Water – Summary of Key Outcomes

The water requirements, wastewater production, stormwater management and flooding potential have been assessed for both construction and operation of the Buronga Peaking Power Plant Project.

Rainwater and stormwater captured on the developed area would be used on site as much as practicable.

Subject to detailed design investigations, it is intended that harvested site stormwater and, where practical, treated effluent from the Buronga Sewage Treatment Plant (STP) would be recycled for use at the site as the primary source of 'raw water' for process and other water needs. Based on the documentation provided in the DWE web-site regarding "Farm Dams", the requirements of the Maximum Harvestable Right Dam Capacity and dam licensing do not apply to this site. Raw water would be treated on-site by a water treatment plant (having a reverse osmosis capability) for use as demineralised plant process water, fire fighting and domestic water. A maximum of 40ML of raw water would be required per annum but it is anticipated that average annual raw water requirements would be approximately 20ML. Raw water derived from stormwater would be stored in a collection pond (stormwater pond) on site before treatment and raw water derived from STP effluent (trucked to site) would be stored in a dedicated site storage tank before treatment.

The average volume of process water required for air emission control and inlet air cooling purposes is expected to average 15ML per annum up to a maximum of 30ML. Process water production includes 150kL of stored water reserved exclusively for fire fighting purposes.

Landscaping water is proposed to be sourced from rainwater, treated effluent and recycled waste water.

The expected volume of wastewater produced from the water treatment plant is up to 12ML per annum, representing the main wastewater source of the peaking power plant. This wastewater would be directed to the site waste water pond. There would be provision for pump out and off-site disposal, in the unlikely event that the waste water pond is full when additional storage is required. Wastewater volumes have been estimated and management strategies developed to maintain a zero discharge from the site except as part of the natural surface flows.

Rainwater runoff from landscaped areas would generally be directed to cut-off drains the outlets of which would be designed to maximise the dispersion of these high flows and thereby minimise their potential to cause off-site 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 storm water pond after passing through the interceptor.

The storm water and waste water ponds would each be lined with an appropriate liner to minimise the risk of the water escaping into the natural groundwater system. When required, the accumulated sediments/waste sludge collected in the ponds would be disposed of by a licensed contractor.

All construction works would be undertaken in a manner to minimise the potential for soil erosion and sedimentation.

Chapter 14 Water Cycle Management

14.1 Introduction

This chapter presents an assessment of the water requirements, wastewater production, stormwater management and flooding potential at the site for the proposed Buronga Peaking Power Plant. Both the construction and operation aspects have been considered.

This assessment has been conducted to include:

- an assessment of the water quantity and quality impacts of the proposal, with particular reference to the water needs of the Buronga Peaking Power Plant;
- the proposed sources of water; including the applicability of the *Maximum Harvestable Right Dam Capacity* as set out in the NSW *State Farm Dam Policy*;
- the implementation of water saving measures;
- identification of the quantity and quality of wastewater and how this wastewater is to be disposed of;
- how stormwater is to be managed at the site; and
- potential for flooding on site.

