Wyong Areas Coal Joint Venture

Hydromorphology Study

Wallarah 2 Coal Project

November 2009

International Environmental Consultants Pty Ltd

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1. Introduction

1.1 Wallarah 2 Coal Project

The Wyong Areas Coal Joint Venture (WACJV) was founded in 1995 at the invitation of the NSW Government to submit a competitive tender for the Wyong Coal Development Areas.

The majority partner in the successful tender was Coal Operations Australia Ltd (COAL), with minority partners including Kores Australia Pty Ltd ("Kores") and other Korean and Japanese interests. BHP Billiton subsequently became a majority shareholder through the acquisition of Coal Operations Australia Ltd. In 2005, Kores acquired the BHP Billiton interest in the WACJV, lifting its equity in the venture to 82.25%.

The WACJV is proposing to develop the coal resource by a new project referred to as the Wallarah 2 Coal Project (W2CP). The W2CP will involve the underground extraction of export quality thermal coal with associated surface facilities and infrastructure. The project is comprised of an underground longwall mine, a coal handling plant and storage facilities, rail loop and loading infrastructure, an underground drift entry, ventilation shafts, gas and water management facilities and administration buildings.

Longwall mining is proposed beneath an area of approximately 2,885 ha, which includes the Wyong State Forest, Jilliby State Conservation Area and surrounding ranges, the Dooralong Valley and the Hue Hue area, and to a much lesser extent, the Yarramalong Valley.

1.2 Context

The risk assessment process identified that the effects of subsidence is a key issue for investigation. Although the mine plan has been designed to minimise its impact on the water supply scheme, the residual implications need to be identified, assessed and further mitigated with the aim of achieving an overall neutral effect or if possible, a net beneficial result.

Interrelated with the potential alterations to flooding and water supply catchments, is the impact of subsidence on the hydromorphology of surface waterways. Changes to the structure and form of creeklines will play an important role in the behaviour of flood waters, and may increase the potential for erosion of the banks, creating possible water quality issues further downstream, which is relevant when considering the Gosford-Wyong Water Supply system.

Potential theoretical hydromorphology impacts that may be seen as a result of subsidence include:

- Localised alterations to flow volumes – A decrease in the volume of water held in each section of the creek is obviously undesirable for current users of the water source. It is important to note however, that if the volume of water held in a particular spot is reduced, the volume of water held in a location further downstream will be increased. The overall net effect will be neutral.

- Localised alterations to flow velocities – this may in fact have a potential positive impact on the creek systems if the water is slowed down, creating greater residence time and reducing the potential for erosion.

- Localised widening or narrowing of the water stream – areas where the water stream narrows is not expected to result in any substantial interruption to normal use and operation of the area, however widening of the channel could have the following implications:

    - Widening of areas of water crossings may result in an existing water crossing being made unsuitable and a new/extended creek crossing may be required;

    - If a fence line is currently in close proximity to the creekline, a widening of the creek may result in the fence becoming inundated and would therefore be required to moved.

- Localised increases in the depth of pools within the channel – this may also have implications for creek crossings.

- Localised areas where there is an increased risk of bank erosion – creek banks that are not vegetated may be subject to additional erosional forces if the flow velocity is increased as a result of subsidence. In areas where there is an established vegetative cover along the bank, the risk of increased erosion resulting from changes in flow velocity will not be significant.

The WACJV has committed to protecting the water supply of the Central Coast, in terms of both water quality and water volumes. In order to do this, the mine plan has been designed to prevent extraction of coal from beneath the Wyong River. However, two tributaries of the Wyong River – Jilliby Jilliby Creek and Little Jilliby Jilliby Creek are present above the mining area. It is therefore important that all of these waterways are protected from adverse impacts such as erosion and sedimentation, and changes in water volumes, since a deterioration in these channels would ultimately impact on the regions water supply.

1.2.1 Planning and Environmental Protection

Over recent years there has been growing concern over the health of the state's waterways. It is clearly recognised that the rivers, creeks and estuaries play a vital role in supplying water to towns, as well as environmental flows and habitat for native flora and fauna. Vital to protecting the health of waterways is appropriate land use and management of catchment areas and riverine environments.

The most effective approach to achieving healthy waterways is through a coordinated approach by government, industry, developers and landowners / managers. In recognition of this, numerous bodies have been established to coordinate the management and protection of these environments, and have developed policies, guidelines and strategies for implementation. Of particular relevance to the W2CP are:

- Water Sharing Plan for the Jilliby Jilliby Creek Water Source
- NSW Rivers and Estuaries Policy;
- NSW Salinity Strategy;
- National Water Quality Management Strategy;
- Catchment Action Plan for the Hunter – Central Rivers CMA;
- Wyong River Streambank Management Plan – Wyong Shire Council / Cardno Lawson Treloar Pty Ltd, 2007; and
- Water Management Act 2000.

All of these documents have been reviewed and taken into consideration during the preparation of this study.

1.3 Scope

Listed previously are a number of potential impacts that may result as a product of subsidence from the W2CP. It is important to remember however, that not all of these impacts will be seen along all sections of the waterways below which mining is proposed.

This report has been prepared to provide a detailed assessment of the existing geomorphological features of the main waterways that may potentially be impacted by the W2CP as a result of subsidence. The location of these waterways is shown on **Figure 1** – Wyong River, Jilliby Jilliby Creek, Little Jilliby Jilliby Creek, Hue Hue Creek and their tributaries.

Mitigation strategies have been recommended for implementation prior to mining occurring beneath particular areas, post mining monitoring and rehabilitation works.

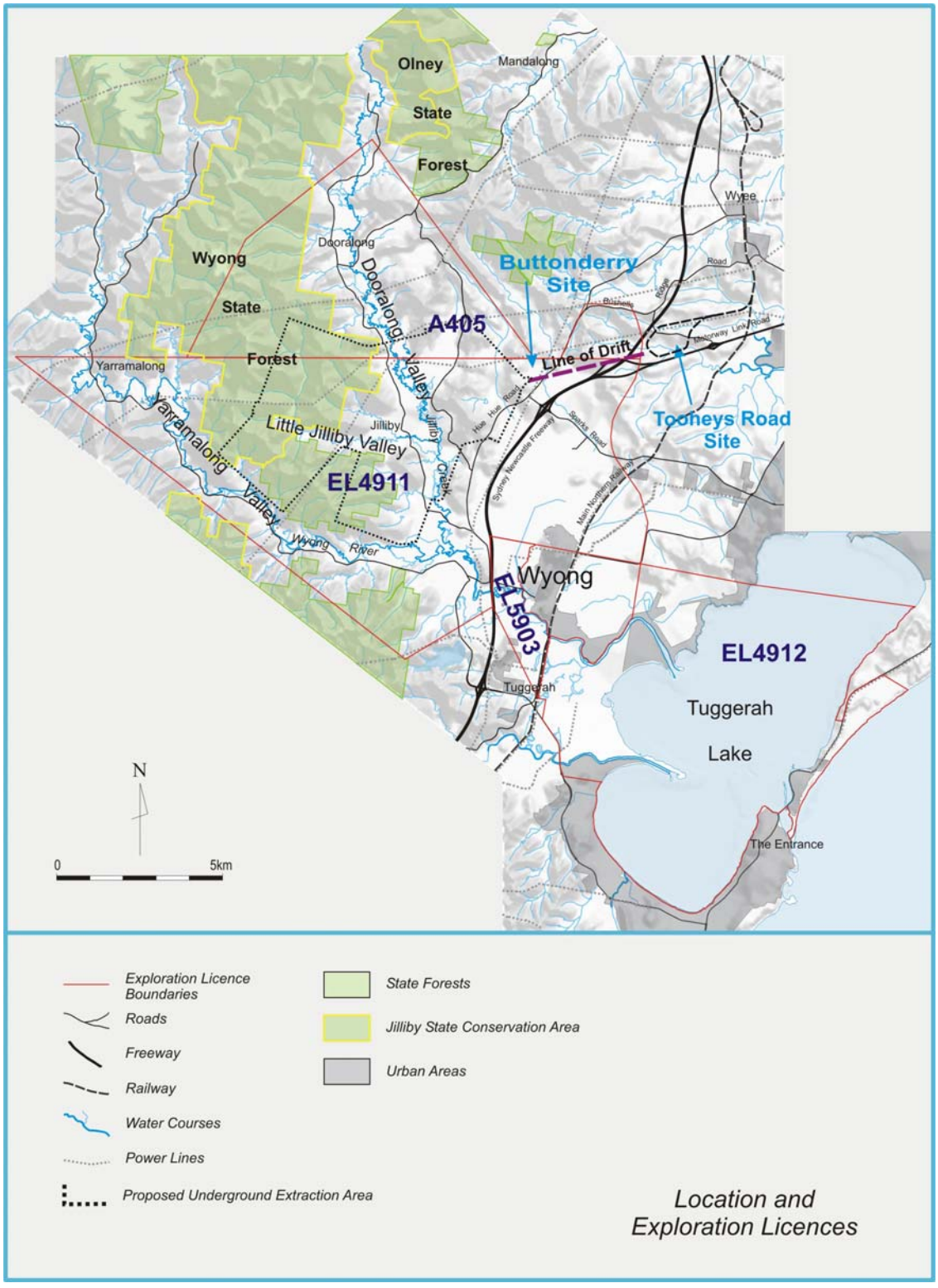

Olney
State
Forest
Mandalong
Wyee
Dooralong
Wyong
State
Forest
Buttonderry
Site
A405
Line of Drift
Yarramalong
Dooralong Valley
Jilliby
Little Jilliby Valley
EL4911
Yarramalong Valley
Wyong River
Tooneys Road
Site
Wyong
EL5903
EL4912
Tuggerah
Lake
Tuggerah
The Entrance
N
0
5km
Exploration Licence Boundaries
Roads
Freeway
Railway
Water Courses
Power Lines
Proposed Underground Extraction Area
State Forests
Jilliby State Conservation Area
Urban Areas
Location and
Exploration Licences

Figure 1

2. Methodology

Many stream assessment methods have been developed worldwide. Within Australia, methods that have been developed and tested include the State of the Rivers Survey, Index of Stream Condition and Geomorphic River Styles. Although based on a method developed in the United Kingdom, the AusRivAS and Habitat Predictive Modelling methods have been successfully adapted to Australian conditions.

The various methods for assessing surface hydrology have been described below, together with their applicability to use in assessing the W2CP.

2.1 AusRivAS Assessment Method

The AusRivAS method is a nationally standardised and predictive approach to biological assessment that has recently been used to determine the condition of around 6,000 river sites across Australia. The United States Environmental Protection Agency's HABSCORE method of stream assessment was used within the AusRivAS predictive model.

The AusRivAS system uses macroinvertebrate information as a basis for assessing the ecological condition of river sites. Macroinvertebrates are a group of organisms commonly used for biological monitoring of water quality. Macroinvertebrates are used to assess river condition because they are common in many different river habitats, they show responses to a wide range of environmental stresses, they act as continuous monitors of the water that they inhabit, and the structure of the benthic macroinvertebrate community indicates the state of the entire ecosystem.

AusRivAS assesses site condition by comparing the macroinvertebrates that are predicted to occur at a test site, with the macroinvertebrates that are actually collected at a test site. The difference between the number of taxa expected to occur and the number of taxa that are actually observed (observed:expected ratio) is a measure of the ecological condition of a site. If the number, or type, of taxa collected at a test site does not fulfil expectations, then it is likely that water quality or habitat conditions are limiting the biological potential of the site.

While the AusRivAS system is widely used throughout Australia for predicting and assessing river health, it's use in assessment of surface hydrology surrounding the W2CP is limited for the following reasons:

- The AusRivAS system requires field sampling at test sites along the river. Much of the river is located on or between private properties where access to the river could not be obtained;

- The AusRivAS system is based on the response of the biota to water quality. As determined by the groundwater study undertaken by Mackie Environmental

Research, it is unlikely that any measurable change in water quality will be observed in the shallow unconsolidated alluvial aquifer systems as a result of subsidence.

The AusRivAS system was therefore not considered to be the most appropriate method for use in assessing the impact of the W2CP on surface hydrology.

2.2 HABSCORE (USEPA Rapid Bioassessment Protocols)

The United States Environmental Protection Agency (USEPA) has developed Rapid Bioassessment Protocols (RBP) that use fish, macroinvertebrates or periphyton to assess stream condition.

Information on the structural, functional and process elements of the biotic community are calculated for a site, and aggregated into an index, which represents the biological condition of a site. Physical and chemical information about each site is also recorded.

HABSCORE is a visual based habitat assessment that evaluates the structure of the surrounding physical habitat that influences the quality of the water resource, and the condition of the resident aquatic community. It includes factors that characterise stream habitat on a micro-scale (e.g. embeddedness) and a macro-scale (e.g. channel morphology), as well as factors such as riparian and bank structure which influence the micro and macro-scale features.

The HABSCORE system would be useful in assessing the impact of subsidence from the W2CP on surface hydrology, however its applicability to the project is limited due to the same factors as the AusRivAS system.

2.3 Index of Stream Condition (ISC)

The ISC measures stream condition within reaches that are between 10 km and 30 km in length, and uses a rating system to assess stream or river condition, when compared to a reference site.

The ISC is based on the premise that the hydrology, physical form, streamside zone, water quality and aquatic life components indicate the processes and functions that act to influence stream condition. As with the other two methods, access to the creeks to undertake field assessment greatly restricts the use of this method.

2.4 River Styles® Framework

The River Styles® system was developed by Macquarie University and the former Department of Land and Water Conservation. The River Styles® assesses river character and behaviour and allows for the development of a rating based around a stream's recovery potential. The method categorises stream reaches based on the

biophysical characteristics such as the planform, channel geometry and the surrounding assemblage of vegetation and landforms.

The River Styles® Framework also helps to provide a geomorphic link with river ecology as it allows an objective assessment of habitat availability to be undertaken using the condition rating and predicted rate of recovery. By using these two aspects of the framework an educated estimate can be made on the level of habitat availability and complexity based upon the level of geomorphic diversity and riparian vegetation coverage. In this way changes in river structure over time can be used to show how habitat availability has changed.

This information can then be collated to help develop proactive management strategies that more effectively prioritise resource allocation to management issues. The technique also enables realistic "target conditions" to be determined based on geomorphological understanding of river processes and the timeframe that these are operating.

2.5 W2CP Assessment Methodology

The parameters and methodology employed in the above assessment schemes were combined and implemented as far as practicable to provide the most detailed assessment of the water channel conditions as was possible using lazer aerial photography (taken 2006) and limited field observations from available sites.

Both Jilliby Jilliby Creek and Little Jilliby Jilliby Creek, and their major tributaries were divided into sections based on the existing riparian vegetation, with section coordinates recorded to identify each section for assessment. The deliniation was based on the riparian vegetation for the following reasons:

- Riparian vegetation was easily visible and measurable from the detailed aerial photography;

- Erosion of creek banks is considered to be the greatest potential threat to the creeklines as a result of changes to flow volume and velocity created through subsidence. The most effective mitigation measure against erosion of banks is the structure and integrity of existing riparian vegetation. By identifying areas along the creeks where riparian vegetation is absent or limited, these areas may be considered to be at a greater risk of erosion that could be produced through subsidence. In these areas the WACJV would be seeking to undertake monitoring of the banks and developing mitigation strategies in conjunction with relevant landowners; and

- Areas where there is a wide or dense band of riparian vegetation naturally limit access and use of the land immediately adjacent to the creek, and the potential impact of stream width widening or narrowing as a result of subsidence will not be as significant since the area is not one of high or intense use.

For each section of the creek, the following observations were recorded using aerial photography:

- Coordinates of the section (E/N);
- Section Length (m);
- Width of the water channel (m) where visible – some sections of the waterways were obscured from aerial photographs by overhanging vegetation;
- Topography eg whether the section of the creek runs through a broad flat valley or a deep gorge etc.;
- The type of riparian vegetation on each bank;
- The width of riparian vegetation on each bank;
- Surrounding land use on each bank;
- The presence or absence of water in the channel;
- Any creek crossing; and
- Any existing obstructions to water flow.

In addition to the physical characteristics of the creek systems above the mining area, water quality was analysed at selected locations where public access to the water stream was available. Since access to the creek could not be obtained for each section identified in the assessment, water quality could only be assumed to be uniform between the sites where access was possible and water quality data could be obtained.

A total of 28 sites were sampled for water quality on a monthly basis since late 2006. The location of monitoring sites are shown on **Figure 2**. Field readings of pH and conductivity were taken for each site, and a water sample was analysed for the following parameters:

- Suspended Solids;
- Total Alkalinity as CaCO3;
- Sulphate as SO42-;
- Chloride;
- Reactive Phosphorus as P;
- Calcium;
- Sodium;
- Magnesium;
- Potassium;
- Arsenic;
- Barium;
- Cadmium;
- Chromium;
- Copper;
- Lead;
- Manganese;
- Nickel;
- Selenium;
- Zinc;
- Iron;
- Mercury;

- ❒ Ammonia as N;
- ❒ Nitrite as N;
- ❒ Nitrate as N;
- ❒ Total Kjeldahl Nitrogen as N;
- ❒ Total Phosphorus as P;
- ❒ Faecal Coliforms; and
- ❒ Oil and Grease.

Sampling methodology was carried out in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC).

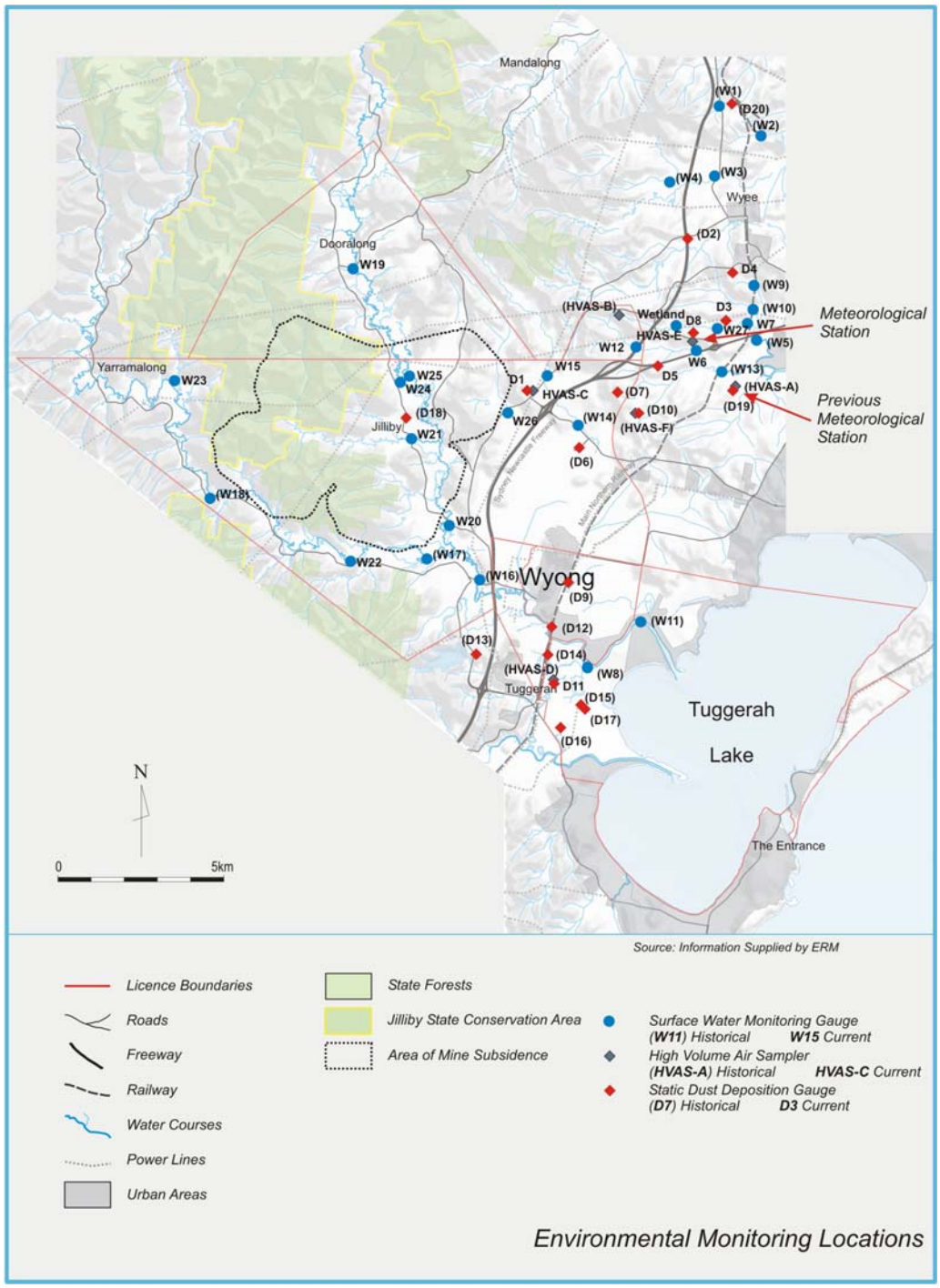


Figure 2

3. Existing Hydromorphology

3.1 Regional Setting

The W2CP is located wholly within the boundaries of the Central Coast Catchment Management Board. This region covers approximately 1,800 square kilometres and includes the catchment areas of Jilliby Jilliby, Lake Macquarie, Lower Wyong (downstream of Bunning Creek confluence), Upper Wyong, Ourimbah, Tuggerah Lakes and Brisbane Water, and corresponds with the local government areas of Gosford City, Lake Macquarie and Wyong Shire Councils. This area covers a range of landscapes that include plateaus, ranges, hills, floodplains, estuarine and coastal areas.

The region is bordered by a series of very small eastern flowing streams in the north, the Sugarloaf Ranges in the north west, Watagan Mountains in the west and Hunter Range in the south and south west.

3.1.1 Existing Catchment Impacts in the Region

Given its close proximity to Sydney the area was settled by Europeans relatively early (early to mid 1800s) and was quickly transformed, with the character of the region's rivers, creeks and floodplains changed dramatically as land was cleared for agricultural pursuits. However, the most significant impact upon the rivers and creeks was logging for the timber industry.

Despite this early clearing there are still considerable areas that form part of state forest and national park within the region and approximately 58% of the region is still covered by native vegetation. However in terms of the preservation of riparian vegetation these areas have only protected the upper reaches, while the lower reaches (particularly the floodplain areas) have been highly altered with little remnant vegetation existing. It is the preservation of the upper reaches which has provided the seed source required to regenerate the riparian vegetation that can now be observed along the channels in the mid to lower reaches of most of the Central Coast streams.

3.2 Jilliby Jilliby Creek and Major Tributaries

Jilliby Jilliby Creek is one of the major tributaries of the Wyong River with the main arm of the creek running south for a distance of approximately 36 km. Jilliby Jilliby Creek has a catchment area of approximately 10,000 ha. The creek stretches from its headwaters in the Olney State Forest to its confluence with the Wyong River at Jilliby Park.

The W2CP proposes to mine underneath approximately 5 km of Jilliby Creek, which represents approximately 14% of the length of the creek. The section of the creek involved is located between 334513.55E and 1323960N and 336375.80E and 1318604.12N.

According to the Lake Macquarie/Tuggerah Lakes/Brisbane Waters Catchment Stressed Rivers Assessment Report (DLWC, 1999) (a desktop assessment) 74% of the catchment

still remains vegetated with 52.4% of the catchment occurring within the Olney State Forest. As part of the Stressed River Report, environmental thresholds for the stream was determined. The report stated that no reach of Jilliby Jilliby Creek had greater than 75% of riparian vegetation cleared, 100% of the banks were stable along its length and 0 % of the stream length is subject to stream bed degradation / sedimentation. However, this data has not been field validated.

Landuse within the catchment is varied and includes:

- grazing / orchards / vegetable growing / horticulture / turf;
- miscellaneous mixed uses such as areas zoned rural residential; and
- animal breeding / horse studs / beef cattle.

3.2.1 Geomorphic Categories of Jilliby Jilliby Creek

Jilliby Jilliby Creek flows from a confined valley setting through to a partly confined valley before joining with the Wyong River and continuing on to Tuggerah Lake within an alluvial setting. Along its length Jilliby Jilliby Creek exhibits three distinct categories of river types:

1. Confined Valley Setting, Floodplain Pockets, Sand dominated;
2. Partly Confined Valley Setting, Low Sinuosity, Sand Dominated; and
3. Laterally Unconfined Setting, Meandering, Sand.

However, within the section beneath which mining is proposed, only the "Laterally Unconfined Setting, Meandering, Sand" occurs. The other two river types are located further upstream and will not be impacted by mining.

3.2.2 Laterally Unconfined Setting, Meandering, Sand

Jilliby Jilliby Creek is situated within an alluvial setting within the area proposed for underground mining. The channel becomes deeper than areas further upstream (up to 1.5 m in places), and the floodplain becomes continuous, rather than as isolated pockets located around the headwaters. This section of the creek is dominated by sand, and the channel is symmetrical and trench-like (deep and narrow) with a moderate sinuosity.

