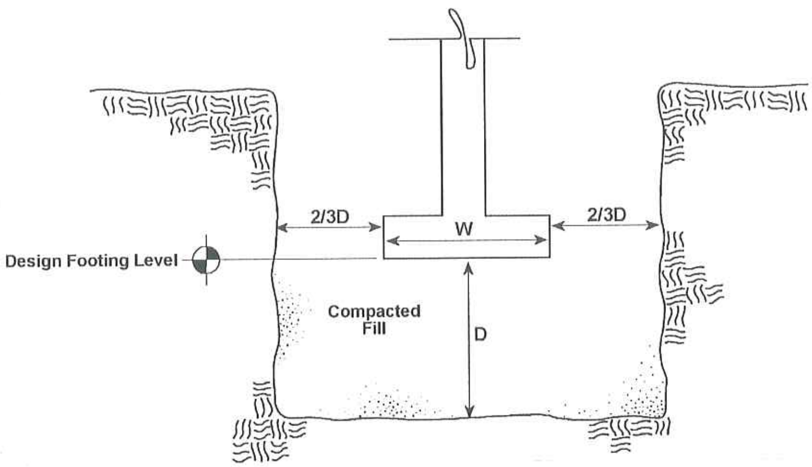
We expect that the materials present at the base of perimeter footings will be medium stiff or stiff native clay soils, loose to medium dense sand, and/or new engineered fill. Those footings that are supported on approved, engineered fill or stiff native clay soils should be limited to a maximum net allowable total load bearing pressure of 2,000 psf for design. This is the pressure that can be applied at the base of the footings in excess of the minimum surrounding overburden pressure.

Continuous-formed footings should have a minimum width of at least 16 inches, and isolated column footings should have a minimum width of at least 30 inches. Earth-formed trench footings also appear feasible.

Long-term foundation settlements of footings bearing within medium stiff or stiff native clay, loose to medium dense sand, and/or approved new-engineered fill at the allowable bearing pressures stated above are expected to be about 1 inch. Differential settlement across the structure is not expected to exceed about two-thirds this value.

Regarding construction of footings, we generally anticipate that material suitable for support of the design bearing pressure will be present at the base of the footings. However, there is a possibility that isolated zones of soft, compressible native soils or low density fill could be encountered below footing bearing level, even though field density tests are expected to be performed during fill placement operations. Therefore, we recommend the base of all footing excavations be observed and evaluated by the geotechnical engineer prior to placing reinforcing steel and concrete.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with approved granular material (such as silty gravel meeting KDOT AB-3 requirements) placed in lifts of 9 inches or less in loose thickness. The granular backfill to support footings should be compacted to at least 95% of their maximum dry density. The overexcavation and backfill procedure is described in the following figure.



Care should be taken to prevent wetting or drying of the bearing materials during construction. Extremely wet or dry material, or any loose or disturbed material in the bottom of the footing excavations should be removed before foundation concrete is placed.

6.4 Additional Design and Construction Considerations

We recommend the sides of all excavations be sloped or braced for stability during construction to comply with OSHA regulations.

The project specifications could be written to state the subgrade moisture-conditioning and re-compaction activity as a separate, unit-price, line item on the project bid documents as subgrade moisture conditions could change significantly before construction.

We recommend that all HVAC supply/return ducts be above floor level as air-flow and heat transfer through these ducts can cause substantial post-construction drying and shrinkage of clay subgrade and result in severe floor slab/interior wall distress.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 for procedures and cautions regarding the use and placement of a vapor retarder.

6.5 Pavements

Pavement Subgrade Preparation: We recommend removal of all vegetation and organic topsoil materials from the areas to be paved. The exposed subgrade should then be proofrolled as described previously in this report (see the *Site Preparation* section). The upper 8 inches of resulting exposed subgrade prior to fill placement should be compacted to at least 95% of its maximum dry density by ASTM D-698 at moisture contents above their optimum moisture content. Any additional fill should be approved material free of organic matter and debris that is placed in lifts not to exceed 9 inches in loose thickness and compacted to at least 95% of their maximum dry density at moisture contents above their optimum moisture content.

The final 8 inches of material directly below flexible pavements should be compacted to at least 98% of standard Proctor maximum dry density. The final 12 inches of subgrade beneath rigid, Portland cement concrete pavements and exterior slabs should meet the compaction and minimum moisture recommendations stated for additional fill in the *Building Pad Subgrade Preparation* section in this report. This may require subgrade removal, moisture manipulation, and recompaction.

