FRIEDA RIVER

Frieda River Limited

Sepik Development Project

Environmental Impact Statement

Appendix 7a – Water Quality, Sediment Quality and Aquatic Ecology Baseline

SDP-6-G-00-01-T-003-016

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Sepik Development Project EIS - Water Quality, Sediment Quality and Aquatic Ecology Baseline

Reference: R.B22024.001.11.Revised Baseline.docx
Date: June 2018

Document Control Sheet

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	Title:	Sepik Development Project EIS - Water Quality, Sediment Quality and Aquatic Ecology Baseline
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	Client Reference:	
Synopsis:	Baseline water quality, sediment quality and aquatic ecology report for the Sepik Development Project EIS.	

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	16th June 2016	SKH		DLR	
1	9th August 2016	DTM		DLR	
2	13th September 2016	BMG		DLR	
3	16th September 2016	BMG		DLR	
4	21st September 2016	BMG		DLR	
5	28th September 2016	BMG		DLR	
6	17th October 2016	BMG		DLR	
7	2nd February 2018	JDV		BMG	
8	23rd March 2018	JDV		BMG	
9	28th May 2018	JDV		BMG	
10	7th June 2018	JDV		BMG	
11	22nd June 2018	JDV		BMG	

DISTRIBUTION

Destination	Revision											
	0	1	2	3	4	5	6	7	8	9	10	11
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Glossary and Abbreviations

Abbreviation	Meaning
Abbreviations and acronyms	
AAA	Advanced Analytical Australia
ALS	Australian Laboratory Services
ASL	Above Sea Level (Elevation)
ANZECC	Australian and New Zealand Environment Conservation Council
ANZFA	Australia New Zealand Food Authority
ARD	Acid-Rock Drainage
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CEPA	Conservation and Environment Protection Authority
CITES	Convention on International Trade in Endangered Species
CL	Carapace Length
DGPS	Differential Global Positioning System
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
ECoP	Environmental Code of Practice
EHS	Environmental, Health and Safety
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
EPL	Ecosystem Protection Level
FAO	Food and Agricultural Organization of the United Nations
FRL	Frieda River Limited
FRHEP	Frieda River Hydroelectric Project
FRP	Filterable Reactive Phosphorous
FSANZ	Food Standards Australia New Zealand
GEL	Generally Expected Level
HITEK	Horse-Ivaal-Trukai, Ekwai and Koki deposits
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma – Mass Spectroscopy
IFC	International Finance Corporation
ISF	Integrated Storage Facility
ISQG	Interim Sediment Quality Guidelines
IUCN	International Union for Conservation of Nature
LLR	Lowland River
LOR	Limit of Reporting

Abbreviation	Meaning
MCR	Mid-Catchment River
ML	Maximum Level
MVA	Megavolta Ampere
NATA	National Association of Testing Authorities
NMI	National Measurement Institute
NOx	Nitrate and Nitrite
NTU	Nephelometric Turbidity Units
ORP	Oxidation/Reduction Potential
ORWB	Off River Water Body
PAF	Potentially Acid Forming
PET	Plecopteran, Ephemeropteran and Trichopteran
PNG	Papua New Guinea
PNG ER	PNG Environmental Regulation
PS	Performance Standard
PSD	Particle Size Distribution
QA	Quality assurance
QC	Quality control
RORWB	Reference Off River Water Body
RPD	Relative Percentage Difference
TC	Total Carbon
TDS	Total Dissolved Solids
TL	Target Length
TN	Total Nitrogen
TOC/DOC	Total Organic Carbon/Dissolved Organic Carbon
TP	Total Phosphorous
TS	Target Strength
TSS	Total Suspended Solids
ULC	Upland Creeks
ULR	Upland Rivers
WHO	World Health Organization
WMA	Wildlife Management Areas
wmt	wet metric tonnes
WQO	Water quality objectives
WWF	World Wildlife Fund
Technical terms	
Meso-habitat	Meso-habitats are medium-sized aquatic habitats such as a pool, run, riffle,

Abbreviation	Meaning
	rapids, etc.
Diel patterns	Daily cycles of a water quality parameter, typically referred to in terms of daily fluctuations of dissolved oxygen.
Black water	Black-stained water bodies, commonly referred to as ‘black waters’, are typically associated with wetlands or floodplains with large accumulations of organic material. The black stain is a result of the breakdown of organic material and tannins leaching out, which results in transparent, acidic water that is darkly stained, resembling tea or coffee.
Labile copper	An operational or analytically defined term used to approximate the bioavailable species of copper – dissolved copper in its free form (Cu2+).
Copper complexing capacity	Complexation capacity is an operationally defined measure of the total capacity of water to bind metals into non-labile forms.
Adsorption isotherms	An adsorption isotherm is a graph used to assess the process of adsorption. Adsorption isotherms allow the relationship between adsorbed and dissolved metals to be investigated.
Supersaturated dissolved oxygen	Dissolved oxygen in water is supersaturated if the % saturation is greater than 100%. This can occur as a result of either the presence of photosynthetic aquatic oxygen producers or because of a slow equilibration after a change of atmospheric conditions.

Executive Summary

Frieda River Limited (FRL) is assessing the feasibility of the Sepik Development Project (the Project) in northwest Papua New Guinea (PNG). The Sepik Development Project is underpinned by the Frieda River Copper-Gold Project (FRCGP) and supported by three separate but interdependent projects which provide key infrastructure including Frieda River Hydroelectric Project (FRHEP) the Sepik Power Grid Project (SPGP), and the Sepik Infrastructure Project (SIP).

The four elements of the Sepik Development Project are located in the Sandaun and East Sepik provinces.

BMT WBM Pty Ltd (BMT WBM) was engaged by Coffey, on behalf of FRL, to prepare a description of the existing freshwater environment to support an Environmental Impact Statement (EIS) for the following components:

- Surface water quality and sediment quality.
- Aquatic ecology.

This baseline report was prepared based on a review of existing information, most notably baseline surveys carried out by Hydrobiology (2007-2010) and BMT WBM (2011-17) on behalf of FRL.

Aquatic Ecosystem Types

Eight main rivers flow through various parts of the Study Area: five rivers near and downstream of the Mine Area (the Frieda, Niar, Nena, Wario, and Sepik rivers) and three rivers along the Infrastructure Corridor (Idam, Usake/May, Horden rivers). Four broad meso-habitat types were examined (upland creeks/rivers, mid-catchment rivers, lowland rivers, and off-river water bodies/lakes) and typically had different habitat characteristics, reflecting differences in geological and hydrological conditions.

Sites at higher elevations in each catchment (i.e. upland creeks and rivers) tended to have lower turbidity than lowland rivers which were typically more turbid with higher total suspended solids (TSS) loads. Upland creeks and rivers were also characterised by coarser sediments relative to off-river water bodies (ORWBs) and lowland rivers. This is typical of many river systems in PNG and is consistent with general stream models (e.g. Rosgen 1996).

Upland habitats had cooler, clear, rocky, fast-flowing streams in mountainous areas. Due to the steep gradient of these waterways, stream velocities were high, resulting in the development of an incised water course with a bed comprised mostly of rocks and coarse sediments. By contrast, lowland rivers were warmer, slow-flowing and relatively large water bodies with high turbidity and limited habitat complexity. Lowland rivers occur in areas where the stream gradient and associated water velocities are low, typically on the alluvial plain.

Habitat conditions in mid-catchment rivers were similar to that found upland river sites, however typically had a lower gradient than upland rivers. Channels were either confined or partially confined with floodplains and areas of deposition occurring around confluences and bends. Water velocities were relatively high, as a result a similar range of meso-habitat types as found in upland rivers/creeks was also present (i.e. run, riffle, pool and rapid habitat). Substrate was comprised of a matrix of sands, gravel and cobbles, reflecting the higher flow conditions than found in in lowland rivers. Turbidity was generally lower than lowland rivers. Both stream flow and turbidity can vary greatly over time in response to catchment rainfall patterns.

Freshwater lakes and ORWBs in the Study Area are comprised of two main types: oxbow lakes and tributary lakes. These two lake types are formed by different physical processes and typically have a different physical and ecological character. Tributary lakes form when a tributary stream is blocked by sediment or debris, and are typically shallow and have variable size. Oxbow lakes form when a meander bend is cut off from the main river channel. All ORWB sites sampled in the present study are tributary lakes and typically fluctuated in many parameters, especially pH and dissolved oxygen, depending on seasonal factors such as rainfall and connectivity to major rivers, as well as other factors such as water body size.

Water and Sediment Quality

Electrical conductivity was generally consistent with that typically found in freshwaters (i.e. median values less than 300 µS/cm) throughout the Study Area, with the exception of some ORWBs which had very low electrical conductivity (<30 µS/cm). Electrical conductivity levels typically decreased along the length of the Sepik River towards the mouth. This may be attributed to the low conductivity inflows along the length of the Sepik River from ORWBs and floodplain water.

Dissolved oxygen (DO) and pH varied throughout the Study Area which correlated broadly with stream order and habitat categories. Dissolved oxygen was typically elevated in upland creeks and streams where turbulent diffusion from the atmosphere is high. This is in contrast to ORWBs and lakes, where DO levels can fluctuate with shifts between high levels of oxygen consumption and production. However, these diel patterns were not always evident in all ORWBs with 'black water' characteristics (i.e. high organic carbon, low DO and low pH), and seasonal changes associated with rainfall and flushing were more evident.

Water pH was generally within guideline levels (ANZECC and PNG ER) throughout the catchment and throughout the monitoring period. Exceptions to this included very low pH (pH ~4) consistently recorded at site W27, which is attributable to naturally occurring acid rock drainage (ARD) at this site, and generally acidic but variable pH levels in some ORWBs (RORWB and W100). Also, sites S3 (Uriake River), S6 (Lower Idam River) and S8 (Yanabu River) had pH values above the ANZECC range of 6-8 (but within the PNG ER range of 6.5-9), indicating that waters at these sites were slightly alkaline at the time of sampling.

Ionic composition of waters was also examined. Most sites were dominant in carbonate alkalinity, with reasonably sufficient levels of total alkalinity (>20 mg/L as $CaCO_3$) to provide good acid buffering capacity. Sites with low alkalinity (<20 mg/L as $CaCO_3$) included three upland sites (W27, W48 and Base Camp), three of the ORWBs (W26, W100 and RORWB), and Site S6 in the lower Idam River. The three upland creek/river sites were dominant in sulphate instead of carbonate, which is consistent with the presence of the sulphur rich mineral deposits in the area and reports of naturally occurring ARD.

Metals and metalloids were examined in both water and sediment. The dataset indicated that concentrations of dissolved copper, zinc and aluminium were recorded above aquatic ecosystem protection guideline levels (ANZECC) mostly at sites in the Sepik River, ORWBs, and in upland creek sites in the Mine Area (e.g. site W27). While dissolved concentrations of metals/metalloids at all sites were below the PNG and WHO (2011) drinking water guidelines, concentrations of total manganese and total nickel at site W101 (Yellow River), and total lead at W114 (Niar River @ Ok Isai), exceeded the PNG and WHO (2011) drinking water guideline values.

Dissolved organic carbon (DOC) levels were lowest in upland creeks and rivers. Dissolved organic carbon was slightly higher in riverine sites, and were highest in ORWBs. DOC is an important water quality parameter as it has a strong influence on metal speciation in aquatic systems. Despite low levels of DOC at most sites in the Study area, copper complexing studies conducted by CSIRO showed that overall the copper complexation capacity of waters in the Study Area was substantially higher than the dissolved concentrations of copper which were observed. This indicates that there is low bioavailability of copper to aquatic organisms inhabiting these waters. Due to very high levels of DOC found in the ORWBs, it is suggested that metals present in this habitat type may potentially be in the organically-bound, less toxic form due to the higher complexing capacity of these water bodies during times when pH values are relatively neutral.

Metals in sediment also showed elevated concentrations of chromium, copper and nickel compared to sediment quality guideline values (Simpson *et al.* 2013) across the Study Area. There were also a few exceedances of silver, mercury, lead and zinc at some upland creek sites near the Mine Area. While the alkalinity and stable pH recorded in the water column at most sites means that bioavailability of these metals in sediment is likely to be low, this was not the case at some upland creek sites (e.g. W27, Basecamp and W48) which may occasionally be subject to ARD runoff. ORWB sites W100, RORWB and W26 also regularly had low pH which may mobilise sediment metals into more bioavailable forms.

Aquatic Biology

Aquatic Macroinvertebrates including Macro-crustaceans

Aquatic macroinvertebrate surveys were undertaken in 2008/2009, 2009 and 2010 (Hydrobiology), and 2011 and 2017 (BMT WBM). Chironominae midge larvae were the most abundant taxa overall during the 2008/2009, 2009 and 2010 surveys and also a significant component of the 2011 and 2017 surveys. The most abundant family found in the 2011 and 2017 surveys were the Veliidae water bugs. However, they were collected infrequently or in small numbers during the 2008/2009, 2009 and 2010 surveys. Differences in sampling methods (i.e. kick-net vs sweep net, and sampling of riffle vs edge habitats) may in part explain some differences observed between surveys.

There were also differences in abundance, richness and species composition among aquatic ecosystem types. Upland creeks/rivers consistently were found to have the highest number of pollutant-sensitive taxa. The 2008/2009, 2009 and 2010 surveys found highest species richness in upland creeks/ rivers. The 2011 and 2017 surveys also found differences in aquatic macroinvertebrate communities in different sections of the river, particularly between upland and lowland river environments (i.e. higher diversity at upland sites compared to lowland sites). These differences typically reflected changes in abundance of particular taxa and only minor differences in taxonomic composition between river sections.

Macrobrachium prawns were the most diverse, abundant and widespread macro-crustacean group recorded in the Study Area. Atyidae shrimps and small numbers of the freshwater crab (*Holthuisana* spp.) were also collected. Macro-crustacean species richness was greatest in lowland rivers, with species richness decreasing with increasing elevation.

No threatened or near-threatened aquatic macroinvertebrates are known to occur in the Study Area or the wider catchment area, or were observed in any of the samples. It is possible that regionally endemic species could occur in the Study Area, but there is a lack of information on the distribution, ecology and systematics of PNG's aquatic invertebrate fauna to assess this.

Fish

There were distinct differences in the composition of fish fauna between lowland and mid-catchment river ecosystem types and those found in upland river types. Of note were the apparent absence/low abundance of non-native species in upland river sites, but a numerical dominance of these species in mid-catchment and lowland river systems. Many of the exotic fish species have been introduced to PNG to provide a human food source.

ORWBs were dominated by the introduced Java carp (*Barbonymus gonionotus*). Eleotrididae (gudgeons) was the most abundant native family found in this habitat. Similarly, lowland rivers were dominated by non-native species, namely *B. gonionotus* and rubber mouth *Prochilodus argenteus*. Overall, the composition of the mid-catchment river sites were similar to that recorded in lowland river habitats, but also included a range of small-bodied species only captured in upland creek and river system habitats such as *Glossogobius bulmeri*. The majority of the upland creeks/rivers catch were small-bodied species from the families Gobiidae (gobies) and Melanotaeniidae (rainbowfish).

To date, nine non-native fish species have been recorded in the Study Area. While introductions of non-native fish has been occurring in PNG since 1949, the largest stock enhancement program in the Sepik (and PNG generally) was FISHAID, which was conducted by the Food and Agricultural Organization (FAO) of the United Nations. This involved the introduction of nine new species with the objective of 'improving naturally poor fish stocks of the Sepik-Ramu basin by stock enhancement' (FAO 1997).

Surveys conducted in the Study Area indicate that non-native species now dominate the fish fauna of most aquatic ecosystem types, the exception being upland rivers and creeks. Many of the non-native species recorded in the Study Area are highly invasive species that are known elsewhere to adversely affect aquatic habitats and native fish species. While the effects of non-native fish have not been experimentally evaluated in the Study Area, their preponderance in most aquatic ecosystem types (except upland rivers and creeks) is indicative of a highly modified fish community.

Species of Conservation Significance

Several fish species of conservation significance - i.e. listed on the International Union for Conservation of Nature (IUCN) Red List - are known or could potentially occur within the Study Area. However, the only aquatic 'Critically Endangered' species that could occur within the Study Area is the freshwater sawfish (*Pristis pristis* formerly *Pristis microdon*). *Pristis pristis* is generally found in shallow near-shore marine environments and estuaries, but also in large, turbid rivers. It is listed as Critically Endangered by IUCN and has been reported to occur within the Sepik River catchment (Allen and Coates 1990), however it was not caught in the Study Area during any of the baseline assessments.

The freshwater gudgeon (*Eleotris aquadulcis*) is listed as Near Threatened by the IUCN and is known only to occur only from the Sepik-Ramu River system (Allen 1991). Two specimens were caught at each of the two sites, W32 (Lower May River) and W39 (ORWB1) during the January and February 2009 surveys. These sites are located upstream of the Sepik-Frieda confluence. There were no specimens caught during 2011 or 2017 at any of the sites in the Study Area.

Microphis spinachioides (spinach pipefish) is listed as Data Deficient by the IUCN and is currently considered to be endemic to the Sepik River catchment. This species was not collected during any of the baseline assessments. A further 15 freshwater fish species have been identified as being locally endemic (Sepik-Ramu systems) or endemic within the broader region (northern New Guinea).

Semi-aquatic Reptiles

There are two species of freshwater turtles reported to occur in the Sepik-Ramu River system: Northern New Guinea softshell turtle (*Pelochelys signifera*), and Schultze's snapping turtle (*Elseya schultzei*). *Pelochelys signifera* is known to occur in the Study Area and was assessed as Vulnerable under the IUCN Red List Criteria in March 2018, but has not yet been published. *Elseya schultzei* is listed as Least Concern under IUCN Red List, and is relatively abundant in New Guinea.

Two crocodile species occur in Sepik River system: saltwater crocodile (*Crocodylus porosus*) and New Guinea crocodile (*Crocodylus novaeguineae*). Both species are listed in Appendix II of the Convention on International Trade in Endangered Species (CITES) and are listed as Least Concern under the IUCN Red List. *Crocodylus porosus* has an extensive natural range occurs in a range of habitats including swamps, tidal rivers and marshes. They were sighted at several locations *en route* to sampling sites, within large, turbid rivers. *Crocodylus novaeguineae* is restricted to New Guinea and associated islands, and occurs in lowland environments, but was not observed in field surveys.

Fish Tissue Metal Concentrations

Metal concentrations in the tissues of aquatic biota were generally below the general exceedance level (GEL)[1] or food consumption standards (maximum level – ML) in most samples. There were a greater number of exceedance of GELs and MLs in 2011 and 2017 compared with earlier sampling events. The 2008/2009, 2009 and 2010 sampling events only reported three samples exceeding the GEL, all of which were flesh tissue. However, the 2011 and 2017 surveys reported exceedances of metal levels in gill and hind body tissue as well as flesh tissue.

Zinc was the only metal exceeding the GEL (15 mg/kg) over multiple years (2008, 2010 and 2011). Selenium (GEL of 2 mg/kg) was elevated in 2008 but was within guideline levels for all other sampling years. Copper, lead and mercury (GELs of 2 mg/kg, 0.3 mg/kg and 0.5 mg/kg respectively) were exceeded in 2011 and 2017 but were below the GELs in the earlier surveys. There was once exceedance of the ML for mercury (0.5 mg/kg) in a fish tissue sample collected from the Usake/May river catchment in 2017. All other metals were below their respective GELs and/or MLs across all surveys.

[1] Derived from an Australian and New Zealand food standard guideline.

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1 Introduction

1.1 Background

Frieda River Limited (FRL) is assessing the feasibility of the Sepik Development Project (the Project) in northwest Papua New Guinea (PNG). The Sepik Development Project is underpinned by the Frieda River Copper-Gold Project (FRCGP) and supported by three separate but interdependent projects which provide key infrastructure including Frieda River Hydroelectric Project (FRHEP) the Sepik Power Grid Project (SPGP), and the Sepik Infrastructure Project (SIP).

The four elements of the Sepik Development Project are located in the Sandaun and East Sepik provinces. Refer to Figure 1-1 for project overview and Figure 1-2 for mine area infrastructure.

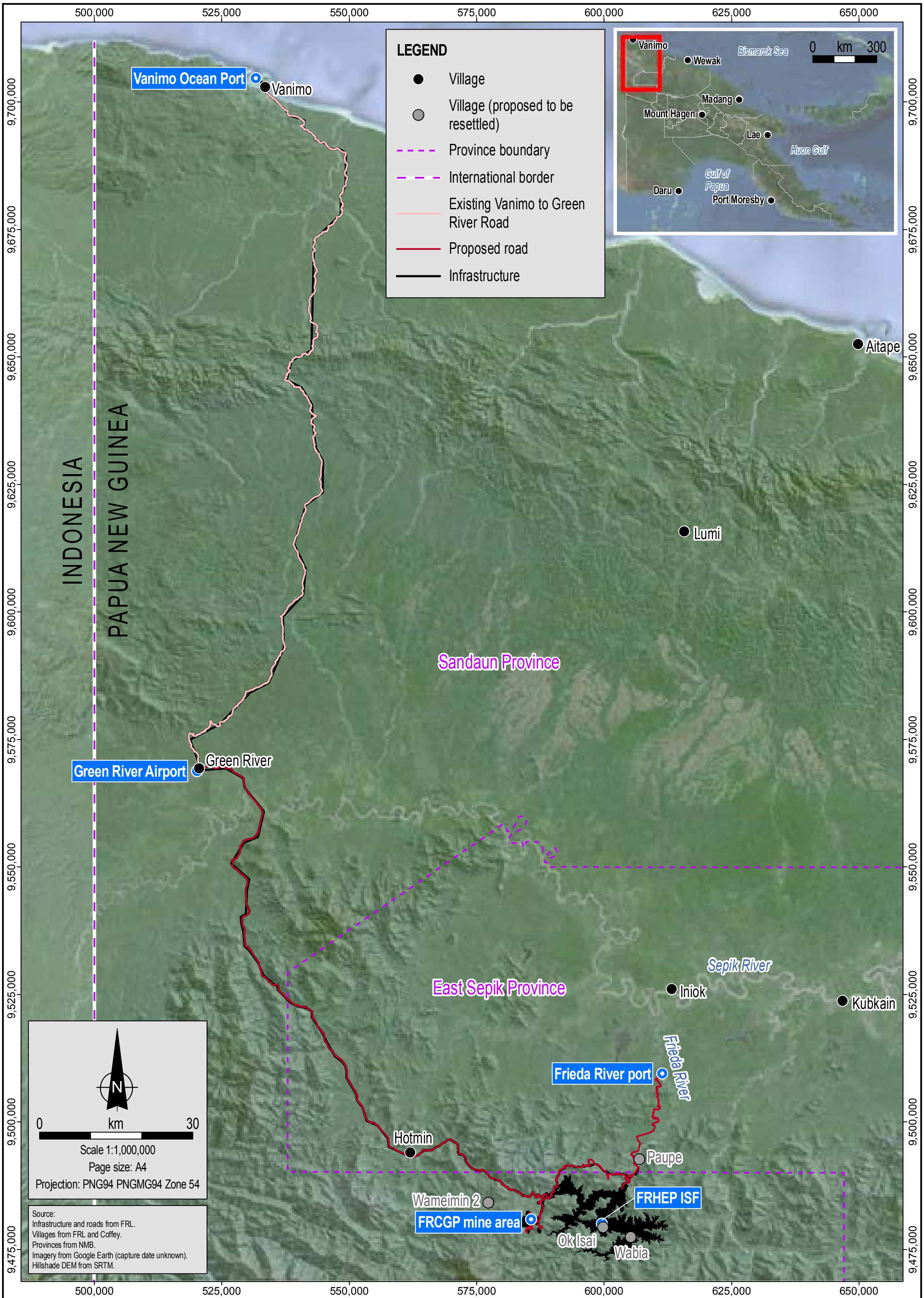
BMT WBM Pty Ltd (BMT WBM) was engaged by Coffey, on behalf of FRL, to prepare a description of the existing freshwater environment to support an Environmental Impact Statement (EIS) for the following components:

- Surface water quality and sediment quality.
- Aquatic ecology.

1.2 Location Terminology

The following terminology has been adopted to describe locations:

- Project Area (see Figure 1-1) includes the Project footprint, with key components being the open pit, Frieda River Hydroelectric Project (FRHEP), process plant, mine infrastructure area, other ancillary infrastructure (including accommodation camps, roads and concentrate export facility located at Vanimo on the north coast of PNG).
- Study Area consists of areas surveyed for the study, which includes:
  - the Mine Area (Figure 1-2).
  - areas downstream of the Mine Area on the Frieda River.
  - the Sepik River from the Frieda River confluence to the river mouth.
  - the Wario River which meets the Sepik River downstream of the Frieda River confluence.
  - waterways intersected by the Infrastructure Corridor (i.e. pipeline and road extending from the Mine Area to Vanimo in the Figure 1-1), including:
    - Upper and lower reaches of the Usake/May Rivers.
    - Idam River.
    - Horden River.



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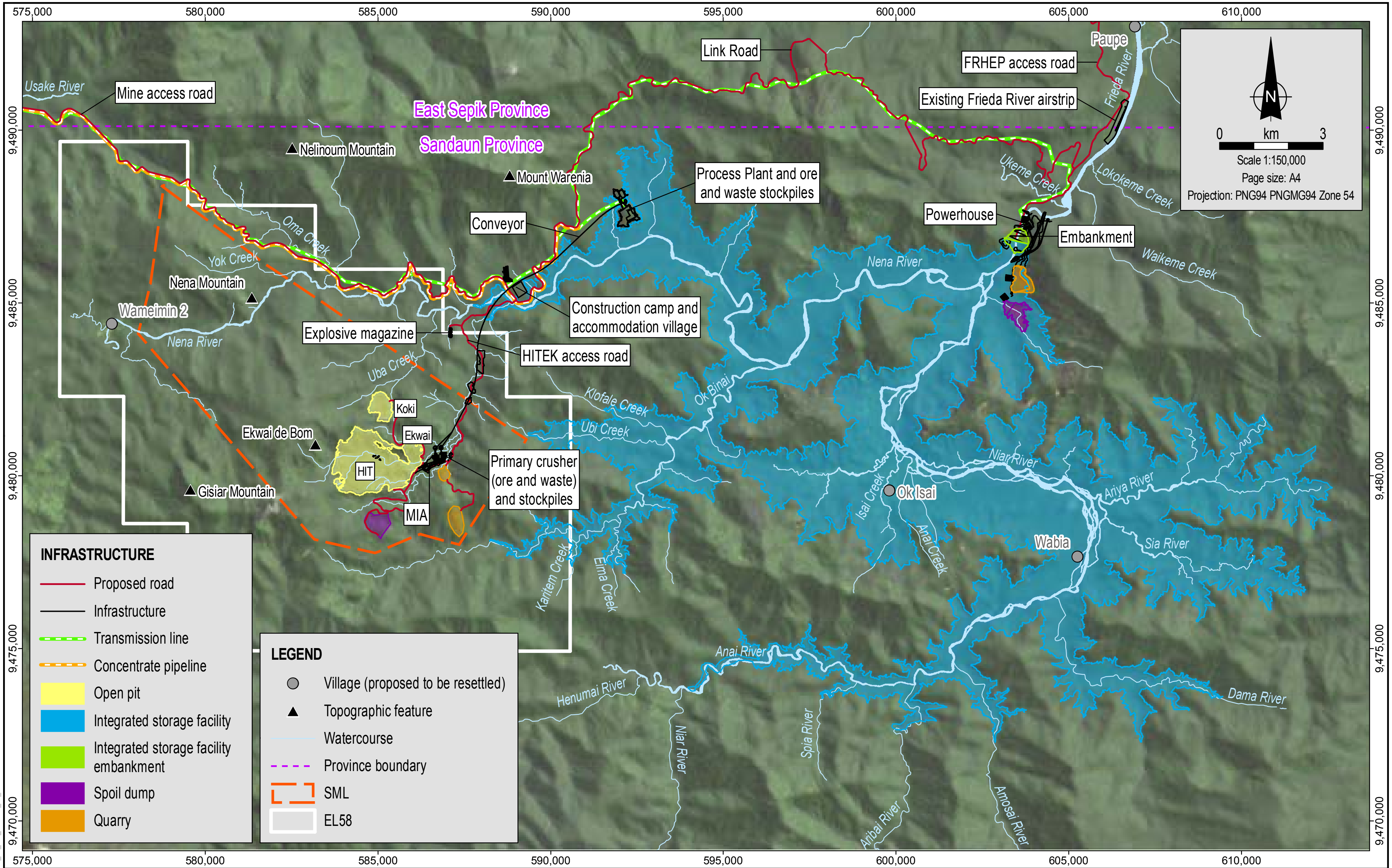
coffey A TETRA TECH COMPANY	Date: 22.02.2018 Project: 754-ENAUABTF11575B File Name: 11575B_11_BM_F001a_GIS	Frieda River Limited / Sepik Development Project	FRIEDA RIVER	Project overview	Figure No: 1a



MXD Reference: 11575B_11_BM_GIS002_v0_3

Source:
Infrastructure, roads and tenements from FRL.
Villages, topographic features, watercourses and water bodies from FRL and Coffey.
Provinces from NMB.
Landsat satellite imagery from FRL (capture date unknown).
Hillshade DEM from SRTM.

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Date:	22.02.2018
Project:	754-ENAUABTF11575A
File Name:	11575B_11_BM_F002a_GIS

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Sepik Development Project

FRIEDA RIVER

Mine and FRHEP area

Figure No: 2a

1.3 Study Objectives

The objectives of the study were to:

- Identify current and relevant international, PNG Government and local government policies, legislation and guidelines regarding aquatic biota, communities, habitats and surface water, and issues for consideration for the Project.
- Characterise spatial and temporal patterns in the physio-chemical properties of surface waters and sediments within the Study Area.
- Characterise spatial and temporal patterns in the aquatic habitats, flora and fauna within the Study Area.
- Document any rare, threatened, undescribed or otherwise noteworthy aquatic fauna and flora species (i.e. International Union for Conservation of Nature (IUCN) listed or community significance), communities and habitats present within the Study Area.
- Describe existing metal/metalloid concentrations in the tissues of selected aquatic fauna species.

1.4 Study Area Context

1.4.1 Background

The Sepik Development Project (the Project) includes the development of the Horse-Ivaal-Trukai, Ekwai and Koki (HITEK) copper-gold deposit in the Sandaun Province of PNG, and supporting infrastructure in Sandaun and East Sepik Provinces. The HITEK deposits represent one of the largest undeveloped copper resources in the world.

The Project requires the development of infrastructure, including, but not limited to:

- Open pit.
- Frieda River Hydroelectric Project (FRHEP) (for tailings and waste rock storage and hydroelectric power).
- Processing facilities.
- Infrastructure corridor including a pipeline to deliver an ore concentrate slurry to an Ocean Port at Vanimo.
- Concentrate dewatering facility at the Ocean Port.
- Construction and operation camps.
- Access roads and bridges.

The proposed mine is located in the northern foothills of the New Guinea Highlands (Central Range) within the Sepik River catchment. The catchment is well known internationally for its environmental and cultural significance, and the PNG Conservation and Environment Protection Authority (CEPA), along with the Sepik Wetlands Management Initiative (SWMI) and the World Wildlife Fund (WWF), has previously flagged the potential listing of wetlands within the catchment as a Ramsar site (i.e. wetland of international importance) (see Jungblut 2014). This potential listing is in the preliminary stages only and is unlikely to progress any further in the near future. However, in recognition of these values, together with their general commitment to limit harm to the environment and communities, a rigorous baseline assessment of the environmental values that have the potential to be impacted by the Project is required.

Eight main rivers flow through various parts of the Study Area: the Frieda, Niar, Nena, Wario, Idam, Usake/May, Horden and Sepik Rivers. A series of surveys have been conducted to characterise the physico-chemical and aquatic ecological characteristics of waters and sediments within and adjacent to the Project footprint. The scope for these surveys has evolved over time in response to variations in project design and perceived priorities. Water quality, sediment quality and aquatic biology has been characterised across a wide area on a regular basis and provides a comprehensive baseline for the project area and its surrounds.

1.4.2 Climate

PNG has a tropical climate, with the majority of the country experiencing high annual rainfalls, high average temperatures and high humidity. The climate in the Sepik River catchment is composed of two distinct regions: the lowland reaches and major tributaries of the Sepik River, and the more mountainous headwaters in the Nena River and Frieda River catchments. The lowland reaches are typified by moderate seasonality and a moderate range in rainfall variability (intermediate to heavy), with the maximum rainfall experienced in January to April. The climate of the upland reaches is characterised by low seasonality and with low rainfall variability (consistently heavy), with no obvious periods of maxima rainfall (McAlpine *et al*. 1983).

Specifically for the mine area, NSR (1999) summarised the climatic pattern as follows:

- Annual mean rainfall of 8,000 mm, with an estimated mean annual evaporation of 1,000-1,250 mm.
- 80% of the rainfall fell at night.
- Generally consistent rainfall throughout the year, with slightly higher rainfall from January to March and lower rainfall from June to September.
- Mean monthly temperatures varied between 21.5 and 23.1ºC.
- There was minimal storage capacity within the catchments thus were subject to high flow variability in response to the rainfall.

1.4.3 Waterbody Types

A number of waterbody types occur in the Project Area including turbid major rivers and minor tributaries in the form of clear-water mountain streams and creeks. Waterway type descriptions which have been adopted for the study include:

- Upland creeks and upland rivers.
- Mid-catchment rivers.
- Lowland rivers.

- Lakes and Off River Water Bodies (ORWB).

These waterbody types are located throughout the Study Area and all form parts of the Sepik River catchment. However, the water bodies can also be categorised based on the specific catchment or river system to which they belong. Most waterbody types are represented within each of the catchment or river systems in the Study Area. Nominally, these systems include:

- Usake/May rivers.
- Frieda/Niar/Nena rivers.
- Sepik River (Sepik floodplain).
- Wario River.
- Idam River.
- Horden River.

2 Legislation and Standards and Assessment Criteria

The Project is regulated under the *Environment Act 2000* and the *Mining Act 1992*. In addition, best practice standards are provided by international standards for the purposes of the Project and environmental impact assessment (EIA) process. Therefore, the following performance standards are applicable to the EIA:

- PNG legislation, including CEPA operational procedures and codes of practice under the *Environment Act 2000.*
- International environmental standards.

2.1 PNG Legislation

2.1.1 Environment Act 2000

EIA in PNG is required under the *Environment Act 2000* in order to assess the potential environmental impacts of significant activities prior to the issue of an Environment Permit. In particular, EIA is required for Level 3 Activities identified under the *Environment (Prescribed Activities) Regulation 2002*. The Project is a Level 3 Activity in accordance with the Regulation.

In preparing an EIA and applying for an Environment Permit, a proponent is required to follow the process set out in operational procedures prepared by CEPA. In addition to operational procedures CEPA has also prepared codes of practice. Codes of practice, unless stated in an Environment Permit, are instruments setting best practice but are not binding on proponents. Relevant CEPA operational procedures and codes of practice are listed in Table 2-1.

Table 2-1 Relevant CEPA operational procedures and codes of practice

Instrument[2]	Purpose
Operational Procedures (Mandatory)	
Operational Procedure (2013): *Information Requirements for Permit Application & Registration of Intention to Carry Out Preparatory Works*	Identifies level of environmental assessment and management required for Level 3 activities.
Information Guideline GL-ENV/02/2004: *Guideline for Conduct of Environmental Impact Assessment & Preparation of Environmental Impact Statement*	Identifies process for conducting EIA and contents of EIS and EMP
Information Guideline GL-Env/03/2004: *Guideline for Submission of an Application for an Environment Permit to Discharge Waste*	Identifies information requirements for an environment permit involving discharge of waste
Technical Guideline IB-ENV/04/2004: *Water & Land Discharges*	Identifies technical studies required for assessing activities involving discharges to land or water
Codes of Practice (Voluntary[3])	
Environmental Code of Practice (2000): *Environmental Code of Practice for the Mining Industry*	Identifies good practice performance for management and assessment of mining activities and environmental impacts

[2] NB – only instruments relevant to the Project in the context of aquatic ecology, water quality and sediment quality considered
[3] While this code of practice is voluntary, this assessment has considered the criteria for freshwater quality life from the code of practice when determining environmental design criteria

2.1.1.1 *Environment (Water Quality Criteria) Regulation 2002*

The *Environment (Water Quality Criteria) Regulation 2002* has been prepared under the *Environment Act 2000* as an instrument to inform design and assessment of activities that are likely to have an impact on water quality. The Regulation sets out ambient water quality criteria for certain parameters at a level deemed necessary to preserve aquatic life.

2.1.2 Protected Species and Protected Area Legislation

Species of conservation significance in PNG consist of those listed as Restricted or Protected under the *Fauna (Protection and Control) Act 1966*. This list of species is based on a list compiled by Kula and George (1996) and primarily consists of terrestrial mammals, reptiles and birds. The list also includes some aquatic mammals, reptiles and fish.

The *Fauna (Protection and Control) Act 1966* also provides for the declaration of Wildlife Management Areas (WMAs) which serve as a form of protected area in PNG. Conservation Areas are another form of protected area declared under the *Conservation Areas Act 1978*. The National Protection Area Policy provides a national governance framework for the establishment and management of protected areas, including the use of environmental offsets from development projects to finance protected areas.

In addition, PNG operational procedure GL-ENV/02/2004 introduces the requirement to consider 'special purpose areas'. While not defined under the procedure or other legislation, these areas have been interpreted as significant and/or sensitive environmental features that are not formally recognised under legislation but still relevant to the EIA decision-making process.

2.2 International Standards

In addition to consideration of the above, the Australian and New Zealand Environment and Conservation Council (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000; with sediment quality guidelines recently revised by Simpson *et al.* 2013) guidelines have been adopted for the purpose of providing additional guidance concerning ambient water and sediment quality, although they have no statutory authority in PNG. These guidelines are discussed further and compared to local guidelines provided in Schedule 1 of the *Environment (Water Quality Criteria) Regulation 2002* (PNG ER) and Appendix 1 of the Environmental Code of Practice for the PNG Mining Industry (PNG ECoP) in Section 3.3.6.

Common seafood tissue trace metal/metalloid concentrations identified by the Australia and New Zealand Food Authority (ANZFA) have been used as a descriptor when discussing fish tissue metal concentrations. However, these are guidelines only and are not intended to be used to determine legal compliance or for strict assessment purposes.

The IUCN Red List identifies species considered as globally threatened or near threatened. In addition, the IUCN Red List is currently being adapted to include a list of threatened ecosystems (see Rodriguez *et al*. 2015).

2.3 Assessment Criteria and Requirements

In the context of the EIS and national and international standards, the following technical content is required for baseline assessment purposes:

- Characterisation of the receiving environment with regards to physical and biological environment, including identification of species of conservation significance, protected areas, special purpose areas and critical habitat.
- Assessment of sensitivity of the environment to changes.

In addition, the PNG and international standards require consideration of ambient water and sediment quality criteria (i.e. the quality of ambient water within an area downstream of the Project). Ambient water quality criteria are listed and discussed further in Sections 2.2, 3.3.6 and 4.

3 Study Methods

3.1 Data Sources

Surveys and studies for aquatic ecology, surface water and sediment quality have been carried out in the Study Area since the early 1990s. The description of the baseline environment is therefore drawn from existing information, particularly baseline monitoring studies done by Hydrobiology (2007, 2008, 2009, 2010) and BMT WBM (2011, 2012, 2013, 2017) for the Project (see Section 3.2). Other studies were also used to provide contextual information.

In addition to a review of these studies the following sources were also reviewed:

- IUCN Red List of Threatened Species on-line database <www.iucnredlist.org>.
- Study into endemism and richness of freshwater biota conducted by Polhemus *et al*. (2004), and underpinning studies (e.g. Allen 1991).

3.2 Historical Studies

Baseline assessments for the following components were based on a review of existing information, field surveys and laboratory based assessments conducted between 2007 and 2017 by Hydrobiology and BMT WBM:

- Water quality.
- Sediment quality.
- Aquatic habitat.
- Fish and macro-crustaceans.
- Aquatic macroinvertebrates.
- Biota tissue sampling (metals).

Limited water quality data had been obtained prior to 2007, with the exception of total suspended sediment (TSS) grab data. Three rounds of water quality samples were taken by EM&M Consultants between July 1993 and December 1994 at 23 stations.

Hydrobiology performed multiple water and sediment quality investigations between September 2007 and October 2010. Aquatic biological investigations were also undertaken by Hydrobiology on three occasions, November 2008-January 2009, November/December 2009 and August/October 2010. Sampling sites were classified into the following four catchment units: Usake/May, Frieda/Nena, Wario and Sepik floodplain.

BMT WBM collected water and sediment quality data quarterly between April 2011 and April 2013, and again in November 2017. Aquatic biology assessments of habitat were performed biannually between June/July 2011 and April 2013, and again in November 2017. Fish and macroinvertebrate assessments were undertaken by BMT WBM on two occasions in 2012, and one occasion in 2017. Metal concentrations in the tissues of selected aquatic fauna species were assessed between 2008 and 2011, and in 2017.

Most of the historical data has been collected in watercourses in the mine area and surrounds, including downstream receiving watercourses. Additional new sampling sites between the mine area and Vanimo on the north coast of PNG (within Usake/May, Idam and Horden River catchments) were included in the program in 2017 due to a revised project description, which includes an infrastructure corridor from the mine site to Vanimo. During the 2017 survey, the mine area sites were not sampled (with the exception of copper-specific water sampling at some sites in the Nena, Frieda and Sepik Rivers, see Section 1.1).

Opportunistic aquatic reptile observations (turtles and crocodiles) were also documented during field surveys throughout the survey period by both BMT WBM and Hydrobiology. A summary of data used for the baseline assessment is shown in Table 3-1.

Table 3-1 Summary of data collected by Hydrobiology and BMT WBM in the Study Area

Monitoring Event	Water Quality	Sediment Quality	Aquatic Biology		
			Habitat	Fish and macro-invertebrates	Biota Tissue Sampling
Hydrobiology					
September 2007	✓	-	-	-	-
November/December 2007	✓	✓	-	-	-
April 2008	✓	-	-	-	-
July 2008	✓	-	-	-	-
October 2008	✓	✓	-	-	-
December 2008	✓	-	-	-	-
November 2008- January 2009		-	-	✓	✓
January 2009	✓	-	-	-	-
October 2009	✓	✓	-	-	-
November/December 2009		-	✓	✓	✓
February 2010	✓	-	-	-	-
April 2010	✓	✓	-	-	-
August/October 2010	✓	✓	✓	✓	✓
BMT WBM					
April 2011	✓	-	-	-	-
June/July 2011	✓	✓	✓	✓	✓
September 2011	✓	-	-	-	-
December 2011	✓	✓	✓	✓	✓
March 2012	✓	-	-	-	-
June 2012	✓	✓	✓	-	-
September 2012	✓	-	-	-	-
December 2012	✓	✓	✓	-	-
April 2013	✓	✓	✓	-	-
November 2017	✓	✓	✓	✓	✓

Dashes (-) indicate no data collected

3.3 Baseline Surveys 2007-2017

Baseline surveys carried out between 2007 to 2017 by Hydrobiology and BMT WBM represent the most recent and relevant information to the EIS. These studies also describe quality assurance (QA) and quality control (QC) procedures and results, providing confidence in data integrity. The methodologies used by BMT WBM and Hydrobiology are summarised below, and the reader is directed to individual technical reports for further details.

3.3.1 Survey Sites

Sites were selected on the basis of the following:

- Providing representative examples of aquatic ecosystem types within and downstream of project infrastructure and waterways located upstream (or in adjacent sub-catchments) that would not be directly affected by the Project (i.e. background sites).
- Characterising aquatic environments in areas potentially affected by the Project that have not previously been surveyed.
- Replicated sampling over time to assess temporal variability at representative sampling sites.
- Providing water and sediment quality data for baseline characterisation and impact assessment.

Table 3-2 provides a summary of sampling undertaken at each site, including waypoints, catchment unit, river type, elevation and the number of sampling events of each sampling type.

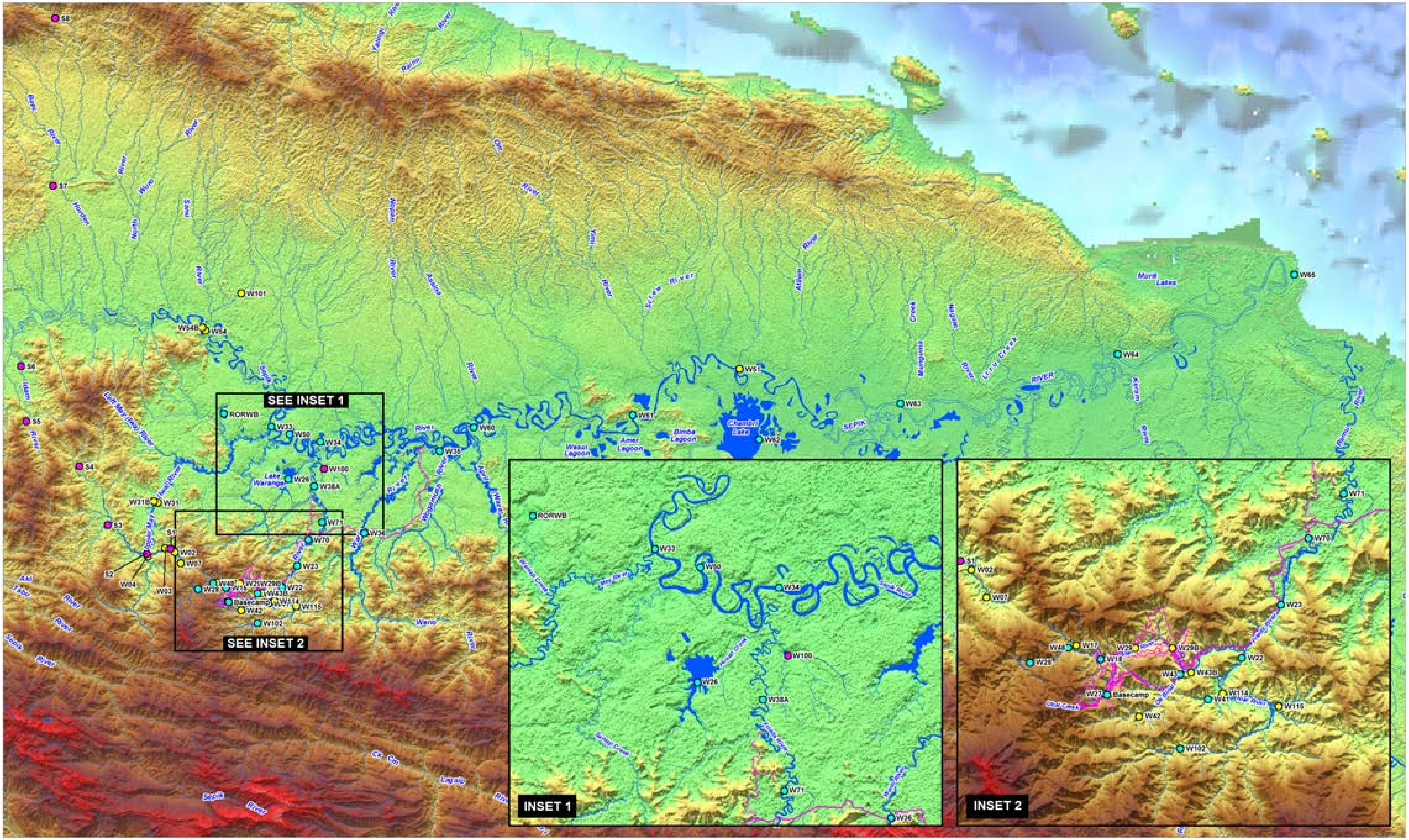
Table 3-2 Site manifest showing the number of times sites have been sampled for the different sampling events (2007 to 2017)

Site Description	Site Code	Latitude (WGS84)*	Longitude (WGS84)*	Catchment Unit	River Type	Elevation (m ALS)*	Number of times sampled - Hydrobiology (2007-2010)					Number of times sampled - BMT WBM (2011- 2017)				
							WQ	SQ	Hab.	M-I	Fish	WQ	SQ	Hab.	M-I	Fish
Usake R us Met Stn	W02	-4.57101	141.64629	Usake/May	MCR	81	11	2	-	-	-	-	-	-	-	-
Usake R @ Village	W03	-4.56009	141.6218	Usake/May	MCR	71	11	2	1	2	2	-	-	-	-	-
Upper May R us Usake	W04	-4.58213	141.5769	Usake/May	MCR	54	11	4	1	3	3	-	-	-	-	-
Upper Usake R	W07	-4.59894	141.66181	Usake/May	ULR	100	11	4	1	2	2	-	-	-	-	-
Ok Oma	W17	-4.6483	141.7534	Nena/Frieda/ Niar	ULC	375	11	4	1	2	3	-	-	-	-	-
Nena R us Koki Ck	W18	-4.662	141.778248	Nena/Frieda/ Niar	ULR	304 (310)	9	1	-	-	-	9	5	5	2	2
Niar R us Nena R	W22	-4.66068	141.92234	Nena/Frieda/ Niar	MCR	72 (68)	11	4	1	2	2	9	5	3		2
Frieda R ds Airstrip	W23	-4.60708 (-4.60636)	141.961816 (141.96206)	Nena/Frieda/ Niar	MCR	51 (60)	10	3	1	2	3	9	5	5	2	2
Lake Warangai	W26	-4.38403	141.93865	Sepik floodplain	ORWB	23 (15)	9	1	1	2	3	9	5	5		2
Ekwai Creek us Ubai River Junction	W27	-4.69735 (-4.69757)	141.78312 (141.78272)	Nena/Frieda/ Niar	ULC	416 (425)	11	2	1	2	2	9	5	5	2	2
Upper Nena GS	W28	-4.66561	141.70626	Nena/Frieda/ Niar	ULR	650	11	4	1	2	3	9	5	5	2	2
Lower Nena	W29	-4.65084	141.81366	Nena/Frieda/ Niar	MCR	197	11	4	-	-	-	-	-	-	-	-
Lower Nena Biology	W29B	-4.65073	141.8516	Nena/Frieda/ Niar	MCR	133	-	-	1	2	3	-	-	-	-	-
Upper May River	W31	-4.445	141.603333	Usake/May	LLR	37	10	2	-	-	-	-	-	-	-	-
Upper May River Biology	W31B	-4.44189	141.59228	Usake/May	LLR	43	-	-	1	1	3	-	-	-	-	-
Sepik US May R Junction	W33	-4.24833 (-4.24924)	141.89 (141.89536)	Sepik floodplain	LLR	21 (18)	10	3	1	1	3	9	5	5	2	2
Sepik at Iniok	W34	-4.28839	142.02072	Sepik floodplain	LLR	15 (18)	11	3	1	-	1	9	5	5	2	2
Sepik at Kubkain	W35	-4.31208	142.3283	Sepik floodplain	LLR	22 (16)	8	1	1	1	2	9	5	5	2	2
Upper Wario	W36	-4.52148	142.13424	Wario	LLR	32 (42)	11	2	1	2	3	9	5	5		2
Lower Frieda Sand Bar	W38A	-4.40182	142.00484	Nena/Frieda/ Niar	LLR	31 (27)	10	4	1	1	2	9	5	5	2	2
Ok Isai	W41	-4.70298	141.88796	Nena/Frieda/ Niar	ULC	103 (128)	-	3	1	1	2	9	5	3	-	2

Site Description	Site Code	Latitude (WGS84)*	Longitude (WGS84)*	Catchment Unit	River Type	Elevation (m ALS)*	Number of times sampled - Hydrobiology (2007-2010)					Number of times sampled - BMT WBM (2011- 2017)				
Upper Ok Binai	W42	-4.72056	141.81768	Nena/Frieda/ Niar	ULC	206	-	1	1	1	1	-	-	-	-	-
Lower Ok Binai	W43	-4.67775	141.85968	Nena/Frieda/ Niar	ULC	119 (102)	11	4	-	-	-	9	5	3	-	2
Lower Ok Binai Biology	W43B	-4.67579	141.87042	Nena/Frieda/ Niar	ULC	117	-	-	1	3	3	-	-	-	-	-
Ok Simbale @ Nena River	W48	-4.65059	141.74544	Nena/Frieda/ Niar	ULC	169 (415)	9	1	1	1	2	9	5	5	2	2
Sepik ds May R (Mowi)	W50	-4.26795	141.94155	Sepik floodplain	LLR	19 (18)	4	1	1	-	1	9	5	5	2	2
Sepik Upstream Kwatit River	W51	-4.10018	143.100005	Sepik floodplain	LLR	13	2	-	1	-	1	-	-	-	-	-
Downstream Sepik crossing	W54	-4.002	141.726	Sepik floodplain	LLR	31	4	1	-	-	-	-	-	-	-	-
Downstream Sepik crossing - Biology	W54B	-3.9936	141.7178	Sepik floodplain	LLR	30	-	-	1	2	2	-	-	-	-	-
Sepik DS April	W60	-4.25143 (-4.25143)	142.416458 (142.41646)	Sepik floodplain	LLR	13 (14)	3	-	1	-	1	9	5	5	2	2
Sepik at Ambunti	W61	-4.22005 (-4.21887)	142.820696 (142.82529)	Sepik floodplain	LLR	12	3	1	1	-	1	9	5	5	2	2
Chambri Lake	W62	-4.28306 (-4.28203)	143.13252 (143.15057)	Sepik floodplain	ORWB	3	3	1	1	-	2	9	5	2	2	2
Sepik at Timbunke	W63	-4.19111 (-4.1896)	143.516619 (143.51434)	Sepik floodplain	LLR	5 (3)	3	-	1	-	1	9	5	5	1	2
Sepik at Angoram	W64	-4.06999 (-4.06212)	144.081655 (144.07339)	Sepik floodplain	LLR	2	3	-	1	-	2	9	5	5	2	2
Sepik at Mouth	W65	-3.87138 (-3.85755)	144.528058 (144.52815)	Sepik floodplain	LLR	0	2	1	-	-	-	9	5	5	2	2
Kaugumi Creek	W70	-4.53467 (-4.53852)	141.98181 (141.99043)	Nena/Frieda/ Niar	LLR	57	1	-	1	-	1	9	5	5	2	2
Frieda River D/S	W71	-4.49314 (-4.49381)	142.02648 (142.02622)	Nena/Frieda/ Niar	LLR	45	1	1	1	-	1	9	5	5	2	2
Lake Diawi	W100	-4.35746	142.02974	Sepik floodplain	ORWB	23 (16)	-	-	-	-	-	9	5	5	2	2
Yellow River	W101	-3.90556	141.81711	Sepik floodplain	LLR	53	3	2		-	-	-	-	-	-	-
Niar River U/S	W102	-4.75346	141.859457	Nena/Frieda/ Niar	ULR	219 (220)	1	0	1	1	1	9	5	3		2

Site Description	Site Code	Latitude (WGS84)*	Longitude (WGS84)*	Catchment Unit	River Type	Elevation (m ALS)*	Number of times sampled - Hydrobiology (2007-2010)					Number of times sampled - BMT WBM (2011- 2017)				
Niar River at Ok Isai	W114	-4.69696	141.90287	Nena/Frieda/ Niar	MCR	81	1	1	1	-	1	-	-	-	-	-
Ariya River U/S of Niar River	W115	-4.71024	141.95977	Nena/Frieda/ Niar	MCR	110	1	1	1	-	1	-	-	-	-	-
Project Base Camp	Basecamp	-4.69841 (-4.69864)	141.7851 (141.78481)	Nena/Frieda/ Niar	ULC	425	2	-	-	-	-	9	5	5	2	2
Reference ORWB	ROR WB	-4.2068 (-4.21615)	141.76343 (141.77249)	Sepik floodplain	ORWB	19 (18)	1	1	1	1	2	9	5	5	2	2
Usake River - middle reaches	S1	-4.5619	141.63486	Usake/May	MCR	75	-	-	-	-	-	1	1	1	1	1
Abei River at Hotmin Mission	S2	-4.57518	141.57455	Usake/May	MCR	61	-	-	-	-	-	1	1	1	1	1
Uriake River	S3	-4.50083	141.47382	Usake/May	MCR	79	-	-	-	-	-	1	1	1	1	1
Muni River	S4	-4.35124	141.40024	Usake/May	MCR	122	-	-	-	-	-	1	1	1	1	1
Upper Idam River	S5	-4.23549	141.26392	Idam	MCR	105	-	-	-	-	-	1	1	1	1	1
Lower Idam River @ Entibi Village	S6	-4.0928	141.25043	Idam	LLR	59	-	-	-	-	-	1	1	1	1	1
Horden River @ Stonepass	S7	-3.62806	141.33287	Horden	MCR	88	-	-	-	-	-	1	1	1	1	1
Yanabu River	S8	-3.19616	141.33881	Horden	ULR	89	-	-	-	-	-	1	1	1	1	1

NOTE: River types – ORWB = Off-river water Body; LLR = Lowland River; MCR = Mid-catchment River; ULR = Upland River; ULC = Upland Creek, WQ= Surface water quality, SQ- Sediment quality, Hab.= Aquatic habitat, M-I.= Macroinvertebrate, Fish= Fish and macro-crustacean. U/S = upstream, D/S = downstream *BMT WBM values in brackets if different. Dashes (-) indicate no data collected.



Title:
Location of Hydrobiology and BMT Monitoring Sites

Figure: 3-1

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

Scale - Insets: 0 10 20km

Scale - Main Map: 0 25 50km

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3.3.2 Water Quality Sampling and Analysis

Field measured (*in situ*) physico-chemical and laboratory analysed water quality parameters were examined at all sites sampled for the present study (Figure 3-1). Sampling was undertaken in accordance with relevant international standards including ISO 5667-1:2006, ISO 5667-2:1991, and ISO 5667-3:2003, along with relevant Australian Standards including AS/NZS 5667.1:1998. Both *in situ* and laboratory-based analytical measurements of water quality were undertaken during all sampling campaigns. Analytical parameters and sites which were visited during each sampling campaign are described in Table 3-3.

3.3.2.1 In Situ Measurements of Water Quality

Physico-chemical water quality parameter measurements were recorded *in situ* at each site using a multi-parameter water quality sonde. This instrument was calibrated prior to each site visit and the calibration was checked again once at site using appropriate calibration solutions. The instrument accuracy was checked regularly during the field program, and a final calibration was performed at the completion of the field program to check for any drift in parameters.

At each site the following was undertaken:

- The instrument was lowered to a water depth of 0.3 m below the water surface (where possible) and allowed to stabilise to ambient conditions (typically less than one minute).
- Optical sensors were wiped to remove air bubbles, debris or sediment.
- Water quality measurements were logged at one second intervals over a period of approximately one minute.
- The mean value for each parameter was calculated for each site.

The following parameters were measured *in situ* at each site:

- pH
- Electrical conductivity (EC)
- Temperature
- Oxidation reduction potential (ORP)
- Turbidity
- Dissolved oxygen (DO)

Additionally, a dissolved oxygen meter was deployed during BMT WBM field trips conducted in 2011 to 2013 at ORWB sites over a 24-hour period in order to continuously measure diel fluctuations in dissolved oxygen levels.

3.3.2.2 Analytical Physio-Chemical Measurements of Water Samples

Surface water samples were collected from a representative area of the study reach at each site. Water samples collected for laboratory analyses were stored and transported in clean, sterile sample containers supplied by National Association of Testing Authorities (NATA) accredited Australian Laboratory Services (ALS) in Brisbane. Samples requiring field filtration (i.e. dissolved metals/metalloids and dissolved organic carbon) were filtered at each monitoring site using a syringe and 0.45 µm filter cartridges. For turbid water sites, glass pre-filters were also used for ease of filtering. At each monitoring site, water samples were taken for laboratory analysis of the following parameters:

- Total suspended solids (TSS)
- Total dissolved solids (TDS)
- Major cations (calcium, magnesium, potassium, sodium and anions (sulphate, chloride and carbonate)
- Total and dissolved metals/metalloids including silver (Ag), arsenic (As), cadmium (Cd), copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), zinc (Zn), selenium (Se), lead (Pb), nickel (Ni), aluminium (Al), antimony (Sb)
- Chlorophyll *a* (only by Hydrobiology in April 2010 and August/October 2010)
- Total organic carbon (TOC)
- Dissolved organic carbon (DOC)
- Nutrients (total nitrogen (TN), oxidised nitrogen (NOx), ammonia, filterable reactive phosphorus (FRP) and total phosphorus (TP))
- Alkalinity (hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity and total alkalinity)

Ultra-trace silver was analysed by BMT WBM at a subset of monitoring sites (W18, W71, W63, W36, and W65) during the April 2013 monitoring event, and at sites S1 to S8 during the November 2017 monitoring event. At least one representative site was sampled in each major waterway (with the exception of an ORWB – samples were intended to be collected at W62, however access to this site was not possible due to high water levels). Ultra-trace analysis (laboratory limit of reporting - LOR 0.0001 mg/L) for silver was undertaken as silver can be toxic to aquatic organisms in concentrations lower than the typical LOR of 0.001 mg/L. The LOR is the lowest concentration of an analyte at which positive identification and quantification can be achieved with reasonable and/or previously determined confidence in a defined matrix using a specific analytical method. Nutrients were sampled biannually only in 2011 and 2012 during the June/July and December monitoring events, and again during the November 2017 monitoring event.

Mercury was not included in the analytical suite by Hydrobiology prior to September 2009 as it was considered unlikely to be present in the relatively undisturbed environment. However, it was added to all sampling events from September 2009 in consideration of obtaining a baseline dataset and confirming this assumption. Mercury has not been detected at any site during any sampling event. Ultra-trace silver (<0.0001 mg/L) was analysed in samples collected from a sub-set of sites.

Organic carbon (TOC and DOC) were not analysed in water samples collected during the December 2017 survey due to loss of suitable sample containers. The exception to this is DOC analysed as part of the assessment of copper complexation by CSIRO (Section 3.3.3).

Also, detailed copper analyses were undertaken in 2017 as part of the copper complexation assessment by CSIRO (Section 3.3.3).

Water samples were kept chilled (and in the dark) in the field using insulated portable containers with ice bricks, and then placed into a refrigerator until ready for shipment. Samples were transported in insulated portable containers with ice bricks to ALS in Brisbane for analysis. Water samples were analysed by the laboratory (ALS) for parameters listed in Table 3-3. In addition, quality control samples were collected and analysed for the same parameters (refer Section 3.3.5). Water quality variables which were below detection limits or LORs in some samples were allocated half that value for reporting and statistical analysis purposes. Analytical methods and LORs for analytical water quality parameters are provided in Table 3-3.

Table 3-3 Analytical parameters for water samples and methods used by the laboratory (ALS)

Analytical Method	Analyte	Units	LOR*
EA025H: Suspended Solids	Suspended Solids (TSS)	mg/L	5
EA015H: Solids - Total Dissolved Solids (TDS) - Standard Level	Total Dissolved Solids	mg/L	5
EP005: Organic Carbon Total (TOC)	Total Organic Carbon	mg/L	1
EP002: Organic Carbon - Dissolved (DOC)	Dissolved Organic Carbon	mg/L	1
ED037P: Alkalinity by PC Titrator	Hydroxide Alkalinity as $CaCO_3$	mg/L	1
	Carbonate Alkalinity as $CaCO_3$	mg/L	1
	Bicarbonate Alkalinity as $CaCO_3$	mg/L	1
	Total Alkalinity as $CaCO_3$	mg/L	1
ED041G: Sulfate (Turbidimetric) as SO_4^{2-} by Discrete Analyser	Sulfate	mg/L	1
ED045G: Chloride by Discrete Analyser	Chloride	mg/L	1
ED093F: Dissolved Major Cations	Calcium	mg/L	1
	Magnesium	mg/L	1
	Sodium	mg/L	1
	Potassium	mg/L	1
EG035F: Dissolved Mercury by FIMS	Mercury	mg/L	0.0001
EG035T: Total Recoverable Mercury by FIMS	Mercury	mg/L	0.0001
EG020F: Dissolved Metals in Fresh Water by ICPMS	Aluminium	mg/L	0.001
	Antimony	mg/L	0.001
	Selenium	mg/L	0.001
	Arsenic	mg/L	0.001
	Cadmium	mg/L	0.0001
	Copper	mg/L	0.001
	Iron	mg/L	0.05
	Lead	mg/L	0.001
	Manganese	mg/L	0.001
	Nickel	mg/L	0.001
	Silver	mg/L	0.001
	Zinc	mg/L	0.005
EG020T: Total Metals in Fresh Water by ICPMS	Aluminium	mg/L	0.001
	Antimony	mg/L	0.001
	Selenium	mg/L	0.001
	Arsenic	mg/L	0.001
	Cadmium	mg/L	0.0001

Analytical Method	Analyte	Units	LOR*
	Copper	mg/L	0.001
	Iron	mg/L	0.05
	Lead	mg/L	0.001
	Manganese	mg/L	0.001
	Nickel	mg/L	0.001
	Silver	mg/L	0.001
	Zinc	mg/L	0.005
EK055G: Ammonia as N by Discrete Analyser	Ammonia as N	mg/L	0.01
EK057G: Nitrite as N by Discrete Analyser	Nitrite as N	mg/L	0.01
EK058G: Nitrate as N by Discrete Analyser	Nitrate as N	mg/L	0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser	Nitrite + Nitrate as N	mg/L	0.01
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser	Total Nitrogen as N	mg/L	0.1
EK067G: Total Phosphorus as P by Discrete Analyser	Total Phosphorus as P	mg/L	0.01
EK071: Reactive Phosphorous as P by Discrete Analyser	Reactive Phosphorous as P	mg/L	0.01
EP008: Chlorophyll a	Chlorophyll a	mg/m^3	1

* LOR = limit of reporting.

3.3.3 Copper Complexation and Adsorption Capacity Study

Water quality samples were collected by Coffey between 29 September and 6 October 2015 from the mine area and downstream water bodies to characterise the copper complexing capacity of the watercourses. Copper complexing capacity refers to the measure of the total capacity of water to bind metals into non-labile (i.e. non- bioavailable) forms. Once the copper complexing capacity is exceeded, further additions of dissolved copper are likely to exist in labile and potentially bioavailable forms.

Additional samples were collected at similar sites by BMT WBM in November 2017 to further characterise copper complexing capacity.

Surface water samples were collected from Ekwai Creek, the Nena, Frieda and Sepik rivers (six samples in 2015 and seven samples in 2017). Laboratory analysis was conducted by CSIRO (Lucas Heights, NSW), using Chelex column coupled with ICP-MS/ICP-AES, for the following analytes:

- Total copper.
- Dissolved copper.
- Labile copper.
- Copper complexing capacity.

Copper speciation was assessed using the Chelex-labile metal measurement technique on filtered (0.45 µm) water to provide information on the fraction of the dissolved copper that is labile and in a potentially bioavailable form. The Chelex-labile metal method measures free metal ions and labile metal complexes (those that can dissociate rapidly), and excludes metals that are strongly complexed by natural organic ligands. Greater metal lability usually results in greater metal bioavailability.

The ability of the waters to mitigate dissolved copper bioavailability was assessed using the Chelex method to measure the copper-complexation capacity of the filtered waters following the addition of various known concentrations of dissolved copper. This measurement technique is used to measure the amount of dissolved copper added to the waters that may be sequestered by DOC, and thus removed from the labile phase. Once the copper complexing capacity is exceeded further additions of dissolved copper are likely to exist in labile and potentially bioavailable forms.

For samples collected in 2017, CSIRO also performed copper adsorption testing. This assessed the ability of the suspended particulate matter in the waters to mitigate metals via adsorption onto suspended particulate matter (SPM) and removal from the dissolved phase. Tests were performed that involve spiking unfiltered waters with a range of dissolved copper concentrations (0, 5, 10, 20 and 50 µg/L) and equilibrating for 24-hours, then measuring the dissolved copper.

Adsorption isotherms were generated to assess the adsorption efficiency of the waters by comparing dissolved copper concentrations in the unfiltered waters with controls (filtered water samples spiked with the same dissolved copper concentrations). Adsorption isotherms allow the relationship between adsorptive capacity of particulates and dissolved metals to be investigated. The partition coefficient provides a means for modelling adsorption processes under the conditions in which it was determined (i.e. SPM concentration, pH, DOC etc.). The higher the value of partition coefficient Kd, the higher the adsorptive affinity of the metal for the sediment in the samples.

3.3.3.1 Limnological Assessments

Limnological assessments of the physico-chemical properties of the water column were conducted from 2011 to 2013 at each ORWB. Assessments involved profiling of each ORWB at a number of locations using a YSI 6600 probe. This profiling provided *in situ* measurements of physical water quality parameters throughout the water column as a means of determining whether there was evidence of lake stratification. A Van Dorn sampler was also used to collect water samples for laboratory analysis from surface and bottom layers at one sample location within each ORWB.

3.3.4 Sediment Quality Sampling and Analysis

Sediment sampling was undertaken in accordance with relevant international standards including ISO 5667-1:2006, ISO 5667-2:1991, and ISO 5667-3:2003, along with relevant Australian standards including AS/NZS 5667.12:1999.

Sediment samples were collected at a number of locations across each waterway using a Van Veen grab sampler (0.028 m^3 grab). All sediment sub-samples were placed into a large clean plastic tray, mixed thoroughly using a plastic trowel, and placed in appropriate clean, sterile sample containers supplied by ALS in Brisbane. This method resulted in a composite sample representing the range of bottom sediments present at each site.

Where bottom sediments consisted predominantly of cobbles or boulders (such as upland rivers and streams), sediment material was collected from the bank and shallow fringe using a clean, plastic trowel.

Sediment samples collected at each site were analysed for the following parameters:

- Particle size distribution (PSD).
- Total metals/metalloids concentrations in the <63 µm fraction, namely: Ag, Al, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, Se, Zn.
- Total metals/metalloids concentrations in the <2000 µm fraction, namely: Ag, Al, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, Se, Zn.
- TN, TP, total carbon (TC) and TOC was also collected by Hydrobiology at a subset of sites (W22, W29, W41, W42, W43).

Aluminium (Al) and Chromium (Cr) were also analysed by Hydrobiology in samples collected in April and August/October 2010 and the whole sediment (rather than broken into fractions) was tested in November/December 2007 and October 2008.

Sediment samples were kept chilled in the field using insulated portable containers with ice bricks, and then placed into a refrigerator until ready for shipment. Samples were shipped in insulated portable containers with ice bricks to ALS in Brisbane for analysis. Analytical methods and LORs for analytical sediment quality parameters are provided in Table 3-4.

All sediment quality results (other than PSD) within this report use the units of mg/kg (dry weight), referred to here after as mg/kg.

Table 3-4 Analytical parameters for sediment samples and methods used by the laboratory (ALS)

Methodology	Analyte	Units	LOR*
EA055: Moisture Content	Moisture Content (dried @ 103°C)	%	1
EA150H: Particle Sizing including Hydrometer	<75 µm	%	1
	+75 µm	%	1
	+150 µm	%	1
	+300 µm	%	1
	+425 µm	%	1
	+600 µm	%	1
	+1180 µm	%	1
	+2.36 mm	%	1
	+4.75 mm	%	1
	+9.5 mm	%	1
	+19.0 mm	%	1
	+37.5 mm	%	1
	+75.0 mm	%	1
EA150: Soil Classification based on Particle Size	Clay (<2 µm)	%	1
	Silt (2-60 µm)	%	1

Methodology	Analyte	Units	LOR*
	Sand (0.06-2.00 mm)	%	1
	Gravel (>2 mm)	%	1
	Cobbles (>6 cm)	%	1
EG020-T: Total Metals in <63µm and >2000 µm fractions by ICPMS	Antimony	mg/kg	0.5
	Arsenic	mg/kg	1
	Cadmium	mg/kg	0.1
	Copper	mg/kg	1
	Lead	mg/kg	1
	Manganese	mg/kg	10
	Nickel	mg/kg	1
	Selenium	mg/kg	0.1
	Silver	mg/kg	0.1
	Zinc	mg/kg	1
EG035T: Mercury in <63µm and >2000 µm fractions by ICPMS	Mercury	mg/kg	0.1
GEO26: Sieving	-2000 µm	%	0.01
	-63 µm	%	0.01
EK062: Total Nitrogen (includes NOx and TKN)	TN	mg/kg	20
EK067: Total Phosphorus as P	TP	mg/kg	2
EP003: TOC (high temp furnace including preparation	Total Organic Carbon	%	0.02

* LOR = limit of reporting

3.3.5 Quality Assurance/Quality Control

3.3.5.1 Sample Collection, Handling, Storage and Transport

To ensure good quality data was collected during the field program, a number of QA/QC procedures were adhered to during all field work. These included the following:

- Proper training and supervision of field staff.
- Use and maintenance of appropriate sampling equipment, and implementation of appropriate calibration procedures (including use of controlled standard solution supplied by ALS in Brisbane).
- Proper sampling techniques were utilised in accordance with relevant water and sediment quality sampling guidelines and standards (e.g. AS/NZS 5667.1:1998 and AS/NZS 5667.12:1999).
- Sample containers were clearly and accurately labelled and a log of collected samples was maintained and updated.
- Chain of custody forms were maintained and included with samples.

- Data validation included cross check by a second scientist after entry into the database.
- Water sample preservation and handling procedures were followed and, with the exceptions noted in Section 3.4.3, samples were supplied to the laboratory within nominated holding times.

3.3.5.2 Quality Control Samples

A range of additional samples were collected for QC purposes to assess the repeatability and precision of laboratory results, and consisted of the following:

- *Intra-laboratory duplicates* – water/sediment samples were split into two duplicate sub-samples and tested as separate (blind) samples by the primary laboratory (ALS). Intra-laboratory duplicates were collected at 10% of monitoring sites.
- *Inter-laboratory duplicates* – water/sediment samples were split into two duplicate sub-samples and tested as separate (blind) samples by the primary laboratory (ALS) and a second independent laboratory (National Measurement Institute (NMI)). Inter-laboratory duplicates were collected at 5% of monitoring sites.
- *Field blanks* – samples taken in the field using laboratory supplied solution which is placed into sample containers the same way as normal samples (i.e. using sampling equipment such as the sample pole, syringes and filters). Field blanks are taken once per monitoring event, and are used to test for sample contamination from sampling personnel, equipment, or the atmosphere. Hydrobiology also collected a field blank for each sampling personnel.

Full discussion of QA/QC for each of the water and sediment quality sampling periods can be found within their respective reports (Hydrobiology 2008b, 2008c, 2008d, 2008e, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2010d, 2011; BMT WBM 2012, 2013a, 2013b). In summary, the assessment of QC samples in these reports indicates that the majority of primary samples and QC samples were within the acceptable range, and therefore the data presented in this report can be considered to be of acceptable quality.

Trip blanks are also sometimes used in monitoring programs to test for sample contamination during transport of samples. However, trip blanks are generally only required when testing for volatile substances (such as hydrocarbons), so were considered not necessary for this monitoring program.

3.3.5.3 Laboratory Quality Control Measures

ALS in Brisbane was the primary laboratory used for water sample analysis. Inter-laboratory duplicates were sent to NMI. Both these laboratories are NATA accredited and as such have strict quality assurance and quality control procedures in place.

Routine laboratory control samples used at ALS include:

- Certified reference materials.
- Laboratory duplicates.
- Laboratory control spikes.
- Matrix spikes.
- Surrogates.

- Secondary and project standards.
- Inter laboratory (proficiency) testing.
- Client and industry managed independent audits and accreditations.

BMT WBM reviewed QA/QC documentation supplied by the primary laboratory and there were no issues identified.

3.3.6 Comparison of Data to Water Quality Objectives and Guideline Values

3.3.6.1 Water Quality

The results were compared to existing water quality objectives and guideline values to assess ambient water quality 'condition'. There are a number of PNG and Australian-based legislation and guideline documents which contain a variety of water quality objectives and/or guideline values. Those which are considered most relevant to the Study Area include the following:

- **PNG ER**: Schedule 1 of the *Environment (Water Quality Criteria) Regulation 2002*, which is subordinate legislation under the *Environment Act 2000*, specifies water quality objectives relevant to permit conditions. These are legally enforceable water quality criteria.
- **PNG ECoP**: Appendix 1 of the Environmental Code of Practice for the PNG Mining Industry – PNG guideline with recommended guideline values based on international standards. Compliance with the ECoP is voluntary.
- **Drinking Water**: standards for raw water as specified in *Public Health (Drinking Water) Regulation 1984* under PNG legislation *Public Health Act 1973* and World Health Organisation (WHO) drinking water guidelines (2011).
- **ANZECC**: ANZECC/ARMCANZ (2000) Water Quality Guidelines – Australian guideline document containing numerical guideline values (referred to as trigger values). Freshwater guidelines for 95% species protection are used for comparison to data.

In PNG, the first priority in assessing ecological impacts is to use guideline values provided in the *Environment (Water Quality Criteria) Regulation 2002* and the PNG ECoP. However, ANZECC guideline values are also often used to supplement the PNG guideline values. Table 3-5 is a summary of the various water quality objectives and guideline values derived from the documents listed above.

Note that the PNG raw drinking water guidelines, which are based on an older version of the WHO guidelines, are mostly the same as the guideline values from the PNG ER, except for lead and mercury which are less stringent in the drinking water standards. The revised WHO (2011) drinking water guidelines generally specify more stringent drinking water guideline values (compared to previous versions), with most parameters more stringent than the PNG ER guideline values, except for copper, mercury and lead.

Table 3-5 Water Quality Objectives and Guideline Values

Parameter	Units	Water Quality Objectives / Guideline Values				
		PNG ER	PNG ECoP [1]	Drinking Water Standards		ANZECC [2]
				PNG	WHO (2011)	
Temperature	°C	No alteration >2°C	No alteration >2°C	-	-	-
Dissolved Oxygen	% sat	-	>80-90% saturation	-	-	85 - 120
	mg/L	>6	> 6	-	-	-
Turbidity	NTU	No alteration >25	<10% change from background seasonal mean	-	-	-
Electrical Conductivity	µS/cm	-	<1500	-	-	-
pH	-	No alteration to natural pH	6.5 – 9.0	-	-	6.0 – 8.0
Total Suspended Solids	mg/L	-	<10% change from background seasonal mean	-	-	-
Potassium (K)	mg/L	5	-	-	-	-
Sulphate (SO_4^{2-})	mg/L	400	-	400	-	-
Silver (Ag)	mg/L	0.05	0.0001	0.05	-	0.00005
Arsenic (As)	mg/L	0.05	0.05	0.05	0.01	0.024
Cadmium (Cd)	mg/L	0.01	0.0007 *	0.01	0.003	0.0002
Copper (Cu)	mg/L	1	0.007 *	-	2	0.0014
Iron (Fe)	mg/L	1	1	-	-	-
Mercury (Hg)	mg/L	0.0002	0.0001	0.001	0.006	0.00006^
Manganese (Mn)	mg/L	0.5	-	0.5	0.4	1.9
Zinc (Zn)	mg/L	5	0.18 *	-	-	0.008
Selenium (Se)	mg/L	0.01	0.005	0.01	0.01	0.005^
Lead (Pb)	mg/L	0.005	0.0013 *	0.10	0.01	0.0034
Nickel (Ni)	mg/L	1	0.056 *	-	0.07	0.011
Aluminium (Al)	mg/L	-	0.1 (pH >6.5), 0.005 (pH <6.5)	-	-	0.055 (pH >6.5) ND (pH <6.5)
Antimony (Sb)	mg/L	-	0.03	-	0.02	-
Tin (Sn)	mg/L	0.5	-	-	-	-
Total Nitrogen	mg/L	-	-	-	-	0.3
Total Phosphorus	mg/L	-	-	-	-	0.01
Ammonia **	mg/L	3.6	1.04	-	-	0.9
Nitrate (NOx)	mg/L	45	-	-	-	0.7
Soluble reactive phosphorus	mg/L	-	-	-	-	0.04

Note: Water quality objectives/guideline values for metals/metalloids are for dissolved metals/metalloids. [1] PNG ECoP guideline values based on protection of aquatic life in freshwater; [2] ANZECC/ARMCANZ (2000) values based on a 95% level of species protection for metals/metalloids in typical slightly–moderately disturbed systems, and slightly disturbed lowland river in tropical Australia for other parameters except:

^ mercury and selenium values are for protection of 99% of species in typical slightly–moderately disturbed systems as per ANZECC/ARMCANZ (2000).
* Water quality objectives/guideline values for Cd, Cu, Pb, Ni, Zn are dependent on water hardness in PNG ECoP guideline and ANZECC/ARMCANZ (2000) – values presented are based on a hardness of <50 mg/L of $CaCO_3$.
** Ammonia water quality objectives/guideline values are dependent on temperature and pH – water quality objectives/guideline value listed is based on temperature of 25 and pH of 7.

3.3.6.2 Sediment Quality

There are currently no PNG freshwater sediment quality guidelines.[4] Therefore, sediment quality data was compared to Australian sediment quality guideline values specified in Simpson *et al.* 2013, which updated the interim sediment quality guideline values specified in ANZECC/ARMCANZ (2000). The revised sediment quality guideline values were not significantly different from those adopted in ANZECC/ARMCANZ (2000), with the only change being a slight increase to the high guideline value for silver (3.7 mg/kg to 4.0 mg/kg).

Simpson *et al.* 2013 specifies sediment quality guideline values which are presented as two trigger values, as follows:

- Guideline Value: concentration level below which ecotoxicological effect probably do not occur.
- Sediment quality guideline-high (SQG-High): concentration level above which ecotoxicological effects could occur.

Relevant sediment guideline values for the present study are summarised in Table 3-6.

These values are considered reasonably accurate at determining the extremes of effects. However, information is lacking in the intermediate range, where effects may or may not be occurring.

The ANZECC/ARMCANZ (2000) guidelines apply to slightly to moderately disturbed and highly disturbed aquatic ecosystems. For aquatic ecosystems considered to be of high conservation/ecological value, a precautionary approach is recommended. ANZECC/ARMCANZ (2000) recommends that in these ecosystems, chemicals originating from human activities should be undetectable, and naturally occurring toxicants (e.g. trace metals) should not exceed background sediment concentrations. This approach should only be relaxed when there are considerable biological assessment data showing that such a change in sediment quality would not disturb the biological diversity of the ecosystem.

[4] Note that marine sediment guidelines have been established under the *Marine Pollution (Sea Dumping) Act 2013* in relation to determining the suitability of sediment for placement at sea.

Table 3-6 Sediment Quality Guidelines

Analyte	Units (dry weight)	Simpson *et al.* 2013 Sediment Quality Guidelines	
		Guideline Value	SQG-High
Silver (Ag)	mg/kg	1	4.0
Arsenic (As)	mg/kg	20	70
Cadmium (Cd)	mg/kg	1.5	10
Chromium (Cr)	mg/kg	80	370
Copper (Cu)	mg/kg	65	270
Mercury (Hg)	mg/kg	0.15	1
Nickel (Ni)	mg/kg	21	52
Lead (Pb)	mg/kg	50	220
Antimony (Sb)	mg/kg	2	25
Zinc (Zn)	mg/kg	200	410

3.3.7 Aquatic Ecology Sampling and Analysis

3.3.7.1 Aquatic Habitats

An assessment of structural habitat characteristics and aquatic/riparian vegetation was conducted at sites listed in Table 3-2. The 2008, 2009 and 2010 aquatic habitat surveys were conducted by Hydrobiology and used standard proformas. The 2011 aquatic habitat surveys undertaken by BMT WBM were conducted based on the semi-quantitative sampling methodology outlined in Pusey *et al.* (2004). The 2012, 2013 and 2017 aquatic habitat surveys undertaken by BMT WBM were conducted based on a modified version of the AusRivAS sampling protocol (DNRM 2001).

Despite differences in assessment methodologies, all surveys assessed a standard set of parameters including waterbody type, stream condition/integrity, substrate type, percent cover of woody debris, aquatic macrophytes, riparian cover, water depths, wetted widths and various other structural micro habitat characteristics. Photographs were taken facing upstream and downstream, and of representative features of each site.

3.3.7.2 Aquatic macroinvertebrates

The aquatic macroinvertebrates surveys were undertaken by Hydrobiology in 2008, 2009 and 2010 and by BMT WBM in 2011 and 2017. Surveys followed the AusRivAS methods as outlined in the Queensland AusRivAS sampling manual (DNRM 2001). Sites were sampled using a triangular dip-net with a 0.25 mm mesh size, with dip-net dimensions of 25x25x25 cm (Hydrobiology) and 30x30x30 cm (BMT WBM). Sites were sampled using a combination of kick-net sampling and sweep-net sampling. Kick-netting involved lifting and kicking rocks directly in front of the opening of the net and sweep-net sampling involved sweeping the dip-net through the water or near vegetation.

Hydrobiology mostly focussed sampling on riffle habitat, due to it representing a major habitat type in the Project area. Hydrobiology sampled macroinvertebrates in the upland creeks and rivers by conducting kick-net sampling (five replicate samples per site) in riffle habitats. At sites without riffle habitat, sweep-net sampling was conducted at suitable pool and run habitats, within a 10 m area, to produce composite habitat samples. These composite samples were used solely for the determination of the presence or absence of taxa and were live-picked in the field using the method described in Conrick and Cockayne (2001), then processed and sent to the laboratory with the kick-net samples.

The BMT WBM aquatic macroinvertebrate surveys consisted of kick-net sampling at riffle habitats and sweep-net sampling at edge habitats at each site over a 10 m reach. Three replicates were collected per site to provide a statically robust assessment of the macroinvertebrate communities in the Study Area.

The retained net material from each sample was placed into appropriately labelled containers, then preserved with either a 70% alcohol solution (Hydrobiology) or a 10% formalin solution (BMT WBM). The samples collected during the Hydrobiology surveys were sent to the National Museum of the Philippines for further taxonomic identification. Samples collected from the BMT WBM surveys were freighted to an Australian laboratory (Dardanus Scientific) for identification and enumeration. Fauna collected in the Hydrobiology surveys were identified based on family level and then further categorised in to genera level groups (e.g., notonectid sp.1, chironomid sp.1, 2, 3). The samples collected during the BMT WBM surveys were identified to family level for arthropods (where possible), sub-family level for chironomid midge larvae, and order or class for other taxa.

A range of biological indices of stream condition and biodiversity value were calculated, including taxa richness, total abundance, plecoptera (stoneflies), Ephemeroptera (mayflies), trichoptera (caddisflies) (PET) taxa richness[5] (Plafkin *et al*. 1989).

Due to the differences in aquatic macroinvertebrate sampling methodologies employed by Hydrobiology and BMT WBM, the macroinvertebrate data is not directly comparable.

3.3.7.3 Fish

Fish were sampled in the Project area by Hydrobiology in 2008, 2009 and 2010 and by BMT WBM in 2011 and 2017. A variety of methods were utilised to target the full range of fish species present (i.e. small and large bodied species) as well as macro-crustaceans. The methods employed by Hydrobiology and BMT WBM are outlined in bullet points below and summarised in Table 3-8.

The fishing methods employed by Hydrobiology and BMT WBM include the following:

- Back-pack electrofishing - Sampling was undertaken using a Smith-Root Model LR24 backpack mounted electrofisher at all upland creeks (ULC) and upland river (ULR) sites within pools, runs and other suitable habitat types. Output power was standardised to conductivity to ensure that only enough power was used to temporarily stun fish. Specifications used by Hydrobiology and BMT WBM are shown in Table 3-7.
- Electro-seining - A fine-meshed seine net with wooden handles was used to block off a section of the stream. Electrofishing was then used to disturb fish and macro-crustaceans and direct them downstream into the net. This technique was employed in fast-flowing streams, which is typically less responsive to tradition electrofishing methods.

[5] Macroinvertebrates from PET taxa orders are considered to be sensitive to changes in their environment and are therefore commonly recorded as an indicator of habitat condition.

- Boat based electrofishing – Sampling was undertaken at all sites situated on lowland rivers (LLR), mid-catchment rivers (MCR) and off river water bodies (ORWBs). A Smith-Root electrofishing unit (7.5GPP) was secured into an aluminium dinghy, long canoe or banana boat. Boom poles were secured to either side of the vessel by a timber trestle attached perpendicular to the hull. Output power was standardised to conductivity to ensure that only enough power was used to temporarily stun fish. Due to the low electrical conductivity of waters (i.e. generally <100µScm-1) output voltage was 1000V DC, with a pulse rate of 120 pulses per second, and a varied range (depending on water conductivity). Sampling consisted of a total of 1000 seconds of electrofishing effort per site. This time was broken into shots of various habitat types including open water, vegetated edge and edge/open water snags. Additional to collecting fish that surfaced, 'blind netting' was used to collect fish particularly along vegetated and undercut banks to overcome the limited visibility and small body species caught within submerged vegetation.
- Panel nets, finnish gill nets (mesh sizes – 1", 1.5", 2") and standard gill-nets (mesh sizes - 1", 1.5", 2", 2.5", 3", 3.5", 4", 5" and 6") were deployed at nine sites within the Mid-Catchment Rivers, Off River Water Bodies and Lowland Rivers and left for approximately 8 hrs overnight.
- Baited box traps - Baited box traps (0.5 mm mesh) were deployed at all sites to sample small bodied fish and crustaceans. Ten collapsible baitfish traps were deployed within the range of microhabitat types present within the site (i.e. littoral margin, among snags, open water) for a minimum period of one hour.

The most effective methods of sampling fish and macro-crustaceans from the shallow clear upland creeks and rivers employed were electrofishing and electro-seining. However, in wider, deeper habitats electrofishing was limited, and bait trapping and netting were used.

Back-pack electrofishing was restricted to shallow areas (<1 m deep) due to safety issues of operating equipment in deeper waters and strong currents. Captured biota were retained in storage bins until all electrofishing was completed to avoid potential recapture. Due to the non-standard pulse time of the Hydrobiology surveys, the sample was converted to fish catch per unit effort by adjusting to catch per 30 seconds of electrofishing. Due to the differences in the electrofishing methods (pulse time and voltage – refer to Table 3-7) employed by Hydrobiology and BMT WBM, the data is not directly comparable.

Table 3-7 Back-pack electrofishing specifications used by Hydrobiology and BMT WBM

Specifications	Hydrobiology	BMT WBM
Voltage range	Approximately 500 to 800 V (max 900 V)	370 to 385 V
Pulse time	Between 341 and 778 s	900 s

All captured fish and macro-crustaceans were retained for identification, and were then directly counted, weighed and measured for total length. Any wounds, lesions or deformities on captured fish were recorded, with detailed notes and photographs taken. In the event a captured species was unable to be identified within the field, voucher specimens were collected, and were then preserved in a 10% formalin solution for transport to the Queensland Museum in Brisbane, Australia for identification. Similarly, unidentified specimens found during the Hydrobiology surveys were first sent to the Hydrobiology laboratory for further examination and, if still were unable to be identified were identified at the Queensland Museum, Brisbane.

Table 3-8 Fish sampling methods employed

Fish Sampling Method	Hydrobiology (2008, 2009, 2010)	BMT WBM (2011)	BMT WBM (2017)
Back-pack electrofishing	✓	✓	✓
Electro-seining	✓	×	×
Boat based electrofishing	×	✓	×
Baited box traps	×	✓	✓
Panel nets	✓	×	×
Finnish gill nets	✓	×	×
Standard gill-nets	✓	×	×

3.3.8 Hydroacoustics

Hydroacoustics, a method for gaining a quantitative assessment of fish stocks in large lakes and ORWBs (Kubecka *et al*. 2009), was employed by Hydrobiology (2009). Hydroacoustic surveys were undertaken at two sites (W26 and RORWB) in 2009.

The hydroacoustic sampling involved the transmission and the subsequent capture and analysis of returning echoes from a pulse of acoustic energy into the water from a transducer. Location data was obtained using a differential GPS unit, with an accuracy of approximately 10 cm. Water temperature, salinity and depth and calculation of speed of sound and absorption coefficients were measured and recorded at each site.

The echo returns were then processed to determine fish density and size distribution. To determine the absolute value of fish density within the sounded (ensonified) track, the contribution of a single target fish (average backscattering cross-section) was measured, using Biosonics Visual Analyzer software. The average backscattering cross-section was converted to the Target Strength (TS) which was the acoustic equivalent of the physical size of individual fish (Kemper & Raat 1997). The TS value (measured in decibels, dB) was then converted to the length of fish using the equation of Love (1971). These data were then used to calculate biomass. Acoustic data were visualised, combined with data received from a differential global positioning system (DGPS) device and fish biomass was mapped in relation to lake area and bathymetry.

3.3.9 Metal Tissue Analyses

Metal tissue analysis was undertaken to describe the baseline concentrations in aquatic biota (i.e. fish and prawns). Metal tissue analysis of fish and Macrobrachium shrimps were conducted on each of the four sampling events by Hydrobiology (2008/2009, 2009 and 2010) and in 2011 and 2017 by BMT WBM.[6] Tissue samples were collected from species considered as common food sources of the local people.

Where possible, tissue sampling conducted in 2008/2009, 2009 and 2010 were taken from up to five specimens of each species per site. Hind body samples were taken from smaller fish

[6] Fish tissue samples were not able to be collected at sites S7 and S8 during the November 2017 survey due to lack of sample storage facilities in remote location

specimens and flesh (dorsal muscle), gill and liver samples were taken from larger fish specimens, where possible.

BMT WBM collected (where possible) five samples of two tissue types (gill and flesh tissue) from two organisms (i.e. a total of 20 sub-samples per site, based on 2 tissue types x 5 replicates x 2 organisms) at aquatic biology survey sites. For smaller fish specimens, hind body samples only were collected. Organisms were chilled on ice until returning to the laboratory in the evening. Each specimen was then re-weighed and measured, before dissection of tissue sample using a standard dissection kit and size 22 surgical scalpel blades. Dissection tools were rinsed after each tissue sample dissection with deionized water. In addition, latex gloves and blades were changed between different species, site, tissue-type, and after the dissection of five samples.

Retained tissue samples were weighed and placed into individual plastic zip lock bags and immediately frozen. Frozen samples were then transported for tissue metal analysis in the laboratory. Samples were analysed by Advanced Analytical Australia (AAA) (2008/2009 and 2010) and the National Measurement Institute (NMI) (2009, 2011 and 2017) using Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) or Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) as appropriate. The list of metal parameters tested and their limit of reporting and analysis methods used is shown in Table 3-9.

Metal burdens were expressed on a dry weight basis (mg/kg) by the lab (NMI). Dry weights were converted to wet weight using the supplied moisture content (%) to enable comparisons to the relevant food standards and guidelines.

Metal/metalloid concentrations in tissues were compared against various food consumption guidelines, as follows:

- ANZFA (2001 & 2015) Food Standards. These refer to Generally Expected Levels (GELs) and Maximum Levels (ML). GELs are guideline values based on analysis of a large number of samples of the edible portions fish/ macro-crustaceans (and other foods not relevant to this study). GELs describe both median and the 90th percentile of results. For the purposes of this study, comparisons of 90th percentile values were used. In comparison, MLs are levels above which an unacceptable risk to human health is perceived. MLs are set for lead, arsenic and mercury, whereas GELs are available for copper, selenium and zinc in a variety of aquatic biota tissue types.
- Food and Agriculture Organisation of the United Nations and World Health Organisation (FAO and WHO, 2006) proposed CODEX standards for the protection of human health.

Guideline values used are presented below in Table 3-9 and Table 3-10.

Table 3-9 Metal species analysed within fish and macro-crustacean tissue samples

Parameter	Units (dry weight)	Limit of Reporting (LOR)
Silver (Ag)	mg/kg	0.02
Aluminium (Al)	mg/kg	0.5
Arsenic (As)	mg/kg	0.05
Cadmium (Cd)	mg/kg	0.01
Copper (Cu)	mg/kg	0.01

Parameter	Units (dry weight)	Limit of Reporting (LOR)
Mercury (Hg)	mg/kg	0.01
Lead (Pb)	mg/kg	0.01
Manganese (Mn)	mg/kg	0.01
Nickel (Ni)	mg/kg	0.01
Antimony (Sb)	mg/kg	0.01
Selenium (Se)	mg/kg	0.05
Zinc (Zn)	mg/kg	0.01

Table 3-10 Food standards used for screening tissue metal results

Analyte	ANZFA/FSANZ Food Standards Code		FAO/WHO CODEX Standards
	Fish flesh	Prawn flesh	Fish flesh
Units	mg/kg (wet weight)	mg/kg (wet weight)	mg/kg (wet weight)
As	2	2	-
Cd	-	-	-
Cr			-
Cu	2	20	-
Pb	-	-	0.3
Hg	0.5	0.5	0.5
Ni	-	-	-
Se	2	1	-
Zn	15	40	-

ANZFA/FSANZ = Black text denotes the ML; shaded grey denotes the GEL
Dash (-) indicates no guideline.

3.3.9.1 *Quality Assurance/Quality Control (QA/QC)*

In order to assess the quality of data, the relative percentage difference (RPD) was calculated between duplicates. The RPD was calculated as follows:

$$RPD(\%) = \frac{|X_1 - X_2|}{\overline{X}} \times 100$$

where: X_1 = 1st result

X_2 = 2nd result

$\overline{X}$ = mean of results.

The calculated RPD was then compared with acceptable quality ranges. One of the major constraints on analysis of tissue metals data is the LOR which are high due to matrix interference from this medium.

4 Existing Environment – Water and Sediment Quality

4.1 Water Quality

This section presents the results of water quality monitoring conducted at sites throughout the Study Area (refer to Figure 3-1 for location of sites). These sites are documented in Table 3-2 and have been categorised into the following groups:

- Upland Creek (ULC).
- Upland River (ULR).
- Mid-catchment River (MCR).
- Lowland River (LLR).
- Off-River Water Body (ORWB).

Water quality data are presented in box and whisker plots, where whiskers represent maximum and minimum values, boxes represent 20th to 80th percentiles and the small blue horizontal bar within boxes represents the median value. An example box and whisker plot is presented in Figure 4-1.

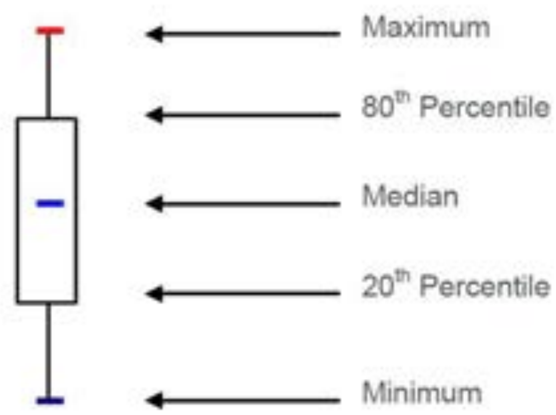


Figure 4-1 Description of BMT WBM Box and Whisker Plots

While all water quality data is included in Appendix A, summary data for *in-situ* parameters (median values) are provided in Table 4-1. Shaded cells in Table 4-1 indicate exceedance of the most stringent guideline values shown at the bottom of Table 4-1 (applicable guideline values are discussed further in Section 3.3.6). Further discussion for each of the water quality parameters is included in the following sections.

Table 4-1 Median values for in-situ water quality monitoring parameters (yellow cells indicate exceedances of guideline values)

Site name	Temp	EC	Salinity	pH	Turbidity	Dissolved Oxygen	
	ºC	µS/cm	ppt	-	NTU	% sat	mg/L
Base C	24.1	76	0.04	6.95	3.1	99.4	8.1
W27	23.6	101	0.04	4.13	1.2	99.0	8.0
W41	26.4	49	0.02	7.28	0.5	97.1	7.7
W43	26.2	60	0.02	7.50	3.2	99.2	8.0
W48	23.0	24	0.01	6.89	0.3	99.6	8.2
W17	23.8	38	0.01	7.65	0.0	97.4	*ND*
W42	25.1	82	0.03	7.89	0.6	98.1	*ND*
W07	25.4	46	0.01	7.35	0.2	99.0	*ND*
W18	23.5	47	0.02	7.61	2.4	100.9	8.4
W28	22.0	49	0.02	7.41	1.2	101.9	8.4
W102	22.5	89	0.04	7.70	23.3	100.4	8.5
W02	26.4	58	0.02	7.38	0.0	99.1	*ND*
W03	26.7	49	0.01	7.04	0.8	95.6	*ND*
W04	26.2	76	0.03	7.87	7.8	100.7	*ND*
W22	26.9	82	0.04	7.68	51.3	101.2	8.2
W23	24.5	67	0.03	7.47	48.4	96.8	8.1
W29	24.6	50	0.01	7.67	0.1	100.2	*ND*
W114	23.6	85	0.03	7.42	363.8	2.9	*ND*
W115	27.8	56	0.01	7.25	14.0	4.6	*ND*
W31	26.5	57	0.02	7.02	14.6	93.6	*ND*
W33	28.1	146	0.07	7.60	355.7	72.1	5.5
W34	28.0	130	0.06	7.20	234.9	70.5	5.4
W35	28.1	115	0.05	7.49	223.3	64.2	5.1
W36	25.2	88	0.04	7.62	84.9	93.6	7.7
W38A	26.1	69	0.03	7.22	73.7	87.5	7.0
W50	27.5	132	0.06	7.50	258.4	65.0	5.5
W51	28.8	69	0.01	6.61	96.0	45.4	*ND*
W54	28.2	95	0.05	7.35	271.9	76.9	*ND*
W60	27.5	118	0.05	7.21	214.2	52.2	4.7
W61	28.1	114	0.05	7.29	170.1	47.4	4.9
W63	28.3	100	0.05	7.20	158.7	48.4	4.8
W64	28.0	104	0.05	7.19	137.2	49.0	4.5
W65	28.5	106	0.05	7.46	113.4	66.7	5.3
W70	25.7	55	0.02	7.11	31.6	82.2	6.7
W71	24.6	71	0.03	7.41	44.6	94.0	7.7
W101	*ND*	216	0.10	7.33	*ND*	86.9	*ND*
RORWB	29.4	21	0.01	5.09	0.9	40.7	3.1
W100	28.1	28	0.01	4.21	0.6	23.7	1.8
W26	30.5	25	0.01	6.38	11.2	66.8	4.8
W62	30.6	81	0.04	7.86	16.8	94.7	7.3
S1	24.1	49	0.02	7.78	9.4	94.9	7.9
S2	24.3	66	0.03	7.79	12.5	100.9	8.4
S3	26.5	47	0.02	8.21	13.6	97.6	7.7
S4	25.5	53	0.02	7.30	10.1	100.7	8.1
S5	24.4	45	0.02	7.89	6.5	100.5	8.3
S6	26.2	31	0.01	8.66	76.4	88.2	7.0
S7	29.3	269	0.13	7.76	164.7	98.6	7.4
S8	24.6	277	0.13	8.36	20.2	101.4	8.1
PNG ER	-	-	-	-	-	-	>6
PNG ECoP	-	*1500*	-	*6.5-9*	-	*>80*	*>6*
ANZECC	-	-	-	*6-8*	-	*85-120*	-

ND = No data available

4.1.1 Turbidity and Total Suspended Solids

The data shows that turbidity tended to be lower in upland creeks and rivers (median values between zero and 23.3 NTU) than in mid-catchment and lowland rivers (median values between zero and 364 NTU), including the Sepik River (Figure 4-3). TSS showed a similar general trend to turbidity with median TSS concentrations <20 mg/L in upland creek sites (Figure 4-4). Turbidity also tended to be low in ORWBs (medians between 0.6 and 17 NTU) which are low energy environments and typically have lower concentrations of suspended particulate matter.

There was high temporal variability in turbidity at Lowland Rivers, most likely reflecting temporal variations in flow conditions. Lower Sepik River sites (W35 to W65) had notably lower turbidity in April 2013 compared to other monitoring data. This may be the result of the inflow of less turbid floodplain runoff into the Sepik River at these sites at the time of monitoring.

Mid-catchment river sites differed to upper and lower catchment sites in that some sites were consistently less turbid (sites W02, W03, W04 in the Usake/May catchment) while others were more variable (W22 and W23 in the Nena/Frieda/Niar catchment – see Figure 4-2 and Figure 4-3). Similar trends were observed in the TSS data (Figure 4-4).

Raw data and further analysis of the results are provided in separate field trip and annual reports (Hydrobiology 2008b, 2008c, 2008d, 2008e, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2010d, 2011; BMT WBM 2012, 2013a, 2013b).

Figure 4-2 Example of visible changes in water quality at Site W22 in (a) July 2008 following a low-flow period and (b) October 2009 following a high-flow period (Hydrobiology 2015)

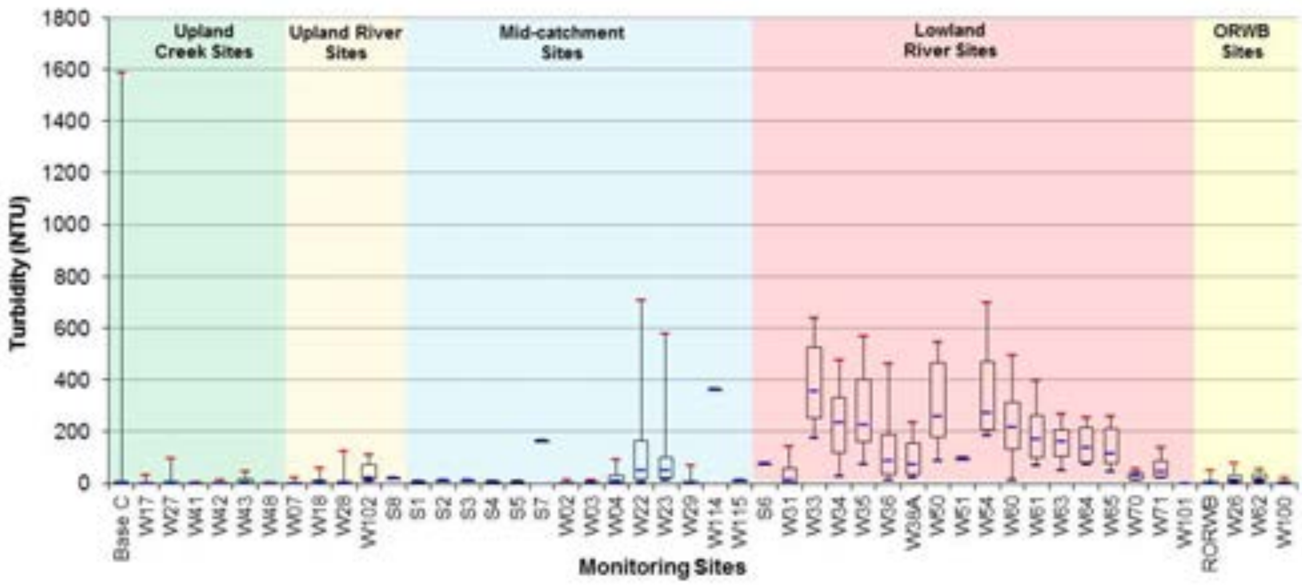


Figure 4-3 Box and whisker plot of turbidity measurements

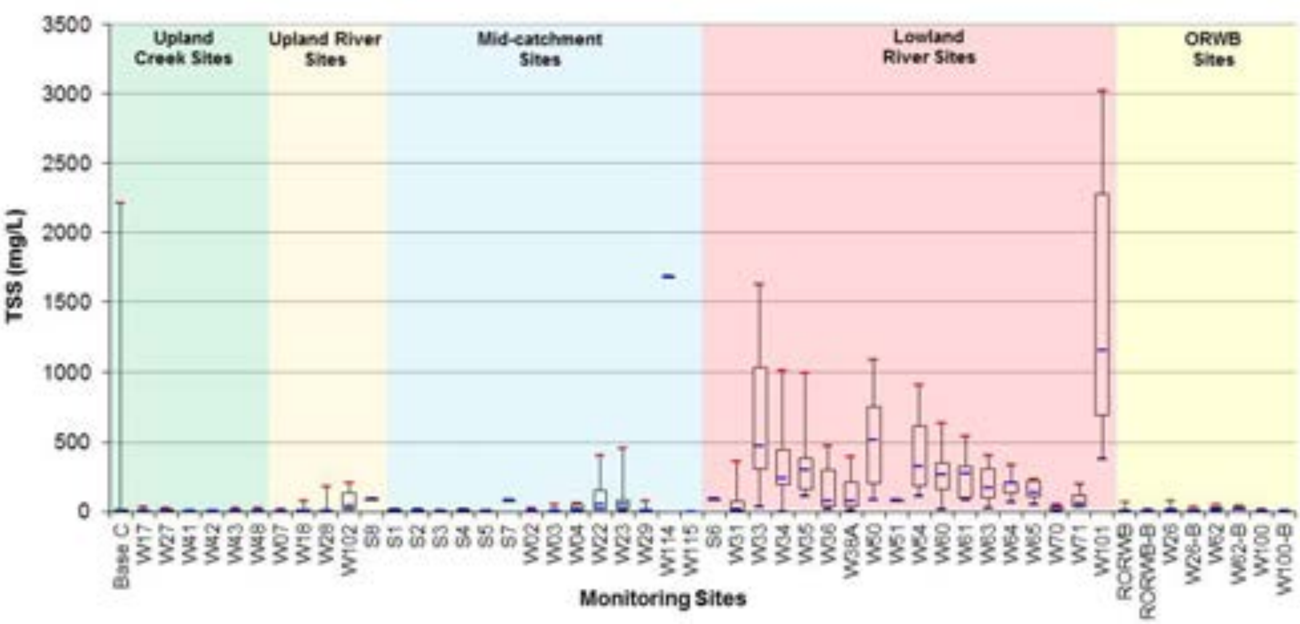


Figure 4-4 Box and whisker plot of TSS measurements

4.1.2 Electrical Conductivity

Electrical conductivity (EC) throughout the entire Study Area was generally consistent with that typically found in freshwaters, with the exception of some ORWBs which had very low median EC (<30 µS/cm). The lowest median EC was recorded at W48 (24 µS/cm) and within the ORWBs (Figure 4-5). The highest median EC was recorded at sites S7 (269 µS/cm) and S8 (277 µS/cm) in the Horden River catchment, and at site W101 (216 µS/cm) in the Yellow River. These median EC values are lower than the PNG ECoP guideline value (<1,500 µS/cm).

Median EC values from all sites visited throughout the monitoring period are provided in Table 4-1. Overall, median EC values were generally consistent throughout the monitoring period as shown in Figure 4-5.

Median EC levels generally decreased along the length of the Sepik River (sites W33 to W35, and W50 to W65) towards the mouth, ranging from 146 to 106 µS/cm. Higher median EC was recorded at the monitoring site furthest upstream (W33), while lower median EC was recorded towards the river mouth (W63, W64 and W65). This may be attributed to the low conductivity inflows along the length of the Sepik River from ORWBs and floodplain water. This trend is illustrated by spatial patterns in EC as depicted in Figure 4-6.

Hydrobiology (2015) suggested that the elevated EC at site W101 on the Yellow River was 'largely associated with high levels of carbonate alkalinity at this site though sulphate was also elevated with respect to the majority of study sites, suggesting predominantly alkaline (e.g., limestone) drainage with potential neutralisation products from ARD (sulphate)'. Yellow River and Site 101 are located a large distance (~100 km) from the mine and any ARD present here is likely to be naturally occurring. Relative to other upland creek sites, elevated median EC was also evident at Site W27 on Ekwai Creek (Figure 4-5) which is also known to be influenced by naturally occurring ARD. This elevated EC may be due to the same causes described by Hydrobiology (2015) for W101, as is likely to be the case with elevated EC at sites S7 and S8.

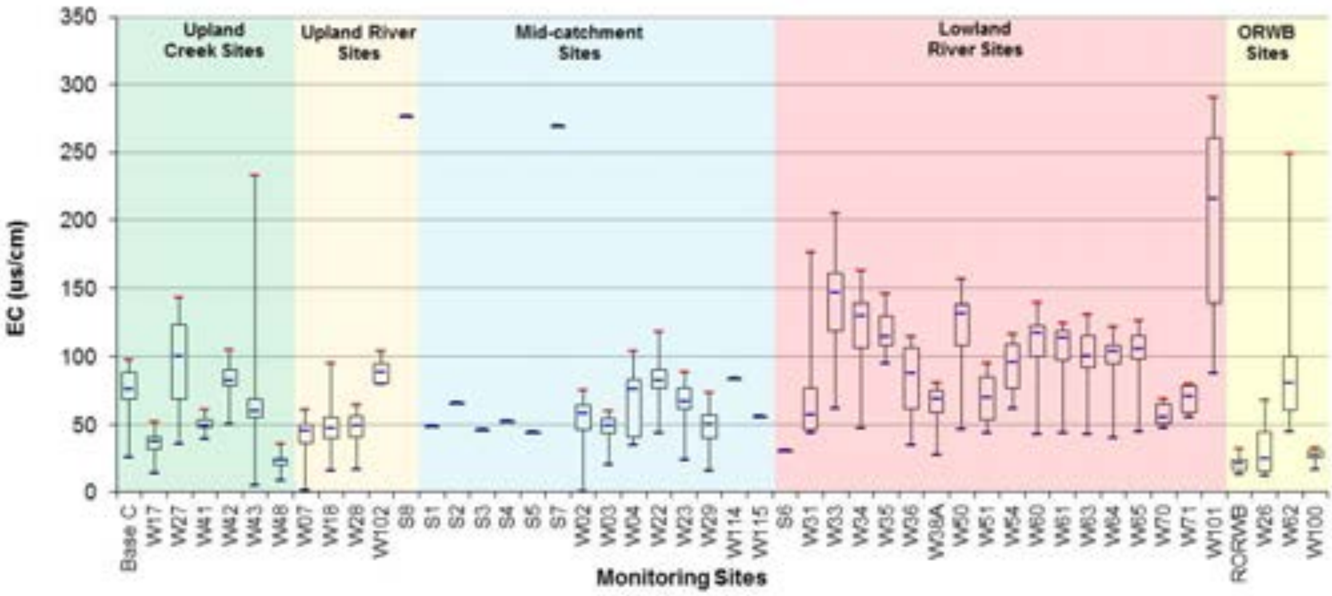
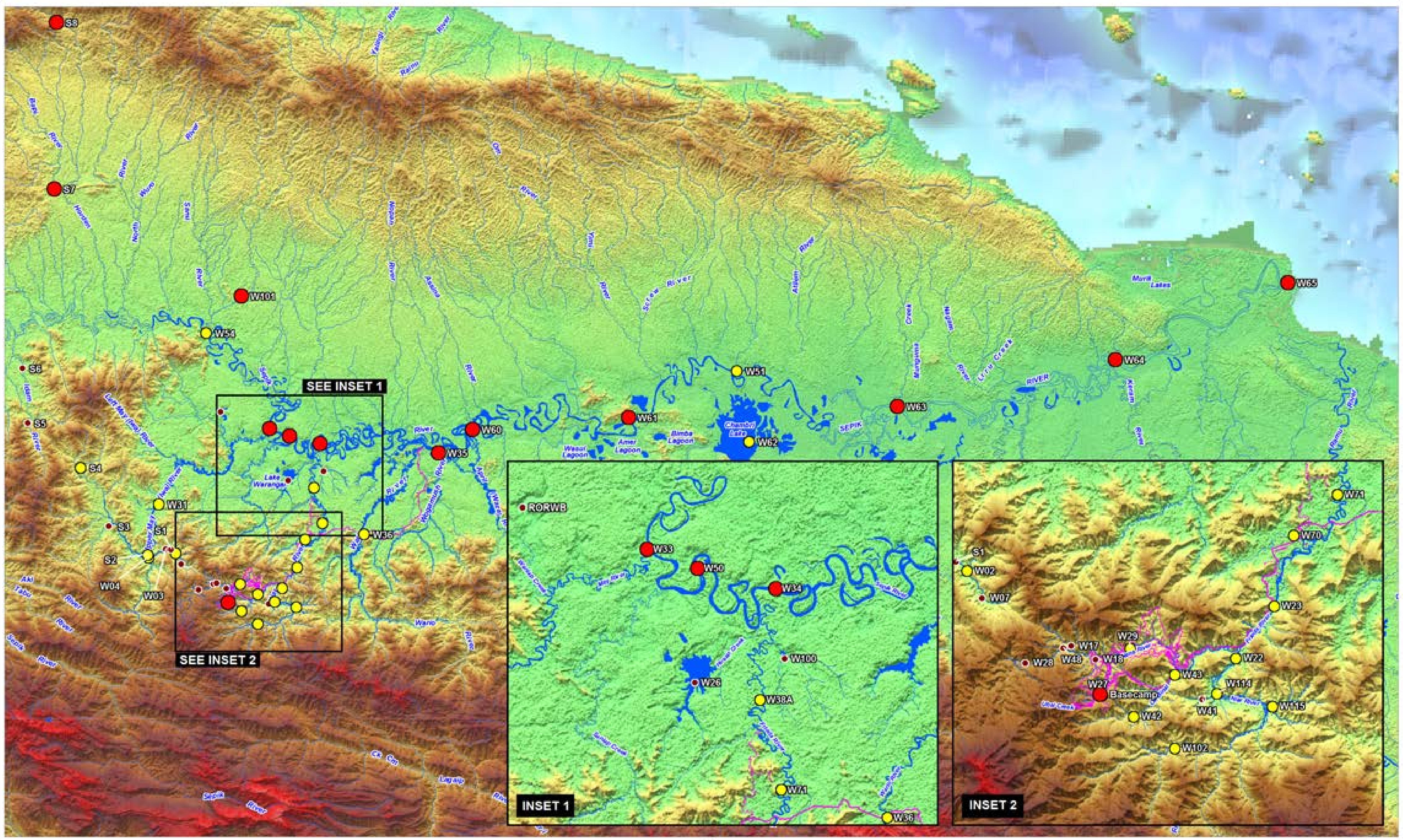


Figure 4-5 Box and whisker plot of conductivity measurements



LEGEND

Major Waterways

Mine Infrastructure

Electrical Conductivity (µs/cm)

- > 100
- 50 - 100
- < 50

Title:

Map of Median Electrical Conductivity (EC) Measurements within Study Area

Figure: **4-6**

Rev: **A**

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0 10 20km
Scale - Insets

0 25 50km
Scale - Main Map

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4.1.3 Temperature

Water temperature remained relatively consistent throughout the monitoring period. The smallest temperature range was seen at Lowland River site W51 (28.5°C – 29.1°C) and the greatest range at the ORWB site W62 (28.1°C – 37.9°C) (Figure 4-7). The lowest recorded temperature was 20.8°C at Site W28 and the highest was 37.9°C at Site W62. Only single measurements were collected for mid-catchment sites W114 and W115, and sites S1 to S8.

The greatest temperature ranges were seen in ORWB sites due to the quiescent nature of these lakes and large surface area to volume ratios. These factors make ORWBs more susceptible to large daily fluctuations in temperature and other parameters such as DO (discussed further in Section 4.1.4).

The lowest recorded temperature and the least variation in temperature range overall were at upland river sites. This is consistent with trends described by Hydrobiology (2015).

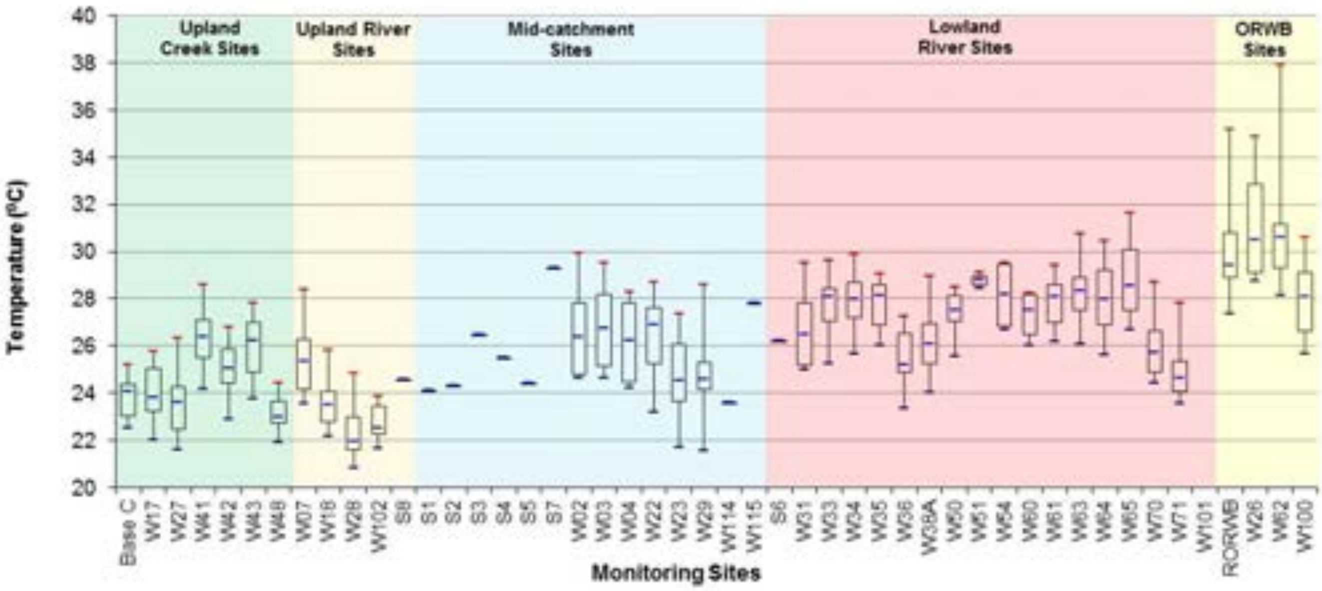


Figure 4-7 Box and whisker plot of temperature measurements

4.1.4 Dissolved Oxygen

Median DO values were within PNG ER criteria (<6 mg/L) and ANZECC guidelines (85-120%) for upland creeks and rivers and mid-catchment rivers and some lowland river sites. These stream types typically exhibit high DO levels due to their turbulent nature and subsequent high rate of diffusion of oxygen from the atmosphere.

The majority of lowland river sites in the Sepik River were consistently below PNG ER criteria and ANZECC guidelines, as were many of the ORWBs (Figure 4-8). ORWBs are typically subject to large daily fluctuations in DO when compared with creeks and rivers due to their generally quiescent nature, high content of decaying organic matter, low water turnover, low relative levels of shading and higher concentrations of aquatic plants and algae. Diel dissolved oxygen data and patterns in stratification for ORWB sites are discussed further in Section 4.1.5. The 'black water' characteristics seen in some ORWBs in the Study Area are discussed in Section 4.1.7. Similarly, low median DO levels in Lowland Sepik River sites and outlier values at other sites throughout the Study Area may also be due to the inflow of oxygen depleted water from adjacent floodplains and ORWBs.

The spatial distribution of DO values (% sat) throughout the Study Area is shown in Figure 4-9.

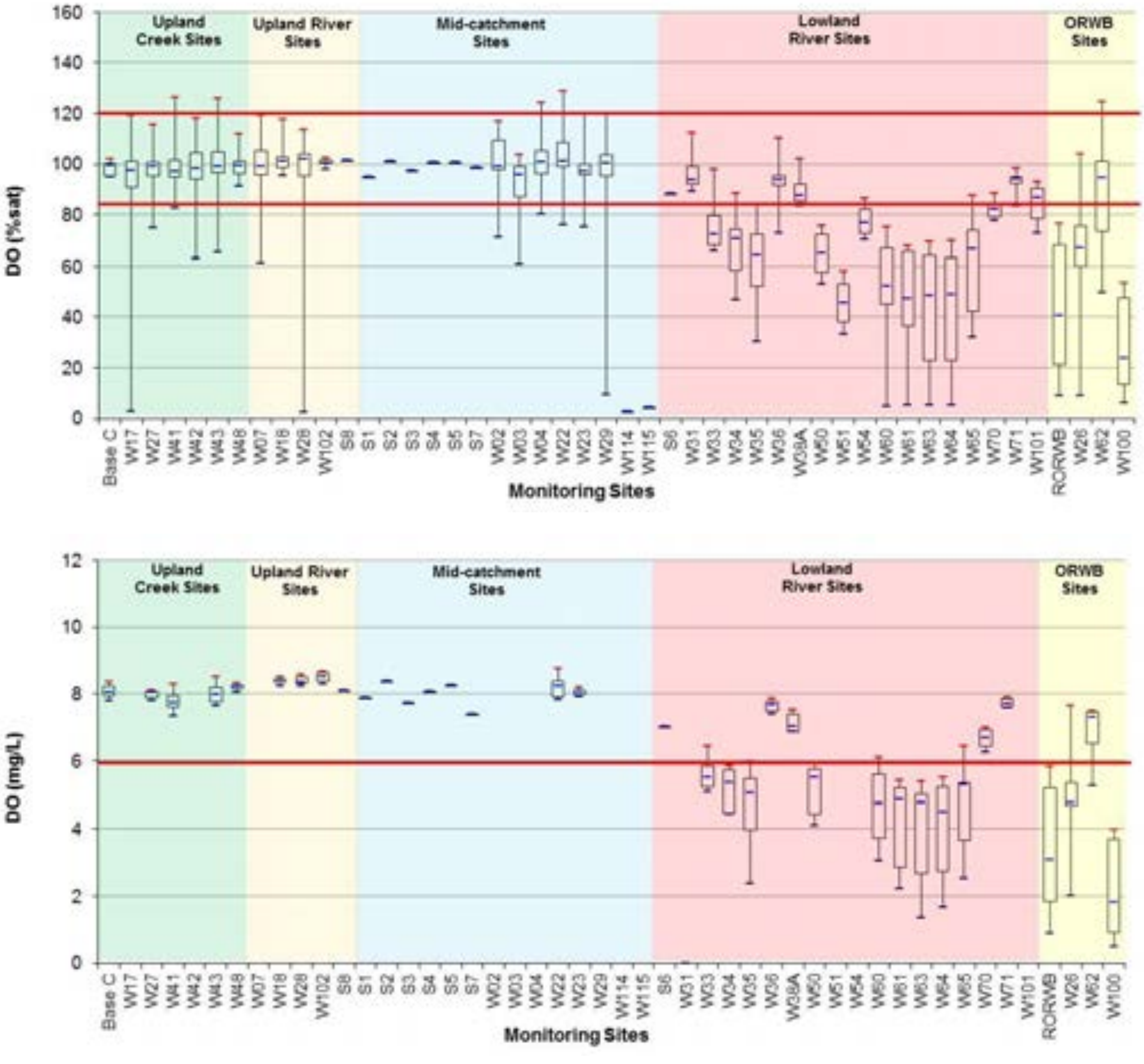
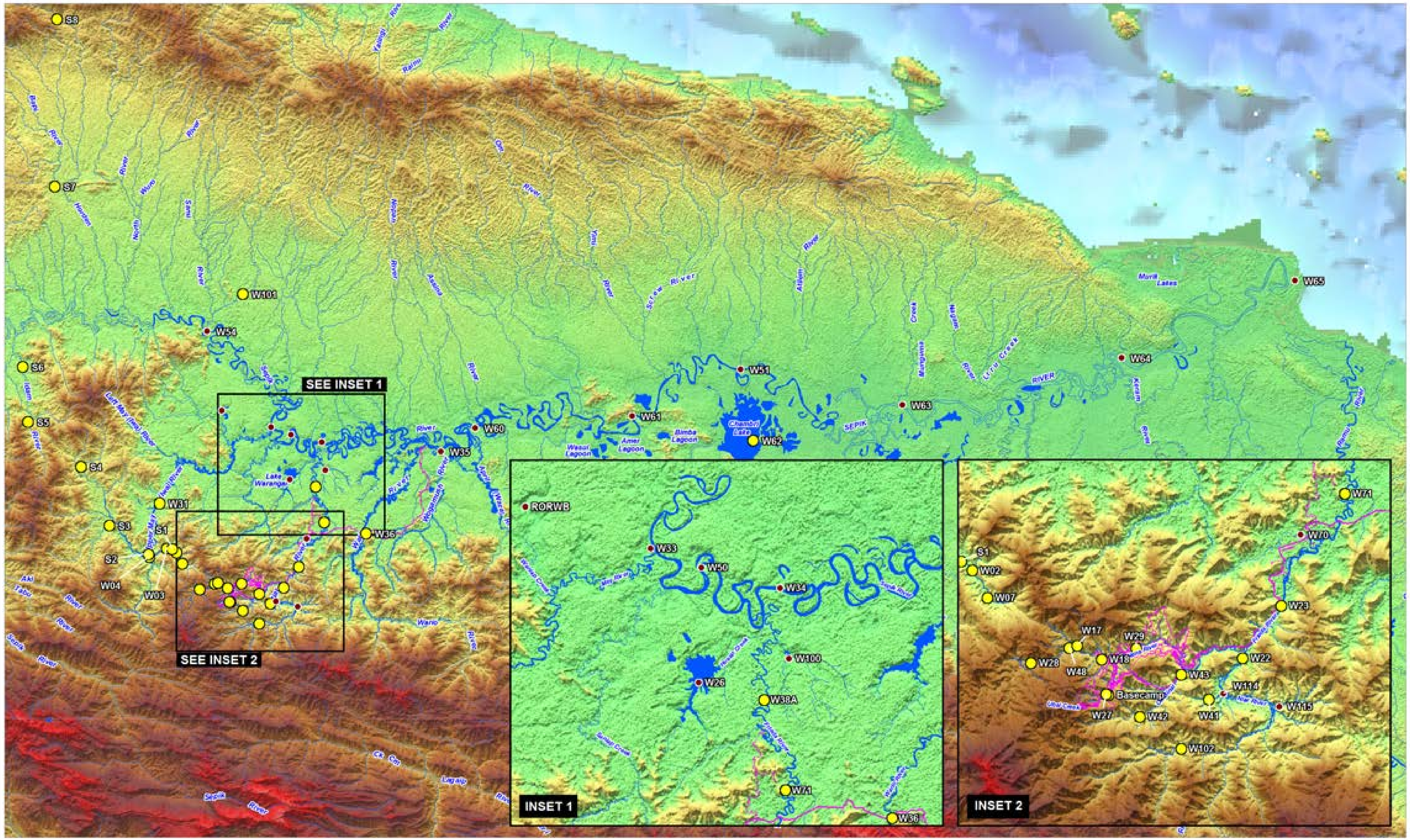


Figure 4-8 Box and whisker plot of dissolved oxygen measurements (% saturation at top and mg/L at bottom). Red lines in indicate ANZECC guidelines in top graph and PNG ER criteria in bottom graph



LEGEND

Major Waterways

Mine Infrastructure

Dissolved Oxygen (%sat)

- > 120 (Upper Guideline Value)
- 85 - 120
- < 85 (Lower Guideline Value)

Title:

Map of Median Dissolved Oxygen (DO) Measurements within Study Area

Figure: 4-9

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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0 10 20km
Scale - Insets

0 25 50km
Scale - Main Map

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4.1.5 Diel Dissolved Oxygen

Dissolved oxygen concentrations were measured over 24-hour periods (i.e. diel range) in each accessible ORWB during the monitoring events conducted in by BMT WBM in 2011, 2012 and 2013. These measurements provide an indication of the fluctuation in DO which occurs in these systems over a 24-hour cycle. DO measurements were taken continuously, midway in the water column of each ORWB and logged once every five minutes using a portable DO probe. Barometric pressure was also measured, and DO readings were automatically adjusted by the probe in line with any fluctuations in local atmospheric pressure. This provided DO readings in local DO % saturation.

Results from the diel DO monitoring at sites W62 (Chambri Lake), W100 (Lake Diawi), RORWB (Lake Kiawi), and W26 (Lake Warangai) are included in Figure 4-10 to Figure 4-13. These figures indicate the following:

- W62 (Chambri Lake) typically had a DO range between 40% and 120% (i.e. supersaturated) across the two monitoring years where this site was accessible. During 2011, the annual median DO value derived from diel DO monitoring was 79% while the median value for 2012 was 92%. DO levels during each monitoring event displaying a similar pattern of higher DO during the daylight hours with DO decreasing during the night.
- W100 (Lake Diawi) typically had a DO range between 7% and 70%, with a median of 16% in 2011 and a median of 17% in 2012. During 2011 this site was only monitored for diel DO during the September and December field trips. In 2012, DO levels during the March monitoring event were higher, and fluctuated to a greater extent, than other months. Only one monitoring event was conducted in 2013 (in April) where DO values ranged between 7% and 56%. There did not appear to be much fluctuation in DO with diurnal cycle of night and day during any of the monitoring years at this site.
- RORWB (Lake Kiawi) had a DO range between 5% and 76% in 2011 and 25% and 70% in 2012, with a median of 14% in 2011 and 37% in 2012. Diel DO was not recorded during the March monitoring event in 2012 due to equipment failure. In 2011 there was a high degree of variation between the monitoring events and this was less pronounced in 2012. A single monitoring event was conducted in 2013 where DO ranged between 7% and 56%. There appeared to be no distinct DO fluctuations with diurnal cycle of night and day, however there were a number of spikes in DO which occurred during both the daytime and night-time across all years which may be attributable to rainfall events. No rainfall data was collected at the lake during the data collection periods.
- DO at W26 (Lake Warangai) was measured in all three monitoring years. In 2011, DO ranged between 10% and 97%, with a median of 57%. In 2012, DO ranged between 30% and 87%, with a median of 60% for the year. DO ranged between 11% and 33% during the single monitoring event in 2013. DO levels did not vary significantly between monitoring events, although DO levels appeared to be much lower in 2013. At this site DO levels fluctuated stochastically throughout the 24-hour monitoring periods during all monitoring events, with no apparent pattern in accordance with diurnal cycles of night and day.

