TILE BASICS AND DISCOVERY FARMS TILE FINDINGS

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Subsurface drainage is used for agricultural, residential and industrial purposes to remove excess water from poorly drained land. An important feature statewide, drainage enhances Wisconsin agricultural systems, especially in years with high precipitation. Drainage systems improve timeliness of field operations, enhance growing conditions for crop production, increase crop yields on poorly drained soils and reduce yield variability. In addition to agronomic benefits, subsurface drainage can improve soil quality by decreasing soil erosion and compaction. To maintain agricultural productivity and protect water quality, producers, consultants and agency personnel must understand tile drainage, locate drainage systems and properly maintain them.

In Wisconsin, drainage systems were originally constructed using short (1-foot) segments of clay or cylindrical concrete "tiles." Tiles were initially installed manually, requiring hand excavation. Modern drain tiles are corrugated, perforated plastic pipes typically installed mechanically using a trencher. These plastic pipes are available in a variety of diameters to accommodate different flow rates. They are typically installed at a depth of 3 to 6 feet below the soil surface and discharge into drainage ditches, streams or wetlands. The majority of tile-drained land in Wisconsin is located in the eastern and southern portions of the state, although county records indicate that tile drainage is prevalent statewide. In Wisconsin's rolling landscape, tile drains are often installed in a random pattern, following depressional areas.

Locating Tile Drains

Knowing the location and extent of tile drains is a challenge facing producers, consultants and agency personnel. Records of main, lateral and outlet tile locations are often lacking. To properly use and maintain an existing tile drainage system, producers must be able to locate tile lines and outlets. Although it is often hard to identify old tile systems in agricultural settings, there are a number of resources available to help. The local Natural Resources Conservation Service or Land Conservation Department offices may have maps or other materials if a previous land owner worked with these agencies. Information from these maps should be field-verified.

There are also three readily identifiable drainage features that can indicate the presence of tiles: vents, surface inlets and outlets. Modern tile systems often include vents to increase water removal efficiency and maintain atmospheric pressure within the drain system. Air vents consist of a perforated orange or white pipe protruding a few feet above the ground. Surface water inlets look similar to air vents and are typically installed in low areas lacking a surface outlet. Surface inlets are designed with above ground openings to allow surface water to directly enter tile. Producers must take special care when applying manure, fertilizers and chemicals close to inlets, given the high potential for direct entry into the system and into surface waters.

Another identifiable feature is a tile outlet, where the tile system discharges to drainage ditches, waterways, streams and/or wetlands. Tile outlets should be located and marked in the field

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for future reference. Producers should inspect outlets and clear debris that could impede flow. A sink hole can occur when a tile outlet is blocked. Blockage creates back pressure within the tile, and the surrounding soil becomes saturated. When the pressure within the drain drops, the saturated soil next to the pipe will get sucked into the tile, resulting in a sink hole.

Maintaining Tile Drains

Tile drainage systems should be inspected annually, preferably at peak flow times that typically occur during spring melt and after heavy rainfall events. Inspection should include checking outlet pipes to ensure that rodent guards are in place and working properly. Rodent guards prevent nests and debris introduced by rodents from plugging tile outlets. A tile outlet with a rodent guard can be quickly cleaned by sliding your hand inside the pipe under the guard and removing any trapped material. Tile outlets should also be inspected for excessive erosion and broken or crushed pipe. A good indicator of tile drain performance is a change in field moisture conditions, such as when traditionally well-drained areas exhibit prolonged periods of wetness. In this case the tile line should be inspected for a possible mid-field blockage and to verify that the drainage outlet exists and is of adequate in size.

On-going maintenance of fields and waterways with tile systems should include visual observations for animal burrows, tile blowouts or sink holes. These features range in size from a few inches to several feet and can be hard to find. The direct pathways created by these features can result in large amounts of sediment, debris, manure, fertilizer or chemicals entering tiles. Blowouts result from excessively high flow velocity or pressure inside the tile, causing it to crack or burst. Blowouts are common at tile junctions, fittings or weak spots. Blowouts will often create a sink hole when the surrounding material is drawn into the tile and transported downstream. Sink holes can be observed during high flow periods by water upwelling or going into the ground and during lower flow by the hole left in the ground. Blowouts should be repaired promptly by knowledgeable individuals. Improper repairs and quick fixes can result in on-going problems with blockages. Always contact Digger's Hotline, 1-800-242-8511, prior to excavation for tile repairs.

Modifying or Installing New Tile Drainage Systems

NRCS standard practices (NRCS Code 606) should be followed when designing, modifying or installing tile drainage systems. A detailed installation plan should be developed addressing specific drainage needs. This plan requires assistance from knowledgeable individuals, such as an engineer or experienced tile installer, and should consider crop and soil types as well as site topography. A sub-surface drain system is composed of lateral, sub-main and main line piping. Laterals are the initial collectors of excess water from the soil. Several laterals convey flow to a main or sub-main. A sub-main carries flow to a main line that typically drains to the outlet.

When enlarging lines or adding new laterals to existing drainage systems, be certain main lines are adequately sized to accommodate the additional flow, thus avoiding backpressure and blowouts. Air vent installation is recommended to maintain atmospheric pressure throughout the system. This allows for maximum flow capacity and relief from backpressure conditions. Tile system vents are open at the ground surface in order to expose the system to the atmosphere.

Good record keeping is an essential part of any drainage maintenance program. The location of tile lines, vents, surface inlets and outfalls is critical for trouble shooting and design modifications. Modern GPS technology has become an indispensable tool for mapping tile lines. Tile system mapping should be conducted when new tiles are installed and whenever information becomes

available for existing systems (e.g., during routine maintenance). Tile location records should be stored in a safe, readily accessible location.

This information is part of a more detailed fact sheet series on “Tile Drainage in Wisconsin” For more information visit: http://www.uwdiscoveryfarms.org