ALPHA TESTING, INC.

2209 Wisconsin St., Suite 100
Dallas, Texas 75229
972/620-8911 FAX: 972/620-1302
www.alphatesting.com

April 24, 2007

Gables Residential
3500 Maple Avenue
Dallas, Texas 75219
Attention: Mr. Peter Lin

Re: Geotechnical Exploration – Addendum
Las Colinas Urban Center-The Paseo
O'Connor and Lake Carolyn Parkway
Irving, Texas
ALPHA Report No. G051140-2

ALPHA Testing, Inc. completed a Geotechnical Exploration as ALPHA Report No. G051140 dated January 10, 2006. Subgrade improvement procedures are desired to reduce slab movements to about 1 inch for at-grade slabs, for parking garage slabs one-level below grade and for parking garage slabs two levels below grade.

Existing fill and possible fill soils were noted to depths of about 4 to 15 ft in the borings. Considering the below-grade construction and soil improvements required to reduce potential seasonal movement of the slabs (as discussed below), it is expected most of the existing fill soil would be over-excavated and either removed or improved following the recommended subgrade improvements.

The following design criteria given in this report have been developed assuming slabs are constructed from the ground surface to about 26 ft below existing grade. Substantial cutting and filling on the site can alter the recommended foundation design parameters. Therefore, it is recommended our office be contacted before performing other cutting and filling on site to verify appropriate design parameters are utilized for final foundation design.

Slabs for at-grade and below grade structures supported on the site clays could experience soil-related potential seasonal movements of on the order of about 5 to 6 inches. These potential seasonal movements have been estimated in general accordance with methods outlined by Texas Department of Transportation (TxDOT) Test Method Tex-124-E and engineering judgment and experience. Estimated movements have been calculated assuming the moisture content of the in-situ soil within the normal zone of seasonal moisture content change varies between a "dry" condition and a "wet" condition as defined by Tex-124-E. Also, it was assumed a 1 psi surcharge load from the slab acts on the subgrade soils. Movements exceeding those predicted above could occur if positive drainage of surface water is not maintained or if soils are subject to an outside water source, such as leakage from a utility line or subsurface moisture migration from off-site locations.

As discussed above, most of the project site will have slabs at-grade, slabs one-level below grade estimated to be about 13 ft below existing grade and slabs two-levels below grade estimated to be about 26 ft below existing grade. If some slab movement for the structures is tolerable (about 1 inch), the concrete slabs can designed to bear uniformly on improved soils. Based on an expected movement tolerance of about 1 inch, subgrade improvement options to reduce potential for slab movements include over-excavating a portion of the existing clayey soils and either 1) backfilling with a combination of moisture-conditioned soil followed by placement of select, non-expansive material or 2) utilizing the procedures of Water Pressure Injection (WPI) in conjunction with placement of select, non-expansive material. The extent (or depth) of these subgrade improvement methods are summarized below in Tables A, B and C and are discussed below in more detail. In choosing these methods of slab movement reduction, the Owner is accepting some post construction seasonal movement of the slabs (1 inch).

TABLE A **At-Grade Slabs** **Resulting Estimated Potential Seasonal Movement = 1 inch**	
SUBGRADE IMPROVEMENT METHODS	**SELECT, NON-EXPANSIVE MATERIAL, FT**
Minimum Thickness of Select, Non-Expansive Material In Conjunction with 15 ft of Moisture-Conditioned Soil below Slabs, ft	1
Minimum Thickness of Select, Non-Expansive Material In Conjunction with 15 ft of Water Pressure Injection (WPI) below Slabs, ft	1

TABLE B **Slabs One Level Below Grade (about 13 ft)** **Resulting Estimated Potential Seasonal Movement = 1 inch**	
SUBGRADE IMPROVEMENT METHODS	**SELECT, NON-EXPANSIVE MATERIAL, FT**
Minimum Thickness of Select, Non-Expansive Material In Conjunction with 10 ft of Moisture-Conditioned Soil below Slabs, ft	1
Minimum Thickness of Select, Non-Expansive Material In Conjunction with 10 ft of Water Pressure Injection (WPI) below Slabs, ft	1

TABLE C Slabs Two Levels Below Grade (about 26 ft) Resulting Estimated Potential Seasonal Movement = 1 inch	
SUBGRADE IMPROVEMENT METHODS	**SELECT, NON-EXPANSIVE MATERIAL, FT**
Minimum Thickness of Select, Non-Expansive Material In Conjunction with 5 ft of Moisture-Conditioned Soil below Slabs, ft * *Please See Note Below*	1

**Note: If moist soil conditions are encountered during excavation for structures with slabs two levels below grade, the depth of moisture-conditioning could possibly be reduced. ALPHA Testing, Inc. should be contacted to observe the subgrade conditions in these areas.*

As an alternate to the use of select, non-expansive material above the moisture-improved subgrade an equal thickness of flexible base material (TxDOT Item 247, Type A, Grade 1 or 2) can be considered. The flexible base material should be compacted to a minimum 95 percent of standard Proctor maximum dry density (ASTM D 698) and within three percentage points of the material's optimum moisture content.

