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Environmental care taken with golf course design and construction

Vaal de Grace – a Nick Price signature course

Vaal de Grace, the first Nick Price designed course in South Africa, is on an island in the Vaal River just outside Parys. The development which is predominantly on old agricultural land comprises the 18 hole golf course, 305 residential properties, a practice facility and a clubhouse. Activities such as fishing, canoeing, birding and nature walks will be available for residents, members and visitors. The hills of the Vredefort Dome are in view in the distance but the development falls outside the boundaries of the World Heritage Site.

The Nick Price design team and developer Chris Dreyer are unified in their focus on the preservation, enhancement and creation of habitat that will support the biodiversity on site. The team conducted an early routing and planning process in conjunction with the developer, environmental consultants Holgate and Associates and Lidwala consulting engineers. The environmental consultants have a staff member permanently on site to monitor every aspect of the construction phase.

Carol Knoll *visited the site with environmental manager Claudia Holgate and interviewed project manager Pete Bohn. Designer Warren Henderson was interviewed telephonically and input was given by Wayne Branthwaite, both of Nick Price Golf Course Design.*

The course is on land which was previously used for lucerne farming and the central part of the island was completely degraded; covered with khakibos and other weedy pioneers, while the riparian zone was infested with bluegums and exotic willows. All of these invasive trees were removed to create good views of the river. Fourteen holes of the course are located on the 110ha island, while the remaining four holes are also on old agricultural land but on the Free State mainland.

The site spans two provinces, North West Province (the island) and Free State, and has had rights for a golf course since 1992, prior to the 1997 requirement for an Environmental Impact Assessment under the Environmental Conservation Act. Initially, there were questions about whether environmental authorisation was needed and uncertainty as to whether this was a national or provincial matter. On completion of the EIA/EMP, done by Holgate and Ass, the Free State Department of Tourism and Economic Affairs issued the Record of Decision under instruction from the National Department of Environmental Affairs and Tourism.

TOP: These birds were all photographed by environmental manager Claudia Holgate on the Vaal de Grace site: Brownhooded Kingfisher, Whitethroated Swallows and European Bee-eater.
ABOVE: The Vaal River adjacent to the Vaal de Grace island site, with one of the hills of the Vredefort Dome in the background. Bluegums on the far side of the river are not on the golf estate's property – all bluegums and exotic willows have been removed from the island.
LEFT: A large fairway bunker on the 3rd hole of the Vaal de Grace course with the Vaal River in the background and the green to the right of the picture in the process of being irrigated. The course is still at growing-in stage.

Warren Henderson commented that the Nick Price team had inherited the original plan for the development, which had been passed giving permission for the golf course but that they had expressed certain concerns about the layout of the course. "We are conscious of the fact that residential units interfere with the movement of wildlife across a site and see the golf holes as being important wildlife corridors that need to be designed with that in mind – also, safety needs to be taken into account. The developer saw value in the points we raised and he was totally behind our ideas to naturalise the farmed areas with an abundance of trees and veldgrasses – to return to what was there naturally – and he accepted a reduction in the stands planned for the property. The housing component was reduced by 50 stands," said Henderson.

The following environmental issues that would require careful land management were identified at planning stage:

Newly planted *Acacia karroo* trees being protected against damage by porcupines.

wildlife conservation and habitat enhancement; water conservation and water quality management; and sediment and erosion control. A plan for Integrated Pest Management was put in place.

The existing riparian habitat on the island, although it is highly disturbed, provides a home for Water Monitor, Cape Clawless Otter and a wide variety of bird species, including Black Crake and Little Bittern. Porcupine have established a burrow in the riparian zone. The fairly extensive Camphor Bush (*Tarchonanthus camphoratus*) environment in the north-west portion of the island provides shelter for the Scrub Hare. This bush is an exceptionally hardy plant and can be an aggressive coloniser, and the dense vegetation is clearly an ideal habitat for the colourful Paintbrush Lily (*Scadoxus puniceus*), as it features in clusters under almost every bush clump, along with a small grassland orchid species (*Eulophia hereroensis*) which also flowers in October. The island as a whole provides habitat for both the Yellow and Slender Mongoose, as well as numerous reptile species including the Giant Legless Skink, Common Mole Snake and Rhinkals.

The Nick Price team always makes use of silt fences as a key element in the sediment and erosion control plan on all the golf courses they design. Containment of runoff to guard against siltation of water bodies is a legal requirement in the USA,

and silt or erosion fencing is used when a golf course is constructed. At Vaal de Grace, the entire site is encompassed by silt fences of 60cm in height, and these provide a physical barrier between the construction area and the river. Claudia Holgate commented that these barriers, simply constructed out of 90% black shade netting, had been essential over the last period of heavy early season rains – 200mm had been measured over a two week period on site. The fences have held up well except in one or two small areas where accumulated silt has broken through onto the river banks, giving some idea of how disastrous the situation would have been had the fences not been in place. The Environmental Site Officer (ESO) monitors the nets for failure on a regular basis.

