

The STRI logo consists of the letters 'STRI' in a white, bold, sans-serif font, positioned on a dark green rectangular background. To the right of the text, there are several thin, white, curved lines that suggest the texture of grass or a golf course surface.

STRI



Montrose Golf Links

Advisory Report on the Golf Course incorporating the STRI Programme

Report Date: 23rd June 2015

Consultant: Ian Craig

CONFIDENTIAL

Date of Visit: 2nd June 2015

Visit Objective: To carry out the annual inspection of the golf course, take further objective measurements from the indicator greens and confirm ongoing maintenance requirements.

Present: Mr Niall Bruce – Course Manager
Mr Les Rae – Deputy Course Manager
Mr Paul Teviotdale – 1st Assistant
Mr Richard Windows – STRI Ltd
Mr Ian Craig – STRI Ltd

Weather: 10°C with heavy showers

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Executive Summary

- General presentation of the golf course was good despite ongoing cold temperatures and difficult growing conditions experienced in the spring.
- Montrose is a wonderfully natural links course currently standing up to the rigours of modern play. To retain its integrity it is important that inputs are carefully managed to optimise growth and recovery without changing the character of the course.
- The cold spring conditions are restricting recovery from winter play, however localised fertiliser applications are helping to accelerate the process.
- Improving the performance of the green hinges on organic matter reduction via more intensive sand top dressing.
- The ongoing superior performance of the 1st green is illustrative of the future agronomic strategy of organic matter reduction.
- Divot recovery has been slow and particularly sensitive areas such as the 4th fairway landing zone are weak and patchy. Some alteration is required to accelerate divot recovery.
- Playing from the fairways in the winter does compromise their spring condition and it does require greater inputs to re-establish grass cover.
- The use of mats will reduce this damage even if used to localised sensitive areas such as the 4th fairway.
- The rough was in superb condition with a fantastic blend of desirable species offering a wonderful visual aesthetic and a fair challenge to the errant golf shot.
- The course development plans are very exciting and STRI would be delighted to offer agronomic assistance in grass species and rootzone selection to optimise the consistency between new and existing areas of the golf course.
- Ongoing gorse removal is required to restore and maintain the links characteristic of the golf course.

Key Observations

Greens

The slow start due to the cold and dry weather through March, April and into May has resulted in difficulties in achieving canopy closure and reasonable sward refinement due to the slow pick up in temperatures and as a result little in the way of fertiliser response.

Recent increases in temperature should result in improved sward density and at the time of inspection annual meadow-grass seed head production had started which is an indication that active growing temperatures are now in place.

Sward density and texture was generally good but variable from green to green with greens 1 and 9 demonstrating a more favourable sward composition with higher populations of the finer grasses and as a result delivering superior performance characteristics.

Fescue overseeding with the Vredo disc seeder has been carried out for the last couple of years and we are beginning to see benefits of this now. The 1st and 9th greens supporting populations of around 10% fescue with good populations of bent and were indeed the best performing of the indicator greens at the time of the visit.

Organic Matter Content

Samples were taken and submitted to our laboratory to assess the organic matter content of the upper soil profile beneath the indicator greens. Our target range for organic matter content is 4 – 6 % in the top 20 mm moving down to < 4 % lower down.

The results of the organic matter content testing are contained in the table below with trends detailed in the Appendix.

Organic Matter Content				
Loss on Ignition (%)				
	Green 1	Green 9	Green 14	Green 15
0-20 mm	5.7	7.6	8.1	9.0
20-40 mm	3.7	5.7	6.5	5.7
40-60 mm	3.3	4.0	3.8	3.9
60-80 mm	3.0	3.9	4.2	3.7

- Organic matter content within the upper 20 mm of the soil profile has shown a positive reduction across all four indicator greens. The 1st green is comfortably within the target range of 4-6% and this positive reduction is illustrated with its superior performance which can be seen in the performance data.
- At the 20-40 mm level the 1st green has reduced also and remains within target range, the 9th, 14th and 15th greens have seen a slight increase in organic matter at this level which would indicate that the increased sand top dressing is simply burying the organic matter.

- We should look to counteract this with some top dressing in conjunction with solid tine aeration in an effort to dilute this organic matter and reduce the levels. Routine aeration should help with natural degradation of this organic matter.

Performance Data

The full suite of STRI programme testing was carried out to the indicator greens with results detailed in the table and graphs in the Appendix and discussions and observations below.

- Average surface firmness was 94 gravities (range 87-100) which is just outside the target range of 100-140 gravities. This is most likely due to the accumulation of organic matter in the upper soil profile combined with the wet conditions experienced on the day of the visit.
- The 1st green was the firmest at 100 gravities which again is indicative of the organic matter levels which are within target range on this green only.
- The soil based 14th green was noticeably softer at 87 gravities.
- Average soil moisture was 37% (range 30-43%) which is outside of the target range of 10-25% for links courses in response to heavy rainfall during the time of inspection.
- As with surface firmness the 1st green was again the best performing with soil moisture of 30% with the soil based 14 having an average soil moisture of 43% indicating higher volume of sand input required to reduce the moisture retentive nature of this surface.
- Smoothness and trueness of ball roll were very consistent and broadly within target range which is very positive given the difficult conditions experienced so far this year. The 14th green was noted to be less smooth than the others which is most likely due to the poorer botanical composition of this green, higher populations of annual meadow grass therefore greater levels of seed head production.
- Average green speed was 8ft 2in which is a little slower than we would ideally like to see however wet conditions at the time of inspection will have significantly affected green speed. Consistency of pace across greens 1, 9 & 15 was superb however the 14th was notably slower owing to the softer moisture retentive nature of this surface.

