DRAX
GOLF CLUB

AGRONOMY REPORT ON THE GOLF COURSE

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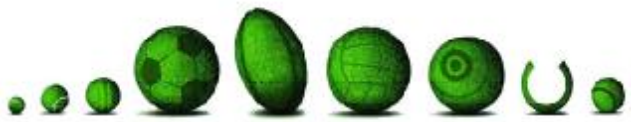

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Date: 6th July 2009 **HCB/LR**

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ON THE GOLF COURSE

Date of Visit
6th July 2009

Object of Visit
To appraise the condition of the course and make recommendations for future improvement.

Present
Mr Craig Lalley – Head Greenkeeper
Mr Elvin Dickinson – Greenkeeper
Mr Gary Jardine– Greenkeeper
Mr Henry Bechelet – Turfgrass agronomist STRI

INTRODUCTION

This report follows my recent annual advisory inspection of the course at Drax Golf Club. The visit was scheduled for this time to review the condition of the course in the summer. This is a good time to review the standards being set for the original 9 and take a look at the new land holes as they approached their proposed opening.

My previous inspection was carried out at the end of June last year during a poor early start to the summer. At that time the course was in good condition and being maintained well. The maintenance routines were well-established and producing good standards. Our main priorities for the greens were to prevent deterioration in the form of disease and dry patch and also to keep working away at reducing the level of organic matter at the turf base. For the tees we discussed the use of the plant growth regulator Primo-MAXX to help improve their quality. For the fairways we were looking to extend the drainage, continue to fertilise and aerate to generate further improvement. All areas of the course were discussed and recommendations were made to achieve continued improvement. We did not make any comment on the new land holes having not been involved with the development, which was very much still in the hands of the contractor.

The weather since the previous inspection has proved extremely testing at times. August and early September saw continued heavy rainfall to wash-out the 2008 playing season and get in the way of the course maintenance. September did dry out but turned wet again from October through to the end of January to keep the course saturated effectively for 7 months. The weather then turned cold in February and early March with significant snowfalls on a couple of occasions. The weather then turned dry from mid March to mid May, which was good for golf, but the cold temperatures served to hold back the emergence of strong early spring growth. It has therefore been a mixed time this year. The weeks prior to inspection had seen a heat wave and then a move to heavy showers. It has been a tough time for greenkeeping with the weather swinging between unhelpful extremes.

Since my previous inspection, Mr Lalley has taken over the responsibilities of head greenkeeper.

GREENS

MAINTENANCE SINCE PREVIOUS INSPECTION

The objectives for the maintenance of the original greens were highlighted in my previous report as being:

- Maintain turf health with the judicious use of fertiliser and irrigation inputs
- Prevent the development of dry patch
- Verticut occasionally to maintain smooth and true surfaces on which to play
- Mow at a considerate level rather than scalping down
- Prevent the development of disease
- Hollow tine and top dress in the autumn
- Verti-Drain in the autumn
- Apply sulphate of iron through the autumn and winter to help the sward against disease attacks

The wet weather through August and September obviously did impact on playing qualities and the surface preparations but generally standards were said to have been maintained. On the bright side the development of dry patch wasn't a problem last year.

The end of season renovation work was completed in October. This involved Verti-Draining, hollow tining, top dressing (8.5 tonnes). No overseeding was carried out at this point. This year the end of season renovations have been scheduled far earlier in the year when growth is still proceeding to allow a heavier top dressing and to make overseeding appropriate.

The greens were said to have faired fairly well against the development of fusarium patch disease last autumn. The wet summer weather meant less use of the irrigation water (and its high pH and alkalinity) and so the risk of fusarium patch disease in the autumn greatly reduced last year. Granular iron continued to be used through the winter to help harden the sward against disease attack. A couple of applications of fungicide were used but in general the greens fared very well.

The early season surface preparation work began in March/April. The greens were scarified, solid tined and top dressed at this time then overseeded with a fescue/bent mix.

Early season growth was boosted with a couple of applications of a 15:6:8 fertiliser. Liquid fertilisers tank mixed with seaweed soil conditioners were then used through the spring and early summer to sustain healthy growth.

The wetting agent Breaker has been applied from April onwards to help prevent the development of dry patch. Micro solid tining is also being carried out on a regular basis to keep the surface open and receptive to effective irrigation.

Fusarium patch disease did flare up as soon as the irrigation water began to be used this spring and the greens required a treatment with the fungicide Dedicate to prevent any scarring from developing.

With regard to the surface preparations, four light top dressings have been applied so far this year to prepare smooth and true surfaces on which to play. Verticutting has also been carried out on a number of occasions to maintain the development of a dense and upright

sward. The greens were being mown at a level of 3.25mm at the time of inspection. No rolling or brushing work had been carried out prior to inspection.

