Landscape CONTRACTOR
FEATURE ARTICLE
Plants for Grey Water Irrigation
By Todd Layt

# CHOOSING THE BEST PLANTS FOR GREY WATER IRRIGATION.

## Based on grey water research and trials.

With water restrictions becoming a regular event around Australia, grey water and black water are being far more widely used as an option. Little research has been done in Australia as to which plants cope best with grey water or black water. This investigation comprises of replicated trials of various Ozbreed Landscape plants being watered with grey water, or more precisely black water from a Bio-Septic. One trial is using excessive irrigation with grey (black) water, whilst another uses a combination of grey (black) water in normal amounts, and periods of drought, and finally another garden with no irrigation at all. When specifiers and Landscapers choose plants, they will rarely know for certain whether the grey (black) water will be used efficiently, excessively, or have periods of low supply, and times of drought. We tried to test the plants in many situations, so plants can be chosen that will do well in most scenarios. If you cannot choose plants such as the ones that did well in this trial, you can always look at giving less adaptable plants a break from grey (black) water each week, or preferably move the grey water around the site, to not excessively water plants, and use low phosphorous washing powders etc. As grey water is from the washing machine, and also includes baths and showers, of which the water is cleaner, you could always have longer showers. Just kidding! Of course I am not advocating this. If it is harder to get the watering right, choose more adaptable plants. This research may help with this. This is only an interim report after year two of a three year investigation. As Australia's water situation is so critical, and grey (black) water is being more widely used, we thought it would be timely to share our preliminary results. Once year three results are available, we will try to get those out as well.

The domestic or household wastewater that comes from the laundry and bathroom is called 'grey water'. Toilet water is termed 'black water' and although kitchen water is technically termed grey water, it is treated as black water. Our trial to date used the Grey water from a household, plus the black water, through a Bio-septic system, plus two extra staff toilets.

### Setting up the trial.

Three gardens were installed. All have a moderately sandy loam soil which has average drainage qualities, neither good, nor poor.

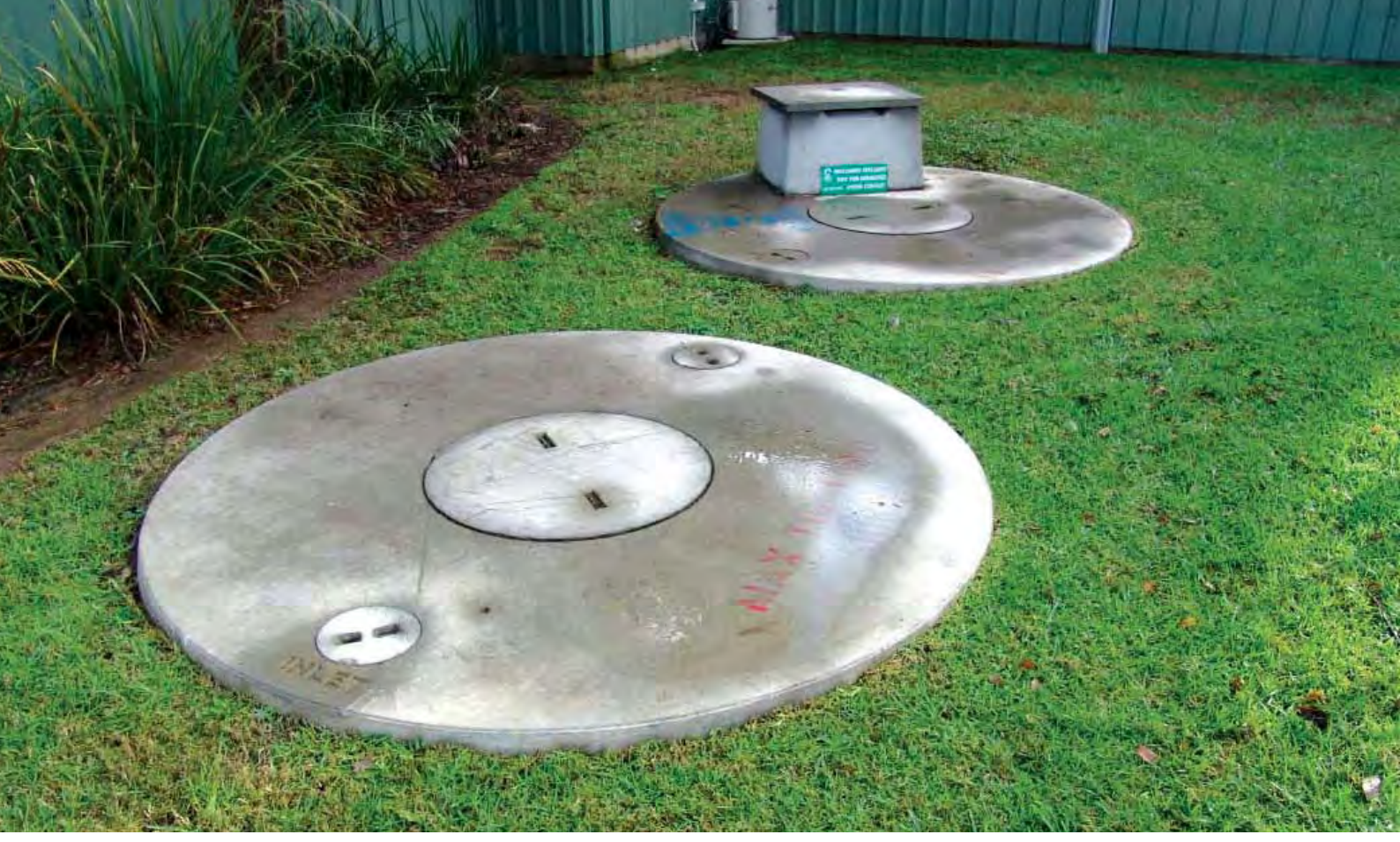
One garden is slightly depressed, and has been irrigated a few times per day using water from a Bio-Cycle system. It has been saturated for 24 months. This is not recommended; however, this mimics an excessively irrigated grey (black) water garden. The Bio-Cycle was chosen as it is a constant non-interrupting source of water. The water also has all of the bad stuff in grey water, plus the added contaminants from black water, although some may say it is a little more processed. The second raised garden is watered with grey water (Bio-Cycle water) sometimes on a regular basis (three times per week), and sometimes not at all for a few weeks, mimicking a spasmodic grey water supply, where the garden can face drought on occasions. Finally, a third raised garden was established, and then no irrigation was applied for 24 months, with this garden only receiving natural rainfall. Three plants of each variety were planted in each garden. Three plants that we know cope well with wet feet, and one other, were not ready to be planted in the initial trial, so we ran another trial starting 4 months later with these plants. We added these 4 plants to the first garden trials after removing some of the poor performing plants two thirds of the way through year one. We will monitor these for the rest of the trial. We placed these 4 plants in buckets to see how they survived soaking in grey water for 24 months. Year 3 of the trial will see us use containers and water tubs to see how the plants survive regular soaking with washing machine water, with some dry time, as well as continuing the current trial for a longer period.

