REVISED REPORT OF
SUBSURFACE EXPLORATION, LABORATORY TESTING, AND GEOTECHNICAL ENGINEERING ANALYSES

NASA Flight Projects Building
Lanham, Prince George's County, Maryland

ECS Project No. 02-5707

Prepared For:

AECOM
3101 WILSON BLVD. SUITE 900
ARLINGTON, VIRGINIA 22201

February 14, 2012

ECS MID-ATLANTIC, LLC
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

February 14, 2012

Mr. David E. Nestleroth, AIA
AECOM
3101 Wilson Blvd.
Suite 900
Arlington, Virginia 22201

ECS Project No. 02-5707

Reference: Revised Report of Subsurface Exploration, Laboratory Testing and Geotechnical Engineering Analyses for **NASA Flight Projects Building**, Lanham, Prince George's County, Maryland

Dear Mr. Nestleroth:

ECS Mid-Atlantic, LLC (ECS) has completed the geotechnical investigation for the above-referenced project. This work was performed in accordance with our proposal No. 02-11316-P and cost estimate, dated September 2010. The following report contains our geotechnical-related evaluations and recommendations regarding the design and construction of the proposed NASA Flight Project building in Lanham, Maryland.

It has been our pleasure to be of service to AECOM on this project. We would appreciate the opportunity to continue our role as Geotechnical Engineer of Record during construction. If you have any questions with regard to the information contained in the enclosed report, or if we can be of further assistance to you during the planning or construction phases of the project, please contact us.

Most sincerely,

ECS Mid-Atlantic, LLC

Dawn M. Appelbaum, P.E.
Project Manager

Hasan M. Aboumatar, P.E.
Principal Engineer

STATE OF MARYLAND
HASAN M. ABOUMATAR
No. 29553
PROFESSIONAL ENGINEER

Professional Certification I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No *29553*. Expiration Date: *12/31/2013*

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Prepared For:

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3101 WILSON BLVD. SUITE 900
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February 14, 2012

NASA FLIGHT PROJECTS BUILDING

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NASA FLIGHT PROJECTS BUILDING

INTRODUCTION

Project Location

The project site is located at the NASA Goddard Flight Center campus in the Lanham area of Prince George's County, Maryland. A Site Location Map is provided in the Appendix.

Project Information and Site Description

The information pertaining to the site included a document titled "Flight Projects Building Statement of Work, Architect – Engineering Services", dated August 16, 2010, as well as a site plan, Sheet C-104 titled "Grading & Drainage Plan, Flight Projects Building", as prepared by AECOM and dated September 30, 2011. The provided plan depicted the existing site conditions, proposed development areas and the requested soil boring locations.

Based on the information provided to us, it is our understanding that the proposed development is to consist of a steel-framed, 4-story structure and associated parking areas and drive lanes. We understand that the building will be constructed at grade (i.e., will not contain a basement level). In addition, we understand that stormwater management (SWM) facilities are planned below the proposed parking areas and that infiltration is desirable for the planned SWM facilities.

The project site is currently developed with asphalt-covered surface parking lots adjacent to existing Building 012 and Building 023. Based on the provided plan, existing grades range from approximate EL 180 in the southwestern corner of the project site to approximate EL 200 in the northeastern corner of the site; however, within the planned building area site grades range from approximately EL 193 to EL 198. A sloped area exists along the eastern boundary of the site, where existing grades range from EL 197 to greater than EL 210. The provided site plan indicated a planned finished floor level of EL 195.0; therefore, we anticipate that minor cuts and fills will be required to establish planned grades.

Based on information provided from AECOM, we understand that maximum column loads for the proposed building will be on the order of 600 to 650 kips.

Scope of Services

In accordance with the scope of services included in our proposal, the subsurface exploration program consisted of drilling sixteen (16) soil test borings to depths of approximately 10 ft to 50 ft below existing site grades. The borings were designated as B-1 through B-16. Boring B-1 was performed to evaluate subsurface conditions for the construction of a future walkway and stairway; Borings B-2 through B-7 were performed to evaluate subsurface conditions for

the construction of the proposed Flight Projects Building; and Borings B-8 through B-16 were performed to evaluate subsurface conditions for the construction of proposed pavement areas and SWM facilities.

Sampling in the borings was performed using a split-barrel sampler and the Standard Penetration Test procedure in accordance with ASTM D1586. In addition, auger drilling and installation of 4-inch solid PVC pipe, for the purpose of performing field infiltration testing, was performed adjacent to Borings B-8 through B-16. Completed boreholes were backfilled with soils returned to ground surface on the auger flights.

After installing the pipes for infiltration testing, ECS field engineer returned to the site to soak the boreholes followed by field infiltration tests. The test consists of measuring the water level drop rate inside the PVC pipe for a period of 4-hours taking measurements every hour. Field infiltration testing was performed in borings adjacent to B-8 through B-16.

The scope of work also included visually classifying soil boring samples, performing laboratory testing on selected soil samples from the borings, performing various engineering analyses, and providing this written report of findings, evaluations and recommendations. The report contains the following information:

a) A general review of the project information;
b) A review of site and geologic conditions;
c) A review of the subsurface conditions encountered, including soil and groundwater conditions;
d) Recommendations for foundation types and design parameters, including allowable bearing pressures and estimates of foundation settlement;
e) Recommendations for ground-supported floor slab construction;
f) Recommendations for lateral earth pressure for below grade walls or site retaining walls, if needed;
g) Recommendations for general earthwork construction, including an evaluation of the suitability of the on-site materials for reuse as engineered fill;
h) Evaluation of subsurface conditions relative to Soil Site Classification for seismic design considerations;
i) Evaluations and recommendations for geotechnical aspects of design and construction for the SWM facilities; and
j) An Appendix, which includes a Site Location Map, a Boring Location Plan, Boring Logs, the results of laboratory testing, and reference sheets.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

All soil test borings were drilled with an ATV-mounted drill rig, using continuous-flight, hollow-stem augers to advance the boreholes. Drilling fluid was not used during advancement of the boreholes.

Representative soil samples were obtained by means of the Standard Penetration Test (SPT) and split-barrel sampling procedure, in general accordance with ASTM D 1586 standards. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the final 12-inch interval is termed the N-value, blow count, or SPT value, and is indicated for each sample on the boring logs.

N-values can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, N-values also provide an indication of consistency of cohesive soils. The indications are qualitative, since many factors can significantly affect N-values and prevent a direct correlation, including differences among drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. In addition, N-values from Standard Penetration Tests performed in fine-grained granular soils below groundwater levels sometimes can result in erroneous information regarding the in-situ conditions of those soils.

The Drill Crew maintained field logs of the soils encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of the soil samples were then sealed in glass jars and brought to ECS' laboratory for further visual examination and laboratory testing.

The soil borings were located in the field by ECS personnel using the site plans provided, referencing existing site features.

Laboratory Testing Program

The laboratory testing program included visual classification of the boring samples by an experienced Geotechnical Engineer. The classifications were based on texture and plasticity in accordance with the Unified Soil Classification System (USCS). A brief explanation of the USCS is included in the Appendix of this report. The USCS group symbol for each soil type is indicated in parentheses following the soil descriptions on the Boring Logs.

During the visual classification procedures, the Geotechnical Engineer grouped the various soil types into the major strata noted on the Boring Logs. The stratification lines designating the interfaces between various soil strata on the Boring Logs are approximate. In situ, these

transitions will likely be gradual and could occur at slightly different levels from those shown on the Boring Logs.

The soil samples will be retained in the ECS laboratory for a period of 60 days. After that holding period, the samples will be discarded, unless ECS receives other instructions regarding their disposition.

EXPLORATION RESULTS

Geologic Conditions

The project site is located within the Atlantic Coastal Plain Physiographic Province, which is characterized by river and marine sediments deposited during successive periods of fluctuating river and sea levels and moving shorelines. Generally, deposited sediments thicken from west to east, toward the Atlantic Ocean. The uppermost sediments are often comprised of interbedded gravels, sands, silts, and clays.

