PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

REPORT

GEOTECHNICAL ENGINEERING EXPLORATION

CITY OF BEDFORD
STREET DEPT GARAGE

1319 H STREET
BEDFORD, INDIANA

PROJECT NUMBER:
26-0033-11G

PREPARED FOR:
David Flinn
City of Bedford
1102 16th Street
Bedford, IN 47421

REPORT DATE:
2/13/26

PREPARED BY:
Patriot Engineering and Environmental, Inc.

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PATRIOT
ENGINEERING AND ENVIRONMENTAL, INC.

2/13/26

Mr. David Flinn
City of Bedford
1102 16th Street
Bedford, IN 47421

Re: Report of Geotechnical Engineering Exploration
City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana
Patriot Project No.: 26-0033-11G

Dear David,

Attached is the report of our geotechnical engineering exploration for the above referenced project. This investigation was completed in general accordance with our Proposal No. P26-0011-11G dated 1/7/26.

This report includes detailed and graphic logs of six soil borings drilled at the proposed project site. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and geotechnical recommendations pertinent to the site development, foundation design, and construction.

We appreciate the opportunity to perform this geotechnical engineering investigation and are looking forward to working with you during the construction phase of the project. If you have questions regarding this report or if we may be of additional assistance regarding geotechnical aspects of the project, please do not hesitate to contact our office.

Respectfully submitted,

Patriot Engineering and Environmental, Inc.

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City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana
Patriot Project No. 26-0033-11G

1.0 INTRODUCTION

1.1 General

City of Bedford is planning the design and construction of a single-story high bay garage to be located at 1319 H Street in Bedford, Indiana (i.e., Lawrence County). The results of our geotechnical engineering exploration for the project are presented in this report.

1.2 Purpose and Scope

The purpose of this exploration is to determine the general near surface and subsurface conditions within the project area and to develop the geotechnical engineering recommendations necessary for the design and construction of the proposed garage. This was achieved by drilling soil borings, and by conducting laboratory tests on samples taken from the borings. This report contains the results of our findings, an engineering interpretation of these results with respect to the available project information, and recommendations to aid in the design and construction of the proposed project.

2.0 PROJECT INFORMATION

Based on information provided by Bryant Engineering, we understand that the proposed structure will have isolated column loads not exceeding 43 kips. Based on visual observations of the existing site, it is assumed that any grade raise fill to complete construction of building pads, finished pavement subgrades, etc., will not exceed 1 foot above the existing surface.

Table 0: Proposed Project Description

Item	Description
Site Address	1319 H Street
Site City, State, and County	Bedford, Indiana (Lawrence County)
Proposed Construction	Single-story High Bay Garage
Building Dimension	Approximately 50 x 54 feet
Grade-raise Fill	Approximately 15,000 tons asphalt millings
Column Loads	43 kips

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

he project site is presently an approximately 1.3-acre parcel used for public works purposes. The surrounding area is generally commercial development. The topography in the area proposed for construction is generally flat with ground surface elevations ranging from 666 to 671 feet based on "*Google Earth Pro*" imagery. The elevations should be considered estimates as accuracy can vary.

Additionally, per the Client, there are approximately 15,000 tons of asphalt millings used as grade raise fill across the site.

Refer to the Figures Appendix for aerial photographs of the Site and surrounding properties.

Table 1: Site Description

Item	Description
Size	Approximately 1.3 acres
Existing Ground Surface	Between 666 to 671 feet
Site Occupied By	City of Bedford
Surrounding Properties	Commercial

3.2 General Explored Subsurface Conditions

Our interpretation of the physically explored subsurface conditions is based upon six (6) borings drilled at the approximate locations shown on the Boring Location Map (Figure No. 2). The surface, subsurface, and groundwater conditions described below are general, and some variations in the descriptions should be expected. For more specific information, refer to the Boring Logs presented in the Appendices. All depths discussed below refer to depths below the existing ground surface. The dashed stratification lines shown on the boring logs indicate approximate transitions between soil types. In-situ stratification changes could occur gradually or at different depths.

3.2.1 Soil Conditions

Urban Fill and Fill

The urban fill material consists of mixtures of asphalt, slag, sand, glass, crushed stone, and porcelain. The fill and possible fill materials consist of sand, sandy and silty clay, with traces of gravel, slag, glass, crushed stone, concrete, porcelain, brick, and limestone. These fill materials were encountered in all six (6) soil borings. The table below details the extent of unsuitable material.

Sand (Fill)

Sand (SP-SM): Loose to medium dense, fine to medium grained **SAND (SP-SM)** was generally encountered from 13.5 to 30 feet below the existing ground surface. Standard Penetration Test N-Values (blow counts) in this material varied from 7 to 28 bpf.

Sandy and Silty Clay (Possible Fill)

Sandy and Silty Clay (CL): Gray and brown, moist to very moist, medium stiff **SILTY** and **SANDY CLAY (CL)** were encountered intermittently throughout the project site.

Unsuitable Soils

As previously mentioned, unsuitable fills, fills, and possible fills were encountered in all six (6) borings, at depths up to 30 feet below the existing ground surface. The following table presents the extent of the unsuitable soils encountered in the borings.

Table 2: Summary of Unsuitable Soils Encountered

Boring	Soil Classification	Approximate Depth of Unsuitable Soils (feet)*
B-1	Urban Fill	1 - 13.5
	Loose Sand (FILL)	13.5 - 30
B-2	Urban Fill	3.5 - 13.5
	Loose Sand (FILL)	13.5 - 23.5
	Stiff Clay (POSSIBLE FILL)	23.5 - 30
B-3	Loose Sand (FILL)	1 - 3.5
		6 - 23.5
	Urban Fill	3.5 - 6
		23.5 - 30
B-4	Medium Stiff Silty Clay (FILL)	3.5 - 8.5
	Urban Fill	8.5 - 25
B-5	Urban Fill	1 - 13.5
	Loose Sand (FILL)	13.5 - 25
B-6	Urban Fill	1 - 18.5
	Loose Sand (FILL)	18.5 - 23.5
	Medium Stiff Silty Clay (POSSIBLE FILL)	23.5 - 25

3.2.2 Groundwater Conditions

The term groundwater pertains to water that percolates through the soil found on-site. This includes overland flow that permeates through a given depth of soil, perched water, and water that occurs below the “water table”, a zone that remains saturated and waterbearing year-round.

Groundwater was not observed during drilling, nor upon completion of drilling activities.

It should be recognized that fluctuations in the groundwaater level should be expected over time due to variations in rainfall and other environmental or physical factors. **The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the installation of which was beyond the scope of this investigation.**

3.3 Karst

The project site is located within a region known for karstic features. Karstic areas are typically associated with the development of solution features within the soluble carbonate bedrock leading to formation of sinkholes. A sinkhole is described as a “closed depression in soil or bedrock formed by the erosion and transport of earth material from below the land surface.” Sinkholes may develop within karstic areas as a result of soil fines migrating from the overburden soil by infiltrating water flowing downward into the bedrock through solution features/channels, such as voids and clay seams within the rock. Sinkholes may consist of a relatively localized weathered feature or larger features resulting from a collapse within a void formed in the overburden soils as a result of loss of the fine soils into the bedrock features.

Several karst features have been documented in the surrounding parcels (See Figures Appendix). The irregularity of the rock surface of the Bedford area could be associated with possible karst conditions. If further analysis of the site is required, we recommend that geophysical testing be performed to verify that karst features are not present in the structure areas and delineate the karst area. *Patriot* can provide a proposal for a geophysical study upon request.

