

Potable Rainwater Harvesting in Houston and elsewhere





Potable Rainwater Harvesting

in Houston and elsewhere

Thank you
Steve Stelzer, Sheila Blake
&
All Who of You Here

Presented by:
Mark Illian
Amanda Tullos
Al McDonald
John Jacobs

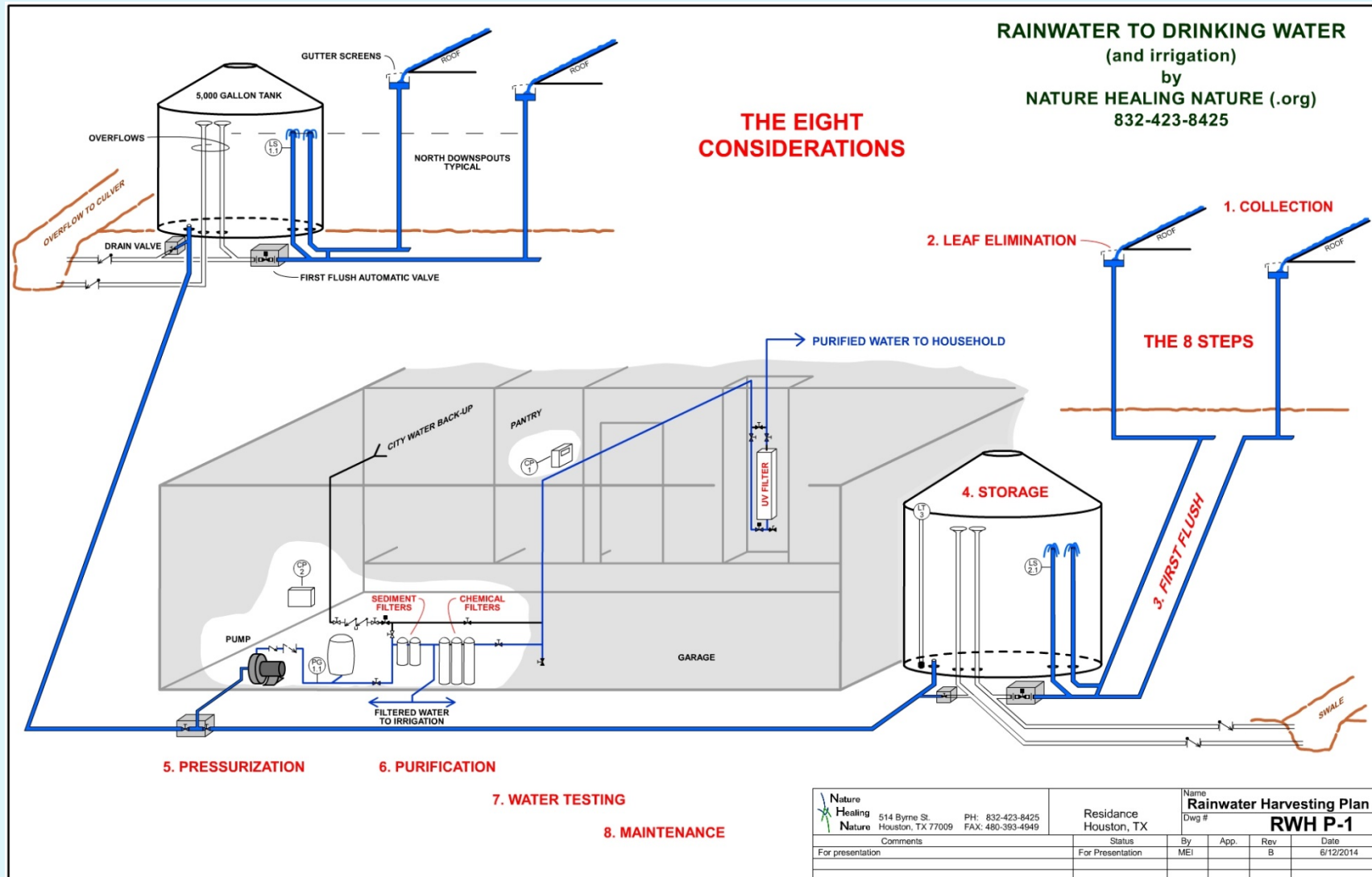
2014

Potable Rainwater Harvesting

in Houston and elsewhere



The Eight Considerations





Plus the CODE and Inspections

Presented by

John Jordan

Senior Plumbing Inspector,
City of Houston Code Enforcement



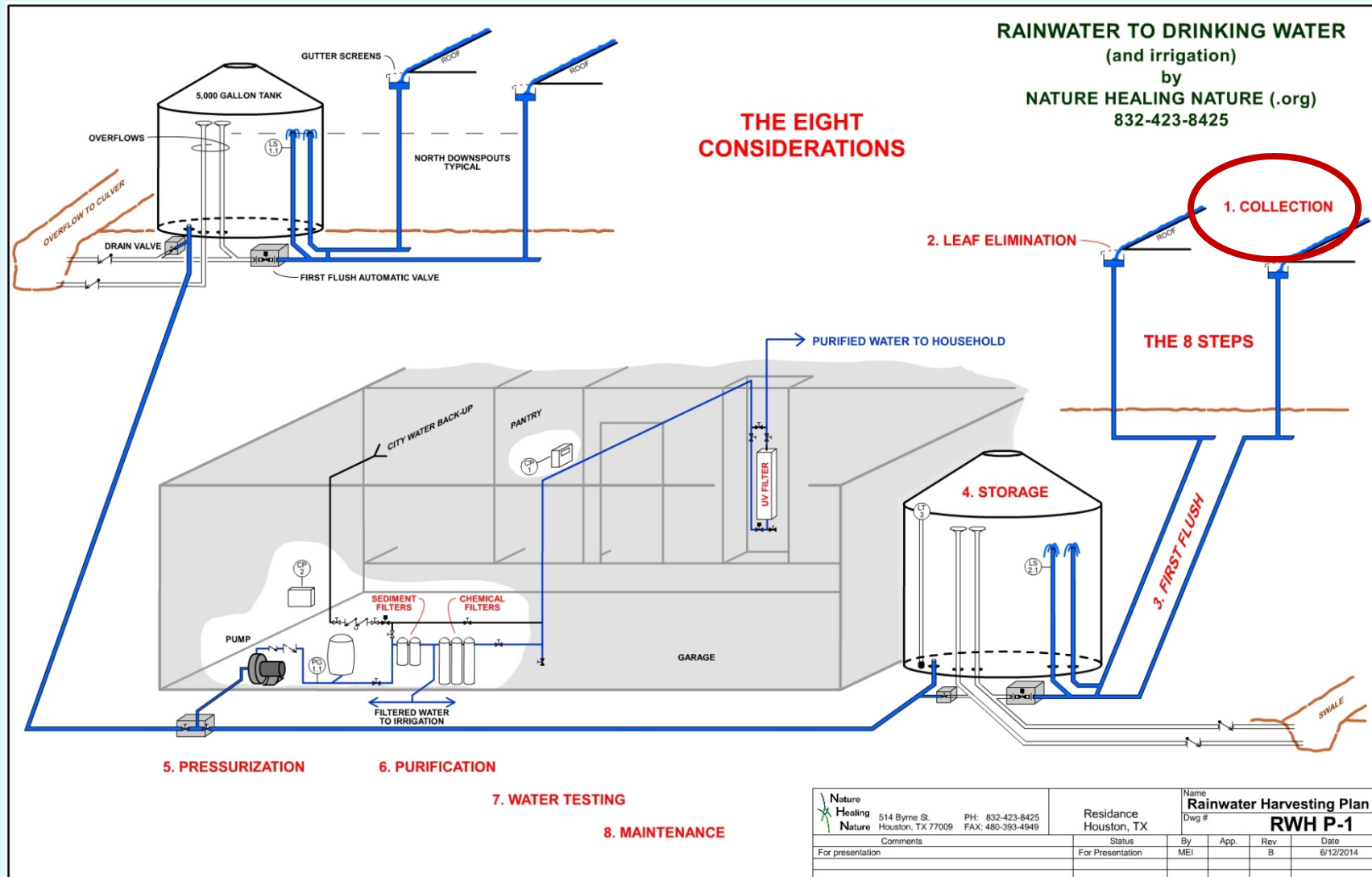


Impact on LEED

Presented by
Amanda Tullos
Owner,
GreenNexus Texas Consulting



First Consideration





Collection – How much roof area? How big of a tank?

You can find this calculator at our site:
www.thecenterforrainwaterharvesting.org
It's interactive . . .

