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Rainwater Harvesting Standards

EOCP, Vancouver, BC 2018 09 10

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CSA/ICC Rainwater Standard Committee
ASSE Rainwater Certification Technical and Working Committees
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Canadian Association for Rainwater Management (CANARM)

Incorporated under the Canada Not-for-profit Corporations Act in May, 2012 to provide a communication network within the fast-developing rainwater 'industry' in Canada.

MISSION STATEMENT:

"To bring awareness, educate, and conduct research in best practices for rainwater and stormwater management across Canada"

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WHAT PEOPLE HAVE BEEN SAYING

Rainwater

- "Can be harvested easily anywhere in the world"
- "Is the answer to a plethora of problems from drought to pollution to flooding"
- "Can be used directly from a roof without treatment"
- "Is a new source of water not previously thought of"
- "Is new water to be stored and shared to alleviate drought problems"
- "Is redundant to harvest in BC's rainforest climate"

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WHAT RAINWATER IS

Rainwater is fresh precipitation straight from the sky that has not touched the ground

Stormwater is rainwater that has touched the ground and has not infiltrated, becoming runoff, and is controlled and managed based on local regulations

Grey water is once-used household water, discharged from washing machines, showers, tubs, and bathroom sinks and without fecal contamination; **Black Water** is from toilets and industrial processes

Potable water is water safe enough for human consumption and food preparation (drinking water)

Ground water is the water present beneath Earth's surface (aquifers)

Surface water is water on the surface of the planet (lakes, rivers, streams)

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TEACHING IT

1. Examine current practices and regulations

2. Gather information

3. Apply it to Canada (BC, Vancouver Island, Greater Victoria, etc…) *(birth of CANARM, 2012)*

4. Develop an outline and progression

5. Create the information modules and testing

6. Collaborate for third-party certification

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NATIONAL BUILDING/PLUMBING CODE 2005
Rainwater dealt with as waste water

NATIONAL BUILDING/PLUMBING CODE 2010
Rainwater can be used for FLUSHING and SUB-SURFACE IRRIGATION (BC 2012 = Flushing only)
(ON 2012 = Flushing, Laundry, Traps…)

NATIONAL DRINKING WATER GUIDELINES
NANAIMO's RAINWATER HARVESTING GUIDELINE 2012
CMHC GUIDELINES: ALBERTA and ONTARIO and NATIONAL VERSION 2012

ARCSA training program
Texas A&M AgriLife Extension 'Rainwater Harvesting: System Planning'

Research Documents: RWH, Water, Drought… (Australia, Germany…)

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BACKGROUND INFORMATION

***POLIS* REPORTS and STUDIES** *(POLIS Project on Ecological Governance, U Victoria)*

'WATER BUCKET' *(The Partnership for Water Sustainability in BC)*

GOVERNMENT PROJECTS CREATING SAMPLE SYSTEM INSTALLATIONS

MANUFACTURERS and DISTRIBUTORS of COMPONENTS

YOUTUBE ANECDOTAL and PERSONAL REPORTS

STRONG INTEREST IN RAINWATER AS A RESOURCE RATHER THAN WASTE

ARCSA RAINWATER MANUAL 2015

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TRAINING PROGRAMS

	USA (ARCSA)		CANADA (CANARM)
pre-2012	ARCSA Accredited Professional ARCSA Installer ARCSA Inspector	2012	CANARM Certified Professional
		2012	Gaia College 'Rainwater Management' (online)
2015	ARCSA Rainwater Manual	2015	ARCSA Accredited Professional
2018	**ASSE Rainwater System Designer** **ASSE Rainwater System Installer** **ASSE Rainwater System Inspector**	**2018**	**Certification Program (with 3rd party organization)**

Equivalencies

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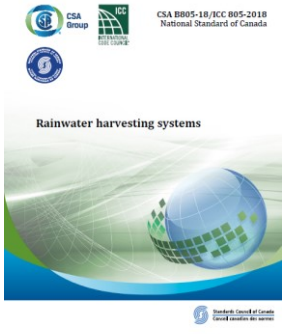
Major References



CSA B805-18/ICC 805- 2018 Rainwater Standard (Apr 2018)
Water quality/Management

CMHC Guidelines for Residential Rainwater Harvesting (2012)
How-to's/Management

also….