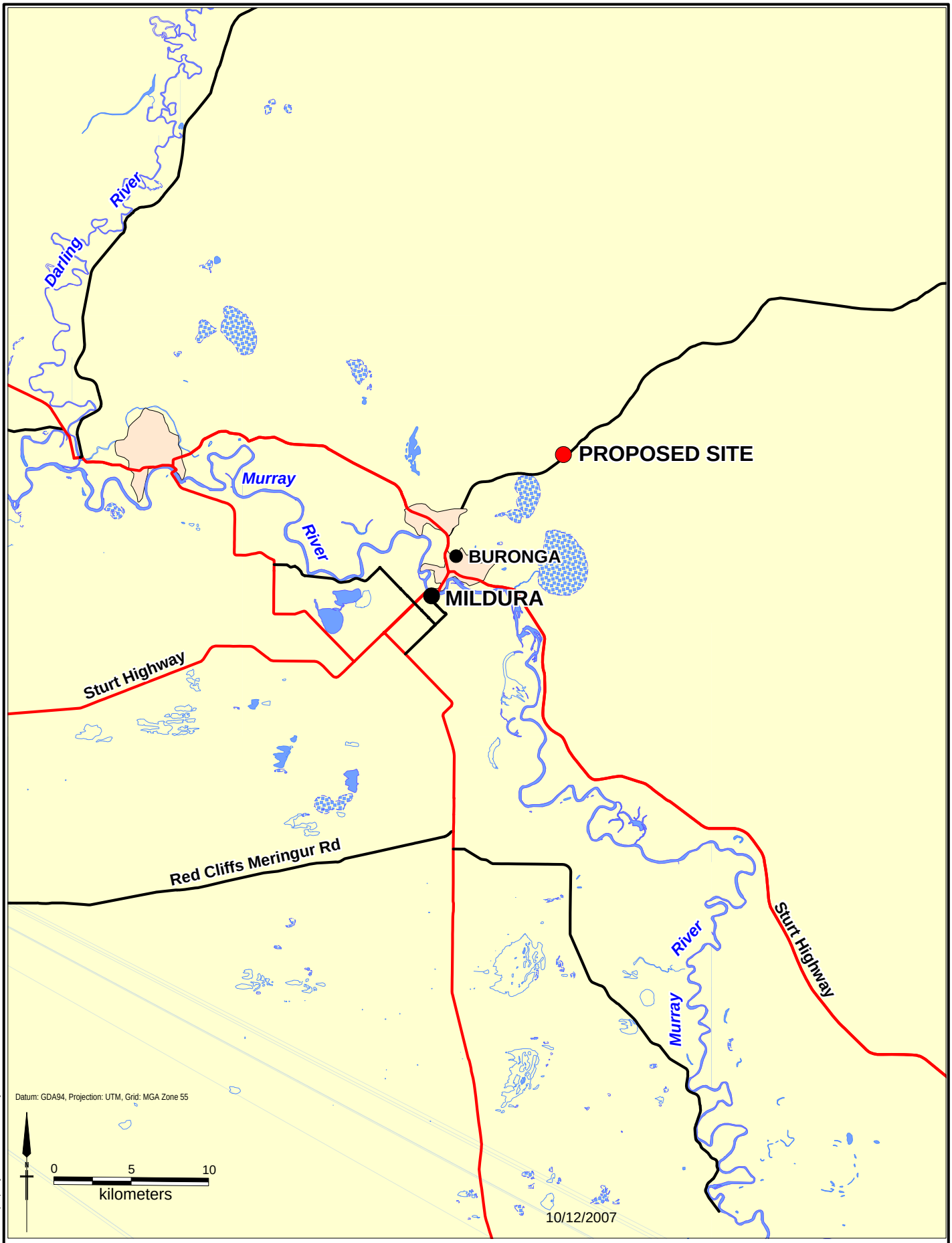
14.2 Existing Environment

The proposed site is located in the Murray-Darling Basin in south-western NSW, approximately 10km northeast of the town of Buronga (**Figure 14-1).** The proposed site is located on the northern side of Arumpo Road immediately adjacent the existing 220kV TransGrid owned switching station. The site is situated approximately 2.5km northeast from the edge of Lake Gol Gol and lies approximately 9km north of the Murray River.

The site is of a sandy nature and vegetation currently comprises open scrubland interspersed with Belah Woodland and Sandplain Mallee communities. The proposed plant would be constructed on a generally level earth bench with minor grading to create a positive fall for surface drainage. The construction bench is expected to be around 0.5 to 0.8m above existing ground level at around 48m AHD.

The landform to the east and west of the proposed site is generally level, with some local grading up to the road corridor. The landform falls very gently from north west to south west across and beyond the proposed site.

Figure 14.1 presents the major surface water features in the area. Apart from a small stock dam there are no developed water sources at the site.



Client: INTERNATIONAL POWER	Project: BURONGA PEAKING POWER PLANT	Title: **LOCAL AND REGIONAL SURFACE WATER FEATURES**
URS	Drawn: BH; Approved: WB; Date:	Figure: **14.1**
	Job No: **43177455**; File No: 43177455.009.wor	

The following table shows relevant climatic data applicable to the site:

	Annual (mm)
Average Rainfall	285.2
Decile 9 Rainfall	392.8
Decile 1 Rainfall	170.7
Average Evaporation	2190

14.3 Water Requirements and Management

During operation of the plant, water would be required at the site for the following uses:

- process water;
- domestic uses;
- general operations and maintenance;
- fire fighting; and
- landscaping.

The requirements for these uses are discussed in more detail below and presented in **Figure 14-2** *Water Balance*.

14.3.1 Process Water Requirements

The main process water requirement is for inlet air cooling and NOx emission control purposes. Comparatively smaller quantities are used for other process purposes, e.g. compressor blade washing.

Inlet Air Cooling

Inlet air cooling allows the gas turbine to maintain a high level of output and avoid generation reduction associated with high ambient temperature operation. To achieve this, IPRA proposes to install evaporative cooling equipment in the gas turbine inlet air duct systems.

