The Problems Associated with Wildlife and Habitat Protection Law to the Operation and Maintenance of SuDS and Suggestions for Reform.

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1 Introduction

This project was initiated by Alan Newman, Dr Steve Smith and Dr Diane Whitehouse following comments made by some participants at the First National Conference on Sustainable Drainage held in Coventry in June 2001. In their paper '*Wildlife Protection Law as a Barrier to Sustainable Drainage Wetlands and Pools in the UK and Elsewhere: A Proposal for Legislative Change*' they state that there was a commonly held view that the potential for a sustainable urban drainage system (SUDS) to encourage colonisation by organisms and the development habitat which are of 'conservation value' so that wildlife protection laws (see section 4) could at a later date inhibit the maintenance and further development of the site, reducing the drainage potential and effectively dismissing the investment put into the system (Newman *et al* 2002).

Rational

Sustainable urban drainage systems have clear advantages in respect of flood control (see section 2.1), reduction of environmental pollution (sections 2.3 & 3) and the creation of potentially biologically diverse habitat (section 3.5) in line with Agenda 21 (UNCED 1992) that promotes the idea of sustainable development. However in his paper '*Small Scale Wind and Solar Energy Systems: Access to Resources Under Irish and English Law*', Newman (2000) points out to us that 'often the law acts as a barrier either because of deliberate decisions (judicial or legislative) made some time in the past which no longer fit with modern conditions…or which, in trying to regulate one activity, inadvertently puts forward a barrier to another'. The same paper also states that 'the law is capable of being a force of either discouragement or encouragement of the adoption of the technology on a wider scale'. Although this paper focuses on sustainable energy and the problems associated with planning law in adopting this technology, the basic potential problems, as discussed above, remain the same in the context of sustainable drainage. This research must therefore answer several critical questions. To what extent does the law effectively discourage sustainable drainage and are the fears expressed at the First National Conference on Sustainable Drainage, reasonable? How does the law protect habitat and species, what features of SUDS may be affected and how can such problems be avoided by proposing new legislation whilst maintaining the principles of wildlife conservation and SUDS operation?

Methodology

Each section of this document was compiled individually using books, journals, research papers and web sites. The content of the individual chapters of this document were formulated at an early stage and effectively decided by the objectives of the research although rather more information on the great crested newt and pond ecology was originally intended to be included. In the initial stages of the research public libraries proved to be inadequate for the specialised information that was required. Therefore the majority of textbooks referred to were from the Coventry University library. The Internet (especially Altavista, Mamma.com and MSN search engines) proved particularly useful in researching what proved to be the first

chapter on Agenda 21 with a full text download of Agenda 21 from the United Nations website. Subsequent sections on SUDS, storm water and pollution were taken from several textbooks, the CIRIA (2000) guide, and research and conference papers provided by Alan Newman (Gay *et al* 1987; Ellis 1989) and Steve Coupe (Jones & Fermor 2001; Powell *et al* 2001) with Butler & Davis (2000) and CIRIA proving especially useful and are referred to heavily during the early sections of this paper. The Internet proved to be of less use in these chapters with the realisation that SUDS are not well covered by the World Wide Web. The University library again proved useful in the sections on wildlife conservation, Bell & McGillivray (2000), Campbell (1998) and Thornton & Beckwith (1997) are excellent texts if however a little dated by more recent legislation on SSSI protection. The Internet was of particular use here, with downloads of the relevant legislation easily accessible and referred to in the text. The English Nature website is of great interest in respect of SSSI designation and statistics and also to newt protection. These same texts are again referred to in section 6 on planning and licensing, Campbell (2000) and Garbutt (2000) are cited in particular with the Environment Agency and DEFRA websites most useful on water abstraction issues. As the research continued to yield relevant information on all sections of this document each section was continually revised and edited. The original intention when writing this document was to contact representatives of the EA, English Nature or the local planning authority for their views as regards SUDS and the proposal outlined in section 7. However this was not carried out as planned, partly due to time limitations but also to a conscious decision that such opinion may reflect the individual bodies own self-interests and unduly influence the research and conclusions.

Statement of objectives

The objective of this research is to consider and propose a possible resolution for the potential legislative problems that a SUDS operator may encounter with respect to wildlife and habitat statutes and protection and the way that the law effectively discourages such development and then by examining other areas of the law in which 'damaging activities' are permitted. The document will conclude by proposing a piece of legislation under which a SUDS scheme may operate allowing the efficient operation and maintenance of the system and effective wildlife and/or habitat protection but without the possibility (or probability) that the system will be lost because of wildlife or habitat focused statutes.

1.1 The ideals of sustainable development with specific reference to Agenda 21

Since the 1987 World Commission of Environment and Development when the issues of environmental protection and economic growth were linked, sustainable development has been a key watchword. The commission headed by Norwegian Prime Minister Gro Harlem Brundtland produced the report '*Our Common Future'* (World Commission on Environment and Development 1987) and concluded that the planet is threatened by serious environmental problems caused in part by development with large-scale destruction of flora, fauna, air, water and forest. As pointed out by Haman & Brown (1994) the Brundtland report produced an alternative to the environmentalists view that economic growth conflicts with

environmental goals. However, economic growth is of prime importance to the developing world and that the world population is predicted to rise from six billion in 2000 to nine billion in 2040 (Eberstadt 2000), a rate at which the population would nearly double in the next century and much earlier the Brundtland Report concluded that a new development pattern that would 'sustain' human development was required (Haman & Brown 1994). Indeed Butler & Davies (2001) point out to us that Brundtland himself defined sustainable development as 'that which meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs'. Both the developed and developing world need to promote sustainable development. It must satisfy environmental, economic and social criteria whilst reducing the developed world's reliance on natural resources and allowing the poorest nations on the planet to provide their populations with basic housing and utilities. Sustainable development should not damage the Earth's basic life support system – the air, soil, water and biological processes; it should be economically viable ensuring the equal distribution of the benefits of goods and services produced.

The 1992 United Nations Conference on Environment and Development took place in Rio de Janeiro and of five documents signed at the conference, the fifth, Agenda 21 provides a blueprint designed to promote sustainable development and combat environmental destruction. Although Agenda 21 is not legally binding on the signatories as stated by Haman & Brown (1994) the general objective is to ensure that sufficient supplies of good quality water are maintained for the entire population of this planet. In agreeing to Agenda 21 the nations must develop plans at national and local levels. (Haman & Brown 1994).

Freshwater is an essential component of the environment. The freshwater environment is characterised by the hydrological cycle that in some regions and seasons manifests itself as extreme drought and dramatic flooding (United Nations Conference on Environment and Development 1992 Agenda 21 Chapter 18(1)). As stated previously the general objective of Agenda 21 with relation to water is to ensure adequate water supplies for the whole planet whilst reducing the impact that climate change and chronic atmospheric pollution has on the hydrological cycle and as stated in Chapter 18(2) ' while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases'. Haman and Brown (1994) state that integrated water resources planning and management accounting for ecosystem functions and processes, water supply, sanitation, agriculture, industry, fisheries, transport, recreation and power generation are needed alongside the adaptation of human activities – water conservation and waste minimisation with priority given to flood prevention measures. Chapter 18.12 (UNCED 1992) suggests a range of possible activities in an attempt to redress the problem: 'Integration of measures for the protection and conservation of potential sources of freshwater supply… and other relevant development and conservation activities, flood and drought management, and integration of water (including surface and underground water resources) quantity and quality management'.

2 Human Interference with the Hydrological Cycle

As socio economic development can conflict with the protection of the environment the UK government, following the 1992 UN summit committed itself to sustainable development under Local Agenda 21, as stated by CIRIA (2000), where local authorities have their own strategies of sustainable development.

Drainage systems are required in the developed world due to the interference by human activity of the hydrological cycle. This takes two forms, firstly water abstraction for general domestic and industrial use and which produces wastewater, a potentially serious environmental and health risk due to the combination of solids from toilets, substances such as phosphates from washing processes and chemicals from industry. The second form of human interference is the covering of land with impermeable surfaces. This has the effect of diverting rainwater from its natural drainage system and this water, termed runoff, is defined by Kolsky (1998) as 'the portion of rainfall that runs off the surface of a drainage area and ends up in streets, drains and natural water courses'. Storm water is another environmental and health risk and as stated by Butler & Davis (2000) if not dealt with in the correct manner can cause serious damage to property, claim lives, cost millions of pounds in flood damages, and poses a grave risk of pollution through the concentration of pollutants from rainfall and land surfaces.

2.1 The Effect of Urbanisation on Storm Water Drainage

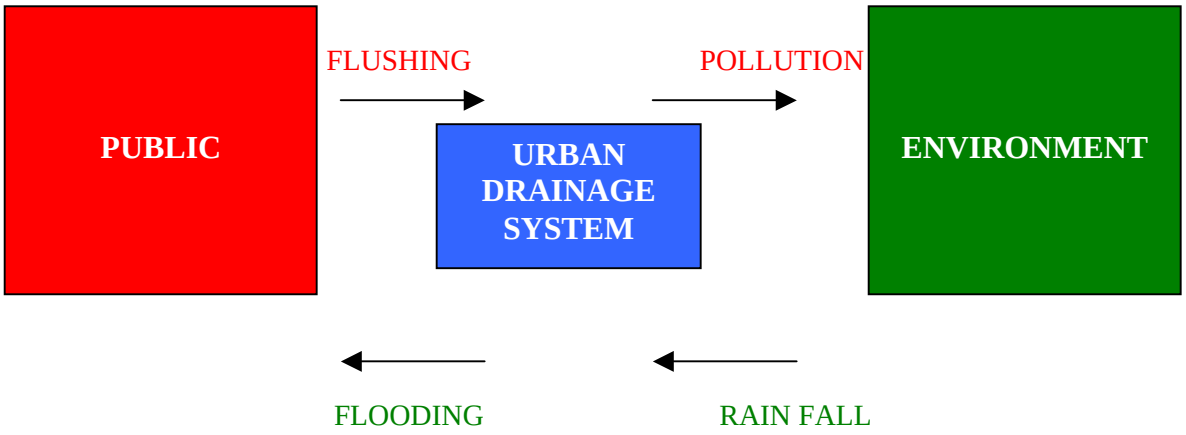
When a natural surface is developed, for example covered with artificial and impermeable surfaces the amount of runoff produced increases in relation to a natural surface where a higher proportion of the storm water is able to infiltrate the surface of the ground to become groundwater. In a study in Denver, Urbonas (1993) showed that during a normal summer storm an acre of paved land produced the same amount of runoff as would several square miles of natural 'rangeland' and that during a thunder storm that produced one inch of rain fall the runoff generated by the single acre of paved area could equal that from forty to one hundred acres of 'rangeland'. In the UK the Environment Agency (EA) estimate that over 125,000 properties are at risk from flooding, affecting about 5% per cent of the region's population. Loughran (2001) reports that the anticipated growth in household numbers to 2016 is over 20,500 each year and will place flood risk areas under even greater development pressure. The floods in England in 2000 demonstrated the serious consequences which flooding can have for people and their property. Eleven thousand people were evacuated from their homes or businesses with some 10,000 properties flooded (National Audit Office 2001). The floods in Easter 1998 caused £400 million worth of damage and claimed five lives with some 1500 people evacuated from their homes (McDonald 2002)

The amount of runoff from a natural surface varies according to the length and intensity of the precipitation and although runoff and groundwater may eventually percolate through the soil to a river or stream, runoff travelling from and over an impermeable surface travels at a greater velocity and in greater volume than

from a comparable natural surface. This has the obvious effect of an increased danger of rapid 'flash' flooding and the removal and transportation of pollutants found on the artificial surface.

2.2 Urban Drainage.

The aim of urban drainage is to minimise disruption to human life and to the environment. Therefore as Butler & Davies (2001) state urban drainage has major interactions with the environment and human population:



The traditional means of removing storm water from urban areas is to drain it rapidly and in large quantities by swale, gutter and underground storm sewers connected to the nearest watercourse so as to order to prevent localised flooding, however in more recent years environmental awareness has increased, and Urbonas & Stahre (1993) report that concerns have arisen over water quality and the impact on the receiving waters by rapid downstream conveyance of storm water because of pollutants from urban areas present in the runoff.

2.3 Sources of Pollution in Storm water

Along with flood control one of the major objectives of storm management is the reduction of pollutants within storm water that pose serious risk to biodiversity and individuals of species that live in the receiving waters. When these substances cause an unfavourable impact they are termed a pollutant. Water quality in relation to runoff is of serious concern in the UK, as stated by Chubb (2002) which has a very high proportion of combined sewers, with 35-40% of combined sewer overflows (CSO) deemed to be of unsatisfactory quality causing short and longer-term problems (Ellis 1989).

Wanielsta & Yousef (1993) define precipitation as 'the material deposited by wet (rainfall) and dry (dust fall) processes on land surfaces'. Wet precipitation i.e. snow, rain and sleet absorbs and dissolves atmospheric pollutants from vehicles, fossil fuel burning, industry and waste incineration that are then conveyed into the drainage system via the storm water and this process is known as wet fallout. Dry fallout is a continuous process by which these same pollutants are deposited on land surfaces as dry particulates by sedimentation, Brownian movement and inertial impaction and then washed into the watercourse by

subsequent precipitation. The significance of wet and dry fallout varies from region to region. Butler & Davies (2000) cite Gothenburg as a city where wet fallout is the dominant source of atmospheric pollutants in storm water, around sixty percent of the total. Dry fallout appears to be a more serious problem in urban regions with large areas of artificial surfaces with Malmqvist's (1979) research showing that 25% phosphorous and 70% of nitrogen in storm water being attributable to atmospheric fallout.

Vehicular pollutants include volatile solids, aromatic hydrocarbons, exhaust fumes, lead, and hydrocarbons from fuel lubrication and hydraulic systems; zinc from tyre wear and body corrosion and copper and nickel from brakes and clutch. The everyday passage of traffic erodes the road surface releasing bitumen, tar, emulsifiers, aromatic hydrocarbons, metals and sediment (Herefordshire Wildlife Trust 2001). In their paper *Pollutant Mass and Physical Particulate Pollution as a Function of Particle Size and Traffic for Urban Snow Runoff* Glenn *et al* (2001) consider snow to have a much greater capacity to accumulate traffic pollutants compared to storm runoff due to its extended residence time and the porous nature of snow. They conclude that urban highway snow is a significant sink for both heavy metals and traffic generated particulates.

