Site Analysis for Golf Course Development

There will be specific issues involved in the development of each course based on the characteristics of the property, climate, surrounding land uses and local regulations.

Wetlands are an important and delicate feature on any course. (Photo by Mike Klemme, Golfoto)

By Bill Love

Developing a golf course with today's environmental and economic issues is a complex process.

Every new course presents a unique series of design challenges and solutions because no two pieces of property are ever the same. The property on which a course is located will give it an inherent character and designing the course is an exercise in utilizing the property in the most advantageous way to produce an enjoyable, intriguing golf experience for every player.

There will be specific issues involved in the development of each course based on the characteristics of the property, climate, surrounding land uses and local regulations. Given the substantial investment of time and money involved through planning and design provides the best opportunity for the successful development of a golf course.

The beautiful Homestead course in Virginia blends in with its mountain surroundings.

Site analysis, which refers to the investigation and study of the existing conditions on a piece of property, is the most important step in the planning and design of a golf course. It is not, however, the initial step. Determining the feasibility of the project will come first with a demographic and economic study to provide a financial overview.

Next, accurate base mapping of the property must be assembled. The base mapping will include surveyed property boundaries, topographic information, locations of utility or other easements and a preliminary delineation of environmentally sensitive areas. This information is necessary to understand the development potential of the property, which in turn, is used to project construction costs and consequently, economic feasibility.

At the same time, the objectives for the golf course are weighed against the development potential of the property and then confirmed. The project objectives will establish whether the course is to be for public or private use, be a stand alone facility or part of a larger development.

The course can serve as a recreational amenity for a community, provide an attraction for a resort or enhance a residential development. This basic design criteria for the course must be established to evaluate its feasibility. Specific criteria, such as the number of holes, configuration, length and par for the course must also be established, but ultimately the specific design of the course will be based on the opportunities and constraints presented by the site.

Once these initial steps have been completed, a detailed site analysis is conducted to identify and provide a thorough understanding of the existing conditions on the property. With the infinite variety presented by different sites, the existing conditions will be the most important consideration in how the development of each golf course is approached during design, construction and management. Only after the site analysis has been substantially completed should preliminary design of the golf course take place. The site analysis will produce the information that is necessary for all specific design decisions. With accurate information on existing conditions, the right design decisions can be made.

Decisions that will minimize the time and expense involved in the regulatory review and approval process and allow for the most economic construction of the course.

These decisions will also produce efficient maintenance and operation of the course when it is opened and provide the opportunity to create the best golf experience from the property.

To achieve these results, the design of the course will be in concert with the property's physical characteristics and natural systems. Even on land that contains no exceptional features, there will still be basic existing conditions that must be considered in the design process. Site analysis investigates all these physical characteristics, as well as environmental issues and land use to

produce information necessary for creating a golf course that lays lightly on the land and is compatible with its surroundings.

A series of maps are used to delineate the different aspects of the site analysis and when reviewed together will illustrate the potentials and constraints involved in the property. Each site will contain unique aspects, however, the following aspects of every property are typically investigated:

Climate

Average seasonal temperature will determine the types of turfgrass that can be used, which affects the playability, aesthetics and maintenance practices on the golf course. Annual rainfall is also considered in the selection of turfgrass and the requirements of the irrigation system for the course.

Sun orientation has a bearing on the layout of the individual golf holes, especially the starting and finishing holes that are played as the sun rises and sets. Sun exposure is always important to the maintenance and quality of turf. However, it is also important to the operation of the course in more those climates that experience frost and the occasional snowfall.

Prevailing winds in some parts of the country play a major role in the layout of golf holes. Playing against, with or across the wind can have a significant impact on the level of challenge in a specific hole and help enhance the overall experience of the course.

Topography

The slope of the land is one of the major issues involved in the layout of the course. Areas of the topography that contain milder slopes will generally be more conducive to the location of golf holes. The slope of the land involved in a hole will have a direct impact on how and at what pace it is played.

Steeper slopes tend to be avoided to prevent an unreasonable challenge for some players and minimize grading during construction. Changes in elevation are important to the location of tees, fairways and greens to prevent blind shots that can detract from the visibility and therefore, the strategy and visibility of a hole. Higher elevations provide views that enhance the overall experience of the course.

