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REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED MCDONALD'S RESTAURANT #29-1564
741 Route 73 South
Block 36, Lot 4.07
Township of Evesham, Burlington County, New Jersey

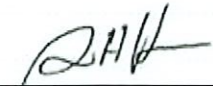
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REPORT OF GEOTECHNICAL INVESTIGATION

Proposed McDonald's Restaurant #29-1564

741 Route 73 South

Block 36, Lot 4.07

Township of Evesham, Burlington County, New Jersey

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Proposed McDonald's Restaurant #29-1564

741 Route 73 South

Block 36, Lot 4.07

Township of Evesham, Burlington County, New Jersey

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1.0 SUMMARY OF FINDINGS

Dynamic Earth, LLC (Dynamic Earth) has completed an exploration and evaluation for the proposed McDonalds Restaurant to be located at 741 Route 73 South in the Township of Evesham, Burlington County, New Jersey. The site of the proposed construction is shown on the attached *Boring Location Plan* in the Appendix of this report.

At the time of Dynamic Earth's investigation, the site currently is developed with a vacant, single-story bank building and associated asphalt-paved parking, driveway and landscaped areas. The proposed site redevelopment will include the construction of a McDonald's restaurant building with associated pavements, trash enclosure, menu-boards, identification signs, and utilities. Based on a August 15, 2023 (most recently revised) *Concept 'A'* prepared by Dynamic, the proposed restaurant will occupy a footprint area of approximately 3,600 square feet. While grading plans have not been developed at this time, we expect site grades will only include minor earth cuts and fills in order to achieve design subgrade elevations.

The subsurface exploration included reconnaissance of the project site, drilling soil borings, performing laboratory testing and evaluating the geotechnical conditions relevant to the proposed construction details provided. A summary of Dynamic Earth's findings and recommendations is presented below:

- **Generalized Subsurface Conditions:** The soil borings were performed within existing pavement and/or landscape areas and encountered either asphaltic concrete or topsoil at the surface. Beneath the surficial cover, existing fill material was generally encountered that included silt and sand with variable amounts of gravel and debris. The existing fill material was encountered to depths ranging between approximately two feet and four feet below the ground surface, corresponding to elevations ranging between 87 feet and 89 feet. Beneath the surficial cover and/or existing fill material, natural coastal plain soils were encountered that generally consisted of silt (USCS: ML), clay (USCS CL) and sand (USCS: SM/SC) with variable amounts of gravel. The natural coastal plain soils extended to the boring termination depths ranging between approximately 10 to 34.25 feet below the ground surface; corresponding to elevations ranging between 56.75 feet and 81.0 feet. Portions of the natural coastal plain deposits were encountered in a loose/very loose condition to depths ranging between six feet and 31 feet, corresponding to elevations of 85 and 61. Groundwater was encountered at depths ranging between six feet and 13 feet.
- **Overexcavation of Existing Fill Material:** Existing fill material is not suitable for direct support of proposed foundations without the risk of excessive settlement. As such, these materials will need to be overexcavated (where encountered) and replaced or recompacted below the proposed foundations. Suitable portions may remain below proposed floor slabs provided that they are properly evaluated during construction, as detailed herein.

- **Foundations:** Following overexcavation and the replacement of the existing fill material (where encountered at foundation subgrade elevations), the proposed building may be supported on conventional shallow foundations bearing within newly placed compacted structural fill material, improved existing fill material, and/or approved natural soils. Foundations may be designed to exert a maximum allowable net bearing pressure of 2,000 pounds per square foot (psf).
- **Floor Slabs and Pavements:** The majority of the on-site soils are preliminarily expected to be suitable for support of proposed floor slabs and pavements provided that these materials are properly evaluated and inspected during construction. However, additional evaluation will need to be performed during construction phase and after demolition of the existing building. **Due to potential variability of existing fill materials and moisture sensitive on-site materials, at least partial overexcavation and replacement and/or subgrade stabilization material should be anticipated.**
- **Groundwater Control:** Groundwater was encountered at depths deeper than anticipated overexcavation, therefore, the need for extensive groundwater control is not expected for building construction. However, the contractor should anticipate the need for temporary groundwater control measures for dewatering surface runoff, perched and infiltrating water.
- **Use of Site Soils as Structural Fill:** The on-site soils (above the groundwater levels) are preliminarily expected to be suitable for reuse as structural fill material, provided moisture contents are within tolerable limits for compaction and oversized/objectionable material (if encountered) is segregated. The on-site soils include increased fines and fine-grained soils with moisture contents higher than typical to achieve compaction. As such, moisture conditioning during periods of favorable weather, mixing with granular material, and/or mixing with cement/lime may be considered depending on construction phase observation.
- **Supplemental Evaluation:** Based on the borings performed near the existing building, existing fill material was encountered to a maximum depth of approximately four feet below the ground surface. The composition of these materials will need to be further evaluated during the early construction phase and following demolition of the existing building to determine the suitability of the existing fill material for reuse as structural fill material and/or floor slab support, and to confirm the depth and lateral extent of unsuitable material to be removed.

Detailed design criteria and construction recommendations for proposed foundations, floor slabs, pavements and related earthwork are discussed in the following report. Dynamic Earth should remain involved to provide consultation and review during final design.

2.0 INTRODUCTION

2.1 Authorization

Dynamic Earth was authorized to conduct a geotechnical investigation in accordance with McDonald's USA, LLC purchase order (PO) # 2672542.

2.2 Purpose

The purpose of this subsurface exploration and analysis was to:

- ascertain the various soil profile components at test locations;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundations, floor slab, and pavement designs;
- provide recommendations for required earthwork and subgrade preparation;
- record groundwater levels at the time of the investigation and discuss the potential impact on the proposed construction; and
- recommend additional investigation, if warranted.

2.3 Scope

The scope of the exploration and analysis included site geologic research and evaluation, subsurface exploration, field testing and sampling, laboratory testing, and geotechnical engineering analysis and evaluation of the subsurface materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions as they relate to the physical support of the proposed construction. Dynamic Earth completed a *Phase I Environmental Site Assessment Report* and the results were issued under a separate cover.

2.3.1 Field Exploration

The field exploration of the project site was conducted by means of six soil borings (identified as B-1 through B-6). The borings were drilled using hollow stem auger techniques with a truck-mounted drill rig. Test locations are summarized in the following table and are shown on the accompanying *Boring Location Plan*. As shown on the attached *Boring Location Plan*, some borings were offset due to access.

TEST LOCATION SUMMARY TABLE		
Number	Proposed Location	Final Depth (feet)
B-1	Northwest Building Corner	30.0
B-2	Northeast Building Corner	20.0
B-3	Southwest Building Corner/Drive Lane	20.0
B-4	Southeast Building Corner	34.3
B-5	Proposed Drive-Thru Area	10.0
B-6	Proposed Trash Enclosure	15.0

The soil borings were completed in the presence of a Dynamic Earth engineer who performed field tests, recorded visual classifications, and collected samples of the various strata encountered. The test locations were located in the field utilizing hand-held GPS techniques, and are presumed to be accurate within several feet of the location plotted on the plans.

Soil borings and standard penetration tests (SPTs) were conducted in general accordance with ASTM D6151 (*Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*) and ASTM D1586 (*Standard Test Method for Standard Penetration Test and Split Barrel Sampling of Soils*). The SPT resistance value (N-value) is used extensively in correlations which relate SPT N-value to engineering behavior of soils. Unconfined compressive strength (Q_u) values were assessed with a pocket penetrometer within the fine-grained soils.

Groundwater level observations were recorded during and at the completion of field operations prior to backfilling the borings. Seasonal variations, temperature, anthropogenic, seasonality, soil permeability, and precipitation will influence the actual and observed groundwater levels. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

2.3.2 Laboratory Testing Program

Physical/Textural Analysis: Each sample was visually classified in general accordance with ASTM D-2488 (visual-manual procedure). In addition, representative samples of selected strata encountered were subjected to a laboratory testing program which included moisture content determinations (ASTM D-2216), particle size distribution (ASTM D-6913), Atterberg Limits (ASTM D-4318), and washed gradation analyses (ASTM D-1140) in order to perform supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table:

PHYSICAL/TEXTURAL TEST RESULTS							
Boring	Sample No.	Depth (feet)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Index (%)	Percent Passing No. 200 (%)	USCS Classification
B-2	S-3	4-6	14.0	Non-Plastic		23.9	SM
B-3	S-3	4-6	19.0	19	1	59.0	ML

The engineering classifications are useful when considered in conjunction with the additional site data to estimate other properties of the soil types encountered and to predict the soil's behavior under construction and service loads.

