14.1 Introduction

This chapter presents an assessment of the water management for the Facilities and associated infrastructure. It presents an assessment of the water management for Common Shared Works, the water requirements, wastewater production, stormwater management and flooding potential for the two Facilities for both construction and operation phases and broad water management issues for the gas pipeline.

14.2 Methodology

This assessment has been conducted to include:

- an assessment of the water quantity and quality impacts, with particular reference to water needs and the Drinking Water Catchments Regional Environmental Plan No. 1 (REP No. 1) heads of consideration;
- the proposed source of water;
- the implementation of water saving measures;
- identification of the quantity and quality of wastewater and how this wastewater is to be disposed of;
- management of stormwater at the Site; and
- an estimation of the flooding potential of the Site.

14.3 Existing Environment

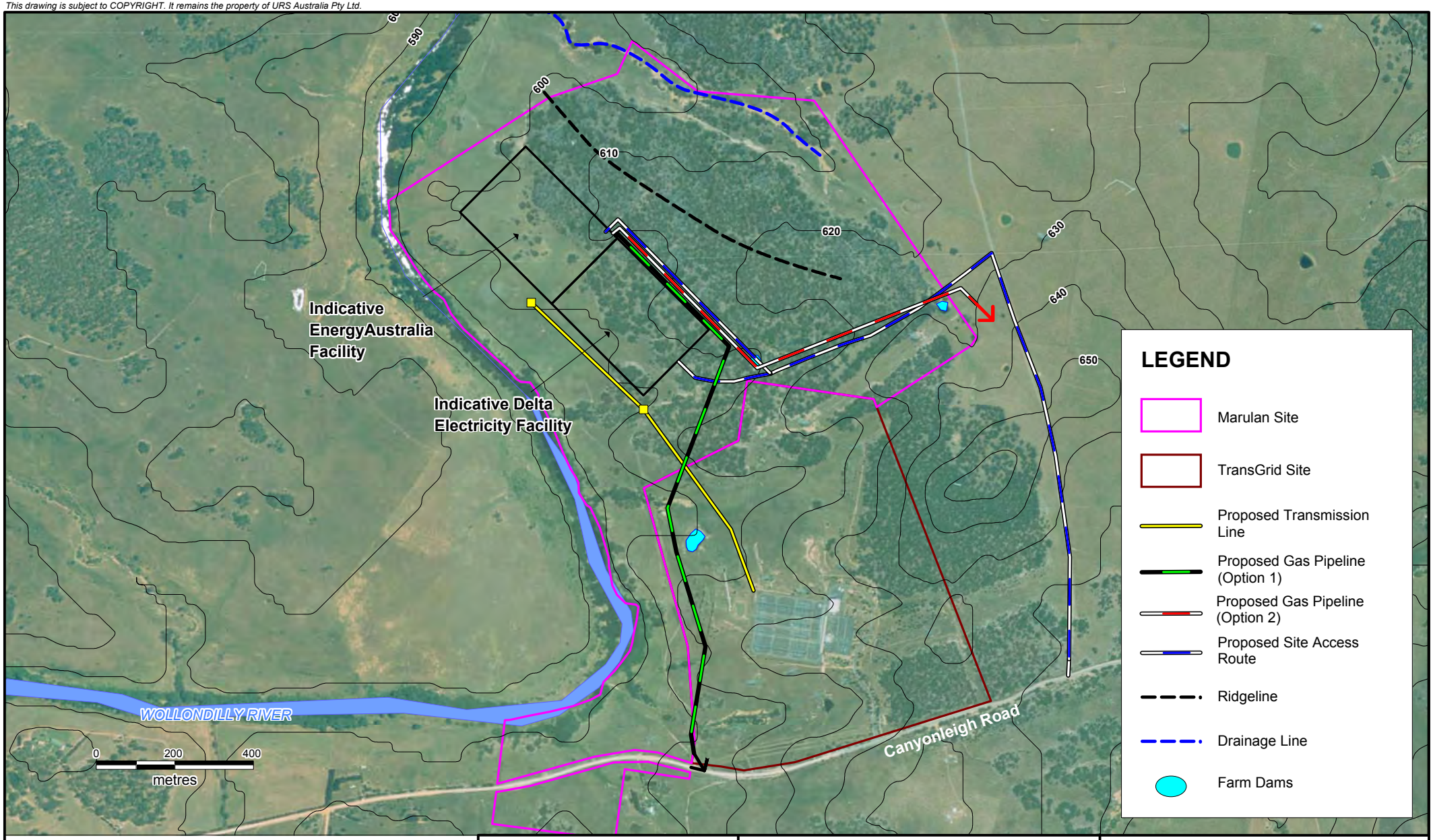
14.3.1 Marulan Site and Surrounding Area

The Marulan Site comprises approximately 116 ha of pasture land and dry eucalypt forest. Overall the site slopes gently west towards the Wollondilly River, with the runoff from the site and the ephemeral gullies flowing directly to the River (refer to **Figure 14-1**).

This development falls within the area covered by REP No. 1 and is also covered by the embargo on river water extraction. **Chapter 5** (Statutory Planning) provides more details on these policies and plans; however, the embargo makes it necessary to recycle rainwater runoff from the proposed development and to use external resources such as effluent from existing sewage treatment plants.

Available information on surface water in the area is not extensive, though a recent quarry environmental impact assessment (Morse McVey, 2008), on the surrounding area indicated that surface water management has not been a significant constraint to infrastructure development.

Groundwater in the Goulburn Mulwaree Council area is dominated by the fractured rocks of the Lachlan Fold Belt which are generally poor aquifers.



Source: Delta Electricity, Energy Australia

Client
DELTA ELECTRICITY AND ENERGY AUSTRALIA

URS

Project
MARULAN
GAS TURBINE FACILITIES

Drawn: AJW	Approved: NB	Date: 14.03.08
Job No: **43177371**	File No: 43177371-184.wor	

Title
NATURAL DRAINAGE AND WATER FEATURES

Figure: **14-1**

While no specific groundwater investigations have been conducted at the site, environmental impact assessments were conducted for the nearby Gunlake quarry, which show that a registered bore used for rural purposes has a low yield rate (2.9 L / sec). In addition, a Water Management Strategy conducted at the quarry by Parsons Brinckerhoff (2007) indicated that the groundwater quality was quite variable with salinity ranging from 400 – 7,500 ppm. It is expected that the higher salinities would be located in lower lying areas such as the Site.

14.3.2 Average Rainfall

Data obtained from the Department of Meteorology indicates that the Average Annual Rainfall (AAR) is approximately 700 mm. This is based on a dataset extending from 1895 to 2007. Investigations have indicated that whilst this may be considered moderate by Australian standards, departures from the average indicate that significant periods of drought have occurred over the preceding 100 years. As such the AAR may not be entirely representative of the rainfall conditions that exist in the study area.