## Testing.

Each plant was rated on a scale of 0 to 10, 0 being dead, and 10 being absolutely healthy, with vigorous growth. The results were put into different tables.

## Results

Table two shows plants that did well in saturated grey water for 24 months. The results were very different than we expected as some plants did better than we expected. For example, *Tanika*, that is known not to like constant wet feet in Sydney's humidity, did well in this grey water test in wet feet and the saturated depressed garden. One possible reason is that Phytophthora, the disease that can harm this plant if the soil is constantly wet in hot humid climates, was killed, or not let thrive in the grey (black) water soaked soil. The toxicities in the grey (black) water may have prevented Phytophthora. In regions like Melbourne, Adelaide, and Perth, Tanika does very well in excessively irrigated areas, so for these regions, this research indicated *Tanika* is a good choice for excessively irrigated grey water gardens, but for Queensland and from Sydney north in NSW, until more research is done, it is safer not to use *Tanika* in depressed saturated grey water gardens. *Tanika* in Sydney is better for dryer areas or flat areas, but not saturated areas. Tanika did extremely well in the non-irrigated garden, also listed in table one. So basically the testing has indicated what plants cope with certain toxicities in grey (black) water, but we should still use local knowledge of what plants work well in which conditions. *Little Jess* is known to do well in excessively irrigated areas in Queensland, and NSW, and elsewhere in Australia. It also did very well in the




depressed garden that received excessive amounts of grey water; the raised garden that was watered with grey water, and also experienced some drought; and the no irrigation garden (See Table Two). Clearly this is a safe choice for grey water gardens under most conditions. Other plants to do well in the excessively irrigated grey water trial were *Breeze, King Alfred, Wingarra, Katrinus Deluxe* and more. Plants such as *Mondra, Lomandra filiformis*, and *Sweet Mist*, a *Phormium*, struggled in grey water. The full results for all three gardens can be seen in Table 2. We are currently undertaking water analysis and hope to have the figures on www.ozbreed.com.au soon.

