

ORDINANCE NO. 2010 - 28

AN ORDINANCE REPEALING ORDINANCE NUMBERS 2008-42 AND 2007-23 AND ADOPTING AN ORDINANCE, "SPECIAL DESIGN AND CONSTRUCTION STANDARDS FOR THE EAGLE FORD (SOILS) GROUP" BY ESTABLISHING POLICY ATTACHED HERETO AS EXHIBIT "A"; PROVIDING THAT THIS ORDINANCE SHALL BE CUMULATIVE OF ALL ORDINANCES; PROVIDING FOR A REPEALER CLAUSE; PROVIDING FOR A PENALTY THAT ANY VIOLATION OF THE TERMS OF THIS ORDINANCE IS DECLARED TO BE A MISDEMEANOR, AND ANY PERSON FOUND TO BE GUILTY THEREOF SHALL BE PUNISHABLE BY A FINE NOT TO EXCEED ONE THOUSAND DOLLARS (\$1,000.00); EACH DAY THAT SUCH VIOLATION CONTINUES SHALL CONSTITUTE A SEPARATE OFFENSE AND SHALL BE PUNISHABLE ACCORDINGLY; PROVIDING FOR A SEVERABILITY CLAUSE; AND SETTING AN EFFECTIVE DATE.

WHEREAS, the City of Midlothian, Texas is a home rule city within the State of Texas, with full power of local self government; and

WHEREAS, the City Council has considered regulations which they deem advisable to protect against the potential for post-construction movement of structures associated with active clay and weathered shale and to minimize the potential high cost of public improvements and maintenance associated with development within the Eagle Ford Group; and

WHEREAS, the City Council of the City of Midlothian, Texas, does find and determine that it is in the best interest of the health, safety, and general welfare of the citizens of the City of Midlothian, Texas to establish Policy attached hereto as Exhibit "A" and repeal Ordinance No.'s. 2008-42 and 2007-23 which established special design and construction standards for development located in the Eagle Ford Group within the corporate limits and extraterritorial jurisdiction (ETJ) of the City of Midlothian, Texas.

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Midlothian, Texas:

SECTION 1. Establishing Policy

That the Special Design and Construction Standards for the Eagle Ford Group attached hereto as Policy - Exhibit "A" and made part hereof for all purposes is, and the same hereby, adopted as the official policy of the City.

SECTION 2. Cumulative Effect

This Ordinance shall be cumulative of all other ordinances of the City of Midlothian, Texas and shall not repeal any of the provisions of such ordinances, except in those instances where provisions of such ordinances are in direct conflict with the provisions of this Ordinance.

SECTION 3. Repealer Clause

This Ordinance shall hereby repeal Ordinance No.'s 2008-42 and 2007-23 in their entirety.

SECTION 4. Penalty

Any person, firm or corporation who shall violate any of the provisions of this Ordinance or who shall fail to comply with any provision hereof shall be deemed guilty of a misdemeanor, and upon conviction shall be subject to a fine not to exceed One Thousand (\$1,000.00) Dollars, and each day that such violation continues shall constitute a separate offense and shall be punishable accordingly.

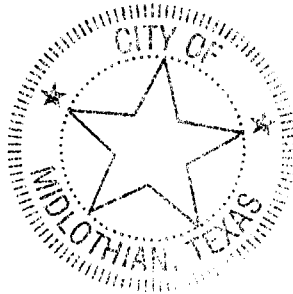
SECTION 5. Severability

That should any sentence, paragraph, subdivision, clause, phrase or section of this Ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this Ordinance as a whole, or any part or provision thereof other than the part so decided to be invalid, illegal or unconstitutional.

SECTION 6. Effective Date

Because of the nature of the interest and safeguard sought to be protected by this Ordinance, and in the interest of health, safety and welfare of the citizens of the City of Midlothian, Texas, this Ordinance shall take effect immediately after passage, approval and publication as required by law.

PASSED, ADOPTED AND APPROVED by the City Council of the City of Midlothian, Texas, on this the 12th day of October, 2010.