Water quality is monitored on a three-monthly basis in both channels and below the island and there

TOP and ABOVE: The Sweet Prickly Pear (*Opuntia ficus-indica*) is a declared Category 1 weed and a problem plant on site. Large quantities of the plant are being cut down and their roots dug out. They are then left to dry out in piles before being carted away.
BELOW LEFT and BELOW: The entire Vaal de Grace site is encompassed by silt fences. Claudia Holgate standing astride the fence demonstrates the silt build-up on the side away from the river, after the recent rains.

Design philosophy and parameters at Vaal de Grace

The general design philosophy of the Nick Price team includes evaluating the property and letting the land dictate what will be suitable. This means a dedication to time spent on site so that the best solution for each location can be achieved. This attention to detail and a focus on the art of strategy, allows the design team to incorporate the 'ground game', which they feel has been largely ignored over the past few decades, into their designs. The team is of the opinion that details do not cost more money, per se, they merely require focus and being on site; and the team is involved in the design process at every level. Price has a strong personal involvement in each of his signature courses – from the planning and design stage through to the construction of the course.

The Lead Designer at Nick Price Golf Course Design is Warren Henderson and he has a degree in landscape architecture from the University of Arizona. He had many years of experience designing courses in the USA prior to joining the Nick Price team in 2004, including four years with golf course architect Michael Hurzdan who is recognised for his innovative solutions to environmental challenges. Henderson's experience in environmentally sensitive golf course design is significant.

As the lead designer for the Westwood Plateau Golf and Country Club, located in the mountains of Coquitlam, British Columbia, Henderson worked with local and federal regulators to ensure that the sensitive Salmon Stream that ran through the property remained unspoiled, as well as creating a wildlife corridor for the Black Bears in the area. He was involved with Wuskowhan Players Club, located in West Olive, Michigan, where a third of the site was federally protected wetlands. The planning and design of this 18-hole golf course resulted in the avoidance of any impacts on the existing wetland system. The wetland systems were protected through creative routing solutions, as well as the use of native vegetation buffers and mechanical filtration of surface water runoff.

Warren was the lead designer for the Shenendoah Golf Club, part of the Oneida Nation's resort development in Verona, New York. With their established independence, the Oneida Nation developed an internal system of environmental and engineering consultants focused on meeting or exceeding all existing local, state and federal development guidelines. The 27-hole course and learning centre facility was designed to protect the existing wetland and ecosystems, and reclaim and restore over 40 ha of land that had been extensively farmed.

The following courses with Warren Henderson as Lead Designer, received *Signature Audubon International* status: The ACE Club, Lafayette Hill, Pennsylvania; Shenendoah at Turning Stone Resort, Verona, New York; and Wuskowhan Players Club, West Olive, Michigan.

Speaking about the design at Vaal de Grace, Henderson, who visits the site on a monthly basis often for 10 or twelve days and sometimes in conjunction with Price, said that the team always took careful note of the goals of the owner/developer and the major features of the topography. At this site, the predominant feature is, of course, the Vaal River and views of the river were an important design consideration which initially involved the removal of all the exotic tree species, so that "the river became part of the property," was Henderson's comment. "We looked carefully at not becoming monotonous, as the holes are always close to the river. From 15 to 18 we tried to combine shots towards and away from the river. At 15, the tee shot is right along and close to the river, even partly across the bank, whereas the second shot turns away from the river. The 17th hole hits away from the river on the tee shot, while the second and third shots towards the green turn back towards the river. This mix of shots gives the player a different feel and, of course, the golfer should not have to worry about hitting into the river."

Talking about the "jigsaw-puzzle" shaped bunkers, Henderson said that the bunkers were designed to be natural in appearance with faces which appear to be eroded, and not highly manicured, to complement the veld-grass rough. He said the bunker faces with their jagged edges would be mowed higher than average to give a more natural appearance. He emphasised that the intention was that the bunkers should serve as hazards and not as the preferred place to miss a shot.

He mentioned that all Nick Price designed courses always paid attention to stormwater runoff, "where it goes and how it is handled" and the swales that were used to help with drainage allowed for design creativity on the course, providing for varied lies. Henderson called this "engineering combined with artistry".

