

A White Paper



OASIS GT600

1. Introduction

Nubian Water Systems was established to provide a suite of high performance integrated solutions at both the on-site and decentralised levels. The OASIS GT600 Greywater Treatment System described in this document has been developed for use in single dwelling, multi dwelling, commercial and industrial applications. It has been designed for integration with existing water and sewage infrastructure. It has been accredited to the highest level of re-use options by NSW Health, the Victorian EPA and the Queensland DIP.



2. Nubian Water Systems

Nubian Water Systems has developed a range of leading urban water solutions applicable to residential, commercial and industrial properties. Borne out of the need for intelligent and effective water management practices, Nubian Water Systems provides both standard products and tailored packages to meet individual needs. Nubian Water Systems aims to instigate the paradigm shift necessary to rescue Australia from the current water crisis and lead the field in providing effective local level water management systems and solutions.

Nubian Water Systems has an engineering alliance with GHD. GHD is an international multidisciplinary consultancy that provides engineering, management and environmental services with over 75 years of experience. Currently, GHD has an integrated network of 62 offices and over 3,500 personnel in Australia, the Middle East, Asia, New Zealand and the Americas, and ranks in the worlds top 50 engineering and architecture firms. GHD is a national leader for experience, expertise and reputation in the water engineering discipline.

Nubian Water Systems is headquartered in Sydney and operates Australia wide.

The greywater treatment system described in this report is designed to operate as part of the Nubian domestic water management packages. Packages have been prepared for rural and urban areas, and single and multi-dwelling premises.

3. Technology and Performance

The OASIS GT600 has been designed for onsite greywater recycling in sewered and unsewered areas. It treats water from baths, showers and hand basins for safe reuse in toilets, urinals and washing machines, and for irrigation and other external applications. The OASIS GT600 comprises of a feed water tank, processing system, incorporating a proprietary treatment column coupled with U.V. disinfection and a treated water storage tank.

3.1 Treatment Processes

The OASIS GT600 utilises three unit processes to ensure effluent quality meets the relevant standards. The first stage of treatment occurs upstream of the feed water tank, where a screen removes lint and other coarse materials to prevent blockages and fouling of the system.

The principal stage of treatment in the OASIS GT600 occurs in the treatment column, where the water flows down through the non-static bed of proprietary media. Contaminant removal is achieved through physical removal, adsorption and microbial induced aerobic degradation. The physical removal mechanisms are those typical of granular medium filters; straining, sedimentation, impaction, interception and adhesion. However, the OASIS GT600 is superior to conventional granular medium filters as it provides additional treatment through the proprietary media. The properties of the media allow a significant degree of adsorption to occur, which complements the physical removal mechanisms. Further, the column is arranged to promote the development of an aerobic biomass on the media. The combined capacities for physical removal, adsorption and bacterial degradation create an extremely robust treatment system.

Treatment is completed through U.V. disinfection.

The System Configuration is illustrated at Attachment A.

3.2 Mechanisms for Organics, Nutrients and Pathogen Removal

The combined treatment processes achieve a very high degree of organic, nutrient and pathogen removal. In the treatment column, straining, impaction and interception on the media cause the media to retain a high portion of organic matter and pathogens. Further retention of particulate organics, and dissolved organics and nutrients is achieved by adsorption. Retained contaminants are discharged to sewer during the automatic backwash cycle.

The final stage of disinfection achieves a high kill rate of pathogenic organisms.

3.3 Flow Management

3.3.1 Treatment Column

The modular nature of the OASIS GT600 treatment column provides flexibility to treat any flow of greywater. The nominal unit for single domestic premises has been designed to treat the peak and average flows of a household generating up to approximately 1,200 litres of greywater per day. However,

the column may be redesigned for specific applications with higher or lower flows. Alternatively, a bank of columns may be installed to treat larger flows of greywater, such as those from commercial, industrial or multi-dwelling applications. Further scope to treat a range of flows is achieved through utilisation of the flow management facilities and procedures outlined below.