14.4 Flooding Potential

The Wollondilly River fronts the Facilities to the west. The potential for flooding at this location is as a result of major rainfall events to the south of the Site that would affect the City of Goulburn prior to affecting this Site. As such, Goulburn is the primary flood warning location for the Site.

It should be noted, that given the paucity of flood related data for the Site, the investigations reported here are estimates only. Investigations are based on available data transposed to the Site to estimate peak flows. Floodplain cross-sections have been developed from limited detailed Site surveys in order to estimate flood levels and are best estimates based on URS' experience and judgement.

The flooding assessment is presented in more detail in the respective *Project Applications*. The assessment indicates that there is a degree of stability regarding flood levels based on the selected parameters in the model and that, with the modelling limitations stated, 1 in 100 year Average Recurrence Interval (ARI) flood levels at the Site would not exceed 600 m AHD. Based on the survey data available of the area, the Site is generally above 600 m AHD falling north west from around 626 m AHD to the Wollondilly River corridor at around 590 m AHD.

The extreme flood estimate (i.e. a flood approaching a PMF- Probable Maximum Flood), considers flood levels above the 600 m AHD level. Given all the uncertainties associated with the hydrology and hydraulic modelling, the lack of historical data, and as there remains the possibility that an extreme flood such as a PMF may affect some of the overall Site, risk-averse property will be constructed above 605 m AHD.

14.5 Assessment of Impacts – Common Shared Works

14.5.1 Construction

The Facilities, common infrastructure and Laydown Area footprint is up to approximately 36 ha. This footprint area may be refined during detailed design. Within this, each Facility footprint is approximately 12.8 ha. Rainfall on the disturbed sites may cause soil erosion, and runoff may contain high levels of sediments which could then enter the natural drainage system. The soils at the Site are likely to have a high percentage of fines, and may or may not be dispersible.

Chapter 14 Water Cycle Management

As the Site is located adjacent to the Wollondilly River, there is potential for sediment laden runoff to reach the river.

There is also the potential for spills and gross pollutants to be mobilised by runoff and enter the natural drainage system if no mitigation measures are put in place.

A detailed Soil and Erosion Control Plan would be developed and implemented as part of the Construction Environmental Management Plan and would identify sediment and erosion control measures. The Soil and Erosion Control Plan would be prepared in accordance with the measures outlined in the *Managing Urban Stormwater – Vol 1 Soils and Construction*. Mitigation measures may include:

- limiting slope length;
- installation of diversion drains and sediment filters; and
- construction of a sedimentation basin(s) downstream of the earthworks area.

For the purposes of this assessment it is assumed that earthworks would proceed for the two Facilities in conjunction. Should the bulk earthworks be progressed at the same time for both Facilities and if there is a time lag until further construction occurs, then appropriate long term erosion control measures will be implemented on the vacant pad area until further work for construction of that facility commences. In the event that earthworks progress separately for the two Facilities, then each would manage the earthworks and runoff appropriately through a Soil and Erosion Control Plan.

Spills would be minimised through proper site management. All possible pollutant materials would be stored well clear of site boundaries and stormwater drainage lines in a designated covered area. Containment bunds would be constructed in accordance with relevant guidelines, with provision for collection of any spilt material.

Waste collection areas would be designated. Appropriate bunding would be installed and appropriate containers would be provided. Waste disposal and collection would be properly undertaken. All vehicle and equipment maintenance would be undertaken offsite. Any vehicle washing onsite would be restricted to specific designated bunded areas.

Staff facilities would be installed and maintained so that pollutants, including wash water are not conveyed from the Site in stormwater. All wastewater during the construction period would be disposed of offsite to a licensed facility.

During the construction period water may be required for dust suppression. This would be sourced from the existing dams or imported, if required.

Flood management for the construction phase would be addressed as part of the CEMP. However, flooding is unlikely to be an issue as the location within the Site is above the extreme flood level (as discussed in **Section 14.4**).

14.5.2 Operation

This section addresses the operation of the access road and transmission line areas. The 'operation' of the areas of bulk earthworks is not relevant as further construction of the Facilities would take place on the pad created by the earthworks.

Rainfall runoff from the access road and transmission line may potentially be contaminated with material such as oil and dust. This water would be directed to settlement ponds, which would be drained by pumps and passed through oil water separators. Cleaned water would be directed to the stormwater storage pond and oil/oily water would be discharged to the wastewater storage pond. Any overflow from the settlement ponds would be directed to the wastewater storage pond. When required, settlement ponds would be drained and sediments/sludge transported by truck for offsite disposal.

14.5.3 Drinking Water Catchments REP No 1 - Summary of Response

Although the proposal is being assessed under Part 3A of the EP&A Act and is critical infrastructure, the Environmental Assessment Requirements request that, as the proposed development falls within the area covered by the *Drinking Water Catchments Regional Environmental Plan (REP) No. 1*, the development should assess the impacts on drinking water quality through water quality criteria and certain heads of consideration in REP No. 1. While the heads of consideration are not specifically stated in REP No. 1, they are generally established in the SCA *Neutral or Beneficial Effect on Water Quality Assessment Guidelines (Guidelines)*.

Further detail on the response to the neutral or beneficial effects test is provided in the respective *Project Applications* however the following provides a summary of the outcomes:

- Each development separately and cumulatively satisfies the requirements laid out in the Guidelines.
- Certain sections of the proposed development have the potential to impact on water quality if no mitigation measures are incorporated into the design. Detailed design would ensure all necessary measures are incorporated to ensure that any waste water or polluted water is captured within the Site, and does not leave the Site other than to transport the waste to a suitable treatment plant.
- Detailed design would ensure a similar approach is adopted to capture runoff from clean areas and this runoff is captured for recycling into the development processes and activities. Again, any waste water would be captured and either recycled or transported offsite for treatment.
- There would be a reduction of flows into the Wollondilly River; however, the reduction is not significant from an overall catchment or sub-catchment point of view, and would have no identifiable potential impact on water quality.
- There would be some clearing of vegetation however there are no watercourses affected by the development. Mitigation measures have been identified and would be incorporated into detailed design for the construction and operational phases of the proposed development to ensure that there is no degradation of flows into the River and that all flows that would have passed through the Site are diverted and returned to their natural course to the River. Only rainfall directly onto the Facilities would be captured for recycling.
- There would be no clearing or degradation of watercourses, existing dams, or of riparian corridors, as a result of this proposed development.

Chapter 14 Water Cycle Management

The Soil and Water Management Plan to be prepared as a part of the Project would include actions needed to meet the *Guidelines* and the Landcom's Blue Book (*'Managing Urban Stormwater: Soil and Construction')*. Surface waters falling or flowing through the site would be managed in accordance with the water management plan. Such management actions would include:

- water retained within the harvestable rights for the Site;
- water of suitable quality being diverted to a natural watercourse; and
- water treatment for those waters originating from disturbed areas.