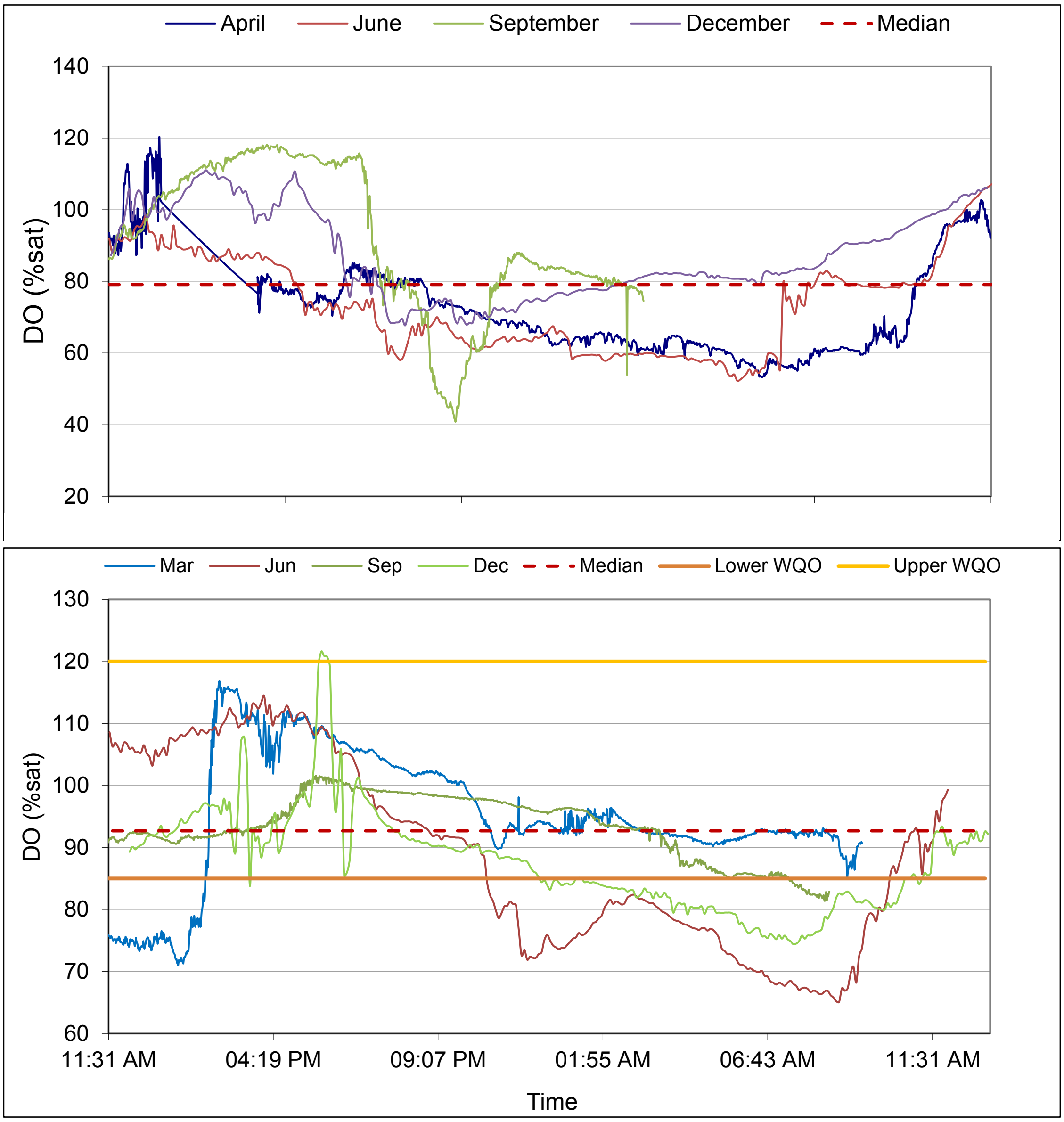


Figure 4-10 W62 (Chambri Lake) Diel DO Plots for BMT WBM data for 2011 (upper) and 2012 (lower)

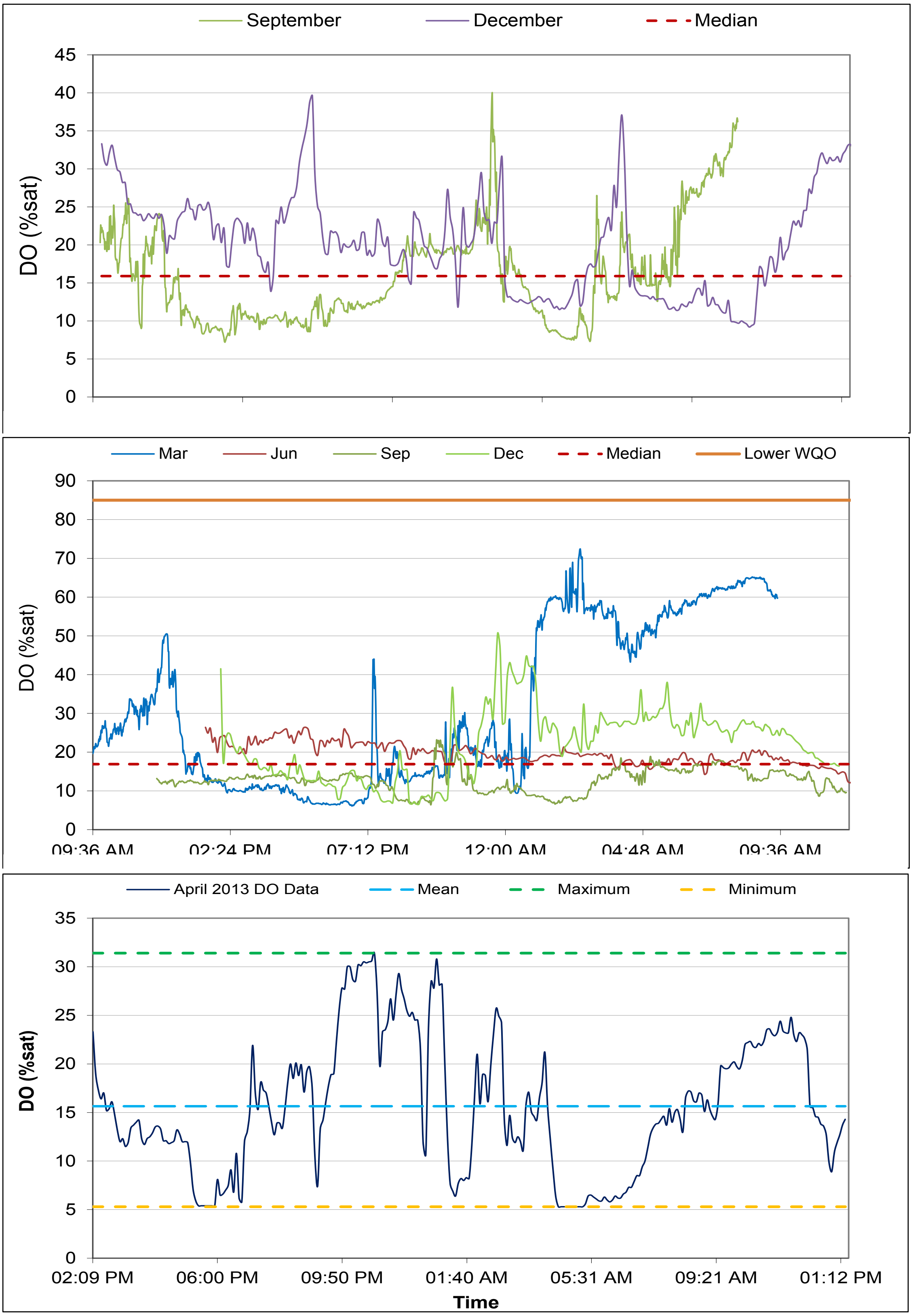


Figure 4-11 W100 (Lake Diawi) Diel DO Plots for BMT WBM data for 2011 (upper), 2012 (middle) and 2013 (lower). Where shown, water quality objectives are based on ANZECC/ARMCANZ (2000).

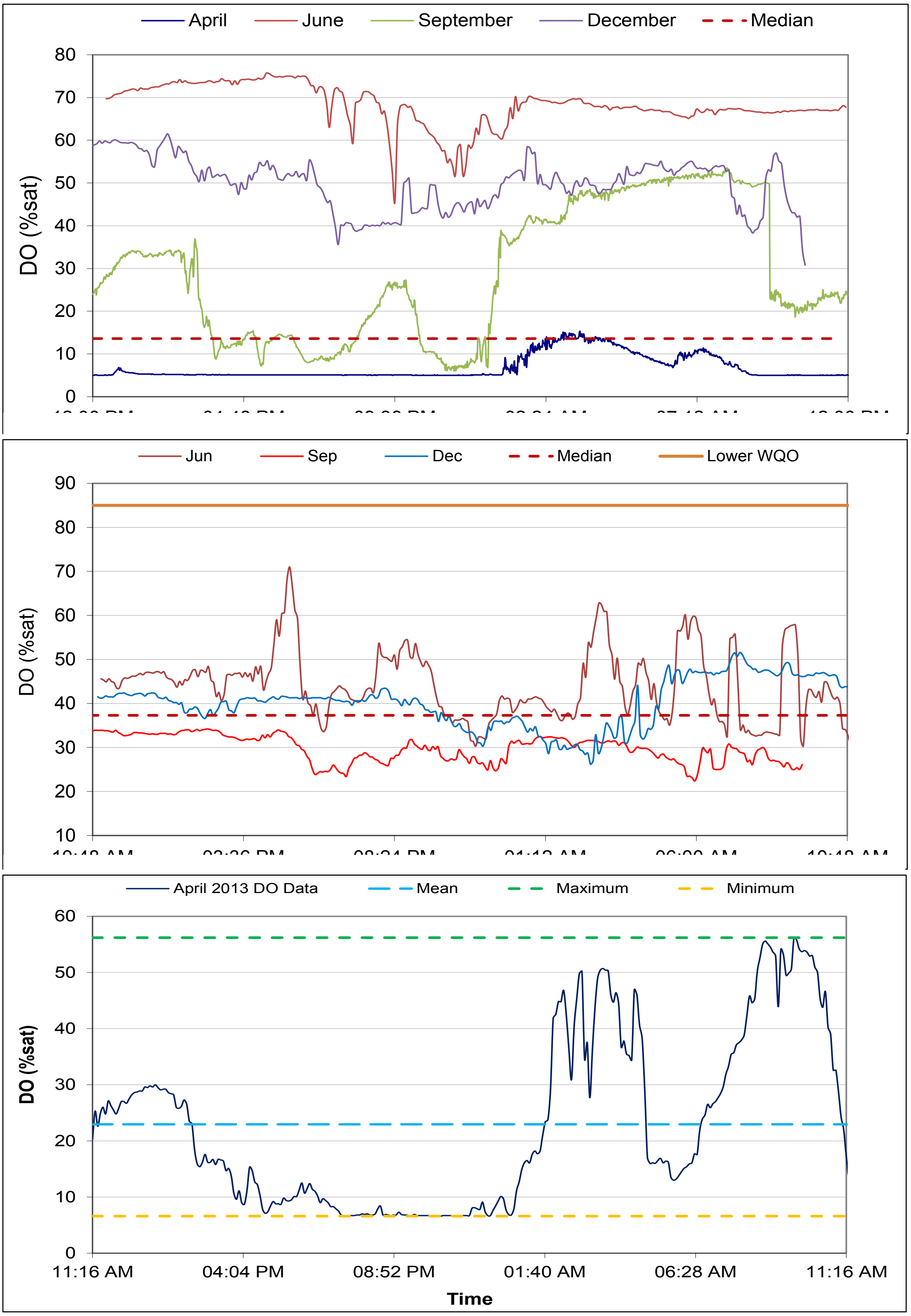


Figure 4-12 RORWB (Lake Kiawi) Diel DO Plots for BMT WBM data for 2011 (upper), 2012 (middle) and 2013 (lower). Where shown, water quality objectives are based on ANZECC/ARMCANZ (2000).

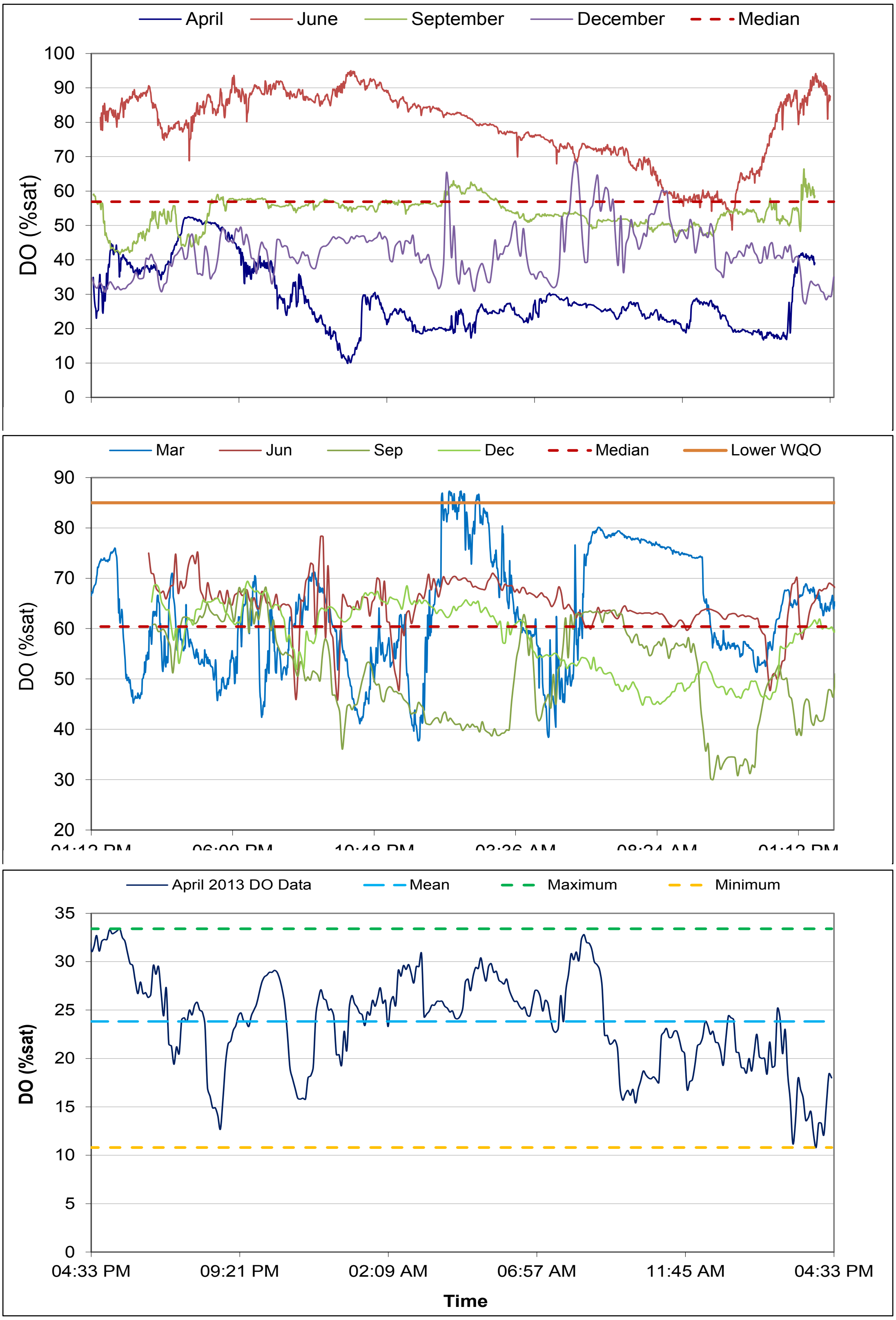


Figure 4-13 W26 (Lake Warangai) Diel DO Plots for BMT WBM data for 2011 (upper), 2012 (middle) and 2013 (lower). Where shown, water quality objectives are based on ANZECC/ARMCANZ (2000).

4.1.6 pH

Median pH values were generally within the PNG ER criteria of 6.5-9 and the ANZECC guideline range of 6-8 at most sites across all water body types and catchment areas. The exceptions were W27 (Ekwai Creek in the Nena River catchment) which had a median pH of 4.13, and two of the ORWBs (W100 and RORWB) which had median pH values of 4.21 and 5.09, respectively (Figure 4-14). The other two ORWBs (W26 and W62) had median values which were within the acceptable pH range but also recorded minimum and/or maximum pH values which were outside the guideline range.

Sites S3 (Uriake River), S6 (Lower Idam River) and S8 (Yanabu River) had pH values of 8.21, 8.66, and 8.36 respectively. While these pH values are within the PNG ER range of 6.5-9, they are above the ANZECC acceptable range of 6-8, indicating that waters at these sites were slightly alkaline at the time of sampling.

It is considered that the low median pH of 4.13 at W27 could be attributable to the geology of the local catchment, as discussed previously in Section 4.1.2. This site also had high sulphate levels (Section 4.1.9), indicating that natural ARD may be occurring in the catchment. This is consistent with observations by Hydrobiology (2015) which suggest that this site is a naturally occurring ARD site.

Generally speaking, low pH values in ORWBs can be attributed to the high level of organic matter, as the breakdown of organic matter causes tannin stained waters, low pH (due to organic acids) and low dissolved oxygen values (due to the chemical and biochemical oxidisation of organic material). These ‘black waters’ are discussed further in Section 4.1.7.

It was observed that pH was more variable in two of the ORWBs (W26 and RORWB) between monitoring events, and was more consistent in W100 and W62. Limnological assessments conducted by BMT WBM (2012, 2013a, 2013b) also indicated that pH remained consistent throughout the water column in the ORWBs. While not confirmed by the analysis in this study, it is suggested that the variation in pH (as well as DO) observed at some ORWBs may be due to changes in connectivity of these ORWBs to other water bodies and adjoining rivers. As river levels rise, pH may be neutralised by the large inflow of river water into the ORWBs. Similarly, lakes which are subject to a more regular rate of water exchange (such as W62 at Lake Chambri) are less prone to ‘black water’ characteristics and display less fluctuations in pH, dissolved oxygen and other parameters.

Spatial patterns in the distribution of pH values in the study area are depicted in Figure 4-15.

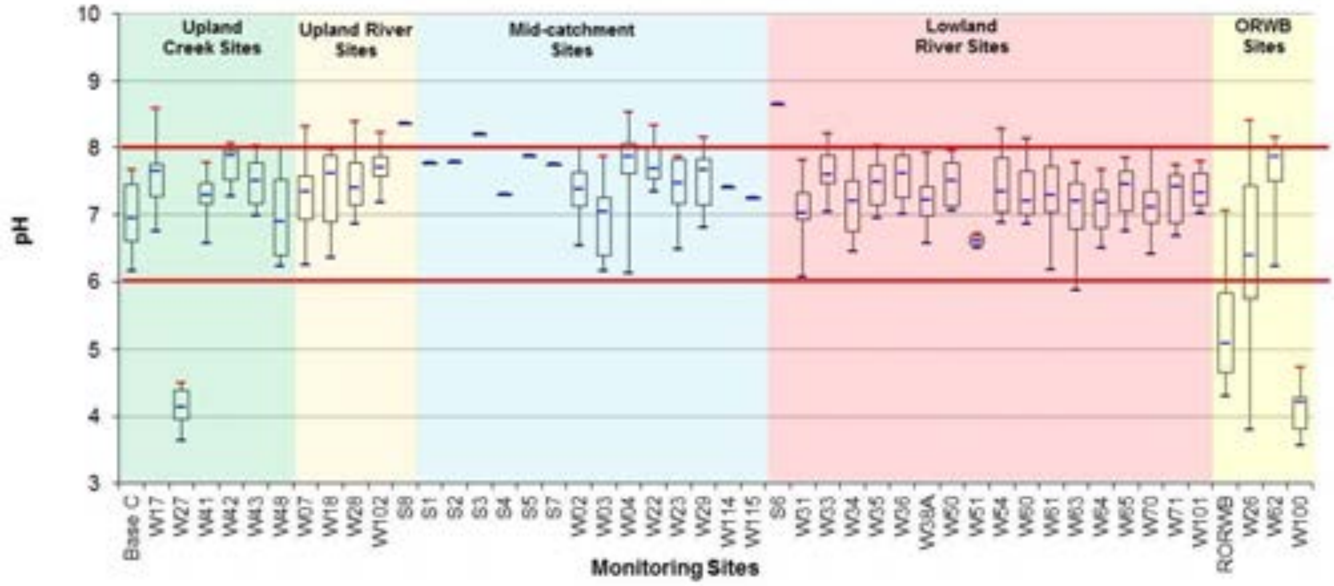
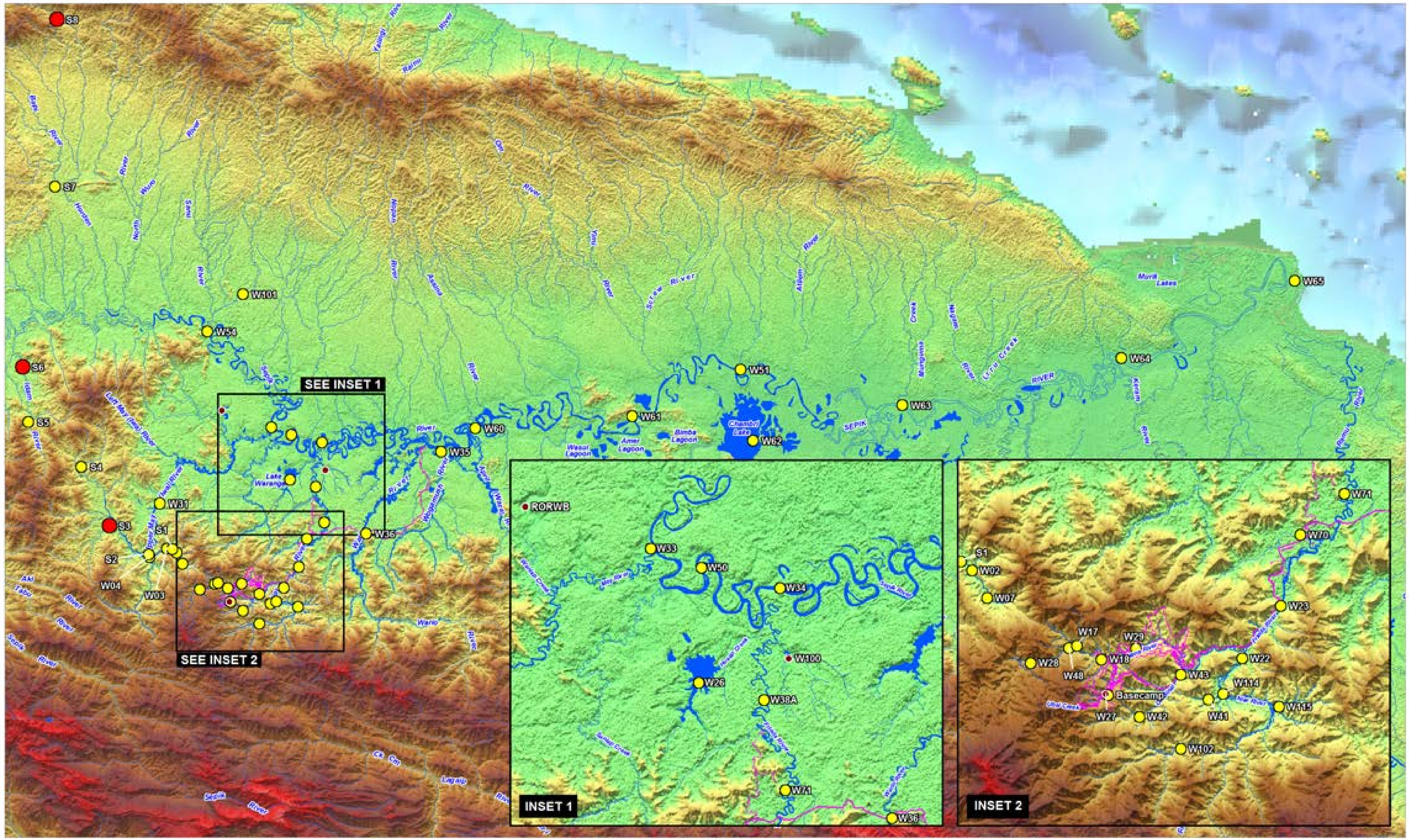


Figure 4-14 Box and whisker plot of pH measurements. Red lines indicate upper and lower guideline from ANZECC/ARMCANZ (2000)



LEGEND

Major Waterways

Mine Infrastructure

Acidity (pH)

> 8 (Upper Guideline Value)

6 - 8

< 6 (Lower Guideline Value)

Title:

Map of Median pH Measurements within Study Area

Figure: 4-15

Rev: A

N

0 10 20km
Scale - Insets

0 25 50km
Scale - Main Map

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4.1.7 Black Water ORWBs

Some of the ORWBs monitored were observed to be a distinct black colour. These deeply coloured water bodies, commonly referred to as 'black waters', are typically associated with wetlands or floodplains which have large accumulations of organic material. The black stain is a result of the vegetation decaying in the water and tannins leaching out, which results in transparent, acidic water that is darkly stained, resembling tea or coffee (NDPI 2011).

The smaller ORWBs monitored displayed the strongest black water characteristics, such as Lake Diawi (W100), Lake Kiawi (RORWB), and to a lesser extent Lake Warangai (W26). These ORWBs had low DO levels and low pH values. Chambri Lake (W62), further downstream in the Sepik River catchment, was not characterised as a black water waterbody due in part to more elevated DO and pH values.

The water quality in the black water ORWBs fluctuated annually, depending on rainfall and water levels in the ORWBs and adjoining rivers. For example, it was observed that the water quality characteristics of some of these ORWBs changed significantly between April and June/July 2011. The black colour of water previously evident in Lake Warangai (W26) and Lake Kiawi (RORWB) in April had changed to a brownish colour. This was probably due to the higher river levels which allowed water from the Sepik and May Rivers to flow back into these ORWBs. As a result, pH and DO levels in W26 and RORWB were significantly higher in June/July compared to April. Conversely, Lake Diawi (W100) displayed black water characteristics during the June/July 2011 field trip and it was observed that river water from the adjoining Frieda River was not flowing into this ORWB. Similar observations were made for other ORWBs with the timing dependent on catchment flows.

In December 2011, the field trip coincided with the start of the wet season flows, with river levels rising throughout the monitoring event. This was evident during monitoring of Lake Diawi (W100), with Frieda River levels rising and causing turbid river water to push up into Lake Diawi. There was a distinct difference in water quality between the black water (low turbidity, pH and DO), and the turbid Frieda River water (highly turbid, higher DO, and neutral pH) within the lake.

Once the floodplains are inundated during the wet season, it is expected that water in Lake Diawi (and other ORWBs) would reach a level high enough to cause outflow into the adjoining rivers. These higher water levels would also cause renewed decay of vegetation and consequent lowering of pH and DO throughout the season. Outflows such as this were observed in 2013 when water levels at all stream sites were higher than those observed in previous monitoring events. River water was above bank height and had inundated adjacent flood plains, especially in the lower Sepik River catchment. Observations during air transit between sites indicated that black water from these floodplains was draining into the Sepik River. Figure 4-16 shows the 'black waters' from the floodplains mixing with the brown turbid waters of the Sepik River. The inflow of black floodplain water had a noticeable impact on water quality in the lower Sepik River.

Figure 4-16 'Black water' from Flood Plains (on the right of image) Draining into the Turbid Sepik River (upstream of W63)

4.1.8 Dissolved and Total Organic Carbon

The data shows that TOC and DOC concentrations were similar at most sites, indicating that organic carbon was predominantly in a dissolved form (DOC). Median DOC (mg/L) (Figure 4-17) was lowest in upland creeks and rivers and mid-catchment rivers, with the exception of W23 which had higher levels of DOC in the June/July monitoring event in 2011 compared to other monitoring events. DOC at W23 was low in all other monitoring events resulting in a low median value (1.0 mg/L) as shown in Figure 4-17. Lowland rivers had slightly higher organic carbon levels than creeks and rivers which were more elevated in the catchment. The 'black water' ORWBs (W100, RORWB, and W26) recorded high levels of DOC throughout all monitoring events, reflecting the high concentrations of tannins in these lakes. Conversely, the other ORWB (W62), which did not display 'black water' characteristics, had low levels of organic carbon.

DOC was analysed in samples collected at seven sites for CSIRO in 2017. The results, presented in Section 4.1.13, show that DOC concentrations were similar to previous DOC analysed at the respective sites (ranging from 0.7 mg/L up to 4.06 mg/L).

Figure 4-18 and Figure 4-19 show the geographical distribution of TOC and DOC within the Study Area[7]. These figures illustrate the slightly higher organic carbon concentrations at sites in the lower catchment compared to the upper catchment and also highlight the elevated organic carbon levels seen in ORWBs. Raw data and further analysis are provided in field trip and annual reports (Hydrobiology 2008b, 2008c, 2008d, 2008e, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2010d, 2011; BMT WBM 2012, 2013a, 2013b).

DOC is an important water quality parameter as it has a strong influence on metal speciation in aquatic systems. DOC and copper complexation studies conducted in the Study Area are discussed further in Section 4.1.13.

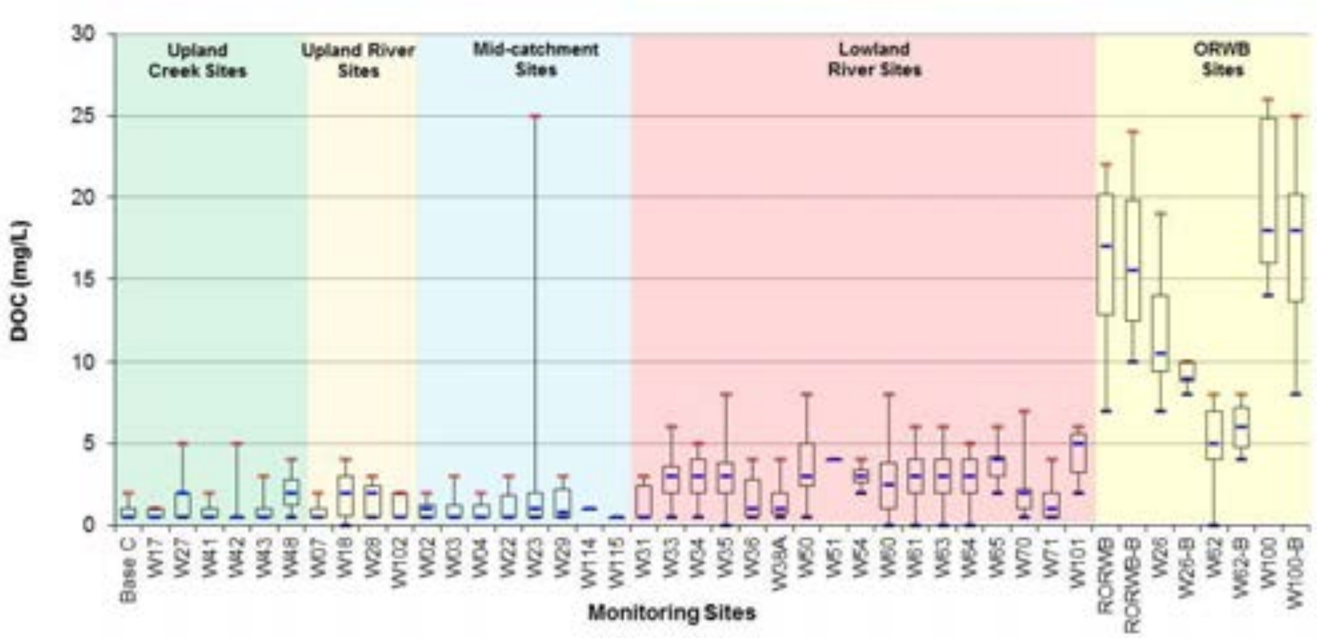
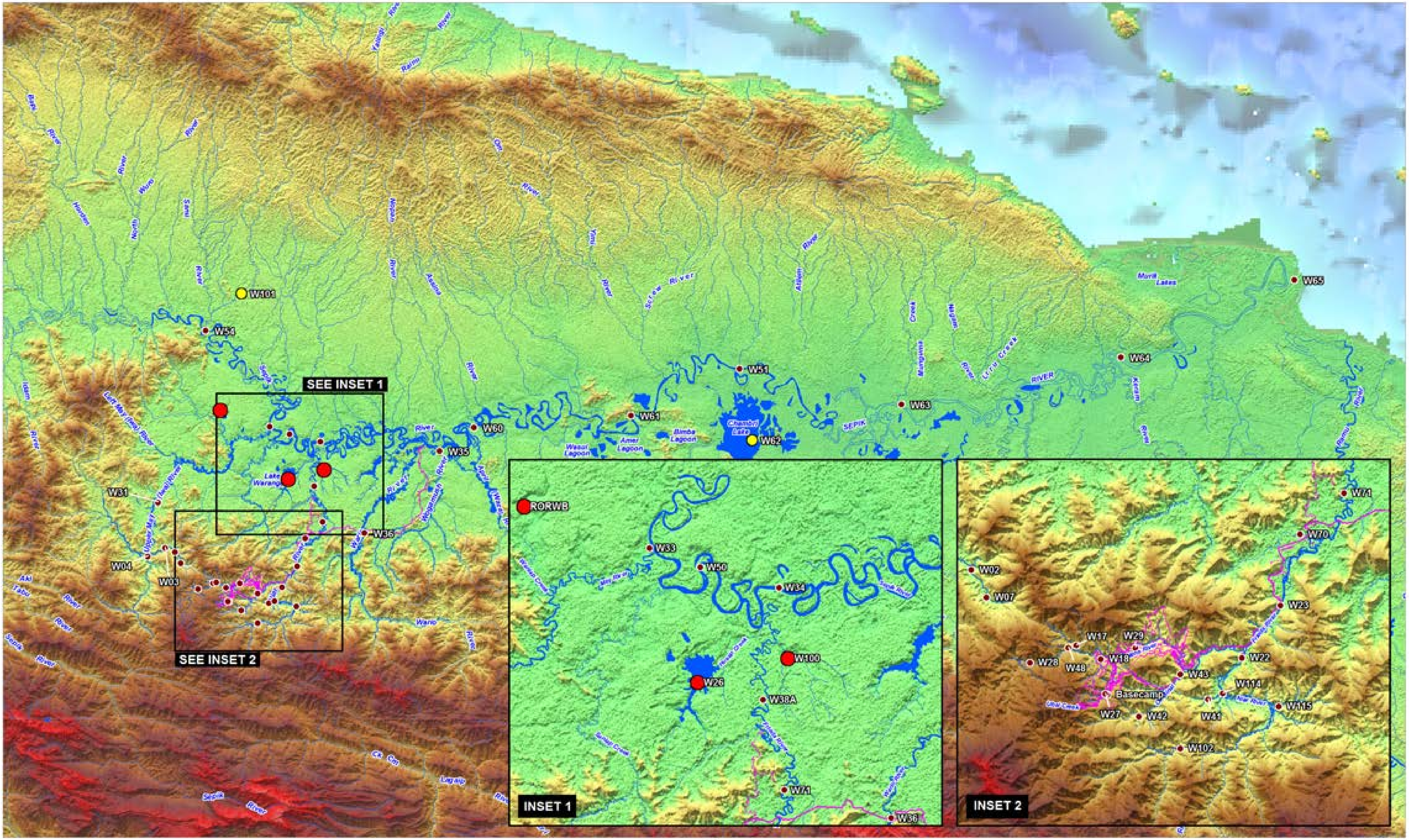


Figure 4-17 Box and whisker plot of dissolved organic carbon (DOC) measurements

[7] Note that TOC and DOC were not analysed in samples collected at sites S1 to S8 in November 2017



LEGEND

- Major Waterways
- Mine Infrastructure

TOC (mg/L)

- > 10
- 5 - 10
- < 5

Title:

Map of Median TOC Concentrations within Study Area

Figure: **4-18**

Rev: **A**

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

Scale - Insets: 0, 10, 20km

Scale - Main Map: 0, 25, 50km

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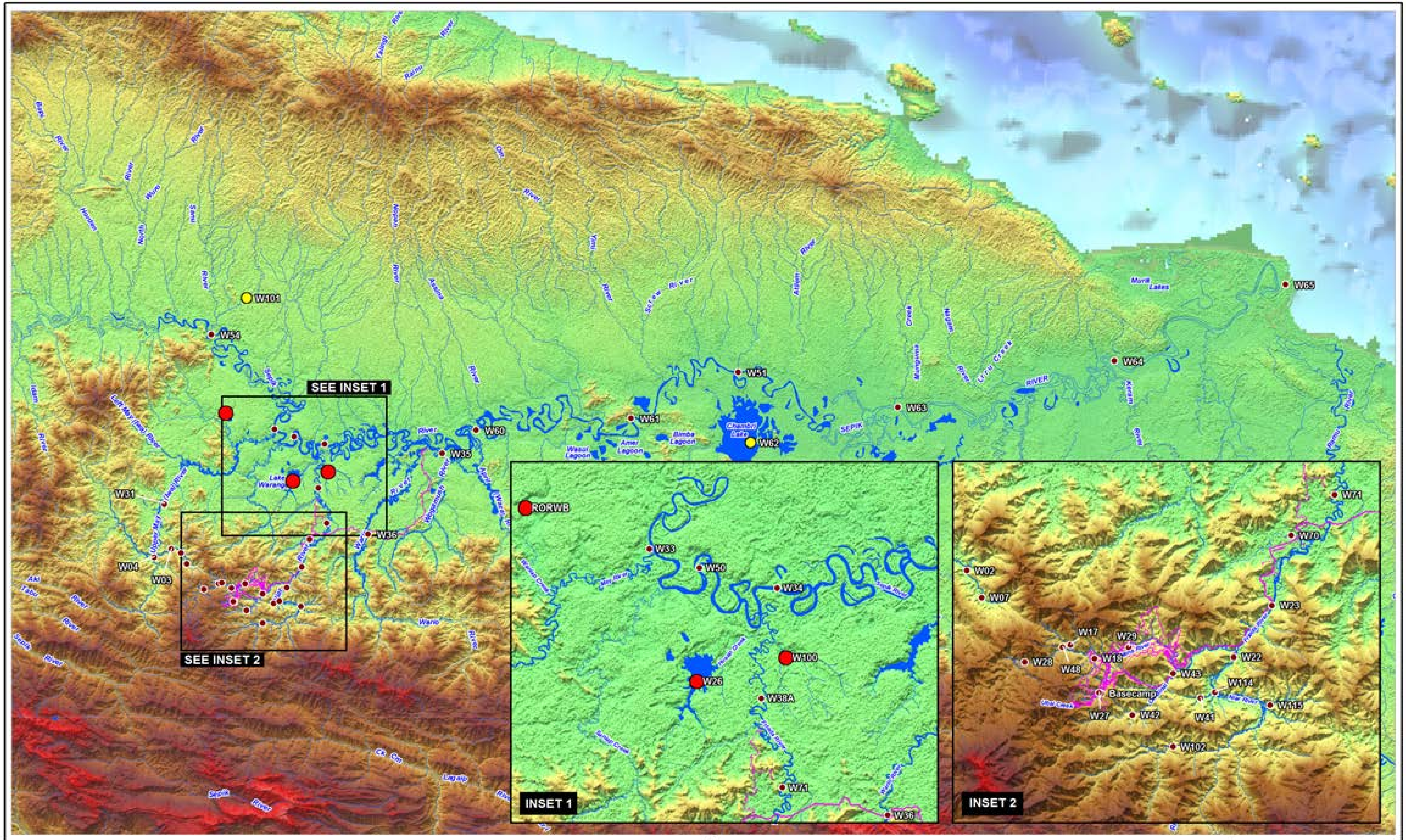

LEGEND

Major Waterways

Mine Infrastructure

DOC (mg/L)

> 10

5 - 10

< 5

Title:

Map of Median DOC Concentrations within Study Area

Figure: 4-19

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Scale - Insets

0 25 50km
Scale - Main Map

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4.1.9 Major Ions and Alkalinity

Major cations analysed include magnesium (Mg^{2+}), calcium (Ca^{2+}), sodium (Na^{+}), and potassium (K^{+}), while major anions include chloride (Cl^{-}), sulphate (SO_4^{2-}), and alkalinity (expressed as $CaCO_3$ and including carbonate CO_3^{2-} and bicarbonate HCO^{3-}).

Cations and anions can be used to determine the geochemical signature of water to indicate the geology and weathering in the contributing catchment. Major ions that are present in water are derived from two main sources: (i) input from rainfall, which have their origin from both marine salts and continental dust, and (ii) acquisition during weathering and water-rock interactions. The geochemical signature of water can be interpreted to understand the key processes that have occurred during the movement of water over the catchment, and through groundwater aquifers and streams.

While all water quality data is included in Appendix A, summary data (median values) for major ion concentrations are presented in Table 4-2. Patterns in the ionic composition of waters at each site are presented in a Piper diagram shown in Figure 4-20.

Piper diagrams

Piper diagrams illustrate:

(i) dominant ions at each site at the time of sampling.

(ii) patterns in similarity (and dissimilarity) in the chemical composition among sites. Sites with similar ionic composition group together, whereas sites that are chemically distinct tend not to group together.

These results indicate that most of the monitoring sites had a similar chemical composition. Calcium was the dominant cation at most sites (Table 4-2) and carbonate (HCO_3 + CO_3) was the dominant anion. These sites can therefore be referred to as calcium-carbonate type waters. The exceptions to this were as follows:

- W27 and Base Camp differ from other sites by having sulphate as the dominant anion instead of carbonate, and can be referred to as calcium-sulphate type waters.
- W48 (Nena River) and the ORWBs (especially the smallest ORWB – W100) had very low concentrations (in most cases undetectable) of major ions.

Alkalinity, comprising specific anions (i.e. carbonate and bicarbonate), measures the total amount of base present in water and indicates the ability of water to resist large pH changes, or the ‘buffering capacity’ (NDPI 2011b). The alkalinity anions are able to buffer by absorbing hydrogen ions when the water is acidic and releasing them when the water becomes basic. Waters of low alkalinity (<20 mg/l) are poorly buffered, and the removal of carbon dioxide (CO_2) during photosynthesis results in rapidly rising pH. Waters with greater than 20 mg/L alkalinity have greater buffering capacity and prevent large fluctuations in pH during photosynthesis. These waters are also less sensitive to any periodic acidic inflows, such as those which can result from mining activities.

Most of the monitoring sites had water with median total alkalinity above 20 mg/L, indicating that these waters have a good acid buffering capacity. Results presented in Figure 4-21 indicate that sites with low alkalinity included three sites in the Frieda/Niar/Nena upper catchment (W27, W48 and Base Camp), three of the ORWBs (W26, W100 and RORWB), and Site S6 in the lower Idam River. The spatial distribution of these sites within the Study Area is shown in Figure 4-22. The dominance of sulphates at two of these sites suggests that the catchment areas upstream of these sites are high in sulphur, which is consistent with the presence of the sulphur rich ore deposits in the area and observation by Hydrobiology (2015) of naturally occurring ARD at some sites.

The two smaller ORWBs (W100 and RORWB) had low concentrations of major ions. Therefore, they had low alkalinity or acid buffering capacity and no dominant cation or anion composition. The other two ORWBs, Lake Warangai (W26) and Chambri Lake (W62) had higher concentrations of ions and higher alkalinity levels. Chambri Lake (W62) had alkalinity levels and ion concentrations that were more similar to river sites than other ORWBs. This suggests that the aquatic ecosystem of Chambri Lake was unlike that occurring in other ORWBs, particularly those in smaller ‘black water’ ORWBs.

Table 4-2 Median Values of Major Ions and Alkalinity

Site	Alkalinity ($CaCO_3$)				Major Cations				Major Anions	
	Hydroxide Alkalinity	Carbonate Alkalinity	Bi-carbonate Alkalinity	Total Alkalinity	Ca^{2+}	Mg^{2+}	K^+	Na^+	Cl^-	SO_4^{2-}
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Base C	1	1	9	9	8	1	1	2	1	20
W27	1	1	1	1	12	1	1	1	1	36
W41	1	1	24	24	5	2	1	2	1	2
W43	1	1	27	27	7	2	1	2	1	3
W48	1	1	4	4	2	1	1	1	1	5
W17	1	1	23	23	5	2	1	2	1	1
W42	1	1	36	36	13	2	1	2	1	6
W07	1	1	24	24	5	2	1	2	1	2
W18	1	1	21	21	5	2	1	1	1	2
W28	1	1	24	24	6	2	1	1	1	2
W102	1	1	40	40	7	5	1	2	1	4
W02	1	1	30	30	8	2	1	2	1	2
W03	1	1	26	26	6	2	1	2	1	2
W04	1	1	37	37	9	4	1	1	1	3
W22	1	1	40	40	8	5	1	2	1	3
W23	1	1	31	31	7	4	1	2	1	3
W29	1	1	20	20	6	2	1	2	1	6
W114	1	1	40	40	8	4	1	1	1	3
W115	1	1	28	28	6	3	1	1	1	1
W31	1	1	32	32	7	3	1	2	1	2
W33	1	1	64	64	22	3	1	3	1	7
W34	1	1	56	56	19	3	1	3	1	6
W35	1	1	50	50	17	3	1	2	1	5
W36	1	1	45	45	14	2	1	1	1	2
W38A	1	1	31	31	6	4	1	1	1	2
W50	1	1	58	58	18	2	1	2	1	6
W51	1	1	45	45	13	3	1	2	1	4
W54	1	1	55	55	18	3	1	3	1	7
W60	1	1	47	47	13	3	1	2	1	4
W61	1	1	49	49	14	3	1	2	1	4
W63	1	1	45	45	12	3	1	2	1	4
W64	1	1	49	49	13	3	1	2	1	3
W65	1	1	46	46	12	3	1	3	2	3
W70	1	1	28	28	4	3	1	2	1	1
W71	1	1	33	33	6	4	1	1	1	3
W101	1	1	119	119	26	13	2	8	1	18
RORWB	1	1	3	3	1	1	1	1	1	1
RORWB-B	1	1	3	3	1	1	1	1	1	1
W100	1	1	1	1	1	1	1	1	1	1
W100-B	1	1	1	1	1	1	1	1	1	1
W26	1	1	8	8	3	1	1	1	1	1
W26-B	1	1	16	16	4	1	1	1	1	1
W62	1	1	38	38	10	2	1	2	1	3
W62-B	1	1	36	36	8	2	1	1	1	2
S1	1	1	24	24	6	1	1	1	1	2
S2	1	1	42	42	9	4	1	1	1	4
S3	1	1	27	27	3	3	1	1	1	2
S4	1	1	31	31	6	2	1	2	1	1
S5	1	1	24	24	5	1	1	2	3	3
S6	1	1	17	17	3	1	1	1	1	2
S7	1	1	100	100	33	4	1	6	3	12
S8	1	1	82	82	22	5	1	11	3	10
PNG ER	-	-	-	-	-	-	5	-	-	400
PNG ECoP	-	-	-	-	-	-	-	-	-	-
ANZECC	-	-	-	-	-	-	-	-	-	-

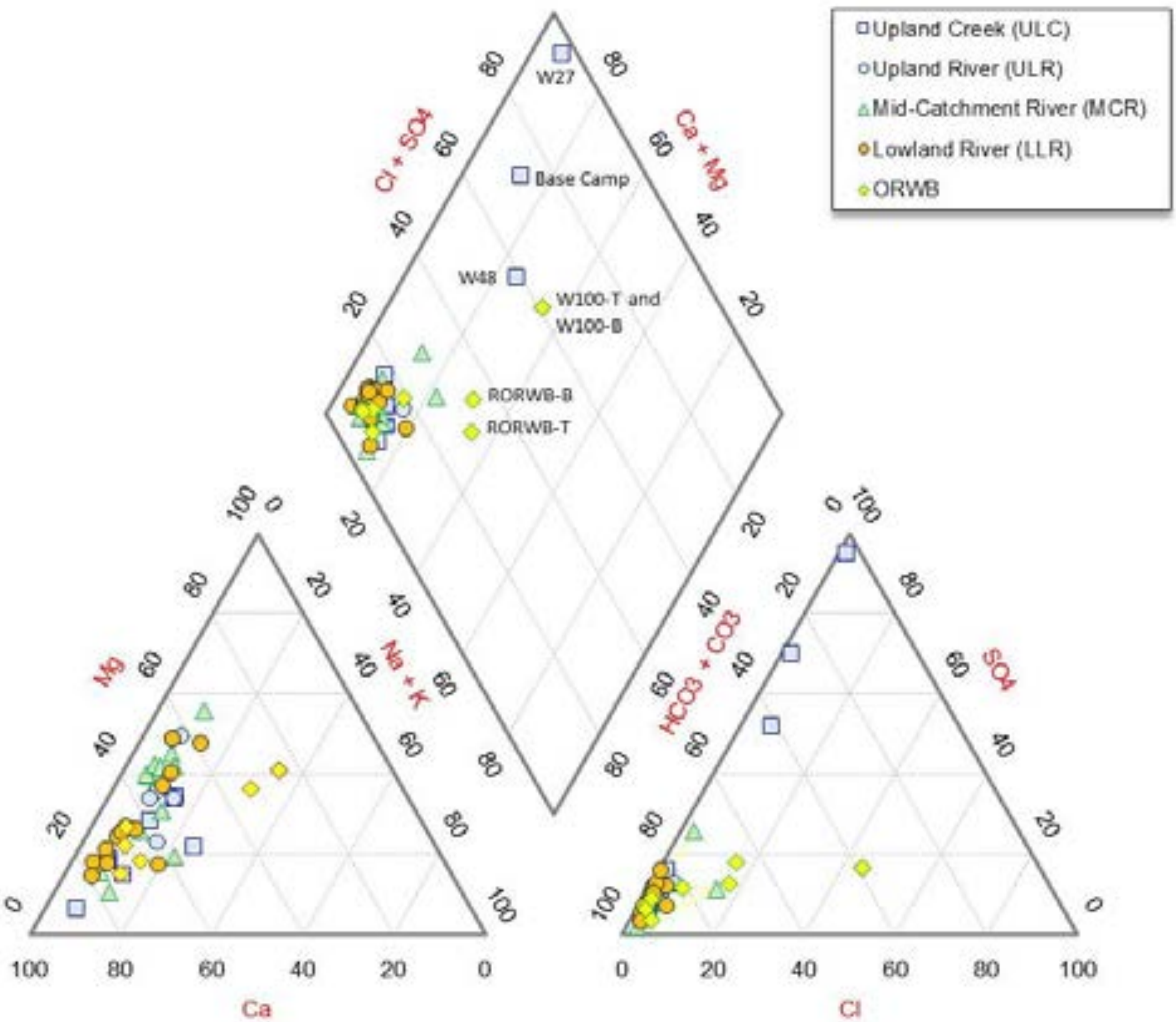


Figure 4-20 Piper Plot of Major Ion Results

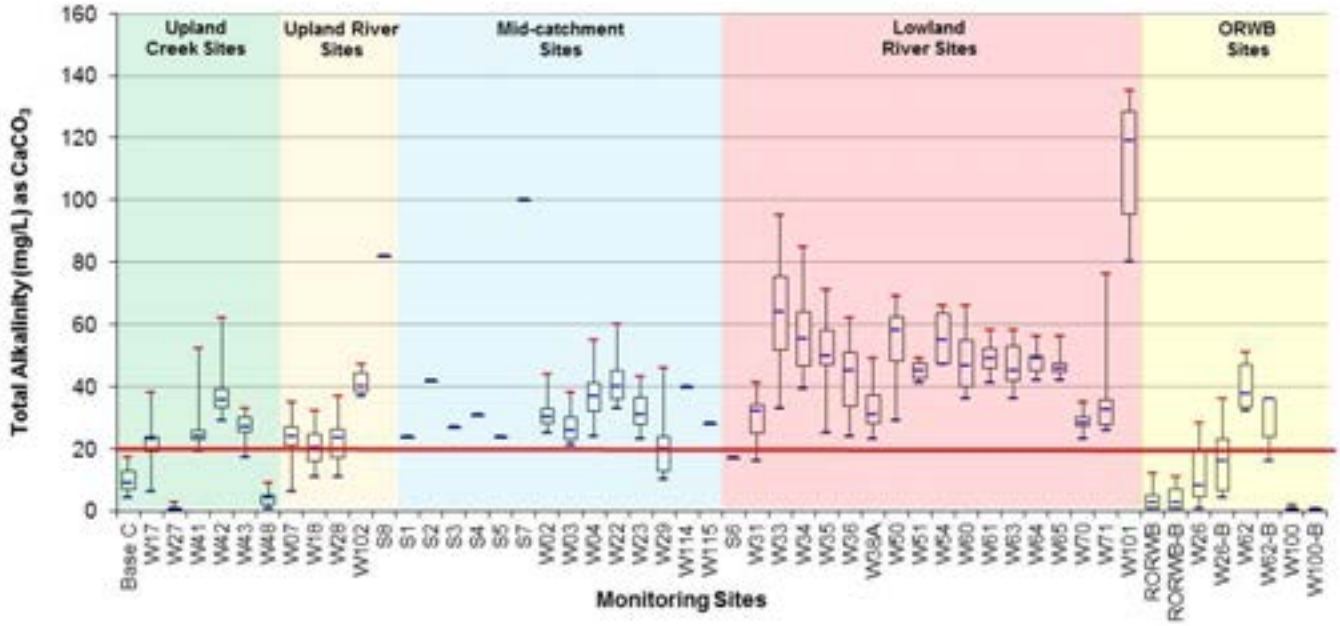
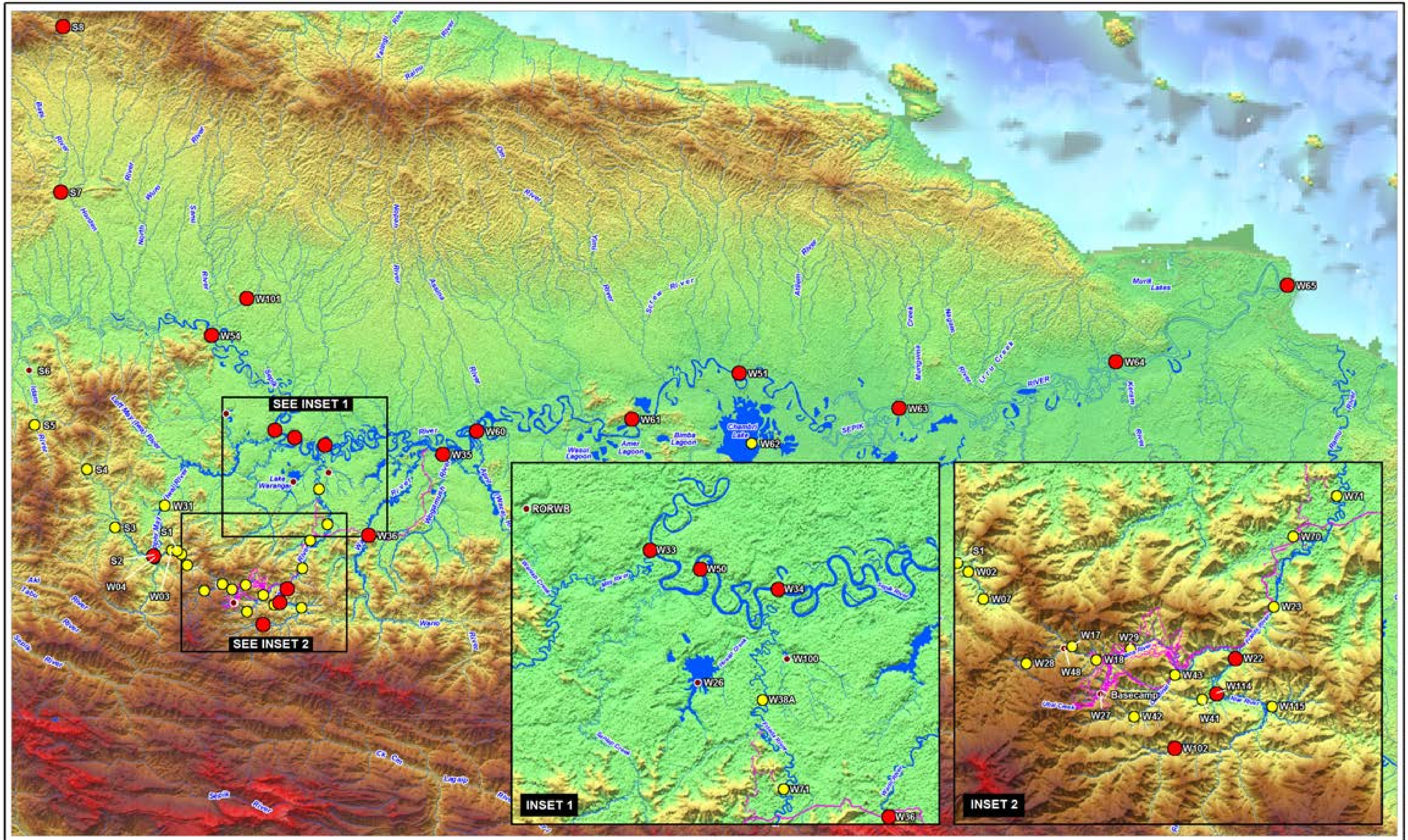


Figure 4-21 Box and whisker plot of Total Alkalinity measurements. Red line indicates guideline value based on ANZECC/ARMCANZ (2000)



LEGEND

Major Waterways

Mine Infrastructure

Total Alkalinity (mg/L)

- > 40
- 20 - 40
- < 20

Title:

Map of Median Total Alkalinity Concentrations within Study Area

Figure: 4-22

Rev: A

N

0 10 20km
Scale - Insets

0 25 50km
Scale - Main Map

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4.1.10 Metals/Metalloids

Median values for dissolved metals/metalloids were calculated and are presented in Table 4-3. Data from discrete monitoring events and/or monitoring years is provided in Appendix A and field trip and annual reports prepared for the relevant monitoring events/years (Hydrobiology 2008b, 2008c, 2008d, 2008e, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2010d, 2011; BMT WBM 2012, 2013a, 2013b).

Total metals generally tended to correlate with TSS which is clearly illustrated by Hydrobiology (2015) in the example provided for total and dissolved aluminium in Figure 4-23. Median values for total metals are also provided in Table 4-4.

In terms of aquatic ecosystem protection guideline values, it should be noted that the water quality criteria for some metals/metalloids stated in Schedule 1 of the PNG ER (which are legally enforceable) are high and it is generally accepted that the more stringent ANZECC guidelines are more appropriate to use based on current knowledge. Therefore, the use of the more conservative ANZECC and PNG ECoP guideline values have been adopted in conjunction with the PNG ER values to assess water quality in terms of aquatic ecosystem protection in this report.

In terms of drinking water guidelines, dissolved concentrations of metals/metalloids at all sites were below the PNG raw drinking water guidelines and the WHO (2011) drinking water guidelines. However, concentrations of total manganese (0.835 mg/L) and total nickel (0.277 mg/L) at site W101 (Yellow River) exceeded the PNG and WHO (2011) drinking water guideline values of 0.4/0.5 mg/L and 0.07 mg/L respectively. Also, concentrations of total lead (0.019 mg/L) at W114 (Niar River @ Ok Isai) exceeded the WHO (2011) drinking water guideline value (0.01 mg/L).

Dissolved aluminium, copper and zinc were consistently recorded in concentrations higher than the most stringent of the aquatic ecosystem protection guideline values (typically ANZECC 2000 - see Section 3.3.6.1) across most sites. Note that all copper and zinc concentrations were below the less stringent PNG ER criteria of 1 mg/l and 5 mg/L respectively (there is no PNG ER criteria for aluminium). Summary data are presented graphically as box and whisker plots in Figure 4-24, Figure 4-25 and Figure 4-26 for these parameters.

Ultratrace dissolved silver was analysed in samples collected at sites S1 to S8 in November 2017. Of these samples, sites S2 (Abei River), S3 (Uriake River) and S5 (upper Idam River) had concentrations that exceeded the ANZECC (2000) guideline value (0.0005 mg/L), but did not exceed the less stringent PNG ER criterion of 0.05 mg/L. All other sites had dissolved silver concentrations below laboratory LORs (note that the LOR for non-ultratrace silver analysed for some sites is above the ANZECC guideline value, thereby making determination of compliance with ANZECC not possible for these sites).

Dissolved aluminium concentrations above ANZECC (2000) were recorded occasionally at many sites. This is reflected in the median values reported in Figure 4-24.

Dissolved copper and zinc were also elevated above ANZECC (2000) at a number of sites across various catchments, with the highest dissolved copper and zinc levels typically recorded in the lower Sepik River, the ORWBs (RORWB, W100, W26 and W62) and in the upland creek site W27 (Figure 4-25 and Figure 4-26).

Dissolved aluminium, copper and zinc concentrations were consistently elevated at site W27 at Ekwai Creek, which is an upland creek site in the Frieda/Niar/Nena River catchment. As discussed previously, site W27 also exhibited low pH levels, low concentration of carbonates and elevated sulphates and appears to be subject to naturally occurring ARD from ore deposits in the upper catchment area. These factors would explain the elevated concentrations of metals which were recorded throughout the monitoring period.

Some dissolved metals can be elevated in acidic water such as W27 and also in black water ORWBs (including RORWB and W100) where pH may be very low, especially during periods of limited flushing. Throughout the data, median values for aluminium in water samples collected from each ORWB were in exceedance of the ANZECC guideline value (Table 4-3). However, the greatest variation in aluminium levels was in W62, which is a larger lake system that is subject to greater levels of flushing and is not considered to be a ‘black water’ ORWB.

Site W33 (upper Sepik River) recorded significantly (i.e. up to two orders of magnitude higher than typical) elevated dissolved concentrations (i.e. exceeded ANZECC guideline values) of a number of metals/metalloids (Al, Fe, Mn, Cu and Ni) during the December 2012 monitoring event. The cause of this spike in metals/metalloids was not evident during the field trip, but may be the result of land disturbance upstream. No anomalous laboratory control data was reported from this field trip.

As mentioned previously, DOC levels play an important role in copper speciation and hence toxicity to aquatic organisms. Waters with higher DOC levels may have a greater proportion of the copper present in organically bound, less toxic complexes (copper-DOC complexes), as opposed to the more bioavailable and toxic free form (Cu^{+}). Further discussion on the copper complexing capacity of waters in the study area is included in Section 4.1.13.

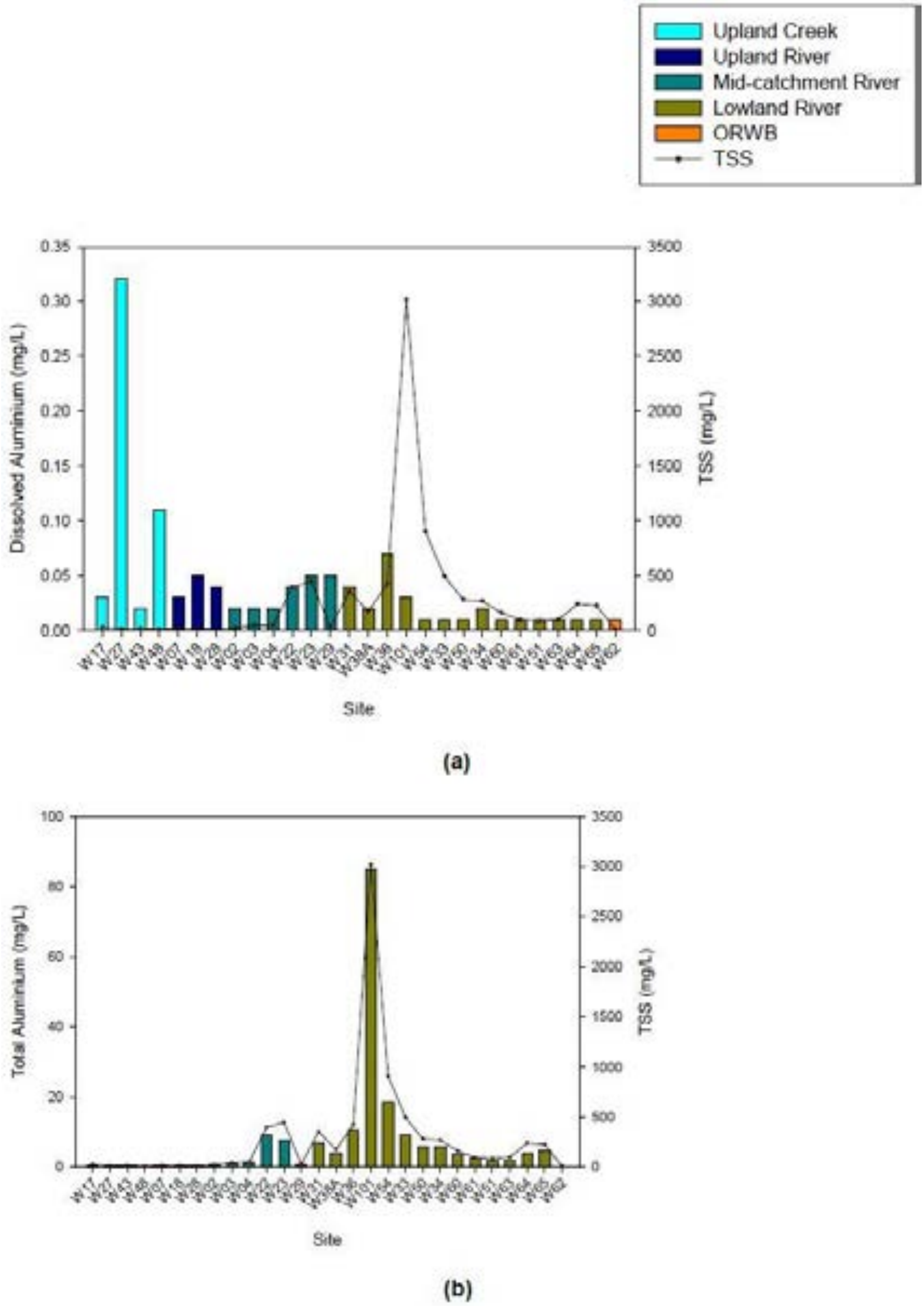


Figure 4-23 (a) dissolved and (b) total aluminium against TSS (for Hydrobiology monitoring from February 2010) (Hydrobiology 2015)

Table 4-3 Median dissolved metal concentrations compared to water quality guideline values

Site	n	Dissolved metals													
		Ag #	Ultratrace Ag #	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
Base Camp	11	0.0005	*ND*	0.02	0.0005	0.00005	0.005	0.03	0.00005	0.021	0.001	0.0005	0.0005	0.005	0.007
W27	19	0.0005	*ND*	0.43	0.0005	0.00005	0.053	0.13	0.00005	0.046	0.001	0.0005	0.0005	0.005	0.019
W41	14	0.0005	0.00005	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.003
W43	18	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.004	0.001	0.0005	0.0005	0.005	0.003
W48	17	0.0005	*ND*	0.05	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.003
W17	10	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
W42	6	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	*ND*	0.005	0.003
W07	10	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
W18	17	0.0005	0.00005	0.05	0.0005	0.00005	0.003	0.03	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
W28	19	0.0005	*ND*	0.03	0.0005	0.00005	0.001	0.03	0.00005	0.002	0.002	0.0005	0.0005	0.005	0.003
W102	9	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.006
W02	10	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.005	0.001	0.0005	0.0005	0.005	0.003
W03	10	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.012	0.001	0.0005	0.0005	0.005	0.003
W04	10	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.003
W22	18	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.009	0.001	0.0005	0.0005	0.005	0.003
W23	18	0.0005	0.00005	0.03	0.0005	0.00005	0.001	0.03	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.003
W29	10	0.0005	*ND*	0.06	0.0005	0.00005	0.004	0.03	0.00005	0.004	0.001	0.0005	0.0005	0.005	0.003
W114	1	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.011	0.001	0.0005	0.0005	0.005	0.003
W115	1	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.06	0.00005	0.007	0.002	0.0005	0.0005	0.005	0.003
W31	9	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.10	0.00005	0.012	0.001	0.0005	0.0005	0.005	0.003
W33	18	0.0005	0.00005	0.02	0.0010	0.00005	0.001	0.08	0.00005	0.008	0.001	0.0005	0.0005	0.005	0.003
W34	18	0.0005	0.00005	0.02	0.0008	0.00005	0.001	0.11	0.00005	0.013	0.001	0.0005	0.0005	0.005	0.003
W35	17	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.13	0.00005	0.013	0.001	0.0005	0.0005	0.005	0.003
W36	18	0.0005	0.00005	0.03	0.0005	0.00005	0.001	0.09	0.00005	0.010	0.001	0.0005	0.0005	0.005	0.003
W38A	18	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.11	0.00005	0.015	0.002	0.0005	0.0005	0.005	0.003
W50	13	0.0005	*ND*	0.03	0.0005	0.00005	0.001	0.15	0.00005	0.013	0.001	0.0005	0.0005	0.005	0.003
W51	2	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.09	0.00005	0.021	0.001	0.0005	0.0005	0.005	0.003
W54	4	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.08	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.003
W60	12	0.0005	*ND*	0.03	0.0005	0.00005	0.001	0.14	0.00005	0.014	0.001	0.0005	0.0005	0.005	0.020
W61	11	0.0005	0.00005	0.03	0.0005	0.00005	0.002	0.18	0.00005	0.012	0.001	0.0005	0.0005	0.005	0.019
W63	11	0.0005	0.00005	0.03	0.0005	0.00005	0.002	0.18	0.00005	0.016	0.001	0.0005	0.0005	0.005	0.029
W64	11	0.0005	0.00005	0.03	0.0010	0.00005	0.001	0.16	0.00005	0.023	0.001	0.0005	0.0005	0.005	0.030
W65	10	0.0005	0.00005	0.03	0.0005	0.00005	0.002	0.17	0.00005	0.031	0.001	0.0005	0.0005	0.005	0.030
W70	10	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.30	0.00005	0.051	0.001	0.0005	0.0005	0.005	0.005
W71	10	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.09	0.00005	0.012	0.002	0.0005	0.0005	0.005	0.015
W101	3	0.0005	*ND*	0.01	0.0005	0.00005	0.002	0.03	0.00005	0.002	0.002	0.0005	0.0005	0.005	0.003
RORWB	10	0.0005	0.00005	0.10	0.0005	0.00005	0.001	0.49	0.00005	0.024	0.001	0.0005	0.0005	0.005	0.032
RORWBB	4	0.0005	*ND*	0.09	0.0005	0.00005	0.006	0.52	0.00005	0.027	0.001	0.0005	0.0005	0.005	0.061
W100	9	0.0005	0.00005	0.05	0.0005	0.00005	0.001	0.14	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.030
W100B	5	0.0005	*ND*	0.06	0.0005	0.00005	0.004	0.11	0.00005	0.006	0.001	0.0005	0.0005	0.005	0.026
W26	18	0.0005	0.00005	0.10	0.0005	0.00005	0.001	0.32	0.00005	0.015	0.001	0.0005	0.0005	0.005	0.008
W26B	5	0.0005	*ND*	0.08	0.0005	0.00005	0.003	0.27	0.00005	0.019	0.002	0.0005	0.0005	0.005	0.024
W62	13	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.18	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.003
W62B	3	0.0005	*ND*	0.06	0.0005	0.00005	0.002	0.31	0.00005	0.004	0.002	0.0005	0.0005	0.005	0.027
S1	1	*ND*	0.00005	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.001	0.003	0.0005	0.0005	0.005	0.003
S2	1	*ND*	0.0004	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
S3	1	*ND*	0.0002	0.01	0.0005	0.00005	0.001	0.09	0.00005	0.015	0.002	0.0005	0.0005	0.005	0.003
S4	1	*ND*	0.00005	0.02	0.0005	0.00005	0.001	0.05	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
S5	1	*ND*	0.0001	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.001	0.001	0.0005	0.0005	0.005	0.003
S6	1	*ND*	0.00005	0.03	0.0005	0.00005	0.001	0.13	0.00005	0.022	0.001	0.0005	0.0005	0.005	0.003
S7	1	*ND*	0.00005	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.003
S8	1	*ND*	0.00005	0.01	0.0005	0.00005	0.001	0.03	0.00005	0.004	0.001	0.0005	0.0005	0.005	0.003
Criteria / Guideline Values	PNG ER	0.05		-	0.05	0.01	1	1	0.0002	0.5	1	0.005	-	0.01	5
	PNG ECoP	0.0001		0.1 (pH>6.5)	0.05	0.0007 *	0.007 *	1	0.0001	-	0.056 *	0.0013 *	0.03	0.005	0.18 *
	ANZECC	0.00005		0.055 (pH>6.5)	0.024	0.0002	0.0014	-	0.00006^	1.9	0.011	0.0034	-	0.005^	0.008
Drinking Water Standards	PNG	0.05		-	0.05	0.01	-	-	0.001	0.5	-	0.1	-	0.01	-
	WHO (2011)	-		-	0.01	0.003	2	-	0.006	0.4	0.07	0.01	0.02	0.01	-

Note: Median values presented in this table have been calculated assuming data below the limit of reporting (LOR) are half of the LOR as per ANZECC/ARMCANZ (2000). Orange highlighted cells indicate exceedance of the most stringent of the stated water quality objectives/guideline values

Median silver values, which are half the LOR (0.001 mg/L), cannot be directly compared to the PNG ECoP (0.0001 mg/L) and ANZECC (0.00005 mg/L) guideline values which are lower than half the LOR. Where available, ultra-trace values for silver are shown.

^ mercury and selenium values are for protection of 99% of species in typical slightly–moderately disturbed systems as per ANZECC/ARMCANZ (2000).

* Water quality objectives/guideline values for Cd, Cu, Pb, Ni, Zn are dependent on water hardness in PNG ECoP guideline and ANZECC/ARMCANZ (2000) – values presented are based on a hardness of <50 mg/L of CaCO3.

ND = No data available

Table 4-4 Median total metal concentrations for all sites

Site	n	Total metals													
		Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
Base C	11	0.0005	*ND*	0.10	0.0005	0.00005	0.009	0.08	0.00005	0.023	0.001	0.0005	0.0005	0.005	0.009
W27	19	0.0005	*ND*	0.49	0.0005	0.00005	0.055	0.19	0.00005	0.045	0.001	0.001	0.0005	0.005	0.015
W41	14	0.0005	0.00005	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.003
W43	18	0.0005	*ND*	0.05	0.0005	0.00005	0.001	0.13	0.00005	0.009	0.001	0.0005	0.0005	0.005	0.003
W48	17	0.0005	*ND*	0.07	0.0005	0.00005	0.001	0.06	0.00005	0.004	0.001	0.0005	0.0005	0.005	0.003
W17	10	0.0005	*ND*	0.02	0.0005	0.00005	0.001	0.03	0.00005	0.002	0.001	0.0005	0.0005	0.005	0.003
W42	6	0.0005	*ND*	0.04	0.0005	0.00005	0.001	0.03	0.00005	0.004	0.001	0.0005	0.0005	0.005	0.003
W07	10	0.0005	*ND*	0.03	0.0005	0.00005	0.001	0.03	0.00005	0.003	0.001	0.0005	0.0005	0.005	0.003
W18	17	0.0005	0.00005	0.15	0.0005	0.00005	0.003	0.14	0.00005	0.006	0.001	0.0005	0.0005	0.005	0.003
W28	19	0.0005	*ND*	0.09	0.0005	0.00005	0.001	0.09	0.00005	0.003	0.001	0.0018	0.0005	0.005	0.003
W102	9	0.0005	0.00005	0.66	0.0005	0.00005	0.002	1.16	0.00005	0.037	0.008	0.0005	0.0005	0.005	0.003
W02	10	0.0005	*ND*	0.05	0.0005	0.00005	0.001	0.06	0.00005	0.007	0.001	0.0005	0.0005	0.005	0.003
W03	10	0.0005	*ND*	0.05	0.0005	0.00005	0.001	0.10	0.00005	0.013	0.001	0.0005	0.0005	0.005	0.003
W04	10	0.0005	*ND*	0.17	0.0005	0.00005	0.001	0.22	0.00005	0.019	0.001	0.0025	0.0005	0.005	0.003
W22	18	0.0005	*ND*	0.45	0.0005	0.00005	0.002	0.76	0.00005	0.047	0.002	0.004	0.0005	0.005	0.003
W23	18	0.0005	0.00005	0.49	0.0005	0.00005	0.003	0.65	0.00005	0.048	0.004	0.002	0.0005	0.005	0.003
W29	10	0.0005	*ND*	0.09	0.0005	0.00005	0.004	0.07	0.00005	0.006	0.001	0.001	0.0005	0.005	0.003
W114	1	0.0005	*ND*	0.42	0.0005	0.00005	0.004	0.64	0.00005	0.125	0.002	0.019	0.0005	0.005	0.003
W115	1	0.0005	*ND*	0.01	0.0005	0.00005	0.001	0.08	0.00005	0.007	0.001	0.002	0.0005	0.005	0.003
W31	9	0.0005	*ND*	0.09	0.0005	0.00005	0.001	0.52	0.00005	0.059	0.001	0.003	0.0005	0.005	0.003
W33	18	0.0005	0.00005	8.89	0.0045	0.00005	0.014	15.00	0.00005	0.272	0.007	0.008	0.0005	0.005	0.033
W34	18	0.0005	0.00005	5.11	0.0030	0.00005	0.009	9.27	0.00005	0.182	0.008	0.0055	0.0005	0.005	0.021
W35	17	0.0005	0.00005	3.24	0.0020	0.00005	0.008	6.98	0.00005	0.207	0.006	0.005	0.0005	0.005	0.021
W36	18	0.0005	0.00005	1.41	0.0005	0.00005	0.004	1.53	0.00005	0.078	0.002	0.006	0.0005	0.005	0.007
W38A	18	0.0005	0.00005	1.45	0.0005	0.00005	0.005	2.06	0.00005	0.086	0.003	0.004	0.0005	0.005	0.007
W50	13	0.0005	*ND*	7.19	0.0040	0.00005	0.012	12.90	0.00005	0.283	0.014	0.01	0.0005	0.005	0.028
W51	2	0.0005	*ND*	1.87	0.0015	0.00005	0.005	3.72	0.00005	0.098	0.002	0.007	0.0005	0.005	0.012
W54	4	0.0005	*ND*	3.75	0.0030	0.00005	0.009	8.89	0.00005	0.159	0.005	0.0075	0.0005	0.005	0.018
W60	12	0.0005	*ND*	4.08	0.0025	0.00005	0.009	6.60	0.00005	0.202	0.010	0.0055	0.0005	0.005	0.023
W61	11	0.0005	0.00105	2.83	0.0020	0.00005	0.007	5.65	0.00005	0.248	0.012	0.006	0.0005	0.005	0.028
W63	11	0.0005	0.00005	3.93	0.0020	0.00005	0.009	7.11	0.00005	0.147	0.017	0.003	0.0005	0.005	0.022
W64	11	0.0005	0.00005	3.61	0.0020	0.00005	0.008	6.09	0.00005	0.176	0.014	0.003	0.0005	0.005	0.019
W65	10	0.0005	0.00005	3.24	0.0020	0.00005	0.008	5.64	0.00005	0.157	0.012	0.0025	0.0005	0.005	0.019
W70	10	0.0005	*ND*	0.61	0.0005	0.00005	0.002	1.55	0.00005	0.083	0.006	0.0005	0.0005	0.005	0.007
W71	10	0.0005	0.00005	1.44	0.0005	0.00005	0.005	2.73	0.00005	0.093	0.026	0.0015	0.0005	0.005	0.009
W101	3	0.0005	*ND*	13.40	0.0040	0.00005	0.060	28.90	0.00005	0.835	0.277	0.009	0.0005	0.005	0.056
RORWB	10	0.0005	0.00005	0.15	0.0005	0.00005	0.001	0.71	0.00005	0.028	0.001	0.0005	0.0005	0.005	0.011
RORWBB	4	0.0005	*ND*	0.10	0.0005	0.00005	0.004	0.68	0.00005	0.027	0.001	0.0005	0.0005	0.005	0.010
W100	9	0.0005	0.00005	0.07	0.0005	0.00005	0.001	0.21	0.00005	0.008	0.001	0.0005	0.0005	0.005	0.017
W100B	5	0.0005	*ND*	0.07	0.0005	0.00005	0.005	0.14	0.00005	0.006	0.001	0.0005	0.0005	0.005	0.021
W26	18	0.0005	0.00005	0.25	0.0005	0.00005	0.001	0.60	0.00005	0.024	0.001	0.0005	0.0005	0.005	0.003
W26B	5	0.0005	*ND*	0.25	0.0005	0.00005	0.003	0.60	0.00005	0.024	0.001	0.0005	0.0005	0.005	0.007
W62	13	0.0005	0.00005	0.38	0.0005	0.00005	0.002	0.87	0.00005	0.027	0.002	0.0005	0.0005	0.005	0.003
W62B	3	0.0005	*ND*	0.62	0.0005	0.00005	0.004	1.08	0.00005	0.033	0.003	0.0005	0.0005	0.005	0.008
S1	1	*ND*	0.00005	1.45	0.0005	0.00005	0.004	1.47	0.00005	0.042	0.005	0.0005	0.0005	0.005	0.003
S2	1	*ND*	0.0004	0.19	0.0005	0.00005	0.001	0.40	0.00005	0.020	0.005	0.0005	0.0005	0.005	0.003
S3	1	*ND*	0.0002	0.31	0.0005	0.00005	0.001	0.69	0.00005	0.031	0.004	0.0005	0.0005	0.005	0.003
S4	1	*ND*	0.00005	0.62	0.0005	0.00005	0.002	0.67	0.00005	0.022	0.001	0.0005	0.0005	0.005	0.003
S5	1	*ND*	0.0001	0.33	0.0005	0.00005	0.001	0.24	0.00005	0.008	0.001	0.0005	0.0005	0.005	0.003
S6	1	*ND*	0.00005	2.83	0.0005	0.00005	0.008	3.75	0.00005	0.101	0.003	0.001	0.0005	0.005	0.006
S7	1	*ND*	0.00005	5.07	0.0010	0.00005	0.016	7.00	0.00005	0.174	0.007	0.001	0.0005	0.005	0.016
S8	1	*ND*	0.00005	1.28	0.0005	0.00005	0.003	1.65	0.00005	0.031	0.002	0.0005	0.0005	0.005	0.003
Drinking Water Standards	PNG	0.05		-	0.05	0.01	-	-	0.001	0.5	-	0.1	-	0.01	-
	WHO (2011)	-		-	0.01	0.003	2	-	0.006	0.4	0.07	0.01	0.02	0.01	-

Note: Median values presented in this table have been calculated assuming data below the limit of reporting (LOR) are half of the LOR as per ANZECC/ARMCANZ (2000). Orange highlighted cells indicate exceedance of the drinking water standards
ND = No data available

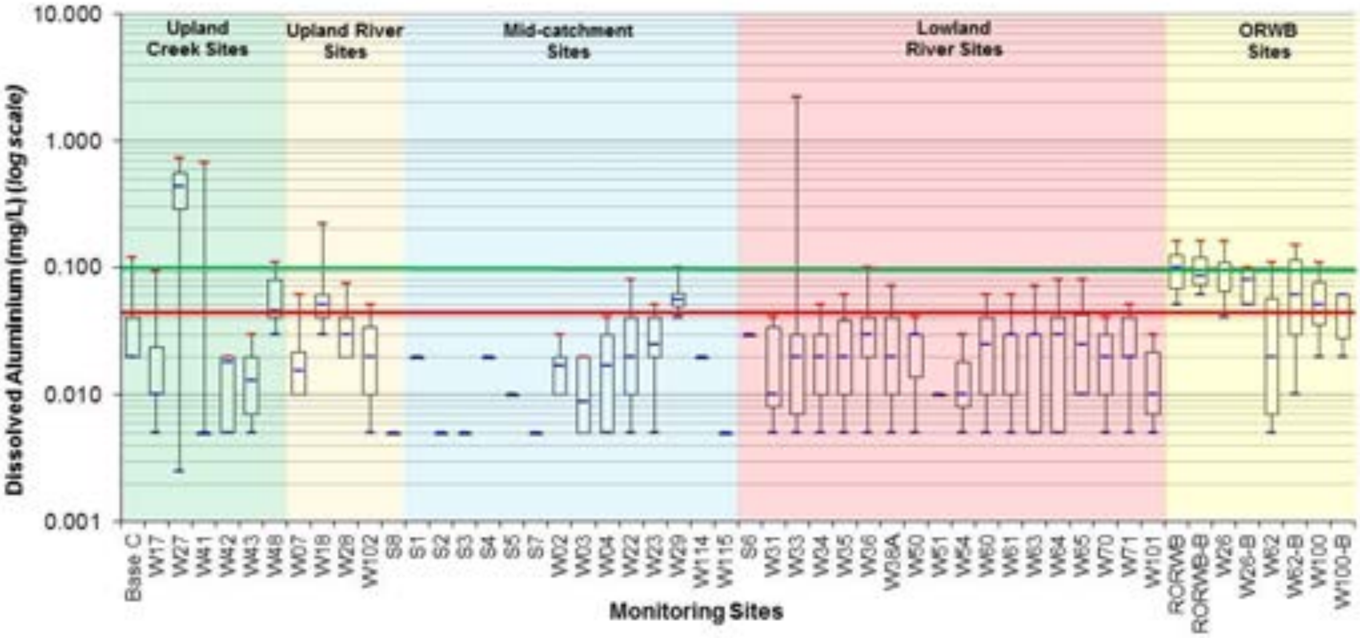


Figure 4-24 Box and whisker plot of dissolved aluminium measurements – compared to ANZECC/ARMCANZ (2000) (red line) and PNG ECoP (green line) guideline values

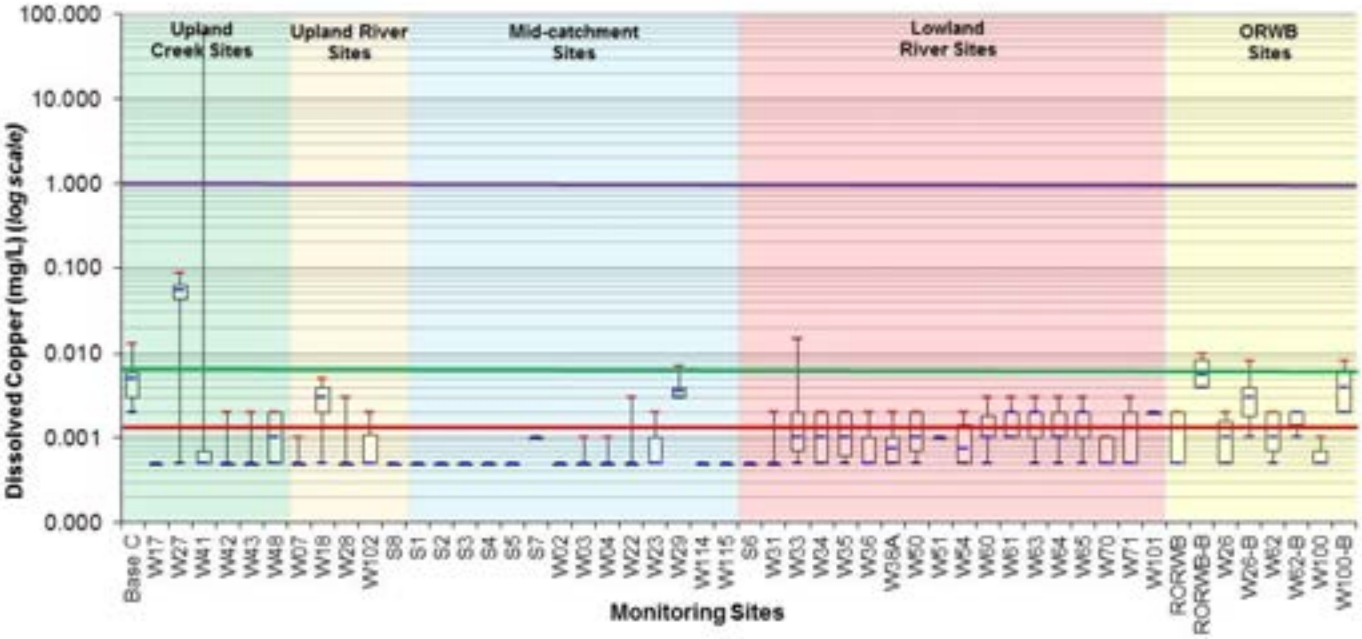


Figure 4-25 Box and whisker plot of dissolved copper measurements – compared to ANZECC/ARMCANZ (2000) (red line), PNG ER (blue line) and PNG ECoP (green line) guideline values

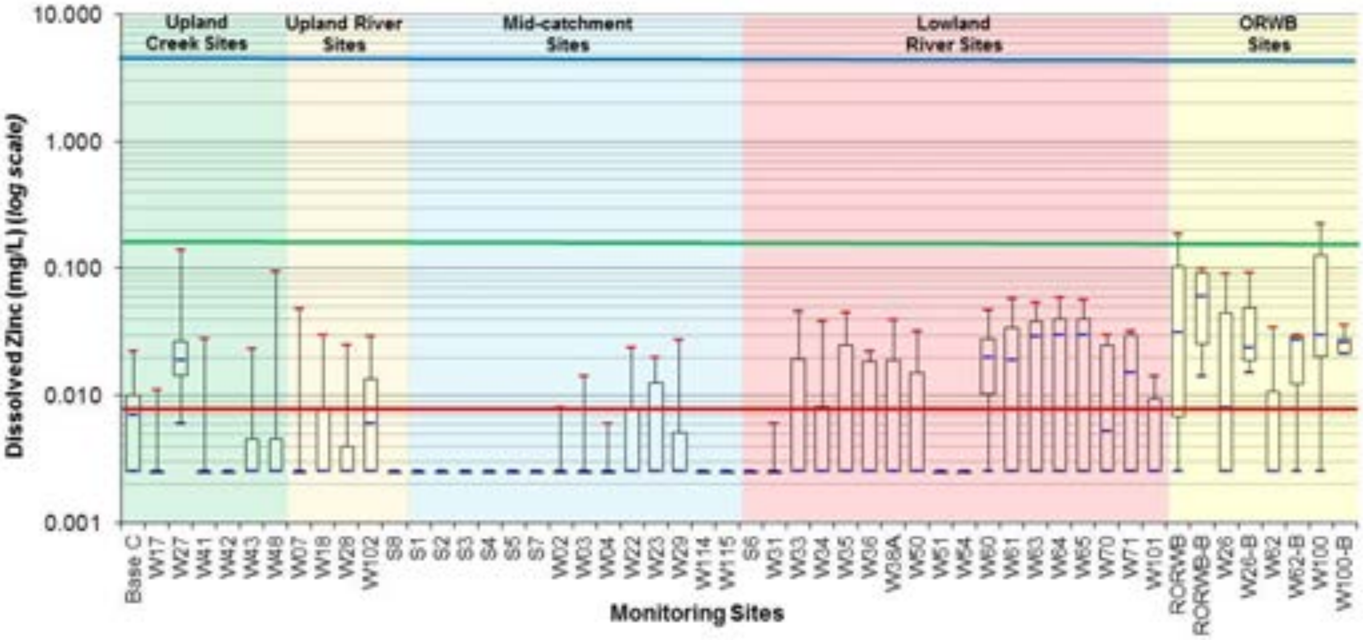


Figure 4-26 Box and whisker plot of dissolved zinc measurements – compared to ANZECC/ARMCANZ (2000) (red line), PNG ER (blue line) and PNG ECoP (green line) guideline values

4.1.11 Nutrients

Nutrients analysed included total nitrogen (TN), ammonia, mono-nitrogen oxides (nitrate and nitrite - NOx), total phosphorus (TP) and filterable reactive phosphorus (FRP). While all nutrient data is included in Appendix A, median values are presented in Table 4-5, and can be summarised as follows:

- Most sites in the Sepik River and ORWBs had median nitrogen levels that exceeded the ANZECC water quality guideline value. Most upland creek and river sites and the mid-catchment river sites had median total nitrogen levels below the ANZECC guideline value, except for sites S1 and S6.
- Most sites had median ammonia levels that exceeded the ANZECC guideline value. However, all sites had ammonia concentrations that were below the PNG based water quality guideline values (i.e. PNG ER and ECoP), which are dependent on pH and temperature. The PNG water quality objectives/guideline values become more stringent with increasing alkalinity and temperature.
- Median NOx levels slightly exceeded the ANZECC guideline value at most of the monitoring sites.
- Total phosphorus levels slightly exceeded the ANZECC guideline value at most sites, except for most of the ORWB sites and some of the upland creek and river sites (in Frieda/Niar/Nena catchment).
- Median FRP, which is the most bioavailable form of phosphorus, was at concentrations below the ANZECC guideline value at all monitoring sites.

Hydrobiology (2015) also assessed nutrient limitation in the Study Area by examining the ratios of FRP to readily bioavailable nitrogen (nitrate, nitrite and ammonia). These ratios were compared to the ideal ratio of 1:16 (P:N), and indicated that both phosphorus or nitrogen limitation may be present for some sites while others fluctuate between phosphorus and nitrogen limitation depending on seasonality (Hydrobiology, 2015). Variability in nutrient ratios can affect nutrient uptake and may affect plant health. Further discussion on P:N ratios and nutrient limitation in the Study Area is available in Hydrobiology (2015).

Table 4-5 Median Values for Nutrients

Site name	Total Nitrogen (mg/L)	Ammonia (mg/L)	NOx (mg/L)	Total Phosphorus (mg/L)	Filterable Reactive Phosphorus (mg/L)
Base C	0.13	0.02	0.03	0.03	0.005
W27	0.08	0.01	0.02	0.02	0.005
W41	0.08	0.01	0.03	0.02	0.005
W43	0.20	0.02	0.06	0.01	0.005
W48	0.20	0.01	0.02	0.01	0.005
W17	0.25	0.09	0.04	0.01	0.008
W42	0.30	0.02	ND	0.02	*ND*
W07	0.10	0.02	0.03	0.02	0.008
W18	0.20	0.01	0.06	0.01	0.005
W28	0.20	0.01	0.03	0.01	0.005
W102	0.30	0.02	0.02	0.06	0.005
W02	0.20	0.01	0.07	0.01	0.008
W03	0.15	0.01	0.04	0.02	0.005
W04	0.20	0.03	0.03	0.03	0.005
W22	0.30	0.07	0.06	0.03	0.005
W23	0.20	0.06	0.03	0.02	0.005
W29	0.05	0.01	0.04	0.02	0.005
W114	0.05	0.15	0.01	0.07	0.005
W115	0.05	0.01	0.01	0.01	0.005
W31	0.20	0.01	0.05	0.03	0.005
W33	0.65	0.41	0.06	0.04	0.020
W34	0.60	0.25	0.04	0.04	0.005
W35	0.75	0.23	0.05	0.03	0.005
W36	0.20	0.06	0.08	0.03	0.005
W38A	0.25	0.10	0.03	0.03	0.005
W50	0.60	0.40	0.05	0.04	0.008
W51	0.07	0.11	0.02	0.10	0.005
W54	0.30	0.10	0.06	0.11	0.005
W60	0.40	0.11	0.03	0.02	0.005
W61	0.45	0.22	0.05	0.03	0.005
W63	0.50	0.12	0.07	0.02	0.005
W64	0.45	0.19	0.05	0.04	0.008
W65	0.30	0.16	0.07	0.04	0.010
W70	0.20	0.06	0.04	0.02	0.005
W71	0.20	0.07	0.01	0.02	0.005
W101	0.90	0.57	0.06	0.04	0.020
RORWB	0.60	0.03	0.04	0.01	0.005
RORWB-B	0.55	0.02	0.06	0.01	0.005
W100	0.40	0.01	0.08	0.01	0.005
W100-B	0.60	0.02	0.08	0.01	0.005
W26	0.45	0.08	0.03	0.01	0.005
W26-B	0.50	0.04	0.05	0.02	0.005
W62	0.70	0.04	0.04	0.02	0.005
W62-B	0.40	0.03	0.08	0.05	0.005
S1	0.5	0.04	0.08	0.09	0.005
S2	0.1	0.03	0.04	0.03	0.005

Site name	Total Nitrogen (mg/L)	Ammonia (mg/L)	NOx (mg/L)	Total Phosphorus (mg/L)	Filterable Reactive Phosphorus (mg/L)
S3	0.05	0.03	0.01	0.04	0.005
S4	0.2	0.02	0.01	0.08	0.005
S5	0.1	0.04	0.02	0.02	0.005
S6	0.4	0.09	0.03	0.12	0.005
S7	0.1	0.02	0.005	0.05	0.005
S8	0.05	0.01	0.005	0.02	0.005
PNG ER	-	3.6*	-	-	-
PNG ECoP	-	1.04*	-	-	-
ANZECC	0.3	0.01	0.01	0.01	0.04

* PNG ECoP and PNG ER ammonia water quality objectives/guideline values are dependent on temperature and pH – water quality objectives/guideline values listed are based on temperature of 25 and pH of 7

Note: Highlighted cells indicate an exceedance of the most stringent of the stated water quality objectives/guideline values.

ND = No data available

4.1.12 Chlorophyll-a

Chlorophyll-a was analysed by Hydrobiology during two sampling events and is discussed in field trip reports (Hydrobiology 2010d, 2011) and summarised in Hydrobiology (2015). Where analysed, chlorophyll-a was at or below the LOR (1 mg/m^3) at all sites except W65 (Sepik River at mouth), where it was recorded at 2 mg/m^3.

4.1.13 Copper Complexing Capacity

The existing concentrations of dissolved copper, labile copper and copper complexing capacity are shown in Table 4-6 (2015 data) and Table 4-7 (2017 data). Copper bioavailability is dependent on chemical speciation, with copper in its free form (Cu^+) (also known as labile copper) the most bioavailable, and thus the potentially most toxic to aquatic ecosystems. In 2015, dissolved copper concentrations ranged from 0.52 µg/L at the Nena River gauging station to 4.7 µg/L at Ekwai Creek (W27) (Table 4-6). In 2017, dissolved copper concentrations ranged from 0.39 µg/L at the Nena River gauging station to 64.4 µg/L at Ekwai Creek (W27) (Table 4-7).

Up to 10% of the dissolved copper was comprised of labile copper, with the exception of Ekwai Creek which reported a percentage labile copper of 36% in 2015 and 70% in 2017. The higher percentage of labile copper at Ekwai Creek corresponds to low pH recorded at this known ARD site (Section 4.1.6). Despite recording a neutral pH of 7.2 in 2015 (Table 4-6), pH was 4.64 in 2017 (Table 4-7). Water pH, along with DOC, plays a role in copper speciation, with low pH giving rise to larger proportions of free copper ions (CSIRO 2005).

The complexing capacity concentration indicates the concentration of dissolved metal above which any further added dissolved metal is likely to lead to an increase in the Chelex-labile metal. The copper complexing capacity ranged from 4.1 to 30.9 µg/L. The lowest readings were measured at Ekwai Creek (8 µg/L in 2015 and 4.1 µg/L in 2017), which, as mentioned above, is known to have acidic pH.

All other waterways sampled, including the Nena River, Frieda River and Sepik River, had similar copper complexing capacities, with most values between 20 µg/L and 30 µg/L. Two Frieda River sites (W23 in 2015 and W71 in 2017) had lower complexing capacities of 11-14 µg/L.

Except for Ekwai Creek (W27), the complexing capacity of copper was substantially higher than the dissolved concentrations, resulting in the Chelex-labile concentrations of these metals being substantially lower than the dissolved concentration (Table 4-6 and Table 4-7). This indicates that there is low bioavailability of dissolved copper to aquatic organisms inhabiting these waters. The concentration of bioavailable copper is unlikely to increase significantly until the dissolved concentration exceeds the complexing capacity at each site. In contrast, the complexation capacity at W27 was relatively low and a large proportion of the dissolved copper was present as Chelex-labile species that are likely to be bioavailable. An increase in the dissolved copper at this site is likely to result in increased bioavailable copper to aquatic organisms.

Furthermore, DOC has a strong influence on metal speciation in aquatic systems, forming extremely strong complexes with trace metals/metalloids, especially copper, which influences bioavailability. Organically bound copper (i.e. copper-DOC complex) is not bioavailable to aquatic organisms and hence poses less of a concern in waterways (CSIRO 2005).

In general, DOC was lowest in upland creeks and rivers and mid-catchment rivers. Lowland rivers had slightly higher organic carbon levels, with 'black water' ORWBs (W100, RORWB, and W26) recording high levels of DOC throughout all monitoring events. This suggests that copper found in these sites with elevated DOC may potentially be organically bound, thus less toxic form due to the higher complexing capacity of these water bodies.

In terms of the 2017 data (Table 4-7), sites in the Nena and Sepik rivers with higher DOC concentrations had correspondingly higher complexing capacity concentrations, suggesting a greater number of complexation sites for copper binding compared with other samples.

Table 4-6 Copper (dissolved, Chelex* labile) concentrations, pH and copper complexing capacity - 2015

Site location	Sample ID	pH	Dissolved Cu (µg/L)	Chelex-labile Cu (µg/L)	Chelex-labile (%)	Cu complexing capacity (µg/L)
Ekwai Creek upstream of Ubai River Junction	W27	7.2	4.7	1.7	36	8
Nena River gauging station	NR-GS	7.1	0.52	0.03	5	21
Lower Nena River	W29	6.9	4.2	0.42	10	23
Frieda River downstream of the Airstrip	W23	7.5	1.0	<0.02	none detected	14
Lower Frieda Sand Bar	W38a	7.0	1.4	0.14	10	25
Sepik River at Iniok	W34	7.4	1.7	0.10	6	20

* Chelex refers to the method of labile copper measurement

Table 4-7 Copper (dissolved, Chelex labile) concentrations, pH and copper complexing capacity - 2017

Site location	Sample ID	pH	Dissolved Cu (µg/L)	Chelex-labile Cu (µg/L)	Chelex-labile (%)	Cu complexing capacity (µg/L)	TSS (mg/L)	Dissolved organic carbon (mg/L)
Ekwai Creek upstream of Ubai River Junction	W27	4.64	64.4	45.4	70	4.1	*ND*	0.93
Nena River gauging station	NR-GS	7.64	0.39	<0.008	none detected	25.8	*ND*	2.05
Lower Nena River	W29	7.28	2.46	<0.008	none detected	30.9	*ND*	2.63
Frieda River downstream of the Airstrip	W23	7.60	2.14	<0.008	none detected	24.7	55	1.58
Lower Frieda Sand Bar	W38a	7.53	0.74	<0.008	none detected	21.4	40	1.64
Sepik River at Iniok	W34	7.55	1.49	<0.008	none detected	24.5	275	4.06
Frieda River downstream	W71	7.59	0.45	<0.008	none detected	11.6	57	0.70

ND = no data - samples were not analysed for TSS at these sites as adsorption capacity (Section 4.1.14) was only assessed at sites W23, W38a, W34 and W71.

4.1.14 Copper Adsorption Capacity

Dissolved Metal Adsorption

Copper adsorption capacity was assessed at selected sites in Frieda River and Sepik River (W23, W34, W38A and W71) by spiking unfiltered sample waters with a mixture of dissolved copper at concentrations of 0, 5, 10, 20 and 50 µg/L. The copper concentrations in the unfiltered adsorption treatments and filtered controls are shown in Table 4-8.

For sites W23 and W38A in the Frieda River, and Site W34 in the Sepik River, the percentages of copper removed from the dissolved phase through adsorption were generally similar and in the range 45-70%. Higher percentages of metal removed through adsorption (66-85%) were measured at site W71 (Frieda River downstream) compared to other sites.

For all sites, the percentage of copper removed through adsorption increased as the spiked concentration increased. The increase in percentage of copper removed through adsorption indicates that the adsorption sites on the suspended particulate matter (SPM) were not becoming saturated with copper at the higher spike concentrations.

Kd Partitioning Coefficients Determined from Adsorption Tests

Kd partitioning coefficients provide a means for assessing the adsorptive affinity of metal to sediment. The higher the value of Kd, the higher the adsorptive affinity of the metal for the particular sediment.

In order to derive Kd partitioning coefficients (Kd (L/g) = [particulate metal concentration, µg/g]/[dissolved metal concentration, µg/L], the slopes of the line of best fit through the linear section of the relationship between adsorbed and dissolved metal concentrations were determined. Over the range of spiked concentrations, the Kds had the general trend of W71 > W38A > W34 > W23, indicating that overall, copper adsorption was highest at Site W71 (Frieda River downstream) and lowest at Site W23 (Frieda River downstream of airstrip).

There is an approximate exponential relationship between TSS and Kd, however this can be influenced by other factors such as TSS composition and aggregation of TSS at higher concentrations, resulting in reduced numbers of binding sites. This may be an explanation for a low Kd value (10.5 L/g) for the Sepik River sample with the highest TSS concentration of 275 mg/L.

Table 4-8 Copper concentrations in spiked unfiltered samples relative to filtered controls and the percentage losses *via* adsorption - 2017

Site location	Sample ID	Spike concentration (µg/L)	Unfiltered treatment (µg/L)	Filtered spike control (µg/L)	Losses via adsorption (%)	Cu adsorbed (µg/g)	Kd (L/g)
Frieda River downstream of the Airstrip	W23	0	1.46	1.49	-	-	37.9
		5	3.17	5.86	45.9	69.1	
		10	4.51	10.54	57.2	78.9	
		20	7.90	20.18	60.8	130	
		50	17.5	50.16	65.1	269	
Sepik River at Iniok	W34	0	2.06	1.82	-	-	10.5
		5	3.25	6.56	50.5	12	
		10	4.25	11.42	62.8	26	
		20	6.74	21.31	68.4	53	
		50	14.7	51.36	71.4	133	
Lower Frieda Sand Bar	W38A	0	0.76	0.71	-	-	57.5
		5	2.56	5.00	48.9	61.0	
		10	4.64	10.12	54.2	137	
		20	7.99	19.50	59.0	287	
		50	16.0	48.80	67.3	818	
Frieda River downstream	W71	0	0.42	0.41	-	-	121
		5	1.59	4.78	66.7	56	
		10	2.17	9.09	76.1	122	
		20	3.19	17.90	82.2	260	
		50	7.02	47.18	85.1	710	

4.2 Sediment Quality

The sediment quality data collected by Hydrobiology (2007-2010) and BMT WBM (2011-2017) is included in Appendix B and summary data is presented in this section. Note that the data has been compared to sediment quality guideline values as per Simpson *et. al.* (2013), which are an update to the ANZECC/ARMCANZ (2000) interim sediment quality guideline values. The differences between these guidelines are as follows:

- ANZECC (2000) includes ISQG-low and ISQG-high, while Simpson *et. al.* (2013) includes Guideline Value and SQG-high.
- The guideline values for metals/metalloids are similar between Simpson *et. al.* (2013) and ANZECC (2000), except for silver which is 4.0 mg/kg in Simpson *et. al.* (2013) and 3.7 mg/kg in ANZECC (2000).

Sediment samples were collected by BMT WBM on two separate occasions during 2011 and 2012, (in June and December of each year), April 2013 and November 2017. Sediment samples were collected by Hydrobiology annually (generally during the dry season) from 2007 to 2010 (Hydrobiology 2015). Sediment samples were analysed for PSD and total metals/metalloids. The sediment samples were split into two particle size fractions prior to analysis, one being <63 µm and the other <2,000 µm. This provides an indication of the metal/metalloid concentrations in silts and clays (<63 µm) compared to whole sediment fractions (<2000 µm). This section presents the median values from the particle size distribution analysis and median values for metals/metalloids derived using data from all monitoring occasions. Data for each discrete monitoring event are included in annual reports for each of the monitoring years (BMT WBM 2012, 2013a, 2013b). A select number of sites were also analysed for nutrients, total carbon and total organic carbon from the April 2010 sampling event (Hydrobiology 2015).

4.2.1 Particle Size Distribution (PSD)

Median values from the BMT WBM and Hydrobiology particle size distribution data (Appendix B) are presented in Figure 4-27. This indicates that upland creek and river sites in the Frieda/Niar/Nena catchment consisted predominantly of sand and gravel, with limited amounts of silts and clays. Mid-catchment river site W22 was more similar to upland creeks and rivers (dominated by sand and gravel) while W23 had a much greater proportion of silt and clay. Lowland river sites and particularly sites in the Sepik River catchment consisted predominantly of sand, with some silts and clays. The Wario River site had a relatively even distribution of sediment classes, while the ORWBs consisted predominantly of silts and clays, with a small fraction of sand. It is noted that the particle size distribution reported is relative to the sediments sampled, and not of the sediment structure of the particular site. For example, site W27 and W23 was dominated by cobbles and boulders, which were not collected in sediment samples for laboratory analysis.

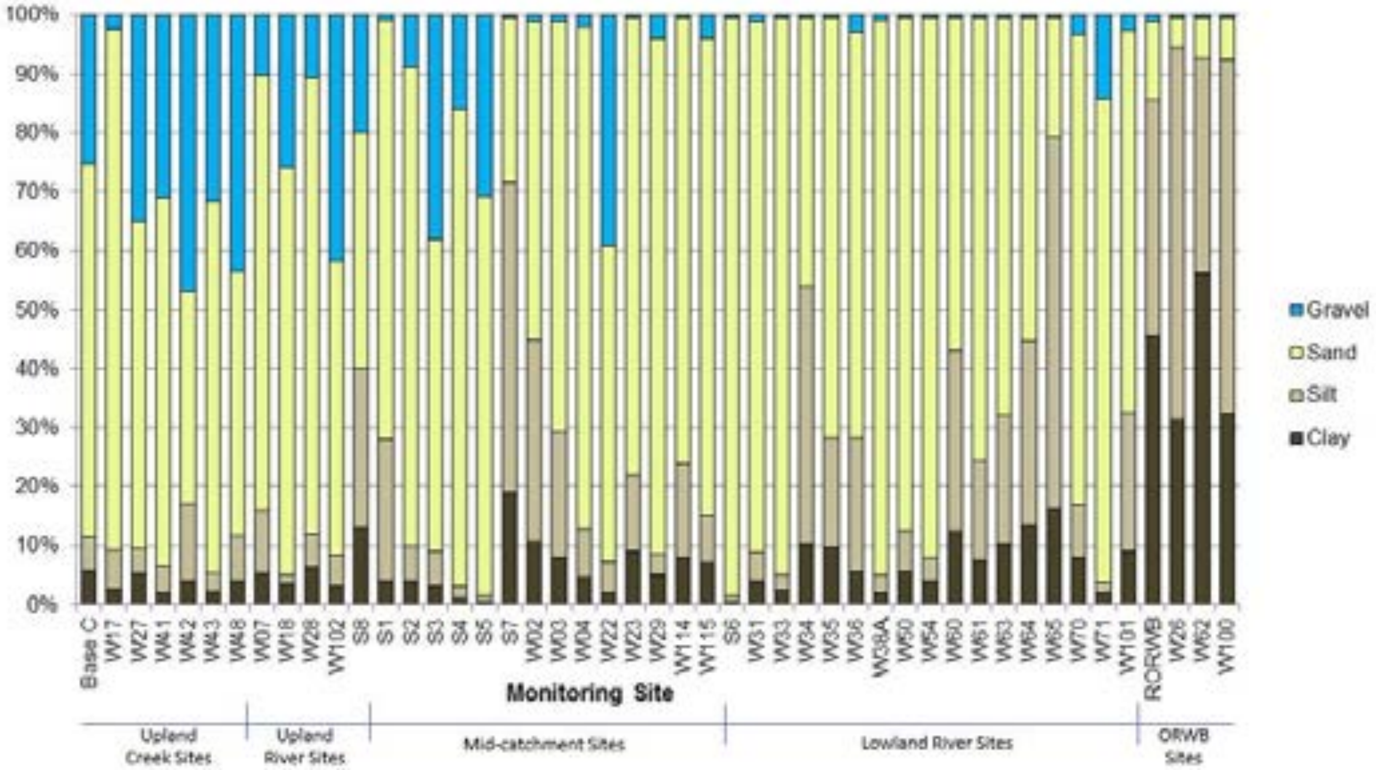
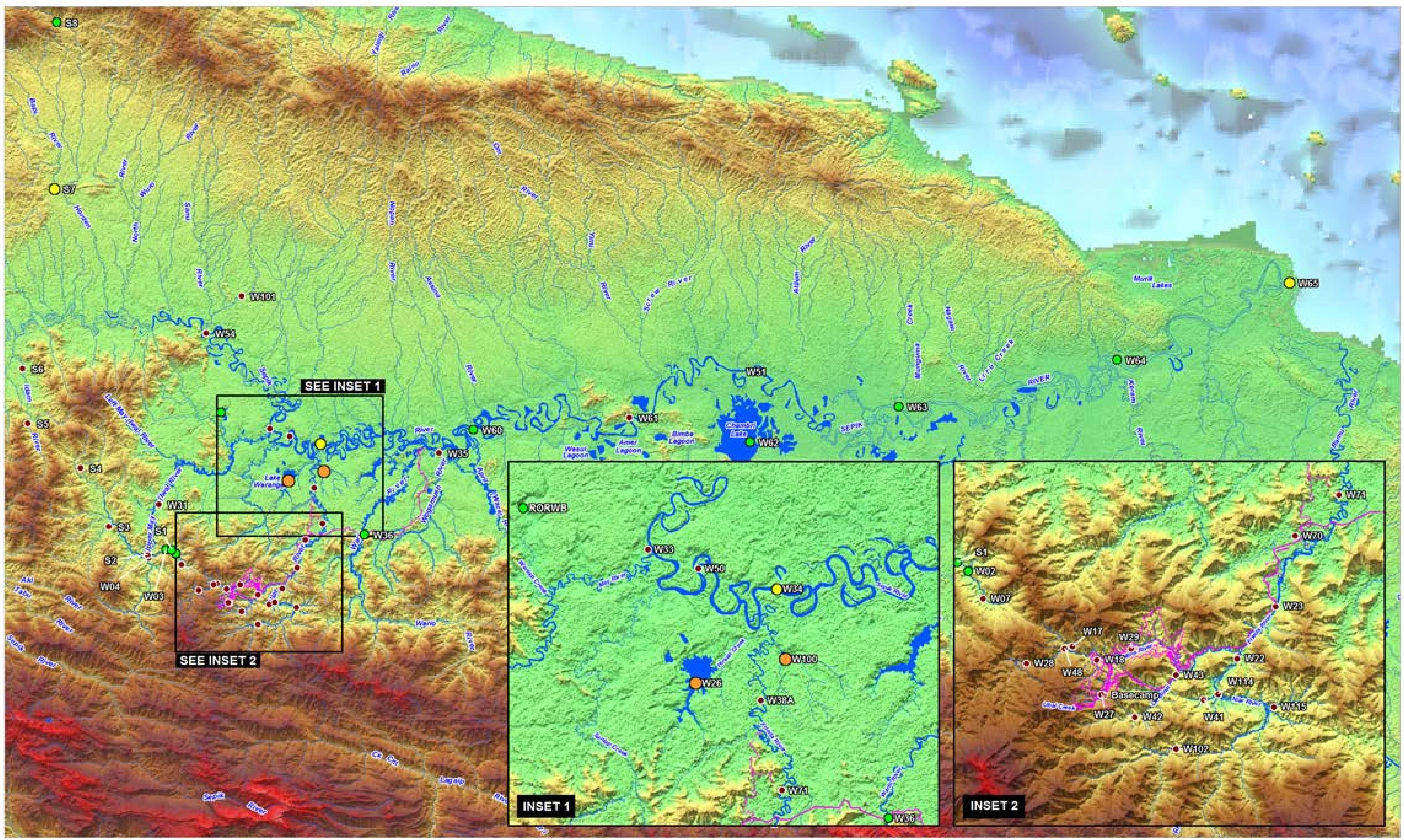


Figure 4-27 Median Particle Size Distribution Results (Clay <2µm; Silt 2-60µm; Sand 60-2000µm; Gravel >2000µm)

The geographical distribution of silt fractions throughout the Study Area is shown in Figure 4-28, as this fraction tends to hold greater proportions of bioavailable metals. Finer sample sediments were more common in lowland rivers and ORWBs while upstream sites were typically dominated by coarser fractions (sands and gravels). Mid-catchment sites W02 and W03 in the Hydrobiology data were atypical with 45% fines and 54% sands. Overall the Hydrobiology data was similar to the BMT WBM data. Additional discussion is provided in the annual and field trip reports (Hydrobiology 2008b, 2008c, 2008d, 2008e, 2009a, 2009b, 2009d, 2010a, 2010b, 2010c, 2010d, 2011; BMT WBM 2012, 2013a, 2013b).



LEGEND

Major Waterways

Mine Infrastructure

Silt (mg/kg)

- > 80
- 60 - 80
- 40 - 60
- 20 - 40
- < 20

Title:

Map of Median Silt Fraction (20-60 µm) Percentage within Study Area

Figure: **4-28**

Rev: **A**

N

0 10 20km
Scale - Insets

0 25 50km
Scale - Main Map

BMT
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4.2.2 Metals/Metalloids

For comparison of median metal/metalloid values to sediment quality guideline values, each particle size fraction is treated as a separate sample (Table 4-9 and Table 4-10). Total metals/metalloids median concentrations (calculated from sediment quality data in Appendix B) were compared with the Simpson *et al.* (2013) sediment quality guidelines as detailed in Section 3.3.6.2. These sediment guidelines give a low value (Guideline Value), below which ecotoxicological effects are unlikely to occur and a high value (SQG-high), above which ecotoxicological effects have a higher probability of occurring.

Median metal/metalloids concentrations that exceeded the SQG-high guideline value included copper in the <63 µm sediment fraction and nickel in the <63 µm and <2000 µm sediment fractions. With several notable exceptions, the silts and clays (i.e. <63 µm) fraction typically had the highest metal/metalloid concentrations (Table 4-9). This reflects the tendency of trace metals/metalloids to bind more readily to finer sediment fractions than sands and gravels that are often dominated by silicates. The exceptions included elevated concentrations of zinc (beyond SQG-high) in whole sediment samples (i.e. <2000 µm) at many sites throughout the Study Area and exceedance of the Guideline Value at some sites (Table 4-10). Results for several metals/metalloids of interest (due to their exceedances of the Guideline Value) are presented in Figure 4-36 to Figure 4-42.

The sediment quality results can be summarised as follows:

- Median concentrations of silver (Ag) in the <63 µm fraction were above the SQG-high guideline of 4 mg/kg at site W42. (Figure 4-36, Figure 4-29). Median values below guideline levels were seen across all other monitoring events.
- Median arsenic (As) was observed above the Guideline Value of 20 mg/kg in the <63 µm fraction at sites W04 and equal to the Guideline Value at W29 (Figure 4-37, Figure 4-30). No exceedances were recorded in the <2,000 µm fraction. Observations from Hydrobiology (2015) indicate that arsenic was highest in the Project Area and specifically at sites near to the mineralised ore body. Exceedance of the Guideline Value for the <63 µm fraction were recorded at sites W27, W48, W18 and W38A on several monitoring occasions however, median values remained below guidelines for these sites.
- Median concentrations of chromium (Cr) exceeded the Guideline Value of 270 mg/kg at a total of 21 sites for the <63 µm fraction and at 17 sites in the <2,000 µm fraction (Table 4-9 and Table 4-10). These exceedances were at sites across the Study Area and across all stream order categories. The SQG-high value of 370 mg/kg was not exceeded at any sites.
- Median copper (Cu) was recorded at concentrations above the SQG-high value of 270 mg/kg at the Basecamp site in the <63 µm fraction (Table 4-9). Median copper was also above the Guideline Value of 65 mg/kg at 18 sites in the <63 µm fraction and four sites in the <2,000 µm fraction (Table 4-10). There was a trend of elevated copper at the upland sites and mid-catchment rivers (Figure 4-38), although observations were also made at isolated Lowland river sites and one ORWB (RORWB).

- Median concentrations of mercury (Hg) were above the Guideline Value of 0.15 mg/kg at upland sites W48 and Basecamp (Figure 4-39, Figure 4-34). In the <2,000 µm fraction, median mercury levels were below the Guideline Value for all sites except W48 (Table 4-10).
- Median nickel (Ni) concentrations exceeded the SQG-high value of 52 mg/kg in the <63 µm and the <2,000 µm fraction at most sites except Basecamp, W27, W48, S4-S7, W33, W50, W54, and RORWB. In the <63 µm fraction, Basecamp, W27, S4-S7, W33, W50, W54 and RORWB were above the Guideline Value of 21 mg/kg and W48 was the only site below the guidelines (Table 4-9, Figure 4-32, Figure 4-40). In the <2,000 µm fraction, S8, W33, W50 and W54 were above the Guideline Value and Basecamp, W27, S4-S7, W48 and RORWB were below the guidelines (Table 4-10, Figure 4-40).
- Median lead (Pb) concentrations were above the Guideline Value of 50 mg/kg at sites W42 and W31 in the <63 µm fraction (Table 4-9). Hydrobiology (2015) also observed a single instance of lead at very elevated levels (well above SGQ-high value of 220 mg/kg) in the <63 µm fraction at site W41. The source of this exceedance and the reason that they were not observed in subsequent years is unknown and the reading has been treated as anomalous.
- Median antimony (Sb) was above the Guideline Value of 2 mg/kg at site W114 and W115 in both sediment fractions (Table 4-9 and Table 4-10). Data was collected from these sites on a single occasion and it unknown whether high levels of antimony are common at these sites or if the observed values were atypical. Antimony was within guideline levels elsewhere throughout the Study Area (Figure 4-33, Figure 4-41).
- Median zinc (Zn) was above the Guideline Value of 200 mg/kg in the <63 µm fraction at sites W42, W43 and W31 (Table 4-9, Figure 4-35, Figure 4-42). No exceedances were recorded in the <2,000 µm fraction (Table 4-10).

Metal/metalloid concentrations in sediment tended to be higher at sites in the upper catchment (upland creeks and rivers) in the vicinity of the mineralised ore body. Hydrobiology (2015) reported a similar trend for arsenic, chromium, copper, nickel and lead.

As mentioned above, a number of metals/metalloids were recorded in elevated levels in the <63 µm fraction at W27 in December 2012 and in earlier years (Hydrobiology 2015). These naturally elevated concentrations may be associated with ore deposits which occur in the upland catchments. There is the potential for mobilisation of these metals/metalloids to more bioavailable forms at W27 due to low pH levels which have been observed here due to the occurrence of naturally occurring ARD in the area.

The finer sediment fraction (silts and clays) generally contained higher concentrations of metals/metalloids than the whole sediment fraction (which includes both fine and coarse sediment fractions). This reflects the tendency for most metals to more readily bind to fine sediment fractions due to the high surface area to mass ratio of fine particles. The exceptions to this were chromium and nickel which were also widely seen at high concentrations in the whole sediment fractions (Table 4-10).

