

NOIDA GOLF COURSE INDIA

Sustainable Golf Renovation Roadmap

Renovation

Date: August 2026

Version: 1.0

Sustainable.Golf

Contents

INTRODUCTION	4
THE CLUB	7
THE PROJECT	16
PROJECTS ROADMAP	22
APPENDICES	37



Cover photo source: GEO



A photograph of a golf driving range. In the foreground, three golfers are visible on a paved area with green artificial turf mats. One golfer on the left is in a follow-through swing, another in the center is preparing a shot, and a third on the right is standing with a club. A large green netted roof covers the area, supported by a metal frame. In the background, there are trees and a clear sky. The text "Sustainability was part of golf in the beginning and it must be part of golf in the future, creating golf courses that respect their surroundings and honour the natural environment." is overlaid in white.

Sustainability was part of golf in the beginning and it must be part of golf in the future, creating golf courses that respect their surroundings and honour the natural environment.

Executive Summary

After visiting Noida GC in 2024, GEO identified a number of short- and long-term projects that the club could consider undertaking to improve the sustainability, efficiency, and overall player experience of the golf course. Based on observations made during the site visit, several key issues were identified along with both major and minor projects that could significantly enhance the course's sustainability.

These recommendations provide a strong basis for the sustainable golf journey towards GEO Certified® Facility status for the facility post renovations work, with the possibility at the time of writing to be the first GEO Certified Facility in India.

This summary outlines the most significant findings and recommended actions. For a more detailed assessment of the issues and proposed solutions, please refer to the full document.

Mapped Issues (pg 11)

- Vegetation - the site is unmanaged and as a result is overgrown with vegetation in many locations. This is impacting course strategy, character and is impacting the health and quality of the habitats and turf.
- Drainage - the system in place is functioning poorly and leads to flooding around the site and areas of turf becoming waterlogged.
- Irrigation - the system is outdated and applies water outside of the managed turf. The system is also old and often leaks, compounding the water logging issues.

Major Priority Projects (pg 23)

- Creation of a vegetation and tree management plan as well as the implementation of it, seeing the pruning, clearing and general management of overgrown areas.
- The creation of a modern and purpose built maintenance facility with appropriate pollution prevention features, staff well-being facilities and appropriate storage space.
- Implementing a staff training program as well as looking to improve staff working conditions and staff pride in their role.
- Look to modernise the maintenance fleet, creating a transition plan to move towards a hybrid and electric fleet.

Minor Priority Projects (pg 31)

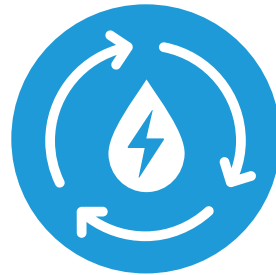
- Implement a water quality testing program.
- Create a course management plan to see a consistent approach to course presentation and management.
- Sign up to the OnCourse® platform on journey to GEO Certified Facility.
- Create golf introduction programs to help grow the game in the local area.

INTRODUCTION

While sustainability can seem complex, for golf it's about integrating a range of practical issues and new ideas into your decision making. We look at four pillars and these are what we define 'sustainable golf' by...



Fostering
Nature



Conserving
Resources



Taking Climate
Action



Strengthening
Communities

GEO has prepared this Sustainable Golf Renovation Roadmap on behalf of Noida GC to summarize the environmental enhancements and social value that can be integrated into this flagship project for sustainable golf as well as the long term planning for the course regeneration.

It outlines a vision and approaches that can help Noida Golf Course realise its full potential - moving beyond responsibility towards meaningful social and environmental regeneration while strengthening the club's overall business model. The report takes a long-term perspective, presenting ideas and projects that could be implemented over the next 20 - 30 years.

The recommendations set out in this document are intended to position the club as a leader in sustainable golf, demonstrating best practice from the local level through to the global stage across the four pillars of sustainability.

All content and recommendations have been developed specifically for Noida Golf Course in India, and reflect the most suitable opportunities and actions for the golf course.

These are based on the International Voluntary Sustainability Standards, which guide sustainable golf developments worldwide. These can be found by visiting <https://sustainable.golf/about/credibility/standards/development-standard/>. These standards have been created during a rigorous process of public and expert consultation. They have been developed so that they are 'Code Compliant' as required by the ISEAL Alliance for global credibility in sustainability labelling.



THE CLUB

Site description

OVERVIEW

Geography

Noida Golf Course is located within the city of Noida, a satellite city of New Delhi, in the state of Uttar Pradesh, India. Uttar Pradesh lies in the northern part of the country and shares an international border with Nepal to the north. It also borders the Indian states of Bihar to the east, Jharkhand and Chhattisgarh to the southeast, Madhya Pradesh to the south, and Rajasthan, Haryana, and Delhi to the west. Uttar Pradesh is the most populous state in India and, if considered an independent country, would rank as the sixth most populous in the world.² The population of Uttar Pradesh accounts for approximately 17% of India's total population and around 3% of the global population.

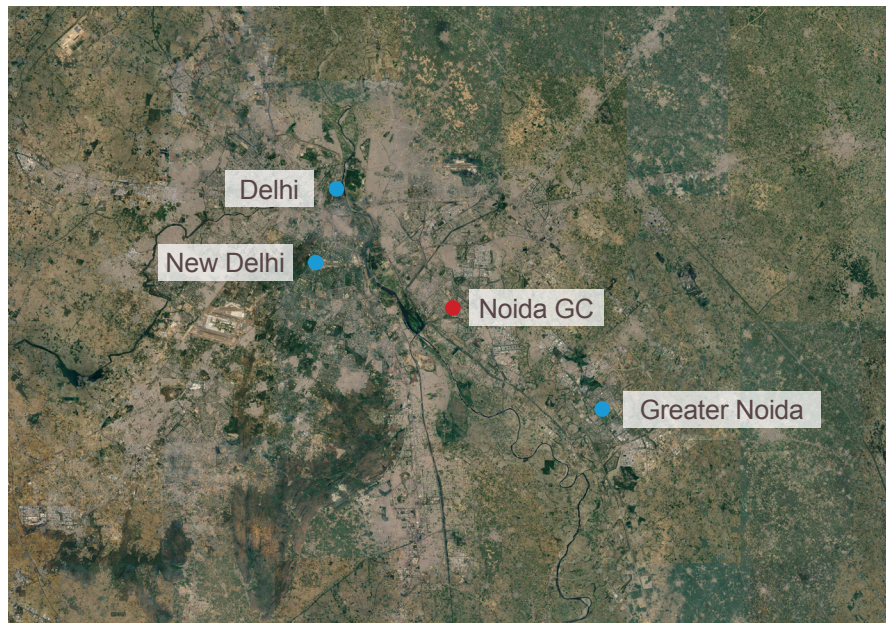


Figure 1: Site context (Source: Google Earth)

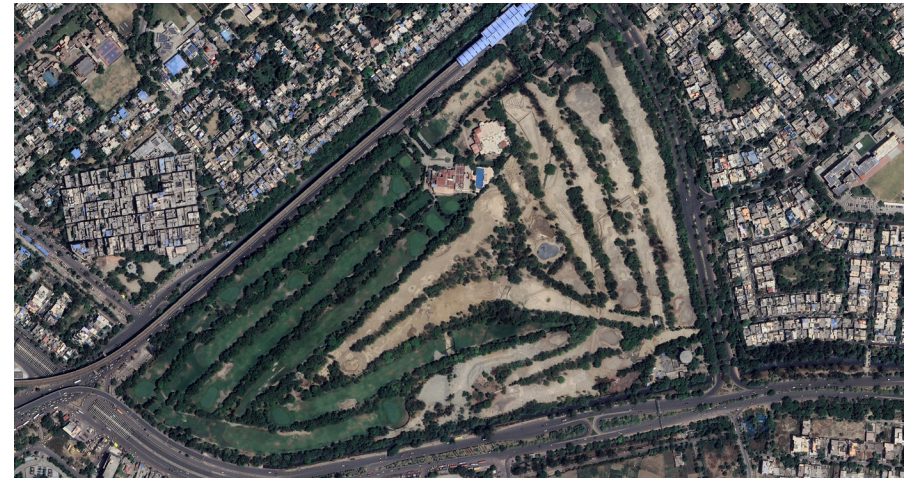


Figure 2: Aerial photo of Noida Golf Course (Source - GEO)

The region is well connected to both domestic and international markets, with three international airports currently in operation and a fourth expected to open by the end of 2026, alongside a further six domestic airports. Uttar Pradesh is also served by some of the largest rail and road networks in India, providing strong connectivity between major urban centres within the state as well as links to neighbouring regions.³

Two distinct geographical regions define the state. The majority of Uttar Pradesh lies within the flat, fertile alluvial plains of the Gangetic Plain, formed by sediment deposits carried from the Himalayas through the Ganges river system. To the south, the landscape transitions into upland terrain that forms part of the Vindhya Range, while the Himalayan mountains border the state to the north.

