

Guidance for Use of Geomembranes and Geotextiles as Engineering Controls Satisfy 62-780.680(2) or (3), F.A.C., No Further Action Requirements

Florida Department of Environmental Protection
Division of Waste Management
District and Business Support Program
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Disclaimer:

This document is provided as guidance when proposing to install geomembrane or geotextile liners as an Engineering Control (EC) as part of the Rule 62-780.680, Florida Administrative Code (F.A.C.), No Further Action (NFA) with Conditions process. The terms "cover" and "cap" may be used interchangeably within this guidance document. Nothing in this guidance supersedes any Federal, State, or Local requirements; the information presented is strictly guidance and does not create any new requirements under Chapter 62-780, F.A.C. All applicable Department rules must still be adhered to. Any regulatory decisions made by the Florida Department of Environmental Protection (FDEP) in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant site-specific facts.

The FDEP District and Business Support Program has prepared this guidance to assist those conducting site rehabilitation and FDEP site managers when considering the use of geomembranes to prevent leaching of contamination to groundwater or to provide protection from direct exposure to soils; or, geotextiles to provide protection from direct exposure to soils remaining in place at a Chapter 62-780, F.A.C., site that exceed the Chapter 62-777, F.A.C., default soil cleanup target levels (SCTLs) or other applicable site-specific alternative SCTLs (ASCTLs).

ACRONYMS

ASCTL	Alternative Soil Cleanup Target Level
EC	Engineering Control
ECMP	Engineering Control Maintenance Plan
F.A.C.	Florida Administrative Code
Ft	Feet
FDEP	Florida Department of Environmental Protection
NFA	No Further Action
RAP	Remedial Action Plan
SCTL	Soil Cleanup Target Level

BACKGROUND

No Further Action with conditions is allowable at contaminated sites if the criteria set forth in Subsections 62-780.680(2), F.A.C., or 62-780.680(3) F.A.C., are satisfied. To satisfy these criteria, engineering controls are often used to protect against direct exposure to remaining soil impacts or to eliminate or minimize the leaching of contamination to groundwater which could lead to migration or spread of groundwater contamination. Any proposed engineering control should be protective for direct exposure or leachability for as long as the soils exceed the applicable SCTL(s). All engineering controls should be maintained to provide the intended protection. All engineering controls should be described in detail and include a maintenance plan prepared in the form of an Engineering Control Maintenance Plan (ECMP). The Professional Engineer shall provide a certification statement that the proposed control will serve the intended purpose and has been implemented and will be maintained, as stated in Chapter 62-780, F.A.C. All engineering controls are also memorialized in a Declaration of Restrictive Covenant that is recorded with the property in the county records.

Occasionally, Persons Responsible for Site Rehabilitation request the use of manufactured synthetic liners as a protective direct exposure control or infiltration control for soils exceeding the applicable SCTL(s). Many times, such requests also include the elimination of a portion of the more common engineering control of 2 feet (ft) of clean fill.

PURPOSE

This guidance primarily focusses on geomembrane and geotextile liners installed within the 2-ft surface soil interval.

CAP/COVER DEFINITION

A cap, or cover, is an engineered barrier located over contaminated soil that mitigates exposure to potential receptors (e.g., direct exposure, infiltration). The capping control should be protective of human health and the environment for as long as the soil exceeding applicable SCTL(s) remains in the subsurface.

Such protection is provided by interrupting an exposure pathway or by exerting control of contaminant movement.

Caps are constructed or installed Engineering Controls (ECs) purposed to prevent the following:

1. exposure to contaminated soils exceeding applicable direct exposure SCTLs; or,
2. downward migration, infiltration, or seepage of surface runoff or rainfall if there remains the potential for natural leaching/migration of contamination over time through the subsurface to the groundwater.

CHARACTERISTICS OF SYNTHETIC LINERS – GEOMEMBRANES VERSUS GEOTEXTILES

Geomembranes are relatively thin sheets of flexible thermoplastic or thermo set polymeric materials. Geomembranes generally function as containment. They are regularly used in the solid waste and hazardous waste industry for containing leachate, contaminated soils, or waste. Geomembranes can be installed either exposed or buried. They are impervious if the integrity of the material is maintained. However, they can be susceptible to tears and degradation, and may require maintenance and testing to ensure functionality throughout the lifetime of the control. Geomembranes are placed in pieces and joined via welding. Repairs to tears are also done by welding. Specialty geomembranes are manufactured to act as a vapor barrier, and various degrees of puncture resistance are produced as well as various thicknesses.