4.0 DESIGN RECOMMENDATIONS

4.1 Basis

Our recommendations are based on data presented in this report, which include soil borings, laboratory testing, and our experience with similar projects. Subsurface variations that may not be indicated by a dispersive exploratory boring program can exist on any site. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected.

4.2 Foundations

As previously mentioned, the project site has urban fills, and fills including loose sand and silty clay, that extends at least to 25 to 30 feet below the existing ground surface (termination of the borings). Based on the provided information and boring logs, we do not recommend constructing any foundational elements on the above-mentioned unsuitable soils. Three foundation alternatives are considered feasible for this site:

1. Undercutting to 1.5 times the width of the footing below the footing elevation, replacing with INDOT No. 53 stone, utilizing conventional spread footings.
2. Mass undercutting a minimum of 3 feet below footing depths, replacing with INDOT No. 53 stone, utilizing a mat foundation.
3. An intermediate foundation system consisting of helical piers.
4. A ground improvement intermediate foundation such as Geopier GeoConcrete Columns or Rigid Inclusion System.

Selection of the foundation system will be determined by the client based on the relative costs and the risk profile associated with each alternative.

4.2.1 Shallow Spread Footings

As previously mentioned, urban fill and fill were encountered in all soil borings to depths ranging from at least 1 to 30 feet below existing grade (termination of borings). ***This layer must be undercut to 1.5 times the width of the footing below the footing elevation and replaced with well-compacted structural fill (INDOT No. 53 stone) prior to construction of foundations.***

Provided the above recommendations are followed, the proposed structure can be supported on spread footings bearing on new well-compacted structural fill. These footings should be proportioned using a net allowable soil bearing pressure not exceeding 1,000 pounds per square feet (psf) for column footings or 800 psf for wall (strip) footings. For proper performance at the recommended design bearing pressure, foundations must be constructed in compliance with the recommendations discussed in Section 5.0 “Construction Considerations”.

In using the above net allowable soil bearing pressures, the weight of the foundation and backfill over the foundation need not be considered. Hence, only loads applied at or above the minimum finished grade adjacent to the footing need to be used for dimensioning the foundations. Each new foundation should be positioned so it does not induce significant pressure on adjacent foundations; otherwise, the stress overlap must be considered in the design.

All exterior foundations and foundations in unheated areas should be located at a depth of at least 24 inches below final exterior grade for frost protection. However, interior foundations in heated areas can bear at depths of approximately 24 inches below the finished floor. We recommend that wall (strip) footings be at least 18 inches wide and column footings be at least 24 inches wide for bearing capacity considerations.

Conventional spread footings in this material poses a considerable risk of excessive differential settlement due to the unpredictable nature of the deep fill and the potential for non-uniform compression under load.

4.2.2 Mat Foundations

As previously mentioned, urban fill and fill were encountered in all soil borings to depths ranging from 1 to 30 feet below existing grade (termination of borings). ***This layer must be undercut at least three (3) feet below footings and replaced with well-compacted structural fill (INDOT No. 53 stone) prior to construction of foundations.***

The proposed structure can be supported on a mat-style foundation. The mat foundation is estimated to bear at an elevation of roughly 665 feet on well-compacted low-volume change structural fill (i.e., INDOT No. 53 crushed stone). Considering the anticipated bearing depth, soil conditions, loading conditions and estimated mat dimensions, we recommend a net allowable soil bearing pressure not exceeding 750 psf for design purposes.

Since the mat foundation is expected to be comparatively rigid, we anticipate differential settlement across the mat foundation will be relatively small.

Undercutting the mat foundation excavation at isolated locations may be necessary to accommodate the design capacity. Foremost, careful field control during construction by Patriot will be necessary to confirm that the exposed bearing material can support the design pressure and minimize the post construction settlement potential. The mat foundation should be located at a depth of at least 24 inches below final exterior grade for frost protection.

A mat foundation, acting as a single, rigid structural element, is able to bridge localized variations in fill stiffness and thereby reduce differential settlement.

4.2.3 Helical Piers

The proposed structures could be supported on new helical piers. Typical ultimate compressions capacities of the commonly used helical piers (such as AB Chance® SS-5, SS-175, and SS-200 and/or other 1 ½” to 3 ½” O.D. schedule 80 pipe helical) range from 55 to 150 kips. However, due to the variation in the selected system and the final tip elevation of the pier, the capacity of the selected helical pier will depend on the specific system and the depth of the piers. We recommend that the tip elevation for the helical piers should not terminate at shallower depths. **The helical piers may encounter construction difficulties such as refusal on buried debris and the contractor should be prepared for this condition.**

The selected helical piers must be designed for both compression and tension loading and installed and warranted by an experienced specialty foundation contractor. Therefore, we recommend that the owner retain a contractor to design, install, and warrant the most appropriate and economical system. We also recommend the design be prepared under the supervision of an Indiana Licensed Professional Engineer.

Deep helical piers are very weak against lateral loads and need to be finished in natural materials below the fills.

4.2.4 Geopier GeoConcrete Columns or Rigid Inclusion System

Geopiers are another solution, but are more expensive than the other solutions presented. Based on the existing soil conditions at this site, properly installed Geopier GeoConcrete Columns™ or a suitable rigid inclusion system (such as Controlled Modulus Column (MCM®)) is recommended to avoid deep undercuts and replacement with structural fill. These rigid inclusion systems not only allows for the use of a shallow spread footing foundation using conventional construction methods, but also allows for some improvement of the soils within the project area due to the construction methods involved in placing the system.

The footings are then constructed directly on the reinforced subgrade using conventional construction methods. The rigid inclusion company retains the responsibility for the final pier designs.

Patriot recommends that the rigid inclusion system should be installed and extended adequately into native materials. Additionally, we recommend that *Patriot* be retained to observe the installation process.

4.3 Floor Slabs

Slab-on-grade

As previously mentioned, urban fill and fill were encountered in all soil borings to depths ranging from 1 to 30 feet below existing grade (termination of the borings). ***This layer must be undercut at least three (3) feet below floor slabs and replaced with well-compacted structural fill (INDOT No. 53 stone) prior to construction. This partial undercut is a considerable risk for future settlement.***

If a mat foundation is selected, the floor slab will act integrally with the mat foundation (see section 4.2.2 *"Mat Foundations"*). If helical pier foundations are selected, the floor slab may be supported directly by the helical piers.

For conventional spread footings, floor slabs can be designed as "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations. Additionally, we recommend that all slabs should be liberally jointed and designed with the appropriate reinforcement for the anticipated loading conditions.

The building floor slabs should be supported on a minimum 6-inch-thick well-compacted granular base course (i.e. Indiana Department of Transportation (INDOT) No. 53 crushed stone) bearing on a suitably prepared subgrade (Refer to Section 5.0 "Construction Considerations"). The granular base course is expected to help distribute loads and equalize moisture conditions beneath the slab.

Provided that the recommendations above for floor slab design and construction are followed, a modulus of subgrade reaction, "K_{30}" value of 40 pounds per cubic inch (pci), is recommended for the design of ground supported floor slabs. It should be noted that the "K_{30}" modulus is based on a 30-inch diameter plate load empirical relationship.

4.4 Pavements

As previously mentioned, urban fill and fill were encountered in all soil borings to depths ranging from 1 to 30 feet below existing grade (termination of the borings). ***This layer must be undercut at least three (3) feet below pavement subgrade and replaced with well-compacted structural fill (INDOT No. 53 stone) prior to construction.***

This shallow undercut presents a considerable risk for future settlements and associated maintenance issues.