Table 4-9 Median metal concentrations in the <63 µm fraction (all in mg/kg)

Site	Category	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
Base C	ULC	0.3	17,800	7	0.40	34	386	46,100	0.20	958	27	26	0.2	2.0	158
W17	ULC	0.1	19,700	4	0.13	128	48	33,600	0.05	635	65	7	0.4	0.5	120
W27	ULC	0.2	15,350	17	0.20	53	190	34,700	0.10	256	33	18	0.4	7.0	117
W41	ULC	0.3	24,850	3	0.25	181	92	42,950	0.05	728	93	11	0.2	0.8	116
W42	ULC	1.4	26,400	17	0.60	97	101	48,800	0.05	1090	83	50	0.4	0.5	239
W43	ULC	0.4	25,400	11	0.20	88	108	47,500	0.05	907	87	21	0.2	0.5	216
W48	ULC	0.2	20,400	18	0.05	20	77	37,750	0.30	641	13	12	0.4	3.5	60
W07	ULR	0.2	23,100	6	0.20	147	93	41,400	0.08	772	75	12	0.3	0.5	162
W18	ULR	0.1	22,500	15	0.20	83	89	42,700	0.10	679	151	13	0.4	1.0	101
W28	ULR	0.1	22,550	7	0.20	48	56	42,400	0.10	777	110	13	0.1	0.5	106
W102	ULR	0.1	19,000	10	0.05	75	50	45,100	0.05	802	265	16	0.1	1.0	95
S8	ULR	0.1	23,300	6	0.05	59	54	48,400	0.04	670	73	8	0.3	0.3	79
S1	MCR	0.1	21,700	5	0.10	92	61	39,100	0.04	667	75	7	0.3	0.4	77
S2	MCR	0.1	17,300	10	0.05	63	43	46,500	0.05	710	213	14	0.3	0.3	81
S3	MCR	0.1	22,500	12	0.05	115	60	52,200	0.05	982	240	15	0.3	0.4	104
S4	MCR	0.1	25,200	3	0.05	46	79	47,000	0.02	808	30	7	0.3	0.2	62
S5	MCR	0.1	19,600	1	0.05	26	34	29,500	0.01	334	32	4	0.3	0.2	45
S7	MCR	0.1	22,400	5	0.10	46	71	50,400	0.03	880	45	7	0.3	0.3	87
W02	MCR	0.3	23,900	6	0.45	100	80	44,000	0.05	754	89	35	0.1	0.5	149
W03	MCR	0.3	22,200	5	0.15	100	75	41,400	0.05	937	79	10	0.1	0.5	99
W04	MCR	0.7	16,200	22	0.30	78	76	30,900	0.08	1037	169	38	0.4	0.8	152
W22	MCR	0.2	20,900	9	0.10	101	61	46,250	0.05	894	297	20	0.1	1.0	108
W23	MCR	0.1	20,950	7	0.05	113	62	44,450	0.05	750	232	17	0.1	0.5	87
W29	MCR	0.3	24,500	20	0.20	92	133	48,000	0.15	792	91	22	0.6	1.5	134
W114	MCR	1.0	21,100	9	0.50	97	51	49,600	0.05	737	216	16	2.5	2.5	94
W115	MCR	1.0	30,100	7	0.50	158	86	63,600	0.05	852	309	14	2.5	6.0	130
S6	LLR	0.1	26,100	2	0.05	49	60	44,700	0.02	714	31	10	0.3	0.4	68
W31	LLR	0.8	17,000	13	0.40	50	76	34,500	0.05	1005	146	52	0.7	0.5	245
W33	LLR	0.1	16,600	8	0.05	30	38	36,900	0.05	459	41	13	0.1	0.5	90
W34	LLR	0.1	20,000	7	0.05	49	38	39,500	0.05	591	60	14	0.1	0.5	89
W35	LLR	0.1	14,200	6	0.05	34	34	35,800	0.05	449	58	12	0.1	0.5	84
W36	LLR	0.1	20,500	5	0.10	116	58	40,300	0.05	708	131	10	0.1	0.5	81

Site	Category	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
W38A	LLR	0.2	21,450	8	0.10	125	69	42,950	0.05	857	265	16	0.1	0.5	97
W50	LLR	0.1	18,100	8	0.05	36	35	37,900	0.05	524	44	15	0.1	0.5	88
W54	LLR	0.2	-	11	0.05	-	50	-	0.05	622	41	15	0.2	0.5	110
W60	LLR	0.1	16,600	7	0.05	48	35	38,900	0.05	569	64	12	0.1	0.5	85
W61	LLR	0.1	18,950	6	0.08	52	41	41,300	0.05	475	79	12	0.1	0.5	98
W63	LLR	0.1	20,400	6	0.05	66	44	41,400	0.05	558	91	11	0.1	0.5	87
W64	LLR	0.1	20,600	5	0.05	57	43	45,900	0.05	547	79	10	0.1	0.5	90
W65	LLR	0.1	20,900	7	0.10	60	39	47,400	0.05	744	76	13	0.1	0.5	86
W70	LLR	0.1	24,300	6	0.10	108	60	46,400	0.05	761	197	13	0.1	0.5	92
W71	LLR	0.1	19,900	8	0.10	136	72	43,250	0.05	836	261	16	0.1	0.5	100
W101	LLR	0.5	17,000	6	0.05	86	49	34,700	0.05	647	133	9	0.1	0.5	85
RORWB	ORWB	0.1	19,400	4	0.25	64	96	29,150	0.08	373	39	12	0.4	1.5	144
W26	ORWB	0.1	22,250	3	0.10	72	46	37,450	0.08	374	93	15	0.1	0.5	95
W62	ORWB	0.1	19,400	7	0.20	67	64	32,400	0.05	354	60	19	0.1	1.0	77
W100	ORWB	0.1	20,200	2	0.05	107	44	30,300	0.05	361	121	10	0.1	0.5	86
Guideline Value		1	-	20	1.5	80	65	-	0.15	-	21	50	2	-	200
SQG-High		4	-	70	10	370	270	-	1	-	52	220	25	-	410

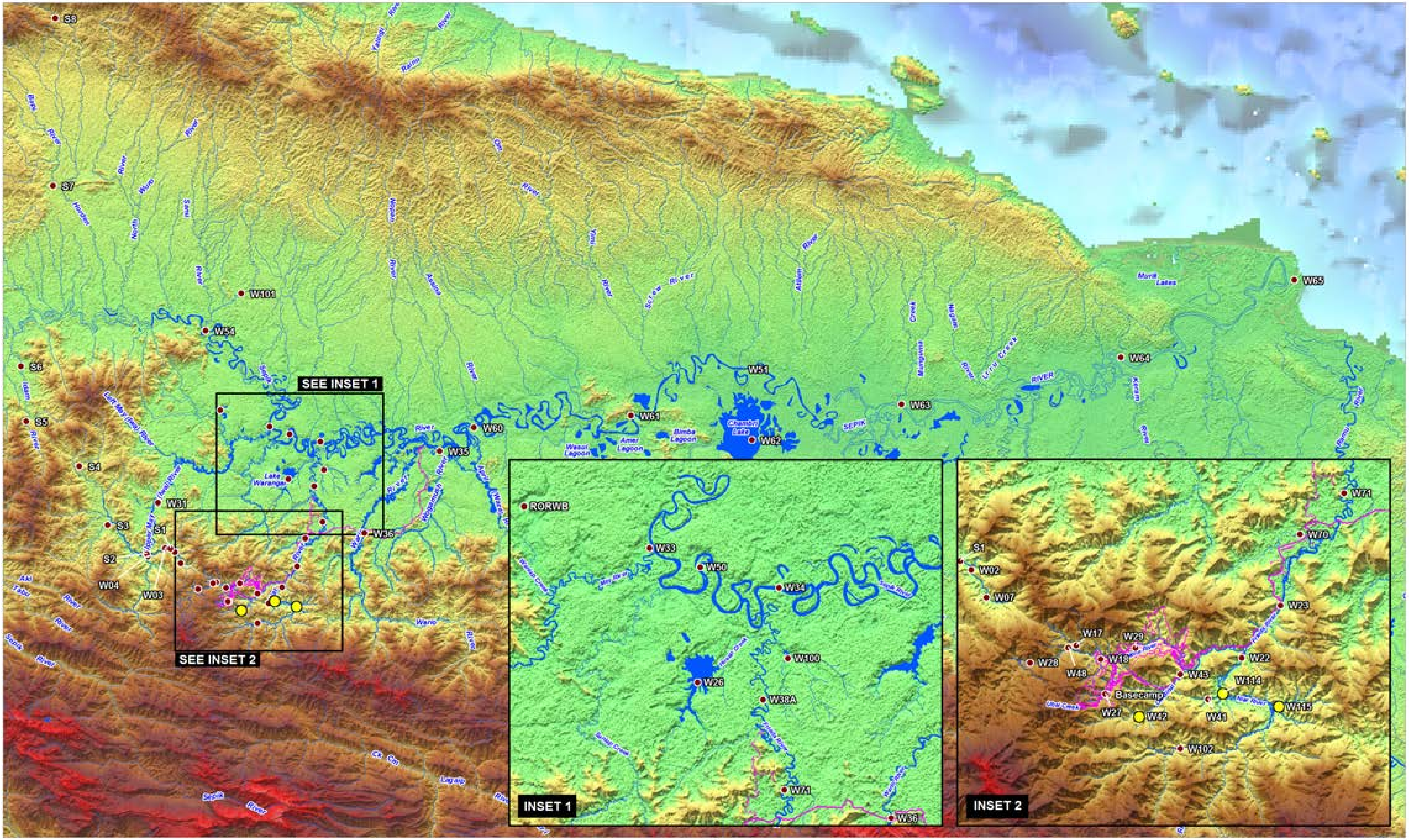
Note: Orange highlight indicates exceedance of the guideline value indicating ***possible*** ecotoxicological effects. Red highlight indicates exceedance of the SQG-High guideline value indicating ***higher probability*** of ecotoxicological effects

Table 4-10 Median metal concentrations in the <2,000 µm fraction (all in mg/kg)

Site	Category	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
Base C	ULC	0.2	13,400	6	0.3	23	190	37,600	0.05	721	18	15	0.1	1.0	128
W17	ULC	0.5	20,900	2	0.3	146	34	27,900	0.05	500	61	3	0.1	1.5	45
W27	ULC	0.1	5,325	15	0.1	12	146	34,300	0.05	148	4	13	0.4	6.0	21
W41	ULC	0.1	12,700	2	0.2	101	47	27,000	0.05	487	59	5	0.1	0.5	44
W42	ULC	0.1	17,100	17	0.6	67	56	35,400	0.05	664	74	22	0.1	0.5	133
W43	ULC	0.1	16,500	8	0.2	67	58	34,600	0.05	558	63	13	0.1	0.5	89
W48	ULC	0.1	10,350	17	0.1	19	40	30,450	0.25	341	9	8	0.8	2.5	38
W07	ULR	0.5	16,500	3	0.4	110	49	22,100	0.05	446	69	4	0.1	1.5	49
W18	ULR	0.1	12,650	20	0.1	82	55	32,300	0.08	517	185	8	0.7	0.5	57
W28	ULR	0.1	14,400	5	0.1	66	34	32,600	0.05	583	187	8	0.1	0.5	64
W102	ULR	0.1	15,000	6	0.1	169	35	42,550	0.05	868	355	9	0.1	0.5	67
S8	ULR	0.1	17,900	1	0.1	19	28	26,700	0.01	611	25	1	0.3	0.1	37
S1	MCR	0.1	15,800	4	0.1	74	44	31,800	0.02	472	53	5	0.3	0.2	56
S2	MCR	0.1	12,800	7	0.1	62	29	38,100	0.03	553	268	8	0.3	0.2	61
S3	MCR	0.1	14,100	6	0.1	125	26	35,400	0.03	512	142	6	0.3	0.2	63
S4	MCR	0.1	14,700	2	0.1	15	37	27,900	0.01	351	11	3	0.3	0.1	32
S5	MCR	0.1	9,500	1	0.1	15	14	17,600	0.01	138	15	2	0.3	0.1	20
S7	MCR	0.1	12,600	2	0.1	19	29	32,800	0.01	549	19	2	0.3	0.1	52
W02	MCR	0.1	17,900	5	0.5	80	54	30,400	0.05	699	62	7	0.1	0.5	64
W03	MCR	0.1	17,100	4	0.1	85	44	31,100	0.05	566	56	5	0.1	0.5	58
W04	MCR	0.5	16,600	8	0.4	91	34	29,500	0.05	698	192	12	0.1	1.5	69
W22	MCR	0.1	12,950	4	0.1	215	34	36,400	0.05	767	412	8	0.1	0.5	59
W23	MCR	0.1	17,200	6	0.1	131	48	37,200	0.05	747	294	11	0.1	0.5	77
W29	MCR	0.6	13,000	19	0.4	55	75	27,300	0.08	486	80	10	0.4	1.8	64
W114	MCR	1.0	19,400	8	0.5	176	45	48,900	0.05	814	396	12	2.5	2.5	88
W115	MCR	1.0	22,200	3	0.5	98	35	48,800	0.05	647	202	10	2.5	2.5	96
S6	LLR	0.1	9,280	1	0.1	16	14	15,600	0.01	190	10	2	0.3	0.1	23
W31	LLR	0.1	12,000	9	0.3	39	22	26,400	0.05	503	132	5	0.1	0.5	48
W33	LLR	0.1	11,600	4	0.1	24	9	29,150	0.05	369	42	8	0.1	0.5	58
W34	LLR	0.1	13,000	6	0.1	42	21	32,100	0.05	427	56	10	0.1	0.5	69
W35	LLR	0.1	12,000	3	0.1	36	14	29,400	0.05	292	57	8	0.1	0.5	60
W36	LLR	0.1	15,600	3	0.1	118	37	34,800	0.05	535	105	6	0.1	0.5	57

Site	Category	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
W38A	LLR	0.1	16,500	6	0.1	203	31	40,500	0.05	944	343	8	0.1	0.5	68
W50	LLR	0.1	12,800	4	0.1	30	10	30,200	0.05	369	42	9	0.1	0.5	62
W54	LLR	0.1	-	4	0.1	-	8	-	0.05	363	36	8	0.1	0.5	58
W60	LLR	0.1	13,100	3	0.1	48	18	34,700	0.05	515	78	7	0.1	0.5	56
W61	LLR	0.1	14,800	7	0.1	72	15	34,950	0.05	377	101	9	0.1	0.5	72
W63	LLR	0.1	15,800	4	0.1	64	16	34,400	0.05	360	96	7	0.1	0.5	57
W64	LLR	0.1	16,300	3	0.1	58	20	33,100	0.05	386	86	7	0.1	0.5	61
W65	LLR	0.1	16,200	6	0.1	57	34	33,400	0.05	731	81	8	0.1	0.5	66
W70	LLR	0.1	17,000	5	0.1	193	32	38,000	0.05	728	310	8	0.1	0.5	69
W71	LLR	0.1	15,950	5	0.1	239	33	37,700	0.05	853	399	7	0.1	0.5	62
W101	LLR	0.1	8,330	3	0.1	68	14	20,400	0.05	351	112	3	0.1	0.5	39
RORWB	ORWB	0.1	8,750	2	0.1	28	134	19,000	0.10	178	15	9	0.1	0.5	38
W26	ORWB	0.1	14,150	5	0.2	69	57	27,050	0.10	542	116	17	0.1	0.5	66
W62	ORWB	0.1	14,200	8	0.1	67	57	33,100	0.10	429	79	18	0.1	1.0	69
W100	ORWB	0.1	18,800	2	0.1	119	59	24,750	0.05	336	117	11	0.1	1.0	63
Guideline Value		1	-	20	1.5	80	65	-	0.15	-	21	50	2	-	200
SQG-High		4	-	70	10	370	270	-	1	-	52	220	25	-	410

Note: Orange highlight indicates exceedance of the guideline value indicating ***possible*** ecotoxicological effects. Red highlight indicates exceedance of the SQG-High guideline value indicating ***higher probability*** of ecotoxicological effects



LEGEND

Major Waterways

Mine Infrastructure

Silver (mg/kg)

- > 4 (SGV-high)
- 1 - 4
- < 1 (Guideline Value)

Title:

Map of Median Silver (<63 µm) Concentrations within Study Area

Figure: 4-29

Rev: A

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Scale - Insets: 0 10 20km

Scale - Main Map: 0 25 50km

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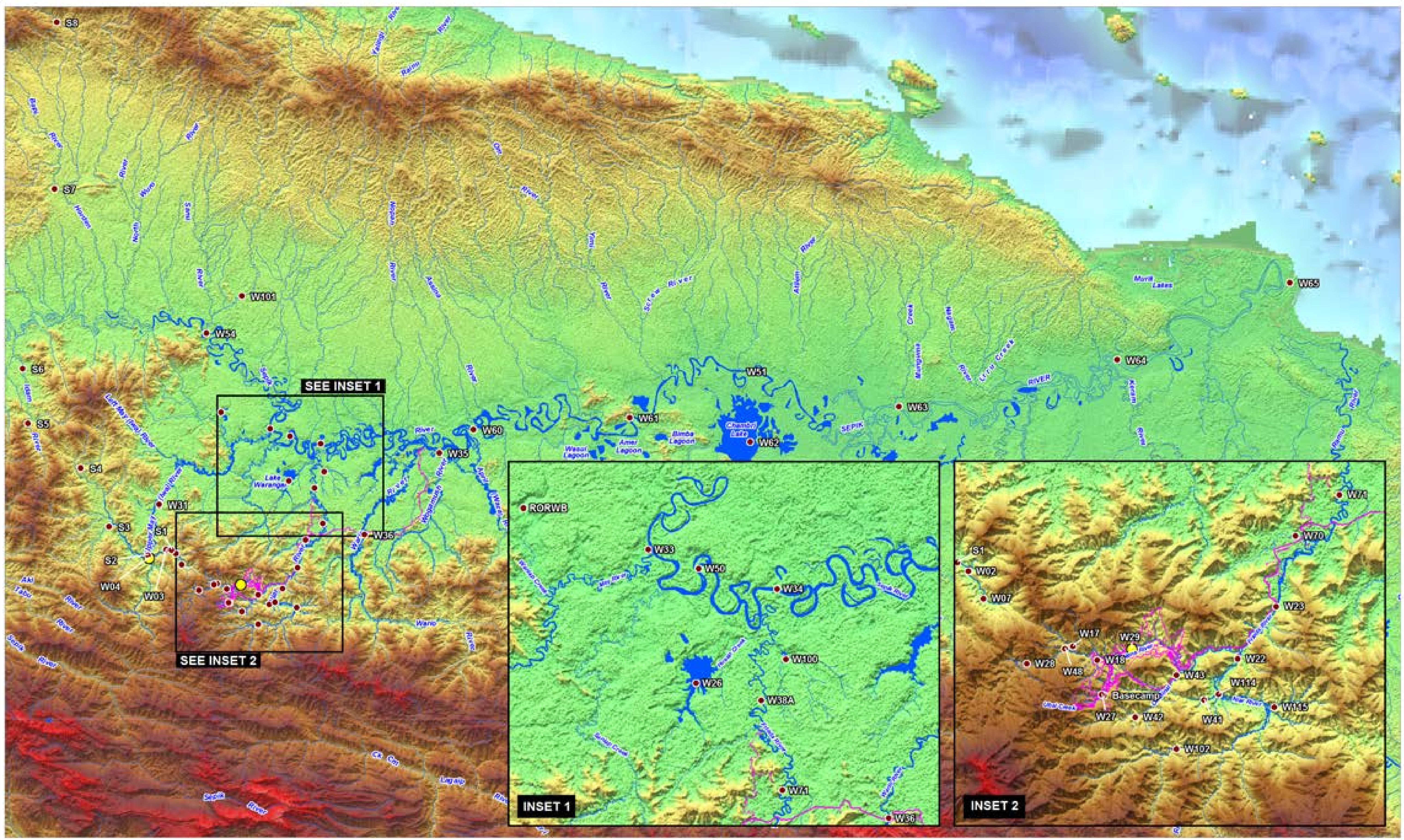

LEGEND

Major Waterways

Mine Infrastructure

Arsenic (mg/kg)

- > 70 (SGV-high)
- 20 - 70
- < 20 (Guideline Value)

Title:

Map of Median Arsenic (<63 µm) Concentrations within Study Area

Figure: 4-30

Rev: A

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Scale - Main Map

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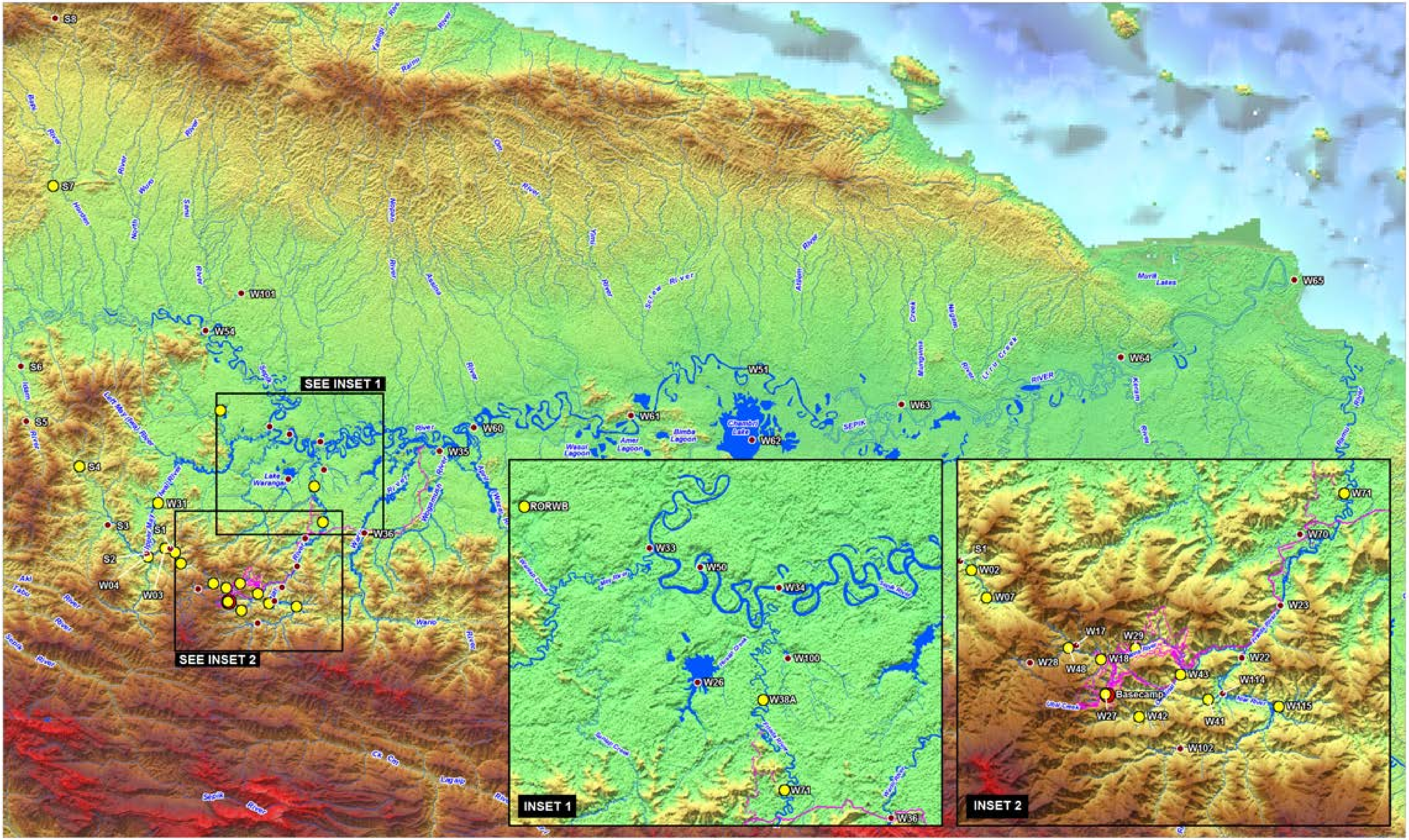

LEGEND

Major Waterways

Mine Infrastructure

Copper (mg/kg)

- > 270 (SGV-high)
- 65 - 270
- < 65 (Guideline Value)

Title:

Map of Median Copper (<63 µm) Concentrations within Study Area

Figure: 4-31

Rev: A

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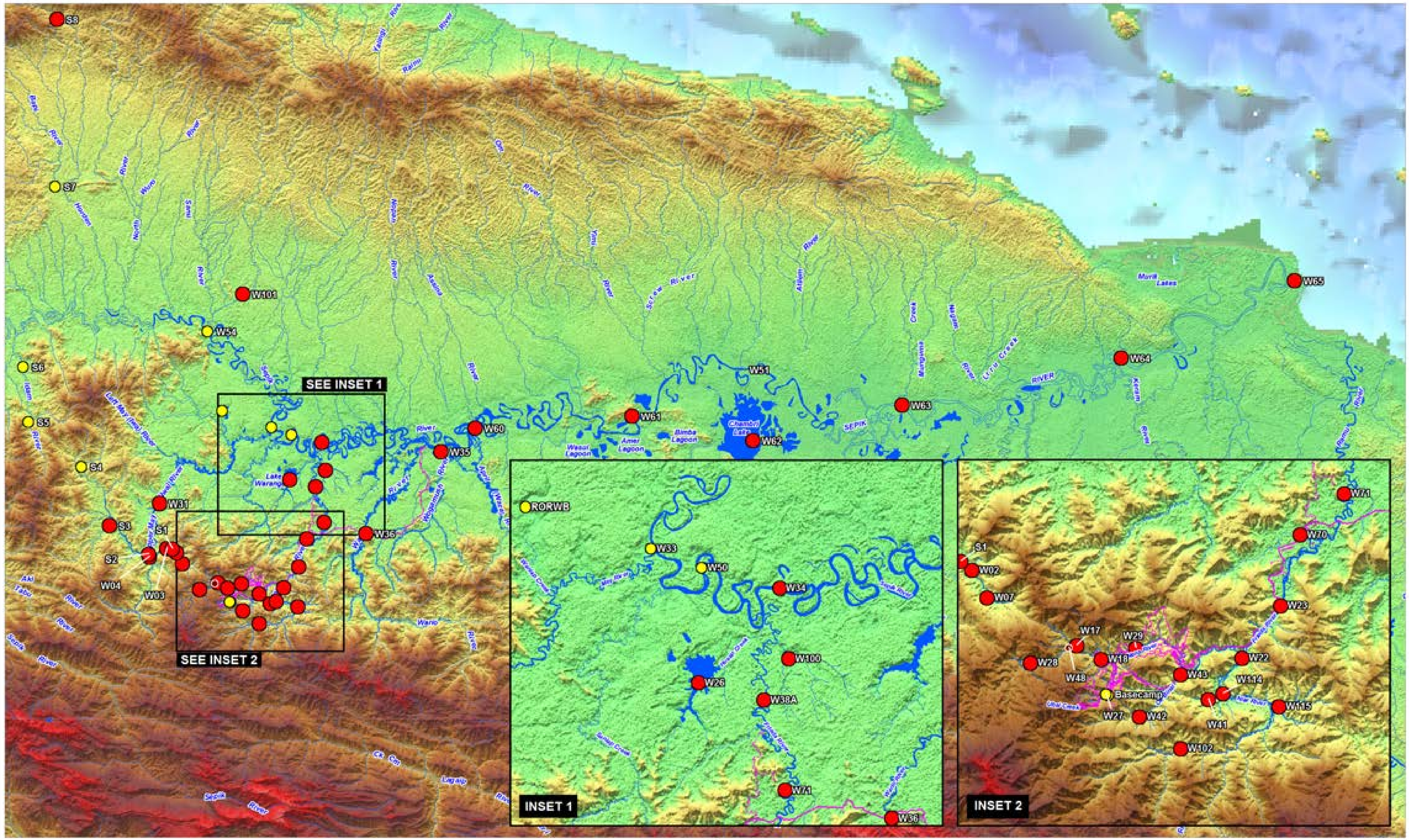

LEGEND

Major Waterways

Mine Infrastructure

Nickel (mg/kg)

- > 52 (SGV-high)
- 21 - 52
- < 21 (Guideline Value)

Title:

Map of Median Nickel (<63 µm) Concentrations within Study Area

Figure: **4-32**

Rev: **A**

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Scale - Main Map

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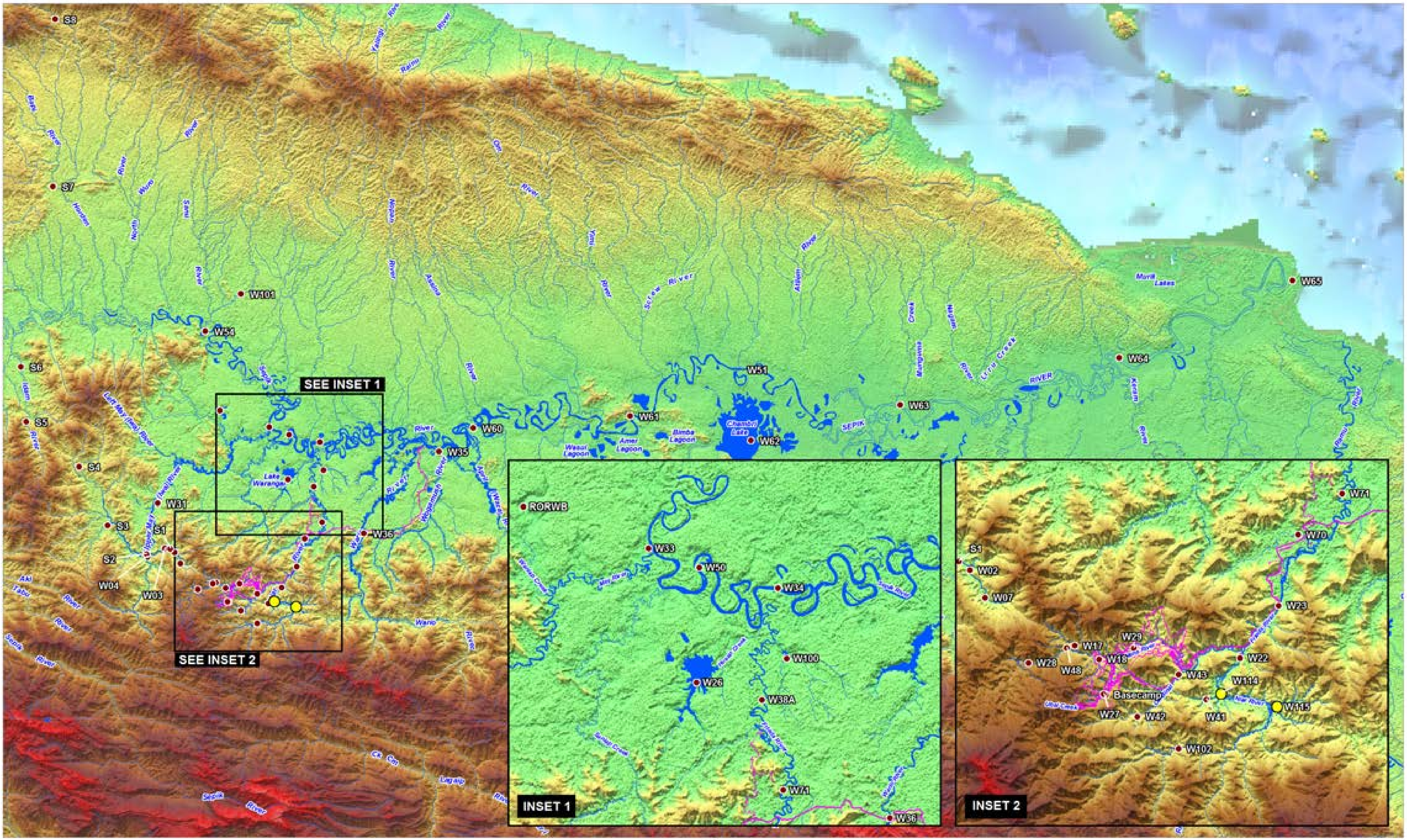

LEGEND

Major Waterways

Mine Infrastructure

Antimony (mg/kg)

- > 25 (SGV-high)
- 2 - 25
- < 2 (Guideline Value)

Title:

Map of Median Antimony (<63 µm) Concentrations within Study Area

Figure: **4-33**

Rev: **A**

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Scale - Insets

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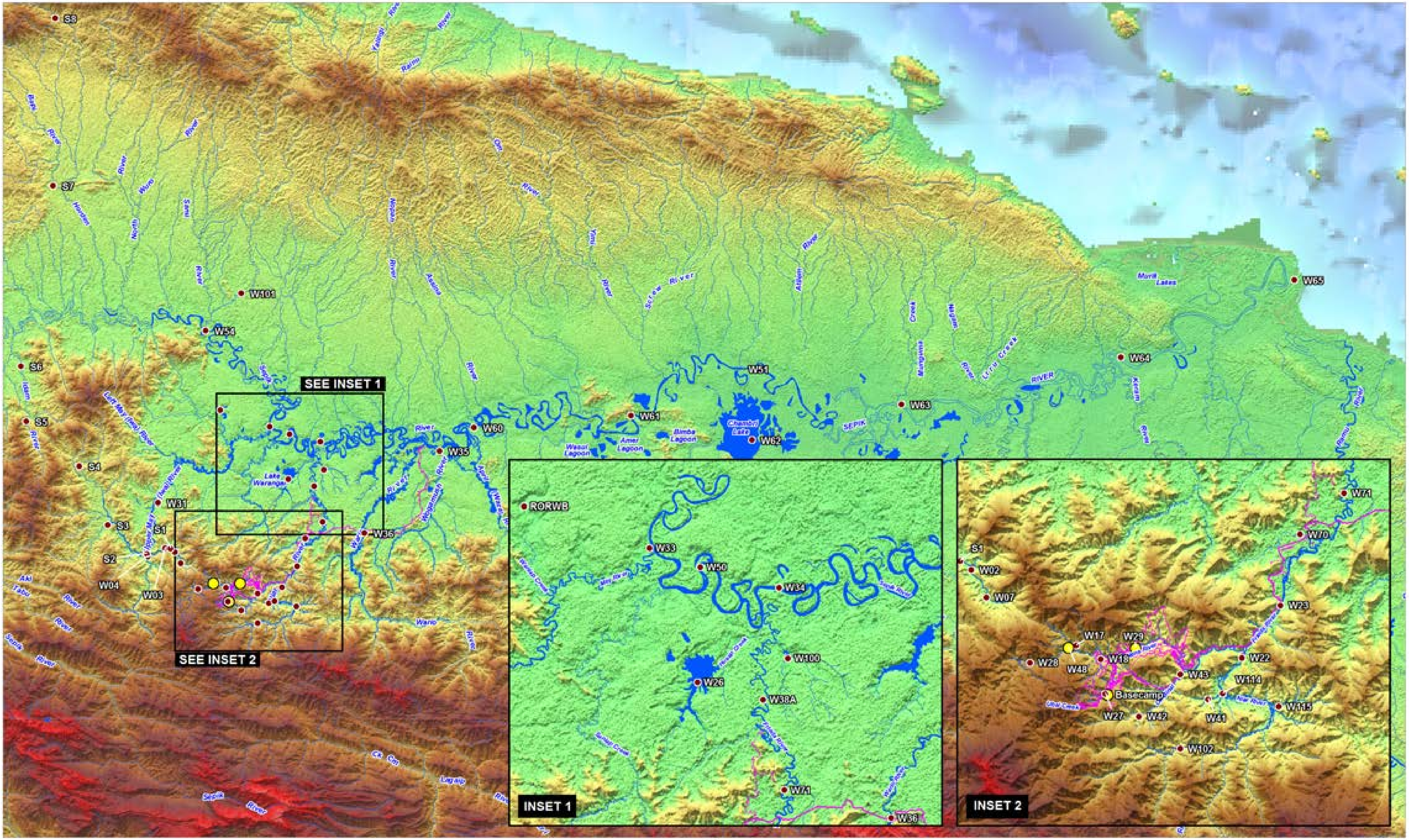

LEGEND

- Major Waterways
- Mine Infrastructure

Mercury (mg/kg)

- > 1.00 (SGV-high)
- 0.15 - 1.00
- < 0.15 (Guideline Value)

Title:

Map of Median Mercury (<63 µm) Concentrations within Study Area

Figure: **4-34**

Rev: **A**

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Scale - Main Map: 0 — 25 — 50km

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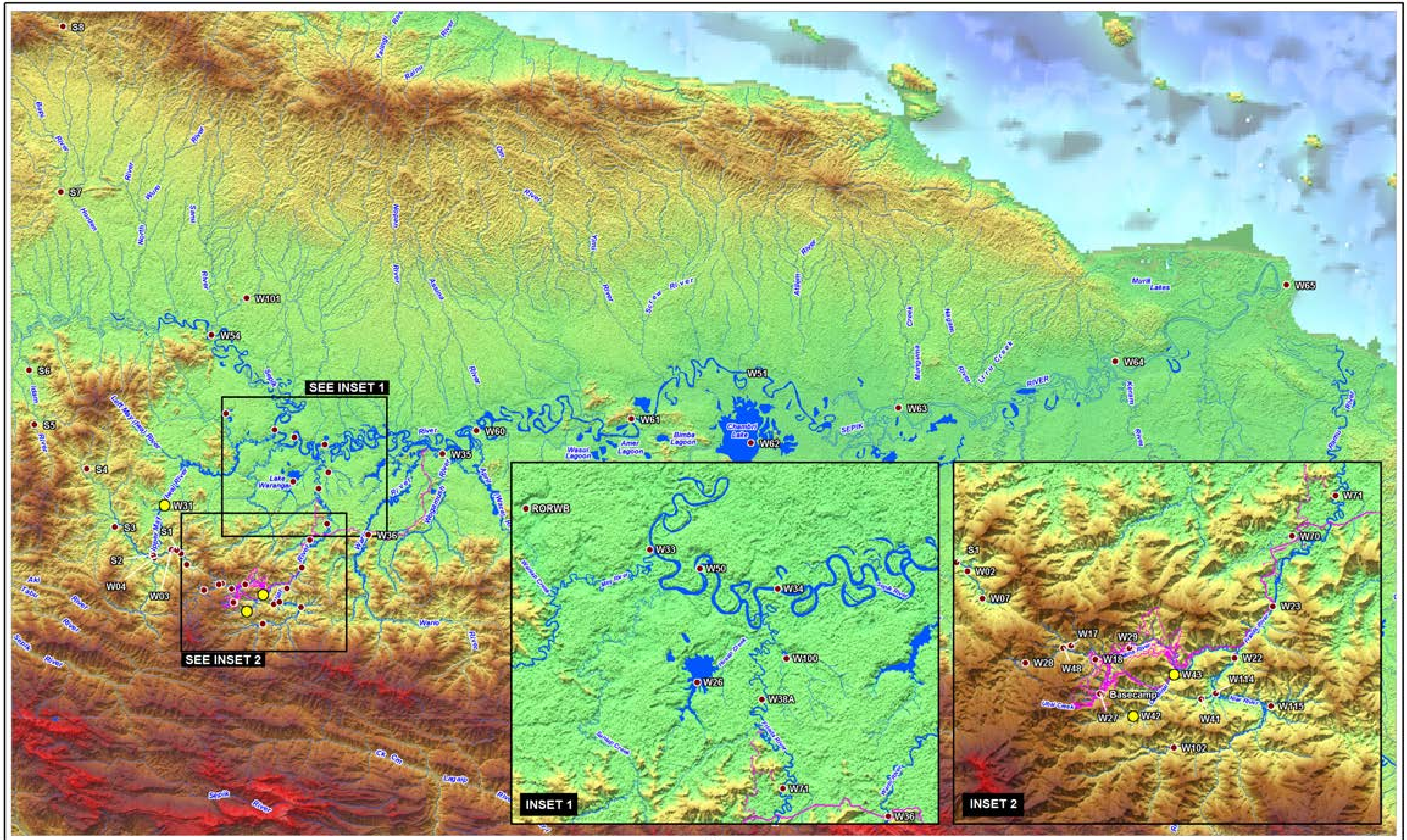

LEGEND

Major Waterways

Mine Infrastructure

Zinc (mg/kg)

- > 410 (SGV-high)
- 200 - 410
- < 200 (Guideline Value)

Title:

Map of Median Zinc (<63 µm) Concentrations within Study Area

Figure: **4-35**

Rev: **A**

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Scale - Main Map

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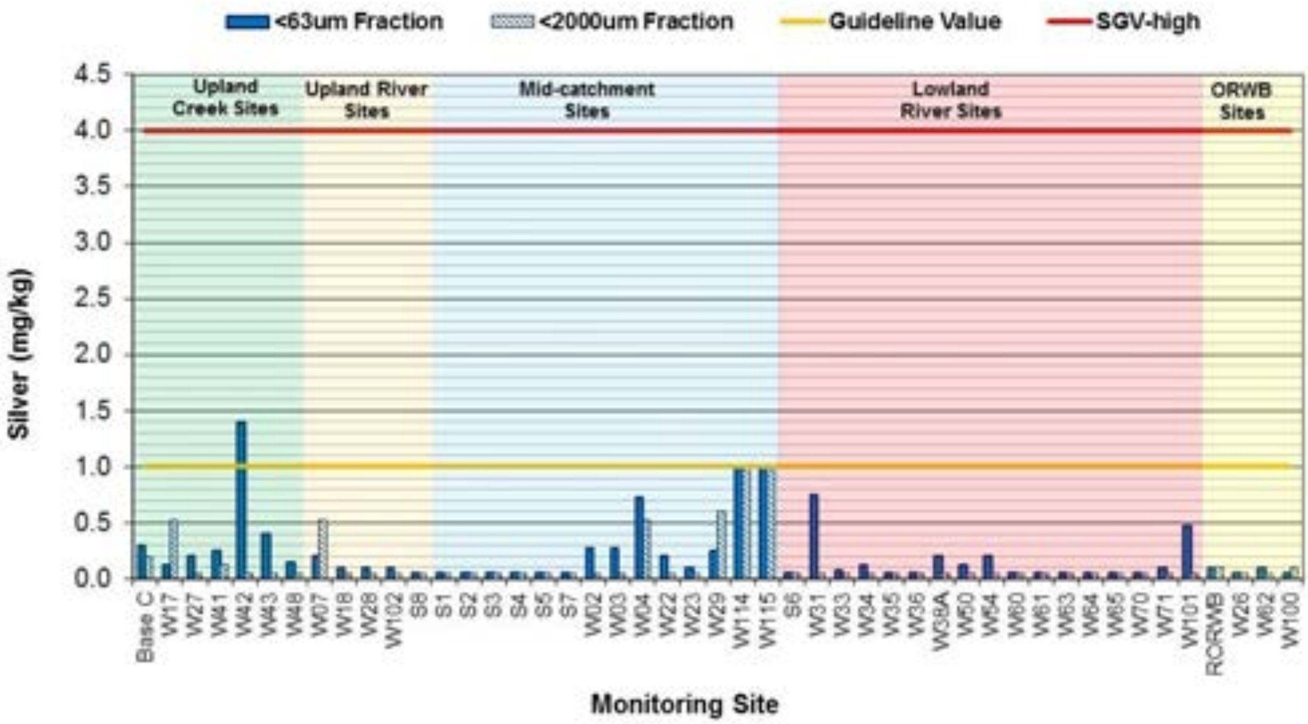

Figure 4-36 Median silver concentrations in sediment

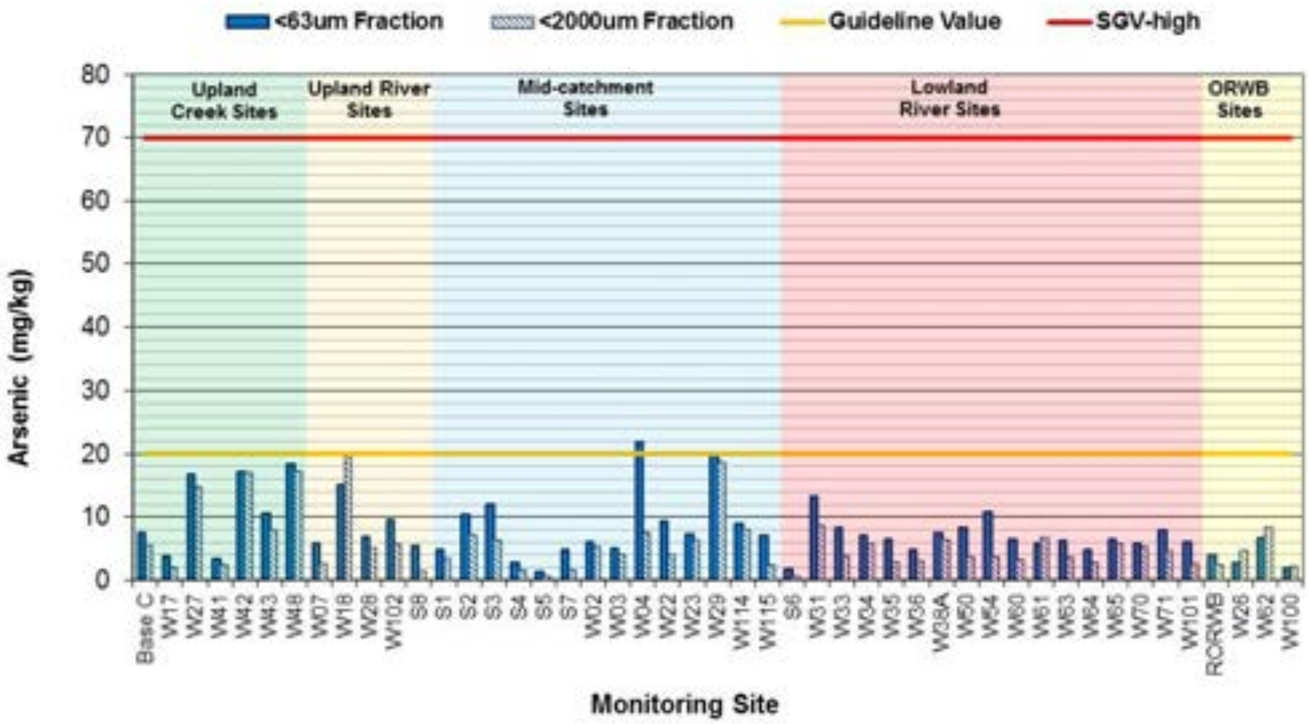

Figure 4-37 Median arsenic concentrations in sediment

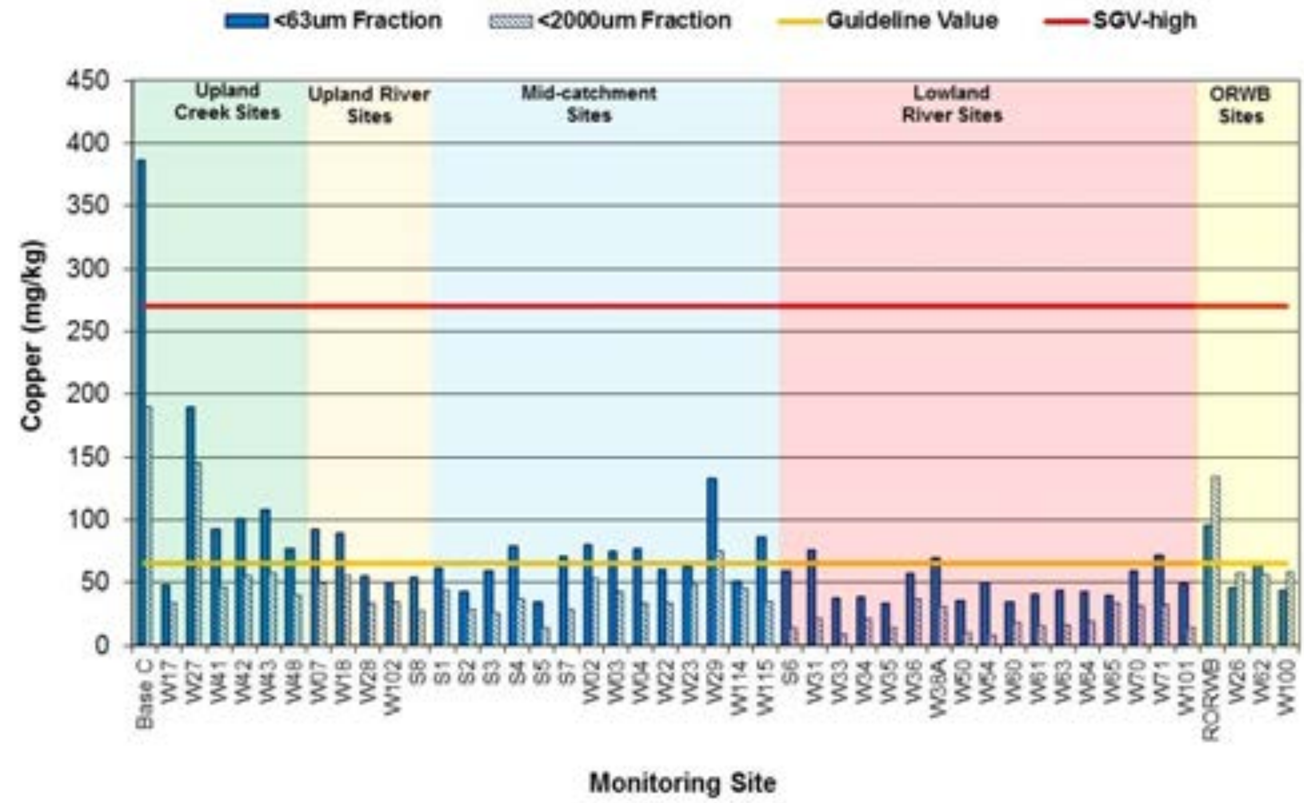

Figure 4-38 Median copper concentrations in sediment

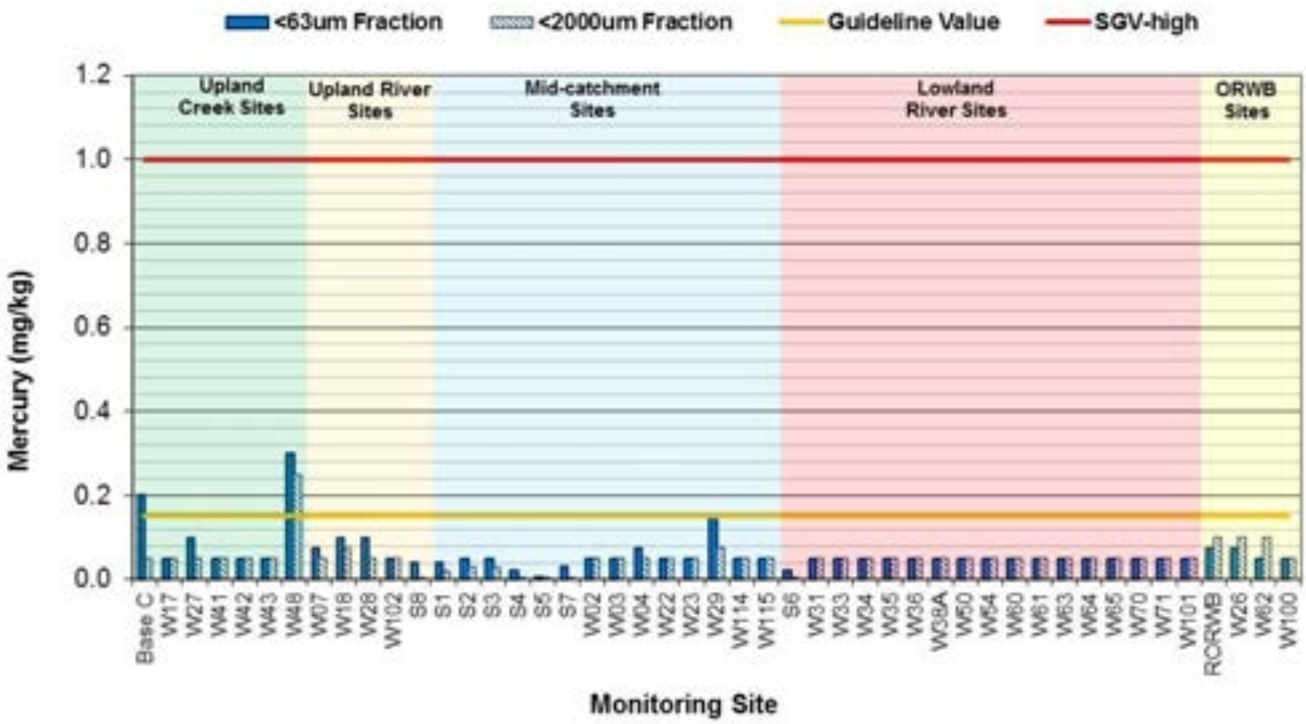

Figure 4-39 Median mercury concentrations in sediment

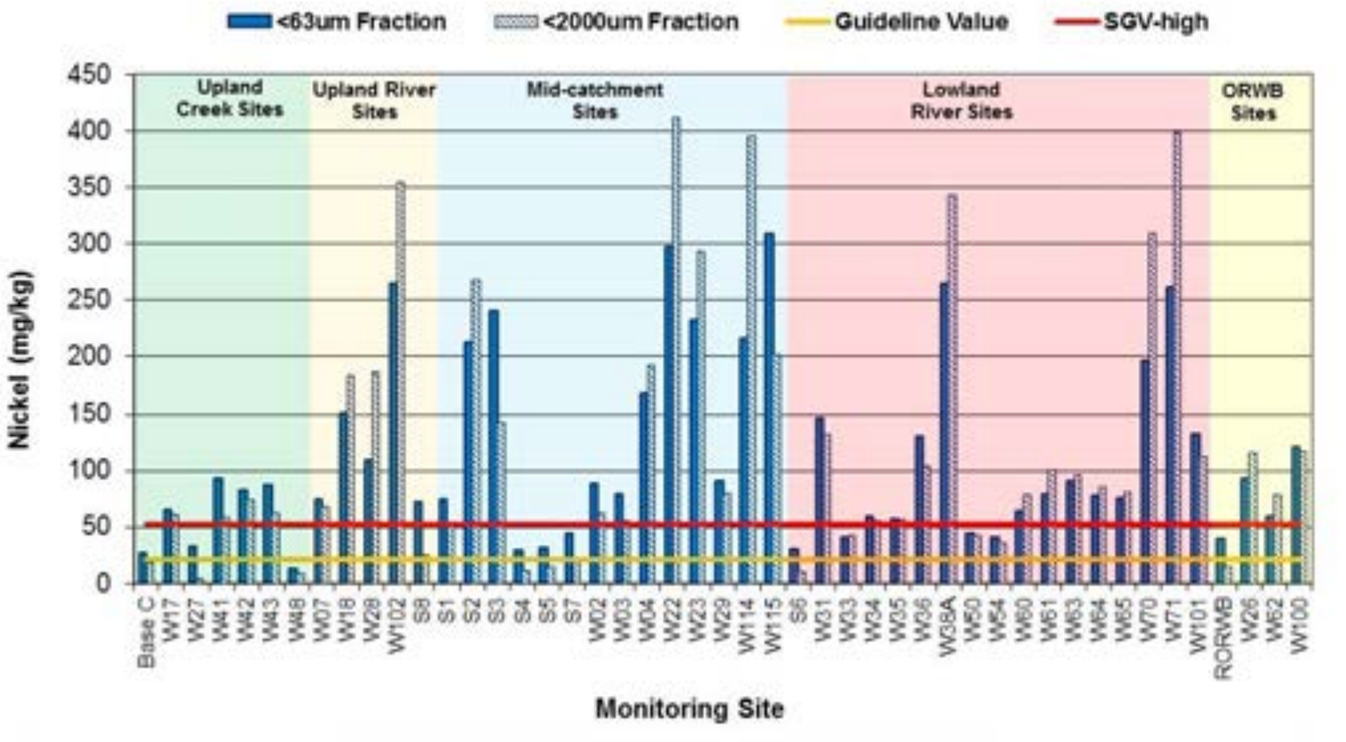

Figure 4-40 Median nickel concentrations in sediment

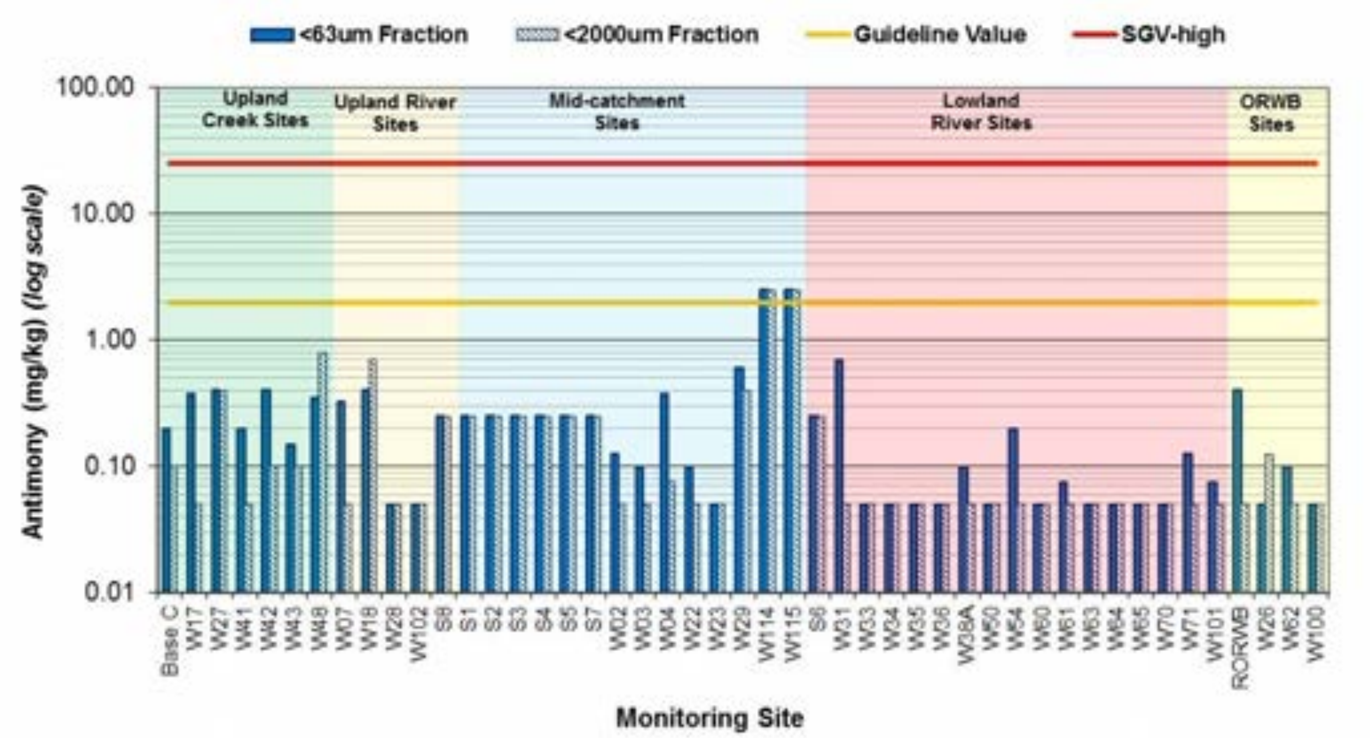

Figure 4-41 Median antimony concentrations in sediment

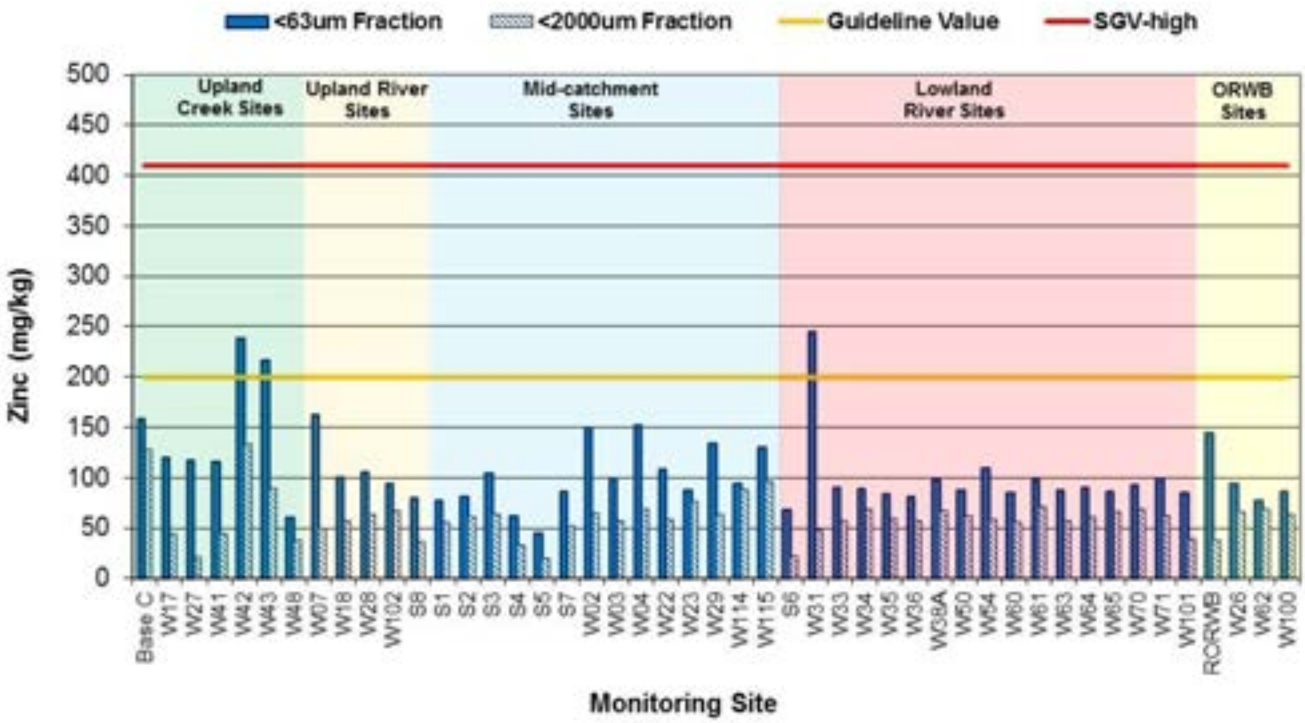

Figure 4-42 Median zinc concentrations in sediment

Median concentrations of copper and nickel exceeded the SQG-high value of 270 mg/kg and 52 mg/kg respectively at some sites. Such concentrations could have ecotoxicological effects to some fauna. These exceedances were mainly due to high values recorded at site W65 during the June 2011 monitoring event and at site W27 during the December 2012 monitoring event. This highlights the variability between years throughout the monitoring period which may be attributable to seasonal and inter-annual fluctuations in sediment metal loads due to the occurrence of natural stochastic events such as landslides within the catchment area of some creeks and rivers, and weathering of soils rich in metals/metalloids, especially in the vicinity of the Frieda ore deposit.

Spatially, there appears to be a concentration of high sediment metal/metalloid loads at sites in the upland creeks and rivers, ORWBs (which often form depositional environments which allow the collection of fine sediments) and at some sites in the Sepik River. This is despite a trend for lower proportions of fines in the upland creeks and rivers (Figure 4-27). Relatively high concentrations of metals/metalloids in the whole sediment fractions (<2,000 µm) were also observed, especially for nickel but also chromium and copper, and to a lesser extent mercury and antimony.

Most sites had nickel concentrations which exceeded the SQG-high guideline value. However, as dissolved nickel was mostly only detected in water samples in very low concentrations, this indicates that the nickel present in sediment is most likely in a non-bioavailable form, which is not readily able to be taken up by aquatic organisms.

Elevated concentrations of silver, mercury, nickel and zinc, as well as substantial concentrations of arsenic and chromium were recorded in fine sediments from the mouth of the Sepik River (W65) on isolated occasions and primarily during monitoring conducted in 2011 (BMT WBM 2012). This may be indicative of a deposition zone, where trace metals/metalloids carried from exposed or shallowcovered ore bodies in the upper catchment are accumulating. However, results from 2012 monitoring indicate that nickel was the only metal recorded in concentrations above guideline values at this location in this year. This may indicate a localised contamination issue at the river mouth which impacted on sampling during the 2011 sampling campaign.

Of note are the sediment quality results at Site W27. Significantly elevated levels of a number of metals/metalloids (As, Hg, Cd, Pb, Sb, Se and Zn) were recorded in sediment in the silt and clay fraction in December 2012 (BMT WBM 2013a) at this site. While these metals/metalloids have been recorded in sediment at W27 previously, they have not been recorded at such elevated levels (BMT WBM 2013a). This suggests that land disturbance prior to the December 2012 sampling event may have occurred in the upstream catchment.

In March 2012, the presence of artisanal mining was observed in the Ok Binai catchment, with evidence of several small-scale dredge operations upstream of Site W43. Throughout the remaining field trips in 2012, these activities were observed to be continuing. However, no anomalous results which could be attributed to these artisanal mining practices were recorded at Site W43 on the Lower Ok Binai.

4.2.3 Nutrients

Hydrobiology analysed sediment nutrients (total nitrogen, total phosphorus, TKN and oxidised nitrogen) during one monitoring event which was conducted in April 2010 (Hydrobiology 2010d). Sediments in the Study Area were found to be low in organic and total carbon and reasonably homogenous in terms of nutrient content (Hydrobiology 2015). Exceptions included:

- Lower nitrogen levels and higher phosphorus levels at Site W29 relative to other sites (Figure 4-43).
- Higher nitrate and nitrite concentrations at Site W43 (Figure 4-44).

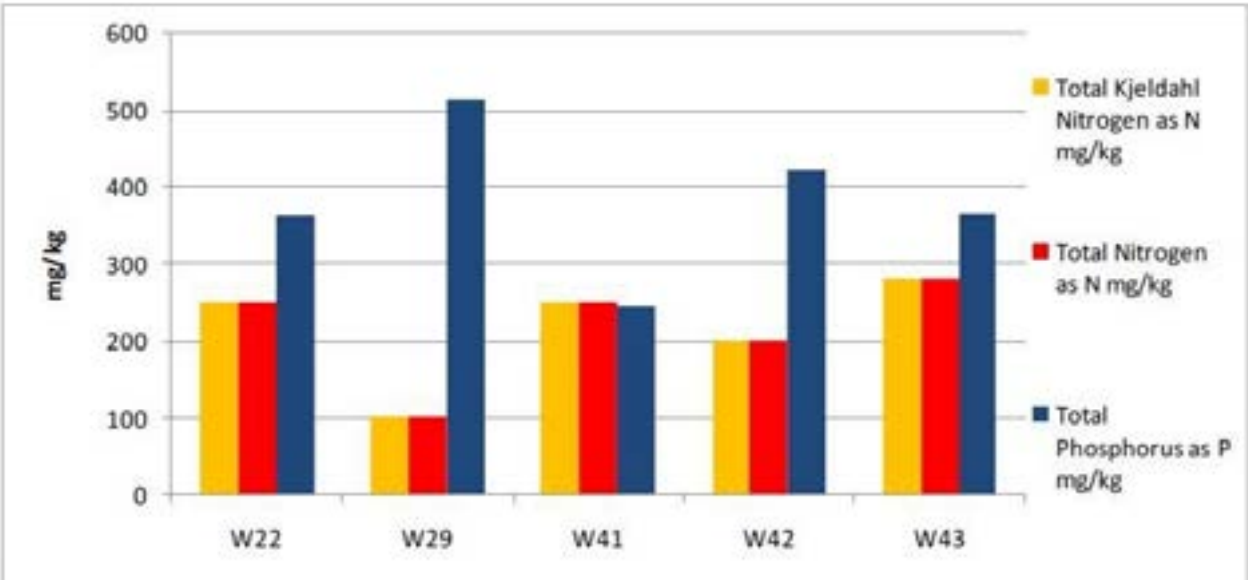

Figure 4-43 Sediment nutrient concentrations for selected sites – April 2010 (Hydrobiology 2015)

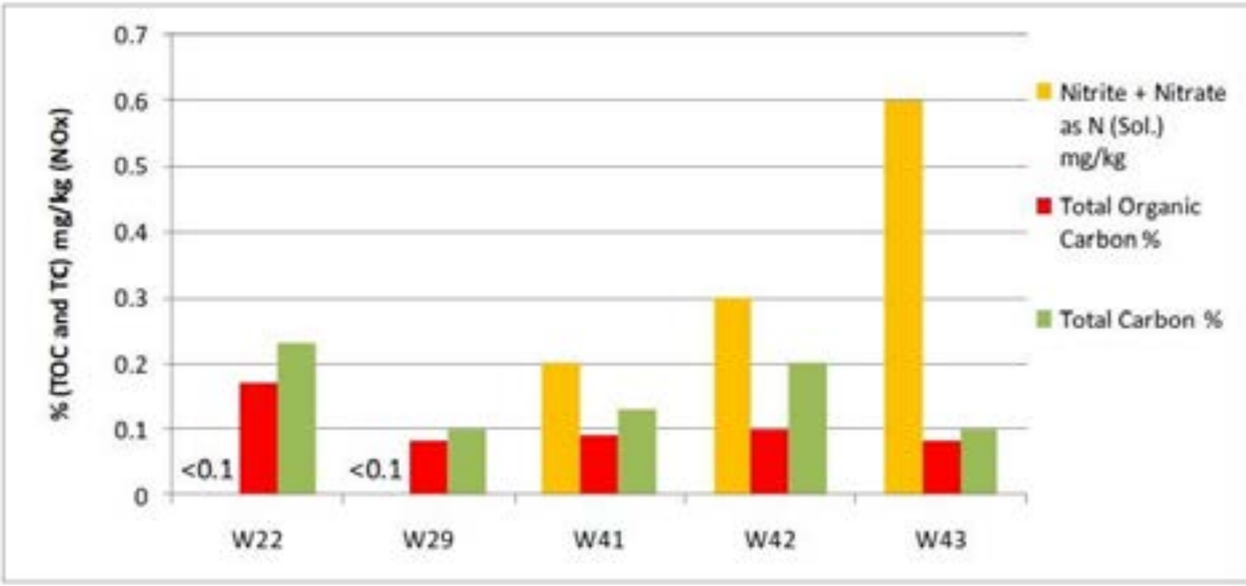

Figure 4-44 Sediment nitrate +nitrite and organic carbon concentrations for selected sites – April 2010 (Hydrobiology 2015)

5 Existing Environment – Aquatic Biology

5.1 Biogeographic Overview

Abell *et al*. (2008) developed a global bioregionalisation scheme for freshwater systems, which for PNG is mainly based on the classification scheme of Polhemus *et al*. (2004). Figure 5-1 shows the ecoregions and areas defined by Abell *et al*. (2008). The Study Area falls within one ecoregion of Abell *et al*. (2008): New Guinea North Coast (Ecoregion 813). This ecoregion encompasses the northern part of New Guinea from the Schouten Islands in the west to the Huon Peninsula in the east (Figure 5-1). This ecoregion contains some of the largest rivers in the island of New Guinea, including the Mamberamo, Sepik, Ramu, and Markham.

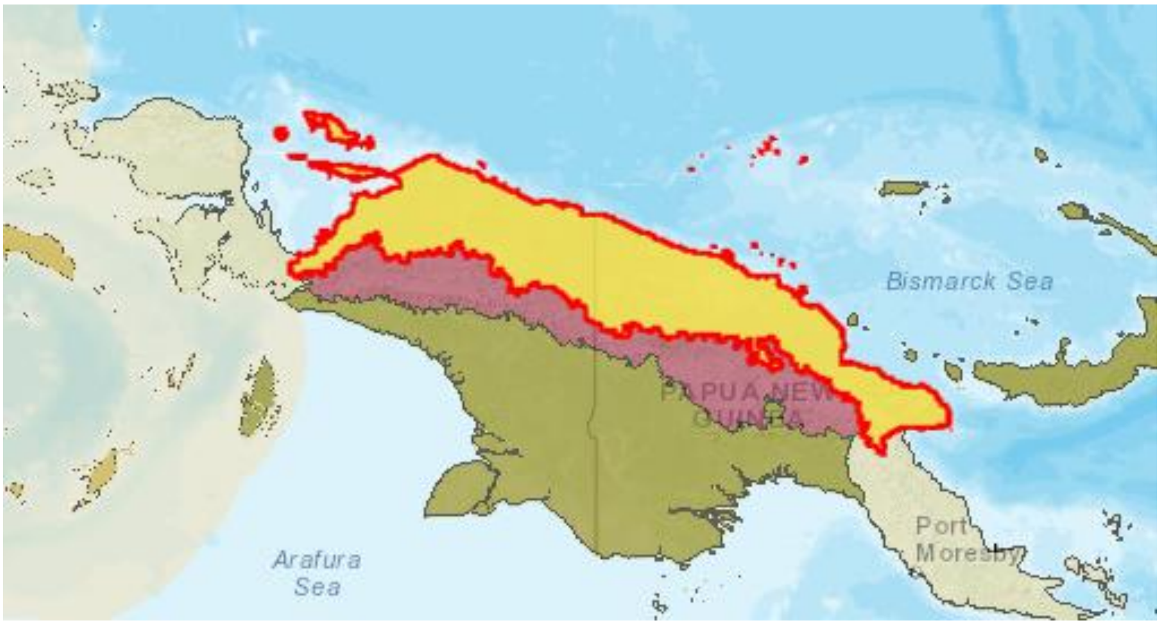

Figure 5-1 New Guinea North Coast Ecoregion 813, which is encompassed within the red line (Source: Abell *et al*. 2008)

The North Coast Ecoregion has an impoverished fish fauna compared to ecoregions in New Guinea. Allen (1991) suggests that the fish fauna of the ecoregion was derived from the older southern fauna, and evolved from ancestral species that were isolated by uplifting 5-6 million years before present. In terms of fish fauna, the mountain barrier that separates the south from the north is nearly absolute, although a few species are common to both areas (Allen 1991). There are also gradients in fish communities with elevation within the bioregion (i.e. lower richness in headwaters), which reflect processes over geological time-scales (glaciation, volcanism) and contemporary environmental gradients (elevation, rainfall, temperature).

This ecoregion has a moderate degree of freshwater endemism, particularly in fish fauna (Allen 1991; Polhemus *et al.* 2004). The ecoregion contains 50 species of fish that are restricted to the ecoregion, which nearly half of these species belonging to the rainbowfish family Melanotaeniidae. The ecoregion is distinguished by two rainbowfish genera: *Glossolepis* (restricted to the ecoregion) and the near-endemic *Chilatherina.* Fish species of conservation significance within the Sepik River catchment are listed in Table 5-11. Polhemus *et al.* (2004) found that several endemic aquatic invertebrate species are restricted to ecoregion, with a species of Gerridae water strider (*Ciliometra sepik*) restricted to the lowland of the Sepik-Ramu-Markham Basin (see Section 5.3.3). Endemic aquatic reptiles restricted to the bioregion are also present (see Section 5.5).

5.2 Aquatic Habitat Assessment

5.2.1 Aquatic Habitat

Hydrobiology (2010b) categorised sites into four aquatic ecosystem types: Upland Creek (ULC), Upland River (ULR), Mid-catchment River (MCR) and Lowland River (LLR). The assessment did not include ORWB sites. A summary of the key habitat characteristics of the four aquatic ecosystem types is presented in Table 5-1.

Aquatic habitats were considered to be in relatively undisturbed condition and largely intact. Few existing exploration-related impacts to aquatic habitats in the mine site area were detected. Ekwai Creek site (W27) had slightly elevated levels of sedimentation, possibly due to upstream drilling activities as suggested by Hydrobiology (2010).

BMT WBM (2012, 2013a, 2013b) characterised aquatic habitat conditions using aquatic ecosystem types similar to Hydrobiology (see above - lowland rivers, mid-catchment rivers, upland rivers, upland creeks), with the addition of ORWBs (Table 5-2). No major changes in habitat conditions were observed across the survey episodes. However, there were distinct differences in key characteristics between aquatic ecosystem types, as described below.

Upland rivers/creeks

Upland river systems had a high gradient, moderate to high flows and clear, well oxygenated waters. These sites occur in confined channels with no floodplain areas and due to their high energy typically do not accumulate areas of deposition. Upland rivers/creeks had high vegetation cover mostly comprised of trees (Figure 5-2), whereas lowland river sites showed lower overall percentage cover and a mixture of life forms (trees, shrubs, grasses). Channel habitat diversity was higher at upland river sites than lowland river sites. In this regard, upland rivers/creeks contained small areas of runs and backwaters, but riffles, glides, cascades and rapids were the main meso-habitat features. Lowland rivers consisted almost entirely of slow-flowing runs, pools and backwaters. This variation in habitat conditions reflects differences in geomorphology and river gradient and flow volumes; compared to lowland rivers the upland rivers were shallower, faster flowing, and had steeper gradients.

Upland river substrate was a mix of substrate types including boulder, cobble, pebble, gravel, sand and fines (silts and clays). While most sites included a variety of substrate types, boulder and cobble was the predominant upland river substrate type, comprising around 80% of substrate area at most upland sites.

Due to high flows and unstable substrates, aquatic macrophytes were largely absent from these upland river sites. Wetted widths were responsive to water levels, with an increase in the April 2013 survey due to higher levels. Undercut banks were uncommon across most sites in the upland rivers/creeks and did not vary between survey episodes. A moderate cover of periphytic algae was observed in several of the surveys.

Figure 5-2 Typical features of the upland river/ creek aquatic ecosystem type, showing clear water, large boulders and tree dominated riparian coverage (BMT WBM, 2013b).

Table 5-1 Key physical aquatic habitat characteristics (Hydrobiology 2010b)

Aquatic Ecosystem Type	Sites	Key physical characteristics
Upland Creek	W28 W17 W27 W43B W48	• High-gradient, predominantly clear-water creek. • Densely forested riparian zone, high degree of creek shading by canopy. • Predominantly boulder-cobble substrate with diverse flow type: riffle, run, pool, cascades/waterfalls. • Some wider upland creeks with less riparian shading and fast-flowing, shallow riffle-run habitats.
Upland River	W07	• High-gradient, predominantly clear-water river. • Wider and often faster flowing than upland creek. • Densely forested riparian zone, creek shading by canopy only close to banks. • Predominantly large boulder-cobble substrate with diverse flow type: riffle-run, pool, small rapids, cascades/waterfalls. • Some slower-flowing bends with gravel bars.
Mid-catchment River	W03 W04 W23 W29B	• Wide, shallow, braided river, episodically fast flowing, with predominantly cobble-gravel substrate. • Predominantly clear water, but some reaches turbid and episodic periods of turbid water in all reaches. • Exposed gravel/sand bars on bends. • Riparian vegetation cover only shading riverbanks. • Predominantly shallow riffle-run habitat with some deep backwater pools.
Lowland River	W31B W33 W35 W36 W54B	• Very wide, turbid river. • Predominantly sand-mud substrate and exposed bars present with some deep back water pools. • Intact rainforest riparian vegetation. • In-stream woody debris typically present.

Note: Sites in Frieda River catchment (upper Project disturbance area) are highlighted in red.

W28 – Upper Nena River, W17 – Ok Oma, W27 – Ekwai Creek – upstream Ubai Creek Junction, W43B – Lower Ok Binai, W48 –Simbale Creek at Nena, W23 – Frieda Airstrip and W29B – Lower Nena

Table 5-2 Aquatic ecosystem types within the present study and their key physical characteristics in 2011-2013 (BMT WBM 2012, 2013a, 2013b and 2017)

Aquatic Ecosystem Type	Sites	Key physical characteristics
Off-river water bodies (ORWB)	RORWB W100 W26 W62	• Native wetland and grassland vegetation • Flat banks • High riparian vegetation coverage, mostly trees <10 m height • Substrate material comprised mostly of fine particles (clays, silts, organic matter) • Lake dimensions (size and depth) vary according to season and flow levels • Low riparian shading • Mostly nil or slight trailing vegetation • Moderate macrophyte coverage • Low water clarity • Anaerobic/ anoxic odours
Lowland rivers (LLR)	W70, W71 W38a, W33 W50, W34 W35, W60 W61, W63, W64, W22, W23, W36, W65, S6	• Mix of vegetation and land use types (cleared/ native forest) • Broad or shallow valley, or floodplain • Flat -moderately sloped banks • Riparian zone comprised of trees, shrubs and grasses. Grasses typically dominant cover category at most sites. • Substrates dominated by clays, silts and fine grain sand. • Wetted channel width of 10s to 100's of metres, depths > 5 metres • Very low riparian shading • Mostly nil or slight trailing vegetation • Turbid water clarity
Mid-Catchment Rivers (MCR)	W23, S1, S2, S3, S4, S5, S7	• Substrate comprising of a matrix of sands, gravel and cobbles; • Moderate gradient; • Variable turbidity • 10's to 100's of metres wide, depths <5 metres; • Lotic / run, riffle, pool and rapid habitat; • Very low riparian shading • Vegetated and non-vegetated sand and point bars • Steep to board valleys, with semi-confirmed channel with areas of floodplain.
Upland Rivers (ULR)	W18, W28, S8	• substrate predominately gravel, cobbles and boulders intermixed with coarse sands; • high gradient • low turbidity and high dissolved oxygen • 10's of metres wide, depths <5 metres; • Lotic / run, riffle, rapid, cascade, waterfall and pool habitat • Low riparian shading • Steep valley and river channel confined with no floodplain areas.
Upland Creeks (ULC)	Base Camp W27 W48, W102, W41, W43	• substrate predominately gravel, cobbles and boulders intermixed with coarse sands; • high gradient • low turbidity and high dissolved oxygen • 10's of metres wide, depths <2 metres • Lotic / run, riffle, rapid, cascade, waterfall and pool habitat • Variable riparian shading (low to high dependant of riparian zone) • Steep valley and river channel confined with no floodplain areas.

Mid-catchment rivers

Habitat conditions were similar to that found upland river sites, however the mid-catchment rivers typically had a lower gradient than upland rivers. Channels were either confined to partially confined with floodplains and areas of deposition occurring around confluences and bends. Water velocities were relatively high. As a result of the high water velocities, a similar range of meso-habitat types as found in upland rivers/creeks was also present (i.e. run, riffle, pool and rapid habitat). Substrate was comprised of a matrix of sands, gravel and cobbles, reflecting the higher flow conditions than found in in lowland rivers. Turbidity was generally lower than lowland rivers. Both stream flow and turbidity vary in these rivers greatly over time in response to catchment rainfall patterns. Mid-catchment rivers were typically 10s to 100s of metres wide, and depths were generally <5 metres.

Figure 5-3 Typical features of MCRs, showing gravel substrate/banks vegetated island bards, backwater habitats and riffle/run habitats (BMT WBM 2017)

Off-river water bodies

ORWBs consisted of off-stream lakes and were only surveyed in 2011-2013. The lakes, located on tributaries of the Sepik River, are periodically connected to surrounding channel environments during higher flows. Some connections remain year-round, though depth and flow vary. Semi-aquatic trees and shrubs were recorded at all ORWB sites, with fringing littoral grasses and reeds also common. While smaller off river water bodies in the lower reaches of the Sepik River were fringed by emergent macrophytes, of the lakes visited, none had large aggregations of floating, submerged or emergent macrophytes. Large aggregations of floating macrophytes are highly dependent on flow conditions – they tend to form during periods of low flow. All lakes had low water clarity, due to either high concentrations of humic substances (i.e. tannins in the black water lakes) or suspended sediment, and consequently the profundal zone (i.e. the section of the water column without light) was dominant. Substrates were comprised almost entirely of fine inorganic and organic material. The characteristics of the ORWB did not vary notably between survey episodes.

Figure 5-4 Typical features of ORWBs, showing flat banks and low riparian shading (BMT WBM, 2013b)

Lowland rivers

Lowland river systems were broad, deep and had low flows (generally <0.1 m/s). Towards confluences these rivers systems tended to meander with old channel forming oxbows. Substrates were dominated by silts and sands. Suspended sediment concentrations were high, and aquatic macrophyte cover was low. No submerged macrophytes were recorded in any surveys. Riparian vegetation was in places discontinuous and dominated by groundcover. Generally, there were low levels of riparian shading, however, the April 2013 survey recorded higher levels of shading due to wider wetted channel widths extending further into riparian zone. Lowland rivers were typified by high turbidity across all surveys (Figure 5-5).

Figure 5-5 Typical features of lowland river aquatic ecosystem type, showing broad meandering channels, low banks, high turbidity and oxbow channels (BMT WBM, 2013b and 2017)

5.2.2 Aquatic Flora

Table 5-3 provides a list of native and non-native aquatic flora species recorded in the Sepik River catchment by Osbourne (1989). Osborne (1989) reported that aquatic macrophyte beds were well developed in areas with low flows, such as Chambri Lake (W62). No new species records or significant beds of native aquatic flora species were recorded by Hydrobiology or BMT WBM, including at Chambri Lake. The present-day lack of native macrophytes within ORWBs may be due to grazing and altered habitat conditions by non-native fish species.

Aquatic macrophyte communities were poorly developed within stream ecosystem types. BMT WBM (2013a, 2013b) suggested that the absence of stream aquatic macrophytes was a response to the following factors:

- Shading of streams. The dense canopy cover of riparian vegetation and narrow width of many streams results in a high degree of shading. The low light provides sub-optimal habitat conditions for most in-stream vegetation species.
- Substrate stability and flows. Most of the Study Area streams are ‘flashy’, and experience pulsed flows in response to rainfall events. High flow velocities can limit the development of aquatic macrophyte communities through (i) substrate scour and (ii) direct physiological damage to plants.
- High turbidity. High turbidity and low light penetration of water would prevent the establishment of submerged aquatic macrophyte communities in mid catchment and lowland river systems.

Table 5-3 Aquatic flora species of the Sepik-Ramu floodplain (Source: Osborne 1989)

Native	
Acorus calamus	*Monochoria hastata*
Acrostichum aureum	*Monochoria vaginalis*
Aeschynomene indica	*Nelumbo nucifera*
Ampelopteris prolifera	*Nephrolepis biserrata*
Azolla pinnata	*Nymphaea dictyophlebia*
Ceratophyllum demersum	*Nymphaea pubescens*
Ceratopteris thalictroides	*Nymphoides exiliflora*
Cyclosorus interruptus	*Nymphoides indica*
Cyperus cephalotes	*Oryza rufipogon*
Cyperus platystylis	*Panicum auritum*
Echinochloa praestans	*Panicum paludosum*
Eleocharis dulcis	*Panicum strigosum*
Eleocharis retroflexa	*Phragmites karka*
Equisetum debile	*Pistia stratiotes*
Hanguana malayana	*Pogostemon stellatus var roxburgianus*
Hydrilla verticillata	*Pogostemon stellatus var stellatus*
Hydrocharis dubia	*Polygonum attenuatum*
Hydroscemma motleyi	*Polygonum minus*
Hymenachne acutigluma	*Scirpus grossus*
Ischaemum polystachyum	*Scirpus mucronatus ssp clemensii*
Isoetes habbemensis	*Scirpus mucronatus ssp mucronatus*
Lasia spinosa	*Spirodela polyrhiza*
Leersia hexandra	*Stenochlaena milnei*
Limnophila aromatica	*Stenochlaena palustris*
Limnophila indica	*Utricularia aurea*
Ludwigia adscendens	*Utricularia exoleta*
Ludwigia octovalvis	
Non-native	
Ipomoea aquatic	*Salvinia molesta*
Eichhornia crassipes	*Alternanthera philoxeroides*

Non-native species have been observed throughout the catchment, including *Ipomoea aquatica* (Gowep 2008), *Eichhornia crassipes* (Gowep 2008, Osborne 1989) and *Salvinia molesta* (Osborne, 1989, Petr 2000). *Salvinia molesta* has historically been a major invasive weed issue within the Sepik-Ramu floodplain, although biological control has greatly reduced its impact (Osborne 1989). *Eichhornia crassipes* has been reported to be prominent throughout the Sepik floodplain waterways (Osborne 1989). Large floating beds of the *Eichhornia crassipes* observed during sampling episodes by both Hydrobiology and BMT WBM.

No threatened or locally endemic aquatic plant species of conservation significance were identified during the field surveys. At least two regionally endemic (i.e. restricted to northern PNG) species of aquatic macrophytes from the genus *Isoetes* are known to occur in northern PNG (Table 5-4 – see Leach and Osborne 1985). *Isoetes neoguineensis* appears to be confined to mountainous areas (>3200 m), and is therefore unlikely to occur with the Study Area. A single specimen of *Isoetes frigida* has been recorded from a small lake near Mount Saruwaged (approximately 50 km north of Lae) suggesting further surveys may find this species has a greater distribution throughout the region than current data suggests. None of the species have been evaluated under the IUCN Red List. It is possible that other regionally endemic aquatic macrophytes occur in the Study Area.

Table 5-4 Endemic aquatic plant species restricted to northern PNG

Species	IUCN	Geographic distribution	Habitats	Presence in Study Area
Isoetes frigida	Not evaluated	Only known from around a single small lake on the southern side of Mt Saruwaged	Rooted in the peat or fine silt sediments of alpine tarns or lake margins from 2800 to 3900 m altitude, mostly above 3300 m	Not recorded
Isoetes neoguineensis	Not evaluated	Scattered on the major peaks the full length of the Wharton Range of the Owen Stanley ranges of eastern New Guinea, from Mt Strong to Mt Victoria, 2800 - 4000 m altitude.	As for *I. frigida*	Not recorded

5.3 Aquatic Macroinvertebrates

All macroinvertebrate data (Hydrobiology and BMT WBM) are included in Appendix C. The following sections summarise this data.

5.3.1 2008 to 2010 (Hydrobiology)

This section describes the results from Hydrobiology's macroinvertebrate sampling.

A total of 96 macroinvertebrate taxa from ten orders and 64 families were collected in riffle and composite sweep samples in the Study Area during the 2008/2009, 2009 and 2010 sampling events. Of this, 38 PET (Plecoptera, Ephemeroptera and Trichoptera) taxon (PET are known to be sensitive to disturbances) from 25 families were recorded. PET taxa richness is a measure of stream condition based on the pollution sensitivity of freshwater invertebrates. In general, sites with good habitat and water quality typically contain higher number of PET families than degraded sites.

The orders Coleopterans (11 taxa), hemipterans (11 taxa) and dipterans (21 taxa) were the main contributors to the components of overall taxon richness (Hydrobiology 2010b).

The results are discussed further below.

5.3.1.1 Temporal Patterns

Riffle assemblages

Only upland creeks and rivers and mid-catchment rivers were sampled, as no riffle habitats were present at lowland river sites. The most abundant taxa collected in the riffle habitat were:

- Chironominae midge larvae - this sub-family was the most abundant taxon in the 2008/2009 and 2009 surveys and most abundant taxon overall. This sub-family was comprised of nine different species.
- Plecoptera stoneflies were abundant in 2008/2009 surveys.
- Hydrophiidae and Caenidae were moderately abundant in 2009, particularly in the upland creek/rivers aquatic ecosystem type.
- Riffle habitat samples in 2010 were dominated by Leptophlebiidae and Baetidae mayflies, which had only been recorded as minor components in 2009 and 2008/2009.

Taxonomic richness, composition and abundance varied greatly over time and space (among aquatic ecosystem types, among sites). This variability is likely due to differences in flow conditions, differences in physico-chemical conditions within and between catchments and differences in sampling effort among aquatic ecosystem types (refer to Section 3.3.7.2).

A total of 79 aquatic macroinvertebrate taxa were collected in riffle samples in the 2008/2009, 2009 and 2010 sampling events. PET taxa formed a large component of the invertebrate fauna (32 taxa), and represented on average 42% of the total richness across sampling events. This relatively high abundance of PET taxa indicates that the survey sites are in good condition and have not been exposed to significant disturbances or pollution. PET taxon richness and total richness were moderate to high for 2008/2009 and 2010, but relatively low for the 2009 sampling event. Site taxon richness and abundance for the 2008/2009, 2009 and 2010 riffle samples are presented in Figure 5-6 and Figure 5-7.

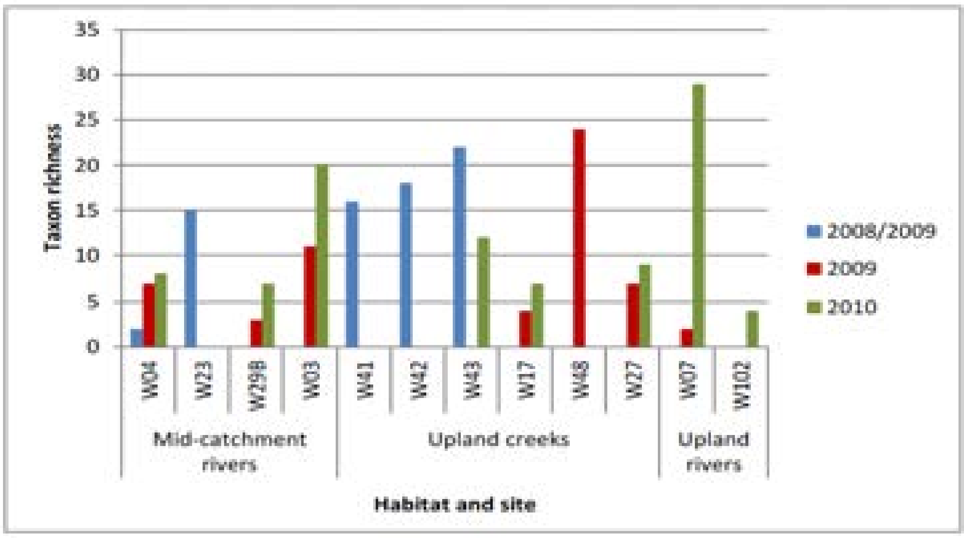

Figure 5-6 Taxon richness for 2008 / 2009, 2009 and 2010 riffle samples (Hydrobiology 2010b)

The mean taxon richness for upland creek/river riffles was similar for the 2010 and 2009 sampling event (9.2), with mean taxon richness the highest for 2008/2009 sampling event (18.7). The low mean taxon richness value for 2009 was due to few taxa recorded for some of the upland river sites. Mean taxon richness for mid-catchment rivers was similar across all sampling events.

Mean taxon abundances in 2008/2009 and 2009 at upland creek riffle sites were higher than mean abundances for mid-catchment river riffles. However, for 2010, the mean taxon abundance for mid-catchment rivers was almost twice as high as the value for upland rivers and creeks. The mean values for mid-catchment rivers and upland rivers were skewed by high abundances at two sites.

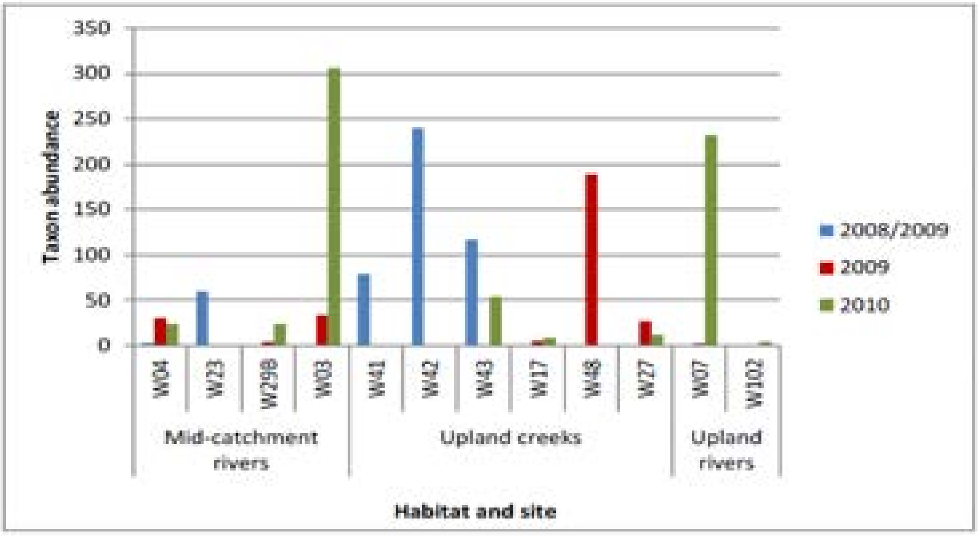

Figure 5-7 Taxon abundance for 2008 / 2009, 2009 and 2010 riffle samples (Hydrobiology 2010b)

Composite/edge communities

Composite sweep (edge) samples were dominated by the aquatic larval stages of terrestrial insects that preferentially inhabit clear, well-oxygenated creeks with hard substrates. Overall, a total of 46 aquatic macroinvertebrate taxa, including 19 PET taxa were collected in composite sweep samples from all sites during the 2008/2009, 2009 and 2010 sampling events. Of the 19 PET taxa collected, 12 were collected only from upland creeks or mid-catchment rivers, with a similarly high representation as in riffle samples.

As composite sweep samples were obtained from only two sites in the 2010 survey, data analysis focussed on the 2008/2009 and 2009 composite sweep data. Total site taxon richness and abundance for composite sweep samples from the 2008/2009 and 2009 sampling events are presented in Figure 5-8 and Figure 5-9. Taxon richness was generally less than five taxa per site, except at site W29B (upland creek site, 2008/09) and W54 (lowland river site, 2009) which both has 12 taxa. There were no consistent differences in richness among aquatic ecosystem types or over time.

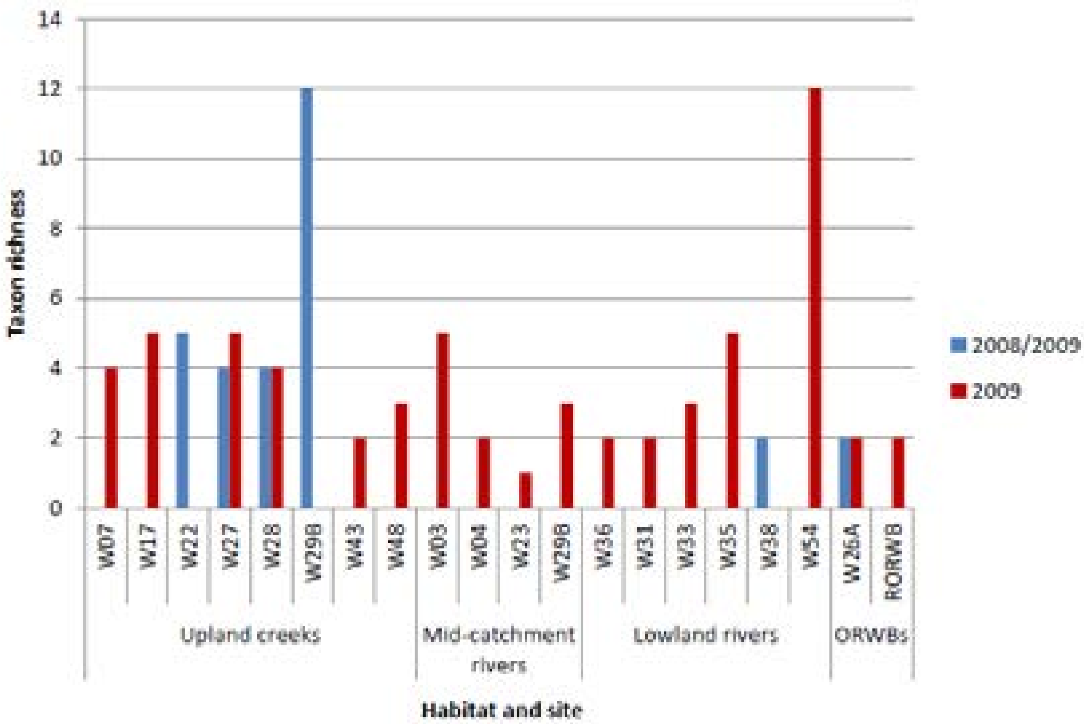

Figure 5-8 Taxon richness for 2008 / 2009 and 2009 composite sweep samples (Hydrobiology 2010b)

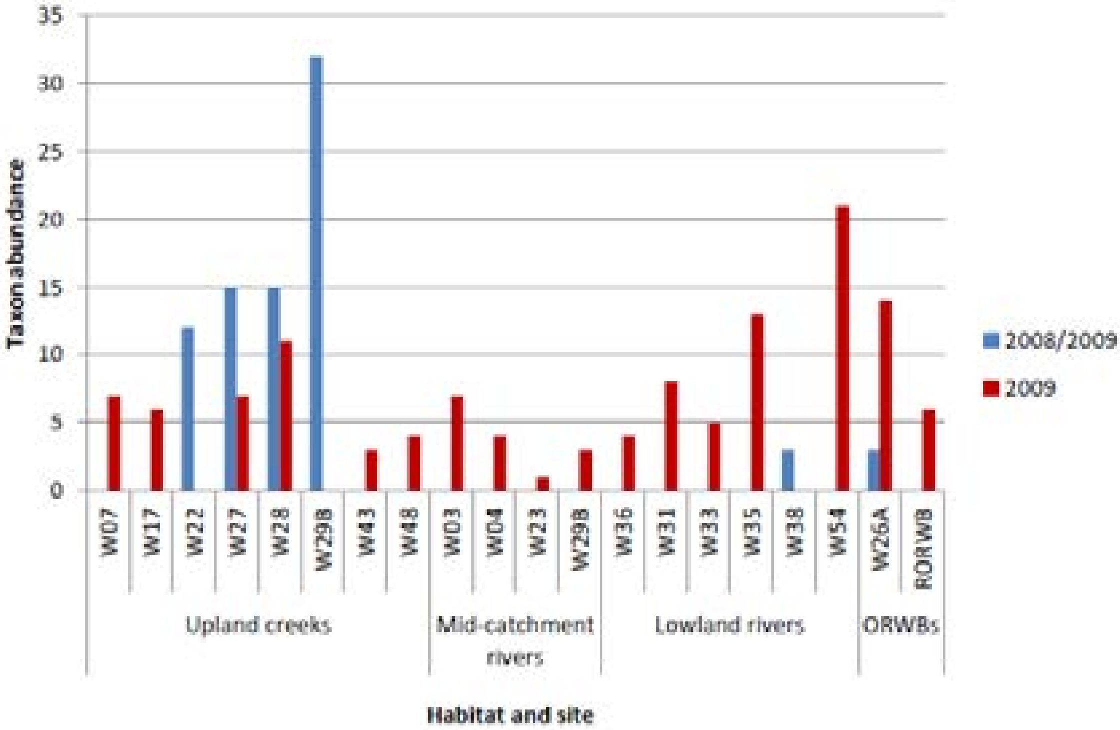

Figure 5-9 Taxon abundance for 2008 / 2009 and 2009 composite sweep samples (Hydrobiology 2010b)

5.3.1.2 Differences Among Aquatic Ecosystem Types

Upland Creeks and Rivers

The higher taxon richness and abundance of macroinvertebrate communities in upland creeks and river may be due to favourable conditions related to available habitats (i.e. more riffle habitat) and ample food resources, such as high plant material input from the dense riparian vegetation typical of these stream types.

Two macroinvertebrate families, Hydrophiliidae and Hygrobiidae, were found only at several Upland Creek sites and were not found elsewhere in the Project Area. The taxa including riffle beetles (Elmidae), water beetles (Noteridae), mayflies (Propistomatidae, Potamanthidae, Caenidae and Baetidae), plecopteran stoneflies and net-spinning caddisflies (Hydropsychidae) were present at this group of sites, and were either absent or in low abundances in the rest of the Project Area. Although members of the nemourid-like stonefly family (cf. Nemouridae, plecopteran sp.1) were found throughout the Project Area, they were much more abundant at these sites.

Upland rivers and creeks have high gradients and generally clear, fast flowing waters. Many of the taxa at the upland river sites were associated with fast flowing creeks, rocky substrates, were filter-feeders or had delicate external gills, which are considered to be sensitive to sediment. The sensitively of these PET taxa to high TSS and sediment loads could explain their poor representation in the lower catchment areas.

Mid-Catchment Rivers

Among the mid-catchment rivers, there was considerable variability in riffle macroinvertebrate abundance and richness (Figure 5-6, Figure 5-7). The macroinvertebrate taxa present in mid-catchment rivers comprised fewer PET taxa than upland creeks and rivers. For example, some stoneflies (nemourids) and net-spinning caddisflies (hydropsychids) were less abundant in the mid-catchment rivers than the upper creeks and rivers.

Lowland Rivers and Off-River Water Bodies

During the 2008/2009 sampling event, seven taxa (including one PET taxon) were recorded for lowland river and ORWB sites. A total of 18 taxa, including five PET taxa were recorded during the 2009 sampling event. The relatively low macroinvertebrate abundance and diversity of these lower parts of the catchment was likely to be due to reduced habitat diversity and sediment conditions in these reaches. Lowland rivers and ORWBs were dominated by non-biting midges (Chironomidae), which tend to be generalist feeders.

5.3.2 2011 and 2017 (BMT WBM)

This section describes the results from BMT WBM's macroinvertebrate sampling.

Macroinvertebrate communities with the Study Area were sampled on two occasions in 2011 (June and December), and once in 2017 (November) at eight new sites between the mine site and toward Vanimo by BMT WBM. Of the 68 taxa recorded overall, six taxa were recorded exclusively in June 2011, five taxa were recorded exclusively in December 2011 and 14 taxa were recorded only in November 2017. The remaining 43 taxa were recorded in all sampling episodes. In June 2011, a total of 48 taxa and 1473 individuals were recorded from 67 samples, compared to 39 taxa and

2206 individuals from 60 samples collected in December 2011 and 49 taxa and 5286 individuals from 45 samples were collected in November 2017. The taxa recorded on only one occasion generally tended to have low abundance (≤10 individuals), indicating that these were uncommon taxa overall.

The most abundant taxa were:

- Veliidae water bugs – this family represented 16.2% of the total number of individuals collected, and was abundant during all sampling episodes. However, relative abundance varied greatly among aquatic ecosystem types and sampling episodes, with high numbers at low-land river sites in June and December 2011, and the mid-river aquatic ecosystem type in June 2011 and November 2017 (edge samples only), but low numbers elsewhere.
- Chironominae midge larvae - this sub-family represented 15.1% of the total number of individuals collected, and was the highly abundant taxon in December 2011 and November 2017 surveys. During these surveys, Chironominae was highly abundant in upland river sites (431 individuals within riffle habitats) and ORWB (236 individuals) during December 2011 and mid-river aquatic (207 and 276 individuals within edge and riffle habitats respectively) ecosystem type in November 2017. All other ecosystem types generally had low abundances of Chironominae.
- Corixdae 'water boatman' bug – this family represented 9% of the total number of individuals collected and was highly abundant in the June 2011 and November 2017 surveys. Corixdae was not recorded during the December 2011 surveys. Abundance varied among the ecosystem types, with high numbers recorded in the mid-river aquatic ecosystem type in December 2017 but low number elsewhere.
- Baetidae mayflies – this family accounted for 7.8% of the total catch. Patterns in relative abundance varied between ecosystem types and sampling episodes, being abundant in the upland river during June and December 2011, off-river waterbody in December 2011 and mid-river aquatic (edge habitat) ecosystem type in November 2017. Overall, Baetidae were substantial more abundant in November 2017 compared to June 2011 and December 2011.
- Hydropsychildae caddisfly – this family accounted for 6.7% of the total catch and was only recorded during the November 2017 survey, being highly abundant in upland river and mid-river ecosystem type (riffle habitats).
- Leptohlebiidae mayflies – this family represented 6.6% of the total number of individuals collected and was highly abundant in November 2017 compared to June and December 2011. It was relatively uncommon in most aquatic ecosystem types but had high abundance in mid-river and upland river ecosystem types in November 2017.
- Gerridae water striders – this family accounted for 6.1% of the total catch. Patterns in relative abundance varied over time and between sampling episodes, being abundant in the lowland rivers during June and December 2011 and mid-river ecosystem type in November 2017, but was uncommon elsewhere. Likewise, Gerridae, were more substantial more abundant during the November 2017 survey compared to June and December 2011 surveys.

- Leptoceridae, Caenidae, Hydrophilidae, Elmidae, Ceratopogonidae and Tanypodinae together accounted for 16% of the total individuals collected and were highly abundance in November 2017 compared to June and December 2011.
- All other taxa comprised <6% of the total abundance of aquatic macroinvertebrates.

Twelve PET taxa were recorded within the study area over all sampling events. Of these, three families belonged to Ephemeroptera (mayflies), with Leptophlebiidae the most abundance and Baetidae the most commonly occurring family. Eight families were recorded from Trichoptera and one family from Plecoptera, which was restricted to riffle habitat and were in low abundances in December 2011. Overall, PET taxa were more abundant in the upland creek and river habitats, than the lowland rivers and ORWBs.

5.3.2.1 Comparison Between Aquatic Ecosystem Types

Figure 5-10 shows the mean taxonomic richness (i.e. the number of macroinvertebrate taxa, generally families, per sample) recorded at each site and Figure 5-11 shows the mean number of taxa per aquatic ecosystem type. Patterns in mean taxonomic richness varied among sites, with the highest richness recorded at Site S3 (mid-river ecosystem type) and lowest at Site W35 (lowland river ecosystem type) in edge habitats across all sites and events. For riffle habitats, the highest mean richness was recorded at Site S2 (mid-river ecosystem type) and the lowest at W18 (upland river ecosystem type) across all sites and sampling events.

Richness was highest in the lowland river and mid-river ecosystem types, particularly during the November 2017 survey, where greater than 10 taxa were typically recorded at each site. In general richness was greater across all ecosystem types surveyed than during June and December 2011 surveys.

Like richness, mean abundance of aquatic macroinvertebrates showed similar high levels of variability among sites and ecosystem types with no clear patterns in abundance overtime (Figure 5-12 and Figure 5-13). Within riffle habitats, the highest abundances were recorded at sites W28, S2, S7 and S7, while for edge habitats, the highest abundances were recorded at sites S2, S3 and W33 across all sites and sampling events. The high abundance at these sites relates to the large number of one or more macroinvertebrate families, mainly non-biting midge larvae Chironimae, Hempitera water bugs and Corixidae water boatman bugs rather than increase in species diversity.

Key trends observed for each aquatic ecosystem type are summarised as follows:

- Upland rivers/creeks - Hemicorduliidae, Plecoptera and Hydrobiosidae were restricted to upland river/creek sites and were in low numbers. Consistent with patterns in overall taxa richness, most upland river sites had higher PET taxa richness than sites in other aquatic ecosystem type types (Table 5-5).
- Mid-catchment rivers – this ecosystem type had similar taxa richness to lowland rivers during the June and December 2011 however richness differed significantly to the November 2017 survey. Mean richness was similar between the two habitat types sampled in November 2017 survey. Macroinvertebrate community composition from edge and riffle habitats differed to those in lowland rivers and upland river/creek.

- Lowland rivers - Conchostraca, Carabidae, Ochteridae, Bryozoa and Spongillidae were restricted to lowland river habitats. Lowland rivers had taxa richness that was within the lower range compared to other aquatic ecosystem types.
- ORWBs (and feeder stream) - Curculionidae were recorded exclusively in ORWBs/feeder stream habitats. ORWBs did not have consistently different taxon richness compared to other aquatic ecosystem types, but there was great variability in taxon richness among sites and over time.

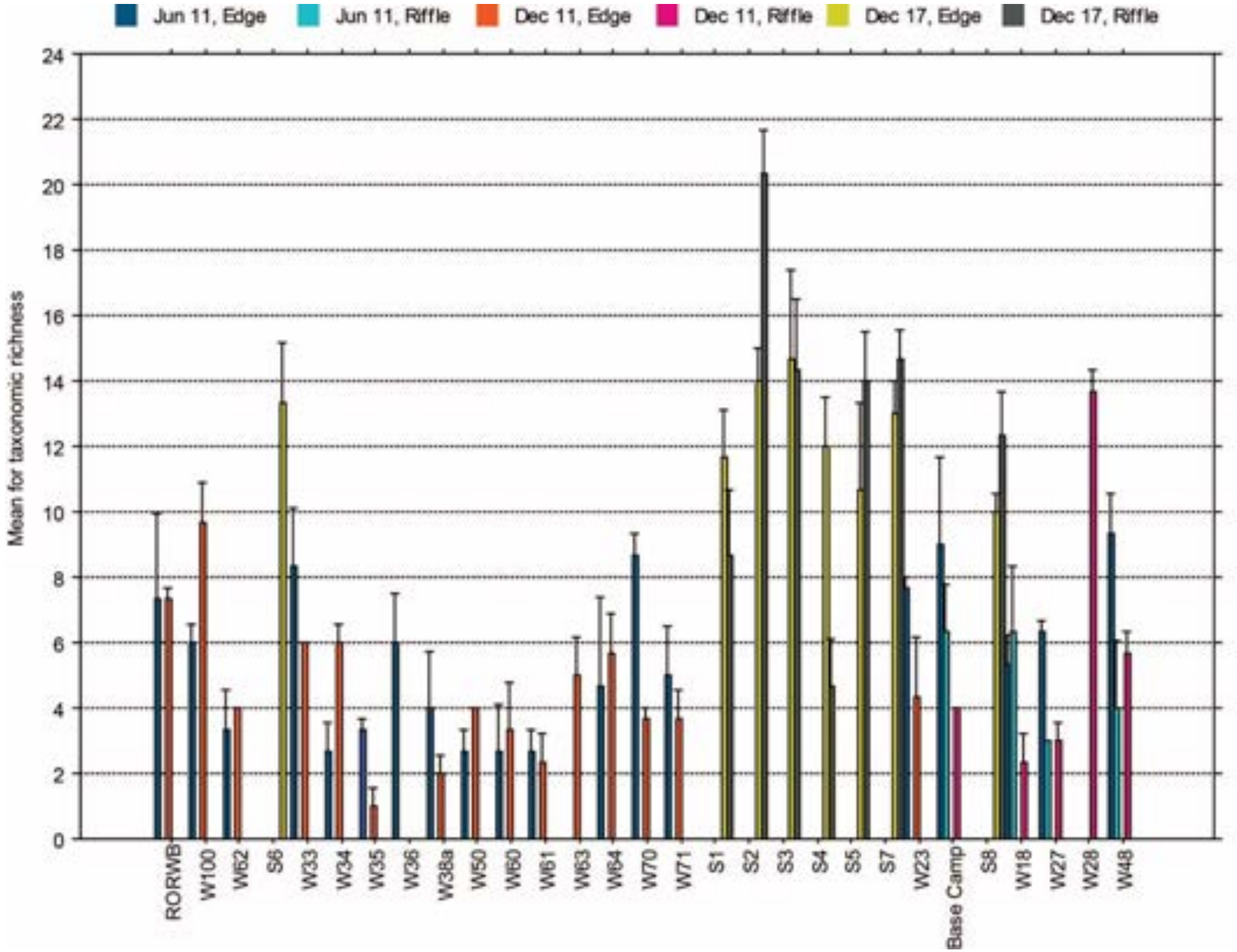

Figure 5-10 Mean (± standard error) number of taxa per 10 m sweep (n = 3) recorded in edge and riffle habitats at each site and sampling event

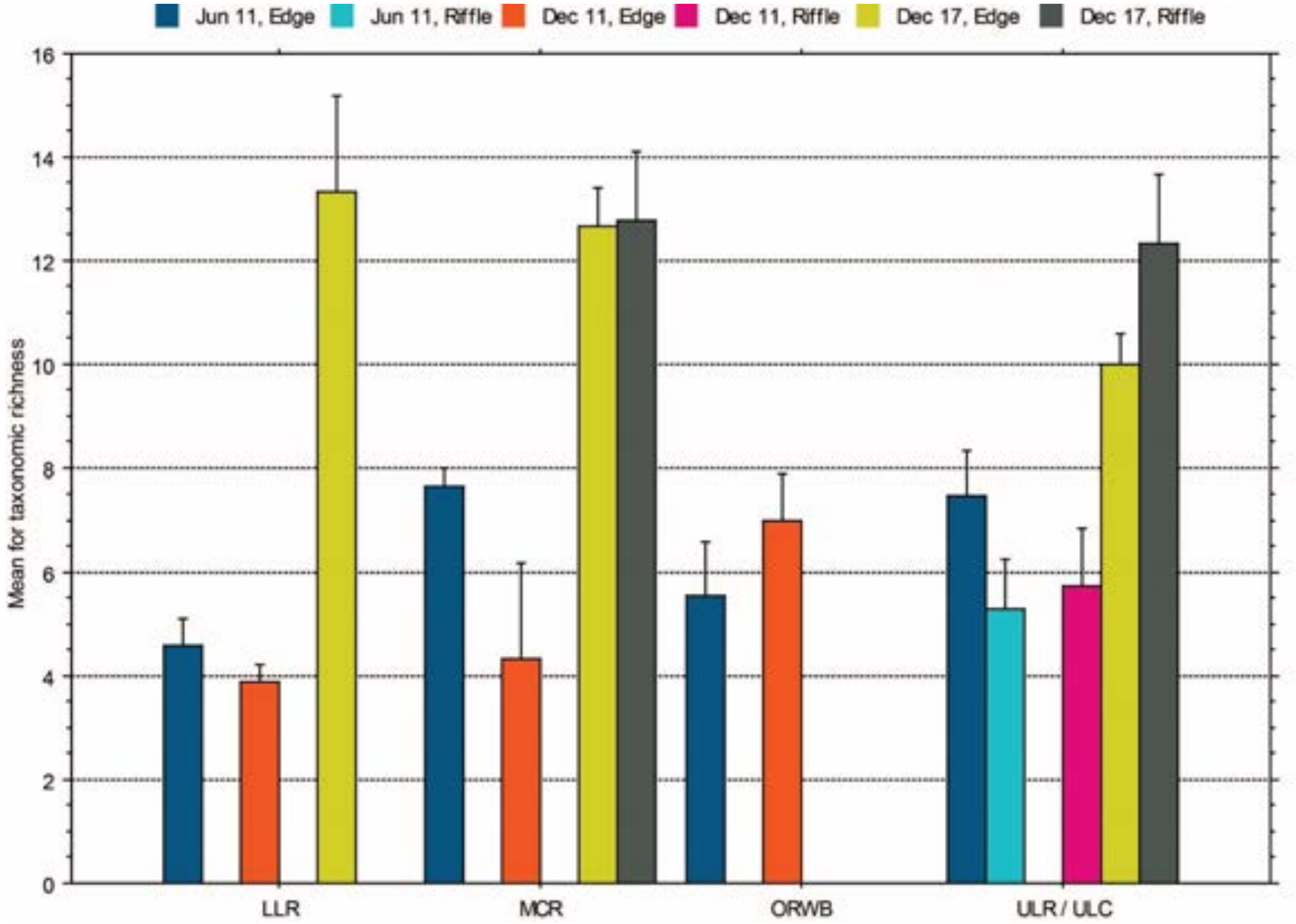

Figure 5-11 Mean (± standard error) number of taxa per 10 m sweep (n = 3) recorded in edge and riffle habitats at each aquatic ecosystem type and sampling event

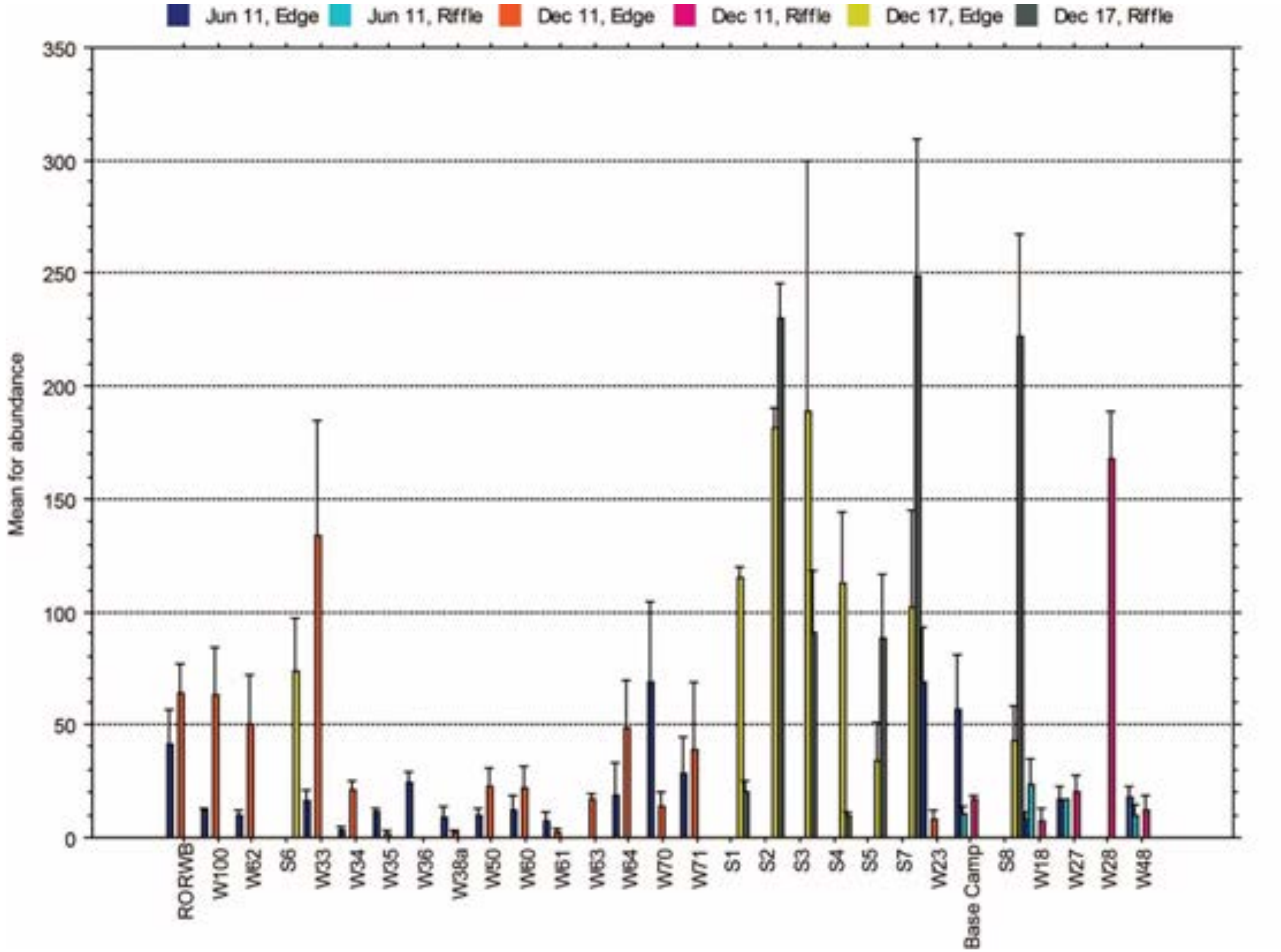

Figure 5-12 Mean (± standard error) macroinvertebrate abundance per 10 m sweep (n = 3) recorded in edge and riffle habitats at each site and sampling event

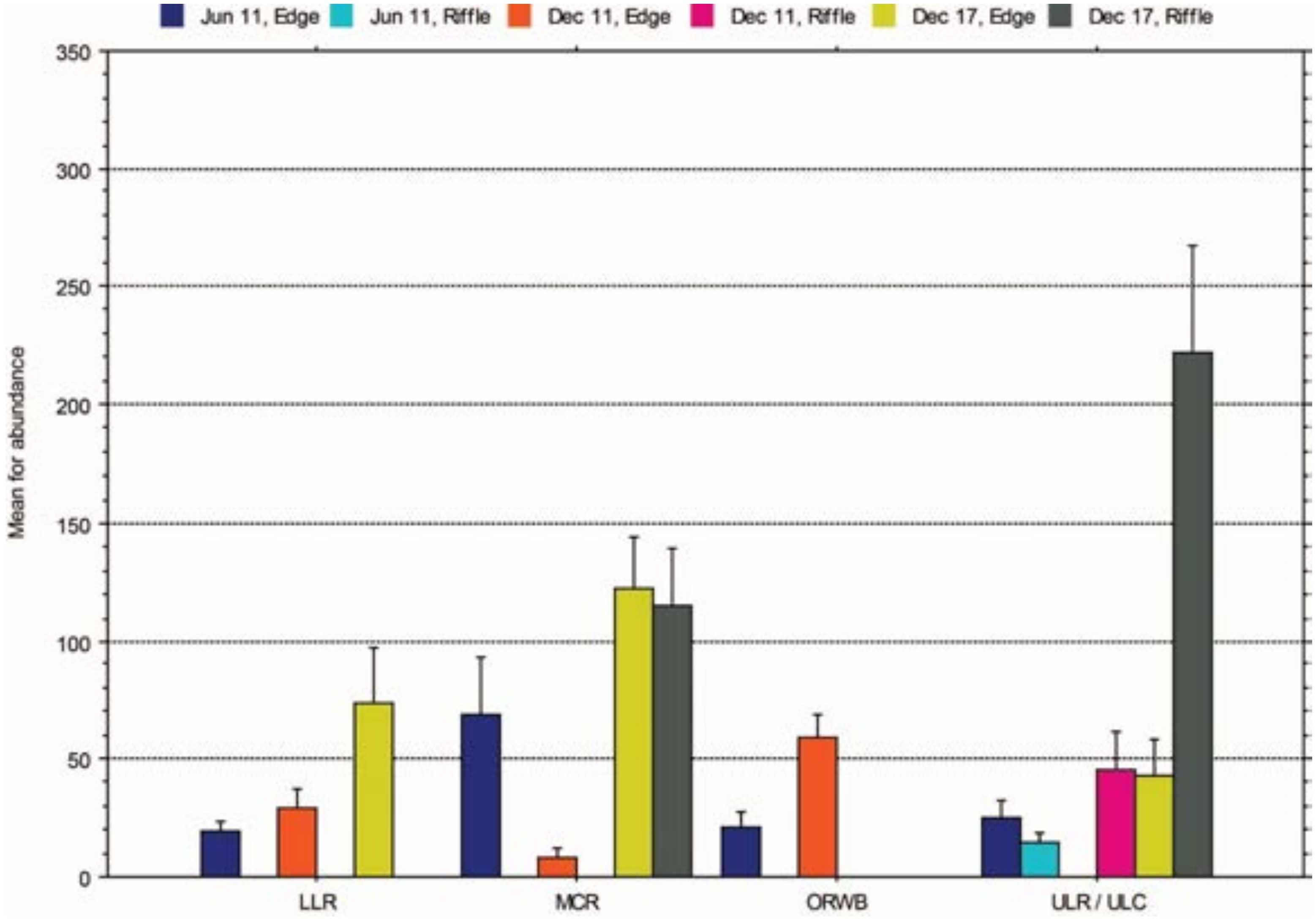

Figure 5-13 Mean (± standard error) abundance per 10 m sweep (n = 3) recorded in edge and riffle habitats at each aquatic ecosystem type and sampling event

Table 5-5 Taxa list and total abundance in each aquatic ecosystem type from BMT WBM sampling (edge micro-habitat, unless indicated otherwise) during each sampling episode

Family	Jun-11					Dec-11					Nov-17					Total	
	ULR	ULR Riffle	MCR	LLR	ORWB	ULR	ULR Riffle	MCR	LLR	ORWB	MCR	MCR Riffle	LLR	ULR	ULR Riffle	No.	%
Acarina	1	0	0	0	1	No edge habitat sampled at ULR sites in December 2011	1	0	0	2	1	5	0	0	1	12	0.13
Bryozoa	0	0	0	7	0		0	0	0	0	0	0	0	0	0	7	0.08
Isotomidae	0	0	0	3	0		0	0	7	0	3	1	0	0	0	14	0.16
Conchostraca	0	0	0	2	0		0	0	0	0	0	0	0	0	0	2	0.02
Atyidae	1	9	4	34	2		14	1	144	3	13	0	0	0	0	225	2.51
Palaemonidae	0	0	0	24	18		0	0	45	15	0	0	0	0	0	102	1.14
Oligochaeta	0	3	1	17	1		1	3	17	35	1	5	3	1	0	88	0.98
Ostracoda	0	0	0	0	0		0	0	1	1	0	0	0	0	0	2	0.02
Planorbidae	0	0	0	1	1		0	0	1	1	0	0	0	0	0	4	0.04
Gastropoda	0	1	0	0	0		0	0	0	0	1	0	0	0	0	2	0.02
Carabidae	0	0	0	2	0		0	0	0	0	0	0	0	0	0	2	0.02
Coleoptera	0	1	0	17	2		0	0	0	0	2	31	2	0	2	57	0.64
Curculionidae	0	0	0	0	0		0	0	0	2	0	0	0	0	0	2	0.02
Dytiscidae	0	0	0	0	4		0	1	1	1	3	2	0	0	0	12	0.13
Elmidae	3	0	0	5	0		2	0	2	0	49	176	14	1	0	252	2.81
Hydrophilidae	2	0	2	3	2		0	1	0	0	32	174	1	0	2	219	2.44
Limnichidae	0	8	1	29	1		0	0	3	0	17	0	5	0	0	64	0.71
Psephenidae	0	0	0	1	0		0	0	0	0	0	0	0	0	0	1	0.01
Ptilodactylidae	0	0	0	0	0		0	0	0	0	0	2	0	0	0	2	0.02
Scirtidae	3	0	1	0	6		0	0	0	0	2	0	0	0	0	12	0.13
Staphylinidae	1	8	3	57	2		0	3	7	0	39	0	0	0	0	120	1.34
Ceratopogonidae	0	2	0	6	11		2	0	5	26	69	102	69	4	5	301	3.36
Diptera	4	1	0	4	0		3	0	0	0	1	1	0	0	0	14	0.16
Dolichopodidae	6	3	1	11	0		4	0	1	0	4	2	0	0	0	32	0.36
Empididae	0	0	0	0	0		0	0	0	0	1	2	1	0	0	4	0.04
Muscidae	0	0	0	0	0		0	0	0	0	2	0	0	0	0	2	0.02

Family	Jun-11					Dec-11					Nov-17					Total	
	ULR	ULR Riffle	MCR	LLR	ORWB	ULR	ULR Riffle	MCR	LLR	ORWB	MCR	MCR Riffle	LLR	ULR	ULR Riffle	No.	%
s.f Chironominae	43	13	6	18	51	No edge habitat sampled at ULR sites in December 2011	431	1	28	236	207	276	15	11	19	1355	15.11
s.f Tanypodinae	28	0	0	4	22		6	0	4	51	115	48	16	4	8	306	3.41
Simuliidae	2	0	0	0	0		0	0	0	0	0	99	0	0	0	101	1.13
Stratiomyidae	0	0	0	0	0		0	0	0	0	1	0	0	0	0	1	0.01
Tabanidae	0	0	0	1	0		3	0	0	0	2	27	0	0	0	33	0.37
Tipulidae	0	0	0	0	0		7	0	3	0	4	62	4	4	7	91	1.02
Baetidae	99	7	12	32	30		74	0	30	92	39	202	19	7	52	695	7.75
Caenidae	22	5	1	0	0		22	0	0	0	36	63	4	15	31	199	2.22
Leptophlebiidae	15	3	2	1	0		57	1	2	0	14	363	7	8	121	594	6.63
Prosopistomatidae	0	0	0	0	0		0	0	0	0	0	9	0	0	0	9	0.10
Belostomatidae	0	0	0	1	0		10	0	0	0	0	0	0	0	0	11	0.12
Corixidae	3	23	13	119	1		0	0	0	0	584	2	54	11	0	810	9.04
Gerridae	3	2	4	98	5		2	0	184	9	209	2	0	29	0	547	6.10
Hydrometridae	0	0	0	0	1		0	0	0	0	2	0	0	0	0	3	0.03
Naucoridae	4	1	0	0	0		6	0	0	0	30	94	0	2	14	151	1.68
Notonectidae	0	0	0	0	16		0	0	6	1	0	0	1	0	0	24	0.27
Ochteridae	0	0	0	2	0		0	0	0	0	0	0	0	0	0	2	0.02
Pleidae	0	0	0	0	1		0	0	1	1	0	0	0	0	0	3	0.03
Veliidae	5	47	155	125	1		0	12	480	4	586	4	0	31	0	1450	16.17
Pyralidae	2	1	0	0	0		5	1	0	0	0	13	0	0	1	23	0.26
Corydalidae	0	0	0	0	0		0	0	0	0	1	0	0	0	0	1	0.01
Calopterygidae	0	0	0	0	0		0	0	0	0	1	0	0	0	0	1	0.01
Chlorocyphidae	0	0	0	0	0		0	0	0	0	3	1	0	0	2	6	0.07
Coenagrionidae	2	0	0	0	2		0	0	0	8	0	0	0	0	0	12	0.13
Diphlebiidae	0	0	0	0	0		0	0	0	0	0	0	0	0	1	1	0.01
Gomphidae	0	0	0	0	0		0	0	0	0	2	0	0	0	0	2	0.02
Hemicorduliidae	1	0	0	0	0		0	0	0	0	0	0	0	0	0	1	0.01
Libellulidae	18	2	0	0	2		3	0	1	2	6	76	0	0	5	115	1.28

Family	Jun-11					Dec-11					Nov-17					Total	
	ULR	ULR Riffle	MCR	LLR	ORWB	ULR	ULR Riffle	MCR	LLR	ORWB	MCR	MCR Riffle	LLR	ULR	ULR Riffle	No.	%
Megapodagrionidae	0	0	0	0	0	No edge habitat sampled at ULR sites in December 2011	0	0	0	0	0	1	0	0	0	1	0.01
Odonata	1	0	0	0	0		0	0	0	2	0	0	0	0	0	3	0.03
Protoneuridae	0	0	0	0	0		0	0	0	0	16	0	1	0	0	17	0.19
Plecoptera	0	0	0	0	0		6	0	0	0	0	0	0	0	0	6	0.07
Calamoceratidae	1	2	0	0	0		0	0	0	0	6	4	0	0	0	13	0.15
Ecnomidae	2	0	0	1	0		1	0	0	6	1	0	0	0	0	11	0.12
Helicopsychidae	20	2	0	0	0		3	0	0	0	0	0	0	0	0	25	0.28
Hydrobiosidae	0	0	0	0	0		3	0	0	0	0	0	0	0	0	3	0.03
Hydropsychidae	0	0	0	0	0		0	0	0	0	6	198	1	1	395	601	6.70
Hydroptilidae	0	0	0	0	0		5	0	0	3	0	0	0	0	0	8	0.09
Leptoceridae	1	4	1	2	7		4	1	2	30	89	11	3	1	0	156	1.74
Philopotamidae	5	0	0	0	0		0	0	0	0	2	8	0	0	1	16	0.18
Gordiidae	0	0	0	0	0		0	0	0	0	1	0	0	0	0	1	0.01
Spongillidae	0	0	0	3	0		0	0	0	0	0	0	0	0	0	3	0.03

Note: grey cells indicate PET taxa

5.3.2.2 Comparison between Hydrobiology and BMT WBM studies

A quantitative comparison between the macroinvertebrate surveys undertaken in 2008/2009, 2009 and 2010 (Hydrobiology) and 2011/2017 (BMT WBM) is not possible due to differences in sampling methodologies. The 2008/2009, 2009 and 2010 surveys focused on riffle habitats, with accessory sweep-net sampling to determine species presence. While the 2011/2017 surveys employed both riffle and edge sampling, with a greater amount of edge habitats surveyed. However, the following general trends are evident:

- Chironominae midge larvae were the most abundant taxa overall during the 2008/2009, 2009 and 2010 surveys, and were also abundant in 2011 and 2017.
- The most abundant family recorded in the 2011/2017 surveys were the Veliidae water bugs. However, they were collected in small numbers and infrequently during the 2009 and 2010 surveys and not recorded at all in the 2008/2009 surveys. This may be due to differences in sampling methods employed by Hydrobiology and BMT WBM (refer to Section 3.3.7.2).
- All surveys found that upland creeks/ rivers had the highest number of PET taxa.
- The 2011 and 2017 surveys found no consistent differences in average taxa richness across aquatic ecosystem types, whereas Hydrobiology found highest species richness in upland creeks and rivers than other ecosystem types.

5.3.3 Species of Conservation Significance

Threatened Species

Three aquatic invertebrate species have been classified as either threatened or near threatened in PNG on the IUCN Red List and potentially occurring in the Study Area:

- The freshwater crayfish *Cherax papuanus* (Vulnerable) – known only from Lake Kutubu in the Southern Highlands (Austin 2010), and on this basis is unlikely to occur in the Study Area.
- The dragonfly *Diplacina arsinoe* (Vulnerable) - reportedly confined to ranges around Port Moresby (Kalkman 2009), and on this basis is not known to occur within the vicinity of the Study Area.
- The dragonfly *Idiocnemis adelbertensis* (Near Threatened) - reportedly confined to ranges around Madang (Kalkman 2009), and on this basis is not known to occur within the vicinity of the Study Area.

Endemic species

Polhemus *et al*. (2004) reviewed patterns of endemism in PNGs flora and fauna. In terms of aquatic macroinvertebrates, 25 insect species were considered to be restricted to the north-eastern PNG region. The distribution of species reflects shifts in plate tectonics operating over geological time-scales, and the habitat requirements and dispersal ability of different species. Polhemus *et al*. (2004) suggested that in lotic (flowing) waters, there are distinct differences in the distribution of endemic aquatic species along river gradients. These differences are thought to reflect segregation of species in responses to a range of environmental factors such as altitude, water temperature, physical habitat and salinity. The dispersal ability of species and degree of habitat stability also has a large influence on species distributions.

A single endemic species (*Ciliometra sepik*) is thought restricted to the Sepik-Ramu-Markham Basins region (defined as 'Area 16' by Polhemus *et al*. 2004) and could possibly occur in the Study Area. This species is thought to occur in lowland areas (a landscape type represented in the Study Area), however it is not known whether this species occurs in the Sepik river catchment or occurs more widely in the Sepik, Ramu or Markham basins. No endemic aquatic macroinvertebrate species are known to be restricted to the Study Area.

No crustaceans are known to be endemic to the north-eastern PNG, although numerous species are known for southern PNG (Polhemus *et al*. 2004).

There is a lack of information on the distribution, ecology and systematics of PNG's macroinvertebrate fauna generally. With additional work it is likely that other endemic species would be found, and that some range restricted species could occur over a much wider area than presently thought.

5.4 Fish and Macro-crustaceans

All fish and macro-crustacean data (Hydrobiology and BMT WBM) are included in Appendix D. The following sections summarise this data.

5.4.1 Fish Abundance and Richness

5.4.1.1 2008, 2009, 2010 (Hydrobiology)

A total of 42 freshwater fish species, comprised of 34 native fish species and eight non-native fish species, were collected during the 2008/2009, 2009 and 2010 sampling events within the Sepik River catchment (Table 5-6). Sixteen of these species are endemic to northern New Guinea, and five are restricted to the Sepik-Ramu River System. Native and non-native species richness and abundance are shown in Figure 5-14 and Figure 5-15 (Hydrobiology 2010b).

Table 5-6 Fish species from the Sepik River catchment caught during the 2008 / 2009, 2009 or 2010 sampling events (Hydrobiology 2010b)

Family	Species	Endemic Category
Native species		
Ambassidae	*Ambassis* sp.	
	Ambassis interruptus	
	Parambassis confinis	
Apogonidae	*Glossamia gjellerupi*	
Ariidae	*Ariid* sp.	
	Brustiarius nox	Sepik endemic
	Brustiarius solidus	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Neoarius coatesi	Sepik endemic
	Neoarius utarus	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Potamosilurus velutinus	Northern New Guinea endemic
Eleotrididae	*Mogurnda aurofodinae*	Northern New Guinea endemic
	Mogurnda nesolepis	Northern New Guinea endemic
	Mogurnda sp.	
	Ophieleotris aporos	
	Ophiocara porocephala	
	Oxyeleotris fimbriata	
	Oxyeleotris gyrinoides	
	Oxyeleotris heterodon	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Eleotris aquadulcis	Sepik endemic
Gobiidae	*Glossogobius bulmeri*	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Glossogobius coatesi	Sepik endemic
	Sicyopterus longifillis	
	Stenogobius laterisquamatus	Northern New Guinea endemic
Hemirhamphidae	*Zenachopterus kampeni*	Northern New Guinea endemics in Category 3 Species of Conservation Significance
Megalopidae	*Megalops cyprinoides*	
Melanotaeniidae	*Chilatherina crassispinosa*	Northern New Guinea endemic
	Chilatherina fasciata	Northern New Guinea endemic
	Chilatherina sp.	
	Glossolepis kabia	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Melanotaenia affinis	Northern New Guinea endemic
	Melanotaenia sp.	

Family	Species	Endemic Category
Plotosidae	*Neosilurus gjellerupi*	Northern New Guinea endemics in Category 3 Species of Conservation Significance
	Neosilurus idenburgi	Northern New Guinea endemic
Terapontidae	*Hephaestus transmontanus*	Northern New Guinea endemics in Category 3 Species of Conservation Significance
Non-native species		
Characidae	*Piaractus brachypomus*	
Cichlidae	*Oreochromis mossambicus*	
	Oreochromis niloticus	
	Tilapia rendalli	
Claridae	*Clarias batrachus*	
Cyprinidae	*Barbonymus gonionotus*	
	Cyprinus carpio	
Prochilodontidae	*Prochilodus argenteus*	

Within the Sepik River catchment there was a decreasing trend in species richness of native species (Figure 5-16) and abundance for both native and non-native species with increasing elevation and decreasing catchment area. The total species richness for ORWBs and lowland river species richness was 14 and 28 species respectively, compared with 23 for mid-catchment rivers and 12 species for upland rivers and creeks combined. The lower fish species richness and abundance in upland rivers/creeks may be due to unfavourable habitat conditions at higher elevations, i.e. cool water temperatures, physical (e.g. rock bars, water falls) and hydraulic (i.e. high water flows) barriers (e.g. Polhemus *et al.* 2004; Smith 2007).

Non-native (introduced) species were numerically dominant (comprising approximately 75% of the total catch) in lowland river and ORWBs aquatic ecosystem types. The highest number of non-native species was recorded at Lake Warangai ORWB (five species), while the upland river and creek habitat had the lowest number (one) of non-native species. As discussed in Section 5.4.3.2, ORWBs provide optimal habitat conditions for many non-native species, and were also targeted in stocking programs.

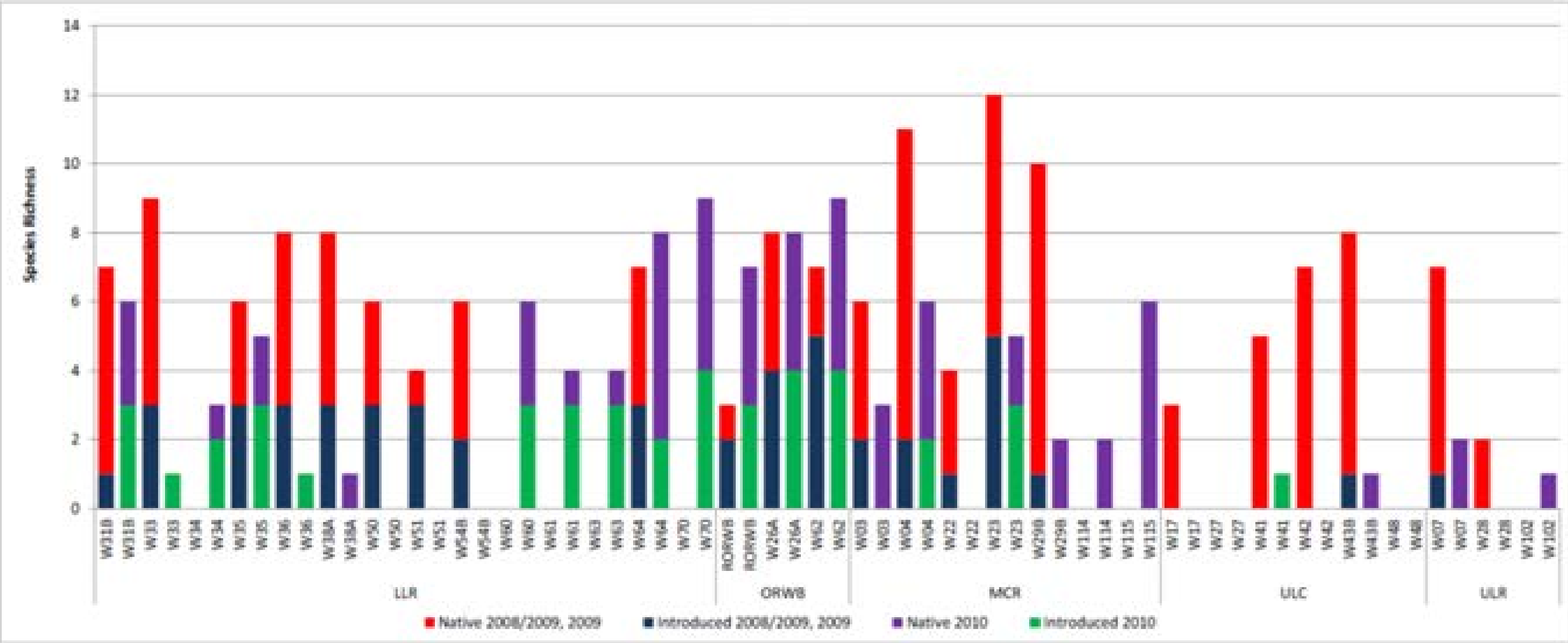

Figure 5-14 Native and non-native fish species richness per site sampled in the Sepik River key catchment habitat types during 2008 / 2009, 2009 and 2010 sampling events (ULC = upland creeks; ULR = upland rivers; MCR = mid-catchment rivers, LLR = lowland rivers, ORWB = off-river water bodies) (Hydrobiology 2010b)

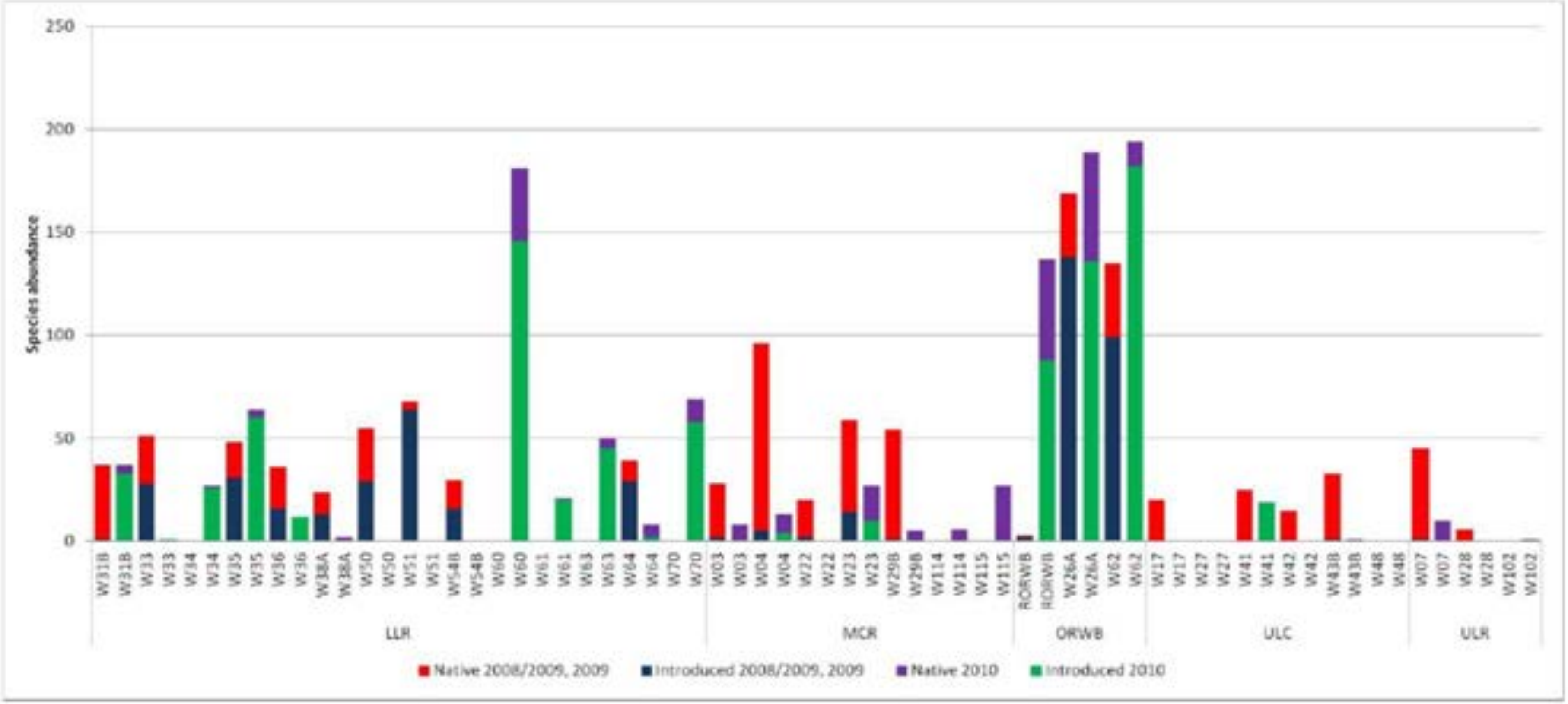

Figure 5-15 Native and non-native fish species abundance per site sampled in the Sepik River key catchment habitat types during 2008 / 2009, 2009 and 2010 sampling events (ULC = upland creeks; ULR = upland rivers; MCR = mid-catchment rivers, LLR = lowland rivers, ORWB = off-river water bodies) (Hydrobiology 2010b)

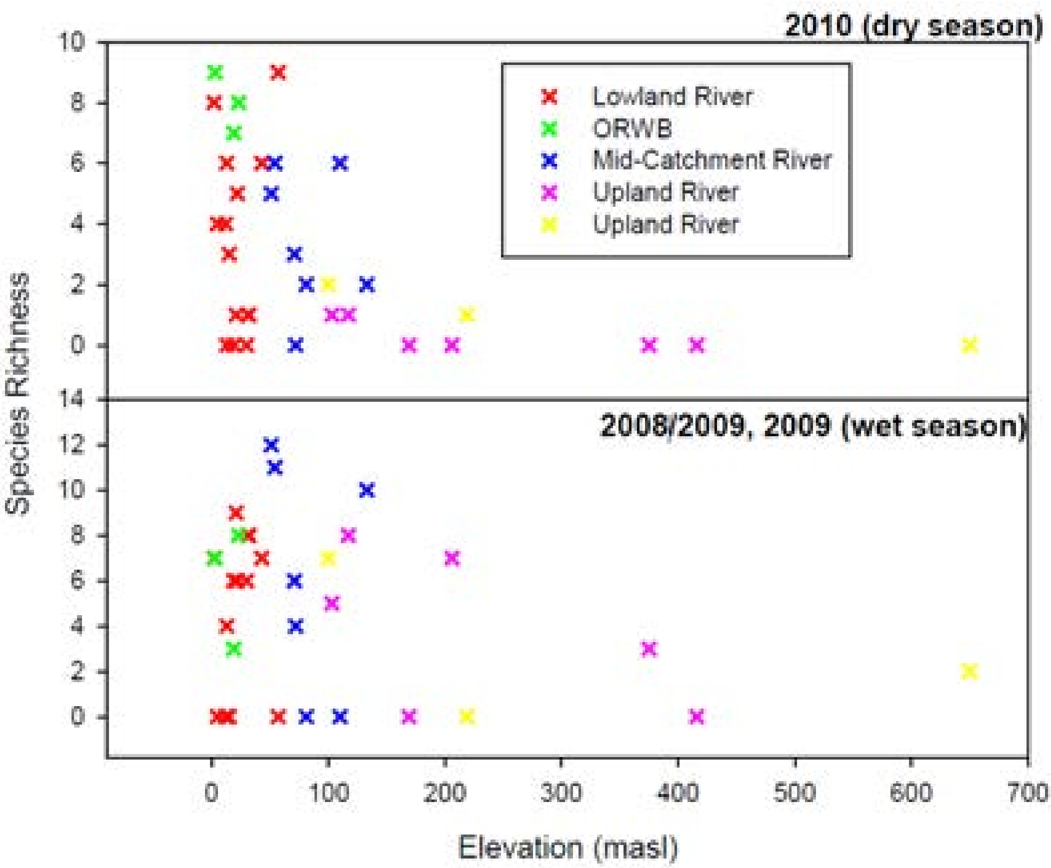

Figure 5-16 Changes in fish species richness per site for key catchment habitat types in the Sepik River catchment for the 2008/2009, 2009 and 2010 sampling events (Hydrobiology 2010b)

5.4.1.2 2011 and 2017 (BMT WBM)

Spatial and Temporal Patterns

A total of 36 freshwater fish species were recorded during the 2011 and 2017 sampling events, comprised of 29 native fish and seven non-native species (Table 5-7), which was similar to that recorded by Hydrobiology (2010b). Apart from, Sepik grunter (*Hephaestus transmontanus*) there were no additional species identified during the November 2017 survey that were not previously recorded by BMT WBM during 2011 survey events. The most species rich families were: Eleotrididae (gudgeons) represented by six species; Ariidae (fork-tailed catfishes) and Gobiidae (gobies) represented by five species each; and Melanotaeniidae (rainbowfishes) represented by four species (BMT WBM 2012).