A sub-floor drainage system is recommended beneath any slab two levels below grade and would be beneficial for slabs at grade and one level below grade. The drain system could consist of collector pipes (4-6 inches in diameter, perforated and wrapped with filter fabric - Mirafi 140N, or equivalent) in shallow trenches connected to a uniform drainage layer at least 6 inches thick. This drainage layer should be a clean, relatively well-graded granular soil consisting of either sand or a sand and gravel mixture (less than 10 percent finer than the No. 200 sieve size).

Consideration can be given to omitting a sub-floor drainage system beneath the slabs one level below grade and rely on the underground wall perimeter drainage system to intercept any groundwater seepage as discussed in the Lateral Earth Pressure section of ALPHA Report No. G051140. Observations during construction could still require the use of subdrains in some areas. If the garage slabs are sensitive to moisture or any below-grade areas are to be finished space, a sub-floor drainage system is recommended. As a minimum, a properly designed and constructed moisture barrier should be placed between the slab and subgrade soils to retard moisture migration through the slabs.

Subgrade Improvement Using Moisture-Conditioned Soil

Movement for slabs could be reduced to about 1 inch by placing the recommended thickness of select, non-expansive material between the bottom of the slab and the top surface of the recommended thickness of moisture-conditioned soil shown above in Tables A, B and C.

Moisture-conditioning consists of over-excavating the site soils, then processing and compacting the specified minimum thickness of soil at a *"target"* moisture content approximated to be at least 4 percentage points above the material's optimum moisture content as determined by the standard Proctor method (ASTM D 698). The moisture-conditioned soil should be placed in 8-in thick loose lifts and compacted to a dry density of 93 to 98 percent of standard Proctor maximum dry density. Moisture conditioning of the on-site soil should extend throughout the entire building pad area and at least 5 ft beyond the perimeter of the building. In major entrance areas, the moisture conditioning process should extend at least 10 ft beyond the perimeter of the building. However, select material should not extend beyond the building limits. Moisture-conditioned soils should be maintained in a moist condition prior to placement of the required thickness of select, non-expansive material.

The resulting estimated potential seasonal movements (1 inch) have been calculated assuming the moisture content of the moisture-conditioned soil varies between the *"target"* moisture content and the "wet" condition while the deeper undisturbed in-situ soil within the normal zone of seasonal moisture content change varies between the "dry" condition and the "wet" condition as defined by methods outlined in TxDOT Test Method Tex-124-E.

Please note, it is the intent of the moisture-conditioning process described above to reduce the free swell potential of the moisture-conditioned soil to 1 percent or less. Additional laboratory tests (i.e., standard Proctors, absorption swell tests, etc.) should be conducted during construction to verify the *"target"* moisture content for moisture-conditioning (estimated at 4 percentage points above the material's optimum moisture content as defined by ASTM D 698) is sufficient to reduce the free swell potential of the processed soil to 1 percent or less. In addition, it is recommended samples of the moisture-conditioned material be routinely obtained during construction to verify the free swell of the improved material is 1 percent or less.

Subgrade Improvement Using Water Pressure Injection

This movement reduction method utilizes the procedures of Water Pressure Injection (WPI). As an alternate chemical injection can also be considered in lieu of water pressure injection. Successful completion of the chemical injection projects should be evaluated using the same swell criteria (1 percent) as discussed below for water pressure injection. The Client should obtain appropriate documentation from the manufacturer indicating the chemical is environmentally safe and long lasting (effective for 10 years or more). The improvement procedures outlined below, again, will not eliminate future movement of a below grade slab (1 inch).

Improvement Procedures:

1. Following removal of the necessary thickness of on-site expansive soils to allow for placement of at least 1 ft of select, non-expansive material, the exposed subgrade of the building pads should be water pressure injected (WPI) to a depth of 15 ft below the bottom of the select fill for slabs at grade. For slabs one level below grade, the depth of water pressure injection may be reduced to 10 ft. This is shown in Tables A and B. The water pressure injection should extend throughout the entire building pad areas and at least 5 ft beyond the perimeter of each building. Recommended specifications for WPI are attached to this report in the appendix.

2. In major entrance areas, WPI should extend at least 10 ft beyond the perimeter of the buildings. The select material should preferably not extend beyond the building limits. Backfill placed above the water pressure injected soils which extend 5 ft beyond the buildings could consist of compacted on-site native clay soil.