If construction is performed during a wet or cold period, the contract will need to exercise care during the grading and fill placement activities in order to achieve the necessary subgrade soil support for the pavement section refer to Section 5.0 "Construction Considerations". The base soil for the pavement section will need to be firm and dry. The subgrade should be sloped properly in order to provide good base drainage. To minimize the effects of groundwater or surface water conditions, the base section for the pavement system should be sufficiently high above adjacent ditches and properly graded to provide pavement surface and pavement base drainage.

4.5 Seismic Considerations

For structural design purposes, we recommend using a Site Classification of "D" as defined by the 2014 Indiana Building Code (modified 2012 International Building Code (IBC)). Furthermore, along with using a Site Classification of "D", we recommend the use of the maximum considered spectral response acceleration and design spectral response acceleration coefficients provided in the Table below. Refer to the Appendix containing the Seismic Soil Site Classification report summary.

Table 3: Seismic Design Spectral Response Acceleration Coefficients

Period (seconds)	Maximum Considered Spectral Response Acceleration Coefficient	Soil Factor	Design Spectral Response Acceleration Coefficient
0.2	S_S = 0.248 g	F_a = 1.6	S_{DS} = 0.264 g
1.0	S_1 = 0.108 g	F_v = 2.385	S_{D1} = 0.171 g

These values were obtained from the "ASCE Hazard Tool" website for geographic-based seismic design parameters, developed by the American Society of Civil Engineers (ASCE), utilizing latitude 38.863818° (degrees) North and longitude -86.481522° (degrees) West as the designation for identifying the location of the parcel. Other earthquake resistant design parameters should be applied consistent with the minimum requirements of the Indiana Building Code.

4.6 Subsurface Utilities

For installation of subsurface utilities (e.g., water lines, storm-sewers lines, sanitary-sewer lines, manholes, culverts, etc.) the soil conditions encountered in our borings should be readily excavated using conventional earthwork equipment. However, some additional effort may be necessary to excavate hard fill layers, which were encountered in the upper 6 feet of soil. Additionally, depending on the invert elevations of the proposed subsurface utilities, sand layers and seams could be encountered, which are expected to be free-flowing and will tend to readily cave and/or slough into excavations; therefore, over-excavation, benching, and/or shoring should be expected in order to maintain the side slopes of the trench excavations.

In regard to bearing and support of the subsurface utilities, the soil conditions encountered in the borings are not suitable for support of the subsurface utilities. ***This fill layer must be undercut at least two (2) feet below utilities and replaced with well-compacted structural fill (INDOT No. 53 stone) prior to construction.***

Additionally, the utilities must be designed for sufficient flexibility due to the unpredictable nature of the deep fills which pose a considerable risk for excessive differential settlement.

4.7 Excavation of Existing Foundations/Underground Utilities

We recommend that an attempt be made to obtain drawings of all past or existing underground structures onsite. We recommend that these documents including this report be made available to the project contractors. Buried foundations and slabs may prove to be obstructions for the proposed construction at the project site. We recommend that existing foundations, pavements, utilities, and backfill be excavated at least 2 feet beyond the proposed structures construction and underground utility limits. Backfill required to reach the design subgrade should be performed in accordance with Section 5.3 “Structural Fill and Fill Placement Control”.

No structural elements of the proposed project should be placed over old foundations or slabs, which can create “hard spots” or over vacated utility lines or “voids”, unless structurally designed to handle the hard and soft spots. In addition, if basement walls are encountered, we recommend cutting these 2 feet below proposed subgrade and backfilling with structural fill as specified above.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

All areas that will support foundations, floor slabs, pavements, and utilities must be properly prepared. ***As previously mentioned, the unsuitable materials must be removed and replaced with well-compacted structural fill consistent with the requirements outlined in this report.***

Prior to construction of floor slabs, pavements, or the placement of new structural fill, the exposed subgrade must be evaluated by a Patriot representative, which will include proof-rolling of the subgrade. Proof-rolling should consist of repeated passes of a loaded, pneumatic-tired vehicle such as a tandem-axle dump-truck or scraper. The proof-rolling operations should be observed by a Patriot representative, and the proofrolling vehicle should be loaded as directed by Patriot. Areas found to rut, pump, or deflect excessively should be compacted in-place or, if necessary, undercut and replaced with structural fill as specified in the Structural Fill and Fill Placement Control Section.

Care must be exercised during grading and fill placement operations. The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near surface soils. The severity of this potential problem depends largely on the weather conditions prevailing during construction. The contractor must exercise discretion when selecting equipment sizes and make a concerted effort to reroute heavy construction traffic (e.g., dump trucks and scrapers) away from building and pavement areas, while also controlling surface water as the subgrade soils are exposed. If such problems do arise, the operations in the affected area should be halted and the Patriot representative contacted to evaluate the condition. The use and placement of a coarse crushed aggregate may be used to stabilize the subgrade. The coarse crushed aggregate should consist of INDOT No. 53 stone. The coarse crushed aggregate should be worked into the subgrade until the subgrade becomes suitably stable.

5.2 Foundation Excavation

For structures selected to be founded on conventional shallow spread foundations or mat foundations, upon completion of the foundation excavations and prior to the placement of reinforcing steel, a Patriot representative should check the exposed subgrade to confirm that a bearing surface of adequate strength has been reached. Localized soft soil zones encountered at the bearing elevations should be further excavated until adequate support soils are encountered. The cavity should be backfilled with structural fill as defined below, or the footing can be poured at the excavated depth. Structural fill used as backfill beneath footings should be limited to lean concrete, well-graded sand and gravel, or crushed stone placed and compacted in accordance with Structural Fill and Fill Placement Control Section.

If it is necessary to support spread footings or mat foundations on structural fill, the fill pad must extend laterally a minimum distance beyond the edge of the footing. The minimum structural pad width would correspond with a point at which an imaginary line extending downward from the outside edge of the footing at a 1H:2V (horizontal: vertical) slope intersects the surface of the natural soils. For example, if the depth to the bottom of excavation is 4 feet below the bottom of the foundation, the excavation would need to extend laterally beyond the edge of the footing at least 2 feet, as shown in the Illustrations Section found at the conclusion of this report.

Excavation slopes should be maintained within all requirements set-forth by the Occupational Safety and Health Standards (OSHA), but specifically Section 1926 Subpart “P” – “Excavations”. We recommend that surcharge fill or heavy equipment be kept at least 5 feet away from the edge of excavations.

In addition, depending on the timing and staging of the structures for the proposed development, excavations that occur near existing in-use foundations should be carefully performed making a conscious effort not to undermine the support of the in-use foundations. If it is necessary to excavate soil adjacent to and below the bearing elevation of in-use foundations, Patriot should be contacted to make further recommendations regarding these excavations. Refer to the Illustrations Section at the end of this report for further details.

5.3 Structural Fill and Fill Placement Control

Structural fill, defined as any fill which will support structural loads (e.g., buildings, slabs, pavements, utilities, and sidewalks), should be clean and free of organic material, marl, debris, deleterious materials, and frozen soils. Samples of the proposed fill materials should be tested prior to initiating the earthwork and backfilling operations to determine the classification, the natural and optimum moisture contents and maximum dry density and overall suitability as a structural fill. Structural fill should have a liquid limit less than 40 and a plasticity index less than 20.

5.3.1 Fill Placement Control

All structural fill beneath floor slabs, adjacent to foundations and over foundations, should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698). This minimum compaction requirement should be increased to 100 percent (%) of the maximum Standard Proctor dry density for fill supporting footings.