With about 6.9% of its land forested, the state's supportive environmental conditions allow for a great variety of life.⁴ Temperate forests are found in the upland regions, and the lower plains feature a variety of habitats including moist deciduous woodland, tropical dry deciduous forests, and arid shrubland.

² <https://qz.com/india/1094942/if-uttar-pradesh-were-a-country-where-would-it-rank-by-size-wealth-and-other-measures>

³ Road India - Government of India 2011

⁴ India State of Forest Report 2011



In addition, the Ganges River, and its tributaries form an important ecological network, creating prominent aquatic and riparian habitats throughout the landscape.

The state is home to a number of endangered species including - Ganges river dolphin *Platanista gangetica*, Bengal tiger *Panthera tigris tigris*, Swamp deer *Barasingha Rucervus duvaucelii duvaucelii*, Sarus crane *Antigone antigone* and Various species of vultures.⁵ To support the protection of these species and their habitats, a number of areas across the state have been formally designated for conservation. These include 10 RAMSAR sites, one national park, two tiger reserves, and 18 wildlife sanctuaries.⁶

The Noida area has been classified in the *Cwa* group (humid subtropical climate) in the Köppen climate classification system.⁷ This sees the area experience dry winters and hot summers. Summertime can see average temperatures reach highs of 34°C in June while January sits at around 14°C. The skies are classified as 'Clear' for the majority of the year, with only July - August having more 'Cloudier' days than 'Clear'.

Rainfall here totals around 632mm annually with the majority of that concentrated between June and September (518.6mm). Daylight is fairly consistent through the year at around 12 hours, reaching 14 in peak summer. Between June and September the humidity can reach close to 100%. Wind speed fluctuates between 8 and 13kph through the year.⁸

Socio-economic

The state's economy is largely driven by agriculture, with rice, wheat, and sugarcane among the primary crops. Although Uttar Pradesh is one of India's major grain-producing regions, many farmers operate on small landholdings and often lack the resources required to invest in modern technology and equipment. Beyond agriculture, sectors including mining, textiles, and sugar

refining are also significant contributors to the state's economic landscape. The state government continues to support the development of medium- and small-scale industries to strengthen economic growth and employment opportunities.⁹

The state experiences regular power shortages, although the situation is gradually improving. Recently, there has been a shift toward hydroelectric power, with a growing number of facilities coming online, complemented by a nuclear power station in the western region.¹⁰

Uttar Pradesh, like other parts of India, faces environmental challenges such as air and water pollution, land degradation, deforestation, and more frequent extreme weather events.¹¹ Because of this there are a number of state level policies in place to combat these issues. Key initiatives feature the Uttar Pradesh Solar Power Policy, targeting 12,000 MW of solar power capacity, and the Uttar Pradesh Clean Air Management Project (UPCAMP), concentrating on enhanced air quality monitoring, strengthened institutional frameworks, and the implementation of technologies for cleaner air.^{12,13}

Cultural¹⁴

Uttar Pradesh holds significant cultural importance in India. The majority of the population is Hindu, and the region has been central to ancient Hindu civilizations. This is where much of the ancient Vedic writings and the Indian epics, Ramayana and Mahabharata (including the Bhagavad Gita), came from. The state also gave birth to the Hindi language.

Uttar Pradesh is home to many museums, colleges, and institutions dedicated to art and music. The region has prominently shaped Indian cultural heritage, especially in music, as people developed both the sitar and tabla here.

5 <https://www.scribd.com/document/945837654/Endangered-Species-of-Uttar-Pradesh>

6 <https://www.pmfias.com/uttar-pradesh-national-parks/#:~:text=Other%20tiger%20reserves%20in%20Uttar%20Pradesh%20include%20Kaimur%20Wildlife%20Sanctuary%20%20Katarniaghat%20Wildlife%20Sanctuary>

7 https://people.eng.unimelb.edu.au/mpeel/Koppen/Europe_MiddleEast.jpg

8 <https://weatherspark.com/y/91632/Average-Weather-in-Helsinki-Finland-Year-Round>

9 <https://www.britannica.com/place/Uttar-Pradesh/Economy>

10 <https://www.britannica.com/place/Uttar-Pradesh/Economy>

11 Environmental Challenges of Uttar Pradesh and Role of Directorate of Environment of the State – An Analysis

12 <https://newsroomindia.org/explainers-reports/uttar-pradeshs-climate-action-plan-building-a-resilient-future/>

13 https://upecp.in/pdf/State%20Environment%20Plan_Uttar%20Pradesh.pdf

14 <https://www.britannica.com/place/Uttar-Pradesh/Cultural-life>



SITE¹⁵

Noida Golf Course is located within the city of Noida and was first opened in 1989 on 97 acres of land within the urban boundary. Surrounded by roads and densely populated residential areas, the course serves as a green oasis amid the city's bustle.

Designed to accommodate players of all skill levels, the 18-hole course stretches roughly 6,989 yards from the back tees. The site features heavily tree-lined fairways and areas of dense vegetation. The land also holds historical significance, as it was the site of the Battle of Delhi in 1803, fought between the armies of the Marathas and the British.

A GOLF VISION

There is a clear vision to rejuvenate the golf course with improvements to strategy and overall character of the course and land to ensure this is a place where members enjoy and are proud of.

Golf is a popular sport in India, with many members and players having a strong passion for the sport. By adopting an appropriate and sustainable strategy, the development of golf in the country can position it at the forefront of the industry. Designing resilient and future-proof courses not only safeguards the game for generations to come but also supports long-term business success.



Figure 3: Golfers heading towards the green (Source GEO)

SCOPE & PROPOSALS

The current renovation project is at the construction stage. The scope of works and budget was allocated prior to GEO's involvement in the project, limiting the influence GEO can have in the current program of works.

The primary objectives of the phase 1 renovation project are to:

- Enhance the strategic design of the golf holes.
- Develop a more cohesive, easier-to-maintain course presentation.
- Improve drainage across the course.
- Reduce pressure on managed turf areas.
- Modernise the irrigation system and supply to ensure efficiency and reliability.

To meet these objectives the project will:

- Increase the size of greens and tees.
- Replace managed turf across the course with a better suited species.
- Clear and improve the function of the drainage system.
- Modernise the irrigation system.
- Simplify bunker style.
- Assess and improve the overall course presentation style.
- Clear scrub vegetation where not appropriate.
- Modernise and expand the maintenance facility.
- Increasing size of maintenance team and team training.
- Improve and modernise the maintenance fleet.

15 <https://noidagolfcourse.com/>



Mapping the Issues

After having visited Noida Golf Course in 2024, spending time on the golf course and meeting with multiple members of staff, GEO recognised that there were some issues of note with the course. By tackling these issues, Noida can take real steps towards a more sustainable future for the property. The following are the issues identified by GEO:

Trees

The playing corridors are bordered by a mix of tree species, some of which appear to be non-native. The overall tree density is higher than would typically be expected in this setting. Trees positioned so close to the fairways can restrict air circulation and sunlight, increasing the turf's vulnerability to pests and disease. The trees are so dense and close to the playing corridors that they are also having a detrimental effect on playing strategy, making the course slightly one-dimensional.