- Provincial Building/Plumbing Codes
- Local bylaws and regulations

- ARCSA Rainwater Manual
- ARCSA/ASPE/ANSI Standard 63
- ARCSA/ASPE/ANSI Standard 78

- Canadian Drinking Water Guidelines

…etc

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Certification Program

A series of in-class and/or on-line training modules, and testing, that establishes a solid base of knowledge skills in the design, installation and management of RWH systems. The certification will be a collaborative effort between CANARM and other closely related and allied organizations.

Current collaborations:

EOCP	Environmental Operators Certification Program	*Course Provider*
ARCSA	American Rainwater Catchment Systems Association	*Committee level*
CWQA	Canadian Water Quality Association	*RWH training MOU*
WCOWMA	Western Canada Onsite Wastewater Management Association	*Speaker series*
….		

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Certification Program

A series of in-class and/or on-line training modules, and testing, that establishes a solid base of knowledge skills in the design, installation and management of RWH systems.

A minimum of 10 hr of training, plus an exam – modules and time listing:

• Rainwater Harvesting Overview	½	Public Awareness
• RWH System Components	1	Practitioners
• RWH Design and Installation	3	Practitioners
• RWH Regulations, Standards, and Guidelines	1	Practitioners
• RWH Water Quality	2	Practitioners
• RWH for Irrigation Applications	2	Practitioners
• RWH for Stormwater Applications	2	Practitioners
• RWH Detailed Design – Case Studies	2	Practitioners
• RWH System Management	1	Practitioners

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Certification Program
Module Learning Formats

LEARNING OUTCOME:
"Share Information and Standards in Best Practices in Rainwater Management and Harvesting, and Evaluate Knowledge and Practical Know-How"

	PUBLIC	DESIGNER	INSTALLER	INSPECTOR
- *Slide presentations*	*X*	*X*	*X*	*X*
- *Workbook exercises*	*(X)*	*X*	*X*	*X*
- *Discussion*	*X*	*X*	*X*	*X*
- *Practical Sessions*		*(opt)*	*X*	*X*
- *Registration*		*X*	*X*	*X*
- *Exam*		*X*	*X*	*X*

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CSA B805-18 / ICC 805-2018 ANSI-approved, 2018 09 06

- **WATER SAFETY PLAN**
- **END USE TIERS and SURFACES**
- **END USE TIERS and EXPOSURE RISK**
- **WATER QUALITY PERFORMANCE and PRESCRIPTIVE REQUIREMENTS**
- **SYSTEM DESIGN CALCULATIONS**
- **SYSTEM MANAGEMENT DOCUMENTATION**

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Water Safety Plan

1. Site Evaluation; Potential Contaminants
2. End Uses….
3. Likelihood of Exposure
4. Consequence of Exposure
5. Risk Assessment