Based on the results of the test borings and a review of the *Geological Map of Prince Georges County* (1951) and other Maryland Geological Survey publications, the geology underlying the NASA Goddard Flight Center can be identified as unconsolidated sediments associated with the Potomac Group (i.e. Patapsco, Arundel and Patuxent Formations). The Potomac Group sediments in this portion of the County are generally comprised of fine to coarse-grained sands and gravels, which are locally interbedded with clayey sands, clayey silts and silty clays. Due to the depositional environment associated with this group, the sediments transition both horizontally and vertically over short distances and locally can be cemented with a variety of iron oxides (e.g. limonite). As a result of the Center's proximity to the "Fall Line" situated to the west, the boundary between the Atlantic Coastal Plain and Piedmont Provinces, the thickness of the sediments varies and they are subsequently underlain by residual soils and rock associated with the underlying crystalline bedrock. However in this portion of the County, the depth to rock is most likely in excess of 100+ feet.

Subsurface Conditions

The conditions at the ground surface encountered during our field exploration program consisted of 6 inches of topsoil or 3 to 4 inches of asphalt over 2 to 5 inches of gravel base.

Existing/possible fill was encountered below the surficial materials in Borings B-7, B-8, B-9, B-11, and B-13 and extended to depths ranging from 3 ft to 10 ft below existing grades. The existing/possible fill generally consisted of dense SAND (SM), soft to very stiff SILT (ML), stiff Sandy SILT (ML) and very stiff Silty CLAY (CL). No debris was observed in the existing/possible fill; however, a large root was encountered in Boring B-11 at a depth of 6 ft

below existing grade and trace amounts of wood were encountered in the Boring B-13 at a depth of approximately 5 ft below existing grade.

Natural soils were encountered below the asphalt and gravel, topsoil and existing/possible fill in all borings. The natural soils were generally gray, reddish gray, brown and orangish brown in color and consisted generally of SAND (SM, SC, SP), Silty SAND (SM), Clayey SAND (SC), SILT (ML), Sandy SILT (ML), CLAY (CL) and Silty CLAY (CL). N-values recorded in the natural granular soils were in the range of 9 blows per foot (bpf) to greater than 80 bpf, indicating firm to extremely dense relative densities. N-values recorded in the cohesive natural soils were noted to range from 4 bpf to greater than 50 bpf, indicating soft to very hard consistencies.

More detailed information regarding subsurface conditions at the site can be obtained through review of the Boring Logs in the Appendix.

Water Level Observations

Groundwater level observations were made in each of the boreholes, generally during the drilling operations and at completion of drilling operations, both before and after removal of the drilling augers. Based on these observations, groundwater was encountered during drilling operations in Borings B-2 through B-7 at depths ranging from approximately 8 ft to 13 ft below existing grades, or EL 180.4 to EL 186.0. Cave-in depths varied from 6.6 ft to 36.8 ft below existing surface grades at the boring locations.

Observations regarding the presence and absence of groundwater levels reflect the conditions at the time of this exploration only. Fluctuations in the locations of groundwater tables or perched water levels could occur as a result of seasonal variations in evaporation, precipitation, surface water run-off, and other factors. Therefore, water levels at future times could vary from those observed at the time of the borings.

ANALYSES AND RECOMMENDATIONS

Building Foundations

Based on the provided site grading information, we anticipate that footing subgrades will be at approximately EL 192.0. Based on the test boring results, we anticipate that the footing subgrades will consist of natural soils or select engineered fill material over natural soils.

Based on our understanding of the proposed construction and the results of the subsurface exploration, the proposed building can be supported on conventional footings placed on suitable natural soils or select fill material placed on suitable natural soils. ECS recommends that footings for the proposed building be designed utilizing a net allowable soil bearing pressure not to exceed 4,000 pounds per square foot (psf). The net allowable soil bearing

pressure refers to the pressure that can be transmitted to the foundation bearing soils in excess of the final overburden pressure at the base of a footing.

For the indicated maximum design bearing pressure, it is estimated that total settlement should not exceed 1 inch and that maximum differential settlements should not exceed ½ inch over a horizontal distance of 30 ft. Such settlements generally would be expected to be tolerable by the proposed structure. If such settlements are not tolerable, the Geotechnical Engineer should be advised.

Prior to the placement of reinforcement and concrete for footings, the bases of the footing excavations should be observed, tested, and approved by a qualified representative of the Geotechnical Engineer to verify that soil conditions at each footing location are suitable for the design bearing pressure. If unsuitable soils are encountered at planned subgrade levels for any footing, the unsuitable soils should be undercut to suitable bearing materials. The footing can be directly supported on competent soils at greater depths or, alternatively, the design footing bearing level can be restored through placement of lean (2,000 psi) concrete, flowable fill (200 psi), or select engineered fill materials. If lean concrete or flowable fill is to be used to restore foundation bearing levels, the undercut excavations can be made “neat” with the dimension of the footing. If the design bearing level is restored using select engineered fill, however, then the excavation to remove the unsuitable soils should extend at least 0.5 foot laterally beyond the bottom edge of the footing for each 1 foot of vertical undercut below the footing bearing level. The engineered fill materials should be placed and compacted as discussed in greater detail in a later report section.

In order to reduce the possibility of excessive settlement due to local shear or "punching" action, we recommend that column footings have a minimum lateral dimension of 2.5 feet and continuous wall footings should have a minimum width of 1.5 feet. In addition, footings should be placed at sufficient depths to provide adequate protection against frost heave. It is recommended that exterior footings or footings in unheated areas should be placed at minimum depths of 30 inches below finished exterior grades for frost protection. Interior footings in heated areas can be located at minimum depths of 18 inches below finished floor grades, provided that architectural and structural considerations are also satisfied. However, if interior footings in future heated areas are constructed at levels less than 30 inches below surface grades and subsequently are subjected to freezing temperatures, there is a possibility for frost heave of those footings to occur. Therefore, the Contractor should take adequate precautions to maintain temperatures above freezing around any shallow interior footings prior to enclosure and heating of the building.

All load-bearing wall foundations should be suitably reinforced with continuous longitudinal steel. To provide continuity and to minimize the effects of differential movements, the foundations should be constructed as continuous units to the greatest extent possible. Where top and bottom steel is provided in continuous wall foundations, a minimum footing thickness of 12 inches should be provided.

Ground-Supported Floor Slabs

Building floor slabs and exterior concrete slabs may be ground-supported on subgrades prepared in accordance with the recommendations in the sections entitled Subgrade Preparation and Fill Placement. It is important that the slab subgrade be firm and stable before the placement of the granular subbase materials, the moisture barrier, and the concrete. The subgrade should be thoroughly proofrolled with suitable equipment and/or probed by a qualified representative of the Geotechnical Engineer in an effort to detect unstable or otherwise unacceptable soil conditions. Proofrolling should be concentrated in those areas where any wall and utility backfill have been placed. Soils in any excessively unstable areas should be undercut and replaced with new engineered fill. Recommendations for construction of engineered fill are presented in the Fill Placement section of this report.

It is recommended that ground-supported slabs be underlain by a minimum of 4 inches of MSHA No. 57 graded coarse aggregate, CR-6 or GA S/B dense-graded aggregate or approved equivalents. Acceptable granular subbase materials should have no aggregate size greater than 1.5 inches, 95 to 100 percent passing the 1 inch sieve, and less than 12 percent by total weight passing the Number 200 sieve. The granular subbase materials will provide a capillary break between the subgrade and the concrete slab, a higher modulus of subgrade reaction, and more uniform support conditions. All granular materials should be compacted; however, if the granular subbase materials have more than 5 percent fines, those materials should be compacted to a minimum of 98 percent of the maximum dry density as determined by the Standard Proctor compaction test method (ASTM D 698). For structural design purposes, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) may be utilized for the structural design of slabs, provided a 4-inch subbase is utilized and the subgrade has been prepared in accordance with the recommendations presented herein.

In the event there is a significant time lag between the site grading work and the fine grading of concrete slab areas prior to the placement of the subbase stone or concrete, the Geotechnical Engineer should verify the condition of the prepared subgrade. Prior to final slab construction, the subgrade may require scarification and re-compaction to provide firm and stable conditions.

