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September 9, 2022

Via Hand Delivery and E-Mail

Denise M. Harris
Planning Manager
Community Development Department
21 Main Street
Warrenton, VA 20186

Re: Special Use Permit #SUP2022-00003, AWS Warrenton Data Center / Post Work Session Submission

Dear Ms. Harris:

In your email to me of August 11, 2022, you asked if our client intended to provide additional information to the Town in preparation for the second work session on this application scheduled for September 27, 2022. We provide the following for the Town's consideration.

1) Schedule a balloon test and let the PC know before it occurs.

This firm has contracted with Wetlands Studies and Solutions to conduct balloon tests. As you know, consultation has already occurred between and among the Town Staff, Bohler, WSSI, and AWS as to the timing of these tests, and their locations and the tests are now scheduled for September 15th. At present the forecast is promising, but September 19 and 20 can be used as rain dates if needed.

2) Provide the Landscape Plan and Tree Survey.

A Landscape Plan is already an exhibit at page 4 of the SUP Plan, and so we would inquire as to what more is required. The Tree Study is included with this letter as **Exhibit 1**.

3) Elaborate and document the water usage.

a) The Applicant has previously reported that the principal ongoing use of water at the site is for "domestic" uses in the sense that it needs water for toilets, sinks, water fountains, humidification, and limited irrigation largely for the purpose of establishing the landscaping. The architects at Corgan have provided the following data. No other comparably valuable use would require so little water.

Office Uses

The average daily water demand for domestic uses is 190.5 gallons per day. The annual such demand is calculated to be 69,532 gallons per year

Humidifiers

The average daily water demand for humidification purposes is calculated to be 190.1 gallons per day and the annual water demand is 69,380 gallons per year. Because there is a requirement that humidifiers be drained and maintained, there is a daily sewer requirement of 18.9 gallons per day and an annual sewer requirement of 6,900 gallons per year associated with this function.

Total

Based on the foregoing, the combined average daily water demand is 380.6 gallons, the annual water demand for domestic purposes and humidification is 138,912 gallons per year.

The average daily demand for sanitary sewer purposes is 209.4 gallons per day, resulting in an annual requirement of 76,432 gallons per year (domestic uses and humidification).

b) As you know, water is also used *in* the cooling system, but as is the Applicant has often stated, it is not used *for* cooling directly. Rather, the facility is air cooled. To accomplish this, the cooling system is initially charged with approximately 19,000 gallons of water over several weeks' time. This is mixed with propylene glycol at the time of that initial charge. Once it is full it is not thereafter replenished, although the glycol may be recycled into and out of the system.

The facility is served by multiple mechanical system types based on space use. For the purpose of understanding how cooling is managed, the building will consist of two "Data Halls" with a central office/support area separating the two Halls.

For those Data Halls there is a dedicated, redundant, chilled water plant consisting of 500-ton air-cooled chillers and associated pumps, and redundant dual path distribution piping that provides chilled water to Data Hall Air Handling Units (DAHU). Each chiller has an associated Thermal Energy Storage Tank (TES) to allow cooling for "ride-through time" in the event of a loss of normal power, and until normal power is restored. All of the chillers, pumps, tanks and accessories are located on the roof. Freeze protection is accomplished by adding 30% propylene glycol, as noted above.

Each Data Hall is served by these DAHU's, by connecting into the ceiling above the servers through overhead ductwork, with drops into each "cold aisle" in the Data Halls. The Data Hall racks are built with what is known as Hot Aisle Containment, which extends a barrier from the floor to an opening in the ceiling and allows for the warm air from a bank of servers to rise and recirculate to the DAHU's where is it re-cooled.[1] Humidification to the Data Hall is provided by wall mounted steam generation humidifiers located with the DAHUs.

4) *Invite PC members to visit site.*

This is only a matter of advising us when members of the Planning Commission would like to visit. If there are FOIA concerns, then they can visit in pairs. We would like to arrange this so that someone from our team is present and if it could be arranged for one or two days that would be quite nice.

5) *Questions about elevations and height.*

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[1] A "cold aisle/hot-aisle containment system" is one in which cold air is distributed by the means described above into a data hall, to maintain a safe and effective temperature. Of course, the servers generate hot air. They are installed back-to-back, creating an "aisle" between them where this hot air concentrates, and so the "hot aisle containment" system consists of a physical barrier that collects the hot air expelled from the rack-mounted equipment and channels it to the ceiling, where it is collected. It is then returned to the DAHUs, cooled, and the process repeats. This moves hot air to where it can be released safely and efficiently before it has the chance to mix with the cold air, which needs to remain cold in order to be effective, and efficiently re-chills and reuses it.

Bohler has prepared revised graphics that depict the height of the structure with the roof-mounted equipment and they are attached to this letter as **Exhibit 2**.

The architects at Corgan are presently working on revised graphics for the building itself but they are not completed. They will be available for the Work Session and will include photorealistic renderings. The standard parapet height is 41'-0" and the highest parapet height is 45'-0". The equipment screening height is 56'-4", and the top of tallest point on rooftop equipment is 56'-9".

Bohler has also prepared a Preliminary Grading Plan as promised at the Work Session, and it is included with this letter as **Exhibit 3**.

6) Noise generation.

A summary of the very extensive noise study that was performed is attached to this letter together with the entire study, which contains the technical background, are attached to this letter as **Exhibits 4** and **5**. To amend previous responses to the effect that noise limits can be fully achieved, this demonstrates that the noise ordinance requirements for the site can be achieved in every location where there is anyone to hear. The only place frequency levels are exceeded is over Route 17 and at the very edge of Parcel 9985-60-5718-500, which is itself zoned Industrial, and is currently vacant.

7) Lighting impacts.

The Town requires a Lighting Plan to be provided as a part of the Site Development Plan. This requires the preparation and submission of a photometric plan that shows the intensity of light throughout the site and at the boundary of the property. The Applicant has written that all building mounted lighting will have a maximum height of 25', and controls be installed on the site fixtures such that they dim to 50% output between 11 PM and dawn, and that fixtures be LED cut off, downward facing, lights that reduce or eliminate spillover at the property boundary. The Applicant has no need to illuminate anything but its secure perimeter and internal areas.

8) Relationship with Dominion, power needs, and phasing.

While AWS does not have a role in planning transmission line routing, it understands that Dominion Energy is working collaboratively with the County, the Town, and the public to understand priorities and refine routes prior to its SCC

submission. The Applicant has said that it will commence operation on existing power and await a decision on additional power by others.

9) Explanation of emergency plans and how potential leaks are contained.

AWS Data Centers (DC) adhere to the Federal Spill Prevention and Control Countermeasure Plan (SPCC) Regulations, as well as State and County rules for oil spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines. *See* 40 CFR Part 112. AWS DC's SPCC Plans are certified by a professional engineer, who assures that all passive and active control measures for oil containment, storage, and discharge comply with Local, State and Federal regulations.

AWS DC's SPCC Plans list a combination of active and passive containment measures needed to meet the requirements of 40 CFR 112.7(c). All affected AWS employees are trained annually on the SPCC mitigation measures. AWS DC's double-walled storage tanks have inner and outer tank walls that meet the definition of secondary containment under the DEQ LPR-SRR-2019-03 - Storage Tank Program Compliance Manual, Volume V - AST Guidance, and under 40 CFR Part 112, Section 8.1.2.2; therefore, tertiary containment[2] is not required. AWS's fuel oil loading and unloading operations fall under the general secondary containment requirements of 40 CFR Part 112.7(c). Oil water separators are not required under 40 CFR 112.7(c) of the SPCC Rule, and at the State and County level are only mentioned as a recommendation, not a mandate.

Diesel fuel oil is delivered by a licensed tanker truck fuel delivery company. Truck unloading facilities and procedures meet the locally accepted standards and the U.S. Department of Transportation (DOT) requirements.

10) Geotechnical Report

A copy of the Geotechnical Study for the site is provided as **Exhibit 6**.

11) Planned Community Outreach, if any.

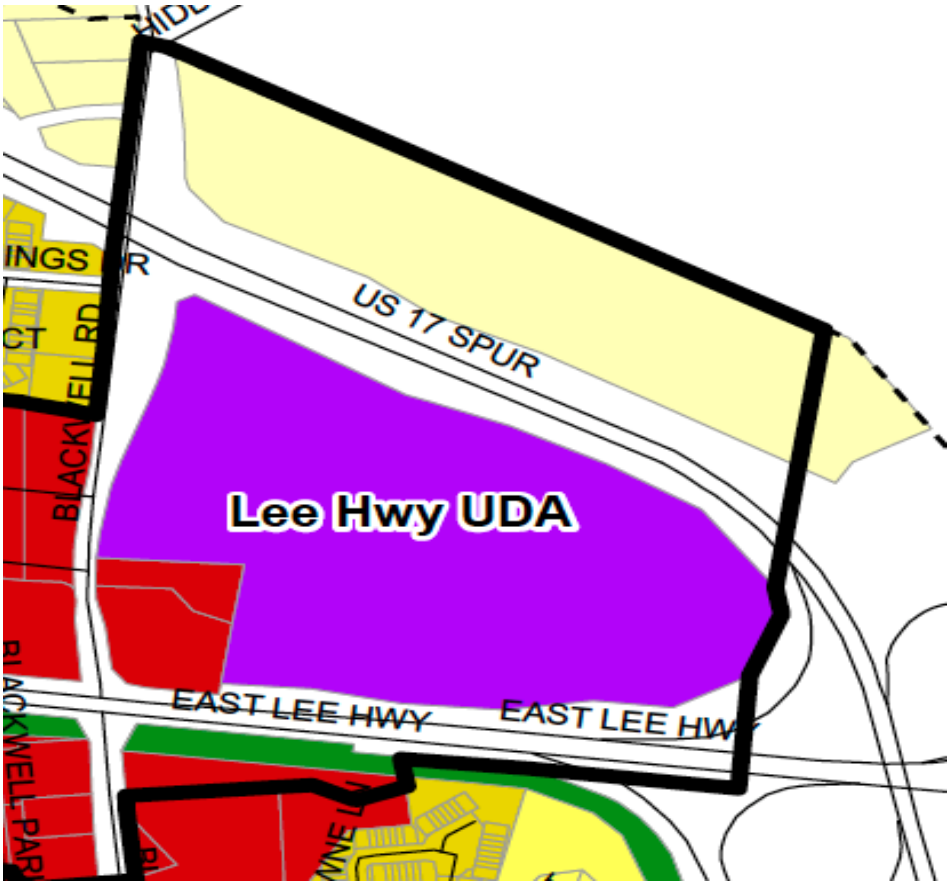
It is still a matter under internal discussion as to whether this can be done effectively. As a general matter, the Applicant has found that the public hearing

[2] Tertiary containment may consist of such things as a remote or diked impoundment comprised of various combinations such as site drainage, sumps, diversion tanks, pits, ponding areas, lagoons, and/or impervious liners.

process remains the most valuable venue for the exchange of information between itself and the community, and the relevant decision-makers. It is in such a forum that information can be shared in an orderly manner, and questions asked that are directly related to the land use issues presented in any case. Based on the specific circumstances pertaining to this case, and the first work session before the Planning Commission, it must be asked whether either an in-person or virtual session could be productive, or whether it would continue to be focused on issues over which the Applicant has no control.

12) Relationship to the Comprehensive Plan.

The Applicant has responded extensively to questions regarding the Comprehensive Plan. The property is shown on the Future Land Use Map as Light Industrial and is zoned Industrial. The property is also located within the Lee Highway Urban Development Area (UDA). One of the Goals and Policies of the Lee Highway UDA is to evaluate development incentives that stimulate private investment and new development. This data center will be a new development on vacant industrial land and will finally put the land to a productive use that has escaped every other potential purchaser that has evaluated it over the last three plus decades.



The proposed data center is a light industrial use, and thus aligns directly with the land use plan. There is little likelihood that another user, were the Applicant not seeking this approval, would rezone the land to a less intense classification. Despite contentions that there are alternative sites in the Town, there is a limited supply of industrially zoned land in Warrenton, some of that land is already in industrial use, or topographically challenged, and this site is suitable for the proposed facility.

A Comprehensive Plan cannot, however, be evaluated solely by looking at its colored land use maps. It is a compilation of policies. The site is located in the New Town Warrenton Character District, which is, among other things, intended to create a mix of uses, green space and public amenities, *as well as provide a location for a major employer*. No individual site can be expected to meet all objectives in the Plan. The District is also a place in which the Town seeks a signature job center. The Applicant in this case is indeed a major employer, and while the data center will not employ hundreds of workers, those that it does employ make above average incomes. Traffic burden post-construction is very low. The physical design of the data center is intended to have the least possible impact on those residential areas in the vicinity,

with substantial screening and buffering areas as depicted on the Landscape Plan, and where the facility itself is situated on the Property. Although a degree of that design must follow the requirements of form following function, the enhanced architecture that Corgan has now produced is intended to avoid previous designs of other data centers that were less architecturally appealing, and to satisfy the purpose and intent of § 9-26.1(F) of the Town Zoning Ordinance with respect to Building Façades at data center developments.

The 2040 Plan has significant economic and fiscal goals that seek to achieve a strong, diversified, and resilient economy that supports both residents and businesses and increases the employment base. The Town proposes that it be *proactive* in its own economic development, and this unique development advances each of these goals

The local tax revenues generated by a data center will assist in promoting a diverse, equitable, and stable tax base to maintain a healthy economy, with exceptionally little impact on Town services.

While there were comments presented at the Work Session to the effect that the new Plan envisioned the development of the site with a greater mix of uses than that which is sought in this Application, the history and circumstances of the property suggest that this will not be the future of the land. As was mentioned at the Work Session, two major retailers have evaluated the site and concluded that it could not be made to suffice for their purposes. This has been largely because Blackwell Road cannot handle a significant, sustained, traffic burden. There is presently insufficient right-of-way and it would be exceptionally difficult and costly to improve it. An estimate for the reconstruction of the intersection of Blackwell and Lee Highway alone is set at a high end of $3.5M. Importantly, Blackwell Road at the site is identified as a Signature Street in the Complete Streets Recommendations, a classification that does not include significant reconstruction.

It is also a fact that the land had been on the market for many years without success. Its size and developable acreage argues against a smaller mixed-use project.

13) Taxation.

It has been suggested that recent changes in Virginia law have adversely affected the taxation of data centers.[3]

[3] It has also been suggested that some data centers may be exempt from local taxation of real estate and tangible personal property. This is not so. Virginia Code § 58.1-3502 makes

Virginia segregates personal property for taxation by localities, and has authorized localities to tax tangible personal property, defined as all personal property that is physical personalty, not intangible, not merchants' capital, or short-term rental property.

There are two statutes that relate to the classification of data centers for purposes of taxation. First, § 58.1-3503 (A)(17) with regard to the general classification of tangible personal property, classifies "computer equipment and peripherals used in a data center" as a potentially separate classification for tangible personal property taxation. A data center is defined (by incorporation from the next statute below) as

> a facility whose primary services are the storage, management, and processing of digital data and is used to house (i) computer and network systems, including associated components such as servers, network equipment and appliances, telecommunications, and data storage systems; (ii) systems for monitoring and managing infrastructure performance; (iii) equipment used for the transformation, transmission, distribution, or management of at least one megawatt of capacity of electrical power and cooling, including substations, uninterruptible power supply systems, all electrical plant equipment, and associated air handlers; (iv) Internet-related equipment and services; (v) data communications connections; (vi) environmental controls; (vii) fire protection systems; and (viii) security systems and services[.]

Second, by Va. Code § 58.1-3506 (A)(43) the General Assembly has created yet another optional classifications of tangible personal property for taxation, and permits data centers to be segregated from other forms of personal property under that section, again at the locality's option.

The distinction between the two statutes is that they permit the application of different tax rates to classifications of kinds of personal property depending on which statute is used for the purpose of classification.

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any firm, company, or corporation engaged in business for profit who or which leases, borrows or otherwise has made available to it any tangible personal property to be used in such business from any agency or political subdivision of the federal, state or local governments liable to local taxation.

Regardless of which classification is employed, data centers are to be valued by means of a percentage or percentages of original cost, or by such other method as may reasonably be expected to determine the actual fair market value. This is determined by the local assessor, and was not changed by the new statute.

That new statute, Code § 58.1-3295.3, found in the Article in the Tax Code dealing with Reassessment/Assessment (Valuation) Procedure and Practice, addresses in part the assessment of data centers. It references "computer equipment and peripherals" as subject to classification under either of the two foregoing statutes, § 58.1-3503 (A)(17) or § 58.1-3506 (A)(43). They remain *valued* for taxation purposes as they have previously been assessed.

However, now if "fixtures" are installed at a data center and taxed under the provisions of Title 58.1 dealing with Tangible Personal Property, Machinery and Tools and Merchants Capital Taxation, those fixtures must now be assessed using the cost approach. "Cost approach" means assessing value by determining the cost to construct a reproduction or suitable replacement of fixtures, and deducting physical, functional, and economic depreciation sustained by such fixtures. "Fixtures" means all fixtures and equipment used in a data center *except computer equipment and peripherals, equipment used for external surveillance and security, and fire and burglar alarm systems*. The term includes generators, radiators, exhaust fans, and fuel storage tanks; electrical substations, power distribution equipment, cogeneration equipment, and batteries; chillers, computer room air conditioners, and cool towers; heating, ventilating, and air conditioning systems; water storage tanks, water pumps, and piping; monitoring systems; and transmission and distribution equipment.

In short, HB 791 passed by the legislature in 2022 does not affect the valuation of computer equipment and peripherals, or the local taxation thereof.

14) Proposed Conditions of a Special Use Permit.

As is customary in the Town, the Applicant is attaching a proposed set of conditions for the special use permit for review and edit by the Town as **Exhibit 7**.

15) Conclusion.

The Applicant respectfully submits that valid planning aspirations must also take into consideration existing zoning and land use history, and the actual, instead of the imagined, impact of a use. This proposal advances a number of policies that are set out in the 2040 Plan, and is matched well both to the actual zoning of the land, and to a realistic future.

Very truly yours,

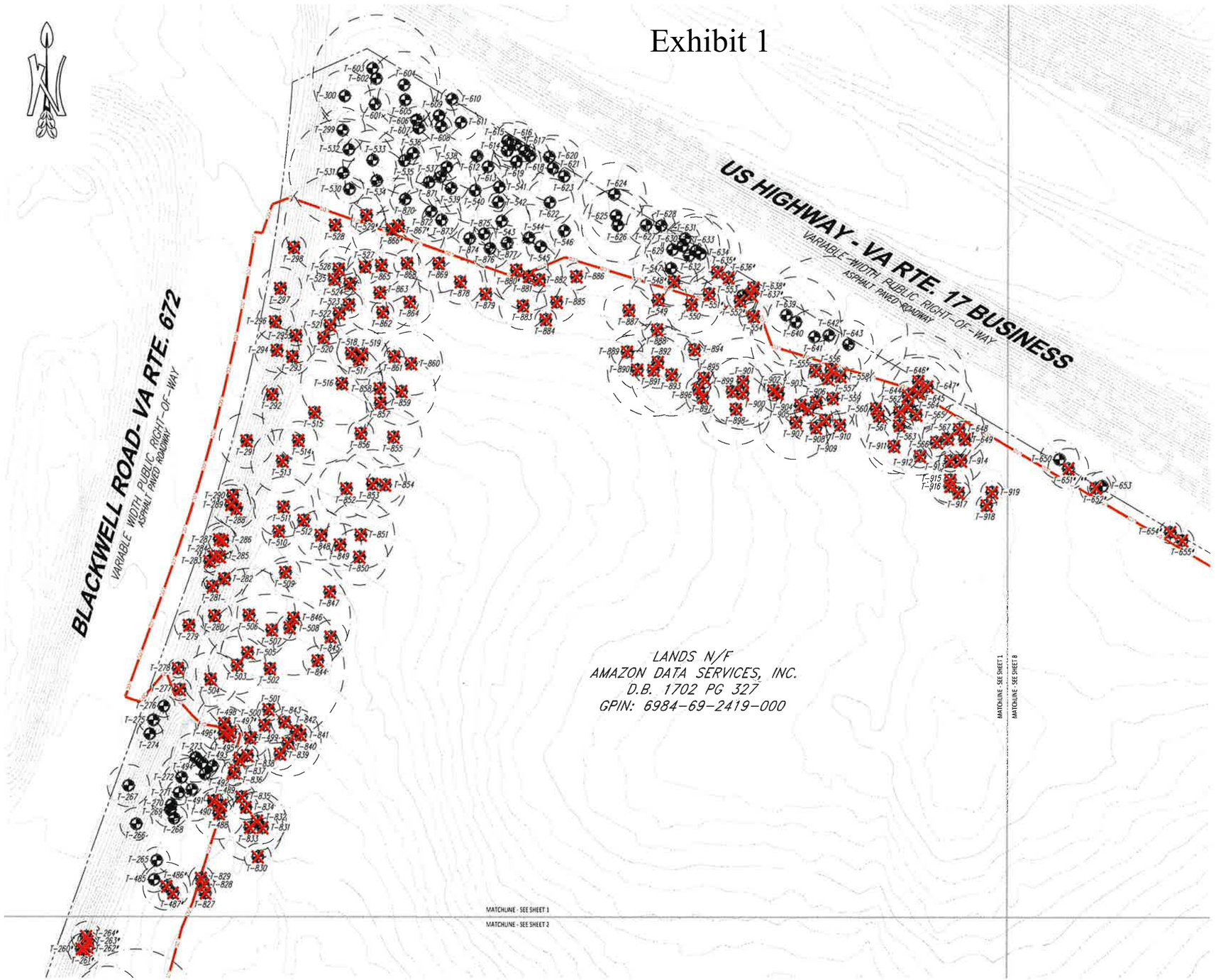
WALSH, COLUCCI,
LUBELEY & WALSH, P.C.

John H. Foote

JHF/jf

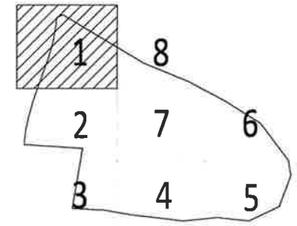
cc: Jay Reinke
Umar Shahid
Rebecca Ford
Taylor Hicks, Esq.
Jessica Pfeiffer

Exhibit 1



LEGEND

- CRITICAL ROOT ZONE (CRZ)
- TREE LOCATION T-XXX
- TREE TO BE REMOVED T-XXX



TREE INVENTORY NOTES:

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SCALE (IN FEET)
15 30
30 0

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BLACKWELL ROAD & LEE HIGHWAY
TOWN OF WARRENTON

TREE REMOVAL BASE

REVISIONS

DATE	COMMENTS

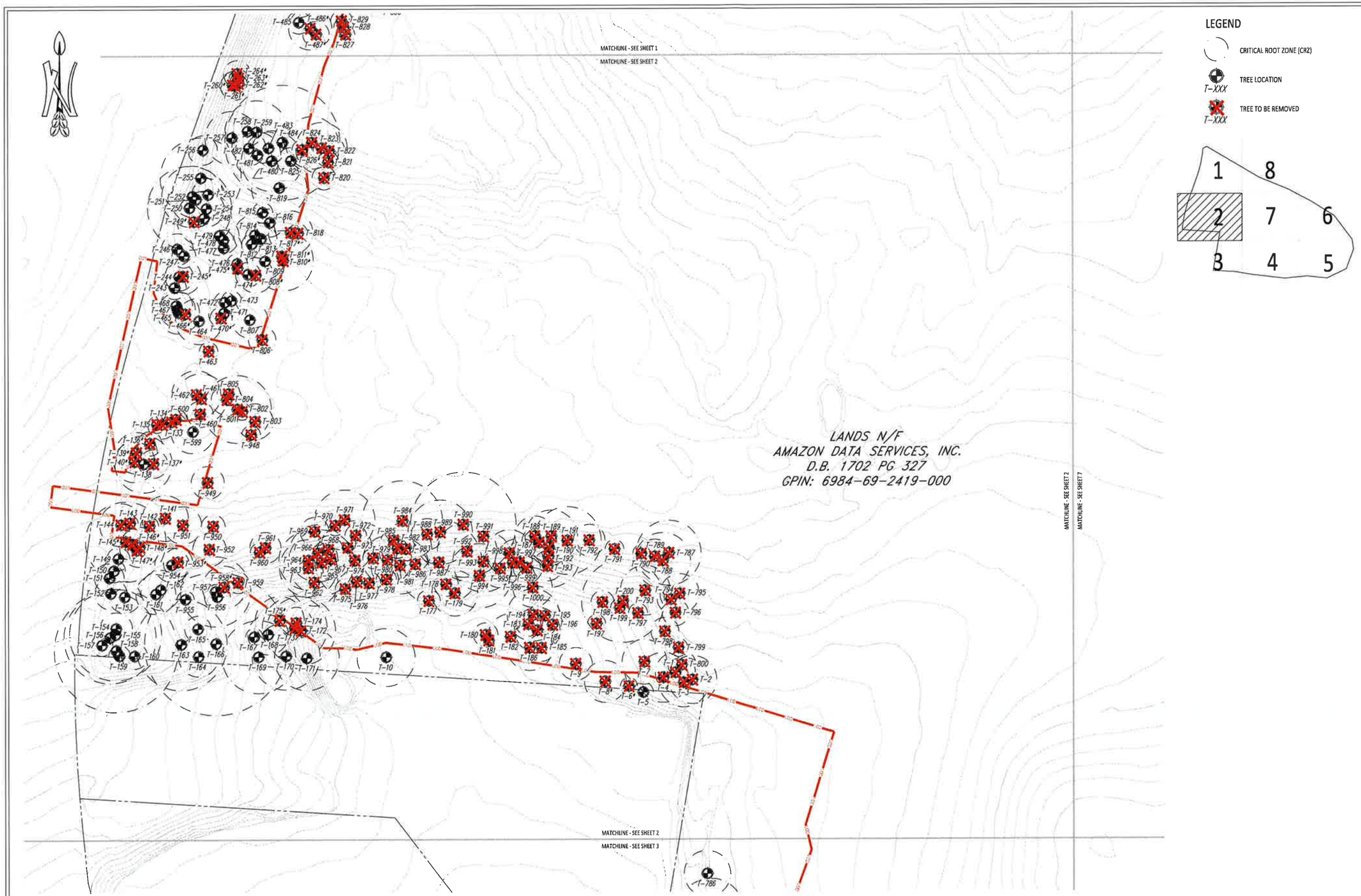
SHEET 1 OF 11

SCALE: 1" - 30'

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724



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SHEET 2 OF 11

SCALE: 1" = 30'

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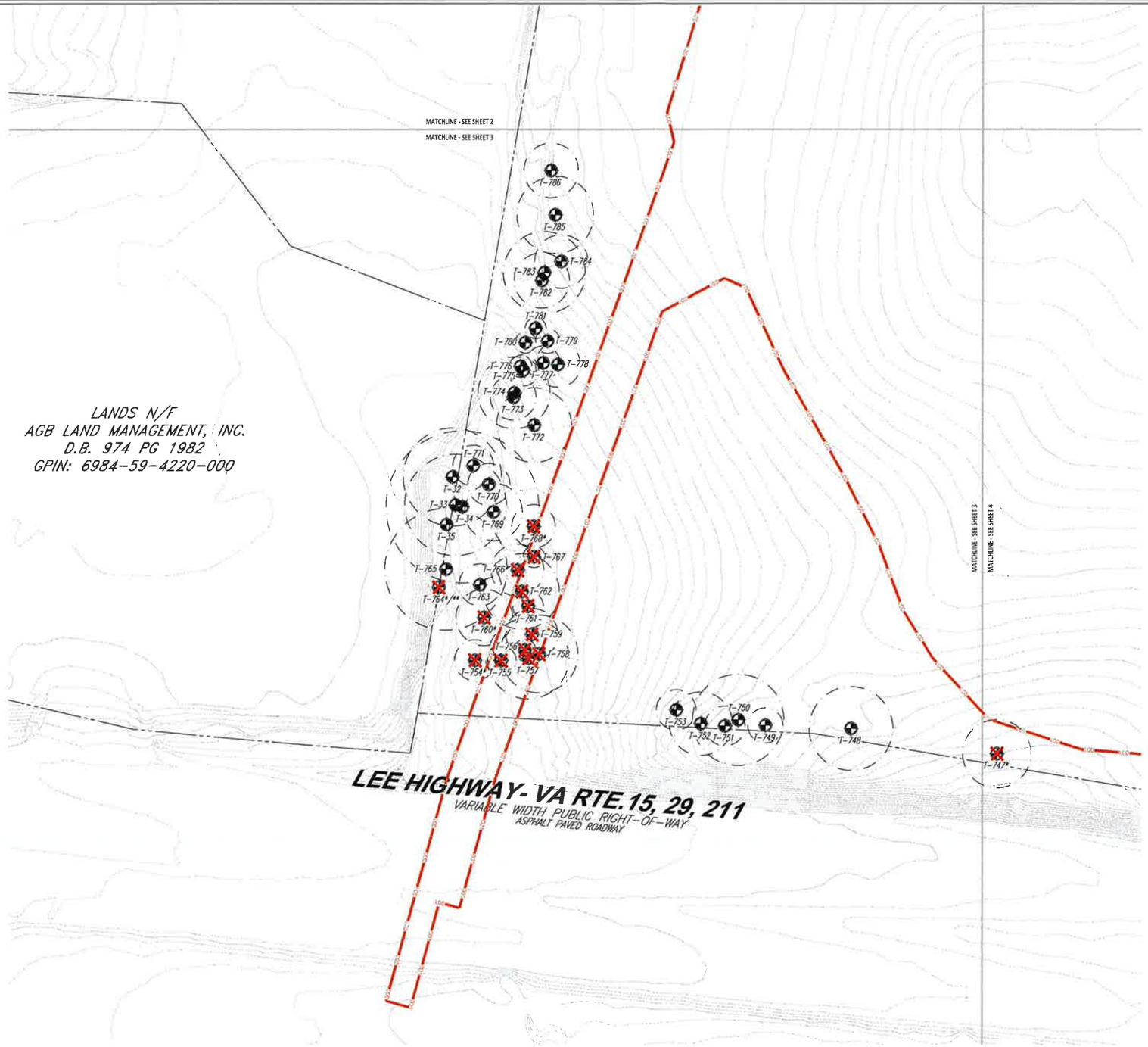

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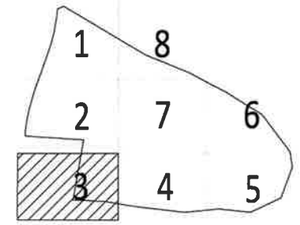

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BLACKWELL ROAD
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TREE REMOVAL
BASE

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SHEET 3 OF 11

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T-XXX TREE LOCATION

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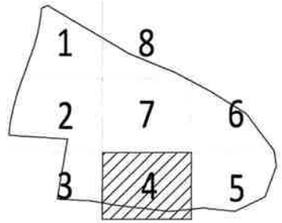
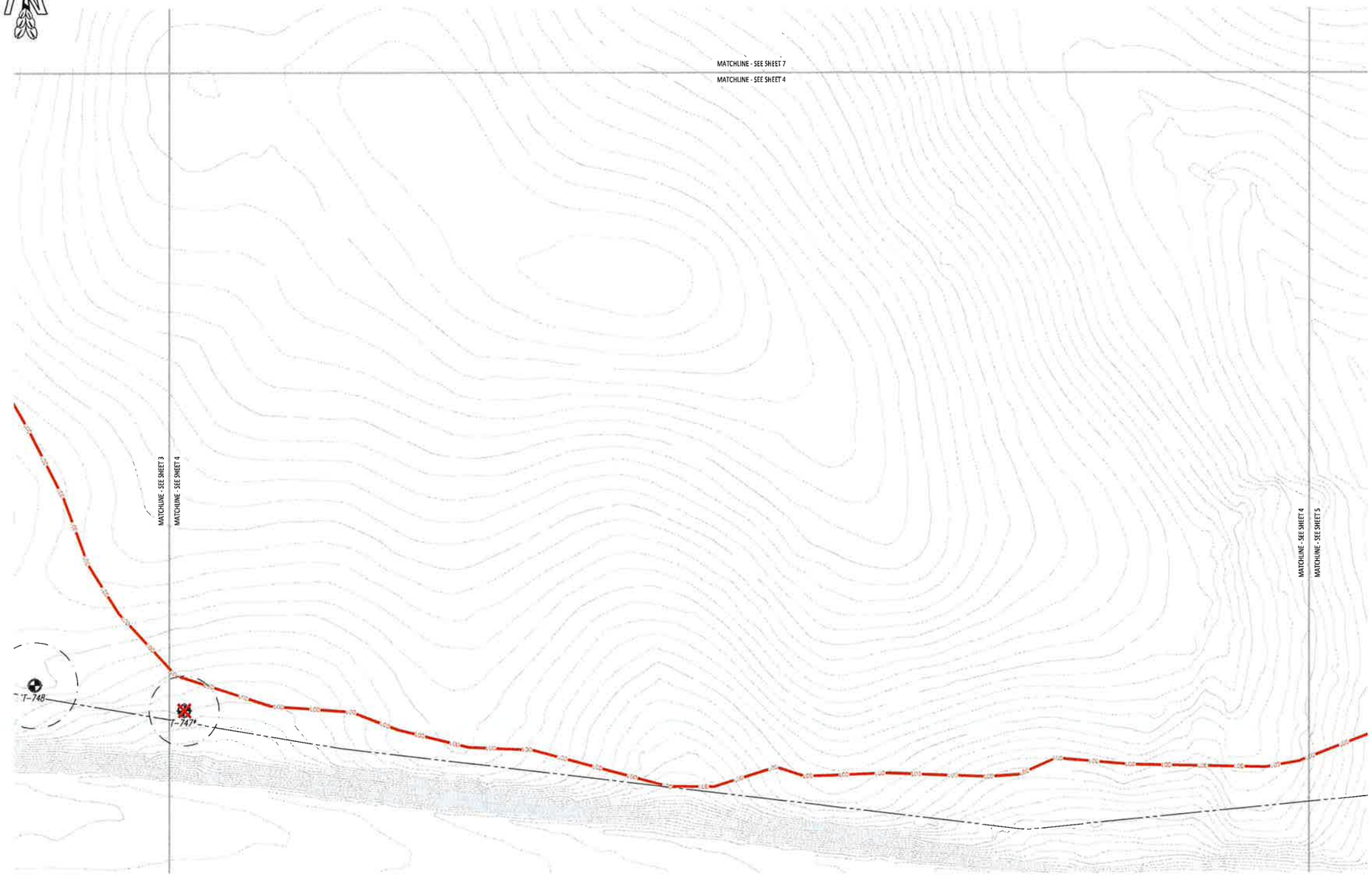


MATCHLINE - SEE SHEET 7

MATCHLINE - SEE SHEET 4



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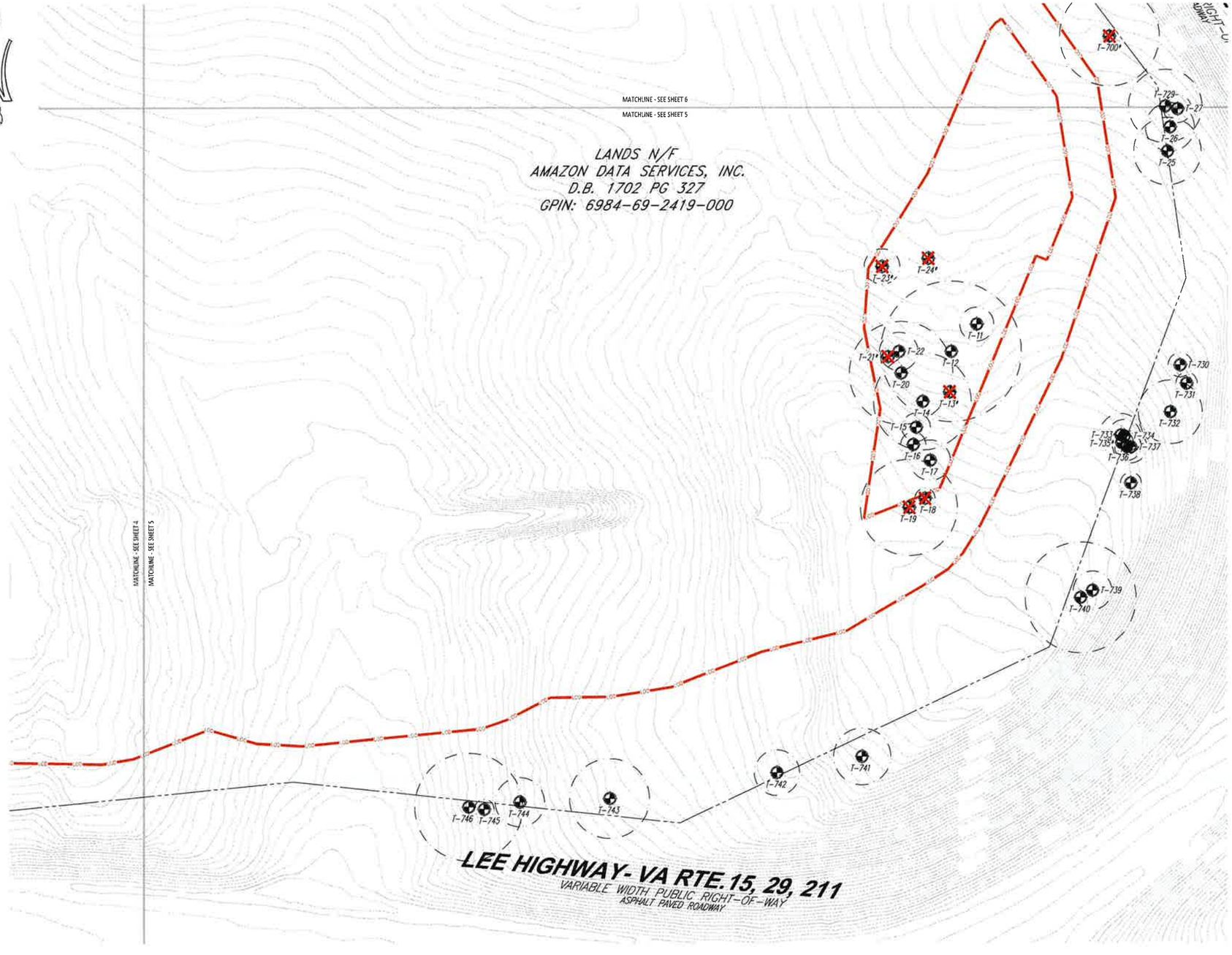

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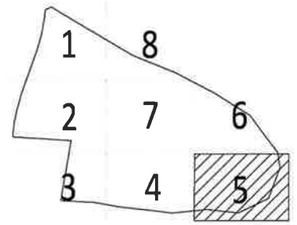

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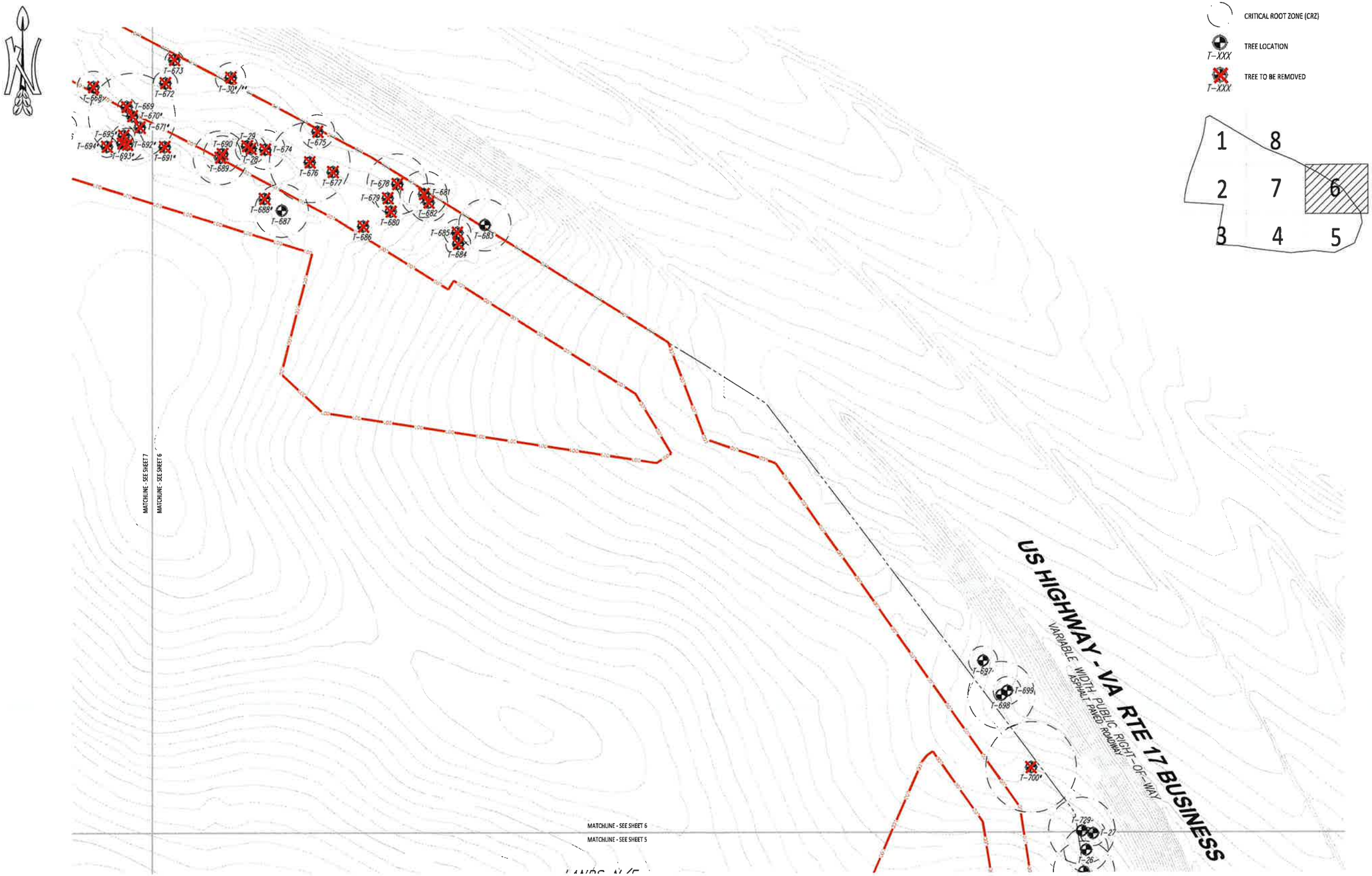
SHEET 5 OF 11

SCALE: 1" = 30'

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724



LEGEND

- CRITICAL ROOT ZONE (CRZ)
- T-XXX — TREE LOCATION
- T-XXX — TREE TO BE REMOVED

SCALE (IN FEET)
15 30
30 0

TREE INVENTORY NOTES:
1. **SHARED/ROW TREES SHALL NOT BE REMOVED WITHOUT WRITTEN PERMISSION FROM AFFECTED ADJACENT PROPERTY OWNERS.
2. *TREES NOTED FOR REMOVAL WITHIN THE SAVE AREAS SHALL BE DONE SO BY HAND WITHOUT THE USE OF HEAVY MACHINERY.
3. OFFSITE TREES WERE ASSESSED FROM THE SUBJECT PROPERTY SO NOT TO TRESPASS ONTO ADJACENT PROPERTY. DBH MEASUREMENTS AND TREE LOCATIONS ARE APPROXIMATE.
4. TREES LOCATED WITHIN OR ON THE LIMITS OF DISTURBANCE, OR RATED AS BEING "POOR" IN CONDITION, ARE RECOMMENDED FOR REMOVAL BY TNT ARBORISTS DUE TO THE LIKELIHOOD OF TREE FAILURE. HOWEVER, AT THE DISCRETION OF THE APPLICANT, SOME OF THESE MAY BE PRESERVED DURING CONSTRUCTION WITH THE APPROVAL OF URBAN FORESTRY.

TNT ENVIRONMENTAL
4455 Brookfield Corporate Drive, Suite 100
Chantilly, VA 20151
PH: 703-466-5123 WWW.TNTENVIRONMENTALINC.COM

BLACKWELL ROAD & LEE HIGHWAY

TOWN OF WARRENTON

TREE REMOVAL BASE

REVISIONS

DATE	COMMENTS

SHEET 6 OF 11

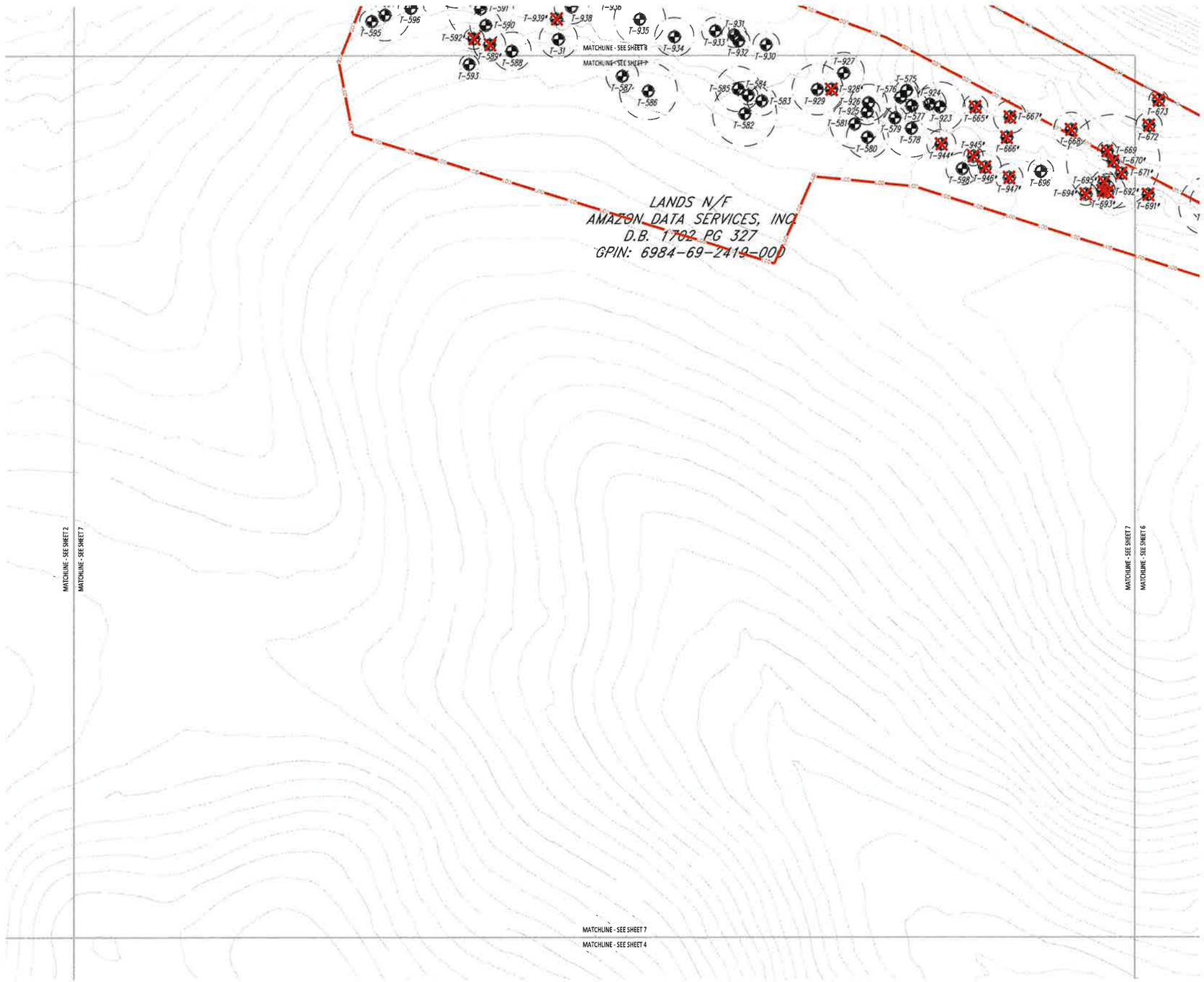
SCALE: 1" – 30'

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

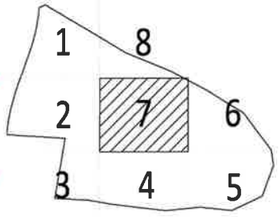
FILE NUMBER: 2724

Ashish M. Sareen
Certified Arborist
Certification # MA-4729A



LEGEND

- CRITICAL ROOT ZONE (CRZ)
- TREE LOCATION T-XXX
- TREE TO BE REMOVED T-XXX



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SCALE (IN FEET)
15 30
30 0

Ginush M. Sareen
Certified Arborist
Certification # MA-4729A

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TOWN OF WARRENTON

TREE REMOVAL BASE

REVISIONS

DATE	COMMENTS

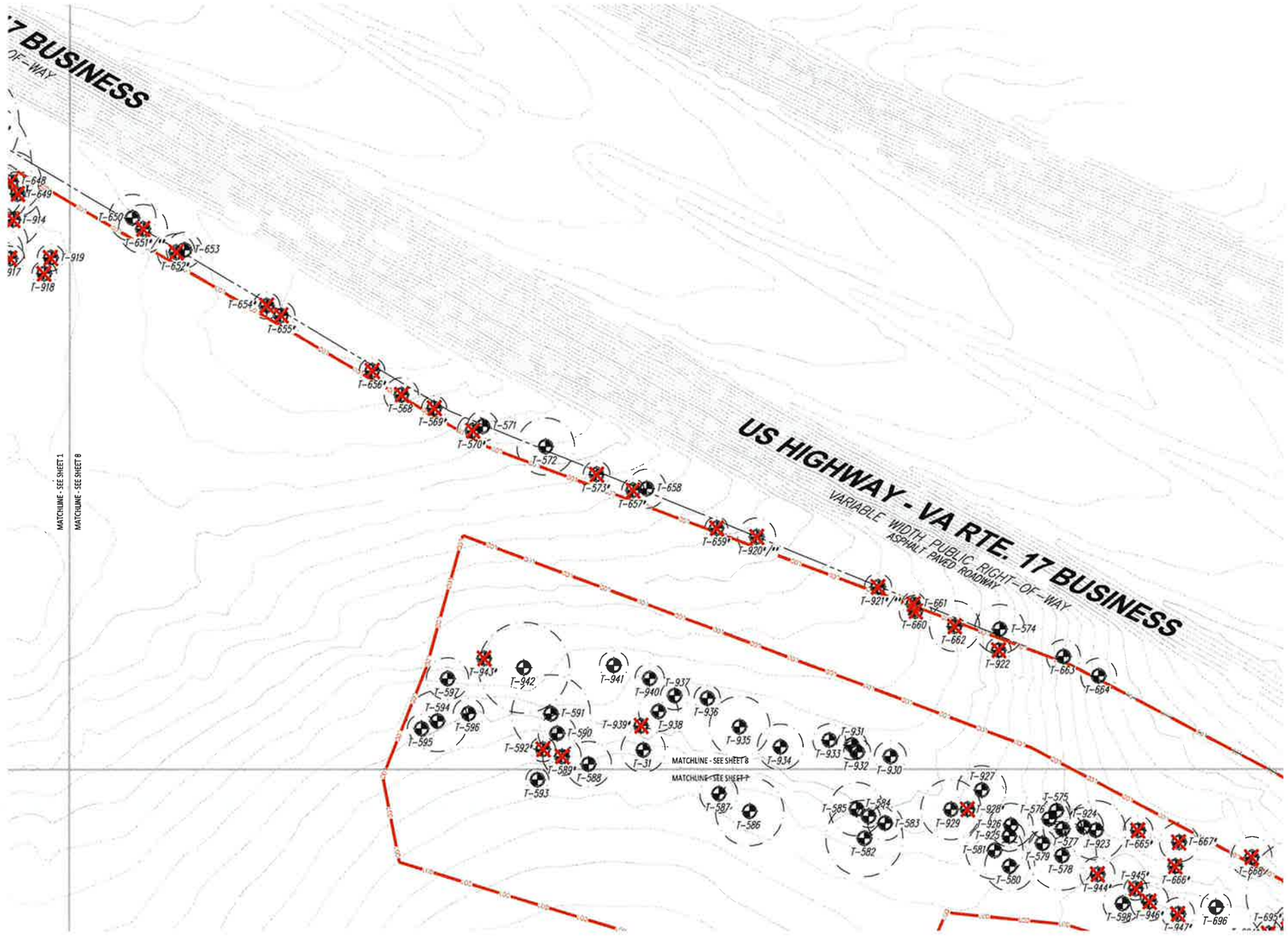
SHEET 7 OF 11

SCALE: 1" = 30'

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724

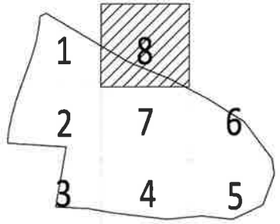


LEGEND

CRITICAL ROOT ZONE (CRZ)

T-XXX TREE LOCATION

T-XXX TREE TO BE REMOVED



SCALE (IN FEET)
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Anas M. Saeed
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BLACKWELL ROAD & LEE HIGHWAY

TOWN OF WARRENTON

TREE REMOVAL BASE

REVISIONS

DATE	COMMENTS

SHEET 8 OF 11

SCALE: 1" = 30'

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Offsite or Shared	Notes & Arborist Recommendations
1	Black Walnut	14.0	14.0	Fair	X		Dead and broken limbs
2	Black Walnut	16.8	16.8	Fair	X		CODIT, lower wound, and dead limbs
3	Black Walnut	17.3	17.3	Fair	X		Vines, and dead limbs
4	Hackberry	17.5	17.5	Fair	X		Watersprouts, dead limbs, and lean in growth
5	Pignut Hickory	7.0	7.0	Poor		Offsite	Double trunk, dead limbs, topped, and vines
6	Black Walnut	6.0	6.0	Poor	X*		Mechanical damage to lower stem, and root flare
7	Hackberry	15.7	15.7	Fair	X		Vines
8	Black Walnut	14.6	14.6	Fair	X*		Vines, dead limbs, and small cavities
9	Pignut Hickory	11.5	11.5	Fair	X		Vines, and dead limbs
10	Black Walnut	20.2	20.2	Fair			Dead limbs, vines, and watersprouts
11	Black Locust	10.4	10.4	Fair			Vines
12	Red Maple	43.0	43.0	Fair			Multi-trunk, vines, watersprouts, and some deadwood
13	Dead	-	-	-	X*		
14	Red Maple	29.7	29.7	Fair			Vines, and dead limbs
15	Black Cherry	8.7	8.7	Fair			Lean in growth
16	Black Locust	7.6	7.6	Fair			Vines, and dead limbs
17	Black Locust	12.4	12.4	Fair			Double trunk, and vines
18	Black Locust	6.1	6.1	Fair	X		Vines, and lean in growth
19	Black Locust	29.5	29.5	Fair	X		Multi-trunk, and vines
20	Red Maple	31.5	31.5	Fair			Multi-trunk
21	Dead	-	-	-	X*		
22	Black Locust	11.7	11.7	Fair			Multi-trunk, and vines
23	White Ash	10.8	10.8	Fair	X*		
24	Dead	-	-	-	X*		
25	Bradford Pear	20.6	20.6	Fair		ROW	
26	Black Walnut	14.9	14.9	Fair		ROW	Dead limbs, and watersprouts
27	Tree of Heaven	8.5	8.5	Fair		ROW	
28	Black Walnut	10.2	10.2	Poor	X		Vines, and dead limbs
29	Black Walnut	7.2	7.2	Poor	X		Vines, dead limbs, and hollow
30	Black Walnut	10.2	10.2	Poor	X*/**	ROW	Dead limbs, and vines
31	Black Walnut	11.7	11.7	Fair			Vines, and dead limbs
32	Tulip Poplar	29.0	29.0	Fair		Offsite	Multi-trunk, watersprouts, and broken leader
33	Boxelder	30.0	30.0	Fair			Multi-trunk, and ivy
34	Boxelder	45.0	45.0	Fair			Multi-trunk, and ivy
35	Dead	-	-	-		Offsite	
133	Black Locust	6.0	6.0	Fair	X		Dead limbs, dieback, vines, and watersprouts
134	Black Locust	10.0	10.0	Fair	X		Dead limbs, dieback, vines, and watersprouts
135	Black Locust	6.0	6.0	Poor	X		Dead limbs, dieback, vines, and watersprouts
136	Black Locust	8.5	8.5	Fair	X*		Dead limbs, dieback, vines, and watersprouts
137	Black Locust	10.0	10.0	Poor	X*		Dead limbs, dieback, vines, and watersprouts
138	Tulip Poplar	20.0	20.0	Fair			Dead limbs, dieback, vines, and watersprouts
139	Pignut Hickory	14.5	14.5	Fair	X*		Dead limbs, dieback, vines, and watersprouts
140	Pignut Hickory	14.3	14.3	Fair	X*		Dead limbs, dieback, vines, and watersprouts
141	Black Locust	16.0	16.0	Poor	X		Dead limbs, dieback, vines, and watersprouts
142	Hackberry	6.3	6.3	Fair	X		Dead limbs, dieback, vines, and watersprouts
143	Tulip Poplar	5.5	5.5	Fair	X		Dead limbs, double trunk, dieback, vines, and watersprouts
144	Pignut Hickory	15.0	15.0	Fair	X		Dead limbs, double trunk, dieback, vines, and watersprouts
145	Tulip Poplar	28.0	28.0	Fair	X*		Dead limbs, dieback, vines, and watersprouts
146	Tulip Poplar	11.0	11.0	Fair	X*		Dead limbs, dieback, vines, and watersprouts
147	Black Locust	8.0	8.0	Poor	X*		Dead limbs, dieback, vines, and watersprouts
148	Black Locust	14.0	14.0	Poor	X*		Dead limbs, dieback, vines, and watersprouts
149	Pignut Hickory	8.0	8.0	Fair			Dead limbs, dieback, vines, and watersprouts
150	Pignut Hickory	8.0	8.0	Fair			Dead limbs, dieback, vines, and watersprouts
151	Pignut Hickory	10.3	10.3	Fair			Dead limbs, dieback, vines, and watersprouts
152	Black Locust	11.2	11.2	Fair			Dead limbs, dieback, vines, and watersprouts
153	Pignut Hickory	11.1	11.1	Fair			Dead limbs, dieback, vines, and watersprouts
154	Tulip Poplar	11.3	11.3	Fair			Dead limbs, dieback, vines, and watersprouts
155	Tulip Poplar	32.0	32.0	Fair			Dead limbs, dieback, vines, and watersprouts
156	Tulip Poplar	32.0	32.0	Poor			Dead limbs, dieback, vines, and watersprouts
157	Black Locust	7.5	7.5	Fair			Dead limbs, dieback, vines, and watersprouts
158	Red Maple	43.0	43.0	Fair			Dead limbs, multi-trunk, dieback, vines, and watersprouts
159	Red Maple	7.5	7.5	Poor			Dead limbs, dieback, vines, and watersprouts
160	Pignut Hickory	9.0	9.0	Fair			Dead limbs, dieback, vines, and watersprouts
161	Pignut Hickory	14.0	14.0	Fair			Dead limbs, dieback, vines, and watersprouts
162	Pignut Hickory	14.0	14.0	Fair			Dead limbs, dieback, vines, and watersprouts
163	White Oak	32.0	32.0	Fair			Dead limbs, dieback, vines, and watersprouts
164	Red Maple	14.0	14.0	Poor			Dead limbs, dieback, vines, and watersprouts
165	Pignut Hickory	9.2	9.2	Fair			Dead limbs, dieback, vines, and watersprouts
166	Northern Red Oak	50.0	50.0	Fair			Dead limbs, dieback, vines, and watersprouts
167	Pignut Hickory	6.0	6.0	Fair			Dead limbs, dieback, vines, and watersprouts
168	Tulip Poplar	14.0	14.0	Fair			Dead limbs, double trunk, dieback, vines, and watersprouts
169	Tulip Poplar	25.5	25.5	Fair			Dead limbs, dieback, vines, and watersprouts
170	Tulip Poplar	23.5	23.5	Fair			Dead limbs, dieback, vines, and watersprouts
171	Tulip Poplar	22.5	22.5	Fair			Dead limbs, watersprouts, and vines
172	Tulip Poplar	24.0	24.0	Fair	X		Dead limbs, watersprouts, and vines
173	Tulip Poplar	22.5	22.5	Fair	X		Dead limbs, watersprouts, and vines
174	Tulip Poplar	11.0	11.0	Fair	X		Dead limbs, watersprouts, and vines
175	Tulip Poplar	17.0	17.0	Fair	X*		Dead limbs, watersprouts, and vines
177	Black Walnut	8.0	8.0	Fair	X		Dead limbs, watersprouts, and vines
178	Black Walnut	8.5	8.5	Fair	X		Dead limbs, watersprouts, and vines
179	Tulip Poplar	16.0	16.0	Fair	X		Dead limbs, watersprouts, and vines
180	Pignut Hickory	8.5	8.5	Poor	X		Dead limbs, watersprouts, and vines
181	Dead	-	-	-	X		Dead limbs, watersprouts, and vines
182	Black Walnut	16.0	16.0	Poor	X		Dead limbs, watersprouts, and vines
183	Tulip Poplar	8.5	8.5	Fair	X		Dead limbs, watersprouts, and vines
184	Black Walnut	16.0	16.0	Fair	X		Dead limbs, watersprouts, and vines
185	Pignut Hickory	9.5	9.5	Fair	X		Dead limbs, watersprouts, and vines
186	Pignut Hickory	16.0	16.0	Fair	X		Dead limbs, watersprouts, and vines
187	Tulip Poplar	12.2	12.2	Fair	X		Crooked trunk, and co-dominant stems
188	Tulip Poplar	13.9	13.9	Fair	X		Covered in dense vines
189	Tulip Poplar	18.4	18.4	Good	X		
190	Tulip Poplar	13.1	13.1	Good	X		A few small broken limbs
191	Tulip Poplar	23.7	23.7	Fair	X		Poor branch formation , and covered in dense vines
192	Tulip Poplar	22.0	22.0	Fair	X		Co-dominant stems
193	Tulip Poplar	10.5	10.5	Fair	X		Broken leader, and covered in vines
194	Tulip Poplar	18.3	18.3	Fair	X		Covered in vines, and several dead and broken limbs
195	Flowering Dogwood	11.0	11.0	Poor	X		Double trunk, and mostly dead
196	Black Walnut	7.3	7.3	Fair	X		Co-dominant stems, and covered in vines
197	Pignut Hickory	6.3	6.3	Fair	X		Covered in vines
198	Pignut Hickory	8.0	8.0	Good	X		Covered in vines
199	Pignut Hickory	6.4	6.4	Fair	X		One-sided
200	Tulip Poplar	29.0	29.0	Fair	X		Several dead and broken limbs
243	Black Oak	8.0	8.0	Fair			Some dead limbs, and vines up trunk
244	Black Oak	9.8	9.8	Fair			Some dead limbs, and mostly one-sided
245	Dead	-	-	-	X*		
246	Black Locust	11.0	11.0	Fair			Several dead limbs, and vines up trunk
247	Black Locust	8.2	8.2	Fair			Several dead limbs, and vines up trunk
248	Northern Red Oak	19.1	19.1	Poor			Mostly dead
249	Dead	-	-	-	X*		
250	Tulip Poplar	29.2	29.2	Fair			Some dead limbs, and vines up trunk
251	Cottonwood	17.3	17.3	Good			
252	Tulip Poplar	21.4	21.4	Good			Some dead limbs
253	Tulip Poplar	11.4	11.4	Fair			Cavity up trunk
254	Tulip Poplar	12.4	12.4	Fair			Some dead limbs