Studies have shown that substantial proportions of heavy metals in road runoff are in a biologically available form as much as fifty to sixty percent of lead and 30-37% of copper are in a potentially exchangeable form (Ellis 1989). Pollutants have serious consequences not only for drinking water quality but also for aquatic plants and insects and consequently other wildlife that depend upon them for shelter and food (Herefordshire Wildlife Trust 2001). Heavy metals may accumulate in sediment, phytoplankton, benthic organisms and fish. Toxic metals may reduce diversity and abundance of sensitive organisms whilst pollution tolerant species may increase their abundance. However metal concentrations are potentially misleading as several authors note. Unstable ionic copper is extremely toxic to aquatic species but as the stability of the copper increases the toxicity actually decreases. As Walker *et al* (2001) state, that other factors in the aquatic environment i.e. pH, temperature, dissolved oxygen levels; water hardness and antagonistic and synergistic effects of metal combinations all affect the toxicity to organisms.

Gay *et al* (1987) have studied the sources of storm water contamination at airports. The de-icing of aircraft is of primary importance as ice formation on the wing affects the aerofoil section of the wing reducing lift; in the UK glycol has been used as a de-icing agent since the second world war and Gay found that in a three month period at Stanstead airport 160 000 litres were used. Aircraft washing produces copious quantities of wastewater (4 500 litres per aircraft) whilst fuel spillages and maintenance work produces significant quantities of hydrocarbons all of which can potentially be released untreated into watercourses.

The erosion of urban buildings by weathering produces sediment, containing particles of bricks, concrete, asphalt and glass and can form a significant constituent of sediment in storm water. The rate of sedimentation depends upon the surrounding land uses, traffic volume, season, type and condition of street

surfaces and their maintenance and the length of dry periods between rainfall events. Some sediment may be tolerated in a stream but when in excess sediment produces turbid water that reduces water clarity and therefore plant growth and clogs up fish gills. The physical action of sediment can change the stream by erosion whilst spatial location of the sediments can remove spawning areas and adsorption of nutrients to the sediment particles have a direct effect on plant growth (Wanielista & Yousef 1993). Butler & Davies (2000) report that inorganic sediment particles sequester organic matter that adheres to the rough surfaces of the sediment creating anaerobic conditions that release fatty acids as a by-product with significant biological oxygen demands (BOD) loads generated that can increase pollutants by up to 400% (Binnie and Partners 1987). However it is difficult to separate the effects of storm water runoff on the BOD of receiving waters from other sources of pollution (Wanielista & Yousef 1993).

Urine and/or faecal deposits on roads and pavements from animals are a source of coliform pollution and the specific pathogens *Shigella, Salmonella* and *Clostridium. Clostridium* has been linked to duck kills in lakes and can potentially affect humans and *Salmonella* is a well- known source of gastrointestinal disorders in humans. The organic matter in these deposits is also a source of high BOD.

Other pollutant sources include phenols and cresols from wood preservative, pesticides and herbicides. Chlorides are usually introduced as sodium chloride during cold weather as a de-icing agent on roads, car parks and pavements and due to its high solubility a large percentage of the chloride finishes up in surface runoff and groundwater causing chloride loads in storm water during or after cold weather to be 50-500 times higher than occurs naturally (Stotz 1987). Most aquatic organisms are adapted to a narrow salinity range due to the problems of retaining and secreting water molecules in the presence of salt. Therefore changes in the salinity of their environment are extremely damaging. Colwill *et al* (1984) suggest that rock salt contains impurities and an insoluble portion that contributed 25% of solids in a study. Salt also accelerates the corrosion of vehicle bodywork and accentuates the levels of toxic metals as discussed previously.

3 Sustainable Urban Drainage Systems

Conventional drainage systems that remove large quantities of storm water rapidly do not control or remedy polluted water and Williams (1982) reports that they may actually exacerbate the problem by increasing flooding and eroding streams and rivers. In response to *Local Agenda 21 – A Framework for Local Sustainability,* and to numerous other pressures i.e. flooding (see section 2.1) sustainable urban drainage systems (SUDS) have been developed under a variety of names (i.e. Best Management Practice) deal with storm water locally, disposing of it close to its source and have several benefits to storm water quality, disposal and the environment.

The regularly cited advantages of SUDS as cited by CIRIA (2000) include the recharge of groundwater, the management of runoff flow rates and reduction of the impact of urbanisation on flooding, the protection and enhancement of water quality and avoidance of pollution of the environment, the capability to allow for new development where existing sewerage systems are at their maximum capacity and are sympathetic to the environmental setting and providing habitat for wildlife. Urbonas & Stahre (1993) also consider the preservation and enhancement of natural vegetation and minimising the use of natural resources as important factors.

SUDS are used as part of site planning and management strategies to control runoff and prevent flooding. There are four general structures in a SUDS system of which any or all may be used holistically according to the setting, local land uses, the needs of local people, associated risks with each component and future land management.

These structures include:

- Filter strips and swales
- Filter drains and permeable surfaces
- Infiltration devices
- Basins and ponds.

These devices attenuate the runoff so as to prevent flooding and urban stream erosion and provide some treatment of the pollutants mentioned previously by sedimentation, filtration, adsorption, degradation and biological uptake (CIRIA 2000).

3.1 Filter strips and swales

Infiltrating filter strips and swales are vegetated surface features that are designed to transport, treat and store runoff from impermeable surfaces. Swales are usually shallow grass lined channels with low water velocity and high infiltration capacity that mimics natural drainage patterns. They may be designed as free flowing channels with positive longitudinal slope causing water movement along the slope or as non-flowing structures with the water disposed of by infiltration into the ground and evapotranspiration (Urbonas & Stahre 1993). Filter strips are gently sloping areas of ground, also referred to as ‘negative buffer strips’ and are similar to swales in the disposal of storm water but are designed to allow the runoff to flow as a sheet across the strip (Butler & Davies 2000).

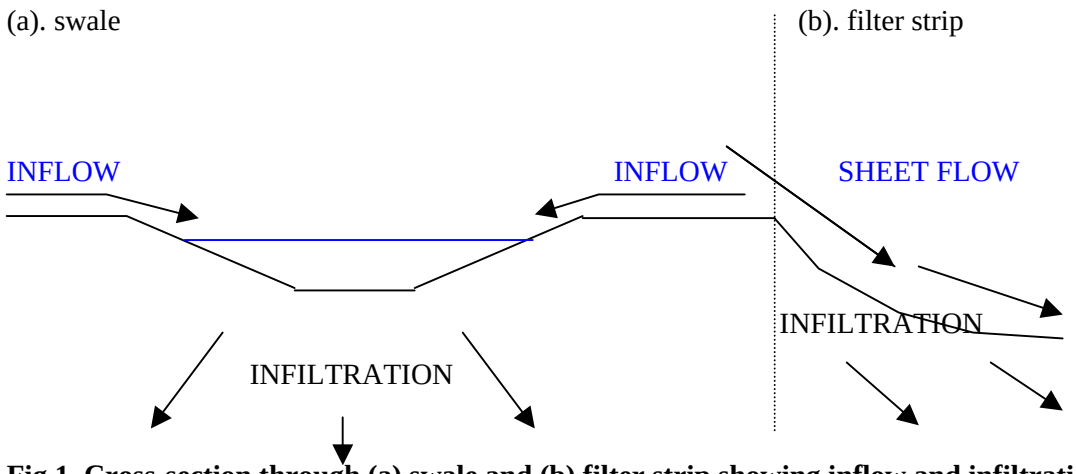


Fig 1. Cross-section through (a) swale and (b) filter strip showing inflow and infiltration of runoff. Source: CIRIA (2000)

According to Butler & Davies (2000) swales require shallow slopes of less than 5% and underlying porous soils that drain easily to function well. For ease of maintenance (i.e. grass cutting) the side slopes should not exceed a gradient of 1:3, a depth of approx 0.25-2 metres and a bottom width of one metre. Although designed as a conveyance system, filter strips and swales are effective at pollutant removal through filtration, biological uptake and sedimentation and improve water quality considerably. Whallen and Callum (1988) report that swales with a high infiltration rate may remove up to eighty percent of some common storm water pollutants whilst Ellis (1992) in a similar study found that 60-70% of solids and 30-40% of metals, hydrocarbons and bacteria were retained by a swale of 30-60 metres long. Bäckström (2001) concluded that sedimentation processes rather than filtration accounted for the removal of 70-98% of solids, with the higher percentages observed in swales with well-developed turf and a high infiltration rate. It appears that the removal of heavy metals, nitrogen and phosphorous occurs more rapidly in bare earth swales than in those that are grass lined and consequently thinner grass is more efficient than a thick grass covering where potential sorption sites are decreased and organic debris such as grass clippings are increased (Wanielista & Yousef 1993).

That all swales remove pollutants with these efficiencies is unlikely and along with filter strips they are best used as a pre-treatment in combination with other measures but it is known that pollutant removal in swales can be increased with small dams (fig 2.) that attenuate the flow and may increase infiltration and sedimentation (Urbonas & Stahre 1993).

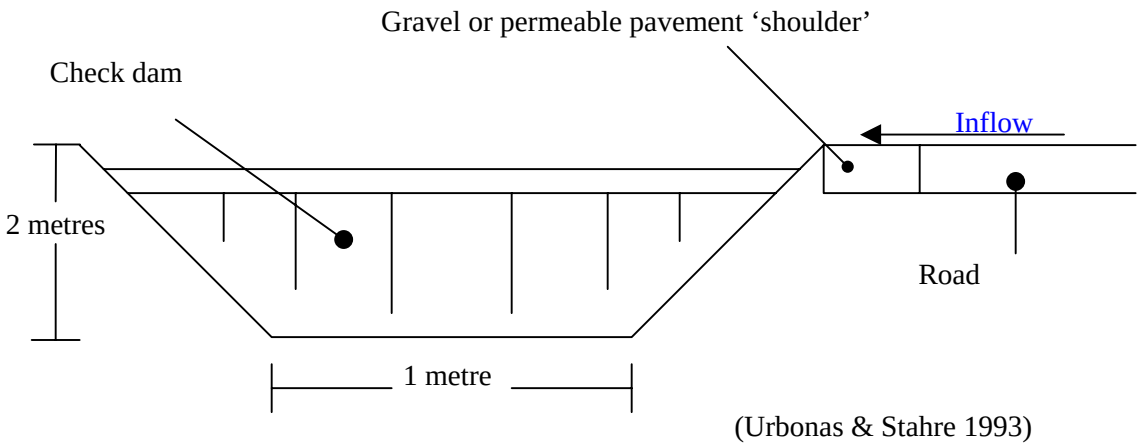


Fig 2. Cross-section through swale showing attenuation dam.

Swales and filter strips are well suited to treating the runoff from small residential areas and roads and for maximum effectiveness and also to avoid erosion the runoff should flow as a sheet down the side of the swale or filter strip (as seen in fig 1) and the flow depth should not exceed the height of the grass vegetation for effective attenuation and infiltration with mowing and litter clearance the only regular maintenance required. These structures are a valuable wildlife habitat and CIRIA in their '*SUDS design manual for England and Wales'* (2000) consider that planting of wild flowers and grasses along with shrubs and trees allow easy integration into the surrounding land. As swales are potentially attractive habitat for numerous plant and animal species there is the possibility that such structures may be affected by species-specific wildlife statutes (see section 4.2 and 4.3) and SSSI designation (see section 4.3.1) and the restrictions that these impose.

3.2 Filter Drains and Permeable Surfaces.

Filter drains or pipe trenches and permeable surfaces are devices with a volume of porous media below ground for the temporary storage of water. Filter drains are robust, linear devices, commonly found alongside roads that collect runoff from such impermeable surfaces. The water passes through the surface to the permeable fill and is disposed of by infiltration, porous piping (see fig 3) that conveys the water to the drainage system or may be pumped out.

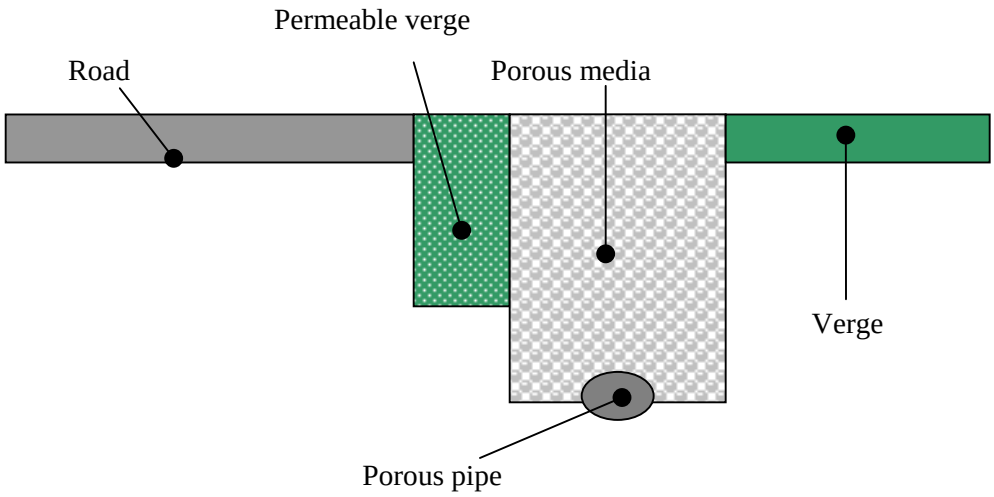


Fig 3. Cross-section through a filter drain. (Source: CIRIA 2000)

The amount of water stored and the reduction of pollutants within the water by a filter drain depends upon the volume of the drain itself and the proportion of void spaces in the filler material. The permeable material traps sediment and it has been shown that metals, hydrocarbons and COD may be removed at 60-80% efficiency (Colwill *et al* 1984).

Permeable surfaces consist of artificial areas constructed from open structured materials. There are three basic types of permeable surface; porous asphalt and porous concrete are largely similar, containing very little fine aggregate (i.e. sand) and therefore voids in the media remain open with a minimum 12% void space by volume often specified (Ferguson 1994). These materials are placed upon a base layer (fig 4) that promotes infiltration (Urbonas & Stahre 1993).

