APPENDICES

Appendix A
Water Balance Table and Water Requirements: May 25, 2005

Alton Water Balance Table May25 05.xls
Projected Monthly Water Storage

Location	Salt Spring Island	Collection Area #1 (sqft)	2100
Property	Alton House Demonstration Project	Collection Area #2 (sqft)	0
Scenario	5980 Cistern / 4 person Hshld.	Collection Area #3 (sqft)	0
		TOTAL Collection Area	2100

Max Storage Cap (gal): 5980

Volume Units: gal (Choose one of gal or litre)

Assumed Rainfall Level used in Calculation: Avg (Enter 10% : 20% : 30% 50% Max : Avg :Min)

Month	Indoor Useage gal/mon	Outdoor Useage gal/mon	Assumed Rainfall inches	Assumed Collection Efficiency	Rainfall Collected gal/mon	Alternate Supply gal/mon	End of month Storage gal/mon
Start							0
November	4050	0	6.6	80%	5744	0	**1694**
December	4050	0	5.9	80%	5139	0	**2784**
January	4050	0	6.0	80%	5235	0	**3969**
February	4050	0	4.2	80%	3689	2000	**5608**
March	4050	0	3.4	70%	2621	1800	**5979**
April	4050	0	2.3	45%	1112	2900	**5941**
May	4050	0	1.7	70%	1307	2800	**5980**
June	4050	500	1.5	65%	1058	3500	**5980**
July	4050	500	1.0	65%	679	2200	**4309**
August	4050	500	1.2	65%	842	2200	**2801**
September	4050	500	1.3	65%	894	2400	**1546**
October	4050	0	3.5	70%	2647	1500	**1643**
TOTAL	48,600	2,000	38.4		30,968	21,300	1,668 Surplus Supply

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The following summarizes the total estimated amount of water that will be required by the Ruby Alton House over a typical year. In addition it estimates how much of this total will be supplied by rainwater each month, and how much stream water will be required to supplement the rainwater supply.

This analysis updates the last water storage calculation that was done in March 2005, and reflects the larger cistern size.

The attached Projected Monthly Water Storage spreadsheet entitled "Ruby Alton House Water Balance Table May 25-05" describes the amount of water that would be in a 5,980 imperial gallon cistern at the end of each month (right hand column). It is based on the following.

Rainfall Amounts

Average precipitation statistics for St Mary's Lake weather station are used. The attached Historical Rainfall –Variation page summarizes 22 years of rainfall statistics starting in 1981. The average annual precipitation total is 38.4 inches (975mm).

Rainfall for the Ruby Alton House location is estimated to be approx. 15% higher than St Mary's Lake which means that the rainwater amounts used in this table should be typical for a year that is 15% dryer than normal.

Catchment Area

The roof catchment comes entirely from the main house, and the roof catchment area is 2,100 sq. ft. (195m^2).

Catchment Efficiency

The asphalt shingle roof has a lower water catchment efficiency than other smoother surfaces such as steel or glazed tile. This is due to higher evaporation rates for light or intermittent summer rainfall events as well as the need to reject a larger quantity of the first flush of each rain. This system is designed to reject the first 0.3 inch (0.75mm)of rainfall per 24-hour period per square foot (.093m^2) of roof catchment area.

It is assumed however that the catchment system is otherwise quite efficient and collects 80% of winter rains, 70% of shoulder season rain, and 65% of summer rain with a short shut-down period and cleaning during the pollen season in April.

Indoor Water Use

Indoor water use reflects a conserver attitude, and assumes the use of low water use fixtures such as low flush toilets, and a water efficient dishwasher and clothes washing machine. A standard of 40 US gal/person/day OR 151.5 litres OR 33.3 imperial gal/person/day (G/P/D)

Use assumes full time occupancy by a family of 4 persons. Daily use would be 606 litres or 133 imperial gallons per day.

Monthly use is assumed to be equal in each month at 18,425 litres or 4,050 imperial gallons.

Outdoor Water Use

A conservative assumption of approximately 500 gallons per month of outdoor water use is added during the peak outdoor watering months – June thru Sept. This assumes that most of the garden watering needs are met by the separate garden water rainwater system. It is further assumed that a minimum of 1,500 imperial gallon will be retained in the cistern at all times to provide emergency water for fire or earthquake.