Where moisture vapor seepage through concrete slab is a concern, a moisture vapor barrier, consisting of at least 8 mil polyethylene sheets, should be placed on top of the granular materials before the placement of the concrete. However, with the use of a moisture vapor barrier, special attention should be given to the surface curing of the slab in order to minimize uneven drying of the slab and any associated cracking and curling.

It is recommended that ground-supported slabs be isolated from the foundation footings so that differential movement between the footings and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free floating slab, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab. Slabs must also be provided with proper control joints to minimize the effects of concrete shrinkage and differential settlements. To minimize the widths of any shrinkage cracks that may develop near the surface of the slab, it is

recommended that welded-wire mesh reinforcement be provided. The welded-wire mesh should be in located the top half of the slab to be effective.

Lateral Earth Pressures for Below-Grade Building Walls and Site Retaining Walls

Based upon our understanding of the proposed construction, below-grade walls and site retaining walls are not anticipated. However, the following recommendations are provided to guide the general design of below-grade building walls and site retaining walls for lateral earth pressures, should such designs become necessary.

It is very important with regard to construction of below-grade building walls and site retaining walls that soils within the critical zones behind the walls meet certain criteria with regard to soil type. The critical zone can be considered as the zone between the bottom back edge of the wall footing or the reinforced zone for mechanically stabilized earth (MSE) retaining walls and an imaginary line extending upward and rearward from the bottom back edge of the wall footing at a 45-degree angle.

It is recommended that all natural soils and backfill soils within the critical zones of basement walls should have USCS classifications of Silty Sand (SM) or more granular. Any soils having classifications less granular than Silty Sand (SM) may need to be removed from the critical zones of the walls, as determined by the Geotechnical Engineer at the time of construction. Based upon the results of the borings and anticipated laboratory results, it would appear that most of the soils at the site should be suitable to remain in-place for use as wall backfill.

Backfill materials for below-grade walls and site retaining walls should be placed and compacted in accordance with criteria outlined in the **Earthwork** section of this report. The minimum degree of compaction for backfill soils behind below-grade building walls and conventional retaining walls should be 95 percent of the Standard Proctor maximum dry density (ASTM D 698), unless otherwise approved by the Geotechnical Engineer.

It is important that below-grade building walls that generally are designed for minimal displacements at the top of the wall should not be backfilled until the walls are adequately braced by permanent structural framing. Conversely, walls that are designed for active earth pressures generally should not be braced during backfill compaction, so that the walls can yield and rotate and develop active earth pressures. For yielding walls, it generally will be best not to place steel framing, or conventional masonry or concrete walls for the buildings, until wall backfilling operations have been completed.

Below-grade building walls and other retaining walls that are rigid and not free to rotate at the top should be designed for at-rest earth pressure conditions. Based on consideration of at-rest earth pressure conditions and typical properties for Silty SAND (SM) or more granular soil types, it is recommended that equivalent fluid pressures on walls from the retained soils be calculated as 60H, in units of pounds per square foot, where H is the height of the wall retaining soils in units of feet.

Site retaining walls that are flexible and free to rotate at the top can be designed for active earth pressure conditions. Based on consideration of active earth pressures and typical properties for Silty SAND (SM) or more granular soil types, it is recommended that equivalent fluid pressures on walls from retained soils be calculated as 40H, in units of pounds per square foot, where H is the height of the wall retaining soils in units of feet.

The design criteria presented above for evaluation of horizontal earth pressures on retaining walls are based on the assumption of level backfill conditions and the absence of free water within the wall backfill materials. Lateral pressures induced by sloping backfills and/or by any surcharge loadings adjacent to walls will also need to be considered in the wall designs. In addition, suitable drainage will need to be provided to intercept and to dispose of any surface infiltration and groundwater behind walls.

Sliding resistance for retaining wall footings can be computed using a coefficient of friction of 0.36 for granular soils and 0.30 for silty and clayey soils. Additional resistance to sliding from passive earth pressure resistance also can be considered, if the earth materials considered for passive resistance will remain in place on the low side of the retaining wall. Equivalent fluid pressures for passive earth pressure resistance can be computed as 250D, in units of pounds per square foot, where D is the depth of undisturbed natural soil or engineered fill that will remain in place above the base of the wall footing. Because the frictional and passive earth pressure resistances are based on limit strength conditions, appropriate factors of safety of at least 1.5 should be applied to the designs considering these resistances.

The Geotechnical Engineer can provide additional design guidance regarding these and other aspects of below-grade wall and retaining wall design upon request.

Soil Seismic Site Classification

Table 1613.5.2 in the 2006 IBC presents Site Class Definitions based on various criteria, one of which is the Standard Penetration Resistance, N_{bar}, derived from the Standard Penetration Test Procedure (ASTM D-1586). The table provides correlations for Site Classes C, D, and E with various ranges of N_{bar} to be calculated for the top 100 feet of the subsurface materials at a site in accordance with procedures described in Section 1613.5.5 of the 2006 IBC. In addition, the table presents criteria related to various soil properties for Site Classes E and F. ECS has used Table 1613.5.2 and the procedures outlined in Section 1613.5.5.1 to evaluate the Site Class for this project site.

Based on our review of the soil test boring results and our experience with the site geology, it is our opinion that the average N_{bar} value should be in the range of 15 to 50 blows per foot over a depth of 100 ft. This N_{bar} places the project site within the Site Classification of D, according to Table 1613.5.2 of the 2006 IBC.

Stormwater Management (SWM) Facilities

Based on the provided information, management of stormwater will be necessary for the project. Specific details regarding the planned SWM facilities were not provided at the time this report was prepared; however, we understand that infiltration practices are desirable for the planned facilities. Proposed facility bottom elevations anticipated to be less than 10 ft below existing grades within planned parking areas.

As noted in the **Water Level Observations** section of this report, groundwater was not encountered in Borings B-8 through B-16, which were drilled to depths of 10 ft below existing grades, or EL 171 to EL 186.

Field infiltration tests were performed in offset borings of B-8 through B-16. Generally, field infiltration tests were performed at depths of 5 ft below existing grades at each boring location. Based on the soil test boring results and field infiltration test results, infiltration may be feasible in the vicinity of Boring B-16. An infiltration rate of 1.0 inches/hour was measured during the field infiltration test. Water did not infiltrate in Borings B-8 through B-15, likely due to the fine-grained soils at the infiltration test depths. It does not appear that infiltration practices will be feasible in the areas of Borings B-8 through B-15.

Pavement Construction

Details regarding traffic conditions anticipated for the site were not provided. However, based on previous experience, it is ECS' opinion that two pavement sections generally should be considered for use – a light-duty pavement section for areas that will be subjected primarily to automobile and light-truck traffic and a medium-duty pavement section for areas that will be subjected to some routine heavier truck traffic, in addition to normal automobile and light-truck traffic. It is our judgment that traffic conditions associated with standard-duty pavements can be represented by approximately 15,000 18-kip equivalent single-axle loads (ESALs) during an approximately 20-year service life, while traffic conditions associated with medium-duty pavements can be represented by approximately 75,000 ESALs during an approximately 20-year service life.

It is ECS' opinion that use of the light-duty pavement section and the medium-duty pavement section most likely will be sufficient for traffic conditions likely to occur at the development. However, traffic loading conditions are an extremely important parameter with regard to pavement design. Therefore, if the traffic condition estimates provided above are considered to be inappropriate for the project, please advise ECS so that revised pavement section designs can be determined for the final geotechnical report for this site. Final decisions regarding pavement sections can be made as project design progresses, when further input regarding likely traffic conditions can be provided by other Design Team members.

Subgrade support conditions are the other major parameter of importance to pavement design and performance. Proposed pavement grades were not known at the time this report was prepared; however, we anticipate that only minor cuts and fills will be required to establish final

grades. It is anticipated that the subgrade soil conditions exposed at final subgrade levels when the project site is graded prior to pavement construction will generally consist of fine-grained soils having USCS classifications of ML or CL or new engineered fill constructed over approved natural soils. Where existing/possible fill is encountered at pavement subgrades, it is recommended to heavily proofroll the subgrade to identify any soft or yielding areas. If unstable conditions are encountered during the proofroll, it is recommended to undercut the top 12 inches of any encountered existing/possible fill at the pavement subgrade and replace it with approved fill material.