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
23	Enter the <u>average</u> number of gallons that you think <u>each person</u> is using in your home each day:										Gallons =	273	per person per day			
24																
25	Second: Entering your roof area and gutter efficiency.															
26	Enter the total area of your guttered roof that you calculated in section 2.2 <i>Calculating your roof area for rainwater harvesting</i> . As you recall, the total roof area in our example was $Aa + Bb + Cc + Dd = 807$. Even though I told you in section 2.2 that the numbers were dimensionless, we are going to assume that they are in square feet for this example.										6420					
27	For those of you in moist climates, and find that you always have lots of water at the end of the month, once you are comfortable with how this spreadsheet works, try entering different combinations of roof areas; like $Aa + Dd$, or $Bb + Cc$, or just Aa . You might find that you need less guttered roof area than you think.										4,220 square feet					
28	Enter the efficiency of your collection system															
29	If you have a high quality, well maintained gutter system the efficiency is probably about 75 to 90%.															
30	If your gutter system integrity is questionable and you see a lot of water running over the edge during a rain storm, the efficiency is probably about 50 to 70%										Efficiency =	85	percent			
45	maintain you tank based on the calculated tables at end of this section.															
46	The tables also suggest you would probably need a tank size less than 14,759 gallons.															
47	You might not need a tank this big. It's time to do some what-if calculations. You can watch what your end of the month inventory will do as you increase or decrease your tank size.															
48	Fourth: Now for the fun part - sizing your tank!															
49	We are going to assume that you will have zero inventory at the end of Apr															
50	Simply type in a tank sizes over the 1,000 in this red box and the green graphic line will indicate what your end of the month inventory will be.															
51	Notice the number of months you have zero inventory. If this is unacceptable, continue to increase the tank size until the numbers don't change (and the green covers the yellow line). That is your maximum tank size. Any larger of a tank will be wasted, or you will need to fill it with something other than rainwater.															
52																
53																
54			monthly rainfall inches	Collected	Consumed	End of month inventory	What-If" inventory									
55	1	Jan	3.38	7,557	8,463	13,752	8,994									
56	2	Feb	3.2	7,155	7,644	13,263	8,504									
57	3	Mar	3.41	7,624	8,463	12,425	7,666									
58	4	Apr	3.31	7,401	8,190	0	0									
59	5	May	5.09	11,381	8,463	2,918	2,918									
60	6	Jun	5.93	13,259	8,190	7,987	7,987									
61	7	Jul	3.79	8,474	8,463	7,998	7,998									
62	8	Aug	3.76	8,407	8,463	7,942	7,942									
63	9	Sep	4.12	9,212	8,190	8,963	8,963									
64	10	Oct	5.7	12,745	8,463	13,245	10,000									
65	11	Nov	4.34	9,704	8,190	14,759	10,000									
66	12	Dec	3.74	8,362	8,463	14,658	9,899									
67																
68	Total rainfall			49.77	Total guttered	111,281	Total Consumed	99,645	Maximum tank inventory	14,759						
69																
70																

Rainwater Inventory Based On Collection, Consumption & Tank Size

Legend:
— Collected
— Consumed
— End of month Inventory
— What-If" inventory



Collection – What's the best roof material?

There is a lot of research on roof material,
but little on real installations. Check our
website for more.

www.thecenterforrainwaterharvesting.org

Effect of Roof Material on Water Quality for Rainwater Harvesting Systems – Additional Physical, Chemical, and Microbiological Data

Report

by
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Texas Water Development Board

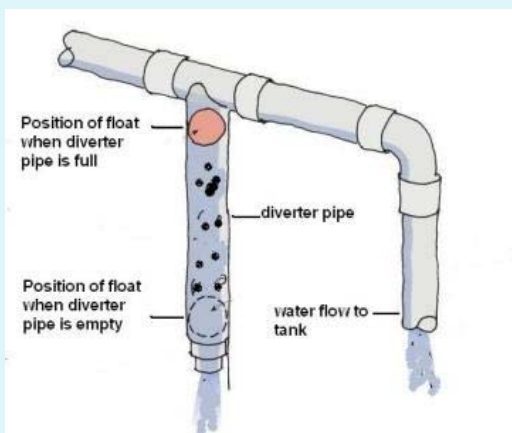
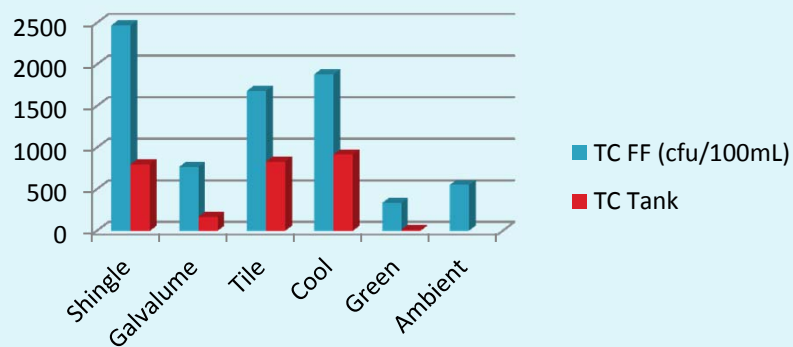
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231
January 2011



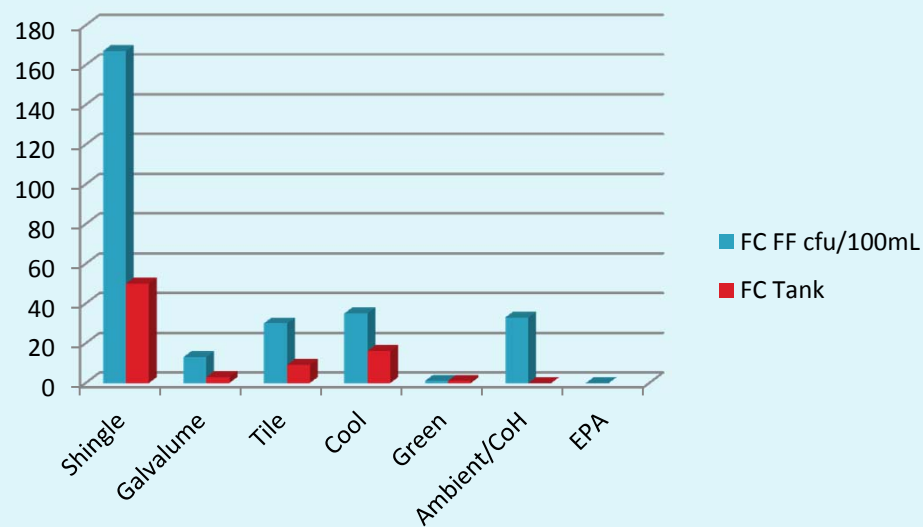
Collection – Critters on your roof? What do materials have to do with it?

10 trillion cells make
up your body ...
... you are home to
100 trillion bacteria

Total Coliforms are groups of indicator
microorganisms.
(Measured as Colony Forming Units per 100mL)



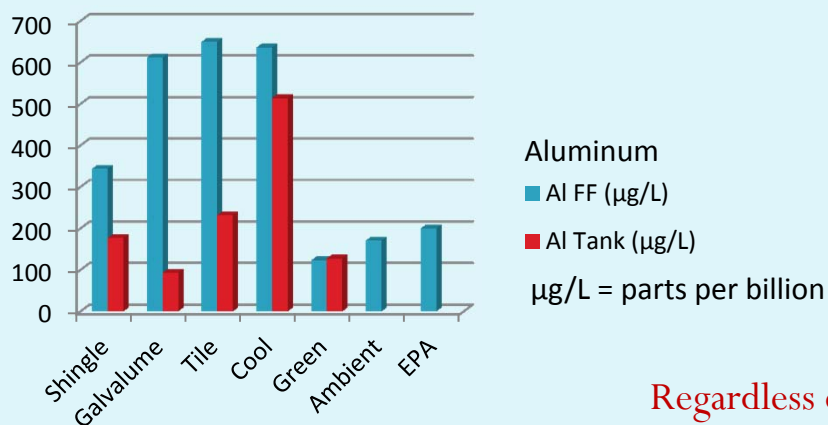
Fecal Coliforms are groups of indicator
microorganisms.



