Maine Department of Transportation

Highway Program Geotechnical Section

GEOTECHNICAL DESIGN REPORT
for
ROUTE 1A RECONSTRUCTION
TOWN OF ELLSWORTH
HANCOCK COUNTY, MAINE

Prepared by:

Michael J. Moreau, P.E.
Geotechnical Design Engineer

Reviewed by:

Karen Gross
Geotechnical Engineer
Kitty Breskin, P.E.
Geotechnical Design Engineer

Hancock County | PIN 10007.00 | Soils Report 2009-12

Federal Number NH-1000(700)E

April 9, 2009

TABLE OF CONTENTS

Section Page

1.0 GEOTECHNICAL DESIGN SUMMARY

This report summarizes our geotechnical engineering evaluations for the reconstruction of Route 1A in the Town of Ellsworth, Hancock County, Maine. The design and construction recommendations below are discussed in greater detail in Section 4.0, Evaluation and Recommendations.

Pavement Structure

- All existing pavement will be salvaged for use on the project or by the Department. Stockpiling of salvaged asphalt will be necessary.

- Full Construction Sections - The Highway Program Pavement Design Group has determined that full construction sections will include 175 mm (7 in) of new Hot Mix Asphalt (HMA) and 575 mm (23 in) of MaineDOT Specification 703.06, Type B, aggregate base course gravel.

- Rehabilitation Sections - Excavate and replace 350 mm (14 in) MaineDOT Specification 703.06 ABCG Type B base aggregate over existing subbase up to finish gravel grade. Use 175 mm (7 in) of new HMA over rehabilitation base gravel.

- Variable Gravel Sections - Use MaineDOT Specification 703.06 ABCG Type B base aggregate over existing subbase up to finish gravel grade. Use 175 mm (7 in) of new HMA over variable gravel sections.

- Shoulder Areas – Shoulder areas require full construction at all locations using 675 mm (27 in) MaineDOT Specification 703.06 ABCG Type B base aggregate over subgrade and 75 mm (3 in) new HMA.

Highway Construction Considerations

This is a Full Reconstruction and Rehabilitation project with the following requirements/recommendations-

- Excavation
  - Excavate existing subbase and subgrade soils as required to planned elevation.
  - Remove cobbles and boulders larger than 150 mm (6 in) at subgrade level in full construction sections.
  - Prepare and protect the exposed subgrade in accordance with Standard Specification 203.17. Remove and replace disturbed or rutted soil materials with compacted sand and gravel.
  - Use approximately 10 m (30 ft) long subgrade excavation transition zones at the beginning and end of the full reconstruction sections.
  - Bedrock excavation will be needed at numerous locations for highway construction, underdrains, and closed drainage piping. Use transition zones where the roadway

subgrade changes from soil to bedrock and bedrock to soil (See Transition Zone Details in Appendix A).

- Reuse of Excavated Soil
  - Do not use excavated existing subbase aggregate for pavement structure construction or to re-base shoulders. Excavated subbase sand and gravel may be used as fill below subgrade elevation in fill embankment areas.
  - Do not use excavated glacial till, marine silty sands and/or clay-silt soils for fill anywhere beneath the pavement structure or dressing slopes. Use these soils to dress slopes only below the bottom elevation of the shoulder subbase gravel.

- Dewatering
  - Control groundwater and surface water infiltration to permit construction in-the-dry.
  - Temporary ditches, pumping from sumps, granular drainage blankets, stone ditch protection, or hand-laid riprap with geotextile underlayment may be needed to divert groundwater if significant seepage is encountered during ditch excavation.
  - Use French drains daylighted to nearby ditches if significant seepage is encountered in the subgrade along the full reconstruction sections.

- Blasting
  - Where blasting is required, conduct pre and post-blast condition surveys, as well as, blast vibration monitoring at nearby residences in accordance with Supplemental Specification 105.2.6 and industry standards at the time of blast.
  - We recommend that the contractor shatter blast the bedrock subgrade in accordance with Special Provision 203, Excavation and Embankment, Shatter Blasting of Solid Rock Subgrade, where bedrock occurs at the subgrade level.

- Embankment Fill Areas
  - Bench existing fill slope soils in accordance with MaineDOT Standard Specification 203.09, Preparation of Embankment Area, where new fill slope extensions are constructed over existing slopes with grades greater than 2:1 (H:V).

- Box Culvert Replacement STA 6+976
  - Excavate soft clay-silt from culvert subgrade down to elevation 23.0 m and a minimum of 600 mm (2ft) beyond the outside face of the box culvert. Place MaineDOT 722.02, Drainage Geotextile, over subgrade at elevation 23.0 m and place crushed stone conforming to MaineDOT 703.22, Underdrain Backfill Material, Type C, over the fabric up to bottom of Granular Borrow grade. Compact the crushed stone with a minimum of four (4) passes with a vibratory compactor. Wrap the geotextile over the top of the crushed stone before placing the Granular Borrow layer.

- Settlement
  - New approach fills and a grade rise of two (2) to three (3) feet are planned between approximate STA 6+940 and 7+010 may result in one (1) to two (2) inches of settlement. We recommend constructing the fill embankment as early as possible in the project. Delay paving over this section for a minimum of 30 days after top of gravel grade is achieved to allow consolidation settlement to occur.

Highway Drainage

- Use full ditches or install Type B or C underdrains in curb or box sections as appropriate. Connect underdrains to closed drainage systems, nearby culverts and/or daylight the outlets.

PCMG Retaining Walls

- Provide supplier design Prefabricated Concrete Modular Gravity (PCMG) Retaining Wall adjacent to box culvert replacement at approximate STA 6+976.

- The PCMG walls will be designed to resist all lateral earth loads and vehicular loads and for all relevant strength, service and extreme limit states in accordance with AASHTO LRFD Bridge Design Specification 4th Edition, 2007, (herein referred to as LRFD).

- Earth loads shall be calculated using an active earth pressure coefficient, K_a, of 0.47 calculated using Coulomb Theory for walls. The designer may assume Soil Type 4 [Bridge Design Guide (BDG) Section 3.6.1] for backfill soil properties. The backfill properties are as follows: ϕ = 32 degrees, γ = 125 pounds per cubic foot (pcf). Additional lateral earth pressure equivalent to 600 mm (2 ft) of soil due to traffic surcharge is required.

- The design of walls founded on spread footings at the strength limit state shall consider nominal bearing resistance, eccentricity (overturning), lateral sliding and structural failure. A sliding resistance factor, φ_τ, of 0.90 shall be applied to the nominal sliding resistance of walls founded on spread footings on soil. For footings on soil, the eccentricity of loading at the strength limit state, based on factored loads, shall not exceed one-fourth (1/4th) of the footing dimensions, in either direction.

- The factored bearing resistance at the strength limit state for spread footings on soil should not exceed 144 kPa (3 ksf) for wall bases 1.8 m (6 ft) to 3.0 m (10 ft) wide and should not exceed 239 kPa (5 ksf) for wall bases 3.7 (12 ft) to 4.9 m (16 ft) wide. Based on presumptive bearing resistance values, a factored bearing resistance of 287 kPa (6 ksf) may be used when analyzing the service limit state and for preliminary sizing, as allowed in LRFD C10.6.2.6.1. In no instance shall the bearing stress exceed the nominal resistance of the footing concrete, which may be taken as $0.3f'c$. The minimum footing size is 600 mm (2 ft) wide regardless of the applied bearing pressure or bearing material.

- Remove and replace weak or unsuitable soils from any wall subgrade with 600 mm (2 ft) of 703.20 Gravel Borrow compacted to 95 % T-180.

- We estimate that settlement below walls constructed on compacted fill will be on the order of 6 mm (¼ in) or less. Differential settlements will also be on the order of 6 mm (¼ in) or less. Most of the settlement will occur as the fill is placed and post construction settlement will be negligible.

- Retaining wall foundations placed on granular soils should be founded a minimum of 1.2 m (4.0 ft) below finish exterior grade for frost protection. Riprap is not considered as contributing to the overall thickness of soil required for frost protection.

<u>Erosion Control Recommendations</u>

- Use MaineDOT Best Management Practices dated February 2008 to minimize erosion of fine-grained soils found along the project.

2.0 INTRODUCTION

The Maine Department of Transportation is reconstructing approximately 6.305 km (3.92 mi) of Route 1A in Ellsworth, Hancock County, Maine (See Site Location Map in Appendix A, Figures). The project begins approximately .25 km (0.16 mi) north of the intersection of Red Bridge Road and extends southeasterly 6.31 km (3.92 mi) to the Union River Bridge. Current plans include 3.6 m (12 ft) and 2.4 m (8 ft) travel lanes and shoulders, respectively, with numerous cuts and fills to improve sight distance and safety.

The presence and depth of some relatively good subbase gravel will allow us to rehabilitate some portions of the highway. Based on our investigations, we plan full construction for approximately 70 percent of the project, and partial excavation and variable gravel rehabilitation methods for the remaining 30 percent of the project. Most of the full construction sections are required to correct horizontal and vertical deficiencies.

The full reconstruction sections include replacement of the base aggregate and pavement for both the travel lanes and shoulders. Full construction of shoulders is required along all sections of the project. Rehabilitation and variable gravel sections include partial excavation and replacement of subbase aggregate or placement of additional base aggregate, respectively. Drainage improvements include pavement underdrains and replacing or installing drainage systems as needed (replacing culverts, ditching, curb, underdrain and catch basins). This project will also require salvage of all of the existing pavement for reuse on the project and by the Department.

3.0 SITE AND SUBSURFACE CONDITIONS

<u>3.1 Site Conditions</u>

Surficial geology maps of the region indicate the predominant soils are glacial marine sediments consisting of silty sand, sandy silt, and clay-silt typical of the Presumpscot Formation, and glacial till soils which often consist of heterogeneous mixtures of gravel, sand, silt, and clay. Because of the numerous marine sediment and glacial till contacts, the glacial till may be inter-fingered or inter-bedded with the marine sediments. The native marine sediments and glacial till soils within the project area are both poorly drained and highly frost susceptible.

The project alignment crosses undulating and sometimes rocky terrain comprised of numerous slopes of low to moderate grade. Surficial drainage along this project is generally east to west to sag locations with cross pipes. There are closed drainage systems at several locations along the project which will be replaced or upgraded. Land use within the corridor is primarily residential, rural residential, and agricultural, with a few small business districts.

The existing highway consists of two travel lanes (one in each direction) with gravel shoulders. As a consequence of the hilly topography, numerous cuts and fills were required to construct the existing highway. Minor cut and fill embankment sections along the alignment occur generally as follows:

Fill Embankment Station	Cut Embankment Station
2+740 to 2+780 RT and LT	
2+820 to 2+880 RT and LT	
3+060 to 3+140 RT and LT	
3+250 to 3+370 RT and LT	
3+510 to 3+550 RT and LT	
	3+570 to 3+610 RT and LT
	3+670 to 3+710 RT and LT
3+740 to 3+900 RT and LT	3+940 to 3+990 RT
	4+030 to 4+060 LT
4+070 to 4+350 RT and LT	4+360 to 4+400 RT
4+630 to 4+730 RT and LT	4+740 to 4+840 RT and LT
	5+060 to 5+130 LT
	5+310 to 5+340 LT
5+340 to 5+530 RT and LT	
5+830 to 5+880 RT and LT	6+020 to 6+120 RT and LT
6+120 to 6+380 RT and LT	6+540 to 6+570 RT
6+580 to 6+620 RT and LT	6+640 to 6+700 RT
6+720 to 6+750 RT and LT	
6+820 to 6+980 RT and LT	7+020 to 7+140 LT
7+270 to 7+320 RT and LT	7+540 to 7+590 RT and LT
7+770 to 7+820 RT and LT	7+880 to 7+900 LT

3.2 Subsurface Conditions

Our field investigation included 32 cased wash borings and power auger borings and 196 bedrock probes. The highway explorations were conducted in several phases in November 2002, October and November 2005, and September 2008. We show the boring locations on the Geoplans in Appendix A, Figures.

In the highway borings, we found pavement depths typically ranging between 150 and 170 mm (6 and 7 in). The pavement is in poor condition and is comprised of cold patch materials, several maintenance mulch applications, and shallow original HMA. The subbase layer was more variable in thickness ranging from as little as 250 mm (10 in) to as high as 790 mm (31 in). The typical subbase layer thickness ranged between 400 and 600 mm (16 to 24 in). The subbase consisted primarily of fine to coarse sandy gravel or gravelly sand with trace to little silt. The subgrade soils we typically encountered were marine sediments comprised of uniform fine to medium silty sands or sandy silts or glacial till.

We encountered ground water at 0.70 m to 1.92 m (2.3 ft to 6.3 ft) below ground surface in several of the highway borings, and 0.61 m to 2.53 m (2.0 ft to 8.3 ft) below ground surface in several of the bedrock probe borings through the existing highway section. However, the groundwater level will fluctuate with seasonal changes, runoff, and adjacent construction activities.

We encountered apparent bedrock refusal at depths ranging between 0.67 m and 2.83 m (2.2 ft to 9.3 ft) below ground surface in many of the bedrock probe and highway borings. For a more detailed description of the subsurface conditions, please refer to the boring exploration data in Appendix B, Field Exploration and Test Data.

3.3 Laboratory Testing

We conducted a laboratory soil testing program on selected samples recovered from the test borings to evaluate soil classification, material reuse, and subgrade soil properties. Laboratory testing consisted of 34 grain-size analyses (5 with hydrometer) and water content determinations, and 2 Atterberg Limits tests. Results of laboratory testing are presented in Appendix C, Laboratory Test Data. The AASHTO and USCS soil classification and water content and Atterberg Limit data are also presented on the boring logs in Appendix B.

4.0 EVALUATION and RECOMMENDATIONS

4.1 Highway Construction Considerations

4.1.1 Pavement Structure

Project plans call for construction of 3.6 m (12 ft) wide travel lanes and 2.4 m (8 ft) wide paved shoulders. The explorations we conducted for this evaluation indicate that the pavement section along the project alignment is variable. The typical existing pavement thickness ranges between 150 and 170 mm (6 to 7 in) and is in poor condition. The average apparent total pavement structure thickness (asphalt paving and subbase) ranges from about 650 to 770 mm (26 to 30 in).

Except in fill embankment areas, the native subgrade soils along the project are predominantly marine sediments consisting of uniform fine to medium sands or sandy silts or glacial till. All of these soil units are moderately or very frost susceptible and a deep pavement structural section is generally needed to minimize frost damage from heaving. In addition, ground water levels will occur at or above the subgrade each spring season and will create weak conditions in these soils.

Based on grain size distribution tests of the existing subbase, the fines content ranges between 9 and 20 percent, with the majority having less than 13 percent. We also estimate that about 90 percent of the subbase materials we tested meet MaineDOT 703.06 ASCG Type D specifications. As a result of the reasonable quality and depth of the existing subbase, we recommend full reconstruction in some sections, variable gravel over existing subbase in some sections, or rehabilitation with partial excavation and base aggregate replacement in other sections. The variable gravel and rehabilitation sections will include full shoulder construction. Based on the field observations and laboratory testing, I recommend the following highway embankment construction methods:

Approximate STA	Construction Method
2+200 to 2+760	Full Construction
2+760 to 3+520	Rehabilitation
3+520 to 6+080	Full Construction
6+080 to 6+800	Rehabilitation
6+800 to 7+040	Variable Gravel
7+040 to 8+020	Full Construction

The Highway Program Pavement Design Group has determined that the pavement section will include 175 mm (7 in) of new HMA and 575 mm (23 in) of MaineDOT Specification 703.06, Type B, aggregate base course gravel. Full shoulder construction is required along the entire project length and will include 75 mm (3 in) of new HMA and 675 mm (27 in) of Type B aggregate base course gravel.

Rehabilitation Sections require excavation and replacement of 350 mm (14 in) of the existing subbase gravel with MaineDOT Specification 703.06 ABCG Type B base aggregate over the remaining existing subbase up to finish gravel grade. Variable Gravel Sections require placement of additional gravel consisting of MaineDOT Specification 703.06, Type B, base aggregate over existing subbase up to finish gravel grade.

Transition zones will be required where the roadway subgrade changes from soil to bedrock and bedrock to soil in the full construction areas. We recommend typical 20:1 longitudinal transition zones that are properly drained because of the frost susceptible soils. These and other typical transition zone details are shown on the attached figures.

4.1.2 Frost Penetration Estimates

We have evaluated the potential frost penetration for the Ellsworth Route 1A project site. Based on State of Maine frost depth maps, MaineDOT Bridge Design Guide (BDG) Figure 5-1, the site has a design-freezing index of approximately 1400. This correlates to a frost depth of 1.2 m (4 ft). Consequently, we recommend that any foundations or leveling pads constructed at the site be founded a minimum of 1.2 m (4 ft) below finished exterior grade. This minimum embedment applies only to foundations constructed on soil and not those founded on bedrock.

4.1.3 Excavation

The marine sediments and glacial till soils at the subgrade surface will be susceptible to disturbance and rutting as a result of exposure to water or construction traffic. We recommend that the contractor protect the subgrade from exposure to water and any unnecessary construction traffic. If disturbance and rutting occur, we recommend that the contractor remove and replace the disturbed materials with compacted sand and gravel. If the subgrade soil contains cobbles or boulders, we recommend that the contractor remove any cobbles and boulders larger than 150 mm (6 in) in diameter by raking the subgrade to a depth of 150 to 300 mm (6 to 12 in). After excavating to the subgrade level, the contractor should proof-roll the surface to identify weak soil areas.

We recommend that the contractor use approximately 10 m (30 ft) long subgrade excavation transition zones at the beginning and end of the new construction. We also recommend that the contractor use transition zones where the roadway subgrade changes from soil to bedrock and bedrock to soil. We show the bedrock transition zone details in Appendix A, Figures.

4.1.4 Reuse of Excavated Soils

The project plans call for full reconstruction in some sections and partial excavation in other sections. To achieve planned grades, the contractor will excavate both existing subbase gravel and native marine sediments or till. We do not recommend using the excavated subbase aggregate to re-base the shoulders. Excavated subbase sand and gravel may be used as fill below subgrade elevation in fill embankment areas. We do not recommend using marine silty sands, clay-silt or glacial till soils excavated from the subgrade level as fill beneath the pavement structure. This soil may be used for dressing slopes, but only below the bottom elevation of the shoulder subbase gravel.

4.1.5 Dewatering

The native glacial-marine sands and silts and glacial till soils within the project area are both poorly drained and highly frost susceptible. In some locations, these soil units may be saturated and significant water seepage may be encountered during excavation for ditches or the pavement structure, or during underdrain construction.

The contractor should control groundwater and surface water infiltration to permit construction in-the-dry. Temporary ditches, pumping from sumps, granular drainage blankets, stone ditch protection, or hand-laid riprap with geotextile underlayment may be needed to divert groundwater if significant seepage is encountered during ditch or back slope excavation. We also recommend using French drains daylighted to nearby ditches if significant seepage is encountered in the subgrade along the full reconstruction sections.

4.1.6 Blasting

We estimate that on the order of 11,000 cubic meters of bedrock excavation will be needed to achieve highway subgrade elevation, or for underdrain or closed drainage system construction throughout the project. The contractor should conduct all blasting work for the project in accordance with Supplemental Specification 105.2.6. We also recommend that the contractor conduct pre and post-blast surveys, as well as, blast vibration monitoring at nearby residences in accordance with industry standards at the time of blast.

Bedrock excavation will be required to establish highway subgrade in several areas of the project. We recommend that the contractor shatter blast the bedrock subgrade at these locations in accordance with Special Provision 203, Excavation and Embankment, Shatter Blasting of Solid Rock Subgrade to enhance/improve drainage at the subgrade level.

4.1.7 Embankment Fill Area

Embankment filling will be necessary to widen the highway and correct sight distance deficiencies at numerous locations throughout the project. Embankment slopes that are created or extended as part of the reconstruction and widening effort should be designed as earth fill slopes no steeper than 2:1 (H:V). Slopes steeper than 2:1 (H:V) typically require reinforcement or rock fill surfacing.

We recommend that embankment fill below the pavement section consist of MaineDOT 703.18 common borrow. We also recommend that all new embankment fill be thoroughly and systematically compacted to the full limit of the slope. Where new fill slope extensions are constructed over existing slopes, we recommend benching the existing slope soils in accordance with MaineDOT Standard Specification 203.09, Preparation of Embankment Area, to prevent creation of a preferential slip plane under the new embankment fill.