3.0 SITE DESCRIPTION

3.1 Location and Description

The subject property is located at 741 Route 73 South in the Township of Evesham, Burlington County, New Jersey. The subject site is further identified as Block 36, Lot 4.07. The Site is bound to the north by a wooded area with Executive Drive beyond; to the west by undeveloped wooded area with residential properties beyond; to the south by commercial developments; and to the east by Route 73 South with commercial development beyond. The site of the proposed construction is shown on the attached *Boring Location Plan* in the Appendix of this report.

3.2 Existing Conditions

Surface Cover/Development: The subject site is currently developed with a single-story bank building (without a basement/lower level) and associated asphalt-paved parking, driveway, and landscaped areas. An existing trash enclosure is located in the northwestern portion of the Site. The northern portion of the property consists of an existing drainage swale that transects the property in a general east-west orientation. The existing bank building was vacant and not in operation at the time of this investigation.

Topography: Based on a September 19, 2023 *Boundary, Location & Topographic Survey* prepared by Dynamic Survey, LLC, the existing site is generally flat with site grades ranging between approximately 90.0 and 92.0 feet. The elevations referenced in the survey are given in 1988 North American Vertical Datum (NAVD 88). The elevations at the base of the aforementioned drainage swale range between approximately 84.0 feet and 83.0 feet.

Site Drainage: Surface runoff generally appears to follow existing site topography toward relatively lower lying areas and inlet structures located at the site. The terminus of the pipes was not determined.

Utilities: At the time of our investigation, the site appeared to be serviced by public and private utilities including electric, gas, water, and sanitary and storm sewer. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

3.3 Proposed Construction

The proposed site development will include demolition of the existing bank building and construction of a McDonald's restaurant building with associated pavements, trash enclosure, menu-boards, identification signs, and utilities. The proposed restaurant will occupy a footprint area of approximately 3,660 square feet. Site grading plans were not developed, but are expected

to include minor earth cuts and fills. The proposed site redevelopment details were provided on an August 15, 2023 (last revised) *Concept 'A'* prepared by Dynamic.

The proposed structure is anticipated to consist of conventional concrete/masonry and metal-framed construction with a concrete slab on grade and no below grade/basement levels. The maximum anticipated loads were preliminarily assumed based on similar projects and are expected to be as follows:

- column loads – 60 kips;
- wall loads – 1.5 kips per linear foot;
- floor slab loads – 125 pounds per square foot; and
- pavement loads – 60,000 18-kip Equivalent Single Axle Loads (ESAL).

The scope of Dynamic Earth's investigation and the professional advice contained in this report were generated based on the project details and loading noted herein. Any revisions or additions to the design details enumerated in this report should be brought to the attention of Dynamic Earth for additional evaluation as warranted.

4.0 SUBSURFACE CONDITIONS

4.1 Site Geology

The area encompassing the subject site is situated within the Atlantic Coastal Plain Physiographic Province of New Jersey. Specifically, the southern portion of the site is underlain by the Tertiary Aged, Lower member of the Kirkwood Formation. The Lower member of the Kirkwood Formation consists of light yellow to white, massive to thick bedded, fine to medium grained sands interbedded with clay. Locally, areas of very micaceous and extensively stained by iron oxides are encountered in near-surface beds. The thick bedded strata commonly consist of interbedded fine grained, micaceous sand and gravelly, coarse to fine grained sand.

4.2 Subsurface Soil Profile

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* presented in the Appendix of this report. The subsurface soil conditions encountered in the soil borings consisted of the following generalized strata in order of increasing depth.

Surface Cover Material: The soil borings were performed within existing landscape and pavement areas. One test performed within an existing landscape area encountered approximately six inches of topsoil at the surface. The remaining locations were performed within existing pavement areas encountered between approximately 4.5 inches and six inches of asphalt concrete at the surface with no apparent granular subbase materials.

Existing Fill Material: Beneath the surficial cover, the majority of the soil borings (except two borings within the northwestern portion of the subject site) encountered existing fill material that generally consisted of silt and sand with variable amounts of gravel and debris. The sampled portions of the debris included brick and glass fragments. The existing fill material was encountered to depths ranging between approximately two feet and four feet below the ground surface, corresponding to elevations ranging between 87.0 feet and 89.0 feet. Standard Penetration Test (SPT) N-values recorded within the stratum ranged from eight to 33 blows per foot (bpf).

Coastal Plain Soils: Beneath the surficial cover and/or existing fill material, natural coastal plain soils were encountered that generally consisted of silt (USCS: ML), clay (USCS CL) and sand (USCS: SM, SC, and SP) with variable amounts of silt, clay, and gravel. The natural coastal plain soils extended to the boring termination depths ranging between approximately ten to 34.3 feet below the ground surface; corresponding to elevations ranging between 56.8 feet and 81.0 feet.

The borings encountered very loose/loose natural coastal plain deposits at various depths and thickness throughout the soil profile. SPT N-values recorded within the granular portions of this

stratum ranged between one bpf and 61 bpf, and averaged 15 bpf; generally indicating a relatively medium dense condition within the coarse-grained soils.

Unconfined compressive strength (Q_p) values obtained from pocket penetrometer tests performed within the cohesive portions of this stratum ranged between approximately one ton per square foot (tsf) and two tsf and averaged 1.5 tsf; generally indicating a stiff consistency.

4.3 Groundwater

Groundwater was encountered between depths of approximately six feet and 13 feet below the existing site surface; corresponding to elevations ranging between approximately 78 and 85 feet. Groundwater levels are expected to fluctuate seasonally and following significant periods of precipitation.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

The results of the subsurface investigation disclosed existing fill materials beneath anticipated foundation bearing elevations within the proposed building. The existing fill materials, and relatively loose/very loose coastal plain deposits, are unsuitable for shallow foundation support without risk of excessive settlement. As such, the existing fill material and loose/very loose natural site soils (where encountered at foundation subgrade elevations) will need to be overexcavated and re-compacted or replaced with approved structural fill material. Following overexcavation and recompaction or replacement, the proposed building may be supported on a conventional shallow foundation bearing within improved existing fill materials, natural coastal plain, and/or structural backfill placed to restore grades, provided these materials are properly evaluated and approved as outlined herein.

The majority of the on-site soils are preliminarily expected to be suitable for support of proposed floor slabs and pavements provided these materials are properly evaluated and inspected during construction. Due to variability of fill material and the moisture sensitive on-site material, at least partial overexcavation and replacement and/or subgrade stabilization should be anticipated beneath proposed floor slab and pavements.

5.2 Site Preparation and Earthwork

Overexcavation and Supplemental Evaluation of Existing Fill Materials: Existing, undocumented fill materials were noted with sufficient variability to suggest uncontrolled conditions for foundation support. Based on the conditions disclosed by the soil borings, Dynamic Earth recommends overexcavating unsuitable existing fill where present below footing bearing zones, but anticipates that the majority of fill may remain in place where possible below floor slabs and pavements. A Dynamic Earth geotechnical engineer familiar with this study will be needed to provide careful construction phase inspection to maximize salvageable areas to remain and identify areas that must be removed and replaced. The supplemental evaluation via test pit excavations may be deferred to the demolition and construction phases. At that time, the vertical/lateral extent of the existing material should be evaluated. The contractor should include an initial unit cost and budget time to perform the soil exchange program.