Many of the trees on site also appear to receive minimal pruning or crown lifting, with low-hanging branches creating obstacles and potentially limiting safe movement around the course.

Overgrown Vegetation

There are parcels of the site where vegetation is unmanaged and overgrown. This has unintentionally altered the strategic play of the course, as the dense vegetation affects lines of sight and influences how shots are approached. There does not appear to be a planned approach to how these areas are cared for.

Overgrown areas have also contributed to the clogging of drainage lines and ditches, compounding the drainage issues noted later and creating further maintenance challenges and having a detrimental impact on the function of the hydrology and water management on the course.



Figure 4: Images showing the extent of the trees on site. The bottom image shows a tee shot through the vegetation where the plants have been allowed to grow out of control. (Source - GEO)



Maintenance Facility

The current maintenance facility falls well below international standard expected for a modern golf club and basic safety provisions for staff. The building is both undersized and poorly organised, with no visible pollution prevention measures in place. This makes efficient and sustainable operations difficult and directly impacts the overall quality of course maintenance. In addition, the facility lacks many of the internal spaces and functions expected.

Maintenance Fleet

Similar to the maintenance facility, the current machinery fleet is outdated and not well suited to the demands of a modern golf club. Some of the equipment may be placing excessive pressure on the turf, potentially contributing to issues such as disease and pest outbreaks.

The fleet is also relatively small and largely powered by diesel, which increases the course's carbon emissions and does not align with more sustainable maintenance practices.

Maintenance Team

Some of the maintenance team have a lack of formal training in the specialism of golf course management. This creates challenges in consistently upholding high standards and, at times, may lead to increased maintenance difficulties.

Ornamental areas

There are areas around the course with garden style planting beds and plant choices. While this is entirely suitable around entrance roads, clubhouse, shelters and outdoor seating, it brings a strange disconnect with the natural environment when used around the course.



Figure 5: Current maintenance facility and some of the team and fleet. (Source - GEO)



Figure 6: Examples of incongruous gardenesque plantings (Source - GEO)



Drainage

The existing drainage system has become partially clogged over time because of the accumulation of debris and vegetation, restricting the flow of water through the network. This has, occasionally, resulted in flooding across sections of the course. Given the intensity of rainfall experienced in the region, it is essential that the drainage system can handle large volumes of water efficiently. As the course is on relatively flat terrain, water can easily accumulate in low areas when the drainage infrastructure is not functioning effectively.

Irrigation

The irrigation system currently in place is not typical of those used at modern golf facilities. A number of wells are distributed around the course, each with its own pump supplying irrigation directly to one or two nearby holes on separate loops. This configuration is not energy efficient nor resilient in the face of potential water shortages - It runs at about 40% of its capacity. The system also depends on the operator's skill and dedication for effective and efficient use. Throughout the irrigation system the mainline and laterals are quite old which has led to lots of leaks, wasting water and leading to further areas of the turf becoming waterlogged and flooded.



Important open drainage features of the golf course to be enhanced and protected



Drainage ditch that has become full of vegetation and debris, blocking the flow of run off water significantly.



Areas around the course where drainage outlets overflow

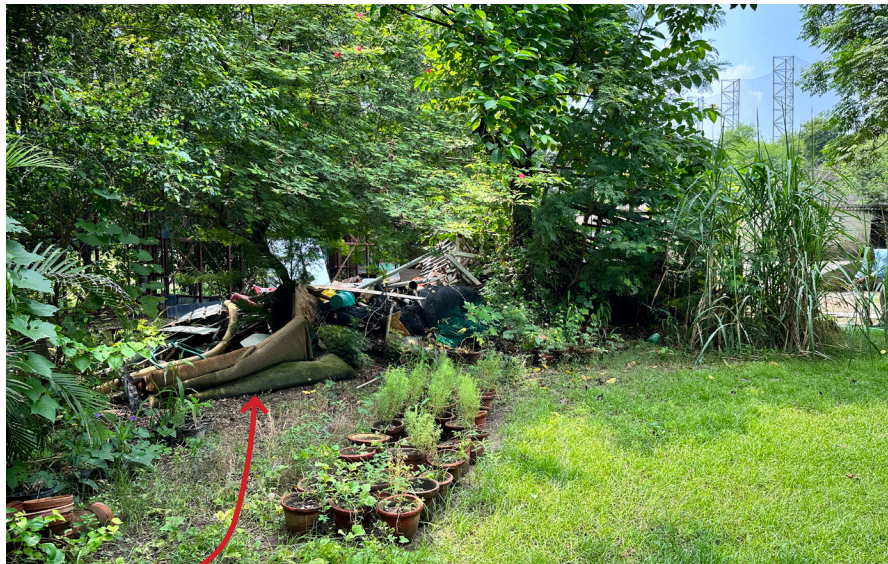
Example of one of the small pump stations found around the course.



Waste Management

The current waste management on site is to a poor standard. Across the site there are examples of materials and waste being stored with no real organisation. In some instances these materials could be reused but for the most part they should be disposed of off site. It does not appear that there is a comprehensive waste management plan in place or a standard means of disposing of waste materials.

Leaving this waste around the site can lead to a number of health and safety issues as well as attracting pests to the site. It also uses up land that could be put to better use on a tight site like this.



Large collections of waste piling up in out of play areas.

Turf Species and Conditions

The current turf species is a mix of local grasses and broadleaved weed plants. While some native carpet grasses and others can provide a reasonable playing surface, particularly in shaded areas, the broadleaved plants are become overly dominant and are negatively affecting the playing experience.

The quality of future sources of irrigation water also need to be considered and understood so that it is compatible with the new turfgrass proposed during the renovation work.



Weed species starting to come through the turf all over the golf course.

Paths

Currently throughout the site there are some informal cart path type areas, these tend to be defined as heavily worn and compacted dirt areas that have continuously been driven over. Given the fact that space is tight on the site it is believed by GEO that there is not enough room on the site for a designated cart path to safely operate. This, alongside the lack of golf carts that are used at Noida means there is no need for specific paths, carts can be driven on fairways easily with minimal impact on turf quality.

Use of Space

The property is constrained in terms of space, and with urban development surrounding the site, there is no opportunity for expansion or new land acquisition. It is therefore essential that the club maximises the use of the land available. At present, several areas across the site are underutilised or not used to their full potential. This presents an opportunity to optimise land use and enhance the overall functionality and value of the course.

Underdeveloped Practice Facilities

The existing practice facilities are not optimised to deliver the best experience for golfers or the wider community. Multiple practice greens are located in separate areas, and there is no clearly defined short-game facility. As a result, there is no consolidated space for learning and developing a variety of golf skills.

Course Furniture

Throughout the course there is an array of dated poor conditioned course furniture. While some signage is useful to direct players around the course, this makes the course feel cluttered and removed the golfer from the round.



Figure 7: Some paved pathways have good character and quality (Source - GEO)



Figure 8: Images showing the mix of course furniture (Source - GEO)



THE PROJECT

Sustainable Renovations Highlights

This section of the roadmap looks at the work that is currently being carried out in this renovation project. It identifies the work and creates a highlight about how this contributes to the long term sustainability of Noida Golf Course. These highlights can then be uploaded to the clubs OnCourse® profile page online.

Irrigation System Upgrade

One of the main focuses of this renovation process has been the modernisation and upgrading of all aspects of the irrigation system. While this is not a cheap works package it can make significant improvement to all aspects of the course and lead to financial savings.