Gas turbines are “constant air volume” machines which at any given shaft rotation speed always move the same volume of air. As the density of the air passing through the gas turbine reduces with increased temperature, the gas turbine maximum output reduces. To offset this reduction in maximum output on hot days, moisture is injected into the inlet air to cool the air temperature (the air is cooled as the moisture evaporates) and increase the air density or “mass volume”. The increase in the density of the air mixture, allows the gas turbine to operate closer to its optimum design output.

Without such cooling the gas turbine output would reduce by as much as 15% at high summer temperature conditions.

Exhaust NOx Emission Control

NOx air emissions will be controlled through water injection for the reasons described in **Chapter 3**.

Essentially, water injected into the combustion chamber reduces the peak flame temperature so as to reduce the production of NOx which is a product of any combustion of fuel in air.

Total Process Water Requirements

The total process water requirements are presented in **Table 14-1**. These are maximum quantities of treated process water required to allow maximum operating capacity generally during hot summer weather with low humidity.

Table 14-1 Process Water Requirements

Process Water Use	Water Demand Requirement for Operation at Maximum Capacity (kL/hr)	
	per turbine	total (3 turbines)
NO_x emission control	9	27
Air cooling	11	33
Other (e.g. blade washing)	<<1	<1

Actual water consumption would vary with ambient and operating conditions. It is expected that some extent of evaporative cooling water will be required during most summer months when there is a high ambient temperature. Evaporative cooling may not be required at all during winter months.

The average volume of process water required for combined emission control and inlet air cooling purposes is expected to be 15ML/annum up to a maximum of 30ML/annum. While some evaporative cooling water is recoverable for re-use, in excess of 50% would be evaporated into the atmosphere.

Domestic Uses

Water would be required for staff facilities, including drinking water, hand washing, showering and toilet flushing. Water for drinking must be of potable quality. It is estimated that up to 5kL/annum would be required. For short periods of time, during major maintenance activities, additional staff would be based at the site and therefore some additional imported domestic water may be required.

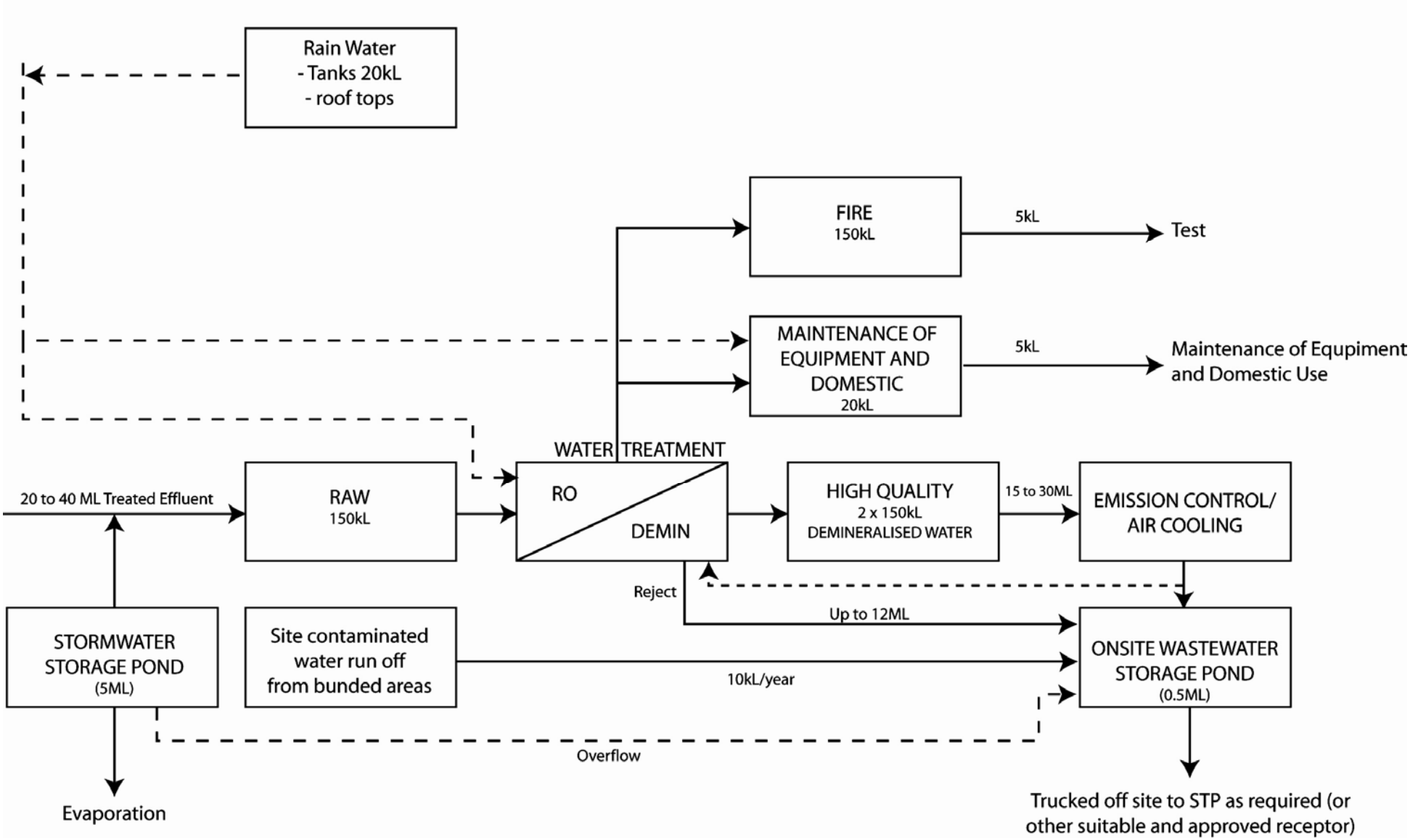
14.3.2 General Purpose (Operation & Maintenance)