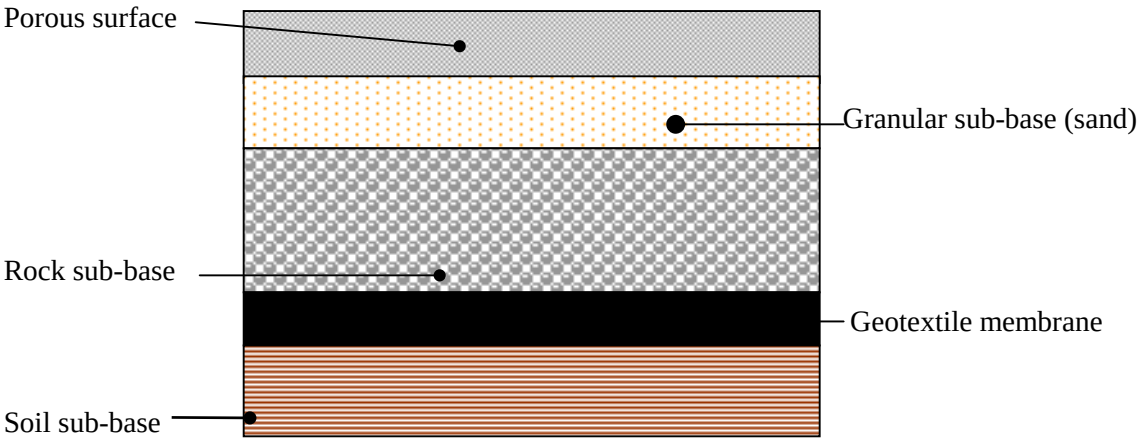


Fig 4. A typical porous pavement. (Butler & Davies 2000)

The third type of porous paving is constructed of modular interlocking concrete blocks with open cells. These blocks are laid over a deep layer of course gravel and geotextile membrane filter is placed beneath this layer to prevent the sub soil migrating into the granular base and so reduce infiltration efficiency.

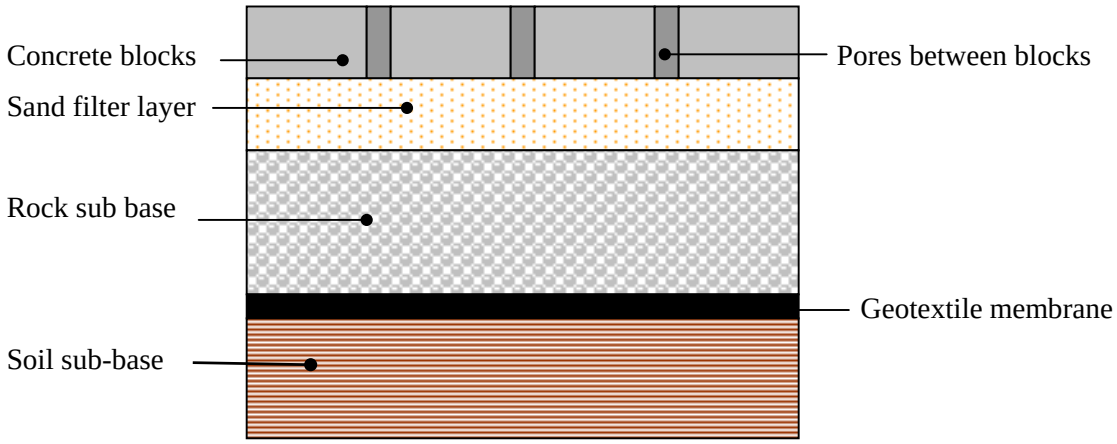


Fig 5. Cross-section through Modular Concrete Block paving.
(Butler & Davies 2000)

Permeable pavements offer an alternative to on site detention reducing the impermeable area of the site and are excellent for use in large parking areas where they may also act as local infiltration devices for surrounding impervious surfaces (Urbonas & Stahre 1993). However over long periods the efficiency levels of concrete and asphalt surfaces may reduce with concerns centred especially on the freeze-thaw action in cold weather and their tendency to clog and seal with silt and dust within three years whilst interlocking concrete also clogs up albeit at a slower rate and asphalt may seal from stresses upon it by vehicle braking action that causes the pores in the material to collapse. To prevent silt sealing a jet or vacuum-cleaning programme is essential, required at least twice a year to slow this process. Unfortunately once sealed with dust and silt asphalt and concrete require expensive replacement whereas concrete block paving only needs the rock sub-base replaced. Such surfaces may have infiltration rates as high as 1mm/s when new, declining to 0.2mm/s after five years (Butler & Davies 2000).

According to Ferguson (1994) porous asphalt can reduce suspended solids to between 20-50 mg/l^{-1} with lead and hydrocarbons also significantly reduced by microbial colonies present within the pores of the material. Porous asphalt has proven to be a satisfactory driving surface and is more skid resistant due to its course surface, with Butler and Davies suggesting that grit need not be applied in freezing conditions as the material does not form a surface of ice in cold weather. Bachtle (1974) confirms that the requirement for salt (and so reducing storm water pollution) is reduced as snow and ice melt at a greater rate on porous surfaces than on impermeable ones.

3.3 Infiltration Devices

Infiltration devices drain water directly into the ground where excess runoff is generated despite the use of permeable surfaces and are useful in increasing soil moisture content and recharging ground water supplies. Infiltration devices include soak ways and trenches and can be used at the source of the runoff, or the runoff be conveyed by pipe or swale to the infiltration device (CIRIA). Infiltration devices enhance the ground's natural capacity to store and drain water by maximising the surface area of the device that is in contact with the soil and take advantage of the surrounding soils natural permeability, therefore when the soil is relatively impermeable the devices efficiency is somewhat limited. A soak away is an underground structure that is stone filled, dry wall lined or constructed with pre-cast concrete rings with a recommended void ratio of at least 30%.

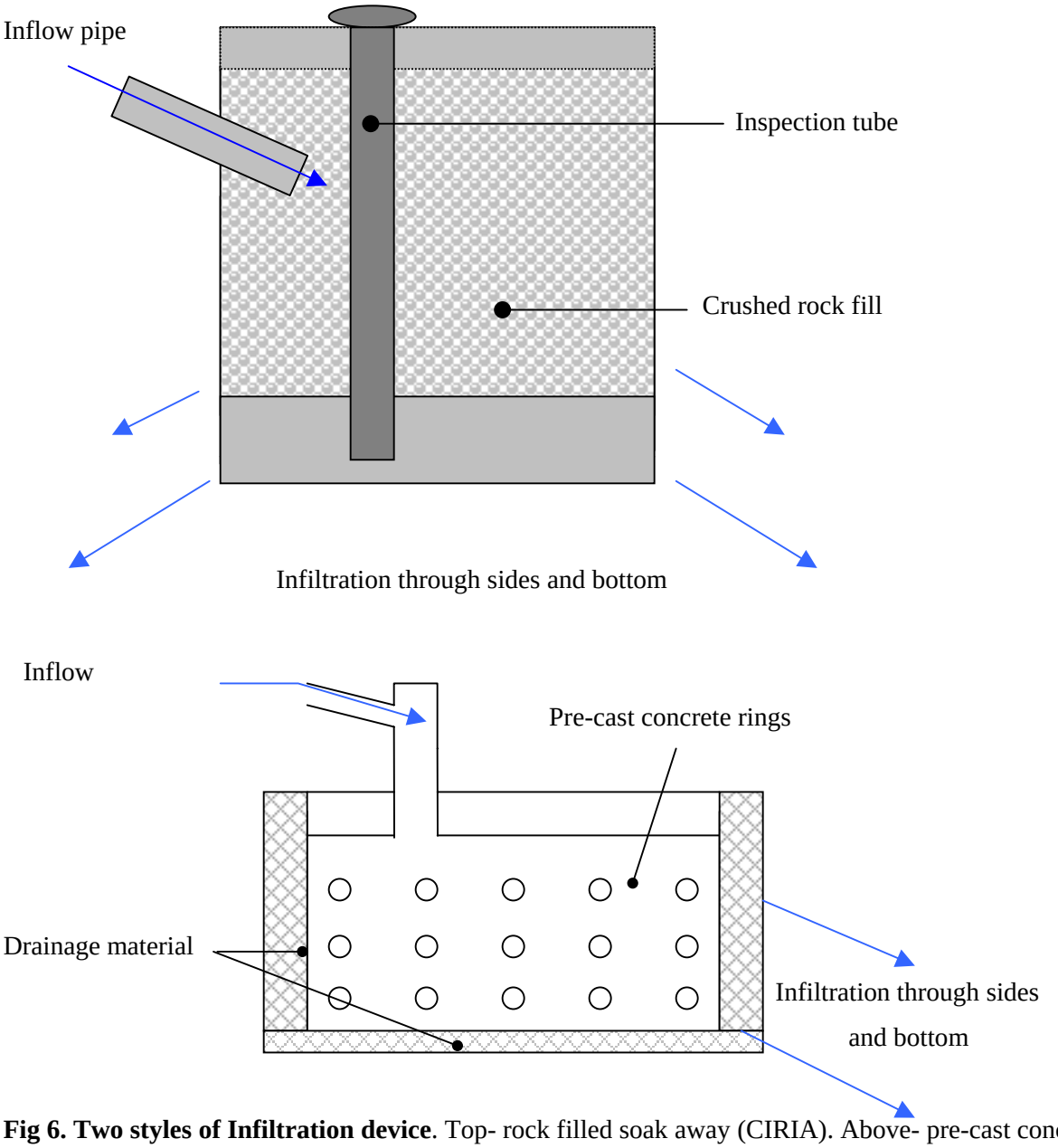


Fig 6. Two styles of Infiltration device. Top- rock filled soak away (CIRIA). Above- pre-cast concrete rings (Butler & Davies 2000).

An infiltration trench is a linear structure and of similar design and construction as a soak away, backfilled with rock and possibly covered in grass. Infiltration basins and swales store water temporarily on the surface in periods of heavy rain but otherwise remain dry. The land surrounding subsurface structures can be reclaimed for other uses, for example car parking, however heavy traffic can compact the fill and the surrounding soil, reducing permeability and limiting the infiltration potential of the device.

Although involving greater expense than surface basins they eliminate the mud and mosquito problem and pose much less of a safety hazard in populated urban areas that are frequently associated with surface infiltration basins. The runoff entering such a device is treated in a similar manner to those already discussed. Solids are removed through physical filtration, heavy metals may be adsorbed onto the backfill material or the soil and hydrocarbons are broken down by microbes growing on and within the media, however as Ferguson (1994) suggests microbial growth may be affected by lack of light and oxygen. Infiltration systems are extremely versatile according to the site and can vary in size, from providing a soak away for an individual roof down-pipe to a basin serving an entire development. Soak ways and trenches can be grassed over and basins may be planted with trees, shrubs and wild flowers providing valuable wildlife habitat.

Diligent construction of these devices is required for long-term performance. Compaction of the surrounding soil by heavy machinery and vehicles must be kept to a minimum, as must sediment and soil accumulation and deposition. Premature use of such a device where local soils are unvegetated and erodible can overload them with sediment reducing infiltration and requiring expensive excavation and cleaning. Therefore it is extremely desirable to allow the soil to stabilise and the vegetation to mature before putting the device into full use. (Butler & Davies 2000)

3.4 Basins and Ponds

Basins and ponds differ in the period of time that water is stored in them. Basins are designed for short-term storage of runoff during wet weather and are dry during periods of fine weather. Most commonly known as detention basins or dry ponds they consist of excavated areas, either oblong or elongated triangular in shape that are lined with grass with even depth so as to prevent uneven water distribution and thus pools of stagnant water that provide a breeding ground for mosquitoes. Detention pools provide flow attenuation and have an outflow connected to adjacent surface waters and are designed to store water from a few hours to a few days duration, releasing it slowly once the flood risk has passed (Wanielista & Yousef 1993).

During a storm event surface runoff is routed through a detention basin with the outlet closed so that the basin fills with runoff. Water is then released at a fixed rate as the peak flow subsides. Whilst the water is

detained in the basin, suspended solids settle out and since many pollutants are attached to such solids, the basin will remove a proportion of them although the exact amount depends upon depth, volume, shape and inlet/outlet configuration as reported by Urbonas and Stahre (1993). Increased detention time also improves treatment efficiency; 'extended' detention basins may contain a small area of permanent pond within the larger mainly dry area. It is preferable for water entering a basin to have undergone some form of pre-treatment prior to entering the structure (i.e. swale, filter strip) to remove sediment loads. CIRIA (2000) report that a depth of greater than three metres may damage the vegetation on the sides and bottom of the basin. There are several important considerations required when designing a detention basin that will be covered briefly here.

Safety

Safety considerations include:

- The structural integrity of the embankment so as to prevent collapse and flooding.
- A satisfactory detention and storage area that prevents overtopping and erosion of the embankment.
- Gently sloping sides (<4:1) to allow easy exit from the basin should the basin begin to fill.
- Adequate fencing and/or barrier planting according to site and structure.

Construction

- Fertile porous soils required that allow healthy plant growth and the adequate drainage of water.
- Excessive compaction of soils must be avoided.
- Plant species that are suited to local soil chemistry and periods of inundation should be used.
- Vegetation should be allowed to mature before operational use to maximise efficiency.

Design

- Inflow structure should dissipate energy from inflow to provide protection from erosion, allow access for repairs, incorporate safety features and be aesthetically pleasing.
- Outflow structure should allow control of several flow levels depending on peak flow rates, be safe and practical to repair, contain no moving parts or pumps that present a danger and provide some means of screening debris to prevent blockages.

Operation

- Access required to entire perimeter to allow maintenance programme.
- Vehicular access required onto site.
- Sediment accumulations require removal every seven to ten years.

(Urbonas & Stahre 1993, Ferguson 1994, CIRIA 2000).

A detention basin, if designed correctly can become an integral part of the community, gently sloping sides and vegetated surface are ideal sites for recreational activities and as sports fields. Such simple and inexpensive considerations in the design of these structures can transform an unattractive and relatively useless hole in the ground into a useful and attractive community amenity (Urbonas & Stahre 1993).

Retention ponds provide long-term storage of storm water with residence times averaging weeks or even months. Permanently wet ponds provide a greater degree of pollution remediation than detention ponds and along with wetland type structures with areas of aquatic vegetation provide greater attenuation and filtration. Retention ponds and wetlands require regular inflow to prevent them drying out but major flood events are routed around these structures to avoid excessive depth fluctuation and damage to plant life. Wet ponds offer excellent habitat to wildlife and integrate easily into open spaces. The planting of a variety of aquatic plant species around the fringes, shallow marginal shelves and in the deeper water of a retention pond allows biological treatment of pollution in addition to greater removal of suspended solids and finer sediments due to the longer residence times compared to that in a detention basin. Aquatic vegetation attenuates flows and currents in the pond providing the still conditions required for particle settlement. The vegetation may also take up some contaminants biologically and help to prevent algal blooms thus enhancing the aesthetic and wildlife value of the pool. Retention ponds are designed to allow water retention of two to three weeks, have a maximum depth of three metres with a minimum twenty-five percent as shallow marginal areas not more than fifty centimetres deep and should be at least three metres wide (CIRIA 2000). In addition to the design considerations in above on detention basins the following are of relevance to retention ponds:

Algal growth

Excessive algal growth causes unpleasant odour, aesthetic problems and in severe cases provides an environment in which pathogens thrive that is likely to cause damage to wildlife. Although almost impossible to prevent it can to some extent be controlled by deeper water, vegetative growth and regular pond cleaning. Aeration and chemicals may be considered. (Urbonas & Stahre 1993)

Sediments

Sediment traps or source control limits this problem to some extent. However expensive (and potentially damaging to wildlife) underwater excavation i.e. hydraulic dredging may be required every seven to ten years as stated by Ferguson (1994) to maintain the efficiency of the pond, important from a SUDS legislation perspective as such activities would almost certainly constitute a potentially damaging activity or be in contravention of a wildlife statute, for example the legislation referring to great crested newts as discussed in section 4.4.