Slope and elevation also establish the drainage patterns for stormwater and must be considered in the placement of the golf holes for maintenance and play.

Drainage patterns

The natural drainage patterns of the property must be carefully considered in the layout of the course to prevent maintenance problems and allow the course to remain open for play as much as possible. Where the surface water flows is important to the placement of features on each hole and the amount of grading that will be required to direct drainage away from areas that come into play most frequently. The drainage patterns also indicate the potential location for impoundments which can be used to maximize the collection of rainfall for use in irrigating the course or as features incorporated into the golf holes.

These impoundments often serve another purpose to control the surface runoff during storms events and prevent erosion problems from occurring either on or off the property.

In addition to the patterns of surface runoff, sub-surface sources of water are studied during site analysis to determine the most efficient and reliable way to supply irrigation for the course.

Water availability

In addition to the patterns of surface runoff, sub surface sources of water are studied during site analysis to determine the most efficient and reliable way to supply irrigation for the course. Often, the impoundments on the course will serve as the main source of irrigation water and are supplemented with underground water on an as needed basis.

Withdrawal of underground water must be studied to determine the quantity required and its impact on the supply for adjacent property. If the withdrawal of groundwater for irrigation may affect the water supply of an area, irrigation require-

ments can be altered, as necessary, to prevent any impact or depletion.

Alternatives to groundwater, such as the collection of stormwater and use of effluent, should be investigated as a source of supply irrigation. Recycled water can lessen the demand on potable water supplies in areas that have little rainfall or experienced persistent drought conditions.

Soils and geology

The quantity and profile of the existing soils on the property are important to the eventual establishment and maintenance of turfgrass for the golf course. Poor or inadequate soils will require amendments either during construction or as a part of seedbed preparation for grassing.

Depending upon political jurisdiction, there may be requirements for safety distances, buffer zones or transition areas.

The geology of the property will have a bearing on the design of the course concerning earthmoving and drainage requirements during construction. Site analysis may include a bedrock composition and depth study to evaluate the additional cost of rock removal.

Environmental issues

Environmental issues will typically establish most of the constraints to the use of the property. However, once carefully delineated and studied, they also represent opportunities for the incorporation of natural features into the golf course and provide enhancement from both an environmental and aesthetic standpoint. Most projects will be required to address the following environmental issues, although depending on where a piece of property is located, there will be specific environmental issues involved and they must be addressed accordingly.

Wetlands

The most sensitive areas on a site will often be wetlands. Avoidance of impacts should be a priority.

Early in the design process, the issue of altering or impacting wetlands and other sensitive areas can be addressed. After field reconnaissance, environmentally sensitive areas are delineated. Using this information, the golf course can be routed so that play will be adjacent to or over the sensitive areas, incorporating them as part of the strategy and aesthetics.

However, in some instances the best overall design solution may require that there be some minor encroachment into low quality wetland areas. Thus, mitigation or new wetland areas will be included as part of the golf course to offset the impact of encroachment. This provides the opportunity to improve the quality of the wetlands and create an attractive feature that provides conservation as well as wildlife habitat.

To prevent impacts to these areas during construction, best management practices are implemented, and then continued as a part of the maintenance for the golf course.

Water quality

The proper design and location of erosion and stormwater management control features address the issue of potential pollution of water quality from earth disturbance during construction.

These features, installed prior to and during construction, will contain the movement of sediment caused by stormwater runoff and the erosion of disturbed areas, thereby protecting existing streams, ponds and sensitive areas from contamination.

Once the grading of the site has been completed, and turfgrass or other vegetation has been established to stabilize the disturbed area, some of these features will be removed. However, if properly designed, most erosion and stormwater management control features will often remain on a permanent basis and continue to provide protection for sensitive areas as a part of the responsible management practices involved in the maintenance of the golf course. These features will be used to filter stormwater runoff from the golf course and to prevent fertilizer, herbicides and pesticides from entering adjacent sensitive areas.

The issue of groundwater contamination from chemical application for turfgrass can be addressed through the preliminary development of a program for resource conservation and Integrated Pest Management (IPM) during the site analysis. Maintenance requirements and practices can be determined that will avoid impacts to groundwater from application of chemicals for disease and insect control.