The new embankment fill loads and densification of the fill materials during construction will result in ground surface settlement and consolidation of the underlying soils. The new approach fills and a grade rise of two (2) to three (3) feet are planned between approximate STA 6+940 and 7+010. We estimate that one (1) to two (2) inches of clay-silt consolidation settlement will occur as a result of the new embankment fill grades. Consequently, we recommend constructing the fill embankment as early as possible in the project. We also recommend delaying the paving operation over this section for a minimum of 30 days after top of gravel grade is achieved. This will allow time for consolidation settlement to occur.

4.1.8 Box Culvert Replacement STA 6+976

Highway construction requires replacement of the box culvert and a grade rise at approximate Station 6+976. We conducted boring HB-ELL-301A to investigate the subsurface conditions at the culvert replacement site. We encountered very soft clay-silt soils at the culvert subgrade level in that boring.

We recommend excavating the soft clay-silt from the culvert subgrade down to elevation 23.0 m and a minimum of 600 mm (2ft) beyond the outside face of the box culvert. The contractor should place MaineDOT 722.02, Drainage Geotextile, over the subgrade at elevation 23.0 m and then place crushed stone conforming to MaineDOT 703.22, Underdrain Backfill Material, Type C, over the fabric up to the bottom of Granular Borrow grade. The crushed stone should be compacted with a minimum of four (4) passes with a vibratory compactor. The contractor should then wrap the geotextile over the top of the crushed stone before placing the Granular Borrow layer.

4.1.9 Cut Areas

We anticipate that soil backslope cuts may be required at several locations. We expect that cut slopes designed at 2:1 (H:V) or flatter should be stable from a global stability standpoint. However, since the anticipated slope soils are marine sand, sandy silt or clay-silt, or glacial till, surficial sloughing may occur on these slopes. Consequently, we recommend that erosion control measures be taken to protect them. In addition, stone ditch protection methods and materials may be required to repair slope sections where significant seepage occurs.

4.2 Highway Drainage Considerations

In general, highway drainage improvements should include culvert installation and replacement, installation of underdrains, curbing, and ditching. Removing water from the pavement section will improve long-term design life and performance of the pavement section and reduce freeze/thaw action. The ditches and underdrains are intended to prevent trapped groundwater or surface water from accumulating in the base course aggregate and on the subgrade.

The estimated seasonal frost penetration depth of 1.2 m (4 ft) exceeds the anticipated thickness of the pavement section (750 mm, 30 in). Therefore, the entire pavement section and 300 mm (1 ft) to 600 mm (2 ft) (depending on non-granular vs. granular subgrade soil) of the subgrade are expected to freeze. Some of the subgrade soils are considered to be frost susceptible (heaving when freezing and loss of strength upon thawing).

In some locations, the project designer may opt to use underdrains to minimize wetland or ROW impacts. In other instances where appropriate, full ditches may be added or extended. There are significant segments of the project with inadequate ditching along both shoulders. There also are a number of residential properties that would be significantly impacted with standard ditch construction.

Consequently, given the nature of the of the Route 1A project and the need to provide adequate subbase drainage, we recommend improving pavement structure performance with underdrains in curbed and box sections and full ditches elsewhere. The ditches and underdrains should be constructed so that the ditch or pipe inverts extend below the bottom of the pavement structure. Standard ditches should be constructed with 3:1 (H:V) fore slopes and 2:1 (H:V) back slopes. To minimize ROW impacts and facilitate pavement and subbase drainage, we also recommend bituminous curb sections with type B or C underdrain trenches adjacent to some residences and other improved properties. We recommend that underdrains outlet into culverts or daylight into existing drain ways onto riprap aprons.

4.3 PCMG Retaining Wall Recommendations

To minimize wetland impacts, earth retaining structures are required adjacent to the box culvert replacement at approximate STA 6+976. The walls shall be designed by a Professional Engineer subcontracted by the contractor as a design-build item. The walls will be designed to resist all lateral earth loads and vehicular loads. PCMG walls will be designed for all relevant strength, service and extreme limit states in accordance with AASHTO LRFD Bridge Design Specification 4th Edition, 2007, Section 11.

The design of walls founded on spread footings at the strength limit state shall consider nominal bearing resistance, eccentricity (overturning), lateral sliding and structural failure. A sliding resistance factor, φ_τ, of 0.90 shall be applied to the nominal sliding resistance of walls founded on spread footings on soil. For footings on soil, the eccentricity of loading at the strength limit state, based on factored loads, shall not exceed one-fourth (1/4th) of the footing dimensions, in either direction. Sliding computations for resistance to lateral loads shall assume a maximum frictional coefficient of 0.36 (tan 20 degrees) at the foundation soil to concrete interfaces and a maximum frictional coefficient of 0.58 (tan 30 degrees) at the foundation soil to soil in-fill interfaces. Recommended values of sliding frictional coefficients are based on LRFD Article 11.11.4.2, Table 10.5.5.2.2-1 and Table 3.11.5.3-1.

Earth loads shall be calculated using an active earth pressure coefficient, K_a, of 0.47 calculated using Coulomb Theory for walls. The designer may assume Soil Type 4 [Bridge Design Guide (BDG) Section 3.6.1] for backfill soil properties. The backfill properties are as follows: $\phi = 32$ degrees, $\gamma = 125$ pounds per cubic foot (pcf). The wall shall also be designed considering a traffic surcharge equal to a uniform horizontal earth pressure due to 600 mm (2 ft) of soil.

The bearing resistance for the PCMG wall founded on a reinforced concrete footing on soil shall be investigated at the strength limit state using factored loads and a factored bearing resistance of 144 kPa (3 ksf) for wall bases 1.8 m (6 ft) to 3.0 m (10 ft) wide and 239 kPa (5 ksf) for footings 3.7 (12 ft) to 4.9 m (16 ft) wide. The designer may assume the stress distribution to be a uniform distribution over the effective footing base as shown in LRFD Figure 11.6.3.2-1. Based on presumptive bearing resistance values, a factored bearing resistance of 287 kPa (6 ksf) may be used when analyzing the service limit state and for preliminary footing sizing, as allowed in LRFD C10.6.2.6.1. In no instance shall the bearing stress exceed the nominal resistance of the footing concrete, which may be taken as $0.3f'c$. The minimum footing size is 2 feet wide regardless of the applied bearing pressure or bearing material.

The bearing resistance for the bottom unit of the PCMG wall shall be checked for the extreme limit state with a resistance factor of 1.0. The PCMG units must be designed so that the nominal bearing resistance provides adequate resistance to support the unfactored strength limit state loads with a resistance factor of 1.0. The overall stability of the wall system should be investigated at the Service I Load Combination with a resistance factor, φ, of 0.65.

After excavation for the wall foundation is complete, the contractor should recompact the subgrade. If weak or unsuitable soils are present at the planned wall subgrade level, we recommend over-excavating 2 feet of the soil and replacing it with compacted MaineDOT 703.20 Gravel Borrow. The gravel borrow should be compacted to 95 percent of the T-180 maximum dry density.

We estimate that settlement beneath walls constructed on compacted fill soil may experience settlement on the order of ¼-inch or less. Differential settlements will also be on the order of ¼-inch or less. Most of the settlement will occur as the fill is placed and post construction settlement will be negligible.

Retaining wall foundations placed on granular soils should be founded a minimum of 1.2 m (4 ft) below finish exterior grade for frost protection. Riprap is not considered as contributing to the overall thickness of soils required for frost protection. Foundations placed on bedrock are not subject to heave by frost. Thus, if the wall footings are cast on bedrock, there are no frost embedment requirements for footings cast directly on sound bedrock.

4.4 Erosion Control Recommendations

The fine-grained soils along the project are susceptible to erosion. We recommend using appropriate erosion control measures during construction as described in the MaineDOT Best Management Practices guidelines dated February 2008 to minimize erosion of the fine-grained soils at the site.

5.0 CLOSURE

This report has been prepared for the use of the MaineDOT Highway Program for specific application to the Ellsworth Route 1A project. The report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other intended use is implied.

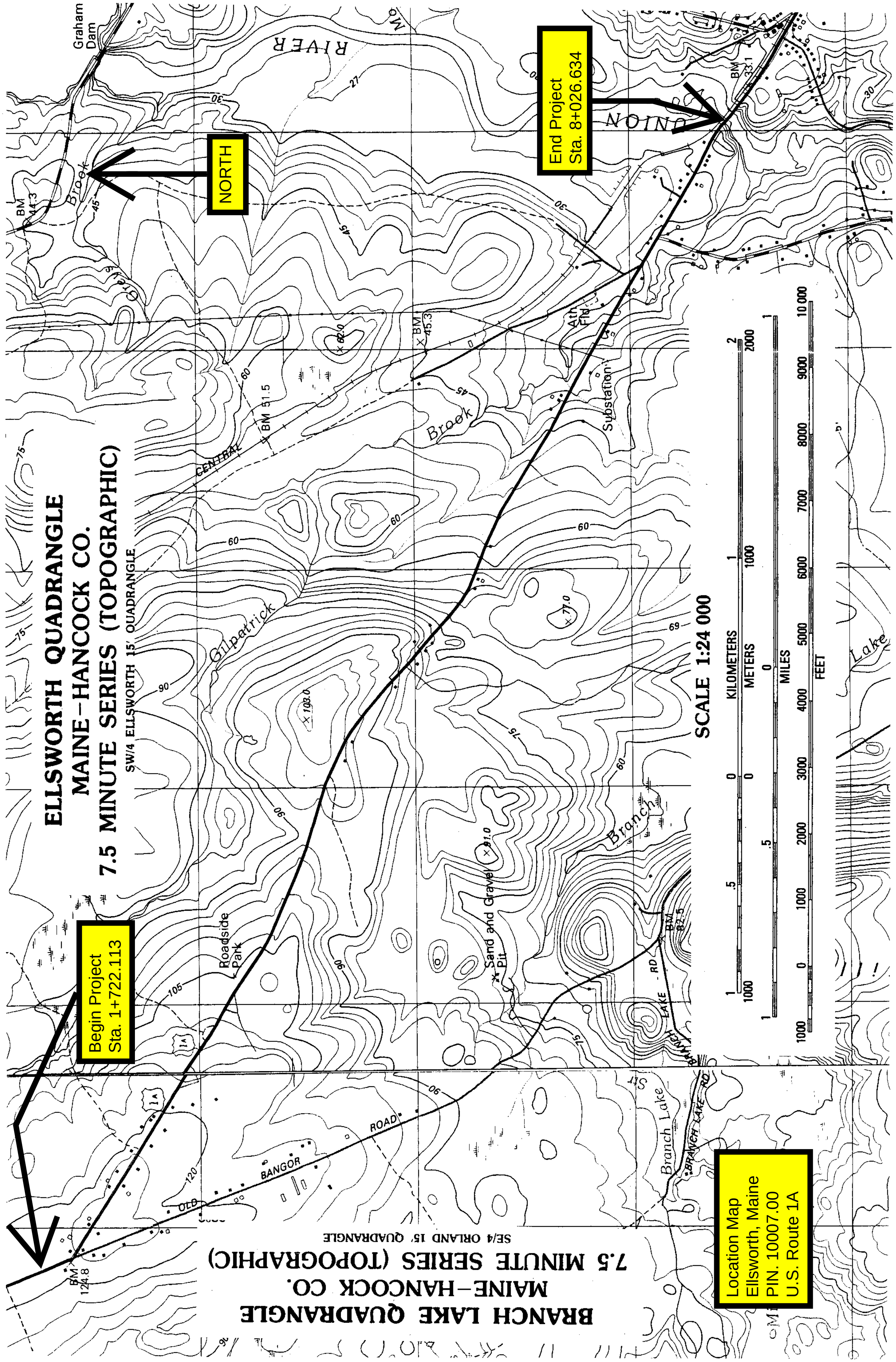
In the event that any changes in the nature, design, or location of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations and to modify the recommendations as appropriate to reflect the changes in design. Further, the analyses and recommendations are based in part upon limited soil explorations completed at discrete locations on the project site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

We also recommend that we be provided the opportunity for a general review of the final design and specifications in order that the earthwork and foundation recommendations may be properly interpreted and implemented in the design.

APPENDIX - A

Figures

Site Location Map
Geoplans
Transition Details


ELLSWORTH QUADRANGLE
MAINE–HANCOCK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 ELLSWORTH 15' QUADRANGLE
BRANCH LAKE QUADRANGLE
MAINE–HANCOCK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 ORLAND 15' QUADRANGLE
NORTH
Begin Project
Sta. 1+722.113
End Project
Sta. 8+026.634
Location Map
Ellsworth, Maine
PIN. 10007.00
U.S. Route 1A
SCALE 1:24 000
KILOMETERS
METERS
MILES
FEET
Graham Dam
RIVER
UNION
Brook
Gilpatrick
Branch
Substation
Sand and Gravel Pit
Roadside Park
CENTRAL
OLD BANGOR ROAD
BRANCH LAKE RD
Branch Lake
BM 124.8
BM 44.3
BM 51.5
BM 45.3
BM 33.1
BM 82.5

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	NH-1000(700)E	1	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SHEET OF

AUGUSTA, MAINE

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	MAR 2009
	CHECKED	T. WHITE	
	REVISIONS		
	FIELD CHANGES		

Filename: ...\GEOTECH\MSTA\001_Geoplan1.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	2	32

10007.00

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

Filename: ...\geotech\msta\002_Geoplan2.dgn
Division: GEOTECH
Username: terry.white
Date:4/6/2009

		BY	DATE
PLANS	PROJECT DESIGN ENGINEER	M. MOREAU	MAR 2009
	DESIGN-DETAILED	T. WHITE	
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	3	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	MAR 2009
	DESIGN-DETAILED	T. WHITE	
	CHECKED	-----	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

Filename: ...\geotech\msta\003_Geoplan3.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	4	32

10007.00

Filename: ...\geotech\msta\004_Geoplan4.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER / DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	5	32

10007.00

Filename: ...\geotech\msta\005_Geoplan5.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

	BY	DATE
PROJECT DESIGN ENGINEER	M. MOREAU	MAR 2009
DESIGN-DETAILED	T. WHITE	
CHECKED		
REVISIONS		
FIELD CHANGES		

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC 1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	6	32

10007.00

Filename: ...\geotech\msta\006_Geoplan6.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF AUGUSTA, MAINE

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	7	32

10007.00

Filename: ...\geotech\msta\007_Geoplan7.dgn
Division: GEOTECH
Username: terry.white
Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	MAR 2009
	CHECKED	T. WHITE	
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	8	32

10007.00

PROJECT DESIGN ENGINEER	M. MOREAU		
DESIGN-DETAILED	T. WHITE		MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

PLANS

Filename: ...\geotech\msta\008_Geoplan8.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	9	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

Date:4/6/2009 Username: terry.white Division: GEOTECH Filename: ...\geotech\msta\009_Geoplan9.dgn

PLANS		BY	DATE
PROJECT DESIGN ENGINEER	DESIGN-DETAILED	M. MOREAU	MAR 2009
	CHECKED	T. WHITE	
	REVISIONS		
	FIELD CHANGES		

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	10	32

10007.00

Date:4/6/2009 Username: terry.white Division: GEOTECH Filename: ...\geotech\msta\010_Geoplan10.dgn

PLANS		BY	DATE
PROJECT DESIGN ENGINEER			
DESIGN-DETAILED		M. MOREAU	T. WHITE	MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	11	32

10007.00

CURVE DATA

PI = 4+126.281
Δ = 06° - 36' - 23.2" LT.
R = 3000.000 m
L = 345.912 m
T = 173.148 m
E = 4.993 m

Filename: ...\geotech\msta\011_Geoplan11.dgn   Division: GEOTECH   Username: terry.white   Date:4/6/2009

PLANS		BY	DATE
PROJECT DESIGN ENGINEER			
DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	12	32

10007.00

Filename: ...\geotech\msta\012_Geoplan12.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	MAR 2009
	DESIGN-DETAILED	T. WHITE	
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	13	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

Filename: ...\geotech\msta\013_Geoplan13.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	14	32

10007.00

Filename: ...\geotech\msta\014_Geoplan14.dgn Division: GEOTECH Username: terry,white Date:4/6/2009

		BY	DATE
PLANS	PROJECT DESIGN ENGINEER	M. MOREAU	MAR 2009
	DESIGN-DETAILED	T. WHITE	
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	15	32

10007.00

Filename: ...\geotech\msta\015_Geoplan15.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	16	32

10007.00

PLANS		BY	DATE
PROJECT DESIGN ENGINEER	M. MOREAU	T. WHITE	MAR 2009
DESIGN-DETAILED			
CHECKED			
REVISIONS			
FIELD CHANGES			

Filename: ...\geotech\msta\016_Geoplan16.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	17	32

10007.00

Filename: ...\geotech\msta\017_Geoplan17.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PROJECT DESIGN ENGINEER	BY	DATE
DESIGN-DETAILED	M. MOREAU	MAR 2009
CHECKED	T. WHITE	
REVISIONS		
FIELD CHANGES		

PLANS

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	18	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

		BY	DATE
PLANS	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

Filename: ...\geotech\msta\018_Geoplan18.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	19	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

PROJECT DESIGN ENGINEER		BY	DATE
PLANS	DESIGN-DETAILED	M. MOREAU	MAR 2009
	CHECKED	T. WHITE	
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

Filename: ...\geotech\msta\019_Geoplan19.dgn Division: GEOTECH Username: terry_white Date:4/6/2009

Filename: ...\geotech\msta\020_Geoplan20.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED	-----	-----
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	20	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	21	32

10007.00

CURVE DATA

PI = 5+853.071
Δ = 11° - 38' - 53.3" RT.
R = 750.000 m
L = 152.474 m
T = 76.501 m
E = 3.891 m

PLANS		BY	DATE
PROJECT DESIGN ENGINEER			
DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

Filename: ...\geotech\msta\021_Geoplan21.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	22	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

PLANS		BY	DATE
PROJECT DESIGN ENGINEER			
DESIGN-DETAILED		M. MOREAU	T. WHITE	MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

Filename: ...\geotech\msta\022_Geoplan22.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	NH-1000(700)E	23	32

10007.00

Filename: ...\geotech\msta\023_Geoplan23.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	
	CHECKED	T. WHITE	MAR 2009
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	24	32

10007.00

Filename: ...\geotech\msta\024_Geoplan24.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
PROJECT DESIGN ENGINEER			
DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
CHECKED			
REVISIONS			
FIELD CHANGES			

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	25	32

10007.00

Date:4/6/2009 Username: terry.white Division: GEOTECH Filename: ...\geotech\msta\025_Geoplan25.dgn

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	26	32

10007.00

Filename: ...\geotech\msta\026_Geoplan26.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	
	CHECKED	T. WHITE	MAR 2009
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	27	32

Filename: ...\geotech\msta\027_Geoplan27.dgn   Division: GEOTECH   Username: terry.white   Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	28	32

10007.00

Filename: ...\geotech\msta\028_Geoplan28.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	
	CHECKED	T. WHITE	MAR 2009
	REVISIONS	-----	-----
	FIELD CHANGES	-----	-----

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

Filename: ...\geotech\msta\029_Geoplan29.dgn   Division: GEOTECH   Username: terry.white   Date:4/6/2009

	BY	DATE
PROJECT DESIGN ENGINEER	M. MOREAU	
DESIGN-DETAILED	T. WHITE	MAR 2009
CHECKED	-----	-----
REVISIONS	-----	-----
FIELD CHANGES	-----	-----

PLANS

METRIC
1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	29	32

10007.00

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters)

SHEET OF

AUGUSTA, MAINE

METRIC

1. All dimensions are in millimeters unless otherwise noted.
2. All elevations and stations are in meters.

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	30	32

10007.00

Filename: ...\geotech\msta\030_Geoplan30.dgn   Division: GEOTECH   Username: terry.white   Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER		
	DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
	CHECKED	-----	-----
	REVISIONS	-----	-----
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	NH-1000(700)E	31	32

10007.00

PROJECT DESIGN ENGINEER M. MOREAU
DESIGN-DETAILED T. WHITE MAR 2009
CHECKED
REVISIONS
FIELD CHANGES

PLANS

Filename: ...\geotech\msta\031_Geoplan31.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