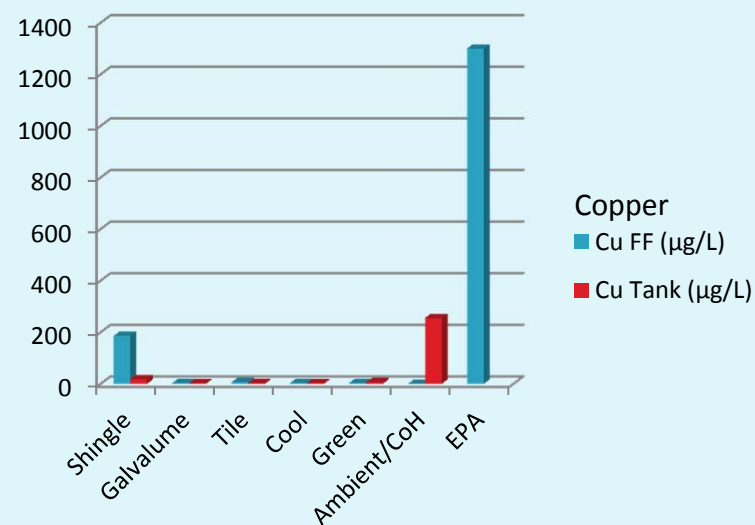
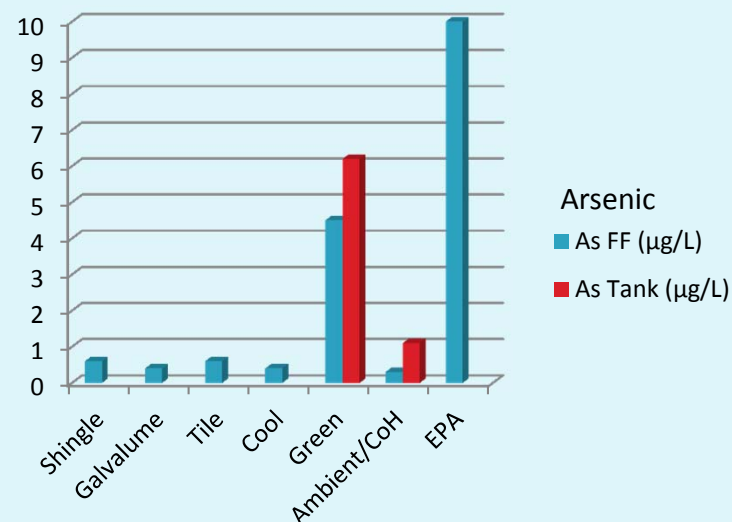
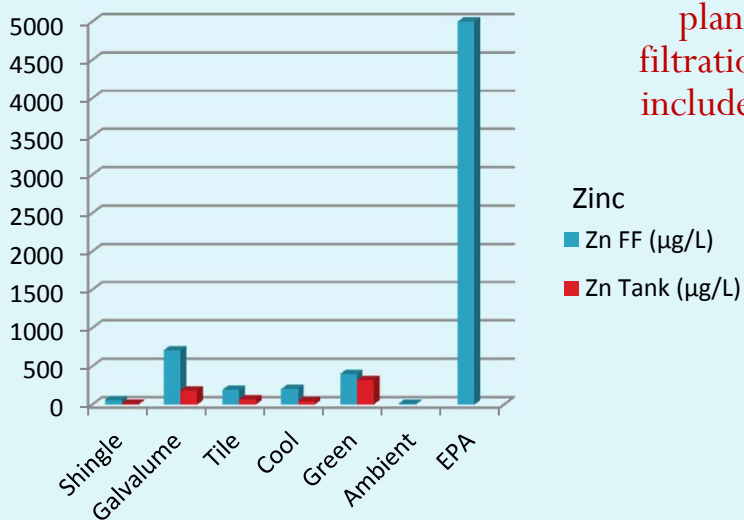


Collection – Heavy Metals on your roof?

Whatever is around your house will wind up on your roof via dust.



Regardless of your roof material, plan on careful filtration and always include a first flush.



Collection - Gutters

Always slope your gutters
toward the downspout at least
 $\frac{1}{16}$ " per foot

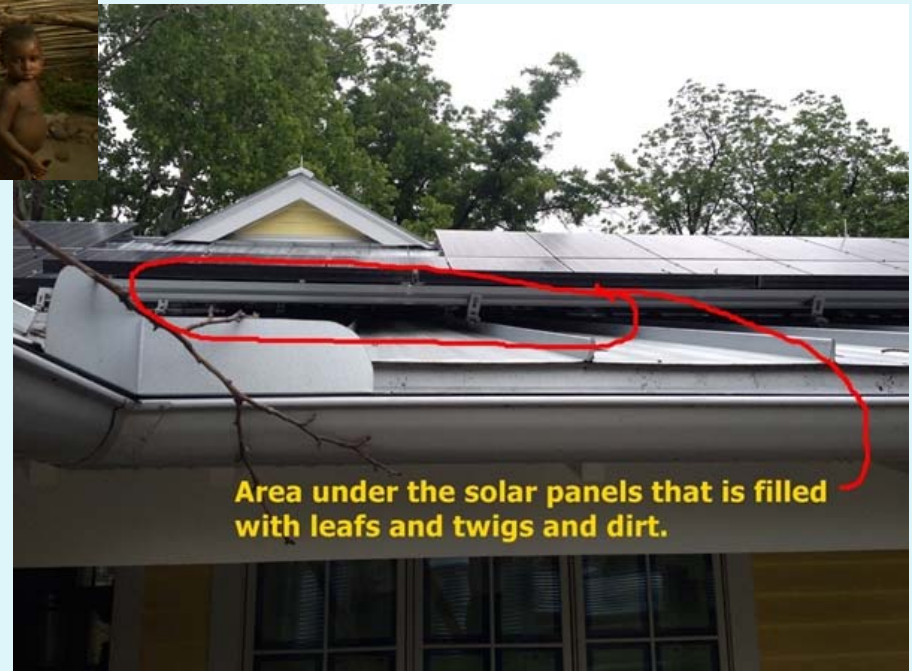
Togo



Don't let stuff accumulate.

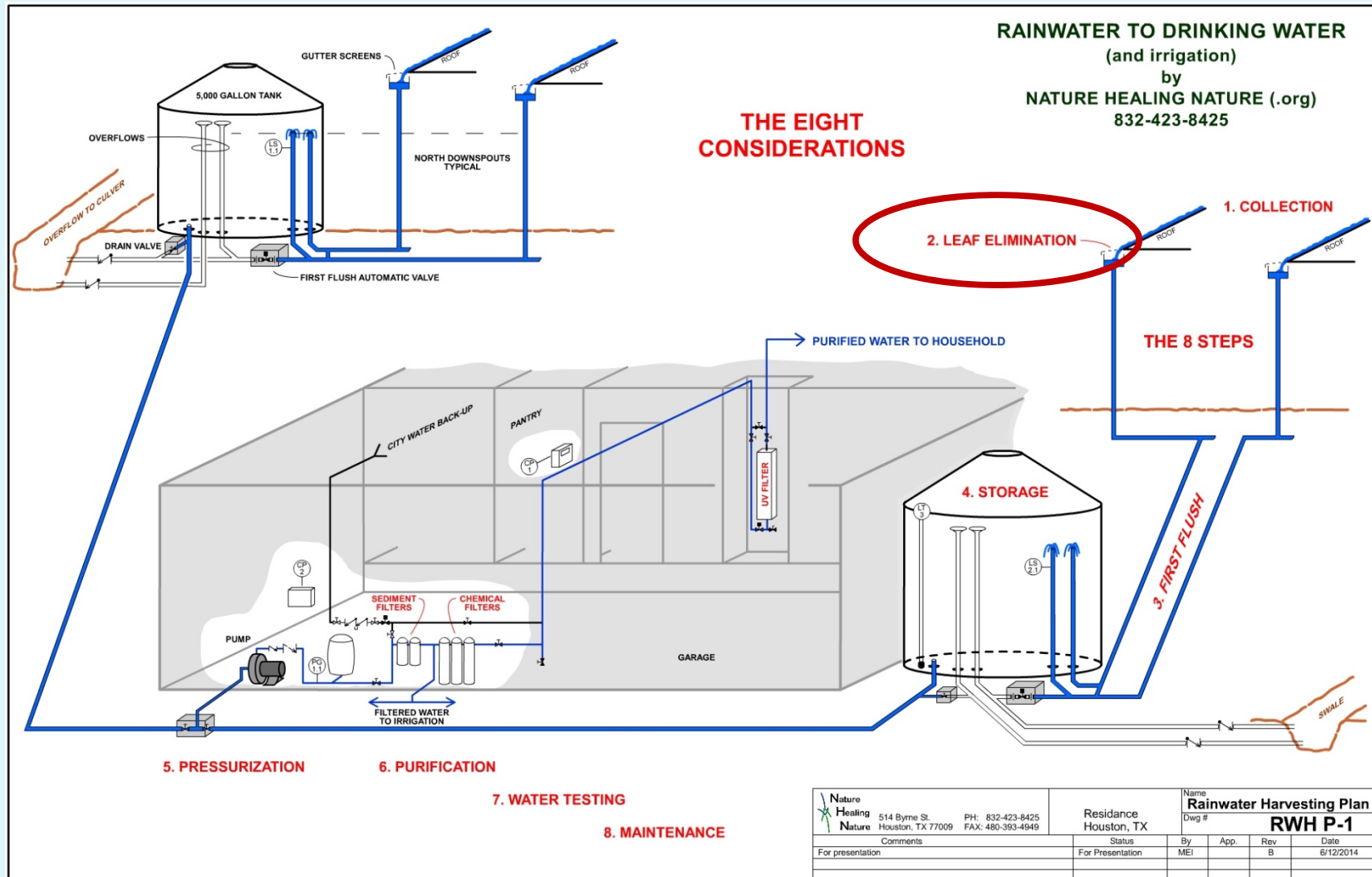


Hempstead

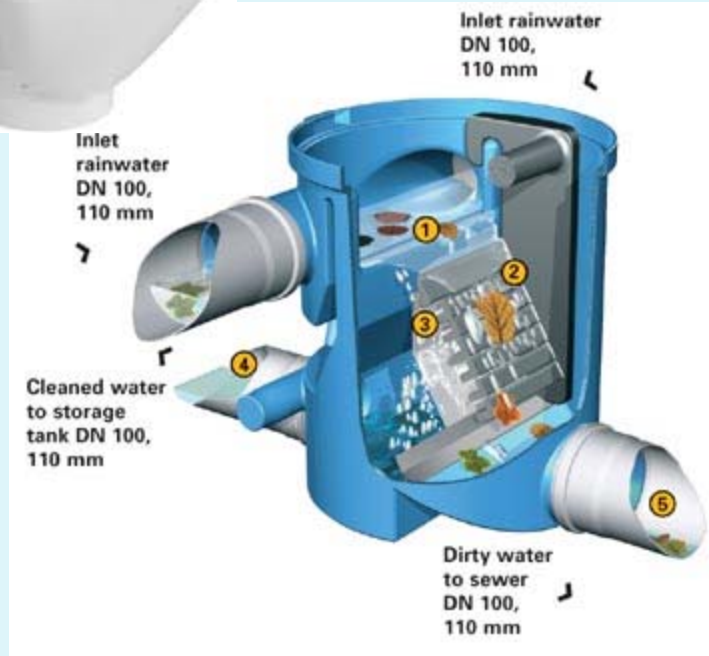


Houston

Second Consideration



Leaf Elimination - Getting rid of leaves and twigs.