Structural fill supporting, around and over utilities should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698) for utilities underlying structural areas (i.e., buildings, slabs, pavements, utilities, and sidewalks). However, the minimum compaction requirement can be reduced for backfill around and over the utilities to 90 percent (%) of the maximum Standard Proctor dry density where utilities underlie greenbelt areas (i.e., grassy lawns, landscaping, and parks). We recommend that a clean well-grade granular material be utilized as the bedding material, as well as the backfill material around and over the utility lines.

In cut areas, where pavement sections are planned, the upper 10 inches of subgrade should be scarified and compacted to a dry density of at least 100 percent (%) of the Standard Proctor maximum dry density (ASTM D-698). Grade-raise fill placed within 1 foot of the base of the pavement section should also be compacted to at least 100 percent (%) of the Standard Proctor maximum dry density. This can be reduced to 95 percent (%) for structural fill placed more than 1 foot below the base of the pavement section.

To achieve the recommended compaction of the structural fill, we suggest that the fill be placed and compacted in layers not exceeding 9 inches in loose thickness and at a moisture content ranging from the optimum moisture content to about 2 percent (%) below optimum. The loose lift thickness should be reduced to 6 inches when utilizing small hand compactors. All fill placements should be monitored by a Patriot representative.

5.4 Groundwater Considerations

Groundwater was not observed during or after drilling activities.

Groundwater inflow into shallow excavations above the groundwater table is expected to be adequately controlled by conventional methods such as gravity drainage and/or pumping from sumps. More significant inflow can be expected in deeper excavations below the groundwater table requiring more aggressive dewatering techniques, such as well or wellpoint systems. For groundwater to have minimal effects on the construction, foundation excavations should be constructed and poured in the same day, if possible.

6.0 INVESTIGATIONAL PROCEDURES

6.1 Field Work

A total of six (6) soil borings were drilled, sampled, and tested at the project site on 1/15/26 at the approximate locations shown on the Boring Location Map in the Figures Appendix. The soil borings were drilled to depths between roughly 25 and 30 feet, as shown on the Boring Logs in the Appendices. All depths are given as feet below the existing ground surface. Elevations shown on the boring logs and referenced throughout the report were gathered utilizing *"Google Earth Pro"* software and should be considered estimates.

The borings were advanced using 3¼ inch inside diameter hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique in accordance with ASTM D 1586-74. A 2 inch outside diameter by 1⅜ inch inside diameter split-spoon sampler was driven a total of 18 inches with the number of blows of a 140-pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the "N"-value (i.e., blow-count). Split-spoon samples were recovered at 2½ feet intervals, beginning at a depth of 1 foot below the existing surface grade, extending to a depth of 10 feet, and at 5 feet intervals thereafter to the termination of the boring.

Groundwater levels were monitored at each borehole location during drilling and upon completion of the borings. The boreholes were backfilled with auger cuttings and borings performed in pavement areas were patched prior to demobilization for safety considerations.

Upon completion of the boring program, the samples retrieved during drilling were returned to Patriot's soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and our visual examination. Test boring logs and a description of the classification system are included in the Soil Borings Appendix in this report. Indicated on each log include: the primary strata encountered, the depth of each stratum change, the depth of each sample, the Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

6.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis included:

Laboratory Test	Number of Tests	Test Standard
Visual Classification (USCS)	Every Sample	ASTM D 2487
Moisture Content	Every cohesive sample	ASTM D 2216
Unconfined Compressive Strength (Pocket Penetrometer)	Every suitable cohesive sample	

7.0 LIMITATIONS OF PROFESSIONAL SERVICES

The professional services presented for this project along with the conclusions and recommendations prepared for this report are in accordance with generally accepted industry standards for geotechnical practice; providing a degree of care and skill ordinarily exercised. Conclusions, opinions, or recommendations expressed by others with regard to information and data provided herein are not the responsibility of Patriot Engineering and Environmental, Inc. No warranty, expressed or implied, is made as to the conclusions and professional opinions included in this report.

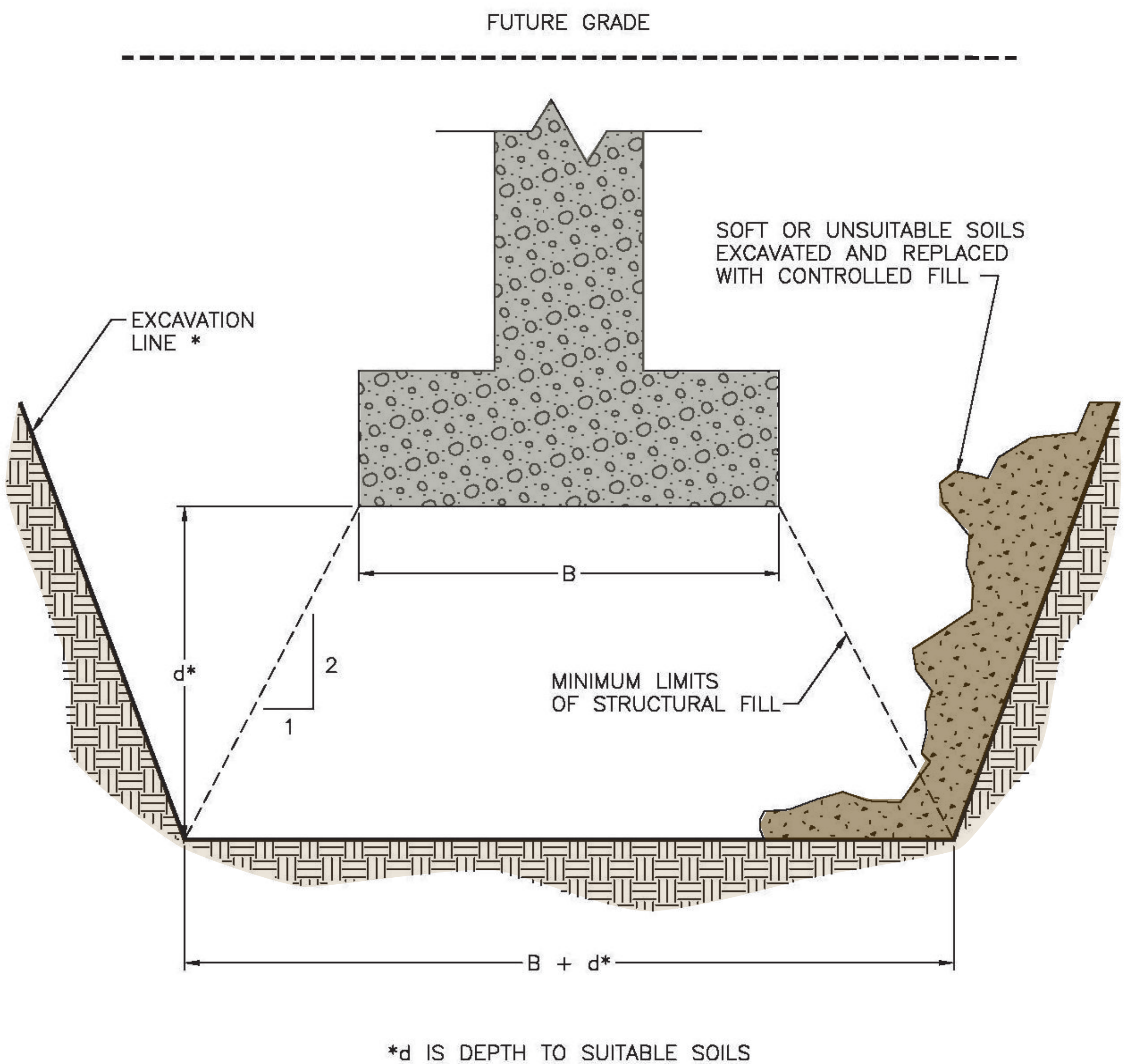
Our analyses and recommendations are based on data presented in this report, which include soil borings, laboratory testing, and our experience with similar projects. Subsurface variations that may not be indicated by a dispersive exploratory boring program can exist and not become evident until construction. If such variations or unexpected conditions are encountered during construction, Patriot Engineering and Environmental, Inc. should be informed immediately since the validity of our recommendations may be affected. Adjustments to the design(s) or alternative design recommendations should be evaluated if changes in conditions are encountered.

