

# Rainwater Harvesting



Presented by Tommy Hilder

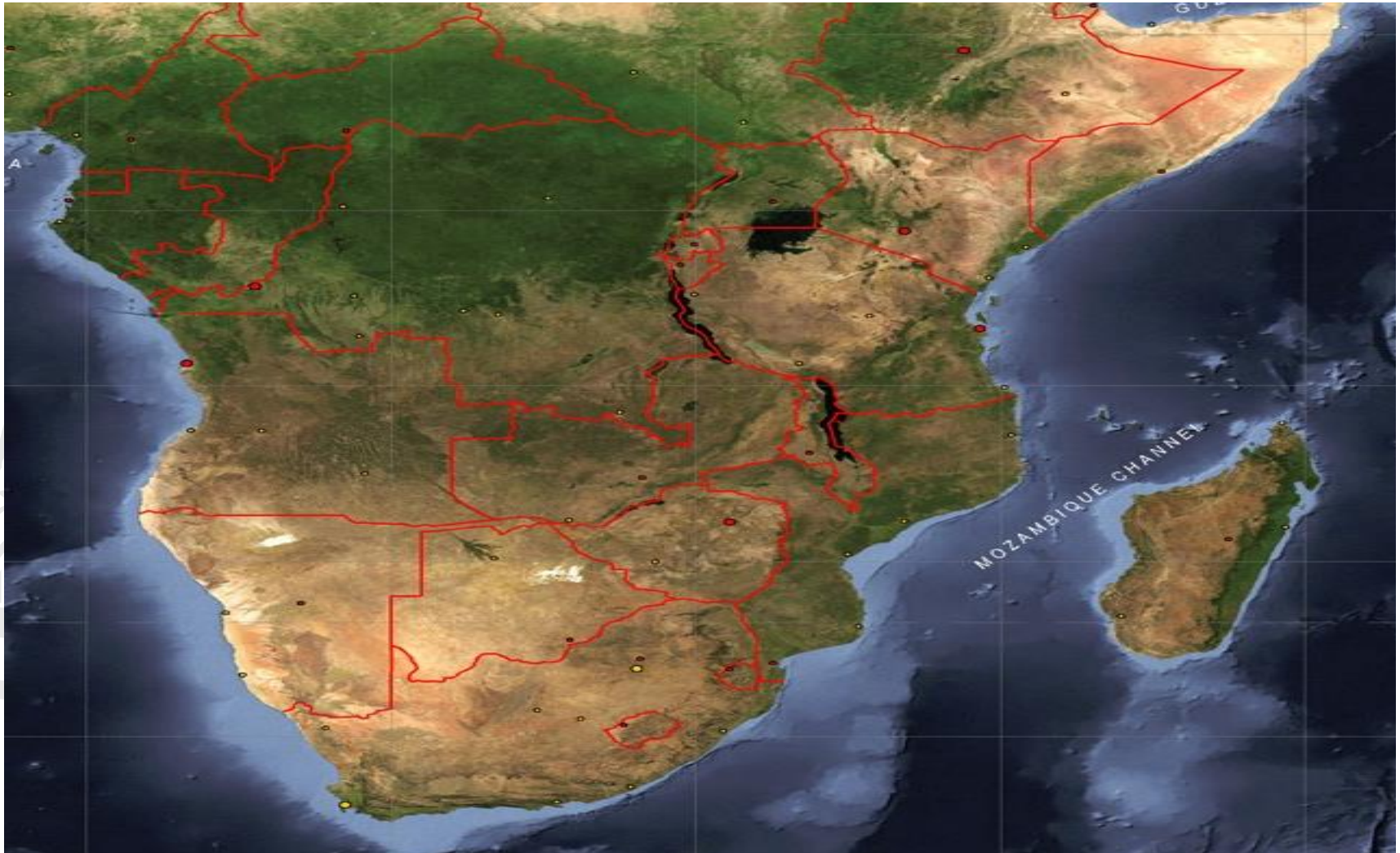
# Background



- Rainwater harvesting is addressed and prescribed in the “Green Building Development By-Laws, Local Authority Notice 328, Section 7 of Rationalisation of the Local Government Affairs Act, 1998 (Act 10 of 1998)”.
- In terms of Tshwane’s Water By-Laws, Clause 20(7), premises should have at least a 24 hour on site water storage during water interruptions.
- Installing rainwater tanks will ensure a 24 hour storage during water interruptions.