Performance of post-injection swell testing and moisture content determinations should be employed as final acceptance criteria in engineering analysis to examine accomplishment of intended objectives of the injection treatment. Maximum benefit of these movement reduction procedures can be achieved by employing ALPHA TESTING, INC. to observe, monitor and test the entire process. Construction specifications for the water pressure injection process are provided in the Appendix of this report.

The purpose of the above procedure is to pre-swell the existing soils. Satisfactory completion of the injection process is achieved when the desired moisture content and abatement of swell in the injected subgrade clay soils are reached. Acceptance criteria for water pressure injection should be based upon obtaining an average free swell of 1 percent or less in the injected zone. Performance of post-injection swell testing and moisture content determinations should be employed as final acceptance criteria in engineering analysis to examine accomplishment of intended objectives of the injection treatment.

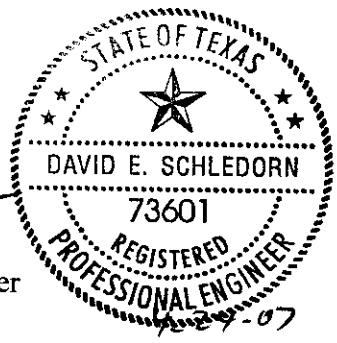
The resulting estimated potential seasonal movements (about 1 inch) have been calculated assuming the average free swell of the injected soils does not exceed 1 percent. Further, it is assumed the moisture content of the soil below the injected zone and within the normal zone of seasonal moisture content change varies between a "dry" condition and a "wet" condition as defined by Tex-124-E.

All other recommendations provided in the Geotechnical Exploration (ALPHA Report No. G051140 dated January 10, 2006) remain unchanged.

ALPHA TESTING, INC. appreciates the opportunity to be of service on this project. If we can be of further assistance, please contact our office.

Sincerely yours,

ALPHA TESTING, INC.



David E. Schledorn, P.E.
Senior Geotechnical Engineer

Brian A. Powell, P.E.
Vice President

Attachment : Soil Modification
Water Pressure Injection Guideline Specifications

DES/BAP/des
Copies: (2) Client
(1) Viewtech Structural Engineers, Inc. (Mr. Victor Lissiak, Jr., P.E.)

SOIL MODIFICATION
WATER PRESSURE INJECTION (WPI)
GUIDELINE SPECIFICATIONS

Purpose

The purpose of this specification is to provide a procedural basis for using water pressure injection as a method to obtain a relatively uniform, moist, pre-swelled zone of soil beneath the slab. Specifically, the intent of this procedure is to reduce the average free swell potential of soils within the injected zone to 1 percent or less.

Material

1. Only potable water shall be used during the entire injection process.

2. A non-ionic surfactant (wetting agent) will be added to the water according to manufacturer's recommendations, but, in no case will proportions be less than one part (undiluted) per 3,500 gallons of water.

Application

1. The water pressure injection work shall be accomplished after the site has been brought to near final subgrade elevation and prior to installation of any plumbing, trenches and utilities.

2. The injection vehicle will have a minimum gross weight of 5 tons and shall be capable of making straight vertical penetrations to minimize pressure loss around the injector rods to at least 10 and 15 ft.

3. Injections will be continued to "REFUSAL" (until the maximum reasonable quantity of water has been injected into the soil and water is flowing freely at the surface, either out of previous injection holes or from areas where the surface soils have fractured. The amount of water flowing from the areas described above will be approximately equivalent to the volume of water being pumped into the soil. As a minimum, injections should be at least 30 seconds at each injection interval unless altered by the Geotechnical Engineer).

   Note: Loss of water or blow-back around injector pipes does not constitute refusal. Continued loss of water in this manner may indicate inadequate injection equipment or techniques, or in some instances, surficial soils that will not form an adequate seal to contain the water. In either instance, the owner's representative should be contacted and an on-site observation made to determine appropriate steps to achieve adequate injection.

   After completion of water injection, the injection contractor will submit records which reflect the total quantity of water used. The injection contractor will be totally responsible for determining the means and methods of injecting the on-site soils such that the average free swell of soils within the injected zone does not exceed 1 %.

4. Injection pipe(s) will penetrate the soil in approximately 12 to 18-inch intervals, injecting to refusal at each interval for a total depth of 10 and 15 feet or impenetrable material, whichever occurs first. If a seemingly impenetrable layer is encountered, ALPHA TESTING, INC. must be contacted to evaluate the significance of the lack of penetration with the injector tubes or provide alternate recommendations. A minimum of six (6) injection intervals will be provided for the 10-ft injection depth. A minimum of nine (9) injection intervals will be provided for the 15-ft injection depth. The lower portion of the injection pipe will consist of a hole pattern that will uniformly disperse water throughout the entire depth.