We recommend modifying the final 8 inches of subgrade in areas to be paved to improve subgrade support and reduce the tendency for rutting in untreated wet cohesive subgrades by the paving spreader and loaded dump trucks during the paving operation.

The final subgrade should be constructed of one of the following:

- Modified subgrade by blending Class C fly ash or hydrated lime with on-site soil.
- Granular subbase of silty gravel meeting KDOT requirements for AB-3 base
- Crushed concrete or limestone subbase over a geo-grid or engineering fabric

If used, we recommend applying the modifying agent at an application rate sufficient to achieve a minimum laboratory CBR value of 25. This can typically be obtained with Class C fly ash contents of about 14% to 16% or hydrated lime contents of about 4% to 6%, based on the dry weight of the soil. The fly ash- or hydrated lime-modified subgrade or silty gravel (KDOT AB-3) subbase should be compacted to at least 98% of standard Proctor MDD at a final moisture content within 2 percentage points of their optimum dry density by ASTM D-698. The modified zone should extend at least 1 foot beyond the edge of the pavement. Soils mixed with Class C fly ash should be compacted within 2 hours following blending operations. Recognized guidelines, such as those specified by the KDOT or the City of Wichita, should be followed in the mixing and blending of fly ash- or hydrated lime-modified material.

Cohesive pavement subgrades, including fly ash-modified materials, can lose strength if subjected to prolonged wetting/drying and/or freeze/thaw conditions or they can become swell susceptible if allowed to dry excessively before paving operations. Therefore, it is important that the recommended moisture content of cohesive, subgrades in pavement areas be maintained. As a check, we recommend the moisture content be evaluated about 1 to 2 days before paving operations. If drying or disturbance/loosening of the subgrade materials has occurred at this time, measures should be taken to adjust their moisture content and/or recompact the subgrade soils before paving operations. If the subgrade was previously modified with fly ash and recompaction is required, additional fly ash (on the order of 8% to 10%) would be needed.

Typical Pavement Thicknesses: Table 1 below represents typical minimum thicknesses of pavements constructed on subgrades modified with fly ash or hydrated lime for similar projects. The typical thicknesses for parking areas are based on car traffic only. As part of the layout design of the facility we recommend the designer use signs and preventive structures to restrict truck traffic from entering these areas.

The typical pavement thicknesses presented in Table 1 assume periodic maintenance will be performed throughout the life of the pavement. Preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing and scheduled overlays). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

Table 1. TYPICAL MINIMUM PAVEMENT SECTIONS (Inches)				
	CAR PARKING & DRIVE AREAS LIGHT DUTY*		TRUCK DRIVE AREAS MEDIUM DUTY**	
PORTLAND CEMENT CONCRETE: Air Entrained 4,000 Psi Compressive 650 Psi Flexural		5.0		6.0
ASPHALTIC CONCRETE: Surface Course (See Note A) and Base Course (See Note B)	2.0 3.5		2.0 5.0	
MODIFIED SUBGRADE: Class C Fly Ash (about 14% to 16%) or Hydrated Lime (about 4% to 6%) or Crushed Aggregate Base (See Note C) or Crushed Aggregate on Tensar BX 1100 geo-grid or Mirafi 370 (or equivalent) 5-inch thickness beneath parking areas 7-inch thickness beneath drives	8.0 ----------	8.0 ----------	8.0 ----------	8.0 ----------

*Based on automobile traffic only. Heavier traffic loads (such as wandering heavy trucks) would require greater pavement thickness

**Based on 15,000 moderate to heavy trucks during the life of the pavement in drive areas. Higher traffic loads would require greater pavement thickness

Note "A": Surface course material should conform to one of the following specifications:

- City of Wichita Specifications for Type SC-1 Asphalt
- 1990 KDOT Specifications for Type BM-2 Asphalt with a minimum stability value of 1800 pounds
- 2007 KDOT Specifications for Class A Commercial Grade Asphalt Type SM-9.5A or SM-12.5A

We recommend the surface course asphalt not contain recycled asphalt product (RAP) in parking areas. The mix design should utilize the appropriate Performance Graded (PG) asphalt cement for the project location and traffic. The approved mix design should have an air void content of 3% to 5% at the optimum asphalt cement content.