"We saw the old-style square tee boxes at Vaal de Grace as complementing the simplicity expressed by veld and river. On older courses, tees were kept as simple as possible on a level area. The green shapes are based on the requirements of each hole and dictated by a number of factors – strategy, the length of the hole and the wind. The landing areas are generous to accommodate the high handicapper, just as the slopes on the greens which accommodate regular pin placements need to be no more than between 1-3%," commented Henderson. A few greens have more severe contouring but there is always ample pin space for the mid to high handicappers. He explained that the course could be set up to challenge the professional.

have been no problems with silt contamination from the construction site. Holgate said this water quality testing would continue into the operational phase of the development to monitor any possible long term impact. She also commented that the only real concern raised by the Vredefort Dome Conservancy, at the time that the application for World Heritage status was being processed and prior to the ROD for Vaal de Grace, was the water quality issue and the positive test results had been reassuring. She commented that as part of the EIA, a specialist study on the aquatic life around the island had been done.

Project manager Pete Bohn, who has worked on the contracting side with Henderson for 13 years, described the measures taken to prevent any excess fertiliser or pesticide from leaching from the greens into the surrounding terrain or the river. At least one or two greens' filters have been incorporated underground at

each green. The filters (*see diagram*) are made by the construction team in the field out of a piece of 355mm plastic pipe which is divided down the centre and the one half filled with activated charcoal. Both the upper and lower ends are concreted while the upper 'lid' has a handle, so that the filter can easily be lifted out of the soil for cleaning. Water from the green enters the filter through 110mm drainage pipe; it filters through the charcoal, which removes nutrients and neutralises chemicals, and rises up until it spills over into the second chamber, where it exits through another 110mm drainage pipe which carries it away from the green. Tracer wire allows the exact location of each filter to be established with ease. Bohn explained that the perimeter of each green was also demarcated with tracer wire, as were all the drainage pipes, to facilitate maintenance.

He commented that the extensive stormwater drainage system on site, with drainage pipes in the greens and bunkers (all of which are lined by geotextiles) and the use of drainage swales, meant that the course would be playable within an hour of a typical highveld storm. Drainage swales have been designed to direct surface water into so called sediment basins in low-lying areas where the silt can settle out in the grass. When the island was used for agricultural purposes, the threat of sediment entering the river was far greater with the seasonal turnover of crops.

Henderson commented that organic fertilisers would eventually be the preferred choice for ongoing maintenance of the course but that during the grow-in period the most important factor was to get the turfgrass to establish as rapidly as possible to guard against possible erosion. He said ongoing soil tests and tissue analysis would be coupled with the transition to organics once the course was established.

The design team is very aware that the conservation of water is a critical issue in South Africa, despite the fact that the course is surrounded by water. Questioned about the choice of Kikuyu for fairways and tees, Henderson said that at Vaal de Grace the turf would be maintained with less water than would normally be required for Kikuyu as there was no need for lush, emerald-green fairways. The fairways were in fact to be kept as dry and firm as possible to suit the style of play, but with sufficient irrigation to keep the grass healthy. He pointed out that anything beyond the critical areas of play on the course would not be irrigated. The indigenous grasses will not be irrigated and the Kikuyu will be maintained with a clearly defined edge to protect the integrity of the veldgrasses in the deep rough and for playability reasons. The veldgrass will also serve as a buffer strip of natural filtration and prevent erosion, and serve as wildlife habitat.

The irrigation system is fully automated and state-of-the-art, and the weather and soil moisture will be monitored to determine appropriate watering needs. Efficient application of water will match soil infiltration rates, reducing excessive runoff and the potential leaching of nutrients.

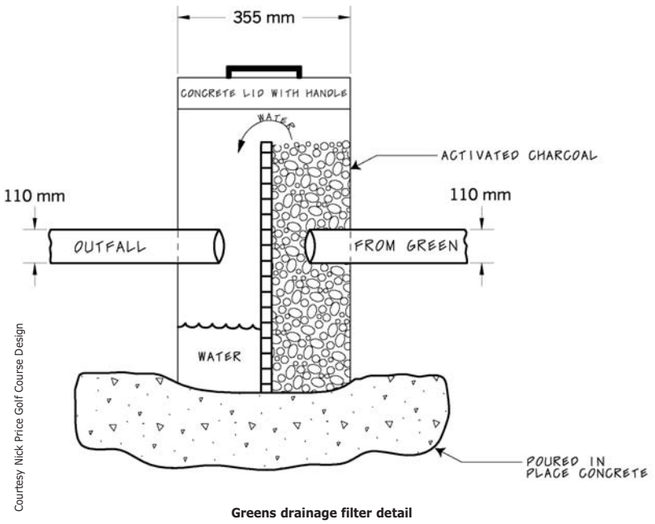
Bohn pointed out that with the double row of irrigation heads around the greens, water could be saved when necessary by just watering the actual greens and not the surrounds. He added that Vaal de Grace had a water users licence to abstract from the river and that the water that was used was metered. "The greens and tees are a priority but we can cut back the watering of both surrounds and fairways," added Bohn.

