



Sustainable Drainage and use of recycled products: Newbattle Golf Club

INTRODUCTION: Newbattle Golf Club is situated adjacent to the market town of Dalkeith. The course is within the Policies of Newbattle Abbey and many Kings and Queens of Scotland and of the United Kingdom, during their visits to the Abbey, have traversed the land on which the course stands. The original Dalkeith Golf Club was formed in 1880 by a group of local businessmen and in 1896 a 9-hole golf course was laid out at the nearby King's Lines and Dalkeith and Newbattle Golf Club was formed.

THE ISSUE

In 2011 and 2012 most if not all golf clubs in Scotland experienced the most prolonged wet summer in recent memory with annual rainfall in the West of Scotland exceeding 2200mm and 230 rain days, a 30% and 22% increase on the previous 30 year averages respectively. Other areas of Scotland although not as severe, didn't escape the periods of intense rainfall and flash flooding which resulted in unprecedented course closures across the country. *(stats courtesy of STRI)*

The low sunshine hours and lack of fast natural drying had a severe impact on the playing conditions of our courses with a variety of issues on greens including foot printing, ball plugs and increased thatch and organic matter layers and disease pressure on greens and tees.

Fairways and bunkers also suffered from increased drainage problems with many existing drainage systems unable to cope with quantities of surface water causing waterlogging and potential pollution and erosion issues in watercourses.

Newbattle Golf Club in Midlothian had similar problems to many other clubs with course conditions being affected by the changing climate and course closures inevitable. The resulting remedial turf maintenance was having an impact on the club resources so the club committee made some serious long term decisions about how they were going to adapt the management of their courses and what infrastructure investments were going to be needed.

AT A GLANCE...

>> To address ongoing drainage problems on the course, in 2012/13, Newbattle GC decided to undertake a large scale sustainable drainage management project for long term improvements.

>>The club used a variety of sustainable drainage techniques:

- Interception of surface water flows
- Cultural turf management and vegetation management to improve natural drainage
- Swales and trenches
- Aquadyne, recycled drainage blocks



They knew that failure to adapt would mean reduced course quality and playability and may result in future loss of members and visitors in an ever more competitive Scottish golf sector.

Although the summer of 2013 was significantly better weather all round, this is thought to be all part of the unpredictable nature of current weather patterns and the next few years cannot be guaranteed to be the same.

THE SOLUTION

The Scottish Golf Environment Group were invited to Newbattle Golf Club to discuss the drainage projects undertaken on the golf course and their plans for the future. The course management team led by Jim Christisen should be commended for how they have adapted to the changing climate in these challenging times.

Newbattle Golf Club has been successfully addressing surface water issues in four different areas;

- Intercepting excess water before it reaches playing surfaces
- Surrounding vegetation management to encourage drying out
- Cultural turf management to allow water to infiltrate through the soil
- Sustainable drainage systems to transport the excess water away from the playing surfaces

Many sustainable, resource efficient methods were considered to address all of these areas as part of a whole course drainage plan before investing in a drainage scheme.

INTERCEPTION OF SURFACE WATER

Whilst trying to keep playing surfaces free from waterlogging and playable, the team have used more 'natural' drainage methods to intercept and divert surface water flows by increasing areas of rough grassland, re-contouring and mounding to convey water away.



Areas of flooding at Newbattle GC



Re-contouring and rough grassland to intercept and divert surface water flows



Large trenches along the side of fairways allowing surface water to be collected and moved away from playing surfaces



Areas of rough grassland between fairways not only give visual definition to each hole and provide a valuable grassland habitat; they are a vital tool in naturally draining the golf course. Longer grass intercepts surface water flows and absorbs more sub-surface water while removing sediments.

Rough grass can also provide a habitat for nesting sites for small birds including blackbird, song thrush, various warbler species, dunnock and wren.

SURROUNDING VEGETATION MANAGEMENT TO ENCOURAGE DRYING OUT

Direct rainfall onto greens or tees cannot be avoided but making sure surrounding vegetation isn't causing shading or blocking airflow can make a big difference to the speed a green dries after rainfall, or frost disappears in winter months. Appropriate thinning of trees and shrubs to reduce shade and allow more sunlight will also increase ventilation and dry out wet surfaces.

There are various species to avoid around greens. Conifers have dense growth so can cause lots of shade. Poplar have roots that are very invasive and can cause problems to greens. Cherry and Larch commonly cause maintenance problems with their blossom and needles. After tree thinning, replacement planting could be with varied height shrubs such as blackthorn, hawthorn, rowan, holly and hazel to provide a continued backdrop to a green without the shade and airflow issues.

Newbattle GC are continuing to manage their shrubs, trees and woodland across the course as part of a wider woodland management plan.

CULTURAL TURF MANAGEMENT TO IMPROVE DRAINAGE

Thatch management is key for giving water a pathway through the grass roots, organic matter and subsoil giving firm dry playing surfaces. Thatch causes greens to be too soft and too water retentive.

