Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup

Local Water Management Strategy (LWMS)

December 2023

JDA Consultant Hydrologists

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1. EXECUTIVE SUMMARY

This Local Water Management Strategy (LWMS) has been prepared to support the Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup Structure Plan (CLE, 2023). The LWMS provides the framework for the application of total water cycle management to the commercial/industrial structure within the Structure Plan and is consistent with the requirements of the Murray District Water Management Plan [DWMP] (DoW, 2011), Nambeelup Industrial Area [NIA] District Water Management Strategy (DWMS) (JDA, 2016), Nambeelup Groundwater Modelling Report (Marillier, 2012) and Department of Water and Environmental Regulation's principles of Water Sensitive Urban Design as described in the Stormwater Management Manual (DWER, 2022).

A summary of the LWMS design principles and objectives is presented in Table 1.

TABLE 1: SUMMARY OF DWMP/DWMS KEY PRINCIPLES AND STRATEGIES AND LWMS DESIGN CRITERIA

Key Guiding Principles for a Water Sensitive Town:		
• Encourage environmentally responsible development • Provide integration with planning processes and clarity for agencies involved with implementation • To minimise public risk, including risk of injury or loss of life. • Protection of infrastructure and assets from flooding and inundation • To maintain the total water cycle.		
Key Principles	**DWMP/DWMS Strategies**	**LWMS Design Criteria**
1. Manage catchments to maintain or improve water resources	1.1 Minimise changes to hydrology • Development could help to mitigate potential impacts of climate change by careful design of drainage infrastructure (DWMP p51) • Marillier (2012) estimated predevelopment 35% gross recharge. • Development areas with higher gross recharge (>35% to 60%), then CGL set at AAMaxGL by wetlands to maintain AAMaxGL of wetland (JDA, 2016).	• Post-development surface water outflows in the critical 1% AEP event are, where practical, detained consistent with pre-development peak flows. • Industrial/Commercial lots are to retain the first 15 mm of rainfall in underground storage units, rainwater tanks or swales. • Subsoil drainage set at Controlled Groundwater Level (CGL) to control rise in groundwater levels; CGL to consider wetland hydrology, site water balance, water quality and potential for A.S.S.
	1.2 Maintain or improve water quality	• Implement non-structural measures such as reduction of nutrient inputs via land use change (from grazing to commercial/industrial) and nutrient-wise landscaping. Possibly limit fertiliser application to some road verges if required. • Implement best management practice water quality treatment trains for stormwater runoff and any subsoil discharge.
	1.3 Manage and restore waterways and wetlands 1.4 Safeguard the quality and availability of water resources for the future	• Manage infiltration device size to deliver desired recharge rates for groundwater aquifers. • Ensure development is outside the Nambeelup Brook floodplain/foreshore reserves or any classified wetlands.

TABLE 1 CONT'D: SUMMARY OF DWMP/DWMS KEY PRINCIPLES AND STRATEGIES AND LWMS DESIGN CRITERIA

Key Principles	DWMP/DWMS Strategies	LWMS Design Criteria
2. Manage flooding and inundation risks to human life and property	2.1 Provide adequate clearance from 1% AEP (100 year ARI) flooding and surface or groundwater inundation	• Finished levels of buildings to provide minimum 0.3 m clearance above 1% AEP flood level of arterial drains and local drainage systems including basins and roads. • Finished levels of buildings to provide minimum 0.5 m clearance above 1% AEP flood level of Nambeelup Brook; • Subsoil drainage/drains set at CGLs to control rise in groundwater levels. Subsoils in all road reserves. • Lot soakage devices sized to manage the first 15 mm of rainfall ('small' event)
	2.2 Do not cause flooding or inundation of upstream or adjacent developed areas 2.3 Manage surface water flows to prevent damage to downstream infrastructure and assets (not worsen existing risk)	• Meet DWMS arterial drain requirements for receiving flows from upstream and discharging to downstream • Restrict peak outflow from the development area for the 10% AEP (10 year ARI) and 1% AEP (100 year ARI). • Manage surface water flows from major events to protect infrastructure and assets from flooding and inundation.
3. Ensure the efficient use and re-use of water resources	3.1 Minimise water use within developments	• Implementation of hydro zoning and minimum 50% native plantings to minimise water use in open areas and streetscapes.
	3.2 Achieve highest-value use of fit-for-purpose water, considering all available forms of water for their potential as a resource	• Consider alternative fit for purpose water sources where appropriate and cost-effective. • Buildings are to comply with water efficiency standards introduced into the building code.

2. INTRODUCTION & PLANNING

This Local Water Management Strategy (LWMS) has been prepared by JDA Consultant Hydrologists on behalf of Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd) in support of the Lot 1221 (formerly Lot 221) Lakes Road and Part Lot 1400 (formerly Lot 400) Paterson Road, Nambeelup Structure Plan (CLE, 2023; Appendix A) which has an area of 202 ha and is herein referred to as the Study Area, Figure 1.

The LWMS provides the framework for the application of total water cycle management to the proposed residential/commercial structure, consistent with the Nambeelup Industrial Area LSP DWMS (JDA, 2016) and Department of Water and Environmental Regulation (DWER) principles of Water Sensitive Urban Design (WSUD) described in the Stormwater Management Manual for WA (DWER, 2022).

2.1 Planning Context

Better Urban Water Management [BUWM] (WAPC, 2008) outlines the water management investigation required for each stage of the land planning process.

2.1.1 Regional Planning

The Study Area is currently zoned ‘Industrial’ under the Peel Region Scheme (WAPC, 2019 - PRS Amendment 046/41) and ‘Industrial Development – Nambeelup’ under the Shire of Murray Local Planning Scheme No. 4 (Shire of Murray, 2020).

2.1.2 District Planning

The Study Area forms part of the Nambeelup Industrial District Structure Plan (DoP, 2016), attached as Appendix B.

The Nambeelup Industrial Area DWMS (JDA, 2016) provides guidance on water reuse options, stormwater detention basins, stormwater peak flows, groundwater management and structural and non-structural controls for stormwater treatment. The DWMS was approved by Shire of Murray and then Department of Water (DoW). The DWMS was guided and informed by the Murray Drainage and Water Management Plan [DWMP] (DoW, 2011).

2.1.3 Local Planning

The LWMS is presented in support of the Lot 1221 Lakes Road and Part Lot 1400 Paterson Road Structure Plan (CLE, 2023), attached as Appendix A, as part of the Better Urban Water Framework [BUWM] (WAPC, 2008). This LWMS develops surface water and groundwater management strategies at a local scale.

This LWMS has been prepared in accordance with the requirements of the DWMP (DoW, 2011) and DWMS (JDA, 2016).

A copy of the LWMS checklist from BUWM (WAPC, 2008) is included as Appendix C.

2.2 Policy Documents

The following water-related policies relevant to industrial developments apply:

State Planning Policy 2.9: Water Resources (WAPC, 2006)

- Requires new developments to follow a total water cycle approach to the consideration of water resources including the achievement of water sensitive urban design outcomes. To implement State Planning Policy 2.9, BUWM (WAPC, 2008) outlines the integration of the land use and water planning systems.

Liveable Neighbourhoods (WAPC, 2009) with following limitations:

- Liveable Neighbourhood is a WAPC operational policy used for the design and assessment of structure plans and subdivision for new urban (predominantly residential) areas. It includes information on water management.
- Note also the non-binding publication: Guidelines for Industrial Development (Perth Region NRM, 2010) was developed to raise awareness and guide implementation of sustainability principles in industrial developments. The guidelines were prepared as other publications primarily focused on residential developments.

The project site is located within the surface catchment of the Peel-Harvey Estuary and the following policies apply:

Environmental Protection (Peel Inlet-Harvey Estuary) Policy (EPA, 1992b)

- This document sets out environmental quality objectives to rehabilitate the Estuary and protect the Estuary from future degradation. The environmental quality objectives to be achieved and maintained for the Estuary includes a median annual load (mass) of total phosphorus flowing into the Estuary of less than 75 tonnes, with less than 21 tonnes from the Serpentine River.

Water Quality Improvement Plan (WQIP) for the Rivers and Estuary of the Peel-Harvey system – Phosphorus Management (EPA, 2008)

- The WQIP was prepared as an action plan to reduce phosphorus discharges from the catchment to meet the objectives outlined in the Environmental Protection Policy (EPA, 1992). The WQIP outlined expectations for all government and private activities including control actions related to agricultural practices and urban land use planning, including:
  - For land use planning and development, Water Sensitive Urban Design treatment trains are to be implemented in development areas.
  - Wastewater treatment plants must achieve zero discharge of Phosphorus to the environment.
  - Waterway protection – incentive programmes for fencing for stock exclusion and revegetation of degraded waterways and wetlands on private land.

Statement of Planning Policy No 2.1. The Peel-Harvey Coastal Plain Catchment (WAPC, 2003a)

- Any proposals to develop land for industry with liquid effluent, must include provision for connection to a reticulated sewerage system.

Note that a draft State Planning Policy (SPP) 2.9 was released for public comment in September 2021 which amalgamates and synthesises various SPPs into a single planning document including SPP 2.1 and SPP 2.9.

The following relevant documents also apply:

- State Water Recycling Strategy (DoW, 2008);
- Local Governmental Guidelines for Subdivision Development (IPWEA, 2017);
- Decision Process for Stormwater Management in Western Australia (DWER, 2017);
- Shire of Murray Local Planning Policy: Water Sensitive Urban Design (Shire of Murray, 2018a);
- Shire of Murray Local Planning Policy: Biodiversity Protection (Shire of Murray, 2018b);
- Australian Rainfall and Runoff (Ball *et al.* 2019); and
- Stormwater Management Manual for WA (DWER, 2022).

2.3 Previous Studies

2.3.1 Murray DWMP (DoW, 2011)

The *Murray Drainage and Water Management Plan* (Murray DWMP) provides key principles and strategies for development within the regional area, total water cycle considerations for the area and outlines Best Management Practice Tools (DoW, 2011). The DWMP study included the Nambeelup catchment and extended to the Lower Serpentine River, Peel Inlet/Harvey Estuary, Fauntleroy Drain and Murray River/Darling Range foothills, covering a total area of 375km^2. The Murray DWMP included multiple supporting technical studies to inform the plan, including the following:

Floodplain Studies:

- Murray DWMP and Associated Studies: Floodplain Development Strategy (GHD, 2010a) with some inputs from the Serpentine River Floodplain Management Strategy (SKM, 2010)

Murray hydrological studies: Surface water, groundwater and environmental water:

- Conceptual Model Report (Hall et al, 2010a);
- Model construction and calibration report (Hall et al, 2010b);
- Land development, drainage and climate scenario report (Hall et al, 2010c); and
- Acid sulfate soil risk assessment and hydrochemistry (Kretschmer *et al.*, 2011b)

Ecological water requirements for selected wetlands:

- Ecological water requirements for selected wetlands in the Murray drainage and water management plan area (GHD, 2010b);
- Wetland flora study (GHD, 2010c);
- Native fish and amphibian survey (GHD, 2010d); and
- Stygofauna baseline study (GHD, 2010e)

Nutrient Studies:

- Hydrological and nutrient modelling of the Peel-Harvey catchment (Kelsey *et al.*, 2011)
- Hydrological and nutrient modelling of the Peel-Harvey estuary catchment (Hennig *et al.*, 2021)

Managed Aquifer Recharge Study:

- Feasibility of managed aquifer recharge using drainage water study (Kretschmer et al, June 2011a)

2.3.2 Nambeelup Industrial Area DSP District Water Management Strategy (JDA, 2016)

The Nambeelup DWMS made use of the technical studies listed above in the Murray DWMP (DoW, 2011) in consideration of the pre-development environment and in development of post-development management strategy.

The Nambeelup District Water Management Strategy (JDA, 2016) informed the Nambeelup Industrial Area District Structure Plan (NIA DSP), a 1480 ha Study Area, consistent with WAPC's BUWM (2008).

The pre-existing environment includes groundwater and surface water regimes that interact at the natural surface, many wetlands and limited existing drainage infrastructure. There is also potential A.S.S., and varying water quality across the site indicating some areas have elevated nutrients from historical land use practices. Groundwater level contours are presented from the DoW-refined Nambeelup MIKE-SHE groundwater-surface water model (Marillier, 2012).

The DWMS considers all aspects of the total water cycle, and outlined strategies for groundwater management, arterial drainage and surface water management, water quality and nutrient management, and summarises the proposed water supply, conservation, reuse and wastewater planning. An integrated approach to water sensitive urban design was taken.

The Nambeelup DSP Groundwater MIKE-She modelling (Marillier, 2012) identified that industrial development will result in significantly less evapotranspiration loss from groundwater which can offset the drying climate change effects of reduced recharge to groundwater impacting on nearby wetlands and on minimum groundwater levels. Setting appropriate Controlled Groundwater Levels (CGLs) in areas such as Nambeelup is complex, with the need to consider freely draining outlet requirements, downstream level constraints, and any wetlands. A draft CGL was generally set below AAMaxGL in industrial areas further from wetlands where hydraulic grade to the outlet could be achieved and set at AAMaxGL beside wetland buffers.

2.4 Key Principles and Design Criteria

This LWMS document adopts the principles and strategies outlined in the *Nambeelup DWMS* (JDA, 2016) and *Murray DWMP* (DoW, 2011), and is consistent with the policies and guidelines above. The LWMS Design Criteria to meet the principles and strategies are shown in Table 1.

3. EXISTING SITE CHARACTERISTICS

3.1 Existing Land Use

The Study Area historically has been used for grazing livestock and farming. Two small sheds are located near the southern Study Area boundary with associated access via a crossover from Paterson Road. There are also two access points from Lakes Road and no residential dwelling associated with Lot 1221. A few groundwater dams have been constructed and are scattered across the Study Area. An aerial photo of the Study Area from September 2020 is shown in Figure 3.

Approximately 22% of the Study Area supports remnant, mostly degraded vegetation (Focused Vision Consulting [FVC], 2020). The rest of the Study Area has been cleared and largely comprises cleared open pasture with isolated trees and shrubs (FVC, 2020).

Wetlands are predominantly located in the north-west quadrant of the Study Area with smaller wetlands to the north-east boundary adjoining neighbouring lots.

Surrounding existing land uses are shown on Figure 1 and are predominantly cleared rural land used for cattle grazing. To the north is the Murrayfield Airport and numerous 2 ha lots the majority of which are dog kennels. To the east is predominantly native vegetation with an abattoir to the north of the lot. Lot 1400 to the south is partially cleared with an extensive area of trees and shrubs fringing Nambeelup Brook. Lot 1400 is generally zoned rural apart from areas north of Nambeelup Brook which forms part of the Study Area. Lot 1530 to the east has been rezoned industrial development and will likely undergo land use change in the near future. In addition, Lot 9001 (formerly Lot 600) to the north-west has been re-zoned industrial/commercial (‘Peel Business Park’) with construction of Stage 1 completed.

3.2 Topography

The topography of the Study Area, shown on Figure 3, is generally north-east to south-west from 14.5 mAHD to 7 mAHD but varies considerably across the Study Area. A sand mound generally surrounds the wetlands in the north-west quadrant with higher elevation mounds generally associated with areas of remnant vegetation.

3.3 Climate

The Nambeelup area is characterised by a Mediterranean climate with warm dry summers and cool wet winters.

Rainfall data is provided by the nearby Bureau of Meteorology *Mandurah* (Site ID. 009977; 2002-2020), *Pinjarra South* (Site ID. 009976; 2001-2020) and closed *Mandurah Park* (Site ID. 009572; 1907-2001) and *Pinjarra* (Site ID. 009596; 1907-2000) rainfall gauging stations, Figure 4. From the Study Area, the operating *Mandurah* and *Pinjarra South* gauges are 10 km east and 13 km south of the Study Area, respectively.

The long-term average annual rainfall, 1907 to 2020 is 830.7 mm at Mandurah and 905 mm at Pinjarra, Figure 4. The 30-year (1991-2020) and 10-year (2011-2020) average annual rainfall has significant declined with an approximate 14% decrease from long term average annual rainfall to the 30-year average annual rainfall at Mandurah (705.6 mm) and Pinjarra (759.7 mm). The decline to the 10-year average annual rainfall (2011-2020) is approximately 28% with 596.8 mm at Mandurah and 655.4 mm at Pinjarra. Rainfall decline at Nambeelup is consistent with decreasing rainfall across the entire south-west of Western Australia (DoW, 2015).

Pan evaporation is provided by the Department of Primary Industries and Regional Development (DPIRD) Pinjarra weather station (2013 – 2020) and which shows an average annual pan evaporation of 1,990 mm (DPIRD, 2021), Figure 4. This is significantly higher than the estimated pan evaporation in Luke (1987) of 1,650 mm.

3.4 Surface Geology and Soils

Regional Surface Geology

Surface geology mapped by Gozzard (1978) is show on Figure 5. The Study Area is generally mapped as Bassendean Sand (Qpb) with some areas identified as a thin veneer of Bassendean Sand overlying a thin wedge of Guildford Formation (Qpb/Qpa). Areas mapped as swamp deposits (Qhw) generally align with mapped wetlands. Nambeelup Brook and its immediate surrounds is mapped as Alluvium (Qha), Figure 5.

The Bassendean Sand is generally fine to medium grained and well sorted and is pale grey to white. A spatially intermittent layer of low-permeability iron-cemented sand (coffee rock), generally 0.5 to 1m thick, is common at the water table. The degree of iron-cementation and permeability of the sand can vary widely.

The Guildford Formation, where present, consists mainly of sandy clay and clay. The clays in the Nambeelup region are of alluvial origin. The base of the formation under the Study Area is expected to be between about -2 mAHD on the west and 6 mAHD on the east. The Guildford Formation unconformably overlies a sand aquifer which has been variably interpreted as Rockingham Sand or the Wanneroo Member of the Leederville Formation.

Local Surface Geology

A soil investigation for Lot 1221 of the Study Area was conducted by Bioscience in 2008. Shallow soil structure was investigated using hand auger; also used for determining the phosphate-binding characteristics of the soil profile. Surface soils were collected for analysis of pH, salinity, nutrient and organic content. Investigation of deeper soils (8 to 10 m) was conducted with the installation of groundwater bores using hollow stem auger (LP series) and sonic coring (T series), Section 3.6. and Figure 6..

Soils across the Study Area are generally Bassendean Sands over Guildford Clay with depth of sand ranging from 1 to 10 m based on topographic changes (Bioscience, 2008). Sands were unrounded and poorly sorted with a general gradual progression of sand to clayey sand to sandy clay to clay over a depth of 1 to 1.5 m. A ferruginous layer was generally found around the water table level, with discrete areas of lateric caprock close to surface including adjacent to the excavated soak near the western boundary and within the bed of Nambeelup Brook (Bioscience, 2008).

Soils in wetland areas are generally peaty sand to depths of about 0.4 m overlying white sands (Bioscience, 2008).

Extractable nutrients (PO_4, K, NH_4) were generally at low levels, typically restricted to the top 100 mm of soil and consistent with former fertilisation history of the Study Area (Bioscience, 2008).

A detailed geotechnical investigation of the Study Area will be conducted at the subdivision/UWMP stage.

3.5 Acid Sulphate Soils

The Study Area is classified as Class 2, having moderate to low risk of Acid Sulphate Soils (A.S.S) occurring less than 3 m from surface but high to moderate risk of A.S.S greater than 3 m below natural soil surface (DWER, 2015), Figure 5. Isolated areas are mapped as Class 1, having high to moderate risk of A.S.S within 3 m of natural surface and these coincide with areas mapped as swamp deposits (Qhw) and alluvium (Qha), shown in Figure 5 and discussed in Section 3.4.

A preliminary assessment of A.S.S by Bioscience in 2008 concluded that there was low risk of A.S.S in the sandy soils, even at depths below the groundwater table (Bioscience, 2008). However, A.S.S does exist in some of the wetland soils; consistent with DWER (2015) mapping.

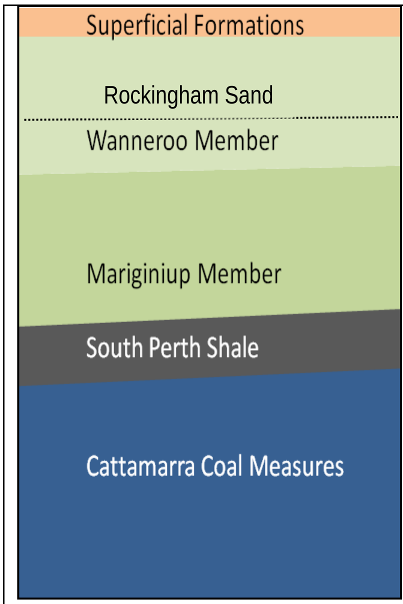
Detailed A.S.S. investigations will be undertaken at the time of subdivision. In the event that any A.S.S is encountered an Acid Sulphate Soil Management Plan will be prepared and implemented as part of the subdivision process in accordance with WAPC (2003b).

3.6 Groundwater

3.6.1 Hydrogeology

The Nambeelup area is underlain in succession by the following aquifers: Superficial Aquifer, Upper Leederville Aquifer (Wanneroo Member), Lower Leederville Aquifer (Mariginiup Member), and the Yarragadee (Cattamarra) Aquifer. The South Perth Shale is an aquiclude between the Lower Leederville and the Cattamarra.

The geological sequence in Artesian Monitoring Bore AM65 (2.215 mAHD natural surface), which is located near the western margin of the Nambeelup area and 3 km north-west from the Study Area, is as follows:



0 to 9 m	Superficial Formations (Bassendean Sand/ Bassendean Sand over Guilford alluvial clays)
9 to 60 m	Rockingham Sand (recently reinterpreted as Wanneroo) Water allocations as part of Superficial (DoW, 2012)
60 to 69 m	Wanneroo Member of Leederville Formation
69 to 188 m	Mariginiup Member of Leederville Formation (Lower Leederville)
188 to 208 m	South Perth Shale
208 to > 363 m	Cattamarra Coal Measures

Rockingham Sand has been interpreted by DWER as part of the Wanneroo Member (Kretschmer *et al.*, 2011b) but is managed in the Murray Groundwater Allocation Plan (DoW, 2012) as part of the superficial groundwater allocation due to the hydraulic connectivity of the Rockingham Sands to the superficial aquifer, Section 3.6.6.

Groundwater in the superficial aquifer is generally fresh, from 500 to 1000 mg/L of Total Dissolved Solids (TDS), however this aquifer is too thin to provide significant yields for abstraction bores. Groundwater flow in the superficial is generally from east to west towards Serpentine River. The superficial recharges the underlying Upper Leederville aquifer (Wanneroo Member) by downward leakage. Groundwater discharge occurs by several mechanisms including surface drains, wetland-related pond evaporation, evapotranspiration and abstraction. Salinity appears to be elevated where evapotranspiration is high.

The Leederville is a major regional aquifer, containing fresh to brackish groundwater (500 to 2000 mg/L TDS) in the upper part, and fresh groundwater (500 to 1000 mg/L TDS) in the lower part. It is composed of inter-bedded sandstone, siltstone and shale.

The South Perth Shale is an aquiclude and is only present on the western side of the Nambeelup area.

The Cattamarra Coal Measures contains brackish groundwater in this area (2000 to 2500 mg/L TDS), and is composed of sandstone with siltstone and shale interbeds.

3.6.2 Superficial Aquifer Bores and Measured Water Levels

Groundwater monitoring bores were installed by several consultants between 2002 and 2007.

Parsons Brinckerhoff [PB] were appointed by the then Department of Planning in 2002 to conduct pre-development monitoring across the then proposed 'Lakes Road Industrial Site'. This proposed area was similar to the eventual Nambeelup Industrial DSP area, Figure 1, but excluded lots to the east of Nambeelup Road. 13 bores were constructed, NB01 to NB13, with three – NB03, NB04 and NB05 within Lot 1221 of the Study Area. The PB bores were drilled by hollow stem auger and completed using 50 mm PVC casing with 3 m slotted section at the base. The bore annulus was backfiled with quartz sands and a bentonite seal placed towards the top of the annulus. PB bores were monitored from August 2004 to November 2005 and August 2007 to July 2009 by PB for Landcorp and from May to December 2011 by JDA.

RPS and BBG were appointed by Clough Nambeelup and Westprime Asset Joint Venture in 2006 to install 20 monitoring bores, LP1 to LP20, across the Joint Venture landholding with 4 – LP1, LP2, LP3 and LP4 within Lot 1221. The RPS/BBG bores were drilled by hollow stem auger, completed using 50 mm PVC casing and screened from the majority of the bore depth with sand (LP2 only), bentonite seal and gravel packs above the screened depth.

To obtain greater detail of groundwater within Lot 1221 of the Study Area, Bioscience and Groundwater Consulting Services [GCS] were appointed by Clough Nambeelup and Westprime Asset Joint Venture in 2017 to install 3 groundwater bores, T1 to T3, through the central area of Lot 1221. The bores were installed by Strata Probe using a sonic rig and completed with 50 mm PVC casing and a 2 m slotted section at the base of the bore.

The RPS/BBG and Bioscience/GCS bores were monitored fortnightly in winter and monthly in summer by Bioscience/GCS from October 2006 to October 2008 and from May to December 2011 by JDA.

Table 2 presents a summary of bore location co-ordinates, top of casing, total depth and screened interval for the groundwater monitoring bores in the Study Area with locations shown on Figure 6. Lithological logs for all bores are included in Appendix D.

TABLE 2: GROUNDWATER BORE DETAILS

Monitoring Bore	GPS Coordinates (GDA 94 Zone 50)		Top of Casing (mAHD)	Total Depth (mbNS)	Screened intervals (mBNS)	Date Completed
	Easting	Northing				
PB Bores						
NB03	391169	6401707	15.14	6.55	N/A	22/10/2002
NB04	390438	6402235	13.45	5.70	N/A	22/10/2002
NB05	389826	6401228	7.97	6.07	N/A	22/10/2002
RPS Bores						
LP1	389545	6402280	7.70	3.5	0.50 – 3.50	06/06/2006
LP2	389635	6401250	7.40	4.5	1.50 – 4.50	06/06/2006
LP3	391271	6402304	15.9	3.8	0.75 – 3.80	06/06/2006
LP4	391280	6401263	13.3	4.8	0.25 – 4.80	06/06/2006
Bioscience/GCS Bores						
T1	389849	6401726	8.31	3.00	1.00 – 3.00	02/2007
T2	390207	6401642	14.64	8.00	6.00 – 8.00	02/2007
T3	309057	6401549	12.49	6.50	2.50 – 4.50	02/2007

Note: mBNS = metres below natural surface; N/A = not available.

Groundwater levels measured in the 3 monitoring programs are shown on Figure 7. Groundwater flow direction is generally north-east to south-west with groundwater intercepted by rural drains and wetlands across the Study Area

(Section 3.7 and 3.8). Over a majority of the Study Area, the seasonal fluctuation in the watertable results in the watertable being close to the natural surface level for a few months of the year, and in wetland areas at natural surface. The pre-development monitoring report (JDA, 2013) is attached as Appendix D.

3.6.3 Seasonal Variation of the Water Table (Superficial Aquifer)

The water table rises as a result of the vertical recharge of rainfall in winter months to the watertable being greater than the horizontal groundwater flow through the Superficial Aquifer. Equilibrium is reached when the groundwater gradient is sufficiently steep to enable all of the recharge to be transmitted as groundwater flow. At this stage the watertable will be at its maximum level. During periods of little or no recharge the groundwater flow will subside and hydraulic gradients will decline. Evapotranspiration also contributes to groundwater fall over summer and autumn months. This cycle is repeated seasonally and is dependent on the amount and intensity of rainfall and evapotranspiration (Davidson, 2006). The winter maximum varies from year to year consistent with the variation in the amount and intensity of rainfall and evapotranspiration.

Seasonal variation in the groundwater levels measured between summer and winter during the 2006-2008 monitoring period varied from 0.82 m (NB03) to 1.44 m (LP1) across the Study Area. Seasonal variation differs across the Study Area due to presence of rural drains, wetlands and Nambeelup Brook controlling groundwater levels in areas from rising and ponding at natural surface.

3.6.4 Modelled Groundwater Levels, District AAMaxGL & AAMinGL

The Murray DWMP (DoW, 2011) identified significant interaction between groundwater and surface water in the Nambeelup Area. The DWMP and DWMS therefore used the DHI Mike-SHE model to simulate groundwater-surface water interaction at a regional and then district scale.

The Nambeelup DMWS (JDA, 2016) included the Nambeelup groundwater modelling report by DoW (Marillier, 2012) as a supporting technical document. In summary, the Nambeelup Mike-SHE model used a 40 m grid and achieved an average residual error of 0.25 m for water level calibration against bore and surface water monitoring data, although individual bore error could be greater (Marillier, 2012; JDA, 2012). A summary of the monitoring bores and levels is included in Marillier (2012) for calibration comparison. The base case scenario of the model represents district scale long-term historical groundwater fluctuations for the 30 year period 1978 to 2007. The Nambeelup DWMS presented the resultant 1978-2007 modelled maximum groundwater level (MaxGL), average annual maximum groundwater level (AAMaxGL), average groundwater level (AverageGL), average annual minimum groundwater level (AAMinGL) and minimum groundwater level (MinGL) surfaces for the Model Area.

The modelled AAMaxGL (1978-2007) from Marillier (2012) is presented in Figure 8, along with the Study Area monitoring bore locations. The contours indicate groundwater flow from north-east to south-west, with a maximum of approximately 15 mAHD at the north-east corner of the Study Area and a minimum of approximately 5 mAHD at the south-west corner. Depth to AAMaxGL below natural surface is shown on Figure 9. Depth to AAMaxGL is largely influenced by the non-uniform topography across the Study Area (Figure 3), particularly on the western half where topographic depressions result in AAMaxGL less than 0.5 m below natural surface and at surface within or adjacent to wetland areas and rural drains. Topographic peaks across the eastern half result in areas with AAMaxGL greater than 1 m below natural surface.

Modelled groundwater levels incorporate the influence of monitored classified wetlands but not all wetlands nor any local rural drains such as those across the Study Area.

To check the modelled AAMaxGL, high-resolution NearMap aerial photography was reviewed for winter months between 2009 and 2021 to observe if groundwater was ponding above natural surface. Aerial photos from September

2009 and August 2017 suggest groundwater at or near surface in a number of areas. In some areas, particularly the north-east, the rural drains appear to prevent groundwater from reaching surface but the natural surface appears damp and it is likely that the natural surface is saturated from the capillary fringe above the watertable. The aerial photograph for August 2021 shows water ponding west of Paterson Road and likely reflects groundwater which used to flow into Paterson Drain ponding at surface. In general, aerial photography agrees with the modelled AAMaxGL in identifying areas where groundwater is at or near surface.

3.6.5 Groundwater Quality

Groundwater sampling was conducted in October 2002 (NB series) by PB, in 2006 (LP bores) and August 2007 (all bores) by Bioscience/CGS, between 2006 and 2008 and by JDA between June and November 2011 (all bores).

A summary of groundwater median water from JDA monitoring (JDA, 2013) is presented in Table 3.

A summary of water quality parameters are as follows:

- pH is generally acidic with bore mean values ranging from 4.55 to 6.33, which is typical for the Peel-Harvey coastal catchment.
- Salinity, most accurately measured by Total Dissolved Solids (TDS) ranged from 125 to 718 mg/L with no clear spatial trends and is generally categorised as fresh (< 500 mg/L TDS) except for LP1 and NB05 which are marginally saline (500 – 1000 mg/L TDS). Mean Electrical Conductivity (EC), an indicator of salinity, ranged from 0.24 mS/cm at T2 to 1.08 mS/cm at NB05. The predominant ions are sodium chloride (Na-Cl) with EC mostly greater than 0.3 mS/cm, the adopted ANZECC/ARMCANZ (2000) guideline.
- Mean concentrations of TN, TP and dissolved nutrients (NO_x_N, NH_4_N, PO_4_P) across the Study Area are generally higher than adopted ANZECC/ARMCANZ (2000) guidelines, which is expected given the open pasture land use across the Study Area and surrounding lots.

  Mean Total Nitrogen (TN) concentrations generally exceeded the guideline value (1.2 mg/L) except in LP1 (1 mg/L) and NB04 (1.1 mg/L) which were just below and NB05 (0.46 mg/L).

  Nitrogen concentrations are mostly in dissolved rather than particulate form with either high concentrations of dissolved ammonium (NH4_N) or oxides of nitrogen (NOx_N) with no clear spatial trend across the Study Area.
- Mean Total Phosphorus (TP) concentrations ranged from 0.02 to 0.12 mg/L and exceeded the ANZECC/ARMCANZ (2000) guideline value of 0.065 mg/L in NB03, T1, LP2 and LP4. Concentrations were all below the EPA (2008) target of 0.2 mg/L. There is no clear spatial trend evident of phosphorus concentrations across the Study Area.

  Most of the Phosphorus was in particulate form with phosphorus in dissolved form as measured by Filterable Reactive Phosphorus (FRP) or PO_4_P, high in NB03 and LP2. Phosphorus concentrations are consistent with the existing grazing land use of the Study Area and pre-development monitoring for the wider Nambeelup DSP Area.
- All metals (except aluminium and iron) were within guideline values. Aluminium values are consistent with groundwater in the Peel region. Iron concentrations are variable across the Study Area, with a minimum mean value of 0.04 mg/L at T2 and a maximum mean value of 17 mg/L at T1.
- Major ion concentrations were generally within guideline values (where applicable). Mean Calcium (Ca^{+2}) and Sulphate (SO_4^{-2}) concentrations were highest in bore NB05 and which had the highest mean EC and TDS across the Study Area.

TABLE 3: PRE-DEVELOPMENT MEAN GROUNDWATER WATER QUALITY

Parameter	LOR[1)]	Guideline Values	NB03	NB04	NB05	T1	T2	T3	LP1	LP2	LP3	LP4
A. Physio-chemical												
pH	0.05	6.5-8.0[2)]	5.13	5.34	5.97	6.21	4.72	5.37	6.07	6.09	6.33	4.55
EC (mS/cm) [in situ.]	0.01	0.12-0.3[2)];	0.3	0.42	1.08	0.27	0.24	0.6	0.82	0.39	0.36	0.74
TDS (mg/L)		NA	148	125	718	155	138	300	518	180	133	418
B. Nutrients (mg/L)												
TN	0.05	<1.2[2)]	1.4	1.1	0.46	1.43	3.2	2.2	1	1.3	1.48	2.9
TKN	0.05	NA	1.3	1.1	0.48	1	0.62	1.9	0.95	0.68	0.4	2.1
NH_4_N	0.005	<0.08[2)]	0.47	0.74	0.38	0.52	0.03	1.35	0.099	0.28	0.091	0.213
NO_x_N	0.005	<0.15[2)]	0.102	0.006	0.007	0.4	2.6	0.25	0.061	0.608	1.09	0.31
TP	0.01	<0.065[2)]	0.09	0.03	0.02	0.08	0.02	0.04	0.05	0.12	0.04	0.11
PO_4_P	0.005	<0.04[2)]	0.06	0.016	0.005	<0.005	0.006	0.006	0.006	0.1	0.011	0.03
C. Metals (mg/L)												
Aluminium, Al	0.005	<2[4)]	0.48	1.3	0.04	0.53	0.08	2	0.22	0.22	0.13	2.6
Arsenic, As	0.001	<0.07[4)]	<0.001	<0.001	0.001	0.005	<0.001	0.001	0.004	0.002	<0.001	0.001
Cadmium, Cd	0.001	<0.02[4)]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium, Cr	0.005	<0.001[3)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper, Cu	0.005	<0.0014[3)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron, Fe	0.01	<0.3[3)]	0.09	0.43	8.1	17	0.04	2.3	2.1	2.6	0.45	2
Lead, Pb	0.001	<0.0034[3)]	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.002
Manganese, Mn	0.005	<1.9[3)]	<0.005	<0.005	0.027	0.063	<0.005	0.007	0.16	0.019	<0.005	0.014
Mercury, Hg	0.0001	<0.0019[3)]	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium, Se	0.005	<0.005[3]	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002
Zinc, Zn	0.01	<0.008[3]	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
D. Major Ions (mg/L)												
Calcium, Ca^{+2}	0.1	N/A	3.1	1.3	185	1.4	3.8	3.5	16	18	28	6
Magnesium, Mg^{+2}	0.1	NA	4.7	4.3	8.7	5.9	5.3	9.5	32	7.3	3.2	14
Potassium, K^+	0.1	NA	1.8	1.7	7.8	4.5	5.6	3.3	2.5	10.2	1.4	10.1
Sodium, Na^+ (mg/L)	1	<300[3)]	25	25	15	22	21	62	87	15	12	7.3
Bicarbonate, HCO_3^-	1	NA	10.5	20	31	32	4	14	60	50	73	5
Carbonate, CO_3^{-2}	1	NA	1	1	1	1	1	1	1	1	1	1
Chloride, Cl^-	1	<400[3)]	36.3	37.5	33	39	43	125	135	28	20	140
Sulphate, SO_4^{-2}	1	<400[3)]	5.5	4	478	5	11	4	120	43	7	29

Notes:

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.

Exceedances of Guideline Values in red

NA: Not Available

3.6.6 Groundwater Resources

The Department of Water and Environmental Regulation manages the groundwater of the State under the Rights in Water and Irrigation Act 1914 (RIWI Act). The Study Area is located within the Murray Groundwater Management Area and the *Murray Groundwater Allocation Plan* sets out the allocation limits (DoW, 2012). Department of Water and Environmental Regulation groundwater allocation limits and remaining available abstractions from the relevant aquifers in the 281 km^2 Nambeelup Sub-area are shown in Table 4, dated 06 September 2021.

TABLE 4: DWER GROUNDWATER RESOURCE ALLOCATION LIMITS & AVAILABILITY, SEPTEMBER 2021

GW Sub Area	Aquifer Categories	Allocation Limit Licensable component, (kL/yr)	Allocated committed & requested (kL/yr)	% Allocated committed & requested	Balance Available excluding requested (kL/yr)
Nambeelup	Superficial Swan (includes Rockingham sands)	12,100,000 (+1 400 000 unlicensed)	9,086,456	75	2,619,304
	Upper Leederville	3,000,000	1,367,434	46	1,632,566
	Lower Leederville	2,000,000	2,159,945	108	0
	Cattamarra (Yarragadee)	600,000	599,500	100	0

The Superficial Swan aquifer is 75% allocated, committed and additionally requested, however, only 3,436,456 kL/year or 28.5% has been allocated with 15,000 kL/year committed and 5,650,000 kL/year (47% of the allocation limit) additionally requested. Of the additionally requested total, JDA understands this includes a single request of greater than 3,000,000 kL/year which has been under EPA review since late-2017 and may change pending the outcome of the review process (pers. comm. DWER, August 2020).

3.7 Surface Water

3.7.1 Regional Surface Water (Nambeelup Brook, Serpentine River)

Regional surface water features include the Serpentine River and its floodplain which encompasses the regionally significant Goegrup and Black Lakes. Nambeelup Brook is a tributary of the Serpentine that drains into Black Lake.

The Murray DWMP regional scale 2D flood model provides estimated flows, levels and floodplains for the major regional waterways including the Serpentine River and Nambeelup Brook (DoW, 2011). Nambeelup Brook and its floodplain intersects the Study Area at the southern boundary with the Study Ara and DSP boundary on the south-eastern boundary reflecting that of the floodplain. Nambeelup Brook floodway, flood fringe and modelled 100 year ARI (1% AEP) flood levels (mAHD) for the Brook adjacent to the Study Area are shown in Figure 10.

3.7.2 District Surface Water

District surface water catchments, as delineated in the DWMS (JDA, 2016), and pre-development flow paths are shown in Figure 11. Discharge from the Study Area is via a series of rural drains, Figure 10, which have a dual function of draining surface water and lowering groundwater levels.

The Study Area is within four district catchments, 'NB2A', 'NB2.E', 'NB3A' and 'NB3B', shown in Figure 11. District catchments are divided into sub-catchments (e.g. NB2A and NB2A.2) based on pre-development cadastral boundaries (Figure 1). Outflow from district catchments is generally southward towards Nambeelup Brook except for the RE/CC wetlands within the centre of the Study Area ('NB2.E') which drains northward to the Lakes Road drain and thereafter westward to the Paterson Road drain and then southward to Nambeelup Brook. The DWMS (JDA, 2016) estimated pre-development peak outflows for the 100 year ARI (1% AEP) at 0.92 m^3/s for catchment 'NB2A' and 2.45 m^3/s for catchments 'NB3A' and 'NB3B', Figure 11. Wetland catchment 'NB2.E' forms part of the wider DSP POS and will have similar peak outflow pre- to post-development.

3.7.3 Measured Surface Water Levels

In August 2008, JDA installed 10 surface water monitoring sites, S1 to S10, on five adjoining lots south of Lakes Road, with S10 the only site within Lot 1221 and on Nambeelup Brook (JDA, 2009). Two additional monitoring sites, S11 and S12, were installed in July 2009 on drains outflows at the Lot 1221 southern boundary from district catchments 'NB2A' and 'NB3A'/'NB3B' to Nambeelup Brook (JDA, 2011), Figure 10. A further five monitoring sites, S13 to S17, were installed on Lot 1221 in June 2011 upstream of S11 and S12 monitoring sites with S15 located within the central CC wetland (JDA, 2013). Locations of surface water monitoring sites on Lot 1221 are shown on Figure 10.

Monitoring sites were equipped with 1 m staff gauge plates, continuous water level data loggers (except S16) and a peak water level indicator. Continuous water levels were recorded using pressure sensor and barometric data recorders (S10) and capacitance loggers (S11-15, S17). Pressure sensor loggers were compensated by barometric record at each site visit. Water level data across all sites were calibrated to manual still water level measurements. The peak level indicator was used as a secondary check ensuring data integrity. Cease to Flow (CTF) for monitoring sites was either natural sand/rock bars or low profile concrete v-notch weirs.

For Lot 1221, site visits (level and discharge measurements) were conducted between August 2008 and October 2009 (S10 – S12), May to December 2010 (S10 – S12) and May to December 2011 (S10 – S17). With the exception of SP10 which is located on Nambeelup Brook, surface monitoring sites within Lot 1221 of the Study Area were generally not flowing during site visits across 2009 to 2011. Discharge measurements were conducted for S11 and S12 between July and October 2009 however no time series data was collected. Due to the lack of observed flow across 2010 and 2011, S11 to S17 could not be rated and converted into flows.

Base flow depths at outflow locations from Lot 1221 to Nambeelup Brook (S11 and S12) were generally 0.05 to 0.15 m.

Monitoring Data and analysis from JDA (2009; 2011 & 2013) for years 2008/09, 2010 and 2011 respectively are included in Appendices D and E. Additional surface water monitoring for one winter period will be performed prior to preparation of any UWMP for the Study Area.

3.7.4 Surface Water Quality

Regional:

The Department of Water undertook an investigation into the Hydrological and Nutrient Modelling of the Peel-Harvey Catchment (Kelsey *et al.*, 2011) to assess current nutrient loads and predict future loads based on potential land management interventions. Measured median winter nutrient concentrations for receiving water environments from the Nambeelup DSP area are presented in JDA (2016) and summarised in Table 5 below. Recent investigations on the Peel-Harvey in Hennig et al. (2021) suggest similar winter median concentrations (Table 5) and were based on more recent observations (2000 – 2015) in then Nambeelup catchment.

TABLE 5: REGIONAL WINTER MEDIAN NUTRIENT CONCENTRATIONS

Data Source	Catchment	Measured winter median Total Phosphorus concentration (mg/L)	Measured winter median Total Nitrogen concentration (mg/L)
DoW (2011) Kelsey *et. al.* (2011)	Nambeelup Brook	0.62	3.0
Hennig et al. (2021)	Nambeelup	0.58	3.6
JDA (2016) Monitoring of existing surface discharge from DWMS Area towards Nambeelup Brook and part lower Serpentine (except Gull Road drain)		0.12 to 0.52	1.5 to 3.8

The WQIP for the Peel-Harvey Estuary system (EPA, 2008) set short- and long-term targets for Total Phosphorus reduction to 0.2 mg/L and 0.1 mg/L respectively. The ANZECC (2000a) lowland river target for Total Nitrogen is 1.2mg/L. Pre-development median winter TP and TN concentration outflows from the DSP area, Table 6, exceed future target limits and are reflective of current open pasture land across the DSP area (Figure 1).

Study Area:

JDA monitored surface water quality across a number of surface water sites in Lot 1221 of the Study Area and the wider Nambeelup area (Section 3.7.3). Monitoring sites were either dry or stagnant at the time of JDA's site visits in 2010 and 2011. Lot 1221 outflows sites to Nambeelup Brook, S11 and S12, were flowing during July, August and September 2009 visits and were sampled and analysed for pH, EC, nutrient and dissolved metal concentrations. A summary of water quality monitoring data July to September 2009 is given in Table 6.

The following sets of concentration-based guidelines are compared with the water quality data provided in Table 6:

- ANZECC and ARMCANZ (2000) default trigger values for physical and chemical stressors for south-west Australia for slightly disturbed ecosystems lowland river. The values presented are a guide to the range outside of which water quality problems and adverse biological impacts may occur. These guidelines are useful as a starting point for comparison where regional data does not exist.
- ANZECC and ARMCANZ (2000) default trigger values for drinking water quality.
- EPA (2007) target on phosphorus loading in draft Water Quality Improvement Plan for Peel Harvey Catchment.

The surface water monitoring locations S11 and S12 are located in winter waterlogged areas, where the groundwater rises up to the ground level. The winter surface water samples in Table 6 represent the combination of shallow groundwater discharge and surface water runoff quality.

TABLE 6: PRE-DEVELOPMENT SURFACE WATER QUALITY SUMMARY

Parameter	LOR 1)	Guideline Value	Location: S11			Location: S12		
			21/07/09	18/08/09	01/10/09	21/07/09	18/08/09	01/10/09
A. Physico-chemical								
pH	0.05	6.5-8.0 2)	4.98	6.25	5.8	5.48	5.58	4.66
EC (µS/cm)	1	120-300 2)	340	250	290	280	200	290
B. Nutrients (mg/L)								
TN	0.05	≤1.2 2)	3.5	4.1	2.1	2.5	3.6	2.3
TKN	0.05	NA	3.5	4.1	2.1	2.5	3.6	2.3
NO_3_N	0.01	NA	<0.01	<0.01	<0.01	<0.1	<0.1	<0.1
TP	0.01	≤0.065 2) ; ≤0.1 5)	0.12	0.09	0.12	0.41	0.16	0.36
PO_4_P	0.005	≤0.04 2)	0.052	0.035	0.047	0.091	0.042	0.091
C. Metals (mg/L)								
Arsenic, As	0.001	≤0.05 3) ; ≤0.007 4)	0.001	<0.001	<0.001	0.003	<0.001	0.008
Cadmium, Cd	0.001	≤0.005 3) ; ≤0.002 4)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005
Chromium, Cr	0.001	≤0.05 3); ≤0.005 4)	0.001	0.002	0.001	<0.001	0.001	<0.001
Copper, Cu	0.005	≤0.005 4)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead, Pb	0.001	≤0.05 3) ; ≤0.01 4)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Hg	0.0001	≤0.001 3),4)	<0.0001	0.0002	<0.0001	<0.0001	0.0003	0.0001
Zinc, Zn	0.005	≤5 3) ;≤3 4)	0.014	0.01	0.024	0.009	0.018	0.018

Notes: 1) Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision; values lower than LOR are shaded.
2) ANZECC and ARMCANZ (2000) Default trigger values for south-west Australia for slightly disturbed ecosystem for lowland river ecosystem (Table 3.3.6 and Table 3.3.7).
3) ANZECC and ARMCANZ (2000) Water quality guidelines for recreational purposes; general chemical (Table 5.2.3).
4) ANZECC and ARMCANZ (2000) Water quality guidelines for drinking water.
5) EPA (2007) Draft WQIP Serpentine River target on phosphorus annual loading of less than 21 tonnes, with median winter concentration 0.1 mg/L.
Guideline values exceedance printed in red.
NA: Not Available

3.8 Wetlands & Protection Requirements

3.8.1 Hydrological regime of wetland systems

At a regional scale, the Geomorphic Wetland classification of lake, sumplands, damplands or palusplains gives a broad indication of a wetland hydrological regime. The definitions along with concepts in relation to water table fluctuation are shown on the chart below (Hill *et al.*, 1996). Wetlands categorised as damplands or palusplains are not inundated during the winter maximum level (Hill *et al.*, 1996).

Sumpland – seasonally inundated basin

Dampland – seasonally waterlogged basin

Palusplain – seasonally waterlogged flats (flat landform)

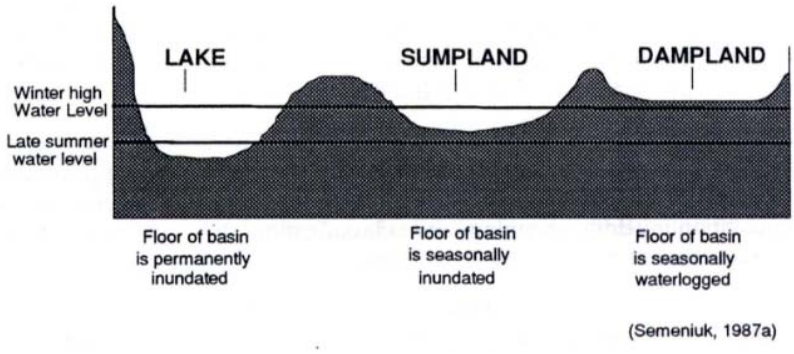


CHART 1: WATER LEVEL FLUCTUATION IN RELATION TO A BASIN SHAPED WETLAND LANDFORM (HILL ET AL, 1996).

The hydrological regime of key selected wetlands was studied in detail as part of the DWMS (JDA, 2016). The effects of developing the site and the impacts that drainage may have on wetlands will need to be carefully managed, with to avoid adversely impacting the wetlands as set out in the DWMS (JDA, 2016).

3.8.2 Ramsar wetland

The Study Area is within the Serpentine Catchment and drains to the Peel-Harvey Estuary, which is part of the Peel Yalgorup system which is listed as a Ramsar Wetland of International Significance. The system is vulnerable to high nutrient load discharges from surrounding land uses, and the Environmental Protection (Peel Inlet-Harvey Estuary) Policy (EPA, 1992) sets out environmental quality objectives for protection of the Estuary. This includes a set Phosphorus load discharge targets, with the median annual load of Total Phosphorus flowing into the estuary from the Serpentine River being less than 21 tonnes/year.

Water quality modelling by Kelsey *et al.* (2011) using the SQUARE software estimated the Nambeelup Brook 143 km^2 sub-catchment discharges 10.5 tonnes/year TP and the Lower Serpentine 92 km^2 sub-catchment discharges 2.9 tonnes/year TP. To reduce phosphorus discharge to meet the EPP policy load target, the allowable phosphorus export load per unit developed area is set at 0.3 kg/ha/year (DoW, 2011; Kelsey *et al.*, 2011). Measures that could be implemented to achieve phosphorus load reductions to the Estuary are detailed in EPA (2008).

3.8.3 Study Area wetlands

Geomorphic wetland mapping of the Swan Coastal Plain (DBCA, 2018) identifies two Conservation Category [CC] and three Resource Enhancement [RE] wetlands partly or wholly within the Study Area, Figure 11. In the centre of the Study Area is a small RE dampland (UFI: 14438) hydrologically linked by a shallow open drain to a down-gradient combined CC/RE sumpland (UFIs: 4834, 4835), Figure 11. Water levels in this wetland (UFI 4834 & 4835) north and south of Lakes Road are controlled by a Ø450 mm balancing culvert.

Multiple Use palusplain and sumpland scattered around the Study Area, Figure 11, reflect low-lying areas with groundwater at or near surface, Figure 10.

A CC sumpland (UFI: 14424) and RE sumpland (UFI: 5127) marginally intersect the Study Area on the eastern boundary but are mostly within the neighbouring site.

All CC/RE wetlands within the Study Area form part of future-POS designated as part of the DSP, Figure 13 and Appendix B.

The hydrological regime of the wetlands pre-development and post-development was modelled by DoW in MIKE-SHE to support the Nambeelup Industiral Area DSP (Marillier, 2012) and which covered the whole DWMS area.

The Marillier (2012) model used the same scale grid as the DWMP Lakes Road Wetland Model (DoW, 2011) and refined the land use. The model included additional calibration data over the Nambeelup DWMS area up to 23 August 2010, data of which was not available for the DoW (2011) wetland model. The calibration residual error in Marillier (2012) was less than in the DoW (2011) and ranged from -1.08 m to +1.28 m with the mean sum of absolute residuals equal to 0.25m (Marillier, 2012).

Water level extracted from the Nambeelup Groundwater Model for the central wetlands are presented in Table 7. The water levels were taken from the location of the lowest modelled point in the wetland.

TABLE 7: MIKE-SHE NAMBEELUP MODEL EXTRACTED WETLAND INVERTS, AAMAXGL & AAMINGL

Wetland UFI ID	Geomorphic Wetland Classification[1]	Geomorphic Wetland Evaluation[1]	Lowest Wetland Invert (mAHD)	AAMaxGL 1978-2009 (m AHD) ± 0.25m**	AAMinGL 1978-2009 (m AHD) ± 0.25m**	Average Wetland Invert (mAHD)
4834/4835 (N&S)	CC/RE	Sumpland	8.49	9.90**	8.37**	9.69
14438	RE	Dampland	10.37	11.26**	9.96**	11.40

Notes:
** Mean sum of absolute residuals is 0.25m, absolute error could be within model residual error of -1.08 m to +1.28 m.
1. Classification and Evaluation taken from the Geomorphic wetland dataset performed at 1:25000 scale between 1991 to 1993.

The impact to wetlands post-development from rural to industrial is detailed in Marillier (2012) and JDA (2016) including changes to the water balance pre- to post-development. Storage in the superficial aquifer pre- to post-development is predicted to be similar due to reduced evapotranspiration post-development. To prevent water levels rising in wetlands, the DWMS (JDA, 2016) states that CGLs should be set at AAMaxGL beside wetland ecological buffers or in the nearest road reserve with land development scenarios in Marillier (2012) modelled based on this approach.

3.9 Contaminated Sites

A search of DWER's publicly-available Contaminated Site Database (accessed 23 November 2020) indicated no contaminated sites within the Study Area. A piggery 1.5 km north of the Study Area is classified as *Contaminated – restricted use*. As groundwater flow direction is generally east to west, the piggery contamination is unlikely to impact the Study Area.

A Preliminary Site Investigation undertaken by Bioscience in 2008 concluded there was little evidence to indicate pollution (Bioscience, 2008).

JDA notes the publicly available contaminated sites database only identifies 3 of the 7 contaminated sites classifications: Contaminated – restricted use; Contaminated – remediation required; and Remediated for restricted use. The remaining classifications are Report not substantiated; Possibly contaminated – investigation required, Not contaminated – unrestricted use; and Decontaminated.

3.10 Aboriginal Heritage

There are no registered aboriginal sites within the Study Area. The entirely of Nambeelup Brook which intersects and is generally adjacent to the southern boundary of the Study Area is listed as an 'other heritage place' (DIA 17982).

An Aboriginal Site Survey was conducted by Yates Heritage Consultants in 2006 on the Nambeelup JV landholding (including Lot 1221 of the Study Area). This identified DIA 71982 (Nambeelup Brook) and also three scar trees and one artefact scatter within the site (Yates Heritage Consultants, 2006).

3.11 Other Environmental Factors

There are no Bush Forever sites located within the Study Area (DLPH, 2019).

The Study Area contains areas mapped under the Swan Bioplan – Peel Regionally Significant Natural Areas (EPA, 2010). Designated Significant Natural Areas are located within classified CC wetland UFI 48355 and fringing Nambeelup Brook, Figure 11. These areas are designated as District Structure Plan POS, Figure 13.

A Flora and Vegetation Survey was completed by Focused Vision Consulting [FVC] (2020) for the Study Area. The report concluded that there are no records of threatened or priority flora listed under the EPBC Act, nor are there considered any likely to occur (FVC, 2020). Over 95% of the Study Area was considered to be 'Degraded' or in poor condition due to historical clearing (FVC, 2020). A preliminary analysis determined one vegetation unit 'BmAfKg' is likely representative of Banksia Woodlands Threatened Ecological Community (TEC) (FVC, 2020). Vegetation unit 'BmAfKg' occurs in 2 two locations within the Study Area, one in 'Degraded' condition, the other is a 3.92 ha patch in 'Good' condition (FVC, 2020). However, it is not in connection to any other areas of Banksia woodland and therefore not part of any more broadly-occurring regional patch (FVC, 2020).

The South West Regional Ecological Linkages Technical Report (Molloy et al., 2009) identified ecological linkages at a regional scale to address the issue of fragmentation of native vegetation which can result in loss of ecological function and biodiversity. This identified east-west ecological linkages within the Nambeelup area along the Serpentine River, Nambeelup Brook and through the centre of the Nambeelup Industrial Area DSP Area (DoP, 2016). A local ecological linkage was provided in the Nambeelup Industrial DSP from Nambeelup Brook in the south to the Gull Road drain in the north and includes areas of retained vegetation and wetland areas within the Study Area and remnant vegetation in Murray Airfield and continues along an arterial drainage flow path on Lot 89 Gull Road (DoP, 2016; Appendix B).

A central public open space is proposed within the Study Area which largely mirrors that shown in the DSP and has been designed to fully retain the four identified Conservation Category and Resource Enhancement Wetlands and largely accommodating their necessary buffers (CLE, 2023; Appendix A). This open space also retains the high-quality Banksia Woodland and provides areas for management of stormwater runoff from the development prior to discharge to wetlands and Nambeelup Brook at pre-development rates, Figure 11.

Further information on flora and fauna and management of potential environmental impacts from development are detailed in the Environmental Assessment report by Coterra Environment (2022).

4. PROPOSED DEVELOPMENT

The Study Area is approximately 202 ha and is situated about 8 km east of Mandurah and 3.5 km east of the Serpentine River. Across the southern Study Area boundary, Nambeelup Brook is either within or less than 200 m north of the Study Area, Figures 1 and 12.

The Structure Plan (SP) by CLE (2023) is presented in Appendix A and shown on Figure 12. The Structure Plan considers the interface with surrounding lots, with industrial development zones, commercial zones, roads and local drainage spaces (Table 8 and Figure 12).

The total lot area for industrial/commercial lots is about 107 ha, with the commercial component being approximately 10% of this area.

A 7 ha area along the northern boundary has been ceded to MRWA for the Lakes Road duplication. The allocated road width for Lakes Road includes space for road-side swales in the road design.

For stormwater management purposes, the industrial and commercial zones have been treated the same.

TABLE 8: DEVELOPMENT PLAN AREA LAND USE

Land Use Description	Study Area (ha)
Industrial	95.95
Commercial	11.02
Public Open Space (POS)	40.15
Road Reserve	47.93
Future Lake Road Duplication	7.00
Total	**202.05**

5. LOCAL WATER MANAGEMENT STRATEGY

5.1 Stormwater Management

5.1.1 Stormwater Design

Local stormwater management is proposed to be consistent with water sensitive design practices and to meet key objectives and criteria as detailed in Table 1. The local stormwater management system will consist of ephemeral water retention areas to capture and detain stormwater runoff from contributing catchments prior to discharge to surrounding drains.

Stormwater management has been designed based on management of the 'small', minor and major events, consistent with practices in DWER (2017).

'Small' event management concentrates on the first 15 mm of rainfall (approximately the 1 EY 1 hour event) and will comprise lot retention and bio-retention systems.

The minor drainage system is defined as a system of drains, pipes, culverts, kerbs, gutters etc, which have the capacity to convey stormwater runoff generated by 'frequent' rainfall events up to the 10% AEP for industrial areas.

The major drainage system is defined as the arrangement of roads, drainage reserves and detention areas planned to provide safe passage of stormwater runoff from 'extreme' rainfall events up to the 1% AEP.

The drainage system is described in more detail below with the post-development catchments and land use shown on Figure 12 with key elements of the drainage system shown on Figures 13.

5.1.2 Arterial Drainage Provisions

Arterial drainage provisions for post-development stormwater modelling were set out in the Nambeelup DSP DWMS (JDA, 2016) and are detailed below as applicable to the Study Area.

- DWMS post-development catchments and peak outflows are shown on Figure 11 with arterial outlet locations reflective of pre-development rural drain outflow locations, Figure 10. District catchments were delineated in the DWMS to reflect the DSP development boundary.
- Arterial flow pathways with connection points for upstream portions of catchments are shown as either fixed alignment or flexible alignment so that staged development is not restrictive to upstream connection points. Downstream landholders with arterial drains marked 'flexible' may modify alignments in-between connection points to suit a structure plan, providing adequate grade exists between the connection point of the upstream landholding to the downstream outlet (JDA, 2016).
- There are 4 arterial drain outlets from the Study Area: NB2A, NB3A.1, NB3A.2 and NB2.E. Up-gradient catchments NB3A.3 and NB3B reflect mapped wetland areas and vegetated surroundings.
- Pre-development allowable peak outflow for 1% AEP to Nambeelup Brook from NB2A is 0.83 m^3/s and from NB2A.2 is 0.09 m^3/s with a total of 0.92 m^3/s, Figure 11.
- Pre-development allowable peak outflow for 1% AEP to Nambeelup Brook from NB3A is 2.03 m^3/s and from NB3B is 0.42 m^3/s with a total of 2.45 m^3/s, Figure 11.
- 100 year ARI flood levels for Nambeelup Brook were applied in the DWMS as backwater levels. Across the Study Area, the 100 year ARI flood level ranges from 5.8 mAHD in the south-west corner to 9.84 mAHD in the south-east corner.

Catchment NB2.D, comprising large areas of Murrayfield Airport and Wetland UFI 4835 North, and Catchment NB2.E, comprising DSP POS and wetland UFI 4835 South, discharge to the Lakes Road drain which flows westward to the Lakes Road / Paterson Road intersection and into Paterson Drain. The flexible alignment drain shown on the southside of Lakes Road in Figure 11 from Catchment NB2.E was filled-in during installation of a water main in 2009.

Wetland 4835 North/South were considered separately in the DWMS despite being connected via a balancing pipe graded to the north wetland. Pre-development modelling in the DWMS assumed the upstream inverts of the existing Lakes Road drains would be set at 9.86 mAHD thereby restricting outflow to 0.15 m^3/s for the Lakes Road north drain and 0.15 m^3/s for Lakes Road south drain (Appendix D in the DWMS). No such restriction presently exists for the drain and thus outflows from the wetlands greatly exceed those described in the DWMS.

The pre-development peak outflows for Catchment NB2.D and NB2.E have been re-modelled in this LWMS using XP-Storm and ARR 2019 (Ball et al., 2019). As the southern drain has been filled, outflow can only occur via the Lakes Road north drain. The pre-development XP-Storm model was developed based on internal culvert information for Murrayfield Airport (provided to JDA in June 2018); survey of Lakes Road from Wetland UFI 4835 to the Gull Road / Paterson Road intersection (conducted in June 2018); and Engineering Drawings for the re-aligned and widened Paterson Road drain (Appendix F). Catchment areas and slopes and stormwater runoff coefficients were kept consistent with the DWMS.

For the 10% AEP (minor rainfall event), modelled peak flows overtop the local driveway crossovers on Lakes Road but stormwater is generally contained within the Lakes Road north drain with peak outflow to the Lakes Road Ø450 culvert (Appendix F) of 0.225 m^3/s.

For the 1% AEP (major rainfall event), modelled peak flows overtop the local driveway crossovers and road drain on Lakes Road with stormwater flowing across Lakes Road to the Paterson Road drain with a peak flow of 0.248 m^3/s conveyed via the stormwater drainage network crossing Lakes Road and a peak flow of 0.556 m^3/s flowing within the road reserve into the Paterson Road drain (total = 0.804 m^3/s).

5.1.3 Local Study Area Drainage

Stormwater systems are to be designed using a major/minor approach, incorporating a treatment train of Best Management Practice systems consistent with the DWMS (JDA, 2016), Stormwater Management Manual (DWER, 2022) and Murray DWMP (DoW, 2011). For the Study Area, that includes underground storage and rainwater tanks in industrial/commercial lots, pits/pipes, bioretention treatment areas and flood detention storages.

Figure 12 shows proposed post-development catchments and land use with the stormwater management plan shown on Figure 13.

Catchments *c1*, *c3*, and *c4* will drain into drainage areas within downstream POS with outflows to foreshore reserves fringing Nambeelup Brook. DWMS catchments NB3A.3 and NB3B which represent mapped wetlands to the east and north-east of the Study Area, Figure 11, are to be connected to the Study Area's road drainage network with flows restricted via orifice plates to those stated in the DWMS. These inflows have been allowed for in the stormwater modelling for catchment *c3*.

Catchment c2 will drain into a drainage area within the central POS (B2). The first 15 mm of rainfall ('small' event) will be treated within bio-retention areas within the POS with stormwater runoff greater than the 'small' event flowing overland into the central wetland (UFI: 4834/4835 and catchment *Wetland.C* in Figure 13).

Catchment *Wetland.C*, consistent with pre-development, will flow northward to the Lakes Road north drain and then westward into the Paterson Road drain via piped drainage and overland flow (Section 5.1.2). This catchment includes the road reserve to the west of the POS. T

Catchments *N.Brook 1* and *N.Brook 2* represent Nambeelup Brook and associated foreshore reserves within the Study Area. Any stormwater runoff generated within these areas will infiltrate or flow overland into Nambeelup Brook.

Areas within Catchment *Pat.Drain* are shown in the DWMS as draining to a southern drainage area. However, these areas generally show pre-development AAMGL at surface (Figures 8 and 9). Draining these areas to the catchment *c1* drainage area (B1) will result in increasingly high fill levels along Paterson and Lakes Road. Therefore, it is proposed that bio-retention swales adjacent to Paterson Drain will capture and treat the first 15 mm of rainfall from road reserves with flow in excess of the 'small' event from road reserves and lots draining into Paterson Drain.

The following strategies have been adopted for the Study Area.

<u>Small Event Management</u>

The following strategies are proposed to meet the criteria for small event management:

- All Industrial/Commercial lots are to retain and infiltrate the first 15 mm of rainfall from connected impervious areas. This can be achieved by means of systems such as soakwells and/or other underground storage devices, rainwater tanks or on-site swales. Underground storage units are to be interconnected within lots and be restricted to a maximum depth of 600 mm to provide clearance to the CGL.
- Stormwater runoff from roads from the first 15 mm of rainfall will be discharged to bio-retention areas (BRAs). These will be located within POS areas except for the *Pat Drain* catchment where they are located adjacent to Paterson Drain.
- Drainage areas, including BRAs, are generally set a minimum 0.3 m above the controlled groundwater level (CGL); consistent with the minimum 0.3 m clearance from the CGL stated in the DWMS (JDA, 2016).
- BRAs will be underlain with 300 mm thick amended soil media and planted with suitable plant species, consistent with Vegetation Guidelines for Biofilters in South-West Western Australia (Monash University, 2014).

Further information should be provided at UWMP stage on:

- The proposed earthworks for the site,
- Proposed lot size,
- Lot connection to road drainage network,
- Onsite landscape swales for first flush treatment of paved surfaces as a % area of the site.

<u>Minor Drainage</u>

To meet the design criteria for the minor drainage system (for events up to the 10% AEP event), the following strategies are proposed:

- Stormwater flow will be conveyed primarily as piped flow to downstream drainage areas.
- Runoff generated within lots in excess of underground storage units will flow either overland or via direct lot connections into the road drainage network.
- A drainage area located at the catchment low-point will provide detention of stormwater runoff prior to outflow to Nambeelup Brook foreshore reserves (*c1, c3, c4*), the central wetland (*Wetland.C, c2*) and Paterson Drain (*Pat.Drain*). The drainage areas have a minimum side slope of 1:6 (v:h).

Major Drainage

The major drainage system is designed to manage rainfall events greater than the 10% AEP event up to the 1% AEP event. Key points of the major drainage system strategy are as follows:

- Management will include detention of stormwater runoff in drainage areas with outflow as stated above.
- Road reserves will provide flood storage and conveyance. In major storm events, the minor drainage pit and pipe system will be full with excess stormwater bypassing the minor drainage structures and flowing overland within the road carriageway, with roads graded towards the downstream drainage areas.
- Minimum habitable building floor levels will have a 300 mm (0.3 m) clearance from the flood management areas and 500 mm (0.5 m) clearance from Nambeelup Brook, consistent with DWER (2017).

5.1.4 Stormwater Modelling

Post-development stormwater drainage catchments are shown in Figure 12.

Bio-retention areas, i.e. for the first 15 mm of rainfall from road reserves, were sized and modelled in PCSump Version 6.1 (JDA, 2020) using the Shallow Water Table Model. Modelling assumes amended soil underlying the BRA has a minimum saturated hydraulic conductivity of 5 m/day (see Section 5.3.1).

The hydrologic/hydraulic model XP-Storm was used to size drainage areas to match pre-development peak flows as described in the DWMS arterial drainage provisions and revised pre-development catchment NB2.D and NB2.E modelling (Section 5.1.2) except for the *Pat.Drain* catchment which due to fill and groundwater constraints only detains the 'small' event. Peak outflows from the *Pat.Drain* catchment are over the short durations (≤ 3 hours) and do not coincide with the peak outflows/flood levels of the surrounding catchments or Nambeelup Brook.

Australian Rainfall and Runoff (ARR) 1987 (IEAust, 1987) was used in the stormwater modelling for the DWMS (JDA, 2016). Since then, new design rainfalls, which take into account an additional 30 years of data compared to ARR1987, were released by the Bureau of Meteorology in 2016 for use in conjunction with the new Australian Rainfall and Runoff 2019 (Ball et al., 2019).

The single temporal pattern in IEAust (1987) has been replaced with an ensemble of 10 temporal patterns in Ball et al. (2019). The rainfall temporal patterns were assumed to be spatially uniform across the catchments. Storm durations modelled ranged from 1 hour to 96 hours (4 days).

Catchment Runoff Parameters

A breakdown of the rainfall-runoff loss model parameters for each land use, shown on Figure 12, is presented in Table 9 below. A 10% proportional loss has been modelled for drainage areas within POS. The loss model for wetlands in Table 9 is consistent with the DWMS.

TABLE 9: CATCHMENT RAINFALL-RUNOFF LOSS MODEL

Land Use	Initial Loss (mm)	Continuing Loss (mm/hr)	Proportional Loss (%)
Industrial Lots	15	-	10
Commercial Lots	15	-	10
Road Reserves	-	-	20
Public Open Space	-	-	90
Wetlands	52	-	53
Drainage	-	-	10

Modelling Results

The stormwater management plan shown in Figure 13 provides details of stormwater catchments, drainage areas and outflow rates.

Stormwater modelling results for the 'small' event bio-retention systems including areas, maximum depths and storage volumes are summarised in Tables 10 to 12 for the drainage area BRAs (Table 10), wetland BRAs (Table 11) and Paterson Drain BRAs (Table 12). Locations and areas of BRAs are shown on the 'small' event plan in Figure 14.

BRA base areas proposed meet the minimum 2% of connected impervious area guideline in FAWB (2009).

TABLE 10: SMALL EVENT MANAGEMENT – DRAINAGE AREA BRAS

	BRA B1 (c1)	BRA B2 (c2)	BRA B3a (c3)	BRA B3b (c3)	BRA B4 (c4)
Catchment Details					
Bio-Retention Road Reserve Area Catchment (ha)	10.51	2.43	8.07	15.10	3.85
Impervious Catchment Area (ha)	8.41	1.94	6.46	12.08	3.08
2% of Impervious Catchment Area (m^2)	1,682	389	1,291	2,416	616
Bio-Retention Base Area Provided (m^2)	4,000	715	2,975	5,440	1,360
Storage Details					
BRA Invert (mAHD)	6.50	11.80	10.00	10.80	10.50
CGL (mAHD)	6.0-6.2	-	9.3-9.4	9.6-10.3	10.1
BRA Base Area (m^2)	4,000	715	2,975	5,440	1,360
Storage Depth (m)	0.30	0.29	0.29	0.30	0.29
Side Slope	1:4	1:4	1:4	1:4	1:4
Small Event Management					
Rainfall (mm)	15	15	15	15	15
Runoff Volume (m^3)	1,235	251	969	1.812	462
Water Depth (m)	0.30	0.29	0.29	0.30	0.29
Top Water Level (mAHD)	6.80	12.09	10.29	11.10	10.79
Top Water Area (m^2)	4,337	896	3,261	5,932	1,576
Stored Volume (m^3)	1,235	232	911	1,712	426
Stored Volume/Runoff Volume (%)	98	92	94	95	92

TABLE 11: SMALL EVENT MANAGEMENT – WETLAND BRAS

	BRA Wet1	BRA Wet2	BRA Wet3
Catchment Details			
Bio-Retention Road Reserve Area Catchment (ha)	0.318	1.047	1.038
Impervious Catchment Area (ha)	0.254	0.838	0.830
2% of Impervious Catchment Area (m^2)	51	168	166
Bio-Retention Base Area Provided (m^2)	52	193	193
Storage Details			
BRA Invert (mAHD)	10.50	10.50	10.50
AAMGL (mAHD)	10.0	10.0	10.0
BRA Base Area (m^2)	52	193	193
Storage Depth (m)	0.16	0.29	0.29
Side Slope	1:4	1:4	1:4
Small Event Management			
Rainfall (mm)	15	15	15
Runoff Volume (m^3)	38	126	125
Water Depth (m)	0.16	0.29	0.29
Top Water Level (mAHD)	10.66	10.79	10.79
Top Water Area (m^2)	90	293	293
Stored Volume (m^3)	12	71	71
Stored Volume/Runoff Volume (%)	32	56	57

TABLE 12: SMALL EVENT MANAGEMENT – PATERSON DRAIN BRAS

	BRA Pat1	BRA Pat2	BRA Pat3	BRA Pat4
Catchment Details				
Bio-Retention Road Reserve Area Catchment (ha)	1.562	1.008	0.903	1.237
Impervious Catchment Area (ha)	1.250	0.806	0.722	0.990
2% of Impervious Catchment Area (m^2)	250	162	145	198
Bio-Retention Base Area Provided (m^2)	264	220	200	280
Storage Details				
BRA Invert (mAHD)	7.50	7.00	7.00	6.50
CGL (mAHD)	7.0	6.5	6.5	6.0
BRA Base Area (m^2)	264	220	200	280
Storage Depth (m)	0.30	0.30	0.29	0.30
Side Slope	1:4	1:4	1:4	1:4
Small Event Management				
Rainfall (mm)	15	15	15	15
Runoff Volume (m^3)	188	121	108	149
Water Depth (m)	0.30	0.30	0.29	0.30
Top Water Level (mAHD)	7.80	7.30	7.29	6.80
Top Water Area (m^2)	472	369	332	461
Stored Volume (m^3)	115	89	78	109
Stored Volume/Runoff Volume (%)	61	74	72	73

Stormwater modelling results for the minor (10% AEP) and major (1% AEP) events are summarised in Table 13 with stormwater event plans shown on Figures 15 and 16.

Concepts of the B1 to B4 drainage areas (Table 13) are shown on Figures 17 to 20.

TABLE 13: STORMWATER MODELLING RESULTS

	B1	B2	B3a	B3b	B4
Catchment Areas (ha)					
Industrial Lots	27.48	12.41	21.65	26.31	5.71
Commercial Lots	2.80	-	-	2.36	-
Road Reserves	10.51	2.43	8.07	15.10	3.85
POS/Drainage	2.11	1.87	1.71	2.12	0.65
Basin Details					
Invert Level (mAHD)	6.50	11.80	10.00	10.80	10.50
Base Area (ha)	1.75	1.16	1.09	1.71	0.49
Side Slope	1:6	1:6	1:6	1:6	1:6
Outlet Control (mm)	1 x Ø525 1 x Ø600	High: 10 m spillway	800 x 1500 mm	1 x Ø525 1 x Ø600	2 x Ø300
Outlet Invert (mAHD)	6.70	12.60	10.10	11.10	10.70
10% AEP (Minor)					
Critical Duration (hours)	9	48[1]	9	9	9
Peak Water Level (mAHD)	7.15	12.64	10.70	11.65	11.07
Maximum Depth (m)	0.65	0.84	0.70	0.85	0.57
Peak Water Level Area (ha)	1.96	1.40	1.27	2.00	0.58
Peak Water Storage Volume (m^3)	12,045	10,520	8,300	15,710	3,060
Peak Outflow (m^3/s)	0.52	0.15[1]	1.15	0.79	0.11
1% AEP (Major)					
Critical Duration (hours)	18	24	12	12	18
Peak Water Level (mAHD)	7.48	12.67	11.00	12.00	11.40
Maximum Depth (m)	0.98	0.87	1.00	1.20	0.90
Peak Water Level Area (ha)	2.07	1.45	1.36	2.13	0.645
Peak Water Storage Volume (m^3)	18,690	11,295	12,270	22,935	5,135
Peak Outflow (m^3/s)	0.785	0.48	1.91	1.23[2]	0.16

Note: 1. No flow to Wetland for events < 24 hours in 10% AEP
2. Outflow to B3a flood management area.

Drainage area outlets are generally set 0.1 to 0.2 m above the drainage area invert. The first 15 mm of rainfall from road reserves is retained and infiltrated within the drainage area BRAs, Table 9, and separated from the main drainage area by a 0.3 m bund. Stormwater in events greater than the 'small' event will overflow into the main drainage area.

Drainage areas B1, B3(a) and B4 drain to the Nambeelup Brook foreshore reserve with 1% peak flows of 0.785 m^3/s, 1.91 m^3/s and 0.16 m^3/s, respectively. Drainage areas B3a and B3b are connected via a Ø525 and Ø600 pipe.

Drainage area B2 detains stormwater runoff prior to discharge via a spillway to the central wetlands (Catchment NB2.E). In the 10% AEP, stormwater is retained for durations less than 24 hours, with modelled outflow of 0.15 m^3/s for the critical 48 hour duration. The 10% AEP flow does not result in an increase to the pre-development peak outflow to the Lakes Road Ø450 culvert which remains at 0.225 m^3/s as the B2 outflow occurs subsequent to the culvert peak flow. For the 1% AEP, additional flow from B2 raises the peak water level in the wetland from 9.99 mAHD to 10.10 mAHD but peak flow crossing Lakes Road into Paterson drain only rises 0.011 m^3/s to 0.567 m^3/s.

The peak flow from the Pat Drain catchment, Figures 15 and 16, occurs during the 3 hour event; prior to the longer duration peak flows from the central wetland to the Gull Road drain (24 hours) or Nambeelup Brook (36 hours).

5.2 Groundwater Management

Groundwater Management for the site has been prepared in line with design criteria presented in the DWMS (JDA, 2016) and the Stormwater Management Manual for Western Australia (DWER, 2022):

- Manage groundwater levels to protect infrastructure and assets;
- Maintain groundwater regime for the protection of groundwater-dependent ecosystems;
- Safeguard the quality and availability of groundwater resources; and
- Maintain or improve water quality by reducing nutrients infiltrating to groundwater.

The DWMS identified the following groundwater management tools:

- Controlling / limiting the rise of maximum groundwater levels (where required) by subsoil drainage;
- Placing controls over soakwells (e.g. volume and size or location of devices);
- Earthwork fill levels and controls over soakwells to provide sufficient separation to groundwater; and
- Suitable foundation designs for the separation to groundwater provided.

These management tools have been implemented in the proposed Groundwater Management Strategy in addition to treatment of subsoil drainage flows prior to discharge from the Study Area.

5.2.1 District Modelled CGL

In the DWMS, a controlled groundwater level (CGL) was proposed (JDA, 2016). A CGL is defined as the lowest level at which subsoil drainage or open drain inverts can be set. The purpose of the CGL is to prevent adverse changes to the groundwater table. CGLs are proposed across the majority of the Nambeelup DSP industrial land use area. As identified in the Murray DWMP, identifying appropriate CGLs in areas such as Nambeelup is complex. The CGLs consider freely draining outlet requirements, downstream level constraints, and wetlands.

The proposed CGL was included in DoW modelling (Marillier, 2012), where it was determined that the CGL was to be set at AAMaxGL by wetlands and can be lower than AAMaxGL further from wetlands. The DWMS CGL was modified from the AAMaxGL by taking into account downstream outlet invert levels, drains and natural surface. Mariller (2012) showed that reduced evapotranspiration post-development would lead to a rise in the annual minimum groundwater levels between 0.2 and 0.36 m below the CGL in development areas, even when accounting for a drying climate scenario (S3) (Marillier, 2012; JDA, 2016).

The DWMS makes allowance for modification of the CGL, especially as the CGL can be at AAMaxGL beside the wetlands, and lower further from the wetlands. The DWMS CGL modelled in Marillier (2012) is shown on Figure 21.

5.2.2 Subsoil Drainage System

To protect infrastructure from high seasonal groundwater levels, subsoil drainage will be used to control groundwater to CGL. Subsoil drainage will be installed within road reserves and beneath drainage areas. Subsoils within roads will discharge to downstream bio-retention areas (BRAs) for water quality treatment, prior to discharge from the Study Area. Subsoil discharge is treated by planted vegetation (Nitrogen removal) and amended soils (Phosphorus removal).

An indicative subsoil drainage layout is shown on Figure 21, with proposed invert levels in some areas above and below the DWMS CGL. This refinement of the CGL is due to outlet grade requirements and inclusion of treatment through BRAs (vertical treatment) to ensure minimum requirements for drainage are satisfied.

The subsoil outlets to the Nambeelup Brook foreshore reserve from drainage areas B3a and B4 have been set above the 100 year ARI flood level for Nambeelup Brook except for outlet constraints, the drainage area B1 subsoil outlet has been set at the 10 year ARI Nambeelup Brook flood level (5.90 mAHD). No subsoil is proposed in B2 due to the proximity to wetlands with the B2 invert of 11.80 mAHD set 0.50 m above the wetland AAMGL; Section 3.8.4 and Table 7. Subsoil inlets into BRAs are to be free flowing with a minimum 0.2 m clearance from the BRA invert.

The subsoil drains within roads have been graded at a minimum 1:500 to the downstream BRAs with a minimum 1:800 used for subsoils beneath drainage areas. The subsoil drainage network is to have accessible flush points for maintenance.

5.2.3 Managing Changes to Groundwater Levels

Water table mounding will occur between subsoil drainage lines. Final design groundwater level will be dependent upon final adopted CGL, subsoil drainage invert levels and soil/fill permeability properties of the fill material.

The importation of free-draining sand fill, together with subsoil drainage, will act to ensure there is sufficient separation between finished lot levels and the CGL.

The minimum specifications are as follows:

- Imported sand fill with minimum saturated hydraulic conductivity of 5 m/day;
- Maximum spacing of 200 m between subsoil drains within road reserves and 10 m wide laneways; and
- Given above, a minimum 1.5 m separation from the adopted CGL and the finished lot level.

Soakwells and/or other underground storage units within industrial lots should be restricted to a maximum depth of 600 mm. These devices should be inter-connected with a pipe connection to the road drainage network. The underground storage unit depth limitation will be controlled via the Development Design Guidelines or similar document produced at subdivision stage.

Post-development groundwater levels and separation distance between groundwater and finished levels will be further detailed in the UWMP.

5.3 Water Quality Management

5.3.1 Nutrient Source Controls

Consistent with best practice water sensitive urban design, non-structural and structural controls are proposed to achieve long term water quality goals for the Peel-Harvey catchment.

Non-structural source controls to reduce nutrient export from the site need to focus on reducing the need for nutrient inputs into the landscape. The following strategies are proposed:

- Local native plants make up a minimum 50% of streetscape treatments. Any non-local species will be selected for drought tolerance and low fertiliser requirements. Only local endemic species will be used near wetland, drainage and foreshore areas to prevent any spread of introduced species into natural areas and the catchment. Landscape maintenance fertiliser restrictions for road reserves are discussed in Section 5.4.3 and are to be finalised in future UWMPs.
- Drainage areas have separate bio-retention areas (BRAs), with native plants selected for nutrient stripping, consistent with Monash (2014).

- Maintenance practices such as street sweeping to reduce sediment build-up, particularly during the development and construction phase. The UWMP will outline the schedule and cleaning requirements for street sweeping, which will be co-ordinated with the Shire of Murray.

In addition, re-zoning of land from grazing/open pasture to commercial/industrial results in a substantial reduction in nutrient input; further detailed in Section 5.4.2.

Structural measures are proposed to complement the non-structural source controls and provide a complete treatment train for stormwater movement and captured groundwater through the development. The first 15 mm of stormwater runoff and outflows from road reserve subsoil drains will be retained and treated, consistent with the Nambeelup DWMS (JDA, 2016), Murray DWMP (DoW, 2011) and DWER (2017).

BRAs are to have a minimum 300 mm soil profile of amended soils consistent with the Murray DWMP (DoW, 2011). Minimum specifications for BRAs are presented in Table 14.

TABLE 14: MINIMUM SPECIFICATIONS FOR BRAS

Item	Specification
Gravel Mulch	• 50 mm gravel mulch to be provided in swales.
Amended soil media	• Minimum 300 mm thick. • Hydraulic conductivity greater than 5 m/day. • PRI >10 • Light compaction only. • Total clay and silt fraction <3% in total (w/w). • Organic matter content <5% (w/w). • Phosphorus content <80 mg/kg.
Plant selection, planting density and distribution.	• Tolerant of periodic inundation and extended dry periods. • Preferential selection of endemic and local native species (Monash, 2014). • As per Vegetation Guidelines for Stormwater Biofilters in the South-west of Western Australia (Monash, 2014). • 12 months following initial planting.
Maintenance	• 12 months following initial planting.

The effective implementation of the structural and non-structural controls as part of the industrial development will further enhance the improvements in water quality from this site as a result of the land use change. Note the improvements in groundwater quality would only be quantifiable after a time delay due to the legacy nutrients in groundwater.

5.3.2 Nutrient Load Targets

Target nutrient export or input loads per unit developed area (kg/ha/year) were identified by Kelsey *et al.* (2011) to meet *EPP Peel Harvey Estuary Policy 1992* objectives for phosphorus loads (DoW, 2011) and presented in the DWMS (JDA, 2016). Updated modelling has since been presented in Hennig et al. (2021). These export and input targets are described in more detailed below.

Method A: Export Targets:

The Serpentine and Murray catchments had target export loads per unit developed area of 0.3 kg/ha/yr for phosphorous (DoW, 2011 and Kelsey *et al.*, 2011). The definition of ‘developed area’ in DoW (2011) and Kelsey *et al.* (2021) referred to areas available to be developed and have no clearing constraints. This included the

Nambeelup “Industrial investigation” area. In Hennig et al. (2021), the Nambeelup DSP area is termed “Peel Business Park” and was modelled as “urban”.

The EPP policy did not focus on Nitrogen. The Murray DWMP identified “a default target, which may be used if appropriate local targets have not been set”. An export target of 2.4 kg/ha/yr nitrogen was estimated to meet ANZECC (2000a) guideline value in lowland rivers of south-west WA for slightly disturbed ecosystems of 1.2 mg/L (DoW, 2011).

In Hennig *et al.* (2021), the estimated phosphorus loading was revised down from Kelsey *et. al* (2011) of 140 tonnes/year to 60 tonnes/year, reflecting a reduction in rainfall and flows since the 1970s but no significant change in phosphorus concentrations within the streams and rivers. The export target of 0.1 mg/L for coastal catchments, applicable to the Nambeelup DSP area, is consistent with EPA (2008).

<u>Method B: Input Targets</u>: An alternative approach to demonstrate achievement of target loads for the Peel Harvey estuary is by setting reduced application rate of nutrients to the land, also known as input targets. This can be achieved by land use change (industrial vs rural), use of native plantings, management of public open spaces or restrictions on fertiliser application to residential lots (Kelsey, 2011). Kelsey *et al.* (2011) and Hennig et al. (2021) used different methods to determine nutrient input targets but given the similarity between the results, Hennig et al. (2021) recommended use of the Kelsey et al (2011) targets for coastal catchments, namely 45 kg N/cleared ha/year and 6.5 kg P/cleared ha/year.

Part of the Nambeelup DSP area including the Study Area was modelled in Kelsey *et al.* (2011) as ‘Industrial investigation’ as per the Peel sub-regional Structure Plan, not as existing rural. The Study Area is within the Nambeelup Brook reporting catchment. Nambeelup Brook results in Kelsey (2011) showed a significant reduction of nutrient load compared with base-case predevelopment loads for all post-development scenarios for nutrient inputs. For the Nambeelup Brook catchment in Kelsey *et al.* (2011), whilst percentage imperviousness increased by 80% and percentage deep-rooted vegetation decreased following development, the proposed industrial development area has lower nutrient inputs than the existing rural grazing land use (Kelsey *et al.*, 2011).

Hennig et al. (2021) modelled the DSP area (‘Peel Business Park) as 90% ‘industrial, manufacturing & roads’ (*urban*) and 10% ‘piggeries & abattoirs’ (*cleared*).

DoW (2016b) analysis in Appendix G of thirteen Western Australian industrial areas (including roads) typically have 7.7% lawn and 0.01% garden, except Balcatta with 1% garden area. DoW (2016a) estimated worst case industrial nutrient inputs of 2.9 kg/ha/yr TP and 14.3 kg/ha/yr TN, based on 7% lawn area, 1.5% garden area and a high input rate for non-native gardens. DoW (2016a) UNDO Tool also adds to all land uses an atmospheric deposition input of 0.15 kg/ha/yr TP and 5.23 kg/ha/yr TN, giving total worst case estimated industrial land input of 3.0 kg/ha/yr TP and 19.5 kg/ha/yr.

The proposed Nutrient Input Target is an 80% reduction in TN and TP, Table 15. This is achievable through the proposed Study Area land use change from rural grazing to commercial/industrial as described in Section 5.3.3 below.

TABLE 15: NUTRIENT INPUT TARGETS

Land Use	Phosphorus (kg/ha/year)	Nitrogen (kg/ha/year)
Catchment Scale Nutrient Input Load for Scenarios (Kelsey, 2011)[1]:		
Rural	12.7	86.4
Future Urban, Urban Investigation Undeveloped Urban and urban deferred	6.5	45
Industrial (existing) and Industrial Investigation	2.5	5
% reduction of industrial compared to rural	-80%	-94%
UNDO Nutrient Input Load Assumptions (DoW, 2016)[2,3]:		
Atmospheric Deposition[2]	0.15	5.23
Industrial including road reserves [3] (worst case) with atmospheric deposition added	2.9 (3.05)	14.3 (19.53)
Nature[4] with atmospheric deposition added	0 (0.15)	4 (9.23)
Road verge not fertilised/maintained[4]	0	0
Road verge native & POS/residential natives - fertilised	0.9	28
Road verge & POS Non-native garden fertilised	24	77
Road verge turf/lawn & residential lawn	15	112
POS passive turf	2	66
Residential non-native garden fertilised	121	434
Targets Adopted for Study Area as a % reduction of industrial vs rural from Kelsey *et al.* (2011) as a load (kg/ha/yr)	 -80% 2.5	 -80% 17.3

Notes:
1. Reproduced from Table 6.11 of Kelsey et al. (2011). (Doesn't include atmospheric deposition)
2. DoW (2016) UNDO Tool. Input results include atmospheric deposition in addition to all land use inputs. Includes *UNDO Tool Fact Sheet Series: Road Reserves default nutrient input rates; Recreation and public open space nutrient input rates.*
3. DoW (2016) *UNDO Tool Fact Sheet: Commercial, industry and schools, nutrient input rates.* The TN input rate of 14.3 kg/ha/yr is based on 7% of residential lawn input rate of 112 kg/ha/yr plus 1.5% of a residential non-native garden input rate of 431 kg/ha/yr. Aerial photo analysis of Western Australian industrial areas was typically 7.7% lawn and 0.01% gardens and for lot plus road reserve total area. Commercial analysis were shopping centres and not applicable to Nambeelup.

5.3.3 Nutrient Input Model (UNDO) Results

The UNDO (Urban Nutrient Decision Outcomes) decision support tool (DoW, 2016) has been used by JDA for this LWMS to help quantify the nutrient inputs and nutrient exports for the post-development scenario across the Study Area. The UNDO tool analyses inputs for Total Phosphorus and Total Nitrogen only.

Road reserves comprise 29% of the total area and therefore could represent significant nutrient input areas if fertilisers are applied to road verges and medians. Local distributor road verges and medians, such as Paterson Road, are typically not fertilised by the Shire. Lakes Road on the Study Area's northern boundary is maintained and managed by MRWA and who do not fertilise road verges.

3 scenarios were modelled to assess various fertiliser application options within the Study Area. For all scenarios, the following assumptions were applied:

- Developed areas of the Study Area, comprising industrial/commercial lots and road reserves, represent 162 ha, or 80% of the total area of the contributing catchments, with the balance (20%) comprising DSP POS areas (including wetlands and section of Nambeelup Brook) and Study Area drainage areas.
- Of the road reserves plus lots, typically 92% of the area is impervious (as discussed above) or not fertilised and 8% is landscaped (DoW, 2016b). Conservatively, the modelled scenarios below assume 90% of the area is not

fertilised, 2% native vegetation in distributer road medians (maintained by the Shire), and 8% landscaped area within lots fertilised by area owners.

- The industrial and commercial lots are treated the same. This is valid for Nambeelup commercial area as it is similar to the Industrial area analysis and assumptions adopted in UNDO (2016b) for Balcatta, rather than the shopping centres analysed as part of DoW (2016) for 'commercial'.
- The drainage areas are primarily bio-retention basins, with native plant selection designed for nutrient stripping purposes consistent with Monash (2014), with no additional fertilisation. The POS/drainage areas were modelled as 99% non-fertilised nature areas and 1% fertilised native landscape areas.

Scenario 1:

Road reserves (verges) and commercial/industrial areas comprise 7% lawn/turfed areas and 1% non-native gardens which will be fertilised and maintained by lot owners. Medians in distributor roads will comprise of 2% native plantings and is assumed will be fertilised by the Shire. The balance of the road reserve, 90%, is assumed as impervious with no fertiliser input.

Scenario 2:

Plantings and fertiliser regimes for Scenario 2 assume greater flexibility for commercial/industrial zones lots for entry statement viewpoints. 10% of commercial/industrial lots and road reserves are assumed as pervious with 5% native plantings and 5% plantings assuming no limitation on plant selection (lawn fertiliser rates assumed). The balance of the road reserve and lots, 90%, is assumed impervious and not fertilised. This scenario would require restrictions for lot front landscaping.

Scenario 3:

The default UNDO worst-case assumptions were applied for industry, 7% lawn and 1.5% garden, similar to the Balcatta Industrial Area with very high fertilisation for non-native gardens.

UNDO model results are enclosed in Appendix G and summarised in Table 16.

TABLE 16: UNDO MODEL RESULTS SUMMARY

UNDO Model Scenario	Phosphorus (kg/ha/year)	Nitrogen (kg/ha/year)
Scenario 1	1.38	14.09
Scenario 2	0.91	12.07
Scenario 3	2.13	16.57
80% reduction Target for Study Area	2.5	17.3

All UNDO Scenarios 1, 2 and 3 show total phosphorus input loads less than the input target of 2.5 kg/ha/yr, (maximum 2.13 kg/ha/yr for Scenario 3). This is compliant with Kelsey (2011) and Hennig et al. (2021) objectives for phosphorus loads. As 'method B' nutrient input target criteria has been met, the nutrient export modelling of WSUD treatment system for method B criteria is not required.

UNDO scenario 1, 2 and 3 results were less than development area total nitrogen input target of 17.3 kg/ha/yr, (Table 16, Appendix G). Further refinement can be modelled at UWMP stage once specific road verge maintenance fertilisation information is agreed upon with the Shire of Murray. As 'method B' nutrient input target criteria has been met, the nutrient export modelling of WSUD treatment system for method B criteria is not required.

5.4 Water Use Sustainability Initiatives

The State Planning Policy 2.9 regarding water resources (WAPC, 2006) requires new developments to employ a total water cycle approach to the consideration of water resources. This section addresses water conservation measures, fit for purpose non-potable supply, and refers to the potable supply strategy and wastewater strategy.

5.4.1 Water Conservation/Efficiency Strategy

Water Conservation initiatives are vital in reducing water demand and can reduce strain or delay timing of potable water supply infrastructure.

The Water Conservation Strategy for the development is detail below. Water Conservation initiatives to be considered for adoption are to be outlined below, with details to be confirmed in the Urban Water Management Plan (WAPC, 2008).

For the estate scale, water conservation recommended initiatives include:

- use of appropriate native species in road reserves and POS areas;
- encourage Lot buyers use of appropriate native species for adoption on lot verges;
- water wise irrigation systems; and
- adoption of non-potable or water reuse sources for irrigation and construction.

For the lot scale, industries should consider the following items outlined in the Guidelines for Industrial Development, (Perth Region NRM, 2010):

- Install water efficient appliances, including WELS (Water Efficiency Labelling and Standards) rated flow controllers, toilets, taps and urinals;
- Install water efficient industrial equipment and seek innovative designs that can be integrated into the built form. This will be dependent upon the processes used within each business but may include automatic shutoff controls, fogging nozzles for cooling or high pressure-low volume nozzles; and
- For the construction phase of the industry, development applications could include water conservation measures. e.g. substitute potable water with alternative fit-for-purpose sources or adopt waterless options. This could include use of recycled water from adjacent land uses for building construction or dust suppression.

Agreed measures to achieve water conservation and efficiencies of use including sources of water for non-potable uses and detailed designs, controls, management and operation of any proposed system will be detailed in the UWMP.

5.4.2 Non-Potable Fit for Purpose Water Supply

Non-potable water sources considered in the DWMS (JDA, 2016) included:

- Groundwater extraction (Superficial Aquifer, or *also initially from Upper Leederville aquifer)*;
- Rainwater tanks or underground tanks (small quantities at the Lot scale)
- Managed Aquifer Recharge (MAR) and Re-use

Groundwater abstraction for non-potable use is proposed in this LWMS and is further detailed in Section 5.4.2.1.

Rainwater tanks and/or underground tanks are generally small quantities at the lot scale and not significant. MAR and re-use is being investigated at the Development WA commercial/industrial development on Lot 9001 (formerly Lot 600) Lakes Road and is not currently being considered for the Study Area.

5.4.2.1 Non-Potable Supply Bore

Groundwater allocations are available from both the Superficial, including Rockingham Sands, and Upper Leederville aquifers, Table 5. The Study Area forms part of the proclaimed Murray Groundwater Area, as documented in DoW (2012) and a Licence to Take Groundwater (Form 3G) will be required prior to abstraction.

As there is sufficient water available for development, licences to construct a bore(s) and take groundwater will be completed with the first subdivision/UWMP for the Study Area. Landscapes areas will contain only native gardens which require water only during the establishment period, and no long-term irrigation.

Establishment irrigation is estimated at approximately 78,210 kL/year, assuming waterwise plant species selection and irrigation requirement of 5,500 kL/ha/year. This estimate assumes road verges and medians are delivered together (Years 1 and 2) and POS establishment and re-vegetation of wetland buffers is staged across 5 to 6 years.

Establishment irrigation is to include irrigation of:

- Median and verges of District Distributor A and Neighbourhood Connector roads;
- Landscape establishment of drainage area; and
- CC/RE wetland buffers.

Total area for irrigation of POS is approximately 25 ha. Internal road verges are to be established and irrigated by adjacent lot owners. Lakes Road and Paterson Road are assumed to be maintained by MRWA.

Water allocations for construction purposes, including dust suppression, are likely to be up to 100,000 kL/year and represent a short-term water requirement.

Further consideration for groundwater extraction for a non-potable third pipe scheme for lots could be considered as a possible enabling tool for potential future MAR uptake and would be included in future UWMPs. If further investigations initially led by the Government of Western Australia on the adjacent Lot 9001 property identify MAR to be technically feasible and viable, a third pipe system initially supplied by either the superficial or Kings Park/Upper Leederville aquifer could be investigated with supply later to be switched over to a MAR scheme supply depending on pipe network design and demand constraints. Due to the current uncertainty of MAR, a third pipe is not currently proposed.

5.4.3 Potable Water Supply

The Study Area is located within Water Corporation's Tamworth water supply zone but due to various reasons including water quality and supply issues, a connection via the Stirling Trunk Main is not possible (Cossill & Webley, 2021). Similarly, connection to the North Mandurah Tank was deemed not possible.

A Ø250 water reticulation main was installed in 2021 from Bortolo Drive, Mandurah to supply the Peel Business Park, located north-west of the Study Area. The main currently extends just west of the Study Area and connection to the main is dependent on various factors including the remain capacity within the main (Cossill & Webley, 2021). Due to likely pressure issues, this main would only be able to supply industrial lots less than 15 to 16 mAHD (Cossill & Webley, 2021).

5.4.4 Wastewater Management Strategy

The Study Area is located within a proposed Water Corporation licenced area for the provision of wastewater services however the area is not in the 5-year Capital Investment Program.

Water Corporation's wastewater planning for the Nambeelup Industrial Area comprises construction of a number of pump stations and associated pressure mains with ultimate discharge to the Gordon Road Waste Water Treatment Plant (WWTP), 7 km west of the Study Area (Cossill & Webley, 2021).

Lots 9001 and a portion of Lot 1530 Lakes Road (Figure 1), once developed into commercial/industrial, will connect via a gravity feed to Amarillo South Pump Station No. 197-01 from which the north-western section of the Study Area may also connect into (Cossill & Webley, 2021).

Most of the wastewater from the Study Area is planned to discharge to a future proposed Amarillo South Pump Station B near Kwinana Freeway and pumped to the Armarillo South Pump Station No. 197-01 (Cossill & Webley, 2021).

6. IMPLEMENTATION PLAN

Implementation of the Local Water Management Strategy involves defining the roles and responsibilities of the developer and local authority, outlining further documentation required to support the development and defining operation, monitoring and maintenance of the stormwater and groundwater management (subsoil) system.

6.1 Roles and Responsibilities, Developer Commitments

Table 17 details the roles and responsibilities to undertake the implementation plan.

The operation and maintenance of the stormwater and groundwater management system within the Study Area will initially be the responsibility of the developer but will ultimately be reverted to the local authority.

Preparation of UWMP's and post-development monitoring will be the responsibility of the developer.

TABLE 17: Implementation Responsibilities

IMPLEMENTATION		RESPONSIBILITY	
LWMS Section	Action	Developer	Shire of Murray
6.2	Preparation of an Urban Water Management Plan to support subdivision	✓	
6.4	Construction of stormwater system	✓	
6.4	Construction of groundwater management (subsoil) system within Study Area	✓	
6.4	Stormwater system operation and maintenance - Initially - Following handover	 ✓ 	 ✓
6.5	Monitoring Program	✓	

6.2 Urban Water Management Plan (Subdivision)

Processes defined in Better Urban Water Management (WAPC, 2008) require an Urban Water Management Plan (UWMP) at subdivision stage. With an approved LWMS, a UWMP is required as a condition of subdivision and prior to any subdivision activities.

The UWMP will include but not be limited to the items listed below:

- Agreed/approved measures to achieve water conservation and efficiencies of use including sources of water for non-potable uses and detailed designs, controls, management and operation of any proposed system;
- Detailed stormwater management design including the size, location and design of drainage open space areas, integrating major and minor flood management capability, landscape plans as related to stormwater function, specific details of local acid sulphate soil investigations, geotechnical investigations and their impact on stormwater design;
- Measures to achieve protection of waterways. Specific structural and non-structural BMPs and treatment trains to be implemented including their function, location, maintenance requirements, expected performance and agreed ongoing management arrangements;
- Final location and inverts of subsoils drainage, consistent with approved controlled groundwater level (CGL);

- Management of subdivisional works (to ensure no impact on downstream regional conservation areas, maintenance of any installed BMPs and management of any dewatering and soil/sediment, including dust); and
- Submission of a licence to construct a bore and licence to take water for water use during construction and post-development for vegetation irrigation (short-term establishment only) and construction water use (including water for dust suppression).

6.3 Construction Management

6.3.1 Dewatering

Dewatering will be required for some elements of subdivision construction including sewer installation. Given the depth of construction, dewatering will only be in the Superficial Aquifer.

Prior to commencement of any dewatering, the construction contractor may need to apply for and obtain from DWER a “Licence to Take Water”.

A licence is not required for dewatering if the pump rate does not exceed 10 L/s over a period of less than 30 days and the volume of water taken over the period does not exceed 25,000 kL.

Dewatering will be carried out in accordance with the licence conditions. Where possible, construction will be timed to minimise impacts on groundwater and any dewatering requirement.

6.3.2 Acid Sulphate Soils

Figure 5 shows a moderate to low risk of A.S.S across most of the Study Area. However, if A.S.S is encountered, a Dewatering and Management Plan will be required to demonstrate the measures that will be taken to minimise risk from disturbance of A.S.S. If A.S.S is encountered, it will be investigated and managed in accordance with the applicable DWER Acid Sulphate Guidelines for Identification and Investigation (DER, 2015a) and Treatment and Management (DER, 2015b) of Disturbed Acid Sulphate Soils. Specific methods for treatment and holding times for A.S.S are specified in these guidelines.

6.4 Stormwater/Subsoil System Operation and Maintenance

The stormwater drainage system (flood storages and culverts) will require maintenance to ensure correct operation. It is considered the following operating and maintenance practices will be required periodically:

- Inspection and removal of debris, litter and sediments surrounding inlets/outlets from pipes;
- Inspection of system for erosion.
- Maintenance of planted areas (flood storages and POS) including plant condition and weeds as outlined in the UWMP; and

A summary of the proposed maintenance schedule is presented in Table 18 below.

TABLE 18: Maintenance Schedule for Drainage Infrastructure

Item	Maintenance Interval		
	Quarterly	Biannually	As required
Street Drainage			
Street sweeping to reduce particulate build-up	✓		
Removal of debris to prevent blockages	✓		
Removal of construction sediment	✓		✓
Planted Areas (Basins/POS)			
Inspect for erosion + sediment accumulation		✓	
Assess health of vegetation. Remove dead plants and replace where necessary.	✓		
Removal of sediment and leaf litter layer build up.			✓
Subsoil System			
Flush the subsoil lines under bio-retention storage		✓	
Flush the subsoil lines in roads (min every 5 years)			✓

6.5 Monitoring Programme

A post-development monitoring program should be prepared to determine:

- The water quality of subsoil and/or surface outflow downstream of the treatment train at each outlet from the Study Area as shown on Figure 13.
- For bio-retention BMP's amended soil media, confirm the permeability performance is as per intended design (5 m/day). This is to be documented in the UWMP.

6.5.1 Post-development Monitoring

The Murray DWMP includes guidance that post-development monitoring will usually continue for a minimum of three years from practical completion of the developments final stage and following review, may extend for a further two years in some circumstances.

Surface water quality monitoring will aim to measure any treated subsoil flow or opportunistic surface water flows generated from the development area following rainfall events. Note flows may only be occasional.

Surface water monitoring of drainage and subsoil outlets is proposed for a minimum of 3 years and is to be conducted on the drainage areas B1, B3a and B4 and *Pat.Drain* catchment subsoil outlets, Figures 13 and 21. Monitoring should be staggered and commence on each outlet once 80% of the contributing area has been developed.

Targets are set only for surface water flows and improvement is to be compared to pre-development surface water quality, Table 6 and Appendices D and E.

Ecological monitoring will form a component of the POS Management Plan and Foreshore Management Plans to be prepared at subdivision stage in relation to revegetation works proposed associated with onsite wetlands and Nambeelup Brook. The specific ecological monitoring details will be outlined within the management plans which are to be approved by the Shire of Murray.

Sampling Frequency

Sampling is to be conducted can be via opportunistic grab samples collected following rainfalls events. A minimum of 3 samples per year is to be collected within 24 hours of the rainfall event. Samples will be collected from the drainage area and/or subsoil outlets if flowing.

Water Quality Parameters

Samples will be analysed in-situ for pH and Electrical Conductivity (EC).

Samples will be collected and analysed for Total Suspended Solids (TSS), dissolved nutrients (TN, TKN, NH_4_N, NO_3_N, TP and PO_4_P), heavy metals and hydrocarbons by a NATA-accredited laboratory. Sampling is to be according to ANZECC (2000b) standards.

Reporting

Surface water sample results are to be compared with both the pre-development surface water and groundwater quality samples for context. Results will be reported to Shire of Murray and Department of Water and Environmental Regulation.

Further detail on the monitoring program including contingency actions is to be provided in the UWMP.