SHEET OF

AUGUSTA, MAINE

METRIC	1. All dimensions are in millimeters unless otherwise noted. 2. All elevations and stations are in meters.	F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
		1	MAINE	NH-1000(700)E	32	32

10007.00

CURVE DATA

PI = 7+944.295
Δ = 13° - 40' - 00.5" RT.
R = 436.595 m
L = 104.141 m
T = 52.319 m
E = 3.124 m

Filename: ...\geotech\msta\032_Geoplan32.dgn Division: GEOTECH Username: terry.white Date:4/6/2009

PLANS		BY	DATE
	PROJECT DESIGN ENGINEER	M. MOREAU	
	DESIGN-DETAILED	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

GEOPLANS

ELLSWORTH

US RTE. 1A

SCALE (in meters) 5 0 5 10

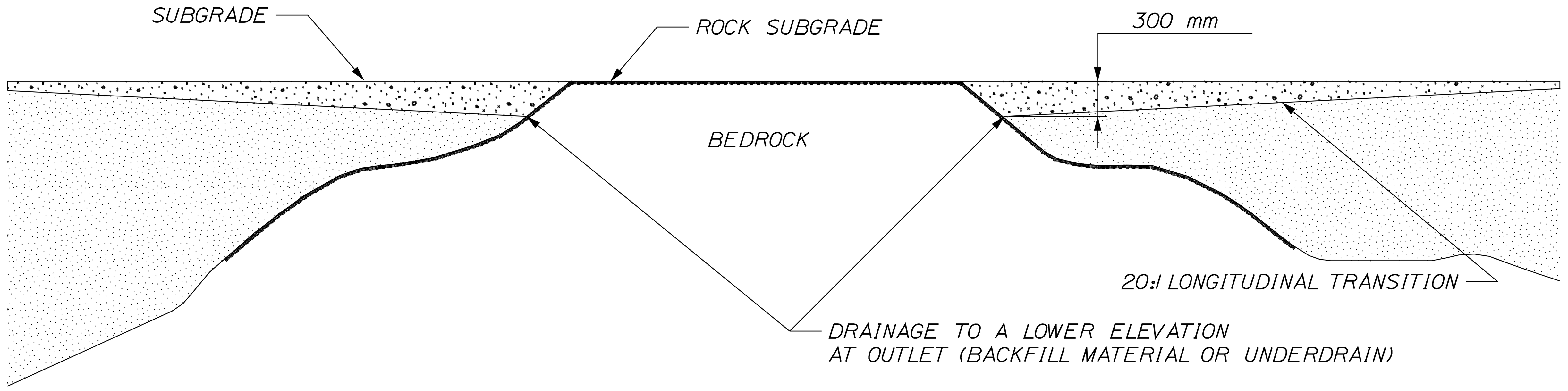
SHEET OF

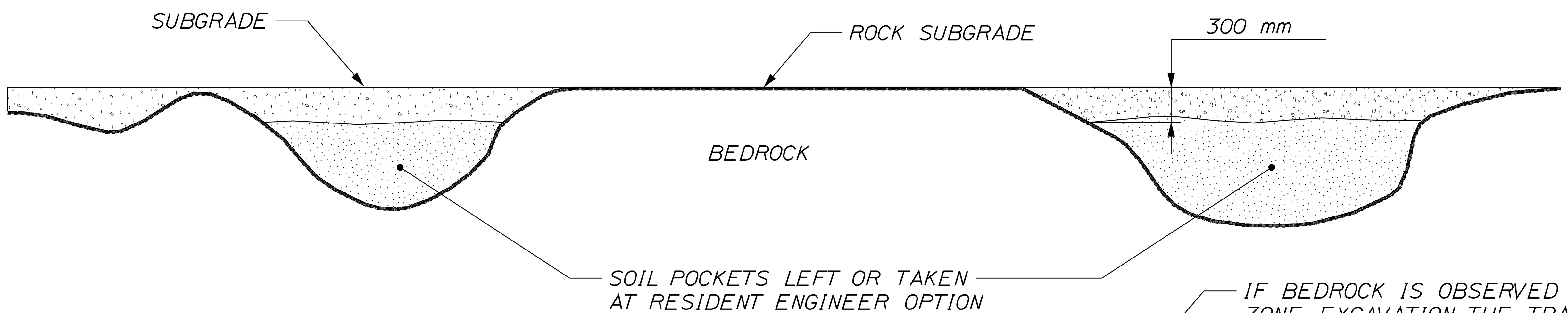
AUGUSTA, MAINE

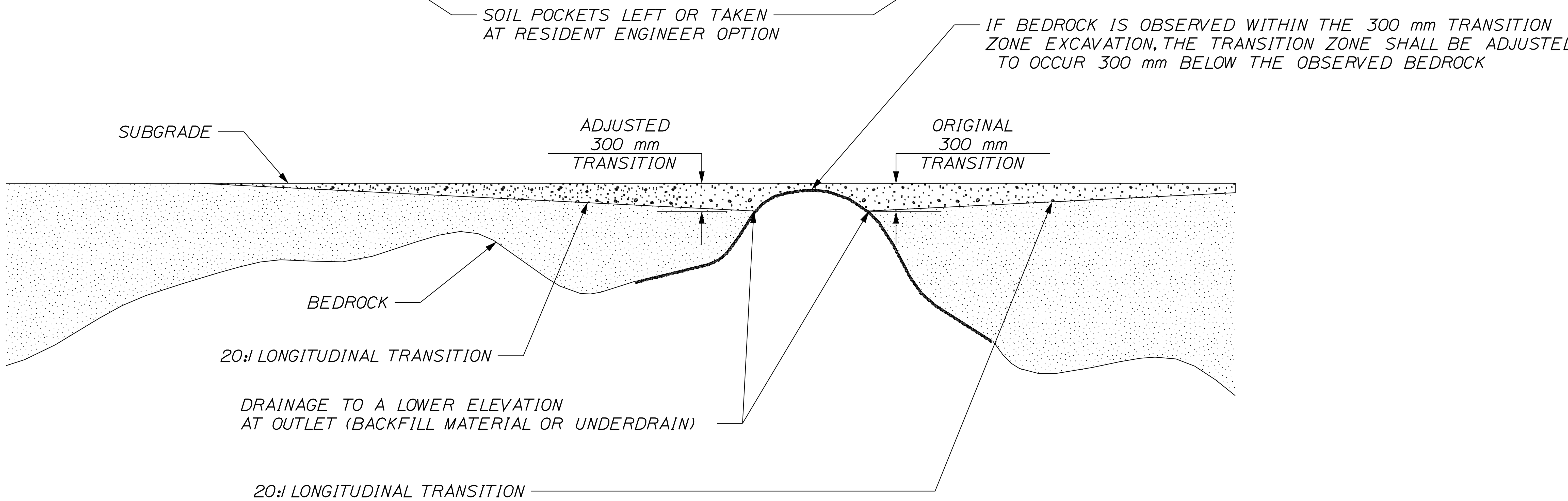
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	NH-1000(700)E	30	193

10007.00

PROFILE OF UNDERCUT OF FROST SUSCEPTIBLE SOILS OVER LEDGE







FROST SUSCEPTIBLE SOIL TO BE UNDERCUT AND REPLACED WITH NON FROST SUSCEPTIBLE MATERIAL

IF A SOIL SECTION BETWEEN LEDGE SUBGRADE IS OF SUCH LENGTH THAT THE TRANSITION FROM EACH EDGE WOULD MEET, IT SHOULD BE TREATED AS AN EARTH POCKET

1. CONSTRUCT A 300 mm UNDERCUT WITH A 20:1 LONGITUDINAL TRANSITION TO SUBGRADE IN AREAS WHERE ROCK AND CLASS IV FROST SUSCEPTIBLE SOILS OCCUR AT SUBGRADE. FROST SUSCEPTIBLE SOILS SHALL BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER OR THE RESIDENT. THE UNDERCUT TRANSITION ZONES SHALL BE DRAINED.

2. EXCAVATION OF THE TRANSITION ZONES SHALL BE PAID FOR AS COMMON EXCAVATION. THE CONTRACTOR SHALL REPLACE THE FROST SUSCEPTIBLE SOILS WITH GRAVEL BORROW AND SHALL BE PAID FOR UNDER THE GRAVEL BORROW PAY ITEM.

3. FOR POTENTIAL BEDROCK LOCATIONS, REFER TO THE BORING LOG SHEETS AND CROSS SECTIONS. ACTUAL BEDROCK LOCATIONS WILL VARY.

4. REFFER TO MAINEDOT SOILS REPORT NO. 2009-12, ROUTE 1A RECONSTRUCTION ELLSWORTH, MAINE FOR ADDITIONAL TRANSITION ZONE DETAILS.

5. AREAS OF EXTENSIVE BEDROCK SUBGRADE SHALL BE SHATTER-BLASTED IN ACCORDANCE WITH SPECIAL PROVISION SECTION 203 SHATTER BLASTING OF SOLID ROCK SUBGRADE.

Filename: ...\MSTA\012_Ledge Details.dgn Division: HIGHWAY Username: bl.tran Date: 4/13/2009

PLANS		BY	DATE
PROJECT DESIGN ENGINEER	DESIGN-DETAILED	M. MOREAU	T. WHITE	MAR 2009
	CHECKED		
	REVISIONS		
	FIELD CHANGES		

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

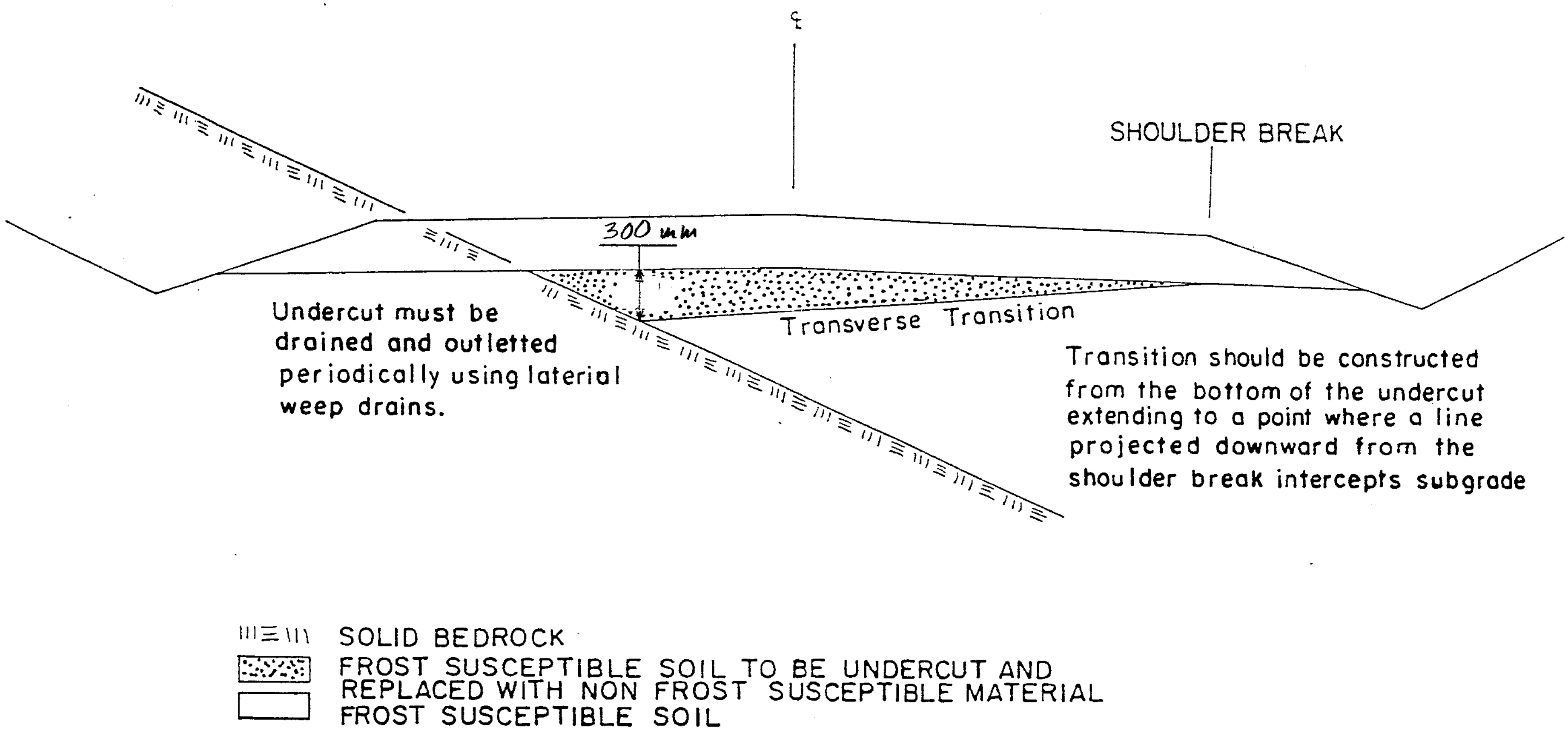
LEDGE TRANSITION ZONE DETAILS

ELLSWORTH

US RTE. 1A

SHEET 1 OF 1 AUGUSTA, MAINE

TRANSVERSE UNDERCUT OF FROST SUSCEPTIBLE SOILS OVER LEDGE



APPENDIX - B

Field Exploration and Test Data

Boring Logs
Auger Probe Logs
FWD Data

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-101
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	29.10	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+777, 2.5 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	28.93		PAVEMENT. 0.17	
								28.43		Brown, damp, sandy GRAVEL, trace silt, (Fill). 0.67	
1								27.58		Brown, damp, sandy SILT, little gravel. 1.52	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-101

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine
Boring No.: HB-ELL-102
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	27.80	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+385, 2.9 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	27.64		PAVEMENT. 0.16	
	S1							27.19		Brown, damp, fine to coarse SAND, some gravel, little silt. 0.61	G#130588 A-1-b, SM WC=3.3%
1	S2							26.28		Brown, damp, Clayey SILT, little fine to coarse sand, trace gravel. 1.52	G#130589 A-4, CL-ML WC=18.9%
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on, and soil samples are taken from, soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-103
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	28.40	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+035, 2.6 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.85 m BGS.

Hammer Efficiency Factor: **Hammer Type:** Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	28.25		PAVEMENT. 0.15	
										Brown, damp, sandy GRAVEL, trace silt, (Fill).	
								27.55		0.85	
1								27.33		Brown, wet, sandy GRAVEL, trace silt. 1.07	
										Brown, wet, sandy SILT, trace clay.	
								26.88		1.52	
										Bottom of Exploration at 1.52 m below ground surface. NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-103

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine
Boring No.: HB-ELL-104
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	36.10	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+539, 2.8 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	1.07 m BGS.

Hammer Efficiency Factor:
Hammer Type: Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	35.95		PAVEMENT. (0.15)	
								35.52		Brown, damp, sandy GRAVEL, trace silt. (0.58)	
1								35.03		Brown, damp, sandy SILT, trace clay. (1.07)	
								34.58		Brown, wet, sandy SILT, trace clay. (1.52)	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine
Boring No.: HB-ELL-105
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	41.30	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+390, 3.1 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
	S3							41.14		0.16	G#130590 A-1-b, SM WC=3.7%
										Brown, damp, fine to coarse SAND, some gravel, little silt, (Fill).	
	S4							40.42		0.88	G#130591 A-1-b, SM WC=8.1%
1										Brown, wet, fine to coarse SAND, some gravel, little silt.	
	S5							40.08		1.22	G#130592 A-4, CL-ML WC=14.2%
										Brown, damp, SILT, some clay, little fine to coarse sand, trace gravel.	
								39.78		1.52	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on, and soil samples are taken from, soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-105

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-106
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	49.30	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+943, 3.0 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Hammer Efficiency Factor: **Hammer Type:** Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	49.14		PAVEMENT.	0.16	
										Brown, damp, sandy GRAVEL, trace silt, (Fill).		
1								48.51			0.79	
								48.36		Cobble.	0.94	
										Brown, damp, sandy SILT, little gravel.		
								47.78			1.52	
										Bottom of Exploration at 1.52 m below ground surface. NO REFUSAL		
2												
3												
4												
5												
6												
7												
8												
9												

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-107
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	69.90	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+447, 6.5 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	1.13 m BGS.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	69.74		PAVEMENT.	0.16	
								69.23		Brown, damp, sandy GRAVEL, trace silt.	0.67	
1								68.77		Brown, damp, silty fine to coarse SAND, little gravel.	1.13	
								68.38		Similar to above, but wet.	1.52	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL		
3												
4												
5												
6												
7												
8												
9												

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-107

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project:	Route 1A	**Location:**	Ellsworth, Maine	**Boring No.:**	HB-ELL-108
				PIN:	10007.00

Driller:	MaineDOT	**Elevation (m):**	86.00	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+050, 2.5 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.79 m BGS.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
	S6							85.84		0.16 Brown, damp, fine to coarse SAND, some gravel, trace silt, (Fill).	G#130593 A-1-b, SM WC=3.4%
								85.45		0.55 Brown, damp, sandy SILT.	
	S7							85.21		0.79 Brown, wet, silty fine to coarse SAND, little gravel.	G#130594 A-4, SC-SM WC=16.3%
1											
								84.48		1.52 **Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on, and soil samples are taken from, soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-109
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	96.30	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+652, 0.8 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								96.13		0.16 Brown, damp, sandy GRAVEL, trace silt.	
								95.75		0.55 Brown, damp, sandy SILT, little gravel.	
1								95.17		1.13 **Bottom of Exploration at 1.13 m below ground surface.** REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project:	Route 1A			**Boring No.:**	HB-ELL-110
Location:	Ellsworth, Maine			**PIN:**	10007.00
Driller:	MaineDOT	**Elevation (m):**	98.20	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+504, 1.5 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	98.04		PAVEMENT. (0.16)	
										Brown, damp, sandy GRAVEL, trace silt.	
1								97.35		(0.85) Brown, damp, sandy SILT, little gravel.	
								96.68		(1.52) **Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log

METRIC UNITS

Project: Route 1A

Location: Ellsworth, Maine

Boring No.: HB-ELL-111

PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	89.70	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+208, 0.3 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	89.54		PAVEMENT.	0.16	
								89.03		Brown, damp, sandy GRAVEL, trace silt, (Fill).	0.67	
1								88.48		Brown, damp, sandy SILT, little gravel.	1.22	
								88.18		Similar to above, but trace clay.	1.52	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL		
3												
4												
5												
6												
7												
8												
9												

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-111

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-112
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	98.10	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+812, 2.0 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	97.95		PAVEMENT. 0.15	
										Brown, damp, sandy GRAVEL, trace silt, (Fill).	
								97.55		0.55	
										Brown, damp, sandy SILT, cobbles, little gravel, (Fill).	
1											
								96.58		1.52	
										Bottom of Exploration at 1.52 m below ground surface. NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-113
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	108.90	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+214, 2.8 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	108.74		PAVEMENT. 0.16	
	S8									Brown, damp, fine to coarse SAND, some gravel, little silt.	G#130595 A-1-b, SM WC=3.1%
	S9							108.35		0.55 Brown, damp, sandy SILT, little clay, trace gravel.	G#130596 A-4, CL-ML WC=12.5%
1											
								107.38		1.52 **Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on, and soil samples are taken from, soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-114
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	114.70	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	2+867, 2.5 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								114.53		0.17	
										Brown, damp, sandy GRAVEL, trace silt, (Fill).	
								114.09		0.61	
1										Brown, damp, sandy SILT, little gravel, trace clay.	
								113.18		1.52	
2										**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-114

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-115
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	125.10	**Auger ID/OD:**	100 mm
Operator:	C. Mann	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	11/19/02-11/19/02	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	2+468, 2.6 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:

D = Split Spoon Sample	R = Rock Core Sample	S_u = Insitu Field Vane Shear Strength (kPa)	$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
MD = Unsuccessful Split Spoon Sample attempt	SSA = Solid Stem Auger	T_v = Pocket Torvane Shear Strength (kPa)	WC = water content, percent
U = Thin Wall Tube Sample	HSA = Hollow Stem Auger	q_p = Unconfined Compressive Strength (Pa)	LL = Liquid Limit
MU = Unsuccessful Thin Walled Tube Sample attempt	RC = Roller Cone	N-uncorrected = Raw field SPT N-value	PL = Plastic Limit
V = Insitu Vane Shear Test	WOH = weight of 64 kg hammer	Hammer Efficiency Factor = Annual Calibration Value	PI = Plasticity Index
MV = Unsuccessful Insitu Vane Shear Test attempt	WOR/C = weight of rods or casing	N_{60} = SPT N-uncorrected corrected for hammer effeciency	G = Grain Size Analysis
	WO1P = Weight of one person	N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected	C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT. 0.18	
	S10							124.92		Brown, damp, SAND some gravel, little silt. 0.67	G#130597 A-1-b, SM WC=4.3%
	S11							124.43		Brown, damp, silty SAND, trace gravel. 1.52	G#130598 A-4, SM WC=10.2%
1											
								123.58		**Bottom of Exploration at 1.52 m below ground surface.** NO REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Visual descriptions are based on, and soil samples are taken from, soil found on extracted auger flights.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-115

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-201
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	126.90	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Brad Ends	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	10/24/05; 09:00-09:20	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	2+300, 1.4 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
	1D	21.3/10.2	0.18 - 0.40	19/50(50)	---			126.72		0.18	G#180620
								126.47		Brown, damp, fine to coarse SAND, some gravel, trace silt, (Fill). 0.43	A-1-a, SW-SM WC=4.0%
								126.29		Augered into ROCK. 0.61	
1										**Bottom of Exploration at 0.61 m below ground surface.** REFUSAL, (Boulder?)	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log

METRIC UNITS

Project:	Route 1A	**Location:**	Ellsworth, Maine	**Boring No.:**	HB-ELL-202
				PIN:	10007.00
Driller:	Maine Test Borings, Inc.	**Elevation (m):**	121.70	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Brad Ends	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	10/24/05; 10:00-10:15	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	2+660, 2.5 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:

D = Split Spoon Sample	R = Rock Core Sample	S_u = Insitu Field Vane Shear Strength (kPa)	$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
MD = Unsuccessful Split Spoon Sample attempt	SSA = Solid Stem Auger	T_v = Pocket Torvane Shear Strength (kPa)	WC = water content, percent
U = Thin Wall Tube Sample	HSA = Hollow Stem Auger	q_p = Unconfined Compressive Strength (Pa)	LL = Liquid Limit
MU = Unsuccessful Thin Walled Tube Sample attempt	RC = Roller Cone	N-uncorrected = Raw field SPT N-value	PL = Plastic Limit
V = Insitu Vane Shear Test	WOH = weight of 64 kg hammer	Hammer Efficiency Factor = Annual Calibration Value	PI = Plasticity Index
MV = Unsuccessful Insitu Vane Shear Test attempt	WOR/C = weight of rods or casing	N_{60} = SPT N-uncorrected corrected for hammer effeciency	G = Grain Size Analysis
	WO1P = Weight of one person	N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected	C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	121.55		PAVEMENT. 0.15	
	1D/AB	61.0/27.9	0.27 - 0.88	24/68/65/70	133	0				Brown, damp, very dense gravelly fine to coarse SAND, little silt, (Fill). (1D/A) 0.27-0.85 m bgs. 0.85	G#180621 A-1-b, SM WC=4.4%
1								120.85 120.82		(1D/B) 0.85-0.88 m bgs. Old PAVEMENT. 0.88	
										Bottom of Exploration at 0.88 m below ground surface. AUGER REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

(75 mm Dia. Core) PC-1, 2+672, 2.2 Lt., 150 mm thick

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-203
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	113.20	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Brad Ends	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	10/24/05; 11:45-12:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+000, 1.6 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	113.08		PAVEMENT. 0.12	
	1D	61.0/25.4	0.27 - 0.88	56/47/64/50	111	0		112.97		MACADAM. 0.23	G#180622 A-1-a, SW-SM WC=4.5%
								112.29		Brown, damp, very dense, fine to coarse SAND, some gravel, trace silt, (Fill). 0.91	
1	2D	61.0/38.1	0.91 - 1.52	13/13/12/13	25	0				Brown, moist, very stiff, fine to coarse sandy SILT, trace gravel, (Till). 1.52	G#180623 A-4, ML WC=12.7%
	3D	61.0/55.9	1.52 - 2.13	11/17/25/27	42	0		111.68		Brown, moist, hard, fine to coarse sandy SILT, trace gravel, (Till). 2.13	G#180624 A-4, ML WC=11.0%
2								111.07		**Bottom of Exploration at 2.13 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

(75 mm Core) PC-1, 2+672, 2.2 Lt., 150 mm thick

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-204
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	107.30	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Brad Ends	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	10/24/05; 13:10-13:35	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	3+400, 2.8 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	107.13		PAVEMENT. 0.17	
	1D	61.0/33.0	0.30 - 0.91	52/87/83/88	170	0		107.06		MACADAM. 0.24	G#180625 A-1-b, SW-SM WC=4.5%
										Brown, damp, very dense, medium to coarse SAND, some gravel, trace fine sand, little silt, (Fill). 0.91	
1	2D/AB	42.7/25.4	0.91 - 1.34	29/42/75(120)	---			106.38		(2D/A) 0.91-1.25 m bgs. Brown, damp, fine to coarse SAND, trace gravel. 1.25	
								106.05		(2D/B) 1.25-1.34 m bgs. Weathered BEDROCK. 1.40	
								105.90			
2										**Bottom of Exploration at 1.40 m below ground surface.** REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project:	Route 1A	**Location:**	Ellsworth, Maine	**Boring No.:**	HB-ELL-205
				PIN:	10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	90.10	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	CME 45C Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/1/05; 14:00-14:45	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	4+940, 2.6 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	1.92 m bgs.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
	1D	61.0/27.9	0.18 - 0.79	41/38/14/9	52	0		89.92		0.18 Damp, very dense, fine to coarse sandy GRAVEL, trace silt, (Fill).	G#175551 A-1-a, GW-GM WC=3.5%
								89.67		0.43 Old Pavement layer.	
								89.61		0.49 Same as above, (Fill).	
1	2D	61.0/40.6	0.79 - 1.40	4/5/9/12	14	0		89.31		0.79 Brown, moist, medium dense, silty fine to medium SAND, little gravel, trace coarse sand, (Till).	
	MD	48.3/0.0	1.52 - 2.01	6/7/9/11	16	0					
2								88.18		1.92 Similar to above, but wet.	
								88.09		2.01 **Bottom of Exploration at 2.01 m below ground surface.** REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

(75 mm Dia. Core) PC-2, 4+944, 2.5 Rt., No thickness given.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine
Boring No.: HB-ELL-206
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	80.80	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 08:00-08:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+200, 2.3 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	80.65		PAVEMENT. 0.15	
	1D	61.0/35.6	0.30 - 0.91	28/47/30/20	77	0		80.59		MACADAM. 0.21	G#175552 A-1-a, SW-SM WC=4.7%
								80.28		Damp, very dense, gravelly fine to coarse SAND, trace silt, (Fill). 0.52	
								80.22		Old Pavement layer. 0.58	
1	2D	61.0/27.9	0.91 - 1.52	5/6/7/10	13	0		79.89		Same as above, (Fill). 0.91	
	3D	61.0/38.1	1.52 - 2.13	7/35/82/100	117	0		79.13		Brown, moist, medium dense, silty fine to medium SAND, trace gravel, (Till). 1.68	
2								78.70		Brown, damp, very dense, silty fine to coarse SAND, trace gravel, (Till). 2.10	
										Bottom of Exploration at 2.10 m below ground surface. REFUSAL, (COBBLE)	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-206

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-207
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	67.40	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 08:50-09:15	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	5+580, 2.3 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	67.22		PAVEMENT. 0.18	
	1D/AB	61.0/30.5	0.30 - 0.91	41/22/31/28	53	0		66.97		Brown, damp, very dense, gravelly fine to coarse SAND, trace silt, (Fill). (1D/A) 0.30-0.43 m bgs. 0.43	G#175553 A-1-a, SW-SM WC=4.9%
1	2D	61.0/38.1	0.91 - 1.52	10/18/14/18	32	0		66.49		(1D/B) 0.43-0.91 m bgs. Brown, moist, very dense, silty fine to medium SAND, trace coarse sand, trace gravel, (Till? Moraine?). 0.91	G#175554 A-4, SM WC=10.0%
	3D	61.0/40.6	1.52 - 2.13	11/12/21/29	33	0		65.88		Similar to above, but dense. 1.52	
2								65.27		Brown, wet, medium dense, silty fine to medium SAND, little coarse sand, trace gravel, (Till). 2.13	
										Bottom of Exploration at 2.13 m below ground surface. NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-208
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	44.10	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 10:30-11:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+200, 1.8 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Hammer Efficiency Factor: **Hammer Type:** Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	43.95		PAVEMENT. 0.15	
	1D	61.0/33.0	0.30 - 0.91	12/50/47/37	97	0		43.89		MACADAM. 0.21	G#175555 A-1-a, GW-GM WC=4.4%
										Brown, damp, very dense, fine to coarse sandy GRAVEL, trace silt, (Fill). 0.91	
1	2D/AB	61.0/25.4	0.91 - 1.52	11/13/16/16	29	0		43.19		(2D/A) 0.91-1.22 m bgs. Olive, moist, medium dense, silty fine to medium SAND, trace gravel, (Till? Moraine?). 1.22	
								42.88		(2D/B) 1.22-1.52 m bgs. Olive, moist, very stiff fine sandy SILT. 1.52	
	3D	61.0/45.7	1.52 - 2.13	6/14/27/29	41	0		42.58		Brown, damp, hard, SILT, trace fine sand. 2.13	
2								41.97		**Bottom of Exploration at 2.13 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-209
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	41.10	**Auger ID/OD:**	125 mm
Operator:	E. Giguere	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 10:30-11:15	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+400, 2.4 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	1.52 m bgs.

Hammer Efficiency Factor: **Hammer Type:** Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	40.95	PAVEMENT. —0.15	
								40.89	MACADAM. —0.21	
	1D	61.0/33.0	0.30 - 0.91	14/22/25/17	47	0			Damp, dense, fine to coarse SAND, some gravel, little silt, (Fill). —0.91	G#175556 A-1-b, SM WC=3.8%
1	2D/AB	61.0/27.9	0.91 - 1.52	15/12/11/4	23	0		40.18	(2D/A) 0.91-1.4 m bgs. Brown, damp, medium dense, fine to coarse SAND, some gravel, trace to little silt, (Fill). —1.40	
								39.70	(2D/B) 1.4-1.52 m bgs. Brown, moist, medium dense, silty fine to coarse SAND, trace gravel, (Moraine?). —1.52	
	3D	61.0/10.2	1.52 - 2.13	7/11/13/15	24	0		39.58	Brown, wet, medium dense, fine to coarse SAND, trace silt. —2.13	
2								38.97	**Bottom of Exploration at 2.13 m below ground surface.** NO REFUSAL	
3										
4										
5										
6										
7										
8										
9										

Remarks:

(75 mm Dia. Core) PC-3, 6+400, 2.0 Rt., 210 mm thick

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-210
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	38.40	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 11:00-11:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+480, 1.9 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.91 m bgs.

Hammer Efficiency Factor:
Hammer Type: Automatic ☐ Hydraulic ☐ Rope & Cathead ☐

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								38.22		0.18	
	1D	61.0/17.8	0.30 - 0.91	33/74/25/14	99	0		38.12		MACADAM.	G#175557
										0.27	A-1-a, SW-SM
										Damp, very dense, gravelly medium to coarse SAND, trace fine sand and silt, (Fill).	WC=4.6%
1	2D/AB	61.0/22.9	0.91 - 1.52	8/8/7/4	15	0		37.48		0.91	
								37.36		(2D/A) 0.91-1.04 m bgs. Similar to above, but wet.	
										1.04	
	3D	61.0/25.4	1.52 - 2.13	1/2/5/13	7	0		36.87		(2D/B) 1.04-1.52 m bgs. Olive, moist, stiff, SILT, trace fine sand.	
2										1.52	
								36.27		Brown, wet, medium stiff, SILT, trace fine sand.	
										2.13	
										Bottom of Exploration at 2.13 m below ground surface. NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation Soil/Rock Exploration Log METRIC UNITS	Project: Route 1A Location: Ellsworth, Maine	Boring No.: HB-ELL-211 PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	33.90	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 11:40-12:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	6+680, 2.4 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	33.75		PAVEMENT. 0.15	
	1D	61.0/25.4	0.30 - 0.91	44/56/43/40	99	0		33.69		MACADAM. 0.21	G#175558 A-1-a, SM WC=5.6%
										Damp, very dense, gravelly fine to coarse SAND, little silt, (Fill). 0.91	
1	2D	61.0/25.4	0.91 - 1.52	27/22/23/31	45	0		32.99		Brown, moist, dense, silty fine to medium SAND, little coarse sand, trace gravel, (Till? Moraine?). 1.52	
	3D	61.0/40.6	1.52 - 2.13	15/33/38/40	71	0		32.38		Brown, moist, very dense, silty fine to coarse SAND, little gravel, (Till). 2.13	
2								31.77		**Bottom of Exploration at 2.13 m below ground surface.** NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A		**Boring No.:**	HB-ELL-212
Location: Ellsworth, Maine		**PIN:**	10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	29.70	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/14/05; 09:00-09:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+175, 2.0 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.76 m bgs.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								29.53		0.17	
								29.46		MACADAM. 0.24	
	1D	30.5/15.2	0.30 - 0.61	58/65	---						G#175559 A-1-a, SW-SM WC=3.3%
								28.94		Damp, very dense, gravelly fine to coarse SAND, little silt, (Fill). 0.76	
1	2D/AB	61.0/35.6	0.91 - 1.52	17/12/18/20	30	0		28.63		Brown, wet, medium dense, gravelly medium to coarse SAND, trace fine sand and silt, (Moraine?). (2D/A) 0.91-1.07 m bgs. 1.07	G#175560 A-1-a, SW-SM WC=6.5%
	3D	61.0/50.8	1.52 - 2.13	8/17/25/31	42	0		28.18		(2D/B) 1.07-1.52 m bgs. Brown, moist, very stiff, fine sandy SILT, trace clay. 1.52	
2								27.57		Brown, moist, hard, mottled CLAY-SILT, trace fine sand in seams. 2.13	
										Bottom of Exploration at 2.13 m below ground surface. NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-213
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	27.50	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/14/05; 09:40-09:55	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+360, 2.8 Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	27.35		PAVEMENT. 0.15	
	1D	39.6/20.3	0.30 - 0.70	46/65/66(90)	---			27.27		MACADAM. 0.23	G#175561 A-1-a, SW-SM WC=3.7%
								26.80		Brown, damp, very dense, gravelly fine to coarse SAND, trace silt, (Fill). 0.70	
1								26.74		Augered into apparent BEDROCK. 0.76	
										Bottom of Exploration at 0.76 m below ground surface. REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-213

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-214
PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	29.60	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 13:30-14:15	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+500, 2.4 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.70 m bgs.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	29.45		PAVEMENT. 0.15	
	1D	61.0/22.9	0.30 - 0.91	29/37/40/21	77	0		28.90		Damp, very dense, fine to coarse sandy GRAVEL, trace silt, (Fill). 0.70	G#175562 A-1-a, GW-GM WC=6.5%
1	2D/AB	61.0/30.5	0.91 - 1.52	1/2/4/3	6	0		28.65		Similar to above, but wet, (Fill). 0.94	
								28.38		(2D/A) 0.95-1.22 m bgs. Brown, wet, loose, silty fine to medium SAND, trace gravel, (Moraine?). 1.22	
	3D	61.0/43.2	1.52 - 2.13	5/9/14/26	23	0		28.08		(2D/B) 1.22-1.52 m bgs. Grey, wet, CLAY-SILT, trace fine sand. 1.52	
2								27.47		Brown, moist, very stiff, mottled CLAY-SILT, trace fine sand. 2.13	
										Bottom of Exploration at 2.13 m below ground surface. NO REFUSAL	
3											
4											
5											
6											
7											
8											
9											

Remarks:

(75 mm Dia. Core) PC-4, 7+503, 2.1 Rt., 150 mm thick

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log

METRIC UNITS

Project: Route 1A

Location: Ellsworth, Maine

Boring No.: HB-ELL-215

PIN: 10007.00

Driller:	Maine Test Borings, Inc.	**Elevation (m):**	30.30	**Auger ID/OD:**	125 mm
Operator:	Ron Idand, Andy	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	G. Lidstone	**Rig Type:**	Mobile B-47 Trailer	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	11/2/05; 14:45-15:15	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	7+860, 2.2 Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	0.85 m bgs.
Hammer Efficiency Factor:		**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	30.15		PAVEMENT. 0.15	
	1D	61.0/22.9	0.30 - 0.91	37/42/27/26	69	0				Damp, very dense, fine to coarse sandy GRAVEL, trace silt, (Fill).	G#175563 A-1-a, GW-GM WC=5.1%
								29.45		0.85	
1	2D	27.4/17.8	0.91 - 1.19	13/100(120)	---					Similar to above, but wet, some silt.	
								29.11		1.19	
								29.02		Augered into apparent BEDROCK. 1.28	
										Bottom of Exploration at 1.28 m below ground surface. REFUSAL	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine
Boring No.: HB-ELL-301A
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	27.10	**Auger ID/OD:**	125 mm Solid Stem
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	9/4/08	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	NQ-2"
Boring Location:	6+969.5, 4.1 Rt.	**Casing ID/OD:**	HW	**Water Level*:**	1.22 m bgs.
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								26.89		0.21	
	1D	61.0/35.6	0.30 - 0.91	13/21/14/21	35	45				Brown, damp, dense, fine to coarse sandy GRAVEL, trace silt, occasional cobbles.	G#211453 A-1-a, GW-GM WC=1.9%
1								25.88		1.22	
	2D	61.0/55.9	1.52 - 2.13	WOH/WOH/WOH/4	---		10			Grey-brown, wet, very soft, SILT, some fine sand, some clay (Glaciomarine).	G#211454 A-4, CL WC=27.4% LL=26 PL=18 PI=8
2							16				
							20				
							44				
							32			Dark brown organics, wood fragments in wash water from 2.74-2.99 m bgs.	
3								24.05		3.05	
	3D	61.0/61.0	3.05 - 3.66	WOH/WOH/WOH/WOH	---		14			Grey, wet, very soft, Clayey SILT (Glaciomarine).	G#211455 A-6, CL WC=32.8% LL=28 PL=18 PI=10
							13				
	V1		3.66 - 3.79	Su=357/55 psf			15			65x130 mm vane raw torque readings: V1: 13.0/2.0 ft-lbs	
4	MV		3.96 - 3.96	Could Not Push			13			Failed 65x130 mm vane attempt.	
								22.92		4.18	
							58				
	4D	21.3/21.3	4.57 - 4.79	16/30(2.4")	---		a100			a100 blows for 0.21 m. Grey-brown, wet, very dense, silty fine to coarse SAND, some gravel, (Till).	G#211456 A-2-4, SM WC=8.2%
								22.31		4.79	
5	R1	152.4/137.2	4.88 - 6.40	RQD = 47%			NQ-2	22.22		Top of Bedrock at Elev. 22.31 m. Roller Coned ahead to 4.88 m bgs.	
										4.88	
6										Bedrock: Grey, fine-grained metasedimentary, chlorite SCHIST, highly fratured in upper 600 mm, slightly weathered, minor silt in-filling along fractures, one silt seam 75 mm thick from 6.22 to 6.31 m.	
								20.70		R1:Core Times (min:sec) 4.88-5.18 m (2:30) 5.18-5.49 m (2:48) 5.49-5.79 m (2:31) 5.79-6.1 m (2:36) 6.1-6.4 m (1:36) 90% Recovery	
7										6.40	
										Bottom of Exploration at 6.40 m below ground surface.	
8											
9											

Remarks:

Field Vane Tests are in US Customary Units (psf/ft-lbs).

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ELL-301A

Maine Department of Transportation

Soil/Rock Exploration Log
METRIC UNITS

Project: Route 1A
Location: Ellsworth, Maine

Boring No.: HB-ELL-301
PIN: 10007.00

Driller:	MaineDOT	**Elevation (m):**	27.10	**Auger ID/OD:**	125 mm Solid Stem
Operator:	E. Giguere/C. Giles	**Datum:**	NAVD 88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	63.5 kg/760 mm
Date Start/Finish:	9/4/08; 08:15-08:30	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N//A
Boring Location:	6+971.4, 4.1 Rt.	**Casing ID/OD:**	HW	**Water Level*:**	N/A
Hammer Efficiency Factor:	0.77	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Walled Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 64 kg hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (kPa)
T_v = Pocket Torvane Shear Strength (kPa)
q_p = Unconfined Compressive Strength (Pa)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer effeciency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (kPa)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (m)	Sample No.	Pen/Rec (cm)	Sample Depth (m)	Blows (150 mm) Shear Strength (kPa) or RQD (%)	N-value	N_{60}	Casing Blows	Elevation (m)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA			PAVEMENT.	
								26.89		0.21	
	MD	61.0/2.5	0.30 - 0.91	15/20/16/25	36	46				Similar to HB-ELL-301A/1D.	
								26.19		0.91	
1										**Bottom of Exploration at 0.91 m below ground surface.** AUGER REFUSAL, hit boulder or bridge abutment. Moved to HB-ELL-301A.	
2											
3											
4											
5											
6											
7											
8											
9											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

State of Maine - Department of Transportation

Power Auger Probe Summary Sheet

Town(s): Ellsworth Project Number: 10007.00

Station (Meter)	Offset (Meter)	Weathered Rock (Meter)	Refusal (Meter)	No Refusal (Meter)	Water Depth (m)	Comments Date:10/31/05, 11/1,2,14/05
2+280	1.6 Rt.			2.13		MaineDOT and
2+320	1.4 Rt.			2.13		Maine Test Borings, Inc
2+620	2.4 Lt.			2.13		5" Solid Stem Augers
2+640	2.6 Lt.	1.19	1.31			
2+680	2.4 Lt.	0.67	0.79			
2+700	2.4 Lt.			2.13		
3+340	2.4 Lt.			2.13		
3+340	4.1 Rt.			2.29	1.58	
3+360	2.2 Lt.		1.77			
3+360	4.1 Rt.		1.92		1.46	
3+380	2.2 Lt.	1.25	1.31			
3+380	4.1 Rt.		1.22		1.10	
3+400	3.4 Rt.		1.95			
3+420	2.6 Lt.		1.10			
3+420	3.7 Rt.		1.28			
3+440	2.6 Lt.		1.37			
3+440	3.6 Rt.		1.98		1.43	
3+460	2.5 Lt.		1.43			
3+460	3.5 Rt.	1.28	1.40			
3+480	2.4 Lt.			2.13		
3+480	4.0 Rt.			2.29	1.98	
3+540	1.9 Lt.			2.29		
3+540	5.2 Rt.			2.29		
3+560	1.2 Lt.	1.40	1.55			
3+560	6.9 Rt.		0.76			
3+580	0.4 Lt.	1.22	1.28			
3+580	4.2 Rt.		1.16			
3+600	0.8 Rt.	1.01	1.10			
3+600	8.0 Rt.		1.34			
3+620	2.1 Rt.	1.04	1.13			
3+620	9.8 Rt.		1.37		0.61	
3+640	3.3 Rt.			2.29		
3+640	11.0 Rt.			2.29		
3+660	4.7 Rt.	1.92	2.04			
3+660	12.3 Rt.		2.13		1.98	
3+680	4.6 Rt.	1.04	1.13			
3+680	12.0 Rt.	1.55	1.62			
3+700	3.9 Rt.		0.79			
3+700	11.4 Rt.	0.98	1.04			
3+720	2.9 Rt.		1.28			
3+720	10.7 Rt.		1.16			
3+740	1.5 Rt.			2.29	0.98	
3+740	9.7 Rt.	1.74	1.83			
3+760	0.2 Lt.		1.89			
3+760	8.8 Rt.	1.77	1.95			
3+780	1.0 Lt.		1.16			
3+780	7.1 Rt.		1.31			
3+800	1.9 Lt.			2.29		

State of Maine - Department of Transportation

Power Auger Probe Summary Sheet

Town(s): Ellsworth Project Number: 10007.00

Station (Meter)	Offset (Meter)	Weathered Rock (Meter)	Refusal (Meter)	No Refusal (Meter)	Water Depth (m)	Comments Date:10/31/05, 11/1,2,14/05
3+800	6.1 Rt.			2.29		MaineDOT and
3+820	2.8 Lt.	2.04	2.16			Maine Test Borings, Inc
3+820	5.6 Rt.		0.94			5" Solid Stem Augers
3+840	3.3 Lt.		2.01			
3+840	4.8 Rt.	1.22	1.28		1.16	
3+860	2.3 Lt.	2.23	2.38			
3+860	4.8 Rt.		1.22			
3+880	2.3 Lt.	2.80	2.87			
3+880	4.7 Rt.		1.13		0.98	
3+900	2.4 Lt.	2.10	2.23			
3+900	4.3 Rt.	1.13	1.25			
3+920	2.3 Lt.	0.94	1.10			
3+920	4.3 Rt.	1.46	1.71			
3+940	2.5 Lt.	1.04	1.13			
3+940	4.3 Rt.	1.49	1.68			
3+960	2.6 Lt.	1.40	1.49			
3+960	4.1 Rt.	1.55	1.68			
3+980	2.7 Lt.	1.01	1.13			
3+980	3.9 Rt.		1.62		0.94	
4+000	2.4 Lt.	2.83	2.99			
4+000	4.9 Rt.		1.10			
4+020	2.1 Lt.	2.74	2.93			
4+020	5.4 Rt.		2.19			
4+040	1.6 Lt.	1.86	2.01			
4+040	5.8 Rt.			3.05		
4+060	1.2 Lt.			3.05		
4+060	6.3 Rt.	2.10	2.26			
4+080	0.2 Lt.			3.05		
4+080	7.6 Rt.			3.05	2.53	
4+280	2.2 Lt.		2.35			
4+280	4.7 Rt.			3.05		
4+300	2.7 Lt.		1.55			
4+300	4.0 Rt.			3.05		
4+320	3.2 Lt.		1.46			
4+320	3.5 Rt.		2.35			
4+340	4.0 Lt.		2.23			
4+340	2.7 Rt.		1.98			
4+360	4.8 Lt.		1.34			
4+360	3.1 Rt.	1.89	2.04			
4+380	5.1 Lt.		0.67			
4+380	3.7 Rt.	0.73	0.79			
4+400	4.7 Lt.		1.68			
4+400	3.9 Rt.	0.40	0.49			
4+420	3.8 Lt.		1.52			
4+420	4.9 Rt.	0.91	1.04			
4+440	2.8 Lt.		1.22			
4+440	4.5 Rt.		1.13			
4+460	1.4 Lt.	1.19	1.31			

State of Maine - Department of Transportation

Power Auger Probe Summary Sheet

Town(s): Ellsworth Project Number: 10007.00

Station (Meter)	Offset (Meter)	Weathered Rock (Meter)	Refusal (Meter)	No Refusal (Meter)	Water Depth (m)	Comments Date:10/31/05, 11/1,2,14/05
4+460	7.1 Rt.		1.22			MaineDOT and
4+480	0.2 Lt.		1.92			Maine Test Borings, Inc
4+480	8.7 Rt.		1.52			5" Solid Stem Augers
4+500	0.8 Rt.		0.98			
4+500	8.9 Rt.		0.85			
4+520	2.2 Rt.	1.43	1.55			
4+520	9.5 Rt.	1.04	1.13			
4+540	2.6 Rt.	2.59	2.68			
4+540	11.7 Rt.	1.95	2.04			
4+560	2.7 Rt.	0.73	0.82			
4+560	10.4 Rt.		0.98			
4+580	2.7 Rt.	1.25	1.34			
4+580	11.7 Rt.	1.55	1.62			
4+600	2.3 Rt.	1.34	1.49			
4+600	10.0 Rt.		0.88			
4+620	1.4 Rt.	1.52	1.71			
4+620	8.6 Rt.	1.62	1.80			
4+640	0.5 Rt.	1.86	2.01			
4+640	7.3 Rt.	1.62	1.71			
4+660	1.3 Lt.			3.05		
4+660	6.1 Rt.	1.22	1.34			
4+700	2.7 Rt.			2.29		
4+720	5.7 Lt.			2.29		
4+720	1.0 Rt.	1.80	1.86			
4+740	6.6 Lt.	1.43	1.55			
4+740	0.3 Lt.	0.98	1.16			
4+760	6.6 Lt.	1.46	1.62			
4+760	0.3 Rt.	1.13	1.19			
4+780	6.2 Lt.	1.19	1.34			
4+780	0.8 Rt.		0.91		0.76	
4+800	5.4 Lt.	1.22	1.31			
4+800	2.1 Rt.		0.98		0.79	
4+820	4.9 Lt.		2.07			
4+820	3.0 Rt.			2.29		
4+840	4.2 Lt.			2.29		
4+840	4.0 Rt.			2.29		
4+860	3.5 Lt.			2.29		
4+860	4.7 Rt.	2.07	2.23			
4+880	2.8 Lt.			2.29		
4+880	5.5 Rt.			2.29		
4+900	2.6 Lt.			2.29		
4+900	5.5 Rt.			2.29		
4+920	2.3 Lt.			2.29		
4+920	5.7 Rt.			2.29		
4+960	5.7 Rt.			2.44		
5+620	6.5 Rt.			2.29		
5+740	5.2 Rt.			2.29		
5+780	5.1 Rt.			2.29		

State of Maine - Department of Transportation

Power Auger Probe Summary Sheet

Town(s): Ellsworth Project Number: 10007.00

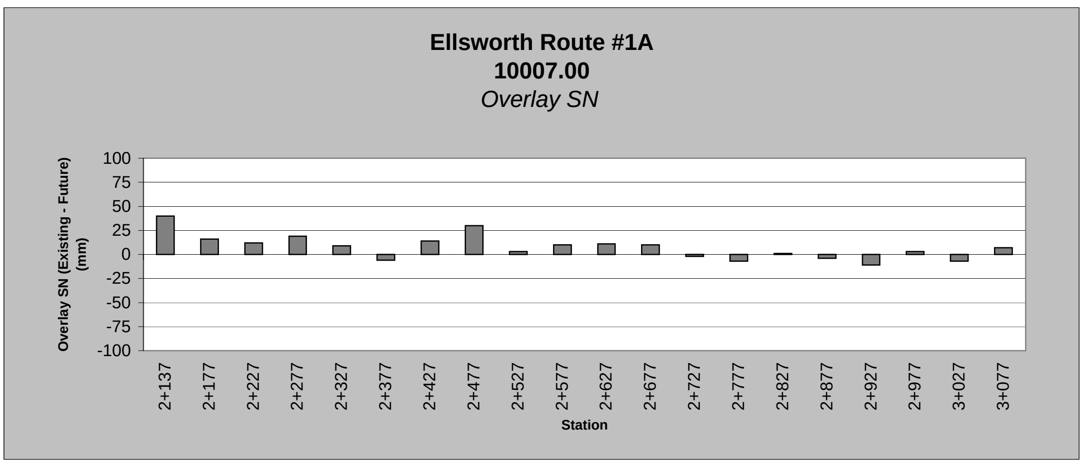
Station (Meter)	Offset (Meter)	Weathered Rock (Meter)	Refusal (Meter)	No Refusal (Meter)	Water Depth (m)	Comments Date:10/31/05, 11/1,2,14/05
5+800	5.0 Rt.			2.29		MaineDOT and
5+820	4.8 Rt.	1.55	1.68			Maine Test Borings, Inc
5+840	2.8 Rt.	1.49	1.62			5" Solid Stem Augers
5+860	4.9 Rt.			2.29		
5+900	6.0 Rt.			2.29		
5+920	6.4 Rt.		1.49			
5+940	6.1 Rt.		1.71			
5+960	5.8 Rt.			2.29		
5+980	6.5 Rt.			2.29	1.07	
6+060	5.6 Rt.			2.29		
6+780	2.4 Lt.			2.29		
6+800	2.3 Lt.			2.29		
6+820	2.1 Lt.			2.29		
6+840	1.9 Lt.			2.29		
7+340	2.7 Lt.			2.13		
7+380	2.2 Lt.	1.86	1.95		1.58	
7+402	2.2 Lt.			2.13		
7+520	2.2 Lt.			2.29		
7+520	2.9 Rt.		1.74			
7+540	2.0 Lt.		1.77			
7+540	5.9 Rt.	1.55	1.62			
7+560	2.0 Lt.		0.49			
7+560	5.8 Rt.	1.04	1.10			
7+580	2.0 Lt.	0.49	0.64			
7+580	6.3 Rt.	1.46	1.55			
7+600	2.6 Lt.	1.25	1.34			
7+600	6.0 Rt.	0.98	1.04			
7+620	2.7 Lt.			2.29		
7+620	3.1 Rt.			2.29		
7+640	2.6 Lt.		1.25			
7+640	2.7 Rt.	1.49	1.62			
7+660	2.9 Lt.		0.82			
7+660	2.2 Rt.			2.29		
7+680	3.1 Lt.		0.46			
7+680	2.1 Rt.	2.04	2.10			
7+700	3.2 Lt.			2.29		
7+700	2.0 Rt.	1.77	1.86			
7+720	3.4 Lt.			2.29		
7+720	2.2 Rt.			2.29		
7+740	2.1 Lt.			2.29		
7+740	2.5 Rt.		1.65			
7+760	2.2 Rt.			2.29		

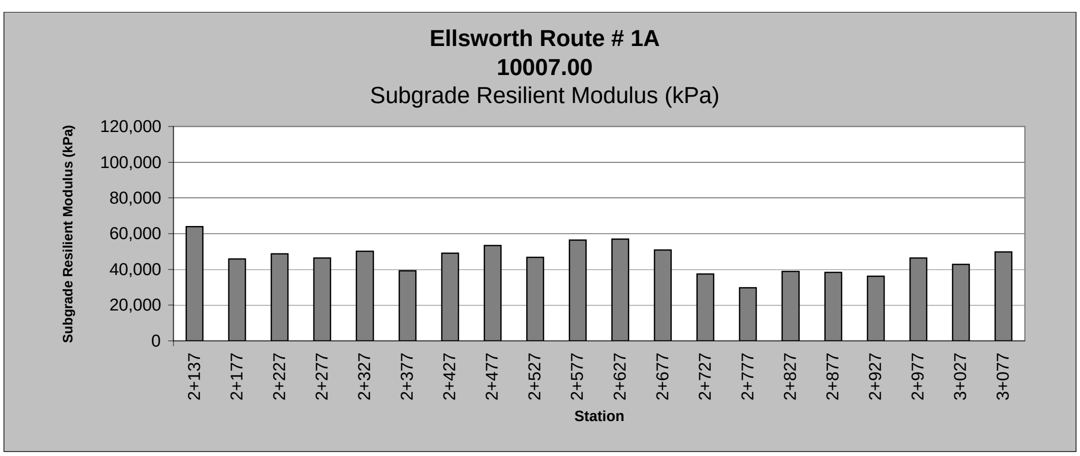
December 17, 2002

Ellsworth Route # 1A
10007.00

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
2+137	144	104	40	-	711,188	63,953	180	670
2+177	132	116	16	-	548,843	45,809	180	670
2+227	126	114	12	-	480,102	48,682	180	670
2+277	134	115	19	-	580,411	46,391	180	670
2+327	121	112	9	-	430,428	50,177	180	670
2+377	116	122	**-6**	**14**	371,205	39,145	180	670
2+427	127	113	14	-	487,137	49,161	180	670
2+477	140	110	30	-	659,101	53,325	180	670
2+527	118	115	3	-	525,234	46,811	170	610
2+577	118	108	10	-	526,762	56,394	170	610
2+627	119	108	11	-	534,977	56,884	170	610
2+677	122	112	10	-	571,843	50,917	170	610
2+727	122	124	**-2**	**5**	584,198	37,403	170	610
2+777	126	133	**-7**	**16**	629,956	29,732	170	610
2+827	123	122	1	-	596,547	38,827	170	610
2+877	119	123	**-4**	**9**	536,615	38,313	170	610
2+927	114	125	**-11**	**25**	474,173	36,146	170	610
2+977	118	115	3	-	529,141	46,396	170	610
3+027	112	119	**-7**	**16**	441,988	42,725	170	610
3+077	120	113	7	-	550,631	49,864	170	610

*** For actual Gravel Depths, see attached logdraft forms**



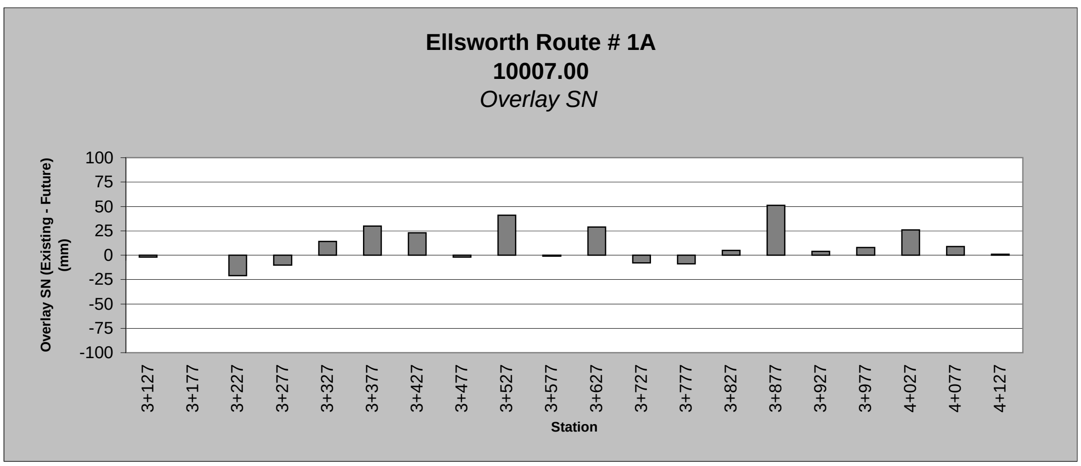


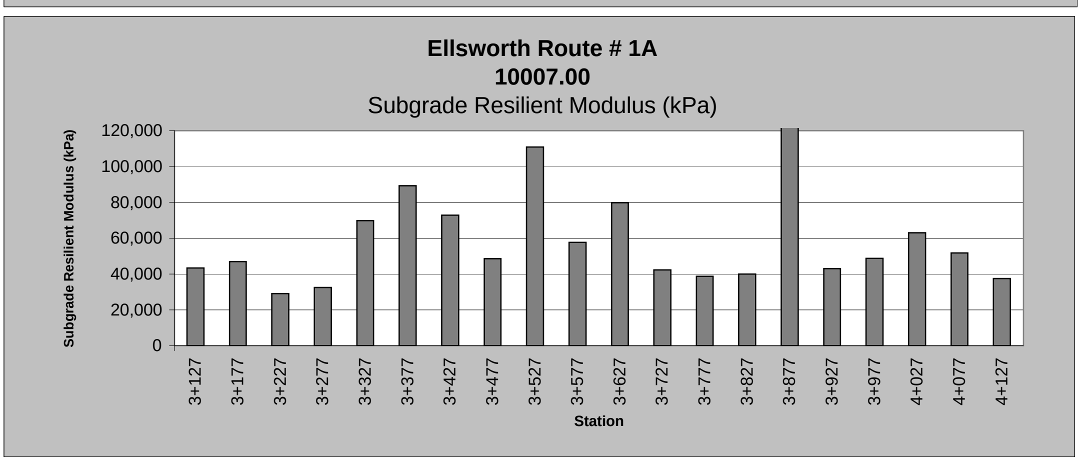
Ellsworth Route # 1A
10007.00

December 17, 2002

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
3+127	116	118	**-2**	**5**	495,781	43,417	170	610
3+177	115	115	0	-	663,028	47,045	160	550
3+227	113	134	**-21**	**48**	627,954	29,106	160	550
3+277	120	130	**-10**	**23**	750,221	32,455	160	550
3+327	115	101	14	-	667,529	69,867	160	550
3+377	122	92	30	-	787,887	89,289	160	550
3+427	122	99	23	-	786,201	72,896	160	550
3+477	112	114	**-2**	**5**	617,723	48,594	150	550
3+527	126	85	41	-	872,814	110,821	150	550
3+577	106	107	**-1**	**2**	517,213	57,592	150	550
3+627	125	96	29	-	854,543	79,854	150	550
3+727	111	119	**-8**	**18**	595,955	42,253	150	550
3+777	113	122	**-9**	**20**	626,048	38,681	150	550
3+827	126	121	5	-	872,327	39,913	150	550
3+877	133	82	51	-	1,021,228	123,450	150	550
3+927	122	118	4	-	793,811	43,074	150	550
3+977	121	113	8	-	765,885	48,836	150	550
4+027	130	104	26	-	948,928	63,096	150	550
4+077	120	111	9	-	744,063	51,803	150	550
4+127	125	124	1	-	474,216	37,535	160	670