Geotextiles are synthetic materials that are either woven or non-woven in sheets. They are primarily used to function as filtration or drainage, as a separation layer, or to provide structural reinforcement. Geotextiles are less impervious than geomembranes but more resistant to penetration damage. Since geotextiles are generally permeable, they may not be suitable for controlling leachability issues. Specifications will need to be evaluated if the material will be considered for leaching protection. The cost for geotextiles is generally less than the cost of geomembranes.

APPROVAL CONSIDERATIONS FOR SYNTHETIC LINER SYSTEMS

Due to complexities related to inspection and maintenance of synthetic liners, additional supporting engineering elements such as manufacturer's specifications or information contained in a Remedial Action Plan (RAP) or other design document, may be helpful in the justification of the use of geomembranes or geotextiles to satisfy Rule 62-780.680, F.A.C., engineering control requirements. The process for verifying the integrity of the liner, including frequency and appropriate in-place testing, as recommended by the manufacturer or as appropriate under the specific conditions of use, may be included in the ECMP.

In general, the use of synthetic liners installed deeper than 2 ft does not conflict with Rule 62-780.680, F.A.C., engineering control requirements (for example when a geomembrane is used as an infiltration barrier to prevent contamination leaching to the groundwater or when voluntary installation of a geotextile is used as a demarcation layer). If a geomembrane or

geotextile is proposed within the upper 2-ft direct exposure interval, then FDEP may request additional information related to the rationale for using a synthetic liner (for example - grade issues, dense tree presence, whether use of traditional engineering control is cost prohibitive, slope stability, drainage issues, etc.).

During the review of such a proposal for an NFA with conditions, FDEP will consider specifics about the type of synthetic liner and details regarding installation (i.e., depth installed and type and thickness of cover material) and proposed maintenance requirements. The use and approval of a liner is site-specific, depending on many variables including the area and depth of impacts, and the protectiveness of the proposed liner. Some things that would be considered include the durability and life expectancy, thickness and penetrability, appropriateness of the liner based on what exposure it is supposed to control, maintenance requirements, and depth to water.

Typically, a minimum of 12-inches of cover is an acceptable depth of cover for a synthetic liner proposed within the upper 2-ft direct exposure interval. However, cover depths other than 12-inches may be proposed based on site-specific conditions. One other consideration in evaluating if a synthetic liner is a suitable engineering control includes the location at which the control will be installed. For example, if the liner extends within a utility easement where subsequent utility work may necessitate repairs to the liner, then a description of how such repairs will be accomplished is suggested to be included in the ECMP and may also need to be negotiated with the easement holder. In this example, the ECMP may describe how the continued use of the liner as an engineering control will not be compromised and how liner repairs will provide the protectiveness that was originally intended.

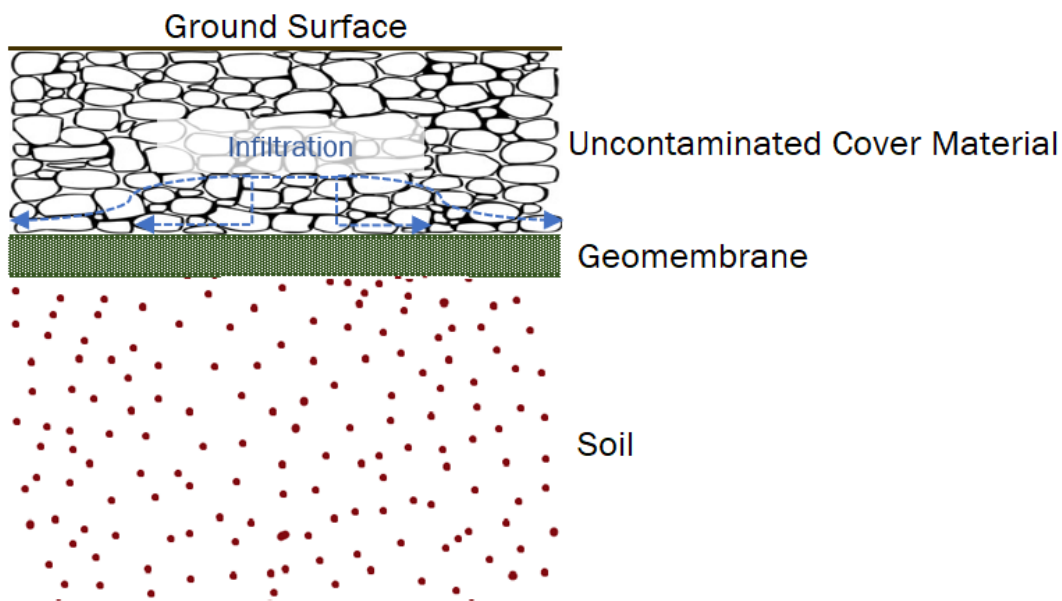
Site-specific issues may be included with a site RAP, RAP Modification, or the Site Rehabilitation Completion Report for review and consideration in evaluating whether a synthetic liner can be approved as an engineering control for conditional site closure under Subsections 62-780.680(2) or (3), F.A.C. It may be appropriate to also include these site-specific issues in the ECMP. If a synthetic liner is approved by the FDEP, the maintenance for the liner used as an engineering control will need to be described in the ECMP as required by Paragraph 62-780.680(7)(f), F.A.C. (see the FDEP Institutional Controls Procedures Guidance document for additional information).