A total of 1,084 individuals were collected from 20 sites in the June 2011 survey, while 1,250 individuals were collected from 21 sites during the December 2011 survey, and 111 individuals were collected from eight sites during the November 2017 survey. Non-native species dominated the catch during both 2011 survey periods, with approximately 60% and 50% of total catch in June 2011 and December 2011, respectively. The most abundant species overall (all sites combined) during the 2011 survey periods was the non-native Java carp (*Barbonymus gonionotus*), comprising 44.4% and 31.8% of individuals collected in June and December, respectively. Other abundant species included the native Sepik garfish (*Zenarchopterus kampeni)*, the non-native species rubber mouth (*Prochilodus argenteus*), and the native North New Guinea rainbowfish (*Melanotaenia affinis*).

In contrast, the November 2017 survey was dominated by native species, which accounted for approximately 99% of the total catch recorded. Of these, silver rainbowfish (*Chilatherina crassispinosa*), Bulmer's goby (*Glossogobius* bulmeri) and barred rainbowfish (*Cliatherina fasciata*) were the most abundant species, accounting for 56%, 12% and 11% of the individuals collected respectively. The dominance of native species during the November 2017 survey is a reflection of the habitat types surveyed, with native species tending to dominate the communities within the upland sites (as discussed in Section 5.4.1.1, Hydrobiology found that non-native species were dominant in lowland rivers and ORWBs, while upland rivers and creeks had the lowest number of non-native species).

Fish species richness and abundance recorded at each site is presented in Figure 5-17 and Figure 5-18, respectively. Total species richness and abundance were highest in the lowland river aquatic ecosystem type and lowest in upland river/creek aquatic ecosystem type, similar to trends observed by Hydrobiology (2010b).

Table 5-7 Fish species collected by BMT WBM within the Sepik River catchment during June and December 2011 sampling events (BMT WBM 2012) and November 2017

Family	Species	Habitat				Endemism			
		ULR & ULC	MCR	LLR	ORWB	S	NNG	NG	NE
Native									
Anguillidae	Anguilla bicolor				√				√
Apogonidae	Glossamia gjellerupi		√√√	√√			√		
Ariidae	Brustiarius nox			√√√	√√	√			
	Brustiarius solidus			√√√	√		√		
	Neoarius coatesi			√√		√			
	Neoarius utarus			√√			√		
	Neoarius velutinus			√√√					√
Chandidae	Ambassis interruptus			√√					√
	Ambassis (juvenile)			√					
	Parambassis confinis		√√	√√					√
Eleotrididae	Giuris margaritacea				√√√				√
	Mogurnda aurofodinae	√√		√					√
	Ophieleotris aporos			√√√	√				√
	Oxyeleotris frimbata			√	√			√	
	Oxyeleotris gyrinoides			√√					√
	Oxyeleotris heterodon			√√	√√√		√		
Gobiidae	Glossogobius bulmeri		√√√				√		
	Glossogobius coatesi	√				√			

Family	Species	Habitat				Endemism			
		ULR & ULC	MCR	LLR	ORWB	S	NNG	NG	NE
	Glossogobius giurus				√				√
	Glossogobius torrentis	√√					√		
	Glossogobius koragenis^	√√√	√						√
	Gobiidae (juvenile)	√		√	√√				
Hemiramphidae	Zenarchopterus kampeni		√√	√√√√	√√		√		
Lutjanidae	Lutjanus goldiei			√√				√	
Melanotaeniidae	Chilatherina crassipinosa	√√√	√√√	√√√					√
	Chilatherina c.f fasciata	√√	√√√						√
	Chilatherina (juvenile)				√√				
	Melanotaenia affinis	√√√	√√	√√√	√√√√				√
	Melanotaenia (juvenile)			√√					
	Glossolepis multisquamtus			√√√			√		
Plotosidae	Neosilurus gjellerupi^	√√					√		
Synbranchidae	Ophisternon bengalense			√√√					√
Terapontidae	Hephaestus transmontanus	√√	√√						
Non-native									
Characidae	Piaractus brachypomus		√	√√√	√√				
Cichlidae	Oreochromis niloticus			√					
	Tilapia rendalli			√	√				
Clariidae	Clarias batrachus		√		√				
Cyprinidae	Barbonymus gonionotus		√√	√√√√	√√√√				
	Cyprinus carpio			√√√	√√				
Prochilodontidae	Prochilodus argenteus		√√√	√√√√	√√√				

ULR & ULC = Upland River and Upland Creek; MCR = Mid-Catchment River; LLR = Lowland River; ORWB = Off River Water Body. S = Sepik; NNG = Northern New Guinea; NG = New Guinea; NE = Non-endemic. √ = 1 individual; √√ = 2 to 10 individuals; √√√ = 11 to 100 individuals; √√√√ = 100+ individuals
^ identification to be confirmed by the Queensland Museum

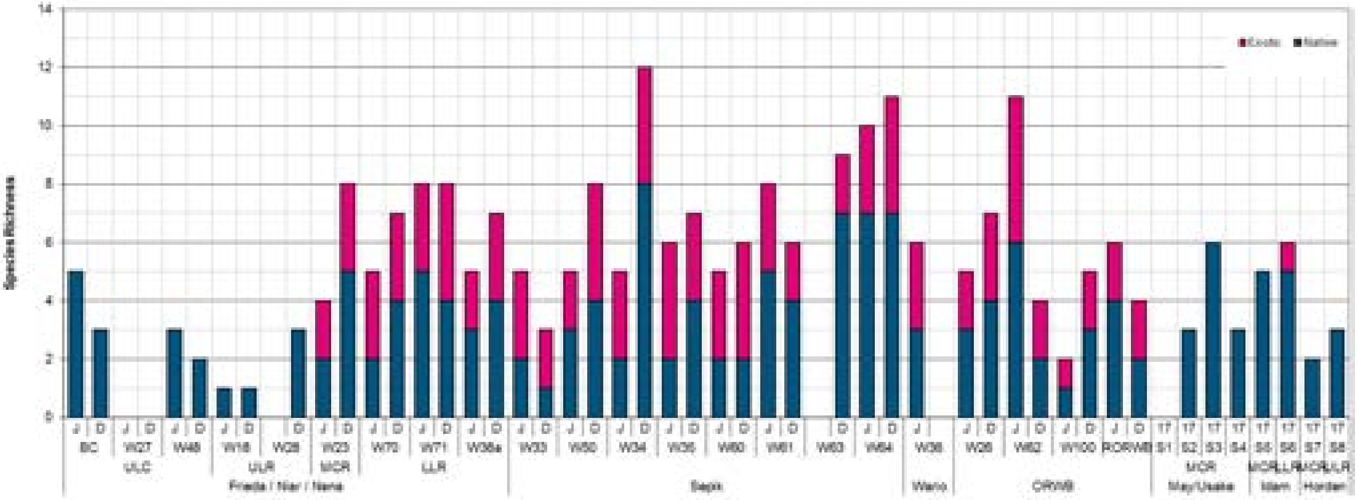

Figure 5-17 Species richness of native and non-native (exotic) fish collected at each site: June and December 2011 (BMT WBM 2012) and in November 2017

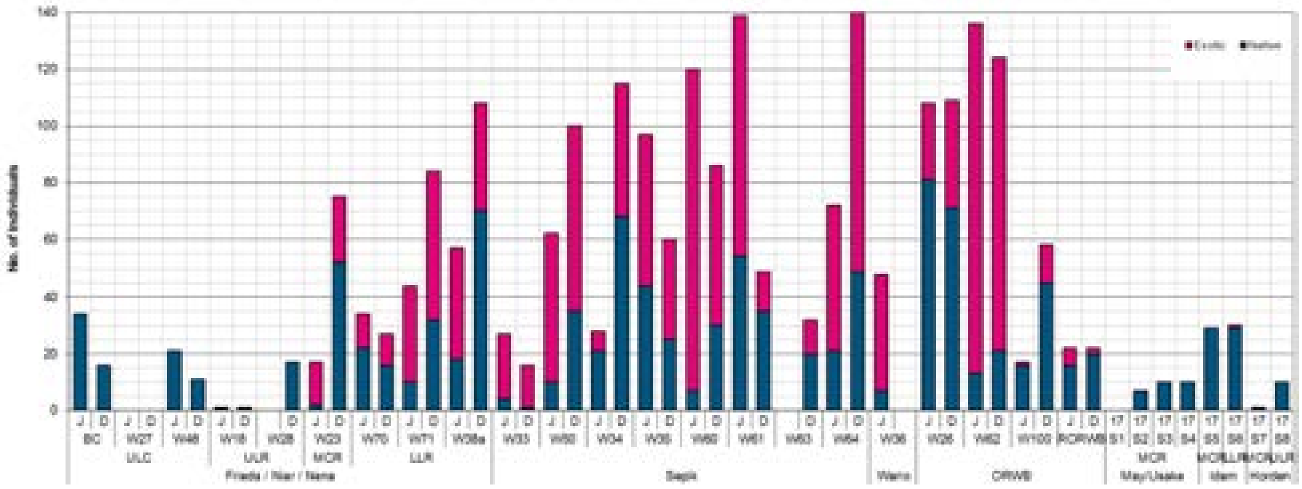

Figure 5-18 Total abundance of native and non-native (exotic) fish species collected at each site by BMT WBM in June and December 2011 (BMT WBM 2012) and in November 2017

Lowland rivers, mid-catchment rivers and ORWBs tended to have relatively similar proportion of native versus non-native (i.e. introduced) species. Non-native fish generally represented 20 to 40% of the number of species captured, though generally accounted for 50 to 80% of all individuals captured. This trend is primarily related to the relative abundances of the non-native species *Barbonymus gonionotus* and to a lesser extent *Prochilodus argenteus*. In contrast to lowland rivers, mid-catchment rivers and ORWBs, no non-native species were collected from upstream river and creek habitats.

These gradients in fish species from lowland to upland areas are likely to be linked to a number of factors, including segregation of individual species by altitude, water temperature, substrate, bed profile and salinity gradients (Polhemus *et al.* 2004), as well as the life-history, reproductive and migratory patterns of different fish species. A summary of data and key spatial and temporal trends of each of the aquatic ecosystem types are shown in Table 5-8.

Table 5-8 Summary of BMT WBM survey results (2011 and 2017)

Descriptor	ORWB	LLR	MCR	ULR/ULC
No. sites	4	13	7	5
No. native sp.	12	19	9	7
No. non-native sp.	6	6	4	0
% native to non-native	50%	~30% dry season), 47% (wet season)	~12% (dry season), ~70-100% (wet season)	100%
Dominant native	Snakehead gudgeon (*Giuris margaritacea)*	Sepik River garfish (*Zenarchopterus kampeni*)	Native rainbowfish (*Chilatherina crassispinosa)*	Goby (*Glossogobius koragenis)*
Dominant non-native	Java carp (*Barbonymus gonionotus)*	Java carp (*Barbonymus gonionotus)*	Rubber mouth (*Prochilodus argenteus*)	-
Key spatial trends	Fish assemblages varied greatly within ORWB sites. However, three species were recorded at sites: the native North New Guinea rainbowfish (*Melanotaenia affinis)* and the non-native Java carp (*Barbonymus gonionotus)* and rubber mouth (*Prochilodus argenteus).*	Fish assemblages varied between lowland river sites. Species caught only in lowland river sites included Papuan black bass (*Lutjanus goldiei*), one-gilled eel (*Ophisternon bengalense*) and long-spined glass perchlet (*Ambassis interruptus*).	Composition of this mid catchment river site was similar to lowland river, but also included a range of small bodied species only captured in upland creek and river system habitats such as the goby (*Glossogobius koragenis)*. No non-native species was observed during the 2017 survey.	Species richness and abundance varied greatly between sites. Upland creek/ river sites were dominated by Gobiidae and Melanotaeniidae species.
Key temporal trends	The wet season (December) had higher species richness than the dry season (June).	Similar species richness between the wet and dry season. There was a higher proportion of native species caught in the wet season.	Species richness, abundance and the proportion of exotic species were greater in the dry than the wet season.	Species richness was greater in the dry season that the wet season, as a result of the absence of two Gobiidae and one Melanotaeniidae species.

5.4.2 Hydroacoustics

Hydroacoustic sampling in the ORWBs at W26 and RORWB enabled the visualisation of the distribution of fish biomass in these water bodies and a quantitative estimate of fish biomass per unit area. The dry season sampling effort of October 2010 could not be completed due to the lack of water in the ORWBs making the hydroacoustic surveys too hazardous both to the equipment and to the operators.

Two fish aggregations were identified in the southern region of Lake Warangai. These aggregations were measured in shallow waters near the edge of the lake. Aggregation A had an average biomass per unit area of 3.39 g/m^2, which was slightly denser than Aggregation B with an average biomass per unit area of 2.01 g/m^2. Both aggregations had a fish size range of 20-600 mm. The fish caught using gill nets in Lake Warangai ranged from 65 mm for Java carp (*Barbonymus gonionotus*) up to 445 mm for pacu (*Piaractus brachypomus*), consistent with the size range detected by the hydroacoustic sampling.

Four fish aggregations were identified in water depth up to 1.2 m throughout the RORWB. The sizes of fish recorded across all aggregations ranged between 60-190 mm, with an average biomass of 2.8 g/m^2. The fish caught using gill nets in RORWB range from 110 mm (for snakehead gudgeon, *Ophieleotris aporos*) to 230 mm (for *Prochilodus argenteus*), correlating with the size range detected by the hydroacoustic sampling.

This baseline hydroacoustics sampling found similar fish biomass between the two locations. However, biomass was unevenly distributed in the water bodies, with high density aggregations occurring in patches.

5.4.3 Collated Freshwater Fish Species List

Table 5-9 is a collated list of fish species reported in the Sepik River Catchment from previous literature (Alan and Coates 1990; Allan, 1991) and from baseline assessments undertaken by Hydrobiology (2008/2009, 2009, 2010) and BMT WBM (2011 and 2017) (Hydrobiology 2010b, BMT WBM 2012).

A total of 60 native species and nine non-native species have been reported in the literature within the Sepik River catchment. Hydrobiology and BMT WBM together reported an additional 29 native species and nine non-native species that had not previously been reported in the literature. The non-native mosquitofish (*Gambusia affinis*) was recorded by Allen and Coates in the catchment, but was not recorded by BMT WBM or Hydrobiology. There were eight species which were only reported by Hydrobiology in the 2008/2009, 2009 and 2010 surveys and seven species found only by BMT WBM during the 2011 and 2017 surveys.

Table 5-9 Fish Species of the Sepik River catchment

Family	Scientific name	Common Name	BMT WBM 2011/2017	Hydrobiology 2008/2009, 2009, 2010	Allan & Coates 1990	Allan 1991
Native Species						
Anguillidae	Anguila bicolour	Indian short finned eel	√		√	
	Anguilla obscura	Pacific short-finned eel				√
Apogonidae	Glossamia gjellerupi	Gjellerup's mouth almighty	√	√	√	
Ariidae	Neoarius coatesi	Coates' catfish	√	√		
	Neoarius utarus	Northern rivers catfish	√	√		
	Neoarius velutinus	Papillate catfish	√	√		
	Brustiarius nox	Comb-gilled catfish	√	√		
	Brustiarius solidus	Hard-palate catfish	√	√		
Carangidae	Caranx sexfasciatus	Bigeye trevally			√	
Chandidae	Ambasis buruensis	Buru glass perchlet			√	
	Ambassis interruptus	Long-spined glass perchlet	√	√		
	Parambassis confinis	Sepik glass perchlet	√	√		
Eleotrididae	Butis amboinensis	Ambon gudgeon			√	
	Eleotris aquadulcis	Freshwater gudgeon		√		
	Eleotris melanosoma	Ebony gudgeon			√	
	Giuris margaritacea	Snakehead gudgeon	√			
	Hypseleotris guentheri	Rainbow prigi				√
	Mogurnda aurofodinae	Northern mogurnda	√	√		
	Mogurnda nesolepis	Yellowbelly gudgeon		√		
	Morgurnda sp.5	Malas gudgeon				√
	Ophieleotris aporos	Snakehead gudgeon	√	√		
	Ophiocara porocephala	Spangled gudgeon		√		
	Oxyeleotris fimbriata	Fimbriate gudgeon	√	√		
	Oxyeleotris gyrinoides	Greenback gauvina	√	√		
	Oxyeleotris heterodon	Sentani gudgeon	√	√		
Gobiidae	Awaous sp. 2	Ocellated goby				√
	Brachyamblyopus urolepis	Scaleless worm goby			√	
	Glossogobius aureus	Golden goby				√

Family	Scientific name	Common Name	BMT WBM 2011/2017	Hydrobiology 2008/2009, 2009, 2010	Allan & Coates 1990	Allan 1991
	Glossogobius bulmeri	Bulmer's goby	√	√		
	Glossogobius coatesi	Coates' goby	√	√		
	Glossogobius giurus	Flathead goby	√		√	
	Glossogobius koragensis	Sepik goby	√		√	
	Glossogobius torrentis	White water goby	√		√	
	Mugilogobius fusculus	Obscure goby			√	
	Redigobius bikolanus	Speckled goby			√	
	Sicyopterus cyanocephalus	Cleft-lipped goby				√
	Sicyopterus longifilis	Threadfin goby		√		
	Sicyopterus micrurus	Clinging goby				√
	Stenogobius beauforti	Beaufort's goby				√
	Stenogobius laterisquamatus	River goby		√		
Hemiramphidae	Zenarchopterus kampeni	Sepik River garfish	√	√		
Kuhlidae	Kuhlia marginata	Spotted flagtail			√	
	Kuhlia rupestris	Jungle perch			√	
Lutjanidae	Lutjanus goldiei	Papuan blackbass	√		√	
Melanotaeniidae	Chilatherina campsi	Highlands rainbowfish			√	
	Chilatherina crassispinosa	Silver rainbowfish	√	√		
	Chilatherina fasciata	Barred rainbowfish	√	√		
	Glossolepis multisquamatus	Sepik rainbowfish	√	√		
	Melanotaenia affinis	North New Guinea rainbowfish	√	√		
Mugilidae	Liza alata	Basket mullet				√
	Liza macrolepis	Large-scaled mullet			√	
	Liza melinoptera	Cream mullet			√	
	Liza tade	Rock mullet			√	
Plotosidae	Neosilurus gjellerupi coatesi	Northern tandan (b)				√
	Neosilurus gjellerupi	Northern tandan (a)	√	√		
	Neosilurus idenburgi	Idenburg tandan		√		
	Neosilurus novaeguineae	New Guinea tandan			√	
Pristidae	Pristis pristis	Freshwater sawfish			√	
Sciaenidae	Nibea soldado	Silver jewfish			√	
Synbranchidae	Ophisternon bengalense	Onegilled eel	√			

Family	Scientific name	Common Name	BMT WBM 2011/2017	Hydrobiology 2008/2009, 2009, 2010	Allan & Coates 1990	Allan 1991
Syngnathidae	Microphis spinachioides	Spinach pipefish			√	
Terapontidae	Hephaestus transmontanus	Sepik grunter	√			
Introduced Species						
Characidae	Piaractus brachypomus	Red belly pacu	√	√		
Cichlidae	Oreochromis mossambicus	Mozambique tilapia		√		
	Oreochromis niloticus	Nile tilapia	√	√		
	Tilapia rendalli	Redbreast tilapia	√	√		
	Clarias batrachus	Walking catfish	√	√		
Cyprinidae	Barbonymus gonionotus	Java carp	√	√		
	Cyprinus carpio	Common carp	√	√		
Poeciliidae	Gambusia affinis	Mosquitofish			√	
Prochilodontidae	Prochilodus argenteus	Rubber mouth	√	√		

5.4.3.1 Native Species

A number of species have been previously recorded in the Sepik River catchment but were not captured or observed in the 2010 to 2017 surveys. A large proportion of the species previously recorded within the catchment but not in the recent surveys were small-bodied species from the families Gobiidae, Eleotrididae and Chandidae. The fish species which were recorded in the surveys included a wide range of sizes, including small bodied species such as Eleotrididae gudgeons and Melanotaeniidae rainbowfish, to large-bodied species such as Ariidae catfish. It is possible that some of the small demersal (bottom-dwelling) species such as members of Gobiidae may have been under-represented in catches, particularly in lowland areas where seine netting and back-pack electrofishing is difficult.

Several species previously recorded within the catchment but not recorded from the surveys were estuarine species that spend part of their life-cycle in freshwaters. This includes the four species of Liza sp., *Caranx sexfasciatus* (bigeye trevally), *Anguilla obscura* (Pacific shortfin eel), *Pristis pristis* (freshwater sawfish), *Microphis spinachioides* (spinach pipefish), *Nibea soldado* (silver jewfish) and several of the Gobiidae species. The survey events included a high level of sampling effort in lowland river systems in which these species typically occur, however, specific targeted sampling methods may have needed to be employed to capture these species.

5.4.3.2 Non-native Species

To date, nine non-native fish species have been recorded in the Study Area. Most of the species have been introduced to the catchment for the purpose of improving fish stocks for human consumption, as well as mosquito control (i.e. *Gambusia affinis*) and aquarium escapees. Therefore, the Sepik River is considered to be a modified system.

While introductions of non-native fish have been occurring in PNG since 1949, the largest stock enhancement programs in the Sepik (and PNG generally) were (Smith 2007, Kolkolo 1995; Table 5-10):

- Sepik River Fish Stock Enhancement Project (SRFSEP) – conducted by FAO (FAO Project No. PNG/85/001) during 1987-93.
- FISHAID – conducted by FAO (FAO Project No. PNG93/007) during 1993–97. This involved the introduction of nine new species with the objective of 'improving naturally poor fish stocks of the Sepik-Ramu basin by stock enhancement' (FAO 1997). This was far larger in scale than the SRFSEP, and is the largest fish stocking program in PNG to date.

Surveys conducted in the Study Area indicate that non-native species now dominate the fish fauna of most aquatic ecosystem types, the exception being upland rivers and creeks. The most abundant non-native species recorded were:

- *Prochilodus argenteus* (rubber mouth), which was stocked in very large numbers in the Middle Sepik Middle Sepik, especially at Lake Chambri and Bunami, and Ramu isolated lakes within the mid Sepik, as well as mid and lower Ramu River catchment, as part of the FISHAID program (Kolkolo 1995).
- *Barbonymus gonionotus* (Java carp), which was stocked in large numbers at a small number of sites in the mid and lower Ramu and Sepik as part of the FISHAID program (Kolkolo 1995).
- *Piaractus brachypomas* (Amazonian pacu), which was stocked in large numbers in isolated lakes within the mid Sepik, as well as mid and lower Ramu River catchment, as part of the FISHAID program (Kolkolo 1995).
- *Cyprinus carpio* (European carp), which is one of the most commonly farmed fish species in PNG that has been released (both deliberately and accidental) into natural river systems (Jellyman et al. 2015).

Interestingly, the most abundant species released in the FISHAID program was *Tilapia rendalli* (173,111 individuals throughout the Sepik River system), however surveys in the Study Area only recorded this species in low abundance in lowland rivers and off-river water bodies. *Schizothorax richardsonii* (snow trout) was also stocked in high numbers (70,309) in high altitude environments throughout the Sepik-Ramu system, and has not been recorded in the Study Area to date.

Table 5-10 Non-native fish species of the Sepik River and stocking programs

Species	SRFSEP	FISHAID	Other [1] (unless stated otherwise)	Study Area Relative Abundance
Oreochromis mossambicus (Mozambique tilapia)	Not known	Not stocked	First introduced pre-1990 – deliberate introductions and escapees from small ponds	*
Oreochromis niloticus (Nile tilapia)	Not known	Not stocked	Farmed in small ponds, first introduced early 2000s	Low abundance in lowland river
Tilapia rendalli (redbreast tilapia)	900	173,111 (52 sites in a wide variety of habitat types)	-	Low abundance in lowland river and off-river water bodies
Osphronemus goramy (giant gouramy)	Not known	37 (single lake in mid-Ramu)	-	Not recorded
Barbonymus gonionotus (Java carp)	Not known	27,750 (8 sites in in mid and lower Ramu and Sepik)	-	Dominant in off-river water bodies and lowland river
Schizothorax richardsonii (snow trout)	Not known	70,309 (40 sites at high altitudes in East Sepik and Madang Provinces)	-	Not recorded
Tor putitora (golden mahseer)	Not known	29,827 (9 sites, mainly Yonki Reservoir, and middle Ramu)	-	Not recorded
Acrossocheilus hexagonolepis (chocolate mahseer)	Not known	11,224 (9 sites, mainly Yonki Reservoir, and middle Ramu)	-	Not recorded
Prochilodus argenteus (=*margravii*) (Rubber mouth)	Not known	160,511 (Middle Sepik, especially Lake Chambri and Bunami) and Ramu	-	Dominant in mid-catchment river systems
Piaractus brachypomus (=*Colossoma bidens*) (pacu)	Not known	14,511 (lakes in middle Sepik, middle and lower Ramu	-	Abundant in lowland river, as well as ORWB and mid-catchment river systems
Clarias batrachus (walking catfish)	Not known	Not stocked	Unknown (Allen 1991)	Low abundance in mid-catchment river and ORWB
Cyprinus carpio (European Carp)	Not known	Not stocked	First introduced pre-1990 – deliberate introductions and escapees from small ponds [2]	Abundant in lowland river and ORWB
Gambusia affinis (mosquitofish)	Not known	Not stocked	Widely introduced throughout PNG since 1949	Not recorded, but previous records for Sepik[3]

1 = Smith (2007); 2 = Jellyman et al. (2015); 3 = Allan and Coates (1990)

Many of the non-native species recorded in the Study Area are highly invasive species that are known elsewhere to adversely affect aquatic habitats and native fish species. The presence of *Cyprinus carpio* and the tilapia species *Oreochromis niloticus* and *Tilapia rendalli* is of most concern. Both carp and tilapia modify their environment to suit their conditions, often resulting in sub-optimal conditions for native species. This is often manifested as the destruction of aquatic plants and disturbance of sediments, which results in increased turbidity and habitat simplification (Polhemus *et al.* 2004). In the 2011 surveys, carp was abundant in lowland river habitats and to a lesser extent ORWBs, although they were only found in very low numbers in ORWBs in the 2008/2009, 2009 and 2010 surveys. The two tilapia species appeared to have low abundance throughout all survey periods and habitats. *Prochilodus argenteus* and *Piaractus brachypomus* have also been implicated in the decline of native fish in the Sepik-Ramu system, through grazing on aquatic vegetation (Jellyman *et al.* 2015). It is expected that in time, these invasive species and probably the other non-native species will spread throughout the catchment, and possibly into high altitude upland streams.

While the effects of non-native fish have not been experimentally evaluated in the Study Area, their preponderance in most aquatic ecosystem types (except upland rivers and creeks) is indicative of a highly modified fish community.

5.4.4 Species of Conservation Significance

5.4.4.1 Threatened species

The only threatened fish species that could occur within the Study Area is the freshwater sawfish (*Pristis pristis*). It is listed as Critically Endangered by the IUCN and has been reported to occur within the Sepik River catchment (Allen and Coates 1990), however it was not caught during any of the baseline assessments. This species is not easily captured using the sampling methods used in the baseline assessments, thus would require targeted surveys to determine patterns in distribution, abundance and demographics.

Pristis pristis is generally found in shallow near-shore marine environments and estuaries, but also in large, turbid rivers. Adults breed in estuarine or marine ecosystem types, but use freshwater reaches as nursery grounds (Thorburn *et al*. 2007). It is unlikely that this species inhabits the Project Area, which is dominated by clear, upland creeks. However, it may occur in the Study Area, within the downstream reaches of the Sepik River.

5.4.4.2 Near threatened and data deficient species

The freshwater gudgeon (*Eleotris aquadulcis*) is listed as Near Threatened by the IUCN and is known only to occur only from the Sepik-Ramu River system (Allen 1991). There were no specimens collected from sites in the Project Area during 2008/2009, 2009 and 2010 surveys. However, two specimens were caught at each of the two sites, W32 (Lower May River) and W39 (ORWB1) during the January and February 2009 surveys. These sites are located upstream of the Sepik-Frieda confluence. There were no specimens caught BMT WBM during 2011 and 2017 surveys at any of the sites in the Study Area.

Although there is minimal information available regarding the ecology of *Eleotris aquadulcis*, its population is classified as declining and is found mainly in oxbow lakes (Allen and Coates 1990). The species grows to a maximum size of 22 to 25 cm standard length. It is a benthic feeder on large aquatic insects, especially dragonfly larvae and snails (Allen and Coates 1990; Coates and Ulaiwi 1995). It spawns during the flood season between December and May and spends its entire life cycle in freshwater habitats.

The spinach pipefish (*Microphis spinachioides*) is listed as Data Deficient by the IUCN and is currently considered to be endemic to the Sepik River catchment. This species was not collected during any of the baseline assessments. Several specimens were collected from dense vegetation within the Sepik River along the shallow river margin at Angoram and Marienberg in the 1980's (Allen and Coates 1990). Furthermore, a single brooding male was reported in the lower reaches of the May River, a tributary of the middle Sepik River (Allen 1991). However, since these sightings there have been no reports of the species within the Sepik River catchment.

There is very little information available on the population status and ecology of *Microphis spinachioides.* Pipefish typically are found in marginal vegetation in quiet waters, feeding mainly on microcrustaceans (Ishihara and Tachihara 2008). ORWBs may represent a potential habitat for this species in the Study Area.

5.4.4.3 Other Non-listed Endemic Species

In addition to the Threatened and Near Threatened species mentioned in Sections 5.4.4.1 and 5.4.4.2, there are a further 15 freshwater fish species identified as being locally endemic (Sepik/Ramu systems) or endemic within the Northern New Guinea ecoregion (refer to Table 5-11). As described in Section 5.1, the high proportion of endemic fish is a distinct feature of PNG and Melanesian freshwater biotas.

Thirteen of these 15 species were recorded within the survey episodes and include:

- *Zenachopterus kampeni* (Sepik River garfish) – this species is endemic to Northern New Guinea and was not restricted to a single catchment, being recorded in Usake/May, Nena/Frieda and Sepik River catchments. This species was widespread and highly abundant species in the Study Area, recorded in lowland rivers, mid-catchment rivers and off-river water bodies.
- *Oxyeleotris heterodon* (sentani gudgeon) – occurs in multiple catchments and was recorded in high abundances within ORWBs in the Study Area.
- *Glossogobius bulmeri* (Bulmer's goby) – recorded in Sepik, Frieda, and Usake/May River catchments. This species occurs in mid-catchment rivers, upland rivers and upland creeks in the Study Area.
- *Glossolepis maculosus* (spotted rainbowfish) is restricted to the Markham and Ramu river systems (Allen 1991). It has not however been recorded in the Study Area to date. This species has been collected in small, clear flowing creeks, as typically found throughout the Study Area. It is possible that this species occurs in the Study Area.
- *Hephaetus transmontanus* (Sepik grunter) – recorded in low abundance in the Usake/May and Horden River catchments. This species occurred in mid-catchment rivers and upland creek habitats in the Study Area.
- Other species present across included a range of habitats included the locally endemic *Brustiarius nox* (comb-gilled catfish) and *Glossamia gjellerupii* (Gjellerup's mouth almighty).

The 2011 surveys found that lowland river habitats contained a greater number of species of conservation significance (seven species), with mid-catchment rivers and upland creeks/rivers recording the least amount of species of conservation significance (three species per habitat type). However, the 2008/2009, 2009 and 2010 surveys (Hydrobiology) found mid-catchment rivers had the highest number of species of conservation significance (seven species) and lowland species with the least (three species).

Table 5-11 Fish species of conservation significance within the Sepik River catchment (Hydrobiology 2010b, BMT WBM 2012)

Family	Species	Common name	Status	2008/2009, 2009, 2010 (Hydrobiology)	2011/2017 (BMT WBM)
IUCN Red Listed Threatened Species					
Pristidae	*Pristis pristis*	Freshwater sawfish	CR		
IUCN Red Listed Other Species					
Eleotrididae	*Eleotris aquadulcis*	Freshwater gudgeon	NT	√	
Syngnathidae	*Microphis spinachioides*	Spinach pipefish	DD		
Sepik Endemic Species					
Ariidae	*Brustiarius nox*	Comb-gilled catfish	U	√	√
Ariidae	*Neoarius coatesi*	Coate's catfish	U	√	√
Gobiidae	*Glossogobius coatesi*	Coate's goby	U	√	√
Gobiidae	*Mugilogobius fusculus*	Obscure goby	U		
Northern New Guinea Endemic Species					
Apogonidae	*Glossamia gjellerupi*	Gjellerup's mouth almighty	U	√	√
Ariidae	*Brustiarius solidus*	Hard-palate catfish	U	√	√
Ariidae	*Neoarius uterus*	Northern rivers catfish	U	√	√
Eleotrididae	*Oxyeleotris heterodon*	Sentani gudgeon	U	√	√
Gobiidae	*Glossogobius bulmeri*	Bulmer's goby	U	√	√
Gobiidae	*Glossogobius torrentis*	White water goby	U		√
Hemiramphidae	*Zenarchopterus kampeni*	Sepik River garfish	U	√	√
Melanotaeniidae	*Glossolepis multisquamtus*	Sepik rainbowfish	U		√
Melanotaeniidae	*Glossolepis maculosus*	Spotted rainbowfish	U		
Plotosidae	*Neosilurus gjellerupi*	Northern tandan	U	√	√
Terapontidae	*Hephaestus transmontanus*	Sepik grunter	U		√

Status (IUCN); NT = Near Threatened; CR = Critically Endangered; DD = Date Deficient; U = Undetermined

5.4.4.4 Implications of Different Fish Community Sampling and Analysis Methods

The main fish and macro-crustacean sampling methods employed by BMT in the 2011 and 2017 studies were electrofishing techniques (boat and back-pack based) in conjunction with baited traps. The 2008/2009, 2009 and 2010 monitoring events used a combination of different nets, baited traps and hydro-acoustic techniques. These different approaches produce a different assemblage of captured specimens, as different techniques may favour different species. Hydroacoustic techniques are an indirect measure of fish abundance, and provide no data on assemblage, and will therefore produce different outputs to direct methods.

It is important to acknowledge the different biases inherent in each sampling method. For example, baited traps are effective at capturing macro-crustaceans and small-bodied fish. Gill nets can be viewed as passive samplers, as they rely on fish to entangle themselves in the net, and may therefore preferentially capture more motile species. Electrofishing relies on the ability to see and collect stunned fish, therefore in deeper or turbid waters, the technique may preferentially bias results towards fish using the upper water column, or who respond to the electric field stronger. Hydroacoustic techniques potentially allow for enumeration of fish populations across a large area in a short period of time, however they provide no data on the species of fish sampled.

Notwithstanding these differences between sampling methods and their inherent biases, it would appear that a similar number of species were captured between different studies. As shown in Table 5-12, a comparison of the current and previous surveys indicated that the methods employed in the present study captured a similar number of overall species. This comparison, while simplistic, supports the use of electrofishing techniques as the primary sampling equipment at these sites.

Table 5-12 Summary of overall species richness recorded in aquatic biology surveys

Survey	No. Sites	Fish
November 2008	1	6
Nov/Dec 2009	23	22
Aug/Oct 2010	24	27
June/July 2011	20	31
December 2011	21	30
December 2017	8	10

5.4.5 Macro-crustacean Richness and Abundance

5.4.5.1 2008/2009, 2009, 2010 (Hydrobiology)

Fifteen macro-crustacean species from two families were collected during the 2008/2009, 2009 and 2010 sampling events. These consisted of five identified Macrobrachium species, within the family Palaemonidae, and several atyid shrimps (Atyidae) (Table 5-13).

The majority of species and individuals were collected from lowland rivers (52% of total abundance) and mid-catchment rivers (27% of total abundance), with decreasing species richness and abundance with elevation. ORWBs had the lowest species richness and abundance of the habitats. Upland creeks and rivers also had low species richness, with only four species, representing only 17% of total abundance, reported.

Table 5-13 Macro-crustacean species occurrence in key Sepik River catchment habitats from 2008 / 2009, 2009 and 2010 sampling events (Hydrobiology 2010b)

Family	Species Name	ORWB	LLR	MCR	ULC	ULR	Total
		Elevation (m ASL)					
		3-25	2-37	57-197	103-781	100-650	
2008 / 2009							
Atyidae	*Caridina* sp.*1*				1		1
Palaemonidae	*Macrobrachium latidactylus*			11			11
	Macrobrachium mammillodactylus		1				1
	Macrobrachium rosenbergii		2				2
	Macrobrachium sp.		4				4
	Macrobrachium sp. (juv.)		6				6
	Macrobrachium weberi		39				39
2009							
Atyidae	*Caridina* sp *cf laoagensis*			7			7
	Caridina sp 2			1			1
	Caridina sp. 3			20			20
Palaemonidae	*Macrobrachium bariense*			19			19
	Macrobrachium latidactylus	5	12	10			27
	Macrobrachium sp.				6	18	24
2010							
Atyidae	*Caridina nilotica complex*				1	3	4
	Caridina serratorostris					8	8
Palaemonidae	*Macrobrachium bariense*					6	6
	Macrobrachium equidens		7				7
	Macrobrachium mammillodactylus		19				19
	Macrobrachium sp. (juv.)	3	39				42
	Macrobrachium sp nov A			1			1
	Macrobrachium sp nov B		3				3
Total		8	132	69	8	35	252

5.4.5.2 2011 and 2017 (BMT WBM)

Seven macro-crustacean species from three families were collected during the 2011 and 2017 surveys. Species were dominated by freshwater prawns (Palaemonidae, Macrobrachium spp.), with additional small numbers of the freshwater crab (*Holthuisana* sp.) and freshwater shrimp (Atyidae, *Caradinia* sp.) (Table 5-14).

Macrobrachium spp. were the most diverse, abundant and widespread macro-crustacean group recorded. Species abundance was similar between the wet and dry season sampling events, however, an additional two *Macrobrachium* species were identified in December. Similar to the 2008/2009, 2009 and 2010 surveys, the majority of macro-crustacean species were collected from lowland rivers (76% of total abundance). Species richness decreased with increasing elevation, which was also reported in the earlier surveys.

Table 5-14 Macro-crustacean species recorded by BMT within key Sepik River catchment habitats during the June and December 2011 sampling events (BMT WBM, 2012) and November 2017 sampling events

Species	Jun-11 (dry season)					Dec-11 (wet season)					Nov-17 (wet season)		
	ORWB	LLR	MCR	ULC	Total	ORWB	LLR	MCR	ULC	Total	MCR	ULC	Total
Palaemonidae													
Macrobrachium c.f *latimanus*			2		2					0			
Macrobrachium mammillodactylus	85	236	20		341	25	315	7		347			
Macrobrachium sp.1							1			1			
Macrobrachium sp.2							1			1			
Macrobrachium sp.3											14		14
Sundathelphusidae													
Holthuisana sp.1			13	1	14				2	2		3	3
Atyidae													
Caridina sp				15	15				5	5			
Total	85	236	35	16	372	25	317	7	7	356	14	3	17

5.5 Freshwater Turtles and Crocodiles

5.5.1 Freshwater Turtles

The freshwater turtle fauna of New Guinea is poorly known (Georges *et al*. 2006), and there is little information on the geographic distributions of most species. There are two species of freshwater turtles reported to occur in the Sepik-Ramu River system, the northern New Guinea softshell turtle (*Pelochelys signifera*), and Schultze's snapping turtle (*Elseya schultzei*).

- *Pelochelys signifera* (northern New Guinea softshell turtle) is endemic to northern New Guinea and was assessed as Vulnerable under the IUCN Red List Criteria in March 2018 (listing yet to be published, pers. comm. S. Richards). Within northern PNG, it is known to inhabit lowland rivers, including the Sepik River system (Georges and Thomson 2010). *P. signifera* is a large species (up to 100cm). While it has a preference for main channel and off-river (i.e. wetland) freshwater habitats, it has also been reported in estuarine and coastal waters (Rhodin *et al*. 1993). Nesting occurs in the dry season, September to October (Rhodin et al. 2018).
- *Elseya schultzei* (Schultze's snapping turtle) is listed as Least Concern (IUCN 2000), although it is noted that a new IUCN assessment for this species is currently being undertaken. *E. schulzei*

is found in New Guinea and Indonesia to the north of the central mountain ranges. It is common and widespread in northern New Guinea, east of the Bird's Head region (pers. comm. S. Richards). This includes the Study Area (i.e. Sepik River system). *E. schultzei* is a small species preferring tidal freshwater creeks and streams, flooded sinkholes and swamps of the lowland rainforest (Georges *et al*. 2006). Nesting season is thought to be May-June (Richards 2018).

Community surveys and consultations were conducted with local villagers in 2011 as part of this assessment. These confirmed the presence of both *P. signifera* and *E. schulzei* at a number of sites within the study area. *P. signifera* was anecdotally reported to be common in most locations, while *E. schultzei* was considered abundant in all locations (BMT WBM 2011). However, neither species was recorded during the baseline surveys conducted for this project (i.e. Hydrobiology 2010, and BMT WBM 2012 and 2017).

5.5.2 Crocodiles

Two crocodile species occur in the Sepik River system: saltwater crocodile (*Crocodylus porosus*) and New Guinea (*Crocodylus novaeguineae*) (Table 5-15). Both species are listed in Appendix II of the Convention on International Trade in Endangered Species (CITES), meaning that trade in these animals (or products derived from them) is strictly regulated. Neither crocodile species is considered threatened under the IUCN Red List of Threatened Species; both are listed as Lower Risk/Least Concern.

- *Crocodylus porosus* has an extensive natural range, covering much of coastal Southeast Asia, New Guinea and northern Australia. *C. porosus* occurs throughout PNG, with the exception of the highlands. Within this range, it inhabits lowland rivers and their tributaries (especially tidal waters and coastlines); wetlands, swamps and marshes; inland lakes; and coastal brackish waters. *C. porosus* occurs throughout the Sepik River catchment.
- *Crocodylus novaeguineae* is a freshwater crocodile that is endemic to New Guinea and Pulau Kimaam, off the southwestern coast of Papua (Cox 2010). Its distribution is widespread across New Guinea, most commonly occurring in lowland environments where it prefers freshwater rivers and marshes. This includes the freshwaters of the Sepik River catchment. Given the similar broad distribution in the context of New Guinea, this species can co-occur with *C. porosus*. However, the two species have different habitat preferences, select different nesting sites, and exhibit avoidance behaviour between the two species (Hollands 1987).

Crocodiles are considered culturally and economically important to communities and commercial operations in the Study Area. They are important totemic symbols in many villages, and feature in rituals and ceremonies important to village life. Crocodiles are important to PNG society as a source of food and livelihoods; they are farmed and hunted for meat for local consumption, as well as export markets for meat and skin. Mainland Holdings Limited (MHL) is the largest commercial crocodile farming operator in the Sepik area, collecting up to 10,000 eggs per year from up to 200 clutches, which are raised on a ranch in Lae (Solmu 2009). Eggs are collected by villagers according to a quota system. Some smaller scale crocodile rearing is also conducted by some villagers, where the skins are sold to buyers from Wewak or Madang.

Harvesting of wild crocodiles is regulated by the *Crocodile Trade (Protection) Act 2003*. A management and monitoring program, known as the Sepik Wetlands Management Initiative (SWMI), is administered by CEPA (in collaboration with WWF and MHL). Nest counts have been undertaken on an (almost) annual basis since 1982 for both species of crocodile. The results of this program are used to inform the quotas set for the villages (which also depends on capacity at MHL's ranch). Both the activities of the SWMI and the MHL ranching program are ongoing (Barnabas Wilmott, Manager Wildlife Trade and Enforcement Branch, CEPA, Pers. Comm 8 August 2016).

During the baseline surveys for this project, *C. porosus* was incidentally observed by Hydrobiology 2010 at three locations in the Study Area (4°15'38.05"S, 141°52'59.84"E; 4°11'32.43"S, 143°29'5.95"E; 4° 4'41.49"S, 144° 5'28.88"E). *C. novaeguineae* was not observed during any of the surveys. Anecdotal evidence from villagers within the Study Area (BMT WBM 2017) suggests that crocodiles are generally most abundant in the off-river waterbodies and lowland river habitats.

5.5.3 Species of Conservation Significance

Threatened Species

Two freshwater turtle species have been recorded in the Sepik River basin, one is Vulnerable (*P. signifera*) and the other (*E. schultzei*) is currently listed as Least Concern by IUCN, but this classification is currently being re-assessed.

The two crocodile species known from PNG and the Sepik River basin (*C. novaeguineae*, *C. porosus*) are listed by the IUCN as Least Concern (i.e. not threatened or near threatened).

Endemic Species

The two freshwater turtle species occurring in the Study Area are endemic to northern New Guinea.

Crocodylus novaeguineae is endemic to New Guinea, but is common throughout its range.

Table 5-15 Crocodile and Freshwater Turtle Species of Conservation Significance in Study Area

Species name	Common name	IUCN	Geographic distribution	Endemism	Habitats	Presence in Study Area
Crocodylus porosus	Saltwater crocodile	Least concern	• Occurs across coastal southeast Asia, New Guinea, and northern Australia	N/A – not restricted to PNG	Inland lakes, swamps, marshes; coastal brackish waters, coastlines and tidal rivers. Terrestrial nest sites and basking areas.	Present
Crocodylus novaeguineae	New Guinea crocodile	Least concern	• Occurs throughout New Guinea • Genetic difference between populations occurring north and south of the Owen Stanley Range	Endemic to the islands of New Guinea and Pulau Kimaam	Lowland environments, preferring freshwater rivers and marshes.	Present
Elseya schultzei	Schultze's snapping turtle	Least concern (under assessment)	• Northern New Guinea	Endemic to northern New Guinea	Coastal freshwater streams, tidal rivers and swamps	Present
Pelochelys signifera	Northern New Guinea softshell turtle	Vulnerable	• Northern New Guinea	Endemic to northern New Guinea	Lowland freshwater habitats, such as inland streams, rivers, swamps, mudflats and estuaries[8]	Present

5.6 Metals in Aquatic Biota

All metals in fish tissue data (Hydrobiology and BMT WBM) are included in Appendix E. The following sections summarise this data.

5.6.1 2008/2009, 2009, 2010 (Hydrobiology)

Tissue samples were collected in nine species of native fish (*Brustiarius solidus, Brustiarius nox, Sciades uterus, Neoarius coatesi, Potamosilurus velutinus, Glossamia gjellerupi, Oxyeleotris heterodon, Chilatherina* sp., *Melanotaenia affinis*) and one prawn, *Macrobrachium* sp. and three non-native species (*Barbonymus gonionotus, P. brachypomus* and *Prochilodus argenteus*). Overall, 633 samples were analysed for metal/metalloid tissue analysis, which included 368 flesh tissue samples, 139 hind body samples, 52 liver samples, 43 tail samples, 20 head samples and 11 whole body samples.

Aquatic biota tissues were generally below the human health guidelines and generally expected levels (GEL) (ANZFA 2001, FSANZ 2015, FAO and WHO 2006). However, there were three instances where the guideline values were exceeded (Table 5-16). Selenium exceeded the GEL in one fish flesh sample at a Lowland River site in the Sepik River. Zinc exceeded the GEL in one fish flesh sample at an ORWB site and one fish flesh sample at Lowland River site in the Sepik River.

Table 5-16 Tissue metal food standard (GEL) exceedances from 2008/2009 and 2009 and 2010 sampling events

Analyte	Year	Species	Site	Tissue	Concentration (mg/kg)	ANZFA/FSANZ GEL
Selenium (Se)	2008	*Barbonymus gonionotus*	W64	Flesh	3.4	2 mg/kg ANZFA/FSANZ GEL
Zinc (Zn)	2010	*Brustiarius solidus*	RORWB	Flesh	18	15 mg/kg ANZFA/FSANZ GEL
Zinc (Zn)	2008	*Neoarius utarus*	W33	Flesh	34	15 mg/kg ANZFA/FSANZ GEL

The key results from the tissue metals analysis were as follows:

- Silver (LOR 0.1 mg/kg) was detected at low levels in the gills of two fish specimens. There are currently no food standards or guidance levels for silver.
- Cadmium (LOR 0.02 mg/kg) was detected in the gills of three fish samples and the liver of two fish samples from various aquatic ecosystem types and catchments. *Macrobrachium* sp. *cephalothorax* samples contained concentrations of cadmium above LOR several of the sites. There are currently no food standards or guidance levels for cadmium in fish tissues.
- Lead was detected at very low levels (<0.2 mg/kg) in the gills of some fish samples collected from the Sepik River catchment.
- Arsenic was detected at low levels (<0.3 mg/kg) below the GEL (2 mg/kg) in fish tissue samples at three Sepik River sites.
- Chromium was below detection limits at most sites, but was detected in a few fish flesh tissue samples (<0.8 mg/kg).
- Nickel and antimony were detected in some fish flesh samples across the catchment in all waterbody types.
- While detected in the 2008/2009 sampling event, antimony (LOR 0.3 mg/kg) was not detected in any samples collected in the 2009 (LOR 0.001 mg/kg) sampling event.
- Selenium was detected in samples at most sites below the GEL (2 mg/kg), except for some sites in Frieda River (W23, W38a), Sepik River (W33, W35 and W50) and Wario River (W36) which exceeded the GEL.
- Aluminium was elevated in flesh tissue at some sites relative to other sites throughout the catchment. In particular, aluminium was elevated (20 mg/kg) in *Brustiarius nox* (flesh and gill) at W04 (Figure 4-14), in *Macrobrachium* sp. *cephalothorax* and flesh samples collected at sites W36, W31B, W35 and W70 (13 – 200 mg/kg) and *Prochilodus argenteus* flesh at W36 (7.8 mg/kg).

- Low levels of mercury (<0.05 mg/kg) were found at most sites, except for some sites in Frieda River (W38a), Sepik River (W33, W35 and W50) and Wario River (W36) which exceeded the GEL.
- Zinc was found to be above the GEL (15 mg/kg) in one *Brustiarius solidus* flesh sample (18 mg/kg) at RORWB (2010) and at the GEL in one *Neoarius utarus* flesh sample (15 mg/kg) at W33 (2008).

5.6.2 2011 and 2017 (BMT WBM)

A total of eight fish species were collected for metal/metalloid tissue analysis, including six native species (*Z. kampeni, Arius* spp.*, G. koragenis, M. affinis, Chilatherina spp.* and *Giuris margaritacea*) and two non-native species (*B. gonionotus* and *P. argenteus*). A single species of freshwater prawn was also analysed (*Macrobrachium mammillodactylus*). Overall, 350 samples were analysed for metal/metalloid tissue burden analysis, which included 179 flesh tissue samples, 138 gill tissue samples and 33 hind body samples.

Results for fish biota have been grouped by tissue type and site/aquatic ecosystem type/river system within Table 5-17. No metals exceeded ANZFA/FSANZ guideline levels in macro-crustacean samples. Four metals (mercury, zinc, lead and copper) had concentrations that exceeded the food standards and/or indicative guideline values, as summarised below.

- Mercury concentrations of one fish hind body sample (1.2 mg/kg) at Site S2 (Upper May River at Hotmin Mission) exceeded the ANZFA Maximum Level (ML) guideline and FAO WHO Standard value of 0.5 mg/kg. Mercury concentrations of one fish flesh tissue sample at a Lowland River site in the Sepik River equalled the ANZFA Maximum Level (ML) guideline and FAO WHO Standard value of 0.5 mg/kg. All other samples had concentrations below relevant guidelines and standards.
- Zinc was recorded in all fish tissue samples, ranging from 2.3 to 25 mg/kg in fish flesh tissue, 6.4 to 180 mg/kg in hind body samples, 160 to 1,110 mg/kg in gill tissue samples and 10 to 13 mg/kg in Macrobrachium flesh tissue. The majority of sites had fish tissue samples with zinc concentrations greater than the 15 mg/kg ANZFA GEL. Zinc concentrations in fish hind body samples collected in the Usake/May and Idam River catchments were all above the GEL and generally higher than those collected in the Frieda/Niar/Nena catchment.
- Zinc concentrations in Ariidae catfish gills were higher than those recorded in other gill samples, and exceeded the ANZFA GEL of 15 mg/kg. The highest zinc concentrations were recorded in Ariidae catfish gill samples, which were only collected from Lowland River sites.
- Copper concentrations in three gill tissue samples were equal to or greater the ANZFA GEL value of 2.0 mg/kg. These samples were all collected from *B. gonionotus*, with two samples from Mid-River Catchment and one from Lowland River.
- Lead was typically recorded in non-detectable to low concentrations in flesh tissue samples, with the exception of one sample (*G. margaritacea* at ORWB) that had a slightly higher concentration than recorded elsewhere (0.13 mg/kg). Additionally, one gill tissue sample from

the Sepik River and one gill tissue sample from the Frieda River had lead concentrations above the FAO WHO standards for flesh tissue consumption (0.30 mg/kg).

Other metals/metalloids were recorded in concentrations below relevant guidelines/standards. Key trends in other metalloids/metalloids are summarised below:

- The range of aluminium concentrations was highly variable within fish and macro-crustacean tissues. There are no relevant guidelines or standards for this metal.
- There were no clear trends in manganese concentrations within samples, which ranged from 0.03 to 28 mg/kg.
- The range of nickel concentrations was relatively consistent for flesh tissue samples (0.01 to 0.72 mg/kg), gill tissue samples (0.02 to 2.3 mg/kg) and hind body samples (0.02 to 0.51 mg/kg) throughout the Study Area.
- Arsenic and cadmium had low concentrations within gill tissue and hind body samples and were usually below the limit of detection for flesh tissue samples. There were no major differences in arsenic and cadmium concentrations between catchments or habitat types.
- Low concentrations of selenium were recorded in fish tissue samples (0.05 to 1.9 mg/kg), gill tissue samples (0.05 to 1.5 mg/kg) and hind body samples (0.11 to 1.2 mg/kg).
- Silver (Ag) and antimony (Sb) concentrations were typically below the limit of detection.

Comparison between Hydrobiology and BMT WBM results

Overall, metal tissue analyses were generally below the GELs across all surveys. There was a greater number of exceedance of metal tissue concentrations in 2011 and 2017 than in the earlier sampling events. The 2008/2009, 2009 and 2010 samplings events only reported three samples exceeding the GEL, all of which were flesh tissue. However, the 2011 and 2017 surveys reported exceedances of metal levels (copper, lead, mercury and zinc) in gill and hind body tissue as well as flesh tissue.

Zinc was the only metal exceeding the GEL over multiple years (2008, 2010 and 2011). Selenium was elevated in 2008 but was below guideline levels for all other sampling years. Copper, lead and mercury exceeded guideline levels in 2011 and 2017, but were found to be below guideline levels in the Hydrobiology surveys. This may reflect inter-specific variations or changes in metal concentrations over time.

Table 5-17 Summary data of metal concentrations recorded in fish flesh tissue, gill tissue and hind body tissue in 2011 (BMT WBM 2012) and 2017 (mg/kg – wet weight)

Parameter		Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
Limit of Reporting (LOR)		0.5	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.02	0.01
ANZFA/FSANZ Food Standard (ML)				2					0.5				
ANZFA/FSANZ Food Standard (GEL)						2					2		15
FAO/WHO CODEX Standard							0.3		0.5				
Flesh tissue													
Frieda / Niar / Nena	min	0.5	0.01	0.05	0.01	0.09	0.01	0.12	0.01	0.01	0.07	0.02	2.3
	max	14.0	0.01	0.07	0.04	1.00	0.04	0.75	0.35	0.72	1.90	0.02	25
Sepik	min	0.5	0.01	0.05	0.01	0.06	0.01	0.10	0.01	0.01	0.05	0.02	2
	max	31.0	0.01	0.28	0.03	0.94	0.02	0.87	0.50	0.18	0.52	0.04	14
Wario	min	0.5	0.01	0.05	0.01	0.11	0.01	0.13	0.02	0.01	0.11	0.02	2.3
	max	1.7	0.01	0.05	0.01	0.23	0.03	0.48	0.30	0.08	0.57	0.02	3.7
ORWB	min	0.5	0.01	0.05	0.01	0.07	0.01	0.03	0.01	0.01	0.11	0.02	2.8
	max	3.2	0.01	0.05	0.02	0.39	0.13	0.86	0.37	0.33	0.46	0.02	6.8
Gill tissue													
Frieda / Niar / Nena	min	4.2	0.01	0.05	0.01	0.45	0.01	1.9	0.01	0.03	0.05	0.02	11
	max	120.0	0.15	0.78	0.19	1.80	0.36	14.0	0.19	2.30	0.94	0.03	43
Sepik	min	5.5	0.01	0.05	0.01	0.28	0.03	2.6	0.01	0.04	0.12	0.02	10
	max	170.0	0.01	0.16	0.08	2.90	0.36	28.0	0.05	0.60	1.10	0.02	1110
Wario	min	9.6	0.01	0.05	0.01	0.45	0.02	3.1	0.01	0.06	0.16	0.02	11
	max	96.0	0.01	0.08	0.01	0.80	0.22	10.0	0.05	0.52	1.50	0.02	20
ORWB	min	2.8	0.01	0.05	0.01	0.49	0.03	1.9	0.01	0.02	0.05	0.02	11
	max	57.0	0.01	0.06	0.06	2.10	0.25	55.0	0.04	0.69	0.91	0.02	46
Hind body tissue													
Frieda / Niar / Nena	min	0.5	0.01	0.05	0.01	0.22	0.01	0.47	0.03	0.02	0.11	0.02	6.4
	max	0.5	0.01	0.08	0.02	0.82	0.01	2.60	0.10	0.25	0.29	0.02	38
Usake / May	min	0.5	0.01	0.05	0.01	0.71	0.01	0.77	0.11	0.05	0.39	0.02	41
	max	13	0.01	0.19	0.02	1.9	0.13	28	1.20	0.51	1.20	0.15	180
Idam	min	1	0.01	0.05	0.01	1.1	0.01	10	0.13	0.01	0.57	0.02	150
	max	5.7	0.01	0.05	0.028	1.6	0.03	14	0.29	0.067	0.92	0.02	170

Note: green highlight denotes an exceedance of an ANZFA Maximum Level (ML) guideline value, yellow highlight denotes exceedance of a ANZFA GEL guideline value, grey highlight denotes exceedance of a FAO/WHO CODEX guideline value, and red highlight denotes exceedance of both guideline values.

5.7 Sensitivity Assessment

Aquatic features of high biodiversity values supported in the Study Area are:

- Aquatic species of biodiversity and conservation significance, including IUCN-listed threatened species (i.e. critically endangered, endangered and vulnerable species), and endemic species.
- Aquatic ecosystems.

The biodiversity values supported in the Study Area are described below. Sensitivities of aquatic ecosystems were assessed with reference to the following attributes:

(1) Habitat values to threatened and range restricted species.

(2) Potential food resources for local communities.

(3) Rarity/replacement of aquatic ecosystem type.

(4) Flow regime modifications.

(5) Instream barriers.

(6) Suspended sediments.

(7) Sedimentation.

(8) Increase in metals/metalloid concentrations.

(9) Weed infestation.

(10) Non-native species.

The sensitivity of aquatic species and ecosystem types was qualitatively classified (based on professional opinion) as either low, moderate or high based on:

- Known or likely tolerances of the attribute to disturbance (taking into account levels of background variability, biotic tolerances, and capacity to recover).
- Importance of the attribute to maintaining the aquatic ecosystem processes.
- Replacement capacity.

5.7.1 Aquatic Species

Threatened Species

As discussed in Section 5.4.4.1, the Study Area potentially supports one threatened fish species: the freshwater sawfish *Pristis pristis* (IUCN: Critically Endangered). *Pristis pristis* is generally found in shallow near-shore marine environments and estuaries, but also in large, turbid rivers. Adults breed in estuarine or marine ecosystem types, but use freshwater reaches as nursery grounds (Thorburn *et al*. 2007). This species has not been captured in fish surveys in the Study Area. If present in the Study Area, it is unlikely that *Pristis pristis* would venture into fast flowing streams due to unfavourable habitat conditions, but may occur in lowland rivers, mid-catchment rivers and ORWBs.

Two other threatened or near threatened freshwater fish species have been recorded in northern PNG:

- *Glossolepis wanamensis* (Lake Wanam rainbowfish) – Critically Endangered. This species is restricted to Lake Wanam in the lower Markham system, and is not expected to occur in the Study Area.
- *Eleotris aquadulcis* (freshwater gudgeon) – Near Threatened. This species is thought to be restricted to the Sepik and Ramu River systems, and has been recorded in the Study Area in upstream aquatic ecosystem types in very low abundances.

Endemic Species

The freshwater fauna of Papua New Guinea has characteristically high levels of endemism (i.e. species restricted to a particular area). The size of the area of occupancy can vary from small (e.g. to a lake or creek systems) to large (whole of the island of New Guinea). Reproductive isolation is a key mechanism driving speciation, a key evolutionary process (Rosenzweig 1995). The Study Area regularly experiences overland flows and flooding, which promotes inter-connectivity among aquatic ecosystem types in the floodplain (i.e. floodplain streams, oxbows, main river systems), and leads to rapid ongoing geomorphological changes. Upland areas that are remote from the sea, particularly those that are isolated, have a higher potential to support range restricted (local endemic) species.

As discussed in Section 5.4.4.3, several fish species are considered to be endemic to northern PNG. The study recorded 12 endemic species, including Sepik River garfish (*Zenachopterus kampeni),* sentani gudgeon (*Oxyeleotris heterodon)*, Bulmer's goby *(Glossogobius bulmeri*) and Gjellerup's mouth almighty (Glossamia gjellerupii).

Furthermore, as described in Section 5.3.3, there is a wide range of aquatic macroinvertebrates that have only been recorded to date in north-east PNG. There was a single endemic species, *Ciliometra sepik*, restricted to the Sepik-Ramu-Markham Basins region that could possibly occur in the Study Area. This species is thought to occur in lowland areas (a landscape type represented in the Study Area), however it is not known whether this species occurs in the Sepik River catchment or occurs more widely in the Sepik, Ramu or Markham basins. It is possible that the Study Area does support additional endemic insect species, although their status here cannot be determined due to lack of information on the geographic distribution and habitat requirements of different species. It is also possible that other species endemic to north-eastern PNG more generally could occur in the Study Area.

There is a lack of information on the distribution, ecology and systematics of PNG's aquatic flora and fauna generally. With additional work it is likely that other endemic species would be found, and that some range restricted species could occur over a much wider area than presently thought.

On the basis of the above:

- Threatened species - mid-catchment rivers, lowland river systems and ORWBs provide potential habitat for freshwater sawfish. There are insufficient data to determine its status in the Study Area, and whether the Study Area supports a significant proportion of its global population.

- Endemic species – all aquatic ecosystem types support habitat for regionally endemic species. However, there have been no confirmed locally endemic species (i.e. restricted to Study Area) present in Study Area.

5.7.2 Aquatic Ecosystems

Upland Rivers/Creeks

Upland rivers/creeks had the following characteristics:

- Generally fast-flowing, typically clear, neutral pH and well oxygenated waters.
- High canopy cover and structural habitat diversity.
- Low incidence of aquatic weeds (and aquatic macrophytes generally), reflecting high flows and bed instability, and high riparian canopy cover.
- High diversity of aquatic macroinvertebrates, particularly in littoral edge environments compared to bed sediments (due to low bed instability).
- Lower species richness of fish compared to other ecosystem types, and generally small-bodied species.
- Low incidence of non-native fish species, mostly reflecting habitat preferences of most non-native species in the Study Area for low flow environments, as well as numerous instream barriers.

This aquatic ecosystem type is common throughout the Study Area and PNG generally. The aquatic flora and fauna found in these environments are common and generally widespread in the region. The small-bodied fish species found here (e.g. rainbowfish, gudgeons) may represent a food resource for local villages.

The high velocity, flashy flow regime is a key driver of aquatic habitat structure and physio-chemical and biological processes in this aquatic ecosystem type. In particular, high flow velocities promote flushing and reduce the potential for sedimentation to occur, and reduce the potential establishment of aquatic species that prefer low energy environments (including aquatic weeds and most non-native fish). These streams generally have low ambient TSS concentrations (except during landslips and high rainfall periods), and biota therefore are likely to be intolerant of persistent high TSS concentrations, but tolerant of periodic high TSS. With the exception of copper (see Section 1.1) little is known about the complexing capacity of waters to metal/metalloid loading, and on this basis it should be conservatively assumed that biota will be sensitive to metal/metalloid concentrations exceeding ANZECC/ARMCANZ (2000) default trigger values (95% protection of species).

Table 5-18 Sensitivities of upland rivers/streams

Attribute	Rating	Description
Rarity/replacement opportunity for aquatic ecosystem type	L	Common in a Study Area and PNG context
Food resources for local villages	M	Small fish provide potential food resources for locals
Flow regime modifications	M	Flow regime is a key ecosystem driver (all phases of flow regime)
Instream barriers	M	Numerous natural instream barriers present, but vulnerable to additional barriers
Persistent high suspended sediment concentrations	M-H	Naturally low ambient TSS, but biota will have natural tolerance to periodic spates
Sedimentation	L	High flows reduce potential for sedimentation
Increase in metals/metalloid concentrations	M	Neutral ambient pH, but some complexation capacity
Weed infestation	L	High flows and riparian shading reduce risk of aquatic weeds
Non-native fish species	L	High flows and instream barriers reduce risk of infestation of most non-native fish species
Overall	**L-M**	

L = Low, M = Moderate, H = High

Mid-catchment Rivers and Lowland River Systems

Mid-catchment and lowland river systems had the following characteristics:

- Receiving waters of flows from upland streams (year-round) and ORWBs (during floods).
- Low flows, high DO, high TSS and low water transparency.
- Low riparian canopy cover and high structural habitat diversity on littoral margins.
- Low incidence of aquatic weeds (and aquatic macrophytes generally), reflecting high TSS and flood scour.
- Moderate diversity of aquatic macroinvertebrates.
- Moderate to high species richness of fish compared to other ecosystem types, comprised of both small-bodied and large-bodied species.
- High incidence of non-native fish species, mostly reflecting habitat preferences of most non-native species in the Study Area for low flow environments.

These aquatic ecosystem types are common throughout the Study Area and PNG generally. The aquatic fauna found in these environments are common and abundant, a possible exception being freshwater sawfish (if present; see Section 5.7.1). Native and non-native fish species may represent a food resource for local villages. These ecosystems provide year-round aquatic fauna movement corridors and refuges.

The ecosystems have moderate sensitivity to changes in water quality as they are well flushed, allowing dispersal and dilution of contaminants even during non-flood periods. The biota present in these habitats is tolerant to high TSS and sedimentation. High TSS, together with the complexation capacity of waters, may potentially reduce the toxicity of metals on aquatic ecosystems.

These ecosystems provide suitable habitat for aquatic species that prefer low energy environments (including aquatic weeds and most non-native fish). Both ecosystems represent a potential source of propagules for non-native fish and weeds.

Table 5-19 Sensitivities of mid-catchment and lowland rivers

Attribute	Rating	Description
Rarity/replacement opportunity for aquatic ecosystem type	L	Common in a Study Area and PNG context
Food resources for local villages	M	Small and large fish provide potential food resources for locals
Flow regime modifications	L	Flow regime is a key ecosystem driver (all phases of flow regime)
Instream barriers	L	Numerous natural instream barriers present, but vulnerable to additional barriers
Persistent high suspended sediment concentrations	L	Naturally high ambient TSS, biota will have natural tolerance to spates
Sedimentation	L	High flushing capacity for most of the time
Increase in metals/metalloid concentrations	M	Neutral ambient pH, some metal (copper and potentially other metals) complexation capacity and absorption by sediment
Weed infestation	L	High TSS reduces habitat values for aquatic weeds
Non-native fish species	M	Optimal habitat for of most non-native fish
Overall	**L-M**	

L = Low, M = Moderate, H = High

Off-river Water Bodies (ORWB)

ORWBs had the following characteristics:

- Intermittently connected to lowland rivers during floods.
- Low to no flows, low DO, low TSS and low water transparency (due to organic matter) during non-flood periods; high DO and TSS when inundated by floodwaters from lowland rivers.
- Low riparian canopy cover and structural habitat diversity.
- High cover of aquatic macrophytes in shallow littoral environments, but black waters limit submerged macrophyte cover in deeper waters.
- High diversity of aquatic macroinvertebrates.
- Moderate to species richness of fish compared to other ecosystem types, and generally small-bodied species.
- High incidence of non-native fish species, mostly reflecting habitat preferences of most non-native species in the Study Area for low flow environments.

This aquatic ecosystem type is moderately common throughout the Study Area and PNG generally. The aquatic flora and fauna found in these environments are common and generally widespread in the region. Native and non-native fish species found in ORWBs may represent a food resource for local villages. ORWBs are likely to provide aquatic refuge functions and a source of propagules for lowland river systems during flood periods.

While most of these ORWBs have low pH, they also generally have high dissolved organic carbon concentrations and high metal complexation capacity, which may (at least partly) reduce their sensitivity to metal contamination. ORWBs have moderate to high sensitivity to water quality and sediment impacts due to their limited capacity to disperse contaminants during non-flood periods. Floodwaters may flush contaminants from ORWBs, depending on the magnitude and type of contamination.

For much of the time, ORWBs do not experience flows, and provide suitable habitat for aquatic species that prefer low energy environments (including aquatic weeds and most non-native fish). Large river systems represent a potential source of propagules for non-native fish and weeds. ORWBs generally have low ambient TSS concentrations (except during flood events), and biota therefore are likely to be intolerant of persistent high TSS concentrations, but tolerant of periodic high TSS.

Table 5-20 Sensitivities of ORWBs

Attribute	Rating	Description
Rarity/replacement opportunity for aquatic ecosystem type	M	Moderately common in a Study Area and PNG context
Food resources for local villages	M	Small fish provide potential food resources for locals
Flow regime modifications	M	Flow regime is a key ecosystem driver (all phases of flow regime)
Instream barriers	L	Numerous natural instream barriers present, but vulnerable to additional barriers
Persistent high suspended sediment concentrations	M-H	Naturally low ambient TSS, but biota will have natural tolerance to periodic spates
Sedimentation	M-H	Low flushing capacity for most of the time, except during floods
Increase in metals/metalloid concentrations	M-H	Low ambient pH, but some complexation capacity, but low flushing capacity except during floods
Weed infestation	M-H	Optimal habitat for of aquatic weeds
Non-native fish species	M-H	Optimal habitat for of most non-native fish
Overall	**M-H**	

L = Low, M = Moderate, H = High

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Appendix A Water Quality Data

A.1 Hydrobiology Data (2007 - 2010)

Table A-1 In-Situ Data

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
Basecamp	26/02/2010	February-10	24.37	6.84	25.5	96.1	355	-	1586
Basecamp	11/08/2010	Aug/Oct 2010	24.42	6.44	97.3	95.1	381	0.04	6.1
RORWB	14/10/2010	Aug/Oct 2010	35.15	5.57	20.5	8.9	307	0	48.4
W02	2/09/2007	Sep-07	26.2	6.96	-	70.9	217	-	2.5
W02	30/11/2007	Dec-07	26.5	7.41	58.8	98.7	362	0.02	0
W02	18/04/2008	Apr-08	24.65	7.4	54.6	100.7	345	0.01	0
W02	30/07/2008	Jul-08	24.64	7.36	75.2	116.9	336	0.02	0
W02	23/10/2008	Oct-08	27.52	7.57	57	99.1	303	0.01	3.2
W02	10/12/2008	Dec-08	26.77	7.83	65	99	121.8	7.92	0
W02	21/01/2009	January-09	29.9	7.99	64	113.3	298	0.02	0
W02	30/10/2009	October-09	29.06	7.3	59	98.4	314	0.02	0
W02	25/02/2010	February-10	24.8	7.17	24.8	94.6	341	-	10.5
W02	25/04/2010	April 2010	25.7	6.54	52.2	108.2	121	-	-1
W02	5/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W03	2/09/2007	Sep-07	26.71	6.16	-	60.8	227	-	0
W03	30/11/2007	Dec-07	27.04	7.11	48.1	96	363	0.01	0
W03	18/04/2008	Apr-08	24.61	7.01	43.8	95.6	337	0.01	0
W03	30/07/2008	Jul-08	25.13	7.07	59.9	85.6	324	0.32	0
W03	23/10/2008	Oct-08	28.15	7.25	49.1	99	355	0.01	7.8
W03	10/12/2008	Dec-08	27.01	7.42	54	92	113.8	7.33	0.8
W03	21/01/2009	January-09	29.5	7.86	51	87.1	306	0.01	0
W03	30/10/2009	October-09	28.93	6.95	48.5	99	324	0.01	0.8
W03	25/02/2010	February-10	24.7	7.04	20.1	93.6	319	-	11.1
W03	25/04/2010	April 2010	25.8	6.26	40.9	103.4	121	-	-1.1
W03	5/08/2010	Aug/Oct 2010	26.58	6.38	55.8	96.8	387	0.01	8.5
W04	2/09/2007	Sep-07	26.22	8.01	-	80.2	219	-	15
W04	30/11/2007	Dec-07	26.98	8.06	79.3	105.1	343	0.03	3.7
W04	18/04/2008	Apr-08	24.29	7.69	78.8	100.7	388	0.03	7.8
W04	30/07/2008	Jul-08	24.46	7.91	104.2	124.2	360	0.04	2.3
W04	23/10/2008	Oct-08	27.37	7.81	34.6	101.7	308	0.02	92.3
W04	10/12/2008	Dec-08	25.2	7.87	74	96.1	108.1	7.91	29.1
W04	21/01/2009	January-09	27.8	8.53	83.3	94.6	279	0.03	4
W04	30/10/2009	October-09	28.28	8.16	85.1	109.4	281	0.03	0.4
W04	25/02/2010	February-10	24.23	7.61	38.3	98.8	313	-	33
W04	25/04/2010	April 2010	25.6	6.12	41.1	103.3	119	-	2.6
W04	5/08/2010	Aug/Oct 2010	27.85	6.13	49.4	96.4	376	0.01	52.3

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W07	2/09/2007	Sep-07	25.35	6.24	-	61.1	210	-	0
W07	30/11/2007	Dec-07	25.5	7.47	44.7	97.9	359	0.001	0
W07	18/04/2008	Apr-08	23.57	7.22	40.6	103.9	345	0.01	0
W07	30/07/2008	Jul-08	24.15	7.46	60.4	119.2	309	0.02	0
W07	23/10/2008	Oct-08	26.26	7.58	42.6	94.1	308	0.01	0.2
W07	10/12/2008	Dec-08	25.92	8.03	52	95.9	115.2	7.79	0.2
W07	21/01/2009	January-09	27.02	8.32	48.6	105.2	289	0.01	0
W07	30/10/2009	October-09	28.38	7.35	46.5	99	335	0.01	1
W07	25/02/2010	February-10	23.88	7.15	17.6	96.4	326	-	22.1
W07	25/04/2010	April 2010	25.2	6.66	1.4	109	126	-	-1.1
W07	5/08/2010	Aug/Oct 2010	25.04	6.93	49.3	100.5	362	0.01	6.6
W102	16/08/2010	Aug/Oct 2010	23.84	7.18	86	97.9	392	0.03	58.6
W114	16/10/2010	Aug/Oct 2010	23.6	7.42	84.5	2.9	338	0.03	363.8
W115	16/10/2010	Aug/Oct 2010	27.8	7.25	56.3	4.6	341	0.01	14
W17	2/09/2007	Sep-07	22	7.65	-	80.7	227	-	1.1
W17	30/11/2007	Dec-07	23.79	7.53	37.3	97.4	357	0	0
W17	18/04/2008	Apr-08	23.31	7.63	38.2	99.6	349	0.01	0
W17	30/07/2008	Jul-08	23.54	7.76	51.6	119.4	3.33	0.01	0
W17	23/10/2008	Oct-08	25.05	7.69	32.7	97.4	314	0	0
W17	8/12/2008	Dec-08	24.04	7.73	45	93.3	114.1	7.85	0.9
W17	21/01/2009	January-09	24.4	8.04	39.7	98.7	308	0.01	0
W17	30/10/2009	October-09	25.76	7.27	38	95.8	336	0	0
W17	25/02/2010	February-10	23.25	6.78	13.9	2.9	326	-	30.4
W17	25/04/2010	April 2010	25.2	6.74	31.6	106.5	146	-	-1.5
W17	5/08/2010	Aug/Oct 2010	22.2	8.58	31.2	-	-	-	-
W18	2/12/2007	Dec-07	23.93	7.81	46.8	100.3	337	0.01	0
W18	18/04/2008	Apr-08	-	-	-	-	-	-	-
W18	30/07/2008	Jul-08	23.53	7.52	69.9	117.4	363	0.02	0
W18	24/10/2008	Oct-08	24.06	7.82	47.2	98.7	311	0.01	1.1
W18	8/12/2008	Dec-08	24.81	7.92	55	95.3	121.7	7.9	1
W18	21/01/2009	January-09	23.5	7.9	94.7	97.2	331	0.04	0
W18	25/02/2010	February-10	23.57	7.36	15.7	98.4	332	-	13.6
W18	25/04/2010	April 2010	25.8	7.08	39.3	105.2	159	-	-0.1
W18	8/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W22	2/09/2007	Sep-07	24.07	7.55	-	76.1	221	-	61
W22	1/12/2007	Dec-07	27.28	8.2	78.2	110.2	337	0.03	17.4
W22	17/04/2008	Apr-08	26.21	7.8	86.6	99.1	331	0.03	154.4
W22	30/07/2008	Jul-08	27.72	8.03	102.4	128.5	334	0.04	38.9
W22	24/10/2008	Oct-08	28.61	8.09	81.5	101.6	307	0.03	589
W22	8/12/2008	Dec-08	27.87	7.99	91	95.3	92.8	7.48	14.5

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W22	21/01/2009	January-09	25.8	7.55	84.8	102.1	315	0.03	81.2
W22	30/10/2009	October-09	25.79	7.6	66.7	99.6	317	0.02	150.3
W22	25/02/2010	February-10	27.21	7.54	43.2	99.2	336	-	707
W22	25/04/2010	April 2010	28.7	7.46	77.7	114.7	162	-	23.6
W22	6/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W23	31/08/2007	Sep-07	21.7	7.19	-	75.1	212	-	99
W23	18/04/2008	Apr-08	25.9	7.62	71.2	97.8	355	0.02	103.4
W23	30/07/2008	Jul-08	26.13	7.64	88.6	119.6	334	0.03	37.1
W23	25/10/2008	Oct-08	24.09	7.87	43.4	95.2	331	0.01	469
W23	8/12/2008	Dec-08	27.37	7.83	81	93.3	125.3	7.38	11.4
W23	21/01/2009	January-09	24.39	6.47	70.4	96.5	356	0.02	44.5
W23	4/11/2009	October-09	26.03	7.4	63.1	98.1	335	0.02	121.2
W23	25/02/2010	February-10	24.55	7.47	24.2	97	341	-	578
W23	25/04/2010	April 2010	26.6	6.98	57.4	108.2	146	-	17.1
W23	6/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W26	3/09/2007	Sep-07	32.89	3.8	-	58.9	267	-	11.1
W26	3/12/2007	Dec-07	30.58	6.19	13.7	82.3	459	0	5.1
W26	12/10/2010	Aug/Oct 2010	34.86	8.4	28.6	8.8	273	0	79.5
W26	18/04/2008	Apr-08	-	-	-	-	-	-	-
W26	30/07/2008	Jul-08	28.87	4.53	15.8	66.3	419	-0.01	61
W26	27/10/2008	Oct-08	29.85	5.63	17.6	71.4	362	-0.01	36.4
W26	8/12/2008	Dec-08	29.06	7.34	25	75.5	143.1	5.74	8.4
W26	21/01/2009	January-09	28.73	6.75	11.7	31.9	356	0	18.5
W27	4/09/2007	Sep-07	22.42	3.64	-	74.8	332	-	4.1
W27	2/12/2007	Dec-07	22.5	4.37	88.6	97.7	554	0.03	0
W27	17/04/2008	Apr-08	22.53	4.08	102.2	96.3	576	0.04	0
W27	30/07/2008	Jul-08	21.59	4.47	35.4	115.4	462	0	97.4
W27	23/10/2008	Oct-08	22.46	4.12	72.4	96	506	0.02	10.3
W27	8/12/2008	Dec-08	24.28	4.32	141	90.9	361.9	7.61	1.4
W27	21/01/2009	January-09	24.3	4.44	63.3	95.8	485	0.02	8
W27	31/10/2009	October-09	22.42	3.95	55.8	94.6	448	0.01	94.6
W27	25/02/2010	February-10	23.62	3.97	41.7	95.4	472	-	7.7
W27	26/04/2010	April 2010	26.3	3.96	100.5	102.2	279	-	0.3
W27	11/08/2010	Aug/Oct 2010	21.77	3.65	130.8	94.1	612	0.05	5
W28	2/09/2007	Sep-07	21.34	7.58	-	88.5	221	-	1.4
W28	30/11/2007	Dec-07	22.9	7.79	47.1	99.2	358	0.01	0
W28	18/04/2008	Apr-08	-	-	-	-	-	-	-
W28	30/07/2008	Jul-08	22.35	7.41	64.1	113.6	3.71	0.02	124.6
W28	23/10/2008	Oct-08	23.04	6.91	40.9	96	367	0.01	1.6
W28	8/12/2008	Dec-08	21.54	7.4	49	91.5	133.5	8.07	1.7

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W28	21/01/2009	January-09	23.86	8.39	56.5	96.1	304	0.01	0
W28	31/10/2009	October-09	24.85	7.71	53.4	95.1	313	0.01	0
W28	25/02/2010	February-10	21.69	7.22	16.4	2.3	335	-	0
W28	25/04/2010	April 2010	23.7	6.89	43.6	102.5	156	-	-1.1
W28	10/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W29	31/08/2007	Sep-07	21.53	7.23	-	76.4	212	-	10
W29	1/12/2007	Dec-07	24.22	7.69	41.9	103.5	351	0.01	0
W29	17/04/2008	Apr-08	24.56	7.67	56.3	100.6	339	0.01	0
W29	30/07/2008	Jul-08	24.28	7.7	73.2	119.5	338	0.02	0
W29	24/10/2008	Oct-08	24.93	7.82	50.2	100.2	282	0.01	0
W29	8/12/2008	Dec-08	24.69	7.82	50	95.5	113.5	7.93	1
W29	21/01/2009	January-09	24.17	8.16	50.9	9.3	311	0.01	0
W29	31/10/2009	October-09	28.58	6.81	32.8	99.9	323	0	66.6
W29	25/02/2010	February-10	23.9	7.35	15.8	100.3	351	-	29.2
W29	25/04/2010	April 2010	26.3	7.02	41.9	106.2	167	-	-0.1
W29	12/08/2010	Aug/Oct 2010	25.29	7.15	60.6	99.6	377	-	3.8
W31	5/12/2007	Dec-07	29.51	7.02	72	99.6	319	0.02	0
W31	18/04/2008	Apr-08	-	-	-	-	-	-	-
W31	30/07/2008	Jul-08	27.48	7.18	84.3	112.1	302	0.03	3.1
W31	27/10/2008	Oct-08	25.39	7.28	46.1	92.4	336	0.01	103.6
W31	8/12/2008	Dec-08	25.1	7.37	57	89.3	123.5	7.37	10.1
W31	21/01/2009	January-09	27.7	7.81	46.8	98.6	281	0.01	19.2
W31	31/10/2009	October-09	27.95	6.92	56.2	94.1	301	0.01	5.2
W31	26/02/2010	February-10	25.24	6.92	176	92.6	341	-	140.4
W31	25/04/2010	April 2010	25	6.06	43.2	93.6	117	-	30.2
W31	5/08/2010	Aug/Oct 2010	26.47	6.92	72.3	91.9	280	0.02	14.6
W33	5/12/2007	Dec-07	29	7.59	115.3	79.9	368	0.05	355.7
W33	18/04/2008	Apr-08	28.07	-	114.9	77.9	336	0.05	363
W33	30/07/2008	Jul-08	28.51	7.6	204.9	95.5	377	0.09	173.7
W33	27/10/2008	Oct-08	29.62	7.73	162.3	97.7	323	0.07	294.9
W33	8/12/2008	Dec-08	26.84	7.6	152	70.9	178.5	5.59	442.2
W33	21/01/2009	January-09	28.5	7.87	142	76.1	314	0.06	286.4
W33	31/10/2009	October-09	28.16	7.03	112.7	76.3	361	0.04	290.7
W33	26/02/2010	February-10	27.27	7.42	61.8	69.3	322	-	636
W33	26/04/2010	April 2010	-	-	-	-	-	-	-
W33	7/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W34	31/08/2007	Sep-07	26.4	6.55	-	46.9	240	-	26.4
W34	5/12/2007	Dec-07	28.96	7.4	99.9	77.2	366	0.04	240.1
W34	18/04/2008	Apr-08	27.97	-	100.7	72.8	354	0.04	195
W34	30/07/2008	Jul-08	28.61	7.47	162	88.2	346	0.07	114.8

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W34	26/10/2008	Oct-08	29.86	7.64	126.8	73.1	370	0.05	451
W34	8/12/2008	Dec-08	26.86	7.52	135	65.1	104.6	5	284.7
W34	21/01/2009	January-09	28.17	8	116.1	70.8	296	0.05	221
W34	31/10/2009	October-09	28.39	6.98	99.7	67.7	340	0.04	210.9
W34	26/02/2010	February-10	27.44	6.99	47.5	58.4	326	-	323.8
W34	26/04/2010	April 2010	-	-	-	-	-	-	-
W34	11/10/2010	Aug/Oct 2010	28.75	7.19	133.6	75.9	346	0.06	234.9
W35	18/04/2008	Apr-08	28.12	-	95	69.4	348	0.04	223.3
W35	30/07/2008	Jul-08	28.31	7.34	140.3	83.7	357	0.06	233.6
W35	26/10/2008	Oct-08	29.07	7.69	115	71.5	330	0.05	463
W35	10/12/2008	Dec-08	27.43	7.49	124	45	118.3	3.56	389.3
W35	21/01/2009	January-09	28.6	7.87	108	62.3	289	0.04	313.2
W35	31/10/2009	October-09	29	7.03	113.2	69.3	337	0.05	348.5
W35	26/04/2010	April 2010	-	-	-	-	-	-	-
W35	16/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W36	3/09/2007	Sep-07	23.36	7	-	72.7	242	-	87.1
W36	3/12/2007	Dec-07	25.04	7.28	55.1	93.7	354	0.01	120.9
W36	18/04/2008	Apr-08	26.46	7.08	87.8	93.4	360	0.03	12
W36	30/07/2008	Jul-08	25.15	7.04	56.7	110.1	375	0.01	200.3
W36	26/10/2008	Oct-08	26.74	7.51	60.8	95.2	323	0.02	100.1
W36	10/12/2008	Dec-08	25.06	7.83	63	89.3	118.6	7.37	170
W36	21/01/2009	January-09	26.6	7.84	91.1	93.7	255	0.03	20.3
W36	31/10/2009	October-09	27.02	7.45	76.6	92.6	331	0.03	82.5
W36	25/02/2010	February-10	25.23	7.96	34.9	91.2	316	-	460
W36	25/04/2010	April 2010	25.7	7.22	80.9	103.7	138	-	257
W36	6/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W38A	5/12/2007	Dec-07	27.31	7.22	64.6	92.3	356	0.02	67
W38A	10/12/2008	Dec-08	26	7.78	59	84	120.6	6.82	130.7
W38A	26/04/2010	April 2010	28.9	6.56	71.1	86.6	139	-	22.4
W38A	1/12/2007	Dec-07	-	-	-	-	-	-	-
W38A	18/04/2008	Apr-08	26.36	6.98	80.3	85.3	342	0.03	99.3
W38A	30/07/2008	Jul-08	24.18	7.03	76.8	102	383	0.03	68.6
W38A	27/10/2008	Oct-08	25.28	7.92	45.1	89.8	320	0.01	233.9
W38A	21/01/2009	January-09	26.9	7.22	71.9	89.3	319	0.02	57.3
W38A	31/10/2009	October-09	28.94	6.98	74.5	87.5	372	0.02	93
W38A	26/02/2010	February-10	25.54	7.21	27.3	85.4	318	-	196
W38A	7/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W41	2/09/2007	Sep-07	24.16	6.57	-	82.7	238	-	3.4
W41	1/12/2007	Dec-07	26.28	7.34	48.6	101.4	357	0.01	0
W41	17/04/2008	Apr-08	25.79	7.07	48.4	95.1	310	0.01	0

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W41	30/07/2008	Jul-08	26.81	7.16	55.5	126.2	3.73	0.01	0
W41	24/10/2008	Oct-08	26.46	7.29	42.3	97	292	0.01	0
W41	8/12/2008	Dec-08	27.07	7.47	52	90.1	72	7.17	0.5
W41	21/01/2009	January-09	25.5	7.68	48.3	95.6	321	0.01	0
W41	25/04/2010	April 2010	28.6	6.88	39.1	98.6	173	-	-0.7
W42	31/08/2007	Sep-07	22.9	7.37	-	63	205	-	14.3
W42	1/12/2007	Dec-07	25.01	7.92	83.3	99.7	348	0.03	0
W42	17/04/2008	Apr-08	25.1	7.74	81.7	98.7	310	0.03	1.3
W42	30/07/2008	Jul-08	24.66	7.86	105.2	117.9	381	0.04	0
W42	24/10/2008	Oct-08	25.33	7.95	77.7	97.5	291	0.03	2.3
W42	8/12/2008	Dec-08	26.77	7.97	92	92	117.2	7.36	0.9
W42	21/01/2009	January-09	24.3	8.07	82.3	96.8	309	0.03	0
W42	25/04/2010	April 2010	26.2	7.27	50	107.4	173	-	-0.2
W43	31/08/2007	Sep-07	24.48	7.14	-	65.5	215	-	13.2
W43	1/12/2007	Dec-07	26.07	7.73	56.8	104.8	345	0.02	0
W43	17/04/2008	Apr-08	26.21	7.17	59.2	100.9	333	0.02	0
W43	30/07/2008	Jul-08	26.46	7.75	72.7	125.7	3.31	0.02	0
W43	24/10/2008	Oct-08	26.23	7.76	55.8	100.6	291	0.01	2.5
W43	8/12/2008	Dec-08	27.53	7.93	78	94.8	113.8	7.48	4.1
W43	21/01/2009	January-09	24.9	7.81	57.1	98.7	316	0.02	0
W43	31/10/2009	October-09	24.86	7.07	4.5	95.8	344	0.01	22.4
W43	25/02/2010	February-10	25.69	7.35	233	98.7	329	-	21.3
W43	25/04/2010	April 2010	27.8	6.99	46.4	110	202	-	0.9
W43	6/08/2010	Aug/Oct 2010	26.83	6.98	64.7	100.4	463	0.02	5.8
W48	18/04/2008	Apr-08	22.74	6.92	21.2	96.5	357	0	0
W48	30/07/2008	Jul-08	22.87	6.72	35.4	111.9	345	0	0
W48	24/10/2008	Oct-08	23.36	6.24	19.9	96.1	397	0	0
W48	8/12/2008	Dec-08	23.65	7.54	26	91.2	117.6	7.73	0.2
W48	21/01/2009	January-09	24	8.01	24	94.7	311	0	0
W48	25/02/2010	February-10	22.76	6.39	8.7	95.6	335	-	2.1
W48	25/04/2010	April 2010	24.4	6.23	16.6	102.5	161	-	-1.8
W48	10/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W49	10/12/2008	Dec-08	-	-	-	-	-	-	-
W50	8/12/2008	Dec-08	-	-	-	-	-	-	-
W50	26/02/2010	February-10	27.31	7.06	46.2	57.9	322	-	294.2
W50	26/04/2010	April 2010	-	-	-	-	-	-	-
W50	7/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-
W51	27/02/2010	February-10	28.45	6.72	43.6	33.1	366	0.01	101.6
W51	27/04/2010	April 2010	29.1	6.5	95	57.7	161	-	90.3
W54	21/01/2009	January-09	29.5	8.28	104.4	86.2	295	0.04	220.8

Station	Date	Sampling Round (month/year)	Temp (Deg C)	pH (ph)	Cond (Field) (microS/cm)	LDO (% sat)	ORP (mV)	Salinity (ppt)	Turb (NTU)
W54	3/11/2009	October-09	29.41	7.15	116.8	79.5	336	0.05	182.6
W54	26/02/2010	February-10	26.97	7.55	62	74.2	310	-	697
W54	26/05/2010	April 2010	26.7	6.88	86.4	70.3	167	-	323
W60	26/02/2010	February-10	27.5	6.85	42.7	50.1	336	0.01	214.2
W60	26/04/2010	April 2010	-	-	-	-	-	-	-
W60	7/08/2010	Aug/Oct 2010	28.17	7.16	117.6	4.8	249	0.05	422
W61	27/02/2010	February-10	28.11	6.9	43.6	37.3	346	0.01	117
W61	27/04/2010	April 2010	28.5	6.17	83.2	38.6	201	-	98.1
W61	22/10/2010	Aug/Oct 2010	28.64	7.06	116	5.1	307	0.05	397.8
W62	27/02/2010	February-10	30.25	7.07	44.7	68.9	366	0.01	14.1
W62	27/04/2010	April 2010	31.3	6.22	80.5	49.7	165	-	1.6
W62	10/10/2010	Aug/Oct 2010	37.92	8.03	248.5	124.6	313	0.12	13.5
W63	27/02/2010	February-10	28.72	6.77	42.9	34.1	355	0.01	87
W63	27/04/2010	April 2010	30.2	6.44	90.5	22	143	-	47.2
W63	23/10/2010	Aug/Oct 2010	28.93	6.8	103.7	5.2	313	0.04	263.3
W64	27/02/2010	February-10	28.33	6.84	40	36.9	341	0.01	201.5
W64	27/04/2010	April 2010	29.9	6.73	86.9	21.9	133	-	78.8
W64	25/10/2010	Aug/Oct 2010	29.28	6.8	107.3	5.4	317	0.04	233.5
W65	27/02/2010	February-10	28.61	7.51	44.8	37.2	373	0.01	206.8
W65	27/04/2010	April 2010	31.6	6.74	89.1	87.6	146	-	103.6
W70	27/08/2010	Aug/Oct 2010	28.7	6.4	52.6	77.5	320	0.01	50.3
W71	25/04/2010	April 2010	27.8	6.77	79.2	98.4	148	-	22.6

Table A-2 Nutrients Data

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
Basecamp	26/02/2010	February-10	-	-	-	-	-	-
Basecamp	11/08/2010	Aug/Oct 2010	<0.01	0.03	0.04	0.3	0.3	<0.01
RORWB	14/10/2010	Aug/Oct 2010	0.05	0.01	<0.01	0.7	0.7	0.06
W02	2/09/2007	Sep-07	-	-	-	-	-	-
W02	30/11/2007	Dec-07	-	-	-	-	-	-
W02	1/12/2007	Dec-07	-	-	-	-	-	-
W02	18/04/2008	Apr-08	-	-	<0.010	0.2	0.2	0.02
W02	30/07/2008	Jul-08	-	-	-	-	-	-
W02	23/10/2008	Oct-08	-	-	-	-	-	-
W02	10/12/2008	Dec-08	-	-	-	-	-	-
W02	21/01/2009	January-09	-	-	-	-	-	-
W02	30/10/2009	October-09	0.01	0.04	0.02	<0.1	<0.1	<0.01
W02	25/02/2010	February-10	-	-	-	-	-	-
W02	25/04/2010	April 2010	-	-	-	-	-	-
W02	5/08/2010	Aug/Oct 2010	<0.01	0.09	<0.01	0.2	0.2	<0.01
W03	2/09/2007	Sep-07	-	-	-	-	-	-
W03	30/11/2007	Dec-07	-	-	-	-	-	-
W03	1/12/2007	Dec-07	-	-	-	-	-	-
W03	18/04/2008	Apr-08	-	-	0.012	0.2	0.2	0.02
W03	30/07/2008	Jul-08	-	-	-	-	-	-
W03	23/10/2008	Oct-08	-	-	<0.01	0.8	0.8	3.24
W03	10/12/2008	Dec-08	-	-	-	-	-	-
W03	21/01/2009	January-09	-	-	-	-	-	-
W03	30/10/2009	October-09	<0.01	0.03	0.03	<0.1	<0.1	<0.01
W03	25/02/2010	February-10	-	-	-	-	-	-
W03	25/04/2010	April 2010	-	-	-	-	-	-
W03	5/08/2010	Aug/Oct 2010	<0.01	0.04	0.02	0.1	0.1	<0.01
W04	2/09/2007	Sep-07	-	-	-	-	-	-
W04	30/11/2007	Dec-07	-	-	-	-	-	-
W04	1/12/2007	Dec-07	-	-	-	-	-	-
W04	18/04/2008	Apr-08	-	-	0.030	0.3	0.3	0.03
W04	30/07/2008	Jul-08	-	-	-	-	-	-
W04	23/10/2008	Oct-08	-	-	-	-	-	-
W04	10/12/2008	Dec-08	-	-	-	-	-	-
W04	21/01/2009	January-09	-	-	-	-	-	-
W04	30/10/2009	October-09	<0.01	0.04	0.05	<0.1	<0.1	0.19
W04	25/02/2010	February-10	-	-	-	-	-	-
W04	25/04/2010	April 2010	-	-	-	-	-	-

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W04	5/08/2010	Aug/Oct 2010	<0.01	0.01	0.03	0.2	0.2	0.01
W07	2/09/2007	Sep-07	-	-	-	-	-	-
W07	30/11/2007	Dec-07	-	-	-	-	-	-
W07	1/12/2007	Dec-07	-	-	-	-	-	-
W07	18/04/2008	Apr-08	-	-	0.014	0.1	0.1	0.02
W07	30/07/2008	Jul-08	-	-	-	-	-	-
W07	23/10/2008	Oct-08	-	-	-	-	-	-
W07	10/12/2008	Dec-08	-	-	-	-	-	-
W07	21/01/2009	January-09	-	-	-	-	-	-
W07	30/10/2009	October-09	0.01	0.03	0.02	<0.1	<0.1	0.04
W07	25/02/2010	February-10	-	-	-	-	-	-
W07	25/04/2010	April 2010	-	-	-	-	-	-
W07	5/08/2010	Aug/Oct 2010	<0.01	0.02	0.02	0.1	0.1	0.02
W102	16/08/2010	Aug/Oct 2010	<0.01	0.02	0.07	0.3	0.4	0.02
W114	16/10/2010	Aug/Oct 2010	<0.01	<0.01	0.07	<0.1	<0.1	0.15
W115	16/10/2010	Aug/Oct 2010	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01
W17	2/09/2007	Sep-07	-	-	-	-	-	-
W17	30/11/2007	Dec-07	-	-	-	-	-	-
W17	1/12/2007	Dec-07	-	-	-	-	-	-
W17	18/04/2008	Apr-08	-	-	<0.010	0.4	0.4	0.01
W17	30/07/2008	Jul-08	-	-	-	-	-	-
W17	23/10/2008	Oct-08	-	-	<0.01	0.2	0.2	0.24
W17	8/12/2008	Dec-08	-	-	-	-	-	-
W17	21/01/2009	January-09	-	-	-	-	-	-
W17	30/10/2009	October-09	0.01	0.03	0.02	<0.1	<0.1	0.17
W17	25/02/2010	February-10	-	-	-	-	-	-
W17	25/04/2010	April 2010	-	-	-	-	-	-
W17	5/08/2010	Aug/Oct 2010	<0.01	0.05	0.02	0.3	0.3	<0.01
W18	1/12/2007	Dec-07	-	-	-	-	-	-
W18	2/12/2007	Dec-07	-	-	-	-	-	-
W18	18/04/2008	Apr-08	-	-	-	-	-	-
W18	30/07/2008	Jul-08	-	-	<0.01	0.2	0.2	<0.01
W18	24/10/2008	Oct-08	-	-	-	-	-	-
W18	8/12/2008	Dec-08	-	-	-	-	-	-
W18	21/01/2009	January-09	-	-	-	-	-	-
W18	25/02/2010	February-10	-	-	-	-	-	-
W18	25/04/2010	April 2010	-	-	-	-	-	-
W18	8/08/2010	Aug/Oct 2010	<0.01	0.03	<0.01	<0.1	<0.1	<0.01
W22	2/09/2007	Sep-07	-	-	-	-	-	-
W22	1/12/2007	Dec-07	-	-	-	-	-	-

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W22	17/04/2008	Apr-08	-	-	0.043	0.3	0.3	0.06
W22	30/07/2008	Jul-08	-	-	-	-	-	-
W22	24/10/2008	Oct-08	-	-	-	-	-	-
W22	8/12/2008	Dec-08	-	-	-	-	-	-
W22	21/01/2009	January-09	-	-	-	-	-	-
W22	30/10/2009	October-09	<0.01	0.10	0.12	0.2	0.3	0.12
W22	25/02/2010	February-10	-	-	-	-	-	-
W22	25/04/2010	April 2010	-	-	-	-	-	-
W22	6/08/2010	Aug/Oct 2010	<0.01	<0.01	-	-	-	<0.01
W23	31/08/2007	Sep-07	-	-	-	-	-	-
W23	18/04/2008	Apr-08	-	-	0.037	<0.1	<0.1	0.07
W23	30/07/2008	Jul-08	-	-	-	-	-	-
W23	25/10/2008	Oct-08	-	-	<0.01	0.2	0.2	0.36
W23	8/12/2008	Dec-08	-	-	-	-	-	-
W23	21/01/2009	January-09	-	-	-	-	-	-
W23	4/11/2009	October-09	0.01	0.05	0.01	0.2	0.2	<0.01
W23	25/02/2010	February-10	-	-	-	-	-	-
W23	25/04/2010	April 2010	-	-	-	-	-	-
W23	6/08/2010	Aug/Oct 2010	<0.01	0.03	0.03	0.2	0.2	<0.01
W26	3/09/2007	Sep-07	-	-	-	-	-	-
W26	1/12/2007	Dec-07	-	-	-	-	-	-
W26	3/12/2007	Dec-07	-	-	-	-	-	-
W26	12/10/2010	Aug/Oct 2010	<0.01	0.06	0.04	0.5	0.5	0.07
W26	18/04/2008	Apr-08	-	-	-	-	-	-
W26	30/07/2008	Jul-08	-	-	<0.01	3.5	3.5	0.15
W26	27/10/2008	Oct-08	-	-	-	-	-	-
W26	8/12/2008	Dec-08	-	-	0.05	0.4	0.4	<0.01
W26	21/01/2009	January-09	-	-	-	-	-	-
W27	4/09/2007	Sep-07	-	-	-	-	-	-
W27	1/12/2007	Dec-07	-	-	-	-	-	-
W27	2/12/2007	Dec-07	-	-	-	-	-	-
W27	17/04/2008	Apr-08	-	-	0.012	0.1	0.1	<0.01
W27	30/07/2008	Jul-08	-	-	-	-	-	-
W27	23/10/2008	Oct-08	-	-	-	-	-	-
W27	8/12/2008	Dec-08	-	-	-	-	-	-
W27	21/01/2009	January-09	-	-	-	-	-	-
W27	31/10/2009	October-09	<0.01	0.08	0.05	<0.1	<0.1	0.05
W27	25/02/2010	February-10	-	-	-	-	-	-
W27	26/04/2010	April 2010	-	-	-	-	-	-

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W27	11/08/2010	Aug/Oct 2010	<0.01	0.02	0.02	0.2	0.2	0.08
W28	2/09/2007	Sep-07	-	-	-	-	-	-
W28	30/11/2007	Dec-07	-	-	-	-	-	-
W28	1/12/2007	Dec-07	-	-	-	-	-	-
W28	18/04/2008	Apr-08	-	-	<0.010	0.2	0.2	<0.01
W28	30/07/2008	Jul-08	-	-	-	-	-	-
W28	23/10/2008	Oct-08	-	-	<0.01	0.2	0.2	0.35
W28	8/12/2008	Dec-08	-	-	-	-	-	-
W28	21/01/2009	January-09	-	-	-	-	-	-
W28	31/10/2009	October-09	<0.01	0.03	0.02	<0.1	<0.1	0.02
W28	25/02/2010	February-10	-	-	-	-	-	-
W28	25/04/2010	April 2010	-	-	-	-	-	-
W28	10/08/2010	Aug/Oct 2010	<0.01	0.02	<0.01	0.1	0.1	0.02
W29	31/08/2007	Sep-07	-	-	-	-	-	-
W29	1/12/2007	Dec-07	-	-	-	-	-	-
W29	17/04/2008	Apr-08	-	-	<0.010	0.2	0.2	0.01
W29	30/07/2008	Jul-08	-	-	-	-	-	-
W29	24/10/2008	Oct-08	-	-	-	-	-	-
W29	8/12/2008	Dec-08	-	-	-	-	-	-
W29	21/01/2009	January-09	-	-	-	-	-	-
W29	31/10/2009	October-09	<0.01	0.03	0.05	<0.1	<0.1	0.05
W29	25/02/2010	February-10	-	-	-	-	-	-
W29	25/04/2010	April 2010	-	-	-	-	-	-
W29	12/08/2010	Aug/Oct 2010	<0.01	0.04	0.02	<0.1	<0.1	0.01
W31	1/12/2007	Dec-07	-	-	-	-	-	-
W31	5/12/2007	Dec-07	-	-	-	-	-	-
W31	18/04/2008	Apr-08	-	-	0.013	0.2	0.2	0.01
W31	30/07/2008	Jul-08	-	-	-	-	-	-
W31	27/10/2008	Oct-08	-	-	-	-	-	-
W31	8/12/2008	Dec-08	-	-	-	-	-	-
W31	21/01/2009	January-09	-	-	-	-	-	-
W31	31/10/2009	October-09	<0.01	0.05	0.15	<0.1	0.1	0.02
W31	26/02/2010	February-10	-	-	-	-	-	-
W31	25/04/2010	April 2010	-	-	-	-	-	-
W31	5/08/2010	Aug/Oct 2010	<0.01	0.04	0.03	0.2	0.2	-
W33	1/12/2007	Dec-07	-	-	-	-	-	-
W33	5/12/2007	Dec-07	-	-	-	-	-	-
W33	18/04/2008	Apr-08	-	-	0.033	0.3	0.4	0.39
W33	30/07/2008	Jul-08	-	-	-	-	-	-

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W33	27/10/2008	Oct-08	-	-	-	-	-	-
W33	8/12/2008	Dec-08	-	-	-	-	-	-
W33	21/01/2009	January-09	-	-	-	-	-	-
W33	31/10/2009	October-09	<0.01	0.05	0.11	0.3	0.4	0.20
W33	26/02/2010	February-10	-	-	-	-	-	-
W33	26/04/2010	April 2010	-	-	-	-	-	-
W33	7/08/2010	Aug/Oct 2010	<0.01	0.03	0.08	0.2	0.3	0.24
W34	31/08/2007	Sep-07	-	-	-	-	-	-
W34	1/12/2007	Dec-07	-	-	-	-	-	-
W34	5/12/2007	Dec-07	-	-	-	-	-	-
W34	18/04/2008	Apr-08	-	-	0.036	0.4	0.4	0.16
W34	30/07/2008	Jul-08	-	-	0.09	0.8	0.9	0.54
W34	26/10/2008	Oct-08	-	-	-	-	-	-
W34	8/12/2008	Dec-08	-	-	0.02	0.5	0.5	0.71
W34	21/01/2009	January-09	-	-	-	-	-	-
W34	31/10/2009	October-09	<0.01	0.04	0.10	0.4	0.5	0.10
W34	26/02/2010	February-10	-	-	-	-	-	-
W34	26/04/2010	April 2010	-	-	-	-	-	-
W34	11/10/2010	Aug/Oct 2010	<0.01	0.02	0.06	<0.1	<0.1	0.01
W35	18/04/2008	Apr-08	-	-	0.011	0.4	0.4	0.16
W35	30/07/2008	Jul-08	-	-	-	-	-	-
W35	26/10/2008	Oct-08	-	-	-	-	-	-
W35	10/12/2008	Dec-08	-	-	-	-	-	-
W35	21/01/2009	January-09	-	-	-	-	-	-
W35	31/10/2009	October-09	<0.01	0.04	0.10	0.3	0.4	0.31
W35	26/04/2010	April 2010	-	-	-	-	-	-
W35	16/08/2010	Aug/Oct 2010	<0.01	0.03	0.06	1.1	1.2	0.12
W36	3/09/2007	Sep-07	-	-	-	-	-	-
W36	1/12/2007	Dec-07	-	-	-	-	-	-
W36	1/12/2007	Dec-07	-	-	-	-	-	-
W36	3/12/2007	Dec-07	-	-	-	-	-	-
W36	18/04/2008	Apr-08	-	-	0.017	0.2	0.2	0.02
W36	30/07/2008	Jul-08	-	-	-	-	-	-
W36	26/10/2008	Oct-08	-	-	0.03	0.3	0.3	0.30
W36	10/12/2008	Dec-08	-	-	-	-	-	-
W36	21/01/2009	January-09	-	-	-	-	-	-
W36	31/10/2009	October-09	<0.01	0.12	0.04	0.2	0.2	0.05
W36	25/02/2010	February-10	-	-	-	-	-	-
W36	25/04/2010	April 2010	-	-	-	-	-	-
W36	6/08/2010	Aug/Oct 2010	<0.01	0.02	0.02	0.2	0.2	0.02

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W38A	5/12/2007	Dec-07	-	-	-	-	-	-
W38A	10/12/2008	Dec-08	-	-	-	-	-	-
W38A	26/04/2010	April 2010	-	-	-	-	-	-
W38A	1/12/2007	Dec-07	-	-	-	-	-	-
W38A	18/04/2008	Apr-08	-	-	0.012	0.3	0.4	0.06
W38A	30/07/2008	Jul-08	-	-	-	-	-	-
W38A	27/10/2008	Oct-08	-	-	-	-	-	-
W38A	21/01/2009	January-09	-	-	-	-	-	-
W38A	31/10/2009	October-09	<0.01	0.03	0.05	<0.1	<0.1	0.15
W38A	26/02/2010	February-10	-	-	-	-	-	-
W38A	7/08/2010	Aug/Oct 2010	<0.01	0.02	0.03	0.2	0.2	0.02
W41	2/09/2007	Sep-07	-	-	-	-	-	-
W41	1/12/2007	Dec-07	-	-	-	-	-	-
W41	1/12/2007	Dec-07	-	-	-	-	-	-
W41	17/04/2008	Apr-08	-	-	<0.010	<0.1	<0.1	0.01
W41	30/07/2008	Jul-08	-	-	-	-	-	-
W41	24/10/2008	Oct-08	-	-	-	-	-	-
W41	8/12/2008	Dec-08	-	-	-	-	-	-
W41	21/01/2009	January-09	-	-	-	-	-	-
W41	25/04/2010	April 2010	-	-	-	-	-	-
W42	31/08/2007	Sep-07	-	-	-	-	-	-
W42	1/12/2007	Dec-07	-	-	-	-	-	-
W42	1/12/2007	Dec-07	-	-	-	-	-	-
W42	17/04/2008	Apr-08	-	-	0.024	0.3	0.3	0.02
W42	30/07/2008	Jul-08	-	-	-	-	-	-
W42	24/10/2008	Oct-08	-	-	-	-	-	-
W42	8/12/2008	Dec-08	-	-	-	-	-	-
W42	21/01/2009	January-09	-	-	-	-	-	-
W42	25/04/2010	April 2010	-	-	-	-	-	-
W43	31/08/2007	Sep-07	-	-	-	-	-	-
W43	1/12/2007	Dec-07	-	-	-	-	-	-
W43	1/12/2007	Dec-07	-	-	-	-	-	-
W43	17/04/2008	Apr-08	-	-	<0.010	<0.1	<0.1	0.03
W43	30/07/2008	Jul-08	-	-	-	-	-	-
W43	24/10/2008	Oct-08	-	-	-	-	-	-
W43	8/12/2008	Dec-08	-	-	-	-	-	-
W43	21/01/2009	January-09	-	-	-	-	-	-
W43	31/10/2009	October-09	<0.01	0.03	0.04	<0.1	<0.1	0.02
W43	25/02/2010	February-10	-	-	-	-	-	-

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W43	25/04/2010	April 2010	-	-	-	-	-	-
W43	6/08/2010	Aug/Oct 2010	<0.01	0.02	<0.01	0.2	0.2	0.01
W48	1/12/2007	Dec-07	-	-	-	-	-	-
W48	18/04/2008	Apr-08	-	-	<0.010	<0.1	<0.1	3.78
W48	30/07/2008	Jul-08	-	-	-	-	-	-
W48	24/10/2008	Oct-08	-	-	-	-	-	-
W48	8/12/2008	Dec-08	-	-	-	-	-	-
W48	21/01/2009	January-09	-	-	-	-	-	-
W48	25/02/2010	February-10	-	-	-	-	-	-
W48	25/04/2010	April 2010	-	-	-	-	-	-
W48	10/08/2010	Aug/Oct 2010	<0.01	0.02	<0.01	0.2	0.2	<0.01
W49	10/12/2008	Dec-08	-	-	-	-	-	-
W50	8/12/2008	Dec-08	-	-	-	-	-	-
W50	26/02/2010	February-10	-	-	-	-	-	-
W50	26/04/2010	April 2010	-	-	-	-	-	-
W50	7/08/2010	Aug/Oct 2010	<0.01	0.03	0.08	0.3	0.4	0.07
W51	27/02/2010	February-10	<0.01	0.016	<.01	-	0.07	0.11
W51	27/04/2010	April 2010	-	-	-	-	-	-
W54	21/01/2009	January-09	-	-	-	-	-	-
W54	3/11/2009	October-09	<0.01	0.06	0.11	0.2	0.3	0.10
W54	26/02/2010	February-10	-	-	-	-	-	-
W54	26/05/2010	April 2010	-	-	-	-	-	-
W60	26/02/2010	February-10	<0.01	0.027	0.01	-	0.11	0.11
W60	26/04/2010	April 2010	-	-	-	-	-	-
W60	7/08/2010	Aug/Oct 2010	<0.01	0.01	0.01	0.2	0.2	0.07
W61	27/02/2010	February-10	<0.01	0.2	0.04	-	0.16	0.087
W61	27/04/2010	April 2010	-	-	-	-	-	-
W61	22/10/2010	Aug/Oct 2010	<0.01	-	-	-	-	-
W62	27/02/2010	February-10	<0.01	0.024	<.01	-	0.33	<.05
W62	27/04/2010	April 2010	-	-	-	-	-	-
W62	10/10/2010	Aug/Oct 2010	<0.01	0.07	0.56	0.2	0.8	0.02
W63	27/02/2010	February-10	<0.01	0.053	<.01	-	0.07	0.091
W63	27/04/2010	April 2010	-	-	-	-	-	-
W63	23/10/2010	Aug/Oct 2010	<0.01	-	-	-	-	-
W64	27/02/2010	February-10	<0.01	0.05	<0.01	-	0.08	0.2
W64	27/04/2010	April 2010	-	-	-	-	-	-
W64	25/10/2010	Aug/Oct 2010	-	-	-	-	-	-
W65	27/02/2010	February-10	<0.01	0.086	0.039	-	0.15	0.17
W65	27/04/2010	April 2010	-	-	-	-	-	-
W70	27/08/2010	Aug/Oct 2010	<0.01	0.03	0.03	0.3	0.3	0.04

Site	Date	Sampling Round (month/year)	FRP (mg/L)	NH4 (mg/L)	NOx as N (mg/L)	TKN as N (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorous as P (mg/L)
W71	25/04/2010	April 2010	-	-	-	-	-	-

Table A-3 General Parameters

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
Basecamp	26/02/2010	February-10	24.37	-	42	2210	<1	<1	4	4	18	-	5	1	2	<1	17	1	4	-	-
Basecamp	11/08/2010	Aug/Oct 2010	24.42	-	82	-	<1	<1	8	8	25	<1	12	1	2	<1	34	<1	2	0.68	0.82
RORWB	14/10/2010	Aug/Oct 2010	35.15	-	77	65	<1	<1	3	3	<1	1	2	<1	1	<1	9	22	22	0.09	0.17
W02	2/09/2007	Sep-07	26.2	54	-	<2	-	-	32	32	2	0.1	8.8	1.9	2	0.44	30	<1	<1	-	-
W02	30/11/2007	Dec-07	26.5	66	34	5	<1	<1	28	28	2	<1	8	2	2	<1	28	-	-	-	-
W02	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
W02	18/04/2008	Apr-08	24.65	57	-	7	<1	<1	25	25	2	<1	8	2	2	<1	28	1	2	-	-
W02	30/07/2008	Jul-08	24.64	72	-	3	<1	<1	30	30	2	<1	8	2	2	<1	28	<1	<1	-	-
W02	23/10/2008	Oct-08	27.52	74	-	6	<1	<1	30	30	1	<1	8	2	2	<1	28	1	2	-	-
W02	10/12/2008	Dec-08	26.77	69	-	2	<1	<1	33	33	3	4	8	2	2	<1	28	2	2	-	-
W02	21/01/2009	January-09	29.9	76	-	10	<1	<1	29	29	2	<1	8	2	2	<1	28	<1	1	-	-
W02	30/10/2009	October-09	29.06	-	57	1	<1	<1	44	44	2	-	10	2	2	<1	33	<1	1	-	-
W02	25/02/2010	February-10	24.8	-	43	25	<1	<1	27	27	2	-	6	1	1	<1	19	2	3	-	-
W02	25/04/2010	April 2010	25.7	-	83	7	<1	<1	30	30	2	<1	8	2	2	<1	28	1	1	0.64	0.62
W02	5/08/2010	Aug/Oct 2010	-	-	39	-	<1	<1	35	35	1	<1	9	2	2	<1	31	1	<1	0.72	0.73
W03	2/09/2007	Sep-07	26.71	45	-	<2	-	-	30	30	1.8	0.1	6.7	1.7	1.8	0.37	24	<1	<1	-	-
W03	30/11/2007	Dec-07	27.04	54	30	5	<1	<1	23	23	2	<1	6	2	2	<1	23	-	-	-	-
W03	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
W03	18/04/2008	Apr-08	24.61	49	-	8	<1	<1	21	21	2	<1	6	2	2	<1	23	2	2	-	-
W03	30/07/2008	Jul-08	25.13	56	-	<5	<1	<1	26	26	2	<1	6	2	2	<1	23	<1	<1	-	-
W03	23/10/2008	Oct-08	28.15	61	-	6	<1	<1	24	24	<1	<1	7	1	2	<1	22	1	2	-	-
W03	10/12/2008	Dec-08	27.01	57	-	4	<1	<1	28	28	2	<1	6	2	2	<1	23	1	1	-	-
W03	21/01/2009	January-09	29.5	60	-	8	<1	<1	26	26	2	<1	6	2	2	<1	23	<1	1	-	-
W03	30/10/2009	October-09	28.93	-	41	2	<1	<1	38	38	1	-	8	2	2	<1	28	<1	1	-	-
W03	25/02/2010	February-10	24.7	-	39	47	<1	<1	22	22	2	-	5	1	1	<1	17	3	3	-	-
W03	25/04/2010	April 2010	25.8	-	69	3	<1	<1	24	24	2	<1	6	1	2	<1	19	<1	<1	0.52	0.48
W03	5/08/2010	Aug/Oct 2010	26.58	-	35	-	<1	<1	30	30	<1	<1	8	2	2	<1	28	<1	<1	0.6	0.64
W04	2/09/2007	Sep-07	26.22	69	-	7	-	-	40	40	3.5	0.2	9.5	4.5	1.4	0.21	42	<1	<1	-	-
W04	30/11/2007	Dec-07	26.98	89	42	12	<1	<1	37	37	3	<1	10	4	1	<1	41	-	-	-	-
W04	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
W04	18/04/2008	Apr-08	24.29	89	-	16	<1	<1	41	41	4	<1	8	4	1	<1	36	<1	<1	-	-
W04	30/07/2008	Jul-08	24.46	98	-	4	<1	<1	32	32	5	<1	7	5	2	<1	38	<1	<1	-	-
W04	23/10/2008	Oct-08	27.37	95	-	54	<1	<1	24	24	2	<1	9	3	1	<1	35	1	3	-	-
W04	10/12/2008	Dec-08	25.2	75	-	50	<1	<1	36	36	3	2	8	4	1	<1	36	2	2	-	-
W04	21/01/2009	January-09	27.8	101	-	8	<1	<1	46	46	4	<1	11	4	2	<1	44	<1	1	-	-
W04	30/10/2009	October-09	28.28	-	68	2	<1	<1	55	55	4	-	12	5	2	<1	51	<1	1	-	-
W04	25/02/2010	February-10	24.23	-	59	52	<1	<1	41	41	3	-	9	3	1	<1	35	2	2	-	-
W04	25/04/2010	April 2010	25.6	-	53	8	<1	<1	25	25	2	<1	6	2	2	<1	23	<1	<1	0.54	0.48
W04	5/08/2010	Aug/Oct 2010	27.85	-	46	-	<1	<1	37	37	-	2	-	-	-	-	-	<1	<1	-	-

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W07	2/09/2007	Sep-07	25.35	43	-	<2	-	-	26	26	2	<0.1	5.3	2.1	2	0.49	22	<1	<1	-	-
W07	30/11/2007	Dec-07	25.5	48	22	1	<1	<1	22	22	2	<1	5	2	2	<1	21	-	-	-	-
W07	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W07	18/04/2008	Apr-08	23.57	45	-	8	<1	<1	21	21	2	<1	4	2	2	<1	18	1	1	-	-
W07	30/07/2008	Jul-08	24.15	58	-	<1	<1	<1	27	27	2	<1	5	2	2	<1	21	1	<1	-	-
W07	23/10/2008	Oct-08	26.26	56	-	2	<1	<1	6	6	1	<1	4	2	2	<1	18	<1	2	-	-
W07	10/12/2008	Dec-08	25.92	54	-	<1	<1	<1	27	27	2	2	5	2	2	<1	21	1	1	-	-
W07	21/01/2009	January-09	27.02	60	-	2	<1	<1	24	24	2	<1	5	2	2	<1	21	<1	1	-	-
W07	30/10/2009	October-09	28.38	-	46	1	<1	<1	35	35	1	-	6	2	2	<1	23	<1	<1	-	-
W07	25/02/2010	February-10	23.88	-	35	18	<1	<1	15	15	2	-	3	1	1	<1	12	2	2	-	-
W07	25/04/2010	April 2010	25.2	-	100	2	<1	<1	24	24	2	<1	5	2	2	<1	21	<1	<1	0.52	0.48
W07	5/08/2010	Aug/Oct 2010	25.04	-	55	-	<1	<1	28	28	<1	<1	6	2	2	<1	23	<1	<1	0.56	0.6
W102	16/08/2010	Aug/Oct 2010	23.84	-	62	55	<1	<1	39	39	2	<1	7	6	2	<1	42	<1	<1	0.81	0.88
W114	16/10/2010	Aug/Oct 2010	23.6	-	49	1680	<1	<1	40	40	3	<1	8	4	1	<1	36	1	1	0.85	0.83
W115	16/10/2010	Aug/Oct 2010	27.8	-	100	<10	<1	<1	28	28	1	<1	6	3	1	<1	27	<1	<1	0.58	0.55
W17	2/09/2007	Sep-07	22	37	-	<2	-	-	24	24	1.4	<0.1	4.9	1.9	1.4	0.17	20	<1	1	-	-
W17	30/11/2007	Dec-07	23.79	42	24	3	<1	<1	20	20	1	<1	4	2	1	<1	18	-	-	-	-
W17	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W17	18/04/2008	Apr-08	23.31	45	-	<1	<1	<1	21	21	2	<1	4	2	2	<1	18	<1	<1	-	-
W17	30/07/2008	Jul-08	23.54	50	-	<5	<1	<1	23	23	2	<1	5	2	2	<1	21	1	<1	-	-
W17	23/10/2008	Oct-08	25.05	47	-	<1	<1	<1	6	6	<1	<1	4	2	2	<1	18	<1	2	-	-
W17	8/12/2008	Dec-08	24.04	45	-	2	<1	<1	38	38	2	<1	7	2	2	<1	26	1	1	-	-
W17	21/01/2009	January-09	24.4	49	-	4	<1	<1	24	24	2	<1	5	2	2	<1	21	<1	1	-	-
W17	30/10/2009	October-09	25.76	-	30	<1	<1	<1	29	29	<1	-	5	2	2	<1	21	<1	1	-	-
W17	25/02/2010	February-10	23.25	-	29	29	<1	<1	13	13	1	-	3	1	1	<1	12	1	2	-	-
W17	25/04/2010	April 2010	25.2	-	47	<1	<1	<1	19	19	1	<1	4	2	1	<1	18	<1	<1	0.41	0.4
W17	5/08/2010	Aug/Oct 2010	22.2	-	43	-	<1	<1	23	23	<1	<1	5	2	1	<1	21	<1	<1	0.46	0.46
W18	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W18	2/12/2007	Dec-07	23.93	64	44	2	<1	<1	21	21	3	<1	5	2	1	<1	21	-	-	-	-
W18	18/04/2008	Apr-08	-	37	-	16	<1	<1	13	13	2	<1	4	1	1	<1	14	3	3	-	-
W18	30/07/2008	Jul-08	23.53	67	-	<2	<1	<1	25	25	6	<1	7	2	2	<1	26	2	<1	-	-
W18	24/10/2008	Oct-08	24.06	61	-	2	<1	<1	24	24	4	<1	6	2	2	<1	23	1	2	-	-
W18	8/12/2008	Dec-08	24.81	53	-	<2	<1	<1	19	19	4	<1	6	2	1	<1	23	2	1	-	-
W18	21/01/2009	January-09	23.5	116	-	4	<1	<1	13	13	33	<1	15	1	2	<1	42	1	1	-	-
W18	25/02/2010	February-10	23.57	-	29	17	<1	<1	17	17	2	-	3	1	<1	<1	12	3	3	-	-
W18	25/04/2010	April 2010	25.8	-	28	3	<1	<1	20	20	4	<1	5	2	1	<1	21	<1	1	0.48	0.47
W18	8/08/2010	Aug/Oct 2010	-	-	31	-	<1	<1	22	22	2	<1	6	2	1	<1	23	-	<1	0.48	0.5
W22	2/09/2007	Sep-07	24.07	67	-	42	-	-	38	38	3.5	0.1	8.7	4.5	1.6	0.17	40	<1	<1	-	-
W22	1/12/2007	Dec-07	27.28	78	24	11	<1	<1	33	33	3	<1	8	4	1	<1	36	-	-	-	-
W22	17/04/2008	Apr-08	26.21	85	-	86	<1	<1	41	41	4	<1	8	4	2	<1	36	<1	<1	-	-

Water Quality Data

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W22	30/07/2008	Jul-08	27.72	88	-	32	<1	<1	42	42	4	<1	8	5	2	<1	41	<1	<1	-	-
W22	24/10/2008	Oct-08	28.61	95	-	320	<1	<1	36	36	4	<1	9	5	2	<1	43	<1	2	-	-
W22	8/12/2008	Dec-08	27.87	91	-	14	<1	<1	60	60	4	<1	10	6	2	<1	50	1	<1	-	-
W22	21/01/2009	January-09	25.8	103	-	58	<1	<1	52	52	5	<1	10	5	2	<1	46	<1	1	-	-
W22	30/10/2009	October-09	25.79	-	55	78	<1	<1	40	40	2	-	8	4	1	<1	36	<1	2	-	-
W22	25/02/2010	February-10	27.21	-	63	398	<1	<1	34	34	3	-	7	3	1	<1	30	2	2	-	-
W22	25/04/2010	April 2010	28.7	-	147	14	<1	<1	42	42	4	<1	9	5	2	<1	43	<1	<1	0.92	0.92
W22	6/08/2010	Aug/Oct 2010	-	-	56	-	<1	<1	43	43	-	-	-	-	-	-	-	-	-	-	-
W23	31/08/2007	Sep-07	21.7	46	-	73	-	-	26	26	2.8	0.1	5.9	2.9	1.2	0.21	27	-	1	-	-
W23	18/04/2008	Apr-08	25.9	77	-	70	<1	<1	37	37	4	<1	8	4	2	<1	36	<1	<1	-	-
W23	30/07/2008	Jul-08	26.13	80	-	21	<1	<1	37	37	5	<1	8	4	2	<1	36	<1	<1	-	-
W23	25/10/2008	Oct-08	24.09	56	-	300	<1	<1	24	24	3	<1	5	2	1	<1	21	2	4	-	-
W23	8/12/2008	Dec-08	27.37	80	-	8	<1	<1	36	36	4	<1	9	4	2	<1	39	1	1	-	-
W23	21/01/2009	January-09	24.39	87	-	31	<1	<1	38	38	4	<1	8	4	2	<1	36	1	1	-	-
W23	4/11/2009	October-09	26.03	-	53	78	<1	<1	34	34	3	-	8	4	2	<1	36	<1	2	-	-
W23	25/02/2010	February-10	24.55	-	48	449	<1	<1	24	24	3	-	5	2	1	<1	21	2	3	-	-
W23	25/04/2010	April 2010	26.6	-	136	31	<1	<1	31	31	3	<1	7	4	2	<1	34	<1	1	0.69	0.71
W23	6/08/2010	Aug/Oct 2010	-	-	56	-	<1	<1	23	23	-	-	-	-	-	-	-	-	<1	-	-
W26	3/09/2007	Sep-07	32.89	10	-	26	-	-	5	5	0.2	0.2	0.56	0.41	0.46	0.12	3	14	14	-	-
W26	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W26	3/12/2007	Dec-07	30.58	14	20	9	<1	<1	5	5	<1	<1	2	<1	<1	<1	9	-	-	-	-
W26	12/10/2010	Aug/Oct 2010	34.86	-	41	36	<1	<1	28	28	2	<1	4	2	<1	<1	18	8	8	0.6	0.42
W26	18/04/2008	Apr-08	-	22	-	11	<1	<1	4	4	1	<1	3	<1	<1	<1	12	10	10	-	-
W26	30/07/2008	Jul-08	28.87	40	-	72	<1	<1	13	13	<1	<1	2	<1	1	<1	9	19	16	-	-
W26	27/10/2008	Oct-08	29.85	23	-	19	<1	<1	10	10	2	<1	3	<1	<1	<1	12	11	14	-	-
W26	8/12/2008	Dec-08	29.06	28	-	10	<1	<1	<1	<1	6	<1	4	<1	<1	<1	14	12	9	-	-
W26	21/01/2009	January-09	28.73	16	-	16	<1	<1	5	5	1	<1	1	<1	<1	<1	7	11	12	-	-
W27	4/09/2007	Sep-07	22.42	120	-	4	-	-	<5	<5	35	0.1	12	1	1.6	0.43	34	<1	<1	-	-
W27	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W27	2/12/2007	Dec-07	22.5	100	32	8	<1	<1	<1	<1	31	<1	9	<1	1	<1	27	-	-	-	-
W27	17/04/2008	Apr-08	22.53	129	-	14	<1	<1	<1	<1	38	<1	11	<1	2	<1	32	<1	<1	-	-
W27	30/07/2008	Jul-08	21.59	33	-	19	<1	<1	<1	<1	8	<1	2	<1	<1	<1	9	5	5	-	-
W27	23/10/2008	Oct-08	22.46	87	-	10	<1	<1	<1	<1	25	<1	8	<1	1	<1	24	2	3	-	-
W27	8/12/2008	Dec-08	24.28	151	-	16	<1	<1	<1	<1	56	<1	16	1	2	<1	44	2	2	-	-
W27	21/01/2009	January-09	24.3	76	-	11	<1	<1	<1	<1	20	<1	6	<1	<1	<1	19	2	2	-	-
W27	31/10/2009	October-09	22.42	-	45	20	<1	<1	<1	<1	15	-	5	<1	<1	<1	17	3	4	-	-
W27	25/02/2010	February-10	23.62	-	62	15	<1	<1	<1	<1	30	-	8	<1	1	<1	24	1	2	-	-
W27	26/04/2010	April 2010	26.3	-	135	3	<1	<1	<1	<1	42	<1	14	<1	2	<1	39	<1	1	0.88	0.79
W27	11/08/2010	Aug/Oct 2010	21.77	-	100	-	<1	<1	<1	<1	41	<1	19	<1	2	<1	52	<1	<1	0.86	1.02
W28	2/09/2007	Sep-07	21.34	49	-	<2	-	-	28	28	2.8	<0.1	7.1	2.6	1.2	0.25	28	<1	<1	-	-