APPROVED:

Boyce L. Whatley

Boyce L. Whatley, Mayor

ATTEST:

Lou Jameson

Lou Jameson, City Secretary

APPROVED AS TO FORM:

Don Stout

Don Stout, City Attorney



City of Midlothian
Special Design and Construction Standards
Eagle Ford Group

Policy – Exhibit “A”
Ordinance 2010-28 - adopted October 12, 2010

Development Services – Engineering Department
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CITY OF MIDLOTHIAN
Special Design and Construction Standards for the Eagle Ford Group
POLICY - EXHIBIT A

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Special Design and Construction Standards for the Eagle Ford Group

Policy - Exhibit "A"

Section 1. Adoption and Purpose

Adoption

That the Special Design and Construction Standards for the Eagle Ford Group is, and the same hereby, adopted as the official policy of the City of Midlothian (City).

Purpose

(a) The western portion of the City is underlain by expansive clay derived from shale of the Eagle Ford Group. The purpose of these standards is to provide requirements relative to design and construction to reduce the potential for post-construction movement of residential structures and infrastructure associated with active clay and weathered shale (also referred to as shaley clay).

(b) Significant settlement of utility backfill has also been experienced when using soils derived from the Eagle Ford Group. These standards shall also apply to utility backfill within the special standards area. The purpose of the standards as it applies to utility backfill is to limit post-construction heave and/or settlement.

Section 2. Scope

(a) These Standards apply to all development within the City of Midlothian and its extraterritorial jurisdiction (ETJ) underlain by the Eagle Ford Group. The general boundary of the area is shown on Attachment 1.

(b) These Standards address required:

1. geotechnical studies;
2. remedial earthwork;
3. utility location and backfill;
4. pavement subgrade;
5. minimum pavement design sections;
6. observation and testing; and,
7. requirements to reduce post-construction soil shrinkage.

Section 3. Required Geotechnical Investigations

(a) A geotechnical investigation and report is required for all development within the City of Midlothian, in conformance with the Texas Engineering Practice Act. The following requirements shall be considered a minimum scope of geotechnical engineering services for projects involving public infrastructure or residential structures within the boundary shown on Attachment 1.

(b) These standards are not intended to replace the professional judgment of the geotechnical engineer for any specific project. Results of the field and laboratory investigations, engineering analyses and recommendations shall be presented in a report and is subject to review and acceptance by the City Engineer or their designated representative.

(1) Field Investigation

- (A) Borings shall be drilled along the center of roadway or underground utilities at 250-foot spacings (or less), alternating between each roadway direction. As an alternative, roadway and utility design within a proposed subdivision can be based on a maximum 200-foot grid throughout the subdivision. Borings shall be drilled to a depth of at least 20 feet below finished subgrade. Where utilities extend to depths greater than 20 feet, borings shall be drilled to a depth of 3 feet below the deepest utility at that location. For single residential lots not covered by a subdivision analysis, the investigation will include a minimum of two core borings to a minimum depth of 20 feet.
- (B) Borings shall be sampled continuously to a depth of six feet and at 5-foot intervals or less thereafter. Samples shall be either obtained by minimum 3-inch diameter Shelby tubes (cohesive soils), or Standard Penetration test (cohesionless soils). Disturbed samples obtained from the augers are not accepted as being part of the required sampling.
- (C) Logs shall be developed to provide a depiction of the soil types encountered in each boring, sample types, descriptions of each layer and ground water conditions.

(2) Laboratory Investigation

- (A) Each sample of cohesive soil or weathered shale shall be evaluated for consistency using a calibrated hand penetrometer.
- (B) Soil types in each boring shall be subjected to classification tests to include, but not necessarily limited to; Atterberg Limits (ASTM D 4318), percent passing No. 200 sieve (ASTM D 1140), moisture content (ASTM D 2216), and unit dry weight. Where logs show uniform conditions, the number of tests can be reduced by visual classification, as long as there is at least one set of classification tests for each strata per each 2 borings.