Numerous studies support the use of an IPM program and promote the benefits of quality turfgrass in avoiding impacts to the environment. Often, an experienced golf course superintendent, who is a licensed chemical applicator, will be involved in the site analysis or design process to provide input in the development of an IPM program that addresses the site specific practices that will be required for a proposed golf course. The responsible management practices contained within an IPM program will address environmental issues and prevent impacts from the ongoing maintenance of the course after construction.

Plant and wildlife habitat

The impacts to plant and wildlife habitat are also addressed during the routing of the golf course.

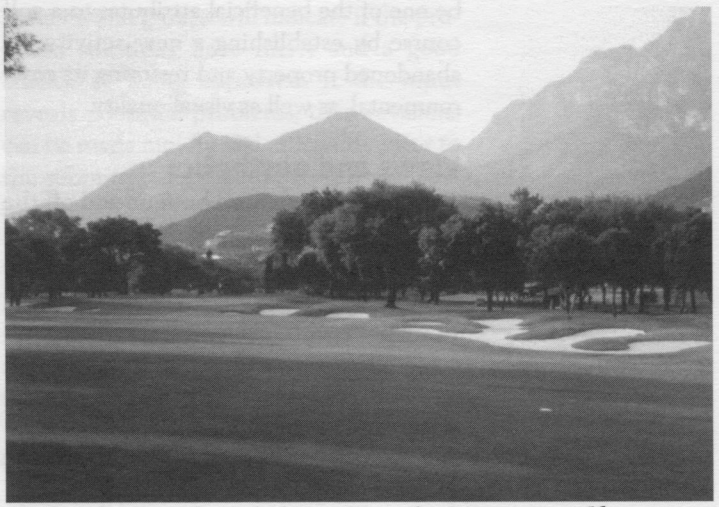
Natural areas, consisting of specific types of indigenous vegetation, can be designed as features to provide a natural setting, enhance existing wildlife habitat and stimulate endangered species. Impacts to sensitive areas of habitat are avoided by carefully removing only the necessary trees and understory plants and then employing responsible management practices during construction of the course.

Conservation areas and wildlife habitat incorporated into the design of the course are protected as an ongoing part of maintenance through the best management practices.

Historic and archeological areas

The same approach is taken with the issue of significant historical or archeological areas.

Old buildings, cemeteries, and ruins with aesthetic qualities can contribute to the character of a golf course. These areas can be preserved by being located within the routing of the golf course, lending interest and a sense of history. If a site of historical or archeological significance is discovered during construction, it may require modifications to the golf course if relocation proves to be unfeasible.



This is the view down hole no. 13 at the Campeare golf course.

Natural features

If a site has an inherent character with distinctive natural features, such as exceptional topography, rock outcroppings or specimen trees, the course can be designed to utilize these features and produce a character that is unique to that property.

The natural features are located and studied during site analysis to determine opportunities for incorporation into the design of the course and identify the areas of the property that may be protected by regulation.

However, the property may be virtually featureless and lacking in character or appearance. This is most often true of land that has been abandoned after intensive use such as quarries, landfills or agricultural fields.

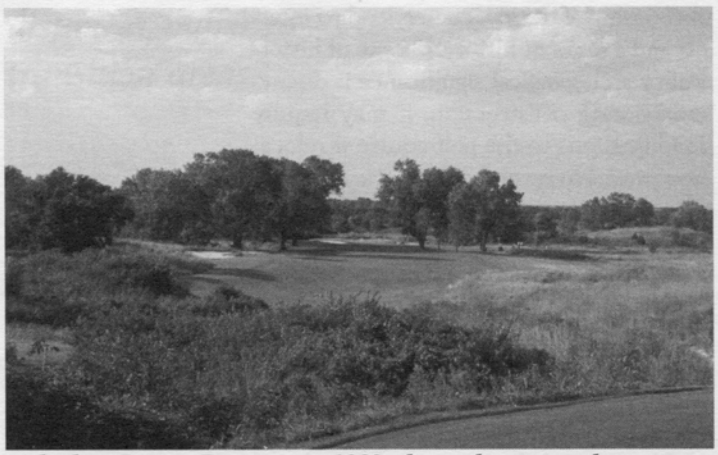
Site analysis will determine if the property contains severely disturbed areas from previous use that would otherwise remain unproductive, they can then be incorporated in the design of the golf course and rehabilitated as features of interest. Land improvement through adaptive reuse can

be one of the beneficial attributes to a golf course by establishing a new activity for abandoned property and restoring its environmental, as well as visual quality.