Note "B": Base course material should conform to one of the following specifications:

- City of Wichita Specifications for Type BC-1 asphalt
- 1990 KDOT Specifications for Type BM-4 Asphalt with a minimum stability value of 1500 pounds
- 2007 KDOT Specifications for Class A Commercial Grade Asphalt Type SR-12.5A or Type SR-19A

The maximum allowable recycled asphalt material in the base course mixes should be limited to 35%. The mix design should utilize the appropriate Performance Graded (PG) asphalt cement for the project location and traffic. The approved mix design should have an air void content between 2% and 5% at the optimum asphalt cement content.

Note "C": Crushed Aggregate should consist of crushed stone, crushed gravel, or crushed recycled concrete. Virgin crushed aggregate should conform to the quality requirements of 1990 KDOT Specification Section 1105 or 2007 KDOT Specification 1104. The gradation of the material should be similar to KDOT materials AB-1 or AB-3, with a maximum of 15% material passing the #200 sieve. Recycled crushed concrete should have a maximum particle size of 2.5", and have a gradation similar to the City of Wichita specification Section 404 for Geogrid Reinforced Aggregate Base. Aggregate materials conforming to other aggregate base course specifications may be considered on a project basis.

We recommend dumpster pickup areas be constructed using at least 7 inches of reinforced concrete pavement. Minimizing subgrade saturation is an important factor in maintaining subgrade strength. Water allowed to pond on or adjacent to the pavement could saturate the pavement and cause premature pavement deterioration. We recommend sloping all pavement surfaces to provide rapid surface drainage. Typically, 2% slopes are used to facilitate rapid surface drainage. Positive surface drainage beyond the edge of the paved areas should be maintained. Design measures that could reduce the risk of subgrade saturation and improve long-term pavement performance would include crowning the pavement subgrade to drain toward the edges of the pavement area, rather than to the center, and installing surface drains next to any area where surface water can pond. Also, all pavement joints and cracks should be sealed to prevent the infiltration of surface water. Thicker pavement sections will reduce the necessity for regular maintenance over the design life of the pavement.

In addition, during construction we recommend preventing any contractor traffic on areas of stabilized subgrade or partial thickness pavement. Heavy loaded vehicles operating on these surfaces will cause significant damage resulting in deterioration and reduction in pavement life. Pavement design methods are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade such as the soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. It is, therefore, important to minimize moisture changes in the subgrade to reduce shrink/swell movements.

Openings in pavements, such as foliage areas installed to comply with landscape code requirements, are sources for water to collect and migrate beneath pavements, and thereby degrade the subgrade support. This is especially applicable for islands with raised concrete curbs, irrigated foliage, and near-surface site soils of impervious clay. The civil design for the pavements with these conditions should include features to restrict, or to collect and discharge excess water from the islands. This could include installing an impervious membrane liner beneath the entire island, or as a minimum, installing trenched lean concrete or rolled sheeting (around the perimeter of the island) that seals against the concrete curb of the island and extends from the ground surface to a depth of at least 3 feet. Alternately, trench drains could be installed around the perimeter of the islands at depths of at least 3 feet, backfilled with free-draining granular material, and connected to sumps with pumps or to collector drain lines that flow to storm sewers or positive outfalls.

Site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction and corrective action will be required. The subgrade should be carefully evaluated at the time of pavement construction for signs of disturbance or excessive rutting. If disturbance has occurred, pavement subgrade areas should be reworked, moisture conditioned, and properly compacted to the recommendations in this report immediately prior to paving. We recommend the pavement areas be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and paving. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. All pavement areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to paving.

6.6 Fill Construction Observation and Testing

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the geotechnical engineer's representative prior to placement of additional lifts. We recommend that each lift of fill be tested for density and moisture content at a frequency of one test for every 2,500 square feet of compacted fill in the building area and 5,000 square feet in pavement areas. We recommend one density and moisture content test for every 50 linear feet of compacted utility trench backfill.