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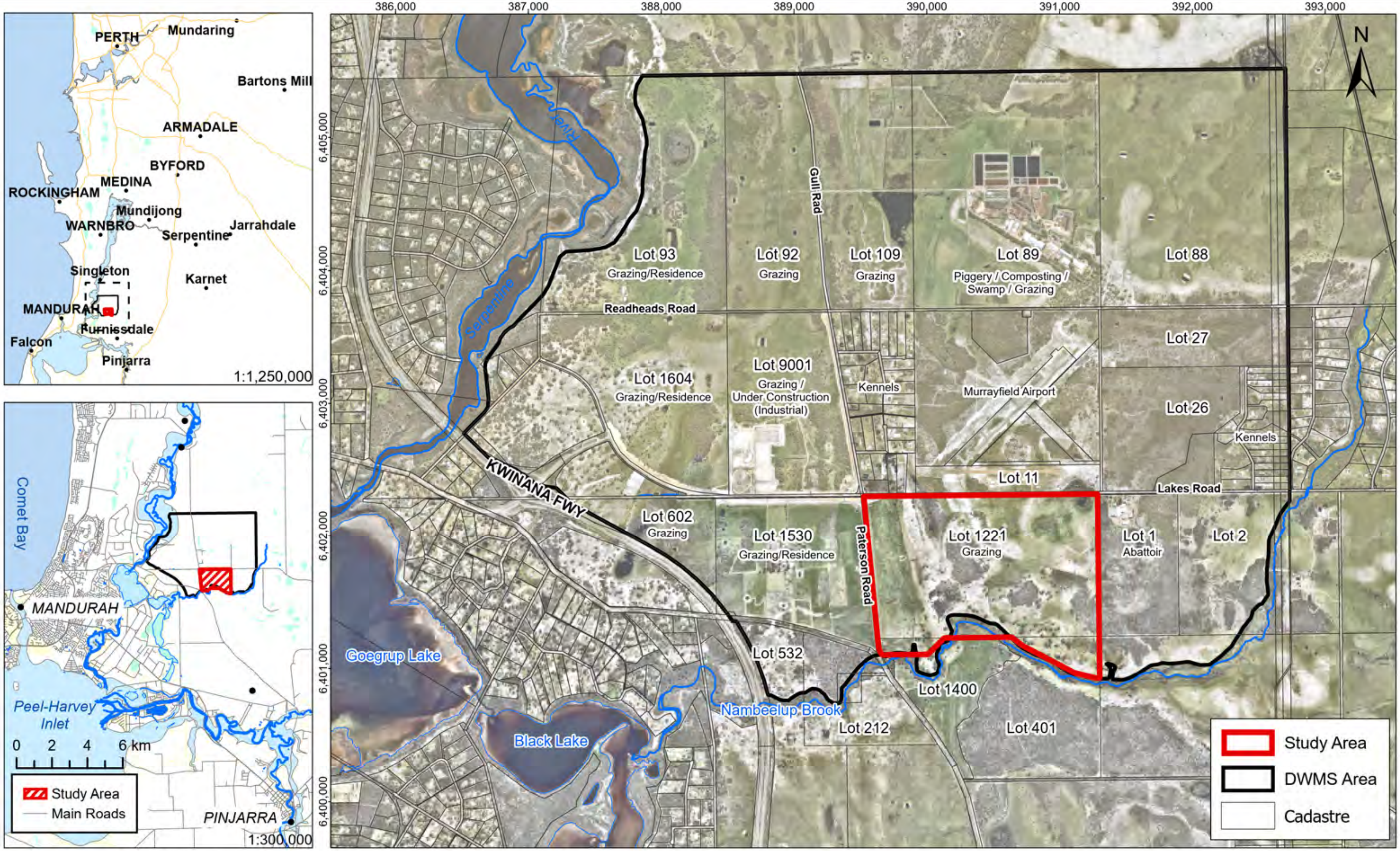
FIGURES



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JDA

Job No. J6890

Scale:1:40,000

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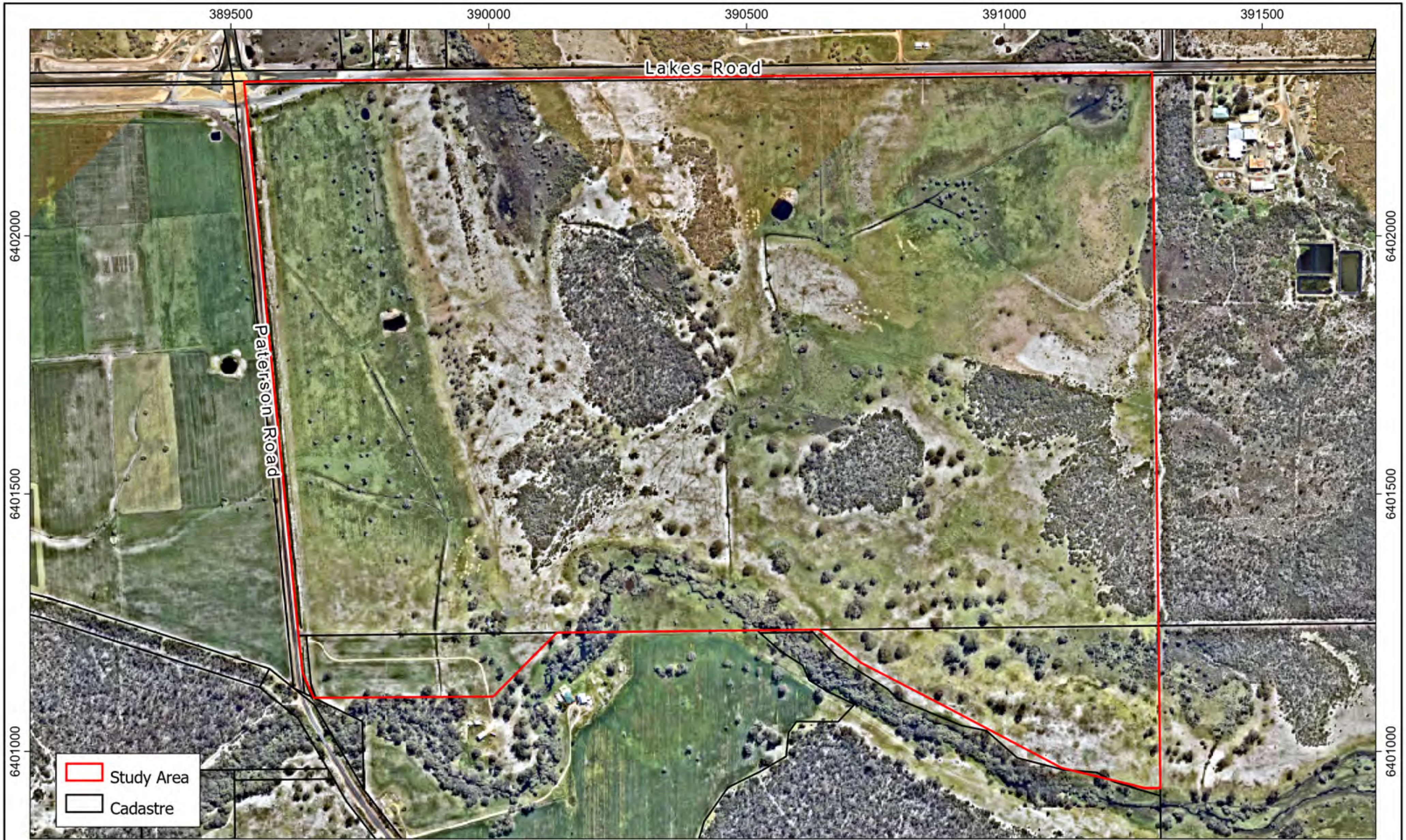
Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 1: Regional Location Plan and Existing Land Use



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Coordinate System: GDA2020 MGA Zone 50

JDA Consultant Hydrologists

Job No. J6890

Scale: 1:10,000 @A4

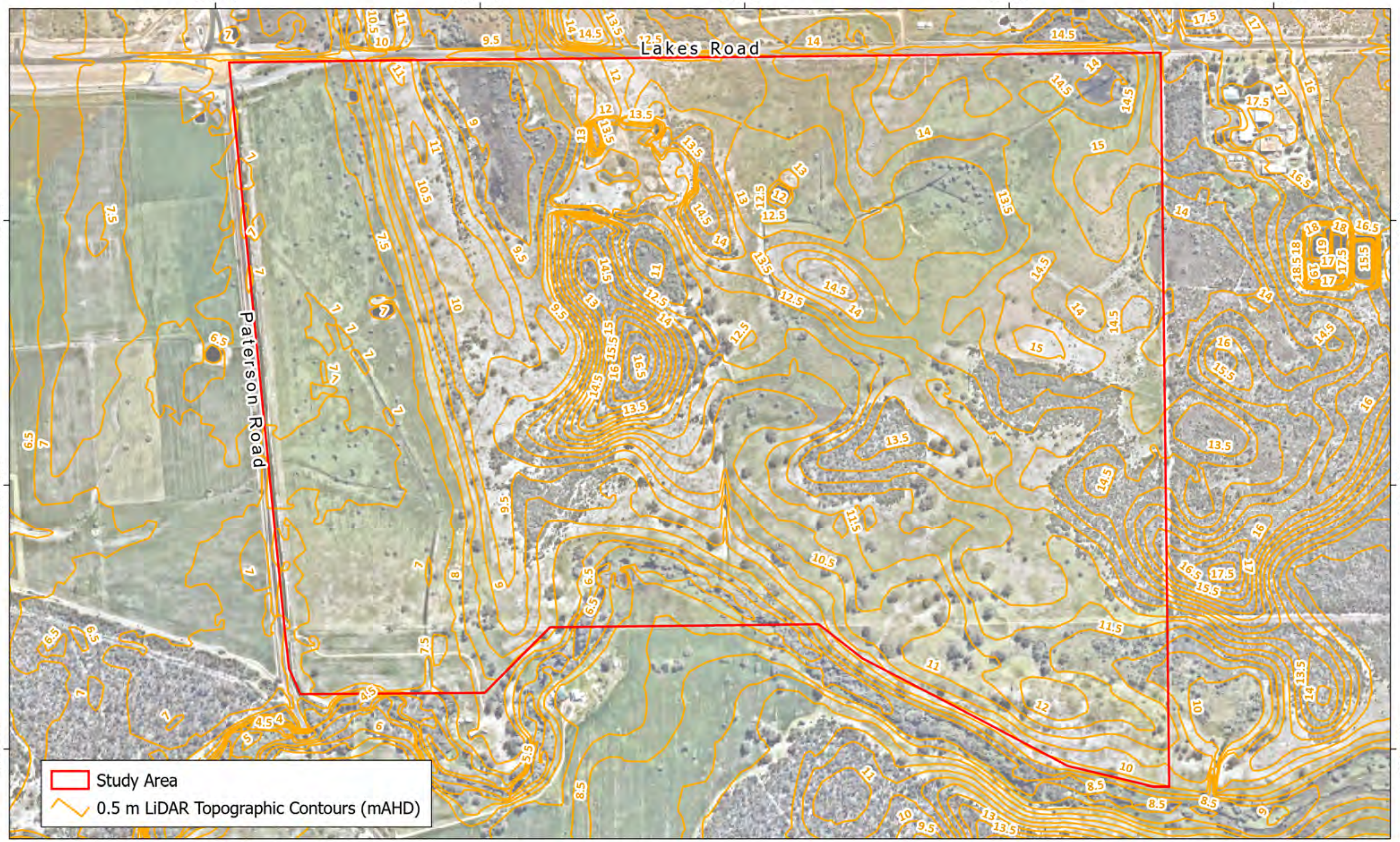
0 100 200 300 400 Metres

N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 2: Aerial Photograph



Data Source: LiDAR (DoW, 2008); NearMaps (2020)

Coordinate System: GDA2020 MGA Zone 50

Job No. J6890

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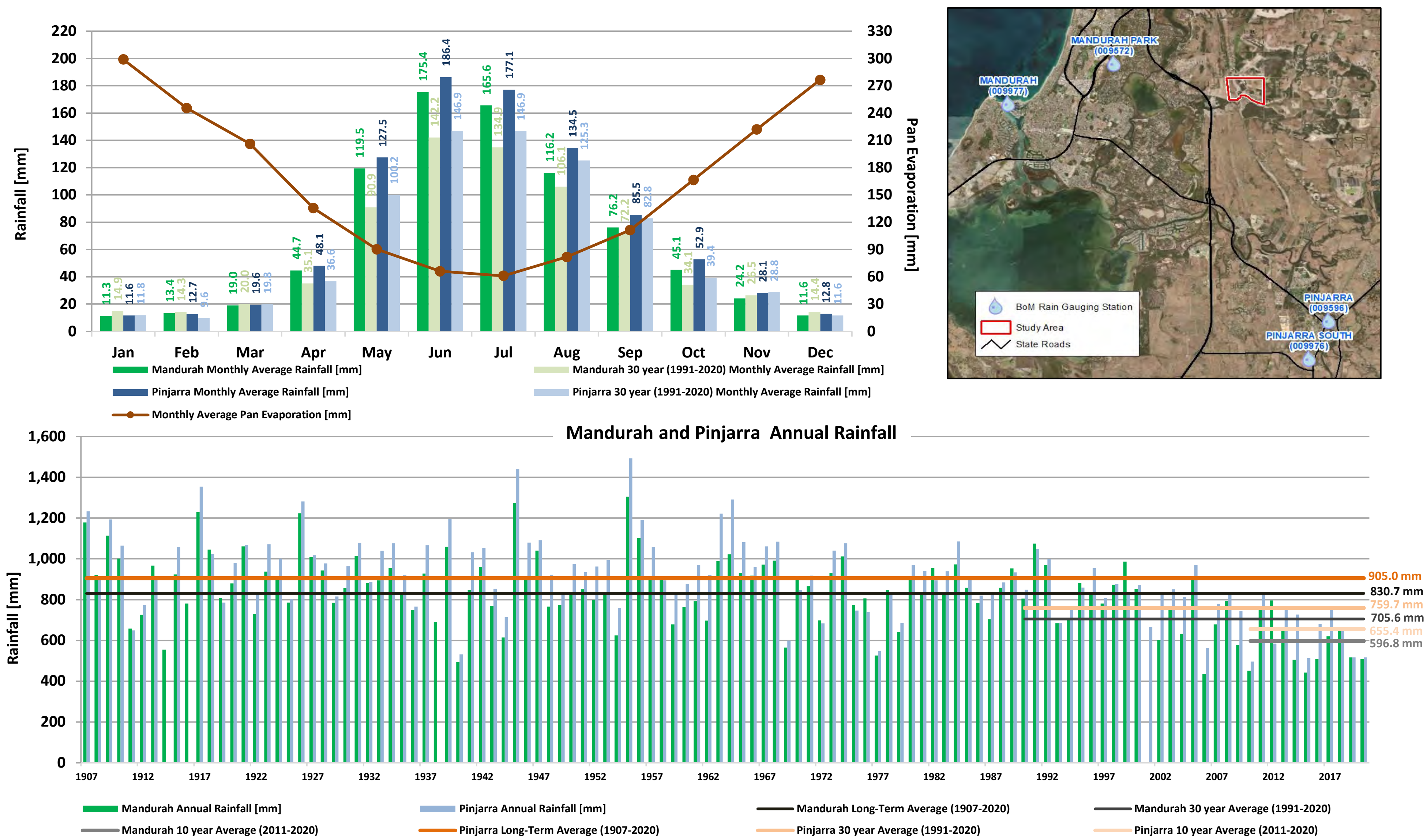
0 100 200 300 400 Metres

N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 3: Topography

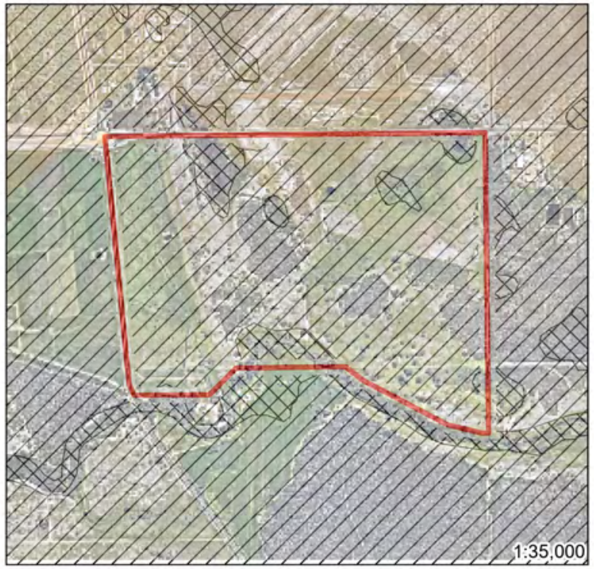


Data Source: BoM (2020) Climate Data Online *Mandurah Park (009572; 1907-2001), Mandurah (009977; 2002-2019), Pinjarra (009596; 1907-2000) and Pinjarra South (009976; 2001-2019) Rain Gauges*;
DPIRD (2020) *Pinjarra Weather Station (Pan Evaporation, 2012-2020)*

JDA Consultant Hydrologists

Job No. J6890

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)
Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS
Figure 4: Rainfall and Evaporation



Surface Geology

Bassendean Sand- Basal conglomerate overlain by dune quartz sand with heavy mineral concentrations

Acid Sulphate Soils

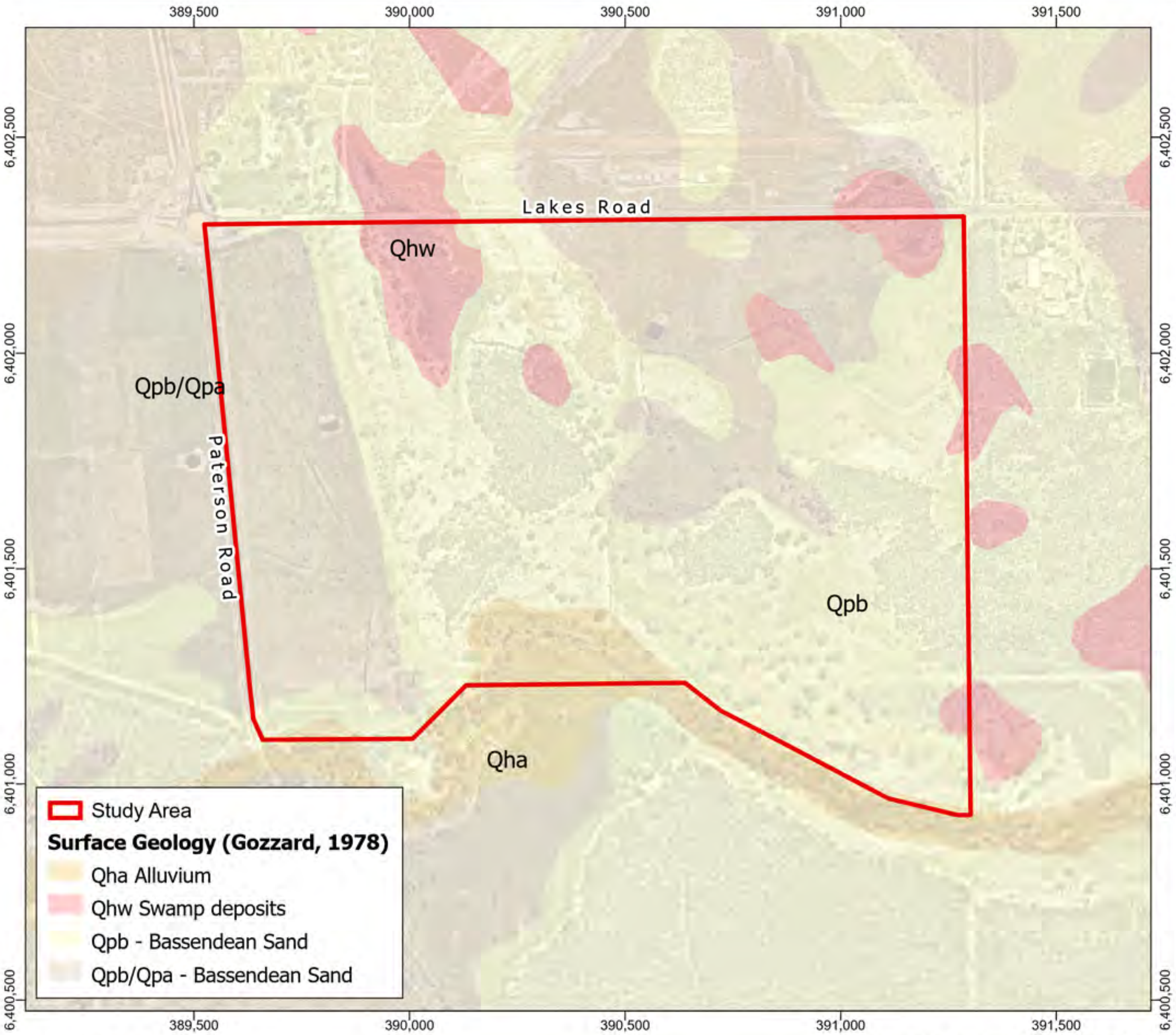
High to Moderate Risk - High to moderate risk of A.S.S occurring within 3m of natural soil surface

Moderate to Low Risk - Moderate to low risk of A.S.S occurring within 3 m of natural soil surface but high to moderate risk of A.S.S beyond 3 m of natural soil surface

A.S.S Risk Mapping (DWER, 2015)

Moderate to Low Risk of A.S.S

High to Moderate Risk of A.S.S



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Coordinate System: GDA 2020, Zone 50

JDA

Job No. J6890

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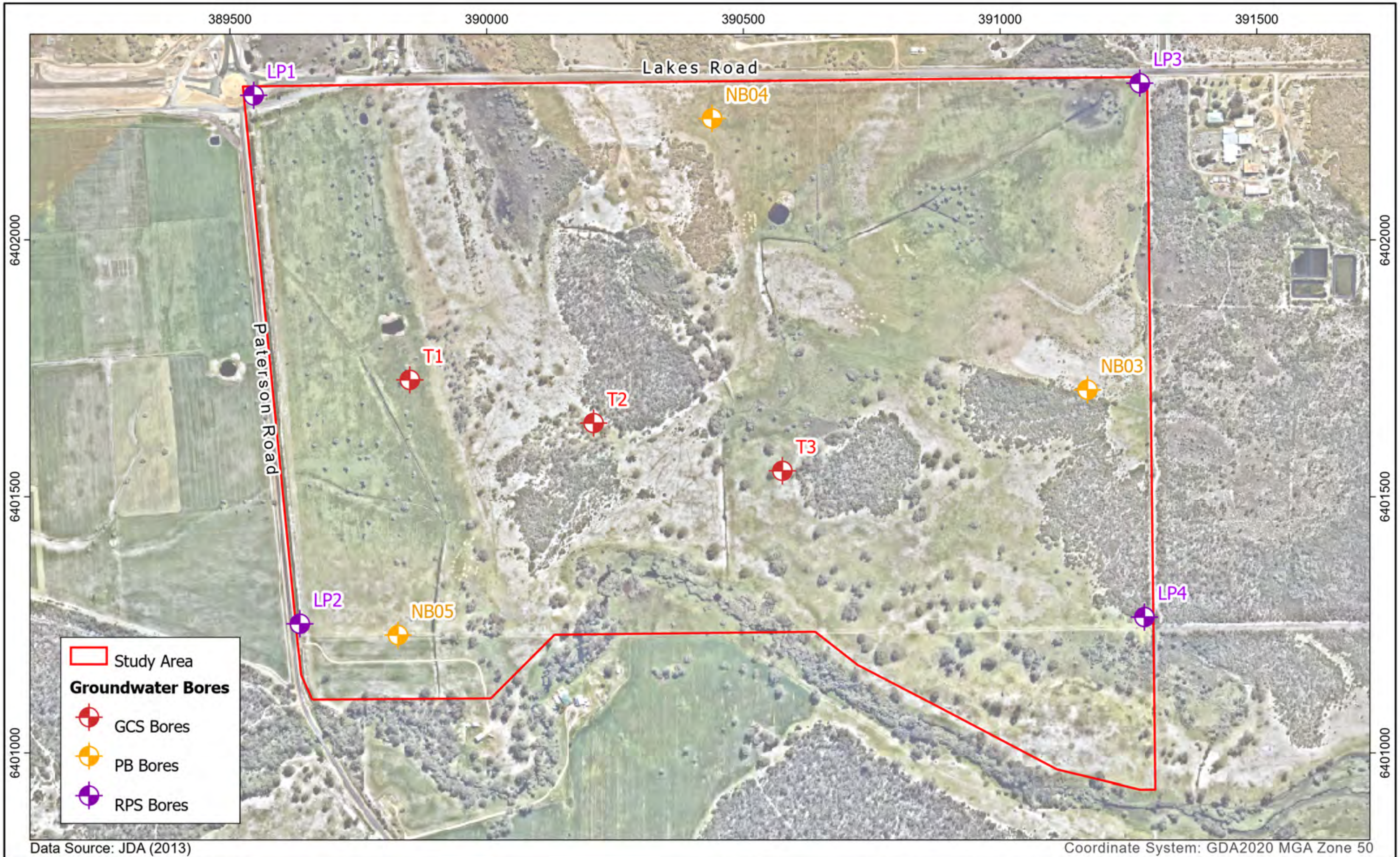
N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 5: Surface Geology and Acid Sulphate Soils Mapping



Data Source: JDA (2013)

Coordinate System: GDA2020 MGA Zone 50

JDA Consultant Hydrologists

Job No. J6890

Scale: 1:10,000 @A4

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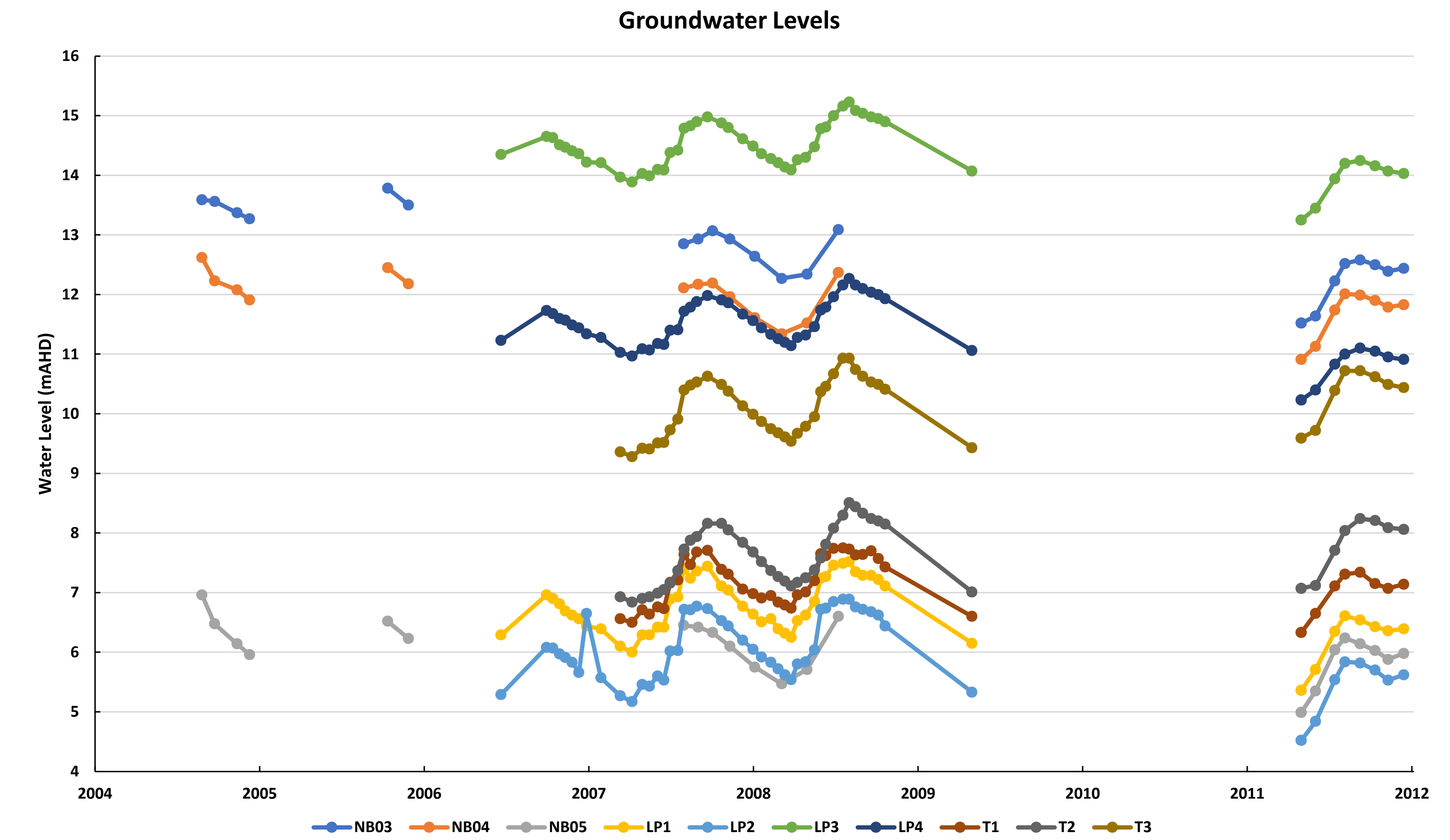
N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

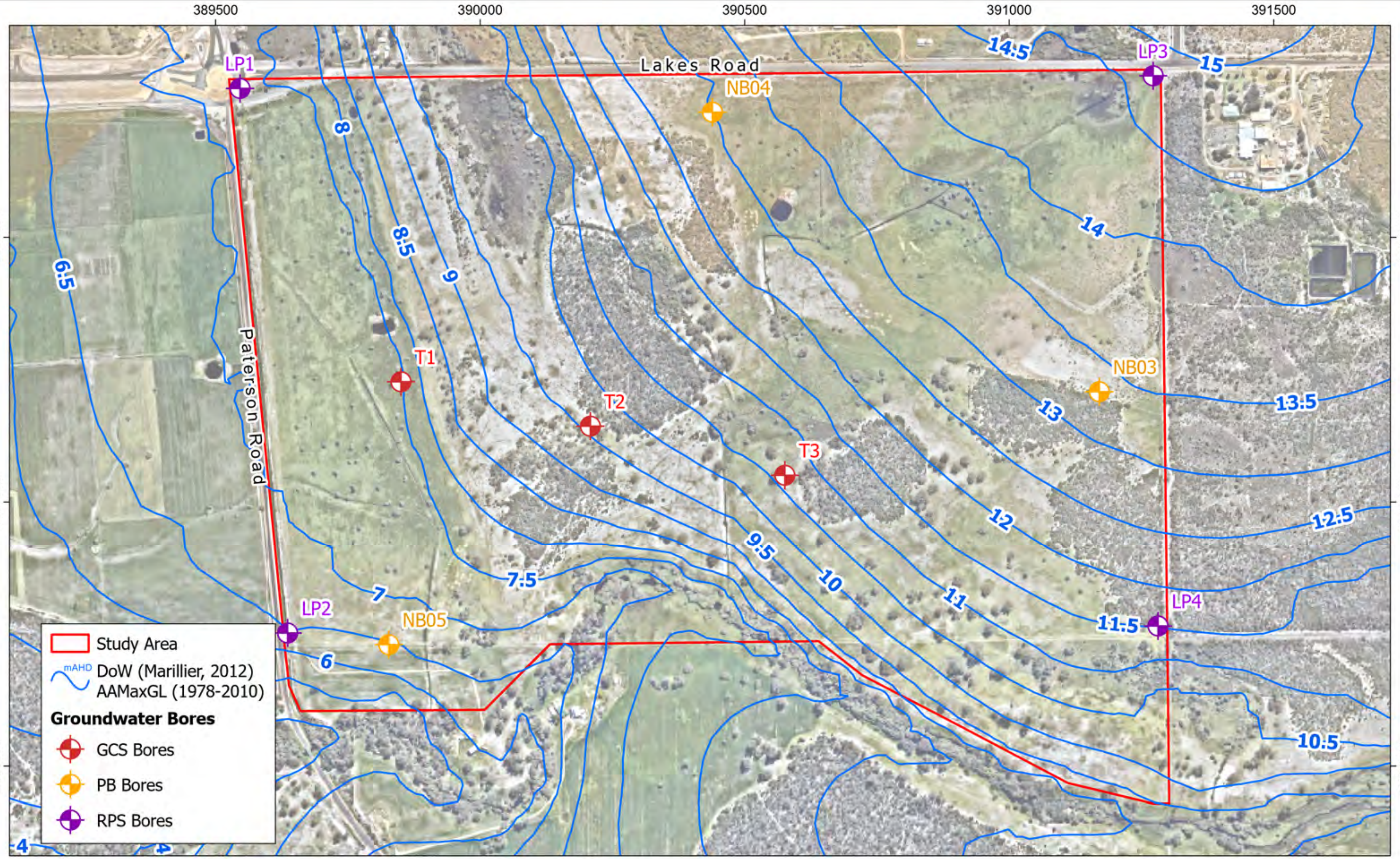
Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 6: Groundwater Monitoring Bores



Data Source: PB (2009); RPS (2010); JDA (2013)

JDA	Job No. J6890	Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd) Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS **Figure 7: Groundwater Level Time Series**



Data Source: Marillier (2012) Nambeelup Groundwater Modelling Report

Coordinate System: GDA2020 MGA Zone 50

Job No. J6890

Scale: 1:10,000 @A4

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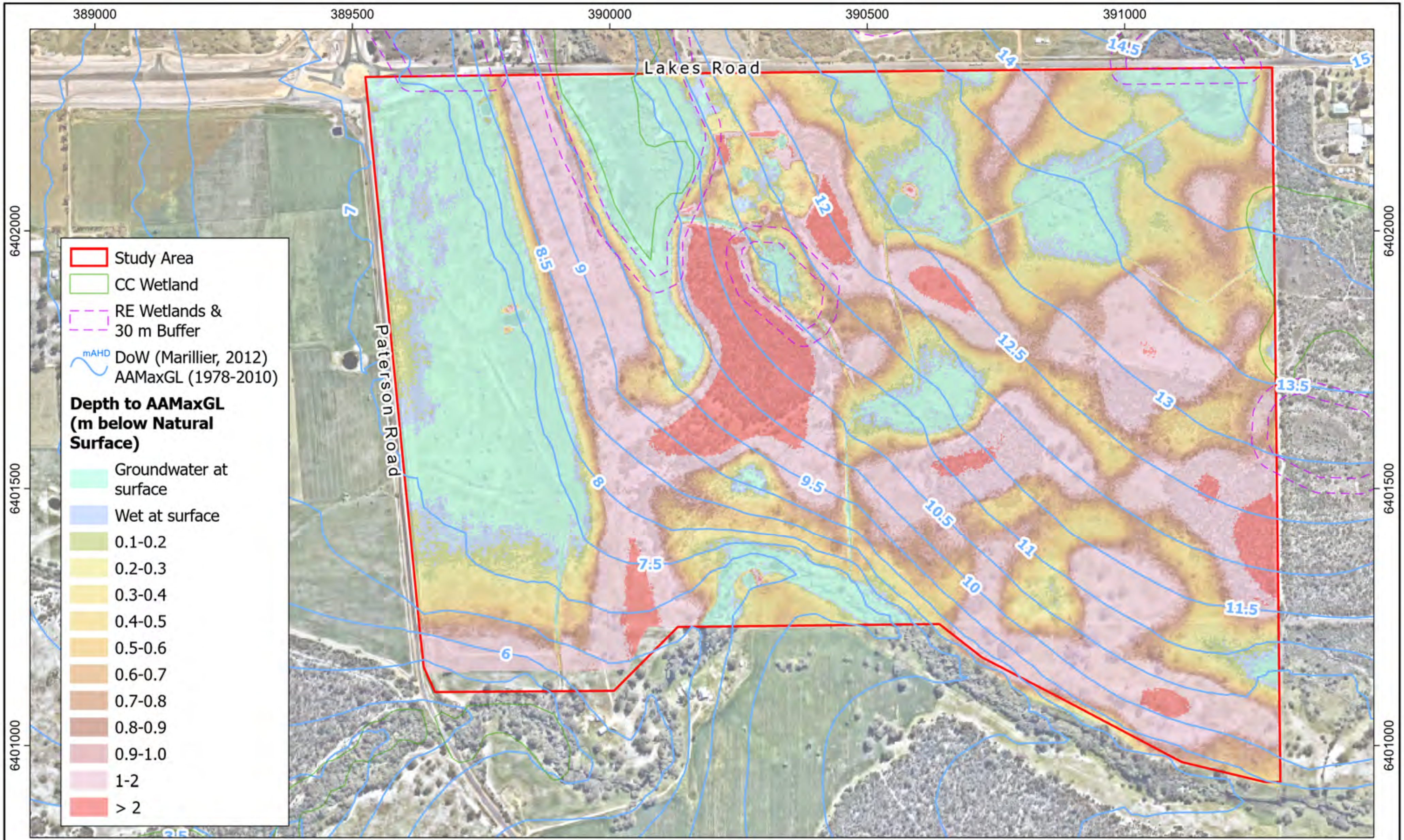
Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 8: DoW Modelled AAMaxGL



Data Source: Marillier (2012) Nambeelup Groundwater Modelling Report

Coordinate System: GDA2020 MGA Zone 50

Job No. J6890

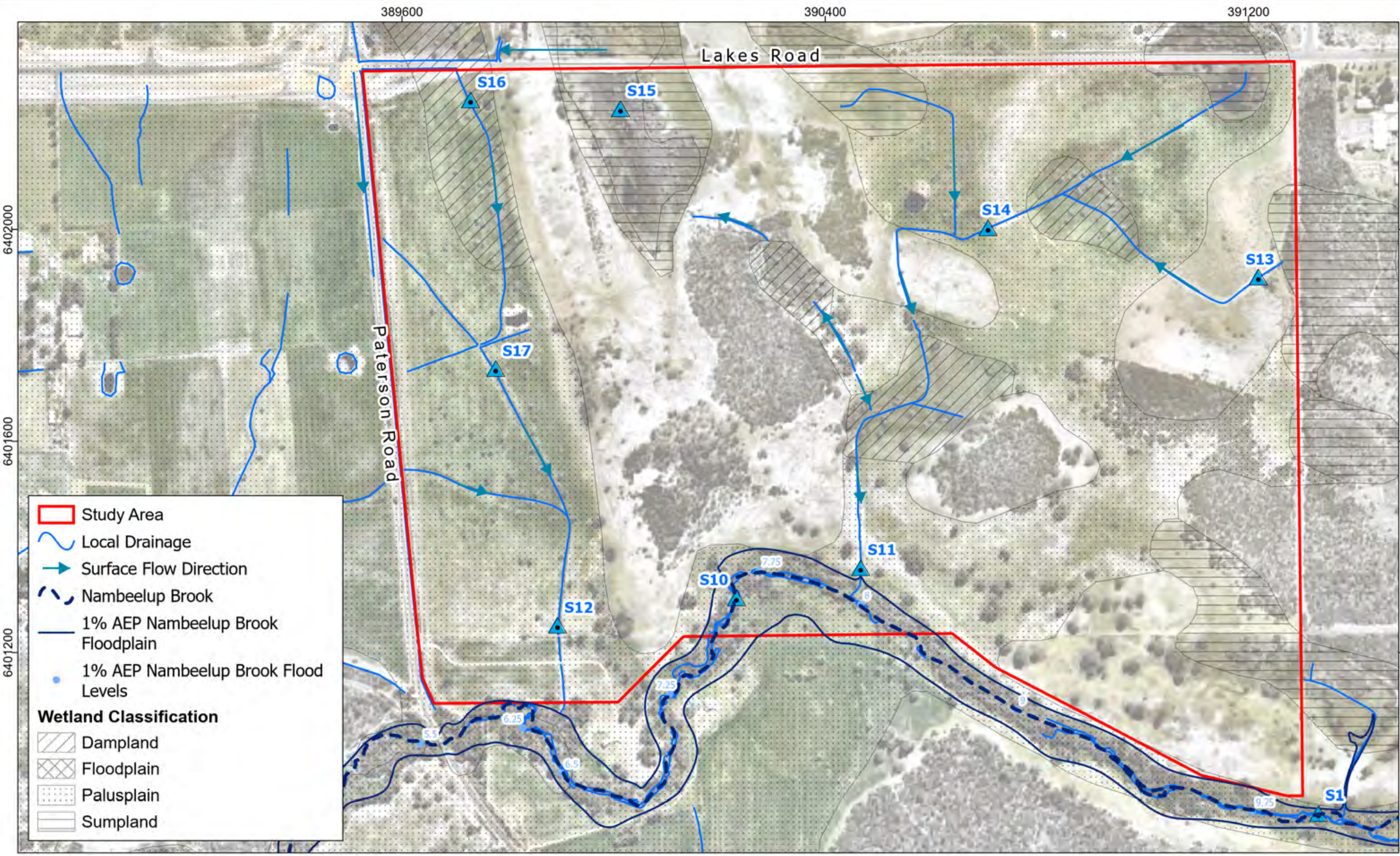
Scale: 1:10,000 @A4

0 100 200 300 400 Metres

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 9: Depth to DoW Modelled AAMaxGL



Data Source: Geomorphic Wetlands SCP (DBCA, 2018); Landgate (2020) Topo Water Line (LGATE-018/167); Nearmap (2020).

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J6890

Scale: 1:10,000 @A4

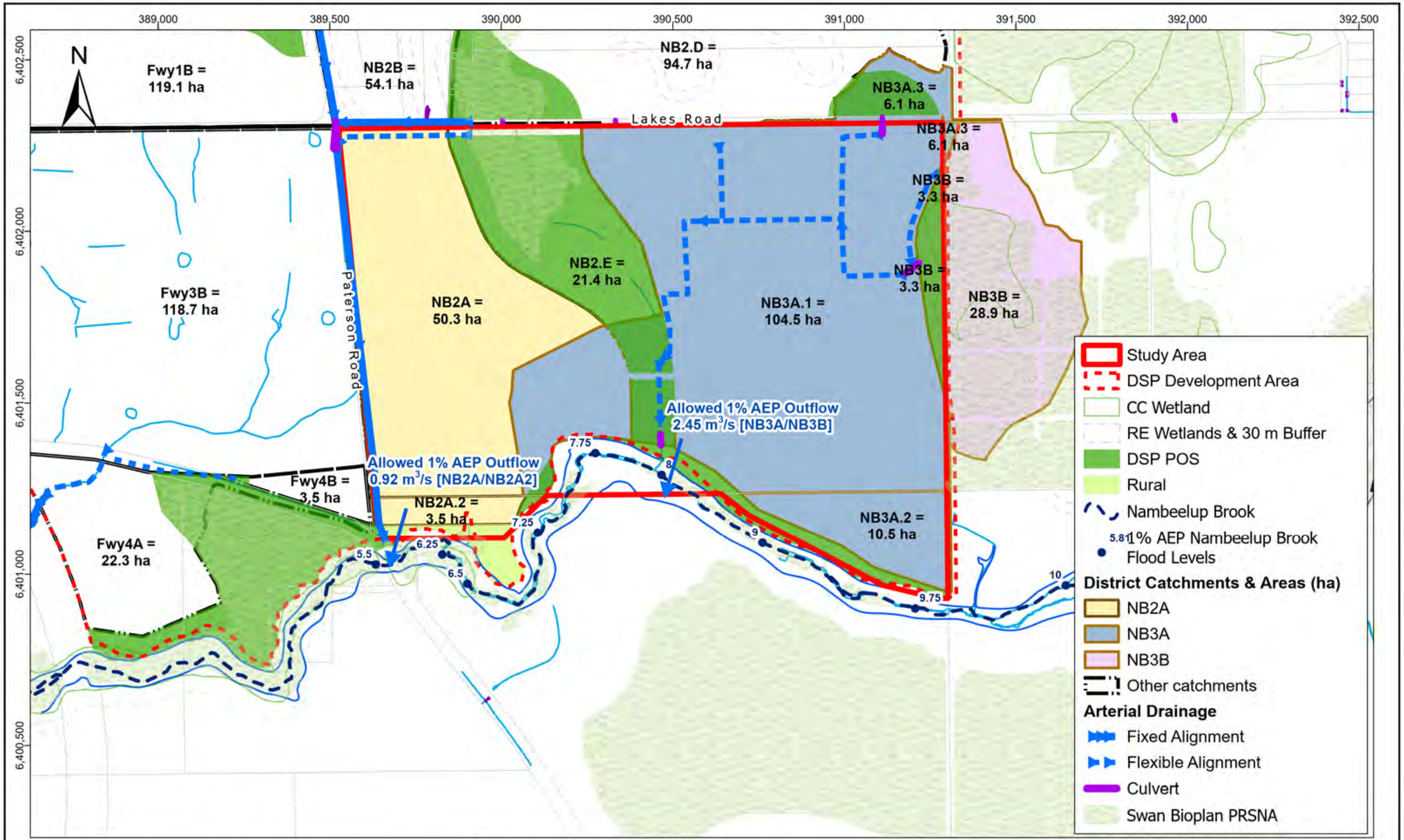
0 100 200 300 400 Metres

N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 10: Local Surface Water Drainage and Wetland Mapping



Data Source: JDA (2016) Nambeelup IA District Water Management Strategy (DWMS); DoW (2011) Murray DWMP

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JDA

Job No. J6890

1:15,000

0 200 400 600 800 Meters

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 11: DWMS Arterial Drainage Provisions

Data Source: NearMaps (2020); CLE (2023).

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J6890

Scale: 1:10,000 @A4

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N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 12: Proposed Development Land Use and Catchment Plan

Data Source: NearMaps (2020); CLE (2023).

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J6890

Scale: 1:10,000 @A4

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N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 13: Stormwater Management Plan

Data Source: NearMaps (2020); CLE (2023).

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J6890

Scale: 1:10,000 @A4

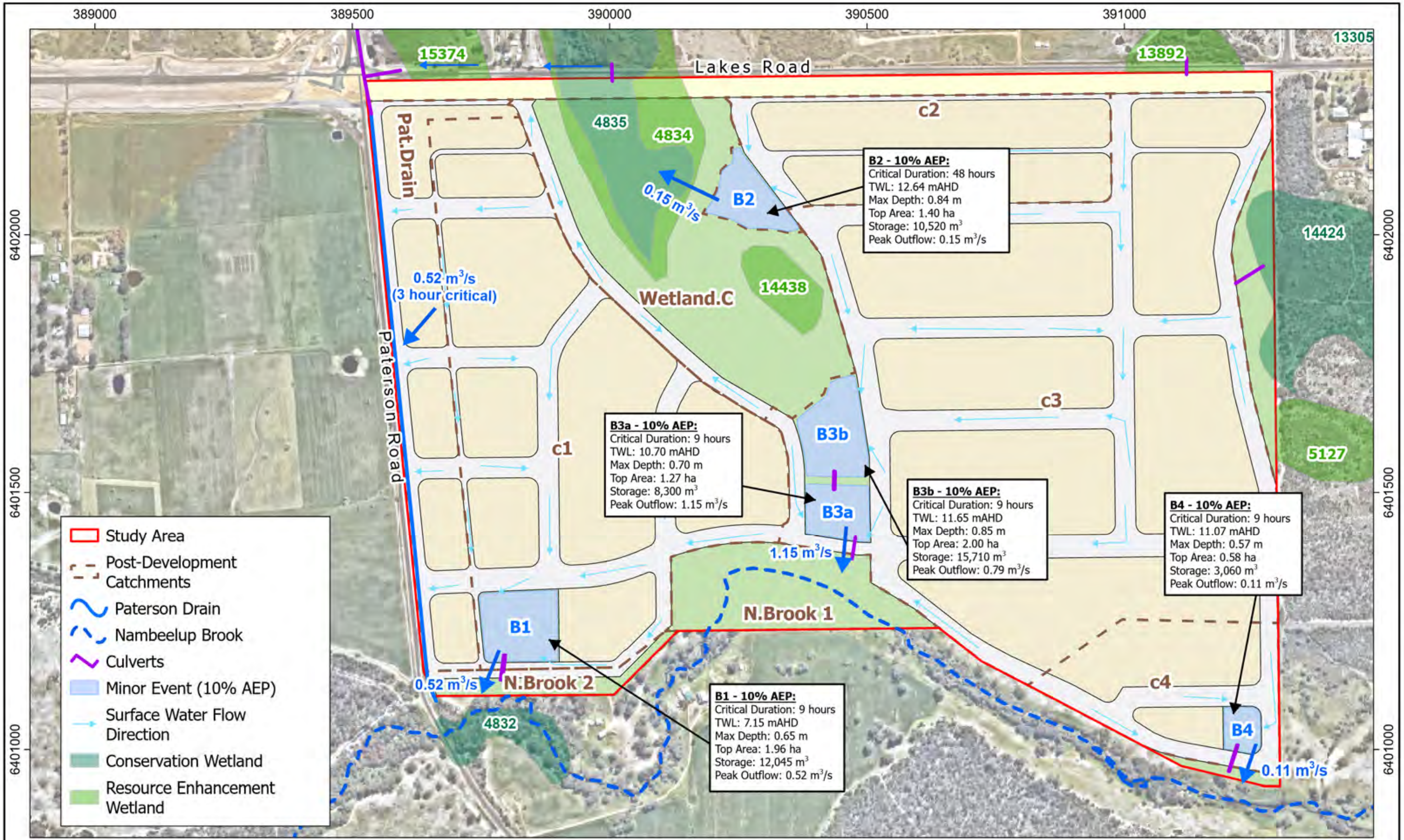
0 100 200 300 400 Metres

N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 14: Small (First 15 mm) Stormwater Event Plan



Data Source: NearMaps (2020); CLE (2023).

Coordinate System: GDA2020 MGA Zone 50

JDA

Job No. J6890

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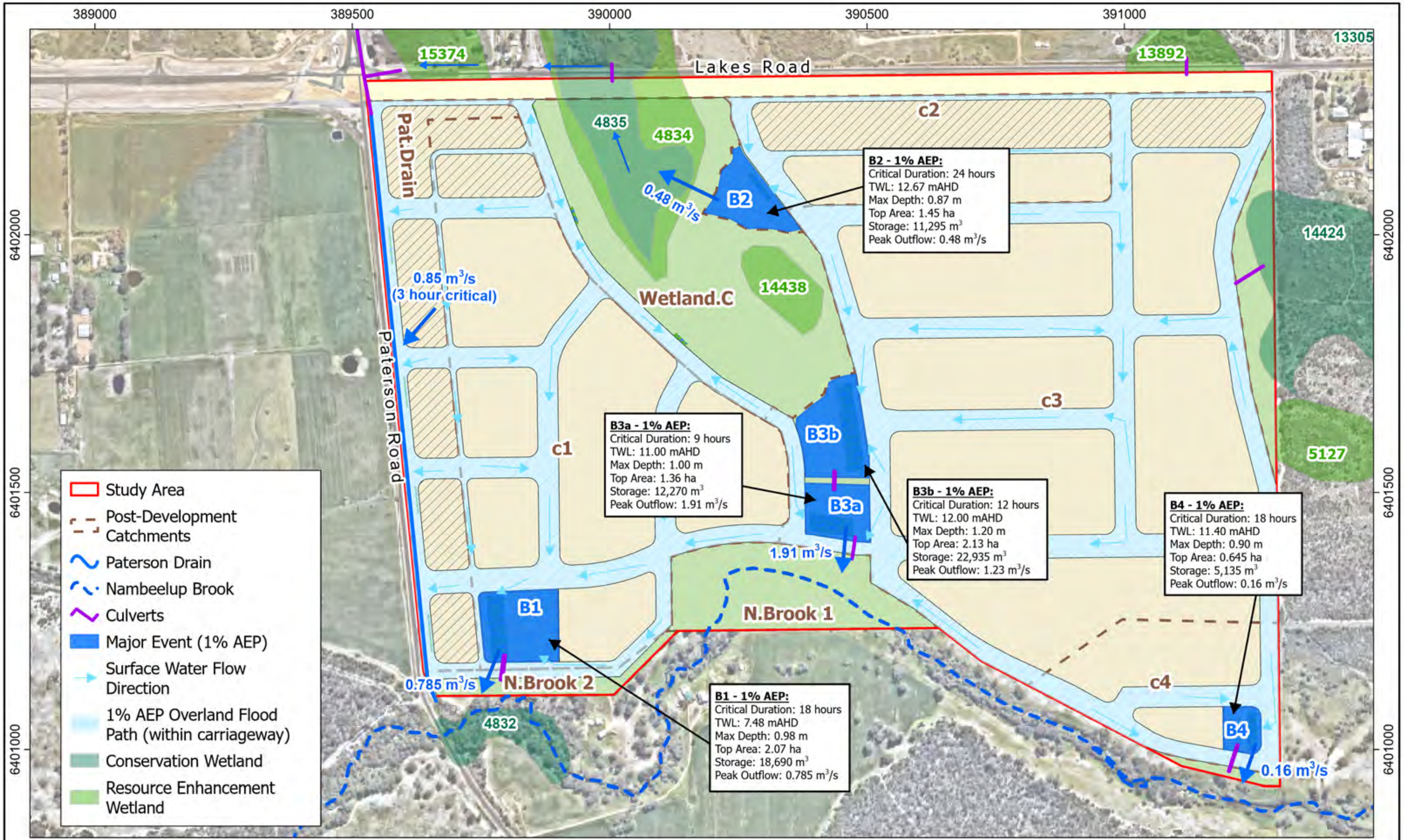
0 100 200 300 400 Metres

N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 15: Minor (10% AEP) Stormwater Event Plan



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Coordinate System: GDA2020 MGA Zone 50

JDA Consultant Hydrologists

Job No. J6890

Scale: 1:10,000 @A4

0 100 200 300 400 Metres

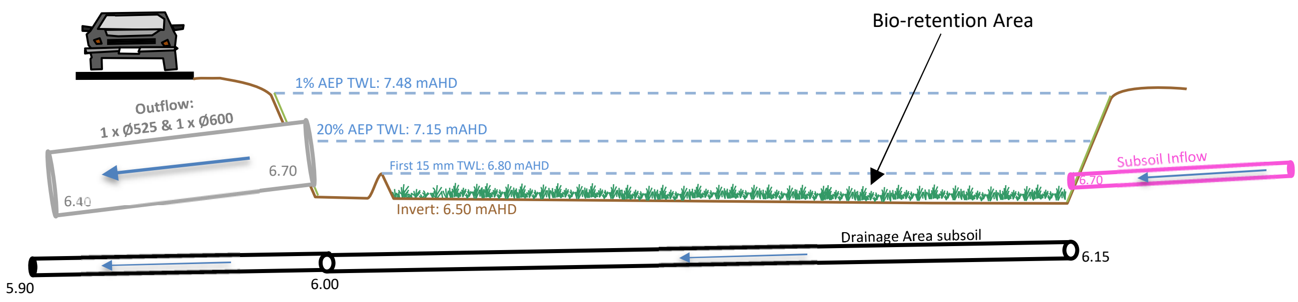
N

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

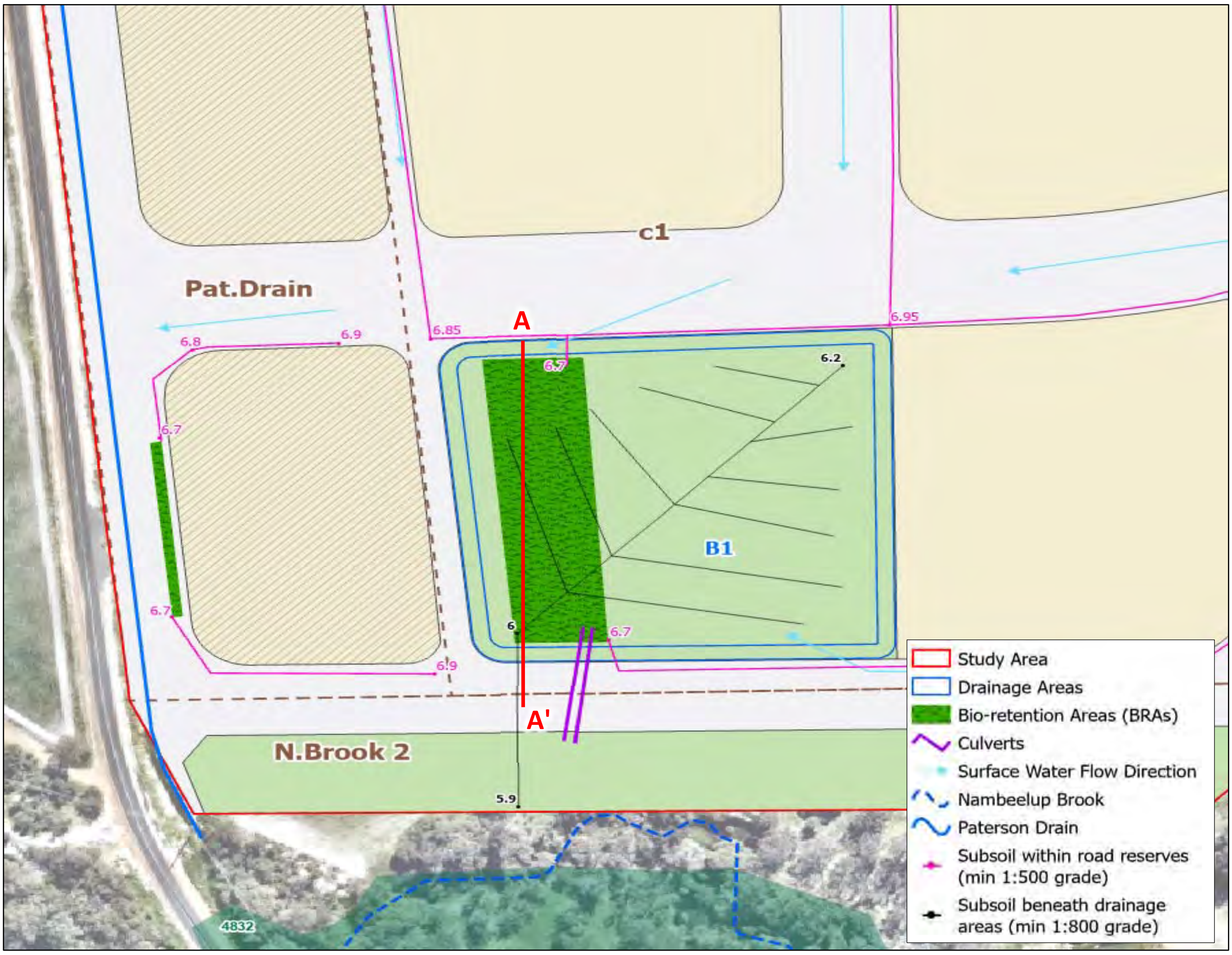
Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 16: Major (1% AEP) Stormwater Event Plan

Cross-Section



Note: Drawing not to scale

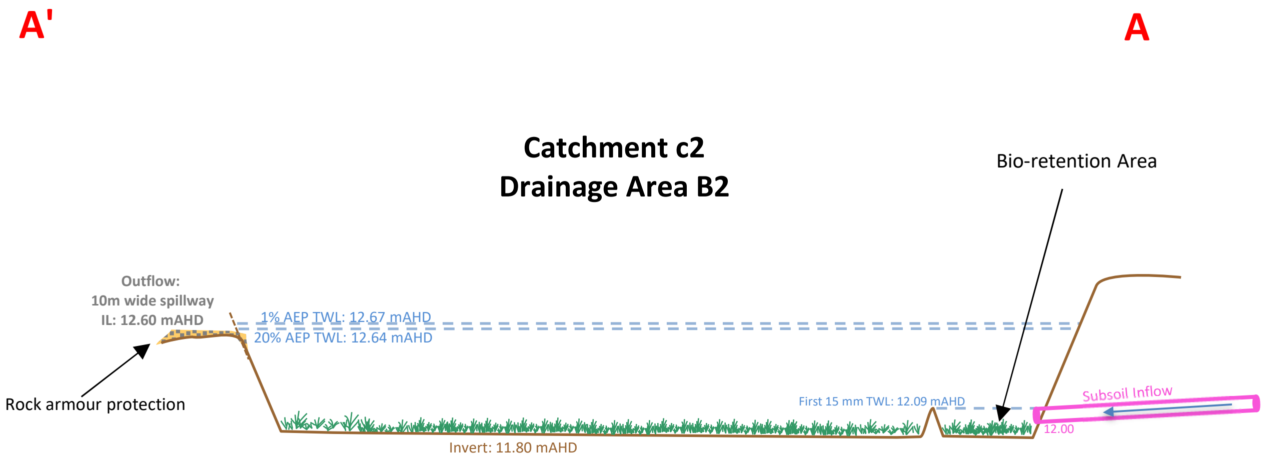


JDA

Job No. J6890

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)
Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS
Figure 17: Drainage Area B1 Cross-section Concept

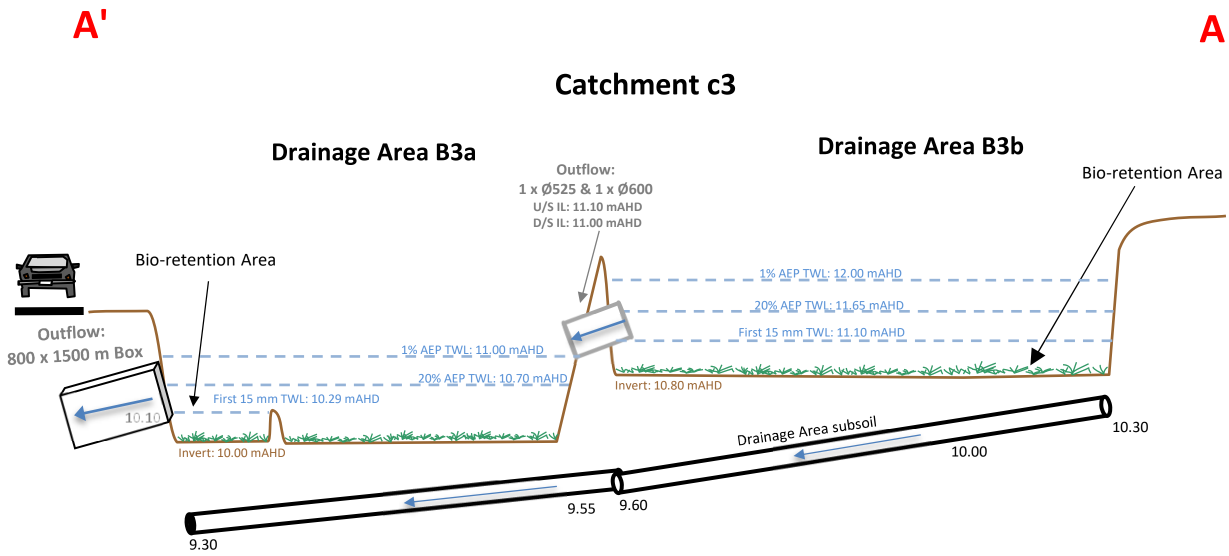
Cross-Section



Note: Drawing not to scale

JDA Consultant Hydrologists	Job No. J6890	Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)
		Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS
		Figure 18: Drainage Area B2 Cross-section Concept

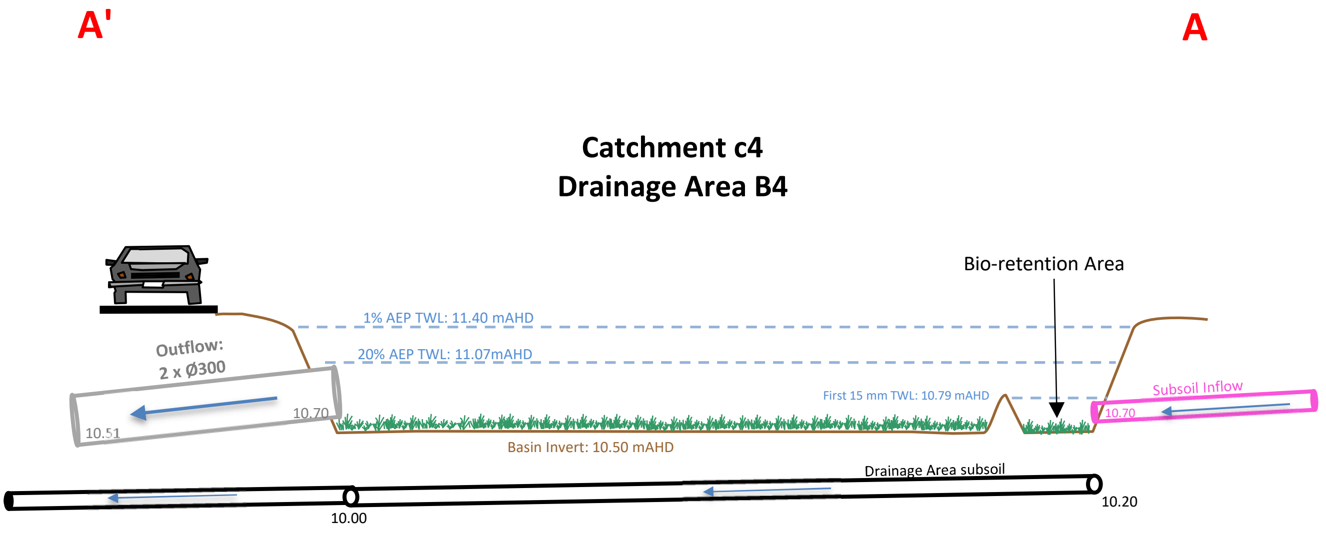
Cross-Section



Note: Drawing not to scale

JDA Consultant Hydrologists	Job No. J6890 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2022	Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd) Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS **Figure 19: Drainage Area B3 Cross-section Concept**

Cross-Section



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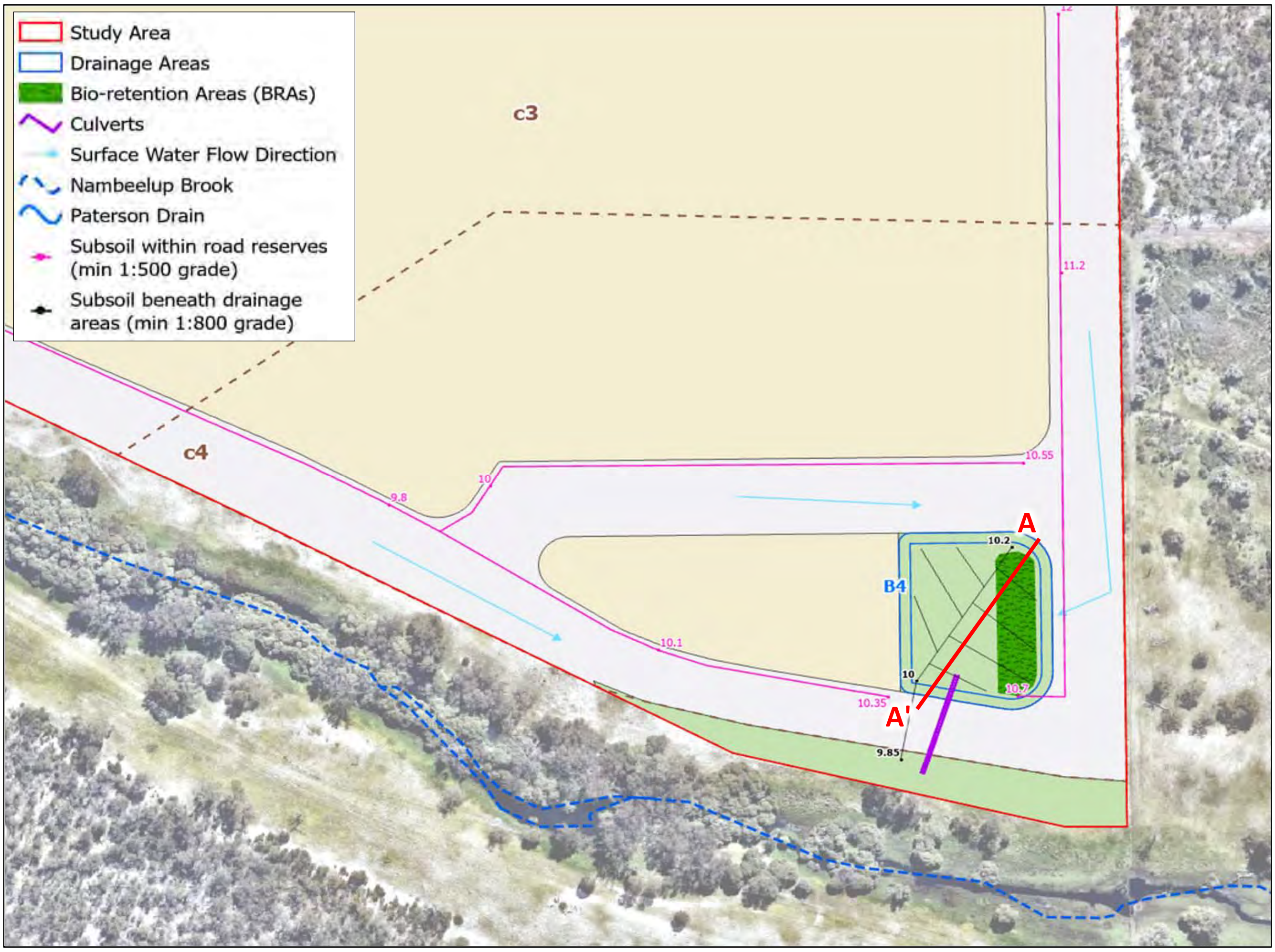


Job No. J6890

Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)
Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 20: Drainage Area B4 Cross-section Concept

Data Source: NearMaps (2020); CLE (2023).

Coordinate System: GDA2020 MGA Zone 50

JDA Consultant Hydrologists

Job No. J6890

Scale: 1:10,000 @A4

0 100 200 300 400 Metres

N

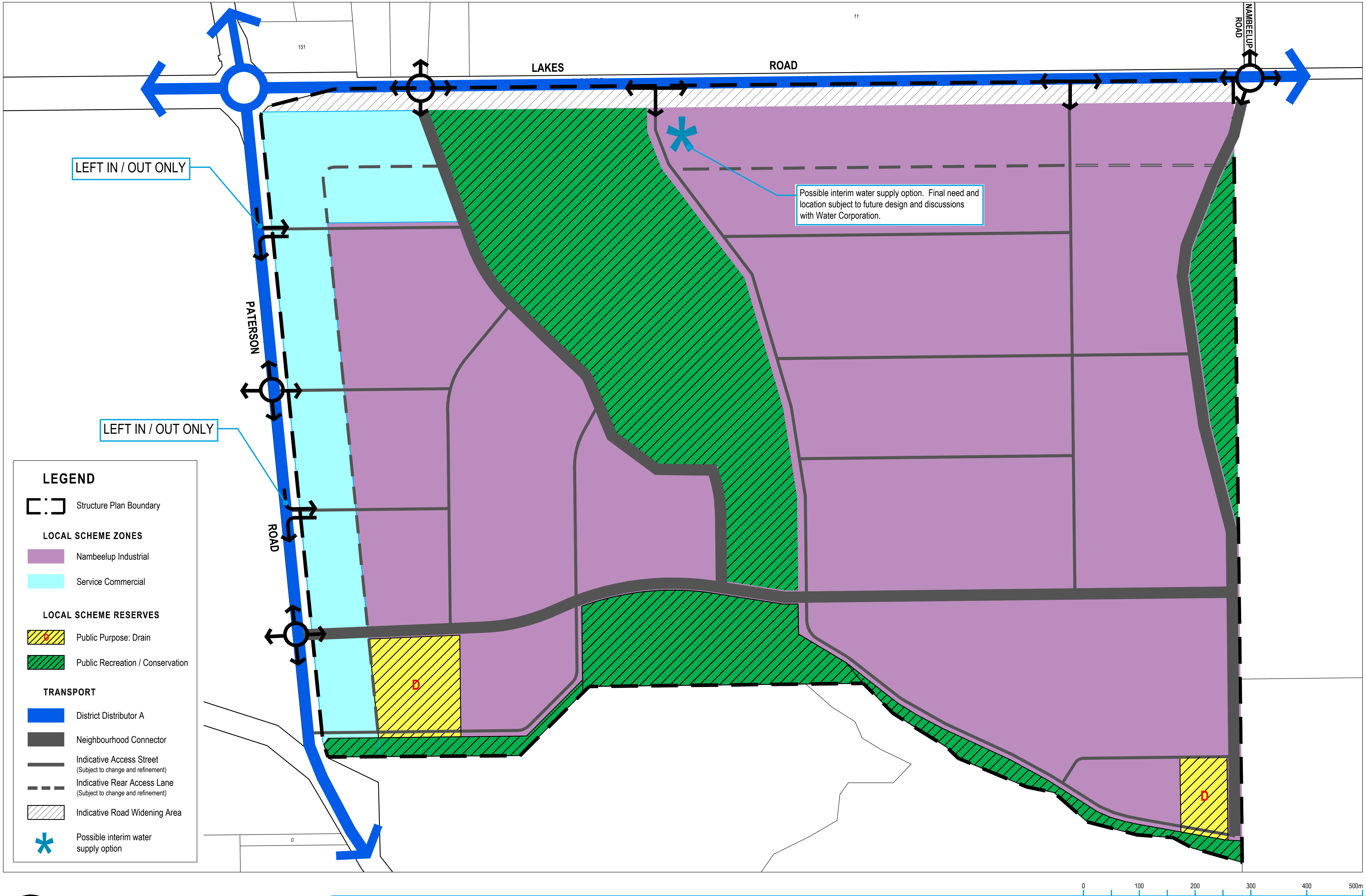
Nambeelup JV (Westprime Asset Pty Ltd & Peel Estates (WA) Pty Ltd)

Lot 1221 Lakes Road and Part Lot 1400 Paterson Road, Nambeelup: LWMS

Figure 21: Proposed Groundwater Management Strategy

APPENDIX A

Local Structure Plan (CLE, 2023)



CLE Town Planning + Design

LOCAL STRUCTURE PLAN

Lot 221 Lakes Road and Part Lot 1400 Patterson Road, Nambeelup

plan no: 2155-101B-01
date: 23 June 2023
scale: 1:6,000 @A3, 1:3,000 @A1

N

APPENDIX B

Nambeelup Industrial District Structure Plan
(DoP, 2016)

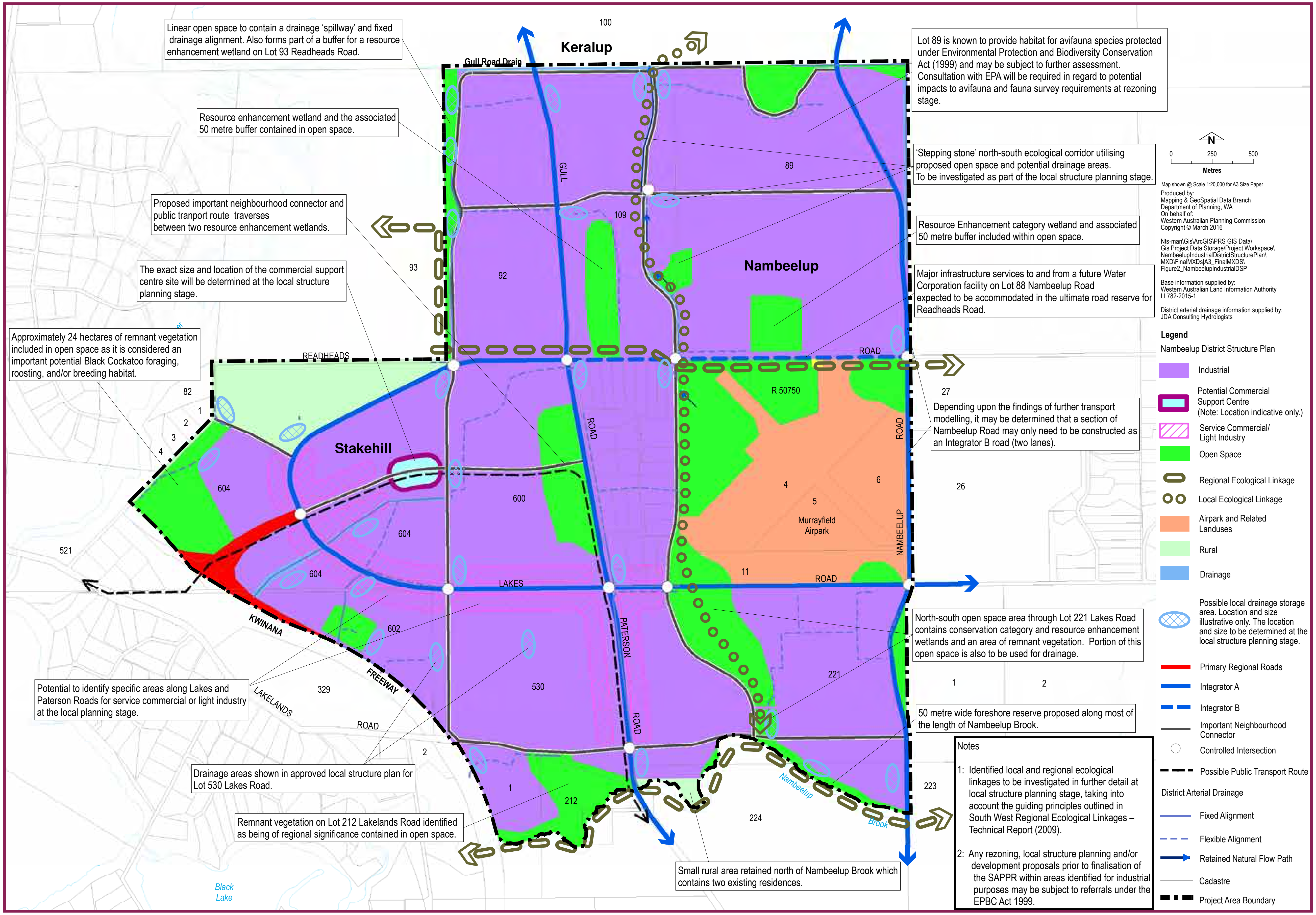


Figure 2: Nambeelup Industrial District Structure Plan

APPENDIX C

Local Water Management Strategy Checklist for Developers

Checklist for integrated water cycle management assessment of local structure plan or local planning scheme amendment

1. Tick the status column for items for which information is provided.
2. Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
3. Provide brief comments on any relevant issues.
4. Provide brief description of any proposed best management practices, eg. multi-use corridors, community based-social marketing, water re-use proposals.

Local water management strategy item	Deliverable	☑	Comments
Executive summary			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1: Design elements & requirements for BMPs and critical control points	☑	Section 1
Introduction			
Total water cycle management – principles & objectives Planning background Previous studies		☑	Section 2
Proposed development			
Structure plan, zoning and land use. Key landscape features Previous land use	Site context plan Structure plan	☑ ☑	Figure 1 Figure 12; Appendix A
Landscape - proposed POS areas, POS credits, water source, bore(s), lake details (if applicable), irrigation areas	Landscape Plan	☐	
Design criteria			
Agreed design objectives and source of objective		☑	Table 1
Pre-development environment			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		☑	Section 3
Site Conditions - existing topography/ contours, aerial photo underlay, major physical features	Site condition plan	☑	Figures 2 and 3
Geotechnical - topography, soils including acid sulfate soils and infiltration capacity, test pit locations	Geotechnical plan	☑	Figure 5;
Environmental - areas of significant flora and fauna, wetlands and buffers, waterways and buffers, contaminated sites	Environmental Plan plus supporting data where appropriate	☑	Figures 5 and 10
Surface Water – topography, 100 year floodways and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface Water Plan	☑	Figures 10 and 11
Groundwater – topography, pre development groundwater levels and water quality, test bore locations	Groundwater Plan plus details of groundwater monitoring and testing	☑	Figures 6 to 9 Appendix D
Water use sustainability initiatives			
Water efficiency measures – private and public open spaces including method of enforcement		☑	Section 5.4.1
Water supply (fit-for-purpose strategy), agreed actions and implementation. If non-potable supply, support with water balance		☑	Section 5.4.2/5.4.3
Wastewater management		☑	Section 5.4.4
Stormwater management strategy			
Flood protection - peak flow rates, volumes and top water levels at control points,100 year flow paths and 100 year detentions storage areas	100yr event Plan Long section of critical points	☑ ☐	Figure 16
Manage serviceability - storage and retention required for the critical 5 year ARI storm events Minor roads should be passable in the 5 year ARI event	5yr event Plan	☑	Figure 15 10% AEP applicable for industrial area

Local water management strategy item	Deliverable	✓	Comments
Protect ecology – detention areas for the 1 yr 1 hr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1yr event plan Typical cross sections	✓ ✓	Figure 14 Figures 17 to 20
Groundwater management strategy			
Post development groundwater levels, fill requirements (including existing and likely final surface levels), outlet controls, and subsoils areas/exclusion zones	Groundwater/subsoil Plan	✓	Figure 21
Actions to address acid sulfate soils or contamination		✓	Section 3.4; 6.3.2
The next stage – subdivision and urban water management plans			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design.		✓	Section 6.2
Monitoring			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		✓	Section 6.5
Implementation			
Developer commitments		✓	Section 6.1
Roles, responsibilities, funding for implementation		✓	Section 6.1
Review		✓	Section 6

APPENDIX D

Pre-Development Surface Water and Groundwater Monitoring Report (JDA, 2013)

David Barnao & Co

Lot 221 Lakes Road Nambeelup

Surface & Groundwater Monitoring 2011

May 2013

JDA Consultant Hydrologists

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ISO 9001 BUREAU VERITAS Certification

Document Version No.	Issue Date
J4914b	23 May 2013

	Name	Signature	Date
Author	Blazenko Kurilj		
Checked by	Jim Davies		
Approved by	Jim Davies		

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B. Laboratory Analysis Results.

C. Hydstra – Hyday Outputs.

1. INTRODUCTION

1.1 Background

In April 2011 JDA was appointed by David Barnao & Co to undertake a surface & groundwater study at Lot 221 Lakes Road in Nambeelup, Shire of Murray. The study area, approximately 160ha, is located 65km South of Perth and 9km East of Mandurah (Figure 1).

Monitoring of surface water at Lot 221 has been conducted by JDA Consultant Hydrologists from August 2008 to December 2010. JDA has provided 2 detailed monitoring reports to Twin Ocean Property Group which include data collected on Lot 221 (JDA, 2009; JDA, 2011).

Groundwater monitoring bores have been installed within Lot 221 by several consultants and the Department of Water (DoW) since 2004 including:

- Parsons Brinkerhoff (PB) NB Series bores, installed in 2004;
- RPS Bowman Bishaw Gorham (BBG) LP Series bores, installed in 2006;
- Groundwater Consulting Services (GCS) T Series bores, installed in 2007;
- Department of Water (DoW) HS Series bores, installed in 2008.

Details on borehole construction installed by PB, RPS, and GCS are provided in Appendix A.

Figure 2 presents surface and groundwater monitoring locations within Lot 221.

2. GROUNDWATER MONITORING

2.1 Groundwater Monitoring Bores

Static groundwater levels were collected from a total of 20 monitoring bores within and surrounding Lot 221. Groundwater monitoring bore details are presented in Table 1, taken from previous reports by others.

TABLE 1: GROUNDWATER MONITORING BORE DETAILS

Monitoring Bore	GPS Co-Ordinates		Top of Casing (mAHD)	Total Depth (mBNS)	Screened Intervals (mBNS)
	Easting (m)	Northing (m)			
PB Bores (NB Series)					
NB03	391169	6401707	15.14	6.55	Unknown
NB04	390438	6402235	13.45	5.70	Unknown
NB05	389826	6401228	7.97	6.07	Unknown
RPS Bores (LP Series)					
LP1	389545	6402280	7.70	3.5	0.50 – 3.50
LP2	389635	6401250	7.40	4.5	1.50 – 4.50
LP3	391271	6402304	15.9	3.8	0.75 – 3.80
LP4	391280	6401263	13.3	4.8	0.25 – 4.80
Groundwater Consulting Services					
T1	389849	6401726	8.31	3.00	1.00 – 3.00
T2	390207	6401642	14.64	8.00	6.00 – 8.00
T3	309057	6401549	12.49	6.50	2.50 – 4.50
DoW					
T640	387536	6403674	2.68	31.00	Unknown
T650	391166	6403726	18.58	18.00	Unknown
HS-92a	388396	6399839	4.27	Unknown	Unknown
HS-92b	388396	6399839	4.21	Unknown	Unknown
HS-97a	389356	6401197	7.40	12.5	Unknown
HS-97b	389356	6401197	7.46	5.27	Unknown
HS-104-3a	390002	6401888	11.26	Unknown	Unknown
HS-104-3b	390002	6401888	11.20	Unknown	Unknown
HS-105a	391304	6402507	17.73	Unknown	Unknown
HS-105b	391304	6402507	17.89	Unknown	unknown

2.2 Groundwater Monitoring Procedure

2.2.1 Static Water Levels

Static groundwater levels were measured using a down-hole dip-probe from Top of Casing (ToC) to water level. The readings were conducted prior to sampling the water for quality analysis.

2.2.2 Groundwater Quality Sampling

- JDA 12v pumps were decontaminated prior to drawing any water from bores using a three stage rinse process of flushing with Decon, tap water & distilled water.

- Groundwater were sampled for analysis of physic-chemical property (EC, pH, TDS), nutrients (TN, TP, TKN, NO_x_N, NH_4_N, PO_4_P), ions (Ca^{+2}, Mg^{+2}, K^+, Na^+, $NH4^+$, HCO_3^-, CO_3^{-2}, NO_2^-, NO_3^-, NH_4^+, PO_4, Cl^{--}, SiO_2^-) and metals (Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Se, Zn).

- Groundwater were sampled using bore purging method, i.e. a sample was collected after three casing volume of water are extracted from bore, until such time as the EC and pH of the discharge water are observed to stabilise.

- Groundwater samples were collected within accordance of AS/NZS 5667:11 1998 Water Quality - Sampling part 11 Guidance on sampling of groundwater.

- All JDA groundwater quality samples for dissolved nutrients and dissolved metals analysis were field-filtered using inline 0.45µm cellulose filters. Water samples for major ions and total dissolved solids (TDS) analysis are not field filtered.

- All collected samples were stored below 4^{o}C in an esky and delivered to a NATA-accredited laboratory within 24 hours of collection.

- pH and electrical conductivity (EC) measurements are conducted *in-situ* by JDA.

2.3 Groundwater Level

Monthly static water levels were collected by JDA from NB, T, LP and HS series bores from May to December 2011; results are provided in Table 2. Time-series plot of monthly water levels recorded from May to Dec 2011 is provided in Figure 3.

Water levels across Lot 221 show an approximate fall of 7m from North East to South West over a distance of approximately 1.5km, i.e. 0.005 gradient.

The difference in minimum and maximum groundwater levels over the site during 2011 monitoring period varies between bores, ranging from 0.87m at LP4 to 1.32m at LP2.

TABLE 2: MONITORING BORE WATER LEVELS MAY TO DECEMBER 2011

Bores	Water Levels (mAHD)										
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Min	Max	Range
NB03	11.52	11.64	12.23	12.52	12.58	12.50	12.39	12.44	11.52	12.58	1.06
NB04	10.91	11.13	11.74	12.01	11.99	11.90	11.79	11.83	10.91	12.01	1.10
NB05	4.99	5.35	6.04	6.24	6.14	6.03	5.88	5.98	4.99	6.24	1.25
LP1	5.36	5.71	6.35	6.61	6.54	6.43	6.36	6.39	5.36	6.61	1.25
LP2	4.52	4.84	5.54	5.84	5.82	5.70	5.53	5.62	4.52	5.84	1.32
LP3	13.25	13.45	13.94	14.02	14.25	14.16	14.07	14.03	13.25	14.25	1.00
LP4	10.23	10.40	10.83	11.00	11.10	11.05	10.95	10.91	10.23	11.10	0.87
T1	6.33	6.65	7.11	7.31	7.34	7.15	7.07	7.14	6.33	7.34	1.01
T2	7.07	7.12	7.71	8.04	8.24	8.21	8.09	8.06	7.07	8.24	1.17
T3	9.59	9.72	10.39	10.72	10.72	10.62	10.49	10.44	9.59	10.72	1.13
T640	0.54	0.83	1.42	1.66	1.64	1.55	1.34	1.38	0.54	1.66	1.12
T650	15.14	15.27	15.64	15.89	16.02	16.01	15.92	15.89	15.14	16.02	0.88
HS-92a	N/A	1.92	2.76	3.10	2.99	2.85	2.72	2.71	1.92	3.10	1.18
HS-92b	N/A	1.92	2.77	3.12	3.03	2.90	2.76	2.75	1.92	3.12	1.20
HS-97a	3.93	4.12	4.72	4.96	4.91	4.83	4.66	4.73	3.93	4.96	1.03
HS-97b	4.03	4.27	4.97	5.24	5.25	5.10	4.97	5.10	4.03	5.25	1.22
HS-104-3a	7.04	7.09	7.62	7.88	7.96	7.96	7.84	7.94	7.04	7.96	0.92
HS-104-3b	7.04	7.09	7.62	7.88	7.97	7.96	7.85	7.94	7.04	7.97	0.93
HS-105a	13.11	13.24	13.81	14.09	14.17	14.10	13.98	13.95	13.11	14.17	1.06
HS-105b	13.70	13.77	14.33	14.64	14.74	14.67	14.52	14.53	13.70	14.74	1.04

Notes: N/A Level Not Available "V" Variation in groundwater Level.

2.4 Groundwater Quality

Groundwater quality monitoring was conducted in June, August, September and November 2011 at NB, T & LP series monitoring bores; the results are presented in Tables 3 to 11. The laboratory certificate of analysis reports are provided in Appendix B.

Tables 3 to 11 also provide the adopted guideline values summarised from the following guideline values:

- ANZECC & ARMCANZ (2000) guideline/trigger values for South West Australia for slightly disturbed ecosystem for lowland river ecosystem (Table 3.3.6 and Table 3.3.7). This guideline values apply to the monitoring results for physicochemical and nutrient analysis. The guideline was applied as groundwater trigger values due to high water table;

- ANZECC & ARMCANZ (2000) guideline/trigger values for toxicants in ecosystems at 95% level of protection (except for Mercury 90% LoP and Selenium 99% LoP), which is also cited in DEC (2010) assessment levels for soil, sediment and water. The guideline values apply to the monitoring results for metal analysis.

- DoH (2006) guideline values for domestic non-potable groundwater use.

- EPA (2008) water quality improvement plan (WQIP) Serpentine River target on phosphorus annual loading of less than 21 tonnes; with median long term concentration of 0.1 mg/L, and short term of 0.2mg/L.

Trigger guideline exceedances in Tables 3 to 11 are highlighted.

TABLE 3: GROUNDWATER QUALITY (PHYSICO-CHEMICAL AND NUTRIENTS) NB SERIES

Parameter		pH	EC (mS/cm)	TDS (mg/L)	TN (mg/L)	TP (mg/L)	TKN (mg/L)	NOx_N (mg/L)	PO_4_P (mg/L)	NH_4_N (mg/L)
LoR[1]		0.05	1	1	0.05	0.01	0.05	0.005	0.005	0.005
Guideline Value		6.5-8.0[2]	<0.3[2]	NA	<1.2[2]	<0.065[2]	NA	<0.15[2]	<0.04[2]	<0.08[2]
NB03	07/06/11	5.08	0.26	170	1.0	0.11	0.98	0.064	0.090	0.440
	11/08/11	5.22	0.17	110	1.3	0.14	1.3	0.030	0.070	0.530
	14/09/11	5.11	0.16	140	1.5	0.07	1.5	<0.005	0.080	0.430
	15/11/11	5.10	0.61	170	1.6	0.05	1.3	0.310	<0.005	0.480
	Min	5.08	0.16	110	1.0	0.05	0.98	<0.005	<0.005	0.430
	Max	5.22	0.61	170	1.6	0.14	1.5	0.310	0.090	0.530
	Mean	5.13	0.30	148	1.4	0.09	1.3	0.102	0.060	0.470
NB04	07/06/11	5.28	0.72	130	1.1	<0.01	1.1	<0.005	<0.005	0.670
	11/08/11	5.35	0.34	120	0.9	0.02	0.9	0.010	<0.005	0.840
	14/09/11	5.34	0.16	140	1.0	<0.01	1.0	<0.005	<0.005	0.720
	15/11/11	5.38	0.44	110	1.5	0.08	1.5	0.0050	0.050	0.720
	Min	5.28	0.16	110	0.9	<0.01	0.9	<0.005	<0.005	0.670
	Max	5.38	0.72	140	1.5	0.08	1.5	0.010	0.050	0.840
	Mean	5.34	0.42	125	1.1	0.03	1.1	0.006	0.016	0.740
NB05	07/06/11	6.00	1.01	800	0.59	0.01	0.59	0.007	<0.005	0.370
	11/08/11	6.02	1.02	530	0.4	0.03	0.43	0.010	0.005	0.440
	14/09/11	6.10	1.00	820	0.41	<0.01	0.41	<0.005	<0.005	0.320
	15/11/11	5.76	1.30	720	0.47	<0.01	0.47	0.005	<0.005	0.380
	Min	5.76	1.00	530	0.4	<0.01	0.41	<0.005	<0.005	0.320
	Max	6.10	1.30	820	0.59	0.03	0.59	0.010	0.005	0.380
	Mean	5.97	1.08	718	0.46	0.02	0.48	0.007	0.005	0.380

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.
5) EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L. NA: Not Available

TABLE 4: GROUNDWATER QUALITY (PHYSICO-CHEMICAL AND NUTRIENTS) T SERIES

Parameter		pH	EC (mS/cm)	TDS (mg/L)	TN (mg/L)	TP (mg/L)	TKN (mg/L)	NOx_N (mg/L)	PO_4_P (mg/L)	NH_4_N (mg/L)
LOR		0.05	1	1	0.05	0.01	0.05	0.005	0.005	0.005
Guideline Value		6.5-8.0[2)]	<0.3[2)]	NA	<1.2[2)]	<0.065[2)]	NA	<0.15[2)]	<0.04[2)]	<0.08[2)]
T1	07/06/11	6.12	0.23	140	1.1	0.08	1.1	<0.005	<0.005	0.580
	11/08/11	6.19	0.26	130	2.0	0.04	0.42	1.600	<0.005	0.530
	14/09/11	6.31	0.25	180	1.0	0.02	1.0	0.007	<0.005	0.490
	15/11/11	6.20	0.34	170	1.6	0.18	1.6	<0.005	<0.005	0.540
	Min	6.12	0.23	130	1.0	0.02	0.42	<0.005	<0.005	0.490
	Max	6.31	0.34	180	2.0	0.18	1.6	1.600	<0.005	0.540
	Mean	6.21	0.27	155	1.43	0.08	1.0	0.400	<0.005	0.520
T2	07/06/11	4.56	0.23	140	3.9	0.03	1.3	2.700	<0.005	<0.005
	11/08/11	5.44	0.25	160	1.3	0.02	0.19	1.100	0.005	0.100
	14/09/11	4.20	0.24	140	3.0	<0.01	0.62	2.400	<0.005	<0.005
	15/11/11	4.67	0.23	110	4.6	<0.01	0.36	4.200	0.008	0.010
	Min	4.20	0.23	110	1.3	<0.01	0.19	1.100	<0.005	<0.005
	Max	5.44	0.25	160	4.6	0.03	1.3	4.200	0.008	0.100
	Mean	4.72	0.24	138	3.2	0.02	0.62	2.600	0.006	0.030
T3	07/06/11	5.17	0.47	260	1.3	0.05	1.3	<0.005	<0.005	1.30
	11/08/11	5.08	0.52	250	3.0	0.04	2.0	1.000	<0.005	1.80
	14/09/11	5.20	0.42	330	1.7	<0.01	1.7	<0.005	<0.005	1.00
	15/11/11	6.01	1.01	360	2.9	0.04	2.9	<0.005	0.009	1.30
	Min	5.08	0.42	250	1.3	<0.01	1.3	<0.005	<0.005	1.00
	Max	6.01	1.01	360	3.0	0.05	2.9	1.000	0.009	1.80
	Mean	5.37	0.60	300	2.2	0.04	1.9	0.250	0.006	1.35

Notes:
1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.
5) EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L.

NA: Not Available

TABLE 5: GROUNDWATER QUALITY (PHYSICO-CHEMICAL AND NUTRIENTS) LP SERIES

Parameter		pH	EC (mS/cm)	TDS (mg/L)	TN (mg/L)	TP (mg/L)	TKN (mg/L)	NOx_N (mg/L)	PO_4_P (mg/L)	NH_4_N (mg/L)
LoR		0.05	1	1	0.05	0.01	0.05	0.005	0.005	0.005
Guideline Value		6.5-8.0 2)	0.3 2)	N/A	<1.2 2)	<0.065 2)	NA	<0.15 2)	<0.04 2)	<0.08 2)
LP1	07/06/11	5.86	0.93	470	0.93	0.05	0.93	<0.005	<0.005	0.190
	11/08/11	6.18	0.87	600	1.1	0.05	0.83	0.210	0.006	0.110
	14/09/11	6.10	0.77	540	0.51	<0.01	0.54	<0.005	<0.005	0.006
	15/11/11	6.17	0.72	460	1.5	<0.01	1.5	0.025	0.008	0.090
	Min	5.86	0.72	460	0.51	<0.01	0.54	<0.005	<0.005	0.006
	Max	6.18	0.93	600	1.5	0.05	1.5	0.210	0.008	0.190
	Mean	6.07	0.82	518	1.0	0.05	0.95	0.061	0.006	0.099
LP2	07/06/11	5.85	0.60	140	0.79	0.08	0.79	<0.005	0.020	0.350
	11/08/11	6.29	0.34	170	1.8	0.10	0.80	0.960	0.030	0.440
	14/09/11	6.57	0.32	250	1.7	0.23	0.40	1.300	0.240	0.092
	15/11/11	5.66	0.31	160	0.96	0.09	0.78	0.170	0.110	0.240
	Min	5.66	0.31	140	0.79	0.08	0.40	<0.005	0.020	0.092
	Max	6.57	0.60	250	1.8	0.23	0.80	1.3	0.240	0.440
	Mean	6.09	0.39	180	1.3	0.12	0.68	0.608	0.100	0.280
LP3	07/06/11	5.99	0.20	110	0.30	0.05	0.30	<0.005	0.020	0.110
	11/08/11	6.33	0.27	130	1.1	0.08	0.13	0.99	0.020	0.190
	14/09/11	6.26	0.22	160	4.1	0.01	0.81	3.300	<0.005	<0.005
	15/11/11	6.72	0.76	130	0.45	<0.01	0.36	0.086	<0.005	0.060
	Min	5.99	0.20	110	0.30	<0.01	0.13	<0.005	<0.005	0.005
	Max	6.72	0.76	160	4.1	0.08	0.81	3.300	0.020	0.190
	Mean	6.33	0.36	133	1.48	0.04	0.40	1.090	0.011	0.091
LP4	07/06/11	5.03	0.41	220	1.2	0.12	1.2	<0.005	0.010	0.410
	11/08/11	4.77	0.51	130	6.0	0.27	2.9	3.100	0.020	0.170
	14/09/11	4.16	1.13	900	2.6	0.03	2.5	0.048	0.080	0.013
	15/11/11	4.22	0.89	420	1.9	0.02	1.9	<0.005	0.020	0.270
	Min	4.16	0.41	130	1.2	0.02	1.2	<0.005	0.010	0.013
	Max	5.03	1.13	900	6.0	0.27	2.9	3.100	0.080	0.410
	Mean	4.55	0.74	418	2.9	0.11	2.1	0.310	0.030	0.213

Notes:
1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.
5) EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L.
NA: Not Available

TABLE 6: GROUNDWATER QUALITY (ION CONCENTRATIONS) NB SERIES

Parameter		Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	HCO_3 (mg/L)	NO_2 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	SiO_2 (mg/L)	SO_4 (mg/L)	NH_3 (mg/L)	NO_3 (mg/L)	PO_4 (mg/L)
LOR		0.1	0.1	0.1	1	1	0.1	1	1	1	1	0.01	0.01	0.01
Guideline Value		N/A	NA	NA	<300[3)]	NA	NA	NA	<400[3)]	NA	<400[3)]	NA	NA	<0.1[3)]
NB03	07/06/11	5.4	7.0	2.3	36	12	0.1	1	46	12	10	0.53	0.9	0.28
	11/08/11	2.5	4	1.4	21	12	0.2	1	35	9.1	1	0.64	0.15	0.21
	14/09/11	2.2	3.9	1.5	24	6	0.1	1	31	8.5	5	0.52	0.10	0.25
	15/11/11	2.2	3.9	1.8	19	12	0.2	1	33	9.8	6	0.58	0.14	0.02
	Min	2.2	3.9	1.4	19	6	0.1	1	31	8.5	1	0.52	0.9	0.02
	Max	5.4	7.0	2.3	36	12	0.2	1	46	12	10	0.64	0.15	0.28
	Mean	3.1	4.7	1.8	25	10.5	0.15	1	36.3	9.9	5.5	0.57	0.31	0.19
NB04	07/06/11	2.3	4.9	1.9	29	19	0.1	1	43	15	5	0.08	0.1	0.02
	11/08/11	1.1	4.3	1.7	23	19	0.2	1	38	13	7	1.02	0.022	0.02
	14/09/11	0.8	3.9	1.5	23	18	0.1	1	32	12	1	0.87	0.1	0.02
	15/11/11	0.8	4.0	1.7	26	24	0.2	1	37	13	1	0.87	0.02	0.15
	Min	0.8	3.9	1.5	23	18	0.1	1	32	12	1	0.08	0.02	0.02
	Max	2.3	4.9	1.9	29	24	0.2	1	43	15	7	1.02	0.1	0.15
	Mean	1.3	4.3	1.7	25.	20	0.2	1	37.5	13	4	0.71	0.06	0.052
NB05	07/06/11	210	11	9.9	17	26	0.1	1	31	7.2	540	0.45	0.1	0.02
	11/08/11	170	8.1	7.1	13	31	0.2	1	32	5.4	460	0.53	0.022	0.02
	14/09/11	180	7.8	6.6	15	32	0.1	1	29	4.8	480	0.39	0.1	0.02
	15/11/11	180	8	7.5	13	34	0.2	1	38	5.3	430	0.46	0.02	0.02
	Min	170	7.8	6.6	13	26	0.1	1	29	4.8	430	0.39	0.02	0.02
	Max	210	11	9.9	17	34	0.2	1	38	7.2	540	0.53	0.1	0.02
	Mean	185	8.7	7.8	15	31	0.2	1	33	5.7	478	0.46	0.06	0.02

TABLE 7: GROUNDWATER QUALITY (ION CONCENTRATIONS) T SERIES

Parameter		Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	HCO_3 (mg/L)	NO_2 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	SiO_2 (mg/L)	SO_4 (mg/L)	NH_3 (mg/L)	NO_3 (mg/L)	PO_4 (mg/L)
LOR		0.1	0.1	0.1	1	1	0.1	1	1	1	1	0.01	0.01	0.01
Guideline Value		N/A	NA	NA	<300[3)]	NA	NA	NA	<400[3)]	NA	<400[3)]	NA	NA	<0.1[3)]
T1	07/06/11	1.3	5	5.1	25	32	0.1	1	40	7.5	1	0.63	0.1	0.02
	11/08/11	1.4	6.5	4.1	22	30	0.2	1	39	6.5	9	0.64	7.08	0.02
	14/09/11	1.2	5.2	4	21	28	0.1	1	35	5.7	7	0.60	0.1	0.02
	15/11/11	1.5	6.9	4.6	21	38	0.2	1	42	6.6	1	0.66	0.02	0.02
	Min	1.2	5.0	4	21	28	0.1	1	35	5.7	1	0.60	0.02	0.02
	Max	1.5	6.9	5.1	25	38	0.2	1	42	7.5	9	0.66	7.08	0.02
	Mean	1.4	5.9	4.5	22	32	0.2	1	39	6.6	5	0.63	0.02	0.02
T2	07/06/11	5	4	7.2	22	5	0.1	1	45	8.3	14	0.01	19	0.02
	11/08/11	3.2	5.7	4.7	19	4	0.2	1	45	8.1	11	0.12	4.871	0.02
	14/09/11	3.3	6.2	5.6	24	3	11	1	35	7.2	7	0.01	0.1	0.02
	15/11/11	3.6	5.4	4.8	17	4	0.2	1	48	7.3	10	0.01	18.6	0.02
	Min	3.2	4.0	7.2	17	3	0.1	1	35	7.2	7	0.01	0.1	0.02
	Max	5	6.2	4.7	24	5	11	1	48	8.3	14	0.12	18.6	0.02
	Mean	3.8	5.3	5.6	21	4	0.9	1	43	7.7	11	0.04	10.6	0.02
T3	07/06/11	3.3	8.7	3.5	58	19	0.1	1	120	16	1	1.58	0.1	0.02
	11/08/11	3.5	11	3.2	66	12	0.2	1	140	14	1	2.20	4.43	0.02
	14/09/11	3	8.1	2.8	60	10	0.1	1	100	12	12	1.20	0.1	0.02
	15/11/11	4	10	3.5	64	14	0.2	1	140	15	1	1.58	0.02	0.02
	Min	3	8.1	2.8	58	10	0.1	1	100	12	1	1.20	0.02	0.02
	Max	4	11	3.5	64	19	0.2	1	140	16	12	2.20	4.429	0.02
	Mean	3.5	9.5	3.3	62	14	0.2	1	125	14	4	1.64	1.16	0.02

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.
EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L. NA: Not Available

TABLE 8: GROUNDWATER QUALITY (ION CONCENTRATIONS) LP SERIES

Parameter		Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	HCO_3 (mg/L)	NO_2 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	SiO_2 (mg/L)	SO_4 (mg/L)	NH_3 (mg/L)	NO_3 (mg/L)	PO_4 (mg/L)
LOR		0.1	0.1	0.1	1	1	0.1	1	1	1	1	0.01	0.01	0.01
Guideline Value		N/A	NA	NA	<300[3)]	NA	NA	NA	<400[3)]	NA	<400[3)]	NA	NA	<0.1[3)]
LP1	07/06/11	15	34	2.8	80	50	0.1	1	140	15	140	0.23	0.10	0.02
	11/08/11	21	35	2.7	96	60	0.15	1	140	14	14	0.13	0.93	0.02
	14/09/11	15	31	2.2	88	63	0.1	1	130	12	110	0.01	0.10	0.02
	15/11/11	12	28	2.3	77	68	0.2	1	130	13	89	0.11	0.12	0.02
	Min	12	28	2.2	77	50	0.1	1	130	12	89	0.01	0.10	0.02
	Max	21	35	2.8	96	68	0.2	1	140	15	140	0.23	0.93	0.02
	Mean	16	32	2.5	87	60	0.14	1	135	14	120	0.12	0.31	0.02
LP2	07/06/11	9.1	5.8	9.9	18	28	0.1	1	33	6.7	45	0.43	0.10	0.06
	11/08/11	22	10	12	17	66	0.14	1	27	6	44	0.53	4.25	0.09
	14/09/11	26	7.3	9	14	64	7	1	23	5.5	33	0.11	0.10	0.29
	15/11/11	13	6.2	10	12	40	0.2	1	27	5.2	48	0.29	0.75	0.34
	Min	9.1	5.8	9	12	28	0.1	1	23	5.2	33	0.11	0.10	0.06
	Max	26	10	12	18	66	7	1	33	6.7	48	0.53	4.25	0.34
	Mean	18	7.3	10.2	15	50	1.9	1	28	5.9	43	0.34	1.30	0.19
LP3	07/06/11	18	2.1	1.4	15	32	0.1	1	30	8.9	4	0.13	0.10	0.06
	11/08/11	36	4.7	1.7	14	120	0.2	1	24	10	8	0.23	4.38	0.06
	14/09/11	31	3.4	1.2	10	72	12	1	11	7.9	8	0.01	0.10	0.02
	15/11/11	26	2.7	1.1	8.4	68	0.2	1	14	8.3	6	0.07	0.39	0.02
	Min	18	2.1	1.1	8.4	32	0.1	1	11	7.9	4	0.01	0.10	0.02
	Max	36	4.7	1.7	15	120	12	1	30	10	8	0.23	4.38	0.06
	Mean	28	3.2	1.4	12	73	3.1	1	20	8.8	7	0.11	1.24	0.04
LP4	07/06/11	4.2	7.8	6.7	44	10	0.1	1	86	14	11	0.50	0.10	0.03
	11/08/11	4.1	7.5	7.5	24	6	0.2	1	46	11	10	0.21	13.72	9.06
	14/09/11	11	30	17	160	1	1.2	1	290	20	81	0.02	0.10	0.02
	15/11/11	4.7	12	9.1	65	1	0.2	1	140	16	14	0.33	0.02	0.06
	Min	4.1	7.5	6.7	24	1	0.1	1	46	11	10	0.02	0.02	0.02
	Max	11	30	17	160	10	1.2	1	290	20	81	0.50	13.72	0.06
	Mean	6	14	10.1	7.3	5	0.43	1	140	15	29	0.27	3.48	0.04

Notes:
1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.
5) EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L.

NA: Not Available

TABLE 9: GROUNDWATER QUALITY (METALS CONCENTRATIONS) NB SERIES

Parameter		Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Se (mg/L)	Zn (mg/L)
LOR		0.05	0.001	0.001	0.005	0.005	0.01	0.001	0.005	0.0001	0.005	0.001
Guideline Value		<2[4)]	<0.07[4)]	<0.02[4)]	<0.001[3)]	<0.0014[3)]	<0.3[3)]	<0.0034[3)]	<1.9[3)]	<0.0019[3)]	<0.005[3]	<0.008[3]
NB03	07/06/11	0.51	<0.001	<0.001	<0.005	<0.005	0.11	<0.001	<0.005	<0.0001	<0.001	0.003
	11/08/11	0.48	<0.001	<0.001	<0.005	<0.005	0.08	<0.001	<0.005	<0.0001	<0.001	<0.001
	14/09/11	0.46	<0.001	<0.001	<0.005	<0.005	0.08	<0.001	<0.005	<0.0001	<0.001	<0.001
	15/11/11	0.47	<0.001	<0.001	<0.005	<0.005	0.09	<0.001	<0.005	<0.0001	0.002	<0.001
	Min	0.46	<0.001	<0.001	<0.005	<0.005	0.08	<0.001	<0.005	<0.0001	<0.001	0.003
	Max	0.51	<0.001	<0.001	<0.005	<0.005	0.11	<0.001	<0.005	<0.0001	0.002	<0.001
	Mean	0.48	<0.001	<0.001	<0.005	<0.005	0.09	<0.001	<0.005	<0.0001	0.001	0.001
NB04	07/06/11	1.3	<0.001	<0.001	<0.005	<0.005	0.82	<0.001	<0.005	<0.0001	<0.001	0.001
	11/08/11	1.4	<0.001	<0.001	<0.005	<0.005	0.38	<0.001	<0.005	<0.0001	<0.001	<0.001
	14/09/11	1.2	<0.001	<0.001	<0.005	<0.005	0.27	<0.001	<0.005	<0.0001	<0.001	<0.001
	15/11/11	1.3	<0.001	<0.001	<0.005	<0.005	0.25	<0.001	<0.005	<0.0001	0.002	<0.001
	Min	1.2	<0.001	<0.001	<0.005	<0.005	0.25	<0.001	<0.005	<0.0001	<0.001	<0.001
	Max	1.4	<0.001	<0.001	<0.005	<0.005	0.82	<0.001	<0.005	<0.0001	0.002	0.001
	Mean	1.3	<0.001	<0.001	<0.005	<0.005	0.43	<0.001	<0.005	<0.0001	0.001	0.001
NB05	07/06/11	0.03	<0.001	<0.001	<0.005	<0.005	8.6	<0.001	0.031	<0.0001	<0.001	0.002
	11/08/11	0.03	<0.001	<0.001	<0.005	<0.005	8.0	<0.001	0.026	<0.0001	<0.001	<0.001
	14/09/11	0.04	<0.001	<0.001	<0.005	<0.005	7.5	<0.001	0.025	<0.0001	<0.001	<0.001
	15/11/11	0.04	0.001	<0.001	<0.005	<0.005	8.2	0.001	0.026	<0.0001	0.002	<0.001
	Min	0.03	<0.001	<0.001	<0.005	<0.005	7.5	<0.001	0.025	<0.0001	<0.001	<0.001
	Max	0.04	0.001	<0.001	<0.005	<0.005	8.6	0.001	0.031	<0.0001	0.002	0.002
	Mean	0.04	0.001	<0.001	<0.005	<0.005	8.1	0.001	0.027	<0.0001	0.001	0.001

TABLE 10: GROUNDWATER QUALITY (METALS CONCENTRATIONS) T SERIES

Parameter		Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Se (mg/L)	Zn (mg/L)
LOR		0.05	0.001	0.001	0.005	0.005	0.01	0.001	0.005	0.0001	0.005	0.001
Guideline Value		<2[4)]	<0.07[4)]	<0.02[4)]	<0.001[3)]	<0.0014[3)]	<0.3[3)]	<0.0034[3)]	<1.9[3)]	<0.0019[3)]	<0.005[3]	<0.008[3]
T1	07/06/11	0.57	0.005	<0.001	<0.005	<0.005	15	<0.001	0.067	<0.0001	<0.001	0.002
	11/08/11	0.47	0.005	<0.001	<0.005	<0.005	21	<0.001	0.082	<0.0001	<0.001	<0.001
	14/09/11	0.53	0.004	<0.001	<0.005	<0.005	16	<0.001	0.031	<0.0001	<0.001	<0.001
	15/11/11	0.55	0.004	<0.001	<0.005	<0.005	17	<0.001	0.071	<0.0001	0.002	<0.001
	Min	0.47	0.004	<0.001	<0.005	<0.005	15	<0.001	0.031	<0.0001	<0.001	0.002
	Max	0.57	0.005	<0.001	<0.005	<0.005	21	<0.001	0.082	<0.0001	0.002	<0.001
	Mean	0.53	0.005	<0.001	<0.005	<0.005	17	<0.001	0.063	<0.0001	0.001	0.001
T2	07/06/11	0.06	<0.001	<0.001	<0.005	<0.005	0.03	<0.001	<0.005	<0.0001	<0.001	0.003
	11/08/11	0.08	<0.001	<0.001	<0.005	<0.005	0.006	<0.001	<0.005	<0.0001	<0.001	<0.001
	14/09/11	0.09	<0.001	<0.001	<0.005	<0.005	0.05	<0.001	<0.005	<0.0001	<0.001	<0.001
	15/11/11	0.09	<0.001	<0.001	<0.005	<0.005	0.07	<0.001	<0.005	<0.0001	0.002	<0.001
	Min	0.06	<0.001	<0.001	<0.005	<0.005	0.006	<0.001	<0.005	<0.0001	<0.001	<0.001
	Max	0.09	<0.001	<0.001	<0.005	<0.005	0.07	<0.001	<0.005	<0.0001	0.002	0.003
	Mean	0.08	<0.001	<0.001	<0.005	<0.005	0.04	<0.001	<0.005	<0.0001	0.001	0.001
T3	07/06/11	2.2	0.001	<0.001	<0.005	<0.005	1.4	<0.001	0.006	<0.0001	<0.001	0.002
	11/08/11	1.7	<0.001	<0.001	<0.005	<0.005	2.4	<0.001	0.007	<0.0001	<0.001	<0.001
	14/09/11	2.1	<0.001	<0.001	<0.005	<0.005	2.4	<0.001	0.006	<0.0001	<0.001	<0.001
	15/11/11	2.0	<0.001	<0.001	<0.005	<0.005	3.0	0.002	0.008	<0.0001	0.002	<0.001
	Min	1.7	<0.001	<0.001	<0.005	<0.005	1.4	<0.001	0.006	<0.0001	<0.001	<0.001
	Max	2.2	0.001	<0.001	<0.005	<0.005	3.0	0.002	0.008	<0.0001	0.003	0.002
	Mean	2.0	0.001	<0.001	<0.005	<0.005	2.3	0.001	0.007	<0.0001	0.001	0.001

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.

2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.

3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.