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Offsite or Shared	Notes & Arborist Recommendations
255	Tulip Poplar	28.2	28.2	Good			Some dead limbs
256	Black Locust	10.2	10.2	Poor			Mostly one-sided, several dead limbs, and vines in canopy
257	Tulip Poplar	18.6	18.6	Poor			Deadwood at base, and vines in canopy
258	Black Cherry	10.2	10.2	Fair			Dense vines up trunk, and irregular growth
259	Tulip Poplar	22.0	22.0	Good			Some dead limbs
260	Tree of Heaven	8.3	8.3	Poor	X*		Several dead limbs, vines up trunk and in canopy. Recommended for removal due to invasive nature.
261	Tree of Heaven	10.1	10.1	Poor	X*		Several dead limbs, vines up trunk and in canopy. Recommended for removal due to invasive nature.
262	Tree of Heaven	6.3	6.3	Poor	X*		Several dead limbs, vines up trunk and in canopy. Recommended for removal due to invasive nature.
263	Tree of Heaven	6.5	6.5	Poor	X*		Several dead limbs, vines up trunk and in canopy. Recommended for removal due to invasive nature.
264	Tree of Heaven	9.4	9.4	Poor	X*		Several dead limbs, vines up trunk and in canopy. Recommended for removal due to invasive nature.
265	Black Locust	8.4	8.4	Poor			Several dead limbs, and vines up trunk
266	Green Ash	10.3	10.3	Poor			Several dead limbs, and vines up trunk
267	Tulip Poplar	13.3	13.3	Fair			Vines up trunk
268	Black Locust	8.3	8.3	Fair			Some dead limbs
269	Black Locust	11.3	11.3	Poor			Several dead limbs, and vines up trunk
270	Black Locust	10.3	10.3	Poor			Several dead limbs, and vines up trunk
271	Black Locust	7.8	7.8	Poor			Several dead limbs, and vines up trunk
272	Black Locust	14.2	14.2	Fair			Double trunk, vines up trunk, and leaning
273	Tulip Poplar	15.6	15.6	Fair			Triple trunk, one dead leader, and some dead limbs
274	Black Locust	8.1	8.1	Poor			Several dead limbs, and vines up trunk
275	American Sycamore	9.1	9.1	Fair			Vines up trunk
276	Tulip Poplar	7.1	7.1	Fair			Vines up trunk
277	Tulip Poplar	7.1	7.1	Fair	X		Vines up trunk
278	Tulip Poplar	6.2	6.2	Good	X		
279	Tulip Poplar	9.0	9.0	Good	X		Vines at base
280	Tulip Poplar	10.8	10.8	Good	X		
281	Red Maple	6.8	6.8	Fair	X		Mostly one-sided, and vines up trunk
282	American Sycamore	13.2	13.2	Good	X		
283	Cottonwood	7.3	7.3	Good	X		
284	Tulip Poplar	6.2	6.2	Good	X		
285	Tulip Poplar	12.3	12.3	Good	X		
286	Tulip Poplar	9.0	9.0	Good	X		
287	Tulip Poplar	10.2	10.2	Good	X		
288	Tulip Poplar	12.2	12.2	Good	X		
289	Tulip Poplar	12.6	12.6	Good	X		
290	Tulip Poplar	9.8	9.8	Good	X		
291	Tulip Poplar	17.4	17.4	Good	X		Vines up trunk
292	Bradford Pear	6.5	6.5	Fair	X		Vines in canopy
293	Tulip Poplar	11.8	11.8	Good	X		
294	American Sycamore	14.0	14.0	Fair	X		Vines up trunk
295	Tulip Poplar	6.6	6.6	Good	X		
296	Tulip Poplar	11.9	11.9	Good	X		Vines at base
297	Tulip Poplar	13.4	13.4	Fair	X		Some dead limbs, and vines up trunk
298	Cottonwood	7.6	7.6	Poor	X		Dense vines in canopy
299	Pignut Hickory	14.2	14.2	Fair			Vines in canopy
300	Pignut Hickory	16.3	16.3	Fair			Double trunk, some dead limbs, and vines up trunk
460	Black Gum	9.2	9.2	Fair	X		Vines, and dead limbs
461	Red Maple	17.7	17.7	Fair	X		Vines, and slight lean in growth
462	Red Maple	17.0	17.0	Fair	X		Multi-trunk, and vines
463	American Sycamore	6.4	6.4	Good	X		Vines
464	Kwanzan Cherry	16.2	16.2	Good			Vines
465	Kwanzan Cherry	14.6	14.6	Fair			Vines, and dead limbs
466	Dead	-	-	-	X*		
467	Kwanzan Cherry	12.4	12.4	Fair			Vines, and dead limbs
468	Kwanzan Cherry	11.2	11.2	Fair			Vines, and dead limbs
470	Tree of Heaven	7.6	7.6	Fair	X*		Lean. Recommended for removal due to invasive nature.
471	Black Locust	10.6	10.6	Fair			
472	Black Cherry	7.4	7.4	Fair			
473	Green Ash	7.0	7.0	Poor			Emerald Ash Borer
474	Black Locust	8.7	8.7	Fair			
475	Dead	-	-	-	X*		
476	Green Ash	7.2	7.2	Fair			Dead limbs
477	American Sycamore	12.8	12.8	Poor			Many small cavities, and vines
478	Tulip Poplar	7.0	7.0	Fair			Vines
479	American Sycamore	13.5	13.5	Fair			Vines
480	Tulip Poplar	21.1	21.1	Good			Double trunk
481	Tulip Poplar	16.2	16.2	Good			
482	Tulip Poplar	12.0	12.0	Fair			Watersprouts, and vines
483	Tulip Poplar	11.3	11.3	Good			Watersprouts
484	Tulip Poplar	40.0	40.0	Fair			Double trunk, dead limbs, and vines
485	Black Walnut	8.0	8.0	Fair			Vines, and dead limbs
486	Black Locust	15.0	15.0	Poor	X*		Multi-trunk ,and vines
487	Tree of Heaven	9.2	9.2	Poor	X*		Topped . Recommended for removal due to invasive nature.
488	Silver Maple	16.2	16.2	Fair	X		Dead limbs, and watersprouts
489	Red Maple	8.0	8.0	Fair	X		Dead limbs, and watersprouts
490	Eastern Redcedar	6.0	6.0	Fair	X		
491	Tulip Poplar	20.0	20.0	Fair			Vines
492	Tulip Poplar	17.0	17.0	Good			
493	Red Maple	8.0	8.0	Good			
494	Eastern Redcedar	8.0	8.0	Fair			Double trunk
495	Tulip Poplar	9.0	9.0	Good	X*		
496	Tulip Poplar	17.0	17.0	Good	X*		
497	Red Maple	6.5	6.5	Good	X*		
498	Tulip Poplar	18.2	18.2	Good	X		
499	Tulip Poplar	12.5	12.5	Good	X		
500	Tulip Poplar	10.2	10.2	Poor	X		Large cavity at base
501	Pin Oak	7.3	7.3	Fair	X		Vines
502	Cottonwood	47.1	47.1	Fair	X		Multi-trunk, and dead limbs
503	Red Maple	18.3	18.3	Fair	X		Multi-trunk, dead limbs, and deadwood
504	Red Maple	17.2	17.2	Fair	X		Multi-trunk
505	Red Maple	17.0	17.0	Good	X		Vines
506	Red Maple	29.5	29.5	Fair	X		Double trunk, and dead limbs
507	Green Ash	11.2	11.2	Poor	X		Emerald Ash Borer
508	Green Ash	8.0	8.0	Poor	X		Emerald Ash Borer
509	Green Ash	9.5	9.5	Fair	X		Lean in growth
510	Mockernut Hickory	10.5	10.5	Good	X		
511	White Oak	19.0	19.0	Fair	X		Dead limbs, and deadwood
512	Mockernut Hickory	8.5	8.5	Good	X		Dead limbs
513	White Oak	20.0	20.0	Fair	X		Dead limbs, and deadwood
514	Red Maple	12.0	12.0	Good	X		
515	White Oak	33.0	33.0	Fair	X		Dead limbs, and deadwood
516	White Oak	26.0	26.0	Fair	X		Dead limbs, and deadwood
517	Tulip Poplar	6.2	6.2	Fair	X		Vines, and dead limbs
518	Tulip Poplar	9.0	9.0	Fair	X		Vines, and dead limbs
519	Tulip Poplar	16.1	16.1	Good	X		
520	White Oak	9.0	9.0	Fair	X		Dead limbs, and deadwood
521	White Oak	6.2	6.2	Fair	X		Dead limbs, and deadwood
522	White Oak	8.0	8.0	Fair	X		Dead limbs, and deadwood
523	Mockernut Hickory	8.5	8.5	Fair	X		Dead limbs, and deadwood
524	Tulip Poplar	7.0	7.0	Fair	X		Dead limbs, and deadwood
525	Tulip Poplar	14.0	14.0	Fair	X		Dead limbs, and deadwood
526	Tulip Poplar	14.0	14.0	Fair	X		Dead limbs, and deadwood
527	Mockernut Hickory	11.0	11.0	Fair	X		Dead limbs, and deadwood
528	Northern Red Oak	32.0	32.0	Fair	X		Dead limbs, and deadwood

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BLACKWELL ROAD
& LEE HIGHWAY
TOWN OF WARRENTON

EXISTING VEGETATION INVENTORY

REVISIONS

DATE	COMMENTS

SHEET 9 OF 11

SCALE: NTS

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2224

Arborist Certification # MA-4727A

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Offsite or Shared	Notes & Arborist Recommendations
529	White Oak	11.0	11.0	Fair	X*		Watersprouts
530	Mockernut Hickory	9.0	9.0	Fair			
531	White Oak	34.0	34.0	Fair			Double trunk, dead limbs, and deadwood
532	White Oak	7.5	7.5	Fair			Dead limbs, and deadwood
533	Mockernut Hickory	19.0	19.0	Fair			Dead limbs, and deadwood
534	White Oak	20.0	20.0	Fair			Dead limbs, and deadwood
535	Northern Red Oak	21.0	21.0	Fair			Dead limbs, and deadwood
536	Pignut Hickory	7.0	7.0	Fair			Dead limbs, and deadwood
537	Tulip Poplar	19.0	19.0	Fair			Dead limbs, and deadwood
538	Pignut Hickory	8.5	8.5	Fair			Dead limbs, and deadwood
539	Pignut Hickory	16.2	16.2	Fair			Dead limbs, and deadwood
540	Pignut Hickory	21.0	21.0	Fair			Dead limbs, and deadwood
541	Pignut Hickory	13.2	13.2	Fair			Dead limbs, and deadwood
542	Tulip Poplar	6.0	6.0	Fair			Dead limbs, and deadwood
543	Tulip Poplar	18.0	18.0	Fair			Dead limbs, vines, and deadwood
544	Tulip Poplar	21.0	21.0	Good			
545	Tulip Poplar	9.0	9.0	Fair			Vines, and dead limbs
546	Pignut Hickory	9.0	9.0	Fair			Dead limbs, and vines
547	Tulip Poplar	24.0	24.0	Good			
548	Tulip Poplar	15.0	15.0	Fair	X*		Dead limbs, and small cavity at base
549	Tulip Poplar	18.2	18.2	Fair	X		Double trunk, and dead limbs
550	Northern Red Oak	18.0	18.0	Poor	X		Vines, dead limbs, and deadwood
551	Northern Red Oak	14.0	14.0	Fair	X*		Dead limbs
552	Black Cherry	10.0	10.0	Fair	X*		Dead limbs, and deadwood
553	Black Cherry	10.0	10.0	Fair			Dead limbs, and deadwood
554	Black Cherry	9.0	9.0	Fair	X		Dead limbs, and deadwood
555	Tree of Heaven	9.0	9.0	Fair	X		Dead limbs, deadwood, and watersprouts
556	Tulip Poplar	19.0	19.0	Fair	X		Dead limbs, and deadwood
557	Tulip Poplar	12.0	12.0	Fair	X		Dead limbs, and deadwood
558	Northern Red Oak	7.2	7.2	Fair	X		Dead limbs, and deadwood
559	Dead	-	-	-	X		
560	Dead	-	-	-	X		
561	Black Gum	7.2	7.2	Fair	X		Dead limbs
562	Black Walnut	10.5	10.5	Fair	X		Dead limbs, and deadwood
563	White Oak	9.0	9.0	Fair	X		Dead limbs, and deadwood
564	White Oak	8.0	8.0	Fair	X		Dead limbs, and watersprouts
565	Tulip Poplar	38.0	38.0	Fair	X		Dead limbs, and deadwood
566	Tulip Poplar	9.0	9.0	Fair	X		Dead limbs
567	Tulip Poplar	16.0	16.0	Fair	X		Dead limbs, and watersprouts
568	Tulip Poplar	9.0	9.0	Good	X		Vines
569	Black Walnut	6.5	6.5	Fair	X*		Vines, and dead limbs
570	Black Walnut	8.0	8.0	Fair	X*		Vines
571	Black Walnut	8.0	8.0	Fair			Dead limbs, and watersprouts
572	Black Cherry	15.0	15.0	Fair		ROW	Lean in growth, vines, and dead limbs
573	Black Walnut	7.0	7.0	Fair	X*		
574	Black Cherry	13.0	13.0	Poor		ROW	Dead limbs
575	Black Walnut	7.0	7.0	Poor			Dead limbs, vines, and deadwood
576	Black Walnut	11.0	11.0	Fair			Dead limbs
577	Black Cherry	10.0	10.0	Poor			Deadwood, dead limbs, and conks
578	Black Cherry	18.0	18.0	Poor			Dead limbs, deadwood, and dead leader
579	Black Walnut	7.0	7.0	Good			Vines
580	Black Walnut	13.0	13.0	Fair			Vines, and dead limbs
581	Black Walnut	15.0	15.0	Fair			Vines, and dead limbs
582	Black Walnut	20.0	20.0	Fair			Vines, and dead limbs
583	Hackberry	9.0	9.0	Fair			Vines, and dead limbs
584	Black Walnut	6.0	6.0	Fair			
585	Black Walnut	14.0	14.0	Poor			Topped
586	Black Walnut	18.0	18.0	Fair			Dead limbs, deadwood, and vines
587	Black Walnut	10.0	10.0	Fair			Dead limbs, deadwood, and vines
588	Black Walnut	12.0	12.0	Fair			Dead limbs, deadwood, and vines
589	Tree of Heaven	10.0	10.0	Poor	X*		Dead limbs, deadwood, small cavity, and vines. Recommended for removal due to invasive nature.
590	Black Walnut	9.8	9.8	Fair			Dead limbs, deadwood, and vines
591	Black Walnut	20.5	20.5	Fair			Dead limbs, deadwood, and vines
592	Tree of Heaven	6.5	6.5	Fair	X*		Dead limbs, deadwood, and vines. Recommended for removal due to invasive nature.
593	Black Walnut	6.0	6.0	Fair			Dead limbs, dieback, vines, and watersprouts
594	Black Walnut	16.0	16.0	Fair			Dead limbs, dieback, vines, and watersprouts
595	Black Walnut	7.5	7.5	Fair			Dead limbs, dieback, vines, and watersprouts
596	Black Walnut	8.0	8.0	Fair			Dead limbs, dieback, vines, and watersprouts
597	Black Walnut	11.0	11.0	Fair			Dead limbs, dieback, vines, and watersprouts
598	Black Walnut	10.0	10.0	Fair			Dead limbs, dieback, vines, and watersprouts
599	Tulip Poplar	15.1	15.1	Fair			Dead limbs, dieback, vines, and watersprouts
600	Tulip Poplar	7.6	7.6	Fair	X		Dead limbs, dieback, vines, and watersprouts
601	Pignut Hickory	9.3	9.3	Good			
602	White Oak	40.2	40.2	Poor			Cavity at base, several dead limbs, and hollow sound
603	Tulip Poplar	6.3	6.3	Good			
604	Pignut Hickory	21.0	21.0	Good			
605	Pignut Hickory	17.4	17.4	Poor			Deadwood up trunk, fungal growth up trunk, and several dead limbs
606	Tulip Poplar	8.4	8.4	Good			
607	Tulip Poplar	8.6	8.6	Good			Sweeping growth
608	Pignut Hickory	6.7	6.7	Good			
609	Pignut Hickory	9.8	9.8	Good			
610	Tulip Poplar	7.0	7.0	Good		Shared	Some vines up trunk
611	Tulip Poplar	11.3	11.3	Good			One-sided with some vines
612	Pignut Hickory	21.1	21.1	Good			Some dead limbs
613	Tulip Poplar	7.8	7.8	Good			
614	Tulip Poplar	6.7	6.7	Good			Sweeping growth
615	Tulip Poplar	11.2	11.2	Poor			Large cavity near base
616	Tulip Poplar	14.4	14.4	Good			Mostly one-sided
617	Tulip Poplar	6.8	6.8	Good			Mostly one-sided
618	Tulip Poplar	12.2	12.2	Good			Vines up trunk, and mostly one-sided
619	Tulip Poplar	15.6	15.6	Good			
620	Tulip Poplar	11.3	11.3	Poor		ROW	Decay at base
621	Tulip Poplar	20.8	20.8	Fair			Vines in canopy, and some dead limbs
622	Tulip Poplar	15.2	15.2	Good			Vines up trunk
623	White Oak	6.7	6.7	Fair			Vines up trunk, and some dead limbs
624	Tulip Poplar	20.0	20.0	Good		ROW	Vines up trunk
625	White Oak	16.6	16.6	Fair			Vines up trunk, swelling at base, and some dead limbs
626	Northern Red Oak	22.9	22.9	Fair			Vines up trunk, and several dead limbs
627	Pignut Hickory	12.3	12.3	Fair			Vines up trunk, and several dead limbs
628	Pignut Hickory	8.8	8.8	Good		Shared	
629	Tulip Poplar	14.2	14.2	Good			
630	Tulip Poplar	23.4	23.4	Fair			Several dead limbs
631	Northern Red Oak	9.1	9.1	Fair		Shared	Mostly one-sided, and vines in canopy
632	Tulip Poplar	12.1	12.1	Good			Vines up trunk
633	Tulip Poplar	21.1	21.1	Poor			Missing top
634	Tulip Poplar	25.4	25.4	Good			Some dead limbs
635	Dead	-	-	-	X*		
636	Dead	-	-	-	X*		
637	Dead	-	-	-	X*		
638	Dead	-	-	-	X*		
639	Pignut Hickory	11.4	11.4	Good			Vines up trunk
640	Tulip Poplar	28.4	28.4	Good			Some dead limbs
641	Tulip Poplar	17.4	17.4	Good			Some dead limbs
642	Tulip Poplar	49.8	49.8	Good			Double trunk, and some dead limbs
643	Black Walnut	15.6	15.6	Fair			Some dead limbs
644	White Oak	8.8	8.8	Good	X		
645	Black Walnut	22.3	22.3	Fair	X		Some dead limbs
646	White Oak	30.3	30.3	Fair	X*		Several dead limbs, and mostly one-sided
647	Black Cherry	8.2	8.2	Fair	X*		Some dead limbs
648	Tulip Poplar	16.0	16.0	Fair	X		Vines in canopy
649	Green Ash	11.6	11.6	Fair	X		Vines in canopy
650	Tulip Poplar	12.3	12.3	Fair		ROW	Dense vines up trunk and in canopy
651	Tulip Poplar	12.8	12.8	Fair	X*/**	Shared	Dense vines up trunk and in canopy
652	Tulip Poplar	9.8	9.8	Fair	X*		Dense vines up trunk and in canopy
653	Mulberry	9.3	9.3	Poor		ROW	Dense vines up trunk and in canopy
654	Green Ash	7.0	7.0	Poor	X*		Dense vines up trunk and in canopy
655	Green Ash	7.4	7.4	Poor	X*		Dense vines up trunk and in canopy
656	Black Walnut	6.7	6.7	Fair	X*		Vines in canopy
657	Black Walnut	6.0	6.0	Poor	X*		Dense vines in canopy
658	Boxelder	10.2	10.2	Poor		ROW	Dense vines in canopy
659	Black Walnut	6.0	6.0	Fair	X*		Dense vines in canopy
660	Black Walnut	8.4	8.4	Fair	X		Dense vines in canopy
661	Black Walnut	6.2	6.2	Fair	X		Dense vines in canopy
662	Black Walnut	13.2	13.2	Fair	X		Dense vines in canopy
663	Black Cherry	8.8	8.8	Poor		ROW	Dense vines in canopy
664	Black Cherry	9.3	9.3	Poor		ROW	Dense vines in canopy
665	Black Walnut	7.6	7.6	Poor	X*		Dense vines in canopy
666	Dead	-	-	-	X*		
667	Hackberry	10.2	10.2	Poor	X*		Failed top, and dense vines
668	Tulip Poplar	10.8	10.8	Fair	X		Dense vines up trunk
669	Black Walnut	6.1	6.1	Poor	X		Failing trunk, and dense vines up trunk
670	Tulip Poplar	29.0	29.0	Fair	X*		Dense vines up trunk
671	Dead	-	-	-	X*		
672	Black Walnut	8.1	8.1	Fair	X		Vines in canopy
673	Black Walnut	6.0	6.0	Fair	X		Vines up trunk
674	Black Walnut	13.2	13.2	Fair	X		Vines up trunk
675	Black Cherry	11.4	11.4	Fair	X		Vines up trunk
676	Tulip Poplar	27.0	27.0	Fair	X		Vines up trunk
677	Dead	-	-	-	X		
678	Tulip Poplar	20.3	20.3	Fair	X		Dense vines up trunk
679	Black Cherry	8.5	8.5	Fair	X		Dense vines up trunk
680	Dead	-	-	-	X		
681	Black Walnut	15.7	15.7	Fair	X		Dense vines up trunk
682	Black Walnut	12.8	12.8	Fair	X		Dense vines up trunk
683	Boxelder	17.4	17.4	Fair		ROW	Double trunk, and dense vines up trunk
684	Black Walnut	8.4	8.4	Fair	X		Dense vines up trunk
685	Black Walnut	9.0	9.0	Fair	X		Dense vines up trunk
686	Dead	-	-	-	X		
687	Black Walnut	17.9	17.9	Fair			Dense vines up trunk
688	Dead	-	-	-	X*		
689	Black Walnut	18.0	18.0	Fair	X		Dense vines up trunk
690	Black Walnut	12.4	12.4	Fair	X		Dense vines up trunk
691	Dead	-	-	-	X*		
692	Tree of Heaven	11.1	11.1	Fair	X*		Dense vines up trunk. Recommended for removal due to invasive nature.
693	Tree of Heaven	7.8	7.8	Fair	X*		Dense vines up trunk. Recommended for removal due to invasive nature.
694	Tree of Heaven	7.0	7.0	Fair	X*		Dense vines up trunk. Recommended for removal due to invasive nature.
695	Tree of Heaven	7.4	7.4	Fair	X*		Dense vines up trunk. Recommended for removal due to invasive nature.
696	Black Cherry	7.9	7.9	Poor			Mostly dead
697	Eastern Redcedar	9.7	9.7	Fair		ROW	Double trunk, and dense vines up trunk
698	Black Cherry	22.5	22.5	Fair		ROW	Vines up trunk
699	Slippery Elm	9.4	9.4	Fair		ROW	Vines up trunk
700	Bradford Pear	30.5	30.5	Fair	X*		Double trunk, and poorly pruned for powerlines. Recommended for removal due to invasive nature.
729	Black Walnut	22.4	22.4	Fair		ROW	Vines up trunk
730	Eastern Redcedar	7.4	7.4	Fair		ROW	Several small dead limbs
731	Eastern Redcedar	6.5	6.5	Fair		ROW	Several small dead limbs
732	Tulip Poplar	19.5	19.5	Good		ROW	
733	Black Cherry	13.2	13.2	Poor			Mostly dead, and vines up trunk
734	Eastern Redcedar	10.1	10.1	Poor			Mostly dead, and many dead limbs
735	Tree of Heaven	7.1	7.1	Fair	X*		Poorly pruned for powerlines. Recommended for removal due to invasive nature.
736	Persimmon	8.7	8.7	Fair		ROW	Vines up trunk
737	Black Cherry	9.8	9.8	Poor		ROW	Poor form, and watersprouts
738	Persimmon	6.4	6.4	Fair		ROW	Vines up trunk
739	Tulip Poplar	11.8	11.8	Fair		ROW	Vines up trunk
740	Tulip Poplar	34.0	34.0	Good		ROW	Double trunk, and vines up trunk
741	Bradford Pear	17.4	17.4	Fair		ROW	Double trunk, and vines up trunk
742	Red Maple	14.0	14.0	Fair			Vines up trunk, and in canopy
743	Black Cherry	24.4	24.4	Fair			Poorly pruned for powerlines, and vines in canopy
744	Black Cherry	15.1	15.1	Fair			Poorly pruned for powerlines, and vines in canopy
745	Red Maple	6.1	6.1	Fair		ROW	Vines up trunk, and some dead limbs
746	Red Maple	33.0	33.0	Fair		ROW	Multi-trunk, poorly pruned for powerlines, and several dead limbs
747	Black Cherry	20.2	20.2	Poor	X*		Deadwood at base, dense vines, and many dead limbs
748	Red Maple	24.8	24.8	Fair			Multi-trunk, several dead limbs, and vines up trunk
749	Red Maple	10.4	10.4	Fair			Vines in canopy
750	Black Cherry	27.0	27.0	Fair			Double trunk, some dead limbs, and vines up trunk
751	Eastern Redcedar	11.8	11.8	Fair			Vines up trunk, and some dead limbs
752	Tulip Poplar	18.8	18.8	Fair			Pruned for powerlines, one-sided, and English ivy up trunk
753	Black Cherry	11.9	11.9	Poor			Dense vines up trunk, and many dead limbs
754	Boxelder	12.1	12.1	Poor	X*		Mostly dead
755	Boxelder	8.8	8.8	Fair	X		Dense vines up trunk
756	Slippery Elm	6.4	6.4	Fair	X		Vines in canopy
757	American Sycamore	24.0	24.0	Fair	X		Dense vines up trunk
758	American Sycamore	23.0	23.0	Fair	X		Dense vines up trunk
759	Tulip Poplar	15.4	15.4	Poor	X		Failed crown, vines up trunk, and poor form
760	Boxelder	16.7	16.7	Poor	X*		Mostly dead
761	Persimmon	9.0	9.0	Fair	X		Vines up trunk
762	Tulip Poplar	22.3	22.3	Fair	X		Several dead limbs
763	Boxelder	12.4	12.4	Fair			Dense vines in canopy
764	Dead	-	-	-	X*/**	Shared	
765	Black Cherry	36.0	36.0	Poor			Mostly dead
766	Tulip Poplar	15.4	15.4	Fair	X*		Dense vines in canopy
767	Boxelder	6.4	6.4	Fair			Vines up trunk
768	Black Walnut	12.8	12.8	Fair	X*		Vines up trunk
769	Boxelder	17.0	17.0	Fair			Corrected growth some dead limbs, and vines in canopy
770	Boxelder	12.4	12.4	Fair			Dense vines up trunk
771	Hackberry	12.1	12.1	Fair			Dense vines up trunk
772	Boxelder	22.0	22.0	Fair			Dense vines up trunk
773	Boxelder	13.4	13.4	Poor			Mostly dead
774	Hackberry	21.2	21.2	Fair			Dense vines up trunk
775	Boxelder	9.2	9.2	Fair			Dense vines up trunk
776	Hackberry	6.6	6.6	Fair			Vines up trunk
777	Hackberry	10.0	10.0	Fair			Vines up trunk
778	Black Walnut	13.4	13.4	Fair			Vines up trunk, and pruned for powerlines
779	Boxelder	7.3	7.3	Poor			Poorly pruned for powerlines, and many dead limbs
780	Hackberry	6.2	6.2	Fair			Dense vines up trunk
781	Hackberry	6.2	6.2	Fair			Dense vines up trunk
782	Hackberry	16.3	16.3	Fair			Vines up trunk
783	Tulip Poplar	24.2	24.2	Poor			Deadwood up trunk, and vines in canopy
784	Tulip Poplar	15.8	15.8	Poor			Poorly pruned for powerlines, hollow sound, and many dead limbs
785	Black Walnut	22.8	22.8	Fair			Vines up trunk

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BLACKWELL ROAD & LEE HIGHWAY

TOWN OF WARRENTON

EXISTING VEGETATION INVENTORY

REVISIONS

DATE	COMMENTS

SHEET 10 OF 11

SCALE: NTS

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724

Graham M. Sarver
Certified Arborist
Certification # MA-4727A

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Offsite or Shared	Notes & Arborist Recommendations
786	Black Walnut	16.2	16.2	Fair			Some dead limbs
787	Tulip Poplar	22.7	22.7	Fair	X		Ivy, and dead limbs
788	American Sycamore	19.5	19.5	Fair	X		Vines and dead limbs
789	Tulip Poplar	12.0	12.0	Fair	X		Vines
790	Eastern Redcedar	6.0	6.0	Fair	X		Topped, broken leader, and vines
791	Eastern Redcedar	6.5	6.5	Poor	X		Topped, and vines
792	Eastern Redcedar	11.1	11.1	Poor	X		Vines, and dead limbs
793	Tulip Poplar	17.4	17.4	Fair	X		Vines
794	Black Walnut	9.5	9.5	Fair	X		Vines, and dead limbs
795	Black Walnut	13.8	13.8	Fair	X		Vines, and dead limbs
796	Eastern Redcedar	9.3	9.3	Fair	X		Dead and broken limbs
797	Pignut Hickory	6.7	6.7	Fair	X		Lean in growth, and vines
798	Black Walnut	9.7	9.7	Fair	X		Dead limbs
799	Eastern Redcedar	6.4	6.4	Good	X		
800	Hackberry	9.8	9.8	Fair	X		Watersprouts, and dead limbs
801	Tulip Poplar	23.7	23.7	Fair	X		Dense vines up trunk
802	Red Maple	6.0	6.0	Fair	X		Growing into trunk of T-801
803	Tulip Poplar	12.5	12.5	Fair	X		Dense vines up trunk
804	Red Maple	10.8	10.8	Fair	X		Dense vines up trunk
805	Red Maple	8.0	8.0	Fair	X		Poor form, and lean in growth
806	Red Maple	9.5	9.5	Fair	X		Poor form, covered in dense vines, and lean in growth
807	Red Maple	12.5	12.5	Fair			Double trunk, co-dominant stems, and covered in dense vines
808	Tulip Poplar	12.3	12.3	Poor	X*		Poor form, broken co-stem, and covered in dense vines
809	American Sycamore	12.5	12.5	Good			
810	American Sycamore	21.0	21.0	Good	X*		Vines in canopy
811	Pignut Hickory	6.5	6.5	Fair	X*		Broken top, and vines up trunk
812	American Sycamore	7.0	7.0	Good			
813	Tulip Poplar	11.1	11.1	Good			
814	American Sycamore	14.6	14.6	Fair			Lean in growth, and vines on trunk
815	Pignut Hickory	7.1	7.1	Fair			Vines on trunk, and a few broken limbs
816	American Sycamore	9.8	9.8	Good			Vines on trunk
817	Tulip Poplar	15.3	15.3	Fair	X*		Codominant stems, and vines on trunk
818	Tulip Poplar	6.8	6.8	Fair	X		Vines on trunk, and several dead and broken limbs
819	American Sycamore	19.1	19.1	Fair			Dense vines on trunk and in canopy
820	American Sycamore	8.3	8.3	Good	X		
821	Tulip Poplar	7.6	7.6	Poor	X		Broken top, and dense vines up trunk
822	Tulip Poplar	11.0	11.0	Fair	X		Vines up trunk
823	Tulip Poplar	18.0	18.0	Fair	X		Vines up trunk
824	Tulip Poplar	18.3	18.3	Fair	X		Vines up trunk
825	American Sycamore	9.5	9.5	Good			Lean in growth
826	Pignut Hickory	7.0	7.0	Good	X*		
827	Tree of Heaven	6.5	6.5	Fair	X		Poor form, and covered in vines
828	Tree of Heaven	7.0	7.0	Fair	X		Poor form, and covered in vines
829	Tree of Heaven	7.6	7.6	Fair	X		Poor form, and covered in vines
830	Red Maple	8.5	8.5	Poor	X		Cavity, dead and broken limbs, and poor form
831	Dead	-	-	-	X		
832	Cottonwood	18.5	18.5	Fair	X		Poor form, and covered in dense vines
833	American Sycamore	21.0	21.0	Good	X		
834	Red Maple	7.9	7.9	Fair	X		Poor form, and vines in canopy
835	Red Maple	8.7	8.7	Fair	X		Co-dominant stems, and several dead and broken limbs
836	Dead	-	-	-	X		
837	Cottonwood	19.8	19.8	Fair	X		Several large dead and broken limbs
838	Red Maple	6.8	6.8	Fair	X		Vines up trunk
839	White Oak	10.0	10.0	Fair/Poor	X		Double trunk, dead co-stems, some broken limbs, and vines in canopy
840	Cottonwood	21.0	21.0	Fair	X		A few dead and broken limbs
841	Mockernut Hickory	6.9	6.9	Poor	X		Double trunk, dead co-stem, poor form, and vines up canopy
842	Northern Red Oak	14.0	14.0	Poor	X		High dieback, hypoxylon canker on limbs
843	Northern Red Oak	8.5	8.5	Fair	X		Vines in canopy
844	Pignut Hickory	9.3	9.3	Fair	X		Dense vines up trunk
845	Tulip Poplar	10.5	10.5	Good	X		Vines up trunk and in canopy
846	White Oak	36.0	36.0	Poor	X		Large cavity, and large dead and broken limbs
847	Dead	-	-	-	X		
848	Mockernut Hickory	15.8	15.8	Good	X		
849	Mockernut Hickory	13.5	13.5	Good	X		
850	Mockernut Hickory	17.8	17.8	Good	X		Vines in canopy
851	Mockernut Hickory	21.4	21.4	Good	X		
852	White Oak	18.1	18.1	Fair	X		A few dead and broken limbs
853	Northern Red Oak	21.6	21.6	Poor	X		High amount of dieback, large dead and broken limbs, and rot throughout
854	Mockernut Hickory	11.5	11.5	Good	X		
855	Tulip Poplar	18.0	18.0	Fair	X		Co-dominant stems, included bark, and several small dead and broken limbs
856	Tulip Poplar	8.0	8.0	Fair	X		Dead co-stem, and several small broken limbs
857	Tulip Poplar	9.0	9.0	Good	X		
858	White Oak	10.5	10.5	Fair	X		Lean in growth
859	Mockernut Hickory	21.5	21.5	Good	X		
860	Mockernut Hickory	20.0	20.0	Good	X		
861	Mockernut Hickory	6.3	6.3	Good	X		
862	Mockernut Hickory	7.0	7.0	Good	X		Dead tree hooked onto T-862
863	White Oak	25.5	25.5	Fair	X		Several dead and broken limbs
864	Mockernut Hickory	15.0	15.0	Fair	X		Many broken limbs in lower canopy
865	Northern Red Oak	23.9	23.9	Fair	X		Several dead and broken limbs
866	Tulip Poplar	7.5	7.5	Good	X*		
867	Northern Red Oak	30.0	30.0	Fair	X*		Several dead and broken limbs
868	Mockernut Hickory	8.5	8.5	Good	X		
869	Tulip Poplar	18.5	18.5	Good	X		
870	Mockernut Hickory	9.7	9.7	Good			
871	Mockernut Hickory	8.2	8.2	Good			
872	Northern Red Oak	18.9	18.9	Fair			Several large dead and broken limbs
873	White Oak	12.4	12.4	Fair			Co-dominant stems, and a few small dead limbs
874	Tulip Poplar	7.5	7.5	Good			
875	Tulip Poplar	7.0	7.0	Fair			Co-dominant stems, and one large dead limb
876	White Oak	12.8	12.8	Fair			Many watersprouts
877	Tulip Poplar	11.0	11.0	Fair			Co-dominant stems
878	White Oak	14.0	14.0	Fair	X		Several dead and broken limbs
879	Dead	-	-	-	X		
880	White Oak	20.0	20.0	Fair	X*		Co-dominant stems, and a few dead and broken limbs
881	Mockernut Hickory	21.5	21.5	Fair	X		Lean in growth, and several dead and broken limbs
882	Mockernut Hickory	7.9	7.9	Good	X		
883	Mockernut Hickory	15.0	15.0	Fair	X		Several dead and broken limbs, and vines in canopy
884	American Elm	6.8	6.8	Fair	X		A few dead and broken limbs
885	Tulip Poplar	12.8	12.8	Fair	X		Crooked trunk, and a few dead and broken limbs
886	White Oak	8.5	8.5	Fair	X		Several dead and broken limbs, and dense vines in canopy
887	Mockernut Hickory	15.8	15.8	Fair	X		Co-dominant stems, and several small broken limbs
888	Mockernut Hickory	9.5	9.5	Good	X		Vines on trunk
889	Tulip Poplar	10.0	10.0	Fair	X		Vines up trunk
890	Tulip Poplar	12.0	12.0	Good	X		
891	Tulip Poplar	29.0	29.0	Poor	X		Several large dead and broken limbs
892	Tulip Poplar	16.5	16.5	Fair	X		Crooked trunk
893	Tulip Poplar	26.0	26.0	Fair	X		A few dead and broken limbs
894	American Elm	6.3	6.3	Good	X		
895	Mockernut Hickory	6.4	6.4	Good	X		
896	Mockernut Hickory	7.8	7.8	Fair/Poor	X		Cavity in trunk
897	Mockernut Hickory	10.5	10.5	Fair	X		Several dead and broken limbs
898	Tulip Poplar	22.5	22.5	Good	X		
899	Tulip Poplar	20.8	20.8	Good	X		Crooked trunk
900	Tulip Poplar	22.8	22.8	Good	X		

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Offsite or Shared	Notes & Arborist Recommendations
901	Tulip Poplar	27.5	27.5	Good	X		
902	Tulip Poplar	6.5	6.5	Good	X		Vines on trunk
903	Cottonwood	11.9	11.9	Fair	X		Crooked trunk, and poor form
904	Mockernut Hickory	12.4	12.4	Poor	X		Cavity in trunk, and poor form
905	Pignut Hickory	8.8	8.8	Good	X		
906	Tulip Poplar	25.3	25.3	Fair	X		Co-dominant stems
907	Tulip Poplar	23.4	23.4	Poor	X		Cavity with weep wounds
908	Dead	-	-	-	X		
909	Black Walnut	9.5	9.5	Fair	X		Poor form, and several dead and broken limbs
910	Pignut Hickory	8.8	8.8	Good	X		
911	White Oak	17.4	17.4	Fair	X		Crooked trunk, and several dead and broken limbs
912	Hackberry	7.5	7.5	Fair	X		Several small dead and broken limbs
913	Black Gum	7.0	7.0	Poor	X		Poor form, many dead and broken limbs, and leaning
914	Black Gum	14.0	14.0	Poor	X		Double trunk, weak crotch, many watersprouts, dead and broken limbs, and dead co-stem
915	Tulip Poplar	14.4	14.4	Fair	X		Poor form, crooked trunk, and several broken limbs
916	Tulip Poplar	12.0	12.0	Poor	X		Cavities throughout, and co-dominant stems
917	Mockernut Hickory	7.5	7.5	Poor	X		Covered in dense vines, and many dead and broken limbs
918	Mockernut Hickory	6.4	6.4	Fair	X		Covered in vines
919	Mockernut Hickory	7.0	7.0	Fair	X		Twisted trunk
920	Mockernut Hickory	10.0	10.0	Poor	X*/**	Shared	Topped, and covered in dense vines
921	American Elm	7.0	7.0	Poor	X*/**	Shared	Partially topped, and covered in dense vines
922	Mockernut Hickory	6.5	6.5	Fair	X		Double trunk, and covered in dense vines
923	Black Cherry	15.5	15.5	Poor			Double trunk, covered in dense vines, and many dead and broken limbs
924	Black Walnut	10.2	10.2	Fair			Covered in vines
925	Black Walnut	8.0	8.0	Fair			Covered in vines
926	Black Walnut	11.5	11.5	Fair			Covered in vines
927	Black Walnut	12.8	12.8	Poor			Large dead and broken limbs, and covered in dense vines
928	Dead	-	-	-	X*		
929	Black Walnut	15.8	15.8	Poor			Large dead and broken limbs, and covered in dense vines
930	Black Walnut	8.2	8.2	Poor			Covered in dense vines, and topped
931	Black Walnut	7.8	7.8	Poor			Covered in dense vines, and topped
932	Black Walnut	7.0	7.0	Poor			Covered in dense vines, and topped
933	Black Walnut	8.5	8.5	Poor			Covered in dense vines, and topped
934	Black Walnut	12.0	12.0	Poor			Poor form, and covered in dense vines
935	Black Walnut	16.0	16.0	Poor			Covered in dense vines, and several cavities throughout
936	Black Walnut	6.8	6.8	Poor			Covered in dense vines, and poor form
937	Black Walnut	7.5	7.5	Poor			Covered in dense vines, and poor form
938	Black Walnut	10.5	10.5	Poor			Covered in dense vines, and poor form
939	Dead	-	-	-	X*		
940	Black Walnut	7.8	7.8	Poor			Covered in dense vines, and poor form
941	Black Walnut	7.5	7.5	Poor			Covered in dense vines, and poor form
942	Black Walnut	23.8	23.8	Poor			Covered in dense vines, large broken limbs, and some dead limbs
943	Dead	-	-	-	X*		Double trunk, covered in dense vines, large broken limbs, and some dead limbs
944	Black Walnut	9.0	9.0	Poor	X*		Topped, and covered in dense vines
945	Black Walnut	6.0	6.0	Poor	X*		Topped, and covered in dense vines
946	Kwanzan Cherry	10.0	10.0	Poor	X*		Poor form, covered in dense vines, and uprooting
947	Black Walnut	8.5	8.5	Poor	X*		Co-dominant stems, covered in dense vines, and partially topped
948	Red Maple	6.5	6.5	Fair	X		Crooked trunk, and vines on trunk
949	Red Maple	11.5	11.5	Fair	X		Covered in dense vines, and several dead and broken limbs
950	Black Cherry	8.3	8.3	Fair	X		Crooked trunk, and covered in dense vines
951	Red Maple	13.1	13.1	Fair	X		Double trunk, dead and broken limbs, and vines in canopy
952	Red Maple	11.7	11.7	Fair	X		Double trunk, included bark, and vines in canopy
953	Black Locust	10.2	10.2	Poor	X*		Topped, and covered in vines
954	Black Locust	12.0	12.0	Fair			Covered in dense vines
955	Pignut Hickory	6.0	6.0	Good			Co-dominant stems
956	American Sycamore	9.0	9.0	Good			Lean in growth
957	Tulip Poplar	24.5	24.5	Fair			Vines on trunk, and a few dead and broken limbs
958	American Sycamore	15.0	15.0	Good	X*		
959	Pignut Hickory	7.5	7.5	Good	X		Vines on trunk
960	Tulip Poplar	6.5	6.5	Poor	X		Cavity in base, and dense vines up truck
961	Tulip Poplar	10.8	10.8	Fair	X		Vines on trunk
962	Tulip Poplar	16.5	16.5	Good	X		
963	Tulip Poplar	20.0	20.0	Good	X		
964	Tulip Poplar	20.5	20.5	Good	X		
965	American Sycamore	23.0	23.0	Good	X		
966	Tulip Poplar	20.0	20.0	Fair	X		Co-dominant stems
967	Tulip Poplar	14.0	14.0	Good	X		
968	Tulip Poplar	10.0	10.0	Fair	X		Covered in dense vines
969	Tulip Poplar	10.0	10.0	Fair	X		Poor form
970	Tulip Poplar	7.0	7.0	Fair	X		Poor form
971	Tulip Poplar	21.0	21.0	Fair	X		A few dead and broken limbs
972	Red Maple	7.5	7.5	Fair	X		Poor form, and vines up trunk
973	Tulip Poplar	17.0	17.0	Good	X		
974	Tulip Poplar	27.8	27.8	Fair	X		Co-dominant stems
975	Red Maple	7.0	7.0	Good	X		
976	Dead	-	-	-	X		
977	Tulip Poplar	8.0	8.0	Fair	X		Covered in dense vines
978	Pignut Hickory	7.1	7.1	Good	X		
979	Pignut Hickory	7.2	7.2	Good	X		
980	Tulip Poplar	17.0	17.0	Good	X		
981	Tulip Poplar	20.0	20.0	Fair	X		Co-dominant stems
982	American Sycamore	7.0	7.0	Good	X		
983	American Sycamore	18.5	18.5	Good	X		
984	Tulip Poplar	28.0	28.0	Fair	X		Dense vines in canopy
985	Dead	-	-	-	X		
986	Tulip Poplar	9.0	9.0	Fair	X		A few dead and broken limbs
987	American Sycamore	30.0	30.0	Fair	X		Covered in dense vines, a few broken limbs, and shallow roots
988	Tulip Poplar	11.0	11.0	Good	X		Vines up trunk
989	Tulip Poplar	22.5	22.5	Fair	X		Co-dominant stems
990	Tulip Poplar	36.8	36.8	Fair	X		Double trunk, covered in dense vines, and some broken limbs
991	Dead	-	-	-	X		
992	American Sycamore	20.7	20.7	Fair	X		Covered in dense vines
993	Tulip Poplar	21.2	21.2	Fair	X		Co-dominant stems, and vines up trunk
994	Tulip Poplar	22.5	22.5	Fair	X		Co-dominant stems, and vines up trunk
995	Tulip Poplar	13.5	13.5	Good	X		Vines on trunk
996	Tulip Poplar	13.7	13.7	Good	X		Vines on trunk
997	Tulip Poplar	17.0	17.0	Good	X		Vines on trunk
998	Tulip Poplar	16.3	16.3	Fair	X		Covered in dense vines, and some broken limbs
999	Tulip Poplar	9.5	9.5	Fair	X		Covered in dense vines, and some broken limbs
1000	Tulip Poplar	13.8	13.8	Fair	X		Co-dominant stems

ENVIRONMENTAL
4455 Brookfield Corporate Drive, Suite 100
Chantilly, VA 20151
PH: 703-466-5123 WWW.TNTENVIRONMENTALINC.COM

BLACKWELL ROAD & LEE HIGHWAY

TOWN OF WARRENTON

EXISTING VEGETATION INVENTORY

REVISIONS

DATE	COMMENTS

SHEET 11 OF 11

SCALE: NTS

PROJECT DATE: 04/05/22

DRAFT: EFW | CHECK: AMS

FILE NUMBER: 2724

Avinash M. Sareen
Certified Arborist
Certification # MA-4727A

Exhibit 2

NOTE:
FOR ILLUSTRATIVE PURPOSES ONLY.

LEGEND

- PROPOSED TREES
- EXISTING TREES TO REMAIN

NOT TO SCALE

NOTES

1. LOCATIONS OF INTERIOR SIDEWALKS AND PARKING ARE SUBJECT TO CHANGE WITH FINAL SITE DESIGN.
2. SIZE AND LOCATION OF PROPOSED BMP / SWM POND IS SUBJECT TO CHANGE WITH FINAL SITE DESIGN.

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	7/10/22	TOWN COMMENTS	CPT / JCW

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PROJECT No.:	V212093
DRAWN BY:	DSH
CHECKED BY:	JCW
DATE:	4/12/2022
CAD I.D.:	REND-0

PROJECT:

SPECIAL USE PERMIT

FOR

AMAZON DATA SERVICES, INC.

PROPOSED DEVELOPMENT

BLACKWELL ROAD & LEE HIGHWAY
TOWN OF WARRENTON
FAUQUIER COUNTY, VIRGINIA 20186

BOHLER
28 BLACKWELL PARK LANE, SUITE 201
WARRENTON, VIRGINIA 20186
Phone: (540) 349-4500
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VA@BohlerEng.com

COMMONWEALTH OF VIRGINIA
JOHN C. WRIGHT
Lic. No. 046690
PROFESSIONAL ENGINEER
7/10/2022

SHEET TITLE:

ILLUSTRATIVE PLAN

SHEET NUMBER:

C-5

REVISION 1 - 7/10/22

VIEW 1

VIEW 2

VIEW 3

VIEW 4

LEGEND

BUILDING OUTLINE

NOTE: TREES SHOWN AT 5 YEARS OF GROWTH

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
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PROJECT No.:	V212093
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CAD I.D.:	-0

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TOWN OF WARRENTON
FAUQUIER COUNTY, VIRGINIA 20186

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7/10/2022
PROFESSIONAL ENGINEER

SHEET TITLE:

STREET VIEW RENDERINGS

SHEET NUMBER:

C-6

REVISION 1 - 7/10/22

VIEW 1

VIEW 2

VIEW 3

VIEW 4

LEGEND

BUILDING OUTLINE

NOTE: TREES SHOWN AT 5 YEARS OF GROWTH

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SURVEY AND ESTIMATING
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	7/10/22	TOWN COMMENTS	CPH / JCW

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PROJECT No.:	V212093
DRAWN BY:	DSH
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DATE:	4/12/2022
CAD I.D.:	-0

PROJECT:

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FOR

AMAZON DATA SERVICES, INC.

PROPOSED DEVELOPMENT

BLACKWELL ROAD & LEE HIGHWAY
TOWN OF WARRENTON
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7/10/2022

SHEET TITLE:

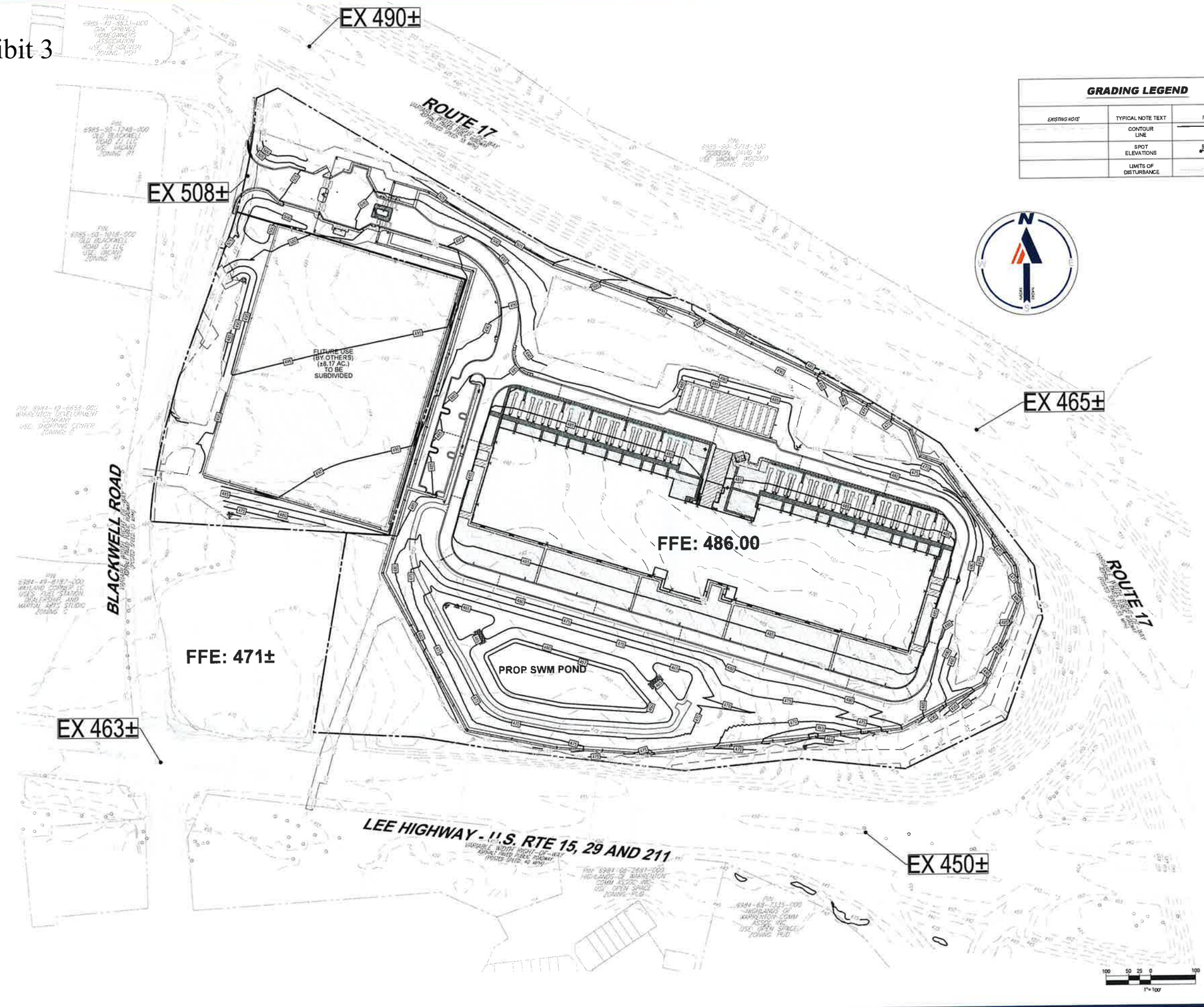
STREET VIEW RENDERINGS

SHEET NUMBER:

C-6

REVISION 1 - 7/10/22

Exhibit 3



GRADING LEGEND

EXISTING NOTE	TYPICAL NOTE TEXT	PROPOSED NOTE
	CONTOUR LINE	120
	SPOT ELEVATIONS	TC 315.00
	LIMITS OF DISTURBANCE	

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ENVIRONMENTAL SERVICES
PERMITTING SERVICES
TRANSPORTATION SERVICES

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REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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PROJECT No.:	V123083
DRAWN BY:	DSH
CHECKED BY:	JCW
DATE:	8/5/2022
CAD I.D.:	EXHK - 0

PROJECT:

EXHIBIT

FOR

AMAZON DATA SERVICES, INC.

PROPOSED DEVELOPMENT

BLACKWELL ROAD & LEE HIGHWAY
TOWN OF WARRENTON
FAUQUIER COUNTY, VIRGINIA 20186

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SHEET TITLE:

GRADING EXHIBIT

SHEET NUMBER:

1

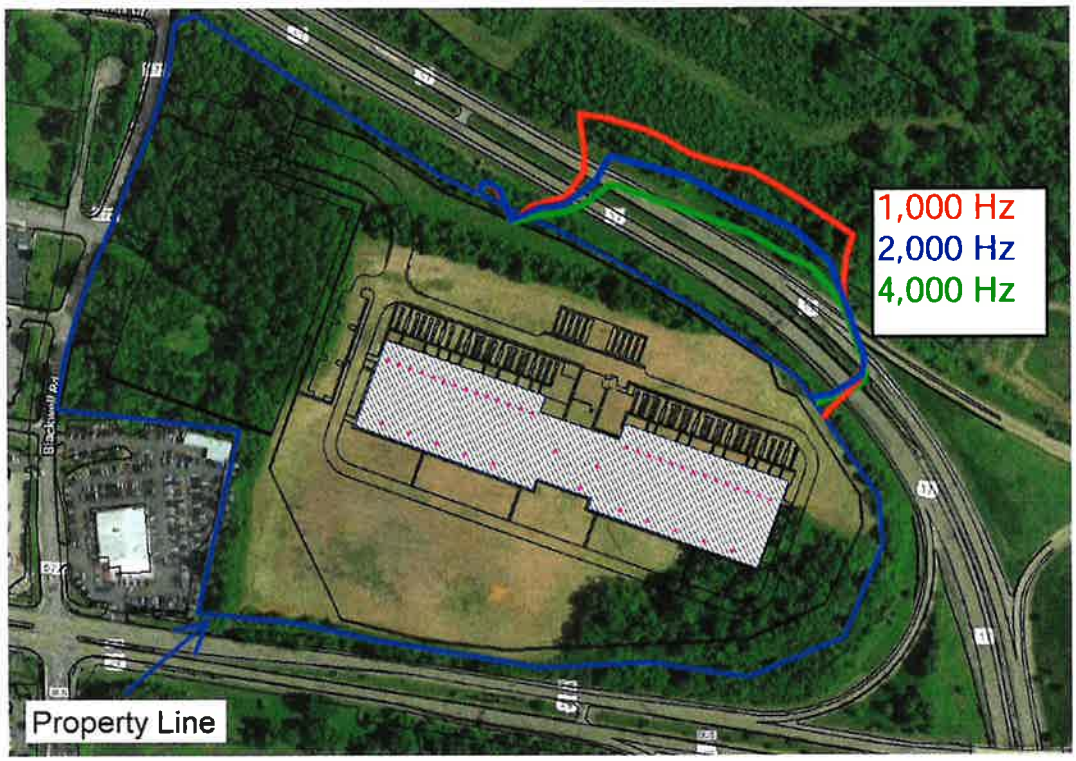
ORG. DATE - 8/5/2022

Exhibits 4 and 5

Town Limits

Limit	Correction	63	125	250	500	1000	2000	4000	8000
Base Limits	n/a	72	70	65	59	55	51	47	44
Daytime	-5 R-District	67	65	60	54	50	46	42	39
Nighttime	-5 R-District -5 10pm-7am	62	60	55	49	45	41	37	34
Daytime Industrial	n/a	72	70	65	59	55	51	47	44
Nighttime Industrial	**-5 10pm-7am**	**67**	**65**	**60**	**54**	**50**	**46**	**42**	**39**
Generator	-5 R-District +5 20% of 1 hr	72	70	65	59	55	51	47	44

Locations Exceeding at Property Line



- Noise Levels
  - Noise from chillers will exceed town limit @ 1,000 – 4,000 Hz at northeast property line for nighttime limits.
  - All other frequencies will be contained within the property line.
  - Daytime limits at all frequencies will be contained within the property line.
- Impact
  - Impact is not possible on Route 17, as there is no one to hear noise.
  - For Industrial land impacted, noise will be equal to traffic noise (per measurements at site).
- Mitigation
  - Either involves a roof barrier taller than equipment (~16-20' tall) or baffles incorporated into sheaths, which would impact airflow.

Summary

- Daytime Model
  - Will exceed town limit @ 1,000 – 4,000 Hz northeast of Route 17, but there is not residential present.
  - Town limit shown to be met.
- Nighttime Model
  - Will exceed town limit @ 500 – 4,000 Hz northeast of Route 17, but there is not residential present.
  - Town limit shown to be met.
- Generator
  - Town limit shown to be met.
- Measurements
  - All measurements in residential areas shown to meet Town Limit. M3 (north of site) is the loudest, but is not impacting residences.
  - M1
    - Data center quieter than background noise except during evening hours.
    - Quieter than town limit except for 2,000 Hz by 1 dB.
  - M2
    - Data center quieter than background noise except during evening hours.
    - Quieter than town limit except for 1,000 – 2,000 Hz, by 1 dB.
  - M3
    - For low frequencies, quieter except during evening hours. For mid to high frequencies, equal to or higher background noise.
    - Quieter than town limit except for 1,000 – 4,000 Hz, by 9 dB.
  - M4
    - Data center quieter than background noise.
    - Quieter than town limit.
  - M5
    - For low frequencies, quieter except during evening hours.
    - Quieter than town limit.

Town Limits

Limit	Correction	63	125	250	500	1000	2000	4000	8000
Base Limits	n/a	72	70	65	59	55	51	47	44
Daytime	-5 R-District	67	65	60	54	50	46	42	39
Nighttime	-5 R-District -5 10pm-7am	62	60	55	49	45	41	37	34
Generator	-5 R-District +5 20% of 1 hr	72	70	65	59	55	51	47	44

Daytime Model

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 63 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 125 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 250 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 500 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 1000 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 2000 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 4000 Hz

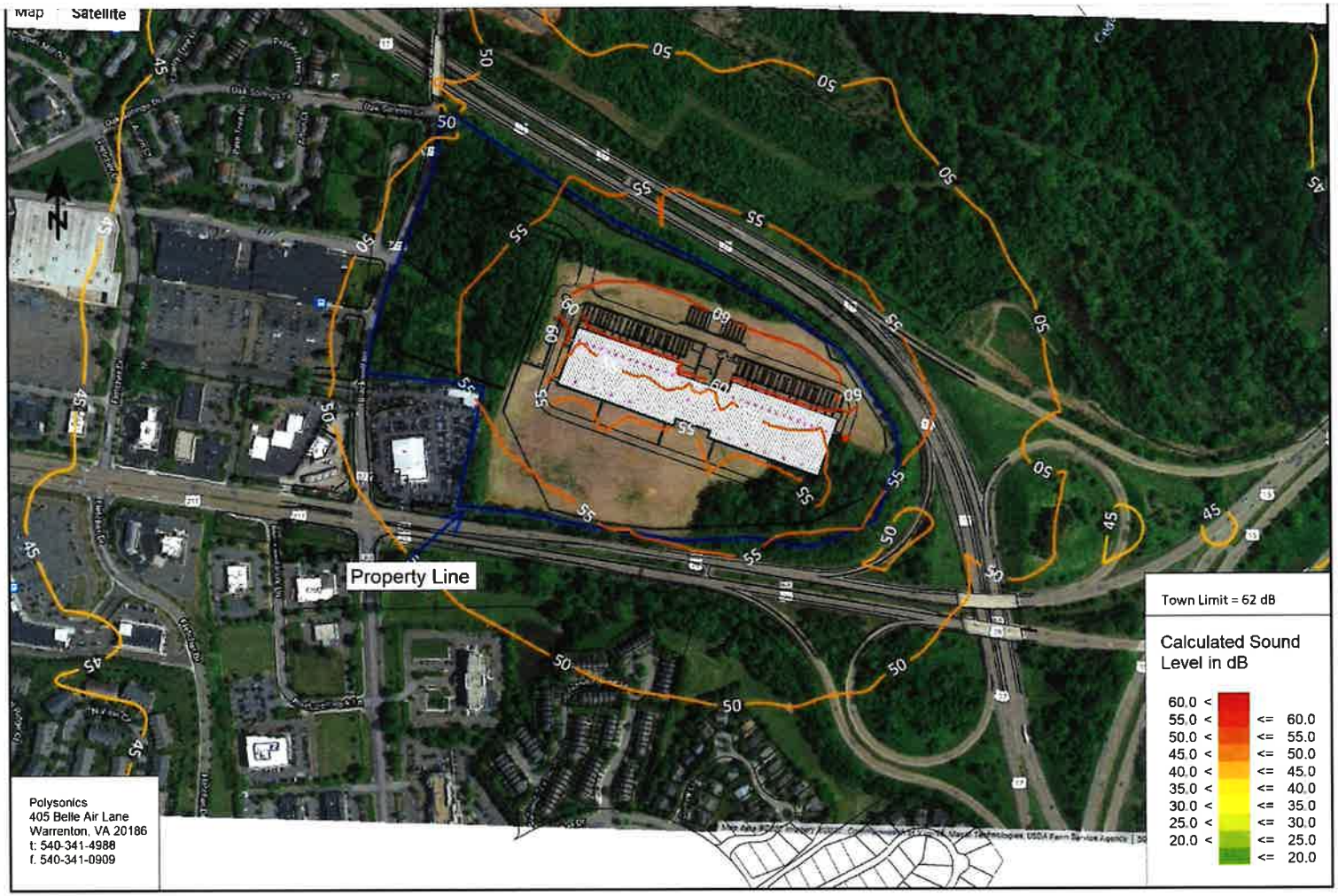
Warrenton Data Center

Rooftop Mechanical Noise Levels Daytime - 8000 Hz

Nighttime Model

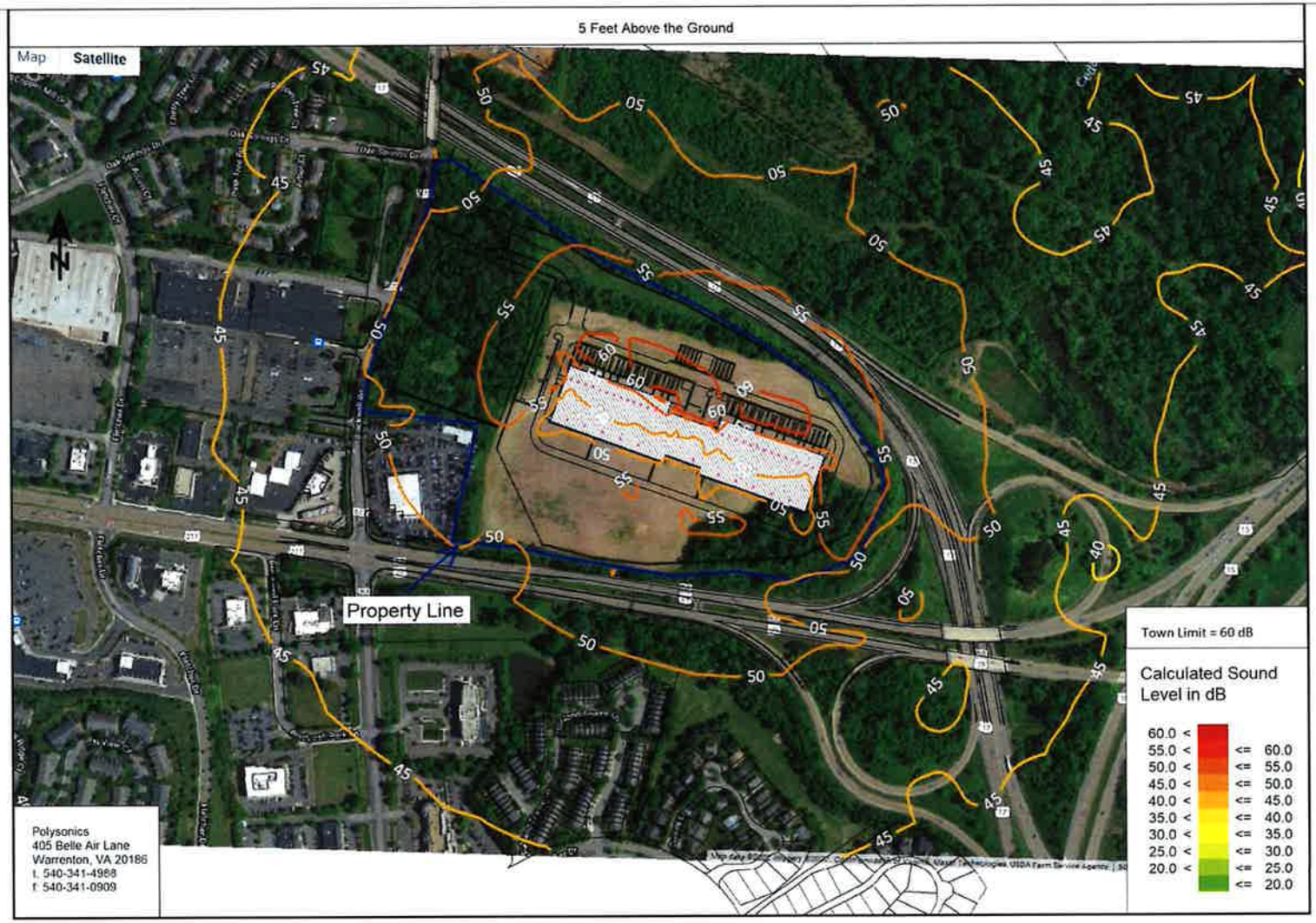
Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 63 Hz



Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 125 Hz



Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 250 Hz

Adjacent Property Owners List

Generated and Reviewed with PWC Real Estate Assessments Website on August 26, 2022

idx	Identifier	PropAdd1	PropAdd2	MailTo1	MailTo2	MailTo3	MailAdd1	MailAdd2	Source
1	7397-84-4736	13000 GATEWAY CENT	GAINESVILLE, VA	LOWES HOME CENTERS INC ATTN: SR VICE PRES C			1000 LOWI	MOORESV	Prince William County
2	7397-93-1744	7450 LIMESTONE DR	GAINESVILLE, VA	VGCC LC			12500 FAIF	FAIRFAX, V	Prince William County
3	7497-03-0650.00	7475 LIMESTONE DR	GAINESVILLE, VA	UNIT OWNERS GATEWAY CROSSING RETAIL COND			12500 FAIF	FAIRFAX, V	Prince William County
4	7397-93-8571.00	7481 LIMESTONE DR	GAINESVILLE, VA	GATEWAY CENTER LC			12500 FAIF	FAIRFAX, V	Prince William County
5	7497-03-0758.00	7485 LIMESTONE DR	GAINESVILLE, VA	FAUQUIER BANK			10 COURTI	WARRENT(	Prince William County
6	7397-93-8854.00	7489 LIMESTONE DR	GAINESVILLE, VA	H3L1 INVESTMENT LLC ATTN KYUNG SIN LEE & LE			14256-A W	CENTREVIL	Prince William County
7	7397-94-3859	5291 WELLINGTON BR	GAINESVILLE, VA	GATEWAY BRANCH OUTDOORS LC			12500 FAIF	FAIRFAX, V	Prince William County
8	7397-93-0796	5300 WELLINGTON BR	GAINESVILLE, VA	DTE WSSI FACILITY LLC C/O THE DAVEY TREE EXPE			1500 N MA	KENT, OH 4	Prince William County
9	7397-94-5516	5351 WELLINGTON BR	GAINESVILLE, VA	GATEWAY BRANCH LC			12500 FAIF	FAIRFAX, V	Prince William County
10	7497-04-1151	5399 WELLINGTON BR	GAINESVILLE, VA	NORTHERN VIRGINIA ELECTRIC COOP PLANT ACC(			PO BOX 27	MANASSAS	Prince William County
1	Gateway Crossing Retail (	12500 Fair Lake Circle	Fairfax, VA 22033	Gateway Crossing Retail CUO			12500 Fair	Fairfax, VA	Planned Development District
				Walsh, Colucci, Lubeley & Walsh, P.C. (c/o Jessica Pfeiffer)			4310 Princ	Prince William, VA 22192	

Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 500 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 1000 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 2000 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 4000 Hz

Warrenton Data Center

Rooftop Mechanical Noise Levels Nighttime - 8000 Hz

Generator Model

Warrenton Data Center

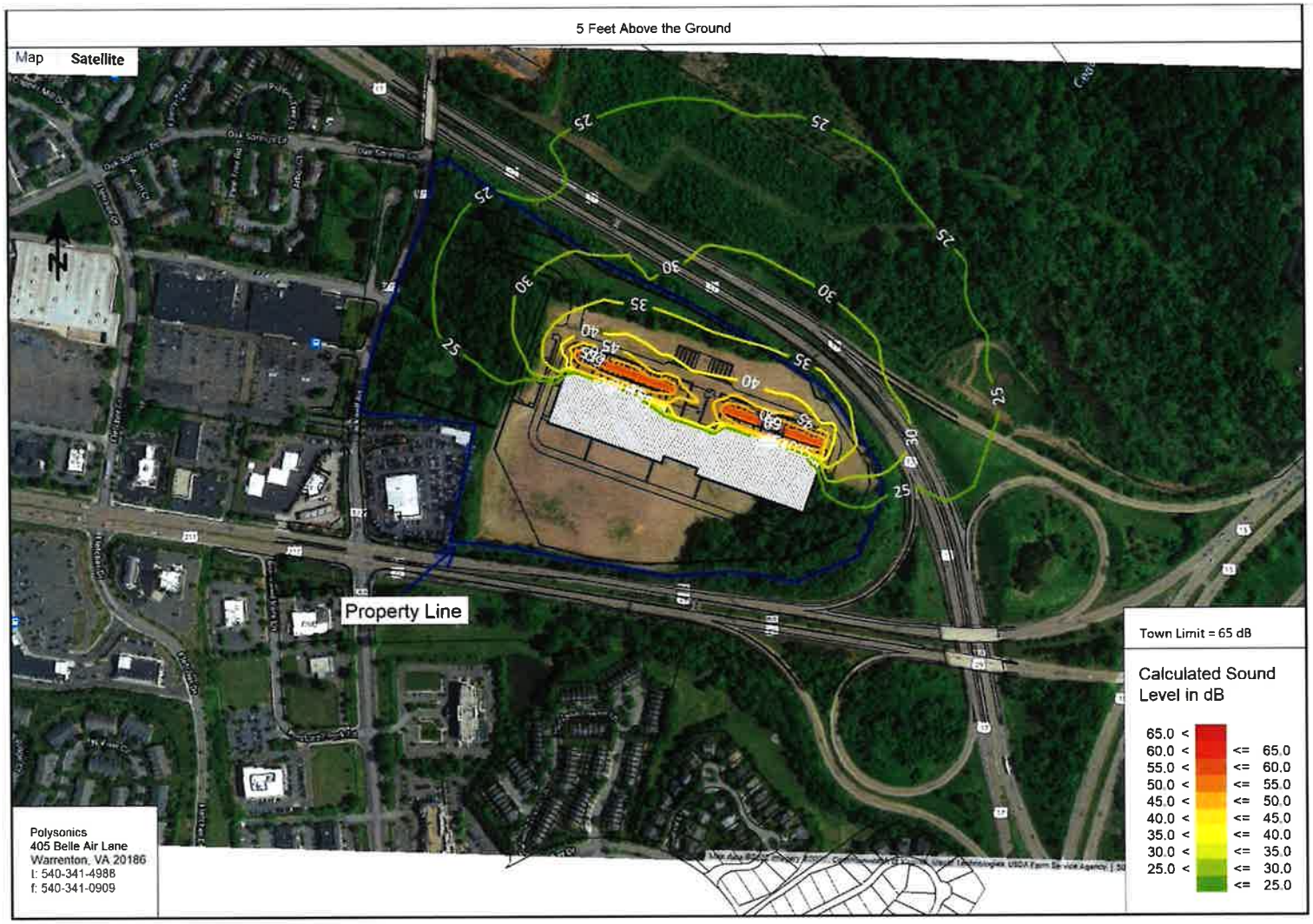
Generator Noise Levels - 63 Hz

Warrenton Data Center

Generator Noise Levels - 125 Hz

Warrenton Data Center

Generator Noise Levels - 250 Hz



Warrenton Data Center

Generator Noise Levels - 500 Hz

Warrenton Data Center

Generator Noise Levels - 1000 Hz

Warrenton Data Center

Generator Noise Levels - 2000 Hz

Warrenton Data Center

Generator Noise Levels - 4000 Hz

Warrenton Data Center

Generator Noise Levels - 8000 Hz

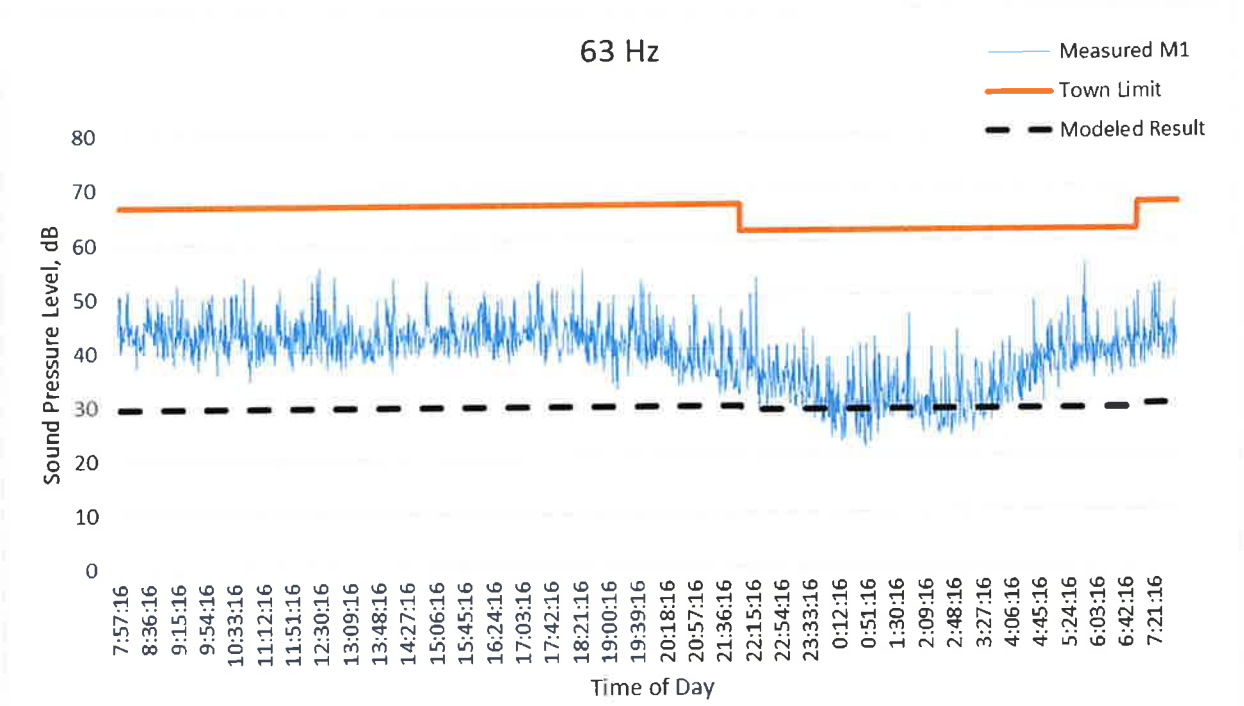
Measurement Map

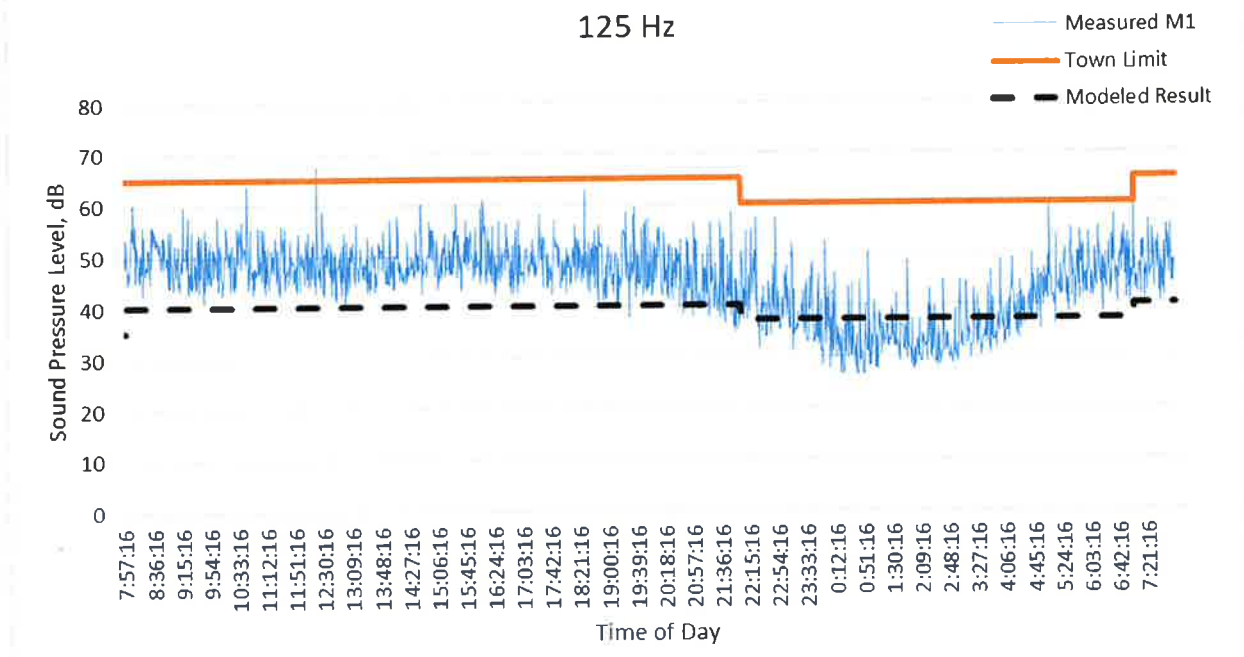

M4
M3
M2
M1
M5
Blackwell Rd
Google Earth
N

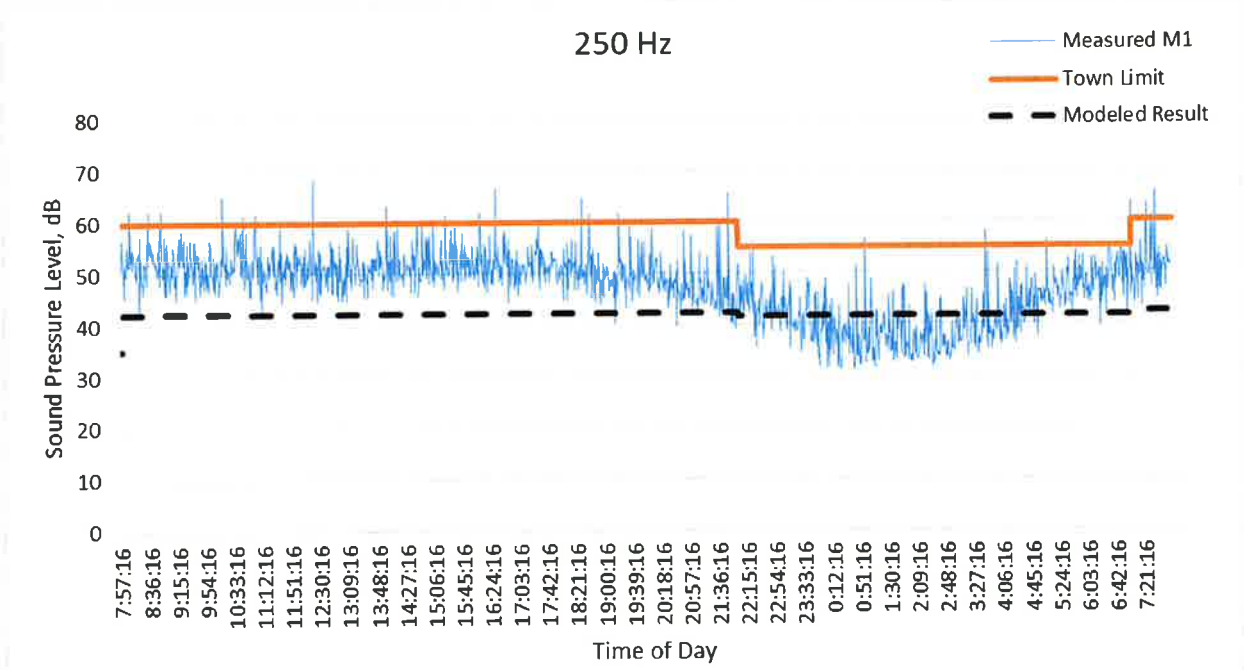
Measurement Summary

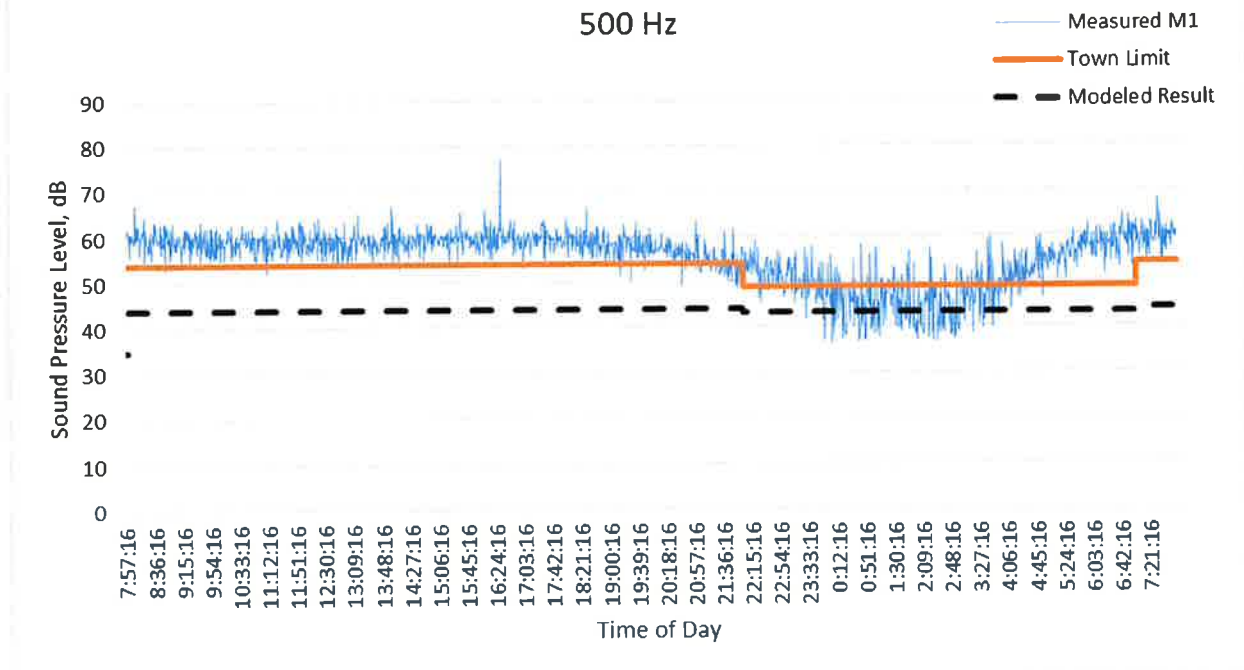
Loc.	Day/ Night	Data	63	125	250	500	1000	2000	4000	8000
M1	Day	Lowest Measured	32	35	40	48	58	52	38	25
		Town Limit	67	65	60	54	50	46	42	39
		SoundPlan	30	40	42	44	48	44	39	17
	Night	Lowest Measured	22	26	31	36	36	28	24	19
		Town Limit	62	60	55	49	45	41	37	34
		SoundPlan	29	37	42	43	**46**	**42**	36	17
M2	Day	Lowest Measured	32	36	34	40	49	46	37	24
		Town Limit	67	65	60	54	50	46	42	39
		SoundPlan	27	38	40	42	47	44	39	16
	Night	Lowest Measured	23	27	27	32	32	23	25	19
		Town Limit	62	60	55	49	45	41	37	34
		SoundPlan	26	35	39	41	**46**	**42**	36	16
M3	Day	Lowest Measured	28	35	34	38	42	37	32	20
		Town Limit	67	65	60	54	50	46	42	39
		SoundPlan	32	45	46	49	**55**	**52**	**48**	32
	Night	Lowest Measured	22	30	31	33	34	32	31	19
		Town Limit	62	60	55	49	45	41	37	34
		SoundPlan	31	42	45	48	**53**	**50**	**45**	32
M4	Day	Lowest Measured	30	37	41	45	53	50	42	26
		Town Limit	67	65	60	54	50	46	42	39
		SoundPlan	25	37	38	41	47	43	35	3
	Night	Lowest Measured	22	30	33	34	35	26	37	19
		Town Limit	62	60	55	49	45	41	37	34
		SoundPlan	24	34	38	41	45	41	32	3
M5	Day	Lowest Measured	27	28	31	37	42	37	30	20
		Town Limit	67	65	60	54	50	46	42	39
		SoundPlan	23	34	37	39	44	42	32	0
	Night	Lowest Measured	22	25	28	29	29	27	23	19
		Town Limit	62	60	55	49	45	41	37	34
		SoundPlan	23	31	36	38	43	40	30	0

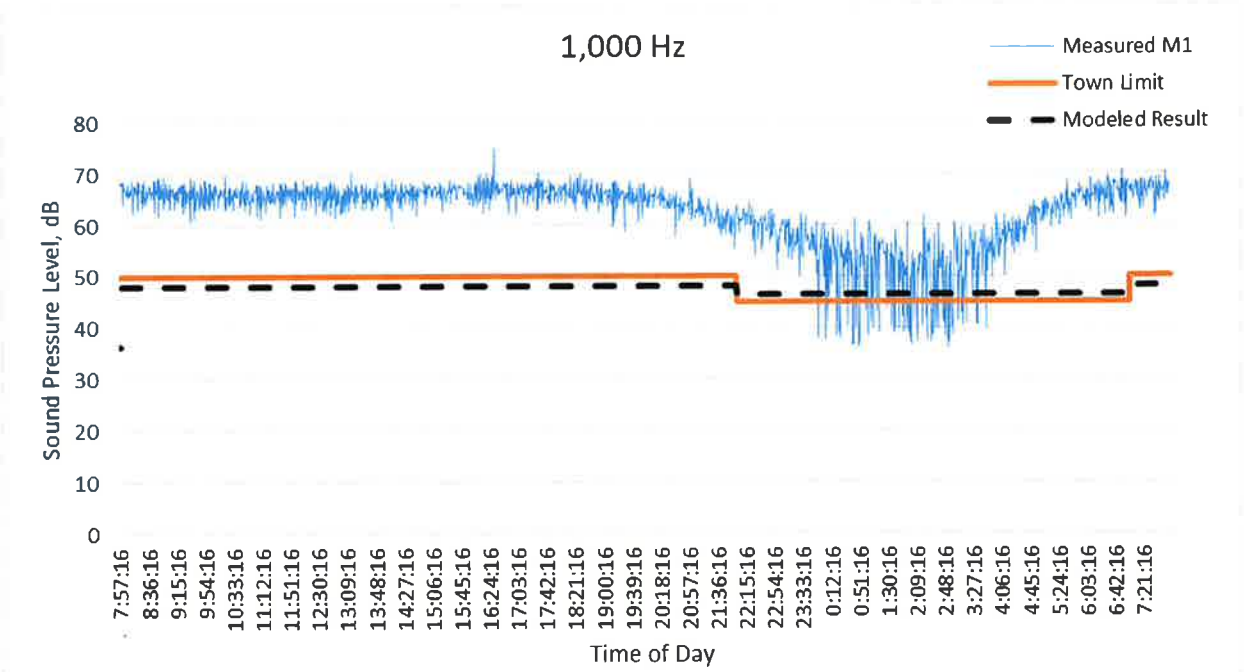
M1 Results

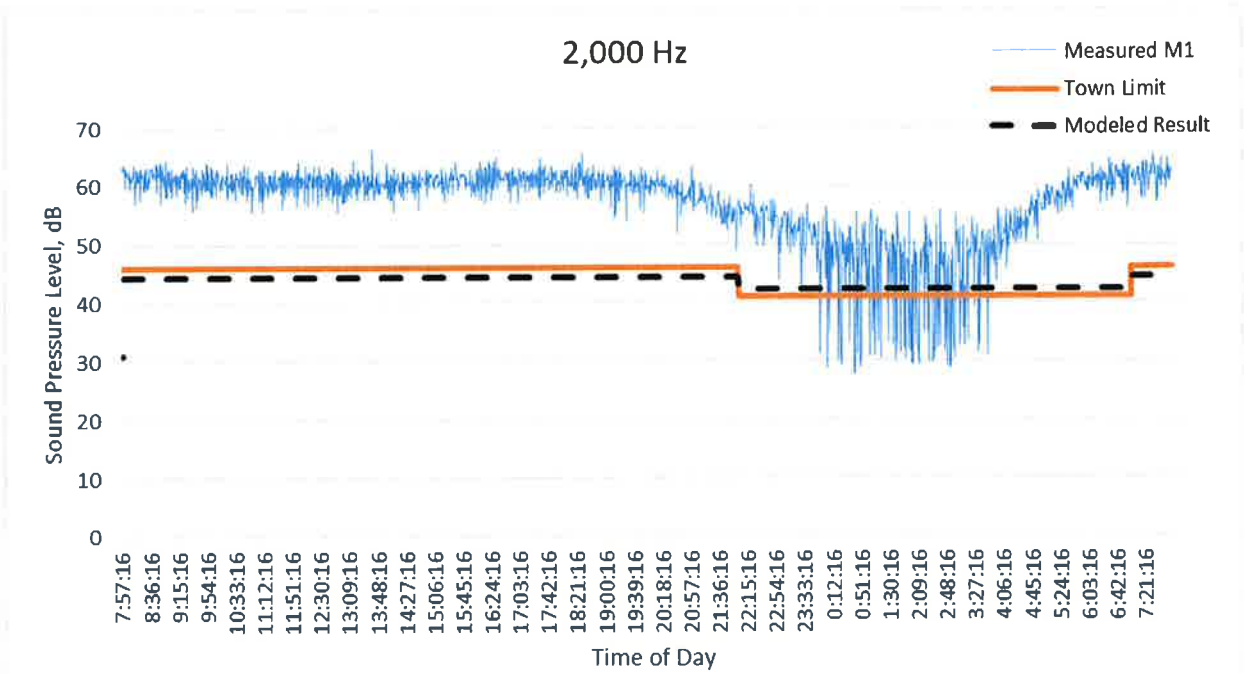

63 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
80
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day

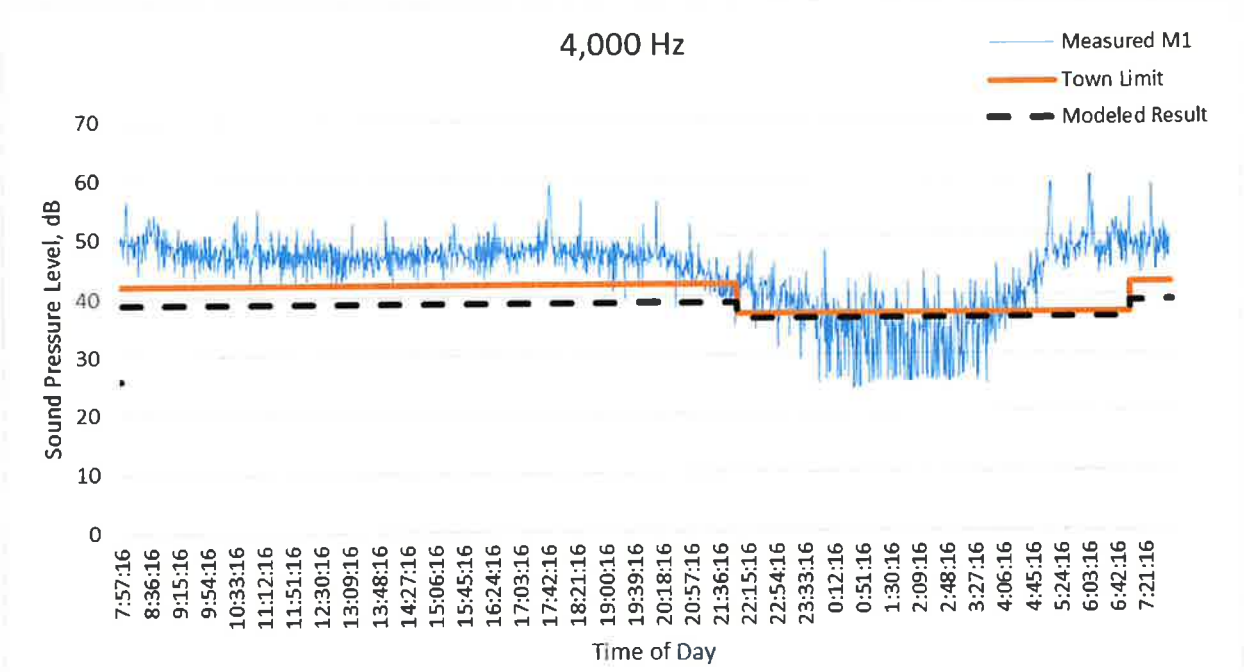

125 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
80
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day

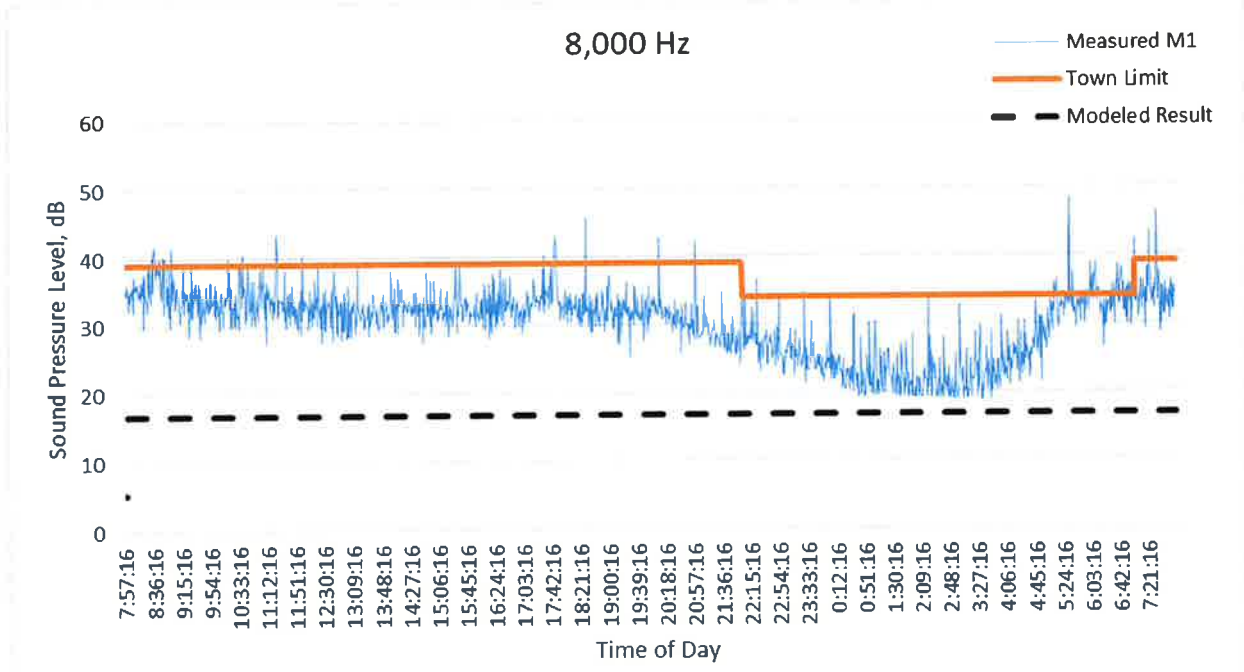

250 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
80
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day


500 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
90
80
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day


1,000 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
80
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day


2,000 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day


4,000 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
22:15:16
22:54:16
23:33:16
0:12:16
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day


8,000 Hz
Measured M1
Town Limit
Modeled Result
Sound Pressure Level, dB
60
50
40
30
20
10
0
7:57:16
8:36:16
9:15:16
9:54:16
10:33:16
11:12:16
11:51:16
12:30:16
13:09:16
13:48:16
14:27:16
15:06:16
15:45:16
16:24:16
17:03:16
17:42:16
18:21:16
19:00:16
19:39:16
20:18:16
20:57:16
21:36:16
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22:54:16
23:33:16
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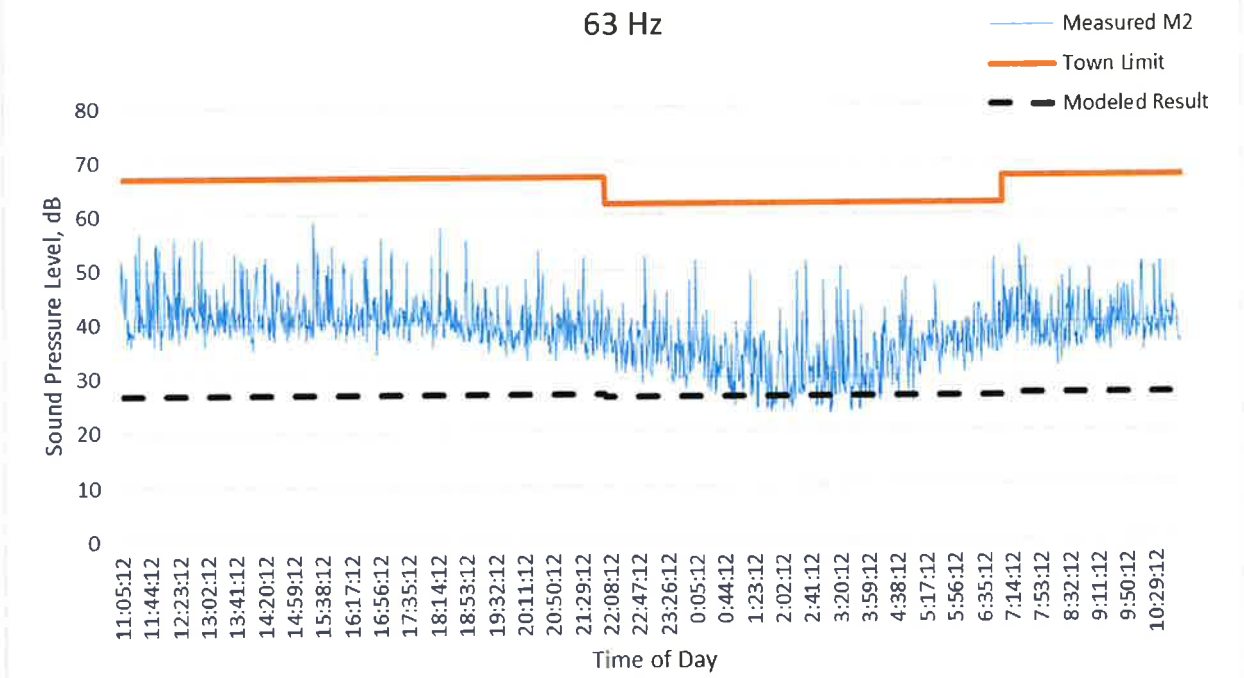
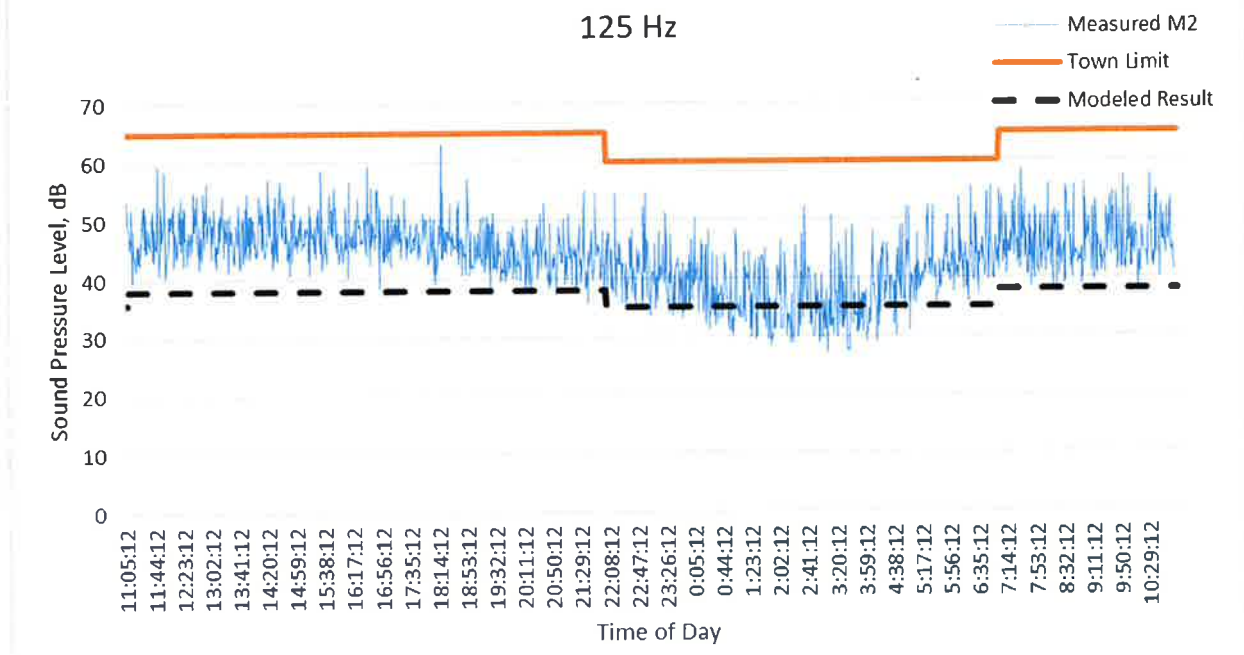
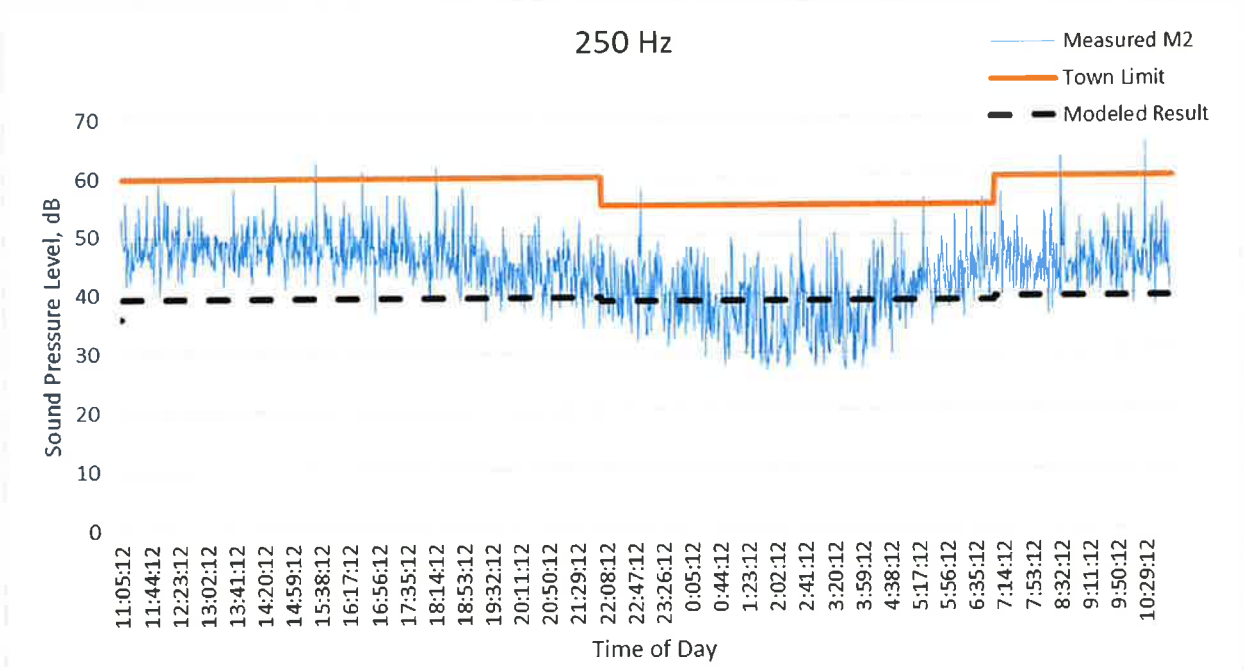
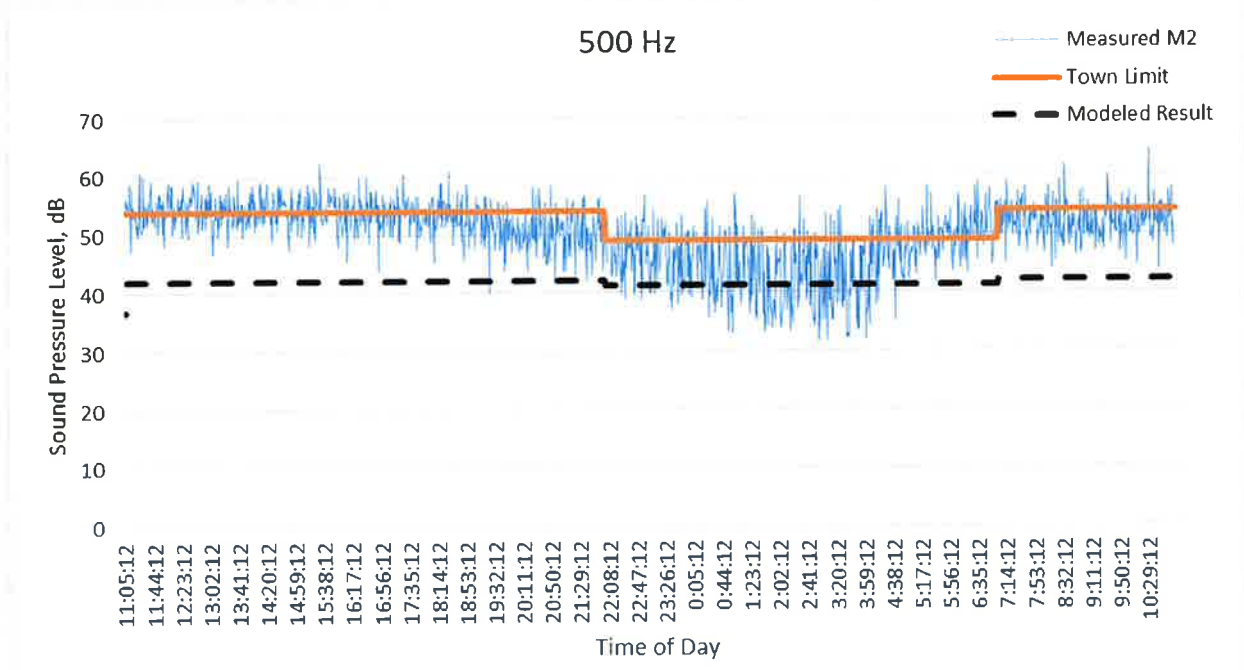
0:51:16
1:30:16
2:09:16
2:48:16
3:27:16
4:06:16
4:45:16
5:24:16
6:03:16
6:42:16
7:21:16
Time of Day

M2 Results


63 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
80
70
60
50
40
30
20
10
0
11:05:12
11:44:12
12:23:12
13:02:12
13:41:12
14:20:12
14:59:12
15:38:12
16:17:12
16:56:12
17:35:12
18:14:12
18:53:12
19:32:12
20:11:12
20:50:12
21:29:12
22:08:12
22:47:12
23:26:12
0:05:12
0:44:12
1:23:12
2:02:12
2:41:12
3:20:12
3:59:12
4:38:12
5:17:12
5:56:12
6:35:12
7:14:12
7:53:12
8:32:12
9:11:12
9:50:12
10:29:12
Time of Day


125 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
40
30
20
10
0
11:05:12
11:44:12
12:23:12
13:02:12
13:41:12
14:20:12
14:59:12
15:38:12
16:17:12
16:56:12
17:35:12
18:14:12
18:53:12
19:32:12
20:11:12
20:50:12
21:29:12
22:08:12
22:47:12
23:26:12
0:05:12
0:44:12
1:23:12
2:02:12
2:41:12
3:20:12
3:59:12
4:38:12
5:17:12
5:56:12
6:35:12
7:14:12
7:53:12
8:32:12
9:11:12
9:50:12
10:29:12
Time of Day


250 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
40
30
20
10
0
11:05:12
11:44:12
12:23:12
13:02:12
13:41:12
14:20:12
14:59:12
15:38:12
16:17:12
16:56:12
17:35:12
18:14:12
18:53:12
19:32:12
20:11:12
20:50:12
21:29:12
22:08:12
22:47:12
23:26:12
0:05:12
0:44:12
1:23:12
2:02:12
2:41:12
3:20:12
3:59:12
4:38:12
5:17:12
5:56:12
6:35:12
7:14:12
7:53:12
8:32:12
9:11:12
9:50:12
10:29:12
Time of Day


500 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
40
30
20
10
0
11:05:12
11:44:12
12:23:12
13:02:12
13:41:12
14:20:12
14:59:12
15:38:12
16:17:12
16:56:12
17:35:12
18:14:12
18:53:12
19:32:12
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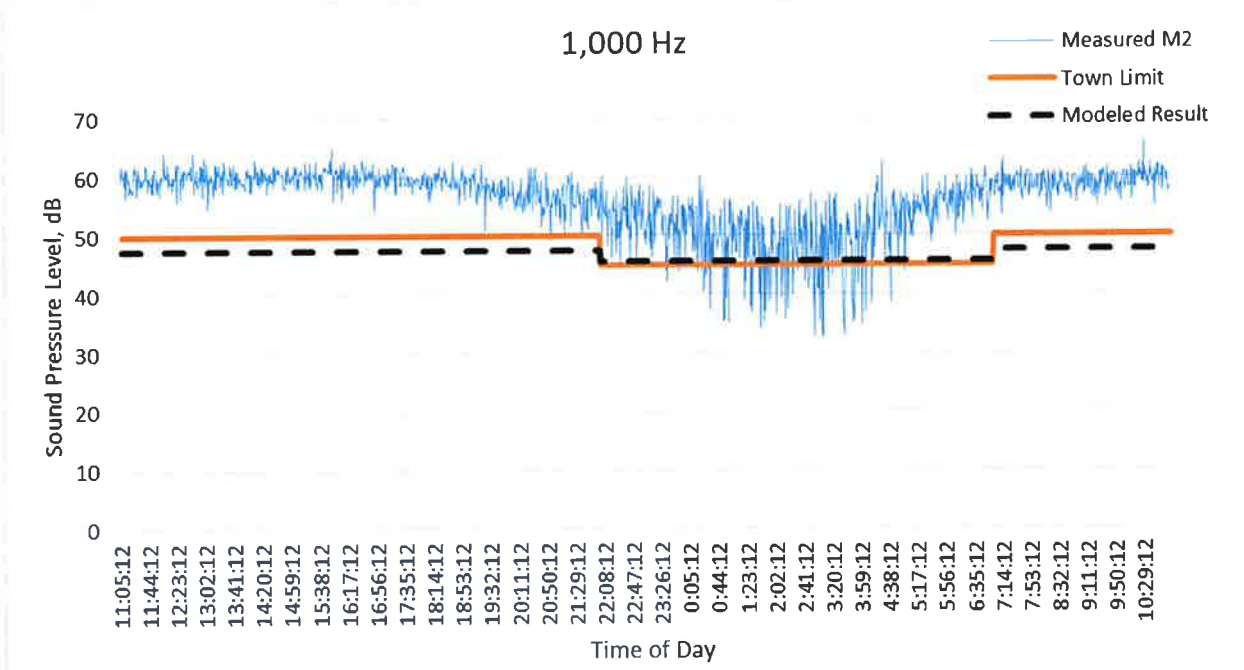
0:05:12
0:44:12
1:23:12
2:02:12
2:41:12
3:20:12
3:59:12
4:38:12
5:17:12
5:56:12
6:35:12
7:14:12
7:53:12
8:32:12
9:11:12
9:50:12
10:29:12
Time of Day


1,000 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
70
60
50
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30
20
10
0
11:05:12
11:44:12
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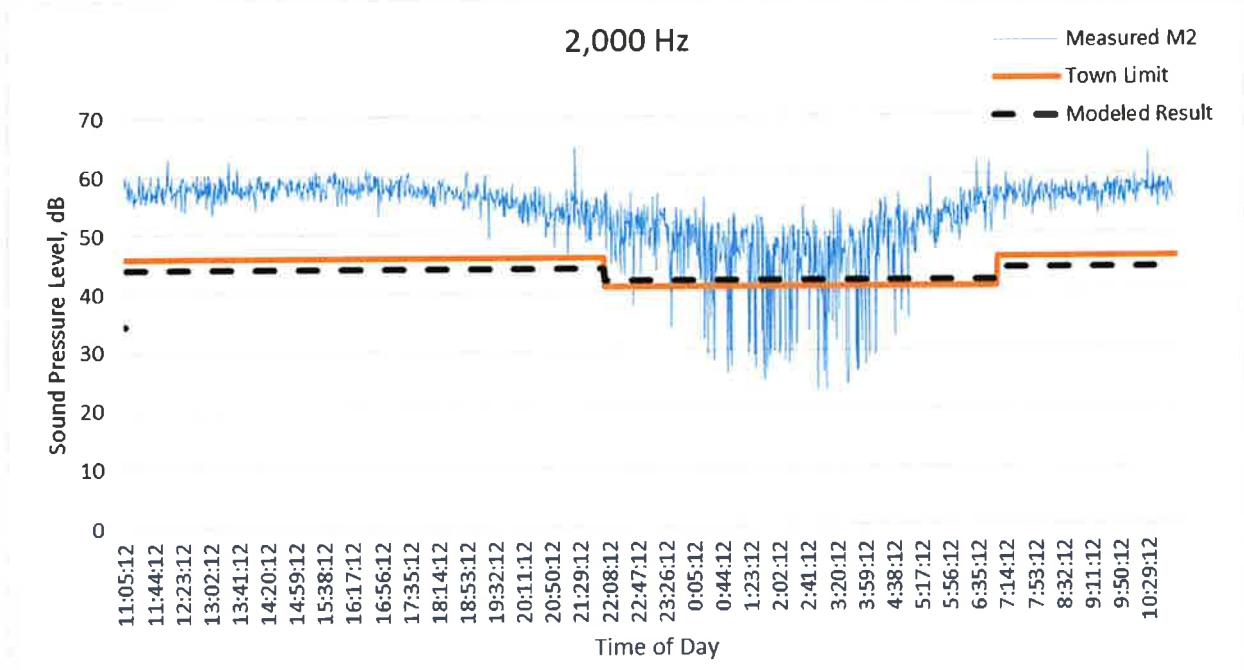
10:29:12
Time of Day


2,000 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
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50
40
30
20
10
0
11:05:12
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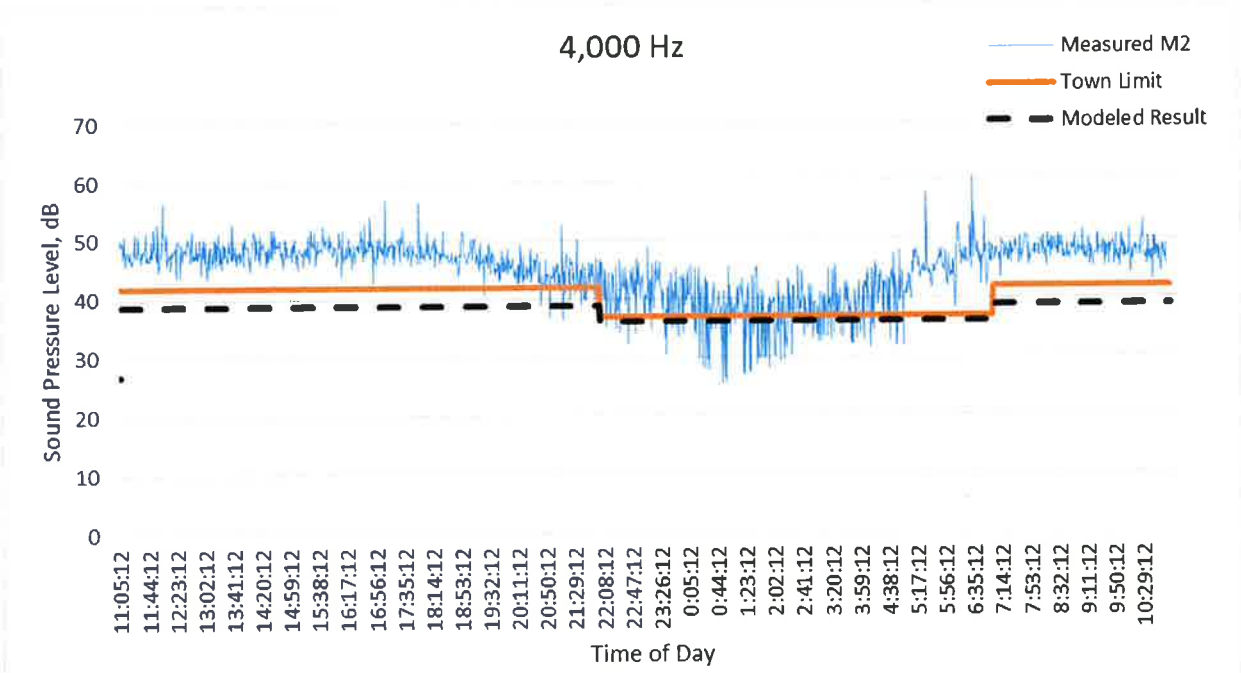
Time of Day


4,000 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
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20
10
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11:05:12
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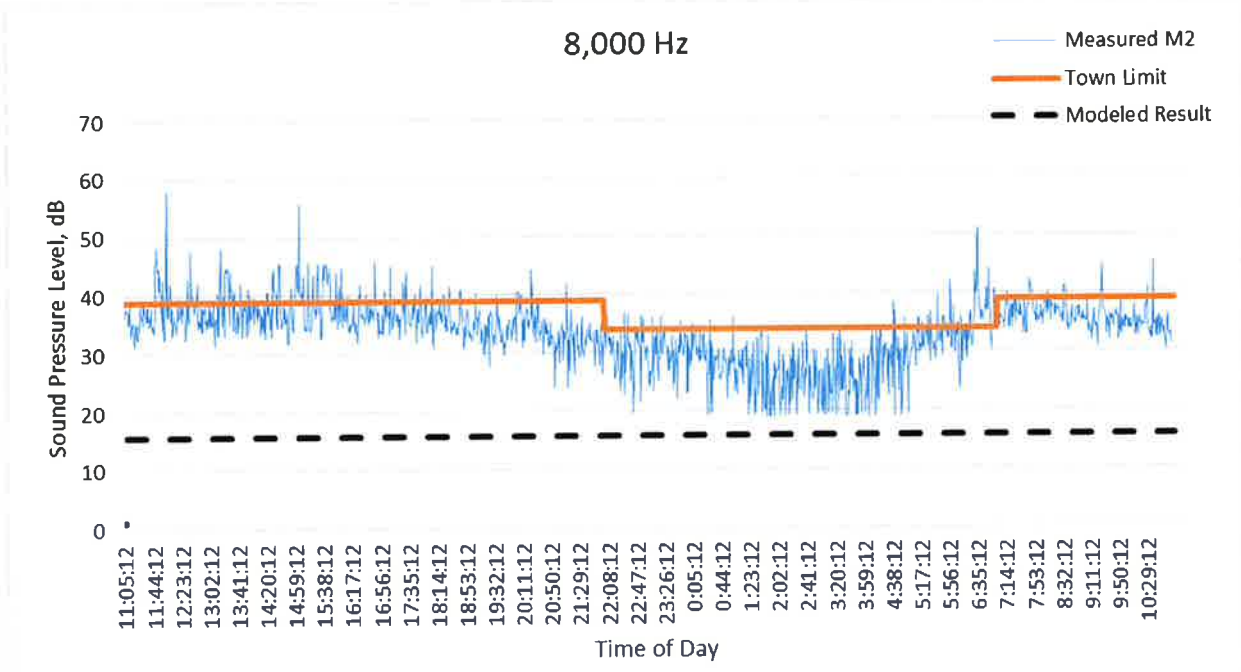
Time of Day


8,000 Hz
Measured M2
Town Limit
Modeled Result
Sound Pressure Level, dB
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40
30
20
10
0
11:05:12
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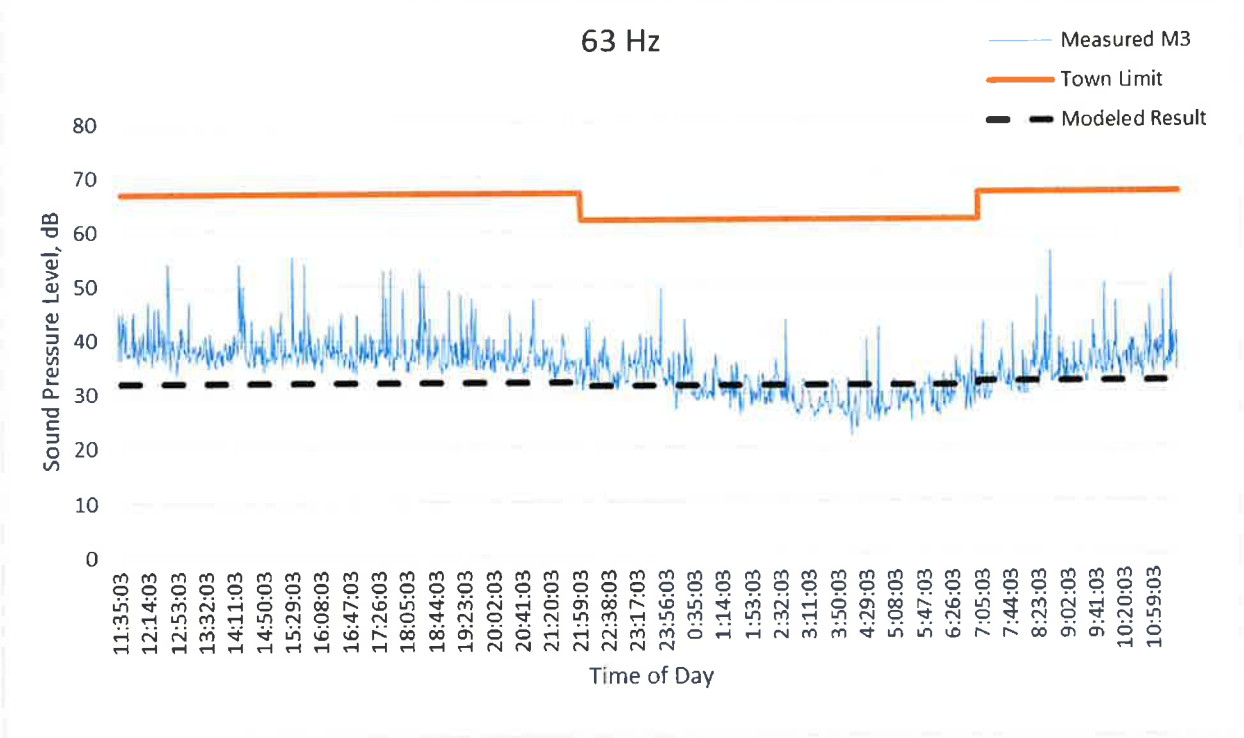
9:50:12
10:29:12
Time of Day

M3 Results


63 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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60
50
40
30
20
10
0
11:35:03
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2:32:03
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4:29:03
5:08:03
5:47:03
6:26:03
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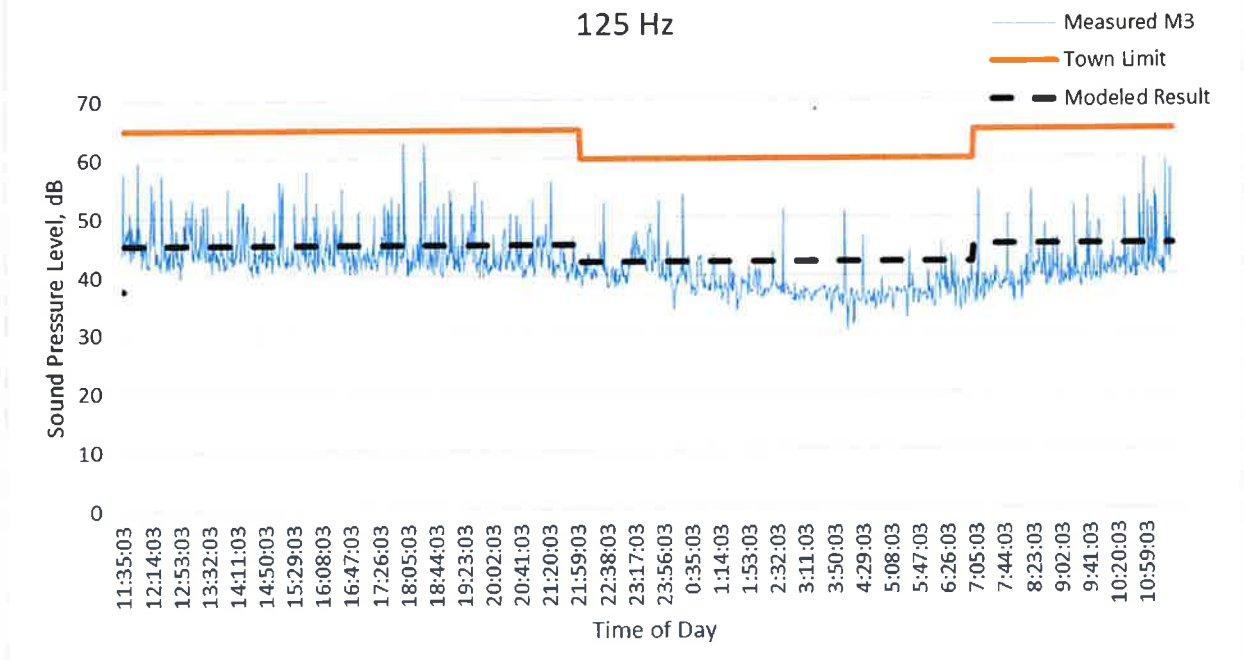
7:44:03
8:23:03
9:02:03
9:41:03
10:20:03
10:59:03
Time of Day


125 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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50
40
30
20
10
0
11:35:03
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5:47:03
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9:41:03
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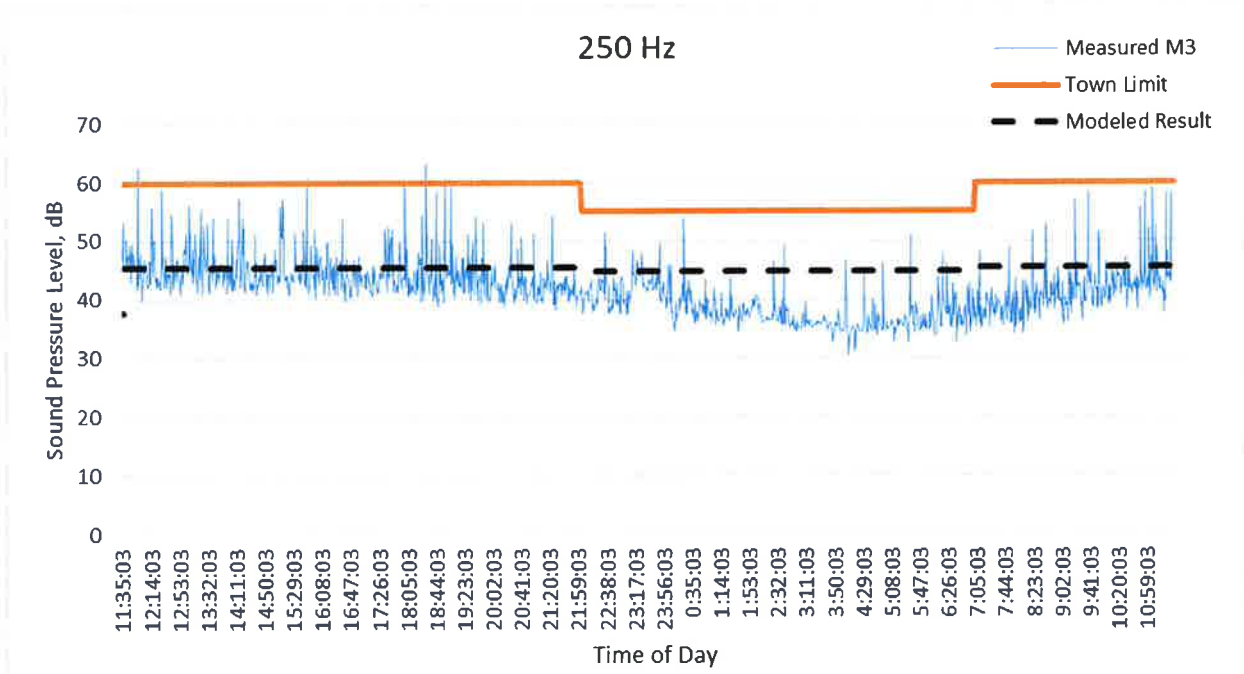
Time of Day


250 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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10
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5:08:03
5:47:03
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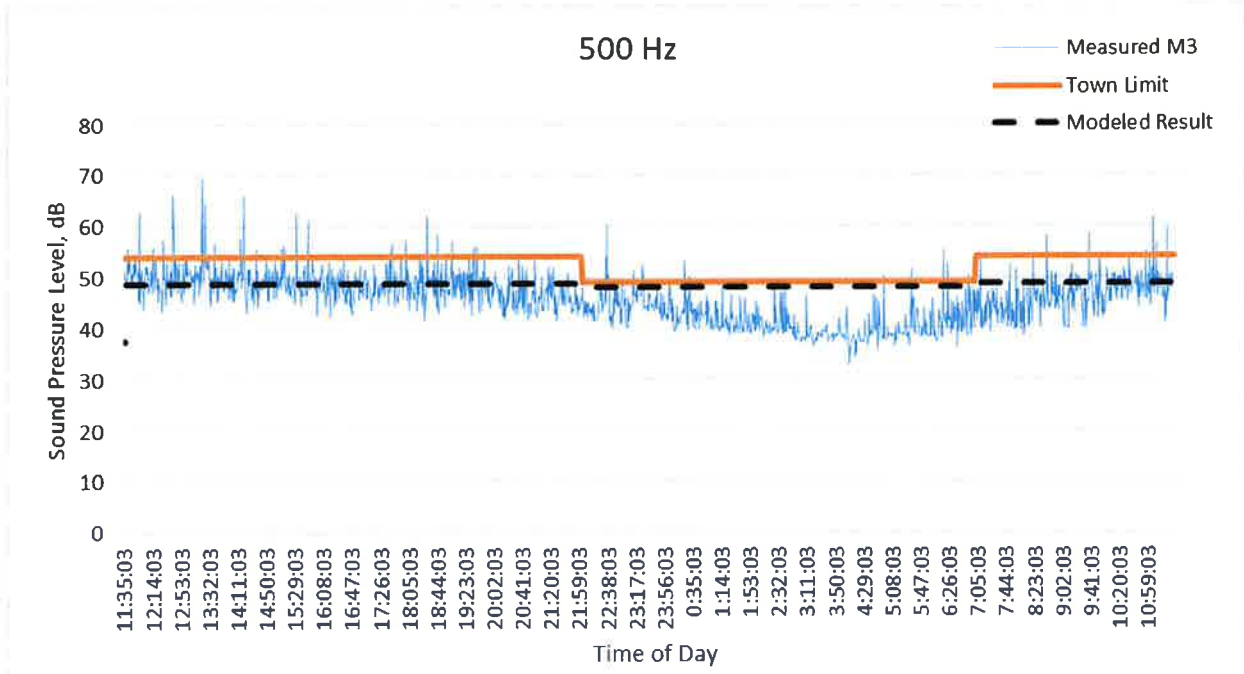
Time of Day


500 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
80
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40
30
20
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5:08:03
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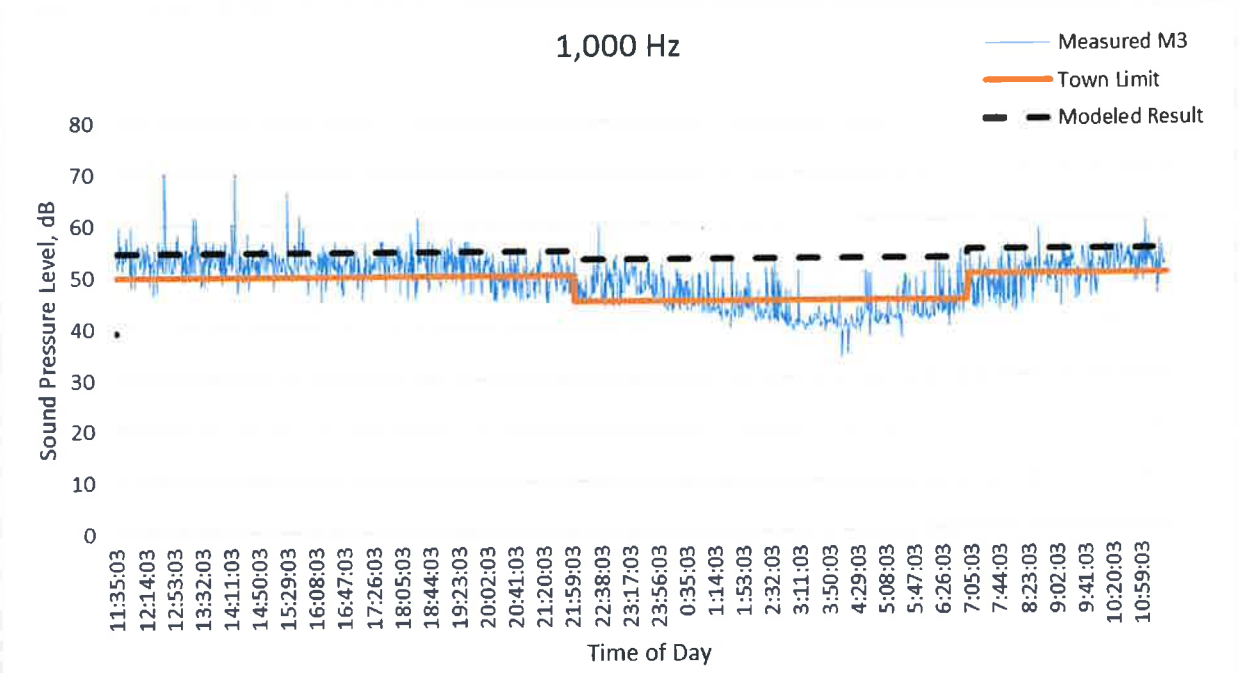
Time of Day