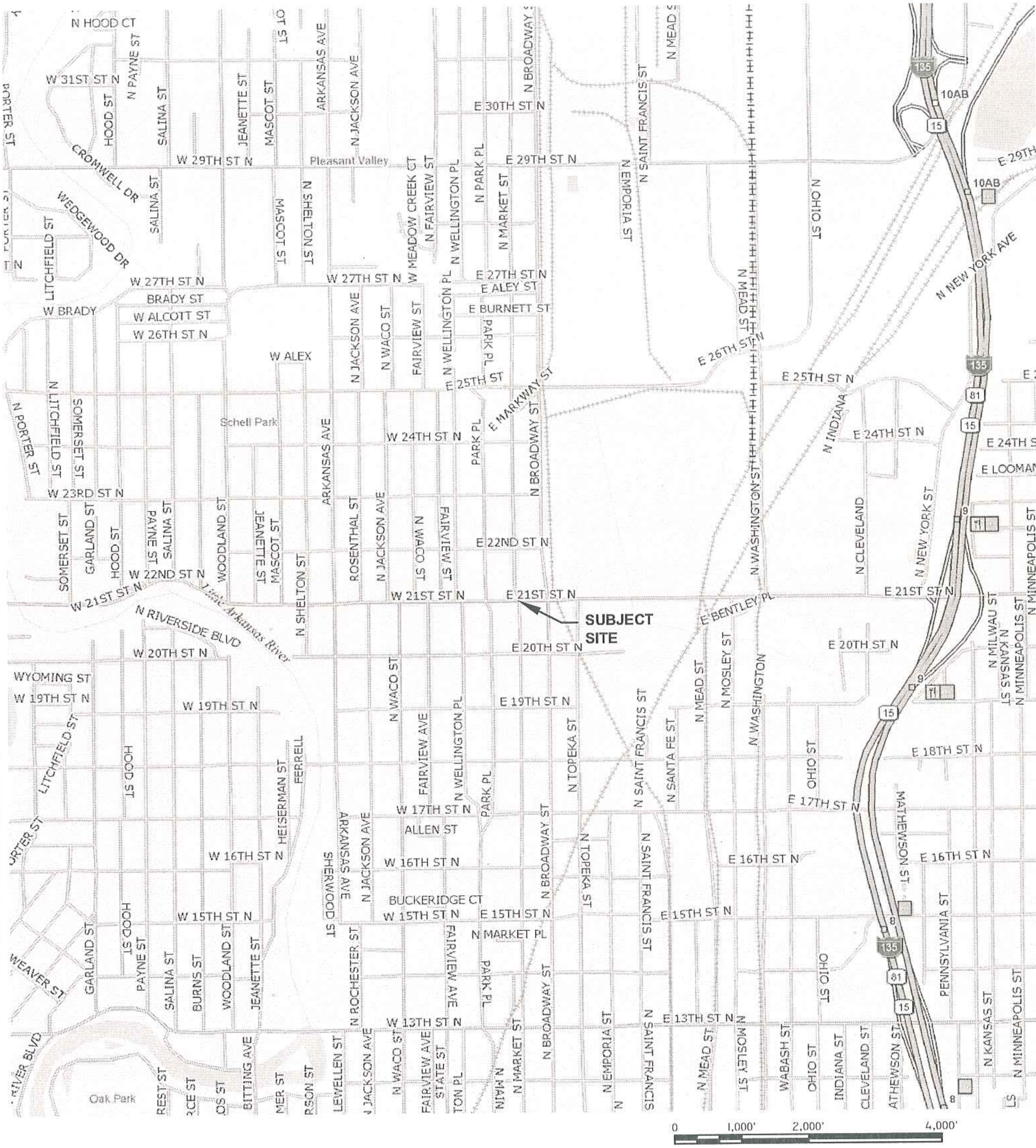
7.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.