A small volume of water would be required for operation and maintenance. It is estimated that up to 5kL/annum would be required. This water would not be required to be of potable quality. However it should not be turbid and should have low levels of suspended solids and salts.

14.3.3 Fire Fighting

Water will be stored on the site for fire fighting. It is proposed that tank storage (comprising up to four tanks, subject to design considerations) would hold 150kL permanently reserved for this purpose. Approximately 5kL per annum will be used to test fire-fighting equipment. As far as practicable, water used for testing fire-fighting equipment will be recycled for site use.

Fire-fighting water would not need to be of potable water quality. However, it needs to have low levels of suspended solids and salts.



Client: INTERNATIONAL POWER (AUSTRALIA) PTY LTD	Project: BURONGA PEAKING POWER PLANT	Title: **WATER BALANCE ANNUAL ESTIMATE**
URS	Drawn: AJW · Approved: CJ · Date: 15/05/2008 Job No: **43177455** · File No: 43177455.022.wor	Figure: **14-2**

14.3.4 Landscaping

To enhance the local ecology and provide landscaping, vegetation would be established around the perimeter of the site. In order to minimise water usage, these areas would be planted with species that are both local to the area and whose water requirements can be supplied by rainfall alone. Supplementary irrigation water may be required during establishment.

14.4 Water Sources

A number of water sources for the Project have been considered. Primary source options for each use are discussed below. In addition, during the construction and initial setup of the peaking power plant operations, the local potable water supply, trucked to the site, would likely be the main water source. Depending on quality, effluent from the Buronga Sewage Treatment Plant could be a further source of water during the construction period.

14.4.1 Process Water Source

Subject to detailed design investigations, it is intended that harvested site stormwater and where practical, treated effluent from the Buronga Sewage Treatment Plant (STP) would be recycled for use at the site as process water, making use of otherwise waste water. Preliminary discussions have taken place with Wentworth Shire Council to establish the availability of treated effluent. Wentworth Shire Council has indicated that, in principle, it supports the effluent being trucked from ponds at the Sewage Treatment Plant for use by the Project.

Treated effluent would be trucked to the site in appropriate tankers. Generally a minimum of 150 kL would be stored at the site before treatment and use.

Effluent from Buronga Sewage Treatment Plant is not of the quality required for process water as it contains salts and other impurities. It is proposed to construct a water treatment unit (including a reverse osmosis capability) at the site to treat this water before its reuse as process or other water with up to 300kL stored at the site for use on an as required basis. In addition, a minimum of 150kL of treated water will be reserved for fire fighting purposes.

As indicated in **Section 14.3.1**, process water requirements will range from an expected average 15ML/annum up to a maximum of 30ML/annum. Depending upon the type of water treatment plant installed, this equates to a total “raw water” requirement (that is, before treatment) of between 20ML/annum up to a maximum of 40ML/annum.

14.4.2 Domestic Use and General Purpose (Operations and Maintenance) Use Source

A relatively small volume of water would be required for domestic and general purpose operations and maintenance use. This has been estimated as 10kL/year. As there will be a number of buildings at the site (including administration, store, controls, and workshop buildings) and the gas turbine enclosures, some or all of these roofed areas will be connected to rainwater tanks (of at least 10kL capacity) as an additional raw water source.