- (C) Due to the variability in moisture contents within the seasonally active zone over the year, the Design Engineer shall assess the condition of the samples and the season. When, in the Design Engineer's opinion, the samples are within the seasonally active zone and are wetter than should normally be expected, the samples shall be air dried such that the samples represent the drier portion of the year. Alternatively, for the seasonally active portion of the profile, the potential for heave can be calculated using TxDOT 124E (Method for Determining the Potential Vertical Rise, PVR) and applying the "dry condition" for the analysis.
- (D) Two samples per boring will be evaluated for swell potential using ASTM D-4546 at overburden stress at depths below the seasonal active zone, or using the absorption pressure swell method as described by Johnson and Snethen¹ (this method is also commonly referred to as the "classic" swell test) to evaluate with reasonable certainty the average swell potential of the subgrade.
- (E) For pavement subgrade design, perform a lime stabilization series for each soil type expected to be in the upper 12 inches of the subgrade. Minimum criteria for the percent lime shall be that required to meet both the Eades-Grimm method of pH testing and maximum Plasticity Index as determined by lime series. Minimum Design Criteria for pavement subgrade shall be the percent lime, plus one percent, to achieve the following:
- i. pH = 12.4 after mellowing (ASTM D 2976) and,
 - ii. Plasticity Index of 15 or less.

(3) Engineering

- (A) The Design Engineer shall utilize the results of the field and laboratory investigation to provide an engineered pavement section including moisture-treated subgrade to reduce the potential for movement as discussed below. The pavement shall consist of City of Midlothian standard sections identified in Section 7. Minimum Pavement Sections for the street classification.
- (B) The Design Engineer shall calculate the potential for vertical heave based upon a minimum 20-foot moisture penetration depth and shall provide recommendations to limit the potential for movement below all roadways to less than four inches and residential structures to less than two inches. The depth of analysis may be reduced to less than 20 feet if it can be demonstrated that geologic conditions support a shallower active zone (i.e., where shallow unweathered shale or static ground water is present or swell pressures do not exceed overburden stress). Recommendations may include moisture treatment or excavation and replacement. An example of a design procedure to calculate the potential for vertical heave is provided in Attachment 2 to this article.

¹ Johnson, L.D., & Snethen, D.R. (1978). "Prediction of Potential Heave of Swelling Soil." Geotechnical Testing Journal, ASTM 1 (3), 117-124.

- (C) Attachment 2 is intended to provide a guideline relative to the analysis for potential movement. It is not intended to replace the judgment of the Design Engineer.
- (D) The Design Engineer shall submit all calculations and assumptions involved in calculating the potential for vertical heave and the recommended depth of moisture treatment to the City for review. Guideline procedures for moisture treatment are included in Section 4. Remedial Earthwork.
- (E) For studies used in pavement design, the report shall identify the type of subgrade stabilization. For materials stabilized in-place, the estimated percent of lime or cement shall be identified based on the results of lime or cement series. A minimum 8-inch stabilized base is required below all municipal paving dedicated to the City.

Section 4. Remedial Earthwork

(a) The potential for heave can be reduced by remedial earthwork, which generally consists of either excavation and recompaction at elevated moisture (mechanical pre-swelling), pre-swelling via pressure injection, excavation and replacement of a portion of the active materials with less active soils, or injection with chemical.

(b) The depth of remedial earthwork will vary with geologic conditions. The Design Geotechnical Engineer shall incorporate the anticipated cut and fill in the potential vertical heave calculations and identify the specific depth and method to reduce the potential vertical heave to less than two inches.

(c) For mechanical pre-swelling, in general, it is recommended clay or weathered shale (shaley clay) used as fill be compacted in approximate 8-inch lifts to a density of between 93 and 98 percent of maximum density as determined by ASTM D-698, at a moisture of +1 to +5 percentage points above optimum moisture. Swell tests shall be conducted on composite samples compacted to the required density and moisture to confirm the reduction in swell. Alternative moisture and density criteria can be specified by the Design Engineer provided swell tests confirm the desired reduction in swell. Higher minimum density may also be desired for fill depths greater than 10 feet.

(d) Pre-swelling via injection can be utilized to obtain the desired reduction in swell. Injection shall consist of multiple passes using water and surfactant or alternatively chemical injection. The Design Engineer shall determine the required depth to reduce the potential for heave below residential structures to less than two inches. The Design Engineer shall develop an observation and testing protocol to confirm the desired post-injection reduction in swell.