1,000 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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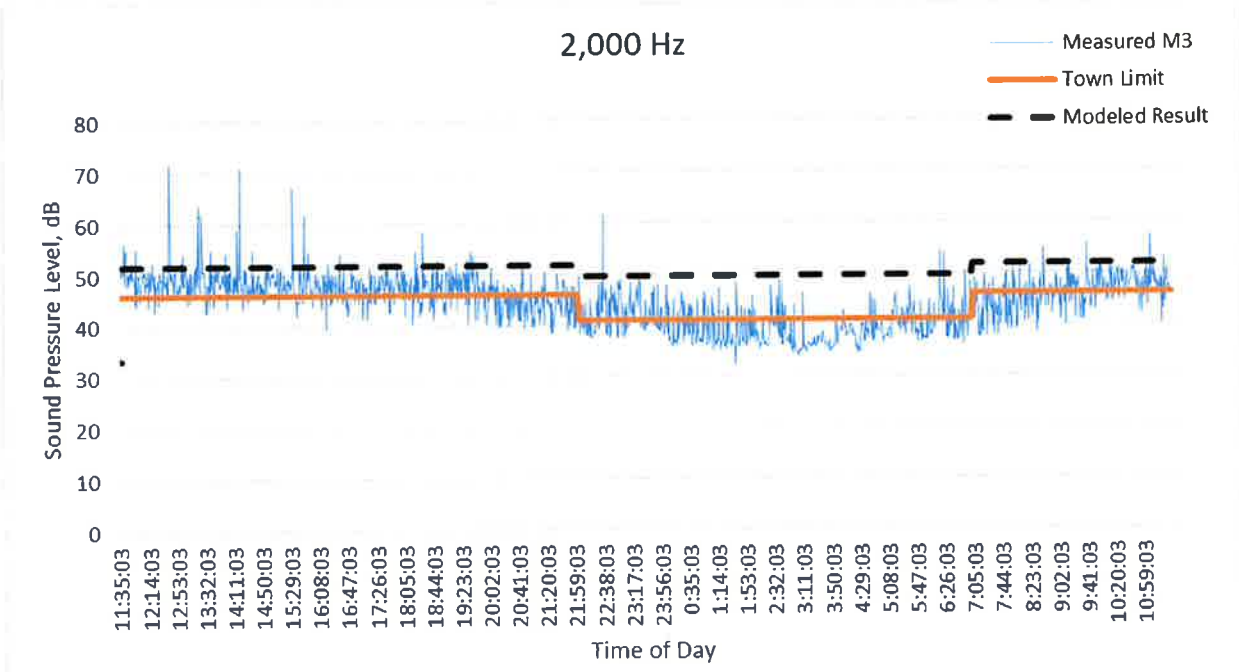
Time of Day


2,000 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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20
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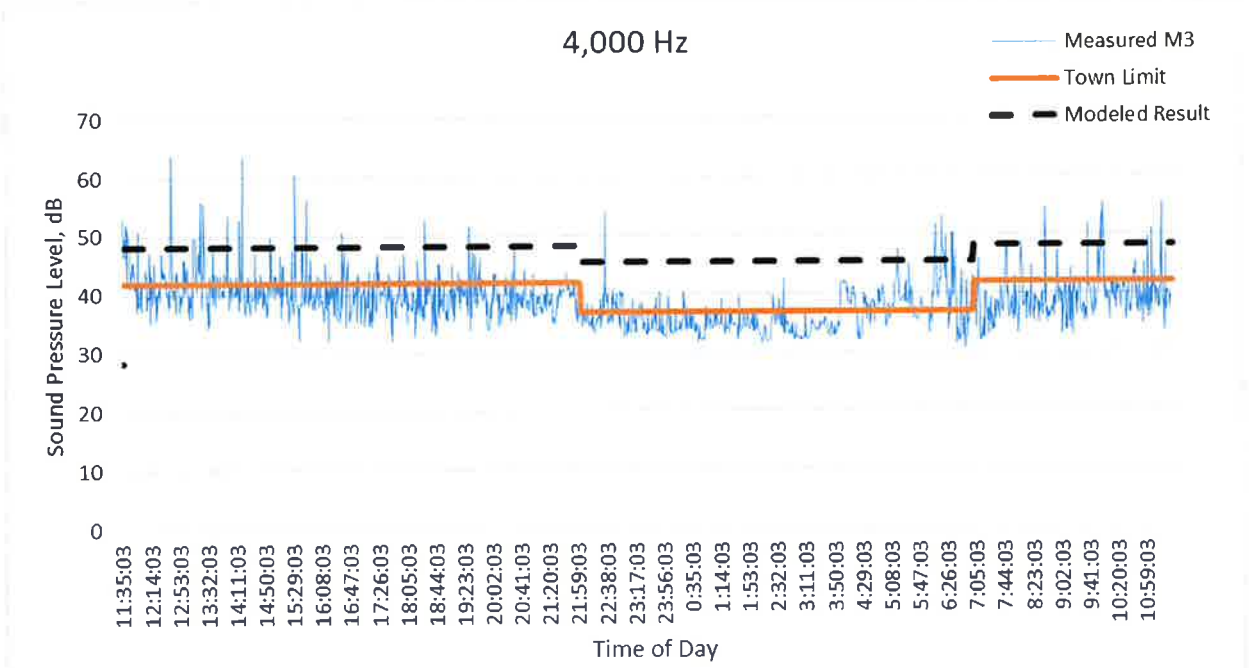
Time of Day


4,000 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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40
30
20
10
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5:47:03
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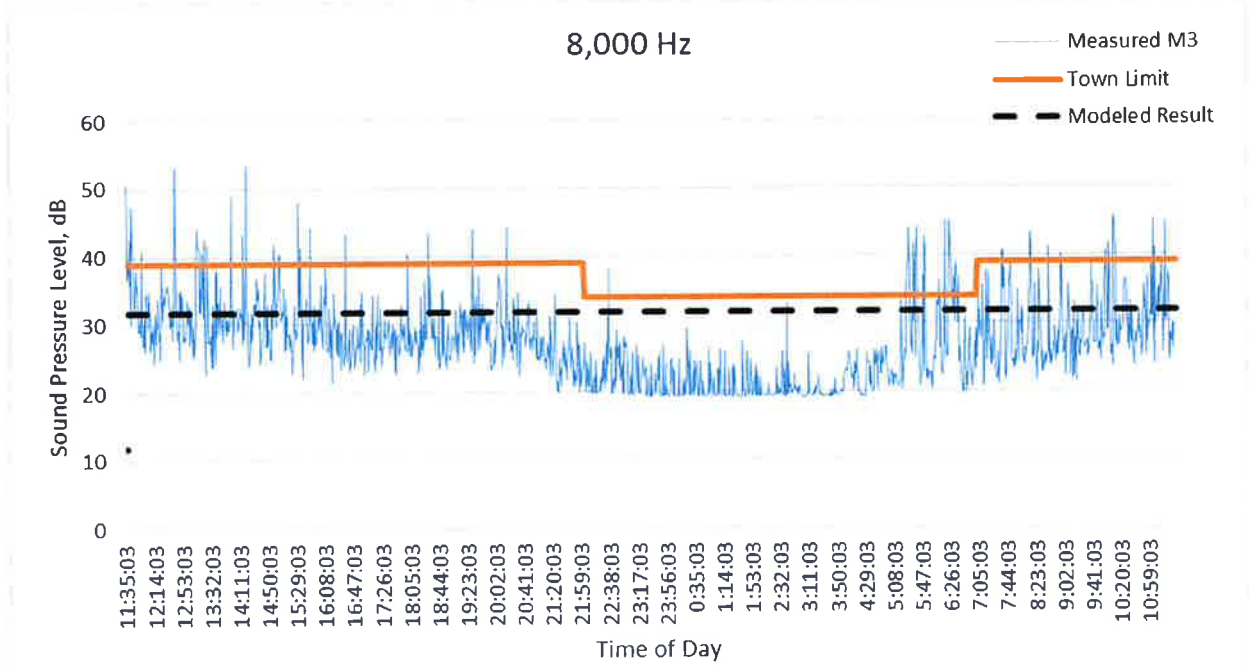
Time of Day


8,000 Hz
Measured M3
Town Limit
Modeled Result
Sound Pressure Level, dB
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30
20
10
0
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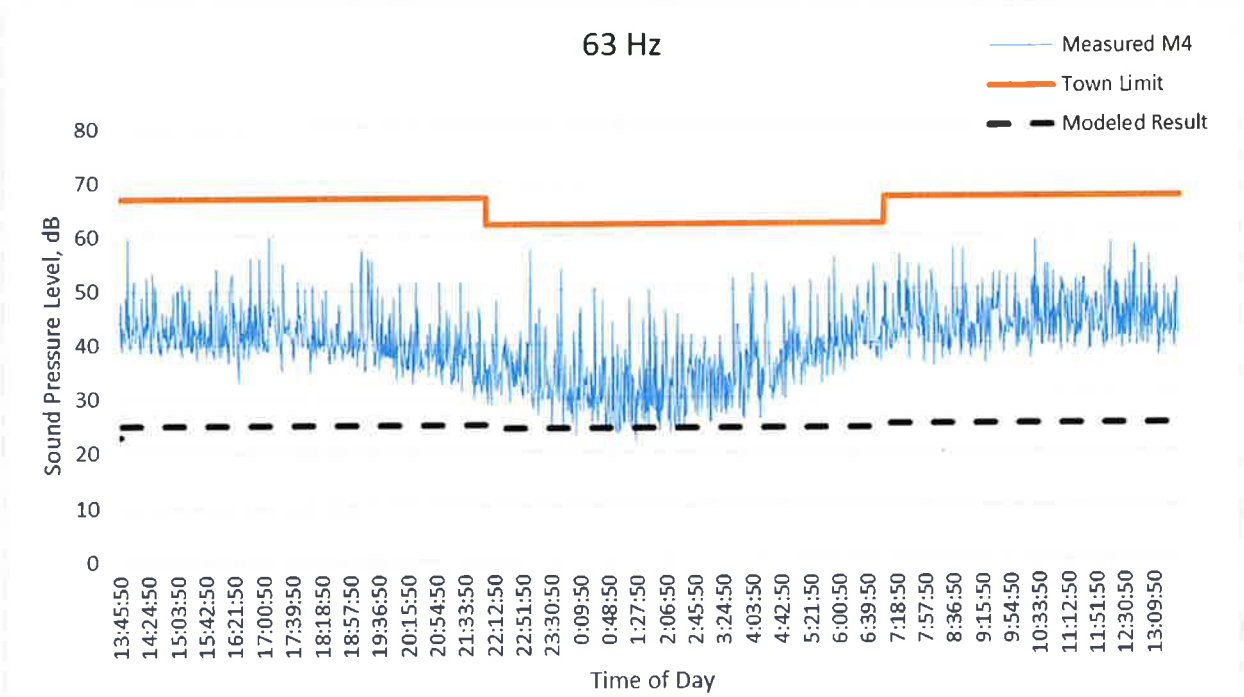
Time of Day

M4 Results


63 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
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30
20
10
0
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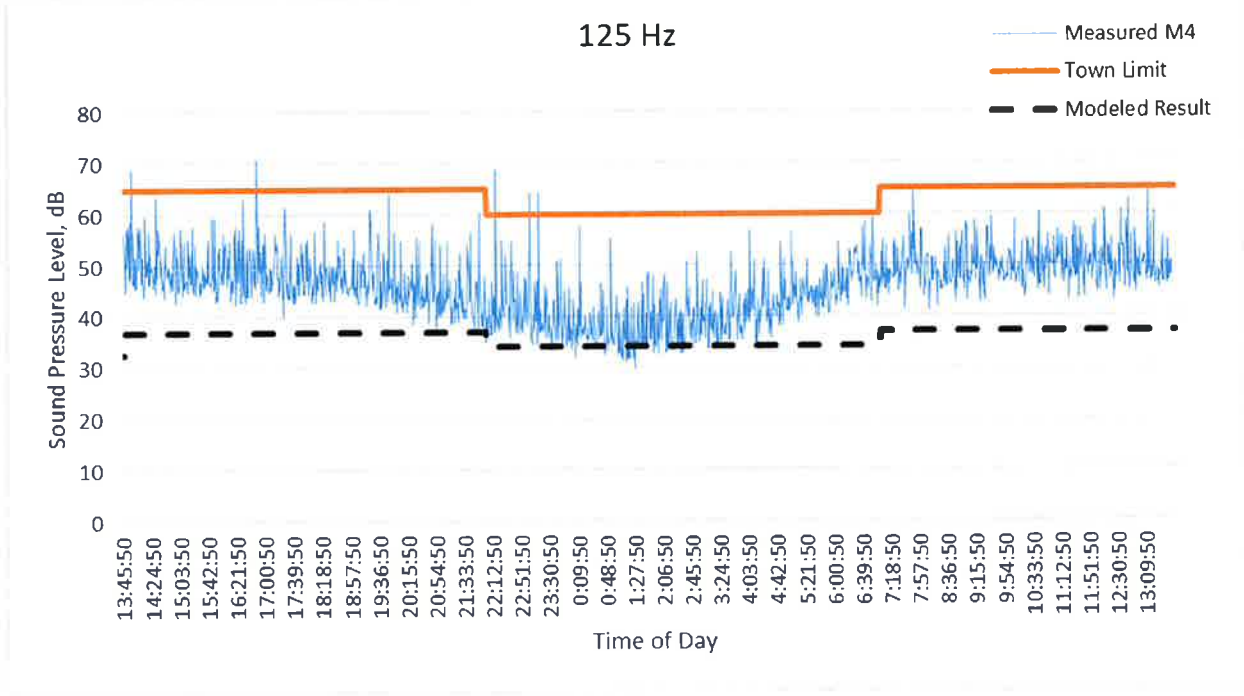
13:09:50
Time of Day


125 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
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40
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20
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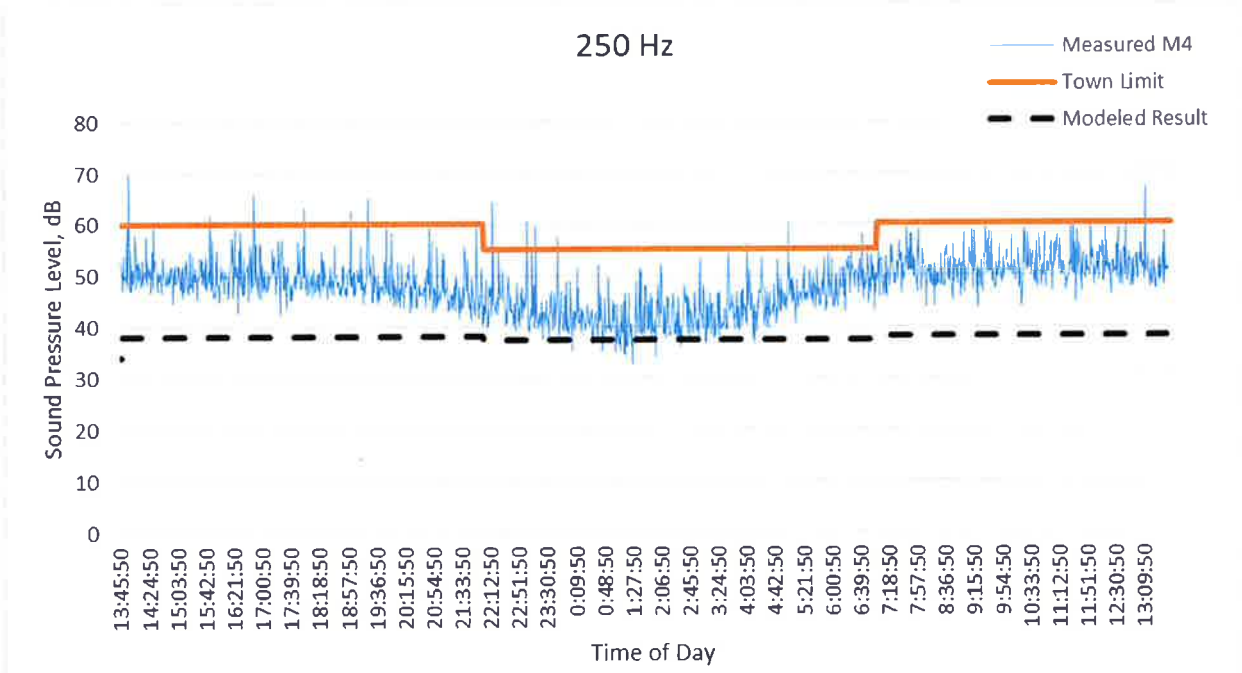
Time of Day


250 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
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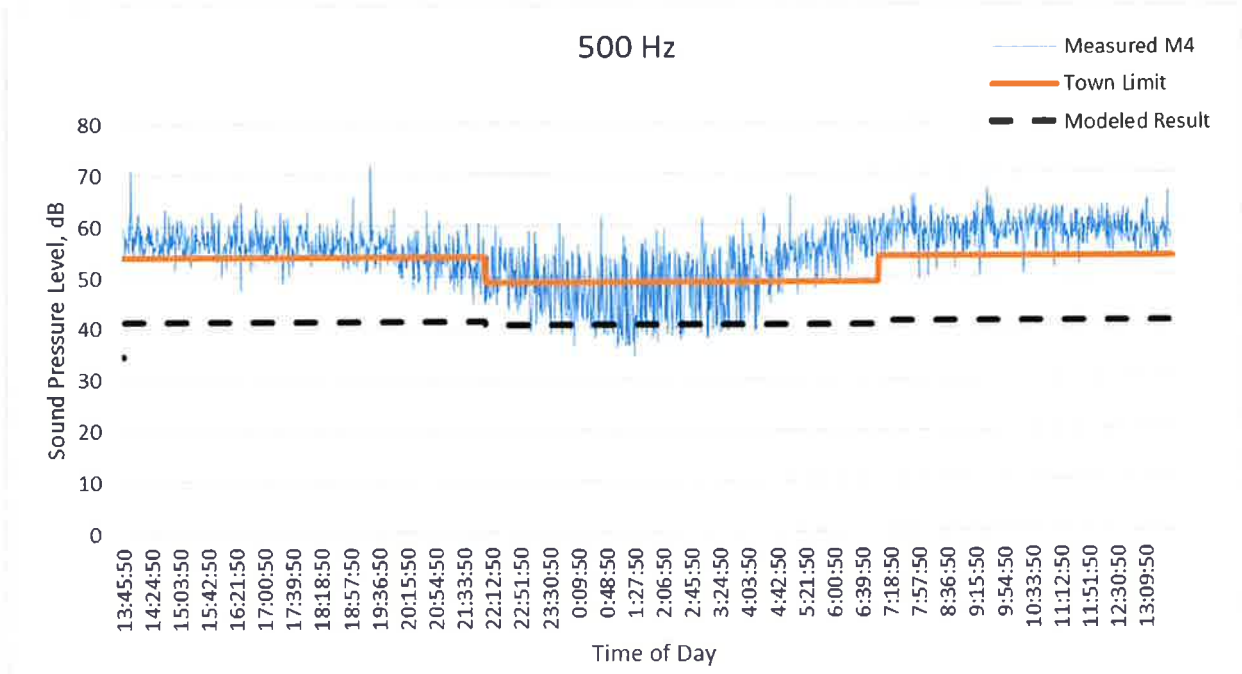
13:09:50
Time of Day


500 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
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70
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50
40
30
20
10
0
13:45:50
14:24:50
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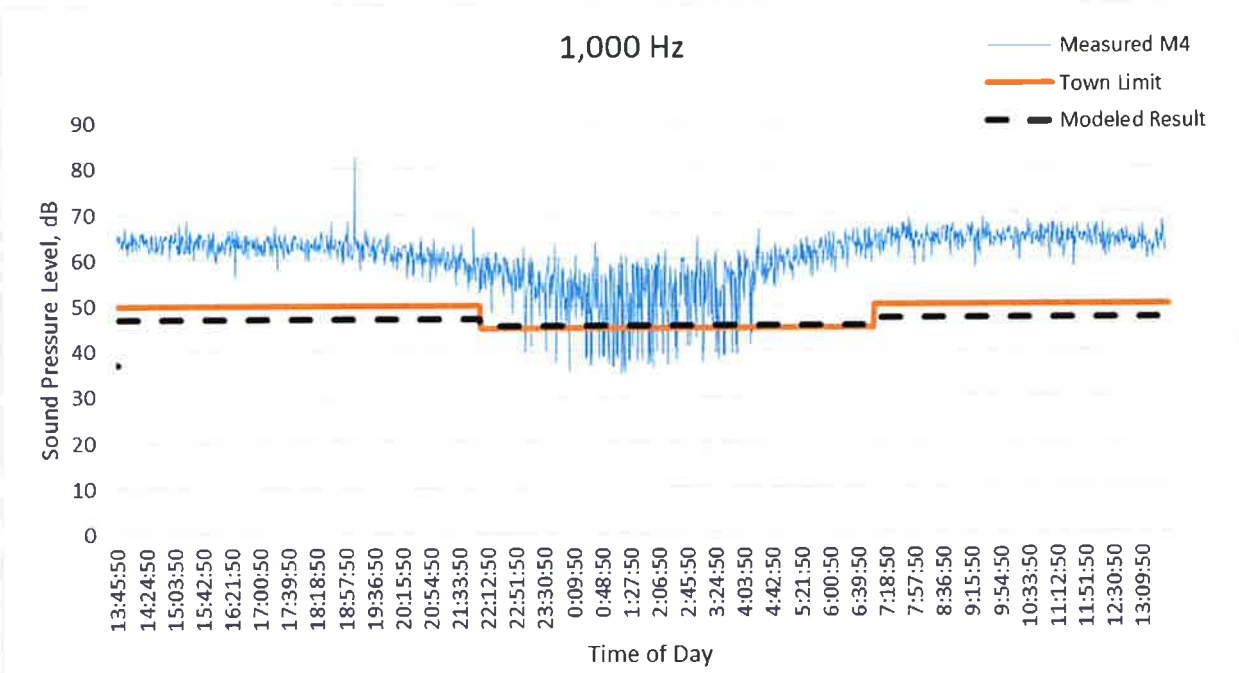
13:09:50
Time of Day


1,000 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
90
80
70
60
50
40
30
20
10
0
13:45:50
14:24:50
15:03:50
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16:21:50
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17:39:50
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18:57:50
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7:57:50
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9:54:50
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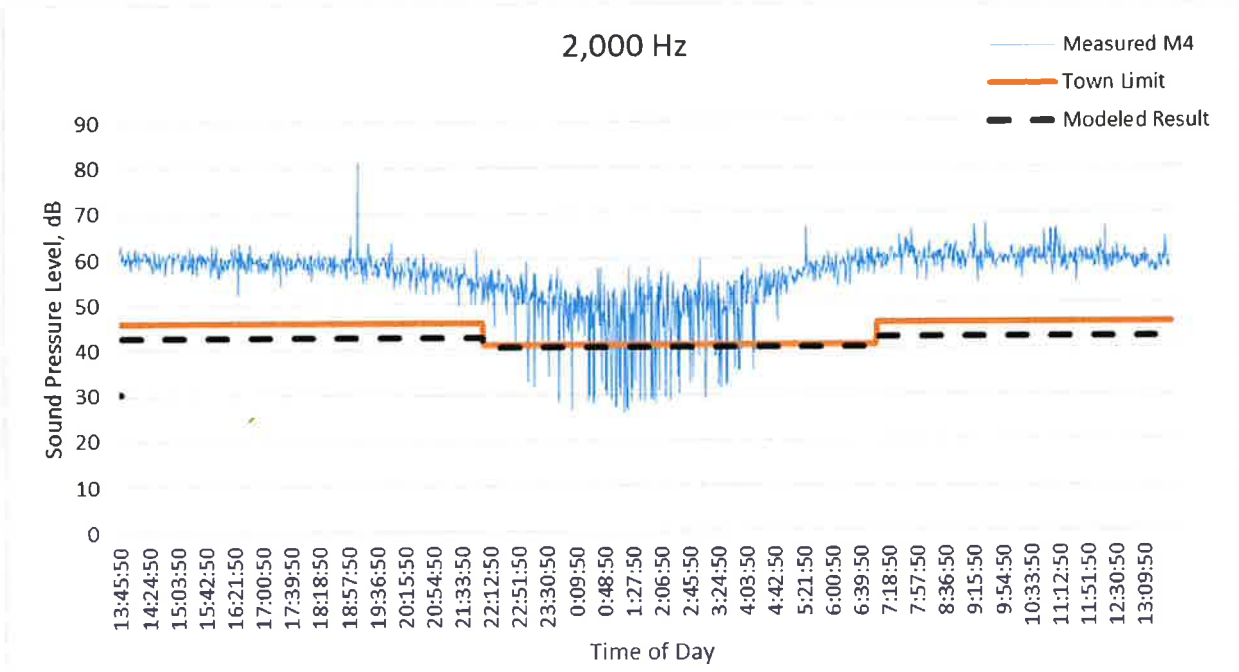
11:51:50
12:30:50
13:09:50
Time of Day


2,000 Hz
Measured M4
Town Limit
Modeled Result
Sound Pressure Level, dB
90
80
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60
50
40
30
20
10
0
13:45:50
14:24:50
15:03:50
15:42:50
16:21:50
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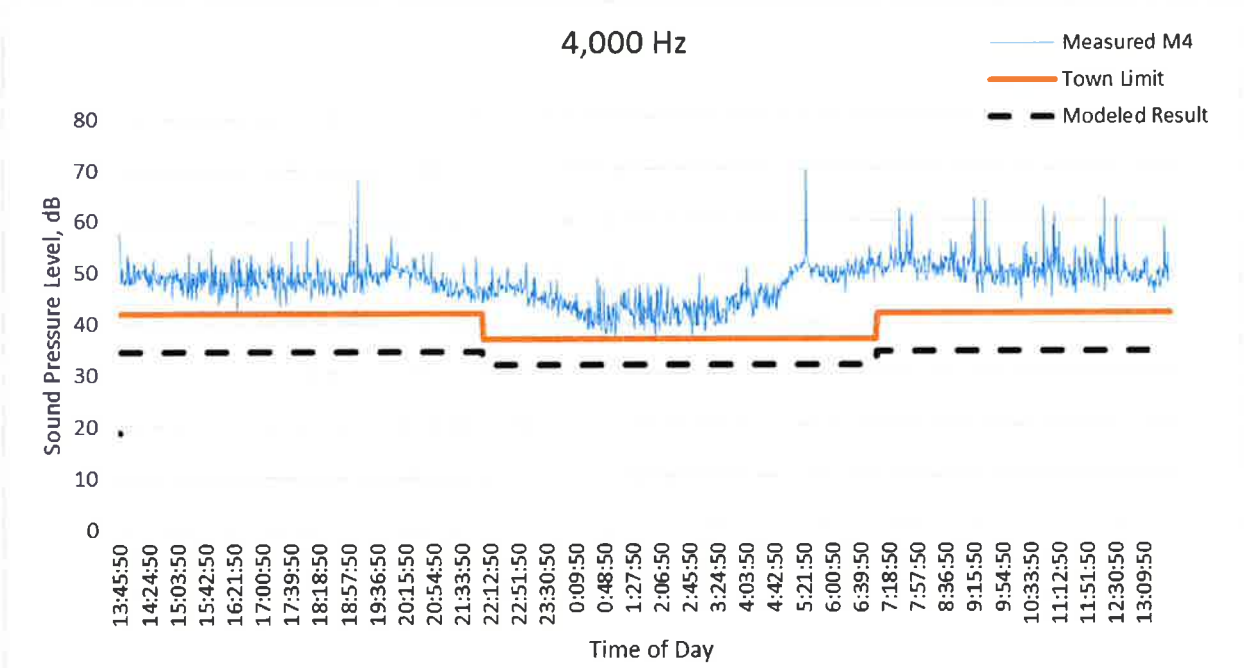
12:30:50
13:09:50
Time of Day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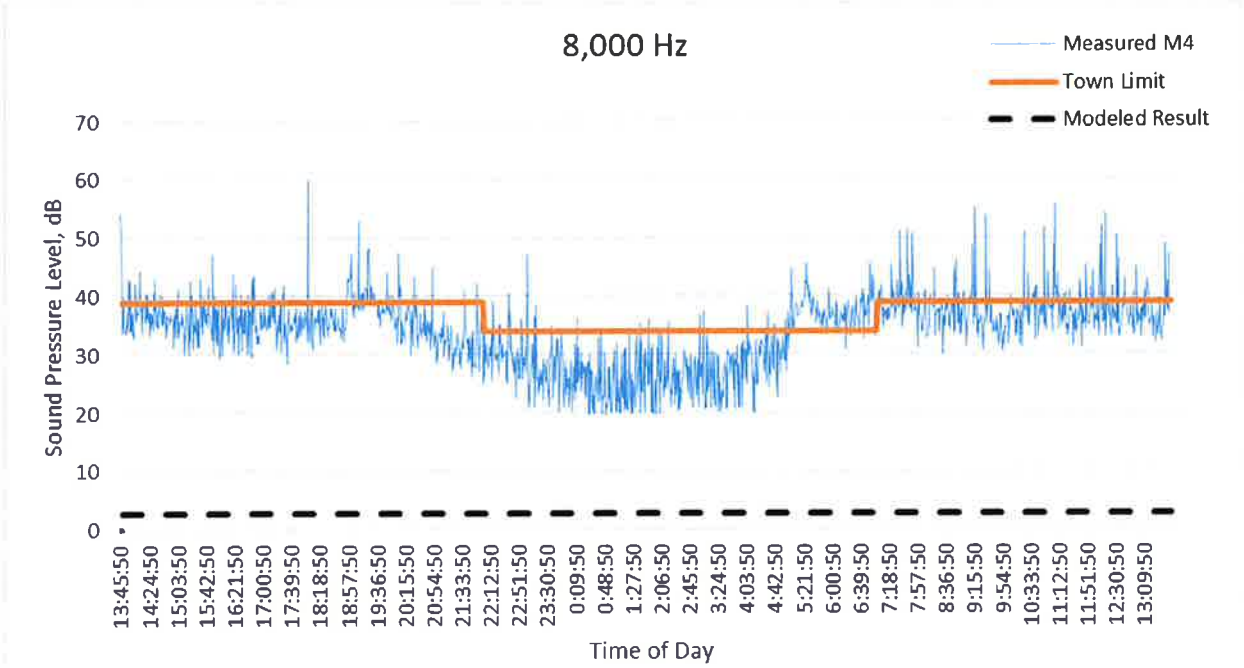
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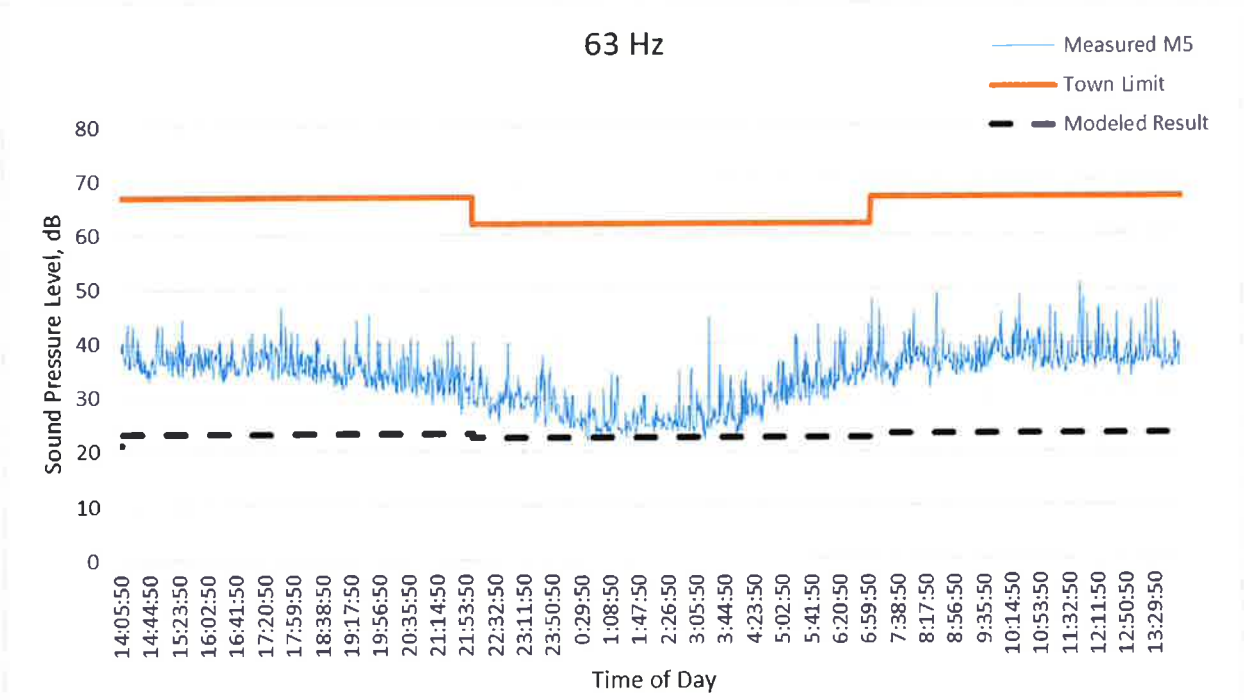
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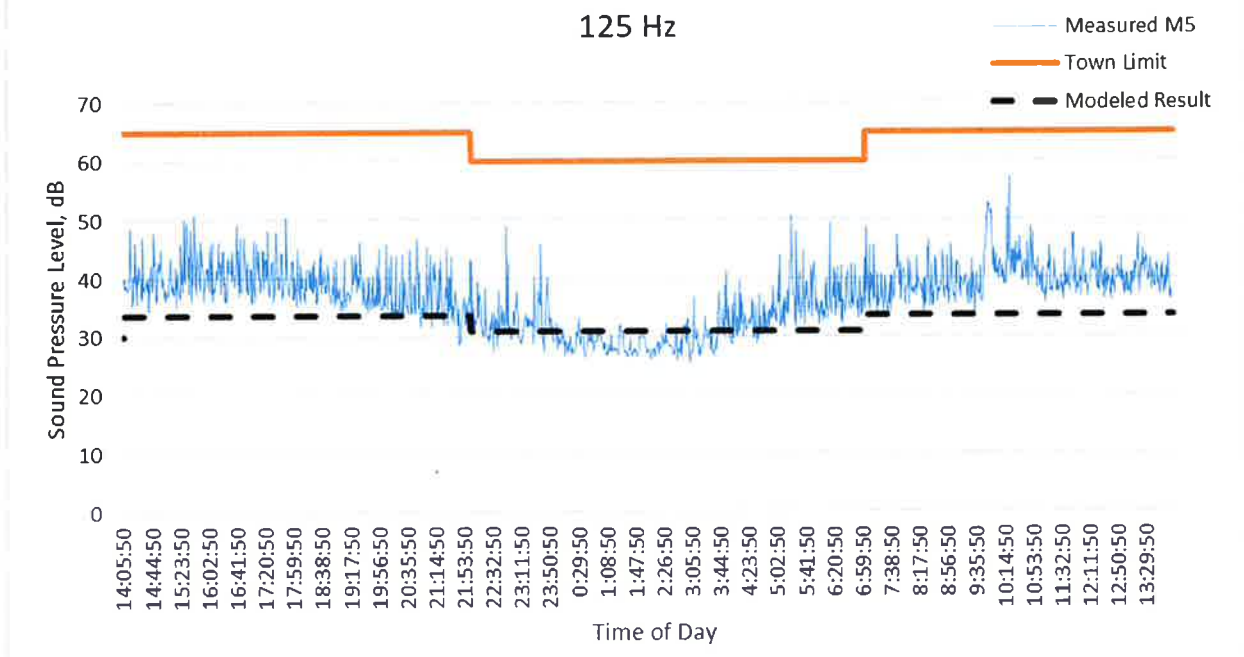
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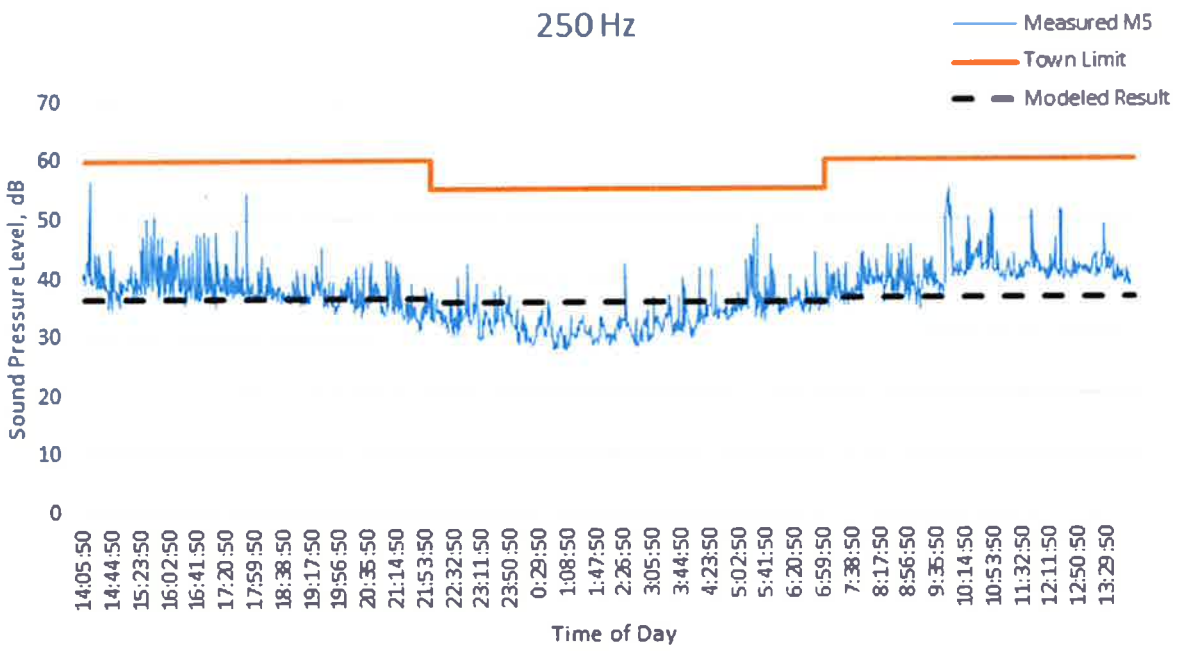
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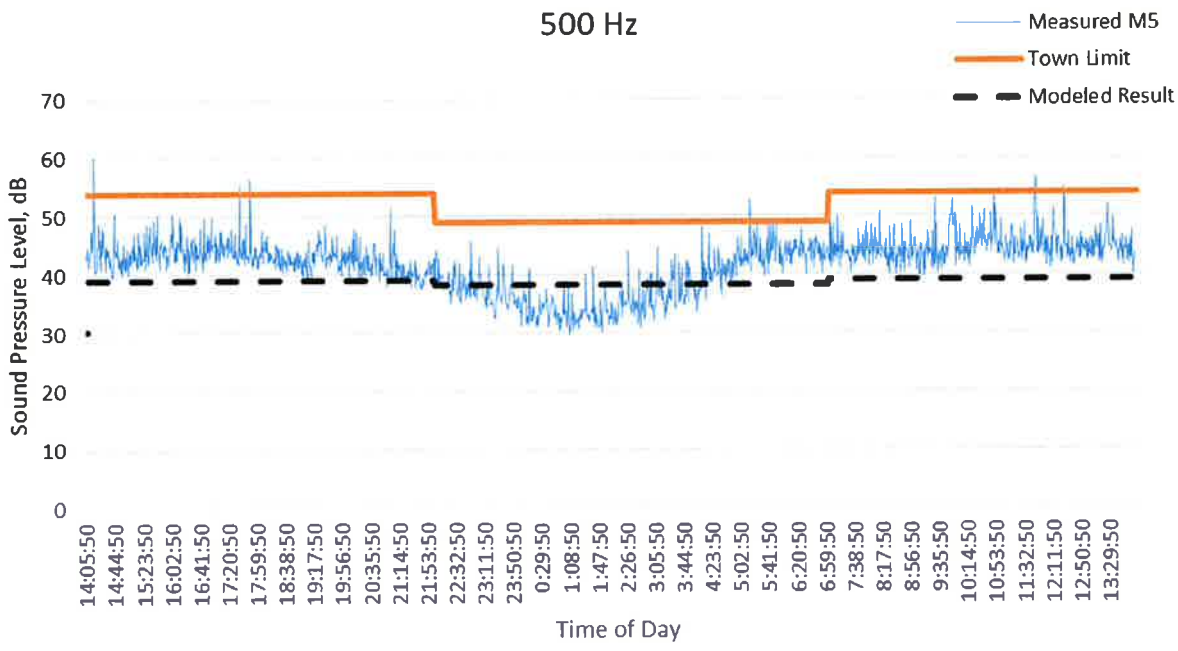
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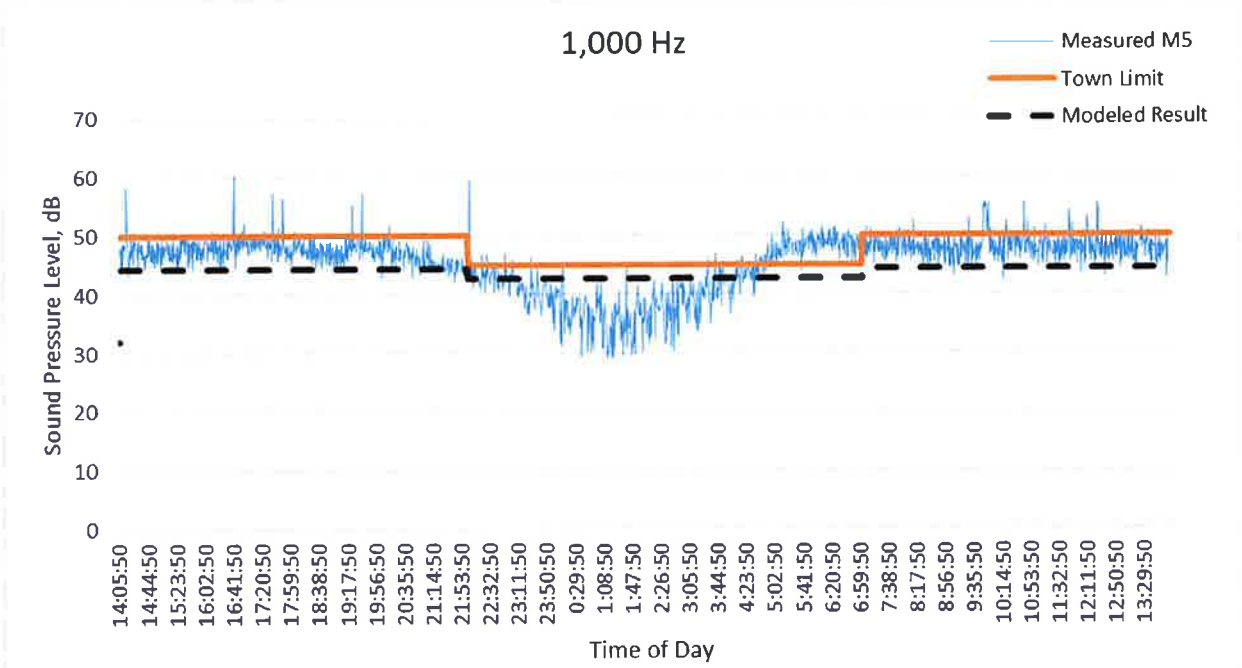
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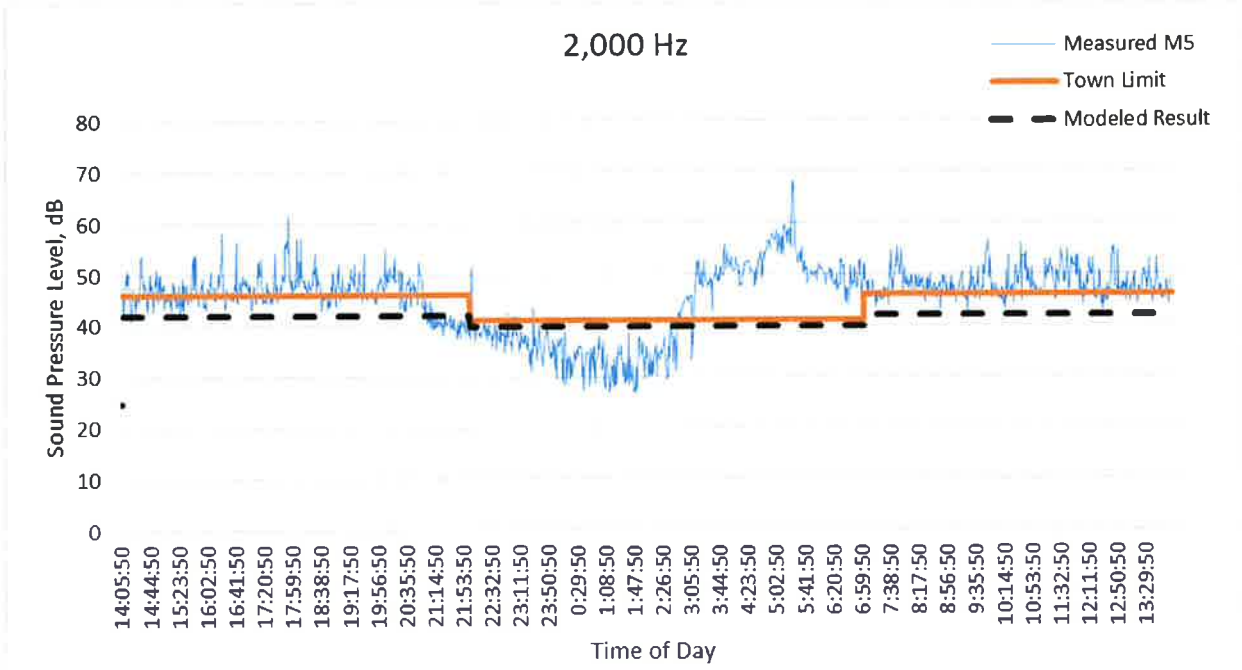
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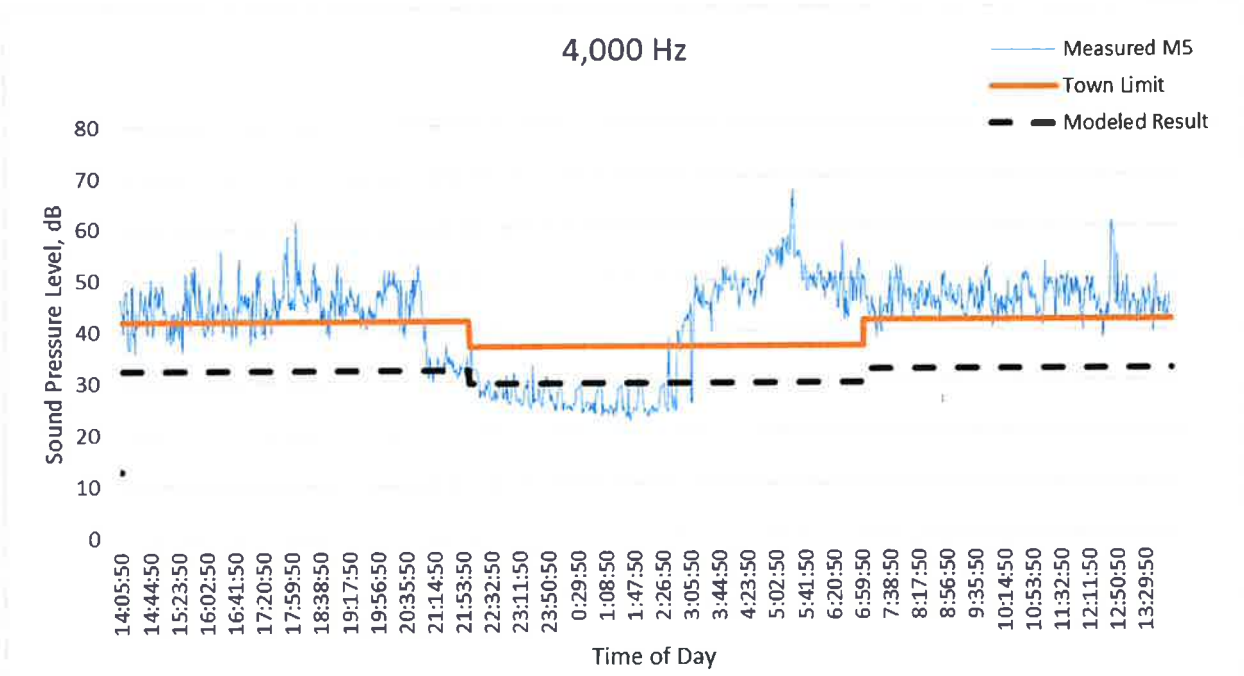
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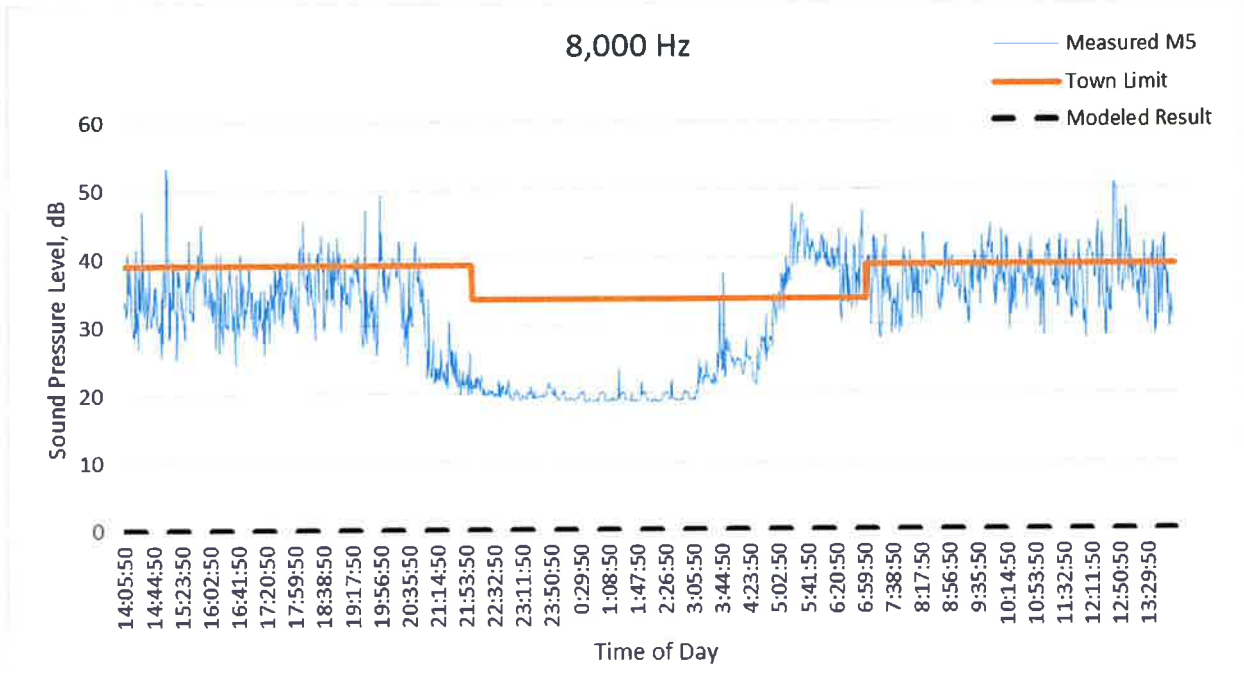
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Exhibit 6

ECS MID-ATLANTIC, LLC

Geotechnical Engineering Report

Warrenton Data Center

Lee Highway and Blackwell Road
Warrenton, Virginia 20186

ECS Project No. 01:31153

Revised August 15, 2022

Revised August 15, 2022

Ms. Patricia Krinke
Bohler Engineering
28 Blackwell Park Lane, Suite 201
Warrenton, Virginia 20186

ECS Project No. 01:31153

Reference: Geotechnical Engineering Report
Warrenton Data Center
Lee Highway and Blackwell Road
Warrenton, Virginia 20186

Dear Ms. Krinke:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 01:63686-GP1, dated May 4, 2021. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration conducted and our design and construction recommendations.

It has been our pleasure to be of service to Bohler Engineering during the design phase of this project. We would welcome the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS MID-ATLANTIC, LLC

John A. Short, EIT
Project Manager
JAShort@ecslimited.com

Dominic O. Agyepong, PE
Principal Engineer
DAgyepong@ecslimited.com

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- Site Location Diagram
- Boring Location Diagram

Appendix B – Field Operations

- Reference Notes for Boring Logs
- Subsurface Exploration Procedure Notes
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Appendix C – Laboratory Testing

- Laboratory Test Results Summary
- Plasticity Charts
- Grain Size Analyses
- Standard Proctor Test Results
- California Bearing Ratio Test Results
- Thermal Resistivity Test Results

Appendix D – Supplemental Report Documents

- French Drain Installation Procedure
- Zone of Influence Diagram

EXECUTIVE SUMMARY

This Executive Summary is intended as a brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from this Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

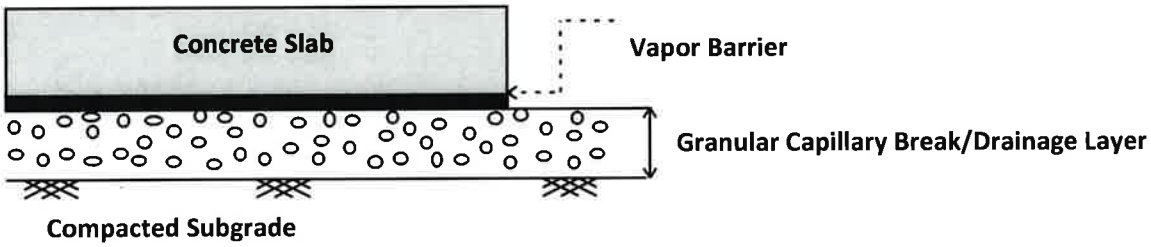
- Based on the subsurface exploration completed we anticipate the site will be suitable for the proposed development. We do not anticipate conditions on the project site to adversely affect future development beyond the typical difficulties encountered in this geographic region (i.e., rock excavation, potentially expansive soils, and moisture sensitive soils).
- For shallow foundation design we recommend the following design parameters:

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure (Stratum I Soil/Structural Fill)	3,000 psf	3,000 psf
Net Allowable Bearing Pressure (Stratum II- Weathered Rock Areas)	8,000 psf	8,000 psf
Minimum Width	24 inches	24 inches
Minimum Footing Embedment Depth (below slab or finished grade)	24 inches	24 inches

Deep foundation systems such as Drilled Shaft foundations or Auger Cast-In-Place (ACIP) Pile foundations can be utilized for heavily loaded structures. Deep foundations may be designed for an allowable bearing pressure on the order of 50 tons to 100 tons, if extended at least 3 drilled shaft diameters into the relatively unweathered rock. Actual designs will be provided in the final geotechnical report.

- Provided subgrades and structural fills are prepared as discussed herein, the proposed floor slabs can be constructed as **Ground Supported Slabs (or Slab-on-Grade).**

- The following graphic depicts our soil-supported slab recommendations:



1. Drainage Layer Thickness: 6 inches minimum.
2. Drainage Layer Material: 6 inches of VDOT #57 stone, VDOT 21-A/21-B

Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted Structural Fill in accordance with the recommendations included in this report. Floor slabs placed in areas where expansive soils (CH/MH) are encountered should be underlain by at least 2 feet of compacted suitable fill.

Subgrade Modulus: Provided the Structural Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 150 pci (lbs./cu. inch).

Based on report, the anticipated geotechnical issues be considered during design included issues related to shallow bedrock, perched groundwater, potentially expansive and moisture sensitive soils, and deep foundations (drilled shafts) for the buildings.

- **Satisfactory Structural Fill Materials:** Materials satisfactory for use as Structural Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Building and Structural Areas	LL < 40, PI<15
Pavement Areas	LL < 45, PI<20
Max. Particle Size	4 inches
Fines Content (% passing #200 sieve)	Max. 25 %
Max. organic content	5% by dry weight

- Compaction Methodologies:

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Standard Proctor, ASTM D698/ Virginia Test Method (VTM-1)
Required Compaction	95% of Max. Dry Density for fill less than 10 feet
	98% of Max. Dry Density for fill greater than 10 feet
Moisture Content	-2 to +3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

- Building and site retaining walls and foundations (soil bearing, lateral earth pressures, subgrade modulus, coefficients of friction, etc.)

- Site Soil Design Parameters

Material	Unit Weight (pcf)	Angle of Internal Friction (phi)	At-Rest Pressure (psf per vertical foot of wall)	Active Pressure (psf per vertical foot of wall)	Passive Pressure (psf per vertical foot of wall)
CH	115	12	90	75	175
ML	120	25	70	50	300
SM	125	30	65	45	375
Weathered Rock	135	45	40	25	400

Material	Compacted or In-Situ Soil Moist Unit Weight (δ)	Angle of Internal Friction (ø)	Cohesion (C)	Coefficient of Earth Pressure at Rest (K_o)	Coefficient of Active Earth Pressure (Ka)	Coefficient of Passive Earth Pressure (K_p)
CH	115	12	0	0.79	0.66	1.52
ML	120	25	0	0.58	0.41	2.46
SM	125	30	0	0.50	0.33	3.0
Weathered Rock	135	45	0	0.29	0.17	5.82

- For sliding coefficient:

Sliding Friction Coefficient [Concrete on Soil] (μ)	0.30
Skin Friction [Concrete cast against Soil] (F_s) [1]	250 psf

- Potentially expansive soils (CH/MH) are common in the local geology characterized at this site. Expansive soils should not be reused as engineered fill in the building pad, nor as fill for roadway, curb, gutter, and sidewalk subgrade, within utility trenches, or within embankment slopes. Expansive soils (CH/MH) should be undercut to 4 feet below finished exterior grade or to 2 feet below the bottom of footing, whichever is deeper, and backfilled with controlled, compacted fill where encountered. In proposed pavement areas, we recommend undercutting and replacement of the expansive soils (CH/MH) to provide at least 2 feet of non-expansive soil fill below the pavement subgrade.

- Based on the soil conditions encountered (shallow rock and low permeability soils), stormwater management facilities that require infiltration are not feasible for this site.

- Considering the shallow weathered rock surface encountered at this site and our experience with other projects in the area, we recommend that the design for the building be based on a seismic site classification of **Site Class C**.

- Preliminary pavement section designs based on laboratory data and assumed design parameters are included within the report. We recommend pavement designs be developed in accordance with applicable VDOT requirements. Finalized designs should be based on anticipated traffic loading conditions and actual soil subgrade conditions. For design purposes, we recommend using a design California Bearing Ratio (CBR) value of 4 for the on-site clayey, silty, and sandy soil materials. Additionally, we recommend a Resiliency Factor (RF) of 1.5 be utilized for design of the proposed pavements.

- Groundwater on this site can be characterized as being broadly perched above less permeable materials and shallow rock. The depth at which perched water is present on the site varies with surface elevation. In low-lying areas, the presence of perched water is more pronounced. In higher areas and on ridge lines, perched water may be present, including above design cut elevations, but is less concentrated. Soils at contact with perched water levels were very moist to wet. In most cases, moisture then decreased with depth. The permanent groundwater able is significantly below the anticipated extents of excavation for this project.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design and construction of an industrial site which includes one data center building, a guard house facility, a stormwater management pond, a substation area, associated pavement infrastructure, and mass grading for the overall site. The recommendations developed for this report are based on project information supplied by Bohler Engineering.

Our services were provided in accordance with our Proposal No. No. 01:63686-GP1, dated May 4, 2021. This report contains the procedures and results of our subsurface exploration program, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items.

- A brief review and description of our field and laboratory test procedures.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Copies of our soil test boring logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.
- Recommended foundation types.
- General recommendations for pavement design including a recommended design CBR value.
- Evaluation and recommendations relative to groundwater control.
- Recommendations for design and construction of drainage structures and stormwater management facilities.
- An evaluation of potential soil and rock excavation issues.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION & CURRENT SITE CONDITIONS

The proposed project site is located to the northeast of the intersection of Lee Highway and Blackwell Road in Warrenton, Fauquier County, Virginia. The subject property spans a single parcel (GPIN: 6984-69-2419) which, at the time of this exploration, is primarily occupied by active farmland with some wooded areas in the northwest and southeast portions, and site elevations range from approximate EL. 510± feet along the north edge of the site to approximate EL. 465± feet in the northeast corner. The southwest corner of the site is bordered by an existing car dealership. An aerial view of the site is pictured below.

Figure 2.1.1 Site Location

2.2 PROPOSED CONSTRUCTION

It is our understanding that the development will include the construction of one 214,388 sq. ft., 1-story data center building (FFE = EL. 486.0 feet), a guard house facility, a stormwater management pond, a 6-acre substation area, a retaining wall with a maximum exposed height of 6 feet, and associated pavement infrastructure. Based on current proposed grading information, it is our understanding that soils fill on the order of 21± feet and cuts on the order of 40± feet will be required in order to establish final site grades.

The description of the proposed project is based on the information provided to us by your office or other design team members at this time. If any of the information is inaccurate, either due to misunderstanding or due to design changes that may occur later, we recommend that we be contacted to provide additional or alternate recommendations that may be required.

2.2.1 Structural Information/Loads

A maximum structural column loading of 450 kips has been provided by the structural engineer at this time and it is our understanding that shallow foundations are considered feasible in design for support of the main building. If additional/revised maximum structural loading becomes available, ECS should be informed so that we may confirm or re-evaluate our recommendations.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our overall scope of work included drilling a total of 20 soil borings. Thirteen borings were performed in the vicinity of the data center building and guard house structural footprints, two borings were performed within the proposed stormwater pond, and five borings were performed within proposed pavement areas.

A track-mounted drill rig was utilized to drill the soil test borings. Borings were advanced to depths on the order of up to 80± feet below the existing ground surface. The subsurface exploration was completed under the general supervision of an ECS geotechnical engineer.

Boring locations were identified in the field by ECS personnel using GPS techniques prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the provided existing contour mapping.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility.

Rock sampling was performed at Borings B-3 and B-10 in accordance with ASTM D-2113 using a diamond-studded bit fastened to the end of a hollow double-tube core barrel. The core barrel was drilled into the rock up to five feet at a time, and the samples were removed for measurement of sample recovery. The recovery is determined as the ratio of sample length recovered to the distance drilled.

The core samples were stored in boxes and returned to our laboratory for identification and determination of the Rock Quality Designation (RQD). The RQD is determined as the ratio of intact rock in NX or NQ core sections 4 inches or longer to the distance drilled. Percentages of recovery and RQD are given on the boring logs included in the Appendix of this report and summarized within the table below.

Boring No.	Depth of Core Run (feet)	REC (%)	RQD (%)
B-3	39.0-44.0	32	13
	44.0-49.0	53	7
B-10	23.5-28.5	87	17
	28.5-33.5	100	22

3.1 SUBSURFACE CHARACTERIZATION

The project site is located within the Central Blue Ridge Anticlinorium. Based on the USGS Geological Map of Virginia (1993), the site is mapped within the Catoctin Formation – Metabasalt soils. This formation typically consists of grayish green to dark yellowish green, fine-grained, schistose chlorite and actinolite

bearing metabasalt. The materials will initially weather into Silty and Clayey SAND and then into SILT and CLAY with extensive weathering.

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata. Please refer to the boring logs in Appendix B.

Table 3.1.1 – Subsurface Soil Summary

Approximate Depth (ft)	Stratum	Description	Ranges of SPT(1) N-values (bpf)
0-0.5 (Surface cover)	n/a	Topsoil, Roots, and Organics	N/A
0.3-32.0	I	- Very Loose to Very Dense SAND (SM) and SILT (ML) with varying amounts of parent rock fragments - Firm to Very Stiff CLAY (CL, CH, MH)	4 to 50/4
3.0-80.0	II	- Very Dense Weathered Rock with varying amounts of parent rock fragments	60 to 50/0

Notes: (1) Standard Penetration Test

3.2 GROUNDWATER OBSERVATIONS

Groundwater was encountered in 4 of the 20 borings (B-1, B-2, B-3, and B-5) drilled as part of this geotechnical study ranging from depths of 23± to 53± feet below the existing ground surface. Perched water occurs as precipitation that enters the site, either directly or from overland flow from adjacent properties, begins to percolate through the near surface soils. Once the water percolation reaches the bedrock, which is virtually impermeable, it begins to flow at the intersection of the rock and the soil. This groundwater flow continues down gradient with the water table occasionally surfacing to form as springs and intermittent streams. Only in the lowest lying areas and adjacent to existing creeks is a shallow groundwater table in a continuous condition. Otherwise, it is related to precipitation, although springs may exist in the lower lying areas for extended periods of time without recharge from rainfall. Therefore, the groundwater conditions at this site are expected to be significantly influenced by surface water runoff and precipitation.

Because of the perched nature of the groundwater at this site, long term groundwater conditions can be deceptive. Although the true groundwater table can exist several hundred feet below the existing ground surface, groundwater located in streams and creeks, because of perched overland flow, creates the presence of an effective near surface groundwater table. Because the water is perched and flows at the interface between the soil and bedrock, water exiting fracture channels and cracks is common. Therefore, although all building excavations may appear dry at the time of completion, it is very common for fracture patterns in the rock, because of natural conditions or blasting to become natural pathways for ground water flow.

The highest groundwater observations are normally encountered in the late winter and early spring. Variations in the location of the long-term water table may occur because of changes in precipitation, evapo-transpiration, surface water runoff, and other factors not immediately apparent at the time of this

exploration. The site may also be subject to severe desiccation during extended dry periods. Therefore, earthwork operations, especially in the winter and spring months are more likely to encounter difficulties with perched conditions than those operations undertaken in the summer or fall.

3.3 LABORATORY TESTING

Representative soil samples were selected tested in our laboratory to check field classification and to evaluate pertinent engineering properties. The laboratory testing program included visual classifications (ASTM D4318), moisture content tests (ASTM D2216), Atterberg Limits tests (ASTM D4318), washed sieve grain size analyses (ASTM D412), thermal resistivity testing (ASTM D5334), and California Bearing Ratio testing.