# South Africa is a water scarce country



# South Africa is a water scarce country



# Green Building Development By-Law



## **LOCAL AUTHORITY NOTICE 328**

### **CITY OF TSHWANE**

#### **GREEN BUILDING DEVELOPMENT BY-LAW**

The City Manager of the City of Tshwane hereby publishes in terms of Section 7 of the Rationalisation of Local Government Affairs Act, 1998 (Act 10 of 1998), read with Section 13 of the Local Government: Municipal System Act, 2000 (Act 32 of 2000), and Section 162 of The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), the CITY OF TSHWANE GREEN BUILDING DEVELOPMENT BY-LAW, 2013, as contemplated hereunder and approved by Council on 25 October 2012.

The purpose of the said By-laws is to provide the City of Tshwane Metropolitan Municipality with legislative measures to ensure that a more sustainable built environment is developed.

These By-laws takes effect on **1 July 2013**.

**MR JASON NGOBENI**  
**CITY MANAGER**

(Notice No 250 of 2013)  
27 March 2013



## WA 6: Rainwater harvesting

In all buildings with a useable area of more than 200m<sup>2</sup>, provision must be made for rainwater harvesting. On-site rainwater harvesting systems must be installed with at least the capacity indicated in Table 5. The rainwater harvesting system should be linked to flush toilets, irrigation systems or other water consumption areas.

Table 5: Rainwater harvesting capacity

Class of occupancy or building	Occupancy	Rainwater harvesting system capacity to useable area ratio (ℓ/m <sup>2</sup> )
A1	Entertainment and public assembly	5
A2	Theatrical and indoor sport	5
A3	Places of instruction	10
A4	Worship	5
A5	Viewing of outdoor sport	5
B1	High-risk commercial	5
B2	Moderate risk commercial	5
B3	Low-risk commercial	5
C1	Exhibition halls	5
C2	Museums	5
D1	High-risk industrial	5
D2	Moderate risk industrial	5
D3	Low-risk industrial	5
D4	Plant rooms	n/a
E1	Places of detention	5
E2	Hospitals	5
E3	Other institutional residences	5
F1	Large shops	5
F2	Small shops	5
F3	Wholesalers' stores	5
G1	Offices	5
H1	Hotels	5
H2	Dormitories	5
H3	Domestic residences	10
H4	Dwelling houses	10
J1	High-risk storage	5
J2	Moderate risk storage	5
J3	Low-risk storage	5
J4	Covered parking areas	2

## Submission requirements

1. Provide a plan drawing that indicates the rainwater harvesting tank and the linked water consumption areas.
2. Provide a table that indicates the useable area, rainwater harvesting system capacity and the ratio of rainwater harvesting capacity to useable area. An example of such a table is given below.

Useable area of building ( $\text{m}^2$ )	Rainwater harvesting tank volume ( $\ell$ )	Rainwater harvesting system capacity to useable area ratio ( $\ell/\text{m}^2$ )
500	5 000	10



## WA 7: On-site storm water retention

Sites which have over 500m<sup>2</sup> of hard surface (for instance surface car parking) should demonstrate how 80% of run-off water volume will be retained on-site. Retention strategies can include appropriately designed rainwater harvesting systems or sustainable urban drainage systems (SUDs) including swales.

### Submission requirements

1. An on-site storm water retention report that indicates the predicted on-site storm water retention performance of the project should be provided. This should show that at least 80% of run-off volume is retained on-site. The report should be supported by detailed and comprehensive calculations. Data – including weather data, soil type, permeability and others – used as a basis for predicted on-site storm water retention should be included. Assumptions used in calculations should be accurate or conservative. Methodology and calculations must be in line with generally accepted good practice standards.

The report must be compiled by a registered civil or wet services engineer. This should be confirmed in the report by the following statement:

"This report has been compiled to provide a realistic prediction of on-site storm water retention in the proposed project. The report is aligned with current best engineering and modelling practice and all assumptions and data used are accurate or conservative in nature."

Signed:

Name:

Registration:

Registration number:

## WA 8: Swimming and ornamental pools

Water to top up swimming pools and ornamental ponds with a volume of  $2 \text{ m}^3$  or more must be sourced from rainwater harvesting tanks. Municipal supplies should not be used for this purpose. Applications to develop pools of  $2 \text{ m}^3$  or more must include a rainwater harvesting system of adequate capacity.

This requirement does not apply where the pool will have a pool cover installed for at least six months of the year and has a filtration system that does not result in waste water from backwashing.

To calculate the required minimum rainwater harvesting capacity, the surface area of the pool in square metres should be multiplied by 1,0 to obtain a volume. Thus, if the surface area of a pool is  $5 \text{ m}^2$ , the volume required would be  $5,0 \times 1,0 = 5,0 \text{ m}^3$  or 5 000 l. This is the minimum required capacity of the rainwater harvesting system.