Agronomic Strategy

- The performance characteristics of the indicator greens serves to highlight the required agronomic strategy over the next few years. The 1st green for example is an exposed coastal green subject to natural top dressing and as a result the sandy profile and lower organic matter are allowing the proliferation of the finer grasses and fescue populations to this green are notably higher than the others. Conversely the 14th green is a fairly sheltered and soil based construction which is much softer and more moisture retentive than greens such as the 1st. While increased sand top dressing would be recommended across all surfaces it is important that extra inputs to the poorer greens, exhibiting higher organic matter and poorer soil profiles such as the 14th are delivered.

Fairways

- Winter golf continues to have an impact on the fairways at Montrose and heavy divot damage was noted to certain sensitive areas of fairways such as the landing zone on No. 4.
- As many as 25 divots in 1 m² was noted to the landing area on the 4th at the time of inspection. The heavy play through the winter coupled with a cold spring resulting in slow divot recovery is having an impact on the playability of these areas.
- A granular 12:6:6 fertiliser has been applied to the fairways however given the low temperatures experienced through the spring the response from this has been limited to date and more intensive fertiliser applications will be required to the sensitive areas such as landing zones and high traffic routes across fairways.
- Short and long term solutions to improve the playing quality and protect these areas further will be discussed later in the report.

Gorse Management

- It is understood that the Club has been in contact with STRI Senior Ecologist Bob Taylor regarding a gorse management plan.
- Many of the more inland lying holes on the golf course are gorse lined, however it has become overgrown and past its best and requires removal to restore the natural links characteristic of this section of the course.

Key Recommendations

Greens

- An increase in sand top dressing inputs is required to all greens to continue the organic matter reduction and produce firmer drier surfaces favouring the finer grasses.
- Top dressing should be increased to ensure that the target of at least 120 tonnes per ha is achieved.
- We should also look at greater applications of sand to the known softer greens such as the 14th. This soil based green is more moisture retentive, softer with higher populations of annual meadow-grass and will require greater inputs of sand to bring it in line with the firmer greens on the course.
- Regular rolling of the greens should also be carried out to optimise ball roll qualities without the necessity of cutting too low and this should also help to favour the finer grasses.
- The Revolution wetting agent programme is delivering consistent results and should be sustained, however the monthly applications can also be tank mixed with Porthcawl which is known to produce good results and an even distribution of the Porthcawl is achieved.
- A continuation of the fescue overseeding would be recommended throughout the season. So far this is yielding some pleasing results on the drier greens and in conjunction with increased top

dressing, firmer and drier surfaces we should expect to see the fescue populations increase to all greens.

Fairways

- The 12:6:6 granular fertiliser to the fairways was applied in the spring and response has been slow, however we would expect to see this pick up in the next few weeks in response to increased temperatures.
- Further applications of fertiliser should be made to landing zones and high traffic routes to accelerate the progress of these areas.
- Localised overseeding may be necessary to restore a full grass cover to areas of high traffic following the winter play.
- Sand top dressing should also be extended to these areas to optimise surface firmness and sward durability.
- The sensitive landing area to the 4th will require intensive divot patching and we should look to apply as close to 30 g/m² of seed within the divot mix to accelerate recovery and restoration of grass cover as quickly as possible.
- We would recommend the use of mats for winter play to fairways in an effort to protect the turf. If not throughout the entire course it would be strongly recommended that localised sensitive areas such as the landing zone on the 4th be protected in this manner during the winter as spring recovery, particularly this year owing to cold temperatures is slow following the heavy traffic experienced during the winter months.
- Long term changes may also be considered to protect this fairway such as relocation of a winter tee which should significantly change the landing zone of the fairway. It may also be worthwhile considering softening some of the mounding and undulations to the 4th fairway as this is resulting in very localised gathering spots which are severely damaged by winter play.

Signed



Ian W Craig BSc (Hons)
Turfgrass Agronomist, STRI Ltd

STRI is completely independent and has no alliances to commercial products, services or contractors. This ensures that our design, project management and advisory services provide the best solutions for each individual client.

The STRI Programme provides golf courses with measurements and data that help to monitor and assess golf course performance. The R&A has recently developed CourseTracker (www.coursetracker.org), a free, online business management tool for golf courses, to record, review and analyse golf club performance across many areas of your business, including the golf course. STRI believes The R&A CourseTracker combined with the STRI Programme provides the tools you need to objectively monitor and assess your golf course performance.

APPENDIX 1

PERFORMANCE DATA

Performance Data

STRI Programme Measurement Protocols

By taking measurements of the playing qualities we can accurately describe the standards being set and also compare the results against our target performance levels. Essentially, our aim is to produce a set of greens that receive approach shots correctly then provide smooth/true and well-paced surfaces for putting. It is important that the greens are performing consistently on any given day and as well as possible throughout the year.

Soil Moisture Content

The soil moisture content is measured using a Theta Probe Moisture Meter. Nine points are sampled on each green (3 x 3 grid pattern) and the average calculated. The Theta Probe measures volumetric water content (VWC) through the upper 60mm of the soil profile.

The moisture content of the soil profile has a significant impact on the playing qualities of the greens and also the health of the turf. When the soil moisture content is too high, the surfaces can become soft and the turf health can also suffer. When the soil moisture content is too low the consistency and uniformity of the turf can become compromised.