Each soil sample was visually classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified Soil Classification System is included in Appendix B of this report. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual, rather than distinct.

4.0 DESIGN RECOMMENDATIONS

The design recommendations outlined in this report are based on the 20 soil test borings performed within the proposed development limits. The following sections provide recommendations for foundation design, soil supported floor slabs, seismic design parameters, pavements, and stormwater management facilities.

4.1 BUILDING FOUNDATIONS

4.1.1 Shallow Foundations (Option)

Provided subgrades and structural fills are prepared as recommended in this report, the buildings, structures, and lightly-loaded substation features may be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters:

Table 4.1.1.1 Shallow Foundation Design

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure (Stratum I Soil/Structural Fill) (1)	3,000 psf	3,000 psf
Net Allowable Bearing Pressure (Stratum II)[1]	8,000 psf	8,000 psf
Minimum Width	24 inches	24 inches
Minimum Footing Embedment Depth (below slab or finished grade) (2)	24 inches	24 inches
Estimated Total Settlement (3)	Less than 1 inch	Less than 1 inch
Estimated Differential Settlement (4)	Less than 0.5 inches between columns	Less than 0.5 inches

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
(2) For frost penetration requirements.
(3) Based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
(4) Based on maximum column/wall loads and variability in borings. Differential settlement should be re-evaluated once the foundation plans are more complete.

Potential Undercuts: Most of the natural soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structures. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1{,}000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete. Additional undercutting of foundations may be required if highly plastic soils or undocumented fill soils are present below the foundation. Please see the High Plasticity Soils section of this report.

For building and site retaining walls and foundations (soil bearing, lateral earth pressures, subgrade modulus, coefficients of friction, etc.).

- Site Soil Design Parameters

Material	Unit Weight (pcf)	Angle of Internal Friction (phi)	At-Rest Pressure (psf per vertical foot of wall)	Active Pressure (psf per vertical foot of wall)	Passive Pressure (psf per vertical foot of wall)
CH	115	12	90	75	175
ML	120	25	70	50	300
SM	125	30	65	45	375
Weathered Rock	135	45	40	25	400

Material	Compacted or In-Situ Soil Moist Unit Weight (δ)	Angle of Internal Friction (ø)	Cohesion (C)	Coefficient of Earth Pressure at Rest (K_o)	Coefficient of Active Earth Pressure (Ka)	Coefficient of Passive Earth Pressure (K_p)
CH	115	12	0	0.79	0.66	1.52
ML	120	25	0	0.58	0.41	2.46
SM	125	30	0	0.50	0.33	3.0
Weathered Rock	135	45	0	0.29	0.17	5.82

- For sliding coefficient:

Sliding Friction Coefficient [Concrete on Soil] (μ)	0.30
Skin Friction [Concrete cast against Soil] (F_s) [1]	250 psf

4.1.2 Drilled Shafts (Option)

In the event maximum structural loads for the building are considered to be excessive for shallow foundation system design, the building as well as typical more heavily-loaded substation structures (e.g. transmission line towers, etc.) can be designed to bear on drilled shaft foundations. **For preliminary design purposes only,** we estimated that drilled shafts may be designed to bear in rock sockets having a depth of at least 1 shaft diameter with a design capacity of 60 ksf. An average rock unconfined strength of 4,000 psi may be utilized for preliminary design purposes. Rock suitable for end bearing can generally be identified in the field during drilling by observing drill cuttings which appear generally dry and to consist of rock fragments, a pronounced grinding of the auger teeth and visible dust noted during drilling. Based on the rock depths encountered, we estimate the shaft lengths will vary across the site between 15 feet to over 40 feet in some areas. **Additional borings and rock coring data will be required to determine final tip elevations for each drilled shaft location.** Project planning and estimates should account for potential variability of drilled shaft length throughout the project.

The actual structural designs of the drilled shaft foundation system (including final pier locations, pier lengths, pier dimensions, and spacing) shall be designed and submitted, separately, for review approval and appropriate permit to Prince William County Building Division prior to construction.

We recommend all drilled shaft excavations be observed and approved by the GER prior to concrete placement. We recommend a pre-production meeting be held prior to drilling operations to review the shaft termination criteria with the GER and drilling contractor. Termination criteria shall be determined by the GER based on the final structural design and type of rig.

4.1.3 Auger Cast-In-Place (ACIP) Pile Foundations (Option)

Auger Cast-In-Place (ACIP) piles are installed by drilling a hollow stem auger with a closed tip. Upon reaching the bearing stratum, the plug is removed, and a sand-cement grout is placed under pressure through the hollow stem as the augers are withdrawn (tremie placement). The upper portion of the pile is terminated approximately 6 inches above the bottom of the proposed pile cap. ACIP foundations may be preliminarily designed for an allowable bearing pressure on the order of 50 tons to 100 tons. We estimate the shaft lengths will vary across the site between 25 feet to over 60 feet in some areas. **Additional borings and rock coring data will be required to determine final tip elevations for each ACIP location**. Project planning and estimates should account for potential variability of drilled shaft length throughout the project.

Auger cast-in-place piles greater than 18 inches in diameter will require special equipment to be installed and generally cannot be drilled more than 60 feet in the ground. Please note top of pile elevations were used in calculations and were estimated to be two feet below the finished floor elevations.

The actual structural designs of the ACIP foundation system (including final pier locations, pier lengths, pier dimensions, and spacing) shall be designed and submitted, separately, for review approval and appropriate permit to Prince William County Building Division prior to construction.

We recommend a series of three widely spaced auger probe/test piles be installed under the observation of the geotechnical engineer. Based on these observations, at least one pile should be selected for load testing, by the geotechnical engineer. The purpose of the test piles is to confirm our assumption of pile capacity (which is related to our design safety factor) and to allow observation of the subsurface conditions encountered by the augers.

The single test pile should be load tested in axial compression. The primary objective of the load test program is to observe the load-settlement response of an individual pile in order to verify that the contractor's construction procedures and installation equipment can produce an acceptable pile foundation. The geotechnical engineer should be retained to select the location of the test, observe and document the installation of the test pile and reaction piles, perform the load test and interpret the results, and develop recommendations concerning installation procedure and design tip elevations of production piles. Significant differences from accepted procedures or expected results should be brought to the attention of the Structural Consultant.

The axial compressive pile load test should be performed in general accordance with procedures outlined in ASTM D1143, Paragraphs 5.1 and 5.3. The test pile should eventually be loaded to plunging failure, which can be described as a total pile butt displacement on the order of 15% of the pile diameter, or about

2 inches. Accurate systems referenced to a stationary reference beam supported well away from the zone of influence of the test pile and reaction piles (if applicable). We recommend the load test be performed no sooner than five days after the installation of the test pile, unless the contractor can establish sufficient grout strength only after three days.

Auger cast piles may also be utilized to anchor the reaction frame system for the pile load test. However, these anchor piles may be pulled upward during loading. Upward movement of the piles beyond that of elastic elongation would reduce the downward axial capacity of these piles. Therefore, these anchor piles should not be used as production piles.

4.2 SLABS ON GRADE

Provided subgrades and structural fills are prepared as discussed herein, the proposed floor slabs can be constructed as Ground Supported Slabs (or Slab-on-Grade). The following graphic depicts our soil-supported slab recommendations:

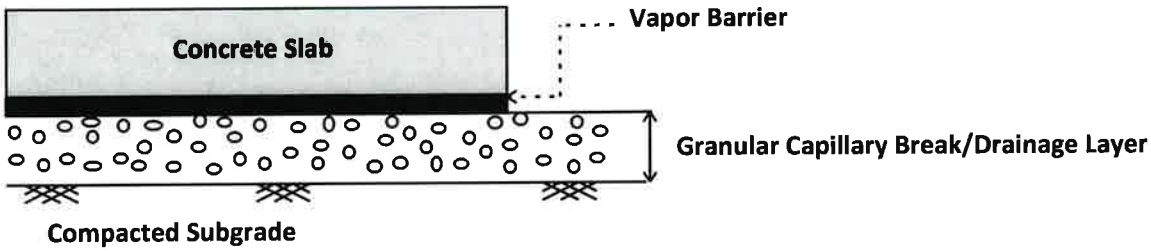


Figure 4.2.1

1. Drainage Layer Thickness: 6 inches minimum.
2. Drainage Layer Material: 6 inches of VDOT #57 stone, VDOT 21-A/21-B

Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. Floor slabs placed in areas where expansive soils (CH/MH) are encountered should be underlain by at least 2 feet of compacted suitable fill.

Subgrade Modulus: Provided the Structural Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 150 pci (lbs./cu. inch).

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.
Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations 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 such as in a drop down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

4.3 BELOW GRADE WALLS

Any below grade walls that will be backfilled with soil or aggregate should be designed to withstand lateral earth pressures and surcharge loads. For below grade walls that are properly drained, the walls may be designed for an equivalent fluid pressure of 60 pounds per square foot (psf) per foot of wall height. The 60 psf horizontal pressure reflects the moderate strength low plasticity silty and clayey soils present with the wall influence zones. A Lateral Earth Pressure Diagram illustrating our general recommendations regarding the application of lateral earth pressure are included in the Appendix D of this report and in Figure 4.3.1.

The following Figure depicts the suggested lateral earth pressure condition for a "drained condition" with restrained wall top:

This diagram is not suitable for the design of Support of Excavation or temporary shoring systems.

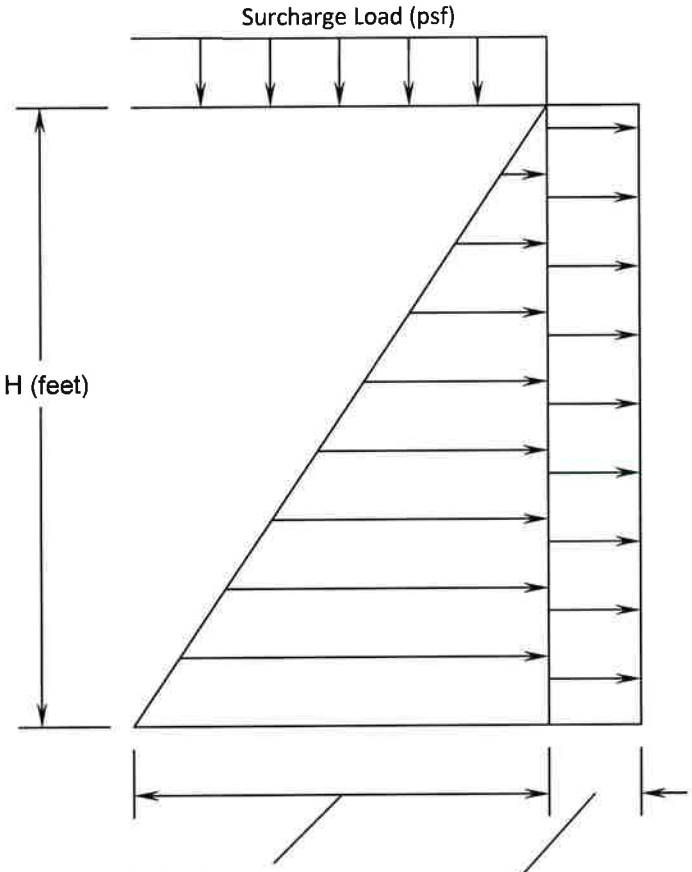


Figure 4.3.1

Any surcharge loads imposed within a 45 degree slope of the base of the wall should be considered in the below grade wall design. The influence of these surcharge loads on the below grade walls should be based on an at-rest pressure coefficient, k_0, of 0.5 in the case of restrained walls.

Backfill materials should consist of inorganic materials, free of debris and be free draining. The fill placed adjacent to the below grade walls should not be over-compacted. Heavy earthwork equipment should maintain a minimum horizontal distance away from the below grade walls of 1 foot per foot of vertical wall height. Lighter compaction equipment should be used close to the below grade walls and the thickness of the lifts should be no more than 6 inches where light weight compaction equipment is used.

To reduce excessive pressures against the below grade walls, and to reduce the settlement of the wall backfill, it is recommended that the wall backfill be compacted to between 92% and 95% of the maximum dry density determined in accordance with ASTM D 698 or VTM-1. Where the fill will be supporting pavement or other structures, the fill should be compacted to near 95% of this specification. Backfill materials which are placed behind below-grade walls should be free of organic materials and debris, free-draining, non-frost susceptible, and should not include any high plasticity Elastic SILT (MH) or Fat CLAY (CH) materials.

Depending upon the excavation methods employed at the time of installation, it may be advantageous to discontinue use of soil as structural backfill and substitute using open graded stone such as VDOT No. 57 stone. The use of No. 57 stone should help with any problems that should be encountered when attempting to backfill and compact soils. The top 2 feet of backfill should be suitable soils placed and compacted in accordance with the section titled Fill Placement. We recommend filter fabric be placed between the VDOT No. 57 stone and the compacted soil to reduce the risk of the soil fines migrating into the voids in the VDOT No. 57 stone. The GER should be contacted prior to employing the use of open graded stone to backfill around these structures.

Suitable manmade drainage materials may be used in lieu of the free draining granular backfill, adjacent to the below grade walls. These materials should be covered with a filter fabric having an Apparent Opening Size (AOS) consistent with the size of the soils to be retained. The material should be placed in accordance with the manufacturer's recommendations and connected to either the perimeter drainage system or the underslab granular mat, which in turn should be properly drained. The ground surface adjacent to the below grade walls should be kept properly graded to prevent ponding of water adjacent to below grade walls.

4.4 SEISMIC DESIGN CONSIDERATIONS

The International Building Code (IBC) 2012 and Chapter 20 of ASCE 7 require site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the undrained shear strength (s_u) method; and the Standard Penetration Test Resistance (N-value) method. Where site specific data are not available to a depth of 100 feet, appropriate soil properties are permitted to be estimated by the registered design professional preparing the soils report based on known geologic conditions. The seismic site class definitions for the weighted average of either the SPT N-values or the shear wave velocities in the upper 100 feet of the soil profile are presented in Chapter 20 of ASCE 7 and in the table below.

Table 4.4.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60
E	Soft Soil Profile	Vs < 600 fps	<15

In the absence of actual shear wave (V_s) data, we utilized the Standard Penetration Test (SPT) N-values recorded from the borings. Considering the shallow rock surface encountered at this site and our experience with other projects in the area, we recommend that the design for the building be based on a seismic site classification of **Site Class C**.

Considering that the foundation will bear in or close to bedrock, a Site Class B may be possible; however, site specific seismic testing to determine the shear wave velocity of the rock would be required to evaluate this site classification. If it is determined by the structural engineer that an increase in the site class for the project site will result in significant economic savings in the final design, we would be pleased to provide additional site-specific seismic testing services.

4.5 PAVEMENTS

The pavement design recommendations shall conform to the latest VDOT Road and Bridge Standards and Specifications. For the design and construction of exterior pavements, we recommend that all the procedures outlined in the Subgrade Preparation and Earthwork Operations and Fill Placement and Compaction sections be followed through the establishment of roadway section subgrade elevations.

We recommend that topsoil, existing fill material, construction debris, and any other soft or unsuitable materials be removed from the pavement area. The stripped surface should be proofrolled and carefully observed at the time of construction in order to aid in identifying the localized soft or unsuitable materials which should be removed. If high plasticity soils are exposed during the final grading of the paved areas, we recommend that these areas be over-excavated of the high plasticity soil to a depth of 2 feet and replaced with engineered fill.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. We would be pleased to be of further assistance to you in the design of the project pavements by providing additional recommendations during construction of the project.

It is common practice to install only the base aggregate and the base course asphalt during initial construction, and then the final topping surface asphalt much later in the construction process. Often, depending upon the sequence and timing of construction, the final pavement surface may not be placed until several months to even years after the initial base asphalt is placed. Studies have shown that the most critical load conditions for most development occur during the construction phase. In particular, the pavement system is subjected to loading that includes construction equipment, low-boys, concrete trucks, pre-fabricated joist and dry wall deliveries, and other heavy, high concentrated truck loading which does not occur once the development is finished. Not only does this represent the highest traffic loading condition, but it occurs at a time when the pavement section is not at its full strength, simply because the surface asphalt has not been placed.

Although it is usually not economically feasible to increase the pavement section to satisfy this potential design issue, it should be recognized that prudent steps can be taken to help reduce failures of the pavement system during the construction. For example, we recommend using intermediate type asphalt for the base layer of asphalt to reduce the amount of surface water infiltration into the pavement subbase.

Furthermore, any areas that are low and will have a tendency to pond water should be drained to the extent feasible. This should normally be undertaken in areas that are relatively low and wet, or in areas where there is known to be a concentration of construction traffic. These concentrations should be considered to be the initial entryways to the site, the travelways and any other high-construction traffic areas.

Depending upon the time in which the temporary construction is used as a service road, some failures should be expected. If the construction pavement system fails, it will be necessary to remove this failed section and replace it with the initial design section or an equivalent repaired section.

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 these activities. The design of actual pavement sections is beyond the scope of this report. We recommend final pavement designs be developed in accordance with applicable VDOT and Prince William County requirements, as appropriate. Such a design should be developed considering anticipated traffic loading conditions, soil subgrade conditions, and CBR value.

Rutting of pavement and ultimately pavement failure are typically experienced due to front loading garbage trucks imposing concentrated wheel loads on pavements. Therefore, we recommend that the pavement in any trash pick-up areas consist of a reinforced concrete pavement underlain by VDOT 21A subbase. Design of concrete pavements is beyond the scope of this report. We recommend concrete pavement designs be developed in accordance with applicable VDOT and Prince William County requirements. Such a design should be based on anticipated traffic loading conditions and soil subgrade conditions.

A design CBR value of 4 is recommended based on laboratory testing performed on samples obtained from Borings B-14 and B-15 during our subsurface exploration. Additionally, we recommend that a Resiliency Factor (RF) of 1.5 be utilized for design purposes of the pavements. If the results of the CBR tests taken during construction differ from that mentioned above, the pavement design should be modified as necessary.

New Asphalt Pavement Section: We have assumed that asphalt (light-duty and heavy-duty) and concrete (heavy-duty) pavement section designs for the parking lot and access roadway pavement areas will be based upon 20-year and 30-year design lives with assumed ESALs of 19,300/610,000 for light/heavy-duty Flexible Pavements and 1,400,000 for Rigid Pavement. If these assumptions are found to be inaccurate for the finalized project average daily traffic values, ECS shall be informed in order to revise pavement section design accordingly.

We have also assumed other design parameters in table below.

Table 4.5.1 Pavement Design Parameters

Reliability	90%
Overall Standard Deviation	0.49
Effective Subgrade Resilient Modulus	6,000 psi
Initial Serviceability	4.2
Terminal Serviceability	2.8

The following sections are expected to provide adequate support for standard-duty pavement and heavy-duty pavements for the newly constructed pavement areas that will be part of the development of the project site.

Table 4.5.2 Design Pavement Sections

Pavement Material	**Pavement Thickness (inches)**		
	Standard-Duty - Asphalt	**Heavy-Duty - Asphalt**	**Heavy-Duty - Concrete**
Surface Course	1.5	1.5	---
Intermediate Course		2.0	---
Base Course	3.0	3.0	---
Portland Cement Concrete	---	---	8.0
Aggregate Base Material	6.0	8.0	8.0
Total Pavement Section Thickness	**10.5**	**14.5**	**16.0**

It should be recognized that construction loading conditions may be more severe than in-service conditions and the Geotechnical Engineer should be advised of any traffic loading conditions that become available in order to confirm and/or modify the pavement section recommendations.

New Concrete Pavement Section: The heavy-duty concrete pavement section should consist of a minimum of 8 inches of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). The concrete pavement shall be underlain by a minimum of 8 inches of compacted dense-graded aggregate base course stone (VDOT 21-A). The rigid concrete pavement section should be provided with construction joints at appropriate intervals per typical concrete pavement construction requirements.

Exterior Concrete Slabs on Grade (Sidewalks, Curbs, Gutters, and Dumpster Pads): The exterior concrete slabs recommendations should conform to the latest VDOT Road and Bridge Standards and Specifications. For the construction of exterior concrete, we recommend that topsoil and any other soft or unsuitable materials be removed from the paved area. The stripped surface should be proofrolled and carefully

observed at the time of construction in order to aid in identifying the localized soft or unsuitable materials which should be removed.

We recommend that exterior concrete slabs such as sidewalks, curbs and gutter be underlain by a minimum of 4 inches of granular material having a maximum aggregate size of 1.5 inches and no more than 2% passing the #200 sieve. This granular layer will reduce the potential for frost heaving of the exterior slabs. Exterior concrete exposed to the weather should be air-entrained.

4.6 SITE RETAINING WALL

One retaining wall with a maximum exposed wall height of 6 feet is proposed along the northeast edge of the site. While design details for the wall are not available at this time, general recommendations have been provided below.

Since retaining walls are free to rotate at the top, they effectively mobilize more of the shear strength of the retained soil than conventional basement or loading dock walls. For the design of permanent site retaining walls with level backfill, we recommend an equivalent fluid pressure of 45 psf per vertical foot of wall. At the areas of the walls such as corners where rotation will be limited, we recommend an equivalent fluid pressure of 60 psf per vertical foot of wall since rotation is restricted in these areas. This lateral earth pressure assumes that low-plasticity materials with a LL equal to or less than 40 and a PI less than 15, unless the material can be shown to have a very low expansion potential, are used for the wall backfill and that drainage of the backfill is provided as discussed below. A Lateral Earth Pressure Diagram has been included in the Appendix to further detail the anticipated earth pressure distribution behind the wall. The design should also account for any surcharge loads that are within a 45° slope from the base of the wall, and any slope of the backfill. The retaining wall should be designed so that the resultant of the overturning forces remains in the central one-third of the footing.

The foundations for proposed retaining wall should be designed for a maximum allowable soil bearing pressure of 3,000 psf, provided that the footings are founded within firm natural soils or engineered fill placed over firm natural soils. Special care should be taken to confirm soft existing soils are removed prior to the placement of structural fill on the established foundation subgrades.

Sliding resistance of the retaining wall can be achieved either through the use of a shear key (for concrete retaining walls only) or through the frictional forces developed at the base of the retaining wall. A shear key, if installed, can be designed for a passive pressure of 300 psf per foot of depth. This assumes that the soils at the base of the retaining wall are approved, firm natural soils or compacted structural fill. A frictional resistance coefficient of 0.3 can be utilized for sliding resistance design for the retaining wall. The structural design of proposed retaining walls should be approved prior to site implementation.

The recommendations presented herein assume that the backfill behind the retaining wall is properly drained. Suitable man-made drainage materials may be used in lieu of the free draining granular backfill, adjacent to the wall. These materials should be covered with a filter fabric having an Apparent Opening Size (AOS) consistent with the size of the soils to be retained and should be placed in accordance with the manufacturer's requirements. Drainage of the backfill may be accomplished through the use of 4-inch diameter weep holes at 8 feet spacing, through the wall, immediately above proposed grade at the front of the wall. Alternatively, a longitudinal drain line could be used behind the retaining wall. The drain should consist of a 6-inch perforated pipe surrounded by a minimum of 6 inches of VDOT No. 57 stone.

The No. 57 stone should be completely wrapped in a filtration geotextile such as Mirafi 140N. The geotextile used should be reviewed and approved by the geotechnical engineer. The ground surface adjacent to the retaining wall should be kept properly graded to prevent ponding of water adjacent to the wall or drainage of water over the front of the wall.

The land above the recommended geogrid reinforcement layers must be designated as a "soil reinforcement zone easement" and any future landscaping or planting should be coordinated such that it does not disturb the soil reinforcement system and/or will not affect the retaining wall stability. The geogrid layers will be installed in conjunction with the wall construction and thus will precede the excavations for plant material and landscaping. Trees and other plant material that might impact the geogrid reinforcing shall be kept outside the soil reinforcement zone easement.

The construction sequence will be important in areas where construction of the wall will either be in conflict or be too close to any existing storm pipes and structures. We recommend that in such cases, the storm pipes and the structures be installed first or simultaneously with the construction of the wall, since excavation for the storm pipes and structures after construction of the wall may jeopardize the stability of the wall. The wall designer should consider the presence of the storm structures in his or her design and should include standard or specific details for placement of wall backfill around these structures in design. In cases where storm sewer pipes penetrate and/or are located underneath the proposed wall, we recommend the provision of an encasement/liner or a grade beam in order to allow the pipes to be removed for maintenance without affecting the wall stability. If the storm line extends through the face of the wall, then block units should be saw cut within 1/2-inch of the pipe. Details for the pipe outlet and casing as well as wall sections with the pipe in the reinforcing zone should be included in the retaining wall design.

4.7 STORM WATER MANAGEMENT PONDS

One storm water management pond is currently proposed for the site. At the time of this report, specific details regarding water surface elevations and locations and elevations of pond structures were not available. As such, it is the intent of this section to provide general recommendations for design and construction of the pond. Once detailed pond designs and grading is available, ECS should be contacted to provide updated recommendations and, if necessary, global stability analyses for the pond.

4.7.1 Earthwork Operations

Subgrade preparation operations should consist of stripping all vegetation, rootmat, and topsoil and any other soft or unsuitable material from the dam embankment. Where possible, stripping limits for the proposed grading of the dam should be extended at least 10 feet beyond the toe.

After stripping to the desired grade and prior to new fill placement, the exposed soils should be carefully examined to identify any localized loose, yielding or otherwise unsuitable materials by an experienced geotechnical engineer or his authorized representative. After examining the exposed soils, loose and yielding areas can be identified by proofrolling with an approved piece of equipment, such as a loaded dump truck having an axle weight of at least 10 tons. Any soft or unsuitable materials encountered during this proofrolling should be removed and replaced with an approved backfill.

4.7.2 Embankment Fill Placement

The on-site materials may be reused as engineered fill if they do not contain organics or foreign debris, are not highly plastic, are not environmentally impacted, and conform to the criteria outlined below for acceptable soil types for construction. Based on observations made during the subsurface exploration program and following visual observation of the recovered soil samples, some of the natural soils may be suitable for reuse as engineered fill materials; however additional laboratory testing will be required for confirmation of soils to be used as engineered fill. Under no circumstances should CH soils be used as fill material in proposed structural areas.

The preparation of fill subgrades should be observed on a full-time basis. These observations should be performed by the Geotechnical Engineer of Record, or their representative, to ensure all unsuitable materials have been removed, and the subgrade is suitable for support of the proposed construction and/or fills. In some areas, excessively soft and/or wet soils may be encountered for fill subgrades, especially in the winter or early spring months. All soft areas should be excavated and removed.

Upon achieving competent subgrade materials, the excavated area should be filled, where appropriate, to planned grades with an approved controlled, compacted fill. All fill and backfill placed within the embankments and around the structures should be placed in lifts not exceeding 8-inches in loose thickness and moisture conditioned to within 2 percentage points on the wet side of the optimum moisture content. We recommend that the lifts be compacted to at least 95 % of their maximum dry density, as determined by ASTM D-698, Standard Proctor, for the full depth of the fill. Acceptable soil types for construction of the embankment on the upstream and downstream side (excluding the clay liner) include soils having a USCS designation of ML and CL; and SM and SC having a minimum of 25% passing No. 200 sieve. The on-site SM and SC soils tested do generally meet these requirements and should be suitable for use as fill.

The timing for placement of backfill for the embankment should be planned to minimize the risk of piping of soil based on laboratory tests performed on the material proposed for use prior to construction (additional observations and analyses may be required for the clay liner placement).

It is recommended that new fill soils be **benched** into the existing soils to verify adequate soil bonding of these materials. If the top of an exposed layer is too smooth, it should be rerolled with a sheepsfoot roller, or scarified prior to the placement of the next lift of fill. Although it is desirable to seal off fill surfaces on a daily basis using a steel drum or rubber tired roller, these surfaces should be scarified the following day prior to fill activities to minimize the creation of planes of seepage within the embankment structure.

Fill materials should not be placed on frozen soils or frost-heaved soils and/or soils which have been recently subjected to precipitation. All frozen soils should be removed prior to continuation of fill operations. Borrow fill materials, if required, should not contain frozen materials at the time of placement. All frost-heaved soils should be removed prior to placement of controlled, compacted fill, granular subbase materials, foundation or slab concrete, and asphalt pavement materials. Soil bridging lifts within the proposed embankment should not be used since excessive settlement of the structure can occur. Also, trees should not be planted on the existing dam embankment.

4.7.3 Facility Outlets

The principal outlet pipes penetrating the embankment dams should be provided with seepage control measures consisting of a concrete cradle and downstream collection drain. Primary outlet conduits, which penetrate the facility embankments, should be constructed on a concrete cradle along the upstream two-thirds of the conduit length. The downstream one-third of the principal spillway pipe should be surrounded with a 12-inch thick layer of open graded coarse aggregate (VDOT No. 78) wrapped with a suitable nonwoven geotextile with an Apparent Opening Size (AOS) of 70. (The coarse aggregate should conform to the current VDOT Road and Bridge Specifications Section 203 and the geotextile with Section 245.) The gravel layer below and around the conduit at the downstream end will serve to collect any seepage along the conduit. This drainage blanket should be daylighted at the slope face or tied into the stormwater discharge structure.

4.7.4 Foundations for Drainage Control Structures

Based on the results of our subsurface exploration and our engineering analysis, we recommend that any proposed stormwater discharge control structures be supported on spread footing foundations bearing either on suitable firm natural soils or on new engineered fill constructed over suitable natural soils. Assuming subgrades are prepared according to the recommendations above, the foundations may be designed for a net allowable soil bearing pressure of 2,000 pounds per square foot (psf).

If unsuitable soil types or bearing conditions are found to exist at the foundation level, then the base of the excavation should be lowered to suitable materials. As an alternative, the original bottom-of-footing level can be restored by the placement of "lean" (1,000 psi) concrete after removal of the unsuitable soils.

Fill materials should be placed in accordance with the Compaction section of this report. The soil will be moisture and disturbance sensitive; therefore, excavation for the outlet structures should proceed in an expeditious manner in order to reduce exposure of the bedding soils. The foundation excavation should be observed and the bearing pressure of the footing subgrade tested by an authorized representative of the GER.

Granular bedding should not be used to support foundations or pipes penetrating the facility embankments. Granular soils should only be used where specifically designed for drainage. Conduits penetrating the embankments should be supported by properly placed soil or natural soils trimmed to fit the pipe diameter, or concrete fill, such as lean concrete or "flowable" fill, to control seepage along such conduits which could otherwise result in a soil piping failure. The upstream two thirds of the primary discharge pipe should be placed over a concrete cradle as described in the previous section.

4.7.5 Pond Liner (Wet Ponds Only)

In order to maintain the permanent pool elevations, we recommend the use of a clay or synthetic liner to minimize the potential for seepage through the silty and clayey sand materials and weathered rock.

The liner should be present along the entire pond bottom, including embankment slopes up to the 10-yr storm elevation on the impounded side only. The liner should consist of an 18-inch thick layer of material meeting the specification of the most recent edition of the BMP Clearinghouse (Table 14.4). The liner should consist of soil with a minimum of 30% clay particles, by weight. The material should also have a

minimum Plasticity Index of 15 and a minimum Liquid Limit of 30. We recommend the liner have a maximum permeability of $1x10^{-7}$ ft/sec and should be compacted to 90% to 95% of the maximum dry density as determined by the Standard Proctor Method (ASTM D698). Generally, a soil material classified as Lean CLAY (CL) and having less than 10% retained on the #4 sieve should meet this requirement. Fat CLAY (CH) is not recommended for use as a liner due to concerns over shrinkage cracks. We also recommend the soils for the liner be installed at 2 to 3 percentage points wet of the optimum moisture content. Clay liner materials should be kept moist during and after installation to reduce the potential for desiccation and cracking. It is recommended that new clay liner soils be benched into the existing soils to verify adequate soil bonding of these materials.

4.8 SOIL THERMAL RESISTIVITY

Soil thermal resistivity testing was performed on remolded samples obtained from depths ranging from 1± feet to 6± feet below site grades. The samples were compacted to approximately 95% of the maximum dry density as determined by the Standard Proctor Method (ASTM D698). Tests were performed in general accordance with ASTM D5334. Tests were performed at various moisture contents to develop a dry-out curve. Based on the test results, we recommend the following maximum resistivity values at each location be used for design:

Sample No.	Recommended Max. Rho (°C*cm/W)
B-2	220
B-7	190
B-11	205

Based on the test results, we recommend a **single maximum resistivity value of 220** be used for design of general site duct banks. Laboratory test results for each sample are included in the Appendix of this report.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, and any soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits, and 5 feet beyond the toe of structural fills. Deeper topsoil or organic laden soils may be present in wet, low-lying, and poorly drained areas. Root balls may extend as deep as about 2 feet and will require additional localized stripping depth to completely remove the organics. ECS should be retained to verify that topsoil and unsuitable surficial materials have been removed prior to the placement of structural fill or construction of structures.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons [e.g. fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are unstable or "pumping" subgrade those areas should be repaired prior to the placement of any subsequent Structural Fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

5.1.3 Site Temporary Dewatering

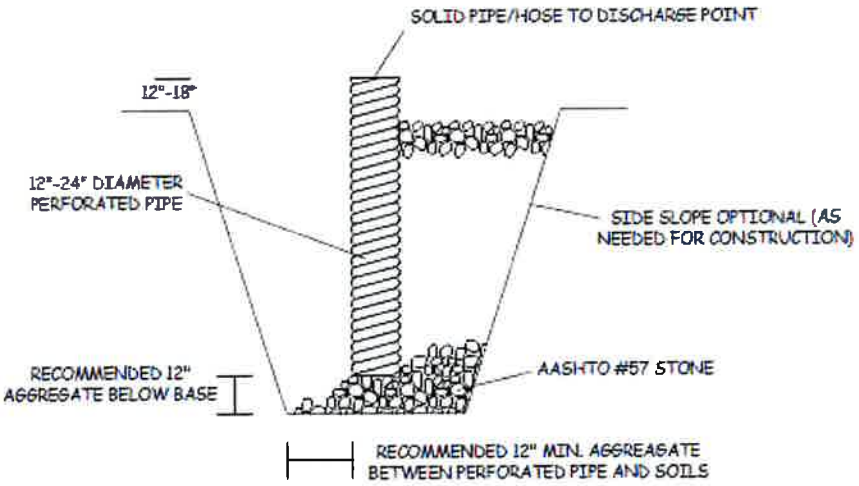
Groundwater on this site can be characterized as being broadly perched above less permeable materials and shallow rock. The depth at which perched water is present on the site varies with surface elevation. In low-lying areas the presence of perched water is more pronounced. In higher areas and on ridge lines, perched water may be present, including above design cut elevations, but is less concentrated. Soils at contact with perched water levels were very moist to wet. In most cases, moisture then decreased with depth.

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil sampling is not continuous, and thus soil and groundwater conditions may vary between sampling intervals (typically 5 feet). If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the succinct geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from any site dewatering system shall be discharged in accordance with all local, state and federal requirements.

Strategies for Addressing Perched Groundwater:

The typical primary strategy for addressing perched groundwater seeping into excavations is pumping from trench (or French) and sump pits with sump pumps. A typical sump pump drain (found in a sump pit or along a French drain) is depicted below. The inlet of the sump pump is placed at the bottom of the corrugated pipe and the discharge end of the sump is directed to an appropriate stormwater drain.



Sump Pit/Pump Diagram

Details of a typical French drainage installation are included in Appendix D. A typical French drain consists of an 18 to 24-inch wide by 18 to 24-inch deep bed of AASHTO #57 (or similar open graded aggregate) aggregate wrapped in a medium duty, non-woven geotextile and (sometimes) containing a 6-inch diameter, Schedule 40 PVC perforated or slotted pipe. Actual dimensions should be as determined necessary by ECS during construction. After the installation has been completed, the geotextile should be wrapped over the top of the aggregate and pipe followed by placement of backfill. The top of the drain should be positioned at least 18 inches below the design subgrade elevations. Drains should not be routed within the expanded building limits.

Pumping wells or a vacuum system could also be used to address perched groundwater. These techniques often are only effective during the initial depletion of the perched water quantity and may quickly be ineffective at addressing accumulation of water from rain, snow, etc.

5.2 EARTHWORK OPERATIONS

5.2.1 High Plasticity Soils

Within the proposed project limits, potentially expansive soils (CH/MH) were encountered during this exploration; these types of soils are common in this area, and, based on the regional geology as well as results from past ECS subsurface explorations performed on nearby sites, these and other high plasticity soils are believed to present at the site at locations which may not have been evaluated during this subsurface exploration. Care should be taken to limit moisture variations in order to reduce potential volume changes. If the field work is conducted during the winter or early spring months, it is expected that even the low-plasticity clay/silt soils at the surface may need to be removed or dried prior to fill placement. If expansive clays and clay-silt mixtures are encountered, they should not be used as fill for roadway, curb, gutter, and sidewalk subgrade, within utility trenches, or within embankment slopes. For suitability of natural soils to be used in structural areas (i.e. foundations and floor slabs), soils meeting all four of the following provisions shall be considered expansive per IBC 2012, except that tests to show compliance with items 1, 2, and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. *Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.*
2. *More than 10 percent of the soil particles pass a No. 200 sieve (0.75 μm), determined in accordance with ASTM D 422.*
3. *More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.*
4. *Expansion Index greater than 20, determined in accordance with ASTM D4829.*

If the Plasticity Index (PI) of the soil is 20 or less and the Liquid Limit (LL) is 45 or less, the Plasticity Index Corrected (PI cor) or the Expansion Index Corrected (E1 cor) may be substituted in the definition of Expansive Soil. Where PI cor and E1 cor are determined as follows:

PI cor = PI x (% Passing No.40 sieve)/100 and EI cor = EI x (% Passing No. 4 Sieve)/100

These soils should not be reused as engineered fill. When these soils are encountered in cut areas, they should be undercut to 4 feet below finished exterior grade or to 2 feet below the bottom of footing, whichever is deeper, and backfilled with controlled, compacted fill. If the bottom of the plastic soils extends to depths less than 4 feet below the finished exterior grade, the undercutting and replacement may be limited to the depth of the high plasticity soils.

Alternatively, the footings can be "stepped down" to bear either at 4 feet below exterior grade or at 2 feet below normal footing subgrade, whichever is deeper, bearing on the plastic soils. If the plastic soils are found to be less than 4 feet in thickness, the footing needs bear only below the plastic soils and the frost line.

Floor slabs placed in areas where highly plastic soils are encountered should be underlain by at least 2 feet of compacted suitable fill. In proposed pavement areas, we recommend undercutting and replacement of the expansive soils in order to provide at least 2 feet of non-expansive soil fill below the pavement subgrade.

5.2.2 Existing Man-Placed Fill

Existing man-placed fill was not encountered below the existing ground surface within any of the borings evaluated for this exploration. However, it should be noted that the general site is bordered by some developed areas and fill may be present in areas of the site not explored during our current study or adjacent to utilities or structures at the site. Existing fill material should be considered undocumented fill and will have to be removed and reworked or replaced within structural areas. Any encountered trash or unsuitable fill materials should be completely removed within structural areas and should not be used in structural fill areas.

If areas of existing fill are encountered at a subsequent time during site development, it may be feasible to remove and re-compact the existing fill materials; however, further laboratory testing should be performed at that time to confirm if the fill materials satisfy the requirements for an engineered fill. Some moisture conditioning of the soils may be necessary prior to placement in order to achieve proper compaction. Additionally, the amount of debris present in existing fill materials can frequently be difficult to evaluate with soil borings. Therefore, test pits may be warranted to confirm the fill does not contain unacceptable debris prior to reuse in engineered fill. Some screening may be required to remove any debris prior to placement of these soils, so the planning of earthwork operations should recognize and account for these efforts and increased costs.

5.2.3 Weathered Rock and Rock Excavation Operations

Weathered rock was encountered as shallow as 3.0± feet below the existing ground surface. Rock excavation will be required for mass grading and installation of any deep utilities. Typically, for excavations in relatively unweathered rock material, ripping is practical for excavations extending down to about 2 feet below the depth of auger refusal. However, blasting or hoe-ramming for removal of weathered rock or intact rock will likely be required below auger refusal depths.

For the construction planning and final pay quantities, we recommend that the following definition be utilized in the project specification to define rock:

> "For footings, trenches and pits, rock shall be defined as those materials that cannot be excavated with a Caterpillar Model No. 320L track-type hydraulic excavator, equipped with a 42-inch wide short-tip radius rock bucket, rated at not less than 120 hp flywheel power with a maximum drawbar pull force of not less than 39,700 lbs. Boulders or masses of rock exceeding one-half cubic yard in volume shall also be considered rock excavation. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, hoe-ramming, or rock trenching, but which for reasons of economy in excavating, the contractor chooses to remove by drilling and blasting, hoe-ramming, or rock trenching techniques."

Refusal materials (intact rock) normally require blasting in deep excavations. Blasting in utility trenches should be done carefully to avoid damage to the surrounding materials. When the material to be excavated requires blasting, the contractor should comply with the requirements of the county.

5.2.4 Structural Fill

Product Submittals: Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Fill material underneath the proposed structures and pavements should consist of an approved material (CL, ML, SC, SM or more granular), free of debris, organics, and cobbles greater than 4 inches. The structural fill in the "active zone" under the building pad should have Liquid Limit (LL) no greater than 40 and Plasticity Index (PI) less than 15, and shall be non-expansive in addition to meeting all the other requirements for a suitable structural fill material. The "active zone" is defined by PWC as a buffer of at least four feet below the final exterior grades or two feet below the bottom of the foundation, whichever is greater. Fill below the "active zone" for structures, and below subgrade for slopes and pavement (curb and gutter, sidewalk, etc.) should have LL and PI no greater than 45 and 20, respectively, unless it can be shown to have very low expansion potential. If no structural fill is required, the upper two feet of existing soil shall meet these criteria. Under no circumstances should high plasticity (CH, MH) soil be used as fill material in proposed structural areas.

The low plasticity natural soils at this site are expected to be suitable for use as controlled fill; however, they may require moisture content adjustments, via discing or other drying techniques or spraying of water to the soil prior to their use as controlled fill material. Additionally, any debris or other unsuitable materials must be removed, as necessary, from the on-site materials prior to their reuse as engineered fill. The planning of earthwork operations should recognize and account for these efforts and increased costs. Suitable structural fill soils should have the index properties shown in the tables below.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Building and Structural Areas	LL < 40, PI<15
Pavement Areas	LL < 45, PI<20
Max. Particle Size	4 inches
Fines Content (% passing #200 sieve)	Max. 25 %
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Standard Proctor, ASTM D698/ Virginia Test Method (VTM-1)
Required Compaction	95% of Max. Dry Density for fill less than 10 feet
	98% of Max. Dry Density for fill greater than 10 feet
Moisture Content	-2 to +3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

Flowable Fill/Lean Concrete Fill Recommendations: Low strength flowable fill/lean concrete materials are also considered suitable for use as fill to restore site grades to final slab-on-grade elevations for conduit installation. Prior to the placement of these materials, subgrades shall be observed and approved in accordance with the requirements presented in this report. Fill areas shall be limited to locations where compaction of approved structural fill soils will not result in adequate parameters/values, and fill depths shall be limited to depths to which consolidation will not be permissible. The flowable fill shall be approved by the design team to ensure placement, curing, and resistivity values are achieved. Other approved structural fill materials shall not be layered between multiple lifts of flowable fill.

On-Site Borrow Suitability: Significant natural deposits of soils classified in our boring logs as Silty SAND/Sandy SILT (SM/ML) have been identified as being present on the site. These occur mostly at relatively shallow depth below the surface where residual soils are mostly weathered.

Non-Durable Rock: Nondurable rock materials removed in ripping excavations may be used as fill if suitably broken down by mechanical compaction effort. Durability is the term used to describe the ability of a rock or rock-like material to withstand long term chemical or mechanical weathering without size degradation. Any weathered rock excavated from the site and used as engineered fill should have a well-graded grain size distribution with rock and soil particles ranging from clay or silt size particles to a maximum size of 4 inches in diameter. Particles larger than this should be broken by mechanical compaction equipment to achieve the desired grain size distribution, and the samples should have a minimum of 20% passing the #200 sieve and 50% passing the #40 sieve. Variations from these recommendations should be approved by the GER, at the time the samples are prepared.

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

Fill Equilibrium Monitoring: Up to approximately 21± feet of new fill will be required to reach planned grades in some areas. With this extensive fill and predominately fine-grained soils anticipated for its construction, settlement monitoring prior to commencing foundation construction is recommended in order to confirm the fill has reached equilibrium. Likewise, it would be prudent to place the extensive new fill for the building as early as possible in the site development phase so that any residual, fill-induced settlement can occur without major impacts to the building construction schedule.

We believe that the majority of the fill-induced settlement will occur within the fill itself, rather than over a deep soft soil layer. Therefore, a monitoring program utilizing near-surface settlement plates or

monuments should be implemented near or immediately upon the conclusion of the fill placement. The frequency of monitoring should be on a weekly basis, but this should be adjusted as necessary by the GER based upon settlement rates. The GER will also determine the duration of the settlement monitoring based on settlement rates and trends. Typically, the fill-induced settlement rates are highest during the fill placement and begin to taper off shortly after ceasing any fill placement. Fill-induced settlements will practically stop within two or so months after the completion of any fill placement. Construction can begin when subsequent readings indicate settlement of the fill under its own weight has virtually ceased.

5.2.5 Temporary and Permanent Slopes

Because of the erodibility of the natural soil at the site, special care should be taken to prevent erosion. We recommend that temporary slopes established during construction be constructed no steeper than 1H:1V and maintained for no more than 30 days.

Landscape berms can be constructed as steep as 2H:1V; however, it should be noted that the site soil is highly erodible and that adequate measures must be taken to prevent erosion of slopes steeper than 3H:1V. All slopes must be protected from erosion by a ground cover of adequate vegetation and erosion control measures. All excavations should be performed in accordance with the current OSHA and VOSHA regulations.

5.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated.

Slab Subgrade Verification: Prior to placement of a drainage layer, the subgrade should be prepared in accordance with the recommendations found in **Section 5.1.2 Proofrolling**.

5.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or unsuitable materials encountered should be removed and replaced with suitable compacted structural fill or pipe stone bedding material.

Utility Backfilling: The granular bedding material (often VDOT #57 stone) should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend

that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill and Fill Placement.

Excavation Safety: All excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

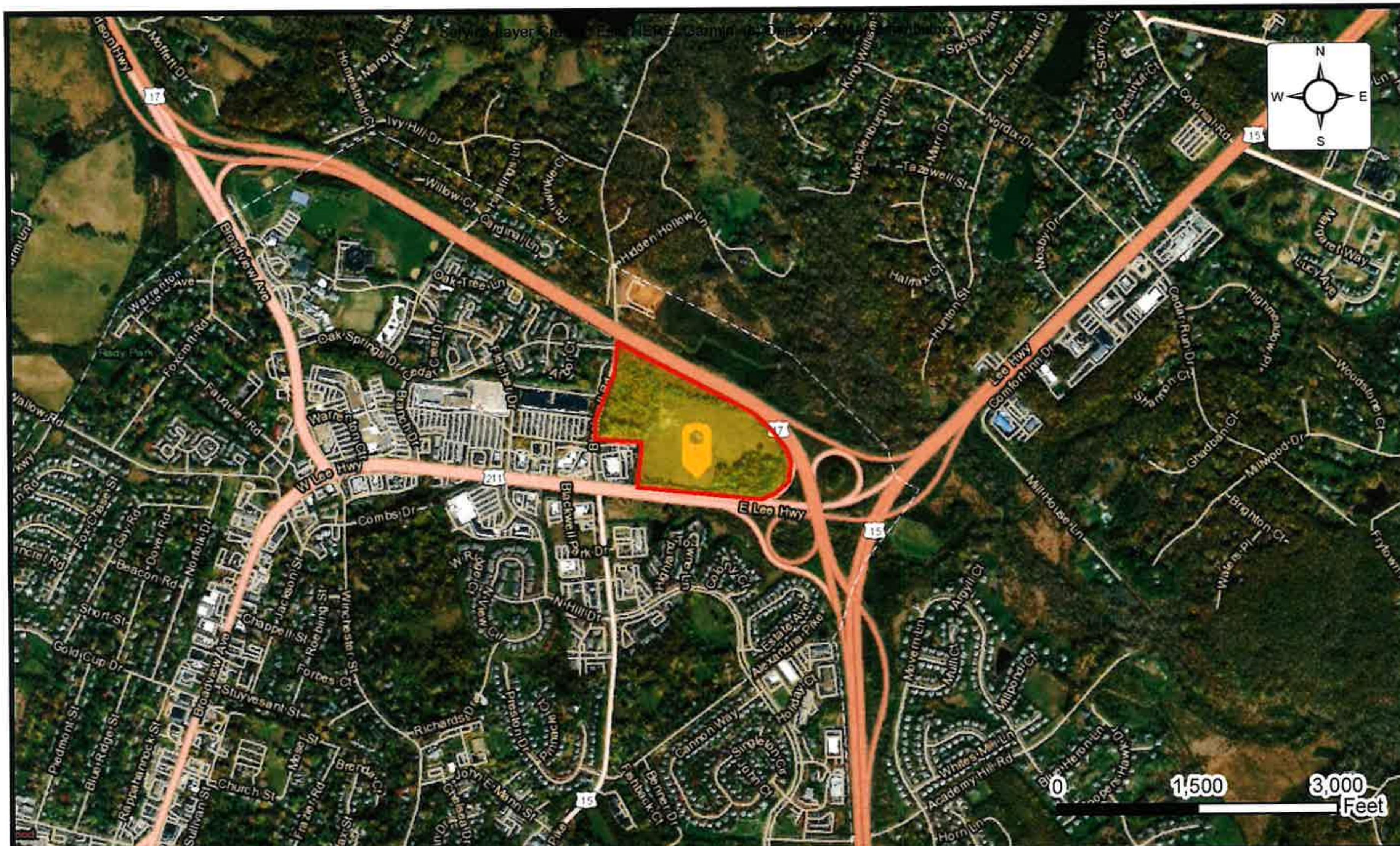
The description of the proposed project is based on information provided to ECS by Bohler. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams & Reports

Site Location Diagram
Boring Location Diagram

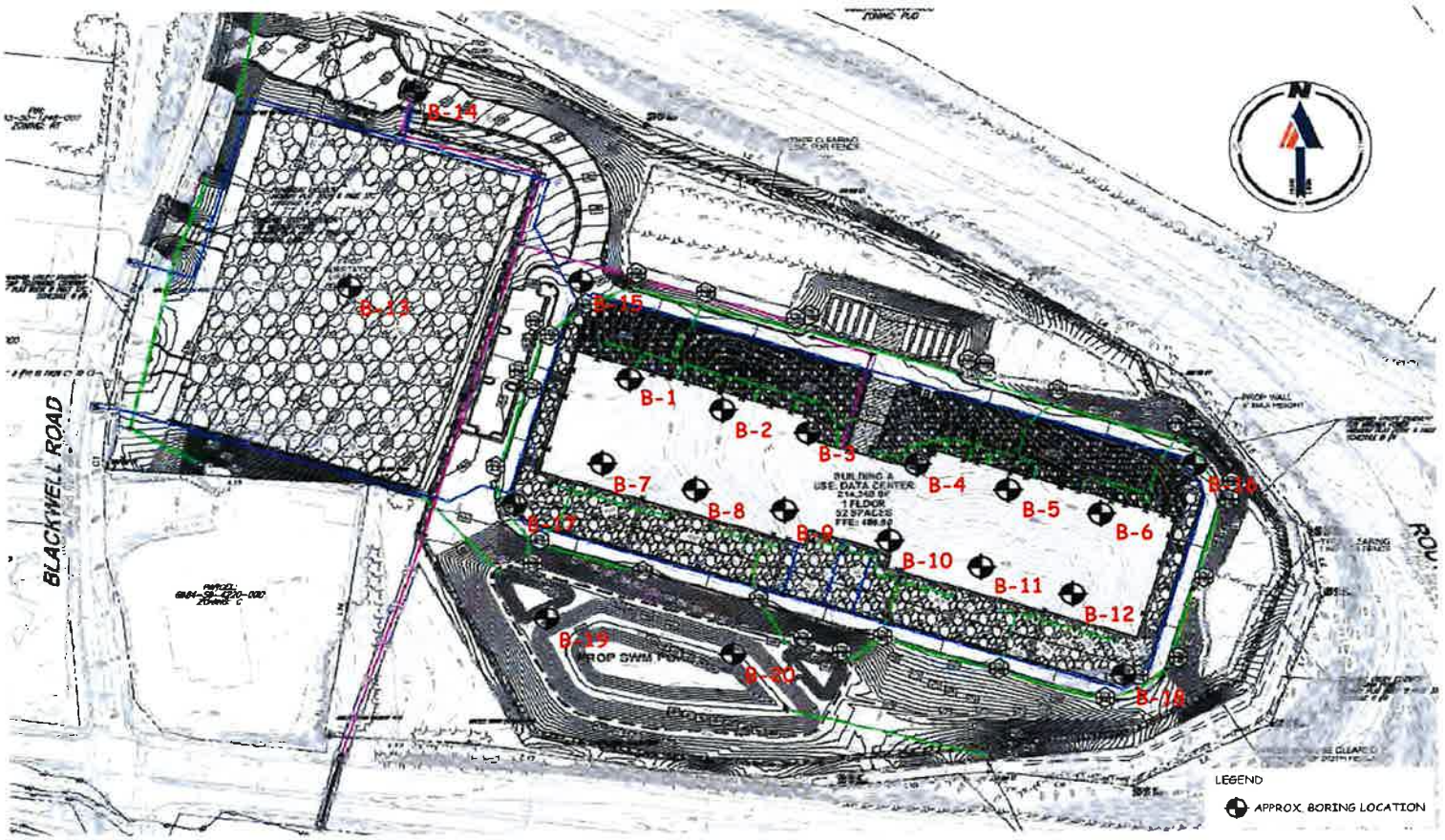


SITE LOCATION DIAGRAM
WARRENTON DATA CENTER

LEE HIGHWAY AND BLACKWELL ROAD, WARRENTON, VIRGINIA

BOHLER ENGINEERING

ENGINEER	DOA
SCALE	AS NOTED
PROJECT NO.	01:31153
SHEET	1 OF 1
DATE	11/10/2021



Proposed Boring Location Diagram Bohler Engineering	ECS	**Warrenton Data Center** Warrenton, Virginia	ENGINEER: JAS6 SCALE: NTS PROJ NO.: 01:31153 SHEET: 1 DATE: 3/18/2022

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Subsurface Exploration Procedure Notes
Boring Logs B-1 through B-20

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL[3] MAN-PLACED SOILS
GW	WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
GP	POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
GM	SILTY GRAVEL gravel-sand-silt mixtures
GC	CLAYEY GRAVEL gravel-sand-clay mixtures
SW	WELL-GRADED SAND gravelly sand, little or no fines
SP	POORLY-GRADED SAND gravelly sand, little or no fines
SM	SM SILTY SAND sand-silt mixtures
SC	CLAYEY SAND sand-clay mixtures
ML	SILT non-plastic to medium plasticity
MH	ELASTIC SILT high plasticity
CL	LEAN CLAY low to medium plasticity
CH	FAT CLAY high plasticity
OL	ORGANIC SILT or CLAY non-plastic to low plasticity
OH	ORGANIC SILT or CLAY high plasticity
PT	PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
Dual Symbol (ex: SW-SM)	10	10
With	15 - 25	15 - 25
Adjective (ex: "Silty")	≥30	≥30

WATER LEVELS[6]

- WL (First Encountered)
- WL (Completion)
- WL (Seasonal High Water)
- WL (Stabilized)

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

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

[7]Minor deviation from ASTM D 2488-17 Note 16.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)

- Auger is advanced* and an additional SPT is performed
- One SPT test is typically performed for every two to five feet

- Obtain two-inch diameter soil sample

**Drilling Methods May Vary*— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-01**	**1 of 2**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **492**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [4"]			
	S-1	SS	18	12	(SM) SILTY SAND, brown, moist, loose			3-3-4 (7)
	S-2	SS	18	16	(CH) SANDY FAT CLAY, brown and gray, moist, firm			4-4-5 (9)
5	S-3	SS	18	10	(SM) SILTY SAND, brown, moist, medium dense		487	5-5-7 (12)
	S-4	SS	9	0	WEATHERED ROCK, light brown, moist, very dense			32-50/3" (50/3")
10							482	
15	S-5	SS	16	13			477	29-38-50/4" (88/10")
	S-6	SS	3	3				50/3" (50/3")
20							472	
	S-7	SS	2	2		▽		50/2" (50/2")
25							467	
	S-8	SS	5	5				50/5" (50/5")
30							462	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

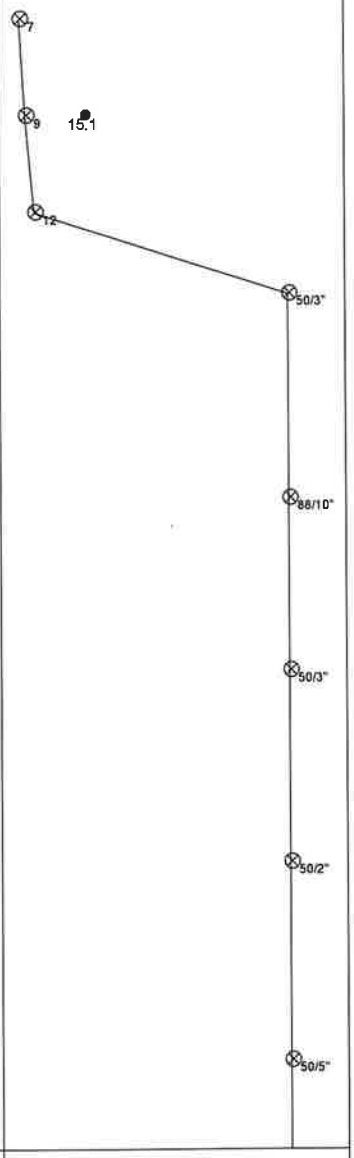
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**23.0**	BORING STARTED:	**Sep 21 2021**	CAVE IN DEPTH:	**47.0**
▼ WL (Completion)	**34.0**	BORING COMPLETED:	**Sep 21 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-01**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **492**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit / Water Content / Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC); CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
35	S-9	SS	5	5	WEATHERED ROCK, light brown, moist, very dense	▼	457	50/5" (50/5")	50/5"
40	S-10	SS	15	15			452	24-43-50/3" (93/9")	16.5 [75/6"]
45	S-11	SS	10	10			447	32-50/4" (50/4")	50/4"
50	S-12	SS	4	4			442	50/4" (50/4")	50/4"
55	S-13	SS	4	4			437	50/4" (50/4")	50/4"
60	S-14	SS	3	3	**END OF BORING AT 58.8 FT**		432	50/3" (50/3")	50/3"

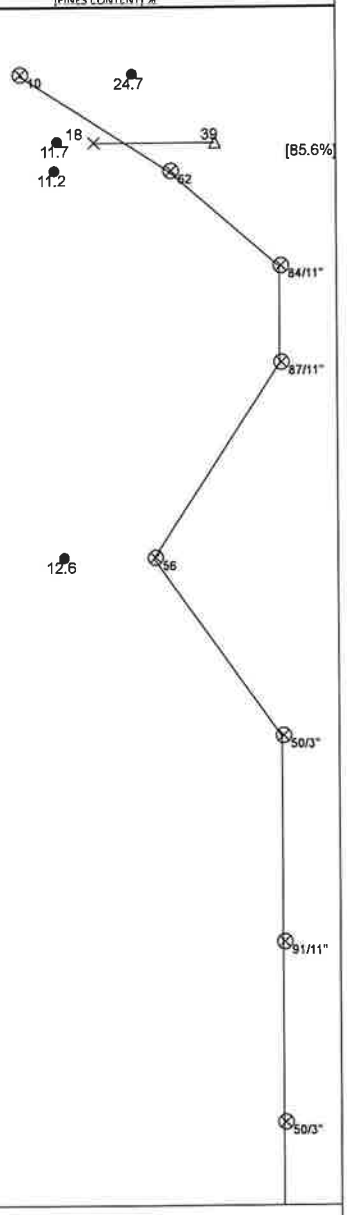
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**23.0**	BORING STARTED:	**Sep 21 2021**	CAVE IN DEPTH:	**47.0**
▼ WL (Completion)	**34.0**	BORING COMPLETED:	**Sep 21 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-02**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **480**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [3"]			
	S-1	SS	18	12	(SM) SILTY SAND, brown, moist, loose			2-3-7 (10)
	~~D3S-191 S-2~~	~~BG1~~ SS	~~60~~ 18	18	WEATHERED ROCK, light brown, greenish gray, and black, moist, very dense		475	17-24-38 (62)
5	S-3	SS	17	17				19-34-50/5" (84/11")
	S-4	SS	17	17			470	20-37-50/5" (87/11")
10								
	S-5	SS	18	18			465	17-24-32 (56)
15								
	S-6	SS	9	9			460	24-50/3" (50/3")
20								
	S-7	SS	17	15			455	30-41-50/5" (91/11")
25								
	S-8	SS	9	9			450	45-50/3" (50/3")
30								



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

▽ WL (First Encountered)	**45.0**	BORING STARTED:	**Sep 27 2021**	CAVE IN DEPTH:	**52.0**
▼ WL (Completion)	**53.0**	BORING COMPLETED:	**Sep 27 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-02**	**2 of 2**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **480**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY — RQD — REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
35	S-9	SS	11	10	WEATHERED ROCK, light brown, greenish gray, and black, moist, very dense		445	38-50/5" (50/5")
40	S-10	SS	4	4			440	50/4" (50/4")
45	S-11	SS	5	5		▽	435	50/5" (50/5")
50	S-12	SS	3	3			430	50/3" (50/3")
55	S-13	SS	4	4		▼	425	50/4" (50/4")
60	S-14	SS	3	3	**END OF BORING AT 58.8 FT**		420	50/3" (50/3")

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

▽ WL (First Encountered)	**45.0**	BORING STARTED:	**Sep 27 2021**	CAVE IN DEPTH:	**52.0**
▼ WL (Completion)	**53.0**	BORING COMPLETED:	**Sep 27 2021**	HAMMER TYPE:	**Auto**
▽ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-03**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **475**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	12	(ML) SANDY SILT, light brown, moist, loose to medium dense			3-3-3 (6)
	S-2	SS	18	18			470	4-5-7 (12)
5	S-3	SS	18	12				6-7-9 (16)
	S-4	SS	4	4	WEATHERED ROCK, light brown to gray, moist, very dense			50/4" (50/4")
10							465	
	S-5	SS	11	11				39-50/5" (50/5")
15							460	
	S-6	SS	5	5				50/5" (50/5")
20							455	
	S-7	SS	5	5				50/5" (50/5")
25							450	
	S-8	SS	2	2		▽		50/2" (50/2")
30							445	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

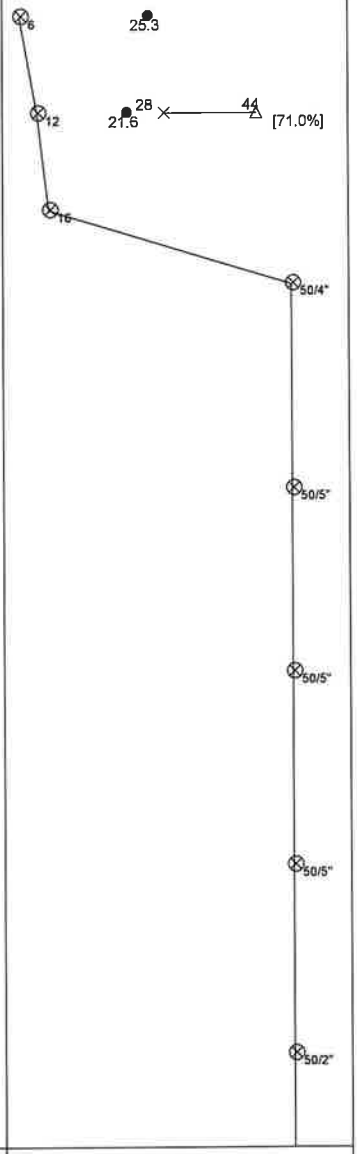
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**29.0**	BORING STARTED:	**Oct 04 2021**	CAVE IN DEPTH:	**36.0**
▼ WL (Completion)	**35.0**	BORING COMPLETED:	**Oct 04 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-03**	**2 of 2**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **475**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
35	S-9	SS	3	3	WEATHERED ROCK, light brown to gray, moist, very dense	▼	440	50/3" (50/3")
	S-10	SS	2	2				50/2" (50/2")
40	S-11	RC	60	19	SCHIST, [REC=32%,RQD=13%], Highly Weathered, Very Hard, Light Gray		435	
45	S-12	RC	60	32	SCHIST, [REC=53%,RQD=7%], Highly Weathered, Very Hard, Brownish Gray		430	
					AUGER REFUSAL AT 49.0 FT			
50							425	
55							420	
60							415	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

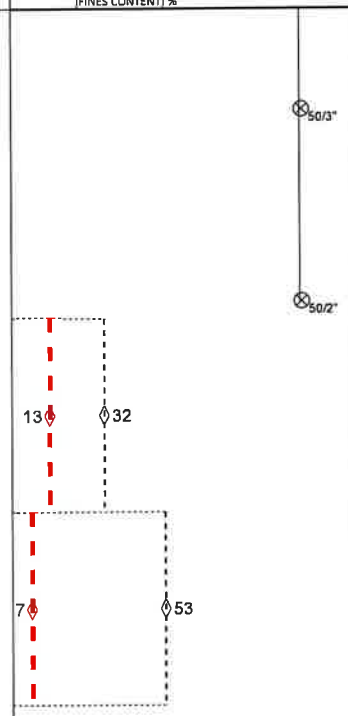
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**29.0**	BORING STARTED:	**Oct 04 2021**	CAVE IN DEPTH:	**36.0**
▼ WL (Completion)	**35.0**	BORING COMPLETED:	**Oct 04 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-04**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **483**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [6"]			
	S-1	SS	18	18	(ML) SILT, brown to light brown, moist, medium dense to very dense			5-5-16 (21)
	~~D3S-188 S-2~~	~~BG1~~ SS	~~60~~ 18	18				11-13-19 (32)
5	S-3	SS	18	18			478	5-7-8 (15)
	S-4	SS	18	18				7-10-10 (20)
10							473	
	S-5	SS	18	18				11-11-13 (24)
15							468	
	S-6	SS	18	18				21-23-31 (54)
20							463	
	S-7	SS	8	8	WEATHERED ROCK, brownish gray, moist, very dense			47-50/2" (50/2")
25							458	
	S-8	SS	11	11				36-50/5" (50/5")
30							453	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

