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NEWTONMORE GOLF CLUB

Advisory Report on the Golf Course incorporating the STRI Programme

Report Date: 29th July 2021
Consultant: Gary Smith



Newtonmore Golf Club

Date of Visit: Tuesday 22nd June 2021

Visit Objective: To review the condition of the golf greens, gather objective performance measurements and confirm ongoing maintenance requirements.

Present: Mr Richard Ralph - Head Greenkeeper, Mr Robert Sellar - Greens Convenor
Mr Paul McArthur - Committee, Mr Gary Smith – Agronomic Consultant STRI Ltd

Weather: Sunshine. 20°C.

Headlines

- The very challenging winter of 2020 with its extended ice cover and following very cold spring of 2021 have without doubt had a severe impact on the grass sward quality and grass plant volumes at Newtonmore Golf Club. The difficulties in managing fine turf throughout this period are well documented in its extremes of cold weather, more especially, as we followed on from a season of restricted maintenance brought on by the Coronavirus pandemic and vastly increased demand for play in most courses, creating huge abiotic stresses on the golf courses. The remnants of the, already weakened, grasses from these episodes in 2020 did not have the luxury of a traditional spring regenerative period, the unseasonal cold conditions and the cumulative effect has impacted the grass plant health outcomes to the point where we have lost many grass plants and suffered substantial damage to many others.
- The turf surfaces at Newtonmore Golf Club still display evidence of quite severe low temperature injury, commonly called “winterkill”, and display many brown/black lesions on the surface of the plants, with a gelatinous look and feel to the leaf structure, coupled with contortion/distortion of growth habit on many of the plant leaves and a bleaching of many of the grass plants leaf tips. All in all, the grass plant populations at Newtonmore Golf Club were, at the time of STRI visit, in a much-weakened position.
- Low temperature injury expressing damage from freeze and thaw cycles is not unique to Newtonmore Golf Club, however, what is unique to Newtonmore Golf Club is the way in which the individual greens and the individual plants within them reacted to such severe growing conditions, comparison in damage outcome should not be made from green to green or golf Club to Golf Club, as all will have a unique eco-system and thus growing environment, and all will react differently to the stresses thrust upon them during these very challenging weather episodes.
- It should also be highlighted that the maintenance team could not have prevented this type of damage from occurring, nor could they, due to the very cold spring, re-instate the damaged sections as they would have in any normal traditional spring conditions year. Indeed, even with a traditional spring, the increasing volume of play, and the lack of security from an automatic or modern piped irrigation system, the maintenance team would still have been at a massive disadvantage in any regeneration strategy.
- Current and historical Basidiomycete activity (fairy ring) is apparent on several of the green surfaces, the continued application of a robust surfactant (wetting agent) application and aeration programme should dampen future activity.
- The difficulties in managing soil moisture during this period, especially when relying on limited irrigation, has widely been seen to fuel issues such as superficial fairy rings (Basidiomycete Fungi), act as a trigger for pathogenic disease outbreak and underpin developing areas of lingering stress and higher wear. Mitigation and security must be provided in the future by the installation of piped water throughout the course or a fully operational automatic irrigation system.
- The wider areas of the course are seen to be presented as well as staff numbers allow, however, many sections are struggling in drought conditions, whilst many of the areas of traffic related wear have had no additional time to recover during the recent cold period. This regenerative period is a luxury we should not expect next spring, as the fickle and ever-changing climatic conditions are proving, so the proactive protection of sensitive areas through green approaches, green surrounds and natural

pathways across the course needs to be set early this autumn, especially given the increased play courses are experiencing.

- Rush infestation was noted on many sections and a strategy was discussed to alleviate and control current and future expressions.
- The organic matter content of the tested greens is well above optimal target with variables from green to green in the 0-80mm horizons. I have every confidence that if maintenance plans of increased aeration, microbial decomposition and top-dressing inputs can be put in place, they will be adequate to stabilise and reverse the current negative trend.
- Soil moisture volume averages were in target. Surface organic matter volume variability and the application method of applied irrigation will affect these results. Despite moisture content in target the greens surfaces expressed a softness, wholly due to the elevated organic matter volumes.
- Firmness or surface receptivity was below desired target and evident of a wide variable from 72g – 97g across the tested surfaces. Without doubt influenced by the organic matter content in the green rootzone profiles.
- Smoothness and trueness results were poor and display a reflection of the pressured surface challenges within the greens areas due to an incomplete canopy closure and aggressive Poa annua seed head activity.
- Green speed averages were below target, the protection of the grass plants is of paramount importance and with these protections in place and the visible damage to the grass plants, green speed values will be lower than desired. The green speed will improve as the weather patterns improve allowing the maintenance team to carry out their normal maintenance and refinement inputs.
- pH is below target at the lower end for optimal growth, aim to achieve an increase in pH value in the coming seasons.

Key Actions

- Introduce increased top-dressing inputs in a little and often approach to dilute the elevated organic matter content, incorporating the surrounds and approaches.
- Inter-seed remaining open canopy sections with fescue/bent seed cultivars mix or an ultra-fine ryegrass cultivar to quickly force the canopy closure.
- Develop a more robust aeration and organic matter removal strategy in the 0-80mm rootzone horizons.
- Refinement strategies such as brushing should be carried out on the greens, surrounds, and approaches more often.
- Continue with the Basidiomycete fungi control programme, already in place at the club.
- Develop a more combative approach to Poa annua seed head activity through Prohexadione applications.
- Develop a strategy to improve/replace the course irrigation system, involve a professional irrigation consultant.
- Monitor Organic matter accumulation through loss on ignition testing, on an annual cycle.

Objective Measurements

Measurement	Average	Target Range
Soil Moisture (%)	20% (range 11-26%)	15-30%
Hardness (Gravities)	83 Gravities (range 72-97g)	85-120g
Smoothness (mm/m)	35 mm/m	<25 mm/m
Trueness (mm/m)	50 mm/m	<10 mm/m
Green Speed	7ft 4in	8-10 ft
Organic Matter 0-20 mm (%)	12.5%	3-6%
Organic Matter 20-40 mm (%)	8.4%	<4%
Soil pH	4.8	5.0-6.5
Phosphate (P ₂ O ₅)	18mg/l	>10 (mg/l)
Potassium (K ₂ O)	102 mg/l	>30 mg/l

Key: In Target Marginal Variance Out of Target

Photo Observations and Comments



Figure 1: The course is presented very well considering the size of the cut areas and the numbers of staff within the golf club.



Figure 2: The greens display a mature sward and an open canopy with large populations of desired fine turf grasses.



Figure 3: Several greens have large sections of grass plant loss or thinning.