Chapter 14 Water Cycle Management

Rainwater would be of suitable quality for potable and non-potable domestic uses including drinking, showers, toilet flushing and for the required maintenance activities. In the unlikely event of a shortfall, the rainwater system would be supplemented by potable water trucked to the site in water tankers.

The rainwater collection system will be properly designed and maintained to ensure that water entering and stored in these tanks remains of good quality. Water collection systems (such as a "first flush system) would ensure water most likely to be contaminated by particles and other potential contaminants on roofs does not enter the rainwater tanks.

14.4.3 Fire Fighting

Water for fire fighting purposes would be sourced from treated raw water as for process water (refer **Section 14.4.1**).

14.4.4 Landscaping

Water would be required for landscaping of the screening vegetation surrounding the peaking power plant on completion of the proposed construction activities particularly during the vegetation establishment phase. This water would be sourced from the plant's domestic wastewater treatment system or from the site's rainwater tanks.

14.4.5 Dam Requirements

Maximum Harvestable Right Dam Capacity

Using the Calculator provided in the DWE web-site, the Maximum Harvestable Right Dam Capacity for this site is 0.5ML – this is a very small (4ha) site and the multiplier adopted was 0.13.

However, in the Section headed "Special Dams Exempt From Harvestable Right Calculations", "dams for the capture, containment and recirculation of drainage and/or effluent, that conform to best management practice or are required by regulation to prevent the contamination of a water source" are exempt from harvestable right calculations.

It is contended that the stormwater storage pond proposed for this development meets the latter criteria and that the Maximum Harvestable Right Dam Capacity does not apply to any action on this site.

Licence Requirements

A Stormwater Storage Pond has been allowed for with this pond supplementing the harvesting of roof runoff into rainwater tanks with volumes up to 20kL (0.02ML). Any excess from the tank (or tanks) will be diverted to the stormwater storage pond with nominal capacity 5 ML, where, if the latter overflows, excess runoff will pass into the Waste Water Storage Pond and be trucked off site as necessary.

As the purpose of the proposed stormwater storage pond is to contain stormwater from the general site area and ensure that the site does not discharge potentially contaminated water into the local water sources, no Licence is required.

14.5 Wastewater Generation and Management

Wastewater from the proposed Buronga Peaking Power Plant Project would be generated by the following operations:

- wastewater from the water treatment unit;
- domestic wastewater;
- wastewater from general purpose use (operations & maintenance) activities;
- fire water;
- water storage tanks overflow and spills; and
- stormwater from bunded areas that may be contaminated.

These wastewater sources are discussed in further detail below and shown in **Figure 14-2** *Water Balance*.

Wastewater volumes have been estimated and management strategies developed to maintain a zero discharge from the site except for part of the natural surface flows.

14.5.1 Wastewater from Processes

The water treatment unit including its reverse osmosis (RO) components would produce a wastewater stream of highly saline water. Subject to the ultimate water treatment / RO plant selected, wastewater volume may range between 25% to 40% of the volume of incoming raw water. The maximum annual volume generated would be approximately 12 ML/annum. This would be the primary source of wastewater generated on site.

Liquid waste generated through the washdown of the turbine blades is expected to contain only contaminants from the inlet air and the cleaning agents used. This wastewater would be directed into the wastewater pond.

A small quantity of chemicals (anti-scalant, citric acid, sulphuric acid, caustic soda) will be required to recondition the RO membrane from time to time. The spent chemicals will be neutralised before being discharged into the waste water pond.

To ensure zero local discharge of this wastewater, it would be directed to an appropriately sized and constructed lined wastewater pond before being trucked off site to an approved receptor. The generation of wastewater would be concentrated at certain times of the year coinciding with the anticipated operating regime of the peaking power plant (refer to **Chapter 4**).

As outlined above, the volume of the stormwater pond and the wastewater pond would be dependant on the final design of the gas turbine unit and the predicted climatic conditions. Occasionally, large volumes of wastewater and stormwater may be required to be stored for some time until ambient conditions allow it to evaporate. The stormwater and wastewater ponds would be sized to ensure that they do not overflow (up to 1 in 100 year probability). The expected timing of wastewater generation and corresponding evaporation rates and rainfall would be taken into account. The final sizes required would be decided during the detailed design phase.