Existing, undocumented fill materials cannot be conclusively evaluated solely based on soil borings because the sampling techniques expose a very small, approximately two inch split spoon sample at widely spaced locations and variable intervals. Therefore, engineering judgment and evaluation of risks needs to be applied to determine how to address the fill condition. Often, small pieces of debris are encountered which in some cases may appear to be the result of simply small fragments

of materials intermixed in a well compacted soil matrix. However, in many cases the small pieces of recovered foreign material can be fragments of much larger or more extensive buried objectionable material. In addition, undocumented fill on previously developed sites can vary substantially. Where deep fills would impact the foundation selection or where more definitive earthwork budgets are necessary, it is customary to conduct further exploration with supplemental test pit excavations to expose a larger cross section of the fill material and enable a better evaluation of the presence of voids, debris, organics, and general consistency. The decision as to whether to conduct such further evaluation during pre-design phases or during initial construction phases also is impacted by the site use and accessibility for larger disturbances, and the owner's risk tolerance for the specific project.

To develop geotechnical recommendations and consult with the client regarding how to address the existing fill on this site based on the information available, Dynamic Earth considered factors that weigh either negatively or positively toward the existing fill condition overall. Factors suggesting unsuitable conditions for foundation support include debris within the samples obtained and relatively loose sampler recovery which generally indicate that the material was placed or re-worked on site without strict engineering control. Records documenting the fill placement also were not available to Dynamic Earth.

Factors which are generally favorable to the probability that portions of the fill may be at least partially salvageable for reuse include the following. The debris encountered within the existing fill material were generally within a soil matrix and such debris were non-deleterious fragments. These conditions suggest that, except where excessive debris or organics are found, the existing fill may be adequate for support of proposed floor slabs. **Depending on a construction phase evaluation, overexcavation and recompaction or replacement with structural fill material should be anticipated below at least a portion of the existing floor slab area. Furthermore, careful inspection and testing to identify areas of the existing fill which might be salvageable is warranted.**

Existing fill material should be overexcavated prior to placing new fill material. Furthermore, the proposed building footprint and interior column locations should be located by a professional surveyor prior to performing overexcavation operations.

The recommendations presented herein are sufficient to support the initial design and planning phase. These recommendations are contingent on the assumption that Dynamic Earth will remain involved in the final design process and that Dynamic Earth will be engaged to conduct the necessary supplemental evaluations and construction phase geotechnical testing and inspection to ensure these recommendations are properly implemented.

Demolition and Surface Cover Stripping: Prior to the start of construction, all utilities should be identified and secured. If encountered, existing structural elements, such as concrete foundations, slabs, and remnant basement walls should be removed entirely from below proposed foundations and floor slabs, and excavated to at least two feet below pavement subgrades. Remnant structural elements may remain in-place below these depths below pavements provided they do not interfere with future construction. Any slabs left in-place should be thoroughly fractured to promote vertical drainage in the presence of a qualified Geotechnical Engineer and should be backfilled with structural fill in accordance with the recommendations of Section 5.3.

The surface cover materials, including surface vegetation, topsoil, gravel, and asphalt should be removed from within, and at least five feet beyond, the limits of the proposed building as well as any other area which will require fill placement. If required, removal of any trees should include root mats and tree stumps.

Surface Preparation/Proofrolling: Prior to placing any fill or subbase materials to raise or restore grades to the desired building pad or pavement subgrade elevations, the existing exposed soils should be overexcavated as directed by the on-site geotechnical engineer and compacted to a firm and unyielding surface with several passes in two perpendicular directions with a minimum 20-ton vibratory, smooth drum roller during favorable moisture conditions. The drum roller should be operated in the static mode or a kneading “sheepsfoot” roller should be used where fine-grained soils are encountered. The surface then should be proofrolled with a loaded tandem axle truck in the presence of Dynamic Earth to help identify soft or loose pockets which may require removal and replacement or further investigation. Dynamic Earth anticipates at least partial overexcavation if the subgrade is wetted or subjected to repeated construction traffic. Any fill or backfill should be placed and compacted in accordance with Section 5.3.

Subgrade Stabilization and Inspection: Portions of the on-site soils are considered to be extremely moisture sensitive and every effort should be made to minimize disturbance of the on-site soils by construction traffic and surface runoff. The on-site soils will likely become unsuitable if exposed to moisture and/or construction traffic. If these materials become overly wetted, the on-site soils will likely require increased handling such as discing and drying during extended periods of favorable weather and/or partial overexcavation and geogrid stabilization. A geogrid may be used for excessively soft or pumping conditions as directed by the geotechnical engineer. Therefore, the subgrades should be sealed daily and construction traffic be minimized to designated non-structural areas and following periods of precipitation as an attempt to minimize deterioration of otherwise suitable subgrade soils. Dynamic Earth should be retained as the Geotechnical Engineer of Record to inspect soil conditions during construction and verify the suitability of prepared foundation, floor slab and pavement subgrades for support of design loads.

Earthwork during Freezing Weather: When temperatures fall below freezing for prolonged periods of time, the moisture within the soil matrix will freeze. Fine-grained soils have a higher susceptibility to frost than well drained granular soils and could freeze at faster rates. Frost susceptible soils will often become unstable once they thaw, even if the material is properly placed and compacted. As such, special construction methods, additional handling and/or construction sequencing should be planned when weather forecasts predict periods of freezing ambient air temperatures. **Fill and subbase material should not be placed on water, snow, ice, or frozen soil.** Subgrade materials that freeze will need to be removed and replaced with suitable structural fill material prior to placement of subsequent fill layers, subbase material and/or surficial cover material as detailed throughout this report. Frozen soils are not suitable for placement as structural fill material and generally need to be exported from the site, unless construction schedules allow for stockpiling and drying of these materials during warmer weather. The contractor should be responsible for including budgetary rates for earthwork during periods of potential freezing weather and for protection against freezing subgrades.

5.3 Structural Fill and Backfill

Import/On-site Structural Fill Material: Soils placed as structural fill material should consist of well graded sand or gravel with a maximum particle size of three inches in diameter and less than 15 percent of material passing the number 200 sieve. These materials should be free of objectionable debris (clay clumps, organic and/or deleterious material, etc.) and within moisture contents suitable for compaction. Alternative soil types with higher percentages of silt and clay may be considered, provided that the contractor is able to achieve proper compaction and maintain suitable subgrade once the material is placed. Fine-grained soils and/or granular soils with higher percentages of silt and clay are extremely moisture sensitive and will only be suitable for reuse as structural fill material during ideal weather conditions. Materials wetted beyond the optimum moisture content and/or materials containing objectionable debris will not be suitable for reuse as structural fill material without special handling. As such, the contractor should be responsible for importing structural fill material and/or processing on-site soils as required so that these materials are suitable for structural fill placement.

If encountered, cobbles/boulders and debris greater than three inches in diameter will need to be separated from on-site soils to be placed as structural fill. Approved material between three to 12 inches in diameter may be crushed or individually placed in fill layers deeper than two feet below proposed subgrade levels. Care must be taken to individually seat any large particles and to compact soil around large particles with hand operated equipment to minimize the risk of void formation.

The on-site soils encountered included existing fill materials and natural coastal plain deposits. Granular portions of the on-site soils (above saturated zones) are preliminarily expected to be

suitable for reuse as structural fill material, provided oversized/objectionable debris is separated (if encountered) and moisture contents are within tolerable limits to achieve compaction. Portions of the on-site soils are considered extremely moisture sensitive and will require moisture conditioning during periods of favorable weather or will become impractical for reuse if exposed to moisture. While reuse of the on-site soils where possible should be attempted, the contractor should also include a unit rate cost for importing structural fill material and exporting unsuitable site soils, particularly if construction occurs during or following periods of precipitation. The contractor should protect and seal subgrades and stockpiles when periods of precipitation are anticipated. Reuse of these materials will be contingent upon further evaluation during construction.

Compaction and Placement Requirements: Structural fill and backfill should be placed in maximum 12 inch loose lifts and compacted to 95 percent of the maximum dry density within a targeted two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Variations in moisture content may be acceptable subject to Dynamic Earth's on-site Geotechnical Engineer's approval if the contractor is able to achieve the necessary compaction. Dynamic Earth recommends using a smooth drum roller or sheepsfoot roller to compact subgrade soils beneath larger areas such as pavements or slabs. Hand operated vibratory jumping jacks and plate compactors should be used in confined excavations for foundations or utilities. Fill material compacted with relatively light weight equipment or in the static mode may require additional passes and/or the material may need to be placed in thinner, loose lifts.