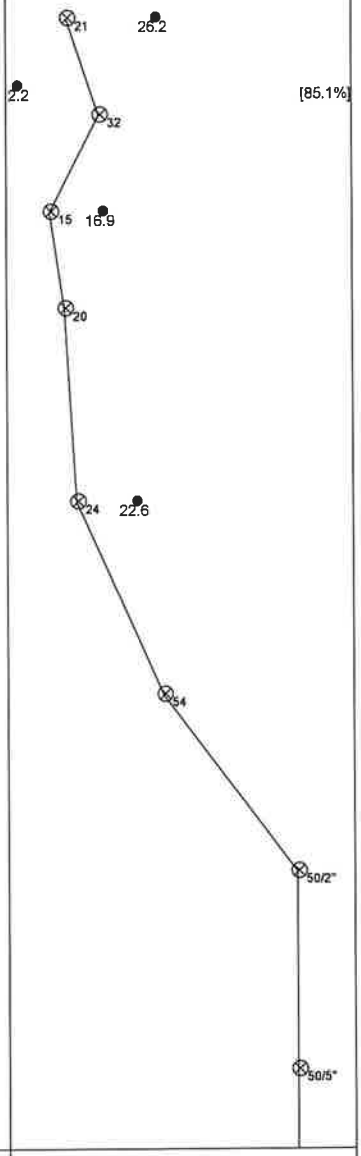
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED: **Sep 28 2021**	CAVE IN DEPTH: **17.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED: **Sep 28 2021**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV** / LOGGED BY:	DRILLING METHOD: **3.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-04**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **483**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit / Water Content / Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY (RQD, REC); CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
35	S-9	SS	1	1	WEATHERED ROCK, brownish gray, moist, very dense **AUGER REFUSAL AT 33.6 FT**		448	50/1" (50/1")	⊗ 50/1"
40							443		
45							438		
50							433		
55							428		
60							423		

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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 28 2021**	CAVE IN DEPTH:	**17.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 28 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-05**	**1 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

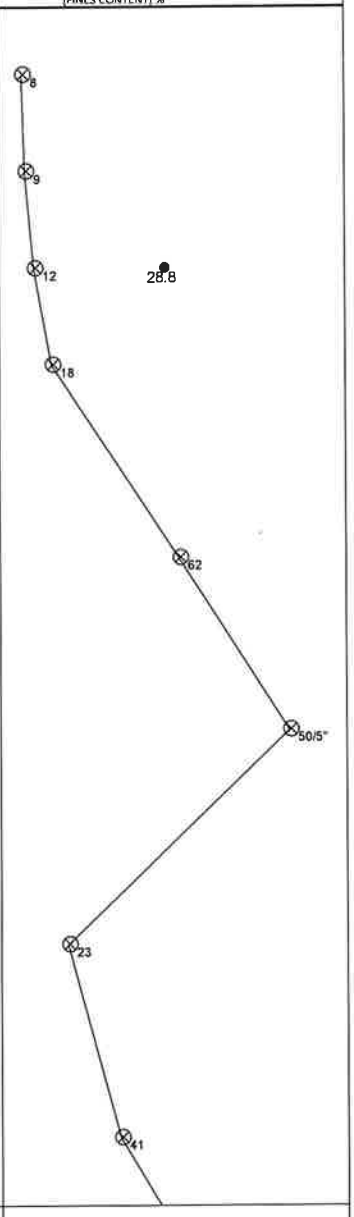
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	10	(ML) SANDY SILT, reddish brown, moist, loose			3-3-5 (8)
	S-2	SS	18	18				4-5-4 (9)
5					(ML) SILT, brown and black, moist, medium dense to very dense		477	
	S-3	SS	18	18				3-5-7 (12)
	S-4	SS	18	18				6-9-9 (18)
10							472	
	S-5	SS	18	18				21-27-35 (62)
15							467	
	S-6	SS	5	5	(ML) SANDY SILT WITH GRAVEL, contains quartz fragments, light brownish gray, moist, very dense			50/5" (50/5")
20							462	
	S-7	SS	18	18	(ML) SILT, light brown, moist, medium dense to dense			9-10-13 (23)
25							457	
	S-8	SS	18	18				16-19-22 (41)
30							452	



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

▽ WL (First Encountered) **53.0**	BORING STARTED: **Sep 28 2021**	CAVE IN DEPTH: **49.0**	
▼ WL (Completion) **48.0**	BORING COMPLETED: **Sep 28 2021**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD: **3.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-05**	**2 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
35	S-9	SS	18	18	(ML) SILT, light brown, moist, medium dense to dense WEATHERED ROCK, brownish gray, moist, very dense		447	21-38-43 (81)
40	S-10	SS	11	11			442	46-50/5" (50/5")
45	S-11	SS	5	5			437	50/5" (50/5")
50	S-12	SS	3	3			432	50/3" (50/3")
55	S-13	SS	2	2			427	50/2" (50/2")
60	S-14	SS	2	2			422	50/2" (50/2")

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

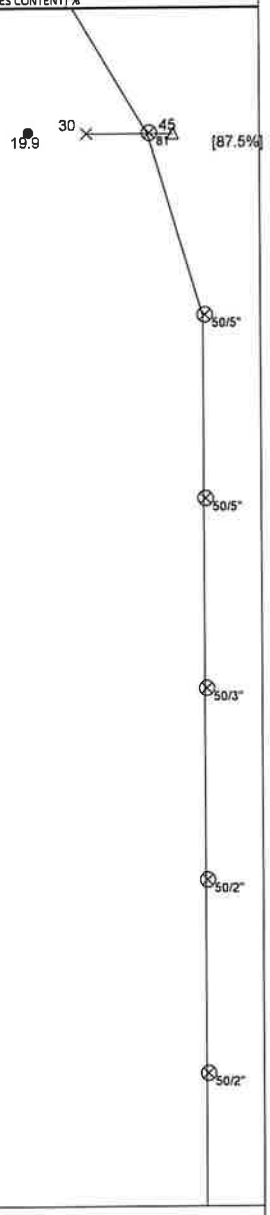
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**53.0**	BORING STARTED:	**Sep 28 2021**	CAVE IN DEPTH:	**49.0**
▼ WL (Completion)	**48.0**	BORING COMPLETED:	**Sep 28 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-05**	**3 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
65	S-15	SS	5	5	WEATHERED ROCK, brownish gray, moist, very dense		417	50/5" (50/5")
70	S-16	SS	1	1			412	50/1" (50/1")
75	S-17	SS	3	3			407	50/3" (50/3")
80	S-18	SS	1	1	END OF BORING AT 78.6 FT		402	50/1" (50/1")
85							397	
90							392	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

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

▽ WL (First Encountered)	**53.0**	BORING STARTED:	**Sep 28 2021**	CAVE IN DEPTH:	**49.0**
▼ WL (Completion)	**48.0**	BORING COMPLETED:	**Sep 28 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-06**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	12	(ML) SANDY SILT, reddish brown, moist, loose			4-5-5 (10)
	S-2	SS	18	10	(ML) SILT, light brown, moist, loose to medium dense			3-5-6 (11)
5	S-3	SS	18	18			477	3-4-4 (8)
	S-4	SS	18	18				7-7-7 (14)
10							472	
					WEATHERED ROCK, light brown and gray, moist, very dense			
	S-5	SS	18	18				22-27-33 (60)
15							467	
	S-6	SS	11	11				33-50/5" (50/5")
20							462	
	S-7	SS	16	16				27-39-50/4" (89/10")
25							457	
	S-8	SS	9	9				20-50/3" (50/3")
30							452	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

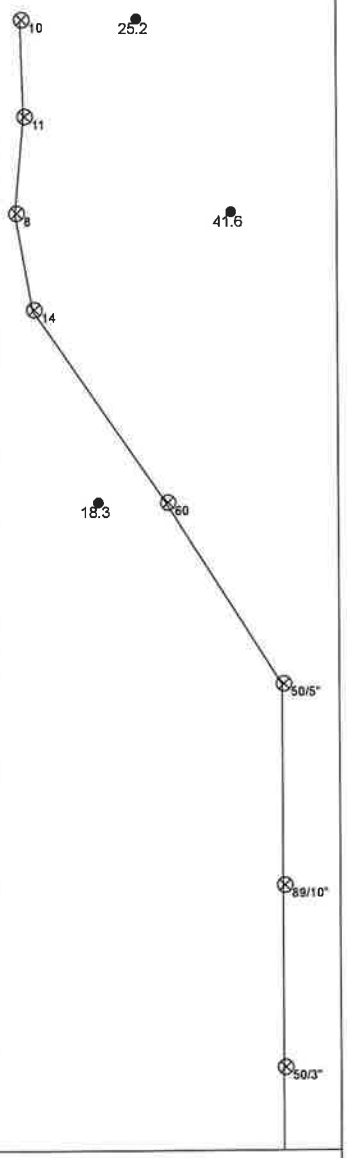
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 28 2021**	CAVE IN DEPTH:	**20.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 28 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-06**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit / Water Content / Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY; RQD; REC; CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
	S-9	SS	1	1	WEATHERED ROCK, light brown and gray, moist, very dense			50/1" (50/1")	50/1"
					AUGER REFUSAL AT 33.6 FT				
35							447		
40							442		
45							437		
50							432		
55							427		
60							422		

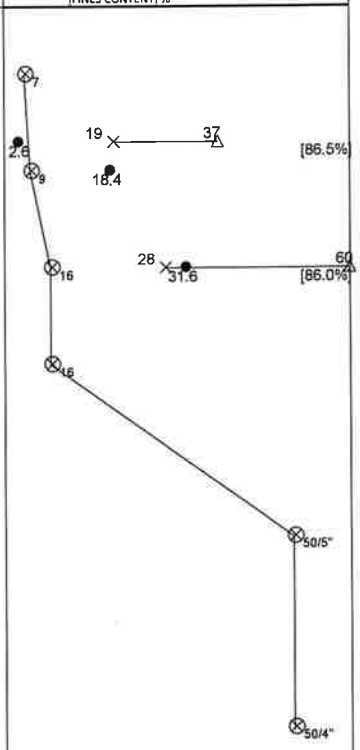
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 28 2021**	CAVE IN DEPTH:	**20.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 28 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-07**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **492**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [6"]			
	S-1	SS	18	9	(ML) SANDY SILT, reddish brown, moist, loose			3-3-4 (7)
	~~D3S-193~~	~~BG1~~ SS	~~60~~ 18	12				3-4-5 (9)
5	~~S-2~~				(CH) FAT CLAY, light brown and gray, moist, very stiff		487	
	S-3	SS	18	18				7-7-9 (16)
	S-4	SS	18	16	(ML) SANDY SILT, brown and gray, moist, medium dense		482	4-7-9 (16)
10								
	~~S-5~~	~~SS~~	~~5~~	~~5~~	WEATHERED ROCK, light brown to gray, moist, very dense		477	50/5" (50/5")
15								
	~~S-6~~	~~SS~~	~~4~~	~~4~~			472	50/4" (50/4")
20					**AUGER REFUSAL AT 20.0 FT**			
25							467	
30							462	



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 29 2021**	CAVE IN DEPTH:	**13.5**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 29 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-08**	**1 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **487**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	18	(ML) SANDY SILT, reddish brown, moist, loose			3-3-3 (6)
	S-2	SS	18	18				2-3-3 (6)
5					(ML) SILT, light brown and gray, moist, loose to medium dense		482	
	S-3	SS	18	18				3-4-5 (9)
	S-4	SS	18	18				4-5-6 (11)
10							477	
	S-5	SS	18	18				6-7-9 (16)
15							472	
	S-6	SS	18	18				7-8-10 (18)
20							467	
	S-7	SS	18	18				8-11-12 (23)
25							462	
	S-8	SS	18	18				9-10-13 (23)
30							457	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

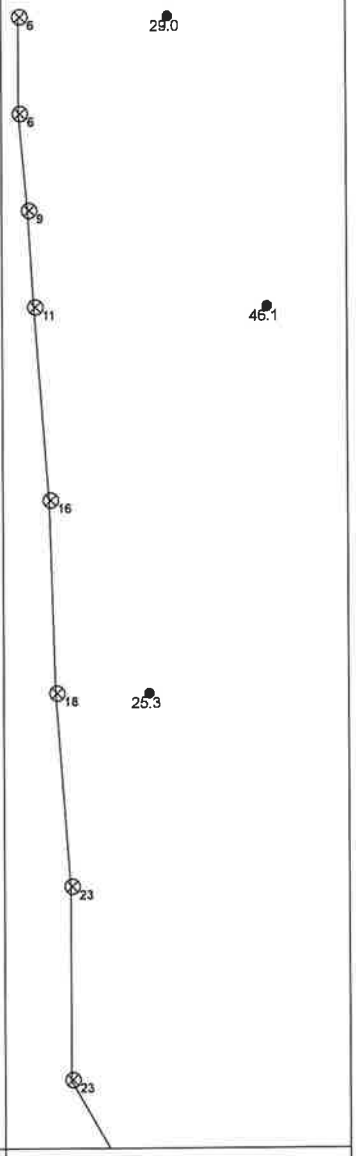
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 02 2021**	CAVE IN DEPTH:	**53.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 02 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-08**	**2 of 3**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **487**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
35	S-9	SS	18	18	(ML) SILT, light brown and gray, moist, loose to medium dense WEATHERED ROCK, brownish gray, moist, very dense		452	11-24-37 (61)
40	S-10	SS	17	17			447	14-23-50/5" (73/11")
45	S-11	SS	5	5			442	50/5" (50/5")
50	S-12	SS	3	3			437	50/3" (50/3")
55	S-13	SS	4	4			432	50/4" (50/4")
60	S-14	SS	3	3			427	50/3" (50/3")

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

61 73/11" 50/5" 50/3" 50/4" 50/3"

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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 02 2021**	CAVE IN DEPTH:	**53.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 02 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-08**	**3 of 3**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **487**

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
65	S-15	SS	5	5	WEATHERED ROCK, brownish gray, moist, very dense		422	50/5" (50/5")
70	S-16	SS	2	2			417	50/2" (50/2")
75	S-17	SS	4	4			412	50/4" (50/4")
80	S-18	SS	5	5			407	50/5" (50/5")
85					**END OF BORING AT 80.0 FT**		402	
90							397	

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

WL (First Encountered) **Dry**	BORING STARTED: **Oct 02 2021**	CAVE IN DEPTH: **53.0**	
WL (Completion) **Dry**	BORING COMPLETED: **Oct 02 2021**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD: **3.25 HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-09**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION 100%
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **478**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	9	(ML) SANDY SILT, reddish brown, moist, loose			2-2-3 (5)
	~~D3S-189 S-2~~	~~BG1~~ SS	~~60~~ 18	13	(CL) LEAN CLAY, reddish brown, moist, firm			3-4-5 (9)
5	S-3	SS	18	14	(ML) SANDY SILT, reddish brown, moist, loose		473	4-4-4 (8)
	S-4	SS	18	18	(ML) SILT, light brown, moist, dense to very dense		468	13-19-26 (45)
10								
15	S-5	SS	18	17			463	11-15-27 (42)
	~~S-6~~	~~SS~~	~~4~~	~~4~~			458	50/4" (50/4")
20								
25	S-7	SS	18	18			453	14-15-17 (32)
	~~S-8~~	~~SS~~	~~5~~	~~5~~	WEATHERED ROCK, light gray, brown, and black, moist, very dense		448	50/5" (50/5")
30								

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

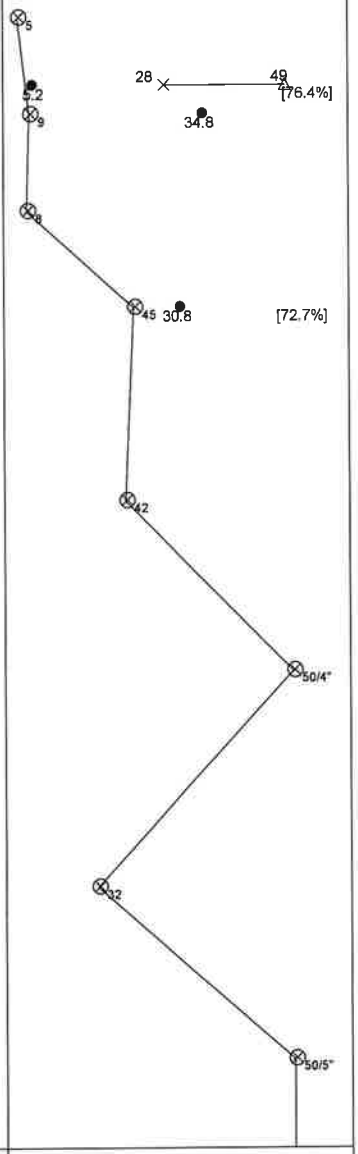
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered) **Dry**	BORING STARTED: **Sep 29 2021**		CAVE IN DEPTH: **27.0**
▼ WL (Completion) **Dry**	BORING COMPLETED: **Sep 29 2021**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD: **3.25 HSA**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-09**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **478**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					WEATHERED ROCK, light gray, brown, and black, moist, very dense			
	S-9	SS	14	14				17-26-50/2" (76/8")
35					**AUGER REFUSAL AT 34.8 FT**		443	
	S-10	SS	0	0				50/0" (50/0")
40							438	
45							433	
50							428	
55							423	
60							418	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

76/8"

50/0"

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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 29 2021**	CAVE IN DEPTH:	**27.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 29 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-10**	**1 of 2**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **469**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	12	(SM) SILTY SAND, reddish brown, moist, very loose to loose			1-2-2 (4)
	S-2	SS	18	18				2-2-3 (5)
5	S-3	SS	18	18	(ML) SANDY SILT WITH GRAVEL, contains quartz fragments, light brown, moist, loose		464	5-4-5 (9)
	S-4	SS	5	5	WEATHERED ROCK, light brown to grayish brown, moist, very dense			50/5" (50/5")
10							459	
	S-5	SS	5	5				50/5" (50/5")
15							454	
	S-6	SS	3	3				50/3" (50/3")
20							449	
	S-7	SS	0	0	SCHIST, [REC=87%,RQD=17%], Highly Weathered, Very Hard, Grayish Brown			50/0" (50/0")
25	S-8	RC	60	52			444	
					SCHIST, [REC=100%,RQD=22%], Highly Weathered, Very Hard, Grayish Brown			
30	S-9	RC	60	60			439	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

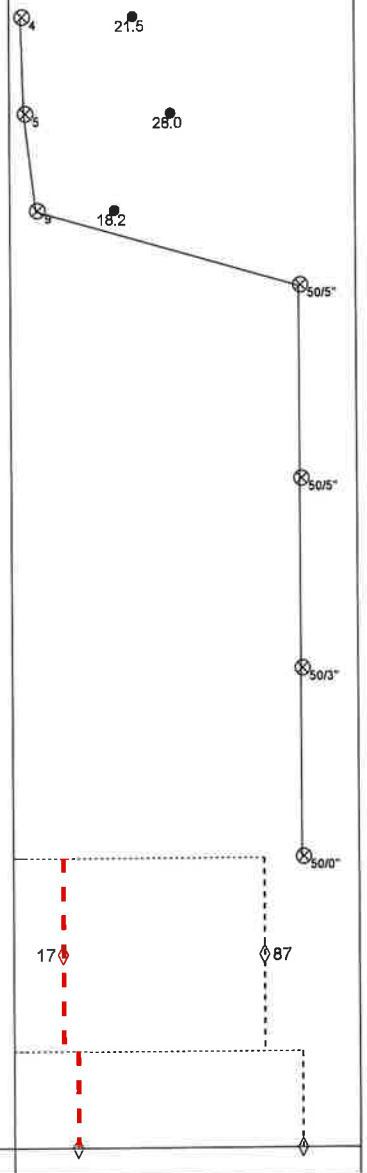
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 05 2021**	CAVE IN DEPTH:	**19.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 05 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-10**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **469**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit; STANDARD PENETRATION BLOWS/FT; ROCK QUALITY DESIGNATION & RECOVERY; RQD; REC; CALIBRATED PENETROMETER TON/SF; [FINES CONTENT] %
					SCHIST, [REC=100%,RQD=22%], Highly Weathered, Very Hard, Grayish Brown				22 — 100
					AUGER REFUSAL AT 33.5 FT				
35							434		
40							429		
45							424		
50							419		
55							414		
60							409		

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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 05 2021**	CAVE IN DEPTH:	**19.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 05 2021**	HAMMER TYPE:	**Auto**
⧩ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
⧨ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-11**	**1 of 1**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **468**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	8	Topsoil Thickness [6"] (ML) SILT, brownish gray, moist, loose to dense			3-3-4 (7)
	~~D3S-194 S-2~~	~~BG1~~ SS	~~60~~ 18	12				5-6-9 (15)
5	S-3	SS	18	16			463	7-10-12 (22)
	S-4	SS	18	18			458	11-12-16 (28)
10								
	S-5	SS	18	18			453	10-15-19 (34)
15					WEATHERED ROCK, gray, moist, very dense			
	~~S-6~~	~~SS~~	~~5~~	~~5~~			448	50/5" (50/5")
20								
	~~S-7~~	~~SS~~	~~3~~	~~3~~			443	50/3" (50/3")
25					**END OF BORING AT 25.0 FT**			
30							438	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

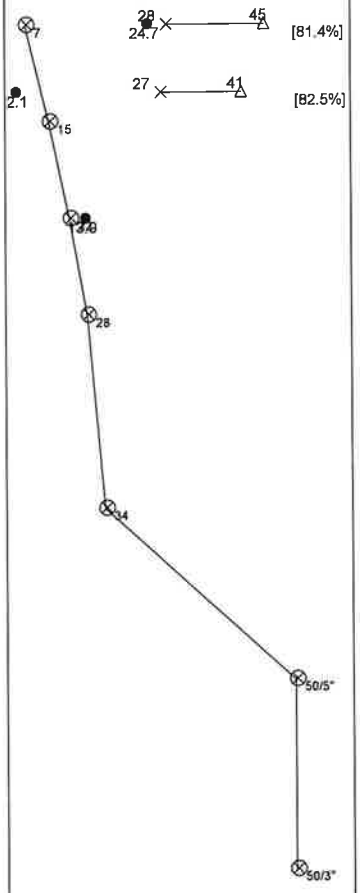
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 29 2021**	CAVE IN DEPTH:	**12.7**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 29 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-12**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **474**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [6"]			
	S-1	SS	18	18	(SM) SILTY SAND, reddish brown, moist, loose			3-4-5 (9)
	S-2	SS	18	18	(ML) SANDY SILT, reddish brown, moist, medium dense			6-7-11 (18)
5	S-3	SS	18	18	(ML) SILT, light brown, moist, medium dense		469	10-13-12 (25)
	S-4	SS	18	18				10-11-15 (26)
10							464	
	S-5	SS	18	18				11-8-11 (19)
15							459	
	S-6	SS	5	5	WEATHERED ROCK, light brown and gray, moist, very dense			50/5" (50/5")
20							454	
	S-7	SS	5	5				50/5" (50/5")
25					**END OF BORING AT 23.9 FT**		449	
30							444	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

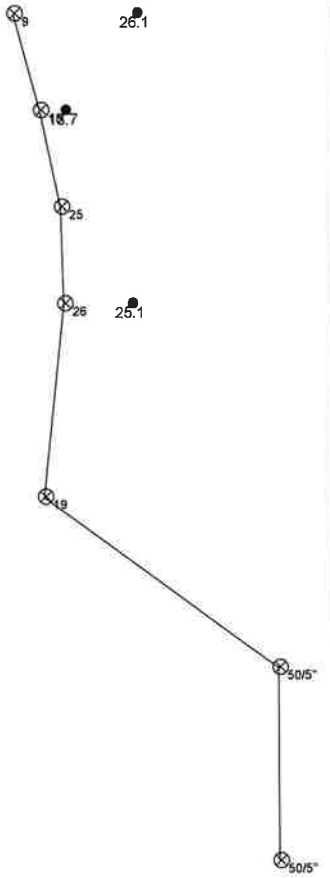
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 02 2021**	CAVE IN DEPTH:	**14.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 02 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-13**	**1 of 1**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **490**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [4"]			
	S-1	SS	18	10	(ML) SILT WITH SAND, reddish brown, moist, loose to medium dense			3-3-5 (8)
	S-2	SS	18	12				2-3-6 (9)
5	S-3	SS	18	18			485	7-8-11 (19)
	S-4	SS	4	4	(SM) SILTY SAND WITH GRAVEL, gray and dark brown, moist, medium dense to very dense			50/4" (50/4")
10	S-5	SS	18	18			480	12-13-15 (28)
15	S-6	SS	18	18			475	10-12-17 (29)
20	S-7	SS	2	2	WEATHERED ROCK, dark brownish gray, moist, very dense		470	50/2" (50/2")
25	S-8	SS	0	0	**AUGER REFUSAL AT 27.0 FT**		465	50/0" (50/0")
30							460	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

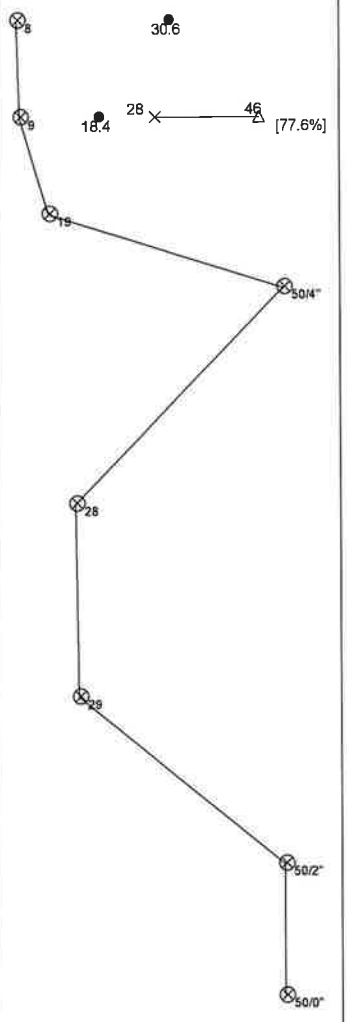
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

(FINES CONTENT) %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 30 2021**	CAVE IN DEPTH:	**18.5**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 30 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-14**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			BOTTOM OF CASING
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **500**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [3"]			
	S-1	SS	18	18	(MH) ELASTIC SILT, light brown, moist, firm to stiff			3-4-4 (8)
	~~D35~~ 186	~~BG1~~ SS	~~60~~ 18	18				2-4-5 (9)
5	~~S-2~~				(SM) SILTY SAND, brown, moist, medium dense to dense		495	
	S-3	SS	18	18				5-9-11 (20)
	S-4	SS	18	18				10-12-19 (31)
10					WEATHERED ROCK, reddish brown and black, moist, very dense		490	
	~~S-5~~	~~SS~~	~~5~~	~~5~~				50/5" (50/5")
15							485	
	~~S-6~~	~~SS~~	~~2~~	~~2~~	**END OF BORING AT 18.7 FT**			50/2" (50/2")
20							480	
25							475	
30							470	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

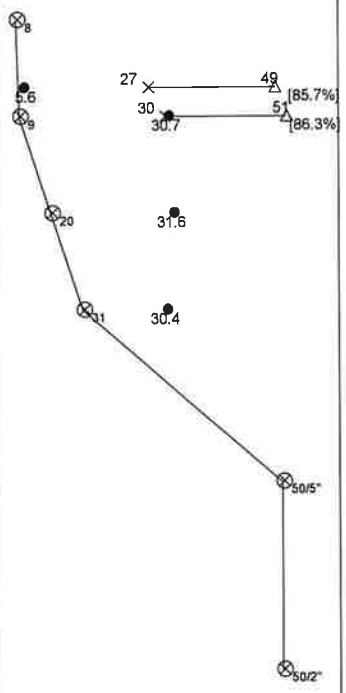
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 30 2021**	CAVE IN DEPTH:	**11.5**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 30 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-15**	**1 of 1**
PROJECT NAME: **Warrenton Data Center**	DRILLER/CONTRACTOR: **All American Geotech, Inc.**		
SITE LOCATION: **Lee Highway and Blackwell Road, Warrenton, Virginia 20186**			LOSS OF CIRCULATION
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **497**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	12	Topsoil Thickness [4"] (CL) LEAN CLAY WITH SAND, grayish brown, moist, stiff			3-4-6 (10)
5	~~D35-187 S-2~~	~~BG1~~ SS	~~60~~ 18	17			492	4-4-7 (11)
	S-3	SS	18	18	(ML) SANDY SILT WITH GRAVEL, light brown and gray, moist, very dense			23-24-29 (53)
10	S-4	SS	15	14	WEATHERED ROCK, grayish brown to gray, moist, very dense		487	15-34-50/3" (84/9")
15	~~S-5~~	~~SS~~	~~3~~	~~3~~			482	50/3" (50/3")
	~~S-6~~	~~SS~~	~~1~~	~~1~~	**AUGER REFUSAL AT 16.1 FT**			50/1" (50/1")
20							477	
25							472	
30							467	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

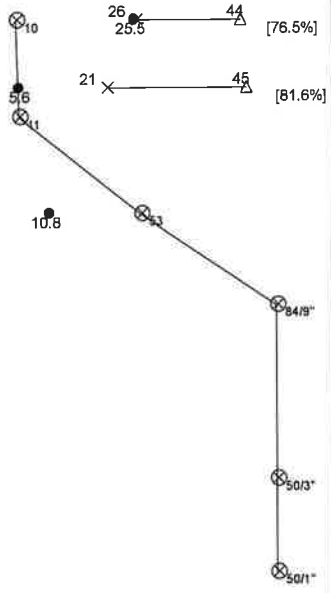
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

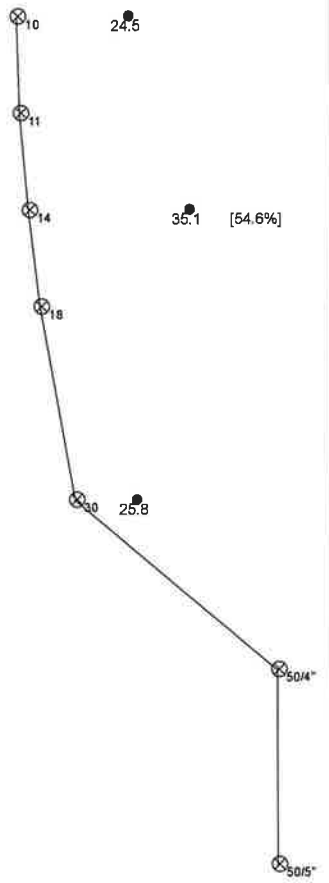
▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Sep 30 2021**	CAVE IN DEPTH:	**10.3**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Sep 30 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-16**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **475**

Plastic Limit Water Content Liquid Limit (X——●——△)
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, loose			3-5-5 (10)
	S-2	SS	18	18	(ML) SANDY SILT, light brown and gray, moist, medium dense			5-4-7 (11)
5							470	
	S-3	SS	18	18				6-6-8 (14)
	S-4	SS	18	18				5-7-11 (18)
10							465	
	S-5	SS	18	14				10-13-17 (30)
15							460	
	S-6	SS	4	4	WEATHERED ROCK, light brown, moist, very dense			50/4" (50/4")
20							455	
	S-7	SS	5	5				50/5" (50/5")
25					**END OF BORING AT 24.0 FT**		450	
30							445	



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 02 2021**	CAVE IN DEPTH:	**14.7**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 02 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-17**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **492**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [3"]			
	S-1	SS	18	20	(SM) SILTY SAND, reddish brown, moist, loose			4-4-4 (8)
	S-2	SS	18	18				3-4-4 (8)
5							487	
	S-3	SS	18	18	(ML) SANDY SILT, brown and gray, moist, very loose			1-2-2 (4)
	S-4	SS	5	5	WEATHERED ROCK, dark gray, moist, very dense			50/5" (50/5")
10							482	
	S-5	SS	3	3				50/3" (50/3")
					END OF BORING AT 13.8 FT			
15							477	
20							472	
25							467	
30							462	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

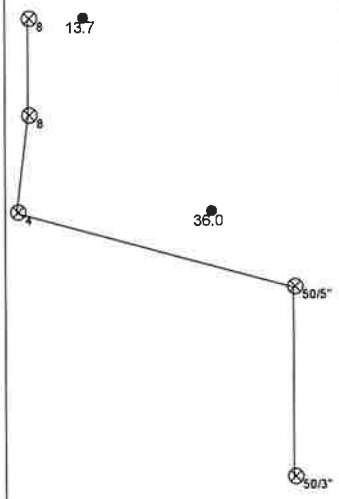
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 02 2021**	CAVE IN DEPTH:	**7.0**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 02 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-18**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **482**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [6"]			
	S-1	SS	18	18	(SM) SILTY SAND, reddish brown, moist, loose to medium dense			3-3-4 (7)
	S-2	SS	18	18				4-5-7 (12)
5							477	
	S-3	SS	18	18				7-9-13 (22)
	S-4	SS	18	18	(ML) SILT, light brown, moist, dense			15-15-22 (37)
10							472	
	S-5	SS	5	5	WEATHERED ROCK, light brown to grayish brown, moist, very dense			50/5" (50/5")
15							467	
	S-6	SS	4	4				50/4" (50/4")
					END OF BORING AT 18.9 FT			
20							462	
25							457	
30							452	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

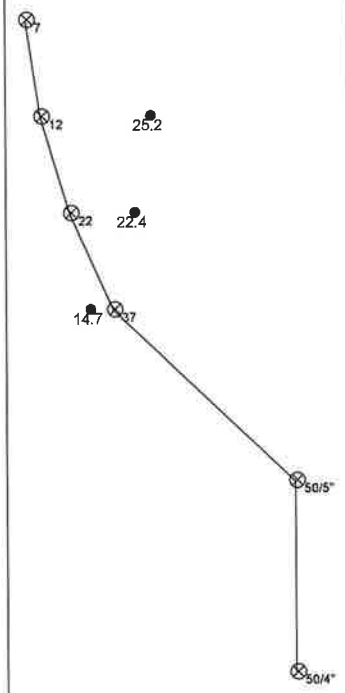
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 01 2021**	CAVE IN DEPTH:	**14.5**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 01 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-19**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **490**
			BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

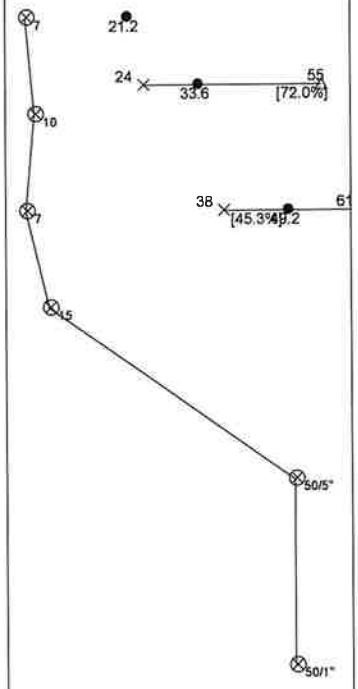
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [4"]			
	S-1	SS	18	18	(CL) SANDY LEAN CLAY, reddish brown, moist, firm			4-4-3 (7)
	~~D35-190~~	~~BG1~~ SS	~~60~~ 18	18	(GM) SILTY GRAVEL WITH SAND, reddish brown and brown, moist, loose to medium dense			3-4-6 (10)
5	~~S-2~~						485	
	S-3	SS	18	18				3-3-4 (7)
	S-4	SS	18	18				9-7-8 (15)
10							480	
	~~S-5~~	~~SS~~	~~5~~	~~5~~	WEATHERED ROCK, light brown and dark gray, moist, very dense			50/5" (50/5")
15							475	
	~~S-6~~	~~SS~~	~~1~~	~~1~~	**END OF BORING AT 18.6 FT**			50/1" (50/1")
20							470	
25							465	
30							460	



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

▽ WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 01 2021**	CAVE IN DEPTH:	**14.5**
▼ WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 01 2021**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Bohler Engineering	**01:31153**	**B-20**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Warrenton Data Center	**All American Geotech, Inc.**		
SITE LOCATION:			LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **490**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness [4"]		
	S-1	SS	18	10	(SM) SILTY SAND, brown, moist, loose		4-4-4 (8)
	S-2	SS	18	18	(ML) SILT, reddish brown to grayish brown, moist, medium dense to very dense		5-7-7 (14)
5	S-3	SS	18	18		485	7-9-10 (19)
	S-4	SS	18	18	(MH) ELASTIC SILT WITH SAND, yellowish brown, moist, hard to very hard		14-15-16 (31)
10						480	
	S-5	SS	18	18			8-15-26 (41)
15						475	
	S-6	SS	18	18			17-23-35 (58)
20						470	
	S-7	SS	5	5	WEATHERED ROCK, light brown and gray, moist, very dense		50/5" (50/5")
25						465	
	S-8	SS	4	4			50/4" (50/4")
30					**END OF BORING AT 28.9 FT**	460	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

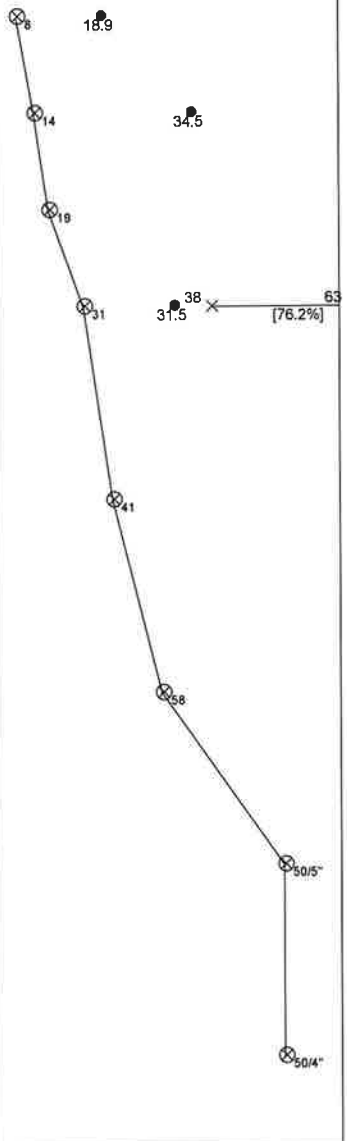
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



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

WL (First Encountered)	**Dry**	BORING STARTED:	**Oct 01 2021**	CAVE IN DEPTH:	**23.0**
WL (Completion)	**Dry**	BORING COMPLETED:	**Oct 01 2021**	HAMMER TYPE:	**Auto**
WL (Seasonal High Water)		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	**3.25 HSA**
WL (Stabilized)		**ATV**			

GEOTECHNICAL BOREHOLE LOG

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary
Plasticity Charts
Grain Size Analysis
Standard Proctor Test Results
California Bearing Ratio Test Results
Thermal Resistivity Test Results

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-01	S-10	38.5-39.75	16.5	ML	NP	NP	NP	75.6					
B-01	S-2	3.5-5	15.1										
B-02	S-1	1-2.5	24.7										
B-02	S-2	3.5-5	11.2										
B-02	S-5	13.5-15	12.6										
B-03	S-1	1-2.5	25.3										
B-03	S-2	3.5-5	21.6	ML	44	28	16	71.0					
B-04	S-1	1-2.5	26.2										
B-04	S-3	6-7.5	16.9										
B-04	S-5	13.5-15	22.6										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Warrenton Data Center
Client:

Project No.: 01:31153
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-05	S-3	6-7.5	28.8										
B-05	S-9	33.5-35	19.9	ML	45	30	15	87.5					
B-06	S-1	1-2.5	25.2										
B-06	S-3	6-7.5	41.6										
B-06	S-5	13.5-15	18.3										
B-07	S-2	3.5-5	18.4										
B-07	S-3	6-7.5	31.6	CH	60	28	32	86.0					
B-08	S-1	1-2.5	29.0										
B-08	S-4	8.5-10	46.1										
B-08	S-6	18.5-20	25.3										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Warrenton Data Center
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Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-09	S-2	3.5-5	34.8										
B-09	S-4	8.5-10	30.8	ML	NP	NP	NP	72.7					
B-10	S-1	1-2.5	21.5										
B-10	S-2	3.5-5	28.0										
B-10	S-3	6-7.5	18.2										
B-11	S-1	1-2.5	24.7	ML	45	28	17	81.4					
B-11	S-3	6-7.5	13.9										
B-12	S-1	1-2.5	26.1										
B-12	S-2	3.5-5	13.7										
B-12	S-4	8.5-10	25.1										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-13	S-1	1-2.5	30.6										
B-13	S-2	3.5-5	18.4	ML	46	28	18	77.6					
B-14	S-2	3.5-5	30.7	MH	51	30	21	86.3					
B-14	S-3	6-7.5	31.6										
B-14	S-4	8.5-10	30.4										
B-15	S-1	1-2.5	25.5	CL	44	26	18	76.5					
B-15	S-3	6-7.5	10.8										
B-16	S-1	1-2.5	24.5										
B-16	S-3	6-7.5	35.1	ML	NP	NP	NP	54.6					
B-16	S-5	13.5-15	25.8										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-17	S-1	1-2.5	13.7										
B-17	S-3	6-7.5	36.0										
B-18	S-2	3.5-5	25.2										
B-18	S-3	6-7.5	22.4										
B-18	S-4	8.5-10	14.7										
B-19	S-1	1-2.5	21.2										
B-19	S-3	6-7.5	49.2	GM	61	38	23	45.3					
B-20	S-1	1-2.5	18.9										
B-20	S-2	3.5-5	34.5										
B-20	S-4	8.5-10	31.5	MH	63	38	25	76.2					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-02	D3S-191	1-6	11.7	CL	39	18	21	85.6	122.1	15.2			
B-04	D3S-188	1-6	2.2	ML	NP	NP	NP	85.1	112.3	15.8			
B-07	D3S-193	1-6	2.6	CL	37	19	18	86.5	112.2	17.7			
B-09	D3S-189	1-6	5.2	ML	49	28	21	76.4	99.5	21.6			
B-11	D3S-194	1-6	2.1	ML	41	27	14	82.5	119.2	13.8			
B-14	D3S-186	1-6	5.6	CL	49	27	22	85.7	102.3	22.4	5	4.7	
B-15	D3S-187	1-6	5.6	CL	45	21	24	81.6	111.0	17.7	7.6	6.6	
B-19	D3S-190	1-6	33.6	CH	55	24	31	72.0	101.9	24.2			

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Warrenton Data Center
Client:

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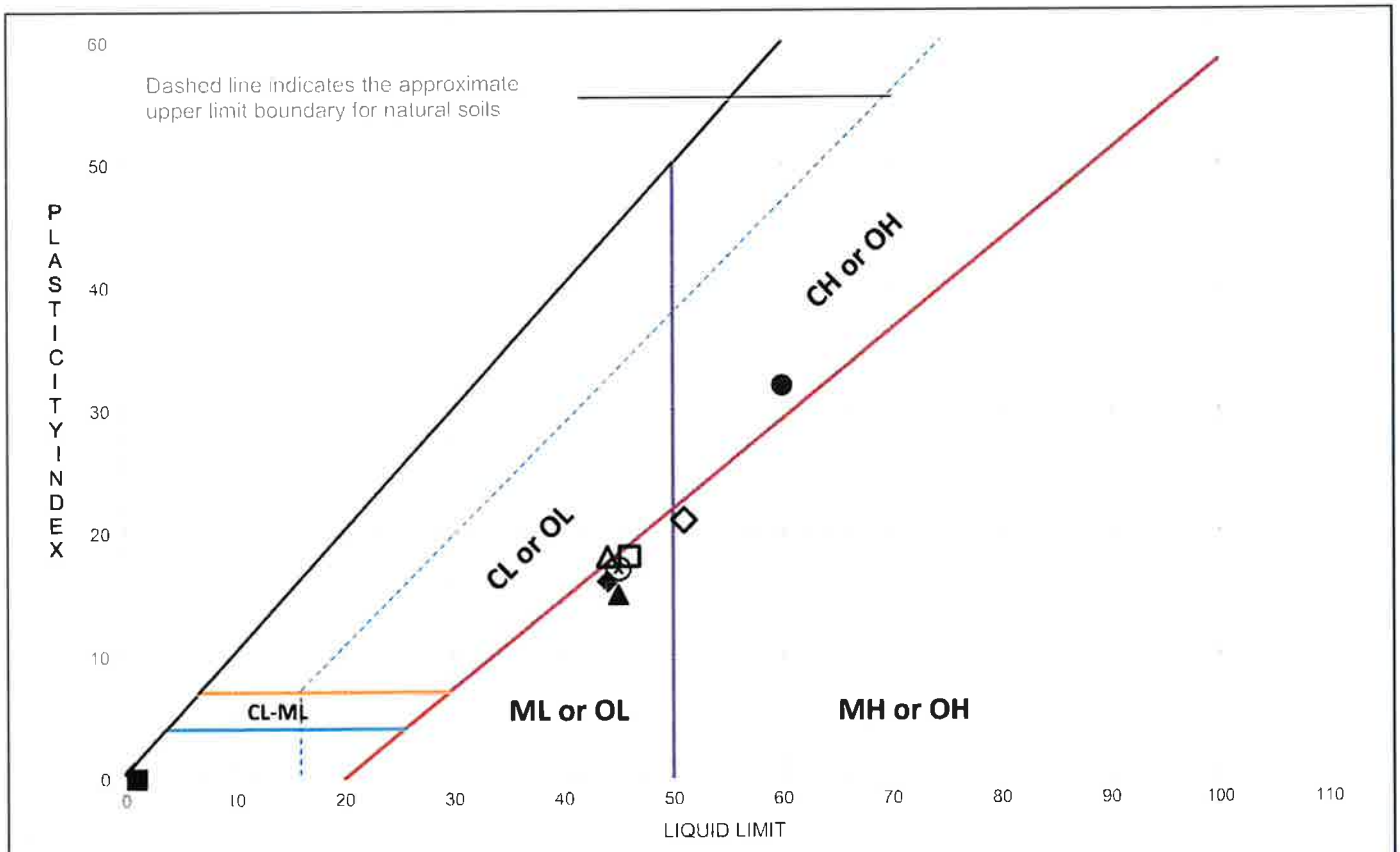
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-01	S-10	38.5-39.75	NP	NP	NP	95.3	75.6	A-4	ML	Silt with Sand Trace Mica Yellow Light Brown
◆	B-03	S-2	3.5-5	44	28	16	91.7	71.0	A-7-6	ML	Silt with Sand Trace Mica Yellow Light Brown
▲	B-05	S-9	33.5-35	45	30	15	99.5	87.5	A-7-5	ML	Silt Trace Mica Yellow Light Brown
●	B-07	S-3	6-7.5	60	28	32	93.9	86.0	A-7-6	CH	Fat Clay Light Brown
✳	B-09	S-4	8.5-10	NP	NP	NP	95.9	72.7	A-4	ML	Silt with Sand Trace Mica Yellow Light Brown
⊗	B-11	S-1	1-2.5	45	28	17	95.3	81.4	A-7-6	ML	Silt with Sand Trace Mica Brown
□	B-13	S-2	3.5-5	46	28	18	89.9	77.6	A-7-6	ML	Silt with Sand Trace Mica Yellowish Light Brown
◇	B-14	S-2	3.5-5	51	30	21	94.7	86.3	A-7-5	MH	Elastic Silt Trace Mica Light Brown
△	B-15	S-1	1-2.5	44	26	18	85.8	76.5	A-7-6	CL	Lean Clay with Sand Light Brown
×	B-16	S-3	6-7.5	NP	NP	NP	85.3	54.6	A-4	ML	Sandy Silt Trace Mica Yellowish Light Brown

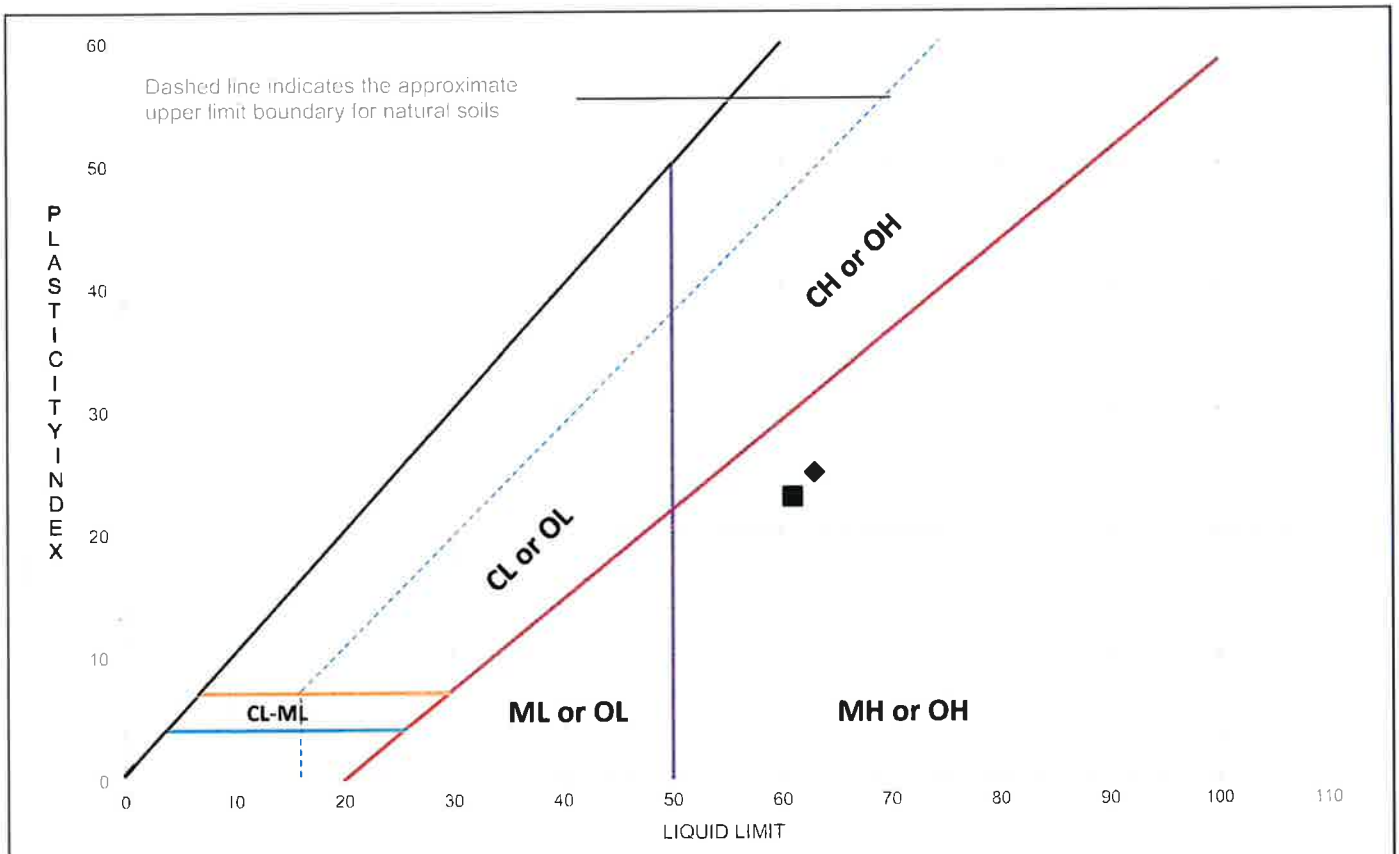
Project: Warrenton Data Center
Client:

Project No.: 01:31153
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-19	S-3	6-7.5	61	38	23	53.5	45.3	A-7-5	GM	Silty Gravel with Sand Trace Mica Yellowish Brown
◆	B-20	S-4	8.5-10	63	38	25	88.6	76.2	A-7-5	MH	Elastic Silt with Sand Trace Mica Yellowish Light Brown

Project: Warrenton Data Center
Client:

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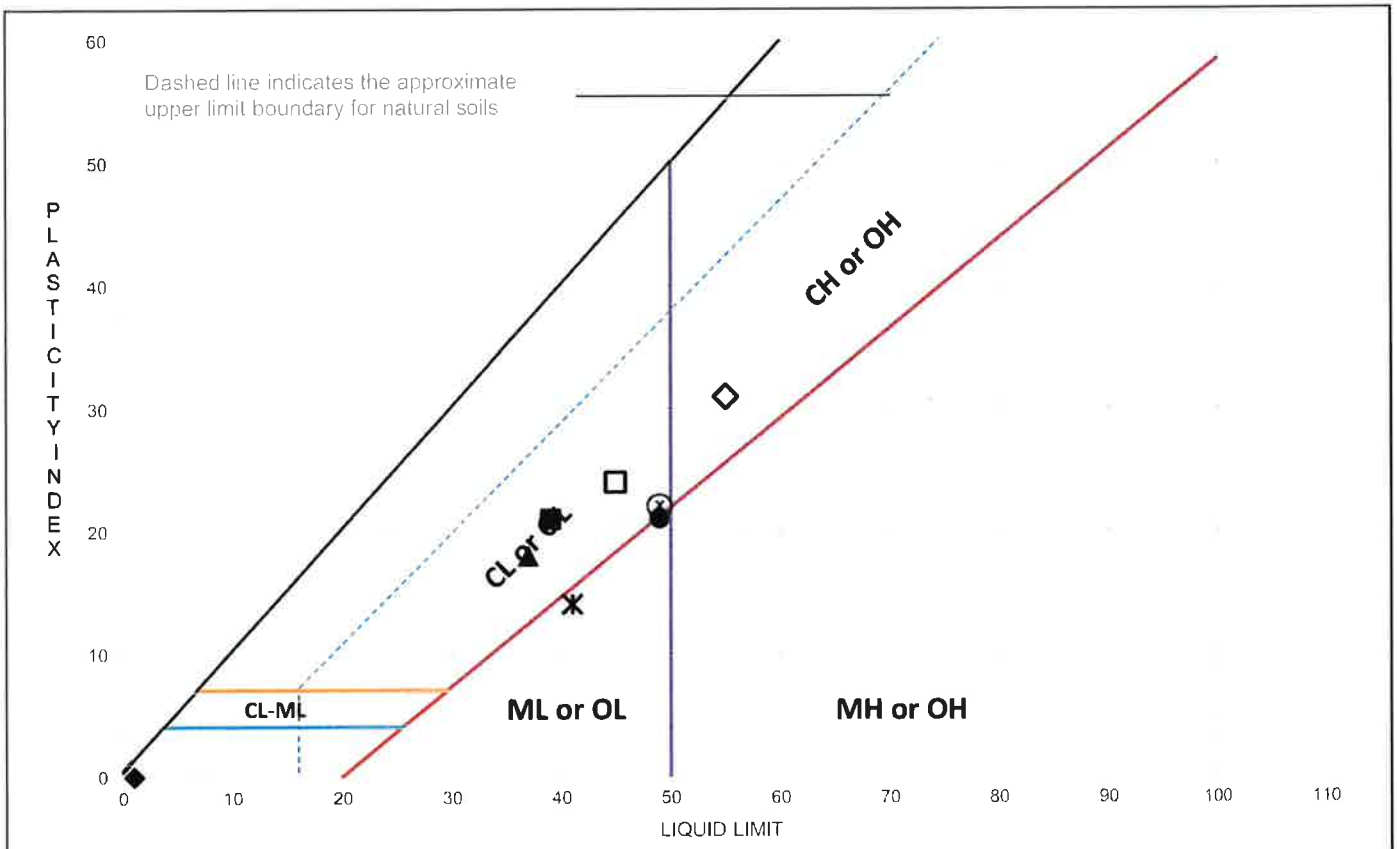
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-02	D3S-191	1-6	39	18	21	98.8	85.6	A-6	CL	Lean Clay Yellowish Brown
◆	B-04	D3S-188	1-6	NP	NP	NP	97.9	85.1	A-4	ML	Silt Trace Mica Yellowish Brown
▲	B-07	D3S-193	1-6	37	19	18	96.0	86.5	A-6	CL	Lean Clay Trace Mica Brown
●	B-09	D3S-189	1-6	49	28	21	91.1	76.4	A-7-6	ML	Silt with Sand Brwon
✳	B-11	D3S-194	1-6	41	27	14	97.9	82.5	A-7-6	ML	Silt with Sand Trace Mica Yellowish Brown
⊗	B-14	D3S-186	1-6	49	27	22	95.3	85.7	A-7-6	CL	Lean Clay with Sand Yellowisht Brown
□	B-15	D3S-187	1-6	45	21	24	92.4	81.6	A-7-6	CL	Lean Clay with Sand Yellowish Brown
◇	B-19	D3S-190	1-6	55	24	31	80.6	72.0	A-7-6	CH	Fat Clay with Sand Brown

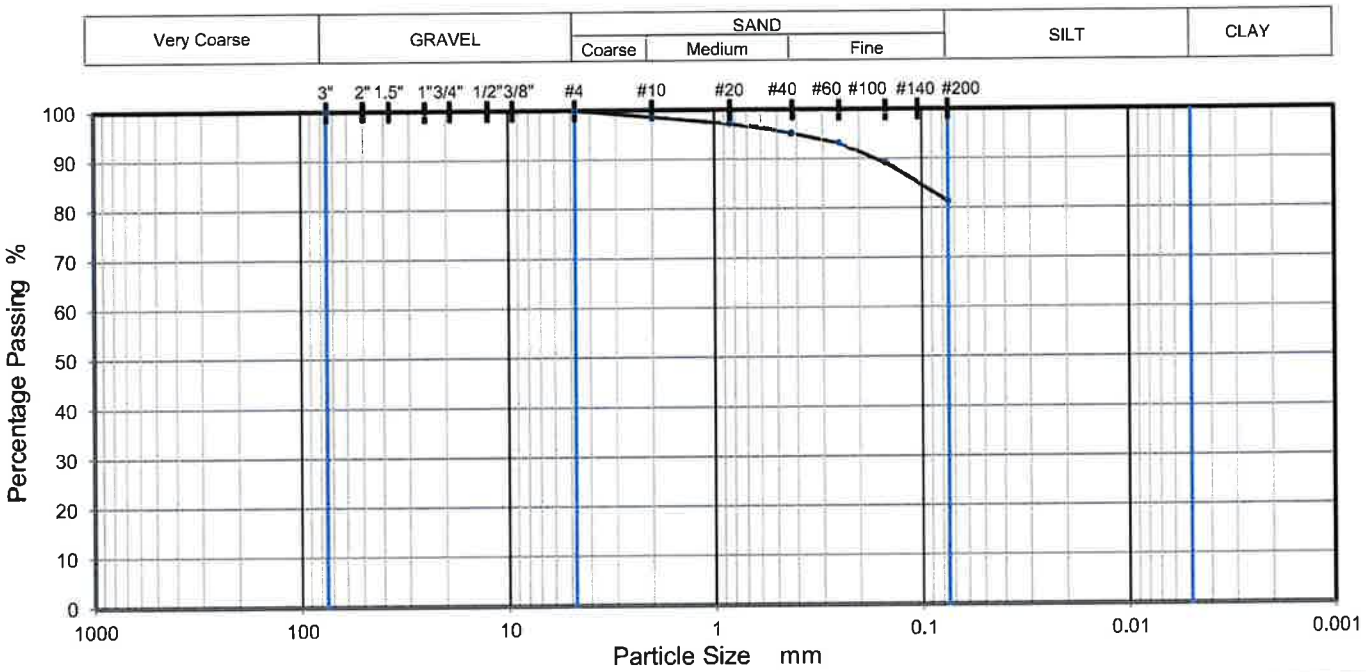
Project: Warrenton Data Center
Client:

Project No.: 01:31153
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.6		
#20	97.2		
#40	95.3		
#60	93.3		
#100	89.1		
#200	81.4		

Dry Mass of sample, g: 40.6

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.4
Medium Sand, #10 to #40	3.3
Fine Sand, #40 to #200	13.9
Fines <#200	81.4

USCS	ML	Liquid Limit	45	D90	0.167	D50		D10	
AASHTO	A-7-6	Plastic Limit	28	D85	0.104	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	17	D60		D15		Cc	

Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Brown
Sample Source: B-11

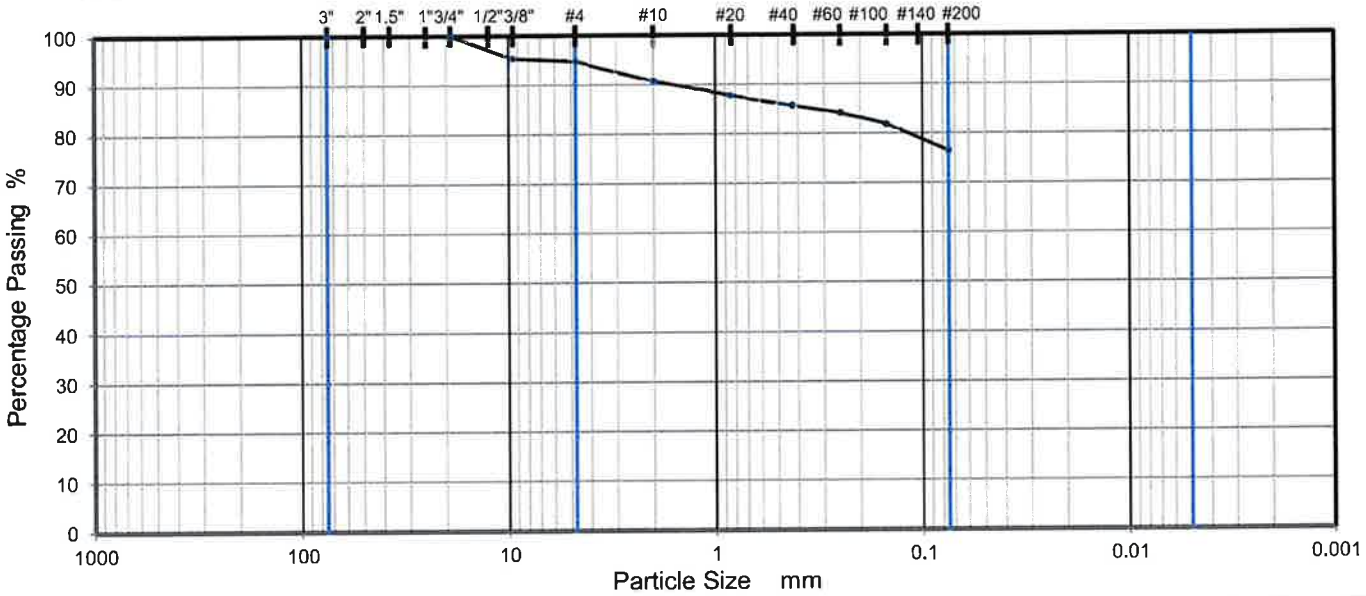
Project No.: 01:31153
Depth (ft): 1 - 2.5
Sample No.: S-1
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
3/4"	100.0		
3/8"	95.4		
#4	94.8		
#10	90.8		
#20	87.8		
#40	85.8		
#60	84.3		
#100	82.0		
#200	76.5		

Dry Mass of sample, g: 42.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	5.2
Coarse Sand, #4 to #10 sieve	4.0
Medium Sand, #10 to #40	5.0
Fine Sand, #40 to #200	9.3
Fines <#200	76.5

USCS	CL	Liquid Limit	44	D90	1.592	D50		D10	
AASHTO	A-7-6	Plastic Limit	26	D85	0.320	D30		Cu	
USCS Group Name	Lean clay with sand	Plasticity Index	18	D60		D15		Cc	

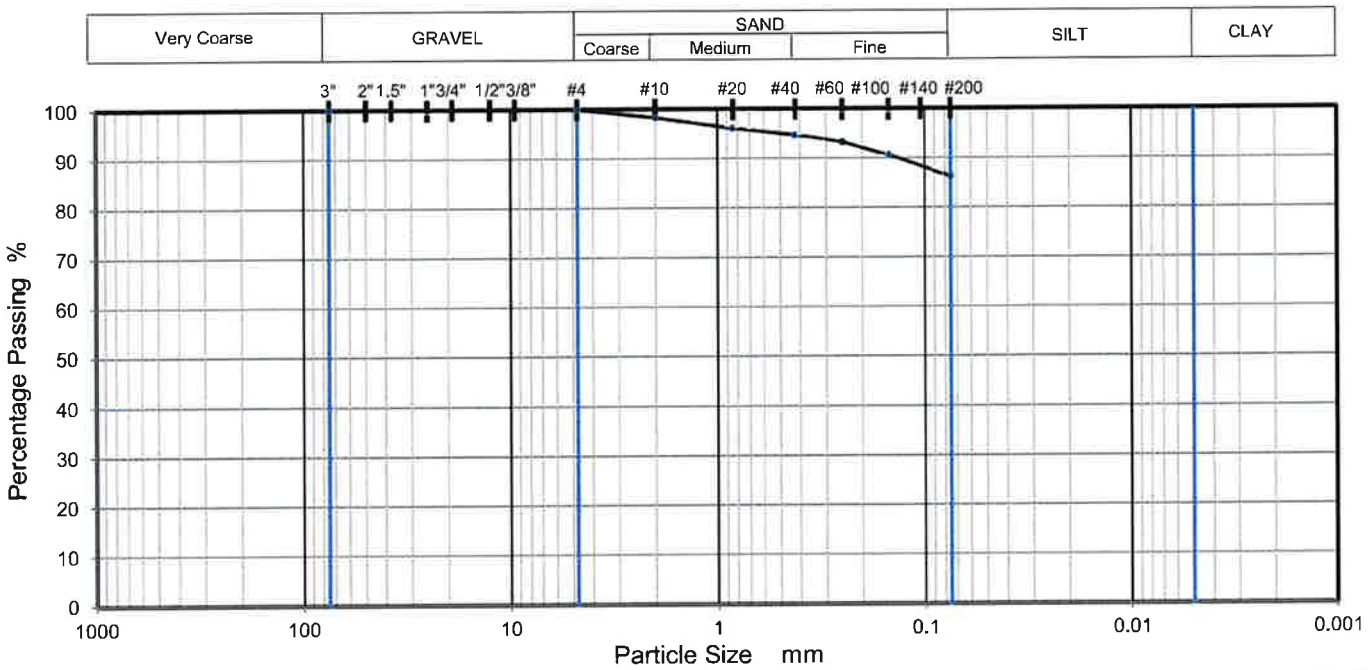
Project: Warrenton Data Center
Client:
Sample Description: Lean Clay with Sand Light Brown
Sample Source: B-15

Project No.: 01:31153
Depth (ft): 1 - 2.5
Sample No.: S-1
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.3		
#20	96.1		
#40	94.7		
#60	93.4		
#100	90.7		
#200	86.3		