There would be provision for pump out and off-site disposal, in the unlikely event that the stormwater and wastewater ponds are full when additional maximum storage is required. The sizing of the stormwater and wastewater ponds (refer to **Figure 14-3** for location) is based on an optimal depth for evaporation, with a substantial freeboard.

The stormwater and wastewater ponds would be lined with an appropriate liner to prevent ingress of saline water into the groundwater. Sediments accumulating on the bottom of the ponds would be periodically removed from site by a licensed waste contractor. The ponds would be designed to facilitate this activity.

14.5.2 Wastewater from General Operations and Maintenance

Domestic Wastewater

A small amount of domestic wastewater would be generated by on-site staff and may contain pathogens, oils and greases and small amounts of chemicals such as detergents and soaps.

The generation of wastewater would occur year-round and increase over the 4 to 5 weeks each year when plant is undergoing inspection or maintenance.

Domestic wastewater is estimated to be less than 5kL/annum on average and would be treated to meet on-site disposal standards. On-site disposal will comprise either a recognised proprietary treatment system and/or a storage and pump-out system for disposal of wastewater off-site at an appropriately licensed facility.

The sewerage system would comply with the requirements of Wentworth Shire Council and the Department of Health.

14.5.3 Fire Fighting

In the event of a fire, wastewater from fire fighting would be collected in bunded areas and/or be drained into the wastewater pond. It may be of poor quality and would be assessed after any event and disposed of off site at licensed facilities if necessary.

All bunds would be sized to conform to relevant industry guidelines and Australian Standards.

14.5.4 Spills

Accidental spills would produce liquid wastes - this would be most likely at the distillate fuel tanks, liquid offload area, liquid stores, the generating plant, transformers and workshop areas. Some of these areas are required by regulation to be bunded. All spills will be contained within bunds or a waste collection system to prevent contaminated water from entering the overland flow system.

A spill management plan will minimise the likelihood of spills occurring and to minimise their impact if they do occur.

14.5.5 Bunded Water

Rainwater collected in fuel storage, fuel unloading and transformer bunds would be regarded as contaminated and would firstly be directed into an oil and water interceptor unit where residue hydrocarbon material is retained.

Bunded areas would be sized to contain potential spills and the maximum potential firewater and/or rainfall.

Rain falling into bunds would be directed into the wastewater pond. This system would be fitted with overflow sensors providing prior warning to the operator. Water collected in bunded areas would be released manually into the site interceptor pit.

Fire water or spills from the minor chemical storage area will be directed to the on-site wastewater pond. Except where recycling is possible, contaminated water will be contained and disposed off site.

14.6 Flooding

The draft Flood Study being undertaken by Patterson Britton & Partners for Wentworth Shire Council was discussed with Council. Wentworth Shire Council could not release the study as it was in draft form. The site was discussed and it was confirmed that it is not subject to mainstream flooding and there are no flood related development controls applying to the site.

14.7 Stormwater Management

14.7.1 Construction Period – Potential Impacts

During the construction period, approximately 4ha of land would be disturbed in order to construct the facility and access road. Rainfall on these disturbed sites may cause soil erosion and runoff may contain high levels of sediments which could then enter the natural drainage system. Given the site area is relatively flat, most of the disturbed sites are likely to present minimal erosion hazard and be classified Soil Loss Class 1.

There would also be 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.

14.7.2 Construction Period – Mitigation

All construction works would be undertaken in a manner to minimise the potential for soil erosion and sedimentation. At a minimum, the measures outlined in the *Managing Urban Stormwater – Vol 1 Soils and Construction (the Blue Book)* would be implemented.

Construction would be planned to minimise the time that disturbed land is exposed. Soil testing at the site would be undertaken to determine erodibility and dispersiveness. Within areas which are disturbed, appropriate erosion prevention and sedimentation devices would be installed and maintained in line with Blue Book guidelines. This may necessitate the installation of sediment filters and the construction of a sedimentation basin downstream of the construction area. These devices would remain in place until the surface is restored.

Disturbed sites would be quickly revegetated or covered with a non-erodable surface following construction.

Stormwater flowing onto the site from adjacent areas would be directed around any earthworks.

Spills would be minimised through proper site management. If any spill was to occur, it would be likely to be of a small volume and contaminate only a small area. All possible pollutant materials would be stored well clear of site boundaries and stormwater drainage lines. They would be stored in a designated covered area. Containment bunds would be constructed 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 on-site would be restricted to specific bunded areas.

Staff facilities would be provided and installed and maintained so that pollutants, including wash water are not conveyed from the site in stormwater.

During the construction period water may be required for dust suppression. This would be sourced from Wentworth's Sewage Treatment Works if available or purchased from other local sources.