8.0 ILLUSTRATIONS

See Illustrations “A” and “B” on the following pages. These illustrations are presented to further visually clarify several of the construction considerations presented in Section 5.2 “Foundation Excavations”.

APPENDIX A

ILLUSTRATIONS



* IN COMPLIANCE WITH OSHA STANDARDS

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

ILLUSTRATION A

Foundation Undercutting & Backfilling

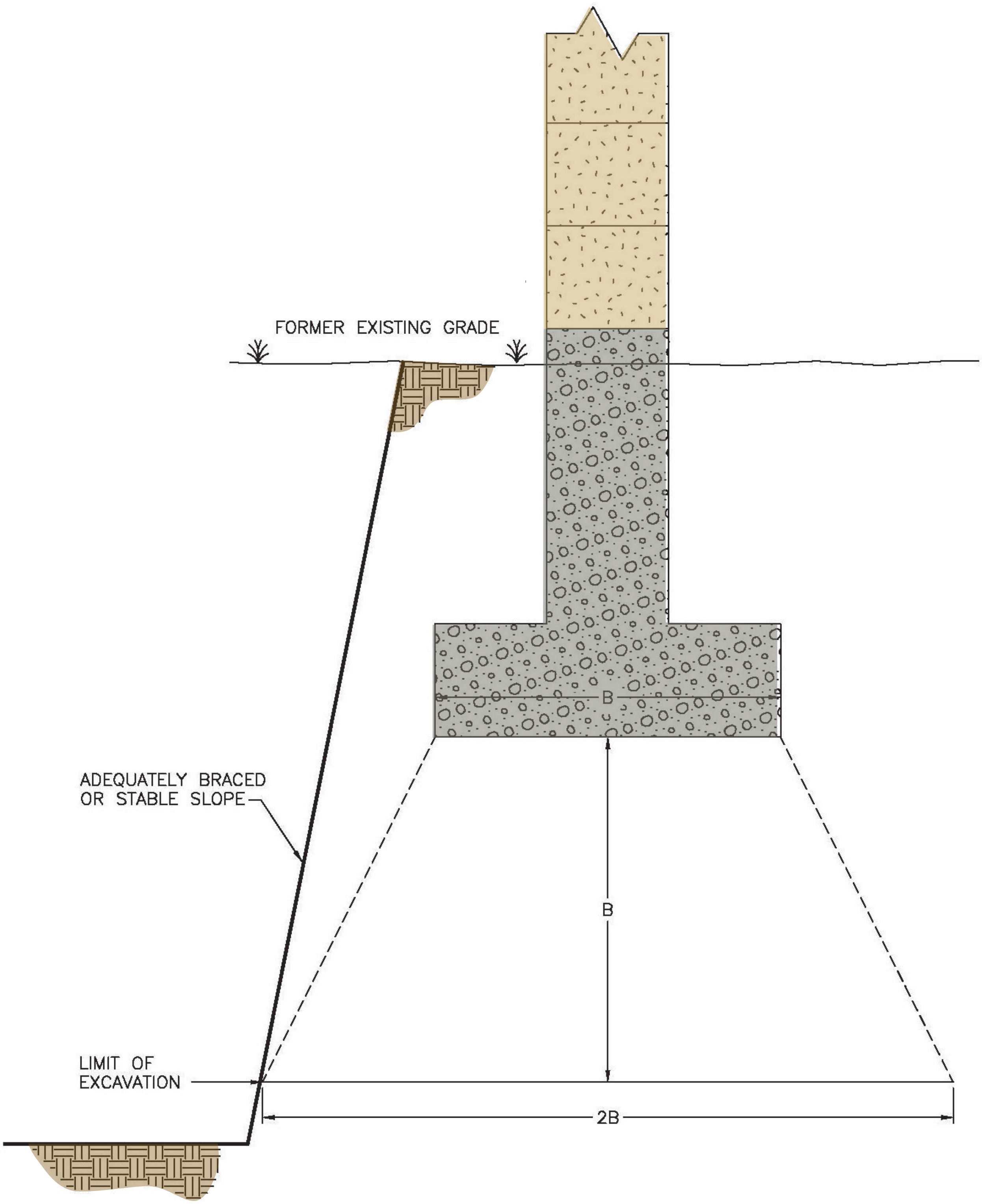


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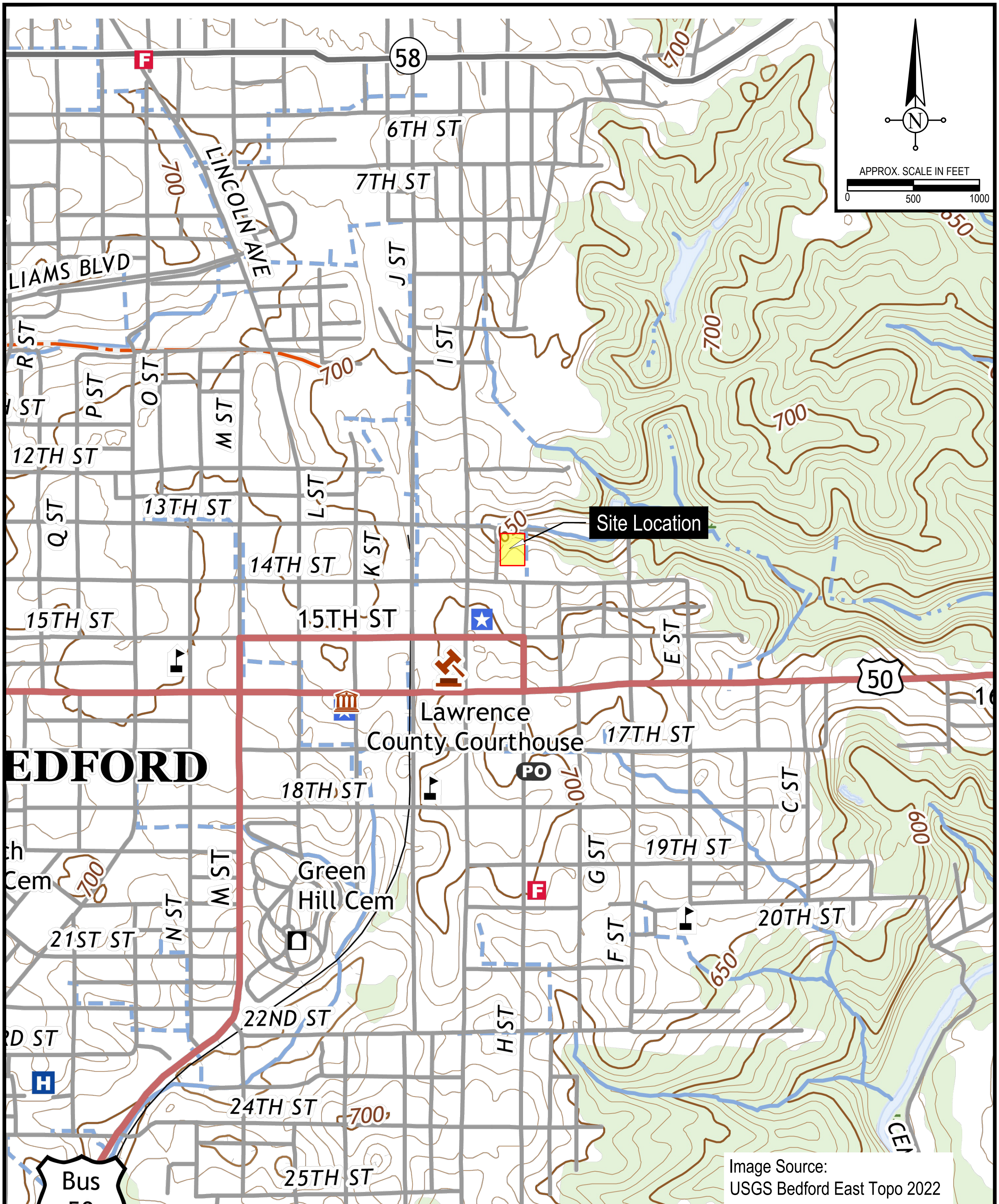
ILLUSTRATION B