TABLE 11: GROUNDWATER QUALITY (METALS CONCENTRATIONS) LP SERIES

Parameter		Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Se (mg/L)	Zn (mg/L)
LOR		0.05	0.001	0.001	0.005	0.005	0.01	0.001	0.005	0.0001	0.005	0.001
Guideline Value		<2[4)]	<0.07[4)]	<0.02[4)]	<0.001[3)]	<0.0014[3)]	<0.3[3)]	<0.0034[3)]	<1.9[3)]	<0.0019[3)]	<0.005[3]	<0.008[3]
LP1	07/06/11	0.18	0.011	<0.001	<0.005	<0.005	4.5	<0.001	0.210	<0.0001	<0.001	0.002
	11/08/11	0.19	<0.001	<0.001	<0.005	<0.005	0.22	<0.001	0.027	<0.0001	<0.001	<0.001
	14/09/11	0.20	<0.002	<0.001	<0.005	<0.005	0.45	<0.001	0.079	<0.0001	<0.001	<0.001
	15/11/11	0.29	<0.002	<0.001	<0.005	<0.005	3.2	0.001	0.150	<0.0001	0.003	<0.001
	Min	0.18	<0.001	<0.001	<0.005	<0.005	0.22	<0.001	0.020	<0.0001	<0.001	<0.001
	Max	0.29	0.011	<0.001	<0.005	<0.005	4.5	0.001	0.210	<0.0001	0.003	<0.001
	Mean	0.22	0.004	<0.001	<0.005	<0.005	2.1	0.001	0.160	<0.0001	0.002	0.001
LP2	07/06/11	0.37	0.001	<0.001	<0.005	<0.005	3.8	<0.001	0.036	<0.0001	<0.001	0.002
	11/08/11	0.16	0.002	<0.001	<0.005	<0.005	2.5	<0.001	0.020	<0.0001	<0.001	<0.001
	14/09/11	0.14	0.003	<0.001	<0.005	<0.005	0.83	<0.001	0.008	<0.0001	<0.001	<0.001
	15/11/11	0.20	0.002	<0.001	<0.005	<0.005	3.2	<0.001	0.013	<0.0001	0.002	<0.001
	Min	0.14	0.001	<0.001	<0.005	<0.005	0.83	<0.001	0.008	<0.0001	<0.001	<0.001
	Max	0.37	0.003	<0.001	<0.005	<0.005	3.8	<0.001	0.036	<0.0001	0.002	<0.001
	Mean	0.22	0.002	<0.001	<0.005	<0.005	2.6	<0.001	0.019	<0.0001	0.001	0.001
LP3	07/06/11	0.19	<0.001	<0.001	<0.005	<0.005	0.04	<0.001	<0.005	<0.0001	<0.001	0.002
	11/08/11	0.16	<0.001	<0.001	<0.005	<0.005	0.49	<0.001	<0.005	<0.0001	<0.001	<0.001
	14/09/11	0.08	<0.001	<0.001	<0.005	<0.005	0.39	<0.001	<0.005	<0.0001	<0.001	<0.001
	15/11/11	0.09	<0.001	<0.001	<0.005	<0.005	0.87	<0.001	<0.005	<0.0001	0.002	<0.001
	Min	0.08	<0.001	<0.001	<0.005	<0.005	0.04	<0.001	<0.005	<0.0001	<0.001	<0.001
	Max	0.19	<0.001	<0.001	<0.005	<0.005	0.87	<0.001	<0.005	<0.0001	0.002	<0.001
	Mean	0.13	<0.001	<0.001	<0.005	<0.005	0.45	<0.001	<0.005	<0.0001	0.001	0.001
LP4	07/06/11	1.7	0.001	<0.001	<0.005	<0.005	2.6	<0.001	0.011	<0.0001	<0.001	0.001
	11/08/11	2.0	<0.001	<0.001	<0.005	<0.005	1.4	0.001	0.015	<0.0001	<0.001	<0.001
	14/09/11	3.8	<0.001	<0.001	<0.005	<0.005	2.0	0.003	0.021	<0.0001	<0.001	<0.001
	15/11/11	2.8	<0.001	<0.001	<0.005	<0.005	2.0	0.002	0.010	<0.0001	0.003	<0.001
	Min	1.7	<0.01	<0.001	<0.005	<0.005	1.4	<0.001	0.010	<0.0001	<0.001	<0.001
	Max	3.8	0.001	<0.001	<0.005	<0.005	2.6	0.003	0.020	<0.0001	0.003	<0.001
	Mean	2.6	0.001	<0.001	<0.005	<0.005	2.0	0.002	0.014	<0.0001	0.002	0.001

Notes:

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.
3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.
4) DoH (2006) Trigger values for domestic non-potable groundwater use.

2.5 Groundwater Quality Results

2.5.1 Physicochemical

The water is generally acidic across the study area with pH ranging from 4.16 at LP4 to 6.72 at LP3. The predominant ions are sodium chloride (Na-Cl) with electrical conductivity mostly are greater than 0.3mS/cm (the adopted ANZECC/ARMCANZ (2000) guideline), except NB3, T1 and T2. Maximum EC recorded was 1.3mS/cm, which equates to approx. 880 mg/L of TDS, which is categorised as fresh to marginal salinity (DoW, 2010).

2.5.2 Nutrients

The concentrations of TN, TP and dissolved nutrients (NOx_N, NH_4_N, PO_4_P) across the study area during monitoring occasions are generally higher than the adopted ANZECC/ARMCANZ (2000) guideline values as is to be expected for a pastoral property within this area.

- TN concentrations were exceeded at all locations excluding NB05. Exceeded values range from 1.3mg/l at NB03 to 6mg/L at LP4.

- TP concentrations were exceeded at all locations excluding LP1, T2, T3 and NB05. Exceeded values range from 0.7mg/L at NB03 to 0.27mg/ L at LP4.

- NH_4_N concentrations were exceeded at all locations. Exceeded values range between 0.091mg/L at LP3 to 1.8mg/L at T3.

2.5.3 Ions

- Anions PO_4^{-2} concentration exceeded the adopted ANZECC/ARMCANZ (2000) guideline values at locations LP2, LP3, LP4, NB03 & NB04 only. Exceeded values range from 0.15mg/L at NB04 to 9.06mg/L at LP4.

- Anions SO_4^{-2} concentration exceeded the adopted ANZECC/ARMCANZ (2000) guideline values at NB05 only. Exceeded values range from 430mg/L to 540mg/L.

2.5.4 Metals

- Aluminium (Al) concentrations at T3 and LP4 exceeded the adopted ANZECC/ARMCANZ (2000) guideline values in some occasion.

- Most iron (Fe) concentrations (except for NB3 and T2) exceeded the adopted ANZECC/ARMCANZ (2000) guideline values, i.e. 0.3 mg/L total Fe. Most of them, however, were less than the DoH (2006) guideline value for domestic non-potable groundwater use (3mg/L)..

- As other metals concentration, most of them were less than the detection level (LoR).

The combination of acidic water and elevated levels of Al and Fe in groundwater quality samples is generally associated with the presence of acid sulphate soils and coffee rock within the soil profile.

3. SURFACE WATER MONITORING

3.1 Surface Water Monitoring Sites

Eight continuously logging surface water sites were monitored on lot 221 over 2011 winter. Table 12 presents surface water site details and Figure 2 shows the surface water site locations.

TABLE 12: SURFACE WATER SITE DETAILS

Site	GPS Location	Logger type	Installation Date	Controlling Feature (CTF)
S10	N:6401302 E:390229	Diver	August 2008	Natural rock bar
S11	N:6401359 E:390464	Odyssey	May 2010	Low profile concrete
S12	N:6401250 E:389891	Odyssey	May 2010	Natural sand bar
S13	N:6401909 E:391215	Odyssey	June 2011	Low profile concrete
S14	N:6402001 E:390704	Odyssey	June 2011	Low profile concrete
S15	N:6402226 E:390009	Odyssey	June 2011	Low profile concrete
S16	N:6402243 E:389726	PLI	June 2011	Channel
S17	N:6401736 E:389774	Odyssey	June 2011	Low profile concrete

3.2 Surface Water Monitoring Procedure

3.2.1 Surface Water Monitoring Site Installation, Survey and Maintenance

On 9 May 2011 surface water sites, i.e. S13 to S17, were installed within creek/drainage lines on Lot 221. The sites were surveyed to Standard Level Elevation (SLE). Equipment was housed upstream of low profile concrete control structures. Equipment datum's were set and loggers programed to record water level at 5 min intervals.

3.2.2 Monitoring Period

Monthly site visits were conducted for surface water sites, S10 to S17 from May to December 2011 including;

- Download data loggers.
- Read water level staff gauges.
- Conduct discharge measurements with JDA current meter when sites flowing.
- Collect water quality sample for laboratory analysis.
- Conduct in-situ water quality sample for EC & pH.

Table 13 presents a summary of the 2011 surface water monitoring including the date the monitoring occurred, drain status, discharge measurements performed and logger downloads.

3.2.3 Data Processing and Flow Analysis

JDA analysed and processed all water level data, checked existing rating curves and generated new rating curves where possible.

The discharge measurements conducted over 2011 monitoring period were used to aid in the generation of new and calibration of existing rating curves.

As there was no flow observed for some of the surface water sites, rating curves were not able to be derived so no continuous flow data could be presented and results are shown as water level in creek/drain only.

TABLE 13: SURFACE WATER MONITORING SUMMARY

Visit No and Date	Notes	Site Flowing (Y/N)							
		S10	S11	S12	S13	S14	S15	S16 (pli)	S17
1: 10 May 2011	No DMs Possible, Loggers programed, sites installed, surveys conducted.	N	N	N	N	N	N	N	N
2: 07 Jun 2011	No DMs Possible, Loggers downloaded, sites installed	N	N	N	N	N	N	N	N
3: 20 Jul 2011	No DMs possible, S10 fully rated and no other sites flowing, loggers downloaded Water Quality samples collected	Y	N	N	N	N	N	N	N
4: 11 Aug 2011	Check levels conducted, loggers download, water quality samples collected and Pli's checked.	Y	N	N	N	Y	N	N	N
5: 14 Sep 2011	Check levels conducted, loggers download, water quality samples collected and Pli's checked.	Y	N	N	N	N	N	N	N
6: 17 Oct 2011	Check levels conducted, loggers download, water quality samples collected and Pli's checked.	Y	N	N	N	N	N	N	N
7: 20 Dec 2011	Check levels conducted, loggers download, water quality samples collected and Pli's checked. Checked survey from site	Y	N	N	N	N	N	N	N

NOTE: PLI (Peak Level Indicator)

3.3 Surface Water Monitoring Results

3.3.1 Rainfall Data

Table 14 presents BoM monthly rainfall totals from BoM Mandurah (site no. 009977) rain gauge. Figure 4 shows the total daily and cumulative annual rainfall.

TABLE 14: MONTHLY TOTAL RAINFALL IN 2011 AT MANDURAH (SITE NO 009977)

Month	BoM 009977 2011 Rainfall (mm)	BoM 009977 10 year Average Rainfall 2002 – 2011 (mm)		
		Min	Max	Average
January	38.8	0.0	75.0	13.7
February	0.0	0.0	44.8	10.0
March	0.0	0.0	72.8	15.3
April	29.8	4.2	138.2	45.7
May	82.0	40.6	265.0	94.6
June	158.2	19.0	227.6	127.3
July	126.4	55.2	155.8	123.2
August	88.2	26.2	153.2	92.8
September	62.6	18.6	97.4	62.2
October	27.8	0.0	71.2	35.8
November	45.0	1.2	47.2	24.6
December	104.4	2.0	104.4	15.6
Annual		434.8 (2006)	915.2 (2005)	**660.8**
2011 Total	**763.2**			

Recorded rainfall total for 2011 of 763.2mm was greater than the 10 year average 2002 to 2011 of 660.8mm, which was the first above average rainfall year since 2008.

3.3.2 Surface Water Levels

Continuous surface water levels were recorded from Sites S10, S11, S12, S13, S14, S15 & S17 using a combination of “Odyssey” capacitance, “Diver” pressure sensor and barometric data recorders. Diver data is calibrated by manual measurements and compensated by Barometric record at each site visit. Peak water level indicators were used as a secondary check measure.

Low profile hydraulic controlling features (Concrete broad crest weirs) were constructed at locations S12, S13, S14 & S17. Cease to Flows (CTF) were identified at all sites and SLE survey conducted. JDA assigns CTF a value of 1.00m SLE for operational reasons. .

3.3.3 Discharge Measurements

No discharge measurements were conducted at Sites S11 to S17 as no flow was observed during routine site visits over 2011.

Site S10 has a stable control and has a well-defined rating curve that was checked at low flow, however no additional discharge measurements were conducted in the medium to high flow range.

3.3.4 Rating Curve

Due to lack of observed flow in creeks/drains during routine site visits, sites S11 to S17 were unable to be rated in 2011. Data for these sites will be presented as continuous water level only.

S10 has a stable control and well defined rating cure. S10 continuous water level data was converted to continuous flow discharge m^3.

S10 Rating curve was derived by use of Hydstra Ratings Workbench, a specialised hydrographic software program designed to convert continuous water level data to continuous flow discharge.

Figure 5 presents S10 rating curve.

Figures 6 presents S10 stage, discharge and rainfall record.

Figures 7 to 12 present continuous water level data (stage) for Sites S11 to S17.

Details on HYDSTRA Hyday results for water level, flow and rainfall are presented in Appendix C.

3.3.5 Monthly Flow Volumes (S10) 2011

Monthly flow peaks and volumes for site S10 are presented in Table 15.

TABLE 15: MONTHLY FLOW VOLUMES (S10) 2011

Month 2011	Max Flow (m^3/s) S10	Max Flow (m^3/s) 614063	S10 Monthly total (m^3)
May	0	0	0
June	9.3	8.3	1,200,000
July	9.9	11.0	2,700,000
August	8.8	9.9	4,100,000
September	4.3	4.6	1,900,000
October	1.3	1.0	440,000
November	0.10	No record	140,000
December	0.17	No record	190,000
Annual Total			11,000,000

Notes: Max flow (m^3/s) rounded to 1 significant figure. Monthly Totals (m^3) rounded to 2 significant figures.

- Site S10 shares a good relationship to DoW site 614063 due to geographical location and is a good check for S10 flow record.
- Peak recorded flow at S10 of 9.9m^3/s was recorded on 31/7/2011.
- Annual total discharge for S10 May to Dec 2011 was 11,000,000m^3, corresponding to 96.5mm of runoff and 12.6% runoff over the 11400ha catchment area.

3.4 Surface Water Quality Sampling

Tables 16, 17 & 18 present surface water quality sampling results for site S10.

TABLE 16 WATER QUALITY RESULTS 2011 (PYSIO-CHEMICAL & NUTRIENTS) S10

Parameter		pH	EC (mS/cm)	TDS (mg/L)	TN (mg/L)	TP (mg/L)	TKN (mg/L)	NOx_N (mg/L)	PO_4_P (mg/L)	NH_4_N (mg/L)
LOR		0.05	1	1	0.05	0.01	0.05	0.005	0.005	0.005
Guideline Value		6.5-8.0[2]	0.3[2]	N/A	<1.2[2]	<0.065[2]	NA	<0.15[2]	<0.04[2]	<0.08[2]
S10	07/06/11	7.40	0.87	650	2.4	0.77	2.0	0.41	0.57	0.29
	11/08/11	6.81	0.85	340	1.6	0.73	1.9	1.40	0.54	0.16
	14/09/11	6.81	0.62	490	1.6	0.59	1.6	<0.005	0.50	<0.005
	15/11/11	6.58	0.72	430	0.7	0.28	0.073	<0.005	0.06	0.011
	Min	6.58	0.62	340	0.7	0.28	0.073	<0.005	0.06	<0.005
	Max	7.40	0.87	650	2.4	0.77	2.0	1.40	0.57	0.29
	Mean	6.90	0.76	478	1.6	0.59	1.40	0.46	0.42	0.12

TABLE 17: WATER QUALITY RESULTS 2011 (MAJOR IONS) S10

Parameter		Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	HCO_3 (mg/L)	NO_2 (mg/L)	CO_3 (mg/L)	Cl (mg/L)	SiO_2 (mg/L)	SO_4 (mg/L)	NH_3 (mg/L)	NO_3 (mg/L)	PO_4 (mg/L)
LOR		0.1	0.1	0.1	1	1	0.1	1	1	1	1	0.01	0.01	0.01
Guideline Value		N/A	NA	NA	<300[3]	NA	NA	NA	<400[3]	NA	<400[3]	NA	NA	<0.1[3]
S10	07/06/11	23	21	10	120	32	0.2	<1	220	11	110	0.35	2.6	1.7
	11/08/11	17	12	5.9	7.8	39	<0.005	<1	140	5	33	0.19	6.2	1.7
	14/09/11	16	14	5.1	90	37	0.4	1	140	4.3	27	<0.01	0.1	1.5
	15/11/11	15	15	5.4	100	40	<0.02	1	150	7.6	25	0.01	<0.02	0.18
	Min	15	12	5.1	7.8	32	<0.005	<1	14	4.3	25	<0.01	<0.02	0.18
	Max	23	21	10	120	40	0.4	1	220	11	110	0.35	6.2	1.7
	Mean	18	16	6.6	97	37	0.16	1	160	6.9	49	0.14	2.2	1.27

TABLE 18: WATER QUALITY RESULTS 2011 (METALS) S10

Parameter		Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Se (mg/L)	Zn (mg/L)
LOR		0.05	0.001	0.001	0.005	0.005	0.01	0.001	0.005	0.0001	0.005	0.001
Guideline Value		<0.055[4]	<0.013[3]	<0.0002[3]	<0.001[3]	<0.0014[3]	<0.3[3]	<0.0034[3]	<1.9[3]	<0.0019[3]	<0.005[3]	<0.008[3]
S10	07/06/11	0.50	0.006	<0.002	<0.005	<0.005	3.0	0.005	0.12	<0.0001	0.002	0.02
	11/08/11	0.52	<0.001	<0.002	<0.005	<0.005	2.2	<0.001	0.04	<0.0001	<0.001	0.01
	14/09/11	0.41	0.002	<0.002	<0.005	<0.005	3.0	0.001	0.07	<0.0001	<0.001	0.04
	15/11/11	0.45	0.002	<0.002	<0.005	<0.005	3.3	0.002	0.10	<0.0001	0.003	0.01
	Min	0.41	<0.001	<0.002	<0.005	<0.005	2.2	<0.001	0.04	<0.0001	<0.001	0.01
	Max	0.50	0.006	<0.002	<0.005	<0.005	3.3	0.005	0.12	<0.0001	0.003	0.04
	Mean	0.45	0.003	<0.002	<0.005	<0.005	2.9	0.002	0.08	<0.0001	0.002	0.02

Notes:

1) Limit of Reporting, defined as the lowest concentration at which an analyses can be detected in a sample within a reasonable degree of accuracy and precision.

2) ANZECC and ARMCANZ (2000) Trigger values for South-west Australia for slightly disturbed ecosystem for lowland river ecosystem.

3) ANZECC and ARMCANZ (2000) Trigger values for toxicants in freshwater ecosystems at 95% level of protection, stated otherwise.

4) EPA (2008) WQIP Serpentine target on phosphorus and annual loadings of less than 21 tonnes; with median long-term concentration of 0.1 mg/L.

NA: Not Available

3.5 Surface Water Quality Results

3.5.1 Physio-Chemical (S10)

Exceedences recorded for;

- TN ranging from 1.6 to 2.4mg/l.
- TP range from 0.28 to 0.77mg/l.
- NOx_N range from 0.06 to 0.57mg/l.
- NH4 range from 0.16 to 0.29mg/l.

3.5.2 Ions (S10)

PO_4 was the only major Ions specie to record an exceedence, ranging from 0.18 to 1.7mg/l.

3.5.3 Metals (S10)

Exceedences recorded for;

- Al, range from 0.41 to 0.50mg/l
- Fe, range from 2.2 to 3.3mg/l.
- Mn, range from 0.04 to 0.12mg/l.

Heavy metal results exceeded guideline values for Al, Fe and Mn which can be an indicator of presence of acid sulphate soils and coffee rock within the study area.

Heavy metals specie exceedence for surface water samples are consistent with those found in the groundwater samples

4. CONCLUSIONS

- Water levels across Lot 221 show an approximate fall of 7m from North East to South West over a distance of approximately 1.5km.
- The seasonal variation in groundwater levels over the site during 2011 monitoring period varies between bores, ranging between 0.87m at LP4 to 1.32m at LP2.
- Groundwater Nutrient analysis results across the study area are generally higher than ANZECC/ARMCANZ guidelines as is to be expected for a pastoral property within this area. Exceedences were recorded for TN, TP, NO_X_N, PO_4_N & NH_4_N. pH of groundwater samples is generally acidic across the entire study area. Heavy metal results exceeded guideline values for Al, Fe and Mn.
- Acidic water and elevated levels of Al and Fe in groundwater quality samples is generally associated with the presence of acid sulphate soils and coffee rock within the soil profile.
- Eight continuously recording surface water sites were monitored over the 2012 monitoring period.
- No discharge measurements were conducted at Sites S11 to S17 as no flow was observed during routine site visits.
- Site S10 on Nambeelup Brook has a stable control and has a well-defined rating curve that was checked at low flow however no additional discharge measurements were collected in the medium to high flow range.
- Due to lack of observed flow in creeks/drains during routine site visits Sites S11 to S17 were unable to be rated in 2011. Data for these sites will be presented as continuous water level only.
- S10 continuous water level data was converted to continuous flow discharge m^3.
- Peak recorded flow at S10 of 9.9m^3/s was recorded on 31/7/2011.
  - Annual total discharge for S10 May to Dec 2011 was 11,000,000m^3, corresponding to 96.5mm of runoff and 12.6% runoff over the 11400ha catchment area.
- ANZECC/ARMCANZ guidelines exceedences for surface water site S10 were recorded for TN, TP, NOx_N, PO_4_N, PO_4, Al, Fe, and Mn.
- Nutrient and heavy metals excedences for surface water samples are consistent with those found in the groundwater samples.

5. RECOMMENDATIONS

- JDA recommends that data presented in this report should be referred to during preparation of future Better Urban Water Management (BUWM) reports on this property.

6. REFERENCES

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BoM – https://www.bom.gov.au/climate/dwo/IDCJDW0600.shtml

BoM – http://bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml

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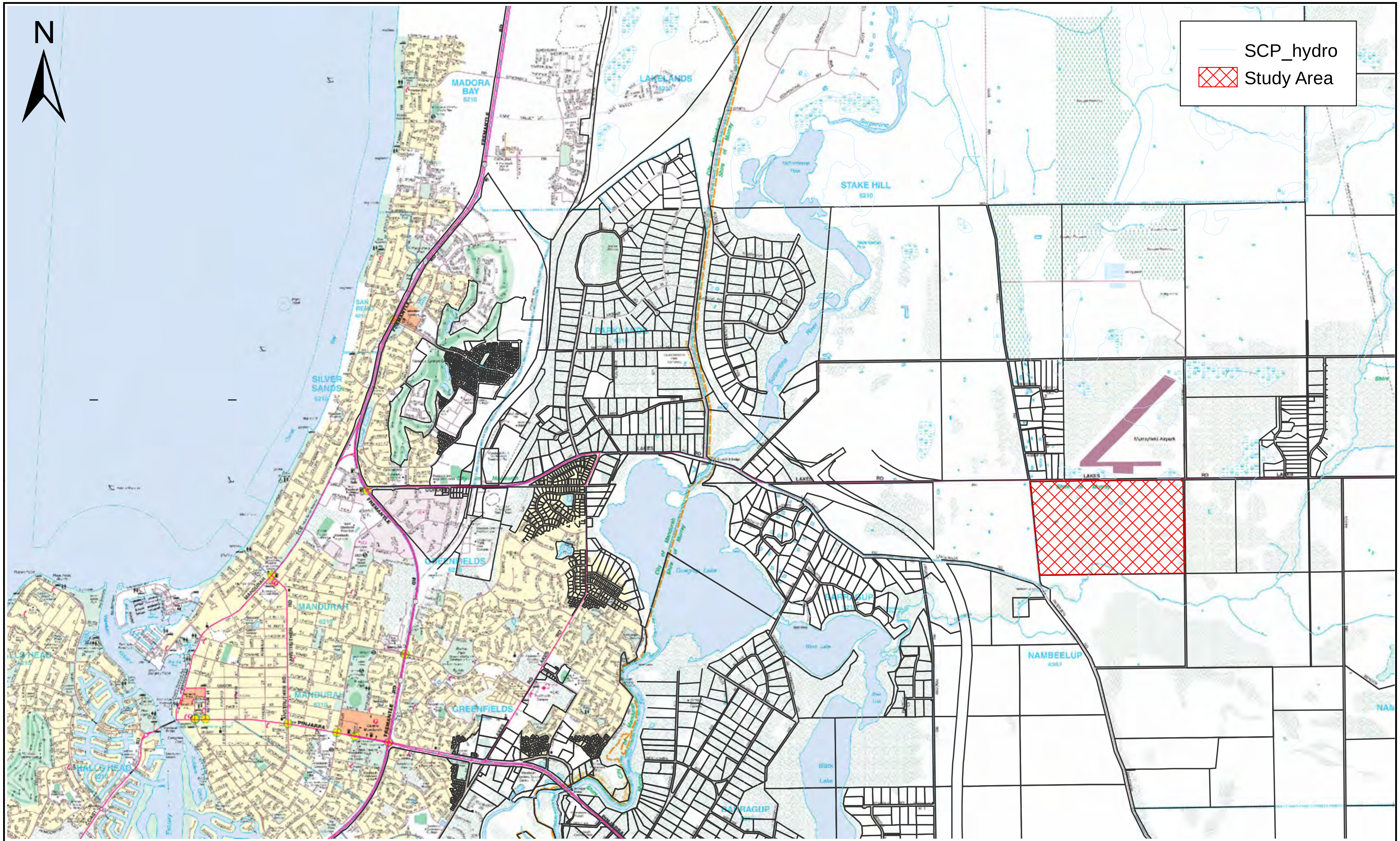
FIGURES



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Lot 221 Lakes Rd Nambeelup: Surface & Groundwater Monitoring 2011
Figure 1: Site Context Plan

Data Source: Landgate (2006)

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Scale:1:10,000

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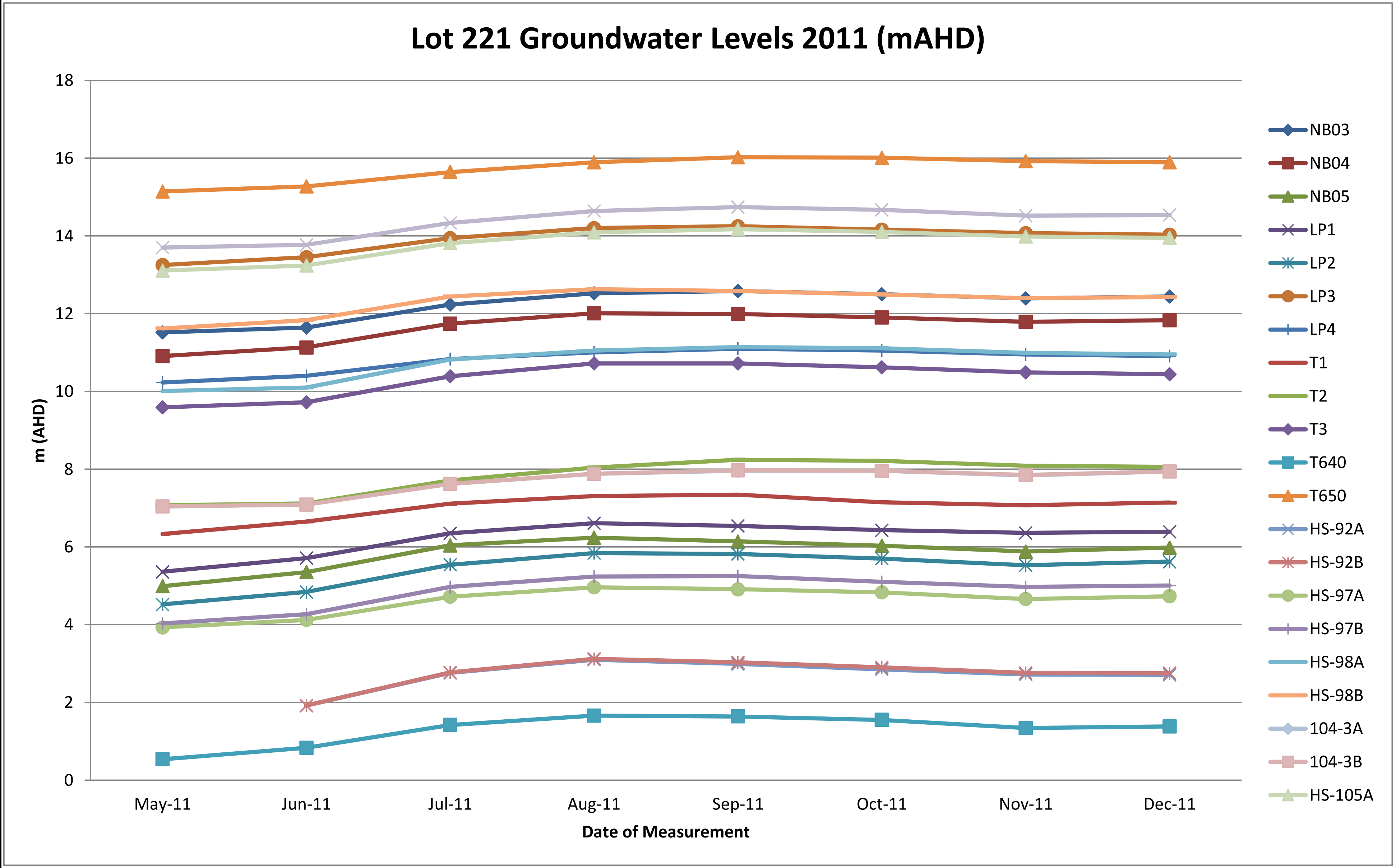
Lot 221 Lakes Rd Nambeelup: Surface & Groundwater Monitoring 2011

Figure 2: Monitoring Site Location



Data Source: JDA DONUTS Database

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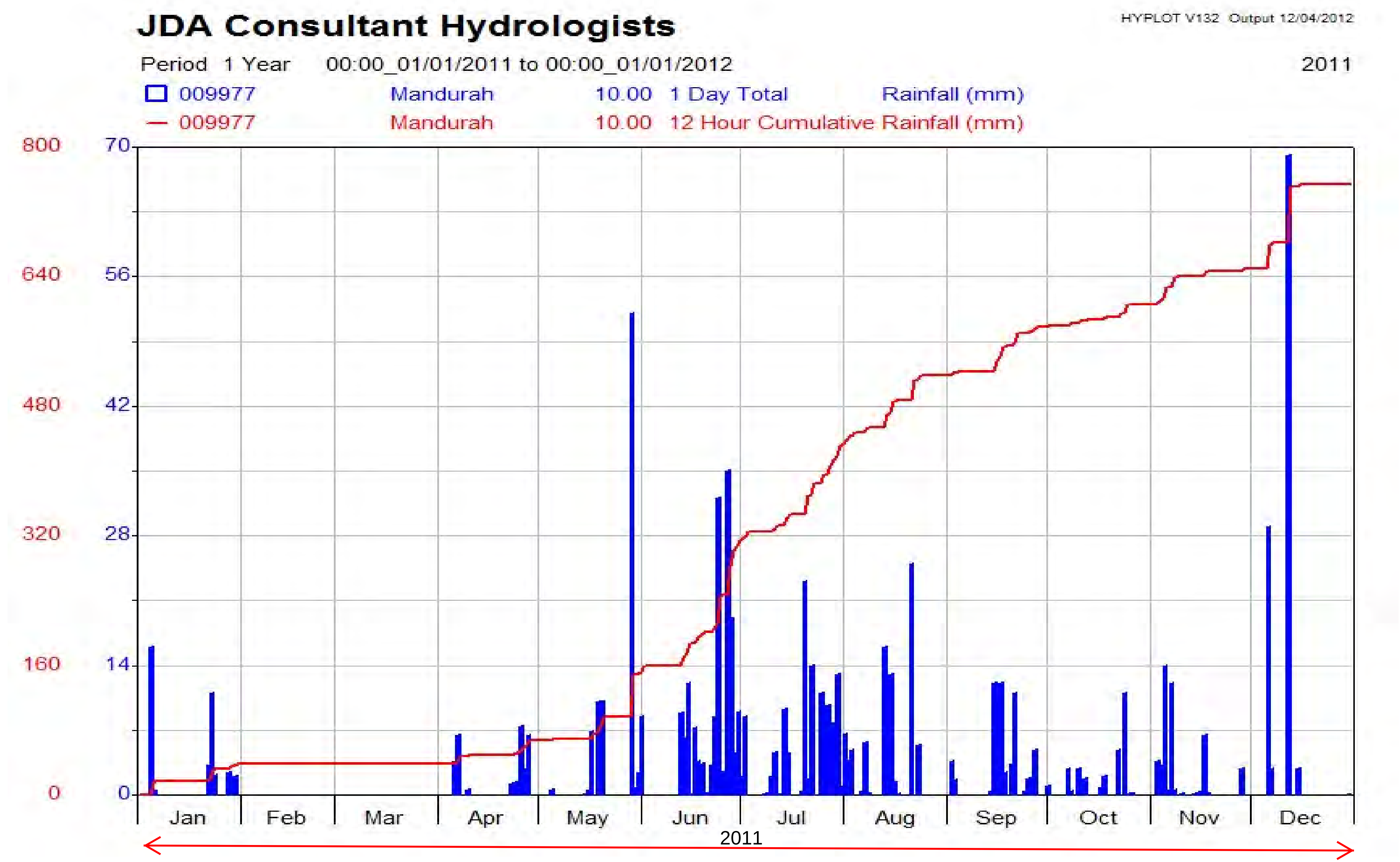
Figure 3: Groundwater Level Data 2011



Data Source: JDA Hydstra Database\BoM Climate Data Online

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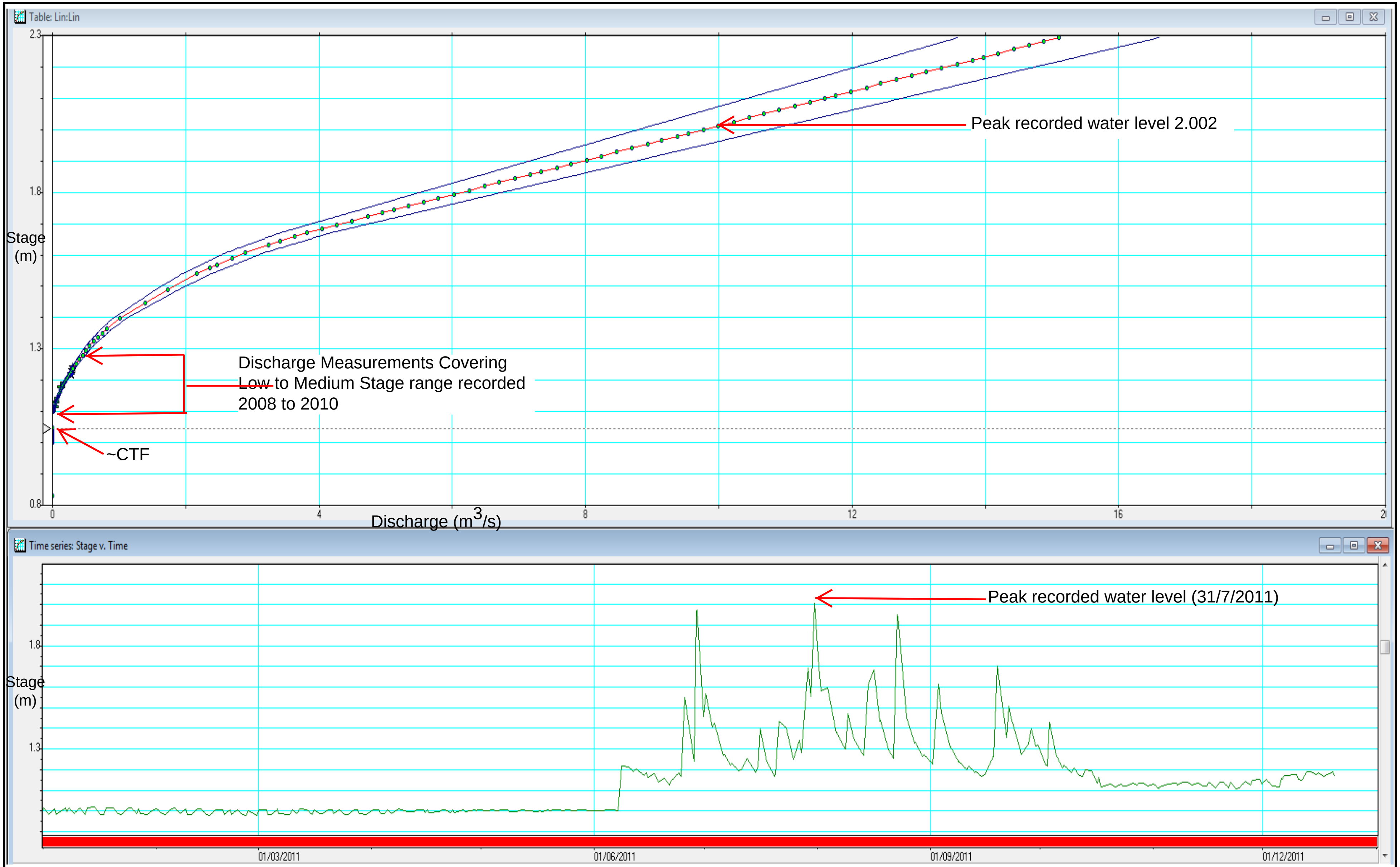
Figure 4: BoM Rainfall Data 2011



Data Source: JDA Hydstra Database

JDA

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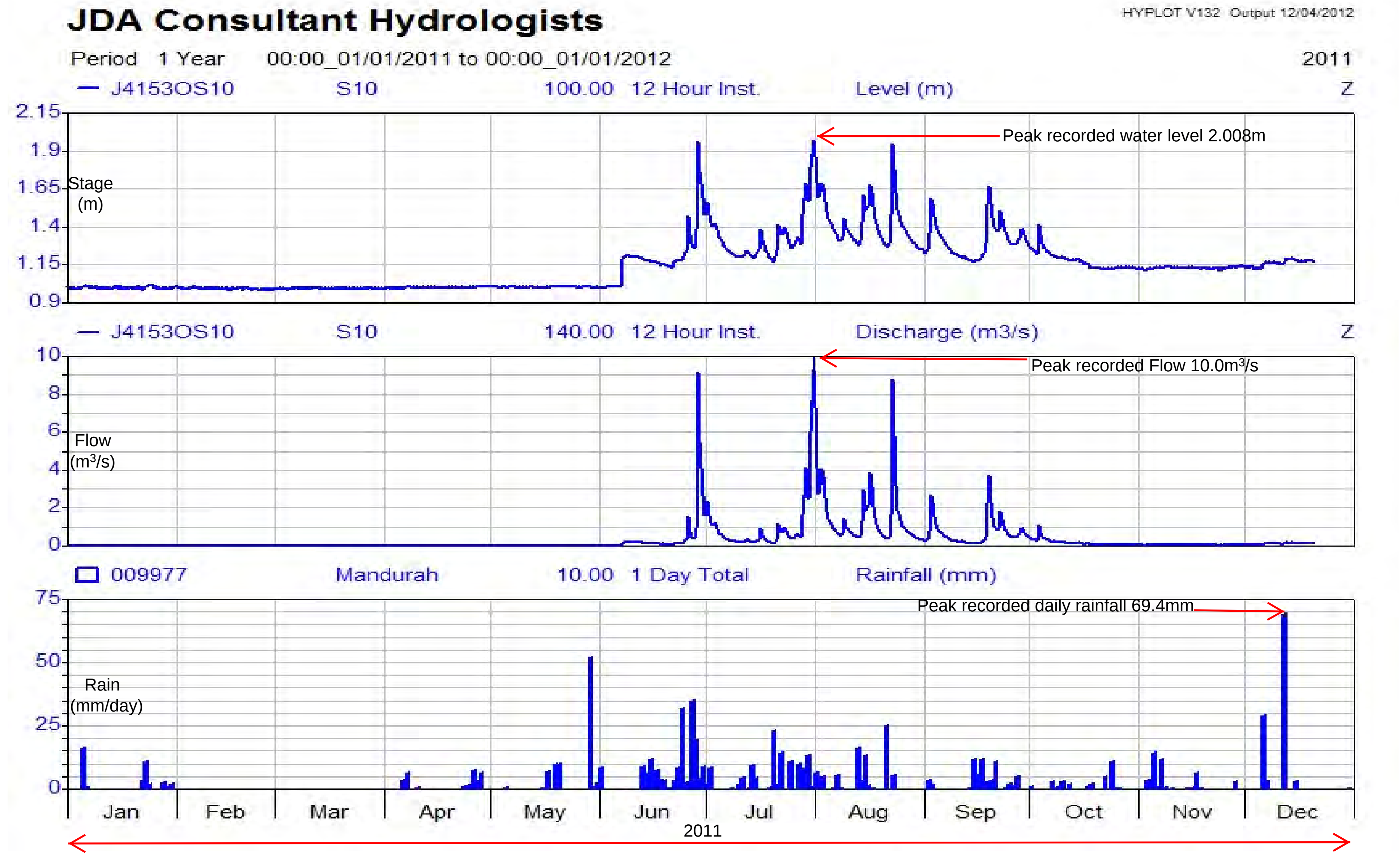
Figure 5: S10 Rating Curve



Data Source: JDA Hydstra Database

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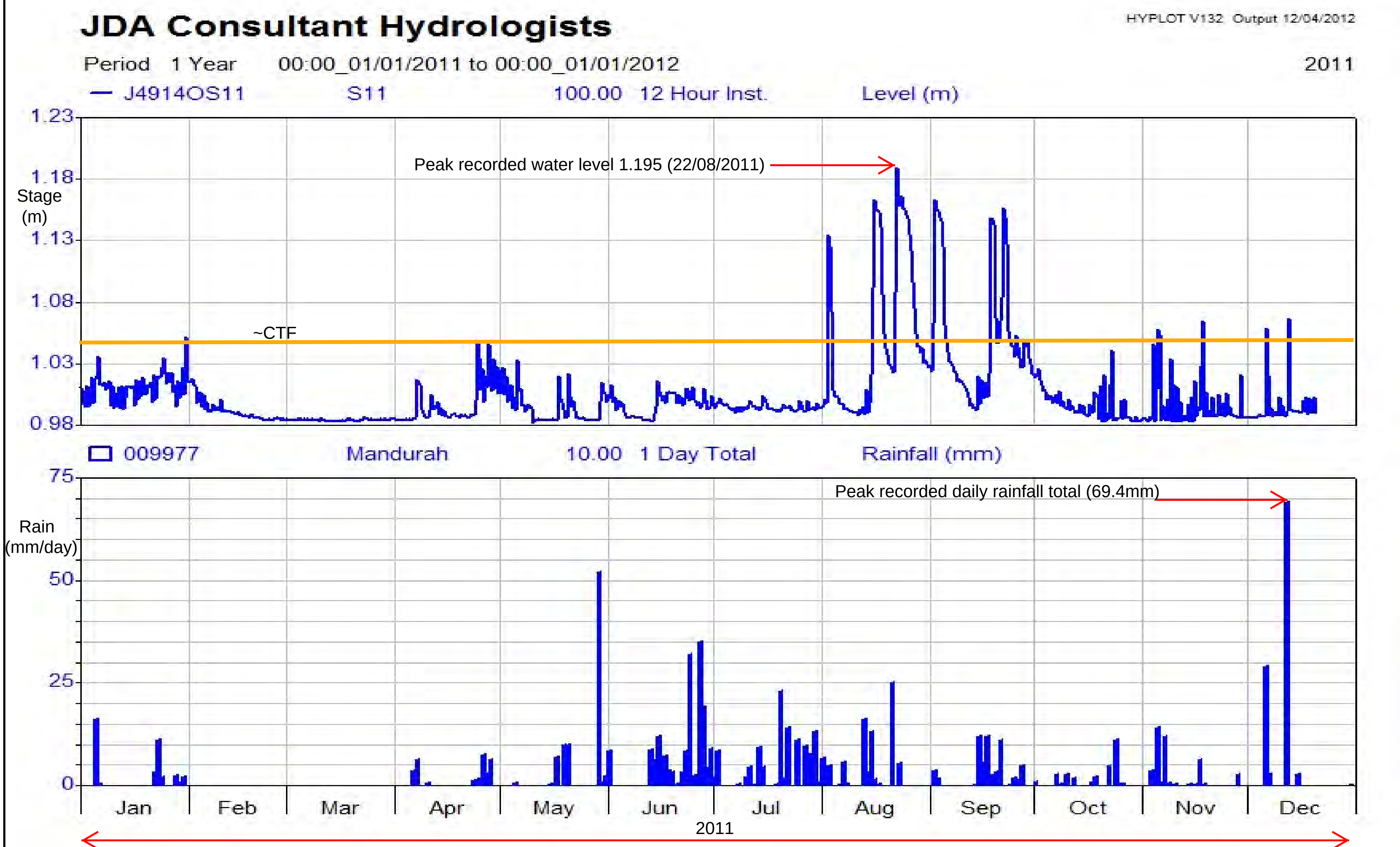
Figure 6: S10 Satge, Discharge & Rainfall



Data Source: JDA Hydstra Database

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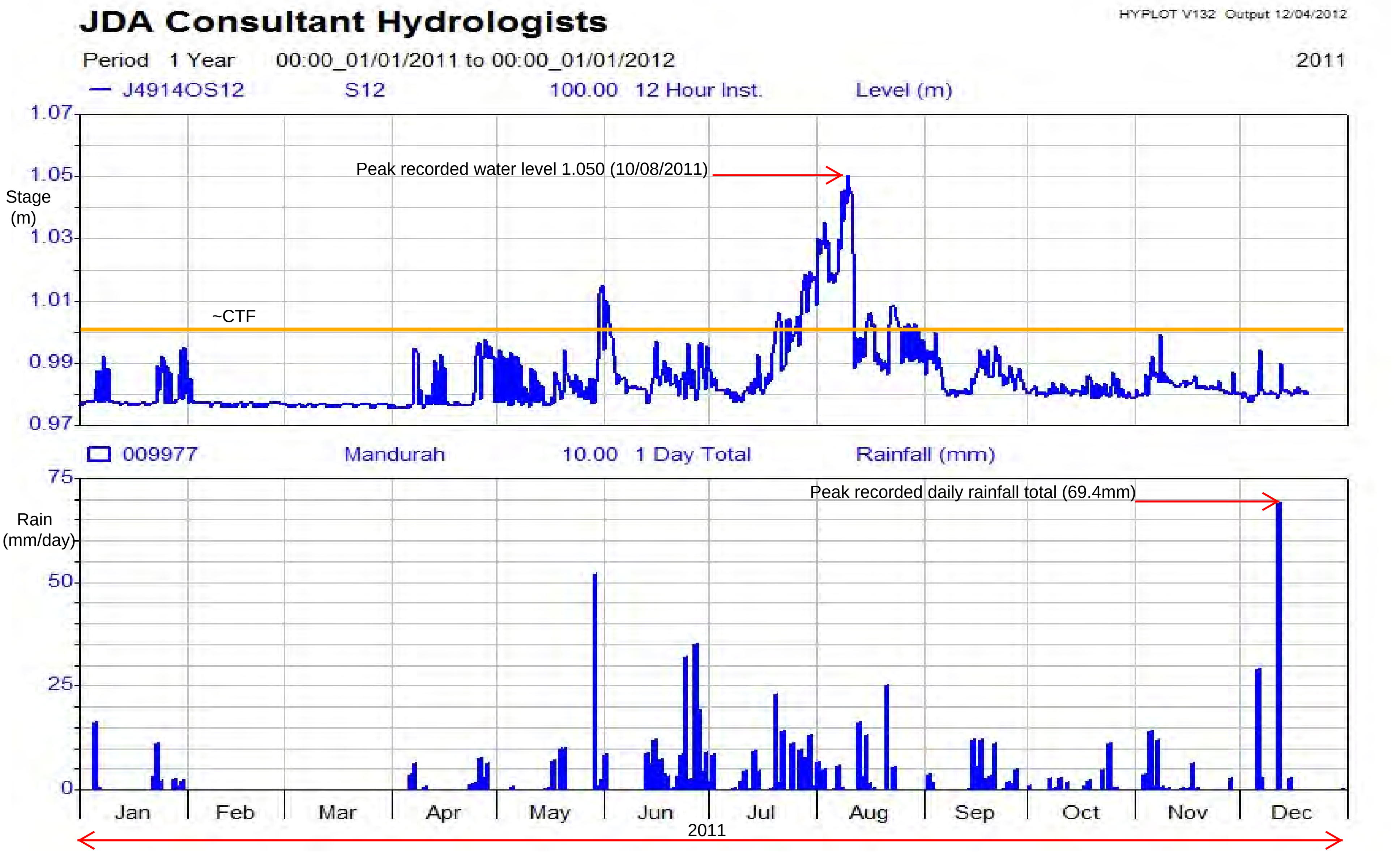
Lot 221 Lakes Rd Nambeelup: Surface & Groundwater Monitoring 2011

Figure 7: S11 Satge & Rainfall



Data Source: JDA Hydstra Database

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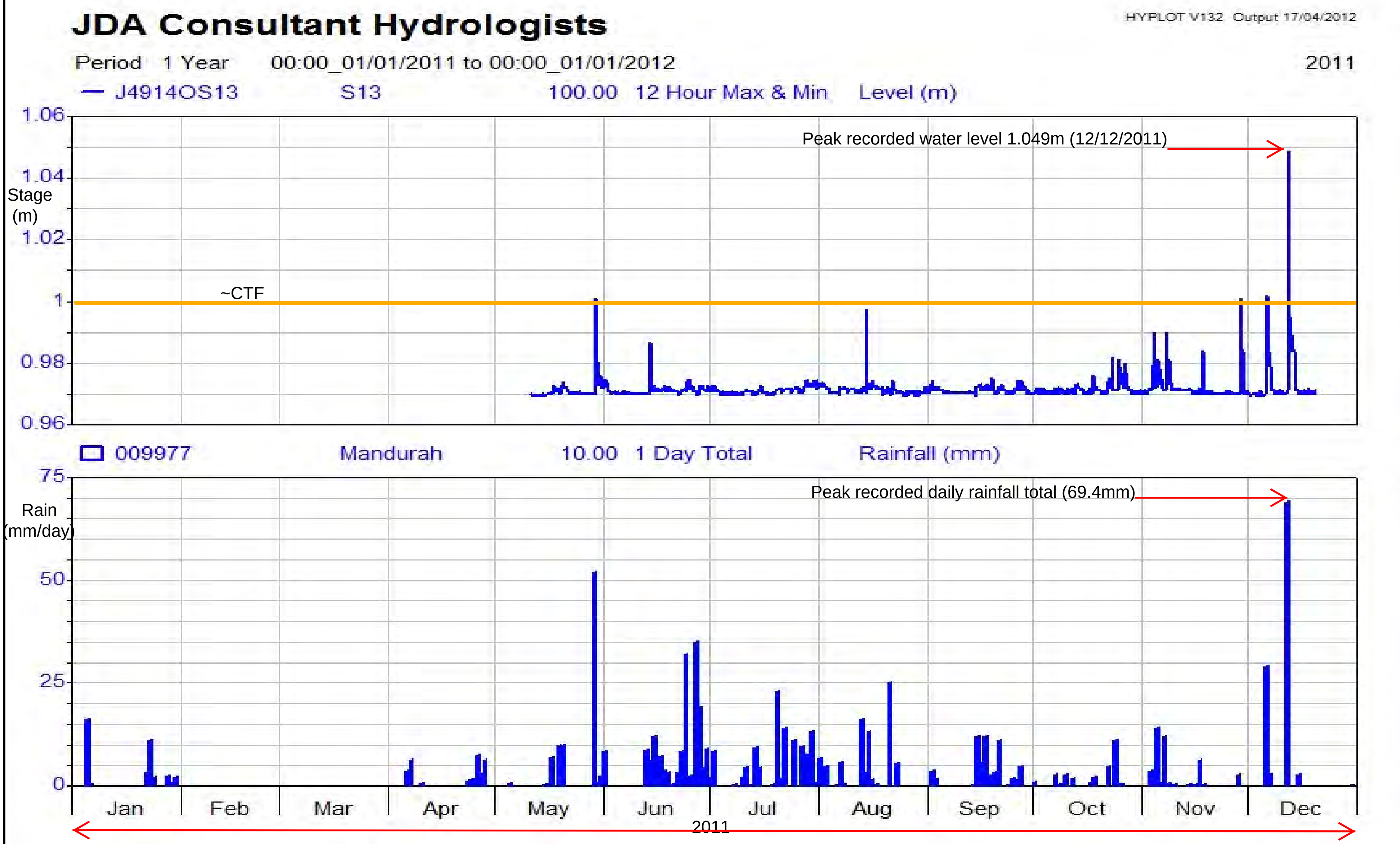
Figure 8: S12 Satge & Rainfall



Data Source: JDA Hydstra Database

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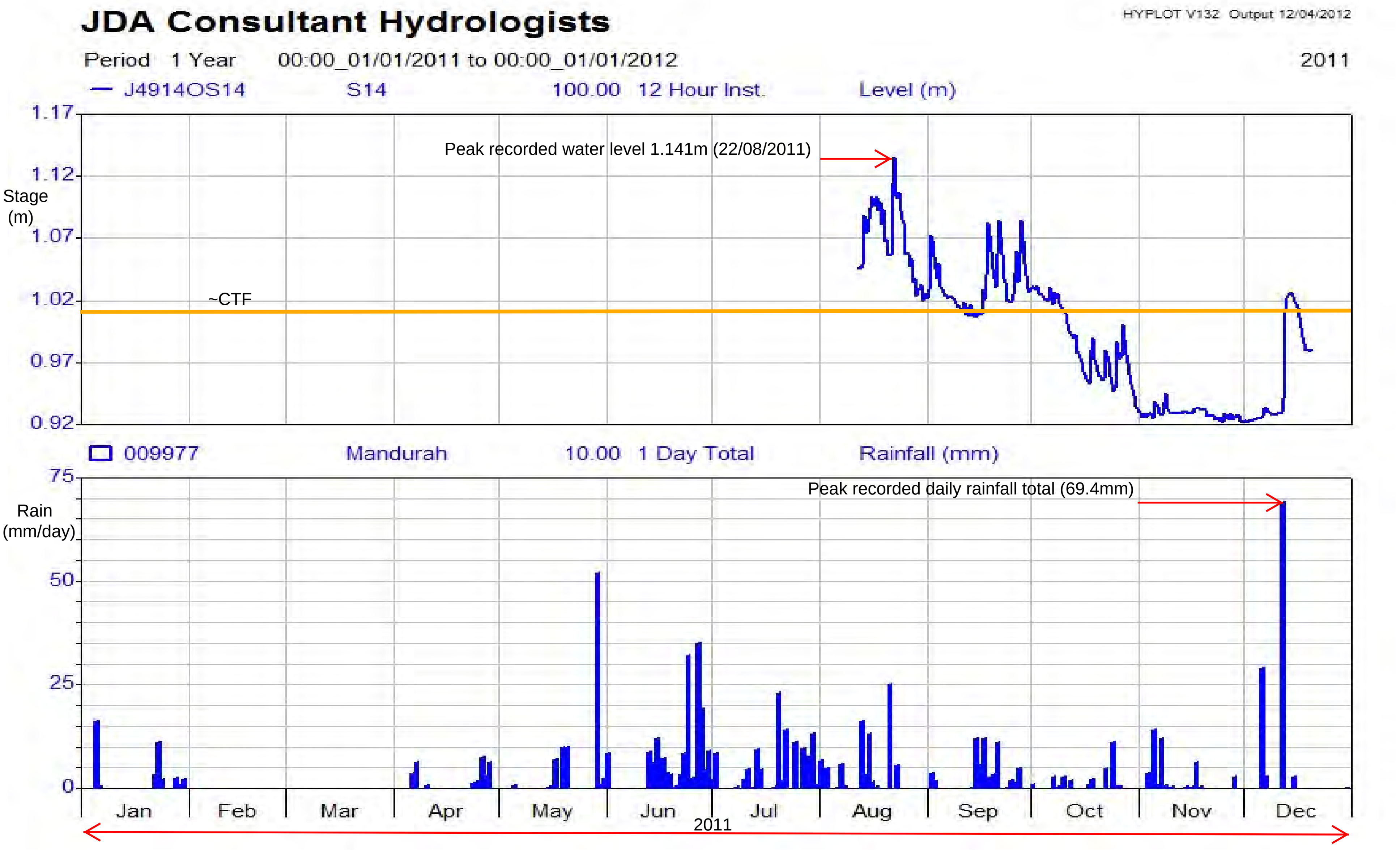
Figure 9: S13 Satge & Rainfall



Data Source: JDA Hydstra Database

J4914

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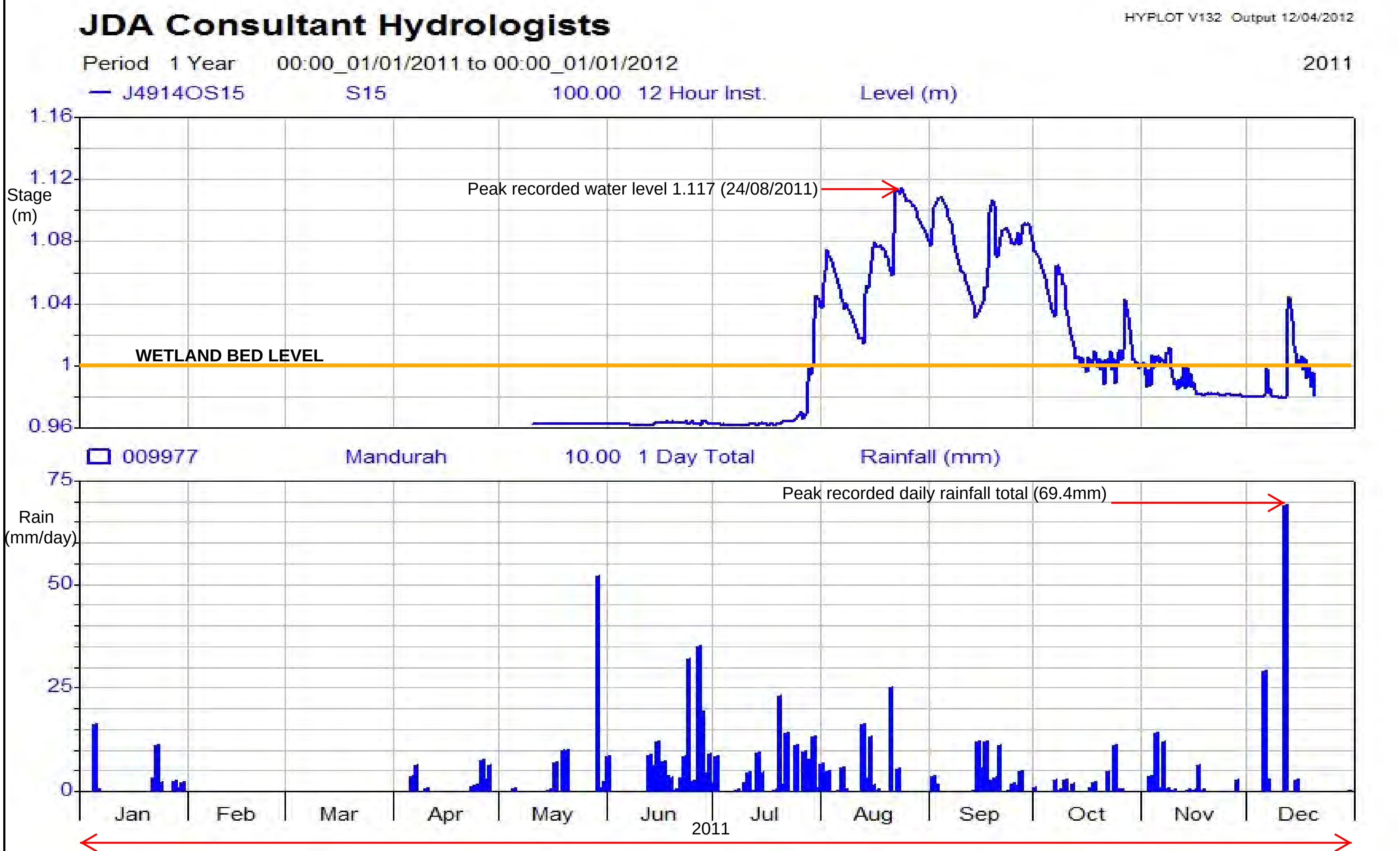
Figure 10: S14 Satge & Rainfall



Data Source: JDA Hydstra Database

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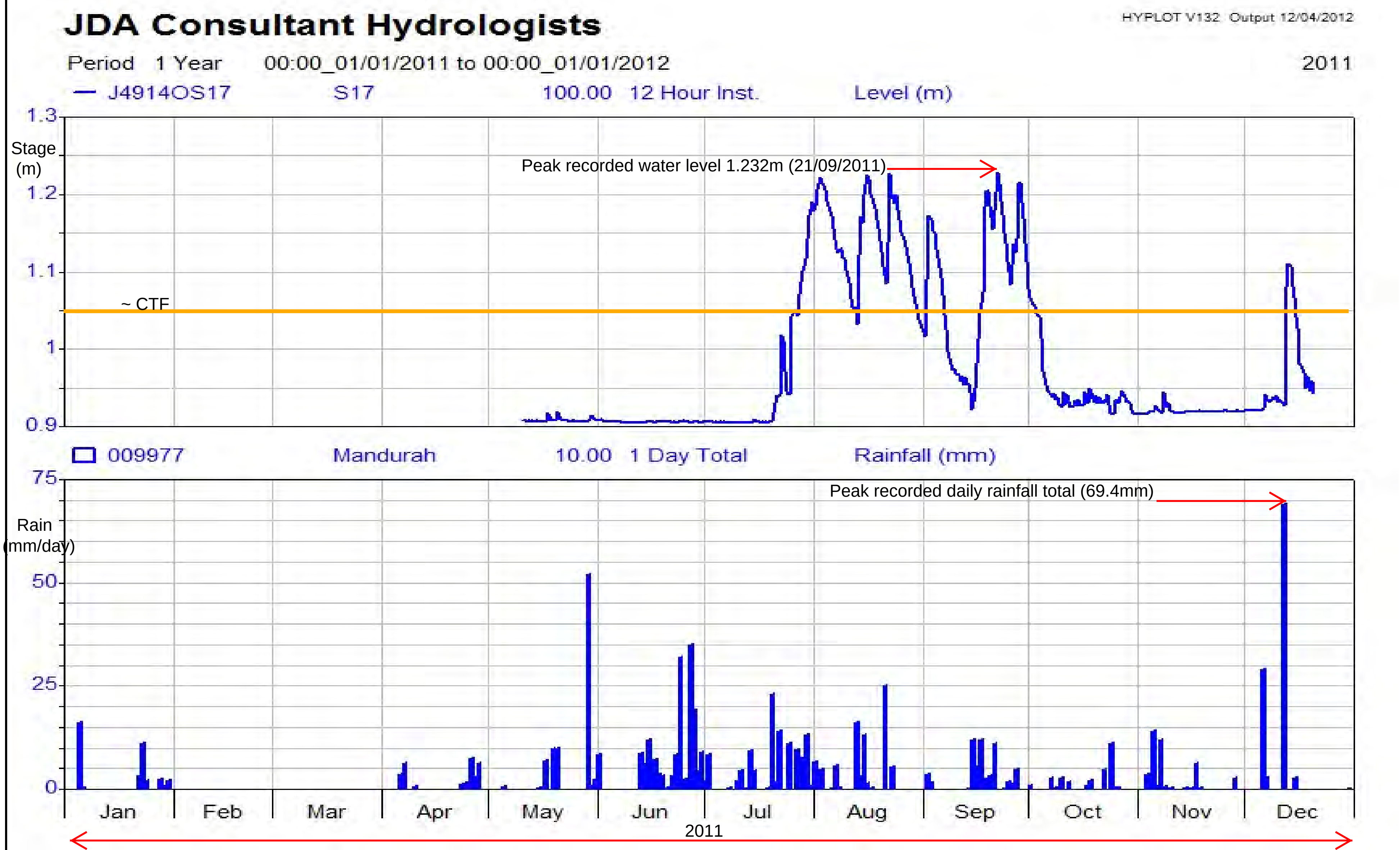
Figure 11: S15 Satge & Rainfall



Data Source: JDA Hydstra Database

JDA	J4914	David Barnao & Co Lot 221 Lakes Rd Nambeelup: Surface & Groundwater Monitoring 2011 **Figure 12: S17 Satge & Rainfall**

APPENDIX A

Borehole Logs (RPS, PB & Groundwater Consulting Services)

BOREHOLE NUMBER: LP1

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Ph: 9382 4744 Fax: 9382 1177
Email: info@bbg.net.au

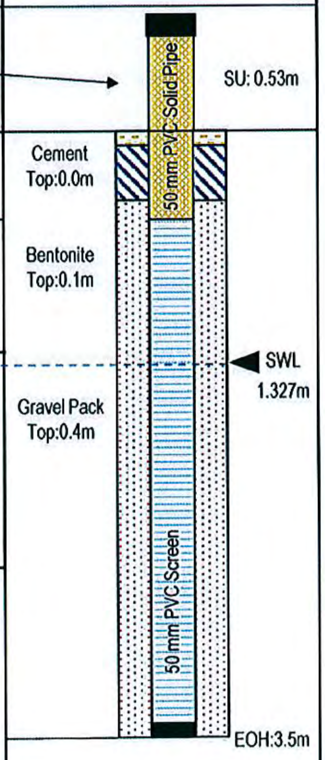
PROJECT NUMBER:	D06192
LOCATION:	Ravenswood (E: 0389542 / N: 6402274)
DRILLING COMPANY:	Proline
DRILLING METHOD:	Hollow Stem Auger
WEATHER:	Fine
DRILLER:	Stuart Burnie
SCIENTIST:	Shae Miller-White
DATE BEGUN:	6/06/2006
DATE COMPLETED:	6/06/2006

TOTAL DEPTH: 3.5m
GROUND SURFACE ELEVATION: 0.53m
SHEET: 1 OF: 20

STATIC WATER LEVEL	
DEPTH:	1.327mbgl
DATE:	16/06/2006

DEPTH	LITHOLOGY DESCRIPTION
0.5 – 0	*Star picket pyramid constructed around bore for protection.*
0 – 0.5	Dark grey / dark brown silty fine to medium grained SAND with some organics (10 – 15%).
0.5 – 1.3	Pale grey fine to medium grained SAND.
1.3 – 2.5	Brown fine to medium grained SAND (coffee sands / not cemented).
2.5 – 4.0	Brown / grey fine to medium grained SAND (high % of medium grains) with abundant quartz and feldspar granules.
4.0 – 4.5	Pale grey / brown sandy CLAY (moderate cohesion).

BORE INSTALLATION



Lockable bore: No Geotextile stocking: No Class: 18 PVC. Case diameter: 50mm

BOREHOLE NUMBER: **LP2**

RPS Bowman Bishaw Gorham
ENVIRONMENTAL MANAGEMENT CONSULTANTS
290 Churchill Avenue
Subiaco W.A. 6008
Ph: 9382 4744 Fax: 9382 1177
Email: info@bbg.net.au

PROJECT NUMBER:	D06192
LOCATION:	Ravenswood (E: 0389633 / N: 6401268)
DRILLING COMPANY:	Proline
DRILLING METHOD:	Hollow Stem Auger
WEATHER:	Fine
DRILLER:	Stuart Burnie
SCIENTIST:	Shae Miller-White
DATE BEGUN:	6/06/2006
DATE COMPLETED:	6/06/2006

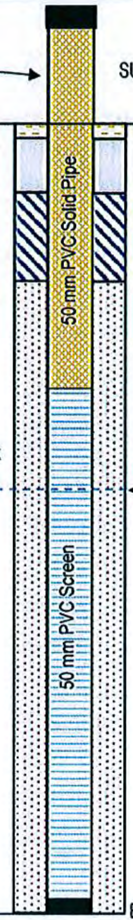
TOTAL DEPTH: 4.5m

GROUND SURFACE ELEVATION: 0.465m

SHEET: 2 OF: 20

STATIC WATER LEVEL	
DEPTH:	2.111mbgl
DATE:	16/06/2006

DEPTH	LITHOLOGY DESCRIPTION	BORE INSTALLATION
0.5 – 0	*Star picket pyramid constructed around bore for protection.*	SU: 0.465m
0 – 0.5	Dark grey / dark brown silty fine to medium grained SAND with some organics (5 -10%).	Cement Top:0.0m
0.5 – 1.0	Grey silty fine to medium grained SAND with trace organics (5%).	Sand Top:0.2m
1.0 – 2.0	Grey / pale grey fine to medium grained SAND with trace cemented gravels (5%).	Bentonite Top:0.4m; Gravel Pack Top:0.9m
2.0 – 3.0	Pale brown / grey fine to medium grained SAND with some coffee rock gravels (5-10%).	SWL 2.111m
3.0 – 3.5	Brown / grey medium grained SAND with trace coffee rock gravels (5%).	
3.5 – 4.0	Mixture of brown / grey fine to medium grained SAND and pale grey sandy CLAY (weak to moderate cohesion).	
4.0 – 4.5	Pale grey sandy CLAY (weak to moderate cohesion).	EOH:4.5m



Lockable bore: No Geotextile stocking: No Class: 18 PVC. Case diameter: 50mm

BOREHOLE NUMBER: **LP3**

RPS Bowman Bishaw Gorham
ENVIRONMENTAL MANAGEMENT CONSULTANTS
290 Churchill Avenue
Subiaco W.A. 6008
Ph: 9382 4744 Fax: 9382 1177
Email: info@bbg.net.au

PROJECT NUMBER:	D06192
LOCATION:	Ravenswood (E: 0391268 / N: 6402284)
DRILLING COMPANY:	Proline
DRILLING METHOD:	Hollow Stem Auger
WEATHER:	Fine
DRILLER:	Stuart Burnie
SCIENTIST:	Shae Miller-White
DATE BEGUN:	6/06/2006
DATE COMPLETED:	6/06/2006

TOTAL DEPTH: 3.8m

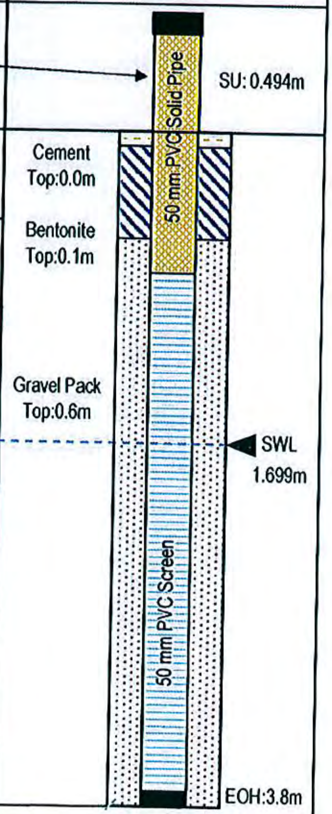
GROUND SURFACE ELEVATION: 0.494m

SHEET: 3 OF: 20

STATIC WATER LEVEL	
DEPTH:	1.699mbgl
DATE:	16/06/2006

DEPTH	LITHOLOGY DESCRIPTION
0.5 – 0	*Star picket pyramid constructed around bore for protection.*
0 – 0.5	Dark grey / dark brown silty fine to medium grained SAND with some organics (5 -10%).
0.5 – 1.0	Grey / brown slightly silty fine to medium grained SAND.
1.0 – 2.0	Mixture of grey / brown fine to medium grained SAND with trace grey sandy CLAY (moderate cohesion).
2.0 – 3.5	Pale grey fine to medium grained SAND.
3.5 – 4.0	Grey / brown fine to medium grained SAND.
4.0 – 4.5	Coffee rock (caused H/S auger to spin out of position therefore it was not possible to drill further).

BORE INSTALLATION



Lockable bore: No Geotextile stocking: No Class: 18 PVC. Case diameter: 50mm

BOREHOLE NUMBER: LP4

RPS Bowman Bishaw Gorham
ENVIRONMENTAL MANAGEMENT CONSULTANTS
290 Churchill Avenue
Subiaco W.A. 6008
Ph: 9382 4744 Fax: 9382 1177
Email: info@bbg.net.au

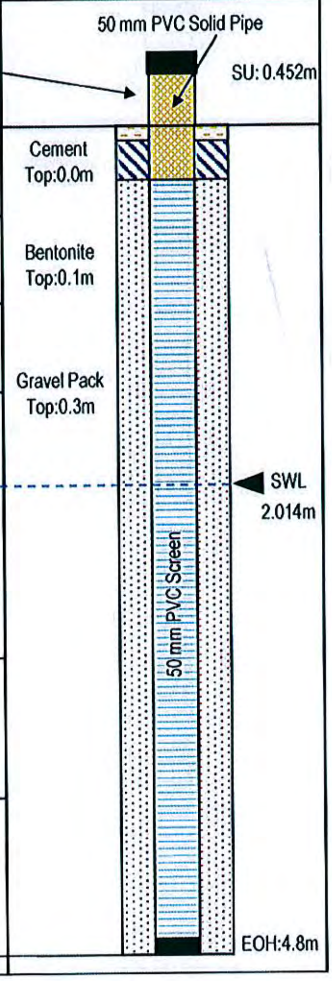
PROJECT NUMBER:	D06192
LOCATION:	Ravenswood (E: 0391278 / N: 6401262)
DRILLING COMPANY:	Proline
DRILLING METHOD:	Hollow Stem Auger
WEATHER:	Fine
DRILLER:	Stuart Burnie
SCIENTIST:	Shae Miller-White
DATE BEGUN:	7/06/2006
DATE COMPLETED:	7/06/2006

TOTAL DEPTH: 4.8m
GROUND SURFACE ELEVATION: 0.452m
SHEET: 4 OF: 20

STATIC WATER LEVEL	
DEPTH:	2.014mbgl
DATE:	16/06/2006

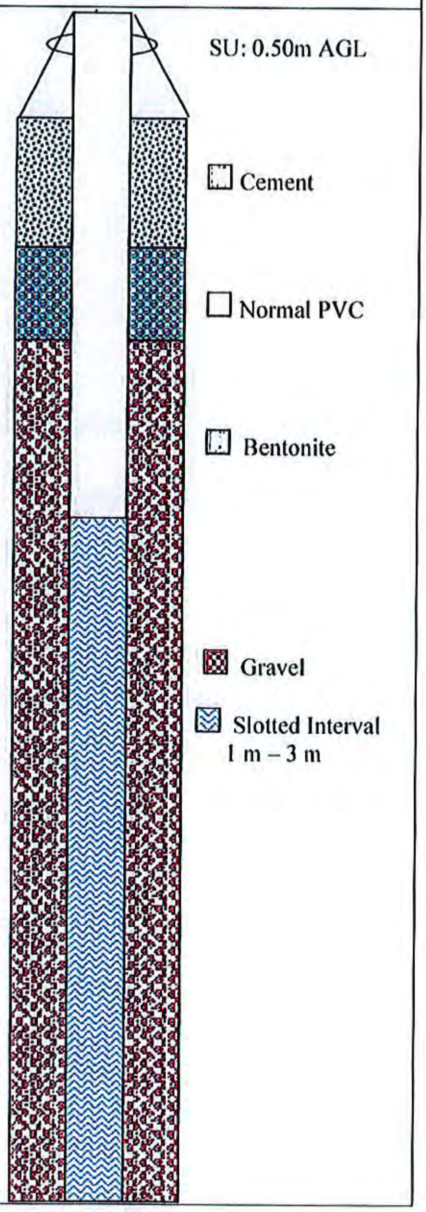
DEPTH	LITHOLOGY DESCRIPTION
0.5 – 0	*Star picket pyramid constructed around bore for protection.*
0 – 0.5	Dark grey / dark brown silty fine to medium grained SAND with some organics (5 -10%).
0.5 – 1.0	Grey fine to medium grained SAND with trace organics (5%).
1.0 – 1.5	Grey / brown fine to medium grained SAND.
1.5 – 3.0	Pale grey / pale brown fine to medium grained SAND.
3.0 – 3.8	Grey fine to medium grained SAND.
3.8 – 4.8	Brown / grey fine to medium grained SAND (coffee rock). Cemented with a hard lens from 3.7-4.5m than became softer to 5.0m

BORE INSTALLATION



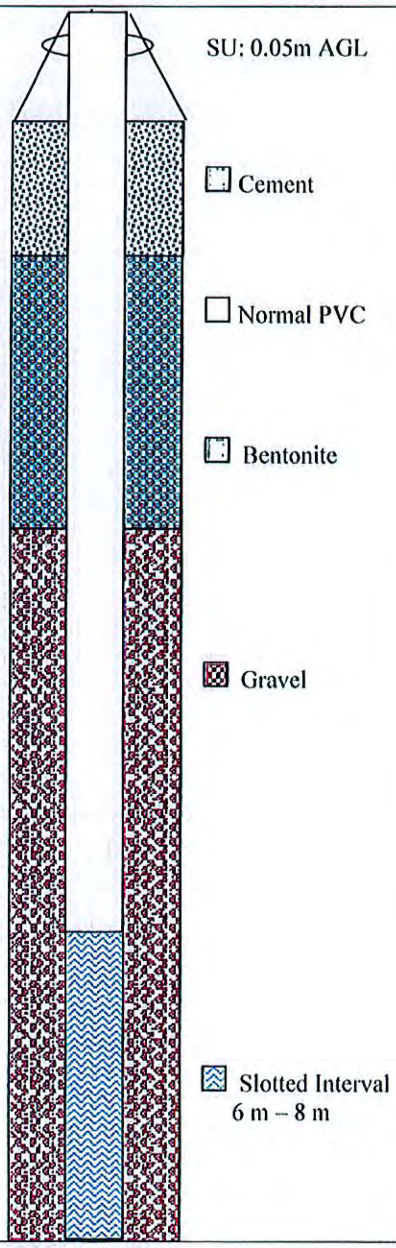
Lockable bore: No Geotextile stocking: No Class: 18 PVC. Case diameter: 50mm

Borehole Number: T 1
GPS Location: 6401726.13 N; 389848.86 E
Ground Level: 7.81 m AHD
Drilling Method: Sonic Samp Drill
Drilling Company: Strata Probe
Scientist: Bioscience

Depth (m)	Lithology Description	Piezometer Design
0.50 – 0	Triangular star picket construction surrounding PVC.	
0 – 0.5	0 – 1.9m Medium grained, grey sand.	
0.5 – 1.0		
1.0 – 1.5		
1.5 – 2.0	1.9 – 3m Coffee rock mixed with medium grained sand.	
2.0 – 2.5		
2.5 – 3.0		

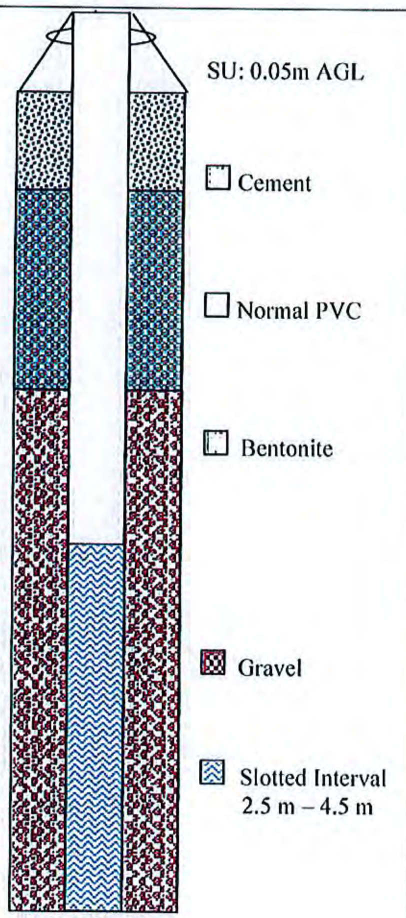
Borehole Number: T 2
GPS Location: 6401642.79 N; 390207.57 E
Ground Level: 14.14 m AHD
Drilling Method: Sonic Samp Drill
Drilling Company: Strata Probe
Scientist: Bioscience

Depth (m)	Lithology Description	Piezometer Design
0.05 – 0	Triangular star picket construction surrounding PVC.	
0 – 0.5	0 – 0.7 m White-grey sand and organic matter.	
0.5 – 1.0	0.7 – 2.1 m White sand.	
1.0 – 1.5		
1.5 – 2.0		
2.0 – 2.5	2.1 – 2.3 m Mixed white and orange sand.	
2.5 – 3.0	2.3 – 3.2 m Orange sand.	
3.0 – 3.5	3.2 – 4 m Light orange/yellow sand.	
3.5 – 4.0		
4.0 – 4.5	4 – 4.6 m Light yellow, fine grained sand.	
4.5 – 5.0	4.6 – 6.0 m Fine grained off-white sand.	
5.0 – 5.5		
5.5 – 6.0		
6.0 – 6.5		
6.5 – 7.0		
7.0 – 7.5		
7.5 – 8.0		



Borehole Number: T 3
GPS Location: 6401549.15 N; 390575.75 E
Ground Level: 11.99 m AHD
Drilling Method: Sonic Samp Drill
Drilling Company: Strata Probe
Scientist: Bioscience

Depth (m)	Lithology Description	Piezometer Design
0.05 – 0	Triangular star picket construction surrounding PVC.	
0 – 0.5	0 – 0.5 m Top soil 0.5 – 1.2 m Grey sand, very fine to coarse quartz.	
0.5 – 1.0		
1.0 – 1.5	1.2 – 1.6 m - gradation.	
1.5 – 2.0	1.6 – 2.2 m - yellow-brown sand, very fine to coarse quartz.	
2.0 – 2.5	2.2 – 4.1 m - weak coffee rock and fine to coarse brown sand.	
2.5 – 3.0		
3.0 – 3.5		
3.5 – 4.0		
4.0 – 4.5	4.1 – 5.0 m - pale brown clayey sand (20% clay), fine to coarse sand	
4.5 – 5.0		
5.0 – 5.5	5.0 – 6.0 m - Green-brown clayey sand (20% clay), fine to coarse sand.	
5.5 – 6.0		



BORE COMPLETION DETAILS

Nambeelup - NB03

LITHOLOGICAL DESCRIPTION	LOG	COMPLETION	DETAILS

LITHOLOGICAL DESCRIPTION

SAND. Dry, loose, dark brown (organic), well to medium sorted, subrounded to rounded, quartz sand.

SAND: Dry, loose, pale tan, well sorted, sub rounded to rounded, medium grained quartz sand.

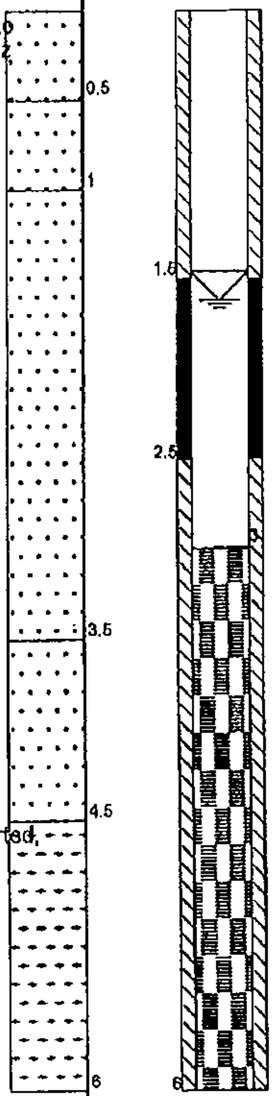
SAND: Wet, loose, pale tan, well sorted, sub rounded to rounded, medium grained quartz sand.

SAND: Wet, loose, pale tan, well sorted, sub rounded to rounded, medium grained quartz sand, thin black organic lense, minor silt component.

SILTY SAND. Wet, brown, well to medium sorted, rounded to subrounded, silt component.

Depth below ground level (metres)

5



DETAILS

GENERAL INFORMATION
Location:Nambellup NB02
Driller:Proline Drilling
Rig Type:Hollow Stem Auger
Date Drilled:22/10/02
Easting:391169 (GDA94)
Northing:6401707 (GDA94)
Surface RL:14.54 (mAHD)
Top of Casing:0.60 magl

FIELD WATER QUALITY
pH: 5.2
Temp: 20.4
Conductivity:12.92 µS/cm:

FILTER PACK MATERIAL
Size:
From: 2.5m To: 6m
Open Area:

CEMENT DETAILS
Casing cemented from: To:
Bentonite Seal from: 1.5m To: 2.5m

HYDRAULIC DATA:
Top of Aquifer:
Static W.L.:1.62 mBGL
Tested by: MD
Test Start:
Discharge:
Duration:
Drawdown:
Recovery:

Notes:
Annulus backfilled with sand drill cuttings
Bentonite seal at 1.5-2.5m
Top of column refers to PVC column

Nambeelup

Date:	17/12/2002
Drawn By:	MD
Job Number:	2142043A

BORE COMPLETION DETAILS

Nambeelup - NB04

LITHOLOGICAL DESCRIPTION	LOG	COMPLETION	DETAILS

Depth below ground level (metres)

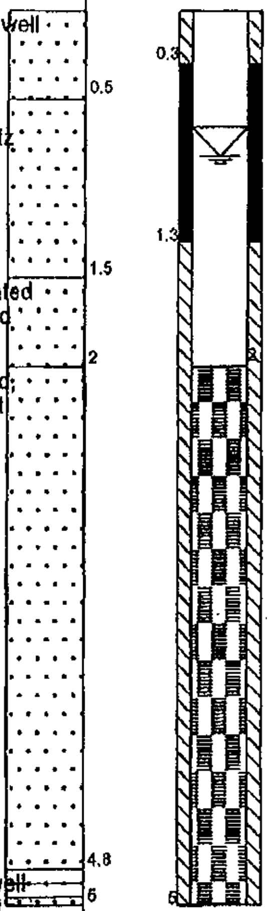
SAND. Dry, loose, dark grey/ black (organic), well to medium sorted, subrounded to rounded, quartz sand.

SAND. Dry, loose, dark grey (organic), well to medium sorted, subrounded to rounded, quartz sand.

SAND: Wet, consolidated, dark brown, cemented sands, medium sorted, subrounded to rounded quartz sand.

SAND: Wet, loose, dark brown, medium sorted, subrounded to rounded quartz sand, minor silt component.

5 CLAYEY SAND. Wet, brown to brown grey, well to medium sorted, subrounded to rounded, silt and clay component.



GENERAL INFORMATION

Location: Nambeelup NB04
Driller: Proline Drilling
Rig Type: Hollow Stem Auger
Date Drilled: 22/10/02
Easting: 390438 (GDA94)
Northing: 6402235 (GDA94)
Surface RL: 12.85 (mAHD)
Top of Casing: 0.60 magl

FIELD WATER QUALITY

pH: 5.4
Temp: 10.7
Conductivity: 210 μS/cm

FILTER PACK MATERIAL

Size:
From: 1.3m To: 5m
Open Area:

CEMENT DETAILS

Casing cemented from: To:
Bentonite Seal from: 0.3m To: 1.3m

HYDRAULIC DATA:

Top of Aquifer:
Static W.L.: 0.82 mBGL
Tested by: MD
Test Start:
Discharge:
Duration:
Drawdown:
Recovery:

Notes:

Annulus backfilled with sand drill cuttings
Bentonite seal at 0.3-1.3m
Top of casing refers to PVC column

Nambeelup

Date:	17/12/2002
Drawn By:	MD
Job Number:	2142043A

BORE COMPLETION DETAILS

Nambeelup - NB05

LITHOLOGICAL DESCRIPTION	LOG	COMPLETION	DETAILS

LITHOLOGICAL DESCRIPTION

SAND. Dry, loose, dark grey/ black (organic), well to medium sorted, subrounded to rounded, quartz sand.

SAND. Dry, loose, pale grey (organic), well to medium sorted, subrounded to rounded, quartz sand.

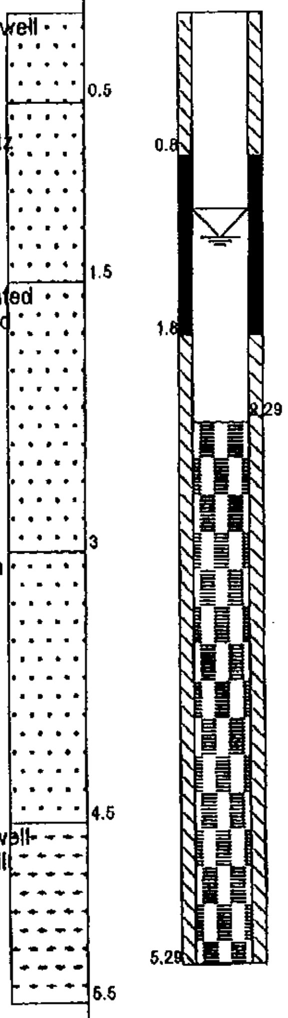
SAND: Wet, consolidated, dark brown, cemented sands, medium sorted, subrounded to rounded quartz sand.

SAND: Wet, loose, light tan to brown, medium sorted, subrounded to rounded quartz sand.

CLAYEY SAND. Wet, brown to brown grey , well to medium sorted, subrounded to rounded, silt and clay component.

Depth below ground level (metres)

5



DETAILS

GENERAL INFORMATION

Location: Nambeelup NB05
Driller: Proline Drilling
Rig Type: Hollow Stem Auger
Date Drilled: 22/10/02
Easting: 389826 (GDA94)
Northing: 6401228 (GDA94)
Surface RL: 7.39 (mAHD)
Top of Casing: 0.58 magl

FIELD WATER QUALITY

pH: 5.6
Temp: 8.6
Conductivity: 1150μ S/cm

FILTER PACK MATERIAL

Size:
From: 0.8m To: 1.80m
Open Area:

CEMENT DETAILS

Casing cemented from: To:
Bentonite Seal from: 0.8m To: 1.8m

HYDRAULIC DATA:

Top of Aquifer:
Static W.L.: 1.26 mBGL
Tested by: MD
Test Start:
Discharge:
Duration:
Drawdown:
Recovery:

Notes:

Annulus backfilled with sand drill cuttings
Bentonite seal at 0.8-1.8m
Top of casing refers to PVC column

Nambeelup	
Date:	17/12/2002
Drawn By:	MD
Job Number:	2142043A

APPENDIX B

Laboratory Analysis Results

16 - 18 Hayden Court, Myaree, Western Australia 6154
PO Box 4023 Myaree BC, Western Australia 6960
Tel: +61 8 9317 2505 / Fax: +61 8 9317 4163
email: laboratory@mpl.com.au
www.envirolabservices.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

mpl Laboratories — Part of the Envirolab Group

CERTIFICATE OF ANALYSIS 111884

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilj

Sample log in details:

Your Reference:	**J4914c1**
No. of samples:	10 x water
Date samples received:	08/06/11
Date completed instructions received:	08/06/11
Location:	Nambeelup Lot 221

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	15/06/11
Date of Preliminary Report:	Not issued
Issue Date:	22/06/11

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This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

Extended Water Analysis						
Our Reference:	UNITS	111884-1	111884-2	111884-3	111884-4	111884-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	7/06/2011	7/06/2011	7/06/2011	7/06/2011	7/06/2011
Type of sample		Water	Water	Water	Water	Water
pH in water	pH Units	5.3	5.4	6.0	6.1	6.0
Electrical Conductivity water	µS/cm	220	200	1,000	710	250
Total Dissolved Solids (grav)	mg/L	170	130	800	470	140
Nitrate as NO_3	mg/L	0.9	<0.1	<0.1	<0.1	<0.1
Nitrite as NO_2	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1

Extended Water Analysis						
Our Reference:	UNITS	111884-6	111884-7	111884-8	111884-9	111884-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	7/06/2011	7/06/2011	7/06/2011	7/06/2011	7/06/2011
Type of sample		Water	Water	Water	Water	Water
pH in water	pH Units	6.2	5.2	6.0	5.0	5.3
Electrical Conductivity water	µS/cm	170	340	200	210	400
Total Dissolved Solids (grav)	mg/L	110	220	140	140	260
Nitrate as NO_3	mg/L	<0.1	<0.1	<0.1	19	<0.1
Nitrite as NO_2	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1

Extended Water Analysis Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-1 NB03 7/06/2011 Water	111884-2 NB04 7/06/2011 Water	111884-3 NB05 7/06/2011 Water	111884-4 LP1 7/06/2011 Water	111884-5 LP2 7/06/2011 Water
Iron	mg/L	0.11	0.82	8.6	4.5	3.8
Manganese	mg/L	<0.005	<0.005	0.031	0.21	0.036
Arsenic	mg/L	<0.001	<0.001	<0.001	0.001	0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.03	0.01	0.02	0.02	0.02
Aluminium	mg/L	0.51	1.3	0.03	0.18	0.37
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silica	mg/L	12	15	7.2	15	6.7

Extended Water Analysis Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-6 LP3 7/06/2011 Water	111884-7 LP4 7/06/2011 Water	111884-8 T1 7/06/2011 Water	111884-9 T2 7/06/2011 Water	111884-10 T3 7/06/2011 Water
Iron	mg/L	0.04	2.6	15	0.03	1.4
Manganese	mg/L	<0.005	0.011	0.067	<0.005	0.006
Arsenic	mg/L	<0.001	0.001	0.005	<0.001	0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.02	0.01	0.02	0.03	0.02
Aluminium	mg/L	0.19	1.7	0.57	0.06	2.2
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silica	mg/L	8.9	14	7.5	8.3	16

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-1 NB03 7/06/2011 Water	111884-2 NB04 7/06/2011 Water	111884-3 NB05 7/06/2011 Water	111884-4 LP1 7/06/2011 Water	111884-5 LP2 7/06/2011 Water
Calcium	mg/L	5.4	2.3	210	15	9.1
Potassium	mg/L	2.3	1.9	9.9	2.8	9.9
Magnesium	mg/L	7.0	4.9	11	34	5.8
Sodium	mg/L	36	29	17	80	18
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	12	19	26	50	28
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	12	19	26	50	28
Chloride in water	mg/L	46	43	31	140	33
Sulphate in water	mg/L	10	5	540	140	45
Ionic Balance	%	17	4.2	0.10	-5.0	-11
Hardness as $CaCO_3$	mg/L	42	26	580	180	47

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-6 LP3 7/06/2011 Water	111884-7 LP4 7/06/2011 Water	111884-8 T1 7/06/2011 Water	111884-9 T2 7/06/2011 Water	111884-10 T3 7/06/2011 Water
Calcium	mg/L	18	4.2	1.3	5.0	3.3
Potassium	mg/L	1.4	6.7	5.1	7.2	3.5
Magnesium	mg/L	2.1	7.8	5.0	4.0	8.7
Sodium	mg/L	15	44	25	22	58
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	32	10	32	5	19
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	32	10	32	5	19
Chloride in water	mg/L	30	86	40	45	120
Sulphate in water	mg/L	4	11	<1	14	<1
Ionic Balance	%	6.2	1.6	-2.5	1.9	-3.3
Hardness as $CaCO_3$	mg/L	54	43	24	29	44

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-1 NB03 7/06/2011 Water	111884-2 NB04 7/06/2011 Water	111884-3 NB05 7/06/2011 Water	111884-4 LP1 7/06/2011 Water	111884-5 LP2 7/06/2011 Water
Total Nitrogen (Total N)	mg/L	1.0	1.1	0.59	0.93	0.79
Total Kjeldahl Nitrogen	mg/L	0.98	1.1	0.59	0.93	0.79
NOx as N	mg/L	0.064	<0.005	0.007	<0.005	<0.005
Ammonia as N	mg/L	0.44	0.67	0.37	0.19	0.35
Total Phosphorus (Total P)	mg/L	0.11	<0.01	0.01	0.05	0.08
Phosphate as P	mg/L	0.09	<0.005	<0.005	<0.005	0.02

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	111884-6 LP3 7/06/2011 Water	111884-7 LP4 7/06/2011 Water	111884-8 T1 7/06/2011 Water	111884-9 T2 7/06/2011 Water	111884-10 T3 7/06/2011 Water
Total Nitrogen (Total N)	mg/L	0.30	1.2	1.1	3.9	1.3
Total Kjeldahl Nitrogen	mg/L	0.30	1.2	1.1	1.3	1.3
NOx as N	mg/L	<0.005	<0.005	<0.005	2.7	<0.005
Ammonia as N	mg/L	0.11	0.41	0.52	<0.005	1.3
Total Phosphorus (Total P)	mg/L	0.05	0.12	0.08	0.03	0.05
Phosphate as P	mg/L	0.02	0.01	<0.005	<0.005	<0.005

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
INORG-081	Nitrate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Nitrite by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
METALS-020	Metals in soil and water by ICP-OES.
METALS-024	Metals by GF-AAS.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.