Dry Mass of sample, g: 43.6

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.7
Medium Sand, #10 to #40	3.6
Fine Sand, #40 to #200	8.4
Fines <#200	86.3

USCS	MH	Liquid Limit	51	D90	0.134	D50		D10	
AASHTO	A-7-5	Plastic Limit	30	D85		D30		Cu	
USCS Group Name	Elastic silt	Plasticity Index	21	D60		D15		Cc	

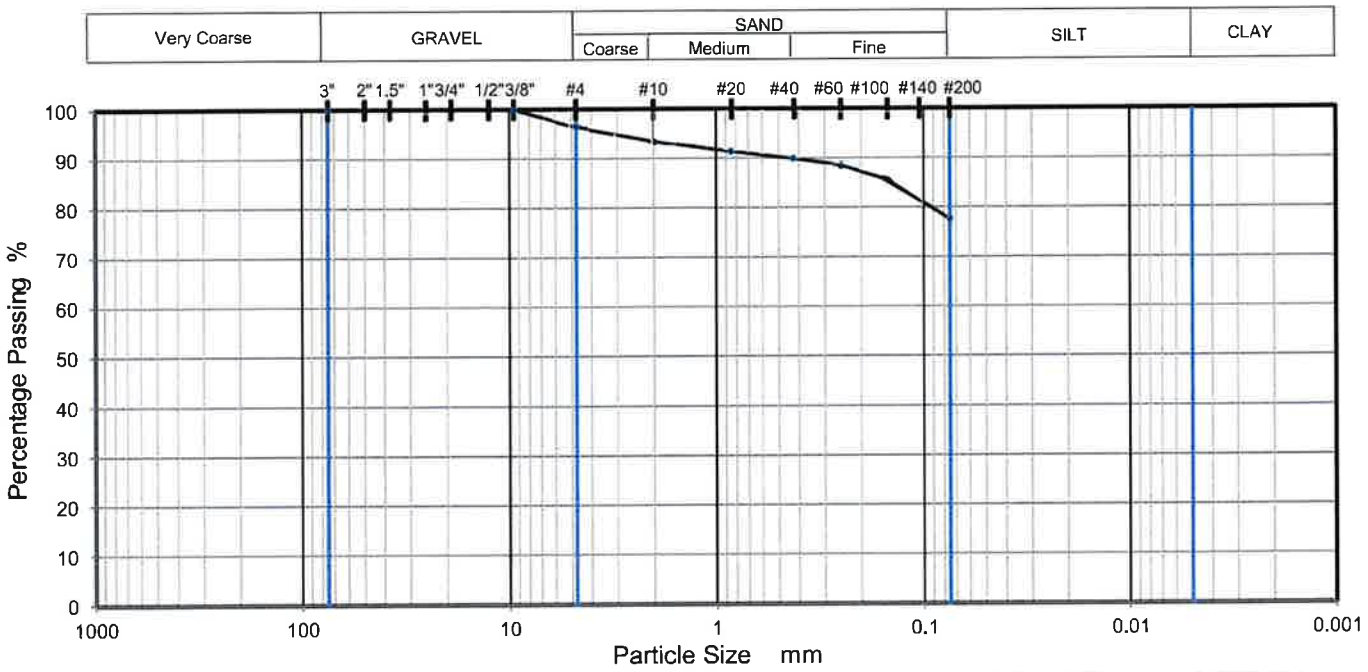
Project: Warrenton Data Center
Client:
Sample Description: Elastic Silt Trace Mica Light Brown
Sample Source: B-14

Project No.: 01:31153
Depth (ft): 3.5 - 5
Sample No.: S-2
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
3/8"	100.0		
#4	96.5		
#10	93.5		
#20	91.4		
#40	89.9		
#60	88.6		
#100	85.7		
#200	77.6		

Dry Mass of sample, g: 41.7

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	3.5
Coarse Sand, #4 to #10 sieve	3.0
Medium Sand, #10 to #40	3.6
Fine Sand, #40 to #200	12.3
Fines <#200	77.6

USCS	ML	Liquid Limit	46	D90	0.445	D50		D10	
AASHTO	A-7-6	Plastic Limit	28	D85	0.141	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	18	D60		D15		Cc	

Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Yellowish Light Brown
Sample Source: B-13

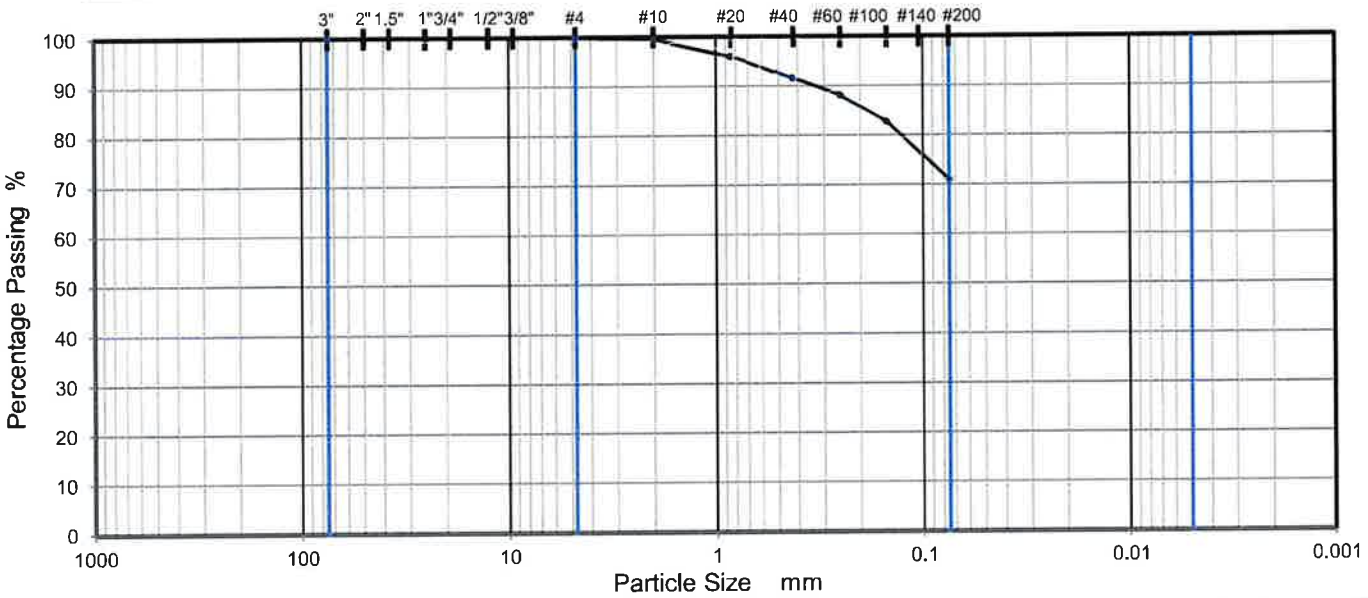
Project No.: 01:31153
Depth (ft): 3.5 - 5
Sample No.: S-2
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.6		
#20	96.1		
#40	91.7		
#60	88.2		
#100	82.9		
#200	71.0		

Dry Mass of sample, g: 40.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.4
Medium Sand, #10 to #40	7.9
Fine Sand, #40 to #200	20.7
Fines <#200	71.0

USCS	ML	Liquid Limit	44	D90	0.328	D50		D10	
AASHTO	A-7-6	Plastic Limit	28	D85	0.184	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	16	D60		D15		Cc	

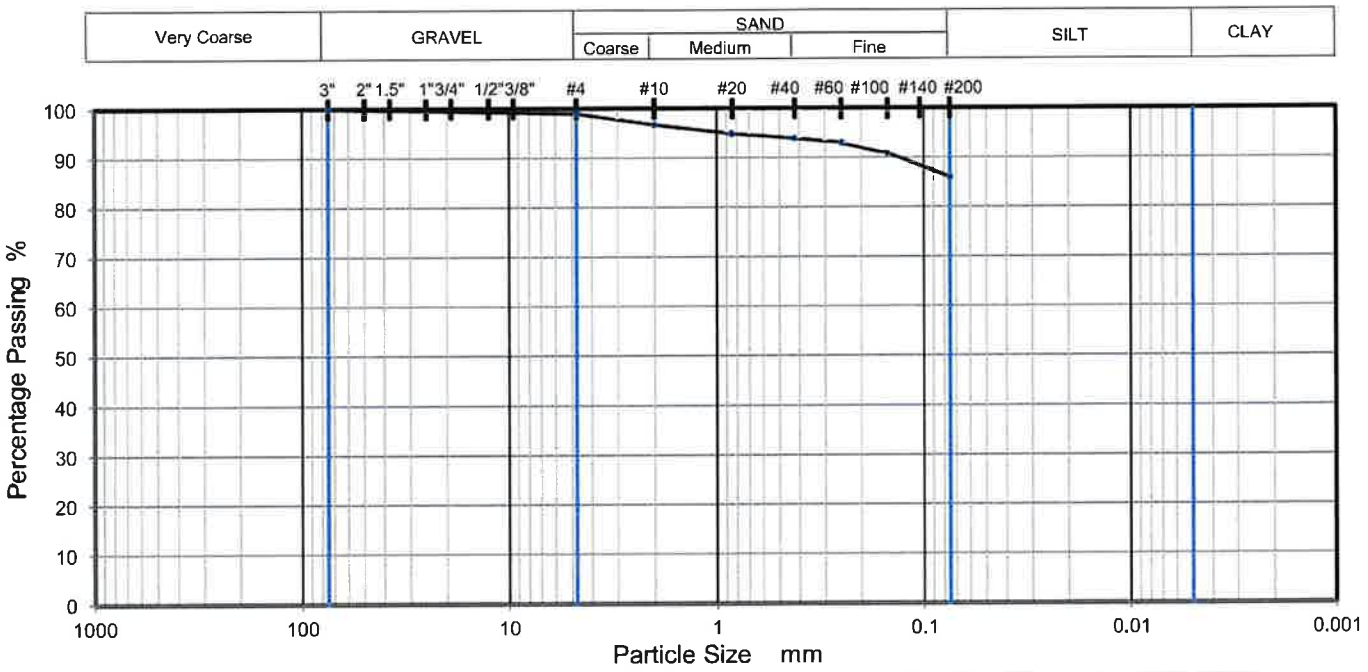
Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Yellow Light Brown
Sample Source: B-03

Project No.: 01:31153
Depth (ft): 3.5 - 5
Sample No.: S-2
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	99.0		
#10	96.7		
#20	94.9		
#40	93.9		
#60	93.0		
#100	90.9		
#200	86.0		

Dry Mass of sample, g: 42.5

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	1.0
Coarse Sand, #4 to #10 sieve	2.3
Medium Sand, #10 to #40	2.8
Fine Sand, #40 to #200	7.9
Fines <#200	86.0

USCS	CH	Liquid Limit	60	D90	0.132	D50		D10	
AASHTO	A-7-6	Plastic Limit	28	D85		D30		Cu	
USCS Group Name	Fat clay	Plasticity Index	32	D60		D15		Cc	

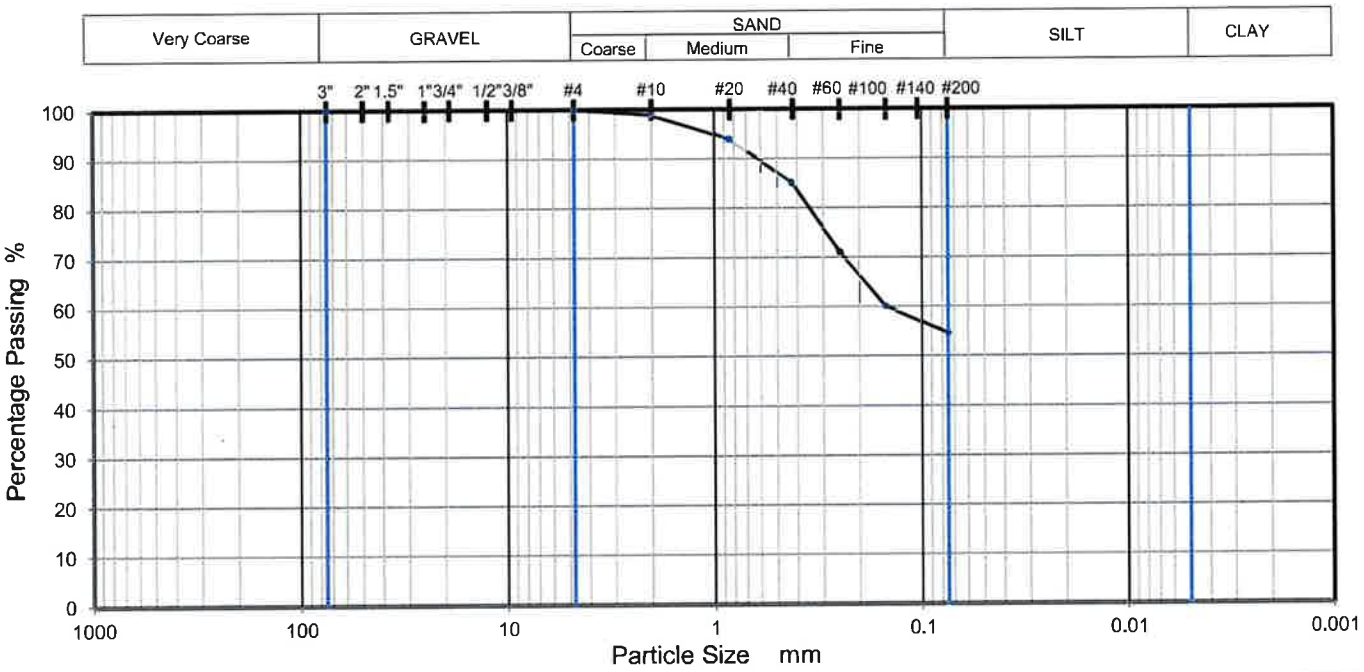
Project: Warrenton Data Center
Client:
Sample Description: Fat Clay Light Brown
Sample Source: B-07

Project No.: 01:31153
Depth (ft): 6 - 7.5
Sample No.: S-3
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.9		
#20	94.1		
#40	85.3		
#60	71.2		
#100	60.1		
#200	54.6		

Dry Mass of sample, g: 41.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.1
Medium Sand, #10 to #40	13.6
Fine Sand, #40 to #200	30.7
Fines <#200	54.6

USCS	ML	Liquid Limit	NP	D90	0.615	D50		D10	
AASHTO	A-4	Plastic Limit	NP	D85	0.420	D30		Cu	
USCS Group Name	Sandy silt	Plasticity Index	NP	D60	0.148	D15		Cc	

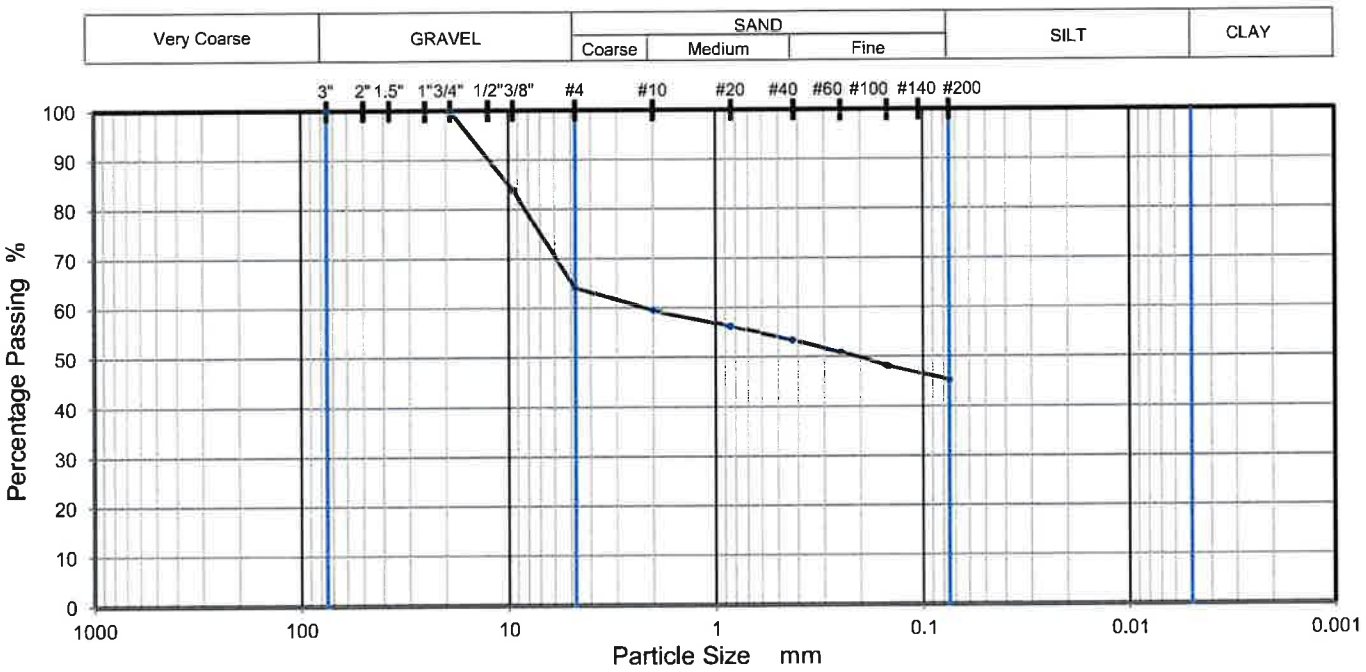
Project: Warrenton Data Center
Client:
Sample Description: Sandy Silt Trace Mica Yellowish Light Brown
Sample Source: B-16

Project No.: 01:31153
Depth (ft): 6 - 7.5
Sample No.: S-3
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
3/4"	100.0		
3/8"	83.9		
#4	64.1		
#10	59.5		
#20	56.3		
#40	53.5		
#60	51.0		
#100	48.3		
#200	45.3		

Dry Mass of sample, g: 41.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	35.9
Coarse Sand, #4 to #10 sieve	4.6
Medium Sand, #10 to #40	6.0
Fine Sand, #40 to #200	8.2
Fines <#200	45.3

USCS	GM	Liquid Limit	61	D90	12.350	D50	0.207	D10	
AASHTO	A-7-5	Plastic Limit	38	D85	9.961	D30		Cu	
USCS Group Name	Silty gravel with sand	Plasticity Index	23	D60	2.197	D15		Cc	

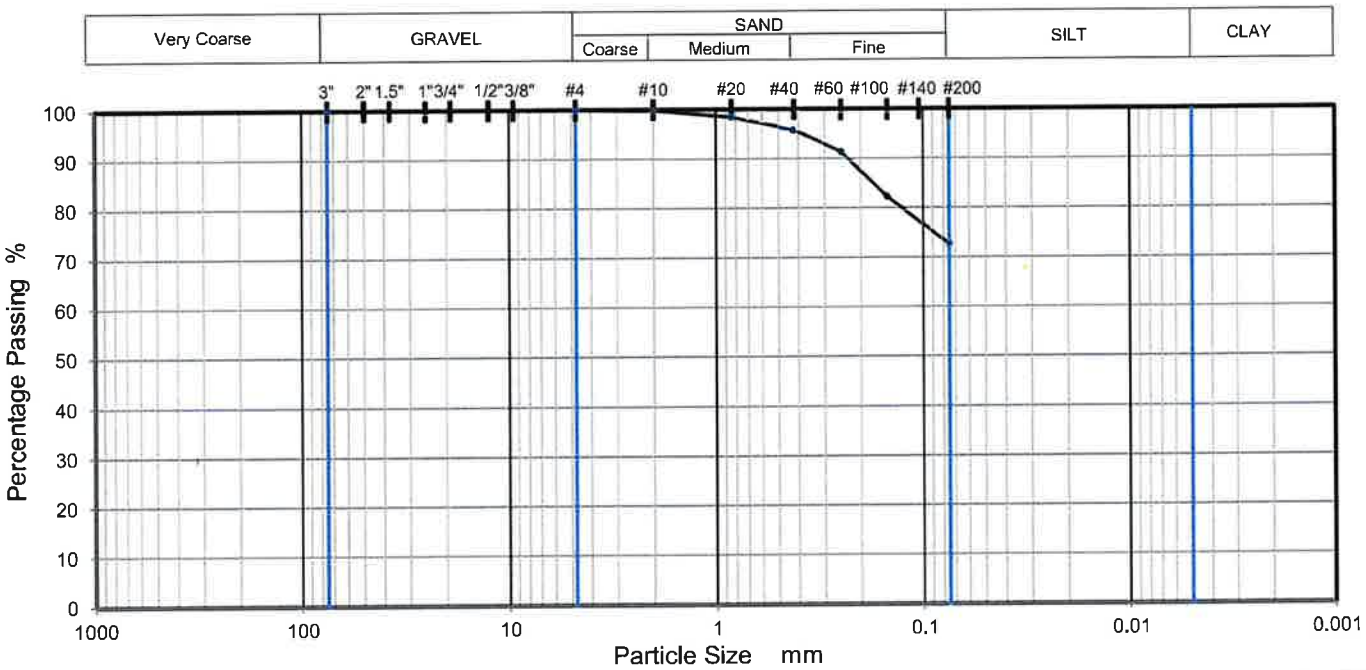
Project: Warrenton Data Center
Client:
Sample Description: Silty Gravel with Sand Trace Mica Yellowish Brown
Sample Source: B-19

Project No.: 01:31153
Depth (ft): 6 - 7.5
Sample No.: S-3
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.8		
#20	98.5		
#40	95.9		
#60	91.5		
#100	82.4		
#200	72.7		

Dry Mass of sample, g: 41.7

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.2
Medium Sand, #10 to #40	3.9
Fine Sand, #40 to #200	23.2
Fines <#200	72.7

USCS	ML	Liquid Limit	NP	D90	0.230	D50		D10	
AASHTO	A-4	Plastic Limit	NP	D85	0.174	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	NP	D60		D15		Cc	

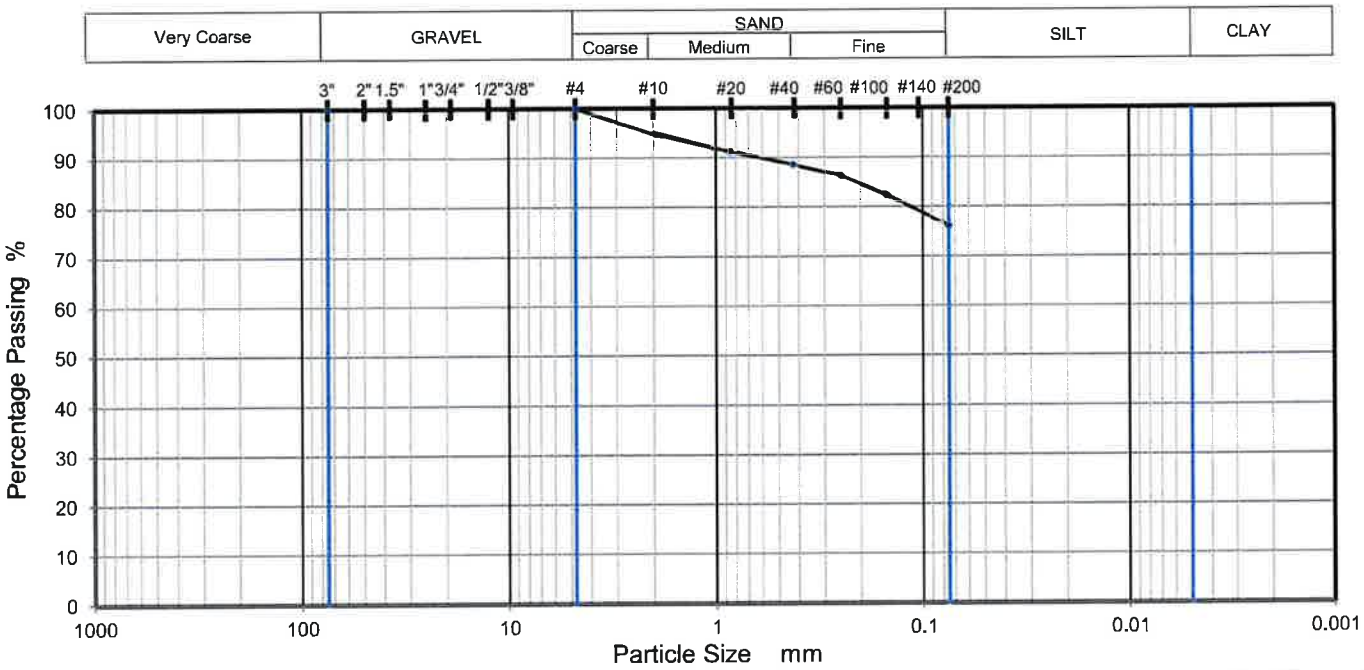
Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Yellow Light Brown
Sample Source: B-09

Project No.: 01:31153
Depth (ft): 8.5 - 10
Sample No.: S-4
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	94.8		
#20	91.2		
#40	88.6		
#60	86.4		
#100	82.4		
#200	76.2		

Dry Mass of sample, g: 44.4

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	5.2
Medium Sand, #10 to #40	6.2
Fine Sand, #40 to #200	12.4
Fines <#200	76.2

USCS	MH	Liquid Limit	63	D90	0.617	D50		D10	
AASHTO	A-7-5	Plastic Limit	38	D85	0.209	D30		Cu	
USCS Group Name	Elastic silt with sand	Plasticity Index	25	D60		D15		Cc	

Project: Warrenton Data Center
Client:
Sample Description: Elastic Silt with Sand Trace Mica Yellowish Light Brown
Sample Source: B-20

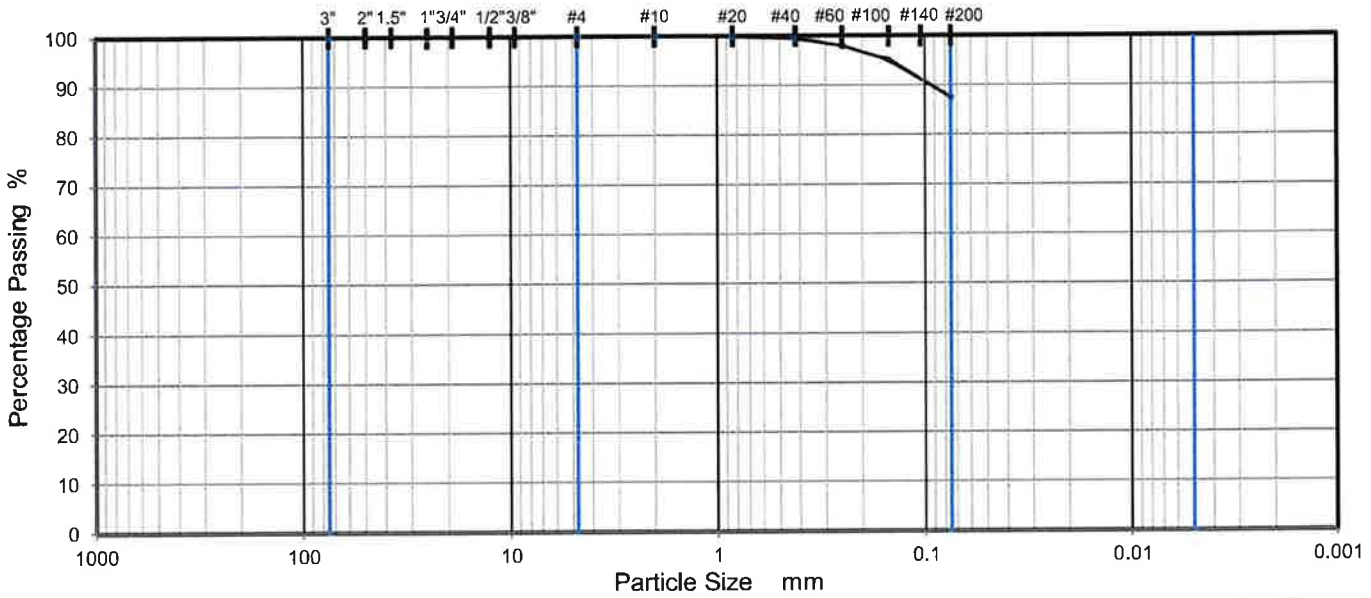
Project No.: 01:31153
Depth (ft): 8.5 - 10
Sample No.: S-4
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.5		
#60	98.1		
#100	95.2		
#200	87.5		

Dry Mass of sample, g: 41.8

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.0
Medium Sand, #10 to #40	0.5
Fine Sand, #40 to #200	12.0
Fines <#200	87.5

USCS	ML	Liquid Limit	45	D90	0.094	D50		D10	
AASHTO	A-7-5	Plastic Limit	30	D85		D30		Cu	
USCS Group Name	Silt	Plasticity Index	15	D60		D15		Cc	

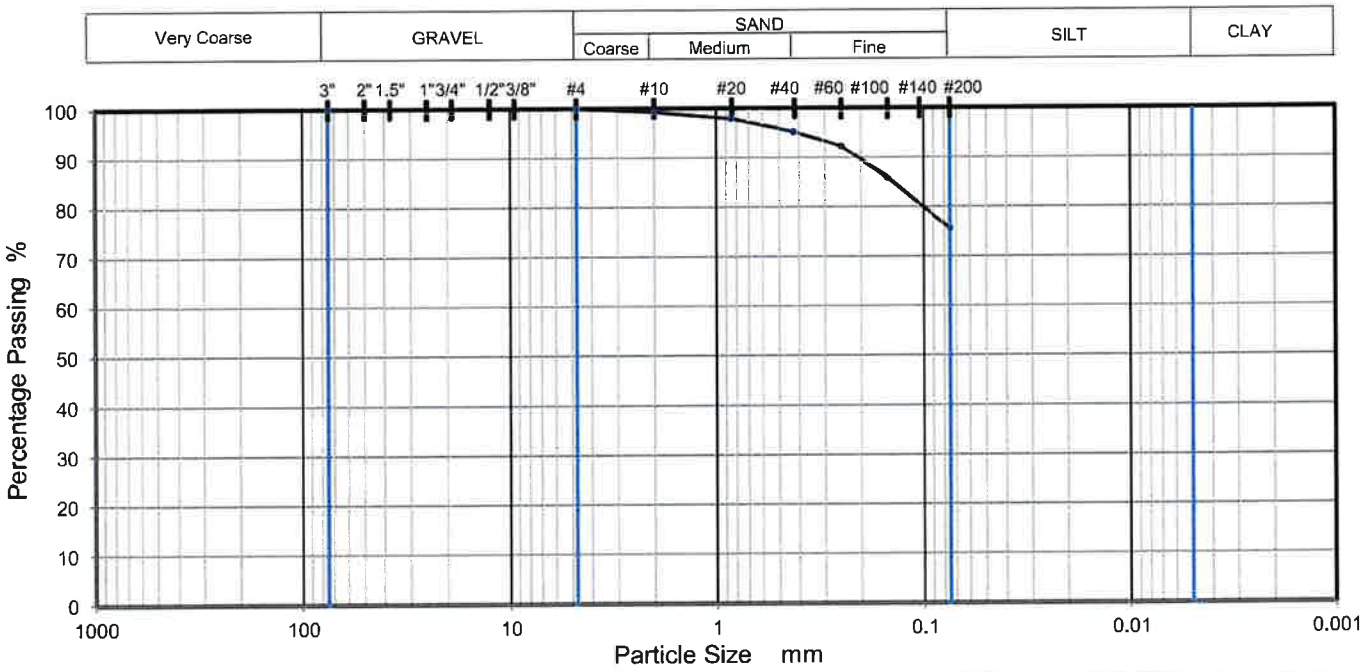
Project: Warrenton Data Center
Client:
Sample Description: Silt Trace Mica Yellow Light Brown
Sample Source: B-05

Project No.: 01:31153
Depth (ft): 33.5 - 35
Sample No.: S-9
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.3		
#20	97.9		
#40	95.3		
#60	92.4		
#100	86.1		
#200	75.6		

Dry Mass of sample, g: 41.5

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.7
Medium Sand, #10 to #40	4.0
Fine Sand, #40 to #200	19.7
Fines <#200	75.6

USCS	ML	Liquid Limit	NP	D90	0.206	D50		D10	
AASHTO	A-4	Plastic Limit	NP	D85	0.140	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	NP	D60		D15		Cc	

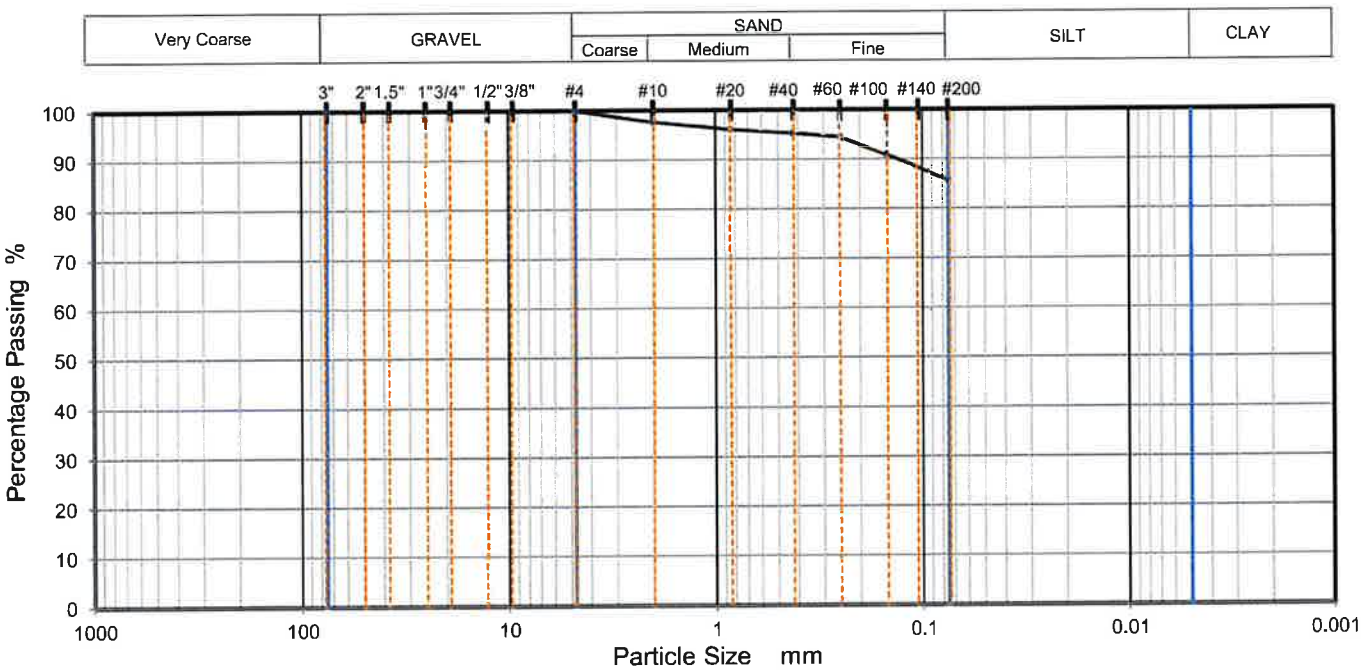
Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Yellow Light Brown
Sample Source: B-01

Project No.: 01:31153
Depth (ft): 38.5 - 39.75
Sample No.: S-10
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	97.6		
#20	96.1		
#40	95.3		
#60	94.5		
#100	91.0		
#200	85.7		

Dry Mass of sample, g: 53.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	2.4
Medium Sand, #10 to #40	2.3
Fine Sand, #40 to #200	9.6
Fines <#200	85.7

USCS	CL	Liquid Limit	49	D90	0.132	D50		D10	
AASHTO	A-7-6	Plastic Limit	27	D85		D30		Cu	
USCS Group Name	Lean clay	Plasticity Index	22	D60		D15		Cc	

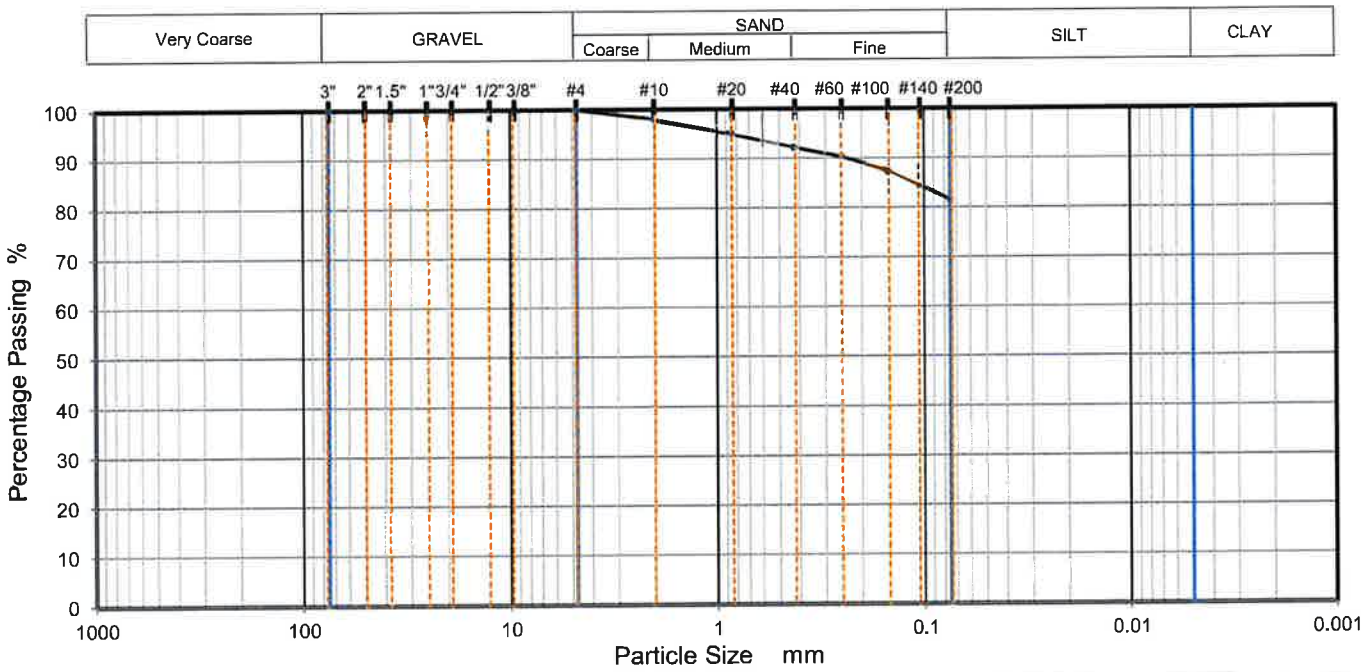
Project: Warrenton Data Center
Client:
Sample Description: Lean Clay with Sand Yellowisht Brown
Sample Source: B-14

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-186
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.1		
#20	95.1		
#40	92.4		
#60	90.3		
#100	87.6		
#200	81.6		

Dry Mass of sample, g: 64.5

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.9
Medium Sand, #10 to #40	5.7
Fine Sand, #40 to #200	10.8
Fines <#200	81.6

USCS	CL	Liquid Limit	45	D90	0.236	D50		D10	
AASHTO	A-7-6	Plastic Limit	21	D85	0.111	D30		Cu	
USCS Group Name	Lean clay with sand	Plasticity Index	24	D60		D15		Cc	

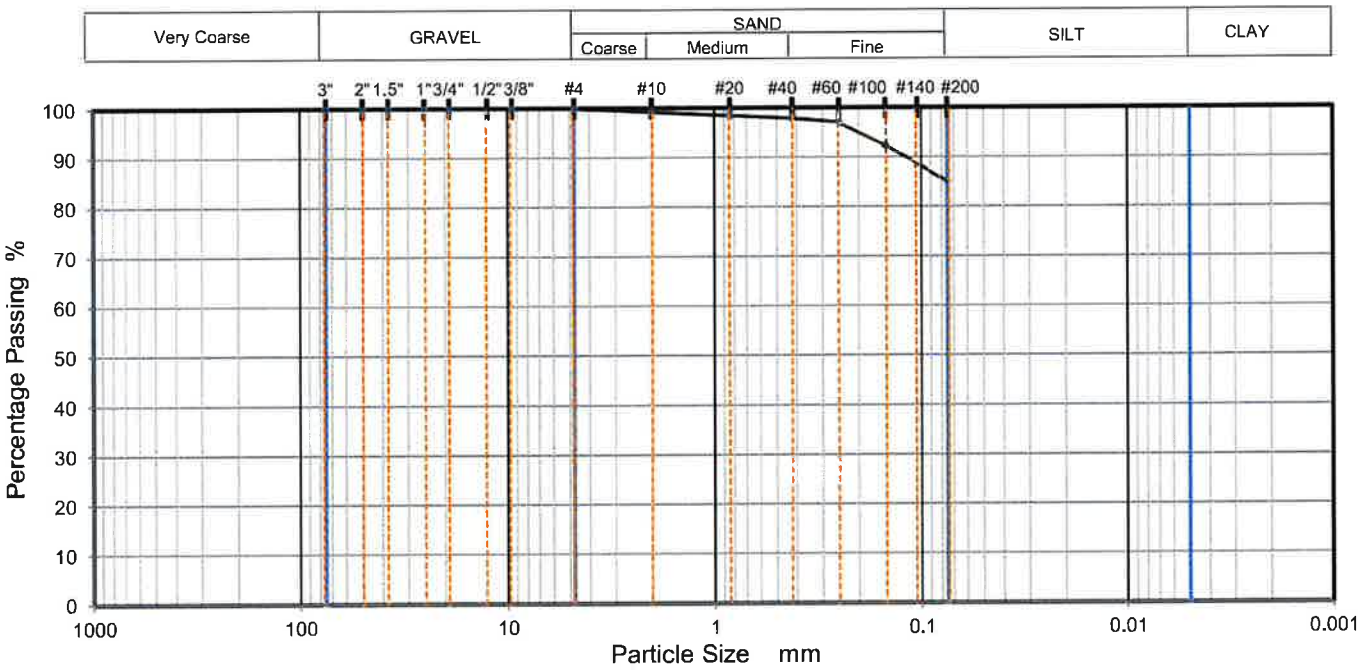
Project: Warrenton Data Center
Client:
Sample Description: Lean Clay with Sand Yellowish Brown
Sample Source: B-15

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-187
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.2		
#20	98.5		
#40	97.9		
#60	97.1		
#100	92.5		
#200	85.1		

Dry Mass of sample, g: 54.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.8
Medium Sand, #10 to #40	1.3
Fine Sand, #40 to #200	12.8
Fines <#200	85.1

USCS	ML	Liquid Limit	NP	D90	0.119	D50		D10	
AASHTO	A-4	Plastic Limit	NP	D85		D30		Cu	
USCS Group Name	Silt	Plasticity Index	NP	D60		D15		Cc	

Project: Warrenton Data Center
Client:
Sample Description: Silt Trace Mica Yellowish Brown
Sample Source: B-04

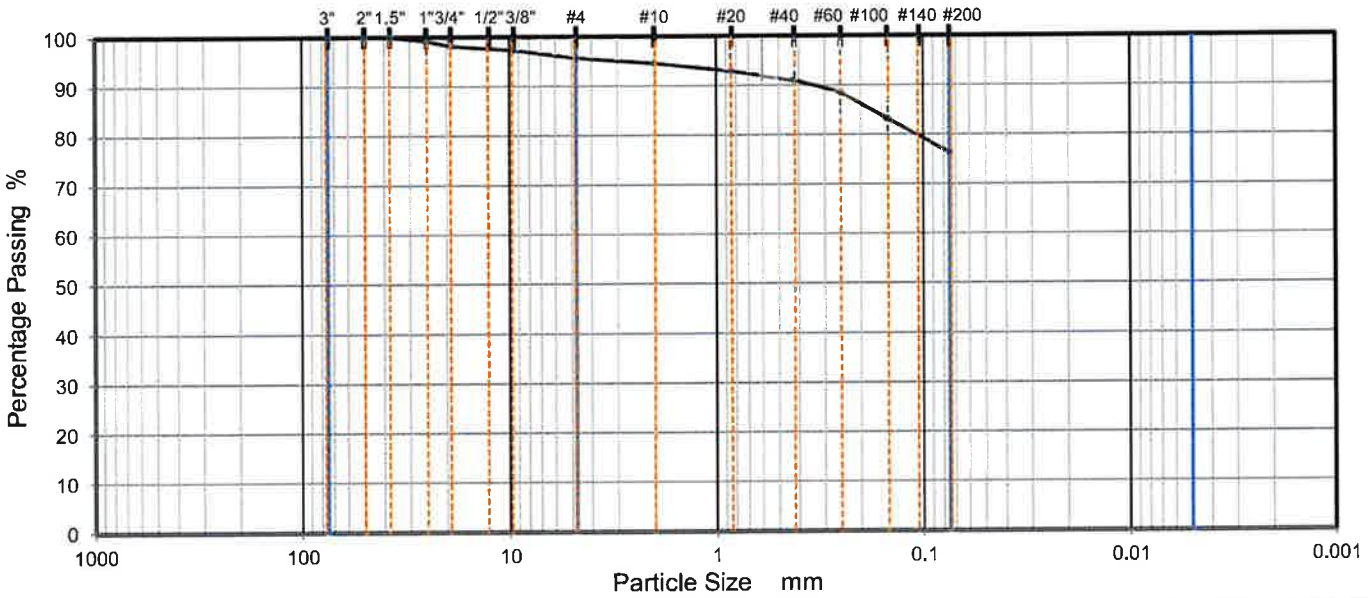
Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-188
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	99.2		
3/4"	98.2		
3/8"	97.3		
#4	95.7		
#10	94.6		
#20	92.9		
#40	91.1		
#60	88.6		
#100	83.4		
#200	76.4		

Dry Mass of sample, g: 5235.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	4.3
Coarse Sand, #4 to #10 sieve	1.1
Medium Sand, #10 to #40	3.5
Fine Sand, #40 to #200	14.7
Fines <#200	76.4

USCS	ML	Liquid Limit	49	D90	0.337	D50		D10	
AASHTO	A-7-6	Plastic Limit	28	D85	0.176	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	21	D60		D15		Cc	

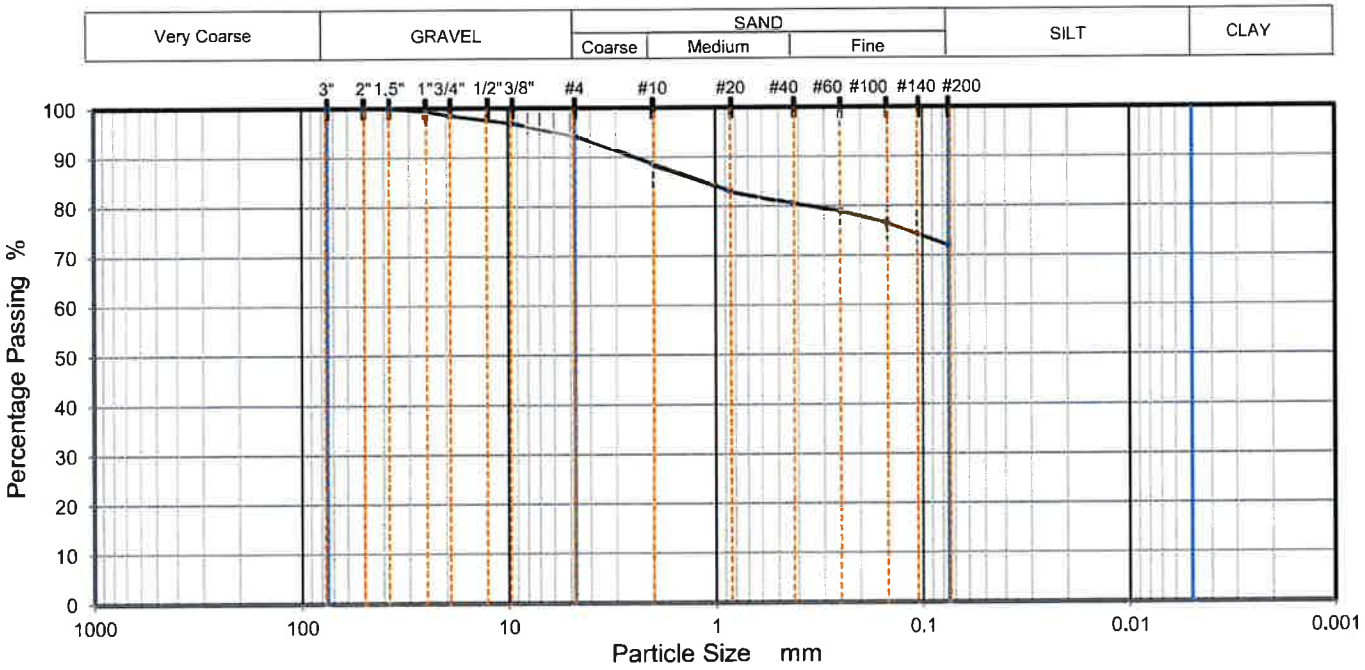
Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Brwon
Sample Source: B-09

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-189
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	99.4		
3/4"	98.5		
3/8"	96.9		
#4	94.4		
#10	88.7		
#20	83.1		
#40	80.6		
#60	79.0		
#100	76.7		
#200	72.0		

Dry Mass of sample, g: 10996.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	5.6
Coarse Sand, #4 to #10 sieve	5.7
Medium Sand, #10 to #40	8.1
Fine Sand, #40 to #200	8.6
Fines <#200	72.0

USCS	CH	Liquid Limit	55	D90	2.436	D50		D10	
AASHTO	A-7-6	Plastic Limit	24	D85	1.136	D30		Cu	
USCS Group Name	Fat clay with sand	Plasticity Index	31	D60		D15		Cc	

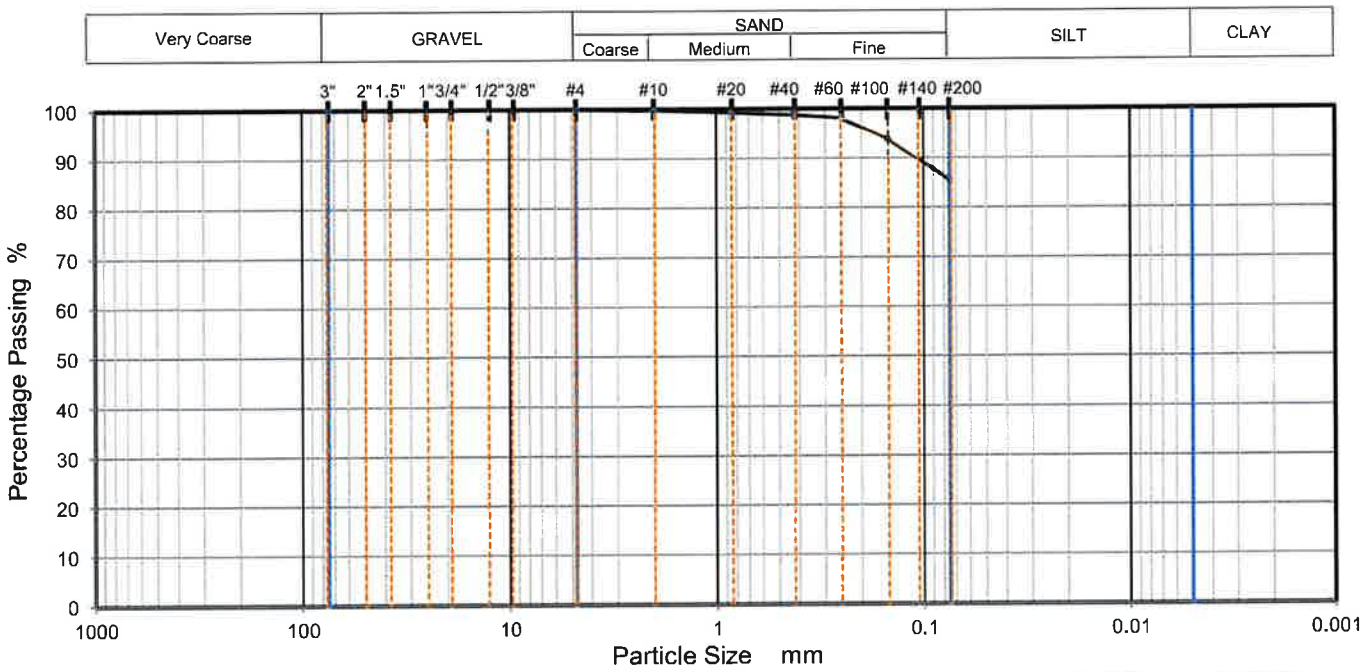
Project: Warrenton Data Center
Client:
Sample Description: Fat Clay with Sand Brown
Sample Source: B-19

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-190
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.8		
#20	99.3		
#40	98.8		
#60	98.1		
#100	94.0		
#200	85.6		

Dry Mass of sample, g: 54.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.2
Medium Sand, #10 to #40	1.0
Fine Sand, #40 to #200	13.2
Fines <#200	85.6

USCS	CL	Liquid Limit	39	D90	0.108	D50		D10	
AASHTO	A-6	Plastic Limit	18	D85		D30		Cu	
USCS Group Name	Lean clay	Plasticity Index	21	D60		D15		Cc	

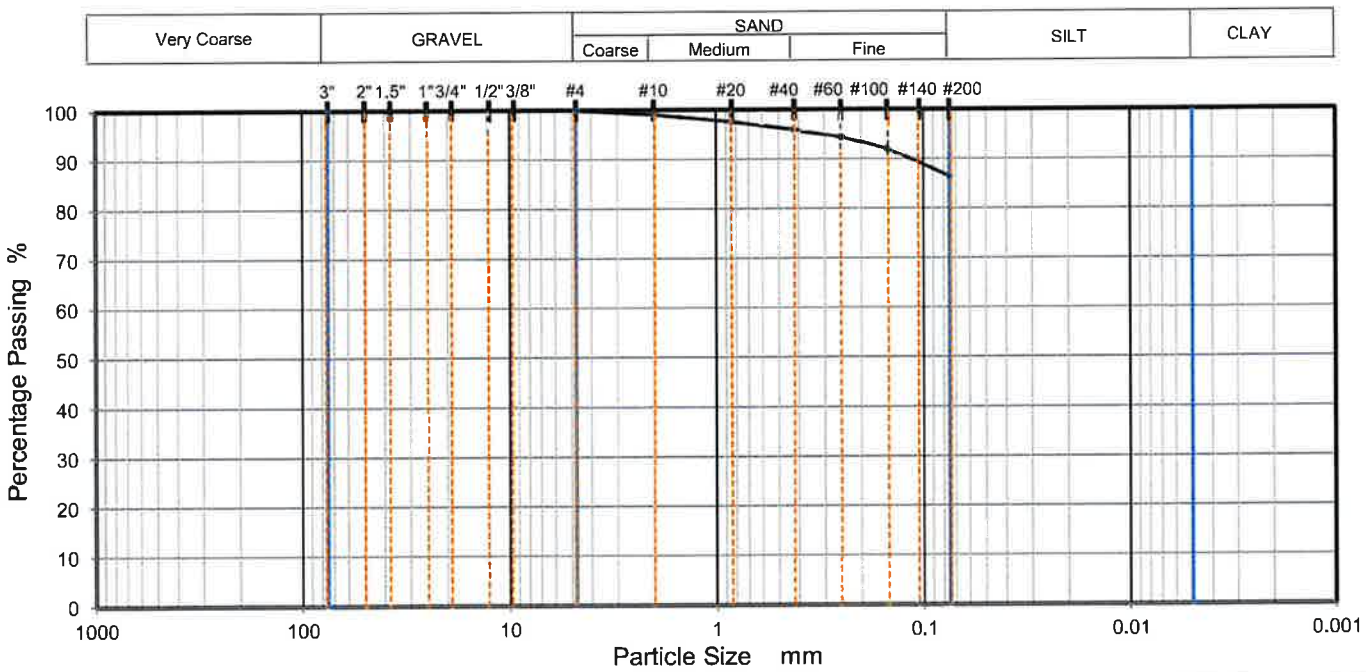
Project: Warrenton Data Center
Client:
Sample Description: Lean Clay Yellowish Brown
Sample Source: B-02

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-191
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.1		
#20	97.6		
#40	96.0		
#60	94.6		
#100	92.2		
#200	86.5		

Dry Mass of sample, g: 64.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.9
Medium Sand, #10 to #40	3.1
Fine Sand, #40 to #200	9.5
Fines <#200	86.5

USCS	CL	Liquid Limit	37	D90	0.115	D50		D10	
AASHTO	A-6	Plastic Limit	19	D85		D30		Cu	
USCS Group Name	Lean clay	Plasticity Index	18	D60		D15		Cc	

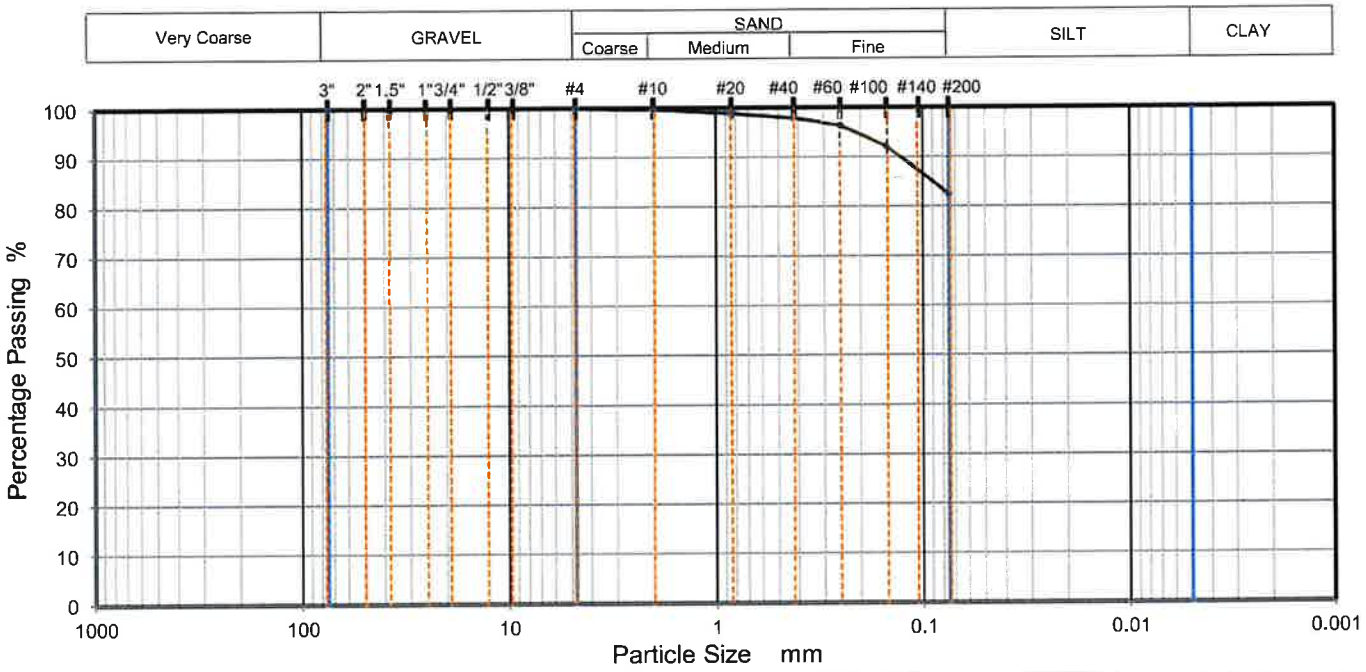
Project: Warrenton Data Center
Client:
Sample Description: Lean Clay Trace Mica Brown
Sample Source: B-07

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-193
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.7		
#20	98.9		
#40	97.9		
#60	96.5		
#100	92.3		
#200	82.5		

Dry Mass of sample, g: 51.5

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.3
Medium Sand, #10 to #40	1.8
Fine Sand, #40 to #200	15.4
Fines <#200	82.5

USCS	ML	Liquid Limit	41	D90	0.128	D50		D10	
AASHTO	A-7-6	Plastic Limit	27	D85	0.090	D30		Cu	
USCS Group Name	Silt with sand	Plasticity Index	14	D60		D15		Cc	

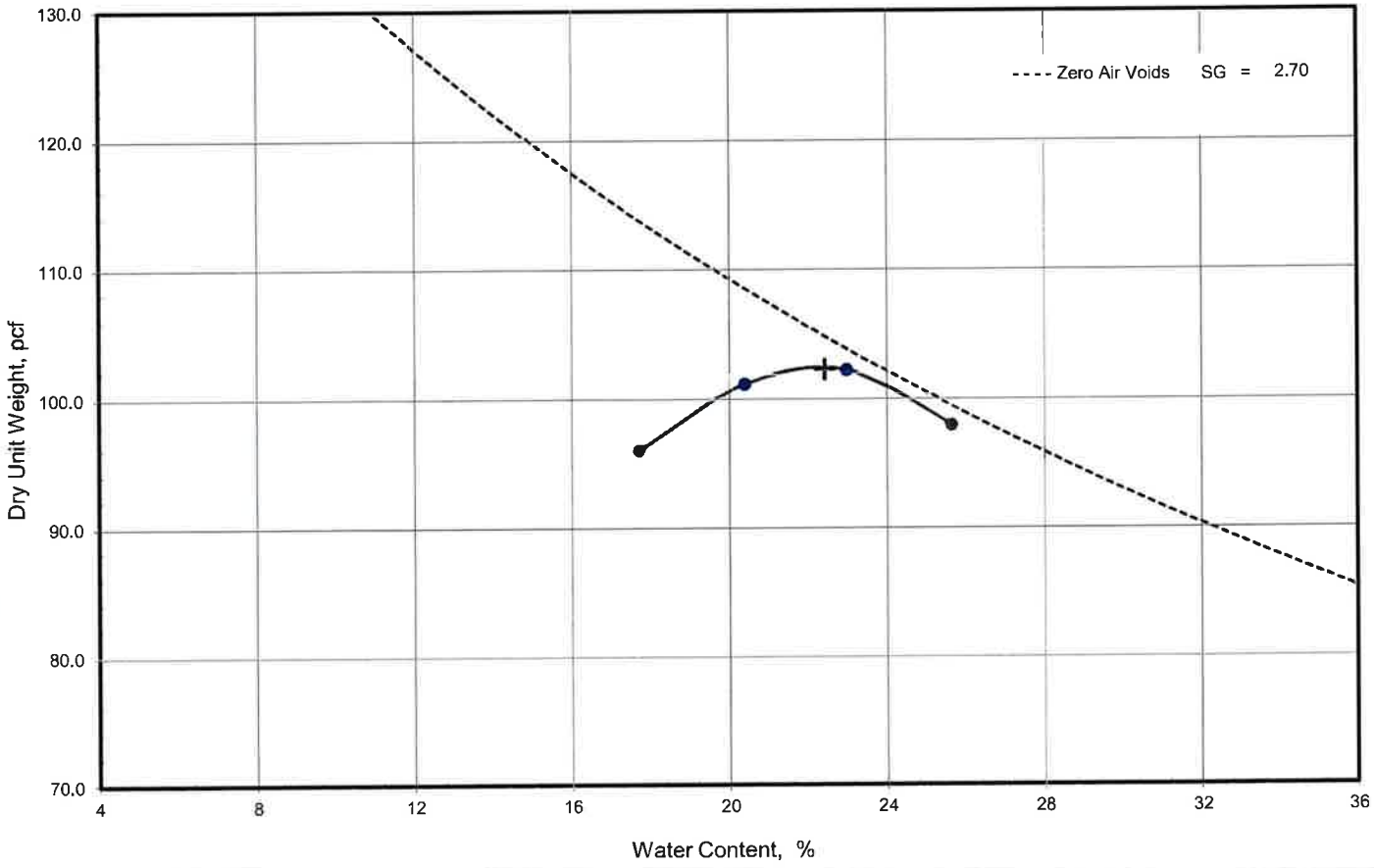
Project: Warrenton Data Center
Client:
Sample Description: Silt with Sand Trace Mica Yellowish Brown
Sample Source: B-11

Project No.: 01:31153
Depth (ft): 1 - 6
Sample No.: D3S-194
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**22.4**	%	Preparation	ASTM moist preparation
Maximum Dry Unit Weight		**102.3**	pcf	Type of rammer	Manual - 5.5lbf (24.5N)
				Test Specfication / Method	ASTM D698-12e2-method A
				Specific gravity - D854 water pycnometer	2.70 Assumed
Cumulative material retained on:	3/4 in. sieve	0.0	%	Coarse Aggregate Specific Gravity -	
	3/8 in. sieve	0.0	%		
	#4 sieve	0.0	%		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay with Sand Yellowisht Brown	5.6	49	22	85.7	CL	A-7-6