(e) Maintenance of the moisture in the subgrade shall be addressed by the Design Engineer. Typical alternatives to maintain the moisture consist of stabilization of the exposed surface soils or capping the remedial soil with inert fill. Residential lots have also been effectively sealed using 10-mil polyethylene with a six- to 12-inch thick soil cover to protect the polyethylene.

(f) The Design Engineer shall provide a letter to the City at the completion of remedial earthwork confirming the desired reduction in movement.

Section 5. Utility Location and Backfill

(a) All utilities shall be located outside of pavement, unless otherwise permitted by the City. In areas where utilities cross future public streets, backfill of the crossings must meet the requirements specified below.

(b) Below ground utilities shall be excavated to allow for mechanical compaction, testing and inspection of the backfill. Excavation sidewalls shall be sloped to allow for safe ingress/egress of testing and inspection personnel. As a minimum where space allows, the excavation sidewalls shall be constructed at a one horizontal to one vertical slope or flatter where dictated by OSHA considerations.

(c) In general, vertical sidewalls will not be allowed unless dictated because of space limitations. For these conditions, trench boxes and shoring will be allowed; however, special provision for testing of the backfill during placement will have to be incorporated into the design. In no case will testing of the backfill via test pits after completion of fill placement be allowed.

(d) The design engineer shall specify the required density to meet settlement and heave considerations. In general, it is recommended that utility fill less than 10 feet in depth be compacted to a density of between 93 and 98 percent of maximum density as determined by ASTM D 698, at a moisture of +1 to +4 percentage points above optimum moisture. Utility fill depths greater than 10 feet typically should be compacted to a density of between 95 and 100 percent of maximum density as determined by ASTM D 698, at a moisture of +1 to +5 percentage points above optimum moisture.

(e) The observation and testing program shall be developed by the Design Engineer to confirm that the fill has been placed and compacted to meet the project specifications. Minimum observation and testing is discussed in Section 8. Compaction Criteria and Testing.

Section 6. Pavement Subgrade

(a) All pavement within the Special Standards area shall have a subgrade stabilized to a minimum depth of 8-inches.

(b) The type of stabilization will be dependent upon the specific material exposed at completion of grading. Where lime is required by the design engineer, lime series tests shall be conducted on the exposed subgrade. Initial testing may be performed during the geotechnical investigation; however, it shall be required that samples of the subgrade be obtained at a maximum spacing of 250 feet on center at completion of initial grading. Each sample will be tested to determine its Plasticity Index (PI). Lime series and the Eades-Grimm method of pH (ASTM D 2976) tests shall then be conducted on representative samples to evaluate the required percent lime for PI reduction and to obtain a pH of 12.4 after mellowing. If the lime series indicates the PI of the lime-stabilized material cannot be reduced to 15 or less, an initial application of lime followed by stabilization with cement will be required. The percent lime will be the percentage, plus one percent, required to reduce the PI to its lowest value.

(c) If the required PI reduction is obtained, the specified percent lime for stabilization shall be that required to obtain a pH of 12.4 after mellowing plus one percent.

(d) For soils where the PI is reduced to 15 or less, lime stabilization will be performed in accordance with the latest edition of the Texas Department of Transportation (TxDOT) “Standard Specifications for Construction of Highways, Street and Bridges”. Stabilized soils shall be compacted to a minimum of 95 percent of Modified Proctor, ASTM D-1557, at or above optimum moisture.

(e) For soils where lime cannot reduce the PI to 15 or less, an initial application of lime followed by cement stabilization is required. The initial lime application will be in accordance with TxDOT Item 260. A mellowing period of 48 to 72 hours is required before the second mixing. Upon completion of the second mixing, stabilization with a minimum of 8 percent cement shall be performed in accordance with TxDOT Item 275. Cement stabilized material shall be compacted to a minimum of 95 percent of Modified Proctor, ASTM D-1557, at or above optimum moisture.

Section 7. Minimum Pavement Sections

(a) The standard pavement section shall consist of concrete curb and gutter and a hot mix asphaltic concrete (HMAC) base and surface course, having a minimum design thickness as shown in Table 7.0. The concrete curb and gutter shall conform to the City’s Standard Construction Details, as may be amended, and the HMAC shall meet the material and construction methods contained in the latest edition of the TxDOT standard specifications manual. This pavement material and section may only be modified upon approval of the City Engineer or their designated representative.