Structural Fill Testing: Before filling operations begin, representative samples of each proposed fill material (on-site and imported) should be collected. The samples should be tested to determine the maximum dry density, optimum moisture content, natural moisture content, gradation, and plasticity of the soil. These tests are needed for quality control during compaction and also to determine if the fill material is acceptable. The placement of all fill and backfill should be monitored by Dynamic Earth's geotechnical engineer or technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests should be performed during fill placement to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

Demolition Material: Considerations for reuse of demolition material may be evaluated as fill material provided the material is properly segregated and processed as recommended herein. Concrete and masonry materials should be crushed to a well graded blend with a maximum size of three inches in diameter. The asphaltic materials and deleterious building material such as wood, insulation, metal, shingles, etc. should not be used as fill material. The maximum percentage allowable of brick, schist, concrete washout and other friable materials is four percent.

Asphalt Milling Reuse: We anticipate that at least a portion of existing asphaltic concrete may be reused within the subbase layer of the proposed pavement section as detailed in Section 5.7, provided that environmental concerns do not preclude reuse. The millings should be processed to a maximum particle size of 1.5 inches and blended (less than 50 percent) with approved dense graded aggregate (DGA) in accordance with the NJDOT DGA gradation requirements. The approved DGA material shall not contain with asphaltic millings prior to blending with new DGA material.

Submerged Fill: If required, backfill at excavations that extend below the groundwater level (in conjunction with dewatering methods) may consist of nominally one inch, crushed stone (such as AASHTO #57 Stone) placed to raise grade above water levels before subsequent lifts of structural fill. Submerged fill should be separated from surrounding soils with a fines barrier geotextile, such as Mirafi FW700 or equivalent to prevent future mitigation of fines content from surrounding soils.

5.4 Groundwater Control

Groundwater levels are expected to be deeper than the majority of proposed foundation excavations. However, depending upon final site grades, groundwater should be anticipated within relatively deeper excavations (such as proposed utility excavations). As such, the contractor should anticipate the need for construction phase groundwater control.

While the means of groundwater control will need to be determined by the contractor, excavations typically extending less than approximately two feet below the groundwater levels may be controlled by providing a sufficient number of sump pumps to draw down groundwater below the bottom of excavations. Deeper excavations that remain open for extended periods will require more extensive dewatering, possibly including installation of deep well points. The contractor should be responsible for providing adequate groundwater control so that proper installation of below grade structures can be accomplished.

Surface water runoff must be controlled and diverted away from construction areas by grading and limiting the exposure of excavations to rainfall.

5.5 Foundation Recommendations

Anticipated Bearing Strata: Depending on final site grading plans and foundation bearing elevations, proposed foundations are expected to bear within the existing fill materials and/or the natural coastal plain deposits. As detailed throughout this report, the existing fill materials and/or relatively loose/very loose natural coastal plain deposits are not suitable for direct foundation support and will need to be overexcavated and recompacted or replaced where encountered at or below foundation subgrade elevations.

Shallow Foundation Design Criteria: Following overexcavation and replacement of existing fill and/or loose/very loose coastal plain deposits materials, Dynamic Earth recommends supporting the proposed structure on a conventional shallow foundation bearing within approved compacted structural fill material and/or approved natural soils. Foundations may be designed to impart a maximum allowable net bearing pressure of 2,000 psf. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Any footings subject to tension loads should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure recommended above. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete, side friction (vertical along the footer) should be neglected.

Lateral resistance should be provided by friction on the base of the footing with a recommended coefficient of friction against sliding:

- Formed concrete on gravel subbase material – 0.40;
- Mass concrete on gravel subbase material – 0.50; and
- Mass concrete on on-site natural soils - 0.30.

Menu Board Foundation: Proposed menu board foundations that are drilled and cast in-place against undisturbed natural soil may be designed using lateral resistance from the passive earth pressure. **Menu board foundations installed by excavating (as opposed to drilling in-place) will not achieve the design lateral resistance unless the soils are properly backfilled and compacted. The lateral resistance within the upper three feet should be neglected.** While the design of the menu board foundation is not included in our current scope of work, the following soil parameters (for undisturbed natural alluvial deposits) may be used for preliminary menu board foundation design:

- Unit Weight of Natural Soil – 120 pounds per cubic foot
- Internal Friction Angle – 30 degrees
- Active Earth Pressure Coefficient (K_a) – 0.33
- Passive Earth Pressure Coefficient (K_p) – 3.00

Careful inspection of the menu board foundation will be critical to confirm these preliminary design parameters.

Inspection/Overexcavation Criteria: The suitability of the bearing soils along and below the footing bottoms must be verified by Dynamic Earth's geotechnical engineer prior to placing

concrete. If required, any overexcavation to be restored with structural fill (on-site or imported) will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. The bottom of overexcavations should be compacted with smooth drum rollers, walk-behind compactors, vibrating plates or plate tampers (“jumping jacks”) to compact locally disturbed materials and densify underlying natural soil zones. Alternatively, considerations for use of lean concrete/Controlled low-strength material (CLSM) or light-weight flowable fill material may be evaluated if lateral overexcavation or compacting of the bottom of the excavation is not possible or practical due to property boundary limitations and/or adjacent structures.

Settlement: Dynamic Earth estimates post construction settlements of proposed restaurant foundations on the order of one inch if the recommendations outlined in this report are properly implemented. Differential settlements of restaurant foundations should be less than one-half inch.

Frost Coverage: Footings subject to frost action should be placed at least 30 inches below adjacent exterior grades or as required by the local building code to provide protection from frost penetration. Interior footings not subject to frost action (including during the period of construction) may be placed at a minimum depth of 24 inches below the slab subgrade.

5.6 Floor Slab

Dynamic Earth anticipates that approved existing fill material, natural on-site soils and/or compacted structural fill material placed over approved subgrades will be suitable for support of the proposed floor slabs provided these materials are properly evaluated, compacted and proofrolled in accordance with Sections 5.2 and 5.3 of this report. **Due to potential variability of the existing fill material and the moisture sensitivity of the on-site soils partial overexcavation and replacement and/or subgrade stabilization should be expected.** Depending on construction phase evaluation, overexcavation depths may typically be limited with the use of geogrid reinforcement or lime/cement stabilization mixing, as directed by the geotechnical engineer of record. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 125 psi/in.

A minimum four-inch layer of stone should be installed below the floor slabs to provide a capillary break. A moisture vapor barrier beneath the floor slab is recommended. Total and post-construction settlements of floor slabs installed in accordance with the recommendations outlined in this report are estimated to be less than one-quarter inch.

5.7 Pavement Design Criteria

General: Dynamic Earth anticipates that the majority of the on-site soils will be suitable for support of proposed pavements. However, due to potential variability within the existing fill materials and moisture sensitivity of the on-site soils, at least partial overexcavation and replacement, in-place densification, and/or subgrade stabilization should be expected within proposed pavement areas. Depending on construction phase evaluation, overexcavation may be limited (to a typical depth of approximately two feet) with the use of subgrade stabilization techniques, such as geogrid stabilization, as directed by Dynamic Earth.

Design Criteria: A design California Bearing Ratio (CBR) value of five has been assigned to the anticipated properly prepared fill soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Pavement Sections: The recommended flexible pavement section is presented below in tabular format:

RECOMMENDED FLEXIBLE PAVEMENT SECTION		
Layer	Material ¹	Thickness (Inches)
Surface	9.5 PG 64 (L or M) ²	1.5
Base	19.0 PG 64 (L or M) ²	2.5
Subbase	NJDOT DGA	6.0

¹Per New Jersey Department of Transportation Standard Specification for Road and Bridge Construction 2007

²Per the designation compaction level shall be "L" or Low for Standard Duty Pavement and "M" or Medium for Heavy Duty Pavement.

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns (such as within the trash enclosure and driveway aprons). The recommended rigid pavement is presented below in tabular format:

RECOMMENDED RIGID PAVEMENT SECTION		
Layer	Material	Thickness (Inches)
Surface	4,000 psi air-entrained concrete	5.0
Base	NJDOT DGA	6.0

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper

construction, inspection, and maintenance. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, all subgrade soil and supporting fill or backfill must be placed, prepared, and evaluated as detailed in Sections 5.2 and 5.3 of this report. Proper drainage must be provided for the pavement structure including appropriate grading and surface water control, as well as measures to drain water from the subgrade such as bleeder drains at inlets.