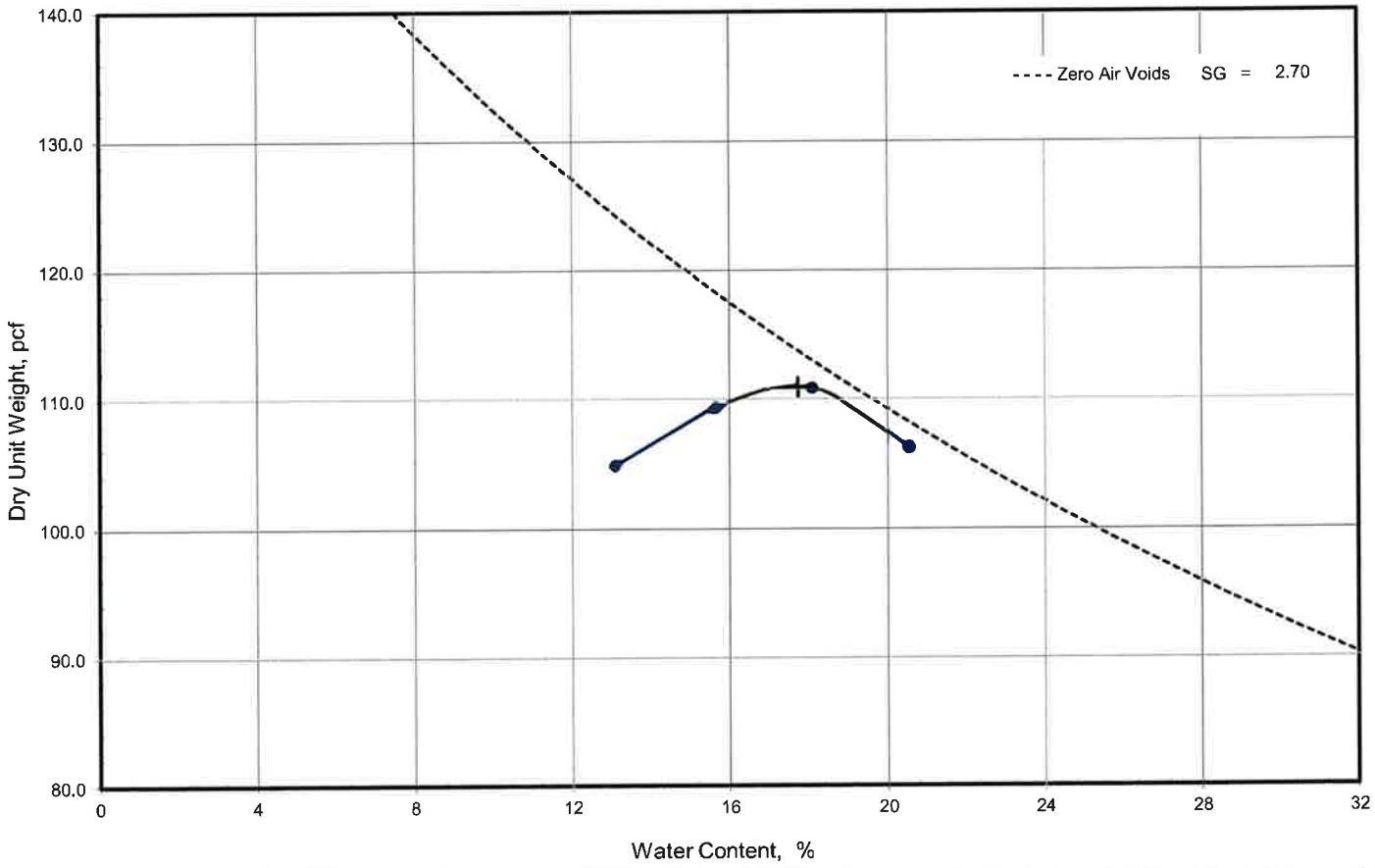
Project: Warrenton Data Center
Client:
Sample / Source B-14
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-186
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**17.7**	%
Maximum Dry Unit Weight		**111.0**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation
Type of rammer	Manual - 5.5lbf (24.5N)
Test Specfication / Method	ASTM D698-12e2-method A
Specific gravity - D854 water pycnometer	2.70 Assumed
Coarse Aggregate Specific Gravity -	

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay with Sand Yellowish Brown	5.6	45	24	81.6	CL	A-7-6

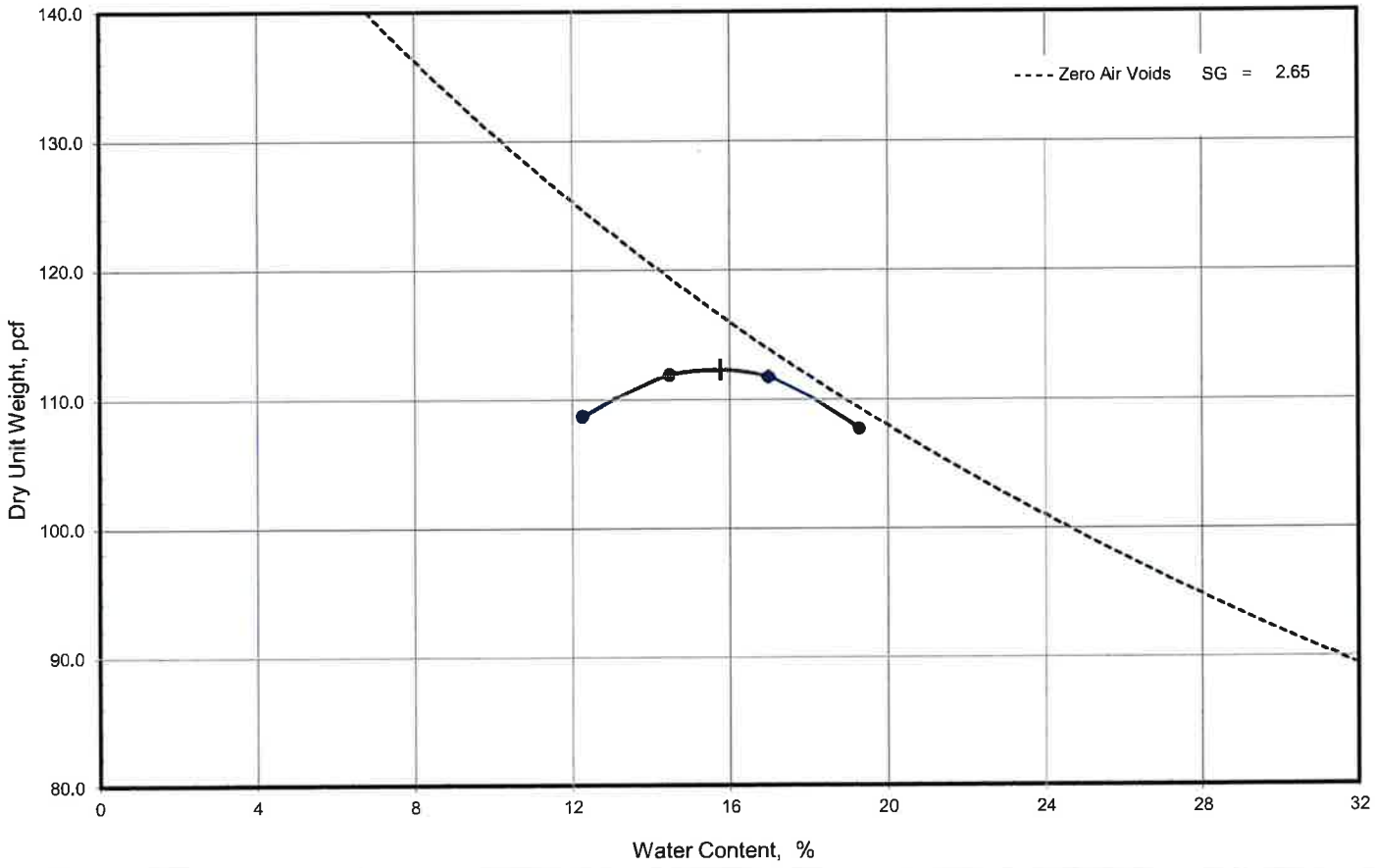
Project: Warrenton Data Center
Client:
Sample / Source B-15
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-187
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**15.8**	%
Maximum Dry Unit Weight		**112.3**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation
Type of rammer	Manual - 5.5lbf (24.5N)
Test Specfication / Method	ASTM D698-12e2-method A
Specific gravity - D854 water pycnometer	2.65 Assumed
Coarse Aggregate Specific Gravity -	

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Silt Trace Mica Yellowish Brown	2.2	NP	NP	85.1	ML	A-4

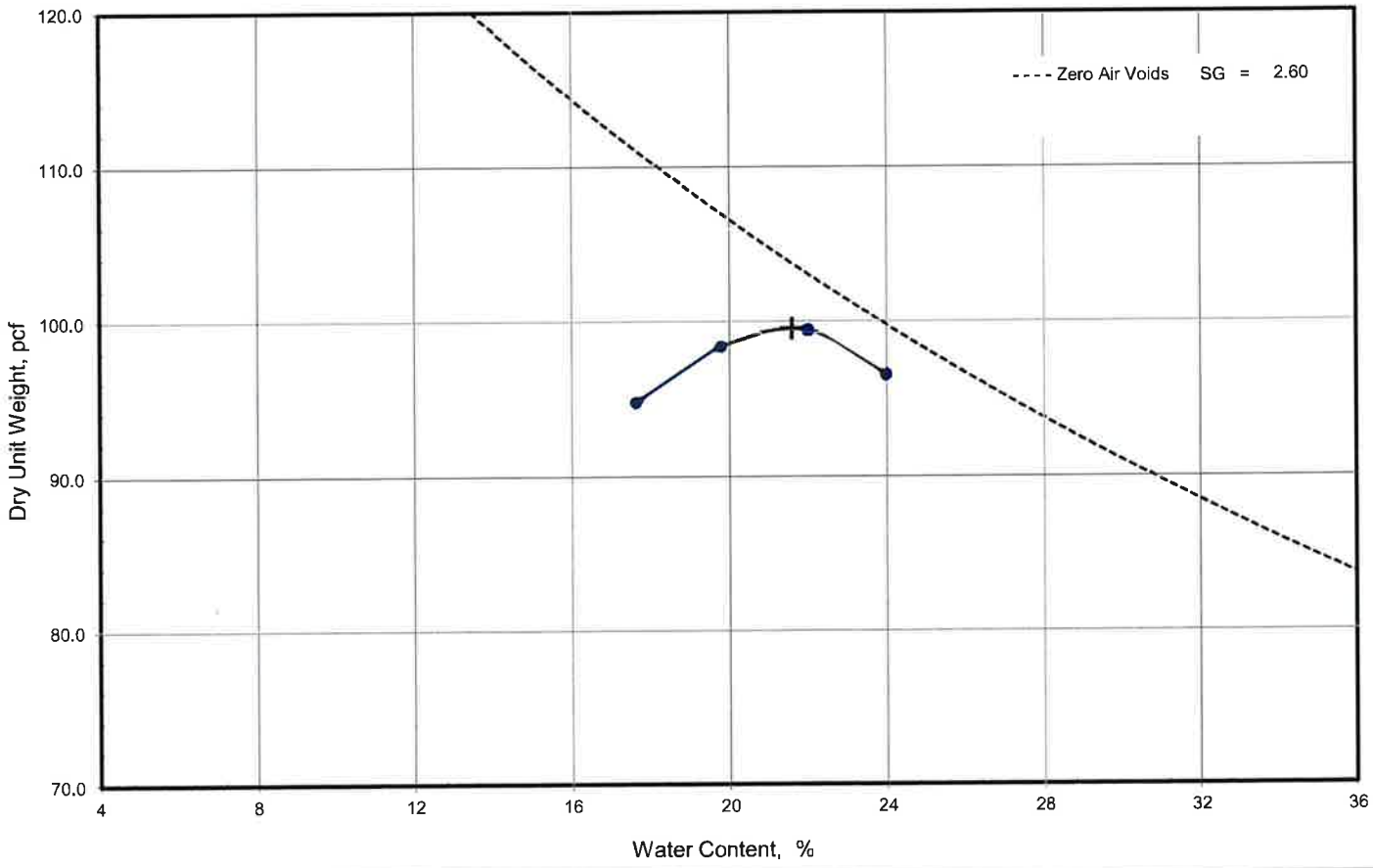
Project: Warrenton Data Center
Client:
Sample / Source B-04
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-188
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**21.6**	%
Maximum Dry Unit Weight		**99.5**	pcf
Cumulative material retained on:	3/4 in. sieve	1.8	%
	3/8 in. sieve	2.7	%
	#4 sieve	4.3	%

Preparation	ASTM moist preparation	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.60	Assumed
Coarse Aggregate Specific Gravity -		Assumed

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Silt with Sand Brown	5.2	49	21	76.4	ML	A-7-6

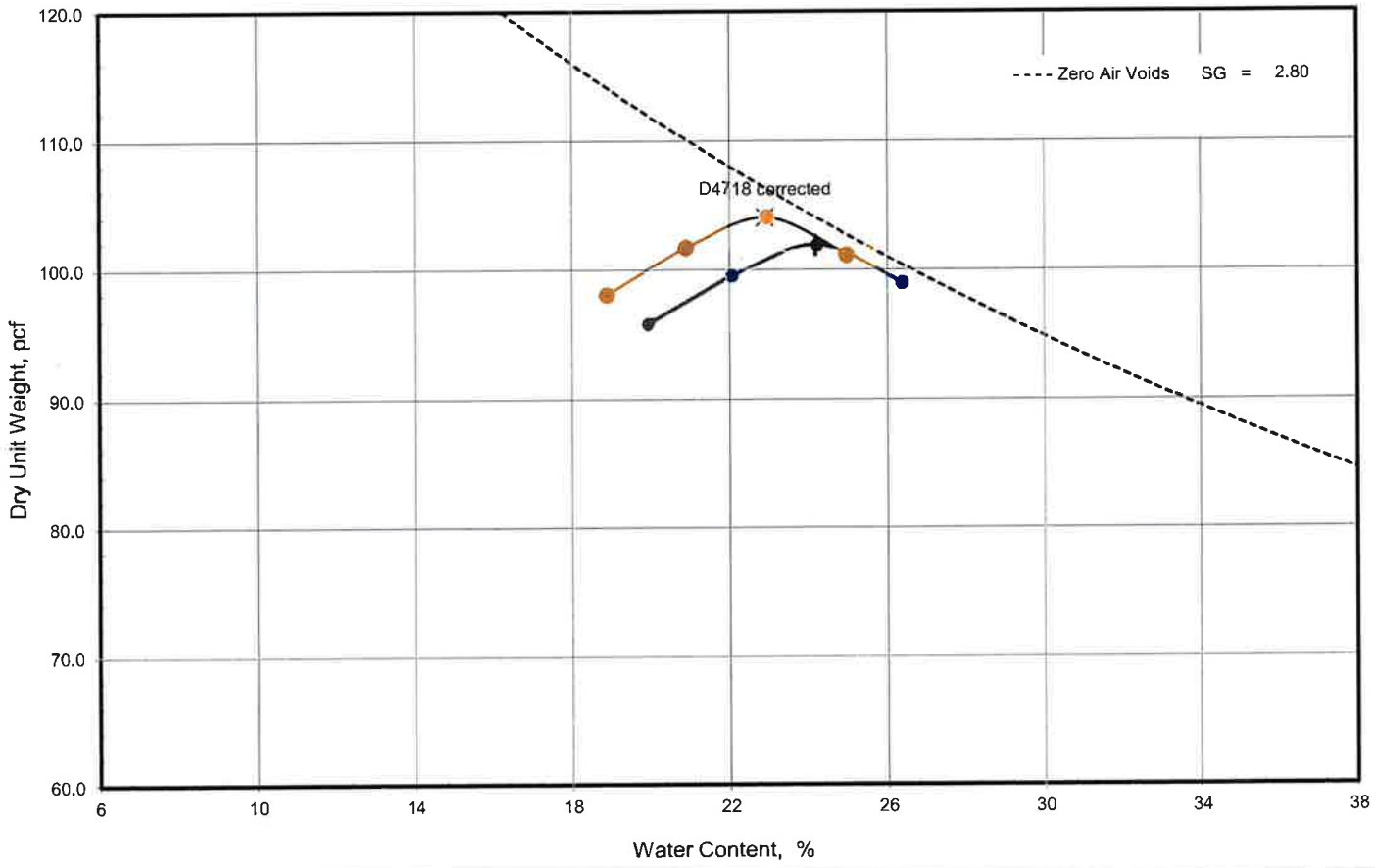
Project: Warrenton Data Center
Client:
Sample / Source B-09
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-189
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**24.2**	%
Maximum Dry Unit Weight		**101.9**	pcf
Corrected Opt. Moisture Content		22.9	%
Corrected Max. Dry Density		104.0	pcf
Cumulative material retained on:	3/4 in. sieve	1.5	%
	3/8 in. sieve	3.1	%
	#4 sieve	5.6	%

5.58 % retained on #4 sieve.

Preparation	ASTM moist preparation	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.80	Assumed
Coarse Aggregate Specific Gravity -	2.60	Assumed

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Fat Clay with Sand Brown	33.6	55	31	72.0	CH	A-7-6

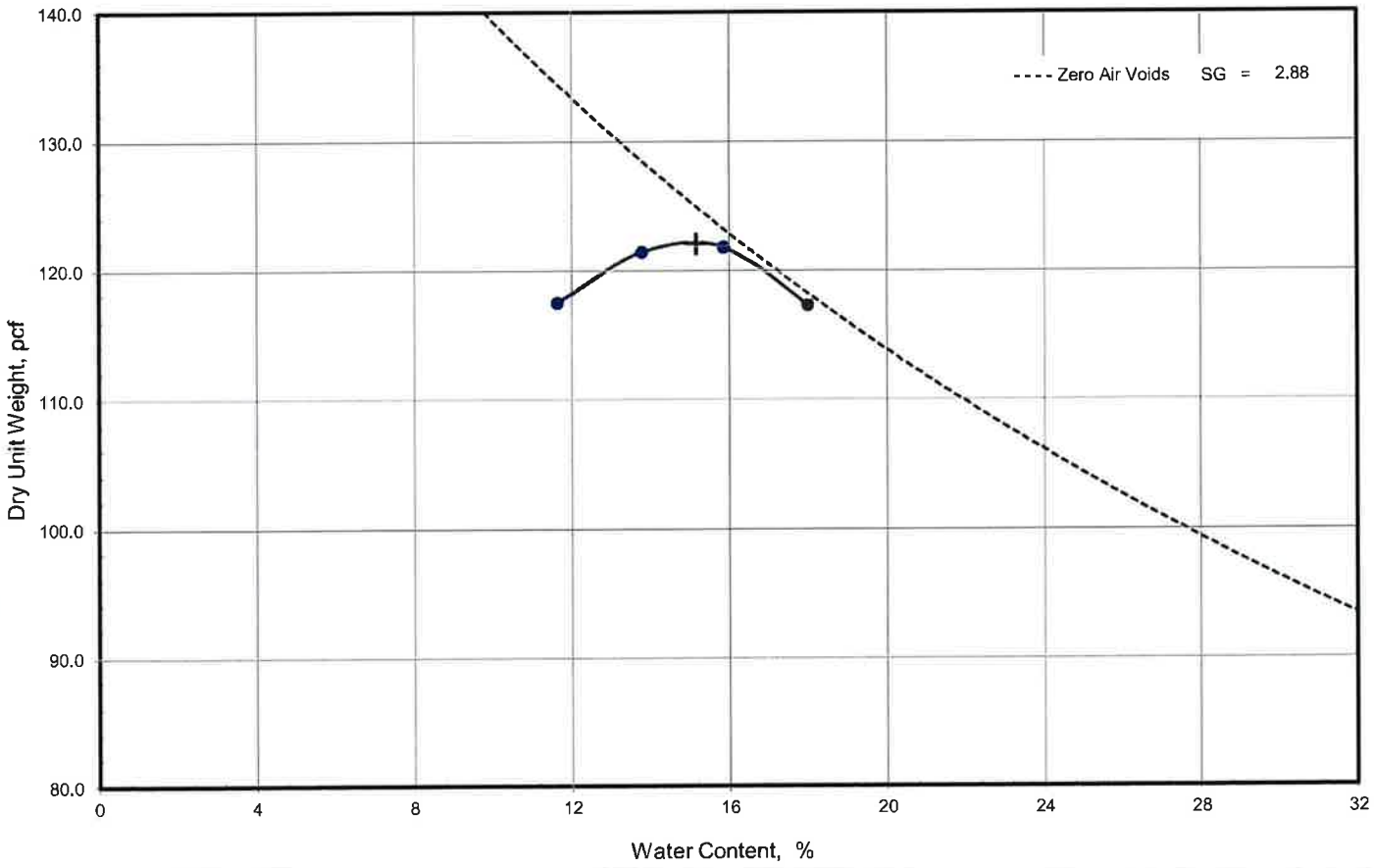
Project: Warrenton Data Center
Client:
Sample / Source B-19
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-190
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**15.2**	%
Maximum Dry Unit Weight		**122.1**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation
Type of rammer	Manual - 5.5lbf (24.5N)
Test Specfication / Method	ASTM D698-12e2-method A
Specific gravity - D854 water pycnometer	2.88 Historical
Coarse Aggregate Specific Gravity -	

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay Yellowish Brown	11.7	39	21	85.6	CL	A-6

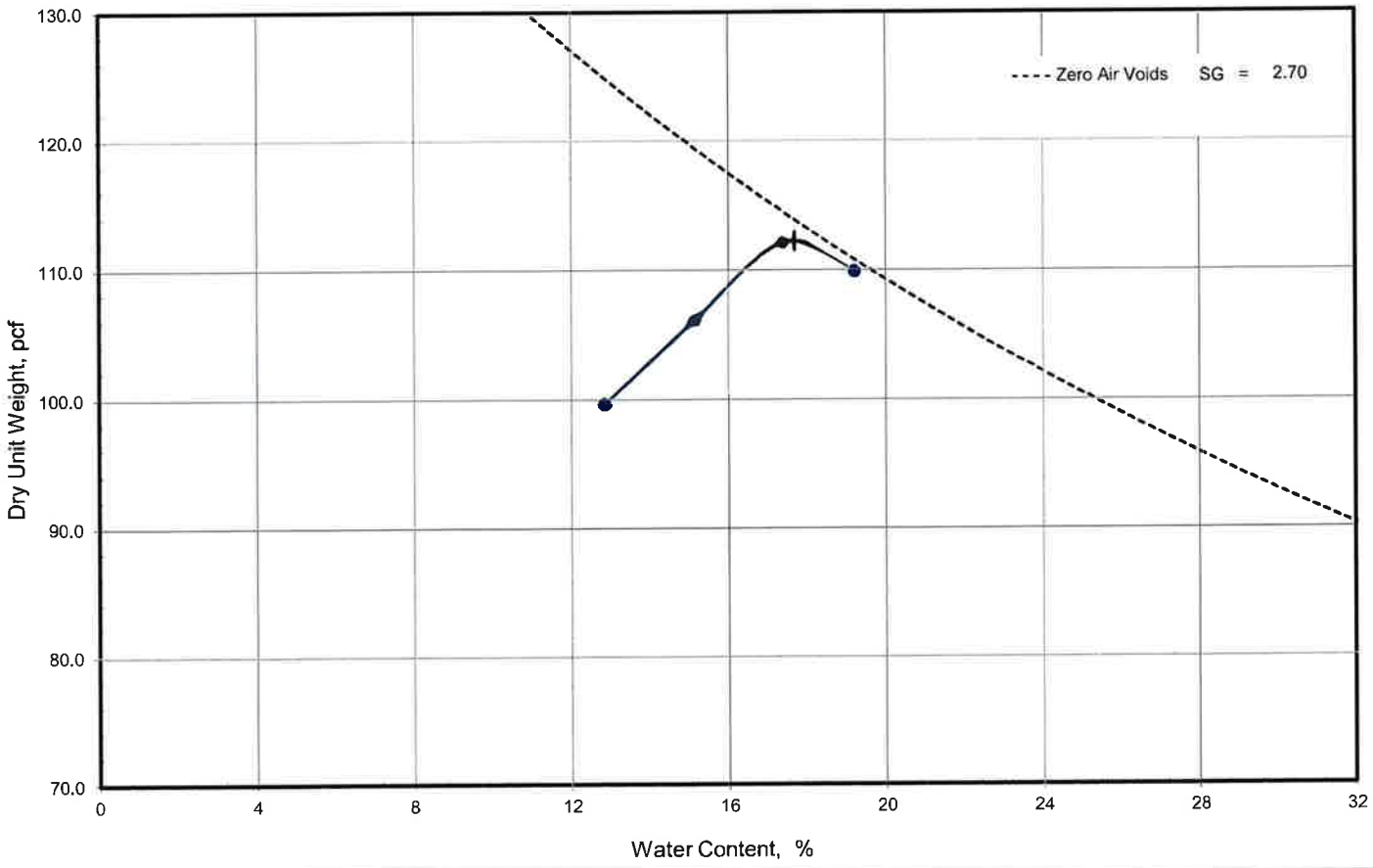
Project: Warrenton Data Center
Client:
Sample / Source B-02
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-191
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**17.7**	%
Maximum Dry Unit Weight		**112.2**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method		
Specific gravity - D854 water pycnometer	2.70	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay Trace Mica Brown	2.6	37	18	86.5	CL	A-6

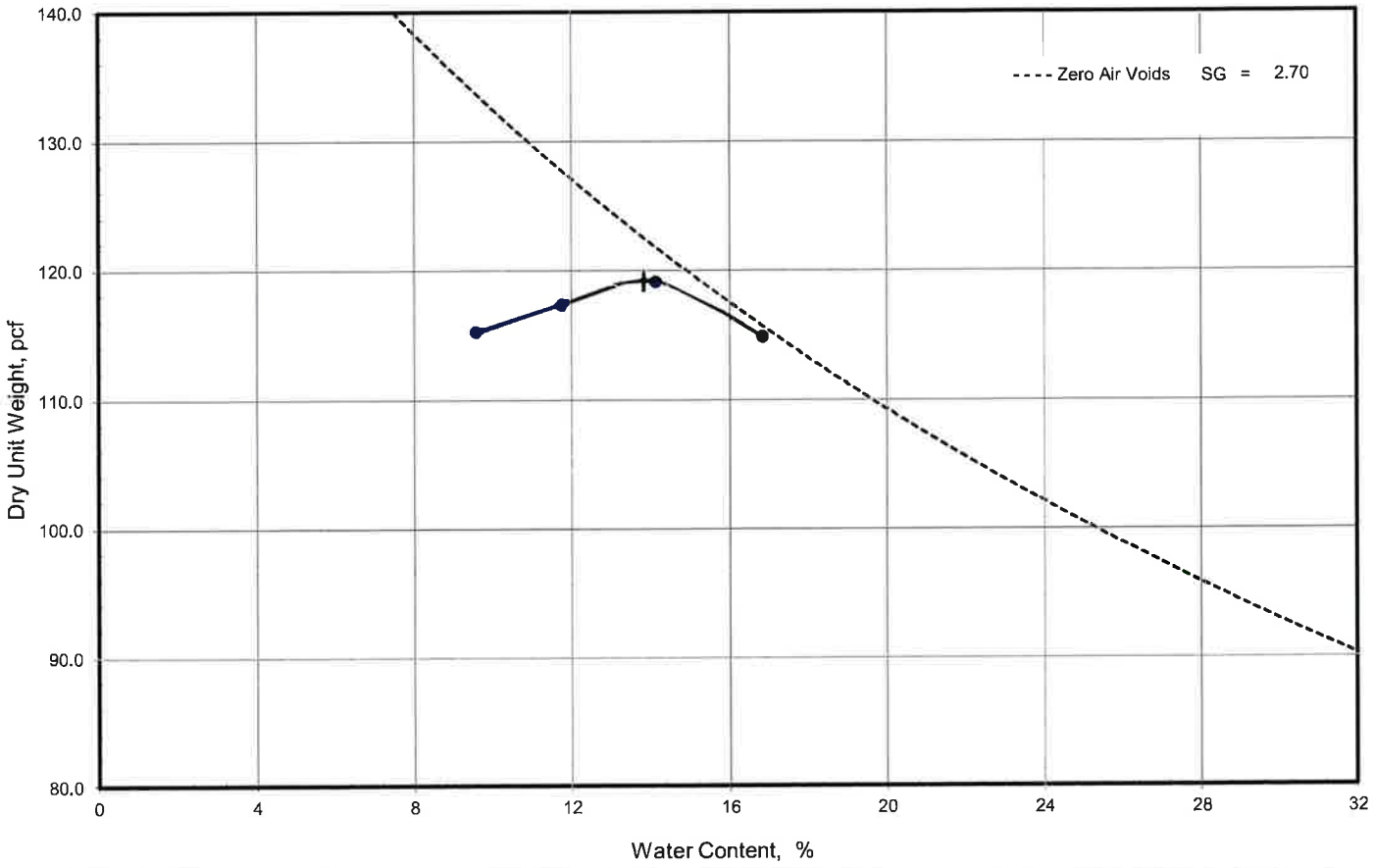
Project: Warrenton Data Center
Client:
Sample / Source B-07
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-193
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content		**13.8**	%
Maximum Dry Unit Weight		**119.2**	pcf
Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve	0.0	%
	#4 sieve	0.0	%

Preparation	ASTM moist preparation	
Type of rammer		
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.70	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Silt with Sand Trace Mica Yellowish Brown	2.1	41	14	82.5	ML	A-7-6

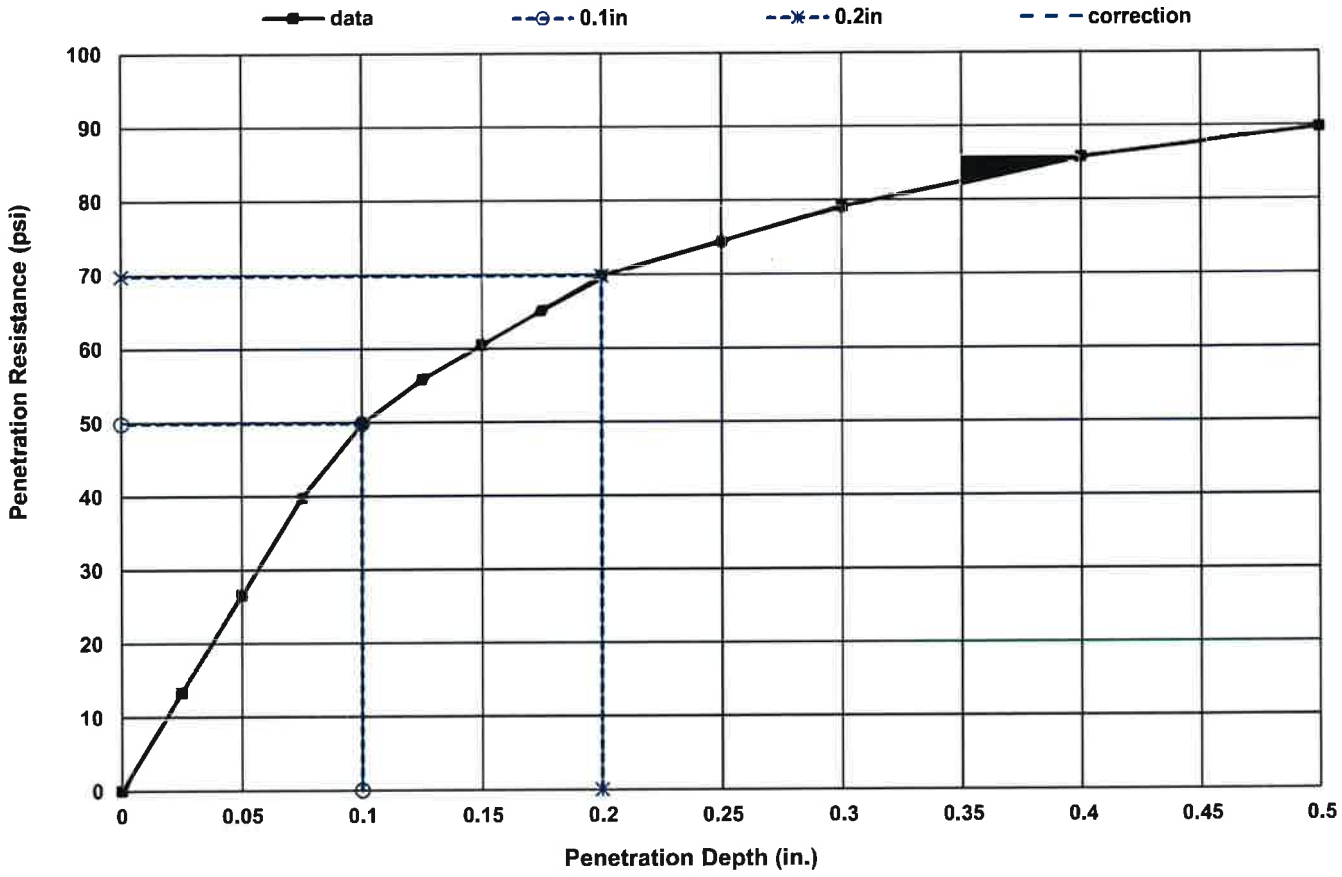
Project: Warrenton Data Center
Client:
Sample / Source B-11
Test Reference/No.:

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-194
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Swell (%)
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.			
101.8	99.5	22.3	91.1	89.1	33.8	5.0	4.7	0.00	10	2.22

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Lean Clay with Sand Yellowish Brown	A-7-6	CL	102.3	22.4	49	22	85.7	0.0

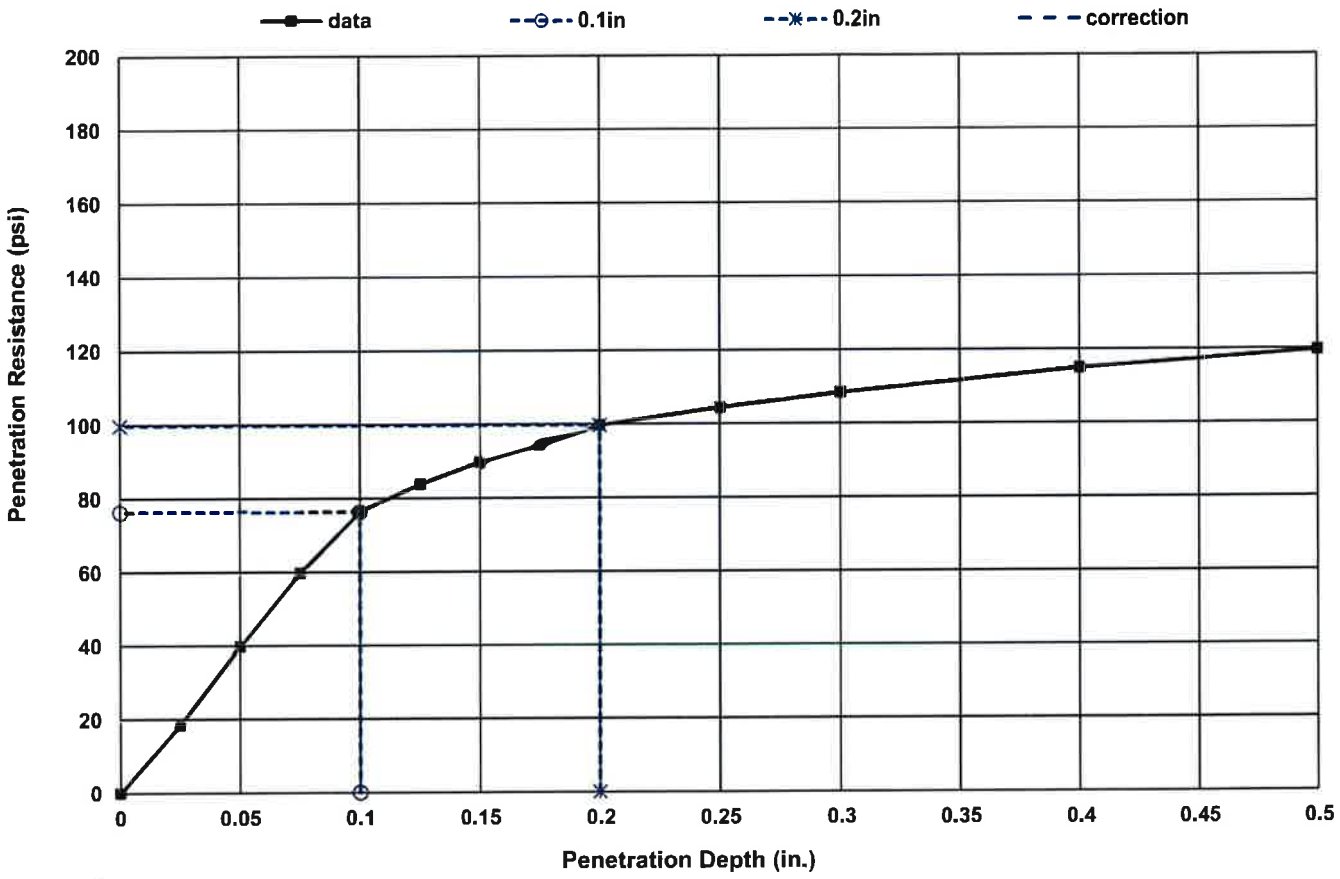
Project: Warrenton Data Center
Client:
Sample / Source B-14
Test Reference/No.: 1

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-186
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)		Swell (%)	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.					
110.5	99.5	17.6	100.2	90.3	27.3	7.6	6.6	0.00	10		1.85	
Material Description					AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Lean Clay with Sand Yellowish Brown					A-7-6	CL	111	17.7	45	24	81.6	0.0

Project: Warrenton Data Center
Client:
Sample / Source B-15
Test Reference/No.: 1

Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-187
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	14026 Thunderbolt Place Suite 100 Chantilly, VA 20151-3232	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334

Test Point	Moisture Content %	Corrected Conductivity									Average Conductivity	Average Resistivity
		1st Reading			2nd Reading			3rd Reading				
		K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Rho=°C·cm/W
Dry Point	0.39	0.450	0.0024	21.3	0.467	0.0042	20.8	0.476	0.0042	20.9	0.464	215.471
Moist Point 1	5.60	0.836	0.0017	21.6	0.849	0.0026	21.3	0.845	0.0018	21.1	0.843	118.624
Moist Point 2	10.30	1.238	0.0020	19.4	1.294	0.0016	19.3	1.283	0.0015	19.3	1.272	78.642
Moist Point 3	12.41	1.353	0.0012	19.2	1.382	0.0013	19.1	1.359	0.0011	19.1	1.365	73.286
Moist Point 4	14.36	1.593	0.0029	19.1	1.480	0.0012	19	1.485	0.0012	19	1.519	65.821
Moist Point 5	16.26	1.534	0.0015	18.9	1.516	0.0013	18.9	1.473	0.0010	18.8	1.508	66.332
Moist Point 6												
Moist Point 7												
Moist Point 8												
Moist Point 9												

K Material (Standard)	0.2730
K Measured	0.2980
Calibration Factor	0.9161

Volume of Mold (cf)	0.0333
Volume of Mold (M^3)	0.00094
Weight of Test Sample (lb)	3.888
Mass of Dry Soil (kg)	1.764

LL	39
PI	21
USCS Symbol	CL

Test Material screened with #4 sieve.

Needle Insertion Metho Pre-drill

Test performed at: 95 % compactive effort @ blows per layer.

Project: Warrenton Data Center

Client:

Sample / Source: B-02

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-191

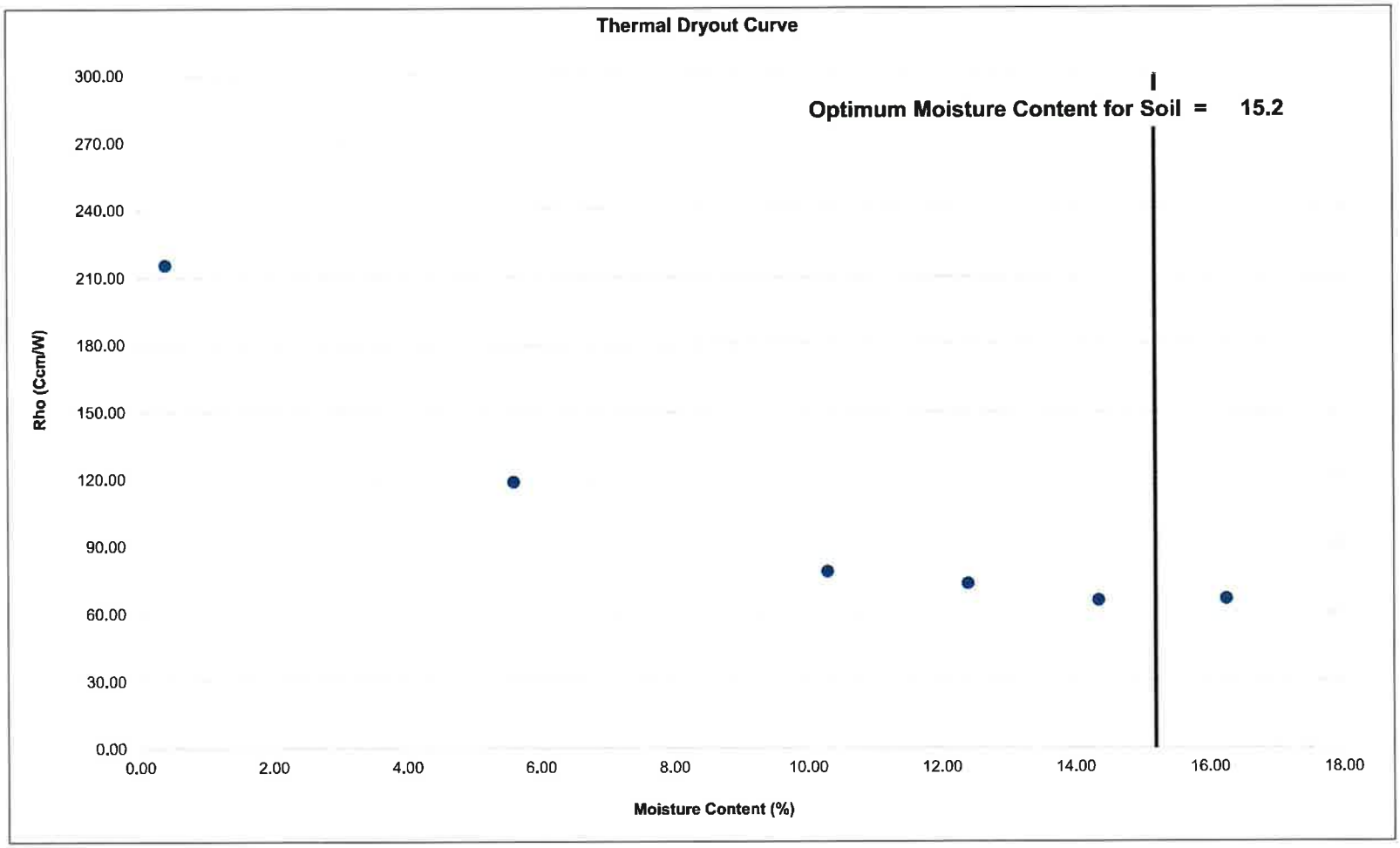
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334



Project: Warrenton Data Center

Client:

Sample / Source: B-02

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-191

Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334

Test Point	Moisture Content %	Corrected Conductivity									Average Conductivity	Average Resistivity
		1st Reading			2nd Reading			3rd Reading				
		K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Rho=°C-cm/W
Dry Point	0.00	0.548	0.0045	22	0.531	0.0030	20.8	0.535	0.0035	20.8	0.538	185.874
Moist Point 1	6.39	1.010	0.0012	20.8	1.058	0.0018	20.4	1.068	0.0019	20.4	1.045	95.668
Moist Point 2	13.78	1.625	0.0013	19.5	1.572	0.0014	19.5	1.580	0.0015	19.5	1.593	62.786
Moist Point 3	15.45	1.692	0.0032	18.8	1.692	0.0016	18.6	1.637	0.0012	18.6	1.674	59.751
Moist Point 4	17.15	1.909	0.0016	18.7	1.852	0.0016	18.7	1.772	0.0010	18.7	1.845	54.214
Moist Point 5	19.24	1.936	0.0013	18.7	1.895	0.0012	18.7	1.867	0.0011	18.7	1.899	52.648
Moist Point 6												
Moist Point 7												
Moist Point 8												
Moist Point 9												

K Material (Standard)	0.2730
K Measured	0.2980
Calibration Factor	0.9161

Volume of Mold (cf)	0.0333
Volume of Mold (M^3)	0.00094
Weight of Test Sample (lb)	3.573
Mass of Dry Soil (kg)	1.621

LL	37
PI	18
USCS Symbol	CL

Test Material screened with #4 sieve.

Needle Insertion Metho: Pre-drill

Test performed at: 95 % compactive effort @ blows per layer.

Project: Warrenton Data Center

Client:

Sample / Source: B-07

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-193

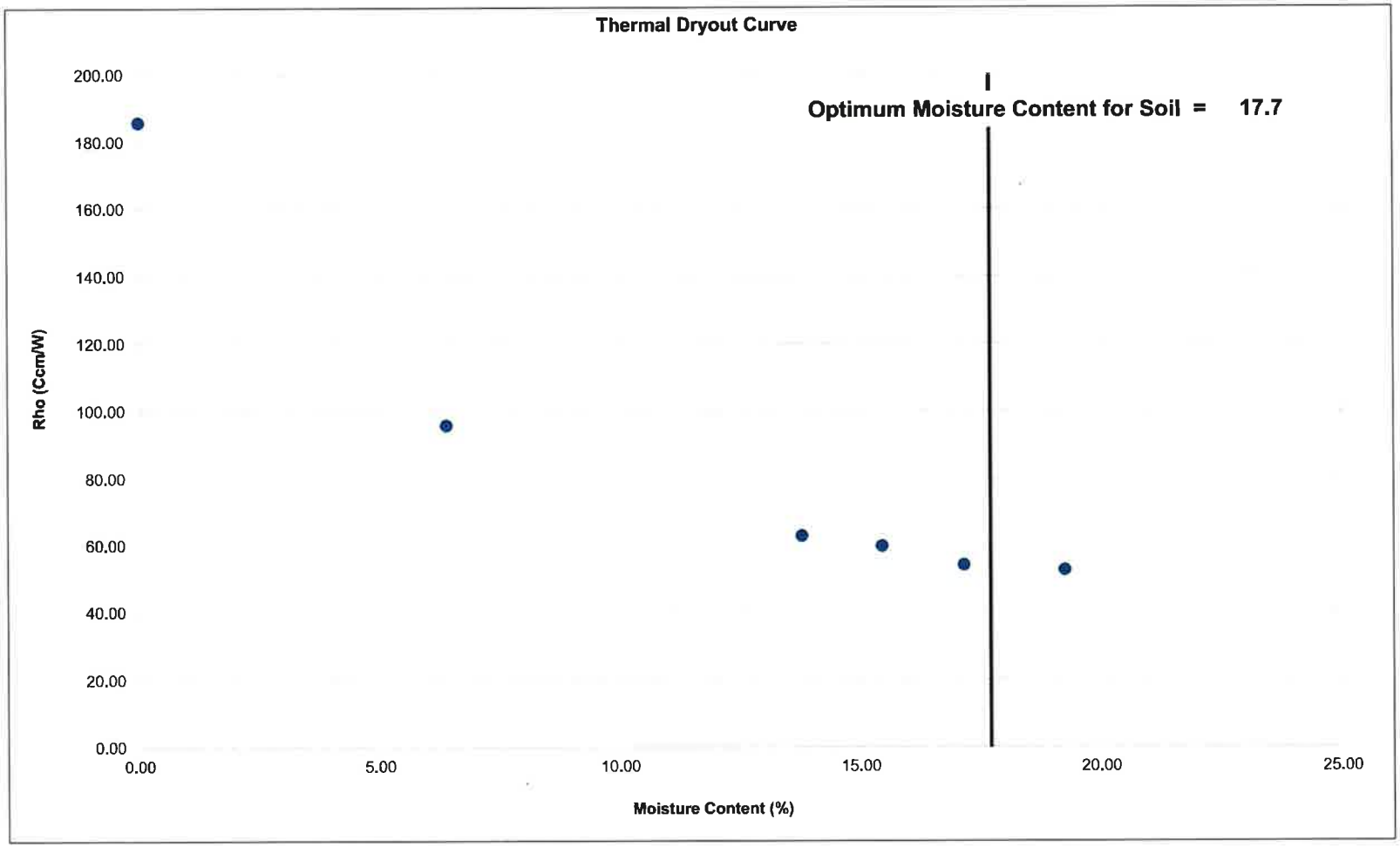
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334



Project: Warrenton Data Center

Client:

Sample / Source: B-07

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-193

Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334

Test Point	Moisture Content %	Corrected Conductivity									Average Conductivity	Average Resistivity
		1st Reading			2nd Reading			3rd Reading				
		K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Rho=°C·cm/W
Dry Point	0.04	0.494	0.0025	22	0.485	0.0033	22	0.489	0.0050	21.8	0.490	204.274
Moist Point 1	6.58	0.919	0.0026	20.3	0.916	0.0018	20.3	0.895	0.0019	20.5	0.910	109.864
Moist Point 2	9.60	1.332	0.0015	19.6	1.322	0.0015	19.5	1.355	0.0018	19.7	1.337	74.812
Moist Point 3	11.77	1.471	0.0022	18.8	1.481	0.0031	18.9	1.471	0.0022	18.5	1.474	67.835
Moist Point 4	14.23	1.741	0.0018	18.5	1.723	0.0018	18.7	1.731	0.0020	18.6	1.732	57.749
Moist Point 5	16.89	1.837	0.0015	18.8	1.843	0.0015	18.6	1.838	0.0012	18.5	1.839	54.365
Moist Point 6												
Moist Point 7												
Moist Point 8												
Moist Point 9												

K Material (Standard)	0.2730
K Measured	0.2935
Calibration Factor	0.9302

Volume of Mold (cf)	0.0333
Volume of Mold (M^3)	0.00094
Weight of Test Sample (lb)	4.326
Mass of Dry Soil (kg)	1.962

LL	41
PI	14
USCS Symbol	ML

Test Material screened with #4 sieve.

Needle Insertion Metho Pre-drill

Test performed at: 95 % compactive effort @ blows per layer.

Project: Warrenton Data Center

Client:

Sample / Source: B-11

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-194

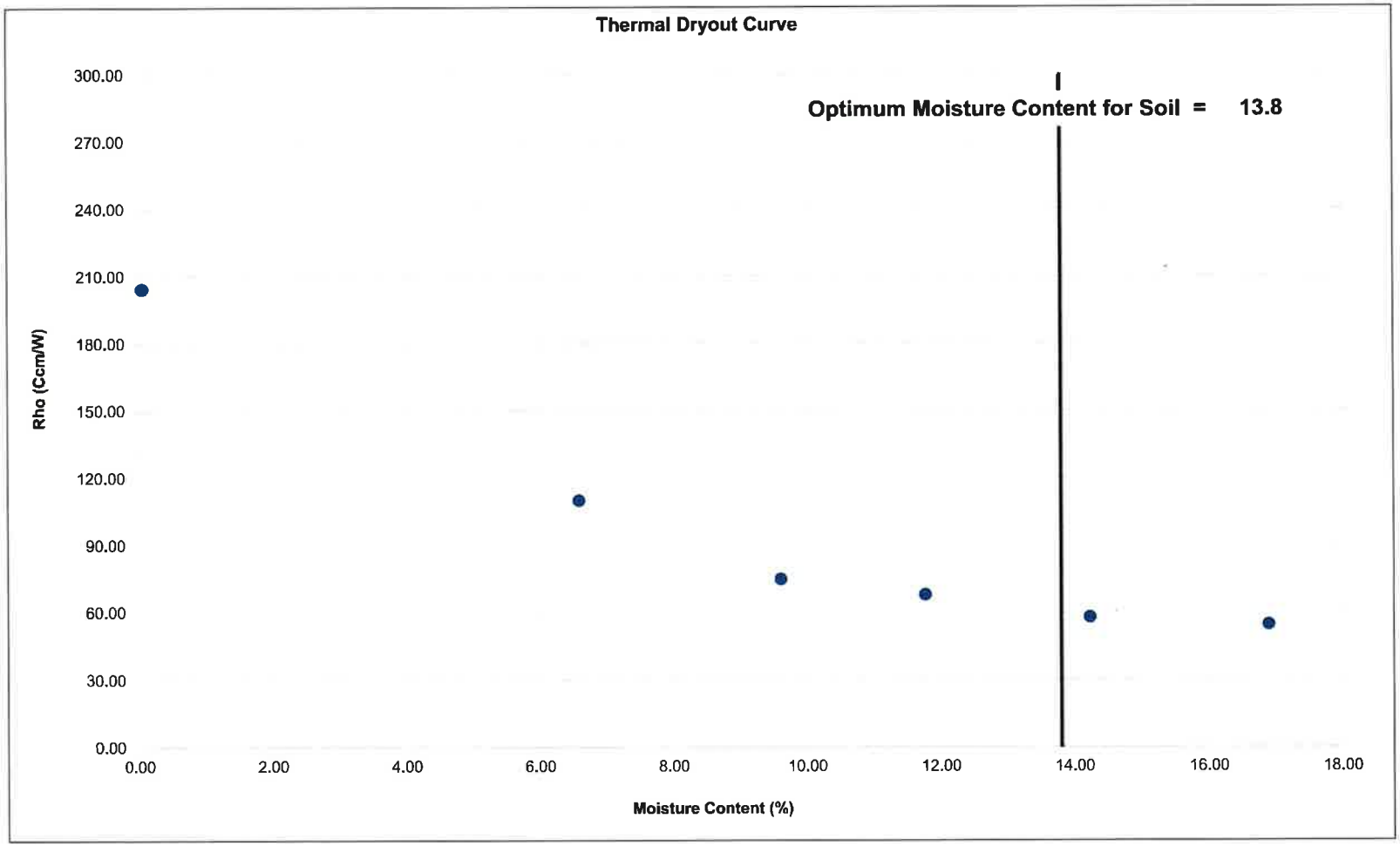
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

Determination of thermal properties using a thermal needle probe

Thermal Conductivity of Soil/Soft Rock ASTM D5334



Project: Warrenton Data Center

Client:

Sample / Source: B-11

Project No.: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-194

Date Reported:

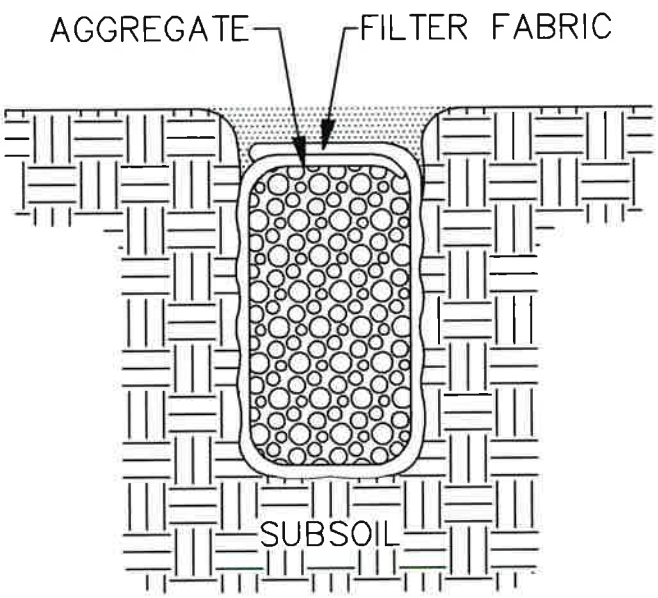
Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Chantilly	026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32	(703)471-8400 (703)834-5527

Tested by	Checked by	Approved by		Remarks
jvong	Htran	Dtran		

APPENDIX D – Supplemental Report Documents

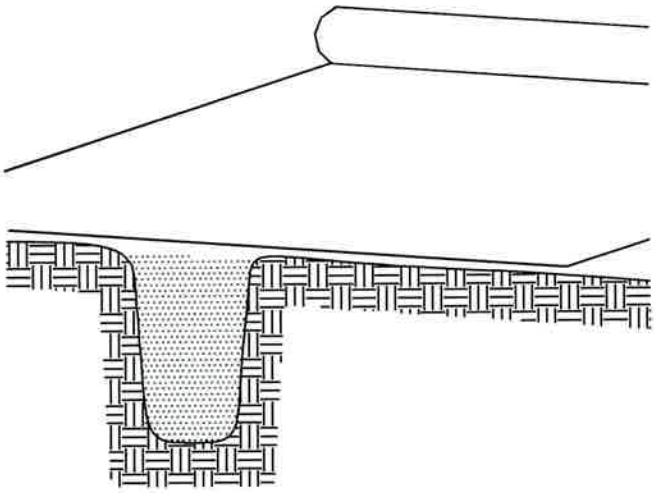
French Drain Installation Procedure
Zone of Influence Diagram

FINAL CONFIGURATION



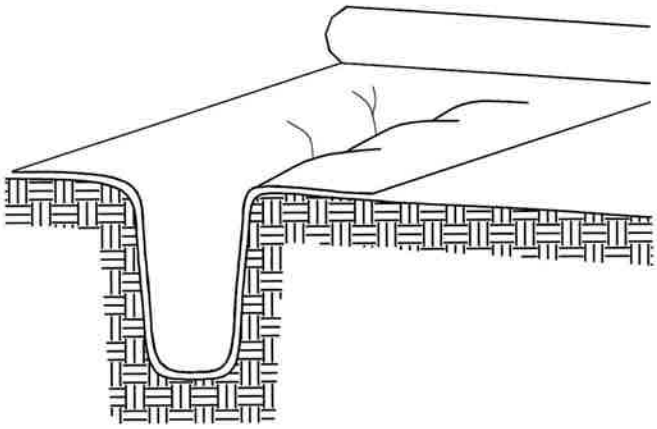
SUBDRAIN USING FILTER FABRIC

STEP 1



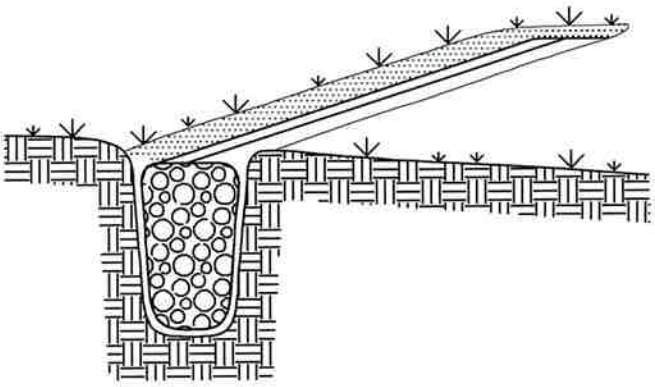
FABRIC IS UNROLLED
DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED
WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED
AND COVERED WITH SOIL

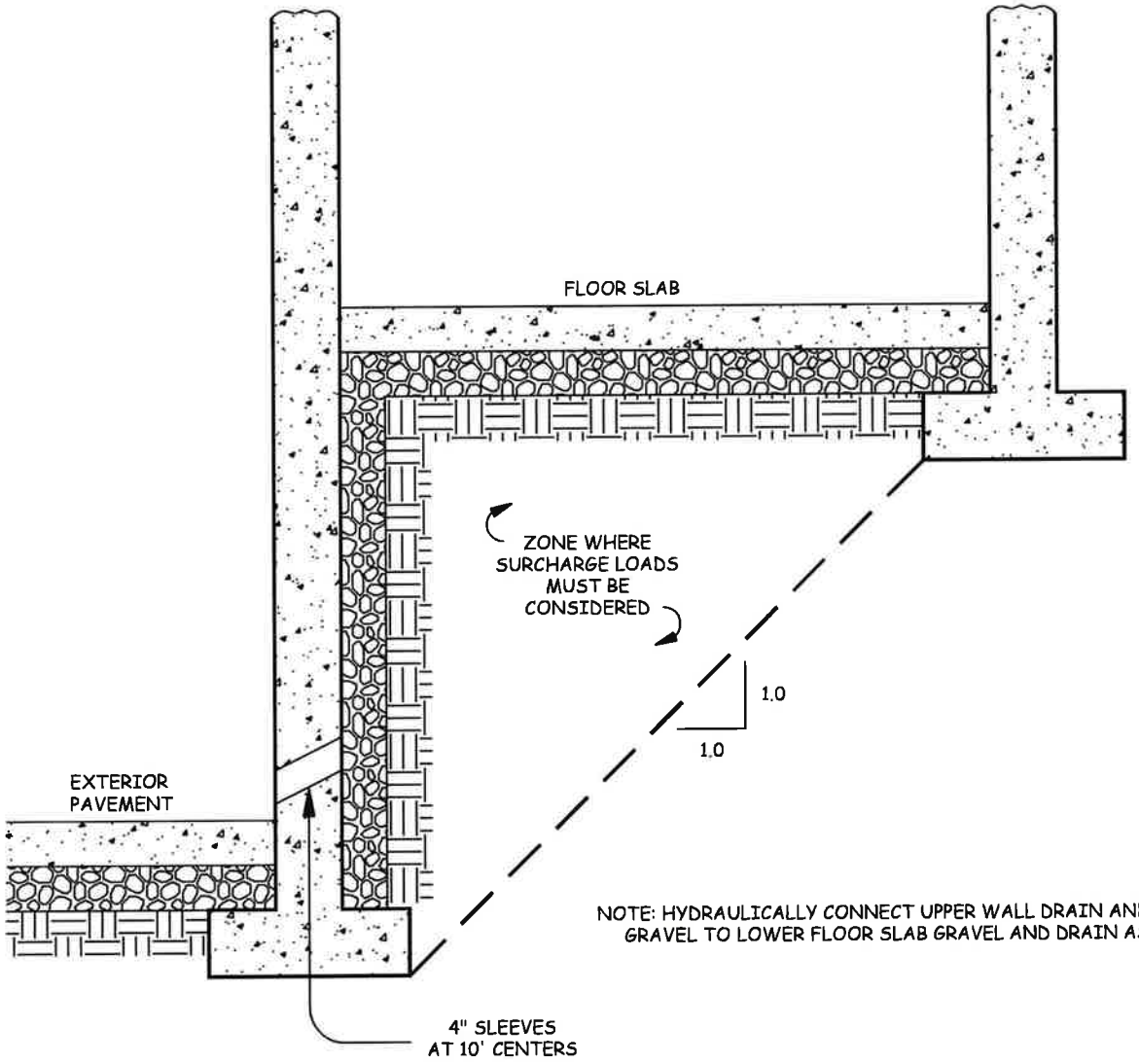
ECS LLC
MID-ATLANTIC
9409 Innovation Drive
Manassas, Virginia 20110
703-396-6259
Fax 703-396-6298

FRENCH DRAIN © INSTALLATION PROCEDURE

ZONE OF INFLUENCE DIAGRAM

(EXTERIOR WALLS)

NOT TO SCALE



NOTE: HYDRAULICALLY CONNECT UPPER WALL DRAIN AND UNDERSLAB GRAVEL TO LOWER FLOOR SLAB GRAVEL AND DRAIN AS SHOWN.

ECS LLC MID-ATLANTIC

Exhibit 7

SPECIAL USE PERMIT CONDITIONS
Applicant: AMAZON DATA SERVICES, INC. (the "Applicant")
Owner: AMAZON DATA SERVICES, INC.
SUP2022-0003, Amazon Data Center
PIN # 6984-69-2419 (the "Property")
Special Use Permit Area: ± 41.71 acres
Zoning: INDUSTRIAL (I)
Date: September 8, 2022

In approving a Special Use Permit, the Town Council may impose such conditions, safeguards, and restrictions as may be necessary to avoid, minimize, or mitigate any potentially adverse or injurious effect of such special uses upon other properties in the neighborhood, and to carry out the general purpose and intent of this Ordinance. The Council may require a guarantee or bond to ensure that compliance with the imposed conditions. All required conditions shall be set out in the documentation approving the Special Use Permit (SUP).

The Applicant shall file a site plan within one (1) year of approval of this Special Use Permit by the Town Council, and shall have up to five (5) years from the date of final site plan approval to commence the proposed use. Issuance of an occupancy permit constitutes commencement of the use.

1. Site Development: The Property shall be developed in substantial conformance with these conditions and the Special Use Permit Plan entitled, "Special Use Permit Plan for Amazon Data Services, Inc.," prepared by Bohler Engineering, dated \, and consisting of \ sheets, subject to minor modifications approved by the Town in connection with final site plan review and final engineering, and except as otherwise provided in these Conditions (the "SUP Plan"). The building and other structures to be constructed on the Property are referred to herein as the "Facility."

2. Use Parameters. Use Limitation: The use approved with this SUP shall be limited to a data center as set forth in § 3-4.12.3 of the Warrenton Zoning Ordinance.

3. Architecture: The architectural design of the data center shall substantially conform to the elevations entitled "Illustrative Elevations," shown on Sheet 6 of the SUP Plan. The Elevations shall be subject to minor modification approved by the Town in connection with site plan review. Additional changes to the design and materials may be made provided that any such changes are approved by the Town prior to the issuance of a building permit. Such approval shall be based on a determination that the changes result in equal to or better than quality than that shown on the Elevations.

4. Height: The Facility shall be no greater than 37 feet in height, as that term is defined in the Town Zoning Ordinance. The mechanical equipment installed on the roof of the building shall be screened with mechanical louver screens.

5. Undergrounding of electrical lines from a substation to the Facility: The Applicant shall underground all electrical lines extending from the substation serving the Facility to the Facility itself.

6. Signage: There shall be no signage except for a street address; provided that if any further signage is sought it shall comply with applicable sign ordinance requirements.

7. Fencing: All fencing on the Property shall be as depicted on the SUP Plan, and shall not exceed 8 feet in height.

8. External Fuel Storage Tanks: The Applicant shall install above-ground double-walled fuel tanks that meet the definition of secondary containment under the DEQ LPR-SRR-2019-03 - Storage Tank Program Compliance Manual, Volume V - AST Guidance, and pursuant to 40 CFR Part 112, Section 8.1.2.2, in the general locations shown on the SUP Plan, for the storage of fuel supplies necessary to maintain an Uninterruptible Power Supply in the event of a loss of external electrical power.

9. Parking: The Applicant shall provide not fewer than 56 parking spaces as shown on the SUP Plan, one of which shall be a loading space.

10. Site Maintenance: The Applicant shall maintain the Property in a clean and orderly manner, and shall provide an on-site masonry screened refuse container station in the location generally shown on the SUP Plan.

11. Access: Access to the site shall be provided as shown on the SUP Plan, subject to changes approved by the Town in consultation with the Virginia Department of Transportation. Mountable curbs shall be provided as required by the Town. There shall be no access from either Routes 17 or 29.

12. Water & Public Sewer Connection: The Property shall connect to public water and public sewer at the Applicant's expense. The Applicant shall limit its water use to internal domestic uses such as service to bathrooms, kitchens, humidification, and external irrigation. It shall not use public water for the general purposes of cooling the data center, but may use it for the initial charging of the cooling system, upon consultation with the Director of Public Works as to the scheduling thereof.

13. Emergency Services:

a. The Applicant shall coordinate training between the Town's fire and rescue companies and those other companies and departments that have experience with data centers. Furthermore, the Applicant will provide the Town's first responders its "Data Center Response Manual" for use in training for emergencies at its Facility, and shall assist in advising those first responders how to implement its provisions.

b. The Applicant shall assure that the water line systems at the Facility have sufficient fire flows, as determined by the Town Fire Marshal.

c. The Applicant shall maintain Facility security personnel 24 hours a day, and each day of the year.

14. Pedestrian access: The Applicant shall construct a five-foot sidewalk on the east side of Blackwell Road along its frontage on that Road.

15. Noise: The Applicant shall ensure that all generators associated with the Facility are supplied with mufflers so as to reduce the sound generated during their operation in order to meet the requirements of the Town's Noise Ordinance, with such exception as may be approved by the Zoning Administrator for any area that is not zoned or developed for residential or commercial purposes.

16. Lighting: The Applicant shall submit a Lighting Plan pursuant to the provisions of § 9-8 et seq. of the Warrenton Zoning Ordinance in connection with its Site Development Plan. All exterior lighting shall utilize LED and be designed and constructed with cutoff and fully shielded fixtures that direct light downward and into the interior of the property and away from adjacent roads and adjacent properties. All building mounted lighting shall have a maximum height of 25', and the Applicant shall install controls on the site fixtures such that they dim to 50% output between 11 PM and dawn.