Currents

Currents need to be reduced to maximise the settlement of suspended solids by using length to width ratios of at least 3:1 and also by windbreaks and baffles – either islands, shoals or promontories.

Safety

Permanently wet ponds are a hazard to the general public. Sloping sides and/or rocks are desirable for ease of exit. Controlled access via footpaths and dense waterside vegetation improves safety.

When established a retention pond should be aesthetically pleasing, well-maintained and permanent features of the locality. Such a pond has the potential to provide a range of amenities from fishing and bird watching to sailing and water sports on larger pools. The choice of plant species can help to provide a valuable habitat for wildlife. The biodiversity value of such features will be discussed in the next section. Basins and ponds are, like swales (see section 3.1), potentially attractive habitat for numerous plant and animal species and again there is the possibility that these structures may be affected by species-specific wildlife statutes (see section 4.2 and 4.3) and SSSI designation (see section 4.3.1).

3.5 Benefits of Sustainable Urban Drainage Systems

3.5.1 Biodiversity

As the United Kingdom's wetlands have suffered a significant decline in the last fifty years through intensive agriculture, urban sprawl, pollution and chronic water abstraction SUDS are now seen as a positive source of wetland habitat potential.

According to the Warwickshire Wildlife Trust, of 225 132 hectares in Warwickshire, open water constitutes just 1.02% of the total and wetland 0.18%. As a consequence of this at a national scale six of the first group (1995) of fourteen national habitat biodiversity action plans (BAP) relate to freshwater with an additional five in the second in 1998-9 (Jones & Fermor 2001)

Plants

The value of SUDS to increasing habitat is unquestioned. What is more uncertain however is their value to biodiversity and species richness. The National Pond Survey (NPS) based at Oxford Brooke University found that out of eighteen SUDS ponds in 'semi natural' landscape only four were close to the average of twenty-three plant species per pond. None of the plant communities included rare or scarce species (Powell *et al* 2001). However 78% contained 'local' plant species, mainly consisting of submerged aquatic species that becoming increasingly rare due to water pollution. A question remains regarding these plants long-term survivorship because of increasing pollution loads as the pond matures.

Animals

The same survey identified between twenty-four and fifty-eight invertebrate species with all but one common and widespread taxa, which according to Powell *et al* (2001) is unusual in itself as an average of four scarce species would normally be expected in such a survey. Smooth (*Triturus vulgaris*) and palmate (*Triturus helveticus*) newts were identified along with a single frog (*Rana temporaria*) but of particular significance were water voles (*Arvicola terrestris*), a UK Biodiversity Action Plan (1994) species under particular threat from competition and predation from the North American mink.

Conclusions

These mixed results suggest greater effort and consideration is required in terms of water quality and SUDS pond/basin design to encourage greater biodiversity but still confirms the potential of SUDS schemes as valuable habitat for wildlife in general and for rare and endangered species. Powell *et al* (2001) and Jones & Fermor (2001) recommend the following measures to maximise the wildlife habitat potential of SUDS:

- The full employment of Best Management Practice in SUDS to minimise pollution (i.e. swales and filter strips).
- The use of a series of linked ponds/basins to progressively filter runoff, thus improving water quality further down the chain.
- The separation of clean runoff sources (i.e. roof runoff) from highly contaminated sources into separate basins.
- The location of SUDS basins close to other wetland areas (lakes or river floodplains) to encourage natural colonisation by species that are more suited to the habitat (water quality, soil chemistry) than artificially introduced species.
- Minimising the use of topsoil and fertiliser and keeping planting disturbances to a minimum to reduce the leaching of nitrates and phosphates into the water and thus reduce or prevent eutrophication.
- The limiting of water depth – deep water is a specialised habitat.
- The maximisation of shallow areas – water of less than twenty centimetres deep is the most biologically diverse area of a pond. Depth variation promotes different habitats from swamp to wet grassland.
- A rough, untidy finish promotes greater physical habitat diversity.
- The incorporation of islands and promontories increases the available habitat diversity and ensures that some parts of the water body are not exposed to the main pollution burden from the inflow.
- The planting of trees and shrubs around pools offers habitat and wind breaks. This may also include introducing broken boughs and branches into the water that provide excellent invertebrate habitat.
- The encouragement of diverse plant communities including the removal of single species stands.
- The creation of shallow, grassy ponds alongside swales.

SUDS clearly have the potential to attract rare, endangered and protected species that would pose problems to the successful operation of such structures.

3.5.2 Economic Benefits

That water is highly regarded for its aesthetic is undeniable. A study in 1993 in America by the National Association of Home Builders (HAHB) found that a proximity to water raises the value of a house by up to twenty-eight percent. The benefits of a SUDS scheme to a new development are therefore considerable; they minimise the environmental impact of a development covered with impermeable surfaces and may also raise the value of the development itself. The US Environmental Protection Agency (EPA) report 841-S-95-002 (1995) covers this in more detail.

4. Nature Conservation in the UK

4.1 Background

This section will examine the founding principles of Nature Conservation in the UK, so as to explain the formation of the Nature Conservancy Council (subsequently English Nature) and the agencies responsible for the designation of Sites of Special Scientific Interest followed by an in depth critical review of the protection of species and habitat in the UK with the objective to examine the law in relation to species and habitat protection and the operation of a SUDS scheme that may be affected by these laws.

In 1947 the Huxley Committee reported on nature conservation and made the following recommendations:

1. That nature conservation should be the responsibility of Government.
2. That protection should be based on the designation of sites that are important examples of their type.
3. That conservation policy should be based on scientific research into the complex relationships between animals and plants and the soils and rocks on which they depend.

(Thornton & Beckwith 1997).

This legislation introduced the practice of designating sites worthy of protection as National Nature Reserves (NNR's) and Sites of Special Scientific Interest (SSSI's). Out of this legislation the Nature Conservancy was established and its role was to create a series of protected sites across the country (Bell & McGillivray 2000) In 1973 this body became the Nature Conservancy Council (NCC), a body that was independent of Government. In 1984, *Nature Conservation in Great Britain* set out the NCC's policy that a 'bedrock' of sites, around ten percent of the country be protected (Nature Conservancy Council 1984). Under the Environmental Protection Act (1990) the NCC was from 1st April 1991 split into three separate bodies, English Nature, The Countryside Council for Wales and under the Natural Heritage (Scotland) Act

1991, Scottish Natural Heritage. The controversy that surrounded the Environmental Protection Act 1990 led to the formation of the Joint Nature Conservation Council, essentially a committee of the three individual bodies with responsibility for the retention of common standards throughout the United Kingdom including the criteria for SSSI designation (Bell 1997).

4.2 Protection of animals and plants

The principle source of legislation on nature conservation is the Wildlife and Countryside Act 1981 (Thorton & Beckwith 1997). To ensure compliance with the European Union Habitats Directive 92/43 the Conservation (Natural Habitats etc) Regulations 1994 (SI 1994/2716) made some changes in the 1981 Act. The method of protection is to establish blanket criminal offences of interfering with specified wildlife. Schedules identify categories of species and the level of protection that is afforded to each category is according to the status and needs of the species contained within. The Act imposes prohibitions on activities detrimental to the species in question and breach of these prohibitions is normally a criminal offence; however as discussed below under a licensing scheme the holder of a licence may be granted exemption from the provisions of the Act (Bell & McGillivray 2000).

Wild birds

Birds have traditionally received more protection than any other species. Birds are divided into two schedules with Schedule I containing the most rare species and are especially protected. Sections 1 to 8 set out the criminal provisions for the protection of wild birds, their nests and eggs and the sale and registration of wild birds in captivity. It is an offence to:

- Intentionally kill, injure or take any wild bird.
- Intentionally take, damage or destroy the nest of any wild bird whilst it is in use or in the process of being built.
- Intentionally take or destroy an egg of a wild bird. (Campbell 1998).

These offences apply to all wild birds but such an offence committed against a Schedule I bird leads to an increase in the level of fine imposed for conviction from the normal one thousand pounds to five thousand pounds (Bell & McGillivray 2000). Section 2 specifies exemptions for the killing or taking of particular birds including pest species by any authorised person. Section 3 empowers the Secretary of State to make orders designating areas of special protection; Section 4 lists defences to the killing of injured birds and the killing of birds where the action is ‘an incidental result of a lawful operation and could not reasonably have been avoided’. This may include crop protection, disease prevention and public health and safety. Section 16 includes exemptions that apply to those with an appropriate licence.

Protection of animals other than birds

The Naturenet website state that protected animals are listed in Schedule 5 and this includes all bats, reptiles and amphibians (however only bat species, the great crested newt, natterjack toad, sand lizard and

smooth snake receive full protection) but only the rarest mammals, butterflies, fish etc. In addition to the 1981 Act the Conservation (Natural Habitats etc) Regulations 1994 lists European Protected Species that includes the dormouse, the otter and the great crested newt (Bell & McGillivray 2000). Section 9 of the 1981 Act lists the following offences aimed at protecting species listed in Schedule 5:

- To kill, injure or take any protected animal.
- To have in your possession or control any live or dead protected animal.
- To intentionally damage or destroy or obstruct access to any structure or place used by a protected animal for shelter or protection or to intentionally disturb any such animal while it is occupying such a structure or place.

Defences include taking the animal for the purposes of tending and releasing an injured animal, killing the animal where it is seriously disabled and where the defendants act was the incidental result of a lawful operation and could not have reasonably been avoided; this last point may be quite important, (see section 7). Further protection is given under the Wild Mammals Protection Act 1996 (Campbell 1998).

4.3 Habitat Protection

The main domestic protective designations for areas of habitat are NNR's and SSSI's. This special statutory protection is required due to the inadequacies of the common law in relation to habitat protection that essentially allows a landowner to do as he wishes upon his own land as stated by Thornton & Beckwith (1997).

4.3.1 Sites of Special Scientific Interest

Thornton & Beckwith (1997) consider that prior to the 1981 Act the provisions relating to SSSI's were seen as rather weak and the NNR regarded as the 'first choice' option. The 1981 Act however extended provisions related to the management of SSSI's and the duties of owners and occupiers that focused SSSI's as the primary means of habitat protection. Bell & McGillivray (2000) make the significant point that the structure of habitat protection does not rest on compulsory controls that were felt would simply anger and antagonise landowners. Rather the favoured policy is one of the management agreement, the NCC seeks agreement with landowners as to the site's protection with compensation payable for incurred losses. English Nature (2002a) state that as of 31 March 2001 there were 2502 management agreements in force with around £7.5 milllion paid in compensation. SSSI's are a representative sample of British habitats established with the aim of maintaining biodiversity. The best examples of various habitat types (including natural, semi natural and man made) are chosen on the basis of naturalness and diversity along with sites catering for individual or endangered habitat type and species. SSSI's may be geographical or biological in nature.

By the end of 2001 there were 4115 designated SSSI's covering 1 097 766 hectares ranging in size from sites of 10 000 hectares down to those of less than an acre (English Nature 2002a). Under the 1981 Act where the appropriate conservation body is of the opinion that an area ought to be designated as an SSSI by reason of its flora, fauna, biological or geographical interest the body is under a duty to issues notification to the landowner specifying the features of special interest and also any operations, commonly ploughing, animal grazing and fertiliser application that is likely to damage the features of special interest. Under section 28(1) of the WCA 1981 the conservation body must notify these facts to the local planning authority, the owner and occupier of the land and the Secretary of State.

Persons notified are given a minimum period of three months to make objections or representations that the conservation authority has a duty to consider and then use its discretion in deciding whether to confirm or modify a notification (Section 28(4A). The conservation body then has a period of nine months in which to confirm the notification (with or without modification) from the date on which notification was served on the Secretary of State. Under Section 28(6b) if confirmation is not made within the nine months period the notification lapses.

The 1981 Act (Section 28E) makes it a criminal offence for the owners or occupiers of land affected by a notification from carrying out, causing or permitting those operations that the conservation body considers to be potentially damaging and that are listed in the notification without reasonable excuse. The implications of this in the context of a SUDS scheme are quite obvious; maintenance work and the removal of highly polluted sediments that are required to maintain and maximise the efficiency of runoff drainage and pollutant removal would potentially damage endangered wildlife inhabiting a SUDS basin. Bell & McGillivray (2000) make the valid and relevant point that although building and agricultural operations are covered by the notification as potentially damaging, actually doing nothing to preserve the site is not and neglect, in the case of SUDS basins allowing silt, heavily contaminated with pollutants to build up so as to prove toxic to wildlife, is just as likely to have adverse impacts on the conservation of rare species or areas of biological interest as would wilful damage.

4.3.2 Duty on Owners and Occupiers

The appropriate nature conservancy body must be notified before any potentially damaging operation can be carried out. Subsequently the operation can be carried out four months after serving the notice or earlier if the NCC give their written permission. Therefore the actual protective effect of an SSSI designation is to impose a four-month ban on damaging operations upon the site in question. In the original legislation only the owner or occupier could be prosecuted for carrying out an operation within the four-month period (Bell & McGillivray 2000). This was reflected in *Southern Water Authority v Nature Conservancy Council* [1992] 1 WLR 775 where SWA carried out drainage works whilst on an SSSI even though they knew the works constituted damaging operations. The House of Lords ruled that an occupier is someone that has

'some form of stable relationship with the land' and thus SWA had committed no offence (Bell & McGillivray 2000). However this loophole has been closed by the Countryside and Rights of Way Act 2000 Part III. The CRoW addresses the shortcomings of the 1981 Act and contains the offence for 'any person intentionally or recklessly' to damage the special interest of an SSSI or its fauna or flora. Under Paragraph 3, Schedule 9 of the 2000 Act also enables the courts to order restoration of an SSSI as far as is practicable so as to meet Government targets to bring 95% of all SSSI's into favourable condition by 2010 (English Nature 2002b).