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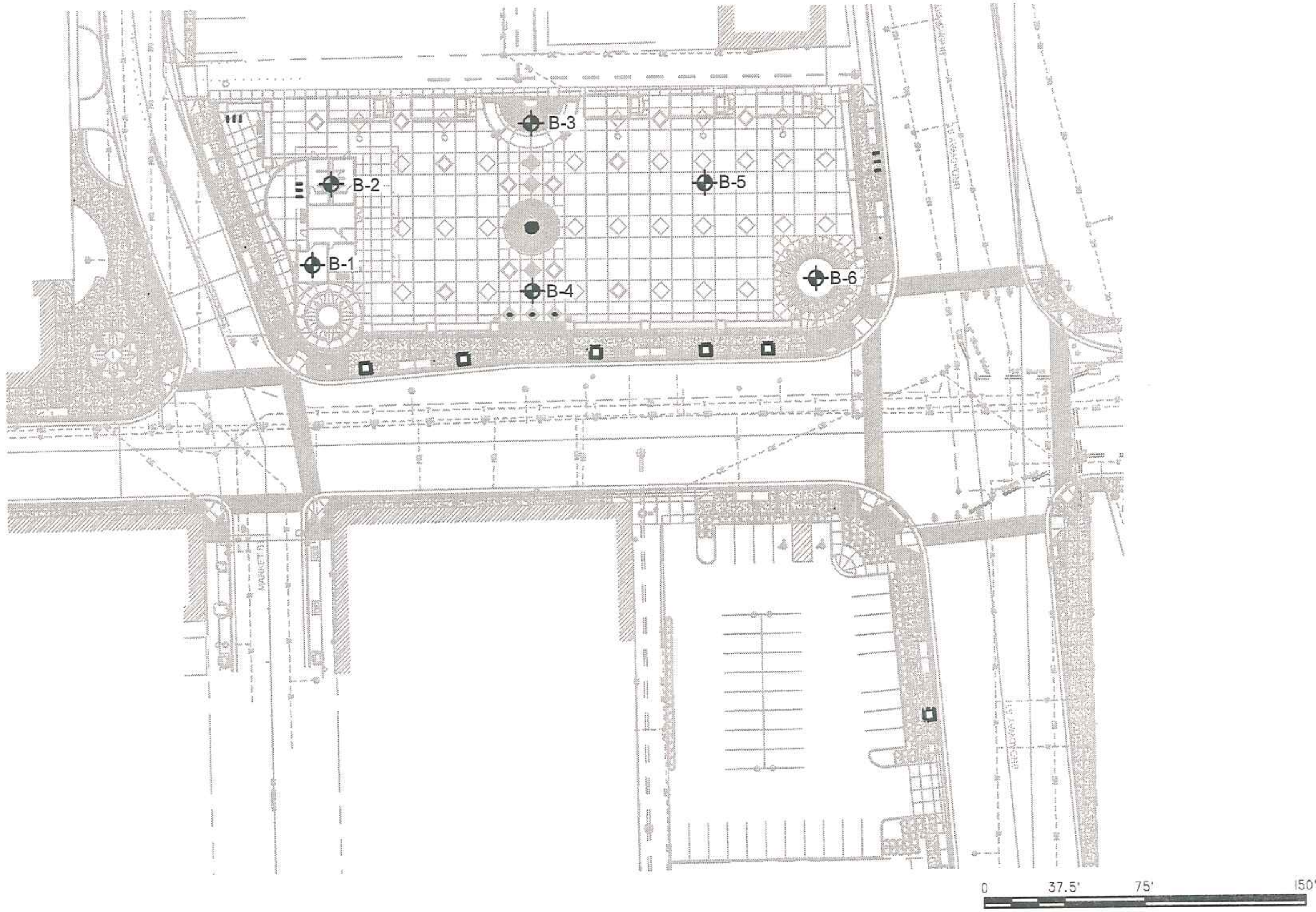
SITE MAP
NOMAR OUTDOOR MARKET
21ST ST NORTH AND MARKET STREET
WICHITA, KANSAS
CLIENT: LAW KINGDON, INC

Project Mngr:	KJS	Terracon	Scale:	SHOWN
Designed By:	KJS	1815 S. Eisenhower	Date:	7/30/09
Checked By:	KJS	Wichita, Kansas 67209	Project No.	01095120
Approved By:	KJS	Phone: (316) 262-0171	File Name:	5120F1.DWG
Drawn By:	WDP	Fax: (316) 262-6997	Figure No.	1

NOTE
MAP PROVIDED BY DELORME STREET ATLAS USA.

DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.



LEGEND

⊕ BORING LOCATION

BORING LOCATION DIAGRAM NOMAR OUTDOOR MARKET 21ST STREET NORTH AND MARKET STREET WICHITA, KANSAS CLIENT: LAW KINGDON, INC			
Project Mngr: KJS	Terracon 1815 S. Eisenhower Wichita, Kansas 67209 Phone: (316) 262-0171 Fax: (316) 262-6997	Scale:	SHOWN
Designed By: KJS		Date:	7/30/09
Checked By: KJS		Project No.	01095120
Approved By: KJS		File Name:	5120F2.DWG
Drawn By: WDP		Figure No.	2

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