



Facts About...

VCP – Golf Course Assessment

The purpose of the Voluntary Cleanup Program (VCP) is to encourage the cleanup and redevelopment of properties throughout Maryland. The VCP has developed this technical fact sheet to provide suggestions for conducting environmental site assessments of golf courses.

Purpose

The purpose of this technical guidance fact sheet is to provide guidance to the environmental professional for developing and carrying out a Phase I and Phase II environmental site assessment for property previously used as a golf course. These recommendations supplement the ASTM standards as well as the procedures established by the Maryland Department of the Environment (MDE).

Overview

Conducting an environmental site assessment requires the environmental professional to take into consideration a site's history. The operational history of golf courses since the 1920s has generally mirrored the agricultural practices common throughout the United States. Golf courses have relied upon evolving turf grass management techniques to maintain the quality of playing surfaces. Such practices over the past seventy years have relied upon the application of pesticides (including organochlorines), herbicides, insecticides and fungicides for turf management including typical application schedules in the Mid-Atlantic region. In addition to the use of agricultural chemicals, golf course facilities are also engaged in operating and maintaining machinery and equipment, storing chemicals or fuel in aboveground storage tanks (ASTs) or underground storage tanks (USTs), and areas where the disposal of brush, debris or other wastes into the environment may have occurred over time.

Recommended Activities

The following section discusses recommended practices for the environmental professional to incorporate into an environmental site assessment. As stated earlier, these practices are intended to supplement the ASTM and MDE procedures for conducting environmental site assessments.

Phase I Environmental Site Assessment

As discussed in the ASTM E1527-05 standard, a Phase I Environmental Site Assessment (ESA) is intended to standardize good commercial and customary practices for environmental site assessments for commercial real estate. As part of this standard, ASTM defines a "recognized environmental condition" as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be de minimis are not recognized environmental conditions.

Furthermore, E1527-05 practice identifies, for informational purposes, certain environmental

conditions (not an all-inclusive list) that may exist on a property that are beyond the scope of this practice but may warrant consideration by parties to a commercial real estate transaction. The need to include an investigation of any such conditions in the environmental professional's scope of services should be evaluated based upon, among other factors, the nature of the property and the reasons for performing the assessment (for example, a more comprehensive evaluation of business environmental risk or the suitability of a property for a specific type of development) and should be agreed upon between the user and environmental professional as additional services beyond the scope of this practice prior to initiation of the environmental site assessment process.

Current and Historic Information to Collect and Evaluate

The size and configuration of golf course facilities can vary over time. Golf course operation and maintenance activities can also vary based on changes in turf grass management techniques, physical changes to the facility layout, and economic conditions. The VCP recommends that the environmental professional incorporate the following activities into a Phase I ESA work plan to assure that a golf course facility is adequately assessed for potential environmental impacts resulting from golf course facility operation.

1. Aerial Photographs and Topographic Maps. The environmental professional should review both current and historic aerial photographs and maps to determine the physical layout of the golf course over time. The primary purpose of this activity is to identify whether the contours of the golf course were physically changed in an effort to identify the locations of low-lying drainage areas where runoff may have accumulated or discharged into adjoining water bodies.
2. Interviews with Golf Course Personnel. The environmental professional should interview knowledgeable persons concerning golf course construction and maintenance and

operations. Typically, such persons include the golf course superintendent with responsibility for the day-to-day maintenance of the course and any golf course employee with knowledge of past operations and maintenance practices.

3. Site Record Reviews. The environmental professional should review the available records pertaining to pesticide, herbicide, and fungicide applications. Such records should include material safety data sheets, documents recording application rates and locations, maintenance plans, and any physical construction plans for the course.

Phase II Environmental Site Assessment

Phase II ESAs are not generally an exhaustive assessment of environmental conditions on property. The purpose of the Phase II ESA is to evaluate the physical conditions of a property, based on the needs of the report's end user. A Phase II ESA is intended to provide the user with enough information on the environmental conditions of the site to make an informed business decision on whether to proceed with project.

Develop Site Sampling Plan

There are unique aspects to golf course sites that require special consideration when designing an assessment plan. Sampling should be biased to areas known to have been treated with pesticides (these areas, such as tees, greens and fairways, have been identified in other golf course assessments throughout the country as containing elevated contaminant concentrations). But, biased sampling should only be part of the entire assessment scope. Sampling to determine a site's impact on public health should be comprehensive and should include data that enables the evaluator to identify an accurate mean concentration while also identifying an accurate maximum concentration. In general, selection of sampling locations should be biased to areas where future development (e.g., residential yards, school playgrounds and other high access areas) will occur and where previous pesticide



ASTM E1903-97 (2002) Phase II ESA – It is intended to provide assistance to users in satisfying the appropriate inquiry element of CERCLA’s innocent purchaser defense, as defined in 42 U.S.C. § 9601(35)(B), where a previous assessment satisfying that element identified recognized environmental conditions. It also is intended to assist a user in gathering reliable information about a property’s environmental conditions to guide the user’s business decisions. However, ASTM cautions that the standard does not purport to include the level of specificity required of technical standards that govern full characterization of a site’s environmental conditions. To fully characterize a site’s environmental conditions may require more than a single iteration of assessment.

The ASTM E1903-97 (2002) standard fosters an iterative approach to Phase II assessments and allows the user to terminate the Phase II ESA at the point where sufficient data have been generated to meet the user’s objectives. At the completion of a Phase II ESA, the environmental professional should be able to conclude, at a minimum, that either (a) the ESA has provided sufficient information to render a professional opinion that there is no reasonable basis to suspect the presence of hazardous substances or petroleum products at the property associated with the recognized environmental conditions under assessment, or (b) the ESA has confirmed the presence of hazardous substances or petroleum products at the property under conditions that indicate disposal or release.

Depending upon the work scope, the environmental professional may also be able to provide guidance on the nature and extent of contamination in order to assist the user in making business decisions regarding the property. Of course, the ASTM E1903-97 (2002) standard is intended to provide guidance for assessing recognized environmental conditions and developing technically sound data. It is not intended to satisfy the level of inquiry that may be necessary to support remedial solutions for a site.

applications occurred most often or would have been expected to accumulate due to drainage patterns and local geology and topography.

A comprehensive assessment therefore, should include biased and grid sampling, surface (0-2" below ground surface) and subsurface sampling (2-42" below ground surface), and should include laboratory analysis for arsenic, other metals (i.e. lead, mercury), pesticides known to have been used or potentially used at the site (i.e. 2'4-D, Glyphosate, Oxidiazon, Chlorpyrifos), and pesticide breakdown products (i.e. heptachlor epoxide and dieldrin). Analytical parameters should be determined based on current and past pesticide and chemical applications. The environmental professional should also be aware of the potential occurrence of elevated levels of other contaminants classes such as metals associated with turf grass management (i.e., copper [Cu], arsenic [As], cadmium [Cd], lead [Pb], mercury [Hg], chromium [Cr], nickel [Ni], selenium [Se], and zinc [Zn]) and organic compounds associated with turf grass application and general maintenance.

When developing a site-specific sampling plan, the environmental professional should select areas to sample based on the identified recognized environmental conditions identified in the Phase I ESA. The VCP recommends that a Phase II ESA sampling plan include the following:

- Biased sampling should be conducted of the greens (and fringes), tees and chemical mixing areas using a grid with closely spaced grid nodes (50 feet or less) that covers the entire area of concern;
- Sampling should be conducted on fairways and other areas along the perimeter of the golf course areas, such as the rough, using a wide-spaced grid system (greater than 150 yards);
- Biased sampling should be conducted of drainage ditches and other areas where surface drainage may accumulate;



- Subsurface sampling at lower frequency or wider spacing than mentioned above should also be conducted, at a sufficient interval to characterize each of the various areas of the site (greens, tees, fairway, drainage areas, and other areas); and
- Additional sampling of wooded areas and other areas not known to be used for the golf course could be conducted, but at a lower frequency or wider spacing than sampling mentioned above for comparison purposes.

References

Matthews, S. L., McCracken, I. R., and Lonergan, G. "Mercury contamination of golf courses due to pesticide use." *Bulletin of Environmental Contamination and Toxicology*, Vol. 55, No. 3 (September, 1995): 390-397.

E 1527-05 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. ASTM International, 100 Bar Harbor Drive, West Conshohocken, PA.

E 1903-97 (2002) Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process. ASTM International, 100 Bar Harbor Drive, West Conshohocken, PA.