The influence of riparian vegetation has provided the creek with a high degree of lateral stability. The creek itself consists of a single, deep, narrow channel ranging between 1.5 – 3 m wide and approximately 1 m deep. Within the channel zone large sandy point bars are common, forming on the inside bends of the meanders, with bank attached bars also evident where sediment has accumulated due to the influence of large woody debris.

The most dominant feature of these reaches is the pool and irregular riffle sequences. These features are controlled by the input of large woody debris to the system from the largely intact riparian vegetation present.

Chute channels are also evident along some of these reaches. These channels carry floodwaters during high flows short-circuiting the main channel. The largely intact riparian vegetation along these reaches helps to provide bed controls as well as providing bank cohesion. This vegetation also sustains large woody debris loads, which aid in the stabilisation of the reaches.

The floodplain adjacent to this section is quite diverse and indicative of the avulsive nature of the meandering stream category in an alluvial setting. The floodplain itself is dominated by cut-offs and abandoned channels, which reflect the morphology of former channel bends. Some of these old meanders have formed wet areas and generally consist of only one meander. Also evident on the floodplain are flood channels, these features primarily exist as a depression within the floodplain that occasionally carry floodwaters.

The geomorphic condition of the section beneath which mining will occur is rated as moderate because some areas of localised degradation of river character and behaviour are evident.

Along this section the riparian vegetation is still quite well established providing a resistance to flow and increasing bank strength through the binding of soil via the root systems. This vegetation also provides a sustainable source of large woody debris to the creek, which provide natural bed controls. However in certain locations this vegetation becomes patchy allowing some accelerated erosion which has resulted in some modified patterns of geomorphic units along these reaches, but given the current condition of upstream areas, recovery is expected to occur quickly and naturally if pressures are removed.

3.2.3 The Riparian Vegetation of Jilliby Jilliby Creek

Vegetation cover along the length of Jilliby Jilliby Creek above the proposed mining area is fairly consistent in its density, being a tall open forest with increasing proportions of exotics species that increases in the lower half, mainly due to greater impacts by humans. Typical riparian vegetation is listed in Table 3.1. This list has been adapted from the "*Geomorphic Categorisation of Streams within the Central Coast Catchment Management Board Area*", and updated/supplemented by recent vegetation analysis by OzArk Environmental and Heritage Management Pty Ltd specifically for the W2CP Environmental Assessment.

Riparian vegetation plays a very important role in the stabilisation of Jilliby Jilliby Creek due to the highly erodible nature of the bed and bank material. The vegetation increases bed and bank cohesiveness and any loss of this vegetation will result in channel instability. Riparian vegetation also directly influences large woody debris loading, which provides the dominant geomorphic controls within Jilliby Jilliby Creek. A loss of the large woody debris will increase bedload transport capacity, which in turn could lead to bed degradation and an overall increase in channel instability.

Table 3.1 – Riparian Vegetation of Jilliby Jilliby Creek

Scientific Name	Common Name	Source*
Eucalyptus punctata	Grey Gum	1
Eucalyptus saligna	Sydney Blue Gum	1
Eucalyptus amplifolia	Cabbage Gum	1
Syncapia glomulifera	Turpentine	1
Pteridium esculentum	Braken Fern	1
Acmena smithii	Lillypilly	1
Lomandra longifolia	Mat Rush	1
Acacia implexa	Hickory	1
Acacia decurrens	Sydney Green Wattle	1
Melaleuca stypheloides	Prickly-leaved Paperbark	1
Commersonia fraseri	Black Fellow Hemp	1
Tristaniopsis laurina	Water Gum	1
† *Tradescantia albiflora*	Wandering Jew	1
Lantana camara	Lantana	1
Ligustrum sinense	Small-leaved Privet	1
Cinnamomum camphora	Camphor Laurel	1
Solanum mauritianum	Wild Tobacco Tree	1
Ageratina adenophora	Crofton Weed	1

Source 1 = *Geomorphic Categorisation of Streams within the Central Coast Catchment Management Board Area*. Department of Infrastructure, Planning and Natural Resources, 2004.
Source 2 = OzArk vegetation assessment carried out specifically for the W2CP Environmental Assessment, 2007.

† Introduced species.

3.2.4 Water Sharing Plan for the Jilliby Jilliby Creek Water Source

The Jilliby Jilliby Creek Water Source was gazetted on 7 February 2003 and included amendments gazetted on 1 July 2004 and again on 14 July 2009. A summary of the plan sourced from the DNR (now the Office of Water under DECCW) is reproduced below.

The Jilliby Jilliby Creek Water Source covers an area of 101 km^2. It is a major tributary of the Wyong River, with the main arm of Jilliby Jilliby Creek running south from the Watagan Mountains for a distance of approximately 22 km to Jilliby Park where it meets the Wyong River. The major tributaries of Jilliby Jilliby Creek include Little Jilliby Jilliby Creek and Lowers Gully.

Jilliby Jilliby Creek is naturally variable, changing frequently from flood to drought and is considered by the DNR to be a stressed river. This means that, relative to the natural flows in the water source, the potential demand for extraction by water users is high. December tends to be the month of the lowest flows. This is also the time when water demands for irrigation are high.

The water sharing plan is a legal document made under the Water Management Act 2000 for the Jilliby Jilliby Creek Water Source and commenced on 1 July 2004 and applies to 30 June 2014. The Plan is implemented by the DNR (now DECCW)

The water sharing rules allocate water for the environmental needs of the water source and direct how water is to be shared among different water users.

The flow data for Jilliby Jilliby Creek is assessed from flow records for the gauge (211010) near the end of the creek where it meets the Wyong River. The period of record from 1972 to 1994 was extended using rainfall run-off modelling to cover the period from 1890 to 1996.

At the start of the Plan, there were 27 water access licences in the water source. Of these, 23 were for irrigation, one for farming purposes, one for industrial and two for domestic and stock purposes. Domestic and stock access licences are required for those landholders whose property does not front a river or creek.

Climate and creek flows, and therefore the water available to meet all competing needs, vary from year-to-year and day-to-day. The Plan sets a limit, or a cap, on overall extractions on an annual basis (the long-term average extraction limit) and also limits on daily extractions the total daily extraction limit (TDEL).

The Plan provides for domestic and stock rights and native title rights – both forms of basic landholder rights that extract water from the water source and do not need to be licensed. At the start of the Plan, the water requirements for domestic and stock access rights were estimated at 0.51 ML/day. There are currently no extractions under native title rights from the water source. However, both forms of right may increase during the Plan's ten-year term. Any such increase will be accommodated by reduced access by unregulated river access licences.

Domestic and stock rights can be restricted during dry times to protect the environment, for reasons of public health or to protect water availability for other basic landholder rights.

Each year, an available water determination is made defining how much of the share component will be available under each category of licence. Except in years of exceptional drought, domestic and stock access licences will receive 100% of their share component, and local water utility access licences will receive 100% of their share component.

The available water determination for unregulated river access licences may be less than 100% if the long-term average extraction limit is being exceeded. At present, water utility access and domestic, and stock licenses receive 100% of their share component. That is, 1 ML per unit share. Figure 3 shows existing water extraction licences within the study area.

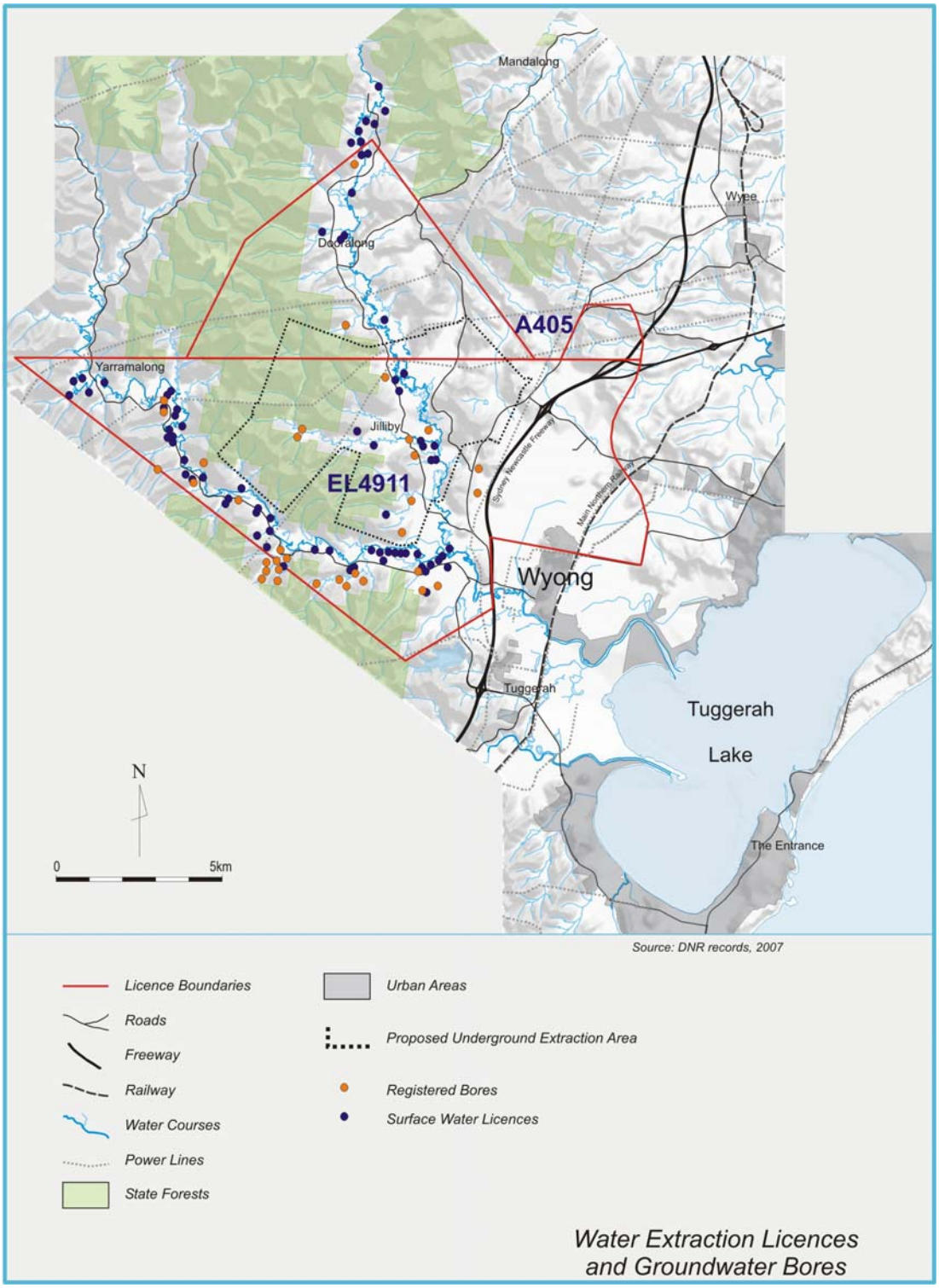


Figure 3 – Existing Water Extraction and Groundwater Bores

3.2.5 Bore Data and Information

A search of data and information for registered bores held by the DECCW revealed the existence of 33 bores within an approximate 6 km search radius centred on the surface footprint of the mine. This database contains all registered structures and includes both pumping bores and wells in use, and exploration/test wells which may have been completed as monitoring bores.

A summary of the details for the 33 registered bores is presented in Table 3.2.

Table 3.2 - Summary Details of Registered Bores

Bore	Coordinates		Depth (m)	Aquifer Type	Year Drilled	Aquifers/ Yield (L/s)	Water Level (m)	Water Quality	Bore Geology
	E	N							
GW028035 20BL021424 P	348750	6318275	30.5	Hardrock	1968	19.8-25.2m/1.26	7.60	good	0.0-4.8 Clay 4.8-6.7 S/S 6.7-18.3 Clay 18.3-20.4 S/S 20.4-24.4 Sh 24.4-30.5 S/S
GW033297 20BL026199 W,D	348930	6321110	19.8	Hardrock	1971	17.6-19.7/0.25	4.60	nil	0.0-10.66 Clay 10.66-11.88 S/S 11.88-17.67 Sh 17.67-19.81 S/S
GW047362 20BL129128 D,S	345025	6317300	38.0	Hardrock	1979	20.0/0.38 29.6/2.0	8.50	good	0.0-7.6 Clay 7.6-9.1 Sh 9.1-38.0 S/S
GW047948 20BL136073 D	351005	6319500	8.0	Hardrock	1981	nil	nil	nil	0.0-8.0 Rock
GW048140 20BL106872 D,S	346225	6316625	38.0	Hardrock	1977	28.4/4.0 35.4/6.8	16.8	good	0.0-7.6 Clay 7.6-28.4 S/S 28.4-37.0 Sh 37.0-38.0 S/S
GW049666 20BL109445 D,S	347125	6316600	45.8	Hardrock	1979	32.4-32.6/3.8 35.6-35.8/1.26	13.7	good	0.0-27.4 Clay 27.4-45.8-Sh
GW051560 20BL111424 F,S	348160	6322940	33.0	Hardrock	1980	28.0/5.0	13.0	nil	0.0-19.0 Clay 19.0-33.0 S/S
GW056461 20BL122630 D,S	346962	6324487	17.0	Hardrock	1982	22.0-23.0/2.52	9.0	nil	0.0-17.0 Clay
GW056521 20BL122843 D,S	345687	6321210	45.0	Hardrock	1982	nil	nil	nil	0.0-8.0 Clay 8.0-25.0 S/S 8.0-25.0 Sh 25.0-44.0 S/S 44.0-45.0 Sh
GW057386 20BL125307 D,F,S	344567	6316775	26.0	Hardrock	1983	16.0-23.0/0.44	6.0	good	0.0-12.0 Clay 12.0-26.0 Sh
GW057493 20BL125665 D	349290	6316420	30.0	Hardrock	1983	18.0-24.0/0.44	6.0	nil	0.00-12.0 Clay 12.0-30.0 Sh
GW058390 20BL127954 D	345575	6321050	0.00	?	1982	nil	nil	nil	nil
GW058789 20BL125583 D,S	351025	6320240	29.0	Hardrock	1983	15.0-15.5/nil 23.0-23.5/nil	nil	salty	0.0-15.0 Clay 15.0-29.0 S/S
GW059092 20BL135236 D,S	349070	6320630	38.0	Hardrock	1981	24.0-25.0/1.26	15.0	salty	0.0-16.0 Clay 16.0-38.0 Sh S/S
GW059166 20BL121663 D,I,S	343820	6319100	0.00	?	1982	nil	nil	nil	nil
GW067069 20BL142928 D,S	349877	6316475	nil	?	nil	nil	nil	nil	nil
GW078064 20BL166821 D,S	346872	6316669	29.0	Hardrock	1998	15.5-18.0/0.40 26.5-27.3/0.80	12.9	0.25 – 120.00 0.50 – 288.00	0.0-15.5 Clay 15.5-18.0 Sand 18.0-26.5 Clay
GW078078 20BL166653 D	349222	6317044	36.0	Hardrock	1996	33.0-33.5/1.0	10.0	fresh	0.0-25.0 Clay 25.0-36.0 S/S

Bore	Coordinates		Depth (m)	Aquifer Type	Year Drilled	Aquifers/ Yield (L/s)	Water Level (m)	Water Quality	Bore Geology
	E	N							
GW078142 20BL166744 D,S	341557	6321975	49.0	Hardrock	1998	22.0-22.8/0.15 45.0-46.0/5.0	15.0 18.0	fresh	0.0-11.5 Clay 11.5-22.8 S/S 22.8-29.5 Mud 29.5-49.0 S/S
GW078148 20BL166707 D,S	342450	6319617	40.0	Hardrock	1998	27.0-29.9/0.19 33.5-35.0/16.0	12.0	fresh	0.0-8.8 Clay 8.8-29.9 S/S 29.9-33.5 Mud 33.5-40.0 S/S
GW078221 20BL166822 I	349022	6319270	60.0	Hardrock	1998	28.9-30.0/0.13	26.0	fresh	0.0-16.5 Clay 16.5-28.9 Mud 28.9-42.6 Cong 42.6-53.0 Mud 53.0-60.0 Cong
GW078295 20BL155229 D	347360	6316892	32.0	Hardrock	1995	20.0-29.0/1.26	nil	good	0.0-15.0 Clay 15.0-20.0 Gravel 20.0-32.0 S/S
GW078356 20BL166558 D	341372	6319926	140.0	Hardrock	1997	131.0-131.5/0.2	95.0	fresh	0.0-5.0 Clay 5.0-36.0 S/S 36.0-36.5 Sh 36.5-97.0 S/S 97.0-99.0 Sh 99.0-115.0 S/S 115.0-117.0 Iron 117.0-128.0 S/S 128.0-131.0 Cong 131.0-133.0 S/S 133.0-140.0 Sh
GW078599 20BL166842 D,S	347596	6316742	48.0	Hardrock	1998	44.4-47.0/3.0	21.0	1.00 - 900.00	0.0-5.3 Clay 5.3-9.0 S/S 9.0-11.5 Clay 11.5-12.8 S/S 12.8-14.2 Clay 14.2-15.6 Ironstone 15.6-19.5 S/S
GW080328 20BL168517 D,S	344706	6317188	12.0	Alluvial	2004	nil	nil	nil	nil
GW080555 20WA202827 D,S	341552	6321690	41.0	Hardrock	2004	33.0-34.0/3.0	17.0	nil	0.0-8.0 Clay 8.0-36.0 S/S 36.0-41.0 Sh
GW080590 20BL169063 D,S	345045	6316735	42.0	Hardrock	2004	24.0-30.0/0.50	13.0	nil	0.0-17.0 Clay 17.0-42.0 S/S
GW080591 20BL169064 D, S	344694	6317000	48.0	Hardrock	2004	39.0-42.0/0.83	20.0	nil	0.0-0.5 Soil 0.5-3.0 Clay 3.0-40.0 S/S 40.0-48.0 Sh
GW080592 20BL169065 D	345090	6317054	48.0	Hardrock	2004	41.0-42.0/1.0	20.0	2.00 – 0.47	0.0-4.0 Clay 4.0-48.0 S/S
GW080593 20BL169100 F,I	345127	6317608	27.0	Hardrock	2003	18.0-21.0/2.0	7.0	nil	0.0-9.0 Clay 9.0-27.0 S/S
GW080599 20BL169105 C,F,I	345324	6317390	30.0	Hardrock	1964	nil	nil	nil	nil
GW080608 20BL169008 D,S	349520	6321281	48.0	Hardrock	2004	41.0-45.0/0.40	3.20	nil	0.0-36.0 Sands 36.0-48.0 Sh
GW200211 20BL169166 D,F,S	342753.35	6320157.49	72.0	Hardrock	2006	nil	nil	nil	nil

Note: 'nil' denotes no recorded data
S/S denotes sandstone
Sh denotes shale/claystone
Cong denotes conglomerate
D, S, F, I, W, P denotes authorised purpose: Domestic, Stock, Farm, Irrigation, Waste Disposal, Poultry

The depths of the registered bores with depth information range from 8.0 to 140.0 m. The majority of bores were drilled to less than 60.0 m-depth with just three bores drilled deeper. Bore GW78221 and GW 200211 were drilled to final depths of 60.0 m and 72.0 m respectively. The deepest bore (GW078356) was drilled to 140.0 m in 1997.

The large majority of bores intersected Triassic sedimentary rocks comprising mostly shale, mudstone and sandstone. Just one registered bore (GW080328) appears to have been drilled and constructed in alluvium.

The indicative yields of the registered bores with yield information range from zero yield to 16.0 L/s. The highest yielding bore (GW078148) is 40.0 m in depth and located south of the Wyong River approximately 1 km south of the south-western longwall panel proposed for extraction between mining years 31 and 40. The sandstone-hosted aquifer was intersected between 33.5 and 35.0 m. The extraction is licensed for Stock and Domestic use.

The available water quality data for registered bores indicates that the salinity of the hardrock aquifers is highly variable with records of 'good', 'fresh' and 'salty' presumably noted from taste tests during drilling.

The bores are mainly licensed for stock and domestic use with two also licensed for farming. Four bores are licensed for irrigation purposes, one for waste disposal and one for chicken growing (poultry). No annual volume allocations for the licensed bores are available.

A review of the DNR database reveals that a total of nine registered bores are located within the mine footprint and two bores close to the footprint boundary. Details of these key bores are provided in Table 3.3.

Table 3.3 - Summary Details of Registered Bores within and Proximal to the Mine Footprint

Bore	Coordinates		Collar Elevation (m AHD)	Mine Panel	Depth (m)	Aquifers/ Yield (L/s)	Elevation Aquifer (m AHD)	Water Level (m)	Water Quality	Bore Geology
	E	N								
GW028035 20BL021424 P	348750	6318275		Years 10-20	30.5	19.8-25.2m/1.26		7.60	good	0.0-4.8 Clay 4.8-6.7 S/S 6.7-18.3 Clay 18.3-20.4 S/S 20.4-24.4 Sh 24.4-30.5 S/S
GW033297 20BL026199 W,D	348930	6321110		Years 1-10	19.8	17.6-19.7/0.25		4.60	nil	0.0-10.66 Clay 10.66-11.88 S/S 11.88-17.67 Sh 17.67-19.81 S/S
GW051560 20BL111424 F,S	348160	6322940		Years 20-30	33.0	28.0/5.0		13.0	nil	0.0-19.0 Clay 19.0-33.0 S/S
GW056461 20BL122630 D,S	346962	6324487		Years 20-30	17.0	22.0-23.0/2.52		9.0	nil	0.0-17.0 Clay

Bore	Coordinates		Collar Elevation (m AHD)	Mine Panel	Depth (m)	Aquifers/ Yield (L/s)	Elevation Aquifer (m AHD)	Water Level (m)	Water Quality	Bore Geology
	E	N								
GW056521 20BL122843 D,S	345687	6321210		Years 30-40	45.0	nil		nil	nil	0.0-8.0 Clay 8.0-25.0 S/S 8.0-25.0 Sh 25.0-44.0 S/S 44.0-45.0 Sh
GW058390 20BL127954 D	345575	6321050		Years 30-40	0.00	nil		nil	nil	nil
GW059092 20BL135236 D,S	349070	6320630		Years 10-20	38.0	24.0-25.0/1.26		15.0	salty	0.0-16.0 Clay 16.0-38.0 Sh S/S
GW059166 20BL121663 D,I,S	343820	6319100		Outside mine footprint	0.00	nil		nil	nil	nil
GW078221 20BL166822 I	349022	6319270		Years 10-20	60.0	28.9-30.0/0.13		26.0	fresh	0.0-16.5 Clay 16.5-28.9 Mud 28.9-42.6 Cong 42.6-53.0 Mud 53.0-60.0 Cong
GW080608 20BL169008 D,S	349520	6321281		Years 1-10	48.0	41.0-45.0/0.40		3.20	nil	0.0-36.0 Sands 36.0-48.0 Sh
GW200211 20BL169166 D,F,S	3427535	63201579		Outside mine footprint	72.0	nil		nil	nil	nil

Note: 'nil' denotes no recorded data
S/S denotes sandstone
Sh denotes shale/claystone
Cong denotes conglomerate
D, S, F, I, W, P denotes authorised purpose: Domestic, Stock, Farm, Irrigation, Waste Disposal, Poultry

The depths of the registered bores within the mine footprint range from 17.0 to 60.0 m. It is noted that there are no details for Bore GW058390 which is located in the central part of the footprint.

The deepest bore (Bore GW78221) is located in the southeast corner of the footprint and drilled to a final depth of 60.0 m. This site is planned for extraction between years 10 and 20. The bore intersected a very low yielding (0.1 L/s) conglomerate-hosted aquifer at about 30.0 m-depth. Water quality is reported to be 'good'.

The majority of the bores recorded low to moderate indicative yields ranging from 0.25 to 5.0 L/s. Three of the bores with yield data intersected sandstone aquifers, one intersected an interbedded shale/sandstone aquifer and one aquifer is hosted by conglomerate.

Little water quality data is available for the private registered bores within the footprint. Two bores recorded 'good' and 'fresh' groundwater (GW028035 and GW078221) and a third reported 'salty' water (GW059092).

Five of the bores are licensed for stock and domestic use. One bore has a poultry (chicken growing) water license (GW021424) and one very low yielding bore (GW078221) is approved for irrigation purposes. Bore GW033297 is licensed for waste disposal.

It is noted that there is no data or information for the two peripheral bores GW059166 and GW200211 which are both located close to the Wyong River in Yarramalong Valley due southwest of the proposed mine footprint.

No annual volume allocations for the licensed bores are available.

3.3 Little Jilliby Jilliby Creek and Major Tributaries

Little Jilliby Jilliby Creek is a major tributary of Jilliby Jilliby Creek. It flows in a west-easterly direction, and is approximately 4.3 km in length. Little Jilliby Jilliby Creek joins Jilliby Jilliby Creek approximately 5.5 km upstream from the confluence with the Wyong River.

Little Jilliby Jilliby Creek drains the south-western section of the catchment, having its origins within the Wyong State Forest. Although the entire length of the creek is located above the proposed mining area for the W2CP, it is predominantly located above a set of main underground roadways which will not be subject to extraction and hence little to no subsidence will occur to the creek.