IF UNTREATED IS OK…

IF TREATMENT IS REQUIRED

6. Develop Treatment Process
7. Establish Control Points

Submit for Approval

8. Manufacture / Install / Test
9. Verification Samples and…

Assess Risk

UNACCEPTABLE

ACCEPTABLE

10. Ongoing Operations and Monitoring

CSA B805-18 Figure 0.1 pg 12 Adapted

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End Use Tiers and Surfaces

End Use Tiers

1. Non-Potable
Traps; Irrigation;
Ice rink; Fire protection

2. Non-Potable
Flushing; Laundry;
HVAC, Thermal Cooling;

3. Non-Potable
Hose Bibbs; Pressure wash;
Vehicles; Spray Irrigation;
Decorative Fountains

4. Potable
Human contact; Food preparation; Dishwashing;
Misting; Swamp coolers

Collection surface			End use tier
Roofing material			
	Asphalt, Ceramic, Clay, Fiberglass, Glass		1, 2, 3, 4
	Concrete, Polyethylene membrane		1, 2, 3, 4
	Steel, coated or stainless		1, 2, 3, 4
	Tin	*corrugated metal; galvanized*	1, 2, 3, 4
	PVC	*polyvinyl chloride*	1, 2, 3, 4
	TPO	*thermoplastic polyolefin*	1, 2, 3, 4
	Asphalt felt and bituminous and tar membranes		1, 2, 3
	Copper, Polymer and acrylic		1, 2, 3
	Rubber/Butyl /EPDM membrane		1, 2, 3
	Vegetated roofs		1, 2*, 3
	Wood, untreated and/or treated		1, 2, 3
	Asbestos cement		‡
Pedestrian and parking surfaces			1, 2*, 3
(e.g., sidewalks, courtyard, driveways, parking areas, pervious surfaces)			
Public pedestrian accessible roofs			1, 2, 3
Subsurface collection†			1, 2, 3
Landscaped runoff			1, 2*, 3
Street, freeway, shoulder areas			‡
Surface waters and stormwater detention ponds			‡

** HVAC evaporative cooling applications not included.*
† Subsurface water shall not be collected from sites which contain contaminated soils.
‡ Not in the scope of this Standard.

CSA B805-18 Table 5.1 pg 26 Adapted

CSA B805-18 Table 7.1 pg 30 Adapted

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End Use Tiers and Exposure Risk

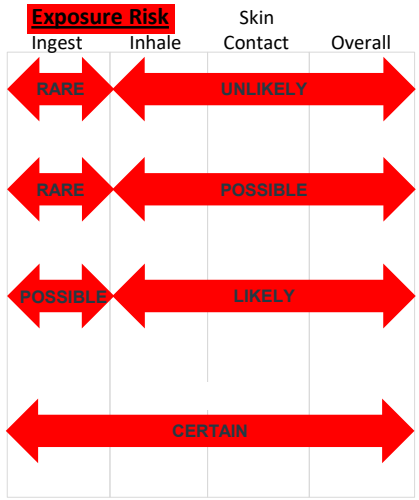
End Use Tiers

1. Non-Potable
Traps; Irrigation;
Ice rink; Fire protection

2. Non-Potable
Flushing; Laundry;
HVAC, Thermal Cooling;

3. Non-Potable
Hose Bibbs; Pressure wash;
Vehicles; Spray Irrigation;
Decorative Fountains

4. Potable
Human contact; Food preparation; Dishwashing; Misting; Swamp coolers



CSA B805-18 Table 5.1 pg 26 Adapted

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Water Quality

Performance and Prescriptive Requirements

Tables 8.1 to 8.4, pp 46-59 – Treatment

Tier	Viruses	Bacteria	Protozoa	pH	OPTION 1 Ultra Violet: Filtration	OPTION 1 Ultra Violet: Disinfection	OPTION 2 Chemical-based: Filtration	OPTION 2 Chemical-based: Disinfection	OPTION 3: Micro - Macro Filtration
PERFORMANCE					PRESCRIPTIVE				

Tables 8.5 and 8.6, pp 61-62 – Output Water Quality

Tier	Parameter	Turbidity (NTU)	HCP CFU / 100 mL	Enterococci CFU / 100 mL	pH	Chlorine: CMF (mg / 100 mL)	Chlorine: SFR (mg / 100 mL)
PRESCRIPTIVE							