### Submission requirements

1. Provide a site plan that indicates the pools and rainwater harvesting system.
2. Provide a table that contains the type of pool, surface area, minimum rainwater harvesting requirements and actual rainwater harvesting capacity provided. An example of such a table is given below.

Type of pool	Surface area ( $\text{m}^2$ )	Minimum rainwater harvesting capacity required (l)	Actual rainwater harvesting capacity provided (l)
Swimming pool	5	5 000	10 000

Alternatively:

1. Provide written and signed confirmation by the building owner that a pool cover will be installed for at least six months of the year and that a filtration system will be used that does not result in waste water from backwashing.

## WA 9: Irrigation

All water used to irrigate landscapes and planting must be sourced from rainwater harvesting. Municipal supplies should not be used for this purpose. All applications for development that include irrigation schemes must indicate that a rainwater harvesting system of adequate capacity to meet the irrigation requirements of planting throughout the year has also been provided. Irrigation for food gardens is exempt from this requirement.

To calculate the minimum rainwater harvesting capacity required, the surface area of the landscape requiring irrigation should be multiplied by the irrigation requirements in millimetre per week multiplied by 16 to get the minimum rainwater harvesting capacity volume. Thus, if the landscaped area is 50 m<sup>2</sup> and the irrigation requirements are 20mm per week, irrigation water requirements per week would be  $50.0 \times 0.02 = 1.0 \text{ k}\ell$  or 1 000 ℓ. This would then be multiplied by 16 to get the minimum rainwater harvesting capacity required (16 000 ℓ). This is the minimum required capacity of the rainwater harvesting system.