14.7.3 Operation Period – Potential Impacts

Stormwater falling onto hard surfaces has the potential to increase the peak rate and volume of stormwater runoff. This would be mitigated through the drainage design and detention provisions detailed in **Section 14.7.4**.

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

- Rainfall runoff from operational areas of the site;
- Rainfall runoff from the access road; and
- Accumulated water within bunds.

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

14.7.4 Operation Period – Mitigation

The flow path of stormwater controls is presented in **Figure 14-3**.

Rain falling onto the site would be collected as far as is practical for use within the site. Once the storage tanks are full, excess rainwater will be directed into the site stormwater pond where detention and sedimentation would occur.

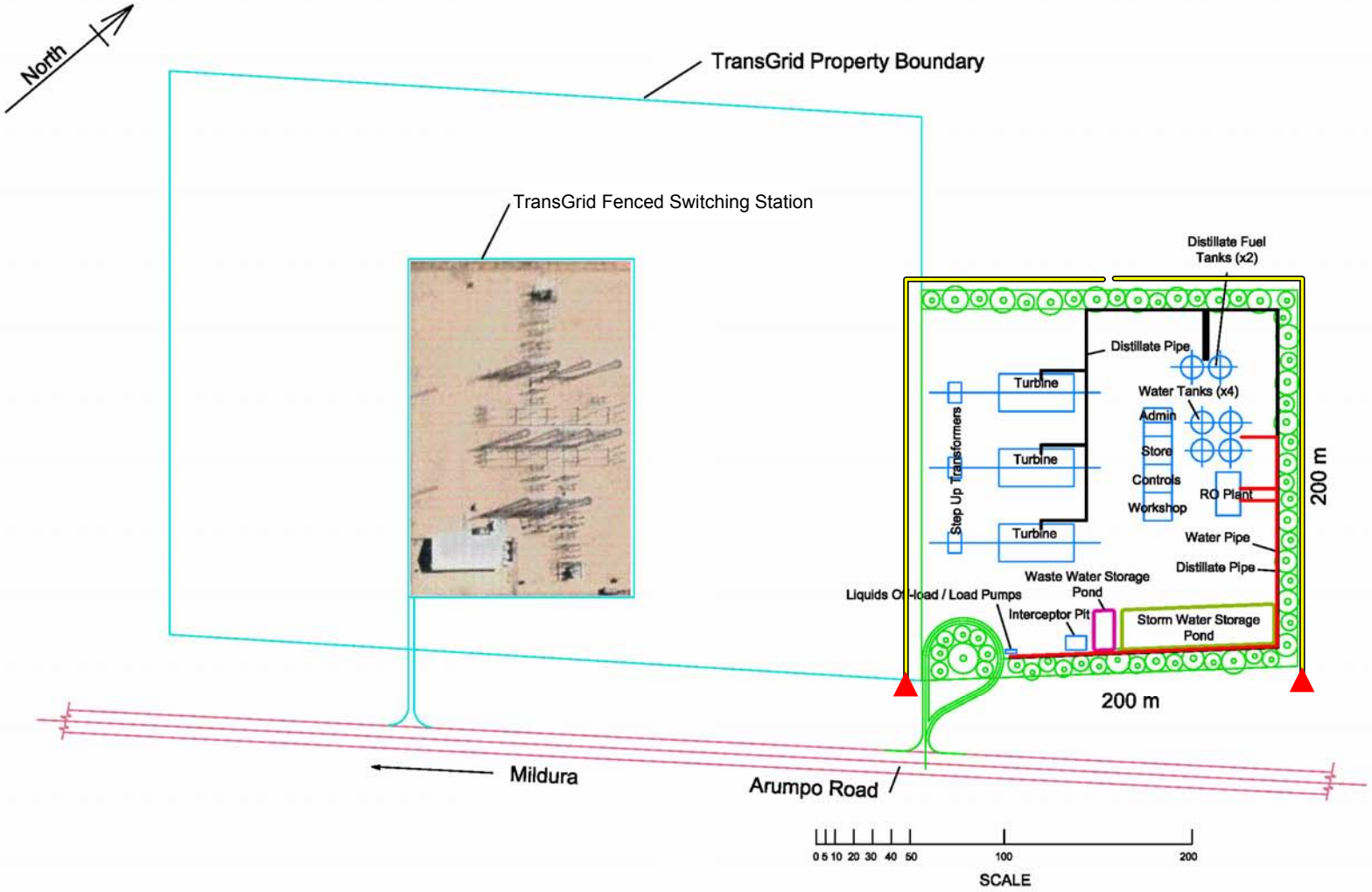
Priority would be given to recycling stormwater as much as possible. This would be achieved by the installation of rainwater tanks collecting runoff from the buildings, and by construction of the stormwater pond to capture stormwater as shown in **Figure 14-3.**

Areas where there is a higher likelihood of spills would be bunded. These areas are likely to include fuel storage areas, the gas turbines and areas where liquids would be unloaded. Water falling into bunds would pass through an interceptor pit which would discharge to the wastewater pond.