Bohn was brought in by Price to manage the construction of the golf course and he employed a team of labourers, virtually all unskilled, from the neighbouring communities of Tumohole and Schonkenville. Most of the labour has learnt skills on this project, through trial and error, supervised by Bohn, as the construction has progressed over about three years; while some had basic skills – but none of the labour force had been involved in golf course construction prior to Vaal de Grace. The actual course construction started in late winter 2006. The idea is to train people who can continue through to the maintenance stage. TopTurf, in the person of greenkeeper Freek Botha, has recently been brought in to oversee the rest of the growing-in phase and to continue with the maintenance of the established course, and they will take over about 20 of the 34 workers as maintenance staff for the course.

"Nick chooses to work this way (build the course 'in-house') as it gives the team good control over the design and the environmental issues, and is cost effective. Nick has a hands-on approach and he and Warren worked on the detailed design by coming to site regularly. Nick finalised all the greens before we did the seeding with an A1/A4 bentgrass blend. When they were not on site, we sent photos and drawings back and forth. We did import a shaper, Jimmy Kleinschmidt, from the States, who has worked with us previously," said Bohn.

Holgate conducts an environmental briefing for all the labourers on site, in both the housing component and on the course. Any outside contractors have to sign contracts, are given an environmental code of conduct to follow and the Environmental Management Plan (EMP).

Holgate commented that owner/developer Chris Dreyer had given her full authority to stop any part of the development for non-compliance with the EMP and to order rectification, in conjunction with a fine if necessary. Workers that attempted to snare porcupine were summarily dismissed – but since the security has been tightened up, there have been no poaching attempts. She said she had worked with Dreyer on other projects and he was committed to the correct environmental action. Trees replaced along the course are of a meaningful size – and over 1 000 trees of five locally indigenous species have been planted on the property: *Celtis africana* (White Stinkwood), *Rhus lancea* (Karee), *Ziziphus mucronata* (Buffalo Thorn), *Acacia karroo* (Sweet Thorn) and *Combretum erythrophyllum* (River Bushwillow). There is a large cluster of 150 year-old White Stinkwoods that has been carefully preserved near the golf course workshop. While *EM* was on site, a Yellow Mongoose made an attack on



Greens drainage filter detail

'Jigsaw-puzzle' shaped greenside bunkers on the 2nd hole. These bunkers are designed to be natural in appearance with faces that appear to be eroded to complement the areas of veldgrass.

ABOVE FAR LEFT: The extensive Camphor Bush clusters are clearly an ideal environment for *Scadoxus puniceus* (Paintbrush Lily).
ABOVE LEFT: *Bulbine abyssinica* flowering in an out-of-play area.
ABOVE: *Papaver aculeatum* – an indigenous poppy of disturbed places.
ABOVE RIGHT: A small ground orchid, *Eulophia hereroensis*, in the Camphor Bush environment.
LEFT: The indigenous Cape Willow, *Salix mucronata*, along the river bank.

Bunding around the temporary diesel tank to guard against spillage can hold one and a half times the volume of the tank.

a nest of plover eggs in the vicinity. The workshop is an old house that has been refurbished. An information centre on site, another of Dreyer's initiatives, will keep residents and visitors informed about the wildlife, particularly the prolific birdlife, and the plants.

One of the most challenging exercises on site has been to retain as much of the Camphor Bush habitat as possible and every attempt has been made to design the houses around the bush habitat, which lies adjacent to the golf course. Initial attempts were made to transplant those portions of the habitat that had to be eradicated for the housing development but this proved not to be viable. The ESO Deon Cruywagen monitors this environment on a continual basis. He also supervises the team which is responsible for bank rehabilitation and reseeding, clearing of invasive plants and other weeds and will supervise the seeding of the veldgrasses on site.

On Dreyer's insistence, Holgate is a member of the architectural aesthetics committee for the housing component, headed up by Martin van Vuuren, to ensure that the stand owners follow requirements and because there are sensitive sites bordering on the river. For every tree that is taken out because of the building of a house (and this is only when it is totally unavoidable), three appropriate trees have to be planted. Only indigenous plants will be acceptable in home owners gardens and, as Holgate points out, these are likely to be largely locally indigenous because it is a cold area and only those plants that are suited to the area will grow there All the housing is being built by local contractors and the site managers for each house are local people. ♦

Report by Carol Knoll
Photographs by Carol Knoll and Claudia Holgate

Project team

Owner/developer:	Dr Chris Dreyer
Golf course design:	Nick Price Golf Course Design (Nick Price and Warren Henderson)
Project manager:	Pete Bohn
Environmental managers:	Holgate and Associates (Claudia Holgate, Robert Kruger and Deon Cruywagen)
Engineers:	Lidwala Consulting Engineers
Golf course maintenance:	TopTurf Group (Freek Botha)
Housing developer:	Martin van Vuuren
Workshop architect:	Smart House Architects (Stephen Bobby)