Figure 4: Low temperature injury- winterkill- damage is evident on most grass plants.



Figure 5: Basidiomycete fungi expressions and localised dry patch are evident on several surfaces.



Figure 6: Poa annua seed head expression is visible throughout the remaining grass plant swards.

Photo Observations and Comments



Figure 7: The rootzone is an open friable structure, however organic matter content is extensive and needs much work to reduce it to provide optimum growing conditions.



Figure 8: Necessary maintenance is also exacerbating the stresses on the grass plants.



Figure 9: Natural pathways are increasing the stresses on grass plants throughout the golf course.



Figure 10: The tee sections are under pressure from play and dry weather but coping with the extremes and in most cases display an admirable grass cover.



Figure 11: The tee sections are under pressure from play and dry weather but coping with the extremes and in most cases display an admirable grass cover.



Figure 12: Rush infestation is apparent on several sections of the golf course.

Recommendations

Greens

- Introducing increased top-dressing inputs should be continued at a minimum 70 tonnes (preferably 120 tonnes) per hectare per annum on the greens, incorporating the surrounds and approaches. This extended area strategy will improve surface firmness, dilute the organic matter, improve the percolation rates of applied irrigation and falling rainwater and underpin positive plant health outcomes.
- Inter-seeding should be increased again using a variety of methods including the use of linear channel or disc seeding in the off season with a mix of pot or dimple seeding throughout the busier periods. This dual approach will offer greater influence and improvement in germination and sward transition rates. A suitable fescue/bent grass cultivar with a mycorrhizal coating will deliver the results required at Newtonmore Golf Club.
- Carry out solid tine aeration regularly and I would hope Sarel rolling on all greens, at least twice monthly is achievable, likewise the deeper Procure or Verti-Drain should be employed two to six times per annum with the length of tines varied to accommodate mid (100mm-150mm) and deep (225mm-300mm) aeration, this will help break up the dense material below the 100mm horizon.
- Use of a Turf Iron on a considered use approach will help increase the overall pace of the greens at pressured times of the year, and to smooth the greens after any surface disturbance. Overuse will no doubt put seedlings under undue pressure, so a disciplined-as necessary-regime must be instilled throughout the year.
- In the off-season introduce a pass of a scarifying unit to intensively remove organic material in the top 5-15mm of the rootzone profile and replace with top-dressing. This operation creates another opportunity to incorporate an inter-seeding with fescue/bent seed coated with mycorrhizal fungi which will further develop the sward populations of these preferred fine grass species whilst accelerating the surface recovery process.
- Follow the scarification operations with a hollow tine over the greens with an 8-10mm diameter core tine at 35mm spacings, to a minimum depth of 80mm. Apply top-dressing and work into the holes through drag matting or a sweep-n-fill type brushing accessory to ensure that the core holes are filled to the surface level. This operation should ideally be carried out on a further two occasions before spring 2022.
- The maintenance team strategic surfactant (wetting agent), bio stimulant and nutritional inputs are ideal to achieve the positive plant health outcomes desired at Newtonmore Golf Club and should be continued with, indeed their use, with emphasis on the surfactant applications, should be extended into the off-season months as required. This extended strategy will facilitate healthy and robust grass plant swards on all fine-turf areas of the golf course.
- The use of Trinexapac-ethyl (Primo-Maxx/Maintain nt) plant growth regulator (PGR), at 0.4lt per hectare monthly on greens or adopting a suitable growth degree day model during the growing season, will positively influence sward texture and surface consistency. This approach has been shown to help reduce the stresses significant to highly managed turf grasses.
- Consider the addition of Prohexadione (Attraxor/Kopis) as an alternative or addition to Trinexapac-ethyl to support a combative approach toward *Poa annua* seed head expression, the adoption of this dual product type in a concurrent single product application strategy is warranted for consideration (one which I would be happy to discuss further), positive results have been witnessed in the reduction of seed head expression using a PGR programme which incorporates applications of both products. Please do not tank mix Prohexadione with products containing Calcium, Manganese or Magnesium.
- Introduce the use of silicon throughout the growing season to facilitate a more upright growth habit and increased grass plant protection. Silicon in plants helps strengthen cell wall tissues, supports a reduced water loss during periods of dry weather, increases ball roll and green speed, improves uniform cutting and appearance of turf and above all assists in removal of *Poa annua* seed heads.
- Introduce the use of Fulvic acid (10lt per hectare) in the off-season, it will prove valuable to the greens condition going forward and will improve health outcomes throughout the off-season. Fulvic acid enhances cell division and elongation. Root growth is magnified with obvious benefits (so long as moisture and soil structure are appropriately managed) it also increases the plants oxygen uptake capacity with an associated increase in chlorophyll production and the permeability of plant membranes which improves the uptake of all nutrients.

- Ph is low, apply increased volumes of Calcium @ 1-tonne per hectare on the green surfaces at the close season and continue to monitor pH on an annual basis.

Greens Collars, Surrounds & Approaches

- All areas adjacent to the greens considered approach or collar should receive the identical maintenance inputs as the greens surface area. A focus on increasing the area size of managed approach sections to the green would improve year-round playability and help ease some of the traffic stress seen on sections of the golf course.
- Inter-seed using an ultra-fine ryegrass to provide a more resilient year-round playing surface. Coat the cultivar with mycorrhizal fungi pre-application to enhance seed germination and microbiome development.