3.3.1 Geomorphic Categories of Little Jilliby Jilliby Creek

The surrounding land uses, geology and soils of Little Jilliby Jilliby Creek are the same as those described for Jilliby Jilliby Creek. However, since the entire length of Little Jilliby Jilliby Creek is located within the proposed extraction area, the full range of geomorphic categories are present, and are described below.

Confined Valley Setting, Floodplain Pockets, Sand Dominated.

This unit occurs at the headwaters or Little Jilliby Jilliby Creek (330902.75:1324143.51, to 331993.74:1321225.55), where it is laterally controlled by the valley shape, and only a few small floodplain pockets evident. The channel pattern in this part of the catchment does exhibit some sinuosity but the bends are not free to migrate downstream or laterally due to the valley margins and some bed rock control.

The bed material along this reach ranges between a medium gravel to a medium sand. This material has been derived from sandy soils, subsoils and weathering of sandstone outcrops within the catchment (Murphy, 1993).

The channel zone consists of a single channel and contains a number of geomorphic units. These include pools, riffles, small islands, mid channel and bank attached bars, the latter of which consist of a coarse sand. This reach is generally in an excellent state with only a few weed species evident, and generally shows little evidence of recent disturbance.

The natural vegetation along this section is helping to increase the cohesiveness of bed and bank material, and reducing flood energy by increasing bed roughness. The riparian

vegetation along this reach also provides a constant sustainable supply of large woody debris to the stream. This large woody debris has created a number of bed control features, which have resulted in some small pools and scour features on the bed of the creek.

As the classification suggests, floodplain pockets are evident along this reach. The floodplain pockets themselves exhibit scour features and flood channels and there is also evidence of past flooding. The texture of the material deposited on the floodplain pockets is a coarse sand similar to the bed material.

Partly Confined Valley Setting, Low Sinuosity, Sand Dominated

Further downstream from the confined valley setting, the creek becomes dominated by a medium sandy material (331993.74:1321225.55 to 333929.73:1320795.38). The geology of this area is similar to that of the upper reaches of the catchment although the floodplain along these particular reaches becomes more developed, generally occurring on the inside bends of the stream and is subject to some lateral accretion. As with the upper reaches, alluvial soils and siliceous sands dominate these floodplains with some vertically and laterally accreted fines present.

The geomorphic character of the creek is typical of a low sinuosity sand dominated system. Some occasional bed rock controls are evident, however the major controlling feature is the riparian vegetation.

The stream itself consists of a single deep narrow channel ranging between 1 – 2.5 m wide, exhibiting a low sinuosity. Within the channel zone a number of geomorphic features are evident with the dominant feature consisting of a series of alternate lateral bars. These are the principle bar feature of low sinuosity reaches and are formed by the lateral accretion process. Point bars are also common along these reaches, forming on the inside bends of the meanders. These features are generally 1 to 2 m wide and are up to 10 m long in some places. The channel zone is also broken up by a random pattern of irregular pools and riffle sequences that are controlled by large woody material deposition, with some pools being up to 1 m deep.

Occasional transverse bars are another geomorphic feature present within these reaches. These bars form across the channel and generally occur in most sand-bed channels and reflect the downstream movement of sand as small slugs. Transverse bars are formed via flow divergence in sandy sediment conditions. Some benches are also evident as the stream energy decreases and suspended loads are deposited. This is typical in sand-bed streams and has resulted in a slow lateral migration that is restricted by riparian vegetation.

In terms of sediment transfer, the section seems to be in balance, meaning that the sediment input of these reaches equals the output over the long term, mainly due to the geomorphically effective riparian vegetation. As the majority of the banks are well vegetated, a relatively constant and sustainable source of large woody debris is made available to the stream.

Laterally Unconfined Setting, Meandering, Sand

The description for Laterally Unconfined Setting, Meandering, Sand above for Jilliby Jilliby Creek can be applied to Little Jilliby Jilliby Creek. The section of the creek where this geomorphic unit occurs is from around 333929.73:1320795.38 (E/N) to its confluence with Jilliby Jilliby Creek (336097.50:1320877.69).

3.3.2 Riparian Vegetation of Little Jilliby Jilliby Creek

Within certain reaches of Little Jilliby Jilliby Creek the riparian vegetation is inconsistent with the majority being exotic and consisting of such species as Camphor Laurel, Lantana and Privet, although there are some areas of remnant vegetation evident. The areas of remnant vegetation are more common in the upstream reaches, mainly within the Wyong State Forest/Jilliby State Conservation Area, and could provide natural recruitment to the stream if the exotic species are effectively managed. Nevertheless, the vegetation present is providing an important function as it is supplying the creek with a consistent supply of large woody debris and is helping to bind the bed and banks of the creek itself.

Species encountered are similar to those found along Jilliby Jilliby Creek and are listed in Table 3.1.

Little Jilliby Jilliby Creek is rated as having a moderate geomorphic condition due to the fact that there are localised areas of degradation of river character and behaviour that are typically marked by modified patterns of geomorphic units. An example of this degradation is evident downstream of the Jilliby Road Bridge, where a loss of riparian vegetation has resulted in accelerated erosion of both the bed and banks.

3.4 Wyong River

Wyong River, along with Mangrove, Mooney Mooney and Ourimbah Creeks, provide the main water source for the Wyong and Gosford Council Areas. Wyong River is a major tributary of Tuggerah Lakes, having a catchment area of 347 km^2, and flows from Wyong River (as well as from Ourimbah Creek and Wallarah Creek) have been attributed to the increase of nutrients and sediments in the Lake. This is due to the highly disturbed nature of the catchment, due initially to forestry practices, and today by intensive agriculture and hobby farms including turf farming, cropping and grazing.

The main arm of the Wyong River runs south- east for a distance of 48 km to meet Tuggerah Lake at Tacoma. The tidal influence in Wyong River extends approximately 9 km past the junction to Deep Creek. The major tributaries of Wyong River include Jilliby Jilliby Creek and Cedar Brush Creek.

3.4.1 Geomorphic Categories of Wyong River

The geomorphology of Wyong River ranges from Confined Valley Headwater, to Laterally Unconfined Valley Tidal as it enters the Tuggerah Lakes. However, the W2CP will not mine underneath the Wyong River, but minor subsidence impacts may be experienced due to mining nearby.

The sections of the Wyong River that may experience low levels of subsidence are described as Partly Confined Valley Planform controlled Meandering (331231:1318405 [E:N] to 329979:1319343), and Laterally Unconfined Valley Meandering Sand (335492:1317531 [E:N] to 333872:1317642), both geomorphic groups have been described previously.

3.4.2 Riparian Vegetation of Wyong River

The banks of the Wyong River studied during this assessment were all very well vegetated, however the composition of this vegetation was not evident from aerial photography. It would be expected however, to be of similar species composition to that of Jilliby and Little Jilliby Jilliby Creeks, sharing a similar land use and history to its tributaries. However, regardless of the species present in the riparian corridors, they all serve the same important function of bank stabilisation.

The "*Geomorphic Categorisation of Streams within the Central Coast Catchment Management Board Area"* rates the geomorphic structure of the River as Moderate, with recovery potential (that is, it's ability to recover from disturbance or stress) being Strategic, and High Recovery Potential for the sections that are predicted to be subsided by the W2CP.

3.5 Hue Hue Creek

The Hue Hue Valley catchment is located to the west of Hue Hue Road between Wyong and Wyee on the Central Coast of New South Wales. It drains into Porters Swamp just downstream of the F3 Freeway. Porters Creek flows from Porters Swamp, under a bridge at Alison Street, Wyong, immediately prior to joining the Wyong River.

The majority of the upper reaches of the Hue Hue catchment and the steeper hillsides are heavily vegetated. The valley in the mid reaches of the catchment has been predominantly cleared and mainly consists of small rural and rural-residential land holdings. Residential development is concentrated in the area around Sandra Street and Hue Hue Road. There is a smaller residential subdivision at Cottesloe Road higher in the catchment.

The drainage system within the Hue Hue Valley consists of a series of small, poorly defined, ephemeral watercourses draining to the south east. There are three locations where roads cross the creek, these are:

- two separate culverts under the F3 Freeway;
- a culvert under Sandra Street; and
- a culvert at Hue Hue Road.

Two private access roads from the end of Cottesloe Road also cross Hue Hue Creek.

3.6 Water Quality

Water quality investigations are undertaken to provide information on the health of water bodies and for the management of catchments and water resources and the environment.

3.6.1 Water Quality Guidelines

The Australian and New Zealand Environment Conservation Council (ANZECC) published the revised Australian and New Zealand guidelines for fresh and marine water quality in 2000.

These guidelines, which are usually called the 'ANZECC guidelines' provide government and the community – especially regulators, industry, consultants, community groups and catchment and water managers – with a framework for conserving ambient water quality in our rivers, lakes, estuaries and marine waters.

The guidelines form the central technical reference of the National Water Quality Management Strategy, which the federal and all state and territory governments have adopted for managing water quality.

For each catchment in NSW, the state government has endorsed the community's environmental values for water, known as 'Water Quality Objectives' (WQOs). The NSW Water Quality Objectives are the environmental values and long-term goals for consideration when assessing and managing the likely impact of activities on waterways.

Environmental values and uses protected by the WQOs include:

- Aquatic ecosystems;
- Aquatic foods;
- Drinking water;
- Homstead water supply;
- Irrigation water supply;
- Livestock water supply;
- Primary contact recreation (eg swimming);
- Secondary contact recreation (eg boating); and
- Visual amenity.

The ANZECC guidelines acknowledge that different levels of protection may be appropriate for different water bodies. The guidelines specify three levels of protection, from stringent to flexible, corresponding to whether the condition of the particular ecosystem is:

- of high conservation value;
- slightly to moderately disturbed; or
- highly disturbed.

The policy in NSW is that the level of protection applied to most waterways is the one suggested for 'slightly to moderately disturbed' ecosystems. However, waterways that mainly flow through relatively undisturbed national parks, World Heritage areas or

wetlands of outstanding ecological significance are designated as being of 'high conservation value'.

In effect, a water quality guideline is a recommended numerical concentration level (eg of a contaminant) or a descriptive statement (eg visual appearance of a water body) that will support and maintain the designated use of a particular water body. Water quality guidelines form the basis for determining water quality objectives. Associated with each environmental value and level of protection are “guidelines” or “trigger vales” for substances that might potentially impair water quality. If these values are exceeded, they may be used to trigger an investigation or initiate a management response.

The waterways that exist within the project area for the proposed W2CP contain sections that may be classified primarily as “slightly to moderately disturbed” and “highly disturbed”. With the “slightly to moderately disturbed” category requiring more stringent management and objectives to be achieved, it has been used in the assessment of all waterways within the W2CP to provide a conservative approach to the study.

Within the W2CP proposed project area, waterways provide a number of functions:

- Aquatic ecosystems;
- Town water supply;
- Stock and wildlife water supply;
- Agricultural water for crops and farming usage;
- Recreation; and
- Aesthetics.

Based on the Water Quality Objectives, current condition of the waterways and water uses, the following ANZECC Guidelines are considered appropriate for the waterways within the proposed W2CP area:

- Protection of Aquatic Ecosystems in South Eastern Australia;
- Water Quality for Irrigation and General Water Use;
- Guidelines for Recreational Water Quality and Aesthetics; and
- Drinking Water.

3.6.2 Existing Water Quality

Existing water quality data has been obtained where possible to gain a baseline indication of water quality, to which monitoring results can be compared post mining. The existing water quality is shown in Appendix 2. Monitoring locations are shown on Figure 2.

From the water quality data available, the following general conclusions can be made:

Hue Hue Creek

- Levels of manganese often exceeded drinking water and recreational / aesthetic guidelines;

- Levels of iron often exceeded drinking water and recreational / aesthetic guidelines;

- ❒ Levels of phosphorus often exceed aquatic ecosystem guidelines;
- ❒ Levels of zinc often exceed aquatic ecosystem guidelines;
- ❒ Levels of ammonia often exceed aquatic ecosystem and recreational / aesthetic guidelines; and
- ❒ Faecal coliforms regularly exceed drinking water and recreational / aesthetic guidelines by a significant amount.

Jilliby Jilliby Creek

- ❒ Levels of manganese often exceeded aquatic ecosystem, drinking water and recreational / aesthetic guidelines;
- ❒ Levels of zinc often exceed aquatic ecosystem guidelines;
- ❒ Levels of iron often exceeded drinking water and recreational / aesthetic guidelines;
- ❒ Levels of ammonia often exceed aquatic ecosystem and recreational / aesthetic guidelines;
- ❒ Faecal coliforms regularly exceed drinking water and recreational / aesthetic guidelines by a significant amount; and
- ❒ At the lowest sampling point arsenic exceeded guidelines for irrigation, recreation and drinking water.

Little Jilliby Jilliby Creek

- ❒ Levels of manganese often exceeded drinking water and recreational / aesthetic guidelines;
- ❒ Levels of iron often exceeded drinking water and recreational / aesthetic guidelines;
- ❒ Levels of phosphorus often exceed aquatic ecosystem guidelines;
- ❒ Levels of zinc often exceed aquatic ecosystem guidelines;
- ❒ Levels of ammonia often exceed aquatic ecosystem and recreational / aesthetic guidelines; and
- ❒ Faecal coliforms regularly exceed drinking water and recreational / aesthetic guidelines by a significant amount.

Wyong River

- ❒ Levels of manganese often exceeded drinking water and recreational / aesthetic guidelines;

- Levels of iron often exceeded drinking water and recreational / aesthetic guidelines;
- Levels of phosphorus often exceed aquatic ecosystem guidelines;
- Levels of zinc often exceed aquatic ecosystem guidelines;
- Levels of ammonia often exceed aquatic ecosystem and recreational / aesthetic guidelines; and
- Faecal coliforms regularly exceed drinking water and recreational / aesthetic guidelines by a significant amount.

4. Impact Assessment

4.1 Subsidence Related Impacts

Detailed assessment of the predicted subsidence associated with the W2CP has been carried out by two leading consultants in the field: Strata Control Technology Pty Limited and Mine Subsidence Engineering Consultants Pty Limited. Based on a number of revisions of the proposed mine plan and subsidence modelling, the amount of subsidence that is expected along the waterways has been calculated. Graph 1, Graph 2 and Graph 3 graphically present the amount of subsidence that is anticipated to occur along Jilliby Jilliby Creek, Little Jilliby Jilliby Creek, and the Wyong River respectively.

4.2 General Waterway Resilience

The type of water channel that exists at any one point is dependent upon a large number of physical factors upstream, downstream and adjacent to the point. These factors determine the geomorphic character and behaviour of the reach. Furthermore a waterway's physical behaviour determines how it is to be managed.

At a national scale it is generally considered that reaches located high in the catchment are the closest to being in an intact condition or have recovered to a near pre-disturbance state. This is because they are typically more resilient to change and are protected by their relative inaccessibility.

Within the proposed mining area reaches located lower in the catchment are also in an intact condition or have recovered from disturbance. These streams are generally small, meandering sand bed systems dominated by a high large woody debris loading and a good riparian vegetation cover, which act as the main factors influencing the stability of geomorphic units present. As these systems are sand dominated, they are also highly susceptible to disturbance and react quickly to change, in particular to a loss of riparian vegetation and the removal of large woody debris. If this was to occur it would result in the stable, geomorphically complex, narrow sinuous streams of the region becoming broad, simplified, unstable, bedload-dominated channels.

Research carried out on the influence of riparian vegetation has highlighted the critical role it plays in channel stability by increasing hydraulic roughness, providing natural bed level controls and controlling stream width and depth. In addition to providing these physical controls riparian vegetation, primarily via the contribution of large woody debris and leaf litter, plays a large role in maintaining and restoring ecological diversity and ecosystem processes at both the local and landscape level.

It is widely acknowledged that a complex geomorphological system forms the basis for a healthy aquatic ecosystem. Therefore the preservation and enhancement of riparian zones are of great importance in maintaining and achieving improved aquatic ecosystem health.

In determining the recovery potential and priority for each reach, consideration of the riparian vegetation condition has been based upon the influence that the vegetation has on the geomorphology and not on the quality of the riparian vegetation. The basis for this is that exotic vegetation may not only be protecting the bed and banks from erosion but also acting to sustain an adequate hydraulic roughness, reducing the velocity of flows within the creek. However, it is recommended that any rehabilitation work undertaken along the creeks include the gradual replacement of this exotic vegetation with native species.

4.3 Jilliby Jilliby Creek and Major Tributaries

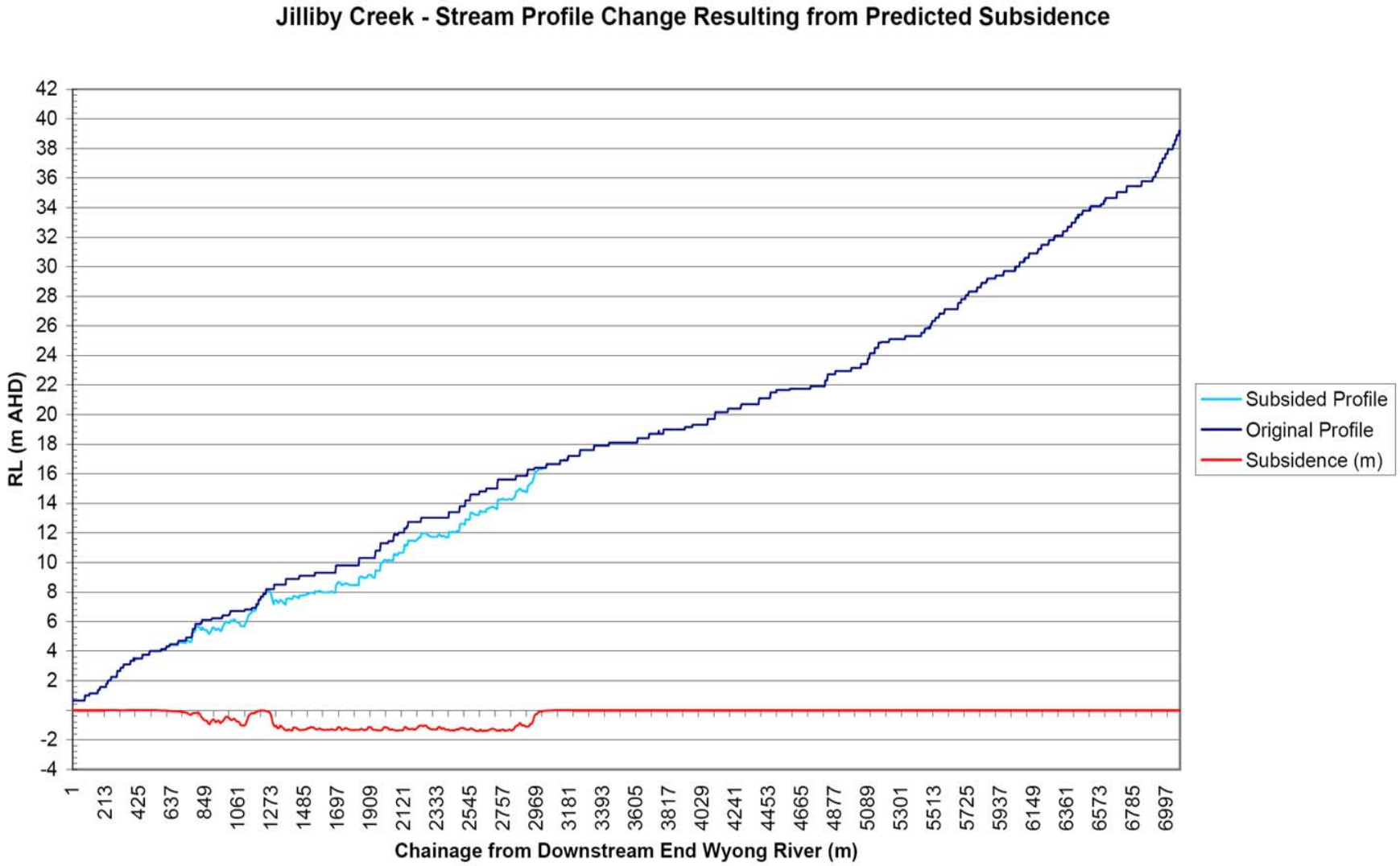
Graph 1 shows the existing profile of Jilliby Jilliby Creek, and the expected profile of the channel following subsidence. Based on the anticipated levels of subsidence, the creek bed is expected to drop in a fairly uniform pattern along its length within the impact zone, with the exception of the junction with Little Jilliby Jilliby Creek. Given that fairly uniform levels of subsidence are anticipated with the above exception, it is expected that the impact on the creek channels will be negligible, except in the following sections (refer to Graph 1):

- Around the upstream point where subsidence begins (approximately 334700.51:1323879.95). The impact expected at this location will be a steeper grade in the bed of the channel, where the upstream section remains unsubsided, and flows down into the subsided section. The potential at this point is for increased erosion of the channel bed, as flow velocities are likely to increase with the change in the bed profile.

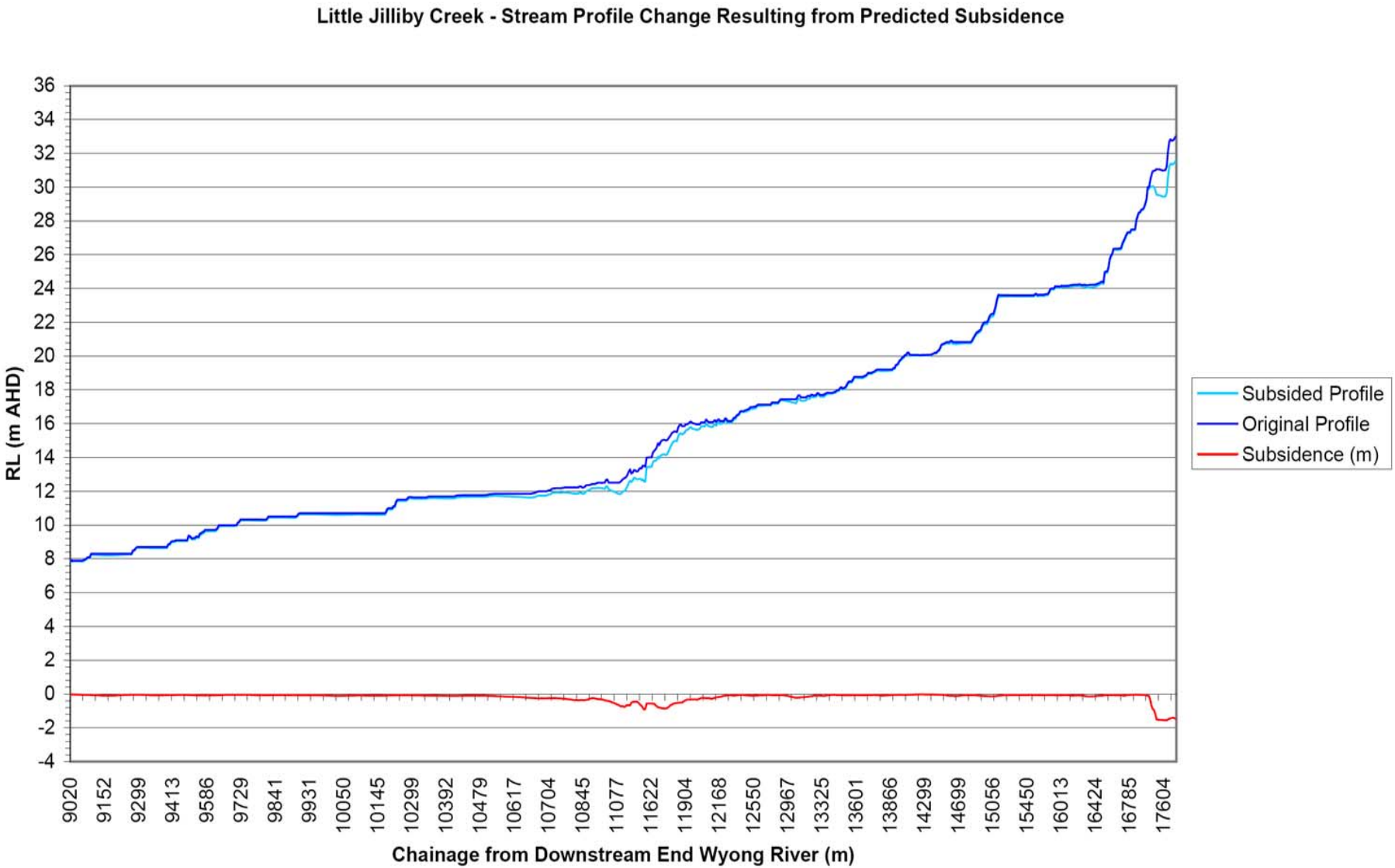
- Around the confluence with Little Jilliby Jilliby Creek the mine plan has been designed to prevent subsidence in this area. The expected resulting impact in this situation will be the creation of a deeper pool upstream of the confluence (increase depth of up to 68 cm), and increased potential for erosion of the creekbed immediately downstream of the confluence, as in the case above where the water flows down a steeper gradient going from an unsubsided to a subsided section.

- At the downstream section of the channel above the limit of underground extraction. This will create an area where there is a deeper pool in the subsided section adjacent to the unsubsided area.