The ECMP should discuss the specifications of the selected liner, an inspection and maintenance plan, and any protocols for the repair of breaches or compromises of the liner. Routine inspection of a synthetic liner may not be feasible. Inspections to verify the liner has not been compromised may include confirmation that the elevation of the liner cover has not changed, identification of undocumented excavation or construction activities, or observations that could indicate a potential breach in the liner (evidence of potential punctures/holes, erosional processes, animal activity, or vegetative changes). Periodic monitoring of the groundwater to verify containment of a groundwater plume by a geomembrane or similar sub-surface engineering control may also be proposed, which could include sampling and analysis of a down-gradient well.

Synthetic liner usage as an engineering control will require a detailed inspection report in order to ensure site direct exposure factors do not change. The inspection may consider the following conditions:

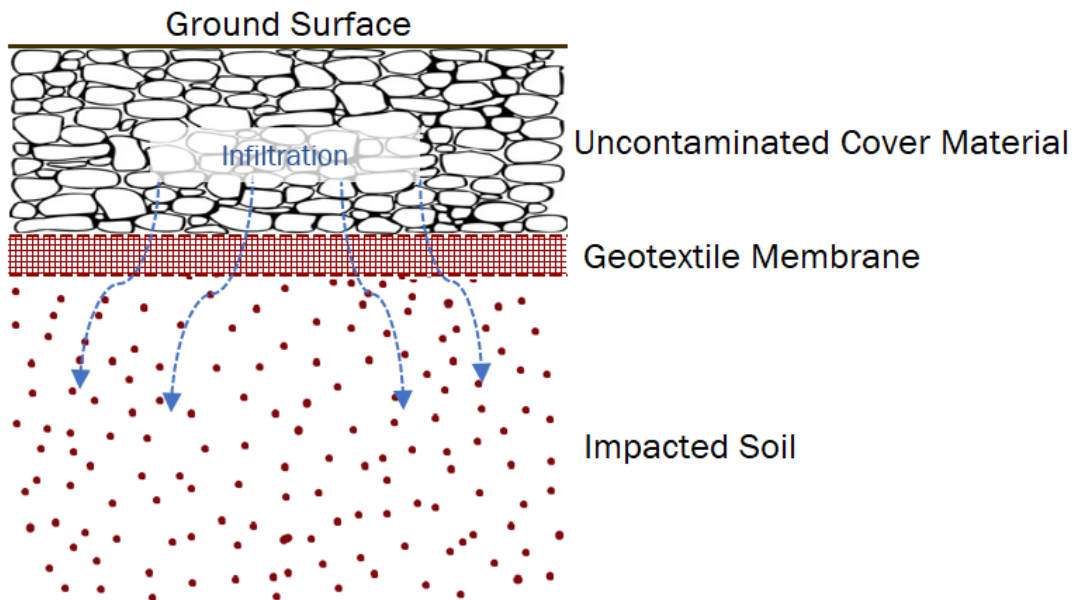
- Is the soil cover depleting or sinking?
- Is the liner visible?
- Are erosional processes visibly affecting the cover?
- Is there evidence of animal activity (burrowing, etc.)?
- Is there evidence of plant growth with potential to damage the liner by the root system since installation?
- Is there evidence of poor water drainage, such as pooling or channel formation?
- Are there visible holes or cracks in the cover material?
- Are there bare spots or dying vegetation in the liner area?
- Are there indentations or warping of the cover surface?
- Is there evidence of undocumented excavation or construction activity?
- Is an inspection needed to investigate potential damage from inclement weather (rainstorm/hurricane/tropical storm)?

Figure 1: Cap with a Geomembrane



Geomembranes are impermeable if the integrity of the material is maintained and generally function as containment. They can be used for containing leachate, contaminated soils, or waste and can be installed either buried (Figure 1) or exposed.

Figure 2: Cap with a Geotextile



Geotextiles are primarily used to function as filtration or drainage, as a separation layer, or to provide structural reinforcement. Geotextiles are generally permeable making them unsuitable for controlling leachability issues.