Based upon our previous experience with similar projects and site conditions, it is our judgment that the typical pavement subgrade soils such as the soils encountered at the site could exhibit a minimum California Bearing Ratio (CBR) value of 3 when compacted to at least 95 percent of the maximum dry density, as determined by the Standard Proctor test (ASTM D 698). Therefore, for pavement design a CBR value of 3 is considered.

The pavement sections provided in this report (for budgeting purposes) have been designed based on methodology from the American Association of State Highway and Transportation Officials' (AASHTO) *Guide for Design of Pavement Structures*, 1993. Summarized below are the subgrade strength parameters, the traffic conditions, and other design parameters and criteria considered in these analyses.

CBR value:	3
Traffic for Light-Duty Pavement:	15,000 ESALs
Traffic for Medium-Duty Pavement:	75,000 ESALs
Reliability:	85 percent
Overall Variance:	0.45
Initial Serviceability:	4.2
Terminal Serviceability:	2.0

Using the above-indicated design parameters, we have estimated pavement section designs as shown in the following table.

Pavement Material	Compacted Material Thicknesses (Inches)*	
	Light-Duty (15,000 ESALs)	Medium-Duty (75,000 ESALs)
Surface Course Asphalt		
HMA SuperPave - 9.5 mm **	1.5	1.5
Base Course Asphalt		
HMA SuperPave – 12.5 mm **	2.0	2.5
Graded Aggregate Base		
GAB	4.0	7.0
Total Pavement Thickness	7.5	11.0
* Compaction: Level 1 (50 Gyrations)		
** Binder Type: PG64-22		

Final determinations of pavement sections to be used at the site may not be possible until the time of actual construction, depending on the sequence of grading and availability of materials, when the subgrade soil conditions become exposed in the various site areas. For planning and pricing considerations, however, it is anticipated that the pavement sections shown for a CBR value of 3 should provide a reasonable estimate of the average pavement sections that will be needed for the site.

The standard-duty pavement section shown in the table above should only be considered for use in areas where traffic will consist primarily of automobiles and light trucks and where any regular use by heavier trucks will be prohibited, such as proposed parking lot areas. The medium-duty pavement section shown in the table above should be considered for the main site entrances and main service drives that may experience some use by heavier vehicles.

It is ECS' opinion that the suggested medium-density flexible pavement section would not be suitable for the support of heavy, concentrated wheel loads. Therefore, we recommend that rigid Portland cement concrete pavement sections should be provided for any dumpster storage areas and for any unloading zones for deliveries. The Portland cement concrete pavement section should be at least 6 inches thick and should consist of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). A minimum of 4 inches of compacted dense-graded aggregate subbase (CR-6 or GASB) should be placed beneath all rigid concrete pavements. For any dumpster storage areas, the Portland cement concrete slab area should be large enough to support the dumpster and at least the front wheels of the truck used to unload the dumpster.

The State of Maryland is now using pavement materials whose characteristics are based on the new SuperPave material specifications. We have provided specifications for Superpave materials in the tables above. Please note that it is important to specify the Compaction Level and the Binder Type for SuperPave materials.

All pavement materials and construction should be in accordance with the most current version of the *Standard Specifications for Construction and Materials* of the Maryland Department of Transportation, State Highway Administration (SHA), and any applicable Prince George's County standards.

The pavement sections provided in the tables above were developed for the anticipated in-service traffic conditions only and do not provide an allowance for construction traffic conditions. Therefore, if pavements will be constructed early during site development to accommodate construction traffic, consideration must be given to the construction of heavier pavement sections, capable of accommodating the much heavier loads normally associated with construction traffic, as well as the future in-service traffic. ECS can provide additional design assistance with regard to pavements during the final geotechnical study.

Earthwork Operations

The following paragraphs detail our recommendations regarding subgrade preparation and compaction requirements.

Subgrade Preparation

Subgrade preparation should generally include the stripping any unsuitable surface materials, including topsoil and asphalt, from the planned structure areas. Caution should be taken when stripping unsuitable materials so as to not mix these materials with otherwise suitable subgrade soils. It is recommended that the stripping of unsuitable surficial materials should extend to a minimum of 5 feet beyond building area limits where feasible. Subsequent to stripping operations, the exposed subgrade soils in the planned structure areas should be examined by a qualified representative of the Geotechnical Engineer. The exposed soils should be thoroughly proofrolled by a vehicle having an axle weight of at least 10 tons, such as a fully-loaded tandem-axle dump truck. This procedure is intended to assist in identifying any localized loose or unstable materials. In the event that any unstable materials are encountered during the proofrolling operations, those subgrade soils should either be thoroughly densified in-place, or undercut to firm ground and replaced with controlled, compacted fill to final subgrade elevations.

Fill Placement

Prior to placement of compacted fill, representative bulk samples (about 50 pounds) should be taken of the proposed fill soils and laboratory tests should be conducted to determine Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. These test results will be necessary for proper control of construction for new engineered fill.

Upon achieving competent subgrade conditions, the Contractor can place and compact engineered fill to reach final subgrade levels. In general, any materials to be used as structural fill should consist of soil types classified as CL, ML, SM, or more granular, in accordance with ASTM D 2487, and should have a Liquid Limit less than 40 and a Plasticity Index less than 20. Footing undercuts should be backfilled with select fill material, such as CR-6 or RC-6 material, compacted to at least 95 percent of the maximum dry density, as determined by the Modified Proctor Compaction Test (ASTM D 1557). Materials used as backfill behind below-grade walls or retaining walls should have classifications of SM with no more than 30 percent passing the Number 200 sieve or more granular, in accordance with ASTM D 2487.

Finer-grained, more plastic, and organic soil types (CH, MH, OL, OH and Pt), if encountered at the site, may be used as fill materials in landscape areas. Any such materials encountered during grading operations should be either stockpiled for later use in landscape fills, or should be placed in approved disposal areas either on-site or off-site. Prior to the utilization of any on-site or off-site borrow materials, the Geotechnical Engineer should be provided with representative samples in order to determine the suitability of the materials for use as a controlled compacted fill and to develop moisture-density relationships. In order to expedite the earthwork operations, it is recommended that any off-site borrow materials generally should comprise of SM or more granular soil types.

All fill should be placed in loose lifts, which do not exceed 8 inches in thickness, and should be compacted to at least 95 percent of the maximum dry density, as determined by the Standard Proctor Compaction Test (ASTM D 698). Generally, the moisture content of the fill material should be maintained within ± 2 percentage points of the optimum moisture content for the fill material, as determined by ASTM D 698. Fill placed in non-structural areas should be compacted to at least 90 percent of the maximum dry density according to ASTM D 698, in order to avoid significant subsidence.

Due to the textural variations of the on-site soils, variations in moisture-density relationships should be anticipated. Such variations must be determined in the field by a qualified representative of the Geotechnical Engineer at the time of construction, so that any necessary changes to fill placement and compaction procedures can be implemented.

The footprint of the proposed building area should be well defined, including the limits of the fill zones at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of the Geotechnical Engineer to determine that minimum compaction requirements are being achieved. A minimum of one compaction test per lift should be made per 2,500 square feet of fill lift area, but not fewer than two tests per lift should be made for any lift. The elevations and locations of the field density tests should be clearly identified at the time of fill placement and compaction.

Compaction equipment suitable for the soil types being used as fill should be selected to compact the fill. Theoretically, any equipment type can be used, so long as the required density is achieved. Ideally, a steel drum roller generally will be the most efficient for

compaction of granular soil types and for sealing the surface soils, while a sheepsfoot roller or pneumatic-tire roller generally will be most efficient for compaction of cohesive soil types.

At the end of each work day, all fill areas should be graded to facilitate surface drainage of any surface runoff associated with precipitation, and should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor should scarify existing subgrade soils so that a weak plane will not be formed between the new fill and the existing subgrade soils. We recommend that subgrade soils should be scarified to depths of about 4 inches prior to placement of new fill.