*** For actual Gravel Depths, see attached logdraft forms**



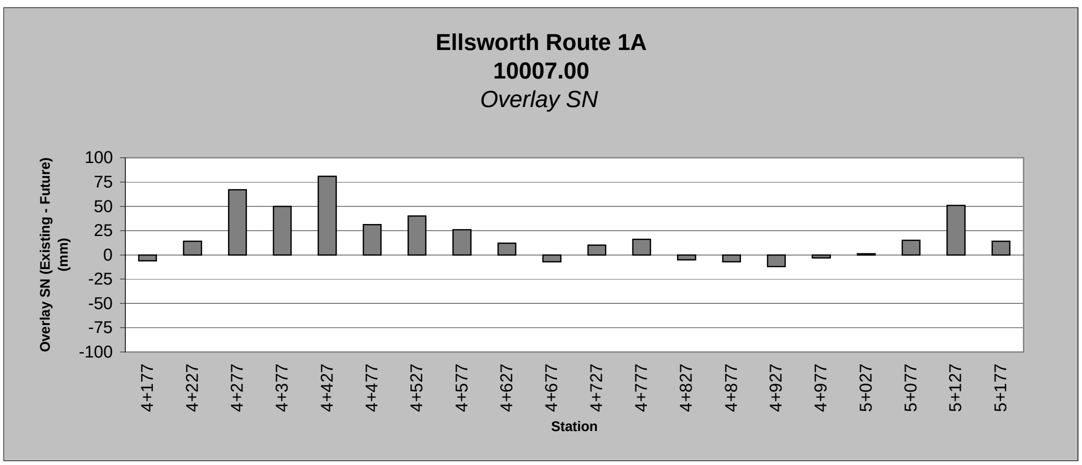


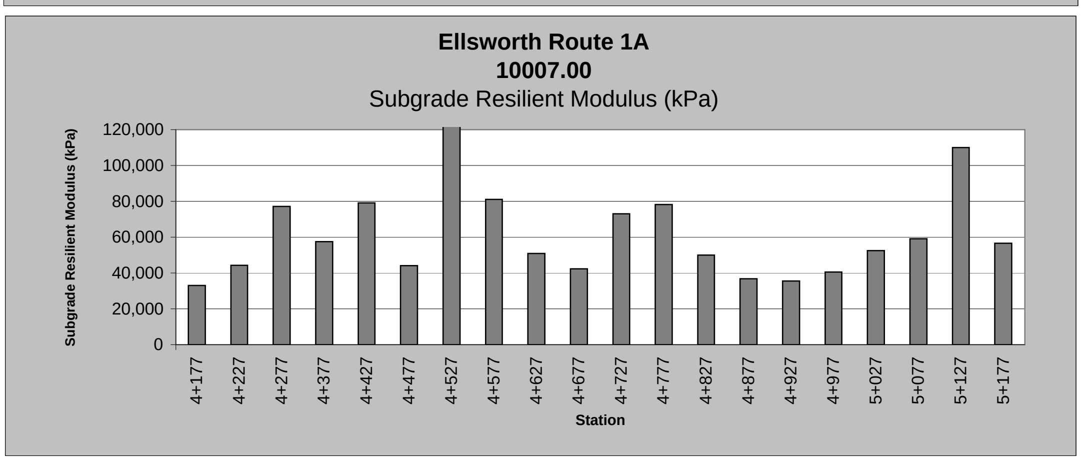
December 17, 2002

Ellsworth Route 1A
10007.00

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
4+177	123	129	**-6**	**14**	451,990	33,055	160	670
4+227	131	117	14	-	539,013	44,207	160	670
4+277	164	97	67	-	721,283	77,158	160	760
4+377	157	107	50	-	640,886	57,526	160	760
4+427	177	96	81	-	910,112	79,119	160	760
4+477	148	117	31	-	530,990	44,193	160	760
4+527	121	81	40	-	764,691	128,153	160	550
4+577	121	95	26	-	766,724	81,088	160	550
4+627	124	112	12	-	824,056	50,840	160	550
4+677	112	119	**-7**	**16**	617,261	42,325	160	550
4+727	109	99	10	-	560,697	73,010	160	550
4+777	113	97	16	-	624,371	78,148	160	550
4+827	108	113	**-5**	**11**	543,825	50,004	160	550
4+877	117	124	**-7**	**16**	703,347	36,849	160	550
4+927	114	126	**-12**	**27**	651,499	35,624	160	550
4+977	118	121	**-3**	**7**	720,791	40,581	160	550
5+027	112	111	1	-	609,007	52,542	160	550
5+077	121	106	15	-	765,605	59,185	160	550
5+127	137	86	51	-	1,116,452	109,916	160	550
5+177	122	108	14	-	785,149	56,570	160	550

*** For actual Gravel Depths, see attached logdraft forms**



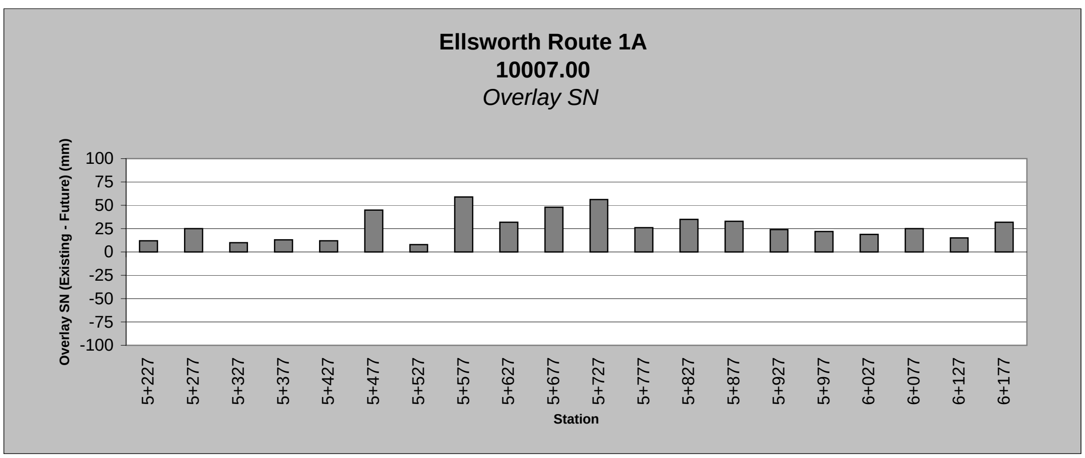


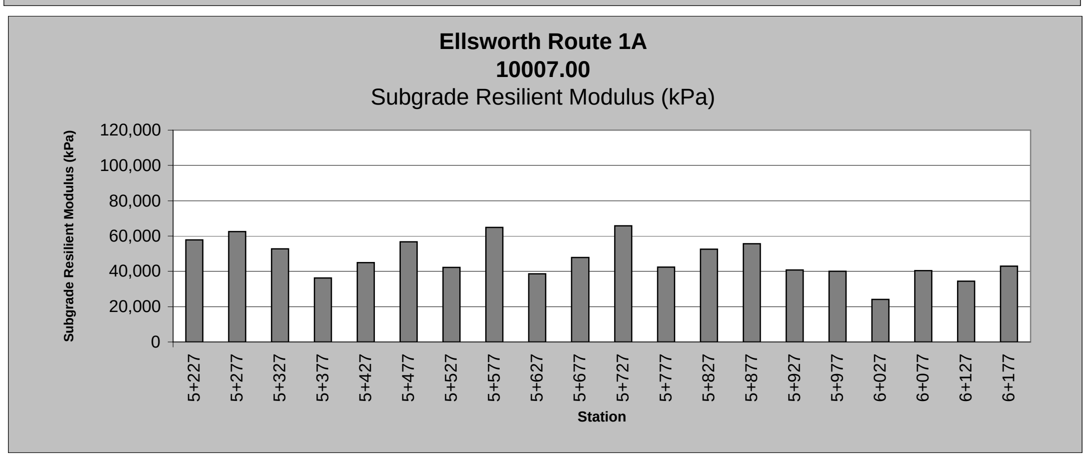
Ellsworth Route 1A
10007.00

December 17, 2002

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
5+227	119	107	12	-	739,924	57,748	160	550
5+277	129	104	25	-	934,241	62,515	160	550
5+327	121	111	10	-	761,342	52,812	160	550
5+377	138	125	13	-	630,558	36,171	160	670
5+427	129	117	12	-	517,274	45,027	160	670
5+477	153	108	45	-	856,947	56,722	160	670
5+527	127	119	8	-	492,957	42,234	160	670
5+577	162	103	59	-	700,557	64,890	160	760
5+627	155	123	32	-	616,797	38,583	160	760
5+677	162	114	48	-	700,914	47,945	160	760
5+727	159	103	56	-	662,788	65,804	160	760
5+777	145	119	26	-	507,256	42,428	160	760
5+827	146	111	35	-	510,708	52,551	160	760
5+877	142	109	33	-	467,677	55,633	160	760
5+927	144	120	24	-	492,525	40,731	160	760
5+977	143	121	22	-	481,427	40,117	160	760
6+027	161	142	19	-	686,913	24,124	160	760
6+077	146	121	25	-	515,305	40,410	160	760
6+127	142	127	15	-	469,279	34,437	160	760
6+177	150	118	32	-	553,888	42,991	160	760

*** For actual Gravel Depths, see attached logdraft forms**



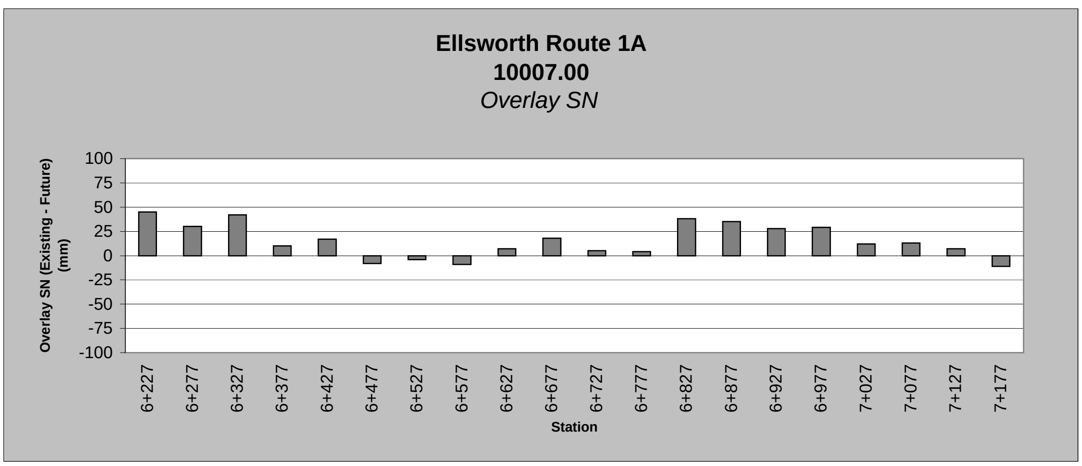


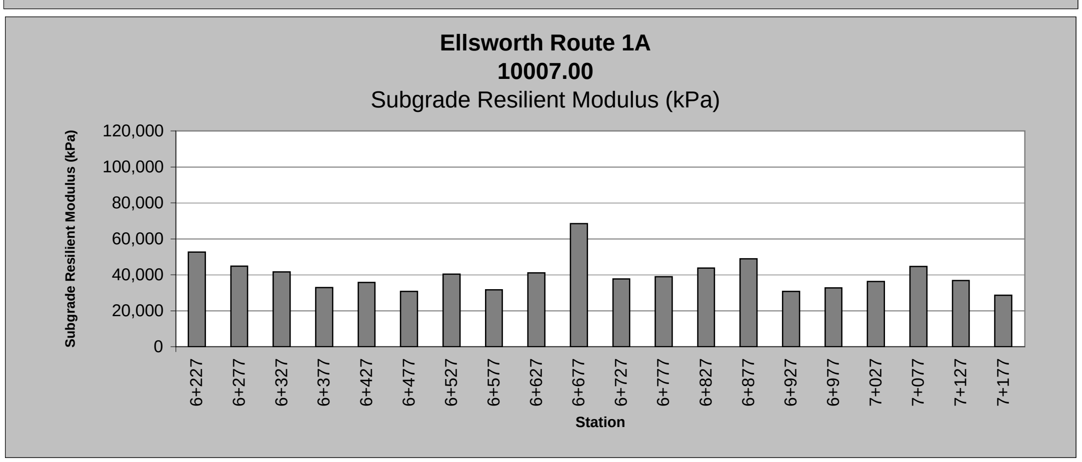
Ellsworth Route # 1A
10007.00

December 17, 2002

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
6+227	156	111	45	-	629,393	52,549	160	760
6+277	147	117	30	-	520,991	44,824	160	760
6+327	162	120	42	-	694,871	41,629	160	760
6+377	139	129	10	-	437,828	32,864	160	760
6+427	143	126	17	-	485,279	35,661	160	760
6+477	124	132	**-8**	**18**	700,404	30,839	150	580
6+527	117	121	**-4**	**9**	590,235	40,301	150	580
6+577	122	131	**-9**	**20**	668,176	31,636	150	580
6+627	127	120	7	-	758,020	41,084	150	580
6+677	119	101	18	-	621,108	68,495	150	580
6+727	128	123	5	-	781,104	37,753	150	580
6+777	126	122	4	-	740,271	38,872	150	580
6+827	156	118	38	-	1,406,685	43,789	150	580
6+877	148	113	35	-	539,079	48,958	150	760
6+927	160	132	28	-	675,987	30,754	150	760
6+977	158	129	29	-	644,817	32,760	150	760
7+027	137	125	12	-	419,977	36,289	150	760
7+077	130	117	13	-	693,874	44,618	160	610
7+127	131	124	7	-	719,138	36,835	160	610
7+177	124	135	**-11**	**25**	601,723	28,686	160	610

*** For actual Gravel Depths, see attached logdraft forms**



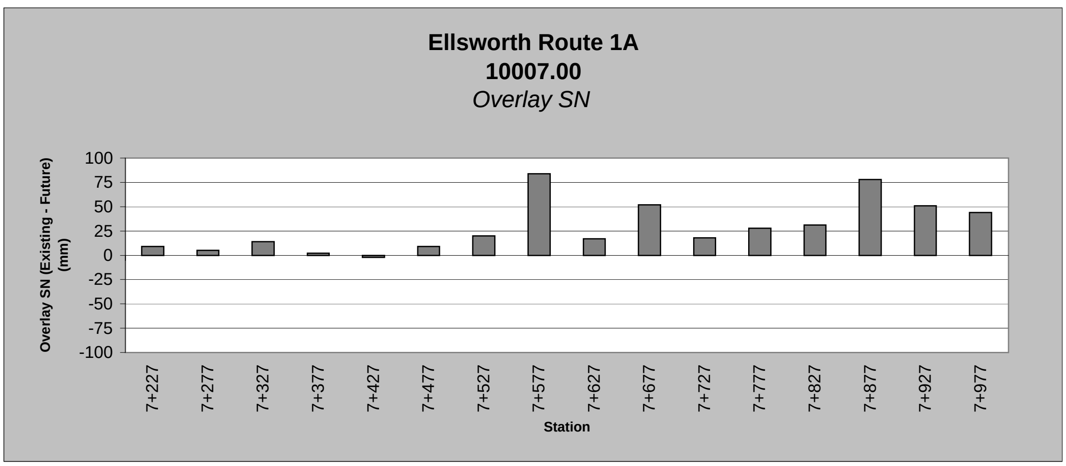


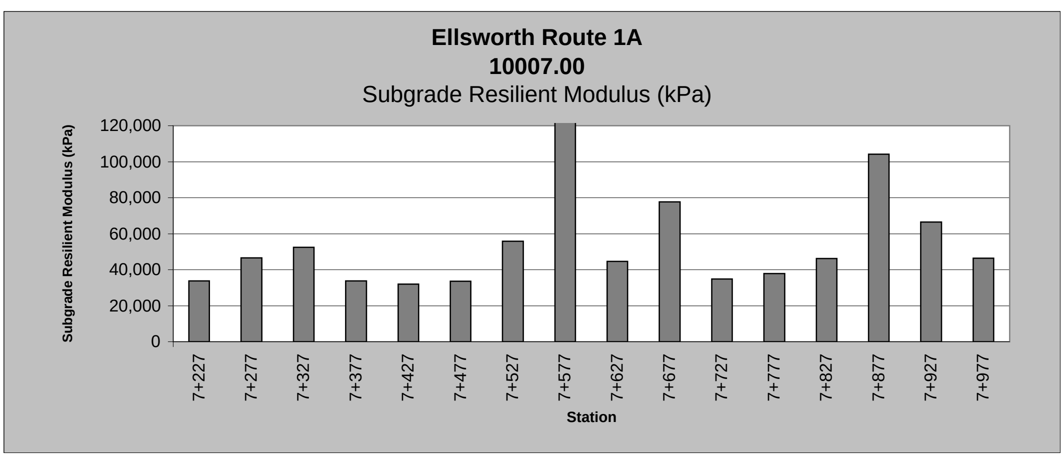
Ellsworth Route 1A
10007.00

December 17, 2002

Station (Meters)	Existing Structural Number (mm)	Future Traffic Structural Number (mm)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (mm)	Existing Pavement Modulus (kPa)	Subgrade Resilient Modulus (kPa)	Pavement Depth (mm)	* Combined Pavement/Gravel Depth Used for Calculation (mm)
7+227	137	128	9	-	814,929	33,731	160	610
7+277	120	115	5	-	551,797	46,492	160	610
7+327	125	111	14	-	626,747	52,386	160	610
7+377	130	128	2	-	700,168	33,855	160	610
7+427	128	130	**-2**	**5**	665,976	32,068	160	610
7+477	137	128	9	-	814,267	33,634	160	610
7+527	129	109	20	-	685,521	55,767	160	610
7+577	152	68	84	-	851,219	208,741	170	670
7+627	134	117	17	-	578,120	44,560	170	670
7+677	149	97	52	-	793,563	77,616	170	670
7+727	145	127	18	-	730,951	34,866	170	670
7+777	151	123	28	-	822,171	37,923	170	670
7+827	147	116	31	-	764,552	46,270	170	670
7+877	165	87	78	-	1,078,266	104,232	170	670
7+927	153	102	51	-	861,112	66,531	170	670
7+977	159	115	44	-	960,478	46,423	170	670

*** For actual Gravel Depths, see attached logdraft forms**





APPENDIX - C

Laboratory Test Data

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Ellsworth Project Number: 10007.00