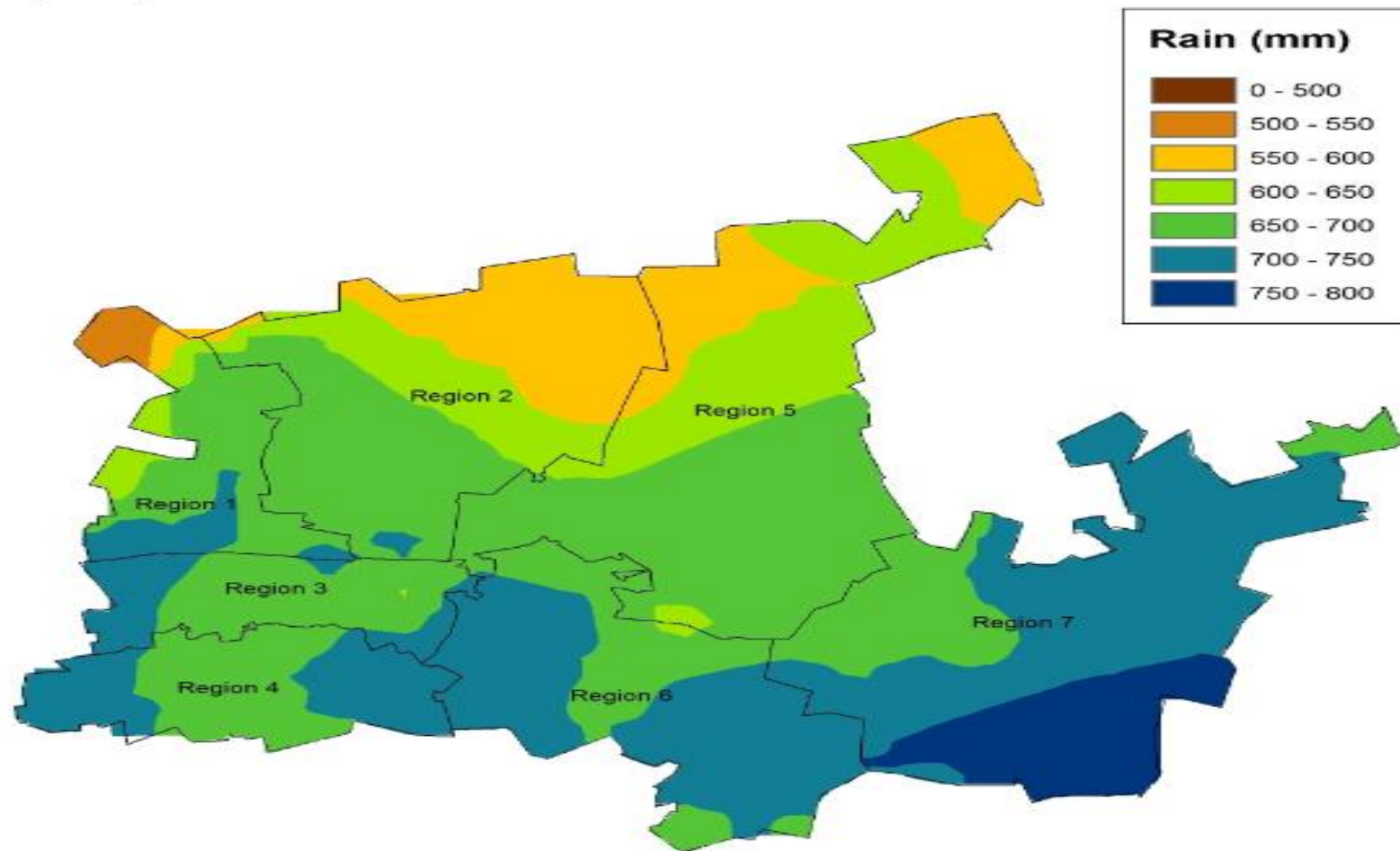
### Submission requirements

1. Provide a site plan that indicates the irrigated area and rainwater harvesting system.
2. Provide a table that indicates the type of vegetation requiring irrigation, the area of the vegetation, the irrigation requirements per week and the minimum actual rainwater harvesting capacity provided. An example of such a table is given below.

Type of vegetation requiring irrigation	Area (m <sup>2</sup> )	Irrigation requirements (mm / week)	Weekly water requirements (ℓ)	Factor	Minimum rainwater harvesting capacity required (ℓ)	Actual rainwater harvesting capacity provided (ℓ)
Front lawn	50	20	1 000	16	16 000	20 000

# Mean Annual Rainfall for City of Tshwane

*Based mainly on data for the  
30 year period 1981-2010*



0 15 30 Kilometers





# Examples of Rainwater Harvesting Tanks





## RAINWATER HARVESTING

nuutste toevoeging tot die RainCell™ reeks. Die nuwe 1100lt RainCell™ planter tenk. Staan net 1.1m hoog, hierdie ontwerp om onder vensters geplaas word sonder om die uitsig te belemmer. Die bokant van die tenk bied 'n self dreinerende plantebak, ideaal vir klein kleurvolle blomme of 'n kruie tuin.

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# Nuwe



**Bespaar water,  
Bespaar ruimte**



Pas netjies onder 'n venster in



Ook beskikbaar met 'n plat bokant





# JoJo Waterwise: IMPROVE

**JoJo Tanks**  
If it doesn't say JoJo on the outside, it's not a JoJo

## WATER QUALITY in your water tank

Now that you have a water tank and are harvesting rainwater you have a reliable and secure water supply. But you also need to keep the water clean. Here are a few valuable tips to improve quality of the collected water going into your JoJo water tank:

Trim back trees and plants hanging over the roof. Keep the roof clean. During dry weather, dust, leaves, animal excrement, dead insects and other particulate matter accumulate on the roof and this can contaminate the water even if a first-flush diverter has been installed.

Make the roof surface smoother the better the rainwater collection. Tiles, metal or plastic sheeting is recommended for roofs used for rainwater harvesting.