Surface Firmness/Hardness

The firmness of the greens is measured using the Clegg Impact Hammer. A 9-point sampling grid was employed to allow us to calculate an average hardness reading for each green and also determine the level of consistency within the 9 readings.

Green Speed

The speed of the greens is measured using a Stimpmeter. The speed is expressed as the average distance rolled by 3 golf balls that are delivered from the Stimpmeter ramp on a flat area of the green and repeated in the opposite direction. The greater the distance the faster the surface is deemed to be. At least two readings are taken from each green then the results were calculated using the Brede equation to take out any slope effects.

Smoothness/Trueness

The smoothness and trueness of the selected greens is measured using the Trueness Meter™. This device measures the smoothness (vertical deviation) and trueness (lateral deviation) of the putting surfaces with the level of deviation being expressed in millimeters per meter (mm/m). With these results, lower readings indicate a smoother or truer surface.

Our aim when maintaining the greens is to produce surfaces that are smooth and true for putting for as long as possible throughout the year. We are aiming to create smooth and true surfaces for putting that do not deflect the ball from its intended path (“snaking”) or kill its momentum (“bobbling” and “chattering”). During the main playing season, our target range for smoothness is <25 mm/m of vertical deviation and for trueness <10 mm/m of lateral deflection. The lower end of these target ranges represents fantastic putting surfaces with the higher end providing really good standards for routine play. These target ranges are very challenging but we are striving to achieve the highest standards of play.

Performance Measurement Results							
Green No.	Speed (distance)	Smoothness (mm/m)	Trueness (mm/m)	Firmness Mean (gravities)	Firmness SEM (±)	Moisture Content (%)	Moisture Content SEM (±)
1	8 ft 2 in	25.85	9.08	100	1.6	30.5	1.6
9	8 ft 2 in	24.37	8.59	98	1.6	35.4	0.7
14	7 ft 9 in	27.33	8.91	87	6.3	43.4	6.5
15	8 ft 1 in	25.76	9.40	90	2.2	37.2	0.8