14.6 Assessment of Impacts – Facilities

14.6.1 Construction Phase

As the majority of earthworks would have been previously completed, this phase involves construction of each Facility. Some minor reprofiling of the Site may be required with minor earthworks. Similar management measures would be employed as those described for the Common Shared Works as described in **Section 14.5.1**.

Water Requirement

The construction phase (approximately 12 to 18 months for each Facility) water requirement for Facilities is estimated to be 6-8 kL per day for each Facility.

This requirement takes into account the following:

- personnel levels;
- minor allowances for wet trades during construction (bricklaying/blocklaying), rendering to small areas only (for example, control rooms);
- all concrete mixing off-site (i.e. not allowed for in estimates);
- no on-site construction camp or canteen facility (i.e., no mess rooms, showers/toilet facilities only);
- no consumption for fire fighting purposes considered; and
- no allowance for water sprays for dust control.

It is noted that water sprays for dust control could be considerable, depending on a number of aspects such as the condition of the road network and prevailing weather conditions. Water requirements for the construction of the Facilities could be up to 100 kL per day during hot dusty windy weather.

14.6.2 Operation

Water Management

Stormwater and wastewater would be managed within each Facility to be effectively self-contained. Mitigation measures proposed will be implemented for each development.

Flooding is not considered to be an issue as the Facilities, including earthworks and structures, would be located above the estimated level (approximately 605 m AHD) for an extreme flood event. The final levels of each of the pads would be refined further during detailed design and may involve benching of the Site.

There would be a reduction of flows into the Wollondilly River; however, with individual areas of approximately 7.8 ha each and a total area of approximately 34 ha, these developments are very small in relation to the size of the overall catchment (some thousands of square kilometres). Thus the reduction in overland flows reaching the Wollondilly River is not significant from an overall catchment or sub-catchment point of view.

Surface water from the Site that may potentially be contaminated could include:

- rainfall runoff from operational areas of the Site; and
- accumulated water within bunds.

Liquid spills could potentially occur in the compound area or during transportation to the Site.

Water falling into bunded areas (such as the transformers), on driveways and on other operational areas would be directed into the containment ponds. This system would be designed to contain 1 in 100 year flows.

Where flows are concentrated, soil erosion may occur. Landscaping around the base of the mounds would slow runoff before it runs over the adjoining grassed surface. This would minimise the potential for soil erosion.

To minimise the volume of potentially contaminated stormwater, surface runoff normally flowing onto the Site from adjacent areas would be directed around the Site using cut-off drains. Appropriate measures would be put in place to maximise the dispersion of these flows over a wide area, thereby minimising their potential to cause soil erosion downstream.

The Facilities would implement an emergency spill preparedness and response and management plan to manage collection, neutralisation (if possible) and disposal of any spills offsite through a licensed contractor.

Delta Electricity Facility Indicative Operational Water Requirements

Table 14-1 summarises the assumed water flows for Delta Electricity Stage 1 and Stage 2. It is assumed that Stage 1 would be operational for approximately 500 hours per annum. It is further noted that the following tables allow for significant onsite recycling of wastewater to minimise the quantity of raw water required. With full recycling, the raw water demand is approximately 2.3 ML per year for Stage 1 open cycle operation. Stage 1 and 2 assume no gas turbine evaporative inlet air cooling.

For Stage 2, a capacity factor of 90 % has been assumed. Rainwater flows and evaporation losses have not been considered. It is further noted that Stage 2 requirements assume significant onsite recycling of wastewater to minimise the quantity of raw water required.

Figures 14-2 and **14-3** present the water management for each stage respectively.

Chapter 14 Water Cycle Management

Table 14-1 Indicative Water Requirements – Delta Electricity Facility

Description	Stage 1 Quantity	Stage 2 Quantity	Comment
Raw Water	2.3 ML pa	63.5 ML pa	Net input required by plant assuming recycling
Service Water	3.2 ML pa	7.9 ML pa	
Filtered Water		102.4 ML pa	**Stage 2** - Feed to demineralised water plant, domestic water plant. Includes recovery from brine concentrator
Demineralised Water	0.2 ML pa	120.1 ML pa	**Stage 1** - Tanker truck delivery **Stage 2** – Fed by recycling plant
Domestic Water	0.2 ML pa	0.7 ML pa	**Stage 1** – Conservatively assumes up to 5 personnel and tanker truck delivery **Stage 2** - Conservatively assumes up to 15 personnel
Clean Water Drains	-	60 ML pa	No rainwater included
Dirty Water Drains	0.9 ML pa	2.4 ML pa	Drainage of service water to settlement pond. No rainwater included
Contaminated Drains	0.6 ML pa	13.6 ML pa	Drainage of service water to contaminated drains tank
Chemical Drains	-	30.8 ML pa	**Stage 1** - Not required **Stage 2** - Drainage of service water and process water to chemical drains tank. Includes treated sewage effluent. Feed to Brine Concentrator
Sewage	0.2 ML pa	0.7 ML pa	**Stage 1** - Offsite disposal **Stage 2** - Treated effluent discharged to chemical drains system. Sludge stored onsite or disposed offsite
Brine Concentrator - Feed - Recovery		 30.8 ML pa 24.6 ML pa	**Stage 1** - Not required **Stage 2** - Quality water returned to Filtered Water Tank while brine disposed of offsite, stored in evaporation ponds or processed in a crystalliser (resultant salt disposed offsite)
Water Recovery	1.0 ML pa	53.5 ML pa	From raw water pond.