The ineffectiveness of the management agreement is reflected in a survey carried out in 1990 of one third of the nations SSSI's that showed forty percent of SSSI's were damaged with twenty-one percent under threat. Walton (2000) cites a 1990 survey that showed 40% of SSSI's damaged; Bell & McGillivray quote a National Audit Office survey in 1994 that showed over a fifth of SSSI's suffered damage and an English Nature survey showed 8 incidents resulting in the total or partial loss of the site's notified features and a further sixty-two damaging activities over fifty sites in 1998/9. English Nature state that 30% of SSSI's require a change in management to bring them back into 'favourable' condition (English Nature 2002c). Walton (2000) in reporting upon the failings of SSSI's states that management agreements do not provide any positive management of a site and 'that it is difficult to show from available data any clear conservation benefits'. There is also reluctance to compulsory purchase sites and a failure to detect damage leading to an inability to successfully prosecute for damage.

4.3.3 Nature Conservation Orders

If a site is deemed to be sufficiently important enough a Nature Conservation Order (NCO) can be made under Section 29 of the WCA 1981. As with SSSI's the order must list potentially damaging operations of which the relevant NCC must be notified before being carried out and a three-month ban on these activities is then imposed. By offering a management agreement this may be extended to twelve months during which time the conservation body may conclude a long-term management agreement or decide to compulsory purchase the site. An NCO is designated by the Secretary of State for the Environment when he is of the opinion that the land is vital for the continued survival of a particular plant or animal species, to conserve geological or physiological features or so as to fulfil an international obligation. The order has immediate effect and must be notification must be made to owners, occupiers and the planning authority. Twenty-eight days are allowed for objections to be made and if these objections are not withdrawn a public enquiry is held after which the Secretary of State may confirm, amend or revoke the order.

4.4 The Protection of great crested newts

In attempting to produce a legislative framework by which SUDS ponds can be exempted from SSSI designation and species-specific statutes, the example of a great crested newt colony inhabiting a SUDS pool and the duties and obligations this would impose on the operator will be of prime consideration in this

document. It is therefore appropriate to consider the protection afforded to great crested newts by the law. The definitive text on newt protection is the English Nature document '*Great crested newt mitigation guidelines*' (August 2001) from which this section is taken. The great crested newt has suffered a major decline in Britain over the last one hundred years. With the advent of agricultural intensification many ponds have been destroyed or left unmanaged and surrounding habitats damaged. Unmanaged ponds can become silted up (note the potential for a SUDS pool to become quickly silted as discussed in section 3.4) and over-shaded, leading to reduced viability as breeding sites. Development, in the form of residential, industrial and commercial buildings has also destroyed ponds and their associated terrestrial habitats.

Under the Wildlife and Countryside Act 1981 it is an offence to:

- Intentionally kill, injure or take a great crested newt.
- Possess or control any live or dead specimen or anything derived from a great crested newt.
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a great crested newt.
- Intentionally or recklessly disturb a great crested newt while it is occupying a structure or place that it uses for that purpose.

In view of its status across Europe, the great crested newt has been listed on Annex IV of the EC 'Habitats and Species Directive'. The domestic legislation which implements this directive, combined with other UK law, ensures that individual newts and their habitats are protected, and this has important implications for those who own or manage land where great crested newts occur. Regulation 39 makes it an offence to:

- Deliberately capture or kill a great crested newt [Regulation 39(1)(a)]
- Deliberately disturb a great crested newt [Regulation 39(1)(b)]
- Deliberately take or destroy the eggs of a great crested newt [Regulation 39(1)(c)]
- Damage or destroy a breeding site or resting place of a great crested newt [Regulation 39(1)(d)]

The legislation applies to all life stages of great crested newts. This clearly presents a problem to a SUDS scheme where maintenance work could potentially breach Regulation 39 (1) a-d above.

A licensing scheme permits otherwise unlawful activities for scientific, conservational and educational purposes where it is in the 'overriding public interest' and has 'beneficial consequences of primary importance for the environment' (Regulation 44 (2e)) but only where there is 'no other satisfactory alternative' (Regulation 44 (3a)) and 'the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range' (Regulation 44(3b)) 'Favourable' status is determined by population dynamics and habitat availability. In order to

obtain a licence to permit the capture of newts, or the destruction of breeding sites in advance of a legitimate development it has to be clearly demonstrated that the damage will be mitigated. English Nature advises that there should be no net loss in local great crested newt status. Therefore when it is unavoidable that a development will affect a great crested newt population, the mitigation should aim to maintain a population of equivalent status on or near the original site, and should address links to adjacent (indirectly affected) populations where present. Further consideration to great crested newts will be made in the concluding section of this document.

4.5 Conclusions

The great crested newt, a potential SUDS inhabitant, is especially well protected at both domestic and European law and essential work on a SUDS pond may easily contravene both SSSI legislation that forbids 'potentially damaging operations' as stated in the designation and also species specific statutes related to the great crested newt discussed in section 4.4. However SSSI designation does not appear to pose the threat to SUDS operations it initially seemed to. Under the designation procedure English Nature actually have discretion in deciding whether to designate a site as an SSSI; therefore notification does not necessarily equate to designation. Secondly the management agreement could actually be used in order to manage the SUDS system and maintain its efficiency with compensation payable for restricted activities. Wildlife law appears to be the principle threat to the successful operation of a SUDS scheme with domestic and European legislation protecting species particularly rigorously and almost certainly making the routine maintenance of a SUDS pool a criminal offence by way of killing, disturbing or damaging a resting place of a great crested newt (see above).

As stated by English Nature in '*Great crested newt mitigation guidelines*' (2001), unmanaged, heavily silted ponds have little value as breeding sites; given the sediment and pollution loads received by an urban SUDS pool from runoff it would seem to be in the conservational interests of the species and in the interests of the efficient operation of the SUDS scheme that SUDS pools should be immune from SSSI designation and the related maintenance activities exempted from species statutes.

The management agreement is a widely used method by which to protect wildlife and habitat not only in the UK but also across the world (see section 5). The management agreement is one way that a SUDS scheme could be successfully operated without the site being designated as a SSSI and being exempted from species-specific wildlife statutes. By entering into an agreement with English Nature the site could be managed in accordance with the agreement and possibly incorporating English Natures 'Wildlife Enhancement Scheme' so as to increase the biodiversity value of SUDS ponds by implementing the measures recommended in section 3.5.1. However the management agreement option is undermined by the failure to protect current SSSI's with an estimated 30% requiring management change to return them to 'favourable' condition.

5 Wildlife Protection in other Common Law Countries

5.1 America

The US boasts the most extensive and powerful set of wildlife conservation and protection laws of any nation in the World. O'Connell (2000) states that the basic fundamental approach to conservation law in the US is the concept that biological diversity belongs to the general public therefore federal law protects this for the benefit of the American people.

The principle source of endangered wildlife and habitat protection in America is the Endangered Species Act 1973 that is principally administered by the US Fish and Wildlife Service. The 1973 Act sets out its purposes as 'to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved. Section 4(3B) of the Act states that The Secretary of Commerce must make determinations solely 'on the basis of the best scientific and commercial data available to him'. In considering which species may require protection under the 1973 Act the Secretary of Commerce must consider those species that require protection from unrestricted commerce by any foreign nation, or in accordance with any international obligations. Under the ESA, certain species of plants and animals are listed as either 'endangered' or 'threatened' according to assessments of the risk of their extinction.
The ESA 1973 also protects areas of habitat essential to the survival of such species and under the Act are termed areas of 'critical habitat'. The term 'critical habitat' for a threatened or endangered species means the specific areas or biological features essential to the conservation of the species that may require special management considerations or protection.

To include a species or area of habitat on the Federal Register a petition must be made to the Secretary of Commerce. The Secretary then has ninety days from the date of receiving the petition to decide if the petition has 'substantial scientific or commercial information indicating that the petitioned action may be warranted' (ESA 1973). If the Secretary decides to list the species he is then under obligation to publish his decision in the register, give notice of the decision to the relevant agency in each US state and foreign nation in which the species is believed to occur as well as giving notice to the scientific community and publishing a summary in a newspaper. Under Section 9, for any species that is listed the Secretary of Commerce is able to issue a series of regulations as deemed to be 'necessary and advisable' to ensure the continued and effective conservation of that species or habitat.

However under Section 10 the Secretary may permit any activity that is forbidden by Section 9 for scientific purposes or to augment the survival of the affected species, including acts that are required for the establishment and protection of experimental populations. The application for a permit must include a habitat conservation plan (HCP) that:

- Specifies the impact which will likely result from such activity.
- What steps the applicant will take to minimize such impacts and the financial provisions that will be available to implement the plan.
- What alternative actions the applicant considered and the reasons why these alternatives are not being utilized.

If these requirements are met and the Secretary is satisfied that the activity will not appreciably reduce the species chances of survival then the permit can be granted. The Secretary is able to attach such terms and conditions to the permit that are seen as being necessary or appropriate, including reporting and record keeping requirements. Habitat conservation plans are popular agreements that landowners develop to manage endangered species on their property and minimise any negative impacts from development. HCPs have proliferated over the last twenty years; while only four HCPs were agreed in the 1980's, 259 HCPs were approved during the 1990's. Today, over 100 threatened or endangered species populations are covered under HCP agreements. HCPs, therefore have in theory the potential to influence the survival and recovery of threatened and endangered species. A habitat conservation plan has the advantages of moving from single-species management to multi-species and habitat management, protecting species that are not listed under the ESA (therefore reducing the likelihood that listing will be needed) and promoting the future conservation of species and habitats through protection and management by engaging landowners and local authorities in positive conservation planning.

However HCP's appear to suffer from the same basic problems as SSSI management agreements in the UK that were identified in section 4.4.2. Large areas of habitat have been lost for endangered species under habitat conservation plans. The 'No Surprises Rule' effectively excuses landowners from having to increase their financial input into the plan if the habitat or species in question suffers any adverse affects and essentially prevents the improvement of HCPs and thus avoiding species decline.

The inclusion of a habitat conservation plan in an application is of great relevance to the SUDS proposal and a potentially useful tool in protecting the biodiversity value of such habitat. By including an HCP in an application for immunity against SSSI designation the SUDS operator could specify how impacts of the operation would be minimized and promote the future conservation of rare species (and their habitat) occupying a SUDS pool. The penalties for violation of the ESA are severe. A criminal prosecution for violation of any of the Acts provisions or a permit carries a maximum fifty thousand dollar fine or a year's imprisonment.

5.2 Australia

The principle source of wildlife and habitat protection in Australia is the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. The EPBC states that its objective is to 'protect native

species (and in particular prevent the extinction, and promote the recovery, of threatened species) … protect ecosystems by means that include the establishment and management of reserves and … identify processes that threaten all levels of biodiversity and implement plans to address these processes' (Section 3, EPBC 1999).

The basic form of protection offered by the EPBC 1999 is that a person must not take any action (defined as 'a project, development, undertaking or activity) that is likely to have a significant impact upon a matter of national environmental significance, listed under Chapter 2 Part 3 of the Act as World Heritage properties, internationally important RAMSAR wetlands, listed threatened species and communities, listed migratory species, nuclear actions and the marine environment (Commonwealth marine areas).

The EPBC protects habitat, communities and species in a manner similar to that in other Common law countries. Under Section 178 the Australian Minister for the Environment and Heritage must establish a list of threatened species divided into the following categories: (i) extinct (ii) extinct in the wild (iii) critically endangered (iv) endangered (v) vulnerable and (vi) conservation dependent. Likewise ecological communities are classified into three categories; critically endangered, endangered and vulnerable. Under Section 207A the Minister must keep a register in which habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community that is termed 'critical habitat'. (Environment Australia 2002).

Under Section 183 the Minister must establish a list of potentially damaging processes that are regarded as 'key threatening processes'. Environment Australia define a process that can be listed as a key threatening process as one that could potentially 'cause a native species or ecological community to become eligible for adding to a threatened list (other than conservation dependent), or cause an already listed threatened species or threatened ecological community to become more endangered, or if it adversely affects two or more listed threatened species or threatened ecological communities'.

As with the American ESA the EPBC 1999 makes exemptions of the prohibited activities listed in the Act if the activity has prior approval. This approval may take the form of a permit system, an activity carried out under a species 'recovery plan' or under an accredited management plan. The approval must be made in writing to the person taking the action specifying the action that is to be taken, the time period for which it is effective and any conditions that are attached. Such conditions may include the repair or mitigation of damage caused by the action, the payment of a deposit to guarantee compliance with the conditions, conditions requiring a periodic environmental audit or environmental monitoring programme and the preparation and approval of a management plan to manage the impacts caused and to conserve the habitat of species and ecological communities; conditions that are of interest to the SUDS proposal by which impacts could be monitored and species protected. The Minister has the power to modify, introduce or delete conditions and to suspend or revoke the approval.

Under a permit scheme certain actions are not considered as offences. However under Section 201 the Minister may not issue a permit unless the specified action will contribute significantly to the conservation of the listed threatened species or community and the action will not adversely affect the survival of that species or community and the holder of the permit must minimise the impact of the action. The Minister is able to impose such conditions as believed appropriate including the time period in which the action may be undertaken and has the power to vary, revoke or impose new conditions. Under an accredited management plan, a class of actions, as declared by the Minister in writing do not require approval. The Minister may only make such a declaration providing that there has been an assessment of the impacts of the actions covered by the plan and that the actions will not have unacceptable or unsustainable impacts (Section 33). Furthermore the Minister may only make a declaration if the plan will promote the survival and/or enhance the conservation status of each species or community. The Minister may revoke a declaration in writing and must publish a declaration or revocation.

The permit scheme features in both American and Australian legislation and appears to be a promising means by which a SUDS pond could be exempted from SSSI designation and species-specific wildlife statutes. Under the American ESA 1973 the actions that the permit allows must not appreciably reduce the species chances of survival, whilst under the Australian legislation the action must contribute to the conservation of the species. Both sets of legislation require a management plan by which negative impacts are mitigated, the HCP in America and indeed English Natures 'Wildlife Enhancement Scheme' offer great scope in which species and habitat could be positively managed and protected and increased biodiversity encouraged and realistically achieved whilst still allowing the efficient operation and management of a sustainable drainage system. The accredited management plan has similar such potential although the greater protection offered by a permit scheme, accompanied by a conservation management plan and a stringent set of conditions appears to be a better option. Permits, licensing schemes and attached conditions are considered in more detail in section 6 below.

6 Planning and Licensing

Introduction

During the next two sections planning consents and licensing schemes will be examined in depth so as to provide a framework by which a proposed scheme might be designed so as to prevent the designation of SUDS as SSSI's and prevent or mitigate against the triggering of species specific wildlife statutes but to still offer a large degree of protection to the habitat or species in question. All relevant aspects of planning and licensing will be considered including application, notice periods, advertising, the lodging of objections, environmental protection, attached conditions, revocation and compensation issues.