Figure 1

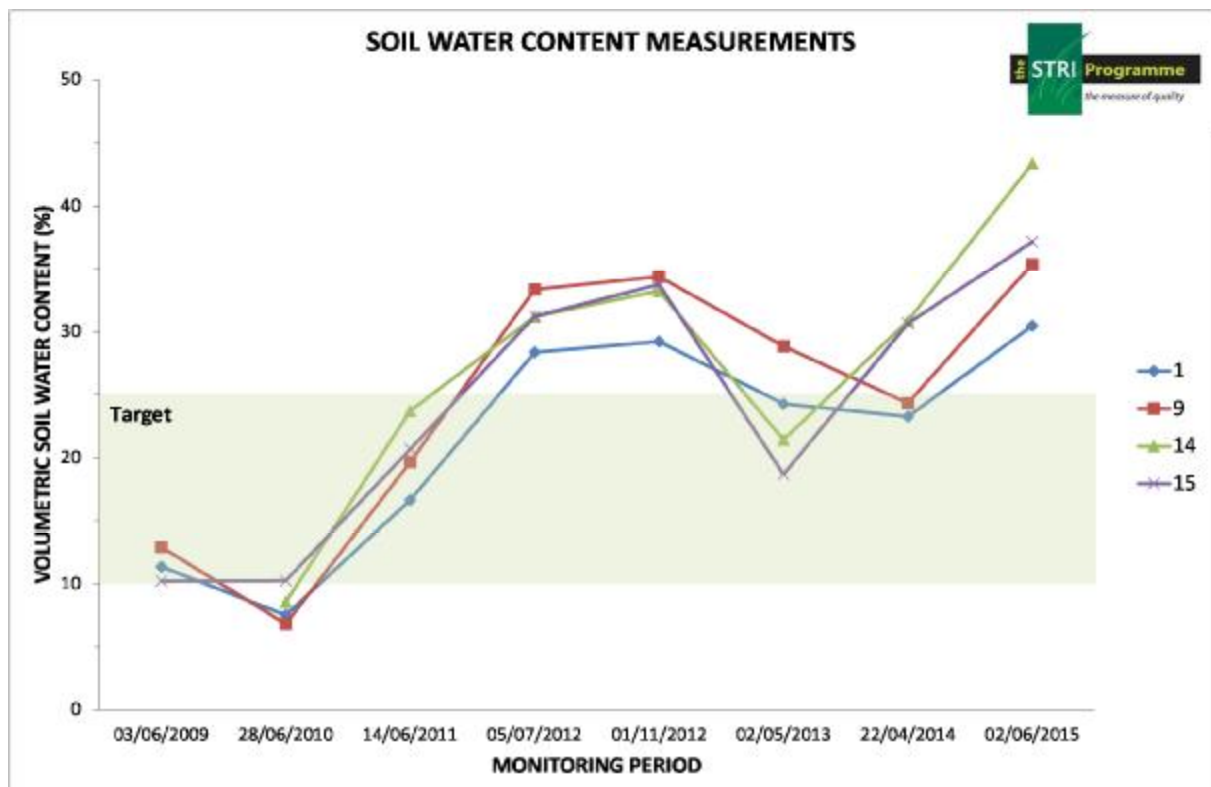


Figure 2

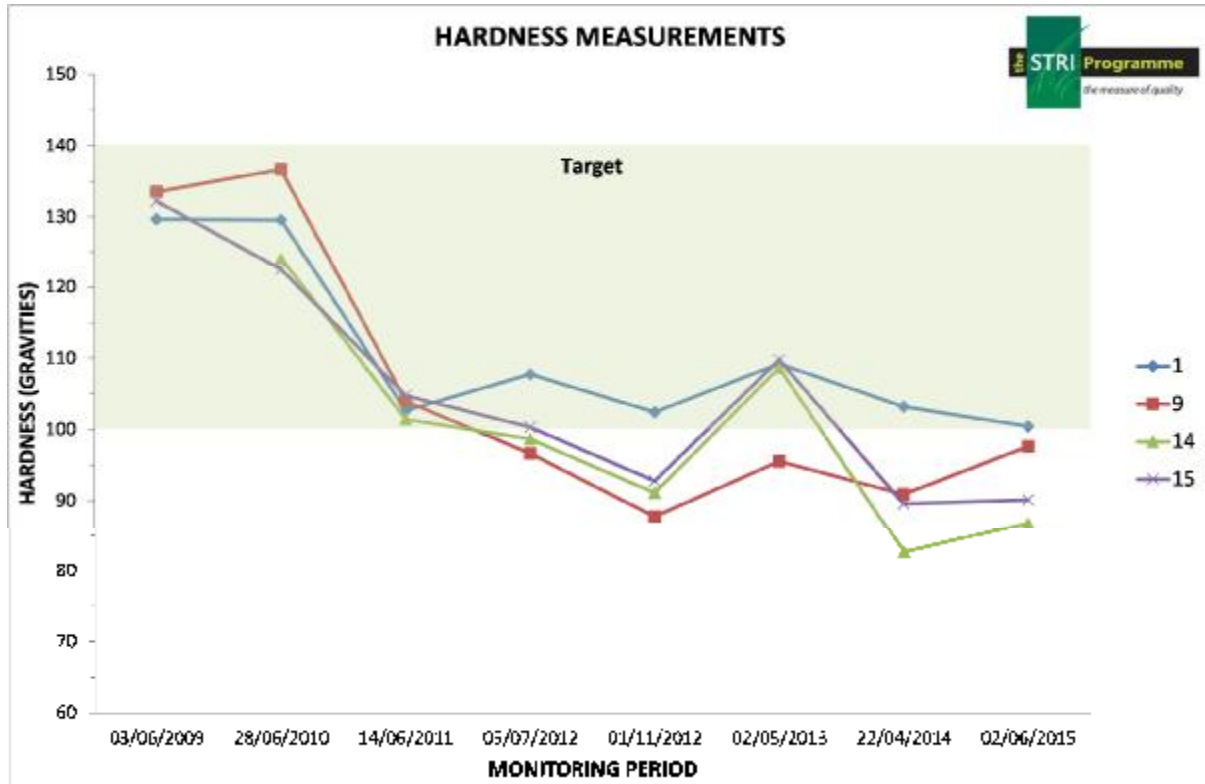


Figure 3

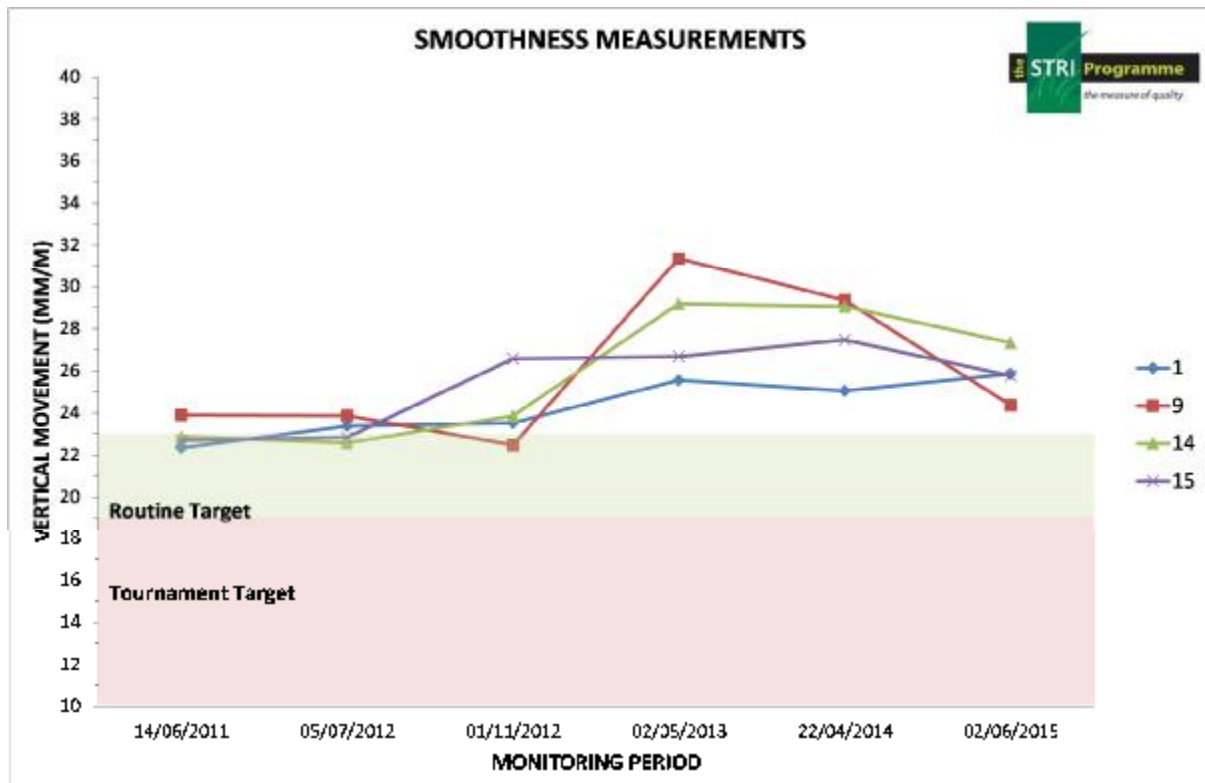


Figure 4

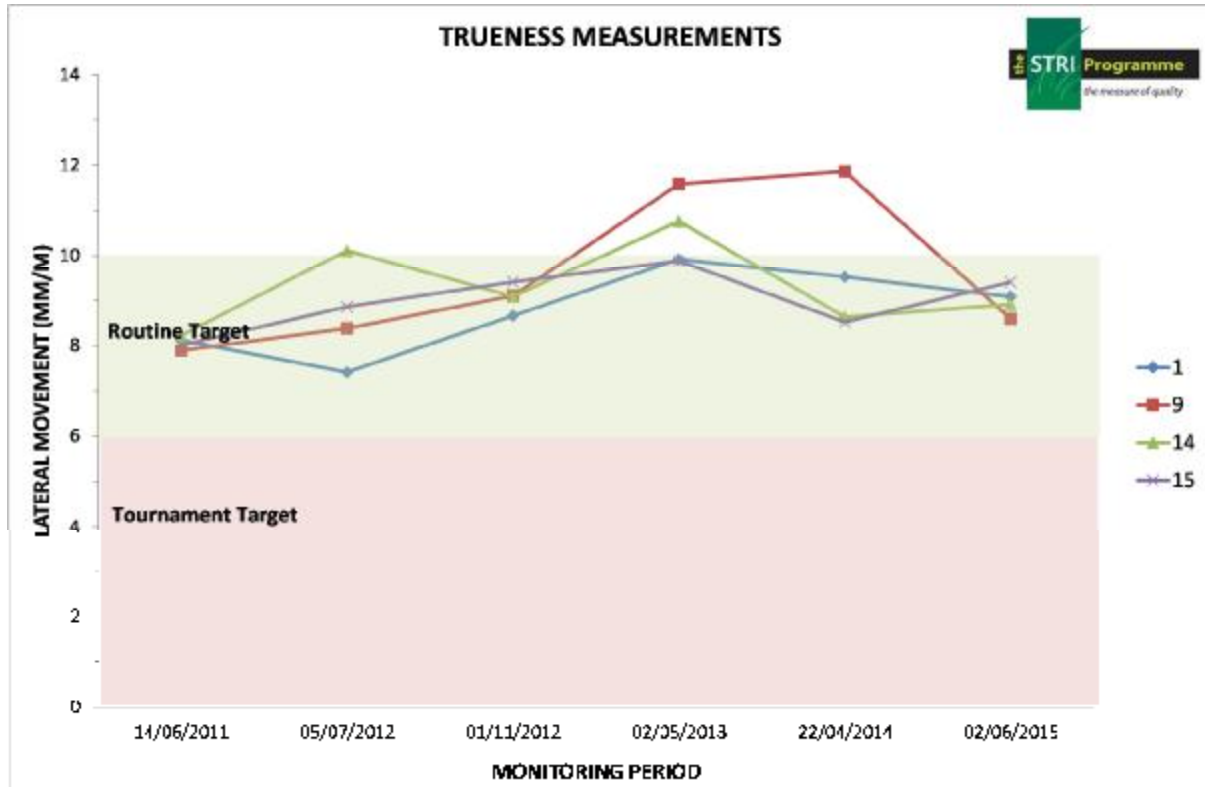


Figure 5

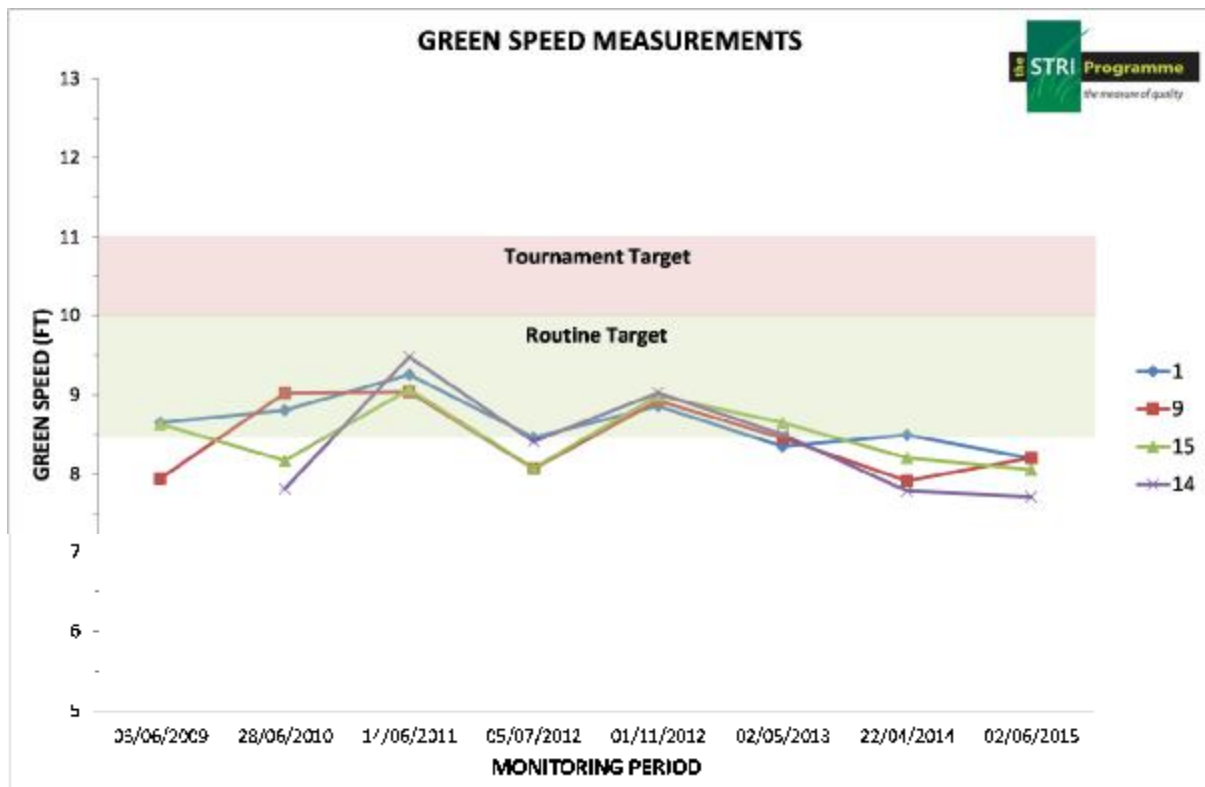


Figure 6

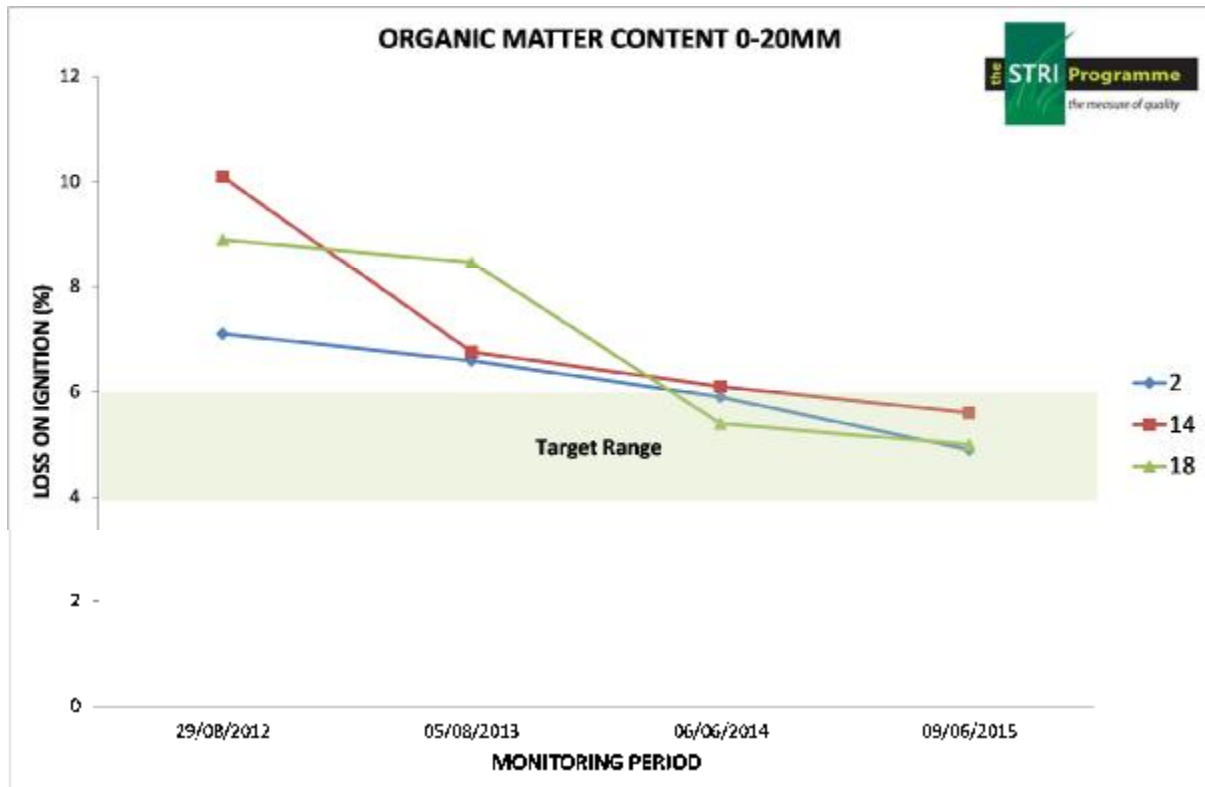


Figure 7

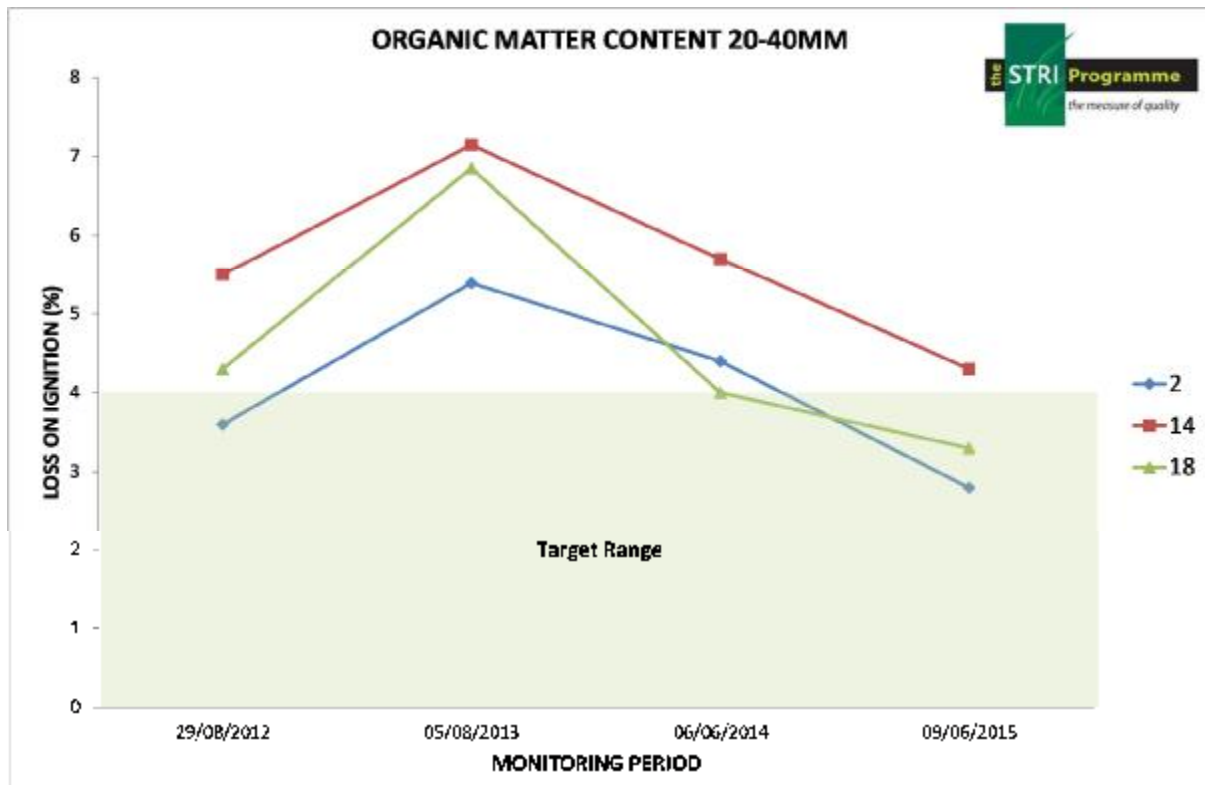


Figure 8

ORGANIC MATTER CONTENT

