

Biologic Design

X

Wetland Ecosystem Treatment

Integrated wastewater purification, resource production & habitat creation

WET System at "The Top" Design & Access Statement

S / 111192 / N

Background

Biologic Design was established in 1993 by Jay Abrahams, a microbiologist and low-entropy systems designer, to create sustainable wastewater purification systems. The ecological and sustainable wastewater treatment systems Biologic Design creates are called Wetland Ecosystem Treatment or WET Systems.

These system were developed by using Permaculture design principles and knowledge of the potential of microbial/biochemical transformations, as well as Jay's 10 years experience working within the conventional wastewater treatment industry.

WET Systems use no non-renewable energy for the purification process, being powered by the solar energy absorbed during photosynthesis in the plants and trees within the system. The main difference between conventional Reedbed Treatment and a WET System is that, unlike a conventional reedbed, WET Systems are multi-species and also that no gravel is used in their construction - soil in the root-zone is the filtration medium.

Established WET Systems

Since it was established in 1993 Biologic Design has created around 87 of these WET Systems for a wide range of clients - purifying sewage from full time populations of between 1 to 400 people and one system now handles the wastewater generated by the 500,000 visitors to a sports/outdoor activities centre in the Midlands.

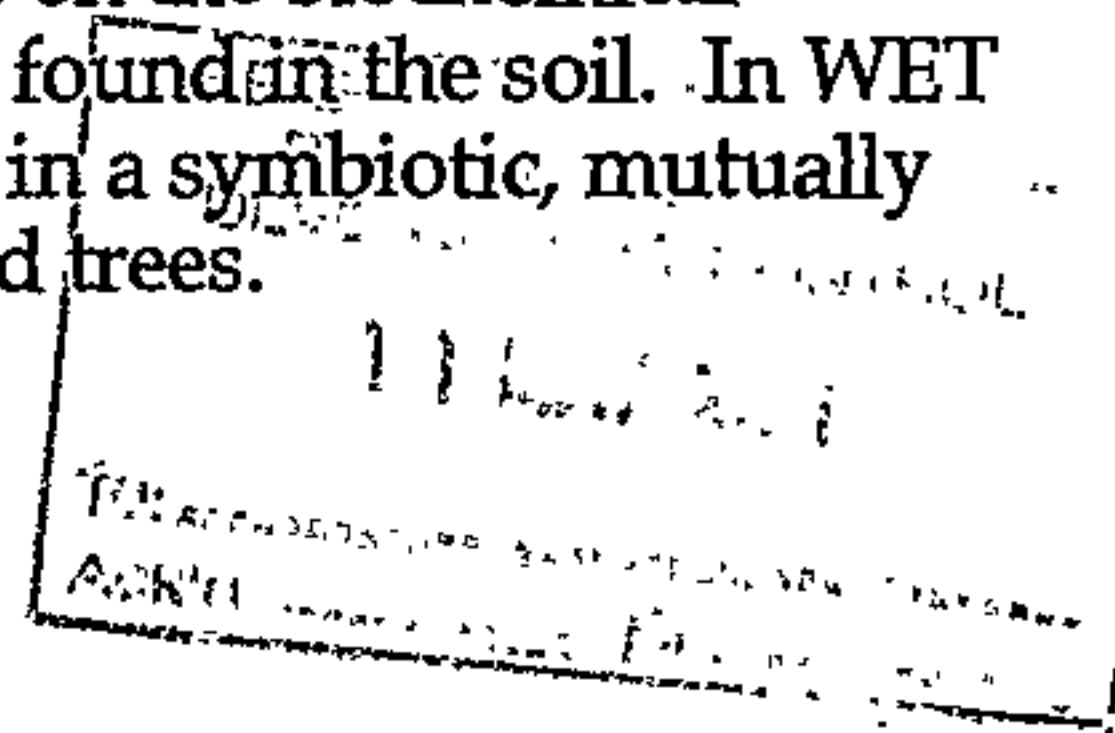
WET Systems also purify agro-industrial and food processing wastewater of much greater strength, notably cider mill and brewery effluent, brewery wastewater, process water from the production of both cheese and ice cream, farm yard runoff/silage effluent and kennels washdown water.