Tees, Fairways & Natural Pathways

- Tee markers should be moved every day or as routinely as time, available surface area and applied rules dictate. Increased traffic wear was evident on several sections, nonetheless, grass cover on the viewed surfaces was admirable.
- Introduce a plan of inter-seeding the tees with an ultra-fine ryegrass mix with an addition of the seeds being coated in a mycorrhizal fungi to accelerate damage recovery and underpin an increase of abiotic and biotic stress tolerance of the tees.
- The use of microbial inoculants such as mycorrhizae is encouraged to further support the growing environment and encourage a hardier turf canopy.
- A programmed use of PGRs on the tees would further support increased resilience and benefit grass plant health through the ever-increasing demand for play.
- Aeration is required more regularly, and I would encourage it continue with increasing operations on the more under pressure tees and all par 3 tees. Spiking, Slitting or Air injection are all viable options to support oxygenation of the surfaces.
- Top-dressing of weaker areas on the wider golf course will also help them develop, the usage of a Wiedenmann TerraRake or similar scarification equipment on all tees, surrounds, fairways, and natural pathways will benefit both in organic matter removal and sward composition improvement. It is suggested surface raking be carried out at least twice to four times per annum. With additional aeration, surface raking and brushing introduced to these sections, they will continue to improve, if sufficient moisture and heat are available, in the meantime, any additional moisture inputs, surface oxygenation followed by increased inter-seeding of weaker areas will boost the expected results this year and beyond.
- Look to increase the inputs of both seaweeds and molasses-based products on the fairways with particular attention given to the more pressured walkways. Both bio stimulants will naturally improve the capacity for microbiome eco system development and improved grass plant health.
- Consider the addition of either a Zeolite type granule or a moisture retentive organic material such as seaweed or minute amounts of peat. This will help retain moisture in the rootzone alongside any wetting agent programme and potential upgrade to the irrigation system.
- The increased addition of ecological and aesthetic rough grasses at Newtonmore golf club should be considered as a necessary reduction in current cutting area, an improvement to play, and course design aspirations. I do understand golfer concerns about unmanaged rough and how it could potentially interfere greatly in the golfing experience at Newtonmore golf club. The loss of a ball or a heavy lie is often a cause of frustration, however naturalised managed rough will enhance the golfing experience at Newtonmore golf club without hindrance of locating and advancing the ball.
Newtonmore has afforded itself through recent experience an excellent opportunity to provide increased habitat for developing wildlife diversity and improved ecological expansion. A strategic and disciplined management structure will improve sward composition and the ecological diversity of any current or future planned sections of naturalised rough grass. Positive eco system development will encourage desired finer grass species, increased variety in wild flora and an abundance of new wildlife to the golf course.

The hoped-for outcomes will take planning and repeated treatments but when reached the betterment of the golfing experience at Newtonmore Golf Club will be greatly enhanced.

Rush Infestation

- Rushes have affected several sections of the golf course; they are found growing in a range of soils from sands to clays. The plants have a distinct preference for moist soils and are usually found near permanent water or, at least, periodic flooding for part of the year, e.g., the margins of fields, drainage lines and ditches. It is tolerant of slightly saline soils, particularly when rainfall has leached out topsoil salt.
- Toad Rush in-particular is an opportunist and can also be commonly found growing on fine turf golf greens when conditions favour the plant. It is generally found in turf that holds moisture and can be regularly seen growing in small clumps dispersed around the green. The key to its control is recognising the weed. An accurate identification of the weed you have and then combating the symptoms that enable the plant to thrive. Greens or surrounds that have excessive thatch and are prone to lying wet will provide the ideal conditions for Toad Rush to flourish.
- Treat the symptoms, reduce thatch levels, aerate, increase calcium inputs and top-dress to improve the surface drainage of the turf.
- Generally, if you carry out a robust maintenance programme with thorough spring and end of season renovations, increase calcium applications and top-dress with appropriate rootzone dressings, whilst having a regular verticutting programme throughout the growing season, you will be more in control of thatch levels and reduce the likelihood of promoting turf that would be susceptible to Toad Rush.
- Instigating an appropriate feeding and overseeding programme will also ensure your turf is well populated and retains a dense sward, thereby reducing the chance of weed seeds such as Toad Rush from establishing.
- As for the Toad Rush plants you already have in your course, you can treat them in the following way: Firstly by removing the clumps by hand cutting out with a knife, close mowing and cutting into its crown - so pre-season verticutting or scarifying, coupled with a reduction in cutting height, should put it under stress and reduce its capacity or consider a spot treatment with a selective herbicide that has diethanolamine salt, known as 2,4-D, as the active ingredient e.g. Depitox.

Irrigation

- The current irrigation strategy requires a review, with renewal or potential staged additions a must have. Purists among the golfing industry may say, that the only use for irrigation systems is really to keep grass plants alive, and in real terms that is what it does, however water is used in several ways to affect the characteristics of the playing surface as well as providing security as one of the most critical elements for any living thing.

Grass plants need air, light, a food source, and water, so the irrigation system effectively supports all these plant mechanisms by providing the moisture plants need when they need it, in the quantity needed to thrive.

When originally conceived the current strategy would have been adequate to keep grass plants alive, golf and maintenance traffic would have been lower, weather patterns more predictable and expectations of a holiday/village golf course quality much lower, however, the strategy now requires a review and push to install an automated system or at the very least a pipe network able to carry water to all or parts of the course, more especially to all fine turf sections.

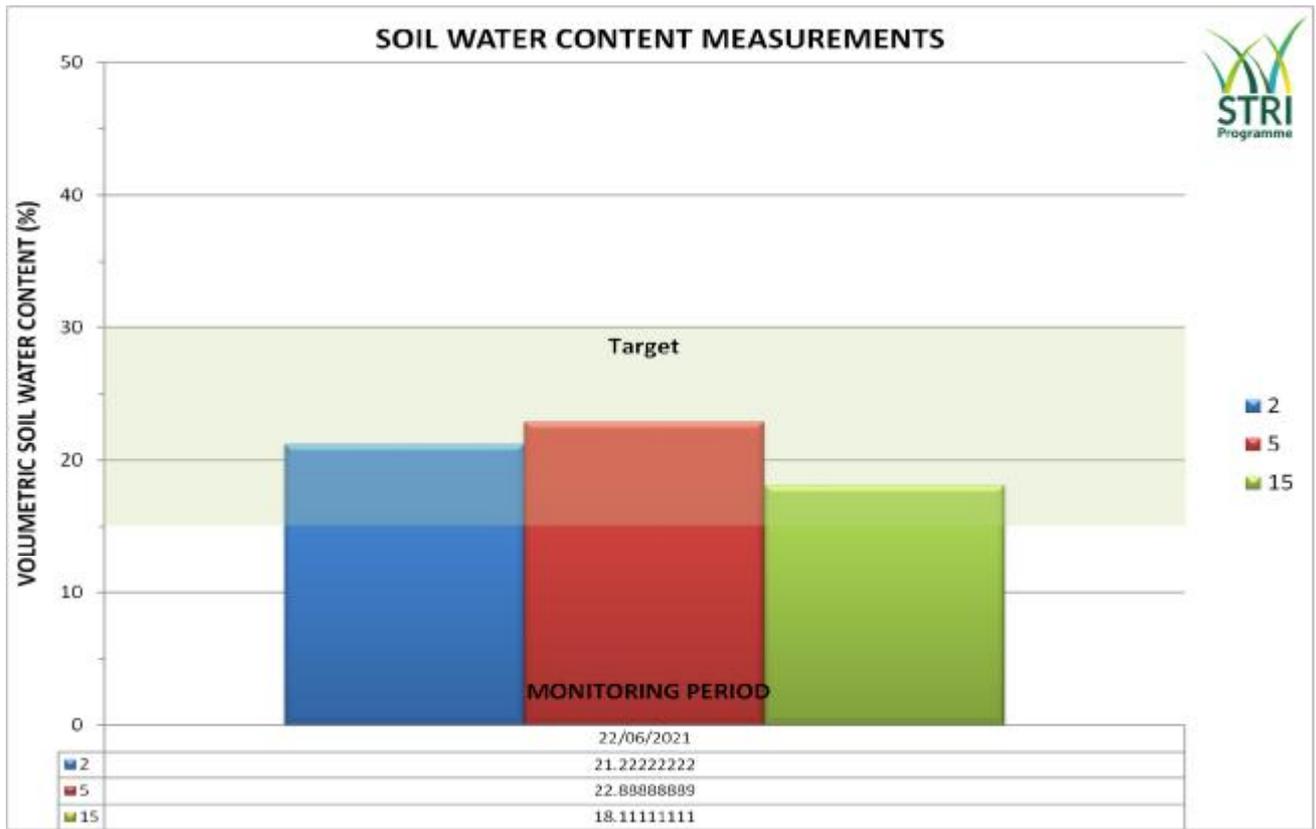
Installing any new additions or a completely new system is a huge fiscal outlay for any institution but as the last few years have proven, weather patterns, increased play and the ever-increasing demand for higher standards enveloping the golfing world, the current strategy at Newtonmore needs a review, preferably by a suitably qualified consultant, to suit the modern 365 day a year golfing facility that Newtonmore Golf Club has become.