The upgrade will see a more sustainable and resilient source of irrigation water being used. Moving from groundwater, Noida now has the infrastructure to receive treated sewage effluent (TSE) from a local treatment plant. This water will be piped directly into a series of lakes on the site, providing a reliable and robust source of water that can be used all year round. Further to the TSE supply, the new grading of the course directs more surface water towards these irrigation lakes as well, ensuring that minimal amounts of water leaves the site and as much as possible is recaptured in the lake system. These sources of water are more sustainable than taking water from groundwater sources.

A more efficient and better controlled system is proposed throughout the course which will reduce the total volume of water that is required to irrigate the golf course. A new and modern pump will be able to push the water through the system using less power. This single pump will replace four that are currently used on site. This will result in financial savings around electricity use and will provide an improved delivery of water to the sprinklers.

These upgrades in the system has given the opportunity to refine the layout of the irrigation system. Previously the sprinkler heads mean that the full site, including tree lines and out of play areas were constantly watered which led to large areas of overgrowth. The new layout will ensure that water is focused on the playing surfaces, allowing rough areas and areas below the

trees the dry out, keeping grass coverage thinner and weeds suppressed. This will lead to significant water savings and create a far more natural appearance for the golf course.

This new system will have improved control systems compared to the complex one in place. Making it more manageable by the maintenance team, which should result in better care of the course being taken. New mainline and laterals have been installed as part of these works which will resolve the issues with leaking. This kind of investment will result in a better quality golf course with a healthier playing surface. It can be expected to see savings to be made in water itself and electricity which will in turn result in financial savings.



Figure 9: Historical marker on the site (Source GEO)



Creation of Irrigation Lakes

A series of eight new lakes have been built. These have been made with the primary role of storing irrigation water through the year. As a secondary function the majority of them will offer new elements of strategy to the golf course. Thirdly they may provide habitats for some fauna species as resting and cooling areas.

The lake system will feed into one primary irrigation lake where the pump station is situated. This is found at the low point of the site on hole seven, meaning that this is a gravity powered system. This will make financial savings for the club as they need to use less energy to move water around the golf course.

Liner has been used on these lakes to ensure that there is no risk of leaching or leaks, meaning that all water will be kept within the golf course and there will be no run off leaving the property.

The lakes themselves provide a safety net for the golf course, offering security in their irrigation supply. In the event that the TSE supply is paused, stopped or a shortage occurs, there will be approximately six days worth of peak irrigation demand held in the lakes. Providing the course with some time to address supply issues.

These lakes also provide an opportunity for water testing to be conducted on the site. This is important to ensure that the water that is being used is suitable for the turf and is not causing damage.



Figure 10: Excavation and shaping of one of the new irrigation lakes
(Source: Golf Design India)



Figure 11: Project team site walk (Source: Golf Design India)



Drainage

The renovation works have provided an opportunity to assess the existing drainage system and implement improvements across several areas of the course. The site's new grading helps water drain naturally to the new lake system rather than out of the site. This approach has reduced the need for additional plastic drainage pipes while enhancing the character of the course.

An existing drainage ditch running diagonally across the north-east of the site has also been cleared and reopened to allow water to flow naturally once again. Over time, this channel had become clogged with debris and vegetation, rendering it largely ineffective. Restoring the ditch will now enable water to be directed to the irrigation lake on hole seven, providing another example of a nature-based drainage solution.

The works have also enabled the installation of an outflow pipe, which did not previously exist. This significantly reduces the risk of flooding by providing an outlet when heavy rainfall fills the lake system. Excess water can now discharge into a Noida City main drainage channel near the site's low point at hole seven, with agreements in place with the city authorities to allow this solution.



Figure 12 - New drainage being installed in a bunker (Source Golf Design India)

Re-grassing

Choosing the right turf species is crucial for sustainable golf course management. Choosing species that are well suited to the local climate and soil conditions can reduce the need for water, fertilisers, and plant protection products. This not only benefits the surrounding natural environment but can also lead to long-term cost savings for the club.

Over time, the existing turf had become heavily infested with broadleaved weed species because of the pressures placed upon it. The new strains of Bermuda grass—TifDwarf and Sun Queen—have been introduced, as they are considered well suited to the site's conditions.

There is also potential to review overall turf footprint and ensure the correct areas have turf cover. It may be possible to reduce the overall area of turf, but importantly it is an opportunity to ensure it is closely coordinated with the new irrigation sprinkler layout.



Figure 13 - Construction of new greens complexes (Source Golf Design India)



Bunker Audit & Reduction

The renovation reduces both the number of bunkers and the overall bunkered area across the course by around 30% with the new bunker area totalling around 3,700m². This will lower the resources and labour required for ongoing maintenance, resulting in operational efficiencies and financial savings for the club.

In addition, several of the remaining bunkers have been redesigned with simpler forms to make maintenance more straightforward for the greens team. This approach should help ensure that bunker quality can be maintained by teams of varying experience levels. By reducing the time required for bunker upkeep, the maintenance team will also have greater capacity to focus on other areas of the course.

Practice Facilities Upgrade

The project team has recognised the importance of well-designed and comprehensive practice facilities. Such facilities play a key role in growing the game of golf by introducing new players to the sport and supporting skill development among members. Historically, the practice areas at Noida were small and dilapidated, lacking a clear or cohesive design.

Significant upgrades have been proposed to the driving range during renovations. New hitting bays and a shade structure, improving comfort for golfers practicing in the summer. The turf renewal and the installation of new target greens is also planned. By reusing the range's existing safety nets, the team has lessened both material consumption and project expenditure.

In addition to the driving range, a new short-game practice area is planned to be developed on land that was previously unused on the course. This provides additional opportunities for players to learn the game and develop their skills, creating a more inclusive and welcoming facility. The improved practice facilities may also offer financial benefits by attracting more members.

Vegetation Clearance (Including Trees)

In recent years, much of the vegetation across the site had been left largely unmanaged. The renovation process has provided an opportunity to address this and implement significant improvements.

Many of the trees on site are legally owned by the government, making their removal challenging. Over time, as the number of trees increased the management of those trees declined. The renovation has allowed the team to tackle some of these issues, with approximately 65 trees removed to date and another 35 planned for removal in the coming year. While this may seem counter-intuitive, reducing tree density and limiting new plantings reopens airways across the course and reduces shading, which can inhibit turf growth. These measures will improve turf quality and reduce the need for artificial inputs.

The tree management work involved identifying native and non-native species, then prioritizing removing the non-native trees. Native species have adapted to local conditions, often requiring less irrigation and fertiliser, and their presence enhances the site's biodiversity.

Beyond tree management, overgrown vegetation throughout other areas of the course was impacting strategy and aesthetic value of the golf holes. Having large areas of un-kept and overgrown vegetation is an unsightly addition to the golfing landscape. Clearing scrub vegetation and allowing the majestic specimen trees to thrive with more space, air and water as a result is normal part of good woodland care principles.



Figure 14 - Areas of clearing the scrub vegetation (Source GEO)



Course Strategy

There has been a significant amount of reshaping carried out to the golf holes within the existing corridors. The original course was relatively flat. These renovation works saw this change with the inclusion of slopes, mounds and undulations through the fairways and roughs.

The work was carefully carried out to ensure that these changes were well tied in to the levels of surrounding boundaries and trees. This returned the course to a more natural character and what the land might have been like prior to the urban development.

The renovations have also included plans to increase in tee areas, reducing the wear and tear, particularly on par 3s. The larger area also allows for more tee locations to be created on each tee box, offering slightly different angles of attack or distances for each hole, changing the strategy slightly.

Green complexes are planned to be completely reworked to create more movement and interest with slopes and undulations. Some greens will also increase in size to increase the amount of sunlight they receive.



Figure 15: Green and bunker shaping on site (Source Golf Design India)



PROJECTS ROADMAP

Priority Projects

Summary

The current renovation work at Noida will see the club take large strides forward. During the visit, there were a variety of additional projects that would improve the course and club, in terms of quality and importantly sustainability. These projects may focus on one pillar of sustainable golf or they may cover multiple.