Boring & Sample Identification Number	Station (Meter)	Offset (Meter)	Depth (Meter)	Reference Number	G.S.D.C. Sheet	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
HB-ELL-201, 1D	2+300	1.4 Rt.	0.18-0.40	180620	1	4.0			SW-SM	A-1-a	0
HB-ELL-115, S10	2+468	2.6 Lt.	0.18-0.67	130597	1	4.3			SM	A-1-b	II
HB-ELL-115, S11	2+468	2.6 Lt.	0.67-1.52	130598	1	10.2			SM	A-4	III
HB-ELL-202, 1D/A	2+660	2.5 Lt.	0.27-0.85	180621	1	4.4			SM	A-1-b	II
HB-ELL-203, 1D	3+000	1.6 Rt.	0.27-0.88	180622	2	4.5			SW-SM	A-1-a	0
HB-ELL-203, 2D	3+000	1.6 Rt.	0.91-1.52	180623	2	12.7			ML	A-4	IV
HB-ELL-203, 3D	3+000	1.6 Rt.	1.52-2.13	180624	2	11.0			ML	A-4	IV
HB-ELL-113, S8	3+214	2.8 Lt.	0.16-0.55	130595	2	3.1			SM	A-1-b	II
HB-ELL-113, S9	3+214	2.8 Lt.	0.55-1.52	130596	2	12.5			CL-ML	A-4	IV
HB-ELL-204, 1D	3+400	2.8 Lt.	0.30-0.91	180625	2	4.5			SW-SM	A-1-b	0
HB-ELL-205, 1D	4+940	2.6 Rt.	0.18-0.79	175551	3	3.5			GW-GM	A-1-a	0
HB-ELL-108, S6	5+050	2.5 Lt.	0.16-0.55	130593	3	3.4			SM	A-1-b	II
HB-ELL-108, S7	5+050	2.5 Lt.	0.79-1.52	130594	3	16.3			SC-SM	A-4	III
HB-ELL-206, 1D	5+200	2.3 Rt.	0.30-0.91	175552	3	4.7			SW-SM	A-1-a	0
HB-ELL-207, 1D/A	5+580	2.3 Rt.	0.30-0.43	175553	3	4.9			SW-SM	A-1-a	0
HB-ELL-207, 1D/B	5+580	2.3 Rt.	0.43-0.91	175554	3	10.0			SM	A-4	III
HB-ELL-208, 1D	6+200	1.8 Rt.	0.30-0.91	175555	4	4.4			GW-GM	A-1-a	0
HB-ELL-105, S3	6+390	3.1 Lt.	0.16-0.88	130590	4	3.7			SM	A-1-b	II
HB-ELL-105, S4	6+390	3.1 Lt.	0.88-1.22	130591	4	8.1			SM	A-1-b	II
HB-ELL-105, S5	6+390	3.1 Lt.	1.22-1.52	130592	4	14.2			CL-ML	A-4	IV
HB-ELL-209, 1D	6+400	2.4 Rt.	0.30-0.91	175556	5	3.8			SM	A-1-b	II
HB-ELL-210, 1D	6+480	1.9 Rt.	0.30-0.91	175557	5	4.6			SW-SM	A-1-a	0
HB-ELL-211, 1D	6+680	2.4 Lt.	0.30-0.91	175558	5	5.6			SM	A-1-a	II
HB-ELL-212, 1D	7+175	2.0 Rt.	0.30-0.61	175559	5	3.3			SW-SM	A-1-a	0
HB-ELL-212, 2D/A	7+175	2.0 Rt.	0.91-1.07	175560	5	6.5			SW-SM	A-1-a	0
HB-ELL-213, 1D	7+360	2.8 Lt.	0.30-0.70	175561	6	3.7			SW-SM	A-1-a	0
HB-ELL-102, S1	7+385	2.9 Lt.	0.16-0.61	130588	6	3.3			SM	A-1-b	II
HB-ELL-102, S2	7+385	2.9 Lt.	0.61-1.52	130589	6	18.9			CL-ML	A-4	IV
HB-ELL-214, 1D	7+500	2.4 Rt.	0.30-0.91	175562	6	6.5			GW-GM	A-1-a	0
HB-ELL-215, 1D	7+860	2.2 Rt.	0.30-0.91	175563	6	5.1			GW-GM	A-1-a	0
HB-ELL-301A/1D	6+969.5	4.1 Rt.	0.30-0.91	211453	7	1.9			GW-GM	A-1-a	0
HB-ELL-301A/2D	6+969.5	4.1 Rt.	1.52-2.13	211454	7	27.4	26	8	CL	A-4	IV
HB-ELL-301A/3D	6+969.5	4.1 Rt.	3.05-3.66	211455	7	32.8	28	10	CL	A-6	IV
HB-ELL-301A/4D	6+969.5	4.1 Rt.	4.57-4.79	211456	7	8.2			SM	A-2-4	II

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

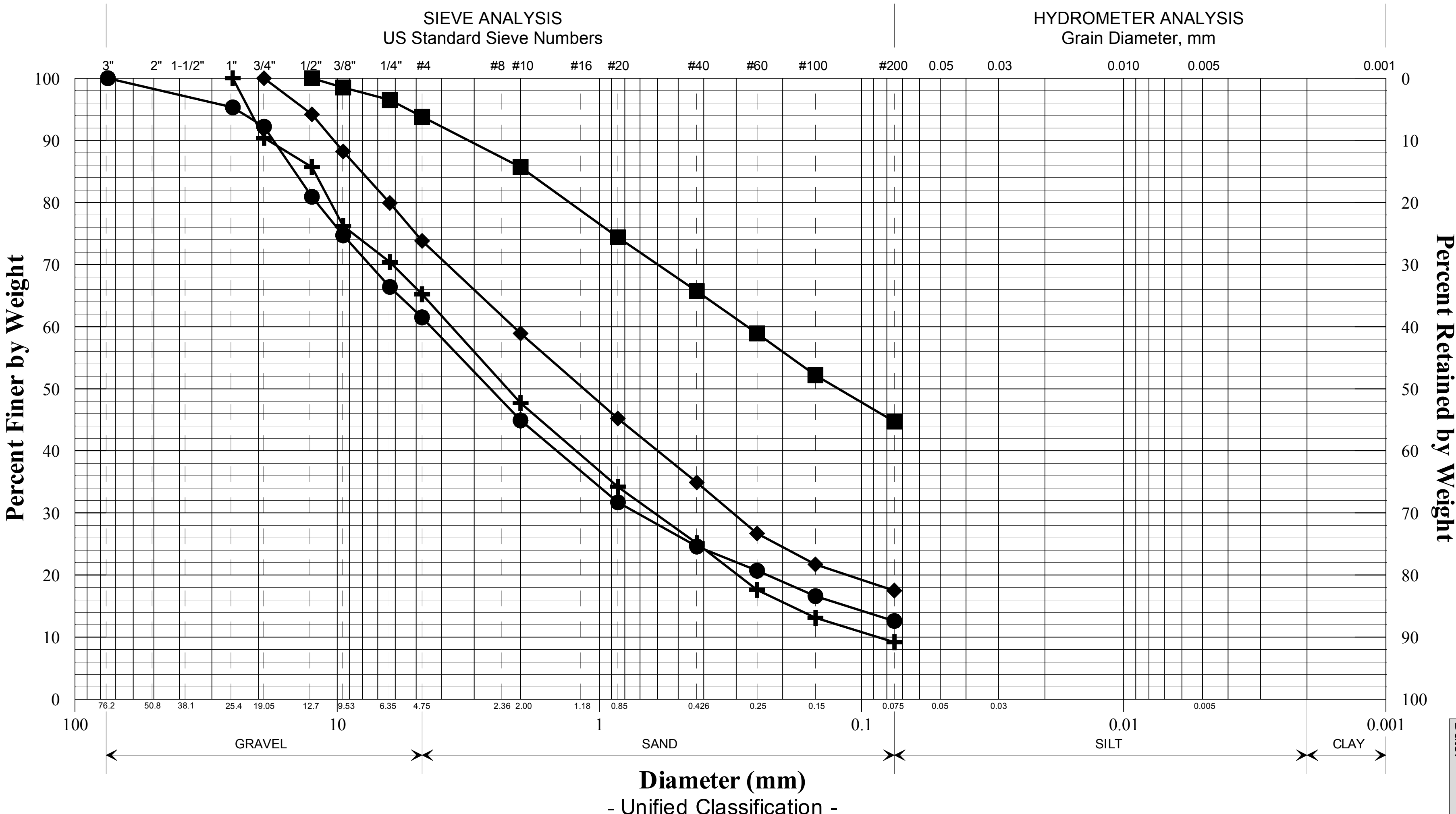
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



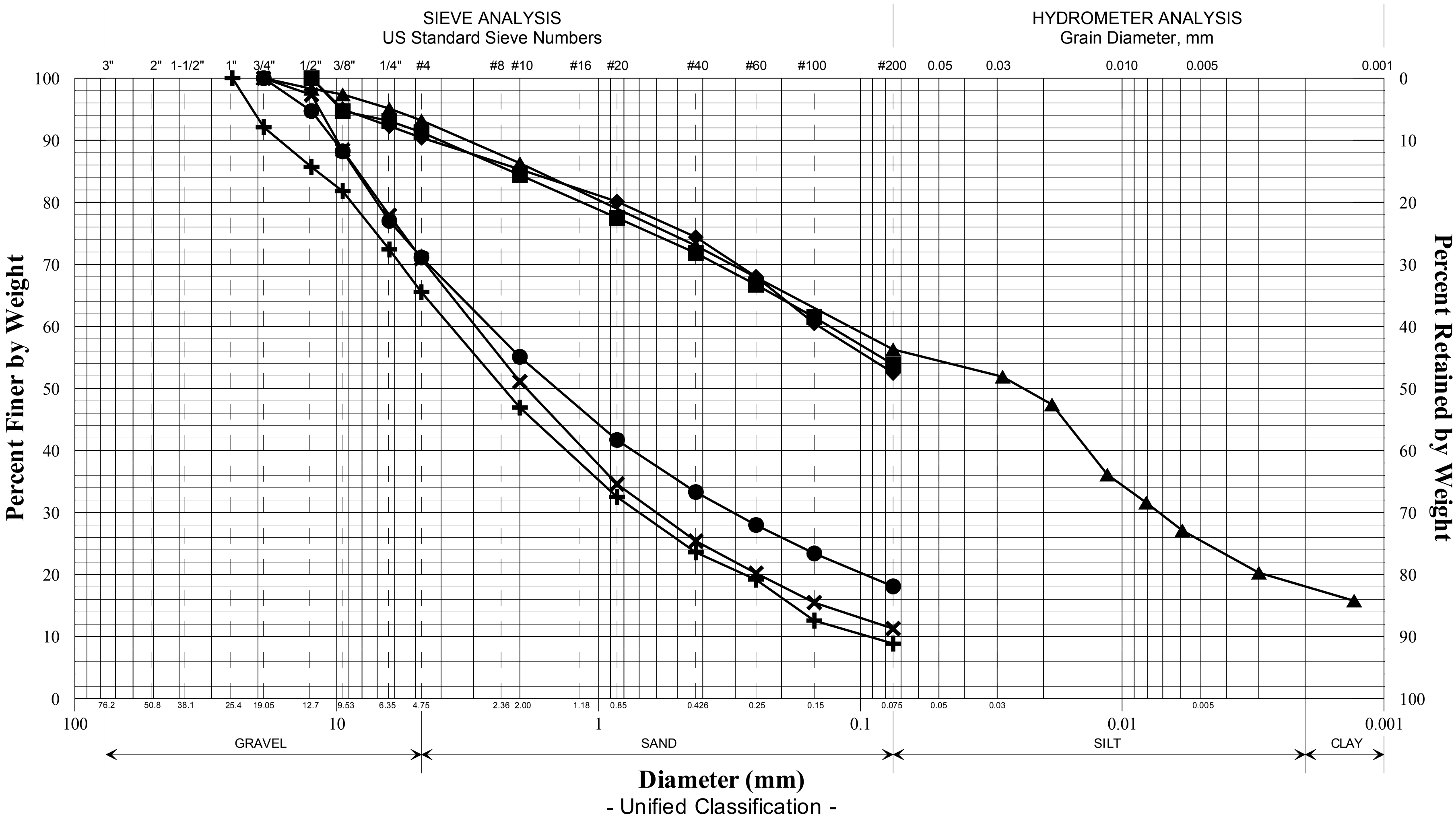
	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-201/1D	2+300	1.4 RT	0.18-0.40	SAND, some gravel, trace silt.	4.0			
◆	HB-ELL-115/S10	2+468	2.6 LT	0.18-0.67	SAND, some gravel, little silt.	4.3			
■	HB-ELL-115/S11	2+468	2.6 LT	0.67-1.52	Silty SAND, trace gravel.	10.2			
●	HB-ELL-202/1D(A)	2+660	2.5 LT	0.27-0.85	Gravelly SAND, little silt.	4.4			
▲									
✖									

PIN:	010007.00
Town:	Ellsworth
Reported by:	WHITE, TERRY A
Date:	1/26/2006

SHEET NO. 1

State of Maine Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE



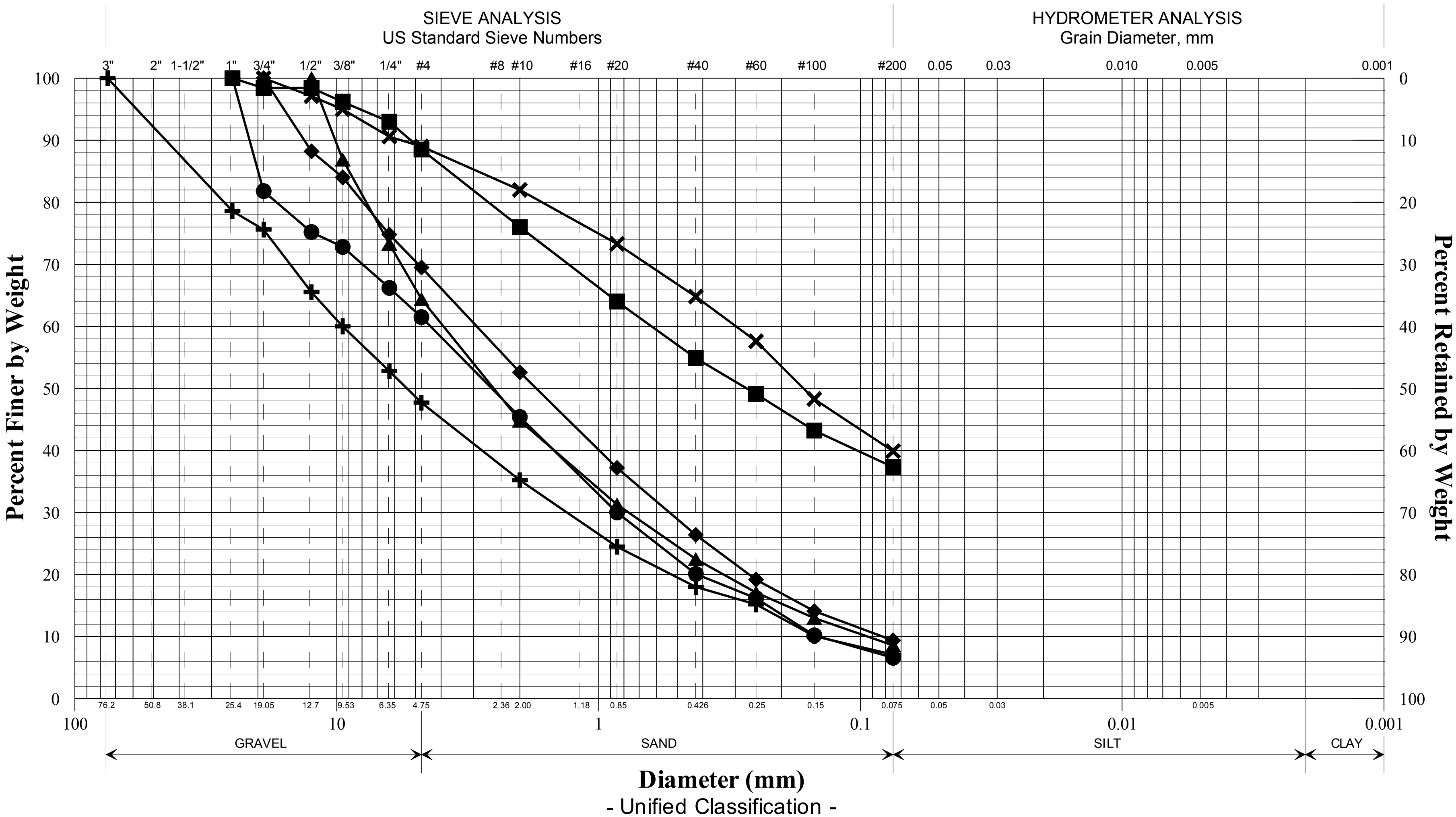
	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-203/1D	3+000	1.6 RT	0.27-0.88	SAND, some gravel, trace silt.	4.5			
◆	HB-ELL-203/2D	3+000	1.6 RT	0.91-1.52	Sandy SILT, trace gravel.	12.7			
■	HB-ELL-203/3D	3+000	1.6 RT	1.52-2.13	Sandy SILT, trace gravel.	11.0			
●	HB-ELL-113/S8	3+214	2.8 LT	0.16-0.55	SAND, some gravel, little silt.	3.1			
▲	HB-ELL-113/S9	3+214	2.8 LT	0.55-1.52	Sandy SILT, little clay, trace gravel.	12.5			
✖	HB-ELL-204/1D	3+400	2.8 LT	0.3-0.91	SAND, some gravel, little silt.	4.5			

PIN
010007.00
Town
Ellsworth
Reported by/Date
WHITE, TERRY A 1/26/2006

SHEET 2

State of Maine Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE

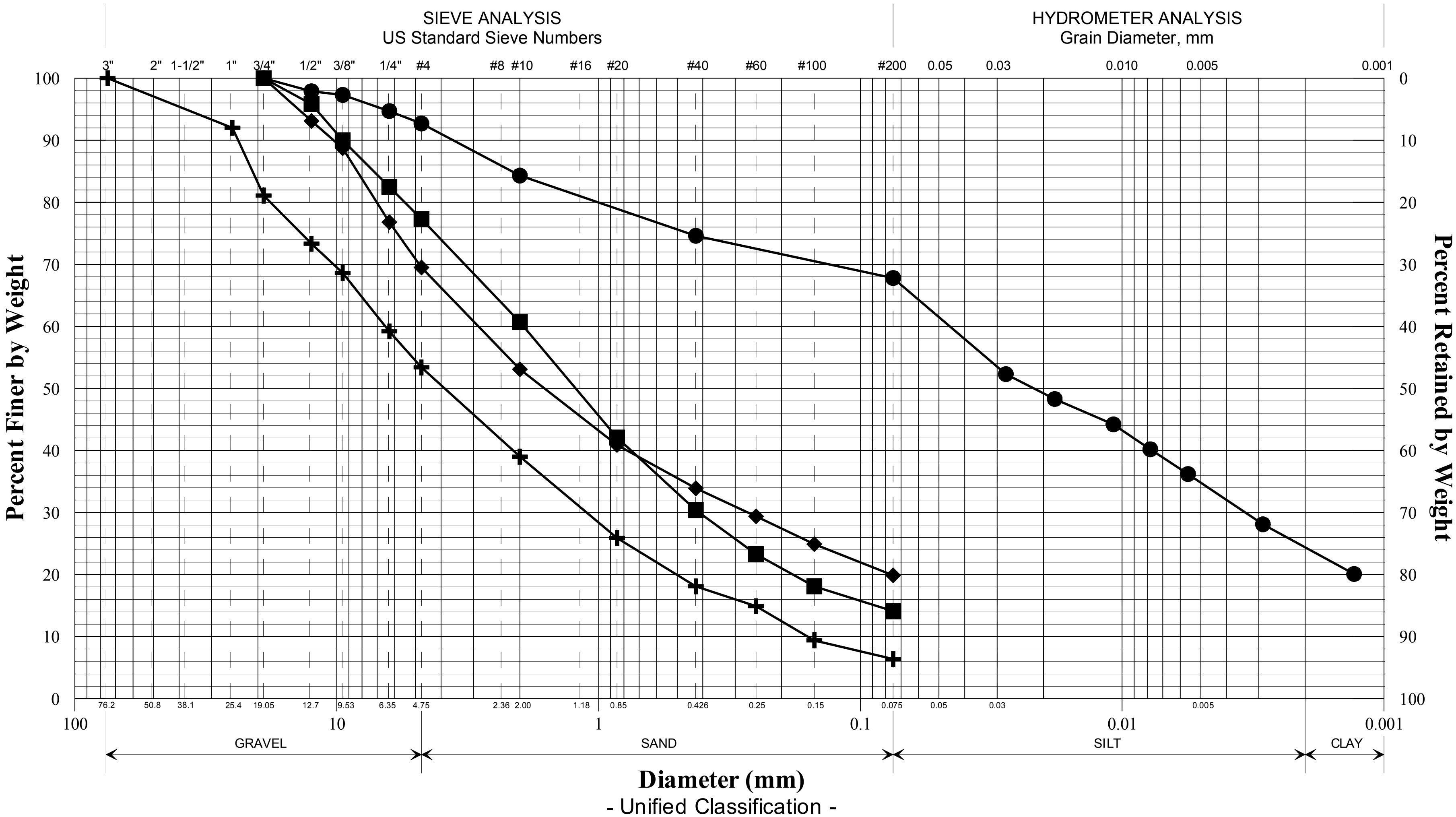


	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-205/1D	4+940	2.6 RT	0.18-0.79	Sandy GRAVEL, trace silt.	3.5			
◆	HB-ELL-108/S6	5+050	2.5 LT	0.16-0.55	SAND, some gravel, trace silt.	3.4			
■	HB-ELL-108/S7	5+050	2.5 LT	0.79-1.52	Silty SAND, little gravel.	16.3			
●	HB-ELL-206/1D	5+200	2.3 RT	0.30-0.91	Gravelly SAND, trace silt.	4.7			
▲	HB-ELL-207/1D(A)	5+580	2.3 RT	0.30-0.43	Gravelly SAND, trace silt.	4.9			
✖	HB-ELL-207/1D(B)	5+580	2.3 RT	0.43-0.91	Silty SAND, trace gravel.	10.0			