Signed

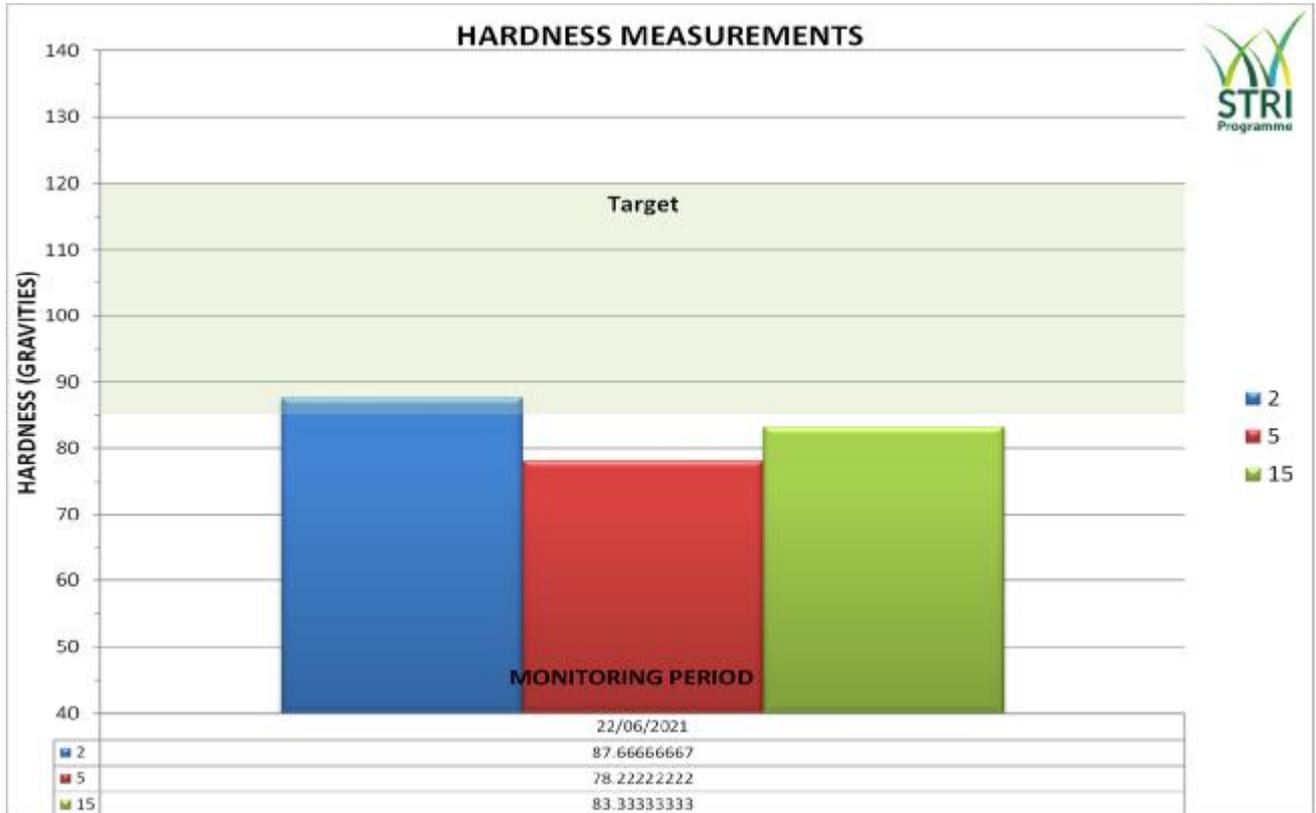


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Objective Data

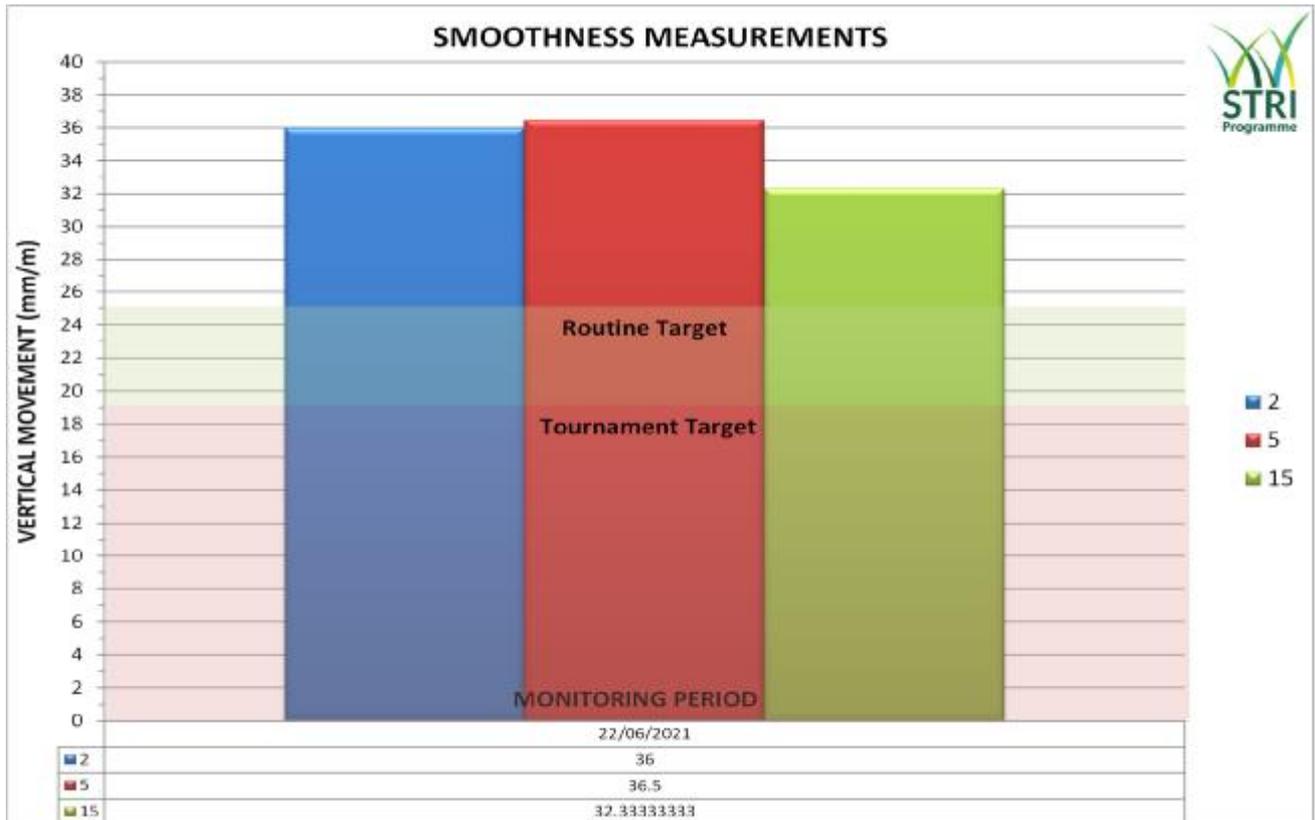


Objective Data Graph 1: Soil moisture content was within average targets on all tested greens.



Objective Data Graph 2: Firmness results were below or marginally within targets and displayed a wide variability throughout the tests. A direct link between these results and the organic matter volume is indisputable.

Objective Data (continued)



Objective Data Graph 3: Smoothness and trueness were both above targets and were both influenced by several factors, including the thinning open canopy sections, Poa annua expressions and the localised dry patches.



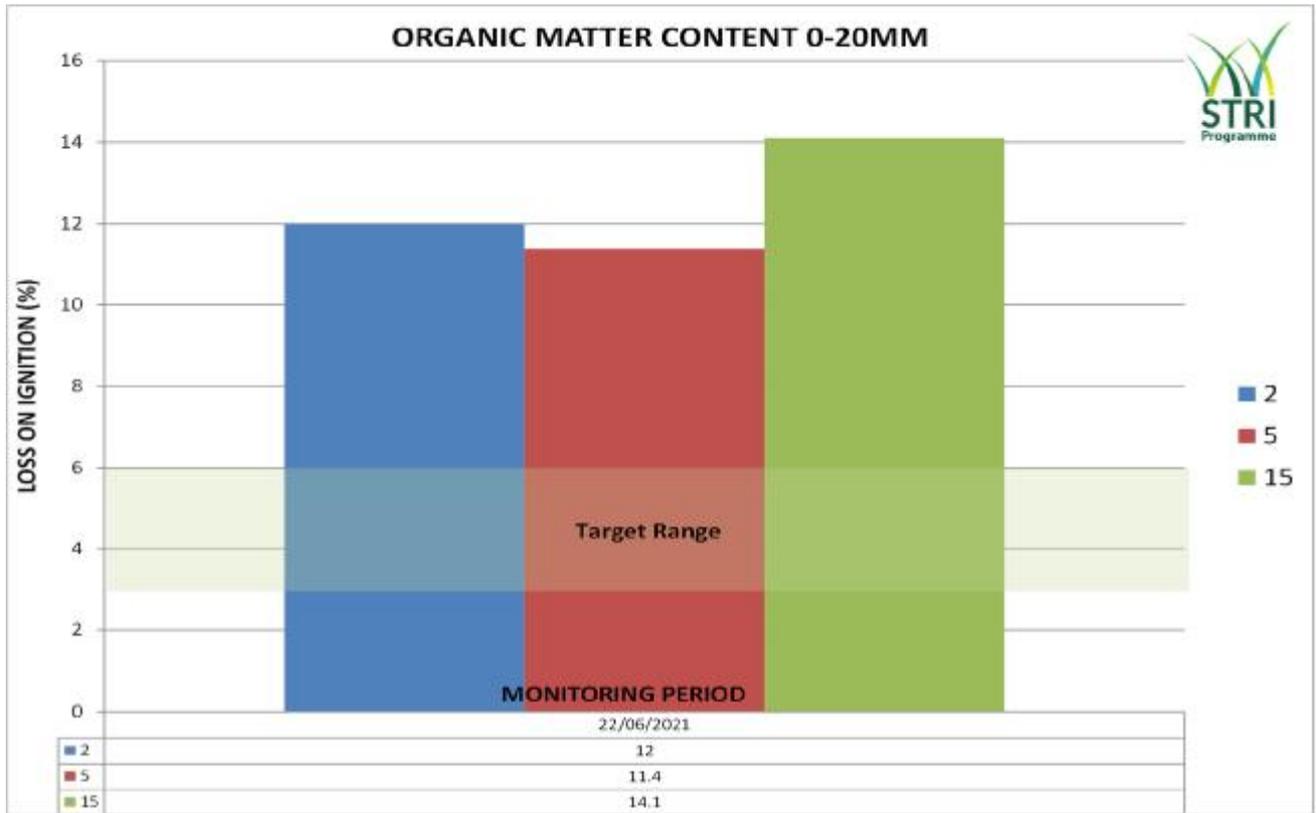
Objective Data Graph 4:

Objective Data (continued)

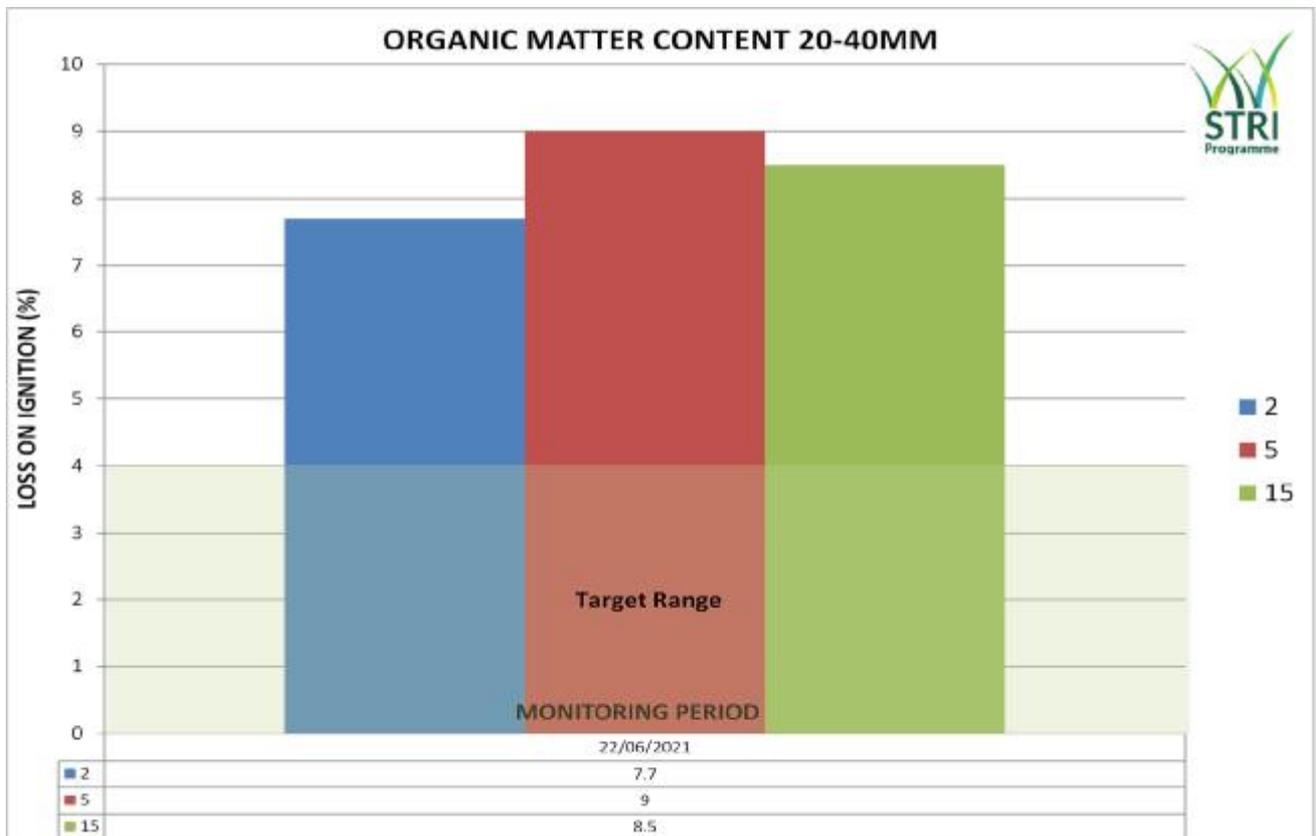


Objective Data Graph 5: Green speeds were below target and will improve as increasing maintenance and improving weather conditions support surface improvement going forward.

Soils Laboratory Data

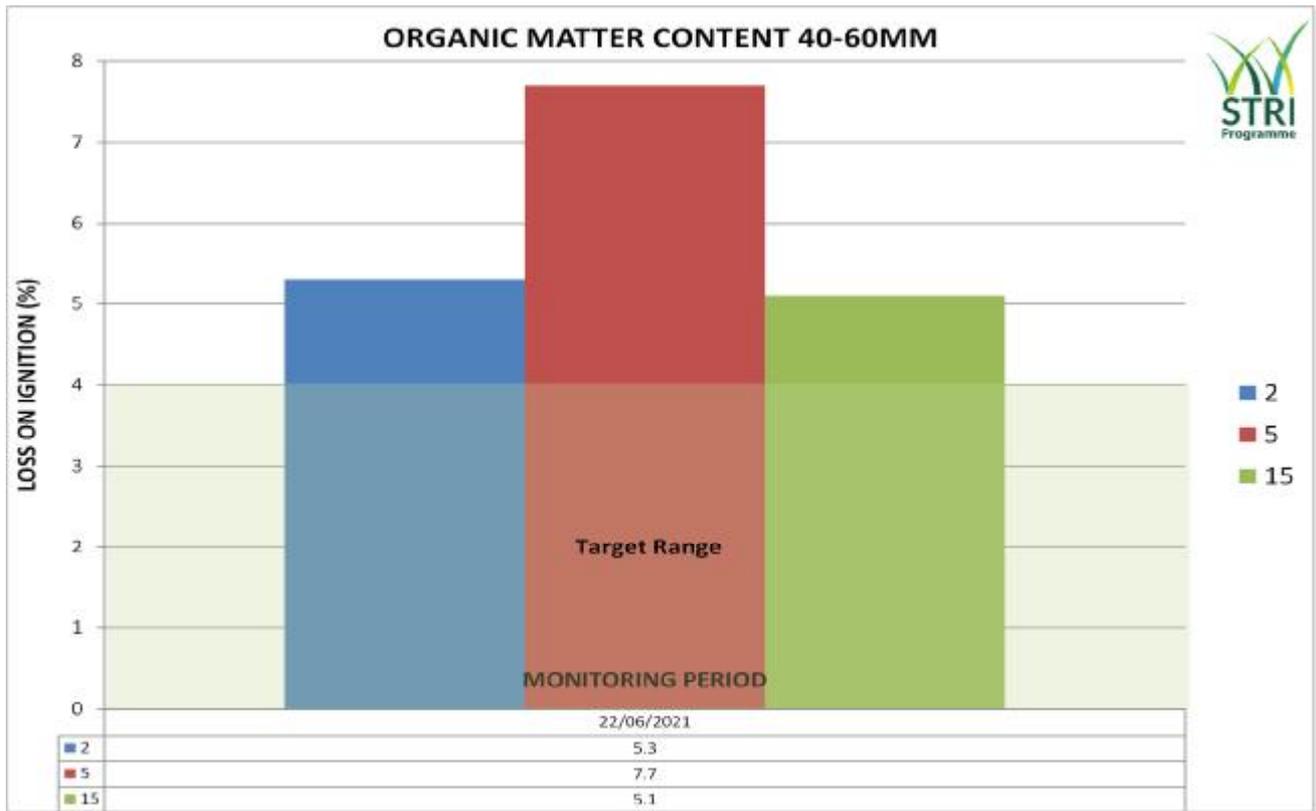


Soils Laboratory Graph 1: Organic matter accumulations is high throughout the tested horizons and must be a priority for reduction in the coming seasons.

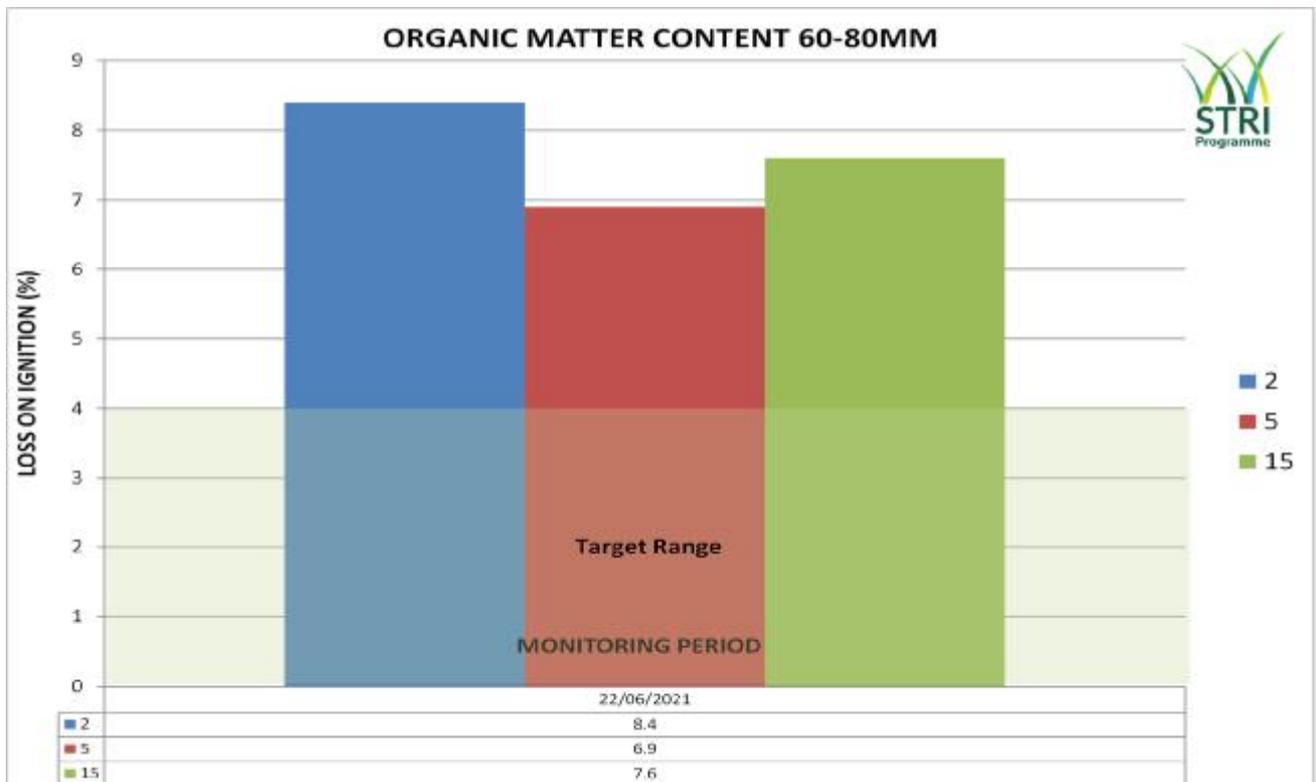


Soils Laboratory Graph 2:

Soils Laboratory Data (continued)

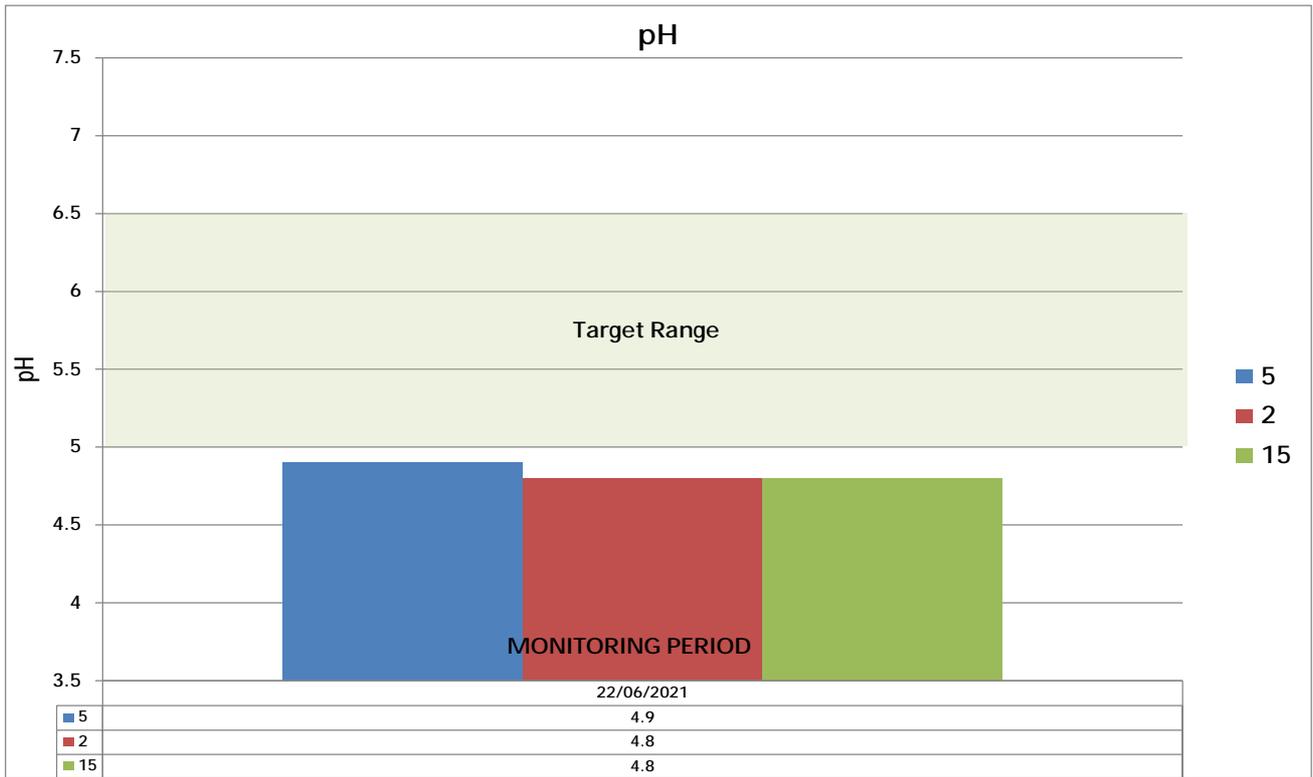


Soils Laboratory Graph 3:



Soils Laboratory Graph 4:

Soils Laboratory Data (continued)



Soils Laboratory Graph 5: pH is below target for optimum growth. Aim to increase pH throughout the coming seasons.

ORGANIC MATTER CONTENT

CLIENT: NEWTONMORE GC
ADDRESS: GOLF COURSE ROAD,
NEWTONMORE,
INVERNESS-SHIRE PH20 1AT

DATE RECEIVED: 01/07/21
DATE REPORTED: 07/07/21
RESULTS TO: GS

TEST RESULTS AUTHORISED BY:
Michael Baines, Laboratory Manager

CONDITION OF SAMPLE UPON ARRIVAL: MOIST

SAMPLE NO	DESCRIPTION	LOSS ON IGNITION (%) [*]
A19119/1	2 0-20 mm	12.00
	20-40 mm	7.67
	40-60 mm	5.31
	60-80 mm	8.42
A19119/2	5 0-20 mm	11.44
	20-40 mm	9.00
	40-60 mm	7.67
	60-80 mm	6.94
A19119/3	15 0-20 mm	14.10
	20-40 mm	8.54
	40-60 mm	5.07
	60-80 mm	7.62

^{*} ASTM F1647-11 (2018) 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

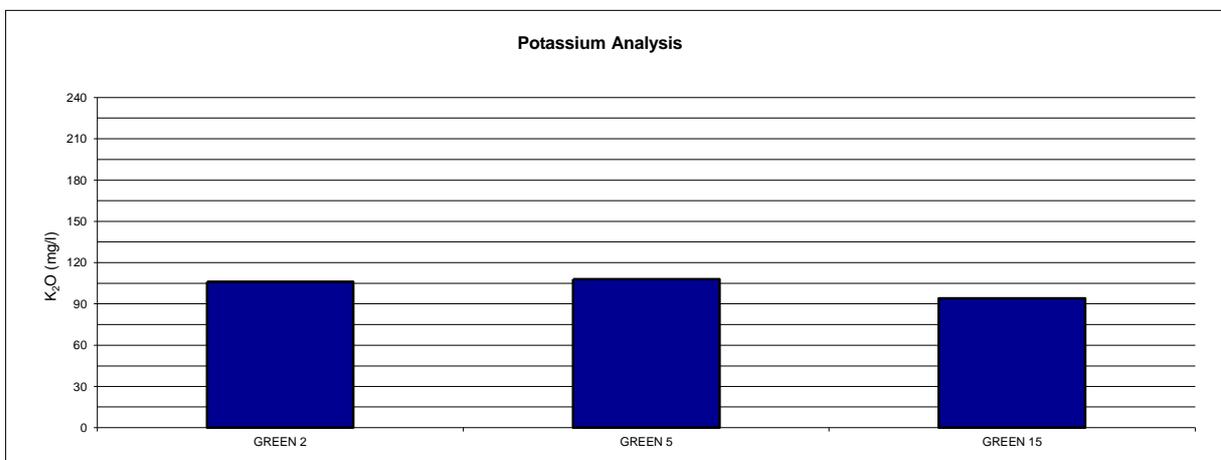
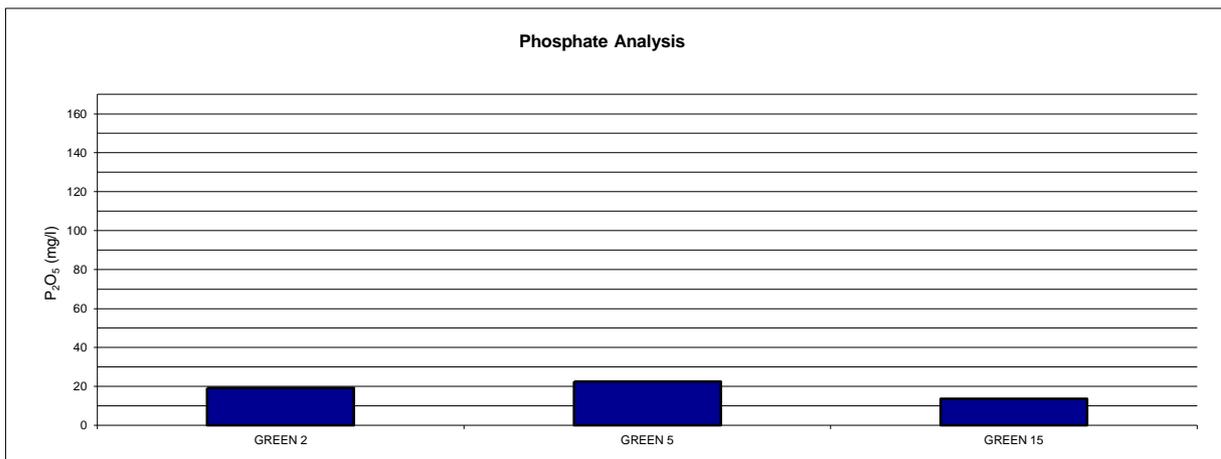
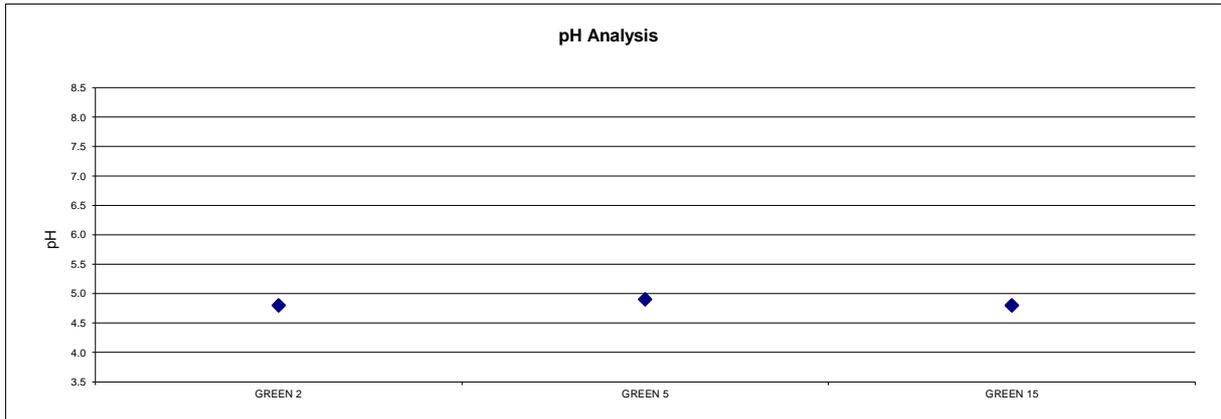
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SOIL CHEMICAL ANALYSIS

NEWTONMORE GC

Date: 01/07/21



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