Assume you have dumb leaves and twigs that don't know where they are suppose to go.



Getting rid of leaves and twigs . . . OR NOT

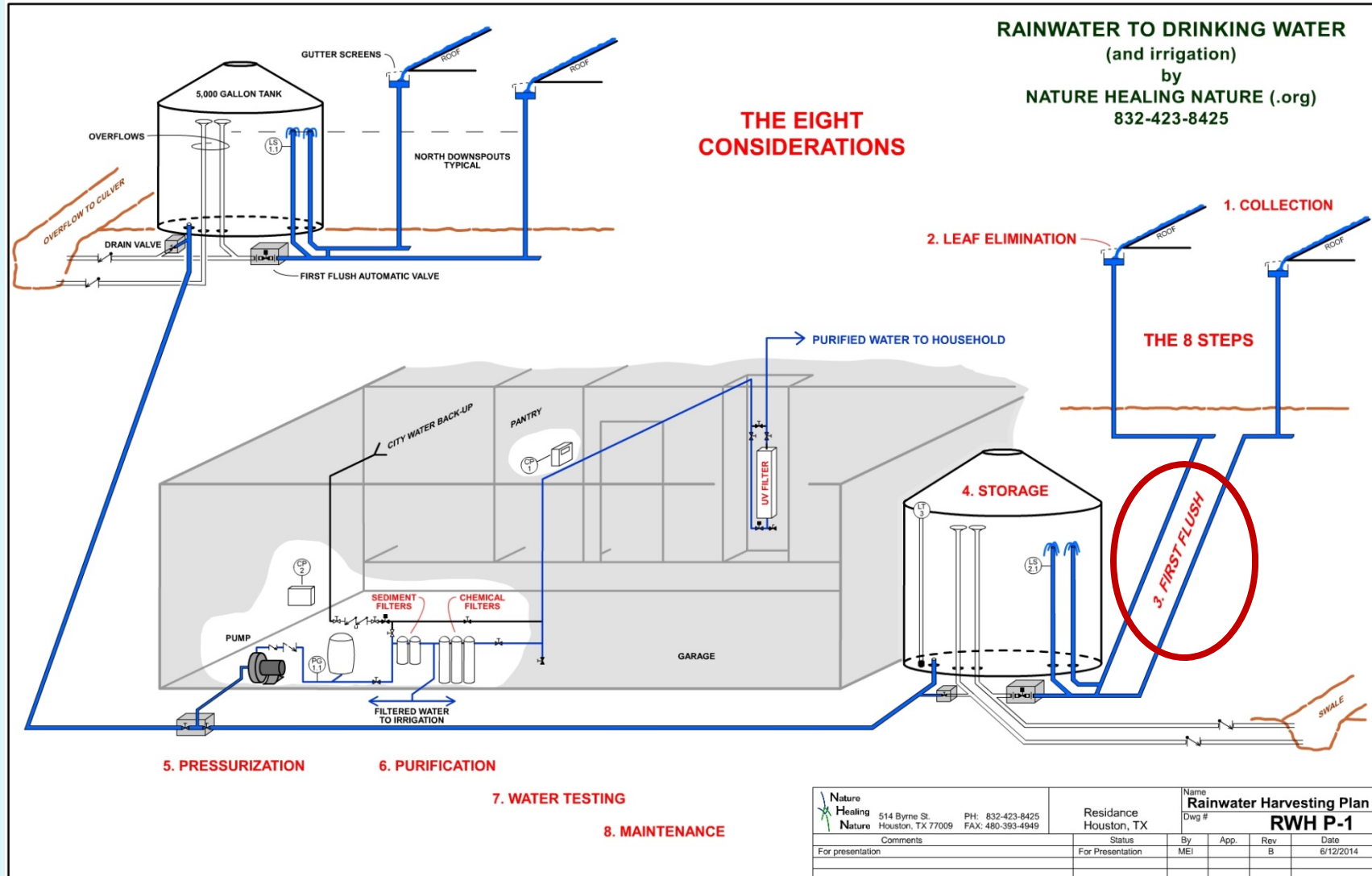


Poor installation . . .

And the results



Third Consideration

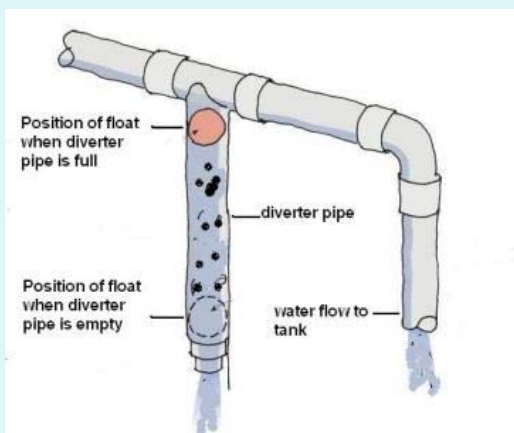
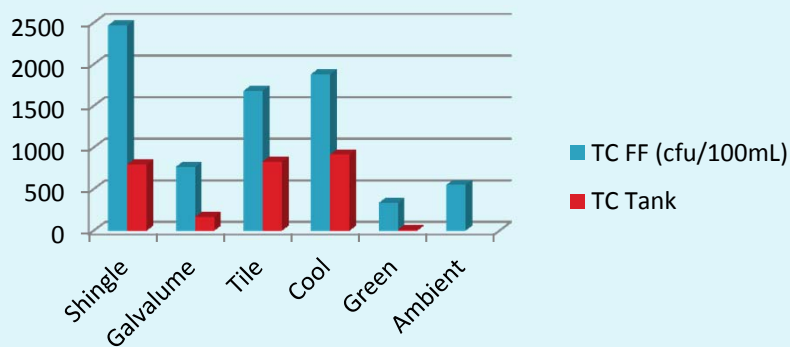


Remember from earlier . . .

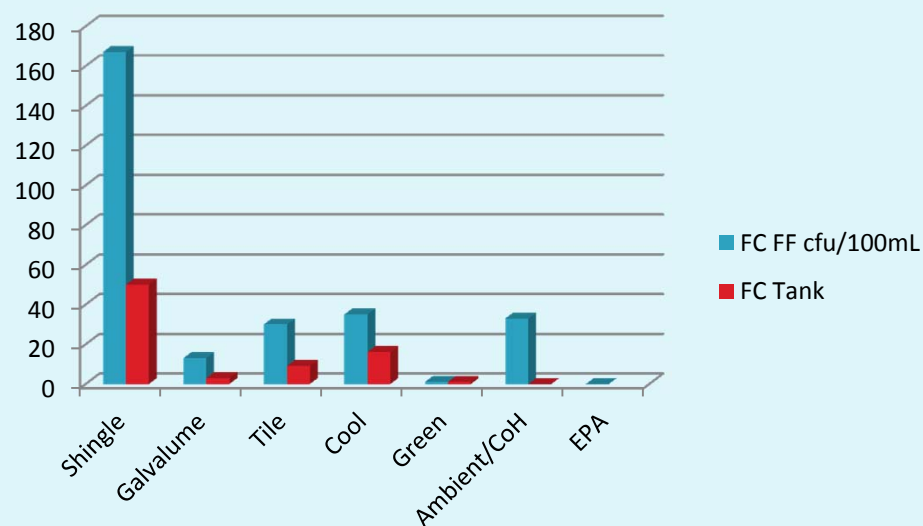
First Flush – it gets rid of a lot.

Total Coliforms are groups of indicator microorganisms.