This section will focus on licences, permits and consents in relation to the protection of the countryside and pollution prevention and then the following section will focus solely on planning permission.

Protection of the Countryside and Buildings

6.1 Tree Preservation Orders (TPO's).

Trees receive limited protection under town planning rules. Specific protection measures are found in the Town and Country Planning Act 1990. Planning permission is not required for the removal of trees but the TCPA imposes a duty on local planning authorities to make provision (conditions that certain trees should be retained or replaced) when planning permission is granted (Bell & McGillivray 2000). A TPO is a means by which trees or woodland may be protected against lopping, topping, felling, uprooting, wilful damage and destruction. Since trees are protected in the interests of amenity it would seem conservation is not a consideration (Campbell 1998). Local planning authorities have responsibilities for making TPO's and the authority that makes the order is then the relevant authority for consent and enforcement. Under the Town and Country Planning (Trees) Regulations 1999 the relevant authority must produce a draft TPO and owners and occupiers notified as well as the draft being advertised publically. Any objections received within twenty-eight days must be considered before the TPO is confirmed. More extensive publicity requirements are discussed in section 6.3.2. Under Section 288 there is a right to challenge a TPO's validity in the High Court but no right of appeal.

The TPO permits work i.e. felling, lopping etc where required to implement a planning permission and also where the tree is dead, dying or potentially dangerous. This would seem to be relevant to any proposed legislation to a SUDS pond; under any legislation certain permitted works would be required towards the maintenance and efficient operation of the pool as discussed previously in section 3.4, therefore such a proposal would include for instance silt removal, that although would be potentially damaging to newts would be permitted under the scheme. The protection offered by a TPO is not absolute and a person that wishes to uproot, fell, lop or top a tree is able to apply to the relevant planning authority to do so. The consent may be refused or granted with or without conditions (for example the planting of replacement trees may be required). Consents do not require publicity but the notification of neighbours and notices at the site itself are encouraged. There is an appeal to the Secretary of State for the Environment to a refusal of consent.

Contravention of a TPO is a criminal offence. The maximum fine for a summary conviction is a £20 000 fine and on idictment there is an unlimited fine. Such a fine would seem to be a suitable deterrent to a SUDS operator from breaching or contravening any legislation or agreement. If a protected tree is removed, uprooted or destroyed the owner of the land is under a duty to replace the tree with another deemed to be of an appropriate size and species. If the landowner fails to comply the planning authority can serve a notice of compliance after which the planning authority is able to enter the land and plant the replacement tree and recover the cost of the operation from the landowner. An appeal against such notices is available to the

Secretary of State. This type of notice is suited to a SUDS scheme by which a conservation body (i.e. English Nature) could enter such land and prevent further damaging operations and possibly remedy any damage caused by a negligent SUDS operator.

Trees in Conservation Areas

Trees in conservation areas benefit from protection similar to that of a TPO but are more limited than TPO's. The most important difference is that prohibited acts are permitted after the notification period of intention to do so of six weeks has expired. This six week period is designed to give the planning authority prior notification of potentially damaging work so as it has time to consider whether or not to impose a TPO. It is an offence to begin the operations without notifying the planning authority and within the six-week period. Exemptions include:

- Where the work is required to comply with a statutory obligation.
- Where work is required for Forestry Commission operations
- Where felling is in accordance to a felling licence (See below)
- Felling is by a planning authority on their land.
- Where the tree(s) in question have a diameter of less than seventy-five millimetres or less than one hundred millimetres where work is necessary to improve the growth of other trees.
  (Campbell 1998)

There are some important points covered in the protection of trees that may be included in the proposed legislation. Firstly under a TPO certain works are permitted as discussed above, either to implement a planning permission or by consent; secondly there is the issue of contravention of the TPO, wildlife protection is obviously a main concern in any legislation and breach of any agreement would be a serious matter with a heavy fine appearing to be a suitable deterrent. Thirdly there is the notice of compliance by which a planning authority can enter private property and remedy any damage caused.

Tree Felling Licences

The Forestry Act 1967 prohibits the felling of any tree in excess of eight centimetres in diameter 1.3 metres from the ground except those in gardens, churchyards, public open spaces or fruit trees. The requirement for a licence does not apply to dead or dangerous trees as stated by Garner and Jones 1997 or those affected by Dutch Elm disease. Further exemptions include felling trees to implement a planning order, to fulfil a statutory obligation, for the purposes of tree surgery and to a landowner who fells less than five cubic metres of timber and sells less than two cubic meters in any calendar quarter. Where a TPO is in force for a tree for which a felling licence is sought the application goes to the forestry commission which may refer the matter to the local planning authority in which case the TPO applies, it may refuse the licence in which case compensation is payable or it can grant the licence (Bell & McGillivray 2000). The Forestry Act empowers the Forestry Commission to attach certain conditions to a felling licence, most significantly is

the condition that the felled area is restocked with appropriate species of trees (Forestry Commission 1997). The attaching of conditions to a licence is of great interest to the SUDS legislation proposal. Such conditions will be considered in more detail in the conclusion but may include such factors as permitted operations, a conservation/site management programme data recording etc. Conditions are covered in more detail in the subsequent section.

Protection of Hedgerows

The Hedgerows Regulations 1997 is designed to protect important hedgerows and hedgerows in general because of the massive loss of hedgerows through intensive agriculture since 1945. The Hedgerow Regulations generally apply to hedgerows growing in or adjacent to common land, protected land or land used for forestry or agriculture and that are more than twenty metres long or those that meet another hedgerow at each end. Hedgerows are not afforded the same protection as trees and the protection is basic. Those hedgerows that are considered unimportant (less than thirty years old) may be removed if the owner notifies the local planning authority and provides evidence that the hedge is less than thirty years old and good reason for its removal. The planning authority has forty-two days in which to serve a retention notice after which the hedgerow may be removed or earlier if the planning authority issues written notification allowing its removal (Garbutt 2000a).

A planning authority may only issue a retention notice for an important hedgerow. Whilst there is a strong presumption that important hedgerows will be protected their removal may still be permitted if the planning authority feels that the circumstances justifies its removal. A hedgerow is considered important if it is greater than thirty years old and if it complies with the criteria of Part II of Schedule I that relates to archaeology, history, wildlife and landscape. The range of hedgerows that are important is relatively narrow. Where a retention notice is served the planning authority must specify which of these criteria apply. When removal is permitted the permission is only effective for two years. Such a time limit may be imposed in the proposed SUDS legislation by which a basin or pond is immune from SSSI designation for a set period before which the operator is required to reapply or the site reassessed for continued immunity. Hedgerows may be removed without planning permission where creating access or for planning permission purposes. The application procedure need not be followed in the case of proper management in the interests of the hedge i.e. laying, coppicing etc. (Bell & McGillivray 2000). As with TPO's mentioned above certain works are permitted; a hedgerow can be removed where the planning authority feels it is justified or in accordance with a planning permission or under the management of the hedgerow. Such permitted works are important in the SUDS context; maintenance operations or those that are in the management interests of the basin or pond would be allowed under the legislation without prosecution of the owner/operator.

6.2 Listed Building Protection

The preservation of buildings that are considered to be of special archaeological or historical interest has for many years been regarded as of the utmost importance in town and country planning. Garner & Jones (1997) consider that the attractiveness of the countryside is enhanced by the individual buildings found within it.

The basis for listed building protection is found in Section 1 of The Listed Buildings and Conservation) Planning Act 1990. Under Section 1 the listing of buildings of special architectural or historical interest is the responsibility of the Secretary of State for National Heritage. The Secretary of State may compile lists of such buildings or approve lists compiled by the Historic Buildings and Monuments Commission (Campbell 2001). Duxbury (1996) states that these lists may include buildings with aesthetic qualities, those buildings associated with well-known persons or events and also those that are demonstrative of a particular era in architecture or of specific architects. When considering whether to list a building the Secretary of State must take into account any respect that contributes to historical or architectural interest of a group of buildings of which it is part or of any feature or structure fixed to the building.

The Secretary of State's decision is final and there is no statutory right of appeal although an appeal can be made if it is felt that the Secretary of State has acted unreasonably and that the building should not have been included on the list in the first instance as stated by Ross (1991). In practice listed buildings are classified as Grade I, Grade II* or Grade II. Grade I buildings of outstanding or exceptional interest such as cathedrals and stately homes and very good examples of building types that are uncommon (Ross 1991). Campbell (2001) states that there are some 9000 Grade I buildings forming approximately two percent of the total. Grade II* are buildings of more than special interest but are not considered outstanding. Country houses and churches are in this category of some nineteen thousand buildings. Grade II buildings represent ninety-four percent of the countries listed buildings and are considered to be buildings of special interest which warrant efforts to preserve them (Duxbury 1999).

If the Secretary of State confirms the listing he must notify the local planning authority that must then give notice to the owners and occupiers. Subject to certain exemptions and in a similar style to SSSI protection it is a criminal offence for the building to be demolished, altered or extended in a manner that would affect its character or its special features of interest. Where a building is threatened with demolition that the local planning authority consider should be listed the authority can serve a building preservation order that gives six months for the authority to consider and list the building and during this time no works can be executed. If after this period the building is not listed then compensation in respect of incurred losses is payable (Garner & Jones 1997).

Certificates of Immunity

The secrecy surrounding listing and late listing of buildings have caused problems for developers and purchasers of buildings. Section 6 of the 1990 Act provides that where a planning permission has been granted or is being sought for development involving the demolition or alteration of a building an application may be made to the Secretary of State for a certificate of immunity from listing in respect of the building in question. If the certificate is granted the Secretary of State is prevented from listing the building within the next five years. This excellent example of immunity is most promising in the SUDS legislation context; a SUDS operator could apply to the Secretary of State upon commencing a SUDS scheme and be granted a certificate of immunity exempting English Nature from designating the site as an SSSI for a set period possibly with certain conditions attached relating to conservation or wildlife enhancement.

Listed Building Consent.

Under Section 9 of the 1990 Act it is an offence to execute any works for the demolition or alteration of a listed building without first obtaining consent. Applications for listed building consent should be made to the local planning authority and must include all relevant particulars, plans and diagrams to describe the works (Campbell 2001).

When an application for consent is received local planning authorities are under an obligation to place an advertisement in local newspapers and on or near the site for not less than seven days and must indicate the nature of the works and stating where the plans can be inspected. The authority must take into account any representations received within twenty-one days from the first display of the advertisements.

Duxbury (1996) reports that in the case of demolition, the planning authority must notify certain national organisations, for example, The Ancient Monuments Society, The Council for British Archaeology and The Society for the Protection of Ancient Buildings. In addition English Heritage must be notified of all applications for consent to alter or demolish any Grade I or Grade II* building outside greater London or any listed building inside Greater London (Ross 1991). Failure to comply with these requirements may lead to the consent being quashed.

In considering whether to grant consent the local planning authority must take into account the preservation of the building but this is not the only consideration. The economical considerations are also of importance i.e. keeping the building in active use. If the local planning authority proposes to grant consent they must notify the Secretary of State and he has twenty-eight days to ‘call in’ the application and consider it personally. If the Secretary of State does not call it in the local planning authority may grant consent with or without conditions attached or refuse consent. Such conditions may include the preservation of particular features, the making good of any damage caused by the works or the reconstruction of any part of the building using original materials (Duxbury 1999).

Revocation and Appeal

Applicants have a right of appeal to the Secretary of State within six months of the decision if their application for consent is refused or if conditions are imposed. Local planning authorities have the power to revoke consents subject to a compensation payment in respect of expenditure, loss or damage directly attributable to the revocation. Compensation issues are covered in more detail in section 6.4 on water abstraction licences. Exemptions to consent include ecclesiastical buildings and scheduled ancient monuments.

Pollution Prevention and Water Abstraction

6.3 Pollution Prevention and Control

Introduction

Legislative control over waste can be traced back to the Public Health Acts of the late nineteenth century but these were not used as preventative measures rather as solving existing problems (Bell & McGillivray 2000). It was not until modern planning legislation came into force that preventative measures were proposed. This basis continues today as some form of planning permission is required before an application can be made for a waste management licence but is considered an inherent weakness because the planning system is ill-equipped to deal with the technicalities of waste management. The first legislative control over hazardous waste was in 1972 with the Deposit of Poisonous Wastes Act that was quickly followed and supplemented by the Control of Pollution Act (COPA) 1974. It was evident that the scope of this act was too narrow and the major defects were identified as a lack of national policy on how the provisions of the Act were to be applied, no strategic plans for waste disposal and too much focus centred on waste disposal rather than waste management. The Environmental Protection Act 1990 addressed some of these problems by shifting the emphasis to management in a ‘cradle to grave’ approach. However the EPA 1990 has never been fully implemented.

The Pollution Prevention and Control (England) Regulations 2000 implement the EC Directive 96/61/EC on Integrated Pollution Prevention and Control as part of the Pollution Prevention and Control Act 1999.

PPCA 1999 controls installations rather than processes with regard to pollution. The 2000 regulations define three types of installation:

- Part A (1) installations are the responsibility of the Environment Agency and are considered as having significant pollution potential.
- Part A (2) installations and mobile plant are the responsibility of the local planning authority where the installation or plant is situated and are not considered to have the same pollution potential as the above.

- Part B installations are subject to the 1999 Act with the purpose of reducing or preventing pollution.

(Garbutt 2000b)

Permit to Operate

An application must be made to the appropriate regulator and advertised by the applicant in the *London Gazette* (in the case of Part A facilities) and in local newspapers. The regulator has a responsibility to ensure that the applicant is the person that will have control over the installation and that they are a 'fit and proper' person (see below) to carry out the activity. The regulator when deciding to issue a permit attaches a series of conditions to that permit. These may include that appropriate measures are taken to prevent pollution; that waste production is avoided, recovered or disposed of to reduce the impact on the environment; that energy is used efficiently; that precautions are taken to prevent accidents and that when operations upon the site cease, effective measures are taken to restore the site to a satisfactory state. Through Regulation 12 of the 2000 Regulations the regulator must impose conditions suitable to the site and to ensure a high level of protection to the environment. A review of conditions may be carried out when significant pollution is emitted or new technologies allow tighter emissions controls. Such conditions, as mentioned earlier, are of particular relevance to the proposed SUDS legislation; conditions could be used to ensure a high level of protection for wildlife occupying a SUDS basin yet allow the operator to continue efficient use of the pond. A review of conditions may also prove to be useful; for example a change in the status of the great crested newt (i.e. if it became critically endangered) or increased scientific knowledge about the species physiology or lifecycle may require even stricter controls on the operations permitted under the legislation. This is discussed in further detail in section 7.

