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Penrith Golf Club

Report on the golf course incorporating performance testing

Report date: 25 August 2023

Consultant: Gary Smith

Date of visit:	20 July 2023
Visit objective:	To review the general condition of the course and carry out STRI surface performance tests on nominated greens.
Present:	Les Balmer – Club Chairman, Gavin Oliver – Chair of Greens Tim Dykes – Director of Golf, Robin Little - Head Greenkeeper Leon Cant – Deputy Head Greenkeeper Gary Smith – Senior Consultant Agronomist, STRI Group Ltd
Weather:	Dry with Partial cloud. Temperature 16°C. Average canopy temperature 18°C. Average rootzone temperature 18°C. Rainfall (club data) 101mm 10 days prior to visit.

Introduction

This was my first visit to Penrith Golf Club as an STRI agronomist and as such, it was determined I should spend the majority of the time with the team reviewing and performance testing the greens surfaces, with their assistance. There is no doubt that other areas need review and although noted and discussed on the day, it was agreed, a greater time period and complete assessment of these areas would be required and will be followed up by myself at the earliest opportunity.

Penrith golf course like so many other golf facilities, has over recent seasons, endured some particularly harsh local weather conditions, and the evidence of these recent episodes still exists on several sections of the course. The greatest impact on plant health from the traditional seasonal changes, is from dry cold conditions like those experienced in this past off-season, to then be compounded by the subsequent dry and cold spring, our traditional regenerative period.

These changes in climatic conditions have formed a pattern that should be considered "the new normal" and all future plans for all similar facilities will have to be designed to accommodate these more challenging early season zero to slow growth conditions. Thankfully for this Club, the strategy of microbiome development and a natural sustainable integrated turf management regime has been in place for many seasons now, and with the regular tweaks, every strategy needs, will continue to prove beneficial and underpin the expected continued improvements across the golf course landscape.

The document details the following:

Executive summary

- The golf course and associated grounds are presented as well as the team are able however, the course area is very large for a small team and if the highest of standards are to be met continuously, team numbers will require to be increased, or more robust/realistic course policy needs to be introduced in standing with current team numbers and business model, to maintain the Club's status and reputation.
- The greens surface condition exhibits a very mature but interrupted canopy with a positive grass plant density, at the time of visit these very good surfaces are similar to many already witnessed, so far this season. The early season challenges from poor growing conditions have impacted Penrith's traditional early season surface quality, however, the many seasons of utilising natural microflora and microfauna have developed a resilient sward with ever improving volumes of desired fine turf species.
- Winterkill or low temperature damage in the form of visible lesions with a distinctive red hue, confirm this unfortunate outcome for Penrith. Evidence on view, points to cold weather reactions across several sections of the course, particularly within the practice green, all greens viewed and the surrounds. Although no longer damaging the grass plants nor visible to the naked eye, the lesions still have an impact on the grass plants potential growth and health outcomes. Low temperature damage usually but not always in frozen ground can express in very cold conditions, or in relatively moderate conditions, that experience rapid changes in temperature. It exhibits in several forms, from complete encasement of the plants in ice, to ice crystal's forming internally or externally on the plant leaf and this interruption in production in plant sugars and thus of Anthocyanins which is generally the causal agent in the red hue, witnessed in early season growth conditions. The outcomes in plant health can vary from slight discolouration or necrosis up to demise, these outcomes are always unique to the individual situation and individual cultivars in situ, and are an impossible challenge to predict, so comparison to other local courses or even areas within your own course should not be made. The recent maintenance inputs have proven successful in defiance of the very poor early season growing conditions.
- Basidiomycete fungi (Fairy ring) was evident across all sections of viewed greens and surrounds, with a varying level of aggression. The instigated surfactant (wetting agent) application system or any future planned fungicide usage will continue to dampen these symptoms and I would encourage the use of surfactants throughout the calendar year to break down any rootzone bound waxy deposits left by the fungal activity.
- Anthracnose disease (Colletotrichum cereale) was apparent on many of the fine turf sections. However, being a stress related disorder and the fact the outbreak was inactive and did not require any remedial input from the greenstaff. It is also a reminder of the severe pressure the greens grass plants were under in the earlier part of the growing season.
- Annual meadow grass (Poa annua) seed heads were visible and through discussion agreed that volumes although low-moderate are an annual irritant in surface quality outcomes, plant growth regulators (PGRs) such as Prohexadione calcium (Attraxor) have proven very successful in reducing the seed head activity and should be adopted alongside Trinexapac-ethyl (Primo), to fully realise the ever-improving outcomes available.
- The nutritional and microbial input programmes are robust and designed to fully develop the rootzone microbiomes balancing cyclical nature and support the plants growth potential throughout the year. Continue with your current strategy with a mind to use bio stimulants such as fulvic acid, throughout the cooler months, with seaweeds year-round.
- One part of this equation we must highlight is the monumental efforts the maintenance team makes to sustain and progress, in real terms, the ability to carry out regular maintenance works in a frequency that suits the challenging conditions at Penrith is the key component that's missing, some may call it attention to detail and if I'm to be honest that is what is missing at the course, however, with such a small team in such a busy course, the team should

be congratulated for the standards they produce. Going forward more works must be carried out on the woodland sections to reduce the obvious shade stresses in many sections and improve light and air movement throughout. Likewise, a development plan for the bunkers to agree a maximum manageable number throughout the course and agreed style that suits this courses topographical position, and its natural landscape should be developed. Regular resting of the greens will only benefit the surfaces through the many seasons to come, and whether that rest period is a day or a month, every little helps and will holistically support improvements throughout the course. For the course to really move forward more time needs to be created to carry out the general maintenance and the more robust inputs that are periodically required. I'm confident that this can be achieved, and I look forward to witnessing the results.

Essential actions

- Look to continue with top-dressing inputs and introduce a little and often strategy, weekly – biweekly @ 3tonnes per hectare incorporating the surrounds and approaches.
- Organic matter removal via scarification, hollow core or dilution must be a priority.
- Apply surfactants throughout the off-season to improve efficacy and dampen the effects of the Basidiomycete fungi.
- Refinement strategies such as brushing and verticutting should be increasingly carried out on the greens, green surrounds and approach sections.
- Develop a longer-term woodland management programme and course policy document.
- Review the bunker condition and style and design a strategy in bunker renovation intervals and future design plans as part of a wider course design policy document.
- Develop a drainage plan on all fine turf surfaces and review via VESS (visual evaluation of soil structure) all areas exhibiting slow percolation/infiltration.
- Devise a longer-term machinery plan and plan to purchase a veemo type scarifier and a Greens/fairway brush system and Sarel roller system.
- Monitor organic matter accumulation through loss on ignition testing, on an annual cycle.

Performance data summary table – HOC 4mm. Greens ironed only prior to test.

Measurement	Average	Target range
Soil moisture (%)	39% (range 33-42%)	15-30%
Hardness (gravities)	73g (range 65-84g)	85-120 g
Smoothness (mm/m)	21.1 mm/m	<25 mm/m
Trueness (mm/m)	7.5 mm/m	<10 mm/m
Green speed	9ft 0in	8-10 ft
Organic matter 0-20mm (%)	7.8%	3-6%
Organic matter 20-40mm (%)	5.8%	<4%
Organic matter 40-60mm (%)	3.5%	<4%
Organic matter 60-80mm (%)	2.9%	<4%
Soil pH	4.7	5.0-6.5
Phosphate (P_2O_5)	11.6 mg/l	>10 mg/l
Potassium (K_2O)	46.6 mg/l	>30 mg/l

Key:

In target
Marginal variance
Out of target

Key points from the performance data:

- Moisture content and surface firmness were below target, however with the recent rainfall and an elevated organic mat at the turf base, the results are in no way a surprise.
- Smoothness and trueness were very good results considering recent weather and growth challenges and highlight the underlying true qualities of the greens at Penrith Golf Club.
- Rootzone pH is low and will not provide the ideal conditions for the microbiome development nor the optimum growing conditions for the desired fine turf species.

Record of site conditions

Photo 1: The greens display a mature canopy with a pressured look, still to reach full canopy closure.

Photo 2: Disfiguring annual meadow grass seed heads were visible throughout the greens.

Photo 3: Low temperature damage and historical Anthracnose disease were apparent on several surfaces.

Photo 4: The rootzone is a friable aggregate with an elevated organic matter volume in the top 0-40mm and a dense aggregate impeding infiltration at its base.

Photo 5: Root growth and density is outstanding.

Photo 6: Shade and dense canopy are a major influence on negative plant health outcomes across the golf course.

Photos 7, 8, 9 & 10: Shade and dense canopy are a major influence on negative plant health outcomes across the golf course.

Photo 9: ref photo no 7

Photo 10: ref photo no 7

Photos 11 & 12: The course is presented well and a credit to the maintrmace team, considering the very demandiing local circumstances.

Photo 13: Bunkers require a review and future development to coordinate a course style.

Photo 14 – 18 inc.: Highlights of the demands on the team and a percieved lack of attention to detail, not a criticism in any way, a reminder of the volume of tasks that need to carried out to present this Club to the high standards expected.

Photo 15: ref phot 14 - hidden irrigation head.

Photo 16: ref photo 14 – high traffic pressure walk way.

Photo 17: ref photo 14 – clean up cut and surrounds.

Photo 18: ref photo 14 huge practice area.

Recommendations

Greens

- Top dressing inputs should be aimed at achieving 100-150 tonnes per hectare on the greens, green surrounds and approaches. This approach will further dilute the organic matter and improve surface firmness whilst supporting percolation rates of applied irrigation and falling rainwater.
- In the off season introduce a single pass of a scarifying unit to intensively remove more organic material in the top 5-15mm of the greens and surrounds profiles and apply top-dressing. Aim to carry out this operation on at least three occasions throughout the off-season. This is also an ideal opportunity to incorporate an inter-seeding with bent seed on the greens and an ultra-fine ryegrass on the green surrounds and approaches. Ideally the grass seed cultivars should be coated with a mycorrhizal fungi to accelerate the germination rates and surface recovery process.
- Follow the scarification with a hollow tine operation on the greens and surrounds with 8-12mm core diameter tines at 35mm spacings to a minimum depth of 80mm. Apply top-dressing and work into the holes with a drag matt, or a sweep-n-fill type brush, ensuring that the tine holes are filled to the surface level.
- Aeration is carried out regularly and I would suggest an introduction of the Sarel rolling on all greens and surrounds twice monthly, likewise the deeper solid tining or slitting operations should be employed six to eight times per annum with the length of tines varied to accommodate mid (100mm-150mm) and deep (225mm-300mm) aeration. This deeper aeration will help to alleviate the potential for aggregate compression in the lower rootzone profile.
- 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. Overuse will no doubt put seedlings under undue pressure, so a disciplined as necessary regime must be instilled throughout the year.
- The current surfactant (wetting agent) and nutritional inputs are robust enough to achieve the positive outcomes desired (although in the main a bulk purchase, enough flexibility exists to tweak as required) and should be continued with, indeed their use 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 consistency. This will also support a lessening of the harming effects of the abiotic and biotic stresses significant to highly managed turf grasses.
- The addition of plant growth regulators (PGR) such as Prohexadione (Attraxor/Kopis) outlines a combative approach toward Poa annua seed reduction. Recent results have shown reduced seed head expression, using this PGR, in a disciplined programme and is worthy of consideration. Please do not tank mix Prohexadione with products containing Calcium, Manganese or Magnesium.
- The use of Fulvic acid (10lt per hectare) in the off-season is requested and will prove valuable to the greens condition going forward. 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.

- Disease pressure was touched on and with the current strategy of aeration, bio stimulant and nutritional inputs, the addition of Phosphite and Liquid Copper Trace elements and monthly applications of Silicon is encouraged to assist in improving plant health and support any ongoing integrated turf management programme.
- Regular inter-seeding requires to be increased using a variety of methods including the use of disc seeding in the off season with a mix of pot or dimple seeding throughout the busier periods. This dual approach carried out 2-4 times per annum will offer greater influence and improvement in germination and sward transition rates. A suitable bentgrass cultivar with a mycorrhizal coating will deliver the results required at Penrith Golf Club.

Green Surrounds and Approaches

- All areas adjacent to the greens should receive the same maintenance inputs as the greens surface area. Sward separation is evident on several sections and planning to reduce the invasion of unwanted coarse grasses due to the pressure of machinery and foot traffic is needed. Regular re-routing of golfers and the maintenance staff is encouraged to keep the golf course in top condition. With increased inter-seeding on the high wear areas carried out using a mix of bentgrass cultivars and ultra-fine ryegrass cultivars. This will without doubt improve the current levels of presentation on the golf course and ensure a greater consistency in year-round playability.

Fairways, Tees & Natural Pathways

- Tee markers should be moved every day or as traffic wear dictates. The aim is to reduce the volume of play on all tees where appropriate, nonetheless grass cover on these surfaces is admirable.
- Inter-seeding the tees with an ultra-fine ryegrass cultivar to improve resilience is advised. Ensure the seeds are coated with a mycorrhizal fungi to accelerate recovery and underpin an increase of the stress tolerance of the tee sections.
- The programmed use of PGRs on the tees would support increased wear tolerance and surface regeneration whilst supporting an overall benefit on grass plant health through the ever-increasing demand for play.
- Aeration is requested on all tees, and I would encourage increasing operations on the more shaded tees and all under pressure Par 3 tees. Spiking, Slitting or Air injection are all viable options to support oxygenation of these surfaces.
- Top-dressing of weaker areas, tees and fairways will also help them develop. The use of a surface scarification system such as a Wiedenmann TerraRake or similar scarification equipment on all tees, fairway and natural pathways will benefit both in organic matter removal and sward composition improvement, it is suggested the scarification inputs be carried out at least four times per annum.
- A plan of action regards the widening of pathway funnels and potential rerouting options of all golfer's and maintenance staff operations is required for future plant health success and aesthetic presentation at Penrith Golf Club.
- The addition of ecological and aesthetic rough grasses growth should be considered as an improvement to play and course design aspirations, as well as supporting a reduction of the cutting area at the Club. Unmanaged rough can interfere greatly in the golfing experience at any venue. The loss of a ball or a heavy lie is often a cause of frustration, however naturalised managed rough enhances the golfing experience and should provide an opportunity of locating and advancing the ball to some degree.
- It will also afford an excellent opportunity to provide habitat for increased wildlife diversity and improved ecological development. With a disciplined management structure in place an improvement in sward composition of all introduced and current sections of naturalised rough

will develop finer grass species and an increased variety in wild flora, which in turn supports a further reduction in the density of the grass canopy and turf base.

- The golf club has an opportunity to achieve an outcome that will improve both the biodiversity of the course and the golfing experience, it will take repeated treatments in the early years to develop, but when reached the betterment of the golfing experience at Penrith Golf Club will be greatly enhanced.

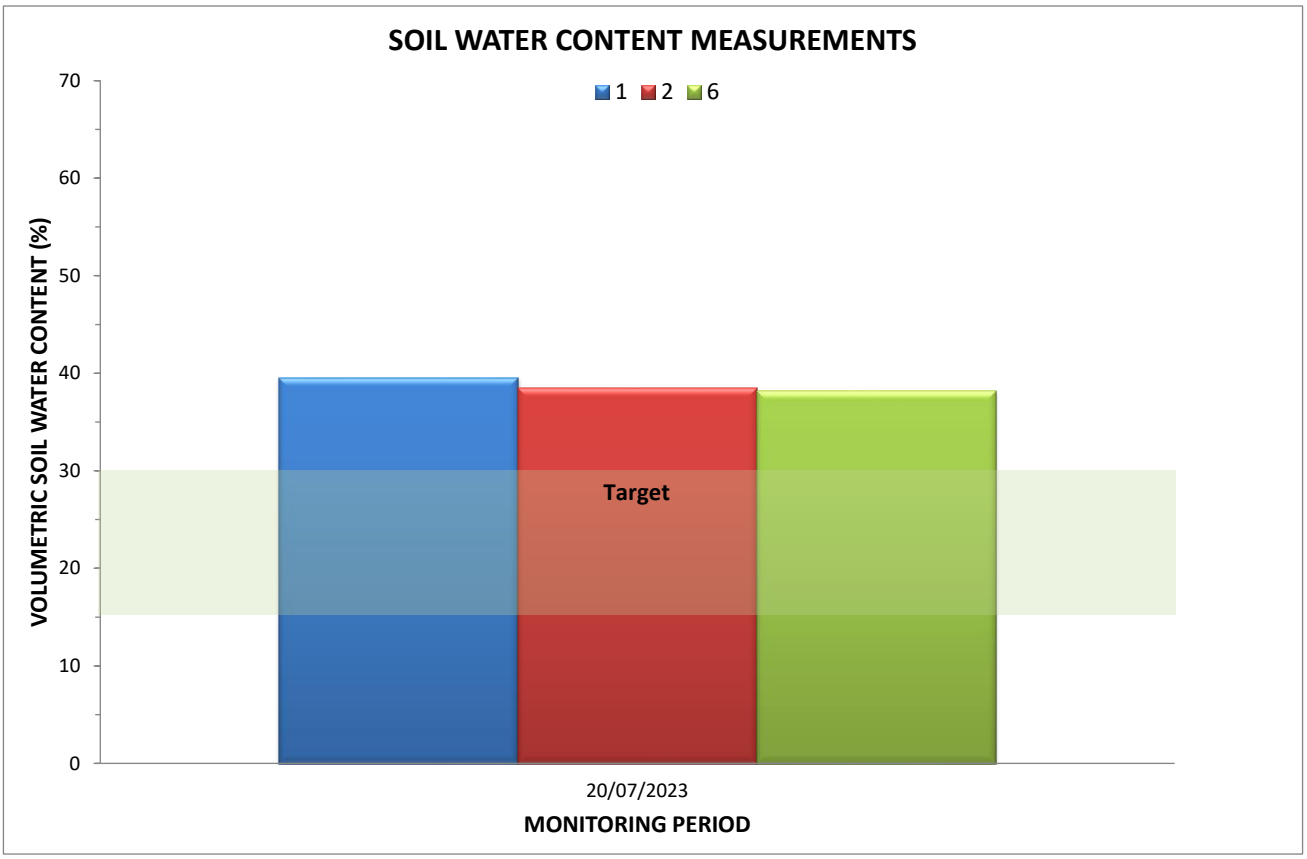
Woodland Management

- Tree management was touched on discussions with the team at the time of visit. Meaningful work producing positive results related to tree removal and crown thinning is in place. For continued future growing success of several sections of fine turf it is vitally important to have an overall long-term tree management plan which responsibly identifies areas and strategies for selected removal, crown thinning or root pruning as improvements need to take place where trees are having or have the potential to cause a deleterious impact on the overall quality of the golf course.

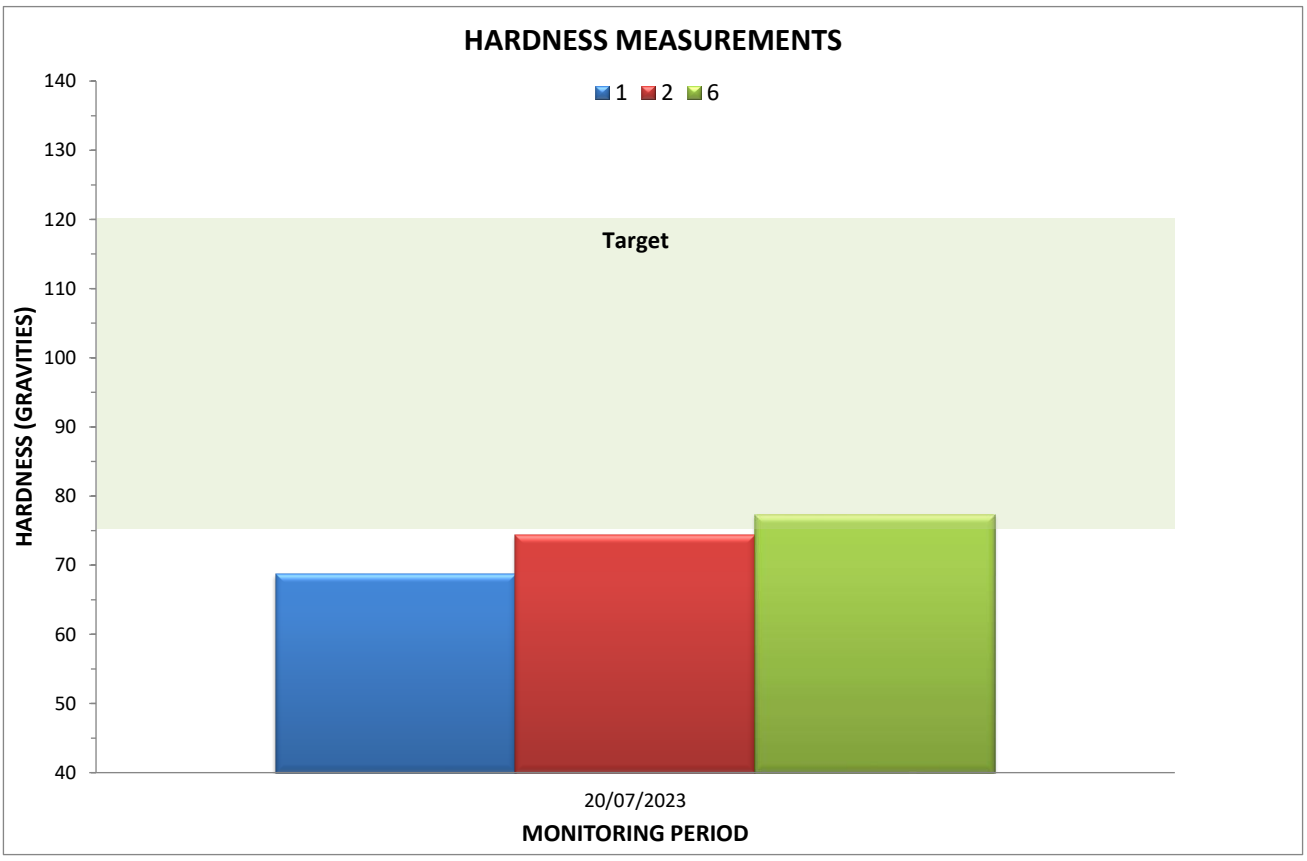
Longer term strategy

- The longer-term ambitions are obvious at the Club and within the golf course development plan and the many sections touched upon in thus report must be continued to be managed and allow the team to remedy any underlying stress issues. All areas should have a longer-term reinstatement plan where possible, at all times highlighting the natural flora and fauna. This is achievable in a modern vibrant and remarkably busy course as Penrith is, however, detailed planning and disciplined inputs will have to be adhered to in reaching these goals. Course condition must also be the number one priority and as we have seen already this season high volumes of play are affecting plant health outcomes and course presentation. The future must allow for increased access for maintenance inputs in the short term and likewise a plan for greater access to irrigation and potential increases in team numbers in the longer term to fully restore and maintain this golf course to its traditional characteristics, but in a very modern golfing facility, that can cater for all year-round play.

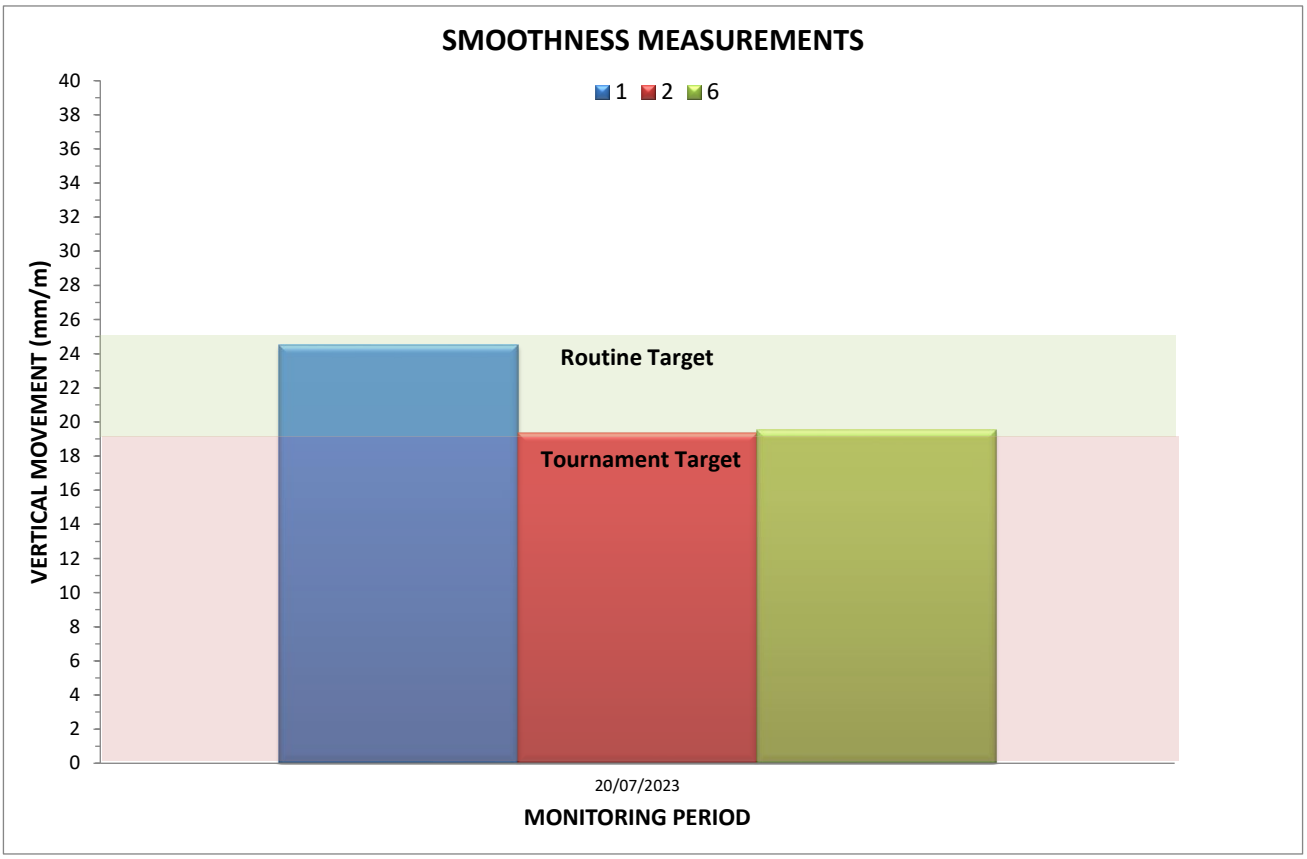
Graphs of performance data and soil results



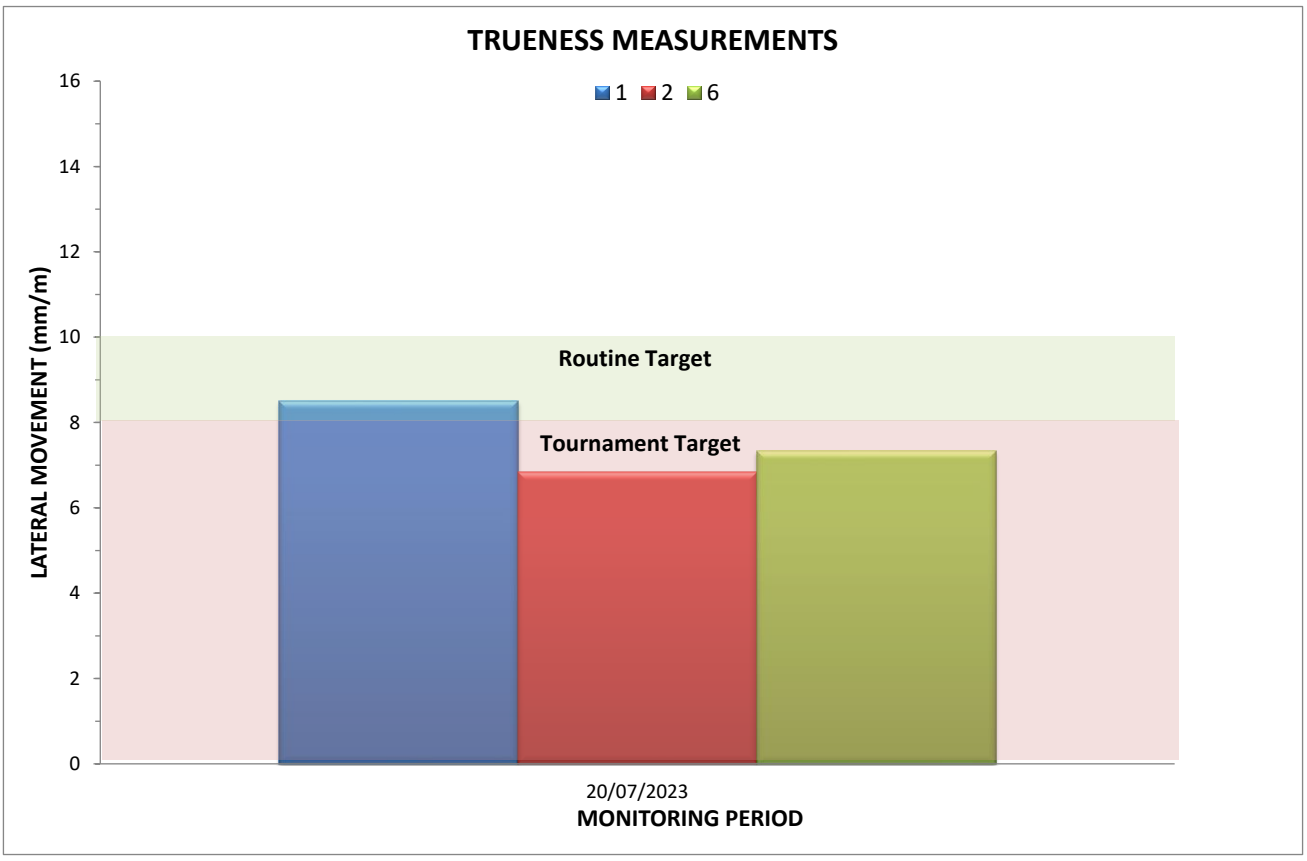
Performance Data Graph 1:



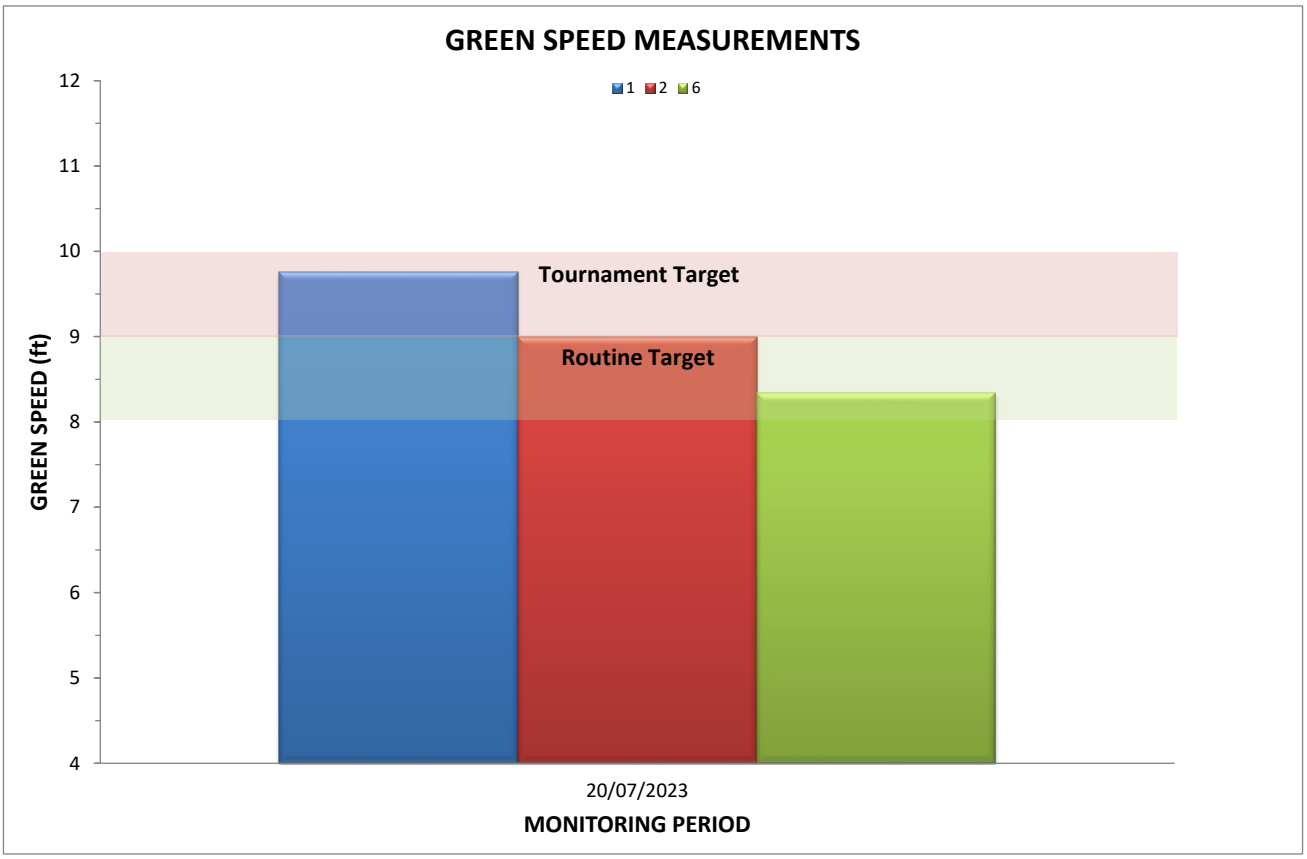
Performance Data Graph 2:



Performance Data Graph 3:

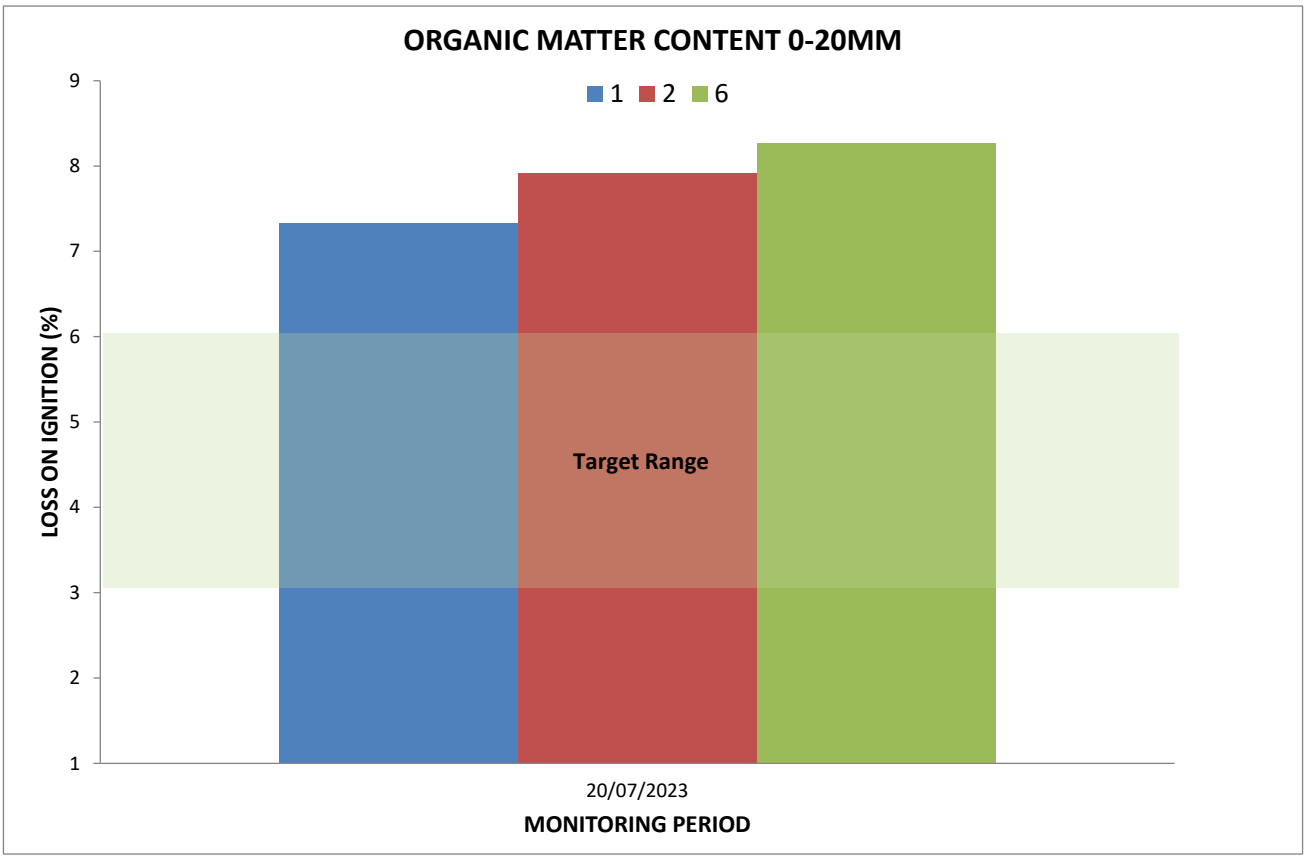


Performance Data Graph 4:

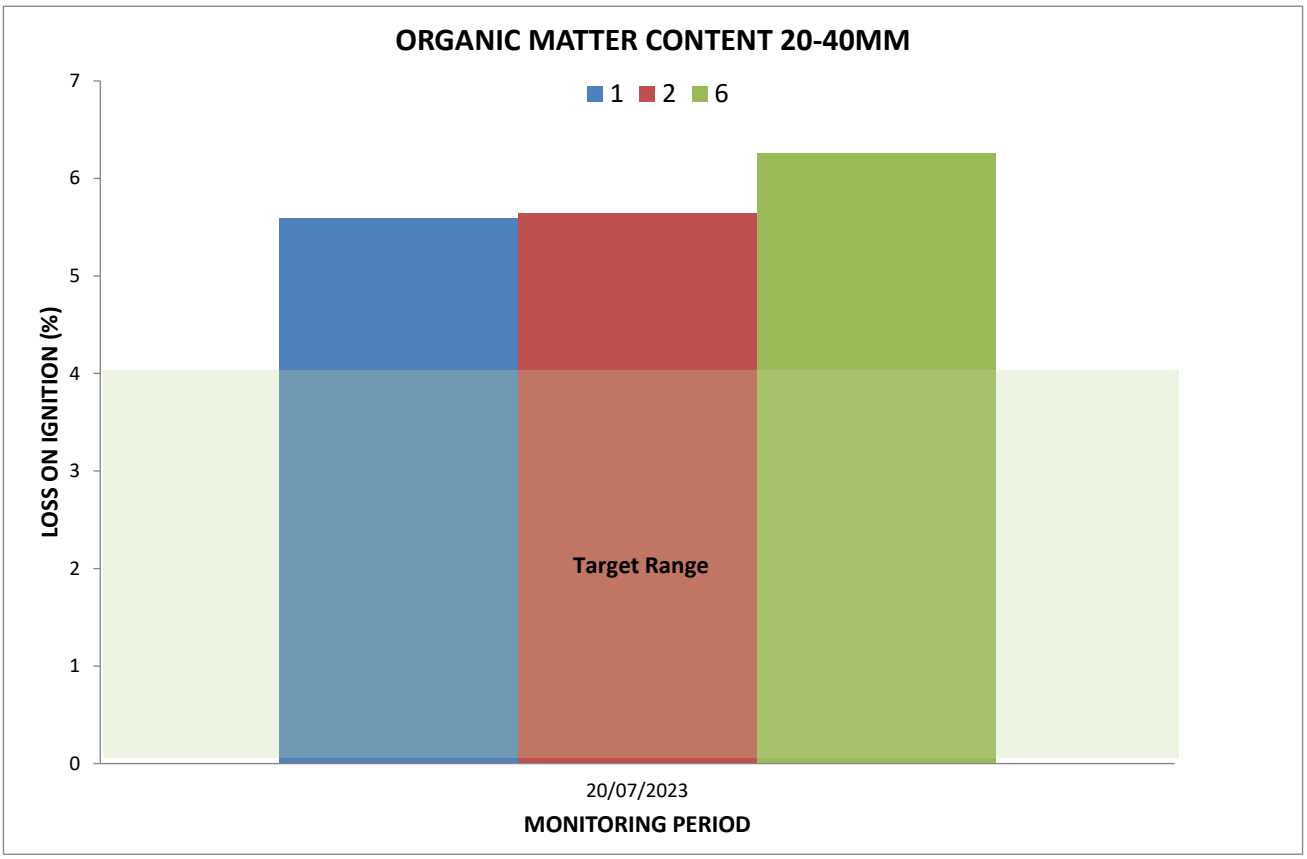


Performance Data Graph 5:

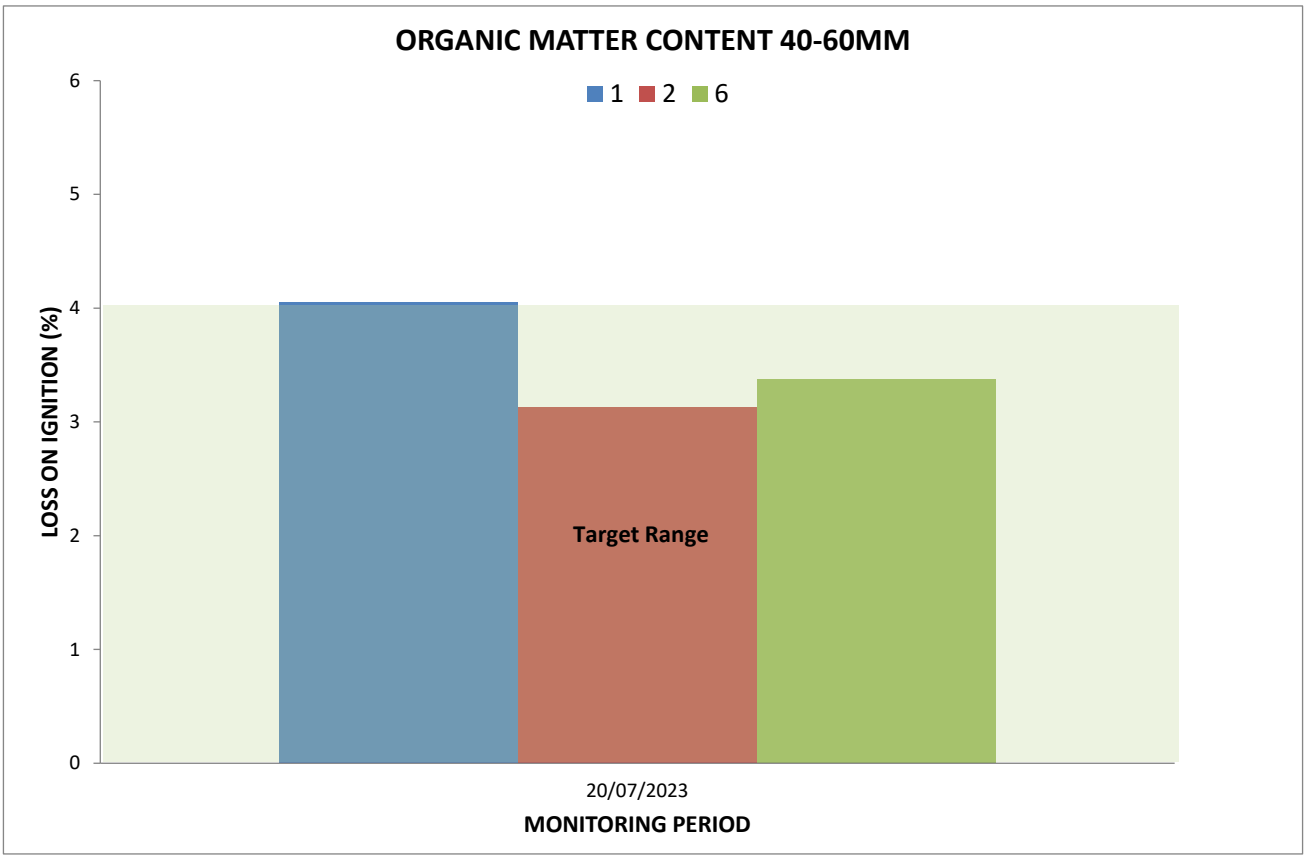
Soil results



Soil Results Graph 6:



Soil Results Graph 7:



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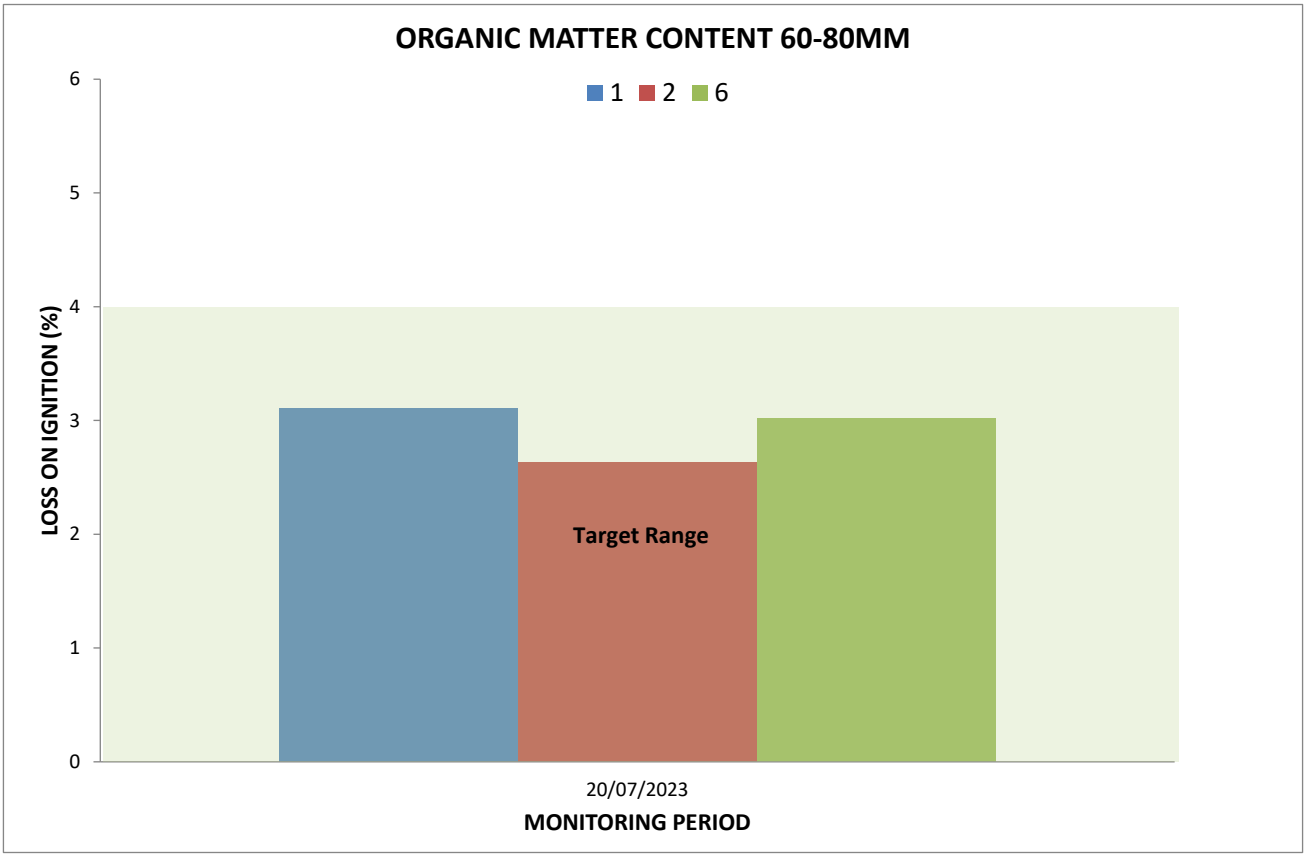
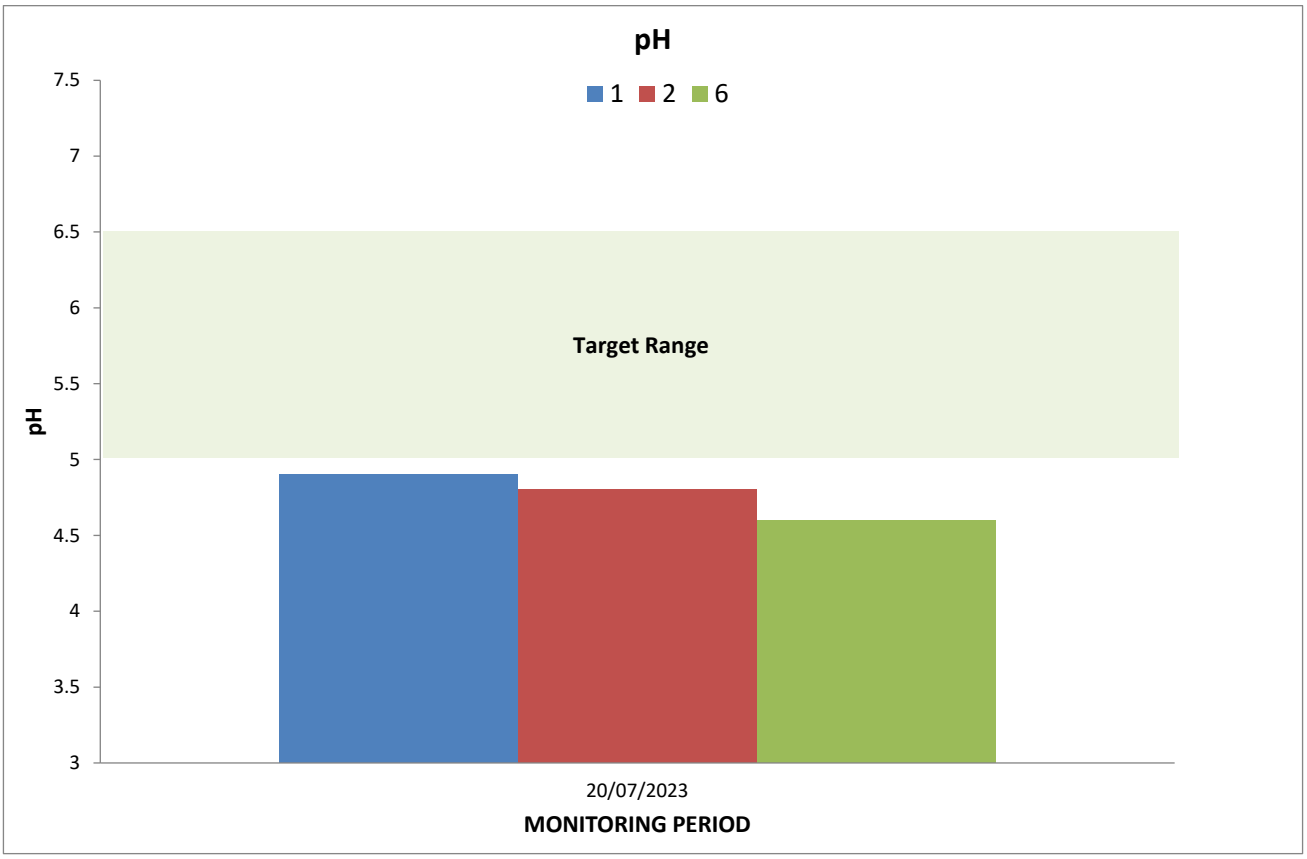


Soil Results Graph 9:



Soil Results Graph 10:

Signed:

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ORGANIC MATTER CONTENT

CLIENT:	PENRITH GC	DATE RECEIVED:	04/08/23
ADDRESS:	SALKELD ROAD PENRITH CUMBRIA CA11 8SG	DATE REPORTED:	10/08/23
		RESULTS TO:	GS
		TEST RESULTS AUTHORISED BY:	
CONDITION OF SAMPLE UPON ARRIVAL:	MOIST	Michael Baines, Laboratory Manager	

SAMPLE NO	DESCRIPTION		LOSS ON IGNITION (%)*
A20329/1	1	0-20 mm	7.33
		20-40 mm	5.59
		40-60 mm	4.05
		60-80 mm	3.11
A20329/2	6	0-20 mm	8.26
		20-40 mm	6.26
		40-60 mm	3.37
		60-80 mm	3.02
A20329/3	2	0-20 mm	7.92
		20-40 mm	5.64
		40-60 mm	3.13
		60-80 mm	2.64

* ASTM F1647-11 (2018) Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes (Method A)

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

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SOIL CHEMICAL ANALYSIS

CLIENT:	PENRITH GC
DATE RECEIVED:	04/08/2023
RESULTS TO:	GS

Lab No.	Source	pH	P_2O_5 (mg/l)	K_2O (mg/l)
A20329/1	GREEN 1	4.9	16	58
A20329/2	GREEN 6	4.6	8	36
A20329/3	GREEN 2	4.8	11	46

Mr M A Baines, Soil Laboratory Manager

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

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