(Measured as Colony Forming Units per 100mL)

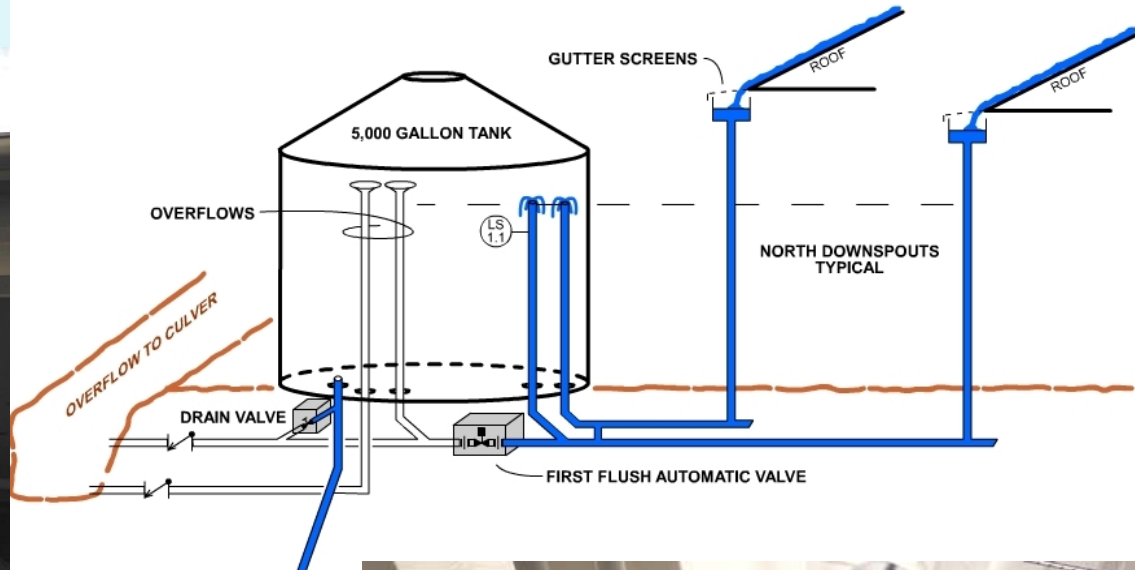


Fecal Coliforms are groups of indicator microorganisms.



The first flush will keep your tank cleaner and reduce the load on your filters.

First Flush – getting rid of small stuff

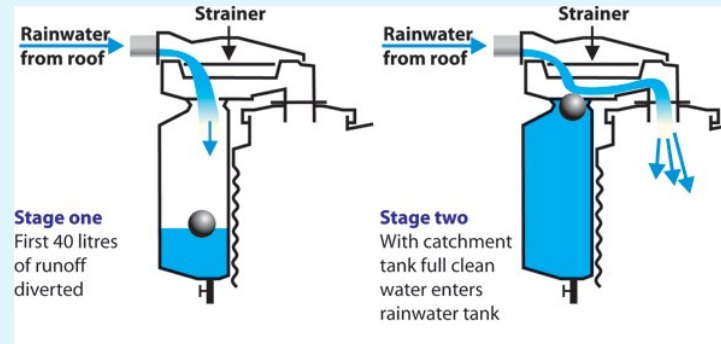


You want to discard a minimum of the first 10 gallons per 1000 sq. ft. off projected roof.

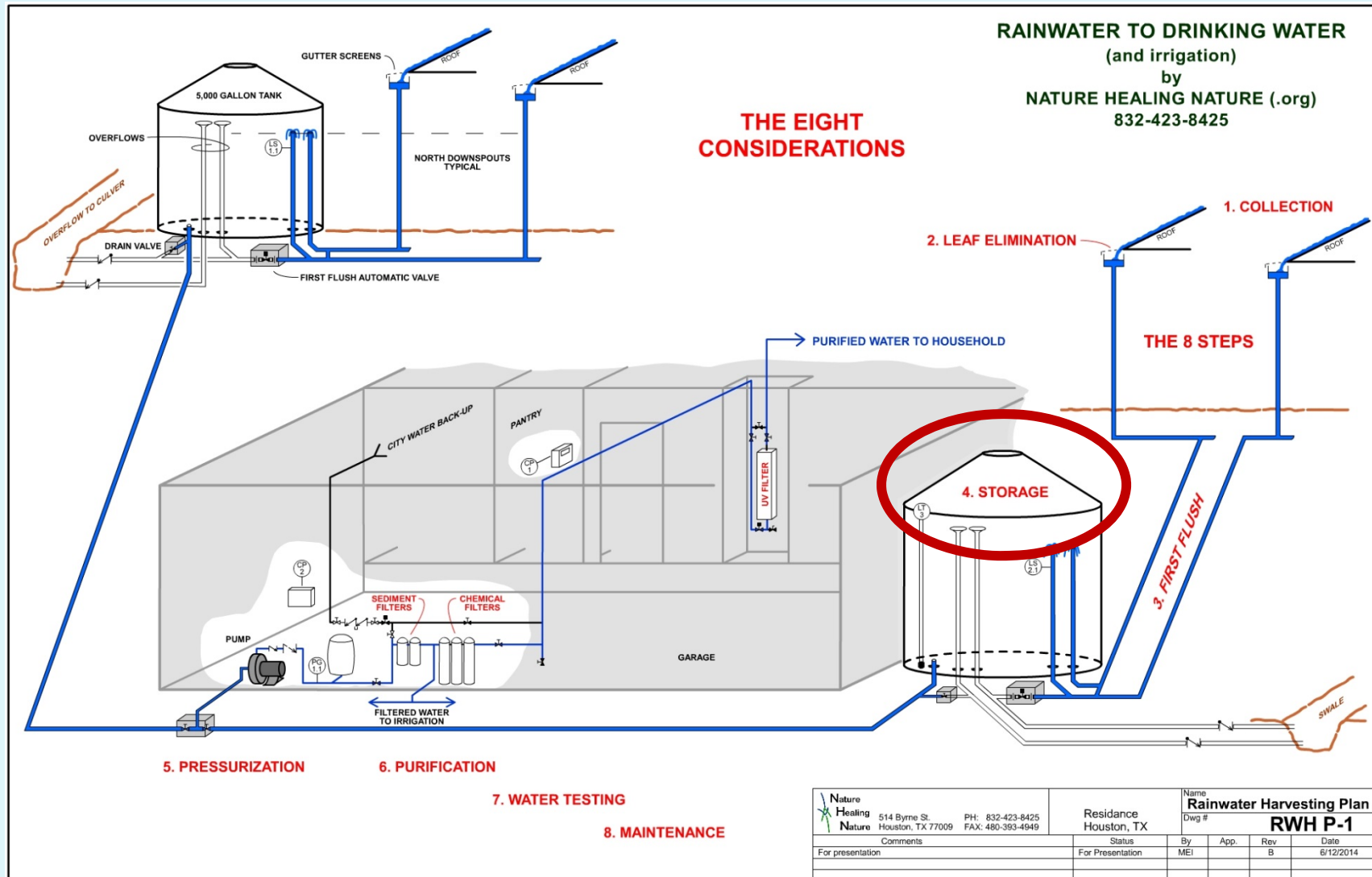


First Flush – a simple vertical

Beware of plugging problems,
use a big dump valve



Forth Consideration



Storage – around the world

Beautiful . . .



Glacier water storage

Peruvian Andes



Thai jars

North West Cambodia



Spring boxes

Peru



Cement jar

Togo



Storage – Lots of options



Don't forget to keep the
mosquitos out

Tanks are about \$0.70 to
\$1.50 per gallon.

A foundation and Installation
can double that.

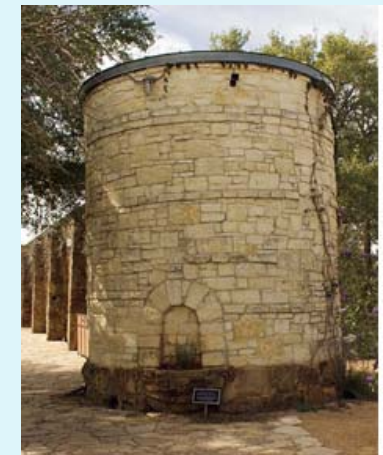


Storage – and more



Tanks can be made out of
just about anything that
holds water.

You can veneer
A plastic tank





Storage — an above ground 5,000 gallon tank

Field constructed metal and wood tanks usually have a plastic liner.