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W28	30/11/2007	Dec-07	22.9	53	40	4	<1	<1	23	23	2	<1	6	2	1	<1	23	-	-	-	-
W28	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W28	18/04/2008	Apr-08	-	58	-	3	<1	<1	25	25	3	<1	6	2	1	<1	23	1	1	-	-
W28	30/07/2008	Jul-08	22.35	59	-	79	<1	<1	24	24	4	<1	8	2	1	<1	28	3	2	-	-
W28	23/10/2008	Oct-08	23.04	56	-	2	<1	<1	12	12	1	<1	5	2	1	<1	21	2	3	-	-
W28	8/12/2008	Dec-08	21.54	49	-	4	<1	<1	23	23	2	<1	5	2	1	<1	21	2	2	-	-
W28	21/01/2009	January-09	23.86	75	-	8	<1	<1	28	28	4	<1	7	2	1	<1	26	<1	1	-	-
W28	31/10/2009	October-09	24.85	-	55	1	<1	<1	37	37	3	-	8	2	2	<1	28	<1	2	-	-
W28	25/02/2010	February-10	21.69	-	31	12	<1	<1	17	17	2	-	3	2	<1	<1	16	3	3	-	-
W28	25/04/2010	April 2010	23.7	-	85	2	<1	<1	25	25	3	<1	6	2	1	<1	23	<1	1	0.56	0.52
W28	10/08/2010	Aug/Oct 2010	-	-	25	-	<1	<1	15	15	<1	<1	4	2	<1	<1	18	1	<1	0.3	0.34
W29	31/08/2007	Sep-07	21.53	39	-	4	-	-	24	24	4.7	<0.1	5.6	1.7	1.2	0.25	21	2	1	-	-
W29	1/12/2007	Dec-07	24.22	44	14	1	<1	<1	12	12	4	<1	5	2	1	<1	21	-	-	-	-
W29	17/04/2008	Apr-08	24.56	62	-	4	<1	<1	20	20	8	<1	7	2	2	<1	26	<1	<1	-	-
W29	30/07/2008	Jul-08	24.28	67	-	4	<1	<1	25	25	9	<1	8	2	2	<1	28	1	<1	-	-
W29	24/10/2008	Oct-08	24.93	66	-	2	<1	<1	24	24	6	<1	7	2	2	<1	26	<1	2	-	-
W29	8/12/2008	Dec-08	24.69	59	-	10	<1	<1	46	46	6	<1	9	3	4	<1	35	2	2	-	-
W29	21/01/2009	January-09	24.17	64	-	6	<1	<1	19	19	8	<1	7	2	2	<1	26	<1	1	-	-
W29	31/10/2009	October-09	28.58	-	34	72	<1	<1	10	10	5	-	5	1	1	<1	17	3	3	-	-
W29	25/02/2010	February-10	23.9	-	34	32	<1	<1	13	13	4	-	3	1	<1	<1	12	3	3	-	-
W29	25/04/2010	April 2010	26.3	-	37	2	<1	<1	18	18	6	<1	6	2	2	<1	23	<1	1	0.49	0.49
W29	12/08/2010	Aug/Oct 2010	25.29	-	49	-	<1	<1	22	22	3	<1	6	2	2	<1	23	<1	1	0.5	0.58
W31	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W31	5/12/2007	Dec-07	29.51	67	12	2	<1	<1	34	34	2	<1	7	4	2	<1	34	-	-	-	-
W31	18/04/2008	Apr-08	-	69	-	4	<1	<1	33	33	2	<1	7	4	2	<1	34	<1	<1	-	-
W31	30/07/2008	Jul-08	27.48	76	-	6	<1	<1	35	35	2	<1	7	4	2	<1	34	<1	<1	-	-
W31	27/10/2008	Oct-08	25.39	51	-	119	<1	<1	29	29	1	<1	8	3	2	<1	32	3	4	-	-
W31	8/12/2008	Dec-08	25.1	57	-	18	<1	<1	33	33	2	<1	6	3	2	<1	27	2	1	-	-
W31	21/01/2009	January-09	27.7	58	-	19	<1	<1	25	25	2	<1	5	2	2	<1	21	<1	1	-	-
W31	31/10/2009	October-09	27.95	-	58	7	<1	<1	41	41	1	-	7	3	2	<1	30	<1	2	-	-
W31	26/02/2010	February-10	25.24	-	28	355	<1	<1	16	16	1	-	3	2	1	<1	16	3	4	-	-
W31	25/04/2010	April 2010	25	-	63	44	<1	<1	25	25	2	<1	5	2	2	<1	21	<1	1	0.53	0.52
W31	5/08/2010	Aug/Oct 2010	26.47	-	51	-	<1	<1	31	31	1	<1	7	3	2	<1	30	<1	<1	0.64	0.69
W33	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W33	5/12/2007	Dec-07	29	75	42	31	<1	<1	33	33	2	<1	7	4	2	<1	34	-	-	-	-
W33	18/04/2008	Apr-08	28.07	119	-	313	<1	<1	48	48	6	<1	14	2	2	<1	43	2	2	-	-
W33	30/07/2008	Jul-08	28.51	182	-	185	<1	<1	75	75	13	<1	28	4	5	<1	86	1	1	-	-
W33	27/10/2008	Oct-08	29.62	196	-	876	<1	<1	95	95	12	<1	32	4	5	<1	96	3	4	-	-
W33	8/12/2008	Dec-08	26.84	149	-	716	<1	<1	82	82	9	<1	26	3	3	<1	77	3	3	-	-
W33	21/01/2009	January-09	28.5	186	-	1040	<1	<1	72	72	10	<1	22	3	3	<1	67	2	3	-	-

Water Quality Data

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W33	31/10/2009	October-09	28.16	-	84	296	<1	<1	67	67	5	-	21	3	3	<1	65	4	4	-	-
W33	26/02/2010	February-10	27.27	-	102	496	<1	<1	51	51	7	-	16	2	2	<1	48	3	4	-	-
W33	26/04/2010	April 2010	-	-	149	300	<1	<1	52	52	6	<1	19	2	2	<1	56	3	4	1.16	1.22
W33	7/08/2010	Aug/Oct 2010	-	-	77	310	<1	<1	50	50	5	<1	17	3	3	<1	55	1	1	1.1	1.22
W34	31/08/2007	Sep-07	26.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	5/12/2007	Dec-07	28.96	106	48	239	<1	<1	43	43	7	<1	15	3	4	<1	50	-	-	-	-
W34	18/04/2008	Apr-08	27.97	97	-	161	<1	<1	39	39	6	<1	15	2	2	<1	46	2	3	-	-
W34	30/07/2008	Jul-08	28.61	141	-	100	<1	<1	61	61	8	<1	21	4	3	<1	69	1	1	-	-
W34	26/10/2008	Oct-08	29.86	154	-	228	<1	<1	68	68	8	<1	21	3	4	<1	65	3	4	-	-
W34	8/12/2008	Dec-08	26.86	117	-	552	<1	<1	85	85	7	<1	26	3	3	<1	77	3	2	-	-
W34	21/01/2009	January-09	28.17	142	-	273	<1	<1	54	54	7	<1	19	3	3	<1	60	2	2	-	-
W34	31/10/2009	October-09	28.39	-	77	142	<1	<1	59	59	4	-	18	3	3	<1	57	4	4	-	-
W34	26/02/2010	February-10	27.44	-	72	270	<1	<1	46	46	5	-	13	2	2	<1	41	4	4	-	-
W34	26/04/2010	April 2010	-	-	125	232	<1	<1	46	46	5	<1	15	2	2	<1	46	3	3	1.02	1.03
W34	11/10/2010	Aug/Oct 2010	28.75	-	100	<10	-	-	-	-	7	<1	19	3	3	<1	60	2	4	-	-
W35	18/04/2008	Apr-08	28.12	58	-	191	<1	<1	25	25	2	<1	9	<1	<1	<1	27	2	2	-	-
W35	30/07/2008	Jul-08	28.31	124	-	181	<1	<1	67	67	6	<1	18	3	3	<1	57	2	2	-	-
W35	26/10/2008	Oct-08	29.07	138	-	280	<1	<1	56	56	6	<1	19	3	3	<1	60	2	5	-	-
W35	10/12/2008	Dec-08	27.43	130	-	637	<1	<1	58	58	6	2	19	3	3	<1	60	5	4	-	-
W35	21/01/2009	January-09	28.6	132	-	306	<1	<1	49	49	7	<1	18	3	3	<1	57	3	3	-	-
W35	31/10/2009	October-09	29	-	88	387	<1	<1	65	65	5	-	21	3	3	<1	65	3	4	-	-
W35	26/04/2010	April 2010	-	-	119	139	<1	<1	46	46	4	<1	15	2	2	<1	46	3	3	1.01	1
W35	16/08/2010	Aug/Oct 2010	-	-	70	323	<1	<1	49	49	3	<1	17	3	2	<1	55	1	<1	1.04	1.17
W36	3/09/2007	Sep-07	23.36	53	-	95	-	-	32	32	1.7	0.1	9.4	2.2	1.1	0.22	33	1	2	-	-
W36	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W36	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W36	3/12/2007	Dec-07	25.04	57	28	81	<1	<1	27	27	1	<1	8	2	<1	<1	28	-	-	-	-
W36	18/04/2008	Apr-08	26.46	83	-	16	<1	<1	44	44	2	<1	11	2	1	<1	36	<1	<1	-	-
W36	30/07/2008	Jul-08	25.15	53	-	131	<1	<1	24	24	2	<1	7	2	1	<1	26	3	3	-	-
W36	26/10/2008	Oct-08	26.74	81	-	64	<1	<1	40	40	2	<1	12	2	1	<1	38	2	2	-	-
W36	10/12/2008	Dec-08	25.06	73	-	221	<1	<1	33	33	6	4	9	2	5	<1	31	3	2	-	-
W36	21/01/2009	January-09	26.6	108	-	29	<1	<1	44	44	3	<1	15	3	2	<1	50	1	1	-	-
W36	31/10/2009	October-09	27.02	-	59	48	<1	<1	45	45	2	-	14	2	1	<1	43	2	3	-	-
W36	25/02/2010	February-10	25.23	-	62	425	<1	<1	34	34	2	-	9	2	<1	<1	31	3	3	-	-
W36	25/04/2010	April 2010	25.7	-	174	343	<1	<1	49	49	3	<1	16	2	1	<1	48	1	2	1.03	1.05
W36	6/08/2010	Aug/Oct 2010	-	-	100	-	<1	<1	62	62	-	-	-	-	-	-	-	-	<1	-	-
W38A	5/12/2007	Dec-07	27.31	77	16	58	<1	<1	31	31	3	<1	6	4	2	<1	31	-	-	-	-
W38A	10/12/2008	Dec-08	26	63	-	385	<1	<1	29	29	3	2	5	3	1	<1	25	2	2	-	-
W38A	26/04/2010	April 2010	28.9	-	93	9	<1	<1	43	43	3	<1	9	5	1	<1	43	2	2	0.92	0.94

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W38A	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W38A	18/04/2008	Apr-08	26.36	59	-	77	<1	<1	29	29	1	<1	8	2	<1	<1	28	<1	<1	-	-
W38A	30/07/2008	Jul-08	24.18	72	-	82	<1	<1	33	33	3	<1	7	4	1	<1	34	1	1	-	-
W38A	27/10/2008	Oct-08	25.28	60	-	232	<1	<1	28	28	2	<1	6	3	1	<1	27	3	4	-	-
W38A	21/01/2009	January-09	26.9	86	-	40	<1	<1	35	35	3	<1	8	4	2	<1	36	1	2	-	-
W38A	31/10/2009	October-09	28.94	-	57	77	<1	<1	49	49	3	-	9	5	2	<1	43	1	2	-	-
W38A	26/02/2010	February-10	25.54	-	42	177	<1	<1	26	26	2	-	4	2	<1	<1	18	2	2	-	-
W38A	7/08/2010	Aug/Oct 2010	-	-	54	-	<1	<1	37	37	2	<1	8	4	2	<1	36	<1	<1	0.78	0.79
W41	2/09/2007	Sep-07	24.16	42	-	<2	-	-	26	26	2.4	<0.1	5	2.5	1.5	0.2	23	<1	<1	-	-
W41	1/12/2007	Dec-07	26.28	53	22	<1	<1	<1	23	23	2	<1	5	2	1	<1	21	-	-	-	-
W41	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W41	17/04/2008	Apr-08	25.79	56	-	2	<1	<1	19	19	2	<1	4	2	1	<1	18	<1	<1	-	-
W41	30/07/2008	Jul-08	26.81	51	-	<1	<1	<1	24	24	2	<1	5	2	2	<1	21	<1	<1	-	-
W41	24/10/2008	Oct-08	26.46	53	-	2	<1	<1	24	24	2	<1	5	2	2	<1	21	<1	2	-	-
W41	8/12/2008	Dec-08	27.07	57	-	<2	<1	<1	23	23	3	<1	5	3	2	<1	25	1	<1	-	-
W41	21/01/2009	January-09	25.5	60	-	8	<1	<1	23	23	3	<1	5	2	2	<1	21	<1	1	-	-
W41	25/04/2010	April 2010	28.6	-	61	2	<1	<1	23	23	2	<1	4	2	2	<1	18	<1	<1	0.5	0.48
W42	31/08/2007	Sep-07	22.9	62	-	6	-	-	36	36	4	<0.1	12	1.6	1.5	0.25	37	-	<1	-	-
W42	1/12/2007	Dec-07	25.01	91	44	<1	<1	<1	34	34	6	<1	12	2	2	<1	38	-	-	-	-
W42	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W42	17/04/2008	Apr-08	25.1	79	-	9	<1	<1	35	35	6	<1	11	2	2	<1	36	<1	<1	-	-
W42	30/07/2008	Jul-08	24.66	91	-	6	<1	<1	41	41	7	<1	14	2	2	<1	43	<1	<1	-	-
W42	24/10/2008	Oct-08	25.33	95	-	9	<1	<1	29	29	5	<1	15	2	2	<1	46	<1	1	-	-
W42	8/12/2008	Dec-08	26.77	92	-	<2	<1	<1	62	62	5	<1	17	3	3	<1	55	5	2	-	-
W42	21/01/2009	January-09	24.3	100	-	6	<1	<1	36	36	6	<1	14	2	2	<1	43	<1	<1	-	-
W42	25/04/2010	April 2010	26.2	-	103	2	<1	<1	33	33	5	<1	11	2	2	<1	36	<1	<1	0.76	0.77
W43	31/08/2007	Sep-07	24.48	30	-	10	-	-	17	17	1.6	<0.1	4.8	1.2	0.7	0.12	17	<1	<1	-	-
W43	1/12/2007	Dec-07	26.07	65	16	<1	<1	<1	27	27	3	<1	7	2	1	<1	26	-	-	-	-
W43	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	17/04/2008	Apr-08	26.21	45	-	5	<1	<1	27	27	4	<1	8	2	2	<1	28	<1	<1	-	-
W43	30/07/2008	Jul-08	26.46	66	-	<1	<1	<1	30	30	4	<1	8	2	2	<1	28	<1	<1	-	-
W43	24/10/2008	Oct-08	26.23	71	-	3	<1	<1	29	29	3	<1	9	2	2	<1	31	<1	2	-	-
W43	8/12/2008	Dec-08	27.53	78	-	2	<1	<1	33	33	5	<1	12	2	2	<1	38	<1	1	-	-
W43	21/01/2009	January-09	24.9	70	-	4	<1	<1	26	26	4	<1	8	2	2	<1	28	1	1	-	-
W43	31/10/2009	October-09	24.86	-	38	18	<1	<1	21	21	2	-	7	2	1	<1	26	3	3	-	-
W43	25/02/2010	February-10	25.69	-	35	18	<1	<1	25	25	3	-	5	2	1	<1	21	1	2	-	-
W43	25/04/2010	April 2010	27.8	-	62	2	<1	<1	27	27	3	<1	7	2	2	<1	26	<1	<1	0.6	0.56
W43	6/08/2010	Aug/Oct 2010	26.83	-	55	-	<1	<1	27	27	1	<1	8	2	2	<1	28	<1	<1	0.57	0.61
W48	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W48	18/04/2008	Apr-08	22.74	24	-	11	<1	<1	2	2	6	<1	2	<1	2	<1	9	2	2	-	-

Site	Date	Analyte	Temperature (Deg C)	Conductivity (Lab) (microS/cm)	TDS (mg/L)	TSS (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Alkalinity Total (mg/L)	SO4 2- (mg/L)	Cl- (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Hardness (mg/L)	DOC (mg/L)	TOC (mg/L)	Tot An (meq/L)	Tot Cat (meq/L)
		LOR*					1	1	1	1	1	1	1	1	1	1		1	1		
		Sampling Round (month/year)																			
W48	30/07/2008	Jul-08	22.87	34	-	7	<1	<1	9	9	7	<1	3	<1	2	<1	12	2	1	-	-
W48	24/10/2008	Oct-08	23.36	32	-	1	<1	<1	<1	<1	6	<1	2	<1	2	<1	9	2	6	-	-
W48	8/12/2008	Dec-08	23.65	26	-	<2	<1	<1	<1	<1	6	<1	2	<1	2	<1	9	2	2	-	-
W48	21/01/2009	January-09	24	30	-	5	<1	<1	5	5	6	<1	2	<1	2	<1	9	<1	2	-	-
W48	25/02/2010	February-10	22.76	-	25	11	<1	<1	4	4	3	-	<1	<1	<1	<1	7	4	4	-	-
W48	25/04/2010	April 2010	24.4	-	39	<1	<1	<1	5	5	5	<1	1	<1	1	<1	7	1	2	0.21	0.13
W48	10/08/2010	Aug/Oct 2010	-	-	17	19	<1	<1	3	3	1	25	2	<1	1	<1	9	2	2	0.14	0.14
W49	10/12/2008	Dec-08	-	99	-	74	<1	<1	48	48	3	1	13	3	1	<1	45	2	2	-	-
W50	8/12/2008	Dec-08	-	70	-	86	<1	<1	29	29	3	<1	10	2	2	<1	33	4	4	-	-
W50	26/02/2010	February-10	27.31	-	72	281	<1	<1	45	45	5	-	13	2	2	<1	41	3	4	-	-
W50	26/04/2010	April 2010	-	-	142	588	<1	<1	51	51	6	<1	18	2	2	<1	53	3	3	1.14	1.17
W50	7/08/2010	Aug/Oct 2010	-	-	89	-	<1	<1	61	61	5	<1	23	3	3	<1	70	<1	<1	1.32	1.48
W51	27/02/2010	February-10	28.45	-	64	87	<1	<1	41	41	4	-	11	3	2	<1	40	4	5	-	-
W51	27/04/2010	April 2010	29.1	-	81	75	<1	<1	49	49	4	<1	15	3	2	<1	50	4	3	1.07	1.13
W54	21/01/2009	January-09	29.5	128	-	235	<1	<1	47	47	8	<1	19	2	3	<1	56	2	2	-	-
W54	3/11/2009	October-09	29.41	-	97	106	<1	<1	66	66	6	-	21	3	3	<1	65	3	4	-	-
W54	26/02/2010	February-10	26.97	-	93	905	<1	<1	62	62	7	-	16	3	3	2	52	4	3	-	-
W54	26/05/2010	April 2010	26.7	-	112	421	<1	<1	48	48	6	<1	16	2	2	<1	48	3	3	1.08	1.02
W60	26/02/2010	February-10	27.5	-	61	163	<1	<1	38	38	5	-	12	2	2	<1	38	4	4	-	-
W60	26/04/2010	April 2010	-	-	69	161	<1	<1	40	40	3	<1	12	2	2	<1	38	3	3	0.87	0.89
W60	7/08/2010	Aug/Oct 2010	28.17	-	70	228	<1	<1	49	49	3	<1	15	4	2	<1	54	<1	1	1.04	1.15
W61	27/02/2010	February-10	28.11	-	72	97	<1	<1	41	41	4	-	11	3	2	<1	40	3	4	-	-
W61	27/04/2010	April 2010	28.5	-	78	98	<1	<1	46	46	4	<1	14	3	2	<1	47	3	3	1	1.01
W61	22/10/2010	Aug/Oct 2010	28.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62	27/02/2010	February-10	30.25	-	64	10	<1	<1	43	43	3	-	11	3	2	<1	40	5	6	-	-
W62	27/04/2010	April 2010	31.3	-	81	7	<1	<1	51	51	3	<1	13	3	2	<1	45	4	4	1.09	1.05
W62	10/10/2010	Aug/Oct 2010	37.92	-	200	<5	-	-	-	-	88	2	30	7	4	<1	104	5	6	-	-
W63	27/02/2010	February-10	28.72	-	65	101	<1	<1	41	41	3	-	11	3	2	<1	40	4	4	-	-
W63	27/04/2010	April 2010	30.2	-	77	54	<1	<1	52	52	4	<1	14	3	2	<1	47	4	4	1.12	1.08
W63	23/10/2010	Aug/Oct 2010	28.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W64	27/02/2010	February-10	28.33	-	74	242	<1	<1	50	50	3	-	12	3	2	<1	42	4	4	-	-
W64	27/04/2010	April 2010	29.9	-	74	138	<1	<1	50	50	3	<1	13	3	2	<1	45	4	4	1.06	1.03
W64	25/10/2010	Aug/Oct 2010	29.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W65	27/02/2010	February-10	28.61	-	79	228	<1	<1	45	45	3	-	11	3	2	<1	40	4	4	-	-
W65	27/04/2010	April 2010	31.6	-	78	111	<1	<1	46	46	3	1	12	4	3	<1	46	4	4	1.02	1.03
W70	27/08/2010	Aug/Oct 2010	28.7	-	39	30	<1	<1	28	28	<1	<1	4	3	2	<1	22	1	16	0.56	0.55
W71	25/04/2010	April 2010	27.8	-	169	39	<1	<1	76	76	4	<1	14	11	1	<1	80	1	2	1.61	1.66

Table A-4 Total Metals Data

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
Basecamp	26/02/2010	February-10	<0.001	32.3	0.007	0.0004	-	-	0.170	35.6	<0.0001	2.85	0.074	0.041	<0.001	<0.01	0.139
Basecamp	11/08/2010	Aug/Oct 2010	<0.001	0.11	<0.001	<0.0001	<0.001	<0.001	0.009	0.11	<0.0001	0.066	0.001	<0.001	<0.001	<0.01	0.009
RORWB	14/10/2010	Aug/Oct 2010	<0.001	0.20	0.001	<0.0001	<0.001	<0.001	<0.001	0.98	<0.0001	0.098	<0.001	<0.001	<0.001	<0.01	0.005
W02	2/09/2007	Sep-07	0.00005	0.1	<0.001	<0.0001	-	-	<0.001	0.085	-	0.0055	<0.001	<0.001	-	<0.001	<0.001
W02	30/11/2007	Dec-07	<0.001	0.15	<0.001	0.0002	<0.001	<0.001	0.004	-	-	0.009	0.002	<0.001	-	<0.010	0.032
W02	1/12/2007	Dec-07	<0.001	0.15	<0.001	0	<0.001	<0.001	0.004	-	-	0.009	0.002	<0.001	<0.001	<0.010	0.032
W02	18/04/2008	Apr-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.006	0.001	<0.001	-	<0.010	<0.005
W02	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W02	23/10/2008	Oct-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.005	0.002	<0.001	-	<0.010	<0.005
W02	10/12/2008	Dec-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.006	<0.001	<0.001	-	<0.010	<0.005
W02	21/01/2009	January-09	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.008	<0.001	<0.001	-	<0.010	<0.005
W02	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.08	<0.0001	0.010	<0.001	<0.001	<0.001	<0.01	<0.005
W02	25/02/2010	February-10	<0.001	0.92	<0.001	<0.0001	-	-	0.002	0.86	<0.0001	0.023	0.003	<0.001	<0.001	<0.01	<0.005
W02	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.05	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W02	5/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.009
W03	2/09/2007	Sep-07	<0.00005	0.064	<0.001	<0.0001	-	-	<0.001	0.14	-	0.01	<0.001	<0.001	-	<0.001	<0.001
W03	30/11/2007	Dec-07	<0.001	0.17	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.014	0.001	<0.001	-	<0.010	<0.005
W03	1/12/2007	Dec-07	<0.001	0.17	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.014	0.001	<0.001	<0.001	<0.010	<0.005
W03	18/04/2008	Apr-08	<0.001	0.04	<0.001	0.0002	<0.001	<0.001	<0.001	0.08	-	0.008	<0.001	<0.001	-	<0.010	<0.005
W03	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.015	<0.001	<0.001	-	<0.010	<0.005
W03	23/10/2008	Oct-08	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	0.10	-	0.012	<0.001	<0.001	-	<0.010	<0.005
W03	10/12/2008	Dec-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.012	<0.001	<0.001	-	<0.010	<0.005
W03	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W03	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.17	<0.0001	0.025	<0.001	<0.001	<0.001	<0.01	<0.005
W03	25/02/2010	February-10	<0.001	1.33	<0.001	<0.0001	-	-	0.003	1.32	<0.0001	0.042	0.006	<0.001	<0.001	<0.01	0.042
W03	25/04/2010	April 2010	<0.001	0.06	<0.001	<0.0001	-	-	<0.001	0.1	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	<0.005
W03	5/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	<0.0001	<0.001	0.006	<0.001	0.13	<0.0001	0.017	<0.001	<0.001	<0.001	<0.01	<0.005
W04	2/09/2007	Sep-07	<0.00005	0.33	<0.001	<0.0001	-	-	<0.001	0.48	-	0.018	0.003	<0.001	-	<0.001	0.001
W04	30/11/2007	Dec-07	<0.001	0.30	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.020	0.003	<0.001	-	<0.010	<0.005
W04	1/12/2007	Dec-07	<0.001	0.3	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.020	0.003	<0.001	<0.001	<0.010	<0.005
W04	18/04/2008	Apr-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	0.08	-	0.007	0.002	<0.001	-	<0.010	<0.005
W04	30/07/2008	Jul-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.010	0.001	<0.001	-	<0.010	<0.005
W04	23/10/2008	Oct-08	<0.001	0.20	<0.001	<0.0001	<0.001	<0.001	0.002	0.24	-	0.044	0.002	<0.001	-	<0.010	<0.005
W04	10/12/2008	Dec-08	<0.001	0.14	<0.001	<0.0001	<0.001	<0.001	<0.001	0.29	-	0.027	0.004	<0.001	-	<0.010	<0.005
W04	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.005	0.001	<0.001	-	<0.010	<0.005
W04	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.13	<0.0001	0.015	<0.001	<0.001	<0.001	<0.01	<0.005
W04	25/02/2010	February-10	<0.001	1.42	<0.001	<0.0001	-	-	0.003	1.93	<0.0001	0.060	0.007	0.001	<0.001	<0.01	<0.005
W04	25/04/2010	April 2010	<0.001	0.1	<0.001	<0.0001	-	-	<0.001	0.2	<0.0001	0.017	<0.001	<0.001	<0.001	<0.01	<0.005
W04	5/08/2010	Aug/Oct 2010	<0.001	1.68	0.001	<0.0001	0.001	0.004	0.003	3.07	<0.0001	0.071	0.008	0.001	<0.001	<0.01	0.010
W07	2/09/2007	Sep-07	<0.00005	0.019	<0.001	<0.0001	-	-	<0.001	0.023	-	0.0014	<0.001	<0.001	-	<0.001	<0.001

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W07	30/11/2007	Dec-07	<0.001	0.14	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	0.001	<0.001	-	<0.010	<0.005
W07	1/12/2007	Dec-07	<0.001	0.14	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	0.001	<0.001	<0.001	<0.010	<0.005
W07	18/04/2008	Apr-08	<0.001	0.03	<0.001	0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	0.001	<0.001	-	<0.010	<0.005
W07	30/07/2008	Jul-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W07	23/10/2008	Oct-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	0.001	<0.001	-	<0.010	<0.005
W07	10/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.001	<0.001	<0.001	-	<0.010	<0.005
W07	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W07	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W07	25/02/2010	February-10	<0.001	0.57	<0.001	<0.0001	-	-	0.002	0.40	<0.0001	0.013	0.002	<0.001	<0.001	<0.01	<0.005
W07	25/04/2010	April 2010	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W07	5/08/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W102	16/08/2010	Aug/Oct 2010	<0.001	0.89	<0.001	<0.0001	0.001	0.005	0.002	1.44	<0.0001	0.044	0.015	<0.001	<0.001	<0.01	<0.005
W114	16/10/2010	Aug/Oct 2010	<0.001	0.42	<0.001	<0.0001	0.003	0.003	0.004	0.64	<0.0001	0.125	0.019	0.002	<0.001	<0.01	<0.005
W115	16/10/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.08	<0.0001	0.007	0.002	<0.001	<0.001	<0.01	<0.005
W17	2/09/2007	Sep-07	<0.00005	0.029	<0.001	<0.0001	-	-	<0.001	0.03	-	0.0015	<0.001	<0.001	-	<0.001	<0.001
W17	30/11/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W17	1/12/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.002	<0.001	<0.001	<0.001	<0.010	<0.005
W17	18/04/2008	Apr-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	0.022
W17	30/07/2008	Jul-08	<0.001	0.02	<0.001	<0.0001	<0.001	0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	0.009
W17	23/10/2008	Oct-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	0.009
W17	8/12/2008	Dec-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W17	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W17	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W17	25/02/2010	February-10	<0.001	0.50	<0.001	<0.0001	-	-	0.001	0.48	<0.0001	0.014	0.002	<0.001	<0.001	<0.01	<0.005
W17	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W17	5/08/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	0.001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W18	1/12/2007	Dec-07	<0.001	0.21	<0.001	<0.0001	<0.001	0.001	0.002	-	-	0.009	0.003	<0.001	<0.001	<0.010	<0.005
W18	2/12/2007	Dec-07	<0.001	0.21	<0.001	<0.0001	<0.001	0.001	0.002	-	-	0.009	0.003	<0.001	-	<0.010	<0.005
W18	18/04/2008	Apr-08	<0.001	0.15	0.001	0.0002	<0.001	<0.001	0.003	0.21	-	0.017	0.002	<0.001	-	<0.010	<0.005
W18	30/07/2008	Jul-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.004	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W18	24/10/2008	Oct-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.003	<0.05	-	0.003	0.001	<0.001	-	<0.010	<0.005
W18	8/12/2008	Dec-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.003	0.06	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W18	21/01/2009	January-09	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	0.004	<0.05	-	0.001	<0.001	<0.001	-	<0.010	<0.005
W18	25/02/2010	February-10	<0.001	0.41	<0.001	<0.0001	-	-	0.047	0.39	<0.0001	0.012	0.004	<0.001	<0.001	<0.01	<0.005
W18	25/04/2010	April 2010	<0.001	0.07	<0.001	<0.0001	-	-	0.004	0.06	<0.0001	0.004	0.003	<0.001	<0.001	<0.01	<0.005
W18	8/08/2010	Aug/Oct 2010	<0.001	0.16	<0.001	<0.0001	<0.001	<0.001	0.003	0.14	<0.0001	0.005	0.001	<0.001	<0.001	<0.01	<0.005
W22	2/09/2007	Sep-07	<0.00005	1.6	<0.001	<0.0001	-	-	0.0024	2.3	-	0.058	0.0091	<0.001	-	<0.001	0.0049
W22	1/12/2007	Dec-07	<0.001	0.40	<0.001	<0.0001	<0.001	0.002	<0.001	-	-	0.023	0.004	<0.001	<0.001	<0.010	<0.005
W22	17/04/2008	Apr-08	<0.001	0.20	<0.001	<0.0001	<0.001	<0.001	0.001	0.21	-	0.030	0.002	<0.001	-	<0.010	<0.005
W22	30/07/2008	Jul-08	<0.001	0.11	<0.001	<0.0001	<0.001	0.001	<0.001	0.12	-	0.006	0.002	<0.001	-	<0.010	<0.005
W22	24/10/2008	Oct-08	<0.001	0.61	0.002	<0.0001	0.003	0.003	0.005	0.82	-	0.135	0.021	0.003	-	<0.010	0.006

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W22	8/12/2008	Dec-08	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	0.12	-	0.014	0.002	<0.001	-	<0.010	<0.005
W22	21/01/2009	January-09	<0.001	0.12	<0.001	<0.0001	<0.001	0.002	<0.001	0.18	-	0.012	0.007	<0.001	-	<0.010	<0.005
W22	30/10/2009	October-09	<0.001	0.45	<0.001	<0.0001	-	-	0.002	0.70	<0.0001	0.066	0.020	0.001	<0.001	<0.01	<0.005
W22	25/02/2010	February-10	<0.001	9.31	0.003	<0.0001	-	-	0.019	14.6	<0.0001	0.402	0.069	0.007	<0.001	<0.01	0.038
W22	25/04/2010	April 2010	<0.001	0.18	<0.001	<0.0001	-	-	<0.001	0.34	<0.0001	0.026	0.006	<0.001	<0.001	<0.01	<0.005
W22	6/08/2010	Aug/Oct 2010	<0.001	0.79	<0.001	<0.0001	<0.001	0.004	0.002	1.28	<0.0001	0.047	0.012	<0.001	<0.001	<0.01	<0.005
W23	31/08/2007	Sep-07	0.0002	2.8	<0.001	<0.0001	-	-	0.0059	4	-	0.11	0.022	0.0015	-	<0.001	0.0087
W23	18/04/2008	Apr-08	<0.001	0.16	<0.001	<0.0001	<0.001	<0.001	<0.001	0.17	-	0.016	0.002	<0.001	-	<0.010	0.006
W23	30/07/2008	Jul-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	0.12	-	0.016	0.003	<0.001	-	<0.010	<0.005
W23	25/10/2008	Oct-08	<0.001	0.23	0.002	<0.0001	<0.001	0.001	0.003	0.28	-	0.022	0.005	<0.001	-	<0.010	<0.005
W23	8/12/2008	Dec-08	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	0.18	-	0.015	0.002	<0.001	-	<0.010	<0.005
W23	21/01/2009	January-09	<0.001	0.09	<0.001	<0.0001	<0.001	0.001	<0.001	0.17	-	0.010	0.004	<0.001	-	<0.010	<0.005
W23	4/11/2009	October-09	<0.001	0.30	<0.001	<0.0001	-	-	0.002	0.49	<0.0001	0.048	0.008	0.001	<0.001	<0.01	<0.005
W23	25/02/2010	February-10	<0.001	7.87	0.003	<0.0001	-	-	0.023	12.2	<0.0001	0.467	0.050	0.008	<0.001	<0.01	0.035
W23	25/04/2010	April 2010	<0.001	0.28	<0.001	<0.0001	-	-	0.001	0.5	<0.0001	0.022	0.006	<0.001	<0.001	<0.01	<0.005
W23	6/08/2010	Aug/Oct 2010	<0.001	1.55	<0.001	<0.0001	0.002	0.008	0.003	2.62	<0.0001	0.069	0.017	<0.001	<0.001	<0.01	<0.005
W26	3/09/2007	Sep-07	0.0001	0.84	<0.001	<0.0001	-	-	0.0013	0.94	-	0.018	<0.001	<0.001	-	<0.001	0.0023
W26	1/12/2007	Dec-07	<0.001	0.34	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.024	0.001	<0.001	<0.001	<0.010	<0.005
W26	3/12/2007	Dec-07	<0.001	0.34	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.024	0.001	<0.001	-	<0.010	<0.005
W26	12/10/2010	Aug/Oct 2010	<0.001	0.18	<0.001	<0.0001	<0.001	<0.001	0.002	0.56	<0.0001	0.037	0.002	0.001	<0.001	<0.01	<0.005
W26	18/04/2008	Apr-08	<0.001	0.12	<0.001	0.0002	<0.001	<0.001	<0.001	0.29	-	0.012	<0.001	<0.001	-	<0.010	<0.005
W26	30/07/2008	Jul-08	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001	0.43	-	0.030	0.002	<0.001	-	<0.010	<0.005
W26	27/10/2008	Oct-08	<0.001	0.24	0.001	0.0001	<0.001	<0.001	0.001	0.50	-	0.028	0.002	<0.001	-	<0.010	0.007
W26	8/12/2008	Dec-08	<0.001	0.35	<0.001	<0.0001	<0.001	<0.001	<0.001	0.70	-	0.027	0.002	<0.001	-	<0.010	0.010
W26	21/01/2009	January-09	<0.001	0.18	<0.001	<0.0001	<0.001	0.002	0.003	0.77	-	0.039	0.002	<0.001	-	<0.010	<0.005
W27	4/09/2007	Sep-07	<0.00005	0.89	<0.001	<0.0001	-	-	0.057	0.28	-	0.055	0.0026	<0.001	-	<0.001	0.0017
W27	1/12/2007	Dec-07	<0.001	0.62	<0.001	<0.0001	0	<0.001	0.048	-	-	0.044	0.002	<0.001	<0.001	<0.010	0.017
W27	2/12/2007	Dec-07	<0.001	0.59	<0.001	<0.0001	0.001	<0.001	0.048	-	-	0.040	0.002	<0.001	-	<0.010	0.014
W27	17/04/2008	Apr-08	<0.001	0.71	<0.001	0.0001	0.002	<0.001	0.058	0.16	-	0.045	0.002	<0.001	-	<0.010	0.020
W27	30/07/2008	Jul-08	<0.001	0.24	<0.001	<0.0001	<0.001	<0.001	0.022	0.19	-	0.019	<0.001	<0.001	-	<0.010	<0.005
W27	23/10/2008	Oct-08	<0.001	0.49	<0.001	0.0001	0.001	<0.001	0.043	0.30	-	0.051	0.002	<0.001	-	<0.010	0.016
W27	8/12/2008	Dec-08	<0.001	0.68	<0.001	0.0001	0.002	<0.001	0.079	0.24	-	0.082	0.001	<0.001	-	<0.010	0.017
W27	21/01/2009	January-09	<0.001	0.38	<0.001	<0.0001	0.001	<0.001	0.050	0.20	-	0.043	0.001	<0.001	-	<0.010	0.013
W27	31/10/2009	October-09	<0.001	0.43	<0.001	<0.0001	-	-	0.057	0.33	<0.0001	0.040	0.001	<0.001	<0.001	<0.01	0.010
W27	25/02/2010	February-10	<0.001	0.54	<0.001	<0.0001	-	-	0.069	0.23	<0.0001	0.041	0.002	<0.001	<0.001	<0.01	0.012
W27	26/04/2010	April 2010	<0.001	0.57	<0.001	<0.0001	-	-	0.06	0.23	<0.0001	0.06	0.002	<0.001	<0.001	<0.01	0.014
W27	11/08/2010	Aug/Oct 2010	<0.001	0.75	<0.001	0.0001	0.002	<0.001	0.072	0.16	<0.0001	0.070	0.002	<0.001	<0.001	<0.01	0.020
W28	2/09/2007	Sep-07	<0.00005	0.13	<0.001	<0.0001	-	-	<0.001	0.076	-	0.003	0.0018	<0.001	-	<0.001	<0.001
W28	30/11/2007	Dec-07	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	0.002	<0.001	-	<0.010	<0.005
W28	1/12/2007	Dec-07	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	0.002	<0.001	<0.001	<0.010	<0.005
W28	18/04/2008	Apr-08	<0.001	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	0.002	<0.001	-	<0.010	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W28	30/07/2008	Jul-08	<0.001	0.26	<0.001	<0.0001	<0.001	<0.001	0.002	0.22	-	0.047	0.003	<0.001	-	<0.010	<0.005
W28	23/10/2008	Oct-08	<0.001	0.06	<0.001	0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	0.002	<0.001	-	<0.010	<0.005
W28	8/12/2008	Dec-08	<0.001	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001	0.10	-	0.003	0.004	<0.001	-	<0.010	<0.005
W28	21/01/2009	January-09	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.001	0.002	<0.001	-	<0.010	<0.005
W28	31/10/2009	October-09	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	0.001	<0.001	<0.001	<0.01	<0.005
W28	25/02/2010	February-10	<0.001	0.29	<0.001	<0.0001	-	-	<0.001	0.31	<0.0001	0.009	0.006	<0.001	<0.001	<0.01	<0.005
W28	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	0.002	<0.001	<0.001	<0.01	<0.005
W28	10/08/2010	Aug/Oct 2010	<0.001	0.49	<0.001	<0.0001	<0.001	0.003	0.001	0.78	<0.0001	0.021	0.018	<0.001	<0.001	<0.01	<0.005
W29	31/08/2007	Sep-07	<0.00005	0.27	<0.001	<0.0001	-	-	0.0036	0.24	-	0.0069	0.002	<0.001	-	<0.001	0.0032
W29	1/12/2007	Dec-07	<0.001	0.15	<0.001	<0.0001	<0.001	<0.001	0.004	-	-	0.004	0.002	<0.001	<0.001	<0.010	<0.005
W29	17/04/2008	Apr-08	<0.001	0.08	<0.001	<0.0001	<0.001	<0.001	0.003	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W29	30/07/2008	Jul-08	<0.001	0.08	<0.001	<0.0001	<0.001	<0.001	0.004	0.06	-	0.006	0.001	<0.001	-	<0.010	<0.005
W29	24/10/2008	Oct-08	<0.001	-	0.001	<0.0001	-	-	0.003	0.06	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W29	8/12/2008	Dec-08	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	0.008	0.15	-	0.008	<0.001	<0.001	-	<0.010	<0.005
W29	21/01/2009	January-09	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.004	0.06	-	0.003	0.001	<0.001	-	<0.010	<0.005
W29	31/10/2009	October-09	<0.001	0.45	<0.001	<0.0001	-	-	0.016	0.55	<0.0001	0.041	0.003	<0.001	<0.001	<0.01	<0.005
W29	25/02/2010	February-10	<0.001	0.65	<0.001	<0.0001	-	-	0.007	0.58	<0.0001	0.020	0.004	<0.001	<0.001	<0.01	0.008
W29	25/04/2010	April 2010	<0.001	0.08	<0.001	<0.0001	-	-	0.004	0.07	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W29	12/08/2010	Aug/Oct 2010	<0.001	0.08	<0.001	<0.0001	<0.001	<0.001	0.003	0.06	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W31	1/12/2007	Dec-07	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.143	0.003	<0.001	<0.001	<0.010	<0.005
W31	5/12/2007	Dec-07	<0.001	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.143	0.003	<0.001	-	<0.010	<0.005
W31	18/04/2008	Apr-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	0.25	-	0.014	0.002	<0.001	-	<0.010	<0.005
W31	30/07/2008	Jul-08	<0.001	0.02	0.001	<0.0001	<0.001	<0.001	<0.001	0.32	-	0.085	0.002	<0.001	-	<0.010	<0.005
W31	27/10/2008	Oct-08	<0.001	0.41	<0.001	<0.0001	0.001	0.001	0.003	0.78	-	0.100	0.006	<0.001	-	<0.010	<0.005
W31	8/12/2008	Dec-08	<0.001	0.11	<0.001	<0.0001	<0.001	<0.001	<0.001	0.31	-	0.019	0.001	<0.001	-	<0.010	<0.005
W31	21/01/2009	January-09	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	0.18	-	0.007	0.001	<0.001	-	<0.010	<0.005
W31	31/10/2009	October-09	<0.001	0.07	<0.001	<0.0001	-	-	0.001	0.52	<0.0001	0.054	0.002	<0.001	<0.001	<0.01	<0.005
W31	26/02/2010	February-10	<0.001	7.12	0.002	<0.0001	-	-	0.015	9.41	<0.0001	0.235	0.045	0.004	<0.001	<0.01	0.037
W31	25/04/2010	April 2010	<0.001	1.05	<0.001	<0.0001	-	-	0.003	1.45	<0.0001	0.047	0.005	<0.001	<0.001	<0.01	<0.005
W31	5/08/2010	Aug/Oct 2010	<0.001	0.68	<0.001	<0.0001	<0.001	0.001	0.002	1.39	<0.0001	0.059	0.004	<0.001	<0.001	<0.01	<0.005
W33	1/12/2007	Dec-07	<0.001	9.25	0.01	<0.0001	0.01	0.021	0.021	-	-	0.362	0.027	0.005	<0.001	<0.010	0.035
W33	5/12/2007	Dec-07	<0.001	1.62	0.002	<0.0001	0.002	0.004	0.004	-	-	0.123	0.009	<0.001	-	<0.010	<0.005
W33	18/04/2008	Apr-08	<0.001	0.77	0.002	<0.0001	0.003	<0.001	0.010	2.28	-	0.236	0.004	0.003	-	<0.010	0.008
W33	30/07/2008	Jul-08	<0.001	0.50	0.003	<0.0001	0.001	<0.001	0.005	2.10	-	0.144	0.002	0.002	-	<0.010	<0.005
W33	27/10/2008	Oct-08	<0.001	0.59	0.003	<0.0001	0.002	<0.001	0.007	1.82	-	0.187	0.002	0.002	-	<0.010	0.005
W33	8/12/2008	Dec-08	<0.001	0.20	<0.001	<0.0001	<0.001	<0.001	0.002	0.50	-	0.039	<0.001	0.001	-	<0.010	<0.005
W33	21/01/2009	January-09	<0.001	0.35	0.001	<0.0001	<0.001	<0.001	0.005	0.83	-	0.036	0.001	0.002	-	<0.010	<0.005
W33	31/10/2009	October-09	<0.001	1.49	0.001	0.0002	-	-	0.010	4.12	<0.0001	0.158	0.006	0.003	<0.001	<0.01	0.026
W33	26/02/2010	February-10	<0.001	9.00	0.005	<0.0001	-	-	0.013	16.2	<0.0001	0.281	0.017	0.008	<0.001	<0.01	0.036
W33	26/04/2010	April 2010	<0.001	5.05	0.004	<0.0001	-	-	0.01	11.6	<0.0001	0.186	0.011	0.006	<0.001	<0.01	0.025
W33	7/08/2010	Aug/Oct 2010	<0.001	10.2	0.005	<0.0001	0.009	0.023	0.018	21.4	<0.0001	0.445	0.032	0.010	<0.001	<0.01	0.041

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W34	31/08/2007	Sep-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	1/12/2007	Dec-07	<0.001	7.35	0	<0.0001	0.01	0.018	0.017	-	-	0.279	0.022	0.004	<0.001	<0.010	0.027
W34	5/12/2007	Dec-07	<0.001	7.35	0.004	<0.0001	0.006	0.018	0.017	-	-	0.279	0.022	0.004	-	<0.010	0.027
W34	18/04/2008	Apr-08	<0.001	0.45	0.001	<0.0001	0.001	<0.001	0.005	1.53	-	0.095	0.002	0.002	-	<0.010	<0.005
W34	30/07/2008	Jul-08	<0.001	0.19	0.001	<0.0001	<0.001	<0.001	0.001	0.59	-	0.017	0.001	<0.001	-	<0.010	<0.005
W34	26/10/2008	Oct-08	<0.001	0.64	0.003	<0.0001	0.001	<0.001	0.006	1.52	-	0.107	0.003	0.002	-	<0.010	<0.005
W34	8/12/2008	Dec-08	<0.001	8.88	0.006	<0.0001	0.007	0.014	0.014	18.6	-	0.357	0.017	0.010	-	<0.010	0.042
W34	21/01/2009	January-09	<0.001	0.31	0.001	0.0001	<0.001	<0.001	0.003	0.70	-	0.014	0.001	<0.001	-	<0.010	<0.005
W34	31/10/2009	October-09	<0.001	2.19	0.002	<0.0001	-	-	0.008	4.10	<0.0001	0.094	0.006	0.002	<0.001	<0.01	0.008
W34	26/02/2010	February-10	<0.001	5.71	0.003	<0.0001	-	-	0.008	9.72	<0.0001	0.175	0.010	0.005	<0.001	<0.01	0.022
W34	26/04/2010	April 2010	<0.001	5.06	0.004	<0.0001	-	-	0.009	11.2	<0.0001	0.18	0.012	0.006	<0.001	<0.01	0.02
W34	11/10/2010	Aug/Oct 2010	<0.001	0.35	0.001	<0.0001	<0.001	<0.001	0.003	1.15	<0.0001	0.074	0.002	0.002	<0.001	<0.01	<0.005
W35	18/04/2008	Apr-08	<0.001	0.43	0.001	<0.0001	0.001	<0.001	0.005	1.40	-	0.109	0.003	0.002	-	<0.010	0.005
W35	30/07/2008	Jul-08	<0.001	0.52	0.002	<0.0001	0.002	0.002	0.005	2.15	-	0.130	0.005	0.003	-	<0.010	<0.005
W35	26/10/2008	Oct-08	<0.001	1.09	0.002	<0.0001	0.002	0.002	0.008	1.98	-	0.145	0.006	0.002	-	<0.010	0.006
W35	10/12/2008	Dec-08	<0.001	4.00	0.002	<0.0001	0.006	0.010	0.016	9.07	-	0.301	0.017	0.006	-	<0.010	0.035
W35	21/01/2009	January-09	<0.001	0.26	0.002	<0.0001	<0.001	<0.001	0.003	0.74	-	0.318	0.001	<0.001	-	<0.010	<0.005
W35	31/10/2009	October-09	<0.001	5.34	0.002	<0.0001	-	-	0.018	11.4	<0.0001	0.312	0.019	0.006	<0.001	<0.01	0.022
W35	26/04/2010	April 2010	<0.001	3.24	0.002	<0.0001	-	-	0.007	6.98	<0.0001	0.126	0.01	0.004	<0.001	<0.01	0.021
W35	16/08/2010	Aug/Oct 2010	<0.001	4.23	0.003	<0.0001	0.004	0.009	0.011	8.08	<0.0001	0.230	0.016	0.005	<0.001	<0.01	0.019
W36	3/09/2007	Sep-07	<0.00005	3.2	<0.001	<0.0001	-	-	0.0061	4.6	-	0.12	0.022	0.0015	-	<0.001	0.0092
W36	1/12/2007	Dec-07	<0.001	3.02	<0.001	<0.0001	0	0.017	0.008	-	-	0.174	0.021	<0.001	<0.001	<0.010	0.009
W36	1/12/2007	Dec-07	<0.001	2.92	<0.001	<0.0001	0	0.016	0.008	-	-	0.159	0.019	<0.001	<0.001	<0.010	0.010
W36	3/12/2007	Dec-07	<0.001	3.02	<0.001	<0.0001	0.004	0.017	0.008	-	-	0.174	0.021	<0.001	-	<0.010	0.009
W36	18/04/2008	Apr-08	<0.001	0.07	<0.001	0.0001	<0.001	<0.001	<0.001	0.29	-	0.035	0.001	<0.001	-	<0.010	<0.005
W36	30/07/2008	Jul-08	<0.001	0.25	<0.001	<0.0001	0.001	0.001	0.003	0.46	-	0.072	0.005	<0.001	-	<0.010	<0.005
W36	26/10/2008	Oct-08	<0.001	0.26	<0.001	<0.0001	<0.001	0.002	0.002	0.39	-	0.032	0.006	<0.001	-	<0.010	<0.005
W36	10/12/2008	Dec-08	<0.001	3.17	<0.001	<0.0001	0.003	0.012	0.007	5.27	-	0.128	0.016	0.002	-	<0.010	0.016
W36	21/01/2009	January-09	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	0.36	-	0.054	<0.001	<0.001	-	<0.010	<0.005
W36	31/10/2009	October-09	<0.001	0.26	<0.001	<0.0001	-	-	0.003	0.60	<0.0001	0.043	0.005	<0.001	<0.001	<0.01	<0.005
W36	25/02/2010	February-10	<0.001	10.5	0.003	<0.0001	-	-	0.026	15.2	<0.0001	0.372	0.058	0.005	<0.001	<0.01	0.034
W36	25/04/2010	April 2010	<0.001	4.67	0.001	<0.0001	-	-	0.013	8.52	<0.0001	0.207	0.026	0.003	<0.001	<0.01	0.017
W36	6/08/2010	Aug/Oct 2010	<0.001	3.03	<0.001	<0.0001	0.004	0.021	0.007	4.60	<0.0001	0.114	0.031	<0.001	<0.001	<0.01	<0.005
W38A	5/12/2007	Dec-07	<0.001	1.64	<0.001	<0.0001	0.002	0.007	0.005	-	-	0.102	0.015	<0.001	-	<0.010	0.007
W38A	10/12/2008	Dec-08	<0.001	2.18	0.001	<0.0001	0.004	0.010	0.009	4.55	-	0.168	0.035	0.003	-	<0.010	0.010
W38A	26/04/2010	April 2010	<0.001	0.26	<0.001	<0.0001	-	-	0.002	0.74	<0.0001	0.051	0.005	<0.001	<0.001	<0.01	<0.005
W38A	1/12/2007	Dec-07	<0.001	1.64	<0.001	<0.0001	0	0.007	0.005	-	-	0.102	0.015	<0.001	<0.001	<0.010	0.007
W38A	18/04/2008	Apr-08	<0.001	0.14	<0.001	0.0001	<0.001	<0.001	0.002	0.35	-	0.033	0.003	<0.001	-	<0.010	<0.005
W38A	30/07/2008	Jul-08	<0.001	0.15	<0.001	<0.0001	<0.001	0.002	0.001	0.34	-	0.006	0.004	<0.001	-	<0.010	<0.005
W38A	27/10/2008	Oct-08	<0.001	0.24	<0.001	<0.0001	<0.001	0.001	0.002	0.46	-	0.032	0.007	<0.001	-	<0.010	<0.005
W38A	21/01/2009	January-09	<0.001	0.11	<0.001	<0.0001	<0.001	0.001	0.001	0.36	-	0.084	0.004	<0.001	-	<0.010	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W38A	31/10/2009	October-09	<0.001	0.13	<0.001	<0.0001	-	-	0.003	0.80	<0.0001	0.050	0.006	<0.001	<0.001	<0.01	<0.005
W38A	26/02/2010	February-10	<0.001	3.92	0.001	<0.0001	-	-	0.009	6.11	<0.0001	0.154	0.035	0.003	<0.001	<0.01	0.017
W38A	7/08/2010	Aug/Oct 2010	<0.001	2.03	<0.001	<0.0001	0.002	0.009	0.005	3.46	<0.0001	0.100	0.020	0.001	<0.001	<0.01	<0.005
W41	2/09/2007	Sep-07	<0.00005	0.071	<0.001	<0.0001	-	-	<0.001	0.045	-	0.002	<0.001	<0.001	-	<0.001	<0.001
W41	1/12/2007	Dec-07	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W41	1/12/2007	Dec-07	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	<0.001	<0.001	<0.001	<0.010	<0.005
W41	17/04/2008	Apr-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W41	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W41	24/10/2008	Oct-08	<0.001	<0.01	0.001	0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W41	8/12/2008	Dec-08	<0.001	0.02	<0.001	0.0002	<0.001	0.001	<0.001	0.08	-	0.004	<0.001	<0.001	-	<0.010	0.024
W41	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W41	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	0.08	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W42	31/08/2007	Sep-07	<0.00005	0.31	<0.001	<0.0001	-	-	0.0012	0.31	-	0.012	<0.001	<0.001	-	<0.001	0.0013
W42	1/12/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W42	1/12/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.004	<0.001	<0.001	<0.001	<0.010	<0.005
W42	17/04/2008	Apr-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.007	<0.001	<0.001	-	<0.010	<0.005
W42	30/07/2008	Jul-08	<0.001	0.01	<0.001	<0.0001	<0.001	0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W42	24/10/2008	Oct-08	<0.001	0.05	0.002	0.0005	<0.001	<0.001	0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.010	0.007
W42	8/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W42	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W42	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W43	31/08/2007	Sep-07	<0.00005	0.32	<0.001	<0.0001	-	-	<0.001	0.41	-	0.013	0.0017	<0.001	-	<0.001	0.0011
W43	1/12/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.005	0.001	<0.001	-	<0.010	<0.005
W43	1/12/2007	Dec-07	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	-	-	0.005	0.001	<0.001	<0.001	<0.010	<0.005
W43	17/04/2008	Apr-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	<0.001	<0.001	<0.001	-	<0.010	<0.005
W43	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W43	24/10/2008	Oct-08	<0.001	0.02	0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.010	<0.005
W43	8/12/2008	Dec-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.014	<0.001	<0.001	-	<0.010	<0.005
W43	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.008	<0.001	<0.001	-	<0.010	<0.005
W43	31/10/2009	October-09	<0.001	0.15	<0.001	<0.0001	-	-	0.003	0.20	<0.0001	0.024	0.002	<0.001	<0.001	<0.01	<0.005
W43	25/02/2010	February-10	<0.001	0.41	<0.001	<0.0001	-	-	0.001	0.46	<0.0001	0.016	0.002	<0.001	<0.001	<0.01	<0.005
W43	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	0.001	0.06	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	<0.005
W43	6/08/2010	Aug/Oct 2010	<0.001	0.53	<0.001	<0.0001	<0.001	<0.001	0.002	0.62	<0.0001	0.034	0.002	<0.001	<0.001	<0.01	0.045
W48	1/12/2007	Dec-07	<0.001	0.11	0	0	<0.001	<0.001	1.420	-	-	0.006	0.003	0.069	<0.001	<0.010	0.874
W48	18/04/2008	Apr-08	<0.001	0.08	<0.001	<0.0001	<0.001	<0.001	0.002	0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W48	30/07/2008	Jul-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W48	24/10/2008	Oct-08	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W48	8/12/2008	Dec-08	<0.001	0.05	<0.001	<0.0001	<0.001	<0.001	0.001	0.06	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W48	21/01/2009	January-09	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W48	25/02/2010	February-10	<0.001	0.24	<0.001	<0.0001	-	-	0.002	0.15	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.005
W48	25/04/2010	April 2010	<0.001	0.06	<0.001	<0.0001	-	-	0.001	0.06	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W48	10/08/2010	Aug/Oct 2010	<0.001	0.38	<0.001	<0.0001	<0.001	<0.001	0.002	0.35	<0.0001	0.012	0.004	<0.001	<0.001	<0.01	<0.005
W49	10/12/2008	Dec-08	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	0.25	-	0.011	<0.001	<0.001	-	<0.010	<0.005
W50	8/12/2008	Dec-08	<0.001	0.24	<0.001	<0.0001	<0.001	<0.001	0.002	0.81	-	0.052	<0.001	0.001	-	<0.010	0.005
W50	26/02/2010	February-10	<0.001	5.97	0.003	0.0002	-	-	0.009	10.4	<0.0001	0.181	0.012	0.006	<0.001	<0.01	0.028
W50	26/04/2010	April 2010	<0.001	5.29	0.004	0.0001	-	-	0.014	12.9	<0.0001	0.283	0.014	0.009	<0.001	<0.01	0.033
W50	7/08/2010	Aug/Oct 2010	<0.001	7.49	0.004	<0.0001	0.005	0.008	0.011	13.2	<0.0001	0.304	0.010	0.008	<0.001	<0.01	0.024
W51	27/02/2010	February-10	<0.001	2.02	0.001	<0.0001	-	-	0.004	3.63	<0.0001	0.104	0.007	0.002	<0.001	<0.01	0.016
W51	27/04/2010	April 2010	<0.001	1.71	0.002	<0.0001	-	-	0.005	3.81	<0.0001	0.092	0.007	0.002	<0.001	<0.01	0.008
W54	21/01/2009	January-09	<0.001	0.27	0.001	<0.0001	<0.001	<0.001	0.002	0.53	-	0.011	<0.001	<0.001	-	<0.010	<0.005
W54	3/11/2009	October-09	<0.001	0.53	<0.001	<0.0001	-	-	0.005	1.78	<0.0001	0.068	0.003	0.001	<0.001	<0.01	<0.005
W54	26/02/2010	February-10	<0.001	18.6	0.006	<0.0001	-	-	0.037	29.9	<0.0001	0.582	0.064	0.012	<0.001	<0.01	0.071
W54	26/05/2010	April 2010	<0.001	6.96	0.005	<0.0001	-	-	0.012	16	<0.0001	0.249	0.012	0.009	<0.001	<0.01	0.033
W60	26/02/2010	February-10	<0.001	3.64	0.003	0.0002	-	-	0.006	5.71	<0.0001	0.122	0.010	0.003	<0.001	<0.01	0.065
W60	26/04/2010	April 2010	<0.001	2.78	0.002	<0.0001	-	-	0.007	5.68	<0.0001	0.112	0.012	0.003	<0.001	<0.01	0.013
W60	7/08/2010	Aug/Oct 2010	<0.001	4.61	0.002	<0.0001	0.004	0.009	0.008	7.49	<0.0001	0.177	0.015	0.004	<0.001	<0.01	0.018
W61	27/02/2010	February-10	<0.001	2.50	<0.001	<0.0001	-	-	0.005	4.25	<0.0001	0.111	0.008	0.002	<0.001	<0.01	0.014
W61	27/04/2010	April 2010	<0.001	2.05	0.002	<0.0001	-	-	0.005	4.5	<0.0001	0.1	0.009	0.002	<0.001	<0.01	0.007
W61	22/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62	27/02/2010	February-10	<0.001	0.25	<0.001	<0.0001	-	-	0.001	0.61	<0.0001	0.023	0.002	<0.001	<0.001	<0.01	0.006
W62	27/04/2010	April 2010	<0.001	0.07	0.001	<0.0001	-	-	<0.001	0.45	<0.0001	0.023	<0.001	<0.001	<0.001	<0.01	<0.005
W62	10/10/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	0.002	0.08	<0.0001	0.029	0.002	<0.001	<0.001	<0.01	<0.005
W63	27/02/2010	February-10	<0.001	2.04	<0.001	<0.0001	-	-	0.004	3.52	<0.0001	0.106	0.009	0.002	<0.001	<0.01	0.017
W63	27/04/2010	April 2010	<0.001	1.29	0.002	<0.0001	-	-	0.003	2.89	<0.0001	0.075	0.006	<0.001	<0.001	<0.01	0.022
W63	23/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W64	27/02/2010	February-10	<0.001	4.15	0.001	<0.0001	-	-	0.008	6.09	<0.0001	0.169	0.012	0.002	<0.001	<0.01	0.014
W64	27/04/2010	April 2010	<0.001	3.15	0.002	<0.0001	-	-	0.007	6.44	<0.0001	0.176	0.013	0.002	<0.001	<0.01	0.039
W64	25/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W65	27/02/2010	February-10	<0.001	4.94	0.002	<0.0001	-	-	0.010	7.49	<0.0001	0.208	0.016	0.003	<0.001	<0.01	0.022
W65	27/04/2010	April 2010	<0.001	2.56	0.002	<0.0001	-	-	0.007	5.5	<0.0001	0.179	0.009	0.002	<0.001	<0.01	0.008
W70	27/08/2010	Aug/Oct 2010	<0.001	0.84	<0.001	<0.0001	0.001	0.002	0.002	3.23	<0.0001	0.159	0.003	<0.001	<0.001	<0.01	0.012
W71	25/04/2010	April 2010	<0.001	0.38	<0.001	<0.0001	-	-	0.002	0.82	<0.0001	0.062	0.008	<0.001	<0.001	<0.01	<0.005

Table A-5 Dissolved Metals Data

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
Basecamp	26/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	0.002	<0.05	<0.0001	0.029	<0.001	<0.001	<0.001	<0.01	<0.005
Basecamp	11/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	0.004	<0.05	<0.0001	0.053	<0.001	0.001	<0.001	<0.01	0.007
RORWB	14/10/2010	Aug/Oct 2010	<0.001	0.12	0.002	<0.0001	<0.001	<0.001	<0.001	0.92	<0.0001	0.097	<0.001	<0.001	<0.001	<0.01	<0.005
W02	2/09/2007	Sep-07	<0.00005	0.014	<0.001	<0.0001	-	-	<0.001	0.021	-	0.0055	<0.001	<0.001	-	<0.001	-
W02	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W02	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W02	18/04/2008	Apr-08	<0.001	0.03	<0.001	0.0004	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W02	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0.01	<0.001	<0.001	-	<0.01	<0.005
W02	23/10/2008	Oct-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W02	10/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.01	<0.005
W02	21/01/2009	January-09	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.011	<0.001	<0.001	-	<0.01	<0.005
W02	30/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.009	<0.001	<0.001	<0.001	<0.01	<0.005
W02	25/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W02	25/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	<0.005
W02	5/08/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.008
W03	2/09/2007	Sep-07	<0.00005	0.0078	<0.001	<0.0001	-	-	<0.001	0.041	-	0.011	<0.001	<0.001	-	<0.001	-
W03	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W03	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W03	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.008	<0.001	<0.001	-	<0.010	<0.005
W03	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0.02	<0.001	<0.001	-	<0.01	<0.005
W03	23/10/2008	Oct-08	<0.001	0.02	<0.001	0.0003	<0.001	<0.001	<0.001	<0.05	-	0.009	<0.001	<0.001	-	<0.010	<0.005
W03	10/12/2008	Dec-08	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.014	<0.001	<0.001	-	<0.01	<0.005
W03	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001	<0.05	<0.0001	0.018	<0.001	<0.001	-	<0.01	<0.005
W03	30/10/2009	October-09	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	0.06	<0.0001	0.022	<0.001	<0.001	<0.001	<0.01	<0.005
W03	25/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.06	<0.0001	0.012	<0.001	<0.001	<0.001	<0.01	0.014
W03	25/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	<0.005
W03	5/08/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.011	<0.001	0.002	<0.001	<0.01	<0.005
W04	2/09/2007	Sep-07	<0.00005	0.014	<0.001	<0.0001	-	-	<0.001	0.035	-	0.0071	<0.001	0.0011	-	<0.001	-
W04	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W04	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W04	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0003	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	0.002	-	<0.010	<0.005
W04	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W04	23/10/2008	Oct-08	<0.001	0.04	0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.008	<0.001	0.001	-	<0.010	<0.005
W04	10/12/2008	Dec-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	0.001	<0.05	-	0.006	<0.001	0.002	-	<0.01	<0.005
W04	21/01/2009	January-09	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.005	<0.001	<0.001	-	<0.01	<0.005
W04	30/10/2009	October-09	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W04	25/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W04	25/04/2010	April 2010	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.011	<0.001	<0.001	<0.001	<0.01	<0.005
W04	5/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.01	<0.001	0.001	<0.001	<0.01	0.006
W07	2/09/2007	Sep-07	0.00022	0.011	<0.001	<0.0001	-	-	<0.001	0.0079	-	<0.001	<0.001	<0.001	-	<0.001	-
W07	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W07	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W07	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0003	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	0.001	-	<0.010	<0.005
W07	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0	<0.001	<0.001	-	<0.01	<0.005
W07	23/10/2008	Oct-08	<0.001	0.02	<0.001	0.0004	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W07	10/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.001	<0.001	<0.001	-	<0.01	<0.005
W07	21/01/2009	January-09	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	-	<0.01	<0.005
W07	30/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W07	25/02/2010	February-10	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	0.001	<0.001	<0.01	<0.005
W07	25/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W07	5/08/2010	Aug/Oct 2010	<0.001	0.06	<0.001	0.0001	<0.001	<0.001	0.001	0.07	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	0.048
W102	16/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	<0.0001	<0.001	0.001	<0.001	<0.05	<0.0001	0.005	<0.001	0.002	<0.001	<0.01	0.008
W114	16/10/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	0.001	<0.001	<0.05	<0.0001	0.011	<0.001	0.001	<0.001	<0.01	<0.005
W115	16/10/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	0.001	<0.001	<0.001	0.06	<0.0001	0.007	<0.001	0.002	<0.001	<0.01	<0.005
W17	2/09/2007	Sep-07	<0.00005	0.093	<0.001	<0.0001	-	-	<0.001	0.0069	-	0.0012	<0.001	<0.001	-	<0.001	-
W17	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W17	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W17	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	0.011
W17	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0	<0.001	<0.001	-	<0.01	<0.005
W17	23/10/2008	Oct-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W17	8/12/2008	Dec-08	<0.001	0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	<0.001	<0.001	<0.001	-	<0.01	<0.005
W17	21/01/2009	January-09	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.001	<0.001	<0.001	-	<0.01	<0.005
W17	30/10/2009	October-09	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W17	25/02/2010	February-10	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W17	25/04/2010	April 2010	<0.001	0.01	<0.001	0.0009	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W17	5/08/2010	Aug/Oct 2010	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W18	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W18	2/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W18	18/04/2008	Apr-08	<0.001	0.12	0.001	0.0002	<0.001	<0.001	0.004	0.06	-	0.019	<0.001	0.002	-	<0.010	<0.005
W18	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0	<0.001	<0.001	-	<0.01	<0.005
W18	24/10/2008	Oct-08	<0.001	0.05	<0.001	0.0006	<0.001	<0.001	0.003	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W18	8/12/2008	Dec-08	<0.001	0.06	0.001	<0.0001	<0.001	<0.001	0.004	<0.05	-	0.002	<0.001	0.001	-	<0.01	<0.005
W18	21/01/2009	January-09	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	0.004	<0.05	<0.0001	0.001	<0.001	<0.001	-	<0.01	<0.005

Water Quality Data

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W18	25/02/2010	February-10	<0.001	0.05	<0.001	<0.0001	-	-	0.002	<0.05	<0.0001	0.002	<0.001	0.002	<0.001	<0.01	<0.005
W18	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	0.003	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W18	8/08/2010	Aug/Oct 2010	<0.001	0.05	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	<0.0001	0.001	<0.001	<0.001	<0.001	<0.01	<0.005
W22	2/09/2007	Sep-07	<0.00005	0.044	<0.001	<0.0001	-	-	<0.001	0.045	-	0.0067	<0.001	0.001	-	0.0017	-
W22	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W22	17/04/2008	Apr-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.01	<0.001	<0.001	-	<0.010	<0.005
W22	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.010	<0.005
W22	24/10/2008	Oct-08	<0.001	0.04	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.009	<0.001	0.001	-	<0.010	0.008
W22	8/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.01	<0.005
W22	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.006	<0.001	0.002	-	<0.01	<0.005
W22	30/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.008	<0.001	0.002	<0.001	<0.01	<0.005
W22	25/02/2010	February-10	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.011	<0.001	0.001	<0.001	<0.01	<0.005
W22	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.011	<0.001	<0.001	<0.001	<0.01	<0.005
W22	6/08/2010	Aug/Oct 2010	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	<0.005
W23	31/08/2007	Sep-07	<0.00005	0.032	<0.001	<0.0001	-	-	<0.001	0.047	-	0.0049	<0.001	0.0019	-	<0.001	-
W23	18/04/2008	Apr-08	<0.001	0.03	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.01	<0.001	<0.001	-	<0.010	<0.005
W23	30/07/2008	Jul-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.007	<0.001	<0.001	-	<0.010	<0.005
W23	25/10/2008	Oct-08	<0.001	0.05	<0.001	0.0002	<0.001	<0.001	0.001	0.09	-	0.009	<0.001	0.002	-	<0.010	<0.005
W23	8/12/2008	Dec-08	<0.001	<0.01	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.01	<0.005
W23	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.011	<0.001	0.001	-	<0.01	<0.005
W23	4/11/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.007	<0.001	0.001	<0.001	<0.01	<0.005
W23	25/02/2010	February-10	<0.001	0.05	<0.001	<0.0001	-	-	0.001	0.1	<0.0001	0.012	<0.001	0.002	<0.001	<0.01	<0.005
W23	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W23	6/08/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-
W26	3/09/2007	Sep-07	<0.00005	0.15	<0.001	<0.0001	-	-	<0.001	0.52	-	0.017	<0.001	<0.001	-	<0.001	-
W26	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W26	3/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W26	12/10/2010	Aug/Oct 2010	<0.001	0.05	0.001	<0.0001	0.002	<0.001	<0.001	0.23	<0.0001	0.007	<0.001	0.002	<0.001	<0.01	<0.005
W26	18/04/2008	Apr-08	<0.001	0.07	<0.001	0.0002	<0.001	<0.001	<0.001	0.22	-	0.011	<0.001	<0.001	-	<0.010	<0.005
W26	30/07/2008	Jul-08	<0.001	0.16	<0.001	<0.0001	<0.001	<0.001	<0.001	0.56	-	0.032	<0.001	0.002	-	<0.010	<0.005
W26	27/10/2008	Oct-08	<0.001	0.1	<0.001	0.0007	<0.001	0.001	0.002	0.38	-	0.023	<0.001	0.001	-	<0.010	0.007
W26	8/12/2008	Dec-08	<0.001	0.11	0.001	0.0001	<0.001	<0.001	0.002	0.34	-	0.02	<0.001	0.001	-	<0.01	0.006
W26	21/01/2009	January-09	<0.001	0.12	<0.001	<0.0001	<0.001	0.002	0.001	0.73	<0.0001	0.04	<0.001	0.002	-	<0.01	0.008
W27	4/09/2007	Sep-07	<0.00005	<0.005	<0.001	<0.0001	-	-	<0.001	0.016	-	0.0025	<0.001	<0.001	-	<0.001	-
W27	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W27	2/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W27	17/04/2008	Apr-08	<0.001	0.66	<0.001	0.0004	0.002	<0.001	0.057	0.15	-	0.045	<0.001	0.002	-	<0.010	0.025

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W27	30/07/2008	Jul-08	<0.001	0.21	<0.001	<0.0001	<0.001	<0.001	0.021	0.12	-	0.017	<0.001	<0.001	-	<0.010	0.006
W27	23/10/2008	Oct-08	<0.001	0.39	<0.001	0.0005	0.002	<0.001	0.046	0.18	-	0.054	<0.001	0.002	-	<0.010	0.016
W27	8/12/2008	Dec-08	<0.001	0.73	<0.001	<0.0001	0.002	<0.001	0.087	0.16	-	0.066	<0.001	<0.001	-	<0.01	0.019
W27	21/01/2009	January-09	<0.001	0.38	<0.001	<0.0001	0.001	<0.001	0.052	0.19	<0.0001	0.046	<0.001	0.002	-	<0.01	0.015
W27	31/10/2009	October-09	<0.001	0.33	<0.001	<0.0001	-	-	0.053	0.2	<0.0001	0.037	<0.001	0.001	<0.001	<0.01	0.009
W27	25/02/2010	February-10	<0.001	0.32	<0.001	<0.0001	-	-	0.058	0.13	<0.0001	0.041	<0.001	0.001	<0.001	<0.01	0.014
W27	26/04/2010	April 2010	<0.001	0.49	<0.001	<0.0001	-	-	0.056	0.16	<0.0001	0.053	<0.001	0.002	<0.001	<0.01	0.016
W27	11/08/2010	Aug/Oct 2010	<0.001	0.65	<0.001	<0.0001	0.002	<0.001	0.072	0.15	<0.0001	0.068	<0.001	0.002	<0.001	<0.01	0.021
W28	2/09/2007	Sep-07	<0.00005	0.074	<0.001	<0.0001	-	-	<0.001	0.017	-	0.0016	<0.001	0.0013	-	<0.001	-
W28	30/11/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W28	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W28	18/04/2008	Apr-08	<0.001	0.04	<0.001	0.0002	<0.001	<0.001	0.003	0.06	-	0.002	<0.001	0.002	-	<0.010	<0.005
W28	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0.01	<0.001	<0.001	-	<0.01	<0.005
W28	23/10/2008	Oct-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.001	<0.001	0.001	-	<0.010	<0.005
W28	8/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	<0.001	<0.001	<0.001	-	<0.01	<0.005
W28	21/01/2009	January-09	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.001	<0.001	0.001	-	<0.01	<0.005
W28	31/10/2009	October-09	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	0.001	<0.001	<0.01	<0.005
W28	25/02/2010	February-10	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	0.06	<0.0001	0.002	<0.001	0.003	<0.001	<0.01	<0.005
W28	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.002	<0.001	0.002	<0.001	<0.01	<0.005
W28	10/08/2010	Aug/Oct 2010	<0.001	0.03	<0.001	0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	<0.001	<0.01	<0.005
W29	31/08/2007	Sep-07	<0.00005	0.045	0.001	<0.0001	-	-	0.0031	0.039	-	0.0026	<0.001	0.0013	-	<0.001	-
W29	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W29	17/04/2008	Apr-08	<0.001	0.06	<0.001	0.0002	<0.001	<0.001	0.003	<0.05	-	0.002	<0.001	<0.001	-	<0.010	0.009
W29	30/07/2008	Jul-08	<0.001	0.05	0.002	<0.0001	<0.001	<0.001	0.003	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W29	24/10/2008	Oct-08	<0.001	0.05	<0.001	0.0006	<0.001	<0.001	0.003	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W29	8/12/2008	Dec-08	<0.001	0.07	<0.001	<0.0001	<0.001	<0.001	0.004	0.06	-	0.007	<0.001	<0.001	-	<0.01	<0.005
W29	21/01/2009	January-09	<0.001	0.06	<0.001	<0.0001	<0.001	<0.001	0.004	<0.05	<0.0001	0.003	<0.001	0.001	-	<0.01	<0.005
W29	31/10/2009	October-09	<0.001	0.06	<0.001	<0.0001	-	-	0.007	0.06	<0.0001	0.01	<0.001	0.001	<0.001	<0.01	<0.005
W29	25/02/2010	February-10	<0.001	0.05	<0.001	<0.0001	-	-	0.004	<0.05	<0.0001	0.005	<0.001	0.002	<0.001	<0.01	<0.005
W29	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	0.003	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W29	12/08/2010	Aug/Oct 2010	<0.001	0.1	<0.001	<0.0001	<0.001	<0.001	0.004	0.13	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	0.027
W31	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W31	5/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W31	18/04/2008	Apr-08	<0.001	0.01	<0.001	0.0004	<0.001	<0.001	<0.001	0.1	-	0.018	<0.001	0.002	-	<0.010	0.006
W31	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.1	-	0.082	<0.001	0.001	-	<0.010	<0.005
W31	27/10/2008	Oct-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001	0.14	-	0.014	<0.001	0.002	-	<0.010	<0.005
W31	8/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.01	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W31	21/01/2009	January-09	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001	0.1	<0.0001	0.01	<0.001	0.001	-	<0.01	<0.005
W31	31/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.19	<0.0001	0.049	<0.001	0.001	<0.001	<0.01	<0.005
W31	26/02/2010	February-10	<0.001	0.04	<0.001	<0.0001	-	-	0.002	0.11	<0.0001	0.006	<0.001	0.002	<0.001	<0.01	<0.005
W31	25/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.07	<0.0001	0.012	<0.001	<0.001	<0.001	<0.01	<0.005
W31	5/08/2010	Aug/Oct 2010	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.08	<0.0001	0.011	<0.001	0.001	<0.001	<0.01	<0.005
W33	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W33	5/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W33	18/04/2008	Apr-08	<0.001	0.03	<0.001	0.0002	<0.001	<0.001	0.001	0.12	-	0.01	<0.001	<0.001	-	<0.010	0.046
W33	30/07/2008	Jul-08	<0.001	<0.01	0.002	<0.0001	-	<0.001	<0.001	<0.05	-	0.021	<0.001	<0.001	-	<0.010	<0.005
W33	27/10/2008	Oct-08	<0.001	0.01	0.001	0.0002	<0.001	<0.001	<0.001	0.06	-	0.045	<0.001	<0.001	-	<0.010	<0.005
W33	8/12/2008	Dec-08	<0.001	0.02	0.002	<0.0001	<0.001	<0.001	0.002	<0.05	-	0.002	<0.001	<0.001	-	<0.01	<0.005
W33	21/01/2009	January-09	<0.001	0.02	0.001	<0.0001	<0.001	<0.001	0.001	0.07	<0.0001	0.008	<0.001	<0.001	-	<0.01	<0.005
W33	31/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.05	<0.0001	0.014	<0.001	<0.001	<0.001	<0.01	<0.005
W33	26/02/2010	February-10	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.09	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W33	26/04/2010	April 2010	<0.001	<0.01	<0.001	<0.0001	-	-	0.001	0.06	<0.0001	0.012	<0.001	0.001	<0.001	<0.01	<0.005
W33	7/08/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W34	31/08/2007	Sep-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	5/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	0.001	0.15	-	0.009	<0.001	<0.001	-	<0.010	<0.005
W34	30/07/2008	Jul-08	<0.001	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.027	<0.001	<0.001	-	<0.010	<0.005
W34	26/10/2008	Oct-08	<0.001	0.02	<0.001	0.0001	<0.001	<0.001	0.001	0.1	-	0.036	<0.001	<0.001	-	<0.010	<0.005
W34	8/12/2008	Dec-08	<0.001	0.02	0.002	<0.0001	<0.001	<0.001	0.002	0.11	-	0.012	<0.001	<0.001	-	<0.01	<0.005
W34	21/01/2009	January-09	<0.001	0.01	0.001	<0.0001	<0.001	<0.001	<0.001	0.09	<0.0001	0.02	<0.001	<0.001	-	<0.01	<0.005
W34	31/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.08	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	<0.005
W34	26/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	0.16	<0.0001	0.016	<0.001	<0.001	<0.001	<0.01	<0.005
W34	26/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.09	<0.0001	0.017	<0.001	0.001	<0.001	<0.01	<0.005
W34	11/10/2010	Aug/Oct 2010	<0.001	<0.01	0.001	<0.0001	0.001	<0.001	<0.001	0.06	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W35	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0005	<0.001	<0.001	0.002	0.14	-	0.02	<0.001	0.001	-	<0.010	<0.005
W35	30/07/2008	Jul-08	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.09	-	0.043	<0.001	<0.001	-	<0.010	<0.005
W35	26/10/2008	Oct-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	0.001	0.07	-	0.007	<0.001	<0.001	-	<0.010	<0.005
W35	10/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	0.002	0.05	-	0.013	<0.001	<0.001	-	<0.01	<0.005
W35	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.22	<0.0001	0.046	<0.001	<0.001	-	<0.01	<0.005
W35	31/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	<0.005
W35	26/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.08	<0.0001	0.019	<0.001	0.001	<0.001	<0.01	<0.005
W35	16/08/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.05	<0.0001	0.001	<0.001	<0.001	<0.001	<0.01	<0.005
W36	3/09/2007	Sep-07	<0.00005	0.038	<0.001	<0.0001	-	-	<0.001	0.1	-	0.0091	<0.001	0.0022	-	<0.001	-

Water Quality Data

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W36	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W36	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W36	3/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W36	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	0.09	-	0.043	<0.001	0.001	-	<0.010	<0.005
W36	30/07/2008	Jul-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	0.001	0.05	-	0.009	<0.001	<0.001	-	<0.010	<0.005
W36	26/10/2008	Oct-08	<0.001	0.03	<0.001	0.0002	<0.001	<0.001	<0.001	0.08	-	0.01	<0.001	0.002	-	<0.010	<0.005
W36	10/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.01	<0.005
W36	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.18	<0.0001	0.033	<0.001	<0.001	-	<0.01	<0.005
W36	31/10/2009	October-09	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	0.09	<0.0001	0.01	<0.001	0.002	<0.001	<0.01	<0.005
W36	25/02/2010	February-10	<0.001	0.07	<0.001	<0.0001	-	-	0.001	0.13	<0.0001	0.006	<0.001	0.001	<0.001	<0.01	<0.005
W36	25/04/2010	April 2010	<0.001	0.03	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W36	6/08/2010	Aug/Oct 2010	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W38A	5/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W38A	10/12/2008	Dec-08	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	0.001	0.1	-	0.019	<0.001	0.003	-	<0.01	<0.005
W38A	26/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.08	<0.0001	0.035	<0.001	0.002	<0.001	<0.01	<0.005
W38A	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W38A	18/04/2008	Apr-08	<0.001	0.02	<0.001	0.0003	<0.001	<0.001	0.001	0.08	-	0.035	<0.001	0.002	-	<0.010	<0.005
W38A	30/07/2008	Jul-08	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.06	-	0.01	<0.001	0.001	-	<0.010	<0.005
W38A	27/10/2008	Oct-08	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	0.001	0.14	-	0.012	<0.001	0.003	-	<0.010	<0.005
W38A	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.11	<0.0001	0.023	<0.001	0.002	-	<0.01	<0.005
W38A	31/10/2009	October-09	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.11	<0.0001	0.022	<0.001	0.002	<0.001	<0.01	<0.005
W38A	26/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	0.001	0.11	<0.0001	0.01	<0.001	0.002	<0.001	<0.01	<0.005
W38A	7/08/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.007	<0.001	0.001	<0.001	<0.01	<0.005
W41	2/09/2007	Sep-07	<0.00005	0.67	<0.001	<0.0001	-	-	61	0.11	-	0.058	<0.001	0.0026	-	<0.001	-
W41	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W41	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W41	17/04/2008	Apr-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W41	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W41	24/10/2008	Oct-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W41	8/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.01	<0.005
W41	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	-	<0.01	<0.005
W41	25/04/2010	April 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W42	31/08/2007	Sep-07	<0.00005	0.016	<0.001	<0.0001	-	-	<0.001	<0.005	-	0.0017	<0.001	<0.001	-	<0.001	-
W42	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W42	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W42	17/04/2008	Apr-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W42	30/07/2008	Jul-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W42	24/10/2008	Oct-08	<0.001	0.02	<0.001	0.0002	<0.001	<0.001	<0.001	<0.05	-	0.002	<0.001	<0.001	-	<0.010	<0.005
W42	8/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.003	<0.001	<0.001	-	<0.01	<0.005
W42	21/01/2009	January-09	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	<0.0001	0.003	<0.001	<0.001	-	<0.01	<0.005
W42	25/04/2010	April 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	31/08/2007	Sep-07	<0.00005	0.016	<0.001	<0.0001	-	-	<0.001	0.019	-	0.0039	<0.001	<0.001	-	<0.001	-
W43	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	17/04/2008	Apr-08	<0.001	0.01	<0.001	0.0001	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.010	<0.005
W43	30/07/2008	Jul-08	<0.001	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W43	24/10/2008	Oct-08	<0.001	0.02	<0.001	0.0003	<0.001	<0.001	<0.001	<0.05	-	0.006	<0.001	<0.001	-	<0.010	<0.005
W43	8/12/2008	Dec-08	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	-	0.005	<0.001	<0.001	-	<0.01	<0.005
W43	21/01/2009	January-09	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	-	<0.01	<0.005
W43	31/10/2009	October-09	<0.001	0.03	<0.001	<0.0001	-	-	0.002	<0.05	<0.0001	0.007	<0.001	0.002	<0.001	<0.01	0.01
W43	25/02/2010	February-10	<0.001	0.02	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W43	25/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W43	6/08/2010	Aug/Oct 2010	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W48	1/12/2007	Dec-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W48	18/04/2008	Apr-08	<0.001	0.07	<0.001	0.0004	<0.001	<0.001	0.002	0.05	-	0.003	<0.001	<0.001	-	<0.010	<0.005
W48	30/07/2008	Jul-08	<0.001	-	<0.001	<0.0001	-	-	<0.001	-	-	0	<0.001	<0.001	-	<0.01	<0.005
W48	24/10/2008	Oct-08	<0.001	0.04	<0.001	0.0002	<0.001	<0.001	0.002	<0.05	-	0.004	<0.001	<0.001	-	<0.010	<0.005
W48	8/12/2008	Dec-08	<0.001	0.04	0.001	<0.0001	<0.001	<0.001	0.002	<0.05	-	0.003	<0.001	<0.001	-	<0.01	0.012
W48	21/01/2009	January-09	<0.001	0.04	<0.001	<0.0001	<0.001	<0.001	0.001	<0.05	<0.0001	0.002	<0.001	<0.001	-	<0.01	<0.005
W48	25/02/2010	February-10	<0.001	0.11	<0.001	<0.0001	-	-	0.002	0.07	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	<0.005
W48	25/04/2010	April 2010	<0.001	0.04	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W48	10/08/2010	Aug/Oct 2010	<0.001	0.08	<0.001	<0.0001	<0.001	<0.001	0.002	<0.05	<0.0001	0.005	<0.001	0.001	<0.001	<0.01	<0.005
W49	10/12/2008	Dec-08	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	0.001	0.08	-	0.022	<0.001	<0.001	-	<0.01	<0.005
W50	8/12/2008	Dec-08	<0.001	0.03	0.001	<0.0001	<0.001	<0.001	0.002	0.2	-	0.034	<0.001	0.001	-	<0.01	0.014
W50	26/02/2010	February-10	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.15	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	<0.005
W50	26/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	0.001	0.08	<0.0001	0.018	<0.001	0.001	<0.001	<0.01	<0.005
W50	7/08/2010	Aug/Oct 2010	<0.001	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005
W51	27/02/2010	February-10	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.16	<0.0001	0.022	<0.001	0.001	<0.001	<0.01	<0.005
W51	27/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	0.001	<0.05	<0.0001	0.02	<0.001	<0.001	<0.001	<0.01	<0.005
W54	21/01/2009	January-09	<0.001	0.03	<0.001	<0.0001	<0.001	<0.001	0.002	0.09	<0.0001	0.005	<0.001	<0.001	-	<0.01	<0.005
W54	3/11/2009	October-09	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	<0.005
W54	26/02/2010	February-10	<0.001	0.01	0.001	<0.0001	-	-	<0.001	0.07	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W54	26/05/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.09	<0.0001	0.012	<0.001	<0.001	<0.001	<0.01	<0.005
W60	26/02/2010	February-10	<0.001	0.01	<0.001	<0.0001	-	-	0.001	0.12	<0.0001	0.034	<0.001	0.001	<0.001	<0.01	0.038

Site	Date	Analyte	Silver	Aluminium	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Lead	Nickel	Antimony	Selenium	Zinc
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
		LOR – Sep-07 (where different)	0.00005	0.005						0.005						0.001	0.001
		Sampling Round (month/year)															
W60	26/04/2010	April 2010	<0.001	0.01	0.001	<0.0001	-	-	0.001	0.09	<0.0001	0.025	<0.001	<0.001	<0.001	<0.01	<0.005
W60	7/08/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.01
W61	27/02/2010	February-10	<0.001	<0.01	<0.001	<0.0001	-	-	0.001	0.09	<0.0001	0.029	<0.001	0.001	<0.001	<0.01	<0.005
W61	27/04/2010	April 2010	<0.001	0.02	<0.001	<0.0001	-	-	0.001	0.18	<0.0001	0.021	<0.001	<0.001	<0.001	<0.01	<0.005
W61	22/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62	27/02/2010	February-10	<0.001	<0.01	0.001	<0.0001	-	-	<0.001	0.17	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W62	27/04/2010	April 2010	<0.001	0.01	0.001	<0.0001	-	-	<0.001	0.1	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	<0.005
W62	10/10/2010	Aug/Oct 2010	<0.001	<0.01	0.001	<0.0001	0.002	<0.001	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	<0.001	<0.01	<0.005
W63	27/02/2010	February-10	<0.001	<0.01	<0.001	<0.0001	-	-	0.001	0.11	<0.0001	0.04	<0.001	0.001	<0.001	<0.01	<0.005
W63	27/04/2010	April 2010	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	0.06	<0.0001	0.021	<0.001	<0.001	<0.001	<0.01	<0.005
W63	23/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W64	27/02/2010	February-10	<0.001	0.01	0.001	<0.0001	-	-	0.001	0.07	<0.0001	0.048	<0.001	0.001	<0.001	<0.01	<0.005
W64	27/04/2010	April 2010	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	0.06	<0.0001	0.06	<0.001	<0.001	<0.001	<0.01	<0.005
W64	25/10/2010	Aug/Oct 2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W65	27/02/2010	February-10	<0.001	0.01	0.001	<0.0001	-	-	0.001	0.11	<0.0001	0.064	<0.001	0.001	<0.001	<0.01	<0.005
W65	27/04/2010	April 2010	<0.001	0.01	<0.001	<0.0001	-	-	<0.001	0.1	<0.0001	0.064	<0.001	<0.001	<0.001	<0.01	<0.005
W70	27/08/2010	Aug/Oct 2010	<0.001	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	0.51	<0.0001	0.074	<0.001	<0.001	<0.001	<0.01	<0.005
W71	25/04/2010	April 2010	<0.001	<0.01	<0.001	<0.0001	-	-	<0.001	<0.05	<0.0001	0.046	<0.001	0.002	<0.001	<0.01	<0.005

A.2 BMT WBM Data (2011 - 2017)

Table A-6 In-situ Data

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
Base C	Frieda Base Camp	16/3/12	15:23	24.1	89	6.16	170	8.1	101.2	8.1
Base C	Frieda Base Camp	13/6/12	8:00	22.6	81	7.67	54	3.1	100.1	8.2
Base C	Frieda Base Camp	9/9/12	12:10	23.7	69	6.95	86	2.1	95.1	8.0
Base C	Frieda Base Camp	28/11/12	13:30	24.1	75	6.60	107	2.6	94.7	7.9
Base C	Frieda Base Camp	7/4/13	10:47	23.6	76	7.45	99	1.7	99.9	8.1
RORWB	Reference ORWB	19/3/12	9:43	29.1	32	7.05	87	12.1	69.9	5.3
RORWB	Reference ORWB	10/6/12	10:30	28.9	25	4.30	214	0.7	50.1	3.8
RORWB	Reference ORWB	9/9/12	15:20	27.3	19	4.74	107	1.9	23.9	1.9
RORWB	Reference ORWB	28/11/12	9:45	29.1	17	4.62	138	0.9	40.3	3.1
RORWB	Reference ORWB	6/4/13	9:47	31.2	17	5.31	128	0.9	41.1	3.0
W100	Lake Diawi	17/3/12	9:33	28.2	17	4.73	139	11.5	48.6	3.8
W100	Lake Diawi	12/6/12	13:45	27.1	30	3.68	228	0.1	26.3	2.0
W100	Lake Diawi	8/9/12	13:04	25.7	27	4.29	181	21.0	5.9	0.5
W100	Lake Diawi	30/11/12	12:30	30.6	31	3.56	183	0.4	53.2	4.0
W100	Lake Diawi	7/4/13	12:30	29.6	25	4.15	204	0.7	21.1	1.6
W102	Upper Niar River	16/3/12	10:03	22.5	90	7.51	188	97.7	101.6	8.6
W102	Upper Niar River	8/6/12	16:15	23.3	104	7.75	73	15.7	100.2	8.3
W102	Upper Niar River	7/9/12	10:39	21.6	89	7.61	91	7.2	100.4	8.7
W102	Upper Niar River	29/11/12	11:05	22.7	80	7.61	88	111.7	100.1	8.5
W102	Upper Niar River	6/4/13	15:25	23.7	80	7.70	71	56.0	100.4	8.3
W18	Nena River upstream of Koki Creek	16/3/12	8:15	22.9	44	7.56	133	11.1	101.8	8.5
W18	Nena River upstream of Koki Creek	9/6/12	8:50	22.9	59	7.73	51	1.5	101.1	8.4
W18	Nena River upstream of Koki Creek	7/9/12	8:00	22.2	49	6.80	108	2.3	102.1	8.5
W18	Nena River upstream of Koki Creek	29/11/12	9:10	22.9	40	6.89	95	15.2	102.6	8.4
W18	Nena River upstream of Koki Creek	6/4/13	13:20	23.7	32	6.36	141	25.6	102.5	8.4

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
W22	Niar R us Nena R	16/3/12	11:10	24.6	90	7.35	43	55.2	102.3	8.4
W22	Niar R us Nena R	8/6/12	15:45	27.4	99	8.00	83	11.8	106.8	8.3
W22	Niar R us Nena R	7/9/12	11:05	23.2	82	7.59	92	47.4	98.1	8.3
W22	Niar R us Nena R	29/11/12	12:00	26.9	77	7.57	91	173.5	99.0	7.8
W22	Niar R us Nena R	6/4/13	16:00	27.0	79	7.76	84	36.2	100.9	7.9
W23	Frieda River downstream of airstrip	15/3/12	8:39	23.5	61	6.94	156	91.7	96.9	8.1
W23	Frieda River downstream of airstrip	11/6/12	8:30	24.1	72	7.13	111	39.0	97.3	8.1
W23	Frieda River downstream of airstrip	6/9/12	10:32	23.0	65	7.47	83	66.5	96.4	8.2
W23	Frieda River downstream of airstrip	27/11/12	8:30	24.5	78	7.47	76	15.0	96.7	8.0
W23	Frieda River downstream of airstrip	5/4/13	9:26	23.9	62	7.39	134	45.7	96.3	8.1
W26	Lake Warangai	15/3/12	11:56	29.6	59	6.81	61	51.2	71.3	5.4
W26	Lake Warangai	11/6/12	14:30	30.5	24	6.26	79	7.4	63.7	4.7
W26	Lake Warangai	6/9/12	15:00	29.2	38	6.50	74	11.4	61.2	4.6
W26	Lake Warangai	27/11/12	13:30	29.5	40	6.78	76	11.3	67.2	5.1
W26	Lake Warangai	5/4/13	14:40	34.1	16	6.21	124	0.9	67.5	4.7
W27	Ok Ekwai upstream of Ok Ubai junction	16/3/12	14:48	23.6	92	4.11	210	6.9	101.0	8.1
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	14:15	23.5	143	4.36	176	0.4	100.4	8.1
W27	Ok Ekwai upstream of Ok Ubai junction	9/9/12	9:18	23.4	93	3.85	157	0.7	99.7	8.1
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	14:30	24.7	131	4.15	189	0.7	99.2	7.8
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	12:00	24.2	115	4.48	196	0.9	100.7	8.0
W28	Upper Nena River	16/3/12	9:17	21.8	36	6.85	189	106.7	104.9	8.5
W28	Upper Nena River	9/6/12	10:30	21.8	63	7.64	68	0.8	104.3	8.5
W28	Upper Nena River	7/9/12	8:28	20.8	53	7.38	87	1.7	102.6	8.6
W28	Upper Nena River	29/11/12	10:25	21.8	42	7.09	103	12.0	101.9	8.3
W28	Upper Nena River	6/4/13	14:03	22.5	40	7.26	101	8.1	104.2	8.3
W33	Sepik River upstream of May River junction	17/3/12	12:28	27.7	146	7.47	112	552.7	70.1	5.5
W33	Sepik River upstream of May River junction	12/6/12	10:00	27.0	164	7.96	81	527.8	76.0	6.0
W33	Sepik River upstream of May River junction	8/9/12	9:15	25.2	147	7.89	73	535.0	66.6	5.4

Water Quality Data

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
W33	Sepik River upstream of May River junction	30/11/12	10:15	28.1	151	7.52	60	325.0	67.9	5.3
W33	Sepik River upstream of May River junction	8/4/13	9:36	28.2	164	7.66	112	515.3	67.6	5.2
W34	Sepik River @ Iniok	17/3/12	10:26	27.7	149	7.21	160	477.4	72.1	5.7
W34	Sepik River @ Iniok	12/6/12	14:25	27.3	153	6.74	174	349.7	74.1	5.8
W34	Sepik River @ Iniok	8/9/12	11:46	25.7	134	7.08	123	450.7	58.7	4.8
W34	Sepik River @ Iniok	30/11/12	13:55	28.3	117	6.62	140	117.1	57.5	4.4
W34	Sepik River @ Iniok	8/4/13	13:56	28.8	140	6.76	163	301.0	58.3	4.5
W35	Sepik River @ Kubkain	21/3/12	12:45	26.5	132	7.37	93	448.5	57.9	4.6
W35	Sepik River @ Kubkain	8/6/12	11:30	27.0	145	8.03	66	568.6	64.2	5.1
W35	Sepik River @ Kubkain	7/9/12	13:46	26.0	111	7.05	107	190.8	63.2	5.1
W35	Sepik River @ Kubkain	1/12/12	10:15	28.3	111	7.20	72	83.4	51.1	4.0
W35	Sepik River @ Kubkain	9/4/13	8:13	28.6	124	7.59	38	146.0	52.5	4.0
W36	Upper Wario River	21/3/12	13:30	26.5	110	7.29	83	43.9	92.3	7.4
W36	Upper Wario River	8/6/12	12:10	25.1	111	7.76	68	46.5	94.7	7.8
W36	Upper Wario River	7/9/12	14:16	24.3	107	7.49	90	84.5	92.7	7.7
W36	Upper Wario River	1/12/12	9:00	25.1	101	7.73	61	33.7	92.3	7.6
W36	Upper Wario River	7/4/13	8:16	24.8	95	8.01	73	85.3	95.4	7.9
W38A	Lower Frieda River	15/3/12	11:05	25.2	66	6.66	150	195.8	92.2	7.5
W38A	Lower Frieda River	11/6/12	12:05	26.1	72	7.00	83	38.3	87.6	7.0
W38A	Lower Frieda River	6/9/12	13:20	24.0	51	6.96	95	173.2	83.4	7.0
W38A	Lower Frieda River	27/11/12	12:10	26.9	76	7.20	80	35.7	86.8	6.9
W38A	Lower Frieda River	3/4/13	12:38	25.7	59	7.29	109	99.6	92.5	7.5
W41	Ok Isai	16/3/12	10:38	25.6	53	7.27	174	5.0	102.5	8.3
W41	Ok Isai	8/6/12	15:05	26.6	61	7.46	61	0.4	97.1	7.7
W41	Ok Isai	7/9/12	9:40	24.5	49	7.17	92	0.9	96.7	8.0
W41	Ok Isai	29/11/12	11:35	26.0	49	7.20	89	1.9	91.4	7.3
W41	Ok Isai	6/4/13	15:38	27.3	50	7.50	77	1.6	102.1	7.9
W43	Lower Ok Binai	16/3/12	11:44	25.4	62	7.24	186	5.8	101.3	8.2

Site	Description	Date Sampled	Time	Temp oC	EC us/cm	pH -	ORP -	Turbidity NTU	DO Local%Sat	DO mg/L
W43	Lower Ok Binai	8/6/12	14:40	27.3	71	7.80	50	1.6	105.4	8.2
W43	Lower Ok Binai	7/9/12	10:13	23.7	55	7.49	82	3.2	97.2	8.1
W43	Lower Ok Binai	29/11/12	12:30	26.4	62	7.32	100	45.3	97.3	7.8
W43	Lower Ok Binai	6/4/13	16:19	27.7	60	7.70	82	18.2	99.2	7.6
W48	Ok Simbale (Aiyok Ck) @ Nena River	16/3/12	8:50	23.2	22	6.38	160	4.6	101.1	8.3
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	9:50	22.8	30	7.49	56	0.3	100.4	8.3
W48	Ok Simbale (Aiyok Ck) @ Nena River	7/9/12	8:55	21.9	25	7.31	75	0.3	99.2	8.3
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	9:50	23.1	21	6.45	104	1.0	99.7	8.2
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	14:43	24.2	17	6.85	100	2.7	103.9	8.0
W50	Sepik River downstream of May River (Mowi)	17/3/12	11:31	27.4	139	7.40	132	544.8	70.2	5.5
W50	Sepik River downstream of May River (Mowi)	12/6/12	11:10	27.1	156	7.91	83	474.8	74.1	5.9
W50	Sepik River downstream of May River (Mowi)	8/9/12	10:13	25.6	129	7.75	77	392.7	59.7	4.9
W50	Sepik River downstream of May River (Mowi)	30/11/12	11:15	28.1	105	7.13	71	222.6	56.0	4.3
W50	Sepik River downstream of May River (Mowi)	7/4/13	10:59	28.5	138	7.51	106	220.0	58.5	4.5
W60	Sepik River downstream of April River	21/3/12	11:45	26.5	131	7.54	97	301.7	59.4	4.7
W60	Sepik River downstream of April River	8/6/12	9:50	26.7	139	8.14	54	493.8	67.1	5.4
W60	Sepik River downstream of April River	9/9/12	14:46	26.0	123	7.17	115	312.2	58.6	4.7
W60	Sepik River downstream of April River	1/12/12	11:20	28.0	90	7.00	66	12.8	39.1	3.1
W60	Sepik River downstream of April River	9/4/13	9:27	28.2	100	7.24	97	135.0	52.2	4.0
W61	Sepik River @ Ambunti	21/3/12	10:30	26.8	118	7.74	93	254.1	61.4	4.9
W61	Sepik River @ Ambunti	5/6/12	8:45	27.7	125	7.73	110	332.0	67.9	5.3
W61	Sepik River @ Ambunti	11/9/12	11:47	26.5	123	7.54	131	264.4	56.1	4.5
W61	Sepik River @ Ambunti	2/12/12	9:15	28.6	108	7.03	55	70.9	38.3	3.0
W61	Sepik River @ Ambunti	9/4/13	11:17	29.4	106	7.12	85	107.0	36.5	2.7
W62	Chambri Lake	20/3/12	11:25	29.3	82	7.61	89	43.8	78.8	6.0
W62	Chambri Lake	5/6/12	10:30	31.0	75	8.02	76	14.0	100.9	7.5
W62	Chambri Lake	10/9/12	10:19	29.3	114	7.42	99	55.3	87.4	6.7
W62	Chambri Lake	2/12/12	10:30	31.3	94	7.82	57	23.5	98.4	7.3

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
W62	Chambri Lake	2013	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	20/3/12	12:50	27.4	131	7.49	112	266.7	64.6	5.1
W63	Sepik River @ Timbunke	6/6/12	12:20	27.9	119	7.51	64	185.8	69.3	5.4
W63	Sepik River @ Timbunke	10/9/12	11:09	26.5	102	7.21	97	201.0	57.2	4.6
W63	Sepik River @ Timbunke	3/12/12	11:40	28.9	116	7.20	68	146.5	39.7	3.1
W63	Sepik River @ Timbunke	10/4/13	12:19	30.8	98	5.87	162	115.0	18.4	1.4
W64	Sepik River @ Angoram	20/3/12	13:45	26.8	114	7.31	110	251.3	69.8	5.5
W64	Sepik River @ Angoram	6/6/12	10:20	27.4	122	7.67	55	218.0	68.9	5.4
W64	Sepik River @ Angoram	10/9/12	13:53	26.3	101	7.23	109	168.2	64.4	5.2
W64	Sepik River @ Angoram	3/12/12	9:45	28.6	107	7.15	80	83.5	43.1	3.3
W64	Sepik River @ Angoram	10/4/13	10:45	30.4	95	6.50	134	71.0	22.5	1.7
W65	Sepik River @ mouth	20/3/12	14:40	28.4	116	7.08	105	227.5	83.3	6.4
W65	Sepik River @ mouth	7/6/12	10:15	27.6	126	7.64	54	123.2	67.2	5.3
W65	Sepik River @ mouth	10/9/12	13:01	26.7	114	7.12	107	256.0	66.6	5.3
W65	Sepik River @ mouth	4/12/12	10:45	30.0	107	7.41	57	85.6	71.7	5.4
W65	Sepik River @ mouth	10/4/13	9:24	30.3	101	7.52	71	46.0	43.6	3.2
W70	Kuagumi Creek	15/3/12	9:26	25.1	47	6.55	138	53.8	84.9	6.9
W70	Kuagumi Creek	11/6/12	9:40	24.9	58	6.95	108	15.6	84.1	6.9
W70	Kaugumi	6/9/12	11:23	24.4	52	7.01	85	31.8	83.5	6.9
W70	Kaugumi	27/11/12	9:50	25.6	65	7.08	59	15.9	80.9	6.6
W70	Kuagumi Creek	5/4/13	10:20	26.0	59	7.33	115	33.0	79.5	6.4
W71	Frieda River road crossing	15/3/12	10:06	24.1	55	6.91	142	136.4	94.5	7.9
W71	Frieda River road crossing	11/6/12	10:40	24.6	75	7.32	99	29.4	94.9	7.8
W71	Frieda River road crossing	6/9/12	12:10	23.6	61	6.67	118	95.5	92.8	7.8
W71	Frieda River road crossing	27/11/12	10:50	25.1	79	7.31	81	31.1	92.5	7.6
W71	Frieda River road crossing	5/4/13	11:21	24.9	59	7.56	100	81.2	93.9	7.7
S1	Usake River - middle reaches	16/11/17	10:30	24.1	49	7.78	98.8	9.4	94.9	7.9
S2	Abei River at Hotmin Mission	17/11/17	10:00	24.3	66	7.79	101.8	12.5	100.9	8.4

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
S3	Uriake River	17/11/17	13:15	26.5	47	8.21	81.8	13.6	97.6	7.7
S4	Muni River	16/11/17	14:30	25.5	53	7.30	100.7	10.1	100.7	8.1
S5	Upper Idam River	18/11/17	10:20	24.4	45	7.89	97.4	6.5	100.5	8.3
S6	Lower Idam River @ Entibi Village	18/11/17	14:00	26.2	31	8.66	85.7	76.4	88.2	7.0
S7	Horden River @ Stonepass	29/11/17	13:45	29.3	269	7.76	72.5	164.7	98.6	7.4
S8	Yanabu River	30/11/17	9:30	24.6	277	8.36	56.5	20.2	101.4	8.1

Table A-7 In-situ Data – CSIRO Sites (2017)

Site	Description	Date Sampled	Time	Temp	EC	pH	ORP	Turbidity	DO	DO
				oC	us/cm	-	-	NTU	Local%Sat	mg/L
W27	Ekwai Creek upstream of Ubai River Junction	20/11/2017	14:31	27.4	111	5.66	163.1	189	65.7	5.1
NRGS	Nena River gauging station	20/11/2017	13:13	22.3	51	8.14	77.5	1.7	104.0	8.4
W29	Lower Nena River	20/11/2017	12:59	23.5	45	8.18	83.0	8.8	103.6	8.6
W23	Frieda River downstream of the Airstrip	19/11/2017	10:41	24.0	64	8.00	72.9	53	99.9	8.3
W38a	Lower Frieda Sand Bar	19/11/2017	8:41	25.6	67	7.63	77.7	35	87.0	7.1
W34	Sepik River at Iniok	20/11/2017	14:32	27.4	111	5.92	150.8	138	59.0	4.6
W71	Frieda River downstream	19/11/2017	9:43	24.4	77	7.79	83.2	33	96.2	8.0

Table A-8 General Parameters

Site	Description	Date Sampled	TSS	TDS	TOC	DOC	Major Cations				Major Anions		Alkalinity			
							Ca	Mg	K	Na	Cl	SO4	Hydroxide Alkalinity	Carbonate Alkalinity	Bi-carbonate Alkalinity	Total Alkalinity
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	5	5	1	1	1	1	1	1	1	1	1	1	1	1
Base C	Frieda Base Camp	16/3/12	<5	70	<1	<1	10	1	<1	2	<1	33	<1	<1	7	7
Base C	Frieda Base Camp	13/6/12	6	59	<1	<1	9	1	<1	2	<1	22	<1	<1	17	17
Base C	Frieda Base Camp	9/9/12	<5	97	1	<1	7	1	<1	2	<1	13	<1	<1	12	12
Base C	Frieda Base Camp	28/11/12	<5	53	18	<1	8	1	<1	2	<1	20	<1	<1	14	14
Base C	Frieda Base Camp	7/4/13	<5	55	1	1	8	1	<1	2	<1	20	<1	<1	13	13
RORWB	Reference ORWB	19/3/12	<5	38	7	7	2	1	<1	1	<1	<1	<1	<1	12	12
RORWB	Reference ORWB	9/9/12	<5	74	19	19	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
RORWB	Reference ORWB - surface	10/6/12	<5	65	21	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
RORWB	Reference ORWB - surface	28/11/12	<5	<10	16	16	<1	<1	<1	<1	<1	<5	<1	<1	2	2
RORWB	Reference ORWB - surface	6/4/13	<5	44	14	12	<1	<1	<1	<1	<1	<1	<1	<1	3	3
RORWB-B	Reference ORWB - bottom	10/6/12	<5	58	25	24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
RORWB-B	Reference ORWB - bottom	28/11/12	<5	22	17	17	<1	<1	<1	<1	<1	<5	<1	<1	1	1
RORWB-B	Reference ORWB - bottom	6/4/13	<5	47	14	14	1	<1	<1	<1	<1	<1	<1	<1	4	4
W100	Lake Diawi	17/3/12	<5	25	16	16	<1	<1	<1	<1	<1	<1	<1	<1	2	2
W100	Lake Diawi	8/9/12	10	41	27	26	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
W100	Lake Diawi - surface	12/6/12	5	41	19	18	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
W100	Lake Diawi - surface	30/11/12	6	62	23	23	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
W100	Lake Diawi - surface	7/4/13	6	52	19	18	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
W100-B	Lake Diawi - bottom	12/6/12	<5	53	19	19	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
W100-B	Lake Diawi - bottom	30/11/12	<5	59	6	8	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
W100-B	Lake Diawi - bottom	7/4/13	<5	52	18	18	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
W102	Upper Niar River	16/3/12	204	62	<1	<1	8	5	<1	2	<1	3	<1	<1	42	42
W102	Upper Niar River	8/6/12	15	67	1	2	9	6	<1	2	<1	3	<1	<1	47	47
W102	Upper Niar River	7/9/12	43	110	<1	2	7	5	<1	1	<1	4	<1	<1	40	40
W102	Upper Niar River	29/11/12	151	115	2	<1	7	4	<1	1	<1	4	<1	<1	37	37
W102	Upper Niar River	6/4/13	125	61	1	2	6	4	<1	1	<1	4	<1	<1	38	38
W18	Nena River upstream of Koki Creek	16/3/12	6	24	2	2	4	2	<1	1	<1	<1	<1	<1	22	22
W18	Nena River upstream of Koki Creek	9/6/12	<5	35	1	<1	6	2	<1	2	<1	<1	<1	<1	32	32
W18	Nena River upstream of Koki Creek	7/9/12	<5	26	2	2	5	2	<1	1	<1	3	<1	<1	20	20
W18	Nena River upstream of Koki Creek	29/11/12	20	103	2	1	4	1	<1	<1	<1	2	<1	<1	11	11
W18	Nena River upstream of Koki Creek	6/4/13	19	33	3	4	3	1	<1	<1	<1	<1	<1	<1	15	15
W22	Niar R us Nena R	16/3/12	57	72	<1	<1	9	5	<1	2	<1	<1	<1	<1	44	44
W22	Niar River upstream of Nena River	8/6/12	12	62	1	1	9	5	<1	2	<1	<1	<1	<1	47	47
W22	Niar R us Nena R	7/9/12	42	44	2	2	8	4	<1	1	<1	3	<1	<1	38	38
W22	Niar R us Nena R	29/11/12	132	112	<1	<1	7	4	<1	1	<1	3	<1	<1	36	36
W22	Niar R us Nena R	6/4/13	163	61	2	2	7	4	<1	1	<1	3	<1	<1	37	37
W23	Frieda River downstream of airstrip	15/3/12	112	56	2	2	6	3	<1	1	<1	<1	<1	<1	31	31
W23	Frieda River downstream of airstrip	11/6/12	48	43	3	2	7	3	<1	2	<1	<1	<1	<1	33	33

Site	Description	Date Sampled	TSS	TDS	TOC	DOC	Major Cations				Major Anions		Alkalinity			
							Ca	Mg	K	Na	Cl	SO4	Hydroxide Alkalinity	Carbonate Alkalinity	Bi-carbonate Alkalinity	Total Alkalinity
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	5	5	1	1	1	1	1	1	1	1	1	1	1	1
W23	Frieda River downstream of airstrip	6/9/12	83	34	2	2	5	3	<1	6	<1	2	<1	<1	29	29
W23	Frieda River downstream of airstrip	27/11/12	9	60	<1	1	7	4	<1	2	<1	4	<1	<1	43	43
W23	Frieda River downstream of airstrip	5/4/13	38	263	2	2	5	3	<1	1	<1	3	<1	<1	29	29
W26	Lake Warangai	15/3/12	10	36	7	7	6	2	<1	1	<1	<1	<1	<1	22	22
W26	Lake Warangai	6/9/12	7	42	8	10	4	1	<1	<1	<1	<1	<1	<1	13	13
W26	Lake Warangai - surface	11/6/12	9	43	10	10	3	<1	<1	<1	<1	<1	<1	<1	8	8
W26	Lake Warangai - surface	27/11/12	<5	51	8	9	6	1	<1	<1	<1	<5	<1	<1	27	27
W26	Lake Warangai - surface	5/4/13	<5	42	11	11	<1	<1	<1	<1	<1	<1	<1	<1	3	3
W26-B	Lake Warangai - bottom	11/6/12	12	50	9	9	4	1	<1	<1	<1	<1	<1	<1	16	16
W26-B	Lake Warangai - bottom	27/11/12	5	39	9	10	5	<1	<1	<1	<1	<5	<1	<1	20	20
W26-B	Lake Warangai - bottom	5/4/13	<5	37	10	10	<1	<1	<1	<1	<1	<1	<1	<1	4	4
W27	Ok Ekwai upstream of Ok Ubai junction	16/3/12	<5	56	1	1	9	<1	<1	1	<1	33	<1	<1	<1	<1
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	<5	95	2	2	16	<1	<1	2	<1	50	<1	<1	<1	<1
W27	Ok Ekwai upstream of Ok Ubai junction	9/9/12	<5	75	2	2	8	<1	<1	<1	<1	29	<1	<1	<1	<1
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	<5	85	<1	2	14	<1	<1	2	<1	46	<1	<1	<1	<1
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	<5	76	2	2	12	<1	<1	1	<1	40	<1	<1	<1	<1
W28	Upper Nena River	16/3/12	182	21	3	3	4	1	<1	<1	<1	<1	<1	<1	17	17
W28	Upper Nena River	9/6/12	<5	46	1	2	6	2	<1	1	<1	<1	<1	<1	30	30
W28	Upper Nena River	7/9/12	<5	69	2	2	5	2	<1	1	<1	2	<1	<1	23	23
W28	Upper Nena River	29/11/12	15	80	2	1	4	2	<1	<1	<1	<1	<1	<1	11	11
W28	Upper Nena River	6/4/13	<5	36	2	2	4	2	<1	<1	<1	<1	<1	<1	20	20
W33	Sepik River upstream of May River junction	17/3/12	1260	99	3	2	22	3	<1	3	<1	<1	<1	<1	64	64
W33	Sepik River upstream of May River junction	12/6/12	1620	128	4	5	26	3	<1	4	<1	<1	<1	<1	77	77
W33	Sepik River upstream of May River junction	8/9/12	1040	76	4	3	22	2	<1	2	<1	8	<1	<1	66	66
W33	Sepik River upstream of May River junction	30/11/12	612	169	4	2	22	3	<1	3	<1	8	<1	<1	67	67
W33	Sepik River upstream of May River junction	8/4/13	1410	137	3	2	24	3	<1	3	<1	10	<1	<1	76	76
W34	Sepik River @ Iniok	17/3/12	1010	80	2	1	21	3	<1	4	<1	<1	<1	<1	65	65
W34	Sepik River @ Iniok	12/6/12	385	117	3	3	21	3	<1	3	<1	<1	<1	<1	70	70
W34	Sepik River @ Iniok	8/9/12	774	56	4	4	20	2	<1	2	<1	4	<1	<1	61	61
W34	Sepik River @ Iniok	30/11/12	224	149	9	<1	16	2	<1	2	<1	5	<1	<1	53	53
W34	Sepik River @ Iniok	8/4/13	541	87	3	3	19	2	<1	2	<1	7	<1	<1	62	62
W35	Sepik River @ Kubkain	21/3/12	868	100	3	2	18	3	<1	2	<1	<1	<1	<1	58	58
W35	Sepik River @ Kubkain	8/6/12	992	153	4	4	24	3	<1	3	<1	<1	<1	<1	71	71
W35	Sepik River @ Kubkain	7/9/12	298	54	3	3	16	2	<1	2	<1	5	<1	<1	47	47
W35	Sepik River @ Kubkain	1/12/12	112	144	10	8	15	2	<1	2	<1	4	<1	<1	50	50
W35	Sepik River @ Kubkain	9/4/13	160	76	3	3	16	3	<1	2	1	5	<1	<1	57	57
W36	Upper Wario River	21/3/12	65	89	2	<1	16	3	<1	1	<1	<1	<1	<1	53	53
W36	Upper Wario River	8/6/12	45	65	<1	<1	16	2	<1	2	<1	<1	<1	<1	52	52
W36	Upper Wario River	7/9/12	103	51	2	2	15	2	<1	1	<1	2	<1	<1	50	50
W36	Upper Wario River	1/12/12	33	150	6	<1	14	3	<1	1	<1	3	<1	<1	47	47
W36	Upper Wario River	7/4/13	467	66	2	2	15	2	<1	1	<1	3	<1	<1	50	50

Site	Description	Date Sampled	TSS	TDS	TOC	DOC	Major Cations				Major Anions		Alkalinity			
							Ca	Mg	K	Na	Cl	SO4	Hydroxide Alkalinity	Carbonate Alkalinity	Bi-carbonate Alkalinity	Total Alkalinity
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	5	5	1	1	1	1	1	1	1	1	1	1	1	1
W38A	Lower Frieda River	15/3/12	389	56	2	1	5	3	<1	1	<1	<1	<1	<1	30	30
W38A	Lower Frieda River	11/6/12	58	51	2	1	6	4	<1	1	<1	<1	<1	<1	36	36
W38A	Lower Frieda River	6/9/12	233	31	3	3	4	3	<1	1	<1	2	<1	<1	23	23
W38A	Lower Frieda River	27/11/12	31	71	2	<1	6	4	<1	1	<1	3	<1	<1	38	38
W38A	Lower Frieda River	3/4/13	169	49	2	2	5	3	<1	1	<1	2	<1	<1	28	28
W41	Ok Isai	16/3/12	<5	46	<1	<1	5	2	<1	2	<1	<1	<1	<1	26	26
W41	Ok Isai	8/6/12	<5	40	1	1	5	3	<1	2	<1	<1	<1	<1	28	28
W41	Ok Isai	7/9/12	<5	45	2	2	4	2	<1	1	<1	2	<1	<1	21	21
W41	Ok Isai	29/11/12	<5	61	1	1	4	2	<1	1	<1	2	<1	<1	24	24
W41	Ok Isai	6/4/13	<5	29	1	<1	4	2	<1	1	<1	2	<1	<1	25	25
W43	Lower Ok Binai	16/3/12	<5	49	<1	<1	7	2	<1	2	<1	<1	<1	<1	29	29
W43	Lower Ok Binai	8/6/12	5	53	2	1	8	2	<1	2	<1	<1	<1	<1	33	33
W43	Lower Ok Binai	7/9/12	5	33	2	2	6	2	<1	1	<1	2	<1	<1	24	24
W43	Lower Ok Binai	29/11/12	23	106	<1	<1	7	2	<1	1	<1	3	<1	<1	31	31
W43	Lower Ok Binai	6/4/13	6	37	1	1	6	2	<1	1	<1	2	<1	<1	27	27
W48	Ok Simbale (Aiyok Ck) @ Nena River	16/3/12	<5	15	3	2	2	<1	<1	1	<1	<1	<1	<1	6	6
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	8	38	2	2	2	<1	<1	2	<1	<1	<1	<1	4	4
W48	Ok Simbale (Aiyok Ck) @ Nena River	7/9/12	<5	84	2	3	2	<1	<1	1	<1	5	<1	<1	4	4
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	<5	54	4	2	1	<1	<1	1	<1	5	<1	<1	5	5
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	<5	27	4	4	1	<1	<1	<1	<1	3	<1	<1	4	4
W50	Sepik River downstream of May River (Mowi)	17/3/12	1090	89	2	2	21	3	<1	3	<1	<1	<1	<1	63	63
W50	Sepik River downstream of May River (Mowi)	12/6/12	753	101	4	5	22	3	<1	3	<1	<1	<1	<1	69	69
W50	Sepik River downstream of May River (Mowi)	8/9/12	781	56	6	4	20	2	<1	2	<1	7	<1	<1	60	60
W50	Sepik River downstream of May River (Mowi)	30/11/12	183	164	9	8	14	2	<1	2	<1	5	<1	<1	47	47
W50	Sepik River downstream of May River (Mowi)	7/4/13	746	100	3	3	21	2	<1	2	<1	7	<1	<1	66	66
W60	Sepik River downstream of April River	21/3/12	394	68	2	2	18	3	<1	2	<1	<1	<1	<1	57	57
W60	Sepik River downstream of April River	8/6/12	636	100	4	5	19	3	<1	2	<1	<1	<1	<1	66	66
W60	Sepik River downstream of April River	9/9/12	359	94	3	3	16	3	<1	2	<1	6	<1	<1	56	56
W60	Sepik River downstream of April River	1/12/12	12	142	6	8	9	4	<1	1	<1	2	<1	<1	44	44
W60	Sepik River downstream of April River	9/4/13	23	71	3	3	11	3	<1	2	<1	3	<1	<1	47	47
W61	Sepik River @ Ambunti	21/3/12	326	76	2	2	14	3	<1	2	<1	<1	<1	<1	52	52
W61	Sepik River @ Ambunti	5/6/12	543	101	4	4	16	3	<1	2	<1	<1	<1	<1	58	58
W61	Sepik River @ Ambunti	11/9/12	272	100	3	3	16	3	<1	2	5	4	<1	<1	54	54
W61	Sepik River @ Ambunti	2/12/12	122	89	4	4	14	3	<1	2	<1	4	<1	<1	49	49
W61	Sepik River @ Ambunti	9/4/13	81	73	3	4	13	3	<1	2	<1	4	<1	<1	49	49
W62	Chambri Lake	20/3/12	30	44	6	6	9	2	<1	2	<1	<1	<1	<1	37	37
W62	Chambri Lake	10/9/12	34	92	3	3	14	3	<1	2	<1	5	<1	<1	48	48
W62	Chambri Lake - surface	5/6/12	15	59	7	7	8	2	<1	2	3	<1	<1	<1	35	35
W62	Chambri Lake - surface	2/12/12	19	68	6	4	11	2	<1	2	<1	3	<1	<1	39	39
W62	Chambri Lake - surface	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62-B	Chambri Lake - bottom	5/6/12	20	63	7	8	8	2	<1	2	<1	<1	<1	<1	36	36

Water Quality Data

Site	Description	Date Sampled	TSS	TDS	TOC	DOC	Major Cations				Major Anions		Alkalinity			
							Ca	Mg	K	Na	Cl	SO4	Hydroxide Alkalinity	Carbonate Alkalinity	Bi-carbonate Alkalinity	Total Alkalinity
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	5	5	1	1	1	1	1	1	1	1	1	1	1	1
W62-B	Chambri Lake - bottom	2/12/12	10	69	6	4	11	2	<1	1	<1	2	<1	<1	36	36
W62-B	Chambri Lake - bottom	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	20/3/12	405	80	3	2	16	4	<1	2	1	<1	<1	<1	58	58
W63	Sepik River @ Timbunke	6/6/12	261	84	3	4	14	3	<1	2	<1	<1	<1	<1	53	53
W63	Sepik River @ Timbunke	10/9/12	178	102	2	2	12	3	<1	2	<1	4	<1	<1	44	44
W63	Sepik River @ Timbunke	3/12/12	169	86	4	3	15	3	<1	2	<1	4	<1	<1	53	53
W63	Sepik River @ Timbunke	10/4/13	25	66	4	5	11	3	<1	2	<1	3	<1	<1	45	45
W64	Sepik River @ Angoram	20/3/12	334	82	3	<1	14	3	<1	2	<1	<1	<1	<1	51	51
W64	Sepik River @ Angoram	6/6/12	214	107	4	4	16	4	<1	3	<1	<1	<1	<1	56	56
W64	Sepik River @ Angoram	10/9/12	213	84	2	2	12	3	<1	2	1	4	<1	<1	45	45
W64	Sepik River @ Angoram	3/12/12	158	76	3	3	13	3	<1	2	<1	4	<1	<1	49	49
W64	Sepik River @ Angoram	10/4/13	66	64	4	4	11	3	<1	2	<1	2	<1	<1	46	46
W65	Sepik River @ mouth	20/3/12	231	86	4	3	10	4	<1	6	8	<1	<1	<1	42	42
W65	Sepik River @ mouth	7/6/12	151	108	4	4	15	4	<1	3	<1	<1	<1	<1	56	56
W65	Sepik River @ mouth	10/9/12	219	111	3	2	13	4	<1	3	2	4	<1	<1	50	50
W65	Sepik River @ mouth	4/12/12	106	82	4	3	13	3	<1	2	1	3	<1	<1	46	46
W65	Sepik River @ mouth	10/4/13	46	70	5	5	11	3	<1	2	2	1	<1	<1	47	47
W70	Kuagumi Creek	15/3/12	50	45	2	2	4	2	<1	1	<1	<1	<1	<1	28	28
W70	Kuagumi Creek	11/6/12	18	41	<1	2	4	3	<1	2	<1	<1	<1	<1	28	28
W70	Kuagumi Creek	6/9/12	34	40	2	3	4	3	<1	2	<1	<1	<1	<1	24	24
W70	Kuagumi Creek	27/11/12	<5	54	1	<1	4	3	<1	2	<1	2	<1	<1	28	28
W70	Kuagumi Creek	5/4/13	26	54	3	2	4	3	<1	2	<1	1	<1	<1	30	30
W71	Frieda River road crossing	15/3/12	193	43	3	2	6	3	<1	1	<1	<1	<1	<1	31	31
W71	Frieda River road crossing	11/6/12	46	51	1	<1	6	4	<1	2	<1	<1	<1	<1	35	35
W71	Frieda River road crossing	6/9/12	115	41	3	2	5	3	<1	1	<1	1	<1	<1	26	26
W71	Frieda River road crossing	27/11/12	44	51	<1	<1	7	4	<1	2	<1	3	<1	<1	33	33
W71	Frieda River road crossing	5/4/13	76	54	2	2	5	3	<1	1	<1	3	<1	<1	28	28
S1	Usake River - middle reaches	16/11/17	14	92	-	-	6	<1	<1	1	<1	2	<1	<1	24	24
S2	Abei River at Hotmin Mission	17/11/17	10	58	-	-	9	4	<1	1	<1	4	<1	<1	42	42
S3	Uriake River	17/11/17	7	30	-	-	3	3	<1	1	<1	2	<1	<1	27	27
S4	Muni River	16/11/17	10	36	-	-	6	2	<1	2	<1	<1	<1	<1	31	31
S5	Upper Idam River	18/11/17	4	30	-	-	5	1	1	2	3	3	<1	<1	24	24
S6	Lower Idam River @ Entibi Village	18/11/17	95	22	-	-	3	<1	<1	1	<1	2	<1	<1	17	17
S7	Horden River @ Stonepass	29/11/17	86	238	-	-	33	4	<1	6	3	12	<1	<1	100	100
S8	Yanabu River	30/11/17	90	132	-	-	22	5	<1	11	3	10	<1	<1	82	82