Views and aesthetics

The views experienced both on and off the property will lend a great deal to the character and setting of the golf course. The site analysis will determine the outstanding views of exceptional features on the property, such as ponds, wetlands, rock outcroppings and specimen trees or distant views to features of the surrounding landscape, such as mountain ranges, large bodies of water or even the skyline of a nearby city.

Incorporating these views into the design of the course can give the individual holes an interesting character and enhance the overall setting by providing a sense of place unique to the region in which the course is located.



A look at Prairie Dunes, in a 1993 photo, showing its harmony with the surroundings.

Feature design takes into consideration the views offered by the property. Tee complexes are often located to take advantage of distant views and green complexes are located in a setting that makes up the more interesting views within the property. The location tees, fairways and their features and greens are designed to blend compatibly with their surroundings.

It is this combination of designed features and views that enhance, or in some cases create, the aesthetic quality of the golf course.

Access

Access to the site establishes a critical first impression and determines the location of the facilities involved in the golf course.

The site analysis will identify potential access points to the property which are then evaluated for their sight and safety distances on existing roads, ease of ingress and egress to the property, and use for primary and secondary entrances. Once access has been determined, the site analysis information is used to establish the vehicular and pedestrian circulation patterns within the property that will provide the most economic construction and efficient operation of the course.

Easements and rights of way

All utility, scenic and conservation easements or right of ways on the property are identified as a part of the site analysis. These easements must be considered during the preliminary design process because they will often present limitations to the location of features, removal of trees or other vegetation and the allowable earth moving involved in the golf course.

Depending upon the political jurisdiction, there may also be requirements for safety distances, buffer zones or transition areas between the golf course and environmentally sensitive features of the property or adjacent land uses.

Adjacent land uses

Adjacent land uses, both existing and those that may occur in the future, are investigated during site analysis to determine what impacts they may have to the use of the property. If there are unsightly qualities, a high level of noise or obnoxious odors involved in the adjacent land use, the design of the golf course may have to mitigate these circumstances.

Existing conditions involving drainage and easements onto or off the property may also impact on the design of the course.

All applicable land use, environmental and construction regulations must be reviewed to complete the site analysis and identify the various issues that will be involved in the development of a golf course.

A clear understanding of the regulatory process at each level, from federal to local, will allow the design team to evaluate the project objectives and determine the proper approach to the development of the course. This information can help determine whether environmentally sensitive areas can be incorporated compatibly into the design of the golf course, or if they must be avoided to prevent potential impacts.

There can be instances when the environmental aspects of the site will require modification of the project objectives or consideration of alternate sites.

Preliminary design

Once the site analysis is complete, it is interpreted as the physical constraints and opportunities of the property. This information provides a basis for the decision making process during the preliminary design process of the golf course.

By carefully considering the site analysis information, innovative design solutions can be determined that will satisfy the project objectives and, at the same time, addresses the environmental issues of the site in a responsible manner.

At this stage it is important to arrange informational meetings with representatives of the regulatory agencies that will be reviewing the project and interested, local community or environmental groups. The site analysis information and concept for the golf course can be discussed to evaluate the project objectives, as well as any environmental issues.

These meetings provide the opportunity for communication and education about the project. Input received from the various agencies and groups will indicate if the proposed solutions have merit and a good chance of being approved. It the input reveals potential problems, then revisions can be made rapidly and efficiently prior to the submittal of a plan for review and permitting.

Complete and detailed property information is critical to the successful development of a golf course and should be the starting point for the design process of every project. Site analysis is the most effective method for compiling this information and providing an understanding of the opportunities and constraints involved in a piece of property.

The most sensitive areas on a site will often be wetlands.

A golf course that is designed based on a thorough site analysis will undergo a more reasonable regulatory process, cost less to construct and offer all players an enjoyable test of golf that fits responsibly and compatibly with its surroundings.

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