Delta Electricity Facility Waste Management

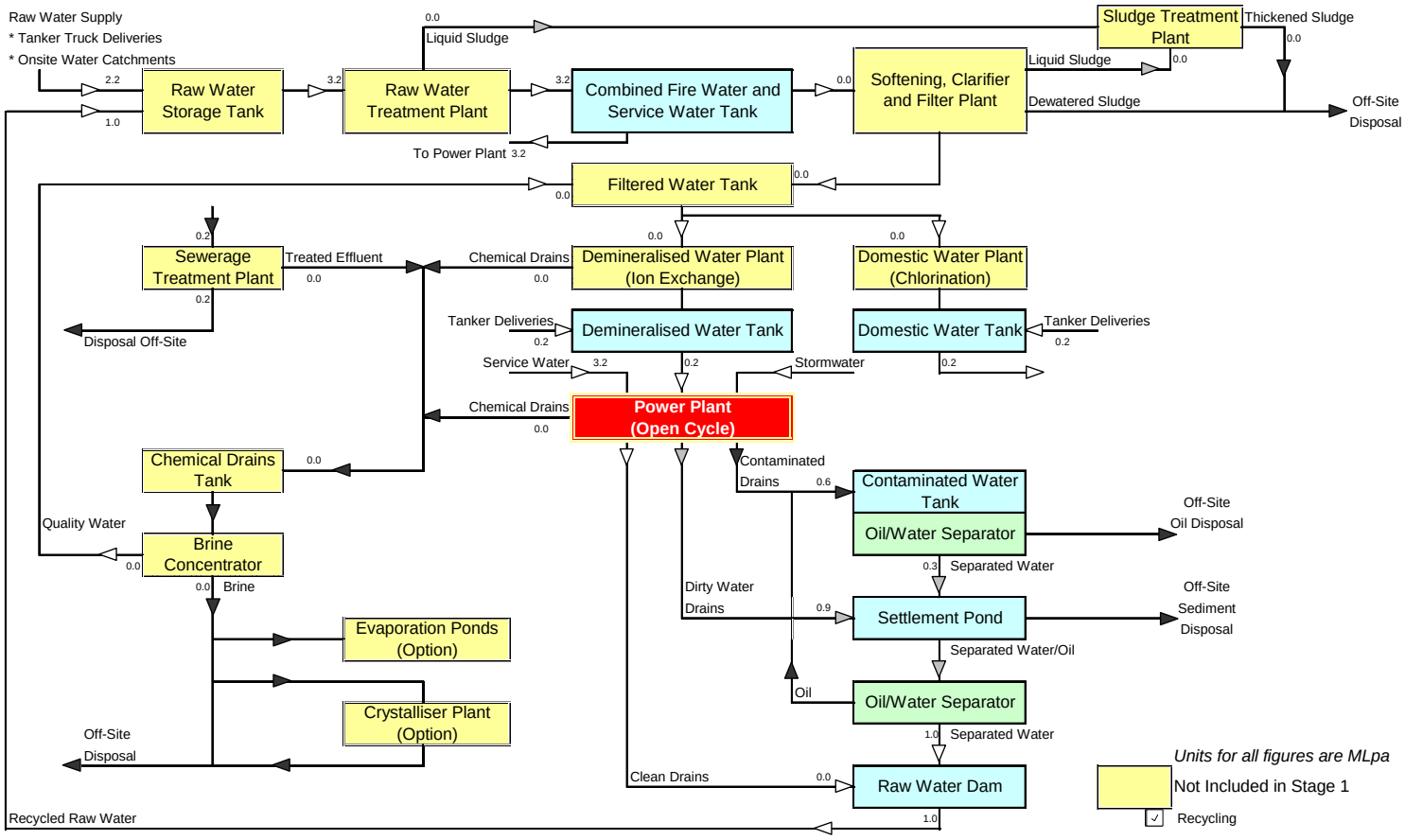
Table 14-2 presents the waste disposal for Stage 1 and Stage 2 for the Delta Electricity Facility. It is noted that only limited onsite treatment processes are proposed for Stage 1.

The Sydney Catchment Authority (SCA) has stated (refer **Appendix B**) that effluent management areas are to be located at least 150 m from the Wollondilly River, 100 m from a creek or gully and 40 m from a drainage depression.

The 150 m distance for the Facilities as a whole has been adopted to account for domestic sewerage systems for staff facilities and the Facility water treatment systems. It has been assumed that the 150 m is measured from the river bank. The Facilities will also require some space between the pad and the river for stormwater management areas.

Given the scale of the development and the location of the Site, a 150 m buffer has been adopted for the significant components of the Facilities (refer to **Figure 14-4**).

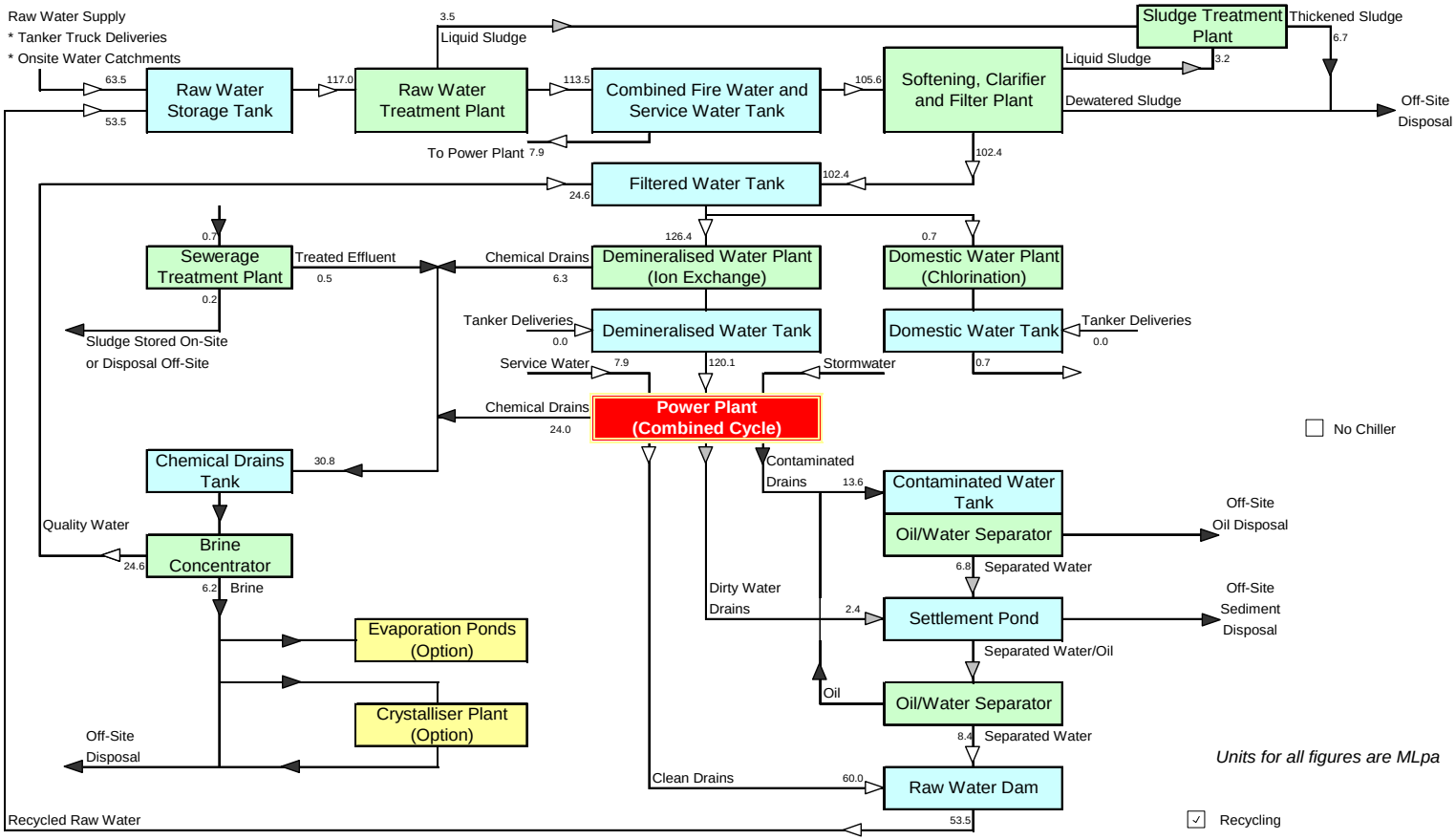
Figure 14-2 Delta Stage 1 Open Cycle Water Management with Recycling