The performance of the pavement will also depend on the quality of materials and workmanship. Dynamic Earth recommends that New Jersey State Department of Transportation (NJDOT) standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. All rigid concrete pavements should be suitably air-entrained, jointed, and reinforced as applicable by state and local codes.

5.8 Retaining Walls and Lateral Earth Pressures

Retaining walls and other structures having lateral earth pressures were not identified at this time. Dynamic Earth should be notified if structures requiring lateral earth pressure estimates subsequently are proposed.

5.9 Seismic and Liquefaction Considerations

Based on the SPT N-Values recorded, the soils are most consistent with a Site Class E defined by the *International Building Code*. Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

5.10 Temporary Excavations

The natural granular soils encountered during the investigation are consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5:1 (horizontal: vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

5.11 Supplemental Post-Investigation Services

Construction Phase Inspection of Existing Fill Soils and Inaccessible Areas: The conditions disclosed by the soil borings preliminarily indicate that the existing fill materials may be suitable for proposed floor slab and pavement support if evaluated and prepared as described herein. Existing fill material beneath proposed foundations will need to be overexcavated and replaced

with structural backfill in a controlled manner. However, there is a potential risk of variability in existing fill, which may not be disclosed solely by soil borings because conventional augering and split-spoon sampling only reveal a very limited section of subsurface materials. Therefore, the composition of the existing fill should be verified by visual observation and test pit excavations prior to or during the early phase of construction to enable further assessment of the depth, possible presence of voids, uncontrolled conditions, or possible deleterious materials. If unsuitable conditions are encountered, alternative recommendations, possibly including additional overexcavation and replacement, may be required. The subsurface conditions in presently inaccessible areas below existing structure also should be evaluated following demolition to verify if the underlying soil conditions are consistent with the soil conditions encountered during this subsurface exploration.

Construction Monitoring and Testing: The recommendations presented herein are contingent on the owner retaining Dynamic Earth to perform inspection, testing and consultation during construction as described in previous sections of this report. **Construction phase evaluation by means of proofroll inspections, soil probes, and/or dynamic cone penetrometer (DCP) testing should be performed on the foundation subgrade soils in order to confirm design bearing capacities for the proposed structure.** Monitoring and testing should also be performed to verify that suitable materials are used for controlled fill, and that they are properly placed and compacted over suitable subgrade soils. Testing of fill placement will also be critical to limiting differential settlement.

6.0 GENERAL COMMENTS

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structure. Dynamic Earth should be included as a consultant to the design team and should be provided final plans for review to confirm these criteria apply or to modify recommendations as necessary.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards that may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the use of the client for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

The possibility exists that conditions between borings may differ from those at specific boring locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, Dynamic Earth's Geotechnical Engineers or their representatives should observe and document the construction procedures used and the conditions encountered, as well as conduct testing and inspection to ensure the design criteria are met or recommendations to address deviations are implemented.

Dynamic Earth assumes that a qualified contractor will be employed to perform the construction work, and that the contractor will be required to exercise care to ensure all excavations are performed in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

The exploration and analysis of the foundation conditions reported herein are presented to form a reasonable basis for foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the preliminary design details furnished or assumed. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

Boring Location Plan

Records of Subsurface Exploration



BOREHOLE LOG

Boring No : B-1

Page 1 of 2

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth (ft)	EI. (ft)	Additional Groundwater Data	Depth (ft)	EI. (ft)
Termination Depth: 30.0 feet	Date Completed: 08-30-2023		While Drilling: ▽	9.0		82.0	
Proposed Location: Proposed Building	Logged by: J. Minnich	At Completion: ▼	10.0	81.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W						
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)					
					1	3		Surface Cover	6 inches of asphalt with apparent subbase material	
0.5-2.0	S-1	SS	11	--	5	4	8	FILL	Dark brown and gray clayey sand, with trace gravel, moist (FILL)	
2.0-4.0	S-2	SS	7	--	4	4	10		As above, moist (FILL)	
					6	7				
4.0-6.0	S-3	SS	5	--	6	6	12		Yellow brown medium to fine sand, trace silt, moist, medium dense (SP)	
					6	5				
6.0-8.0	S-4	SS	20	--	4	3	6		Yellow brown medium to fine sand, some silt, moist, loose (SM)	
					3	3				
8.0-10.0	S-5	SS	22	--	2	2	3		As above, wet, very loose (SM)	
					1	2				
13.0-15.0	S-6	SS	15	--	4	2	5	Coastal Plain Deposits	As above, light gray, loose (SM)	
					3	3				
18.0-20.0	S-7	SS	24	--	3	2	5		As above (SM)	
					3	5				
23.0-25.0	S-8	SS	16	--	3	4	9		As above (SM)	
					5	5				



BOREHOLE LOG

Boring No : B-1

Page 2 of 2

Project: Proposed McDonald's Restaurant #29-1564				Proj. No.: 0114-23-02695						
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey				Client: McDonald's USA, LLC						
Surface Elevation: 91.0 feet		Date Started: 08-30-2023		Groundwater Data		Depth	EI.	Additional Groundwater Data	Depth	EI.
Termination Depth: 30.0 feet		Date Completed: 08-30-2023				(ft)	(ft)		(ft)	(ft)
Proposed Location: Proposed Building		Logged by: J. Minnich		While Drilling: ▾		9.0	82.0			
Drill/Test Method: HSA/SPT		Contractor: FM&W		At Completion: ▾		10.0	81.0			
Hammer Type: Auto		Rig Type: CME 55								

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N				
28.0-30.0	S-9	SS	24	--	3 3 7 7	10	<div style="text-align: center;">Coastal Plain Deposits</div>	Dark gray sandy clay, wet, very stiff (CL)	Qp = 2.0 tsf	
								Boring B-1 was terminated at approximately 30 feet below the ground surface.		



BOREHOLE LOG

Boring No : B-2

Page 1 of 1

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
Termination Depth: 20.0 feet	Date Completed: 08-30-2023						
Proposed Location: Proposed Building	Logged by: J. Minnich	While Drilling: ▽	13.0	78.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W	At Completion: ▼	13.0	78.0			
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks	
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)						N
					1	17			Surface Cover	6 inches of asphalt with no apparent subbase material	
0.5-2.0	S-1	SS	8	--	16	13	33		FILL	Brown medium to fine sand, with trace debris (brick and glass), moist (FILL)	
2.0-4.0	S-2	SS	22	--	12	13	23			As above, moist (FILL)	
4.0-6.0	S-3	SS	20	--	3	4	8	5		Yellowish brown coarse to fine sand, some silt, trace fine gravel, moist, medium dense (SM)	
6.0-8.0	S-4	SS	20	--	4	6	22			As above, orange and yellowish brown, loose (SM)	
8.0-10.0	S-5	SS	24	--	7	9	21			As above, medium dense (SM)	
					13	12				As above (SM)	
					10	10			Coastal Plain Deposits		
13.0-15.0	S-6	SS	24	--	10	10	20			As above, wet (SM)	
					10	11					
18.0-20.0	S-7	SS	22	--	3	3	8			As above, dark gray, loose (SM)	
					5	6					
								20		Boring B-2 was terminated at approximately 20 feet below the ground surface.	



BOREHOLE LOG

Boring No : B-3

Page 1 of 1

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth (ft)	EI. (ft)	Additional Groundwater Data	Depth (ft)	EI. (ft)
Termination Depth: 20.0 feet	Date Completed: 08-30-2023						
Proposed Location: Proposed Drive Lane	Logged by: J. Minnich	At Completion: ▾	13.0	78.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W						
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N				
								Surface Cover	6 inches of asphalt with no apparent subbase material	
0.5-2.0	S-1	SS	8	--	1 4 6 8	10		FILL	Gray sandy clay, moist (FILL)	
2.0-4.0	S-2	SS	9	--	9 8 6 6	14			Yellowish brown medium to fine sand, trace quartz, moist (FILL)	
4.0-6.0	S-3	SS	22	--	2 1 2 1	3	5	Coastal Plain Deposits	Dark grayish brown silt, and coarse to fine sand, moist, very loose (ML)	
6.0-8.0	S-4	SS	18	--	2 2 1 2	3			As above (ML)	Qp = 1.5 tsf
8.0-10.0	S-5	SS	18	--	1 1 2 2	3			As above (ML)	Qp = 1.0 tsf
13.0-15.0	S-6	SS	10	--	18 28 33 35	61	15	Coastal Plain Deposits	Greenish brown coarse sand, trace silt, wet, very dense (SP)	
18.0-20.0	S-7	SS	22	--	14 17 15 4	32			As above, yellowish brown, with gravel, dense (SP)	
							20		Boring B-3 was terminated at approximately 20 feet below the ground surface.	