This section details the projects that have been identified by GEO as the 'Priority Projects', these are seen as ones that will give the most benefits and are generally bigger projects that would require some level of capital expenditure to implement. They are detailed below in no particular order.

Maintenance Facility Upgrade

1-3 years

Financial - Climate action - Carbon - Nature - Resources - Climate

There are some major improvements that can be made to the current maintenance facility at Noida Golf Course, some of which can be quickly carried out and others which can be looked at in the future. Having a properly set up maintenance facility can help ensure there are reduced risks of negative impacts to the surrounding nature, it can save significant time and money, and if done properly it can positively impact the climate.

The current facility is too small for what it is required for. GEO would recommend removing the existing structure and replacing it with a larger, basic structure that has enough room for all the required facilities. Within this building GEO would recommend including space for; all maintenance machinery, fertiliser storage, separate chemical storage, staff toilets and shower facilities, staff kitchens, staff accommodation, an office and a meeting room. Outside of the building structure there should be a bunded wash down area and fuelling area as well as space for material storage and waste.

Ensuring comprehensive pollution prevention is essential here. All chemicals should be stored securely in a well ventilated room. Rooms that hold

chemicals should be bunded to ensure that any leaks or spills and contained within the room and wall fabric should also be fire rated. Drip trays beneath stores or shelving should also be used to prevent any spills. All car/vehicle batteries should be stored in the same way.

Fully stocked spill kits should be available throughout the maintenance facility in case of a spill. These should also be taken if fuelling is required outside of the maintenance facility. All staff should be trained on how to use such kits and only qualified staff should handle hazardous substances.

For Noida, GEO would recommend taking a simple approach to the maintenance facility design. A simple and secure 'portal' or 'A-frame' structure is all that is required here. A large concrete pad can be built as the ground floor. This should slope internally towards a drain that passes through a solids and oil interceptor to ensure no potentially polluting materials leave the building if there is a spill.

It is important that there is appropriate staff facilities included in the building design. This means there must toilets, shower rooms and changing areas. There could also be an area where greens staff can cook and eat. These facilities should be to a good sanitary standard. The club could look at including some part time accommodation where employees can sleep which may be useful and important at certain times of the year.

The washdown area should make use of a closed-loop-system. This kind of system will reduce the water demand of the facility greatly as the water is captured, cleaned and re-used within the system. The system would also capture solids like grass clippings, stopping them from clogging drainage pipes.



Figure 16: Simple A-frame structure



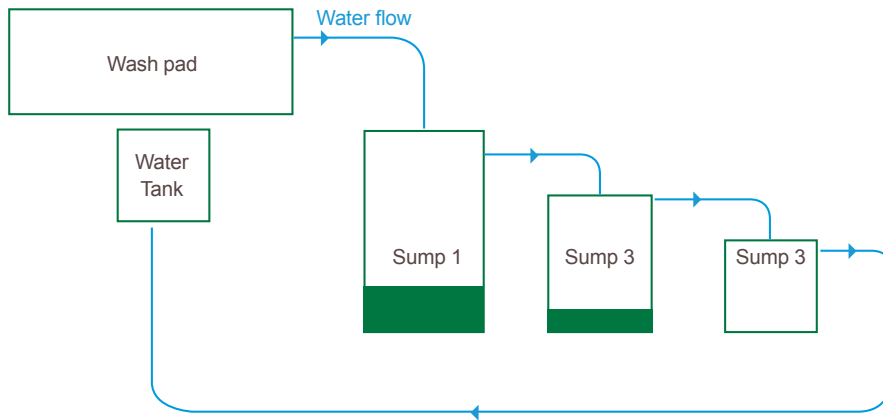


Figure 17: Diagram of a staged grass clipping settlement system for cleaning washdown water and recycling it.

Given the climate here there is also a good opportunity for microrenewables to be installed at the maintenance centre. Solar panels on the buildings roof would produce energy towards powering the building itself. As more and more of the maintenance fleet becomes electric/hybrid, this solar generated electricity could be used to charge the machinery.

This kind of approach can be taken across the golf course. Solar panels on the clubhouse roof would be able to charge the golf carts. This can greatly decrease the demand for non-renewable electricity within the golf operations and long-term will return on that investment. In a similar vein grey water recycling and rainwater harvesting solutions could be incorporated in this process in order to reduce how much water the club uses.

Appropriate waste management is another aspect that should be looked at and can be easily resolved. All waste should be separated at the source and where possible, collected by an appropriate third party waste handler for recycling. One aspect of waste management that can be handled internally is green waste. Compost can be made on-site using this waste simply by following aerobic or anaerobic processes. This compost can then be used back in the landscape areas, reducing the demand for fertilisers.

It is important that this maintenance facility is not over complicated. It should be purpose built to serve the maintenance team and no other groups or



Figure 18: Example of a wash down area draining one way (Source - GEO)

members of the golf course. Appendix A illustrates the potential to far better utilise the space available to the club around the current maintenance area. This would represent a significant upgrade to the facility.

Targets should include:

- Build a new maintenance facility that is fit for purpose.
- Improve the machinery wash and fuelling areas to meet minimum pollution prevention best practice.
- Investigate the potential use of solar-panels.
- Provide good quality and safe facilities for staff to rest, eat and changes within the maintenance facility.



Figure 19: Solar panels on maintenance shed at Royal Portrush (Source - Solarfix)



Staff Training

1-10 years

Financial- Resources

In 2025 the USGA stated that 'Ultimately, a golf course's greatest asset is its people.'² There is great value in finding experienced, enthusiastic and well trained greenkeepers and it can be even harder to keep them. It takes time and money for new employees to learn how to best maintain a golf course, a far more efficient solution is internal training and employee retention.

GEO would recommend looking at the structure of the greens team at Noida and assessing where this can be improved to ensure there is a proper structure with sufficient roles filled. As each course has different requirements GEO would suggest that the club looks to golf course architect Vijit Nandrajog for support in setting this structure up over the next few years.

Employee satisfaction is key to retaining a good workforce. Ensuring that all staff members feel and are appreciated is a major part of this. This does not mean increases in salary, but can be as simple as the likes of providing good facilities for them to work and rest in as well as uniforms. These give employees a sense of pride in what they are doing.



Figure 20: Maintenance team in matching uniforms (Source - Hoiana Shores Golf Club)

Another way to value the greenkeepers is to place them through continual professional development and training. This approach benefits both the staff individually and the club as a whole as their skill level increases. This could involve bringing in external people to train the staff, they may be from other golf courses or through organised training companies.

Without a good team looking after the golf course it is easy for the quality to quickly drop so it should be an absolute priority that Noida look at investing, caring for and growing their team.

Targets for this project should include:

- Creating staff facilities that are of a high standard.
- Creating a staff benefit program that shows appreciation of the staff.
- Bringing Vijit Nandrajog and his team in to help create the staffing structure and roles and responsibilities as well as to help through grow in and beyond.
- Create a continual development program which sees staff given professional training to improve skills.

² <https://www.usga.org/content/usga/home-page/course-care/green-section-record/63/issue-04/investing-in-staff-is-critical-for-success.html#:~:text=A%20well%2Dtrained%20and%20experienced,17%25%20from%202022%20to%202024.>



Maintenance Machinery

1-10 years

Financial - Climate action - Carbon - Resources - Climate

Similarly to staff, having an efficient and effective maintenance fleet is very important to the quality of the golf course and the effectiveness of maintenance. The current maintenance fleet is old, poorly maintained and made up of fewer pieces of machinery than would be expected. All of this increases the difficulty of maintenance, increases carbon emissions, reduce course quality and can increase long-term costs.

While it is unrealistic for any club to upgrade its full maintenance fleet in one go, it is very possible that they can create an improvement plan and see gradual improvements over the coming years. This is something that Noida can do. Alongside Vijit Nandrajog, the club should audit the machinery they currently have and prioritize where money should be invested and what should be upgraded.

While it might not be a priority just now, the club should look at the potential to transition to a hybrid and electric fleet when this machinery becomes more available. There is a higher initial cost with these but they will lead to long term savings in fuel. The possibility to bring these machines in will be determined on there being a reliable electricity source and sufficient infrastructure in place to be able to charge machinery in the maintenance facility.

While the electric machinery industry is still fairly new, they have the backing of some of the most prestigious courses and organisations in golf. The St. Andrews Links have invested heavily in electric machinery with all greens mowers on the Old Course now being electric. Fully backed by The R&A these machines were used in preparation for the 150th Open.

Targets for this project should include:

- Carry out a full machinery audit.
- Create a long term plan to gradually upgrade and modernise the maintenance fleet.



Figure 21: Electric greens mower at St Andrews Old Course (Source - GEO)



Vegetation Management Plan

1-10 years

Financial - Nature - Climate action - Carbon - Resources - Climate

Vegetated areas across the golf course contribute significantly to strategy, habitat creation, and the overall character of the site. It is therefore important to adopt a clear and consistent management approach to ensure these areas are maintained in a healthy and high-quality condition. This can be achieved through the development and implementation of formal management plans. GEO recommends the creation of two key documents: a general vegetation management plan and a dedicated tree management plan.

Although some regulatory constraints apply to the trees on site because of their government ownership, this does not prevent management. Trees significantly influence the landscape and strategy of the course; therefore, actively managing their long-term health and suitability is essential. GEO recommends developing a comprehensive tree management plan to guide this work. It would be beneficial for Vijit Nandrajog to be involved in preparing this plan to ensure it reflects both landscape best practice and the needs of the golf course - GEO is able to support such work as needed to ensure the long term improvements to the management of vegetation on site.



Figure 22: Example of overly dense stand of trees (Source - GEO)

An important component of the plan should focus on branch and canopy management. This would involve seasonal pruning and coppicing of low-hanging branches to maintain adequate clearance beneath the trees, allowing people to move comfortably under them. Regular pruning would also help maintain the natural form of the trees, prevent an unkempt appearance, protect important sight-lines across the course, and contribute to overall tree health.

GEO also recommends starting discussions with local government authorities regarding the long-term management of trees on the site. In some cases, it may be beneficial to remove selected trees—particularly non-native species—to improve course conditions and tree health. Reducing tree density in certain areas would increase sunlight and air circulation, which is likely to improve turf health and reduce maintenance pressures.

A general vegetation management plan is equally important. As with the tree plan, Vijit Nandrajog should be involved to ensure that the proposed management practices support local habitats and biodiversity while remaining compatible with the golf course. Without regular management, vegetation will quickly become overgrown, potentially blocking drainage channels and obstructing important sight lines across the course. Routine maintenance will help prevent these issues while maintaining healthy habitats.

A key principle within both plans should be the identification and gradual removal of non-native plant species. A comprehensive vegetation & tree survey should be undertaken to document the species currently present on the site.



Figure 23: Example of new trees continually being planted on the site. (Source - GEO)

Increased vegetation management will also generate greater volumes of green waste, primarily as cuttings. As part of the project, the club should establish a clear strategy for handling this material. Two practical options include storing the waste on site for collection by a third-party contractor, or establishing a designated composting area on site. The site can reuse or sell the compost produced through this process, making both options viable and appropriate solutions.

Targets for this project should include:

- Create contemporary and forward looking Tree and Vegetation Management Plans for the site in coordination with the correct authorities.
- Remove non-native species from the planting pallet.



Figure 24: Example of overly dense tree planting areas. (Source - GEO)



Course Presentation Plan

1-3 years

Financial - Nature - Climate action - Carbon - Resources - Climate

To ensure a consistent approach to course presentation a plan should be created and followed. This plan would outline an agreed way in which the course will be presented as well as the maintenance practices that are required to ensure this.

At a basic level the plan should outline maintenance process. It should include the likes of mowing frequency and heights of cut on all areas of the course. As well as how to maintain the bunkers, how often sand needs to be changed and how often top dressing is required for example. These specifications should be created in line with industry best practice and with the help of Vijit Nandrajog to ensure best practice for his course design.

One key part of this plan should be how the course looks. In this location and climate, GEO would recommend that out of play areas and the rough are allowed to naturally dry out. This would be carried out by applying no artificial irrigation to these areas. In the wet season these areas would grow green and lush with the natural rainfall. But in summer these areas should be allowed to turn golden, dry out and become thinner and more open.

This approach will significantly reduce the volume of irrigation water used on the course leading to financial and energy savings and will create a far more natural setting. There are examples of courses around the world that do this.

An audit of the pest management should also be carried out and an approach included in this plan. GEO would recommend taking an integrated pest management (IPM) approach to all future management. This approach leans more towards early identification and monitoring rather than blanket prevention through pesticide and fungicide application. The IPM process involves:

- Regular monitoring and record keeping being used to identify the pest problem, analyse the conditions causing it, and determine the damage threshold level below which the issue can be tolerated.

- Strategies are laid out to change conditions to prevent or discourage recurrence of the problem.
- If damage thresholds are met or exceeded, control strategies are selected that will cause minimal environmental impact. These include biological (predators, parasites), cultural (habitat modification), physical (soil aeration, increased air movement), and chemical (pesticides, herbicides) methods.

Targets for this project should include:

- Auditing the existing maintenance practices.
- Creating a comprehensive and detailed management plan for the golf course.
- Create a low input and low maintenance golf course.



Figure 25: Examples of dried out roughs at Pinehurst No. 10 (Source - Pinehurst Resort)

Course Furniture

1-3 years

Financial - Nature - Resources

A fairly simply but impactful project that the team can carry out is the replacement and modernisation of course furniture throughout the golf course. Course furniture as a term covers a wide range of items on the course including tees markers, signpost, yard markers, bins, ball cleaning stations and benches.

The most important thing to consider here is that the course furniture fits the style of the golf course, and it site quietly within in it. It should not stand out in the course. While it is important that people feel well orientated, know their yardages and can play quickly and easily, there is a balance to be found to ensure that the course does not become cluttered.

The question should be posed “Do we need it?” When considering furniture placement. Often the temptation is to err on the side of caution and install a sign, or yardage stick or bench when in fact once into operations mode they become unused, more to maintain, more difficult to cut round and clean and an additional visual distraction for the golfer. Advertising or sponsor board should be viewed as a last resort for revenue generation as they are visually disruptive on the golf course.

A coordinated and rational approach is recommended when considering placement and design of signs and markers. While it may be tempting to opt for a design which is bold and gives the impression of luxury the better option is often the simple and locally made designs seen on the majority of Top 100 golf courses.

If materials on site are able to be reused then this would be preferable as it will lead to savings in costs and transport.

Targets for this project should include:

- Carry out an audit of the furniture on site and outline what is required and what can be removed.
- Update the course furniture with a more subtle style suited to the site.