Table A-9 Dissolved Metals Data

Site	Description	Date Sampled	Dissolved Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
Base C	Frieda Base Camp	16/3/12	<0.001	-	0.02	<0.001	<0.0001	0.003	<0.05	<0.0001	0.018	0.003	<0.001	<0.001	<0.01	0.022
Base C	Frieda Base Camp	13/6/12	<0.001	-	0.06	<0.001	0.0001	0.009	0.06	<0.0001	0.019	<0.001	<0.001	<0.001	<0.01	<0.005
Base C	Frieda Base Camp	9/9/12	<0.001	-	0.02	<0.001	<0.0001	0.006	<0.05	<0.0001	0.014	<0.001	<0.001	<0.001	<0.01	0.022
Base C	Frieda Base Camp	28/11/12	<0.001	-	0.02	<0.001	<0.0001	0.004	<0.05	<0.0001	0.012	<0.001	<0.001	<0.001	<0.01	<0.005
Base C	Frieda Base Camp	7/4/13	<0.001	-	0.02	<0.001	<0.0001	0.006	<0.05	<0.0001	0.015	<0.001	<0.001	<0.001	<0.01	<0.005
RORWB	Reference ORWB	19/3/12	<0.001	-	0.06	<0.001	<0.0001	0.002	0.43	<0.0001	0.022	<0.001	<0.001	<0.001	<0.01	0.057
RORWB	Reference ORWB	9/9/12	<0.001	-	0.11	<0.001	<0.0001	0.001	0.56	<0.0001	0.023	<0.001	<0.001	<0.001	<0.01	0.156
RORWB	Reference ORWB - surface	10/6/12	<0.001	-	0.09	0.001	<0.0001	<0.001	0.42	<0.0001	0.018	<0.001	<0.001	<0.001	<0.01	0.008
RORWB	Reference ORWB - surface	28/11/12	<0.001	-	0.07	<0.001	<0.0001	<0.001	0.38	<0.0001	0.015	<0.001	<0.001	<0.001	<0.01	0.011
RORWB	Reference ORWB - surface	6/4/13	<0.001	-	0.05	<0.001	<0.0001	0.002	0.46	<0.0001	0.025	<0.001	<0.001	<0.001	<0.01	0.089
RORWB-B	Reference ORWB - bottom	10/6/12	<0.001	-	0.08	0.001	<0.0001	0.01	0.36	<0.0001	0.018	<0.001	<0.001	<0.001	<0.01	0.033
RORWB-B	Reference ORWB - bottom	28/11/12	<0.001	-	0.09	<0.001	<0.0001	0.007	0.48	<0.0001	0.018	<0.001	<0.001	<0.001	<0.01	0.014
RORWB-B	Reference ORWB - bottom	6/4/13	<0.001	-	0.06	<0.001	<0.0001	0.004	0.65	<0.0001	0.036	<0.001	<0.001	<0.001	<0.01	0.098
W100	Lake Diawi	17/3/12	<0.001	<0.0001	0.1	<0.001	<0.0001	0.001	0.33	<0.0001	0.014	0.002	<0.001	<0.001	<0.01	0.189
W100	Lake Diawi	8/9/12	<0.001	<0.0001	0.04	<0.001	<0.0001	<0.001	0.1	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.222
W100	Lake Diawi - surface	12/6/12	<0.001	<0.0001	0.05	<0.001	<0.0001	<0.001	0.12	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	0.012
W100	Lake Diawi - surface	30/11/12	<0.001	<0.0001	0.03	<0.001	<0.0001	0.001	0.1	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	0.026
W100	Lake Diawi - surface	7/4/13	<0.001	-	0.02	<0.001	<0.0001	<0.001	0.12	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	0.085
W100-B	Lake Diawi - bottom	12/6/12	<0.001	-	0.06	<0.001	<0.0001	0.002	0.16	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.021
W100-B	Lake Diawi - bottom	30/11/12	<0.001	-	0.03	<0.001	<0.0001	0.006	0.08	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.026
W100-B	Lake Diawi - bottom	7/4/13	<0.001	-	0.02	<0.001	<0.0001	0.008	0.11	<0.0001	0.006	0.002	<0.001	<0.001	<0.01	0.026
W102	Upper Niar River	16/3/12	<0.001	<0.0001	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	0.012
W102	Upper Niar River	8/6/12	<0.001	-	0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W102	Upper Niar River	7/9/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	0.001	<0.001	<0.001	<0.01	0.016
W102	Upper Niar River	29/11/12	<0.001	<0.0001	0.05	<0.001	<0.0001	0.002	<0.05	<0.0001	0.006	0.002	<0.001	<0.001	<0.01	0.029
W102	Upper Niar River	6/4/13	<0.001	-	0.04	<0.001	<0.0001	0.002	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.006
W18	Nena River upstream of Koki Creek	16/3/12	<0.001	<0.0001	0.03	<0.001	<0.0001	0.003	0.05	<0.0001	0.002	0.002	<0.001	<0.001	<0.01	0.03
W18	Nena River upstream of Koki Creek	9/6/12	<0.001	<0.0001	0.05	<0.001	<0.0001	0.003	<0.05	<0.0001	0.002	0.001	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	7/9/12	<0.001	<0.0001	0.04	<0.001	<0.0001	0.002	<0.05	<0.0001	0.001	0.001	<0.001	<0.001	<0.01	0.009
W18	Nena River upstream of Koki Creek	29/11/12	<0.001	<0.0001	0.22	<0.001	0.0001	0.005	0.32	<0.0001	0.019	0.004	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	6/4/13	<0.001	<0.0001	0.06	<0.001	<0.0001	0.004	0.09	<0.0001	0.003	0.004	<0.001	<0.001	<0.01	<0.005
W22	Niar R us Nena R	16/3/12	<0.001	-	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.021	0.001	<0.001	<0.001	<0.01	0.011
W22	Niar River upstream of Nena River	8/6/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	<0.005
W22	Niar R us Nena R	7/9/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.006	0.001	<0.001	<0.001	<0.01	0.017
W22	Niar R us Nena R	29/11/12	<0.001	-	0.05	<0.001	<0.0001	0.001	0.08	<0.0001	0.008	0.002	<0.001	<0.001	<0.01	0.024

Site	Description	Date Sampled	Dissolved Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W22	Niar R us Nena R	6/4/13	<0.001	-	0.04	<0.001	<0.0001	0.003	0.1	<0.0001	0.015	0.002	<0.001	<0.001	<0.01	0.007
W23	Frieda River downstream of airstrip	15/3/12	<0.001	-	0.02	<0.001	<0.0001	0.001	<0.05	<0.0001	0.006	0.002	<0.001	<0.001	<0.01	0.015
W23	Frieda River downstream of airstrip	11/6/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W23	Frieda River downstream of airstrip	6/9/12	<0.001	<0.0001	0.03	<0.001	<0.0001	<0.001	0.07	<0.0001	0.007	0.002	<0.001	<0.001	<0.01	0.02
W23	Frieda River downstream of airstrip	27/11/12	<0.001	-	0.02	<0.001	<0.0001	0.001	<0.05	<0.0001	0.005	0.001	<0.001	<0.001	<0.01	<0.005
W23	Frieda River downstream of airstrip	5/4/13	<0.001	-	0.04	<0.001	<0.0001	0.002	0.11	<0.0001	0.008	0.003	<0.001	<0.001	<0.01	0.015
W26	Lake Warangai	15/3/12	<0.001	<0.0001	0.04	<0.001	<0.0001	0.002	0.23	<0.0001	0.013	0.001	<0.001	<0.001	<0.01	0.031
W26	Lake Warangai	6/9/12	<0.001	-	0.09	<0.001	<0.0001	0.001	0.27	<0.0001	0.012	0.002	<0.001	<0.001	<0.01	0.051
W26	Lake Warangai - surface	11/6/12	<0.001	-	0.11	<0.001	<0.0001	0.001	0.27	<0.0001	0.016	0.001	<0.001	<0.001	<0.01	0.008
W26	Lake Warangai - surface	27/11/12	<0.001	-	0.07	<0.001	<0.0001	0.001	0.2	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.006
W26	Lake Warangai - surface	5/4/13	<0.001	-	0.04	<0.001	<0.0001	0.001	0.26	<0.0001	0.009	<0.001	<0.001	<0.001	<0.01	0.086
W26-B	Lake Warangai - bottom	11/6/12	<0.001	-	0.1	<0.001	<0.0001	0.003	0.25	<0.0001	0.02	0.002	<0.001	<0.001	<0.01	0.015
W26-B	Lake Warangai - bottom	27/11/12	<0.001	-	0.08	<0.001	<0.0001	0.001	0.27	<0.0001	0.019	0.003	<0.001	<0.001	<0.01	0.024
W26-B	Lake Warangai - bottom	5/4/13	<0.001	-	0.05	<0.001	<0.0001	0.008	0.4	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	0.02
W27	Ok Ekwai upstream of Ok Ubai junction	16/3/12	<0.001	-	0.17	<0.001	<0.0001	0.037	0.05	<0.0001	0.037	0.001	<0.001	<0.001	<0.01	0.139
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	<0.001	-	0.63	0.001	<0.0001	0.081	0.1	<0.0001	0.06	0.002	<0.001	<0.001	<0.01	0.028
W27	Ok Ekwai upstream of Ok Ubai junction	9/9/12	<0.001	-	0.29	<0.001	<0.0001	0.049	0.09	<0.0001	0.035	0.001	<0.001	<0.001	<0.01	0.106
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	<0.001	-	0.51	<0.001	<0.0001	0.065	0.1	<0.0001	0.046	0.002	<0.001	<0.001	<0.01	0.019
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	<0.001	-	0.44	<0.001	0.0001	0.061	0.15	<0.0001	0.049	0.001	<0.001	<0.001	<0.01	0.019
W28	Upper Nena River	16/3/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	0.001	<0.001	<0.001	<0.01	0.016
W28	Upper Nena River	9/6/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	0.002	<0.001	<0.001	<0.01	0.014
W28	Upper Nena River	7/9/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.001	0.002	<0.001	<0.001	<0.01	0.025
W28	Upper Nena River	29/11/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	0.06	<0.0001	<0.001	0.002	<0.001	<0.001	<0.01	<0.005
W28	Upper Nena River	6/4/13	<0.001	-	0.04	<0.001	<0.0001	0.001	0.07	<0.0001	0.002	0.004	<0.001	<0.001	<0.01	0.005
W33	Sepik River upstream of May River junction	17/3/12	<0.001	-	<0.01	0.001	<0.0001	0.002	0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.006
W33	Sepik River upstream of May River junction	12/6/12	<0.001	-	0.02	<0.001	<0.0001	0.002	0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W33	Sepik River upstream of May River junction	8/9/12	<0.001	-	0.03	0.001	<0.0001	0.001	0.08	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	0.005
W33	Sepik River upstream of May River junction	30/11/12	<0.001	<0.0001	2.21	0.002	0.0002	0.015	6.78	<0.0001	0.337	0.011	0.005	<0.001	<0.01	0.028
W33	Sepik River upstream of May River junction	8/4/13	<0.001	-	0.03	0.001	<0.0001	0.002	0.1	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W34	Sepik River @ Iniok	17/3/12	<0.001	<0.0001	<0.01	0.001	<0.0001	0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.007
W34	Sepik River @ Iniok	12/6/12	<0.001	<0.0001	0.02	<0.001	0.0003	0.002	0.06	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.009
W34	Sepik River @ Iniok	8/9/12	<0.001	-	0.01	0.001	<0.0001	0.001	0.07	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W34	Sepik River @ Iniok	30/11/12	<0.001	-	0.03	<0.001	<0.0001	0.002	0.25	<0.0001	0.026	<0.001	<0.001	<0.001	<0.01	0.038
W34	Sepik River @ Iniok	8/4/13	<0.001	-	0.03	<0.001	<0.0001	0.002	0.13	<0.0001	0.011	<0.001	<0.001	<0.001	<0.01	0.006
W35	Sepik River @ Kubkain	21/3/12	<0.001	-	0.01	<0.001	<0.0001	0.002	0.08	<0.0001	0.009	<0.001	<0.001	<0.001	<0.01	0.01
W35	Sepik River @ Kubkain	8/6/12	<0.001	-	0.02	<0.001	<0.0001	0.002	0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.006
W35	Sepik River @ Kubkain	7/9/12	<0.001	-	0.04	0.001	<0.0001	0.001	0.15	<0.0001	0.011	<0.001	<0.001	<0.001	<0.01	0.025

Site	Description	Date Sampled	Dissolved Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W35	Sepik River @ Kubkain	1/12/12	<0.001	-	0.04	0.001	<0.0001	0.002	0.31	<0.0001	0.041	0.001	<0.001	<0.001	<0.01	0.045
W35	Sepik River @ Kubkain	9/4/13	<0.001	-	0.01	<0.001	<0.0001	0.002	0.2	<0.0001	0.031	<0.001	<0.001	<0.001	<0.01	0.02
W36	Upper Wario River	21/3/12	<0.001	<0.0001	0.01	<0.001	<0.0001	<0.001	0.08	<0.0001	0.04	<0.001	<0.001	<0.001	<0.01	0.019
W36	Upper Wario River	8/6/12	<0.001	<0.0001	0.03	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.011	<0.001	<0.001	<0.001	<0.01	<0.005
W36	Upper Wario River	7/9/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	0.09	<0.0001	0.017	<0.001	<0.001	<0.001	<0.01	0.022
W36	Upper Wario River	1/12/12	<0.001	-	0.04	<0.001	<0.0001	0.001	0.13	<0.0001	0.009	0.001	<0.001	<0.001	<0.01	0.022
W36	Upper Wario River	7/4/13	<0.001	<0.0001	0.1	<0.001	<0.0001	0.002	0.11	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	<0.005
W38A	Lower Frieda River	15/3/12	<0.001	-	0.01	<0.001	<0.0001	0.001	0.06	<0.0001	0.008	0.002	<0.001	<0.001	<0.01	0.02
W38A	Lower Frieda River	11/6/12	<0.001	-	0.01	<0.001	<0.0001	0.001	0.08	<0.0001	0.015	0.002	<0.001	<0.001	<0.01	<0.005
W38A	Lower Frieda River	6/9/12	0.001	-	0.05	<0.001	<0.0001	0.001	0.14	<0.0001	0.016	0.003	<0.001	<0.001	<0.01	0.018
W38A	Lower Frieda River	27/11/12	<0.001	-	0.03	<0.001	<0.0001	<0.001	0.13	<0.0001	0.015	0.002	<0.001	<0.001	<0.01	0.039
W38A	Lower Frieda River	3/4/13	<0.001	-	0.05	<0.001	<0.0001	0.002	0.14	<0.0001	0.012	0.003	<0.001	<0.001	<0.01	0.019
W41	Ok Isai	16/3/12	<0.001	-	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.018
W41	Ok Isai	8/6/12	<0.001	-	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	7/9/12	<0.001	<0.0001	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.028
W41	Ok Isai	29/11/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	6/4/13	<0.001	-	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	16/3/12	<0.001	-	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.012
W43	Lower Ok Binai	8/6/12	<0.001	-	0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	7/9/12	<0.001	-	0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.023
W43	Lower Ok Binai	29/11/12	<0.001	-	0.03	<0.001	<0.0001	0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	6/4/13	<0.001	-	0.02	<0.001	<0.0001	0.001	<0.05	<0.0001	0.009	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	16/3/12	<0.001	-	0.04	<0.001	<0.0001	0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	0.094
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	<0.001	-	0.03	<0.001	0.0001	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	7/9/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.027
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	<0.001	-	0.06	<0.001	<0.0001	0.001	0.06	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	<0.001	-	0.1	<0.001	<0.0001	0.002	0.08	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.005
W50	Sepik River downstream of May River (Mowi)	17/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	0.06	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W50	Sepik River downstream of May River (Mowi)	12/6/12	<0.001	-	0.02	<0.001	<0.0001	0.002	0.07	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W50	Sepik River downstream of May River (Mowi)	8/9/12	<0.001	-	0.04	<0.001	<0.0001	0.002	0.18	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	0.006
W50	Sepik River downstream of May River (Mowi)	30/11/12	<0.001	-	0.04	<0.001	<0.0001	0.002	0.26	<0.0001	0.02	<0.001	<0.001	<0.001	<0.01	0.032
W50	Sepik River downstream of May River (Mowi)	7/4/13	<0.001	-	0.02	<0.001	<0.0001	0.001	0.13	<0.0001	0.014	<0.001	<0.001	<0.001	<0.01	<0.005
W60	Sepik River downstream of April River	21/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	0.06	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.011
W60	Sepik River downstream of April River	8/6/12	<0.001	-	0.01	0.001	<0.0001	0.001	0.05	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.008
W60	Sepik River downstream of April River	9/9/12	<0.001	-	0.04	0.001	<0.0001	0.002	0.16	<0.0001	0.011	0.001	<0.001	<0.001	<0.01	0.021
W60	Sepik River downstream of April River	1/12/12	<0.001	-	0.02	<0.001	<0.0001	0.002	0.3	<0.0001	0.016	0.003	<0.001	<0.001	<0.01	0.019
W60	Sepik River downstream of April River	9/4/13	<0.001	-	0.04	<0.001	<0.0001	0.001	0.32	<0.0001	0.026	0.001	<0.001	<0.001	<0.01	0.028

Site	Description	Date Sampled	Dissolved Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W61	Sepik River @ Ambunti	21/3/12	<0.001	<0.0001	<0.01	<0.001	<0.0001	0.001	0.07	<0.0001	0.007	0.001	<0.001	<0.001	<0.01	0.013
W61	Sepik River @ Ambunti	5/6/12	<0.001	-	0.01	<0.001	<0.0001	0.001	0.06	<0.0001	0.003	0.001	<0.001	<0.001	<0.01	0.012
W61	Sepik River @ Ambunti	11/9/12	<0.001	-	0.03	0.001	<0.0001	0.002	0.15	<0.0001	0.008	0.001	<0.001	<0.001	<0.01	0.031
W61	Sepik River @ Ambunti	2/12/12	<0.001	-	0.03	0.001	<0.0001	0.002	0.27	<0.0001	0.033	0.006	<0.001	<0.001	<0.01	0.019
W61	Sepik River @ Ambunti	9/4/13	<0.001	-	0.03	<0.001	<0.0001	0.002	0.33	<0.0001	0.04	<0.001	<0.001	<0.001	<0.01	0.032
W62	Chambri Lake	20/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	0.18	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.006
W62	Chambri Lake	10/9/12	<0.001	-	0.02	0.001	<0.0001	0.001	0.09	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	0.024
W62	Chambri Lake - surface	5/6/12	<0.001	-	0.02	<0.001	<0.0001	0.001	0.18	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W62	Chambri Lake - surface	2/12/12	<0.001	-	0.05	<0.001	<0.0001	0.002	0.25	<0.0001	0.003	0.004	<0.001	<0.001	<0.01	<0.005
W62	Chambri Lake - surface	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62-B	Chambri Lake - bottom	5/6/12	<0.001	-	0.01	<0.001	0.0001	0.001	0.17	<0.0001	0.004	0.001	<0.001	<0.001	<0.01	0.027
W62-B	Chambri Lake - bottom	2/12/12	<0.001	-	0.06	<0.001	<0.0001	0.002	0.31	<0.0001	0.003	0.003	<0.001	<0.001	<0.01	0.03
W62-B	Chambri Lake - bottom	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	20/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	<0.05	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.014
W63	Sepik River @ Timbunke	6/6/12	<0.001	-	0.01	<0.001	0.0001	0.002	0.06	<0.0001	0.005	0.001	<0.001	<0.001	<0.01	0.019
W63	Sepik River @ Timbunke	10/9/12	<0.001	-	0.03	<0.001	<0.0001	0.002	0.18	<0.0001	0.012	0.001	<0.001	<0.001	<0.01	0.029
W63	Sepik River @ Timbunke	3/12/12	<0.001	-	0.04	0.001	<0.0001	0.002	0.29	<0.0001	0.019	0.002	<0.001	<0.001	<0.01	0.042
W63	Sepik River @ Timbunke	10/4/13	<0.001	<0.0001	0.03	0.001	<0.0001	<0.001	0.37	<0.0001	0.038	<0.001	<0.001	<0.001	<0.01	0.037
W64	Sepik River @ Angoram	20/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	<0.05	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.013
W64	Sepik River @ Angoram	6/6/12	<0.001	-	<0.01	<0.001	<0.0001	0.001	0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.021
W64	Sepik River @ Angoram	10/9/12	<0.001	<0.0001	0.05	<0.001	<0.0001	0.001	0.16	<0.0001	0.012	<0.001	<0.001	<0.001	<0.01	0.03
W64	Sepik River @ Angoram	3/12/12	<0.001	-	0.04	0.001	<0.0001	<0.001	0.31	<0.0001	0.027	0.002	<0.001	<0.001	<0.01	0.04
W64	Sepik River @ Angoram	10/4/13	<0.001	-	0.03	0.001	<0.0001	0.001	0.42	<0.0001	0.065	0.001	<0.001	<0.001	<0.01	0.035
W65	Sepik River @ mouth	20/3/12	<0.001	-	0.01	<0.001	<0.0001	0.001	0.06	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	0.025
W65	Sepik River @ mouth	7/6/12	<0.001	-	0.01	<0.001	<0.0001	0.002	0.07	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.031
W65	Sepik River @ mouth	10/9/12	<0.001	-	0.04	<0.001	<0.0001	0.002	0.1	<0.0001	0.016	<0.001	<0.001	<0.001	<0.01	0.03
W65	Sepik River @ mouth	4/12/12	<0.001	-	0.05	0.001	<0.0001	0.002	0.32	<0.0001	0.026	0.003	<0.001	<0.001	<0.01	0.039
W65	Sepik River @ mouth	10/4/13	<0.001	<0.0001	0.02	<0.001	<0.0001	0.002	0.41	<0.0001	0.076	<0.001	<0.001	<0.001	<0.01	0.029
W70	Kuagumi Creek	15/3/12	<0.001	-	0.02	<0.001	<0.0001	0.001	0.17	<0.0001	0.028	0.001	<0.001	<0.001	<0.01	0.02
W70	Kuagumi Creek	11/6/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	0.16	<0.0001	0.048	0.001	<0.001	<0.001	<0.01	<0.005
W70	Kuagumi Creek	6/9/12	<0.001	-	0.03	<0.001	<0.0001	<0.001	0.4	<0.0001	0.046	0.002	<0.001	<0.001	<0.01	0.024
W70	Kuagumi Creek	27/11/12	<0.001	-	0.01	<0.001	<0.0001	<0.001	0.29	<0.0001	0.067	0.001	<0.001	<0.001	<0.01	<0.005
W70	Kuagumi Creek	5/4/13	<0.001	-	0.02	<0.001	<0.0001	0.001	0.58	<0.0001	0.087	<0.001	<0.001	<0.001	<0.01	0.027
W71	Frieda River road crossing	15/3/12	<0.001	-	0.02	<0.001	<0.0001	0.002	0.09	<0.0001	0.009	0.003	<0.001	<0.001	<0.01	0.012
W71	Frieda River road crossing	11/6/12	<0.001	<0.0001	0.02	<0.001	<0.0001	<0.001	0.09	<0.0001	0.009	0.002	<0.001	<0.001	<0.01	0.03
W71	Frieda River road crossing	6/9/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	0.1	<0.0001	0.014	0.002	<0.001	<0.001	<0.01	0.015
W71	Frieda River road crossing	27/11/12	<0.001	<0.0001	0.02	<0.001	<0.0001	0.001	0.16	<0.0001	0.023	0.002	<0.001	<0.001	<0.01	0.03

Site	Description	Date Sampled	Dissolved Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W71	Frieda River road crossing	5/4/13	<0.001	<0.0001	0.05	<0.001	<0.0001	0.002	0.16	<0.0001	0.012	0.003	<0.001	<0.001	<0.01	0.016
S1	Usake River - middle reaches	16/11/17	-	<0.0001	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.003	<0.001	<0.001	<0.01	<0.005
S2	Abei River at Hotmin Mission	17/11/17	-	0.0004	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.002	0.001	<0.001	<0.001	<0.01	<0.005
S3	Uriake River	17/11/17	-	0.0002	<0.01	<0.001	<0.0001	<0.001	0.09	<0.0001	0.015	0.002	<0.001	<0.001	<0.01	<0.005
S4	Muni River	16/11/17	-	<0.0001	0.02	<0.001	<0.0001	<0.001	0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
S5	Upper Idam River	18/11/17	-	0.0001	0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005
S6	Lower Idam River @ Entibi Village	18/11/17	-	<0.0001	0.03	<0.001	<0.0001	<0.001	0.13	<0.0001	0.022	<0.001	<0.001	<0.001	<0.01	<0.005
S7	Horden River @ Stonepass	29/11/17	-	<0.0001	<0.01	<0.001	<0.0001	0.001	<0.05	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
S8	Yanabu River	30/11/17	-	<0.0001	<0.01	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005

Table A-10 Total Metals Data

Site	Description	Date Sampled	Total Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
Base C	Frieda Base Camp	16/3/12	<0.001	-	0.11	<0.001	<0.0001	0.006	<0.05	<0.0001	0.021	<0.001	<0.001	<0.001	<0.01	<0.005
Base C	Frieda Base Camp	13/6/12	<0.001	-	0.04	<0.001	0.0002	0.006	<0.05	<0.0001	0.019	<0.001	<0.001	<0.001	<0.01	0.005
Base C	Frieda Base Camp	9/9/12	<0.001	-	0.1	<0.001	<0.0001	0.01	0.08	<0.0001	0.016	<0.001	<0.001	<0.001	<0.01	0.01
Base C	Frieda Base Camp	28/11/12	<0.001	-	0.05	<0.001	<0.0001	0.007	0.07	<0.0001	0.013	<0.001	<0.001	<0.001	<0.01	0.006
Base C	Frieda Base Camp	7/4/13	<0.001	-	0.03	<0.001	<0.0001	0.01	0.08	<0.0001	0.017	<0.001	<0.001	<0.001	<0.01	<0.005
RORWB	Reference ORWB	19/3/12	<0.001	-	0.2	<0.001	<0.0001	0.002	0.73	<0.0001	0.032	0.002	<0.001	<0.001	<0.01	0.01
RORWB	Reference ORWB	9/9/12	<0.001	-	0.15	<0.001	0.0002	0.001	0.71	<0.0001	0.024	<0.001	<0.001	<0.001	<0.01	0.017
RORWB	Reference ORWB - surface	10/6/12	<0.001	-	0.09	<0.001	<0.0001	<0.001	0.47	<0.0001	0.015	<0.001	<0.001	<0.001	<0.01	<0.005
RORWB	Reference ORWB - surface	28/11/12	<0.001	-	0.1	<0.001	<0.0001	<0.001	0.48	<0.0001	0.018	<0.001	<0.001	<0.001	<0.01	<0.005
RORWB	Reference ORWB - surface	6/4/13	<0.001	-	0.03	<0.001	<0.0001	<0.001	0.5	<0.0001	0.026	<0.001	<0.001	<0.001	<0.01	0.011
RORWB-B	Reference ORWB - bottom	10/6/12	<0.001	-	0.1	<0.001	<0.0001	0.005	0.53	<0.0001	0.016	<0.001	<0.001	<0.001	<0.01	0.018
RORWB-B	Reference ORWB - bottom	28/11/12	<0.001	-	0.1	<0.001	<0.0001	0.002	0.52	<0.0001	0.019	<0.001	<0.001	<0.001	<0.01	<0.005
RORWB-B	Reference ORWB - bottom	6/4/13	<0.001	-	0.04	<0.001	<0.0001	0.003	0.82	<0.0001	0.035	<0.001	<0.001	<0.001	<0.01	0.011
W100	Lake Diawi	17/3/12	<0.001	<0.0001	0.21	<0.001	<0.0001	<0.001	0.37	<0.0001	0.014	0.002	<0.001	<0.001	<0.01	0.028
W100	Lake Diawi	8/9/12	<0.001	<0.0001	0.04	<0.001	<0.0001	<0.001	0.13	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.031
W100	Lake Diawi - surface	12/6/12	<0.001	<0.0001	0.05	<0.001	<0.0001	<0.001	0.11	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	0.017
W100	Lake Diawi - surface	30/11/12	<0.001	<0.0001	0.02	<0.001	<0.0001	0.002	0.08	<0.0001	0.008	0.002	<0.001	<0.001	<0.01	<0.005
W100	Lake Diawi - surface	7/4/13	<0.001	-	0.03	<0.001	<0.0001	<0.001	0.18	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	0.01
W100-B	Lake Diawi - bottom	12/6/12	<0.001	-	0.07	<0.001	<0.0001	0.002	0.18	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	0.022
W100-B	Lake Diawi - bottom	30/11/12	<0.001	-	0.03	<0.001	<0.0001	0.005	0.07	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.021
W100-B	Lake Diawi - bottom	7/4/13	<0.001	-	<0.01	<0.001	<0.0001	0.005	0.13	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.01
W102	Upper Niar River	16/3/12	<0.001	<0.0001	1.21	<0.001	<0.0001	0.003	2.01	<0.0001	0.083	0.028	0.002	<0.001	<0.01	0.005
W102	Upper Niar River	8/6/12	<0.001	-	0.09	0.002	<0.0001	<0.001	0.09	<0.0001	0.009	0.002	<0.001	<0.001	<0.01	<0.005
W102	Upper Niar River	7/9/12	<0.001	-	0.55	<0.001	<0.0001	0.002	0.95	<0.0001	0.037	0.008	<0.001	<0.001	<0.01	<0.005
W102	Upper Niar River	29/11/12	<0.001	<0.0001	3.97	0.002	<0.0001	0.008	6.32	<0.0001	0.153	0.02	0.003	<0.001	<0.01	0.017
W102	Upper Niar River	6/4/13	<0.001	-	4.87	0.002	<0.0001	0.009	7.86	<0.0001	0.182	0.033	0.003	<0.001	<0.01	0.026
W18	Nena River upstream of Koki Creek	16/3/12	<0.001	<0.0001	0.09	<0.001	<0.0001	0.003	0.07	<0.0001	0.006	0.002	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	9/6/12	<0.001	<0.0001	0.07	<0.001	<0.0001	0.004	0.07	<0.0001	0.004	0.002	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	7/9/12	<0.001	<0.0001	0.09	<0.001	<0.0001	0.003	0.09	<0.0001	0.004	0.002	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	29/11/12	<0.001	<0.0001	0.72	<0.001	<0.0001	0.005	0.78	<0.0001	0.023	0.004	<0.001	<0.001	<0.01	<0.005
W18	Nena River upstream of Koki Creek	6/4/13	<0.001	<0.0001	0.9	<0.001	<0.0001	0.006	1.41	<0.0001	0.039	0.024	<0.001	<0.001	<0.01	0.007
W22	Niar R us Nena R	16/3/12	<0.001	-	0.33	<0.001	<0.0001	0.001	0.51	<0.0001	0.053	0.013	<0.001	<0.001	<0.01	<0.005
W22	Niar River upstream of Nena River	8/6/12	<0.001	-	0.09	<0.001	<0.0001	<0.001	0.11	<0.0001	0.017	0.002	<0.001	<0.001	<0.01	<0.005
W22	Niar R us Nena R	7/9/12	<0.001	-	0.66	<0.001	<0.0001	0.002	1.11	<0.0001	0.044	0.014	<0.001	<0.001	<0.01	<0.005
W22	Niar R us Nena R	29/11/12	<0.001	-	3.92	0.001	<0.0001	0.009	6.22	<0.0001	0.15	0.014	0.003	<0.001	<0.01	0.018
W22	Niar R us Nena R	6/4/13	<0.001	-	5.96	0.002	0.0003	0.012	9.66	<0.0001	0.256	0.052	0.004	<0.001	<0.01	0.025
W23	Frieda River downstream of airstrip	15/3/12	<0.001	-	4.59	<0.001	<0.0001	0.005	8.57	<0.0001	0.091	0.028	0.001	<0.001	<0.01	0.006
W23	Frieda River downstream of airstrip	11/6/12	<0.001	-	0.49	0.002	<0.0001	0.003	0.65	<0.0001	0.042	0.006	<0.001	<0.001	<0.01	<0.005
W23	Frieda River downstream of airstrip	6/9/12	<0.001	<0.0001	1.46	<0.001	<0.0001	0.004	2.43	<0.0001	0.08	0.024	<0.001	<0.001	<0.01	0.008
W23	Frieda River downstream of airstrip	27/11/12	<0.001	-	0.44	<0.001	<0.0001	0.001	0.65	<0.0001	0.018	0.004	<0.001	<0.001	<0.01	<0.005

Site	Description	Date Sampled	Total Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W23	Frieda River downstream of airstrip	5/4/13	<0.001	-	1.42	<0.001	0.0002	0.006	2.29	<0.0001	0.073	0.024	<0.001	<0.001	<0.01	0.006
W26	Lake Warangai	15/3/12	<0.001	<0.0001	0.41	<0.001	<0.0001	0.002	0.71	<0.0001	0.026	0.003	<0.001	<0.001	<0.01	<0.005
W26	Lake Warangai	6/9/12	<0.001	-	0.29	<0.001	<0.0001	0.001	0.66	<0.0001	0.024	0.003	<0.001	<0.001	<0.01	0.008
W26	Lake Warangai - surface	11/6/12	<0.001	-	0.21	<0.001	<0.0001	0.001	0.54	<0.0001	0.02	0.001	<0.001	<0.001	<0.01	0.008
W26	Lake Warangai - surface	27/11/12	<0.001	-	0.33	<0.001	<0.0001	0.001	0.55	<0.0001	0.014	0.001	<0.001	<0.001	<0.01	<0.005
W26	Lake Warangai - surface	5/4/13	<0.001	-	0.02	<0.001	<0.0001	0.001	0.3	<0.0001	0.01	<0.001	<0.001	<0.001	<0.01	0.009
W26-B	Lake Warangai - bottom	11/6/12	<0.001	-	0.25	<0.001	<0.0001	0.002	0.59	<0.0001	0.024	0.003	<0.001	<0.001	<0.01	0.006
W26-B	Lake Warangai - bottom	27/11/12	<0.001	-	0.39	<0.001	<0.0001	0.004	0.64	<0.0001	0.025	0.001	<0.001	<0.001	<0.01	0.243
W26-B	Lake Warangai - bottom	5/4/13	<0.001	-	0.06	<0.001	<0.0001	0.008	0.57	<0.0001	0.014	<0.001	<0.001	<0.001	<0.01	0.014
W27	Ok Ekwai upstream of Ok Ubai junction	16/3/12	<0.001	-	0.34	<0.001	<0.0001	0.037	0.1	<0.0001	0.036	0.001	<0.001	<0.001	<0.01	0.014
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	<0.001	-	0.58	<0.001	<0.0001	0.078	0.12	<0.0001	0.057	0.002	<0.001	<0.001	<0.01	0.02
W27	Ok Ekwai upstream of Ok Ubai junction	9/9/12	<0.001	-	0.4	<0.001	<0.0001	0.048	0.12	<0.0001	0.032	<0.001	<0.001	<0.001	<0.01	0.015
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	<0.001	-	0.51	<0.001	<0.0001	0.067	0.12	<0.0001	0.048	0.002	<0.001	<0.001	<0.01	0.015
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	<0.001	-	0.47	<0.001	<0.0001	0.061	0.19	<0.0001	0.051	0.001	<0.001	<0.001	<0.01	0.02
W28	Upper Nena River	16/3/12	<0.001	-	1	<0.001	<0.0001	0.004	1.02	<0.0001	0.094	0.006	0.001	<0.001	<0.01	0.011
W28	Upper Nena River	9/6/12	<0.001	-	0.04	0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	0.002	<0.001	<0.001	<0.01	<0.005
W28	Upper Nena River	7/9/12	<0.001	-	0.03	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	0.002	<0.001	<0.001	<0.01	<0.005
W28	Upper Nena River	29/11/12	<0.001	-	0.34	<0.001	<0.0001	0.002	0.36	<0.0001	0.018	0.004	<0.001	<0.001	<0.01	<0.005
W28	Upper Nena River	6/4/13	<0.001	-	0.24	<0.001	<0.0001	0.002	0.43	<0.0001	0.011	0.009	<0.001	<0.001	<0.01	0.011
W33	Sepik River upstream of May River junction	17/3/12	<0.001	-	21	0.007	0.0002	0.044	30.7	<0.0001	0.776	0.052	0.015	<0.001	<0.01	0.082
W33	Sepik River upstream of May River junction	12/6/12	<0.001	-	24.6	0.01	0.0003	0.063	52	<0.0001	0.983	0.088	0.016	<0.001	<0.01	0.106
W33	Sepik River upstream of May River junction	8/9/12	<0.001	-	22.2	0.012	0.0001	0.035	44.2	<0.0001	0.763	0.042	0.022	<0.001	<0.01	0.103
W33	Sepik River upstream of May River junction	30/11/12	<0.001	<0.0001	12.7	0.006	<0.0001	0.027	22	<0.0001	0.525	0.031	0.009	<0.001	<0.01	0.053
W33	Sepik River upstream of May River junction	8/4/13	<0.001	-	32.5	0.018	0.0001	0.054	65.8	<0.0001	1.38	0.058	0.04	<0.001	<0.01	0.169
W34	Sepik River @ Iniok	17/3/12	<0.001	<0.0021	7.81	0.003	<0.0001	0.022	14.8	<0.0001	0.338	0.028	0.006	<0.001	<0.01	0.04
W34	Sepik River @ Iniok	12/6/12	<0.001	<0.0001	5.56	0.002	0.0002	0.02	11.5	<0.0001	0.343	0.022	0.005	<0.001	<0.01	0.028
W34	Sepik River @ Iniok	8/9/12	<0.001	-	17.4	0.01	0.0001	0.031	37.9	<0.0001	0.665	0.039	0.018	<0.001	<0.01	0.09
W34	Sepik River @ Iniok	30/11/12	<0.001	-	4.2	0.002	0.0001	0.009	7.32	<0.0001	0.177	0.011	0.004	<0.001	<0.01	0.019
W34	Sepik River @ Iniok	8/4/13	<0.001	-	14.4	0.008	<0.0001	0.022	27.6	<0.0001	0.52	0.024	0.015	<0.001	<0.01	0.074
W35	Sepik River @ Kubkain	21/3/12	<0.001	-	10.7	0.005	<0.0001	0.033	20.7	<0.0001	0.583	0.039	0.01	<0.001	<0.01	0.05
W35	Sepik River @ Kubkain	8/6/12	<0.001	-	12.7	0.007	0.0002	0.025	25.4	<0.0001	0.539	0.026	0.014	<0.001	<0.01	0.058
W35	Sepik River @ Kubkain	7/9/12	<0.001	-	6.38	0.003	<0.0001	0.011	11.6	<0.0001	0.207	0.018	0.005	<0.001	<0.01	0.023
W35	Sepik River @ Kubkain	1/12/12	<0.001	-	2.46	0.002	<0.0001	0.006	4.14	<0.0001	0.124	0.006	0.002	<0.001	<0.01	0.026
W35	Sepik River @ Kubkain	9/4/13	<0.001	-	5.64	0.004	<0.0001	0.009	9.14	<0.0001	0.181	0.008	0.004	<0.001	<0.01	0.021
W36	Upper Wario River	21/3/12	<0.001	<0.0001	0.5	<0.001	<0.0001	0.002	1.14	<0.0001	0.073	0.003	<0.001	<0.001	<0.01	<0.005
W36	Upper Wario River	8/6/12	<0.001	<0.0001	0.84	<0.001	<0.0001	0.002	1.37	<0.0001	0.05	0.004	<0.001	<0.001	<0.01	0.007
W36	Upper Wario River	7/9/12	<0.001	-	1.41	<0.001	<0.0001	0.004	2.35	<0.0001	0.078	0.008	<0.001	<0.001	<0.01	0.016
W36	Upper Wario River	1/12/12	<0.001	-	0.37	<0.001	<0.0001	0.002	0.59	<0.0001	0.036	0.006	<0.001	<0.001	<0.01	<0.005
W36	Upper Wario River	7/4/13	<0.001	<0.0001	15.4	0.003	<0.0001	0.037	23.9	<0.0001	0.553	0.054	0.006	<0.001	<0.01	0.055
W38A	Lower Frieda River	15/3/12	<0.001	-	3.7	0.001	<0.0001	0.012	6.87	<0.0001	0.25	0.05	0.004	<0.001	<0.01	0.024
W38A	Lower Frieda River	11/6/12	<0.001	-	0.75	<0.001	<0.0001	0.004	1.66	<0.0001	0.064	0.012	<0.001	<0.001	<0.01	0.009

Site	Description	Date Sampled	Total Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W38A	Lower Frieda River	6/9/12	<0.001	-	6.66	0.002	<0.0001	0.017	11.4	<0.0001	0.319	0.067	0.004	<0.001	<0.01	0.026
W38A	Lower Frieda River	27/11/12	<0.001	-	1.26	<0.001	<0.0001	0.003	2.14	<0.0001	0.06	0.013	<0.001	<0.001	<0.01	<0.005
W38A	Lower Frieda River	3/4/13	<0.001	-	3.4	0.001	<0.0001	0.01	6.27	<0.0001	0.18	0.046	0.002	<0.001	<0.01	0.018
W41	Ok Isai	16/3/12	<0.001	-	<0.01	<0.001	<0.0001	0.015	<0.05	<0.0001	0.002	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	8/6/12	<0.001	-	<0.01	0.001	<0.0001	<0.001	<0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	7/9/12	<0.001	<0.0001	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	29/11/12	<0.001	-	0.03	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W41	Ok Isai	6/4/13	<0.001	-	<0.01	<0.001	<0.0001	0.001	0.05	<0.0001	0.003	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	16/3/12	<0.001	-	0.04	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.006	<0.001	<0.001	<0.001	<0.01	0.006
W43	Lower Ok Binai	8/6/12	<0.001	-	0.02	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	7/9/12	<0.001	-	0.05	<0.001	<0.0001	<0.001	0.06	<0.0001	0.007	<0.001	<0.001	<0.001	<0.01	<0.005
W43	Lower Ok Binai	29/11/12	<0.001	-	1.32	<0.001	<0.0001	0.003	1.28	<0.0001	0.039	<0.001	<0.001	<0.001	<0.01	0.008
W43	Lower Ok Binai	6/4/13	<0.001	-	0.13	<0.001	0.0001	0.002	0.21	<0.0001	0.018	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	16/3/12	<0.001	-	0.07	<0.001	<0.0001	0.001	0.07	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	<0.001	-	0.05	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	0.009
W48	Ok Simbale (Aiyok Ck) @ Nena River	7/9/12	<0.001	-	0.05	<0.001	<0.0001	0.001	0.06	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	<0.001	-	0.09	<0.001	<0.0001	0.002	0.08	<0.0001	0.004	<0.001	<0.001	<0.001	<0.01	<0.005
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	<0.001	-	0.12	<0.001	<0.0001	0.002	0.13	<0.0001	0.005	<0.001	<0.001	<0.001	<0.01	<0.005
W50	Sepik River downstream of May River (Mowi)	17/3/12	<0.001	-	21.2	0.005	0.0001	0.054	28.9	<0.0001	0.728	0.051	0.013	<0.001	<0.01	0.073
W50	Sepik River downstream of May River (Mowi)	12/6/12	<0.001	-	11.8	0.004	0.0002	0.031	23.4	<0.0001	0.532	0.039	0.01	<0.001	<0.01	0.051
W50	Sepik River downstream of May River (Mowi)	8/9/12	<0.001	-	17	0.008	0.0001	0.027	34.4	<0.0001	0.617	0.035	0.016	<0.001	<0.01	0.077
W50	Sepik River downstream of May River (Mowi)	30/11/12	<0.001	-	5.47	0.002	0.0001	0.012	8.86	<0.0001	0.202	0.014	0.004	<0.001	<0.01	0.022
W50	Sepik River downstream of May River (Mowi)	7/4/13	<0.001	-	17.6	0.01	<0.0001	0.027	34.6	<0.0001	0.654	0.03	0.02	<0.001	<0.01	0.085
W60	Sepik River downstream of April River	21/3/12	<0.001	-	7.02	0.003	<0.0001	0.019	12.3	<0.0001	0.293	0.024	0.006	<0.001	<0.01	0.03
W60	Sepik River downstream of April River	8/6/12	<0.001	-	12.9	0.006	0.0001	0.022	26.8	<0.0001	0.449	0.042	0.011	<0.001	<0.01	0.062
W60	Sepik River downstream of April River	9/9/12	<0.001	-	8.22	0.004	<0.0001	0.013	14.9	<0.0001	0.266	0.02	0.008	<0.001	<0.01	0.035
W60	Sepik River downstream of April River	1/12/12	<0.001	-	0.17	<0.001	<0.0001	0.011	0.64	<0.0001	0.022	0.005	<0.001	<0.001	<0.01	0.011
W60	Sepik River downstream of April River	9/4/13	<0.001	-	1.05	0.001	<0.0001	0.003	2.08	<0.0001	0.052	0.006	<0.001	<0.001	<0.01	0.006
W61	Sepik River @ Ambunti	21/3/12	<0.001	<0.0021	5.95	0.002	<0.0001	0.016	10.6	<0.0001	0.258	0.026	0.006	<0.001	<0.01	0.024
W61	Sepik River @ Ambunti	5/6/12	<0.001	-	7.97	0.004	0.0001	0.021	16.9	<0.0001	0.4	0.041	0.006	<0.001	<0.01	0.04
W61	Sepik River @ Ambunti	11/9/12	<0.001	-	9.68	0.005	<0.0001	0.018	18.3	<0.0001	0.317	0.032	0.009	<0.001	<0.01	0.045
W61	Sepik River @ Ambunti	2/12/12	<0.001	-	2.83	0.002	<0.0001	0.007	5.09	<0.0001	0.122	0.012	0.002	<0.001	<0.01	0.015
W61	Sepik River @ Ambunti	9/4/13	<0.001	-	2.18	0.002	<0.0001	0.006	4.37	<0.0001	0.111	0.006	0.002	<0.001	<0.01	0.036
W62	Chambri Lake	20/3/12	<0.001	-	0.53	<0.001	<0.0001	0.002	0.89	<0.0001	0.034	0.002	<0.001	<0.001	<0.01	<0.005
W62	Chambri Lake	10/9/12	<0.001	-	1.36	0.002	<0.0001	0.003	2.02	<0.0001	0.036	0.005	0.001	<0.001	<0.01	0.007
W62	Chambri Lake - surface	5/6/12	<0.001	-	0.38	<0.001	0.0001	0.002	0.7	<0.0001	0.027	0.002	<0.001	<0.001	<0.01	<0.005
W62	Chambri Lake - surface	2/12/12	<0.001	-	0.56	<0.001	<0.0001	0.002	0.98	<0.0001	0.021	0.004	<0.001	<0.001	<0.01	<0.005
W62	Chambri Lake - surface	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W62-B	Chambri Lake - bottom	5/6/12	<0.001	-	0.39	<0.001	<0.0001	0.002	0.76	<0.0001	0.033	0.002	<0.001	<0.001	<0.01	<0.005
W62-B	Chambri Lake - bottom	2/12/12	<0.001	-	0.62	<0.001	<0.0001	0.004	1.08	<0.0001	0.023	0.003	<0.001	<0.001	<0.01	0.008
W62-B	Chambri Lake - bottom	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	20/3/12	<0.001	-	4.04	0.002	0.0001	0.016	7.84	<0.0001	0.266	0.023	0.005	<0.001	<0.01	0.042

Site	Description	Date Sampled	Total Metals													
			Ag	Ultratrace Ag	Al	As	Cd	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.001	0.0001	0.01	0.001	0.0001	0.001	0.05	0.0001	0.001	0.001	0.001	0.001	0.01	0.005
W63	Sepik River @ Timbunke	6/6/12	<0.001	-	3.93	0.002	0.0001	0.01	7.52	<0.0001	0.162	0.017	0.003	<0.001	<0.01	0.082
W63	Sepik River @ Timbunke	10/9/12	<0.001	-	5.72	0.003	<0.0001	0.012	10.5	<0.0001	0.186	0.024	0.004	<0.001	<0.01	0.023
W63	Sepik River @ Timbunke	3/12/12	<0.001	-	4.56	0.002	<0.0001	0.01	7.59	<0.0001	0.147	0.02	0.002	<0.001	<0.01	0.020
W63	Sepik River @ Timbunke	10/4/13	<0.001	<0.0001	0.82	0.002	<0.0001	0.003	2.12	<0.0001	0.077	0.003	<0.001	<0.001	<0.01	<0.005
W64	Sepik River @ Angoram	20/3/12	<0.001	-	5.65	0.002	<0.0001	0.016	9.08	<0.0001	0.26	0.021	0.004	<0.001	<0.01	0.024
W64	Sepik River @ Angoram	6/6/12	<0.001	-	4.5	0.002	0.0002	0.012	8.81	<0.0001	0.185	0.019	0.003	<0.001	<0.01	0.019
W64	Sepik River @ Angoram	10/9/12	<0.001	<0.0001	7.14	0.003	0.0002	0.015	12.1	<0.0001	0.217	0.026	0.004	<0.001	<0.01	0.029
W64	Sepik River @ Angoram	3/12/12	<0.001	-	3.61	0.002	<0.0001	0.008	6.00	<0.0001	0.133	0.015	0.002	<0.001	<0.01	0.014
W64	Sepik River @ Angoram	10/4/13	<0.001	-	1.92	0.002	<0.0001	0.004	3.84	<0.0001	0.12	0.006	<0.001	<0.001	<0.01	0.017
W65	Sepik River @ mouth	20/3/12	<0.001	-	6.78	0.002	<0.0001	0.015	10.4	<0.0001	0.255	0.025	0.004	<0.001	<0.01	0.025
W65	Sepik River @ mouth	7/6/12	<0.001	-	2	0.001	0.0001	0.007	3.95	<0.0001	0.097	0.008	0.002	<0.001	<0.01	0.011
W65	Sepik River @ mouth	10/9/12	<0.001	-	7.89	0.003	<0.0001	0.015	11.9	<0.0001	0.23	0.023	0.004	<0.001	<0.01	0.027
W65	Sepik River @ mouth	4/12/12	<0.001	-	3.33	0.002	<0.0001	0.008	5.58	<0.0001	0.119	0.013	0.002	<0.001	<0.01	0.016
W65	Sepik River @ mouth	10/4/13	<0.001	<0.0001	1.59	0.002	<0.0001	0.004	3.1	<0.0001	0.118	0.003	<0.001	<0.001	<0.01	0.006
W70	Kuagumi Creek	15/3/12	<0.001	-	0.7	<0.001	<0.0001	0.003	1.54	<0.0001	0.069	0.01	<0.001	<0.001	<0.01	<0.005
W70	Kuagumi Creek	11/6/12	<0.001	-	0.14	<0.001	<0.0001	0.001	0.81	<0.0001	0.058	0.003	<0.001	<0.001	<0.01	0.018
W70	Kuagumi Creek	6/9/12	<0.001	-	0.87	<0.001	<0.0001	0.003	1.84	<0.0001	0.084	0.01	<0.001	<0.001	<0.01	<0.005
W70	Kuagumi Creek	27/11/12	<0.001	-	0.23	<0.001	<0.0001	0.001	1.02	<0.0001	0.081	0.003	<0.001	<0.001	<0.01	<0.005
W70	Kuagumi Creek	5/4/13	<0.001	-	1	<0.001	<0.0001	0.004	2.74	<0.0001	0.144	0.01	<0.001	<0.001	<0.01	0.008
W71	Frieda River road crossing	15/3/12	<0.001	-	2.67	<0.001	<0.0001	0.008	9.54	<0.0001	0.168	0.049	0.002	<0.001	<0.01	0.01
W71	Frieda River road crossing	11/6/12	<0.001	<0.0001	0.64	<0.001	<0.0001	0.003	1.17	<0.0001	0.05	0.01	<0.001	<0.001	<0.01	0.005
W71	Frieda River road crossing	6/9/12	<0.001	-	3.07	<0.001	<0.0001	0.008	5.22	<0.0001	0.159	0.046	0.002	<0.001	<0.01	0.028
W71	Frieda River road crossing	27/11/12	<0.001	<0.0001	1.31	<0.001	<0.0001	0.004	2.24	<0.0001	0.064	0.014	<0.001	<0.001	<0.01	0.006
W71	Frieda River road crossing	5/4/13	<0.001	<0.0001	2.88	0.001	0.0002	0.008	4.74	<0.0001	0.165	0.038	0.002	<0.001	<0.01	0.014
S1	Usake River - middle reaches	16/11/17	-	<0.0001	1.45	<0.001	<0.0001	0.004	1.47	<0.0001	0.042	0.005	<0.001	<0.001	<0.01	<0.005
S2	Abei River at Hotmin Mission	17/11/17	-	0.0004	0.19	<0.001	<0.0001	<0.001	0.4	<0.0001	0.02	0.005	<0.001	<0.001	<0.01	<0.005
S3	Uriake River	17/11/17	-	0.0002	0.31	<0.001	<0.0001	<0.001	0.69	<0.0001	0.031	0.004	<0.001	<0.001	<0.01	<0.005
S4	Muni River	16/11/17	-	<0.0001	0.62	<0.001	<0.0001	0.002	0.67	<0.0001	0.022	<0.001	<0.001	<0.001	<0.01	<0.005
S5	Upper Idam River	18/11/17	-	0.0001	0.33	<0.001	<0.0001	<0.001	0.24	<0.0001	0.008	<0.001	<0.001	<0.001	<0.01	<0.005
S6	Lower Idam River @ Entibi Village	18/11/17	-	<0.0001	2.83	<0.001	<0.0001	0.008	3.75	<0.0001	0.101	0.003	0.001	<0.001	<0.01	0.006
S7	Horden River @ Stonepass	29/11/17	-	<0.0001	5.07	0.001	<0.0001	0.016	7	<0.0001	0.174	0.007	0.001	<0.001	<0.01	0.016
S8	Yanabu River	30/11/17	-	<0.0001	1.28	<0.001	<0.0001	0.003	1.65	<0.0001	0.031	0.002	<0.001	<0.001	<0.01	<0.005

Table A-11 Nutrients Data

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
Base C	Frieda Base Camp	16/3/12	-	-	-	-	-
Base C	Frieda Base Camp	13/6/12	0.6	0.04	0.55	0.06	<0.01
Base C	Frieda Base Camp	9/9/12	-	-	-	-	-
Base C	Frieda Base Camp	28/11/12	<0.1	0.03	<0.01	0.04	<0.01
Base C	Frieda Base Camp	7/4/13	<0.1	<0.01	0.04	0.02	<0.01
RORWB	Reference ORWB	19/3/12	-	-	-	-	-
RORWB	Reference ORWB	9/9/12	-	-	-	-	-
RORWB	Reference ORWB - surface	10/6/12	0.8	<0.01	0.02	<0.01	<0.01
RORWB	Reference ORWB - surface	28/11/12	0.4	0.05	<0.01	<0.01	<0.01
RORWB	Reference ORWB - surface	6/4/13	0.5	<0.01	0.11	<0.01	<0.01
RORWB-B	Reference ORWB - bottom	10/6/12	0.7	<0.01	0.08	<0.01	<0.01
RORWB-B	Reference ORWB - bottom	28/11/12	0.4	<0.01	<0.01	<0.01	<0.01
RORWB-B	Reference ORWB - bottom	6/4/13	0.4	0.03	0.04	<0.01	<0.01
W100	Lake Diawi	17/3/12	-	-	-	-	-
W100	Lake Diawi	8/9/12	-	-	-	-	-
W100	Lake Diawi - surface	12/6/12	0.5	<0.01	0.13	0.01	<0.01
W100	Lake Diawi - surface	30/11/12	0.5	<0.01	0.08	<0.01	<0.01
W100	Lake Diawi - surface	7/4/13	0.4	0.02	0.17	<0.01	<0.01
W100-B	Lake Diawi - bottom	12/6/12	0.6	<0.01	0.08	<0.01	<0.01
W100-B	Lake Diawi - bottom	30/11/12	0.9	0.02	0.25	0.16	<0.01
W100-B	Lake Diawi - bottom	7/4/13	0.8	0.02	0.64	<0.01	<0.01
W102	Upper Niar River	16/3/12					
W102	Upper Niar River	8/6/12	0.2	<0.01	0.05	0.05	<0.01
W102	Upper Niar River	7/9/12	-	-	-	-	-
W102	Upper Niar River	29/11/12	0.3	<0.01	0.08	0.06	0.01

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
W102	Upper Niar River	6/4/13	0.2	0.15	0.02	0.05	<0.01
W18	Nena River upstream of Koki Creek	16/3/12	-	-	-	-	-
W18	Nena River upstream of Koki Creek	9/6/12	<0.1	0.04	0.07	<0.01	<0.01
W18	Nena River upstream of Koki Creek	7/9/12	-	-	-	-	-
W18	Nena River upstream of Koki Creek	29/11/12	0.2	<0.01	0.06	0.02	<0.01
W18	Nena River upstream of Koki Creek	6/4/13	0.6	0.03	0.34	<0.01	<0.01
W22	Niar R us Nena R	16/3/12	-	-	-	-	-
W22	Niar River upstream of Nena River	8/6/12	0.2	0.1	0.07	0.02	<0.01
W22	Niar R us Nena R	7/9/12	-	-	-	-	-
W22	Niar R us Nena R	29/11/12	0.8	0.07	0.64	0.05	0.01
W22	Niar R us Nena R	6/4/13	0.2	0.13	0.03	0.03	<0.01
W23	Frieda River downstream of airstrip	15/3/12	-	-	-	-	-
W23	Frieda River downstream of airstrip	11/6/12	0.4	0.02	0.17	0.02	<0.01
W23	Frieda River downstream of airstrip	6/9/12	-	-	-	-	-
W23	Frieda River downstream of airstrip	27/11/12	<0.1	<0.01	<0.01	0.04	<0.01
W23	Frieda River downstream of airstrip	5/4/13	<0.1	0.06	0.02	0.02	<0.01
W26	Lake Warangai	15/3/12	-	-	-	-	-
W26	Lake Warangai	6/9/12	-	-	-	-	-
W26	Lake Warangai - surface	11/6/12	0.4	0.08	0.03	<0.01	<0.01
W26	Lake Warangai - surface	27/11/12	0.3	0.03	0.01	<0.01	<0.01
W26	Lake Warangai - surface	5/4/13	0.4	0.04	0.48	<0.01	<0.01
W26-B	Lake Warangai - bottom	11/6/12	0.4	0.07	0.07	0.07	<0.01
W26-B	Lake Warangai - bottom	27/11/12	0.4	0.04	0.04	<0.01	<0.01
W26-B	Lake Warangai - bottom	5/4/13	0.9	0.03	0.59	<0.01	<0.01
W27	Ok Ekwai upstream of Ok Ubai junction	16/3/12	-	-	-	-	-
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	0.3	<0.01	<0.01	0.01	0.01

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
W27	Ok Ekwai upstream of Ok Ubai junction	9/9/12	-	-	-	-	-
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	<0.1	0.07	0.01	0.02	<0.01
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	<0.1	<0.01	0.02	<0.01	<0.01
W28	Upper Nena River	16/3/12	-	-	-	-	-
W28	Upper Nena River	9/6/12	0.3	<0.01	0.06	0.02	<0.01
W28	Upper Nena River	7/9/12	-	-	-	-	-
W28	Upper Nena River	29/11/12	0.2	<0.01	0.1	0.02	<0.01
W28	Upper Nena River	6/4/13	<0.1	<0.01	0.02	<0.01	<0.01
W33	Sepik River upstream of May River junction	17/3/12	-	-	-	-	-
W33	Sepik River upstream of May River junction	12/6/12	1.8	0.9	0.19	0.04	0.02
W33	Sepik River upstream of May River junction	8/9/12	-	-	-	-	-
W33	Sepik River upstream of May River junction	30/11/12	1	0.38	0.06	0.04	0.02
W33	Sepik River upstream of May River junction	8/4/13	2	1.33	0.07	0.03	0.02
W34	Sepik River @ Iniok	17/3/12	-	-	-	-	-
W34	Sepik River @ Iniok	12/6/12	0.8	0.38	0.04	0.02	0.02
W34	Sepik River @ Iniok	8/9/12	-	-	-	-	-
W34	Sepik River @ Iniok	30/11/12	0.6	0.15	0.35	0.04	0.01
W34	Sepik River @ Iniok	8/4/13	0.8	0.56	0.06	0.02	<0.01
W35	Sepik River @ Kubkain	21/3/12	-	-	-	-	-
W35	Sepik River @ Kubkain	8/6/12	1.5	0.65	0.05	0.04	0.02
W35	Sepik River @ Kubkain	7/9/12	-	-	-	-	-
W35	Sepik River @ Kubkain	1/12/12	0.4	0.07	0.15	0.02	<0.01
W35	Sepik River @ Kubkain	9/4/13	1.1	0.21	0.2	0.02	<0.01
W36	Upper Wario River	21/3/12	-	-	-	-	-
W36	Upper Wario River	8/6/12	0.1	0.06	0.03	0.03	<0.01
W36	Upper Wario River	7/9/12	-	-	-	-	-

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
W36	Upper Wario River	1/12/12	0.3	0.06	0.13	0.02	<0.01
W36	Upper Wario River	7/4/13	1.2	0.46	0.17	0.02	<0.01
W38A	Lower Frieda River	15/3/12	-	-	-	-	-
W38A	Lower Frieda River	11/6/12	0.2	0.1	0.05	0.02	<0.01
W38A	Lower Frieda River	6/9/12	-	-	-	-	-
W38A	Lower Frieda River	27/11/12	0.2	0.06	<0.01	0.03	<0.01
W38A	Lower Frieda River	3/4/13	0.8	0.15	0.14	0.02	<0.01
W41	Ok Isai	16/3/12	-	-	-	-	-
W41	Ok Isai	8/6/12	0.2	<0.01	0.08	0.02	<0.01
W41	Ok Isai	7/9/12	-	-	-	-	-
W41	Ok Isai	29/11/12	0.1	0.05	0.07	0.03	<0.01
W41	Ok Isai	6/4/13	<0.1	0.01	0.03	0.01	<0.01
W43	Lower Ok Binai	16/3/12	-	-	-	-	-
W43	Lower Ok Binai	8/6/12	0.2	<0.01	0.06	0.01	<0.01
W43	Lower Ok Binai	7/9/12	-	-	-	-	-
W43	Lower Ok Binai	29/11/12	0.2	0.02	0.08	0.03	<0.01
W43	Lower Ok Binai	6/4/13	0.7	<0.01	0.23	0.01	<0.01
W48	Ok Simbale (Aiyok Ck) @ Nena River	16/3/12	-	-	-	-	-
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	0.3	0.07	<0.01	0.02	<0.01
W48	Ok Simbale (Aiyok Ck) @ Nena River	7/9/12	-	-	-	-	-
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	0.3	<0.01	0.24	0.01	<0.01
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	0.2	<0.01	0.02	<0.01	<0.01
W50	Sepik River downstream of May River (Mowi)	17/3/12	-	-	-	-	-
W50	Sepik River downstream of May River (Mowi)	12/6/12	1.1	0.47	0.06	0.04	0.02
W50	Sepik River downstream of May River (Mowi)	8/9/12	-	-	-	-	-
W50	Sepik River downstream of May River (Mowi)	30/11/12	0.6	0.26	0.07	0.04	<0.01

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
W50	Sepik River downstream of May River (Mowi)	7/4/13	1	0.66	0.06	0.02	0.01
W60	Sepik River downstream of April River	21/3/12	-	-	-	-	-
W60	Sepik River downstream of April River	8/6/12	1	0.41	<0.01	0.03	0.02
W60	Sepik River downstream of April River	9/9/12	-	-	-	-	-
W60	Sepik River downstream of April River	1/12/12	0.4	0.06	0.17	0.02	0.01
W60	Sepik River downstream of April River	9/4/13	0.1	0.06	0.02	0.02	<0.01
W61	Sepik River @ Ambunti	21/3/12	-	-	-	-	-
W61	Sepik River @ Ambunti	5/6/12	1.1	0.49	0.04	0.03	0.01
W61	Sepik River @ Ambunti	11/9/12	-	-	-	-	-
W61	Sepik River @ Ambunti	2/12/12	0.4	0.11	0.05	0.03	0.02
W61	Sepik River @ Ambunti	9/4/13	0.3	0.13	0.19	0.01	<0.01
W62	Chambri Lake	20/3/12	-	-	-	-	-
W62	Chambri Lake	10/9/12	-	-	-	-	-
W62	Chambri Lake - surface	5/6/12	0.7	<0.01	0.32	0.02	<0.01
W62	Chambri Lake - surface	2/12/12	0.4	<0.01	0.04	<0.01	<0.01
W62	Chambri Lake - surface	2013	-	-	-	-	-
W62-B	Chambri Lake - bottom	5/6/12	0.8	0.02	0.68	0.05	<0.01
W62-B	Chambri Lake - bottom	2/12/12	0.4	0.03	0.07	0.01	<0.01
W62-B	Chambri Lake - bottom	2013	-	-	-	-	-
W63	Sepik River @ Timbunke	20/3/12	-	-	-	-	-
W63	Sepik River @ Timbunke	6/6/12	0.9	0.15	0.64	0.06	0.01
W63	Sepik River @ Timbunke	10/9/12	-	-	-	-	-
W63	Sepik River @ Timbunke	3/12/12	0.4	0.07	0.09	0.04	0.02
W63	Sepik River @ Timbunke	10/4/13	0.4	0.07	0.07	<0.01	<0.01
W64	Sepik River @ Angoram	20/3/12	-	-	-	-	-
W64	Sepik River @ Angoram	6/6/12	0.6	0.14	0.04	0.04	0.01

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
W64	Sepik River @ Angoram	10/9/12	-	-	-	-	-
W64	Sepik River @ Angoram	3/12/12	0.5	0.18	0.08	0.04	0.02
W64	Sepik River @ Angoram	10/4/13	0.3	0.26	0.08	<0.01	<0.01
W65	Sepik River @ mouth	20/3/12	-	-	-	-	-
W65	Sepik River @ mouth	7/6/12	0.6	0.11	0.04	0.06	0.01
W65	Sepik River @ mouth	10/9/12	-	-	-	-	-
W65	Sepik River @ mouth	4/12/12	0.4	0.12	0.07	0.05	0.02
W65	Sepik River @ mouth	10/4/13	0.3	0.26	0.09	<0.01	0.01
W70	Kuagumi Creek	15/3/12	-	-	-	-	-
W70	Kuagumi Creek	11/6/12	0.2	0.05	0.05	0.01	<0.01
W70	Kuagumi Creek	6/9/12	-	-	-	-	-
W70	Kuagumi Creek	27/11/12	0.1	0.02	0.05	0.02	<0.01
W70	Kuagumi Creek	5/4/13	<0.1	0.06	0.04	<0.01	<0.01
W71	Frieda River road crossing	15/3/12	-	-	-	-	-
W71	Frieda River road crossing	11/6/12	0.1	0.05	0.02	0.02	<0.01
W71	Frieda River road crossing	6/9/12	-	-	-	-	-
W71	Frieda River road crossing	27/11/12	0.1	0.01	<0.01	0.04	<0.01
W71	Frieda River road crossing	5/4/13	0.4	0.07	0.19	0.01	<0.01
S1	Usake River - middle reaches	16/11/17	0.5	0.09	0.04	0.08	<0.01
S2	Abei River at Hotmin Mission	17/11/17	0.1	0.03	0.03	0.04	<0.01
S3	Uriake River	17/11/17	<0.1	0.04	0.03	0.01	<0.01
S4	Muni River	16/11/17	0.2	0.08	0.02	0.01	<0.01
S5	Upper Idam River	18/11/17	0.1	0.02	0.04	0.02	<0.01
S6	Lower Idam River @ Entibi Village	18/11/17	0.4	0.12	0.09	0.03	<0.01
S7	Horden River @ Stonepass	29/11/17	0.1	0.05	0.02	<0.01	<0.01

Site	Description	Date Sampled	Nutrients				
			TN	TP	Ammonia	Nox	FRP
			mg/L	mg/L	mg/L	mg/L	mg/L
		LOR	0.1	0.01	0.01	0.01	0.01
S8	Yanabu River	30/11/17	<0.1	0.02	0.01	<0.01	<0.01

Appendix B Sediment Quality Data

B.1 Hydrobiology Data (2007 - 2010)

Table B-1 Metals in Sediment (<63 um fraction)

Site	Sampling Round (month/year)	Station	Date	< 63 microns													
				Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	Unit (dry wt)			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RORWB	Aug/Oct 2010	RORWB	14/10/2010	<2	33400	<5	<1	63	97	37600	<0.1	472	34	13	5	<5	105
W02	October 2009	W02	29/10/2009	0.5	-	5.8	0.2	-	78.8	-	<0.1	701	86.8	10	0.2	<1	117
W02	April 2010	W02	25/4/2010	<0.1	23900	6.4	0.7	99.8	80.3	44000	<0.1	807	90.9	59.4	<0.1	<1	181
W03	October 2009	W03	29/10/2009	0.5	-	5.1	0.2	-	71.1	-	<0.1	1110	76.6	8.9	0.1	<1	97.4
W03	April 2010	W03	25/4/2010	<0.1	22200	4.8	0.1	100	78.3	41400	<0.1	763	80.8	10.1	0.1	<1	99.9
W04	November 2007	W04	30/11/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W04	October 2008	W04	23/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W04	October 2009	W04	29/10/2009	1.4	-	39.8	0.3	-	96.6	-	0.1	1520	262	61.1	0.7	1	181
W04	April 2010	W04	25/4/2010	<0.1	16200	3.9	0.3	78	56.3	30900	<0.1	553	75.8	14.3	<0.1	<1	123
W07	November 2007	W07	30/11/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W07	October 2008	W07	23/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W07	October 2009	W07	29/10/2009	0.3	-	4.4	0.2	-	72.4	-	0.1	777	53.3	8.4	<0.1	<1	109
W07	April 2010	W07	25/4/2010	0.1	23100	7.2	0.2	147	113	41400	<0.1	767	96	15.4	0.6	<1	215
W114	Aug/Oct 2010	W114	16/10/2010	<2	21100	9	<1	97	51	49600	<0.1	737	216	16	<5	<5	94
W115	Aug/Oct 2010	W115	16/10/2010	<2	30100	7	<1	158	86	63600	<0.1	852	309	14	<5	6	130
W17	November 2007	W17	30/11/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W17	October 2008	W17	23/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W17	October 2009	W17	30/10/2009	0.2	-	6.3	0.2	-	59	-	<0.1	753	71.3	10.5	0.7	<1	186
W17	April 2010	W17	25/4/2010	<0.1	19700	1.2	<0.1	128	37	33600	<0.1	516	59	4.2	<0.1	<1	54.5
W18	April 2010	W18	25/4/2010	0.1	21000	23.2	0.2	79.3	95.8	42700	0.2	841	106	18.4	0.7	1	104
W22	December 2007	W22	1/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W22	October 2008	W22	24/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W22	October 2009	W22	3/11/2009	0.2	-	8.4	<0.1	-	54.1	-	<0.1	962	297	16.7	0.1	<1	108
W22	April 2010	W22	25/4/2010	0.2	18700	11.6	0.2	97	60.7	43700	<0.1	876	207	32.6	0.9	<1	134
W23	October 2008	W23	25/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W23	October 2009	W23	4/11/2009	0.3	-	11.9	0.1	-	76.1	-	<0.1	866	253	18.6	0.5	<1	142
W23	April 2010	W23	25/4/2010	0.1	18700	10.9	0.1	107	73.1	45600	0.1	951	226	27.6	<0.1	<1	106
W26	Aug/Oct 2010	W26	12/10/2010	<2	23900	<5	<1	82	55	43100	<0.1	576	124	14	<5	<5	92
W27	October 2009	W27	31/10/2009	0.5	-	21.7	0.2	-	374	-	0.1	222	10	25	1.1	7	126
W27	April 2010	W27	26/4/2010	0.2	19400	10.6	0.1	115	80.2	44500	<0.1	1130	234	16.7	0.2	<1	117
W28	November 2007	W28	30/11/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W28	October 2008	W28	23/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W28	October 2009	W28	29/10/2009	0.3	-	8.2	0.2	-	72.5	-	0.1	887	89.4	12.8	0.1	<1	152
W28	April 2010	W28	25/4/2010	0.2	22700	16.1	0.4	50.8	78.2	45700	0.2	810	104	61.1	0.2	<1	176
W29	December 2007	W29	1/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W29	October 2008	W29	24/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W29	October 2009	W29	31/10/2009	0.3	-	17.8	0.1	-	104	-	0.2	708	65.4	13.8	0.4	1	100
W29	April 2010	W29	25/4/2010	0.2	24500	22.3	0.3	92.3	162	48000	0.1	875	117	31.1	0.8	2	168

Sediment Quality Data

Site	Sampling Round (month/year)	Station	Date	< 63 microns													
				Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	Unit (dry wt)			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
W31	October 2009	W31	29/10/2009	1.2	-	14	0.3	-	96.1	-	<0.1	1520	187	20.8	1.1	<1	305
W31	April 2010	W31	25/4/2010	0.3	17000	12.6	0.5	50.2	54.9	34500	<0.1	489	105	82.3	0.3	<1	185
W33	December 2007	W33	3/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W33	October 2008	W33	27/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W33	October 2009	W33	31/10/2009	0.2	-	9.9	0.1	-	46.9	-	<0.1	766	55.2	14.5	0.1	<1	99.6
W34	December 2007	W34	1/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	October 2008	W34	26/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W34	October 2009	W34	31/10/2009	0.2	-	9.5	<0.1	-	35.6	-	<0.1	610	49.2	13.5	0.1	<1	89.9
W35	October 2009	W35	31/10/2009	0.1	-	8.5	<0.1	-	43.8	-	<0.1	680	71.4	13.3	0.1	<1	90.7
W36	October 2009	W36	3/11/2009	0.2	-	5.8	0.1	-	88.8	-	<0.1	941	164	12.6	0.2	<1	141
W36	April 2010	W36	25/4/2010	<0.1	19400	4.8	0.1	116	66.2	39100	<0.1	675	136	10.4	<0.1	<1	84.6
W38A	December 2007	W38A	3/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W38A	April 2010	W38A	26/4/2010	0.3	8790	21.4	<0.1	22.9	329	42200	0.2	190	12.9	27.3	0.7	8	58.8
W38A	October 2008	W38A	27/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W38A	October 2009	W38A	31/10/2009	0.2	-	9.9	0.1	-	69.1	-	<0.1	891	208	15.5	0.1	<1	98
W41	December 2007	W41	1/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W41	October 2008	W41	24/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W41	April 2010	W41	25/4/2010	0.8	23200	4.9	1.9	204	90.2	42600	<0.1	821	99.3	706	0.2	<1	575
W42	April 2010	W42	25/4/2010	1.4	26400	17.1	0.6	96.7	101	48800	<0.1	1090	82.6	50.4	0.4	<1	239
W43	December 2007	W43	1/12/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	October 2008	W43	24/10/2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W43	October 2009	W43	31/10/2009	0.4	-	11.5	0.7	-	163	-	<0.1	1820	128	35.8	0.3	<1	172
W43	April 2010	W43	25/4/2010	0.8	26600	29	0.6	126	136	49300	<0.1	1050	115	67	7.9	<1	244
W48	April 2010	W48	25/4/2010	0.2	21800	24.9	0.2	31.4	88.3	37900	0.3	840	44.3	33.2	0.6	3	107
W50	October 2009	W50	31/10/2009	0.2	-	10.7	0.1	-	51.9	-	<0.1	533	46.6	14.7	0.4	<1	147
W54	October 2009	W54	31/10/2009	0.2	-	10.7	<0.1	-	49.5	-	<0.1	622	40.6	14.9	0.2	<1	110
W61	April 2010	W61	27/4/2010	<0.1	18400	8.3	0.1	53.9	41.9	43000	<0.1	509	78.2	15.2	0.1	<1	102
W62	Aug/Oct 2010	W62	10/10/2010	<2	20300	8	<1	62	64	42500	<0.1	477	78	20	<5	<5	77
W65	April 2010	W65	27/4/2010	<0.1	14900	5.7	<0.1	90.9	29.4	55500	0.4	629	87.6	12.9	0.3	<1	123
W71	April 2010	W71	25/4/2010	0.1	17100	8.4	0.2	145	74.3	40200	<0.1	938	246	16.2	0.5	<1	99.8
W101	October 2009	W101	31/10/2009	0.9	-	7	<0.1	-	59.6	-	<0.1	768	146	10.4	0.1	<1	99.7
W101	April 2010	W101	26/4/2010	<0.1	17000	4.9	<0.1	86.1	37.9	34700	<0.1	525	119	7.6	<0.1	<1	71.2

Table B-2 Metals in Sediment (<2000 um fraction)

Site	Sampling Round (month/year)	Station	Date	< 2000 microns													
				Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	Unit (dry wt)			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RORWB	Aug/Oct 2010	RORWB	14/10/2010	<2	8750	<5	<1	53	154	19000	0.1	327	22	16	<5	<5	39
W02	October 2009	W02	29/10/2009	<0.1	-	4.4	0.2	-	63.1		<0.1	836	63.1	7.2	<0.1	<1	71.1
W02	April 2010	W02	25/4/2010	<0.1	17900	6.4	0.7	79.6	44.4	30400	<0.1	562	61.1	7.2	<0.1	<1	57.7
W03	October 2009	W03	29/10/2009	<0.1	-	3.3	<0.1	-	44.3		<0.1	618	51.7	4.6	<0.1	<1	55.2
W03	April 2010	W03	25/4/2010	<0.1	17100	4.8	0.1	85.1	42.7	31100	<0.1	513	60	5	<0.1	<1	60
W04	November 2007	W04	30/11/2007	<2	-	8	<1	-	35		-	750	152	11	-	<5	74
W04	October 2008	W04	23/10/2008	<2	-	7	<1	-	32	29500	-	645	232	12	-	<5	64
W04	October 2009	W04	29/10/2009	<0.1	-	15.1	<0.1	-	30.4		<0.1	1170	279	14.9	0.1	<1	77.4
W04	April 2010	W04	25/4/2010	<0.1	16600	3.9	0.3	90.6	44.9	29500	<0.1	472	64.9	4.1	<0.1	<1	57.9
W07	November 2007	W07	30/11/2007	<2	-	<5	<1	-	54		-	461	64	<5	-	<5	46
W07	October 2008	W07	23/10/2008	<2	-	<5	<1	-	41	15200	-	337	80	<5	-	<5	33
W07	October 2009	W07	29/10/2009	<0.1	-	2.8	0.1	-	44		<0.1	511	38.3	5.3	<0.1	<1	52
W07	April 2010	W07	25/4/2010	<0.1	16500	7.2	0.2	110	69.4	29000	<0.1	431	73.6	5.7	<0.1	<1	54.1
W114	Aug/Oct 2010	W114	16/10/2010	<2	19400	8	<1	176	45	48900	<0.1	814	396	12	<5	<5	88
W115	Aug/Oct 2010	W115	16/10/2010	<2	22200	<5	<1	98	35	48800	<0.1	647	202	10	<5	<5	96
W17	November 2007	W17	30/11/2007	<2	-	<5	<1	-	44		-	580	96	<5	-	<5	51
W17	October 2008	W17	23/10/2008	<2	-	<5	<1	-	34	19900	-			<5	-	<5	36
W17	October 2009	W17	30/10/2009	<0.1	-	1.7	<0.1	-	33.5		<0.1	467	52.5	3.5	<0.1	<1	44
W17	April 2010	W17	25/4/2010	<0.1	20900	1.2	<0.1	146	33.4	35900	<0.1	500	61	2.9	<0.1	<1	45.2
W18	April 2010	W18	25/4/2010	<0.1	17200	23.2	0.2	81.8	76.8	38200	0.1	592	132	22.2	2.1	1	71
W22	December 2007	W22	1/12/2007	<2	-	6	<1	-	46		-	767	347	9	-	<5	71
W22	October 2008	W22	24/10/2008	<2	-	<5	<1	-	27	25000	-	570	336	7	-	<5	46
W22	October 2009	W22	3/11/2009	0.4	-	6.4	<0.1	-	39.6		<0.1	795	364	10.6	<0.1	<1	80.8
W22	April 2010	W22	25/4/2010	<0.1	15600	11.6	0.2	230	36.3	41700	<0.1	778	440	8.8	<0.1	<1	75.3
W23	October 2008	W23	25/10/2008	<2	-	9	<1	-	51	35700	-	818	380	12	-	<5	77
W23	October 2009	W23	4/11/2009	0.5	-	6.9	<0.1	-	49.9		<0.1	768	271	11	<0.1	<1	77.6
W23	April 2010	W23	25/4/2010	<0.1	17800	10.9	0.1	194	58.9	46600	<0.1	786	432	11	<0.1	<1	85.1
W26	Aug/Oct 2010	W26	12/10/2010	<2	10500	9	<1	72	107	26600	0.2	1660	113	23	<5	<5	51
W27	October 2009	W27	31/10/2009	<0.1	-	20.8	<0.1	-	186		<0.1	148	4.5	13.8	0.3	<1	26.5
W27	April 2010	W27	26/4/2010	0.1	5240	10.6	0.1	12.7	142	38000	<0.1	169	5.9	13.2	0.4	7	23
W28	November 2007	W28	30/11/2007	<2	-	5	<1	-	38		-	583	205	7	-	<5	65
W28	October 2008	W28	23/10/2008	<2	-	<5	<1	-	36	22200	-	490	140	9	-	<5	60
W28	October 2009	W28	29/10/2009	0.1	-	5.1	<0.1	-	40.1		<0.1	755	125	8.3	<0.1	<1	64.9
W28	April 2010	W28	25/4/2010	<0.1	17900	16.1	0.4	59.5	43.2	39400	<0.1	778	187	12.5	0.1	<1	87.3
W29	December 2007	W29	1/12/2007	<2	-	15	<1	-	83		-	567	149	10	-	<5	82
W29	October 2008	W29	24/10/2008	<2	-	37	<1	-	67	20800	-	381	72	10	-	<5	55

Site	Sampling Round (month/year)	Station	Date	< 2000 microns													
				Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
	Unit (dry wt)			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
W29	October 2009	W29	31/10/2009	<0.1	-	6.8	<0.1	-	48.9		<0.1	404	52.3	5	0.1	<1	46.4
W29	April 2010	W29	25/4/2010	0.2	13000	22.3	0.3	54.7	108	33800	0.1	571	87.2	11	0.7	1	73.2
W31	October 2009	W31	29/10/2009	<0.1	-	4.7	<0.1	-	20.2		<0.1	664	151	5.6	<0.1	<1	47.9
W31	April 2010	W31	25/4/2010	<0.1	12000	12.6	0.5	38.8	23.1	26400	<0.1	342	113	4.4	<0.1	<1	47.5
W33	December 2007	W33	3/12/2007	<2	-	<5	<1	-	20		-	458	164	<5	-	<5	51
W33	October 2008	W33	27/10/2008	<2	-	10	<1	-	31	33100	-	555	43	14	-	<5	85
W33	October 2009	W33	31/10/2009	<0.1	-	6.5	<0.1	-	25		<0.1	490	41.4	9.7	<0.1	<1	75.7
W34	December 2007	W34	1/12/2007	<2	-	6	<1	-	40		-	680	57	13	-	<5	86
W34	October 2008	W34	26/10/2008	<2	-	8	<1	-	40	32600	-	614	55	14	-	<5	88
W34	October 2009	W34	31/10/2009	<0.1	-	5.6	<0.1	-	19.2		<0.1	392	37.8	9	<0.1	<1	66.8
W35	October 2009	W35	31/10/2009	<0.1	-	5.5	<0.1	-	24.9		<0.1	458	58.6	9.4	<0.1	<1	69.1
W36	October 2009	W36	3/11/2009	0.2	-	3	<0.1	-	38.1		<0.1	535	107	4.8	<0.1	<1	54.4
W36	April 2010	W36	25/4/2010	<0.1	19500	4.8	0.1	130	39.9	38300	<0.1	569	125	6.4	<0.1	<1	77
W38A	December 2007	W38A	3/12/2007	<2	-	6	<1	-	28		-	1000	360	7	-	<5	66
W38A	April 2010	W38A	26/4/2010	<0.1	15000	21.4	<0.1	257	25.1	40500	<0.1	1040	368	7	<0.1	<1	64.7
W38A	October 2008	W38A	27/10/2008	<2	-	7	<1	-	32	33600	-	958	366	8	-	<5	68
W38A	October 2009	W38A	31/10/2009	<0.1	-	6.8	<0.1	-	44.1		<0.1	818	281	10.8	<0.1	<1	81.6
W41	December 2007	W41	1/12/2007	<2	-	<5	<1	-	49		-	640	56	<5	-	<5	60
W41	October 2008	W41	24/10/2008	<2	-	<5	<1	-	48	25100	-	483	61	6	-	<5	58
W41	April 2010	W41	25/4/2010	<0.1	14000	4.9	1.9	103	46.1	27900	<0.1	490	61.4	8.9	<0.1	<1	49.6
W42	April 2010	W42	25/4/2010	<0.1	17100	17.1	0.6	66.7	55.6	35400	<0.1	664	74.1	21.9	0.1	<1	133
W43	December 2007	W43	1/12/2007	<2	-	<5	<1	-	26		-	382	35	10	-	<5	58
W43	October 2008	W43	24/10/2008	<2	-	9	<1	-	58	26600	-	619	63	14	-	<5	89
W43	October 2009	W43	31/10/2009	<0.1	-	8.4	0.1	-	64.4		<0.1	1030	77.2	24.8	<0.1	<1	101
W43	April 2010	W43	25/4/2010	<0.1	16800	29	0.6	89.8	52.5	34600	<0.1	558	82.1	43.8	0.1	<1	91.2
W48	April 2010	W48	25/4/2010	<0.1	13900	24.9	0.2	36.9	46.9	34900	0.3	490	96.9	7.6	1.6	2	54.2
W50	October 2009	W50	31/10/2009	<0.1	-	4	<0.1	-	7.4		<0.1	341	53.7	8	<0.1	<1	59.4
W54	October 2009	W54	31/10/2009	<0.1	-	3.7	<0.1	-	8		<0.1	363	36.1	8	<0.1	<1	58.1
W61	April 2010	W61	27/4/2010	<0.1	13000	8.3	0.1	45.6	17.4	30300	<0.1	336	84.5	6.8	<0.1	<1	63.6
W62	Aug/Oct 2010	W62	10/10/2010	<2	14200	21	<1	76	154	44500	0.2	874	114	38	<5	6	69
W65	April 2010	W65	27/4/2010	<0.1	13700	5.7	<0.1	56.6	8.6	30200	<0.1	352	92.4	4.2	<0.1	<1	59.4
W71	April 2010	W71	25/4/2010	<0.1	16500	8.4	0.2	260	36.1	41200	<0.1	938	410	7.2	0.1	<1	68.1
W101	October 2009	W101	31/10/2009	<0.1	-	2.9	<0.1	-	18.7		<0.1	406	118	4	<0.1	<1	46.3
W101	April 2010	W101	26/4/2010	<0.1	8330	2.2	<0.1	67.8	10.1	20400	<0.1	295	106	2.8	<0.1	<1	32.5

Table B-3 PSD, Nutrients and Carbon Data

Sampling Round (month/year)	Station	Date	PSD					Nutrients				Carbon	
			Clay	Silt	Sand	Cobble	Gravel	Nox as N	TKN as N	TN	TP	TOC	DOC
Unit (dry wt)	100		%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aug/Oct 2010	RORWB	14/10/2010	42	51	7	<1	<1	<0.1	3600	3600	531	7.56	7.86
October 2009	W02	29/10/2009	13	66	19	-	2	-	-	-	-	-	-
April 2010	W02	25/4/2010	8	3	89	<1	<1	-	-	-	-	-	-
October 2009	W03	29/10/2009	10	40	48	-	2	-	-	-	-	-	-
April 2010	W03	25/4/2010	6	3	91	<1	<1	-	-	-	-	-	-
November 2007	W04	30/11/2007	4	9	86	-	1	-	-	-	-	-	-
October 2008	W04	23/10/2008	5	7	82	-	6	-	-	-	-	-	-
October 2009	W04	29/10/2009	12	50	35	-	3	-	-	-	-	-	-
April 2010	W04	25/4/2010	2	2	96	<1	<1	-	-	-	-	-	-
November 2007	W07	30/11/2007	4	-	82	-	14	-	-	-	-	-	-
October 2008	W07	23/10/2008	3	3	78	-	16	-	-	-	-	-	-
October 2009	W07	29/10/2009	10	16	74	-	<1	-	-	-	-	-	-
April 2010	W07	25/4/2010	7	11	75	<1	7	-	-	-	-	-	-
Aug/Oct 2010	W114	16/10/2010	8	16	76	<1	<1	<0.1	450	450	393	0.51	0.66
Aug/Oct 2010	W115	16/10/2010	7	8	81	<1	4	0.2	490	490	262	0.24	0.34
November 2007	W17	30/11/2007	2	7	87	-	4	-	-	-	-	-	-
October 2008	W17	23/10/2008	3	1	79	-	17	-	-	-	-	-	-
October 2009	W17	30/10/2009	8	8	83	-	1	-	-	-	-	-	-
April 2010	W17	25/4/2010	1	6	93	<1	<1	-	-	-	-	-	-
April 2010	W18	25/4/2010	6	2	90	<1	2	-	-	-	-	-	-
December 2007	W22	1/12/2007	2	8	52	-	38	-	-	-	-	-	-
October 2008	W22	24/10/2008	4	7	60	-	29	-	-	-	-	-	-
October 2009	W22	3/11/2009	7	9	84	-	<1	-	-	-	-	-	-
April 2010	W22	25/4/2010	5	5	85	<1	5	<0.1	250	250	362	0.17	0.23
October 2008	W23	25/10/2008	7	13	80	-	0	-	-	-	-	-	-
October 2009	W23	4/11/2009	7	12	81	-	<1	-	-	-	-	-	-
April 2010	W23	25/4/2010	3	3	94	<1	<1	-	-	-	-	-	-
Aug/Oct 2010	W26	12/10/2010	30	65	5	<1	<1	0.5	2630	2630	658	4.8	5.02
October 2009	W27	31/10/2009	8	9	74	-	9	-	-	-	-	-	-
April 2010	W27	26/4/2010	5	11	43	<1	41	-	-	-	-	-	-
November 2007	W28	30/11/2007	2	6	85	-	7	-	-	-	-	-	-
October 2008	W28	23/10/2008	6	5	77	-	12	-	-	-	-	-	-
October 2009	W28	29/10/2009	12	16	70	-	2	-	-	-	-	-	-
April 2010	W28	25/4/2010	10	13	69	<1	8	-	-	-	-	-	-
December 2007	W29	1/12/2007	2	3	93	-	2	-	-	-	-	-	-
October 2008	W29	24/10/2008	4	4	64	-	28	-	-	-	-	-	-
October 2009	W29	31/10/2009	7	6	85	-	2	-	-	-	-	-	-
April 2010	W29	25/4/2010	6	<1	88	<1	6	<0.1	100	100	514	0.08	0.1

Sampling Round (month/year)	Station	Date	PSD					Nutrients				Carbon	
			Clay	Silt	Sand	Cobble	Gravel	Nox as N	TKN as N	TN	TP	TOC	DOC
Unit (dry wt)	100		%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
October 2009	W31	29/10/2009	4	<1	94	-	2	-	-	-	-	-	-
April 2010	W31	25/4/2010	4	9	87	<1	<1	-	-	-	-	-	-
December 2007	W33	3/12/2007	2	3	95	-	0	-	-	-	-	-	-
October 2008	W33	27/10/2008	8	40	52	-	0	-	-	-	-	-	-
October 2009	W33	31/10/2009	13	71	16	-	<1	-	-	-	-	-	-
December 2007	W34	1/12/2007	24	60	16	-	0	-	-	-	-	-	-
October 2008	W34	26/10/2008	13	63	24	-	0	-	-	-	-	-	-
October 2009	W34	31/10/2009	11	58	31	-	<1	-	-	-	-	-	-
October 2009	W35	31/10/2009	11	41	48	-	<1	-	-	-	-	-	-
October 2009	W36	3/11/2009	3	<1	93	-	4	-	-	-	-	-	-
April 2010	W36	25/4/2010	8	23	69	<1	<1	-	-	-	-	-	-
December 2007	W38A	3/12/2007	1	-	97	-	2	-	-	-	-	-	-
April 2010	W38A	26/4/2010	1	<1	98	<1	1	-	-	-	-	-	-
October 2008	W38A	27/10/2008	3	3	94	-	0	-	-	-	-	-	-
October 2009	W38A	31/10/2009	11	29	60	-	<1	-	-	-	-	-	-
December 2007	W41	1/12/2007	2	9	69	-	20	-	-	-	-	-	-
October 2008	W41	24/10/2008	5	4	85	-	6	-	-	-	-	-	-
April 2010	W41	25/4/2010	5	7	72	<1	16	0.2	250	250	245	0.09	0.13
April 2010	W42	25/4/2010	4	13	36	<1	47	0.3	200	200	423	0.1	0.2
December 2007	W43	1/12/2007	0	-	35	-	65	-	-	-	-	-	-
October 2008	W43	24/10/2008	4	2	88	-	6	-	-	-	-	-	-
October 2009	W43	31/10/2009	8	14	67	-	11	-	-	-	-	-	-
April 2010	W43	25/4/2010	2	2	95	<1	1	0.6	280	280	365	0.08	0.1
April 2010	W48	25/4/2010	8	22	41	<1	29	-	-	-	-	-	-
October 2009	W50	31/10/2009	2	<1	98	-	<1	-	-	-	-	-	-
October 2009	W54	31/10/2009	4	4	92	-	<1	-	-	-	-	-	-
April 2010	W61	27/4/2010	7	18	75	<1	<1	-	-	-	-	-	-
Aug/Oct 2010	W62	10/10/2010	57	33	10	<1	<1	0.2	4240	4240	402	6.06	6.29
April 2010	W65	27/4/2010	1	<1	99	<1	<1	-	-	-	-	-	-
April 2010	W71	25/4/2010	1	<1	95	<1	4	-	-	-	-	-	-
October 2009	W101	31/10/2009	-	-	-	-	-	-	-	-	-	-	-
April 2010	W101	26/4/2010	4	7	84	<1	5	-	-	-	-	-	-

B.2 BMT WBM Data (2011 - 2017)

Table B-4 Metals in Sediment (<63 um fraction)

Site	Description	Date Sampled	<63um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
W18	Nena River upstream of Koki Creek	9/6/12	0.1	22,500	17	0.3	88	163	43,200	0.2	893	151	18	0.4	1	165
Base C	Frieda Base Camp	13/6/12	0.2	20,600	7	0.4	41	416	51,700	0.1	1050	40	24	0.2	3	158
Base C	Frieda Base Camp	28/11/12	0.3	17,800	15	0.9	34.2	386	43,400	2.2	958	27.3	26.2	0.4	2	271
Base C	Frieda Base Camp	7/4/13	0.3	17,000	8.4	0.4	15.7	182	47,400	0.2	911	19.2	30.8	0.2	2	139
RORWB	Reference ORWB	10/6/12	<1.7	13,900	20	<1.7	68	209	45,400	<0.6	422	45	24	<1.7	<17	174
RORWB	Reference ORWB	28/11/12	0.1	21,000	5.5	0.2	65.2	94.5	20,700	0.9	324	44.9	11.6	0.2	2	117
RORWB	Reference ORWB	6/4/13	0.1	22,300	5.6	0.3	73.7	103	129,000	<0.1	638	47	34.5	0.6	<1	212
W100	Lake Diawi	12/6/12	<0.1	17,000	3	<0.1	80	48	24,600	<0.1	289	98	10	<0.1	<1	91
W100	Lake Diawi	30/11/12	<2	19,600	1.7	<0.1	125	39.9	31,300	0.1	387	144	9.5	<0.1	<1	77.2
W100	Lake Diawi	7/4/13	<0.1	20,300	1.9	<0.1	107	82.8	30,300	<0.1	361	114	9.6	<0.1	<1	88.9
W102	Upper Niar River	8/6/12	<0.1	19,400	12	<0.1	74	57	46,800	<0.1	838	243	15	<0.1	<1	105
W102	Upper Niar River	29/11/12	<2	18,600	8.6	<0.1	37.6	41.7	44,900	<0.1	711	64.5	17.5	<0.1	<1	94.6
W102	Upper Niar River	6/4/13	<0.1	18,200	8.7	<0.1	76.6	45.7	45,300	<0.1	766	318	14.9	<0.1	<1	91.8
W18	Nena River upstream of Koki Creek	29/11/12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W18	Nena River upstream of Koki Creek	6/4/13	<0.1	23,500	11	0.2	104	76.4	45,600	0.1	679	288	11	0.1	<1	82.5
W22	Niar River upstream of Nena River	8/6/12	<0.2	21,100	11	<0.2	89	61	48,800	<0.1	792	214	20	<0.2	<2	119
W22	Niar River upstream of Nena River	29/11/12	<2	23,600	8	<0.1	96.2	63.6	46,000	0.3	894	186	19.7	<0.1	<1	98.7
W22	Niar River upstream of Nena River	6/4/13	0.8	20,200	9.3	<0.1	105	55.8	50,500	<0.1	908	305	15.6	<0.1	<1	98.3
W23	Frieda River downstream of airstrip	11/6/12	<0.1	23,800	8	<0.1	103	60	51,500	<0.1	662	197	16	<0.1	<1	87
W23	Frieda River downstream of airstrip	27/11/12	0.1	20,500	5.8	<0.1	131	61.8	45,100	<0.1	713	256	16.9	<0.1	<1	87.3
W23	Frieda River downstream of airstrip	5/4/13	<0.1	21,400	6.5	<0.1	107	62.1	43,300	<0.1	471	216	13.7	<0.1	<1	87
W26	Lake Warangai	11/6/12	<0.1	22,600	3	<0.1	74	45	39,900	<0.1	390	100	14	<0.1	<1	95
W26	Lake Warangai	27/11/12	<0.1	20,800	3.8	0.1	81	46.3	35,000	0.2	432	97.9	15.1	<0.1	<1	94.5
W26	Lake Warangai	5/4/13	<0.1	25,000	2.9	<0.1	66.1	63.2	40,400	0.1	358	87.7	15.1	<0.1	<1	102
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	<0.1	17,600	3	0.1	76	51	24,900	<0.1	272	89	10	<0.1	<1	102
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	0.9	9,680	421	1.5	54.3	184	30,900	56.8	660	36.6	79.1	19	19	703
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	0.2	11,300	16.8	<0.1	12.5	257	47,400	0.1	196	7.8	17.6	0.4	8	56.6
W28	Upper Nena River	9/6/12	<0.1	25,000	7	0.1	42	54	45,200	<0.1	744	124	11	<0.1	<1	110
W28	Upper Nena River	29/11/12	<2	22,200	5.8	0.1	45.4	55.5	39,200	0.1	777	110	11.6	<0.1	<1	88.9
W28	Upper Nena River	6/4/13	<0.1	27,700	6.8	0.2	49.9	60.6	48,700	<0.1	803	151	11.6	<0.1	<1	97.8
W33	Sepik River upstream of May River junction	12/6/12	<0.1	15,100	9	<0.1	28	33	36,000	<0.1	436	39	12	<0.1	<1	93
W33	Sepik River upstream of May River junction	30/11/12	<2	17,700	8.4	<0.1	37.4	42.3	40,500	<0.1	472	42.7	13	<0.1	<1	87.1
W33	Sepik River upstream of May River junction	8/4/13	<0.1	14,400	7.8	<0.1	28.3	28.6	36,800	<0.1	378	32.7	11	<0.1	<1	72.9
W34	Sepik River @ Iniok	12/6/12	<0.1	11,800	5	<0.1	54	12	30,500	<0.1	345	95	8	<0.1	<1	58
W34	Sepik River @ Iniok	30/11/12	<2	17,900	8.4	0.1	45.9	42.1	39,500	<0.1	577	53.3	13.7	<0.1	<1	88.2
W34	Sepik River @ Iniok	8/4/13	<0.1	20,000	9	<0.1	41.4	36.8	45,200	<0.1	534	54.4	13.6	<0.1	<1	86.9
W35	Sepik River @ Kubkain	8/6/12	<0.1	14,200	6	<0.1	33	30	36,600	<0.1	335	55	11	<0.1	<1	108
W35	Sepik River @ Kubkain	1/12/12	<2	14,100	6.4	<0.1	33.5	29.4	33,300	<0.1	368	42.4	11.2	<0.1	<1	72.9
W35	Sepik River @ Kubkain	9/4/13	<0.1	20,000	8.5	<0.1	43	39.7	44,300	<0.1	586	60.6	14	<0.1	<1	88.4

Sediment Quality Data

Site	Description	Date Sampled	<63um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
W36	Upper Wario River	8/6/12	<0.1	23,300	5	0.1	132	59	43,300	<0.1	785	137	10	<0.1	<1	84
W36	Upper Wario River	1/12/12	<2	16,400	3.8	<0.1	116	48	33,400	0.2	646	121	7.4	<0.1	<1	61.7
W36	Upper Wario River	7/4/13	<0.1	21,600	5.4	0.1	111	56.5	41,200	<0.1	740	125	10.3	<0.1	<1	78.7
W38A	Lower Frieda River	11/6/12	<0.1	19,700	7	<0.1	127	65	47,200	<0.1	754	268	13	<0.1	<1	97
W38A	Lower Frieda River	27/11/12	<0.1	20,600	7.5	0.1	158	64	43,700	<0.1	916	299	12.8	<0.1	<1	87.1
W38A	Lower Frieda River	3/4/13	<0.1	23,200	6.1	0.1	122	60.2	45,500	<0.1	857	265	13.5	<0.1	<1	85.8
W41	Ok Isai	8/6/12	<0.1	26,500	3	0.3	156	95	43,500	<0.1	660	88	11	<0.1	<1	110
W41	Ok Isai	29/11/12	<2	22,500	4.1	0.2	176	99.5	36,400	0.2	771	79.6	11	0.2	<2	95.8
W41	Ok Isai	6/4/13	0.1	27,000	3.6	0.2	186	137	44,200	<0.1	684	103	9.8	<0.1	<1	76.7
W43	Lower Ok Binai	8/6/12	0.1	26,500	11	0.2	78	134	50,100	<0.1	907	76	21	0.1	<1	222
W43	Lower Ok Binai	29/11/12	<2	24,300	8.6	0.2	97	82.9	45,900	<0.1	932	80.6	18.4	<0.1	<1	108
W43	Lower Ok Binai	6/4/13	0.1	26,600	10.2	0.2	106	90.7	49,100	<0.1	861	86.8	21.7	<0.1	<1	118
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	<0.5	18,800	23	<0.5	61	200	37,600	<0.1	720	152	28	1.2	<5	417
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	<2	20,000	11.6	<0.1	16.6	71.1	34,300	0.4	562	8.9	8.6	0.2	5	58.4
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	<0.1	25,000	13.8	<0.1	19.9	67.2	39,500	0.3	732	15	8.3	0.1	4	61.8
W50	Sepik River downstream of May River (Mowi)	12/6/12	<0.1	14,300	8	<0.1	27	31	34,000	<0.1	409	41	11	<0.1	<1	87
W50	Sepik River downstream of May River (Mowi)	30/11/12	<2	15,100	9.9	<0.1	36.2	31.1	36,300	<0.1	530	41.6	14.7	<0.1	<1	86.7
W50	Sepik River downstream of May River (Mowi)	7/4/13	<0.1	18,100	10.2	<0.1	30.9	32.6	43,900	<0.1	489	40.2	15.4	<0.1	<1	83.8
W60	Sepik River downstream of April River	8/6/12	<0.1	16,000	7	0.2	47	39	34,900	<0.1	457	67	12	<0.1	<1	85
W60	Sepik River downstream of April River	1/12/12	<2	17,800	8.4	<0.1	49.1	34.5	41,100	<0.1	707	62	15.3	<0.1	<1	85.6
W60	Sepik River downstream of April River	9/4/13	<0.1	19,000	8.1	<0.1	39.4	34.7	41,400	<0.1	569	58.4	12.9	<0.1	<1	85.4
W61	Sepik River @ Ambunti	5/6/12	<0.1	15,400	10	0.5	41	50	37,900	<0.1	468	56	13	0.1	<1	112
W61	Sepik River @ Ambunti	2/12/12	<0.1	18,800	4.9	<0.1	38.3	21.3	42,800	<0.1	482	42.6	7.3	<0.1	<1	48.5
W61	Sepik River @ Ambunti	9/4/13	<0.1	19,200	5.4	<0.1	67.8	50.2	47,600	<0.1	451	111	11.1	<0.1	<1	106
W62	Chambri Lake	5/6/12	0.1	14,700	4	0.2	47	65	21,500	<0.1	212	55	18	0.1	1	74
W62	Chambri Lake	2/12/12	<0.1	17,600	4.6	0.1	67.9	56.8	28,900	0.2	276	56.5	15.1	<0.1	<1	67.5
W62	Chambri Lake	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	6/6/12	<0.1	18,400	7	<0.1	56	44	38,900	<0.1	578	83	12	<0.1	<1	88
W63	Sepik River @ Timbunke	3/12/12	<0.1	20,400	5	<0.1	61	37	41,400	<0.1	372	82	10	<0.1	<1	76
W63	Sepik River @ Timbunke	10/4/13	<0.1	22,000	6.2	<0.1	79.7	45.2	42,400	<0.1	618	115	11.6	<0.1	<1	86.9
W64	Sepik River @ Angoram	6/6/12	<0.1	21,600	6	<0.1	53	43	45,900	<0.1	615	76	12	<0.1	<1	92
W64	Sepik River @ Angoram	3/12/12	<0.1	18,000	4	<0.1	50	28	40,900	<0.1	309	59	8	<0.1	<1	65
W64	Sepik River @ Angoram	10/4/13	<0.1	20,600	4.1	0.1	67.2	46.6	46,300	<0.1	470	90.9	9.3	<0.1	<1	90.4
W65	Sepik River @ mouth	7/6/12	<0.1	20,900	7	<0.1	54	44	44,400	<0.1	758	76	11	<0.1	<1	85
W65	Sepik River @ mouth	4/12/12	<0.1	24,200	7	0.1	59	39	47,400	<0.1	874	70	13	<0.1	<1	79
W65	Sepik River @ mouth	10/4/13	<0.1	23,200	6.4	0.1	60.3	47	45,100	<0.1	744	74.4	11.2	<0.1	<1	85.6
W70	Kuagumi Creek	11/6/12	0.1	23,300	7	0.1	117	71	49,700	<0.1	704	228	14	<0.1	<1	99
W70	Kuagumi Creek	27/11/12	<0.1	22,400	6.5	0.1	108	58.8	46,100	0.1	761	197	13.4	<0.1	<1	92.3
W70	Kuagumi Creek	5/4/13	<0.1	24,300	5	<0.1	88.8	52.6	46,400	<0.1	668	166	11.9	<0.1	<1	83.6
W71	Frieda River road crossing	11/6/12	0.1	19,300	7	0.1	127	89	44,700	<0.1	798	308	14	<0.1	<1	100
W71	Frieda River road crossing	27/11/12	<0.2	16,700	15.7	<0.2	87.5	69	42,500	1.2	832	183	16.3	1.1	<2	169
W71	Frieda River road crossing	5/4/13	<0.1	20,900	6.2	<0.1	146	62.1	44,000	<0.1	839	276	13.2	<0.1	<1	89.8

Sediment Quality Data

Site	Description	Date Sampled	<63um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
S1	Usake River - middle reaches	16/11/17	<0.1	21,700	4.75	0.1	91.7	61.4	39,100	0.04	667	74.9	7.4	<0.50	0.4	77
S2	Abei River at Hotmin Mission	17/11/17	<0.1	17,300	10.4	<0.1	62.5	43.2	46,500	0.05	710	213	14.4	<0.50	0.3	80.6
S3	Uriake River	17/11/17	<0.1	22,500	12	<0.1	115	59.5	52,200	0.05	982	240	14.5	<0.50	0.4	104
S4	Muni River	16/11/17	<0.1	25,200	2.76	<0.1	46	78.8	47,000	0.02	808	29.7	7	<0.50	0.2	61.5
S5	Upper Idam River	18/11/17	<0.1	19,600	1.27	<0.1	26.1	34.4	29,500	<0.01	334	32.2	4.3	<0.50	0.2	44.9
S6	Lower Idam River @ Entibi Village	18/11/17	<0.1	26,100	1.62	<0.1	48.6	59.5	44,700	0.02	714	31	10.2	<0.50	0.4	68.2
S7	Horden River @ Stonepass	29/11/17	<0.1	22,400	4.78	0.1	45.5	70.9	50,400	0.03	880	45	7.2	<0.50	0.3	86.8
S8	Yanabu River	30/11/17	<0.1	23,300	5.51	<0.1	58.8	54.2	48,400	0.04	670	72.6	8.2	<0.50	0.3	79.3

Table B-5 Metals in Sediment (<2000 um fraction)

Site	Description	Date Sampled	<2000um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
W18	Nena River upstream of Koki Creek	9/6/12	<0.1	12,800	11	<0.1	83	54	32,000	<0.1	1,080	185	9	0.4	<1	55
Base C	Frieda Base Camp	13/6/12	0.2	13,400	6	0.3	23	268	45,700	<0.1	721	21	15	0.1	3	144
Base C	Frieda Base Camp	28/11/12	0.2	14,700	6.2	0.3	25.5	302	42,600	0.1	824	20.1	16.1	0.2	2	109
Base C	Frieda Base Camp	7/4/13	0.2	13,800	5.5	0.4	19.5	155	37,600	0.1	833	17.9	19	0.1	1	136
RORWB	Reference ORWB	10/6/12	0.1	5,720	40	<0.1	15	134	30,800	<0.1	88	3	9	0.8	4	15
RORWB	Reference ORWB	28/11/12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RORWB	Reference ORWB	6/4/13	0.1	25,800	2.4	0.2	65.9	137	25,500	0.1	361	35.4	17.9	<0.1	<1	95
W100	Lake Diawi	12/6/12	<0.2	11,600	2	<0.2	52	59	12,600	<0.1	267	57	11	0.3	<2	54
W100	Lake Diawi	30/11/12	<2	18,800	1.9	<0.1	121	42.6	29,100	0.1	354	140	9.8	<0.1	<1	66.3
W100	Lake Diawi	7/4/13	<0.1	18,800	3.2	<0.1	119	64.6	26,500	0.1	368	126	11.3	<0.1	<1	102
W102	Upper Niar River	8/6/12	<0.1	15,200	5	<0.1	120	34	40,700	<0.1	858	271	9	<0.1	<1	56
W102	Upper Niar River	29/11/12	<2	17,900	7.1	<0.1	83.7	36.1	44,400	<0.1	878	169	13.2	<0.1	<1	80.7
W102	Upper Niar River	6/4/13	<0.1	14,800	7.6	<0.1	218	29.3	38,200	<0.1	1060	439	8.8	<0.1	<1	66.8
W18	Nena River upstream of Koki Creek	29/11/12	<1	10,700	0	0.2	69.7	47.8	28,800	<0.1	435	184	6.2	0.4	9.4	59
W18	Nena River upstream of Koki Creek	6/4/13	<0.1	18,800	16.8	0.1	113	56.7	34,600	0.1	708	217	9.3	0.3	<1	87.6
W22	Niar River upstream of Nena River	8/6/12	<0.1	12,300	4	<0.1	191	46	36,400	<0.1	616	412	7	<0.1	<1	52
W22	Niar River upstream of Nena River	29/11/12	<2	15,700	5.7	<0.1	200	34.2	43,300	<0.1	952	374	9.2	<0.1	<1	65.3
W22	Niar River upstream of Nena River	6/4/13	<0.1	11,000	4.1	<0.1	244	22.3	29,100	<0.1	724	533	4	<0.1	<1	44.4
W23	Frieda River downstream of airstrip	11/6/12	<0.1	14,100	6	<0.1	113	40	37,200	<0.1	549	214	9	<0.1	<1	76
W23	Frieda River downstream of airstrip	27/11/12	<0.1	17,900	5.9	<0.1	140	37.5	41,800	<0.1	725	317	10	<0.1	<1	71
W23	Frieda River downstream of airstrip	5/4/13	<0.1	21,100	7	<0.1	121	54.7	47,500	<0.1	556	230	14.2	<0.1	<1	91.7
W26	Lake Warangai	11/6/12	<0.1	17,800	5	0.1	117	54	37,400	0.1	713	199	16	<0.1	<1	76
W26	Lake Warangai	27/11/12	<0.2	9,610	5.3	0.2	66.3	52.5	24,600	0.3	586	119	15	0.3	<2	56
W26	Lake Warangai	5/4/13	<0.1	20,000	4	0.1	83.5	60.5	35,800	<0.1	497	121	16.2	<0.1	<1	91.4
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	<0.1	11,600	8	0.3	38	52	13,200	<0.1	196	45	13	0.2	1	89
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	<0.1	5,440	27.1	<0.1	10.6	147	33,000	<0.1	149	3.9	12.5	0.4	8	16.7
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	<0.1	5,000	13.7	<0.1	7.6	167	35,600	<0.1	126	1.8	9.6	0.6	6	12.2
W28	Upper Nena River	9/6/12	<0.1	13,700	6	<0.1	61	31	32,600	<0.1	520	220	7	<0.1	<1	56
W28	Upper Nena River	29/11/12	<2	14,300	5.4	<0.1	73	28.1	35,500	0.4	632	292	7.4	<0.1	<1	61.6
W28	Upper Nena River	6/4/13	<0.1	17,200	7.2	<0.1	70.6	29.1	32,100	0.2	538	131	8.9	0.4	<1	63.9
W33	Sepik River upstream of May River junction	12/6/12	<0.1	12,200	4	<0.1	24	9	31,800	<0.1	328	43	8	<0.1	<1	55
W33	Sepik River upstream of May River junction	30/11/12	<2	11,600	3.8	<0.1	23.3	8.9	27,700	<0.1	310	36.3	7.7	<0.1	<1	56.1
W33	Sepik River upstream of May River junction	8/4/13	<0.1	12,900	3.9	<0.1	38	7.4	30,400	<0.1	410	57.6	8.8	<0.1	<1	63
W34	Sepik River @ Iniok	12/6/12	<0.1	11,000	5	<0.1	36	9	28,600	<0.1	342	75	7	<0.1	<1	54
W34	Sepik River @ Iniok	30/11/12	<2	13,000	4.7	<0.1	42	12.7	31,600	<0.1	411	66.2	8.8	<0.1	<1	61.5
W34	Sepik River @ Iniok	8/4/13	<0.1	15,800	7.1	<0.1	42.2	23	37,600	<0.1	442	52.1	11.6	<0.1	<1	71.8
W35	Sepik River @ Kubkain	8/6/12	<0.1	12,000	3	<0.1	33	12	29,400	<0.1	256	59	7	<0.1	<1	58
W35	Sepik River @ Kubkain	1/12/12	<2	12,700	3.4	<0.1	36.2	14.2	29,300	<0.1	295	52.9	7.7	<0.1	<1	62
W35	Sepik River @ Kubkain	9/4/13	<0.1	17,400	6.2	<0.1	49.9	30.6	37,500	<0.1	514	63.1	12	<0.1	<1	81.8
W36	Upper Wario River	8/6/12	<0.1	13,300	2	<0.1	118	22	27,300	<0.1	409	96	4	<0.1	<1	47
W36	Upper Wario River	1/12/12	<2	14,500	2.7	<0.1	83.1	27.8	29,000	<0.1	460	89.1	4.8	<0.1	<1	53.1

Site	Description	Date Sampled	<2000um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
W36	Upper Wario River	7/4/13	<0.1	19,900	4.1	<0.1	125	49.6	38,600	<0.1	615	142	8.3	<0.1	<1	74
W38A	Lower Frieda River	11/6/12	<0.1	16,400	5	<0.1	204	31	41,600	<0.1	923	343	8	<0.1	<1	69
W38A	Lower Frieda River	27/11/12	<0.1	16,600	6.3	<0.1	245	26.2	40,600	<0.1	964	405	7.4	<0.1	<1	61.8
W38A	Lower Frieda River	3/4/13	0.1	17,700	6	<0.1	202	33.1	42,700	<0.1	944	337	8.6	<0.1	<1	69.7
W41	Ok Isai	8/6/12	<0.1	11,000	3	<0.1	81	39	27,000	<0.1	406	67	5	<0.1	<1	43
W41	Ok Isai	29/11/12	<2	11,900	1.8	0.1	98.9	45.6	24,200	<0.1	414	48	5.1	<0.1	<1	35.2
W41	Ok Isai	6/4/13	0.2	14,000	2.4	0.2	109	82.3	31,900	<0.1	678	43	5.4	<0.1	<1	43.5
W43	Lower Ok Binai	8/6/12	<0.1	16,200	7	0.1	53	39	36,800	<0.1	495	49	13	0.1	<1	87
W43	Lower Ok Binai	29/11/12	<2	18,100	6.4	0.2	72.4	61.7	36,900	<0.1	730	59.5	14.7	<0.1	<1	89.1
W43	Lower Ok Binai	6/4/13	<0.1	20,100	7.5	0.2	81.2	63.8	37,800	<0.1	765	64.7	11.8	<0.1	<1	109
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	<0.1	9,220	21	<0.1	21	74	29,200	<0.1	397	106	7	<0.1	<1	43
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	<2	10,300	21.6	<0.1	14.5	39.8	27,400	0.3	285	5.6	12	1.1	3	27.4
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	<0.1	15,700	16.3	<0.1	18.2	39.5	35,600	0.3	473	10.6	8	0.9	4	44.8
W50	Sepik River downstream of May River (Mowi)	12/6/12	<0.1	12,100	3	<0.1	20	7	30,200	<0.1	306	42	8	<0.1	<1	56
W50	Sepik River downstream of May River (Mowi)	30/11/12	<2	13,500	7.1	<0.1	29.9	19.9	32,100	<0.1	437	42.1	11.4	<0.1	<1	70.2
W50	Sepik River downstream of May River (Mowi)	7/4/13	<0.1	13,800	5.8	<0.1	36.8	12.1	33,000	<0.1	416	49.7	10	<0.1	<1	67.4
W60	Sepik River downstream of April River	8/6/12	<0.1	12,000	3	<0.1	34	16	28,500	<0.1	299	64	7	<0.1	<1	56
W60	Sepik River downstream of April River	1/12/12	<2	17,000	7.3	<0.1	48.4	30.3	39,000	<0.1	567	63.8	12.7	<0.1	<1	77.4
W60	Sepik River downstream of April River	9/4/13	<0.1	16,900	6.7	<0.1	82.1	27.5	38,400	<0.1	530	126	11.8	<0.1	<1	79.1
W61	Sepik River @ Ambunti	5/6/12	<0.1	14,800	6	<0.1	43	32	32,600	<0.1	342	69	10	<0.1	<1	79
W61	Sepik River @ Ambunti	2/12/12	<0.1	19,900	7	<0.1	66	29	42,100	<0.1	634	64	13	<0.1	<1	76
W61	Sepik River @ Ambunti	9/4/13	<0.1	15,100	7.3	<0.1	107	10.7	37,300	<0.1	411	172	9.3	<0.1	<1	72.5
W62	Chambri Lake	5/6/12	<0.1	13,300	4	<0.1	50	57	20,300	0.1	255	56	18	<0.1	1	59
W62	Chambri Lake	2/12/12	<0.1	21,400	4	0.1	67	48	33,100	0.1	284	64	17	<0.1	<1	82
W62	Chambri Lake	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W63	Sepik River @ Timbunke	6/6/12	<0.1	10,300	4	<0.1	57	11	25,800	<0.1	419	100	6	<0.1	<1	51
W63	Sepik River @ Timbunke	3/12/12	<0.1	15,800	4	<0.1	64	16	34,800	<0.1	276	94	7	<0.1	<1	57
W63	Sepik River @ Timbunke	10/4/13	<0.1	16,400	4.4	<0.1	77	26.8	34,400	<0.1	482	129	9.2	<0.1	<1	74.4
W64	Sepik River @ Angoram	6/6/12	<0.1	15,000	4	<0.1	58	20	33,100	<0.1	471	92	7	<0.1	<1	61
W64	Sepik River @ Angoram	3/12/12	<0.1	16,300	3	<0.1	58	17	35,900	<0.1	304	78	6	<0.1	<1	56
W64	Sepik River @ Angoram	10/4/13	<0.1	16,300	2.8	<0.1	72	17.4	31,900	<0.1	378	121	6.7	<0.1	<1	64.3
W65	Sepik River @ mouth	7/6/12	<0.1	16,200	4	<0.1	52	34	33,400	<0.1	771	78	8	<0.1	<1	66
W65	Sepik River @ mouth	4/12/12	<0.1	24,400	7	<0.1	58	37	47,400	<0.1	865	68	13	<0.1	<1	78
W65	Sepik River @ mouth	10/4/13	<0.1	22,800	7.1	0.1	75.2	50.1	45,500	<0.1	731	86.8	12.4	<0.1	<1	97.7
W70	Kuagumi Creek	11/6/12	<0.1	17,000	6	<0.1	206	32	43,500	<0.1	653	310	8	<0.1	<1	69
W70	Kuagumi Creek	27/11/12	<0.1	15,700	5.1	<0.1	193	28.8	37,800	<0.1	728	286	7.5	<0.1	<1	58.9
W70	Kuagumi Creek	5/4/13	<0.1	18,600	5.9	<0.1	164	34.4	44,300	<0.1	755	323	8.9	<0.1	<1	71.2
W71	Frieda River road crossing	11/6/12	<0.1	15,800	5	<0.1	226	33	40,000	<0.1	826	395	7	<0.1	<1	64
W71	Frieda River road crossing	27/11/12	<0.1	16,100	4.5	<0.1	250	32.1	38,500	<0.1	891	402	7	<0.1	<1	55
W71	Frieda River road crossing	5/4/13	<0.1	14,500	4.9	<0.1	249	25.1	36,900	<0.1	824	409	5.9	<0.1	<1	54.8
S1	Usake River - middle reaches	16/11/17	<0.1	15,800	3.54	<0.1	74	44	31,800	0.02	472	53.4	5	<0.50	0.2	56.4
S2	Abei River at Hotmin Mission	17/11/17	<0.1	12,800	7.07	<0.1	61.5	28.6	38,100	0.03	553	268	8.4	<0.50	0.2	61.1

Sediment Quality Data

Site	Description	Date Sampled	<2000um Fraction													
			Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.1	50	0.1	0.1	0.1	0.1	50	0.1	0.1	0.1	0.1	0.1	1	0.1
S3	Uriake River	17/11/17	<0.1	14,100	6.25	<0.1	125	26.1	35,400	0.03	512	142	6.4	<0.50	0.2	63.1
S4	Muni River	16/11/17	<0.1	14,700	1.53	<0.1	15	36.9	27,900	<0.01	351	11.1	2.9	<0.50	<0.1	32.1
S5	Upper Idam River	18/11/17	<0.1	9,500	<1	<0.1	14.9	14	17,600	<0.01	138	15.4	2.4	<0.50	<0.1	20.4
S6	Lower Idam River @ Entibi Village	18/11/17	<0.1	9,280	<1	<0.1	15.7	14	15,600	<0.01	190	10.1	2.2	<0.50	<0.1	23
S7	Horden River @ Stonepass	29/11/17	<0.1	12,600	1.69	<0.1	18.8	29.2	32,800	<0.01	549	19.2	2.4	<0.50	0.1	51.6
S8	Yanabu River	30/11/17	<0.1	17,900	1.37	<0.1	19.2	28.1	26,700	<0.01	611	25.3	1.2	<0.50	0.1	37.1

Table B-6 PSD Data

Site	Description	Date Sampled	Particle Size Distribution			
			Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)
		LOR	0.01	0.01	0.01	0.01
W18	Nena River upstream of Koki Creek	9/6/12	5	1	55	39
Base C	Frieda Base Camp	13/6/12	7	11	39	43
Base C	Frieda Base Camp	28/11/12	2	1	80	17
Base C	Frieda Base Camp	7/4/13	5	5	69	21
RORWB	Reference ORWB	10/6/12	50	42	8	<1
RORWB	Reference ORWB	28/11/12	42	31	16	11
RORWB	Reference ORWB	6/4/13	31	52	14	3
W100	Lake Diawi	12/6/12	37	55	8	<1
W100	Lake Diawi	30/11/12	33	59	6	2
W100	Lake Diawi	7/4/13	24	65	11	<1
W102	Upper Niar River	8/6/12	4	4	38	54
W102	Upper Niar River	29/11/12	5	7	56	32
W102	Upper Niar River	6/4/13	2	9	48	41
W18	Nena River upstream of Koki Creek	29/11/12	1	<1	57	42
W18	Nena River upstream of Koki Creek	6/4/13	2	6	73	19
W22	Niar River upstream of Nena River	8/6/12	4	7	38	51
W22	Niar River upstream of Nena River	29/11/12	2	<1	34	64
W22	Niar River upstream of Nena River	6/4/13	2	2	59	37
W23	Frieda River downstream of airstrip	11/6/12	14	37	39	10
W23	Frieda River downstream of airstrip	27/11/12	11	13	76	<1
W23	Frieda River downstream of airstrip	5/4/13	13	43	43	1
W26	Lake Warangai	11/6/12	30	65	5	<1
W26	Lake Warangai	27/11/12	31	57	11	1
W26	Lake Warangai	5/4/13	33	66	1	<1
W27	Ok Ekwai upstream of Ok Ubai junction	9/6/12	6	4	59	31

Site	Description	Date Sampled	Particle Size Distribution			
			Clay	Silt	Sand	Gravel
			(<2 µm)	(2-60 µm)	(0.06-2.00 mm)	(>2mm)
		LOR	0.01	0.01	0.01	0.01
W27	Ok Ekwai upstream of Ok Ubai junction	28/11/12	2	2	47	49
W27	Ok Ekwai upstream of Ok Ubai junction	7/4/13	5	4	49	42
W28	Upper Nena River	9/6/12	13	5	72	10
W28	Upper Nena River	29/11/12	4	1	70	25
W28	Upper Nena River	6/4/13	6	5	63	26
W33	Sepik River upstream of May River junction	12/6/12	7	9	84	<1
W33	Sepik River upstream of May River junction	30/11/12	3	2	95	<1
W33	Sepik River upstream of May River junction	8/4/13	1	1	98	<1
W34	Sepik River @ Iniok	12/6/12	1	2	97	<1
W34	Sepik River @ Iniok	30/11/12	10	11	79	<1
W34	Sepik River @ Iniok	8/4/13	9	30	61	<1
W35	Sepik River @ Kubkain	8/6/12	22	59	19	<1
W35	Sepik River @ Kubkain	1/12/12	5	2	93	<1
W35	Sepik River @ Kubkain	9/4/13	7	26	67	<1
W36	Upper Wario River	8/6/12	6	23	14	57
W36	Upper Wario River	1/12/12	4	6	78	12
W36	Upper Wario River	7/4/13	5	24	69	2
W38A	Lower Frieda River	11/6/12	5	3	83	9
W38A	Lower Frieda River	27/11/12	2	4	94	<1
W38A	Lower Frieda River	3/4/13	3	6	89	2
W41	Ok Isai	8/6/12	6	7	46	41
W41	Ok Isai	29/11/12	1	1	77	21
W41	Ok Isai	6/4/13	2	4	54	40
W43	Lower Ok Binai	8/6/12	5	5	60	30
W43	Lower Ok Binai	29/11/12	4	4	76	16
W43	Lower Ok Binai	6/4/13	2	8	28	62

Site	Description	Date Sampled	Particle Size Distribution			
			Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)
		LOR	0.01	0.01	0.01	0.01
W48	Ok Simbale (Aiyok Ck) @ Nena River	9/6/12	3	4	29	64
W48	Ok Simbale (Aiyok Ck) @ Nena River	29/11/12	3	3	39	55
W48	Ok Simbale (Aiyok Ck) @ Nena River	1/4/13	4	10	37	49
W50	Sepik River downstream of May River (Mowi)	12/6/12	5	5	90	<1
W50	Sepik River downstream of May River (Mowi)	30/11/12	13	24	63	<1
W50	Sepik River downstream of May River (Mowi)	7/4/13	6	9	85	<1
W60	Sepik River downstream of April River	8/6/12	8	26	66	<1
W60	Sepik River downstream of April River	1/12/12	22	60	18	<1
W60	Sepik River downstream of April River	9/4/13	7	32	61	<1
W61	Sepik River @ Ambunti	5/6/12	8	16	76	<1
W61	Sepik River @ Ambunti	2/12/12	16	55	29	<1
W61	Sepik River @ Ambunti	9/4/13	1	1	98	<1
W62	Chambri Lake	5/6/12	51	47	2	<1
W62	Chambri Lake	2/12/12	59	37	4	<1
W62	Chambri Lake	2013	-	-	-	-
W63	Sepik River @ Timbunke	6/6/12	10	38	52	<1
W63	Sepik River @ Timbunke	3/12/12	4	7	89	<1
W63	Sepik River @ Timbunke	10/4/13	6	16	78	<1
W64	Sepik River @ Angoram	6/6/12	17	30	53	<1
W64	Sepik River @ Angoram	3/12/12	2	4	94	<1
W64	Sepik River @ Angoram	10/4/13	1	<1	99	<1
W65	Sepik River @ mouth	7/6/12	22	59	19	<1
W65	Sepik River @ mouth	4/12/12	20	69	11	<1
W65	Sepik River @ mouth	10/4/13	15	72	13	<1
W70	Kuagumi Creek	11/6/12	4	7	87	2
W70	Kuagumi Creek	27/11/12	7	8	42	43

Site	Description	Date Sampled	Particle Size Distribution			
			Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)
		LOR	0.01	0.01	0.01	0.01
W70	Kuagumi Creek	5/4/13	8	20	71	1
W71	Frieda River road crossing	11/6/12	3	3	78	16
W71	Frieda River road crossing	27/11/12	<1	<1	88	12
W71	Frieda River road crossing	5/4/13	<1	<1	84	16
S1	Usake River - middle reaches	16/11/17	4	24	71	1
S2	Abei River at Hotmin Mission	17/11/17	4	6	81	9
S3	Uriake River	17/11/17	3	6	53	38
S4	Muni River	16/11/17	1	2	81	16
S5	Upper Idam River	18/11/17	<1	1	68	31
S6	Lower Idam River @ Entibi Village	18/11/17	<1	1	99	<1
S7	Horden River @ Stonepass	29/11/17	19	53	28	<1
S8	Yanabu River	30/11/17	13	27	40	20

Appendix C Aquatic Macroinvertebrate Data

C.1 Hydrobiology Data (2008 - 2010)

Table C-1 List of macroinvertebrate species collected during the 2008/2009, 2009 and 2010 surveys

Order	Family	Taxon
Ephemeroptera	Ephemerellidae	*Ephemerellid sp.1*
	Ephemerellidae	*Ephemerellid sp.2*
	Caenidae	*Caenid sp.1*
	Baetidae	*Baetid sp.1*
	Baetidae	*Baetid sp.2*
	Baetidae	*Baetid sp.3*
	Baetidae	*Baetid sp.4*
	Ecdyonuridae	*Ecdyonurid sp.1*
	Potamanthidae	*Potamanthid sp.1*
	Ephemeridae	*Ephemerid sp.1*
	Leptophlebiidae	*Leptophlebiid sp.1*
	Leptophlebiidae	*Leptophlebiid sp.2*
	Leptophlebiidae	*Leptophlebiid sp.3*
	Prosopistomatidae	*Prosopistomatid sp.1*
	Prosopistomatidae	*Prosopistomatid sp.2*
	Siphlonuridae	*Siphlonurid sp.1*
	Palingenidae	*Palingenid sp.1*
Plecoptera	cf Leuctridae	*Plecopteran sp.1(ld)*
	cf Leuctridae	*Plecopteran sp.2 (lsp)*
	cf Nemouridae	*Plecopteran sp.3(ns)*
	cf Perlidae	*Plecopteran sp.4(pv)*
	cf Capnidae	*Plecopteran sp.5 (csp)*
Trichoptera	Odontoceridae	*Odontocerid sp.1 (msp)*
	Philopotamidae	*Philopotamid sp.1*
	Hydropsychidae	*Hydropsychid sp.1*
	Hydropsychidae	*Hydropsychid sp.2*
	Rhyacophilidae	*Rhyacophilid sp.1*
	Rhyacophilidae	*Rhyacophilid sp.2*
	Polycentropodidae	*Polycentropodid sp.1*
	Chathamidae	*Chathamid sp.1*
	Calamoceratidae	*Calamoceratid sp.1*
	Leptoceridae	*Leptocerid sp.1*

Order	Family	Taxon
	Leptoceridae	*Leptocerid sp.2*
	Plectrotarsidae	*Plectrotarsid sp.1*
	Hydroptilidae	*Hydroptilid sp.1*
	Hydroptilidae	*Hydroptilid sp.2*
	Hydroptilidae	*Hydropitlid sp.3*
	Oeconesidae	*Oeconesid sp.1*
Coleoptera	Hydrophiliidae	*Hydrophiliid sp.1*
	Hydrophiliidae	*Hydrophyliid sp.2*
	Hygrobiidae	*Hygrobiid sp.1*
	Psephenidae	*Psephenid sp.1*
	Elmidae	*Elmid sp.1*
	Elmidae	*Elmid sp.2*
	Noteridae	*Noterid sp.1*
	Noteridae	*Noterid sp.2*
	Helodidae	*Helodid sp.1*
	Gyrinidae	*Gyrinid sp.1*
	Histeridae	*Histerid sp.1*
Odonata	Libellulidae	*Libellulid sp.1*
	Libellulidae	*Libellulid sp.2*
	Libellulidae	*Libellulid sp.3*
	Libellulidae	*Libellulid sp.4*
	Coenagrionidae	*Coenagrionid sp.1*
	Aeshnidae	*Aeshnid sp.1*
	Lestidae	*Lestid sp.1*
	Cordullidae	*Cordullid sp.1*
Hemiptera	Nepidae	*Nepid sp.1*
	Naucoridae	*Naucorid sp.1*
	Ilyocoridae	*Ilyocorid sp.1*
	Notonectidae	*Notonectid sp.1*
	Pleidae	*Pleid sp.1*
	Veliidae	*Veliid sp.1*
	Veliidae	*Veliid sp.2*
	Veliidae	*Veliid sp.3*
	Hebridae	*Hebrid sp.1*
	Hebridae	*Hebrid sp.2*
Diptera	Chironomidae	*Chironomid sp.1*
	Chironomidae	*Chironomid sp.2*
	Chironomidae	*Chironomid sp.3*

Order	Family	Taxon
	Chironomidae	*Chironomid sp.4*
	Chironomidae	*Chironomid sp.5*
	Chironomidae	*Chironomid sp.6*
	Chironomidae	*Chironomid sp.7*
	Chironomidae	*Chironomid sp.8*
	Chironomidae	*Chironomid sp.9*
	Tipulidae	*Tipulid sp.1*
	Ceratopogonidae	*Ceratopogonid sp.1*
	Ceratopopogonidae	*Ceratopogonid sp.2*
	Pediciidae	*Pediciid sp.1*
	Pediciidae	*Pediciid sp.2*
	Simuliidae	*Simuliid sp.1*
	Culicidae	*Culicid sp.1*
	Syrphidae	*Syrphid sp.1*
	Tabanidae	*Tabanid sp.1*
	Dolichopodidae	*Dolichopodid sp.1*
	Rhagionidae	*Rhagionid sp.1*
	Therevidae	*Therevid sp.1*
(Acari) Trombidiformes	Hydrachnellae	*Hydrachnellid sp.1*
	Halacaridae	*Halacarid sp.1*
Decapoda	Paratelphusidae	*Paratelphusid sp.1*
	Palaemonidae	*Palaemonid sp.1*
	Atyidae	*Atyid sp.1*
	Penaeidae	*Penaeid sp.1*
Class Oligochaeta		*Oligochaete sp.1*

9 Orders, 59 families 90 species (incl 38 PET species) –List of macroinvertebrate taxa from riffle and composite sweep samples from all sites surveyed Jan 09, Nov 09 and Aug 2010 in the project area.