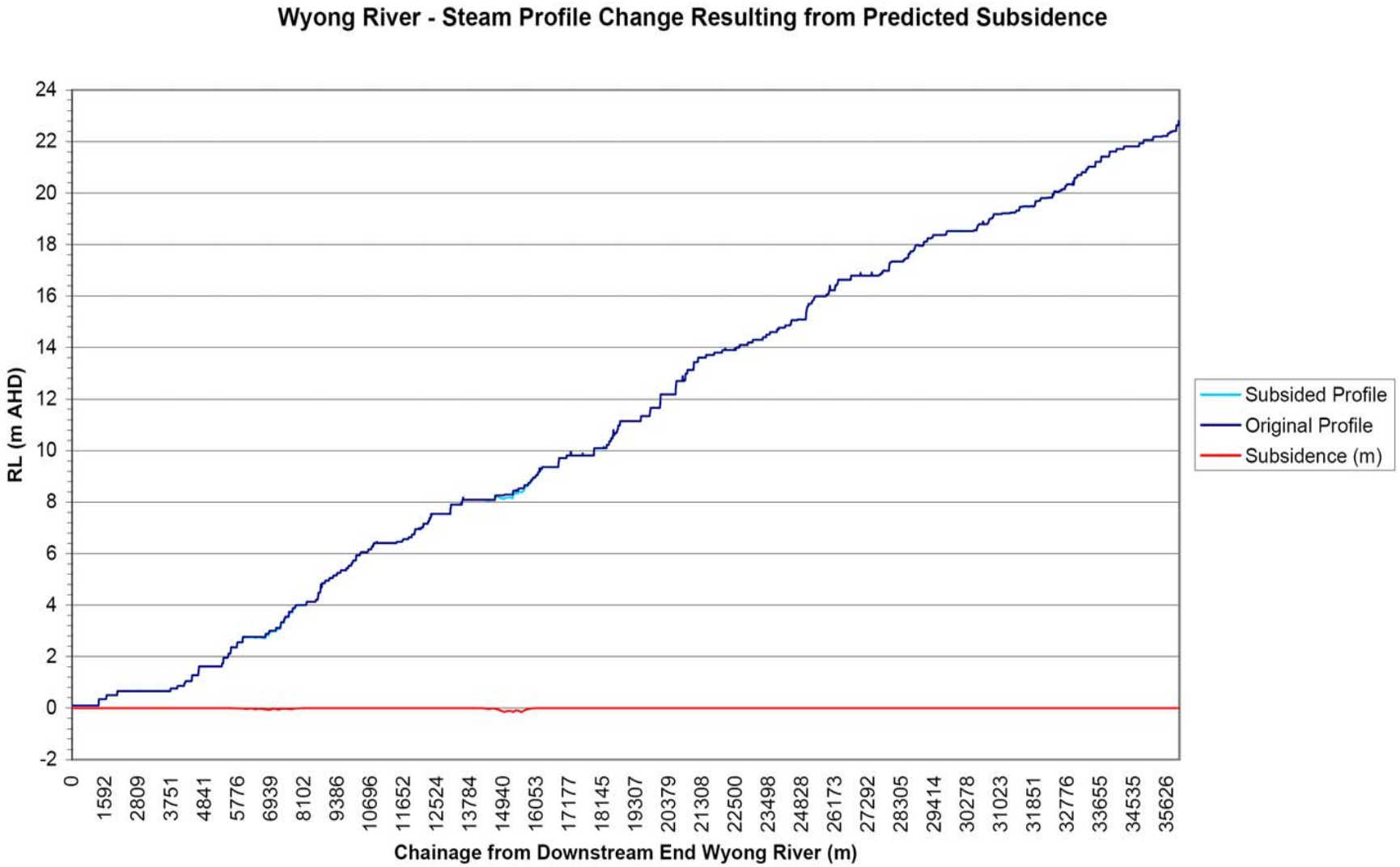
This section of the creek was assessed in the *Geomorphic Categorisation of Streams within the Central Coast Catchment Management Board Area*, Department of Infrastructure, Planning and Natural Resources, 2004, as having a "High Recovery Potential – Connected" since it exhibits a high capacity to recover from disturbance, but is presently in a moderate geomorphic condition. It is therefore considered, that with the implementation of the mitigation strategies described in the following chapter, that the overall impact on the creek stability and water quality will be negligible.


Jilliby Creek - Stream Profile Change Resulting from Predicted Subsidence
RL (m AHD)
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
-2
-4
1
213
425
637
849
1061
1273
1485
1697
1909
2121
2333
2545
2757
2969
3181
3393
3605
3817
4029
4241
4453
4665
4877
5089
5301
5513
5725
5937
6149
6361
6573
6785
6997
Chainage from Downstream End Wyong River (m)
Subsided Profile
Original Profile
Subsidence (m)

Graph 1


Little Jilliby Creek - Stream Profile Change Resulting from Predicted Subsidence
RL (m AHD)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
9020
9152
9299
9413
9586
9729
9841
9931
10050
10145
10299
10392
10479
10617
10704
10845
11077
11622
11904
12168
12550
12967
13325
13601
13866
14299
14699
15056
15450
16013
16424
16785
17604
Chainage from Downstream End Wyong River (m)
Subsided Profile
Original Profile
Subsidence (m)

Graph 2


Wyong River - Steam Profile Change Resulting from Predicted Subsidence
RL (m AHD)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
0
1592
2809
3751
4841
5776
6939
8102
9386
10696
11652
12524
13784
14940
16053
17177
18145
19307
20379
21308
22500
23498
24828
26173
27292
28305
29414
30278
31023
31851
32776
33655
34535
35626
Chainage from Downstream End Wyong River (m)
Subsided Profile
Original Profile
Subsidence (m)

Graph 3

4.4 Little Jilliby Jilliby Creek and Major Tributaries

Little Jilliby Jilliby Creek, for the majority of its length, runs parallel with the underground extraction panels. The mine plan has been designed to ensure that the creek remains above a pillar as far as possible. The result of this is that there will be negligible subsidence of the creek, as shown in Graph 2.

The greatest impact on Little Jilliby Jilliby Creek will occur in the upper reaches, where up to 1.55 m of subsidence is predicted around a location (331779:1322133 EN) in the Wyong State Forest. The resulting impact at this location will be the deepening of an existing pool in the channel. However, given the isolated nature of this section, and the good condition of the banks and riparian vegetation, it is anticipated that this will not be a major impact, nor will it effect long term water quality or create erosion of the creekline.

4.5 Wyong River

The mine plan for the W2CP was designed to ensure that there will be no mining beneath the Wyong River. This has ensured that only minimal subsidence will occur in the channel, as shown in Graph 3. The maximum anticipated subsidence along the Wyong River will be up to 150 mm, and will be a result of mining nearby, not below the River.

Subsidence of less than 150 mm is not predicted to have any visible impact on the river, and will not be sufficient enough to alter water flows, aquatic habitat, riparian vegetation, or water quality. Riparian vegetation along the entire length of the River examined remains intact, and at the time of survey, consisted of a healthy native community. It is anticipated that the riparian vegetation will easily withstand the low levels of subsidence predicted, and therefore it is highly unlikely that the W2CP will result in stream bank erosion or sedimentation of the Wyong River.

The predicted degree of subsidence will have a negligible impact on the River, and is consistent with the W2CP commitment to protect the River and the regions water supply.

4.6 Water Quality Implications

The subsidence assessment undertaken for the W2CP provided an assessment of the potential for water quality impacts as a result of subsidence. This assessment particularly covered the issue of increased iron concentrations in surface waters as a result of subsidence. The results are summarised in the following sections.

4.6.1 Valley floors

The precipitation of iron hydroxide and associated iron staining has been observed in some areas of the Southern Coalfield. These occurrences appear to be related to relatively saline, iron-rich groundwater seeping from mining induced fracture

systems in the floor of some gorges and mixing with fresh, oxygenated stream water. The associated chemical reaction produces an iron precipitate which, though non-toxic and readily filterable, can result in unsightly staining of the rock gorge. The source of the iron is thought to be ferruginous minerals within the sandstones that form the walls to the gorges.

The valleys in the W2CP mining area are not only much broader than the gorges of the Southern Coalfield, they are filled with some 20-30m of alluvium. As has been described in the Subsidence Study, while some shallow fracturing in response to upsidence of the bedrock in these valleys may occur, it will do so at the base of the thick alluvial layer. Piezometric testing has shown that not only is this alluvium saturated, the water that it contains is layered – with less dense fresh water at the top and denser saline water at the base.

Therefore, in the event that shallow groundwater should emerge from fractures in bedrock beneath the deep alluvium, the potential for iron precipitation to occur is limited by:

- The chemical conditions that drive the reaction not being available
    - Both water types will be relatively saline
    - The interface will be in a low oxygen environment
- The sandstones in the W2CP area being less ferruginous than their Southern Coalfield counterparts.

Furthermore, any precipitation that did occur would be filtered almost immediately within the alluvium and would be essentially contained within alluvial materials of limited transmissivity.

4.6.2 Upland areas

The western portion of the W2CP area consists primarily of forested hills. During the exploration of these areas drilling operations on the ridges were hampered somewhat by an almost total loss of water circulation until the drill holes reached the level of the adjacent valley floor. This observation supports another significant point of difference between the dissected plateaux of the Southern Coalfield and the stress relieved ridges of the W2CP area. This stress relief over geological time has resulted in well-formed joint systems in the forested hills in the western portion of W2CP that are preferred pathways for infiltrated rainwater. This infiltrated water then gradually discharges though springs in the sides of the ridges. These springs tend to occur at interfaces of certain strata, particularly in the southern facing (down-dip) slopes. Hard rock aquifers do not occur in these well jointed areas.

With no known occurrences of iron staining from existing springs there is no basis to suggest it will result from mining activity. There is a more realistic case to suggest that the existing joint/ fracture systems may actually be enhanced by subsidence effects to potentially increase the water bearing capacity of these upland areas.

5. Management Strategies

5.1 Pre-Mining Work

This hydromorphic assessment has undertaken to document the existing condition of Wyong River, Jilliby Jilliby Creek, Little Jilliby Jilliby Creek, and their tributaries in terms of both water quality, and the physical condition of the channels. This information is included in Appendix A and includes the channel width, riparian vegetation type and width, and surrounding land uses.

This work is valuable as a monitoring tool, where it provides baseline data on the waterway stability prior to mining and subsidence, and has identified areas where rehabilitation work may be required prior to coal extraction to remedy any existing erosion that has the potential to be exacerbated through subsidence.

Although there is little likelihood of actual increased erosion from subsidence, there are a few areas identified where the risk will be increased following mining. In these areas, permission will be sought from the appropriate landowner to carry out necessary work to stabilise the channel. This work will be in consultation with the landowner, and the Gosford Wyong Joint Water Authority.

The "Wyong River Streambank Management Plan" prepared for Wyong Shire Council has identified a number of initiatives to improve the existing health and stability of the Yarramalong and Dooralong Valleys. These works will be considered and offered to landowners, and include:

- Weed removal and control.

- Training walls (permeable and solid) - orientated parallel to the river currents at or beyond the toe of the bank, they are designed to either separate the eroding bank from the river currents (solid walls) or break the flow and create a quiescent area between the wall and the bank.

- Brushing - a technique that involves securing woody debris in front of the eroding bank. The blanket of woody debris is usually secured by cables attached to anchor blocks located on the bank and sometimes supplemented by concrete weights resting on the river bed. The debris slows the river currents attacking the bank as well as allowing sediment transported by the river to be deposited amongst the debris. Over time new vegetation can become established on the sediment deposits and providing additional protection to the bank.

- Brush groynes are a hybrid technique that takes advantage of brushing and groynes by deflecting the majority of the fast flowing water away from the vulnerable bank while at the same time allowing some slower flow to pass through the groynes and deposit sediment in the area behind the groyne.

Eventually the sediment deposits can be stabilised with vegetation that has established in the quiescent area between the bank and the groyne.

- Soil confinement combined with re-vegetation - This technique involves the use of a proprietary cellular product that is secured to a prepared bank face or is stacked in horizontal layers. The system is manufactured from either woven coir yarn or high density polyethylene (HDPE).

- Bank battering - significantly less than the natural repose angle of the material forming the bank. The battered slope would normally be vegetated, and often in conjunction with top-soil and a bio-degradable matting, to assist in the re-vegetation process.

- Re-vegetation - is only successful as a stand-alone technique where suitable conditions already exist and the exposed bank has resulted from an abnormal set of circumstances such as a sequence of significant floods where the intervening time between floods has been less than the natural recovery time for damaged vegetation.

5.2 Monitoring

Monitoring is an important tool for land managers and planners to firstly verify the predicted impacts of an activity, but most importantly, to provide timely detection of deterioration in water quality or stream stability.

5.2.1 Water Quality

Extensive baseline data has been systematically collected by the WACJV on local water quality, and will be an important tool following subsidence. Water quality monitoring at these sites will continue through the life of the project and results compared to baseline data to provide an indication of the influence of mining and subsidence on the water quality in these creeks. By measuring total suspended solids an indication can also be gained of increased erosion that may be occurring upstream, and trigger a more detailed search for areas where stabilisation works may be required.

Surface water monitoring will be carried out on a monthly basis, or following significant rain events.

5.2.2 Waterway Stability

The most appropriate method of determining deterioration in the stability of creek beds and banks is through visual inspection of the channel. However, the majority of the length of Jilliby Jilliby Creek and Little Jilliby Jilliby Creek within the mining area, and Wyong River, is bounded by privately owned lands. In order to carry out visual inspections of the waterways landowner consent must be obtained for access to the channels. These access arrangements will play a major role in the quality of the monitoring plan that is implemented.

Subject to landowners providing access, it is proposed to monitor the stability of the waterways through visual inspection on the ground under the following timeframe:

- 12 months prior to mining an area. This will provide baseline data and information on the existing channel stability prior to mining and subsidence;
- within 6 months following underground extraction of the section of creek. This will allow for subsidence to occur;
- on a 6 monthly basis thereafter for the first 3 years;
- after the first 3 years, inspections will be carried out annually for the life of the project or at a time agreed to by relevant stakeholders when it is evident that no further impacts are likely; and
- or at other times subject to a request from a landowner who believes an impact has occurred and not been detected.

The inspections will involve recording information such as areas of erosion, damage to riparian vegetation, and any obstructions to water flow. This information will be recorded as both written data and supplemented with photographs.

5.3 Rehabilitation

Rehabilitation will be carried out to rectify degradation that occurs to the creeks as a result of mining and subsidence. It is expected that the impact with the greatest potential to occur is erosion of the water channel banks. These will be repaired through the following techniques:

- laying of a geotextile fabric over the eroded section to prevent further loss of material;
- if possible, sediment traps such as silt stop fencing or hay bales may be placed temporarily in the creekline to capture any sediment. This will only be possible in section of the creeks that are relatively dry, and not expected to take a large flow;
- re-shaping of the eroded banks to a more stable profile that will resist further erosion. In same situation, such as sections of the creeks with dense riparian vegetation it may be necessary to undertake this work by hand to prevent damage to riparian vegetation;
- sowing newly shaped banks with a sterile cover crop to aid in rapid stabilisation without introducing a potentially unwanted species to the creekbanks, while native species can be established; and
- planting of native species suitable for the riparian zone to assist in bank stability. These areas will then be subject to ongoing maintenance to ensure that the newly planted vegetation does not become overtaken by weed species.

All rehabilitation works will be site specific, and developed in consultation with the affected landowner. Rehabilitation works will be carefully monitored to ensure their long term success.

6. Conclusion

The mine plan for the W2CP has been developed to ensure that the affects of subsidence is minimised. The sensitivity of the waterways located within the area has been recognised, as they are part of water supply system for the region. The impacts of vertical movement is not by itself a hazard to fluvial systems but rather the differential movement which may lead to changes in grade along a stream length. In the case of Little Jilliby Jilliby Creek, the level of subsidence expected is minor, and it is not anticipated that there will be a major impact on creek stability or water quality. The greatest potential for an effect will be in the upper reaches, which is currently in excellent condition and will quickly recover from any impact.

The amount of subsidence predicted for Jilliby Jilliby Creek is expected to be reasonably uniform along its length within the mining area, with the exception of the confluence with Little Jilliby Jilliby Creek. The result of this is that while there will be an impact in terms of the creek being subsided, the uniformity of the subsidence along the length will largely maintain the bed profile, thereby limiting the potential for additional affects such as changes to flow velocity which in turn would lead to increased erosion potential. The uniform levels of subsidence will also assist in limiting the creation of "steps" or obstructions that would create pools and ponds, and potentially cause the creek to break its banks, ultimately resulting in new channels being created.

At a number of locations along Jilliby Jilliby Creek as described previously in this report, there will be some ponding, and some increased flow velocity. However, the monitoring program developed for the creek should identify any potential problems as they occur, allowing remediation works to be carried out before water quality impacts become problematic.

It is concluded that while there will be some impact from the W2CP on the hydromorphology of Jilliby Jilliby Creek and Little Jilliby Jilliby Creek, the impacts will be either minor, or of a degree that will be able to be effectively managed through the implementation of mitigation measures and rehabilitation works.

It is also expected that while no mining will occur beneath the Wyong River, it will be subject to up to 150 mm of subsidence, however this is deemed to be negligible, and will not have a significant or noticeable impact on the River, or the water supply system.

The WACJV's commitment to protect surface waters and catchments is consistent with the aims of the Water Management Act, NSW Rivers and Estuaries Policy and the Draft Catchment Action Plan for the Hunter – Central Rivers CMA objectives to prevent negative impacts on the waterways and improve catchments.

Appendix 1

Jilliby Jilliby Creek

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Stream Width (m)	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JJ1	334513.55:1323960.45 334618.28:1323907.60	100	Not visible	3	Trees	Trees	20	20	Grazing	Grazing	0	Data collected from air photo only. Water
JJ2	334618.28:1323907.60 334664.15:1323939.61	51	Not visible	3	Trees	Trees	13	13	Grazing	Grazing	0	Data collected from air photo only. Water
JJ3	334664.15:1323939.61 334700.51:1323879.95	70	Not visible	3	Trees	Trees	23	23	Grazing	Grazing	0	Data collected from air photo only. Water
JJ4	334700.51:1323879.95 334708.28:1323798.79	82	Not visible	3	Trees	Trees	18	18	Grazing	Grazing	-0.007	Data collected from air photo only. Water
JJ5	334708.28:1323798.79 334659.69:1323783.01	51	Not visible	3	Trees	Trees	5	5	Grazing	Grazing	-0.027	Data collected from air photo only. Water
JJ6	334659.69:1323783.01 334661.21:1323744.88	38	3.5	3	Trees	Trees	5	4	Grazing	Grazing	-0.024	Data collected from air photo only.
JJ7	334661.21:1323744.88 334605.16:1323636.41	122	Not visible	3	Trees	Trees	11	11	Grazing	Grazing	-0.041	Data collected from air photo only. Water
JJ8	334605.16:1323636.41 334604.13:1323617.65	19	Partially visible	3	Trees	Grass	15	0	Grazing	Grazing	-0.121	Data collected from air photo only. Water
JJ9	334604.13:1323617.65 334650.54:1323543.68	88	Not visible	3	Trees	Trees	7	7	Grazing	Grazing	-0.156	Data collected from air photo only. Water
JJ10	334650.54:1323543.68 334662.02:1323533.73	14	5.5	3	Grass	Grass	0	0	Grazing	Grazing	-0.628	Data collected from air photo only.
JJ11	334662.02:1323533.73 334690.49:1323470.28	113	Not visible	3	Trees	Trees	10	10	Grazing	Grazing	-0.753	Data collected from air photo only. Water
JJ12	334690.49:1323470.28 334722.09:1323409.67	74	Not visible	3	Trees	Trees	15	15	Grazing	Grazing	-1.034	Data collected from air photo only. Water
JJ13	334722.09:1323409.67 334733.62:1323403.35	14	10	3	Grass	Grass	0	0	Grazing	Grazing	-1.112	Data collected from air photo only.
JJ14	334733.62:1323403.35 334776.38:1323442.39	103	Not visible	3	Trees	Trees	9	9	Grazing	Grazing	-1.11	Data collected from air photo only. Water
JJ15	334776.38:1323442.39 334813.19:1323454.29	112	Not visible	3	Trees	Trees	19	19	Grazing	Grazing	-1.027	Data collected from air photo only. Water
JJ16	334813.19:1323454.29 334816.54:1323389.59	66	Not visible	3	Trees	Trees	9	9	Grazing	Grazing	-0.996	Data collected from air photo only. Water
JJ17	334816.54:1323389.59 334843.68:1323323.77	82	Not visible	3	Trees	Trees	10	10	Grazing	Grazing	-1.135	Data collected from air photo only. Water

Jilliby Jilliby Creek

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Stream Width (m)	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JJ18	334843.68:1323323.77 334774.25:1323178.03	351	8	3	Occasional tree	Occasional tree	-	-	Turf	Turf	-1.35	Data collected from air photo only.
JJ19	334774.25:1323178.03 334858.22:1323083.88	163	9	3	Occasional tree	Occasional tree	-	-	Turf	Turf	-1.34	Data collected from air photo only. Creek
JJ20	334858.22:1323083.88 334796.65:1323078.29	90	8	3	Occasional tree	Occasional tree	-	-	Turf	Turf	-1.258	Data collected from air photo only.
JJ21	334796.65:1323078.29 334760.04:1323069.31	56	Not visible	3	Trees	Trees	10	10	Turf	Turf	-1.356	Data collected from air photo only. Water
JJ22	334760.04:1323069.31 334767.49:1323041.38	27	Not visible	3	Trees	Trees	11	11	Turf	Turf	-1.397	Data collected from air photo only. Water
JJ23	334767.49:1323041.38 334786.11:1322908.25	135	Not visible	3	Trees	Trees	45	45	Turf	Turf	-1.388	Data collected from air photo only. Water
JJ24	334786.11:1322908.25 334830.43:1322839.59	83	Not visible	3	Trees	Trees	9	9	Turf	Turf	-1.297	Data collected from air photo only. Water
JJ25	334830.43:1322839.59 334973.32:1322651.15	210	Not visible	3	Trees	Trees	26	26	Turf	Turf	-1.193	Data collected from air photo only. Water
JJ26	334973.32:1322651.15 335068.48:1322589.78	154	Not visible	3	Trees	Trees	19	19	Turf	Turf	-1.209	Data collected from air photo only. Water
JJ27	335068.48:1322589.78 335070.12:1322523.74	90	Not visible	3	Trees	Trees	12	12	Turf	Turf	-1.246	Data collected from air photo only. Water
JJ28	335070.12:1322523.74 335207.33:1322463.83	176	Not visible	3	Trees	Trees	13	13	Turf	Turf	-1.296	Data collected from air photo only. Water
JJ29	335207.33:1322463.83 335329.67:1322549.95	120	Not visible	3	Trees	Trees	20	20	Turf	Turf	-1.064	Data collected from air photo only. Water
JJ30	335329.67:1322549.95 335460.31:1322496.66	154	Not visible	3	Trees	Trees	37	37	Turf	Turf	-1.277	Data collected from air photo only. Water
JJ31	335460.31:1322496.66 335686.12:1322457.16	457	Not visible	3	Trees	Trees	14	14	Turf	Turf	-1.157	Data collected from air photo only. Water
JJ32	335686.12:1322457.16 335778.92:1322293.03	160	Not visible	1	Trees	Trees	60	60	Grazing	Grazing	-1.198	Data collected from air photo only. Water
JJ33	335778.92:1322293.03 335711.03:1322133.54	172	Not visible	1	Trees	Trees	110	11	forest	Grazing	-1.367	Data collected from air photo only. Water
JJ34	335711.03:1322133.54 335709.34:1322071.36	60	Not visible	1	Trees	Trees	11	11	Grazing	Grazing	-1.358	Data collected from air photo only. Water