Source : Burns Roe Worley, 2006

Chapter 14 Water Cycle Management

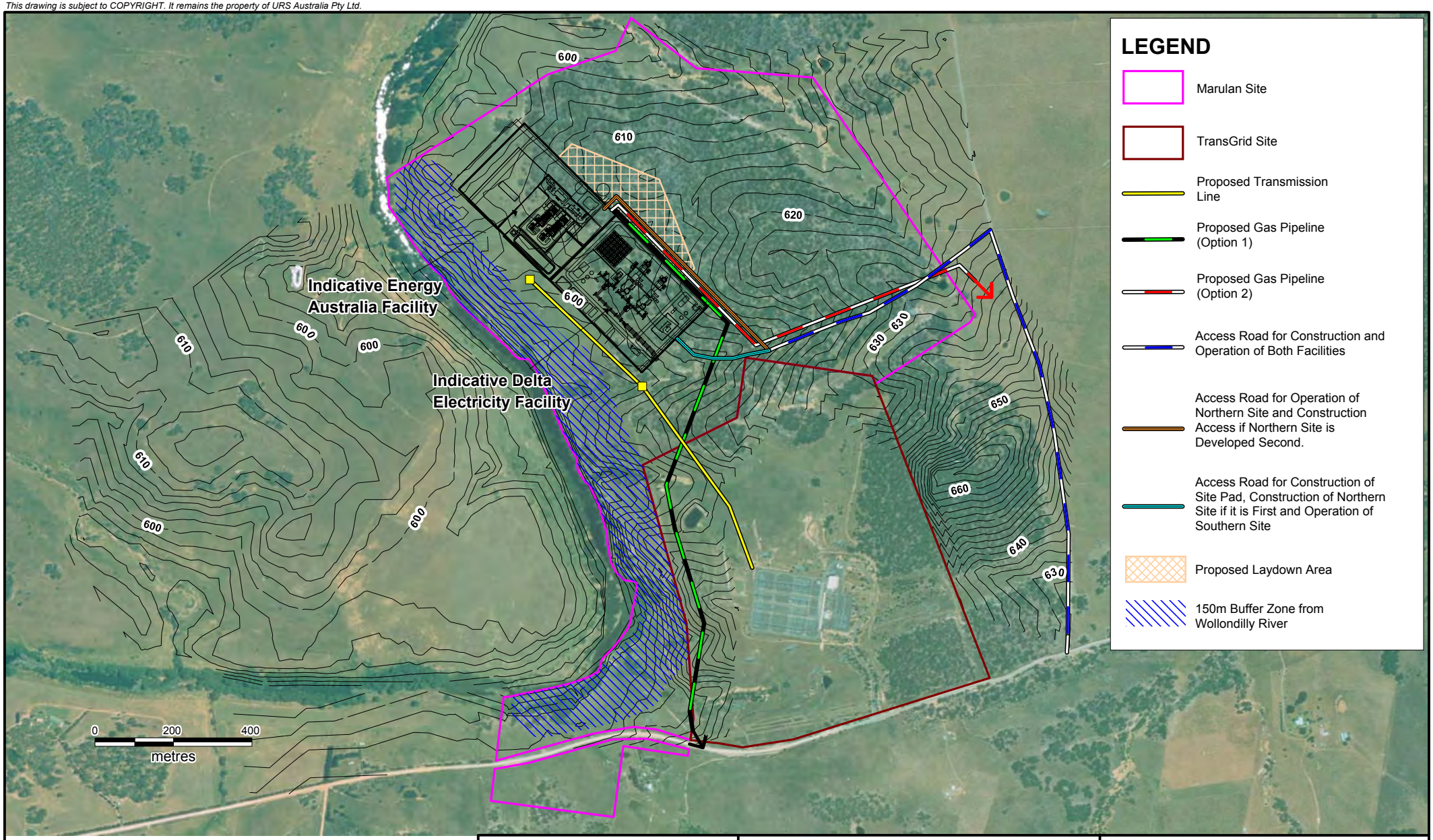
Figure 14-3 Delta Stage 2 Combined Cycle Water Management with Recycling



Source : Burns Roe Worley, 2006

Table 14-2 Indicative Waste Disposal for Delta Electricity Facility

Process	Waste	Treatment and Disposal
Raw water treatment (filtering, softening, reverse osmosis, microfiltration, etc depending on quality)	Liquid sludge	Stage 1 and Stage 2 - Thickening and offsite disposal by truck to a licensed facility.
Filtered Water Plant	Dewatered and liquid sludge	Stage 2 - Liquid sludge would be thickened and combined with the dewatered sludge for disposal by truck to a licensed facility.
Domestic Sewage	Sewage	Stage 2 - Storage without treatment and offsite disposal by tanker truck to local sewage treatment plant.
Sewage Treatment Plant	Treated Effluent and Sewage Sludge	Stage 2 - Onsite treatment. Effluent would be discharged to chemical drains system for reuse in the plant while sludge would be dewatered (belt filter) and disposed offsite by truck to a licensed facility.
Contaminated Drains Oil/Water Separation	Oil/Oily Water	Stage 1 - Oil separation and disposal offsite by tanker truck to commercial oil recycling facility stage 2 - Oil separation and disposal offsite by tanker truck to commercial oil recycling facility. Water directed to settlement ponds.
Dirty Water Drains	Water with dust, oil, chemical contamination	Stage 1 - Discharge to settlement pond to remove sediments and to separate any oil. Sediments removed would be disposed to land fill. Separated oil discharged to the contaminated water system. Clean water discharge would be to stormwater storage/ raw water pond for recycling. Stage 2 - Discharge to settlement pond to remove sediments and to separate any oil. Sediments removed can be buried on the site or disposed in land fill. Separated oil discharged to the contaminated water system.
Clean Water Drains	Water	Stage 1 - Discharge to stormwater storage/ raw water pond for recycling. Stage 2 - Discharge to raw water pond for recycling.
Chemical Drains	Water	Stage 2 - Neutralised water would be supplied to a Brine Concentrator with quality water recycled to the Filtered Water Tank.
Brine Concentrator	Brine	Stage 2 - Offsite disposal by truck to existing power station ash pond or similar disposal facility.



Source: Delta Electricity, EnergyAustralia, Southern Cross Consulting Surveyors

Client
DELTA ELECTRICITY AND ENERGYAUSTRALIA

URS

Project
MARULAN GAS TURBINE FACILITIES

Drawn: AJW | Approved: NB | Date: 12/08/2008

Job No: **43177371** | File No: 43177371-124.wor

Title
INDICATIVE BUFFER ZONE

Figure: **14-4**

EnergyAustralia Facility Indicative Operational Water Requirements

The EnergyAustralia Facility and Delta Electricity Facility have differing operational water demands. The process water demand, based on an assumption of the EnergyAustralia Facility operating for 10% of the year (i.e., operating intermittently but up to a total of approximately 40 days per year) is approximately 12 ML per annum (refer to **Figure 14-5**).