Water falling onto operational areas of the site would be collected and directed through an oil trap, gross pollutant trap and the wastewater pond before discharge from the site. This stormwater system would be designed to reduce oil and suspended solids to an acceptable level prior to discharge.

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

To minimise the volume of stormwater, surface runoff normally flowing onto the site from adjacent paddocks would be directed around the site. This is shown in **Figure 14-3**. The land profile is relatively flat and these cut-off drains would likewise have minimal slope to fit into the existing surfaces. These flows would potentially be more concentrated than compared to current conditions and appropriate measures would be put in place to maximize the dispersion of these flows over a wide area, thereby minimising their potential to cause soil erosion downstream.



Cut-off Drain

Flow Dissipater

Source: International Power
URS CAD File Ref: T:\JOBS\43177455\Tables\CAD\7dec06 Buronga Site - Drainage.dwg

Client: INTERNATIONAL POWER	Project: BURONGA PEAKING POWER PLANT		Title: **STORMWATER INFRASTRUCTURE**
URS	Drawn: BH	Approved: WB	Date: 26/05/2008
	Job No: **43177455**	File No: 43177455.010	Figure: **14-3**

14.8 Summary of Mitigation Measures

Table 14-2 presents a summary of mitigation measures related to water management.

Table 14-2 Summary of Mitigation Measures

Mitigation Measure	Implementation of mitigation measure		
	Design Phase	Construction	Operation
Soil Erosion			
All construction works would be undertaken in a manner to minimise the potential for soil erosion and sedimentation.		✓	
At a minimum the measures outlined in the *Managing Urban Stormwater – Vol 1 Soils and Construction* would be implemented. Measures may include: - installation of sediment filters and - the construction of a sedimentation basin on site	✓	✓	
Soil erosion and sedimentation devices would remain in place until the surface is restored. These devices would also capture any gross pollutants.		✓	✓
Disturbed sites would be suitably revegetated or covered with a non-erodable surface as soon as practicable following construction.		✓	
Spills and site management			
All potential pollutant materials would be stored in appropriate containers in designated areas and where required these areas will be bunded.		✓	✓
Appropriately bunded areas would be included for storage of distillate, oils and minor quantity of chemicals.		✓	✓
Waste collection areas would be designated.	✓	✓	✓
Waste collection and disposal would be undertaken by a licensed contractor.		✓	✓
All vehicle maintenance would be undertaken offsite or in appropriately managed site areas.		✓	✓
Any vehicle washing on-site would be restricted to specific bunded areas.		✓	✓
Staff facilities would be provided and installed and maintained so that pollutants, including wash water are not conveyed from the site in stormwater.		✓	✓
Water may be required for dust suppression and would be of a quality that represents no health risk.		✓	

Chapter 14 Water Cycle Management

Mitigation Measure	Implementation of mitigation measure		
	Design Phase	Construction	Operation
Surface water			
Treatable stormwater would be reused at the site. No contaminated effluent will be discharged to local waterways.	✓	✓	✓
Water management strategies developed and implemented to ensure nominated peak flows discharging from the site do not exceed existing flows.	✓	✓	✓
Cut-off drains would be constructed to divert overland flows around the site. The outlets of the cut-off drains would be designed to maximise the dispersion of flow.	✓	✓	✓
Wastewater Treatment			
All process wastewater will be collected in the wastewater pond and evaporated into the atmosphere or disposed of offsite to approved receptors if required.	✓		✓
Waste solids and sludge would be removed from site and disposed of by a licensed contractor.		✓	✓
All domestic wastewater during construction would be collected and disposed of through a licensed septic system or offsite by a licensed contractor.		✓	
Domestic and general purpose use “black” and “grey” water during operations would be treated by a zero discharge proprietary treatment system or stored and disposed of offsite by a licensed contractor.	✓		✓
Bund water would pass through an interceptor pit which would discharge into the wastewater pond.			✓
Stormwater would be directed into the site stormwater pond where detention and sedimentation would occur.	✓		✓