Due to timing reasons, we had to run a second test for *Katie Belles* and *Tropic Belle* for year 1, but they were included in year 2. Both *Lomandra hystrix* varieties, and King Alfred a *Dianella caerulea*, and *Katrinus Deluxe*, a *Lomandra longifolia* were tested additionally. Two plants of each type were left in grey water, soaking for 8 months, then 24 months. The water was replaced every 2 months. Two pots of each type were also placed in normal irrigation as a trial. The results can be seen in Tables 3 and 4. *Katie Belles, Tropic Belle,* and *King Alfred* all did very well. Predictably, the *Lomandra longifolia* could not cope with the water above its crown for 8 months. After 24 months however, only the 2 *Lomandra Hystrix* varieties were still healthy. *Katie Belles* did the best of all, with *Tropic Belle* still doing OK. This is to be expected, as they seem to be able to survive living in very shallow permanent water.

As these are interim results, we need to be very cautious, and use this data in conjunction with other data, and local plant knowledge. As such, we have analysed this data and studied the individual plant data sheet for each variety for each region, and based on all this information have developed a table showing the plant types that have the best chance of living and doing well in grey water gardens for each region of Australia. As this research enters its third year, more plants may be added to the list, or possibly even removed from it. For Dry land areas (No Irrigation), the preliminary tests showed that in Sydney, *Tanika, Little Jess, Cassa Blue, Little Rev, Baby Bliss, Revelation, Wingarra, Katrinus,* and *Kingsdale* were the best choice, followed closely by *Breeze, Nyalla, Tasred* and *Nafray. Mondra, Black Lea, Mingo*, and *Sweet Mist* suffered badly in the no irrigation trial, although with a little water, the *Mingo* did very well in the low irrigation grey water trial.

We also conducted trials on grey (black) water with turf, and hope to have the full results next year, but so far, all the warm season turf types like Empire Turf, Palmetto Buffalo, Couch and Kikuyu are doing well where regular application of this grey (black) water have been applied.

## Conclusion

Grey (black) water should be used like any other irrigation water supply, and that is used with best horticultural practices in mind and not to excessively irrigate areas. Unfortunately in the real world, this does not often happen. Therefore, using adaptable plants is probably the best answer. If you know good horticultural practices will be used, then the list of plants that can be used on the landscape project with grey (black) water can be increased.

Grey water irrigation testing with popular native plants.

Summary of results. Note; This table has changed from first year evaluations.

The best plants for grey (black) water based on this investigation and real world knowledge are listed below. To work out the best plants we have assumed the gardens could be excessively irrigated with grey water or dry for periods of time.

* If the Grey water is high in salt, avoid these plants. (Based on salt trials) ** Good draining soils in raised gardens suggested for these plants.

These are only preliminary results, and as the research progresses, more plants may be added to this list.

**For the full papers visit**
**www.ozbreed.com.au/greywaterNSW.pdf**
**www.ozbreed.com.au/greywaterQld.pdf**
**www.ozbreed.com.au/greywaterOTHER.pdf** LC

Table 1

| Vic, ACT, Tas, SA, WA, NZ and Southern NSW | Sydney to Port Macquarie (NSW) | Queensland and Northern NSW |
|---|---|---|
| Tanika | Breeze | Breeze |
| Breeze | Little Jess | Little Jess |
| King Alfred | Wingarra | Wingarra |
| Wingarra | Nafray | Nafray |
| Katrinus | KatieBelles | KatieBelles |
| Eskdale | Tropic Belle * | Tropic Belle * |
| Nafray | King Alfred | King Alfred |
| Savannah Blue * | Poa eskdale | Katrinus ** |
| KatieBelles | Tanika** | Katrinus Deluxe ** |
| Tropic Belle * | Katrinus ** | |
| Poa eskdale | Katrinus Deluxe ** | |
| Katrinus Deluxe | | |

Table 2

| | Depressed area | Raised area low | Dryland area, No |
|---|---|---|---|
| Variety | grey water | grey water | grey water. Only Rain. |
| Tanika | 8.33 | 8.00 | 8.17 |
| Breeze | 8.67 | 8.00 | 8.33 |
| Nyalla | 3.00 | 5.33 | 4.17 |
| Little Jess | 9.67 | 9.33 | 9.50 |
| Utopia | 8.00 | 2.33 | 5.17 |
| Savannah Blue | 6.67 | 8.00 | 7.33 |
| Revelation | 2.33 | 9.00 | 5.67 |
| Sweet Mist | 0.00 | 0.00 | 0.00 |
| Little Rev | 1.00 | 3.67 | 2.33 |
| Baby Bliss | 5.00 | 8.00 | 6.50 |
| Cassa Blue | 2.00 | 4.33 | 3.17 |
| Wingarra | 9.67 | 9.00 | 9.33 |
| Katrinus | 8.67 | 7.67 | 8.17 |
| Tasred | 6.33 | 5.33 | 5.83 |
| Eskdale | 7.33 | 7.67 | 7.50 |
| Kingsdale | 6.00 | 7.33 | 6.67 |
| Nafray | 9.00 | 7.33 | 8.17 |
| Mingo | 2.33 | 8.33 | 5.33 |
| Black Lea | 3.67 | 0.00 | 1.83 |
| Mondra | 0.33 | 0.00 | 0.17 |
| Katrinus Deluxe | 9.00 | 8.00 | 8.50 |
| Katie Belles | 9.33 | 8.00 | 8.67 |
| Aranda | 5.00 | 8.00 | 6.50 |
| Tropic Belle | 9.33 | 8.00 | 8.67 |
| King Alfred | 9.00 | 8.00 | 8.50 |

Table 3

Average Rating out of 10.