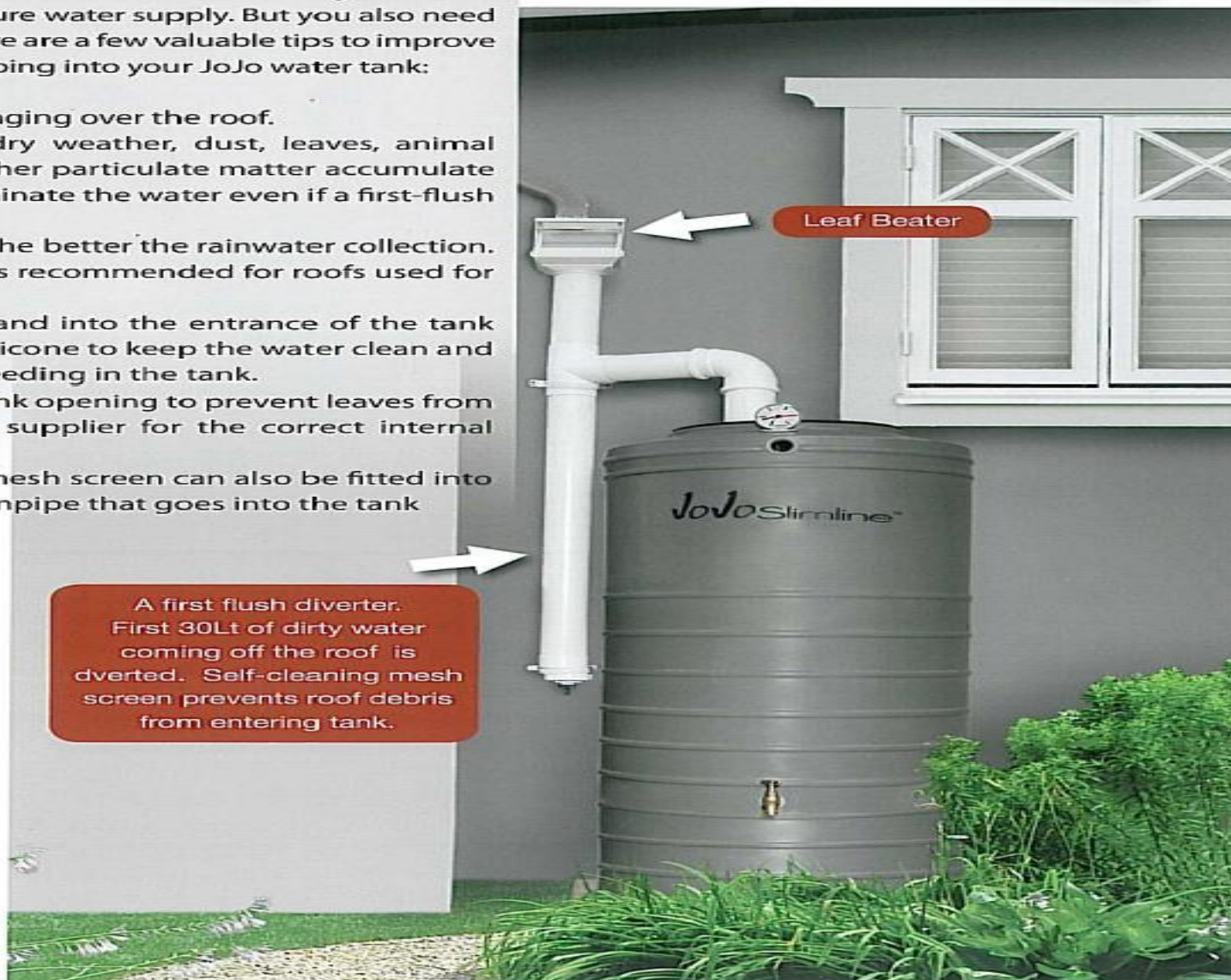
Seal the downpipe into the gutter and into the entrance of the tank. It must be properly sealed with silicone to keep the water clean and prevent mosquitoes from breeding in the tank.

Install a mesh screen into the tank opening to prevent leaves from entering. Ask your JoJo Tanks supplier for the correct internal screen for your tank.

As an additional precaution, a mesh screen can also be fitted into the gutter leading into the downpipe that goes into the tank.

Install a first flush diverter. The first rain after a dry period moves dirt from the roof. The first flush diverter ensures that this dirt does not enter the tank.

Keeping water clean by using these tips from JoJo will greatly improve the quality of the water stored. Rainwater harvesting provides clean water for a variety of domestic purposes including drinking, washing, cleaning, watering the garden, cleaning driveways, and flushing





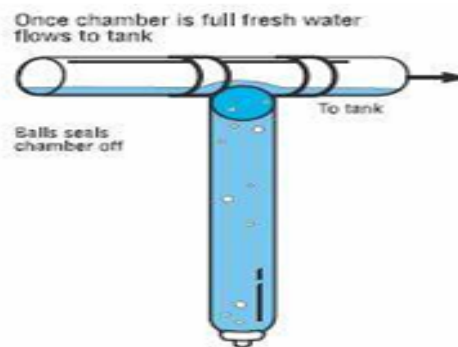
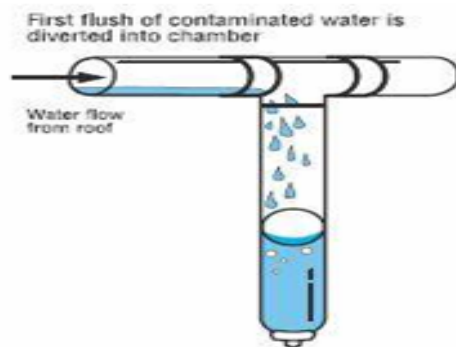
Leave Diverter and Tank Cover (Basket)