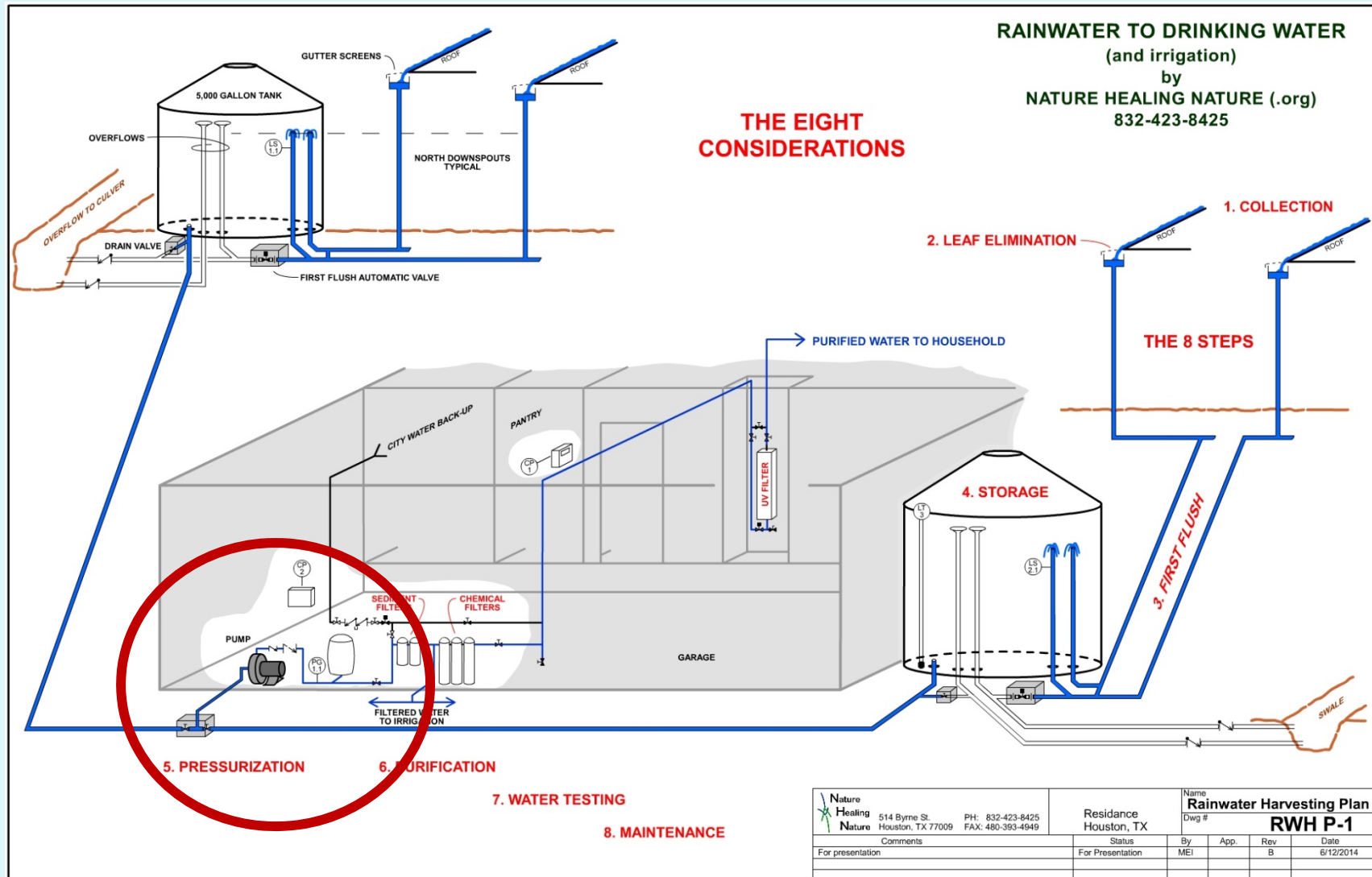


Storage – 10,000 gallons of underground storage

Interconnecting the tanks at
the bottom makes them
behave as one.



Fifth Consideration



Pressurization – without electricity

Keep it simple . . .
Keep it working



Gravity

Foot pump



40% of the rural
hand-pumps in
Africa are broken.

Hand pump



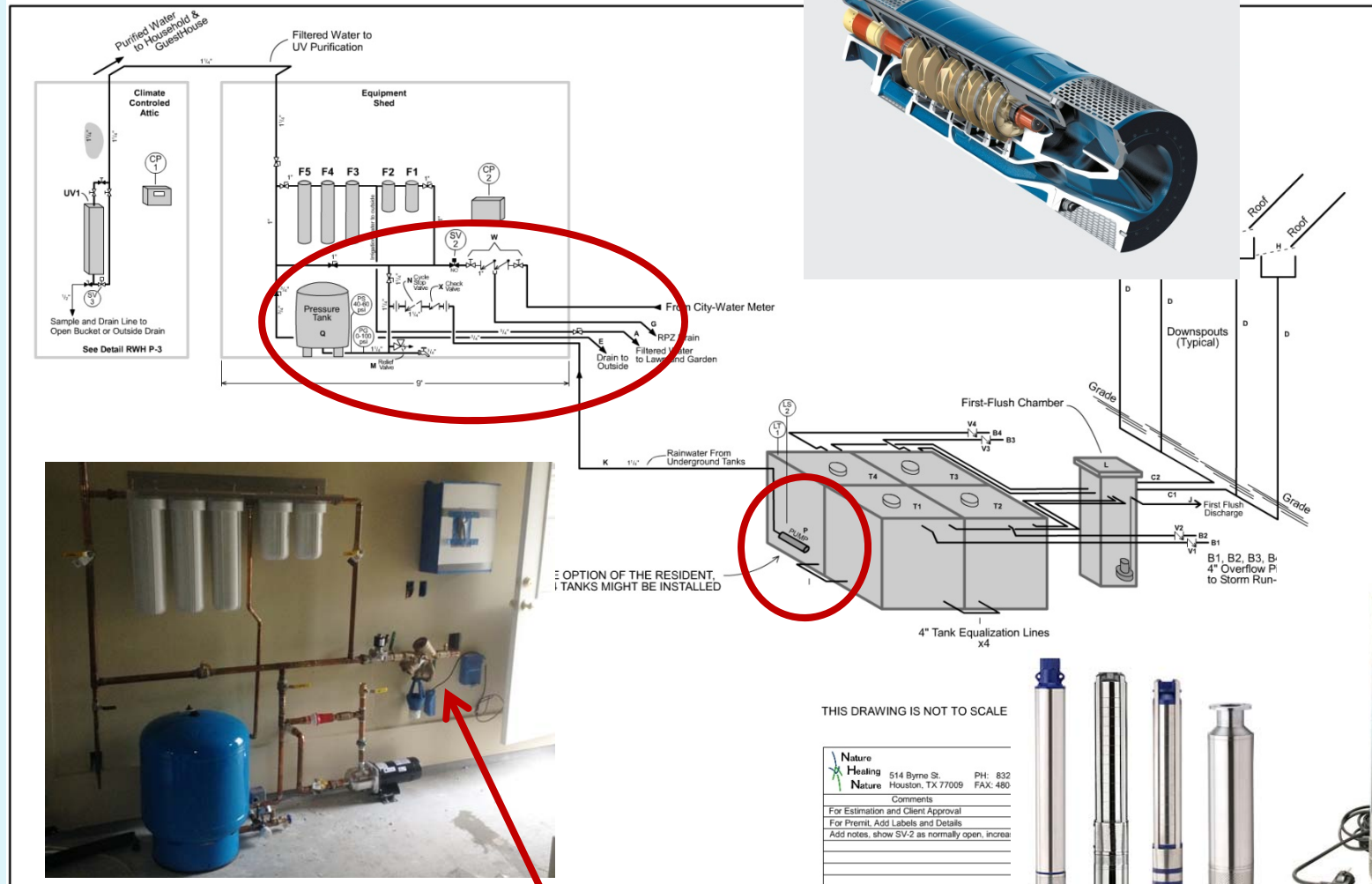
Rope pump





Pressurization – the pump the pressure tank and city-water back-up

It's installed like a water well system



City water backup requires a RPZ or air gap



Pressurization – There are many pumps to choose from. The better the pump the more expensive.

Pumps don't require
much maintenance

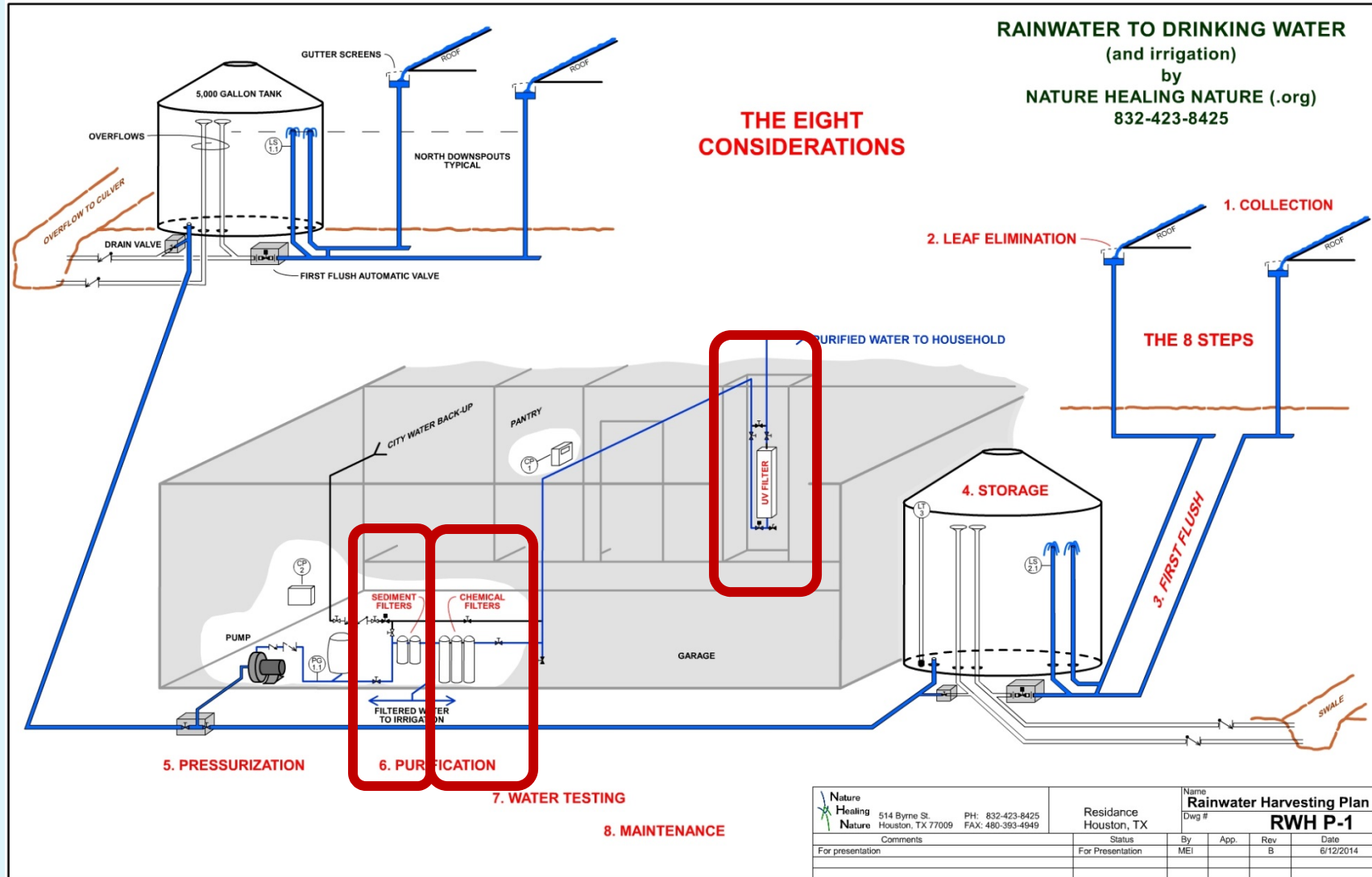


Above ground pumps
\$400 to \$800



Or much less

Sixth Consideration





Purification

Presented by
Al McDonald

Owner,
Amac Water Products

DON'T IGNORE THIS . . .
get spares and monitor
everything monthly.