Foundation Excavation Near Existing Slopes or Foundations

APPENDIX B

FIGURES



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Project: City of Bedford Street Dept. Garage 1319 H Street Bedford, Indiana		Figure 1 Site Vicinity Map
	Drawn By: J. DuMond	
Project Number: 26-0033-11	Approved: N. Collins	
Date: February 13, 2026	DWG: 26-0033-11_geo	

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

NOTES:
1. Boring locations were staked by PATRIOT. All locations are shown as approximate.
2. All locations were determined in the field with references to existing landmarks.
3. Image Source: Google Earth
4. Scale as shown.

Project: City of Bedford Street Dept. Garage 1319 H Street Bedford, Indiana	
	Drawn By: J. DuMond
Project Number: 26-0033-11	Approved: N. Collins
Date: February 13, 2026	DWG: 26-0033-11_geo

Figure 2

Soil Boring Location Map

Karst Sinkhole Record

PATRIOT

APPENDIX C
SOIL BORINGS

LOG OF BORING B-1

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					URBAN FILL (asphalt, slag, sand, crushed stone)	1	67	19/22/24			
						2	67	15/21/17			
5					URBAN FILL (slag, sand, glass, crushed stone)	3	44	2/3/4			
						4	44	1/4/4			
10											
			SP-SM		Black, slighlty moist, loose, fine to medium grained, SAND and slag with trace silt and trace glass (FILL)	5	33	3/3/5			
15											
			SP-SM		Black, slightly moist, loose, fine to medium grained, SAND with trace silt, trace brick, trace slag, little limestone, and intrbedded clay seams (FILL)	6	44	4/4/4			
20											
						7	33	3/3/4			
25											Boring caved to 27.0 feet upon auger removal.
			SP-SM		Gray, slightly moist, loose, fine to medium grained, SAND with trace silt, some gravel, trace brick, and trace limestone (FILL)	8	33	3/4/4			
30					Boring terminated at 30 feet.						Groundwater was not encountered during, nor upon completion.
35											

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

LOG OF BORING B-2

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			SP-SM	Gray, slightly moist, medium dense, fine to medium grained, SAND and gravel with trace silt and trace slag (FILL)	1	56	10/12/16			
				URBAN FILL (sand, slag, gravel)	2	56	4/5/5			
5				URBAN FILL (sand, slag, glass, porcelain)	3	44	1/4/4			
				URBAN FILL (sand, slag)	4	44	2/2/5			
10										
15			SP-SM	Black, slightly moist, loose, fine to medium grained, SAND and limestone with trace silt and trace slag (FILL)	5	44	2/3/6			
20			SP-SM	Black, slightly moist, loose, fine to medium grained, SAND with trace silt, trace gravel, trace slag, and interbedded clay seams (FILL)	6	44	3/4/4			
25			CL	Gray and brown, moist, stiff, SANDY CLAY with trace gravel (POSSIBLE FILL)	7	33	5/5/4	1.5	22	Boring caved to 26.0 feet upon auger removal.
			CL	Brown, very moist, medium stiff, SILTY CLAY with trace sand and trace gravel (POSSIBLE FILL)	8	33	5/3/4	0.7	28	
30				Boring terminated at 30 feet.						Groundwater was not encountered during, nor upon completion.
35										

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PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

LOG OF BORING B-3

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- ▼ During Drilling - Dry
- ▽ After Completion - Dry
- ◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0			SP-SM		Gray, slightly moist, medium dense, fine to medium grained, SAND and limestone with trace silt, and trace glass (FILL)	1	44	9/18/9			
5					URBAN FILL (sand, slag, gravel, limestone)	2	33	WOH/3/6			WOH - Weight of Hammer
			SP-SM		Black, slightly moist, loose, fine to medium grained, SAND with little slag, trace silt, and trace glass (FILL)	3	33	1/2/5			
10			SP-SM		Black, slighlty moist, loose, fine to medium grained, SAND and slag with trace silt and trace glass (FILL)	4	33	2/3/4			
15						5	56	2/4/4			
20			SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND and limestone with trace silt and interbedded clay seams (FILL)	6	44	3/3/6			
25					URBAN FILL (clayey sand, slag, glass, porcelain)	7	56	1/3/5			Boring caved to 25.0 feet upon auger removal.
30					URBAN FILL (sand, slag. gravel, limestone)	8	44	2/3/4			
35					Boring terminated at 30 feet.						Groundwater was not encountered during, nor upon completion.

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

LOG OF BORING B-4

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0				CRUSHED CONCRETE	1	11	45/20/7			
			CL	Reddish brown, moist, medium stiff, SILTY CLAY with trace sand and trace slag (FILL)	2	11	2/3/4		16	
5			CH	Reddish brown, moist, medium stiff, CLAY with trace sand and trace gravel (FILL)	3	11	1/3/4		24	
10				URBAN FILL (sand, slag, gravel)	4	11	W/O/H			WOH - Weight of Hammer
15				URBAN FILL (slag, clay, sand, glass)	5	6	3/3/5			
20					6	44	4/5/5			Boring caved to 21.0 feet upon auger removal.
25				URBAN FILL (sand, slag, limestone)	7	56	3/4/5		56	
				Boring terminated at 25 feet.						Groundwater was not encountered during, nor upon completion.
30										
35										

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LOG OF BORING B-5

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					URBAN FILL (sand, slag, limestone)	1	56	6/7/7			
					URBAN FILL (sand, slag, clayey sand, glass)	2	56	5/6/7			
5						3	44	3/4/5			
					URBAN FILL (sand, slag, clay)	4	44	4/4/4			
10											
			SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND with trace silt, trace gravel, trace glass, and trace limestone (FILL)	5	44	3/3/5			
15											
			SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND and gravel with trace silt and trace slag (FILL)	6	44	4/4/5			Boring caved to 20.0 feet upon auger removal.
20											
			SP-SM		Gray, slightly moist, medium dense, fine to medium grained, SAND with trace silt, some gravel, and trace slag (FILL)	7	44	4/5/6			
25					Boring terminated at 25 feet.						Groundwater was not encountered during, nor upon completion.
30											
35											

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LOG OF BORING B-6

PATRIOT ENGINEERING AND ENVIRONMENTAL, INC.