Fill materials should not be placed on frozen soils, frost-heaved soils, and/or excessively wet soils. All frozen, frost-heaved, or excessively wet soils should be removed prior to continuation of fill operations. Borrow fill materials should not contain frozen materials at the time of placement. All frozen, frost-heaved, or excavated wet soils should be removed prior to placement of controlled, compacted fill. Moisture contents for excessively wet soils will need to be lowered to the range limits previously discussed.

If any problems are encountered during the earthwork operations, or if site conditions deviate from those indicated by the borings, the Geotechnical Engineer should be notified immediately.

Construction Considerations

The near surface on-site soils will be sensitive to moisture and disturbance. Construction activities in the presence of excess moisture can lead to softening of the subgrade soils and loss of bearing capacity. Therefore, it will be prudent to schedule earthwork operations during the warmer and drier seasons that typically extend from late spring to early fall. Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas.

A firm work surface should be established prior to construction of new fills. Also, the moisture contents of the fill soils at the time of placement should be carefully controlled. These measures are necessary to ensure that the required compaction effort can be achieved without excessive pumping or movement of the fill mass.

As noted in the **Water Level Observations** section of this report, groundwater was encountered in all of the borings within the planned building area at depths ranging from approximately at depths ranging from approximately 8 ft to 13 ft below existing grades, or EL 180.4 to EL 186.0, at the time of the subsurface exploration. Groundwater is not anticipated to affect construction operations; however, if perched water is encountered, it should be readily managed by interceptor trenches and localized systems of sumps and pumps.

Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped at a grade of 1 to 2 percent to reduce the potential of ponding water and the subsequent saturation of the surface

soils. At the end of each work day, the subgrade should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

The surface soils will be erodible. Therefore, the contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation shall be controlled in accordance with sound engineering practices and current local requirements.

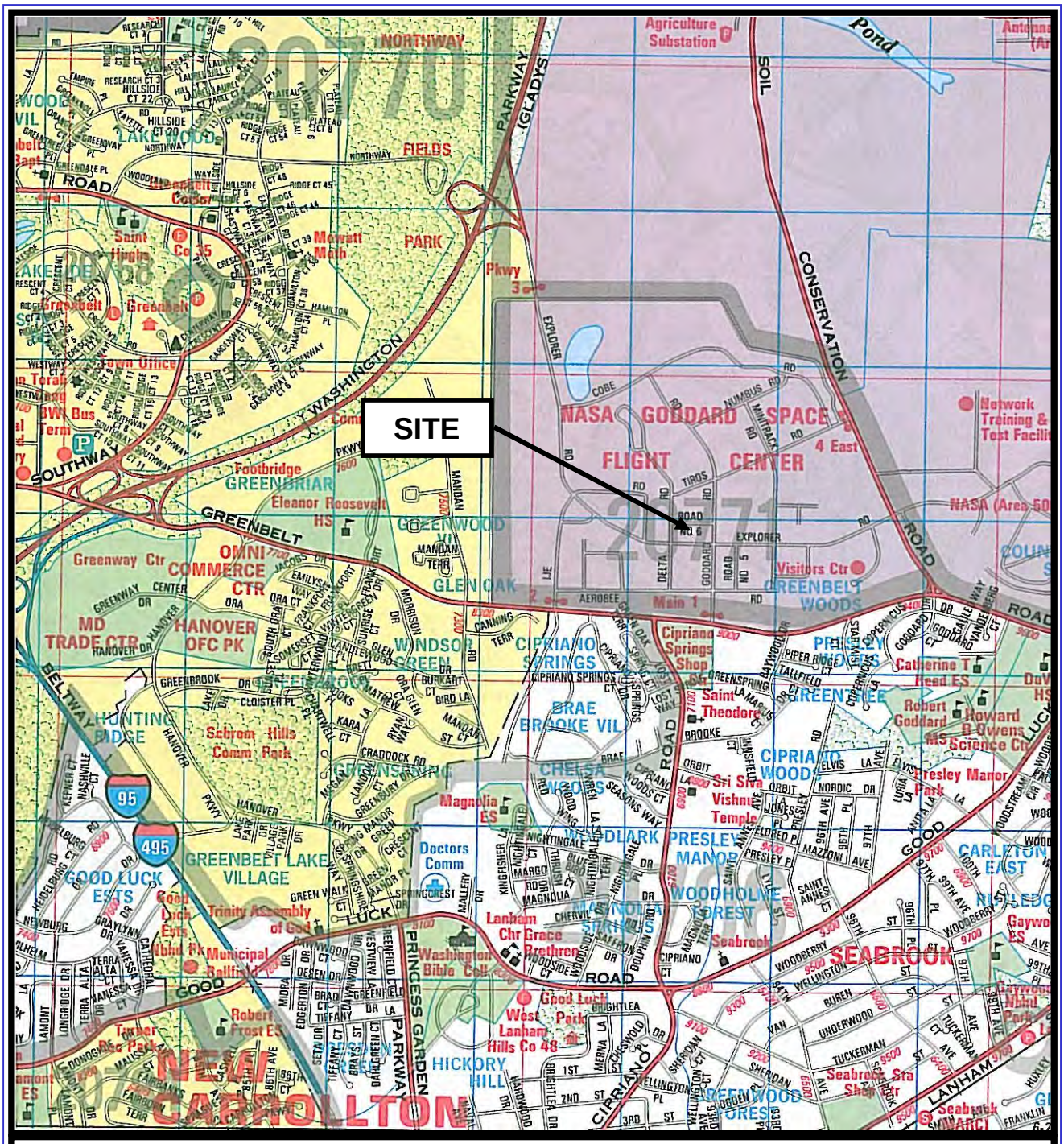
CLOSING

This report has been prepared to provide the Owner and the Design Team with subsurface information and evaluations and recommendations to guide geotechnical-related design and construction for development of the proposed Flight Projects Building.

The evaluations and recommendations presented in this report are, of necessity, based on the information made available to us at the time of the actual writing of the report and the site conditions, surface and subsurface, that existed at the time the exploratory borings were drilled. If there are significant changes to the proposed construction from those previously discussed, ECS may need to review the changes to determine whether the evaluations and recommendations of this report will remain valid. ECS should be provided with appropriate plans and other information as project design progresses, so that we can review the information and provide additional geotechnical guidance, as needed. The Geotechnical Engineer should be retained to prepare, or at least to review, any earthwork specifications to assure that the recommendations of this report have been properly interpreted and included in the construction documents.

APPENDIX

- **Site Location Map**
- **Unified Soil Classification System**
- **Reference Notes for Boring Logs**
- **Boring Logs (B-1 through B-16)**
- **Boring Location Plan**



Source: ADC Map of Prince George's County, Maryland, dated 1999

Scale: NTS

NORTH

NASA Flight Projects Building

Lanham, Prince George's County, Maryland

ECS LLC MID-ATLANTIC

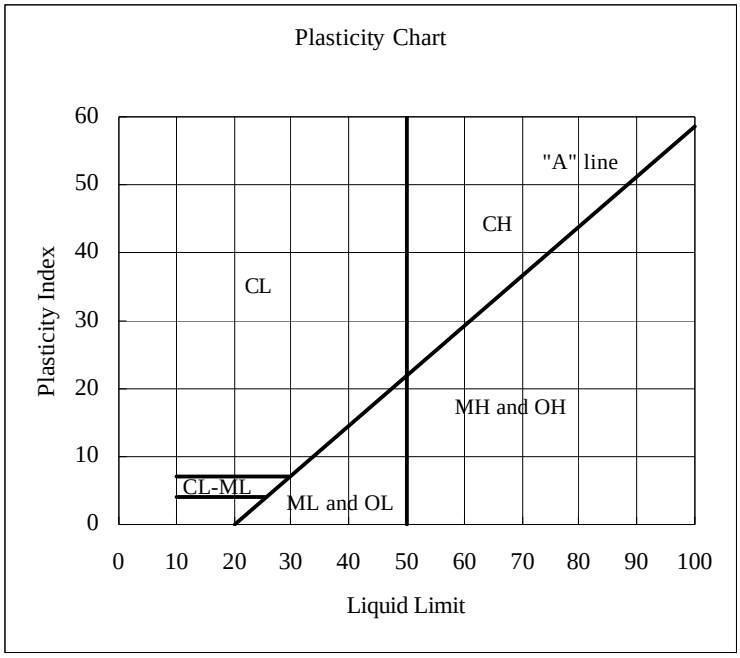
Site Location Map

ECS Project 02-5707

February 2012

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

Major Divisions			Group Symbols		Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 Sieve size)	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	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols[b]	$C_u = D_{60}/D_{10}$ greater than 4 $C_c = (D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or P.I. less than 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		$C_u = D_{60}/D_{10}$ greater than 6 $C_c = (D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in CL-ML zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 Sieve)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			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 greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly Organic soils		Pt		Peat and other highly organic soils			