# First Flush Devices - A Review

by Doug Pushard

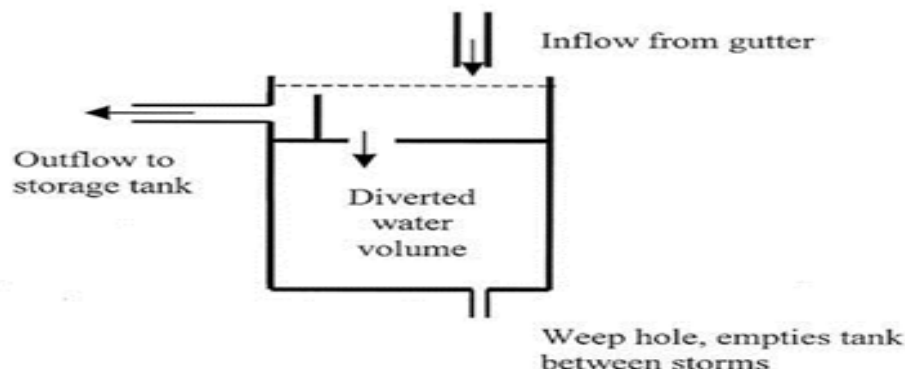
What is a First Flush? Is there one perfect type of First Flush device? Where do I put a First Flush on my rainwater catchment system?



First Flush or Rain Diverters, as the name implies, flush off the first water of a storm before it enters the storage tank. This is the water that could be the most contaminated by particulates, bird droppings, and other materials

laying on the roof. Eliminating these contaminants before they enter into your storage and conveyance system is critical to keeping rainwater clean.

After screening your gutters, a First Flush device is the next line of defense in keeping your system and water clean. This is especially true if the water is used inside the house or where children or those with weakened immune systems may come in contact with the water.



Over the years, numerous articles have been written about First Flush devices and it is still an area of much research. However, it is generally agreed that these devices can improve the quality of the rainwater, lengthen the life of your system components, and reduce overall

maintenance. The simple diagram above depicts the theory behind these devices (i.e. draining off first rainfall before it enters the tank).

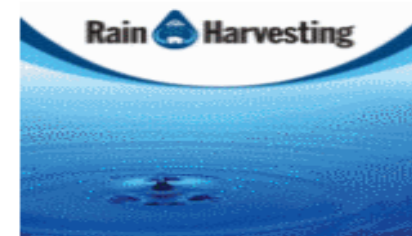
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## GENERAL WATER NEWS

February 2011

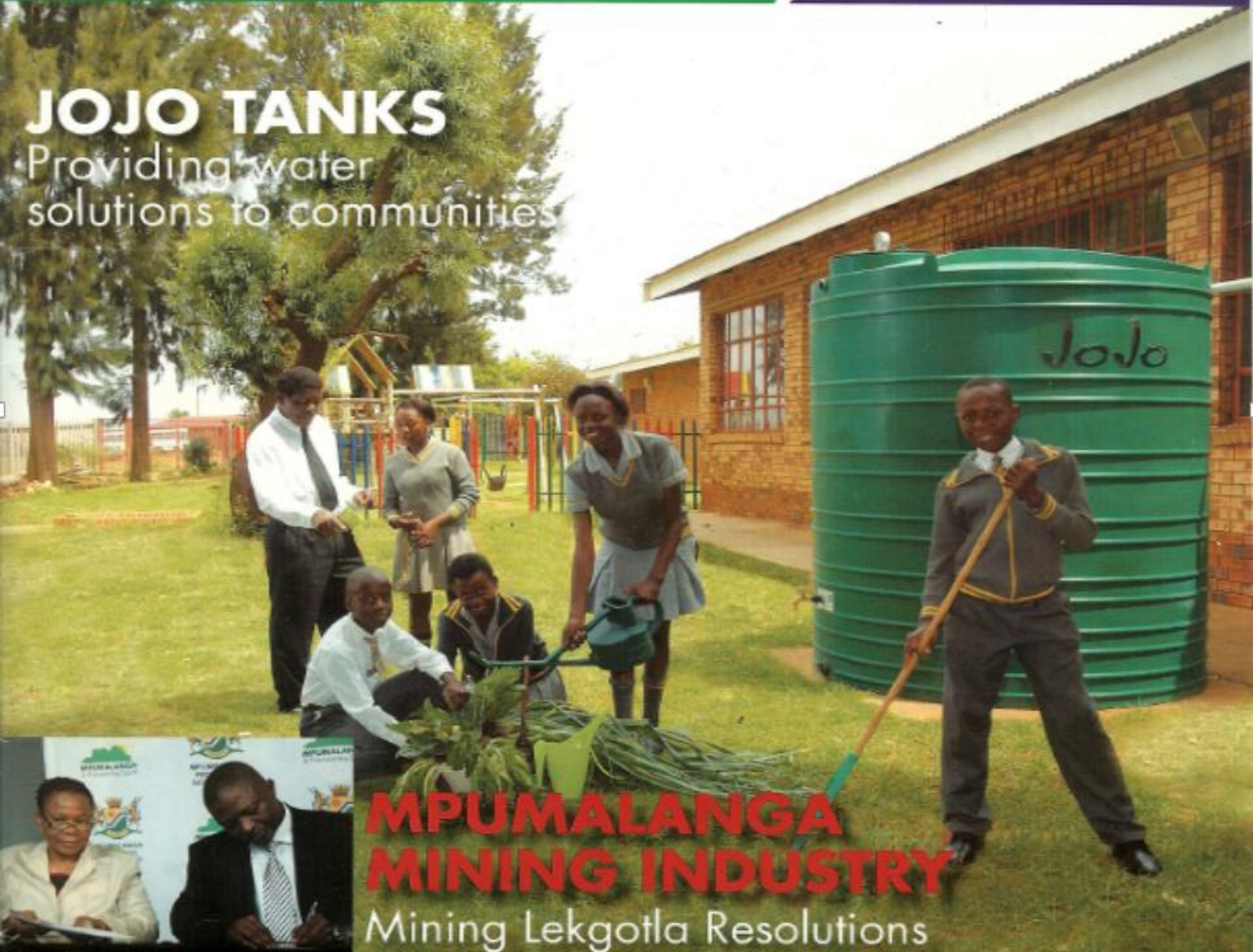
Water Labeling  
Systems Under  
Consideration