QUALITY CONTROL Extended Water Analysis	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
pH in water	pH Units		INORG-001	[NT]	111884-2	5.4 || 5.4 || RPD: 0	LCS	102%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	111884-2	200 || 200 || RPD: 0	LCS	94%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	111884-2	130 || [N/T]	LCS	85%
Nitrate as NO_3	mg/L	0.1	INORG-081	<0.1	111884-2	<0.1 || [N/T]	LCS	100%
Nitrite as NO_2	mg/L	0.1	INORG-081	<0.1	111884-2	<0.1 || [N/T]	LCS	101%

QUALITY CONTROL Extended Water Analysis	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Iron	mg/L	0.02	METALS-020	<0.02	111884-1	0.11 || 0.08 || RPD: 32	LCS	105%
Manganese	mg/L	0.005	METALS-020	<0.005	111884-1	<0.005 || <0.005	LCS	110%
Arsenic	mg/L	0.001	METALS-024	<0.001	111884-1	<0.001 || [N/T]	LCS	88%
Mercury	mg/L	0.0001	METALS-024	<0.0001	111884-1	<0.0001 || [N/T]	LCS	104%
Cadmium	mg/L	0.002	METALS-020	<0.002	111884-1	<0.002 || <0.002	LCS	99%
Copper	mg/L	0.005	METALS-020	<0.005	111884-1	<0.005 || <0.005	LCS	108%
Lead	mg/L	0.001	METALS-024	<0.001	111884-1	<0.001 || [N/T]	LCS	109%
Chromium	mg/L	0.005	METALS-020	<0.005	111884-1	<0.005 || <0.005	LCS	106%
Zinc	mg/L	0.01	METALS-020	<0.01	111884-1	0.03 || 0.02 || RPD: 40	LCS	106%
Aluminium	mg/L	0.02	METALS-020	<0.02	111884-1	0.51 || 0.40 || RPD: 24	LCS	101%
Selenium	mg/L	0.001	METALS-024	<0.001	111884-1	<0.001 || <0.001	LCS	103%
Silica	mg/L	0.1	METALS-020	<0.1	111884-1	12 || 9.6 || RPD: 22	LCS	120%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	111884-1	5.4 || 4.2 || RPD: 25	LCS	121%
Potassium	mg/L	0.1	METALS-020	<0.1	111884-1	2.3 || 1.9 || RPD: 19	LCS	106%
Magnesium	mg/L	0.1	METALS-020	<0.1	111884-1	7.0 || 5.5 || RPD: 24	LCS	102%
Sodium	mg/L	0.5	METALS-020	<0.5	111884-1	36 || 28 || RPD: 25	LCS	108%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	111884-1	12 || [N/T]	LCS	103%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	111884-1	<1 || [N/T]	LCS	103%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	111884-1	12 || [N/T]	LCS	103%
Chloride in water	mg/L	1	INORG-081	<1	111884-1	46 || 46 || RPD: 0	LCS	106%
Sulphate in water	mg/L	1	INORG-081	<1	111884-1	10 || 9 || RPD: 11	LCS	104%
Ionic Balance	%		INORG-040	[NT]	111884-1	17 || [N/T]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	111884-1	42 || 33 || RPD: 24	[NR]	[NR]

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	[NT]	[NT]	LCS	97%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	0.005	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	INORG-055	<0.005	[NT]	[NT]	LCS	100%
Ammonia as N	mg/L	0.005	INORG-057	<0.005	[NT]	[NT]	LCS	96%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	[NT]	[NT]	LCS	92%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	[NT]	[NT]	LCS	100%

QUALITY CONTROL Extended Water Analysis	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Nitrate as NO_3	mg/L	111884-1	0.9 || 0.9 || RPD: 0
Nitrite as NO_2	mg/L	111884-1	<0.1 || <0.1

QUALITY CONTROL Extended Water Analysis	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Iron	mg/L	111884-10	1.4 || 1.5 || RPD: 7	[NR]	[NR]
Manganese	mg/L	111884-10	0.006 || 0.006 || RPD: 0	[NR]	[NR]
Arsenic	mg/L	111884-10	0.001 || [N/T]	111884-2	84%
Mercury	mg/L	111884-10	<0.0001 || [N/T]	111884-2	101%
Cadmium	mg/L	111884-10	<0.002 || <0.002	[NR]	[NR]
Copper	mg/L	111884-10	<0.005 || <0.005	[NR]	[NR]
Lead	mg/L	111884-10	<0.001 || [N/T]	111884-2	100%
Chromium	mg/L	111884-10	<0.005 || <0.005	[NR]	[NR]
Zinc	mg/L	111884-10	0.02 || 0.02 || RPD: 0	[NR]	[NR]
Aluminium	mg/L	111884-10	2.2 || 2.2 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Extended Water Analysis	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Silica	mg/L	111884-10	16 || 17 || RPD: 6	[NR]	[NR]

QUALITY CONTROL Ionic Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Calcium	mg/L	111884-10	3.3 || 3.3 || RPD: 0
Potassium	mg/L	111884-10	3.5 || 3.6 || RPD: 3
Magnesium	mg/L	111884-10	8.7 || 8.8 || RPD: 1
Sodium	mg/L	111884-10	58 || 59 || RPD: 2
Hardness as $CaCO_3$	mg/L	111884-10	44 || 45 || RPD: 2

QUALITY CONTROL Ionic Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Calcium	mg/L	111884-7	4.2 || [N/T]
Potassium	mg/L	111884-7	6.7 || [N/T]
Magnesium	mg/L	111884-7	7.8 || [N/T]
Sodium	mg/L	111884-7	44 || [N/T]
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	111884-7	10 || 10 || RPD: 0
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	111884-7	<1 || <1
Total Alkalinity as $CaCO_3$	mg/L	111884-7	10 || 10 || RPD: 0
Chloride in water	mg/L	111884-7	86 || [N/T]
Sulphate in water	mg/L	111884-7	11 || [N/T]
Ionic Balance	%	111884-7	1.6 || [N/T]
Hardness as $CaCO_3$	mg/L	111884-7	43 || [N/T]

QUALITY CONTROL Extended Water Analysis	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
pH in water	pH Units	111884-4	6.1 || [N/T]
Electrical Conductivity water	µS/cm	111884-4	710 || [N/T]
Total Dissolved Solids (grav)	mg/L	111884-4	470 || 410 || RPD: 14
Nitrate as NO_3	mg/L	111884-4	<0.1 || [N/T]
Nitrite as NO_2	mg/L	111884-4	<0.1 || [N/T]

Report Comments:

This report R01 replaces the original due to amendment in sample ID

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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CERTIFICATE OF ANALYSIS 113149

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Greg Willett

Sample log in details:

Your Reference:	**J4914C2**
No. of samples:	2 Waters
Date samples received:	21/7/11
Date completed instructions received:	21/7/11
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	28/07/11
Date of Preliminary Report:	Not issued
Issue Date:	28/07/11

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Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

Miscellaneous Inorganics			
Our Reference:	UNITS	113149-1	113149-2
Your Reference	-------------	J4914 S10	J4735 SW2
Date Sampled	------------	20/07/2011	20/07/2011
Type of sample		Water	Water
Date prepared	-	21/7/11	21/7/11
Date analysed	-	21/7/11	21/7/11
pH in water	pH Units	7.4	8.5
Electrical Conductivity water	µS/cm	870	440
Total Dissolved Solids (grav)	mg/L	650	280

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113149-1 J4914 S10 20/07/2011 Water	113149-2 J4735 SW2 20/07/2011 Water
Calcium	mg/L	23	10
Potassium	mg/L	10	5.5
Magnesium	mg/L	21	12
Sodium	mg/L	120	68
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	32	110
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	4
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	32	110
Chloride in water	mg/L	220	84
Sulphate in water	mg/L	110	<1
Nitrate as NO_3	mg/L	2.6	<0.1
Nitrite as NO_2	mg/L	0.2	<0.1
Ionic Balance	%	-5.3	-0.99
Hardness as $CaCO_3$	mg/L	140	74

Dissolved Metals in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113149-1 J4914 S10 20/07/2011 Water	113149-2 J4735 SW2 20/07/2011 Water
Date prepared	-	26/7/11	26/7/11
Date analysed	-	26/7/11	26/7/11
Arsenic	mg/L	0.006	0.006
Lead	mg/L	0.005	0.004
Selenium	mg/L	0.002	0.001
Aluminium	mg/L	0.50	0.06
Cadmium	mg/L	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005
Iron	mg/L	3.0	0.31
Manganese	mg/L	0.12	0.007
Mercury	mg/L	<0.0001	<0.0001
Zinc	mg/L	0.02	0.02
Copper	mg/L	<0.005	<0.005
Silica	mg/L	11	13

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113149-1 J4914 S10 20/07/2011 Water	113149-2 J4735 SW2 20/07/2011 Water
Total Nitrogen (Total N)	mg/L	2.4	2.0
NOx as N	mg/L	0.41	<0.005
Total Kjeldahl Nitrogen	mg/L	2.0	2.0
Ammonia as N	mg/L	0.29	0.13
Total Phosphorus (Total P)	mg/L	0.77	0.31
Phosphate as P	mg/L	0.57	0.17

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
METALS-020	Metals in soil and water by ICP-OES.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Nitrate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Nitrite by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.
METALS-024	Metals by GF-AAS.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/7/11	113149-1	21/7/11 || 21/7/11	LCS	21/7/11
Date analysed	-			21/7/11	113149-1	21/7/11 || 21/7/11	LCS	21/7/11
pH in water	pH Units		INORG-001	[NT]	113149-1	7.4 || [N/T]	LCS	106%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	113149-1	870 || [N/T]	LCS	93%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	113149-1	650 || 670 || RPD: 3	LCS	105%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	115%
Potassium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	102%
Magnesium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	102%
Sodium	mg/L	0.5	METALS-020	<0.5	[NT]	[NT]	LCS	105%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	106%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	106%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	106%
Chloride in water	mg/L	1	INORG-081	<1	[NT]	[NT]	LCS	100%
Sulphate in water	mg/L	1	INORG-081	<1	[NT]	[NT]	LCS	96%
Nitrate as NO_3	mg/L	0.1	INORG-081	<0.1	[NT]	[NT]	LCS	99%
Nitrite as NO_2	mg/L	0.1	INORG-081	<0.1	[NT]	[NT]	LCS	99%
Ionic Balance	%		INORG-040	[NT]	[NT]	[NT]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/7/11	113149-1	26/7/11 || 26/7/11	LCS	26/7/11
Date analysed	-			26/7/11	113149-1	26/7/11 || 26/7/11	LCS	26/7/11
Arsenic	mg/L	0.001	METALS-024	<0.001	113149-1	0.006 || [N/T]	LCS	106%
Lead	mg/L	0.001	METALS-024	<0.001	113149-1	0.005 || [N/T]	LCS	130%
Selenium	mg/L	0.001	METALS-024	<0.001	113149-1	0.002 || [N/T]	LCS	113%
Aluminium	mg/L	0.02	METALS-020	<0.02	113149-1	0.50 || [N/T]	LCS	112%
Cadmium	mg/L	0.002	METALS-020	<0.002	113149-1	<0.002 || [N/T]	LCS	101%
Chromium	mg/L	0.005	METALS-020	<0.005	113149-1	<0.005 || [N/T]	LCS	114%
Iron	mg/L	0.02	METALS-020	<0.02	113149-1	3.0 || [N/T]	LCS	112%
Manganese	mg/L	0.005	METALS-020	<0.005	113149-1	0.12 || [N/T]	LCS	114%
Mercury	mg/L	0.0001	METALS-024	<0.0001	113149-1	<0.0001 || <0.0001	LCS	89%
Zinc	mg/L	0.01	METALS-020	<0.01	113149-1	0.02 || [N/T]	LCS	111%
Copper	mg/L	0.005	METALS-020	<0.005	113149-1	<0.005 || [N/T]	LCS	113%
Silica	mg/L	0.1	METALS-020	<0.1	113149-1	11 || [N/T]	LCS	100%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	113149-1	2.4 || 2.6 || RPD: 8	LCS	102%
NOx as N	mg/L	0.005	INORG-055	<0.005	113149-1	0.41 || [N/T]	LCS	106%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	0.005	113149-1	2.0 || [N/T]	[NR]	[NR]
Ammonia as N	mg/L	0.005	INORG-057	<0.005	113149-1	0.29 || [N/T]	LCS	106%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	113149-1	0.77 || 0.77 || RPD: 0	LCS	99%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	113149-1	0.57 || [N/T]	LCS	100%

QUALITY CONTROL Dissolved Metals in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	113149-2	26/7/11
Date analysed	-	[NT]	[NT]	113149-2	26/7/11
Arsenic	mg/L	[NT]	[NT]	[NR]	[NR]
Lead	mg/L	[NT]	[NT]	[NR]	[NR]
Selenium	mg/L	[NT]	[NT]	[NR]	[NR]
Aluminium	mg/L	[NT]	[NT]	[NR]	[NR]
Cadmium	mg/L	[NT]	[NT]	[NR]	[NR]
Chromium	mg/L	[NT]	[NT]	[NR]	[NR]
Iron	mg/L	[NT]	[NT]	[NR]	[NR]
Manganese	mg/L	[NT]	[NT]	[NR]	[NR]
Mercury	mg/L	[NT]	[NT]	113149-2	90%
Zinc	mg/L	[NT]	[NT]	[NR]	[NR]
Copper	mg/L	[NT]	[NT]	[NR]	[NR]
Silica	mg/L	[NT]	[NT]	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and
10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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CERTIFICATE OF ANALYSIS 113775

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Nathan Gardner

Sample log in details:

Your Reference:	**J4914C3**
No. of samples:	1 Water
Date samples received:	11/8/11
Date completed instructions received:	11/8/11
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	18/08/11
Date of Preliminary Report:	Not issued
Issue Date:	18/08/11

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

Miscellaneous Inorganics						
Our Reference:	UNITS	113775-1	113775-2	113775-3	113775-4	113775-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	11/08/2011	11/08/2011	11/08/2011	11/08/2011	11/08/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
pH in water	pH Units	5.3	5.5	6.1	6.3	6.4
Electrical Conductivity water	µS/cm	170	190	820	760	270
Total Dissolved Solids (grav)	mg/L	110	120	530	600	170

Miscellaneous Inorganics						
Our Reference:	UNITS	113775-6	113775-7	113775-8	113775-9	113775-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	11/08/2011	11/08/2011	11/08/2011	11/08/2011	11/08/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
pH in water	pH Units	6.4	4.8	5.9	4.8	5.2
Electrical Conductivity water	µS/cm	200	210	210	220	390
Total Dissolved Solids (grav)	mg/L	130	130	130	160	250

Miscellaneous Inorganics			
Our Reference:	UNITS	113775-11	113775-12
Your Reference	-------------	S10	S14
Date Sampled	------------	11/08/2011	11/08/2011
Type of sample		Water	Water
Date prepared	-	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11
pH in water	pH Units	6.6	5.7
Electrical Conductivity water	µS/cm	520	220
Total Dissolved Solids (grav)	mg/L	340	140

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113775-1 NB03 11/08/2011 Water	113775-2 NB04 11/08/2011 Water	113775-3 NB05 11/08/2011 Water	113775-4 LP1 11/08/2011 Water	113775-5 LP2 11/08/2011 Water
Calcium	mg/L	2.5	1.1	170	21	22
Potassium	mg/L	1.4	1.7	7.1	2.7	12
Magnesium	mg/L	4.0	4.3	8.1	35	10
Sodium	mg/L	21	23	13	96	17
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	12	19	31	60	66
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	12	19	31	60	66
Chloride in water	mg/L	35	38	32	140	27
Sulphate in water	mg/L	<1	7	460	140	44
Hardness as $CaCO_3$	mg/L	23	20	450	190	98
Ionic Balance	%	7.3	-4.9	-5.9	0.57	0.0

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113775-6 LP3 11/08/2011 Water	113775-7 LP4 11/08/2011 Water	113775-8 T1 11/08/2011 Water	113775-9 T2 11/08/2011 Water	113775-10 T3 11/08/2011 Water
Calcium	mg/L	36	4.1	1.4	3.2	3.5
Potassium	mg/L	1.7	7.5	4.1	4.7	3.2
Magnesium	mg/L	4.7	7.5	6.5	5.7	11
Sodium	mg/L	14	24	22	19	66
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	120	6	30	4	12
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	120	6	30	4	12
Chloride in water	mg/L	24	46	39	45	140
Sulphate in water	mg/L	8	10	9	11	<1
Hardness as $CaCO_3$	mg/L	110	41	30	32	54
Ionic Balance	%	-6.0	11	-6.1	0.050	-1.7

Ionic Balance			
Our Reference:	UNITS	113775-11	113775-12
Your Reference	-------------	S10	S14
Date Sampled	------------	11/08/2011	11/08/2011
Type of sample		Water	Water
Calcium	mg/L	17	9.6
Potassium	mg/L	5.9	2.5
Magnesium	mg/L	12	4.0
Sodium	mg/L	78	24
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	39	13
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	39	13
Chloride in water	mg/L	140	48
Sulphate in water	mg/L	33	7
Hardness as $CaCO_3$	mg/L	93	40
Ionic Balance	%	-0.050	4.1

Dissolved Metals in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113775-1 NB03 11/08/2011 Water	113775-2 NB04 11/08/2011 Water	113775-3 NB05 11/08/2011 Water	113775-4 LP1 11/08/2011 Water	113775-5 LP2 11/08/2011 Water
Date prepared	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminium	mg/L	0.48	1.4	0.03	0.19	0.16
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.08	0.38	8.0	0.22	2.5
Manganese	mg/L	<0.005	<0.005	0.026	0.027	0.020
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Silica	mg/L	9.1	13	5.4	14	6.0

Dissolved Metals in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	113775-6 LP3 11/08/2011 Water	113775-7 LP4 11/08/2011 Water	113775-8 T1 11/08/2011 Water	113775-9 T2 11/08/2011 Water	113775-10 T3 11/08/2011 Water
Date prepared	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11	12/8/11	12/8/11	12/8/11
Arsenic	mg/L	<0.001	<0.001	0.005	<0.001	<0.001
Lead	mg/L	<0.001	0.001	<0.001	<0.001	<0.001
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Aluminium	mg/L	0.16	2.0	0.47	0.08	1.7
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.49	1.4	21	0.06	2.4
Manganese	mg/L	<0.005	0.015	0.082	<0.005	0.007
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Silica	mg/L	10	11	6.7	8.1	14

Dissolved Metals in Water			
Our Reference:	UNITS	113775-11	113775-12
Your Reference	-------------	S10	S14
Date Sampled	------------	11/08/2011	11/08/2011
Type of sample		Water	Water
Date prepared	-	12/8/11	12/8/11
Date analysed	-	12/8/11	12/8/11
Arsenic	mg/L	<0.001	<0.001
Lead	mg/L	<0.001	<0.001
Selenium	mg/L	<0.001	<0.001
Aluminium	mg/L	0.41	0.43
Cadmium	mg/L	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005
Iron	mg/L	2.2	1.1
Manganese	mg/L	0.038	<0.005
Mercury	mg/L	<0.0001	<0.0001
Zinc	mg/L	0.01	<0.01
Copper	mg/L	<0.005	<0.005
Silica	mg/L	5.0	7.6

Nutrients in Water	UNITS	113775-1	113775-2	113775-3	113775-4	113775-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	11/08/2011	11/08/2011	11/08/2011	11/08/2011	11/08/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	1.3	0.90	0.43	1.1	1.8
Total Kjeldahl Nitrogen	mg/L	1.3	0.90	0.43	0.83	0.80
NOx as N	mg/L	0.032	<0.005	<0.005	0.25	1.0
Nitrate as N	mg/L	0.035	<0.005	<0.005	0.21	0.96
Nitrite as N	mg/L	<0.005	<0.005	<0.005	0.046	0.042
Ammonia as N	mg/L	0.53	0.84	0.44	0.11	0.44
Total Phosphorus (Total P)	mg/L	0.14	0.02	0.03	0.05	0.10
Phosphate as P	mg/L	0.07	<0.005	0.005	0.006	0.03

Nutrients in Water Our Reference:	UNITS	113775-6	113775-7	113775-8	113775-9	113775-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	11/08/2011	11/08/2011	11/08/2011	11/08/2011	11/08/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	1.1	6.0	2.0	1.3	3.0
Total Kjeldahl Nitrogen	mg/L	0.13	2.9	0.42	0.19	2.0
NOx as N	mg/L	0.99	3.1	1.6	1.1	1.0
Nitrate as N	mg/L	0.99	3.1	1.6	1.1	1.0
Nitrite as N	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia as N	mg/L	0.19	0.17	0.53	0.10	1.8
Total Phosphorus (Total P)	mg/L	0.08	0.27	0.04	0.02	0.04
Phosphate as P	mg/L	0.02	0.02	<0.005	0.005	<0.005

Nutrients in Water Our Reference:	UNITS	113775-11	113775-12
Your Reference	-------------	S10	S14
Date Sampled	------------	11/08/2011	11/08/2011
Type of sample		Water	Water
Total Nitrogen (Total N)	mg/L	1.6	1.5
Total Kjeldahl Nitrogen	mg/L	0.19	0.59
NOx as N	mg/L	1.4	0.95
Nitrate as N	mg/L	1.4	0.95
Nitrite as N	mg/L	<0.005	<0.005
Ammonia as N	mg/L	0.16	0.14
Total Phosphorus (Total P)	mg/L	0.73	0.29
Phosphate as P	mg/L	0.54	0.14

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
METALS-020	Metals in soil and water by ICP-OES.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-024	Metals by GF-AAS.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrate by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrite by colourimetric analysis in accordance with APHA 21st ED 4500-NO2 B.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/8/11	113729-1	12/8/11 || 12/8/11	LCS	12/8/11
Date analysed	-			12/8/11	113729-1	12/8/11 || 12/8/11	LCS	12/8/11
pH in water	pH Units		INORG-001	[NT]	113729-1	5.3 || [N/T]	LCS	102%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	113729-1	170 || [N/T]	LCS	99%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	113729-1	110 || 110 || RPD: 0	LCS	94%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	113775-1	2.5 || [N/T]	LCS	113%
Potassium	mg/L	0.1	METALS-020	<0.1	113775-1	1.4 || [N/T]	LCS	95%
Magnesium	mg/L	0.1	METALS-020	<0.1	113775-1	4.0 || [N/T]	LCS	97%
Sodium	mg/L	0.5	METALS-020	<0.5	113775-1	21 || [N/T]	LCS	99%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	113775-1	12 || [N/T]	LCS	1011%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	113775-1	<1 || [N/T]	LCS	101%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	113775-1	12 || [N/T]	LCS	101%
Chloride in water	mg/L	1	INORG-081	<1	113775-1	35 || 34 || RPD: 3	LCS	103%
Sulphate in water	mg/L	1	INORG-081	<1	113775-1	<1 || <1	LCS	94%
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	113775-1	23 || [N/T]	[NR]	[NR]
Ionic Balance	%		INORG-040	[NT]	113775-1	7.3 || [N/T]	[NR]	[NR]

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/8/11	[NT]	[NT]	LCS	12/8/11
Date analysed	-			12/8/11	[NT]	[NT]	LCS	12/8/11
Arsenic	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	86%
Lead	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	71%
Selenium	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	87%
Aluminium	mg/L	0.02	METALS-020	<0.02	[NT]	[NT]	LCS	104%
Cadmium	mg/L	0.002	METALS-020	<0.002	[NT]	[NT]	LCS	102%
Chromium	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	106%
Iron	mg/L	0.02	METALS-020	<0.02	[NT]	[NT]	LCS	105%
Manganese	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	109%
Mercury	mg/L	0.0001	METALS-024	<0.0001	[NT]	[NT]	LCS	72%
Zinc	mg/L	0.01	METALS-020	<0.01	[NT]	[NT]	LCS	105%
Copper	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	106%
Silica	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	88%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	[NT]	[NT]	LCS	104%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	INORG-055	<0.005	[NT]	[NT]	LCS	113%
Ammonia as N	mg/L	0.005	INORG-057	<0.005	[NT]	[NT]	LCS	109%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	[NT]	[NT]	LCS	106%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	[NT]	[NT]	LCS	104%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	113775-5	12/8/11 || 12/8/11
Date analysed	-	113775-5	12/8/11 || 12/8/11
pH in water	pH Units	113775-5	6.4 || 6.3 || RPD: 2
Electrical Conductivity water	µS/cm	113775-5	270 || 270 || RPD: 0

QUALITY CONTROL Ionic Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Calcium	mg/L	113775-11	17 || 17 || RPD: 0
Potassium	mg/L	113775-11	5.9 || 6.0 || RPD: 2
Magnesium	mg/L	113775-11	12 || 12 || RPD: 0
Sodium	mg/L	113775-11	78 || 78 || RPD: 0
Chloride in water	mg/L	113775-11	140 || 140 || RPD: 0
Sulphate in water	mg/L	113775-11	33 || 31 || RPD: 6
Hardness as $CaCO_3$	mg/L	113775-11	93 || 93 || RPD: 0

QUALITY CONTROL Dissolved Metals in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	113775-11	12/8/11 || 12/8/11	113775-2	12/8/11
Date analysed	-	113775-11	12/8/11 || 12/8/11	113775-2	12/8/11
Arsenic	mg/L	113775-11	<0.001 || [N/T]	113775-2	71%
Lead	mg/L	113775-11	<0.001 || [N/T]	113775-2	77%
Selenium	mg/L	113775-11	<0.001 || [N/T]	113775-2	79%
Aluminium	mg/L	113775-11	0.41 || 0.42 || RPD: 2	[NR]	[NR]
Cadmium	mg/L	113775-11	<0.002 || <0.002	[NR]	[NR]
Chromium	mg/L	113775-11	<0.005 || <0.005	[NR]	[NR]
Iron	mg/L	113775-11	2.2 || 2.3 || RPD: 4	[NR]	[NR]
Manganese	mg/L	113775-11	0.038 || 0.038 || RPD: 0	[NR]	[NR]
Mercury	mg/L	113775-11	<0.0001 || <0.0001	[NR]	[NR]
Zinc	mg/L	113775-11	0.01 || 0.01 || RPD: 0	[NR]	[NR]
Copper	mg/L	113775-11	<0.005 || <0.005	[NR]	[NR]
Silica	mg/L	113775-11	5.0 || 5.0 || RPD: 0	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and
10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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Laboratories Part of the Envirolab Group

CERTIFICATE OF ANALYSIS 114830

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Nathan Gardner

Sample log in details:

Your Reference:	**J4914C4**
No. of samples:	11 x Waters
Date samples received:	15/9/11
Date completed instructions received:	15/9/11
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	22/09/11
Date of Preliminary Report:	Not issued
Issue Date:	23/09/11

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This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

Miscellaneous Inorganics Our Reference:	UNITS	114830-1	114830-2	114830-3	114830-4	114830-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	15/9/11	15/9/11	15/9/11	15/9/11	15/9/11
Date analysed	-	15/9/11	15/9/11	15/9/11	15/9/11	15/9/11
pH in water	pH Units	5.5	5.2	5.1	5.5	5.7
Electrical Conductivity water	µS/cm	170	180	1,000	780	310
Total Dissolved Solids (grav)	mg/L	140	140	820	540	250

Miscellaneous Inorganics Our Reference:	UNITS	114830-6	114830-7	114830-8	114830-9	114830-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	15/9/11	15/9/11	15/9/11	15/9/11	15/9/11
Date analysed	-	15/9/11	15/9/11	15/9/11	15/9/11	15/9/11
pH in water	pH Units	5.8	4.1	4.9	5.0	5.0
Electrical Conductivity water	µS/cm	200	1,100	230	230	410
Total Dissolved Solids (grav)	mg/L	160	900	180	140	330

Miscellaneous Inorganics Our Reference:	UNITS	114830-11
Your Reference	-------------	S10
Date Sampled	------------	14/09/2011
Type of sample		Water
Date prepared	-	15/9/11
Date analysed	-	15/9/11
pH in water	pH Units	5.2
Electrical Conductivity water	µS/cm	610
Total Dissolved Solids (grav)	mg/L	490

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114830-1 NB03 14/09/2011 Water	114830-2 NB04 14/09/2011 Water	114830-3 NB05 14/09/2011 Water	114830-4 LP1 14/09/2011 Water	114830-5 LP2 14/09/2011 Water
Calcium	mg/L	2.2	0.8	180	15	26
Potassium	mg/L	1.5	1.5	6.8	2.2	9.0
Magnesium	mg/L	3.9	3.9	7.8	31	7.3
Sodium	mg/L	24	23	15	88	14
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	6	18	32	63	64
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	6	18	32	63	64
Chloride in water	mg/L	31	32	29	130	23
Sulphate in water	mg/L	5	<1	480	110	33
Ionic Balance	%	16	5.6	-4.9	-0.10	2.4
Hardness as $CaCO_3$	mg/L	22	18	480	160	95

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	114830-6 LP3 14/09/2011 Water	114830-7 LP4 14/09/2011 Water	114830-8 T1 14/09/2011 Water	114830-9 T2 14/09/2011 Water	114830-10 T3 14/09/2011 Water
Calcium	mg/L	31	11	1.2	3.3	3.0
Potassium	mg/L	1.2	17	4.0	5.6	2.8
Magnesium	mg/L	3.4	30	5.2	6.2	8.1
Sodium	mg/L	10	160	21	24	60
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	72	<1	28	3	10
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	72	<1	28	3	10
Chloride in water	mg/L	11	290	35	35	100
Sulphate in water	mg/L	8	81	7	7	12
Ionic Balance	%	8.9	3.6	-6.2	22	1.0
Hardness as $CaCO_3$	mg/L	91	150	24	34	41

Ionic Balance		
Our Reference:	UNITS	114830-11
Your Reference	-------------	S10
Date Sampled	------------	14/09/2011
Type of sample		Water
Calcium	mg/L	16
Potassium	mg/L	5.1
Magnesium	mg/L	14
Sodium	mg/L	90
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	37
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1
Total Alkalinity as $CaCO_3$	mg/L	37
Chloride in water	mg/L	140
Sulphate in water	mg/L	27
Ionic Balance	%	6.0
Hardness as $CaCO_3$	mg/L	96

Dissolved Metals in Water						
Our Reference:	UNITS	114830-1	114830-2	114830-3	114830-4	114830-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/9/11	20/9/11	20/9/11	20/9/11	20/9/11
Date analysed	-	20/9/11	20/9/11	20/9/11	20/9/11	20/9/11
Aluminium	mg/L	0.46	1.2	0.04	0.20	0.14
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.08	0.27	7.5	0.45	0.83
Manganese	mg/L	<0.005	<0.005	0.025	0.079	0.008
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silica	mg/L	8.5	12	4.8	12	5.5
Arsenic	mg/L	<0.001	<0.001	<0.001	0.002	0.003
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Dissolved Metals in Water						
Our Reference:	UNITS	114830-6	114830-7	114830-8	114830-9	114830-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/9/11	20/9/11	20/9/11	20/9/11	20/9/11
Date analysed	-	20/9/11	20/9/11	20/9/11	20/9/11	20/9/11
Aluminium	mg/L	0.08	3.8	0.53	0.09	2.1
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.32	2.0	16	0.05	2.4
Manganese	mg/L	<0.005	0.021	0.031	<0.005	0.006
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silica	mg/L	7.5	20	5.7	7.2	12
Arsenic	mg/L	<0.001	<0.001	0.004	<0.001	<0.001
Lead	mg/L	<0.001	0.003	<0.001	<0.001	<0.001
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Dissolved Metals in Water		
Our Reference:	UNITS	114830-11
Your Reference	-------------	S10
Date Sampled	------------	14/09/2011
Type of sample		Water
Date prepared	-	20/9/11
Date analysed	-	20/9/11
Aluminium	mg/L	0.41
Cadmium	mg/L	<0.002
Chromium	mg/L	<0.005
Iron	mg/L	3.0
Manganese	mg/L	0.071
Mercury	mg/L	<0.0001
Copper	mg/L	<0.005
Zinc	mg/L	0.04
Silica	mg/L	4.3
Arsenic	mg/L	0.002
Lead	mg/L	<0.001
Selenium	mg/L	<0.001

Nutrients in Water						
Our Reference:	UNITS	114830-1	114830-2	114830-3	114830-4	114830-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	1.5	1.0	0.41	0.54	1.7
Total Kjeldahl Nitrogen	mg/L	1.5	1.0	0.41	0.54	0.40
NOx as N	mg/L	<0.005	<0.005	<0.005	<0.005	1.3
Ammonia as N	mg/L	0.43	0.72	0.32	0.006	0.092
Total Phosphorus (Total P)	mg/L	0.07	<0.01	<0.01	<0.01	0.23
Phosphate as P	mg/L	0.08	<0.005	<0.005	<0.005	0.24
Nitrite as NO_2	mg/L	<0.1	<0.1	<0.1	<0.1	7.0
Nitrate as NO_3	mg/L	<0.1	<0.1	<0.1	<0.1	0.1

Nutrients in Water						
Our Reference:	UNITS	114830-6	114830-7	114830-8	114830-9	114830-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	14/09/2011	14/09/2011	14/09/2011	14/09/2011	14/09/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	4.1	2.6	1.0	3.0	1.7
Total Kjeldahl Nitrogen	mg/L	0.81	2.5	1.0	0.62	1.7
NOx as N	mg/L	3.3	0.048	0.007	2.4	<0.005
Ammonia as N	mg/L	<0.005	0.013	0.49	<0.005	1.0
Total Phosphorus (Total P)	mg/L	<0.01	0.03	0.02	<0.01	<0.01
Phosphate as P	mg/L	<0.005	0.008	<0.005	<0.005	<0.005
Nitrite as NO_2	mg/L	12	1.2	<0.1	11	<0.1
Nitrate as NO_3	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1

Nutrients in Water		
Our Reference:	UNITS	114830-11
Your Reference	-------------	S10
Date Sampled	------------	14/09/2011
Type of sample		Water
Total Nitrogen (Total N)	mg/L	1.6
Total Kjeldahl Nitrogen	mg/L	1.6
NOx as N	mg/L	<0.005
Ammonia as N	mg/L	<0.005
Total Phosphorus (Total P)	mg/L	0.59
Phosphate as P	mg/L	0.50
Nitrite as NO_2	mg/L	0.4
Nitrate as NO_3	mg/L	<0.1

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
METALS-020	Metals in soil and water by ICP-OES.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.
METALS-024	Metals by GF-AAS.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.
INORG-081	Nitrite by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Nitrate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/9/11	114830-1	15/9/11 || 15/9/11	LCS	15/9/11
Date analysed	-			15/9/11	114830-1	15/9/11 || 15/9/11	LCS	15/9/11
pH in water	pH Units		INORG-001	[NT]	114830-1	5.5 || 5.3 || RPD: 4	LCS	92%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	114830-1	170 || 170 || RPD: 0	LCS	77%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	114830-1	140 || 130 || RPD: 7	LCS	109%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	114830-1	2.2 || 2.2 || RPD: 0	LCS	116%
Potassium	mg/L	0.1	METALS-020	<0.1	114830-1	1.5 || 1.5 || RPD: 0	LCS	103%
Magnesium	mg/L	0.1	METALS-020	<0.1	114830-1	3.9 || 3.9 || RPD: 0	LCS	108%
Sodium	mg/L	0.5	METALS-020	<0.5	114830-1	24 || 24 || RPD: 0	LCS	107%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	114830-1	6 || [N/T]	LCS	100%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	114830-1	<1 || [N/T]	LCS	100%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	114830-1	6 || [N/T]	LCS	100%
Chloride in water	mg/L	1	INORG-081	<1	114830-1	31 || 30 || RPD: 3	LCS	100%
Sulphate in water	mg/L	1	INORG-081	<1	114830-1	5 || 5 || RPD: 0	LCS	95%
Ionic Balance	%		INORG-040	[NT]	114830-1	16 || [N/T]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	114830-1	22 || 22 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/9/11	114830-1	20/9/11 || 20/9/11	LCS	20/9/11
Date analysed	-			20/9/11	114830-1	20/9/11 || 20/9/11	LCS	20/9/11
Aluminium	mg/L	0.02	METALS-020	<0.02	114830-1	0.46 || 0.46 || RPD: 0	LCS	107%
Cadmium	mg/L	0.002	METALS-020	<0.002	114830-1	<0.002 || <0.002	LCS	106%
Chromium	mg/L	0.005	METALS-020	<0.005	114830-1	<0.005 || <0.005	LCS	106%
Iron	mg/L	0.02	METALS-020	<0.02	114830-1	0.08 || 0.08 || RPD: 0	LCS	108%
Manganese	mg/L	0.005	METALS-020	<0.005	114830-1	<0.005 || <0.005	LCS	109%
Mercury	mg/L	0.0001	METALS-024	<0.0001	114830-1	<0.0001 || [N/T]	[NR]	[NR]
Copper	mg/L	0.005	METALS-020	<0.005	114830-1	<0.005 || <0.005	LCS	106%
Zinc	mg/L	0.01	METALS-020	<0.01	114830-1	<0.01 || <0.01	LCS	108%
Silica	mg/L	0.1	METALS-020	<0.1	114830-1	8.5 || 8.4 || RPD: 1	LCS	92%
Arsenic	mg/L	0.001	METALS-024	<0.001	114830-1	<0.001 || <0.001	LCS	94%
Lead	mg/L	0.001	METALS-024	<0.001	114830-1	<0.001 || <0.001	LCS	96%
Selenium	mg/L	0.001	METALS-024	<0.001	114830-1	<0.001 || <0.001	LCS	85%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	114830-1	1.5 || [N/T]	LCS	93%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	[NT]	114830-1	1.5 || [N/T]	[NR]	[NR]
NOx as N	mg/L	0.005	INORG-055	<0.005	114830-1	<0.005 || <0.005	LCS	101%
Ammonia as N	mg/L	0.005	INORG-057	<0.005	114830-1	0.43 || 0.43 || RPD: 0	LCS	99%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	114830-1	0.07 || [N/T]	LCS	80%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	114830-1	0.08 || 0.08 || RPD: 0	LCS	97%
Nitrite as NO_2	mg/L	0.1	INORG-081	<0.1	114830-1	<0.1 || <0.1	LCS	105%
Nitrate as NO_3	mg/L	0.1	INORG-081	<0.1	114830-1	<0.1 || <0.1	LCS	104%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	114830-11	15/9/11 || 15/9/11
Date analysed	-	114830-11	15/9/11 || 15/9/11
pH in water	pH Units	114830-11	5.2 || 5.4 || RPD: 4
Electrical Conductivity water	µS/cm	114830-11	610 || 630 || RPD: 3

QUALITY CONTROL Ionic Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	114830-11	16 || 16 || RPD: 0	[NR]	[NR]
Potassium	mg/L	114830-11	5.1 || 5.0 || RPD: 2	114830-3	112%
Magnesium	mg/L	114830-11	14 || 13 || RPD: 7	114830-3	106%
Sodium	mg/L	114830-11	90 || 88 || RPD: 2	114830-3	110%
Chloride in water	mg/L	114830-11	140 || 140 || RPD: 0	[NR]	[NR]
Sulphate in water	mg/L	114830-11	27 || 27 || RPD: 0	[NR]	[NR]
Hardness as $CaCO_3$	mg/L	114830-11	96 || 94 || RPD: 2	[NR]	[NR]

QUALITY CONTROL Dissolved Metals in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	114830-11	20/9/11 || 20/9/11	114830-3	20/9/11
Date analysed	-	114830-11	20/9/11 || 20/9/11	114830-3	20/9/11
Aluminium	mg/L	114830-11	0.41 || 0.40 || RPD: 2	114830-3	102%
Cadmium	mg/L	114830-11	<0.002 || <0.002	114830-3	101%
Chromium	mg/L	114830-11	<0.005 || <0.005	114830-3	102%
Iron	mg/L	114830-11	3.0 || 2.9 || RPD: 3	[NR]	[NR]
Manganese	mg/L	114830-11	0.071 || 0.069 || RPD: 3	114830-3	104%
Copper	mg/L	114830-11	<0.005 || <0.005	114830-3	103%
Zinc	mg/L	114830-11	0.04 || <0.01	114830-3	104%
Silica	mg/L	114830-11	4.3 || 4.1 || RPD: 5	114830-3	94%
Arsenic	mg/L	114830-11	0.002 || 0.002 || RPD: 0	[NR]	[NR]
Lead	mg/L	114830-11	<0.001 || <0.001	[NR]	[NR]
Selenium	mg/L	114830-11	<0.001 || <0.001	[NR]	[NR]

QUALITY CONTROL Nutrients in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
NOx as N	mg/L	114830-11	<0.005 || <0.005
Ammonia as N	mg/L	114830-11	<0.005 || <0.005
Phosphate as P	mg/L	114830-11	0.50 || 0.50 || RPD: 0

Report Comments:

Mercury analysed by Envirolab report 62021
Arsenic, Lead and Selenium analysed by Envirolab Sydney, Report No: 62207

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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CERTIFICATE OF ANALYSIS 115778

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilj

Sample log in details:

Your Reference:	**J4914c5**
No. of samples:	1x Water
Date samples received:	17/10/11
Date completed instructions received:	17/10/11
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	24/10/11
Date of Preliminary Report:	Not issued
Issue Date:	21/10/11

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorganics		
Our Reference:	UNITS	115778-1
Your Reference	-------------	J4914 S10
Date Sampled	------------	17/10/2011
Type of sample		Water
Date prepared	-	18/10/11
Date analysed	-	18/10/11
pH in water	pH Units	6.9
Electrical Conductivity water	µS/cm	560
Total Dissolved Solids (grav)	mg/L	430

Dissolved Metals in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	115778-1 J4914 S10 17/10/2011 Water
Date prepared	-	18/10/11
Date analysed	-	18/10/11
Silica	mg/L	7.6
Aluminium	mg/L	0.45
Arsenic	mg/L	0.002
Lead	mg/L	0.002
Selenium	mg/L	0.003
Cadmium	mg/L	<0.002
Chromium	mg/L	<0.005
Iron	mg/L	3.3
Manganese	mg/L	0.10
Mercury	mg/L	<0.0001
Zinc	mg/L	0.01
Copper	mg/L	<0.005

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	115778-1 J4914 S10 17/10/2011 Water
Total Nitrogen (Total N)	mg/L	0.07
Total Kjeldahl Nitrogen	mg/L	0.073
NOx as N	mg/L	<0.005
Nitrate as N	mg/L	<0.005
Nitrite as N	mg/L	<0.005
Ammonia as N	mg/L	0.011
Total Phosphorus (Total P)	mg/L	0.28
Phosphate as P	mg/L	0.06

Ionic Balance		
Our Reference:	UNITS	115778-1
Your Reference	-------------	J4914 S10
Date Sampled	------------	17/10/2011
Type of sample		Water
Calcium	mg/L	15
Potassium	mg/L	5.4
Magnesium	mg/L	15
Sodium	mg/L	100
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	40
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1
Total Alkalinity as $CaCO_3$	mg/L	40
Chloride in water	mg/L	150
Sulphate in water	mg/L	25
Ionic Balance	%	7.8
Hardness as $CaCO_3$	mg/L	97

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
METALS-020	Metals in soil and water by ICP-OES.
METALS-024	Metals by GF-AAS.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrate by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrite by colourimetric analysis in accordance with APHA 21st ED 4500-NO2 B.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			18/10/11	115778-1	18/10/11 || 18/10/11	LCS	18/10/11
Date analysed	-			18/10/11	115778-1	18/10/11 || 18/10/11	LCS	18/10/11
pH in water	pH Units		INORG-001	[NT]	115778-1	6.9 || [N/T]	LCS	102%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	115778-1	560 || [N/T]	LCS	113%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	115778-1	430 || 450 || RPD: 5	LCS	100%

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			18/10/11	[NT]	[NT]	LCS	18/10/11
Date analysed	-			18/10/11	[NT]	[NT]	LCS	18/10/11
Silica	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	[NR]	[NR]
Aluminium	mg/L	0.02	METALS-020	<0.02	[NT]	[NT]	LCS	107%
Arsenic	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	78%
Lead	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	107%
Selenium	mg/L	0.001	METALS-024	<0.001	[NT]	[NT]	LCS	126%
Cadmium	mg/L	0.002	METALS-020	<0.002	[NT]	[NT]	LCS	104%
Chromium	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	104%
Iron	mg/L	0.02	METALS-020	<0.02	[NT]	[NT]	LCS	105%
Manganese	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	107%
Mercury	mg/L	0.0001	METALS-024	<0.0001	[NT]	[NT]	LCS	82%
Zinc	mg/L	0.01	METALS-020	<0.01	[NT]	[NT]	LCS	104%
Copper	mg/L	0.005	METALS-020	<0.005	[NT]	[NT]	LCS	104%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	[NT]	[NT]	LCS	99%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	INORG-055	<0.005	[NT]	[NT]	LCS	104%
Ammonia as N	mg/L	0.005	INORG-057	<0.005	[NT]	[NT]	LCS	90%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	[NT]	[NT]	LCS	95%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	[NT]	[NT]	LCS	101%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	109%
Potassium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	102%
Magnesium	mg/L	0.1	METALS-020	<0.1	[NT]	[NT]	LCS	102%
Sodium	mg/L	0.5	METALS-020	<0.5	[NT]	[NT]	LCS	109%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	100%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	100%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	[NT]	[NT]	LCS	100%
Chloride in water	mg/L	1	INORG-081	<1	[NT]	[NT]	LCS	99%
Sulphate in water	mg/L	1	INORG-081	<1	[NT]	[NT]	LCS	98%
Ionic Balance	%		INORG-040	[NT]	[NT]	[NT]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	[NT]	[NT]	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

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RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
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Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

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10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

Part of the Envirolab Group

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CERTIFICATE OF ANALYSIS 116623

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilj

Sample log in details:

Your Reference:	**J4914C6**
No. of samples:	10x Waters
Date samples received:	16/11/11
Date completed instructions received:	16/11/11
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	23/11/11
Date of Preliminary Report:	Not issued
Issue Date:	24/11/11

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Operations Supervisor

ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorganics						
Our Reference:	UNITS	116623-1	116623-2	116623-3	116623-4	116623-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/11/11	16/11/11	16/11/11	16/11/11	16/11/11
Date analysed	-	16/11/11	16/11/11	16/11/11	16/11/11	16/11/11
pH in water	pH Units	5.7	5.7	6.2	6.1	6.2
Electrical Conductivity water	µS/cm	290	180	970	690	270
Total Dissolved Solids (grav)	mg/L	170	110	720	460	160

Miscellaneous Inorganics						
Our Reference:	UNITS	116623-6	116623-7	116623-8	116623-9	116623-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/11/11	16/11/11	16/11/11	16/11/11	16/11/11
Date analysed	-	16/11/11	16/11/11	16/11/11	16/11/11	16/11/11
pH in water	pH Units	6.4	4.3	6.0	4.9	5.1
Electrical Conductivity water	µS/cm	170	540	210	210	470
Total Dissolved Solids (grav)	mg/L	130	420	170	110	360

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	116623-1 NB03 15/11/2011 Water	116623-2 NB04 15/11/2011 Water	116623-3 NB05 15/11/2011 Water	116623-4 LP1 15/11/2011 Water	116623-5 LP2 15/11/2011 Water
Calcium	mg/L	2.2	0.8	180	12	13
Potassium	mg/L	1.8	1.7	7.5	2.3	10
Magnesium	mg/L	3.9	4.0	8.0	28	6.2
Sodium	mg/L	19	26	13	77	12
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	12	24	34	68	40
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	12	24	34	68	40
Chloride in water	mg/L	33	37	38	130	27
Sulphate in water	mg/L	6	<1	430	89	48
Ionic Balance	%	-0.21	1.3	-1.4	-4.2	-13
Hardness as $CaCO_3$	mg/L	21	19	480	150	59

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	116623-6 LP3 15/11/2011 Water	116623-7 LP4 15/11/2011 Water	116623-8 T1 15/11/2011 Water	116623-9 T2 15/11/2011 Water	116623-10 T3 15/11/2011 Water
Calcium	mg/L	26	4.7	1.5	3.6	4.0
Potassium	mg/L	1.1	9.1	4.6	4.8	3.5
Magnesium	mg/L	2.7	12	6.9	5.4	10
Sodium	mg/L	8.4	65	21	17	64
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	68	<1	38	4	14
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as $CaCO_3$	mg/L	68	<1	38	4	14
Chloride in water	mg/L	14	140	42	48	140
Sulphate in water	mg/L	6	14	<1	10	<1
Ionic Balance	%	0.91	-0.030	-7.7	-4.8	-3.4
Hardness as $CaCO_3$	mg/L	76	59	32	31	53

Dissolved Metals in Water						
Our Reference:	UNITS	116623-1	116623-2	116623-3	116623-4	116623-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/11/11	17/11/11	17/11/11	17/11/11	17/11/11
Date analysed	-	17/11/11	17/11/11	17/11/11	17/11/11	17/11/11
Silica	mg/L	9.8	13	5.3	13	5.2
Aluminium	mg/L	0.47	1.3	0.04	0.29	0.20
Arsenic	mg/L	<0.001	<0.001	0.001	0.002	0.002
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.09	0.25	8.2	3.2	3.2
Lead	mg/L	0.001	<0.001	0.001	0.001	<0.001
Manganese	mg/L	<0.005	<0.005	0.026	0.15	0.013
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium	mg/L	0.002	0.002	0.002	0.003	0.002
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Dissolved Metals in Water						
Our Reference:	UNITS	116623-6	116623-7	116623-8	116623-9	116623-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/11/11	17/11/11	17/11/11	17/11/11	17/11/11
Date analysed	-	17/11/11	17/11/11	17/11/11	17/11/11	17/11/11
Silica	mg/L	8.3	16	6.6	7.3	15
Aluminium	mg/L	0.09	2.8	0.55	0.09	2.0
Arsenic	mg/L	<0.001	<0.001	0.004	<0.001	<0.001
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.87	2.0	17	0.07	3.0
Lead	mg/L	<0.001	0.002	<0.001	<0.001	0.002
Manganese	mg/L	<0.005	0.01	0.071	<0.005	0.008
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium	mg/L	0.002	0.003	0.002	0.002	0.003
Zinc	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Nutrients in Water	UNITS	116623-1	116623-2	116623-3	116623-4	116623-5
Our Reference:		116623-1	116623-2	116623-3	116623-4	116623-5
Your Reference	-------------	NB03	NB04	NB05	LP1	LP2
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	1.6	1.5	0.47	1.5	0.96
Total Kjeldahl Nitrogen	mg/L	1.3	1.5	0.47	1.5	0.78
NOx as N	mg/L	0.31	<0.005	<0.005	0.025	0.17
Nitrate as N	mg/L	0.31	<0.005	<0.005	0.026	0.17
Nitrite as N	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia as N	mg/L	0.48	0.72	0.38	0.090	0.24
Total Phosphorus (Total P)	mg/L	0.05	0.08	<0.01	<0.01	0.099
Phosphate as P	mg/L	<0.005	0.05	<0.005	0.008	0.11

Nutrients in Water	UNITS	116623-6	116623-7	116623-8	116623-9	116623-10
Our Reference:		116623-6	116623-7	116623-8	116623-9	116623-10
Your Reference	-------------	LP3	LP4	T1	T2	T3
Date Sampled	------------	15/11/2011	15/11/2011	15/11/2011	15/11/2011	15/11/2011
Type of sample		Water	Water	Water	Water	Water
Total Nitrogen (Total N)	mg/L	0.45	1.9	1.6	4.6	2.9
Total Kjeldahl Nitrogen	mg/L	0.36	1.9	1.6	0.36	2.9
NOx as N	mg/L	0.086	<0.005	<0.005	4.2	<0.005
Nitrate as N	mg/L	0.088	<0.005	<0.005	4.2	<0.005
Nitrite as N	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia as N	mg/L	0.060	0.27	0.54	0.010	1.3
Total Phosphorus (Total P)	mg/L	<0.01	0.02	0.18	<0.01	0.04
Phosphate as P	mg/L	<0.005	0.02	<0.005	0.008	0.009

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
INORG-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 21st ED 2510 and Rayment & Higginson.
INORG-018	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540 C.
METALS-020	Metals in soil and water by ICP-OES.
INORG-006	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320 B.
INORG-081	Chloride by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-081	Sulphate by Ion Exchange Chromatography in accordance with APHA 21st ED 4110B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA 21st ED 2340B.
METALS-024	Metals by GF-AAS.
INORG-055	Total Nitrogen by colourimetric analysis in accordance with APHA 4500-P J, 4500-NO3 F.
INORG-062	TKN by calculation fromTotal Nitrogen and NOx using APHA methodology.
INORG-055	NOx by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrate by colourimetric analysis and calculation in accordance with APHA 21st ED 4500-NO3 F.
INORG-055	Nitrite by colourimetric analysis in accordance with APHA 21st ED 4500-NO2 B.
INORG-057	Ammonia by colourimetric analysis in accordance with APHA 21st ED 4500-NH3 F.
INORG-060	Total Phosphorus by colourimetric analysis in accordance with APHA 21st ED 4500-P J.
INORG-060	Phosphate by colourimetric analysis in accordance with APHA 21st ED 4500-P E.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/11/11	116623-2	16/11/11 || 16/11/11	LCS	16/11/11
Date analysed	-			16/11/11	116623-2	16/11/11 || 16/11/11	LCS	16/11/11
pH in water	pH Units		INORG-001	[NT]	116623-2	5.7 || 5.7 || RPD: 0	LCS	104%
Electrical Conductivity water	µS/cm	1	INORG-002	<1	116623-2	180 || 170 || RPD: 6	LCS	100%
Total Dissolved Solids (grav)	mg/L	1	INORG-018	<1	116623-2	110 || [N/T]	LCS	83%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	METALS-020	<0.1	116623-1	2.2 || [N/T]	LCS	112%
Potassium	mg/L	0.1	METALS-020	<0.1	116623-1	1.8 || [N/T]	LCS	98%
Magnesium	mg/L	0.1	METALS-020	<0.1	116623-1	3.9 || [N/T]	LCS	101%
Sodium	mg/L	0.5	METALS-020	<0.5	116623-1	19 || [N/T]	LCS	106%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	INORG-006	<1	116623-1	12 || 12 || RPD: 0	LCS	107%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	INORG-006	<1	116623-1	<1 || <1	LCS	107%
Total Alkalinity as $CaCO_3$	mg/L	1	INORG-006	<1	116623-1	12 || 12 || RPD: 0	LCS	107%
Chloride in water	mg/L	1	INORG-081	<1	116623-1	33 || 34 || RPD: 3	LCS	105%
Sulphate in water	mg/L	1	INORG-081	<1	116623-1	6 || 5 || RPD: 18	LCS	98%
Ionic Balance	%		INORG-040	[NT]	116623-1	-0.21 || [N/T]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L		METALS-008	[NT]	116623-1	21 || [N/T]	[NR]	[NR]

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			17/11/11	116623-1	17/11/11 || 17/11/11	LCS	17/11/11
Date analysed	-			17/11/11	116623-1	17/11/11 || 17/11/11	LCS	17/11/11
Silica	mg/L	0.1	METALS-020	<0.1	116623-1	9.8 || [N/T]	LCS	100%
Aluminium	mg/L	0.02	METALS-020	<0.02	116623-1	0.47 || [N/T]	LCS	106%
Arsenic	mg/L	0.001	METALS-024	<0.001	116623-1	<0.001 || [N/T]	LCS	76%
Cadmium	mg/L	0.002	METALS-020	<0.002	116623-1	<0.002 || [N/T]	LCS	104%
Chromium	mg/L	0.005	METALS-020	<0.005	116623-1	<0.005 || [N/T]	LCS	106%
Iron	mg/L	0.02	METALS-020	<0.02	116623-1	0.09 || [N/T]	LCS	106%
Lead	mg/L	0.001	METALS-024	<0.001	116623-1	0.001 || [N/T]	LCS	74%
Manganese	mg/L	0.005	METALS-020	<0.005	116623-1	<0.005 || [N/T]	LCS	107%
Mercury	mg/L	0.0001	METALS-024	<0.0001	116623-1	<0.0001 || <0.0001	LCS	100%
Selenium	mg/L	0.001	METALS-024	<0.001	116623-1	0.002 || [N/T]	LCS	119%
Zinc	mg/L	0.01	METALS-020	<0.01	116623-1	<0.01 || [N/T]	LCS	108%
Copper	mg/L	0.005	METALS-020	<0.005	116623-1	<0.005 || [N/T]	LCS	106%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	INORG-055	<0.05	[NT]	[NT]	LCS	78%
Total Kjeldahl Nitrogen	mg/L	0.005	INORG-062	0.005	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	INORG-055	<0.005	[NT]	[NT]	LCS	105%
Ammonia as N	mg/L	0.005	INORG-057	<0.005	[NT]	[NT]	LCS	92%
Total Phosphorus (Total P)	mg/L	0.01	INORG-060	<0.01	[NT]	[NT]	LCS	108%
Phosphate as P	mg/L	0.005	INORG-060	<0.005	[NT]	[NT]	LCS	104%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	116623-1	16/11/11 || 16/11/11
Date analysed	-	116623-1	16/11/11 || 16/11/11
Total Dissolved Solids (grav)	mg/L	116623-1	170 || 160 || RPD: 6

QUALITY CONTROL Ionic Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	116623-1	12 || 12 || RPD: 0
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	116623-1	<1 || <1
Total Alkalinity as $CaCO_3$	mg/L	116623-1	12 || 12 || RPD: 0
Chloride in water	mg/L	116623-1	33 || 34 || RPD: 3
Sulphate in water	mg/L	116623-1	6 || 5 || RPD: 18

QUALITY CONTROL Dissolved Metals in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	116623-2	17/11/11
Date analysed	-	[NT]	[NT]	116623-2	17/11/11
Silica	mg/L	[NT]	[NT]	[NR]	[NR]
Aluminium	mg/L	[NT]	[NT]	[NR]	[NR]
Arsenic	mg/L	[NT]	[NT]	[NR]	[NR]
Cadmium	mg/L	[NT]	[NT]	[NR]	[NR]
Chromium	mg/L	[NT]	[NT]	[NR]	[NR]
Iron	mg/L	[NT]	[NT]	[NR]	[NR]
Lead	mg/L	[NT]	[NT]	[NR]	[NR]
Manganese	mg/L	[NT]	[NT]	[NR]	[NR]
Mercury	mg/L	[NT]	[NT]	116623-2	96%
Selenium	mg/L	[NT]	[NT]	[NR]	[NR]
Zinc	mg/L	[NT]	[NT]	[NR]	[NR]
Copper	mg/L	[NT]	[NT]	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2011.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

APPENDIX C

Hydstra – Hyday Outputs

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site 009977 BOM Mandurah Raingauge Year 2011
Variable 10.00 Rainfall in Millimetres Table Type Rain
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1						8.4	2.0	6.6		1.0			1
2							8.4	3.8	3.6				2
3								4.8	1.6		3.6		3
4											3.2		4
5	16.0				0.6						14.0		5
6	0.4			3.6				0.4			0.6	29.0	6
7				6.4				5.6		2.8	12.0	2.8	7
8							0.2	0.2		0.4	0.6		8
9													9
10				0.6			2.0			2.8	0.2		10
11							4.6						11
12										1.8		69.0	12
13						8.8	0.2	16.0					13
14						6.2	9.2	3.0	0.4		0.2		14
15					0.2	12.0	4.4	13.0	12.0			2.8	15
16					0.6	0.2		1.4	5.8		0.4		16
17					6.8	7.2		0.2	12.0	0.8	6.4		17
18						3.6			2.4	2.0	0.2		18
19					10.0	3.4	0.4						19
20					10.0	0.2	23.0		3.4				20
21							1.8	25.0	11.0				21
22	3.2					3.2	14.0			4.8			22
23	11.0			1.2		8.4		5.4					23
24	2.2			1.4		32.0			0.4	11.0			24
25						2.4	11.0		1.8	0.2			25
26				7.4					1.6	0.2			26
27				2.8		35.0	9.6		4.8				27
28	2.4			6.4		19.0	7.6				2.8		28
29	1.0				52.0	4.4	5.0						29
30	2.0				0.8	9.0	13.0						30
31					2.4		0.8					[ ]	31
Mean	1.2	0.0	0.0	1.0	2.7	5.4	3.8	2.8	2.0	0.9	1.5	3.5	
Maximum	16.0	0.0	0.0	7.4	52.0	35.0	23.0	25.0	12.0	11.0	14.0	69.0	
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	38.2	0.0	0.0	29.8	83.4	163.4	117.2	85.4	60.8	27.8	44.2	103.6	
Wet Days	8	0	0	8	9	17	18	13	13	11	12	4	
Missing Days	0	0	0	0	0	0	0	0	0	0	0	1	

Summaries

Annual Mean	2.1
Annual Total	753.8
Wet Days	113
Missing Days	1

	Maximum	Minimum
Daily	69.0	0.0

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site J49140S10 Lot 221 Lakes Rd Nambeelup S10 Year 2011
Variable 100.00 Stream Water Level in Metres Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1.002	1.003	0.995	0.997	1.004	1.001	1.528	1.706	1.235	1.262	1.124	1.140	1
2	1.000	1.000	0.995	0.998	1.003	1.002	1.433	1.636	1.387	1.235	1.120	1.137	2
3	1.000	0.997	0.996	0.997	1.003	1.003	1.415	1.644	1.547	1.331	1.122	1.136	3
4	0.998	0.997	0.995	0.998	1.004	1.003	1.377	1.509	1.421	1.300	1.125	1.133	4
5	1.006	1.003	0.996	0.998	1.004	1.004	1.307	1.421	1.352	1.256	1.131	1.134	5
6	1.008	1.003	0.999	0.998	1.004	1.004	1.265	1.371	1.306	1.231	1.133	1.161	6
7	1.007	1.000	0.999	1.003	1.003	1.100	1.240	1.329	1.272	1.216	1.133	1.166	7
8	1.005	0.999	0.998	1.004	1.002	1.206	1.228	1.311	1.248	1.203	1.137	1.165	8
9	1.001	0.997	0.997	1.003	1.002	1.202	1.214	1.423	1.227	1.199	1.136	1.166	9
10	0.999	0.997	0.997	1.001	1.001	1.202	1.204	1.374	1.214	1.199	1.133	1.165	10
11	1.001	0.999	0.999	1.002	1.002	1.200	1.207	1.330	1.206	1.188	1.132	1.162	11
12	0.999	1.000	1.001	1.002	1.004	1.196	1.237	1.301	1.198	1.183	1.132	1.175	12
13	1.001	0.999	1.000	1.002	1.003	1.189	1.225	1.283	1.187	1.186	1.131	1.187	13
14	1.004	0.996	0.996	1.002	1.002	1.180	1.201	1.449	1.180	1.187	1.130	1.185	14
15	1.004	0.994	0.994	1.001	1.001	1.175	1.208	1.529	1.179	1.179	1.132	1.181	15
16	1.001	0.993	0.996	0.999	1.001	1.173	1.356	1.628	1.188	1.163	1.132	1.179	16
17	0.999	0.996	0.996	0.999	1.002	1.165	1.279	1.535	1.216	1.143	1.128	1.177	17
18	1.000	0.995	0.996	1.000	1.003	1.157	1.228	1.415	1.323	1.125	1.127	1.178	18
19	1.000	0.995	0.998	1.002	1.004	1.152	1.193	1.354	1.633	1.128	1.128	1.181	19
20	1.002	1.000	0.999	1.003	1.003	1.147	1.187	1.310	1.467	1.127	1.128	[ ]	20
21	1.001	0.995	0.998	1.001	1.005	1.144	1.371	1.272	1.376	1.125	1.127	[ ]	21
22	1.000	0.994	0.997	1.000	1.005	1.176	1.359	1.562	1.466	1.127	1.126	[ ]	22
23	1.008	0.995	0.996	0.999	1.004	1.176	1.381	1.779	1.410	1.127	1.123	[ ]	23
24	1.012	0.993	0.995	1.001	1.004	1.192	1.322	1.529	1.345	1.127	1.124	[ ]	24
25	1.007	0.991	0.994	1.002	1.003	1.362	1.264	1.444	1.297	1.131	1.128	[ ]	25
26	1.003	0.992	0.995	1.002	1.003	1.361	1.308	1.377	1.284	1.133	1.134	[ ]	26
27	0.999	0.993	0.997	1.004	1.003	1.271	1.310	1.341	1.305	1.133	1.138	[ ]	27
28	0.995	0.992	0.997	1.005	1.004	1.436	1.452	1.312	1.372	1.133	1.141	[ ]	28
29	0.998		0.996	1.005	1.003	1.776	1.641	1.283	1.345	1.132	1.143	[ ]	29
30	0.999		0.996	1.004	1.002	1.496	1.619	1.258	1.297	1.130	1.144	[ ]	30
31	1.005		0.996		1.002		1.937	1.243		1.126		[ ]	31
Mean	1.002	0.997	0.997	1.001	1.003	1.195	1.339	1.428	1.316	1.176	1.131	1.164	
Median	1.001	0.997	0.996	1.001	1.003	1.176	1.307	1.377	1.301	1.163	1.131	1.166	
Max.Daily Mean	1.012	1.003	1.001	1.005	1.005	1.776	1.937	1.779	1.633	1.331	1.144	1.187	
Min.Daily Mean	0.995	0.991	0.994	0.997	1.001	1.001	1.187	1.243	1.179	1.125	1.120	1.133	
Inst.Max	1.018	1.013	1.009	1.008	1.007	1.972	2.008	1.949	1.703	1.429	1.154	1.192	
Inst.Min	0.983	0.979	0.982	0.985	0.997	1.000	1.169	1.229	1.168	1.115	1.108	1.118	
Missing Days	0	0	0	0	0	0	0	0	0	0	0	12	

Summaries

Annual Mean	1.146
Ann. Median	1.128
Missing Days	12

	Maximum	Minimum
Daily Mean	1.937	0.991
Instant	2.008	0.979

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site J41530S10 Nambeelup Lot 221 Site J41530S10.Z
VarFrom 100.00 Stream Water Level in Metres Year 2011
VarTo 140.00 Stream Discharge in Cubic metres/second Table Type Rate
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	0.000	0.000	2.074	4.531	0.299	0.389	0.044	0.073	1
2	0.000	0.000	0.000	0.000	0.000	0.000	1.284	3.328	1.108	0.300	0.037	0.067	2
3	0.000	0.000	0.000	0.000	0.000	0.000	1.150	3.426	2.287	0.719	0.040	0.065	3
4	0.000	0.000	0.000	0.000	0.000	0.000	0.901	1.904	1.201	0.530	0.046	0.059	4
5	0.000	0.000	0.000	0.000	0.000	0.000	0.549	1.192	0.758	0.369	0.056	0.063	5
6	0.000	0.000	0.000	0.000	0.000	0.000	0.398	0.854	0.546	0.286	0.060	0.111	6
7	0.000	0.000	0.000	0.000	0.000	0.091	0.316	0.647	0.422	0.243	0.059	0.119	7
8	0.000	0.000	0.000	0.000	0.000	0.214	0.277	0.563	0.342	0.205	0.066	0.117	8
9	0.000	0.000	0.000	0.000	0.000	0.203	0.237	1.223	0.275	0.193	0.066	0.119	9
10	0.000	0.000	0.000	0.000	0.000	0.203	0.208	0.873	0.237	0.193	0.060	0.117	10
11	0.000	0.000	0.000	0.000	0.000	0.197	0.216	0.652	0.215	0.164	0.057	0.112	11
12	0.000	0.000	0.000	0.000	0.000	0.184	0.305	0.524	0.190	0.151	0.057	0.136	12
13	0.000	0.000	0.000	0.000	0.000	0.167	0.268	0.463	0.161	0.158	0.056	0.159	13
14	0.000	0.000	0.000	0.000	0.000	0.145	0.199	1.533	0.145	0.161	0.054	0.155	14
15	0.000	0.000	0.000	0.000	0.000	0.136	0.220	2.101	0.143	0.144	0.057	0.146	15
16	0.000	0.000	0.000	0.000	0.000	0.131	0.788	3.242	0.162	0.114	0.057	0.142	16
17	0.000	0.000	0.000	0.000	0.000	0.118	0.450	2.166	0.243	0.079	0.051	0.139	17
18	0.000	0.000	0.000	0.000	0.000	0.103	0.279	1.155	0.720	0.045	0.048	0.141	18
19	0.000	0.000	0.000	0.000	0.000	0.093	0.178	0.768	3.303	0.050	0.051	0.146	19
20	0.000	0.000	0.000	0.000	0.000	0.085	0.165	0.565	1.563	0.049	0.050	[ ]	20
21	0.000	0.000	0.000	0.000	0.000	0.079	0.908	0.425	0.884	0.046	0.049	[ ]	21
22	0.000	0.000	0.000	0.000	0.000	0.138	0.793	3.305	1.545	0.048	0.047	[ ]	22
23	0.000	0.000	0.000	0.000	0.000	0.138	0.915	5.778	1.119	0.048	0.043	[ ]	23
24	0.000	0.000	0.000	0.000	0.000	0.175	0.618	2.104	0.722	0.049	0.044	[ ]	24
25	0.000	0.000	0.000	0.000	0.000	1.042	0.397	1.370	0.513	0.055	0.051	[ ]	25
26	0.000	0.000	0.000	0.000	0.000	0.839	0.562	0.892	0.463	0.059	0.062	[ ]	26
27	0.000	0.000	0.000	0.000	0.000	0.419	0.563	0.702	0.543	0.059	0.069	[ ]	27
28	0.000	0.000	0.000	0.000	0.000	1.866	1.539	0.568	0.868	0.059	0.073	[ ]	28
29	0.000		0.000	0.000	0.000	5.741	3.386	0.459	0.726	0.057	0.078	[ ]	29
30	0.000		0.000	0.000	0.000	1.797	3.203	0.377	0.512	0.054	0.079	[ ]	30
31	0.000		0.000		0.000		8.627	0.325		0.048		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.477	1.031	1.549	0.741	0.165	0.056	0.115	
Median	0.000	0.000	0.000	0.000	0.000	0.138	0.549	0.892	0.528	0.114	0.056	0.119	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	5.741	8.627	5.778	3.303	0.719	0.079	0.159	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.165	0.325	0.143	0.045	0.037	0.059	
Inst.Max	0.000	0.000	0.000	0.000	0.000	9.262	9.913	8.858	4.390	1.255	0.099	0.174	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.124	0.280	0.123	0.028	0.017	0.033	
Missing Days	0	0	0	0	0	0	0	0	0	0	0	12	

Summaries

Annual Mean	0.355
Ann. Median	0.051
Missing Days	12

	Maximum	Minimum
Daily Mean	8.627	0.000
Instant	9.913	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 31/05/2013

Site J4914OS11 Lot 221 Lakes Rd Nambeelup S11 Year 2011
Variable 100.00 Stream Water Level in Metres Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1.003	1.015	0.984	0.984	1.018	1.006	0.998	0.997	1.033	1.021	0.985	0.986	1
2	1.004	1.012	0.984	0.984	1.014	1.002	1.000	1.027	1.147	1.018	0.985	0.986	2
3	1.006	1.005	0.984	0.984	1.009	0.998	1.001	1.117	1.154	1.009	1.001	0.987	3
4	1.010	1.000	0.984	0.984	1.004	0.996	0.997	1.015	1.147	1.004	1.012	0.988	4
5	1.021	0.999	0.985	0.984	1.007	0.992	0.995	1.001	1.072	1.003	1.031	0.987	5
6	1.020	0.996	0.984	0.985	1.018	0.987	0.992	0.997	1.034	1.002	1.008	1.032	6
7	1.013	0.993	0.984	1.002	1.001	0.987	0.993	0.995	1.027	1.002	0.992	0.995	7
8	1.011	0.994	0.984	1.000	0.993	0.987	0.994	0.993	1.020	1.002	0.998	0.992	8
9	1.007	0.996	0.984	0.988	0.996	0.987	0.994	0.991	1.013	0.997	1.009	0.991	9
10	1.002	0.994	0.984	0.986	0.989	0.986	0.994	0.991	1.011	0.996	0.998	0.991	10
11	1.004	0.992	0.985	1.003	0.985	0.985	0.999	0.990	1.009	0.996	0.996	0.989	11
12	1.004	0.991	0.984	0.996	0.984	0.984	0.995	0.992	0.999	0.992	0.993	1.014	12
13	1.006	0.990	0.983	0.995	0.984	0.984	0.995	0.997	0.995	0.993	0.987	1.017	13
14	1.010	0.990	0.983	0.992	0.984	1.002	0.994	0.996	0.994	0.994	0.989	0.991	14
15	1.010	0.990	0.983	0.990	0.984	1.011	1.000	1.081	1.007	0.992	0.996	0.991	15
16	1.006	0.988	0.983	0.986	0.984	1.003	0.996	1.157	1.015	0.989	1.002	0.991	16
17	1.008	0.988	0.984	0.988	0.995	1.002	0.993	1.152	1.008	[ ]	1.025	0.997	17
18	1.010	0.988	0.985	0.988	1.005	1.007	0.993	1.092	1.105	1.008	1.013	0.996	18
19	1.011	0.988	0.985	0.987	0.991	1.005	0.992	1.046	1.127	0.997	0.997	0.995	19
20	1.011	0.986	0.984	0.988	1.007	1.003	0.997	1.031	1.052	0.999	0.990	[ ]	20
21	1.009	0.986	0.984	0.988	0.999	1.002	0.994	1.031	1.096	1.000	0.989	[ ]	21
22	1.013	0.985	0.985	0.987	0.992	0.999	0.996	1.169	1.148	1.005	0.989	[ ]	22
23	1.033	0.985	0.987	0.995	0.987	1.009	0.994	1.160	1.074	1.002	0.989	[ ]	23
24	1.025	0.985	0.985	1.020	0.986	1.008	0.992	1.160	1.045	0.984	0.990	[ ]	24
25	1.018	0.985	0.985	1.022	0.985	1.002	0.995	1.153	1.038	1.010	0.998	[ ]	25
26	1.019	0.986	0.984	1.013	0.984	0.998	0.996	1.124	1.037	0.995	0.991	[ ]	26
27	1.010	0.985	0.985	1.027	0.984	0.997	0.994	1.076	1.042	0.994	0.987	[ ]	27
28	1.005	0.984	0.985	1.019	0.984	1.004	0.995	1.047	1.052	0.988	0.992	[ ]	28
29	1.020		0.985	1.024	0.987	0.996	0.994	1.041	1.037	0.984	0.998	[ ]	29
30	1.016		0.985	1.017	1.008	0.998	0.997	1.034	1.024	0.984	0.987	[ ]	30
31	1.029		0.985		1.001		0.995	1.029		0.984		[ ]	31
Mean	1.012	0.992	0.984	0.997	0.995	0.998	0.995	1.054	1.052	0.998	0.997	0.996	
Median	1.010	0.990	0.984	0.989	0.992	0.999	0.995	1.031	1.037	0.997	0.994	0.991	
Max.Daily Mean	1.033	1.015	0.987	1.027	1.018	1.011	1.001	1.169	1.154	1.021	1.031	1.032	
Min.Daily Mean	1.002	0.984	0.983	0.984	0.984	0.984	0.992	0.990	0.994	0.984	0.985	0.986	
Inst.Max	1.075	1.021	0.991	1.052	1.038	1.020	1.009	1.195	1.167	1.081	1.103	1.140	
Inst.Min	0.992	0.983	0.983	0.984	0.982	0.983	0.985	0.988	0.989	0.982	0.982	0.986	
Missing Days	0	0	0	0	0	0	0	0	0	1	0	12	

Summaries

Annual Mean	1.006
Ann. Median	0.996
Missing Days	13

	Maximum	Minimum
Daily Mean	1.169	0.983
Instant	1.195	0.982

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site J49140S12 Lot 221 Lakes Rd Nambeelup S12 Year 2011
Variable 100.00 Stream Water Level in Metres Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.977	0.981	0.977	0.976	0.986	1.006	0.985	1.021	0.987	0.981	0.981	0.980	1
2	0.977	0.983	0.976	0.976	0.986	1.004	0.983	1.024	0.992	0.982	0.980	0.980	2
3	0.977	0.978	0.976	0.976	0.987	0.989	0.982	1.030	0.992	0.981	0.982	0.980	3
4	0.977	0.977	0.977	0.976	0.986	0.985	0.980	1.024	0.993	0.980	0.985	0.979	4
5	0.980	0.977	0.977	0.976	0.986	0.984	0.980	1.017	0.989	0.981	0.989	0.979	5
6	0.984	0.977	0.977	0.976	0.987	0.984	0.980	1.017	0.983	0.981	0.988	0.987	6
7	0.984	0.977	0.977	0.989	0.985	0.983	0.980	1.028	0.981	0.982	0.989	0.984	7
8	0.985	0.977	0.977	0.986	0.983	0.983	0.979	1.039	0.980	0.983	0.987	0.980	8
9	0.982	0.977	0.976	0.979	0.981	0.982	0.979	1.041	0.981	0.981	0.986	0.980	9
10	0.977	0.977	0.977	0.976	0.980	0.982	0.979	1.043	0.980	0.981	0.985	0.980	10
11	0.977	0.977	0.977	0.980	0.985	0.982	0.982	1.018	0.981	0.982	0.984	0.979	11
12	0.977	0.977	0.977	0.981	0.982	0.981	0.981	0.991	0.981	0.981	0.983	0.983	12
13	0.977	0.977	0.976	0.986	0.981	0.979	0.981	0.994	0.981	0.981	0.983	0.986	13
14	0.977	0.977	0.976	0.985	0.979	0.983	0.981	0.993	0.981	0.982	0.983	0.981	14
15	0.977	0.977	0.976	0.984	0.977	0.993	0.986	1.000	0.984	0.981	0.983	0.980	15
16	0.977	0.977	0.976	0.977	0.978	0.986	0.981	1.005	0.988	0.980	0.984	0.980	16
17	0.977	0.977	0.977	0.978	0.982	0.983	0.982	1.000	0.989	| |M	0.986	0.981	17
18	0.977	0.977	0.977	0.977	0.984	0.987	0.983	0.992	0.990	0.985	0.983	0.981	18
19	0.977	0.977	0.977	0.977	0.981	0.985	0.990	0.990	0.990	0.982	0.982	0.981	19
20	0.976	0.976	0.977	0.982	0.988	0.984	1.001	0.990	0.986	0.982	0.982	| |	20
21	0.977	0.977	0.976	0.977	0.986	0.983	0.999	0.991	0.992	0.982	0.982	| |	21
22	0.977	0.976	0.977	0.977	0.984	0.981	0.990	1.006	0.990	0.982	0.982	| |	22
23	0.983	0.976	0.977	0.978	0.983	0.985	0.996	1.006	0.986	0.982	0.982	| |	23
24	0.991	0.977	0.977	0.981	0.983	0.987	0.998	1.003	0.984	0.981	0.982	| |	24
25	0.983	0.977	0.976	0.992	0.982	0.985	0.999	0.997	0.984	0.985	0.983	| |	25
26	0.985	0.977	0.976	0.988	0.981	0.987	0.999	0.993	0.983	0.982	0.981	| |	26
27	0.981	0.977	0.976	0.994	0.983	0.980	1.003	0.993	0.985	0.982	0.981	| |	27
28	0.977	0.977	0.977	0.992	0.982	0.991	1.016	0.994	0.986	0.981	0.981	| |	28
29	0.983		0.977	0.989	0.982	0.986	1.008	0.993	0.984	0.980	0.983	| |	29
30	0.986		0.977	0.986	1.010	0.990	1.017	0.993	0.981	0.980	0.981	| |	30
31	0.987		0.976		1.009		1.015	0.990		0.979		| |	31
Mean	0.980	0.977	0.977	0.982	0.985	0.986	0.990	1.007	0.986	0.981	0.983	0.981	
Median	0.977	0.977	0.977	0.980	0.983	0.985	0.983	1.000	0.985	0.981	0.983	0.980	
Max.Daily Mean	0.991	0.983	0.977	0.994	1.010	1.006	1.017	1.043	0.993	0.985	0.989	0.987	
Min.Daily Mean	0.976	0.976	0.976	0.976	0.977	0.979	0.979	0.990	0.980	0.979	0.980	0.979	
Inst.Max	0.997	0.996	0.980	1.000	1.023	1.018	1.024	1.050	1.002	0.999	1.000	1.007	
Inst.Min	0.976	0.976	0.976	0.976	0.976	0.977	0.977	0.986	0.979	0.978	0.979	0.976	
Missing Days	0	0	0	0	0	0	0	0	0	1	0	12	

Summaries

Annual Mean	0.985
Ann. Median	0.982
Missing Days	13

	Maximum	Minimum
Daily Mean	1.043	0.976
Instant	1.050	0.976

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
| | Data Not Recorded

JDA Consultant Hydrologists   HYDAY V120 Output 21/05/2013

Site J4914OS13 Lot 221 Lakes Rd Nambeelup S13   Year 2011
Variable 100.00 Stream Water Level in Metres   Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	0.974	0.971	0.973	0.971	0.970	0.971	0.970	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	0.972	0.972	0.973	0.972	0.971	0.971	0.970	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	0.971	0.971	0.972	0.971	0.971	0.974	0.970	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	0.971	0.971	0.971	0.971	0.971	0.980	0.970	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.970	0.971	0.971	0.976	0.970	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.970	0.970	0.971	0.974	0.982	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.970	0.971	0.973	0.978	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.972	0.970	0.971	0.981	0.971	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.970	0.971	0.972	0.971	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.970	0.971	0.971	0.970	10
11	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.971	0.970	0.971	0.971	0.970	11
12	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.971	0.970	0.970	0.971	0.978	12
13	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.971	0.971	0.971	0.972	0.971	0.989	13
14	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.971	0.972	0.970	0.971	0.971	0.976	14
15	[ ]	[ ]	[ ]	[ ]	0.970	0.972	0.971	0.972	0.972	0.971	0.970	0.971	15
16	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.971	0.973	0.972	0.970	0.970	0.971	16
17	[ ]	[ ]	[ ]	[ ]	0.971	0.971	0.970	0.972	0.971	0.971	0.973	0.971	17
18	[ ]	[ ]	[ ]	[ ]	0.972	0.972	0.970	0.972	0.972	0.973	0.977	0.970	18
19	[ ]	[ ]	[ ]	[ ]	0.971	0.972	0.970	0.971	0.972	0.971	0.970	0.970	19
20	[ ]	[ ]	[ ]	[ ]	0.972	0.972	0.971	0.971	0.971	0.971	0.970	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	0.971	0.971	0.971	0.972	0.972	0.970	0.970	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.972	0.973	0.972	0.973	0.970	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.972	0.971	0.971	0.973	0.970	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	0.970	0.972	0.972	0.971	0.971	0.971	0.970	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	0.970	0.973	0.972	0.970	0.971	0.977	0.970	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.972	0.970	0.972	0.974	0.970	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.971	0.970	0.972	0.975	0.970	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	0.970	0.972	0.973	0.971	0.972	0.971	0.971	[ ]	28
29	[ ]		[ ]	[ ]	0.971	0.971	0.972	0.970	0.971	0.971	0.982	[ ]	29
30	[ ]		[ ]	[ ]	0.975	0.971	0.973	0.970	0.970	0.971	0.970	[ ]	30
31	[ ]		[ ]		0.973		0.973	0.971		0.971		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	0.971	0.971	0.971	0.971	0.971	0.971	0.972	0.973	
Median	[ ]	[ ]	[ ]	[ ]	0.970	0.971	0.971	0.971	0.971	0.971	0.971	0.971	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.975	0.974	0.973	0.973	0.972	0.977	0.982	0.989	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	
Inst.Max	[ ]	[ ]	[ ]	[ ]	1.001	0.987	0.975	0.997	0.975	0.982	1.001	1.049	
Inst.Min	[ ]	[ ]	[ ]	[ ]	0.969	0.970	0.970	0.969	0.969	0.970	0.970	0.969	
Missing Days	31	28	31	30	10	0	0	0	0	0	0	12	

Summaries

Annual Mean	0.971
Ann. Median	0.971
Missing Days	142

	Maximum	Minimum
Daily Mean	0.989	0.970
Instant	1.049	0.969

------------------ Notes -------------------

All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists | HYDAY V120 Output 21/05/2013

Site J49140S14 Lot 221 Lakes Rd Nambeelup S14 | Year 2011
Variable 100.00 Stream Water Level in Metres | Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.030	1.028	0.928	0.922	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.065	1.027	0.926	0.923	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.046	1.025	0.929	0.924	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.038	1.023	0.928	0.925	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.029	1.022	0.934	0.925	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.023	1.021	0.935	0.931	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.022	1.020	0.931	0.933	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.021	1.021	0.947	0.929	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.018	1.016	0.930	0.928	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.014	1.013	0.929	0.929	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.012	1.003	0.929	0.929	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.045	1.010	0.992	0.929	0.957	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.054	1.010	0.988	0.929	1.020	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.078	1.007	0.977	0.931	1.026	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.090	1.009	0.969	0.929	1.022	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.099	1.011	0.962	0.930	1.013	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.096	1.020	0.966	0.933	1.000	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.090	1.074	0.983	0.932	0.986	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.081	1.060	0.968	0.932	0.980	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.064	1.039	0.960	0.930	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.063	1.064	0.956	0.927	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.120	1.056	0.968	0.927	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.098	1.031	0.960	0.925	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.093	1.020	0.949	0.925	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.074	1.020	0.976	0.926	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.054	1.040	0.975	0.925	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.045	1.067	0.991	0.926	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.033	1.066	0.968	0.926	[ ]	28
29	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	1.026	1.041	0.953	0.927	[ ]	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	1.025	1.029	0.942	0.922	[ ]	30
31	[ ]		[ ]		[ ]		[ ]	1.021		0.932		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.067	1.033	0.986	0.929	0.958	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.069	1.029	0.977	0.929	0.931	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.120	1.074	1.028	0.947	1.026	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.021	1.007	0.932	0.922	0.922	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.141	1.095	1.032	0.967	1.039	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.016	1.003	0.930	0.921	0.921	
Missing Days	31	28	31	30	31	30	31	11	0	0	0	12	

Summaries

Annual Mean	0.992
Ann. Median	1.001
Missing Days	235

	Maximum	Minimum
Daily Mean	1.120	0.922
Instant	1.141	0.921

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...

[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site J49140S15 Lot 221 Lakes Rd Nambeelup S15 Year 2011
Variable 100.00 Stream Water Level in Metres Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.963	1.042	1.079	1.076	0.998	0.980	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.963	1.065	1.100	1.070	0.994	0.980	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.072	1.106	1.063	0.999	0.980	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.067	1.108	1.055	1.002	0.980	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.058	1.106	1.046	1.004	0.980	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.049	1.098	1.037	1.004	0.987	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.040	1.091	1.048	1.004	0.989	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.038	1.079	1.061	1.010	0.982	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.962	1.036	1.070	1.055	1.001	0.980	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	0.962	0.961	1.029	1.062	1.043	0.992	0.980	10
11	[ ]	[ ]	[ ]	[ ]	0.962	0.962	0.962	1.021	1.056	1.025	0.987	0.979	11
12	[ ]	[ ]	[ ]	[ ]	0.962	0.962	0.962	1.017	1.049	1.013	0.993	0.991	12
13	[ ]	[ ]	[ ]	[ ]	0.962	0.962	0.962	1.018	1.042	1.005	0.993	1.041	13
14	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.051	1.034	1.004	0.995	1.016	14
15	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.963	1.062	1.035	1.002	0.991	1.004	15
16	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.078	1.044	0.998	0.987	1.001	16
17	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.076	1.051	1.003	0.982	1.001	17
18	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.076	1.092	1.005	0.981	0.997	18
19	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.073	1.104	1.000	0.982	0.992	19
20	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.963	1.068	1.081	0.998	0.982	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.964	1.062	1.080	0.996	0.982	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.965	1.107	1.088	1.004	0.981	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.964	1.111	1.087	1.002	0.981	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	0.962	0.964	0.964	1.113	1.083	0.998	0.981	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.967	1.109	1.077	1.008	0.982	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.968	1.106	1.081	1.008	0.981	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.966	1.103	1.087	1.032	0.981	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	0.962	0.964	0.985	1.101	1.091	1.024	0.981	[ ]	28
29	[ ]		[ ]	[ ]	0.962	0.963	0.996	1.095	1.091	1.007	0.981	[ ]	29
30	[ ]		[ ]	[ ]	0.962	0.963	1.033	1.090	1.086	1.002	0.980	[ ]	30
31	[ ]		[ ]		0.962		1.043	1.083		0.999		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.970	1.068	1.078	1.022	0.990	0.992	
Median	[ ]	[ ]	[ ]	[ ]	0.962	0.963	0.962	1.068	1.082	1.008	0.987	0.987	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.962	0.964	1.043	1.113	1.108	1.076	1.010	1.041	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.962	0.962	0.961	1.017	1.034	0.996	0.980	0.979	
Inst.Max	[ ]	[ ]	[ ]	[ ]	0.962	0.987	1.047	1.117	1.109	1.083	1.020	1.050	
Inst.Min	[ ]	[ ]	[ ]	[ ]	0.962	0.962	0.961	1.005	1.027	0.987	0.980	0.979	
Missing Days	31	28	31	30	10	0	0	0	0	0	0	12	

Summaries

Annual Mean	1.008
Ann. Median	0.993
Missing Days	142

	Maximum	Minimum
Daily Mean	1.113	0.961
Instant	1.117	0.961

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V120 Output 21/05/2013

Site J49140S17 Lot 221 Lakes Rd Nambeelup S17 Year 2011
Variable 100.00 Stream Water Level in Metres Table Type Level
Figures are for period ending 24:00

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	0.908	0.906	1.189	1.026	1.067	0.916	0.920	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	0.908	0.906	1.217	1.157	1.055	0.917	0.920	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	0.907	0.906	1.216	1.165	1.044	0.918	0.920	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.205	1.145	1.009	0.919	0.921	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.181	1.117	0.963	0.928	0.921	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.158	1.071	0.946	0.923	0.931	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.133	1.023	0.940	0.927	0.938	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.127	0.988	0.939	0.936	0.934	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	0.905	0.905	1.123	0.976	0.930	0.926	0.937	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	0.905	0.904	1.101	0.970	0.930	0.919	0.935	10
11	[ ]	[ ]	[ ]	[ ]	0.907	0.905	0.905	1.070	0.965	0.936	0.918	0.932	11
12	[ ]	[ ]	[ ]	[ ]	0.907	0.905	0.905	1.050	0.960	0.930	0.918	0.952	12
13	[ ]	[ ]	[ ]	[ ]	0.907	0.904	0.905	1.050	0.958	0.930	0.919	1.107	13
14	[ ]	[ ]	[ ]	[ ]	0.907	0.907	0.905	1.162	0.936	0.932	0.919	1.087	14
15	[ ]	[ ]	[ ]	[ ]	0.907	0.908	0.908	1.194	0.939	0.932	0.919	1.048	15
16	[ ]	[ ]	[ ]	[ ]	0.907	0.906	0.907	1.216	1.009	0.930	0.919	0.991	16
17	[ ]	[ ]	[ ]	[ ]	0.913	0.906	0.905	1.196	1.059	0.939	0.921	0.973	17
18	[ ]	[ ]	[ ]	[ ]	0.913	0.906	0.905	1.180	1.157	0.942	0.920	0.960	18
19	[ ]	[ ]	[ ]	[ ]	0.908	0.906	0.905	1.154	1.199	0.935	0.919	0.954	19
20	[ ]	[ ]	[ ]	[ ]	0.917	0.906	0.918	1.124	1.172	0.934	0.919	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	0.910	0.906	0.938	1.095	1.195	0.932	0.919	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	0.908	0.905	0.964	1.205	1.211	0.934	0.919	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	0.907	0.906	1.006	1.193	1.173	0.929	0.919	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	0.907	0.908	0.953	1.194	1.134	0.916	0.919	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	0.907	0.907	0.968	1.167	1.098	0.935	0.920	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	0.906	0.906	1.048	1.143	1.120	0.934	0.920	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	0.906	0.905	1.048	1.122	1.159	0.942	0.919	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	0.906	0.907	1.085	1.098	1.207	0.936	0.920	[ ]	28
29	[ ]		[ ]	[ ]	0.908	0.906	1.108	1.070	1.167	0.930	0.920	[ ]	29
30	[ ]		[ ]	[ ]	0.911	0.906	1.146	1.049	1.109	0.918	0.920	[ ]	30
31	[ ]		[ ]		0.908		1.185	1.030		0.916		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	0.908	0.906	0.954	1.142	1.086	0.948	0.920	0.962	
Median	[ ]	[ ]	[ ]	[ ]	0.907	0.906	0.906	1.154	1.113	0.934	0.919	0.937	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.917	0.908	1.185	1.217	1.211	1.067	0.936	1.107	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.906	0.904	0.904	1.030	0.936	0.916	0.916	0.920	
Inst.Max	[ ]	[ ]	[ ]	[ ]	0.978	0.942	1.193	1.229	1.232	1.078	0.956	1.112	
Inst.Min	[ ]	[ ]	[ ]	[ ]	0.905	0.904	0.904	1.020	0.898	0.915	0.915	0.919	
Missing Days	31	28	31	30	10	0	0	0	0	0	0	12	

Summaries

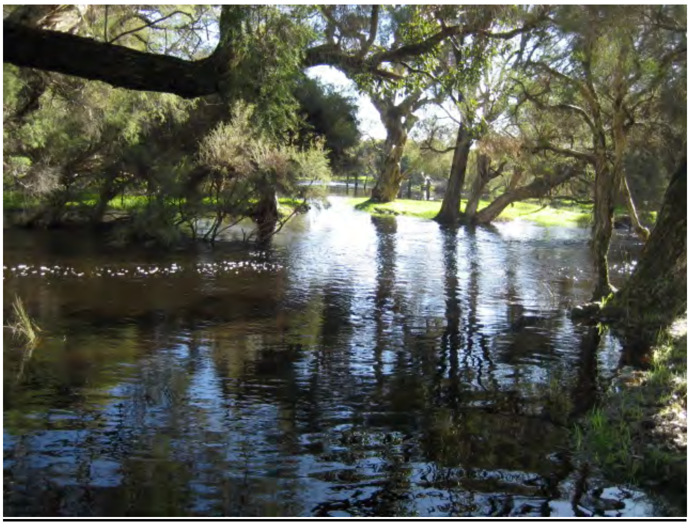
Annual Mean	0.982
Ann. Median	0.930
Missing Days	142

	Maximum	Minimum
Daily Mean	1.217	0.904
Instant	1.232	0.898

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

APPENDIX E

NIA Pre-Development Surface Water Monitoring
(JDA, 2009 & 2011)



Twin Ocean Property

Lakes Rd, Nambeelup: Pre-development Surface Water Monitoring 2008/09

November 2009

JDA Consultant Hydrologists

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APPENDICES

1. INTRODUCTION

1.1 Background

JDA was appointed by Twin Ocean Property Ltd to perform pre-development surface water monitoring in Nambeelup, Shire of Murray.

The Study Area consists of 1918 ha, comprising of 5 adjoining properties located on Lakes Rd Nambeelup, see Figure 1.

A total of 12 surface water sites were monitored over the 15 month monitoring period August 2008 to October 2009 inclusive, including Nambeelup Brook and 5 tributaries as shown in Figure 2:

- Nambeelup Brook (S1, S2, S4, S10);
- Creek 1 upstream and downstream (S5, S3);
- Creek 2 upstream and downstream (S7, S6);
- Creek 3 upstream and downstream (S8, S9);
- Creek 4 downstream (S11);
- Creek 5 downstream (S12).

TABLE 1: MONITORING LOCATIONS

Site	Location
S1	Nambeelup Brook, Lot 223 W. boundary
S2	Nambeelup Brook, Lot 223 N. boundary
S3	Creek 1, Lot 223, 30 m upstream of the confluence with Nambeelup Brook
S4	Nambeelup Brook, Lot 223 N. boundary
S5	Creek 1, Lot 246 E. boundary
S6	Creek 2, Lot 247 E. boundary
S7	Creek 2, Lot 248 E. boundary
S8	Creek 3, Lot 248 N. boundary
S9	Creek 3, Lot 248 N. boundary
S10	Nambeelup Brook, Lot 221 S. boundary
S11	Creek 4, Lot 221 S. boundary
S12	Creek 5, Lot 221 S. boundary

1.2 Scope

The proposal by JDA (P4153a, 28/7/08) comprised the following:

- August 2008 install 10 water monitoring sites, consisting of, data loggers, staff gauges and peak water level indicators at selected locations (Figure 2), and maintain approximately to 31 October 2008.
- Site visits to check that equipment is operational and recording data.
- August to November 2008, monthly routine station visits, consisting of data downloads, equipment checks and maintenance if necessary.
- Obtain discharge measurements given flow is sufficient to do so, via wading rod method. Visual area velocity estimates to be taken where meter readings are not possible, along with photographic record of flow regime at each site.
- Estimate stage discharge rating curves, derive flow record, plot time series data and estimated runoff coefficients along with monthly flow volumes at each location.
- Present the above in a report

The proposal by JDA (J4153e, 6/5/09) comprised the following:

- Site visits to check that equipment is operational and recording data.
- Install 2 additional, surface water monitoring locations on Lot 221, monitor for monthly water quality and point velocity discharge.
- Routine water quality sampling for nutrients at all sites when flowing and any rising stage samples.
- Site visits to check that equipment is operational and recording data.
- Obtain discharge measurements given flow is sufficient to do so, via wading rod method. Visual area velocity estimates to be taken where meter readings are not possible, along with photographic record of flow regime at each site.
- Review and derive updated rating curves via use of Hydstra Ratings Workbench.
- Present the above data in pre-development report 2008/09.

This report presents a summary of the work completed under this scope.

2. MONITORING AND DATA ANALYSIS

2.1 Period of Monitoring

Table 2 presents a summary of the period of monitoring, including the date of monitoring, creek status and discharge measurements performed.

TABLE 2: SUMMARY OF MONITORING VISITS

Date	Visit	DM	WQ	Notes	Site Flowing?											
					1	2	3	4	5	6	7	8	9	10	11	12
25/08/08	1	1	No	S2,3 & 10 installed DM conducted	Y	Y	Y	Y	Y	Y				Y		
27/08/08	2	2	No	S1 installed DM conducted	Y	Y	Y	Y	Y	Y				Y		
29/08/08	3	3	No	Loggers installed @ S1,2,3,4,5 &10.	Y	Y	Y	Y	Y	Y				Y		
04/09/08	4	4	No	Data D\L S6 logger installed	Y	Y	Y	Y	Y	Y			Y	Y		
17/09/08	5	5	No	Data D\L + DM's	Y	Y	Y	Y	Y	Y			Y	Y		
15/10/08	6	6	No	Data D\L + DM's	Y	Y	Y	Y	Y	Y				Y		
05/11/08	7	7	No	Data D\L + DM's, survey to SL , CTF located	Y	Y	Y	Y	Y	Y				Y		
18/12/08	8		No	Data D\L inspected drains on Lot 221	Y	N	Y	N	Y	N	N	N	N	Y	N	N
14/01/09	9	8	No	Data D\L investigated base flow origins	Y	N	Y	N	Y	N	N	N	N	N		N
19/05/09	10		No	Data D\L	N	N	Y	N	Y	N	N	N	N	N	N	N
16/06/09	11	9	3x	Data D\L, DM's & WQ	N	N	Y	N	Y	N	N	N	N	Y	N	N
21/07/09	12	10	7X	Data D\L, DM's & WQ	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
18/08/09	13	11	11X	Data D\L \, DM's & WQ	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1/10/09	14	12	9X	Data D\L \, DM's & WQ	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
21/10/09	15	13	6X	Data D\L \, DM's & WQ	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

D\L Download, DM Discharge Measurement, WQ Water Quality, S/L Standard Level

2.2 Rainfall Data

Table 3 presents rainfall data 2008/09

TABLE 3: RAINFALL DATA

Month	Pinjarra South BoM 009976 (mm)	Mandurah BoM 009977 (mm)	Average of BoM 009976 & 009977 (mm)
16/09/08 to 30/09/08	46	36	41
October 2008	51.6	34.0	42.8
November 2008	55.6	47.2	51.4
December 2008	33.2	5.4	19.3
January 2009	0.2	2.8	1.5
February 2009	11.4	8.8	10.1
March 2009	2.8	9.4	6.1
April 2009	0.2	4.2	2.2
May 2009	61.4	52.4	56.9
June 2009	177.8	131.8	154.8
July 2009	138.6	125.2	131.9
August 2008	105.6	104.4	105
September 2009	93.2	84	88.6
October 2009	3.8	1.6	2.7
Total 16/09/08 to 21/10/09	781.4	647.2	714.3

An average of BoM 009976 and 009977 was used for rainfall totals as Nambeelup is situated between the two rain gauges. Rainfall data displayed in Figure 3.

2.3 Water Levels

Continuous water levels were recorded from 7 locations (S1 to S6 and S10). S11 and S12 were monitored from 18/12/2008 on a monthly basis. Due to lack of accessibility during winter Sites S7 to S9 were not monitored regularly.

Continuous water levels were monitored using "Diver" pressure sensor and barometric data recorders. Recorders were housed alongside staff gauges equipped with Peak Water Level Indicators (PLI) as a secondary check measure insuring data integrity.

Photographs (Appendix A) show the sites.

2.4 Data Status

- Site S1: 16/09/02008 through to 21/10/09 good quality time series data
- Site S2: : 16/09/02008 through to 21/10/09 good quality time series data
- Site S3: : 16/09/02008 through to 21/10/09 good quality time series data
- Site S4: : 16/09/02008 through to 21/10/09 good quality time series data
- Site S5: : 16/09/02008 through to 21/10/09 good quality time series data
- Site S6: : 16/09/02008 through to 21/10/09 good quality time series data
- Site S7: No Time series data collected, irregular point water level and discharge record
- Site S8: No Time series data collected, irregular point water level and discharge record
- Site S9: No Time series data collected, irregular point water level and discharge record
- Site S10: 16/09/02008 through to 21/10/09 good quality time series data
- Site S11: No Time series data collected, irregular point water level and discharge record
- Site S12: No Time series data collected, irregular point water level and discharge record

All recording instrumentation has been left out on site at October 2009 ensuring data continuity if further monitoring is required in the near future.

2.5 Discharge Measurements

Flow was measured at 10 of the 12 sites using wading rod current meter method, or by visual area velocity estimation. The results are presented in Table 4.

TABLE 4: DISCHARGE MEASUREMENT RESULTS 2008/09

Date		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
25/08/08	**m**		0.28	0.11							0.24		
	L/s		112	37							300		
27/08/08	**m**	0.43	0.27	0.11							0.23		
	L/s	207	123	30							296		
29/08/08	**m**	0.42			0.19	0.18							
	L/s	227			86	29							
04/09/08	**m**	0.43	0.22		0.19	0.19	0.5			Vis	0.22		
	L/s	209	109		91	29	43			9	284		
17/09/08	**m**	0.36	0.18	0.10	0.15	0.18	0.31		Vis		0.18		
	L/s	105	45	22	46	16	33		5		135		
15/10/08	**m**	0.28		0.09	0.12	0.23	0.23				0.13		
	L/s	50		22	12	18	8				42		
05/11/08	**m**	0.28									0.12		
	L/s	50									38		
14/01/09	**m**	0.18		0.11		0.16							
	L/s	3		3		3							
16/06/09	**m**	0.23											
	L/s	10											
21/07/09	**m**			0.61		0.37	0.26					0.12	0.857
	L/s			139		88	65					12	5
18/08/09	**m**		0.68	0.458	0.72	0.35	0.50					0.18	0.9
	L/s		1280	188	1216	78	81					22	10
01/10/09	**m**	0.54	0.26		0.26	0.25	0.33					0.15	0.88
	L/s	487	417		229	19	76					10	6

2.6 Rating Curves

As previously stated discharge measurements have been used to develop estimated rating curve for 7 locations, S1 to S6, S10.

JDA conducted many discharge measurements over the monitoring period, most of which cover the lower to mid stage range. Rating curve extrapolation for sites S1, S2, S4 and S10 were calibrated to DoW peak recorded flow of 15.4m^3/s. Confidence Bands of 15% have been applied to all rating curves.

Rating curves have been generated with the aid of Hydstra Ratings Workbench a specialized hydrographic software program.

Based on the generated rating curves, recorded water level (Stage) data was converted to flow discharge.

Figures 4 to 11 detail the rating curves at each of the 7 locations S1 to S6 and S10.

2.7 Peak Flow Estimates

Based on calculated flows, peak flows for 2008/09 varied between 84 L/s (S6) to 14280 L/s (S10). Peak flow estimates for 2008/09 are shown in Table 5.

TABLE 5: CONTRIBUTING AREA AND PEAK RECORDED FLOW

	S1	S2	S3	S4	S5	S6	S10	614063 DoW
Contributing Area ~(ha)	10000	7500	770	7500	390	200	11400	11400
Peak Flow Sep 08 to Dec 08 (L/s) inclusive	1010	436	57	506	41	77	1239	13222
Peak Flow Jan 09 to Oct 09 (L/s) inclusive	12030	5588	165	5057	132	84	14280	15400

2.8 Monthly Flow Volumes

Table 6 presents monthly runoff volumes, runoff depths and runoff coefficients between 16/09/08 to 21/10/09.

- Site S1 (10000 ha) has monthly runoff coefficients ranging between 0.003% to 130% and an average runoff coefficient of 27.8% for the entire period of record.
- Site S2 (7500 ha) has monthly runoff coefficients ranging between 0.1% to 46% and an average runoff coefficient of 14.1% for the entire period of record.
- Site S3 (770 ha) has monthly runoff coefficients ranging between 6% to 240% and an average runoff coefficient of 19.7% for the entire period of record.
- Site S4 (7500 ha) has monthly runoff coefficients ranging between 2% to 40% and an average runoff coefficient of 11.8% for the entire period of record.
- Site S5 (390 ha) has monthly runoff coefficients ranging between 2% to 460% and an average runoff coefficient of 23.5% for the entire period of record.
- Site S6 (200ha) has monthly runoff coefficients ranging between 3% to 1500% and an average runoff coefficient of 73.5% for the entire period of record.
- Site S10 (11400ha) has monthly runoff coefficients ranging between 0.1% to 97% and an average runoff coefficient of 25.4% for the entire period of record.
- Monthly runoff coefficients are distorted by shallow groundwater discharge, inflating lake winter runoff volumes relative to rainfall. This is particularly evident in October 2009.

Site S6 has the highest average rainfall runoff coefficient of all the sites monitored (approx 75%) and probably has the largest proportion of catchment areas saturated over winter.

S1, S5 and S10 have the next highest rainfall runoff coefficients (approx 25%). The 2 locations, S1 and S10 monitor the Nambeelup Brook and represent realistic runoff coefficients for the catchment size and characteristics.

Site S3 on the same creek as S5 has lower runoff coefficient (approx 22%), probably due to lower proportion of saturated area.

Sites S3 & S5 continued to flow for the entire summer 2009 where all the other sites dried out.

Figures 11 to 17 present individual Stage, Discharge & total daily rainfall for S1 to S6 and S10 sites.

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TABLE 6: ESTIMATED MONTHLY RUNOFF DEPTH, RUNOFF VOLUME & RUNOFF COEFFICIENT – YEARS 2008/09

		Year 2008				Year 2009										Total
		Sep 16-30	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
Site	**Rainfall (mm)**	41	42.8	51.4	19.3	1.5	10.1	6.1	2.2	56.9	154.8	131.9	105	88.6	2.7	714.3
(S1)	**Runoff Volume (m3)**	328568	350203	183874	9773	60524	441	20		32875	1236872	4903192	6984730	5514599	340840	19892039
10000 ha	Runoff (mm)	3.28	3.5	1.8	0.1	0.6	0.004	0.0002		0.32	12.4	49.0	69.8	55.14	3.40	198.9
	Runoff Coefficient (%)	8	8.2	3.5	6.5	40.3	0.04	0.003		0.6	8	37	66	62	130	27.83
(S2)	**Runoff Volume (m3)**	43116	3759	28898							555509	2002532	2382897	2448013	93515	7558239
7500 ha	Runoff (mm)	0.57	0.050	0.38							7.4	26.7	31.8	32.6	1.24	100.8
	Runoff Coefficient (%)	1.4	0.1	0.8							4	20	30	37	46	14.1
(S3)	**Runoff Volume (m3)**	52575	92223	102414	27238	26177	44545	49717	34869	24581	118848	227762	241726	246853	49352	1082430
770 ha	Runoff (mm)	6.82	12	13.3	3.53	3.4	5.8	6.5	4.5	3.19	15.43	29.6	31.4	32.1	6.4	140.6
	Runoff Coefficient (%)	17	28	26	18	230	57	100	200	6	10	22	30	36	240	19.7
(S4)	**Runoff Volume (m3)**	289980	368999	124395							191747	1291566	2238669	1745504	81365	6332225
7500 ha	Runoff (mm)	3.86	4.9	1.7							2.6	17.2	29.8	23.3	1.1	84.4
	Runoff Coefficient (%)	9	12	3							2	13	28	26	40	11.8
(S5)	**Runoff Volume (m3)**	20909	56335	3649	26250	25909	31234	38418	39396	25595	81587	111111	95670	83236	26654	655953
390 ha	Runoff (mm)	5.4	14.4	0.93	6.7	6.6	8.0	9.9	10.1	6.6	20.9	28.5	24.5	21.3	6.8	168.2
	Runoff Coefficient (%)	13	34	2	35	440	80	160	460	12	14	22	23	24	250	23.5
(S6)	**Runoff Volume (m3)**	89683	175943	129932	15044						8895	142323	201527	206528	80068	1049943
200 ha	Runoff (mm)	44.8	88	64.9	7.5						4.4	71.2	100.8	103.3	40	525
	Runoff Coefficient (%)	110	210	130	39						3	54	96	120	1500	73.5
(S10)	**Runoff Volume (m3)**	446061	341365	119969	1741						1186515	5524992	7365181	5417458	298660	20701969
11400ha	Runoff (mm)	3.9	3	1.1	0.015						10.4	48.5	64.6	47.52	2.6	181.6
	Runoff Coefficient (%)	10	7	2	0.1						7	37	62	54	97	25.42

Runoff (mm) = Runoff (m3)/Catchment Area (ha)/10   Rainfall for Nambeelup has been generated by use of an average of the total rainfall from BoM meteorological sites 00997 Mandurah and 009976 Pinjarra South.

2.9 Water Quality Sampling

Water quality sampling was not listed as a requirement in the 2008 proposal, However water quality samples were taken as grab samples at selected locations for TN and TP during site visits.

Water quality sampling was conducted monthly over the 2009 monitoring period when sites were flowing. Sites S1 to S6 and S10 were monitored for nutrients. S11 and 12 were sampled for nutrients and metals. Table 7 to 15 presents water quality results.

TABLE 7: WATER QUALITY RESULTS (S1)

S1							
2008			2009		min	max	Average
Analysis	15/10/08	18/12/08	01/10/09	21/10/09			
EC	1.33	0.35	0.57	0.68	0.35	1.33	**0.73**
pH	4.62	5.69	6.36	6.34	4.62	6.36	**5.75**
Tot P	0.51	0.46	0.37	0.41	0.37	0.51	**0.44**
PO4_P			0.21	0.27	0.21	0.27	**0.24**
TN	2.6	3.1	2	3.2	2	3.2	**2.7**
TKN			2	3.2	2	3.2	**2.6**
NO3			<0.1	0.13	<0.1	0.13	**0.065**
NOX_N			0.005	0.030	0.005	0.030	**0.017**
NO2_N			<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 8: WATER QUALITY RESULTS (S2)

S2									
2008			2009				min	max	Average
Analysis	25/08/08	15/10/08	21/07/09	18/08/09	01/10/09	21/10/09			
EC	0.62	1.19	0.4	0.35	0.76	0.9	0.35	1.19	**0.7**
pH	6.62	6.08	5.89	6.59	5.78	6.38	5.78	6.62	**6.2**
Tot P	0.49	0.50	0.53	0.49	0.38	0.56	0.38	0.56	**0.49**
PO4_P			0.33	0.36	0.23	0.39	0.23	0.39	**0.33**
TN	1.9	2.6	2.8	3.1	2.1	3.7	1.9	3.7	**2.7**
TKN			2.5	3	2.1	3.7	2.1	3.7	**2.8**
NO3			1	0.3	<0.1	0.13	<0.01	1	**0.715**
NOX_N					0.005	0.029	0.005	0.029	**0.017**
NO2_N					<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 9: WATER QUALITY RESULTS (S3)

S3										
2008			2009					min	max	Average
Analysis	25/08/08	15/10/08	16/06/09	21/07/09	18/08/09	01/10/09	21/10/09			
EC	0.36	0.9	0.58	0.48	0.36	0.51	0.3	0.3	0.9	**0.5**
pH	5.62	5.61	5.06	5.6	5.71	5.24	5.52	5.06	5.71	**5.48**
Tot P	0.25	0.32	0.19	0.36	0.31	0.24	0.19	0.19	0.36	**0.27**
PO4_P				0.21	0.22	0.12	0.14	0.12	0.22	**0.17**
TN	2.0	2.7	2.6	3.2	3.1	2.6	2.6	2.0	3.2	**2.7**
TKN				3	3.4	2.6	2.6	2.6	3.4	**2.9**
NO3				0.8	0.6	<0.01	<0.005	<0.005	0.08	**0.35**
NOX_N						0.017	<0.005	<0.005	0.017	**0.009**
NO2_N						<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 10: WATER QUALITY RESULTS (S4)

S4									
	2008		2009				min	max	Average
Analysis	**29/08/08**	**15/10/08**	**21/07/09**	**18/08/09**	**01/10/09**	**21/10/09**			
EC	**0.64**	**1.19**	0.4	0.34	0.35	0.84	0.34	1.19	**0.62**
pH	**6.35**	**6.34**	6.13	6.54	6.89	6.61	6.13	6.89	**6.48**
Tot P	**0.55**	**0.49**	0.53	0.53	0.35	0.53	0.35	0.55	**0.5**
PO4_P			0.34	0.36	0.23	0.37	0.23	0.37	**0.33**
TN	**2.2**	**3**	3.1	2.9	2.5	3.8	2.5	3.8	**2.9**
TKN			2.9	2.9	2.5	3.8	2.5	2.9	**3.0**
NO3			1	0.3	<0.01	0.08	<0.01	1	**0.35**
NOX_N					<0.005	0.018	<0.005	0.018	**0.009**
NO2_N					<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 11: WATER QUALITY RESULTS (S5)

S5										
	2008		2009					min	max	Average
Analysis	**29/08/08**	**15/10/08**	**16/06/09**	**21/07/09**	**18/08/09**	**01/10/09**	**21/10/09**			
EC	0.36	0.89	0.65	0.57	0.4	0.42	0.31	0.31	0.89	**0.514**
pH	5.39	5.07	5.31	5.07	5.68	5.4	5.01	5.01	5.68	**5.27**
Tot P	0.16	0.25	0.13	0.3	0.32	0.15	0.27	0.13	0.32	**0.23**
PO4_P				0.12	0.18	0.08	0.12	0.08	0.18	**0.13**
TN	2.0	2.9	3.3	3.5	4.1	3.3	3.1	2.0	4.1	**3.2**
TKN				3.4	3.8	3	2.4	2.4	3.8	**3.2**
NO3				0.7	0.9	1.1	2.8	0.7	2.8	**1.4**
NOX_N						0.24	0.64	0.24	0.64	**0.44**
NO2_N						<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 12: WATER QUALITY RESULTS (S6)

S6									
	2008				2009		min	max	Average
Analysis	**04/09/08**	**15/10/08**	**21/07/09**	**18/08/09**	**01/10/09**	**21/10/09**			
EC	0.75	1.58	0.82	0.49	0.73	0.92	0.49	1.58	**0.88**
pH	6.32	5.67	6.07	5.76	5.82	6.72	5.67	6.32	**6.06**
Tot P	0.58	0.48	0.3	0.25	0.31	0.37	0.25	0.58	**0.38**
PO4_P			0.18	0.19	0.2	0.27	0.18	0.27	**0.21**
TN	2.6	3.1	2.5	2.7	3.1	3.8	2.5	3.8	**3.0**
TKN			2.5	2.7	3.1	3.7	2.5	3.7	**3.0**
NO3			<0.01	<0.01	<0.01	0.26	<0.01	<0.26	**0.065**
NOX_N					<0.005	0.59	<0.005	0.059	**0.030**
NO2_N					<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 13: WATER QUALITY RESULTS (S10)

S10							
	2008		2009		min	max	Average
Analysis	**27/08/08**	**15/10/08**	**01/10/09**	**21/10/09**			
EC	0.58	1.13	0.34	0.52	0.34	1.13	**0.64**
pH	6.47	5.74	4.98	6.24	4.98	6.47	**5.85**
Tot P	0.46	0.32	0.12	0.44	0.12	0.46	**0.34**
PO4_P			0.05	0.28	0.05	0.28	**0.17**
TN	1.8	2.7	3.5	3.1	1.8	3.5	**2.8**
TKN			3.5	3.1	3.1	3.5	**3.3**
NO3			<0.1	0.25	<0.1	0.25	**0.13**
NOX_N			<0.005	0.056	<0.005	0.056	**0.028**
NO2_N			<0.005	<0.005	<0.005	<0.005	**<0.005**

TABLE 14: WATER QUALITY RESULTS (S11)

S11						
2009				min	max	Average
Analysis	**21/07/09**	**18/08/09**	**01/10/09**			
EC	0.34	0.25	0.29	0.25	0.34	**0.29**
pH	4.98	6.25	5.8	4.98	6.25	**5.68**
Tot P	0.12	0.09	0.12	0.09	0.12	**0.11**
PO4_P	0.052	0.035	0.047	0.035	0.052	**0.045**
TN	3.5	4.1	2.1	2.1	4.1	**3.2**
TKN	3.5	4.1	2.1	2.1	4.1	**3.2**
NO3	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**
As	0.001	<0.001	<0.001	<0.001	0.001	**0.001**
Cu	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
Ni	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
Cd	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**
Cr	0.001	0.002	0.001	0.001	0.002	**0.001**
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**
Hg	<0.0001	0.0002	<0.0001	<0.0001	0.0002	**0.0001**
Zn	0.014	0.01	0.024	0.01	0.024	**0.016**

TABLE 15: WATER QUALITY RESULTS (12)

S12						
2009				min	max	Average
Analysis	**21/07/09**	**18/08/09**	**01/10/09**			
EC	0.28	0.2	0.29	0.2	0.29	**0.26**
pH	5.48	5.58	4.66	4.66	5.58	**5.24**
Tot P	0.41	0.16	0.36	0.16	0.41	**0.31**
PO4_P	0.091	0.042	0.091	0.042	0.091	**0.075**
TN	2.5	3.6	2.3	2.3	3.6	**2.8**
TKN	2.5	3.6	2.3	2.3	3.6	**2.8**
NO3	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
As	0.003	<0.001	0.008	<0.001	0.008	**0.004**
Cu	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
Ni	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
Cd	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
Cr	<0.001	0.001	<0.001	<0.001	0.001	**0.001**
Pb	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**
Hg	<0.0001	0.0003	0.0001	<0.0001	0.0003	**0.0002**
Zn	0.009	0.018	0.018	0.009	0.018	**0.015**

Excluding pH and EC (mS/cm) all other units are in mg/L.

Results of interest

- pH values are slightly acidic across the study area ranging between 5.24 and 6.48
- TP results excluding S11 on 18/8/09, exceed the EPA trigger levels for the Serpentine River of 0.1 mg/L. Results range between 0.09 mg/l to 0.58 mg/L.
- Average TP results entering the study area from Nambeelup brook at Sites (S2) and (S4) are 0.5 mg/L

Average TP results within the study area,

- (Creek 1) Sites S3 & S5, 0.25mg/L
- (Creek 2) Site S6, 0.38mg/L
- (Creek 4) Site S11, 0.11mg/L
- (Creek 5) Site S12, 0.31mg/L

2.10 Rising Stage Samples

Rising stage samples were collected from Sites S1 to S10 when water level rose above the sample bottles inlet tube (see photographs, Appendix A). The sample bottles are gravity filled and are collected on a monthly basis. It should be noted that samples are exposed to atmosphere and temperature fluctuations from time of collection to date of analysis. Samples have been analysed for nutrients.

TABLE 16: RISING STAGE SAMPLE (RSS) RESULTS

Analysis	Site							min	max	Average
	S1	S2	S3	S4	S4	S5	S6			
	18/12/08	8/09/09	8/09/09	18/12/08	08/09/09	18/12/08	08/09/09			
EC	0.67	0.7	0.36	0.71	0.7	0.33	0.51	0.33	0.71	**0.57**
pH	5.67	6.37	6.51	5.6	6.18	4.6	5.76	4.6	6.51	**5.8**
Tot P	0.41	0.85	0.73	0.93	3.0	0.34	0.24	0.24	3	**0.92**
PO4_P		0.57	0.37		0.35	0.14	0.18	0.14	0.57	**0.32**
TN	3.6	4.2	4.2	4.2	11	4	2.9	2.9	11	**4.9**
TKN		3.8	4.1		11	3.7	2.9	2.9	11	**5.1**
NO3		1.9	0.4		0.3	1.4	<0.1	<0.1	1.9	**1**

Date represents the day the sample was collected by field staff & not the specific date the sample bottle filled.

Excluding pH and EC (mS/cm) all other units are in mg/L

Results of interest:

- pH values are slightly acidic across the study area ranging between 5.24 and 6.48;
- TP results exceed the EPA trigger levels for the Serpentine River of 0.1mg/L. Results range between 0.24 mg/l at site (S6) to 3.0 mg/L at site (S4);
- The rising stage samples (Table 16) generally have higher nutrient concentrations than grab samples (Tables 7 to 15). For example at site S3 collected 8/9/09 TP was 0.73 mg/L (Table 16), whereas TP in grab samples was 0.31 and 0.24 mg/L on dates before and after (18/8 and 1/10/09). This is consistent with the first flush effect during runoff events.

3.0 CONCLUSIONS

- Continuous surface water monitoring has been conducted over a 14 month period 16/09/2008 through 21/10/2009 at locations S1 to S6 & S10.
- 2 additional monitoring locations S11 & S12 were installed on Lot 221 and were monitored monthly for water quality (nutrient & heavy metals) and point velocity discharge.
- No hydraulic controlling features were constructed at the monitoring locations. All monitoring sites were subject to open channel flows throughout the recorded stage range.
- Rainfall for Nambeelup was taken as an average of BoM sites 009976 (Pinjarra South) and 009977 (Mandurah) as Nambeelup is situated between the two meteorological sites.
- JDA conducted many discharge measurements over the monitoring period, most of which cover the lower to mid stage range.
- Rating curve extrapolation for sites S1, S2, S4 and S10 were calibrated to DoW peak recorded flow of 15.4m^3/s. Confidence Bands of 15% have been applied to all rating curves.
- Recorded peak flows range between 84L/s at S6 to 14280 L/s at S10.
- Rainfall runoff coefficients have been generated for flow monitoring sites.
- Site S6 has the highest average rainfall runoff coefficient of all the sites monitored (approx 75%) due to a high proportion of saturated catchment.
- S1, S5 and S10 have the next highest rainfall runoff coefficient (approx 25%). S1 & S10 monitor the Nambeelup Brook and represent realistic runoff coefficients for the catchment size and characteristics.
- Sites S3 & S5 continued to flow for the entire summer 2009, all the other sites dried out.
- The peak recorded flow at DoW gauging station 614063 Nambeelup Brook for winter 2009 was 15.4m^3/s. The peak recorded flow at S10 for winter 2009 was 14.3m^3/s, showing reasonable agreement.
- Surface water nutrient concentrations generally exceed EPI (2007) trigger values for the Serpentine River.
- The data in this report can be used to assist estimation of predevelopment (current) rainfall runoff coefficients and water quality.

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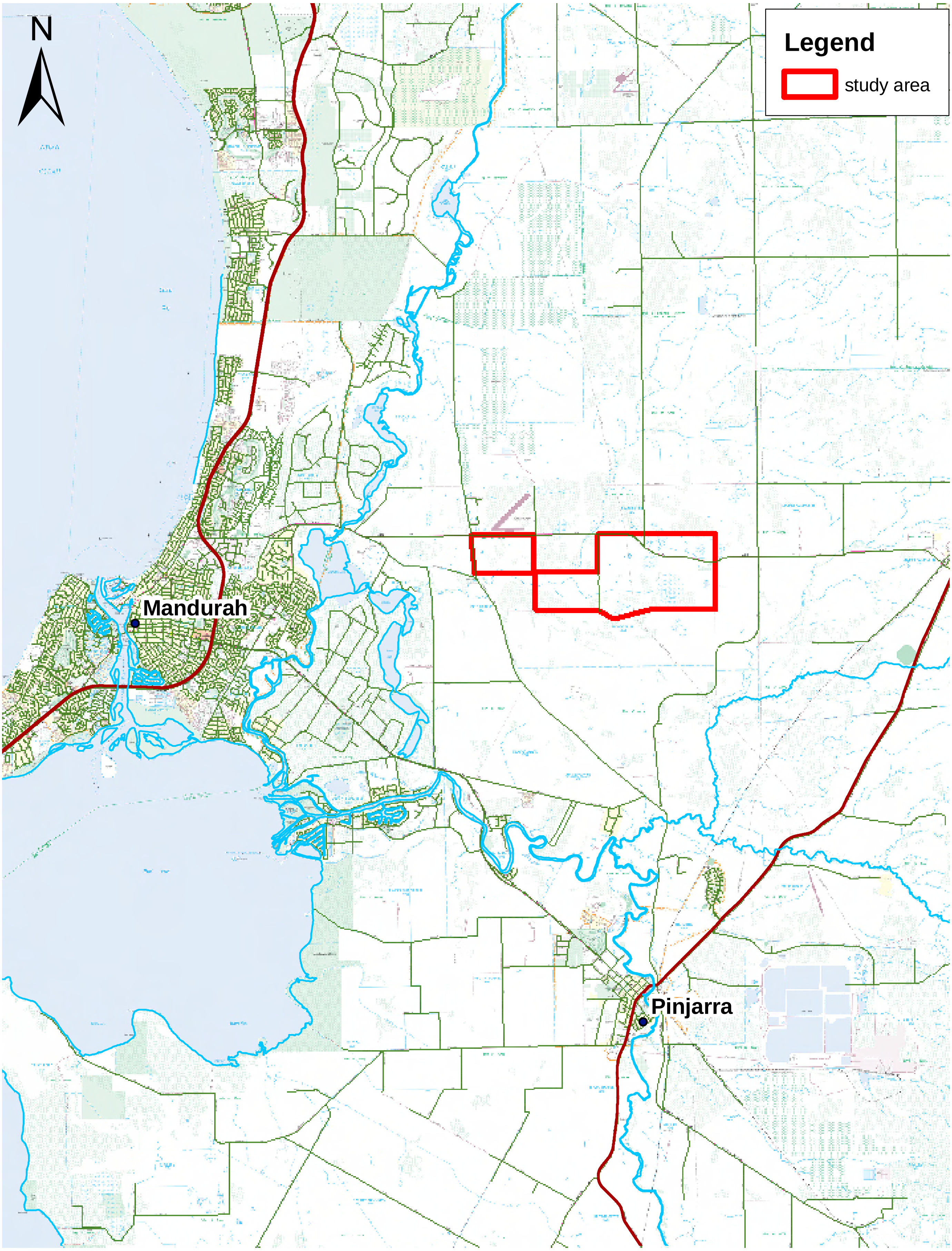
Figures



JDA Consultant Hydrologists

Job No. J4153

3 1.5 0 3 Kilometers

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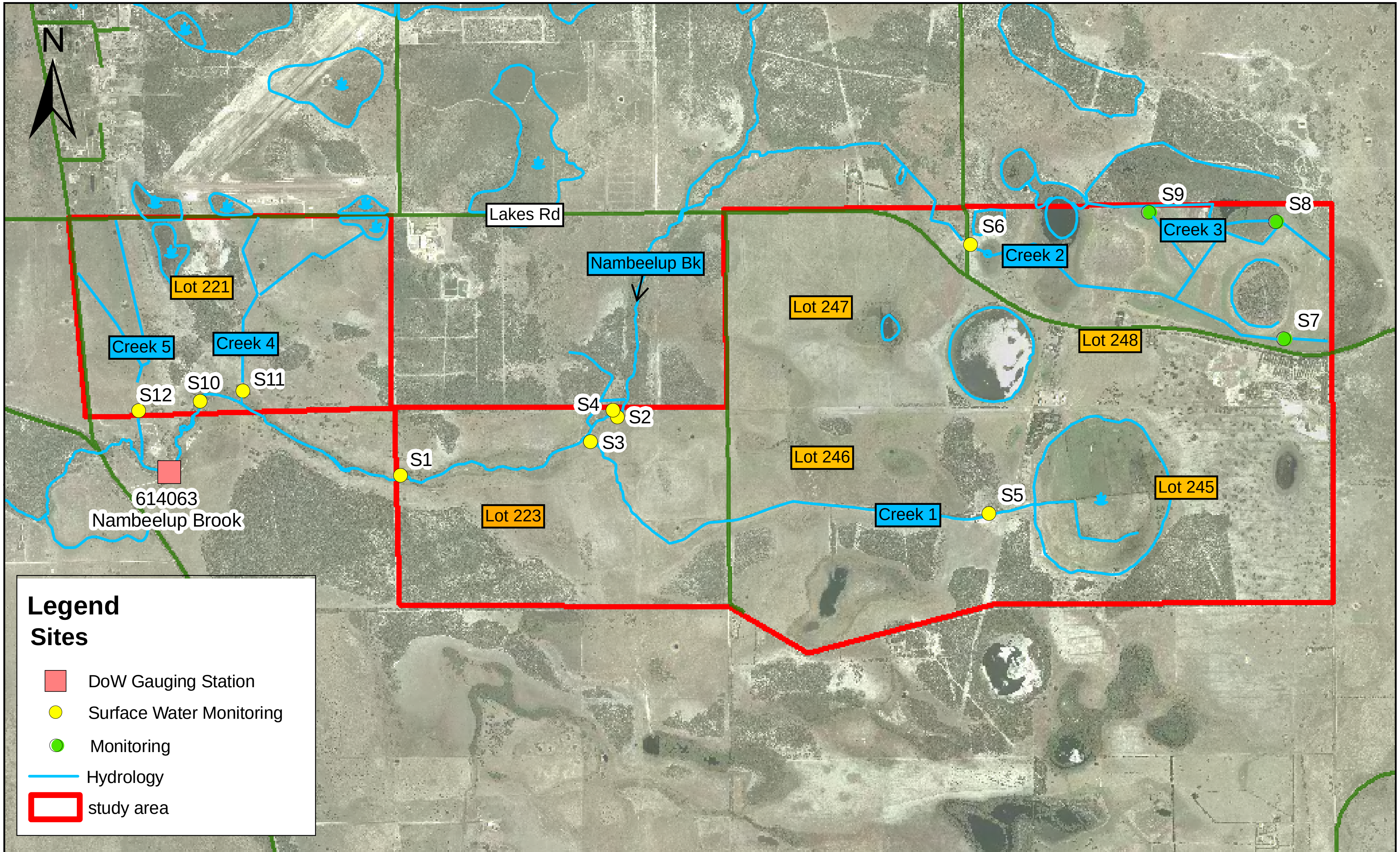
Nambeelup Surface Water Monitoring 2008/09

Figure 1 : Site Context Plan



JDA

Job No. J4153

0 0.3 0.6 1.2 1.8 2.4 Kilometers

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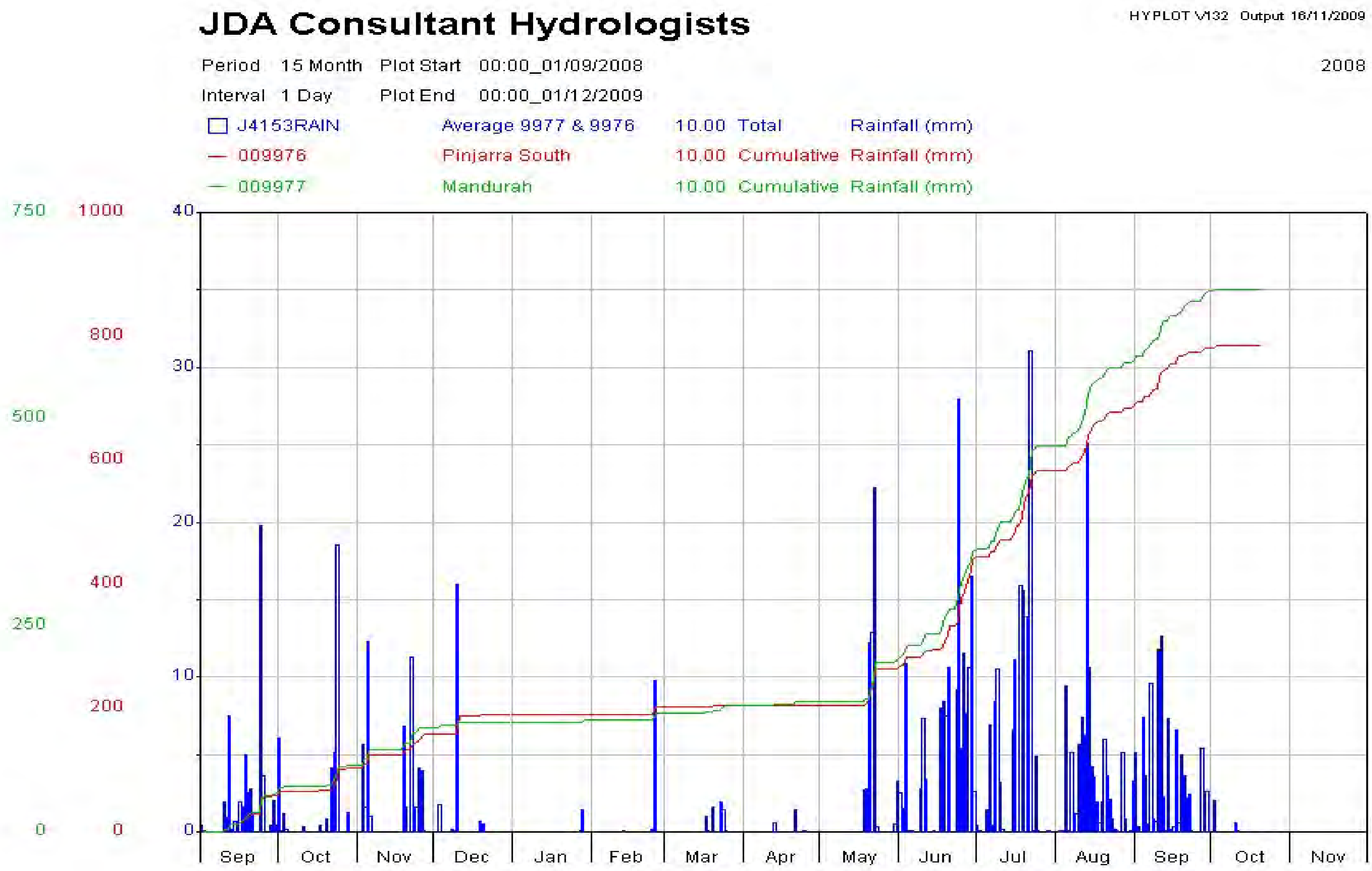
Lakes Rd Nambeelup Surface Water Monitoring 2008/09

Figure 2: Site Locations



Data Source: JDA HYDSTRA Database

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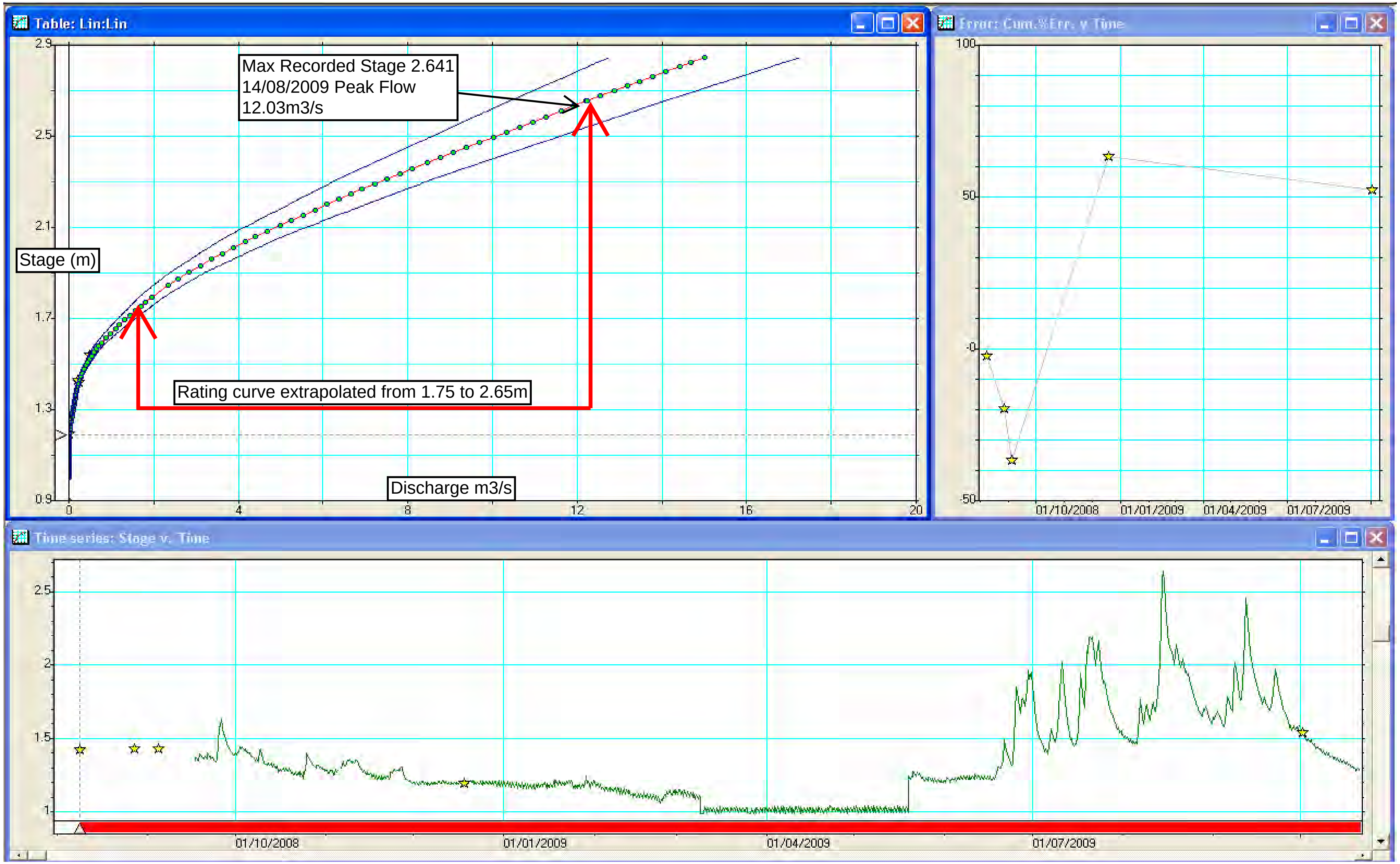
Figure 3: Average Daily Total Rainfall Vs Cumulative Total from BoM 9977 & 9976



Data Source: JDA HYDSTRA Database

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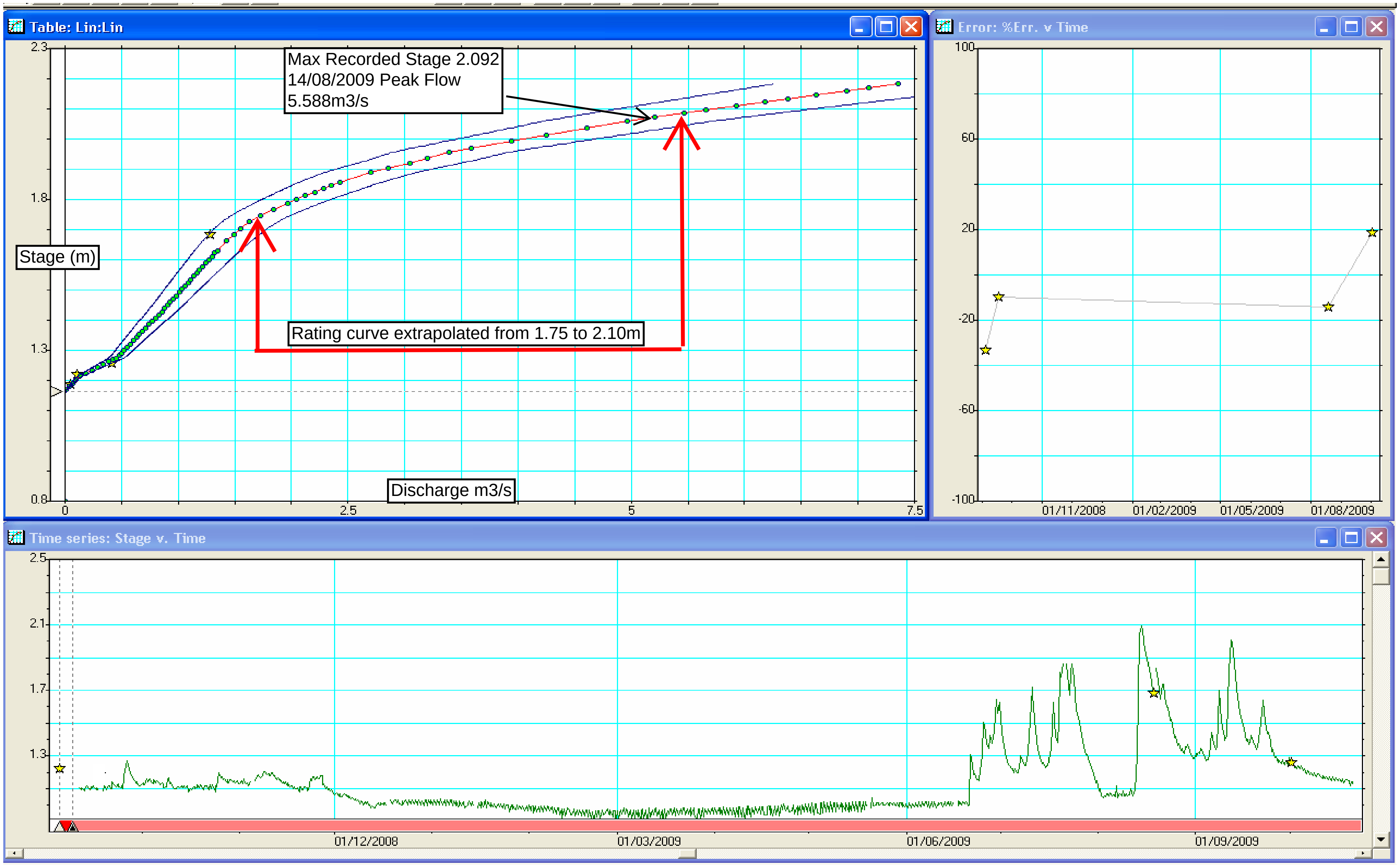
Figure 4: Rating Curve (S1)



Data Source: JDA HYDSTRA Database

Job No. J4153

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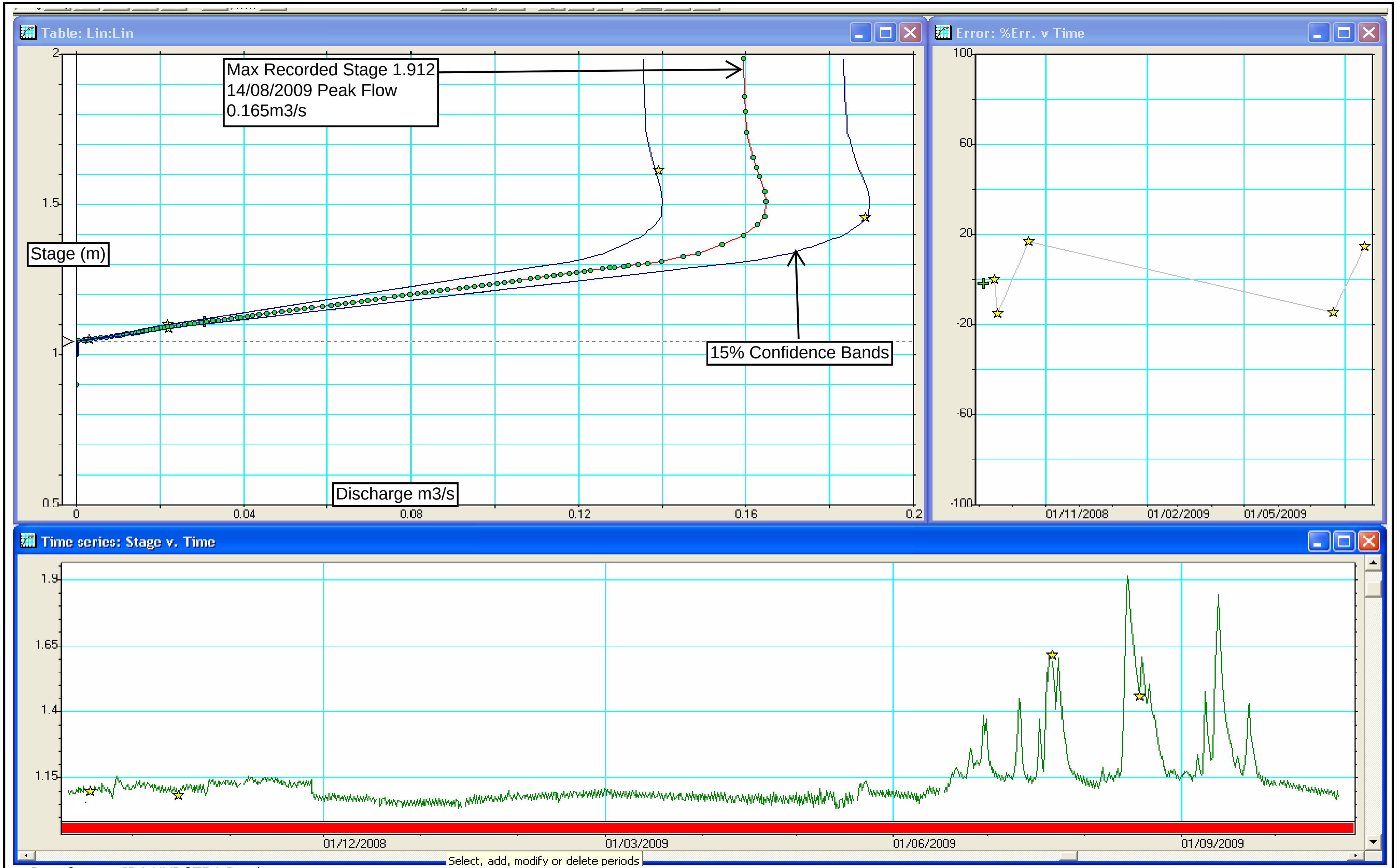
Figure 5: Rating Curve (S2)



Data Source: JDA HYDSTRA Database

Job No. J4153

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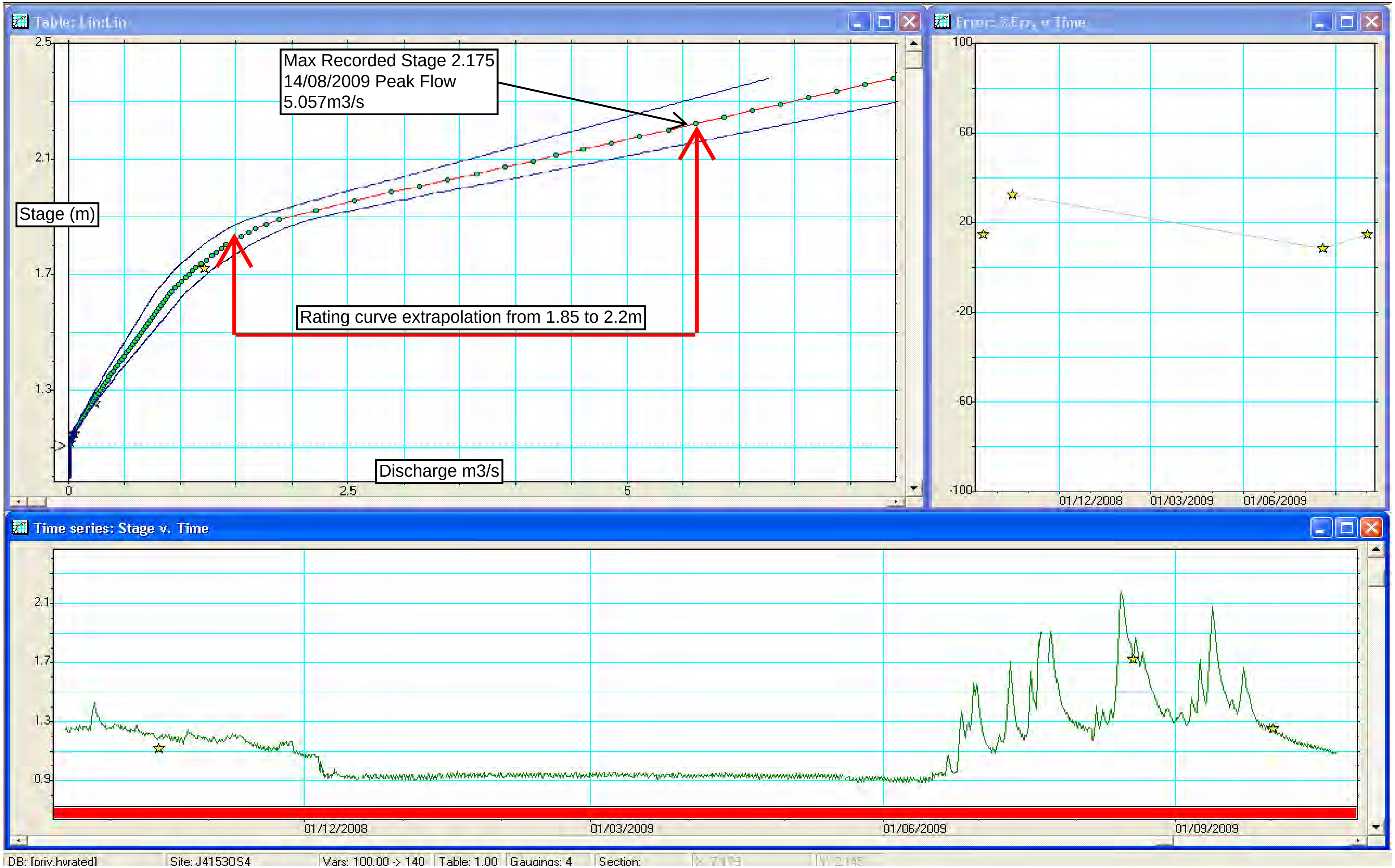
Figure 6: Rating Curve (S3)



Data Source: JDA HYDSTRA Database

Job No. J4153

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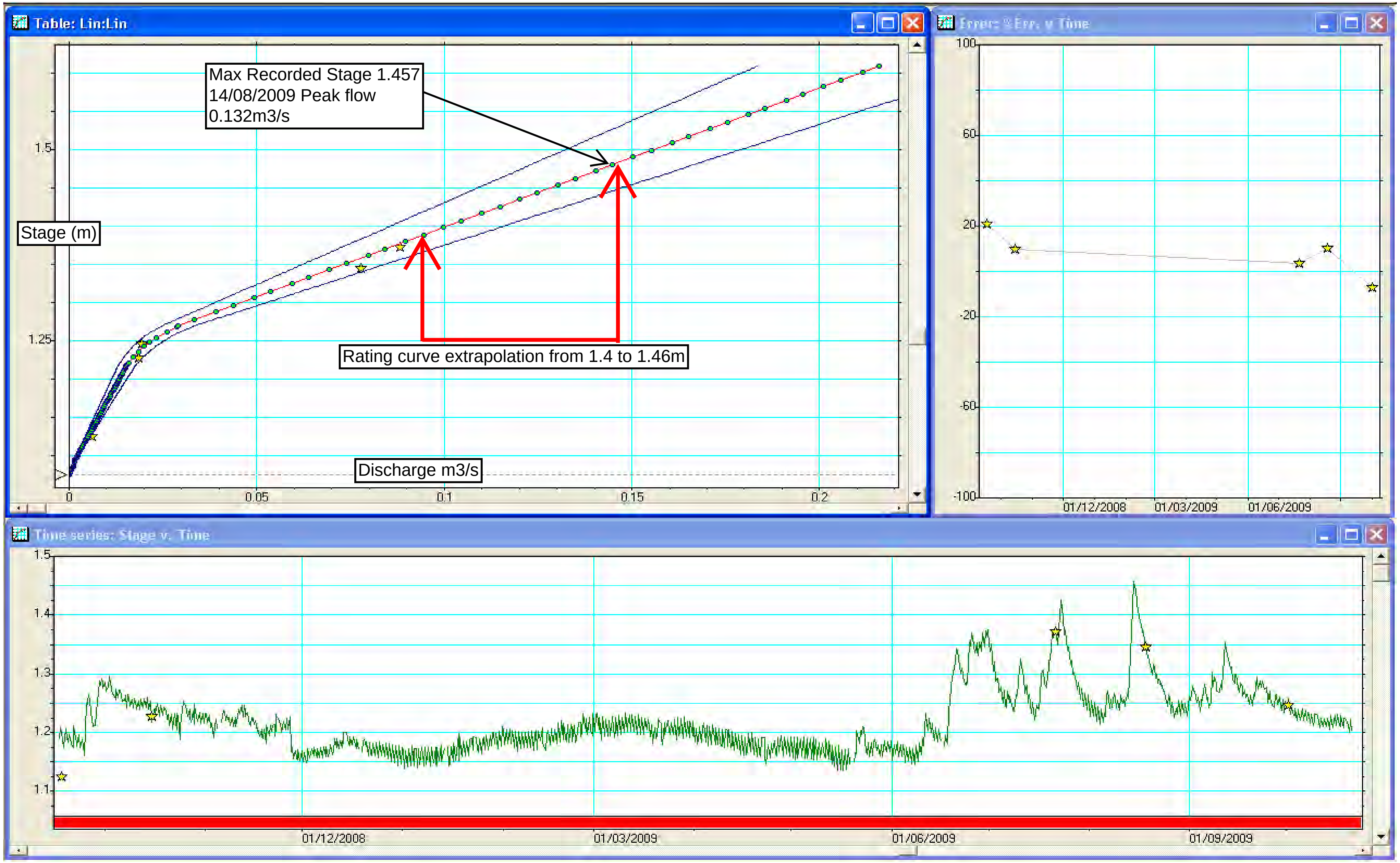
Figure 7: Rating Curve (S4)



Data Source: JDA HYDSTRA Database

Job No. J4153

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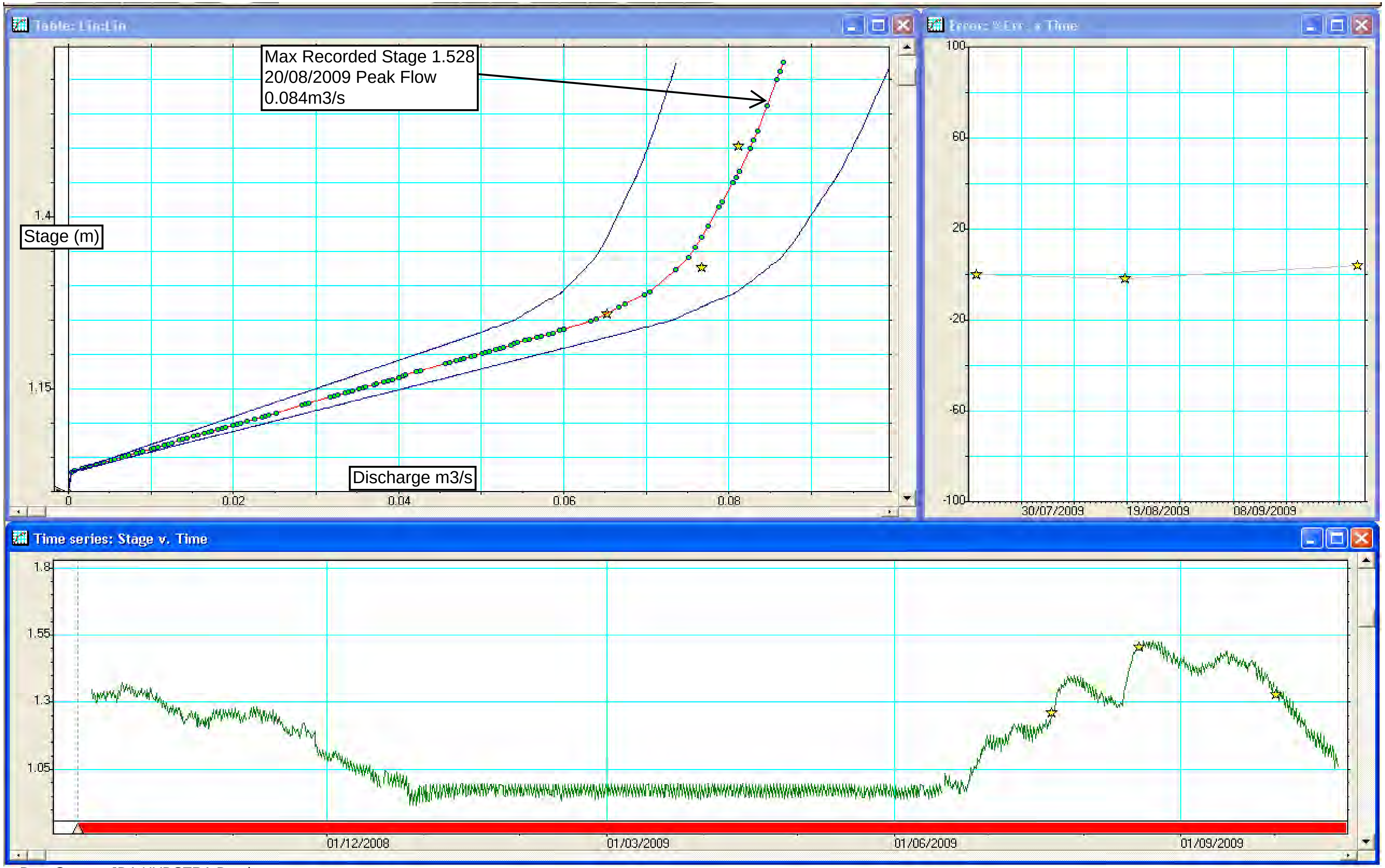
Figure 8: Rating Curve (S5)



Data Source: JDA HYDSTRA Database

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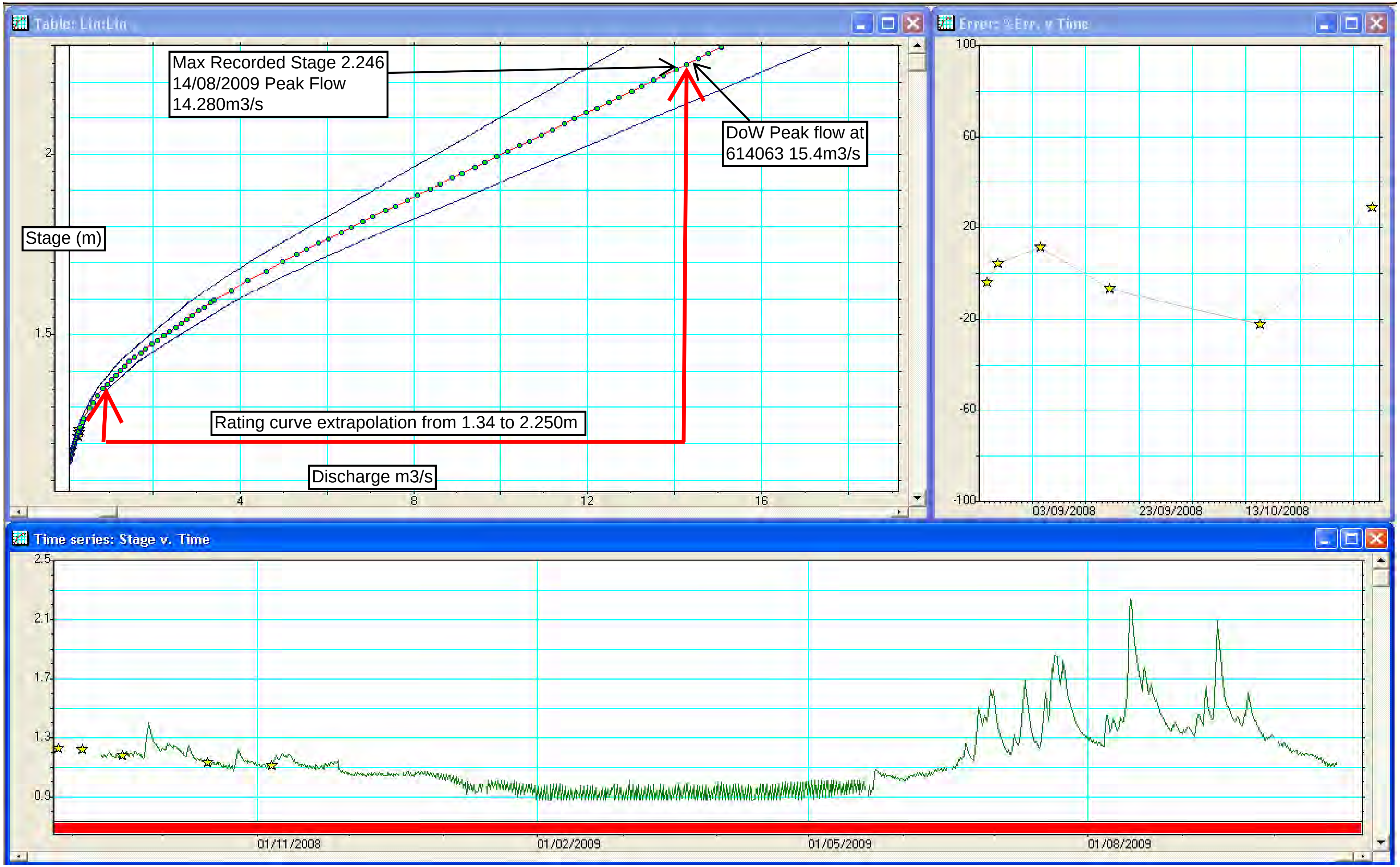
Figure 9: Rating Curve (S6)



Data Source: JDA HYDSTRA Database

Job No. J4153

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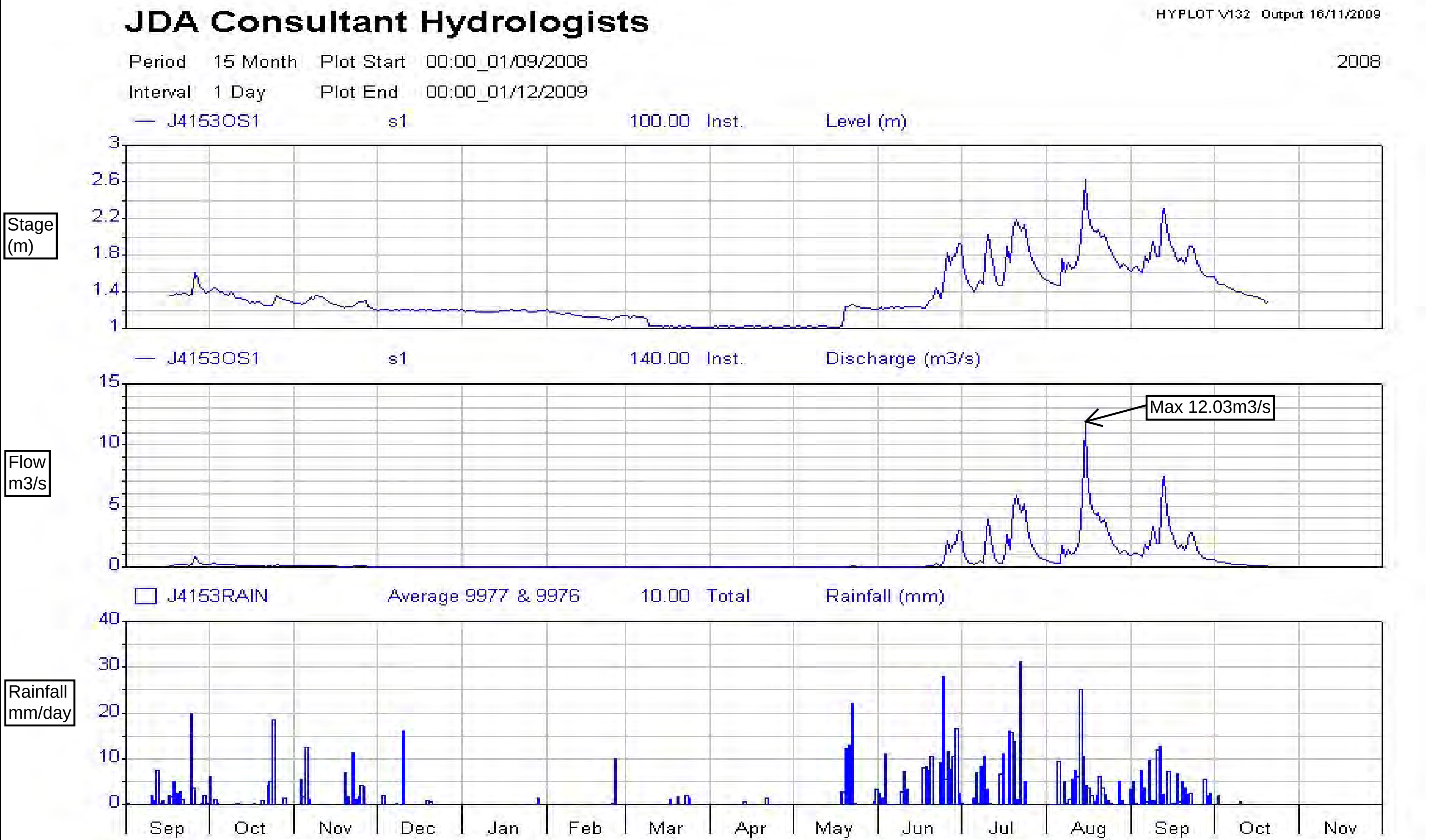
Figure 10: Rating curve 10



Data Source: JDA HYDSTRA Database

Job No. J4153

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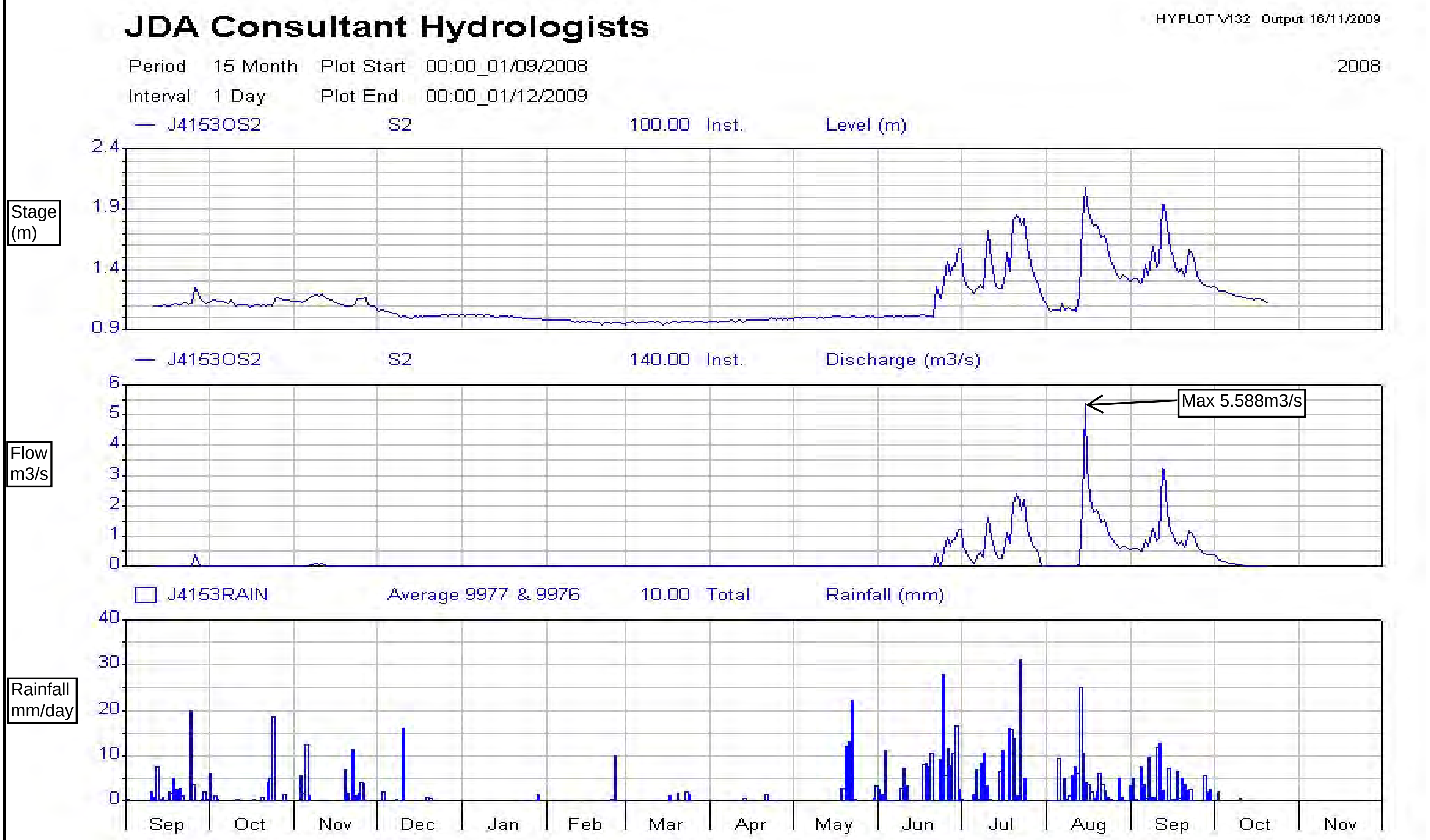
Figure 11: Stage, Discharge & Average Daily Total Rainfall (S1)



Data Source: JDA HYDSTRA Database

Job No. J4153

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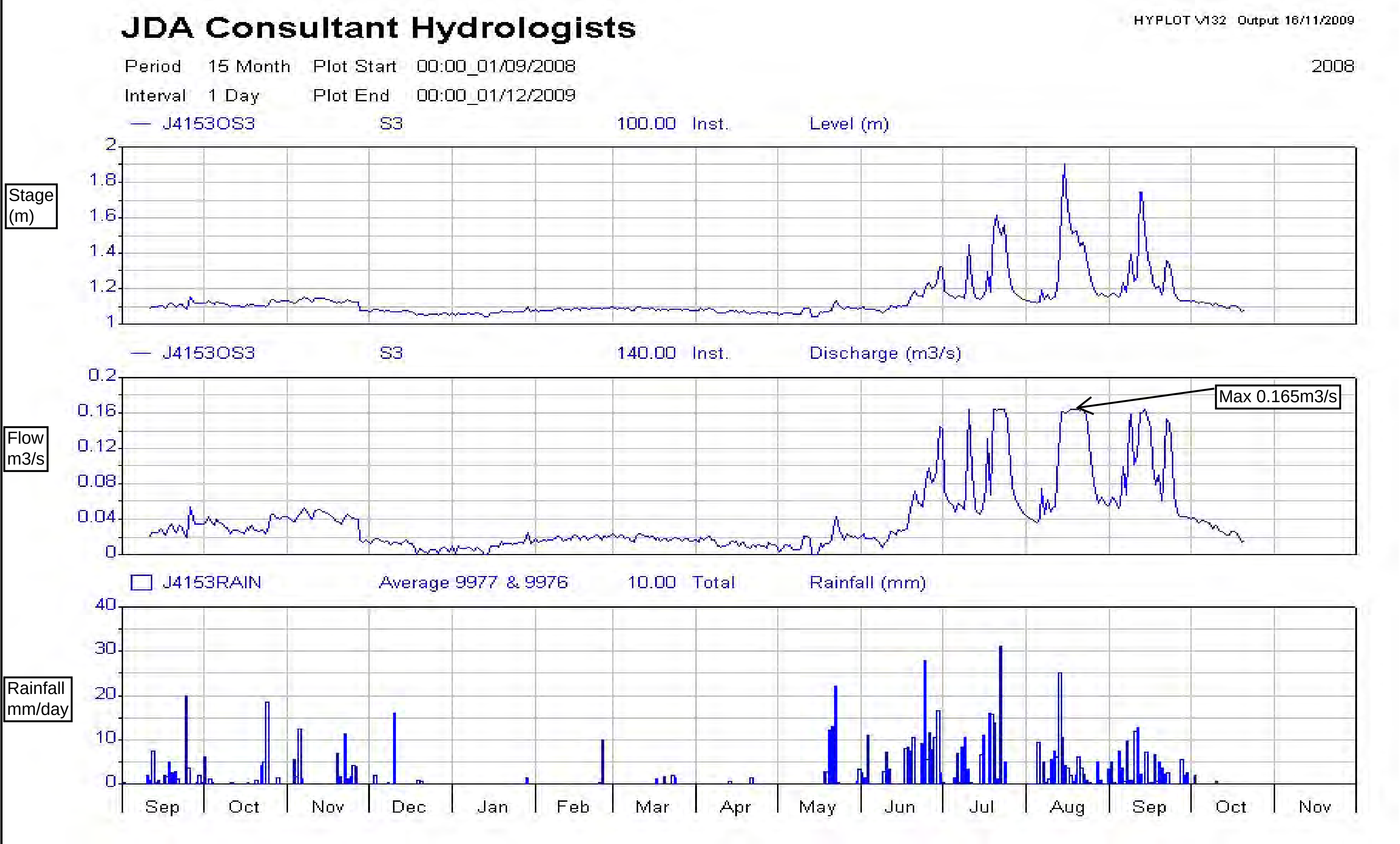
Figure 12: Stage, Discharge & Average Daily Total Rainfall (S2)



Data Source: JDA HYDSTRA Database

Job No. J4153

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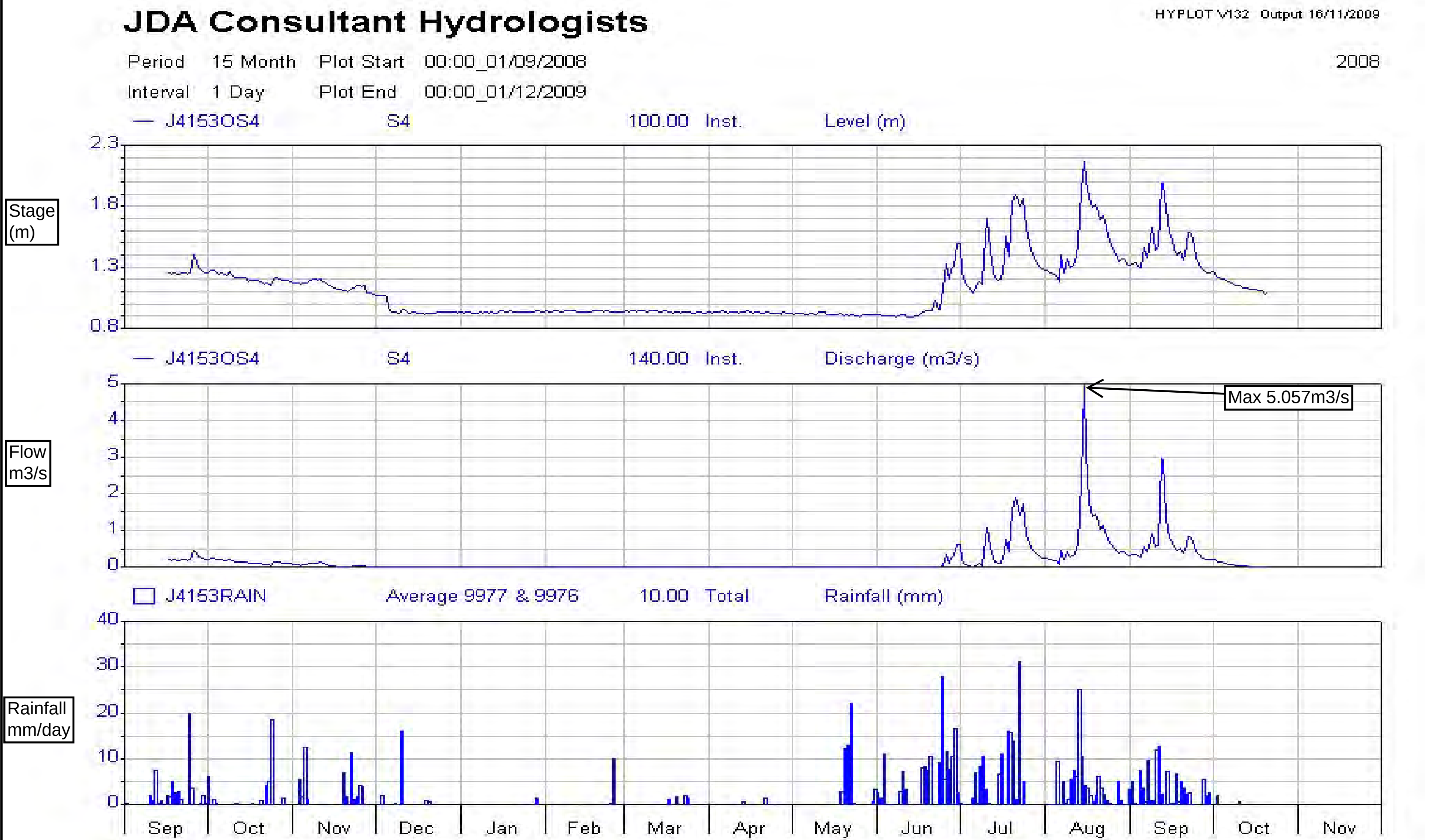
Figure 13: Stage, Discharge & Average Daily Total Rainfall (S3)



Data Source: JDA HYDSTRA Database

Job No. J4153

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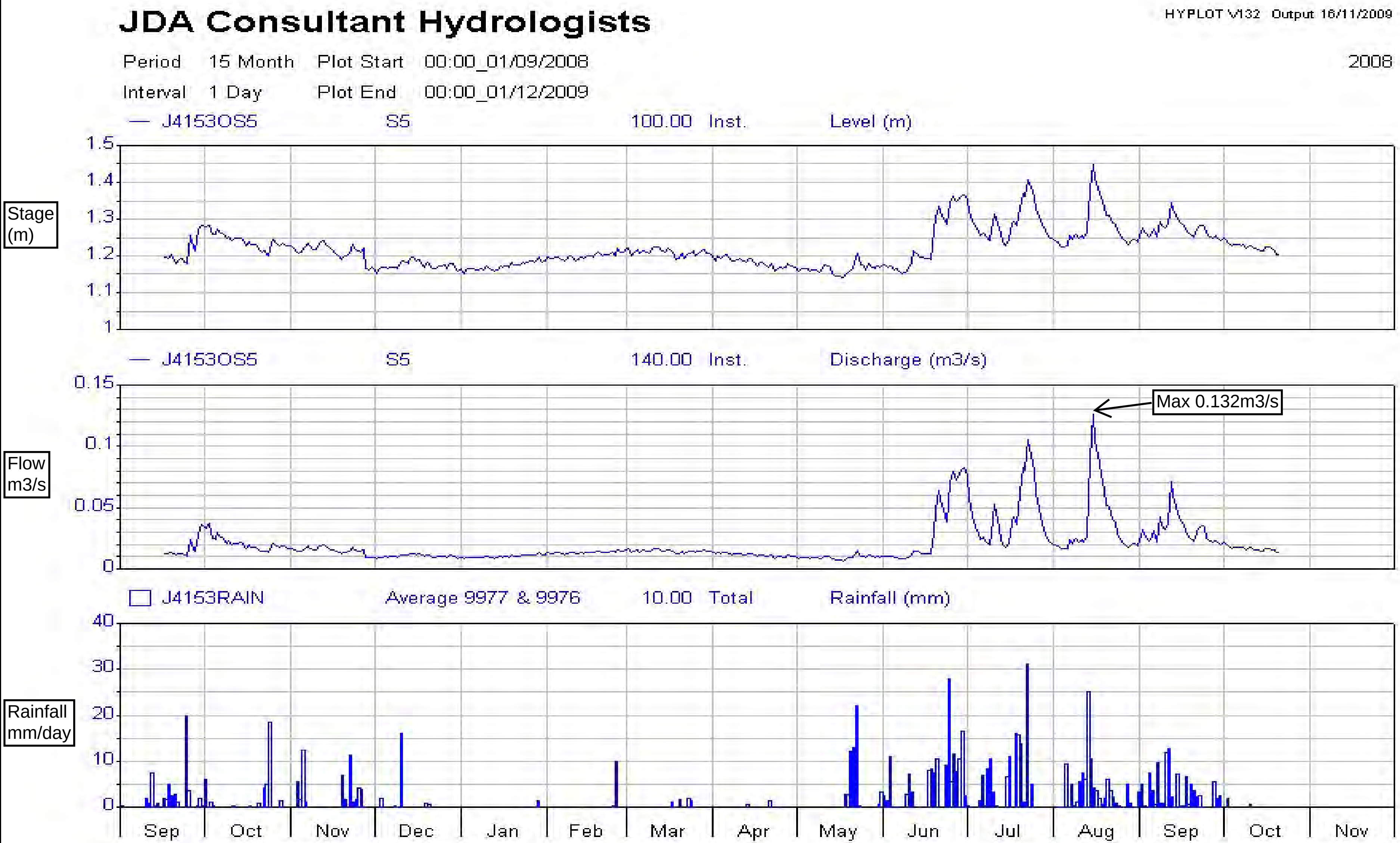
Figure 14: Stage, Discharge & Average Daily Total Rainfall (S4)



Data Source: JDA HYDSTRA Database

Job No. J4153

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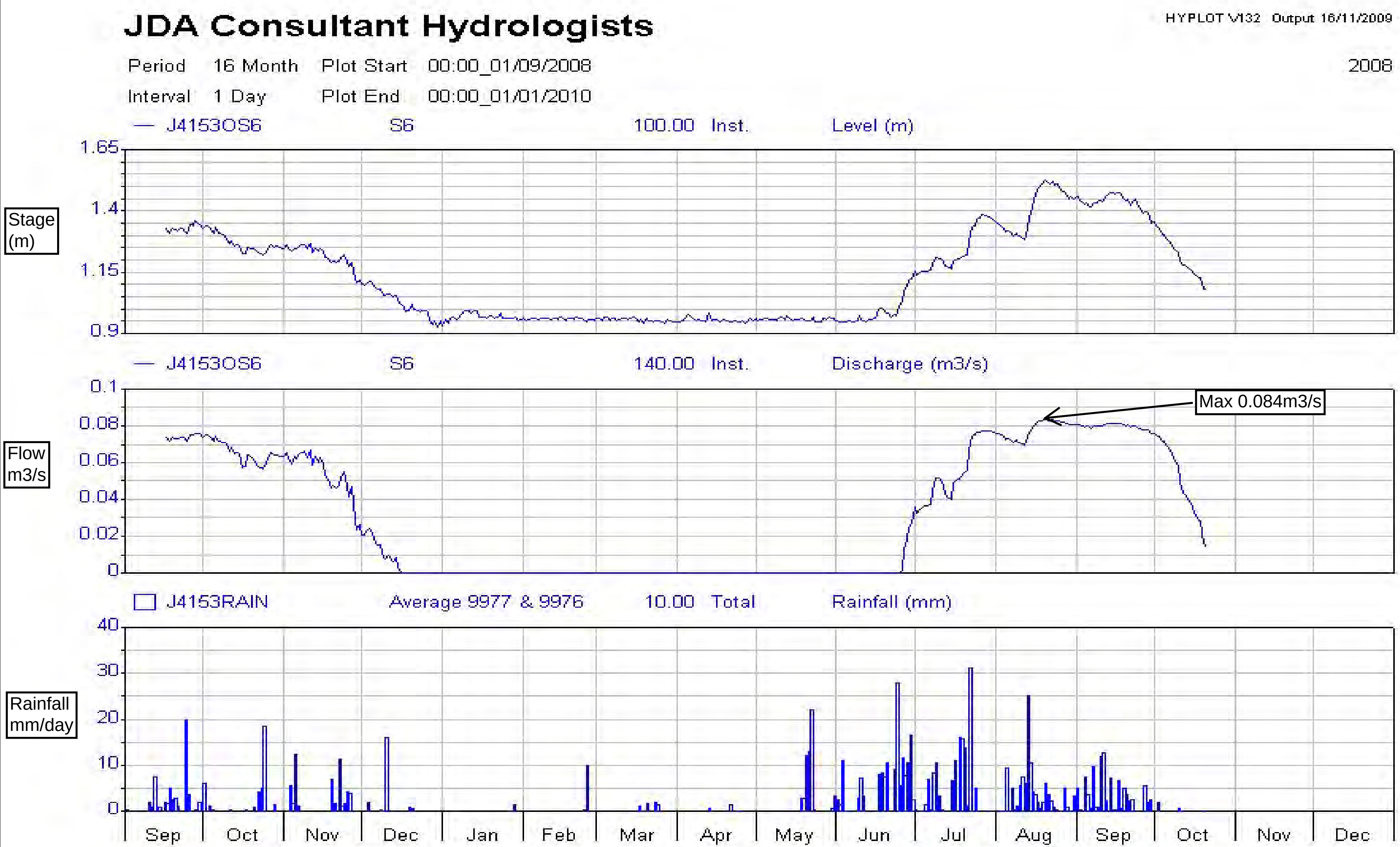
Figure 15: Stage, Discharge & Average Daily Total Rainfall (S5)



Data Source: JDA HYDSTRA Database

Job No. J4153

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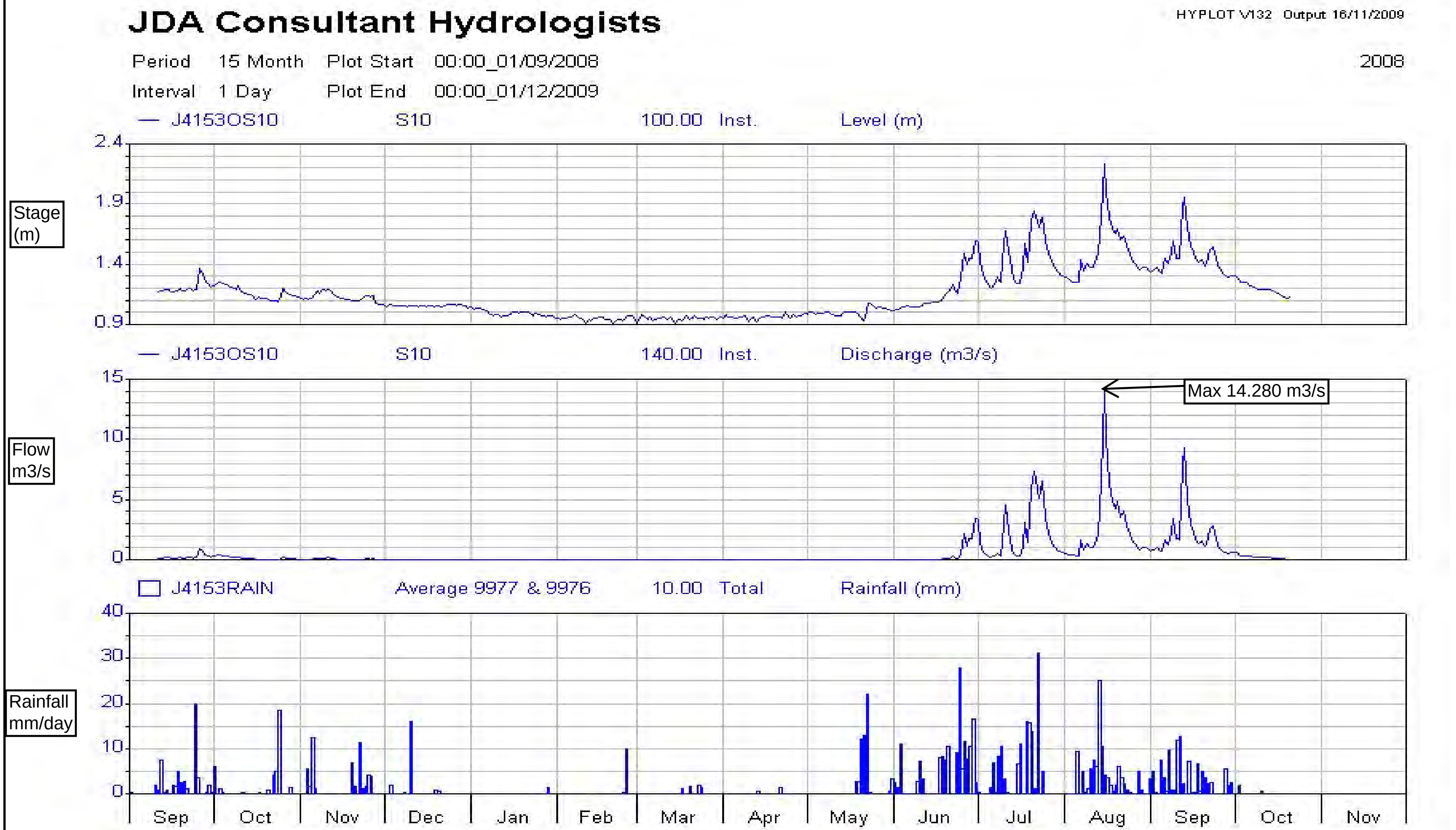
Figure 16: Stage, Discharge & Average Daily Total Rainfall (S6)



Data Source: JDA HYDSTRA Database

Job No. J4153

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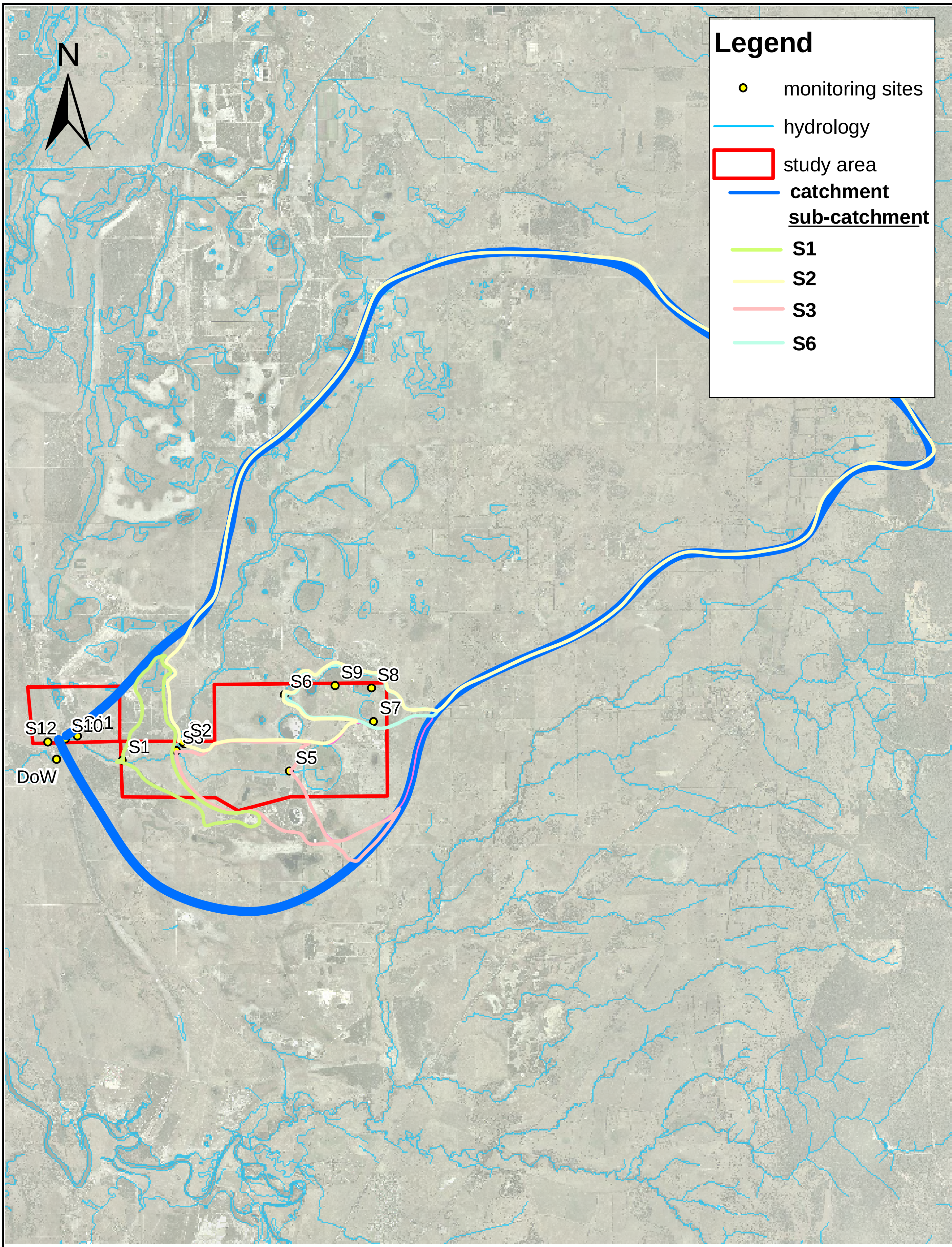
Lakes Rd, Nambeelup: Surface Water Monitoring 2008/09

Figure 17: Stage, Discharge & Average Daily Total Rainfall (S10)



Job No. J4153

0 0.5 1 2 3 4 Kilometers

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Nambeelup Surface Water Monitoring 2008/09

Figure 18: Catchment and Sub-catchment Areas

APPENDIX A

Site Photos 2008 & 2009

SITE S3 PHOTOS

4/09/2008

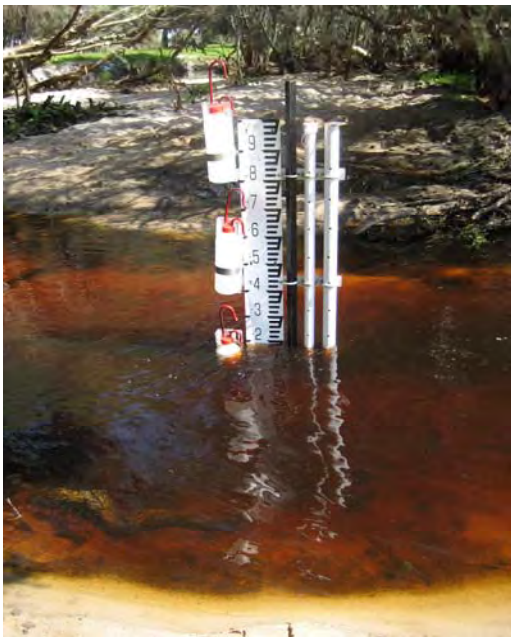
25/09/2008

15/10/2008

Data Source:

JDA	Job No. J4153 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2008	Twin Ocean Property LTD Nambeelup Surface Water Monitoring 2008/09 **Appendix A:Site Photos S3 2008**

SITE S4 PHOTOS



4/09/2008

25/09/2008

15/10/2008

Data Source:

Job No. J4153

Twin Ocean Property LTD
Nambeelup Surface Water Monitoring 2008/09
Appendix A: Site Photos S4 2008

SITE S5 PHOTOS

29/09/2008

15/10/2008

15/10/2008

Data Source:

JDA	Job No. J4153 	Twin Ocean Property LTD Nambeelup Surface Water Monitoring 2008/09 **Appendix A: Site Photos S5 2008**

SITE S10 PHOTOS

Data Source:

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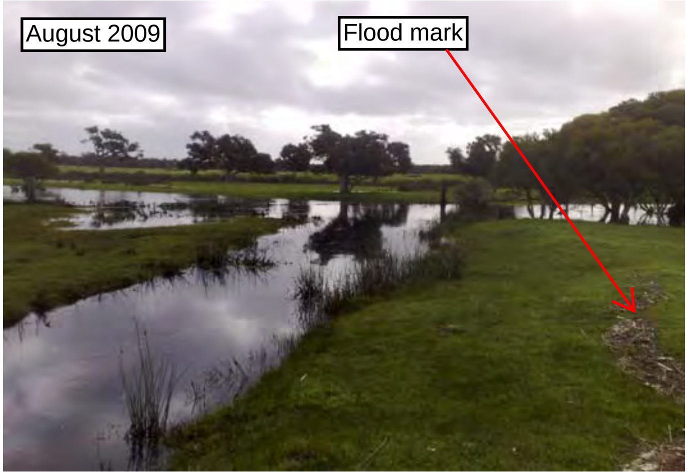
Site S1 Photos 2009

Job No. J4153

Twin Ocean Property Ltd
Nambeelup Surface Water Monitoring 2008/09
Appendix A: Site S1 Photos 2009

Site S3 Photos

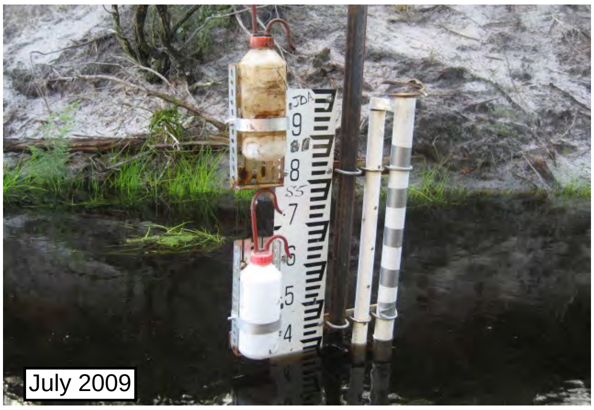


Data Source:

JDA	Job No. J4153 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2009	Twin Ocean Property Ltd Nambeelup Surface Water Monitoring 2008/09 **Appendix A: Site S3 Photos 2009**

Site S5, S11 & S12 Photos

S5



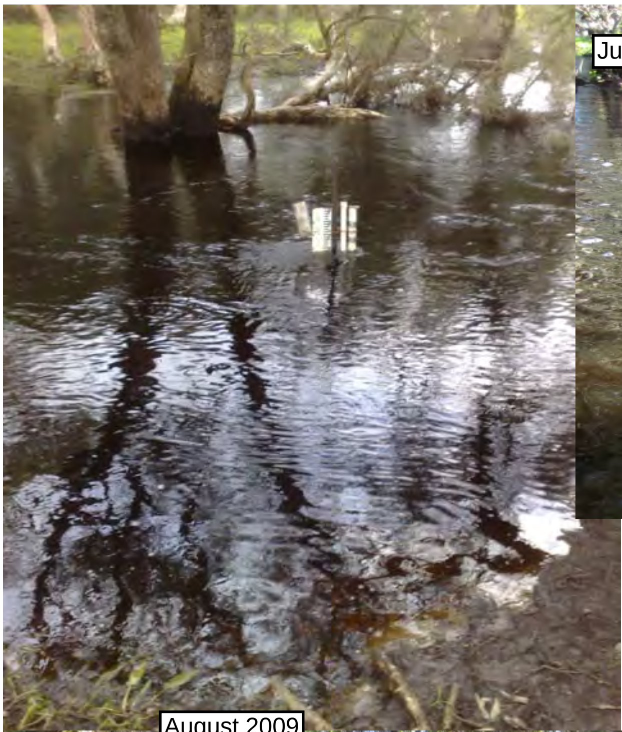
July 2009

S11

August 2009

S12

Site S2 & S4 Photos



July 2009

July 2009

August 2009

August 2009

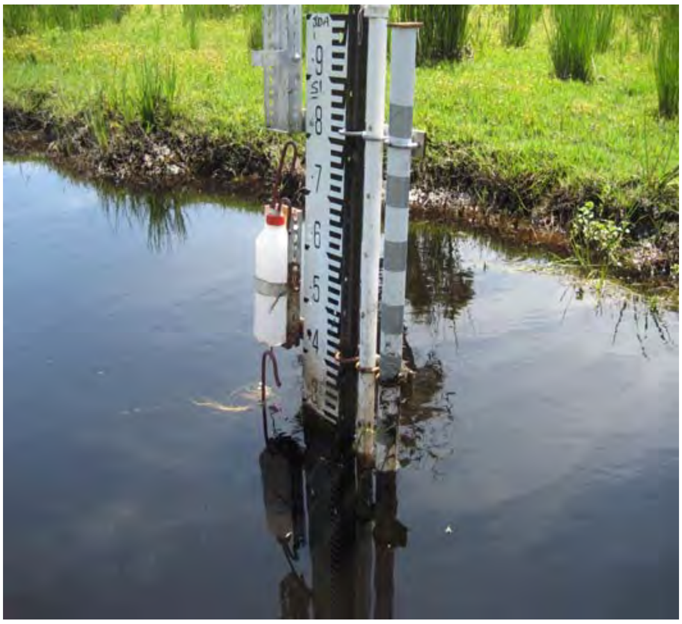
Data Source:

JDA Consultant Hydrologists	Job No. J4153 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2009	Twin Ocean Property Ltd Nambeelup Surface Water Monitoring 2008/09 **Appendix A: Site S2 & S4 Photos 2009**

SITE S1 PHOTOS

4/09/2008

19/09/2008



15/10/2008

Site S6 Photos

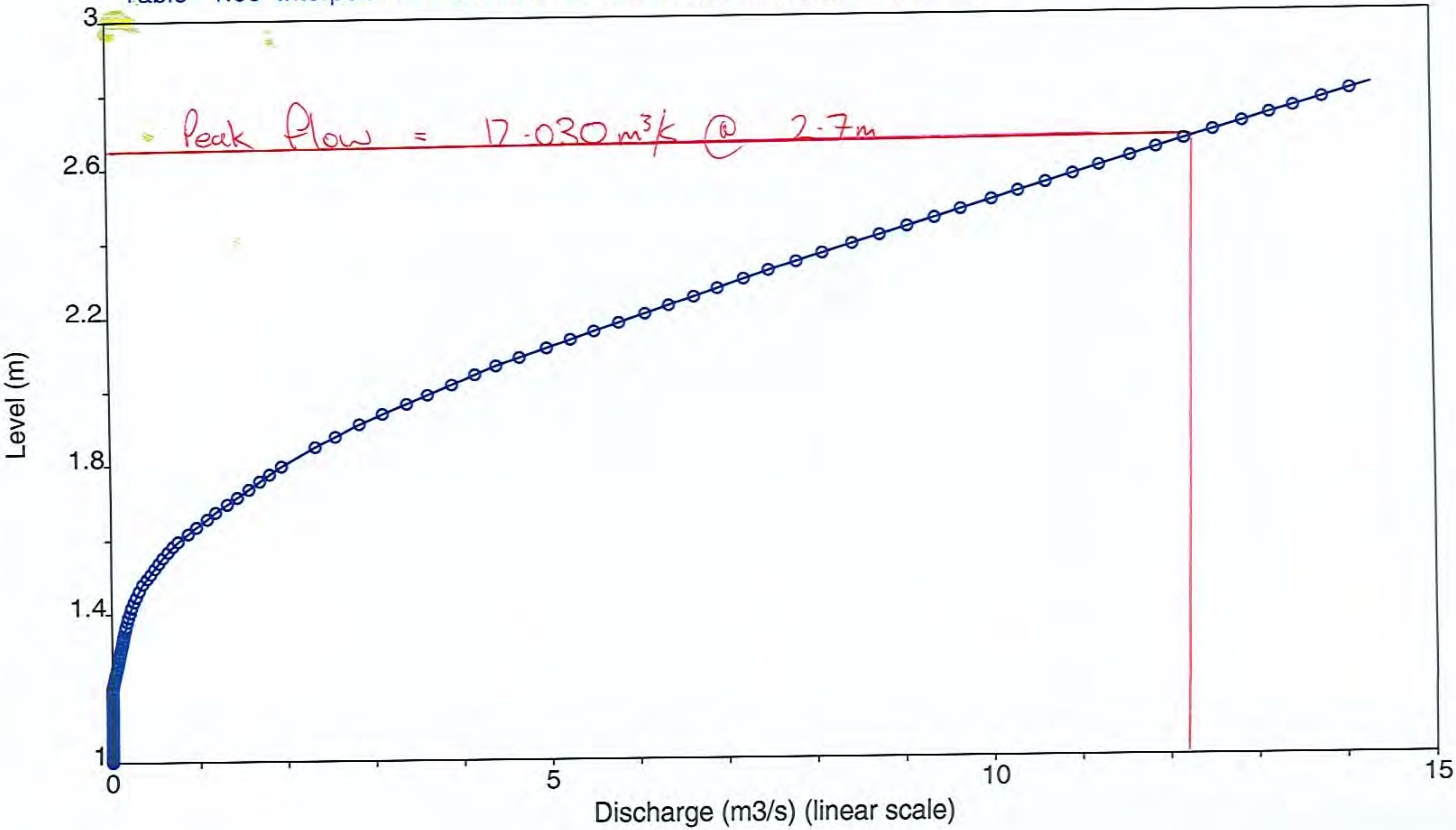
APPENDIX B

Hydstra Outputs

JDA Consultant Hydrologists

Site	J4153OS1	Nambeelup Lot 221
VarFrom	100	Stream Water Level in Metres
VarTo	140	Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.1935 08/08/2008 to Present



Site J41530S1 Nambeelup Lot 221

Rating Table 1.00 08/08/2008 to Present Interpolation = Lin CTF = 1.1120

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.10	0.0	0.0	0.0000201	0.0000446	0.0000743	0.000120	0.000176	0.000291	0.000568	0.000961
1.20	0.00332	0.0130	0.0223	0.0308	0.0405	0.0502	0.0599	0.0693	0.0788	0.0873
1.30	0.0967	0.106	0.116	0.124	0.134	0.143	0.153	0.163	0.177	0.190
1.40	0.204	0.217	0.232	0.250	0.271	0.291	0.311	0.333	0.356	0.391
1.50	0.423	0.454	0.486	0.517	0.548	0.580	0.619	0.658	0.695	0.741
1.60	0.792	0.847	0.900	0.952	1.01	1.07	1.12	1.17	1.23	1.30
1.70	1.36	1.42	1.49	1.55	1.61	1.67	1.73	1.79	1.85	1.92
1.80	1.99	2.06	2.14	2.21	2.29	2.37	2.45	2.54	2.62	2.70
1.90	2.79	2.87	2.97	3.07	3.17	3.27	3.37	3.47	3.57	3.67
2.00	3.77	3.87	3.97	4.07	4.17	4.27	4.38	4.49	4.61	4.74
2.10	4.87	4.99	5.11	5.23	5.36	5.48	5.60	5.73	5.85	5.98
2.20	6.10	6.22	6.34	6.46	6.59	6.72	6.84	6.96	7.08	7.20
2.30	7.33	7.45	7.59	7.73	7.87	8.00	8.13	8.27	8.41	8.55
2.40	8.69	8.83	8.97	9.11	9.25	9.39	9.53	9.66	9.80	9.95
2.50	10.1	10.2	10.4	10.5	10.6	10.8	10.9	11.1	11.2	11.3
2.60	11.5	11.6	11.7	11.9	12.0	12.2	12.3	12.5	12.6	12.7
2.70	12.9	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.0	14.2
2.80	14.3	14.5	14.6	14.8	14.9					

------------------ Notes -------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

Site J41530S1 Nambeelup Lot 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2008
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.205	0.077	0.002	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.256	0.076	0.002	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.253	0.067	0.003	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.224	0.077	0.005	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.210	[ ]M	0.002	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.185	0.120	0.001	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.162	0.120	0.002	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.153	0.137	0.002	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.227	0.144	0.003	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.150	0.136	0.007	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.122	0.141	0.007	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.120	0.110	0.004	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.117	0.084	0.003	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.108	0.068	0.003	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.088	0.062	0.002	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.083	0.053	0.003	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.154	0.088	0.042	0.003	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.164	0.086	0.035	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.172	0.082	0.031	0.003	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.168	0.064	0.033	0.012	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.179	0.060	0.038	0.006	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.170	0.059	0.040	0.002	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.156	0.057	0.068	0.003	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.149	0.064	0.081	0.003	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.571	0.175	0.084	0.005	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.822	0.142	0.090	0.004	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.416	0.118	0.069	0.004	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.267	0.107	0.027	0.004	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.218	0.105	0.014	0.003	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.198	0.097	0.004	0.004	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.087		0.004	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.272	0.131	0.073	0.004	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.176	0.117	0.069	0.003	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.822	0.256	0.144	0.012	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.149	0.057	0.004	0.001	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.010	0.283	0.155	0.020	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.137	0.030	0.001	0.000	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

Summaries

Annual Mean	0.097
Ann. Median	0.077
Missing Days	262

	Maximum	Minimum
Daily Mean	0.822	0.001
Instant	1.010	0.000

JDA Consultant Hydrologists

HYDAY V106 Output 16/11/2009

Site J41530S1 Nambeelup Lot 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.002	0.003	0.000	0.000	0.000	0.022	2.063	0.479	1.010	[ ]M	[ ]	[ ]	1
2	0.002	0.001	0.000	0.000	0.000	0.021	0.911	0.429	1.186	0.428	[ ]	[ ]	2
3	0.001	0.000	0.000	0.000	0.000	0.020	0.448	0.391	1.041	0.400	[ ]	[ ]	3
4	0.001	0.000	0.000	0.000	0.000	0.023	0.295	0.349	0.781	0.368	[ ]	[ ]	4
5	0.001	0.000	0.000	0.000	0.000	0.027	0.234	0.332	1.277	0.311	[ ]	[ ]	5
6	0.001	0.000	0.000	0.000	0.000	0.031	0.244	0.926	1.738	0.268	[ ]	[ ]	6
7	0.001	0.000	0.000	0.000	0.000	0.035	0.550	1.280	1.539	0.241	[ ]	[ ]	7
8	0.001	0.000	0.000	0.000	0.000	0.037	0.426	0.976	3.396	0.221	[ ]	[ ]	8
9	0.001	0.000	0.000	0.000	0.000	0.033	0.724	1.350	2.458	0.203	[ ]	[ ]	9
10	0.000	0.000	0.000	0.000	0.000	0.035	2.698	1.024	1.806	0.195	[ ]	[ ]	10
11	0.000	0.000	0.000	0.000	0.000	0.040	3.215	1.449	3.855	0.175	[ ]	[ ]	11
12	0.001	0.000	0.000	0.000	0.000	0.038	1.489	1.463	8.600	0.164	[ ]	[ ]	12
13	0.001	0.000	0.000	0.000	0.000	0.034	0.691	3.327	5.884	0.155	[ ]	[ ]	13
14	0.001	0.000	0.000	0.000	0.000	0.034	0.406	10.72	3.687	0.146	[ ]	[ ]	14
15	0.001	0.000	0.000	0.000	0.000	0.033	0.309	10.05	2.743	0.139	[ ]	[ ]	15
16	0.001	0.000	0.000	0.000	0.000	0.032	0.528	6.524	2.248	0.128	[ ]	[ ]	16
17	0.001	0.000	0.000	0.000	0.000	0.027	2.615	4.898	1.766	0.119	[ ]	[ ]	17
18	0.006	0.000	0.000	0.000	0.000	0.051	1.914	4.053	1.713	0.106	[ ]	[ ]	18
19	0.004	0.000	0.000	0.000	0.017	0.098	2.916	4.981	1.577	0.097	[ ]	[ ]	19
20	0.002	0.000	0.000	0.000	0.032	0.110	5.320	3.913	1.388	0.084	[ ]	[ ]	20
21	0.001	0.000	0.000	0.000	0.056	0.294	5.751	3.952	2.062	[ ]	[ ]	[ ]	21
22	0.006	0.000	0.000	0.000	0.056	0.195	4.402	3.428	3.176	[ ]	[ ]	[ ]	22
23	0.010	0.000	0.000	0.000	0.056	0.130	5.067	3.004	2.256	[ ]	[ ]	[ ]	23
24	0.001	0.000	0.000	0.000	0.033	0.194	4.097	2.352	1.777	[ ]	[ ]	[ ]	24
25	0.000	0.000	0.000	0.000	0.024	1.819	2.746	1.869	1.260	[ ]	[ ]	[ ]	25
26	0.000	0.000	0.000	0.000	0.025	1.717	2.083	1.518	0.910	[ ]	[ ]	[ ]	26
27	0.000	0.000	0.000	0.000	0.023	1.531	1.470	1.227	0.703	[ ]	[ ]	[ ]	27
28	0.001	0.000	0.000	0.000	0.019	1.708	1.105	1.223	0.671	[ ]	[ ]	[ ]	28
29	0.019		0.000	0.000	0.015	2.863	0.827	1.391	0.646	[ ]	[ ]	[ ]	29
30	0.001		0.000	0.000	0.013	3.082	0.651	1.076	0.673	[ ]	[ ]	[ ]	30
31	0.003		0.000		0.012		0.553	0.883		[ ]		[ ]	31
Mean	0.002	0.000	0.000	0.000	0.012	0.477	1.831	2.608	2.128	0.208	[ ]	[ ]	
Median	0.001	0.000	0.000	0.000	0.000	0.038	1.105	1.449	1.725	0.175	[ ]	[ ]	
Max.Daily Mean	0.019	0.003	0.000	0.000	0.056	3.082	5.751	10.72	8.600	0.428	[ ]	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.020	0.234	0.332	0.646	0.084	[ ]	[ ]	
Inst.Max	0.053	0.014	0.000	0.000	0.079	3.456	6.031	12.03	9.456	0.466	[ ]	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.006	0.201	0.317	0.591	0.074	[ ]	[ ]	
Missing Days	0	0	0	0	0	0	0	0	0	12	30	31	

Summaries

Annual Mean	0.754
Ann. Median	0.022
Missing Days	73

	Maximum	Minimum
Daily Mean	10.72	0.000
Instant	12.03	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 16/11/2009

Site J41530S1 Nambeelup Lot 221 Year 2008
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17720	6612	146.8	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	22078	6598	147.0	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	21836	5771	265.9	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	19350	6691	452.3	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	18104	[ ]M	172.7	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15970	10358	115.7	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13975	10370	161.0	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13259	11840	203.6	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	19635	12404	295.9	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12930	11756	599.0	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	10532	12219	636.6	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	10391	9470	362.0	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	10078	7256	246.7	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	9365	5903	219.6	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	7610	5329	211.9	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	7153	4604	269.8	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13284	7641	3656	218.2	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14148	7401	2985	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14902	7110	2704	260.9	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14509	5503	2862	1055	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15481	5213	3300	557.8	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14656	5056	3491	153.6	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13501	4953	5884	298.5	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12861	5554	6975	285.5	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	49334	15159	7250	418.9	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	71039	12242	7780	323.4	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	35904	10181	5931	306.6	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	23068	9244	2312	370.2	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	18792	9044	1178	300.9	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17083	8409	369.4	353.1	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		7490		361.7	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	23469	11296	6340	325.7	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15191	10078	5931	290.7	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	71039	22078	12404	1055	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12861	4953	369.4	115.7	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	328568	350203	183874	9773	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

Summaries

Annual Mean	8388
Ann. Median	6652
Annual Total	872418
Missing Days	262

	Maximum	Minimum
Daily	71039	115.7

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

Site J41530S1 Nambeelup Lot 221 Year 2009
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	186.4	244.6	5.8	0.0	0.0	1878	178236	41376	87224	[ ]M	[ ]	[ ]	1
2	162.9	48.1	5.7	0.0	0.0	1800	78671	37023	102502	36987	[ ]	[ ]	2
3	121.7	27.5	2.4	0.0	0.0	1739	38716	33750	89957	34541	[ ]	[ ]	3
4	91.3	14.4	2.5	0.0	0.0	1966	25511	30136	67450	31782	[ ]	[ ]	4
5	71.2	13.3	2.6	0.0	0.0	2296	20235	28722	110366	26827	[ ]	[ ]	5
6	57.0	12.3	0.9	0.0	0.0	2702	21085	79999	150189	23137	[ ]	[ ]	6
7	60.0	11.7	0.5	0.0	0.0	3051	47522	110615	133012	20849	[ ]	[ ]	7
8	49.2	12.9	0.1	0.0	0.0	3197	36786	84344	293384	19089	[ ]	[ ]	8
9	46.5	9.9	0.0	0.0	0.0	2851	62582	116605	212387	17508	[ ]	[ ]	9
10	40.7	7.7	0.0	0.0	0.0	3065	233094	88436	156048	16832	[ ]	[ ]	10
11	40.1	7.0	0.0	0.0	0.0	3486	277752	125202	333089	15079	[ ]	[ ]	11
12	62.3	6.2	0.0	0.0	0.0	3303	128663	126371	743025	14127	[ ]	[ ]	12
13	46.4	3.6	0.0	0.0	0.0	2947	59725	287491	508389	13392	[ ]	[ ]	13
14	85.7	1.3	0.0	0.0	0.0	2967	35103	926409	318594	12590	[ ]	[ ]	14
15	82.7	1.2	0.0	0.0	0.0	2869	26692	868540	236970	12039	[ ]	[ ]	15
16	59.6	0.8	0.0	0.0	0.0	2755	45641	563639	194199	11074	[ ]	[ ]	16
17	72.5	1.0	0.0	0.0	0.0	2311	225966	423170	152559	10253	[ ]	[ ]	17
18	477.7	1.3	0.0	0.0	0.0	4448	165327	350181	147967	9115	[ ]	[ ]	18
19	362.0	0.7	0.0	0.0	1429	8450	251951	430326	136249	8395	[ ]	[ ]	19
20	155.2	0.3	0.0	0.0	2737	9501	459690	338082	119932	7214	[ ]	[ ]	20
21	103.6	0.1	0.0	0.0	4850	25391	496851	341483	178132	[ ]	[ ]	[ ]	21
22	481.0	0.0	0.0	0.0	4827	16811	380371	296197	274438	[ ]	[ ]	[ ]	22
23	875.0	0.0	0.0	0.0	4841	11246	437803	259582	194907	[ ]	[ ]	[ ]	23
24	122.0	0.0	0.0	0.0	2843	16740	353974	203197	153502	[ ]	[ ]	[ ]	24
25	32.8	1.9	0.0	0.0	2068	157158	237211	161517	108836	[ ]	[ ]	[ ]	25
26	37.0	4.6	0.0	0.0	2168	148361	179930	131134	78638	[ ]	[ ]	[ ]	26
27	32.1	2.6	0.0	0.0	1984	132305	127049	106053	60760	[ ]	[ ]	[ ]	27
28	48.8	5.6	0.0	0.0	1623	147580	95461	105631	57964	[ ]	[ ]	[ ]	28
29	1675		0.0	0.0	1299	247396	71478	120216	55790	[ ]	[ ]	[ ]	29
30	71.1		0.0	0.0	1165	266287	56286	92981	58127	[ ]	[ ]	[ ]	30
31	242.1		0.0		1036		47815	76309		[ ]		[ ]	31
Mean	195.2	15.7	0.7	0.0	1060	41229	158167	225313	183820	17939	[ ]	[ ]	
Median	72.5	4.1	0.0	0.0	0.0	3250	95461	125202	149078	15079	[ ]	[ ]	
Maximum	1675	244.6	5.8	0.0	4850	266287	496851	926409	743025	36987	[ ]	[ ]	
Minimum	32.08	0.00	0.00	0.00	0.00	1739	20235	28722	55790	7214	[ ]	[ ]	
Total	6052	441	20	0	32875	1236872	4903192	6984730	5514599	340840	[ ]	[ ]	
Missing Days	0	0	0	0	0	0	0	0	0	12	30	31	

Summaries

Annual Mean 65135
Ann. Median 1922
Annual Total 19019621
Missing Days 73

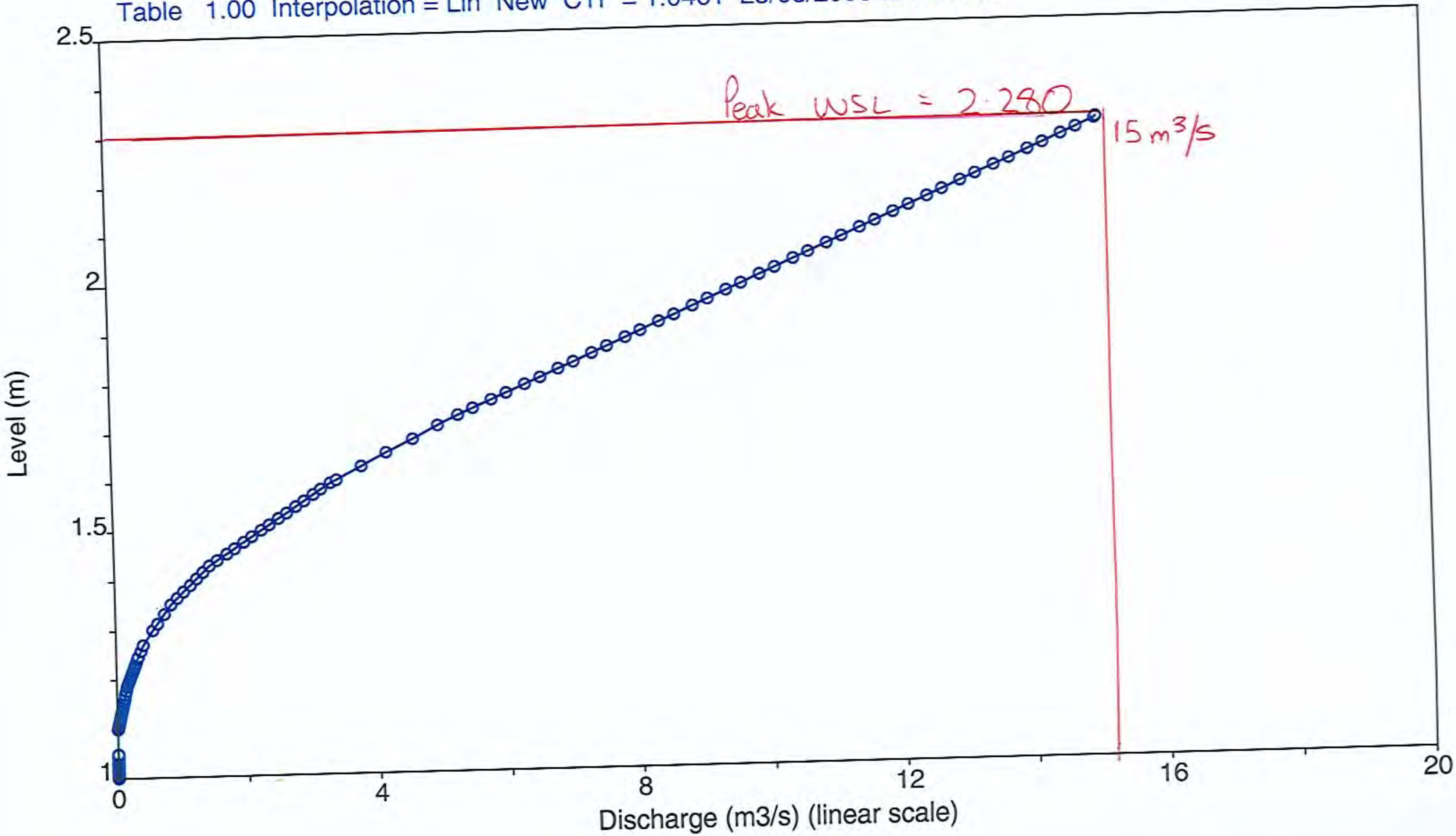
	Maximum	Minimum
Daily	926409	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site	J4153OS10	Nambeelup Lot 221
VarFrom	100	Stream Water Level in Metres
VarTo	140	Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.0461 25/08/2008 to Present



JDA Consultant Hydrologists

HYRATAB V146 Output 16/11/2009

Site J41530S10 Nambeelup Lot 221

Rating Table 1.00 25/08/2008 to Present Interpolation = Lin CTF = 1.0461

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.000785	0.000964	0.00114	0.00132	0.00150
1.10	0.00283	0.0193	0.0381	0.0539	0.0722	0.0906	0.109	0.126	0.145	0.168
1.20	0.197	0.225	0.255	0.284	0.313	0.348	0.382	0.411	0.462	0.513
1.30	0.564	0.618	0.674	0.729	0.784	0.839	0.914	0.991	1.07	1.15
1.40	1.23	1.31	1.39	1.47	1.59	1.71	1.82	1.93	2.05	2.16
1.50	2.28	2.40	2.51	2.63	2.74	2.86	2.97	3.08	3.20	3.32
1.60	3.47	3.61	3.76	3.90	4.05	4.19	4.34	4.50	4.65	4.79
1.70	4.94	5.09	5.25	5.41	5.58	5.75	5.92	6.10	6.27	6.44
1.80	6.61	6.78	6.95	7.13	7.30	7.47	7.64	7.81	7.98	8.15
1.90	8.32	8.50	8.67	8.84	9.01	9.18	9.35	9.52	9.70	9.86
2.00	10.0	10.2	10.4	10.6	10.7	10.9	11.1	11.2	11.4	11.6
2.10	11.8	11.9	12.1	12.3	12.4	12.6	12.8	13.0	13.1	13.3
2.20	13.5	13.6	13.8	14.0	14.2	14.3	14.5	14.7	14.8	15.0

------------------ Notes ------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S10 Nambeelup Lot 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	0.000	0.000	2.292	0.506	0.820	[ ]M	[ ]	[ ]	1
2	0.000	0.000	0.000	0.000	0.000	0.000	0.923	0.451	0.964	0.405	[ ]	[ ]	2
3	0.000	0.000	0.000	0.000	0.000	0.000	0.484	0.410	0.877	0.363	[ ]	[ ]	3
4	0.000	0.000	0.000	0.000	0.000	0.000	0.304	0.374	0.707	0.362	[ ]	[ ]	4
5	0.000	0.000	0.000	0.000	0.000	0.000	0.226	0.356	1.052	0.308	[ ]	[ ]	5
6	0.000	0.000	0.000	0.000	0.000	0.001	0.214	0.825	1.560	0.249	[ ]	[ ]	6
7	0.000	0.000	0.000	0.000	0.000	0.000	0.531	1.263	1.305	0.228	[ ]	[ ]	7
8	0.000	0.000	0.000	0.000	0.000	0.000	0.423	0.904	3.387	0.203	[ ]	[ ]	8
9	0.000	0.000	0.000	0.000	0.000	0.001	0.636	1.264	2.372	0.174	[ ]	[ ]	9
10	0.000	0.000	0.000	0.000	0.000	0.001	2.792	0.935	1.534	0.166	[ ]	[ ]	10
11	0.000	0.000	0.000	0.000	0.000	0.001	3.704	1.348	3.886	0.170	[ ]	[ ]	11
12	0.000	0.000	0.000	0.000	0.000	0.001	1.542	1.384	10.56	0.163	[ ]	[ ]	12
13	0.000	0.000	0.000	0.000	0.000	0.001	0.712	3.559	7.110	0.150	[ ]	[ ]	13
14	[ ]M	0.000	0.000	0.000	0.000	0.001	0.426	12.48	3.776	0.135	[ ]	[ ]	14
15	0.000	0.000	0.000	0.000	0.000	0.001	0.321	12.31	2.588	0.115	[ ]	[ ]	15
16	0.000	0.000	0.000	0.000	0.000	[ ]M	0.486	8.219	2.054	0.094	[ ]	[ ]	16
17	0.000	0.000	0.000	0.000	0.000	0.002	2.738	5.549	1.470	0.064	[ ]	[ ]	17
18	0.000	0.000	0.000	0.000	0.000	0.024	2.065	4.167	1.426	0.037	[ ]	[ ]	18
19	0.000	0.000	0.000	0.000	[ ]M	0.096	3.078	5.487	1.319	0.034	[ ]	[ ]	19
20	0.000	0.000	0.000	0.000	0.000	0.119	6.597	3.937	1.131	0.036	[ ]	[ ]	20
21	0.000	0.000	0.000	0.000	0.000	0.288	7.228	3.948	1.851	[ ]	[ ]	[ ]	21
22	0.000	0.000	0.000	0.000	0.000	0.209	5.330	3.335	3.154	[ ]	[ ]	[ ]	22
23	0.000	0.000	0.000	0.000	0.001	0.106	6.135	2.809	2.120	[ ]	[ ]	[ ]	23
24	0.000	0.000	0.000	0.000	0.001	0.162	4.918	2.093	1.527	[ ]	[ ]	[ ]	24
25	0.000	0.000	0.000	0.000	0.000	1.658	2.994	1.499	1.054	[ ]	[ ]	[ ]	25
26	0.000	0.000	0.000	0.000	0.000	1.618	2.263	1.174	0.764	[ ]	[ ]	[ ]	26
27	0.000	0.000	0.000	0.000	0.000	1.373	1.431	0.949	0.601	[ ]	[ ]	[ ]	27
28	0.000	0.000	0.000	0.000	0.000	1.591	1.061	0.935	0.554	[ ]	[ ]	[ ]	28
29	0.000		0.000	0.000	0.000	3.010	0.815	1.121	0.559	[ ]	[ ]	[ ]	29
30	0.000		0.000	0.000	0.000	3.466	0.688	0.885	0.615	[ ]	[ ]	[ ]	30
31	0.000		0.000		0.000		0.589	0.755		[ ]		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.474	2.063	2.750	2.090	0.182	[ ]	[ ]	
Median	0.000	0.000	0.000	0.000	0.000	0.001	1.061	1.264	1.448	0.166	[ ]	[ ]	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.001	3.466	7.228	12.48	10.56	0.405	[ ]	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.214	0.356	0.554	0.034	[ ]	[ ]	
Inst.Max	0.001	0.000	0.000	0.000	0.001	3.865	7.607	14.26	11.67	0.470	[ ]	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.164	0.323	0.499	0.010	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	0	0	0	12	30	31	

Summaries

Annual Mean	0.793
Ann. Median	0.000
Missing Days	76

	Maximum	Minimum
Daily Mean	12.48	0.000
Instant	14.26	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S10
VarFrom 100.00
VarTo 140.00
Figures are for period ending 2400 hours.

Nambeelup Lot 221
Stream Water Level in Metres
Stream Discharge in Cubic metres/second

Year 2008
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.270	0.028	0.001	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.355	0.021	0.001	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.344	0.011	0.001	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.305	0.024	0.001	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.287	[ ]M	0.001	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.243	0.106	0.000	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.193	0.114	0.001	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.159	0.132	0.001	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.307	0.153	0.001	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.138	0.173	0.141	0.001	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.134	0.106	0.155	0.001	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.171	0.101	0.104	0.001	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.151	0.092	0.063	0.001	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.141	0.077	0.038	0.001	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.126	0.045	0.029	0.000	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]M	0.037	0.022	0.000	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.148	0.049	0.009	0.001	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.168	0.050	0.006	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.159	0.044	0.003	0.001	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.187	0.013	0.003	0.001	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.181	0.010	0.006	0.001	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.155	0.009	0.007	0.001	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.137	0.008	0.032	0.001	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.681	0.009	0.045	0.001	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.020	0.196	0.052	0.001	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.565	0.139	0.054	0.001	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.365	0.097	0.029	0.001	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.286	0.070	0.001	0.001	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.250	0.066	0.001	0.000	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]		0.056	0.001	0.000	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.041		0.000	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.272	0.127	0.048	0.001	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.168	0.092	0.029	0.001	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.020	0.355	0.155	0.001	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.126	0.008	0.001	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1.239	0.394	0.176	0.001	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.104	0.001	0.000	0.000	
Missing Days	31	29	31	30	31	30	31	31	11	0	1	1	

Summaries

Annual Mean	0.097
Ann. Median	0.041
Missing Days	257

	Maximum	Minimum
Daily Mean	1.020	0.000
Instant	1.239	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 11/11/2009

Site J41530S10 Nambeelup Lot 221 Year 2008
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	23370	2379	72.58	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	30710	1806	67.56	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	29713	917.8	72.35	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	26320	2074	74.30	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	24761	[ ]M	44.24	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	20995	9170	36.14	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16635	9819	56.66	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13735	11379	62.65	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	26518	13253	65.35	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14958	12202	66.78	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	11898	9162	13365	75.24	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	11579	8734	9021	58.68	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14805	7926	5429	50.17	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13013	6683	3315	53.30	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12218	3848	2501	32.39	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	10853	3169	1885	37.37	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]M	4246	786.0	46.04	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12770	4293	496.9	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14502	3815	276.8	60.84	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13743	1156	281.3	85.88	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16142	894.2	524.7	53.23	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15617	798.5	593.0	44.00	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	13372	669.5	2755	84.41	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	11840	808.0	3870	83.10	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	58851	16943	4497	83.26	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	88118	11973	4641	75.52	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	48836	8358	2483	64.85	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	31526	6064	102.3	57.72	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	24729	5703	87.21	35.89	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	21639	4816	76.99	27.10	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		3578		13.63	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	23476	11011	4137	58.04	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14502	7926	2483	59.76	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	88118	30710	13365	85.88	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	10853	669.5	76.99	13.63	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	446061	341365	119996	1741	
Missing Days	31	29	31	30	31	30	31	31	11	0	1	1	

Summaries

Annual Mean	8340
Ann. Median	3578
Annual Total	909163
Missing Days	257

	Maximum	Minimum
Daily	88118	13.63

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 11/11/2009

Site J41530S10 Nambeelup Lot 221 Year 2009
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	3	0	0	0	0	0	198007	43715	70864	[ ]M	[ ]	[ ]	1
2	1	0	0	0	0	0	79787	38958	83304	35007	[ ]	[ ]	2
3	0	0	0	0	0	1	41825	35418	75805	31404	[ ]	[ ]	3
4	0	0	0	0	0	25	26247	32326	61075	31319	[ ]	[ ]	4
5	0	0	0	0	0	43	19560	30737	90876	26632	[ ]	[ ]	5
6	0	0	0	0	0	61	18464	71244	134765	21516	[ ]	[ ]	6
7	0	0	0	0	0	31	45919	109093	112730	19717	[ ]	[ ]	7
8	0	0	0	0	0	27	36561	78092	292618	17520	[ ]	[ ]	8
9	0	0	0	0	0	52	54982	109171	204938	15075	[ ]	[ ]	9
10	0	0	0	0	0	71	241232	80771	132568	14340	[ ]	[ ]	10
11	0	0	0	0	0	98	319986	116507	335791	14662	[ ]	[ ]	11
12	0	0	0	0	0	113	133255	119546	912629	14083	[ ]	[ ]	12
13	0	0	0	0	0	115	61533	307508	614297	12972	[ ]	[ ]	13
14	[ ]M	0	0	0	0	123	36835	1078749	326268	11641	[ ]	[ ]	14
15	0	0	0	0	0	126	27762	1064269	223641	9957	[ ]	[ ]	15
16	0	0	0	0	0	[ ]M	41961	710159	177488	8128	[ ]	[ ]	16
17	0	0	0	0	0	176	236556	479466	127023	5527	[ ]	[ ]	17
18	0	0	0	0	0	2110	178389	360070	123206	3160	[ ]	[ ]	18
19	0	0	0	0	[ ]M	8277	265938	474049	113993	2914	[ ]	[ ]	19
20	0	0	0	0	0	10306	570001	340200	97692	3085	[ ]	[ ]	20
21	0	0	0	0	0	24891	624476	341143	159964	[ ]	[ ]	[ ]	21
22	0	0	0	0	37	18041	460548	288112	272538	[ ]	[ ]	[ ]	22
23	0	0	0	0	104	9191	530031	242732	183139	[ ]	[ ]	[ ]	23
24	0	0	0	0	66	14015	424904	180836	131970	[ ]	[ ]	[ ]	24
25	0	0	0	0	21	143288	258708	129513	91094	[ ]	[ ]	[ ]	25
26	0	0	0	0	10	139775	195518	101427	65994	[ ]	[ ]	[ ]	26
27	0	0	0	0	0	118585	123618	81996	51915	[ ]	[ ]	[ ]	27
28	0	0	0	0	0	137497	91656	80813	47834	[ ]	[ ]	[ ]	28
29	0		0	0	0	260042	70442	96856	48320	[ ]	[ ]	[ ]	29
30	0		0	0	0	299433	59410	76441	53118	[ ]	[ ]	[ ]	30
31	0		0		0		50880	65265		[ ]		[ ]	31
Mean	0.1	0.0	0.0	0.0	7.9	40914	178225	237586	180581	15718	[ ]	[ ]	
Median	0.0	0.0	0.0	0.0	0.0	126.3	91656	109170	125114	14339	[ ]	[ ]	
Maximum	3	0	0	0	104	299433	624476	1078749	912629	35007	[ ]	[ ]	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	18463	30736	47833	2913	[ ]	[ ]	
Total	3	0	0	0	238	1186515	5524992	7365181	5417458	298660	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	0	0	0	12	30	31	

Summaries

Annual Mean	68488
Ann. Median	0.63
Annual Total	19793046
Missing Days	76

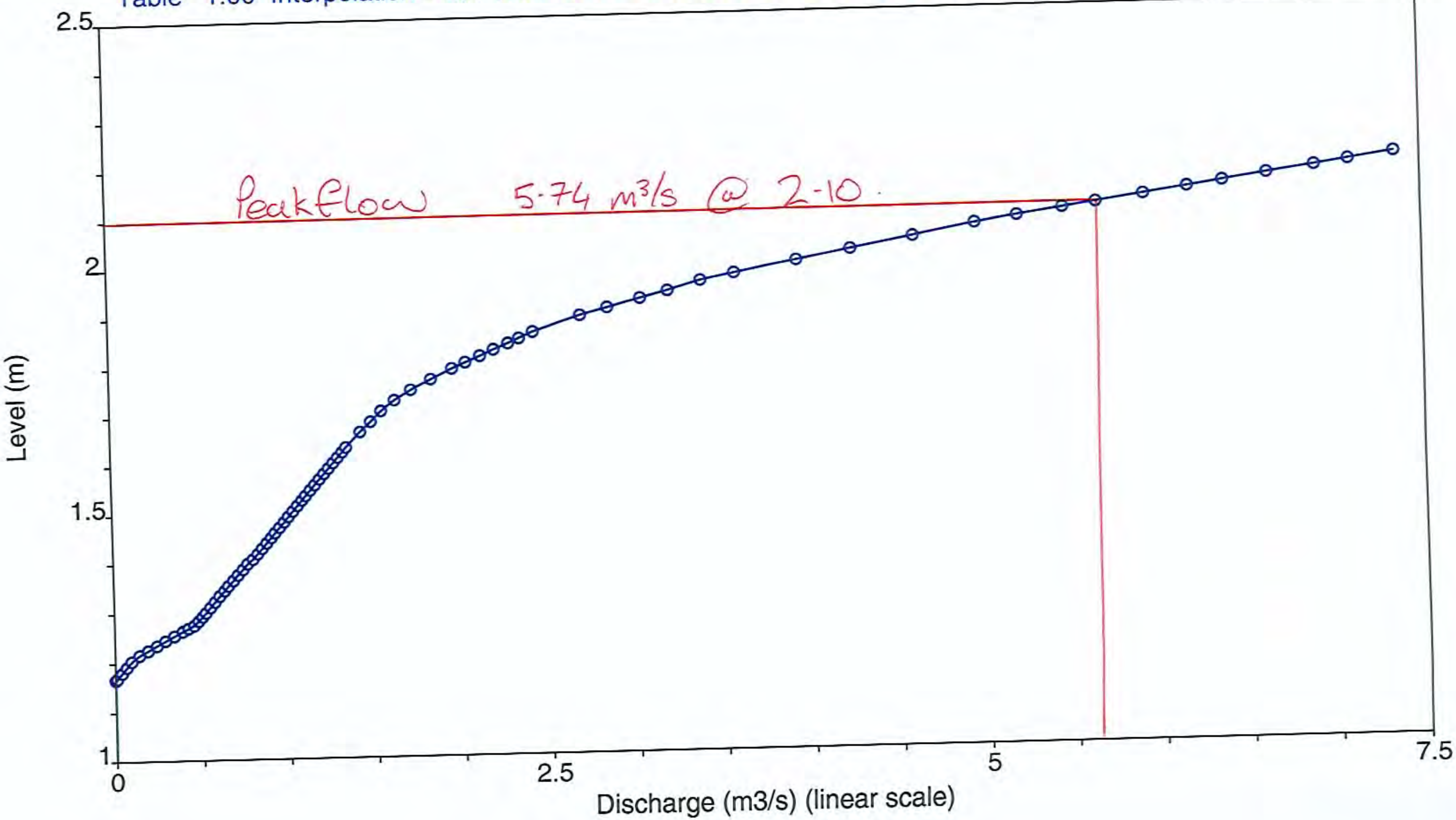
	Maximum	Minimum
Daily	1078749	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site	J4153OS2	NAMBEELUP LOT 221
VarFrom	100	Stream Water Level in Metres
VarTo	140	Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.1656 04/09/2008 to Present



JDA Consultant Hydrologists

Site J41530S2 NAMBEELUP LOT 221

Rating Table 1.00 04/09/2008 to Present Interpolation = Lin CTF = 1.1656

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0128	0.0378	0.0622
1.20	0.0856	0.119	0.163	0.215	0.268	0.320	0.374	0.430	0.471	0.499
1.30	0.524	0.549	0.573	0.598	0.624	0.649	0.675	0.700	0.726	0.752
1.40	0.780	0.811	0.835	0.859	0.884	0.909	0.932	0.957	0.981	1.00
1.50	1.03	1.05	1.08	1.10	1.12	1.15	1.17	1.20	1.22	1.25
1.60	1.27	1.30	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51
1.70	1.54	1.57	1.61	1.65	1.70	1.75	1.80	1.86	1.92	1.98
1.80	2.04	2.11	2.18	2.24	2.31	2.38	2.44	2.53	2.62	2.71
1.90	2.82	2.92	3.03	3.14	3.25	3.34	3.46	3.61	3.76	3.91
2.00	4.06	4.22	4.37	4.52	4.68	4.83	4.98	5.17	5.36	5.55
2.10	5.74	5.94	6.13	6.33	6.52	6.72	6.92	7.11	7.30	

------------------ Notes ------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S2 NAMBEELUP LOT 221

VarFrom 100.00 Stream Water Level in Metres

VarTo 140.00 Stream Discharge in Cubic metres/second

Figures are for period ending 2400 hours.