So, the maintenance of the original greens has proceeded very much as planned.

The new greens have been a different story. It soon became clear to Mr Lalley that the construction of these greens has been of a dubious standard using materials that do not conform to any recognised specifications. Soil compaction, a lack of healthy growth and the development of very poor surfaces has been the main issues. Regular and intensive aeration, fertilising, overseeding and top dressing have been carried out to try to create a situation where the greens could be opened for play.

PLAYING QUALITIES

Our aim when maintaining the greens is to create a consistent set of firm smooth and well-paced surfaces that remain playable throughout the year. We are aiming to create high quality summer surfaces that challenge the players in an enjoyable way. During the visit we took the time to measure the key playing qualities of speed, smoothness and firmness. This would give us a precise measure on the standards being set and allow us to decide what improvements need to be made. If we set the speed firmness and smoothness at the right level then they combine to make playing surfaces of the highest standard.

Speed

We measured the speed of the greens using the Stimpmeter. The Stimpmeter measures the distance a ball rolls from a standard delivery. The longer the ball rolls the faster the surface is deemed to be. All the readings were carried out strictly according to the recognised protocol and the results were factored using the Brede equation to take out any slope effects. The results of the testing read as follows:

STRI Green Speed	
Green Nº	**Stimpmeter Readings**
1	**8’ 1”**
5	**6’ 9”**
7	**8’ 1”**
9	**8’ 0”**
New 2	**6’ 3”**
New 3	**6’ 4”**

The following table serves to put these results into context.

Green Speed (Radko 1980)

	Average distance rolled		Green speed classification
	(m)	(ft)	
For regular membership play	2.55	8'6"	Fast
	2.25	7'6"	Medium fast
	1.95	6'6"	Medium
	1.65	5'6"	Medium slow
	1.35	4'6"	Slow
For tournament play	3.15	10'6"	Fast
	2.85	9'6"	Medium fast
	2.55	8'6"	Medium
	2.25	7'6"	Medium slow
	1.95	6'6"	Slow

So, the original greens were in good condition and exhibited a decent pace. Our target level would probably be between 8' - 8' 6" on the Stimpmeter for routine play (fast). The surface preparation routines are working well with the current level of mowing, verticutting and top dressing combining to maintain these high standards.

We did not feel that the sward was under any pressure but if any stress does appear during periods of warm or dry weather the height of cut should be eased back slightly to prevent thinning out.

We would improve the speed with rolling or hand cutting to polish the surfaces quick but at present these machines are not available. I would certainly recommend demonstrating the vibratory rollers to review their positive impact on routine green speeds without adding any extra pressure to the sward.

The new greens were still being prepared at the time of inspection. They were very new and not without their problems and certainly won't be fully up to speed until next year at the earliest (to be discussed). The compaction in the rootzone means that if we start to maintain them too intensively or play them too early they will quickly begin to decline. These greens should be treated differently than the established greens and the maintenance should concentrate on maintaining turf health before any intensification of the preparation routines could be considered.

Smoothness

We rated the smoothness of the surfaces using the following rating scale. We rated the smoothness of each roll while carrying out the Stimpmeter speed procedure. The results of this testing are outlined below:

STRI Smoothness Scale		
Scale	**Description of smoothness/trueness**	**Example greens**
10	No chatter or snaking. Perfect roll.	
9		
8	Minor chatter no snaking.	**SUMMER TARGET** **Green 5**
7		**1, 7, 9 & New 2**
6	Chatter, isolated bobble and occasional snaking.	**New 3**
5		
4	Distinct bobbling with some snaking.	
3		
2	Bobbling and snaking.	
1		
Chatter = Distinct vertical vibrations discernable but ball does not leave ground. Snaking = Lateral deflection from intended path. Bobble = Distinct vertical movement where ball leaves the ground.		

So, the smoothness of the greens was generally very good. An overall rating of a 7 is very good. A 7 is where a smooth roll is broken by “chatter” (discernable oscillation) at regular intervals. These are good surfaces and smoother than most I was seeing at the time of inspection.

Ultimately, our target should be to achieve 8’s and to achieve this we reduce the level of chatter. This would be achieved primarily by continuing to create a fine and dense sward. We do this with top dressing, verticutting, regular brushing and rolling. We should consider getting the vibratory rollers in on demo from Greentek to review their positive impact on both speed and smoothness. It is important not to be too damaging if we are going to favour the development of the bents and fescues and so brushing and rolling are certainly more desirable than close mowing and regular verticutting.

Certainly, we can’t be too aggressive with the new greens and so continued regular top dressing would be the key to maintaining their smoothness. If we put too much pressure on these greens they will thin out and become uneven.

For all of the greens it is important to keep on top of the development of dry patch and disease. Both of these can cause scarring to affect the smoothness of the surfaces. Both disease and dry patch were being managed well at the time of inspection.

Firmness
We measured the firmness of the surfaces using Clegg Impact Hammer. Our aim is to create firm surfaces that take well struck approach shots but do not become soft when wet. The results of this testing is outlined below.

STRI Clegg Hammer Readings	
Green Nº	**Clegg Reading**
1	**88 ± 2.4**
5	**91 ± 2.5**
7	**83 ± 2.0**
9	**83 ± 3.0**
New 2	**135 ± 5.3**
New 3	**115 ± 2.5**

For a parkland setting we should be looking to achieve readings of 80 – 105. Below 70 is too soft and above 115 would become too hard. The numbers for the original greens are very good we just need to keep on top of organic matter build-up to prevent them from softening when wet.

The new greens are very firm and will need time to soften down with a natural and managed accumulation of organic matter to an acceptable level at the turf base.

Consistency
There certainly will be playing quality consistency issues between the new and the old greens. At present the newer greens are firmer and slower than the originals. Our task when establishing the new greens is to marry them up with the existing set whose standards are already good.

Year-Round Playability
The year-round playability of the original greens is generally very good. The new greens are not in a condition that will allow them to be played through their first winter and the poor materials used in their construction will certainly pose problems when considering playing through the winter in the future. The rootzone material chosen is prone to compaction and will drain very poorly if played when wet. The playing qualities of these new greens are certainly in question with the materials that were used during their construction.

SUMMARY TO PLAYING QUALITY
So, the original greens were in good condition and being maintained well. The new greens are struggling and will need a great deal of work to establish a playable surface let alone marry them up to the original set. The materials used in the construction of the new greens will make it very difficult to bring them up to standard especially with regards to year round playability.

Our targets for the original greens this year would be:

- Achieve speeds of 8 - 8½ feet on the Stimpmeter during the summer.
- Achieve smoothness readings of 7 – 8 during the summer.
- Achieve firmness figures of 80-100 gravities during the summer.

We need to review these figures in the winter and set suitable targets for that time. For the new greens the objective is to get them into a condition that would make them acceptable for play. This will probably mean achieving speeds of 7+ on the Stimpmeter and smoothness readings of 6 and 7 but generally the problems with these greens is going to be maintaining the turf health under play. The following agronomic issues section serves to deal with these goals.

AGRONOMIC ISSUES FOR GREENS

New Greens
The STRI weren't involved at any point during the development of the new land holes. Unfortunately the greens haven't been constructed to any recognised standard. It seems that the rootzone growing medium has been formed in a very crude way by mixing sand with soil without any consideration to the makeup of the final mix. If we were constructing these greens then we would be building up a layered profile with very specific materials so that the final construction drains to the desired level and can support healthy growth. The USGA or UK method of construction specifies the nature of the rootzone and drainage layers to guarantee performance. Put simply, your rootzone contains too many fine particles that cause the soil profile to compact to stifle the growing environment and drain poorly to limit year round performance.

If you want a full and detailed appraisal of the construction of the new development greens then contact the STRI Design Department. Such a detailed study is well beyond the scope of your annual agronomy subscription, which currently just covers the maintenance and development of the original 9. Such a survey needs to involve a far more in-depth appraisal of the profiles with extensive soil testing.

During the visit we discussed the following measures to try to help improve the situation but my opinion was that these greens should never have been accepted in the first place, because their construction is so poor that even with intensive (and costly) maintenance the end result would still be less than satisfactory.

- Verti-Drain regularly to relieve soil compaction
- Top dress on a regular basis to smooth out the surfaces and integrate into the upper soil profile.
- Fertilise to maintain turf health.
- Do not mow or verticut too aggressively to cause thinning out of the sward.
- Do not play as the turf begins to thin out.

We did discuss reconstruction and starting again, which I feel would probably be your best option. Contact our Golf Course Architect Jonathan Tucker for specialist advice on the proper design and construction of new golf greens.

Original Greens Surface Preparations
Continue with the existing routines of verticutting, top dressing and mowing as they are producing good results. Raise the height of cut during extended periods of dry weather to prevent the sward from stressing out. I would certainly demonstrate the cassette system for

the vibratory rollers or the brushes to improve the surface refinement process. Otherwise, continue with the existing routines they are working well.

Fertiliser
The fertiliser programme seems to be working well. For the original greens we should be looking to apply in the region of 80kg N/h to promote the development of brown top bent dominant sward. A 3:0:3 turf hardener would be beneficial in the autumn to sustain healthy growth before the onset of winter dormancy.

With the new greens our objective is to simply try to maintain strong growth levels. A growth test was commissioned for sample of New green 1 and the results of this will be forwarded to you in the near future.