City of Bedford Street Dept Garage
1319 H Street
Bedford, Indiana

Client Name	: City of Bedford	Driller	: B. Roberts
Project Number	: 26-0033-11G	Sampling	: Splitspoon
Logged By	: D. Myers	Approx. Elevation	: +/- feet
Start Date	: 01/15/2026	Latitude	:
Drilling Method	: HSA	Longitude	:

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0–6					URBAN FILL (sand, slag, limestone)	1	44	1/2/5			
						2	33	4/4/5			
6–8.5					URBAN FILL (sand, slag)	3	17	3/3/4			
8.5–13.5					URBAN FILL (sand, slag, clay)	4	56	2/5/5			
13.5–18.5					URBAN FILL (sand, slag, limestone, brick)	5	44	2/4/6			
18.5–23.5			SP-SM		Gray, slightly moist, loose, fine to medium grained, SAND with trace silt, trace gravel, trace slag, and interbedded clay seams (FILL)	6	44	3/4/4			Boring caved to 20.0 feet upon auger removal.
23.5–25			CL		Brown and gray, very moist, medium stiff, SILTY CLAY with trace sand and interbedded sand seams (POSSIBLE FILL)	7	44	4/4/4	0.6	25	

Boring terminated at 25 feet.

Groundwater was not encountered during, nor upon completion.

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Combinations)

Density	Field Identification (SPT Blows/ft)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 51

Grain Size Terminology

Soil Fraction		Particle Size	US Standard Sieve Size
Boulders		> 12 inches	> 12 inches
Cobbles		3 - 12 inches	3 - 12 inches
Gravel:	Coarse	¾ - 3 inches	¾ - 3 inches
	Small	4.76 mm - ¾ inch	No. 4 - ¾ inches
Sand:	Coarse	2.00 - 4.76 mm	No. 10 - No. 4
	Medium	0.42 - 2.00 mm	No. 40 - No. 10
	Fine	0.074 - 0.42 mm	No. 200 – No. 40
Silt		0.005 - 0.074 mm	< No. 200
Clay		< 0.005 mm	< No. 200

RELATIVE PROPORTIONS FOR SOILS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Unconfined Compressive Strength (tons/ft^2)	Field Identification (SPT Blows/ft)
Very Soft	Less than 0.25	0 - 2
Soft	0.25 – < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 -15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification: Provided on Boring Logs are made by visual inspection.

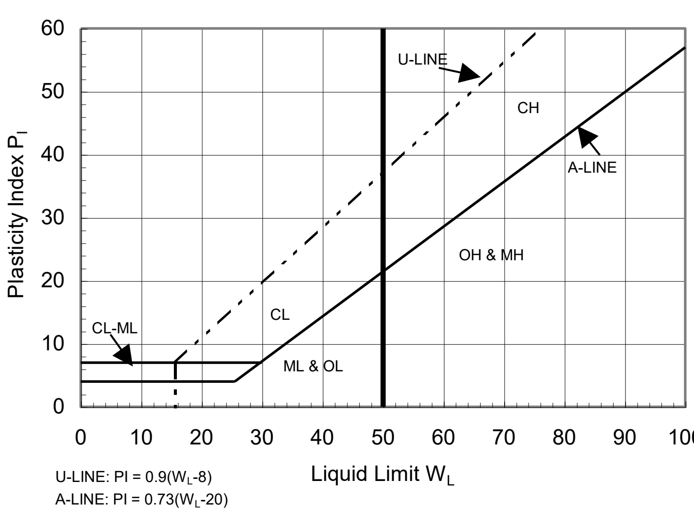
Standard Penetration Test: Driving a 2 inch outer-diameter (O.D.) by 1⅜ inch inner-diameter (I.D.) split-spoon sampler a total of 18 inches into undisturbed soil with the number of blows of a 140 pound hammer free-falling a distance of 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the "N"-value (or blow-count).

Strata Changes: In the column "Descriptions" on the Boring Logs the horizontal lines represent strata changes. A solid line (———) represents an observed change, a dashed line (- - - - - -) represents an estimated change.

Groundwater: Observations were made at the times indicated on the Boring Logs. Fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. *Groundwater symbols*: (▼)-observed groundwater level and/or elevation during drilling; (∇)-observed groundwater level and/or elevation upon completion of boring.

Unified Soil Classification System (USCS)

Major Divisions			Group Symbol	Typical Names	Classification Criteria for Coarse-Grained Soils	
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{D^2_{30}}{D_{10}\,D_{60}}$
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)	
		Gravels with fines (appreciable amount of fines)	GM d u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Above A line with $4 < P_I < 7$ are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_I > 7$	
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10}\,D_{60}}$
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_c > 3$)	
		Sands with fines (appreciable amount of fines)	SM d u	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Limits plotting in hatched zone with $4 \leq P_I \leq 7$ are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_I > 7$	
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP More than 12% - GM, GC, SM, SC 5-12% - Borderline cases requiring dual symbols	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (liquid limit >50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays or high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		PT	Peat and other highly organic soils		



Plasticity Chart

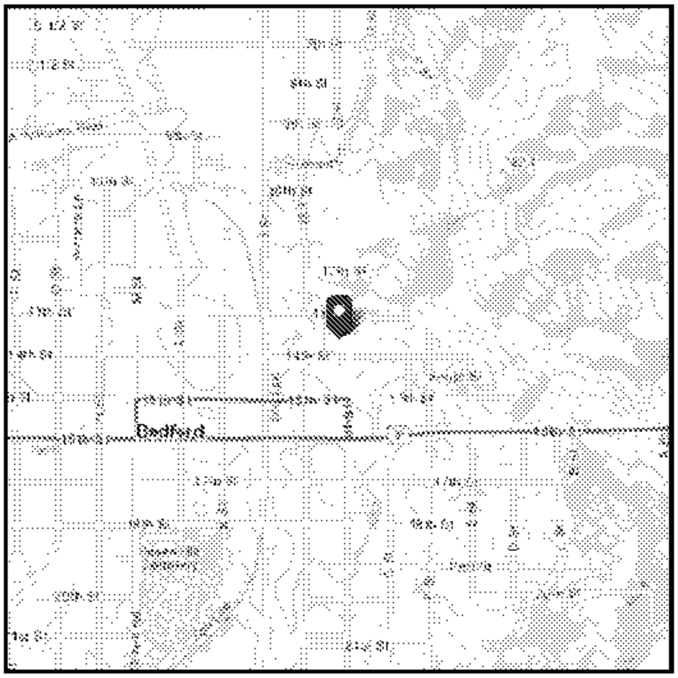
APPENDIX D

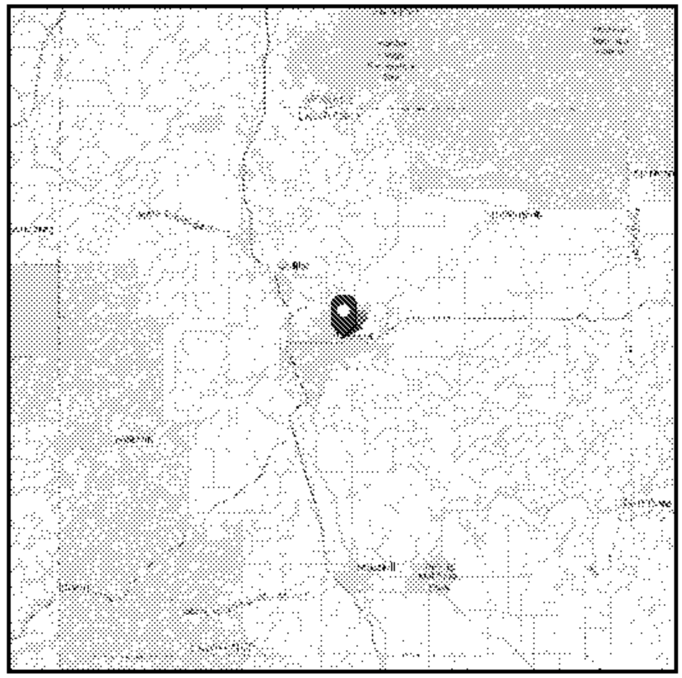
SEISMIC SOIL SITE CLASSIFICATION

ASCE Hazards Report

Address:
1319 H St
Bedford, Indiana
47421

Standard:	ASCE/SEI 7-16	**Latitude:**	38.863818
Risk Category:	II	**Longitude:**	-86.481522
Soil Class:	D - Default (see Section 11.4.3)	**Elevation:**	670.9282256232459 ft (NAVD 88)