CLIENT: MONTROSE LINKS TRUST
ADDRESS: TRAILL DRIVE, MONTROSE,
ANGUS DD10 8SW

DATE RECEIVED: 08/05/15
DATE REPORTED: 19/05/15
RESULTS TO: IWC

TEST RESULTS AUTHORISED BY:

Michael Baines, Laboratory Manager

CONDITION OF SAMPLE UPON ARRIVAL: MOIST

SAMPLE NO	DESCRIPTION	LOSS ON IGNITION (%) [*]
A13792/1	1 0-20 mm	5.7
	20-40 mm	3.7
	40-60 mm	3.3
	60-80 mm	3.0
A13792/2	9 0-20 mm	7.6
	20-40 mm	5.7
	40-60 mm	4.0
	60-80 mm	3.9
A13792/3	14 0-20 mm	8.1
	20-40 mm	6.5
	40-60 mm	3.8
	60-80 mm	4.2
A13792/4	15 0-20 mm	9.0
	20-40 mm	5.7
	40-60 mm	3.9
	60-80 mm	3.7

* ASTM F1647-11 Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes (Method A)



THE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED

Testing Certificate 2159 - 01

STRI

St Ives Estate, Bingley, West Yorkshire, BD16 1AU
T. 01274 565131 F. 01274 561891 E. info@stri.co.uk www.stri.co.uk

SOIL CHEMICAL ANALYSIS

CLIENT:

MONTROSE LINKS TRUST

RESULTS TO: **IWC**

DATE RECEIVED:

08/05/2015

Lab No.	Source	pH	P ₂ O ₅ (mg/l)	K ₂ O (mg/l)
A13792/1	GREEN 1	5.6	18	71
A13792/2	GREEN 9	5.0	5	80
A13792/3	GREEN 14	4.9	7	84
A13792/4	GREEN 15	4.9	7	84

Mr M A Baines, Soil Laboratory Manager

THE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED.