Revocation, Suspension and Appeal

Permits may be revoked wholly or in part by the regulator. The regulator must state the date this comes into effect (not less than twenty-eight days from the date of notification) and the operator may be required to take the necessary steps to avoid pollution risk and return the site to a satisfactory condition. The regulator also has the power to issue a suspension notice (of possible use in the SUDS legislation to protect the species or habitat from damage caused by breach of agreement) where there is a risk of damage to the environment or where the operator has ceased to be a fit and proper person. The notice must state the regulators opinion with regard to imminent risks and the required steps to resolve the problem. Under Section 43 of the EPA 1990 appeals may be made in respect of rejection of application, conditions that are imposed, suspension and revocation.

6.3.1 Waste on Land

Section 30 (1) of the Control of Pollution Act 1974 defines waste as 'any substance which constitutes a scrap material or an effluent or other unwanted surplus substance'. Controlled waste is split into three

categories; household consisting of waste from a private residence; industrial waste from factories and commercial waste consisting of waste from trade or business or from sport, recreation and entertainment.

A person may not deposit controlled waste or permit disposal on any land or use any plant or equipment to do so. A licence authorises the disposal in accordance with the conditions attached to it. The EPA 1990 replaced large parts of the COPA 1974 including the tightening up of licensing (Garbutt 2000a).

Licences

An application for a licence may be made to the EA by the occupier or operator of land. The application must be in writing accompanied by planning permission or a certificate of purpose (under TCPA 1990). The EA is required to grant the application with two exceptions:

1. Where the applicant is not a 'fit and proper' person, for example where the applicant or another relevant person (employee) has been convicted of a relevant offence or where the activities are not managed by a technically competent person, or where the person is not able to make financial provision sufficient to discharge the obligations arising from the licence. The EA has the power to overlook previous convictions but not in relation to technical and financial capability.
2. Where the rejection is necessary to prevent detrimental effects to the environment, human health or local amenities. This does not apply where planning permission is already granted.

The EA have four months to reach a decision and may consult local planning authorities or the Health and Safety Executive. The use of a 'fit and proper person' is of possible use in the SUDS proposal. The question is should the activities allowed under the proposal be supervised by a 'fit and proper' person with technical competence in both SUDS operations and in wildlife conservation so as to fulfil any conditions relating to wildlife protection and still adequately manage a SUDS scheme? The advantages of this seem obvious but it must be accepted that there is great potential for conflict of interests.

Conditions

The Environment Agency may grant a licence with appropriate terms attached. Conditions relate to activities the licence authorises and necessary precautions. Conditions may require the applicant to undertake an environmental monitoring programme and owners and occupiers of adjacent land that is required to host these mechanisms (i.e. boreholes) are entitled to compensation (Garbutt 2000a).

Revocation

The EA may revoke the licence where the holder is convicted of a relevant offence and ceases to be a fit and proper person or ceases to be a technically competent person, where a continuation of licensed

activities may cause harm to the environment and cannot be avoided by variation or modification of the licence. The EA may bind the licence holder to continue to prevent pollution that may be caused by previous activities by the licence holder. The EA may also suspend the licence and require the holder to take the necessary measures to avoid pollution or harm. A notice period is required in both cases (Garbutt 2000a).

6.3.2 Consents for Discharges to Water

Consent is required from the Environment Agency for:

- A discharge of effluent into 'controlled' waters (coastal, inland and groundwaters)
- A discharge of effluent through a pipe from land to sea outside the limits of 'controlled' waters
- A discharge where a prohibition is in force (Bell & McGillivray 2000)

When receiving an application the EA must publish a notice of application in a newspaper at least once in each of two successive weeks that circulates in the locality of the proposed discharge and in the vicinity of any waters that the Environment Agency considers may be affected by the discharge. The notice of application must also be published in the *London Gazette* and any relevant local authorities or water companies must be informed (Thorton & Beckwith 1997). The importance of advertising an application should not be underestimated and would be included in any SUDS legislation. Consent is required for each discharge therefore an applicant with three discharge pipes is required to apply for three separate consents.

The EA must consider representations and objections within six weeks from the time of the publication of the notice in the *London Gazette*. Again this is of great importance to the proposal on SUDS so as objections could be raised (by for example English Nature) and would be included in the legislation. The EA may decide to grant the consent unconditionally or subject to conditions and if after a period of four months the applicant has not heard from the EA they may consider that the application has been refused. The Environment Agency is obliged to notify those who made objections of their decision. There is no requirement that the applicant be a 'fit and proper' person or with technical knowledge (Thornton & Beckwith 1997).

Conditions

The Environment Agency has the power to grant such conditions as it sees fit. The most significant conditions relate to biological oxygen demand (BOD), toxicity and suspended solids. Other conditions that may be included relate to temperature, volume and rate of discharge, the quality and composition, times that discharge may or may not be made and the provision of meters, adequate monitoring and relevant record keeping that is made available to the Environment Agency as required (Bell & McGillivray 2000).

Revocation and Modification

Of great significance to the SUDS proposal is the fact that the Environment Agency is under an obligation to review the consent and conditions that are attached periodically. During this review the EA may revoke the consent or modify the conditions. Consent is exempt from revocation or modification for a minimum of four years from the date it was granted but may be longer dependent on the conditions (this is possibly a useful inclusion in the SUDS context in order to give the operator some modicum of protection from revocation for a set period). However the Secretary of State has the power to direct the EA to revoke or modify consent in order to comply with European or International obligations or for the protection of public health, flora or fauna. Compensation is payable to persons that suffer incurred losses as a result of this and if the direction is made within the agreed exemption period (Thornton & Beckwith 1997).

Appeal

A right of appeal is available to the Secretary of State where the Environment Agency refuses consent or revokes or modifies conditions.

6.4 Water Abstraction Licences

Water abstraction is controlled by the Environment Agency. The present system for authorising abstractions originated in the Water Resources Act 1963. This Act laid the foundations for modern water resources management and superseded the previous system which involved riparian (i.e. river bank) rights for surface water, general freedom to abstract groundwater with selective licensing in some areas, and intervention by Parliament to alter these rights where it considered this necessary.

The 1963 Act came into force in 1965 and made provision for the granting of licences of right in situations where abstractors were already entitled to abstract under a statutory provision or where they had abstracted from a source of supply during the previous five years. In total some 48,000 licences of right were granted to abstract at a total rate of approximately 100,000 Ml/d. The number of licences of right reduced drastically when abstraction charging was introduced in 1969 but around two-thirds of the current 48,000 licences are licences of right. There have been a number of modifications to the 1963 Act but these legislative changes have not essentially altered the structure of the original Act. The Water Resources Act 1991 consolidated amendments to the legislation and the Environment Act 1995 incorporated further changes (DEFRA 1998).

Potential abstractors apply to the Agency, identifying the purpose and amount of the proposed abstraction, and where the water is to be used. Sometimes they are required to provide an environmental impact of the abstraction. The Agency has to determine whether to approve the authorisation, on the basis of issues including the resource availability, the likely environmental impact of the abstraction and its effect on other abstractors. The EA has a duty to serve notice on any navigation, harbour, conservancy authority or internal

drainage board with responsibilities at the proposed point of abstraction and any statutory water undertaker in whose area the proposed abstraction is located as well as advertising details of the application in the London Gazette and in a local newspaper on two successive weeks. The Agency has a three-month period in which to determine the application in which time it must assess the likely impacts of the abstraction in consultation with conservation bodies. The agency can attach certain conditions on the licence for example the means of abstraction and method of measurement, the period over which the licence is valid or conditions under which the abstraction must cease. If the Agency refuses to grant a licence, or imposes unacceptable conditions, the applicant may appeal to the Secretary of State against the decision. In addition, if the Agency wishes to vary or revoke a licence against the wishes of the abstractor, the latter can also appeal, and, if unsuccessful, has a right to compensation.

The legal basis on which compensation is paid for the variation or revocation of licences is set out in Section 61 of the Water Resources Act, 1991. Full details of this section are contained in the link to the Water Resources Act (see right), but key points are summarised here. Section 61(1) states that where a licence is revoked or varied on the direction of the Secretary of State the licence holder may be entitled to compensation if he can show that he has:

- Incurred expenditure carrying out work which is abortive as a result of the revocation or variation; or
- Otherwise sustained loss or damage that is directly attributable to the revocation or variation of the licence.

Equivalence is the basic principle of compensation. This aims to ensure that the affected party is provided with an equivalent of their loss, or, is returned, so far as is reasonably possible, to the same position they were in before the compulsory action, in this case the variation or revocation of the licence (May 2001a). This point is quite relevant to a SUDS scheme operating under proposed immunity from SSSI designation and wildlife laws; if at any point the relevant body proposed to revoke the immunity then the SUDS operator may seek compensation for loss attributable to the revocation (i.e. no longer able to efficiently operate a basin) and by returning the operator to the position they were in before the revocation via compensation then the operator would be in a position to replace the basin in a suitable location without incurring any extra costs.

In May 1997, the Deputy Prime Minister announced that the system of abstraction licensing in England and Wales was to be reviewed by the Department of the Environment, Transport and the Regions and the Welsh Office, in consultation with the Environment Agency. The aim of the review is to ensure that abstraction licensing and related arrangements provide full protection to the water environment while allowing fair and flexible measures for meeting the demand for water resources. The future abstraction licence system must be designed so that it can contribute towards sustainable development, protecting and enhancing the aquatic

environment whilst facilitating economic growth and higher living standards (DEFRA 1998). The majority of existing abstraction licences were granted without time limit. That does not mean that they are valid in perpetuity. The legislation provides that licences, unless time-limited, remain in force until revoked. They can be revoked at any time, either at the request of the holder or upon notice from the Environment Agency. The Government's view is that, in principle, all abstraction authorisations should be on a time-limited basis The Government wishes to see conversion to time-limited status achieved by negotiated voluntary means wherever possible. This will require the conversion terms to provide reasonable notice and to take account of the reasonable needs of the licence holder. From October 2001, the Agency is unlikely to issue abstraction licences without a time limit and time limits will be applied to most new abstraction licences (May 2001b) The review also includes compensation issues and despite the publication of *Fundamental Review of the Laws and Procedures Relating to Compulsory Purchase and Compensation* in July 2000 no legislative changes have been made and compensation provisions are still bound by the present statutory requirements discussed above (May 2001a).

6.5 Planning Permission

The development of land must be weighed against the conservation and preservation of such land and the environment for the present and future generations. The principle mechanism by which this is achieved is the planning system. There are four main ways in which a development may be permitted:

1. General Permitted Development Order 1995 (GPDO) A GPDO grants permission for minor development without the requirements for an application. Most GPDO permissions are limited by individual conditions and do not allow developments that include road widening, require Environmental Impact Assessments and are restricted by Regulation 60 of the Nature Conservancy Regulations that ensures development does not have detrimental effects on 'European' sites.
2. Enterprise Zones were introduced in 1980 under the Local Government and Planning Act as a means of generating economic activity in areas of high unemployment The Secretary of Sate may invite a relevant local authority to prepare a scheme and this may then be designated as an enterprise zone. The main incentive to developers is that no further planning permission is required providing that the development is in strict accordance to the agreement.
3. Simplified Planning Zones are similar to the above and are subject to conditions and limitations and remain in force for ten years (Garbutt 2000a).

The fourth method is by planning permission. When it is established that permission for a development is required an application is made to the district council (local planning authority). It is not necessary for the applicant to be the owner and occupier of the land, but the applicant must give twenty-one days notice of the application to the owner (Duxbury 1999). Thornton and Beckwith (1997) state that once an application has been made the planning authority has eight weeks in which to notify the applicant of its decision. On

receipt of the application the authority consult a wide range of authorities including parish councils, the Environment Agency, highways authorities and nature conservancy bodies as well as considering national planning policy (i.e. pollution planning guidance) For certain types of development (waste disposal, quarries, roads) an environmental impact assessment must accompany the application.

The local planning authority is required to publicise all applications. Major developments (covering more than 1 ha, 10 houses or 1000m^2 mineral and waste applications) requires advertisement in local newspapers and either the display of a site notice for a minimum twenty-one days or the notification of adjoining owners and occupiers. Applications that require an environmental impact assessment require a newspaper advertisement and a site notice whilst other applications require only a site notice or neighbour notification (Bell & McGillivray 2000)

Determination

The nature of the consultation process ensures that the local planning authority have a great deal of discretion in determining applications. The Secretary of State has the power to call in any application under the TCPA 1990 but this is generally reserved for highly controversial projects. As stated above the local planning authority has eight weeks to determine an application. The authority must consider the views of those bodies involved in the consultation process and any representations or objections made. The planning authority may refuse permission; grant it unconditionally or with conditions. The decision must be in writing and include reasons for the decision and any conditions that are imposed. The TCPA 1990 allows the authority to attach such conditions as it sees fit (Duxbury 1999).

Conditions

Nearly all planning permissions are subject to conditions on which the application is permitted. Despite the wide discretion of the local planning authority to impose conditions, it is restricted in its power by a set of constraints set down by the courts (Garbutt 2000a) and may be of use in protecting SUDS operators from unreasonable conditions in any legislation. Bell & McGillivray (2000) list these as follows:

- The condition must serve a planning purpose and not for any other reason
- The condition must fairly and reasonably relate to the development
- The condition must not be so unreasonable as to be perverse

Conditions may include limits upon the length of time the permission is valid for, restricting the use of buildings and the achievement of environmental protections and obligations (Thorton & Beckwith 1997).

Under TCPA 1990 any new planning permission is subject to the condition that the development will commence within five years or other period as expressly imposed in the permission.

Revocation and Modification

The power to revoke or modify applies only to those permissions where the development has not been completed. Section 97 of the 1990 Act states that any authority desiring to revoke or modify permission must do so before any authorised change in land use has occurred (Heap 1991). The Secretary of State must be notified and he may call in the order. An existing building or land use may be altered or removed via a discontinuance order where the planning authority considers it desirable for the area. A discontinuance order does not become effective until confirmed by the Secretary of State (Duxbury 1999).

Compensation in Respect of Planning Decisions

Compensation is payable under the TCPA 1990 where planning decisions either prevent or hamper land development or cause loss, damage, or depreciation of the land (Heap 1991). In respect of revocation and modification of permission compensation may be claimed by any person with interests in the land that is able to show that they have incurred expenditure in carrying out work that is then revoked or modified or has otherwise sustained loss or damage that is directly attributable to the revocation or modification. Where a discontinuance order is made the local planning authority is liable to pay compensation to any person who has suffered damage by the depreciation in the value of their interest of the land or a disturbance in the enjoyment of the land (Heap 1991). Any person that carries out work in compliance with the order is also entitled to compensation for their costs. Claims must be made within twelve months in respect of revocation and modification and six months for discontinuance orders (Duxbury 1999)

6.6 Conclusions

In the proposed SUDS legislation the following aspects of licensing and planning law are of great interest:

- Permitted works - (i.e TPO's) Under Tree Preservation Orders certain works are still permitted. This is of relevance because under any legislation the maintenance and efficient operation of a SUDS pool depends upon regular work to remove silt, litter and plant debris and mowing and weed cutting, all of which may be damaging to a newt colony inhabiting the pool.