Aeration and hollow coring breaks through the thatch layer below the surface of the turf and removes the excess organic matter that is acting like a sponge and stopping water from penetrating through to the subsoil. Top dressing with sand can fill the resulting voids with a permeable material or sand can be injected with machinery such as a Graden machine to improve firmness.

There has been an extensive programme of cultural turf management over recent years at Newbattle to improve the drainage and playability of the surfaces. The greenkeeping team have used techniques such as aeration and topdressing to ensure the thatch layer is minimised.



SUSTAINABLE DRAINAGE SYSTEMS (SUDS)

The next stage of removing water from greens is usually a gravel band / pipe drainage system feeding into larger collector pipes and eventually to a positive open outlet such as a watercourse or pond.

There are a variety of sustainable drainage systems (SUDs) non piped options to collect and convey water away while also attenuating and slow down surface water flows to avoid erosion at the outlet.

SUDs such as swales, open ditches, retention and detention ponds also provide natural filtration and treatment to remove pollutants, (turf products, sediments, hydrocarbons), protecting water quality, and creating and improving habitats and linkage across the course. Newbattle have a variety of contoured swales and trenches on the course to assist with sustainable drainage into the River Esk.

At Newbattle GC they have extensively improved the green drainage to remove excess water by installing the product Aquadyne. This is a relatively new innovative recycled, durable drainage product that has been developed for sports turf drainage by Econoplas Ltd. It is supplied in Scotland by Aitkens www.aitkens.co.uk

The panels are made from 100% post use recycled waste plastic, ground down and formed into 1m x 220mm x 45mm panels weighing approx. 6kg. Every 100m of Aquadyne panels saves up to 1 tonne of greenhouse.

Aquadyne is easier to install than traditional pipes as the trench required is much shallower and narrower than traditional methods. As it is so light and easy to work with up to 1000 metres can be laid in a day; Aquadyne is 75% lighter than aggregate drainage mediums.

Aquadyne has an open pore surface area of 50% compared to 5% with perforated pipes. They have the capacity to support flow rates of 21,000mm/hr in comparison to 2,089mm/hr for medium course sand which is 10 times the percolation rate and is less likely to clog with sand migration.

Aquadyne is much more durable because the panels do not settle and compact and can support 1000 tonnes/sq. m. They do not degrade like sand or gravel mediums so do not need replaced as regularly and can considerably reduce the long term costs associated with maintenance and refurbishment.



Aquadyne panels



Aquadyne installation



Aquadyne percolation



In dry periods it can retain moisture due to the high surface area and micro/macro porous honeycomb structure stopping the turf above from drying out and less likely to experience scorching and unsightly lines. Aquadyne can also be used for bunker drainage and as path edging.

LONG TERM COST DIFFERENCES

In comparison to conventional drainage pipes, overall, Aquadyne can be up to 20% cheaper. To make a direct comparison the following estimate calculations were made:

100m of fairway drainage using standard piped solution in 18" deep trench:

100mm dia. Perforated drainage pipe	£120
16 tonnes Gravel to surround pipe	£270
½ tonne Rootzone material	£68
Seed	£30
Total	£488

100m of fairway drainage using Aquadyne (shallower trench so less excavation required)

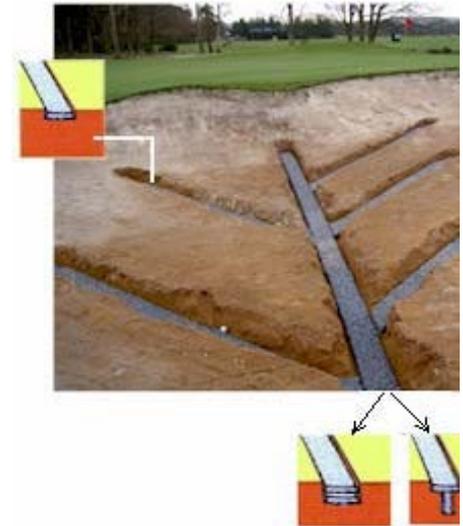
Aquadyne installation	£480
¼ tonne Rootzone material	<£34
Seed	<£34
Total	<£548

Although the Aquadyne material may be slightly more expensive per 100m, there will be labour savings in trench excavation costs as the depth is considerable less and installation is quicker as the product is lighter.

OUTCOMES

In the long term the product will last considerably longer so will not need replaced as often as conventional gravel banding or piped drainage. The performance benefits will also contribute to this being a worthwhile investment for golf courses.

Newbattle GC said that this recycled product has proved very easy to install with minimal disruption and the reinstatement of the greens has been successful. The drainage and playability of the courses has improved hugely and as this product is claimed to last many years longer than traditional backfilled pipe systems, it has been a good long term investment for the club.



Aquadyne in bunkers



Greens after Aquadyne installation

FIND OUT MORE

If your club would like to promote its business success story or require support in this area, please contact your Club Development Officer or Environment Manager Carolyn Hedley c.hedley@scottishgolf.org

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