CSA B805-18 Tables 8.1 to 8.6 pp 46-62 Adapted

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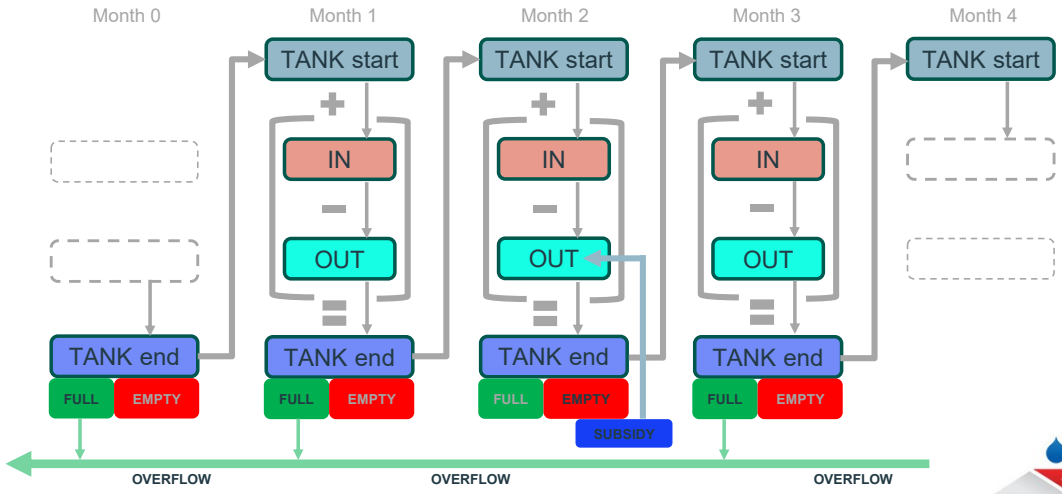
Design Calculations



CSA B805-18 Annex 'C' pp 65-78 Adapted

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System Management

CSA B805-18

Section 5 - General system requirements
Section 6 - System design and installation — General
Section 7 - Subsystem design and installation
Section 8 - Water quality
Section 9 - Rainwater system tests and inspections

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System Management

Rainwater System Maintenance Checklist

Client: _____ Date: _____

SAMPLE PROJECT

Catchment	Notes
Roof Type	metal
Gutter Type	metal, 5 inch
Other:	
Conveyance	
Downspout Type	aluminum, 3 inch; presumed connected to storm drain line in street
Adaptor(s) to Conveyance	direct connection, no openings, smooth transition from downspout to conveyance piping
Conveyance Type	4" PVC from each downspout, 6" PVC where more than one downspout line connects
Filter Type(s)	downspout gravity leaf filter, located not more than 5' above ground level, for each downspout
Cleanout(s)	provide one cleanout per 15 m for each buried line
Other:	wicking filter required just before water entry into storage; waste to be connected to the overflow
Storage	
Cistern Type	plastic/composite, below-ground rated; follow manufacturer's specifications for surface loading
Calming Inlet	eliminate turbulance from incoming water with calming inlet at the base of each inlet downpipe

COMPONENTS LIST, WITH MANUFACTURER DETAILS

RELATIONSHIPS BETWEEN COMPONENTS AND PERTINENT INFORMATION REGARDING MAINTENANCE IS NOTED

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System Management

Rainwater System Maintenance Checklist

Client: ***Case Study - East Sooke*** Date: *yyyy-mm-dd*

Catchment	Notes	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Checklist for monthly maintenance, or notes for periodic inspectio											
Roof Type	*new metal, red, well-installed*												
Gutter Type	*aluminum, 4", seamless*												
	zinc-coated stack - watch levels												

ANNUAL MAINTENANCE SCHEDULE BLOCKED OUT FOR EACH COMPONENT, ADD DETAILS AS NEEDED

Rainwater System Maintenance Checklist

Client: ***Case Study - East Sooke*** Date: ***2014 02 20***

Catchment	Notes	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Checklist for monthly maintenance, or notes for periodic inspections											
Roof Type	*new metal, red, well-installed*		X										
Gutter Type	*aluminum, 4", seamless*		X										
	zinc-coated stack - watch levels												
Conveyance													
Downspout Type	*aluminum, 4"*		X										
Adaptor(s) to Conveyance	*PVC, white*		X										
Conveyance Type	*PVC, buried (not seen; requires snake)*	possible check of lines for breaks, cracks - not imperative											