3.3.2 Management of Peak Generation

The OASIS GT600 maintains its high standard of treatment when receiving peak and low flows and loads. While the treatment system has been designed to treat the flows dictated in the NSW Health guidelines, it has the capacity to treat much higher and lower flows. Under low flow conditions, the GT600 automatically cycles the feed pump under level control. Further, the weir and arrangement of components ensure that the media remains submerged. During periods of extended low flows, a feed system may be initiated to preserve the biomass, or alternatively, the biomass may be allowed to reduce, and regrow when flows resume. This is satisfactory because the physical removal mechanisms are sufficient for treatment. Peak flows are managed by a feed water balance tank, which equalises flow through the treatment column.

The management of peak flows and loads is also dependent on the nature of the application. In sewerred areas, the system is designed to overflow to sewer during periods of extreme flows. This reduces the required storage capacities. Conversely, in unsewerred areas, the system is designed to overflow to the on-site waste treatment system.

3.3.3 Management of Peak Demands

Demands are managed through the treated water storage, alternative water sources and external control devices. The treated water storage tank allows for most delays between greywater generation and demand. When demand is greater than supply an external control device coordinates the delivery of potable water to the greywater demand locations. When supply exceeds demand, the treated water tank overflows to sewer.

3.4 Expected Performance

The OASIS GT600 was tested as part of the NSW Health accreditation process, and is accredited for use in NSW. Results from this investigation are shown below.

3.4.1 Treatment Column Performance Analysis

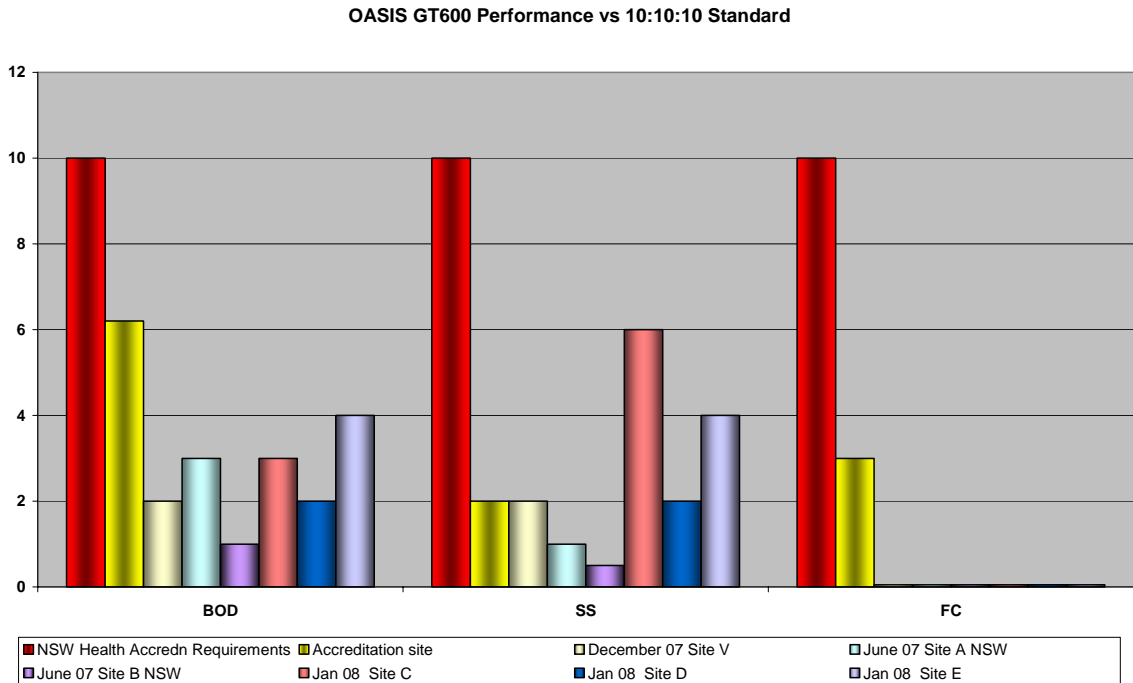
The performance of the system was investigated as part of the NSW Health accreditation process. The results presented in Table 1 were obtained over a six month period, by independent investigators. The source of the greywater was bathroom and laundry facilities in a school boarding house.