How the WET System works

A WET System comprises specially designed and constructed earth banks and ponds. As the wastewater flows through the WET System, which is densely planted with wetland trees and marginal plants, it is both purified by microbiological action and transpired by growing plants.

Up to 40 different wetland species can be used in and around the lagoons, ponds and reedbeds. Several species of willow and many of reed, rush, sedge and other marginals are used depending on the type of wastewater to be purified.

The basis of the purification process is microbiological; it relies on the biochemical transformations provided by the plethora of micro-organisms found in the soil. In WET Systems the bacteria and fungi which transform the waste are in a symbiotic, mutually beneficial, relationship with the roots of the wetland plants and trees.



Biologic Design

Wetland Ecosystem Treatment

Within this symbiosis the plant roots provide oxygen, sugars and attachment points for the microbes, whilst the microbes mineralise the organic matter found in the wastewater making this available to the growing plants.

S / 111192 / N

Aims of a WET System

WET Systems design are to create a purification system which has a low embodied energy to sustainably purify wastewater - using no non-renewable energy; create a rich, multi-species ecosystem and produce a varied yield viz. coppice willow and reeds for traditional craft work (basketry, hurdle making and hedge laying) and a biomass fuel source.

Impermeable Liner

The WET System at The Top will be completely lined with a Geosynthetic Clay Liner which is used to line landfill sites, this comprises a 11mm layer of Bentonite clay sandwiched between two geomembranes. It has the advantage over other pond lining materials in that it is self-sealing and being mineral based will not degrade over time.

WET System for The Top

We have been commissioned by Mike and Sharon Sherno the owners of The Top to create a sustainable wastewater treatment system for the farmhouse redevelopment there since they wish to minimise the power use of the site and enhance the local biodiversity.

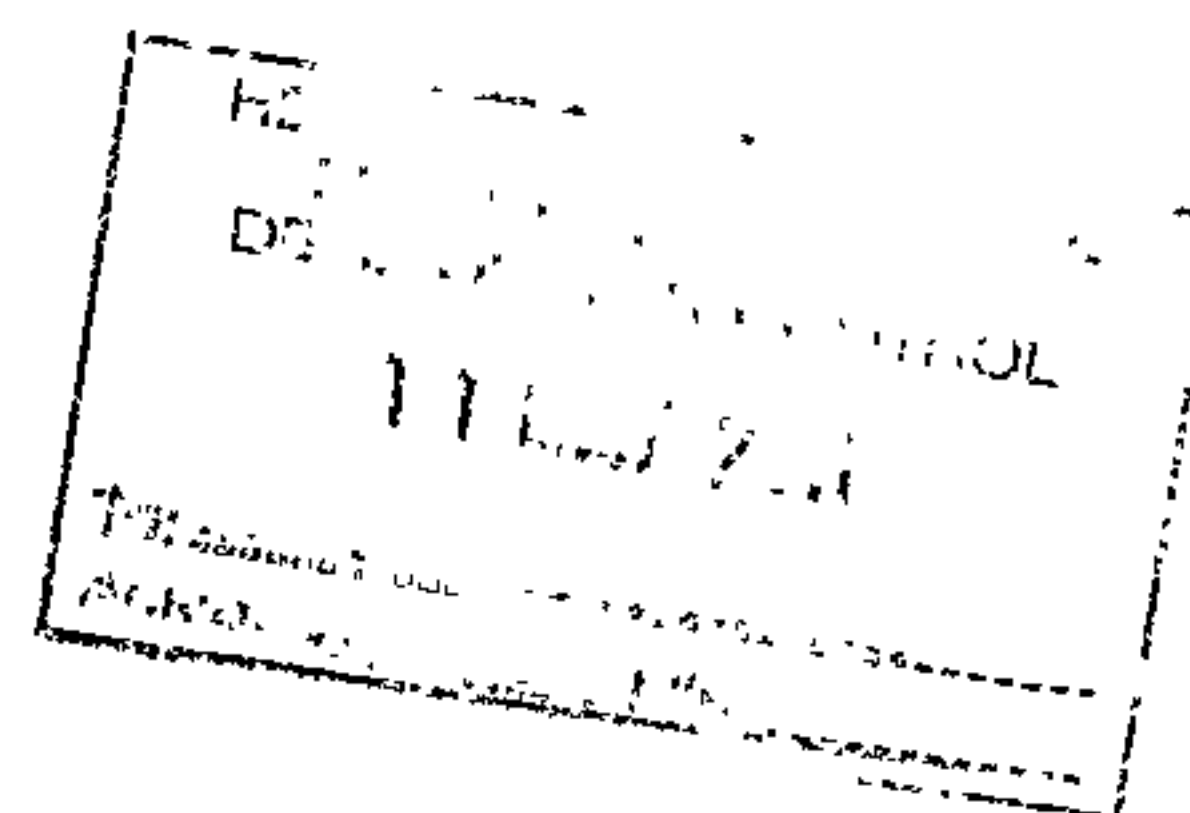
The WET System for The Top is designed to purify and absorb up to 1.85 m³ of sewage per day or an annual input of around 675m³. It comprises a twin-chambered septic tank, which will act to settle out the solids, whilst the liquids then pass into a series of five sequentially arranged swales, these will then be followed by a large polishing pond and deep topsoil soakaway bank. The volumetric capacity of the WET System is increased by this final pond which acts to 'polish' the water to bathing quality standard.