ANNUAL MAINTENANCE SCHEDULE COMPLETED, ADD DETAILS AS NEEDED

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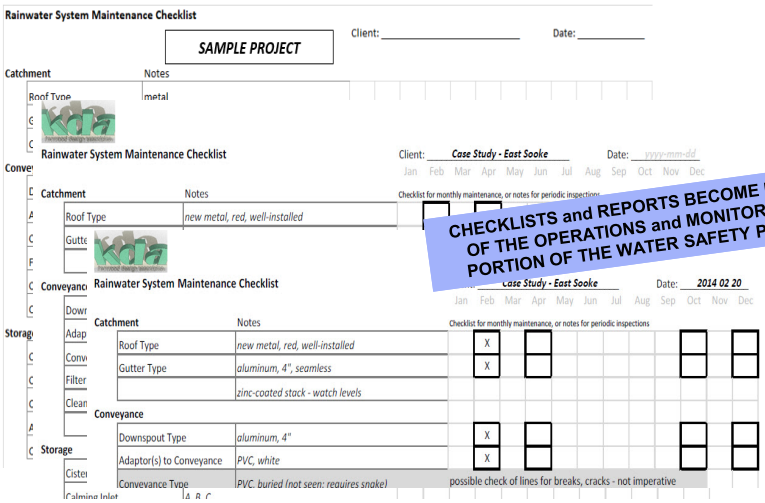
System Management



Rainwater System Maintenance Checklist

SAMPLE PROJECT

Client: _____ Date: _____

Catchment	Notes
Roof Type	metal

Rainwater System Maintenance Checklist

Client: *Case Study - East Sooke* Date: *yyyy-mm-dd*

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

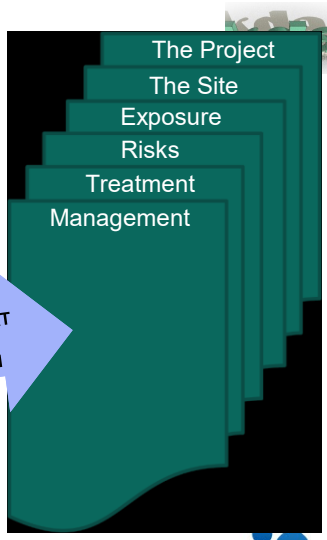
Catchment	Notes	Checklist for monthly maintenance, or notes for periodic inspections
Roof Type	new metal, red, well-installed	

Rainwater System Maintenance Checklist

Client: *Case Study - East Sooke* Date: *2014 02 20*

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Catchment	Notes	Checklist for monthly maintenance, or notes for periodic inspections
Roof Type	new metal, red, well-installed	X
Gutter Type	aluminum, 4", seamless	X
	zinc-coated stack - watch levels	
Conveyance		
Downspout Type	aluminum, 4"	X
Adaptor(s) to Conveyance	PVC, white	X
Convevance Type	PVC, buried (not seen; requires snake)	possible check of lines for breaks, cracks - not imperative



CHECKLISTS and REPORTS BECOME PART OF THE OPERATIONS and MONITORING PORTION OF THE WATER SAFETY PLAN

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SCENARIO: POTABLE and FLUSHING, RURAL

"We need to have a design for approval of rainwater for potable uses in a single-family residential rural home. Include flushing and everything indoors for three adults. The work will be done by ourselves, I am a contractor, and we have a plumber engaged."

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Certification Program

RECOMMENDED MODULE(S) FOR THIS SCENARIO (Design / Build – all highlighted for certification)

Rainwater Harvesting Overview	½	Public Awareness
RWH System Components	1	Practitioners
RWH Design and Installation	**3**	**Practitioners**
RWH Regulations, Standards, and Guidelines	**1**	**Practitioners**
RWH Water Quality	**2**	**Practitioners**
RWH for Irrigation Applications	2	Practitioners
RWH for Stormwater Applications	2	Practitioners
RWH Detailed Design – Case Studies	2	Practitioners
RWH System Management	1	Practitioners