Year 2008

Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	[ ]M	0.000	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.026	0.000	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.022	0.000	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.068	0.000	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.063	0.000	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.051	0.000	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.064	0.000	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.012	0.000	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]M	0.000	0.000	0.000	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.005	0.000	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.163	0.042	0.008	0.000	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.293	0.001	0.010	0.000	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.044	0.000	0.005	0.000	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.000		0.000	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.001	0.012	0.000	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.293	0.042	0.068	0.000	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.436	0.079	0.094	0.000	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.000	0.000	0.000	
Missing Days	31	29	31	30	31	30	31	31	11	0	1	1	

Summaries

Annual Mean	0.008
Ann. Median	0.000
Missing Days	257

	Maximum	Minimum
Daily Mean	0.293	0.000
Instant	0.436	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S2 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	0.000	0.000	0.907	0.000	0.546	[ ]M	[ ]	[ ]	1
2	0.000	0.000	0.000	0.000	0.000	0.000	0.556	0.000	0.598	0.231	[ ]	[ ]	2
3	0.000	0.000	0.000	0.000	0.000	0.000	0.349	0.000	0.537	0.219	[ ]	[ ]	3
4	0.000	0.000	0.000	0.000	0.000	0.000	0.189	0.000	0.468	0.190	[ ]	[ ]	4
5	0.000	0.000	0.000	0.000	0.000	0.000	0.115	0.000	0.661	0.129	[ ]	[ ]	5
6	0.000	0.000	0.000	0.000	0.000	0.000	0.143	0.000	0.782	0.091	[ ]	[ ]	6
7	0.000	0.000	0.000	0.000	0.000	0.000	0.472	0.000	0.721	0.072	[ ]	[ ]	7
8	0.000	0.000	0.000	0.000	0.000	0.000	0.344	0.000	1.348	0.057	[ ]	[ ]	8
9	0.000	0.000	0.000	0.000	0.000	0.000	0.503	0.000	0.994	0.040	[ ]	[ ]	9
10	0.000	0.000	0.000	0.000	0.000	0.000	1.181	0.000	0.798	0.034	[ ]	[ ]	10
11	0.000	0.000	0.000	0.000	0.000	0.000	1.291	0.000	1.682	0.011	[ ]	[ ]	11
12	0.000	0.000	0.000	0.000	0.000	0.000	0.737	0.002	3.777	0.005	[ ]	[ ]	12
13	0.000	0.000	0.000	0.000	0.000	0.000	0.506	0.632	2.410	0.003	[ ]	[ ]	13
14	[ ]M	0.000	0.000	0.000	0.000	0.000	0.344	4.666	1.409	0.000	[ ]	[ ]	14
15	0.000	0.000	0.000	0.000	0.000	0.000	0.248	4.319	1.104	0.000	[ ]	[ ]	15
16	0.000	0.000	0.000	0.000	0.000	[ ]M	0.436	2.735	0.943	0.000	[ ]	[ ]	16
17	0.000	0.000	0.000	0.000	0.000	0.000	1.156	2.042	0.776	0.000	[ ]	[ ]	17
18	0.000	0.000	0.000	0.000	0.000	0.000	0.872	[ ]M	0.786	0.000	[ ]	[ ]	18
19	0.000	0.000	0.000	0.000	[ ]M	0.000	1.318	2.102	0.710	0.000	[ ]	[ ]	19
20	0.000	0.000	0.000	0.000	0.000	0.000	2.234	1.513	0.654	0.000	[ ]	[ ]	20
21	0.000	0.000	0.000	0.000	0.000	0.445	[ ]M	1.564	0.924	[ ]	[ ]	[ ]	21
22	0.000	0.000	0.000	0.000	0.000	0.160	1.836	1.330	1.264	[ ]	[ ]	[ ]	22
23	0.000	0.000	0.000	0.000	0.000	0.001	2.170	1.200	0.954	[ ]	[ ]	[ ]	23
24	0.000	0.000	0.000	0.000	0.000	0.092	1.633	0.988	0.792	[ ]	[ ]	[ ]	24
25	0.000	0.000	0.000	0.000	0.000	0.900	1.142	0.832	0.600	[ ]	[ ]	[ ]	25
26	0.000	0.000	0.000	0.000	0.000	0.801	0.910	0.699	0.499	[ ]	[ ]	[ ]	26
27	0.000	0.000	0.000	0.000	0.000	0.762	0.664	0.613	0.418	[ ]	[ ]	[ ]	27
28	0.000	0.000	0.000	0.000	0.000	0.801	0.525	0.616	0.407	[ ]	[ ]	[ ]	28
29	0.000		0.000	0.000	0.000	1.205	0.321	0.661	0.367	[ ]	[ ]	[ ]	29
30	0.000		0.000	0.000	0.000	1.262	0.076	0.558	0.403	[ ]	[ ]	[ ]	30
31	0.000		0.000		0.000		0.000	0.509		[ ]		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.222	0.773	0.919	0.944	0.057	[ ]	[ ]	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.540	0.614	0.779	0.011	[ ]	[ ]	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	1.262	2.234	4.666	3.777	0.231	[ ]	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.367	0.000	[ ]	[ ]	
Inst.Max	0.000	0.000	0.000	0.000	0.000	1.378	2.514	5.588	4.198	0.278	[ ]	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.314	0.000	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	0.302
Ann. Median	0.000
Missing Days	78

	Maximum	Minimum
Daily Mean	4.666	0.000
Instant	5.588	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S2 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2008
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	[ ]M	0.00	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	2276	0.00	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	1907	0.00	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	5852	0.00	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17.37	5479	0.00	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	4419	0.00	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	5512	0.00	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	1002	0.00	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	2.74	0.00	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]M	0.00	0.00	0.00	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	426.7	0.00	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14049	3645	733.1	0.00	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	25288	96.88	856.2	0.00	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3778	0.00	428.6	0.00	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.00		0.00	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2269	121.2	996.5	0.00	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	25288	3645	5852	0.00	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.00	0.00	0.00	0.00	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	43116	3759	28898	0.00	
Missing Days	31	29	31	30	31	30	31	31	11	0	1	1	

Summaries

Annual Mean	695.1
Ann. Median	0.00
Annual Total	75775
Missing Days	257

	Maximum	Minimum
Daily	25288	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site J41530S2 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2009
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.0	0.0	0.0	0.0	0.0	0.0	78348	0.0	47157	[ ]M	[ ]	[ ]	1
2	0.0	0.0	0.0	0.0	0.0	0.0	48025	0.0	51639	19980	[ ]	[ ]	2
3	0.0	0.0	0.0	0.0	0.0	0.0	30160	0.0	46438	18924	[ ]	[ ]	3
4	0.0	0.0	0.0	0.0	0.0	0.0	16345	0.0	40410	16381	[ ]	[ ]	4
5	0.0	0.0	0.0	0.0	0.0	0.0	9940	0.0	57115	11131	[ ]	[ ]	5
6	0.0	0.0	0.0	0.0	0.0	0.0	12346	0.0	67582	7823	[ ]	[ ]	6
7	0.0	0.0	0.0	0.0	0.0	0.0	40747	0.0	62297	6199	[ ]	[ ]	7
8	0.0	0.0	0.0	0.0	0.0	0.0	29758	0.0	116447	4965	[ ]	[ ]	8
9	0.0	0.0	0.0	0.0	0.0	0.0	43433	0.0	85903	3457	[ ]	[ ]	9
10	0.0	0.0	0.0	0.0	0.0	0.0	102005	0.0	68951	2958	[ ]	[ ]	10
11	0.0	0.0	0.0	0.0	0.0	0.0	111580	0.0	145342	979.6	[ ]	[ ]	11
12	0.0	0.0	0.0	0.0	0.0	0.0	63698	214.0	326374	445.5	[ ]	[ ]	12
13	0.0	0.0	0.0	0.0	0.0	0.0	43681	54586	208219	233.0	[ ]	[ ]	13
14	[ ]M	0.0	0.0	0.0	0.0	0.0	29757	403168	121759	34.8	[ ]	[ ]	14
15	0.0	0.0	0.0	0.0	0.0	0.0	21436	373179	95393	1.5	[ ]	[ ]	15
16	0.0	0.0	0.0	0.0	0.0	[ ]M	37639	236274	81501	0.0	[ ]	[ ]	16
17	0.0	0.0	0.0	0.0	0.0	0.0	99892	176441	67037	0.0	[ ]	[ ]	17
18	0.0	0.0	0.0	0.0	0.0	0.0	75310	[ ]M	67890	0.0	[ ]	[ ]	18
19	0.0	0.0	0.0	0.0	[ ]M	0.0	113890	181642	61315	0.0	[ ]	[ ]	19
20	0.0	0.0	0.0	0.0	0.0	0.0	193043	130691	56545	0.0	[ ]	[ ]	20
21	0.0	0.0	0.0	0.0	0.0	38465	[ ]M	135156	79829	[ ]	[ ]	[ ]	21
22	0.0	0.0	0.0	0.0	0.0	13836	158606	114892	109219	[ ]	[ ]	[ ]	22
23	0.0	0.0	0.0	0.0	0.0	49.1	187470	103638	82399	[ ]	[ ]	[ ]	23
24	0.0	0.0	0.0	0.0	0.0	7988	141121	85331	68395	[ ]	[ ]	[ ]	24
25	0.0	0.0	0.0	0.0	0.0	77739	98650	71862	51878	[ ]	[ ]	[ ]	25
26	0.0	0.0	0.0	0.0	0.0	69231	78630	60403	43150	[ ]	[ ]	[ ]	26
27	0.0	0.0	0.0	0.0	0.0	65814	57379	52950	36148	[ ]	[ ]	[ ]	27
28	0.0	0.0	0.0	0.0	0.0	69239	45323	53192	35139	[ ]	[ ]	[ ]	28
29	0.0		0.0	0.0	0.0	104145	27713	57078	31739	[ ]	[ ]	[ ]	29
30	0.0		0.0	0.0	0.0	108998	6594	48244	34791	[ ]	[ ]	[ ]	30
31	0.0		0.0		0.0		0.0	43948		[ ]		[ ]	31
Mean	0.00	0.00	0.00	0.00	0.00	19155	66751	79429	81600	4921	[ ]	[ ]	
Median	0.00	0.00	0.00	0.00	0.00	0.00	46674	53071	67309	979.6	[ ]	[ ]	
Maximum	0.0	0.0	0.0	0.0	0.0	108998	193043	403168	326374	19980	[ ]	[ ]	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31739	0.00	[ ]	[ ]	
Total	0	0	0	0	0	555509	2002532	2382897	2448013	93515	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	26071
Ann. Median	0.00
Annual Total	7482466
Missing Days	78

	Maximum	Minimum
Daily	403168	0.00

------------------ Notes ------------------

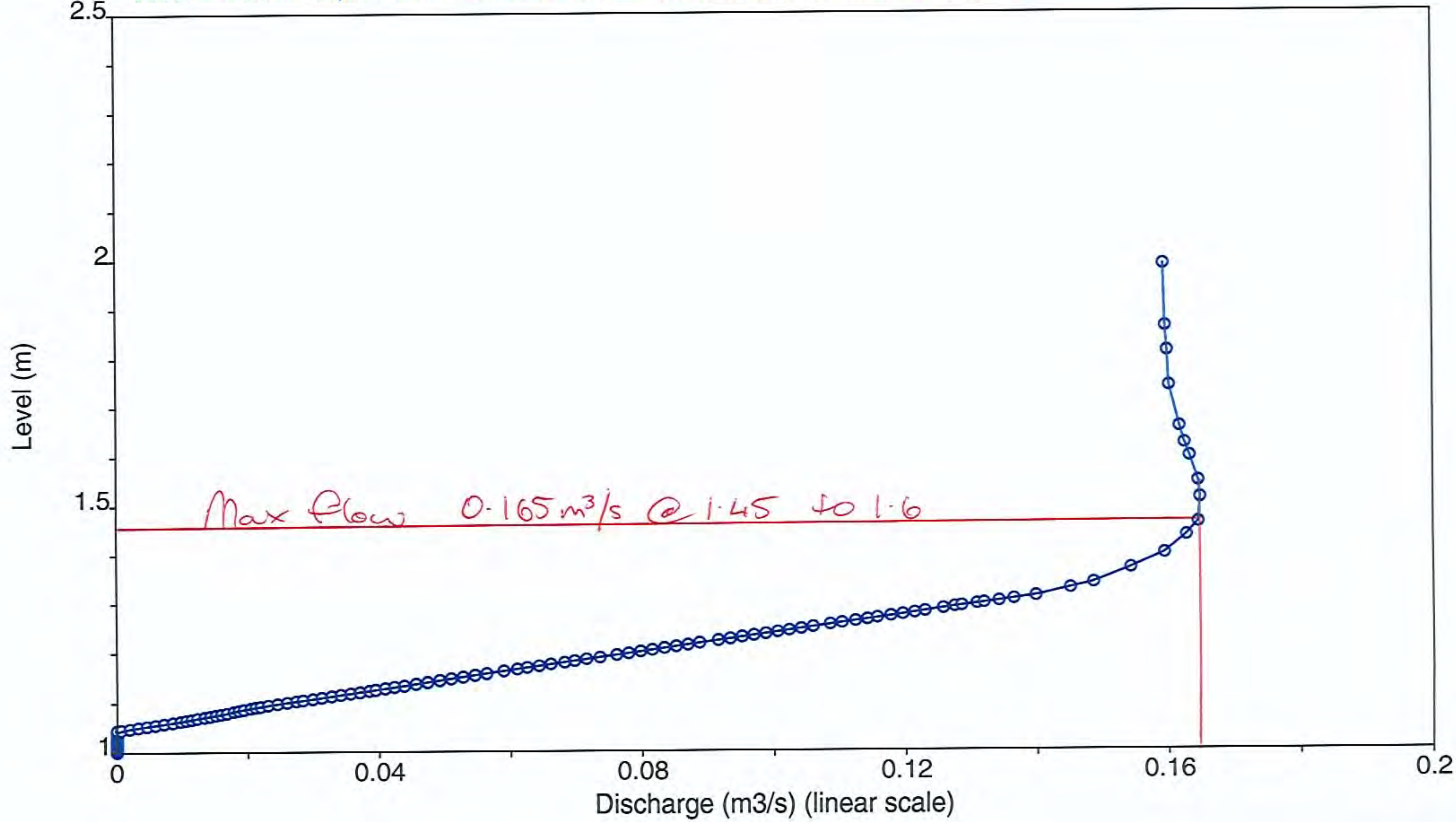
All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site J4153OS3 NAMBEELUP LOT 221
VarFrom 100 Stream Water Level in Metres
VarTo 140 Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.0445 07/09/2008 to Present



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Site J4153OS3 NAMBEELUP LOT 221

Rating Table 1.00 07/09/2008 to Present Interpolation = Lin CTF = 1.0445

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.00300	0.00843	0.0129	0.0171	0.0209
1.10	0.0258	0.0313	0.0368	0.0423	0.0477	0.0530	0.0583	0.0636	0.0691	0.0746
1.20	0.0798	0.0853	0.0907	0.0961	0.101	0.107	0.112	0.118	0.123	0.128
1.30	0.134	0.140	0.143	0.146	0.149	0.151	0.153	0.155	0.156	0.158
1.40	0.160	0.161	0.161	0.162	0.163	0.164	0.164	0.165	0.165	0.165
1.50	0.165	0.165	0.165	0.165	0.165	0.164	0.164	0.164	0.164	0.163
1.60	0.163	0.163	0.162	0.162	0.162	0.162	0.162	0.161	0.161	0.161
1.70	0.161	0.161	0.161	0.160	0.160	0.160	0.160	0.160	0.160	0.160
1.80	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160
1.90	0.160	0.160	0.160	0.159	0.159	0.159	0.159	0.159	0.159	

------------------ Notes ------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site	J41530S3	NAMBEELUP LOT 221	Year	2008
VarFrom	100.00	Stream Water Level in Metres	Table Type	Rate
VarTo	140.00	Stream Discharge in Cubic metres/second		

Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.034	0.043	0.014	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.041	0.041	0.015	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.040	0.037	0.017	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.035	0.041	0.017	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.038	[ ]M	0.015	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.037	0.049	0.015	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.034	0.052	0.014	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.033	0.050	0.013	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.031	0.046	0.013	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.031	0.044	0.013	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.023	0.027	0.049	0.014	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.023	0.028	0.050	0.013	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.027	0.029	0.051	0.013	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.028	0.050	0.015	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.028	0.024	0.049	0.014	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.028	0.047	0.012	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.032	0.044	0.010	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.029	0.034	0.041	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.031	0.035	0.040	0.005	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.030	0.028	0.037	0.010	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.031	0.030	0.039	0.007	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.029	0.031	0.040	0.005	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.028	0.031	0.043	0.006	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.021	0.028	0.041	0.006	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.039	0.043	0.043	0.006	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.051	0.045	0.041	0.005	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.039	0.042	0.029	0.004	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.033	0.041	0.016	0.005	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.035	0.042	0.016	0.005	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.033	0.044	0.015	0.005	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.044		0.007	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.030	0.034	0.041	0.011	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.029	0.034	0.043	0.013	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.051	0.045	0.052	0.017	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.021	0.024	0.015	0.004	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.057	0.050	0.056	0.021	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.014	0.018	0.010	0.000	
Missing Days	31	29	31	30	31	30	31	31	10	0	1	1	

Summaries

Annual Mean	0.029	
Ann. Median	0.030	
Missing Days	256	
	Maximum	Minimum
Daily Mean	0.052	0.004
Instant	0.057	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J4153OS3 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.006	0.016	0.023	0.015	0.011	0.021	0.098	0.044	0.062	[ ]M	[ ]	[ ]	1
2	0.007	0.016	0.024	0.016	0.010	0.020	0.069	0.042	0.063	0.042	[ ]	[ ]	2
3	0.008	0.016	0.020	0.017	0.011	0.019	0.061	0.040	0.057	0.041	[ ]	[ ]	3
4	0.006	0.016	0.020	0.018	0.013	0.019	0.057	0.038	0.053	0.038	[ ]	[ ]	4
5	0.007	0.015	0.022	0.017	0.013	0.019	0.052	0.038	0.070	0.038	[ ]	[ ]	5
6	0.007	0.016	0.019	0.017	0.012	0.018	0.054	0.057	0.085	0.037	[ ]	[ ]	6
7	0.007	0.016	0.019	0.017	0.010	0.016	0.057	0.054	0.079	0.035	[ ]	[ ]	7
8	0.007	0.018	0.019	0.013	0.010	0.014	0.053	0.052	0.159	0.034	[ ]	[ ]	8
9	0.007	0.018	0.019	0.010	0.011	0.013	0.062	0.056	0.131	0.032	[ ]	[ ]	9
10	0.006	0.018	0.020	0.012	0.017	0.018	0.127	0.052	0.095	0.032	[ ]	[ ]	10
11	0.005	0,017	0.020	0.013	0.019	0.024	0.144	0.062	0.155	0.028	[ ]	[ ]	11
12	0.006	0.018	0.020	0.013	0.018	0.027	0.068	0.069	0.160	0.028	[ ]	[ ]	12
13	0.002	0.018	0.019	0.015	0.007	0.025	0.054	0.148	0.162	0.027	[ ]	[ ]	13
14	[ ]M	0.016	0.019	0.013	0.002	0.025	0.049	0.160	0.162	0.025	[ ]	[ ]	14
15	0.008	0.021	0.019	0.011	0.003	0.027	0.048	0.160	0.150	0.024	[ ]	[ ]	15
16	0.008	0.018	0.020	0.012	0.011	[ ]M	0.059	0.162	0.123	0.025	[ ]	[ ]	16
17	0.009	0.018	0.020	0.013	0.013	0.029	0.132	0.164	0.089	0.025	[ ]	[ ]	17
18	0.013	0.020	0.018	0.015	0.012	0.037	0.086	[ ]M	0.088	0.022	[ ]	[ ]	18
19	0.012	0.020	0.016	0.012	[ ]M	0.057	0.130	0.164	0.074	0.020	[ ]	[ ]	19
20	0.012	0.019	0.018	0.009	0.014	0.064	0.164	0.164	0.066	0.018	[ ]	[ ]	20
21	0.012	0.019	0.018	0.011	0.033	0.067	[ ]M	0.164	0.116	[ ]	[ ]	[ ]	21
22	0.014	0.020	0.015	0.013	0.036	0.059	0.164	0.161	0.159	[ ]	[ ]	[ ]	22
23	0.015	0.020	0.017	0.013	0.037	0.055	0.164	0.154	0.125	[ ]	[ ]	[ ]	23
24	0.013	0.022	0.017	0.013	0.024	0.065	0.162	0.128	0.091	[ ]	[ ]	[ ]	24
25	0.013	0.021	0.017	0.013	0.021	0.097	0.138	0.095	0.059	[ ]	[ ]	[ ]	25
26	0.015	0.021	0.017	0.011	0.022	0.082	0.098	0.073	0.049	[ ]	[ ]	[ ]	26
27	0.013	0.021	0.016	0.012	0.023	0.082	0.070	0.061	0.046	[ ]	[ ]	[ ]	27
28	0.016	0.022	0.017	0.012	0.021	0.085	0.062	0.062	0.045	[ ]	[ ]	[ ]	28
29	0.018		0.017	0.014	0.020	0.141	0.056	0.064	0.041	[ ]	[ ]	[ ]	29
30	0.014		0.015	0.013	0.021	0.149	0.052	0.056	0.043	[ ]	[ ]	[ ]	30
31	0.017		0.017		0.020		0.048	0.053		[ ]		[ ]	31
Mean	0.010	0.018	0.019	0.013	0.016	0.047	0.088	0.093	0.095	0.030	[ ]	[ ]	
Median	0.009	0.018	0.019	0.013	0.014	0.027	0.065	0.063	0.086	0.028	[ ]	[ ]	
Max.Daily Mean	0.018	0.022	0.024	0.018	0.037	0.149	0.164	0.164	0.162	0.042	[ ]	[ ]	
Min.Daily Mean	0.002	0.015	0.015	0.009	0.002	0.013	0.048	0.038	0.041	0.018	[ ]	[ ]	
Inst.Max	0.027	0.031	0.028	0.025	0.045	0.158	0.165	0.165	0.165	0.047	[ ]	[ ]	
Inst.Min	0.000	0.006	0.009	0.001	0.000	0.006	0.041	0.031	0.036	0.013	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	0.044
Ann. Median	0.021
Missing Days	78

	Maximum	Minimum
Daily Mean	0.164	0.002
Instant	0.165	0.000

------------------- Notes -------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S3 NAMBEELUP LOT 221

VarFrom 100.00 Stream Water Level in Metres

VarTo 150.00 Stream Discharge Volume in Cubic metres

Figures are for period ending 2400 hours.

Year 2008

Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2973	3724	1213	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3506	3584	1298	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3417	3198	1439	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3040	3583	1480	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3307	[ ]M	1305	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3173	4238	1261	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2944	4453	1242	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2883	4335	1148	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2642	3956	1158	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2683	3812	1134	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2009	2363	4258	1231	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1950	2391	4306	1142	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2330	2481	4375	1130	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2271	2445	4293	1302	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2438	2074	4260	1228	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2203	2436	4095	1080	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2231	2805	3794	880.6	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2476	2918	3574	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2709	3030	3494	453.7	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2621	2454	3207	890.0	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2696	2614	3366	583.3	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2503	2689	3453	455.9	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2417	2679	3726	543.4	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1795	2454	3520	483.4	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3410	3682	3713	478.5	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	4385	3861	3550	398.3	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3384	3587	2542	381.9	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2886	3499	1390	457.0	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3000	3588	1344	395.8	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2851	3788	1255	419.3	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		3802		615.1	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2628	2974	3531	907.9	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2490	2918	3713	1105	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	4385	3861	4453	1480	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1795	2074	1255	381.9	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	52575	92223	102414	27238	
Missing Days	31	29	31	30	31	30	31	31	10	0	1	1	

Summaries

Annual Mean	2494
Ann. Median	2631
Annual Total	274449
Missing Days	256

	Maximum	Minimum
Daily	4453	381.9

------------------ Notes ------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 11/11/2009

Site J41530S3 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2009
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	508.6	1391	1955	1326	961.6	1808	8504	3790	5316	[ ]M	[ ]	[ ]	1
2	612.5	1365	2044	1354	859.2	1759	5930	3589	5466	3630	[ ]	[ ]	2
3	681.5	1396	1693	1483	939.4	1612	5250	3498	4931	3578	[ ]	[ ]	3
4	560.8	1372	1743	1513	1128	1642	4883	3249	4572	3304	[ ]	[ ]	4
5	589.3	1318	1860	1509	1107	1617	4492	3287	6077	3280	[ ]	[ ]	5
6	609.1	1375	1676	1493	1079	1588	4628	4950	7361	3156	[ ]	[ ]	6
7	636.9	1412	1661	1506	895.1	1417	4915	4699	6798	3048	[ ]	[ ]	7
8	562.0	1553	1648	1145	889.7	1199	4607	4511	13776	2899	[ ]	[ ]	8
9	593.5	1591	1626	866.5	925.0	1162	5314	4798	11312	2733	[ ]	[ ]	9
10	485.6	1542	1714	1054	1472	1548	10996	4514	8211	2781	[ ]	[ ]	10
11	408.0	1493	1703	1125	1656	2099	12476	5388	13400	2446	[ ]	[ ]	11
12	535.8	1539	1704	1163	1516	2295	5846	5941	13814	2415	[ ]	[ ]	12
13	148.5	1560	1645	1257	577.6	2160	4685	12814	14015	2319	[ ]	[ ]	13
14	[ ]M	1357	1637	1153	166.6	2196	4253	13800	14001	2122	[ ]	[ ]	14
15	702.0	1816	1628	936.6	217.1	2348	4150	13806	12931	2112	[ ]	[ ]	15
16	730.3	1586	1691	1070	929.0	[ ]M	5089	13957	10658	2167	[ ]	[ ]	16
17	752.7	1524	1719	1164	1106	2466	11410	14187	7712	2156	[ ]	[ ]	17
18	1102	1695	1580	1297	1027	3225	7434	[ ]M	7581	1902	[ ]	[ ]	18
19	1047	1720	1345	1000	[ ]M	4955	11210	14148	6411	1763	[ ]	[ ]	19
20	1032	1601	1578	793.0	1230	5504	14132	14161	5725	1530	[ ]	[ ]	20
21	1072	1674	1522	975.5	2821	5805	[ ]M	14205	10013	[ ]	[ ]	[ ]	21
22	1242	1744	1309	1091	3067	5056	14156	13870	13695	[ ]	[ ]	[ ]	22
23	1254	1688	1473	1097	3178	4741	14173	13341	10757	[ ]	[ ]	[ ]	23
24	1082	1878	1440	1127	2070	5651	13969	11041	7827	[ ]	[ ]	[ ]	24
25	1128	1820	1501	1089	1804	8380	11910	8244	5121	[ ]	[ ]	[ ]	25
26	1338	1802	1444	914.4	1874	7085	8435	6269	4226	[ ]	[ ]	[ ]	26
27	1164	1803	1417	1001	1951	7082	6058	5292	3942	[ ]	[ ]	[ ]	27
28	1347	1917	1477	1055	1834	7367	5354	5343	3928	[ ]	[ ]	[ ]	28
29	1554		1466	1188	1730	12153	4840	5543	3580	[ ]	[ ]	[ ]	29
30	1226		1334	1108	1810	12914	4502	4868	3679	[ ]	[ ]	[ ]	30
31	1466		1469		1751		4148	4607		[ ]		[ ]	31
Mean	872.5	1590	1603	1162	1419	4098	7592	8057	8228	2597	[ ]	[ ]	
Median	741.5	1573	1628	1126	1179	2348	5600	5465	7471	2446	[ ]	[ ]	
Maximum	1554	1917	2044	1513	3178	12914	14173	14205	14015	3630	[ ]	[ ]	
Minimum	148.5	1318	1309	793.0	166.6	1162	4148	3249	3580	1530	[ ]	[ ]	
Total	26177	44545	49717	34869	42581	118848	227762	241726	246853	49352	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	3771
Ann. Median	1803
Annual Total	1082430
Missing Days	78

	Maximum	Minimum
Daily	14205	148.5

------------------ Notes ------------------

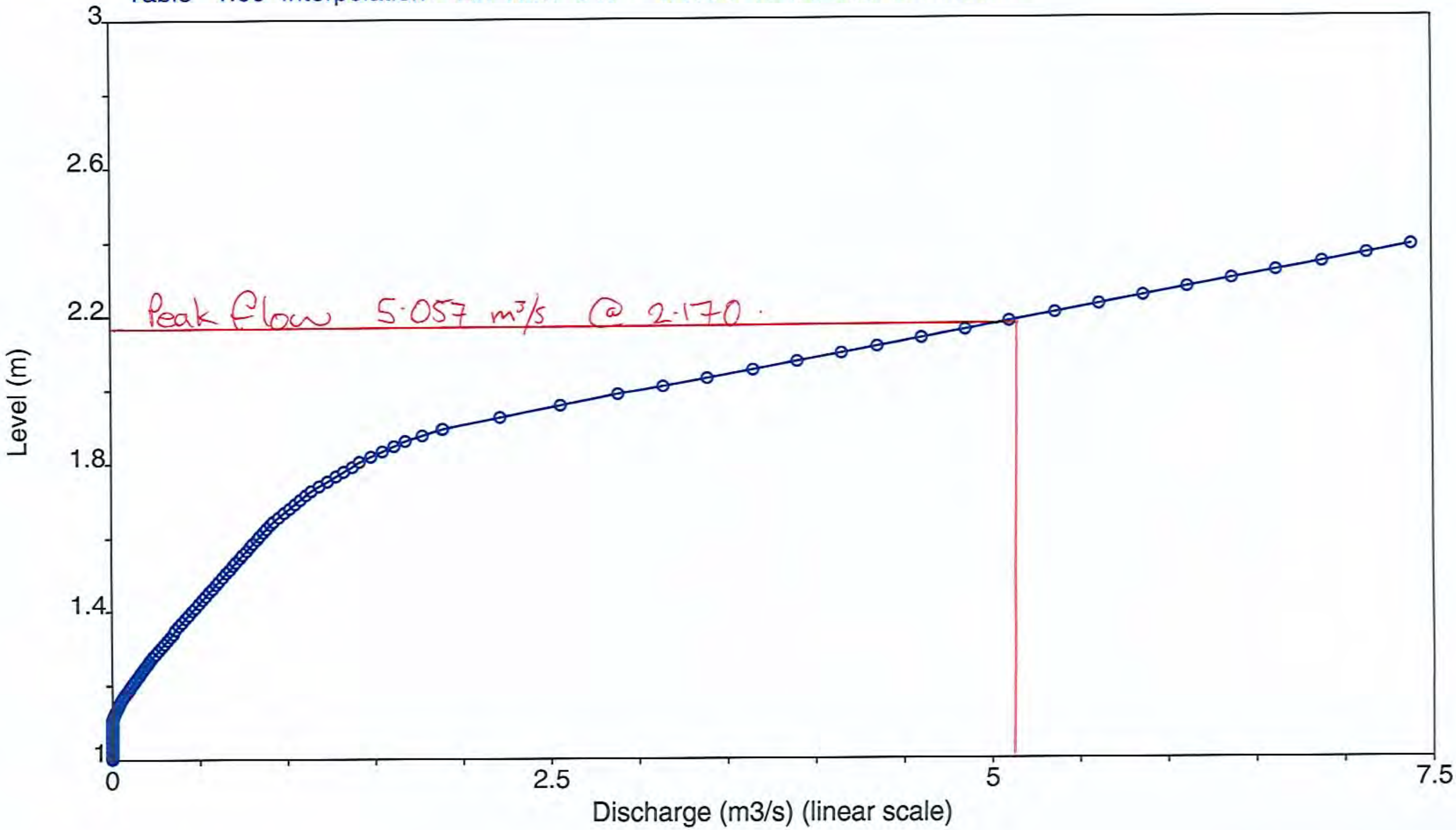
All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site	J4153OS4	NAMBEELUP LOT 221
VarFrom	100	Stream Water Level in Metres
VarTo	140	Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.1089 12/09/2008 to Present



JDA Consultant Hydrologists HYRATAB V146 Output 11/11/2009

Site J41530S4 NAMBEELUP LOT 221

Rating Table 1.00 12/09/2008 to Present Interpolation = Lin CTF = 1.1089

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.10	0.0	0.00127	0.00936	0.0194	0.0296	0.0400	0.0503	0.0659	0.0819	0.0976
1.20	0.113	0.129	0.145	0.161	0.176	0.192	0.208	0.223	0.241	0.260
1.30	0.279	0.297	0.316	0.335	0.351	0.364	0.382	0.402	0.420	0.440
1.40	0.458	0.478	0.496	0.514	0.535	0.553	0.573	0.591	0.609	0.629
1.50	0.647	0.667	0.686	0.703	0.724	0.742	0.762	0.781	0.798	0.818
1.60	0.836	0.854	0.874	0.894	0.915	0.940	0.966	0.992	1.02	1.04
1.70	1.07	1.10	1.12	1.15	1.19	1.23	1.26	1.30	1.33	1.37
1.80	1.40	1.44	1.49	1.54	1.58	1.63	1.68	1.74	1.81	1.88
1.90	1.98	2.08	2.19	2.30	2.40	2.51	2.62	2.72	2.83	2.95
2.00	3.07	3.19	3.31	3.42	3.54	3.65	3.76	3.88	3.99	4.10
2.10	4.22	4.33	4.44	4.55	4.67	4.78	4.89	5.00	5.12	5.23
2.20	5.35	5.46	5.57	5.68	5.80	5.91	6.02	6.14	6.25	6.36
2.30	6.47	6.59	6.70	6.82	6.93	7.04	7.15	7.27	7.38	

------------------ Notes -------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

Site	J41530S4	NAMBEELUP LOT 221	Year 2008
VarFrom	100.00	Stream Water Level in Metres	Table Type Rate
VarTo	140.00	Stream Discharge in Cubic metres/second	

Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.204	0.074	0.000	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.233	0.081	0.000	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.229	0.058	0.000	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.206	0.064	0.000	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.202	0.069	0.000	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.188	0.099	0.000	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.174	0.099	0.000	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.178	0.122	0.000	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.214	0.117	0.000	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.165	0.106	0.000	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.139	0.109	0.000	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.142	0.073	0.000	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.139	0.054	0.000	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.135	0.040	0.000	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.108	0.034	0.000	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.098	0.024	0.000	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.188	0.110	0.013	0.000	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.185	0.112	0.007	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.191	0.112	0.007	0.000	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.195	0.085	0.003	0.000	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.202	0.083	0.008	0.000	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.201	0.075	0.009	0.000	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.199	0.073	0.031	0.000	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.190	0.072	0.038	0.000	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.365	0.160	0.042	0.000	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.455	0.137	0.042	0.000	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.321	0.116	0.018	0.000	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.251	0.103	0.000	0.000	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.216	0.102	0.000	0.000	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.199	0.094	0.000	0.000	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.083		0.000	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.240	0.138	0.048	0.000	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.200	0.135	0.041	0.000	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.455	0.233	0.122	0.000	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.185	0.072	0.000	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.506	0.253	0.146	0.000	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.154	0.032	0.000	0.000	
Missing Days	31	29	31	30	31	30	31	31	16	0	0	1	

Summaries

Annual Mean	0.086	
Ann. Median	0.073	
Missing Days	261	
	Maximum	Minimum
Daily Mean	0.455	0.000
Instant	0.506	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

Site	J4153OS4	NAMBEELUP LOT 221	Year	2009
VarFrom	100.00	Stream Water Level in Metres	Table Type	Rate
VarTo	140.00	Stream Discharge in Cubic metres/second		

Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	0.000	0.000	0.402	0.229	0.322	[ ]M	[ ]	[ ]	1
2	0.000	0.000	0.000	0.000	0.000	0.000	0.134	0.213	0.359	0.153	[ ]	[ ]	2
3	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.198	0.313	0.141	[ ]	[ ]	3
4	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.182	0.250	0.127	[ ]	[ ]	4
5	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.142	0.400	0.105	[ ]	[ ]	5
6	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.255	0.500	0.084	[ ]	[ ]	6
7	0.000	0.000	0.000	0.000	0.000	0.000	0.105	0.308	0.459	0.070	[ ]	[ ]	7
8	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.262	0.965	0.058	[ ]	[ ]	8
9	0.000	0.000	0.000	0.000	0.000	0.000	0.180	0.347	0.679	0.046	[ ]	[ ]	9
10	0.000	0.000	0.000	0.000	0.000	0.000	0.725	0.270	0.526	0.040	[ ]	[ ]	10
11	0.000	0.000	0.000	0.000	0.000	0.000	0.821	0.373	1.279	0.030	[ ]	[ ]	11
12	0.000	0.000	0.000	0.000	0.000	0.000	0.360	0.398	3.625	0.025	[ ]	[ ]	12
13	0.000	0.000	0.000	0.000	0.000	0.000	0.190	1.016	2.001	0.022	[ ]	[ ]	13
14	[ ]M	0.000	0.000	0.000	0.000	0.000	0.126	4.482	1.018	0.018	[ ]	[ ]	14
15	0.000	0.000	0.000	0.000	0.000	0.000	0.103	4.073	0.756	0.014	[ ]	[ ]	15
16	0.000	0.000	0.000	0.000	0.000	0.000	0.184	2.391	0.631	0.008	[ ]	[ ]	16
17	0.000	0.000	0.000	0.000	0.000	0.000	0.761	1.569	0.510	0.002	[ ]	[ ]	17
18	0.000	0.000	0.000	0.000	0.000	0.000	0.536	[ ]M	0.503	0.000	[ ]	[ ]	18
19	0.000	0.000	0.000	0.000	[ ]M	0.000	0.937	1.630	0.445	0.000	[ ]	[ ]	19
20	0.000	0.000	0.000	0.000	0.000	0.000	1.742	1.116	0.399	0.000	[ ]	[ ]	20
21	0.000	0.000	0.000	0.000	0.000	0.000	[ ]M	1.168	0.611	[ ]	[ ]	[ ]	21
22	0.000	0.000	0.000	0.000	0.000	0.000	1.380	0.946	0.903	[ ]	[ ]	[ ]	22
23	0.000	0.000	0.000	0.000	0.000	0.000	1.749	0.838	0.664	[ ]	[ ]	[ ]	23
24	0.000	0.000	0.000	0.000	0.000	0.000	1.241	0.677	0.530	[ ]	[ ]	[ ]	24
25	0.000	0.000	0.000	0.000	0.000	0.285	0.805	0.563	0.381	[ ]	[ ]	[ ]	25
26	0.000	0.000	0.000	0.000	0.000	0.209	0.628	0.458	0.294	[ ]	[ ]	[ ]	26
27	0.000	0.000	0.000	0.000	0.000	0.190	0.463	0.383	0.236	[ ]	[ ]	[ ]	27
28	0.000	0.000	0.000	0.000	0.000	0.237	0.378	0.381	0.223	[ ]	[ ]	[ ]	28
29	0.000		0.000	0.000	0.000	0.609	0.323	0.410	0.203	[ ]	[ ]	[ ]	29
30	0.000		0.000	0.000	0.000	0.690	0.283	0.340	0.219	[ ]	[ ]	[ ]	30
31	0.000		0.000		0.000		0.251	0.292		[ ]		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.074	0.498	0.864	0.673	0.050	[ ]	[ ]	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.342	0.391	0.501	0.030	[ ]	[ ]	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.690	1.749	4.482	3.625	0.153	[ ]	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.142	0.203	0.000	[ ]	[ ]	
Inst.Max	0.000	0.000	0.000	0.000	0.000	0.770	2.130	5.057	3.996	0.170	[ ]	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.073	0.183	0.000	[ ]	[ ]	
Missing Days	1	0	0	0	1	0	1	1	0	12	30	31	

Summaries

Annual Mean	0.223
Ann. Median	0.000
Missing Days	77

	Maximum	Minimum
Daily Mean	4.482	0.000
Instant	5.057	0.000

------------------ Notes ------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 11/11/2009

Site J41530S4 NAMBEELUP LOT 221 Year 2008
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17604	6392	0.00	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	20112	6983	0.00	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	19800	4991	0.00	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17790	5499	0.00	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17487	5940	0.00	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16250	8557	0.00	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15068	8529	0.00	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15339	10561	0.00	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	18529	10076	0.00	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	14224	9123	0.00	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12008	9402	0.00	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12247	6346	0.00	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	12011	4666	0.00	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	11701	3464	0.00	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	9295	2936	0.00	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	8453	2056	0.00	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16229	9483	1130	0.00	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15950	9709	571.5	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16528	9687	586.2	0.00	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16868	7320	293.0	0.00	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17438	7152	658.5	0.00	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17333	6511	779.7	0.00	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17178	6297	2666	0.00	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	16431	6193	3313	0.00	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	31507	13837	3639	0.00	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	39272	11818	3660	0.00	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	27776	10039	1565	0.00	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	21661	8941	0.00	0.00	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	18638	8771	0.00	0.00	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17165	8105	0.00	0.00	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		7203		0.00	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	20712	11903	4146	0.00	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	17256	11701	3551	0.00	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	39272	20112	10561	0.00	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	15950	6193	0.00	0.00	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	289980	368999	124395	0.0	
Missing Days	31	29	31	30	31	30	31	31	16	0	0	1	

Summaries

Annual Mean	7460
Ann. Median	6297
Annual Total	783375
Missing Days	261

	Maximum	Minimum
Daily	39272	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S4 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2009
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.0	0.0	0.0	0.0	0.0	0.0	34722	19763	27838	[ ]M	[ ]	[ ]	1
2	0.0	0.0	0.0	0.0	0.0	0.0	11605	18375	30983	13192	[ ]	[ ]	2
3	0.0	0.0	0.0	0.0	0.0	0.0	4028	17076	27009	12166	[ ]	[ ]	3
4	0.0	0.0	0.0	0.0	0.0	0.0	1129	15725	21582	10941	[ ]	[ ]	4
5	0.0	0.0	0.0	0.0	0.0	0.0	107.7	12243	34565	9030	[ ]	[ ]	5
6	0.0	0.0	0.0	0.0	0.0	0.0	644.0	22030	43200	7235	[ ]	[ ]	6
7	0.0	0.0	0.0	0.0	0.0	0.0	9104	26647	39663	6055	[ ]	[ ]	7
8	0.0	0.0	0.0	0.0	0.0	0.0	6123	22650	83388	5010	[ ]	[ ]	8
9	0.0	0.0	0.0	0.0	0.0	0.0	15539	29955	58654	3980	[ ]	[ ]	9
10	0.0	0.0	0.0	0.0	0.0	0.0	62653	23366	45455	3452	[ ]	[ ]	10
11	0.0	0.0	0.0	0.0	0.0	0.0	70963	32266	110500	2589	[ ]	[ ]	11
12	0.0	0.0	0.0	0.0	0.0	0.0	31125	34355	313189	2198	[ ]	[ ]	12
13	0.0	0.0	0.0	0.0	0.0	0.0	16399	87779	172856	1913	[ ]	[ ]	13
14	[ ]M	0.0	0.0	0.0	0.0	0.0	10849	387284	87930	1559	[ ]	[ ]	14
15	0.0	0.0	0.0	0.0	0.0	0.0	8906	351944	65356	1179	[ ]	[ ]	15
16	0.0	0.0	0.0	0.0	0.0	0.0	15868	206584	54513	649.4	[ ]	[ ]	16
17	0.0	0.0	0.0	0.0	0.0	0.0	65736	135538	44039	195.6	[ ]	[ ]	17
18	0.0	0.0	0.0	0.0	0.0	0.0	46279	[ ]M	43422	14.1	[ ]	[ ]	18
19	0.0	0.0	0.0	0.0	[ ]M	0.0	80992	140836	38433	0.0	[ ]	[ ]	19
20	0.0	0.0	0.0	0.0	0.0	0.0	150502	96453	34490	0.0	[ ]	[ ]	20
21	0.0	0.0	0.0	0.0	0.0	0.0	[ ]M	100955	52789	[ ]	[ ]	[ ]	21
22	0.0	0.0	0.0	0.0	0.0	0.0	119232	81777	77981	[ ]	[ ]	[ ]	22
23	0.0	0.0	0.0	0.0	0.0	0.0	151147	72371	57385	[ ]	[ ]	[ ]	23
24	0.0	0.0	0.0	0.0	0.0	23.6	107240	58490	45774	[ ]	[ ]	[ ]	24
25	0.0	0.0	0.0	0.0	0.0	24639	69522	48606	32947	[ ]	[ ]	[ ]	25
26	0.0	0.0	0.0	0.0	0.0	18020	54291	39556	25440	[ ]	[ ]	[ ]	26
27	0.0	0.0	0.0	0.0	0.0	16415	40038	33130	20415	[ ]	[ ]	[ ]	27
28	0.0	0.0	0.0	0.0	0.0	20437	32687	32959	19239	[ ]	[ ]	[ ]	28
29	0.0		0.0	0.0	0.0	52611	27909	35388	17558	[ ]	[ ]	[ ]	29
30	0.0		0.0	0.0	0.0	59598	24487	29334	18896	[ ]	[ ]	[ ]	30
31	0.0		0.0		0.0		21726	25219		[ ]		[ ]	31
Mean	0.00	0.00	0.00	0.00	0.00	6391	43052	74622	58183	4282	[ ]	[ ]	
Median	0.00	0.00	0.00	0.00	0.00	0.00	29517	33743	43311	2589	[ ]	[ ]	
Maximum	0.0	0.0	0.0	0.0	0.0	59598	151147	387284	313189	13192	[ ]	[ ]	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	107.7	12243	17558	0.00	[ ]	[ ]	
Total	0	0	0	0	0	191747	1291566	2238669	1745504	81365	[ ]	[ ]	
Missing Days	1	0	0	0	1	0	1	1	0	12	30	31	

Summaries

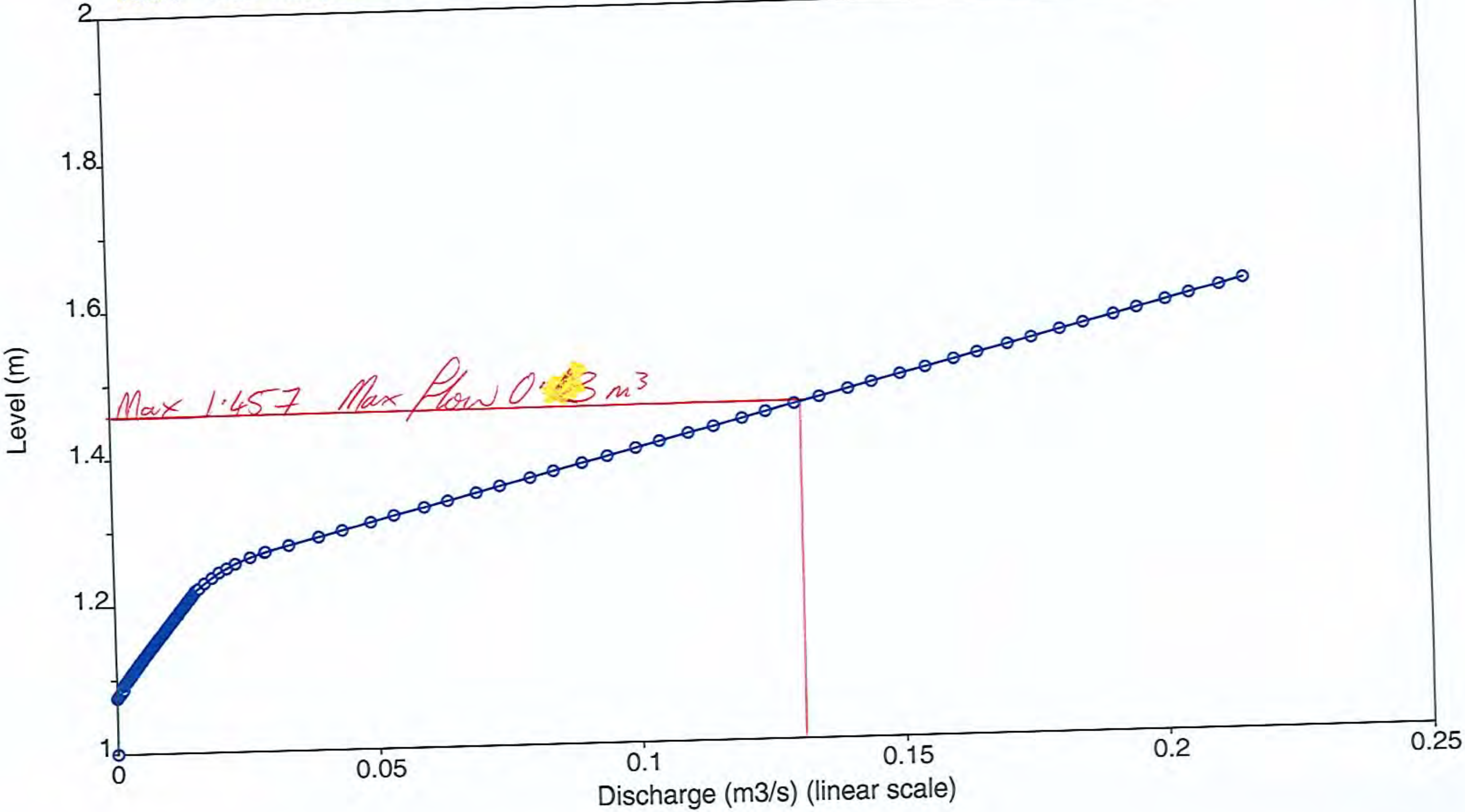
Annual Mean	19266
Ann. Median	0.00
Annual Total	5548850
Missing Days	77

	Maximum	Minimum
Daily	387284	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site J4153OS5 NAMBEELUP LOT 221
VarFrom 100 Stream Water Level in Metres
VarTo 140 Stream Discharge in Cubic metres/second
Table 1.00 Interpolation = Lin New CTF = 1.0754 13/09/2008 to Present



JDA Consultant Hydrologists

HYRATAB V146 Output 11/11/2009

Site J41530S5 NAMBEELUP LOT 221

Rating Table 1.00 13/09/2008 to Present Interpolation = Lin CTF = 1.0754

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000429	0.00130
1.10	0.00214	0.00326	0.00436	0.00551	0.00658	0.00774	0.00889	0.00996	0.0111	0.0122
1.20	0.0133	0.0145	0.0156	0.0174	0.0194	0.0219	0.0250	0.0292	0.0346	0.0403
1.30	0.0457	0.0511	0.0567	0.0623	0.0677	0.0731	0.0788	0.0841	0.0897	0.0954
1.40	0.101	0.106	0.112	0.117	0.123	0.128	0.134	0.139	0.145	0.150
1.50	0.156	0.161	0.167	0.172	0.178	0.183	0.189	0.194	0.200	0.205
1.60	0.211									

------------------ Notes ------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J4153OS5 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2008
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.034	0.017	0.009	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.037	0.016	0.009	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.030	0.014	0.009	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.015	0.010	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.027	[ ]M	0.009	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.026	0.017	0.009	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.024	0.017	0.010	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.023	0.016	0.010	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.021	0.015	0.010	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.022	0.016	0.010	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.021	0.018	0.011	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.022	0.019	0.011	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.022	0.018	0.012	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.022	0.017	0.012	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.018	0.016	0.012	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.019	0.015	0.012	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.013	0.019	0.014	0.011	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.012	0.019	0.013	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.013	0.018	0.013	0.010	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.012	0.016	0.013	0.011	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.012	0.016	0.014	0.010	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.012	0.015	0.014	0.010	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.012	0.015	0.016	0.010	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.010	0.015	0.014	0.010	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.019	0.021	0.015	0.010	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.020	0.019	0.015	0.010	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.015	0.018	0.012	0.010	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.019	0.018	0.009	0.010	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.035	0.017	0.009	0.009	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.036	0.017	0.009	0.009	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.017		0.009	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.017	0.021	0.015	0.010	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.013	0.019	0.015	0.010	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.036	0.037	0.019	0.012	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.010	0.015	0.009	0.009	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.041	0.044	0.021	0.013	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.009	0.012	0.008	0.007	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

Summaries

Annual Mean	0.016
Ann. Median	0.015
Missing Days	262

	Maximum	Minimum
Daily Mean	0.037	0.009
Instant	0.044	0.007

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S5 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.008	0.013	0.015	0.013	0.010	0.010	0.070	0.020	0.027	[ ]M	[ ]	[ ]	1
2	0.009	0.013	0.016	0.013	0.010	0.010	0.052	0.019	0.030	0.019	[ ]	[ ]	2
3	0.009	0.012	0.014	0.013	0.010	0.010	0.039	0.018	0.024	0.018	[ ]	[ ]	3
4	0.009	0.012	0.014	0.013	0.010	0.010	0.031	0.017	0.022	0.017	[ ]	[ ]	4
5	0.009	0.012	0.014	0.013	0.010	0.009	0.026	0.017	0.031	0.018	[ ]	[ ]	5
6	0.009	0.012	0.014	0.013	0.010	0.009	0.024	0.025	0.026	0.017	[ ]	[ ]	6
7	0.009	0.012	0.014	0.013	0.010	0.009	0.024	0.022	0.028	0.017	[ ]	[ ]	7
8	0.009	0.012	0.015	0.012	0.010	0.009	0.021	0.024	0.039	0.016	[ ]	[ ]	8
9	0.009	0.012	0.014	0.012	0.009	0.009	0.025	0.022	0.034	0.016	[ ]	[ ]	9
10	0.009	0.012	0.015	0.012	0.010	0.011	0.050	0.023	0.033	0.016	[ ]	[ ]	10
11	0.009	0.012	0.015	0.012	0.010	0.015	0.047	0.022	0.054	0.015	[ ]	[ ]	11
12	0.009	0.013	0.016	0.012	0.010	0.015	0.033	0.025	0.065	0.015	[ ]	[ ]	12
13	0.009	0.013	0.015	0.012	0.009	0.014	0.024	0.048	0.055	0.015	[ ]	[ ]	13
14	[ ]M	0.012	0.015	0.012	0.008	0.013	0.019	0.113	0.044	0.015	[ ]	[ ]	14
15	0.009	0.013	0.015	0.011	0.008	0.013	0.018	0.117	0.042	0.015	[ ]	[ ]	15
16	0.009	0.013	0.015	0.011	0.008	[ ]M	0.024	0.099	0.034	0.016	[ ]	[ ]	16
17	0.010	0.013	0.015	0.011	0.008	0.012	0.044	0.085	0.031	0.016	[ ]	[ ]	17
18	0.011	0.013	0.014	0.011	0.008	0.017	0.039	[ ]M	0.027	0.015	[ ]	[ ]	18
19	0.010	0.014	0.012	0.010	[ ]M	0.041	0.055	0.056	0.024	0.015	[ ]	[ ]	19
20	0.010	0.013	0.014	0.010	0.009	0.053	0.074	0.049	0.024	0.014	[ ]	[ ]	20
21	0.010	0.013	0.013	0.010	0.012	0.062	[ ]M	0.045	0.033	[ ]	[ ]	[ ]	21
22	0.011	0.013	0.013	0.010	0.013	0.049	0.078	0.039	0.035	[ ]	[ ]	[ ]	22
23	0.011	0.013	0.014	0.009	0.013	0.040	0.107	0.034	0.036	[ ]	[ ]	[ ]	23
24	0.011	0.014	0.014	0.010	0.010	0.050	0.085	0.027	0.031	[ ]	[ ]	[ ]	24
25	0.011	0.015	0.014	0.010	0.010	0.077	0.071	0.023	0.025	[ ]	[ ]	[ ]	25
26	0.012	0.015	0.014	0.010	0.011	0.072	0.055	0.020	0.023	[ ]	[ ]	[ ]	26
27	0.011	0.014	0.014	0.011	0.011	0.070	0.043	0.018	0.023	[ ]	[ ]	[ ]	27
28	0.012	0.015	0.014	0.011	0.010	0.074	0.035	0.020	0.023	[ ]	[ ]	[ ]	28
29	0.012		0.014	0.011	0.010	0.079	0.027	0.020	0.021	[ ]	[ ]	[ ]	29
30	0.012		0.014	0.010	0.010	0.083	0.024	0.020	0.021	[ ]	[ ]	[ ]	30
31	0.012		0.014		0.011		0.022	0.020		[ ]		[ ]	31
Mean	0.010	0.013	0.014	0.011	0.010	0.033	0.043	0.037	0.032	0.016	[ ]	[ ]	
Median	0.010	0.013	0.014	0.011	0.010	0.015	0.037	0.023	0.030	0.016	[ ]	[ ]	
Max.Daily Mean	0.012	0.015	0.016	0.013	0.013	0.083	0.107	0.117	0.065	0.019	[ ]	[ ]	
Min.Daily Mean	0.008	0.012	0.012	0.009	0.008	0.009	0.018	0.017	0.021	0.014	[ ]	[ ]	
Inst.Max	0.014	0.018	0.018	0.015	0.014	0.087	0.115	0.132	0.075	0.020	[ ]	[ ]	
Inst.Min	0.006	0.010	0.011	0.007	0.006	0.007	0.016	0.015	0.018	0.013	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	0.022
Ann. Median	0.014
Missing Days	78

	Maximum	Minimum
Daily Mean	0.117	0.008
Instant	0.132	0.006

------------------ Notes ------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 11/11/2009

Site	J4153OS5	NAMBEELUP LOT 221	Year	2008
VarFrom	100.00	Stream Water Level in Metres	Table Type	Total
VarTo	150.00	Stream Discharge Volume in Cubic metres		

Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2933	1438	736.7	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3190	1339	755.1	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2566	1200	805.6	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2213	1277	854.0	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2343	[ ]M	810.2	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2224	1442	804.8	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	2053	1470	821.8	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1999	1383	825.8	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1849	1335	842.4	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1905	1359	900.0	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1779	1581	985.7	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1868	1619	953.7	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1889	1588	1014	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1863	1435	1066	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1575	1365	1021	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1612	1289	1006	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1104	1654	1173	971.0	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1069	1623	1135	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1093	1588	1120	903.4	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1048	1398	1156	986.2	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1055	1365	1221	888.4	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1017	1336	1233	843.1	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1030	1322	1355	847.0	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	906.5	1327	1250	849.1	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1647	1789	1282	862.4	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1764	1624	1283	840.7	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1330	1517	1059	847.7	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1660	1516	791.5	843.3	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3059	1502	787.9	803.0	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3120	1456	770.7	769.5	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		1439		788.5	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1493	1817	1267	874.9	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	1099	1654	1283	847.3	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	3120	3190	1619	1066	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	906.5	1322	770.7	736.7	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	20909	56335	36749	26250	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

Summaries

Annual Mean	1348
Ann. Median	1282
Annual Total	140243
Missing Days	262

	Maximum	Minimum
Daily	3190	736.7

------------------ Notes ------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S5 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2009
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	726.5	1088	1314	1092	869.8	841.7	6011	1723	2308	[ ]M	[ ]	[ ]	1
2	737.7	1082	1357	1090	873.3	899.4	4452	1661	2549	1640	[ ]	[ ]	2
3	775.2	1078	1176	1115	859.4	846.6	3337	1545	2070	1587	[ ]	[ ]	3
4	773.9	1060	1225	1107	861.9	846.4	2675	1461	1859	1503	[ ]	[ ]	4
5	752.0	1025	1247	1108	832.2	786.1	2208	1449	2687	1525	[ ]	[ ]	5
6	766.8	1019	1209	1106	845.2	789.1	2105	2121	2247	1501	[ ]	[ ]	6
7	775.2	1004	1235	1083	834.8	740.6	2056	1890	2426	1482	[ ]	[ ]	7
8	756.3	1040	1274	1058	828.9	756.2	1798	2065	3338	1418	[ ]	[ ]	8
9	781.2	1056	1238	1043	804.6	819.2	2181	1939	2957	1391	[ ]	[ ]	9
10	779.2	1026	1278	1060	837.9	932.2	4280	1944	2860	1424	[ ]	[ ]	10
11	766.5	1036	1301	1065	873.5	1283	4092	1935	4642	1324	[ ]	[ ]	11
12	820.4	1084	1367	1044	847.4	1266	2821	2129	5654	1320	[ ]	[ ]	12
13	757.8	1099	1289	1033	783.8	1184	2046	4189	4737	1329	[ ]	[ ]	13
14	[ ]M	1026	1262	1030	724.3	1133	1683	9762	3837	1317	[ ]	[ ]	14
15	779.2	1105	1282	945.6	699.5	1112	1544	10077	3631	1335	[ ]	[ ]	15
16	807.5	1092	1286	911.2	664.9	[ ]M	2079	8525	2937	1351	[ ]	[ ]	16
17	834.7	1093	1288	926.6	652.8	1028	3838	7384	2638	1355	[ ]	[ ]	17
18	910.4	1165	1190	957.0	675.1	1436	3336	[ ]M	2307	1311	[ ]	[ ]	18
19	898.3	1180	1078	898.7	[ ]M	3562	4794	4868	2056	1303	[ ]	[ ]	19
20	890.3	1152	1196	888.4	773.3	4599	6386	4257	2082	1230	[ ]	[ ]	20
21	894.1	1153	1164	893.1	1054	5338	[ ]M	3883	2851	[ ]	[ ]	[ ]	21
22	964.5	1143	1122	905.2	1101	4226	6774	3344	3061	[ ]	[ ]	[ ]	22
23	989.6	1132	1224	794.9	1141	3480	9233	2943	3071	[ ]	[ ]	[ ]	23
24	933.2	1224	1224	842.7	898.8	4329	7359	2373	2638	[ ]	[ ]	[ ]	24
25	944.4	1289	1249	885.8	866.7	6689	6162	1984	2175	[ ]	[ ]	[ ]	25
26	994.1	1264	1213	880.3	915.3	6224	4791	1723	2017	[ ]	[ ]	[ ]	26
27	951.4	1235	1225	934.2	917.8	6074	3746	1589	2018	[ ]	[ ]	[ ]	27
28	1023	1271	1246	913.2	861.6	6356	3000	1733	1981	[ ]	[ ]	[ ]	28
29	1057		1223	912.8	870.2	6822	2342	1711	1790	[ ]	[ ]	[ ]	29
30	1000		1195	863.6	899.9	7179	2061	1721	1797	[ ]	[ ]	[ ]	30
31	1065		1226		923.5		1905	1725		[ ]		[ ]	31
Mean	863.6	1115	1239	979.8	853.1	2813	3703	3189	2774	1402	[ ]	[ ]	
Median	827.5	1093	1235	951.3	860.5	1266	3168	1964	2593	1355	[ ]	[ ]	
Maximum	1065	1289	1367	1115	1141	7179	9233	10077	5654	1640	[ ]	[ ]	
Minimum	726.5	1004	1078	794.9	652.8	740.6	1544	1449	1790	1230	[ ]	[ ]	
Total	25909	31234	38418	29396	25595	81587	111111	95670	83236	26654	[ ]	[ ]	
Missing Days	1	0	0	0	1	1	1	1	0	12	30	31	

Summaries

Annual Mean	1912
Ann. Median	1230
Annual Total	548810
Missing Days	78

	Maximum	Minimum
Daily	10077	652.8

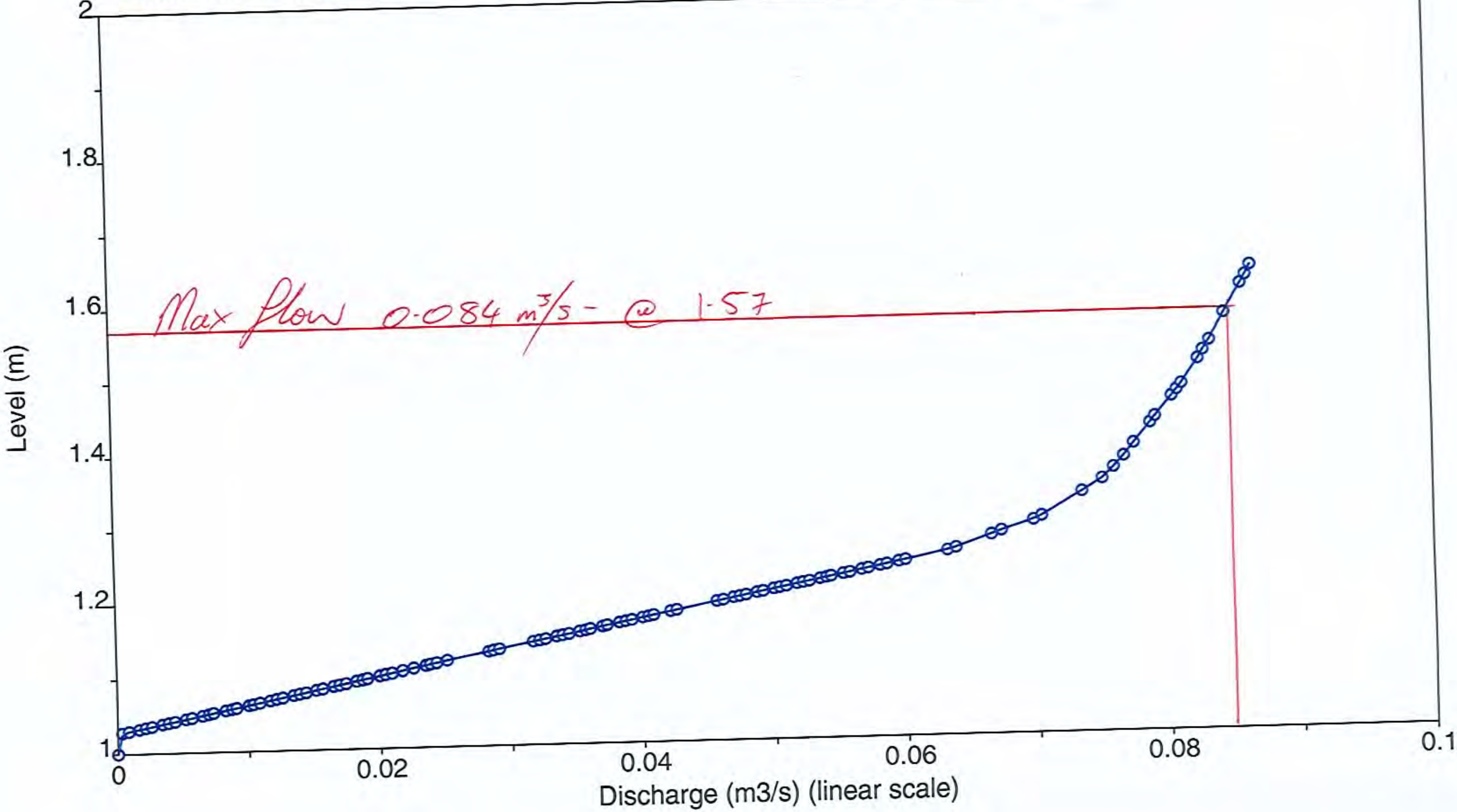
------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

Site	J4153OS6	NAMBEELUP LOT 221
VarFrom	100	Stream Water Level in Metres
VarTo	140	Stream Discharge in Cubic metres/second

Table 1.00 Interpolation = Lin New CTF = 1.0000 12/09/2008 to Present



JDA Consultant Hydrologists HYRATAB V146 Output 11/11/2009

Site J4153OS6 NAMBEELUP LOT 221

Rating Table 1.00 12/09/2008 to Present Interpolation = Lin CTF = 1.0000

Converting 100 Stream Water Level in Metres
Into 140 Stream Discharge in Cubic metres/second

G.H.	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.00	0.0	0.000122	0.000244	0.000754	0.00362	0.00649	0.00935	0.0122	0.0151	0.0179
1.10	0.0209	0.0237	0.0266	0.0294	0.0323	0.0352	0.0380	0.0409	0.0438	0.0467
1.20	0.0495	0.0525	0.0553	0.0582	0.0610	0.0636	0.0653	0.0669	0.0686	0.0702
1.30	0.0712	0.0722	0.0732	0.0741	0.0750	0.0756	0.0762	0.0767	0.0772	0.0776
1.40	0.0781	0.0786	0.0791	0.0795	0.0800	0.0805	0.0810	0.0814	0.0818	0.0822
1.50	0.0825	0.0829	0.0833	0.0836	0.0839	0.0842	0.0845	0.0849	0.0852	0.0855
1.60	0.0859	0.0862	0.0865							

------------------ Notes ------------------

All rated data has been coded as reliable

JDA Consultant Hydrologists

Site J41530S6 NAMBEELUP LOT 221 Year 2008
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.065	0.019	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.075	0.064	0.019	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.060	0.023	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.073	0.061	0.021	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	[ ]M	0.017	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.065	0.013	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.072	0.066	0.012	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.072	0.066	0.010	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.070	0.065	0.008	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.069	0.062	0.007	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.067	0.062	0.007	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.068	0.062	0.005	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.066	0.062	0.005	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.066	0.059	0.006	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.060	0.058	0.002	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.057	0.055	0.000	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.073	0.062	0.050	0.000	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.073	0.065	0.047	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.073	0.062	0.045	0.001	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.058	0.047	0.000	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.073	0.058	0.047	0.000	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.057	0.044	0.000	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.056	0.054	0.000	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.072	0.057	0.047	0.000	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.063	0.044	0.000	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.076	0.064	0.042	0.000	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.076	0.064	0.037	0.000	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.076	0.063	0.025	0.000	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.075	0.065	0.023	0.000	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.064	0.021	0.000	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		0.065		0.000	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.066	0.052	0.006	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.074	0.065	0.055	0.001	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.076	0.075	0.066	0.023	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.072	0.056	0.021	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.077	0.076	0.069	0.025	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.071	0.050	0.017	0.000	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

Summaries

Annual Mean	0.046
Ann. Median	0.059
Missing Days	262

	Maximum	Minimum
Daily Mean	0.076	0.000
Instant	0.077	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S6 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2009
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.076	0.081	[ ]M	[ ]	[ ]	1
2	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.075	0.080	0.074	[ ]	[ ]	2
3	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.075	0.080	0.074	[ ]	[ ]	3
4	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.074	0.079	0.071	[ ]	[ ]	4
5	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.072	0.079	0.070	[ ]	[ ]	5
6	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.074	0.079	0.068	[ ]	[ ]	6
7	0.000	0.000	0.000	0.000	0.000	0.000	0.039	0.072	0.079	0.065	[ ]	[ ]	7
8	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.072	0.079	0.061	[ ]	[ ]	8
9	0.000	0.000	0.000	0.000	0.000	0.000	0.053	0.072	0.080	0.057	[ ]	[ ]	9
10	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.071	0.080	0.055	[ ]	[ ]	10
11	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.070	0.080	0.045	[ ]	[ ]	11
12	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.070	0.081	0.043	[ ]	[ ]	12
13	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.073	0.081	0.042	[ ]	[ ]	13
14	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.078	0.082	0.038	[ ]	[ ]	14
15	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.080	0.082	0.037	[ ]	[ ]	15
16	0.000	0.000	0.000	0.000	0.000	[ ]M	0.046	0.081	0.081	0.032	[ ]	[ ]	16
17	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.082	0.081	0.028	[ ]	[ ]	17
18	0.000	0.000	0.000	0.000	0.000	0.000	0.051	[ ]M	0.081	0.027	[ ]	[ ]	18
19	0.000	0.000	0.000	0.000	0.000	0.000	0.055	0.083	0.080	0.025	[ ]	[ ]	19
20	0.000	0.000	0.000	0.000	0.000	0.000	0.054	0.083	0.080	0.015	[ ]	[ ]	20
21	0.000	0.000	0.000	0.000	0.000	0.000	[ ]M	0.083	0.080	[ ]	[ ]	[ ]	21
22	0.000	0.000	0.000	0.000	0.000	0.000	0.069	0.083	0.080	[ ]	[ ]	[ ]	22
23	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.083	0.080	[ ]	[ ]	[ ]	23
24	0.000	0.000	0.000	0.000	0.000	0.000	0.076	0.083	0.080	[ ]	[ ]	[ ]	24
25	0.000	0.000	0.000	0.000	0.000	0.003	0.077	0.083	0.079	[ ]	[ ]	[ ]	25
26	0.000	0.000	0.000	0.000	0.000	0.005	0.077	0.082	0.078	[ ]	[ ]	[ ]	26
27	0.000	0.000	0.000	0.000	0.000	0.013	0.077	0.081	0.078	[ ]	[ ]	[ ]	27
28	0.000	0.000	0.000	0.000	0.000	0.019	0.077	0.081	0.078	[ ]	[ ]	[ ]	28
29	0.000		0.000	0.000	0.000	0.027	0.077	0.081	0.076	[ ]	[ ]	[ ]	29
30	0.000		0.000	0.000	0.000	0.035	0.077	0.081	0.076	[ ]	[ ]	[ ]	30
31	0.000		0.000		0.000		0.077	0.080		[ ]		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.004	0.055	0.078	0.080	0.049	[ ]	[ ]	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.080	0.080	0.045	[ ]	[ ]	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.035	0.077	0.083	0.082	0.074	[ ]	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.070	0.076	0.015	[ ]	[ ]	
Inst.Max	0.000	0.000	0.000	0.000	0.000	0.043	0.078	0.084	0.082	0.075	[ ]	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.068	0.075	0.008	[ ]	[ ]	
Missing Days	0	0	0	0	0	1	1	1	0	12	30	31	

Summaries

Annual Mean 0.026
Ann. Median 0.000
Missing Days 76

	Maximum	Minimum
Daily Mean	0.083	0.000
Instant	0.084	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 11/11/2009

Site J41530S6 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2008
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6405	5608	1619	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6463	5550	1619	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6429	5141	1955	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6330	5287	1806	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6420	[ ]M	1478	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6377	5584	1147	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6259	5677	1052	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6214	5706	864.7	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6090	5606	688.8	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5995	5314	576.3	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5801	5355	587.2	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5837	5353	419.8	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5734	5337	390.0	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5730	5129	479.7	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	5191	5047	130.6	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	4941	4772	37.02	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6293	5351	4356	6.10	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6309	5576	4083	[ ]M	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6343	5396	3882	82.03	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6366	5049	4077	22.57	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6326	4996	4025	11.90	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6403	4893	3819	18.46	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6397	4804	4638	25.95	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6247	4920	4033	10.51	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6403	5450	3785	8.16	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6553	5524	3648	4.82	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6538	5559	3233	0.00	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6561	5435	2132	0.00	28
29	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6508	5593	1947	0.00	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6430	5562	1796	0.00	30
31	[ ]		[ ]		[ ]		[ ]	[ ]		5605		0.00	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6405	5675	4480	501.4	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6400	5593	4772	106.3	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6561	6463	5706	1955	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	6247	4804	1796	0.00	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	89683	175943	129932	15044	
Missing Days	31	29	31	30	31	30	31	31	16	0	1	1	

Summaries

Annual Mean	3948
Ann. Median	5089
Annual Total	410601
Missing Days	262

	Maximum	Minimum
Daily	6561	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists   HYDAY V106 Output 11/11/2009

Site J41530S6   NAMBEELUP LOT 221   Year 2009
VarFrom 100.00   Stream Water Level in Metres   Table Type Total
VarTo 150.00   Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.00	0.00	0.00	0.00	0.00	0.00	3127	6571	6980	[ ]M	[ ]	[ ]	1
2	0.00	0.00	0.00	0.00	0.00	0.00	3016	6520	6923	6375	[ ]	[ ]	2
3	0.00	0.00	0.00	0.00	0.00	0.00	2936	6457	6885	6369	[ ]	[ ]	3
4	0.00	0.00	0.00	0.00	0.00	0.00	3021	6354	6840	6148	[ ]	[ ]	4
5	0.00	0.00	0.00	0.00	0.00	0.00	2916	6261	6848	6029	[ ]	[ ]	5
6	0.00	0.00	0.00	0.00	0.00	0.00	3264	6359	6804	5852	[ ]	[ ]	6
7	0.00	0.00	0.00	0.00	0.00	0.00	3393	6179	6837	5599	[ ]	[ ]	7
8	0.00	0.00	0.00	0.00	0.00	0.00	4076	6227	6867	5312	[ ]	[ ]	8
9	0.00	0.00	0.00	0.00	0.00	0.00	4564	6215	6910	4936	[ ]	[ ]	9
10	0.00	0.00	0.00	0.00	0.00	0.00	4483	6142	6909	4739	[ ]	[ ]	10
11	0.00	0.00	0.00	0.00	0.00	0.00	4402	6017	6923	3926	[ ]	[ ]	11
12	0.00	0.00	0.00	0.00	0.00	0.00	4008	6054	6979	3692	[ ]	[ ]	12
13	0.00	0.00	0.00	0.00	0.00	0.00	3873	6287	7018	3651	[ ]	[ ]	13
14	0.00	0.00	0.00	0.00	0.00	0.00	3716	6702	7043	3298	[ ]	[ ]	14
15	0.00	0.00	0.00	0.00	0.00	0.00	3750	6878	7064	3234	[ ]	[ ]	15
16	0.00	0.00	0.00	0.00	0.00	[ ]M	4005	7016	7004	2744	[ ]	[ ]	16
17	0.00	0.00	0.00	0.00	0.00	18.25	4344	7110	7027	2389	[ ]	[ ]	17
18	0.00	0.00	0.00	0.00	0.00	5.90	4365	[ ]M	6994	2340	[ ]	[ ]	18
19	0.00	0.00	0.00	0.00	0.00	0.01	4766	7160	6940	2138	[ ]	[ ]	19
20	0.00	0.00	0.00	0.00	0.00	0.98	4693	7178	6939	1286	[ ]	[ ]	20
21	0.00	0.00	0.00	0.00	0.00	0.02	[ ]M	7168	6911	[ ]	[ ]	[ ]	21
22	0.00	0.00	0.00	0.00	0.00	0.99	5996	7171	6876	[ ]	[ ]	[ ]	22
23	0.00	0.00	0.00	0.00	0.00	0.00	6479	7164	6947	[ ]	[ ]	[ ]	23
24	0.00	0.00	0.00	0.00	0.00	3.29	6529	7157	6898	[ ]	[ ]	[ ]	24
25	0.00	0.00	0.00	0.00	0.00	279.1	6625	7137	6796	[ ]	[ ]	[ ]	25
26	0.00	0.00	0.00	0.00	0.00	452.7	6660	7075	6745	[ ]	[ ]	[ ]	26
27	0.00	0.00	0.00	0.00	0.00	1139	6683	7040	6719	[ ]	[ ]	[ ]	27
28	0.00	0.00	0.00	0.00	0.00	1655	6687	7018	6726	[ ]	[ ]	[ ]	28
29	0.00		0.00	0.00	0.00	2328	6665	6991	6600	[ ]	[ ]	[ ]	29
30	0.00		0.00	0.00	0.00	3010	6648	6972	6561	[ ]	[ ]	[ ]	30
31	0.00		0.00		0.00		6618	6934		[ ]		[ ]	31
Mean	0.00	0.00	0.00	0.00	0.00	306.7	4744	6717	6884	4214	[ ]	[ ]	
Median	0.00	0.00	0.00	0.00	0.00	0.00	4383	6906	6909	3926	[ ]	[ ]	
Maximum	0.00	0.00	0.00	0.00	0.00	3010	6687	7178	7064	6375	[ ]	[ ]	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	2916	6017	6561	1286	[ ]	[ ]	
Total	0.0	0.0	0.0	0.0	0.0	8895	142323	201527	206528	80068	[ ]	[ ]	
Missing Days	0	0	0	0	0	1	1	1	0	12	30	31	

Summaries

Annual Mean	2212
Ann. Median	0.00
Annual Total	639343
Missing Days	76

	Maximum	Minimum
Daily	7178	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

APPENDIX C

Laboratory Reports 2008 & 2009

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1/2

Analytical Report

Chemical Water Analysis

Job No :	**097349**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Andy Britt
E-mail:	andy@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c8
Date Sampled:	21/10/2009
Date Received:	21/10/2009
Date Reported:	9/11/2009
Sampled By:	Client
Location:	Nambeelup

RECEIVED 13 NOV 2009

Approved Checker
Leonard Kong

Approved Signatory
Ben Humphreys

Entered AB 16/11/09.

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

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Analytical Report

Job No : 097349

Lab Id	External Idents	NO3	NO2_N	NOx_N	Tot N	Tot P	PO4_P	TKN
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.005	0.005	0.005	0.05	0.01	0.005	0.05
097349-001	S1	0.13	<0.005	0.030	3.2	0.41	0.27	3.2
097349-002	S2	0.13	<0.005	0.029	3.7	0.56	0.39	3.7
097349-003	S3	<0.005	<0.005	<0.005	2.6	0.19	0.14	2.6
097349-004	S4	0.080	<0.005	0.018	3.8	0.53	0.37	3.8
097349-005	S5	2.8	<0.005	0.64	3.1	0.27	0.12	2.4
097349-006	S6	0.26	<0.005	0.059	3.8	0.37	0.27	3.7
097349-007	S10	0.25	<0.005	0.056	3.1	0.44	0.28	3.1
097349-001-DUP	S1	0.12	<0.005	0.028	3.2	0.41	0.27	3.2

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LAB 18 (5)

Analytical Report

Chemical Water Analysis

Job No :	**096924**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Blazenko Kurilj
E-mail:	blaz@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c7
Date Sampled:	1/10/2009
Date Received:	1/10/2009
Date Reported:	22/10/2009
Sampled By:	Client
Location:	Nambeelup
Test Method:	Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
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Approved Signatory
Nelly Liusnaini Hislop

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Analytical Report

Job No : 096924

Lab Id Units LQL	External Idents	NO3 mg/L 0.1	NOx_N mg/L 0.005	Tot N mg/L 0.05	TKN mg/L 0.05	PO4_P mg/L 0.005	Tot P mg/L 0.01	NO2_N mg/L 0.005	Cd mg/L 0.001	Cr mg/L 0.001	Cu mg/L 0.005
096924-001	J4153 S11	<0.1	<0.005	2.1	2.1	0.047	0.12	<0.005	<0.001	0.001	<0.005
096924-002	J4153 S12	<0.1	<0.005	2.3	2.3	0.091	0.36	<0.005	<0.001	<0.001	<0.005
096924-001-DUP	J4153 S11	<0.1	<0.005	2.0	2.0	0.047	0.12	<0.005	<0.001	0.001	<0.005

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Analytical Report

Job No : **096924**

Lab Id	External Idents	Ni	Zn	As	Pb	Hg
Units		mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.005	0.005	0.001	0.001	0.0001
096924-001	J4153 S11	<0.005	0.024	<0.001	<0.001	<0.0001
096924-002	J4153 S12	<0.005	0.018	0.008	<0.001	<0.0001
096924-001-DUP	J4153 S11	<0.005	0.020	<0.001	<0.001	<0.0001

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Analytical Report

Chemical Water Analysis

Job No : **096924B**
Client: JDA Consultant Hydrologists
Address: PO Box 117
SUBIACO
WA 6904

Approved Checker
Leonard Kong

Approved Signatory
Ben Humphreys

Contact: Blazenko Kurilj
E-mail: blaz@jdahydro.com.au
Fax: 08 9381 9279
Client Reference: J4153c7
Date Sampled: 1/10/2009
Date Received: 1/10/2009
Date Reported: 26/10/2009
Sampled By: Client
Location: Unspecified

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

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Analytical Report

Job No : 096924B

Lab Id	External Idents	Tot N	TKN	NOx_N	NO3	Tot P	PO4_P	NO2_N
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.05	0.05	0.005	0.01	0.01	0.005	0.005
096924B-001	J4153 S1	2.0	2.0	<0.005	<0.01	0.37	0.21	<0.005
096924B-002	J4153 S2	2.1	2.1	0.005	<0.01	0.38	0.23	<0.005
096924B-003	J4153 S3	2.6	2.6	0.017	<0.01	0.24	0.12	<0.005
096924B-004	J4153 S4	2.5	2.5	<0.005	<0.01	0.35	0.23	<0.005
096924B-005	J4153 S5	3.3	3.0	0.24	1.1	0.15	0.081	<0.005
096924B-006	J4153 S6	3.1	3.1	<0.005	<0.01	0.31	0.20	<0.005
096924B-007	J4153 S7	1.5	1.5	<0.005	<0.01	0.04	0.005	<0.005
096924B-008	J4153 S8	1.6	1.6	<0.005	<0.01	0.10	<0.005	<0.005
096924B-009	J4153 S1 (RSS1)	3.9	3.7	0.23	1.0	0.65	0.32	<0.005
096924B-010	J4153 S10	2.7	2.7	<0.005	<0.01	0.34	0.21	<0.005
096924B-001-DUP	J4153 S1	2.1	2.1	<0.005	<0.01	0.37	0.21	<0.005

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Analytical Report

	Chemical Water Analysis
Job No :	**095643B**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Blazenko Kurilj
E-mail:	blaz@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c6
Date Sampled:	18/08/2009
Date Received:	19/08/2009
Date Reported:	1/09/2009
Sampled By:	Client
Location:	Nambeelup
Test Method:	Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Ben Humphreys

Approved Signatory
Nelly Liusnaini Hislop

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Analytical Report

Job No : 095643B

Lab Id	External Idents	NO3	Tot N	Tot P	PO4_P	TKN	Cd	Cr	Cu	Ni	Zn	As	Pb	Hg
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.1	0.05	0.01	0.005	0.05	0.001	0.001	0.005	0.005	0.005	0.001	0.001	0.0001
095643B-001	S10	<0.1	3.6	0.16	0.042	3.6	<0.001	0.001	<0.005	<0.005	0.018	<0.001	<0.001	0.0003
095643B-002	S11	<0.1	4.1	0.09	0.035	4.1	<0.001	0.002	<0.005	<0.005	0.010	<0.001	<0.001	0.0002
095643B-001-DUP	S10	<0.1	3.6	0.15	0.042	3.6	<0.001	0.001	<0.005	<0.005	0.016	<0.001	<0.001	0.0003

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Analytical Report

Chemical Water Analysis

Job No :	**095643**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
Ben Humphreys

Contact:	Blazenko Kurilj
E-mail:	blaz@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c6
Date Sampled:	18/08/2009
Date Received:	19/08/2009
Date Reported:	1/09/2009
Sampled By:	Client
Location:	Nambeelup

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

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Analytical Report

Job No : 095643

Lab Id	External Idents	NO3	Tot N	Tot P	PO4_P	TKN
Units		mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.1	0.05	0.01	0.005	0.05
095643-001	S2	0.3	3.1	0.49	0.36	3.0
095643-002	S3	0.6	3.6	0.31	0.22	3.4
095643-003	S4	0.3	2.9	0.53	0.36	2.9
095643-004	S5	0.9	4.1	0.32	0.18	3.8
095643-005	S6	<0.1	2.7	0.25	0.19	2.7
095643-006	S2 Rising Stage 1	1.9	4.2	0.85	0.57	3.8
095643-007	S2 Rising Stage 2	0.4	4.2	0.73	0.37	4.1
095643-008	S4 Rising Stage 1	0.3	11	3.0	0.35	11
095643-009	S6 Rising Stage	<0.1	2.9	0.24	0.18	2.9
095643-001-DUP	S2	0.3	3.1	0.49	0.36	3.0

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LAB : 12

1/2

Analytical Report

	Chemical Water Analysis
Job No :	**094684**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Ross P
E-mail:	ross@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c5
Date Sampled:	21/07/2009
Date Received:	22/07/2009
Date Reported:	3/08/2009
Sampled By:	Client
Location:	Nambeelup
Test Method:	Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
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Analytical Report

Job No : 094684

Lab Id	External Idents	NO3	Tot N	Tot P	TKN	PO4_P
Units		mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.1	0.05	0.01	0.05	0.005
094684-001	S2	1.0	2.8	0.53	2.5	0.33
094684-002	S3	0.8	3.2	0.36	3.0	0.21
094684-003	S4	1.0	3.1	0.53	2.9	0.34
094684-004	S5	0.7	3.5	0.30	3.4	0.12
094684-005	S6	<0.1	2.5	0.30	2.5	0.18
094684-006	S5 Rising Stage	1.4	4.0	0.34	3.7	0.14
094684-007	S6 Rising Stage	<0.1	2.5	0.40	2.5	0.26
094684-001-DUP	S2	0.9	2.8	0.53	2.6	0.33

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Analytical Report

Chemical Water Analysis

Job No : **094684B**
Client: JDA Consultant Hydrologists
Address: PO Box 117
SUBIACO
WA 6904

Approved Checker
Ben Humphreys

Approved Signatory
Nelly Liusnaini Hislop

Contact: Ross P
E-mail: ross@jdahydro.com.au
Fax: 08 9381 9279
Client Reference: J4153c5
Date Sampled: 21/07/2009
Date Received: 22/07/2009
Date Reported: 3/08/2009
Sampled By: Client
Location: Nambeelup

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

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Analytical Report

Job No : 094684B

Lab Id	External Idents	NO3	Tot N	Tot P	TKN	PO4_P	Cd	Cr	Cu	Ni
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LQL		0.1	0.05	0.01	0.05	0.005	0.001	0.001	0.005	0.005
094684B-001	S11	<0.1	3.5	0.12	3.5	0.052	<0.001	0.001	<0.005	<0.005
094684B-002	S12	<0.1	2.5	0.41	2.5	0.091	<0.001	<0.001	<0.005	<0.005
094684B-001-DUP	S11	<0.1	3.2	0.12	3.2	0.052	<0.001	0.001	<0.005	<0.005

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Analytical Report

Job No : 094684B

Lab Id	External Idents	Zn	As	Pb	Hg
Units		**mg/L**	**mg/L**	**mg/L**	**mg/L**
LQL		**0.005**	**0.001**	**0.001**	**0.0001**
094684B-001	S11	0.014	0.001	<0.001	<0.0001
094684B-002	S12	0.009	0.003	<0.001	<0.0001
094684B-001-DUP	S11	0.013	0.001	<0.001	<0.0001

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LAB :10 (1/2)

Analytical Report

Chemical Water Analysis

Job No :	**093605**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Andy Britt
E-mail:	andy@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c4
Date Sampled:	16/06/2009
Date Received:	16/06/2009
Date Reported:	30/06/2009
Sampled By:	Client
Location	Nambeelup
Test Method:	Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
Chris Munro

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Analytical Report

Job No : **093605**

Lab Id	External Idents	Tot N	Tot P
Units		mg/L	mg/L
LQL		0.05	0.01
093605-001	J4153 S3	2.6	0.19
093605-002	J4153 S5	3.0	0.13
093605-003	J4153 S10	2.1	0.26
093605-001-DUP	J4153 S3	2.6	0.19

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LAB 7 (2)

Analytical Report

Chemical Water Analysis

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Job No :	**088487**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Andy Britt
E-mail:	andy@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c3
Date Sampled:	18/12/2008
Date Received:	19/12/2008
Date Reported:	2/01/2009
Sampled By:	Client
Location	Nambeelup

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
Ben Humphreys

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Analytical Report

Job No : **088487**

Lab Id	External Idents	Tot P	Tot N
Units		mg/L	mg/L
LQL		0.01	0.05
088487-001	S10 - J4153	0.59	2.9
088487-002	S10 - J4153 (RSS)	0.90	6.7
088487-003	S1 - J4153	0.46	3.1
088487-004	S1 - J4153 (RSS)	0.41	3.6
088487-005	S3 - J4153	0.31	2.4
088487-006	S4 - J4153 (RSS)	0.93	4.2
088487-007	S5 - J4153	0.23	3.2
088487-001-DUP	S10 - J4153	0.61	2.7

Date Printed **2/01/2009**

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LAB (6)
1/2

Analytical Report

Job No : **088131**

Lab Id	External Idents	Tot N	Tot P
Units		mg/L	mg/L
LQL		0.05	0.01
		+	+
088131-001	J4153 SW10	1.6	0.42
088131-001-DUP	J4153 SW10	1.6	0.43

+ indicates sample received outside holding time recommended by AS/NZ 5667.1:1998

Date Printed **18/12/2008**

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Analytical Report

Chemical Water Analysis

Job No : **088131**
Client: JDA Consultant Hydrologists
Address: PO Box 117
SUBIACO
WA 6904

Contact: Andy Britt
E-mail: andy@jdahydro.com.au
Fax: 08 9381 9279
Client Reference: J4153c2
Date Sampled: 25/08/2008
Date Received: 4/12/2008
Date Reported: 18/12/2008
Sampled By: Client
Location Nambeelup

Test Method: Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
Ben Humphreys

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Analytical Report

	Chemical Water Analysis
Job No :	**088087**
Client:	JDA Consultant Hydrologists
Address:	PO Box 117 SUBIACO WA 6904
Contact:	Andy Britt
E-mail:	andy@jdahydro.com.au
Fax:	08 9381 9279
Client Reference:	J4153c1
Date Sampled:	Various
Date Received:	2/12/2008
Date Reported:	15/12/2008
Sampled By:	Client
Location:	Nambeelup
Test Method:	Water samples submitted by clients are analysed on an as received basis. Metals analysis on acidified samples as received. Analysis performed in accordance with MPL Laboratories WILAB 5(A, B, C and D), 6, 8, 17 and 18.

Approved Checker
Nelly Liusnaini Hislop

Approved Signatory
Chris Munro

LAB 5
(2) 1/2

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Analytical Report

Job No : 088087

Lab Id Units LQL	External Idents	Description	Tot N mg/L 0.05	Tot P mg/L 0.01
088087-001	J4153 S10	27/08/2008	1.8	0.46
088087-002	J4153 S3	25/08/2008	2.0	0.25
088087-003	J4153 S2	25/08/2008	1.9	0.49
088087-004	J4153 S4	29/08/2008	2.2	0.55
088087-005	J4153 S5	29/08/2008	2.0	0.16
088087-006	J4153 S9	4/09/2008	1.1	0.06
088087-007	J4153 S6	4/09/2008	2.6	0.58
088087-008	J4153 S1	15/10/2008	2.6	0.51
088087-009	J4153 S2	15/10/2008	2.6	0.50
088087-010	J4153 S3	15/10/2008	2.7	0.32
088087-011	J4153 S4	15/10/2008	3.0	0.49
088087-012	J4153 S5	15/10/2008	2.9	0.25
088087-013	J4153 S6	15/10/2008	3.1	0.48
088087-014	J4153 S10	15/10/2008	2.7	0.32
088087-001-DUP	J4153 S10	27/08/2008	1.7	0.47

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Date Printed 17/12/2008

Twin Ocean Property

Lakes Rd, Nambeelup: Pre-development Surface Water Monitoring January to December 2010

September 2011

JDA Consultant Hydrologists

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APPENDICES

1. INTRODUCTION

1.1 Background

JDA was appointed by Twin Ocean Property Ltd to perform pre-development surface water monitoring in Nambeelup, Shire of Murray.

Monitoring of surface water at Lakes Rd, Nambeelup has been conducted by JDA since August 2008 through to current. Data August 2008 to October 2009 is presented in JDA (2009).

The study area consists of 1918 ha, comprising of 5 adjoining properties located on Lakes Rd Nambeelup, see Figure 1.

A total of 12 surface water sites were monitored over the 12 month monitoring period January to December 2010 inclusive.

Monitoring locations are presented in Table 1 and Figure 2.

- Nambeelup Brook (S1, S2, S4, S10);
- Creek 1 upstream and downstream (S5, S3);
- Creek 2 upstream and downstream (S7, S6);
- Creek 3 upstream and downstream (S8, S9);
- Creek 4 downstream (S11);
- Creek 5 downstream (S12).

TABLE 1: MONITORING LOCATIONS

Site	Location
S1	Nambeelup Brook, Lot 223 W. boundary
S2	Nambeelup Brook, Lot 223 N. boundary
S3	Creek 1, Lot 223, 30 m upstream of the confluence with Nambeelup Brook
S4	Nambeelup Brook, Lot 223 N. boundary
S5	Creek 1, Lot 246 E. boundary
S6	Creek 2, Lot 247 E. boundary
S7	Creek 2, Lot 248 E. boundary
S8	Creek 3, Lot 248 N. boundary
S9	Creek 3, Lot 248 N. boundary
S10	Nambeelup Brook, Lot 221 S. boundary
S11	Creek 4, Lot 221 S. boundary
S12	Creek 5, Lot 221 S. boundary

1.2 Scope

The proposal by JDA (J4153h, 01/12/09) comprised the following:

Continue monitoring of all primary and secondary surface water monitoring sites within the study area for 2010 consistent with 2008/09, including;

- Continuous surface water level monitoring and monthly water quality sampling to be undertaken at all primary sites (S1 to S6, S8 & S10 to S12).
- Monthly water level, point velocity discharge measurements and Water quality to be conducted at all secondary sites (S7 & S9)
- Water quality samples collected from sites S1 to S9 to be analysed for nutrients only. Sites S10 to S12 on lot 221 to be analysed for Comprehensive Chemical Analysis, due to future rezoning to Industrial.

This report presents a summary of the work completed under this scope.

2. MONITORING AND DATA ANALYSIS

2.1 Period of Monitoring

Table 2 presents a summary of the period of monitoring, including the date of monitoring, creek status and discharge measurements performed.

TABLE 2: SUMMARY OF MONITORING VISITS 2010

Date	Visit	DM	WQ	Notes	Site Flowing?											
					1	2	3	4	5	6	7	8	9	10	11	12
17/05/10	16	14	2x	DM conducted, WQ Collected	N	N	Y	N	Y	N	N	N	N	N	N	N
14/06/10	17		4x	WQ Collected	Y	N	Y	N	Y	N	N	N	N	Y	N	N
06/07/10	18	15	5x	DM conducted, WQ Collected	Y	N	Y	N	Y	N	N	Y	N	Y	N	N
10/08/10	19	16	7x	DM conducted, WQ Collected	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	N
15/09/10	20	17	7x	DM conducted, WQ Collected	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	N
13/10/10	21		3x	DM conducted, WQ Collected	N	N	Y	N	Y	N	N	N	N	Y	N	N
16/11/10	22	18	4x	DM conducted, WQ Collected	Y	N	Y	N	Y	N	N	N	N	Y	N	N
15/12/10	23	19	2x	DM conducted, WQ Collected	N	N	Y	N	Y	N	N	N	N	N	N	N

D\L Download, DM Discharge Measurement, WQ Number of Water Quality Samples Collected Visit and DM number are sequential from 21/010/09

2.2 Rainfall Data

Table 3 presents rainfall data 2009/10

TABLE 3: RAINFALL DATA 2009/10

Month	Average of BoM 009976 & 009977 (mm) 2009	Average of BoM 009596 & 009977 (mm) 2010
January	1.5	0.0
February	10.1	0.8
March	6.1	29.6
April	2.2	39.0
May	56.9	67.8
June	154.8	82.7
July	131.9	122.6
August	105	71.9
September	88.6	23.7
October	5.6*	15.4
November	46.6*	11.5
December	2.8*	8.6
Total	557.1	473.6

*Data from 009977 only

For 2009, total rainfall results were based on an average of BoM (Bureau of Meteorology) sites 009976 and 009977 as Nambeelup is situated between the 2 monitoring sites.

For 2010, due to a lack of reliable rainfall data from site 009976, BoM Site 009596 was used instead. The site was chosen as it had a complete data set and is located in close proximity to 009976.

2010 annual rainfall total was 83.5mm less then 2009.

Rainfall data for 2010 is presented in Figure 3.

Hydstra daily rainfall totals are presented in Appendix A.

2.3 Water Levels

Continuous water levels were recorded from 10 locations, S1 to S6, S8 and S10 to S12.

Continuous water levels were monitored using a combination of "Odyssey" Capacitance loggers, "Diver" pressure sensor and barometric data recorders.

Recorder housings were equipped with Peak Water Level Indicators (PLI) as a secondary check measure insuring data integrity.

2.4 Data Status

- Site S1: 15/06/10 through to 15/12/10 good quality time series data.
- Site S2: 17/05/10 through to 15/12/10 good quality time series data.
- Site S3: 17/05/10 through to 15/12/10 good quality time series data.
- Site S4: 17/05/10 through to 15/12/10 good quality time series data.
- Site S5: 17/05/10 through to 15/12/10 good quality time series data.
- Site S6: 17/05/10 through to 15/12/10 good quality time series data.
- Site S7: No Time series data collected, irregular water level and discharge record.
- Site S8: : 06/07/10 through to 15/12/10 good quality time series data.
- Site S9: No Time series data collected, irregular water level and discharge record.
- Site S10: 17/05/10 through to 15/12/10 good quality time series data.
- Site S11: 10/08/10 through to 15/12/10 good quality time series data.
- Site S12: 10/08/10 through to 15/12/10 good quality time series data.

Instrumentation was left onsite following the 2009 monitoring program which allowed for data to be reported from January through to December 2010 with a maximum 2 months data loss between April to May 2010 where logger memory had filled up prior to the first monitoring period of 2010.

2.5 Discharge Measurements

Flow was measured at 10 of the 12 sites using wading rod current meter method, & area velocity estimation. The results are presented in Table 4.

TABLE 4: DISCHARGE MEASUREMENT RESULTS 2010

Date		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
17/05/10	m	D	D	0.060	D	0.230	D	D	D	D	D	D	D
	L/s	----	----	3	----	6	----	----	----	----	----	----	----
14/06/10	m	0.240	D	0.080	D	0.250	D	D	D	D	D	D	D
	L/s	13	----	----	----	----	----	----	----	----	----	----	----
06/07/10	m	0.239	D	0.095	D	0.250	D	D	0.025	D	0.110	D	D
	L/s	----	----	13	----	11.7	----	----	<1	----	----	----	----
10/08/10	m	0.295	0.145	0.118	0.105	0.225	D	D	0.060	D	0.120	D	D
	L/s	42	11	14	23	----	----	----	2	----	----	----	----
15/09/10	m	0.299	0.132	0.120	0.105	0.228	D	D	0.062	D	0.135	D	D
	L/s	----	----	----	----	----	----	----	2	----	----	----	----
13/10/10	m	0.195	D	0.140	D	0.210	D	D	D	D	0.055	D	D
	L/s	----	----	----	----	----	----	----	----	----	----	----	----
16/11/10	m	1.190	D	0.075	D	0.220	D	D	D	D	0.035	D	D
	L/s	4	----	3	----	6	----	----	----	----	----	----	----
15/12/10	m	D	D	0.08	D	0.237	D	D	D	D	D	D	D
	L/s	----	----	----	----	<1*	----	----	----	----	----	----	----

*Discharge measurement for S5 taken on 15/12/10 indicates a control change due to debris buildup. D-Dry ------ Discharge Measurement not conducted

2.6 Rating Curves

Discharge measurements were used to develop rating curves for 8 locations, S1 to S6, S8 & S10.

JDA conducted discharge measurements over the 2008 - 2010 monitoring period, most of which cover the low to mid stage range. Rating curve extrapolation for sites S1, S2, S4 and S10 were calibrated to DoW peak recorded flow of 15.4m^3/s in August 2009. Confidence Bands of 15% have been applied to all rating curves.

Rating curves have been generated with the aid of Hydstra Ratings Workbench a specialized hydrographic software program.

Based on the generated rating curves, 2010 recorded water level (Stage) data was converted to flow discharge.

Figures 4 to 11 show the rating curves and water level data at each of the 8 locations S1 to S6, S8 and S10.

2.7 Peak Flow Estimates

- Peak flows for 2008/09 varied between 84 L/s (S6) to 14280 L/s (S10)
- 2010 varied between 0L/s at (S6) to 3103L/s at (S10).

Recorded peak flow estimates for 2008/09 & 2010 monitoring periods are presented in Table 5. Peak flows were less in 2010 than 2009 due to lower rainfall.

TABLE 5: CONTRIBUTING AREA AND PEAK RECORDED FLOWS

	Monitoring Location								
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S8**	**S10**	**614063 DoW**
Contributing Area ~(ha)	10000	7500	770	7500	390	200	25	11400	11400
Peak Flow Jan 09 to Oct 09 (L/s) inclusive	12030	5588	165	5057	132	84	---	14280	15400
Peak Flow May 10 to Dec 10 (L/s)	3092	1621	165	1207	86	0	13	3103	3060

---- No Data

2.8 Monthly Flow Volumes

Table 6 presents monthly runoff volumes, runoff depths and runoff coefficients between January to December 2010.

- Site S1 (10000 ha) has monthly runoff coefficients ranging between 0.002% to 9.7% with an average runoff coefficient of 3.4% for the entire 2010 period of record.
- Site S2 (7500 ha) has monthly runoff coefficients ranging between 0% to 6.7% and an average runoff coefficient of 2.6% for the entire 2010 period of record.
- Site S3 (770 ha) has monthly runoff coefficients ranging between 0.4% to 780% and an average runoff coefficient of 20% for the entire 2010 period of record.
- Site S4 (7500 ha) has monthly runoff coefficients ranging between 0% to 4.6% and an average runoff coefficient of 1% for the entire 2010 period of record.
- Site S5 (390 ha) has monthly runoff coefficients ranging between 4.6% to 1400% and an average runoff coefficient of 23.2% for the entire 2010 period of record.
- Site S8 (25 ha) has monthly runoff coefficients ranging between 0% to 79% and an average runoff coefficient of 21% for the entire period of record.
- Site S10 (11400ha) has monthly runoff coefficients ranging between 0.0% to 9.3% and an average runoff coefficient of 3.1% for the entire period of record.

- Rainfall runoff coefficients for site S1,S2, S4, S6 & S10 in 2010 are much lower than in 2009 due to lower rainfall. Monthly runoff coefficients for Sites S3, S5 and S8 are influenced by shallow groundwater discharge.

- Site S5 has the highest average rainfall runoff coefficient of approximately 23%, identical to 2009.

- Site S3, directly downstream of S5 has the next highest rainfall runoff coefficient of approximately 20% identical to 2009.

- The 2 locations, S5 & S3 monitor Creek 1 which drains groundwater all year from a natural wetland within the study area therefore the values do not represent actual rainfall runoff for this area.

- Sites S3 & S5 continued to flow for the entire summer 2010 where as all the other sites dried out.

Figures 12 to 18 present individual stage, discharge & total daily rainfall for S1 to S6 and S10 sites.

TABLE 6: MONTHLY RUNOFF DEPTH, RUNOFF VOLUME & RUNOFF COEFFICIENT 2010

		Year 2010												Total
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**2010**
Site	**Rainfall (mm)**	0	0.8	29.6	39	67.8	82.7	122.6	71.9	23.7	15.4	11.5	8.6	473.6
(S1)	**Runoff Volume (m3)**	250	160	3.5*	*0	*0	39000*	710000	700000	110000	12000	1400	19	1600000
10000 ha	Runoff (mm)	0.0025	0.0016	*	*	*	0.4	7.1	7	1.1	0.12	0.014	0.0002	16
	Runoff Coefficient (%)	**0.25**	**0.2**	*****	*****	*****	**0.4**	**5.8**	**9.7**	**5**	**1**	**0.12**	**0.002**	**3.4%**
(S2)	**Runoff Volume (m3)**	0	0	0	0	0	0	570000	360000	8600	0	0	0	950000
7500 ha	Runoff (mm)	0	0	0	0	0	0	7.6	4.8	0.11	0	0	0	12.6
	Runoff Coefficient (%)	**0**	**0**	**0**	**0**	**0**	**0**	**6.1**	**6.7**	**0.48**	**0**	**0**	**0**	**2.6%**
(S3)	**Runoff Volume (m3)**	60000	34000	37000	5700*	21000*	69000	140000	140000	98000	100000	19000	18000	730000
770 ha	Runoff (mm)	7.79	4.4	4.8	0.74	0.27	8.9	18	18	13	13	2	2	95
	Runoff Coefficient (%)	**780**	**550**	**16**	**2**	**0.4**	**11**	**15**	**25**	**54**	**84**	**21**	**27**	**20%**
(S4)	**Runoff Volume (m3)**	18000	0	0	0	0	0	86000	250000	14000	820	0	0	370000
7500 ha	Runoff (mm)	0.024	0	0	0	0	0	1.1	3.3	0.19	0.01	0	0	4.9
	Runoff Coefficient (%)	**2.4**	**0**	**0**	**0**	**0**	**0**	**0.9**	**4.6**	**0.78**	**0.07**	**0**	**0**	**1%**
(S5)	**Runoff Volume (m3)**	56000	31000	43000	7100*	23000*	73000	96000	35000	18000	17000	17000	8200	430000
390 ha	Runoff (mm)	14	7.9	11	1.8	5.9	19	25	9	5	4	4	2	110
	Runoff Coefficient (%)	**1400**	**990**	**37.2**	**4.6**	**8.6**	**23**	**20**	**12**	**19**	**28**	**38**	**24**	**23.2%**
(S8)	**Runoff Volume (m3)**	0	0	0	0	0	0	9900	10000	4700	15	0.3	0	25000
25 ha	Runoff (mm)	0	0	0	0	0	0	40	40	19	0.06	0.0012	0	100
	Runoff Coefficient (%)	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**56**	**79**	**0.38**	**0.01**	**0**	**21%**
(S10)	**Runoff Volume (m3)**	0*	0*	0*	0*	2500*	50000	740000	760000	180000	2600	45	0	1700000
11400ha	Runoff (mm)	0	0	0	0	0.02	0.44	6.5	6.7	1.6	0.02	0.0004	0	14.9
	Runoff Coefficient (%)	**0**	**0**	**0**	**0**	**0.03**	**0.53**	**5.3**	**9.3**	**6.6**	**0.15**	**0.004**	**0**	**3.1%**

Runoff (mm) = Runoff (m3)/Catchment Area (ha)/10   Rainfall for Nambeelup has been generated by use of an average of the total rainfall from BoM meteorological sites 00997 Mandurah and 009976 Pinjarra South.

* No or incomplete monthly data

2.9 Water Quality Sampling

Water quality sampling was conducted monthly over the 2010 monitoring period when sites were flowing. Sites S1 to S5 and S8 were monitored for nutrients. S10 to S12 were sampled for a Comprehensive Chemical Analysis. Table 7 to 13 presents water quality results.