If you are not likely to do this
or hire somebody to do it for
you, **DON'T** install a potable
system!



In all of history, more humans have died from water related illness than anything else
- combined.

Bacteria, viruses, helminths . . .
Purification — using what's available



Mom's way -
using a bottle and
UV sunlight
— 6 hours



The original UV was from
the sun . . . It still is.

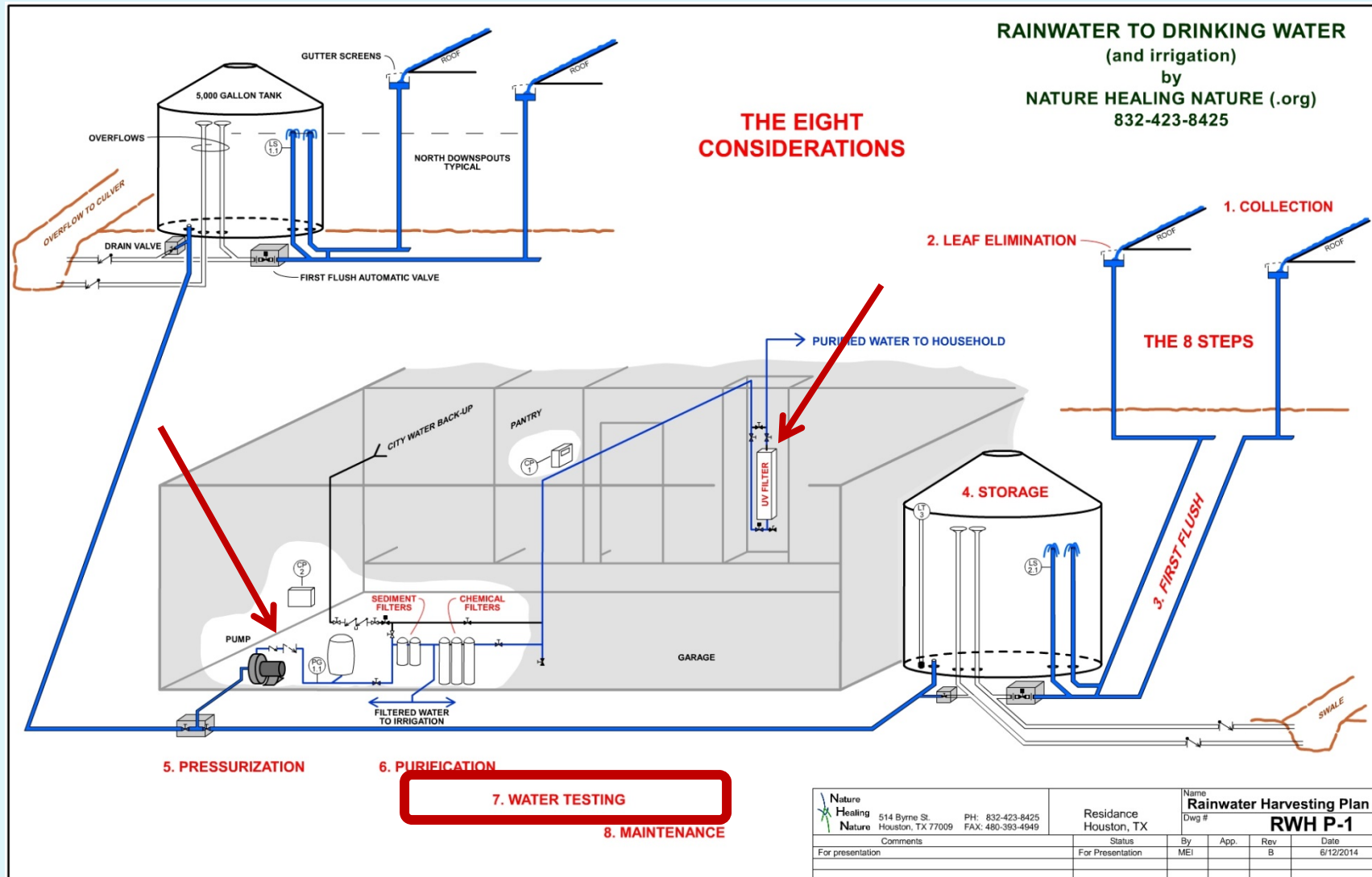
Get help
from an expert.

Ozone takes residence time.
Chlorine is, well, chlorine

Here we use
electrically
generated UV —
a few seconds



Seventh Consideration





Water Testing – How?

Just do it.

NOT testing your potable water is like playing Russian Roulette.

Test #755 \$79
150 Contaminant Screening

- 25 Times More Coverage Than All Retail Stores Water Tests
- Simple, Fast, and Easy
- No Mixing of Messy Inaccurate Colorimetric Kits, Reagents and Litmus Paper
- Free Retest And Corroboration of Every Contaminant Included
- Fast And Accurate Certified Laboratory Facility Analysis
- Lowest Price USEPA Lab Methodology Water Test For 150 Contaminants
- Designed for Apartment, Home, Drinking, Bottled Water, Well & Industry Water
- Multi Floor Business and Apartment Buildings DISCOUNTS TODAY

Test #779 \$199
240 Contaminant Screening

- Highest Quality Drinking Water Laboratory Testing Levels In Kit Form Worldwide
- Safest Home Coverage Test That Exists
- Recommended for Pollution, Contamination and Natural Gas Drilling Areas
- Certified Laboratory Facility Quality Water Testing for all contamination
- Free Retest And Corroboration of Every Contaminant Included
- USEPA METHODOLOGY
- Platinum Value in Well Water Tests
- Tests for Wells, Springs, Lakes, Streams, Ponds, Farm, Home, City, Industrial and Process Water, Pesticides, Storms and Flooding
- 10% DISCOUNT – TODAY!

Test # 777 \$225
225 Contaminant S

- USEPA METHODOLOGY
- Six Times The Number of Some State Tests
- Certified Quality Drinking Analysis in Kit Form
- Fast Turn Around
- Free Retest And Corroboration of Every Contaminant
- Yearly Testing and Monitoring Homes, City, Public, We Industry and Process W
- Most Superior All Purpose
- GREAT DISCOUNT – T

Buy Now **Learn More**

E-MAIL US !

WaterLab.info@houstontx.gov

City of Houston
Health Department Laboratory
Water & Dairy Section
2250 Holcombe Blvd.
Houston, TX 77030

CALL US !

832.393.3939

DRINKING WATER INFORMATION & TESTING

The City of Houston Water & Dairy Environmental Microbiology Lab accepts and tests samples of water intended for human consumption and use. Water is tested for the presence of Total Coliform bacteria and E. coli. The analysis takes 24 hours to complete.

Samples must be submitted in sterile treated bottles supplied by the City of Houston Health Department, Harris County Health Department, the Texas Department of State Health Services, Texas Commission on Environmental Quality (TCEQ), or your local health authority.