HIGHLY RECOMMENDED RECOMMENDED

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CASE STUDY – S/F RESIDENTIAL: POTABLE and FLUSHING

DEMAND USE VOLUME FOR 3 ADULTS: flushing, potable, no irrigation

CATCHMENT AREA:

- 285 sq m, 3,070 sq ft

ANNUAL RAINFALL:

- 885 mm, 35 inches

CISTERN VOLUME:

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Water Safety Plan

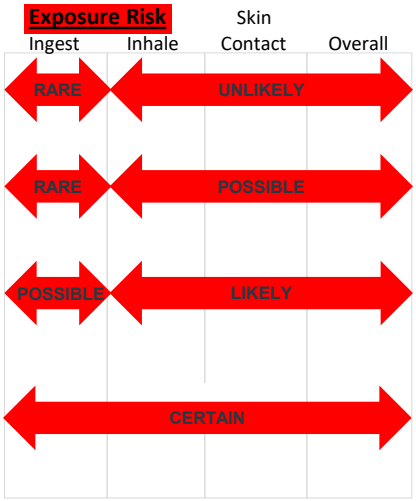
End Use Tiers

1. Non-Potable
Traps; Irrigation;
Ice rink; Fire protection

2. Non-Potable
Flushing; Laundry;
HVAC, Thermal Cooling;

3. Non-Potable
Hose Bibbs; Pressure wash;
Vehicles; Spray Irrigation;
Decorative Fountains

4. Potable
Human contact; Food preparation; Dishwashing; Misting; Swamp coolers



FULL TEXT:
- *Human consumption*
- *Oral care*
- *Food preparation*
- *Dishwashing*
- *Bathing, showering, and hand washing*
- *Pools, hot tubs, spas, splash pads*
- *Misting stations*
- *Swamp coolers*

CSA B805-18 Table 5.1 pg 26 Adapted

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Water Safety Plan

Table 8.1, pg 46-48 – Treatment for Single-Family Residential *X*
Table 8.2, pg 49-51 – SW Treatment for Single-Family Residential ____
Table 8.3, pg 52-55 – Treatment for Multi-Family + NonResidential ____
Table 8.4, pg 56-59 – SW Treatment for Multi-Family + NonResidential ____

+ Third-Party certifications

Tier	Viruses	Bacteria	Protozoa	pH	Filtration	Disinfection	Filtration	Disinfection	Micro - Macro Filtration
4		*99.9999 %*	*99.99 %*	*7 – 10.5*	*5 µm*	*40 mj / cm²*	*NR*	*NR*	*0.2 µm*
					Ultra Violet		Chemical-based		
					OPTION 1		**OPTION 2**		**OPTION 3**

CSA B805-18 Tables 8.1 to 8.6 pp 46-62 Adapted

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Water Safety Plan

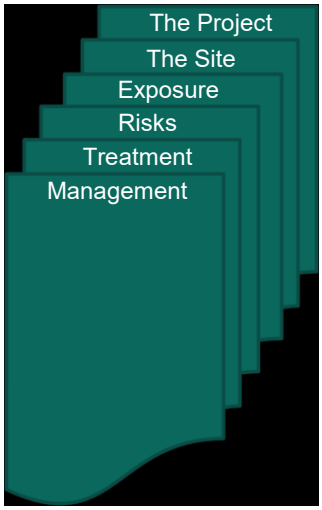
1. Site Evaluation; Potential Contaminants
2. End Uses….
3. Likelihood of Exposure
4. Consequence of Exposure
5. Risk Assessment

IF UNTREATED IS OK…

IF TREATMENT IS REQUIRED

6. Develop Treatment Process
7. Establish Control Points

Submit for Approval



CSA B805-18 Figure 0.1 pg 12 Adapted

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CASE STUDY – S/F RESIDENTIAL: POTABLE and FLUSHING

DEMAND USE VOLUME FOR 3 ADULTS: flushing, potable, no irrigation

- **132,000 litres / season**
- **34,320 US gal / season**

CATCHMENT AREA:

- **220 sq m, 2,365 sq ft**

ANNUAL POTENTIAL CATCHMENT VOLUME: after efficiency, leakage, drought scenario

- **146,000 litres, 37,960 US gal**

CISTERN VOLUME:

- **51,700 litres, 13,440 US gal**

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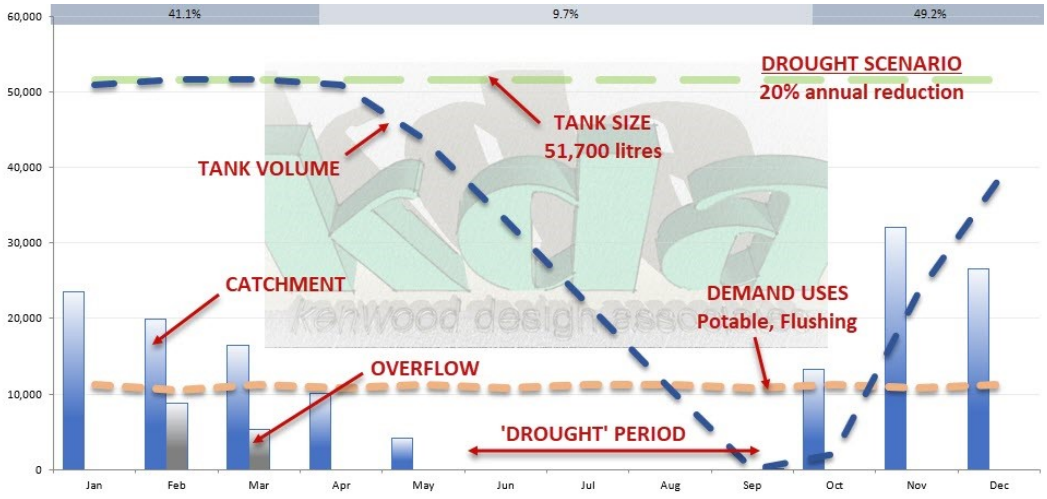
CASE STUDY – S/F RESIDENTIAL: POTABLE and FLUSHING



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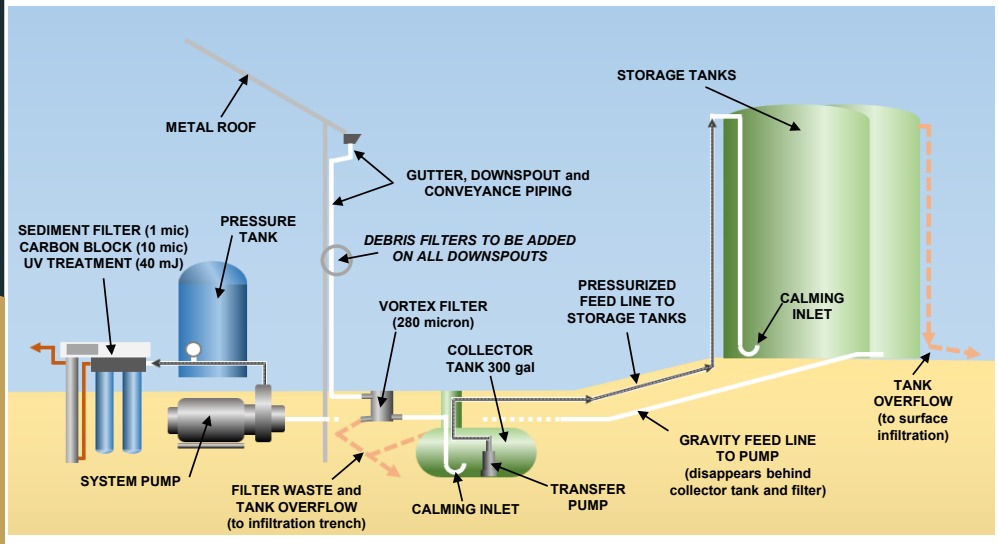
CASE STUDY – S/F RESIDENTIAL: POTABLE and FLUSHING



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