Figure 26: Subtle tee markers made with locally made clay. (Source - GEO)

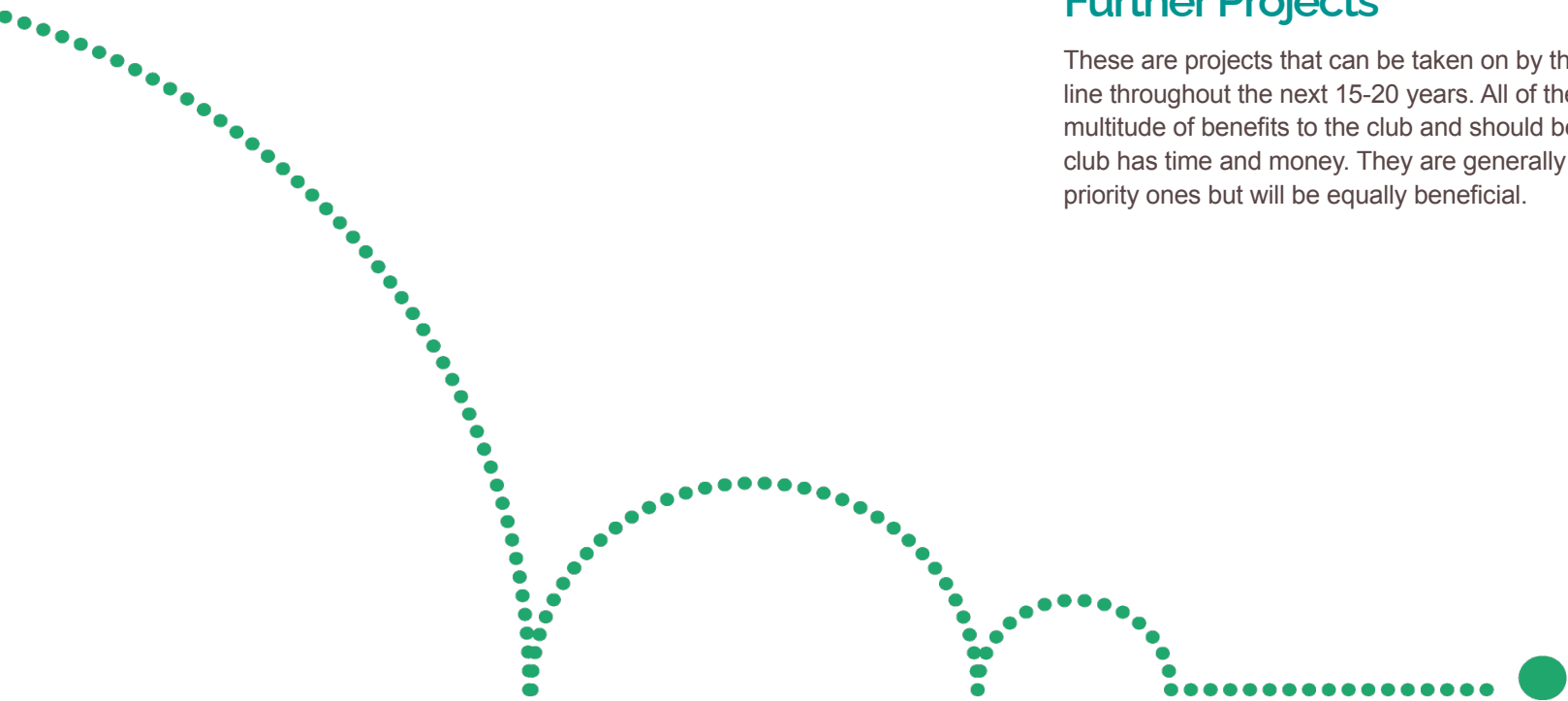


Figure 27: Example of range bay set up with minimal clutter. (Source - Heritage)



Further Projects

These are projects that can be taken on by the club further down the line throughout the next 15-20 years. All of these projects will bring a multitude of benefits to the club and should be progressed when the club has time and money. They are generally smaller projects than the priority ones but will be equally beneficial.



Project #	Project details	Time-line	Capital Cost
Nature			
N1	Biodiversity Gains Create 'bug hotels' at various points around the course.	This can be carried out at various times throughout the year.	Low
	Benefits • This is a simple way of attracting new invertebrates to the site, many of which will act as pollinators like butterflies and moths. • This will see an increase in biodiversity around the site and also help to create a unique atmosphere and experience. • These can be built on site using materials from the site.		
N2	Review and modernise fertiliser and pesticide applications Ensure that the application of fertilisers, pesticides and fungicides are appropriate, suitable, legal and minimal use principles are applied.	Start as soon as possible	Low
	Benefits • Potential to reduce the inputs on the course saving on costs. • Lower inputs means lower chance of run off, by assessing what is required then there can be close to full absorption for these.		
N3	Review and modernise fertiliser and pesticide applications Follow Integrated Pest Management (IPM) and Minimum Level of Sustainable Nutrition (MLSN) golf maintenance principles.	This should be followed as soon as renovation works stop.	Low
	Benefits • Reduces the total amount of chemicals used in maintenance, • Reduces the risk of run-off and leaching into the adjacent water bodies, • Is an overall less intensive maintenance program.		



Project #	Project details	Time-line	Capital Cost
N4	Water Testing Set up regular water quality testing with sample locations where water enters the site and exits the site. These tests should be carried out at least monthly to ensure a high quality of water enters the site and that unpolluted or contaminated water leaves it.	On-going	Low
	Benefits • Ensures good quality irrigation water. • Protects the course against claims it is polluting water.		
Resources			
R1	Course presentation Look at different ways the course can be presented which will impact the maintenance. For example, letting fairways turn golden and surfaces play hard and fast by reducing the volume of irrigation supplied to the turfgrass areas.	This can be looked at over the years and at any time of year.	Low
	Benefits • This will create a new look and feel to the course, • This would reduce overall water demand and costs, • This can totally change the way the course plays.		
R2	Solar Panels Investigate the potential to generate energy on site through solar panels on the roof of golf buildings.	This can be looked at whenever. It is good to assess this when there is an infrastructure change going on.	Medium
	Benefits • Renewable energy supply that can power some of the maintenance facility. • Potential to lead to financial savings.		



Project #	Project details	Time-line	Capital Cost
R3	OnCourse® Platform Continue to make full use of the OnCourse online tool, entering annual data required to complete the 'GEO Certified Facility' process.	This will require continual attention but should be looked at as soon as renovation works are complete.	Low
	Benefits - Using this should help identify ways that the club can improve its maintenance and operations annually. - This will contribute towards GEO Certification. - Provides a space where all operational data is collected.		
Community			
C1	Growing the Game The club can set out a plan to grow the game in this area through coaching and community introductions to the sport.	This kind of program can be looked at any time.	Medium
	Benefits - This can integrate the club in the community. - This can become another income avenue for the club. - Can ensure longevity of the membership.		



Project #	Project details	Time-line	Capital Cost
C2	Continual education and development for staff Have established development paths for club staff including course management staff with continual education and training available for them to increase their skill set. Benefits • Creates a strong workforce who are educated in golf and sustainable specialisms. • Will encourage staff to stay with the club and appeal to new potential staff. • Allows the club to direct employees in the direction they need. • Increases the skill sets throughout the local community	This should be established as soon as possible	Medium