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC,well-graded gravel-sand mixture with clay binder. (From Table 2.16 - Winterkorn and Fang, 1975)

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols:

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HAS	Hollow Stem Auger	WS	Wash Sample

II. Correlation of Penetration Resistances to Soil Properties:

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. Hammer falling 30 inches on a 2-inch OD split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 3 blows/ft.	Very Loose	Adjective Form	36% to 49%
4 to 6 blows/ft.	Loose	With	21% to 35%
7 to 10 blows/ft.	Firm	Some	11% to 20%
11 to 30 blows/ft.	Medium Dense	Trace	1% to 10%
31 to 50 blows/ft.	Dense		
51 to 80 blows/ft.	Very Dense		
Over 80 blows/ft.	Extremely Dense		

Particle Size Identification

Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00mm (dia. of broom straw)
	Fine	0.074 to 0.42mm (dia. of human hair)
Silt and Clay		0 .0 to 0.074mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/Ft	*Consistency*	*Unconfined Comp. Strength Q_P(tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 4	Very Soft	Under 0.25	None to Slight	0 - 4
4 to 5	Soft	0.25-0.49	Slight	5 – 7
6 to 10	Med. Stiff	0.50-0.99	Medium	8- 22
11 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00-8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	AB	Before Casing Removal
WS	While Sampling	AC	After Casing Removal
WD	While Drilling		

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-1	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 209

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 6"			
	1	SS	18	9	SILT, Some Sand, Trace Roots, Tan, Moist, Very Stiff to Very Hard, (ML)			19 (5-9-10)
	2	SS	18	12			205	(8-31-48) 79
5					SILT, With Sand, Orangish Tan, Moist, Hard, (ML)			
	3	SS	18	16				(17-19-25) 44
	4	SS	18	12			200	(15-27-23) 50
10								
	5	SS	18	12	SAND, Trace Silt, Tan, Moist, Medium Dense, (SP)		195	17 (6-7-10)
15								
					SAND, Some Silt, Trace Gravel, Orangish Brown, Moist, Dense, (SM)			
	6	SS	18	7			190	(21-26-22) 48
20								
	7	SS	18	16	Clayey SAND, Orangish Brown, Moist, Medium Dense, (SC)		185	12 (4-6-6)
25								
					SILT, With Sand, Trace Clay, Light Gray, Orangish Tan, Moist, Stiff, (ML)			
	8	SS	18	12			180	13 (5-6-7)
30								

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL DRY (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) DRY	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 27.8'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-1	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 209

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					SILT, With Sand, Trace Clay, Light Gray, Orangish Tan, Moist, Stiff, (ML)			
	9	SS	18	12			175	12 (4-6-6)
35					END OF BORING @ 35.0'			
							170	
40								
							165	
45								
							160	
50								
							155	
55								
							150	
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 27.8'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-2	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 195

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"			
	1	SS	18	12	Gravel Depth 3"			13 (6-6-7)
					Silty SAND, Grayish Brown, Moist, Medium Dense, (SM)			
	2	SS	18	12				24 (7-9-15)
5					SAND, Some Silt, Orangish Tan, Moist, Medium Dense, (SM)		190	
	3	SS	18	16				17 (8-8-9)
					SAND, With Silt, Trace Clay, Orangish Brown, Moist, Dense, (SM)			
	4	SS	18	16				(16-16-18) 34
10							185	
					Silty CLAY, Reddish Gray, Moist, Stiff to Very Stiff, (CL)			
	5	SS	18	12				15 (4-6-9)
15							180	
	6	SS	18	16				18 (6-9-9)
20							175	
					Sandy SILT, Gray, Moist, Very Stiff, (ML)			
	7	SS	18	18				20 (6-8-12)
25							170	
					Silty CLAY, Purplish/Reddish Gray, Moist, Very Stiff, (CL)			
	8	SS	18	16				19 (8-9-10)
30								

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 13.00 (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 12.67	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 24.1'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-2	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 195

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					Silty CLAY, Purplish/Reddish Gray, Moist, Very Stiff, (CL)			
	9	SS	18	12				19 (9-9-10)
35					END OF BORING @ 35.0'		160	
40							155	
45							150	
50							145	
55							140	
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 13.00 (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 12.67	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 24.1'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-3	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 193

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"		
	1	SS	18	8	Gravel Depth 5"		13 (5-6-7)
					SAND, Some Silt, Orangish Tan, Moist, Medium Dense, (SM)	190	
	2	SS	18	10			12 (4-6-6)
5					Silty CLAY, Gray, Moist, Hard, (CL)		
	3	SS	18	10			(10-17-18) 35
					SAND, Some Clay, Orangish Brown, Moist, Medium Dense, (SC)	185	
	4	SS	18	16			20 (8-10-10)
10							
					Clayey SAND, Reddish Brown, Wet, Medium Dense, (SC)	180	
	5	SS	18	16			16 (5-6-10)
15							
					Silty CLAY, Dark Reddish Gray, Purplish Tan, Moist, Stiff to Very Stiff, (CL)	175	
	6	SS	18	16			18 (6-9-9)
20							
						170	
	7	SS	18	6			12 (5-6-6)
25							
						165	
	8	SS	18	16			27 (6-10-17)
30							

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 11.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 12.58	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 36.8'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-3	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— (20%, 40%, 60%, 80%, 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 193

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					Silty CLAY, Dark Reddish Gray, Purplish Tan, Moist, Stiff to Very Stiff, (CL)		
					SILT, With Sand, Gray, Moist, Very Hard, (ML)	160	
	9	SS	18	18			(30-34-39) 73
35							
					Silty CLAY, Reddish Gray, Moist, Hard to Very Hard, (CL)	155	
	10	SS	18	12			(10-18-28) 46
40							
						150	
	11	SS	18	16			(12-22-32) 54
45							
						145	
	12	SS	17	17			(18-38-50/5) 88/11
50					END OF BORING @ 49.9'		
						140	
55							
						135	
60							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 11.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 12.58	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 36.8'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-4	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 195

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"		
	1	SS	18	12	Gravel Depth 5"		17 (4-11-6)
					SILT, Some Sand, Brown, Moist, Stiff to Very Stiff, (ML)		
	2	SS	18	16			13 (5-6-7)
5						190	
					SAND, With Silt, Reddish Brown, Moist to Wet, Medium Dense, (SM)		
	3	SS	18	12			12 (4-6-6)
	4	SS	18	16			17 (5-9-8)
10						185	
					Silty CLAY, Gray, Moist, Stiff, (CL)		
	5	SS	18	16			15 (5-6-9)
15						180	
					CLAY, Some Silt, Trace Gravel, Brown, Moist, Very Stiff, (CL)		
	6	SS	18	5			16 (4-6-10)
20						175	
	7	SS	18	9			24 (6-10-14)
25						170	
					Silty CLAY, Reddish Brown, Moist, Very Stiff, (CL)		
	8	SS	18	12			21 (9-10-11)
30							

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 8.00 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 9.08	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 25.3'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-4	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 195