TABLE 7: WATER QUALITY RESULTS (S1)

S1									
2010							min	max	Average
Analysis	ANZECC	10/06	06/07	10/08	15/09	16/11			
EC	<0.3 to <1.5	0.650	0.760	1.010	1.200	0.340	0.340	1.20	**0.792**
pH	7.0 to 8.5	6.37	6.31	6.52	6.61	8	6.31	8	**6.77**
Tot P	<0.06	0.28	0.27	0.44	0.33	0.57	0.27	0.57	**0.38**
PO4_P	<0.030	0.040	0.070	0.230	0.180	0.270	0.040	0.270	**0.158**
TN	<1.5	0.93	4.2	3.8	3.1	2.7	0.93	4.2	**2.9**
TKN	N/A	0.880	4.2	3.6	3.1	2.7	0.88	4.2	**2.89**
NO3	<0.7	0.221	-	0.664	0.035	0.020	0.020	0.664	**0.235**
NOX_N	<0.10	0.053	<0.005	0.150	0.008	<0.005	<0.005	0.150	**0.044**
NH4_N	<0.04	0.310	<0.005	0.051	-	-	<0.005	0.310	**0.122**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 8: WATER QUALITY RESULTS (S2)

S2						
2010				min	max	Average
Analysis	ANZECC	10/08	15/09			
EC	<0.3 to <1.5	1.300	1.440	1.300	1.440	**1.370**
pH	7.0 to 8.5	6.18	6.61	6.18	6.61	**6.39**
Tot P	<0.06	0.83	0.46	0.46	0.83	**0.64**
PO4_P	<0.030	0.310	0.280	0.280	0.310	**0.295**
TN	<1.5	3.3	3.3	3.3	3.3	**3.3**
TKN	N/A	3.3	3.3	3.3	3.3	**3.3**
NO3	<0.7	0.022	0.049	0.022	0.049	0.034
NOX_N	<0.10	<0.005	<0.011	<0.005	<0.011	**0.008**
NH4_N	<0.04	0.130	-	0.130	0.130	**0.130**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 9: WATER QUALITY RESULTS (S3)

S3											
2010									Min	Max	Average
Analysis	ANZECC	19/08	10/06	06/07	10/08	15/09	13/10	11/11	15/12			
EC	<0.3 to <1.5	0.330	0.860	0.680	0.700	0.750	0.480	0.280	0.230	0.230	0.860	**0.538**
pH	7.0 to 8.5	5.79	6.13	6.52	6.43	7.03	6.14	7.2	5.36	5.36	7.2	**6.33**
Tot P	<0.06	0.330	0.290	0.290	0.280	0.200	0.380	0.450	0.280	0.200	0.450	**0.312**
PO4_P	<0.030	0.120	0.030	0.260	0.170	0.080	0.220	0.240	0.180	0.030	0.260	**0.163**
TN	<1.5	3.3	1.5	3.9	3.4	3.8	3.1	2.5	2.8	1.5	3.9	**3.04**
TKN	N/A	3.3	1.5	3.9	3.3	3.8	3.1	2.5	2.8	1.5	3.9	**3.04**
NO3	<0.7	-	<0.02	-	0.35	0.22	<0.02	<0.02	0.020	<0.02	0.350	**0.11**
NOX_N	<0.10	0.008	<0.005	0.041	0.079	0.005	<0.005	<0.005	<0.005	<0.005	0.079	**0.019**
NH4_N	<0.04	-	0.120	1.00	0.032	-	<0.005	-	-	<0.005	1.00	**0.289**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 10: WATER QUALITY RESULTS (S4)

S4						
		2010		min	max	Average
Analysis	ANZECC	10/08	15/09			
EC	<0.3 to <1.5	1.160	1.480	1.16	1.48	**1.32**
pH	7.0 to 8.5	6.65	7.00	6.65	7	**6.83**
Tot P	<0.06	0.790	0.440	0.440	0.790	**0.615**
PO4_P	<0.030	0.300	0.270	0.270	0.300	**0.285**
TN	<1.5	3.3	3.3	3.3	3.3	**3.3**
TKN	N/A	3.3	3.3	3.3	3.3	**3.3**
NO3	<0.7	0.022	0.093	0.022	0.093	**0.058**
NOX_N	<0.10	<0.005	0.021	<0.005	0.021	**0.013**
NH4_N	<0.04	-	-	-	-	**-**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 11: WATER QUALITY RESULTS (S5)

S5												
		2010								min	max	Average
Analysis	ANZECC	19/05	10/06	06/07	10/08	15/09	13/10	16/11	15/12			
EC	<0.3 to <1.5	0.310	0.540	0.840	0.680	0.520	0.750	0.280	0.360	0.280	0.840	0.535
pH	7.0 to 8.5	5.1	5.94	6.19	6.34	6.5	5.6	6.7	4.87	4.87	6.70	5.90
Tot P	<0.06	0.170	0.230	0.740	0.840	0.250	0.420	0.200	0.180	0.170	0.840	0.378
PO4_P	<0.030	0.110	0.120	0.090	0.180	0.120	0.120	0.120	0.150	0.090	0.180	0.126
TN	<1.5	3.5	1.7	5.7	1.2	3.4	3.8	2	2.6	1.2	5.7	2.98
TKN	N/A	3.5	1.7	5.7	1.1	3.2	3.7	2	2.6	1.1	5.7	2.98
NO3	<0.7	-	0.133	-	0.239	0.664	0.531	<0.02	0.020	<0.02	0.664	0.267
NOX_N	<0.10	0.030	0.034	0.030	0.054	0.150	0.120	<0.005	<0.005	<0.005	0.150	0.054
NH4_N	<0.04	-	0.450	0.260	0.750	-	<0.005	-	-	<0.005	0.750	0.366

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 12: WATER QUALITY RESULTS (S6)

S8							
		2010			min	max	Average
Analysis	ANZECC	06/07	10/08	15/09			
EC	<0.3 to <1.5	1.120	0.780	0.820	0.780	1.120	**0.906**
pH	7.0 to 8.5	5.92	6.57	6.96	5.92	6.96	**6.48**
Tot P	<0.06	0.140	0.030	0.080	0.030	0.140	**0.083**
PO4_P	<0.030	0.006	0.020	0.020	0.006	0.02	**0.015**
TN	<1.5	1.5	2.5	2.1	1.5	2.5	**2.0**
TKN	N/A	1.5	2.5	2.1	1.5	2.5	**2.0**
NO3	<0.7	-	0.022	0.022	0.022	0.022	**0.022**
NOX_N	<0.10	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**
NH4_N	<0.04	0.240	0.044	-	0.044	0.240	**0.142**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

TABLE 13 WATER QUALITY RESULTS (S10)

S10									
		2010					min	max	Average
Analysis	ANZECC	06/07	10/08	15/09	13/10	16/11			
EC	<0.3 to <1.5	0.790	0.980	1.220	1.240	0.550	0.550	1.240	**0.956**
pH	7.0-8.5	6.31	6.46	6.94	6.56	7.30	6.31	7.30	**6.71**
TDS	N/A	580	560	700	-	460	460	700	**575**
Chloride	N/A	140	290	350	-	200	140	350	**245**
Sulphate	N/A	98	73	58	-	200	58	200	**107**
Bicarbonate	N/A	33	40	44	-	40	33	44	**39**
Carbonate	N/A	1	<1	<1	-	<1	<1	1	**1**
Total Alkalinity	N/A	33	40	44	-	40	33	40	**39**
Tot P	<0.06	0.200	0.740	0.320	0.620	0.600	0.200	0.740	**0.496**
PO4_P	<0.030	0.060	0.230	0.180	0.300	0.280	0.060	0.300	**0.210**
TN	<1.5	2.9	3.9	3.3	3.6	2.5	2.5	3.9	**3.2**
TKN	N/A	2.9	3.9	3.3	3.6	2.5	2.5	3.9	**3.2**
NO3	<0.7	<0.100	0.062	0.053	<0.020	<0.020	<0.020	0.062	**0.043**
NOX_N	<0.10	<0.005	0.014	0.012	<0.005	<0.005	<0.005	0.014	**0.008**
NH4_N	<0.04	<0.005	0.160	<0.005	<0.005	0.020	<0.005	0.160	**0.039**
Al	<0.055	0.420	0.610	<0.400	-	0.430	<0.400	0.610	**0.465**
As	<0.013	-	0.002	0.002	-	<0.005	0.002	<0.005	**0.003**
Ca	N/A	<0.002	31	26	-	14	<0.002	31	**18**
Cd	<0.02	<0.002	<0.002	<0.04	-	<0.002	<0.002	<0.04	**0.012**
Cr	<0.001	<0.005	<0.005	<0.1	-	<0.005	<0.005	<0.1	**0.028**
Cu	<0.0014	<0.005	<0.005	<0.1	-	<0.005	<0.005	<0.1	**0.028**
Fe	N/A	2.3	3.5	1.8	-	3.9	1.8	3.9	**2.9**
Hg	<0.0006	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0005	<0.0005	**<0.0005**
K	N/A	8.7	13	7.2	-	9.8	7.2	13	**9.7**
Mg	N/A	26	29	29	-	16	16	29	**25**
Mn	<1.9	0.10	0.11	<0.10	-	0.11	<0.10	0.11	**0.11**
Na	N/A	97	150	140	-	88	88	150	**99**
Pb	<0.0034	<0.001	<0.001	-	-	<0.005	<0.001	<0.005	**0.002**
Se	<0.011	<0.001	<0.001	<0.001	-	<0.005	<0.001	<0.001	**<0.001**
SiO2	N/A	10	14	6	-	-	6	14	**10**
Zn	<0.008	<0.01	<0.01	<0.2	-	<0.01	<0.01	<0.2	**0.057**
CaCO3	N/A	190	200	180	-	100	100	200	**168**

ANZECC (guidelines for slightly disturbed ecosystems 'Wetlands")

- Excluding pH and EC (mS/cm) all other units are in mg/L.
- Limits of detection reported vary at times due to laboratory dilution requirements at time of analysis
- Excedence of ANZECC Guidelines for South-Western Australia, slightly disturbed ecosystems (wetlands) are highlighted in yellow.

Results of interest

- pH values are generally slightly acidic across the study area, ranging between 4.8 and 8.0
- TP results, excluding S8 on 10/08/2010, all exceed the ANZECC guidelines for South-Western Australia for a Slightly Disturbed Wetland Ecosystems of <0.06 mg/L and the EPA trigger levels for the Serpentine River of 0.1 mg/L. Results range between 0.18 mg/L to 0.84 mg/L.
- Average TP results entering the study area from Nambeelup brook at Sites (S2) and (S4) are 0.63 mg/L.

Average TP results within the study area,

- (Creek 1) Sites S3 & S5, 0.345mg/L.
- (Creek 3) Site S8, 0.083mg/L.

3. CONCLUSIONS

- A total of 12 surface water sites were monitored over the 12 month monitoring period January to December 2010 inclusive.
- 2010 annual rainfall total was 83.5mm less than 2009.
- Flow was measured at 10 of the 12 sites using wading rod current meter method, and area velocity estimation.
- JDA conducted discharge measurements over the 2008 - 2010 monitoring period, most of which cover the low to mid stage range. Rating curve extrapolation for sites S1, S2, S4 and S10 were calibrated to DoW peak recorded flow of 15.4m3/s August 2009. Confidence bands of 15% have been applied to all rating curves.
- Based on the generated rating curves, 2010 recorded water level (Stage) data was converted to flow discharge.
- 2010 recorded peak flows varied between 0L/s at (S6) to 3103L/s at (S10).
- Rainfall runoff coefficients for 2010 for sites S1,S2, S4, S6 & S10 in 2010 are much lower than reported in 2009 due to lower rainfall.
- Monthly runoff coefficients for Sites S3, S5 and S8 are influenced by shallow groundwater discharge.
- Site S5 has the highest average rainfall runoff coefficient of approximately 23%, identical to 2009.
- Site S3, directly downstream of S5 has the next highest rainfall runoff coefficient of approximately 20%, identical to 2009.
- The two locations, S5 & S3 monitor Creek 1, which drain groundwater all year from a natural wetland within the study area. The runoff coefficient values include a groundwater seepage component.
- Sites S3 & S5 continued to flow for the entire summer 2010 whereas all the other sites dried out.
- pH values are generally slightly acidic across the study area ranging between 4.8 and 8.0
- TP results, excluding S8 on 10/08/2010, all exceed the ANZECC guidelines for South-Western Australia for a Slightly Disturbed Wetland Ecosystems of <0.06mg/l and the EPA trigger levels for the Serpentine River of 0.1 mg/L. Results range between 0.18 mg/l to 0.84 mg/l.

4. RECOMMENDATIONS

- JDA recommend that surface water monitoring continue in 2011 consistent with 2010 monitoring ensuring data continuity.

- JDA recommends that the data presented in previous report (JDA, 2009) and this report be incorporated in reports prepared under the Better Urban Water Management (BUWM) Framework for the property.

5. REFERENCES

- WA Atlas – https://www2.landgate.wa.gov.au/idelve/bmvf/app/awatlas/
- ARC GIS
- BoM – http://www.bom.gov.au/climate/dwo/IDCJDW0600.shtml
- BoM - http://bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml
- ANZECC/ARMCANZ 2000 freshwater and Marine Water Quality Guidelines.
- JDA (2009) Lakes Rd, Nambeelup – Predevelopment Surface Water Monitoring 2008/09 (J4153g). Report to Twin Ocean Property 17/11/09.

FIGURES

Data Source: Nearmap 2011, Landgate Roads (LGATE-012) via SLIP

1:125,000

JDA Consultant Hydrologists

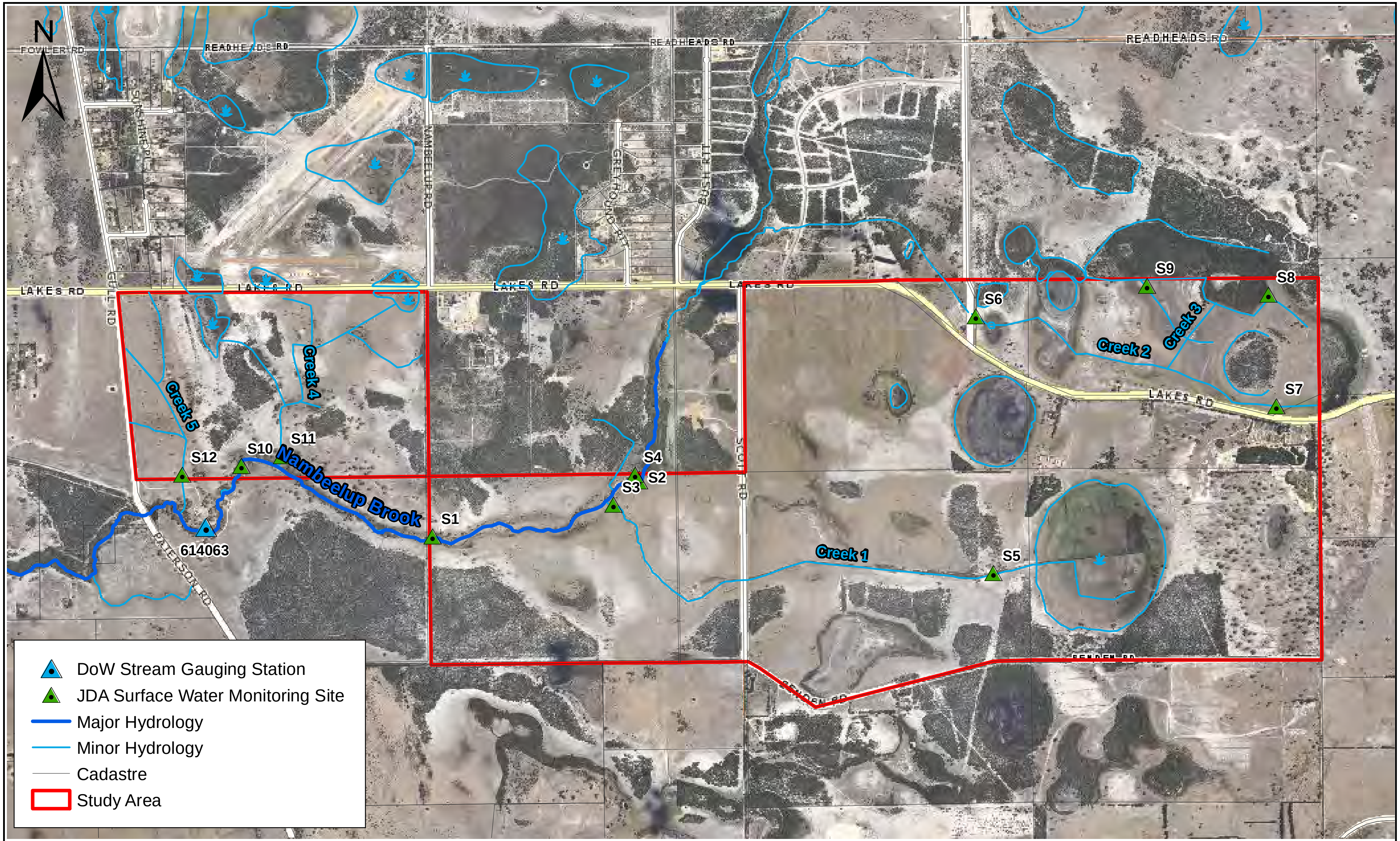
Job No. P4620

0 2.5 5 Km

Twin Ocean Property Ltd

Lakes Rd Nambeelup: Pre-Development Surface Water Monitoring 2010

Figure 1: Study Area Regional Plan



Data Source: WIN Database 2011

JDA

Job No. J4620

Scale: 1:30,000

0 1 2 Kilometers

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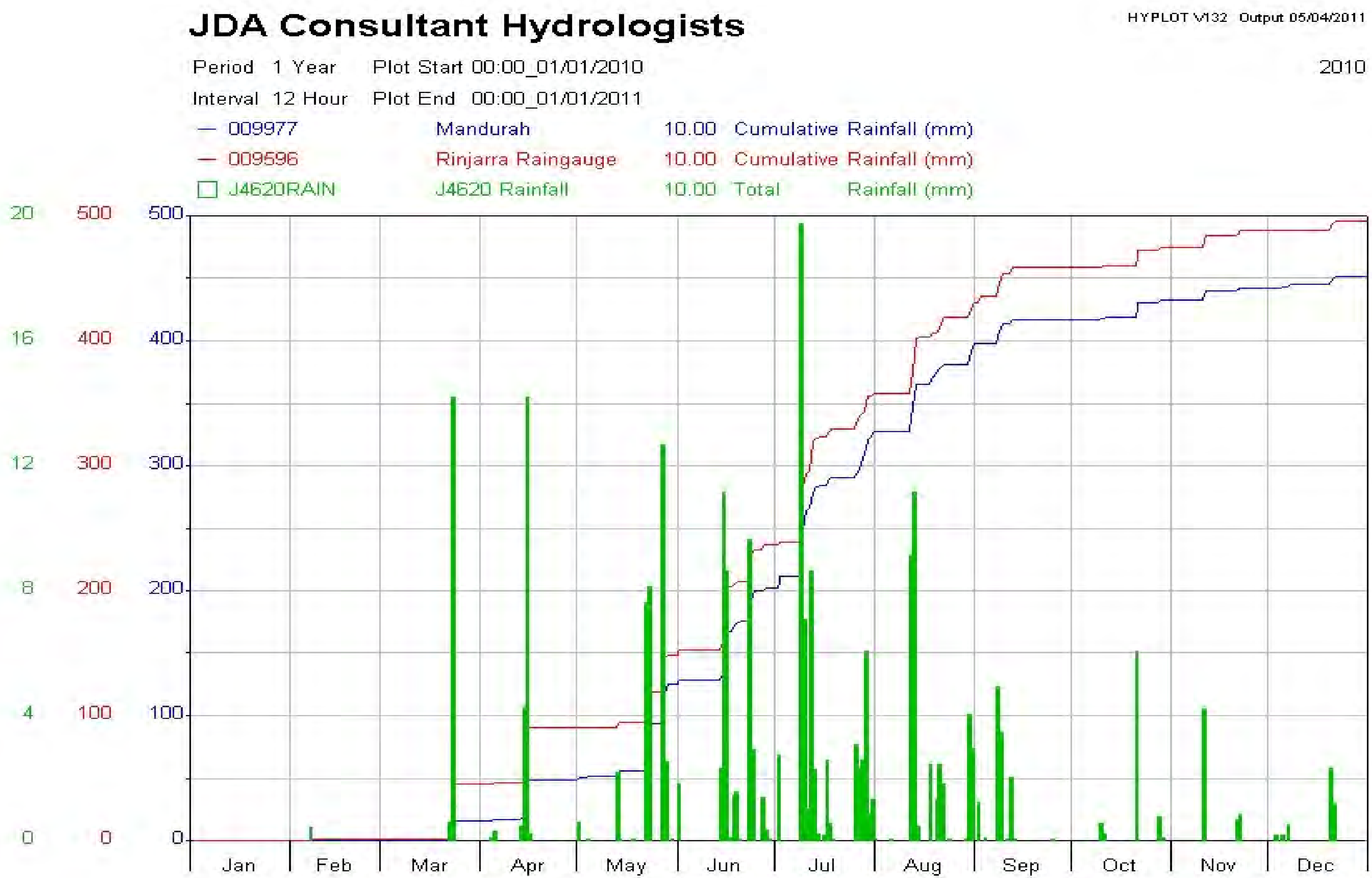
Lakes Rd Nambeelup: Pre-Development Surface Water Monitoring 2010

Figure 2: Surface Hydrology & Monitoring Site Location Plan



Data Source: JDA Hydstra Database

Job No: J4620

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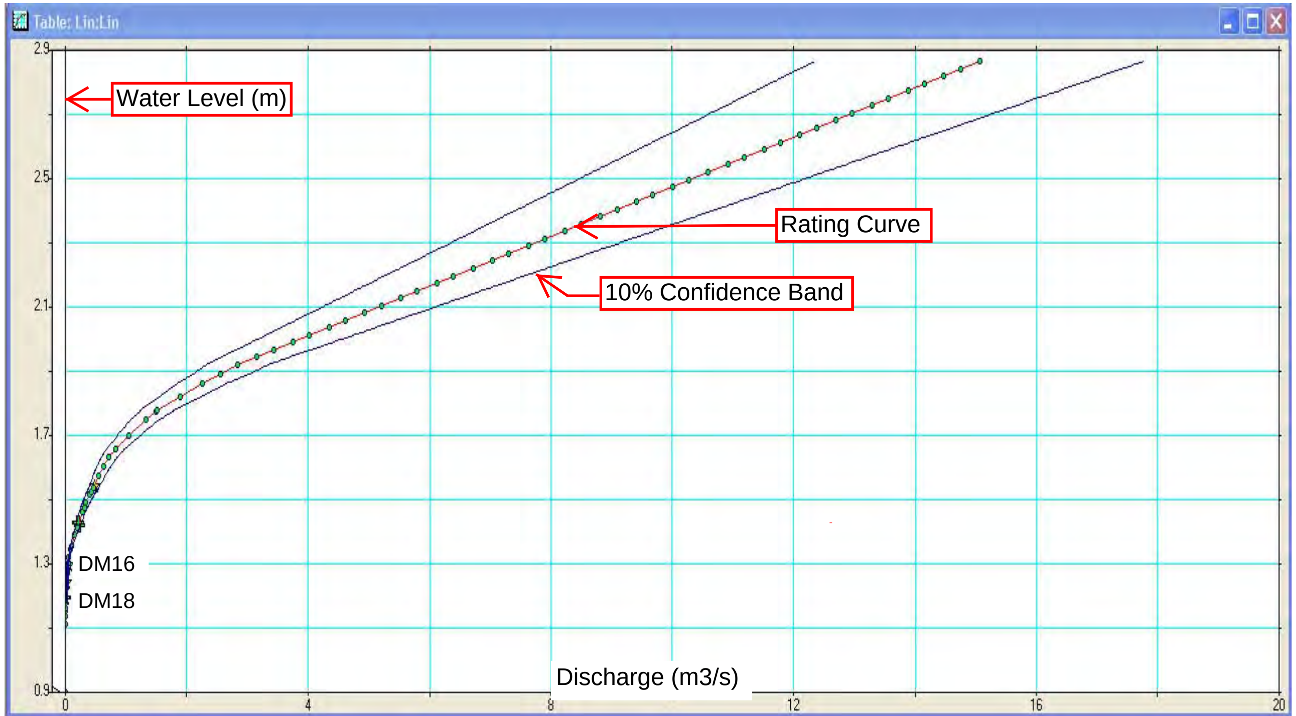
Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 3: Rainfall Data



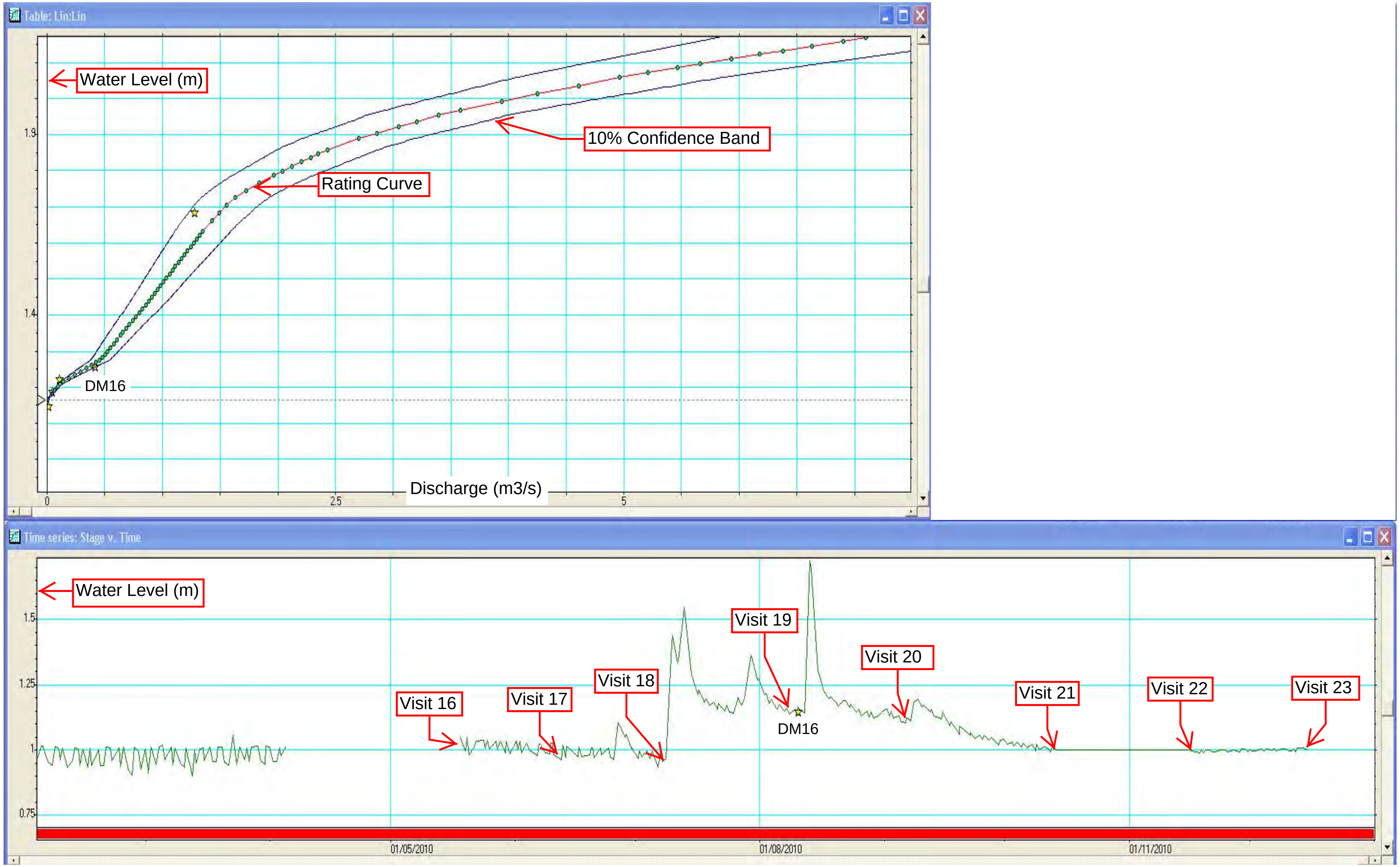
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

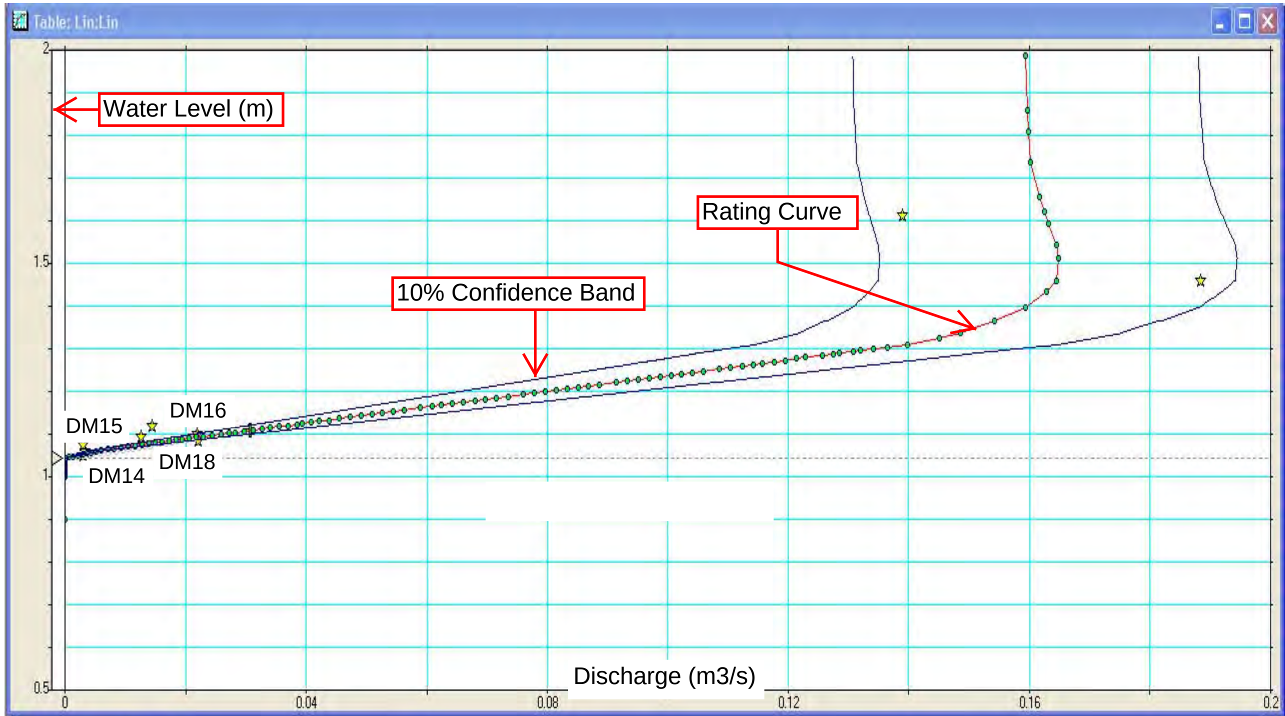
Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

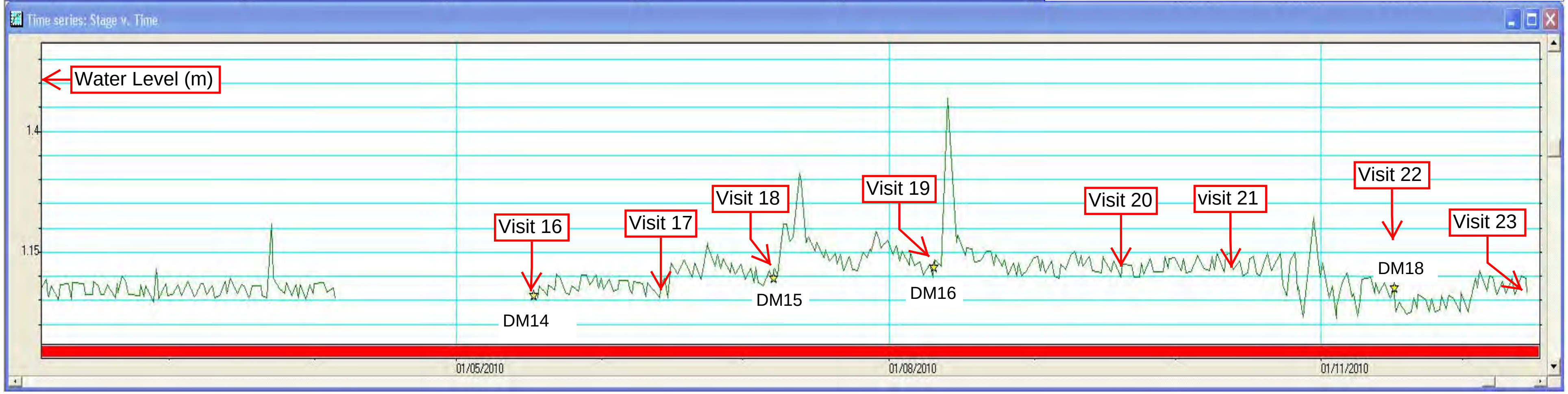
Figure 4: Rating Curve (S1) and Water Level Data



Data Source: JDA Hydstra Database

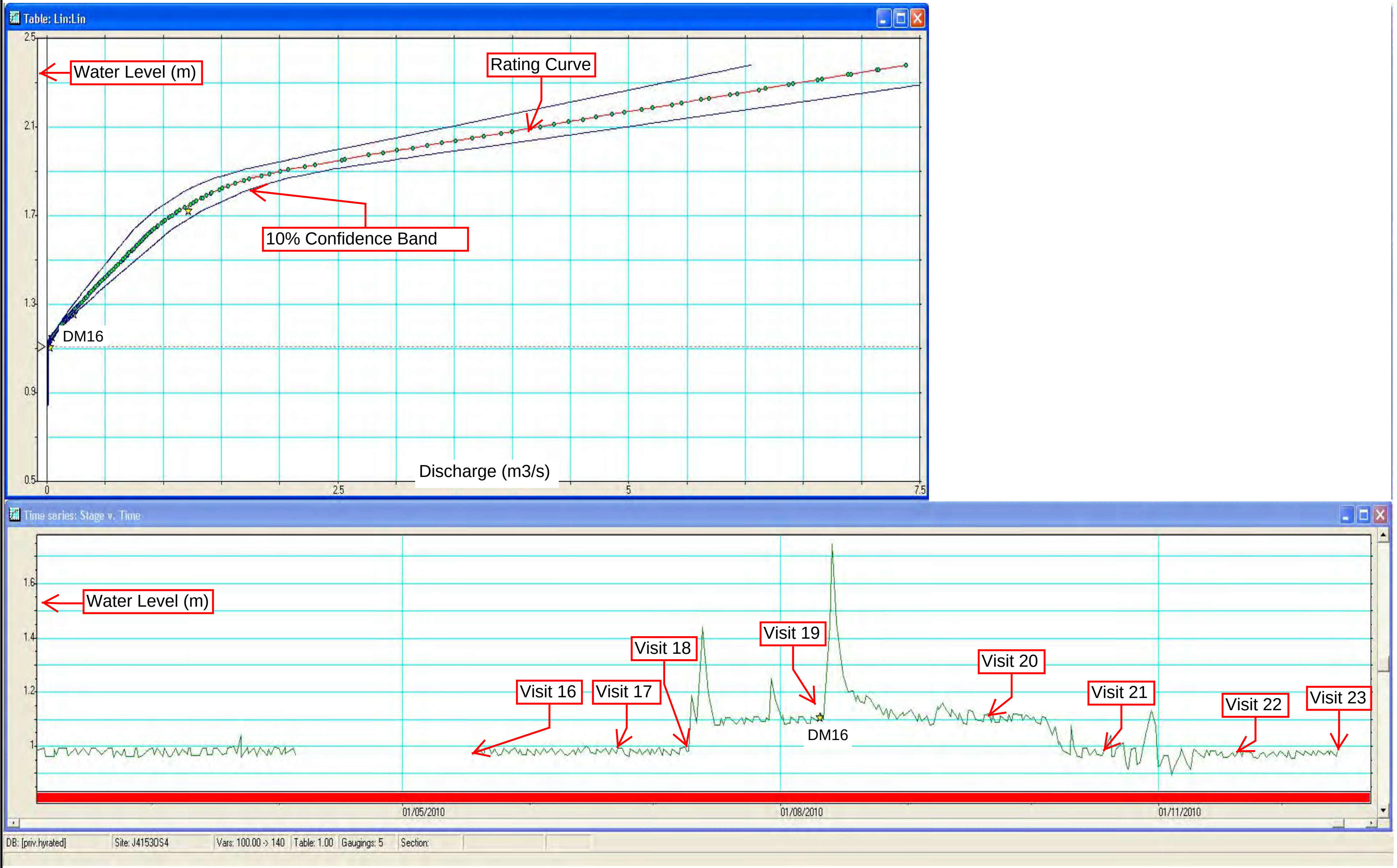
JDA	Job No: J4620 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2011	Twin Ocean Property Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010 **Figure 5: Rating Curve (S2) and Water Level Data**





Data Source: JDA Hydstra Database

JDA	Job No: J4620 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2011	Twin Ocean Property Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010 **Figure 6: Rating Curve (S3) and Water Level Data**



Data Source: JDA Hydstra Database

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Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 7: Rating Curve (S4) and Water Level Data

Data Source: JDA Hydstra Database

JDA

Job No: J4620

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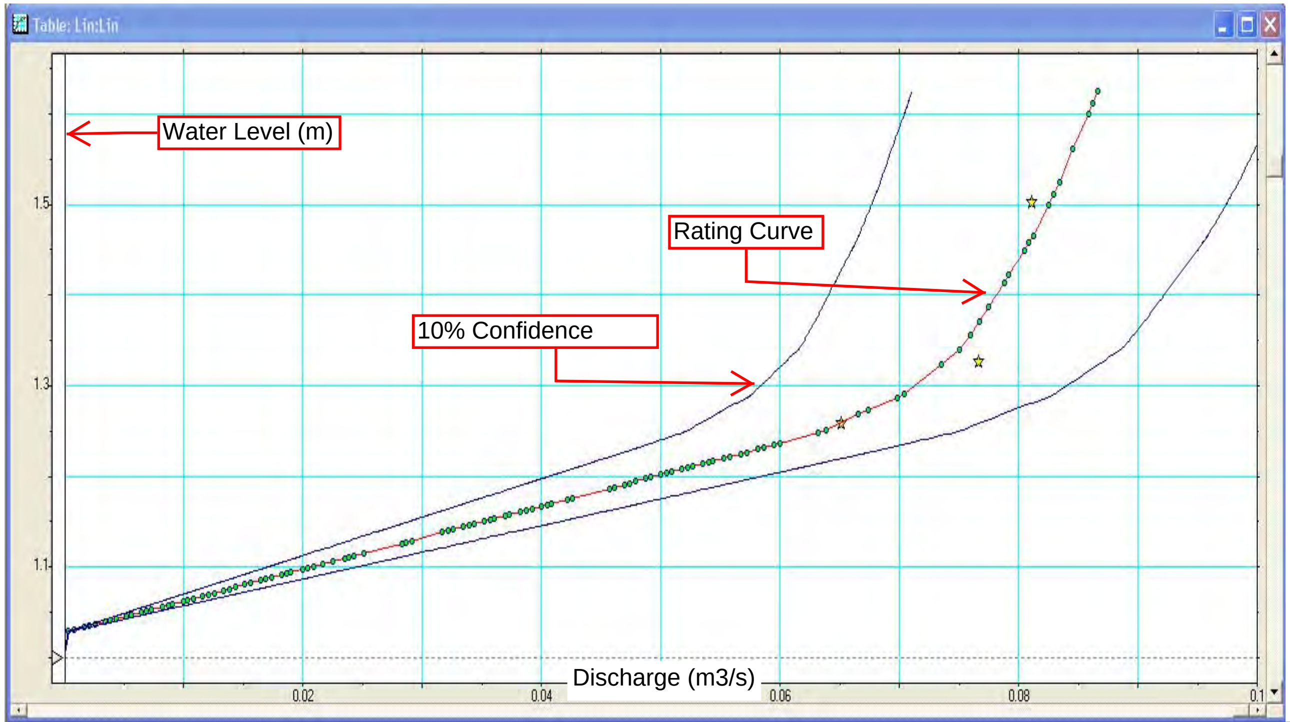
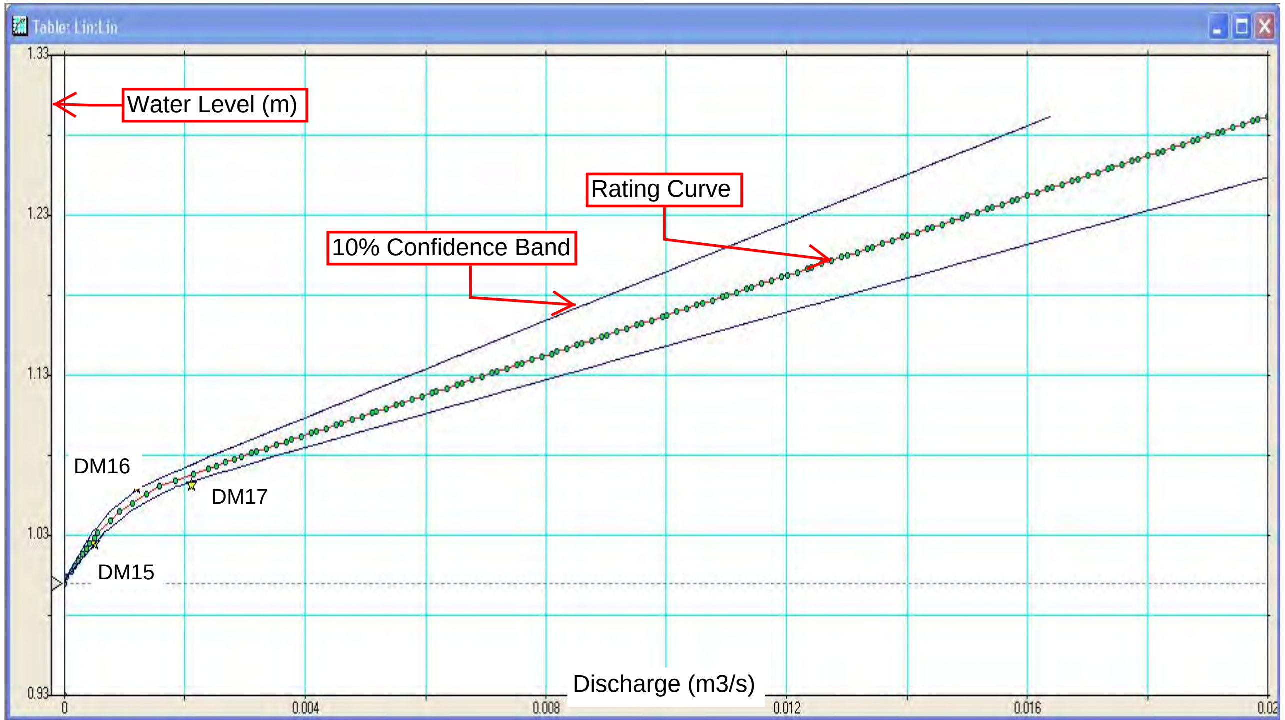
Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

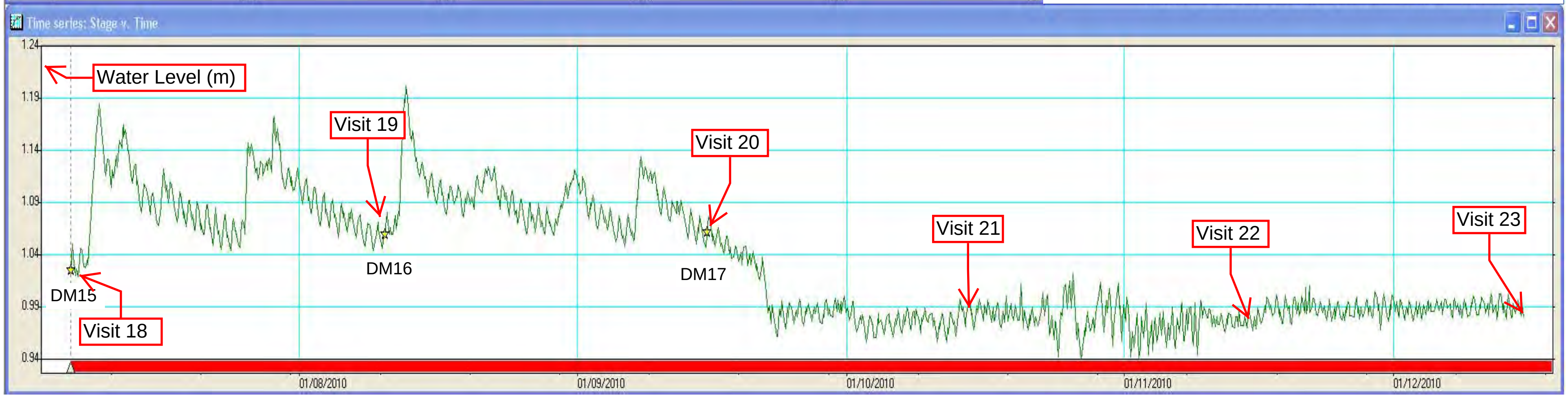
Figure 8: Rating Curve (S5) and Water Level Data



Data Source: JDA Hydstra Database

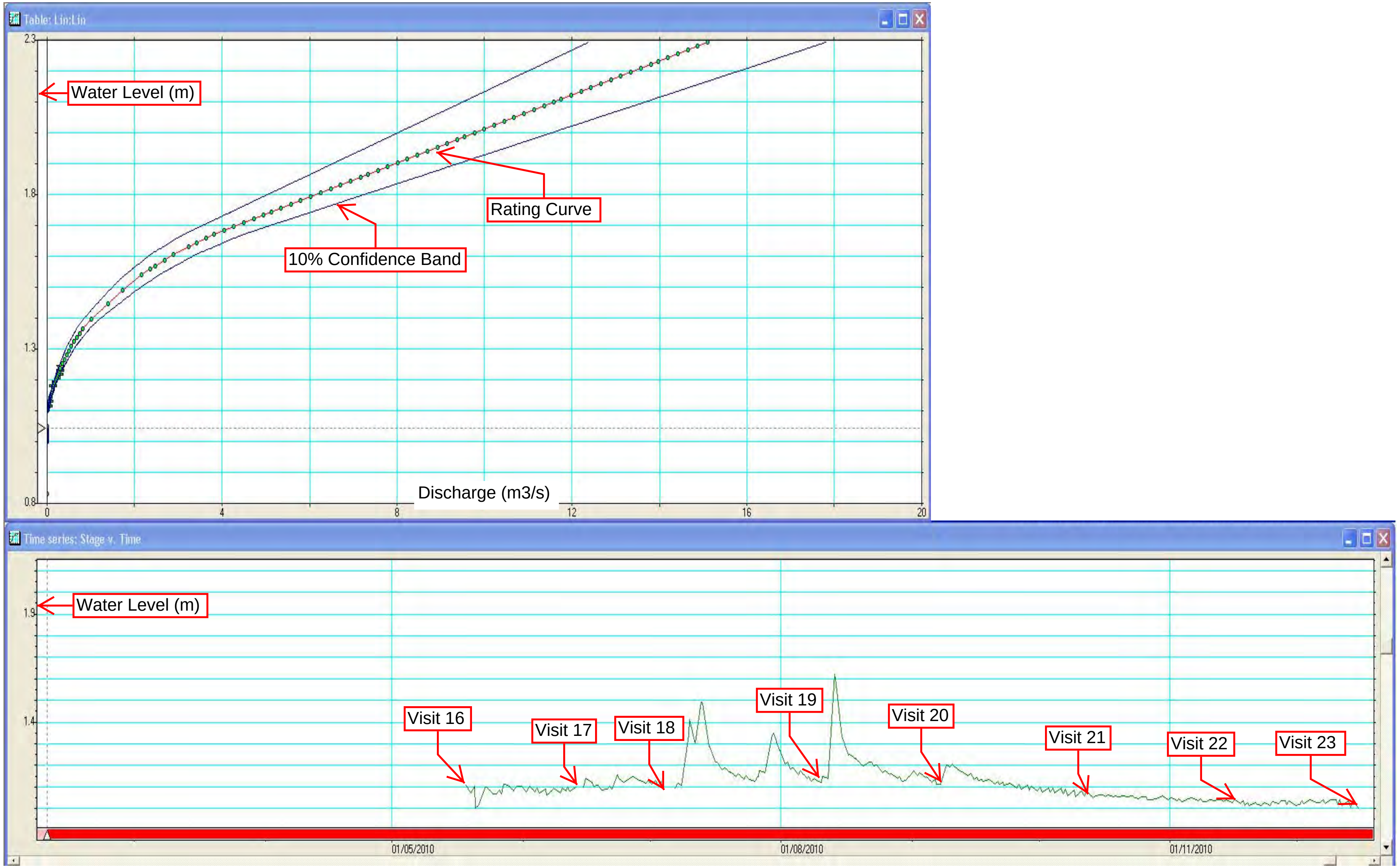
JDA	Job No: J4620 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2011	Twin Ocean Property Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010 **Figure 9: Rating Curve (S6) and Water Level Data**





Data Source: JDA Hydstra Database

JDA	Job No: J4620 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2011	Twin Ocean Property Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010 **Figure 10: Rating Curve (S8) and Water Level Data**



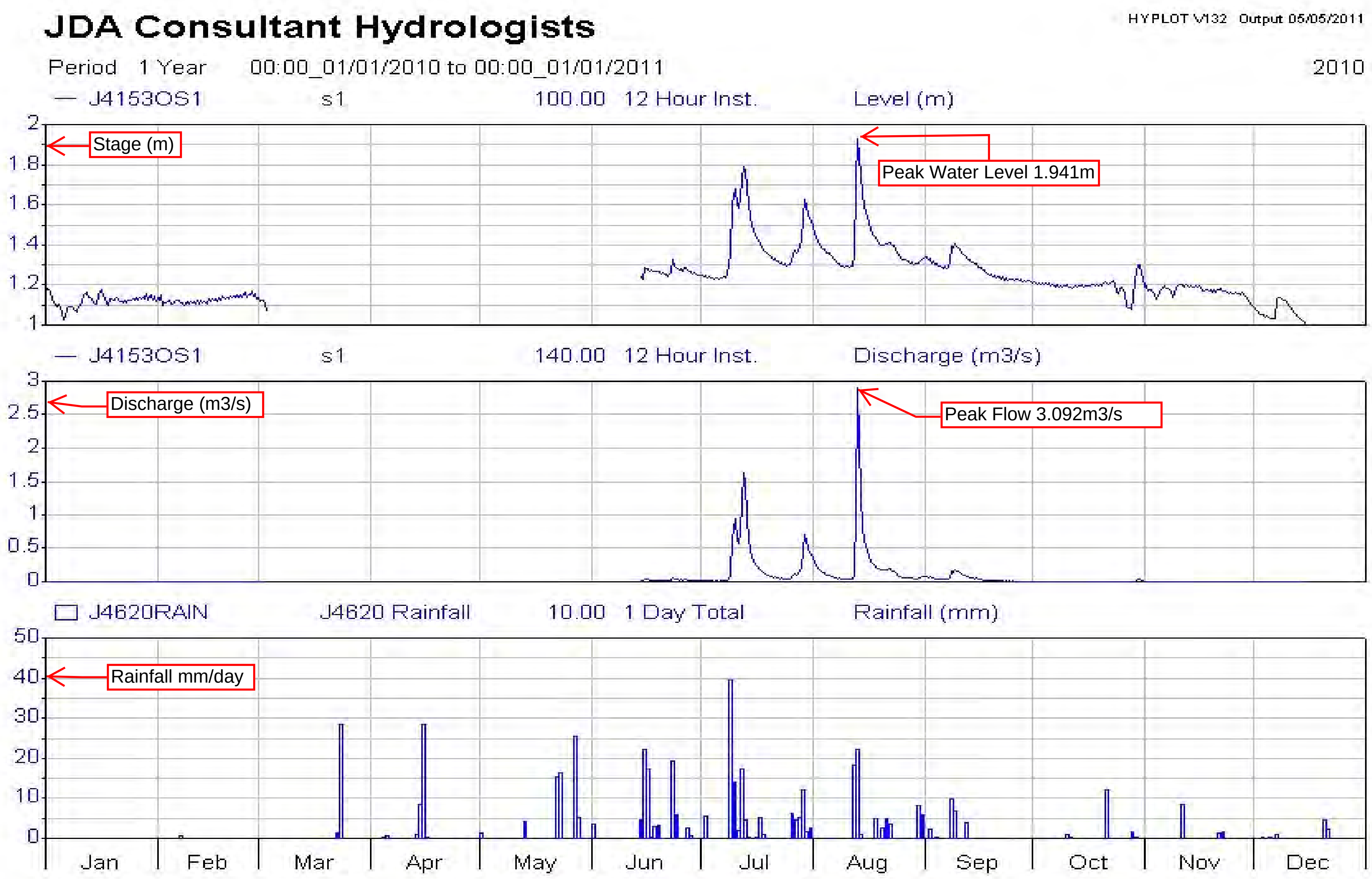
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 11: Rating Curve (S10) and Water Level Data



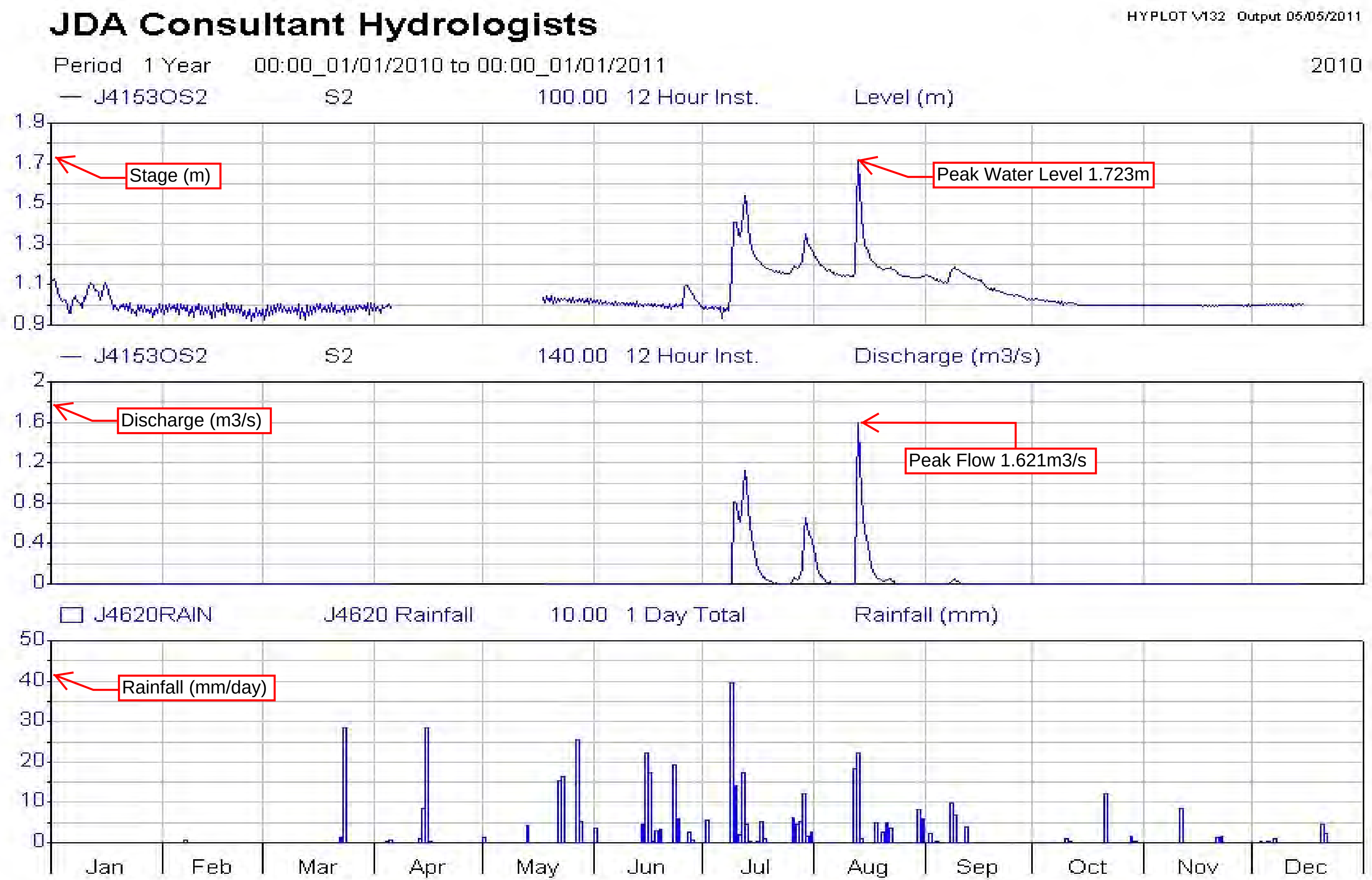
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 12: Stage, Discharge & Average Daily Rainfall (S1)



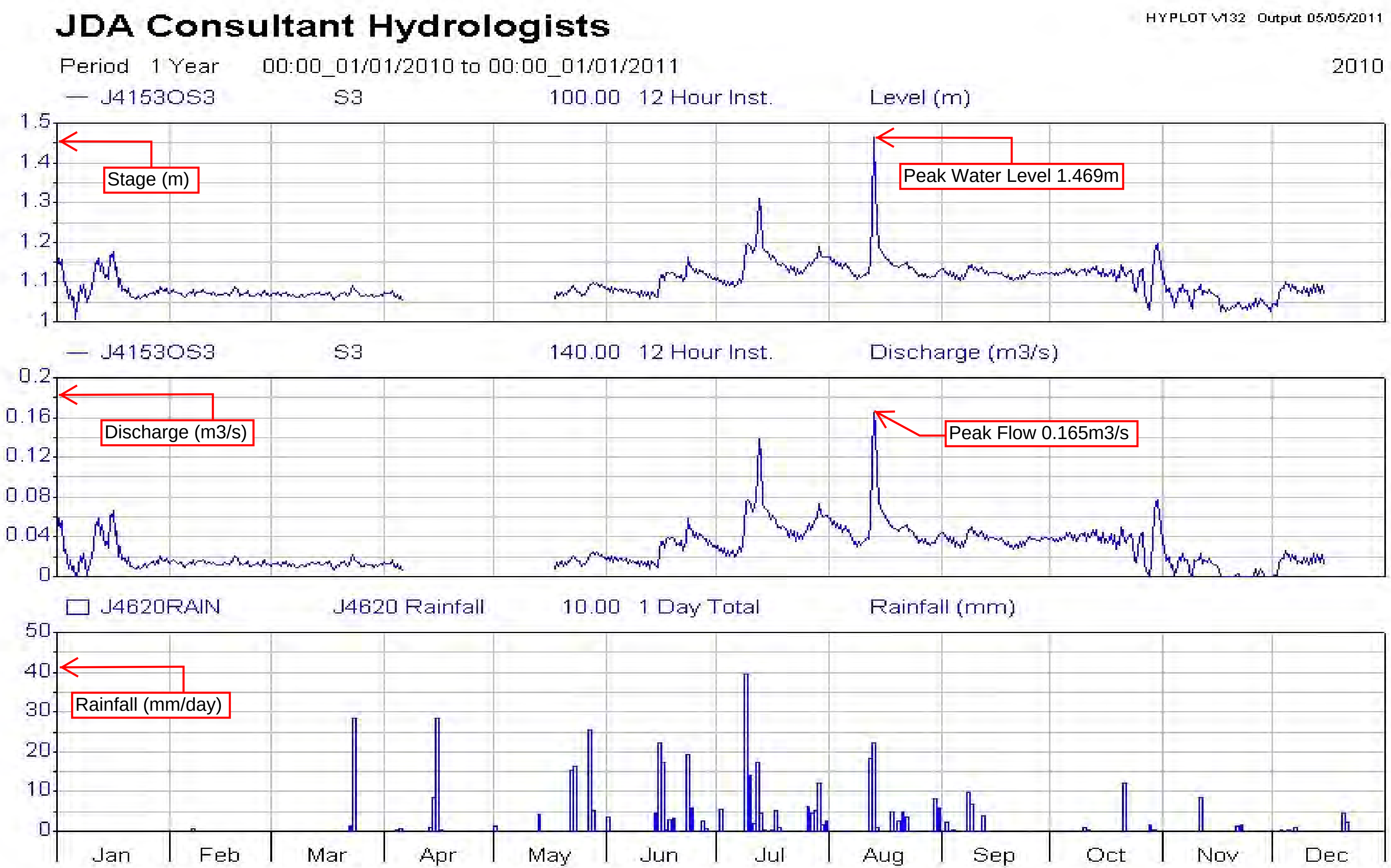
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 13: Stage, Discharge & Average Daily Rainfall (S2)



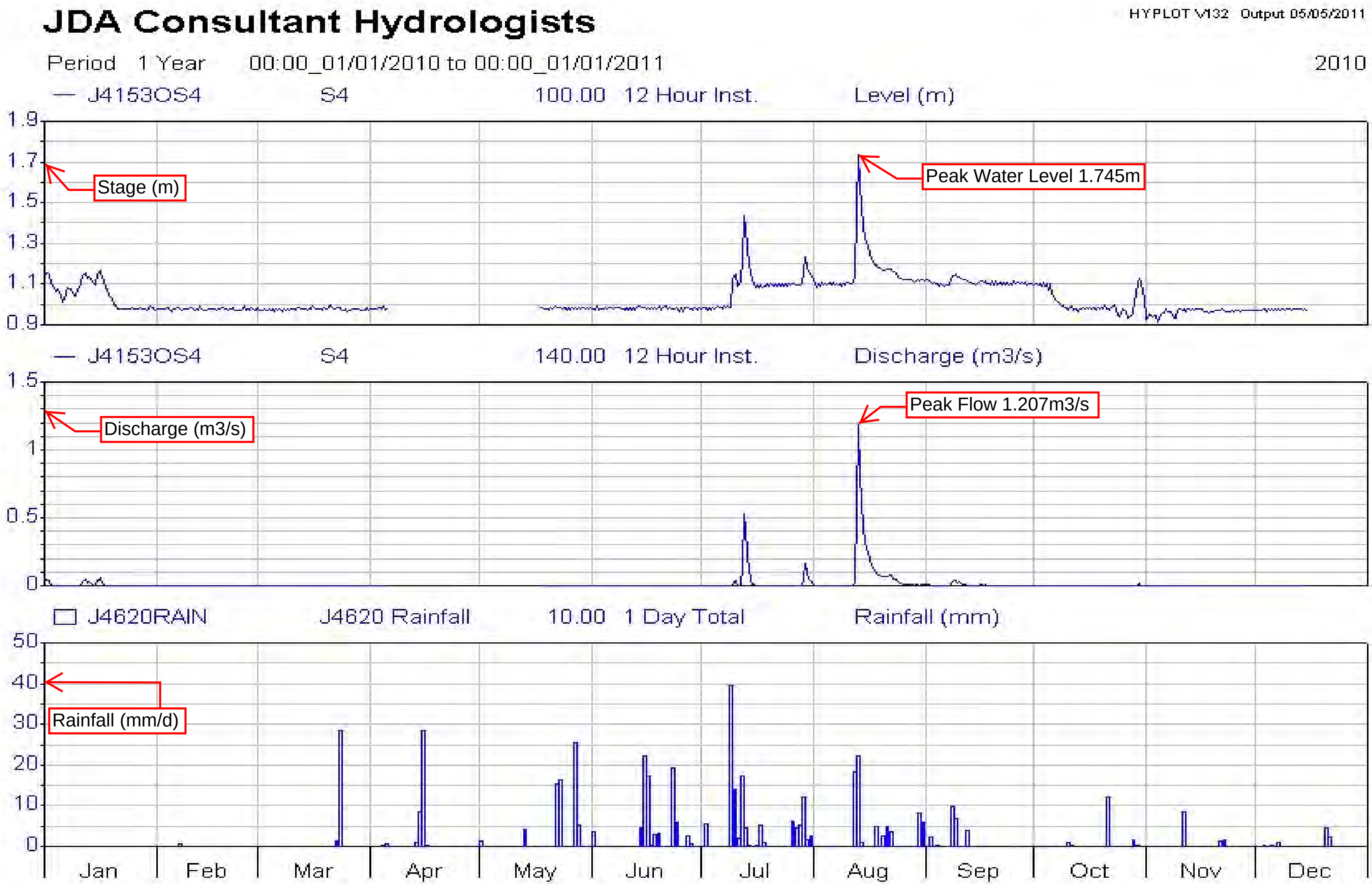
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 14: Stage, Discharge & Average Daily Rainfall (S3)



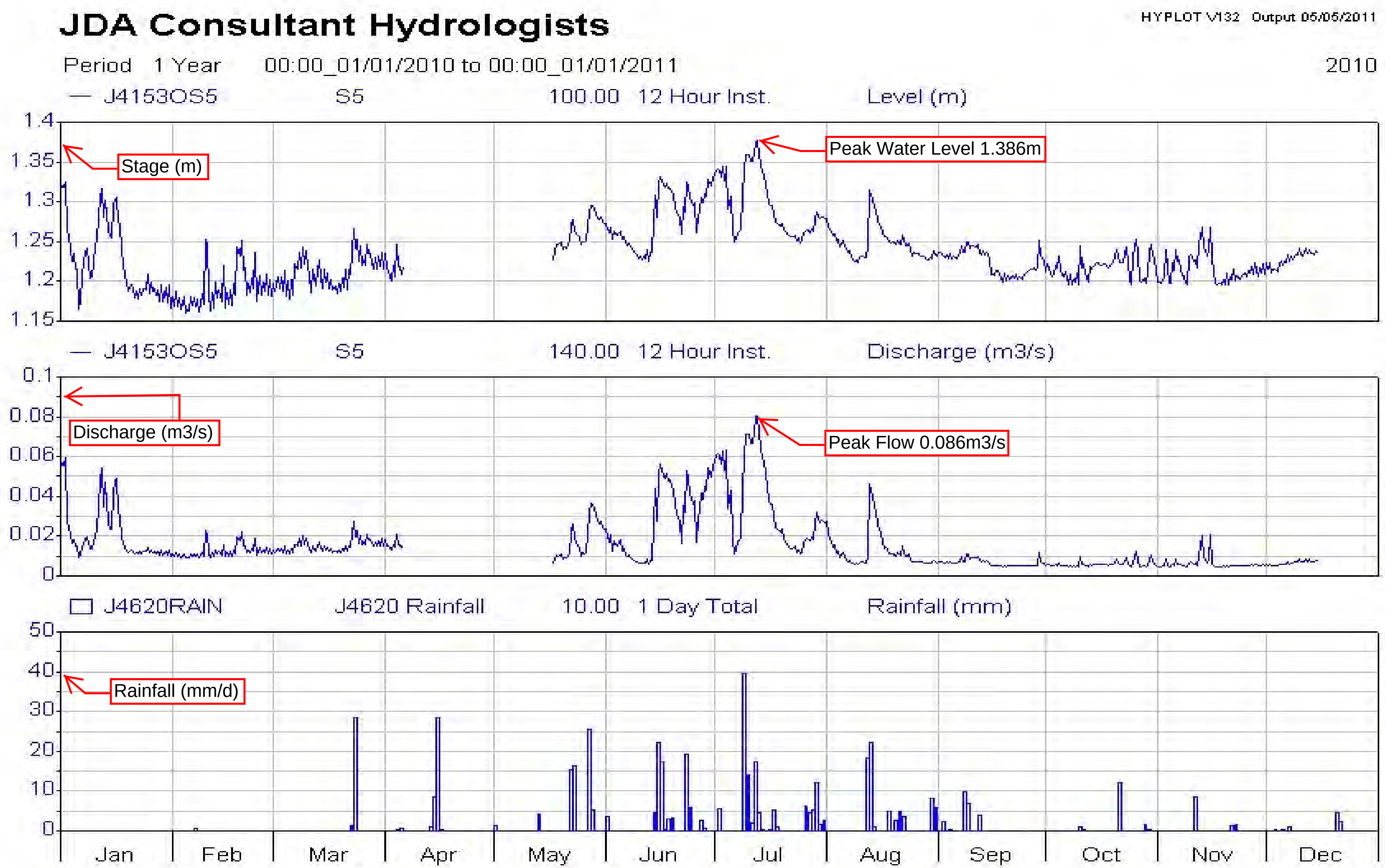
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 15: Stage, Discharge & Average Daily Rainfall (S4)



Data Source: JDA Hydstra Database

Job No: J4620

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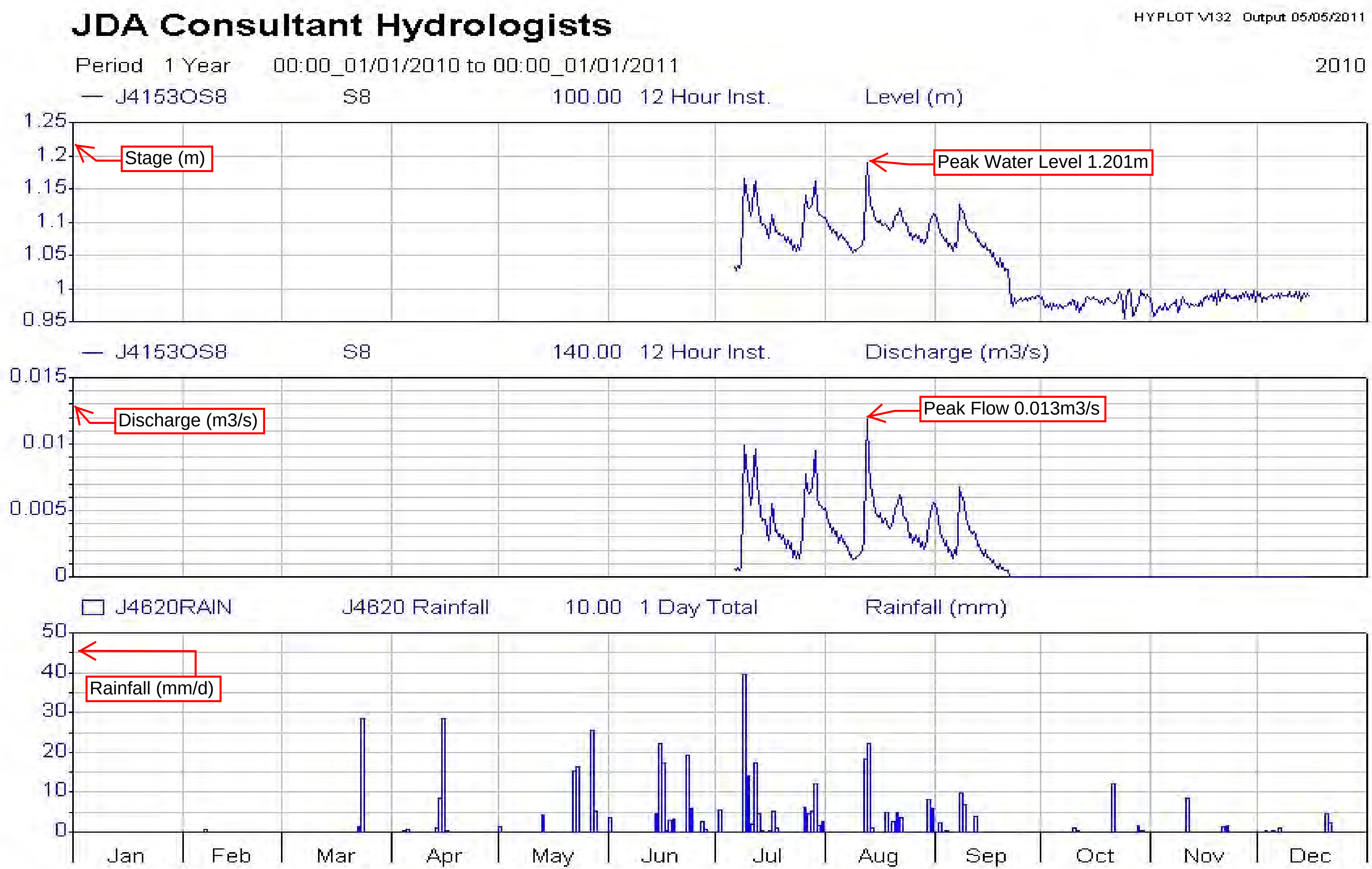
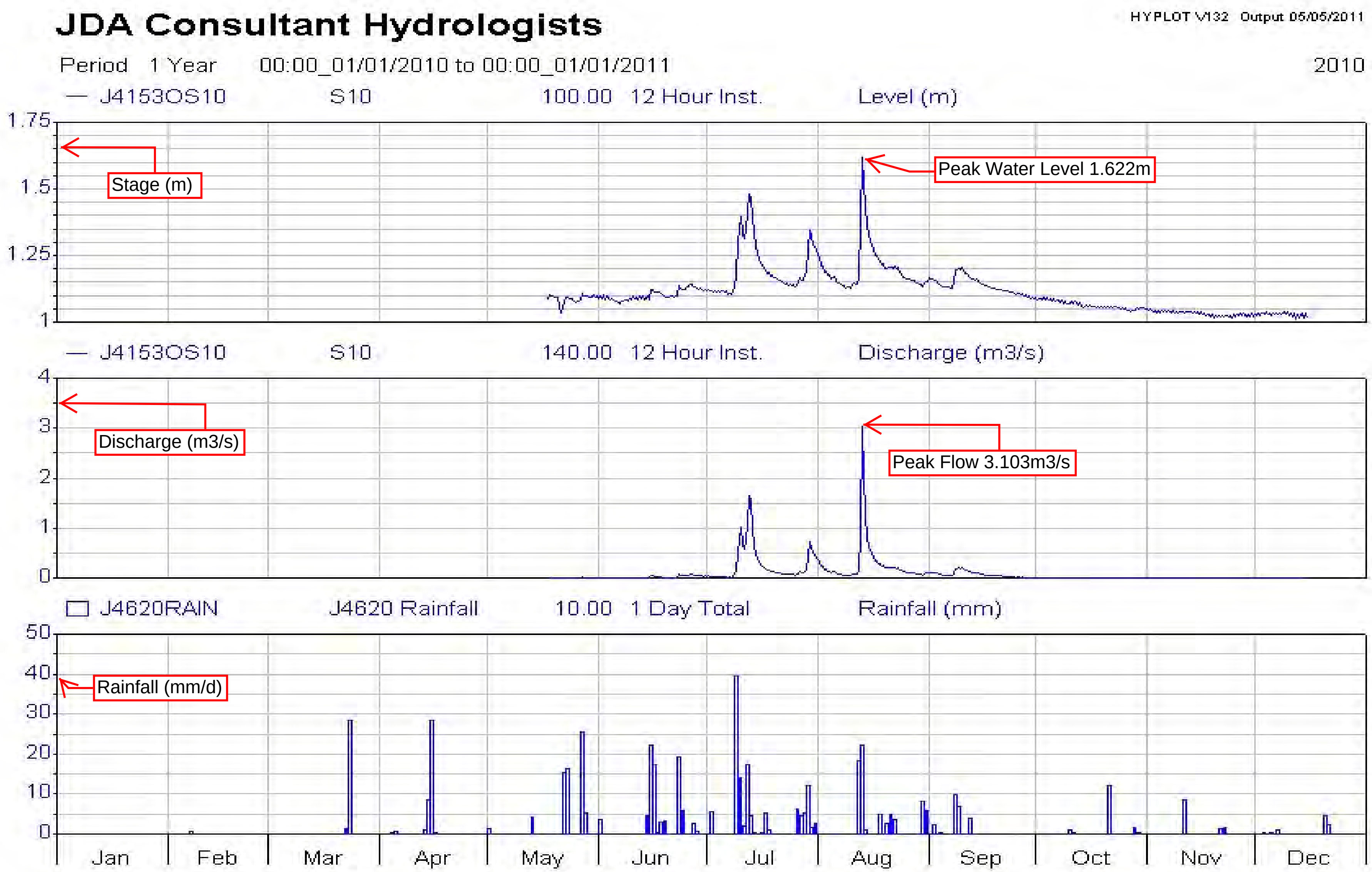
Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 16: Stage, Discharge & Average Daily Rainfall (S5)



Data Source: JDA Hydstra Database

JDA	Job No: J4620 © COPYRIGHT JIM DAVIES & ASSOCIATES PTY. LTD. 2011	Twin Ocean Property Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010 **Figure 17: Stage, Discharge & Average Daily Rainfall (S8)**



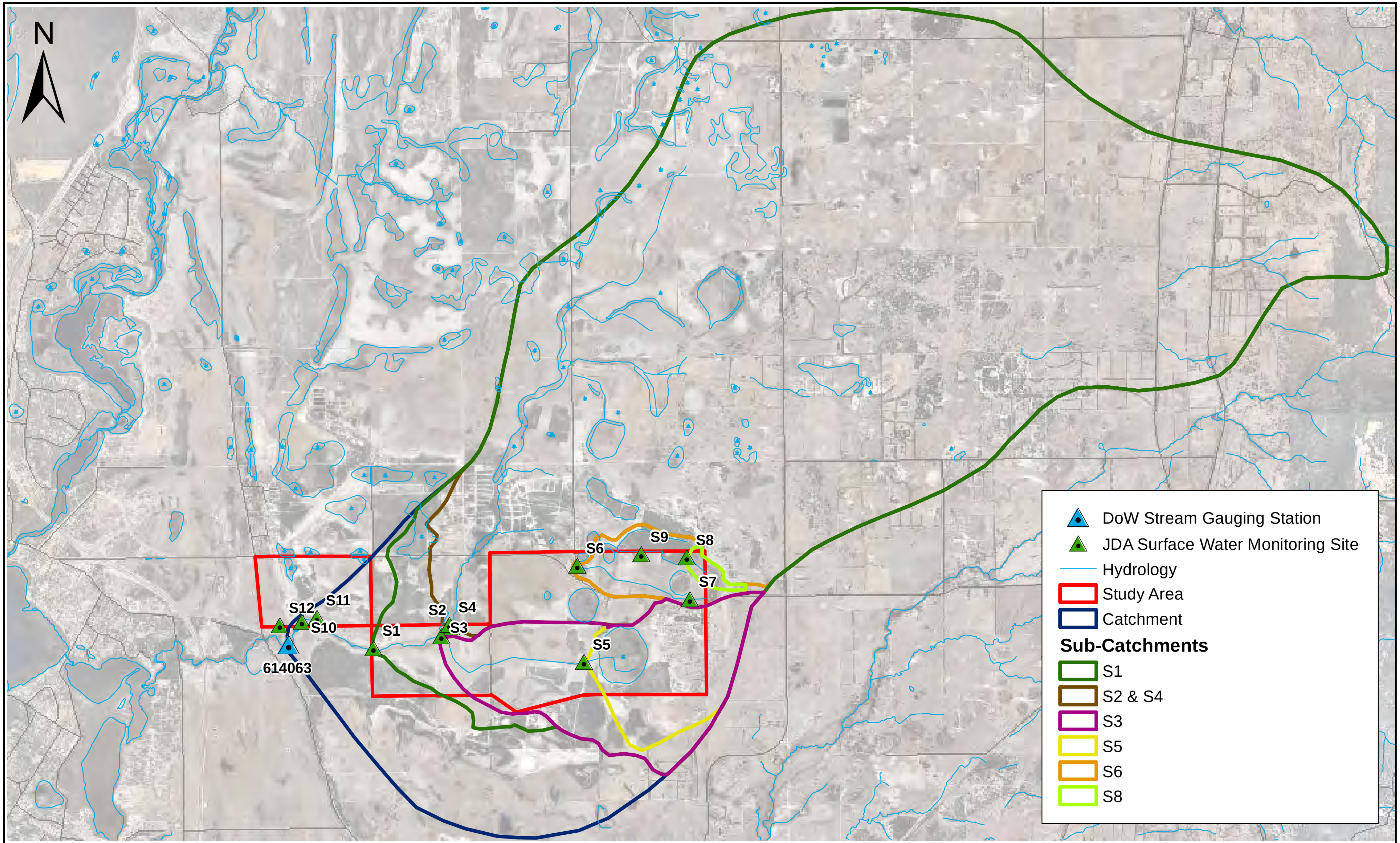
Data Source: JDA Hydstra Database

Job No: J4620

Twin Ocean Property

Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010

Figure 18: Stage, Discharge & Average Daily Rainfall (S10)



Data Source: WIN Database 2011

JDA Consultant Hydrologists

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Scale: 1:80,000

0 1 2 3 4 5 Kilometers

Twin Ocean Property Ltd

Lakes Rd Nambeelup: Pre-Development Surface Water Monitoring 2010

Figure 19: Catchment & Sub-Catchment Areas


(S1) 17.05.2010


(S1) 15.09.2010


(S2) 17.05.2010


(S2) 17.05.2010


(S3) 17.05.2010


(S3) 17.05.2010


(S4) 17.05.2010


(S4) 17.05.2010


(S5) 17.05.2010


(S5) 17.05.2010


(S6) 17.05.2010


(S6) 15.09.2010


(S8) 17.05.2010


(S8) 17.05.2010


(S10) 17.05.2010


(S10) 17.05.2010


(S12) 17.05.2010


(S12) 15.09.2010


(S12) 17.05.2010

Data Source: JDA Photos

JDA

Job No: J4620

Twin Ocean Property
Lakes Rd, Nambeelup: Predevelopment Surface Water Monitoring 2010
Figure 20: Photos 2010

APPENDIX A

Site J4620RAIN J4620 Average of BoM 009977 and 009596 Year 2010
Variable 10.00 Rainfall in Millimetres Table Type Rain
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]				1.2	3.6		0.1					1
2							5.5		2.4				2
3												0.3	3
4				0.2	0.1				0.2				4
5				0.6								0.3	5
6								0.1					6
7		0.8										1.0	7
8									9.8				8
9							39.5		6.9				9
10							14.2			1.1			10
11							2.0		0.1	0.4	8.4		11
12							17.2	18.2	4.1				12
13				0.9	4.4		4.6	22.3	0.1				13
14				8.5	0.1	4.7	0.4	0.9					14
15				28.4		22.3							15
16				0.4		17.2	0.3						16
17						0.2	5.2						17
18					0.1	2.8	1.1	4.9					18
19						3.1	0.1						19
20						0.1		2.6				4.7	20
21								4.9		12.2	1.3	2.3	21
22			1.2		15.2			3.6			1.7		22
23			28.4		16.2	19.3							23
24						5.8		0.1					24
25									0.1				25
26							6.2						26
27					25.3	2.7	4.7						27
28					5.1	0.7	5.2			1.5			28
29						0.1	12.2	0.1		0.2			29
30					0.1		1.7	8.1					30
31							2.6	5.9					31
Mean	0.0	0.0	1.0	1.3	2.2	2.8	4.0	2.3	0.8	0.5	0.4	0.3	
Maximum	0.0	0.8	28.4	28.4	25.3	22.3	39.5	22.3	9.8	12.2	8.4	4.7	
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	0.0	0.8	29.6	39.0	67.8	82.7	122.6	71.9	23.7	15.4	11.5	8.6	
Wet Days	0	1	2	6	10	13	17	13	8	5	3	5	
Missing Days	1	0	0	0	0	0	0	0	0	0	0	0	

Summaries

Annual Mean	1.3
Annual Total	473.6
Wet Days	83
Missing Days	1

	Maximum	Minimum
Daily	39.5	0.0

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site 009977 BOM Mandurah Raingauge Year 2010
Variable 10.00 Rainfall in Millimetres Table Type Rain
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]				2.4	3.0		0.2					1
2							8.9						2
3												0.6	3
4				0.4	0.2				0.2				4
5				0.2								0.6	5
6								0.2					6
7		0.4										2.0	7
8									9.3				8
9							36.4		5.9				9
10							16.2			1.0			10
11							2.2			0.8	7.7		11
12							11.1	20.2	3.0				12
13				1.8	4.0		6.1	17.2	0.2				13
14				16.2	0.2	4.5	0.2	0.4					14
15				13.2		22.3							15
16				0.8		12.1	0.2						16
17						0.4	5.9						17
18					0.2	4.0	0.8	6.9					18
19						3.4	0.2						19
20						0.2		4.3				3.6	20
21								2.8		12.1	1.2	3.0	21
22			2.4		17.2			2.0			0.4		22
23			13.2		21.3	16.2							23
24						8.1		0.2					24
25									0.2				25
26							4.3						26
27					23.3	1.4	6.1						27
28					7.7	1.4	8.1			1.2			28
29						0.2	11.1			0.4			29
30					0.2		3.2	9.9					30
31							3.2	6.9					31
Mean	0.0	0.0	0.5	1.1	2.5	2.6	4.0	2.3	0.6	0.5	0.3	0.3	
Maximum	0.0	0.4	13.2	16.2	23.3	22.3	36.4	20.2	9.3	12.1	7.7	3.6	
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	0.0	0.4	15.6	32.6	76.7	77.3	124.3	71.3	18.8	15.6	9.3	9.9	
Wet Days	0	1	2	6	10	13	17	12	6	5	3	5	
Missing Days	1	0	0	0	0	0	0	0	0	0	0	0	

Summaries

Annual Mean	1.2
Annual Total	451.8
Wet Days	80
Missing Days	1

	Maximum	Minimum
Daily	36.4	0.0

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site 009596 BoM Pinjarra Raingauge Year 2010
Variable 10.00 Rainfall in Millimetres Table Type Rain
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]					4.2							1
2							2.0		4.9				2
3													3
4									0.2				4
5				1.0									5
6													6
7		1.2											7
8									10.1				8
9							43.5		7.9				9
10							12.1			1.2			10
11							1.8		0.2		9.1		11
12							23.3	16.2	5.1				12
13					4.7		3.0	27.3					13
14						4.9	0.6	1.4					14
15				43.5		22.2							15
16						23.3	0.4						16
17							4.4						17
18						1.6	1.4	2.8					18
19						2.8							19
20								1.0				5.7	20
21								6.9		13.1	1.4	1.6	21
22					13.1			5.3			3.0		22
23			44.5		11.1	21.2							23
24						3.4							24
25													25
26							8.2						26
27					27.3	4.0	3.2						27
28					2.4		2.3			1.8			28
29							13.1	0.2					29
30							0.2	6.3					30
31							2.0	4.9					31
Mean	0.0	0.0	1.4	1.5	1.9	2.9	3.9	2.3	0.9	0.5	0.5	0.2	
Maximum	0.0	1.2	44.5	43.5	27.3	23.3	43.5	27.3	10.1	13.1	9.1	5.7	
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	0.0	1.2	44.5	44.5	58.6	87.8	121.7	72.2	28.3	16.2	13.5	7.3	
Wet Days	0	1	1	2	5	9	16	10	6	3	3	2	
Missing Days	1	0	0	0	0	0	0	0	0	0	0	0	

Summaries

Annual Mean	1.4
Annual Total	495.8
Wet Days	58
Missing Days	1

	Maximum	Minimum
Daily	44.5	0.0

------------------ Notes ------------------

All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J4153OS1 Nambeelup Lot 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	[ ]M	[ ]M	[ ]M	0.015	0.288	0.077	0.006	0.001	0.000	1
2	0.000	0.000	0.000	[ ]M	[ ]M	[ ]M	0.016	0.209	0.060	0.004	0.000	0.000	2
3	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.012	0.154	0.048	0.003	0.000	0.000	3
4	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.012	0.122	0.044	0.003	0.000	0.000	4
5	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.011	0.096	0.038	0.003	0.000	0.000	5
6	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.077	0.035	0.002	0.001	0.000	6
7	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.012	0.058	0.037	0.002	0.000	0.000	7
8	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.023	0.047	0.127	0.002	0.000	0.000	8
9	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.164	0.040	0.170	0.002	0.001	0.000	9
10	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.838	0.038	0.144	0.002	0.002	0.000	10
11	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.617	0.039	0.100	0.001	0.002	0.000	11
12	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	1.191	0.224	0.083	0.001	0.001	0.000	12
13	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	1.440	2.386	0.063	0.002	0.001	0.000	13
14	0.000	0.000	[ ]M	[ ]M	[ ]M	[ ]M	0.652	1.351	0.052	0.001	0.001	0.000	14
15	0.000	0.000	[ ]M	[ ]M	[ ]M	0.029	0.361	0.624	0.043	0.001	0.001	[ ]	15
16	0.001	0.000	[ ]M	[ ]M	[ ]M	0.033	0.236	0.391	0.035	0.002	0.001	[ ]	16
17	0.000	0.000	[ ]M	[ ]M	[ ]M	0.027	0.179	0.273	0.026	0.002	0.000	[ ]	17
18	0.000	0.000	[ ]M	[ ]M	[ ]M	0.027	0.131	0.233	0.020	0.002	0.000	[ ]	18
19	0.000	0.000	[ ]M	[ ]M	[ ]M	0.024	0.103	0.188	0.017	0.002	0.000	[ ]	19
20	0.000	0.000	[ ]M	[ ]M	[ ]M	0.020	0.082	0.174	0.014	0.004	0.000	[ ]	20
21	0.000	0.000	[ ]M	[ ]M	[ ]M	0.018	0.068	0.179	0.012	0.004	0.000	[ ]	21
22	0.000	0.000	[ ]M	[ ]M	[ ]M	0.017	0.056	0.191	0.011	0.004	0.000	[ ]	22
23	0.000	0.000	[ ]M	[ ]M	[ ]M	0.059	0.049	0.154	0.010	0.005	0.000	[ ]	23
24	0.000	0.000	[ ]M	[ ]M	[ ]M	0.035	0.044	0.114	0.009	0.000	0.000	[ ]	24
25	0.000	0.000	[ ]M	[ ]M	[ ]M	0.030	0.042	0.081	0.009	0.001	0.000	[ ]	25
26	0.000	0.000	[ ]M	[ ]M	[ ]M	0.035	0.093	0.064	0.008	0.000	0.000	[ ]	26
27	0.000	0.000	[ ]M	[ ]M	[ ]M	0.031	0.107	0.056	0.008	0.000	0.000	[ ]	27
28	0.000	0.000	[ ]M	[ ]M	[ ]M	0.024	0.158	0.050	0.007	0.001	0.000	[ ]	28
29	0.000		[ ]M	[ ]M	[ ]M	0.021	0.487	0.046	0.007	0.023	0.000	[ ]	29
30	0.000		[ ]M	[ ]M	[ ]M	0.017	0.603	0.054	0.007	0.040	0.000	[ ]	30
31	0.000		[ ]M		[ ]M		0.413	0.070		0.011		[ ]	31
Mean	0.000	0.000	0.000	[ ]	[ ]	0.028	0.274	0.260	0.044	0.004	0.001	0.000	
Median	0.000	0.000	0.000	[ ]	[ ]	0.027	0.105	0.122	0.035	0.002	0.000	0.000	
Max.Daily Mean	0.001	0.000	0.000	[ ]	[ ]	0.059	1.440	2.386	0.170	0.040	0.002	0.000	
Min.Daily Mean	0.000	0.000	0.000	[ ]	[ ]	0.017	0.011	0.038	0.007	0.000	0.000	0.000	
Inst.Max	0.005	0.001	0.000	[ ]	[ ]	0.083	1.738	3.092	0.199	0.075	0.005	0.000	
Inst.Min	0.000	0.000	0.000	[ ]	[ ]	0.009	0.008	0.031	0.005	0.000	0.000	0.000	
Missing Days	0	0	29	30	31	14	1	0	0	0	0	17	

Summaries

Annual Mean	0.075
Ann. Median	0.002
Missing Days	122

	Maximum	Minimum
Daily Mean	2.386	0.000
Instant	3.092	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists — HYDAY V106 Output 05/05/2011

Site J4153OS1 Nambeelup Lot 221 — Year 2010
VarFrom 100.00 Stream Water Level in Metres — Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	36.2	5.5	1.8	[ ]M	[ ]M	[ ]M	1310	24902	6666	497.1	119.6	1.5	1
2	39.4	2.6	1.7	[ ]M	[ ]M	[ ]M	1384	18062	5213	348.6	24.7	1.3	2
3	1.5	1.1	[ ]M	[ ]M	[ ]M	[ ]M	1073	13265	4133	271.2	4.2	1.2	3
4	0.1	0.9	[ ]M	[ ]M	[ ]M	[ ]M	1011	10568	3781	264.1	2.7	1.1	4
5	0.0	0.8	[ ]M	[ ]M	[ ]M	[ ]M	952.3	8265	3248	245.7	8.8	1.1	5
6	0.0	2.3	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	6656	3004	189.1	61.9	1.1	6
7	0.0	2.1	[ ]M	[ ]M	[ ]M	[ ]M	1059	5016	3176	178.9	19.8	1.5	7
8	0.0	0.4	[ ]M	[ ]M	[ ]M	[ ]M	1998	4062	11008	136.2	3.6	1.8	8
9	0.0	0.7	[ ]M	[ ]M	[ ]M	[ ]M	14149	3431	14673	150.1	106.4	1.7	9
10	0.1	1.3	[ ]M	[ ]M	[ ]M	[ ]M	72367	3321	12457	179.2	204.1	1.7	10
11	7.9	1.1	[ ]M	[ ]M	[ ]M	[ ]M	53319	3394	8631	70.3	203.9	1.5	11
12	20.1	1.8	[ ]M	[ ]M	[ ]M	[ ]M	102891	19311	7188	92.2	121.1	1.3	12
13	4.5	2.1	[ ]M	[ ]M	[ ]M	[ ]M	124433	206111	5454	144.4	95.1	1.1	13
14	0.2	2.1	[ ]M	[ ]M	[ ]M	[ ]M	56373	116739	4502	110.4	114.1	0.9	14
15	8.8	3.4	[ ]M	[ ]M	[ ]M	2528	31155	53939	3749	108.4	115.2	[ ]	15
16	57.9	4.0	[ ]M	[ ]M	[ ]M	2837	20384	33757	3032	159.4	59.0	[ ]	16
17	4.1	4.2	[ ]M	[ ]M	[ ]M	2304	15436	23612	2283	174.5	13.9	[ ]	17
18	0.2	5.1	[ ]M	[ ]M	[ ]M	2310	11333	20173	1729	195.0	11.4	[ ]	18
19	2.6	6.8	[ ]M	[ ]M	[ ]M	2099	8938	16258	1487	200.9	8.7	[ ]	19
20	5.3	6.7	[ ]M	[ ]M	[ ]M	1700	7090	15023	1225	378.4	9.4	[ ]	20
21	4.1	8.5	[ ]M	[ ]M	[ ]M	1581	5884	15460	1058	356.2	11.9	[ ]	21
22	2.2	10.5	[ ]M	[ ]M	[ ]M	1428	4868	16511	928.5	360.5	10.0	[ ]	22
23	2.3	10.1	[ ]M	[ ]M	[ ]M	5138	4209	13329	857.4	415.9	5.4	[ ]	23
24	5.1	11.7	[ ]M	[ ]M	[ ]M	3064	3774	9849	803.1	5.7	4.1	[ ]	24
25	5.4	12.9	[ ]M	[ ]M	[ ]M	2619	3593	6999	790.9	45.4	3.9	[ ]	25
26	4.7	16.5	[ ]M	[ ]M	[ ]M	3002	8063	5555	719.0	6.5	4.6	[ ]	26
27	6.2	13.6	[ ]M	[ ]M	[ ]M	2683	9271	4802	722.3	1.5	2.9	[ ]	27
28	7.7	6.4	[ ]M	[ ]M	[ ]M	2099	13647	4358	627.3	46.1	2.6	[ ]	28
29	8.4		[ ]M	[ ]M	[ ]M	1783	42059	3965	625.9	2009	1.8	[ ]	29
30	6.1		[ ]M	[ ]M	[ ]M	1449	52124	4657	635.2	3485	1.6	[ ]	30
31	4.0		[ ]M		[ ]M		35689	6026		939.4		[ ]	31
Mean	7.90	5.19	1.75	[ ]	[ ]	2414	23661	22496	3813	379.5	45.22	1.34	
Median	4.08	3.70	1.75	[ ]	[ ]	2307	9105	10568	3018	179.2	10.66	1.31	
Maximum	57.9	16.5	1.8	[ ]	[ ]	5138	124433	206111	14673	3485	204.1	1.8	
Minimum	0.00	0.35	1.67	[ ]	[ ]	1428	952.2	3321	625.8	1.51	1.62	0.95	
Total	244.9	145.4	3.5	[ ]	[ ]	38634	709847	697391	114415	11766	1356	18.8	
Missing Days	0	0	29	30	31	14	1	0	0	0	0	17	

Summaries

Annual Mean	6476
Ann. Median	200.8
Annual Total	1573824
Missing Days	122

	Maximum	Minimum
Daily	206111	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

Site J4153OS2 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.0	0.0	0.0	0.0	[ ]M	0.0	0.0	22641	0.0	0.0	0.0	0.0	1
2	0.0	0.0	0.0	0.0	[ ]M	0.0	0.0	10356	0.0	0.0	0.0	0.0	2
3	0.0	0.0	0.0	0.0	[ ]M	0.0	0.0	5136	0.0	0.0	0.0	0.0	3
4	0.0	0.0	0.0	0.0	[ ]M	0.0	0.0	2673	0.0	0.0	0.0	0.0	4
5	0.0	0.0	0.0	0.0	[ ]M	0.0	0.0	517.9	0.0	0.0	0.0	0.0	5
6	0.0	0.0	0.0	[ ]M	[ ]M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6
7	0.0	0.0	0.0	[ ]M	[ ]M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7
8	0.0	0.0	0.0	[ ]M	[ ]M	0.0	0.0	0.0	2439	0.0	0.0	0.0	8
9	0.0	0.0	0.0	[ ]M	[ ]M	0.0	19365	0.0	4575	0.0	0.0	0.0	9
10	0.0	0.0	0.0	[ ]M	[ ]M	0.0	67893	0.0	1547	0.0	0.0	0.0	10
11	0.0	0.0	0.0	[ ]M	[ ]M	0.0	55943	0.0	0.0	0.0	0.0	0.0	11
12	0.0	0.0	0.0	[ ]M	[ ]M	0.0	81072	17281	0.0	0.0	0.0	0.0	12
13	0.0	0.0	0.0	[ ]M	[ ]M	0.0	86094	119826	0.0	0.0	0.0	0.0	13
14	0.0	0.0	0.0	[ ]M	[ ]M	0.0	51578	78994	0.0	0.0	0.0	0.0	14
15	0.0	0.0	0.0	[ ]M	[ ]M	0.0	31966	46033	0.0	0.0	0.0	[ ]	15
16	0.0	0.0	0.0	[ ]M	[ ]M	0.0	15450	25297	0.0	0.0	0.0	[ ]	16
17	0.0	0.0	0.0	[ ]M	[ ]M	0.0	7990	11482	0.0	0.0	0.0	[ ]	17
18	0.0	0.0	0.0	[ ]M	0.0	0.0	4987	7542	0.0	0.0	0.0	[ ]	18
19	0.0	0.0	0.0	[ ]M	0.0	0.0	3149	4110	0.0	0.0	0.0	[ ]	19
20	0.0	0.0	0.0	[ ]M	0.0	0.0	1374	2846	0.0	0.0	0.0	[ ]	20
21	0.0	0.0	0.0	[ ]M	0.0	0.0	549.3	3081	0.0	0.0	0.0	[ ]	21
22	0.0	0.0	0.0	[ ]M	0.0	0.0	261.8	4169	0.0	0.0	0.0	[ ]	22
23	0.0	0.0	0.0	[ ]M	0.0	0.0	76.4	1343	0.0	0.0	0.0	[ ]	23
24	0.0	0.0	0.0	[ ]M	0.0	0.0	0.0	21.3	0.0	0.0	0.0	[ ]	24
25	0.0	0.0	0.0	[ ]M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[ ]	25
26	0.0	0.0	0.0	[ ]M	0.0	0.0	3824	0.0	0.0	0.0	0.0	[ ]	26
27	0.0	0.0	0.0	[ ]M	0.0	0.0	3759	0.0	0.0	0.0	0.0	[ ]	27
28	0.0	0.0	0.0	[ ]M	0.0	0.0	7802	0.0	0.0	0.0	0.0	[ ]	28
29	0.0		0.0	[ ]M	0.0	0.0	43096	0.0	0.0	0.0	0.0	[ ]	29
30	0.0		0.0	[ ]M	0.0	0.0	49924	0.0	0.0	0.0	0.0	[ ]	30
31	0.0		0.0		0.0		37441	0.0		0.0		[ ]	31
Mean	0.00	0.00	0.00	0.00	0.00	0.00	18503	11721	285.4	0.00	0.00	0.00	
Median	0.00	0.00	0.00	0.00	0.00	0.00	3759	1343	0.00	0.00	0.00	0.00	
Maximum	0.0	0.0	0.0	0.0	0.0	0.0	86094	119826	4575	0.0	0.0	0.0	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total	0.0	0.0	0.0	0.0	0.0	0.0	573602	363356	8562	0.0	0.0	0.0	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean 3089
Ann. Median 0.00
Annual Total 945520
Missing Days 59

	Maximum	Minimum
Daily	119826	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J41530S2 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.262	0.000	0.000	0.000	0.000	1
2	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.120	0.000	0.000	0.000	0.000	2
3	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.059	0.000	0.000	0.000	0.000	3
4	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.031	0.000	0.000	0.000	0.000	4
5	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.006	0.000	0.000	0.000	0.000	5
6	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6
7	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7
8	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.028	0.000	0.000	0.000	8
9	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.224	0.000	0.053	0.000	0.000	0.000	9
10	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.786	0.000	0.018	0.000	0.000	0.000	10
11	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.647	0.000	0.000	0.000	0.000	0.000	11
12	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.938	0.200	0.000	0.000	0.000	0.000	12
13	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.996	1.387	0.000	0.000	0.000	0.000	13
14	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.597	0.914	0.000	0.000	0.000	0.000	14
15	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.370	0.533	0.000	0.000	0.000	[ ]	15
16	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.179	0.293	0.000	0.000	0.000	[ ]	16
17	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.092	0.133	0.000	0.000	0.000	[ ]	17
18	0.000	0.000	0.000	[ ]M	0.000	0.000	0.058	0.087	0.000	0.000	0.000	[ ]	18
19	0.000	0.000	0.000	[ ]M	0.000	0.000	0.036	0.048	0.000	0.000	0.000	[ ]	19
20	0.000	0.000	0.000	[ ]M	0.000	0.000	0.016	0.033	0.000	0.000	0.000	[ ]	20
21	0.000	0.000	0.000	[ ]M	0.000	0.000	0.006	0.036	0.000	0.000	0.000	[ ]	21
22	0.000	0.000	0.000	[ ]M	0.000	0.000	0.003	0.048	0.000	0.000	0.000	[ ]	22
23	0.000	0.000	0.000	[ ]M	0.000	0.000	0.001	0.016	0.000	0.000	0.000	[ ]	23
24	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	24
25	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	25
26	0.000	0.000	0.000	[ ]M	0.000	0.000	0.044	0.000	0.000	0.000	0.000	[ ]	26
27	0.000	0.000	0.000	[ ]M	0.000	0.000	0.044	0.000	0.000	0.000	0.000	[ ]	27
28	0.000	0.000	0.000	[ ]M	0.000	0.000	0.090	0.000	0.000	0.000	0.000	[ ]	28
29	0.000		0.000	[ ]M	0.000	0.000	0.499	0.000	0.000	0.000	0.000	[ ]	29
30	0.000		0.000	[ ]M	0.000	0.000	0.578	0.000	0.000	0.000	0.000	[ ]	30
31	0.000		0.000		0.000		0.433	0.000		0.000		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.214	0.136	0.003	0.000	0.000	0.000	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.016	0.000	0.000	0.000	0.000	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.996	1.387	0.053	0.000	0.000	0.000	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Inst.Max	0.000	0.000	0.000	0.000	0.000	0.000	1.139	1.621	0.069	0.000	0.000	0.000	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	0.036
Ann. Median	0.000
Missing Days	59

	Maximum	Minimum
Daily Mean	1.387	0.000
Instant	1.621	0.000

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J4153OS3 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.051	0.015	0.013	0.014	[ ]M	0.018	0.029	0.058	0.044	0.039	0.025	0.001	1
2	0.047	0.016	0.014	0.016	[ ]M	0.017	0.029	0.054	0.038	0.038	0.015	0.004	2
3	0.019	0.013	0.013	0.014	[ ]M	0.017	0.026	0.050	0.036	0.037	0.006	0.016	3
4	0.009	0.012	0.014	0.012	[ ]M	0.018	0.025	0.048	0.036	0.039	0.004	0.023	4
5	0.005	0.012	0.013	0.010	[ ]M	0.018	0.022	0.045	0.032	0.041	0.014	0.020	5
6	0.001	0.014	0.012	[ ]M	[ ]M	0.017	0.022	0.044	0.031	0.042	0.019	0.019	6
7	0.016	0.016	0.013	[ ]M	[ ]M	0.014	0.026	0.038	0.033	0.040	0.012	0.017	7
8	0.016	0.015	0.012	[ ]M	[ ]M	0.015	0.035	0.033	0.044	0.040	0.003	0.013	8
9	0.005	0.016	0.012	[ ]M	[ ]M	0.014	0.069	0.032	0.049	0.042	0.012	0.015	9
10	0.019	0.016	0.012	[ ]M	[ ]M	0.013	0.074	0.033	0.045	0.042	0.017	0.014	10
11	0.043	0.014	0.012	[ ]M	[ ]M	0.013	0.071	0.038	0.043	0.040	0.018	0.016	11
12	0.053	0.014	0.015	[ ]M	[ ]M	0.013	0.105	0.062	0.044	0.043	0.015	0.015	12
13	0.042	0.014	0.016	[ ]M	[ ]M	0.013	0.115	0.156	0.039	0.041	0.015	0.017	13
14	0.029	0.013	0.015	[ ]M	[ ]M	0.015	0.069	0.107	0.037	0.036	0.013	0.015	14
15	0.049	0.014	0.014	[ ]M	[ ]M	0.026	0.065	0.068	0.038	0.036	0.009	[ ]	15
16	0.058	0.014	0.014	[ ]M	[ ]M	0.035	0.060	0.060	0.039	0.037	0.005	[ ]	16
17	0.036	0.014	0.012	[ ]M	[ ]M	0.035	0.055	0.054	0.036	0.038	0.000	[ ]	17
18	0.021	0.017	0.012	[ ]M	0.012	0.039	0.050	0.052	0.034	0.035	0.000	[ ]	18
19	0.014	0.018	0.013	[ ]M	0.012	0.036	0.048	0.048	0.033	0.033	0.000	[ ]	19
20	0.015	0.013	0.013	[ ]M	0.013	0.032	0.045	0.048	0.031	0.039	0.001	[ ]	20
21	0.011	0.014	0.013	[ ]M	0.015	0.031	0.044	0.050	0.031	0.038	0.002	[ ]	21
22	0.010	0.014	0.020	[ ]M	0.020	0.029	0.041	0.050	0.032	0.037	0.000	[ ]	22
23	0.009	0.012	0.020	[ ]M	0.019	0.054	0.040	0.045	0.033	0.032	0.000	[ ]	23
24	0.011	0.013	0.017	[ ]M	0.014	0.046	0.040	0.044	0.037	0.016	0.000	[ ]	24
25	0.012	0.014	0.014	[ ]M	0.013	0.042	0.039	0.039	0.039	0.038	0.000	[ ]	25
26	0.013	0.015	0.013	[ ]M	0.014	0.041	0.048	0.035	0.037	0.035	0.001	[ ]	26
27	0.015	0.014	0.014	[ ]M	0.022	0.040	0.051	0.033	0.037	0.007	0.002	[ ]	27
28	0.015	0.013	0.012	[ ]M	0.023	0.035	0.057	0.033	0.038	0.011	0.004	[ ]	28
29	0.015		0.011	[ ]M	0.022	0.034	0.069	0.033	0.040	0.061	0.001	[ ]	29
30	0.017		0.012	[ ]M	0.021	0.031	0.061	0.037	0.040	0.071	0.001	[ ]	30
31	0.015		0.014		0.019		0.061	0.044		0.049		[ ]	31
Mean	0.022	0.014	0.014	0.013	0.017	0.027	0.051	0.051	0.038	0.038	0.007	0.015	
Median	0.015	0.014	0.013	0.014	0.017	0.027	0.048	0.045	0.037	0.038	0.004	0.016	
Max.Daily Mean	0.058	0.018	0.020	0.016	0.023	0.054	0.115	0.156	0.049	0.071	0.025	0.023	
Min.Daily Mean	0.001	0.012	0.011	0.010	0.012	0.013	0.022	0.032	0.031	0.007	0.000	0.001	
Inst.Max	0.077	0.034	0.084	0.020	0.028	0.064	0.141	0.165	0.054	0.091	0.041	0.032	
Inst.Min	0.000	0.001	0.005	0.005	0.006	0.006	0.017	0.025	0.024	0.000	0.000	0.000	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	0.028
Ann. Median	0.020
Missing Days	59

	Maximum	Minimum
Daily Mean	0.156	0.000
Instant	0.165	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J41530S3 NAMBEELUP LOT 221 Year 2010

VarFrom 100.00 Stream Water Level in Metres Table Type Total

VarTo 150.00 Stream Discharge Volume in Cubic metres

Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	4376	1259	1147	1196	[ ]M	1538	2483	4968	3830	3400	2197	83.98	1
2	4082	1400	1211	1407	[ ]M	1459	2511	4643	3303	3298	1289	314.3	2
3	1651	1124	1153	1226	[ ]M	1435	2217	4317	3144	3214	522.3	1378	3
4	817.1	1066	1186	1041	[ ]M	1535	2163	4149	3117	3355	362.5	1970	4
5	466.9	1023	1089	843.0	[ ]M	1536	1922	3928	2772	3568	1236	1716	5
6	106.0	1209	1072	[ ]M	[ ]M	1487	1931	3771	2718	3587	1612	1602	6
7	1355	1380	1154	[ ]M	[ ]M	1242	2266	3242	2893	3490	1052	1495	7
8	1386	1254	1079	[ ]M	[ ]M	1264	2997	2882	3776	3430	233.4	1156	8
9	465.1	1355	1054	[ ]M	[ ]M	1168	5969	2775	4216	3660	1024	1313	9
10	1661	1345	1037	[ ]M	[ ]M	1115	6419	2847	3868	3609	1484	1236	10
11	3749	1202	1029	[ ]M	[ ]M	1139	6166	3264	3729	3434	1568	1390	11
12	4591	1234	1258	[ ]M	[ ]M	1090	9075	5339	3764	3686	1286	1299	12
13	3643	1234	1359	[ ]M	[ ]M	1147	9910	13498	3373	3503	1272	1494	13
14	2471	1141	1290	[ ]M	[ ]M	1285	6002	9237	3233	3126	1140	1269	14
15	4231	1224	1170	[ ]M	[ ]M	2203	5589	5912	3288	3108	798.3	[ ]	15
16	5007	1187	1241	[ ]M	[ ]M	3031	5141	5208	3357	3228	438.5	[ ]	16
17	3080	1232	1069	[ ]M	[ ]M	3047	4781	4673	3142	3300	1.22	[ ]	17
18	1783	1503	1002	[ ]M	1037	3396	4341	4462	2973	2999	0.00	[ ]	18
19	1199	1540	1102	[ ]M	1038	3144	4149	4166	2819	2877	6.49	[ ]	19
20	1255	1135	1118	[ ]M	1109	2729	3888	4111	2691	3381	83.30	[ ]	20
21	946.4	1185	1136	[ ]M	1268	2700	3801	4298	2676	3321	148.9	[ ]	21
22	868.0	1181	1728	[ ]M	1714	2474	3557	4350	2769	3174	25.99	[ ]	22
23	810.7	1016	1717	[ ]M	1664	4645	3434	3906	2885	2786	6.90	[ ]	23
24	958.1	1111	1440	[ ]M	1230	3949	3432	3774	3182	1343	32.97	[ ]	24
25	1006	1192	1204	[ ]M	1089	3599	3372	3365	3330	3305	12.98	[ ]	25
26	1143	1259	1107	[ ]M	1179	3569	4155	3012	3235	3063	65.17	[ ]	26
27	1289	1167	1209	[ ]M	1934	3457	4363	2876	3181	622.1	171.2	[ ]	27
28	1308	1161	1016	[ ]M	1995	3057	4911	2816	3314	965.9	362.4	[ ]	28
29	1335		991.5	[ ]M	1904	2915	5975	2811	3475	5273	74.32	[ ]	29
30	1467		1014	[ ]M	1819	2648	5267	3189	3482	6121	118.8	[ ]	30
31	1289		1173		1634		5270	3789		4204		[ ]	31
Mean	1929	1226	1179	1143	1472	2300	4434	4373	3251	3272	621.0	1266	
Median	1335	1205	1147	1196	1451	2339	4155	3928	3234	3321	362.4	1345	
Maximum	5007	1540	1728	1407	1995	4645	9910	13498	4216	6121	2197	1970	
Minimum	106.0	1016	991.5	843.0	1037	1090	1922	2775	2676	622.1	0.00	83.98	
Total	59806	34331	36570	5716	20621	69017	137473	135590	97550	101446	18631	17724	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	2400
Ann. Median	1722
Annual Total	734481
Missing Days	59

	Maximum	Minimum
Daily	13498	0.00

------------------ Notes -------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J4153OS4 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	2963	0.00	0.00	0.00	[ ]M	0.00	0.00	156.6	1099	2.74	0.00	0.00	1
2	2643	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	384.0	0.00	0.00	0.00	2
3	38.60	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	164.4	1.01	0.00	0.00	3
4	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	68.03	0.00	0.00	0.00	4
5	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.10	5.82	0.00	0.00	0.00	5
6	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	3.34	0.00	0.00	0.00	6
7	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	86.31	0.00	0.00	0.00	7
8	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	2750	0.00	0.00	0.00	8
9	0.00	0.00	0.00	[ ]M	[ ]M	0.00	24.73	0.00	3383	0.00	0.00	0.00	9
10	0.00	0.00	0.00	[ ]M	[ ]M	0.00	2942	105.1	2029	0.00	0.00	0.00	10
11	1529	0.00	0.00	[ ]M	[ ]M	0.00	23.56	38.44	1012	0.00	0.00	0.00	11
12	3316	0.00	0.00	[ ]M	[ ]M	0.00	17044	9736	701.4	0.00	0.00	0.00	12
13	1362	0.00	0.00	[ ]M	[ ]M	0.00	35738	85312	179.9	0.00	0.00	0.00	13
14	94.60	0.00	0.00	[ ]M	[ ]M	0.00	10303	53827	74.12	0.00	0.00	0.00	14
15	1996	0.00	0.00	[ ]M	[ ]M	0.00	1269	28769	397.6	0.00	0.00	[ ]	15
16	3747	0.00	0.00	[ ]M	[ ]M	0.00	0.00	17553	499.1	0.00	0.00	[ ]	16
17	748.6	0.00	0.00	[ ]M	[ ]M	0.00	0.00	11112	265.1	0.00	0.00	[ ]	17
18	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	8758	50.31	0.00	0.00	[ ]	18
19	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	6777	75.69	0.00	0.00	[ ]	19
20	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	6146	68.73	0.00	0.00	[ ]	20
21	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	6130	60.18	0.00	0.00	[ ]	21
22	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	6407	19.52	0.00	0.00	[ ]	22
23	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	4287	10.05	0.00	0.00	[ ]	23
24	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	2951	7.54	0.00	0.00	[ ]	24
25	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	1581	81.51	0.00	0.00	[ ]	25
26	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	985.8	126.1	0.00	0.00	[ ]	26
27	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	761.8	106.8	0.00	0.00	[ ]	27
28	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	590.6	64.70	0.00	0.00	[ ]	28
29	0.00		0.00	[ ]M	0.00	0.00	7246	441.8	73.75	242.5	0.00	[ ]	29
30	0.00		0.00	[ ]M	0.00	0.00	8895	636.4	31.85	576.5	0.00	[ ]	30
31	0.00		0.00		0.00		2821	845.4		0.00		[ ]	31
Mean	594.8	0.00	0.00	0.00	0.00	0.00	2784	8190	462.7	26.54	0.00	0.00	
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	845.4	83.91	0.00	0.00	0.00	
Maximum	3747	0.00	0.00	0.00	0.00	0.00	35738	85312	3383	576.5	0.00	0.00	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34	0.00	0.00	0.00	
Total	18440	0.0	0.0	0.0	0.0	0.0	86310	253915	13881	822.8	0.0	0.0	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	1220
Ann. Median	0.00
Annual Total	373371
Missing Days	59

	Maximum	Minimum
Daily	85312	0.00

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All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J4153OS4 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.034	0.000	0.000	0.000	[ ]M	0.000	0.000	0.002	0.013	0.000	0.000	0.000	1
2	0.031	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.004	0.000	0.000	0.000	2
3	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.002	0.000	0.000	0.000	3
4	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.001	0.000	0.000	0.000	4
5	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5
6	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6
7	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.001	0.000	0.000	0.000	7
8	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.032	0.000	0.000	0.000	8
9	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.039	0.000	0.000	0.000	9
10	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.034	0.001	0.023	0.000	0.000	0.000	10
11	0.018	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.012	0.000	0.000	0.000	11
12	0.038	0.000	0.000	[ ]M	[ ]M	0.000	0.197	0.113	0.008	0.000	0.000	0.000	12
13	0.016	0.000	0.000	[ ]M	[ ]M	0.000	0.414	0.987	0.002	0.000	0.000	0.000	13
14	0.001	0.000	0.000	[ ]M	[ ]M	0.000	0.119	0.623	0.001	0.000	0.000	0.000	14
15	0.023	0.000	0.000	[ ]M	[ ]M	0.000	0.015	0.333	0.005	0.000	0.000	[ ]	15
16	0.043	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.203	0.006	0.000	0.000	[ ]	16
17	0.009	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.129	0.003	0.000	0.000	[ ]	17
18	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.101	0.001	0.000	0.000	[ ]	18
19	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.078	0.001	0.000	0.000	[ ]	19
20	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.071	0.001	0.000	0.000	[ ]	20
21	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.071	0.001	0.000	0.000	[ ]	21
22	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.074	0.000	0.000	0.000	[ ]	22
23	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.050	0.000	0.000	0.000	[ ]	23
24	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.034	0.000	0.000	0.000	[ ]	24
25	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.018	0.001	0.000	0.000	[ ]	25
26	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.011	0.001	0.000	0.000	[ ]	26
27	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.009	0.001	0.000	0.000	[ ]	27
28	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.007	0.001	0.000	0.000	[ ]	28
29	0.000		0.000	[ ]M	0.000	0.000	0.084	0.005	0.001	0.003	0.000	[ ]	29
30	0.000		0.000	[ ]M	0.000	0.000	0.103	0.007	0.000	0.007	0.000	[ ]	30
31	0.000		0.000		0.000		0.033	0.010		0.000		[ ]	31
Mean	0.007	0.000	0.000	0.000	0.000	0.000	0.032	0.095	0.005	0.000	0.000	0.000	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.001	0.000	0.000	0.000	
Max.Daily Mean	0.043	0.000	0.000	0.000	0.000	0.000	0.414	0.987	0.039	0.007	0.000	0.000	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Inst.Max	0.099	0.000	0.000	0.000	0.000	0.000	0.534	1.207	0.052	0.023	0.000	0.000	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	0.014
Ann. Median	0.000
Missing Days	59

	Maximum	Minimum
Daily Mean	0.987	0.000
Instant	1.207	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 05/05/2011

Site J4153OS5 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Year 2010
Table Type Rate

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.055	0.011	0.014	0.017	[ ]M	0.022	0.059	0.023	0.008	0.007	0.005	0.006	1
2	0.048	0.011	0.013	0.015	[ ]M	0.017	0.063	0.018	0.007	0.005	0.006	0.006	2
3	0.021	0.010	0.014	0.017	[ ]M	0.016	0.058	0.014	0.007	0.006	0.005	0.005	3
4	0.016	0.010	0.013	0.018	[ ]M	0.017	0.051	0.011	0.007	0.006	0.005	0.006	4
5	0.013	0.010	0.012	0.015	[ ]M	0.016	0.028	0.009	0.007	0.005	0.006	0.006	5
6	0.011	0.011	0.013	[ ]M	[ ]M	0.014	0.018	0.009	0.007	0.005	0.006	0.006	6
7	0.017	0.011	0.017	[ ]M	[ ]M	0.011	0.016	0.007	0.008	0.005	0.005	0.006	7
8	0.018	0.010	0.019	[ ]M	[ ]M	0.009	0.026	0.007	0.008	0.005	0.005	0.007	8
9	0.014	0.012	0.018	[ ]M	[ ]M	0.007	0.062	0.006	0.012	0.005	0.007	0.007	9
10	0.019	0.018	0.017	[ ]M	[ ]M	0.007	0.070	0.007	0.010	0.006	0.007	0.008	10
11	0.035	0.011	0.014	[ ]M	[ ]M	0.007	0.070	0.007	0.009	0.006	0.006	0.008	11
12	0.047	0.012	0.015	[ ]M	[ ]M	0.008	0.078	0.018	0.009	0.005	0.017	0.008	12
13	0.034	0.012	0.018	[ ]M	[ ]M	0.008	0.073	0.045	0.008	0.006	0.013	0.008	13
14	0.023	0.014	0.014	[ ]M	[ ]M	0.028	0.060	0.036	0.007	0.006	0.009	0.008	14
15	0.036	0.013	0.015	[ ]M	[ ]M	0.049	0.049	0.027	0.006	0.006	0.010	[ ]	15
16	0.043	0.011	0.014	[ ]M	[ ]M	0.055	0.037	0.019	0.005	0.006	0.005	[ ]	16
17	0.025	0.012	0.013	[ ]M	[ ]M	0.050	0.030	0.013	0.005	0.006	0.005	[ ]	17
18	0.016	0.015	0.013	[ ]M	0.010	0.049	0.024	0.013	0.005	0.006	0.005	[ ]	18
19	0.012	0.021	0.013	[ ]M	0.010	0.043	0.021	0.011	0.005	0.006	0.005	[ ]	19
20	0.013	0.017	0.014	[ ]M	0.010	0.032	0.018	0.011	0.005	0.007	0.005	[ ]	20
21	0.012	0.013	0.015	[ ]M	0.010	0.028	0.016	0.011	0.005	0.006	0.005	[ ]	21
22	0.012	0.013	0.021	[ ]M	0.021	0.028	0.015	0.012	0.005	0.007	0.005	[ ]	22
23	0.012	0.015	0.023	[ ]M	0.021	0.051	0.014	0.010	0.005	0.007	0.005	[ ]	23
24	0.013	0.015	0.021	[ ]M	0.014	0.043	0.012	0.009	0.005	0.005	0.005	[ ]	24
25	0.013	0.013	0.020	[ ]M	0.012	0.029	0.011	0.008	0.005	0.011	0.005	[ ]	25
26	0.013	0.013	0.019	[ ]M	0.012	0.024	0.017	0.007	0.005	0.010	0.005	[ ]	26
27	0.012	0.013	0.020	[ ]M	0.033	0.039	0.018	0.007	0.006	0.005	0.005	[ ]	27
28	0.012	0.013	0.017	[ ]M	0.036	0.043	0.020	0.007	0.008	0.005	0.006	[ ]	28
29	0.012		0.017	[ ]M	0.031	0.050	0.032	0.006	0.011	0.008	0.006	[ ]	29
30	0.012		0.018	[ ]M	0.027	0.056	0.027	0.007	0.008	0.009	0.006	[ ]	30
31	0.011		0.018		0.024		0.028	0.007		0.006		[ ]	31
Mean	0.021	0.013	0.016	0.016	0.019	0.028	0.036	0.013	0.007	0.006	0.006	0.007	
Median	0.014	0.012	0.015	0.017	0.017	0.028	0.028	0.010	0.007	0.006	0.005	0.007	
Max.Daily Mean	0.055	0.021	0.023	0.018	0.036	0.056	0.078	0.045	0.012	0.011	0.017	0.008	
Min.Daily Mean	0.011	0.010	0.012	0.015	0.010	0.007	0.011	0.006	0.005	0.005	0.005	0.005	
Inst.Max	0.060	0.026	0.061	0.047	0.042	0.070	0.086	0.051	0.020	0.022	0.033	0.011	
Inst.Min	0.007	0.008	0.011	0.013	0.007	0.006	0.007	0.005	0.005	0.005	0.005	0.005	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	0.016
Ann. Median	0.012
Missing Days	59

	Maximum	Minimum
Daily Mean	0.078	0.005
Instant	0.086	0.005

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J41530S5 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	4785	928.5	1189	1445	[ ]M	1862	5134	1986	657.1	561.8	419.7	496.1	1
2	4163	971.3	1160	1321	[ ]M	1485	5467	1556	609.0	475.1	486.2	477.9	2
3	1852	894.3	1212	1493	[ ]M	1356	4986	1204	594.9	538.4	444.2	474.0	3
4	1399	879.6	1146	1562	[ ]M	1479	4411	976.0	630.5	543.3	427.9	495.2	4
5	1118	858.6	1078	1299	[ ]M	1368	2442	820.2	594.1	457.8	540.8	526.0	5
6	933.3	933.8	1155	[ ]M	[ ]M	1168	1521	735.6	630.0	450.6	546.0	547.8	6
7	1448	949.3	1489	[ ]M	[ ]M	912.0	1342	612.4	688.0	451.7	463.2	555.7	7
8	1547	902.7	1629	[ ]M	[ ]M	790.2	2210	572.5	715.4	425.8	421.4	590.2	8
9	1191	1047	1578	[ ]M	[ ]M	628.5	5332	535.0	1016	425.2	587.4	635.2	9
10	1603	1557	1500	[ ]M	[ ]M	604.8	6042	596.9	825.7	545.7	587.6	658.2	10
11	3043	947.1	1174	[ ]M	[ ]M	625.4	6023	600.8	786.3	510.1	549.2	671.2	11
12	4023	1012	1260	[ ]M	[ ]M	652.0	6775	1546	760.1	459.9	1510	681.1	12
13	2932	1067	1580	[ ]M	[ ]M	649.9	6289	3870	660.9	481.1	1121	688.3	13
14	1992	1177	1206	[ ]M	[ ]M	2409	5158	3104	630.9	499.3	776.4	657.4	14
15	3106	1086	1259	[ ]M	[ ]M	4215	4257	2290	511.3	500.9	891.6	[ ]	15
16	3723	979.0	1198	[ ]M	[ ]M	4727	3225	1612	461.2	505.1	463.6	[ ]	16
17	2150	1032	1145	[ ]M	[ ]M	4324	2594	1158	460.9	509.9	422.8	[ ]	17
18	1413	1303	1137	[ ]M	868.5	4220	2067	1116	443.4	506.8	424.8	[ ]	18
19	1057	1784	1134	[ ]M	858.6	3746	1855	986.6	437.0	561.5	425.8	[ ]	19
20	1114	1511	1181	[ ]M	856.6	2801	1535	981.0	443.0	646.5	437.6	[ ]	20
21	1052	1093	1266	[ ]M	897.3	2429	1405	991.3	442.2	542.5	445.9	[ ]	21
22	1057	1134	1782	[ ]M	1838	2437	1280	1079	441.7	565.8	451.2	[ ]	22
23	1054	1309	2002	[ ]M	1801	4368	1215	832.7	445.8	642.9	448.9	[ ]	23
24	1150	1291	1788	[ ]M	1200	3755	1058	797.7	448.2	434.0	448.5	[ ]	24
25	1145	1144	1747	[ ]M	1006	2547	953.1	687.2	462.2	948.1	455.2	[ ]	25
26	1088	1160	1647	[ ]M	1053	2107	1484	607.0	469.8	862.4	469.0	[ ]	26
27	1045	1107	1770	[ ]M	2881	3378	1591	592.2	487.1	424.9	470.5	[ ]	27
28	1038	1124	1496	[ ]M	3115	3672	1703	583.6	688.5	413.9	485.3	[ ]	28
29	1000		1479	[ ]M	2667	4336	2743	554.3	917.3	670.8	501.9	[ ]	29
30	1031		1550	[ ]M	2297	4807	2348	611.3	711.1	769.5	487.8	[ ]	30
31	936.7		1535		2046		2393	619.7		519.4		[ ]	31
Mean	1813	1114	1402	1424	1670	2462	3124	1123	602.3	543.6	553.7	582.5	
Median	1191	1077	1266	1445	1501	2419	2393	832.7	602.0	509.9	466.3	572.9	
Maximum	4785	1784	2002	1562	3115	4807	6775	3870	1016	948.1	1510	688.3	
Minimum	933.3	858.6	1078	1299	856.6	604.8	953.1	535.0	437.0	413.9	419.7	474.0	
Total	56206	31193	43486	7122	23390	73871	96853	34821	18071	16852	16612	8155	
Missing Days	0	0	0	25	17	0	0	0	0	0	0	17	

Summaries

Annual Mean	1394
Ann. Median	1042
Annual Total	426636
Missing Days	59

	Maximum	Minimum
Daily	6775	413.9

------------------ Notes -------------------

All recorded data is continuous and reliable except where the following tags are used...