- Consent/licences/permits – The operation of a SUDS pond under a licence or permit scheme with conditions attached is one of the three most realistic ways in which a SUDS pool could be operated efficiently while being exempt from SSSI designation and wildlife statutes.

- Certificates of immunity – Certificates of immunity as awarded so as to prevent listed building designation for a minimum of five years is the second realistic method by which a SUDS pool could be operated under immunity/exemption.

- Conditions – As has been discussed above the use of attached conditions are extremely important and the primary means by which the relevant regulatory body controls a licensed or permitted operation. The conditions in a SUDS licence may relate to wildlife protection and enhancement, the mitigation of damage through a management plan and time limits all of which are subject to periodical review by an appropriate regulator. Breach or contravention of the agreed terms would be a criminal offence as in TPO contravention with a heavy fine as a suitable deterrent.

- Fit and proper person – The management of a SUDS pool by a technically competent person with a detailed knowledge of the endangered species or habitat in question has obvious advantages for conservation.

- Notice of compliance/Suspension notice – of possible use against wilful or negligent damage by a SUDS operator to mitigate such damage or stop further operations until the problem is resolved.

- Compensation / revocation – In order to protect the SUDS operator from incurred losses through revocation, compensation should be payable based on the principle of equivalence for loss that is directly attributable to the revocation so as to return the operator to his former state before the compulsory action.

7 Final Conclusions and Legislation Proposal

In proposing any legislation it is important that the primary objectives are clearly defined.

- The exemption of the pool from SSSI designation but primarily from wildlife statutes.
- The stringent protection and conservation of the wildlife or habitat of interest.
- The allowing of maintenance work and actions necessary for the efficient operation of the scheme.
- A compensation package for incurred losses under any legislation through revocation of the proposal.

This project was initially proposed to investigate any means by which a SUDS pool could be exempted from species-specific statutes or SSSI designation if and when occupied by a colony of great crested newts so as to encourage the building of wet ponds and increase the amount of such habitat for wildlife while still allowing an efficient maintenance programme. This research has shown that the threat to SUDS ponds from

wildlife statutes is greater than from SSSI designation, there are a number of means by which the objectives could be achieved and also that the newt colony in the pond could be managed with more protection than current SSSI designation would allow but also promote the success of the species and indeed other species and their habitat through positive management of the pool.

There are three main ways in which a SUDS scheme could possibly be exempted from the negative effects of SSSI designation and species-specific wildlife statutes via:

- The Management Agreement
- Certificate of Immunity
- Permit/licensing scheme

Management agreement

The management agreement is widely used in wildlife conservation legislation to provide positive management of the site in partnership with the landowner or occupier without antagonising such persons with compensation payable for incurred losses under the agreement. As stated in section 4.2 the owner cannot be prosecuted where the impacts are an incidental result of a lawful operation and could not reasonably have been avoided. This is one means by which a management agreement may successfully operate under exemption from species-specific laws, where the operator is carrying out an activity that is permitted under the agreement and the impacts are incidental to this. However the management agreement has been shown to be rather inadequate in successfully protecting SSSI's in this country and critical habitat in America. The so-called strengths of the agreement appear to be in fact inherent weaknesses as reflected by the data referred to in section 4 where 30% of SSSI's require a management change to return them to favourable condition. Any moves to exempt SUDS from SSSI designation is likely to prove controversial; it must be remembered that Sites of Special Scientific Interest are seen as the 'flagship' of habitat protection in this country and any move away from designation of such sites may be strongly resisted. However if it could be shown that any new proposal would not only protect the species in question, but also positively manage and encourage a successful breeding population and improve the conservation of other species with greater success than the current means of doing so (i.e. SSSI designation) then such a proposal may not seem quite so controversial. This is where the management agreement fails. New legislation in this country (i.e. CRoW 2000) may well over time improve and strengthen the management agreement; however any conservation agreement where nearly one-third of sites require management change must surely be viewed as having failed and therefore the management agreement will not be considered any further in respect of the proposed SUDS legislation.

Certificate of Immunity

As discussed in section 6.2 certificates of immunity prevent the listing of a building for five years. Although this means of exemption remain a definite option in the SUDS context the actual scope of the certificate appears rather narrow. However by attaching a series of conditions to the certificate the exemption may be operated in a similar manner to the permit/licence scheme as detailed below.

Permit or licence

The permit or licence appears to be the best example of how a SUDS pool could efficiently operate under exemption from SSSI designation and wildlife laws whilst still promoting conservation and protecting species and habitat by incorporating specific conditions into the permit. The permit is widely used in both the UK and Australia and the USA so as to exempt the holder from certain offences under the relevant legislation whilst allowing certain permitted works. In conclusion the permit system offers the greatest potential to fulfil the objectives identified above and this is means by which such proposed legislation will allow SUDS pools to be exempted from SSSI designation. The following discussion will cover the most important aspects of the proposed permit/licence.

Application

The application for a licence would be made to the Environment Agency or to English Nature who would be under obligation to advertise the application in local newspapers and at the site for a minimum period of twenty-eight days (as with TPO's) and any objections received must be considered. The regulator would then have a set period in which to decide the application with the decision made in writing to the person who applied stating the reasons for doing so and referring to any conditions that are attached.

Permitted works

English Nature in 'G*reat crested newt mitigation guidelines'* (2001) consider temporary disturbance of the breeding pool and associated terrestrial habitat to be of low impact upon the species and even temporary destruction followed by reinstatement has low impact upon a population.

Conditions

The Environment Agency or English Nature would have the power to attach such conditions as it saw fit but in accordance with planning conditions (section 6.5) the conditions must serve a relevant purpose, must fairly and reasonably relate to the development and must not be so unreasonable as to be perverse.

Damage mitigation – In order to minimise the impacts of maintenance activity the maintenance programme should account for the time of year when an operation is likely to have the minimum possible impact on the newt population. The following diagram is taken from English Natures '*great crested newt mitigation guidelines'* (2001):

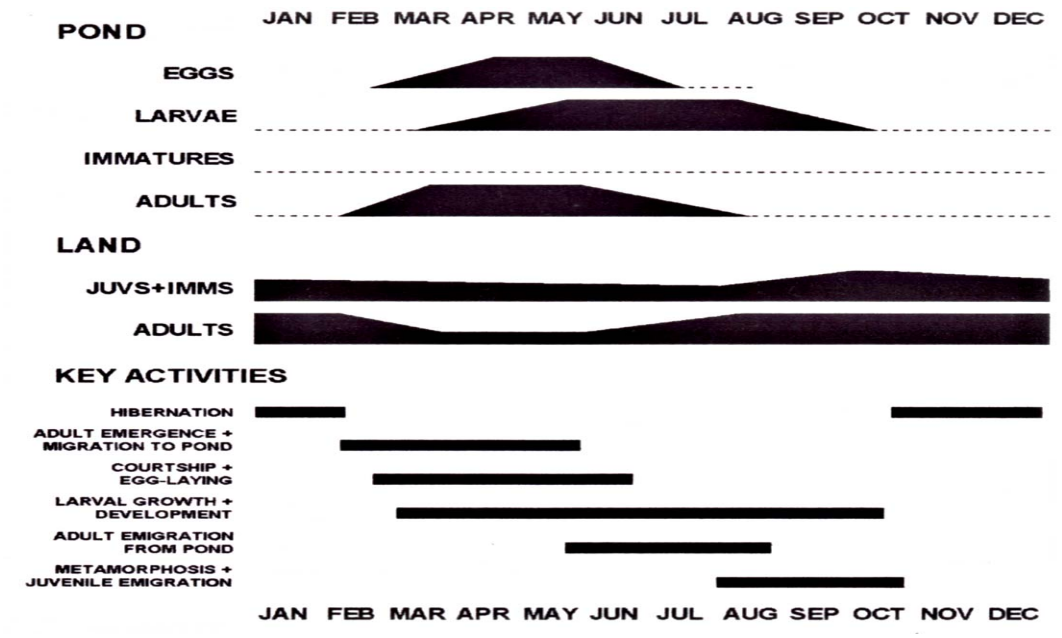


Fig 7 The lifecycle of the great crested newt. (English Nature 2001)

The diagram clearly shows that the least damaging period for pond operations is during the winter months, from the end September until the beginning of March when the population is on land hibernating. Therefore pond maintenance work, i.e. silt removal; inlet/outlet maintenance should take place during this period with the minimal disturbance possible to the bank side. The diagram also shows that the maximum numbers of newts are in the pond between March and June, therefore activities on the bank side habitat, i.e. mowing, shrub/tree pruning should take place during the spring. An alternative to this is the use of capture and exclusion as laid out in the G*reat Crested Newt Mitigation Guidelines* (2001) where newts are captured and released into a suitable refuge and an exclusion fence is then placed around the pool whilst the work takes place. Expert advice would be required as to the best means of mitigation. The licence would also state the conditions in which (i.e. drought) operations would cease or not be allowed to be performed (as in section 6.4)

Habitat conservation plans to promote survival/enhance conservation

Under the proposed legislation the operator of the SUDS pond would need to produce a conservation management plan, similar to the HCP in the US upon application for an exemption licence. Not only would the operator have to include damage mitigation as discussed above, the following must also be considered:

Increasing habitat potential – As the law stands at present SUDS operators may well be discouraged from constructing a system with real biodiversity potential. Under this legislation enhancing the habitat of the great crested newt, and to biodiversity in general is a simple but important condition and herein lays the key advantage of this proposal. As discussed in section 3.5 the studies by Powell *et al* (2001) and Jones & Fermor (2001) found that the design of SUDS pools could easily incorporate features to enhance the

biodiversity potential of the site. English Natures document *'Great Crested Newt Mitigation Guidelines'* (2001) considers the ecology and habitat requirements of the species. Habitat surrounding a pond is extremely important to the species as juveniles and hibernating adults are largely terrestrial. Dense undergrowth, log piles and rubble provide essential shelter to newts on land and encourage invertebrates on which they feed. Newts dislike pools that are heavily shaded and silt may reduce breeding success. Great crested newts often inhabit ponds that are part of a 'pond cluster' and individuals may move between ponds. This ability to shift between locations is beneficial, for example, if a pond were to become less suitable for breeding through prolonged drought or extreme flooding/pollutant loads in the case of SUDS. These features are easily created on a SUDS site; maintenance operations would remove silt and over shading of the pool is remedied by tree pruning with the waste wood used to create log piles. As stated in section 3.5 by Powell *et al* (2001) and Jones & Fermor (2001) a series of linked ponds would enhance water quality and this cluster is also beneficial to newt metapopulations; this and other features i.e. shallow water areas, islands, bank side planting etc are all simple measures easily incorporated at the design and construction stage of a SUDS pool and not only make the pool more attractive to the species in question but encourage increased biodiversity generally.

Monitoring programme – A programme of environmental monitoring by a technically competent person (see below) is an obvious method by which any impacts could be assessed and species data recorded to provide greater understanding of the species populations and to review the conditions of the licence when appropriate.

Fit & proper person – English Nature (2001) report in their document 'G*reat Crested Newt Mitigation Guidelines'* that in order to successfully resolve most great crested newt issues consultants should have a thorough knowledge of, and experience with the species and ecosystems in general, including an understanding of hydrology, aquatic vegetation and invertebrates. A number of permit schemes discussed in section 6 require the applicant to be a competent person and this is quite relevant to this proposal. Expert supervision of a SUDS scheme under an exemption licence is desirable by ensuring conditions are complied with, protecting habitat and wildlife and managing the site in a positive manner with conservation the top priority.

Time limitation As stated in section 6.4 on water abstraction licensing the Government does not favour licences without time limits or those granted in perpetuity. Therefore a condition of this proposal is that the licence is valid only for a set period after which the application must be made again. The exact time limit imposed would need to be considered against future development in the area and the operational lifetime of the scheme.

Revocation / compensation

In order to protect the site from detrimental impacts caused by actions under the proposed licence the relevent agency (either EA or EN) would have the power to suspend or revoke the exemption permit with a period of notice. A suspension notice, as used in waste on land consent discussed in section 6.3.1, may be used to temporarily halt damaging actions or where a condition has been breached so as a site assessment can be made and/or to allow the operator to repair any damage caused and to revise the management strategy so as to ensure compliance with the conditions and management plan set out in the licence.

The regulator may seek to revoke the licence where there is a serious breach of condition or where the site's conservation or biodiversity value is considered to be of the upmost importance. The regulator must give notice of the decision in writing and state the date on which the revocation comes into force. Under the principle of equivalence as discussed in section 6.4 and to provide the SUDS operator's original investment in the scheme with some protection compensation would be payable in respect of incurred expenditure carrying out work which is abortive as a result of the revocation or variation or otherwise sustained loss or damage that is directly attributable to the revocation or variation of the licence.

As discussed in section 6.4 'equivalence' is the basic principle of compensation and aims to ensure that the affected party is provided with an equivalent of their loss or returned to the same position they were in before the revocation of the licence. By returning the SUDS operator to their former position, they then may choose to invest in another SUDS scheme in the locality which has the double incentive of further promoting sustainable drainage and the benefits associated with flood reduction (see section 2) and environmental protection from pollution (sections 2.3 & 3) and also the creation of new wildlife habitat (as discussed in section 3.5.1) affording increased conservation and biodiversity opportunities and improved species and habitat protection under the SUDS 'exemption licence'.

As environmental awareness increases and further sustainable patterns of development are encouraged there is the potential for additional instances where statutory legislation effectively discourages investment in such development. Newman (1999) in his article *The Water Abstraction Licensing System in England and Wales: Is There a Case for a New Approach to Hydropower?* recommends a type of licence that recognises the special contribution of hydropower to the environment; similarly the licence proposed above for a SUDS system would recognise the contribution and benefits of SUDS to biodiversity, conservation, the environment and flood reduction and encourage rather than discourage (as discussed by Newman [2000] see section 1) the development of sustainable urban drainage systems. As this document has shown the objectives of such discouraging legislation can be fulfilled and even strengthened whilst simultaneously encouraging sustainable development and, as in the case of this research, promote the creation and protection of valuable natural habitat.

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