National Trust

Sustainable technology case study

- rainwater harvesting
- collecting from garden buildings, glass houses and Orangery
- saving on mains water
- submersible Hydroforce pump

Rainwater Harvesting

Reduction in water usage for garden irrigation

March 2012

Background

■ All National Trust buildings have Key Performance Indicators (KPIs) to meet and these include levels of sustainability and environmental consciousness.

■ Given the large volumes of water used around Calke Abbey gardens, it was an easy decision to harvest the rain which falls freely on the extensive roofs of the Walled Garden. It is wasteful to pump purified drinking water from hundreds of miles away, to use for watering the gardens. So by harvesting the rainwater there is the tangible aspect of saving on the mains water bill, but also the more altruistic intentions.

■ Harvesting the rainwater will make the property more sustainable, by becoming less dependent on outside resources, and helping to ease Britain's water shortages.

The project

■ This rainwater harvesting installation follows state of the art industry recommendations, with the storage tanks situated underground.

■ The tank size has been calculated according to the Code for Sustainable Homes, the British Standard BS 8515 and Building Reg Part G. This ensures that the available water from the roofs (taking into account their area and rainfall) is equated to its usage within the gardens. The tanks are sized to provide at least three weeks supply during a period without rain. The roof area (from the garden buildings, glass houses and Orangery) which drains into the rainwater harvesting tanks is 345m^2 and the corresponding tank size is 9,600 litres.

■ The tanks are fitted with a leaf filter which discards leaves and debris, leaving clean water in the tank.

■ The cool ground conditions prevent bacterial action – ensuring that the water stays crystal clear.

■ The supply pump is fitted in the bottom of the tank and pumps on demand (pressure-sensitive action).

Top left **The image shows the grey turret on each tank in which the leaf filter is mounted. Rainwater flows in through a four inch pipe; the filter diverts clean water into the tank**

Bottom left **The Carat tanks are injection moulded in plastic respecting as much as possible the need for a low carbon footprint. Each of these tanks has a capacity of 4,800 litres and a total height of over 2.4 metres**

Design

■ The installation had to commence in early spring when ground conditions were dry. The system also had to be installed and commissioned within a couple of weeks ready for the peak gardening season.

■ The gardens remained open to the public throughout the project.

■ The results of a ground radar survey were taken into account.

■ The specification reads:

- Supply and install 2 x 4,800 litre Carat-S tanks (9,600 litre total storage), as a direct supply system including a submersible Hydroforce pump and a mains water 'Rain Back-up in a Box' unit to top the tank up with mains water when required.

- The size of the excavation will be approximately 5m x 2.5m x 3m deep, depending on the depth of the existing drainage pipework to be connected.

- The overflow from the tank will be taken to an existing soakaway which is approximately 15m away from the proposed tank location.

- Drain runs to and from the tank could total 50m of underground pipework.

- Ducting will be necessary for the pipework and cables to be taken from the underground tank to the glass house where the mains water back-up will be situated and a tap will be positioned. This ducting will need to go through or under a 12ft wall between the tank and the glass house.

- The downpipes go to open gullies at the ground level which will not be changed for aesthetic reasons.

- Avoid anything unattractive to the eye.

- Get top quality tanks and associated products, plus installation by a specialist provider, to ensure reliable working over a long period.

- Turnkey low-maintenance installation, for example automatic provision of mains water to the same taps when rainwater runs out.

- Save water.

Above **Beginning the excavation**

Right **Advising visitors about the works**

Cost

■ Initial project budget: £15,000.00

Cost breakdown:

■ Components: Rainwater Harvesting Ltd
Tanks, Filters, Pumps, Drainage
£3,028.73 excluding VAT

■ Installation: Rainwater Harvesting Ltd
Tanks, Drainage
£5,200.00 excluding VAT

■ Installation: South Derbyshire Direct Labour Team
Water service pipework, Drainage
£1,413.13

■ Sundry materials
Turf for making good, Water pipe
£1,540.00 excluding VAT

■ **Total: £11,181.86**

Impact

■ We are beginning to realise that our water is a precious resource. The UK has been spoilt so far: with cheap and plentiful water, however this is changing. We need to use water more efficiently, but however 'green' we are, we all want to know how much it will cost us and save us.

■ Costs vary depending on individual needs and whether the collected rainwater is to be used just for outdoor use (irrigation, outdoor-cleaning) or inside buildings as well for supplying bathroom and toilets.

■ The investment will be worth it. In August 2008, ten water companies applied for price increases that could lead to a 40% rise in water bills within five years. Most in the water industry expect higher price rises in the next planning phase (2015-2020). Using rainwater in combination with a metered mains water supply makes saving on water bills more realistic.

■ There is now official pressure backing the use of rainwater:

- The Code for Sustainable Homes which became mandatory in May 2008 assesses homes for reduction in drinking water consumption and flood risk. All social housing must be built to Code level 3, reducing daily consumption from 160 to 103 litres a day.

- Planning applications with rainwater harvesting are favoured.

- Planning regulations changed in September 2008 to encourage the use of permeable surfaces and rainwater harvesting to offset the threat of flood from hard standings around houses.

- All new homes must have water meters and Water Boards must install meters free of charge to existing households. Records show that metered homes use 10% less water.

- Businesses can benefit from the Enhanced Capital Allowance scheme to offset the installation cost of rainwater harvesting against tax.

- In the future the Government may implement grants, as in Germany, where in some areas a grant of £1,000 is given towards the cost of installation. Germany now has 50,000 rainwater harvesting systems installed every year (500,000 in total).

Above **The hole for the tanks is best dug in a grassed area where the green manhole covers are subsequently unobtrusive**

Review

Performance

■ To date the system has been working fine. The property is considering installing a buster pump. When a number of taps are being used those garden taps furthest from the tanks experience a drop in pressure.

Savings

■ The garden was previously watered exclusively by Mains water. The primary supply is now harvested rainwater and Mains is only used to top up in periods of little or no rainfall.

■ The current costs savings will be around £625/year, but this will increase as Mains water costs inevitably rise.

Maintenance

■ The installation went very smoothly.

■ It is low maintenance.

■ The only regular maintenance item is to clean out the internal leaf filter. This involves lifting the lid to check if any leaves have accumulated. Any leaves need to be removed – this should be checked weekly and after windy days.

■ The actual water filter is a cartridge type that will need replacing every five years.

Engagement

■ Interpretation boards were put up to explain the work being undertaken.

■ The Calke Abbey blog was updated with information about the project.

Review

Lessons learnt

- It is important to select the right equipment and components. These should be of top quality to ensure reliability over a long period.
- The system should be low maintenance.
- The project involved the in-house Direct Labour team to expand their skills and enable them to undertake similar installations elsewhere.
- The installation was well planned and hidden from sight.

Recommendations

- Saving on Mains water to save money and to contribute to easing Britain's water shortages.
- It is important to specify a proven system that will work and not to be a guinea pig for a system with no established track record.
- Ensure the installing Contractor has experience in putting in the chosen system and know what they are doing.
- Ensure that all the levels, drains, tanks, overflows etc are correct.

Left **The only visible parts will be the manhole covers, underneath which the filter and pump can be inspected**

Contact

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www.nationaltrust.org.uk/calke-abbey
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Product

Rainwater harvesting system including tanks, filters, pumps, fittings and installation
Rainwater Harvesting Ltd.
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