Table 1 Performance

OASIS GT600 - Performance Analysis						
		Greywater	Treated Water	NSW Health Requirements	Removal Rate %	Basis
pH		N/A	7	6.5 - 8.0		
Biological Oxygen Demand (BOD)	mg/L	123	4	<10	96.7%	10 %ile
Suspended Solids (SS)	mg/L	187	3	<10	98.4%	10 %ile
Thermotolerant Coliforms (TC)	cfu/100mL	1,680,000	4	<10	99.9998%	10 %ile
Total Nitrogen (TN)	mg/L	18	10	N/A	45.6%	average
Total Phosphorus (TP)	mg/L	4	3	N/A	34.1%	average

Field test results (see Chart 1) have indicated even better performance than the accreditation trial.

Chart 1 Performance



3.4.2 Removal of Organics and Nutrients

The results in Table 1 demonstrate that the OASIS GT600 achieves high rates of organic and nutrient removal.

3.4.3 Pathogen Control

Pathogen removal is achieved in the both the treatment column and U.V. disinfection. A pathogen removal rate of 95% was observed in the treatment column. The combined treatment system achieved a level of 99.999%. Recent measurements of systems in the field (Chart 1) show that pathogens were reduced to non-detectable levels.

3.5 Control and Operation

3.5.1 Procedures and Practices

- The control system has 2 modes of operation, automatic, and manual.
- Under normal operation, the “automatic” signal will be used by the micro Programmable Logic Control (PLC) as a trigger for automatic (unattended) control. Maintenance technicians will use the “manual” mode to override PLC control.

3.5.2 Integration with Centralised Management System (SCADA monitoring and control, or equivalent with appropriate alarms)

The OASIS GT600 incorporates an alarm system that indicates electrical, blower and pump failures. The system comprises audible and visual alarms, which are independent of the normal power supply. The alarm can also be remotely monitored.

4. Installation and Operation

4.1 Accreditation

The OASIS GT600 is accredited by NSW Health in the highest category of treated water quality, which means the treated water can be used for above ground irrigation, toilet flushing, as the cold water supply for clothes washing and car washing (subject to council approval).

The system is also accredited in Victoria by the EPA and the treated water may be used for above ground irrigation. The Victorian Department of Human Services has indicated that treated greywater of the quality produced by the OASIS GT600 is appropriate for toilet flushing and direct connection to clothes washing machines.

In Queensland the OASIS GT600 system is accredited by the Department of Infrastructure and Planning. Approved uses are lawn and garden spray irrigation, toilet flushing, washing machine, vehicle washing and path/wall washdown.

The OASIS GT600 may also be installed in the ACT and the treated water can be re-used for above ground irrigation, toilet flushing, the cold water supply to the laundry and car washing.

In SA and WA, Health depts have accredited the system and treated water may be used in above ground irrigation applications subject to specific control.

4.2 Maintenance

A condition of accreditation in each state is that the system receives regular maintenance.

The OASIS GT600 must be serviced in accordance with the requirements of the accrediting authority in each state and the local council. This requires that the owner of an OASIS GT600 enters into a service agreement with the manufacturer or a service contractor acceptable to the local council.

In NSW, the ACT and Queensland servicing is required every four months. In Victoria, SA and WA it is every six months. In all cases the UV lamp is changed annually.

Every three years the media in the treatment column will be renewed.

Costs for the above maintenance items vary with location and details may be obtained from Nubian.