To meet the construction and operational water requirements for the EnergyAustralia Facility, a number of current and potential water sources, including potable, recycled and stormwater have been identified to provide water quantities which can meet and in fact exceed the requirements of the proposed Facility. These would be the primary sources of "raw water" for process and other water needs.

The EnergyAustralia Facility requires process or service water for various purposes including wash down, irrigation and water washing of gas turbines as well as for supply to the water treatment plant for process water as required by the evaporative cooler. Demineralised water may also be required within the process although the quantities required would be minor top-up quantities only.

Water is required to be stored onsite for fire fighting purposes. This would consist of a storage tank but storage may be in conjunction with process water requirements. The volume of the tank would be confirmed at the detailed design stage and in consultation with relevant authorities. **Table 14-3** provides a summary of indicative water demands.

Table 14-3 Summary of Indicative Water Demands – EnergyAustralia Facility

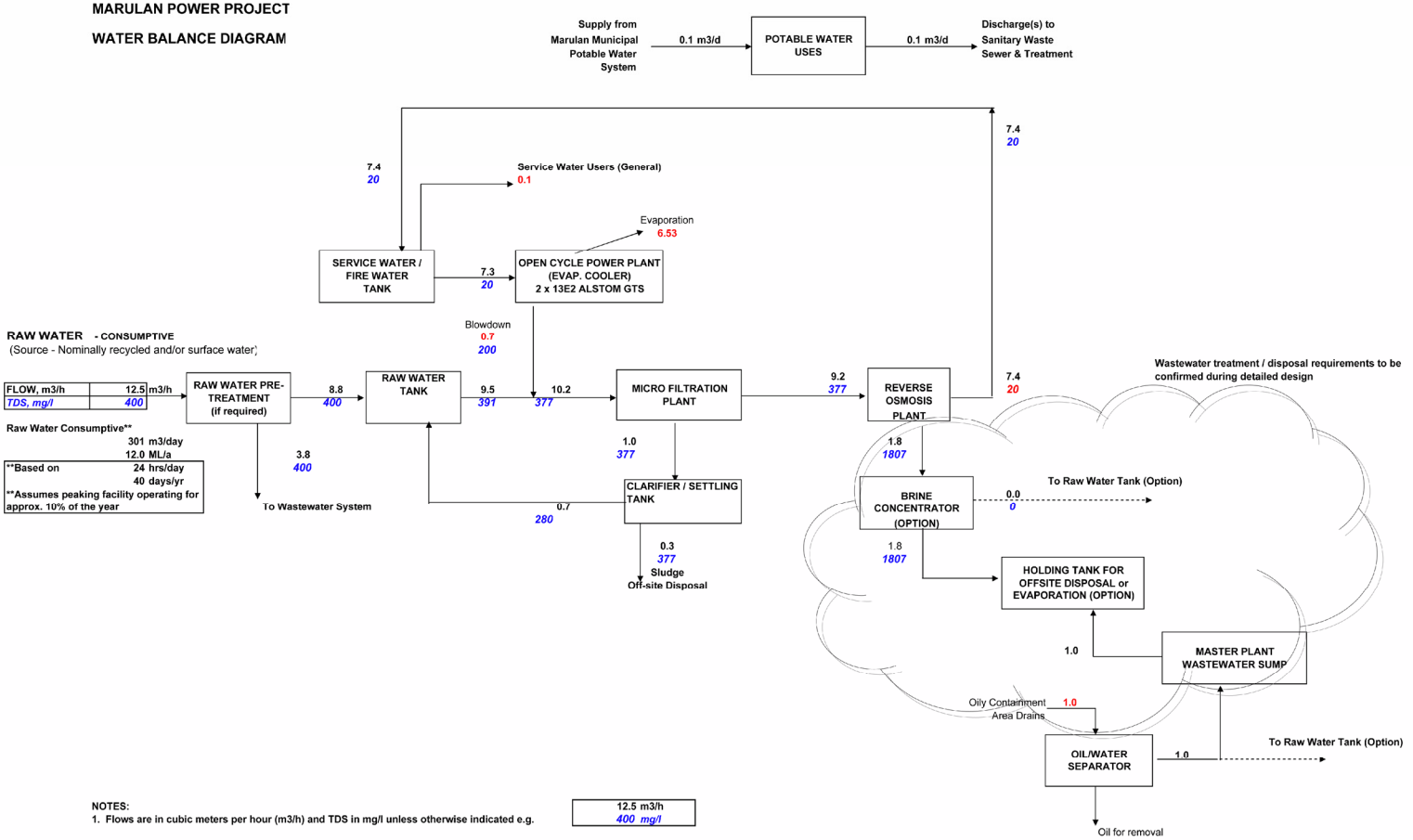
Staging	Indicative Water Requirements EnergyAustralia Facility (ML pa)
Potable	0.04
Demineralised	0.0012
Non-Potable	12.0
	(+ 7.4 EA startup[1])
Total Water Demand[1]	12.0

Source: GHD, 2008.

Notes: 1 . Startup volumes not included in total water demand (one off demand only). They will be required during startup of the EnergyAustralia Facility.

MARULAN POWER PROJECT

WATER BALANCE DIAGRAM



NOTES:

1. Flows are in cubic meters per hour (m3/h) and TDS in mg/l unless otherwise indicated e.g. 12.5 m3/h, 400 mg/l
2. Arrangement shown is indicative and subject to change. Dependent on incoming water quality.
3. Water consumption estimate is based on GT Pro software output and projects of similar nature
4. Reverse Osmosis plant output and reject based on discussions with vendor
5. Some rounding has been undertaken
6. Note that following further analysis, it has been determined that consumptive water demand has been reduced from earlier figures as a consequence of water recovery from the treatment processes

INDICATIVE-NOT FOR DESIGN

Source: GHD, 2117301 - WMB Rev A, 2008

Client: DELTA ELECTRICITY AND ENERGYAUSTRALIA	Project: MARULAN GAS TURBINE FACILITIES	Title: **ENERGYAUSTRALIA FACILITY INDICATIVE WATER MANAGEMENT**
URS	Drawn: AJW; Approved: NB; Date: 03/09/2008	Figure: **14-5**
	Job No: **43177371**; File No: 43177371-195.wor	

EnergyAustralia Facility Waste Management

Rainwater runoff from part of the landscaped areas would be directed to stormwater cut-off drains. The outlets of these drains would be designed to maximise the dispersion of these high flows and thereby minimise their potential to cause erosion downstream. Detention would be provided so that nominated peak flows from the Site do not exceed existing flows. Accumulated water in bunds would be directed to the stormwater pond after passing through the interceptor. Stormwater from the Site would pass through a sedimentation basin / storage pond before discharge from the Site.