Table 7.0 – Minimum Design Thickness (inches)			
Street Classification	Minimum Thickness of Base Course (Type “B”)	Minimum Thickness of Surface Course (Type “C” or “D”) ⁽¹⁾	Total Minimum Thickness
Residential/Local	4.5	1.5	6.0
Minor Collector	5.0	2.0	7.0
Industrial	6.0	2.0	8.0
Major Collector and Arterial	6.0	2.0	8.0

⁽¹⁾ Surface course type shall be based upon street classification, surrounding land use and as directed by the City.

(b) All pavement sections shall be constructed over a treated subgrade in accordance with Section 6. Pavement Subgrade.

Section 8. Compaction Criteria and Testing

(a) The developer shall be responsible for hiring a pre-approved geotechnical engineering company for compliance testing of remedial earthwork, construction of the pavement subgrade and placement of utility backfill. The City may elect to perform its own testing; however, these tests will be for the sole use of the City and will not be used for acceptance.

(b) The Design Engineer shall develop an observation and testing protocol to confirm that the desired density and moisture has been obtained in all fill and/or remedial earthwork to reduce the potential for post-construction movement.

(c) All mass earthwork shall be tested for compaction and moisture at a minimum rate of one test per 8-inch thick lift per 5,000 square feet of fill area. Remedial earthwork involving pre-swelling via pressure injection shall be tested using continuous sample borings to the full injection depth at a maximum spacing of one boring per 10,000 square feet, or one boring per lot for residential subdivisions.

(d) The pavement subgrade shall be tested for gradation and compaction at maximum 10,000-square foot intervals. The gradation tests shall meet TxDOT specifications. The upper 6-inches of subgrade below the stabilized layer shall be compacted to a minimum of 95 percent of Standard Proctor, ASTM D 1557, at or above optimum moisture.

(e) Utility trench backfill shall be tested at a minimum rate of one test per 100 linear feet of trench, per 8-inch thick lift.

(f) At completion of testing, the Design Engineer shall provide a letter to the City Engineer or their designated representative confirming that the required remedial earthwork has been performed in accordance with the Plans and Specifications and that all fill has been placed to meet the Specifications.