Jilliby Jilliby Creek

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Stream Width (m)	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JJ35	335709.34:1322071.36 335675.77:1321953.13	129	Not visible	1	Trees	Trees	10	10	Grazing	Grazing	-1.345	Data collected from air photo only. Water
JJ36	335675.77:1321953.13 335658.21:1321901.99	57	Not visible	1	Trees	Trees	25	25	Grazing	Grazing	-1.329	Data collected from air photo only. Water
JJ37	335658.21:1321901.99 335584.40:1321833.48	103	Not visible	1	Trees	Trees	80	80	Grazing	Grazing	-1.326	Data collected from air photo only. Water
JJ38	335584.40:1321833.48 335509.71:1321794.59	93	Not visible	1	Trees	Trees	11	11	Grazing	Grazing	-1.322	Data collected from air photo only. Water
JJ39	335509.71:1321794.59 335505.10:1321580.62	194	Not visible	1	Trees	Trees	40	40	Grazing	Grazing	-1.142	Data collected from air photo only. Water
JJ40	335505.10:1321580.62 335565.77:1321498.14	98	Not visible	1	Trees	Trees	55	55	Grazing	Grazing	-1.326	Data collected from air photo only. Water
JJ41	335565.77:1321498.14 335935.34:1321383.15	578	Not visible	1	Trees	Trees	16	16	Grazing	Grazing	-1.227	Data collected from air photo only. Water
JJ42	335935.34:1321383.15 335982.19:1321307.06	72	Not visible	1	Trees	Trees	35	35	Grazing	Grazing	-1.356	Data collected from air photo only. Water
JJ43	335982.19:1321307.06 336066.31:1321227.62	148	Not visible	1	Trees	Trees	17	17	Grazing	Grazing	-1.276	Data collected from air photo only. Water
JJ44	336066.31:1321227.62 336177.18:1321119.08	155	Not visible	1	Trees	Trees	90	58	Grazing	Grazing	-1.062	Data collected from air photo only. Water
JJ45	336177.18:1321119.08 336131.66:1320953.59	167	Not visible	1	Trees	Trees	25	25	Grazing	Grazing	-0.854	Data collected from air photo only. Water
JJ46	336131.66:1320953.59 336086.14:1320810.08	149	Not visible	3	Trees	Trees	50	50	Grazing	Grazing	-0.121	Data collected from air photo only. Water
JJ47	336086.14:1320810.08 336053.58:1320693.39	126	Not visible	3	Trees	Trees	20	20	Grazing	Grazing	-0.028	Data collected from air photo only. Water
JJ48	336053.58:1320693.39 336079.07:1320527.21	155	Not visible	3	Trees	Trees	84	18	Turf	Turf	-0.016	Data collected from air photo only. Water
JJ49	336079.07:1320527.21 336079.07:1320433.96	88	Not visible	2	Trees	Trees	32	32	Turf	Turf	-0.078	Data collected from air photo only. Water
JJ50	336079.07:1320433.96 336011.63:1320366.84	117	Not visible	2	Trees	Trees	35	35	Turf	Turf	-0.194	Data collected from air photo only. Water
JJ51	336011.63:1320366.84 336088.43:1320281.33	117	Not visible	2	Trees	Trees	49	49	Turf	Turf	-0.249	Data collected from air photo only. Water

Jilliby Jilliby Creek

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Stream Width (m)	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JJ52	336088.43:1320281.33 336180.71:1320240.03	103	Not visible	2	Trees	Trees	27	27	Turf	Turf	-0.862	Data collected from air photo only. Water
JJ53	336180.71:1320240.03 336278.48:1320193.56	95	Not visible	2	Trees	Trees	40	40	Turf	Turf	-1.03	Data collected from air photo only. Water
JJ54	336278.48:1320193.56 336320.11:1320086.44	100	Not visible	2	Trees	Trees	48	48	Grazing	Grazing	-0.838	Data collected from air photo only. Water
JJ55	336320.11:1320086.44 336323.98:1320009.32	77	Not visible	2	Trees	Trees	50	50	Grazing	Grazing	-0.679	Data collected from air photo only. Water
JJ56	336323.98:1320009.32 336323.98:1319957.04	54	Not visible	2	Trees	Trees	36	36	Grazing	Grazing	-0.582	Data collected from air photo only. Water
JJ57	336323.98:1319957.04 336278.68:1319801.31	155	Not visible	2	Trees	Trees	30	19	Forest	Grazing	-0.517	Data collected from air photo only. Water
JJ58	336278.68:1319801.31 336228.44:1319709.24	120	Not visible	2	Trees	Trees	35	35	Forest	Grazing	-0.474	Data collected from air photo only. Water
JJ59	336228.44:1319709.24 336142.05:1319657.20	92	Not visible	2	Trees	Trees	43	77	Forest	Grazing	-0.53	Data collected from air photo only. Water
JJ60	336142.05:1319657.20 336130.60:1319608.80	50	Not visible	2	Trees	Trees	50	56	Forest	Grazing	-0.732	Data collected from air photo only. Water
JJ61	336130.60:1319608.80 336092.09:1319522.41	90	Not visible	2	Trees	Trees	55	30	Forest	Grazing	-0.718	Data collected from air photo only. Water
JJ62	336092.09:1319522.41 336059.82:1319442.26	82	Not visible	2	Trees	Trees	62	81	Forest	Grazing	-0.738	Data collected from air photo only. Water
JJ63	336059.82:1319442.26 336073.87:1319374.61	65	Not visible	2	Trees	Trees	45	42	Forest	Grazing	-0.74	Data collected from air photo only. Water
JJ64	336073.87:1319374.61 336050.98:1319270.52	105	Not visible	2	Trees	Trees	46	24	Forest	Grazing	-0.606	Data collected from air photo only. Water
JJ65	336050.98:1319270.52 336112.91:1319217.96	76	Not visible	2	Trees	Trees	38	38	Forest	Grazing	-0.41	Data collected from air photo only. Water
JJ66	336112.91:1319217.96 336035.88:1319146.09	83	Not visible	2	Trees	Trees	124	124	Forest	Grazing	-0.183	Data collected from air photo only. Water
JJ67	336035.88:1319146.09 336034.12:1319068.16	85	Not visible	2	Trees	Trees	127	127	Forest	Grazing	-0.156	Data collected from air photo only. Water
JJ68	336034.12:1319068.16 336059.52:1318954.41	113	Not visible	2	Trees	Trees	165	165	Forest	Grazing	-0.113	Data collected from air photo only. Water

Jilliby Jilliby Creek

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Stream Width (m)	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JJ69	336059.52:1318954.41 336153.17:1318846.63	145	Not visible	2	Trees	Trees	50	50	Grazing	Grazing	-0.067	Data collected from air photo only. Water
JJ70	336153.17:1318846.63 336182.77:1318831.61	36	Not visible	2	Trees	Trees	44	44	Grazing	Grazing	-0.032	Data collected from air photo only. Water
JJ71	336182.77:1318831.61 336266.25:1318798.48	75	Not visible	2	Trees	Trees	84	84	Grazing	Grazing	-0.025	Data collected from air photo only. Water
JJ72	336266.25:1318798.48 336356.37:1318771.09	65	Not visible	2	Trees	Trees	105	105	Grazing	Grazing	-0.007	Data collected from air photo only. Water
JJ73	336356.37:1318771.09 336410.26:1318712.34	71	Not visible	2	Trees	Trees	26	26	Grazing	Grazing	0	Data collected from air photo only. Water
JJ74	336410.26:1318712.34 336375.80:1318604.12	111	Not visible	2	Trees	Trees	66	66	Grazing	Grazing	0	Data collected from air photo only. Water

Outside Mining Area

* Bank Stability taken from the "Wyong River Streambank Management Plan", March 2007

1	2	3	4	5
Excellent	Good	Poor	Degraded	Erosion

Jilliby Jilliby Tributary

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JT1	335078.50:1323983.70 335085.61:1323893.71	113	Not visible	trees	Trees	10	10	Grazing	Grazing	-0.008	Data collected from air photo only. Water surface not visible from air photo. Creek crossing at start of this
JT2	335085.61:1323893.71 335080.46:1323888.85	5	Not visible	grass	Grass	-	-	Grazing	Grazing	-0.025	Data collected from air photo only. Water surface not visible due to shadow on photo.
JT3	335080.46:1323888.85 335072.48:1323821.09	74	Not visible	Trees	Trees	9	9	Grazing	Grazing	-0.027	Data collected from air photo only. Water surface not visible from air photo.
JT4	335072.48:1323821.09 335061.93:1323764.22	64	Not visible	Trees	Trees	7	7	Grazing	Grazing	-0.059	Data collected from air photo only. Water surface not visible from air photo.
JT5	335061.93:1323764.22 335010.87:1323751.90	54	3	occasional trees	occasional trees	14	4	Grazing	Grazing	-0.113	Data collected from air photo only.
JT6	335010.87:1323751.90 335029.52:1323694.70	60	Not visible	Trees	Trees	19	19	Grazing	Grazing	-0.133	Data collected from air photo only. Water surface not visible from air photo.
JT7	335029.52:1323694.70 335023.39:1323664.53	30	Not visible	Trees	Trees	9	9	Grazing	Grazing	-0.242	Data collected from air photo only. Water surface not visible from air photo.
JT8	335023.39:1323664.53 335196.76:1323501.90	428	10	grass	grass	-	-	Grazing	Grazing	-0.357	Data collected from air photo only. This section is predominatly dry, with isolated pools. Creekline ends
JT9	335196.76:1323501.90 335160.26:1323449.52	79	1	grass	grass	-	-	Grazing	Grazing	-1.222	Data collected from air photo only. This section is only a slight depression in the ground and was dry at time
JT10	335160.26:1323449.52 335110.40:1323423.33	55	4	grass	grass	-	-	Grazing	Grazing	-1.289	Data collected from air photo only. Dry during time of photo.
JT11	335110.40:1323423.33 335139.02:1323398.71	37	11	trees	occasional trees	4	-	Grazing	Grazing	-1.204	Data collected from air photo only.
JT12	335139.02:1323398.71 335196.81:1323342.04	92	Not visible	trees	trees	9	9	Grazing	Grazing	-1.332	Data collected from air photo only. Water surface not visible from air photo.
JT13	335196.81:1323342.04 335116.79:1323337.92	119	Not visible	trees	trees	9	9	Grazing	Grazing	-1.242	Data collected from air photo only. Water surface not visible from air photo.
JT14	335116.79:1323337.92 335116.79:1323337.92	88	11	grass	grass	-	-	Grazing	Grazing	-1.356	Data collected from air photo only. This section dry at time of photo, dead trees in paddocks around.
JT15	335116.79:1323337.92 335018.06:1323303.85	62	not visible	trees	trees	10	41	Grazing	Grazing	-1.356	Data collected from air photo only. Water surface not visible from air photo.
JT16	335018.06:1323303.85 335075.52:1323272.25	89	19	occasional trees	occasional trees	-	-	Grazing	Grazing	-1.132	Data collected from air photo only. Full of water.
JT17	335075.52:1323272.25 335112.65:1323098.10	209	20	grass	grass	-	-	Turf	Turf	-1.34	Data collected from air photo only. Full of water. bridge crossing at the end of this section.

Jilliby Jilliby Tributary

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
JT18	335112.65:1323098.10 335026.29:1323041.07	110	14	occasional trees	occasional trees	-	-	Turf	Turf	-1.245	Data collected from air photo only. Full of water. Creek/road crossing at the end of this section.
JT19	335026.29:1323041.07 334938.74:1322963.12	117	13	occasional trees	trees	-	11	Turf	Turf	-1.355	Data collected from air photo only. Water surface not visible from air photo.
JT20	334938.74:1322963.12 335013.23:1322800.01	180	12	trees	trees	10	10	Turf	Turf	-1.254	Data collected from air photo only. Full of water.
JT21	335013.23:1322800.01 334992.55:1322665.64	164	not visible	trees	trees	18	50	Turf	Turf	-1.232	Data collected from air photo only. Water surface not visible from air photo. Road crossing in this section.
JT22	335035.06:1322762.36 335328.67:1322771.67	321	not visible	trees	trees	6	13	Turf	Turf	-1.186	Data collected from air photo only. Full of water.
JT23	335328.67:1322771.67 335329.67:1322549.95	211	9	trees	trees	7	7	Turf	Turf	-1.052	Data collected from air photo only. Full of water.

Little Jilliby Northern Tributary

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Bank Stability	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
LJTN1	332870.91:1322616.17 333420.10:1322426.81	585	2	not visible	Trees	Trees	25	25	Forest	Forest	-2.46	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN2	333420.10:1322426.81 333736.21:1321819.77	700	2	not visible	channel not determined.		channel not determined.		Forest	Forest	-2.166	Data obtained from air photo only. Path of the creek could not be determined from the air photo.
LJTN3	333736.21:1321819.77 333822.04:1321685.90	190	3	7	occassional trees	occassional trees	-	-	Grazing	Grazing	-1.976	Data obtained from air photo only. Majority of this section dry, occassional pools. Riparian vegetation consists of scattered trees.
LJTN4	333822.04:1321685.90 333873.84:1321670.09	63	3	7	grass	grass	-	-	Grazing	Grazing	-1.982	Data obtained from air photo only. This section dry. No riparian vegetation. Erosion of creek banks evident.
LJTN5	333873.84:1321670.09 333909.25:1321631.17	61	3	not visible	Trees	Trees	10	24	Grazing	Grazing	-1.785	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN6	333909.25:1321631.17 333936.46:1321641.70	34	3	7	grass	grass	-	-	Grazing	Grazing	-1.613	Data obtained from air photo only. This section dry. No riparian vegetation. Erosion of creek banks evident.
LJTN7	333936.46:1321641.70 333977.14:1321655.75	57	3	6	occassional trees	occassional trees	-	-	Grazing	Grazing	-1.584	Data obtained from air photo only. This section contains water. Scattered trees on banks.
LJTN8	333977.14:1321655.75 333982.12:1321673.02	17	3	6	grass	grass	-	-	Grazing	Grazing	-1.658	Data obtained from air photo only. This section contains water.
LJTN9	333982.12:1321673.02 334010.80:1321668.92	34	3	5	Trees	grass	10	-	Grazing	Grazing	-1.652	Data obtained from air photo only. This section contains water.
LJTN10	334010.80:1321668.92 334031.87:1321626.76	71	3	5	occassional trees	occassional trees	-	-	Grazing	Grazing	-1.704	Data obtained from air photo only. This section contains water. Scattered trees on banks.
LJTN11	334031.87:1321626.76 334054.11:1321607.76	30	3	4	grass	grass	-	-	Grazing	Grazing	-1.664	Data obtained from air photo only. Majority of this section dry, occassional pools. Erosion of creek banks evident.
LJTN12	334054.11:1321607.76 334152.44:1321596.64	162	3	4	occassional trees	occassional trees	-	-	Grazing	Grazing	-1.602	Data obtained from air photo only. Majority of this section dry, occassional pools. Erosion of creek banks evident.
LJTN13	334152.44:1321596.64 334228.24:1321541.32	93	2	7	grass	Trees	-	10	Grazing	Grazing	-1.416	Data obtained from air photo only. This section appears dry during the time photo was taken. Erosion of creek banks evident.
LJTN14	334228.24:1321541.32 334331.84:1321486.01	165	2	5	occassional trees	occassional trees	-	-	Grazing	Grazing	-1.429	Data obtained from air photo only. Majority of this section dry, occassional pools. Erosion of creek banks evident.
LJTN15	334331.84:1321486.01 334348.52:1321522.89	70	2	Not visible	trees	trees	6	6	Turf	Turf	-1.214	Data obtained from air photo only. Water surface not visible at time of assessment. Road crosses the creek near the start of this section.
LJTN16	334348.52:1321522.89 334418.17:1321353.44	134	4	Not visible	trees	trees	7	7	Turf	Turf	-1.207	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN17	334418.17:1321353.44 334362.86:1321333.25	134	4	Not visible	trees	trees	7	7	Turf	Turf	-1.332	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN18	334362.86:1321333.25 334399.17:1321254.12	80	4	Not visible	trees	trees	7	7	Turf	Turf	-1.318	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN19	334399.17:1321254.12 334450.08:1321274.28	54	4	Not visible	trees	trees	7	7	Turf	Turf	-1.328	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN20	334450.08:1321274.28 334470.24:1321228.75	150	4	Not visible	trees	trees	6	6	Turf	Turf	-1.26	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN21	334470.24:1321228.75 334499.64:1321210.44	53	4	Not visible	trees	trees	7	7	Turf	Turf	-1.208	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN22	334499.64:1321210.44 334486.87:1321168.94	99	4	Not visible	trees	trees	6	6	Turf	Turf	-1.186	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN23	334486.87:1321168.94 334539.97:1321173.64	48	4	Not visible	trees	trees	7	7	Turf	Turf	-1.181	Data obtained from air photo only. Water surface not visible at time of assessment.

Little Jilliby Northern Tributary

					Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Bank Stability	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
LJTN24	334539.97:1321173.64 334547.13:1321206.93	38	4	Not visible	trees	trees	10	10	Turf	Turf	-1.295	Data obtained from air photo only. Water surface not visible at time of assessment. Some erosion of creek bank evident.
LJTN25	334547.13:1321206.93 334590.57:1321200.35	73	4	Not visible	trees	trees	8	8	Turf	Turf	-1.284	Data obtained from air photo only. Water surface not visible at time of assessment. Some erosion of creek bank evident.
LJTN26	334590.57:1321200.35 334661.74:1321196.93	74	4	Not visible	trees	trees	10	10	Turf	Turf	-1.414	Data obtained from air photo only. Water surface not visible at time of assessment. Some erosion of creek bank evident.
LJTN27	334661.74:1321196.93 334650.59:1321098.61	95	4	Not visible	trees	trees	19	19	Turf	Turf	-1.355	Data obtained from air photo only. Water surface not visible at time of assessment. Road cross creek in this section.
LJTN28	334650.59:1321098.61 334710.32:1321051.17	87	4	Not visible	trees	trees	6	6	Turf	Turf	-1.27	Data obtained from air photo only. Water surface not visible at time of assessment. Some erosion evident near creek.
LJTN29	334710.32:1321051.17 334762.91:1321041.17	35	4	Not visible	trees	trees	18	18	Turf	Turf	-0.958	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN30	334762.91:1321041.17 334767.77:1321018.02	22	4	Not visible	trees	trees	7	7	Turf	Turf	-0.697	Data obtained from air photo only. Water surface not visible at time of assessment.
LJTN31	334767.77:1321018.02 334764.91:1320976.86	71	4	Not visible	trees	trees	10	10	Turf	Turf	-0.64	Data obtained from air photo only. Water surface not visible at time of assessment. A dead tree noted in this section.
LJTN32	334764.91:1320976.86 334813.49:1320921.70	90	4	Not visible	trees	trees	8	8	Turf	Turf	-0.575	Data obtained from air photo only. Water surface not visible at time of assessment.

Tributary joins Little Jilliby Jilliby Creek

Bank Stability taken from the "Wyong River Streambank Management Plan", March 2007

1	2	3	4	5
Excellent	Good	Poor	Degraded	Erosion

Little Jilliby Jilliby Creek

						Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Cumulative from upstream	cumulative from downstream	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	330902.75:1324143.51		409	10329									Data obtained from air photo only. Water
LJT1	331068.64:1323982.28	409			3	Trees	Trees	15	15	Forest	Forest	0	surface not visible at time of assessment.
	331068.64:1323982.28		883	9920									Data obtained from air photo only. Water
LJT2	331395.74:1323634.16	474			3	Trees	Trees	190	190	Forest	Forest	-0.025	surface not visible at time of assessment.
	331395.74:1323634.16		1419	9446									Data obtained from air photo only. Water
LJT3	331901.87:1323560.84	536			3	Trees	Trees	140	140	Forest	Forest	-1.867	surface not visible at time of assessment.
	331901.87:1323560.84		2049	8910									Data obtained from air photo only. Water
LJT4	331758.37:1322801.66	630			3	Trees	Trees	75	75	Forest	Forest	-1.51	surface not visible at time of assessment.
	331758.37:1322801.66		2758	8280									Data obtained from air photo only. Water
LJT5	331281.26:1322344.44	709			3	Trees	Trees	40	40	Forest	Forest	-1.701	surface not visible at time of assessment.
	331281.26:1322344.44		3081	7571									Data obtained from air photo only. Water
LJT6	331608.36:1322192.57	323			3	Trees	Trees	130	13	Forest	Forest	-1.855	surface not visible at time of assessment.
	331608.36:1322192.57		3538	7248									Data obtained from air photo only. Water
LJT7	331776.59:1321783.69	457			3	Trees	Trees	150	150	Forest	Forest	-1.497	surface not visible at time of assessment.
	331776.59:1321783.69		3798	6791									Data obtained from air photo only. Water
LJT8	331736.87:1321498.65	260			3	Trees	Trees	125	125	Forest	Forest	-0.396	surface not visible at time of assessment.
	331736.87:1321498.65		3953	6531									Data obtained from air photo only. Water
LJT9	331993.74:1321225.55	155			3	Trees	Trees	25	25	Forest	Grazing	-0.045	surface not visible at time of assessment.
	331993.74:1321225.55		4265	6376									Data obtained from air photo only. Water
LJT10	332242.54:1321125.67	312			3	Trees	Trees	25	25	Forest	Grazing	-0.054	surface not visible at time of assessment.
	332242.54:1321125.67		4491	6064									Data obtained from air photo only. Water
LJT11	332525.65:1321198.49	226			3	Trees	Trees	25	25	Forest	Grazing	-0.068	surface not visible at time of assessment.
	332525.65:1321198.49		4568	5838									Data obtained from air photo only. Water
LJT12	332510.99:1321085.06	77			3	Trees	Trees	18	18	Grazing	Grazing	-0.073	surface not visible at time of assessment.
	332510.99:1321085.06		4656	5761									Data obtained from air photo only. Water
LJT13	332583.82:1321044.56	88			3	Trees	Trees	20	20	Grazing	Grazing	-0.057	surface not visible at time of assessment.
	332583.82:1321044.56		4722	5673									Data obtained from air photo only. Water
LJT14	332650.00:1321039.29	66			3	Trees	Trees	11	11	Grazing	Grazing	-0.062	surface not visible at time of assessment.
	332650.00:1321039.29		4772	5607									Data obtained from air photo only. Water
LJT15	332650.72:1320983.92	50			3	Trees	Trees	20	20	Grazing	Grazing	-0.057	surface not visible at time of assessment.
	332650.72:1320983.92		4817	5557									Data obtained from air photo only. Water
LJT16	332608.37:1320986.09	45			3	Trees	Trees	11	11	Grazing	Grazing	-0.062	surface not visible at time of assessment.
	332608.37:1320986.09		4885	5512									Data obtained from air photo only. Water
LJT17	332566.02:1320935.07	68			3	Trees	Trees	13	13	Grazing	Grazing	-0.068	surface not visible at time of assessment.
	332566.02:1320935.07		4976	5444									Data obtained from air photo only. Water
LJT18	332654.33:1320871.79	91			3	Trees	Trees	14	14	Grazing	Grazing	-0.1	surface not visible at time of assessment.
	332654.33:1320871.79		5044	5353									Data obtained from air photo only. Water
LJT19	332722.43:1320875.88	68			3	Trees	Trees	16	16	Grazing	Forest	-0.136	surface not visible at time of assessment.
	332722.43:1320875.88		5112	5285									Data obtained from air photo only. Water
LJT20	332778.49:1320890.32	68			3	Trees	Trees	13	13	Grazing	Grazing	-0.12	surface not visible at time of assessment.
	332778.49:1320890.32		5235	5217									Data obtained from air photo only. Water
LJT21	332861.27:1320886.71	123			3	Trees	Trees	21	60	Grazing	Forest	-0.092	surface not visible at time of assessment.

Little Jilliby Jilliby Creek

						Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Cumulative from upstream	cumulative from downstream	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	332861.27:1320886.71		5323	5094									Data obtained from air photo only. Water
LJT22	332861.51:1320831.36	88			3	Trees	Trees	12	30	Forest	Grazing	-0.067	surface not visible at time of assessment.
	332861.51:1320831.36		5366	5006									Data obtained from air photo only. Water
LJT23	332844.67:1320791.90	43			3	Trees	Trees	20	20	Grazing	Grazing	-0.082	surface not visible at time of assessment.
	332844.67:1320791.90		5441	4963									Data obtained from air photo only. Water
LJT24	332907.71:1320759.89	75			3	Trees	Trees	10	62	Grazing	Forest	-0.107	surface not visible at time of assessment.
	332907.71:1320759.89		5496	4888									Data obtained from air photo only. Water
LJT25	332959.21:1320788.29	55			3	Trees	Trees	9	19	Grazing	Grazing	-0.087	surface not visible at time of assessment.
	332959.21:1320788.29		5542	4833									Data obtained from air photo only. Water
LJT26	332988.81:1320826.55	46			3	Trees	Trees	17	17	Grazing	Grazing	-0.057	surface not visible at time of assessment.
	332988.81:1320826.55		5686	4787									Data obtained from air photo only. Water
LJT27	333131.98:1320883.34	144			3	Trees	Trees	28	100	Grazing	Forest	-0.045	surface not visible at time of assessment.
	333131.98:1320883.34		5746	4643									Data obtained from air photo only. Water
LJT28	333185.54:1320910.69	60			3	Trees	Trees	10	10	Grazing	Grazing	-0.037	surface not visible at time of assessment.
	333185.54:1320910.69		5952	4583		occassional trees	occassional trees						Data obtained from air photo only. Dry
LJT29	333339.50:1320898.89	206			3			-	-	Grazing	Grazing	-0.049	sections in this area.
	333339.50:1320898.89		6152	4377									Data obtained from air photo only. Water
LJT30	333377.47:1320900.21	200			3	Trees	Trees	13	13	Grazing	Grazing	-0.056	surface not visible at time of assessment.
	333377.47:1320900.21		6216	4177									Data obtained from air photo only. Dry
LJT31	333422.64:1320885.59	64			3	grass	grass	-	-	Grazing	Grazing	-0.063	section in this area.
	333422.64:1320885.59		6300	4113									Data obtained from air photo only. Water
LJT32	333507.40:1320881.28	84			3	Trees	Trees	12	12	Grazing	Grazing	-0.066	surface not visible at time of assessment.
	333507.40:1320881.28		6492	4029									Data obtained from air photo only. Water
LJT33	333590.07:1320952.14	192			3	Trees	Trees	20	20	Grazing	Grazing	-0.072	surface not visible at time of assessment.
	333590.07:1320952.14		6598	3837									Data obtained from air photo only. Water
LJT34	333661.26:1320885.75	106			3	Trees	Trees	12	12	Grazing	Grazing	-0.138	surface not visible at time of assessment.
	333661.26:1320885.75		6900	3731									Data obtained from air photo only. Water
LJT35	333714.25:1320860.85	302			3	Trees	Trees	16	16	Grazing	Grazing	-0.097	surface not visible at time of assessment.
	333714.25:1320860.85		6955	3429									Data obtained from air photo only. Water
LJT36	333720.63:1320814.88	55			3	Trees	Trees	15	15	Grazing	Grazing	-0.093	surface not visible at time of assessment.
	333720.63:1320814.88		7066	3374									Data obtained from air photo only. Water
LJT37	333827.25:1320785.91	111			3	Trees	Trees	20	20	Grazing	Grazing	-0.065	surface not visible at time of assessment.
	333827.25:1320785.91		7173	3263									Data obtained from air photo only. Water
LJT38	333929.73:1320795.38	107			3	Trees	Trees	34	34	Grazing	Grazing	-0.061	surface not visible at time of assessment.
	333929.73:1320795.38		7245	3156									Data obtained from air photo only. Water
LJT39	334015.30:1320779.27	72			3	Trees	Trees	23	23	Grazing	Grazing	-0.089	surface not visible at time of assessment.
	334015.30:1320779.27		7402	3084									Data obtained from air photo only. Water
LJT40	334051.74:1320778.67	157			3	Trees	Trees	13	13	Grazing	Grazing	-0.086	surface not visible at time of assessment.
	334051.74:1320778.67		7449	2927									Data obtained from air photo only. Water
LJT41	334089.19:1320756.52	47			3	Trees	Trees	25	25	Grazing	Grazing	-0.091	surface not visible at time of assessment.
	334089.19:1320756.52		7599	2880									Data obtained from air photo only. Water
LJT42	334116.37:1320776.05	150			3	Trees	Trees	12	12	Grazing	Grazing	-0.085	surface not visible at time of assessment.

						Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Cumulative from upstream	cumulative from downstream	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	334116.37:1320776.05		7677	2730									Data obtained from air photo only. Water
LJT43	334143.75:1320858.60	78			3	Trees	Trees	12	12	Grazing	Grazing	-0.108	surface not visible at time of assessment.
	334143.75:1320858.60		7737	2652									Data obtained from air photo only. Water
LJT44	334208.38:1320846.52	60			3	Trees	Trees	14	14	Grazing	Grazing	-0.221	surface not visible at time of assessment.
	334208.38:1320846.52		7781	2592									Data obtained from air photo only. Water
LJT45	334249.85:1320869.06	44			3	Trees	Trees	25	25	Grazing	Grazing	-0.247	surface not visible at time of assessment.
	334249.85:1320869.06		7900	2548									Data obtained from air photo only. Water
LJT46	334251.26:1320908.12	119			3	Trees	Trees	25	25	Grazing	Grazing	-0.349	surface not visible at time of assessment.
	334251.26:1320908.12		8012	2429									Data obtained from air photo only. Water
LJT47	334308.44:1320919.60	112			3	Trees	Trees	25	25	Grazing	Grazing	-0.544	surface not visible at time of assessment.
	334308.44:1320919.60		8078	2317									Data obtained from air photo only. Water
LJT48	334362.27:1320887.56	66			3	Trees	Trees	10	10	Grazing	Grazing	-0.708	surface not visible at time of assessment.
	334362.27:1320887.56		8303	2251									Data obtained from air photo only. Water
LJT49	334462.00:1320905.72	225			3	Trees	Trees	9	9	Grazing	Grazing	-0.591	surface not visible at time of assessment.
	334462.00:1320905.72		8378	2026									Data obtained from air photo only. Water
LJT50	334548.14:1320865.10	75			3	Trees	Trees	7	7	Grazing	Grazing	-0.966	surface not visible at time of assessment.
	334548.14:1320865.10		8473	1951									Data obtained from air photo only. Water
LJT51	334599.98:1320868.73	95			3	Trees	Trees	9	9	Grazing	Grazing	-0.891	surface not visible at time of assessment.
	334599.98:1320868.73		8621	1856									Data obtained from air photo only. Water
LJT52	334639.50:1320854.51	148			3	Trees	Trees	12	12	Grazing	Grazing	-0.873	surface not visible at time of assessment.
	334639.50:1320854.51		8664	1708									Data obtained from air photo only. Water
LJT53	334639.50:1320854.51	43			3	grass	grass	-	-	Grazing	Grazing	-0.699	surface not visible at time of assessment.
	334639.50:1320854.51		8714	1665									Data obtained from air photo only. Water
LJT54	334706.04:1320885.80	50			3	Trees	Trees	6	6	Grazing	Grazing	-0.699	surface not visible at time of assessment.
	334706.04:1320885.80		8924	1615									Data obtained from air photo only. Water
LJT55	334815.89:1320916.94	210			3	Trees	Trees	10	10	Grazing	Grazing	-0.556	surface not visible at time of assessment.
	334815.89:1320916.94		8972	1405									Data obtained from air photo only. Water
LJT56	334811.94:1320914.57	48			4	Trees	Trees	14	14	Grazing	Grazing	-0.342	surface not visible at time of assessment.
	334811.94:1320914.57		9084	1357									Data obtained from air photo only. Water
LJT57	334957.51:1320957.40	112			4	Trees	Trees	15	15	Grazing	Grazing	-0.347	surface not visible at time of assessment.
	334957.51:1320957.40		9214	1245									Data obtained from air photo only. Water
LJT58	335075.42:1320946.97	130			4	Trees	Trees	15	15	Grazing	Grazing	-0.177	surface not visible at time of assessment.
	335075.42:1320946.97		9266	1115									Data obtained from air photo only. Water
LJT59	335095.97:1320990.28	52			4	Trees	Trees	23	23	Grazing	Grazing	-0.096	surface not visible at time of assessment.
	335095.97:1320990.28		9320	1063									Data obtained from air photo only. Water
LJT60	335144.18:1320999.92	54			4	Trees	Trees	13	13	Grazing	Grazing	-0.106	surface not visible at time of assessment.
	335144.18:1320999.92		9392	1009									Data obtained from air photo only. Water
LJT61	335197.44:1320953.61	72			4	Trees	Trees	24	24	Grazing	Grazing	-0.094	surface not visible at time of assessment.
	335197.44:1320953.61		9459	937									Data obtained from air photo only. Water
LJT62	335364.15:1320975.01	67			4	Trees	Trees	32	32	Grazing	Grazing	-0.075	surface not visible at time of assessment.
	335364.15:1320975.01		9517	870									Data obtained from air photo only. Water
LJT63	335409.20:1320952.59	58			4	Trees	Trees	22	22	Grazing	Grazing	-0.083	surface not visible at time of assessment.

Little Jilliby Jilliby Creek

						Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Cumulative from upstream	cumulative from downstream	Bank Stability*	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	335409.20:1320952.59		9562	812									Data obtained from air photo only. Water
LJT64	335445.46:1320912.82	45			4	Trees	Trees	26	26	Grazing	Grazing	-0.076	surface not visible at time of assessment.
	335445.46:1320912.82		9641	767									Data obtained from air photo only. Water
LJT65	335510.73:1320877.87	79			4	Trees	Trees	32	32	Grazing	Grazing	-0.061	surface not visible at time of assessment.
	335510.73:1320877.87		9712	688									Data obtained from air photo only. Water
LJT66	335606.11:1320849.30	71			4	Trees	Trees	13	13	Grazing	Grazing	-0.055	surface not visible at time of assessment.
	335606.11:1320849.30		9784	617									Data obtained from air photo only. Water
LJT67	335652.04:1320887.10	72			4	Trees	Trees	17	17	Grazing	Grazing	-0.051	surface not visible at time of assessment.
	335652.04:1320887.10		9928	545									Data obtained from air photo only. Water
LJT68	335793.79:1320845.20	144			4	Trees	Trees	17	17	Grazing	Grazing	-0.083	surface not visible at time of assessment.
	335793.79:1320845.20		9999	401									Data obtained from air photo only. Water
LJT69	335851.37:1320880.51	71			4	Trees	Trees	11	11	Grazing	Grazing	-0.051	surface not visible at time of assessment.
	335851.37:1320880.51		10099	330									Data obtained from air photo only. Water
LJT70	335899.06:1320850.40	100			4	Trees	Trees	16	16	Grazing	Grazing	-0.068	surface not visible at time of assessment.
	335899.06:1320850.40		10239	230									Data obtained from air photo only. Water
LJT71	336006.08:1320910.62	140			4	Trees	Trees	14	14	Grazing	Grazing	-0.047	surface not visible at time of assessment.
	336006.08:1320910.62		10329	90									Data obtained from air photo only. Water
LJT72	336097.50:1320877.65	90			4	Trees	Trees	47	47	Grazing	Grazing	-0.095	surface not visible at time of assessment.

Joins Jilliby Jilliby Creek

Bank Stability taken from the "Wyong River Streambank Mar

Excellent

1	2	3	4	5
Excellent	Good	Poor	Degraded	Erosion

Wyong River Tributary

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
WR1	336799.43:1317511.65 336641.61:1317537.37	154.5	23	TREES	TREES	65	41	PASTURE	PASTURE	0	
WR2	336641.61:1317537.37 336537.18:1317467.62	123	15	TREES	TREES	120	13	PASTURE	PASTURE	0	JUNCTION WITH JILLIBY CREEK
WR3	336537.18:1317467.62 336528.22:1317477.36	190	7	TREES	TREES	67	16	PASTURE	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG ON LEFT BANK IS CONTINUOS WITH VEG OF NEXT LENGTH
WR4	336528.22:1317477.36 336420.27:1317493.33	129	9.6	TREES	TREES	67	42	RIPARIAN VEG	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR5	336420.27:1317493.33 336346.24:1317485.15	75	12.5	TREES	TREES	42	25	RIPARIAN VEG	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR6	336346.24:1317485.15 336295.58:1317400.20	89.5	12	TREES	TREES	28	25	RIPARIAN VEG	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR7	336295.58:1317400.20 336245.31:1317366.3	64	7	TREES	TREES	22	18	RIPARIAN VEG	PASTURE	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR8	336245.31:1317366.3 336285.45:1317431.76	72	7	TREES	TREES	22	13	RIPARIAN VEG	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR9	336285.45:1317431.76 336281.16:1317477.36	45.5	9	TREES	TREES	90	28	RIPARIAN VEG	RIPARIAN VEG	0	
WR10	336281.16:1317477.36 336193.48:1317448.52	92.5	10	TREES	TREES	55	22	RIPARIAN VEG	RIPARIAN VEG	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR11	336193.48:1317448.52 336175.95:1317494.89	43.6	10.6	TREES	TREES	122	16	RIPARIAN VEG	PASTURE	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR12	336175.95:1317494.89 336205:1317567.37	81.5	8.7	TREES	TREES	66	20	RIPARIAN VEG	PASTURE	0	RIVER VERY SINUOUS, RIPARIAN VEG CONTINUOUS WITH ADJACENT SECTIONS.
WR13	336205:1317567.37 336191.53:1317638.3	68	10	TREES	TREES	24	17	PASTURE	PASTURE	0	
WR14	336191.53:1317638.3 336129.96:1317679.60	77	7.7	TREES	TREES	14	32	PASTURE	PASTURE	0	
WR15	336129.96:1317679.60 336036.05:1317590.75	119	9.5	TREES	TREES	64	80	CROPPING	CROPPING	0	
WR16	336036.05:1317590.75 336016.96:1317544.38	41	11	TREES	TREES	22	25	CROPPING	PASTURE	0	
WR17	336016.96:1317544.38 336076.19:1317468.01	103	12	TREES	TREES	31	32	CROPPING	PASTURE	0	
WR18	336076.19:1317468.01 336036.05:1317402.15	78	7	TREES	TREES	19	24	CROPPING	CROPPING	0	
WR19	336036.05:1317402.15 365922.65:1317356.17	109	7	TREES	TREES	32	36	CROPPING	CROPPING	0	
WR20	365922.65:1317356.17 335855.24:1317326.16	87	7	TREES	TREES	20	27	CROPPING	CROPPING	0	
WR21	335855.24:1317326.16 335798.35:1317277.84	86	7	TREES	TREES	29	70	CROPPING	CROPPING	0	
WR22	335798.35:1317277.84 335652.60:1317233.03	158	7	TREES	TREES	24	20	CROPPING	CROPPING	0	ROAD CROSSING AT UPSTREAM END OF THIS SECTION

Wyong River Tributary

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
WR23	335652.60:1317233.03 335591.81:1317218.22	58	NOT VISIBLE	TREES	TREES	17	18	PASTURE	PASTURE	0	
WR24	335591.81:1317218.22 335522.06:1317249.39	69	NOT VISIBLE	TREES	TREES	14	75	PASTURE	PASTURE	0	
WR25	335522.06:1317249.39 335467.51:1317296.55	77	NOT VISIBLE	TREES	TREES	25	25	PASTURE	PASTURE	0	
WR26	335467.51:1317296.55 335445.29:1317352.27	59	NOT VISIBLE	TREES	TREES	19	59	PASTURE	PASTURE	0	
WR27	335445.29:1317352.27 335506.86:1317335.90	88	NOT VISIBLE	TREES	TREES	17	18	PASTURE	PASTURE	0	
WR28	335506.86:1317335.90 335651.05:1317416.18	159	NOT VISIBLE	TREES	TREES	16	9	PASTURE	PASTURE	0	
WR29	335651.05:1317416.18 335501.41:1317554.12	189	NOT VISIBLE	TREES	TREES	20	22	PASTURE	PASTURE	0	
WR30	335501.41:1317554.12 335493.62:1317644.92	65	NOT VISIBLE	TREES	TREES	19	59	PASTURE	PASTURE	-0.005	
WR31	335493.62:1317644.92 335423.86:1317647.26	78	NOT VISIBLE	TREES	TREES	29	19	PASTURE	PASTURE	-0.01	
WR32	335423.86:1317647.26 335299.55:1317747.80	206	NOT VISIBLE	TREES	TREES	55	55	PASTURE	PASTURE	-0.012	
WR33	335299.55:1317747.80 335147.01:1317676.05	154	NOT VISIBLE	TREES	TREES	84	146	CROPPING	PASTURE	-0.035	
WR34	335147.01:1317676.05 335025.16:1317654.67	134	NOT VISIBLE	TREES	TREES	25	32	CROPPING	PASTURE	-0.026	
WR35	335025.16:1317654.67 334760.07:1317645.69	245	NOT VISIBLE	TREES	TREES	29	24	CROPPING	PASTURE	-0.034	
WR36	334760.07:1317645.69 334681.40:1317665.79	90	NOT VISIBLE	TREES	TREES	38	33	CROPPING	CROPPING	-0.051	
WR37	334681.40:1317665.79 334471.47:1317621.32	211	NOT VISIBLE	TREES	TREES	65	65	CROPPING	CROPPING	-0.061	
WR38	334471.47:1317621.32 334415.46:1317614.48	83	NOT VISIBLE	TREES	TREES	44	27	CROPPING	CROPPING	-0.028	
WR39	334415.46:1317614.48 334420.59:1317615.34	67	NOT VISIBLE	TREES	TREES	44	23	CROPPING	CROPPING	-0.024	
WR40	334420.59:1317615.34 334337.65:1317636.29	94	NOT VISIBLE	TREES	TREES	39	41	CROPPING	PASTURE	-0.025	
WR41	334337.65:1317636.29 334218.36:1317721.37	143	NOT VISIBLE	TREES	TREES	14	48	CROPPING	PASTURE	-0.023	
WR42	334218.36:1317721.37 334137.12:1317744.46	78	NOT VISIBLE	TREES	TREES	13	55	CROPPING	PASTURE	-0.034	
WR43	334137.12:1317744.46 333995.18:1317696.15	146	11	TREES	TREES	22	39	PASTURE	PASTURE	-0.034	
WR44	333995.18:1317696.15 333892.71:1317615.34	102	11	TREES	TREES	67	14	PASTURE	PASTURE	-0.011	

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	333892.71:1317615.34										
WR45	333799.36:1317605.08	86	NOT VISIBLE	TREES	TREES	45	39	PASTURE	PASTURE	0	
	333799.36:1317605.08										
WR46	333667.63:1317417.20	174	NOT VISIBLE	TREES	TREES	20	22	PASTURE	PASTURE	0	
	333667.63:1317417.20										
WR47	333641.12:1317352.44	88	NOT VISIBLE	TREES	TREES	33	13	PASTURE	PASTURE	0	
	333641.12:1317352.44										
WR48	333624.93:1317317.28	42	10	TREES	TREES	17	16	PASTURE	PASTURE	0	
	333624.93:1317317.28										
WR49	333592.27:1317280.71	47	NOT VISIBLE	TREES	TREES	23	22	PASTURE	PASTURE	0	
	333592.27:1317280.71										
WR50	333538.96:1317256.71	65	NOT VISIBLE	TREES	TREES	23	50	PASTURE	PASTURE	0	
	333538.96:1317256.71										
WR51	333472.26:1317200.89	89	10	TREES	TREES	24	21	PASTURE	ROAD	0	
	333472.26:1317200.89										
WR52	333375.97:1317162.93	113	10	TREES	TREES	24	16	PASTURE	ROAD	0	
	333375.97:1317162.93										
WR53	333285.82:1317303.6	167	NOT VISIBLE	TREES	TREES	26	26	PASTURE	PASTURE	0	
	333285.82:1317303.6										
WR54	333250.93:1317321.46	19.5	7	TREES	TREES	22	18	PASTURE	PASTURE	0	
	333250.93:1317321.46										
WR55	333181.15:1317301.99	68	10	TREES	TREES	36	10	PASTURE	PASTURE	0	
	333181.15:1317301.99										
WR56	333192.87:1317373.93	69	5	TREES	TREES	48	13	PASTURE	PASTURE	0	
	333192.87:1317373.93										
WR57	333195.94:1317425.57	40	NOT VISIBLE	TREES	TREES	21	17	PASTURE	PASTURE	0	
	333195.94:1317425.57										
WR58	333137.89:1317398.77	60	10	TREES	TREES	48	16	PASTURE	PASTURE	0	
	333137.89:1317398.77										
WR59	333120.31:1317501.21	102	NOT VISIBLE	TREES	TREES	23	23	PASTURE	PASTURE	0	
	333120.31:1317501.21										
WR60	333077.60:1317542.51	41	NOT VISIBLE	TREES	TREES	17	17	PASTURE	PASTURE	0	
	333077.60:1317542.51										
WR61	333072.30:1317457.11	83	NOT VISIBLE	TREES	TREES	23	23	PASTURE	PASTURE	0	
	333072.30:1317457.11										
WR62	332985.78:1317556.19	129	NOT VISIBLE	TREES	TREES	26	26	PASTURE	PASTURE	0	
	332985.78:1317556.19										
WR63	332952.91:1317603.6	76	NOT VISIBLE	TREES	TREES	38	38	PASTURE	PASTURE	0	
	332952.91:1317603.6										
WR64	332792.55:1317774.34	212	NOT VISIBLE	TREES	TREES	81	81	FOREST	FOREST	0	
	332792.55:1317774.34										
WR65	332451.17:1318016.32	434	NOT VISIBLE	TREES	TREES	>500	29	FOREST	FOREST	0	
	332451.17:1318016.32										
WR66	332300.56:1318064.01	119	NOT VISIBLE	TREES	TREES	>500	56	FOREST	FOREST	0	

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	332300.56:1318064.01										
WR67	332453.42:1317827.88	198	NOT VISIBLE	TREES	TREES	26	26	PASTURE	PASTURE	0	
	332453.42:1317827.88										
WR68	332369.94:1317868.01	80	NOT VISIBLE	TREES	TREES	26	26	PASTURE	PASTURE	0	
	332369.94:1317868.01										
WR69	332430.80:1317698.89	179	NOT VISIBLE	TREES	TREES	17	17	PASTURE	PASTURE	0	
	332430.80:1317698.89										
WR70	332348.66:1317683.00	75	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	332348.66:1317683.00										
WR71	332277.64:1317736.56	76	NOT VISIBLE	TREES	TREES	59	59	PASTURE	PASTURE	0	
	332277.64:1317736.56										
WR72	332113.10:1317832.05	186	NOT VISIBLE	TREES	TREES	21	21	PASTURE	PASTURE	0	
	332113.10:1317832.05										
WR73	332058.48:1317805.60	69	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	contains bridge.
	332058.48:1317805.60										
WR74	331991.50:1317758.54	76	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	331991.50:1317758.54										
WR75	331989.09:1317849.92	84	NOT VISIBLE	TREES	TREES	12	12	PASTURE	PASTURE	0	
	331989.09:1317849.92										
WR76	331835.54:1317734.84	167	NOT VISIBLE	TREES	TREES	20	20	PASTURE	PASTURE	0	
	331835.54:1317734.84										
WR77	331885.01:1317614.95	130	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	331885.01:1317614.95										
WR78	331697.79:1317583.35	188	NOT VISIBLE	TREES	TREES	25	25	PASTURE	ROAD	0	
	331697.79:1317583.35										
WR79	331589.58:1317594.34	116	NOT VISIBLE	TREES	TREES	17	17	PASTURE	PASTURE	0	
	331589.58:1317594.34										
WR80	331546.74:1317644.50	69	NOT VISIBLE	TREES	TREES	23	23	PASTURE	PASTURE	0	
	331546.74:1317644.50										
WR81	331551.45:1317657.55	14	NOT VISIBLE	TREES	TREES	9	9	PASTURE	PASTURE	0	
	331551.45:1317657.55										
WR82	331477.25:1317709.42	76	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	331477.25:1317709.42										
WR83	331654.16:1317733.81	172	NOT VISIBLE	TREES	TREES	18	18	PASTURE	PASTURE	0	
	331654.16:1317733.81										
WR84	331532.22:1317774.00	129	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	331532.22:1317774.00										
WR85	331397.21:1317866.75	165	12	TREES	TREES	20	21	PASTURE	PASTURE	0	
	331397.21:1317866.75										
WR86	331297.60:1317936.14	161	8	TREES	TREES	24	23	PASTURE	PASTURE	0	
	331297.60:1317936.14										
WR87	331127.90:1318049.50	208	10	TREES	TREES	19	26	PASTURE	ROAD	0	
	331127.90:1318049.50										driveway crosses river at point where high voltage TL
WR88	331095.27:1318098.97	61	NOT VISIBLE	TREES	TREES	20	24	PASTURE	ROAD	0	crosses.