Both the stormwater and wastewater storage ponds would be lined with an appropriate impermeable liner to minimise the risk of the water escaping into the natural groundwater system. When required the accumulated sediments / waste sludge collected in the storage ponds would be disposed of by a licensed contractor.

Wastewater volumes have been estimated and management strategies would be developed to maintain a zero discharge from the Site except as part of the natural surface flows.

Given the scale of the development and the location of the Site, a 150 m buffer has been adopted for the significant components of the Facilities (refer to **Figure 14-4**).

A summary of EnergyAustralia's Facility waste disposal is presented in **Table 14-5**.

Table 14-4 Indicative Waste Disposal for EnergyAustralia's Facility

Process	Waste	Treatment and Disposal
Raw water treatment (filtering, softening, reverse osmosis, micro filtration, etc, depending on quality)	Liquid sludge	Treated onsite by a water treatment plant (having a reverse osmosis capability)
Domestic Sewage	Sewage	Proprietary septic-type system and periodically disposed of offsite by a licensed contractor
Contaminated Drains Oil/Water Separation	Oil/Oily Water	Oil recovery pit.
Dirty Water Drains	Water with dust, oil, chemical contamination	Wastewater pond
Clean Water Drains	Water	Stormwater ponds

Potential Water Sources for the Facilities

Based on an average operation of 10 % per annum for the EnergyAustralia Facility and 500 hours per annum for Stage 1 of the Delta Electricity Facility, the total operational water requirement for the Facilities would be approximately 14 ML per annum. During Stage 2 of the Delta Electricity Facility, the total operational water requirement for the Facilities would be approximately 76 ML per annum.

To meet the construction and operational water requirements for the Facilities, it is proposed to use treated effluent from offsite sources and / or rainwater captured from the Facilities hard stand areas. A number of current and potential water sources, including potable, recycled and stormwater have been identified to provide water quantities which can meet and exceed the requirements of the proposed Facilities. The potential sources for water have been considered for the combined requirements of both the Delta Electricity and EnergyAustralia Facilities. Water source options include:

- Marulan water supply network;

- Marulan sewage treatment plant;
- Moss Vale sewage treatment plant; and
- Site stormwater runoff.

Any of the above water servicing options for each of the Facilities' water demands could be adopted in conjunction with the other options. A decision would be made on the preferred option or option mixes following appropriate assessment of economic and non-economic factors. The water sources listed above have been identified to provide water quantities which can meet and exceed the requirements of the proposed Facilities. Whilst it is recognised that these potential sources will require further design and negotiation with the Water Supply authorities, the volumes, diversity of supply and timing reduce the risk that the water demand for the Facilities will not be met.

It is proposed that water would be trucked to the Site to meet the operational requirements for the EnergyAustralia and Delta Electricity Facilities. A new pipeline may be considered to meet operational needs for EnergyAustralia and Delta Electricity Stage 2 Facilities however this pipeline would be subject to further consultation, detailed design and approvals.

Current and Future Regional Water Demands

The Goulburn Mulwaree local government area is expected to experience modest population growth in selected areas, including Goulburn and Marulan, with lower levels of growth expected in Tarago and rural villages. Goulburn Mulwaree Council is seeking to encourage population and employment growth across the whole of the Goulburn Mulwaree area. Evidence from recent development data indicates positive trends particularly in Goulburn. This may be largely attributed to the 'tree change' phenomenon, which has been stimulated by lifestyle choices and higher property prices in the Sydney metropolitan and the coastal areas.

The major water storages servicing the Goulburn Mulwaree local government area are the Sooley and Pejar Dams and the Rossi River. Goulburn's water supply is currently supplied from the Rossi Weir, with Pejar and Sooley Dams providing water storage and release flows when the flows at Rossi Weir are insufficient to meet supply needs or for environmental requirements. Marulan's water supply is sourced from the Wollondilly River.

Between 2000 and 2006 Goulburn's water resources became increasingly stressed due to below average rainfall. This led to significant water restrictions, emergency water supply measures and the planning and funding of a Wingecarribee Reservoir to Goulburn pipeline.

As indicated above, a number of the water sourcing options were influenced by the actions and proposed programs of Goulburn Mulwaree and Wingecarribee Shire Councils.

Discussions with Goulburn Mulwaree Council identified that;

- Council undertook a *Sewerage Master Plan for the Marulan Township Development* in 2005, however the (then) anticipated rate of developments have not materialised and as such Goulburn Mulwaree Council is currently in discussions with current and potential high water demand customers to determine its strategy forward.

- Goulburn Mulwaree Council's current water and waste water strategies are set out in its *Management Plan 2008/09* (available on Council Web Page) which makes provisions for:
  - Development of an Integrated Water Cycle Management Plan (ongoing asset), targeted for completion in December 2008.
  - Marulan Sewerage Treatment Plant Investigation and Design (new asset) commencing in the 2010/11 financial years.
  - A Sewer Pumping upgrade of the Marulan Pumping Station over the next four years.
  - Identified Marulan STP Investigation and then construction in its 'Forward Capital Works Plan' for the next four years as a 'forward capital'.
  - Identified a Marulan Raw Water Mains, Pumping Station upgrade though this is included in Council "*Projects NOT able to be included '*, as funds are not available.

Discussions with Wingecarribee Shire Council identified that;

- Some 600 ML per annum of recycled water available for the Moss Vale sewage treatment plant.
- Effluent is currently discharged to Whites Creek with no immediate plans for alternative effluent management.
- Plant augmentation is to be considered as part of a feasibility study to meet future requirements (nominally around 2010) which will also include consideration of reuse options.

Conclusion

To meet the construction and operational water requirements for the Facilities, it is proposed to use treated effluent from offsite sources (Marulan water supply network, Marulan sewage treatment plant, Moss Vale sewage treatment plant) and / or rainwater captured from hard stand areas. Any of these water servicing options for each of the Facilities' water demands could be adopted in conjunction with the other options. A decision would be made on the preferred option or option mixes following appropriate assessment of economic and non-economic factors.

It is proposed that water would be trucked to the Site to meet the operational requirements for the EnergyAustralia Facility and Delta Electricity Facility as these water requirements are relatively low. A new pipeline may be considered to meet the combined operational needs for EnergyAustralia and Delta Electricity Stage 2 Facilities; however, this pipeline would be subject to further consultation, detailed design and approvals.

14.6.3 Drinking Water Catchments REP No 1 - Summary of Response

Although the proposal is being assessed under Part 3A of the EP&A Act and is critical infrastructure the Environmental Assessment Requirements request that as the proposed development falls within the area covered by the *Drinking Water Catchments Regional Environmental Plan (REP) No. 1*, the development should assess the impacts on drinking water quality through water quality criteria and certain heads of consideration in the REP which, while not specifically stated in the REP, are generally established in the SCA *Neutral or Beneficial Effect on Water Quality Assessment Guidelines (Guidelines)*.