BOREHOLE LOG

Boring No : B-4

Page 1 of 2

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation:	91.0 feet	Date Started:	08-30-2023				
Termination Depth:	34.3 feet	Date Completed:	08-30-2023				
Proposed Location:	Proposed Building	Logged by:	J. Minnich				
Drill/Test Method:	HSA/SPT	Contractor:	FM&W				
Hammer Type:	Auto	Rig Type:	CME 55				
		Groundwater Data	Depth	El.	Additional Groundwater Data	Depth	El.
		White Drilling:	▽	8.0	83.0		
		At Completion:	▼	10.0	81.0		

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)					
								Surface Cover	4.5 inches of asphalt with no apparent subbase material	
0.5-2.0	S-1	SS	8	--	--	16	31	FILL	Brown medium to fine sand, with trace quartz, moist (FILL)	
					15	10				
2.0-4.0	S-2	SS	20	--	10	10	21		Yellowish brown medium to fine sand, some silt, moist, medium dense (SM)	
					11	10				
4.0-6.0	S-3	SS	20	--	6	5	11	5	As above (SM)	
					6	7				
6.0-8.0	S-4	SS	24	--	7	7	15		As above (SM)	
					8	9				
8.0-10.0	S-5	SS	24	--	11	11	21	10	As above, yellowish brown to olive brown, wet (SM)	
					10	11				
13.0-15.0	S-6	SS	20	--	7	12	28	Coastal Plain Deposits	Orange coarse to fine sand, trace silt, wet, medium dense (SP)	
					16	18				
18.0-20.0	S-7	SS	9	--	9	6	12		Yellowish brown to orange-brown coarse sand, and gravel, wet, medium dense (SP)	
					6	8				
23.0-25.0	S-8	SS	14	--	3	4	9		Dark gray medium to fine sand, little clay, wet, loose (SC)	
					5	6				



BOREHOLE LOG

Boring No : B-4

Page 2 of 2

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth (ft)	EI. (ft)	Additional Groundwater Data	Depth (ft)	EI. (ft)
Termination Depth: 34.3 feet	Date Completed: 08-30-2023						
Proposed Location: Proposed Building	Logged by: J. Minnich	At Completion: ▼	10.0	81.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W						
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N				
28.0-30.0	S-9	SS	8	--	3 4 4 4	8	Coastal Plain Deposits	As above, loose (SC)		
33.0-34.3	S-10	SS	16	--	8 23 50/3 --	73/9				As above, gray, with trace shells, very dense (SC)
								Boring B-4 was terminated at approximately 34.3 feet below the ground surface.		



BOREHOLE LOG

Boring No : B-5

Page 1 of 1

Project: Proposed McDonald's Restaurant #29-1564		Proj. No.: 0114-23-02695					
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey		Client: McDonald's USA, LLC					
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth	El.	Additional Groundwater Data	Depth	El.
Termination Depth: 10.0 feet	Date Completed: 08-30-2023						
Proposed Location: Proposed Drive-Thru	Logged by: J. Minnich	While Drilling: ▽	8.0	83.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W	At Completion: ▼	8.0	83.0			
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N				
								Surface Cover	6 inches of asphalt with no apparent subbase material	
0.5-2.0	S-1	SS	14	--	6 6 10 10	16			Yellowish brown coarse to fine sand, moist, medium dense (SP)	
2.0-4.0	S-2	SS	20	--	13 18 20 17	38			As above, dense (SP)	
4.0-6.0	S-3	SS	18	--	6 5 6 5	11	5	Coastal Plain Deposits	Yellowish brown coarse to fine sand, and silt, moist, medium dense (SM)	
6.0-8.0	S-4	SS	22	--	3 4 5 6	9			As above, olive brown, wet, loose (SM)	
8.0-10.0	S-5	SS	20	--	5 7 7 6	14			As above, medium dense (SM)	
							10		Boring B-5 was terminated at approximately 10 feet below the ground surface.	
							15			
							20			



BOREHOLE LOG

Boring No : B-6

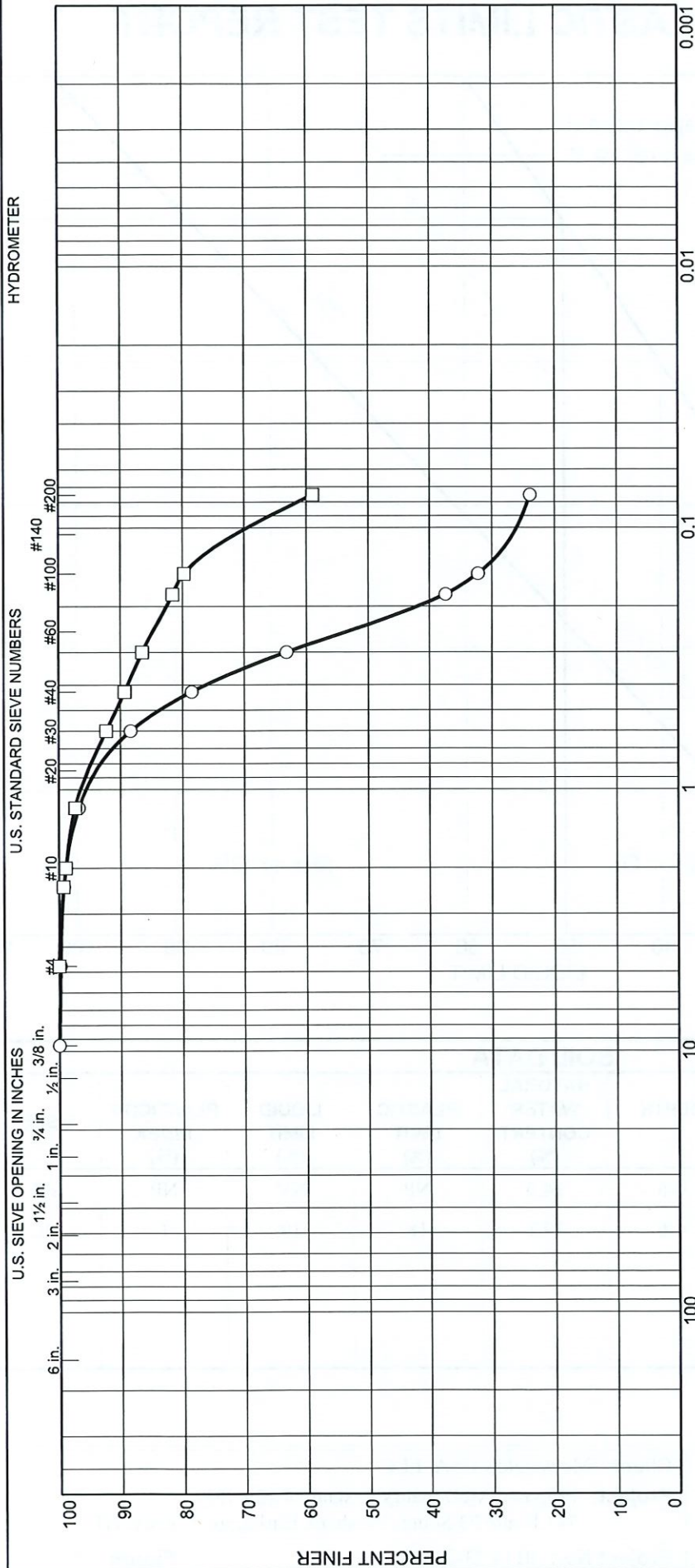
Page 1 of 1

Project: Proposed McDonald's Restaurant #29-1564	Proj. No.: 0114-23-02695						
Location: 741 Route 73 South Evesham Township, Burlington County, New Jersey	Client: McDonald's USA, LLC						
Surface Elevation: 91.0 feet	Date Started: 08-30-2023	Groundwater Data	Depth	EI.	Additional Groundwater Data	Depth	EI.
Termination Depth: 15.0 feet	Date Completed: 08-30-2023		(ft)	(ft)		(ft)	(ft)
Proposed Location: Proposed Dumpster Pad	Logged by: J. Minnich	While Drilling: ▽	6.0	85.0			
Drill/Test Method: HSA/SPT	Contractor: FM&W	At Completion: ▼	6.0	85.0			
Hammer Type: Auto	Rig Type: CME 55						