The WET System is a Horizontal, Plug-flow, Multi-species constructed wetland. The swale banks and ponds are designed and constructed to enable the septic wastewater to flow through the banks of topsoil which are densely planted with a variety of wetland and marginal native species. As the wastewater passes through the soil banks it is purified by the plethora of micro-organisms which inhabit the root zone of the planted species.

The swale ponds have a large volumetric capacity which will give the WET System a hydraulic retention time in excess of that required for purification and the final/polishing pond will soon be colonised by the frogs and newts which are already present in the existing spring fed pond by the house.

The polishing pond will have, as it's lower bank, a deep uncompacted, densely planted topsoil 'soak away' which will enable the purified water to percolate into the surrounding soil.

The design and sizing of the WET System gives a high degree of stability to the purification process with the ability to withstand wide variation in the inputs - both shock loading and lower than expected feed rates.



Biologic Design

Wetland Ecosystem Treatment

Mulching of the earthworks

The entire system will be mulched with woodchip prior to planting which will give both weed suppression and an immediate ability to accept wastewater prior to planting. The woodchip will over the course of the first two years operation decompose into a deep topsoil layer.

Potential odour from the WET System

The inlet of the WET System will have a floating 'reed-raft' created on it which has been developed by Biologic Design to preclude any odour problems.

Location of the WET System in the landscape

The location chosen for the WET System will enable it to be gravity-fed from the septic tank at The Top, therefore no pumps will need to be installed and maintained. The area currently is of low quality pasture land, used most recently for grazing sheep.

Biodiversity

The creation of a WET System on this land will greatly increase the biodiversity of the site by providing a wetland habitat densely planted with a range of native wetland species - both marginals and willows. The WET System created 19 years ago at the Westons Cider Mill in Much Marcle, Herefordshire has been subject to regular surveys by the British Trust for Ornithology and there have been over 60 species of bird recorded using the site.

In the upland environment of The Top the WET System will not only provide wetland habitat for various bird species and also a refuge for frogs and newts and other aquatic species. The various willow types used provide an early nectar source for bees as well as the potential for the system to yield an annual coppice willow wand harvest.

Maintenance

Biologic Design, as a part of our contractual agreement with the client, will maintain the WET System for the first year of its operation and we are able to offer a long term maintenance agreement if required.

Biologic Design Ltd.
Archenhills, Stanford Bishop,
Bringsty, Herefordshire, WR6 5TZ
Telephone 01 886 884 721
www.biologicdesign.co.uk