Governor: Water  
crucial to Colorado



# JOJO TANKS

Providing water  
solutions to communities



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MINING INDUSTRY**

Mining Lekgotla Resolutions













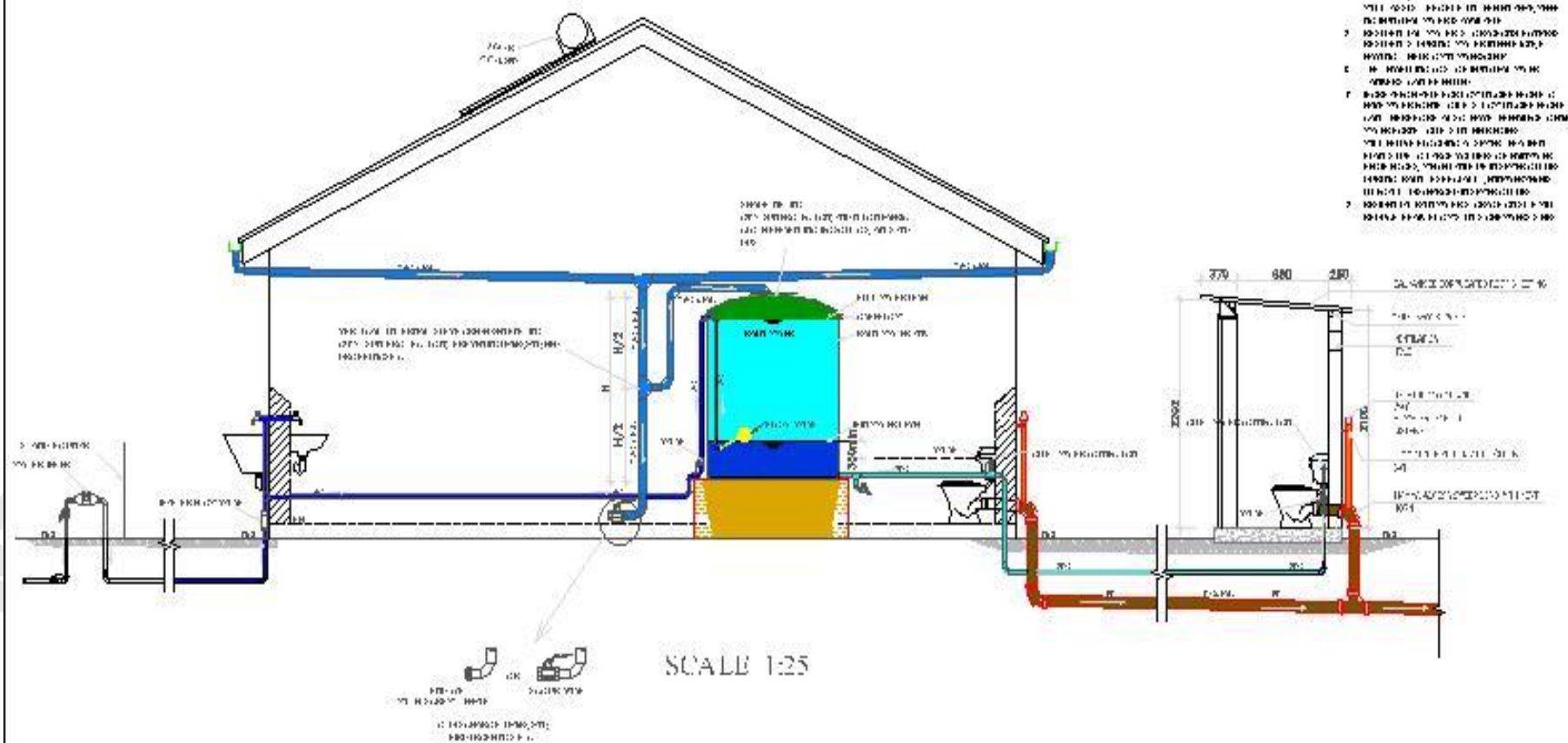












# RAIN WATER HARVESTING

Agpro  
Water Tanks  
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**R1,852<sup>49</sup>**

5000L  
23084

**R3,163<sup>50</sup>**



Booster  
Compressor Pump  
(DRUKPOM)  
700W 24L Tank  
3429

**R1,049<sup>99</sup>**



Jo Jo  
Slimline  
750L  
00000

**R1,822<sup>50</sup>**



Clean Rain  
Downspout  
Converter  
43353

**R709<sup>49</sup>**



Clean Rain  
Tank Gauge  
43350

**R175<sup>99</sup>**



Clean Shield  
Advanced Leaf Eater  
00000

**R228<sup>49</sup>**

## BATTERY CENTRE

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638  
1114

**R669<sup>99</sup>**

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**R69<sup>49</sup>**

# Producing Vegetables from Stored Rainwater



- Rainwater can be used to water vegetables to assist with food shortages, especially amongst Low Income people.
- Rainwater is free of the salts, minerals and chemicals, such as chlorine, that are found in municipal treated water and therefore rainwater is pure hydration and an ideal source for growing vegetables, etc.

## Examples of Vegetables Gardens grown with Rainwater









# Use drip irrigation to save water





# Use drip irrigation to save water





# Drip irrigation in Israel





# Drip irrigation in Israel





# Israel is a water scarce country





# Use drip irrigation to save water

































# On-site food storage



# Minimum water required for basic water needs (“Self help – Do it yourself ”)

<b>Basic water necessary for washing, drinking and cooking.</b>								
(25 liter per person per day, according to the Red Book Guidelines of the CSIR)								
Roof catchment area m2	Average annual Rainfall mm	Estimate Rainwater harvested m3	Basic water needed per person per day liters	Number of persons No	Estimate number of days of water supply	Estimate number of years No	Estimate minimum Tank capacity required liter	Estimate Tank Cost Rand