Dry Patch
The greens at Drax do develop dry patch if they are allowed to. Continue to micro solid tine on a regular basis to keep the surfaces open and receptive to effective watering. Continue to use wetting agent to treat the soil and prevent it from becoming water repellent if it is dried out. The wetting agent will also help the soil re-wet properly. Hand watering may be necessary in localised areas to prevent them from stressing out. Unfortunately, we don't really want to use the irrigation system because of its high pH and alkalinity and will promote the development of damaging disease attack if it is used too much.

Disease Control
The development of Fusarium patch disease is the main danger for the original greens especially if we have a dry summer when irrigation water has been used intensively. A preventative application of fungicide should be made in August and then possibly again towards the end of September to protect the greens from undue fusarium patch disease activity if this is the case.

Take all patch may also develop on the new greens as it is common in new constructions. Use the fungicide Heritage in the event of a Take all patch disease outbreak. I enclose our leaflets on disease control for your reference on this matter.

Organic Matter
Samples were taken from a couple of the greens to determine the organic matter content of the upper soil profile the results of this testing are outlined below.

STRI Organic Matter Content		
Loss on Ignition (%)		
Depth	**Green 1**	**Green 7**
0 – 20 mm	**9.9**	**10.9**
20 - 40 mm	**5.6**	**6.1**
40 - 60 mm	**3.9**	**3.7**
60 - 80 mm	**3.5**	**3.8**

Our target levels for the top 20mm are 5-6% moving to 3-4% lower down. We therefore have to work the soil profile to get organic matter presence to the right level. If we hit our target levels the greens remain firm whether wet or dry and the year round performance greatly improves. The end of season renovations should involve micro hollow tining and heavy top dressing to remove cores from the top 40mm and replace it with a sandy top dressing.

Aeration
The original greens do require Verti-Draining to relive compaction built up during the playing season. This should be carried out in October when the soil is still dry enough to fissure upon heave of the tines. The new greens require Verti-Draining at regular intervals to constantly relieve the compaction that has built as a result of a poor choice of rootzone material.

Sward Composition
The original greens comprise of a fairly even blend of bent, fescue and annual meadow grass species. Continue to overseed with the fescue bent mix to promote the development of a fescue bent sward. I think our target would probably be an even blend of bents and fescues with the inevitable annual meadow grass there as well.

At present we are happy with any grass cover on the new greens keep overseeding and fertilising to get as much grass cover as you possibly can.

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Charity Hole
The Charity Hole has been constructed with a Mackenzie slope within. Unfortunately the tier is far too steep and needs digging out and softening down to allow it to be mown properly.

OTHER AREAS

TEES
Growth is maintained on the tees throughout the playing season with an application of controlled release fertiliser in the spring. In general the in-season routines seemed to be good and working well with a good grass cover presented at the time of inspection. The use of Primo-MAXX is certainly helping to fine down the sward and reduce the mowing demands.

The renovations at the end of the season should involve scarification, Verti-Draining, top dressing and overseeding. .

APPROACHES, COLLARS AND SURROUNDS
Primo-MAXX is also being used on the approaches to help fine down this grass cover and reduce the mowing demands. If we are looking to improve the quality of this area we would like to top dress more but obviously there is a budgetary constraint to this.

FAIRWAYS
The fairways were being mown at a level of 19mm. They greatly benefit from the worm cast treatment to improve playability during wet periods of autumn and winter weather. Some weeds were evident but these were due to be controlled with a selective herbicide when conditions allow following inspection. Continue to fertilise fairways as required to maintain the development of a dense sward and slit tine through the winter to encourage root development.

ROUGH
It was good to see some seed head rough being encouraged. At present it is a little thick in nature and contains quite a high proportion of coarse grasses. These areas should be baled off in the autumn to take the nutrient out of the situation and encourage the development of the finer grasses. The selective graminicide, Rescue from Syngenta has also become available that can be used to take out coarser perennial ryegrass and Yorkshire fog from the sward to leave the fine fescues behind. Our aim when producing seed head rough is to create beautiful seed head rough that is thin in the base so that we can find and play our ball.

TREE MANAGEMENT
The tree management continues. As discussed you should take out any trees that shade the new greens right from the start. They have been constructed using such a poor rootzone they won't be able to take any additional stress.

NEW LAND
The design appears to be flawed and it doesn't appear to have been the intensity of drainage that appears on the has built drawings. I fear that the new land holes will keep costing the Club to get them performing right because the initial construction hasn't been of a high standard.

CONCLUSION

So the original course was in terrific condition but we have real concerns about the new holes. The STRI Design and Golf Course Architecture departments can help you construct new holes properly.

I hope you find all the points contained within the report both clear and helpful if however you do require any further clarifications do not hesitate to contact me.

Signed

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Turfgrass Agronomist