5. Spacing for the injections will not exceed 5 feet on-center each way. Subsequent injections will be offset laterally at one-half the distance in both directions between the original injection centers.

6. Injection pressures should be adjusted to inject the greatest quantity of water possible within a pressure range of 50 - 200 psi pump pressure.

7. After a minimum curing time of 48 hours, the water injected pad shall be tested for moisture content and swell abatement to determine if additional injections with water are necessary. Subsequent water injections will be 5 feet on-center each way and spaced 2 1/2 feet offset in two orthogonal directions from the initial injection.

8. Upon completion of the final water pressure injection, the top surface of the injected pad should be scarified to a depth of at least 6 inches and re-compacted to between 93 and 98 percent of the optimum density, at a moisture content between 2 and 4 percentage points above the optimum values, as defined by ASTM D-698. Compaction tests should be performed at a frequency of 1 test per 5,000 sq ft with a minimum of 3 tests per pad.

9. The moisture content of the injected soils will be maintained until the slab is placed. Loss of moisture from the surface or sides of the building pad must be prevented by watering or use of a membrane. Any open trenches should be sealed or kept wet to prevent loss of moisture. All trenches should be backfilled with the excavated material. The moisture content of the backfill should be maintained in the range of 2 to 4 percentage points above optimum.

Special Considerations

Several water injections may be required to achieve the desired final moisture content and corresponding soil swell abatement. If construction of the slab-on-grade is initiated with soils at their current moisture content level, about 6 to 8 gallons or more of water per sq ft of injected area may be required to achieve the final moisture content in the injected soils, if uniformly distributed.

Due to variations in the subsurface soils, the number of injection passes required to reduce the swell potential of the injected soils to 1 percent or less is unknown. Hence, the Client should allow for extra construction time on the site considering the time frame required to achieve the desired reduction in swell potential is unknown. Further, the contract with the Injection Contractor should address the situation where more injection passes than predicted are required to achieve the desired result.

Between the time the subgrade is water pressure injected and either select, fill material or the plastic sheeting is placed, the upper surface of the injected soil should not be allowed to dry. To allow for adequate pre-swelling of the soils from the injection procedure, concrete for the slab should not be placed above injected areas until at least 2 weeks following the final water injection. During this 2-week period, the surface of the injected soil must be kept moist or covered with plastic sheeting to prevent moisture loss. About 3 to 4 inches of heave can be expected in the building pad during and shortly after completion of the injection process.

Additionally, experience indicates injection adjacent to the existing buildings can result in swelling of soil in the injected zone as well as those beneath existing nearby buildings. Swelling of soil supporting existing slabs can result in distress (movement) to existing buildings. Therefore, if an existing building is located within 30 ft of the proposed water injection area, it is recommended a temporary vertical moisture barrier be installed longitudinally between the existing building and the injected pad to prevent injected water from entering the subgrade of the existing building. The moisture barrier could consist of a 12-ft deep trench (about 1 ft wide) for a 10 ft injection depth and a 17-ft deep trench for a 15 ft injection depth backfilled with lean concrete or other suitable relatively impermeable material.

Monitoring

A full-time ALPHA TESTING, INC. technician should be retained and present throughout the injection operations. Moisture content and free swell samples should be taken at 1-foot intervals to the total depth injected from a minimum of one test boring per each 4,000 sq feet of injected area (minimum 2 borings per structure). The moisture content and shear strength (using a pocket-penetrometer) will be determined for each sample. One-dimension free swell tests (ASTM D 4546-85 Method B) will be performed on selected samples at a frequency of 3 free swell tests per test boring for a 10 ft injection depth and 4 free swell tests per boring for a 15 ft injection depth. The free swell tests will be performed with a surcharge equal to the overburden pressure anticipated upon completion of the new structure. Based upon the test results, the current swell potential of the injected soils should be determined by the project Geotechnical Engineer. Acceptance criteria for water pressure injection will be based upon achieving the potential movements indicated in the Geotechnical Exploration. As a guide, an average free swell of 1 percent or less in the injected zone could be used for planning. However, due to variations in the soils across the site, an average free swell of more than 1 percent may be allowable in some areas. Acceptance of soils with average free swells of more than 1 percent should be evaluated by ALPHA TESTING, INC. Depending upon the moisture content and the potential swell remaining in the existing injected soils, additional injections with water containing surfactant may be required until these requirements are met.

Wet and soft surface conditions resulting from the water injection procedures will require the contractor to provide access to drilling equipment used to obtain the soil samples which verify the injection process. Special track equipment may be required to provide the required access. The contractor will be responsible for providing and operating suitable equipment to permit sampling of the injected soils (test borings) with a standard truck-mounted drilling rig.