14	700	9.8	25	1	392	1.07	3000	3,927.00
<b>Drip irrigation for vegetables</b>								
(During a summer crop period of 6 months)								
Roof catchment area m2	Average annual Rainfall mm	Estimate Rainwater harvested m3	Number of Vegetables Plants No	Water consumption per plant per day liter	Number of days of water supply	Estimate Number of years No	Estimate minimum Tank capacity required liter	Estimate Tank Cost Rand
45	700	31.5	80	1	394	1.08	2400	3,141.60



# Benefits of Rainwater Tanks

1. Own “water source”.
2. During electrical power failure, candles can be used for light, but there is no substitute for water, therefore:
  - No flushing of toilets
  - No cooking
  - No bathing
  - No washing
  - No drinking water.
3. “Back up” system.
4. Vegetables can be watered to assist with food shortages, especially amongst the Low Income people.
5. Rainwater storage on site can also be used for fire protection.
6. Will reduce illegal rainwater spillage in sewer gullies, which causes flooding at sewer treatment plants during rain.
7. Will assist Tshwane, Rand Water, Department of Water and Sanitation and South Africa to save water.
8. To top-up swimming pools.
9. Low pressure - No pressure management is required.
10. Even dew water on roofs can be harvested with rainwater tanks during the off rainwater season.
11. Less high quality “blue drop” drinking water is used to flush toilets.
12. Rainwater is for free! No payment or billing is required!
13. Rainwater is “Heavenly Water”. Some rivers and dams are polluted with sewer water. First person drinking water from a rainwater tank.
14. Your own “Self help, do it your self” sustainable water supply system.
15. Will reduce your municipal water and sewer account.
16. “Water is life!” (“No water!!! No life!!!”)
17. “Hands” (roof catchment area) of a small house is large enough to harvest rainwater.



1. Do your house comply to the Green Building By-Laws and Water By-Laws.
2. Should water supply to your house stop for a week or longer, are you prepared ? Will you be able to survive ?
3. Is your house in order?



Thank You

Ngiyabonga