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
WR89	331095.27:1318098.97 331069.50:1318219.88	119	NOT VISIBLE	TREES	TREES	15	46	PASTURE	ROAD	0	
WR90	331069.50:1318219.88 331126.87:1318341.11	141	NOT VISIBLE	TREES	TREES	32	32	PASTURE	PASTURE	0	
WR91	331126.87:1318341.11 331221.33:1318365.53	98	NOT VISIBLE	TREES	TREES	23	23	PASTURE	PASTURE	0	
WR92	331221.33:1318365.53 331180.00:1318512.85	140	NOT VISIBLE	TREES	TREES	61	61	PASTURE	PASTURE	0	
WR93	331180.00:1318512.85 331035.62:1318589.33	170	not visible	TREES	TREES	>500	70	FOREST	PASTURE	-0.011	
WR94	331035.62:1318589.33 330961.56:1318750.89	175	NOT VISIBLE	TREES	TREES	13	17	grazing	PASTURE	-0.022	road crossing river.
WR95	330961.56:1318750.89 330906.81:1318852.06	108	NOT VISIBLE	TREES	TREES	18	18	grazing	PASTURE	-0.064	
WR96	330906.81:1318852.06 330824.16:1319016.02	183	NOT VISIBLE	TREES	TREES	121	28	PASTURE	PASTURE	-0.098	
WR97	330824.16:1319016.02 330729.91:1319063.68	96	NOT VISIBLE	TREES	TREES	>500	30	FOREST	PASTURE	-0.144	
WR98	330729.91:1319063.68 330649.53:1319098.59	107	NOT VISIBLE	TREES	TREES	18	24	PASTURE	PASTURE	-0.12	
WR99	330649.53:1319098.59 330599.46:1319220.36	136	NOT VISIBLE	TREES	TREES	23	15	PASTURE	PASTURE	-0.09	
WR100	330599.46:1319220.36 330448.94:1319388.03	202	NOT VISIBLE	TREES	TREES	68	48	PASTURE	PASTURE	-0.141	road crossing river.
WR101	330448.94:1319388.03 330376.08:1319384.89	58	NOT VISIBLE	TREES	TREES	50	27	PASTURE	PASTURE	-0.152	
WR102	330376.08:1319384.89 330316.08:1319375.46	36	NOT VISIBLE	TREES	TREES	22	23	CROPPING	PASTURE	-0.106	
WR103	330316.08:1319375.46 330269.22:1319338.74	61	NOT VISIBLE	TREES	TREES	17	24	CROPPING	PASTURE	-0.07	
WR104	330269.22:1319338.74 329913.79:1319350.32	402	NOT VISIBLE	TREES	TREES	18	18	CROPPING	CROPPING	-0.042	
WR105	329913.79:1319350.32 329682.65:1319402.03	235	NOT VISIBLE	TREES	TREES	132	15	PASTURE	PASTURE	0	
WR106	329682.65:1319402.03 329505.79:1319438.32	185	NOT VISIBLE	TREES	TREES	76	29	PASTURE	PASTURE	0	
WR107	329505.79:1319438.32 329439.50:1319400.89	62	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	extensive dirt tracks through pasture on left bank.
WR108	329439.50:1319400.89 329546.93:1319334.60	126	NOT VISIBLE	TREES	TREES	26	26	PASTURE	PASTURE	0	
WR109	329546.93:1319334.60 329313.22:1319250.89	245	NOT VISIBLE	TREES	TREES	23	19	PASTURE	PASTURE	0	road crossing river.
WR110	329313.22:1319250.89 329148.36:1319216.91	159	NOT VISIBLE	TREES	TREES	25	24	PASTURE	ROAD	0	

Wyong River Tributary

				Riparian Vegetation		Riparian Width (m)		Land Use			
ID	Section Cordinates (E/N)	Section Length (m)	Channel Width (m)	Left Bank	Right Bank	Left Bank	Right Bank	Left Bank	Right Bank	Predicted Subsidence (m)	Comment
	329148.36:1319216.91										
WR111	329072.44:1319245.08	88	NOT VISIBLE	TREES	TREES	18	18	PASTURE	ROAD	0	
	329072.44:1319245.08										
WR112	329064.73:1319281.83	30	NOT VISIBLE	TREES	TREES	15	15	PASTURE	PASTURE	0	
	329064.73:1319281.83										
WR113	329101.26:1319330.91	64	8	TREES	TREES	18	16	PASTURE	PASTURE	0	
	329101.26:1319330.91										
WR114	329090.92:1319350.71	21	5	TREES	TREES	6	10	PASTURE	PASTURE	0	
	329090.92:1319350.71										
WR115	329052.41:1319423.55	73	NOT VISIBLE	TREES	TREES	16	16	PASTURE	PASTURE	0	
	329052.41:1319423.55										
WR116	329031.28:1319498.37	89	NOT VISIBLE	TREES	TREES	19	19	PASTURE	PASTURE	0	
	329031.28:1319498.37										
WR117	329055.27:1319505.86	24	6	TREES	TREES	11	8	PASTURE	PASTURE	0	
	329055.27:1319505.86										
WR118	329068.47:1319508.94	11	6	TREES	grass	14	0	PASTURE	PASTURE	0	section of bank with no trees.
	329068.47:1319508.94										
WR119	329078.16:1319524.56	25	NOT VISIBLE	TREES	TREES	14	14	PASTURE	PASTURE	0	
	329078.16:1319524.56										
WR120	329077.94:1319595.20	69	NOT VISIBLE	TREES	TREES	28	28	PASTURE	PASTURE	0	
	329077.94:1319595.20										
WR121	329062.75:1319804.26	168	NOT VISIBLE	TREES	TREES	>500	35	FOREST	PASTURE	0	
	329062.75:1319804.26										
WR122	329045.67:1319911.47	107	NOT VISIBLE	TREES	TREES	>500	22	FOREST	PASTURE	0	
	329045.67:1319911.47										
WR123	329006.97:1319937.77	42	NOT VISIBLE	TREES	TREES	14	14	PASTURE	PASTURE	0	
	329006.97:1319937.77										
WR124	328994.01:1319932.32	10	5	grass	TREES	0	13	PASTURE	PASTURE	0	section of bank with no trees.
	328994.01:1319932.32										
WR125	328954.37:1319918.61	41	7	TREES	TREES	14	24	PASTURE	PASTURE	0	

Appendix 2

W15 – Hue Hue Creek at Hue Hue Road Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	16.0	73.0	185	163	67	19	113	12		0.054	0.0001		0.003		0.12	0.004	0.02	0.29		0.52	2.1	0.05	
8/8/06	23	50	114	157	33	13	118	8		0.038		0.001	0.004		0.08	0.003	0.02	1.74		0.02	0.8	0.04	330
8/9/06	72	23	35	58.1	9	4	52	5		0.015			0.004		0.03	0.002	0.01	0.47		0.03	1.2	0.25	9200
18/10/06	13	101	86	105	34	14	80	7	0.001	0.039					0.85	0.003	0.01	0.72			1.2	0.02	1
9/11/06	9	98	96	114	34	14	92	8		0.048			0.001		0.6	0.001		0.65			0.8	0.03	
21/2/07																							
7/3/07	11	117	68	107	31	13	85	10	0.002	0.061	0.0002	0.001	0.006	0.001	0.128	0.006	0.045	1.72	0.0001	0.062	1.5	0.13	80
4/4/07	15	126	81	108	36	14	93	10	0.001	0.04	0.0001	0.001	0.001	0.001		0.002	0.005	0.44	0.0001	0.197	1.1	0.08	1
26/4/07	107	48	29	59.2	12	7	46	6												0.042	1.8	0.17	5000
4/6/07	30	110	54	70.8	30	12	61	10	0.002	0.086	0.0001	0.001	0.002	0.001	0.041	0.003	0.042	0.63	0.0001	0.437	1.9	0.16	50
14/6/07	21	5	12	38.5	4	4	17	5	0.0005	0.045	0.0003	0.002	0.005	0.001	0.541	0.003	0.044	1.38	0.00005	0.112	1.8	0.1	50
3/7/07	6	5	9	46.5	4	4	24	4	0.002		0.00005	0.002	0.002	0.001		0.005	0.082		0.00005	0.149	1.6	0.56	2
9/8/07	46	7	5	53.1	4	4	24	5	0.0005	0.13	0.00005	0.002	0.003	0.001	0.837	0.005	0.071	3.34	0.00005	0.093	2.3	0.09	1
5/9/07	4	11	4	25.8	4	3	15	5	0.002	0.074	0.00005	0.002	0.004	0.002	0.601	0.004	0.064	2.98	0.00005	0.134	1.6	0.14	
3/10/07	14	10	4	29.1	4	3	16	4	0.0005	0.025	0.0003	0.001	0.002	0.0005	0.631	0.005	0.02	3.16	0.00005	0.024	2.4	0.14	6
8/11/07																							
4/12/07																							1900
2/1/08	6	16	4	16.1	4	3	11	4	0.003		0.001	0.001	0.002	0.001		0.005	0.022		0.00005	0.02	0.6	0.24	25
5/2/08	25	16	6	23.3	4	3	16	5	0.002	0.031	0.0002	0.0005	0.006	0.002	0.636	0.005	0.029	2.32	0.00005	0.005	2.4	0.14	150
11/3/08	32	16	1	23.4	4	3	15	4	0.002	0.026	0.0004	0.001	0.005	0.001	0.572	0.004	0.024	2.15	0.00005	0.02	2.4	0.06	2700
1/4/08	34																						
28/4/08	23	224	0.5	49.9	5	4	28	4	0.0005	0.153	0.00005	0.001	0.004	0.0005	0.036	0.004	0.096	1.04	0.00005	0.079	0.3	0.12	170
6/5/08	49	22	2	18.4	3	2	14	4	0.001	0.124	0.00005	0.002	0.0005	0.0005	0.453	0.003	0.064	3.95	0.00005	0.005	1.6	0.03	30
4/6/08	32	14	2	19.8	3	2	13	4	0.0005	0.193	0.00005	0.0005	0.004	0.002	0.366	0.003	0.114	2.56	0.00005	0.077	2.1	0.18	65
8/7/08																							
5/8/08																							
10/9/08	38	8	1	18	2	2	11	5	0.0005	0.025	0.00005	0.005	0.006	0.0005	0.333	0.002	0.034	0.85	0.00005	0.06	1.2	0.07	45
1/10/08	198	12	9	25	3	3	14	6	0.002	0.307	0.00005	0.002	0.005	0.004	0.764	0.02	0.202	4.78	0.00005	0.04	4.6	0.52	17
4/11/08																							
4/12/08																							

* ANZECC Guidelines for Aquatic Ecosystems
* ANZECC Guidelines for Irrigation / Livestock
* ANZECC Guidelines for Recreation and Aesthetics
* NHMRC Australian Drinking Water Guidelines 6, 2004

W19 – Jilliby Jilliby Creek at Mandalong Road Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06																							
8/8/06																							
8/9/06	34	8	14	100	4	7	56	7		0.035			0.002		0.107	0.003	0.012	1.26		0.213	1.1	0.22	50
18/10/06																							
9/11/06	4	5	2	115	6	11	66	6	0.001	0.068					0.962	0.002	0.009	4.98		0.267	0.9	0.06	2400
21/2/07																							
7/3/07																							
4/4/07																							
26/4/07	16	38	3	56.8	4	7	28	5												0.063	0.7	0.12	920
4/6/07	18	28	5	83.6	5	8	45	4	0.001	0.109	0.0001	0.001	0.001	0.001	0.104	0.001	0.047	2.49	0.0001	0.052	0.4	0.09	130
14/6/07	176	11	16	99.1	5	9	49	4	0.0005	0.175	0.0005	0.0005	0.001	0.0005	0.37	0.003	0.069	1.39	0.0005	0.068	0.4	0.06	90
3/7/07	6	21	13	116	5	12	62	4	0.0005		0.0005	0.0005	0.0005	0.0005		0.004	0.054		0.0005	0.132	0.4	0.21	79
9/8/07	6	26	10	161	6	13	83	4	0.0005	0.131	0.0005	0.0005	0.0005	0.0005	0.4555	0.002	0.041	2.36	0.0005	0.109	0.4	0.07	70
5/9/07	5	24	12	1222	6	12	64	4	0.0005	0.119	0.0005	0.0005	0.0005	0.0005	0.494	0.003	0.04	2.43	0.0005	0.123	0.05	0.23	80
3/10/07	6	38	10	127	6	12	70	3	0.0005	0.063	0.0005	0.0005	0.0005	0.0005	0.434	0.002	0.006	2.3	0.0005	0.077	0.6	0.07	50
8/11/07	6	38	5	113	5	11	61	4	0.0005	0.126	0.0005	0.0005	0.0005	0.0005	0.893	0.003	0.042	8.37	0.0005	0.039	1.1	0.14	70
4/12/07	50	9	8	36.6	2	3	22	3	0.0005	0.028	0.0002	0.0005	0.002	0.0005	0.192	0.004	0.016	1.61	0.0005	0.112	0.8	0.14	2200
2/1/08	7	30	8	105	5	10	59	3	0.001		0.0005	0.0005	0.0005	0.0005		0.002	0.0025		0.0005	0.056	0.05	0.1	210
5/2/08	17	11	8	28.5	2	3	17	4	0.0005	0.027	0.0005	0.0005	0.002	0.0005	0.074	0.003	0.008	0.68	0.0005	0.005	1	0.13	660
11/3/08	8	16	2	66.9	3	6	38	3	0.001	0.045	0.0002	0.0005	0.002	0.0005	0.38	0.003	0.006	1.65	0.0005	0.096	1.5	0.12	490
1/4/08	4	18	4	26	2	2	16	6	0.002	0.028	0.0005	0.0005	0.001	0.0005	0.584	0.004	0.008	7.03	0.0005	0.035	1.7	0.15	20
28/4/08	13	12	2	56.8	2	5	26	3	0.0005	0.135	0.0005	0.0005	0.002	0.0005	0.23	0.003	0.056	0.98	0.0005	0.02	0.6	0.06	170
6/5/08	3	24	8	85.3	4	8	46	3	0.0005	0.132	0.0005	0.0005	0.0005	0.0005	0.342	0.002	0.046	1.15	0.0005	0.134	0.2	0.06	110
4/6/08	30	22	2	100	5	8	54	4	0.0005	0.128	0.0005	0.0005	0.002	0.0005	0.236	0.002	0.054	1	0.0005	0.075	0.6	0.08	9500
8/7/08	2	26	11	112	5	10	58	3	0.0005	0.141	0.0005	0.0005	0.0005	0.0005	0.183	0.001	0.056	0.94	0.0005	0.005	0.05	0.005	100
5/8/08		28	7	109	5	10	59	10	0.0005	0.149	0.0005	0.0005	0.0005	0.0005	0.138	0.001	0.048	1.08	0.0005	0.03	0.05	0.03	30
10/9/08	8	18	8	72	4	7	42	4	0.0005	0.045	0.0005	0.0005	0.002	0.0005	0.273	0.002	0.025	1.06	0.0005	0.15	0.5	0.13	200
1/10/08	246	30	10	102	5	10	57	3	0.0005	0.139	0.0001	0.0005	0.0005	0.0005	0.236	0.002	0.057	1.71	0.0005	0.03	0.3	0.05	18
4/11/08	2	25	16	109	6	11	58	4	0.0005	0.048	0.0005	0.0005	0.002	0.0005	0.266	0.002	0.025	2.88	0.0005	0.04	0.2	0.005	110
4/12/08	5	32	0.5	89	4	8	49	4	0.0005	0.13	0.0005	0.0005	0.002	0.0005	0.337	0.003	0.08	2.59	0.0005	0.02	0.4	0.07	70

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W20 – Jilliby Jilliby Creek at the Jilliby Rd Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	224	20	18	33	4	5	23	4	0.006	0.019			0.014		0.362	0.002	0.063	0.99		0.077	0.4	0.15	
8/8/06																							
8/9/06	54	14	31	91	5	8	57	10		0.035			0.004		0.246	0.003	0.017	1.07		0.471	2.1	0.46	
18/10/06	5	46	10	105	5	9	62	6		0.045			0.001		0.63	0.003	0.008	2.3		0.085	0.7	0.16	16000
9/11/06	4	59	4	121	6	11	72	6		0.042					0.411	0.002		2.23		0.037	0.5	0.08	26
21/2/07																							
7/3/07	41	52	2	100	5	10	59	6	0.001	0.134	0.0001	0.001	0.001	0.001	0.886	0.002	0.044	3.88	0.0001	0.034	0.5	0.25	170
4/4/07																							
26/4/07	40	76	4	125	9	11	80	10												1.26	2.6	0.25	5000
4/6/07	4	29	9	95.6	5	9	52	6	0.002	0.0116	0.0001	0.001	0.001	0.001	0.143	0.002	0.051	2.89	0.0001	0.089	1.0	0.26	50
14/6/07	8	18	25	127	8	13	62	5	0.0005	0.204	0.0001	0.0005	0.0005	0.0005	0.619	0.006	0.071	2.13	0.00005	0.188	1.2	0.35	18
3/7/07	11	17	16	109	5	11	60	4	0.0005		0.00005	0.0005	0.0005	0.0005		0.004	0.055		0.00005	0.109	0.6	0.36	130
9/8/07	7	24	14	150	6	12	78	5	0.0005	0.142	0.00005	0.0005	0.0005	0.0005	0.14	0.002	0.038	1.85	0.00005	0.039	0.2	0.09	100
5/9/07	4	23	16	126	6	12	67	5	0.0005	0.118	0.00005	0.0005	0.0005	0.0005	0.225	0.003	0.044	2.99	0.00005	0.087	0.16	0.14	40
3/10/07	4	30	13	143	6	12	77	4	0.0005	0.053	0.00005	0.0005	0.0005	0.0005	0.21	0.002	0.005	2.58	0.00005	0.041	0.6	0.09	85
8/11/07	20	46	7	123	6	12	70	5	0.0005	0.092	0.00005	0.0005	0.0005	0.0005	0.278	0.002	0.038	3.13	0.00005	0.014	0.8	0.12	430
4/12/07																				0.028			680
2/1/08	2	30	8	107	5	9	59	4	0.001		0.00005	0.0005	0.002	0.0005		0.003	0.007		0.00005	0.049	0.2	0.23	85
5/2/08	38	10	8	28.9	2	3	17	4	0.001	0.02	0.00005	0.0005	0.003	0.0005	0.088	0.004	0.014	0.88	0.0001	0.005	1.1	0.18	620
11/3/08	41	10	2	27.2	2	2	16	3	0.002	0.021	0.0002	0.0005	0.003	0.0005	0.131	0.002	0.008	1.28	0.00005	0.035	1.6	0.29	800
1/4/08	6	27	5	98.9	4	9	56	3	0.0005	0.046	0.00005	0.0005	0.0005	0.0005	0.206	0.002	0.0025	1.61	0.00005	0.036	0.4	0.02	160
28/4/08	75	8	4	27.2	2	3	14	2	0.0005	0.119	0.00005	0.0005	0.002	0.0005	0.11	0.003	0.071	0.94	0.00005	0.022	0.5	0.12	540
6/5/08	6	23	10	81.9	4	7	45	3	0.0005	0.119	0.00005	0.0005	0.0005	0.0005	0.178	0.003	0.059	1.47	0.00005	0.097	0.4	0.005	120
4/6/08	33	25	2	97.1	5	8	54	4	0.0005	0.126	0.00005	0.0005	0.001	0.0005	0.122	0.001	0.054	1.21	0.00005	0.059	0.8	0.12	7200
8/7/08	3	28	13	120	6	10	63	4	0.0005	0.103	0.00005	0.0005	0.0005	0.0005	0.096	0.0005	0.052	1.38	0.00005	0.005	0.2	0.005	50
5/8/08		27	9	122	6	11	66	11	0.0005	0.155	0.00005	0.0005	0.0005	0.0005	0.082	0.001	0.056	0.95	0.00005	0.023	0.05	0.05	40
10/9/08	22	3	7	44	3	4	24	4	0.0005	0.026	0.00005	0.0005	0.004	0.0005	0.102	0.002	0.04	0.63	0.00005	0.04	0.2	4.06	540
1/10/08	244	32	12	105	5	10	60	4	0.0005	0.138	0.00005	0.0005	0.003	0.0005	0.142	0.003	0.06	1.88	0.00005	0.02	0.4	0.08	30
4/11/08	2	35	10	130	6	12	70	5	0.0005	0.046	0.00005	0.0005	0.002	0.0005	0.166	0.002	0.013	2.02	0.00005	0.02	0.2	0.02	55
4/12/08	6	30	0.5	98	5	9	52	5	0.0005	0.142	0.00005	0.0005	0.003	0.0005	0.245	0.003	0.089	2.38	0.00005	0.04	0.4	0.12	85

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W21 – Little Jilliby Jilliby Creek at Jilliby Road Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06																							
8/8/06																							
8/9/06	19	22	38	5	5	7	67	10		0.036			0.002		0.316	0.003	0.019	1.46		0.109	1.3	0.17	50
18/10/06																							
9/11/06	10	97	2	11	11	14	88	9	0.001	0.121					1.66			12		0.637	1.4	0.27	3500
21/2/07																							
7/3/07																							
4/4/07																							
26/4/07	2	23	4	4	4	5	17	4												0.03	0.9	0.05	350
4/6/07																							
14/6/07	5	21	29	8	8	14	64	5	0.0005	0.098	0.00005	0.0005	0.001	0.0005	0.633	0.005	0.29	2.02	0.00005	0.169	0.6	0.005	18
3/7/07	10	29	23	8	8	14	74	5	0.0005		0.00005	0.0005	0.0005	0.0005		0.004	0.052		0.00005	0.263	0.7	0.05	350
9/8/07	9	39	20	8	8	14	84	6	0.0005	0.124	0.00005	0.0005	0.0005	0.0005	0.262	0.002	0.037	2.15	0.00005	0.142	0.4	0.06	210
5/9/07	6	34	20	8	8	13	70	6	0.0005	0.143	0.00005	0.0005	0.0005	0.0005	0.316	0.003	0.04	2.44	0.00005	0.164	0.2	0.09	100
3/10/07	7	40	17	8	8	13	77	5	0.0005	0.073	0.0001	0.0005	0.0005	0.0005	0.361	0.002	0.005	1.41	0.00005	0.092	0.8	0.06	100
8/11/07	18	59	10	8	8	13	77	6	0.001	0.146	0.00005	0.0005	0.0005	0.0005	0.685	0.002	0.043	4.57	0.00005	3.54	1.6	0.1	3300
4/12/07																				0.033			650
2/1/08	23	51	9	8	8	12	62	5	0.0005		0.00005	0.0005	0.0005	0.0005		0.002	0.0025		0.00005	0.128	0.7	0.22	110
5/2/08	22	8	10	2	2	4	23	4	0.0005	0.026	0.00005	0.0005	0.002	0.0005	0.072	0.003	0.012	0.64	0.00005	0.005	0.9	0.09	390
11/3/08	18	22	11	4	4	7	46	4	0.001	0.056	0.0002	0.0005	0.002	0.0005	0.338	0.003	0.009	1.93	0.00005	0.11	1.6	0.005	770
1/4/08	6	28	4	4	4	9	55	4	0.0005	0.04	0.00005	0.0005	0.008	0.0005	0.122	0.004	0.022	2.08	0.00005	0.024	0.5	0.05	150
28/4/08	10	16	10	4	4	6	34	3	0.001	0.19	0.00005	0.0005	0.002	0.0005	0.271	0.003	0.087	1.51	0.00005	0.047	0.5	0.02	1600
6/5/08	7	34	17	6	6	10	56	4	0.0005	0.17	0.00005	0.0005	0.0005	0.0005	0.328	0.003	0.062	1.47	0.00005	0.178	0.5	0.005	410
4/6/08	31	27	6	6	6	10	53	5	0.0005	0.141	0.00005	0.0005	0.0005	0.0005	0.188	0.002	0.054	1.55	0.00005	0.115	0.7	0.12	6000
8/7/08	5	32	17	8	8	13	69	4	0.0005	0.139	0.00005	0.0005	0.0005	0.0005	0.174	0.002	0.055	1.12	0.00005	0.071	0.2	0.005	180
5/8/08		32	9	8	8	14	73	14	0.0005	0.151	0.00005	0.0005	0.0005	0.0005	0.162	0.002	0.032	0.75	0.00005	0.04	0.5	0.02	70
10/9/08	7	20	8	5	5	9	53	4	0.0005	0.177	0.00005	0.0005	0.006	0.0005	0.219	0.003	0.133	1.2	0.00005	0.19	0.9	0.005	250
1/10/08	292	38	14	7	7	12	69	4	0.0005	0.148	0.00005	0.0005	0.002	0.0005	0.23	0.002	0.061	2.02	0.00005	0.04	0.4	0.08	550
4/11/08	2	35	6	9	9	14	73	5	0.0005	0.073	0.0001	0.0005	0.008	0.002	0.356	0.005	0.059	2.35	0.00005	0.09	0.2	0.005	160
4/12/08	6	35	8	10	10	15	69	5	0.0005	0.199	0.00005	0.0005	0.003	0.0005	0.429	0.003	0.092	2.66	0.00005	0.1	0.3	0.04	210