Conclusions

Using the above assumptions, rainwater catchment over a 12 month period will total almost 31,000 imperial gallons (141,000 litres). This amounts to 61% of the total annual household water demand. The house would run entirely on the rainwater from November through January each year, but will require a total of 21,300 gallons of stream water to supplement the rainwater supply. The provision of this size of cistern reduces the summer stream water demand to 2,200-2,400 gallons per month during the driest summer months.

The summer draw on the stream water could be reduced by approximately 500 gallons per month if the 1,500 gallon emergency water supply requirement was used to supply the house.

APPENDIX B
Maintenance Tools and Replacement Parts Provided

This Appendix to the Owners Manual for the Alton House rainwater harvesting and water supply system lists the equipment required for the ongoing maintenance of the system, and suggests the type of spare parts that the owner may wish to keep on hand.

Standard Maintenance Kit for Rainwater System

- 2 keys for the cistern padlock
- spare 30 mesh screen for Banjo filters
- 4" First Flush Diverter plug with 3/32" hole
- 3" First Flush Diverter plug with 3/32" hole
- small 7" adjustable wrench
- 3" poly brush attached to 25 foot long plumbers snake
- 3" toilet cleaning brush
- grout and tile brush
- 1 ½ " bottle cleaning brush
- 1 can of green plastic spray paint for surge/pump tank
- 2 cans plastic spray paint primer
- partial can of brown paint used for catchment pipes
- partial can of Bullseye 1 2 3 primer paint for PVC piping
- small container of chlorine tablets
- chlorine dispenser on rope tether
- 4 liter size measuring cup

Other Equipment Required by Owner or Cleaning Contractor

- 20 foot extension ladder for access to west roof
- shoulders for ladder to keep ladder from resting on the gutters
- climbing grade safety rope and full chest harness for working on roof
- lightweight leaf or air blower (gasoline powered – cordless)
- Spray bottle with household bleach with no additives or Oxy Jan 7% solution of Hydrogen Peroxide (preferred)
- cleaning bucket and rags
- light bulbs for winter box

APPENDIX C
Monthly Maintenance Checklist

This appendix contains the 2 page Monthly Maintenance Checklist for the Alton House Water Supply System. A print ready copy is also included with the manual to facilitate the production of multiple paper copies for record keeping.

The Rainwater Connection encourages the owner to fax copies of these completed forms to us every 3 months during the first two years of system operation. The information will be used to help monitor system operation to guide the design of future systems. The Rainwater Connection will contact the owner if the data indicates changes that should be made to the system or the maintenance procedures.

It must be noted that some of these maintenance procedures can be a safety hazard. A list of safety warnings is listed below, and the tasks where a hazard exists is marked with a ▲ in the table.

SAFETY HAZARDS

Roof and Gutter Cleaning

The roof is too steep for a person to safely walk on it for purposes of hand or machine cleaning. A *safety harness and rope attached* to the chimney should be used at all times.

The gutters on the east side are a full two stories above grade. A tall ladder can be used, but given the height and poor ladder footage on the sloped backyard, it is recommended to service them from the *roof using a safety harness*.

Pipe Cleaning Chemicals for pipe and surge/pump tank cleaning

Use either hydrogen peroxide or chlorine with extreme care. With either cleaner *avoid contact with eyes or skin*. In case of contact, flush promptly with abundant water. Read and follow the manufactures instructions on the container.

Harmful if swallowed.

Both cleaners can mark clothing.

NEVER use hydrogen peroxide if chlorine is being used anywhere in the catchment or storage system. A dangerous chemical reaction can occur. *DO NOT* use any other type of household cleaner which may contain soap or other chemicals which could affect the quality of the collected water, or react with chlorine.

Surge Pump Tank

Keep the *inspection hatch closed at all times* to avoid the possibility of small rodents entering and drowning in the tank.

Electrical Components and Float Switches

Unplug any pump or other system component before touching or servicing it.

DO NOT attempt to service the float switches. Contact the Rainwater Connection or an electrician.

Cistern

This tank qualifies as a confined space. The air inside may not contain sufficient oxygen to maintain consciousness. *NEVER* enter the cistern without a respirator, and follow all of the other current regulations of the WCB.

This tank is often filled with sufficient water for a person to drown in.

Keep the *access hatch locked* except when servicing, and never leave an unlocked tank unattended.

As a further precaution, never leave a ladder in place which could provide access to the tank roof.

MONTHLY MAINTENANCE CHECKLIST

Alton House, Water Supply System

Date: _____

Inspector: _____

Use these forms for recording monthly cleaning and maintenance inspections.