M ... Missing Data

[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 05/05/2011

Site J4153OS6 NAMBEELUP LOT 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2010
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	1
2	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	2
3	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	3
4	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	4
5	0.00	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	5
6	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	6
7	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	7
8	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	8
9	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	9
10	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	10
11	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	11
12	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	12
13	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	13
14	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	14
15	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	15
16	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	16
17	0.00	0.00	0.00	[ ]M	[ ]M	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	17
18	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	18
19	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	19
20	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	20
21	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	1.55	0.00	0.00	[ ]	[ ]	21
22	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	7.58	0.00	0.00	[ ]	[ ]	22
23	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.20	0.00	0.00	[ ]	[ ]	23
24	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.35	0.00	0.00	[ ]	[ ]	24
25	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	25
26	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	26
27	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	27
28	0.00	0.00	0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	28
29	0.00		0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	29
30	0.00		0.00	[ ]M	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	[ ]	30
31	0.00		0.00		0.00		0.00	0.00		0.00		[ ]	31
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	[ ]	
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	
Maximum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.58	0.00	0.00	0.00	[ ]	
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[ ]	
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.68	0.00	0.00	0.00	[ ]	
Missing Days	0	0	0	25	17	0	0	0	0	0	15	31	

Summaries

Annual Mean	0.03
Ann. Median	0.00
Annual Total	9.68
Missing Days	88

	Maximum	Minimum
Daily	7.58	0.00

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists   HYDAY V106 Output 05/05/2011

Site J4153OS6 NAMBEELUP LOT 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	1
2	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	2
3	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	3
4	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	4
5	0.000	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	5
6	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	6
7	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	7
8	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	8
9	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	9
10	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	10
11	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	11
12	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	12
13	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	13
14	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	14
15	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	15
16	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	16
17	0.000	0.000	0.000	[ ]M	[ ]M	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	17
18	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	18
19	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	19
20	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	20
21	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	21
22	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	22
23	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	23
24	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	24
25	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	25
26	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	26
27	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	27
28	0.000	0.000	0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	28
29	0.000		0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	29
30	0.000		0.000	[ ]M	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	[ ]	30
31	0.000		0.000		0.000		0.000	0.000		0.000		[ ]	31
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Max.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Min.Daily Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Inst.Max	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Inst.Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[ ]	
Missing Days	0	0	0	25	17	0	0	0	0	0	15	31	

Summaries

Annual Mean	0.000
Ann. Median	0.000
Missing Days	88

	Maximum	Minimum
Daily Mean	0.000	0.000
Instant	0.000	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J41530S8 Nambeelup Lot 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.005	0.005	0.000	0.000	0.000	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.004	0.004	0.000	0.000	0.000	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.003	0.000	0.000	0.000	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.002	0.000	0.000	0.000	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.002	0.000	0.000	0.000	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.002	0.000	0.000	0.000	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.001	0.002	0.003	0.000	0.000	0.000	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.002	0.006	0.000	0.000	0.000	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.009	0.001	0.006	0.000	0.000	0.000	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.007	0.002	0.004	0.000	0.000	0.000	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.007	0.002	0.003	0.000	0.000	0.000	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.009	0.009	0.003	0.000	0.000	0.000	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.006	0.009	0.002	0.000	0.000	0.000	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.004	0.006	0.002	0.000	0.000	0.000	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.004	0.005	0.002	0.000	0.000	[ ]	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.004	0.005	0.001	0.000	0.000	[ ]	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.005	0.004	0.001	0.000	0.000	[ ]	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.004	0.001	0.000	0.000	[ ]	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.004	0.001	0.000	0.000	[ ]	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.003	0.005	0.001	0.000	0.000	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.005	0.000	0.000	0.000	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.006	0.000	0.000	0.000	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.004	0.000	0.000	0.000	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.004	0.000	0.000	0.000	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.002	0.003	0.000	0.000	0.000	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.007	0.003	0.000	0.000	0.000	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.006	0.003	0.000	0.000	0.000	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.007	0.002	0.000	0.000	0.000	[ ]	28
29	[ ]		[ ]	[ ]	[ ]	[ ]	0.009	0.002	0.000	0.000	0.000	[ ]	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	0.006	0.004	0.000	0.000	0.000	[ ]	30
31	[ ]		[ ]		[ ]		0.005	0.006		0.000		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.005	0.004	0.002	0.000	0.000	0.000	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.004	0.004	0.002	0.000	0.000	0.000	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.009	0.009	0.006	0.000	0.000	0.000	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.001	0.001	0.000	0.000	0.000	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.011	0.013	0.007	0.000	0.000	0.000	
Inst.Min	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	0.000	0.001	0.000	0.000	0.000	0.000	
Missing Days	31	28	31	30	31	30	6	0	0	0	0	17	

Summaries

Annual Mean	0.002	
Ann. Median	0.000	
Missing Days	204	
	Maximum	Minimum
Daily Mean	0.009	0.000
Instant	0.013	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists

HYDAY V106 Output 05/05/2011

Site J4153OS8 Nambeelup Lot 221
VarFrom 100.00 Stream Water Level in Metres
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Year 2010
Table Type Total

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	400.1	436.2	0.00	0.00	0.00	1
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	339.0	306.5	0.00	0.00	0.00	2
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	279.3	230.9	0.00	0.00	0.00	3
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	257.8	215.3	0.00	0.00	0.00	4
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	221.9	154.9	0.00	0.00	0.00	5
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	214.8	150.9	0.00	0.00	0.00	6
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	51.14	177.7	283.6	0.00	0.00	0.00	7
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	138.4	141.0	542.9	0.00	0.00	0.00	8
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	792.3	122.5	480.4	0.00	0.00	0.00	9
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	573.6	142.2	342.0	0.00	0.00	0.00	10
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	581.1	179.4	281.8	0.00	0.00	0.02	11
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	754.5	739.6	284.5	0.00	0.00	0.04	12
13	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	521.5	792.5	198.0	0.00	0.00	0.01	13
14	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	369.6	547.2	159.1	0.00	0.00	0.00	14
15	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	324.6	444.1	147.4	0.00	0.00	[ ]	15
16	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	350.2	394.8	124.6	0.00	0.00	[ ]	16
17	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	398.6	352.6	93.62	0.00	0.00	[ ]	17
18	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	298.8	373.8	73.72	0.00	0.01	[ ]	18
19	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	265.8	322.2	66.99	0.00	0.00	[ ]	19
20	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	229.5	389.5	57.33	0.15	0.00	[ ]	20
21	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	213.9	474.6	35.75	0.00	0.15	[ ]	21
22	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	177.5	502.8	0.04	0.11	0.00	[ ]	22
23	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	148.1	369.1	0.00	0.02	0.00	[ ]	23
24	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	139.8	329.4	0.00	0.00	0.00	[ ]	24
25	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	151.7	265.9	0.00	3.87	0.00	[ ]	25
26	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	619.6	225.1	0.00	5.53	0.00	[ ]	26
27	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	545.9	220.2	0.00	0.00	0.00	[ ]	27
28	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	578.3	203.2	0.00	0.00	0.09	[ ]	28
29	[ ]		[ ]	[ ]	[ ]	[ ]	745.2	198.6	0.00	2.32	0.03	[ ]	29
30	[ ]		[ ]	[ ]	[ ]	[ ]	483.5	359.8	0.00	0.63	0.00	[ ]	30
31	[ ]		[ ]		[ ]		465.0	480.8		2.20		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	396.7	337.5	155.5	0.48	0.01	0.00	
Median	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	369.6	329.4	136.0	0.00	0.00	0.00	
Maximum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	792.3	792.5	542.9	5.53	0.15	0.04	
Minimum	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	51.14	122.5	0.00	0.00	0.00	0.00	
Total	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	9919	10462	4667	14.85	0.29	0.06	
Missing Days	31	28	31	30	31	30	6	0	0	0	0	17	

Summaries

Annual Mean	155.6
Ann. Median	2.20
Annual Total	25064
Missing Days	204

	Maximum	Minimum
Daily	792.5	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
[ ] Data Not Recorded

JDA Consultant Hydrologists HYDAY V106 Output 05/05/2011

Site J41530S10 Nambeelup Lot 221 Year 2010
VarFrom 100.00 Stream Water Level in Metres Table Type Total
VarTo 150.00 Stream Discharge Volume in Cubic metres
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	131.6	3017	26453	10325	129.7	26.1	0.0	1
2	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	178.5	2879	18428	9267	125.9	13.1	0.0	2
3	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	127.6	2375	13719	7871	127.1	0.0	0.0	3
4	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	120.4	2419	11452	5835	121.6	0.0	0.0	4
5	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	116.9	2594	9964	4698	118.8	1.3	0.0	5
6	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	106.6	[ ]M	7714	4326	117.3	3.5	0.0	6
7	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	106.7	1016	6253	4704	109.3	0.4	0.0	7
8	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	116.9	3104	5194	13240	105.1	0.0	0.0	8
9	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	115.7	14151	4565	16921	99.7	0.0	0.0	9
10	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	126.5	75121	5369	16487	101.4	0.0	0.0	10
11	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	132.6	53086	6764	12949	103.4	0.0	0.0	11
12	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	129.4	99572	18695	11086	97.3	0.0	0.0	12
13	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	128.5	127607	200693	9742	87.1	0.0	0.0	13
14	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	59010	114660	8600	81.3	0.0	0.0	14
15	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	2813	32218	54181	7169	84.4	0.0	[ ]	15
16	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	2638	21086	36901	5787	82.1	0.0	[ ]	16
17	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	1965	15629	28465	4988	80.5	0.0	[ ]	17
18	[ ]M	[ ]M	[ ]M	[ ]M	245.9	1306	12704	24826	4682	78.7	0.0	[ ]	18
19	[ ]M	[ ]M	[ ]M	[ ]M	145.7	419.6	11185	21262	4091	76.8	0.0	[ ]	19
20	[ ]M	[ ]M	[ ]M	[ ]M	114.2	137.1	9913	18355	3435	77.8	0.0	[ ]	20
21	[ ]M	[ ]M	[ ]M	[ ]M	38.9	201.9	8607	18889	2995	77.1	0.0	[ ]	21
22	[ ]M	[ ]M	[ ]M	[ ]M	101.0	174.5	7297	18919	2637	75.6	0.0	[ ]	22
23	[ ]M	[ ]M	[ ]M	[ ]M	132.1	5877	6694	16858	2320	72.0	0.0	[ ]	23
24	[ ]M	[ ]M	[ ]M	[ ]M	116.5	3931	6277	12654	1674	52.4	0.0	[ ]	24
25	[ ]M	[ ]M	[ ]M	[ ]M	106.7	4726	5442	10733	1056	60.5	0.0	[ ]	25
26	[ ]M	[ ]M	[ ]M	[ ]M	109.2	6324	7701	9536	919.7	26.2	0.0	[ ]	26
27	[ ]M	[ ]M	[ ]M	[ ]M	600.5	5875	9115	8428	663.7	0.0	0.0	[ ]	27
28	[ ]M	[ ]M	[ ]M	[ ]M	284.7	4458	11627	7253	550.7	15.7	0.0	[ ]	28
29	[ ]M		[ ]M	[ ]M	151.0	3832	37087	6201	216.3	69.0	0.0	[ ]	29
30	[ ]M		[ ]M	[ ]M	189.7	3382	53555	6313	131.2	67.8	0.0	[ ]	30
31	[ ]M		[ ]M		161.4		36339	8402		45.7		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	178.3	1713	24614	24455	5979	82.82	1.48	0.00	
Median	[ ]	[ ]	[ ]	[ ]	138.8	178.4	10549	12654	4701	81.33	0.00	0.00	
Maximum	[ ]	[ ]	[ ]	[ ]	600.5	6324	127607	200693	16921	129.7	26.1	0.0	
Minimum	[ ]	[ ]	[ ]	[ ]	38.90	106.6	1016	4565	131.2	0.00	0.00	0.00	
Total	[ ]	[ ]	[ ]	[ ]	2497	49703	738439	758113	179380	2567	44.5	0.0	
Missing Days	31	28	31	30	17	1	1	0	0	0	0	17	

Summaries

Annual Mean 8281
Ann. Median 245.9
Annual Total 1730746
Missing Days 156

	Maximum	Minimum
Daily	200693	0.00

------------------ Notes ------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

JDA Consultant Hydrologists | HYDAY V106 Output 05/05/2011

Site J4153OS10 Nambeelup Lot 221 | Year 2010
VarFrom 100.00 Stream Water Level in Metres | Table Type Rate
VarTo 140.00 Stream Discharge in Cubic metres/second
Figures are for period ending 2400 hours.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.002	0.035	0.306	0.120	0.002	0.000	0.000	1
2	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.002	0.033	0.213	0.107	0.001	0.000	0.000	2
3	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.027	0.159	0.091	0.001	0.000	0.000	3
4	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.028	0.133	0.068	0.001	0.000	0.000	4
5	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.030	0.115	0.054	0.001	0.000	0.000	5
6	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	[ ]M	0.089	0.050	0.001	0.000	0.000	6
7	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.012	0.072	0.054	0.001	0.000	0.000	7
8	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.036	0.060	0.153	0.001	0.000	0.000	8
9	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.164	0.053	0.196	0.001	0.000	0.000	9
10	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.869	0.062	0.191	0.001	0.000	0.000	10
11	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.002	0.614	0.078	0.150	0.001	0.000	0.000	11
12	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	1.152	0.216	0.128	0.001	0.000	0.000	12
13	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.001	1.477	2.323	0.113	0.001	0.000	0.000	13
14	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.683	1.327	0.100	0.001	0.000	0.000	14
15	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.033	0.373	0.627	0.083	0.001	0.000	[ ]	15
16	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.031	0.244	0.427	0.067	0.001	0.000	[ ]	16
17	[ ]M	[ ]M	[ ]M	[ ]M	[ ]M	0.023	0.181	0.329	0.058	0.001	0.000	[ ]	17
18	[ ]M	[ ]M	[ ]M	[ ]M	0.003	0.015	0.147	0.287	0.054	0.001	0.000	[ ]	18
19	[ ]M	[ ]M	[ ]M	[ ]M	0.002	0.005	0.129	0.246	0.047	0.001	0.000	[ ]	19
20	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.002	0.115	0.212	0.040	0.001	0.000	[ ]	20
21	[ ]M	[ ]M	[ ]M	[ ]M	0.000	0.002	0.100	0.219	0.035	0.001	0.000	[ ]	21
22	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.002	0.084	0.219	0.031	0.001	0.000	[ ]	22
23	[ ]M	[ ]M	[ ]M	[ ]M	0.002	0.068	0.077	0.195	0.027	0.001	0.000	[ ]	23
24	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.046	0.073	0.146	0.019	0.001	0.000	[ ]	24
25	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.055	0.063	0.124	0.012	0.001	0.000	[ ]	25
26	[ ]M	[ ]M	[ ]M	[ ]M	0.001	0.073	0.089	0.110	0.011	0.000	0.000	[ ]	26
27	[ ]M	[ ]M	[ ]M	[ ]M	0.007	0.068	0.105	0.098	0.008	0.000	0.000	[ ]	27
28	[ ]M	[ ]M	[ ]M	[ ]M	0.003	0.052	0.135	0.084	0.006	0.000	0.000	[ ]	28
29	[ ]M		[ ]M	[ ]M	0.002	0.044	0.429	0.072	0.003	0.001	0.000	[ ]	29
30	[ ]M		[ ]M	[ ]M	0.002	0.039	0.620	0.073	0.002	0.001	0.000	[ ]	30
31	[ ]M		[ ]M		0.002		0.421	0.097		0.001		[ ]	31
Mean	[ ]	[ ]	[ ]	[ ]	0.002	0.020	0.285	0.283	0.069	0.001	0.000	0.000	
Median	[ ]	[ ]	[ ]	[ ]	0.002	0.002	0.122	0.146	0.054	0.001	0.000	0.000	
Max.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.007	0.073	1.477	2.323	0.196	0.002	0.000	0.000	
Min.Daily Mean	[ ]	[ ]	[ ]	[ ]	0.000	0.001	0.012	0.053	0.002	0.000	0.000	0.000	
Inst.Max	[ ]	[ ]	[ ]	[ ]	0.022	0.106	1.759	3.103	0.214	0.003	0.001	0.000	
Inst.Min	[ ]	[ ]	[ ]	[ ]	0.000	0.001	0.002	0.043	0.001	0.000	0.000	0.000	
Missing Days	31	28	31	30	17	1	1	0	0	0	0	17	

Summaries

Annual Mean	0.096
Ann. Median	0.003
Missing Days	156

	Maximum	Minimum
Daily Mean	2.323	0.000
Instant	3.103	0.000

------------------ Notes -------------------
All recorded data is continuous and reliable
except where the following tags are used...
M ... Missing Data
[ ] Data Not Recorded

APPENDIX B

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Part of the Envirolab Group

CERTIFICATE OF ANALYSIS 102713

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilj

Sample log in details:

Your Reference:	**J4620C1, Nambeelup Lot 221**
No. of samples:	2 Waters
Date samples received:	18/5/10
Date completed instructions received:	18/5/10

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	25/05/10
Date of Preliminary Report:	Not issued
Issue Date:	25/05/10

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Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Reporting Supervisor

Nutrients in Water			
Our Reference:	UNITS	102713-1	102713-2
Your Reference	-------------	J4620 S3	J4620 S5
Date Sampled	------------	17/05/2010	17/05/2010
Type of sample		Water	Water
Total Nitrogen (Total N)	mg/L	3.3	3.5
TKN by Discrete Analyser	mg/L	3.3	3.5
Nitrate as N	mg/L	0.008	0.03
Total Phosphorus (Total P)	mg/L	0.33	0.17
Phosphate as P (TRP)	mg/L	0.12	0.11

Method ID	Methodology Summary
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	Nitrate by calculation
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	128%
TKN by Discrete Analyser	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	[NR]	[NR]
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	88%
Phosphate as P (TRP)	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	98%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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www.envirolabservices.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 103297

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilz

Sample log in details:

Your Reference:	**J4620C2**
No. of samples:	4 Waters
Date samples received:	15/06/10
Date completed instructions received:	15/06/10

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	21/06/10
Date of Preliminary Report:	Not issued
Issue Date:	23/06/10

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Results Approved By:

Joshua Lim
Reporting Supervisor

MPL Reference: 103297
Revision No: R 00

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	103297-1 J4620 S1 14/06/2010 Water	103297-2 J4620 S3 14/06/2010 Water	103297-3 J4620 S5 14/06/2010 Water	103297-4 J4620 S10 14/06/2010 Water
Date prepared	-	16/6/10	16/6/10	16/6/10	16/6/10
Date analysed	-	23/6/10	23/6/10	23/6/10	23/6/10
Total Nitrogen (Total N)	mg/L	0.93	1.5	1.7	2.5
Total Kjeldahl Nitrogen	mg/L	0.88	1.5	1.7	2.4
NOx as N	mg/L	0.053	<0.005	0.034	0.12
Nitrate as N	mg/L	0.05	<0.005	0.03	0.12
Ammonia as N	mg/L	0.31	0.12	0.45	0.18
Total Phosphorus (Total P)	mg/L	0.28	0.29	0.23	0.27
Phosphate as P (TRP)	mg/L	0.04	0.03	0.12	0.29

Method ID	Methodology Summary
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F
WILAB 18	Nitrate by calculation
WILAB 18	Ammonia by colourimetric chemistry in accordance to APHA 4500-NH3 F
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/6/10	[NT]	[NT]	LCS	16/6/10
Date analysed	-			23/6/10	[NT]	[NT]	LCS	23/6/10
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	111%
Total Kjeldahl Nitrogen	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	112%
Ammonia as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	96%
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	98%
Phosphate as P (TRP)	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	105%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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www.envirolabservices.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

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CERTIFICATE OF ANALYSIS 103765

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurliz

Sample log in details:

Your Reference:	**J4620C3 - Nambeelup J4620**
No. of samples:	5 Waters
Date samples received:	06/07/10
Date completed instructions received:	06/07/10

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	14/07/10
Date of Preliminary Report:	Not issued
Issue Date:	14/07/10

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Tests not covered by NATA are denoted with *.

Results Approved By:

Joshua Lim
Reporting Supervisor

MPL Reference: 103765
Revision No: R 00

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorganics		
Our Reference:	UNITS	103765-5
Your Reference	-------------	J4620 S10
Date Sampled	------------	6/07/2010
Type of sample		water
Date prepared	-	7/7/10
Date analysed	-	7/7/10
pH in water	pH Units	6.8
Electrical Conductivity water	µS/cm	750
Total Dissolved Solids (grav)	mg/L	580
Nitrate as NO_3	mg/L	<0.1
Nitrite as NO_2	mg/L	<0.1

Metals - water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	103765-5 J4620 S10 6/07/2010 water
Date digested	-	8/7/10
Date analysed	-	8/7/10
Aluminium - Dissolved	mg/L	0.42
Cadmium - Dissolved	mg/L	<0.002
Chromium - Dissolved	mg/L	<0.005
Copper - Dissolved	mg/L	<0.005
Iron - Dissolved	mg/L	2.3
Mercury - Dissolved	mg/L	<0.0001
Manganese - Dissolved	mg/L	0.10
Silica - Dissolved	mg/L	10
Zinc - Dissolved	mg/L	<0.01

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	103765-1 J4620 S8 6/07/2010 water	103765-2 J4620 S5 6/07/2010 water	103765-3 J4620 S3 6/07/2010 water	103765-4 J4620 S1 6/07/2010 water	103765-5 J4620 S10 6/07/2010 water
Total Nitrogen (Total N)	mg/L	1.5	5.7	3.9	4.2	2.9
Total Kjeldahl Nitrogen	mg/L	1.5	5.7	3.9	4.2	2.9
NOx as N	mg/L	<0.005	0.030	0.041	<0.005	<0.005
Ammonia as N	mg/L	0.24	0.26	1.0	<0.005	<0.005
Total Phosphorus (Total P)	mg/L	0.14	0.74	0.29	0.27	0.20
Phosphate as P (TRP)	mg/L	0.006	0.09	0.26	0.07	0.06

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	103765-5 J4620 S10 6/07/2010 water
Calcium - Dissolved	mg/L	34
Potassium - Dissolved	mg/L	8.7
Magnesium - Dissolved	mg/L	26
Sodium - Dissolved	mg/L	97
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	33
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1
Total Alkalinity as $CaCO_3$	mg/L	33
Chloride in water	mg/L	140
Sulphate in water	mg/L	98
Hardness as $CaCO_3$	mg/L	190

External Testing		
Our Reference:	UNITS	103765-5
Your Reference	-------------	J4620 S10
Date Sampled	------------	6/07/2010
Type of sample		water
Arsenic-Dissolved	mg/L	0.002
Lead-Dissolved	mg/L	<0.001
Selenium-Dissolved	mg/L	<0.001

Method ID	Methodology Summary
WILAB.5A	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
WILAB.5A	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 21st ED and Rayment & Higginson.
WILAB.5A	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540-C.
WILAB 5d	Nitrate by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Nitrite by Ion Exchange Chromatography; APHA 4110 B
WILAB 17	Metals in soil and water by ICP-OES.
WILAB 6	Metals by AAS
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F
WILAB 18	Ammonia by colourimetric chemistry in accordance to APHA 4500-NH3 F
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E
WILAB.5A	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320-B.
WILAB 5d	Chloride by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Sulphate by Ion Exchange Chromatography; APHA 4110 B
WILAB 5b	Hardness calculated from Calcium and Magnesium.

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			7/7/10	[NT]	[NT]	LCS	7/7/10
Date analysed	-			7/7/10	[NT]	[NT]	LCS	7/7/10
pH in water	pH Units		WILAB.5A	[NT]	[NT]	[NT]	LCS	98%
Electrical Conductivity water	µS/cm	1	WILAB.5A	<1	[NT]	[NT]	LCS	101%
Total Dissolved Solids (grav)	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	88%
Nitrate as NO_3	mg/L	0.1	WILAB 5d	<0.1	[NT]	[NT]	LCS	107%
Nitrite as NO_2	mg/L	0.1	WILAB 5d	<0.1	[NT]	[NT]	LCS	105%
QUALITY CONTROL Metals - water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			8/7/10	[NT]	[NT]	LCS	8/7/10
Date analysed	-			8/7/10	[NT]	[NT]	LCS	8/7/10
Aluminium - Dissolved	mg/L	0.02	WILAB 17	<0.02	[NT]	[NT]	LCS	100%
Cadmium - Dissolved	mg/L	0.002	WILAB 17	<0.002	[NT]	[NT]	LCS	116%
Chromium - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	110%
Copper - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	112%
Iron - Dissolved	mg/L	0.02	WILAB 17	<0.02	[NT]	[NT]	LCS	113%
Mercury - Dissolved	mg/L	0.0001	WILAB 6	<0.0001	[NT]	[NT]	LCS	96%
Manganese - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	112%
Silica - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	[NR]	[NR]
Zinc - Dissolved	mg/L	0.01	WILAB 17	<0.01	[NT]	[NT]	LCS	116%
QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	111%
Total Kjeldahl Nitrogen	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	82%
Ammonia as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	97%
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	82%
Phosphate as P (TRP)	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	92%
QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Calcium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	99%
Potassium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	98%
Magnesium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	101%
Sodium - Dissolved	mg/L	0.5	WILAB 17	<0.5	[NT]	[NT]	LCS	100%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	95%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	95%
Total Alkalinity as $CaCO_3$	mg/L	0.1	WILAB.5A	<0.1	[NT]	[NT]	LCS	95%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Chloride in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	106%
Sulphate in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	93%
Hardness as $CaCO_3$	mg/L		WILAB 5b	[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL External Testing	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Arsenic-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	104%
Lead-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	102%
Selenium-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	95%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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CERTIFICATE OF ANALYSIS 104647

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilz

Sample log in details:

Your Reference:	**J4620C4**
No. of samples:	7 Waters
Date samples received:	10/08/10
Date completed instructions received:	10/08/10
Location:	Nambeelup

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	17/08/10
Date of Preliminary Report:	Not issued
Issue Date:	16/08/10

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Tests not covered by NATA are denoted with *.

Results Approved By:

Todd Lee
Laboratory Supervisor

Miscellaneous Inorganics		
Our Reference:	UNITS	104647-4
Your Reference	-------------	J4620 S10
Date Sampled	------------	10/08/2010
Type of sample		Water
Date prepared	-	11/8/10
Date analysed	-	11/8/10
pH in water	pH Units	6.6
Electrical Conductivity water	µS/cm	930
Total Dissolved Solids (grav)	mg/L	560
Chloride in water	mg/L	290
Sulphate in water	mg/L	73
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	40
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1
Total Alkalinity as $CaCO_3$	mg/L	40

Metals - water		
Our Reference:	UNITS	104647-4
Your Reference	-------------	J4620 S10
Date Sampled	------------	10/08/2010
Type of sample		Water
Date prepared	-	11/8/10
Date analysed	-	11/8/10
Aluminium - Dissolved	mg/L	0.61
Arsenic-Dissolved	mg/L	0.002
Calcium - Dissolved	mg/L	31
Cadmium - Dissolved	mg/L	<0.002
Chromium - Dissolved	mg/L	<0.005
Copper - Dissolved	mg/L	<0.005
Iron - Dissolved	mg/L	3.5
Mercury - Dissolved	mg/L	<0.0001
Potassium - Dissolved	mg/L	13
Magnesium - Dissolved	mg/L	29
Manganese - Dissolved	mg/L	0.11
Sodium - Dissolved	mg/L	150
Lead-Dissolved	mg/L	<0.001
Selenium-Dissolved	mg/L	<0.001
Silica - Dissolved	mg/L	14
Zinc - Dissolved	mg/L	<0.01
Hardness as $CaCO_3$	mg/L	200

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	104647-1 J4620 S1 10/08/2010 Water	104647-2 J4620 S3 10/08/2010 Water	104647-3 J4620 S5 10/08/2010 Water	104647-4 J4620 S10 10/08/2010 Water	104647-5 J4620 S2 10/08/2010 Water
Total Nitrogen (Total N)	mg/L	3.8	3.4	1.2	3.9	3.3
NOx as N	mg/L	0.15	0.079	0.054	0.014	<0.005
Total Kjeldahl Nitrogen	mg/L	3.6	3.3	1.1	3.9	3.3
Ammonia as N	mg/L	0.051	0.032	0.75	0.16	0.13
Nitrate as N	mg/L	0.15	0.079	0.054	0.014	<0.005
Nitrite as N	mg/L	[NA]	[NA]	[NA]	<0.005	[NA]
Total Phosphorus (Total P)	mg/L	0.44	0.28	0.84	0.74	0.83
Phosphate	mg/L	0.23	0.17	0.18	0.23	0.31

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	104647-6 J4620 S4 10/08/2010 Water	104647-7 J4620 S8 10/08/2010 Water
Total Nitrogen (Total N)	mg/L	3.3	2.5
NOx as N	mg/L	<0.005	<0.005
Total Kjeldahl Nitrogen	mg/L	3.3	2.5
Ammonia as N	mg/L	0.054	0.044
Nitrate as N	mg/L	<0.005	<0.005
Total Phosphorus (Total P)	mg/L	0.79	0.03
Phosphate	mg/L	0.30	0.02

Method ID	Methodology Summary
WILAB.5A	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
WILAB.5A	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 21st ED and Rayment & Higginson.
WILAB.5A	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540-C.
WILAB 5d	Chloride by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Sulphate by Ion Exchange Chromatography; APHA 4110 B
WILAB.5A	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320-B.
WILAB 17	Metals in soil and water by ICP-OES.
WILAB 6	Metals by AAS
WILAB 5b	Hardness calculated from Calcium and Magnesium.
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	Ammonia by colourimetric chemistry in accordance to APHA 4500-NH3 F
WILAB 18	Nitrate by calculation
WILAB 18	Nitrite by colourimetric chemistry in accordance to APHA 4500-NO2 B
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			11/8/10	[NT]	[NT]	LCS	11/8/10
Date analysed	-			11/8/10	[NT]	[NT]	LCS	11/8/10
pH in water	pH Units		WILAB.5A	[NT]	[NT]	[NT]	LCS	100%
Electrical Conductivity water	µS/cm	1	WILAB.5A	<1	[NT]	[NT]	LCS	100%
Total Dissolved Solids (grav)	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	85%
Chloride in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	108%
Sulphate in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	106%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	98%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	98%
Total Alkalinity as $CaCO_3$	mg/L	0.1	WILAB.5A	<0.1	[NT]	[NT]	LCS	98%

QUALITY CONTROL Metals - water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			11/8/10	[NT]	[NT]	LCS	11/8/10
Date analysed	-			11/8/10	[NT]	[NT]	LCS	11/8/10
Aluminium - Dissolved	mg/L	0.02	WILAB 17	<0.02	[NT]	[NT]	LCS	113%
Arsenic-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	91%
Calcium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	119%
Cadmium - Dissolved	mg/L	0.002	WILAB 17	<0.002	[NT]	[NT]	LCS	126%
Chromium - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	117%
Copper - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	115%
Iron - Dissolved	mg/L	0.02	WILAB 17	<0.02	[NT]	[NT]	LCS	118%
Mercury - Dissolved	mg/L	0.0001	WILAB 6	<0.0001	[NT]	[NT]	LCS	103%
Potassium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	117%
Magnesium - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	121%
Manganese - Dissolved	mg/L	0.005	WILAB 17	<0.005	[NT]	[NT]	LCS	118%
Sodium - Dissolved	mg/L	0.5	WILAB 17	<0.5	[NT]	[NT]	LCS	95%
Lead-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	98%
Selenium-Dissolved	mg/L	0.001	WILAB 6	<0.001	[NT]	[NT]	LCS	101%
Silica - Dissolved	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	116%
Zinc - Dissolved	mg/L	0.01	WILAB 17	<0.01	[NT]	[NT]	LCS	120%
Hardness as $CaCO_3$	mg/L		WILAB 5b	[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	116%
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	87%
Total Kjeldahl Nitrogen	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
Ammonia as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	107%
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	100%
Phosphate	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	86%

QUALITY CONTROL Metals - water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	104647-2	11/8/10
Date analysed	-	[NT]	[NT]	104647-2	11/8/10
Aluminium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Arsenic-Dissolved	mg/L	[NT]	[NT]	104647-2	112%
Calcium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Cadmium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Chromium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Copper - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Iron - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Mercury - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Potassium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Magnesium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Manganese - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Sodium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Lead-Dissolved	mg/L	[NT]	[NT]	104647-2	76%
Selenium-Dissolved	mg/L	[NT]	[NT]	104647-2	76%
Silica - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Zinc - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Hardness as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

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RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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Part of the Envirolab Group

CERTIFICATE OF ANALYSIS 106183

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilz

Sample log in details:

Your Reference:	**J4620C5**
No. of samples:	3 Waters
Date samples received:	13/10/10
Date completed instructions received:	13/10/10
Location:	J4620 Nambeelup Lot 221

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	20/10/10
Date of Preliminary Report:	Not issued
Issue Date:	19/10/10

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Todd Lee
Laboratory Manager

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	106183-1 J4620 S5 13/10/2010 Water	106183-2 J4620 S3 13/10/2010 Water	106183-3 J4620 S10 13/10/2010 Water
Total Nitrogen (Total N)	mg/L	3.8	3.1	3.6
Total Kjeldahl Nitrogen	mg/L	3.7	3.1	3.6
NOx as N	mg/L	0.12	<0.005	<0.005
Nitrate as N	mg/L	0.12	<0.005	<0.005
Ammonia as N	mg/L	<0.005	<0.005	<0.005
Total Phosphorus (Total P)	mg/L	0.42	0.38	0.62
Phosphate	mg/L	0.12	0.22	0.30

Method ID	Methodology Summary
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F
WILAB 18	Nitrate by calculation
WILAB 18	Ammonia by colourimetric chemistry in accordance to APHA 4500-NH3 F
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	124%
Total Kjeldahl Nitrogen	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	98%
Ammonia as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	78%
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	103%
Phosphate	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	75%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

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RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and
10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 107035

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Craig Bowman

Sample log in details:

Your Reference:	**J4620C7**
No. of samples:	4 Waters
Date samples received:	16/11/10
Date completed instructions received:	16/11/10
Location:	Nambeelup

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	23/11/10
Date of Preliminary Report:	Not issued
Issue Date:	22/11/10

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Todd Lee
Laboratory Manager

Basic Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	107035-1 S1 16/11/2010 Water	107035-2 S5 16/11/2010 Water	107035-3 S3 16/11/2010 Water	107035-4 S10 16/11/2010 Water
pH in water	pH Units	8.0	6.7	7.2	7.3
Electrical Conductivity water	µS/cm	340	280	280	550
Total Dissolved Solids (grav)	mg/L	[NA]	[NA]	[NA]	460

Dissolved Metals in Water		
Our Reference:	UNITS	107035-4
Your Reference	-------------	S10
Date Sampled	------------	16/11/2010
Type of sample		Water
Date prepared	-	18/11/10
Date analysed	-	18/11/10
Aluminium	mg/L	0.43
Arsenic	mg/L	<0.005
Cadmium	mg/L	<0.002
Chromium	mg/L	<0.005
Iron	mg/L	3.9
Lead	mg/L	<0.005
Manganese	mg/L	0.11
Mercury	mg/L	<0.0001
Selenium	mg/L	<0.005
Zinc	mg/L	<0.01
Copper	mg/L	<0.005

Ionic Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	107035-4 S10 16/11/2010 Water
Calcium	mg/L	14
Potassium	mg/L	9.8
Magnesium	mg/L	16
Sodium	mg/L	88
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	40
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	<1
Hydroxide, OH^- as $CaCO_3$	mg/L	<1
Total Alkalinity as $CaCO_3$	mg/L	40
Chloride in water	mg/L	200
Sulphate in water	mg/L	7
Nitrate as NO_3	mg/L	<0.1
Nitrite as NO_2	mg/L	<0.1
Hardness as $CaCO_3$	mg/L	100

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	107035-1 S1 16/11/2010 Water	107035-2 S5 16/11/2010 Water	107035-3 S3 16/11/2010 Water	107035-4 S10 16/11/2010 Water
Total Nitrogen (Total N)	mg/L	2.7	2.0	2.5	2.5
TKN by Discrete Analyser	mg/L	2.7	2.0	2.5	2.5
NOx as N	mg/L	[NA]	[NA]	[NA]	<0.005
Nitrate as N	mg/L	<0.005	<0.005	<0.005	<0.005
Nitrite as N	mg/L	[NA]	[NA]	[NA]	<0.005
Ammonia as N	mg/L	[NA]	[NA]	[NA]	0.020
Total Phosphorus (Total P)	mg/L	0.57	0.20	0.45	0.60
Phosphate	mg/L	0.27	0.12	0.24	0.28

Method ID	Methodology Summary
WILAB.5A	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
WILAB.5A	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 21st ED and Rayment & Higginson.
WILAB.5A	Total Dissolved Solids - determined gravimetrically by drying the sample, in accordance with APHA 21st ED, 2540-C.
WILAB 17	Metals in soil and water by ICP-OES.
WILAB 6	Metals by AAS
WILAB.5A	Alkalinity - determined titrimetrically in accordance with APHA 21st ED, 2320-B.
WILAB 5d	Chloride by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Sulphate by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Nitrate by Ion Exchange Chromatography; APHA 4110 B
WILAB 5d	Nitrite by Ion Exchange Chromatography; APHA 4110 B
WILAB 5b	Hardness calculated from Calcium and Magnesium.
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F
WILAB 18	Nitrate by calculation
WILAB 18	Nitrite by colourimetric chemistry in accordance to APHA 4500-NO2 B
WILAB 18	Ammonia by colourimetric chemistry in accordance to APHA 4500-NH3 F
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E

QUALITY CONTROL Basic Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
pH in water	pH Units		WILAB.5A	[NT]	[NT]	[NT]	LCS	100%
Electrical Conductivity water	µS/cm	1	WILAB.5A	<1	[NT]	[NT]	LCS	99%
Total Dissolved Solids (grav)	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	98%

QUALITY CONTROL Dissolved Metals in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/11/10	107035-4	18/11/10 || 18/11/10	LCS	18/11/10
Date analysed	-			19/11/10	107035-4	18/11/10 || 18/11/10	LCS	18/11/10
Aluminium	mg/L	0.02	WILAB 17	<0.02	107035-4	0.43 || [N/T]	LCS	107%
Arsenic	mg/L	0.001	WILAB 6	<0.001	107035-4	<0.005 || <0.001	LCS	94%
Cadmium	mg/L	0.002	WILAB 17	<0.002	107035-4	<0.002 || [N/T]	LCS	110%
Chromium	mg/L	0.005	WILAB 17	<0.005	107035-4	<0.005 || [N/T]	LCS	111%
Iron	mg/L	0.02	WILAB 17	<0.02	107035-4	3.9 || [N/T]	LCS	110%
Lead	mg/L	0.001	WILAB 6	<0.001	107035-4	<0.005 || <0.001	LCS	88%
Manganese	mg/L	0.005	WILAB 17	<0.005	107035-4	0.11 || [N/T]	LCS	111%
Mercury	mg/L	0.0001	WILAB 6	<0.0001	107035-4	<0.0001 || <0.0001	LCS	114%
Selenium	mg/L	0.001	WILAB 6	<0.001	107035-4	<0.005 || <0.001	LCS	104%
Zinc	mg/L	0.01	WILAB 17	<0.01	107035-4	<0.01 || [N/T]	LCS	107%
Copper	mg/L	0.005	WILAB 17	<0.005	107035-4	<0.005 || [N/T]	LCS	106%

QUALITY CONTROL Ionic Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Calcium	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	100%
Potassium	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	97%
Magnesium	mg/L	0.1	WILAB 17	<0.1	[NT]	[NT]	LCS	102%
Sodium	mg/L	0.5	WILAB 17	<0.5	[NT]	[NT]	LCS	108%
Bicarbonate, HCO_3 as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	105%
Carbonate, CO_3^{2-} as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	105%
Total Alkalinity as $CaCO_3$	mg/L	1	WILAB.5A	<1	[NT]	[NT]	LCS	105%
Chloride in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	106%
Sulphate in water	mg/L	1	WILAB 5d	<1	[NT]	[NT]	LCS	100%
Nitrate as NO_3	mg/L	0.1	WILAB 5d	<0.1	[NT]	[NT]	LCS	104%
Nitrite as NO_2	mg/L	0.1	WILAB 5d	<0.1	[NT]	[NT]	LCS	102%
Hardness as $CaCO_3$	mg/L		WILAB 5b	[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	104%
TKN by Discrete Analyser	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	84%
Ammonia as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	104%
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	99%
Phosphate	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	82%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

INS: Insufficient sample for this test; NT: Not tested; PQL: Practical Quantitation Limit; <: Less than; >: Greater than
RPD: Relative Percent Difference; NA: Test not required; LCS: Laboratory Control Sample; NR: Not requested
NS: Not specified; NEPM: National Environmental Protection Measure

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Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
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LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however were analysed at a frequency to meet of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

Part of the Envirolab Group

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CERTIFICATE OF ANALYSIS 107849

Client:
JDA Consultant Hydrologists
PO Box 117
SUBIACO
WA 6904

Attention: Blaz Kurilj

Sample log in details:

Your Reference:	**J4620C8**
No. of samples:	2 Waters
Date samples received:	16/12/10
Date completed instructions received:	16/12/10
Location:	

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	4/01/11
Date of Preliminary Report:	Not issued
Issue Date:	24/12/10

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Todd Lee
Laboratory Manager

Miscellaneous Inorganics			
Our Reference:	UNITS	107849-1	107849-2
Your Reference	-------------	S5	S3
Date Sampled	------------	15/12/2010	15/12/2010
Type of sample		Water	Water
Date prepared	-	22/12/10	22/12/10
Date analysed	-	22/12/10	22/12/10
pH in water	pH Units	6.0	6.8
Electrical Conductivity water	µS/cm	360	240

Nutrients in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ------------- ------------	107849-1 S5 15/12/2010 Water	107849-2 S3 15/12/2010 Water
Total Nitrogen (Total N)	mg/L	2.6	2.8
Total Kjeldahl Nitrogen	mg/L	2.6	2.8
Nitrate as N	mg/L	<0.005	<0.005
Total Phosphorus (Total P)	mg/L	0.18	0.28
Phosphate as P	mg/L	0.15	0.18
NOx as N	mg/L	<0.005	<0.005

Method ID	Methodology Summary
WILAB.5A	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
WILAB.5A	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 21st ED and Rayment & Higginson.
WILAB 18	Total Nitrogen by colourimetric chemistry in accordance to APHA 4500-P B5, 4500-NO3 F
WILAB 18	TKN by calculation
WILAB 18	Nitrate by calculation
WILAB 18	Total Phosphorus by colourimetric chemistry in accordance to APHA 4500-P B5, E
WILAB 18	Phosphate by colourimetric chemistry in accordance to APHA 4500-P E
WILAB 18	NOx by colourimetric chemistry in accordance to APHA 4500-NO3 F

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/12/10	[NT]	[NT]	LCS	22/12/10
Date analysed	-			22/12/10	[NT]	[NT]	LCS	22/12/10
pH in water	pH Units		WILAB.5A	[NT]	[NT]	[NT]	LCS	113%
Electrical Conductivity water	µS/cm	1	WILAB.5A	<1	[NT]	[NT]	LCS	107%

QUALITY CONTROL Nutrients in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Total Nitrogen (Total N)	mg/L	0.05	WILAB 18	<0.05	[NT]	[NT]	LCS	101%
Total Kjeldahl Nitrogen	mg/L	0.005	WILAB 18	[NT]	[NT]	[NT]	[NR]	[NR]
Total Phosphorus (Total P)	mg/L	0.01	WILAB 18	<0.01	[NT]	[NT]	LCS	99%
Phosphate as P	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	104%
NOx as N	mg/L	0.005	WILAB 18	<0.005	[NT]	[NT]	LCS	96%

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

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Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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Matrix Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.

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APPENDIX F

UNDO Modelling

Government of Western Australia
Department of Water and Environmental Regulation

Project:	J6890 Post-Development Scenario 1	Date:	17/09/2021
		Version:	Version 1.2.0.19289

Subregion name: Subregion 1

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	0	0.00	0.00	0.00
Industrial, commercial & schools	0	0.00	0.00	0.00
Rural living	0	0.00	0.00	0.00
Public open space	7	11.34	53.64	2.72
Road reserve	93	150.66	1381.55	197.06

Total area (ha)	Total percent (%)
162.00	100

Nitrogen input (kg/ha/yr)	Phosphorus input (kg/ha/yr)
14.09	1.38

Nitrogen export (kg/ha/yr)	Phosphorus (kg/ha/yr)
NaN	NaN

Public Open Space (POS)

Landuse	Percent (%)	Area (ha)
Native gardens	0	0.00
Non-native gardens	1	0.11
Not fertilised	0	0.00
Nature	99	11.23
Sport	0	0.00
Recreation	0	0.00
Golf course	0	0.00
Bowling green	0	0.00
Impervious	0	0.00
Water body	0	0.00

Total area (ha)	Total percent (%)
11.34	7

Nitrogen input (kg)	Phosphorus input (kg)
53.64	2.72

Road reserve

Landuse	Percent (%)	Area (ha)
Roads	0	0.00
Road reserve - impervious	0	0.00
Road reserve - native garden	2	3.01
Road reserve - non-native garden	1	1.51
Road reserve - turf	7	10.55
Road reserve - not fertilised	90	135.59

Total area (ha)	Total percent (%)
150.66	**93**

Nitrogen input (kg)	Phosphorus input (kg)
1381.55	**1381.55**

Soil and drainage information

Type of drainage

Soil type

Depth to groundwater (m) **1.5**

Groundwater slope (%) **0.5**

Soil PRI **0.0**

Does it contain imported fill? **No**

Does subregion contain onsite sewage diposal system? **No**

Note: Please attach the results of soil tests to this report when submitting.

Summary: Nutrient stripping devices

Treatment	Name	Size (m^2)	Treated area (ha)	Treating	N removed (kg/ha/yr)	P removed (kg/ha/yr)
Load removed					0.00	0.00
Net export					NaN	NaN

Summary: Nutrient load exports			
Region	**Area (ha)**	**P export (kg/ha/yr)**	**N export (kg/ha/yr)**
Subregion 1	162.00	NaN	NaN

PRE-TREATMENT LOAD (kg/ha/yr)		LOAD REMOVED (kg/ha/yr)		NET LOAD EXPORT (kg/ha/yr)	
NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS
NaN	**NaN**	**0.00**	**0.00**	**NaN**	**NaN**

Government of Western Australia
Department of Water and Environmental Regulation

Project:	J6890 Post-Development Scenario 2	Date:	17/09/2021
		Version:	Version 1.2.0.19289

Subregion name: Subregion 1

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	0	0.00	0.00	0.00
Industrial, commercial & schools	0	0.00	0.00	0.00
Rural living	0	0.00	0.00	0.00
Public open space	7	11.34	53.64	2.72
Road reserve	93	150.66	1054.62	119.77

Total area (ha)	Total percent (%)
162.00	100
Nitrogen input (kg/ha/yr)	**Phosphorus input (kg/ha/yr)**
12.07	0.91
Nitrogen export (kg/ha/yr)	**Phosphorus (kg/ha/yr)**
NaN	NaN

Public Open Space (POS)

Landuse	Percent (%)	Area (ha)
Native gardens	0	0.00
Non-native gardens	1	0.11
Not fertilised	0	0.00
Nature	99	11.23
Sport	0	0.00
Recreation	0	0.00
Golf course	0	0.00
Bowling green	0	0.00
Impervious	0	0.00
Water body	0	0.00

Total area (ha)	Total percent (%)
11.34	7
Nitrogen input (kg)	**Phosphorus input (kg)**
53.64	2.72

Road reserve

Landuse	Percent (%)	Area (ha)
Roads	0	0.00
Road reserve - impervious	0	0.00
Road reserve - native garden	5	7.53
Road reserve - non-native garden	0	0.00
Road reserve - turf	5	7.53
Road reserve - not fertilised	90	135.59

Total area (ha)	Total percent (%)
150.66	**93**

Nitrogen input (kg)	Phosphorus input (kg)
1054.62	**1054.62**

Soil and drainage information

Type of drainage

Soil type

Depth to groundwater (m) **1.5**

Groundwater slope (%) **0.5**

Soil PRI **0.0**

Does it contain imported fill? **No**

Does subregion contain onsite sewage diposal system? **No**

Note: Please attach the results of soil tests to this report when submitting.

Summary: Nutrient stripping devices

Treatment	Name	Size (m^2)	Treated area (ha)	Treating	N removed (kg/ha/yr)	P removed (kg/ha/yr)
Load removed					0.00	0.00
Net export					NaN	NaN

Summary: Nutrient load exports

Region	Area (ha)	P export (kg/ha/yr)	N export (kg/ha/yr)
Subregion 1	162.00	NaN	NaN

PRE-TREATMENT LOAD (kg/ha/yr)		LOAD REMOVED (kg/ha/yr)		NET LOAD EXPORT (kg/ha/yr)	
NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS
NaN	NaN	0.00	0.00	NaN	NaN

Government of Western Australia
Department of Water and Environmental Regulation

Project:	J6890 Post-Development Scenario 3	Date:	17/09/2021
		Version:	Version 1.2.0.19289

Subregion name: Subregion 1

Landuse	Percent (%)	Area (ha)	Input load Nitrogen (kg)	Input load Phosphorus (kg)
Residential	0	0.00	0.00	0.00
Industrial, commercial & schools	66	106.92	1528.96	310.07
Rural living	0	0.00	0.00	0.00
Public open space	0	0.00	0.00	0.00
Road reserve	34	55.08	308.45	9.91

Total area (ha)	Total percent (%)
162.00	100

Nitrogen input (kg/ha/yr)	Phosphorus input (kg/ha/yr)
16.57	2.13

Nitrogen export (kg/ha/yr)	Phosphorus (kg/ha/yr)
NaN	NaN

Commercial, Industry and Schools

Landuse	Percent (%)	Area (ha)
Light industrial	100	106.92
Heavy industrial	0	0.00
Commercial / Offices	0	0.00
Schools	0	0.00
Public buildings	0	0.00

Total area (ha)	Total percent (%)
106.92	66

Nitrogen input (kg)	Phosphorus input (kg)
1528.96	310.07

Road reserve

Landuse	Percent (%)	Area (ha)
Roads	0	0.00
Road reserve - impervious	0	0.00
Road reserve - native garden	20	11.02
Road reserve - non-native garden	0	0.00
Road reserve - turf	0	0.00
Road reserve - not fertilised	80	44.06

Total area (ha)	Total percent (%)
55.08	34

Nitrogen input (kg)	Phosphorus input (kg)
308.45	308.45

Soil and drainage information

Type of drainage

Soil type

Depth to groundwater (m) **1.5**

Groundwater slope (%) **0.5**

Soil PRI **0.0**

Does it contain imported fill? **No**

Does subregion contain onsite sewage diposal system? **No**

Note: Please attach the results of soil tests to this report when submitting.

Summary: Nutrient stripping devices

Treatment	Name	Size (m^2)	Treated area (ha)	Treating	N removed (kg/ha/yr)	P removed (kg/ha/yr)
Load removed					0.00	0.00
Net export					NaN	NaN

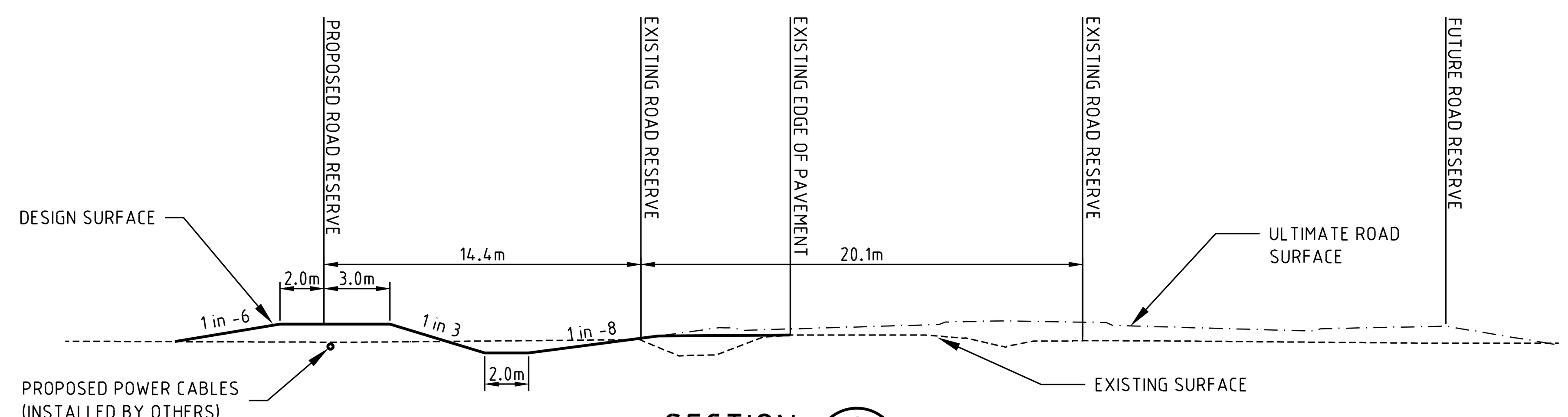
Summary: Nutrient load exports

Region	Area (ha)	P export (kg/ha/yr)	N export (kg/ha/yr)
Subregion 1	162.00	NaN	NaN

PRE-TREATMENT LOAD (kg/ha/yr)		LOAD REMOVED (kg/ha/yr)		NET LOAD EXPORT (kg/ha/yr)	
NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS	NITROGEN	PHOSPHORUS
NaN	**NaN**	**0.00**	**0.00**	**NaN**	**NaN**

APPENDIX G

Engineering Drawings, Paterson Road Drain
(C&W, 2018)



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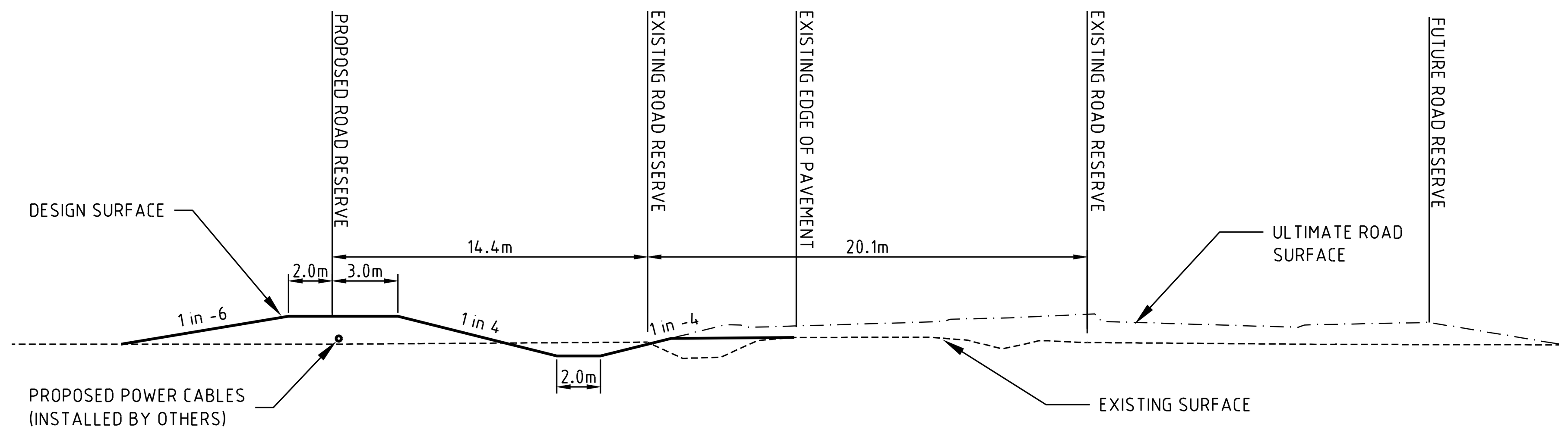

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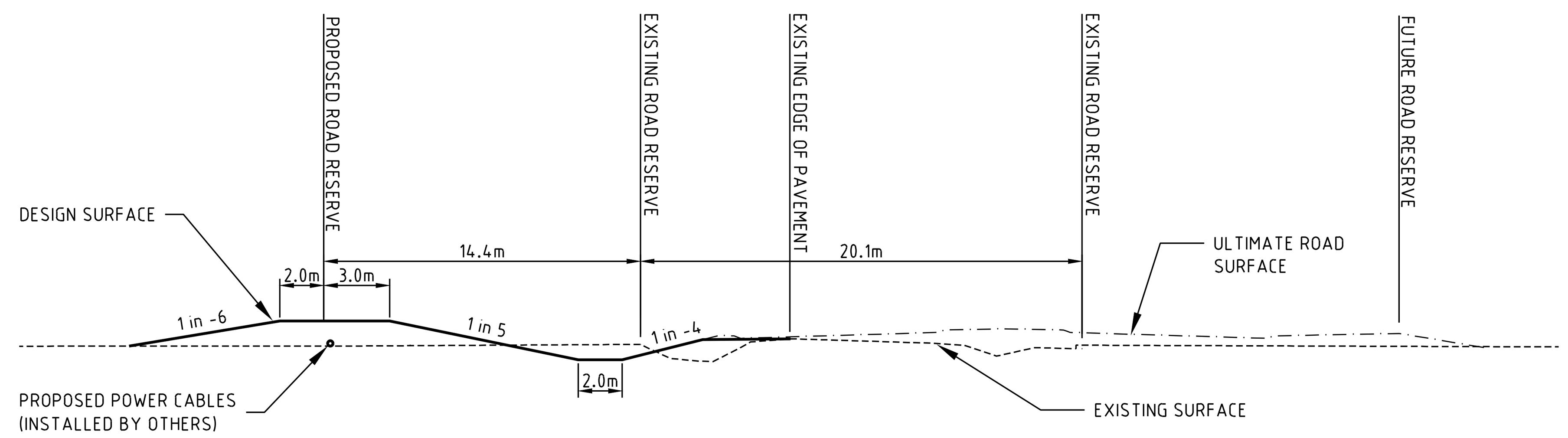

SECTION C
1:250

GENERAL NOTES

1. ALL LEVELS IN METRES TO AHD. EXISTING SURVEY BY KR SURVEYS.
2. BATTERS TO EXISTING SURFACE AT 1:4 (CUT) 1:6 (FILL) UNLESS NOTED OTHERWISE.
3. ALL UNSUITABLE MATERIAL TO BE REMOVED BY THE CONTRACTOR TO APPROVED TIPPING SITE PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL FEES TO BE PAID BY CONTRACTOR.
4. EXTENT OF EARTHWORKS TO BE LIMITED TO THE EARTHWORKS BOUNDARY UNLESS AGREED WITH THE SUPERINTENDENT.
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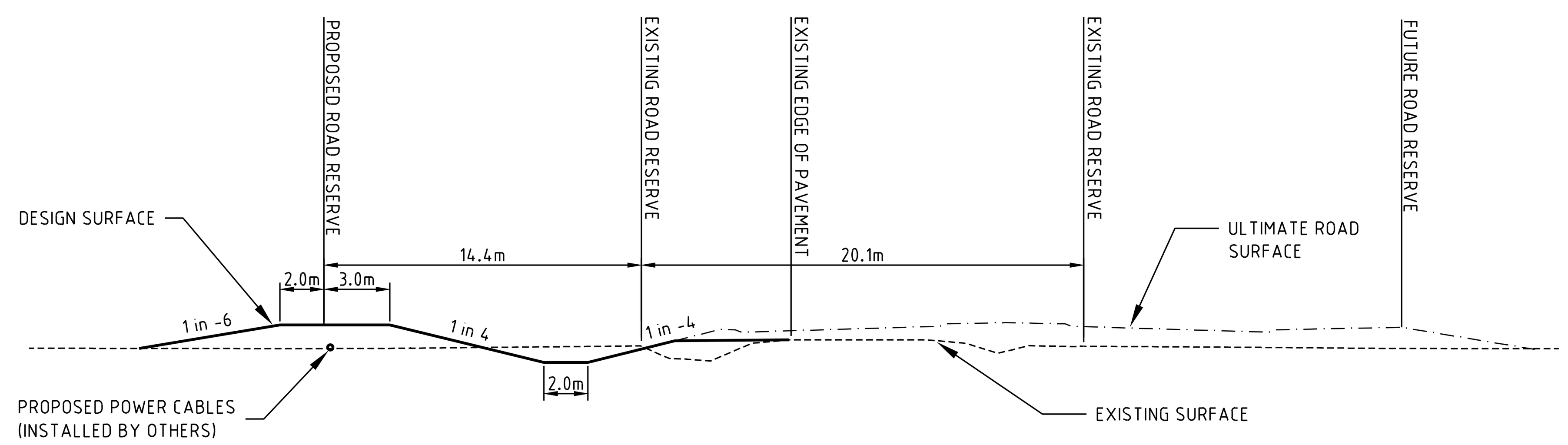
12. EARTHWORKS AREA TO HAVE HYDROMULCH WITH SEED APPLIED.

LEGEND

- 7 — EXISTING CONTOUR (0.25m)
- 6.0 — DESIGN CONTOUR (0.25m)
- STAGE BOUNDARY
- EXISTING/PROPOSED CADASTRAL BOUNDARY
- EXISTING ROAD PAVEMENT
- OPHV1 — EXISTING OVERHEAD HIGH VOLTAGE POWERLINES
- OP — EXISTING OVERHEAD LOW VOLTAGE POWERLINES
- UPLV — EXISTING UNDERGROUND LOW VOLTAGE POWER
- C — EXISTING UNDERGROUND COMMUNICATIONS
- X — EXISTING FENCING
- // — PROPOSED 1.2m HIGH RINGLOCK FENCE



SECTION D
1:250

1:250 0m 5 10 15m
1:500 0m 10 20 30m

REV	DATE	DRN	CKD	APP	AMENDMENT	REV	DATE	DRN	CKD	APP	AMENDMENT
A	10.09.18	MH	PLS	[signature]	ISSUED FOR APPROVAL						

Cossill & Webley
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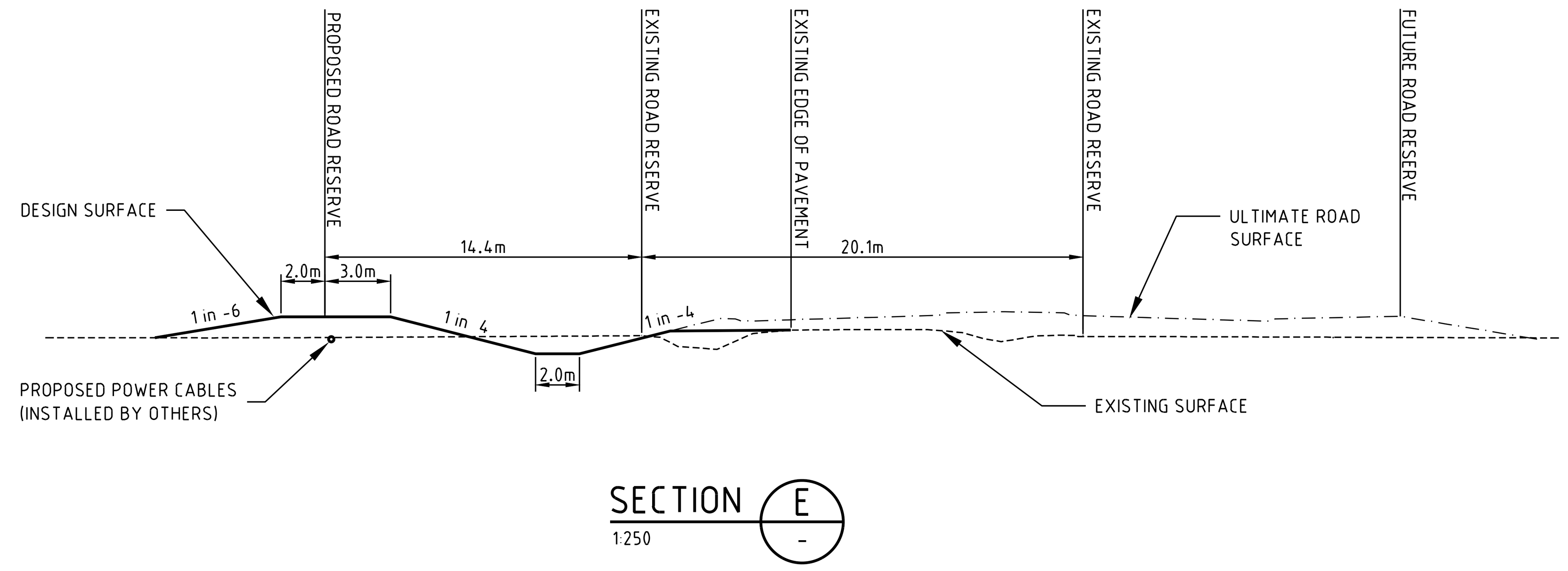
CLIENT: LANDCORP
APPROVED: 14.09.18
DESIGNED: M.H.
SCALE: 1:500
PROJECT: NAMBEELUP INDUSTRIAL PARK
TITLE: PATERSON ROAD OPEN DRAIN EARTHWORKS PLAN - SHEET 1 OF 4
WAPC No.: N/A
DRAWING No.: 6079-00-C110
REVISION: A
ORIGINAL SIZE: A1



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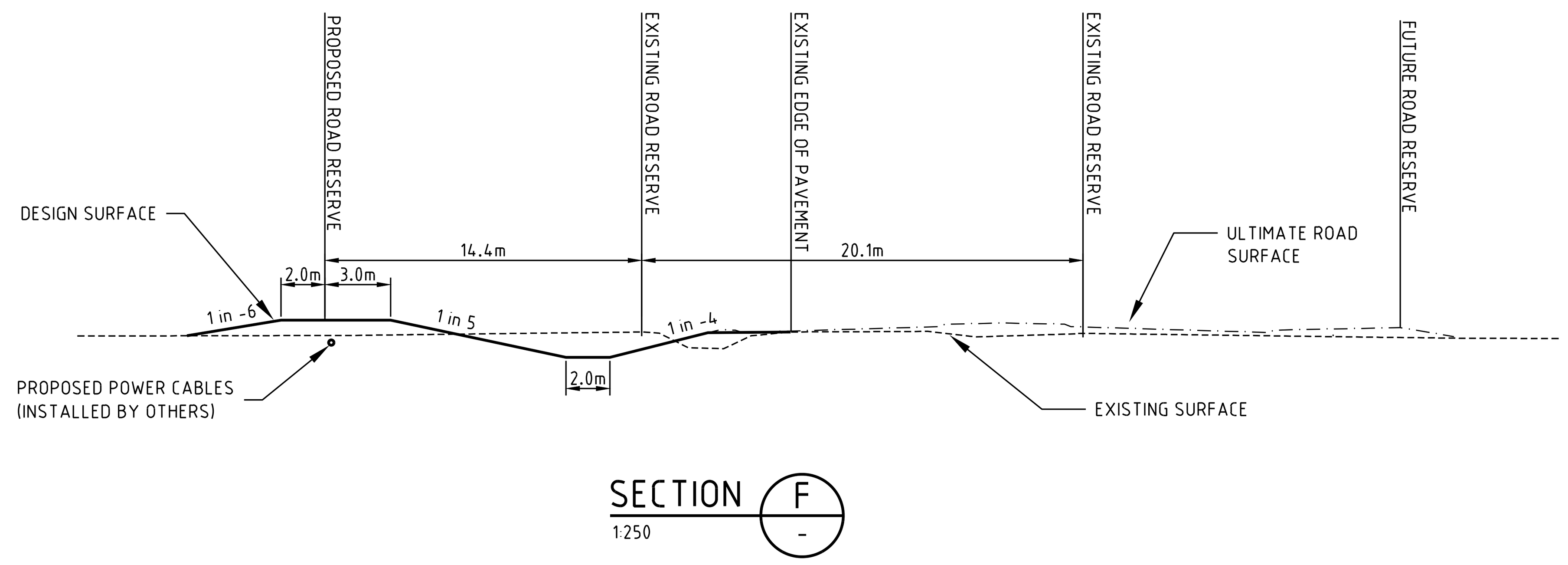

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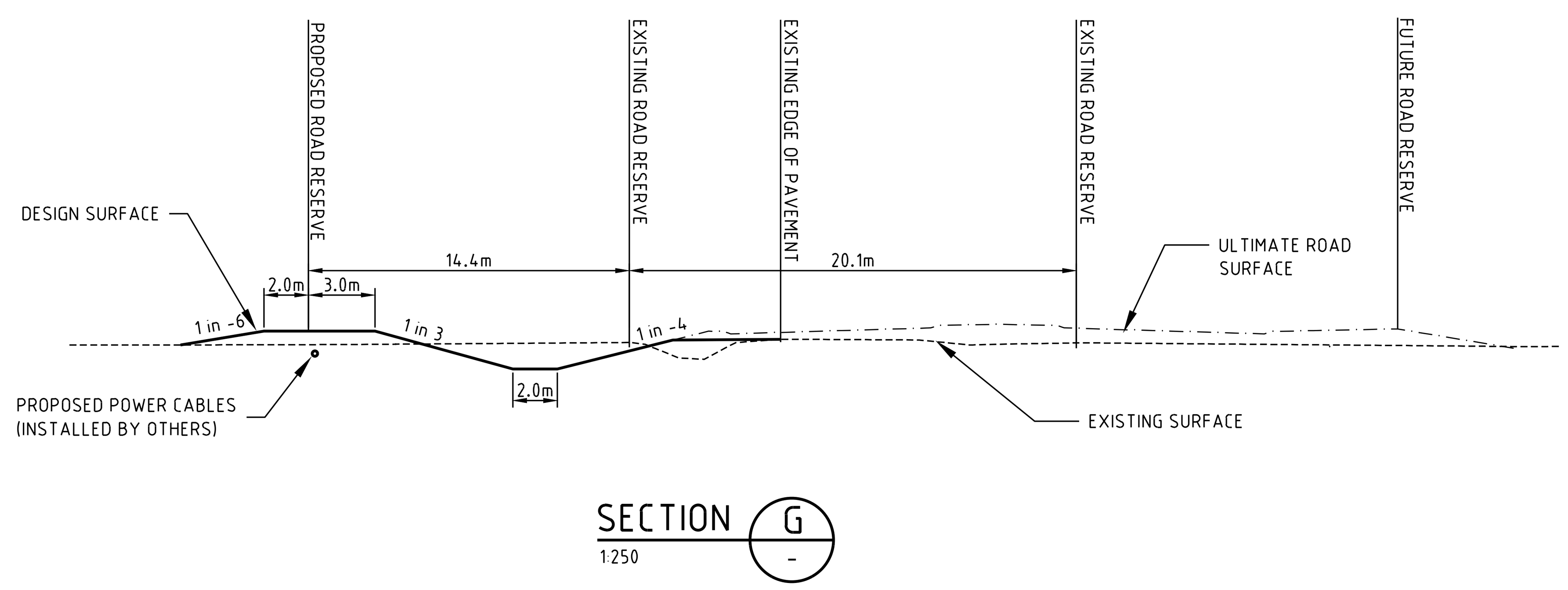

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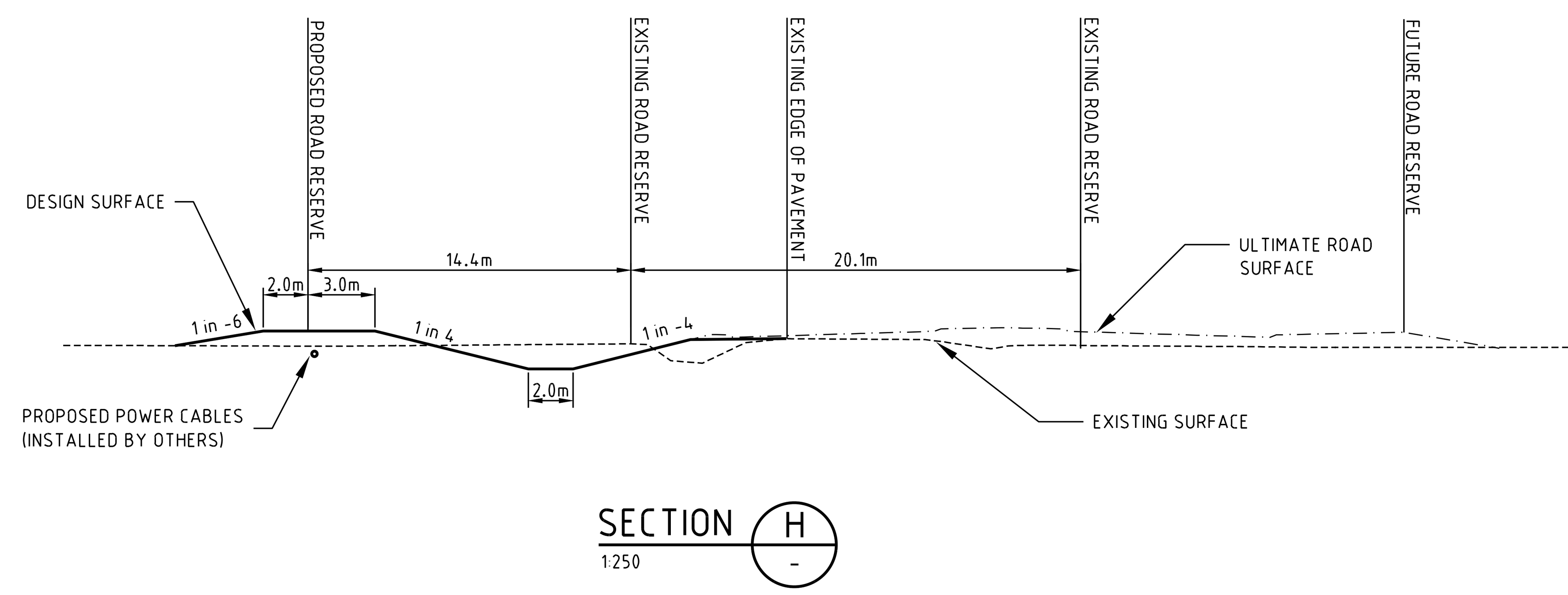

SECTION H
1:250

GENERAL NOTES

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12. EARTHWORKS AREA TO HAVE HYDROMULCH WITH SEED APPLIED.

LEGEND

7	EXISTING CONTOUR (0.25m)
6.0	DESIGN CONTOUR (0.25m)
	STAGE BOUNDARY
	EXISTING/PROPOSED CADASTRAL BOUNDARY
	EXISTING ROAD PAVEMENT
OPHV1	EXISTING OVERHEAD HIGH VOLTAGE POWERLINES
OP	EXISTING OVERHEAD LOW VOLTAGE POWERLINES
UPLV	EXISTING UNDERGROUND LOW VOLTAGE POWER
C	EXISTING UNDERGROUND COMMUNICATIONS
x	EXISTING FENCING
//	PROPOSED 1.2m HIGH RINGLOCK FENCE

0m 10 20 30m
1:500

REV	DATE	DRN	CKD	APP	AMENDMENT
A	10.09.18	MH	PLS		ISSUED FOR APPROVAL.

This plan is not to be used for construction unless issued as revision 0 or higher

Cossill & Webley
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CLIENT: LANDCORP
APPROVED: 14.09.18
DESIGNED: M.H.
SCALE: 1:500
PROJECT: NAMBEELUP INDUSTRIAL PARK
TITLE: PATERSON ROAD OPEN DRAIN EARTHWORKS PLAN - SHEET 2 OF 4
WAPC No.: N/A
DRAWING No.: 6079-00-C111
REVISION: A
A1 ORIGINAL SIZE

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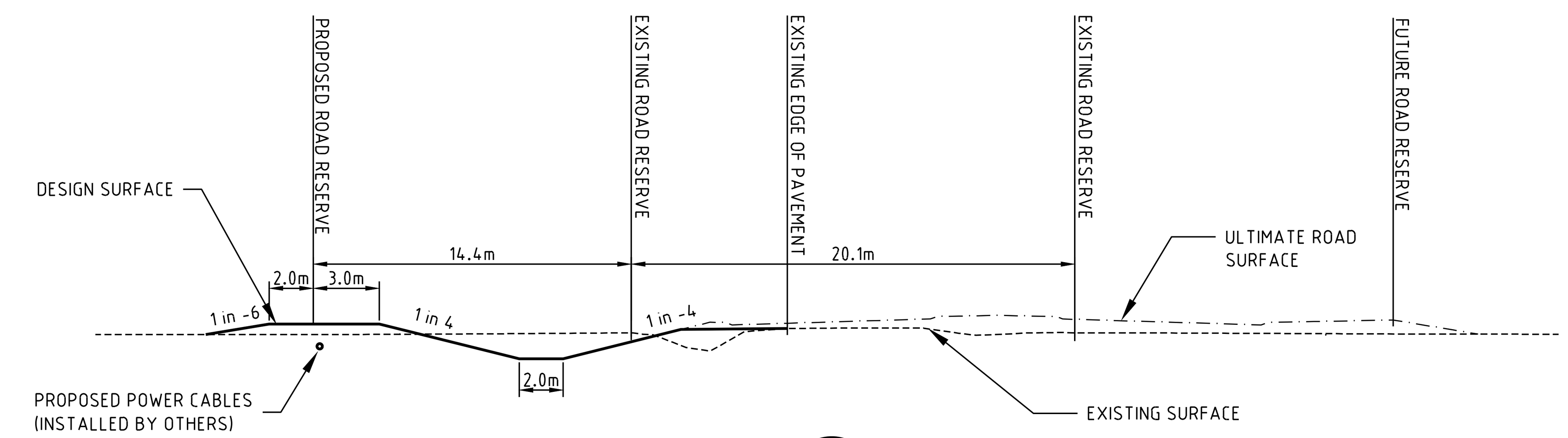

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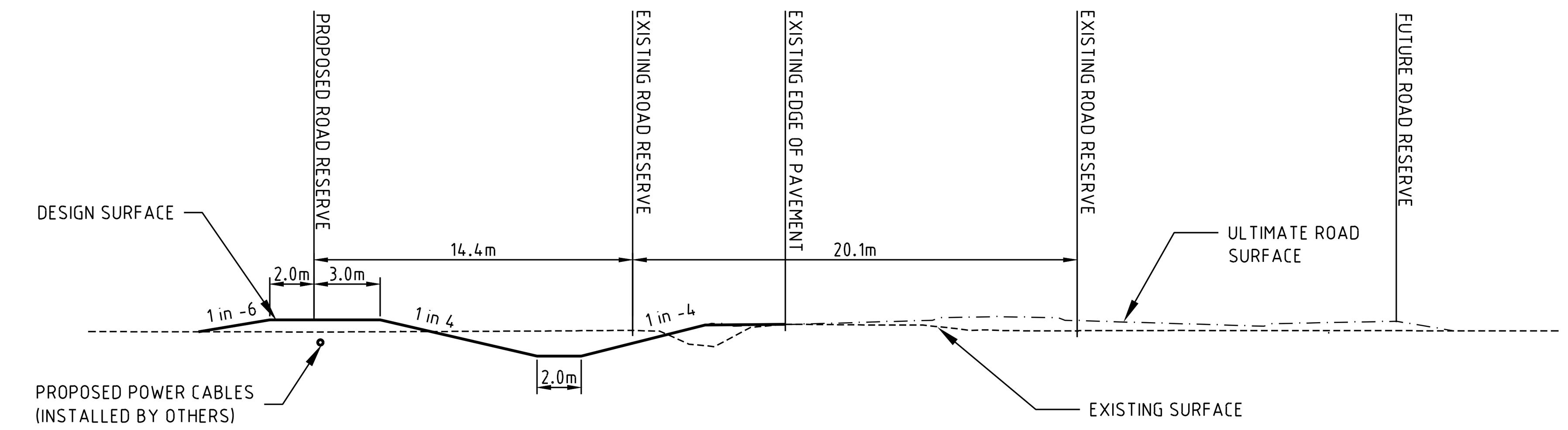

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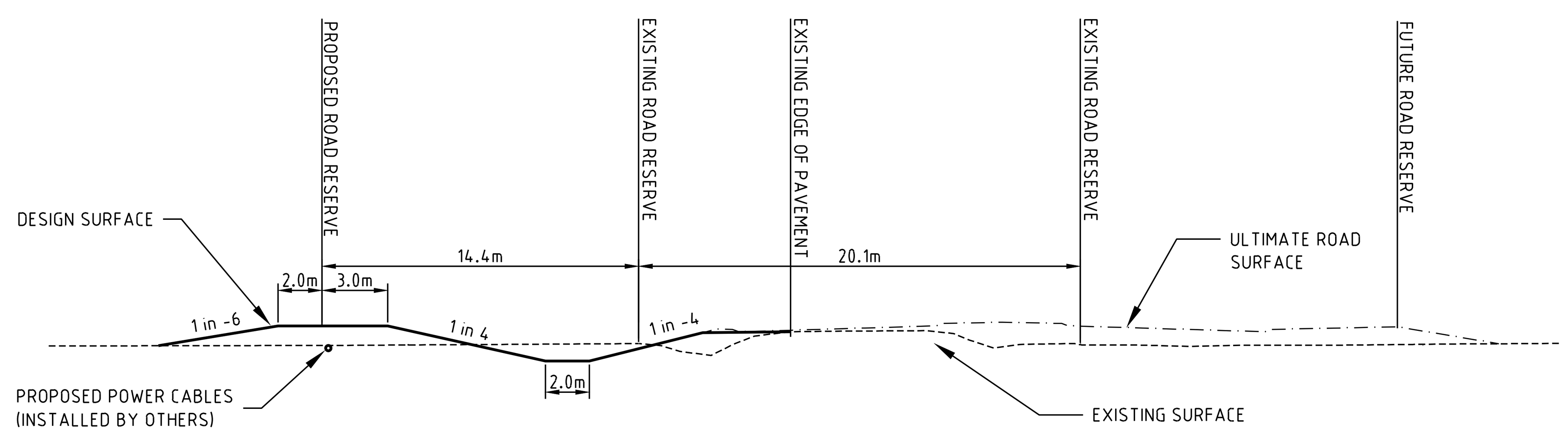

SECTION L
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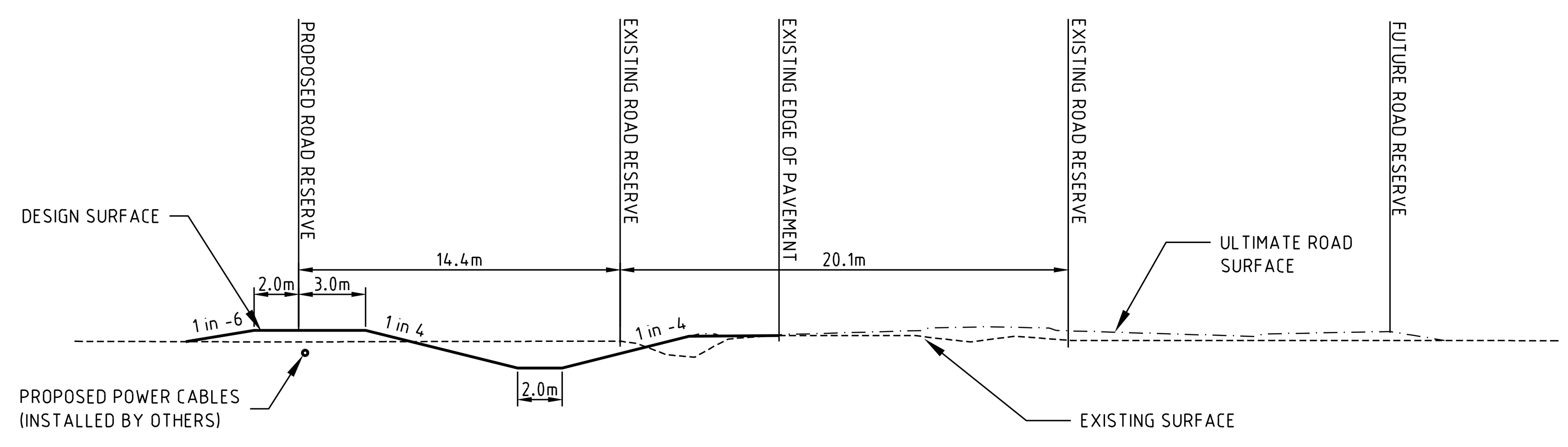

SECTION M
1:250

LEGEND

- EXISTING CONTOUR (0.25m)
- DESIGN CONTOUR (0.25m)
- STAGE BOUNDARY
- EXISTING/PROPOSED CADASTRAL BOUNDARY
- EXISTING ROAD PAVEMENT
- EXISTING OVERHEAD HIGH VOLTAGE POWERLINES
- EXISTING OVERHEAD LOW VOLTAGE POWERLINES
- EXISTING UNDERGROUND LOW VOLTAGE POWER
- EXISTING UNDERGROUND COMMUNICATIONS
- EXISTING FENCING
- PROPOSED 1.2m HIGH RINGLOCK FENCE

GENERAL NOTES

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1:500 0m 10 20 30m

REV	DATE	DRN	CKD	APP	AMENDMENT
A	10.09.18	MH	PCS		ISSUED FOR APPROVAL.

REV	DATE	DRN	CKD	APP	AMENDMENT

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Cossill & Webley
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CLIENT: LANDCORP

APPROVED: 14.09.18

DESIGNED: M.H.

SCALE: 1:500

PROJECT: NAMBEELUP INDUSTRIAL PARK

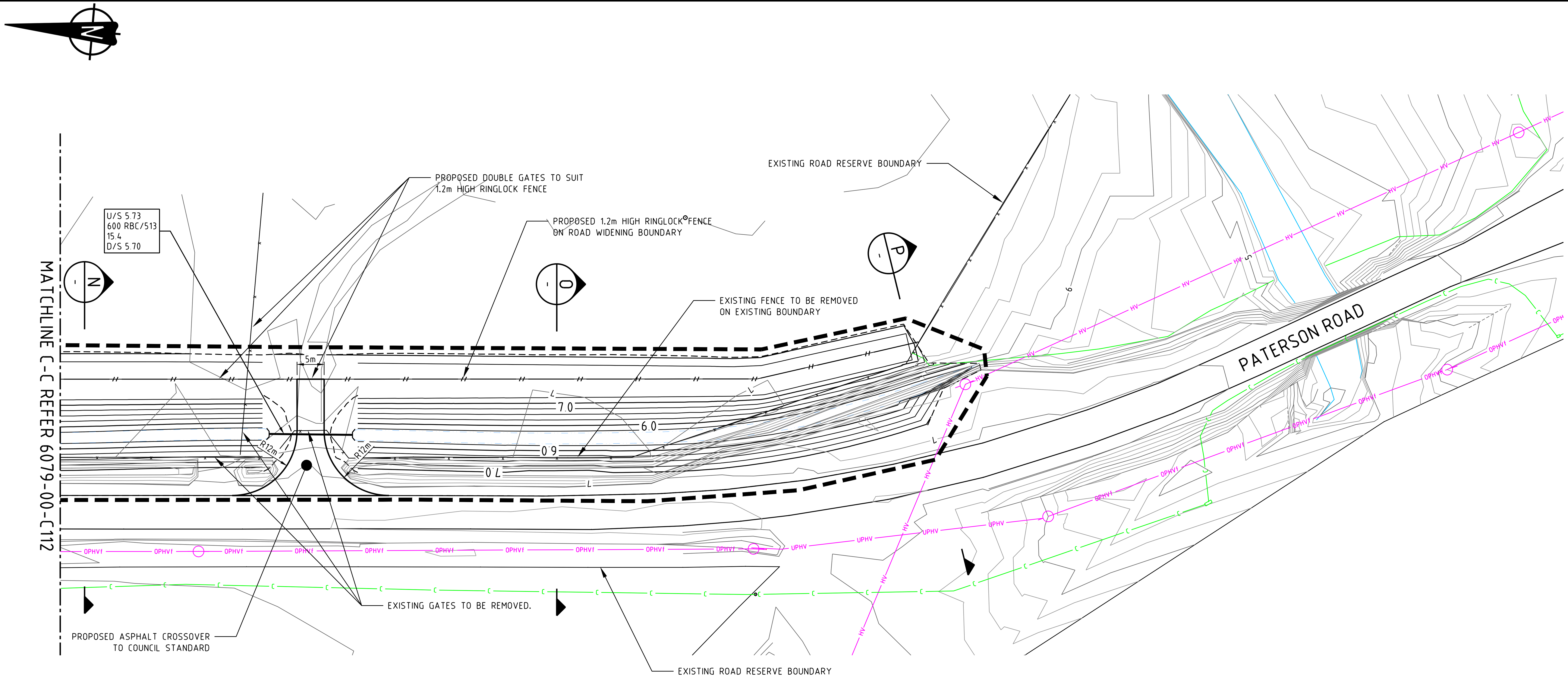
TITLE: PATERSON ROAD OPEN DRAIN EARTHWORKS PLAN - SHEET 3 OF 4

WAPC No.: N/A

DRAWING No.: 6079-00-C112

REVISION: A

ORIGINAL SIZE: A1



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LEGEND

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6.0	DESIGN CONTOUR (0.25m)
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	EXISTING/PROPOSED CADASTRAL BOUNDARY
	EXISTING ROAD PAVEMENT
OPHV1	EXISTING OVERHEAD HIGH VOLTAGE POWERLINES
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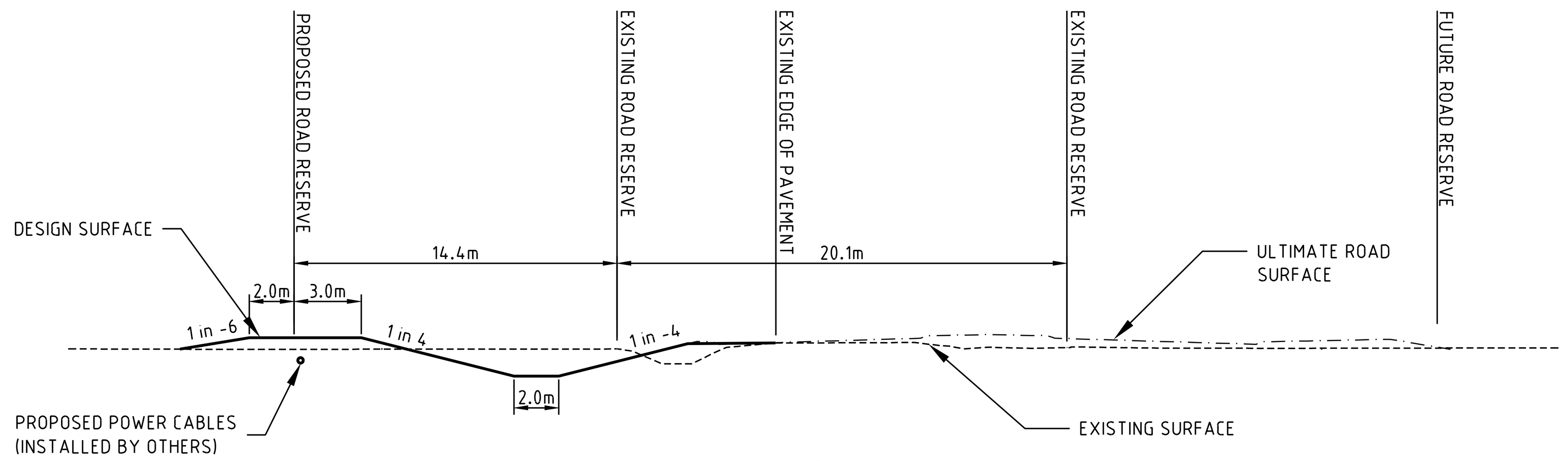

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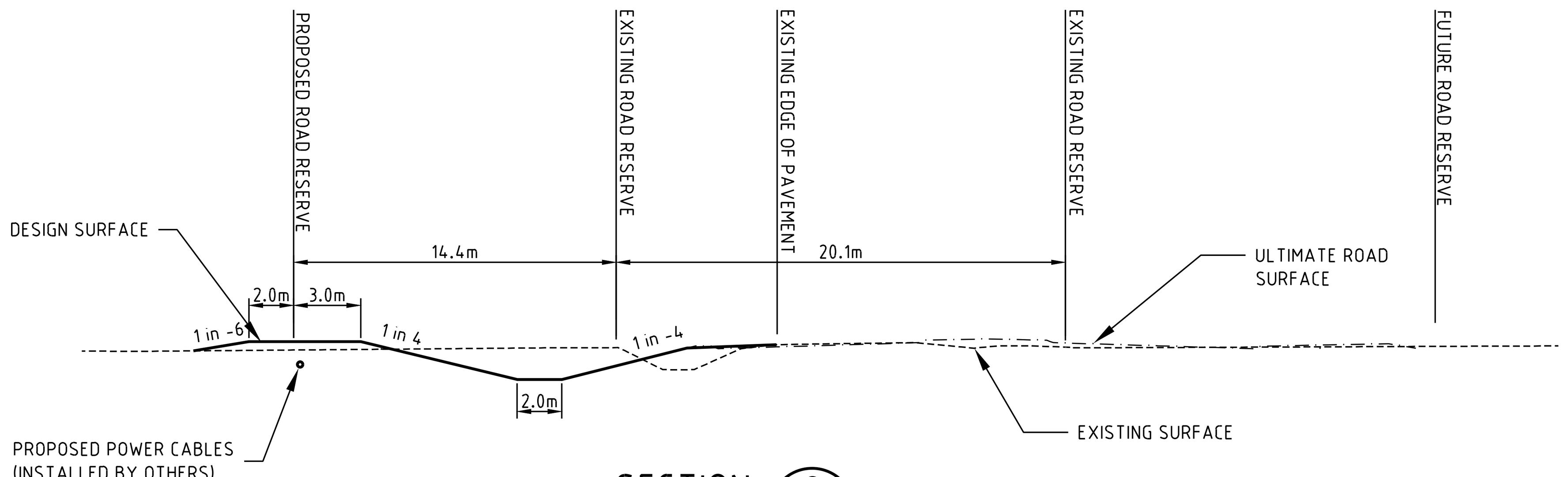

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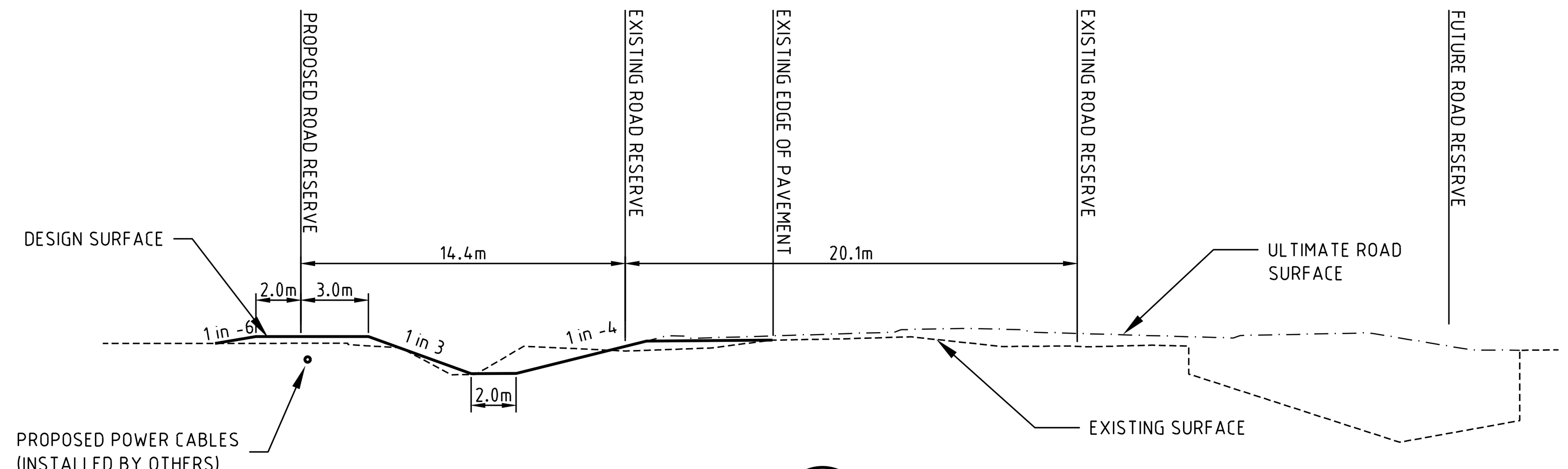

SECTION P
1:250

0m 10 20 30m
1:500

REV	DATE	DRN	CKD	APP	AMENDMENT
A	10.09.18	MH	PLS		ISSUED FOR APPROVAL

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CLIENT: LANDCORP

APPROVED: 14.09.18

DESIGNED: M.H.

SCALE: 1:500

PROJECT: NAMBEELUP INDUSTRIAL PARK

TITLE: PATERSON ROAD OPEN DRAIN EARTHWORKS PLAN - SHEET 4 OF 4

WAPC No.: N/A

DRAWING No.: 6079-00-C113

REVISION: A

ORIGINAL SIZE: A1

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