Sample Information							Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N				
							Surface Cover	6 inches of topsoil		
0.5-2.0	S-1	SS	10	--	1 3 7 6	10	Coastal Plain Deposits	Tan brown medium to fine sand, with some silt, moist, loose (SP)		
2.0-4.0	S-2	SS	15	--	6 8 9 9	17		As above, with trace gravel, medium dense (SP)		
4.0-6.0	S-3	SS	15	--	3 2 4 5	6		Tan medium to fine sand, some silt, wet, loose (SM)		
6.0-8.0	S-4	SS	24	--	3 3 4 3	7		As above, wet, loose (SM)		
8.0-10.0	S-5	SS	20	--	1 WOH 1 1	1		As above, wet, very loose (SM)		
13.0-15.0	S-6	SS	24	--	2 3 3 3	6		As above, gray, loose (SM)		
								Boring B-6 was terminated at approximately 15 feet below the ground surface.		

Laboratory Test Results

Particle Size Distribution Report



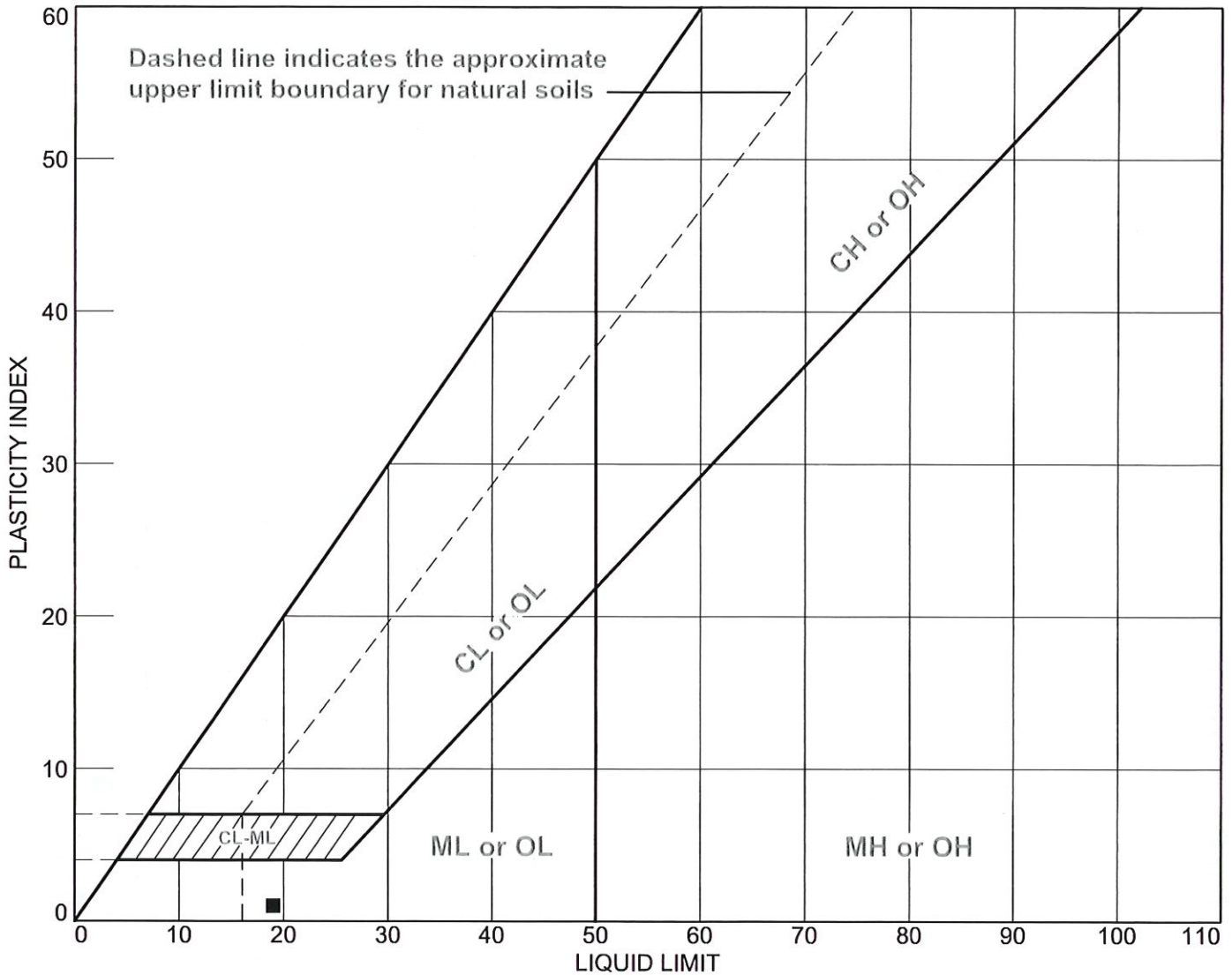
U.S. Sieve Opening (inches)	U.S. Standard Sieve Number	% Sand			% Gravel		Date Sampled	USCS	Material Description	NM %	LL	PL
		Coarse	Medium	Fine	Coarse	Fine						
0.075	#200	0.0	20.4	54.6	0.0	0.2	08/30/2023	SM	Orange and yellowish brown c-f sand, some silt, trace f gravel	14.0	NV	NP
0.075	#200	0.0	9.6	30.3	0.0	0.0	08/30/2023	ML	Dark grayish brown silt, and c-f sand	19.1	19	18

Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
B-2	S-3	4-6	08/30/2023	SM	Orange and yellowish brown c-f sand, some silt, trace f gravel	14.0	NV	NP
B-3	S-3	4-6	08/30/2023	ML	Dark grayish brown silt, and c-f sand	19.1	19	18



Client McDonald's USA, LLC #29-1564
 Project Proposed McDonald's Restaurant
 741 Route 73 South, Evesham, Burlington County, NJ
 Project No. 0114 23-02695 Figure 1

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-2	S-3	4-6	14.0	NP	NV	NP	SM
■	B-3	S-3	4-6	19.1	18	19	1	ML



Client: McDonald's USA, LLC

Project: Proposed McDonald's Restaurant #29-1564
741 Route 73 South, Evesham, Burlington County, NJ