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					Silty CLAY, Reddish Brown, Moist, Very Stiff, (CL)			
	9	SS	18	16				26 (9-12-14)
35					END OF BORING @ 35.0'		160	
40							155	
45							150	
50							145	
55							140	
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 8.00 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 9.08	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 25.3'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-5	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 198

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"			
	1	SS	18	12	Gravel Depth 4"			14 (6-8-6)
					Silty SAND, Yellowish Orange, Moist, Medium Dense, (SM)		195	
	2	SS	18	16				11 (6-5-6)
5					SAND, With Silt, Yellowish/Reddish Brown, Moist, Medium Dense, (SM)			
	3	SS	18	16				23 (8-9-14)
							190	
	4	SS	18	10				13 (7-7-6)
10								
					Silty CLAY, Trace Gravel, Reddish Brown, Moist, Medium Stiff, (CL)	▽	185	
	5	SS	18	12				7 (9-3-4)
15								
					SILT, Some Clay, Some Sand, Gray, Moist, Very Stiff, (ML)		180	
	6	SS	18	10				16 (6-7-9)
20								
					Silty CLAY, Gray, Moist, Stiff to Very Stiff, (CL)		175	
	7	SS	18	16				14 (5-7-7)
25								
							170	
	8	SS	18	18				20 (6-9-11)
30								

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 12.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 13.08	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 22.4'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-5	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 198

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					Silty CLAY, Gray, Moist, Stiff to Very Stiff, (CL)		165	
	9	SS	18	16				29 (11-13-16)
35					END OF BORING @ 35.0'		160	
40							155	
45							150	
50							145	
55							140	
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 12.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) 13.08	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 22.4'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-6	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 194

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"			
	1	SS	18	12	Gravel Depth 2"			13 (5-6-7)
					SILT, Some Sand, Trace Clay, Light Gray, Moist, Stiff, (ML)			
	2	SS	18	8	SAND, Trace Silt, Reddish/Orangish Brown, Moist, Firm to Medium Dense, (SP)		190	12 (6-5-7)
5	3	SS	18	7				9 (3-4-5)
	4	SS	18	10	SAND, Some Clay, Reddish Brown, Moist, Firm, (SC)		185	10 (4-4-6)
10						▼		
	5	SS	18	16	SAND, With Clay, Trace Gravel, Orangish Tan/Brown, Moist to Wet, Medium Dense, (SC)		180	18 (7-9-9)
15								
	6	SS	18	10			175	13 (5-7-6)
20								
					SAND, Some Clay, Orangish Brown, Wet, Dense, (SC)			
	7	SS	18	12			170	(14-17-16) 33
25								
					SILT, With Sand, Light Gray, Moist, Hard, (ML)			
	8	SS	18	16			165	(13-15-19) 34
30								

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 12.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 11.75	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 22.8'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-6	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 194

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					SILT, With Sand, Light Gray, Moist, Hard, (ML)			
					Silty CLAY, Reddish/Purplish Gray, Moist, Hard, (CL)			
	9	SS	18	16			160	(13-15-25) 40
35					END OF BORING @ 35.0'			
							155	
40								
							150	
45								
							145	
50								
							140	
55								
							135	
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 12.42 (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 11.75	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 22.8'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-7	1 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 193

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"		
	1	SS	18	12	Gravel Depth 4"		18 (5-9-9)
					SILT, With Sand, Trace Gravel, Tan, Moist, Very Stiff, (Possible Fill-ML)	190	
	2	SS	18	16			15 (4-6-9)
5					Silty SAND, Some Clay, Orangish Brown, Moist, Medium Dense, (SM)		
	3	SS	18	18			19 (6-7-12)
					SAND, Some Silt, Orangish Tan, Moist, Medium Dense, (SM)	185	
	4	SS	18	16			18 (6-8-10)
10							
					SAND, With Silt, Trace Clay, Trace Gravel, Orangish Brown, Wet, Dense, (SM)	180	
	5	SS	18	7			(45-34-10) 44
15							
					Sandy SILT, Light Gray, Moist, Hard, (ML)	175	
	6	SS	18	16			(16-22-22) 44
20							
					Silty CLAY, Trace Gravel, Light Gray, Moist, Very Hard, (CL)	170	
	7	SS	18	6			(28-44-38) 82
25							
					SAND, Trace Silt, Light Pinkish Gray, Moist, Very Dense, (SP)	165	
	8	SS	15	15			(23-47-50/3) 97/9
30							

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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 13.00 (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 11.67	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 27.7'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)
(07/13/2011)
DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-7	2 OF 2

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC.% ——
20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 193

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)
30					SAND, Trace Silt, Light Pinkish Gray, Moist, Very Dense, (SP)		
					Silty CLAY, Reddish/Purplish Brown, Moist, Hard, (CL)		160
	9	SS	18	18			
35					END OF BORING @ 35.0'		
							155
40							
							150
45							
							145
50							
							140
55							
							135
60							

(10-14-19) ⊗ 33

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 13.00 (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) 11.67	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 27.7'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-8	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 195

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"			
	1	SS	18	12	Gravel Depth 4"			5 (3-2-3)
	2	SS	18	6	SILT, Some Sand, Trace Clay, Grayish Brown, Moist, Soft to Medium Stiff, (Possible Fill-ML)			5 (4-2-3)
5							190	
	3	SS	18	3				8 (5-4-4)
	4	SS	18	12				8 (3-4-4)
10					END OF BORING @ 10.0'		185	
15							180	
20							175	
25							170	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 7.0'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-9	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 193

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 6"			
	1	SS	18	12	SAND, Some Silt, Trace Gravel, Grayish Brown, Moist, Dense, (Possible Fill-SM)		190	(10-26-7) 33
	2	SS	18	8	SILT, Some Clay, Trace Sand, Brown, Moist, Medium Stiff, (ML)			6 (3-3-3)
5	3	SS	18	6	SILT, With Sand, Trace Clay, Brown, Moist, Soft, (ML)			4 (2-2-2)
	4	SS	18	6	SILT, Some Clay, Trace Sand, Tannish Brown, Moist, Stiff, (ML)		185	12 (3-4-8)
10					END OF BORING @ 10.0'			
15							180	
20							175	
25							170	
30							165	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 7.7'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-10	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 191

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"		190	
	1	SS	18	12	Gravel Depth 4"			18 (5-9-9)
					SILT, Some Sand, Grayish Brown, Moist, Very Stiff to Hard (ML)			
5	2	SS	18	12				24 (5-7-17)
	3	SS	18	16			185	(7-14-19) 33
	4	SS	18	12	Sandy SILT, Grayish Brown, Moist, Very Hard (ML)			(13-27-39) 66
10					END OF BORING @ 10.0'		180	
15							175	
20							170	
25							165	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 6.6'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-11	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 184

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 6"			
	1	SS	18	6	Sandy SILT, Brown, Moist, Stiff (Fill-ML)			11 (6-4-7)
	2	SS	18	7	Silty CLAY, Some Sand, Trace Roots, Reddish Gray/Grayish Brown, Moist, Very Stiff (FILL)		180	19 (7-9-10)
5	3	SS	18	12				26 (8-10-16)
	4	SS	18	6	SILT, Some Sand, Trace Gravel, Reddish Brown, Moist, Hard (ML)		175	(13-15-20) 35
10					END OF BORING @ 10.0'			
							170	
15								
							165	
20								
							160	
25								
							155	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 6.7'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/14/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-12	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 181

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 3"		180	
	1	SS	18	11	Gravel Depth 5"			24 (4-10-14)
					SILT, Trace Sand, Trace Gravel, Reddish Brown, Moist, Very Stiff (ML)			
	2	SS	18	12				17 (5-9-8)
5					SILT, Some Sand, Grayish Brown, Moist, Very Stiff (ML)		175	
	3	SS	18	16	Clayey SAND, Gray, Moist, Medium Dense (SC)			15 (6-7-8)
	4	SS	18	12	Sandy SILT, Gray, Moist, Medium Stiff (ML)			6 (3-3-3)
10					END OF BORING @ 10.0'		170	
15							165	
20							160	
25							155	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 7.5'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/14/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-13	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY

RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 190

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"			
	1	SS	18	6	Gravel Depth 4"			4 (2-2-2)
	2	SS	18	12	SILT, With Sand, Trace Clay, Trace Gravel, Brown, Moist, Soft (Possible Fill-ML)			8 (4-3-5)
5							185	
	3	SS	18	18	SILT, With Sand, Trace Clay, Trace Gravel, Trace Wood, Brown, Moist, Medium Stiff (Possible Fill-ML)			25 (10-12-13)
	4	SS	18	16	Silty CLAY, Purplish Gray, Moist, Very Stiff (CL)			16 (7-7-9)
10					END OF BORING @ 10.0'		180	
15							175	
20							170	
25							165	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 7.4'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/14/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-14	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 191

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"		190	
	1	SS	18	16	Gravel Depth 5"			5 (2-2-3)
					Silty CLAY, Purplish Gray, Moist, Soft to Very Stiff, (CL)			
5	2	SS	18	18				14 (3-5-9)
							185	
	3	SS	18	18				21 (7-9-12)
	4	SS	18	16				18 (5-9-9)
10					END OF BORING @ 10.0'		180	
15							175	
20							170	
25							165	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/15/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/15/11	CAVE IN DEPTH @ 7.8'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/14/2011)

DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-15	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 196

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Asphalt Depth 4"		195	
	1	SS	18	12	Gravel Depth 4"			18 (9-9-9)
					SILT, With Sand, Brown, Moist, Very Stiff (ML)			
	2	SS	18	12				16 (5-7-9)
5					Silty SAND, Tan, Moist, Medium Dense (SM)		190	
	3	SS	18	12	SAND, Some Silt, Tan, Moist, Medium Dense (SM)			17 (8-9-8)
	4	SS	18	10	Silty SAND, Orangish Brown, Moist, Medium Dense (SM)			22 (9-13-9)
10					END OF BORING @ 10.0'		185	
15							180	
20							175	
25							170	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL DRY (WS) OR WD	BORING STARTED 06/13/11	DRILLER: D&S Drilling, Inc.
▽WL(BCR) ▼WL(ACR) DRY	BORING COMPLETED 06/13/11	CAVE IN DEPTH @ 6.6'
▽WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

(07/13/2011) DAppelbaum

CLIENT	JOB #	BORING #	SHEET
AECOM	5707	B-16	1 OF 1

PROJECT NAME: NASA Goddard Flight Center - Flight Projects Building

ARCHITECT-ENGINEER:

SITE LOCATION: Good Luck Road and MD 193, Lanham, MD

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗ 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION 186

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 6"			
	1	SS	18	6	Silty CLAY, Brown, Moist, Stiff, (CL)		185	14 (7-7-7)
	2	SS	18	10	Sandy SILT, Purplish Gray, Moist, Stiff to Very Stiff, (ML)			17 (5-8-9)
5							180	
	3	SS	18	16				17 (8-7-10)
	4	SS	18	16				25 (11-12-13)
10					END OF BORING @ 10.0'		175	
15							170	
20							165	
25							160	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY (WS) OR WD	BORING STARTED 06/14/11	DRILLER: D&S Drilling, Inc.
WL(BCR) WL(ACR) DRY	BORING COMPLETED 06/14/11	CAVE IN DEPTH @ 6.6'
WL	RIG 750 ATV FOREMAN T COVINGTON	DRILLING METHOD HSA

DMA (07-13-11) DMA (07-14-11) DMA (07-14-11) DMA (07-15-11) DMA (02-14-12)

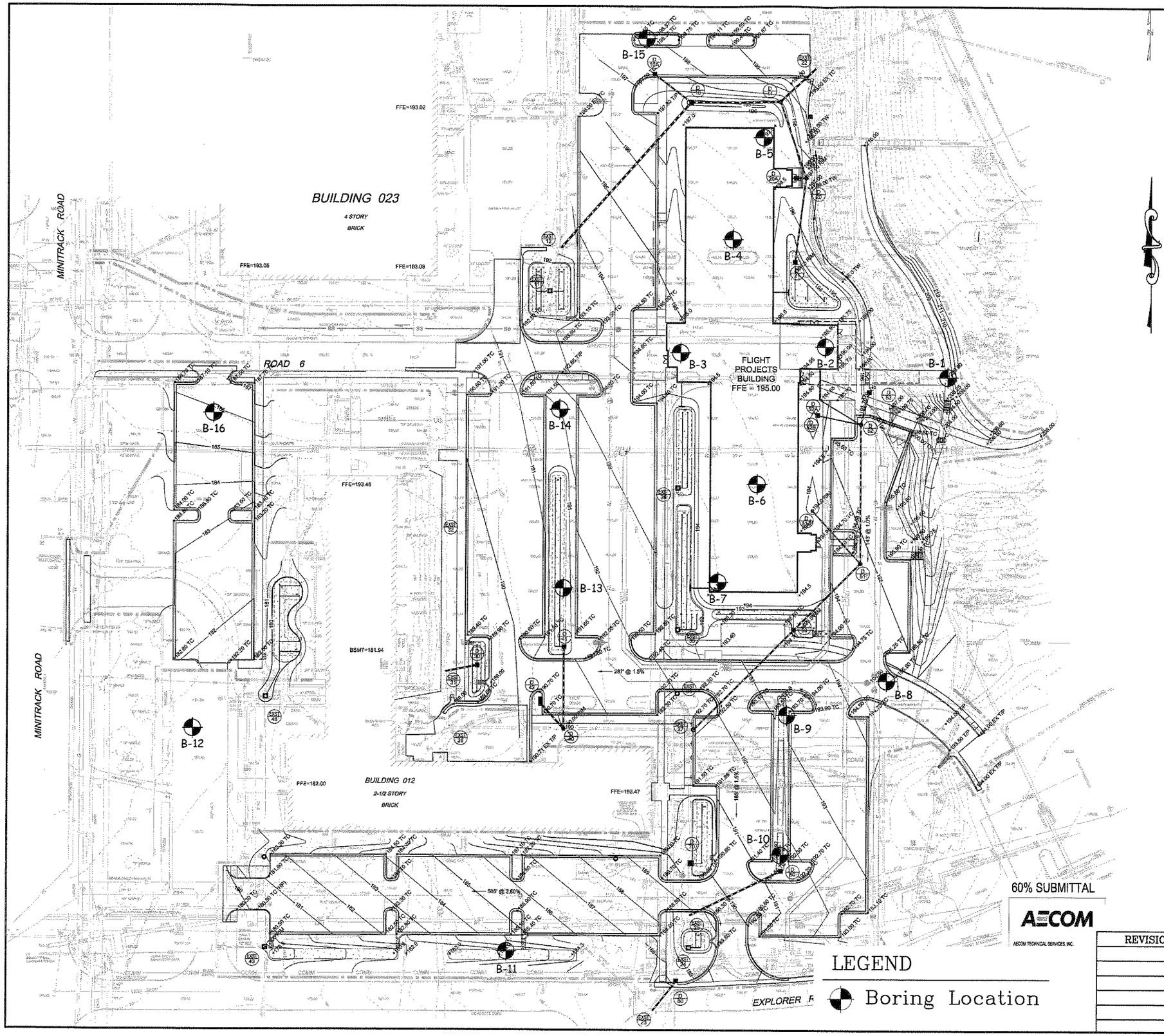
(07/14/2011)

DAppelbaum

ECS MID-ATLANTIC, LLC

NOTES THIS SHEET:

1. SEE SHEET C001 FOR GENERAL NOTES, CONTROL INFORMATION.
2. SEE SHEETS C402-C403 FOR SWM MAN PLANS.
3. SEE SHEET C601 FOR STORM DRAIN : OUT DATA.
4. SEE SHEETS C201-C202 FOR STORI
5. SEE SHEETS C508-C509 FOR STOF DETAILS.



60% SUBMITTAL

AECOM

AECOM TECHNICAL SERVICES, INC.

LEGEND

Boring Location

REVISIONS						

ECS LLC MID-ATLANTIC

Boring Location Plan

NASA Flight Projects Building

AECOM

DMA	DMA	02/14/12	NTS	5707	1 OF 1