Chapter 14 Water Cycle Management

Further detail on the response to the neutral or beneficial effects test is provided in the respective *Project Applications* however the following provides a summary of the outcomes:

- Each development separately and cumulatively satisfies the requirements laid out in the Guidelines.
- Certain sections of the proposed development have the potential to impact on water quality if no mitigation measures are incorporated into the design. Detailed design would ensure all necessary measures are incorporated to ensure that any waste water or polluted water is captured within the site and does not leave the site, other than to transport the waste to a suitable treatment plant.
- Detailed design would ensure a similar approach is adopted to capturing runoff from clean areas and this runoff is captured for recycling into the development processes and activities. Again, any waste water would be captured and either recycled or transported off-site for treatment.
- There will be a reduction of flows into the Wollondilly River however the reduction is not significant from an overall catchment or sub-catchment point of view and would have no identifiable potential impact on water quality.
- There will be some clearing of vegetation however there are no watercourses affected by the development. Mitigation measures have been identified and designed for both the construction and operational phases of the proposed development to ensure that there is no degradation of flows into the River and that all flows that would have passed through the Site are diverted and returned to their natural course to the River.
- Detailed design would ensure that only rainfall directly onto the Facility area would be captured for recycling. This water would be treated and cleaned for limited recycling with residues taken off-site for disposal in accordance with the requirements of REP No. 1.
- There would be no clearing or degradation of watercourses or of riparian corridors as a result of this proposed development.

14.7 Assessment of Impacts – Pipeline

14.7.1 Construction

At this stage the alignment of the pipeline has not been refined and will be located within the corridor identified in **Figure 4-3**, however some disturbance of soil would be required during the construction phase. Rainfall on the disturbed sites may cause soil erosion and runoff may contain high levels of sediments which could then enter the natural drainage system depending on the final alignment.

There is also the potential for spills and gross pollutants to be mobilised by runoff and enter the natural drainage system if no mitigation measures are put in place.

The disturbed area would be rehabilitated following construction and is likely to involve measures to revegetate the disturbed area (for example through seeding).

A detailed Soil and Erosion Control Plan would be developed and implemented as part of the Construction Environmental Management Plan for these works.

14.7.2 Operation

Once the pipeline is installed and the area rehabilitated effectively, it is not anticipated that there would be any impacts associated with its operation.

14.8 Mitigation Measures

Table 14-4 presents a summary of mitigation measures related to water management for the proposed works. The phase of implementation is indicated in the table by *Cons* – Construction, *Ops* – Operation and *Design*.

Table 14-5 Summary of Mitigation Measures

Mitigation Measures	Implementation of mitigation measure		
	Common Shared Works	Facilities	Gas Pipeline
As a way of further enhancing public infrastructure, and if deemed viable, upgrade works would be undertaken to local sewage treatment facilities to meet the Facilities' operational water requirements.	✓ (Cons & Ops)	✓ (Cons & Ops)	
Site Design			
The Facilities would be designed to incorporate the following: • minimum elevation of risk averse property within the Facility is to be approximately 605 m AHD to minimise the potential for flooding; and • maintaining approximately 150 m between the Wollondilly River and the Facilities.		✓ (Design)	
Soil Erosion			
All construction works would be undertaken in a manner to minimise the potential for soil erosion and sedimentation and managed through a Soil and Erosion Control Plan. These measures would be incorporated into the CEMP. The CEMP would address the potential staging of the bulk earthworks: ▪ should the bulk earthworks be progressed at the same time for both Facilities and there is a time lag until further construction, measures required for longer term erosion control would be implemented on the vacant pad area until further work for construction of that facility commences; and ▪ in the event that earthworks progress separately for the two Facilities, then each Facility site would manage the earthworks and runoff appropriately through a Soil and Erosion Control Plan.	✓ (Cons)	✓ (Cons)	✓ (Cons)

Chapter 14 Water Cycle Management

Mitigation Measures	Implementation of mitigation measure		
	Common Shared Works	Facilities	Gas Pipeline
Spills and site management			
All possible pollutant materials would be stored well clear of site boundaries and stormwater drainage lines and stored in a designated covered area.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Appropriately bunded areas would be included for storage of fuels, oils and chemicals.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Waste collection areas would be designated	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Appropriate bunding would be installed and appropriate containers would be provided.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Waste disposal and collection would be properly undertaken.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
All major vehicle maintenance would be undertaken off-site.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Any vehicle washing on-site would be restricted to designated bunded areas.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	
Staff facilities would be installed and maintained so that pollutants, including wash water are not conveyed from the site in stormwater so there is no discharge to the environment.	✓ (Design & Cons. & Ops.)	✓ (Design & Cons. & Ops.)	✓ (Cons.)
Surface water			
There would be no direct drainage from the Site to Wollondilly River other than natural surface flows.	✓ (Design & Ops.)	✓ (Design & Ops.)	
Water management strategies would be developed and implemented to maintain zero discharge from the site except for natural surface flows.	✓ (Design & Ops.)	✓ (Design & Ops.)	
Water from impervious surfaces would be directed through oil and grit traps designed to remove any oil and minimise suspended solids to an acceptable level prior to discharge from the site. This system may also be fitted with a gross pollutant trap to collect any large material mobilised by stormwater.	✓ (Design & Ops.)	✓ (Design & Ops.)	
The outlet of the Facilities' stormwater system would be designed to maximise the dispersion of these high flows and spread the outflow over a wider area and thereby minimise their potential to cause soil erosion downstream.	✓ (Design & Ops.)	✓ (Design & Ops.)	

Mitigation Measures	Implementation of mitigation measure		
	Common Shared Works	Facilities	Gas Pipeline
Wastewater Treatment			
Maintain minimum distance of 150 m from the Wollondilly River for effluent management areas.	✓(Cons.)	✓ (Cons.)	
Staff facilities would be installed and maintained so that pollutants, including wash water are not conveyed from the site in stormwater. All wastewater generated during the construction period would be disposed of offsite to a licensed facility.	✓ (Cons.)	✓ (Cons.)	✓ (Cons.)
"Black" wastewater generated during operations would be treated by a proprietary septic-type system and waste products stored and then disposed of offsite by a licensed contractor.	✓ (Design & Ops.)	✓ (Design & Ops.)	
Clean water drains would be directed to the stormwater storage pond from, which any stormwater flow would be released in a regulated manner.	✓ (Design & Ops.)	✓ (Design & Ops.)	
Dirty Water drains would be directed to settlement ponds and oil/water separators before discharge to the on-site wastewater pond.	✓ (Design & Ops.)	✓ (Design & Ops.)	
Contaminated drains would be directed to a contaminated drains tank with oil water separator. Oil would be disposed offsite to a licensed facility and water would be directed to the on-site wastewater pond.	✓ (Design & Ops.)	✓ (Design & Ops.)	