- Water samples are accepted Monday – Friday from 8:00 am to 4:00 pm
- The fee for drinking water testing is \$16.50 per bottle
- Payment must be made when the sample is delivered to the laboratory. We accept checks, money orders, credit cards (Visa, MC, Discover), and City of Houston accounts.
- Samples will not be processed without payment or a City of Houston account in good standing.
- **No cash will be accepted – no exceptions**

[Click here for Laboratory and sample drop-off locations](#)

Sample Collection

- Select a cold water faucet, preferably an outside faucet that does not leak (avoid hoses, fire

Water Testing – some examples

Our test kits are form
micrologylabs.com



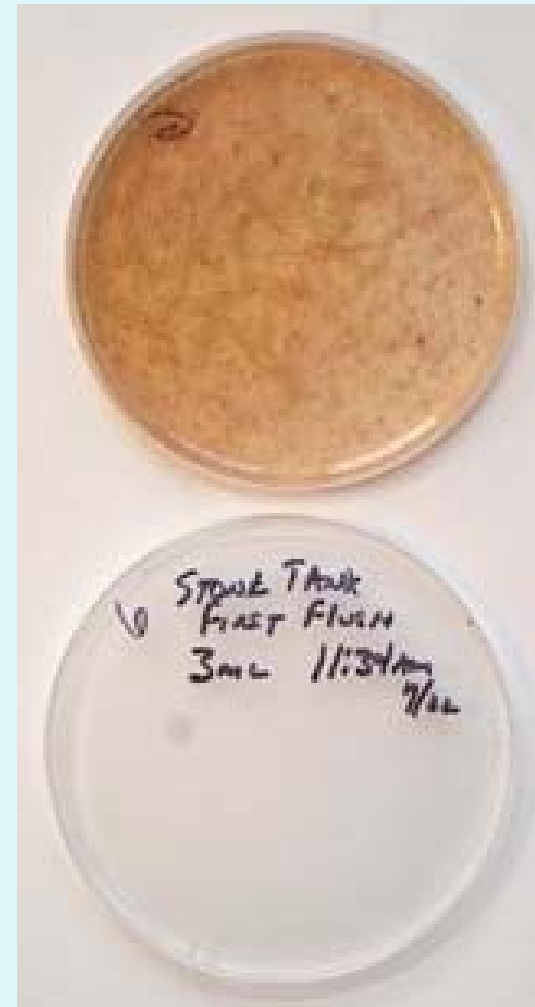
Water Testing – some examples

Our test kits are from
microgylabs.com



Water Testing – some examples

Our test kits are from
micrologylabs.com





Water Testing – some examples

Our test kits are form micrologylabs.com



Water Testing – some examples

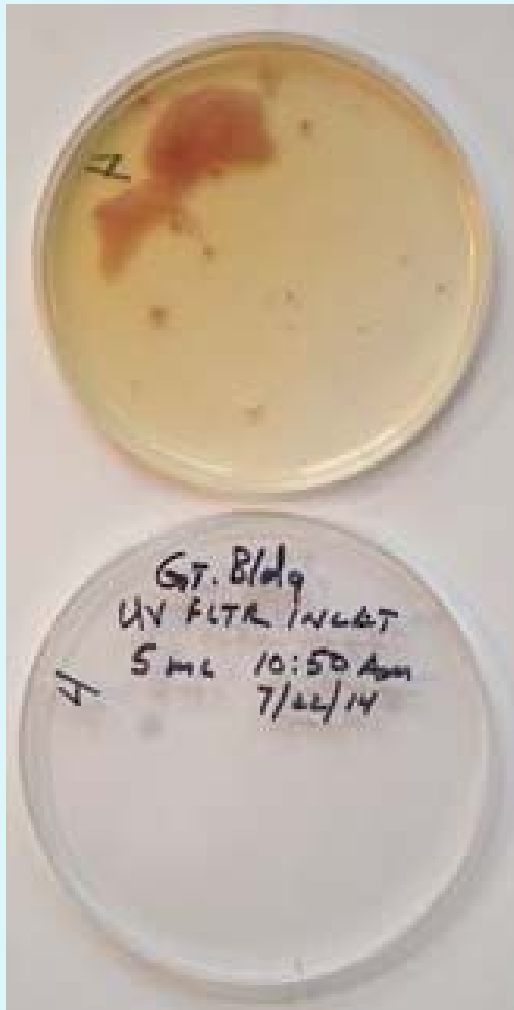
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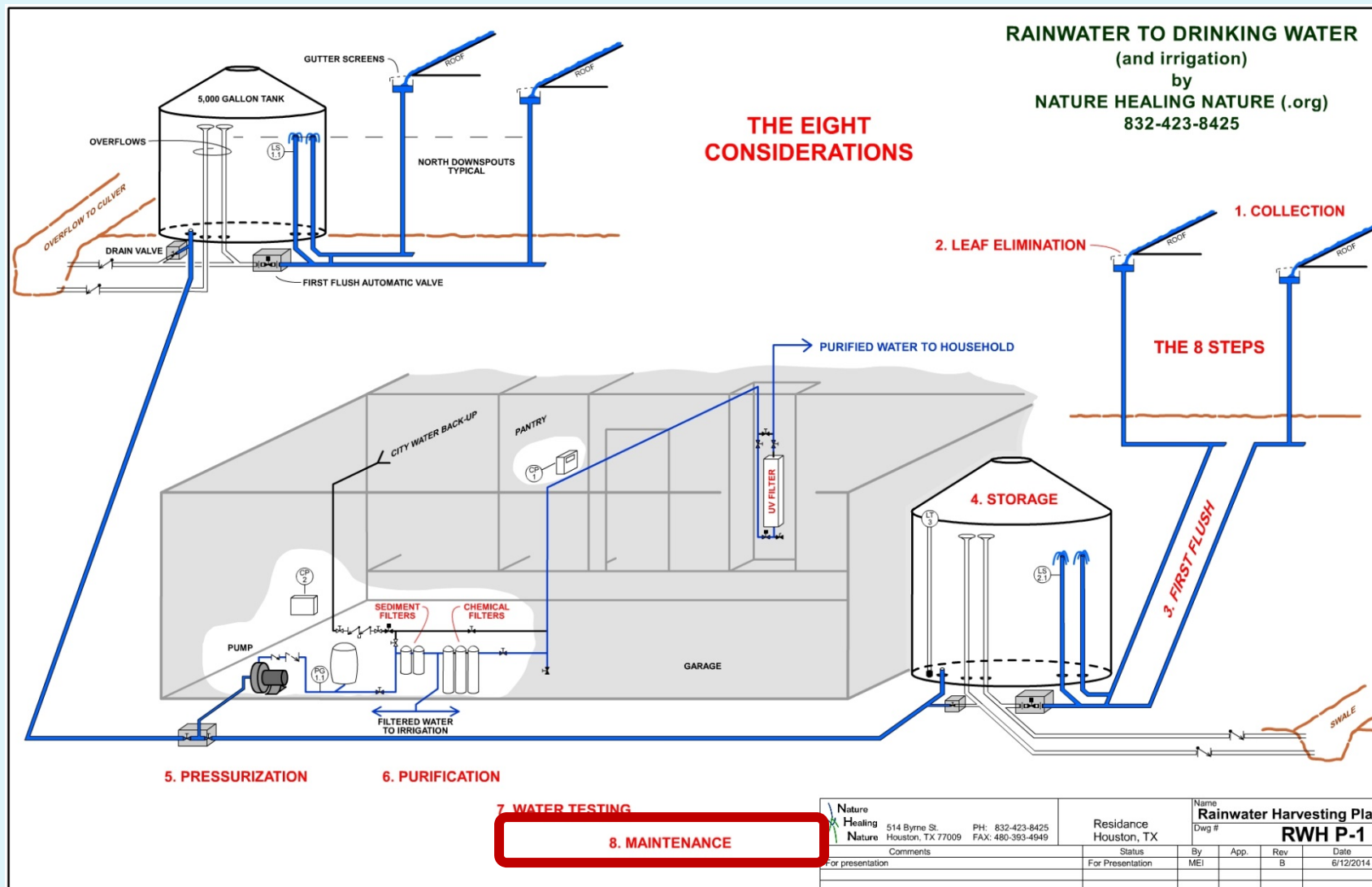


Water Testing – some examples

Our test kits are form
microgylabs.com



Eighth Consideration





Maintenance – the unglamorous

Just do it - too

When you skip the maintenance,
it breaks . . . BIG-TIME

**It is time to wrap-
up,
ask questions,
make comments,
do critiques,
and go home.**

**If you think of
questions later, call
me at
832-423-8425**

<u>Table R 101.5.1</u> <u>Minimum Potable Rainwater Catchment System</u> <u>Testing, Inspection, and Maintenance Frequency</u>	
<u>Description</u>	<u>Minimum Frequency</u>
<u>Inspect and clean filters and screens, and replace (if necessary).</u>	<u>Every 3 months</u>
<u>Inspect and verify that disinfection, filters, and water quality treatment devices and systems are operational. Perform any water quality tests as required by the Authority Having Jurisdiction.</u>	<u>In accordance with manufacturer's instructions and the Authority Having Jurisdiction</u>
<u>Perform a water quality test for E. Coli, Total Coliform, and Heterotrophic bacteria. For a system where 25 different persons consume water from the system over a 60 day period a water quality test for cryptosporidium shall also be performed.</u>	<u>After initial installation and every 12 months thereafter or as directed by the Authority Having Jurisdiction</u>
<u>Inspect and clear debris from rainwater gutters, downspouts, and roof washers</u>	<u>Every 6 months</u>
<u>Inspect and clear debris from roof or other above ground rainwater collection surface</u>	<u>Every 6 months</u>
<u>Remove tree branches and vegetation overhanging roof or other above-ground rainwater collection surface</u>	<u>As needed</u>
<u>Inspect pumps and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect valves and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect pressure tanks and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Clear debris from and inspect storage tanks, locking devices, and verify operation</u>	<u>After initial installation and every 12 months thereafter</u>
<u>Inspect caution labels and marking</u>	<u>After initial installation and every 12 months thereafter</u>



Thank you!

It's doable!



Mark Illian and Monika Cikhart
Founders of
Nature Healing Nature (.org)
832-423-8425

Blessings



The Eight Considerations