0 = Dead 10 = Best Qualtiy

| Plants sitting in grey water, wet for 20 months. | | |
|---|---|---|
| | Pot 1 | Pot 2 |
| Tropic Belle | 9 | 8 |
| Katie Belles | 10 | 10 |
| King Alfred | 4 | 3 |
| Katrinus Deluxe | 0 | 0 |

Table 4

| Pot 1 | Pot 2 |
|---|---|
| 9 | 10 |
| 9 | 9 |
| 9 | 9 |
| 10 | 10 |

## Water Chemistry Profile

CLIENT: **OZBREED**
PO Box 1011
Richmond NSW 2753
**Attn: Beck Clark**

PROJECT: Name: **Irrigation Water Assessment**
Location:
SESL Quote N°: Client Job N°: Order N°:
Date Received: **04/06/2008**

SAMPLE: Batch N°: **6742** Sample N°: **1**
Name: **Irrigation Water (2 bottles)**
Test Type: **W04-TAH (FW)**

Quality System
Quality Endorsed Company
AS/NZS ISO 9001: 2000
QEC 21650

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry, Agronomy and Contamination Assessments

**Tests are performed under a quality system certified as complying with ISO 9001: 2000. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.**

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Total No Pages:

| TEST | RESULT | COMMENTS |
|---|---|---|
| pH | 7.3 | slightly alkaline |
| EC mS/cm | 1.13 | Class 3 Irrigation Water. Elevated |
| Total Dissolved Salts mg/L | 723.2 | Moderate to high nutrient concentrations in the water |

| TEST | CATIONS | | | ANIONS | | | |
|---|---|---|---|---|---|---|---|
| Unit | meq/L | mg/L | Comment | Test | meq/L | mg/L | Comment |
| Sodium | 5.1 | 117.3 | Elevated | Chloride | 3.3 | 115.7 | High |
| Potassium | .79 | 30.8 | Acceptable | Sulphate | 1.86 | 89.5 | High |
| Calcium | 2.04 | 40.8 | Acceptable | Nitrate | <0.08 | <5.0 | Acceptable |
| Magnesium | .58 | 7 | Acceptable | Phosphate | .61 | 29 | High |
| Aluminium | | | | Bicarbonate | 5.72 | 349.3 | Very High |
| Ammonium | 1.18 | 16.5 | High | Carbonate | 0.02 | 0.7 | Acceptable |

| TRACE | mg/L | Comment |
|---|---|---|
| Iron | 0.22 | acceptable |
| Zinc | 0.07 | acceptable |
| Copper | 0.06 | acceptable |
| Manganese | 0.06 | acceptable |
| Boron | | |

**Derived Values**

| | | |
|---|---|---|
| Sodium Adsorption Ratio mmol$^{½}$. L$^{½}$ | 4.46 | acceptable |
| Anion/Cation Balance meq/L | -1.84 | |
| Titrateable Alkalinity g/L CaCO3 | 0.35 | acceptable |
| $CaCO_3$ Saturation Index (pH-$pH_c$) | 2.1 | some risk of scaling |
| Total Hardness (mg/L as $CaCO_3$) | 130.7 | slightly hard |

**Recommendations**

phc = 7.40. Water has potential to precipitate calcium and magnesium salts.
Adjusted SAR = 8.9. High potential for sodium to accumulate.
Results of the water analysis has indicated that this water is a class 5 irrigation water under NSW Department of Primary Industries guidelines. Class 5 waters are very high salinity waters are classified as being totally unstable even with strict precautions. The chloride level is extremely high for turf grass irrigation, and it is expected that a leaf burn will occur in high temperatures. The Adjusted Sodium Absorption Ratio indicates that there is a very high potential for sodium accumulation to occur with repeated use of this water. This water is not ideal for turf grass irrigation and ideally, options to shandy or reduce the use of this water should be investigated.

Consultant:
**Shane Harvey**

Date of Report: **13/06/2008**

Authorised Signatory:
**Murray Fraser**

**Explanation of the Methods:** **pH:** Glass Calomel electrode
**Na, K, Ca, Mg, Fe, Zn, Cu, Mn:** flame AAS
**N, P, Cl, $CO_3$, B:** Spectrophotometric method