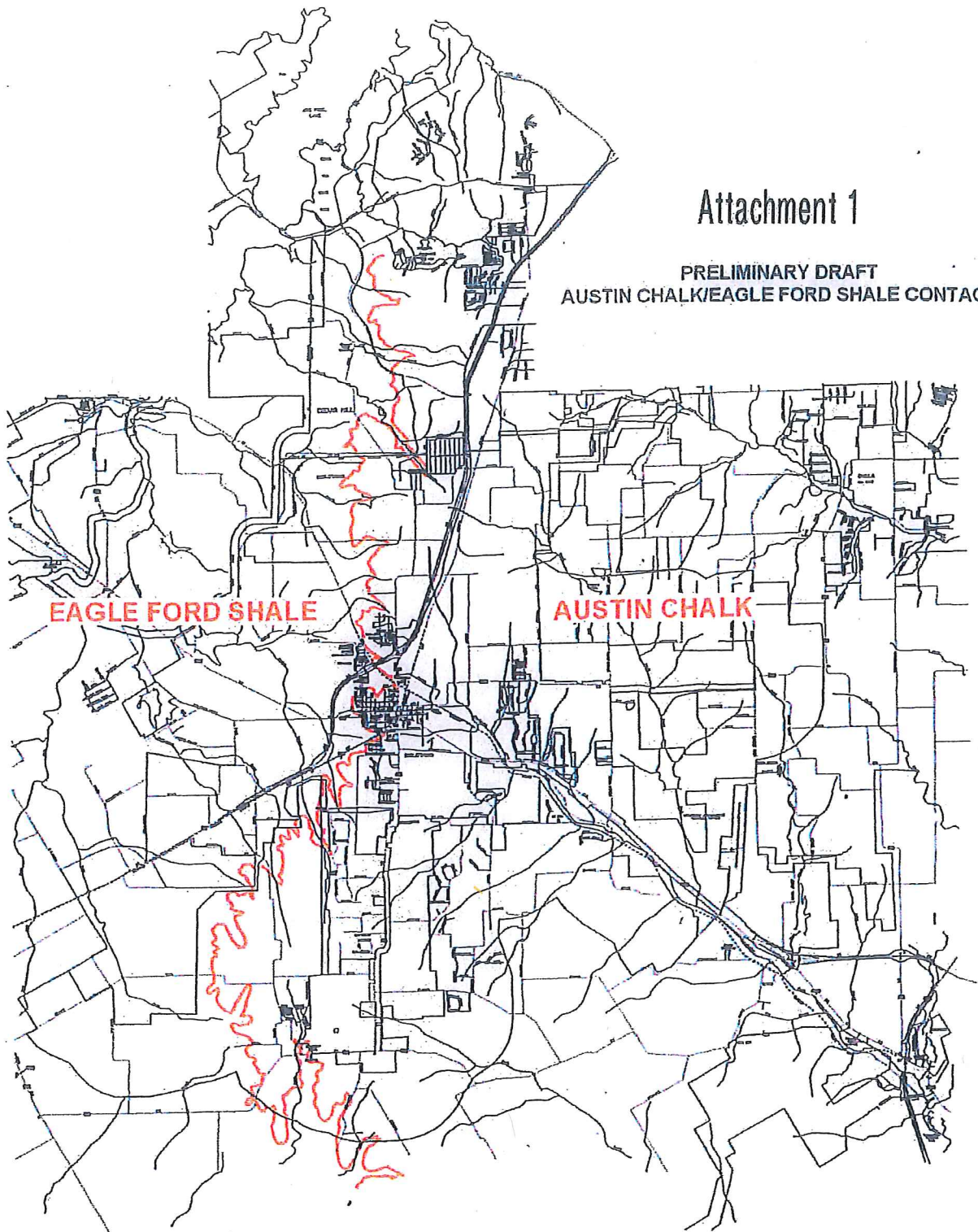
Section 9. Shrinkage Control

(a) Remedial earthwork to reduce the potential for heave utilizing pre-swelling alternatives (either mechanical or pressure injection), shall incorporate irrigation and landscape plans to reduce the potential for shrinkage, including the restriction of water thirsty plant species.

(b) In addition, sidewalks along residential/local streets shall be located adjacent to the back of curb and shall be a minimum of six (6) feet in width, unless permitted otherwise by the City.

Attachment 1

PRELIMINARY DRAFT
AUSTIN CHALK/EAGLE FORD SHALE CONTACT



EAGLE FORD SHALE

AUSTIN CHALK

LEGEND

 AUSTIN/EAGLE FORD CONTACT

NOTE: CONTACT IS APPROXIMATE, BASED ON
THE GEOLOGIC ATLAS OF TEXAS - DALLAS SHEET (1972)
PUBLISHED BY THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY



NOT TO SCALE:

Attachment 2

(a) Example of Calculation of Potential Vertical Rise. Example incorporates seasonally active soils to 12 feet with dry expansive weathered shale to 20 feet.

(b) Swell Test Results

Depth, ft.	Initial Moisture, %	Final Moisture, %	% Swell ¹
14	22.0	28.5	6.2
18	23.4	26.3	3.2

¹ Percent swell at final overburden pressure

(c) Seasonally active zone, 0 to 12 feet, calculate using TxDOT 124E, applying the dry condition. Laboratory results indicate the soils have a Plasticity Index from 0 to 6 feet of 38 and from 6 to 12 feet of 41. PVR of upper 12 feet from the dry condition equals 3.1.

(d) Direct application of swell tests; apply 6.2 percent swell for soils from 12 feet to 16 feet and 3.2 percent swell for soils from 16 feet to 20 feet. Potential movement from 12 to 16 feet equals 2.98 (3.0) inches and from 16 to 20 feet equals 1.54 (1.5).

(e) Total potential movement equals; 3.1 + 3.0 + 1.5 for a total of 7.6 inches.

Revisions by Ordinance

(Ordinance 2010-28 adopted 10/12/10 Repealing Ordinances 2008-42 and 2007-23)

(Ordinance 2008-42 adopted 9/23/08 Amended Ordinance 2007-23)

(Ordinance 2007-23 adopted 6/26/07)