Similarity Indices - Hydrobiology Data

Similarity Index (S) COMP. SWEEP 2009 Upland Creek Comparisons						
	W07	W17	W27	W28	W43	W48
W07	x	x	x	x	x	x
W17	0	x	x	x	x	x
W27	0.3	0.2	x	x	x	x
W28	0	0	0	x	x	x
W43	0	0	0	0	x	x
W48	0	0.2	0.2	0	0	x

Similarity Index (S) COMP. SWEEP 2009 Mid-Catchment Creek Comparisons				
	W03	W04	W23	W29B
W03	x	x	x	x
W04	0	x	x	x
W23	0	0	x	x
W29B	0	0	0	x

Similarity Index (S) COMP. SWEEP 2009 Lowland River and ORWB Comparisons							
	W36	W31	W33	W35	W54	W26	RORWB
W36	x	x	x	x	x	x	x
W31	0.5	x	x	x	x	x	x
W33	0	0	x	x	x	x	x
W35	0.2	0.3	0	x	x	x	x
W54	0	0	0.3	0.3	x	x	x
W26	0	0	0	0.3	0.1	x	x
RORWB	0	0	0.4	0	0.1	0	x

Similarity Index (S) COMP. SWEEP 2008/2009 Lowland Rivers and ORWB Comparisons				
	W36	W38	W54	W26A
W36	x	X	x	x
W38	0	X	x	x
W54	0	0	x	x
W26A	0	0.5	0	x

Similarity Index (S) COMP. SWEEP 2008/2009 Upland Creek Comparisons				
	W22	W27	W28	W29
W22	x	x	x	x
W27	0.4	x	x	x
W28	0	0	x	x
W29	0.3	0.1	0.1	x

C.2 BMT WBM Data (2011)

Replicate code
D/J = December/June sample
W38a = Site number
E1/R1 = Edge/Riffle replicate 1

Table C-2 June 2011 and December 2011 Macroinvertebrate Data

						Site	W 38 A			W 34			W 35			W 33			W 60			W 64			RORWB		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	D W38a E1	D W38a E2	D W38a E3	D W34 E1	D W34 E2	D W34 E3	D W35 E1	D W35 E2	D W35 E3	D W33 E1	D W33 E2	D W33 E3	D W60 E1	D W60 E2	D W60 E3	D W64 E1	D W64 E2	D W64 E3	D RORWB E1	D RORWB E2	D RORWB E3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2																6	3	1	5	4	21
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6																					
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1																					
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3	.		1							1	2			1		67	48	4			
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4					1	6				9	3	2				2					
69	Arthropoda	Crustacea	Ostracoda																								
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1					1												1				
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3																					
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2																					1
	Arthropoda	Uniramia	Insecta	Coleoptera		5																					
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2	1																				
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7									2												
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2																					
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4								3													
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6																					
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6																					
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3																					
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4	2	1		1									1							1	1
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3																					
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3	1			1	2	6		1				1	1	2		2	5	1	22	12	53
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4						2											1				
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5																					
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3																					
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5																					
	Arthropoda	Uniramia	Insecta	Diptera		3																					
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5				1	2					3	2	3		1				1	5	39	10
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4																					
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8												1		1							
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1																					
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2																					
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4			2	12	8	3				8	96	5		1		1	1		2	4	1
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3																					
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2																					
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1				1		2				2									1		
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																					
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2																					
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3					3	10				209	6	46	1	28	29		1		2	1	
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3																					
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2																			1		
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5																					
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4						1															
	Arthropoda	Uniramia	Insecta	Odonata		3																					
71	Arthropoda	Uniramia	Insecta	Plecoptera		10																					
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7																					
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4																					
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8																					
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8																					
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4																				1	
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6											1								3		
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8																					
48	Bryozoa					4																					
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2																	1				1
	Mollusca		Gastropoda			1																					
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3																					

Aquatic Macroinvertebrate Data

						Site	W 23			W 70			W 71			W 61			W 62			W 63			W 50		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	D W23 E1	D W23 E2	D W23 E3	D W70 E1	D W70 E2	D W70 E3	D W71 E1	D W71 E2	D W71 E3	D W61 E1	D W61 E2	D W61 E3	D W62 E1	D W62 E2	D W62 E3	D W63 E1	D W63 E2	D W63 E3	D W50 E1	D W50 E2	D W50 E3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2			3		3	2							2	3				1	1		
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6																					
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1																					
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3		1		14	2		2		1	1					3						
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4								1			1	1		13	2	6	7	1	1	1	3
69	Arthropoda	Crustacea	Ostracoda													1			1								
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1												1					4				
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3																					
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2															1						
	Arthropoda	Uniramia	Insecta	Coleoptera		5																					
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2	1																				
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7																					
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2	1																				
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4																					
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6																					
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6																					
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3	1		2		5	2															
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4																					
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3							1														
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3	1			1									45	38			1	2			1
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4													16	26			1				
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5																					
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3																					
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5				2		1															
	Arthropoda	Uniramia	Insecta	Diptera		3																					
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5							1			2						7	2	4		1	
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4																					
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8	1																				
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1																					
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2																					
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4				9	1		1		26	1									6	3	
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3																					
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2																					
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1																					1
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																					
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2																	1				
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3	1	1	10				8	4	71						1	9	1	3	29	16	6
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3	1																				
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2																					
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5																					
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4																					
	Arthropoda	Uniramia	Insecta	Odonata		3																					
71	Arthropoda	Uniramia	Insecta	Plecoptera		10																					
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7																					
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4																					
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8																					
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8																					
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4																					
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6	1								1												
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8																					
48	Bryozoa					4																					
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2																					
	Mollusca		Gastropoda			1																					
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3																					

Aquatic Macroinvertebrate Data

						Site	W 100			W18			W 27			W 48			BC			W 28		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	D W100 E1	D W100 E2	D W100 E3	D W18 R1	D W18 R2	D W18 R3	D W27 R1	D W27 R2	D W27 R3	D W48 R1	D W48 R2	D W48 R3	D BC R1	D BC R2	D BC R3	D W28 R1	D W28 R2	D W28 R3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2																	1	
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6		2														1		
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1																		
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3											13					1		
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4																		
69	Arthropoda	Crustacea	Ostracoda																					
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1																		
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3																		
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2																		
	Arthropoda	Uniramia	Insecta	Coleoptera		5																		
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2			1															
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7																1		1
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2																		
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4																		
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6																		
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6																		
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3																		
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4	1	10	13								1					1		
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3										3		1						
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3	13	27	26	5		1	7	18	17	1	5		6	1	3	125	150	92
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4	3	1	5				1	1			1						2	1
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5																		
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3												1					1	1
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5																5	1	1
	Arthropoda	Uniramia	Insecta	Diptera		3																1	1	1
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5	4	26	8	10			1	10	1	1			7	5	8	17	9	5
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4																6	10	6
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8				1						2		1	3	5	8	16	9	12
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1															1	3	4	2
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2																		
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4		2			1						1							
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3																		
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2				3		2					1							
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1																		
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																		
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2		1																
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3																		
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3										1						3		1
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2	1	1	5															
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5																		
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4	1	1												3				
	Arthropoda	Uniramia	Insecta	Odonata		3		1	1															
71	Arthropoda	Uniramia	Insecta	Plecoptera		10								5								1		
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7																		
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4	1	5										1						
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8													1			1		1
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8											2						1	
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4			2													1	4	
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6	1	21	5									1					1	2
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8																		
48	Bryozoa					4																		
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2																		
	Mollusca		Gastropoda			1																		
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3																		

Aquatic Macroinvertebrate Data

						Site	W 18			W 27			W 48			BC			W38 A			W34			W35		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	J W18 E1	J W18 E2	J W18 E3	J W27 E1	J W27 E2	J W27 E3	J W48 E1	J W48 E2	J W48 E3	J BC E1	J BC E2	J BC E3	J W38a E1	J W38a E2	J W38a E3	J W34 E1	J W34 E2	J W34 E3	J W35 E1	J W35 E2	J W35 E3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2																					
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6								1													
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1																					
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3								1													
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4																					
69	Arthropoda	Crustacea	Ostracoda																								
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1																1					
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3																					
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2																					
	Arthropoda	Uniramia	Insecta	Coleoptera		5																1	1			9	2
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2																					
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7									1	1		1									
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2			1						1												
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4															1	1			2	4	4
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6														1							
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6									1			2									
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3						1										2					
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4																					
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3	1	1		1		1		1			1				1						
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3	3	1	1	5	3	2	2	2	1	7		16		1			1				
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4	2	1		3	8			1	5	1		7									
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5							1					1									
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3														1							
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5																					
	Arthropoda	Uniramia	Insecta	Diptera		3						1	1		1			1		3							
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5	1		1	2	13	2			5	35	3	37		1	4						
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4	1	3	1				1		5	3	3	5									
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8	5						2	2	5	1											
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1																					
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2		1			1	1												1	1		
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4							1	2					1	1	1				2		2
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3																					
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2												4									
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1																					
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																				2	
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2																					
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3							1	4						10			2		6		
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3					1				1												
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2								2													
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5								1													
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4	1									4	3	10									
	Arthropoda	Uniramia	Insecta	Odonata		3												1									
71	Arthropoda	Uniramia	Insecta	Plecoptera		10																					
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7												1									
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4				1	1																
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8										1	6	13									
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8																					
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4																					
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6									1												
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8				2	1							2									
48	Bryozoa					4																					
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2																					
	Mollusca		Gastropoda			1																					
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3																					

Aquatic Macroinvertebrate Data

						Site	W36			W33			W60			W64			RORWB			W23			W70		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	J W36 E1	J W36 E2	J W36 E3	J W33 E1	J W33 E2	J W33 E3	J W60 E1	J W60 E2	J W60 E3	J W64 E1	J W64 E2	J W64 E3	J RORWB E1	J RORWB E2	J RORWB E3	J W23 E1	J W23 E2	J W23 E3	J W70 E1	J W70 E2	J W70 E3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2															1	1				12	2
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6																					
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1												2									
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3				1							2	27				2		2	2	1	1
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4				2		1		1				1									
69	Arthropoda	Crustacea	Ostracoda																								
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1						1															
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3				1															1		
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2																					
	Arthropoda	Uniramia	Insecta	Coleoptera		5	1			1		1															
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2															1						
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7					2	1													2		
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2															2	2				1	
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4	2	2				1					1	1						1		2	
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6																					
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6																		1			
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3	1	2	7										1					3		9	13
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4				2	1	1									2				2		
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3				2			1										1		5		1
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3		2		3	1		1			2	4		20	11	13		3	3	3		
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4				1									4	4	12				3		
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5																					
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3																					
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5																					
	Arthropoda	Uniramia	Insecta	Diptera		3																					1
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5	1	3	3	2	2	7						3	7	1	16	10	2			3	
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4																	1				
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8							1											2			
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1																					
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2		1														4	6	3	2	107	7
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4	7	6	23	2		1	3	1				1			2	1	3		8	4	2
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3															1						
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2																					
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1													3		13						
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																					
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2																					
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3	4	7		1	1	10	8	20								59	88	8	11		2
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3																					
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2																					
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5																					
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4															2						
	Arthropoda	Uniramia	Insecta	Odonata		3																					
71	Arthropoda	Uniramia	Insecta	Plecoptera		10																					
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7																					
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4												1									
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8																					
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8																					
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4																					
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6	1	1											4		3	1					
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8																					
48	Bryozoa					4												7									
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2												1	1								
	Mollusca		Gastropoda			1																					
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3												3									

Aquatic Macroinvertebrate Data

						Site	W71			W61			W62			W50			W100			W 18			W27	W 48			BC		
Ref #	Phylum	Sub-Phylum	Class	Order	Family	SIGNAL Grade	J W71 E1	J W71 E2	J W71 E3	J W61 E1	J W61 E2	J W61 E3	J W62 E1	J W62 E2	J W62 E3	J W50 E1	J W50 E2	J W50 E3	J W100 E1	J W100 E2	J W100 E3	J W18 R1	J W18 R2	J W18 R3	J W27 R1	J W48 R1	J W48 R2	J W48 R3	J BC R1	J BC R2	J BC R3
42	Annelida		Oligochaeta	Oligochaeta	Oligochaeta	2	3																			1	2				
36	Arthropoda	Chelicerata	Arachnida	Acarina	Acarina	6													1												
49	Arthropoda	Crustacea	Branchiopoda	Conchostraca	Conchostraca	1																									
10	Arthropoda	Crustacea	Malacostraca	Decapoda	Atyidae	3								1	1							1	1	1			6				
31	Arthropoda	Crustacea	Malacostraca	Decapoda	Palaemonidae	4				13			12	6		2	3	1													
69	Arthropoda	Crustacea	Ostracoda																												
26	Arthropoda	Hexapoda	Entognatha	Collembola	Isotomidae	1					1																				
32	Arthropoda	Uniramia	Insecta	Coleoptera	Carabidae	3																									
68	Arthropoda	Uniramia	Insecta	Coleoptera	Curculionidae	2																									
	Arthropoda	Uniramia	Insecta	Coleoptera		5		1						2																1	
37	Arthropoda	Uniramia	Insecta	Coleoptera	Dytiscidae	2													3												
34	Arthropoda	Uniramia	Insecta	Coleoptera	Elmidae	7																									
9	Arthropoda	Uniramia	Insecta	Coleoptera	Hydrophilidae	2		1				1																			
12	Arthropoda	Uniramia	Insecta	Coleoptera	Limnichidae	4		6				1			1		1					8									
20	Arthropoda	Uniramia	Insecta	Coleoptera	Psephenidae	6																									
39	Arthropoda	Uniramia	Insecta	Coleoptera	Scirtidae	6								3	1					2											
13	Arthropoda	Uniramia	Insecta	Coleoptera	Staphylinidae	3	2	17	4					1								2	1	2		2			1		
16	Arthropoda	Uniramia	Insecta	Diptera	Ceratopogonidae	4														3	6			2							
6	Arthropoda	Uniramia	Insecta	Diptera	Dolichopodidae	3	1																			2				1	
5	Arthropoda	Uniramia	Insecta	Diptera	s.f Chironominae	3									1				1	3	2			4		7				2	
4	Arthropoda	Uniramia	Insecta	Diptera	s.f Tanypodinae	4													1		1										
54	Arthropoda	Uniramia	Insecta	Diptera	Simuliidae	5																									
22	Arthropoda	Uniramia	Insecta	Diptera	Tabanidae	3																									
66	Arthropoda	Uniramia	Insecta	Diptera	Tipulidae	5																									
	Arthropoda	Uniramia	Insecta	Diptera		3																			1						
3	Arthropoda	Uniramia	Insecta	Ephemeroptera	Baetidae	5	1	1									1		5		1			2					1	1	3
1	Arthropoda	Uniramia	Insecta	Ephemeroptera	Caenidae	4																				2			1	1	1
2	Arthropoda	Uniramia	Insecta	Ephemeroptera	Leptophlebiidae	8																1				1				1	
41	Arthropoda	Uniramia	Insecta	Hemiptera	Belostomatidae	1						1																			
8	Arthropoda	Uniramia	Insecta	Hemiptera	Corixidae	2														1		20		1	2						
19	Arthropoda	Uniramia	Insecta	Hemiptera	Gerridae	4	1	32												1	2						1				1
45	Arthropoda	Uniramia	Insecta	Hemiptera	Hydrometridae	3																									
15	Arthropoda	Uniramia	Insecta	Hemiptera	Naucoridae	2																				1					
44	Arthropoda	Uniramia	Insecta	Hemiptera	Notonectidae	1																									
29	Arthropoda	Uniramia	Insecta	Hemiptera	Ochteridae	2																									
38	Arthropoda	Uniramia	Insecta	Hemiptera	Pleidae	2														1											
11	Arthropoda	Uniramia	Insecta	Hemiptera	Veliidae	3	1	2	12	2	1	3				3	4	15		1		14	6	1	14		1		3	6	2
17	Arthropoda	Uniramia	Insecta	Lepidoptera	Pyralidae	3																		1							
40	Arthropoda	Uniramia	Insecta	Odonata	Coenagrionidae	2															2										
57	Arthropoda	Uniramia	Insecta	Odonata	Hemicorduliidae	5																									
7	Arthropoda	Uniramia	Insecta	Odonata	Libellulidae	4																		1						1	
	Arthropoda	Uniramia	Insecta	Odonata		3																									
71	Arthropoda	Uniramia	Insecta	Plecoptera		10																									
61	Arthropoda	Uniramia	Insecta	Trichoptera	Calamoceratidae	7																								2	
50	Arthropoda	Uniramia	Insecta	Trichoptera	Ecnomidae	4																									
60	Arthropoda	Uniramia	Insecta	Trichoptera	Helicopsychidae	8																							2		
64	Arthropoda	Uniramia	Insecta	Trichoptera	Hydrobiosidae	8																									
65	Arthropoda	Uniramia	Insecta	Trichoptera	Hydroptilidae	4																									
23	Arthropoda	Uniramia	Insecta	Trichoptera	Leptoceridae	6																					3		1		
52	Arthropoda	Uniramia	Insecta	Trichoptera	Philopotamidae	8																									
48	Bryozoa					4																									
46	Mollusca		Gastropoda	Basommatophora	Planorbidae	2																									
	Mollusca		Gastropoda			1																		1							
47	Porifera		Demospongiae	Haplosclerina	Spongillidae	3																									

C.3 BMT WBM Data (2017)

Family	Order	S1_E1	S1_E2	S1_E3	S1_R1	S1_R2	S1_R3	S2_E1	S2_E2	S2_E3	S2_R1	S2_R2	S2_R3	S3_E1	S3_E2	S3_E3	S3_R1	S3_R2	S3_R3	S4_E1	S4_E2	S4_E3	S4_R1	S4_R2	S4_R3
Acarina	Acarina							1				1	1						1						
Isotomatidae	Entomobrymorpha									3							1								
Atyidae	Decapoda			2											1	1									
Gastropoda	Gastropoda																				1				
Coleoptera	Coleoptera											5							26	1		1			
Dytiscidae	Coleoptera						2	1												1	1				
Elmidae	Coleoptera	7	4	2	1	1	5	2	3	4	53	57	26	4	4	2	8	1	8	3	3	6	8	5	
Hydrophilidae	Coleoptera	2	2	1	6	6	9	3	2	2	16	67	55	1	2		5		2	5	2	8		1	1
Limnichidae	Coleoptera		8																	3	2	3			
Ptilodactylidae	Coleoptera											1													1
Scirtidae	Coleoptera														1	1									
Staphylinidae	Coleoptera							6	5	1				7		7				5	2	3			
Ceratopogonidae	Diptera	2		2	2	4	1	3	2	3	21	10	19	19	29		26	2	10	1		4			1
Chironominae	Diptera																								
s.f Chironominae	Diptera	5	10	2	1	5	2	7	4	6	27	13	21	4	79	14	18	22	23	3		2		3	1
s.f Tanypodinae	Diptera				1	1	1		10	6	5	2	12	2	72	5	11		2	1					
Diptera	Diptera					1									1										
Dolichopodidae	Diptera	3	1				1						1												
Empididae	Diptera	1										2													
Muscidae	Diptera		1																			1			
Simuliidae	Diptera					2					1	1						3							
Stratiomyidae	Diptera																					1			
Tabanidae	Diptera			1							4	3	3				2	1	1						1
Tipulidae	Diptera										3	3	5	2	2		26	1	16					3	
Baetidae	Ephemeroptera			1		1	1	1			7	11	1		10	6	6	2	7						
Caenidae	Ephemeroptera										6	2	8	1	15	3	10		1						
Leptophlebiidae	Ephemeroptera		1			1					15	11	7		1	1	1		1						
Prosopistomatidae	Ephemeroptera										1	2	4						1						
Corixidae	Hemiptera			5				93	123	117				15	138	32	1	1		14	3	15			
Gerridae	Hemiptera		10	13				8	12	8						1				7	24	122			
Hydrometridae	Hemiptera									1															
Naucoridae	Hemiptera	2	1					2			18	15	12		2		2		7					1	
Notonectidae	Hemiptera																								
Veliidae	Hemiptera	101	63	82				63	4	4				3	7	6				47	34	7	2		

Family	Order	S1_E1	S1_E2	S1_E3	S1_R1	S1_R2	S1_R3	S2_E1	S2_E2	S2_E3	S2_R1	S2_R2	S2_R3	S3_E1	S3_E2	S3_E3	S3_R1	S3_R2	S3_R3	S4_E1	S4_E2	S4_E3	S4_R1	S4_R2	S4_R3
Pyralidae	Lepidoptera										3	2	3												1
Corydalidae	Megaloptera	1																							
Calopterygidae	Odonata																								
Chlorocyphidae	Odonata														2										
Diphlebiidae	Odonata																								
Gomphidae	Odonata														1										
Libellulidae	Odonata								2		7	13	7		2		2	2	4						
Megapodagrionidae	Odonata																								
Protoneuridae	Odonata							2	3	4					4										
Calamoceratidae	Trichoptera		1			1		1	1		1	1								1		1			
Ecnomidae	Trichoptera													1											
Hydropsychidae	Trichoptera		1			3		1			21	36	30				3								1
Leptoceridae	Trichoptera		1	3				5	4	11	1	2	3		37	19	2	1	1			1			
Philopotamidae	Trichoptera		1								1		1												
Gordiidae	Gordiidae																								
Lumbriculidae	Oligochaeta			1		1	1					1					1								

Aquatic Macroinvertebrate Data

Family	Order	S5_E1	S5_E2	S5_E3	S5_R1	S5_R2	S5_R3	S6_E1	S6_E2	S6_E3	S6_P1	S6_P2	S6_P3	S7_E1	S7_E2	S7_E3	S7_R1	S7_R2	S7_R3	S8_E1	S8_E2	S8_E3	S8_R1	S8_R2	S8_R3
Acarina	Acarina						1											1					1		
Isotomatidae	Entomobrymorpha																								
Atyidae	Decapoda			7											1	1									
Gastropoda	Gastropoda																								
Coleoptera	Coleoptera								2														2		
Dytiscidae	Coleoptera																								
Elmidae	Coleoptera			2	1			8	5	1	1		1			3	1		1		1				
Hydrophilidae	Coleoptera				1	1	1	1				1	1	2			2		1				1	1	
Limnichidae	Coleoptera							2	3					1											
Ptilodactylidae	Coleoptera																								
Scirtidae	Coleoptera																								
Staphylinidae	Coleoptera			1											1	1									
Ceratopogonidae	Diptera	1				1	2	26	42	1	7	9	16	3					3	2		2	3	1	1
Chironominae	Diptera							1																	
s.f Chironominae	Diptera		1	6	20	20	25	4	7	3	1	2	4	48	7	9	21	36	18	2	5	4	9	5	5
s.f Tanypodinae	Diptera	4		5	5	2	3	10	5	1	3	4	7	7	2	1	2	1			2	2		3	5
Diptera	Diptera																								
Dolichopodidae	Diptera																								
Empididae	Diptera							1																	
Muscidae	Diptera																								
Simuliidae	Diptera					1	1										21	55	14						
Stratiomyidae	Diptera																								
Tabanidae	Diptera					1	1									1	6	3	1						
Tipulidae	Diptera				2		2	1	2	1	1	1					1			1	2	1	1	2	4
Baetidae	Ephemeroptera			2	4	2	3	5	8	6	1		4	2	6	11	34	100	23	5		2	19	21	12
Caenidae	Ephemeroptera	4	1		1		3	1	1	2			1	4	2	6	11	8	13	2	4	9	16	6	9
Leptophlebiidae	Ephemeroptera		1	1	11	3	63	2	3	2		1	1	6	1	2	42	113	95	2	5	1	43	47	31
Prosopistomatidae	Ephemeroptera						1				1														
Corixidae	Hemiptera	9	2	14				35	12	7	2				4					8	1	2			
Gerridae	Hemiptera	1	1	2													2			25		4			
Hydrometridae	Hemiptera			1																					
Naucoridae	Hemiptera	5		14	14	6	12								2	2	1	3	3		2		6	4	4
Notonectidae	Hemiptera							1																	
Veliidae	Hemiptera		2	2										18	4	139		1	1	25	6				
Pyralidae	Lepidoptera					1											1	2					1		
Corydalidae	Megaloptera																								

Aquatic Macroinvertebrate Data

Family	Order	S5_E1	S5_E2	S5_E3	S5_R1	S5_R2	S5_R3	S6_E1	S6_E2	S6_E3	S6_P1	S6_P2	S6_P3	S7_E1	S7_E2	S7_E3	S7_R1	S7_R2	S7_R3	S8_E1	S8_E2	S8_E3	S8_R1	S8_R2	S8_R3
Calopterygidae	Odonata															1									
Chlorocyphidae	Odonata			1														1							2
Diphlebiidae	Odonata																						1		
Gomphidae	Odonata			1																					
Libellulidae	Odonata				2	3	3								1	1	11	12	10				3	1	1
Megapodagrionidae	Odonata				1																				
Protoneuridae	Odonata			2				1						1											
Calamoceratidae	Trichoptera						1									1									
Ecnomidae	Trichoptera																								
Hydropsychidae	Trichoptera	2	1		10	7	17			1					1		18	31	21	1			174	162	59
Leptoceridae	Trichoptera		1	5				1	1	1				1		1	1					1			
Philopotamidae	Trichoptera	1			2		4																1		
Gordiidae	Gordiidae													1											
Lumbriculidae	Oligochaeta							3					1					1		1					

Appendix D Fish Data

D.1 Previous Fish Data

Table D-1 Sepik River Fish species reported by Allen and Coates (1993)

Family	Species	E/FW	FW
Native species			
Pristidae	*Pristis pristis*	x	
Megalopodidae	*Megalops cyprinoides*	x	
Anguillidae	*Anguilla marmorata*	x	
	A. bicolour	x	
Chanidae	*Chanos*	x	
Ariidae	*Brustiarius nox*		x
	B. solidus		x
	Neoarius utareus		x
	Neoarius velutinus		x
	Potamosilurus coatesi		x
Plotosidae	*Neosilurus coatesi*		x
	N. gjellerupi		x
Hemirhamphidae	*Zenarchopterus kampeni*	x	
Melanotaeniidae	*Chilatherina campsi*		x
	C. crassispinosa		x
	C. fasciata		x
	Glossolepis kabia		x
	Melanotaenia affinis		x
Sygnathidae	*Microphis spinachoides*	x	
Ambassidae	*Ambassis burensis*	x	
	A. interruptus	x	
	Parambassis confinis		x
Terapontidae	*Hephaestus transmontanus*		x
	Mesopristes argenteus	x	
Kuhlidae	*Kuhlia rupestris*	x	
	K. marginate	x	
Apogonidae	*Glossamia gjellerupi*		x
Carangidae	*Caranx sexfasciatus*	x	
Lutjanidae	*Lutjanus goldiei*	x	
Sciaenidae	*Nibea soldado*	x	
Mugilidae	*Liza macrolepis*	x	

Family	Species	E/FW	FW
	L. melinoptera	x	
	L. tade	x	
Eleotrididae	*Butis amboinensis*		x
	Eleotris aquadulcis		x
	E. melanosoma		x
	Hypseleotris cyprinoides		x
	Mogurnda aurofodinae		x
	Mogurnda nesolepis		x
	Ophieleotris aporos		x
	Ophiocara porocephala		x
	Oxyeleotris fimbriata		x
	O. heterodon		x
Gobiidae	*Glossogobius bulmeri*		x
	G. giuris		x
	Glossogobius koragensis		x
	G. coatesi		x
	G. torrentis		x
	Mugilogobius fusculus		x
	Rediogobius bikolanus	x	
	Stenogobius lateris squamatus		x
Gobioididae	*Brachyamblyopus urolepis*	x	
Non-native species			
Cyprinidae	*Cyprinus carpio*		x
Cichlidae	*Oreochromis mossambicus*	x	
Poeciliidae	*Gambusia holbrooki*	x	
E/FW species Estuarine/Marine and Freshwater phases in life cycle or species tolerates brackish water; FW = Species life cycle entirely within freshwater			

D.2 Hydrobiology Data (2008 - 2010)

Table D-2 ORWBs fish summary for number of individuals caught for 2008/2009, 2009 and 2010 events

Family	Species	RORWB		W26A			W62		
		Dec-09	Oct-10	Jan-09	Dec-09	Oct-10	Nov-08	Aug-10	Oct-10
Native species									
Ariidae	*Brustiarius nox*		14	10	2	8			2
	Brustiarius solidus		2			11	12		1
	Neoarius utarus								1
Eleotridae	*Mogurnda nesolepis*			2					
	Ophieleotris aporos	1	3	2		2			
	Oxyeleotris heterodon		30	13	2	32	24		4
Hemiramphidae	*Zenarchopterus kampeni*							4	
Introduced species									
Characidae	*Piaractus brachypomus*		8		5	3	3		3
Cichlidae	*Oreochromis mossambicus*						2		
	Tilapia rendalli			1					
Clariidae	*Clarias batrachus*	1					2		
Cyprinidae	*Barbonymus gonionotus*		47	11	43	85	73	5	76
	Cyprinus carpio					1			1
Prochilodontidae	*Prochilodus argenteus*	1	33	28	50	47	19		97
Total		**3**	**137**	**67**	**102**	**189**	**135**	**9**	**185**

Table D-3 Lowland rivers fish summary for number of individuals caught for 2008/2009, 2009 and 2010 events

Family	Species	W31B			W33			W34		W35		W36			W38A		W50	W51	W54		W60	W61	W63	W64		W70
		Jan-09	Dec-09	Aug-10	Nov-08	Dec-09	Aug-10	Aug-10	Oct-10	Dec-09	Aug-10	Jan-09	Dec-09	Aug-10	Jan-09	Aug-10	Nov-08	Nov-08	Jan-09	Dec-09	Oct-10	Oct-10	Oct-10	Dec-08	Oct-10	Aug-10
Native species																										
Ambassidae	*Ambassis sp.*			2																						
	Ambassis interruptus																								1	
	Parambassis confinis		9																							
Anguillidae	*Zenarchopterus kampeni*		2																							
Apogonidae	*Glossamia gjellerupi*		1									3														2
Ariidae	*Brustiarius nox*					1															21	1	5		1	
	Brustiarius solidus				2																			4		
	Ariid sp.																								1	
	Neoarius coatesi																									1
	Neoarius utarus				12							1			1		6	4	6					3		
	Neoarius velutinus			1	4					16		2	3		2		13				13					5
	Potamosilurus coatesi	1			2												7		2							
Eleotridae	*Ophieleotris aporos*																								1	
	Oxyeleotris heterodon				2				1	1														2		
Gobiidae	*Glossogobius bulmeri*														3											

Fish Data

Family	Species	W31B			W33			W34		W35		W36			W38A		W50	W51	W54		W60	W61	W63	W64		W70
		Jan-09	Dec-09	Aug-10	Nov-08	Dec-09	Aug-10	Aug-10	Oct-10	Dec-09	Aug-10	Jan-09	Dec-09	Aug-10	Jan-09	Aug-10	Nov-08	Nov-08	Jan-09	Dec-09	Oct-10	Oct-10	Oct-10	Dec-08	Oct-10	Aug-10
	Sicyopterus longifilis																								1	
Hemiramphidae	*Zenarchopterus kampeni*										3	2			1	1			5		1				1	2
Megalopidae	*Megalops cyprinoides*																									1
Melanotaeniidae	*Chilatherina crassispinosa*	19	4	1																						
	Chilatherina fasciata											9			4											
	Melanotaenia affinis																		1							
Plotosidae	*Neosilurus idenburgi*																							1		
Introduced species																										
Characidae	*Piaractus brachypomus*			14		1	1			2	3	1	1		1		2				31	1	3		1	45
Clariidae	*Clarias batrachus*										1							3						1		
Cyprinidae	*Barbonymus gonionotus*		1	16	7	7		4	18	23	46	2	6	12	9		3	50	1	5	50	14	21	18		1
	Cyprinus carpio																									1
Prochilodontidae	*Prochilodus argenteus*			3	13				4	6	11	2	4		3		24	11	8	2	65	5	21	10	1	11
Total		**20**	**17**	**37**	**42**	**9**	**1**	**4**	**23**	**48**	**64**	**22**	**14**	**12**	**24**	**1**	**55**	**68**	**23**	**7**	**181**	**21**	**50**	**39**	**7**	**69**

Table D-4 Mid-catchment rivers fish summary for number of individuals caught for 2008/2009, 2009 and 2010 events

Family	Species	W03		W04		W114		W115		W22		W23		W29B	
		Dec-09	Aug-10	Jan-09	Dec-09	Aug-10	Oct-10	Oct-10	Jan-09	Nov-09	Jan-09	Dec-09	Aug-10	Jan-09	Nov-09
Native species															
Ambassidae	*Parambassis confinis*				23						3				
Apogonidae	*Glossamia gjellerupi*			1		1	2	1	2		3		3	1	5
Ariidae	*Brustiarius nox*			1	9										
	Neoarius utarus										1				
	Neoarius velutinus					3					8				
	Potamosilurus coatesi										1				
Eleotridae	*Mogurnda aurofodinae*							9							
	Mogurnda sp.													1	
	Oxyeleotris fimbriata				1									2	
Gobiidae	*Glossogobius bulmeri*	14		1	9					1				1	3
	Glossogobius coatesi		6			1		1						4	
Melanotaeniidae	*Chilatherina crassispinosa*		1		30	4	4	2				4			4
	Chilatherina fasciata	4						8	15		25				3
	Chilatherina sp A												14		
	Melanotaenia affinis	6	1	7				6							28
	Melanotaenia sp.														1
Plotosidae	*Neosilurus gjellerupi*	2			2										
Terapontidae	*Hephaestus transmontanus*				7										
Introduced species															
Characidae	*Piaractus brachypomus*										2		1	1	
Clariidae	*Clarias batrachus*	1									1				
Cyprinidae	*Barbonymus gonionotus*			1		3			2		3	1	4		
Prochilodontidae	*Prochilodus argenteus*	1			4	1					3	4	5		
Total		**28**	**8**	**11**	**85**	**13**	**6**	**27**	**19**	**1**	**50**	**9**	**27**	**10**	**44**

Table D-5 Upland rivers fish summary for number of individuals caught for 2008/2009, 2009 and 2010 events

Family	Species	W07		W102	W28		W29B
		Nov-09	Aug-10	Aug-10	Jan-09	Nov-09	Aug-10
Native species							
Apogonidae	*Glossamia gjellerupi*	9	2				2
Eleotridae	*Oxyeleotris fimbriata*					1	
Gobiidae	*Glossogobius bulmeri*	26			4	1	
	Glossogobius coatesi		8	1			3
Melanotaeniidae	*Melanotaenia* sp.	1					
	Melanotaenia affinis	5					
Plotosidae	*Neosilurus gjellerupi*	1					
Terapontidae	*Hephaestus transmontanus*	2					
Introduced species							
Clariidae	*Clarias batrachus*	1					
Total		**45**	**10**	**1**	**4**	**2**	**5**

Table D-6 Upland creeks fish summary for number of individuals caught for 2008/2009, 2009 and 2010 events

Family	Species	W17	W27	W41		W42	W43B			W48
		Nov-09	Dec-09	Jan-09	Aug-10	Jan-09	Jan-09	Dec-09	Aug-10	Nov-09
Native species										
Apogonidae	*Glossamia gjellerupi*			9	2				2	
Eleotridae	*Oxyeleotris fimbriata*							1		
Gobiidae	*Glossogobius bulmeri*			26			4	1		
	Glossogobius coatesi				8	1			3	
Melanotaeniidae	*Melanotaenia* sp.			1						
	Melanotaenia affinis			5						
Plotosidae	*Neosilurus gjellerupi*			1						
Terapontidae	*Hephaestus transmontanus*			2						
Introduced species										
Clariidae	*Clarias batrachus*			1						
Total				**45**	**10**	**1**	**4**	**2**	**5**	

SITE BY SITE SUMMARIES

Key to methods		
Key	method	dimensions
EL	Electrofishing	
ES	Electroseineing	
13	Finnish gillnet (13mm mesh)	10m x 2m
19	Finnish gillnet (19mm mesh)	10m x 2m
25	Finnish gillnet (25mm mesh)	10m x 2m
1 - 6	Standard gill net	
PN	Panel net (3”,4”,5” 5m panles)	15m x 1.5m
FY	Fyke net	5m x 1m wings
VIS	Visual observations	
TIS	Combined catch for tissue metals	
SS	10m haul x 5 reps	10m x 1m
ANG	Angling	
CL	Collapsible Bait/prawn trap	

Sampling period 2008/2009

Habitat type: ULC (Upland creeks)

Site: W41

Family	Species	Number of fish	Weight of fish (g)
EL		**12**	**113.5**
Apogonidae	*Glossamia gjellerupi*	3	36.3
Eleotridae	*Mogurnda aurofodinae*	1	19.9
Gobiidae	*Glossogobius bulmeri*	4	22.6
Melanotaeniidae	*Melanotaenia affinis*	3	11.5
Terapontidae	*Hephaestus transmontanus*	1	23.2
Site total		**12**	**113.5**

Site W42

Family	Species	Number of fish	Weight of fish (g)
EL		**12**	**87.3**
Apogonidae	*Glossamia gjellerupi*	2	31.4
Eleotridae	*Oxyeleotris fimbriata*	1	7.3
Gobiidae	*Glossogobius bulmeri*	4	4.5
	Glossogobius coatesi	1	1.7
Melanotaeniidae	*Chilatherina fasciata*	2	19
	Melanotaenia affinis	1	16.6
Terapontidae	*Hephaestus transmontanus*	1	6.8
Site total		**12**	**87.3**

Site 43B

Family	Species	Number of fish	Weight of fish (g)
2.5		**6**	**195.8**
Apogonidae	*Glossamia gjellerupi*	1	15.6
Eleotridae	*Mogurnda sp.*	1	8.4
Gobiidae	*Glossogobius bulmeri*	1	1.6
Melanotaeniidae	*Chilatherina fasciata*	1	106.8
	Melanotaenia nigrans	1	63.2
Terapontidae	*Hephaestus transmontanus*	1	0.2
EL		**3**	**4.4**
Gobiidae	*Glossogobius bulmeri*	3	4.4
Site total		**9**	**200.2**

Habitat type ULR (Upland Rivers)

Site W28

Family	Species	Number of fish	Weight of fish (g)
EL		**2**	**3.4**
Gobiidae	*Glossogobius bulmeri*	2	3.4
Site total		**2**	**3.4**

Habitat type MCR (Mid Catchment River)

Site W04

Family	Species	Number of fish	Weight of fish (g)
EL		**5**	**31.4**
Apogonidae	*Glossamia gjellerupi*	1	7.7
Gobiidae	*Glossogobius bulmeri*	1	0.2
Melanotaeniidae	*Melanotaenia affinis*	3	23.5
SS		**1**	**31.9**
Ariidae	*Brustiarius nox*	1	31.9
VC		**1**	**282**
Cyprinidae	*Barbonymus gonionotus*	1	282
Site total		**7**	**345.3**

Site W22

Family	Species	Number of fish	Weight of fish (g)
3.5		**1**	**508**
Cyprinidae	*Barbonymus gonionotus*	1	508
EL		**1**	**8.9**
Melanotaeniidae	*Chilatherina fasciata*	1	8.9
SS		**4**	**32.9**
Apogonidae	*Glossamia gjellerupi*	1	6.4
Melanotaeniidae	*Chilatherina fasciata*	3	26.5
Site total		**6**	**549.8**

Site W23

Family	Species	Number of fish	Weight of fish (g)
3		**2**	**576**
Ariidae	*Neoarius velutinus*	1	228
Cyprinidae	*Barbonymus gonionotus*	1	348
3.5		**5**	**4381**
Ariidae	*Neoarius velutinus*	1	1713
	Neoarius coatesi	1	388
	Neoarius utarus	1	780
Characidae	*Piaractus brachypomus*	1	1160
Cyprinidae	*Barbonymus gonionotus*	1	340
4		**2**	**2920**
Ariidae	*Neoarius velutinus*	1	1440
Prochilodontidae	*Prochilodus argenteus*	1	1480
5		**2**	**2480**
Ariidae	*Neoarius velutinus*	1	1520
Characidae	*Piaractus brachypomus*	1	960
EL		**5**	**347.6**
Ambassidae	*Parambassis confinis*	1	14.2
Apogonidae	*Glossamia gjellerupi*	2	33.4
Clariidae	*Clarias batrachus*	1	50
Cyprinidae	*Barbonymus gonionotus*	1	250
SS		**3**	**24.4**
Melanotaeniidae	*Chilatherina fasciata*	3	24.4
Site total		**19**	**10729**

Site W29B

Family	Species	Number of fish	Weight of fish (g)
EL		**7**	**35.7**
Apogonidae	*Glossamia gjellerupi*	1	1.9
Eleotridae	*Mogurnda* sp.	1	0.6
	Oxyeleotris fimbriata	2	23
Gobiidae	*Glossogobius bulmeri*	1	0.4
	Glossogobius coatesi	2	9.8
VC		**1**	**2130**
Characidae	*Piaractus brachypomus*	1	2130
Site total		**7**	**2165.7**

Habitat type: LLR (Lowland Rivers)

Site W31B

Family	Species	Number of fish	Weight of fish (g)
EL		3	6.1
Ariidae	*Neoarius coatesi*	1	0.2
Melanotaeniidae	*Chilatherina crassispinosa*	2	5.9
SS		2	3
Melanotaeniidae	*Chilatherina crassispinosa*	2	3
Site total		5	9.1

Site W33

Family	Species	Number of fish	Weight of fish (g)
1.5		**1**	
Cyprinidae	*Barbonymus gonionotus*	1	
2		**4**	
Ariidae	*Neoarius velutinus*	1	
	Neoarius coatesi	1	
	Neoarius utarus	1	
Cyprinidae	*Barbonymus gonionotus*	1	
2.5		**3**	
Ariidae	*Brustiarius solidus*	1	
Cyprinidae	*Barbonymus gonionotus*	1	
Prochilodontidae	*Prochilodus argenteus*	1	
3		**3**	
Ariidae	*Neoarius utarus*	1	
Cyprinidae	*Barbonymus gonionotus*	1	
Prochilodontidae	*Prochilodus argenteus*	1	
3.5		**4**	
Ariidae	*Brustiarius solidus*	1	
	Neoarius velutinus	1	
	Neoarius utarus	1	
Prochilodontidae	*Prochilodus argenteus*	1	
4		**2**	
Eleotridae	*Oxyeleotris heterodon*	1	
Prochilodontidae	*Prochilodus argenteus*	1	
TIS		**3**	
Ariidae	*Neoarius utarus*	1	
Eleotridae	*Oxyeleotris heterodon*	1	
Prochilodontidae	*Prochilodus argenteus*	1	
Site total		**20**	

*No weight data for this site

Site W36

Family	Species	Number of fish	Weight of fish (g)
1		**1**	**8.4**
Melanotaeniidae	*Chilatherina fasciata*	1	8.4
2		**1**	**200**
Cyprinidae	*Barbonymus gonionotus*	1	200
3		**1**	**273**
Cyprinidae	*Barbonymus gonionotus*	1	273
3.5		**1**	**483**
Ariidae	*Neoarius velutinus*	1	483
4		**2**	**1560**
Ariidae	*Neoarius velutinus*	1	880
	Neoarius utarus	1	680
5		**1**	**660**
Prochilodontidae	*Prochilodus argenteus*	1	660
6		**2**	**3528**
Characidae	*Prochilodus argenteus*	1	1520
Prochilodontidae	*Prochilodus argenteus*	1	2008
EL		**5**	**19.6**
Apogonidae	*Glossamia gjellerupi*	2	4.8
Hemiramphidae	*Zenarchopterus kampeni*	2	12.8
Melanotaeniidae	*Chilatherina fasciata*	1	2
SS		**1**	**2.7**
Melanotaeniidae	*Chilatherina fasciata*	1	2.7
Site total		**15**	**6734.7**

Site W38A

Family	Species	Number of fish	Weight of fish (g)
1		**1**	**7.4**
Cyprinidae	*Barbonymus gonionotus*	1	7.4
2.5		**2**	**427**
Cyprinidae	*Barbonymus gonionotus*	1	227
Prochilodontidae	*Prochilodus argenteus*	1	200
3		**1**	**238**
Prochilodontidae	*Prochilodus argenteus*	1	238
5		**1**	**880**
Prochilodontidae	*Prochilodus argenteus*	1	880
6		**1**	**1100**
Characidae	*Piaractus brachypomus*	1	1100
ANG		**2**	**2205**
Ariidae	*Neoarius velutinus*	1	585
	Neoarius utarus	1	1620

EL		**6**	**152.4**
Cyprinidae	*Barbonymus gonionotus*	2	140.9
Gobiidae	*Glossogobius bulmeri*	1	0.4
Hemiramphidae	*Zenarchopterus kampeni*	1	9.7
Melanotaeniidae	*Chilatherina fasciata*	2	1.4
Site total		**14**	**5009.8**

Site W50*

Family	Species	Number of fish
2		**1**
Prochilodontidae	*Prochilodus argenteus*	1
2.5		**2**
Cyprinidae	*Barbonymus gonionotus*	1
Prochilodontidae	*Prochilodus argenteus*	1
3		**3**
Ariidae	*Neoarius velutinus*	1
	Potamosilurus coatesi	1
Prochilodontidae	*Prochilodus argenteus*	1
3.5		**1**
Prochilodontidae	*Prochilodus argenteus*	1
4		**4**
Ariidae	*Neoarius velutinus*	1
	Neoarius coatesi	1
	Neoarius utarus	1
Prochilodontidae	*Prochilodus argenteus*	1
5		**1**
Characidae	*Piaractus brachypomus*	1
TIS		**4**
Ariidae	*Neoarius coatesi*	1
	Neoarius utarus	1
Characidae	*Piaractus brachypomus*	1
Prochilodontidae	*Prochilodus argenteus*	1
Site total		**16**

* No weight data for this site.

Site W51

Family	Species	Number of fish	Weight of fish (g)
1		**1**	**7**
Cyprinidae	*Barbonymus gonionotus*	1	7
1.5		**3**	**1268**
Clariidae	*Clarias batrachus*	1	167
Cyprinidae	*Barbonymus gonionotus*	1	1016
Prochilodontidae	*Prochilodus argenteus*	1	85
2		**1**	**55**
Prochilodontidae	*Prochilodus argenteus*	1	55
2.5		**2**	**832**
Ariidae	*Neoarius utarus*	1	686
Cyprinidae	*Barbonymus gonionotus*	1	146
3		**3**	**738**
Ariidae	*Neoarius utarus*	1	258
Cyprinidae	*Barbonymus gonionotus*	1	195
Prochilodontidae	*Prochilodus argenteus*	1	285
3.5		**1**	**1547**
Prochilodontidae	*Prochilodus argenteus*	1	1547
4		**1**	**818**
Prochilodontidae	*Prochilodus argenteus*	1	818
5		**1**	**1878**
Prochilodontidae	*Prochilodus argenteus*	1	1878
Site total		**13**	**7143**

Site W54

Family	Species	Number of fish	Weight of fish (g)
1		**3**	**118**
Cyprinidae	*Barbonymus gonionotus*	1	7
Hemiramphidae	*Zenarchopterus kampeni*	1	105
Melanotaeniidae	*Melanotaenia affinis*	1	6
2		**2**	**628**
Ariidae	*Neoarius utarus*	1	462
Prochilodontidae	*Prochilodus argenteus*	1	166
3		**2**	**518**
Ariidae	*Neoarius utarus*	1	189
Prochilodontidae	*Prochilodus argenteus*	1	329
3.5		**2**	**2672**
Ariidae	*Neoarius utarus*	1	327
Prochilodontidae	*Prochilodus argenteus*	1	2345
4		**1**	**1106**
Ariidae	*Neoarius utarus*	1	1106
6		**1**	**3820**

Ariidae	*Neoarius coatesi*	1	3820
Site total		**11**	**8862**

Site W64

Family	Species	Number of fish	Weight of fish (g)
1		**1**	**7.2**
Cyprinidae	*Barbonymus gonionotus*	1	7.2
1.5		**3**	**406.9**
Clariidae	*Clarias batrachus*	1	103
Cyprinidae	*Barbonymus gonionotus*	1	278.6
Prochilodontidae	*Prochilodus argenteus*	1	25.3
2		**3**	**443**
Ariidae	*Brustiarius solidus*	1	120
Cyprinidae	*Barbonymus gonionotus*	1	241
Plotosidae	*Neosilurus idenburgi*	1	82
2.5		**2**	**769**
Ariidae	*Brustiarius solidus*	1	376
Prochilodontidae	*Prochilodus argenteus*	1	393
3		**3**	**1221**
Ariidae	*Brustiarius solidus*	1	240
	Neoarius utarus	1	470
Prochilodontidae	*Prochilodus argenteus*	1	511
3.5		**2**	**1654**
Eleotridae	*Oxyeleotris heterodon*	1	1214
Prochilodontidae	*Prochilodus argenteus*	1	440
4		**2**	**2208**
Ariidae	*Neoarius utarus*	1	764
Prochilodontidae	*Prochilodus argenteus*	1	1444
5		**1**	**1114**
Ariidae	*Neoarius utarus*	1	1114
6		**1**	**1137**
Prochilodontidae	*Prochilodus argenteus*	1	1137
Site total		**18**	**8960.1**

Habitat type ORWB (Off River Water Bodies)

Site W26A

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**252**
Eleotridae	*Ophieleotris aporos*	1	83
	Oxyeleotris heterodon	1	169
2		**3**	**1033**
Ariidae	*Brustiarius nox*	1	390
Cyprinidae	*Barbonymus gonionotus*	1	402
Eleotridae	*Oxyeleotris heterodon*	1	241
2.5		**5**	**5799**
Ariidae	*Brustiarius nox*	1	1008
Cyprinidae	*Barbonymus gonionotus*	1	421
Eleotridae	*Ophieleotris aporos*	1	233
	Oxyeleotris heterodon	1	2690
Prochilodontidae	*Prochilodus argenteus*	1	1447
3		**2**	**3322**
Eleotridae	*Oxyeleotris heterodon*	1	289
Prochilodontidae	*Prochilodus argenteus*	1	3033
3.5		**3**	**2632**
Cyprinidae	*Barbonymus gonionotus*	1	661
Eleotridae	*Oxyeleotris heterodon*	1	613
Prochilodontidae	*Prochilodus argenteus*	1	1358
EL		**2**	**0.8**
Eleotridae	*Mogurnda nesolepis*	2	0.8
VIS		**1**	**9.3**
Cichlidae	*Oreochromis mossambica*	1	9.3
Site total		**18**	**13048.1**

Site W62

Family	Species	Number of fish	Weight of fish (g)
1		1	243.4
Cyprinidae	*Barbonymus gonionotus*	1	243.4
1.5		2	899
Cyprinidae	*Barbonymus gonionotus*	1	425
Eleotridae	*Oxyeleotris heterodon*	1	474
2		4	2493
Ariidae	*Brustiarius solidus*	1	87
Clariidae	*Clarias batrachus*	1	197
Cyprinidae	*Barbonymus gonionotus*	1	964
Eleotridae	*Oxyeleotris heterodon*	1	1245
2.5		4	2040
Ariidae	*Brustiarius solidus*	1	486
Cyprinidae	*Barbonymus gonionotus*	1	340
Eleotridae	*Oxyeleotris heterodon*	1	309
Prochilodontidae	*Prochilodus argenteus*	1	905
3		5	3685
Ariidae	*Brustiarius solidus*	1	510
Cichlidae	*Oreochromis mossambica*	1	151
Cyprinidae	*Barbonymus gonionotus*	1	1014
Eleotridae	*Oxyeleotris heterodon*	1	1575
Prochilodontidae	*Prochilodus argenteus*	1	435
3.5		3	2014
Characidae	*Piaractus brachypomus*	1	100
Eleotridae	*Oxyeleotris heterodon*	1	463
Prochilodontidae	*Prochilodus argenteus*	1	1451
4		2	1053
Eleotridae	*Oxyeleotris heterodon*	1	697
Prochilodontidae	*Prochilodus argenteus*	1	356
5		2	3616
Characidae	*Piaractus brachypomus*	1	2607
Prochilodontidae	*Prochilodus argenteus*	1	1009
TIS		5	5076
Ariidae	*Brustiarius solidus*	1	861
Characidae	*Piaractus brachypomus*	1	97
Cichlidae	*Oreochromis mossambica*	1	152
Eleotridae	*Oxyeleotris heterodon*	1	2167
Prochilodontidae	*Prochilodus argenteus*	1	1799
Site total		28	21119.4

Sampling period 2009

Habitat type ULC (Upland Creeks)

Site W17

Family	Species	Number of fish	Weight of fish (g)
EL		**3**	**10.8**
Melanotaeniidae	*Melanotaeniidae affins*	3	10.8
ES		**17**	**55.8**
Gobiidae	*Glossogobius bulmeri*	1	1.8
Melanotaeniidae	*Melanotaeniidae affins*	14	45.3
Terapontidae	*Hephaestus transmontanus*	2	8.7
Site total		**20**	**66.6**

Site W27

Family	Species	Number of fish	Weight of fish (g)
EL		**0**	**0**
NO CATCH		-	-
Site total		**0**	**0**

Site W43B

Family	Species	Number of fish	Weight of fish (g)
EL		**3**	**122**
Apogonidae	*Glossamia gjellerupi*	1	108.7
Gobiidae	***Glossogobius bulmeri***	**1**	**0.6**
Melanotaeniidae	*Melanotaeniidae affins*	1	12.7
VIS		2	-
Prochilodontidae	*Prochilodus argenteus*	1	-
Terapontidae	*Hephaestus transmontanus*	1	-
Site total		**5**	**122**

Site W48

Family	Species	Number of fish	Weight of fish (g)
EL		**0**	**0**
NO CATCH		-	-
Site total		**0**	**0**

Habitat type ULR (Upland River)

Site W07

Family	Species	Number of fish	Weight of fish (g)
EL		**39**	**506.9**
Apogonidae	*Glossamia gjellerupi*	9	435.5
Gobiidae	*Glossogobius bulmeri*	24	19.4
Melanotaeniidae	*Melanotaenidae* sp.	1	15.3
	Melanotaeniidae affins	4	6.6
Plotosidae	*Neosilurus gjellerupi*	1	30.1
ES		**6**	**116.2**
Clariidae	*Clarias batrachus*	1	100.1
Gobiidae	*Glossogobius bulmeri*	2	3.7
Melanotaeniidae	*Melanotaeniidae affins*	1	0.3
Terapontidae	*Hephaestus transmontanus*	2	12.1
Site total		**45**	**623.1**

Site W28

Family	Species	Number of fish	Weight of fish (g)
EL		**2**	**5.5**
Eleotridae	*Oxyeleotris fimbriata*	1	5.4
Gobiidae	*Glossogobius bulmeri*	1	0.1
Site total		**2**	**5.5**

Habitat type MCR (Mid Catchment Rivers)

Site W03

Family	Species	Number of fish	Weight of fish (g)
EL		**13**	**102**
Gobiidae	*Glossogobius bulmeri*	10	6.2
Melanotaeniidae	*Chilatherina fasciata*	2	12.6
Plotosidae	*Neosilurus gjellerupi*	1	83.2
ES		**15**	**558.6**
Clariidae	*Clarias batrachus*	1	123.3
Gobiidae	*Glossogobius bulmeri*	4	3.6
Melanotaeniidae	*Chilatherina fasciata*	2	30
	Melanotaeniidae affins	6	26.2
Plotosidae	*Neosilurus gjellerupi*	1	38
Prochilodontidae	*Prochilodus argenteus*	1	337.5
Site total		**28**	**660.6**

Site W04

Family	Species	Number of fish	Weight of fish (g)
1		**52**	**1034**
Ambassidae	*Parambassis confinis*	22	292
Ariidae	*Brustiarius nox*	6	463.2
Melanotaeniidae	*Chilatherina crassispinosa*	18	210.8
Terapontidae	*Hephaestus transmontanus*	6	68
1.5		**3**	**455.9**
Ambassidae	*Parambassis confinis*	1	65.1
Ariidae	*Brustiarius nox*	2	390.8
2		**1**	**95.8**
Ariidae	*Brustiarius nox*	1	95.8
EL		**20**	**51.5**
Eleotridae	*Oxyeleotris fimbriata*	1	7
Gobiidae	*Glossogobius bulmeri*	6	6.6
Melanotaeniidae	*Chilatherina crassispinosa*	11	17.1
Plotosidae	*Neosilurus gjellerupi*	1	5.4
Terapontidae	*Hephaestus transmontanus*	1	15.4
ES		**5**	**32.9**
Gobiidae	*Glossogobius bulmeri*	3	4.1
Melanotaeniidae	*Chilatherina crassispinosa*	1	9.7
Plotosidae	*Neosilurus gjellerupi*	1	19.1
PN		**4**	**1642.5**
Prochilodontidae	*Prochilodus argenteus*	4	1642.5
Site total		**85**	**3312.6**

Site W22

Family	Species	Number of fish	Weight of fish (g)
EL		**1**	**0.1**
Gobiidae	*Glossogobius bulmeri*	1	0.1
Site total		**1**	**0.1**

Site W23

Family	Species	Number of fish	Weight of fish (g)
2			
NO CATCH		-	-
5			
NO CATCH		-	-
1		**3**	**24.1**
Melanotaeniidae	*Chilatherina crassispinosa*	3	24.1
1.5		**1**	**19.4**
Melanotaeniidae	*Chilatherina crassispinosa*	1	19.4
2.5		**2**	**349.3**
Cyprinidae	*Barbonymus gonionotus*	1	154
Prochilodontidae	*Prochilodus argenteus*	1	195.3
3		**1**	**322.3**
Prochilodontidae	*Prochilodus argenteus*	1	322.3
3.5		**1**	**261.6**
Prochilodontidae	*Prochilodus argenteus*	1	261.6
4		**1**	**614**
Prochilodontidae	*Prochilodus argenteus*	1	614
CL			
NO CATCH		-	-
Site total		**9**	**1590.7**

Site W29B

Family	Species	Number of fish	Weight of fish (g)
EL		**30**	**136.3**
Apogonidae	*Glossamia gjellerupi*	2	5.9
Gobiidae	*Glossogobius bulmeri*	3	3.7
Melanotaeniidae	*Chilatherina crassispinosa*	1	9.2
	Chilatherina fasciata	2	24.9
	Melanotaenidae sp.	1	0.1
	Melanotaeniidae affins	21	92.5
ES		**14**	**104.2**
Apogonidae	*Glossamia gjellerupi*	3	49.7
Melanotaeniidae	*Chilatherina crassispinosa*	3	24
	Chilatherina fasciata	1	8.6
	Melanotaeniidae affins	7	21.9
Site total		**44**	**240.5**

Habitat type LLR (Lowland Rivers)

Site W31B

Family	Species	Number of fish	Weight of fish (g)
1		**8**	**65.5**
Ambassidae	*Parambassis confinis*	8	65.5
1.5		**2**	**19.2**
Ambassidae	*Parambassis confinis*	1	7.1
Apogonidae	*Glossamia gjellerupi*	1	12.1
FY		**6**	**18.5**
Hemiramphidae	*Zenarchopterus kampeni*	2	16.5
Melanotaeniidae	*Chilatherina crassispinosa*	4	2
PN		**1**	**1343**
Cyprinidae	*Barbonymus gonionotus*	1	1343
Site total		**17**	**1446.2**

Site W33

Family	Species	Number of fish	Weight of fish (g)
1			
NO CATCH		-	-
1.5		**-**	**-**
NO CATCH		-	-
6		**-**	**-**
NO CATCH		-	-
2		**1**	**105**
Cyprinidae	*Barbonymus gonionotus*	1	105
2.5		**1**	**64**
Cyprinidae	*Barbonymus gonionotus*	1	64
3		**2**	**397.6**
Ariidae	*Brustiarius nox*	1	205.6
Cyprinidae	*Barbonymus gonionotus*	1	192
3.5		**2**	**520**
Cyprinidae	*Barbonymus gonionotus*	2	520
4		**2**	**1003**
Cyprinidae	*Barbonymus gonionotus*	2	1003
5		**1**	**2245**
Characidae	*Piaractus brachypomus*	1	2245
CL			
NO CATCH		-	-
Site total		**9**	**4334.6**

Site W35

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**13**
Ariidae	*Neoarius velutinus*	2	13
1.5		**16**	**428.3**
Cyprinidae	*Barbonymus gonionotus*	16	428.3
2		**1**	**237.9**
Ariidae	*Neoarius velutinus*	1	237.9
2.5		**10**	**1123.6**
Ariidae	*Neoarius velutinus*	7	865.5
Cyprinidae	*Barbonymus gonionotus*	3	258.1
3		**2**	**541.6**
Ariidae	*Neoarius velutinus*	1	378.3
Prochilodontidae	*Prochilodus argenteus*	1	163.3
3.5		**8**	**3913.5**
Ariidae	*Neoarius velutinus*	2	711.3
Characidae	*Piaractus brachypomus*	1	1669
Cyprinidae	*Barbonymus gonionotus*	3	932.4
Prochilodontidae	*Prochilodus argenteus*	2	600.8
4		**5**	**2582.9**
Ariidae	*Neoarius velutinus*	1	686
Cyprinidae	*Barbonymus gonionotus*	1	333.6
Prochilodontidae	*Prochilodus argenteus*	3	1563.3
5		**1**	**3632**
Ariidae	*Neoarius velutinus*	1	3632
6		**2**	**2381**
Ariidae	*Neoarius velutinus*	1	1425
Characidae	*Piaractus brachypomus*	1	956
CL		**1**	**96.3**
Eleotridae	*Oxyeleotris heterodon*	1	96.3
VIS			
Hemiramphidae	*Zenarchopterus kampeni*		
Site total		**48**	**14950.1**

Site W36

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**53.1**
Cyprinidae	*Barbonymus gonionotus*	2	53.1
1.5		**1**	**45.2**
Cyprinidae	*Barbonymus gonionotus*	1	45.2
2.5		**5**	**554.6**
Ariidae	*Neoarius velutinus*	3	384.1
Cyprinidae	*Barbonymus gonionotus*	2	170.5
3.5		**1**	**480**
Prochilodontidae	*Prochilodus argenteus*	1	480
4		**2**	**1038**
Cyprinidae	*Barbonymus gonionotus*	1	460
Prochilodontidae	*Prochilodus argenteus*	1	578
5		**3**	**2936**
Characidae	*Piaractus brachypomus*	1	1311
Prochilodontidae	*Prochilodus argenteus*	2	1625
CL			
NO CATCH		-	-
Site total		**14**	**5106.9**

Site W54

Family	Species	Number of fish	Weight of fish (g)
3.5		**5**	**205**
Cyprinidae	*Barbonymus gonionotus*	5	205
4		**1**	**376**
Prochilodontidae	*Prochilodus argenteus*	1	376
5		**1**	**605**
Prochilodontidae	*Prochilodus argenteus*	1	605
CL			
NO CATCH		-	-
Site total		**7**	**1186**

Habitat type ORWB (Off River Water Bodies)

Site RORWB

Family	Species	Number of fish	Weight of fish (g)
1.5			
NO CATCH		-	-
2			
NO CATCH		-	-
3.5			
NO CATCH		-	-
4			
NO CATCH		-	-
5			
NO CATCH		-	-
6			
NO CATCH		-	-
1		**1**	**14.7**
Eleotridae	*Ophieleotris aporos*	1	14.7
2.5		**1**	**97.4**
Clariidae	*Clarias batrachus*	1	97.4
3		**1**	**162.5**
Prochilodontidae	*Prochilodus argenteus*	1	162.5
Site total		**3**	**274.6**

Site W26A

Family	Species	Number of fish	Weight of fish (g)
6			
NO CATCH			
1		**18**	**120.5**
Cyprinidae	*Barbonymus gonionotus*	18	120.5
1.5		**12**	**328.6**
Cyprinidae	*Barbonymus gonionotus*	12	328.6
2		**6**	**809.1**
Cyprinidae	*Barbonymus gonionotus*	5	685.9
Prochilodontidae	*Prochilodus argenteus*	1	123.2
2.5		**10**	**2900.9**
Characidae	*Piaractus brachypomus*	1	1753
Cyprinidae	*Barbonymus gonionotus*	7	867.5
Prochilodontidae	*Prochilodus argenteus*	2	280.4
3		**30**	**5711.2**
Eleotridae	*Oxyeleotris heterodon*	1	365
Prochilodontidae	*Prochilodus argenteus*	29	5346.2
3.5		**13**	**3825.2**
Ariidae	*Brustiarius nox*	1	324.2
Eleotridae	*Oxyeleotris heterodon*	1	533.4
Prochilodontidae	*Prochilodus argenteus*	11	2967.6
4		**11**	**5055.2**
Ariidae	*Brustiarius nox*	1	507.4
Characidae	*Piaractus brachypomus*	2	1617.5
Cyprinidae	*Barbonymus gonionotus*	1	170.5
Prochilodontidae	*Prochilodus argenteus*	7	2759.8
5		**2**	**2120**
Characidae	*Piaractus brachypomus*	2	2120
CL			
NO CATCH		-	-
Site total		**102**	**20870.7**

Sampling Data for 2010

Habitat type ULC (Upland Creeks)

Site W43B

Family	Species	Number of fish	Weight of fish (g)
EL		**1**	**0.4**
Gobiidae	*Glossogobius coatesi*	1	0.4
Site total		**1**	**0.4**

Site W27

Family	Species	Number of fish	Weight of fish (g)
EL		**0**	**0**
	NO CATCH	-	-
Site total		**0**	**0**

Habitat type ULR (Upland Rivers)

Site W07

Family	Species	Number of fish	Weight of fish (g)
ES		**4**	**7.1**
Apogonidae	*Glossamia gjellerupi*	2	2.6
Gobiidae	*Glossogobius coatesi*	2	4.5
Site total		**4**	**7.1**

Site W102

Family	Species	Number of fish	Weight of fish (g)
EL		**1**	**1.1**
Gobiidae	*Glossogobius coatesi*	1	1.1
Site total		**1**	**1.1**

Site W29B

Family	Species	Number of fish	Weight of fish (g)
EL		**4**	**16.2**
Apogonidae	*Glossamia gjellerupi*	2	10.2
Gobiidae	*Glossogobius coatesi*	2	6
Site total		**4**	**16.2**

Habitat type MCR (Mid Catchment Rivers)

Site W03

Family	Species	Number of fish	Weight of fish (g)
ES		**5**	**13.4**
Gobiidae	*Glossogobius coatesi*	3	4.6
Melanotaeniidae	*Chilatherina crassispinosa*	1	8.7
	Melanotaenia affinis	1	0.1
Site total		**5**	**13.4**

Site W04

Family	Species	Number of fish	Weight of fish (g)
1		**3**	**432**
Ariidae	*Neoarius velutinus*	1	397
Melanotaeniidae	*Chilaterina crassispinosa*	2	35
1.5		**1**	**57**
Ariidae	*Neoarius velutinus*	1	57
4		**2**	**1395**
Ariidae	*Neoarius velutinus*	1	473
Cyprinidae	*Barbonymus gonionotus*	1	922
ES		**2**	**0.9**
Apogonidae	*Glossamia gjellerupi*	1	0.8
Gobiidae	*Glossogobius coatesi*	1	0.1
PN		**1**	**235**
Prochilodontidae	*Prochilodus argenteus*	1	235
Site total		**9**	**2119.9**

Site W114

Family	Species	Number of fish	Weight of fish (g)
EL		**4**	**85**
Apogonidae	*Glossamia gjellerupi*	1	39.2
Melanotaeniidae	*Chilatherina crassispinosa*	3	45.8
Site total		**4**	**85**

Site W115

Family	Species	Number of fish	Weight of fish (g)
EL		**15**	**284.7**
Apogonidae	*Glossamia gjellerupi*	1	6.7
Eleotridae	*Mogurnda aurofodinae*	3	150
Gobiidae	*Glossogobius coatesi*	1	0.9
Melanotaeniidae	*Chilatherina crassispinosa*	2	8.2
	Chilatherina fasciata	3	82.3
	Melanotaenia affinis	5	36.6
Site total		**15**	**284.7**

Site W23

Family	Species	Number of fish	Weight of fish (g)
25		**3**	**339.9**
Apogonidae	*Glossamia gjellerupi*	1	32.7
Cyprinidae	*Barbonymus gonionotus*	1	186.7
Melanotaeniidae	*Chilatherina* sp A	1	120.5
PN		**3**	**2814.4**
Characidae	*Piaractus brachypomus*	1	503.5
Cyprinidae	*Barbonymus gonionotus*	1	337.6
Prochilodontidae	*Prochilodus argenteus*	1	1973.3
Site total		**6**	**3154.3**

Habitat type LLR (Lowland Rivers)

Site W31B

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**28.2**
Ambassidae	*Ambassis* sp.	1	18.1
Melanotaeniidae	*Chilatherina crassispinosa*	1	10.1
1.5		**2**	**324.3**
Cyprinidae	*Barbonymus gonionotus*	2	324.3
2		**5**	**853.1**
Ariidae	*Neoarius velutinus*	1	140.1
Characidae	*Piaractus brachypomus*	1	514.5
Cyprinidae	*Barbonymus gonionotus*	2	148.3
Prochilodontidae	*Prochilodus argenteus*	1	50.2
3		**3**	**3080.3**
Characidae	*Piaractus brachypomus*	1	1554
Cyprinidae	*Barbonymus gonionotus*	1	1231.3
Prochilodontidae	*Prochilodus argenteus*	1	295
4		**3**	**3368.3**
Characidae	*Piaractus brachypomus*	2	2206.7
Cyprinidae	*Barbonymus gonionotus*	1	1161.6
5		**1**	**886**
Cyprinidae	*Barbonymus gonionotus*	1	886
6		**2**	**9070.7**
Characidae	*Piaractus brachypomus*	1	7291.7
Prochilodontidae	*Prochilodus argenteus*	1	1779
PN		**2**	**2135**
Characidae	*Piaractus brachypomus*	1	1877
Cyprinidae	*Barbonymus gonionotus*	1	258
Site total		**20**	**19745.9**

Site W33

Family	Species	Number of fish	Weight of fish (g)
2.5		**1**	**249.8**
Characidae	*Piaractus brachypomus*	1	249.8
Site total		**1**	**249.8**

Site W34

Family	Species	Number of fish	Weight of fish (g)
13		**1**	**394**
Cyprinidae	*Barbonymus gonionotus*	1	394
2		**1**	**500.9**
Cyprinidae	*Barbonymus gonionotus*	1	500.9
2.5		**2**	**1031.6**
Cyprinidae	*Barbonymus gonionotus*	1	918
Prochilodontidae	*Prochilodus argenteus*	1	113.6
3		**2**	**891.7**
Cyprinidae	*Barbonymus gonionotus*	1	477.1
Prochilodontidae	*Prochilodus argenteus*	1	414.6
3.5		**2**	**2040.8**
Cyprinidae	*Barbonymus gonionotus*	1	1531
Eleotridae	*Oxyeleotris heterodon*	1	509.8
4		**2**	**1604.2**
Cyprinidae	*Barbonymus gonionotus*	1	441.9
Prochilodontidae	*Prochilodus argenteus*	1	1162.3
Site total		**10**	**6463.2**

Site W35

Family	Species	Number of fish	Weight of fish (g)
1.5		**2**	**231**
Cyprinidae	*Barbonymus gonionotus*	1	189
Hemiramphidae	*Zenarchopterus kampeni*	1	42
13		**1**	**704**
Cyprinidae	*Barbonymus gonionotus*	1	704
19		**7**	**2314.6**
Clariidae	*Clarias batrachus*	1	113
Characidae	*Piaractus brachypomus*	2	914
Cyprinidae	*Barbonymus gonionotus*	3	1153.6
Prochilodontidae	*Prochilodus argenteus*	1	134
25		**2**	**6499**
Cyprinidae	*Barbonymus gonionotus*	1	4092
Prochilodontidae	*Prochilodus argenteus*	1	2407
PN		**5**	**4447**
Characidae	*Piaractus brachypomus*	1	505
Cyprinidae	*Barbonymus gonionotus*	2	3092
Prochilodontidae	*Prochilodus argenteus*	2	850
Site total		**17**	**14195.6**

Site W36

Family	Species	Number of fish	Weight of fish (g)
2.5		**1**	**4216.9**
Cyprinidae	*Barbonymus gonionotus*	1	4216.9
Site total		**1**	**4216.9**

Site W38A

Family	Species	Number of fish	Weight of fish (g)
13		**1**	**25.9**
Hemiramphidae	*Zenarchopterus kampeni*	1	25.9
Site total		**1**	**25.9**

Site W41

Family	Species	Number of fish	Weight of fish (g)
25		**1**	**2084.1**
Prochilodontidae	*Prochilodus argenteus*	1	2084.1
Site total		**1**	**2084.1**

Site W60

Family	Species	Number of fish	Weight of fish (g)
13		**2**	**359.9**
Hemiramphidae	*Zenarchopterus kampeni*	1	22.4
Prochilodontidae	*Prochilodus argenteus*	1	337.5
19		**5**	**8637**
Ariidae	*Brustiarius nox*	1	2319
	Neoarius velutinus	1	270.6
Characidae	*Piaractus brachypomus*	1	1895.7
Cyprinidae	*Barbonymus gonionotus*	1	3418.8
Prochilodontidae	*Prochilodus argenteus*	1	732.9
2		**1**	**239.9**
Prochilodontidae	*Prochilodus argenteus*	1	239.9
25		**3**	**3375.7**
Characidae	*Piaractus brachypomus*	1	1325.8
Cyprinidae	*Barbonymus gonionotus*	1	366.7
Prochilodontidae	*Prochilodus argenteus*	1	1683.2
3.5		**3**	**5552.1**
Ariidae	*Brustiarius nox*	1	459.8
Cyprinidae	*Barbonymus gonionotus*	1	2625.2
Prochilodontidae	*Prochilodus argenteus*	1	2467.1
4		**5**	**11873.6**
Ariidae	*Brustiarius nox*	1	620.7
	Neoarius velutinus	1	1609.5
Characidae	*Piaractus brachypomus*	1	2343.1
Cyprinidae	*Barbonymus gonionotus*	1	4438.9
Prochilodontidae	*Prochilodus argenteus*	1	2861.4
6		**1**	**1096.1**
Characidae	*Piaractus brachypomus*	1	1096.1
PN		**5**	**24921.5**
Ariidae	*Brustiarius nox*	1	11104.8
	Neoarius velutinus	1	2969.1
Characidae	*Piaractus brachypomus*	1	6274.9
Cyprinidae	*Barbonymus gonionotus*	1	1762.2
Prochilodontidae	*Prochilodus argenteus*	1	2810.5
Site total		**25**	**56055.8**

Site W61

Family	Species	Number of fish	Weight of fish (g)
13		**1**	**168**
Cyprinidae	*Barbonymus gonionotus*	1	168
19		**1**	**99**
Cyprinidae	*Barbonymus gonionotus*	1	99
25		**1**	**164**
Cyprinidae	*Barbonymus gonionotus*	1	164
3.5		**3**	**3137**
Ariidae	*Brustiarius nox*	1	691
Cyprinidae	*Barbonymus gonionotus*	1	714
Prochilodontidae	*Prochilodus argenteus*	1	1732
4		**1**	**476.6**
Cyprinidae	*Barbonymus gonionotus*	1	476.6
6		**1**	**1045**
Characidae	*Piaractus brachypomus*	1	1045
PN		**1**	**404**
Cyprinidae	*Barbonymus gonionotus*	1	404
Site total		**9**	**5493.6**

Site W63

Family	Species	Number of fish	Weight of fish (g)
13		**1**	**214**
Prochilodontidae	*Prochilodus argenteus*	1	214
3		**3**	**4690**
Ariidae	*Brustiarius nox*	1	423
Cyprinidae	*Barbonymus gonionotus*	1	2143
Prochilodontidae	*Prochilodus argenteus*	1	2124
3.5		**4**	**5253**
Ariidae	*Brustiarius nox*	1	1844
Characidae	*Piaractus brachypomus*	1	603
Cyprinidae	*Barbonymus gonionotus*	1	1999
Prochilodontidae	*Prochilodus argenteus*	1	807
4		**4**	**12425**
Ariidae	*Brustiarius nox*	1	2354
Characidae	*Piaractus brachypomus*	1	839
Cyprinidae	*Barbonymus gonionotus*	1	4681
Prochilodontidae	*Prochilodus argenteus*	1	4551
Site total		**12**	**22582**

Site W64

Family	Species	Number of fish	Weight of fish (g)
13		**5**	**109.9**
Ambassidae	*Ambassis interuptus*	1	0.7
Ariidae	*Brustiarius nox*	1	9.8
Eleotridae	*Ophieleotris aporos*	1	15.3
Gobiidae	*Sicyopterus longifilis*	1	55.7
Hemiramphidae	*Zenarchopterus kampeni*	1	28.4
3.5		**1**	**245**
Prochilodontidae	*Prochilodus argenteus*	1	245
6		**1**	**3696**
Characidae	*Piaractus brachypomus*	1	3696
CL		**1**	**2.7**
Ariidae	*Ariidae* sp. (Juvenile catfish)	1	2.7
Site total		**8**	**4053.6**

Site W70

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**44.7**
Hemiramphidae	*Zenarchopterus kampeni*	2	44.7
1.5		**1**	**37.6**
Apogonidae	*Glossamia gjellerupi*	1	37.6
2		**2**	**1200**
Apogonidae	*Glossamia gjellerupi*	1	42
Prochilodontidae	*Prochilodus argenteus*	1	1158
3		**2**	**2214**
Ariidae	*Neoarius velutinus*	1	2012
Prochilodontidae	*Prochilodus argenteus*	1	202
4		**4**	**3417**
Ariidae	*Neoarius velutinus*	1	520
Characidae	*Piaractus brachypomus*	1	1212
Cyprinidae	*Barbonymus gonionotus*	1	300
Prochilodontidae	*Prochilodus argenteus*	1	1385
5		**4**	**18641.1**
Characidae	*Piaractus brachypomus*	2	15977.1
Prochilodontidae	*Prochilodus argenteus*	2	2664
6		**4**	**22808**
Ariidae	*Neoarius coatesi*	1	2625
Characidae	*Piaractus brachypomus*	1	18514
Cyprinidae	*Cyprinus carpio*	1	1248
Megalopidae	*Megalops cyprinoides*	1	421
PN		**2**	**2879**
Ariidae	*Neoarius velutinus*	1	745
Characidae	*Piaractus brachypomus*	1	2134
Site total		**21**	**51241.4**

Habitat type ORWB (Off River Water Bodies)

Site RORWB

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**275**
Cyprinidae	*Barbonymus gonionotus*	1	258.9
Eleotridae	*Oxyeleotris heterodon*	1	16.1
1.5		**2**	**814.8**
Cyprinidae	*Barbonymus gonionotus*	1	49.3
Eleotridae	*Oxyeleotris heterodon*	1	765.5
2		**5**	**10346.3**
Ariidae	*Brustiarius nox*	1	1360.3
Cyprinidae	*Barbonymus gonionotus*	1	3197.9
Eleotridae	*Ophieleotris aporos*	1	623.5
	Oxyeleotris heterodon	1	3620.6
Prochilodontidae	*Prochilodus argenteus*	1	1544
2.5		**3**	**1153.7**
Cyprinidae	*Barbonymus gonionotus*	1	380.8
Eleotridae	*Oxyeleotris heterodon*	1	449.4
Prochilodontidae	*Prochilodus argenteus*	1	323.5
3		**4**	**4468.2**
Ariidae	*Brustiarius nox*	1	1615.7
Cyprinidae	*Barbonymus gonionotus*	1	738.2
Eleotridae	*Oxyeleotris heterodon*	1	613.7
Prochilodontidae	*Prochilodus argenteus*	1	1500.6
3.5		**4**	**5628.6**
Ariidae	*Brustiarius solidus*	1	1085.7
Cyprinidae	*Barbonymus gonionotus*	1	1252.1
Eleotridae	*Oxyeleotris heterodon*	1	624.7
Prochilodontidae	*Prochilodus argenteus*	1	2666.1
4		**2**	**4458.3**
Characidae	*Piaractus brachypomus*	1	3796.5
Eleotridae	*Oxyeleotris heterodon*	1	661.8
5		**1**	**1406.7**
Prochilodontidae	*Prochilodus argenteus*	1	1406.7
6		**2**	**7221.6**
Characidae	*Piaractus brachypomus*	1	5378.6
Eleotridae	*Oxyeleotris heterodon*	1	1843
Site total		**25**	**35773.2**

Site W26A

Family	Species	Number of fish	Weight of fish (g)
1		**1**	**487.6**
Eleotridae	*Oxyeleotris heterodon*	1	487.6
1.5		**5**	**1178.3**
Ariidae	*Brustiarius nox*	1	106.6
Cyprinidae	*Barbonymus gonionotus*	1	698
Eleotridae	*Ophieleotris aporos*	1	60.7
	Oxyeleotris heterodon	1	264.4
Prochilodontidae	*Prochilodus argenteus*	1	48.6
2		**5**	**6851.9**
Ariidae	*Brustiarius solidus*	1	477.9
Cyprinidae	*Barbonymus gonionotus*	1	3731.4
Eleotridae	*Ophieleotris aporos*	1	191
	Oxyeleotris heterodon	1	1808.4
Prochilodontidae	*Prochilodus argenteus*	1	643.2
2.5		**5**	**8430.8**
Ariidae		2	1366.6
Brustiarius nox	*Brustiarius solidus*	1	658.5
Cyprinidae	*Barbonymus gonionotus*	1	3605.6
Eleotridae	*Oxyeleotris heterodon*	1	2879.4
Prochilodontidae	*Prochilodus argenteus*	1	579.2
3		**2**	**5192.1**
Cyprinidae	*Barbonymus gonionotus*	1	1999.8
Prochilodontidae	*Prochilodus argenteus*	1	3192.3
3.5		**5**	**9577.5**
Ariidae	*Brustiarius nox*	1	182.6
	Brustiarius solidus	1	1080.2
Cyprinidae	*Barbonymus gonionotus*	1	419.5
Eleotridae	*Oxyeleotris heterodon*	1	2950.6
Prochilodontidae	*Prochilodus argenteus*	1	4944.6
4		**5**	**7615.9**
Ariidae	*Brustiarius solidus*	1	2093.4
Characidae	*Piaractus brachypomus*	1	1621.8
Cyprinidae	*Cyprinus carpio*	1	613.6
Eleotridae	*Oxyeleotris heterodon*	1	1161.7
Prochilodontidae	*Prochilodus argenteus*	1	2125.4
5		**2**	**2542.7**
Characidae	*Piaractus brachypomus*	1	1356.3
Eleotridae	*Oxyeleotris heterodon*	1	1186.4
Site total		**30**	**41876.8**

Site W62

Family	Species	Number of fish	Weight of fish (g)
1		**2**	**59.6**
Cyprinidae	*Barbonymus gonionotus*	1	22.9
Eleotridae	*Oxyeleotris heterodon*	1	36.7
1.5		**3**	**615.4**
Ariidae	*Brustiarius nox*	1	272.3
Cyprinidae	*Barbonymus gonionotus*	1	213
Eleotridae	*Oxyeleotris heterodon*	1	130.1
13		**2**	**518.7**
Cyprinidae	*Barbonymus gonionotus*	1	441.6
Hemiramphidae	*Zenarchopterus kampeni*	1	77.1
2		**3**	**4593.1**
Ariidae	*Neoarius utarus*	1	162.3
Cyprinidae	*Barbonymus gonionotus*	1	3744.9
Prochilodontidae	*Prochilodus argenteus*	1	685.9
2.5		**3**	**5560.2**
Cyprinidae	*Barbonymus gonionotus*	1	3348.4
Eleotridae	*Oxyeleotris heterodon*	1	456.7
Prochilodontidae	*Prochilodus argenteus*	1	1755.1
3		**3**	**7117.2**
Ariidae	*Brustiarius solidus*	1	251
Cyprinidae	*Barbonymus gonionotus*	1	1176.6
Prochilodontidae	*Prochilodus argenteus*	1	5689.6
3.5		**2**	**2754.4**
Cyprinidae	*Barbonymus gonionotus*	1	912.4
Prochilodontidae	*Prochilodus argenteus*	1	1842
4		**3**	**5932.3**
Characidae	*Piaractus brachypomus*	1	209.5
Cyprinidae	*Barbonymus gonionotus*	1	928.9
Prochilodontidae	*Prochilodus argenteus*	1	4793.9
4.5		**1**	**11756.6**
Prochilodontidae	*Prochilodus argenteus*	1	11756.6
5		**3**	**5069**
Cyprinidae	*Barbonymus gonionotus*	1	669
	Cyprinus carpio	1	1168
Prochilodontidae	*Prochilodus argenteus*	1	3232
PN		**3**	**7815.7**
Characidae	*Piaractus brachypomus*	1	416.8
Cyprinidae	*Barbonymus gonionotus*	1	2684.6
Prochilodontidae	*Prochilodus argenteus*	1	4714.3
Site total		**28**	**51792.2**

Table D-7 Macrocrustacean Raw Data

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2008/2009	W51	LLR	Palaemonidae	Macrobrachium sp.	xx	xx
2008/2009	W51	LLR	Palaemonidae	Macrobrachium sp.	xx	xx
2008/2009	W64	LLR	Palaemonidae	Macrobrachium weberi	1.85	3.8
2008/2009	W43b	ULC	Atyidae	Caridina	0.8	<0.1
2008/2009	W23	MCR	Palaemonidae	Macrobrachium latidactylus	8.5	1.2
2008/2009	W23	MCR	Palaemonidae	Macrobrachium latidactylus	10.5	1.2
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	12	0.9
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	11.2	1.1
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	10.2	1.1
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	8	1.7
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	7	1
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	11.8	1.3
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	9	1
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	10	8.9
2008/2009	W22	MCR	Palaemonidae	Macrobrachium latidactylus	9.8	1
2008/2009	W36	LLR	Palaemonidae	Macrobrachium rosenbergii	15.5	8.9
2008/2009	W36	LLR	Palaemonidae	Macrobrachium rosenbergii	12.5	3.8
2008/2009	W36	LLR	Palaemonidae	Macrobrachium weberi	6	0.5
2008/2009	W36	LLR	Palaemonidae	Macrobachium weberi	11	0.9
2008/2009	W36	LLR	Palaemonidae	Macrobrachium weberi	12	2.9
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	13.2	1.5
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	7.9	0.5
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	7.2	0.2
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	5.8	0.1
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	5	0.2
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	4.3	0.1
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	9.5	0.6
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	6.5	0.3
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	8.2	0.5
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	8.2	0.3
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	7.2	0.4
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	4.8	0.2
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	3.5	0.1
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	6.1	0.3
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	5.2	0.2
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	3.8	0.1
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	5.5	0.2
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W38a	LLR	Palaemonidae	Macrobrachium weberi	xx	xx
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	31	11.9
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	5	<0.1
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	2	<0.1
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	1	<0.1
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	3	<0.1
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	2	<0.1
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp. (juv)	4	0.2
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium weberi	8	0.6
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp.	xx	xx
2008/2009	W31B	LLR	Palaemonidae	Macrobrachium sp.	xx	xx
2009	W03	MCR	Palaemonidae	Macrobrachium latidactylus	3	xx
2009	W03	MCR	Palaemonidae	Macrobrachium latidactylus	4	xx
2009	W04	MCR	Palaemonidae	Macrobrachium latidactylus	11.9	1.8
2009	W04	MCR	Palaemonidae	Macrobrachium latidactylus	19.6	3.5
2009	W04	MCR	Palaemonidae	Macrobrachium latidactylus	22.3	11.5
2009	W04	MCR	Palaemonidae	Macrobrachium latidactylus	23.7	7.6
2009	W04	MCR	Palaemonidae	Macrobrachium latidactylus	25.4	10.6
2009	W07	ULR	Palaemonidae	Macrobrachium sp.	9.5	0.9
2009	W07	ULR	Palaemonidae	Macrobrachium sp.	10	0.9
2009	W07	ULR	Palaemonidae	Macrobrachium sp.	13.3	2.2
2009	W07	ULR	Palaemonidae	Macrobrachium sp.	14	2.3
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	1.4	1.5

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	21	7.4
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	25.5	4.2
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	20.8	3.2
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	21.7	7.9
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	22.2	7.6
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	23	7.8
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	23.1	13.2
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	23.3	12.3
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	23.4	7.9
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	24.6	10.8
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	27.2	16
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	27.8	18.5
2009	W102	ULR	Palaemonidae	Macrobrachium sp.	29.5	18.9
2009	W114	MCR	Atyidae	Caridina cf laoagensis	4	0.1
2009	W114	MCR	Atyidae	Caridina cf laoagensis	4.7	0.3
2009	W114	MCR	Atyidae	Caridina cf laoagensis	4.9	0.2
2009	W114	MCR	Atyidae	Caridina cf laoagensis	5	0.1
2009	W114	MCR	Atyidae	Caridina cf laoagensis	5	0.2
2009	W114	MCR	Atyidae	Caridina cf laoagensis	5	0.3
2009	W114	MCR	Atyidae	Caridina cf laoagensis	5.6	0.3
2009	W114	MCR	Atyidae	Caridina sp 2	6.5	0.3
2009	W114	MCR	Atyidae	Caridina sp.	2.8	0
2009	W114	MCR	Atyidae	Caridina sp.	3.5	0.2
2009	W114	MCR	Atyidae	Caridina sp.	4	0.3
2009	W114	MCR	Atyidae	Caridina sp.	4.3	0.3
2009	W114	MCR	Atyidae	Caridina sp.	4.9	0.1
2009	W114	MCR	Atyidae	Caridina sp.	4.9	0.2
2009	W114	MCR	Atyidae	Caridina sp.	4.9	0.3
2009	W114	MCR	Atyidae	Caridina sp.	4.9	0.5
2009	W114	MCR	Atyidae	Caridina sp.	5	0.3
2009	W114	MCR	Atyidae	Caridina sp.	5	0.6
2009	W114	MCR	Atyidae	Caridina sp.	5.1	0.2
2009	W114	MCR	Atyidae	Caridina sp.	5.2	0.2
2009	W114	MCR	Atyidae	Caridina sp.	5.3	0.4
2009	W114	MCR	Atyidae	Caridina sp.	5.4	0.3
2009	W114	MCR	Atyidae	Caridina sp.	5.7	0.5
2009	W114	MCR	Atyidae	Caridina sp.	5.8	0.6
2009	W114	MCR	Atyidae	Caridina sp.	5.9	0.2
2009	W114	MCR	Atyidae	Caridina sp.	5.9	0.4

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2009	W114	MCR	Atyidae	Caridina sp.	6	0.3
2009	W114	MCR	Atyidae	Caridina sp.	6.3	0.6
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	2.5	0.2
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	2.6	0
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	4.2	0.1
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	4.3	0.1
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	5.2	0.1
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	6.9	0.6
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	7.7	0.3
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	7.7	0.6
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	9	0.8
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	10.4	0.7
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	10.5	2
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	12	2.7
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	13	2.8
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	13.4	3.2
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	15	3.5
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	15.7	4.2
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	15.8	4.7
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	16	4.4
2009	W114	MCR	Palaemonidae	Macrobrachium bariense	16.3	4.6
2009	W23	MCR	Palaemonidae	Macrobrachium latidactylus	11.9	3.8
2009	W23	MCR	Palaemonidae	Macrobrachium latidactylus	27.3	15.1
2009	W23	MCR	Palaemonidae	Macrobrachium latidactylus	28.7	16.9
2009	W26A	ORWB	Palaemonidae	Macrobrachium latidactylus	7.5	0.5
2009	W26A	ORWB	Palaemonidae	Macrobrachium latidactylus	8.7	1
2009	W26A	ORWB	Palaemonidae	Macrobrachium latidactylus	11.9	4.7
2009	W26A	ORWB	Palaemonidae	Macrobrachium latidactylus	12	5.5
2009	W26A	ORWB	Palaemonidae	Macrobrachium latidactylus	12.9	5.4
2009	W27	ULC	Palaemonidae	Macrobrachium sp.	17.2	3.5
2009	W27	ULC	Palaemonidae	Macrobrachium sp.	21.2	12.2
2009	W27	ULC	Palaemonidae	Macrobrachium sp.	22	14.4
2009	W33	LLR	Palaemonidae	Macrobrachium latidactylus	26	12.2
2009	W33	LLR	Palaemonidae	Macrobrachium latidactylus	28.3	19.5
2009	W33	LLR	Palaemonidae	Macrobrachium latidactylus	32.8	24.3
2009	W35	LLR	Palaemonidae	Macrobrachium latidactylus	10.6	1
2009	W35	LLR	Palaemonidae	Macrobrachium latidactylus	17.8	5.3
2009	W35	LLR	Palaemonidae	Macrobrachium latidactylus	20.5	5.9
2009	W43B	ULC	Palaemonidae	Macrobrachium sp.	27.4	15.4

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2009	W43B	ULC	Palaemonidae	Macrobrachium sp.	30.5	18.2
2009	W43B	ULC	Palaemonidae	Macrobrachium sp.	32	11.4
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	21	8
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	22.3	8
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	23	9
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	24.3	8
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	29.3	16
2009	W54	LLR	Palaemonidae	Macrobrachium latidactylus	31	19
2010	RORWB	ORWB	Palaemonidae	Macrobrachium sp (unidentified)	7	0.5
2010	RORWB	ORWB	Palaemonidae	Macrobrachium sp (unidentified)	21.1	7.5
2010	RORWB	ORWB	Palaemonidae	Macrobrachium sp (unidentified)	27.75	16.1
2010	W04	MCR	Palaemonidae	Macrobrachium sp nov A	9.5	11.1
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	4	0.1
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	5.5	0.3
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	8.5	0.7
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	11.5	1.5
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	12	1.3
2010	W07	ULR	Palaemonidae	Macrobrachium bariense	13	1.6
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina serratorostris	xx	xx
2010	W07	ULR	Atyidae	Caridina nilotica complex	xx	xx
2010	W07	ULR	Atyidae	Caridina nilotica complex	xx	xx
2010	W07	ULR	Atyidae	Caridina nilotica complex	xx	xx
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	28.85	17.1
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	30.1	17.3
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	30.95	20.4
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	31	19.7
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	31.2	18.4
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	33.6	18.4

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2010	W31B	LLR	Palaemonidae	Macrobrachium mammillodactylus	38.1	14
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	9.7	2
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	11.5	2.8
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	12.1	3
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	12.7	1.5
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	13.35	3.8
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	14.65	4.6
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	15.4	3.5
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	17.5	4.1
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	19.3	5.2
2010	W34	LLR	Palaemonidae	Macrobrachium sp (unidentified)	21.35	8.1
2010	W34	LLR	Palaemonidae	Macrobrachium sp nov B	20.8	9.1
2010	W34	LLR	Palaemonidae	Macrobrachium sp nov B	21.4	10.3
2010	W34	LLR	Palaemonidae	Macrobrachium sp nov B	24	14.3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	15.7	3.4
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	16.85	4.1
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	16.9	4.3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	18	4.8
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	xx	xx
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	14.5	2.9
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	14.6	3.1
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	15	3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	15.8	3.5
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	15.8	3.8
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	16	3.5
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	16	4
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	16.6	4.2
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	17.4	4.8
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	18	5.7
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	19	6.9
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	19.2	4.8
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	19.3	4.3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	19.5	6.9
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20	6.3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20	6.5
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20.5	6
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20.5	7.1
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20.5	7.3

Sampling Round	Site	Habitat Type	Family	Species Name	Carapace Length (mm)	Weight (g)
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	20.9	6.2
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	21	7
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	21.3	5.2
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	22	7.3
2010	W64	LLR	Palaemonidae	Macrobrachium sp (unidentified)	25.8	10.5
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	13.2	1.9
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	18.55	4.3
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	21.4	6.4
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	23.1	7.1
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	23.6	8.4
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	26.45	12.3
2010	W70	LLR	Palaemonidae	Macrobrachium equidens	27.95	14.4
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	29.7	13
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	33.5	22
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	29.25	14
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	14.85	2.7
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	29.65	15.2
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	30.55	13.5
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	28.35	11.4
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	28	10.9
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	16.9	3.4
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	27.7	10.6
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	22.25	6.6
2010	W36	LLR	Palaemonidae	Macrobrachium mammillodactylus	19.9	3.9
2010	W48	ULC	Atyidae	Caridna nilotica complex	xx	xx

D.3 BMT WBM Data (2011)

Table D-8 The abundance of fish species collected within the Sepik River catchment during the June and December 2011 survey (1 / 2)

Family	Species	Frieda / Niar / Nena																		Sepik																Wario	
		ULC						ULR				MCR		LLR																							
		BC		W27		W48		W18		W28		W23		W70		W71		W38a		W33		W50		W34		W35		W60		W61		W63		W64		W36	
		J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D	J	D
Native										Not sampled in June 2011																											
Anguillidae	*Anguilla bicolor*																																				
Apogonidae	*Glossamia gjellerupi*												5		1										1												
Ariidae	*Brustiarius nox*																						1	3	1					8			2	2	1	1	
	Brustiarius solidus																					4					1	6					3				
	Neoarius coatesi															2				3		2			2												
	Neoarius utarus															1		1					1		3								3				
	Neoarius velutinus																6		3				18		8				10	2	10						
Chandidae	*Ambassis interruptus*																													1					1		
	Ambassis (juvenile)																											1									
	Parambassis confinis												8		3	1			1						3						1						
Eleotrididae	*Giuris margaritacea*																																				
	Morgurnda aurofodinae					1					1																							1			
	Ophieleotris aporos																																1		13		
	Oxyeleotris frimbata																								1												
	Oxyeleotris gyrinoides																										1							1			
	Oxyeleotris heterodon																																2		3		
Gobiidae	*Glossogobius bulmeri*												1																								
	Glossogobius coatesi							1																													
	Glossogobius giurus																																				
	Glossogobius torrentis	3																																			
	*Glossogobius sp 1 (c.f. koragenis)^*	15	10			11	5				9	1																									
	Gobiidae (juvenile)								1								1																				
Hemiramphidae	*Zenarchopterus kampeni*											1	5	10	11	5	23	16	64	1	1	4	15	18	49	43	22		20	42	23		8	3		1	
Lutjanidae	*Lutjanus goldiei*																														1		1	1	3		
Melanotaeniidae	*Chilatherina crassipinosa*												33	12	1	1	2	1																		5	
	Chilatherina c.f fasciata	1				9																															
	Chilatherina (juvenile)																																				
	Melanotaenia affinis	13	5				6				7								2								1							8			
	Melanotaenia (juvenile)																									1				1							
	Glossolepis multisquamtus																																	5	8		
Plotosidae	*Neosilurus sp 1 (c.f. gjellerupi gjellerupi)^*	2	1																																		
Synbranchidae	*Ophisternon bengalense*																																		20		
Exotic																																					
Characidae	*Piaractus brachypomus*												1	1	4	6	14		3				4	2	1	2	1	12	2						1	2	
Cichlidae	*Oreochromis niloticus*																																		1		
	Tilapia rendall																									1											
Clariidae	*Clarias batrachus*												1																								
Cyprinidae	*Barbonymus gonionotus*											5		5	4	20	14	30	28	18	14	45	44	2	41	33	18	73	41	73	12		10	11	34	25	
	Cyprinus carpio																3			2			1		1				1	1			2	1			
Prochilodontidae	*Prochilodus argenteus*											10	21	6	3	8	21	9	7	3	1	7	16	3	4	17	16	28	12	11	2			39	55	14	
	No. of Individuals	**34**	**16**	**0**	**0**	**21**	**11**	**1**	**1**		**17**	**17**	**75**	**34**	**27**	**44**	**84**	**57**	**108**	**27**	**16**	**62**	**100**	**28**	**115**	**97**	**60**	**120**	**86**	**139**	**49**		**32**	**72**	**140**	**48**	
	Species Richness	**5**	**3**	**0**	**0**	**3**	**2**	**1**	**1**		**3**	**4**	**8**	**5**	**7**	**8**	**8**	**5**	**7**	**5**	**3**	**5**	**8**	**5**	**12**	**6**	**7**	**5**	**6**	**8**	**6**		**9**	**10**	**11**	**6**	

^ identification to be confirmed by the Queensland Museum

Table D-9 The abundance of fish species collected within the Sepik River catchment during the June and December 2011 survey (2 / 2)

Family	Species	ORWB										
		W26		W62		W100		RORWB		Total		
		J	D	J	D	J	D	J	D	J	D	Total
Native												
Anguillidae	*Anguilla bicolor*						1			**0**	**1**	**1**
Apogonidae	*Glossamia gjellerupi*									**0**	**7**	**7**
Ariidae	*Brustiarius nox*			1	2					**15**	**7**	**22**
	Brustiarius solidus			1						**11**	**4**	**15**
	Neoarius coatesi									**7**	**2**	**9**
	Neoarius utarus									**2**	**7**	**9**
	NeoNeoarius velutinus									**2**	**55**	**57**
Chandidae	*Ambassis interruptus*									**1**	**1**	**2**
	Ambassis (juvenile)									**1**	**0**	**1**
	Parambassis confinis									**1**	**16**	**17**
Eleotrididae	*Giuris margaritacea*	64	17					3	5	**67**	**22**	**89**
	Morgurnda aurofodinae									**2**	**1**	**3**
	Ophieleotris aporos			1						**1**	**14**	**15**
	Oxyeleotris frimbata							1		**1**	**1**	**2**
	Oxyeleotris gyrinoides									**1**	**1**	**2**
	Oxyeleotris heterodon	8	14							**8**	**19**	**27**
Gobiidae	*Glossogobius bulmeri*									**0**	**1**	**1**
	Glossogobius coatesi									**1**	**0**	**1**
	Glossogobius giurus			1						**1**	**0**	**1**
	Glossogobius torrentis									**3**	**0**	**3**
	*Glossogobius sp 1 (c.f. koragenis)^*									**27**	**24**	**51**
	Gobiidae (juvenile)			8						**8**	**2**	**10**
Hemiramphidae	*Zenarchopterus kampeni*		1				1	2		**146**	**243**	**389**
Lutjanidae	*Lutjanus goldiei*									**1**	**5**	**6**
Melanotaeniidae	*Chilatherina crassipinosa*									**19**	**36**	**55**
	Chilatherina c.f fasciata									**10**	**0**	**10**
	Chilatherina (juvenile)	9								**9**	**0**	**9**
	Melanotaenia affinis		39	1	19	16	43	10	15	**48**	**137**	**185**
	Melanotaenia (juvenile)									**2**	**0**	**2**
	Glossolepis multisquamtus									**5**	**8**	**13**
Plotosidae	*Neosilurus sp 1 (c.f. gjellerupi gjellerupi)^*									**2**	**1**	**3**
Synbranchidae	*Ophisternon bengalense*									**0**	**20**	**20**
Exotic												
Characidae	*Piaractus brachypomus*			2						**27**	**31**	**58**
Cichlidae	*Oreochromis niloticus*									**0**	**1**	**1**
	Tilapia rendall			1						**2**	**0**	**2**
Clariidae	*Clarias batrachus*								1	**0**	**2**	**2**
Cyprinidae	*Barbonymus gonionotus*	25	34	112	102		1	4	1	**481**	**398**	**879**
	Cyprinus carpio		3	1						**5**	**11**	**16**
Prochilodontidae	*Prochilodus argenteus*	2	1	7	1	1	12	2		**167**	**172**	**339**
	No. of Individuals	**108**	**109**	**136**	**124**	**17**	**58**	**22**	**22**	**1084**	**1250**	**2334**
	Species Richness	**5**	**7**	**11**	**4**	**2**	**5**	**6**	**4**	**32**	**29**	**39**

^ identification to be confirmed by the Queensland Museum

D.4 BMT WBM Data (2017)

Family	Species name	May/Usake				Idam		Horden	
		MCR				MCR	LLR	MCR	ULR
		S1	S2	S3	S4	S5	S6	S7	S8
		2017	2017	2017	2017	2017	2017	2017	2017
Anguillidae	*Anguilla bicolor*								
Apogonidae	*Glossamia gjellerupi*	2	2		1	1		1	
Ariidae	*Brustiarius nox*								
Ariidae	*Brustiarius solidus*								
Ariidae	*Arius coatesi*								
Ariidae	*Arius utarus*								
Ariidae	*Arius velutinus*								
Chandidae	*Ambassis interruptus*								
Chandidae	*Ambassis (juvenile)*								
Chandidae	*Parambassis confinis*								
Eleotrididae	*Giuris margaritacea*								
Eleotrididae	*Morgurnda aurofodinae*								
Eleotrididae	*Ophieleotris aporos*								
Eleotrididae	*Oxyeleotris frimbata*								
Eleotrididae	*Oxyeleotris gyrinoides*								
Eleotrididae	*Oxyeleotris heterodon*								
Gobiidae	*Glossogobius bulmeri*	3	1			9			4
Gobiidae	*Glossogobius coatesi*								
Gobiidae	*Glossogobius giurus*								
Gobiidae	*Glossogobius torrentis*								1
Gobiidae	*Glossogobius sp 1 (c.f. koragenis)*								
Gobiidae	*Gobiidae (juvenile)*								
Hemiramphidae	*Zenarchopterus kampeni*		1	1					
Lutjanidae	*Lutjanus goldiei*								
Melanotaeniidae	*Chilatherina crassipinosa*			9	21	12		9	11
Melanotaeniidae	*Chilatherina c.f fasciata*				5	7			
Melanotaeniidae	*Chilatherina (juvenile)*								
Melanotaeniidae	*Melanotaenia affinis*	2	5		2				
Melanotaeniidae	*Melanotaenia (juvenile)*								
Melanotaeniidae	*Glossolepis multisquamtus*						1		

Family	Species name	May/Usake				Idam		Horden	
Plotosidae	*Neosilurus sp 1 (c.f. gjellerupi gjellerupi)*								
Synbranchidae	*Ophisternon bengalense*								
Terapontidae	*Hephaetus transmontanus*		1						2
Characidae	*Piaractus brachypomus*								
Cichlidae	*Oreochromis niloticus*								
Cichlidae	*Tilapia rendall*								
Clariidae	*Clarias batrachus*								
Cyprinidae	*Barbonymus gonionotus*								
Cyprinidae	*Cyprinus carpio*								
Prochilodontidae	*Prochilodus argenteus*						1		

Appendix E Fish Tissue Data

E.1 Hydrobiology Data (2008 - 2010)

Appendix Notes:
W29 and W29B are used interchangeably in this appendix
W31 and W31B are used interchangeably in this appendix
W43 and W43B are used interchangeably in this appendix
W54 and W54B are used interchangeably in this appendix
All units – mg/kg (wet weight)

Table E-1 Fish Tissue Data – 2008 to 2010

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Head	0.06	68.0	0.3	0.4	0.8	24.00	0.02	48.0	0.8	0.1	-	-	30.0	0.2	140.0
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Head	0.05	72.0	0.3	0.2	0.7	26.00	0.02	49.0	1.0	0.1	-	-	36.0	0.2	140.0
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Head	0.05	26.0	0.2	0.3	0.4	23.00	0.02	33.0	0.3	0.1	-	-	33.0	0.1	48.0
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Head	0.06	23.0	0.2	0.4	0.9	39.00	0.04	20.0	0.3	0.1	-	-	32.0	0.1	49.0
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Head	0.06	28.0	0.2	0.2	0.5	40.00	0.03	27.0	0.3	0.1	-	-	29.0	0.1	68.0
26/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Head	0.09	200.0	0.2	0.1	0.9	150.00	0.01	37.0	0.9	0.1	-	-	36.0	0.2	400.0
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Head	0.08	190.0	0.2	0.4	0.7	40.00	0.06	13.0	0.6	0.1	-	-	48.0	0.2	340.0
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Head	0.05	130.0	0.2	0.2	0.5	15.00	0.02	180.0	0.5	0.1	-	-	38.0	0.1	220.0
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Head	0.05	110.0	0.3	0.1	0.4	21.00	0.05	49.0	0.4	0.1	-	-	37.0	0.1	180.0
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Head	0.06	13.0	0.2	0.2	0.1	9.40	0.02	64.0	0.1	0.1	-	-	40.0	0.2	31.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Head	0.05	180.0	0.2	0.2	2.6	18.00	0.03	12.0	2.0	0.1	-	-	40.0	0.2	400.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Head	0.05	73.0	0.2	0.1	1.3	16.00	0.02	14.0	0.7	0.1	-	-	32.0	0.1	130.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Head	0.05	160.0	0.2	0.1	2.3	11.00	0.02	150.0	2.6	0.1	-	-	65.0	0.5	290.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Head	0.05	190.0	0.2	0.2	2.3	41.00	0.02	17.0	1.9	0.1	-	-	39.0	0.3	400.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Head	0.06	170.0	0.2	0.2	2.4	45.00	0.02	19.0	1.6	0.1	-	-	37.0	0.2	320.0
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Head	0.08	19.0	0.2	0.5	0.2	31.00	0.03	190.0	0.2	0.1	-	-	44.0	0.2	130.0
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Head	0.05	34.0	0.2	0.3	0.2	21.00	0.02	240.0	0.3	0.1	-	-	38.0	0.5	130.0
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Head	0.12	23.0	0.2	0.3	0.2	30.00	0.03	89.0	0.2	0.1	-	-	32.0	0.1	83.0
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Head	0.08	33.0	0.3	0.2	0.4	26.00	0.03	240.0	0.6	0.1	-	-	35.0	0.5	200.0
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Head	0.05	86.0	0.3	0.2	0.2	17.00	0.01	550.0	1.0	0.1	-	-	43.0	0.9	300.0
1/12/2009	Chilaterina fasciata	W03	Usage/May	MCR	Hind	0.01	0.2	0.0	0.0	-	0.20	0.10	3.8	0.0	0.0	0.0	0.1	16.0	-	-
1/12/2009	Chilaterina fasciata	W03	Usage/May	MCR	Hind	0.01	0.2	0.0	0.0	-	0.21	0.09	3.4	0.0	0.0	0.0	0.1	18.0	-	-
1/12/2009	Melanotaenia affinis	W03	Usage/May	MCR	Hind	0.01	0.2	0.0	0.0	-	0.23	0.05	0.5	0.0	0.0	0.0	0.1	16.0	-	-
1/12/2009	Melanotaenia affinis	W03	Usage/May	MCR	Hind	0.01	0.1	0.0	0.0	-	0.34	0.05	1.5	0.0	0.0	0.0	0.1	19.0	-	-
1/12/2009	Melanotaenia affinis	W03	Usage/May	MCR	Hind	0.01	0.3	0.0	0.0	-	0.35	0.05	1.4	0.0	0.0	0.0	0.1	19.0	-	-
1/12/2009	Melanotaenia affinis	W03	Usage/May	MCR	Hind	0.01	0.3	0.0	0.0	-	0.49	0.08	4.4	0.1	0.0	0.0	0.0	29.0	-	-
1/12/2009	Melanotaenia affinis	W03	Usage/May	MCR	Hind	0.01	0.1	0.0	0.0	-	0.32	0.06	2.4	0.0	0.0	0.0	0.0	23.0	-	-
17/08/2010	Chilatherina crassipinosa	W04	Usage/May	MCR	Hind	0.05	1.5	0.1	0.0	0.1	0.27	0.03	2.1	0.1	0.1	-	-	25.0	0.1	3.6
17/08/2010	Chilatherina crassipinosa	W04	Usage/May	MCR	Hind	0.05	1.5	0.1	0.0	0.1	0.38	0.02	13.0	0.1	0.1	-	-	27.0	0.1	4.3
17/08/2010	Chilatherina crassipinosa	W04	Usage/May	MCR	Hind	0.05	1.5	0.1	0.0	0.1	0.30	0.04	5.5	0.1	0.1	-	-	41.0	0.1	4.8
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.3	0.32	0.03	8.6	0.1	0.2	0.3	0.8	29.0	-	-
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.3	0.32	0.03	8.6	0.1	0.2	0.3	0.8	29.0	-	-
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.2	0.29	0.02	9.4	0.1	0.2	0.3	0.8	28.0	-	-
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.3	0.32	0.02	5.6	0.1	0.2	0.3	0.8	35.0	-	-
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.2	0.34	0.02	5.3	0.1	0.2	0.3	0.9	33.0	-	-
10/01/2009	Chilaterina fasciata	W04	Usage/May	MCR	Hind	0.10	-	0.3	-	0.2	0.36	0.02	4.8	0.1	0.2	0.3	0.9	35.0	-	-
3/12/2009	Chilaterina crassispinosa	W04	Usage/May	MCR	Hind	0.01	0.1	0.0	0.0	-	0.27	0.04	3.2	0.0	0.0	0.0	0.2	27.0	-	-
3/12/2009	Chilaterina crassispinosa	W04	Usage/May	MCR	Hind	0.01	0.3	0.0	0.0	-	0.25	0.05	2.2	0.0	0.0	0.0	0.2	26.0	-	-
3/12/2009	Chilaterina crassispinosa	W04	Usage/May	MCR	Hind	0.01	0.2	0.0	0.0	-	0.28	0.06	5.6	0.0	0.0	0.0	0.1	27.0	-	-
3/12/2009	Chilaterina crassispinosa	W04	Usage/May	MCR	Hind	0.01	0.1	0.0	0.0	-	0.25	0.04	3.0	0.0	0.0	0.0	0.2	23.0	-	-
3/12/2009	Chilaterina crassispinosa	W04	Usage/May	MCR	Hind	0.01	0.2	0.0	0.0	-	0.21	0.04	4.7	0.0	0.0	0.0	0.2	23.0	-	-
30/11/2009	Melanotaenia affinis	W07	Usage/May	ULR	Hind	0.01	0.1	0.0	0.0	-	0.24	0.04	0.8	0.0	0.0	0.0	0.0	21.0	-	-
16/10/2010	Chilatherina crassipinosa	W114	Nena/Frieda	ULR	Hind	0.05	1.6	0.1	0.0	0.1	0.28	0.03	2.3	0.1	0.1	-	-	32.0	0.1	3.3
16/10/2010	Glossamia gjellerupi	W114	Nena/Frieda	ULR	Hind	0.05	1.5	0.1	0.0	0.1	0.22	0.05	7.8	0.1	0.1	-	-	17.0	0.1	2.4
16/10/2010	Glossamia gjellerupi	W114	Nena/Frieda	ULR	Hind	0.05	1.5	0.1	0.0	0.1	0.21	0.03	10.0	0.1	0.1	-	-	18.0	0.1	2.9
16/10/2010	Chilatherina crassipinosa	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.26	0.04	0.8	0.1	0.1	-	-	22.0	0.1	4.1
16/10/2010	Chilatherina crassipinosa	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.25	0.06	1.0	0.1	0.1	-	-	25.0	0.1	4.6

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
16/10/2010	Chilatherina crassipinosa	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.30	0.02	8.5	0.1	0.1	-	-	36.0	0.1	3.2
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.21	0.05	1.5	0.1	0.1	-	-	28.0	0.1	4.1
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.21	0.04	1.7	0.1	0.1	-	-	21.0	0.1	4.3
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.6	0.1	0.0	0.1	0.22	0.06	3.6	0.1	0.1	-	-	25.0	0.1	11.0
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.19	0.05	1.9	0.1	0.1	-	-	29.0	0.1	5.6
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.19	0.09	1.7	0.1	0.1	-	-	25.0	0.1	4.0
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.28	0.07	2.3	0.1	0.1	-	-	28.0	0.1	3.9
16/10/2010	Chilatherina fasciata	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.22	0.08	2.5	0.1	0.1	-	-	17.0	0.1	3.9
16/10/2010	Glossamia gjellerupi	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.22	0.03	3.8	0.1	0.1	-	-	15.0	0.1	3.2
16/10/2010	Melanotaenia affinis	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.22	0.03	2.6	0.1	0.1	-	-	31.0	0.1	3.1
16/10/2010	Melanotaenia affinis	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.25	0.03	4.0	0.1	0.1	-	-	28.0	0.1	5.6
16/10/2010	Melanotaenia affinis	W115	Nena/Frieda	ULC	Hind	0.05	1.7	0.1	0.0	0.1	0.28	0.03	1.1	0.1	0.1	-	-	25.0	0.1	3.8
16/10/2010	Melanotaenia affinis	W115	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.24	0.03	2.6	0.1	0.1	-	-	22.0	0.1	3.8
28/11/09	Melanotaenia affinis	W17	Nena/Frieda	ULC	Hind	0.01	0.1	0.0	0.0	-	0.28	0.13	1.4	0.0	0.0	0.0	0.0	27.0	-	-
28/11/09	Melanotaenia affinis	W17	Nena/Frieda	ULC	Hind	0.01	0.8	0.0	0.0	-	0.30	0.20	1.9	0.0	0.0	0.0	0.0	27.0	-	-
28/11/09	Melanotaenia affinis	W17	Nena/Frieda	ULC	Hind	0.01	0.1	0.0	0.0	-	0.42	0.09	1.1	0.0	0.0	0.0	0.0	29.0	-	-
28/11/2009	Melanotaenia affinis	W17	Nena/Frieda	ULC	Hind	0.01	0.1	0.0	0.0	-	0.30	0.19	1.3	0.0	0.0	0.0	0.0	41.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.30	0.06	1.1	0.1	0.2	0.3	0.8	26.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.30	0.06	1.1	0.1	0.2	0.3	0.8	26.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.29	0.04	1.0	0.1	0.2	0.3	0.8	28.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.27	0.03	2.1	0.1	0.2	0.3	1.0	28.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.32	0.02	2.8	0.1	0.2	0.3	0.8	29.0	-	-
13/01/2009	Chilaterina fasciata	W21	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.36	0.05	2.8	0.1	0.2	0.3	0.9	41.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.27	0.03	1.7	0.1	0.2	0.3	0.8	32.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.25	0.03	2.0	0.1	0.2	0.3	1.2	37.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.27	0.03	2.0	0.1	0.2	0.3	1.1	37.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.26	0.04	2.2	0.1	0.2	0.3	0.9	39.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.27	0.03	3.3	0.1	0.2	0.3	0.8	46.0	-	-
13/01/2009	Chilaterina fasciata	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.28	0.03	2.6	0.1	0.2	0.3	0.8	39.0	-	-
13/01/2009	Glossamia gjellerupi	W22	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.27	0.03	35.0	0.1	0.2	0.3	0.9	15.0	-	-
14/01/2009	Chilaterina fasciata	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.39	0.07	4.7	0.1	0.2	0.3	1.0	39.0	-	-
14/01/2009	Chilaterina fasciata	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.34	0.06	3.3	0.1	0.2	0.9	1.1	43.0	-	-
14/01/2009	Chilaterina fasciata	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.44	0.03	2.0	0.1	0.2	0.3	1.1	40.0	-	-
14/01/2009	Chilaterina fasciata	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.37	0.03	6.5	0.1	0.2	0.3	1.1	33.0	-	-
14/01/2009	Chilaterina fasciata	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.40	0.05	5.6	0.1	0.2	0.5	1.3	50.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.19	0.10	19.0	0.1	0.2	0.3	0.9	17.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.1	0.17	0.04	7.4	0.1	0.2	0.3	0.9	18.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.1	0.20	0.04	10.0	0.1	0.2	0.3	1.0	18.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.1	0.20	0.04	10.0	0.1	0.2	0.3	0.9	18.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.1	0.29	0.05	45.0	0.1	0.2	0.3	0.9	17.0	-	-
14/01/2009	Glossamia gjellerupi	W23	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.1	0.18	0.02	8.9	0.1	0.2	0.3	0.9	15.0	-	-
2/12/2009	Chilaterina crassispinosa	W23	Nena/Frieda	MCR	Hind	0.01	5.0	0.0	0.0	-	0.20	0.06	1.0	0.1	0.0	0.0	0.0	20.0	-	-
2/12/2009	Chilaterina crassispinosa	W23	Nena/Frieda	MCR	Hind	0.01	4.2	0.0	0.0	-	0.29	0.11	1.0	0.1	0.0	0.0	0.2	26.0	-	-
10/01/2009	Melanotaenia affinis	W28	Nena/Frieda	ULR	Hind	0.10	-	0.3	-	0.2	0.38	0.13	1.2	0.1	0.2	0.3	0.9	34.0	-	-
10/01/2009	Melanotaenia affinis	W28	Nena/Frieda	ULR	Hind	0.10	-	0.3	-	0.2	0.33	0.11	1.2	0.1	0.2	0.7	0.8	25.0	-	-
10/01/2009	Melanotaenia affinis	W28	Nena/Frieda	ULR	Hind	0.10	-	0.3	-	0.2	0.44	0.05	1.4	0.1	0.2	0.3	0.8	32.0	-	-
15/01/2009	Chilaterina fasciata	W29	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.3	0.84	0.05	2.8	0.3	0.2	0.3	0.8	47.0	-	-
15/01/2009	Glossamia gjellerupi	W29	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.28	0.04	3.9	0.1	0.2	0.3	1.1	17.0	-	-
15/01/2009	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.10	-	0.3	-	0.2	0.41	0.05	1.0	0.1	0.2	0.6	0.9	29.0	-	-
30/11/2009	Chilaterina crassispinosa	W29	Nena/Frieda	MCR	Hind	0.01	0.6	0.0	0.0	-	0.23	0.08	2.5	0.0	0.0	0.0	0.2	35.0	-	-
30/11/2009	Chilaterina crassispinosa	W29	Nena/Frieda	MCR	Hind	0.01	0.3	0.0	0.0	-	0.18	0.09	1.4	0.0	0.0	0.0	0.2	34.0	-	-
30/11/2009	Chilaterina crassispinosa	W29	Nena/Frieda	MCR	Hind	0.01	0.4	0.0	0.0	-	0.25	0.08	1.3	0.0	0.0	0.0	0.2	30.0	-	-
30/11/2009	Chilaterina crassispinosa	W29	Nena/Frieda	MCR	Hind	0.01	0.1	0.0	0.0	-	0.27	0.08	4.3	0.0	0.0	0.0	0.2	40.0	-	-
30/11/09	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.01	0.2	0.0	0.0	-	0.30	0.06	1.0	0.0	0.0	0.0	0.0	20.0	-	-
30/11/09	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.01	0.3	0.0	0.0	-	0.27	0.05	0.7	0.0	0.0	0.0	0.0	15.0	-	-
30/11/09	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.01	0.1	0.0	0.0	-	0.42	0.04	0.7	0.0	0.0	0.0	0.0	18.0	-	-
30/11/09	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.01	0.3	0.0	0.0	-	0.23	0.14	1.2	0.0	0.0	0.0	0.0	21.0	-	-
30/11/09	Melanotaenia affinis	W29	Nena/Frieda	MCR	Hind	0.01	0.2	0.0	0.0	-	0.29	0.09	1.7	0.0	0.0	0.0	0.0	25.0	-	-
16/06/2010	Chilatherina crassipinosa	W31	Usage/May	LLR	Hind	0.05	1.8	0.1	0.0	0.1	0.26	0.05	2.3	0.1	0.1	-	-	32.0	0.1	6.5

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
16/06/2010	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.05	7.4	0.1	0.0	0.1	0.27	0.10	3.5	0.1	0.1	-	-	27.0	0.1	14.0
16/01/2009	Chilaterina fasciata	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.3	0.31	0.06	2.0	0.1	0.2	0.3	0.8	33.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.1	0.17	0.04	3.6	0.1	0.2	0.3	0.9	14.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.2	0.22	0.06	8.7	0.1	0.2	0.3	1.0	18.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.2	0.21	0.06	8.7	0.1	0.2	0.3	1.0	18.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.1	0.20	0.06	3.9	0.1	0.2	0.3	0.9	14.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.2	0.19	0.06	9.8	0.1	0.2	0.3	1.2	21.0	-	-
16/01/2009	Glossamia gjellerupi	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.1	0.24	0.05	14.0	0.1	0.2	0.3	1.0	16.0	-	-
16/01/2009	Potamosiluras velutinus	W36	Wario	LLR	Hind	0.10	-	0.3	-	0.1	2.50	0.75	0.8	0.1	0.2	0.3	3.0	390.0	-	-
7/12/2009	Barbonymus gonionotus	W36	Wario	LLR	Hind	0.01	1.4	0.1	0.0	-	0.35	0.04	0.6	0.0	0.0	0.0	0.2	15.0	-	-
7/12/2009	Barbonymus gonionotus	W36	Wario	LLR	Hind	0.01	0.7	0.0	0.0	-	0.57	0.04	1.6	0.0	0.0	0.0	0.3	13.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.26	0.05	6.0	0.1	0.2	0.3	0.8	12.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.26	0.05	6.0	0.1	0.2	0.3	0.8	12.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.30	0.01	3.9	0.1	0.2	0.3	0.7	14.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.29	0.01	4.1	0.1	0.2	0.3	0.7	14.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.32	0.01	4.0	0.1	0.2	0.3	0.7	14.0	-	-
8/01/2009	Glossamia gjellerupi	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.32	0.02	5.5	0.1	0.2	0.3	0.8	15.0	-	-
8/01/2009	Melanotaenia affinis	W41	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.30	0.02	0.6	0.1	0.2	0.3	0.8	22.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.42	0.06	2.6	0.1	0.2	0.3	0.7	43.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.24	0.05	1.6	0.1	0.2	0.3	0.8	34.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.33	0.04	1.6	0.1	0.2	0.3	0.8	30.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.31	0.07	3.3	0.1	0.2	0.3	0.8	38.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.31	0.07	3.3	0.1	0.2	0.3	0.7	38.0	-	-
15/01/2009	Chilaterina fasciata	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.29	0.08	1.5	0.1	0.2	0.3	0.8	36.0	-	-
15/01/2009	Glossamia gjellerupi	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.26	0.11	2.1	0.1	0.2	0.3	0.8	13.0	-	-
15/01/2009	H. transmontanus	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.48	0.13	6.3	0.1	0.2	0.3	1.0	27.0	-	-
15/01/2009	Melanotaenia affinis	W42	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.38	0.03	0.7	0.1	0.2	0.3	0.7	25.0	-	-
10/08/2010	Glossamia gjellerupi	W43	Nena/Frieda	ULC	Hind	0.05	1.5	0.1	0.0	0.1	0.29	0.03	7.8	0.1	0.1	-	-	14.0	0.1	3.2
8/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.22	0.05	1.6	0.1	0.2	0.3	0.8	34.0	-	-
8/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.20	0.05	4.1	0.1	0.2	0.3	0.7	27.0	-	-
8/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.34	0.05	6.3	0.1	0.2	0.3	0.8	30.0	-	-
8/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.25	0.03	6.5	0.1	0.2	0.3	0.7	29.0	-	-
8/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.29	0.04	1.7	0.1	0.2	0.3	0.8	25.0	-	-
8/01/2009	Glossamia gjellerupi	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.1	0.20	0.05	4.9	0.1	0.2	0.3	0.9	9.1	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.25	0.01	1.1	0.1	0.2	0.3	0.8	17.0	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.29	0.09	4.4	0.1	0.2	0.3	0.6	31.0	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.35	0.04	4.7	0.1	0.2	0.3	0.7	31.0	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.37	0.02	4.8	0.1	0.2	0.4	0.7	28.0	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.37	0.02	4.7	0.1	0.2	0.3	0.7	28.0	-	-
8/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.27	0.05	5.2	0.1	0.2	0.3	0.7	29.0	-	-
22/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.3	0.56	0.06	2.4	0.1	0.2	0.3	1.0	100.0	-	-
22/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.51	0.02	1.7	0.1	0.2	0.3	0.9	66.0	-	-
22/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.51	0.06	1.3	0.1	0.2	0.5	0.9	75.0	-	-
22/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.64	0.04	1.3	0.1	0.2	0.3	0.9	57.0	-	-
22/01/2009	Chilaterina fasciata	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.65	0.02	1.7	0.1	0.2	0.3	1.0	81.0	-	-
22/01/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.10	-	0.3	-	0.2	0.56	0.04	1.0	0.1	0.2	0.3	0.8	29.0	-	-
1/12/2009	Melanotaenia affinis	W43	Nena/Frieda	ULC	Hind	0.01	0.4	0.0	0.0	-	0.23	0.04	1.3	0.0	0.0	0.0	0.0	17.0	-	-
22/01/2009	Melanotaenia affinis	W54	Sepik Floodplain	LLR	Hind	0.10	-	0.3	-	0.4	0.36	0.02	17.0	0.1	0.2	0.3	0.7	33.0	-	-
6/12/2009	Barbonymus gonionotus	W54	Sepik Floodplain	LLR	Hind	0.01	3.3	0.0	0.0	-	0.35	0.07	2.2	0.0	0.0	0.0	0.2	16.0	-	-
6/12/2009	Barbonymus gonionotus	W54	Sepik Floodplain	LLR	Hind	0.01	0.6	0.0	0.0	-	0.22	0.12	2.0	0.0	0.0	0.0	0.2	16.0	-	-
6/12/2009	Barbonymus gonionotus	W54	Sepik Floodplain	LLR	Hind	0.01	1.0	0.1	0.0	-	0.28	0.13	2.1	0.0	0.0	0.0	0.3	15.0	-	-
26/08/2010	Glossamia gjellerupi	W70	Nena/Frieda	MCR	Hind	0.05	1.5	0.1	0.0	0.1	0.17	0.03	12.0	0.1	0.1	-	-	11.0	0.1	2.5
26/08/2010	Glossamia gjellerupi	W70	Nena/Frieda	MCR	Hind	0.05	1.5	0.1	0.0	0.1	0.14	0.03	10.0	0.1	0.1	-	-	11.0	0.1	2.0
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Liver	0.12	13.0	0.3	0.2	0.8	2.40	0.17	10.0	0.9	0.1	-	-	110.0	0.5	350.0
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Liver	0.05	5.2	0.1	0.6	0.1	1.50	0.60	1.4	0.3	0.1	-	-	390.0	0.8	230.0
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Liver	0.05	3.3	0.1	0.4	0.1	1.30	0.40	1.1	0.3	0.1	-	-	640.0	1.0	350.0
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Liver	0.10	-	0.3	-	0.1	2.80	0.41	1.0	0.2	0.2	0.3	2.9	100.0	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Liver	0.10	-	0.3	-	0.1	2.50	0.16	1.6	0.1	0.2	0.3	1.4	450.0	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Liver	0.10	-	0.3	-	0.1	2.30	0.18	1.0	0.1	0.2	0.3	1.5	260.0	-	-

Fish Tissue Data

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Liver	0.10	-	0.3	-	0.1	4.50	0.21	1.3	0.1	0.2	0.3	3.2	710.0	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Liver	0.10	-	0.3	-	0.1	2.80	0.17	1.1	0.1	0.2	0.3	2.3	970.0	-	-
26/08/2010	Potamosiluras velutinus	W31B	Usage/May	LLR	Liver	0.05	2.8	0.1	0.2	0.1	1.80	0.29	2.3	0.3	0.1	-	-	10.0	0.4	300.0
15/11/2008	Oxyeleotris heterodon	w33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	11.00	0.18	2.9	0.1	0.1	0.3	1.3	34.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	3.90	2.00	2.0	0.1	0.2	0.3	2.5	600.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	4.00	1.10	2.4	0.1	0.2	0.3	6.1	580.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.80	1.00	1.7	0.1	0.1	0.3	1.8	420.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.80	0.99	1.7	0.1	0.1	0.3	1.8	420.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.50	0.18	1.3	0.1	0.1	0.3	2.4	250.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.40	0.54	2.1	0.1	0.2	1.6	2.9	460.0	-	-
17/08/2010	Potamosiluru velutinus	W35	Sepik floodplain	LLR	Liver	0.05	3.8	0.2	0.1	0.3	2.20	0.51	3.4	0.4	0.1	-	-	570.0	1.1	160.0
17/08/2010	Potamosiluru velutinus	W35	Sepik floodplain	LLR	Liver	0.05	1.6	0.1	92.0	0.3	1.90	0.29	1.4	0.2	0.1	-	-	580.0	0.8	320.0
17/08/2010	Potamosiluru velutinus	W35	Sepik floodplain	LLR	Liver	0.05	3.9	0.2	0.2	0.2	1.80	0.68	1.5	0.5	0.1	-	-	160.0	2.0	260.0
17/08/2010	Potamosiluru velutinus	W35	Sepik floodplain	LLR	Liver	0.05	6.9	0.1	0.1	0.1	1.60	0.37	0.8	0.2	0.1	-	-	300.0	1.0	340.0
17/08/2010	Potamosiluru velutinus	W35	Sepik floodplain	LLR	Liver	0.05	2.9	0.1	53.0	0.1	1.80	0.37	0.7	0.1	0.1	-	-	370.0	0.7	90.0
1/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Liver	0.01	3.3	0.0	0.2	-	11.00	4.20	0.9	0.1	0.1	0.0	2.9	200.0	-	-
2/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Liver	0.01	5.5	0.0	0.1	-	1.60	0.89	1.8	0.0	0.0	0.0	1.5	45.0	-	-
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Liver	0.05	2.4	0.1	0.3	0.1	1.50	0.55	0.7	0.1	0.1	-	-	330.0	0.1	110.0
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Liver	0.05	3.5	0.1	0.4	0.1	1.60	0.57	1.0	0.1	0.1	-	-	660.0	0.1	140.0
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Liver	0.05	24.0	0.2	0.7	0.1	1.70	2.70	1.0	0.1	0.4	-	-	920.0	0.1	110.0
16/01/2009	Potamosiluras velutinus	W36	Wario	LLR	Liver	0.10	-	0.3	-	0.1	4.00	0.42	0.9	0.1	0.2	0.3	2.5	100.0	-	-
19/01/2009	Potamosiluras velutinus	W38a	Nena/Frieda	LLR	Liver	0.10	-	0.3	-	0.1	3.40	1.30	1.7	0.1	0.2	0.3	3.1	200.0	-	-
19/01/2009	Potamosiluras velutinus	W38a	Nena/Frieda	LLR	Liver	0.10	-	0.3	-	0.1	1.20	0.70	0.8	0.1	0.2	0.3	1.4	71.0	-	-
19/01/2009	Potamosiluras velutinus	W38a	Nena/Frieda	LLR	Liver	0.10	-	0.3	-	0.1	1.20	0.68	0.7	0.1	0.2	0.3	1.5	70.0	-	-
16/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	6.00	1.20	1.0	0.1	0.2	0.3	4.7	330.0	-	-
16/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.70	5.00	1.6	0.1	0.2	0.3	3.5	66.0	-	-
16/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	3.60	0.30	1.0	0.1	0.2	0.3	2.5	170.0	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.50	0.41	2.1	0.1	0.2	0.3	2.3	290.0	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.6	-	0.1	5.90	0.54	2.1	0.1	0.2	0.5	3.3	460.0	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	3.70	0.55	1.8	0.1	0.2	0.3	3.0	420.0	-	-
17/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	4.30	0.67	1.1	0.1	0.2	0.3	2.5	190.0	-	-
17/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	4.70	0.85	1.6	0.1	0.2	0.3	3.5	350.0	-	-
17/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.50	0.94	1.6	0.1	0.2	0.3	3.4	330.0	-	-
17/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.70	0.11	1.5	0.1	0.2	0.3	2.2	180.0	-	-
17/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.10	0.47	1.7	0.1	0.2	0.3	1.5	240.0	-	-
4/12/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.50	0.28	1.5	0.1	0.2	0.3	2.0	580.0	-	-
4/12/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	2.00	0.49	2.0	0.1	0.2	0.3	1.8	390.0	-	-
4/12/2008	Sciades utaris	W50	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	3.20	0.29	1.0	0.1	0.2	0.3	1.6	560.0	-	-
22/10/2010	Brustiarius nox	W61	Sepik floodplain	LLR	Liver	0.05	20.0	0.1	99.0	0.1	3.50	1.20	1.9	0.1	0.1	-	-	110.0	0.2	780.0
23/10/2010	Brustiarius nox	W63	Sepik floodplain	LLR	Liver	0.05	3.1	0.1	38.0	0.1	1.80	0.43	1.9	0.1	0.1	-	-	220.0	0.1	330.0
4/12/2008	Brustiarius solidus	W64	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	8.20	0.08	1.3	0.1	0.3	0.3	1.8	74.0	-	-
4/12/2008	Brustiarius solidus	W64	Sepik floodplain	LLR	Liver	0.10	-	0.3	-	0.1	5.00	0.20	1.3	0.1	0.2	0.3	2.0	110.0	-	-
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Liver	0.05	6.9	0.1	0.3	0.2	1.50	0.37	0.8	0.8	0.1	-	-	690.0	1.3	430.0
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Liver	0.05	2.2	0.1	99.0	0.1	1.50	0.14	1.0	0.2	0.1	-	-	950.0	2.0	170.0
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Liver	0.05	3.4	0.1	0.0	0.3	0.45	0.01	2.1	0.1	0.1	-	-	10.0	0.6	49.0
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Liver	0.05	11.0	0.1	0.5	0.4	1.40	0.37	1.0	1.1	0.1	-	-	10.0	1.5	220.0
13/01/2009	Macrobrachium sp	W21	Nena/Frieda	ULC	Tail	0.10	-	0.3	-	0.1	5.10	0.01	1.4	0.1	0.2	0.3	0.9	12.0	-	-
13/01/2009	Macrobrachium weberi	W21	Nena/Frieda	ULC	Tail	0.10	-	0.3	-	0.1	5.40	0.01	0.5	0.1	0.2	0.3	0.8	14.0	-	-
13/01/2009	Macrobrachium weberi	W21	Nena/Frieda	ULC	Tail	0.10	-	0.3	-	0.1	2.80	0.01	2.6	0.2	0.2	0.6	0.9	12.0	-	-
13/01/2009	Macrobrachium weberi	W21	Nena/Frieda	ULC	Tail	0.10	-	0.3	-	0.1	4.00	0.01	1.6	0.1	0.2	0.3	0.8	12.0	-	-
2/12/2009	Macrobrachium latidactylus	W23	Nena/Frieda	MCR	Tail	0.01	0.3	0.0	0.0	-	3.60	0.01	0.5	0.0	0.0	0.0	0.2	9.2	-	-
2/12/2009	Macrobrachium latidactylus	W23	Nena/Frieda	MCR	Tail	0.01	1.1	0.0	0.0	-	2.50	0.01	2.3	0.1	0.0	0.0	0.3	9.6	-	-
2/12/2009	Macrobrachium latidactylus	W23	Nena/Frieda	MCR	Tail	0.01	0.5	0.1	0.0	-	3.50	0.01	0.5	0.0	0.0	0.0	0.5	9.4	-	-
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Tail	0.05	1.5	0.1	0.0	0.1	3.60	0.01	1.4	0.1	0.1	-	-	9.6	0.1	1.7
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Tail	0.05	1.5	0.1	0.0	0.1	4.20	0.02	1.9	0.1	0.1	-	-	11.0	0.1	1.5
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Tail	0.05	1.5	0.1	0.0	1.0	4.10	0.01	0.9	0.1	0.1	-	-	10.0	0.1	10.0
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Tail	0.05	1.5	0.1	0.0	0.1	4.00	0.02	0.7	0.1	0.1	-	-	10.0	0.1	1.5
26/08/2010	Macrobrachium sp	W31B	Usage/May	LLR	Tail	0.05	1.5	0.1	0.0	0.1	3.30	0.01	0.8	0.1	0.1	-	-	11.0	0.1	1.5
6/12/2009	Macrobrachium latidactylus	W33	Sepik floodplain	LLR	Tail	0.01	0.3	0.1	0.0	-	3.80	0.01	0.8	0.0	0.0	0.0	0.2	10.0		