ITEM	CONDITION/ACTION TAKEN
Blow off Roof ▲ Inspect monthly, and clean with air blower if required during the spring, summer and fall. Special attention in Sept. and Oct. [Refer to Section 3.2.2]	
Clean Gutters ▲ Inspect monthly and blow or hand clean as required. With gutter guard clean the top monthly, and inspect and clean the gutters underneath every 2 or 3 months. [refer to Section 3.2.3]	
Clean Debris Traps Monthly or as needed just before rainfalls. Check and clean leaf catcher and debris pigtail under it Inspect all-in-one debris pail. Clean debris filter cloths and replace filter when saturated with needles. Remove and clean lower chamber if required. Open and clean debris pigtail plugs Every 2-3 months remove filter in the 4” high capacity debris filter, and clean if required. [refer to Section 3.3]	

ITEM	CONDITION/ACTION TAKEN
Check Catchment Piping on South Wall ▲ Inspect in July and August If collected debris smells, rinse and clean to reduce warmth fostered bacterial growth [open the appropriate drains and be careful with the cleaning agents – refer to Section 3.4]	
Inspect and Clean 2 Inch Gravity Mesh Filters At start up inspect bi-monthly to determine rate of filling After two months inspect monthly and clean if required [refer to Section 3.5]	
First Flush Diverter Pipe Monthly spring through fall. Less frequently in winter. Check exit valve operation – i.e. the drip rate during or just after a rain. Clean the threads and/or the exit hole if required. [refer to Section 3.6]	
Surge/Pump Tank ▲ Inspect monthly and check condition of residual water in tank If water is badly coloured; has a smell, or if sediment is over ½ inch in depth, pump the tank dry and clean it. Add 2 chlorine tablets to floating dispenser. Ensure inspection hatch is securely closed [refer to Section 3.7]	
Check Steam Water In-line Rusco Filter Visually inspect monthly Flush out, or remove and clean mesh screen if required. [refer to Section 3.9.2]	

ITEM	CONDITION/ACTION TAKEN
House Supply Meter Reading Record accumulated water use number	
SPECIAL ITEMS DURING EXTREME WINTER FREEZING CONDITIONS open and drain first flush diverters empty dripper plugs on debris pigtails open drip plug on gravity mesh filters pump surge/pump tank empty and/or remove pump check light bulb in winter box [refer to Section 3.11]	

APPENDIX D
Spring & Fall Maintenance Checklist

This appendix contains the 3 page Spring & Fall Maintenance Checklist for the Alton House Water Supply System.

A print ready copy is also included with the manual to facilitate the production of multiple paper copies for record keeping.

The Rainwater Connection encourages the owner to fax copies of these completed forms to us every 3 months during the first two years of system operation. The information will be used to help monitor system operation to guide the design of future systems.

The Rainwater Connection will contact the owner if the data indicates changes that should be made to the system or the maintenance procedures.

It must be noted that some of these maintenance procedures can be a safety hazard. A list of safety warnings is listed below, and the tasks where a hazard exists is marked with a ▲ in the table.

SAFETY HAZARDS

Roof and Gutter Cleaning

The roof is too steep for a person to safely walk on it for purposes of hand or machine cleaning. A *safety harness and rope attached* to the chimney should be used at all times.

The gutters on the east side are a full two stories above grade. A tall ladder can be used, but given the height and poor ladder footage on the sloped backyard, it is recommended to service them from the *roof using a safety harness*.

Pipe Cleaning Chemicals for pipe and surge/pump tank cleaning

Use either hydrogen peroxide or chlorine with extreme care.

With either cleaner *avoid contact with eyes or skin*. In case of contact, flush promptly with abundant water.

Harmful if swallowed.

Read and follow the manufactures instructions on the container.

Both cleaners can mark clothing.

NEVER use hydrogen peroxide if chlorine is being used anywhere in the catchment or storage system. A dangerous chemical reaction can occur.

DO NOT use any other type of household cleaner which may contain soap or other chemicals which could affect the quality of the collected water, or react with chlorine.

Surge Pump Tank

Keep the *inspection hatch closed at all times* to avoid the possibility of small rodents entering and drowning in the tank.

Electrical Components and Float Switches

Unplug any pump or other system component before touching or servicing it.

DO NOT attempt to service the float switches. Contact the Rainwater Connection or an electrician.

Cistern

This tank qualifies as a confined space. The air inside may not contain sufficient oxygen to maintain consciousness. *NEVER* enter the cistern without a respirator, and follow all of the other current regulations of the WCB.

This tank is often filled with sufficient water for a person to drown in.