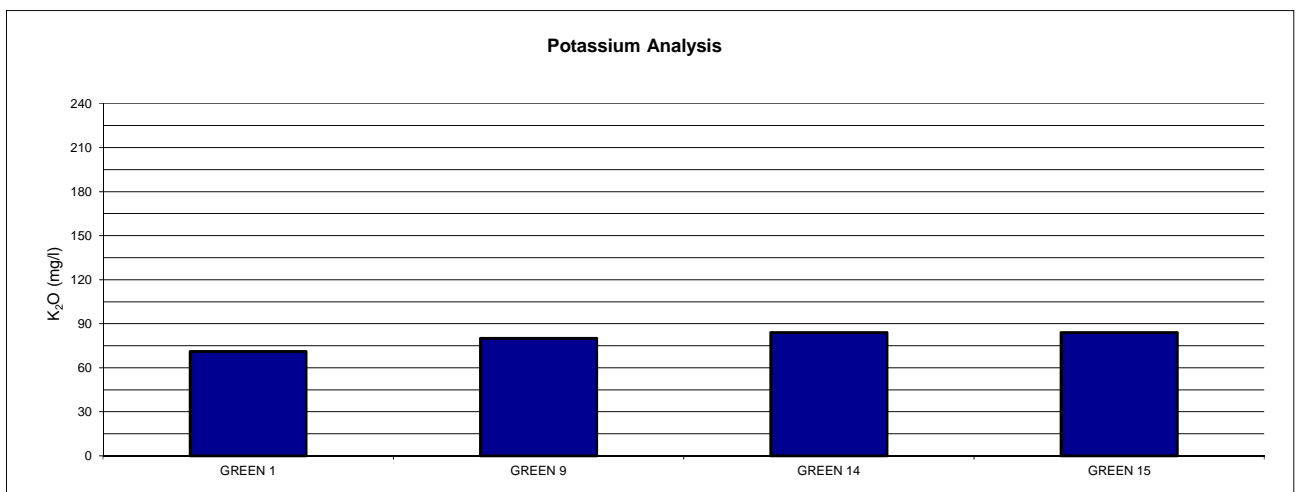
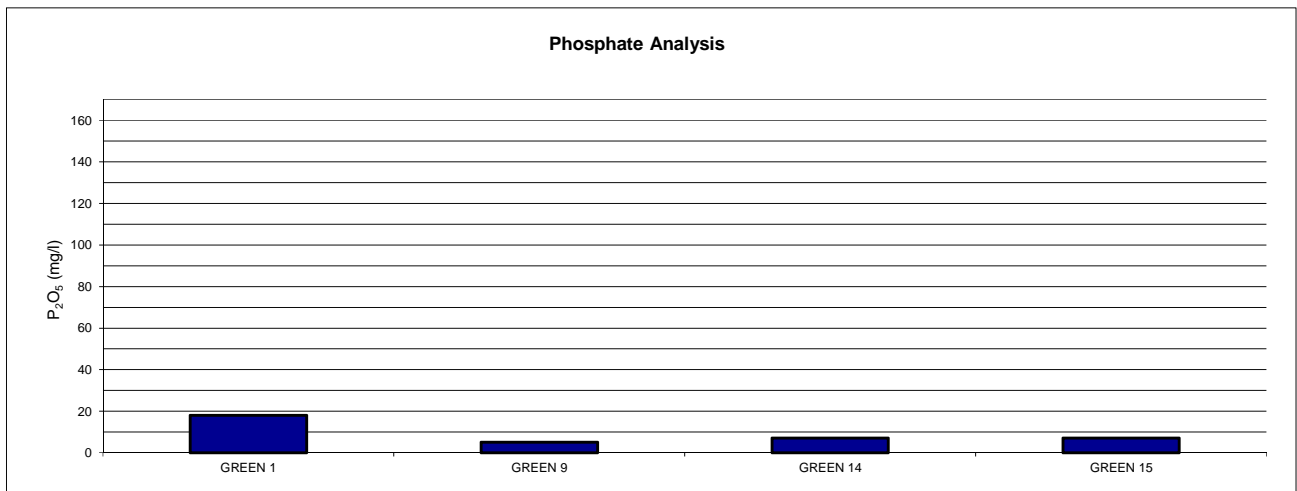
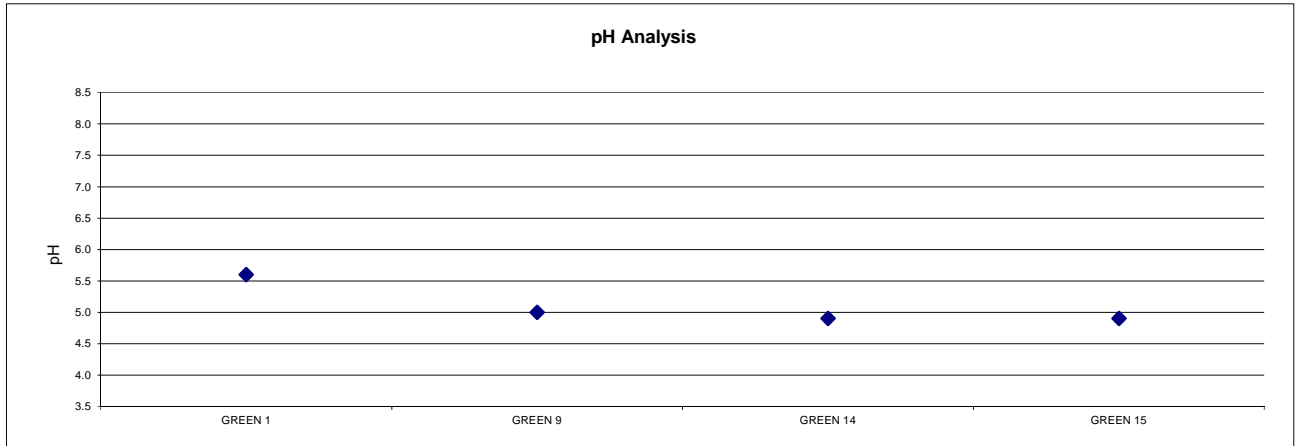
STRI

St Ives Estate, Bingley, West Yorkshire, BD16 1AU
T. 01274 565131 F. 01274 561891 E. info@stri.co.uk www.stri.co.uk

SOIL CHEMICAL ANALYSIS

MONTROSE LINKS TRUST

Date: 08/05/15



THE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED.