DEPARTMENT OF AGRICULTURE

http://www.mda.state.mn.us/pesticide-fertilizer/spills-cleanup

Soil Sampling at Golf Courses for Contamination

Guidance Document 30

The following is the Minnesota Department of Agriculture's (MDA) recommended guidance for collection of soil samples at golf courses for potential contamination from past pesticide use, and from past storage and handling of pesticides and fertilizers. This guidance is suitable only for sampling at golf courses. Please consult the MDA guidance document GD11 - Soil Sampling Guidance for sampling procedures for all other agricultural chemical contamination.

SAMPLE COLLECTION PROCEDURES

Soil sampling at golf courses for potential contamination from past pesticide use should minimally occur on greens, tee boxes, pesticide mixing, loading and storage areas, and areas used for disposal of grass clippings.

1. Composite Samples

A. Subsample Collection

During an investigation of potential pesticide contamination from past pesticide use, the MDA usually requires collection of composite samples to characterize a large area or volume of near-surface soil in likely contaminated areas. A composite soil sample consists of several subsamples that are thoroughly mixed together to create one sample for analysis. When investigating potential agricultural chemical contamination, the MDA requests that composite samples be created from equal volume subsamples collected from three to six equally spaced locations within a 15-foot diameter sampling area.

1. For areas potentially impacted from past pesticide use, samples should be collected at three different depths:

    A. 0-6 inches;
    B. 6 inches to 1 foot; and
    C. 1-2 feet.

2. For mixing, loading and storage areas, samples should be collected at these three different depths:

    A. 0-6 inches;
    B. 2 to 2.5 feet; and
    C. 4.5 to 5 feet.

The exact size and shape of the sampling area may be adjusted to meet site specific conditions.

In general, it will likely be appropriate to composite subsamples from each green and each tee box separately. The exact size and shape of each sampling area should be discussed in a work plan. Regardless of sampling area shape and size, exact subsample locations must be well-documented (see the following section discussing documentation).

All subsamples used to create a given composite sample must be collected from the same corresponding 6 inch to 1-foot depth interval. **Do not** create a composite sample from subsamples collected over different vertical intervals or a long vertical depth interval (e.g., 0 to 2 feet or 1 to 4 feet, etc.). The MDA requests that surficial composite samples in non-graveled high-risk areas be collected from the surface to a depth of 6 inches, and in loose graveled areas from a depth

interval of 0 to 6 inches below the base of the gravel. All sample depths must be referenced from the ground surface for sample identification purposes.

B. Creating a Composite Sample

A new pair of disposable gloves must be used during creation of each composite sample to prevent cross contamination of the sample. Create a composite sample from the subsamples using the following procedure:

1. Combine all of the subsamples in a large clean stainless steel mixing bowl or disposable aluminum pan;
2. Decant or drain away any liquids;
3. Remove large stones, sticks and vegetation;
4. Thoroughly mix the subsamples together with a clean stainless steel or disposable spoon;
5. Transfer an adequate volume of the composite sample to a lab-clean amber glass jar with a Teflon lined lid or other laboratory supplied sample container; and
6. Wipe the threads, then cover, label and seal the container.

2. Duplicate Samples

The MDA generally requires collection of duplicate samples; one for every ten samples or less submitted for laboratory analysis. A duplicate sample must be submitted to the laboratory as a "blind" sample and be reported to the MDA as a duplicate sample. The MDA will occasionally request split samples so that independent or additional analyses can be conducted by the MDA.

A duplicate sample may be created by splitting, collecting a field duplicate, or cutting a core down the vertical axis. Split samples are created by sieving the soil through a laboratory cleaned number ten (#10) slot sieve and thoroughly mixing the sieved soil prior to splitting. Duplicate soil samples created from soil that has been mixed but not sieved must be identified as “field duplicates." Field duplicates are useful as an analytical confirmation method and should provide similar analytical results. It is often difficult to create totally homogeneous split soil samples in the field, particularly for wet or fine-grained soil and it may not be possible to split cohesive soils (clay) in the field. As an analytical confirmation method, cut clay cores down the vertical axis into halves for separate analysis. Core halves are not considered split samples.

3. Equipment and Decontamination

Re-usable sampling equipment must be made of glass, stainless steel, Teflon, or other inert material. All re-usable shovels, picks, hand augers, split tube samplers, stainless steel bowls or spoons and any other equipment that comes in direct contact with the sample must be thoroughly cleaned between each sample. All subsamples collected for a single composite sample are considered one sample unless the subsamples are used for both discrete and composite samples. Clean sampling equipment using the following procedure:

1. Using a non-phosphate soap and clean potable water solution, wash the equipment to remove all visible soil particles, changing the wash water at regular intervals or between borings when using a drill rig. Do not use water from contaminated or onsite wells. The wash basin must be steel or another inert material, not plastic;
2. Rinse with potable water to remove all soap;
3. Rinse with acetone (preferred) or methanol. Wiping the equipment with an acetone or methanol saturated towel is acceptable but dispose of the towel after each use;
4. Triple rinse with deionized water. Deionized water can usually be obtained from the laboratory. If deionized water is not available, distilled water may be used;
5. If time allows air dry; and
6. Wrap in aluminum foil or other suitable material, or store on a clean surface in a shaded protected area until used.

Alternatively, disposable plastic and PVC materials may be used. Replace disposable equipment between samples.

For drilling equipment clean all downhole sampling equipment (e.g. split spoon), as described above, between samples. Other downhole drilling tools and auger flights must be cleaned as described above or by steam cleaning or high-pressure hot water wash between each boring.

Laboratories can provide guidance on method appropriate sampling containers. Sampling containers may be purchased directly from laboratory equipment and supply vendors. However, most commercial laboratories will provide them when they are conducting the analyses. In general, canning jars, plastic jugs, paper bags, plastic bags, etc. purchased at local grocery stores, hardware stores, etc., are not considered appropriate sampling containers.

4. Documentation, Packaging and Shipping

Keep a precise record of the distance from each sample location (including individual subsample locations within each composite sampling area) to two permanent immobile objects so that sampling areas can be easily and exactly relocated. In addition, photographs taken after the samples have been collected, annotated with the date, photographer, sample number and orientation of the sample area, are recommended.

Include the following information on the sample label:

1. Site name;
2. Sample location and depth;
3. Date collected;
4. Analysis requested; and
5. Name of the person collecting the sample.

For samples that will be submitted to an MDA approved commercial laboratory, the MDA staff will usually approve a procedure whereby individual sample bottles are stored and transported to the laboratory in a second sealed container such as a cooler. Use a Chain of Custody Form for all samples collected for analysis. Include the sample number, location and depth for all samples on the Chain of Custody Form. Submit the Chain of Custody Form to the laboratory with the samples submitted for analysis.

Once collected, samples should be kept cool to preserve sample integrity. Clean freezer packs are recommended. If ice is used it must be double wrapped in plastic to keep the sample labels and seals from getting wet. For short travel times in moderate temperatures cooling is not required, however, the samples must not be allowed to warm above ambient temperatures.

Soil samples that are not analyzed immediately (i.e., within a few days) may be stored frozen for up to six months under proper chain of custody. Do not dispose of stored samples without the MDA staff approval including the portions of samples remaining after analysis.

All samples must be collected, transported and stored in accordance with all federal and state applicable rules, statutes or regulations. Any sample being shipped by common carrier or through the mail must comply with the United States Department of Transportation Hazardous Materials Regulation 49 Code of Federal Regulations Part 172). The person offering such material for transportation is responsible for ensuring compliance with applicable regulations.

5. Analytical Parameters

Soil should be tested for arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver and other pesticides applied to the greens and tee boxes including older organochlorine pesticides such as DDT, heptachlor and chlordane. Historical pesticide application records should be compiled, reviewed and used as a guide to select analytical parameters.

Commercial laboratories proposed for these analyses should have Quality Assurance/Quality Control (QA/QC) plans and analytical methods that are pre-approved by the MDA. See the MDA guidance document GD 24 - Fixed Base Laboratories Quality Assurance/Quality Control Plans. A list of commercial laboratories that have approved QA/QC plans and analytical methods on file with the MDA is available. See the MDA guidance document GD23 - Pre-approved Commercial Laboratories: Fixed Base and Mobile.

Alternatively, for metals analyses, the commercial laboratory should be accredited for metals in soil by the Minnesota Department of Health (MDH) through the MDH Environmental Laboratory Accreditation Program.

6. General Information

Safety is always the highest priority at any site. If for any reason the procedures discussed in this or other MDA guidance documents cannot be implemented safely, MDA staff will consider proposed alternative procedures.

MDA staff prefer to review all investigation and cleanup activities at golf courses prior to their implementation. The MDA strongly recommends that owners, developers and other interested parties enter the MDA Agricultural Voluntary Investigation and Cleanup (AgVIC) Program for MDA staff review, guidance, and verification of appropriate steps taken to address potential contamination.