Keep the *access hatch locked* except when servicing, and never leave an unlocked tank unattended.

As a further precaution, never leave a ladder in place which could provide access to the tank roof.

CAUTION

Before cleaning the roof or gutters with water, open and remove:

1. the debris pigtail plugs,
2. the plastic filter inside the 4" high capacity filter
3. the screen inside the Banjo filters, and
4. the first flush diverter end plugs.

This ensures that none of this contaminated water reaches the surge/pump tank.

DO NOT use hydrogen peroxide or any other cleaning agent on the mesh screen or filter housing. These can reduce the longevity of the stainless steel in the mesh screens.

SPRING & FALL SERVICING CHECKLIST

Date: _____

Inspector: _____

Use these forms for recording spring (April or May) and fall (Oct. or Nov.) maintenance inspections and cleaning.

ITEM	CONDITION/ACTION TAKEN
Clean Roof ▲ After pollen season in late April or May and again in late October or November after the leaves and fir needles have fallen. De-moss by hand, blow, and rinse with water. [refer to procedures in Section 3.2.2] Assess whether new zinc strips need to be added. [refer to Section 3.13]	
Clean Gutters ▲ Thorough cleaning in spring after pollen season and in the fall Inspect and record amount and type of debris Clean by brush, pressure washer, and by hand if required rinse with hydrogen peroxide or bleach If Gutter Guard is installed also inspect gutters in July and Sept, and clean if required. [refer to procedures and Safety Warning in Section 3.2.3]	

ITEM	CONDITION/ACTION TAKEN
Clean Leaf/Debris Traps Spring and Fall when the catchment piping is being cleaned. Inspect and record debris amounts and types in each type of debris trap Open and clean debris pigtail plugs Clean leaf catcher and debris pigtail under it Clean all-in-one debris pail. Clean debris filter cloths and replace filter if saturated with needles. Remove and clean lower chamber. Inspect and clean standpipe below filter. Remove filter in the 4" high capacity debris filter, and clean. [refer to Section 3.3]	
Clean Catchment Piping ▲ Clean in spring. Inspect and clean in fall if pipes are dirty or smelly Record amount and type of sediment in pipes Open the appropriate drains and remove filters Use the brush on the plumbers snake Follow the safety warnings. [refer to Section 3.4]	
Inspect and Clean 2 Inch Gravity Mesh Filters Open and inspect the stainless steel mesh screen and record sediment amount and type Clean mesh screen, housing and adjacent piping as described in Section 3.5 Inspect mesh for small perforations or tears and replace if necessary	

ITEM	CONDITION/ACTION TAKEN
Clean First Flush Diverter Pipes ▲ Empty any trapped water Record condition of pipes as observed from lower end Clean the threads and/or the exit hole Partially fill with water and check the drip rate (54 and 28 ml per minute) If pipe is extremely dirty, clean it using Catchment Pipe cleaning procedure in Section 3.4. [refer to Section 3.6 and 3.4]	
Service Surge Tank ▲ Full cleaning in spring, and fall if required. Read and follow the safety warnings in Section 3.7. Check and record smell, colour & sediment depth of residual water Check operation of float switch by lifting it up and waiting for the pump to start Pump the tank dry and clean it Check pump bottom water entry grill, and clean if required. Add 2 chlorine tablets to the floating chlorine dispenser. Check filter cloth in the vents of the inspection hatch, and ensure that it is securely closed. In fall check screening on end of surge/pump tank overflow pipe, and remove and clean if required [refer to Section 3.7]	

ITEM	CONDITION/ACTION TAKEN
Service Cistern and Fittings Once per year in the fall Brush or blow accumulated debris off the cistern roof Check functioning of padlock on roof hatch, and lubricate if necessary Inspect integrity of screening, and repair damaged portions if required. From the inspection hatch visually check the sediment level in the tank. Record its colour and texture. If there are significant deposits use a measuring stick with a padded end to measure depth. Inspect screening on end of overflow pipe, and clean if required. Check drain rock circle around tank and winter box, clean up debris if required Replace light bulb in winter box [for all of the above refer to Section 3.9] check condition of vinyl sight tube (water level indicator), and replace if necessary [Section 3.13] Once per year in the spring: Assess need to re-stain the winter box exterior Check valve function of cistern *valves by briefly opening and closing them.*	
House Supply Meter Reading Record accumulated water use number	
Compare Cistern and Metered Water Use Once per year in the fall compare cistern volume to metered usage to check for pipe or cistern leakage. [refer to Section 3.1.3]	