Industrial and commercial applications may require a higher frequency of maintenance, depending on the application.

Servicing of the OASIS GT600 is the responsibility of the owner; it is not provided free of charge by the manufacturer.

4.3 Warranty and Support

Nubian Water Systems supplies the occupier/owner with a comprehensive manual, setting out the operation and maintenance requirements of the system, including procedures to be followed in the event of a system malfunction. There is also a list of emergency contact numbers included with the manual.

The OASIS GT600 has a manufacturer's warranty period of:

- 3 years from the date of delivery for all components other than mechanical and electrical parts; and
- 1 year from the date of delivery for all mechanical and electrical parts (including pumps and motors).

Providing that the OASIS GT600 has been installed and serviced by Nubian authorised representatives in accordance with the Installation and Servicing Manuals, and is used in accordance with the Owner's Manual (supplied upon delivery), then all labour and materials will be supplied free of charge by the manufacturer during the warranty period for the purposes of fixing any equipment or component failures. Installation and servicing by other than Nubian authorised representatives will cause the manufacturer's warranty to become void.

In addition to the manufacturer's warranty, you may be entitled to certain statutory warranties in relation to this product.

All components of the OASIS GT600, other than mechanical and electrical parts, are designed for a service life of at least 15 years. All mechanical and electrical parts (including pumps and motors), installed within the OASIS GT600 have an expected life of 5 years.

4.4 Required Infrastructure

4.4.1 Collection and Distribution

The OASIS GT600 may require plumbing modifications for installation in existing dwellings. Discharges from baths, showers, washing machine and hand basins must be redirected to the feed water tank. Pipes to the toilet cisterns, washing machine and hose points may be disconnected from direct potable supply and be connected to the treated greywater / potable system.

4.4.2 Integration and Redundancy

The OASIS GT600 has been designed for integration with existing infrastructure. It operates within the conventional system of centralised water and wastewater treatment, distribution and collection. On a development scale potable water and sewerage pipes and stormwater infrastructure are still utilised. No additional infrastructure is required. Modifications are limited to individual dwellings, allowing owners to choose a water management system tailored to their specific needs.

The system has been designed so that it may be taken offline for maintenance or decommissioned without requiring alterations or modifications to any household plumbing infrastructure. The OASIS GT600 is taken offline by a single valve directing all greywater directly to sewer. Once offline, the system may be taken apart or removed without interference to wastewater disposal.

Overflow and drain pipes connect all components of the OASIS GT600 to sewer. In the event of extreme flows or system malfunction, greywater is safely diverted to the sewer with wastewater from the toilets and kitchen.

4.5 Typical Applications and Size

The OASIS GT600 is appropriate for single dwelling, multi dwelling, commercial and industrial applications. The modular nature of the unit allows for any flow to be managed. As such, the dimensions and footprint of the system will depend on the application it is designed for. For a family in a single domestic premise with reasonably high external demands, the tanks and treatment unit occupy a footprint of approximately 2.5 m by 0.6 m.

5. Non-Technical Information

5.1 Economics

Operational costs for the OASIS GT600 are low, and vary with the application. Design of the system has minimised moving components reducing the overall power consumption of the facility.

5.2 Environmental

The OASIS GT600 is consistent with Ecological Sustainable Development principles with minimal greenhouse gas emissions, odours and noise resulting in a net positive impact on the environment.

Urban Water Management solutions developed by Nubian's team of water engineers allow the maximum reuse of water sources from individual sites and allow owners to take responsibility for their own water usage and management, encouraging innovation and conservation.

- Incoming greywater is aerated and mixed to prevent anaerobic conditions and odour generation.
- Noise generated by the systems blowers and pumping systems is attenuated through the use of small, quiet blowers and submerged pumps. Trials have shown that operation of the OASIS GT600 does not generate any significant levels of noise.

5.3 Intellectual Property

The OASIS GT600 is patented.

6. Company contact details

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System Configuration

