

LAND DEVELOPMENT SERVICES

STAFF REPORT

- PROPOSED COUNTY CODE AMENDMENT
- PROPOSED PFM AMENDMENT
- APPEAL OF DECISION
- WAIVER REQUEST

Proposed Amendment to Chapter 4 (Geotechnical Guidelines) of the Public Facilities Manual Regarding Expansive Soils and Slope Stability

Authorization to Advertise:	July 26, 2016
Planning Commission Hearing:	September 15, 2016, at 8:15 p.m.
Board of Supervisors Hearing:	November 1, 2016, at 4:00 p.m.
Prepared by:	Site Code R&D Branch - BF 703-324-1780
Revised:	October 3, 2016

STAFF REPORT

A. Issue:

Proposed amendment to Chapter 4 (Geotechnical Guidelines) of the Public Facilities Manual (PFM)

B. Recommended Action:

Staff recommends that the Board of Supervisors (Board) adopt the proposed amendment to Chapter 4 (Geotechnical Guidelines) of the PFM.

C. Timing:

Board of Supervisors authorization to advertise public hearings – July 26, 2016

Planning Commission Public Hearing – September 15, 2016, at 8:15 p.m.

Board of Supervisors Public Hearing – November 1, 2016, at 4:00 p.m.

Effective Date – November 2, 2016, at 12:01 a.m.

D. Source:

Land Development Services (LDS)

E. Coordination:

The proposed amendment has been prepared by LDS and coordinated with the County Attorney and the Geotechnical Review Board (GRB). The amendment has been recommended for approval by the Engineering Standards Review Committee.

F. Background:

Chapter 4 of the Public Facilities Manual sets forth the guidelines for conducting subsurface explorations and preparing geotechnical reports. The planning, sampling, testing and analysis involved in the preparation of geotechnical reports is vested in a competent geotechnical engineer who has experience in this type of work and who is licensed by the State. For work in areas with problem soils, the GRB has been established to review geotechnical reports and associated plans referred to it by the LDS Director, and to provide recommendations to the Director on the sufficiency of the soils investigations, analyses, and proposed designs and construction techniques.

Expansive soils, also known as “shrink-swell soils,” are problem soils found throughout the County. Foundations built on soils which are expansive will “heave” and can cause lifting of a building or other structure during periods of high moisture. Conversely, during periods of less moisture, expansive soils will “collapse” and can result in building settlement. Either way, property damage to building foundations and footings

constructed in expansive soils can be severe. Expansive soils will also exert pressure on the vertical face of a foundation, basement, or retaining wall and the resulting instability can lead to various forms of foundation problems and slope failures. Slope instability is a concern when very soft, very loose, fissured or over consolidated soils are present. Of particular concern in the County are the clayey soils of the Potomac Formation that are often fissured and over consolidated. The proper identification and laboratory testing of these soils are critical for proper design and construction of structures such as foundations and retaining walls.

At this time, staff recommends that the PFM's provisions related to expansive soils and slope stability be updated to incorporate the best practices currently being recommended by the GRB and generally used by industry engineers. Codifying the proposed provisions is necessary to improve ease of use and achieve consistency during the regulatory review process.

G. Proposed Amendment:

The proposed amendment updates the geotechnical requirements set forth in § 4-0300 (Geotechnical Report) and § 4-0400 (Construction Plans) of the PFM related to expansive soils and slope stability. A summary of the amendment is below.

Slope Stability: Procedures for laboratory testing of fissured and deltaic clays to evaluate the potential for slope failure are being codified.

- A minimum number of three stress reversals at any particular normal stress is required.
- The strain rate used to shear the samples during each reversal is now explicitly described.
- Only pre-split *in-situ* or intact reconstituted samples may only be selected for testing. The sample types and strain rate must be identified in the geotechnical report.
- Two methodologies may now be used to estimate the shear-strength parameters with limitations on the maximum residual friction angle. For less complex situations, methodologies may be used as approved by the Director.

In addition, the amendment requires that the analyses of slopes include:

- An evaluation of potential adverse effects on adjoining properties using tests that include perched groundwater modeling to represent the long-term groundwater conditions.
- An upper and lower factor of safety for slope stability as follows: A lower minimum factor of safety of 1.25 can be used with sufficient laboratory and field data. Otherwise, a higher minimum factor of safety of 1.5 is required.
- The requirement that preliminary design criteria for walls retaining more than 8 feet of soil be included in the Geotechnical Report to determine whether

structural or earthwork measures are needed to achieve a sufficient factor of safety against slope failure.

Expansive Soils: Best-practice designs for foundations and floor slabs are proposed to:

- Clarify that spread footings be at least 4 feet below the nearest exterior finished grade or to the bottom of the expansive soil stratum, whichever occurs first. However, if the 4-foot buffer is insufficient, as determined by the Director, the proper buffer depth must be recommended by the geotechnical engineer.
- Add a requirement that ground-supported concrete floor slabs shall not bear directly on the expansive soils and requires at least a 2-foot separation between the slab and any expansive soil to minimize the possibility of heaving and shrinkage settlement.

A copy of the proposed PFM amendment is included as Attachment A.

H. Regulatory Impact:

For consistency and ease of use, the amendment proposes to standardize the best practices utilized by experienced professional engineers to deal effectively with expansive soils and slope stability concerns. Major elements of the amendment include:

- Procedures for laboratory testing of fissured and deltaic clays used to evaluate the potential for slope failure are being codified.
- Slope analysis shall include a minimum factor of safety of 1.25 and all walls 8 feet in height and greater shall provide a preliminary global stability analysis.
- Best-practice designs for foundations and slabs in problem soils are proposed.

The principle objective of the proposed amendment is to safeguard people and properties from unsafe conditions inherent in slopes and expansive soils. In addition, standardizing geotechnical best practices is recommended at this time to improve consistency and thereby reduce the time for submitting engineers to prepare, and the County to review, geotechnical reports submitted during the land development process. This amendment aligns with Goal #3 of the County's Economic Success Strategic Plan by improving the speed, consistency and predictability of the land development regulatory process.

I. Attached Document:

Attachment A – Proposed amendment to Chapter 4 (Geotechnical Guidelines) of the Public Facility Manual