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
6/12/2009	Macrobrachium latidactylus	W33	Sepik floodplain	LLR	Tail	0.02	0.1	0.0	0.0	-	4.40	0.02	0.9	0.0	0.0	0.0	0.3	11.0	-	-
6/12/2009	Macrobrachium latidactylus	W33	Sepik floodplain	LLR	Tail	0.01	0.3	0.0	0.0	-	3.60	0.01	0.4	0.0	0.0	0.0	0.4	8.3	-	-
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Tail	0.05	1.5	0.1	0.0	0.1	2.10	0.01	2.4	0.1	0.1	-	-	8.8	0.1	1.5
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Tail	0.05	1.5	0.1	0.0	0.1	2.20	0.03	1.1	0.1	0.1	-	-	8.5	0.1	2.3
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Tail	0.05	1.5	0.1	0.0	0.1	1.30	0.01	8.0	0.1	0.1	-	-	8.3	0.1	1.5
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Tail	0.05	2.5	0.1	0.0	0.1	2.00	0.03	0.7	0.1	0.1	-	-	8.1	0.1	3.4
17/08/2010	Macrobrachium sp	W35	Sepik floodplain	LLR	Tail	0.05	2.6	0.1	0.0	0.1	2.20	0.01	1.0	0.1	0.1	-	-	9.6	0.1	4.3
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Tail	0.05	1.5	0.1	0.0	0.2	4.90	0.01	0.7	0.1	0.1	-	-	8.9	0.1	1.5
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Tail	0.05	1.5	0.1	0.0	0.2	4.90	0.01	1.0	0.1	0.1	-	-	11.0	0.1	1.5
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Tail	0.05	2.1	0.1	0.0	0.2	3.90	0.01	1.4	0.1	0.1	-	-	11.0	0.1	3.9
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Tail	0.05	11.0	0.1	0.0	0.2	7.70	0.03	3.8	0.2	0.1	-	-	12.0	0.1	34.0
16/06/2010	Macrobrachium sp	W36	Wario	LLR	Tail	0.05	1.5	0.1	0.0	0.2	5.30	0.01	0.9	0.1	0.1	-	-	9.2	0.1	2.4
16/01/2009	Macrobrachium weberi	W36	Wario	LLR	Tail	0.10	-	0.3	-	0.2	8.00	0.02	1.0	0.1	0.2	0.3	0.9	14.0	-	-
16/01/2009	Macrobrachium weberi	W36	Wario	LLR	Tail	0.10	-	0.3	-	0.1	6.70	0.01	1.5	0.1	0.2	0.3	0.8	14.0	-	-
16/01/2009	Macrobrachium weberi	W36	Wario	LLR	Tail	0.10	-	0.3	-	0.2	5.20	0.02	0.7	0.1	0.2	0.3	0.8	13.0	-	-
16/01/2009	Macrobrachium weberi	W36	Wario	LLR	Tail	0.10	-	0.3	-	0.1	4.90	0.02	1.4	0.1	0.2	0.3	0.8	12.0	-	-
16/01/2009	Macrobrachium weberi	W36	Wario	LLR	Tail	0.10	-	0.3	-	0.2	9.00	0.01	0.8	0.1	0.2	0.3	0.8	14.0	-	-
1/12/2009	Macrobrachium latidactylus	W43	Nena/Frieda	ULC	Tail	0.01	0.1	0.0	0.0	-	4.10	0.01	0.4	0.0	0.0	0.0	0.4	13.0	-	-
1/12/2009	Macrobrachium latidactylus	W43	Nena/Frieda	ULC	Tail	0.01	0.1	0.1	0.0	-	6.70	0.01	0.4	0.0	0.0	0.0	0.5	9.8	-	-
1/12/2009	Macrobrachium latidactylus	W43	Nena/Frieda	ULC	Tail	0.01	0.9	0.1	0.0	-	4.20	0.01	0.4	0.0	0.0	0.0	0.5	13.0	-	-
6/12/2009	Macrobrachium latidactylus	W54	Sepik Floodplain	LLR	Tail	0.01	0.6	0.0	0.0	-	5.80	0.01	1.4	0.0	0.0	0.0	0.6	10.0	-	-
6/12/2009	Macrobrachium latidactylus	W54	Sepik Floodplain	LLR	Tail	0.01	0.8	0.0	0.0	-	3.80	0.01	0.3	0.0	0.0	0.0	0.3	10.0	-	-
6/12/2009	Macrobrachium latidactylus	W54	Sepik Floodplain	LLR	Tail	0.01	0.7	0.0	0.0	-	3.80	0.01	0.7	0.0	0.0	0.0	0.7	9.1	-	-
6/12/2009	Macrobrachium latidactylus	W54	Sepik Floodplain	LLR	Tail	0.01	0.4	0.1	0.0	-	3.80	0.01	0.7	0.0	0.0	0.0	0.8	9.6	-	-
6/12/2009	Macrobrachium latidactylus	W54	Sepik Floodplain	LLR	Tail	0.01	0.8	0.0	0.0	-	3.30	0.01	0.7	0.0	0.0	0.0	0.2	10.0	-	-
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Tail	0.05	1.5	0.1	0.0	0.1	4.00	0.01	1.9	0.1	0.1	-	-	9.3	0.1	1.5
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Tail	0.05	1.6	0.1	0.0	0.1	3.40	0.01	2.0	0.1	0.1	-	-	10.0	0.1	2.2
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Tail	0.05	1.5	0.1	0.0	0.1	4.00	0.03	1.5	0.1	0.1	-	-	9.1	0.1	1.5
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Tail	0.05	1.5	0.1	0.0	0.1	4.70	0.01	2.3	0.1	0.1	-	-	11.0	0.1	1.5
27/08/2010	Macrobrachium sp	W70	Nena/Frieda	MCR	Tail	0.05	1.5	0.1	0.0	0.1	3.70	0.01	3.7	0.1	0.1	-	-	9.2	0.1	5.1
13/01/2009	Glossamia gjellerupi	W22	Nena/Frieda	MCR	Whole Body	0.10	-	0.3	-	0.5	0.59	0.07	38.0	1.1	0.2	0.3	0.8	22.0	-	-
10/01/2009	Melanotaenia affinis	W28	Nena/Frieda	ULR	Whole Body	0.11	-	1.1	-	0.2	1.40	0.04	4.1	0.4	0.3	1.0	1.5	52.0	-	-
15/01/2009	Glossamia gjellerupi	W29	Nena/Frieda	MCR	Whole Body	0.10	-	0.3	-	0.2	0.64	0.02	5.3	0.1	0.2	0.3	1.0	22.0	-	-
15/01/2009	Glossamia gjellerupi	W29	Nena/Frieda	MCR	Whole Body	0.10	-	0.3	-	0.4	1.00	0.02	9.5	0.4	0.2	0.3	1.0	25.0	-	-
25/01/2009	Chilatherina fasciata	W31	Usage/May	LLR	Whole Body	0.10	-	0.3	-	0.2	0.62	0.03	5.1	0.1	0.2	0.3	0.9	38.0	-	-
25/01/2009	Chilatherina fasciata	W31	Usage/May	LLR	Whole Body	0.10	-	0.3	-	0.2	0.61	0.02	4.8	0.1	0.2	0.3	0.7	39.0	-	-
25/01/2009	Chilatherina fasciata	W31	Usage/May	LLR	Whole Body	0.10	-	0.3	-	0.2	0.61	0.02	4.9	0.1	0.2	0.3	0.7	39.0	-	-
25/01/2009	Chilatherina fasciata	W31	Usage/May	LLR	Whole Body	0.10	-	0.3	-	0.2	0.83	0.03	4.1	0.2	0.2	0.8	0.9	47.0	-	-
25/01/2009	Chilatherina fasciata	W31	Usage/May	LLR	Whole Body	0.10	-	0.3	-	0.2	0.69	0.03	11.0	0.2	0.2	0.3	1.0	56.0	-	-
16/01/2009	Chilatherina fasciata	W36	Wario	LLR	Whole Body	0.10	-	0.3	-	0.2	0.63	0.05	7.6	0.1	0.2	0.3	1.0	49.0	-	-
8/01/2009	Melanotaenia affinis	W41	Nena/Frieda	ULC	Whole Body	0.10	-	0.3	-	0.9	0.87	0.02	5.7	0.4	0.2	0.3	0.8	35.0	-	-
14/10/2010	Barbonymus gonionotus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.02	0.7	0.1	0.1	-	-	2.7	0.1	1.7
14/10/2010	Barbonymus gonionotus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	2.1	0.1	0.0	0.1	0.09	0.03	0.8	0.1	0.1	-	-	3.3	0.1	2.3
14/10/2010	Barbonymus gonionotus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.02	0.4	0.1	0.1	-	-	2.5	0.1	1.5
14/10/2010	Barbonymus gonionotus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.02	0.8	0.1	0.1	-	-	3.1	0.1	1.5
14/10/2010	Barbonymus gonionotus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.6	0.1	0.0	0.4	0.11	0.02	0.7	0.1	0.1	-	-	3.1	0.1	4.2
14/10/2010	Brustiarius nox	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.12	0.2	0.1	0.1	-	-	2.8	0.1	1.9
14/10/2010	Brustiarius nox	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.20	0.1	0.1	0.1	-	-	4.0	0.1	2.4
14/10/2010	Brustiarius nox	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.28	0.1	0.1	0.1	-	-	5.0	0.1	3.1
14/10/2010	Brustiarius nox	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.6	0.1	0.0	0.1	0.17	0.25	0.1	0.1	0.1	-	-	3.8	0.1	1.9
14/10/2010	Brustiarius nox	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.15	0.1	0.1	0.1	-	-	3.0	0.1	1.6
14/10/2010	Brustiarius solidus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.32	0.1	0.1	0.1	-	-	18.0	0.1	1.7
14/10/2010	Brustiarius solidus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.22	0.1	0.1	0.1	-	-	3.5	0.1	2.3
14/10/2010	Oxyeleotris heterodon	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.08	0.1	0.1	0.1	-	-	2.2	0.1	1.5
14/10/2010	Oxyeleotris heterodon	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.09	0.4	0.1	0.1	-	-	1.9	0.1	1.5
14/10/2010	Oxyeleotris heterodon	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.13	0.1	0.1	0.1	-	-	1.9	0.1	1.5
14/10/2010	Oxyeleotris heterodon	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.7	0.1	0.0	0.1	0.11	0.18	0.1	0.1	0.1	-	-	2.1	0.1	1.5
14/10/2010	Oxyeleotris heterodon	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.7	0.1	0.0	0.1	0.13	0.25	0.1	0.1	0.1	-	-	2.2	0.1	1.5
14/10/2010	Piaractus brachypomus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.4	0.1	0.1	-	-	2.5	0.1	1.5

Fish Tissue Data

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
14/10/2010	Piaractus brachypomus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.02	0.4	0.1	0.1	-	-	2.5	0.1	1.5
14/10/2010	Piaractus brachypomus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.02	0.6	0.1	0.1	-	-	2.8	0.1	1.5
14/10/2010	Piaractus brachypomus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.03	0.7	0.1	0.1	-	-	2.6	0.1	1.5
14/10/2010	Piaractus brachypomus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.10	0.4	0.1	0.1	-	-	3.0	0.1	1.5
14/10/2010	Prochilodus argenteus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.8	0.1	0.0	0.1	0.10	0.05	0.2	0.1	0.1	-	-	2.7	0.1	1.5
14/10/2010	Prochilodus argenteus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.08	0.3	0.1	0.1	-	-	3.0	0.1	2.0
14/10/2010	Prochilodus argenteus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.08	0.4	0.1	0.1	-	-	2.8	0.1	1.7
14/10/2010	Prochilodus argenteus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.04	0.4	0.1	0.1	-	-	2.7	0.1	1.5
14/10/2010	Prochilodus argenteus	RORWB	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.10	0.5	0.1	0.1	-	-	2.8	0.1	1.5
29/12/2009	Prochilodus argenteus	W03	Usage/May	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.36	0.08	0.1	0.0	0.0	0.0	0.5	3.1	-	-
17/08/2010	Barbonymus gonionotus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.02	0.3	0.1	0.1	-	-	5.3	0.1	2.8
17/08/2010	Barbonymus gonionotus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.25	0.01	0.3	0.1	0.1	-	-	3.8	0.1	2.5
17/08/2010	Barbonymus gonionotus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.01	0.4	0.1	0.1	-	-	4.1	0.1	3.9
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.05	0.2	0.1	0.1	-	-	4.1	0.1	1.5
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.12	0.1	0.1	0.1	-	-	3.1	0.1	1.5
17/08/2010	Potamosiluras velutinus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.20	0.10	0.1	0.1	0.1	-	-	5.8	0.1	2.3
17/08/2010	Prochilodus argenteus	W04	Usage/May	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.20	0.10	0.2	0.1	0.1	-	-	5.4	0.2	2.5
10/01/2009	Brustiarius nox	W04	Usage/May		Flesh	0.10	-	0.3	-	0.1	0.39	0.04	0.2	0.1	0.2	0.3	0.5	6.9	-	-
18/12/2009	Prochilodus argenteus	W04	Usage/May	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.13	0.02	0.1	0.0	0.0	0.0	0.3	14.0	-	-
19/12/2009	Prochilodus argenteus	W04	Usage/May	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.14	0.13	0.5	0.0	0.0	0.0	0.3	4.0	-	-
26/12/2009	Brustiarius nox	W04	Usage/May	MCR	Flesh	0.01	0.3	0.0	0.0	-	0.13	0.08	0.2	0.0	0.0	0.0	0.0	4.9	-	-
27/12/2009	Brustiarius nox	W04	Usage/May	MCR	Flesh	0.01	0.4	0.0	0.0	-	0.13	0.11	0.2	0.0	0.0	0.0	0.1	3.7	-	-
28/12/2009	Brustiarius nox	W04	Usage/May	MCR	Flesh	0.01	1.3	0.0	0.0	-	0.16	0.08	0.2	0.0	0.0	0.0	0.0	3.3	-	-
29/12/2009	Brustiarius nox	W04	Usage/May	MCR	Flesh	0.01	4.9	0.0	0.0	-	0.19	0.10	0.2	0.0	0.0	0.0	0.1	3.1	-	-
30/12/2009	Brustiarius nox	W04	Usage/May	MCR	Flesh	0.01	1.1	0.0	0.0	-	0.18	0.09	0.3	0.1	0.0	0.0	0.1	3.6	-	-
30/12/2009	Prochilodus argenteus	W04	Usage/May	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.11	0.08	0.1	0.0	0.0	0.0	0.3	2.8	-	-
31/12/2009	Prochilodus argenteus	W04	Usage/May	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.12	0.08	0.1	0.0	0.0	0.0	0.3	2.7	-	-
20/12/2009	Prochilodus argenteus	W100	Sepik Floodplain	ORWB	Flesh	0.01	0.4	0.0	0.0	-	0.16	0.31	0.7	0.0	0.0	0.0	0.2	5.0	-	-
12/08/2010	Barbonymus gonionotus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.01	0.4	0.1	0.1	-	-	4.8	0.1	2.1
12/08/2010	Barbonymus gonionotus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.05	0.2	0.1	0.1	-	-	5.4	0.1	2.8
12/08/2010	Barbonymus gonionotus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.44	0.03	0.3	0.1	0.1	-	-	6.9	0.1	2.8
12/08/2010	Barbonymus gonionotus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.02	0.2	0.1	0.1	-	-	5.3	0.1	1.8
12/08/2010	Barbonymus gonionotus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.02	0.3	0.1	0.1	-	-	3.0	0.1	1.7
12/08/2010	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.04	0.2	0.1	0.1	-	-	4.0	0.1	1.5
12/08/2010	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.1	0.1	0.1	-	-	4.3	0.1	1.8
12/08/2010	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.13	0.2	0.1	0.1	-	-	5.2	0.1	2.2
12/08/2010	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.05	0.2	0.1	0.1	-	-	4.8	0.1	1.5
12/08/2010	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.03	0.2	0.1	0.1	-	-	4.6	0.1	1.5
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.12	0.19	0.1	0.3	0.2	0.3	0.4	3.1	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.19	0.07	0.2	0.1	0.2	0.3	0.4	5.9	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.18	0.07	0.2	0.1	0.2	0.3	0.4	5.9	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.14	0.06	0.1	0.1	0.2	0.5	0.4	2.9	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.12	0.06	0.1	0.1	0.2	0.3	0.4	3.6	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.13	0.06	0.1	0.1	0.2	0.3	0.4	3.6	-	-
14/01/2009	Potamosiluras velutinus	W23	Nena/Frieda	MCR	Flesh	0.10	-	0.3	-	0.1	0.12	0.06	0.1	0.1	0.2	0.3	0.4	3.4	-	-
25/12/2009	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.18	0.11	0.1	0.0	0.0	0.0	0.3	1.8	-	-
26/12/2009	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.01	0.3	0.0	0.0	-	0.10	0.11	1.0	0.0	0.0	0.0	0.4	3.1	-	-
27/12/2009	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.01	0.1	0.0	0.0	-	0.13	0.13	0.3	0.0	0.0	0.0	0.9	3.0	-	-
28/12/2009	Prochilodus argenteus	W23	Nena/Frieda	MCR	Flesh	0.01	2.9	0.0	0.0	-	0.11	0.03	0.1	0.0	0.0	0.0	0.7	2.4	-	-
12/10/2010	Barbonymus gonionotus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.01	0.2	0.1	0.1	-	-	2.8	0.1	1.5
12/10/2010	Barbonymus gonionotus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.7	0.1	0.0	0.1	0.16	0.01	0.3	0.1	0.1	-	-	2.9	0.1	1.6
12/10/2010	Barbonymus gonionotus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.01	0.3	0.1	0.1	-	-	2.6	0.1	1.5
12/10/2010	Barbonymus gonionotus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.02	0.2	0.1	0.1	-	-	2.7	0.1	1.5
12/10/2010	Barbonymus gonionotus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.4	0.1	0.1	-	-	2.7	0.1	1.5
12/10/2010	Brustiarius nox	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.28	0.33	0.1	0.1	0.1	-	-	7.3	0.1	8.2
12/10/2010	Brustiarius nox	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.18	0.24	0.1	0.1	0.1	-	-	10.0	0.1	3.9
12/10/2010	Brustiarius solidus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.35	0.2	0.1	0.1	-	-	3.1	0.1	1.9
12/10/2010	Brustiarius solidus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.22	0.22	0.1	0.1	0.1	-	-	4.3	0.1	4.6
12/10/2010	Brustiarius solidus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.28	0.13	0.2	0.1	0.1	-	-	15.0	0.1	5.3

Fish Tissue Data

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
12/10/2010	Oxyeleotris heterodon	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.18	0.1	0.1	0.1	-	-	2.6	0.1	1.5
12/10/2010	Oxyeleotris heterodon	W26	Sepik floodplain	ORWB	Flesh	0.05	1.7	0.1	0.0	0.1	0.11	0.30	0.1	0.1	0.1	-	-	2.0	0.1	1.5
12/10/2010	Oxyeleotris heterodon	W26	Sepik floodplain	ORWB	Flesh	0.05	1.7	0.1	0.0	0.1	0.08	0.11	0.1	0.1	0.1	-	-	2.1	0.1	1.5
12/10/2010	Oxyeleotris heterodon	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.34	0.1	0.1	0.1	-	-	2.3	0.1	1.5
12/10/2010	Oxyeleotris heterodon	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.20	0.1	0.1	0.1	-	-	2.3	0.1	1.5
12/10/2010	Piaractus brachypomus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.04	0.7	0.1	0.1	-	-	3.2	0.1	1.5
12/10/2010	Piaractus brachypomus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.04	0.5	0.1	0.1	-	-	2.7	0.1	1.7
12/10/2010	Piaractus brachypomus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.09	0.6	0.1	0.1	-	-	3.0	0.1	1.5
12/10/2010	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.07	0.3	0.1	0.1	-	-	2.7	0.1	1.5
12/10/2010	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.07	0.7	0.1	0.1	-	-	2.8	0.1	1.5
12/10/2010	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.07	0.6	0.1	0.1	-	-	3.6	0.1	1.5
12/10/2010	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.05	2.6	0.1	0.0	0.1	0.11	0.14	0.3	0.1	0.1	-	-	3.2	0.1	3.9
12/10/2010	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.05	1.6	0.1	0.0	0.1	0.09	0.19	0.4	0.1	0.1	-	-	2.9	0.1	1.5
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.09	0.08	0.7	0.1	0.2	0.3	0.7	3.6	-	-
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.12	0.18	0.3	0.1	0.2	0.3	0.6	4.0	-	-
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.12	0.17	0.3	0.1	0.2	0.3	0.6	4.0	-	-
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.09	0.11	0.4	0.1	0.2	0.3	0.6	3.6	-	-
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.11	0.05	0.3	0.1	0.2	0.3	0.7	3.2	-	-
24/01/2009	Prochilodus argenteus	W26	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.11	0.11	0.3	0.1	0.2	0.3	0.6	3.5	-	-
18/12/2009	Brustiarius nox	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.2	0.0	0.0	-	0.11	0.84	0.1	0.0	0.0	0.0	0.1	3.6	-	-
21/12/2009	Prochilodus argenteus	W26	Sepik Floodplain	ORWB	Flesh	0.01	1.0	0.0	0.0	-	0.08	0.09	0.2	0.0	0.1	0.0	0.5	3.3	-	-
22/12/2009	Prochilodus argenteus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.5	0.0	0.0	-	0.10	0.19	0.4	0.0	0.0	0.0	0.6	3.1	-	-
23/12/2009	Piaractus brachypomus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.3	0.0	0.0	-	0.10	0.12	0.1	0.0	0.0	0.0	0.0	3.0	-	-
23/12/2009	Prochilodus argenteus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.1	0.0	0.0	-	0.07	0.09	0.3	0.0	0.0	0.0	0.3	2.7	-	-
24/12/2009	Piaractus brachypomus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.1	0.0	0.0	-	0.08	0.04	0.1	0.0	0.0	0.0	0.0	1.9	-	-
24/12/2009	Prochilodus argenteus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.1	0.0	0.0	-	0.11	0.02	0.1	0.0	0.0	0.0	0.7	2.3	-	-
25/12/2009	Piaractus brachypomus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.5	0.0	0.0	-	0.12	0.14	0.2	0.0	0.0	0.0	0.0	2.8	-	-
25/12/2009	Prochilodus argenteus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.1	0.0	0.0	-	0.07	0.09	0.1	0.0	0.0	0.0	0.4	2.1	-	-
26/12/2009	Piaractus brachypomus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.5	0.0	0.0	-	0.08	0.03	0.3	0.0	0.0	0.0	0.0	2.2	-	-
27/12/2009	Piaractus brachypomus	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.4	0.0	0.0	-	0.11	0.01	0.7	0.0	0.0	0.0	0.0	3.0	-	-
31/12/2009	Brustiarius nox	W26	Sepik Floodplain	ORWB	Flesh	0.01	0.6	0.0	0.0	-	0.11	0.48	0.1	0.0	0.0	0.0	0.0	3.3	-	-
21/12/2009	Barbonymus gonionotus	W31	Usage/May	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.18	0.11	0.1	0.0	0.0	0.0	0.4	2.5	-	-
26/08/2010	Barbonymus gonionotus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.18	0.02	0.3	0.1	0.1	-	-	2.6	0.1	2.8
26/08/2010	Barbonymus gonionotus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.18	0.01	0.3	0.1	0.1	-	-	3.1	0.1	2.4
26/08/2010	Barbonymus gonionotus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.01	0.4	0.1	0.1	-	-	2.4	0.1	2.4
26/08/2010	Barbonymus gonionotus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.18	0.02	0.3	0.1	0.1	-	-	2.9	0.1	1.8
26/08/2010	Barbonymus gonionotus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.06	0.3	0.1	0.1	-	-	2.3	0.1	1.5
26/08/2010	Piaractus brachypomus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.01	0.3	0.1	0.1	-	-	2.3	0.1	1.6
26/08/2010	Piaractus brachypomus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.4	0.1	0.1	-	-	2.5	0.1	1.5
26/08/2010	Piaractus brachypomus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.6	0.1	0.1	-	-	2.4	0.1	1.5
26/08/2010	Piaractus brachypomus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.3	0.1	0.1	-	-	2.3	0.1	1.5
26/08/2010	Piaractus brachypomus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.02	0.8	0.1	0.1	-	-	2.5	0.1	1.5
26/08/2010	Potamosiluras velutinus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.05	0.1	0.1	0.1	-	-	3.3	0.1	2.6
26/08/2010	Prochilodus argenteus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.07	0.7	0.1	0.1	-	-	2.6	0.1	2.9
26/08/2010	Prochilodus argenteus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.2	0.10	0.09	0.2	0.1	0.1	-	-	2.4	0.1	2.1
26/08/2010	Prochilodus argenteus	W31B	Usage/May	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.08	0.3	0.1	0.1	-	-	3.7	0.1	1.6
12/08/2010	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.05	0.2	0.1	0.1	-	-	4.4	0.1	1.6
12/08/2010	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.26	0.03	0.4	0.1	0.1	-	-	5.3	0.1	3.6
12/08/2010	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.20	0.05	0.2	0.1	0.1	-	-	5.0	0.1	2.5
12/08/2010	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.02	0.2	0.1	0.1	-	-	4.5	0.1	2.2
12/08/2010	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.12	0.1	0.1	0.1	-	-	4.4	0.1	1.8
12/08/2010	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.19	0.22	0.4	0.1	0.1	-	-	6.7	0.1	1.9
12/08/2010	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.19	0.04	0.2	0.1	0.1	-	-	5.3	0.1	1.5
12/08/2010	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.33	0.03	0.2	0.1	0.1	-	-	5.2	0.1	3.2
12/08/2010	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.19	0.03	0.2	0.1	0.1	-	-	5.1	0.1	2.3
12/08/2010	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.21	0.03	0.2	0.1	0.1	-	-	5.1	0.1	2.2
15/11/2008	Oxyeleotris heterodon	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.13	0.01	0.1	0.1	0.1	0.3	0.6	2.5	-	-
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.19	0.20	0.6	0.1	0.1	0.3	0.6	4.0	-	-
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.17	0.19	0.6	0.1	0.1	0.3	0.6	3.6	-	-

Fish Tissue Data

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.21	0.03	0.6	0.1	0.1	0.3	1.0	4.6	-	-
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.18	0.03	0.3	0.1	0.1	0.3	0.8	3.4	-	-
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.24	0.08	0.9	0.1	0.1	0.3	0.7	4.9	-	-
15/11/2008	Platorchestia platensis	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.15	0.08	0.3	0.1	0.1	0.3	0.6	3.2	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.21	0.11	0.1	0.1	0.2	1.0	0.3	10.0	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.19	0.04	0.1	0.1	0.2	0.3	0.4	6.3	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.16	0.05	0.1	0.1	0.2	0.3	0.4	7.1	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.15	0.04	0.1	0.1	0.2	0.3	0.5	5.4	-	-
15/11/2008	Sciades utaris	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.23	0.09	0.1	0.1	0.2	0.3	0.4	34.0	-	-
18/01/2009	Prochilodus argenteus	W33	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.07	0.05	0.2	0.1	0.2	0.3	0.6	2.5	-	-
9/12/2009	Barbonymus gonionotus	W33	Sepik floodplain	LLR	Flesh	0.01	0.4	0.0	0.0	-	0.20	0.10	0.2	0.0	0.0	0.0	0.2	2.6	-	-
10/12/2009	Barbonymus gonionotus	W33	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.10	0.01	0.1	0.0	0.0	0.0	0.0	2.0	-	-
11/12/2009	Barbonymus gonionotus	W33	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.30	0.02	0.2	0.0	0.0	0.0	0.1	3.3	-	-
12/12/2009	Barbonymus gonionotus	W33	Sepik Floodplain	LLR	Flesh	0.01	0.2	0.0	0.0	-	0.08	0.02	0.2	0.0	0.0	0.0	0.1	2.0	-	-
13/12/2009	Barbonymus gonionotus	W33	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.34	0.02	0.3	0.0	0.0	0.0	0.1	3.4	-	-
19/12/2009	Piaractus brachypomus	W33	Sepik Floodplain	LLR	Flesh	0.01	0.6	0.0	0.0	-	0.12	0.03	0.1	0.0	0.0	0.0	0.0	2.2	-	-
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.09	0.3	0.1	0.1	-	-	2.6	0.1	1.5
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.22	0.02	0.2	0.1	0.1	-	-	6.0	0.1	2.5
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.25	0.08	0.2	0.1	0.1	-	-	6.1	0.1	2.8
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.09	0.2	0.1	0.1	-	-	5.3	0.1	3.2
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.26	0.07	0.1	0.1	0.1	-	-	4.9	0.1	3.6
11/08/2010	Piaractus brachypomus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.01	0.2	0.1	0.1	-	-	3.8	0.1	1.5
11/08/2010	Potamosiluras velutinus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.28	0.07	0.2	0.1	0.1	-	-	4.7	0.1	2.5
11/08/2010	Potamosiluras velutinus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.07	0.2	0.1	0.1	-	-	8.8	0.1	1.5
11/08/2010	Prochilodus argenteus	W34	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.22	0.02	0.3	0.1	0.1	-	-	3.9	0.1	1.6
18/01/2009	Prochilodus argenteus	W34	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.06	0.09	0.2	0.1	0.2	0.3	0.4	2.1	-	-
17/08/2010	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.12	0.2	0.1	0.1	-	-	7.9	0.1	2.6
17/08/2010	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.09	0.1	0.1	0.1	-	-	2.3	0.1	1.5
17/08/2010	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.11	0.1	0.1	0.1	-	-	3.4	0.1	1.5
17/08/2010	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.14	0.1	0.1	0.1	-	-	7.4	0.1	1.7
17/08/2010	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.14	0.1	0.1	0.1	-	-	2.4	0.1	1.5
18/01/2009	Prochilodus argenteus	W35	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.12	0.09	0.5	0.1	0.2	0.3	0.7	3.2	-	-
1/12/2009	Potamosiluras velutinus	W35	Sepik floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.08	0.62	0.1	0.0	0.0	0.0	0.1	3.5	-	-
2/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.5	0.0	0.0	-	0.14	0.28	0.1	0.0	0.0	0.0	0.1	2.9	-	-
3/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.15	0.19	0.2	0.0	0.0	0.0	0.2	5.3	-	-
4/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.12	0.16	0.1	0.0	0.0	0.0	0.2	5.5	-	-
5/12/2009	Potamosiluras velutinus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.12	0.10	0.2	0.0	0.0	0.0	0.2	2.8	-	-
14/12/2009	Barbonymus gonionotus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.14	0.02	0.7	0.0	0.0	0.0	0.2	3.6	-	-
15/12/2009	Barbonymus gonionotus	W35	Sepik Floodplain	LLR	Flesh	0.01	2.2	0.0	0.0	-	0.33	0.01	0.2	0.0	0.0	0.0	0.1	3.6	-	-
16/12/2009	Barbonymus gonionotus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.5	0.0	0.0	-	0.10	0.01	0.4	0.0	0.0	0.0	0.3	2.9	-	-
17/12/2009	Barbonymus gonionotus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.4	0.0	0.0	-	0.13	0.09	0.2	0.0	0.0	0.0	0.2	2.4	-	-
18/12/2009	Barbonymus gonionotus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.32	0.06	0.2	0.0	0.0	0.0	0.5	3.4	-	-
18/12/2009	Prochilodus argenteus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.11	0.10	0.3	0.0	0.0	0.0	0.3	2.6	-	-
20/12/2009	Piaractus brachypomus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.09	0.04	0.1	0.0	0.0	0.0	0.0	1.8	-	-
21/12/2009	Piaractus brachypomus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.2	0.0	0.0	-	0.09	0.02	0.0	0.0	0.0	0.0	0.0	2.2	-	-
28/12/2009	Prochilodus argenteus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.2	0.0	0.0	-	0.34	0.17	0.3	0.0	0.0	0.0	0.4	3.2	-	-
29/12/2009	Prochilodus argenteus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.09	0.08	0.1	0.0	0.0	0.0	0.7	2.4	-	-
30/12/2009	Prochilodus argenteus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.2	0.0	0.0	-	0.56	0.06	0.2	0.0	0.0	0.0	0.6	3.7	-	-
31/12/2009	Prochilodus argenteus	W35	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.12	0.11	0.1	0.0	0.0	0.0	0.2	2.0	-	-
16/06/2010	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.02	0.4	0.1	0.1	-	-	4.0	0.1	1.5
16/06/2010	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.02	0.5	0.1	0.1	-	-	5.3	0.1	1.5
16/06/2010	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.16	0.2	0.1	0.1	-	-	4.7	0.1	1.5
16/06/2010	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.03	0.3	0.1	0.1	-	-	5.2	0.1	1.5
16/06/2010	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.02	0.7	0.1	0.1	-	-	6.4	0.1	1.7
16/06/2010	Piaractus brachypomus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.05	0.2	0.1	0.1	-	-	2.7	0.1	1.5
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.09	0.1	0.1	0.1	-	-	6.1	0.1	2.5
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.05	0.2	0.1	0.1	-	-	2.6	0.1	1.5
16/06/2010	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.13	0.1	0.1	0.1	-	-	4.1	0.1	1.5
16/01/2009	Potamosiluras velutinus	W36	Usage/May	LLR	Flesh	0.10	-	0.3	-	0.1	0.18	0.13	0.1	0.1	0.2	0.3	0.4	3.5	-	-

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
16/01/2009	Potamosiluras velutinus	W36	Usage/May	LLR	Flesh	0.10	-	0.3	-	0.1	0.11	0.20	0.1	0.1	0.2	0.3	0.4	3.6	-	-
18/01/2009	Prochilodus argenteus	W36	Usage/May	LLR	Flesh	0.10	-	0.3	-	0.1	0.15	0.03	0.4	0.1	0.2	0.3	0.4	3.6	-	-
6/12/2009	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.01	1.0	0.0	0.0	-	0.14	0.17	0.1	0.0	0.0	0.0	0.2	3.2	-	-
7/12/2009	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.01	0.5	0.0	0.0	-	0.24	0.14	0.1	0.0	0.0	0.0	0.1	3.8	-	-
8/12/2009	Potamosiluras velutinus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.20	0.14	0.2	0.0	0.0	0.0	0.2	3.8	-	-
21/12/2009	Prochilodus argenteus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.08	0.08	0.2	0.0	0.0	0.0	0.3	2.0	-	-
22/12/2009	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.13	0.01	0.3	0.0	0.0	0.0	0.2	2.9	-	-
22/12/2009	Piaractus brachypomus	W36	Wario	LLR	Flesh	0.01	1.5	0.0	0.0	-	0.10	0.01	0.1	0.0	0.0	0.0	0.0	1.9	-	-
22/12/2009	Prochilodus argenteus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.08	0.15	0.0	0.0	0.0	0.0	0.7	1.9	-	-
23/12/2009	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.15	0.06	0.4	0.0	0.0	0.0	0.1	3.0	-	-
23/12/2009	Prochilodus argenteus	W36	Wario	LLR	Flesh	0.01	7.8	0.0	0.0	-	0.14	0.37	0.6	0.0	0.0	0.0	0.4	2.8	-	-
24/12/2009	Barbonymus gonionotus	W36	Wario	LLR	Flesh	0.01	0.3	0.0	0.0	-	0.15	0.06	0.5	0.0	0.0	0.0	0.2	3.4	-	-
24/12/2009	Prochilodus argenteus	W36	Wario	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.08	0.07	0.0	0.0	0.0	0.0	0.8	1.6	-	-
19/01/2009	Potamosiluras velutinus	W38a	Nena/Frieda	LLR	Flesh	0.10	-	0.3	-	0.1	0.16	0.08	0.1	0.1	0.2	0.3	0.4	3.8	-	-
19/01/2009	Potamosiluras velutinus	W38a	Nena/Frieda	LLR	Flesh	0.10	-	0.3	-	0.1	0.13	0.09	0.2	0.1	0.2	0.3	0.5	2.7	-	-
19/01/2009	Prochilodus argenteus	W38a	Nena/Frieda	LLR	Flesh	0.10	-	0.3	-	0.1	0.10	0.09	0.1	0.1	0.2	0.3	0.7	3.6	-	-
19/01/2009	Prochilodus argenteus	W38a	Nena/Frieda	LLR	Flesh	0.10	-	0.3	-	0.1	0.09	0.05	0.5	0.1	0.2	0.5	0.7	4.5	-	-
19/01/2009	Prochilodus argenteus	W38a	Nena/Frieda	LLR	Flesh	0.10	-	0.3	-	0.1	0.12	0.13	0.5	0.1	0.2	0.3	0.8	3.6	-	-
22/01/2009	Prochilodus argenteus	W43	Nena/Frieda	ULC	Flesh	0.10	-	0.3	-	0.1	0.18	0.06	0.3	0.1	0.2	0.3	0.7	3.9	-	-
22/01/2009	Prochilodus argenteus	W43	Nena/Frieda	ULC	Flesh	0.10	-	0.3	-	0.1	0.26	0.07	0.4	0.1	0.2	0.3	0.6	6.5	-	-
22/01/2009	Prochilodus argenteus	W43	Nena/Frieda	ULC	Flesh	0.10	-	0.3	-	0.1	0.17	0.10	0.5	0.1	0.2	0.3	0.7	5.0	-	-
22/01/2009	Prochilodus argenteus	W43	Nena/Frieda	ULC	Flesh	0.10	-	0.3	-	0.1	0.15	0.05	0.5	0.1	0.2	0.6	0.8	4.7	-	-
22/01/2009	Prochilodus argenteus	W43	Nena/Frieda	ULC	Flesh	0.10	-	0.3	-	0.1	0.23	0.04	0.4	0.1	0.2	0.3	0.6	4.5	-	-
16/11/2008	Platorchestia platensis	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.29	0.06	0.3	0.2	0.2	0.3	0.9	3.4	-	-
16/11/2008	Platorchestia platensis	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.21	0.08	0.6	0.1	0.2	0.3	4.1	4.5	-	-
16/11/2008	Platorchestia platensis	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.2	1.10	0.08	1.9	0.1	0.2	0.3	2.6	13.0	-	-
16/11/2008	Platorchestia platensis	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.18	0.01	0.3	0.1	0.2	0.3	0.6	2.6	-	-
16/11/2008	Potamosiluras coatsi	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.11	0.05	0.2	0.2	0.2	0.3	0.9	3.9	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.18	0.05	0.4	0.1	0.2	0.3	0.5	3.1	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.17	0.04	0.1	0.1	0.2	0.3	0.5	5.0	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.25	0.15	0.4	0.1	0.2	0.3	0.4	5.3	-	-
16/11/2008	Sciades utaris	W50	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.17	0.08	0.1	0.2	0.2	0.3	0.4	6.0	-	-
16/11/2008	Potamosiluras coatsi	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.12	0.07	0.1	0.1	0.2	0.3	1.0	2.8	-	-
24/11/2008	Brustiarius solidus	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.28	0.02	0.2	0.1	0.2	0.3	0.5	4.2	-	-
24/11/2008	Platorchestia platensis	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.14	0.02	0.1	0.1	0.2	0.3	0.6	3.8	-	-
24/11/2008	Platorchestia platensis	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.17	0.01	0.4	0.1	0.2	0.3	0.6	3.0	-	-
24/11/2008	Platorchestia platensis	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.16	0.03	0.3	0.1	0.2	0.3	0.5	3.2	-	-
24/11/2008	Platorchestia platensis	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.11	0.01	0.3	0.1	0.2	0.3	0.6	3.1	-	-
24/11/2008	Platorchestia platensis	W51	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.13	0.01	0.3	0.1	0.2	0.3	0.7	2.7	-	-
24/11/2008	Brustiarius solidus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.17	0.01	0.1	0.1	0.2	0.3	0.5	4.0	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.15	0.02	0.3	0.1	0.2	0.3	0.7	3.1	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.11	0.03	0.3	0.1	0.2	0.3	1.0	3.2	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.09	0.12	0.4	0.1	0.2	0.3	0.6	2.9	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.13	0.09	0.8	0.1	0.2	0.3	0.6	3.0	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.12	0.04	0.5	0.1	0.2	0.3	0.6	3.5	-	-
22/01/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.12	0.04	0.5	0.1	0.2	0.3	0.6	3.6	-	-
19/12/2009	Barbonymus gonionotus	W54	Sepik Floodplain	LLR	Flesh	0.01	0.3	0.0	0.0	-	0.28	0.17	0.4	0.0	0.0	0.0	0.2	3.9	-	-
19/12/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.11	0.03	0.1	0.0	0.0	0.0	0.5	1.9	-	-
20/12/2009	Barbonymus gonionotus	W54	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.26	0.08	0.6	0.0	0.0	0.0	0.1	5.0	-	-
20/12/2009	Prochilodus argenteus	W54	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.15	0.04	0.1	0.0	0.0	0.0	0.1	1.7	-	-
25/12/2009	Brustiarius nox	W54	Sepik Floodplain	LLR	Flesh	0.01	0.1	0.0	0.0	-	0.07	0.23	0.1	0.0	0.0	0.0	0.0	3.1	-	-
19/10/2010	Barbonymus gonionotus	W60	Sepik floodplain	LLR	Flesh	0.05	1.7	0.1	0.0	0.1	0.14	0.04	0.3	0.1	0.1	-	-	4.2	0.1	2.2
19/10/2010	Barbonymus gonionotus	W60	Sepik floodplain	LLR	Flesh	0.05	2.7	0.1	0.0	0.1	0.13	0.02	0.3	0.1	0.1	-	-	3.3	0.1	4.4
19/10/2010	Barbonymus gonionotus	W60	Sepik floodplain	LLR	Flesh	0.05	1.6	0.1	0.0	0.1	0.15	0.02	0.5	0.1	0.1	-	-	4.5	0.1	2.2
19/10/2010	Barbonymus gonionotus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.02	0.2	0.1	0.1	-	-	3.7	0.1	1.5
19/10/2010	Barbonymus gonionotus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.02	0.3	0.1	0.1	-	-	3.0	0.1	2.0
19/10/2010	Brustiarius nox	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.11	0.1	0.1	0.1	-	-	3.4	0.1	1.5
19/10/2010	Piaractus brachypomus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.01	0.3	0.1	0.1	-	-	2.3	0.1	1.5
19/10/2010	Piaractus brachypomus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.02	0.3	0.1	0.1	-	-	2.3	0.1	1.5

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
19/10/2010	Piaractus brachypomus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.04	0.3	0.1	0.1	-	-	2.4	0.1	1.5
19/10/2010	Piaractus brachypomus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.3	0.1	0.1	-	-	2.5	0.1	1.5
19/10/2010	Piaractus brachypomus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.01	0.4	0.1	0.1	-	-	2.5	0.1	1.5
19/10/2010	Potamosiluras velutinus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.06	0.2	0.1	0.1	-	-	8.1	0.1	1.5
19/10/2010	Potamosiluras velutinus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.09	0.1	0.1	0.1	-	-	3.9	0.1	1.5
19/10/2010	Potamosiluras velutinus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.05	0.2	0.1	0.1	-	-	2.3	0.1	1.5
19/10/2010	Potamosiluras velutinus	W60	Sepik floodplain	LLR	Flesh	0.05	1.9	0.1	0.0	0.1	0.09	0.08	0.2	0.1	0.1	-	-	2.4	0.1	2.1
19/10/2010	Potamosiluras velutinus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.09	0.1	0.1	0.1	-	-	2.8	0.1	1.5
19/10/2010	Prochilodus argenteus	W60	Sepik floodplain	LLR	Flesh	0.05	1.6	0.1	0.0	0.1	0.09	0.07	0.4	0.1	0.1	-	-	2.7	0.1	2.2
19/10/2010	Prochilodus argenteus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.05	0.5	0.1	0.1	-	-	3.0	0.1	1.5
19/10/2010	Prochilodus argenteus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.02	0.3	0.1	0.1	-	-	2.8	0.1	1.5
19/10/2010	Prochilodus argenteus	W60	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.05	0.2	0.1	0.1	-	-	3.2	0.1	1.8
19/10/2010	Prochilodus argenteus	W60	Sepik floodplain	LLR	Flesh	0.05	1.8	0.1	0.0	0.1	0.09	0.14	0.5	0.1	0.1	-	-	3.7	0.2	2.2
22/10/2010	Barbonymus gonionotus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.01	0.3	0.1	0.1	-	-	3.1	0.1	1.6
22/10/2010	Barbonymus gonionotus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.01	0.2	0.1	0.1	-	-	3.2	0.1	1.5
22/10/2010	Barbonymus gonionotus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.06	0.01	0.3	0.1	0.1	-	-	3.2	0.1	1.5
22/10/2010	Barbonymus gonionotus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.01	0.3	0.1	0.1	-	-	2.7	0.1	1.5
22/10/2010	Brustiarius nox	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.21	0.1	0.1	0.1	-	-	6.5	0.1	1.6
22/10/2010	Piaractus brachypomus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.02	0.4	0.1	0.1	-	-	2.8	0.1	1.8
22/10/2010	Prochilodus argenteus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.05	0.7	0.1	0.1	-	-	2.8	0.1	2.1
22/10/2010	Prochilodus argenteus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.03	0.3	0.1	0.1	-	-	2.7	0.1	1.6
22/10/2010	Prochilodus argenteus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.03	0.1	0.1	0.1	-	-	2.8	0.1	1.5
22/10/2010	Prochilodus argenteus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.09	0.4	0.1	0.1	-	-	2.5	0.1	1.7
22/10/2010	Prochilodus argenteus	W61	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.02	0.2	0.1	0.1	-	-	2.7	0.1	2.1
10/10/2010	Barbonymus gonionotus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.2	0.1	0.1	-	-	3.2	0.1	1.6
10/10/2010	Barbonymus gonionotus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.3	0.1	0.1	-	-	2.9	0.1	2.0
10/10/2010	Barbonymus gonionotus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.02	0.2	0.1	0.1	-	-	3.2	0.1	1.7
10/10/2010	Barbonymus gonionotus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.01	0.3	0.1	0.1	-	-	2.7	0.1	1.7
10/10/2010	Barbonymus gonionotus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.3	0.1	0.1	-	-	2.5	0.1	1.5
10/10/2010	Brustiarius nox	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.07	0.2	0.1	0.1	-	-	4.3	0.1	2.5
10/10/2010	Brustiarius nox	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.07	0.2	0.1	0.1	-	-	13.0	0.1	2.8
10/10/2010	Brustiarius solidus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.10	0.2	0.1	0.1	-	-	6.2	0.1	1.8
10/10/2010	Oxyeleotris heterodon	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.09	0.2	0.1	0.1	-	-	3.1	0.1	1.5
10/10/2010	Oxyeleotris heterodon	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.03	0.1	0.1	0.1	-	-	2.6	0.1	1.5
10/10/2010	Oxyeleotris heterodon	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.06	0.2	0.1	0.1	-	-	2.5	0.1	1.5
10/10/2010	Piaractus brachypomus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.02	0.4	0.1	0.1	-	-	3.4	0.1	3.1
10/10/2010	Piaractus brachypomus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.01	0.3	0.1	0.1	-	-	2.8	0.1	2.6
10/10/2010	Piaractus brachypomus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.03	0.3	0.1	0.1	-	-	3.0	0.1	2.2
10/10/2010	Prochilodus argenteus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.06	0.2	0.1	0.1	-	-	3.2	0.1	1.5
10/10/2010	Prochilodus argenteus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.04	0.2	0.1	0.1	-	-	3.3	0.1	1.5
10/10/2010	Prochilodus argenteus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.06	0.6	0.1	0.1	-	-	3.6	0.1	1.5
10/10/2010	Prochilodus argenteus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.3	0.1	0.1	-	-	3.2	0.1	1.6
10/10/2010	Prochilodus argenteus	W62	Sepik floodplain	ORWB	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.04	0.3	0.1	0.1	-	-	3.3	0.1	1.5
28/11/2008	Brustiarius solidus	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.34	0.05	0.1	0.1	0.2	0.3	0.5	6.5	-	-
28/11/2008	O.mossambicus	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.43	0.02	0.2	0.1	0.2	0.3	0.5	2.7	-	-
28/11/2008	Oxyeleotris heterodon	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.15	0.01	0.2	0.1	0.2	0.3	0.7	4.1	-	-
28/11/2008	Piaractus brachypomus	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.53	0.04	0.1	0.1	0.2	0.5	0.5	2.7	-	-
28/11/2008	Platorchestia platensis	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.27	0.04	0.1	0.1	0.2	0.3	0.9	4.5	-	-
28/11/2008	Platorchestia platensis	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.32	0.05	0.3	0.1	0.2	0.3	0.7	5.8	-	-
28/11/2008	Platorchestia platensis	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.5	-	0.1	0.36	0.07	1.2	0.1	0.2	0.4	0.7	6.1	-	-
28/11/2008	Platorchestia platensis	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.29	0.06	0.2	0.1	0.2	0.3	0.7	5.2	-	-
28/11/2008	Platorchestia platensis	W62	Sepik floodplain	ORWB	Flesh	0.10	-	0.3	-	0.1	0.28	0.06	0.2	0.1	0.2	0.3	0.6	5.2	-	-
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.11	0.2	0.1	0.1	-	-	2.4	0.1	1.9
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.07	0.01	0.2	0.1	0.1	-	-	2.6	0.1	1.5
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.03	0.4	0.1	0.1	-	-	2.8	0.1	1.5
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.15	0.01	0.3	0.1	0.1	-	-	3.3	0.1	1.7
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.01	0.3	0.1	0.1	-	-	2.7	0.1	1.5
19/10/2010	Barbonymus gonionotus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.01	0.3	0.1	0.1	-	-	2.8	0.1	1.5
23/10/2010	Brustiarius nox	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.15	0.1	0.1	0.1	-	-	3.3	0.1	2.0

Fish Tissue Data

Date	Species	Site name	Catchment	Type	Tissue	Ag	Al	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Se	Zn	Co	Fe
23/10/2010	Brustiarius nox	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.21	0.1	0.1	0.1	-	-	5.2	0.1	2.1
23/10/2010	Brustiarius nox	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.12	0.1	0.1	0.1	-	-	2.7	0.1	1.5
23/10/2010	Brustiarius nox	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.36	0.1	0.1	0.1	-	-	3.6	0.1	2.0
23/10/2010	Piaractus brachypomus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.5	0.1	0.1	-	-	2.7	0.1	1.5
23/10/2010	Piaractus brachypomus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.09	0.5	0.1	0.1	-	-	2.5	0.1	1.5
23/10/2010	Piaractus brachypomus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.09	0.3	0.1	0.1	-	-	2.6	0.1	1.5
23/10/2010	Prochilodus argenteus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.2	0.1	0.1	-	-	2.5	0.1	1.6
23/10/2010	Prochilodus argenteus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.2	0.1	0.1	-	-	3.8	0.1	1.7
23/10/2010	Prochilodus argenteus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.03	0.3	0.1	0.1	-	-	2.4	0.1	1.5
23/10/2010	Prochilodus argenteus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.02	0.4	0.1	0.1	-	-	2.4	0.1	1.5
23/10/2010	Prochilodus argenteus	W63	Sepik floodplain	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.06	0.3	0.1	0.1	-	-	2.5	0.2	1.5
28/11/2008	Brustiarius solidus	W63	Sepik floodplain	LLR	Flesh	0.11	-	1.1	-	0.1	0.96	0.05	0.2	0.2	0.2	1.0	1.0	8.4	-	-
28/11/2008	Oxyeleotris heterodon	W63	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.13	0.01	0.1	0.1	0.2	0.3	0.5	2.5	-	-
28/11/2008	Brustiarius solidus	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.30	0.05	0.1	0.1	0.2	0.3	0.4	4.4	-	-
28/11/2008	Oxyeleotris heterodon	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.21	0.02	0.1	0.1	0.2	0.3	0.5	3.3	-	-
4/12/2008	Barbonymus gonionotus	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.6	-	0.2	0.65	0.02	0.7	0.1	0.2	0.3	3.4	12.0	-	-
4/12/2008	Brustiarius solidus	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.20	0.01	0.1	0.1	0.2	0.3	0.3	3.0	-	-
4/12/2008	Oxyeleotris heterodon	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.14	0.01	0.1	0.1	0.2	0.3	0.6	2.8	-	-
4/12/2008	Platorchestia platensis	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.23	0.03	0.1	0.1	0.2	0.3	0.8	3.4	-	-
4/12/2008	Platorchestia platensis	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.5	-	0.1	0.39	0.07	0.8	0.1	0.2	0.5	1.3	8.6	-	-
4/12/2008	Platorchestia platensis	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.20	0.02	0.3	0.1	0.2	0.3	0.7	3.0	-	-
4/12/2008	Platorchestia platensis	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.20	0.02	0.3	0.1	0.2	0.3	0.7	3.0	-	-
4/12/2008	Platorchestia platensis	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.27	0.06	0.6	0.1	0.2	0.3	0.8	5.0	-	-
4/12/2008	Sciades utaris	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.4	-	0.1	0.18	0.02	0.1	0.1	0.2	0.3	0.5	5.6	-	-
4/12/2008	Sciades utaris	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.11	0.01	0.1	0.1	0.2	0.3	0.4	10.0	-	-
4/12/2008	Sciades utaris	W64	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.19	0.01	0.1	0.1	0.2	0.3	0.4	6.0	-	-
28/11/2008	Brustiarius solidus	W65	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.48	0.04	0.1	0.1	0.2	0.3	0.5	14.0	-	-
28/11/2008	Oxyeleotris heterodon	W65	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.15	0.02	0.1	0.1	0.2	0.3	0.7	4.5	-	-
4/12/2008	Brustiarius solidus	W65	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.20	0.01	0.1	0.1	0.2	0.3	0.3	3.0	-	-
4/12/2008	Oxyeleotris heterodon	W65	Sepik floodplain	LLR	Flesh	0.10	-	0.3	-	0.1	0.25	0.03	0.1	0.1	0.2	0.3	0.6	3.4	-	-
27/08/2010	Glossogobius coatesi	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.08	0.29	0.1	0.1	0.1	-	-	2.5	0.1	1.5
27/08/2010	Piaractus brachypomus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.04	0.2	0.1	0.1	-	-	2.5	0.1	1.5
27/08/2010	Piaractus brachypomus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.4	0.1	0.1	-	-	2.6	0.1	1.6
27/08/2010	Piaractus brachypomus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.2	0.1	0.1	-	-	2.3	0.1	1.5
27/08/2010	Piaractus brachypomus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.02	0.3	0.1	0.1	-	-	2.2	0.1	1.5
27/08/2010	Piaractus brachypomus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.01	0.6	0.1	0.1	-	-	2.4	0.1	1.5
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.02	0.1	0.1	0.1	-	-	2.4	0.1	2.7
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.07	0.2	0.1	0.1	-	-	2.9	0.1	1.6
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.16	0.1	0.1	0.1	-	-	3.8	0.1	1.9
27/08/2010	Potamosiluras velutinus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.09	0.1	0.1	0.1	-	-	3.0	0.1	1.6
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.06	0.3	0.1	0.1	-	-	2.4	0.1	1.5
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.09	0.04	0.3	0.1	0.1	-	-	2.6	0.1	1.8
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.10	0.3	0.1	0.1	-	-	3.2	0.1	1.5
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.10	0.03	0.1	0.1	0.1	-	-	6.1	0.1	1.5
27/08/2010	Prochilodus argenteus	W70	Nena/Frieda	MCR	Flesh	0.05	1.5	0.1	0.0	0.1	0.05	0.05	0.1	0.1	0.1	-	-	0.2	0.1	1.5
10/08/2010	Barbonymus gonionotus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.18	0.02	0.8	0.1	0.1	-	-	5.7	0.1	1.6
10/08/2010	Barbonymus gonionotus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.23	0.03	0.3	0.1	0.1	-	-	4.5	0.1	2.6
10/08/2010	Barbonymus gonionotus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.01	0.4	0.1	0.1	-	-	3.5	0.1	3.2
10/08/2010	Barbonymus gonionotus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.16	0.02	0.2	0.1	0.1	-	-	6.0	0.1	1.6
10/08/2010	Barbonymus gonionotus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.17	0.02	0.3	0.1	0.1	-	-	3.8	0.1	2.5
10/08/2010	Potamosiluras velutinus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.13	0.07	0.2	0.1	0.1	-	-	2.9	0.1	1.9
10/08/2010	Prochilodus argenteus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.07	0.2	0.1	0.1	-	-	3.0	0.1	1.5
10/08/2010	Prochilodus argenteus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.12	0.06	0.3	0.1	0.1	-	-	4.6	0.1	1.5
10/08/2010	Prochilodus argenteus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.14	0.08	0.3	0.1	0.1	-	-	5.6	0.1	2.1
10/08/2010	Prochilodus argenteus	W71	Nena/Frieda	LLR	Flesh	0.05	1.5	0.1	0.0	0.1	0.11	0.03	0.4	0.1	0.1	-	-	3.4	0.1	1.5

E.2 BMT WBM Data (2011)

Table E-2 Concentrations of metals/metalloid (mg/kg) derived from fish and macrobrachium tissue samples in June and December 2011

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
BC	*Glossogobius koragenis*	Flesh	30/06/2011	1	13	104	5	0.94	<0.01	<0.05	<0.01	0.19	<0.01	0.26	0.02	<0.01	0.34	<0.02	3.4
BC	*Glossogobius koragenis*	Flesh	30/06/2011	2	10	101	4	1.4	<0.01	<0.05	0.01	0.24	<0.01	0.67	0.02	0.01	0.3	<0.02	3.2
BC	*Glossogobius koragenis*	Flesh	30/06/2011	3	19	120	6	0.58	<0.01	<0.05	<0.01	0.2	<0.01	0.29	0.03	0.01	0.3	<0.02	2.9
BC	*Melanotaenia affinis*	Flesh	30/06/2011	1	5	84	2	1.4	<0.01	<0.05	0.02	1	<0.01	0.61	0.03	0.02	0.24	<0.02	25
BC	*Melanotaenia affinis*	Flesh	30/06/2011	2	13	102	5	1.2	<0.01	<0.05	0.02	0.51	<0.01	0.18	0.03	<0.01	0.26	<0.02	7.1
BC	*Melanotaenia affinis*	Flesh	30/06/2011	3	3	80	2	1	<0.01	<0.05	0.02	0.98	<0.01	0.63	0.02	0.02	0.27	<0.02	21
BC	*Melanotaenia affinis*	Flesh	30/06/2011	4	6	88	3	0.97	<0.01	<0.05	0.01	0.82	0.01	0.38	0.02	<0.01	0.23	<0.02	19
BC	*Melanotaenia affinis*	Flesh	30/06/2011	5	6	90	3	0.89	<0.01	<0.05	0.02	0.79	<0.01	0.33	0.01	0.01	0.28	0.02	15
RORWB	*Barbonymus gonionotus*	Flesh	30/06/2011	1	187	236	12	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.2	0.07	<0.01	0.22	<0.02	3.8
RORWB	*Barbonymus gonionotus*	Flesh	30/06/2011	2	116	208	11	<0.5	<0.01	<0.05	<0.01	0.21	<0.01	0.42	0.18	<0.01	0.18	<0.02	3.2
RORWB	*Barbonymus gonionotus*	Flesh	30/06/2011	3	75	180	12	1.2	<0.01	<0.05	0.02	0.39	<0.01	0.4	0.09	0.01	0.11	<0.02	3.9
RORWB	*Barbonymus gonionotus*	Flesh	30/06/2011	4	57	171	10	0.75	<0.01	<0.05	<0.01	0.26	<0.01	0.26	0.07	0.33	0.21	<0.02	5
RORWB	*Barbonymus gonionotus*	Gill	30/06/2011	1	187	236	5	16	<0.01	<0.05	0.01	0.77	0.06	13	<0.01	0.05	0.24	<0.02	23
RORWB	*Barbonymus gonionotus*	Gill	30/06/2011	2	116	208	3	3.4	<0.01	<0.05	0.02	1	0.04	15	0.02	0.02	0.29	<0.02	23
RORWB	*Barbonymus gonionotus*	Gill	30/06/2011	3	75	180	3	48	<0.01	<0.05	0.02	1.2	0.09	13	0.01	0.14	0.07	<0.02	25
RORWB	*Barbonymus gonionotus*	Gill	30/06/2011	4	57	171	1	41	<0.01	<0.05	0.01	1.2	0.08	13	<0.01	0.13	0.06	<0.02	28
RORWB	*Prochilodus argenteus*	Flesh	30/06/2011	1	162	250	9	1	<0.01	<0.05	<0.01	0.1	<0.01	0.27	0.36	<0.01	0.19	<0.02	3.3
RORWB	*Prochilodus argenteus*	Flesh	30/06/2011	2	208	263	11	0.53	<0.01	<0.05	<0.01	0.09	<0.01	0.26	0.28	<0.01	0.32	<0.02	3.1
RORWB	*Prochilodus argenteus*	Gill	30/06/2011	1	162	250	6	30	<0.01	<0.05	0.06	0.81	0.1	3.4	0.02	0.08	0.31	<0.02	11
RORWB	*Prochilodus argenteus*	Gill	30/06/2011	2	208	263	6	5.7	<0.01	<0.05	0.02	0.64	0.08	3	0.02	0.05	0.39	<0.02	11
W100	*Prochilodus argenteus*	Flesh	28/06/2011	1	170	256	12	1.1	<0.01	<0.05	<0.01	0.13	0.03	0.21	0.21	0.02	0.25	<0.02	3.7
W100	*Prochilodus argenteus*	Flesh	3/12/2011	1	656	380	10	<0.5	<0.01	<0.05	<0.01	0.13	0.01	0.26	0.07	0.03	0.33	<0.02	5.6
W100	*Prochilodus argenteus*	Flesh	3/12/2011	2	382	318	17	1.1	<0.01	<0.05	<0.01	0.15	<0.01	0.21	0.2	0.04	0.34	<0.02	4.4
W100	*Prochilodus argenteus*	Flesh	3/12/2011	3	287	288	11	<0.5	<0.01	<0.05	<0.01	0.14	<0.01	0.1	0.13	0.03	0.46	<0.02	3
W100	*Prochilodus argenteus*	Flesh	3/12/2011	4	245	271	12	1.6	<0.01	<0.05	<0.01	0.12	<0.01	0.25	0.1	0.04	0.29	<0.02	4
W100	*Prochilodus argenteus*	Flesh	3/12/2011	5	228	271	9	<0.5	<0.01	<0.05	<0.01	0.12	0.01	0.86	0.37	0.03	0.21	<0.02	3.6
W100	*Prochilodus argenteus*	Gill	28/06/2011	1	170	256	5	3	<0.01	<0.05	<0.01	0.57	0.14	2	0.01	0.11	0.42	<0.02	13
W100	*Prochilodus argenteus*	Gill	3/12/2011	1	656	380	15	36	<0.01	<0.05	<0.01	0.75	0.15	2.6	<0.01	0.56	0.6	<0.02	13
W100	*Prochilodus argenteus*	Gill	3/12/2011	2	382	318	10	53	<0.01	<0.05	0.01	0.86	0.18	3.9	<0.01	0.69	0.71	<0.02	14
W100	*Prochilodus argenteus*	Gill	3/12/2011	3	287	288	8	57	<0.01	<0.05	0.01	0.63	0.25	3.9	0.01	0.56	0.91	<0.02	15
W100	*Prochilodus argenteus*	Gill	3/12/2011	4	245	271	6	6.9	<0.01	<0.05	<0.01	0.51	0.09	1.9	<0.01	0.45	0.43	<0.02	12
W100	*Prochilodus argenteus*	Gill	3/12/2011	5	228	271	8	9.2	<0.01	<0.05	<0.01	0.49	0.21	5.8	0.02	0.24	0.33	<0.02	13
W23	*Chilatherina crassipinosa*	Flesh	26/06/2011	1	9	106	2	1.3	<0.01	<0.05	<0.01	0.33	<0.01	0.55	0.13	0.07	0.33	<0.02	13
W23	*Chilatherina crassipinosa*	Flesh	26/06/2011	2	16	125	4	14	<0.01	<0.05	<0.01	0.34	<0.01	0.25	0.17	0.04	0.25	<0.02	15
W23	*Chilatherina crassipinosa*	Flesh	26/06/2011	3	15	118	4	0.85	<0.01	<0.05	<0.01	0.33	0.01	0.18	0.06	0.07	0.23	<0.02	11
W23	*Chilatherina crassipinosa*	Flesh	26/06/2011	4	15	122	3	4.4	<0.01	<0.05	<0.01	0.34	<0.01	0.41	0.09	0.03	0.32	<0.02	15
W23	*Chilatherina crassipinosa*	Flesh	26/06/2011	5	11	115	3	0.98	<0.01	<0.05	<0.01	0.37	<0.01	0.26	0.09	0.04	0.24	<0.02	12
W23	*Prochilodus argenteus*	Flesh	26/06/2011	1	321	305	16	1.6	<0.01	<0.05	0.04	0.18	<0.01	0.17	0.11	0.06	0.37	<0.02	3.3
W23	*Prochilodus argenteus*	Flesh	26/06/2011	2	371	296	14	1.3	<0.01	<0.05	<0.01	0.19	<0.01	0.21	0.1	0.06	0.41	<0.02	2.7
W23	*Prochilodus argenteus*	Flesh	26/06/2011	3	226	265	13	1.6	<0.01	<0.05	<0.01	0.17	<0.01	0.23	0.11	0.09	0.46	<0.02	4.9
W23	*Prochilodus argenteus*	Flesh	26/06/2011	4	316	274	13	<0.5	<0.01	<0.05	<0.01	0.16	<0.01	0.17	0.03	0.05	0.33	<0.02	2.7
W23	*Prochilodus argenteus*	Flesh	26/06/2011	5	223	262	12	<0.5	<0.01	<0.05	<0.01	0.16	<0.01	0.13	0.11	0.05	0.35	<0.02	3.3
W23	*Prochilodus argenteus*	Gill	26/06/2011	1	321	305	7	17	<0.01	0.07	0.19	0.72	0.14	2.3	<0.01	0.87	0.92	<0.02	11
W23	*Prochilodus argenteus*	Gill	26/06/2011	2	371	296	9	84	0.01	0.09	0.05	1.8	0.36	6.9	<0.01	2.3	0.94	<0.02	15
W23	*Prochilodus argenteus*	Gill	26/06/2011	3	226	265	6	27	<0.01	0.07	0.02	1	0.15	2.9	<0.01	0.91	0.79	<0.02	12
W23	*Prochilodus argenteus*	Gill	26/06/2011	4	316	274	7	36	<0.01	<0.05	0.01	0.94	0.18	3.1	<0.01	0.88	0.57	<0.02	12
W23	*Prochilodus argenteus*	Gill	26/06/2011	5	223	262	5	13	<0.01	<0.05	0.06	0.99	0.11	3.1	<0.01	0.69	0.93	<0.02	14
W26	*Barbonymus gonionotus*	Flesh	28/06/2011	1	121	212	18	<0.5	<0.01	<0.05	<0.01	0.14	<0.01	0.31	0.11	<0.01	0.15	<0.02	3.5
W26	*Barbonymus gonionotus*	Flesh	28/06/2011	2	95	190	11	0.57	<0.01	<0.05	<0.01	0.12	<0.01	0.33	0.09	<0.01	0.14	<0.02	4.4
W26	*Barbonymus gonionotus*	Flesh	28/06/2011	3	65	174	8	<0.5	<0.01	<0.05	<0.01	0.25	<0.01	0.74	0.07	<0.01	0.18	<0.02	4
W26	*Barbonymus gonionotus*	Flesh	28/06/2011	4	58	174	7	0.68	<0.01	<0.05	<0.01	0.29	<0.01	0.52	0.15	<0.01	0.13	<0.02	6.8
W26	*Barbonymus gonionotus*	Flesh	28/06/2011	5	24	128	5	0.95	<0.01	<0.05	<0.01	0.39	<0.01	0.4	0.07	<0.01	0.13	<0.02	5.9
W26	*Barbonymus gonionotus*	Gill	28/06/2011	1	121	212	4	3	<0.01	<0.05	<0.01	0.85	0.12	6.6	0.02	0.03	0.23	<0.02	29
W26	*Barbonymus gonionotus*	Gill	28/06/2011	2	95	190	3	9.3	<0.01	<0.05	<0.01	0.65	0.09	7.6	0.02	0.03	0.2	<0.02	23

Fish Tissue Data

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
W26	*Barbonymus gonionotus*	Gill	28/06/2011	3	65	174	2	2.8	<0.01	<0.05	<0.01	2	0.08	50	0.01	0.03	0.27	<0.02	26
W26	*Barbonymus gonionotus*	Gill	28/06/2011	4	58	174	3	3.5	<0.01	<0.05	<0.01	0.65	0.1	12	0.02	0.04	0.16	<0.02	35
W26	*Barbonymus gonionotus*	Gill	28/06/2011	5	24	128	1	31	<0.01	<0.05	<0.01	2.1	0.11	6.5	0.02	0.11	<0.05	<0.02	35
W26	*Giuris margaritacea*	Flesh	28/06/2011	1	99	200	11	<0.5	<0.01	<0.05	<0.01	0.07	<0.01	0.06	0.12	<0.01	0.34	<0.02	4.7
W26	*Giuris margaritacea*	Flesh	28/06/2011	2	101	200	12	0.86	<0.01	<0.05	<0.01	0.1	<0.01	0.19	0.09	<0.01	0.21	<0.02	3.8
W26	*Giuris margaritacea*	Flesh	28/06/2011	3	102	200	16	<0.5	<0.01	<0.05	<0.01	0.17	<0.01	0.03	0.14	<0.01	0.13	<0.02	3.7
W26	*Giuris margaritacea*	Flesh	28/06/2011	4	102	204	17	<0.5	<0.01	<0.05	<0.01	0.17	<0.01	0.18	0.08	0.01	0.2	<0.02	3.9
W26	*Giuris margaritacea*	Flesh	28/06/2011	5	86	201	12	<0.5	<0.01	<0.05	<0.01	0.28	0.13	0.05	0.11	<0.01	0.19	<0.02	4.4
W26	*Giuris margaritacea*	Gill	28/06/2011	1	99	200	2	8.6	<0.01	<0.05	<0.01	0.57	0.06	30	0.04	0.04	0.34	<0.02	37
W26	*Giuris margaritacea*	Gill	28/06/2011	2	101	200	2	8.4	<0.01	<0.05	<0.01	0.49	0.06	37	0.03	0.04	0.23	<0.02	39
W26	*Giuris margaritacea*	Gill	28/06/2011	3	102	200	4	4.7	<0.01	<0.05	<0.01	0.54	0.11	8.9	0.03	0.03	0.21	<0.02	46
W26	*Giuris margaritacea*	Gill	28/06/2011	4	102	204	3	10	<0.01	<0.05	<0.01	0.52	0.04	55	0.03	0.04	0.26	<0.02	39
W26	*Giuris margaritacea*	Gill	28/06/2011	5	86	201	3	18	<0.01	<0.05	<0.01	0.49	0.07	41	0.04	0.04	0.25	<0.02	43
W28	*Glossobius koragenis*	Hind	5/12/2011	1	12	109	7	<0.5	<0.01	<0.05	0.02	0.73	<0.01	1.5	0.07	0.21	0.24	<0.02	6.4
W28	*Glossobius koragenis*	Hind	5/12/2011	2	10	100	5	<0.5	<0.01	<0.05	0.02	0.37	<0.01	2.1	0.07	0.11	0.26	<0.02	8.7
W28	*Glossobius koragenis*	Hind	5/12/2011	3	9	98	5	<0.5	<0.01	0.05	0.02	0.23	<0.01	1.8	0.06	0.07	0.28	<0.02	6.4
W28	*Glossobius koragenis*	Hind	5/12/2011	4	8	92	4	<0.5	<0.01	0.05	0.01	0.22	<0.01	1.6	0.06	0.06	0.29	<0.02	7.2
W28	*Glossobius koragenis*	Hind	5/12/2011	5	6	81	3	<0.5	<0.01	<0.05	<0.01	0.82	<0.01	2.6	0.06	0.25	0.24	<0.02	8.8
W28	*Melanotaenia affinis*	Hind	5/12/2011	1	11	102	6	<0.5	<0.01	<0.05	<0.01	0.65	<0.01	0.47	0.1	0.08	0.24	<0.02	38
W28	*Melanotaenia affinis*	Hind	5/12/2011	2	6	89	3	<0.5	<0.01	<0.05	<0.01	0.38	<0.01	0.49	0.06	0.03	0.19	<0.02	24
W28	*Melanotaenia affinis*	Hind	5/12/2011	3	7	89	4	<0.5	<0.01	<0.05	<0.01	0.45	<0.01	0.61	0.05	0.03	0.15	<0.02	23
W28	*Melanotaenia affinis*	Hind	5/12/2011	4	5	81	3	<0.5	<0.01	0.08	<0.01	0.33	<0.01	0.86	0.04	0.08	0.11	<0.02	28
W28	*Melanotaenia affinis*	Hind	5/12/2011	5	2	62	1	<0.5	<0.01	<0.05	<0.01	0.52	<0.01	1.3	0.03	0.02	0.2	<0.02	33
W33	*Arius nox*	Flesh	29/06/2011	1	207	295	12	1.2	<0.01	<0.05	<0.01	0.17	<0.01	0.21	0.18	<0.01	0.16	<0.02	3.6
W33	*Arius nox*	Flesh	29/06/2011	2	119	240	12	2.1	<0.01	<0.05	<0.01	0.2	<0.01	0.24	0.1	<0.01	0.17	<0.02	3.6
W33	*Arius nox*	Flesh	29/06/2011	3	66	210	10	5.2	<0.01	<0.05	<0.01	0.14	<0.01	0.33	0.11	0.04	0.14	<0.02	4.8
W33	*Arius nox*	Gill	29/06/2011	1	207	295	6	21	<0.01	<0.05	<0.01	0.28	0.17	14	0.03	0.2	0.74	<0.02	280
W33	*Arius nox*	Gill	29/06/2011	2	119	240	3	19	<0.01	0.06	<0.01	0.45	0.12	20	0.05	0.07	1.1	<0.02	160
W33	*Arius nox*	Gill	29/06/2011	3	66	210	2	11	<0.01	<0.05	<0.01	0.55	0.03	16	0.03	0.08	0.95	<0.02	280
W33	*Barbonymus gonionotus*	Flesh	29/06/2011	1	216	240	9	0.52	<0.01	<0.05	<0.01	0.17	<0.01	0.36	0.02	<0.01	0.18	<0.02	5.1
W33	*Barbonymus gonionotus*	Flesh	29/06/2011	2	325	184	14	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.3	0.03	<0.01	0.11	<0.02	3.1
W33	*Barbonymus gonionotus*	Flesh	29/06/2011	3	196	240	12	0.89	<0.01	<0.05	<0.01	0.15	<0.01	0.18	0.02	<0.01	0.13	<0.02	2.6
W33	*Barbonymus gonionotus*	Flesh	29/06/2011	4	178	230	12	0.91	<0.01	<0.05	<0.01	0.17	<0.01	0.17	0.09	<0.01	0.17	<0.02	3.3
W33	*Barbonymus gonionotus*	Flesh	29/06/2011	5	166	220	9	1.5	<0.01	<0.05	<0.01	0.13	<0.01	0.42	0.04	<0.01	0.11	<0.02	3.4
W33	*Barbonymus gonionotus*	Gill	29/06/2011	1	216	240	4	32	<0.01	0.06	<0.01	0.54	0.12	9.7	<0.01	0.11	0.26	<0.02	23
W33	*Barbonymus gonionotus*	Gill	29/06/2011	2	325	184	6	34	<0.01	<0.05	<0.01	0.71	0.1	8.4	<0.01	0.12	0.21	<0.02	22
W33	*Barbonymus gonionotus*	Gill	29/06/2011	3	196	240	4	28	<0.01	<0.05	<0.01	0.57	0.07	5.3	<0.01	0.15	0.21	<0.02	20
W33	*Barbonymus gonionotus*	Gill	29/06/2011	4	178	230	3	26	<0.01	<0.05	<0.01	0.66	0.05	5.8	0.01	0.08	0.24	<0.02	24
W33	*Barbonymus gonionotus*	Gill	29/06/2011	5	166	220	3	55	<0.01	0.06	0.02	1	0.09	7.3	<0.01	0.21	0.18	<0.02	19
W34	*Macrobrachien sp 3.*	Flesh	29/06/2011	1	5		1	1.4	<0.01	<0.05	<0.01	2.6	<0.01	0.76	0.02	0.24	0.27	0.02	10
W34	*Macrobrachien sp 3.*	Flesh	29/06/2011	2	3		1	0.67	<0.01	0.08	<0.01	2.8	<0.01	0.68	<0.01	<0.01	0.28	<0.02	11
W34	*Macrobrachien sp 3.*	Flesh	29/06/2011	3	7		3	3.1	<0.01	<0.05	<0.01	3.6	<0.01	1.5	0.02	0.04	0.29	<0.02	13
W34	*Macrobrachien sp 3.*	Flesh	29/06/2011	4	4		1	7.2	<0.01	0.06	<0.01	4	<0.01	1.5	<0.01	0.04	0.27	<0.02	11
W34	*Macrobrachien sp 3.*	Flesh	29/06/2011	5	3		1	2.2	<0.01	0.06	<0.01	4.6	<0.01	0.7	0.01	0.02	0.25	<0.02	11
W34	*Prochilodus argenteus*	Flesh	29/06/2011	1	898	435	29	0.87	<0.01	<0.05	<0.01	0.14	<0.01	0.26	0.11	0.01	0.35	<0.02	3.2
W34	*Prochilodus argenteus*	Flesh	29/06/2011	2	211	254	11	0.88	<0.01	<0.05	<0.01	0.09	0.01	0.29	0.06	<0.01	0.44	<0.02	3.3
W34	*Prochilodus argenteus*	Flesh	29/06/2011	3	158	331	10	0.53	<0.01	<0.05	<0.01	0.14	<0.01	0.27	0.25	<0.01	0.2	<0.02	3.5
W34	*Prochilodus argenteus*	Gill	29/06/2011	1	898	435	10	21	<0.01	<0.05	0.02	0.9	0.09	2.6	<0.01	0.18	0.44	<0.02	14
W34	*Prochilodus argenteus*	Gill	29/06/2011	2	211	254	5	32	<0.01	<0.05	<0.01	0.53	0.15	3.8	<0.01	0.13	0.64	<0.02	15
W34	*Prochilodus argenteus*	Gill	29/06/2011	3	158	331	5	36	<0.01	0.06	<0.01	0.59	0.14	4.1	0.04	0.12	0.44	<0.02	18
W34	*Zenarchopterus kampeni*	Flesh	29/06/2011	1	17	180	6	4.1	<0.01	<0.05	<0.01	0.25	<0.01	0.29	0.11	0.02	0.4	<0.02	9.6
W34	*Zenarchopterus kampeni*	Flesh	29/06/2011	2	10	156	4	1.9	<0.01	<0.05	<0.01	0.17	<0.01	0.63	0.11	0.02	0.52	<0.02	7.7
W34	*Zenarchopterus kampeni*	Flesh	29/06/2011	3	12	160	5	2.6	<0.01	<0.05	<0.01	0.39	0.02	0.65	0.12	0.02	0.41	<0.02	13
W34	*Zenarchopterus kampeni*	Flesh	29/06/2011	4	10	150	3	3.4	<0.01	<0.05	<0.01	0.31	<0.01	0.33	0.14	0.02	0.44	<0.02	11
W34	*Zenarchopterus kampeni*	Flesh	29/06/2011	5	23	200	9	6.5	<0.01	<0.05	<0.01	0.29	<0.01	0.59	0.3	<0.01	0.37	<0.02	9.9
W35	*Barbonymus gonionotus*	Flesh	3/07/2011	1	105	241	14	0.52	<0.01	<0.05	<0.01	0.08	<0.01	0.26	0.04	<0.01	0.07	<0.02	2.8
W35	*Barbonymus gonionotus*	Flesh	3/07/2011	2	276	259	12	1	<0.01	<0.05	<0.01	0.11	<0.01	0.39	<0.01	<0.01	0.1	<0.02	2.8

Fish Tissue Data

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
W35	*Barbonymus gonionotus*	Flesh	3/07/2011	3	231	260	13	1.2	<0.01	<0.05	<0.01	0.1	<0.01	0.31	0.03	<0.01	0.21	<0.02	2.7
W35	*Barbonymus gonionotus*	Flesh	3/07/2011	4	129	210	12	1.3	<0.01	<0.05	<0.01	0.1	<0.01	0.46	0.03	<0.01	0.14	<0.02	3.2
W35	*Barbonymus gonionotus*	Flesh	3/07/2011	5	238	252	9	3.8	<0.01	<0.05	<0.01	0.13	<0.01	0.44	0.14	0.01	0.18	<0.02	3.4
W35	*Prochilodus argenteus*	Flesh	3/07/2011	1	226	260	13	1.6	<0.01	<0.05	0.03	0.09	<0.01	0.18	0.05	0.02	0.28	<0.02	2.5
W35	*Prochilodus argenteus*	Flesh	3/07/2011	2	374	304	21	1.6	<0.01	<0.05	0.01	0.15	<0.01	0.19	0.05	0.01	0.21	<0.02	2.6
W35	*Prochilodus argenteus*	Flesh	3/07/2011	3	256	269	16	0.95	<0.01	<0.05	0.02	0.08	<0.01	0.16	0.05	<0.01	0.35	<0.02	2.7
W35	*Prochilodus argenteus*	Flesh	3/07/2011	4	250	255	12	1	<0.01	<0.05	<0.01	0.1	<0.01	0.27	0.03	<0.01	0.19	<0.02	2.9
W35	*Prochilodus argenteus*	Flesh	3/07/2011	5	266	271	14	0.59	<0.01	<0.05	<0.01	0.07	<0.01	0.21	0.09	<0.01	0.38	<0.02	2.7
W35	*Prochilodus argenteus*	Gill	3/07/2011	1	226	260	5	11	<0.01	<0.05	<0.01	0.44	0.12	2.7	<0.01	0.15	0.64	<0.02	11
W35	*Prochilodus argenteus*	Gill	3/07/2011	2	374	304	5	8.1	<0.01	0.16	<0.01	0.41	0.04	3	<0.01	0.05	0.69	<0.02	13
W35	*Prochilodus argenteus*	Gill	3/07/2011	3	256	269	8	43	<0.01	0.09	<0.01	0.73	0.11	3.2	<0.01	0.16	0.66	<0.02	13
W35	*Prochilodus argenteus*	Gill	3/07/2011	4	250	255	8	24	<0.01	0.06	<0.01	0.64	0.13	3	<0.01	0.11	0.48	<0.02	12
W35	*Prochilodus argenteus*	Gill	3/07/2011	5	266	271	7	41	<0.01	0.07	0.02	0.35	0.14	5.4	<0.01	0.14	0.55	<0.02	13
W35	*Zenarchopterus kampeni*	Flesh	3/07/2011	1	17	182	5	2.7	<0.01	<0.05	0.02	0.18	<0.01	0.32	0.12	<0.01	0.35	0.04	9.4
W35	*Zenarchopterus kampeni*	Flesh	3/07/2011	2	15	170	5	2.6	<0.01	<0.05	<0.01	0.15	<0.01	0.25	0.12	<0.01	0.43	<0.02	7.1
W35	*Zenarchopterus kampeni*	Flesh	3/07/2011	3	14	168	5	0.78	<0.01	<0.05	<0.01	0.14	<0.01	0.4	0.5	<0.01	0.32	<0.02	9.7
W35	*Zenarchopterus kampeni*	Flesh	3/07/2011	4	19	189	6	0.67	<0.01	<0.05	<0.01	0.23	<0.01	0.6	0.3	<0.01	0.35	<0.02	14
W35	*Zenarchopterus kampeni*	Flesh	3/07/2011	5	12	170	5	2	<0.01	<0.05	<0.01	0.14	<0.01	0.41	0.23	<0.01	0.4	<0.02	7.5
W36	*Barbonymus gonionotus*	Flesh	2/07/2011	1	261	278	11	1.7	<0.01	<0.05	<0.01	0.13	<0.01	0.24	0.09	0.01	0.11	<0.02	3.1
W36	*Barbonymus gonionotus*	Flesh	2/07/2011	2	336	301	15	<0.5	<0.01	<0.05	<0.01	0.15	<0.01	0.48	0.02	<0.01	0.12	<0.02	3
W36	*Barbonymus gonionotus*	Flesh	2/07/2011	3	239	252	12	<0.5	<0.01	<0.05	<0.01	0.13	<0.01	0.24	0.3	<0.01	0.18	<0.02	2.9
W36	*Barbonymus gonionotus*	Flesh	2/07/2011	4	227	257	11	1.1	<0.01	<0.05	<0.01	0.16	<0.01	0.36	0.04	<0.01	0.15	<0.02	3.1
W36	*Barbonymus gonionotus*	Flesh	2/07/2011	5	159	224	10	0.68	<0.01	<0.05	<0.01	0.17	<0.01	0.35	0.03	0.02	0.13	<0.02	2.7
W36	*Barbonymus gonionotus*	Gill	2/07/2011	1	261	278	4	9.6	<0.01	<0.05	<0.01	0.8	0.02	4.8	<0.01	0.06	0.23	<0.02	20
W36	*Barbonymus gonionotus*	Gill	2/07/2011	2	336	301	6	38	<0.01	<0.05	<0.01	0.76	0.05	8.8	<0.01	0.19	0.16	<0.02	17
W36	*Barbonymus gonionotus*	Gill	2/07/2011	3	239	252	4	35	<0.01	<0.05	<0.01	0.64	0.04	7.5	0.05	0.17	0.2	<0.02	16
W36	*Barbonymus gonionotus*	Gill	2/07/2011	4	227	257	5	15	<0.01	<0.05	<0.01	0.76	0.05	7.1	<0.01	0.07	0.2	<0.02	20
W36	*Barbonymus gonionotus*	Gill	2/07/2011	5	159	224	3	62	<0.01	<0.05	<0.01	0.71	0.13	10	<0.01	0.26	0.27	<0.02	20
W36	*Prochilodus argenteus*	Flesh	2/07/2011	1	367	329	23	0.83	<0.01	<0.05	<0.01	0.14	0.03	0.36	0.25	0.01	0.47	<0.02	3.7
W36	*Prochilodus argenteus*	Flesh	2/07/2011	2	227	264	10	0.53	<0.01	<0.05	<0.01	0.23	<0.01	0.13	0.11	0.01	0.57	<0.02	2.6
W36	*Prochilodus argenteus*	Flesh	2/07/2011	3	154	234	11	1.5	<0.01	<0.05	<0.01	0.13	<0.01	0.16	0.3	<0.01	0.43	<0.02	2.5
W36	*Prochilodus argenteus*	Flesh	2/07/2011	4	204	258	13	0.78	<0.01	<0.05	<0.01	0.13	<0.01	0.18	0.13	<0.01	0.27	<0.02	2.3
W36	*Prochilodus argenteus*	Flesh	2/07/2011	5	162	240	16	0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.21	0.08	0.08	0.33	<0.02	3
W36	*Prochilodus argenteus*	Gill	2/07/2011	1	367	329	10	46	<0.01	<0.05	<0.01	0.6	0.22	3.4	<0.01	0.35	0.76	<0.02	11
W36	*Prochilodus argenteus*	Gill	2/07/2011	2	227	264	5	44	<0.01	0.06	0.01	0.6	0.09	3.1	<0.01	0.31	1.5	<0.02	11
W36	*Prochilodus argenteus*	Gill	2/07/2011	3	154	234	4	77	<0.01	0.06	0.01	0.58	0.11	4.1	0.01	0.43	0.87	<0.02	12
W36	*Prochilodus argenteus*	Gill	2/07/2011	4	204	258	5	96	<0.01	0.08	<0.01	0.68	0.15	7.2	0.01	0.52	0.59	<0.02	13
W36	*Prochilodus argenteus*	Gill	2/07/2011	5	162	240	4	40	<0.01	0.07	<0.01	0.45	0.09	4.3	<0.01	0.26	0.53	<0.02	12
W38a	*Barbonymus gonionotus*	Flesh	27/06/2011	1	269	271	11	1.8	<0.01	<0.05	<0.01	0.12	<0.01	0.45	0.03	0.04	0.12	<0.02	3.4
W38a	*Barbonymus gonionotus*	Flesh	27/06/2011	2	300	270	14	2.9	<0.01	<0.05	<0.01	0.13	<0.01	0.48	0.02	0.04	0.09	<0.02	3
W38a	*Barbonymus gonionotus*	Flesh	27/06/2011	3	208	242	16	1.5	<0.01	<0.05	<0.01	0.16	<0.01	0.24	0.04	0.03	0.14	<0.02	3
W38a	*Barbonymus gonionotus*	Flesh	27/06/2011	4	176	241	13	2.6	<0.01	<0.05	<0.01	0.16	<0.01	0.32	0.03	0.05	0.18	<0.02	3.1
W38a	*Barbonymus gonionotus*	Flesh	27/06/2011	5	141	221	9	1.5	<0.01	<0.05	<0.01	0.1	<0.01	0.36	0.03	0.03	0.16	<0.02	3.6
W38a	*Barbonymus gonionotus*	Gill	27/06/2011	1	269	271	6	20	<0.01	<0.05	<0.01	0.8	0.06	11	<0.01	0.37	0.25	<0.02	24
W38a	*Barbonymus gonionotus*	Gill	27/06/2011	2	300	270	7	35	<0.01	<0.05	<0.01	0.67	0.08	13	<0.01	0.6	0.21	<0.02	24
W38a	*Barbonymus gonionotus*	Gill	27/06/2011	3	208	242	4	14	<0.01	<0.05	<0.01	0.79	0.04	6.1	<0.01	0.21	0.23	<0.02	22
W38a	*Barbonymus gonionotus*	Gill	27/06/2011	4	176	241	4	24	<0.01	<0.05	<0.01	0.75	0.07	10	<0.01	0.28	0.23	<0.02	20
W38a	*Barbonymus gonionotus*	Gill	27/06/2011	5	141	221	2	25	<0.01	<0.05	<0.01	0.62	0.05	9.6	<0.01	0.32	0.19	<0.02	17
W38a	*Prochilodus argenteus*	Flesh	27/06/2011	1	555	352	24	3.7	<0.01	<0.05	<0.01	0.29	0.01	0.33	0.09	0.05	0.35	<0.02	3.3
W38a	*Prochilodus argenteus*	Flesh	27/06/2011	2	607	360	11	3.1	<0.01	<0.05	<0.01	0.12	0.01	0.35	0.07	0.07	0.4	<0.02	3
W38a	*Prochilodus argenteus*	Flesh	27/06/2011	3	481	348	18	1.1	<0.01	<0.05	<0.01	0.09	0.02	0.28	0.09	0.03	0.43	<0.02	3.2
W38a	*Prochilodus argenteus*	Flesh	27/06/2011	4	488	328	19	4.8	<0.01	<0.05	<0.01	0.1	<0.01	0.28	0.03	0.04	0.3	<0.02	2.3
W38a	*Prochilodus argenteus*	Flesh	27/06/2011	5	183	241	17	2.9	<0.01	<0.05	<0.01	0.11	<0.01	0.25	0.05	0.04	0.3	<0.02	2.8
W38a	*Prochilodus argenteus*	Gill	27/06/2011	1	555	352	12	41	<0.01	<0.05	<0.01	0.87	0.12	5.9	<0.01	0.9	0.48	<0.02	13
W38a	*Prochilodus argenteus*	Gill	27/06/2011	2	607	360	14	120	<0.01	0.07	0.02	1.2	0.15	7.5	<0.01	2.3	0.67	<0.02	11
W38a	*Prochilodus argenteus*	Gill	27/06/2011	3	481	348	16	22	<0.01	<0.05	<0.01	0.45	0.17	4.6	<0.01	0.5	0.63	<0.02	11
W38a	*Prochilodus argenteus*	Gill	27/06/2011	4	488	328	11	41	<0.01	<0.05	<0.01	0.61	0.11	4.8	<0.01	0.72	0.54	<0.02	12

Fish Tissue Data

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
W38a	*Prochilodus argenteus*	Gill	27/06/2011	5	183	241	5	55	<0.01	0.06	<0.01	0.62	0.14	5.5	<0.01	0.9	0.4	<0.02	14
W48	*Chilatherina fasciata*	Flesh	1/07/2011	1	13	99	5	0.63	<0.01	<0.05	<0.01	0.41	<0.01	0.18	0.16	<0.01	0.58	<0.02	7
W48	*Chilatherina fasciata*	Flesh	1/07/2011	2	19	121	7	0.63	<0.01	<0.05	<0.01	0.25	<0.01	0.12	0.24	0.01	0.58	<0.02	5.7
W48	*Chilatherina fasciata*	Flesh	1/07/2011	3	14	105	6	3.9	<0.01	<0.05	<0.01	0.32	<0.01	0.14	0.2	<0.01	0.52	<0.02	6.8
W48	*Chilatherina fasciata*	Flesh	1/07/2011	4	5	80	2	2.1	<0.01	<0.05	<0.01	0.31	0.01	0.28	0.18	0.01	0.64	<0.02	6.7
W48	*Chilatherina fasciata*	Flesh	1/07/2011	5	10	96	4	0.54	<0.01	<0.05	<0.01	0.32	<0.01	0.17	0.17	0.02	0.57	<0.02	6
W48	*Chilatherina fasciata*	Gill	1/07/2011	1	13	99	1	4.6	<0.01	<0.05	0.06	1.1	<0.01	4.6	0.07	0.06	<0.05	<0.02	34
W48	*Chilatherina fasciata*	Gill	1/07/2011	2	19	121	2	8.6	<0.01	<0.05	0.03	0.62	0.01	1.9	0.1	0.06	0.33	<0.02	26
W48	*Chilatherina fasciata*	Gill	1/07/2011	3	14	105	1	11	<0.01	<0.05	0.02	0.91	0.01	3.1	0.08	0.12	0.13	<0.02	32
W48	*Chilatherina fasciata*	Gill	1/07/2011	4	5	80	1	28	<0.01	<0.05	0.04	1.2	<0.01	4.3	0.08	0.22	<0.05	<0.02	30
W48	*Chilatherina fasciata*	Gill	1/07/2011	5	10	96	1	4.2	<0.01	<0.05	0.07	0.64	0.01	2.3	0.08	0.03	<0.05	<0.02	28
W48	*Glossogobius koragenis*	Flesh	1/07/2011	1	9	94	1	1.4	<0.01	0.06	<0.01	0.2	<0.01	0.45	0.1	0.05	0.91	<0.02	3.4
W48	*Glossogobius koragenis*	Flesh	1/07/2011	2	11	100	3	0.62	<0.01	0.06	<0.01	0.15	<0.01	0.33	0.14	0.03	1	<0.02	3.4
W48	*Glossogobius koragenis*	Flesh	1/07/2011	3	9	104	2	3.5	<0.01	<0.05	<0.01	0.23	0.03	0.48	0.22	0.05	1.6	<0.02	4.2
W48	*Glossogobius koragenis*	Flesh	1/07/2011	4	5	80	1	1.9	<0.01	<0.05	<0.01	0.19	<0.01	0.75	0.2	0.02	0.96	<0.02	4.1
W48	*Glossogobius koragenis*	Flesh	1/07/2011	5	6	86	2	1.1	<0.01	0.07	<0.01	0.13	<0.01	0.39	0.15	0.02	1.9	<0.02	3.3
W48	*Glossogobius koragenis*	Gill	1/07/2011	1	9	94	1	6.8	<0.01	0.11	0.03	1.7	0.02	9.5	0.14	0.06	0.57	<0.02	34
W48	*Glossogobius koragenis*	Gill	1/07/2011	2	11	100	1	60	<0.01	0.09	0.05	0.78	0.08	13	0.14	0.44	0.56	<0.02	37
W48	*Glossogobius koragenis*	Gill	1/07/2011	3	9	104	1	28	<0.01	0.06	0.03	0.55	0.13	9	0.19	0.19	0.49	<0.02	35
W48	*Glossogobius koragenis*	Gill	1/07/2011	4	5	80	1	85	0.15	0.78	0.04	0.84	0.23	13	0.19	0.09	<0.05	<0.02	43
W48	*Glossogobius koragenis*	Gill	1/07/2011	5	6	86	1	4.8	<0.01	0.06	0.04	0.49	0.03	12	0.1	0.07	0.54	<0.02	33
W50	*Barbonymus gonionotus*	Flesh	29/06/2011	1	151	221	8	4.7	<0.01	<0.05	<0.01	0.19	<0.01	0.29	0.08	<0.01	0.25	<0.02	3.5
W50	*Barbonymus gonionotus*	Flesh	29/06/2011	2	228	250	10	0.69	<0.01	<0.05	<0.01	0.22	<0.01	0.34	0.02	<0.01	0.1	<0.02	4.3
W50	*Barbonymus gonionotus*	Flesh	29/06/2011	3	135	220	10	1.2	<0.01	<0.05	<0.01	0.25	<0.01	0.87	0.05	<0.01	0.18	<0.02	5.7
W50	*Barbonymus gonionotus*	Flesh	29/06/2011	4	178	234	11	3.5	<0.01	<0.05	<0.01	0.22	<0.01	0.36	0.05	<0.01	0.14	<0.02	3.8
W50	*Barbonymus gonionotus*	Flesh	29/06/2011	5	131	230	8	0.91	<0.01	<0.05	<0.01	0.22	<0.01	0.31	0.08	0.06	0.21	<0.02	3.8
W50	*Barbonymus gonionotus*	Gill	29/06/2011	1	151	221	3	22	<0.01	0.07	<0.01	1.1	0.1	9.1	<0.01	0.07	0.39	<0.02	25
W50	*Barbonymus gonionotus*	Gill	29/06/2011	2	228	250	6	17	<0.01	<0.05	<0.01	0.88	0.1	10	<0.01	0.06	0.22	<0.02	27
W50	*Barbonymus gonionotus*	Gill	29/06/2011	3	135	220	2	34	<0.01	0.06	<0.01	1.1	0.07	10	<0.01	0.11	0.32	<0.02	25
W50	*Barbonymus gonionotus*	Gill	29/06/2011	4	178	234	4	15	<0.01	<0.05	<0.01	0.82	0.07	13	<0.01	0.08	0.22	<0.02	24
W50	*Barbonymus gonionotus*	Gill	29/06/2011	5	131	230	3	25	<0.01	0.07	<0.01	1.1	0.11	9	<0.01	0.08	0.34	<0.02	29
W50	*Prochilodus argenteus*	Flesh	29/06/2011	1	227	280	24	0.78	<0.01	<0.05	<0.01	0.32	<0.01	0.15	0.06	<0.01	0.3	<0.02	3.6
W50	*Prochilodus argenteus*	Flesh	29/06/2011	2	309	290	15	0.63	<0.01	<0.05	<0.01	0.11	<0.01	0.21	0.07	<0.01	0.34	<0.02	3
W50	*Prochilodus argenteus*	Flesh	29/06/2011	3	203	256	13	0.91	<0.01	<0.05	<0.01	0.1	<0.01	0.15	0.06	<0.01	0.25	<0.02	2.5
W50	*Prochilodus argenteus*	Flesh	29/06/2011	4	414	322	20	0.61	<0.01	<0.05	<0.01	0.17	<0.01	0.18	0.1	<0.01	0.34	<0.02	2.3
W50	*Prochilodus argenteus*	Flesh	29/06/2011	5	196	240	12	1.3	<0.01	<0.05	<0.01	0.08	<0.01	0.19	0.05	<0.01	0.34	<0.02	2.6
W50	*Prochilodus argenteus*	Gill	29/06/2011	1	227	280	5	100	<0.01	0.1	<0.01	0.81	0.2	8.8	<0.01	0.33	0.6	<0.02	18
W50	*Prochilodus argenteus*	Gill	29/06/2011	2	309	290	9	20	<0.01	0.05	0.01	0.97	0.19	3.6	<0.01	0.1	0.85	<0.02	19
W50	*Prochilodus argenteus*	Gill	29/06/2011	3	203	256	5	110	<0.01	0.08	<0.01	0.91	0.18	6.4	<0.01	0.33	0.49	<0.02	17
W50	*Prochilodus argenteus*	Gill	29/06/2011	4	414	322	10	120	<0.01	0.09	<0.01	0.69	0.36	6.3	<0.01	0.38	0.82	<0.02	16
W50	*Prochilodus argenteus*	Gill	29/06/2011	5	196	240	5	86	<0.01	0.07	0.01	0.82	0.2	6.6	<0.01	0.26	0.55	<0.02	20
W60	*Barbonymus gonionotus*	Flesh	3/07/2011	1	338	552	21	<0.5	<0.01	<0.05	<0.01	0.1	<0.01	0.43	<0.01	<0.01	0.1	<0.02	2.8
W60	*Barbonymus gonionotus*	Flesh	3/07/2011	2	270	257	13	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.35	0.03	<0.01	0.14	<0.02	2.8
W60	*Barbonymus gonionotus*	Flesh	3/07/2011	3	270	258	15	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.2	<0.01	<0.01	0.11	<0.02	2.6
W60	*Barbonymus gonionotus*	Flesh	3/07/2011	4	282	302	9	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.27	<0.01	<0.01	0.1	<0.02	2.9
W60	*Barbonymus gonionotus*	Flesh	3/07/2011	5	260	329	11	<0.5	<0.01	<0.05	<0.01	0.1	<0.01	0.36	<0.01	<0.01	0.07	<0.02	3.1
W60	*Barbonymus gonionotus*	Gill	3/07/2011	1	338	552	13	16	<0.01	<0.05	<0.01	0.54	0.08	7.3	<0.01	0.08	0.17	<0.02	16
W60	*Barbonymus gonionotus*	Gill	3/07/2011	2	270	257	4	140	<0.01	0.12	<0.01	0.78	0.13	14	<0.01	0.56	0.28	<0.02	20
W60	*Barbonymus gonionotus*	Gill	3/07/2011	3	270	258	5	69	<0.01	0.09	0.01	0.65	0.16	8.7	<0.01	0.28	0.28	<0.02	20
W60	*Barbonymus gonionotus*	Gill	3/07/2011	4	282	302	8	19	<0.01	<0.05	<0.01	0.48	0.07	7.2	<0.01	0.08	0.19	<0.02	16
W60	*Barbonymus gonionotus*	Gill	3/07/2011	5	260	329	8	6.4	<0.01	<0.05	<0.01	0.55	0.03	9.1	<0.01	0.05	0.12	<0.02	18
W60	*Prochilodus argenteus*	Flesh	3/07/2011	1	278	298	16	<0.5	<0.01	<0.05	<0.01	0.07	<0.01	0.32	0.12	<0.01	0.46	<0.02	3.1
W60	*Prochilodus argenteus*	Flesh	3/07/2011	2	303	365	14	<0.5	<0.01	<0.05	<0.01	0.06	<0.01	0.26	0.11	<0.01	0.24	<0.02	2.5
W60	*Prochilodus argenteus*	Flesh	3/07/2011	3	331	442	28	0.54	<0.01	<0.05	<0.01	0.08	<0.01	0.19	0.1	<0.01	0.34	<0.02	3.6
W60	*Prochilodus argenteus*	Flesh	3/07/2011	4	270	265	15	0.51	<0.01	<0.05	<0.01	0.14	0.01	0.31	0.14	0.01	0.4	<0.02	2.8
W60	*Prochilodus argenteus*	Flesh	3/07/2011	5	289	293	16	0.72	<0.01	<0.05	0.01	0.13	<0.01	0.38	0.22	<0.01	0.19	<0.02	3
W60	*Prochilodus argenteus*	Gill	3/07/2011	1	278	298	7	170	<0.01	0.12	0.04	0.89	0.29	6.8	<0.01	0.6	0.85	<0.02	13

Fish Tissue Data

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
W60	*Prochilodus argenteus*	Gill	3/07/2011	2	303	365	10	27	<0.01	0.06	<0.01	0.42	0.16	4.4	<0.01	0.16	0.34	<0.02	10
W60	*Prochilodus argenteus*	Gill	3/07/2011	3	331	442	11	92	<0.01	0.08	0.02	0.65	0.21	5.1	<0.01	0.39	0.87	<0.02	12
W60	*Prochilodus argenteus*	Gill	3/07/2011	4	270	265	6	30	<0.01	0.06	0.01	0.72	0.21	4.8	<0.01	0.19	0.82	<0.02	13
W60	*Prochilodus argenteus*	Gill	3/07/2011	5	289	293	9	52	<0.01	<0.05	0.08	0.68	0.17	4.9	<0.01	0.27	0.44	<0.02	13
W61	*Arius nox*	Flesh	5/07/2011	1	61	211	9	<0.5	<0.01	<0.05	<0.01	0.2	<0.01	0.19	0.4	<0.01	0.24	<0.02	5
W61	*Arius nox*	Flesh	5/07/2011	2	76	231	9	4	<0.01	<0.05	<0.01	0.24	<0.01	0.22	0.45	0.02	0.19	<0.02	3.7
W61	*Arius nox*	Flesh	5/07/2011	3	52	205	6	<0.5	<0.01	<0.05	<0.01	0.16	<0.01	0.19	0.4	<0.01	0.14	<0.02	4.5
W61	*Arius nox*	Flesh	5/07/2011	4	36	175	7	1.8	<0.01	<0.05	<0.01	0.24	0.02	0.24	0.48	<0.01	0.13	<0.02	6
W61	*Arius nox*	Flesh	5/07/2011	5	62	206	8	1.8	<0.01	<0.05	<0.01	0.26	<0.01	0.23	0.25	<0.01	0.22	<0.02	6.8
W61	*Barbonymus gonionotus*	Flesh	5/07/2011	1	222	249	12	0.58	<0.01	<0.05	0.02	0.17	<0.01	0.28	<0.01	<0.01	0.1	0.03	3.4
W61	*Barbonymus gonionotus*	Flesh	5/07/2011	2	129	221	10	0.85	<0.01	<0.05	0.02	0.15	<0.01	0.22	0.06	<0.01	0.27	<0.02	3.6
W61	*Barbonymus gonionotus*	Flesh	5/07/2011	3	162	227	18	<0.5	<0.01	<0.05	<0.01	0.2	0.01	0.18	0.02	0.01	0.16	<0.02	5.2
W61	*Barbonymus gonionotus*	Flesh	5/07/2011	4	155	227	14	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.23	0.04	<0.01	0.12	<0.02	3.2
W61	*Barbonymus gonionotus*	Flesh	5/07/2011	5	218	246	10	<0.5	<0.01	<0.05	<0.01	0.13	<0.01	0.2	0.03	<0.01	0.1	<0.02	3.7
W61	*Barbonymus gonionotus*	Gill	5/07/2011	1	222	249	6	15	<0.01	<0.05	0.04	0.56	0.07	7.8	<0.01	0.07	0.14	<0.02	16
W61	*Barbonymus gonionotus*	Gill	5/07/2011	2	129	221	4	12	<0.01	<0.05	0.02	0.6	0.05	5.6	<0.01	0.06	0.22	<0.02	19
W61	*Barbonymus gonionotus*	Gill	5/07/2011	3	162	227	4	15	<0.01	0.05	0.04	0.56	0.07	6.1	<0.01	0.08	0.24	<0.02	23
W61	*Barbonymus gonionotus*	Gill	5/07/2011	4	155	227	4	49	<0.01	0.06	0.02	0.72	0.07	5.4	<0.01	0.17	0.2	<0.02	19
W61	*Barbonymus gonionotus*	Gill	5/07/2011	5	218	246	5	120	<0.01	0.07	0.03	0.73	0.17	9.6	<0.01	0.39	0.2	<0.02	20
W61	*Zenarchopterus kampeni*	Flesh	5/07/2011	1	13	160	5	8.5	<0.01	<0.05	0.01	0.23	0.02	0.28	0.13	0.02	0.23	<0.02	8
W61	*Zenarchopterus kampeni*	Flesh	5/07/2011	2	9	156	3	0.55	<0.01	<0.05	<0.01	0.14	<0.01	0.38	0.14	<0.01	0.38	<0.02	9.9
W61	*Zenarchopterus kampeni*	Flesh	5/07/2011	3	10	153	3	1.6	<0.01	<0.05	0.01	0.23	<0.01	0.27	0.08	<0.01	0.41	<0.02	8.2
W61	*Zenarchopterus kampeni*	Flesh	5/07/2011	4	11	173	5	0.72	<0.01	<0.05	<0.01	0.14	<0.01	0.45	0.23	<0.01	0.43	<0.02	12
W61	*Zenarchopterus kampeni*	Flesh	5/07/2011	5	7	141	3	0.56	<0.01	<0.05	<0.01	0.17	<0.01	0.43	0.17	<0.01	0.3	<0.02	8.2
W62	*Barbonymus gonionotus*	Flesh	6/07/2011	1	203	252	11	1.1	<0.01	<0.05	<0.01	0.11	<0.01	0.32	0.02	<0.01	0.2	<0.02	3.7
W62	*Barbonymus gonionotus*	Flesh	6/07/2011	2	190	241	11	1.1	<0.01	<0.05	<0.01	0.08	<0.01	0.45	0.01	0.02	0.12	<0.02	4.3
W62	*Barbonymus gonionotus*	Flesh	6/07/2011	3	177	236	11	<0.5	<0.01	<0.05	<0.01	0.08	<0.01	0.15	0.04	<0.01	0.18	<0.02	2.8
W62	*Barbonymus gonionotus*	Flesh	6/07/2011	4	133	212	10	<0.5	<0.01	<0.05	<0.01	0.15	<0.01	0.22	0.04	<0.01	0.19	<0.02	3.7
W62	*Barbonymus gonionotus*	Flesh	6/07/2011	5	154	223	9	<0.5	<0.01	<0.05	<0.01	0.09	<0.01	0.24	0.04	<0.01	0.31	<0.02	3.2
W62	*Barbonymus gonionotus*	Gill	6/07/2011	1	203	252	5	56	<0.01	0.06	0.03	0.69	0.1	8.5	<0.01	0.23	0.45	<0.02	20
W62	*Barbonymus gonionotus*	Gill	6/07/2011	2	190	241	4	37	<0.01	<0.05	0.01	0.5	0.06	6.3	<0.01	0.05	0.25	<0.02	20
W62	*Barbonymus gonionotus*	Gill	6/07/2011	3	177	236	4	12	<0.01	<0.05	0.02	0.54	0.07	3.8	<0.01	0.05	0.35	<0.02	20
W62	*Barbonymus gonionotus*	Gill	6/07/2011	4	133	212	2	9.8	<0.01	<0.05	0.01	0.57	0.04	5.3	<0.01	0.05	0.29	<0.02	21
W62	*Barbonymus gonionotus*	Gill	6/07/2011	5	154	223	3	16	<0.01	<0.05	<0.01	0.61	0.03	4.5	<0.01	0.07	0.41	<0.02	21
W62	*Prochilodus argenteus*	Flesh	6/07/2011	1	128	216	12	<0.5	<0.01	<0.05	<0.01	0.08	<0.01	0.14	0.07	<0.01	0.46	<0.02	3.4
W62	*Prochilodus argenteus*	Flesh	6/07/2011	2	40	152	5	0.85	<0.01	<0.05	<0.01	0.13	<0.01	0.23	0.04	<0.01	0.38	<0.02	2.9
W62	*Prochilodus argenteus*	Flesh	6/07/2011	3	22	121	5	3.2	<0.01	<0.05	<0.01	0.24	<0.01	0.31	0.01	0.02	0.32	<0.02	5.1
W63	*Arius spp*	Flesh	10/12/2011	1	476	368	13	<0.5	<0.01	0.28	<0.01	0.17	<0.01	0.1	0.14	0.02	0.17	<0.02	3.9
W63	*Arius spp*	Flesh	10/12/2011	2	390	348	16	<0.5	<0.01	<0.05	<0.01	0.69	<0.01	0.13	0.1	0.18	0.14	<0.02	5
W63	*Arius spp*	Flesh	10/12/2011	3	389	343	14	<0.5	<0.01	<0.05	<0.01	0.1	<0.01	0.12	0.11	<0.01	0.14	<0.02	4.5
W63	*Arius spp*	Flesh	10/12/2011	4	156	268	6	31	<0.01	<0.05	<0.01	0.15	0.02	0.87	0.05	0.16	0.15	<0.02	4.6
W63	*Arius spp*	Flesh	10/12/2011	5	78	221	6	4	<0.01	<0.05	<0.01	0.15	<0.01	0.37	0.16	0.02	0.2	<0.02	6.4
W63	*Arius spp*	Gill	10/12/2011	1	476	368	17	18	<0.01	0.06	<0.01	0.69	0.07	7.2	0.01	0.12	0.81	<0.02	920
W63	*Arius spp*	Gill	10/12/2011	2	390	348	13	60	<0.01	<0.05	<0.01	0.47	0.03	3.8	0.01	0.19	0.83	<0.02	520
W63	*Arius spp*	Gill	10/12/2011	3	389	343	12	54	<0.01	<0.05	<0.01	0.46	0.03	4.4	<0.01	0.2	0.93	<0.02	600
W63	*Arius spp*	Gill	10/12/2011	4	156	268	6	23	<0.01	<0.05	<0.01	0.54	0.05	8.2	<0.01	0.1	1.1	<0.02	720
W63	*Arius spp*	Gill	10/12/2011	5	78	221	2	47	<0.01	0.06	<0.01	0.57	0.06	28	0.02	0.19	1.1	<0.02	1110
W63	*Barbonymus gonionotus*	Flesh	10/12/2011	1	306	274	8	0.88	<0.01	<0.05	<0.01	0.53	<0.01	0.61	0.05	0.14	0.2	<0.02	4.9
W63	*Barbonymus gonionotus*	Flesh	10/12/2011	2	416	298	14	0.67	<0.01	<0.05	<0.01	0.18	<0.01	0.37	0.01	0.03	0.12	<0.02	4
W63	*Barbonymus gonionotus*	Flesh	10/12/2011	3	217	251	8	0.56	<0.01	<0.05	<0.01	0.16	<0.01	0.25	0.12	0.02	0.14	<0.02	4.3
W63	*Barbonymus gonionotus*	Flesh	10/12/2011	4	27	138	7	1.5	<0.01	<0.05	<0.01	0.39	<0.01	0.39	0.02	0.03	0.26	<0.02	6.3
W63	*Barbonymus gonionotus*	Flesh	10/12/2011	5	23	124	5	1.7	<0.01	<0.05	<0.01	0.94	<0.01	0.58	0.02	0.02	0.15	<0.02	5.6
W63	*Barbonymus gonionotus*	Gill	10/12/2011	1	306	274	6	9.1	<0.01	<0.05	<0.01	0.61	0.04	21	<0.01	0.2	0.3	<0.02	26
W63	*Barbonymus gonionotus*	Gill	10/12/2011	2	416	298	8	8.1	<0.01	<0.05	<0.01	0.55	0.04	4.5	<0.01	0.05	0.19	<0.02	17
W63	*Barbonymus gonionotus*	Gill	10/12/2011	3	217	251	4	6.7	<0.01	<0.05	<0.01	0.5	0.03	2.7	0.01	0.04	0.22	<0.02	20
W63	*Barbonymus gonionotus*	Gill	10/12/2011	4	27	138	1	120	<0.01	0.06	<0.01	1.4	0.19	12	<0.01	0.45	0.34	<0.02	30
W63	*Barbonymus gonionotus*	Gill	10/12/2011	5	23	124	1	49	<0.01	<0.05	<0.01	2.9	0.08	19	<0.01	0.24	0.17	<0.02	34

Fish Tissue Data

site	biota	tissue type	date collected	replicate	specimen weight (g)	specimen length (mm)	sample size (g)	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
W64	*Barbonymus gonionotus*	Flesh	9/07/2011	1	185	238	14	0.99	<0.01	<0.05	<0.01	0.11	<0.01	0.35	0.05	<0.01	0.23	<0.02	3.6
W64	*Barbonymus gonionotus*	Flesh	9/07/2011	2	225	250	14	1.9	<0.01	<0.05	<0.01	0.12	<0.01	0.29	0.03	<0.01	0.21	<0.02	3.3
W64	*Barbonymus gonionotus*	Flesh	9/07/2011	3	415	302	20	<0.5	<0.01	<0.05	<0.01	0.09	<0.01	0.27	0.02	<0.01	<0.05	<0.02	2.8
W64	*Barbonymus gonionotus*	Flesh	9/07/2011	4	211	347	16	0.73	<0.01	<0.05	<0.01	0.09	<0.01	0.33	0.02	<0.01	0.17	<0.02	3.3
W64	*Barbonymus gonionotus*	Flesh	9/07/2011	5	173	338	12	<0.5	<0.01	<0.05	<0.01	0.14	<0.01	0.24	0.02	<0.01	0.16	<0.02	3.4
W64	*Barbonymus gonionotus*	Gill	9/07/2011	1	185	238	4	29	<0.01	<0.05	<0.01	0.56	0.06	7.6	<0.01	0.13	0.28	<0.02	22
W64	*Barbonymus gonionotus*	Gill	9/07/2011	2	225	250	5	12	<0.01	<0.05	<0.01	0.94	0.04	9.9	<0.01	0.09	0.28	<0.02	21
W64	*Barbonymus gonionotus*	Gill	9/07/2011	3	415	302	9	5.5	<0.01	<0.05	<0.01	0.63	0.03	9.6	<0.01	0.04	0.12	<0.02	19
W64	*Barbonymus gonionotus*	Gill	9/07/2011	4	211	347	4	12	<0.01	<0.05	<0.01	0.67	0.04	18	<0.01	0.1	0.26	<0.02	24
W64	*Barbonymus gonionotus*	Gill	9/07/2011	5	173	338	4	85	<0.01	0.06	<0.01	0.96	0.09	13	<0.01	0.34	0.32	<0.02	23
W64	*Prochilodus argenteus*	Flesh	9/07/2011	1	305	278	20	<0.5	<0.01	<0.05	<0.01	0.07	<0.01	0.18	0.03	<0.01	0.24	<0.02	2.3
W64	*Prochilodus argenteus*	Flesh	9/07/2011	2	596	485	43	0.78	<0.01	<0.05	<0.01	0.07	<0.01	0.1	0.07	<0.01	0.19	<0.02	2
W64	*Prochilodus argenteus*	Flesh	9/07/2011	3	288	374	19	1.1	<0.01	<0.05	<0.01	0.1	<0.01	0.29	0.07	<0.01	0.28	<0.02	2.8
W64	*Prochilodus argenteus*	Flesh	9/07/2011	4	227	346	20	1.6	<0.01	<0.05	<0.01	0.1	<0.01	0.22	0.04	<0.01	0.33	<0.02	3.6
W64	*Prochilodus argenteus*	Flesh	9/07/2011	5	288	374	14	<0.5	<0.01	<0.05	<0.01	0.11	<0.01	0.27	0.02	<0.01	0.29	<0.02	4.1
W64	*Prochilodus argenteus*	Gill	9/07/2011	1	305	278	9	8.3	<0.01	0.05	<0.01	0.56	0.05	5.8	<0.01	0.08	0.41	<0.02	13
W64	*Prochilodus argenteus*	Gill	9/07/2011	2	596	485	17	7.4	<0.01	0.06	0.03	0.37	0.14	3.3	<0.01	0.06	0.57	<0.02	11
W64	*Prochilodus argenteus*	Gill	9/07/2011	3	288	374	7	11	<0.01	0.08	<0.01	0.6	0.09	5.9	<0.01	0.09	0.52	<0.02	12
W64	*Prochilodus argenteus*	Gill	9/07/2011	4	227	346	6	14	<0.01	0.05	<0.01	0.48	0.06	5.9	<0.01	0.1	0.54	<0.02	14
W64	*Prochilodus argenteus*	Gill	9/07/2011	5	288	374	9	9.9	<0.01	0.06	<0.01	0.44	0.07	5.9	<0.01	0.08	0.49	<0.02	13
W70	*Prochilodus argenteus*	Flesh	26/06/2011	1	587	371	17	1.9	<0.01	<0.05	<0.01	0.19	0.02	0.25	0.09	0.06	0.27	<0.02	3.5
W70	*Prochilodus argenteus*	Flesh	26/06/2011	2	392	292	17	0.66	<0.01	<0.05	<0.01	0.11	<0.01	0.22	0.23	0.03	0.27	<0.02	2.3
W70	*Prochilodus argenteus*	Flesh	26/06/2011	3	328	288	17	2.2	<0.01	<0.05	<0.01	0.09	<0.01	0.49	0.21	0.03	0.31	<0.02	2.8
W70	*Prochilodus argenteus*	Flesh	26/06/2011	4	376	318	18	1.7	<0.01	<0.05	<0.01	0.1	0.04	0.28	0.17	0.02	0.43	<0.02	4.2
W70	*Prochilodus argenteus*	Flesh	26/06/2011	5	222	254	10	1.8	<0.01	<0.05	<0.01	0.12	<0.01	0.17	0.07	0.14	0.15	<0.02	2.5
W70	*Prochilodus argenteus*	Gill	26/06/2011	1	587	371	17	15	<0.01	<0.05	0.02	0.77	0.15	2.4	<0.01	0.29	0.53	<0.02	15
W70	*Prochilodus argenteus*	Gill	26/06/2011	2	392	292	9	46	<0.01	<0.05	<0.01	0.53	0.06	5.7	0.02	0.47	0.33	<0.02	11
W70	*Prochilodus argenteus*	Gill	26/06/2011	3	328	288	8	31	<0.01	<0.05	0.01	0.7	0.11	7.5	0.01	0.53	0.41	0.03	11
W70	*Prochilodus argenteus*	Gill	26/06/2011	4	376	318	11	32	<0.01	<0.05	0.02	0.79	0.14	4.6	<0.01	0.3	0.51	<0.02	17
W70	*Prochilodus argenteus*	Gill	26/06/2011	5	222	254	6	33	<0.01	<0.05	<0.01	0.78	0.07	4.5	<0.01	0.3	0.29	<0.02	14
W71	*Barbonymus gonionotus*	Flesh	27/06/2011	1	248	258	14	<0.5	<0.01	<0.05	<0.01	0.21	<0.01	0.36	0.02	0.03	0.11	<0.02	4
W71	*Barbonymus gonionotus*	Flesh	27/06/2011	2	143	240	10	<0.5	<0.01	<0.05	<0.01	0.18	<0.01	0.28	0.02	<0.01	0.12	<0.02	3.6
W71	*Barbonymus gonionotus*	Flesh	27/06/2011	3	229	252	15	0.65	<0.01	<0.05	<0.01	0.16	<0.01	0.26	0.01	<0.01	0.07	<0.02	2.8
W71	*Barbonymus gonionotus*	Flesh	27/06/2011	4	162	240	11	<0.5	<0.01	<0.05	<0.01	0.19	<0.01	0.3	0.04	<0.01	0.14	<0.02	4
W71	*Barbonymus gonionotus*	Flesh	27/06/2011	5	177	226	9	<0.5	<0.01	<0.05	<0.01	0.1	<0.01	0.55	0.02	<0.01	0.16	<0.02	2.8
W71	*Barbonymus gonionotus*	Gill	27/06/2011	1	248	258	6	12	<0.01	<0.05	<0.01	0.63	0.12	8.7	<0.01	0.15	0.07	<0.02	19
W71	*Barbonymus gonionotus*	Gill	27/06/2011	2	143	240	3	29	<0.01	<0.05	<0.01	0.65	0.12	8.9	<0.01	0.35	0.07	<0.02	22
W71	*Barbonymus gonionotus*	Gill	27/06/2011	3	229	252	5	9.1	<0.01	<0.05	<0.01	0.73	0.06	7.2	<0.01	0.12	<0.05	<0.02	24
W71	*Barbonymus gonionotus*	Gill	27/06/2011	4	162	240	3	26	<0.01	<0.05	<0.01	0.72	0.1	7.6	<0.01	0.34	0.12	<0.02	20
W71	*Barbonymus gonionotus*	Gill	27/06/2011	5	177	226	3	4.7	<0.01	<0.05	<0.01	0.6	0.06	14	<0.01	0.11	<0.05	<0.02	22
W71	*Prochilodus argenteus*	Flesh	27/06/2011	1	209	240	13	1.9	<0.01	<0.05	<0.01	0.13	0.01	0.34	0.35	0.03	0.27	<0.02	3
W71	*Prochilodus argenteus*	Flesh	27/06/2011	2	422	300	21	0.54	<0.01	<0.05	<0.01	0.11	<0.01	0.25	0.06	0.03	0.28	<0.02	2.8
W71	*Prochilodus argenteus*	Flesh	27/06/2011	3	175	245	10	0.87	<0.01	<0.05	<0.01	0.2	0.02	0.19	0.11	0.72	0.49	<0.02	3.4
W71	*Prochilodus argenteus*	Flesh	27/06/2011	4	194	245	15	<0.5	<0.01	<0.05	<0.01	0.9	<0.01	0.19	0.09	0.34	0.26	<0.02	3.5
W71	*Prochilodus argenteus*	Flesh	27/06/2011	5	385	300	20	<0.5	<0.01	<0.05	<0.01	0.35	<0.01	0.15	0.08	0.05	0.27	<0.02	2.3
W71	*Prochilodus argenteus*	Gill	27/06/2011	1	209	240	5	38	<0.01	<0.05	0.01	0.58	0.16	6.9	0.02	0.68	0.36	<0.02	13
W71	*Prochilodus argenteus*	Gill	27/06/2011	2	422	300	11	18	<0.01	<0.05	<0.01	0.69	0.07	3	<0.01	0.33	0.31	<0.02	13
W71	*Prochilodus argenteus*	Gill	27/06/2011	3	175	245	4	12	<0.01	<0.05	0.03	0.98	0.09	2.8	<0.01	0.57	0.58	<0.02	12
W71	*Prochilodus argenteus*	Gill	27/06/2011	4	194	245	5	8.3	<0.01	<0.05	0.01	0.74	0.04	2.5	<0.01	0.17	0.22	<0.02	12
W71	*Prochilodus argenteus*	Gill	27/06/2011	5	385	300	8	31	<0.01	0.05	<0.01	0.75	0.28	5.5	<0.01	0.68	0.37	<0.02	13

E.3 BMT WBM Data (2017)

Sample	Replicate	Biota	Specimen weight (g)	Tissue type	Date collected	Aluminium	Antimony	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc	Moisture (%)
S1-1	1	*Glossamia sp.*	52	Hind	16/11/2017 10:00	0.9	0.01	0.079	0.01	1.3	0.01	1.8	0.86	0.38	0.96	0.15	65	79.8
S1-2	2	*Glossamia sp.*	27	Hind	16/11/2017 10:00	1	0.01	0.19	0.01	1.2	0.01	5.8	0.39	0.37	1	0.11	62	79.9
S2-1	2	*Glossamia sp.*	149	Hind	17/11/17 10:00	0.5	0.01	0.05	0.01	0.71	0.01	0.77	1.2	0.085	1.1	0.027	41	80.8
S2-2	1	*Rainbowfish sp*	42.3	Hind	17/11/17 10:00	0.84	0.01	0.082	0.02	0.78	0.013	2.2	0.45	0.11	1.2	0.029	41	80.7
S2-3	2	*Rainbowfish sp*	15.4	Hind	17/11/17 10:00	2.2	0.01	0.056	0.01	1.7	0.024	15	0.16	0.06	0.87	0.026	150	75.6
S2-4	3	*Rainbowfish sp*	16.6	Hind	17/11/17 10:00	1.8	0.01	0.05	0.01	1.3	0.025	18	0.18	0.1	0.87	0.02	120	76.4
S2-5	4	*Rainbowfish sp*	10.7	Hind	17/11/17 10:00	2.7	0.01	0.05	0.01	1	0.02	13	0.16	0.47	0.76	0.02	130	74.4
S2-6	5	*Rainbowfish sp*	8.3	Hind	17/11/17 10:00	4.8	0.01	0.05	0.01	1.3	0.035	9.4	0.13	0.16	0.71	0.021	110	75.7
S3-1	1	*Rainbowfish sp*	11.1	Hind	17/11/17 13:00	2.1	0.01	0.061	0.01	1.5	0.02	21	0.96	0.07	0.83	0.023	160	75.6
S3-2	2	*Rainbowfish sp*	15.9	Hind	17/11/17 13:00	2.2	0.01	0.063	0.01	1.5	0.019	25	0.63	0.51	0.94	0.02	180	77.1
S3-3	3	*Rainbowfish sp*	15.7	Hind	17/11/17 13:00	2.9	0.01	0.079	0.01	1.5	0.055	20	0.63	0.47	0.87	0.02	180	76.1
S3-4	4	*Rainbowfish sp*	7.9	Hind	17/11/17 13:00	2.2	0.01	0.078	0.01	1.3	0.019	25	0.22	0.17	0.73	0.02	120	74.7
S3-5	1	*Garfish sp.*	21.6	Hind	17/11/17 13:00	1	0.01	0.05	0.01	0.9	0.01	5.2	0.38	0.053	0.61	0.02	64	75
S4-1	1	*Rainbowfish sp*	11.7	Hind	16/11/17 14:00	2.4	0.01	0.05	0.01	1.4	0.041	9.4	0.11	0.11	0.44	0.062	110	76.9
S4-2	2	*Rainbowfish sp*	13.2	Hind	16/11/17 14:00	1.1	0.01	0.057	0.01	1.6	0.01	12	0.17	0.05	0.46	0.048	160	78
S4-3	3	*Rainbowfish sp*	12.9	Hind	16/11/17 14:00	13	0.01	0.12	0.017	1.9	0.13	15	0.11	0.22	0.39	0.051	170	73.4
S4-4	4	*Rainbowfish sp*	11.2	Hind	16/11/17 14:00	7.8	0.01	0.05	0.01	1	0.014	28	0.28	0.05	0.4	0.043	80	76.7
S4-5	1	*Glossamia sp.*	25.8	Hind	16/11/17 14:00	1.9	0.01	0.065	0.01	1	0.012	15	0.15	0.051	0.41	0.032	81	75.9
S5-1	1	*Rainbowfish sp*	34.6	Hind	18/11/17 10:15	1.2	0.01	0.05	0.01	1.4	0.023	13	0.29	0.01	0.66	0.02	170	75.7
S5-2	2	*Rainbowfish sp*	27.6	Hind	18/11/17 10:15	5.7	0.01	0.05	0.028	1.1	0.022	14	0.22	0.01	0.57	0.02	170	74.7
S5-3	6	*Rainbowfish sp*	28.7	Hind	18/11/17 10:15	1	0.01	0.05	0.02	1.2	0.01	14	0.17	0.067	0.92	0.02	150	76.3
S5-4	4	*Rainbowfish sp*	38.6	Hind	18/11/17 10:15	1.9	0.01	0.05	0.01	1.2	0.034	10	0.17	0.018	0.64	0.02	170	75.7
S5-5	5	*Rainbowfish sp*	28.1	Hind	18/11/17 10:15	2.5	0.01	0.05	0.011	1.6	0.017	13	0.13	0.059	0.81	0.02	160	77.5

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