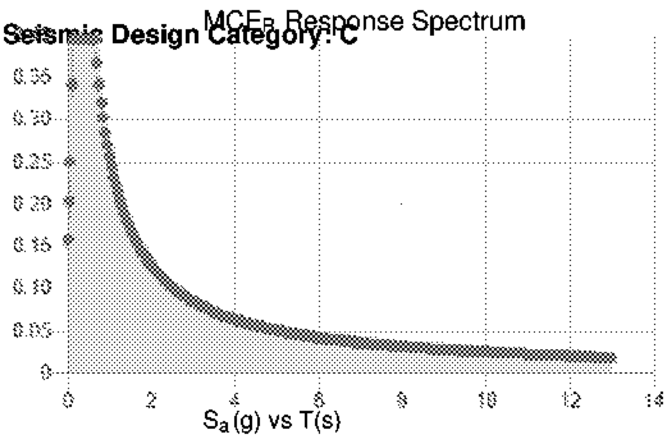
Seismic

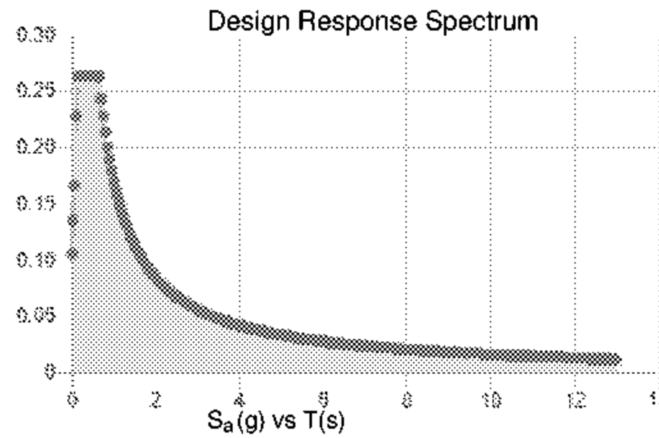
Site Soil Class: D - Default (see Section 11.4.3)

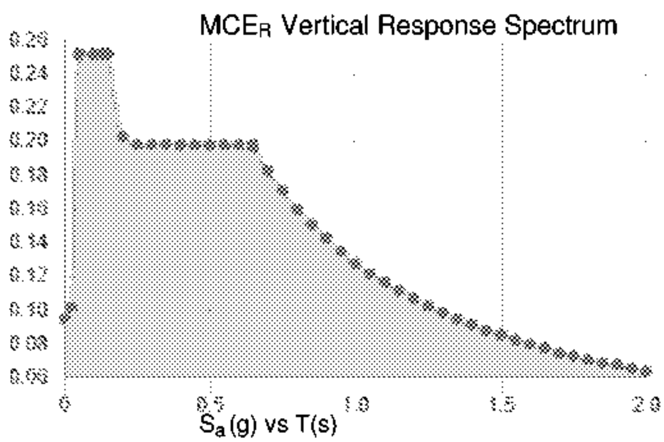
Results:

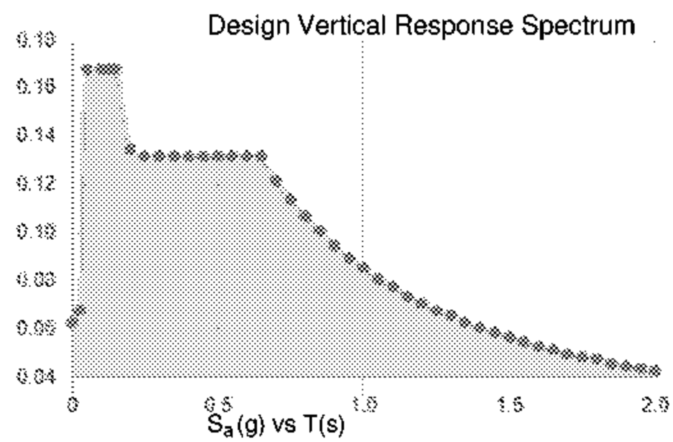
S_S :	0.248	S_{D1} :	0.171
S_1 :	0.108	T_L :	12
F_a :	1.6	PGA :	0.129
F_v :	2.385	PGA_M :	0.199
S_{MS} :	0.396	F_{PGA} :	1.542
S_{M1} :	0.257	I_e :	1
S_{DS} :	0.264	C_v :	0.795

Seismic Design Category: C









Data Accessed: **Thu Feb 12 2026**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.

APPENDIX E

GENERAL QUALIFICATIONS AND STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

GENERAL QUALIFICATIONS

of Patriot Engineering's Geotechnical Engineering Investigation

This report has been prepared at the request of our client for his use on this project. Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

This report may not contain sufficient information for purposes of other parties or other uses. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report. Should there be any significant differences in structural arrangement, loading or location of the structure, our analysis should be reviewed.

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. The analysis, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our exploration. Subsurface conditions at other locations may differ from those occurring at the specific drill sites. The nature and extent of variations between borings may not become evident until the time of construction. If, after performing on-site observations during construction and noting the characteristics of any variation, substantially different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We urge that Patriot be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations. In addition, we are available to observe construction, particularly the compaction of structural backfill and preparation of the foundations, and such other field observations as may be necessary.

In order to fairly consider changed or unexpected conditions that might arise during construction, we recommend the following verbiage (Standard Clause for Unanticipated Subsurface Conditions) be included in the project contract.

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

"The owner has had a subsurface exploration performed by a soils consultant, the results of which are contained in the consultant's report. The consultant's report presents his conclusions on the subsurface conditions based on his interpretation of the data obtained in the exploration. The contractor acknowledges that he has reviewed the consultant's report and any addenda thereto, and that his bid for earthwork operations is based on the subsurface conditions as described in that report. It is recognized that a subsurface exploration may not disclose all conditions as they actually exist and further, conditions may change, particularly groundwater conditions, between the time of a subsurface exploration and the time of earthwork operations. In recognition of these facts, this clause is entered in the contract to provide a means of equitable additional compensation for the contractor if adverse unanticipated conditions are encountered and to provide a means of rebate to the owner if the conditions are more favorable than anticipated.

At any time during construction operations that the contractor encounters conditions that are different than those anticipated by the soils consultant's report, he shall immediately (within 24 hours) bring this fact to the owner's attention. If the owner's representative on the construction site observes subsurface conditions which are different than those anticipated by the consultant's report, he shall immediately (within 24 hours) bring this fact to the contractor's attention. Once a fact of unanticipated conditions has been brought to the attention of either the owner or the contractor, and the consultant has concurred, immediate negotiations will be undertaken between the owner and the contractor to arrive at a change in contract price for additional work or reduction in work because of the unanticipated conditions. The contract agrees that the following unit prices would apply for additional or reduced work under the contract. For changed conditions for which unit prices are not provided, the additional work shall be paid for on a time and materials basis."

Another example of a changed conditions clause can be found in paper No. 4035 by Robert F. Borg, published in ASCE Construction Division Journal, No. CO2, September 1964, page 37.