Project No.: 0114 23-02695

Figure 2

**NRCS-USDA Custom
Soil Report – Burlington
County, New Jersey**



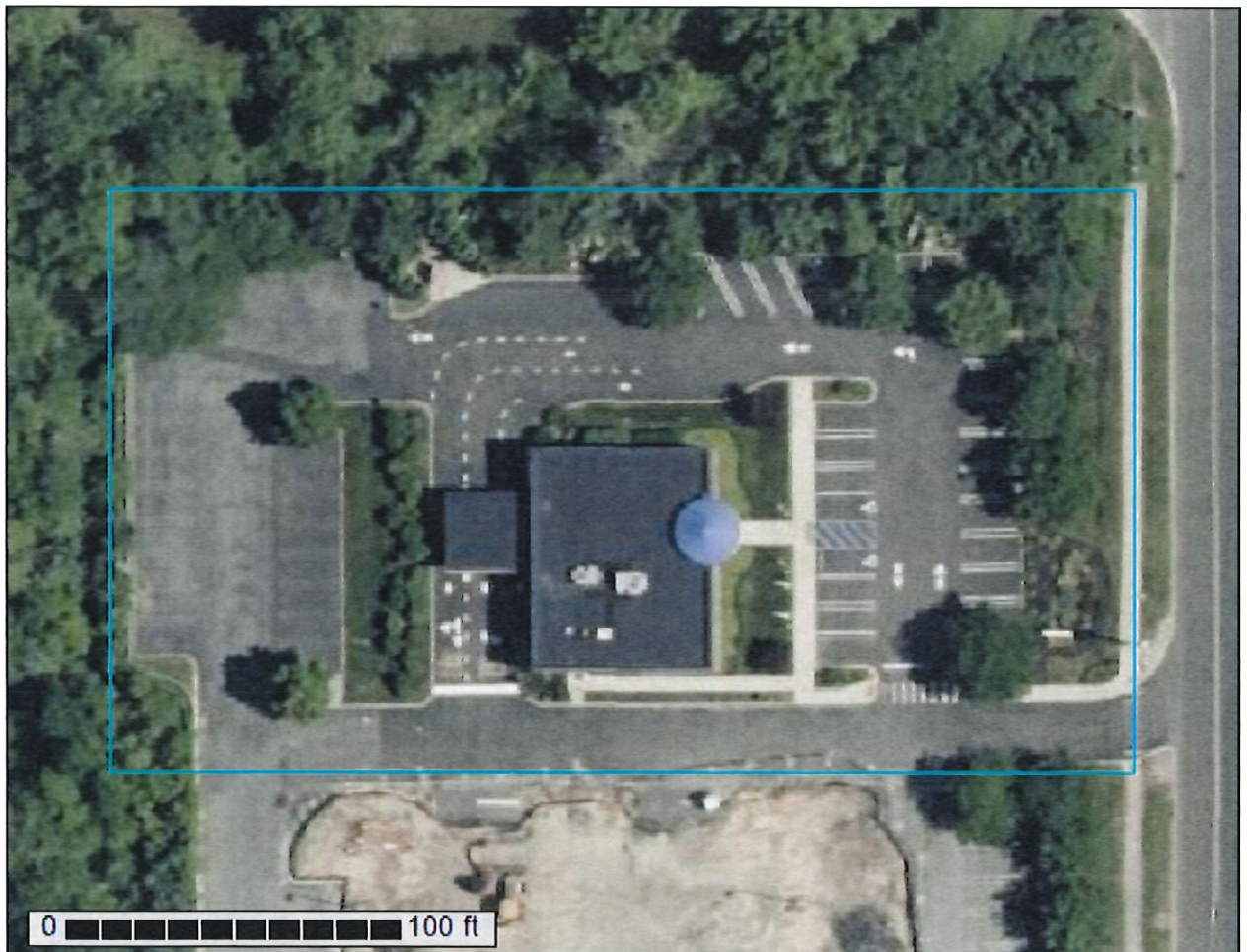
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Burlington County, New Jersey**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map











































Soil Map may not be valid at this scale.

Map Scale: 1:511, if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator. Corner coordinates: WGS84. Edge tics: UTM Zone 18N WGS84.



MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	 Streams and Canals
 Borrow Pit	 Transportation
 Clay Spot	 Rails
 Closed Depression	 Interstate Highways
 Gravel Pit	 US Routes
 Gravelly Spot	 Major Roads
 Landfill	 Local Roads
 Lava Flow	 Background
 Marsh or swamp	 Aerial Photography
 Mine or Quarry	
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Burlington County, New Jersey
 Survey Area Data: Version 19, Oct 11, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BumA	Buddtown-Deptford complex, 0 to 2 percent slopes	1.2	100.0%
Totals for Area of Interest		1.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Burlington County, New Jersey

BumA—Buddtown-Deptford complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: sjzx
Elevation: 30 to 150 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Buddtown and similar soils: 65 percent
Deptford and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buddtown

Setting

Landform: Flats
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy eolian deposits and/or loamy fluviomarine deposits

Typical profile

Ap - 0 to 9 inches: fine sandy loam
Bt1 - 9 to 12 inches: very fine sandy loam
Bt2 - 12 to 26 inches: loam
Bt3 - 26 to 34 inches: loam
2C1 - 34 to 41 inches: loamy coarse sand
2C2 - 41 to 54 inches: loamy sand
2C3 - 54 to 65 inches: coarse sand
2C4 - 65 to 80 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

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Description of Deptford

Setting

Landform: Flats

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy eolian deposits and/or loamy fluviomarine deposits

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bt1 - 8 to 12 inches: very fine sandy loam

Bt2 - 12 to 22 inches: loam

Btg - 22 to 46 inches: very fine sandy loam

BCtg - 46 to 50 inches: fine sandy loam

Cg1 - 50 to 62 inches: fine sandy loam

Cg2 - 62 to 80 inches: stratified loamy very fine sand to very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Depth to water table: About 12 to 18 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: B/D

Hydric soil rating: No

Minor Components

Jade run

Percent of map unit: 5 percent

Landform: Flats, depressions

Landform position (three-dimensional): Dip

Down-slope shape: Linear, concave

Across-slope shape: Linear, concave

Hydric soil rating: Yes

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Geotechnical Terms and Symbols



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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. or a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
- Qu: Unconfined compressive strength, TSF.
- Qp: Penetrometer value, unconfined compressive strength, TSF.
- Mc: Moisture content, %
- LL: Liquid limit, %
- PI: Plasticity index, %
- δd: Natural dry density, PCF.
- ▼: Apparent groundwater level at time noted after completion of boring.
- =

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered)
- SS: Split-Spoon – 1½" I.D., 2" O.D., except where noted
- ST: Shelby Tube – 3" O.D., except where noted
- AU: Auger Sample
- OB: Diamond Bit
- CB: Carbide Bit
- WS: Washed Sample

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>Term (Non-Cohesive Soils)</u>	<u>Standard Penetration Resistance</u>
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

<u>Term (Cohesive Soils)</u>	<u>Qu (TSF)</u>
Very Soft	0-0.25
Soft	0.25-0.50
Firm (Medium)	0.50-1.00
Stiff	1.00-2.00
Very Stiff	2.00-4.00
Hard	4.00 +

PARTICLE SIZE

Boulders	8 in. +	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in. – 3 in.	Medium Sand	0.6mm-0.2mm	Clay	- 0.005mm
Gravel	3 in. – 5mm	Fine Sand	0.2mm – 0.074mm		

USCS Standard Classification System

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488

MAJOR DIVISION		GROUP SYMBOL	LETTER SYMBOL	GROUP NAME	
COARSE GRAINED SOILS CONTAINS MORE THAN 50% FINES	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH *5% FINES		GW	Well-graded GRAVEL
				GP	Poorly graded GRAVEL
		GRAVEL WITH BETWEEN 5% AND 15% FINES		GW-GM	Well-graded GRAVEL with silt
				GW-GC	Well-graded GRAVEL with clay
				GP-GM	Poorly graded GRAVEL with silt
				GP-GC	Poorly graded GRAVEL with clay
		GRAVEL WITH ≥ 15% FINES		GM	Silty GRAVEL
			GC	Clayey GRAVEL	
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH *5% FINES		SW	Well-graded SAND
				SP	Poorly graded SAND
		SAND WITH BETWEEN 5% AND 15% FINES		SW-SM	Well-graded SAND with silt
				SW-SC	Well-graded SAND with clay
				SP-SM	Poorly graded SAND with silt
				SP-SC	Poorly graded SAND with clay
SAND WITH ≥ 15% FINES			SM	Silty SAND	
		SC	Clayey SAND		
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	SILT AND CLAY	LIQUID LIMIT LESS THAN 50		ML	Inorganic SILT with low plasticity
				CL	Lean inorganic CLAY with low plasticity
				OL	Organic SILT with low plasticity
	LIQUID LIMIT GREATER THAN 50		MH	Elastic inorganic SILT with moderate to high plasticity	
			CH	Fat inorganic CLAY with moderate to high plasticity	
			OH	Organic SILT or CLAY with moderate to high plasticity	
HIGHLY ORGANIC SOILS			PT	PEAT soils with high organic contents	

NOTES:

- 1) Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.
- 2) Solid lines between soil descriptions indicate change in interpreted geologic unit. Dashed lines indicate stratigraphic change within the unit.
- 3) Fines are material passing the U.S. Std. #200 Sieve.