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W22 Wyong River at Yarramalong Rd Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	7	16	4	45.1	3	4	22	4		0.03					0.105		0.088	2.02		0.041	0.3	0.01	
8/8/06	3	11	5	39.5	2	4	11	4		0.03					0.071		0.01	1.81		0.01	0.4	0.03	
8/9/06	5	14	19	43.8	4	5	36	7		0.04					0.092	0.002	0.007	1.76		0.104	0.7	0.07	350
18/10/06	6	37	4	52.5	3	6	28	4		0.047					0.156	0.001	0.006	2.86		0.044	0.8	0.03	130
9/11/06	2	39	3	54.5	4	7	36	5		0.049					0.115			4.63		0.022	0.4		
21/2/07	8	24	6	35.5	3	4	24	5												0.034	0.9	0.02	65
7/3/07	6	15	7	27.5	3	3	14	4	0.001	0.095	0.0002	0.001	0.002	0.001	0.121	0.003	0.047	1.97	0.0001	0.027	0.5	0.02	220
4/4/07	9	22	5	36.4	4	5	22	4	0.001	0.034	0.0001	0.001	0.001	0.001		0.001	0.005	2.56	0.0001	0.026	0.4	0.03	30
26/4/07	20	24	6	46.8	4	5	23	4												0.027	0.8	0.05	540
4/6/07	2	18	6	53.1	4	6	28	4	0.001	0.096	0.0001	0.001	0.001	0.001	0.114	0.001	0.041	2.42	0.0001	0.039	0.4	0.05	130
14/6/07	18	6	8	58.8	3	6	25	4	0.0005	0.179	0.00005	0.0005	0.0005	0.0005	0.354	0.003	0.066	1.15	0.00005	0.051	0.6	0.06	40
3/7/07	10	16	8	67.1	4	7	34	4	0.0005		0.00005	0.0005	0.0005	0.0005		0.003	0.055		0.00005	0.132	0.6	0.19	36
9/8/07	4	21	5	69.1	3	7	34	4	0.0005	0.106	0.00005	0.0005	0.0005	0.0005	0.162	0.002	0.035	2.1	0.00005	0.107	0.05	0.08	10
5/9/07	5	16	7	69.7	4	7	36	4	0.0005	0.12	0.00005	0.0005	0.0005	0.0005	0.19	0.002	0.038	2.35	0.00005	0.102	0.3	0.08	40
3/10/07	4	20	6	65.9	4	7	34	3	0.0005	0.051	0.00005	0.0005	0.0005	0.0005	0.142	0.001	0.0025	2.34	0.00005	0.033	0.5	0.07	14
8/11/07	6	27	4	57.9	4	6	30	4	0.0005	0.122	0.0002	0.0005	0.0005	0.0005	0.13	0.002	0.04	4.51	0.00005	0.005	0.8	0.06	55
4/12/07	23	10	7	35.6	0	3	19	3	0.0005	0.038	0.00005	0.0005	0.001	0.0005	0.168	0.002	0.007	1.56	0.00005	0.059	0.9	0.09	340
2/1/08	4	21	4	54.6	6	6	30	3	0.0005		0.0004	0.0005	0.0005	0.0005		0.001	0.0025		0.00005		0.2	0.09	60
5/2/08	24	7	7	36	2	3	20	4	0.0005	0.031	0.00005	0.0005	0.002	0.0005	0.102	0.002	0.007	0.72	0.00005	0.005	0.7	0.07	400
11/3/08	20	9	0.5	45.9	2	4	25	3	0.0005	0.043	0.00005	0.0005	0.001	0.0005	0.164	0.002	0.005	0.96	0.00005	0.033	1.3	0.04	530
1/4/08	3	42	8	113	6	12	63	5	0.0005	0.061	0.00005	0.0005	0.002	0.0005	0.226	0.005	0.011	2.52	0.00005	0.076	0.6	0.02	430
28/4/08	25	7	2	37.4	2	3	17	3	0.0005	0.12	0.0001	0.0005	0.002	0.0005	0.179	0.002	0.073	0.56	0.00005	0.014	0.7	0.72	350
6/5/08	6	13	10	57.2	3	6	27	3	0.0005	0.137	0.00005	0.0005	0.0005	0.0005	0.221	0.002	0.047	1.12	0.00005	0.071	0.3	0.005	80
4/6/08	15	5	8	72.8	4	7	37	4	0.0005	0.158	0.0001	0.0005	0.001	0.0005	0.142	0.002	0.074	1.08	0.00005	0.03	0.4	0.01	1400
8/7/08	2	12	7	77.2	4	7	35	3	0.0005	0.097	0.00005	0.0005	0.0005	0.0005	0.147	0.001	0.036	1.03	0.00005	0.005	0.2	0.005	50
5/8/08		15	4	703	4	8	32	8	0.0005	0.148	0.00005	0.0005	0.0005	0.0005	0.117	0.0005	0.044	0.89	0.00005	0.022	0.2	0.02	16
10/9/08	11	7	5	46	2	4	24	3	0.0005	0.043	0.00005	0.0005	0.001	0.0005	0.155	0.001	0.01	0.61	0.00005	0.12	0.6	0.12	80
1/10/08	154	14	4	70	4	6	32	3	0.0005	0.124	0.00005	0.0005	0.0005	0.0005	0.127	0.002	0.049	1.22	0.00005	0.01	0.3	0.06	40
4/11/08	2	15	5	66	4	7	34	4	0.0005	0.05	0.0001	0.0005	0.001	0.0005	0.103	0.001	0.016	1.63	0.00005	0.02	0.3	0.005	75
4/12/08	3	23	0.5	64	4	6	30	3	0.0005	0.138	0.00005	0.0005	0.002	0.0005	0.134	0.002	0.079	1.94	0.00005	0.01	0.3	0.23	45

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W23 Wyong River Upstream – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	3	13	3	41.4	3	4	21	4		0.027					0.059		0.009	1.61		0.023	0.2		130
8/8/06	1	16	3	35	2	4	20	4		0.023					0.035		0.009	1.39			0.2	0.02	17
8/9/06	8	13	5	30.3	2	4	26	4		0.025					0.048			1.1		0.055	0.3	0.03	130
18/10/06	2	36	4	51.2	4	6	27	4		0.05					0.172	0.001	0.006	2.46		0.043	0.6		240
9/11/06	36	40	3	49.3	4	7	33	5		0.044					0.101			3.78		0.029	0.5		
21/2/07	2	26	9	35.3	4	5	23	4												0.052	0.8	0.02	30
7/3/07	7	12	7	27.7	3	3	14	4	0.001	0.085	0.0001	0.001	0.002	0.001	0.104	0.002	0.053	1.71	0.0001	0.023	0.5	4.34	130
4/4/07	7	20	4	33	3	4	21	4	0.001	0.034	0.0001	0.001	0.001	0.001		0.001	0.005	2.64	0.0001	0.028	0.4	0.02	30
26/4/07	2	19	4	36.5	4	4	17	4												0.03	0.6	0.02	540
4/6/07	3	18	5	47.6	3	5	26	4	0.001	0.103	0.0001	0.001	0.001	0.001	0.072	0.001	0.039	2.1	0.0001	0.039	0.3	0.1	110
14/6/07	13	6	9	58.4	4	6	24	4	0.0005	0.079	0.00005	0.0005	0.001	0.0005	0.351	0.003	0.024	1.13	0.00005	0.041	0.5	0.14	20
3/7/07	7	17	8	65.6	4	7	32	4	0.0005		0.00005	0.0005	0.0005	0.0005		0.002	0.045		0.00005	0.144	0.5	0.23	36
9/8/07	20	22	5	66.3	4	7	33	4	0.0005	0.108	0.00005	0.0005	0.0005	0.0005	0.233	0.001	0.033	1.79	0.00005	0.14	0.05	0.08	6
5/9/07	4	15	7	67.6	5	7	34	4	0.0005	0.114	0.00005	0.0005	0.0005	0.0005	0.243	0.002	0.034	2.37	0.00005	0.149	0.1	0.1	30
3/10/07	3	20	5	65	4	7	32	3	0.0005	0.044	0.00005	0.0005	0.0005	0.0005	0.403	0.002	0.007	2.06	0.00005	0.039	0.5	0.1	14
8/11/07	6	25	4	51.5	4	6	26	3	0.0005	0.114	0.00005	0.0005	0.0005	0.0005	0.141	0.001	0.038	3.92	0.00005	0.024	0.7	0.05	75
4/12/07	20	8	7	35.3	2	3	19	3	0.0005	0.038	0.00005	0.0005	0.001	0.0005	0.156	0.002	0.008	1.32	0.00005	0.051	0.5	0.05	540
2/1/08	9	21	4	55.8	4	6	30	3	0.0005		0.00005	0.0005	0.0005	0.0005		0.001	0.0025		0.00005		0.1	0.07	30
5/2/08	16	6	7	38.9	2	3	20	3	0.0005	0.032	0.00005	0.0005	0.002	0.0005	0.083	0.002	0.007	0.52	0.00005	0.005	0.6	0.08	370
11/3/08	14	11	2	50.5	2	4	26	3	0.0005	0.046	0.00005	0.0005	0.001	0.0005	0.185	0.002	0.0025	1.09	0.00005	0.047	1.3	0.08	480
1/4/08	4	17	1	63.5	3	6	33	3	0.0005	0.05	0.00005	0.0005	0.0005	0.0005	0.182	0.002	0.01	1.89	0.00005	0.014	0.4	0.005	45
28/4/08	14	6	1	40.3	2	4	18	3	0.0005	0.128	0.00005	0.0005	0.002	0.0005	0.173	0.002	0.062	0.63	0.00005	0.005	0.05	0.08	540
6/5/08	4	16	8	56.2	3	6	27	3	0.0005	0.125	0.00005	0.0005	0.0005	0.0005	0.249	0.002	0.045	1.07	0.00005	0.087	0.3	0.005	90
4/6/08	18	12	7	65.1	4	6	31	3	0.0005	0.14	0.00005	0.0005	0.002	0.0005	0.127	0.001	0.055	1.07	0.00005	0.032	0.3	0.03	790
8/7/08	2	14	6	76.6	4	7	33	3	0.0005	0.146	0.0001	0.0005	0.0005	0.0005	0.167	0.0005	0.056	0.87	0.00005	0.014	0.05	0.07	40
5/8/08		15	4	70.9	4	7	31	7	0.0005	0.13	0.00005	0.0005	0.0005	0.0005	0.145	0.0005	0.036	0.81	0.00005	0.034	0.4	0.05	10
10/9/08	8	4	5	47	3	4	24	3	0.0005	0.129	0.00005	0.0005	0.001	0.0005	0.193	0.001	0.057	0.74	0.00005	0.01	0.6	0.09	55
1/10/08	153	16	5	71	4	7	33	3	0.0005	0.132	0.00005	0.0005	0.0005	0.0005	0.146	0.001	0.05	1.12	0.00005	0.03	0.05	0.52	40
4/11/08	4	15	7	63	5	7	33	4	0.0005	0.051	0.0001	0.0005	0.002	0.0005	0.125	0.001	0.02	1.73	0.00005	0.03	0.05	0.1	40
4/12/08	3	21	0.5	63	4	6	29	3	0.0005	0.16	0.001	0.0005	0.002	0.0005	0.142	0.002	0.081	1.99	0.00005	0.02	0.05	0.04	45

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W24 Jilliby Jilliby Creek at Durren Rd Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06																							130
8/8/06																							
8/9/06	15	8	71	152	13	16	84	16		0.059			0.004		0.366	0.006	0.041	0.8		0.573	2.3	0.55	16000
18/10/06	42	75	7	117	9	14	60	6	0.003	0.096			0.003		4.14	0.011	0.027	9.52		0.163	3	0.68	540
9/11/06	54	65	4	116	8	13	65	7	0.002	0.073			0.001		2.44	0.007		10.6		0.111	2	0.66	
21/2/07																							
7/3/07	16	46	9	70.3	7	9	39	8	0.002	0.113	0.0001	0.001	0.003	0.0001	0.445	0.006	0.048	3.42	0.0001	0.354	1.5	0.68	110
4/4/07																							
26/4/07	102	59	7	61.9	8	10	35	9												0.407	4.4	1.08	920
4/6/07																							
14/6/07	16	8	13	89.3	5	8	42	4	0.0005	0.044	0.00005	0.0005	0.001	0.00005	0.147	0.002	0.012	1.11	0.00005	0.017	0.5	0.11	110
3/7/07	5	15		104	5	9	54	4	0.0005		0.00005	0.0005	0.0005	0.00005		0.003	0.056		0.00005	0.099	0.7	0.09	170
9/8/07	4	24	14	147	6	12	75	5	0.0005	0.107	0.00005	0.0005	0.002	0.0001	0.208	0.002	0.042	1.53	0.00005	0.027	0.2	0.15	55
5/9/07	2	22	10	118	6	11	63	5	0.0005	0.102	0.00005	0.0005	0.0005	0.00005	0.271	0.003	0.039	2.46	0.00005	0.079	0.4	0.15	70
3/10/07	4	28	12	135	6	12	70		0.0005	0.044	0.00005	0.0005	0.001	0.00005	0.215	0.002	0.006	4.11	0.00005	0.061	1.3	0.1	70
8/11/07	10	53	10	124	6	13	69	4	0.001	0.108	0.00005	0.0005	0.0005	0.00005	1.88	0.003	0.039	3.25	0.00005	0.097	1.2	0.21	260
4/12/07	57	8	3	30.3	2	3	18	4	0.0005	0.024	0.0043	0.0005	0.002	0.0043	0.106	0.003	0.011	1.07	0.00005	0.058	0.8	0.15	3000
2/1/08	4	30	9	101	5	10	56	3	0.002		0.00005	0.0005	0.002	0.00005		0.003	0.0025		0.00005	0.067	0.2	0.15	260
5/2/08	22	12	7	26.2	2	3	16	4	0.0005	0.024	0.00005	0.0005	0.003	0.00005	0.063	0.004	0.013	0.74	0.00005	0.005	0.9	0.17	550
11/3/08	11	14	8	44.4	2	4	26	4	0.0005	0.032	0.00005	0.0005	0.002	0.00005	0.214	0.003	0.006	1.34	0.00005	0.048	1.7	0.23	360
1/4/08	5	17	0.5	66.2	3	6	32	3	0.0005	0.052	0.00005	0.0005	0.001	0.00005	0.235	0.001	0.012	1.7	0.00005	0.046	0.5	0.005	60
28/4/08	22	9	0.5	37.2	2	3	19	3	0.0005	0.082	0.00005	0.0005	0.003	0.00005	0.108	0.003	0.046	0.72	0.00005	0.017	0.1	0.1	350
6/5/08	12	15	0.5	82.6	4	7	43	2	0.0005	0.132	0.00005	0.0005	0.0005	0.00005	0.176	0.002	0.052	1.4	0.00005	0.079	0.05	0.13	90
4/6/08	62	21	12	86.2	4	8	49	3	0.0005	0.132	0.00005	0.0005	0.002	0.00005	0.165	0.002	0.053	1.08	0.00005	0.072	0.6	0.25	11500
8/7/08	2	26	6	104	5	9	54	4	0.0005	0.096	0.00005	0.0005	0.0005	0.00005	0.092	0.001	0.043	1.25	0.00005	0.005	0.2	0.005	35
5/8/08		26	10	112	5	10	58	3	0.0005	0.121	0.00005	0.0005	0.001	0.00005	0.086	0.0005	0.036	0.94	0.00005	0.012	0.05	0.04	40
10/9/08	12	10	6	59	3	5	32	10	0.0005	0.204	0.00005	0.0005	0.003	0.00005	0.156	0.002	0.156	0.89	0.00005	0.11	0.4	0.005	200
1/10/08	244	29	0.5	105	5	10	58	4	0.0005	0.124	0.0002	0.0005	0.002	0.0002	0.189	0.002	0.014	1.94	0.00005	0.02	0.4	0.03	280
4/11/08	3	35	10	113	6	11	61	3	0.0005	0.035	0.00005	0.0005	0.002	0.00005	0.208	0.002	0.09	1.81	0.00005	0.03	0.2	0.005	90
4/12/08	7	30	8	96	5	8	51	4	0.0005	0.172	0.00005	0.0005	0.002	0.00005	0.299	0.003		2.02	0.00005	0.04	0.8	0.13	70

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W25 Jilliby Jilliby Creek Tributary at Durren Rd Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	36	55	18	154	13		90	19		0.032			0.006		0.637	0.002	0.012	0.3		1.28	4.2	6.14	9200
8/8/06	30	65	22	221	12		131	16	0.002	0.035			0.004		0.551	0.003	0.086	2.59		1.03	2.8	1.12	79
8/9/06	57	56	29	82.3	14	16	52	15	0.003	0.039		0.001	0.004		0.34	0.005	0.027	0.9		1.35	5.3	1.43	3500
18/10/06	4	33	15	102	5	14	59	6	0.001	0.033			0.013		0.385	0.002	0.008	2.04		0.214	1.2	0.21	220
9/11/06	9	61	13	100	10	13	54	13	0.002	0.017			0.002		0.577	0.002		1.69		1.25	3.8	0.94	
21/2/07													0.002										
7/3/07	11	75	25	356	12	9	194	12	0.002	0.092	0.0001	0.001		0.001	0.638	0.003	0.038	1.66	0.0001	0.483	1.8	0.56	350
4/4/07	4	56	7	78.6	7		47	10	0.003	0.018	0.0001	0.001	0.002	0.001		0.002	0.006	2.11	0.0001	0.091	13	0.38	12
26/4/07	15	69	11	62.7	9	10	37	18					0.001							2.11	5.9	3.25	1600
4/6/07	4	25	9	68.4	4		39	6	0.003	0.092	0.0001	0.001		0.001	0.272	0.002	0.048	2.66	0.0001	0.163	1.4	0.72	330
14/6/07	22	15	11	61.1	4	8	29	4	0.0005	0.034	0.0002	0.0005	0.001	0.0005	0.238	0.002	0.033	1.93.	0.00005	0.072	0.8	0.22	60
3/7/07	7	16	12	71.3	4	9	39	4	0.0005		0.00005	0.0005	0.002	0.0005		0.003	0.057		0.00005	0.118	1.1	0.23	220
9/8/07	5	29	12	126	6	12	67	6	0.005	0.095	0.00005	0.0005	0.0005	0.0005	0.209	0.002	0.041	1.74	0.00005	0.099	0.7	0.26	110
5/9/07	14	32	10	64.3	6	11	38	7	0.001	0.076	0.00005	0.0005	0.002	0.0005	0.677	0.003	0.045	2.89	0.00005	0.302	0.9	0.6	
3/10/07	4	34	8	85.4	6	12	49	5	0.0005	0.027	0.00005	0.0005	0.002	0.0005	0.215	0.002	0.006	4.11	0.00005	0.061	1.3	0.54	60
8/11/07	14	45	5	133	7	13	75	5	0.002	0.1	0.00005	0.0005	0.001	0.0005	0.875	0.002	0.045	2.69	0.00005	0.014	1.2	0.39	290
4/12/07	22	11	7	29.2	2	3	17	4	0.0005	0.019	0.0008	0.0005	0.0005	0.0005	0.077	0.003	0.011	1.19	0.00005	0.06	0.05	0.21	800
2/1/08	11	29	7	73.9	5	10	42	4	0.0005		0.00005	0.0005	0.003	0.0005		0.002	0.0025		0.00005	0.005	0.6	0.46	15
5/2/08	17	8	8	26.4	2	3	16	4	0.0005	0.02	0.00005	0.0005	0.0005	0.0005	0.045	0.003	0.012	0.7	0.0003	0.005	1.0	0.16	370
11/3/08	12	12	0.5	31.5	2	4	19	3	0.0005	0.024	0.00005	0.0005	0.003	0.0005	0.154	0.003	0.008	1.3	0.00005	0.071	1.6	0.12	320
1/4/08	26	27	0.5	99	4	6	54	4	0.0005	0.034	0.0005	0.0005	0.0036	0.0005	0.21	0.002	0.01	1.49	0.00005	0.038	0.5	0.05	130
28/4/08	11	9	0.5	34.2	2	3	17	3	0.001	0.08	0.00005	0.0005	0.002	0.0005	0.105	0.003	0.048	0.7	0.00005	0.016	0.5	0.16	240
6/5/08	10	21	2	60.1	3	7	31	3	0.0005	0.166	0.00005	0.002	0.003	0.0005	0.224	0.003	0.083	1.5	0.00005	0.165	0.9	0.19	55
4/6/08	13	27	4	93	5	8	53	6	0.0005	0.114	0.0001	0.0005	0.002	0.0005	0.182	0.002	0.064	1.13	0.00005	0.306	1.0	0.73	3500
8/7/08	7	24	12	99.8	5	9	55	4	0.0005	0.114	0.0002	0.0005	0.005	0.0005	0.097	0.002	0.062	1.28	0.00005	0.012	0.5	0.1	35
5/8/08		28	6	119	5	10	63	10	0.0005	0.098	0.00005	0.0005	0.002	0.0005	0.08	0.0005	0.032	0.75	0.00005	0.021	0.4	0.04	6
10/9/08	19	7	1	37	2	5	21	4	0.0005	0.053	0.00005	0.0005	0.001	0.0005	0.113	0.002	0.051	0.59	0.00005	0.13	0.7	0.07	210
1/10/08	220	25	11	85	4	10	48	4	0.0005	0.127	0.0001	0.0005	0.003	0.0005	0.299	0.002	0.059	1.49	0.00005	0.1	0.5	0.24	480
4/11/08	5	25	15	115	6	11	63	4	0.001	0.033	0.00005	0.0005	0.001	0.0005	0.339	0.002	0.022	1.44	0.00005	0.005	0.1	0.005	20
4/12/08	8	36	0.5	95	5	8	49	7	0.007	0.176	0.00005	0.0005	0.003	0.0005	0.637	0.003	0.099	1.78	0.00005	1.38	3.1	0.77	250

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W26 Hue Hue Creek at Hue Hue Road Crossing – Water Quality Monitoring

	Suspended Solids	Total Alkalinity as $CaCO_3$	Sulphate as SO_4^{2-}	Chloride	Calcium	Magnesium	Sodium	Potassium	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Zinc	Iron	Mercury	Ammonia as N	Total Kjeldahl Nitrogen	Total Phosphorus	Faecal Coliforms (CFU/100 ml)
*									0.013		0.0002		0.0014	0.0034	1.90	0.011	0.008		0.0006	0.020		0.05	
*									0.5		0.01	1	0.4-5	0.1	10	1	5	10	0.002				
*		500	400	400			300		0.005	1.0	0.005	0.05	1.0	0.05	0.10	0.10	5.0	0.30	0.001	0.01			150
*			500	250					0.007	0.7	0.002	0.05	2.0	0.01	0.5	0.02		0.3	0.001				0.00
18/7/06	39	2	14	93.8	6	10	40	8		0.038			0.006		0.031	0.002	0.037	0.55		0.025	1.4	0.09	790
8/8/06																							
8/9/06	14	8	12	68.2	3	5	50	4		0.018			0.002		0.014	0.002	0.016	1.05		0.031	1.0	0.18	9200
18/10/06	76	32	13	170	7	12	91	5		0.035			0.001		0.142	0.002	0.01	1.94		0.031	0.8	0.09	33
9/11/06	22	59	19	144	10	13	86	4		0.031			0.001		0.066	0.001		1.71		0.013	1.0	0.04	
21/2/07																							
7/3/07																							
4/4/07																							
26/4/07	18	9	7	61.6	3	4	32	4												0.015	1.5	0.09	1600
4/6/07	4	22	8	167	6	13	86	5	0.001	0.125	0.0001	0.001	0.001	0.001	0.099	0.003	0.054	2.46	0.0001	0.068	1.2	0.12	3
14/6/07	38	5	11	38.3	4	4	17	4	0.0005	0.111	0.00005	0.002	0.004	0.0005	0.541	0.003	0.093	1.32	0.00005	0.114	1.6	0.11	30
3/7/07	14	11	10	75.1	4	6	40	3	0.0005		0.00005	0.001	0.0005	0.0005		0.004	0.077		0.00005	0.024	2.0	0.59	170
9/8/07	15	22	11	116	5	9	62	4	0.0005	0.084	0.00005	0.0005	0.002	0.0005	0.042	0.002	0.055	1.17	0.00005	0.014	1.0	0.17	1
5/9/07	11	11	11	111	5	10	57	5	0.0005	0.084	0.00005	0.001	0.002	0.0005	0.82	0.002	0.057	1.7	0.00005	0.038	0.4	0.15	
3/10/07	20	22	12	118	6	9	63	4	0.002	0.029	0.0002	0.0005	0.002	0.0005	0.041	0.003	0.008	1.5	0.00005	0.02	1.2	0.09	2
8/11/07																							
4/12/07																							360
2/1/08	9	44	7	106	8	12	59	5	0.002		0.001	0.001	0.001	0.0005		0.005	0.006		0.00005	0.04	1.4	0.16	10
5/2/08	14	8	6	28.1	2	3	19	3	0.001	0.018	0.00005	0.0005	0.003	0.0005	0.039	0.004	0.017	1.44	0.00005	0.005	1.6	0.14	240
11/3/08	8	14	0.5	37.7	2	4	24	2	0.001	0.018	0.00005	0.002	0.003	0.0005	0.057	0.003	0.014	1.74	0.00005	0.022	2.4	0.08	270
1/4/08	17	28	1	87.4	3	7	50	4	0.001	0.029	0.00005	0.0005	0.001	0.0005	0.278	0.002	0.007	1.71	0.00005	0.153	0.8	0.23	50
28/4/08	10	10	0.5	36.1	2	3	19	2	0.0005	0.064	0.0001	0.0005	0.003	0.001	0.034	0.002	0.037	1.53	0.00005	0.005	0.2	0.15	240
6/5/08	15	9	0.5	63.5	3	5	33	3	0.001	0.118	0.00005	0.001	0.002	0.0005	0.068	0.003	0.067	1.37	0.00005	0.133	1.4	0.19	45
4/6/08	23	5	3	90.7	4	7	46	4	0.0005	0.149	0.0002	0.001	0.003	0.0005	0.052	0.002	0.091	1.17	0.00005	0.012	0.8	0.09	11600
8/7/08	7	7	22	229	10	19	113	5	0.0005	0.128	0.00005	0.0005	0.001	0.0005	0.047	0.002	0.076	1.05	0.00005	0.005	0.7	0.005	2
5/8/08		11	22	330	12	27	162	27	0.0005	0.148	0.00005	0.0005	0.0005	0.0005	0.084	0.001	0.048	0.43	0.00005	0.005	0.3	0.02	1
10/9/08	13	4	2	76	3	6	39	4	0.0005	0.032	0.00005	0.0005	0.004	0.0005	0.042	0.002	0.038	0.59	0.00005	0.06	0.8	0.07	210
1/10/08	380	8	17	151	6	11	79	5	0.0005	0.154	0.00005	0.0005	0.004	0.0005	0.109	0.004	0.08	1.03	0.00005	0.005	0.7	0.06	10
4/11/08	10	30	38	295	8	22	174	5	0.0005	0.053	0.0001	0.0005	0.01	0.0005	0.234	0.005	0.053	1.41	0.00005	0.06	0.7	0.005	35
4/12/08	13	9	0.5	126	5	10	58	4	0.0005	0.169	0.00005	0.0005	0.004	0.0005	0.167	0.004	0.134	1.35	0.00005	0.01	1.4	0.15	50

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