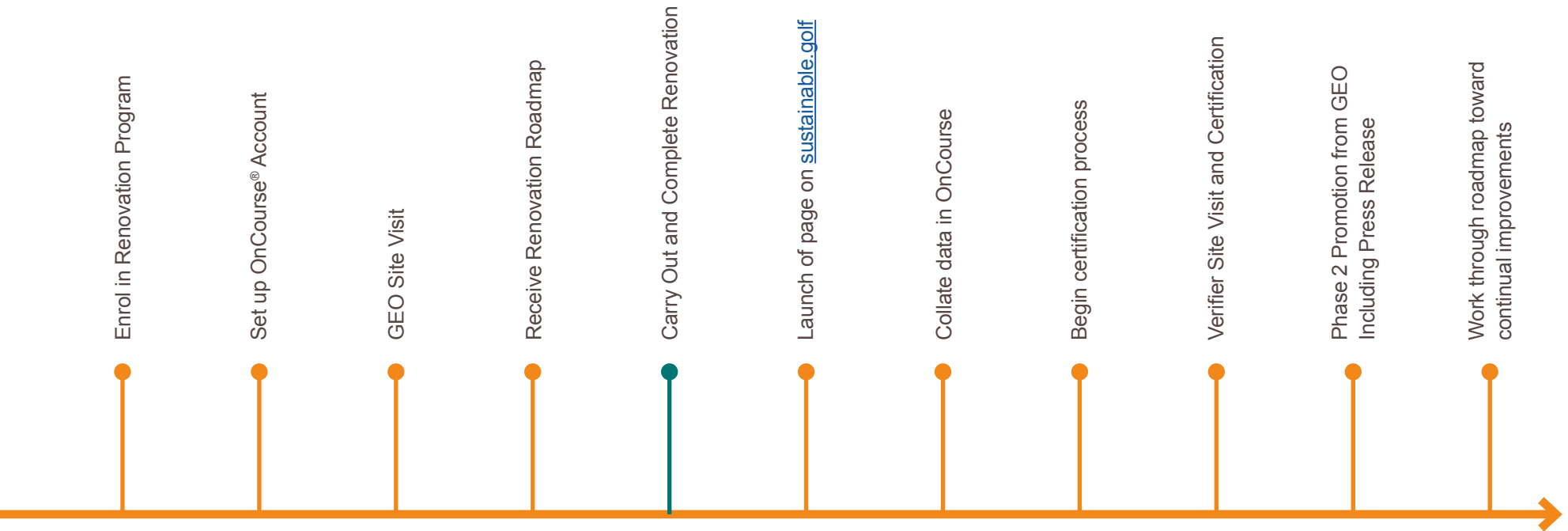
Future Partnership

GEO Sustainable Golf Foundation are very pleased to be working alongside Noida Golf Course during this time of renovation for the course. By establishing this partnership, GEO have committed to assisting Noida Golf Course on its journey to becoming a more sustainable and a future-proofed venue.

The property always have the option to bring GEO in at any time for consultation on these projects or to discuss other potential projects. Whether it be by email, phone call, meeting or even a site visit, GEO are here to help drive sustainability through the proud work of the Noida Golf Course team.



Renovation to Certification Pathway



This shows the step-by-step process involved in the Sustainable Golf Renovations program. The blue line shows the stage of the process that Noida GC is currently in. With works on site continuing to pick up pace and an OnCourse® account created the club is exactly where GEO would expect them to be.

Next Steps

- Noida Golf Course project team to continue with on site works and to remain conscious of their actions impacts to the surrounding areas.
- While carrying out works the team can take pictures and videos of key moments which can be included on the web page and in press releases by GEO upon completion of the renovation work.
- GEO to finalise Noida Golf Course's web page in time for works completing - to include testimonials, photos, highlights, key achievements and press release.
- Once works are complete the team should start to complete the OnCourse® profile, inputting data and best practices from one year pre-renovation and up to data information post-renovation. If we can obtain pre and post renovation information it will allow us to evidence the improvements made.
- Once there is at least one (1) years worth of data post-renovation an independent verifier can carry out a site visit, leading to GEO Certified Facility status.

Appendix A - Maintenance Area Sketch

Suggestion of improvement to create a modern maintenance yard for the improvement of the long term presentation and efficient running of the golf course at Noida GC.

The sketches below are intended to illustrate the potential for the area of under used space around the maintenance facility that currently exists at Noida GC. This is intended for discussion and feasibility purposes only, not for construction.

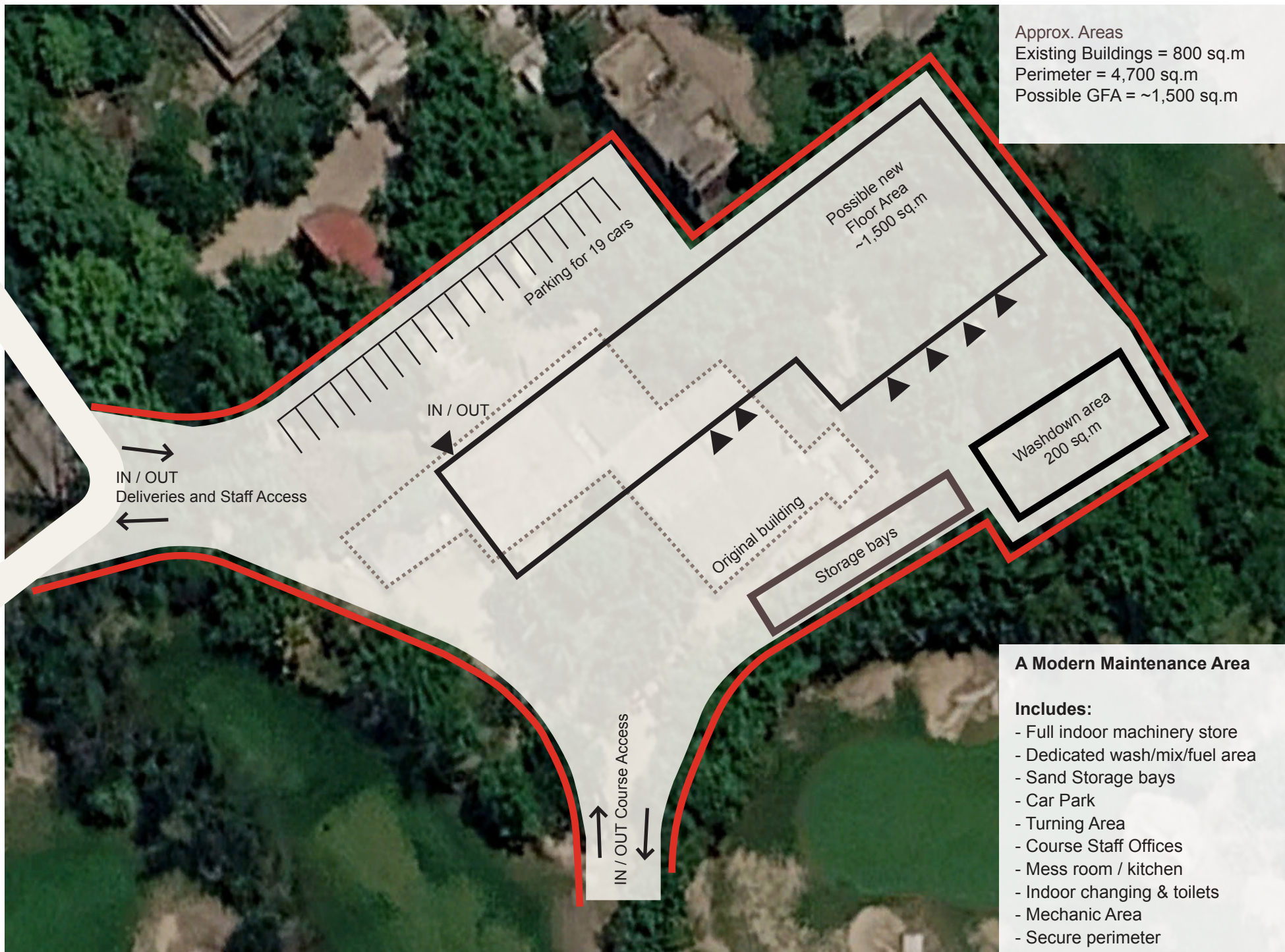
The area allows for the creation of a high standard and scale of maintenance yard to handle all course requirements, waste management, caddy space, 19 car park spaces and deliveries area as well as the course attributes listed on the drawing.

Although traditionally the course management facilities have been far smaller and basic in style in the past, there is objective evidence to support a direct link between a good well-staffed maintenance centre and a high-quality golf course experience. If Noida are serious about making improvements to the course, then the maintenance centre build should be considered a project of good merit.

GEO would welcome any further discussion on this as required to support the club to make good decisions if they chose to develop this area of their land.

Approx. Areas
Existing Buildings = 800 sq.m
Perimeter = 4,700 sq.m





A Modern Maintenance Area

Includes:

- Full indoor machinery store
- Dedicated wash/mix/fuel area
- Sand Storage bays
- Car Park
- Turning Area
- Course Staff Offices
- Mess room / kitchen
- Indoor changing & toilets
- Mechanic Area
- Secure perimeter

Limitations

The content of the Sustainability Blueprint V1 is drawn from information contained within exiting project documentation and surveys carried out by consultants hired by the Client. It reflects information correct at the time of writing, it is possible that new information will become available after the completion of this report. This new information would be incorporated into future revisions of this report or in the subsequent stages of the certification reporting.



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