PIN
010007.00
Town
Ellsworth
Reported by/Date
WHITE, TERRY A 1/26/2006

SHEET 3

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

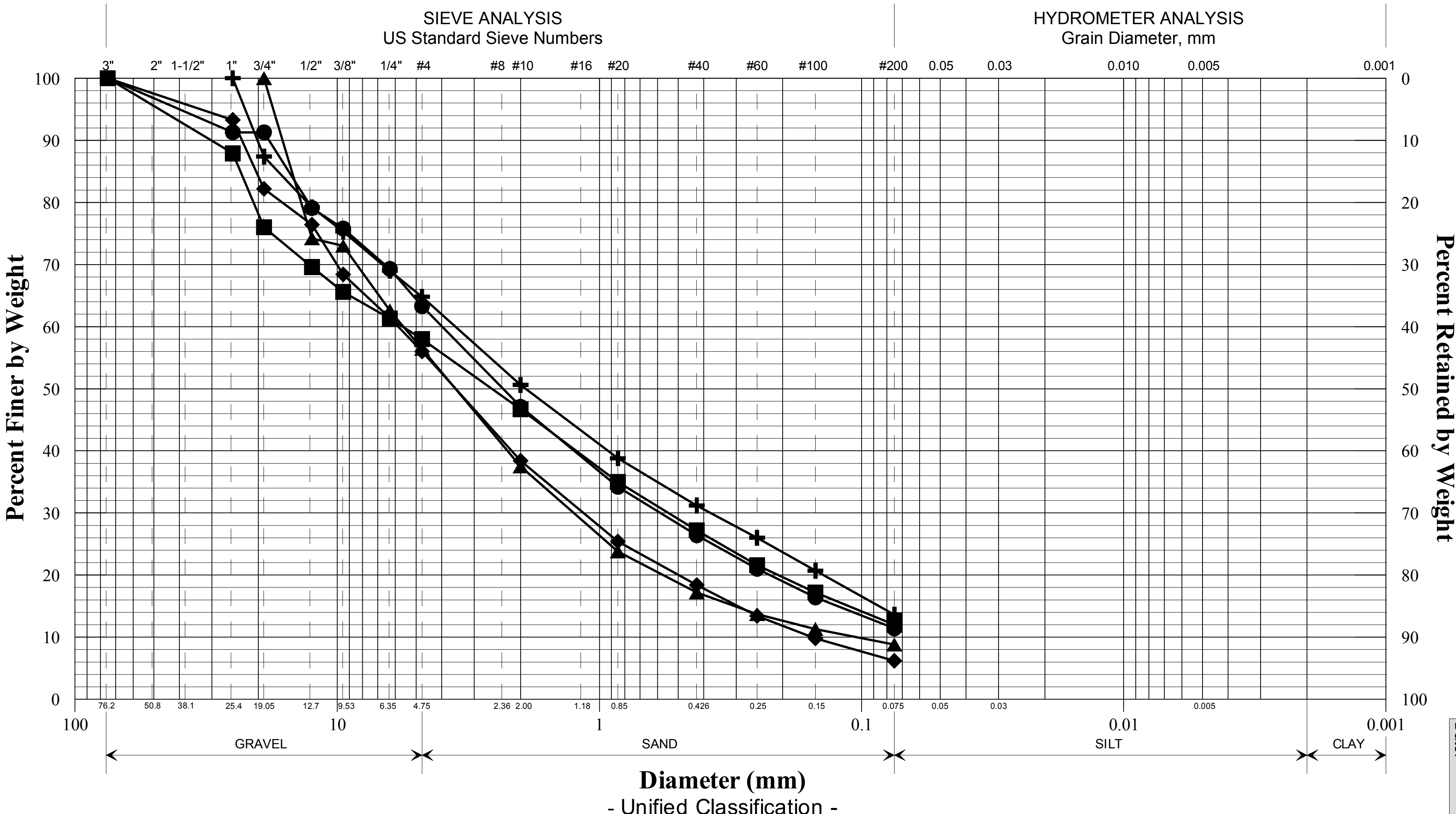


	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-208/1D	6+200	1.8 RT	0.30-0.91	Sandy GRAVEL, trace silt.	4.4			
◆	HB-ELL-105/S3	6+390	3.1 LT	0.16-0.88	SAND, some gravel, little silt.	3.7			
■	HB-ELL-105/S4	6+390	3.1 LT	0.88-1.22	SAND, some gravel, little silt.	8.1			
●	HB-ELL-105/S5	6+390	3.1 LT	1.22-1.52	SILT, some clay, some sand, trace gravel.	14.2			
▲									
✖									

PIN
010007.00
Town
Ellsworth
Reported by/Date
WHITE, TERRY A 1/26/2006

SHEET 4

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



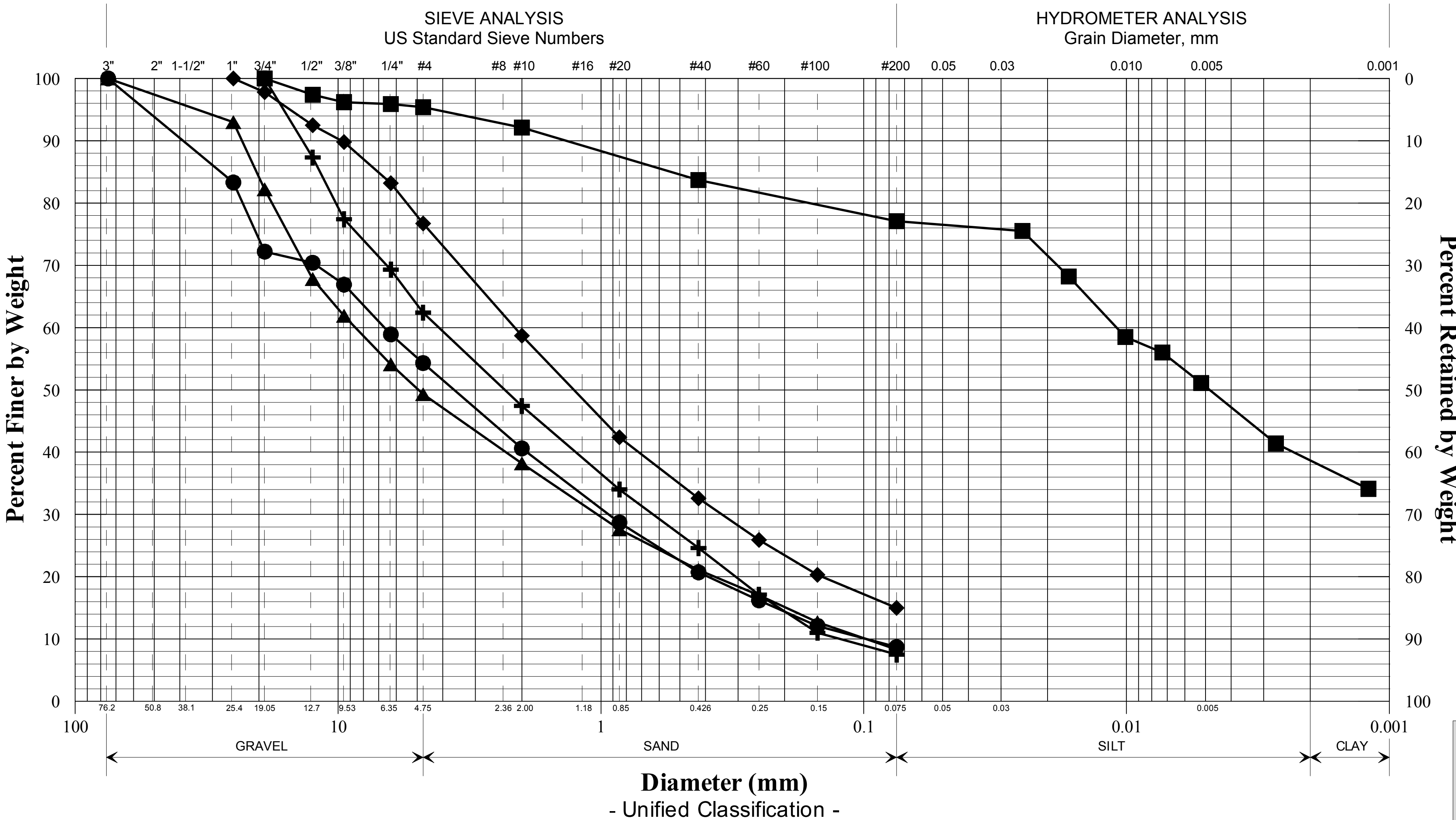
	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-209/1D	6+400	2.4 RT	0.30-0.91	SAND, some gravel, little silt.	3.8			
◆	HB-ELL-210/1D	6+480	1.9 RT	0.30-0.91	Gravelly SAND, trace silt.	4.6			
■	HB-ELL-211/1D	6+680	2.4 LT	0.30-0.91	Gravelly SAND, little silt.	5.6			
●	HB-ELL-212/1D	7+175	2.0 RT	0.30-0.61	Gravelly SAND, little silt.	3.3			
▲	HB-ELL-212/2D(A)	7+175	2.0 RT	0.91-1.07	Gravelly SAND, trace silt.	6.5			
✖									

PIN:	010007.00
Town:	Ellsworth
Reported by:	WHITE, TERRY A
Date:	1/27/2006

SHEET NO. 5

State of Maine Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE

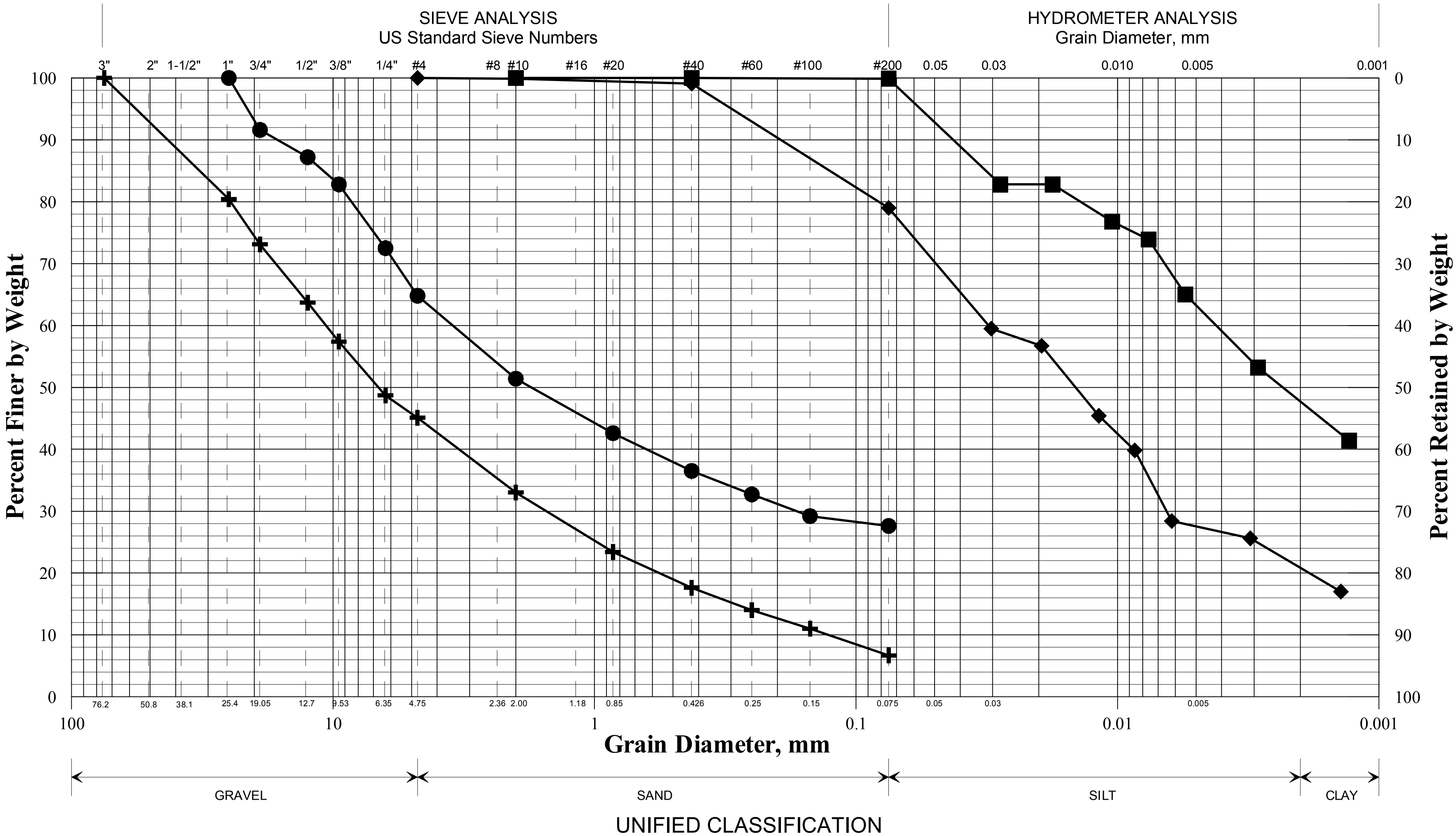


	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-213/1D	7+360	2.8 LT	0.30-0.70	Gravelly SAND, trace silt.	3.7			
◆	HB-ELL-102/S1	7+385	2.9 LT	0.16-0.61	SAND, some gravel, little silt.	3.3			
■	HB-ELL-102/S2	7+385	2.9 LT	0.61-1.52	Clayey SILT, little sand, trace gravel.	18.9			
●	HB-ELL-214/1D	7+500	2.4 RT	0.30-0.91	Sandy GRAVEL, trace silt.	6.5			
▲	HB-ELL-215/1D	7+860	2.2 RT	0.30-0.91	Sandy GRAVEL, trace silt.	5.1			
✖									

PIN:	010007.00
Town:	Ellsworth
Reported by:	WHITE, TERRY A
Date:	1/27/2006

SHEET NO. 6

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

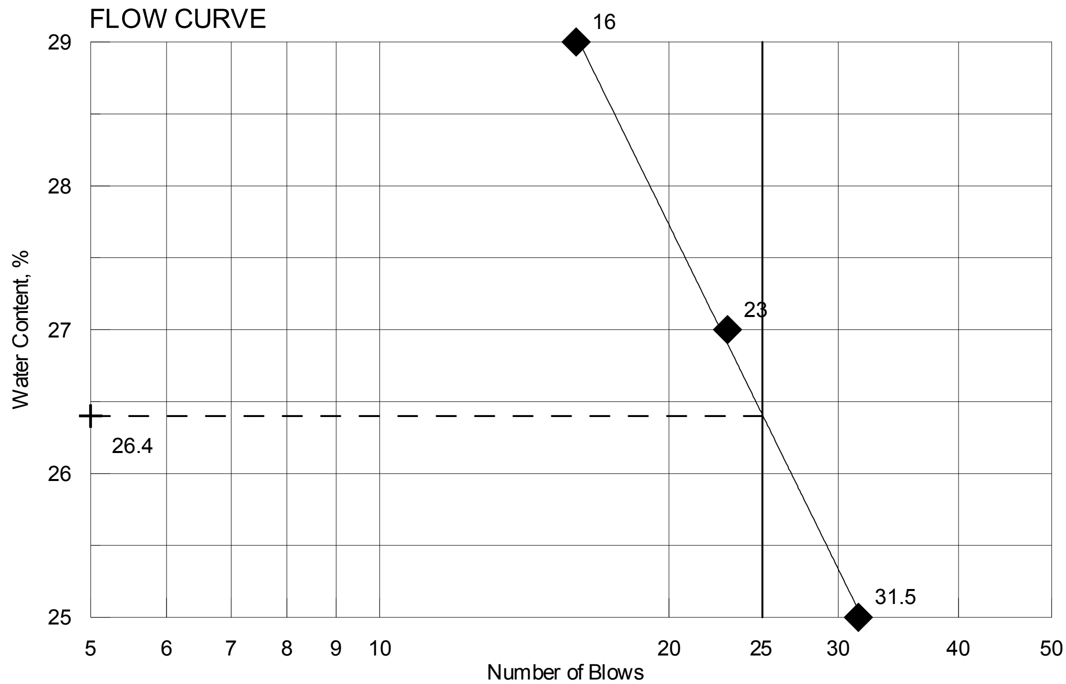


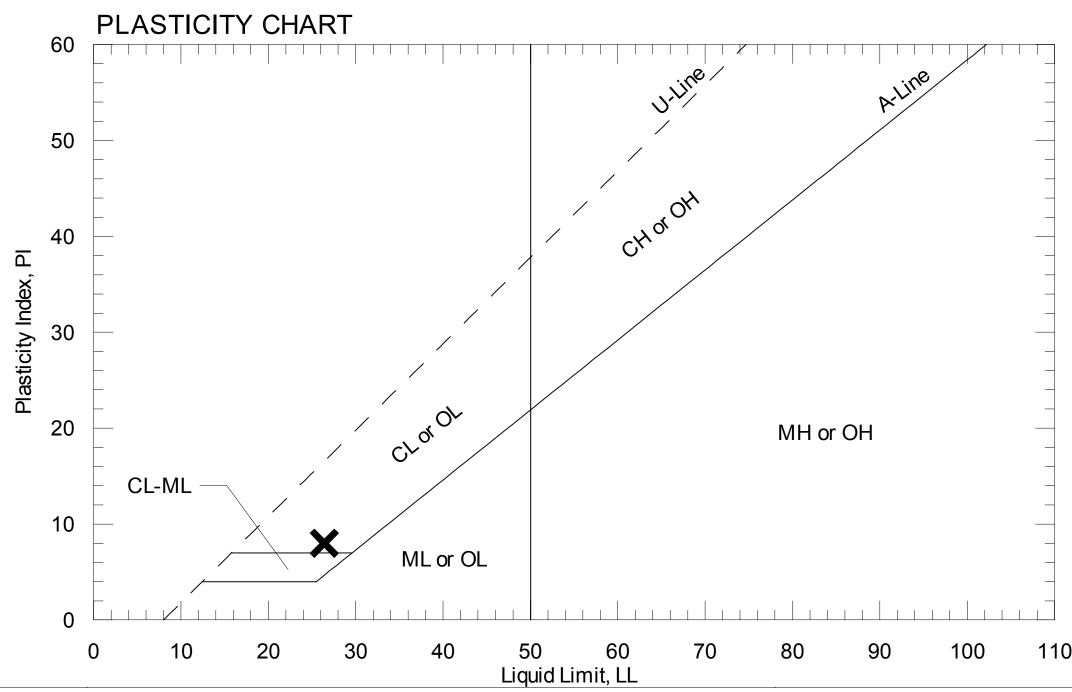
	Boring/Sample No.	Station	Offset, m	Depth, m	Description	W, %	LL	PL	PI
✚	HB-ELL-301A/1D	6+969.5	4.1 RT	0.30-0.91	Sandy GRAVEL, trace silt.	1.9			
◆	HB-ELL-301A/2D	6+969.5	4.1 RT	1.52-2.13	SILT, some sand, some clay.	27.4	26	18	8
■	HB-ELL-301A/3D	6+969.5	4.1 RT	3.05-3.66	Clayey SILT, trace fine sand.	32.8	28	18	10
●	HB-ELL-301A/4D	6+969.5	4.1 RT	4.57-4.79	SAND, some gravel, some silt.	8.2			
▲									
✖									

PIN
010007.00
Town
Ellsworth
Reported by/Date
WHITE, TERRY A 12/8/2008

SHEET 7

TOWN	Ellsworth	Reference No.	211454
PIN	010007.00	Water Content, %	27.4
Sampled	9/4/2008	Plastic Limit	18
Boring No./Sample No.	HB-ELL-301A/2D	Liquid Limit	26
Station	6+969.5	Plasticity Index	8
Depth	1.52-2.13	Tested By	BBURR



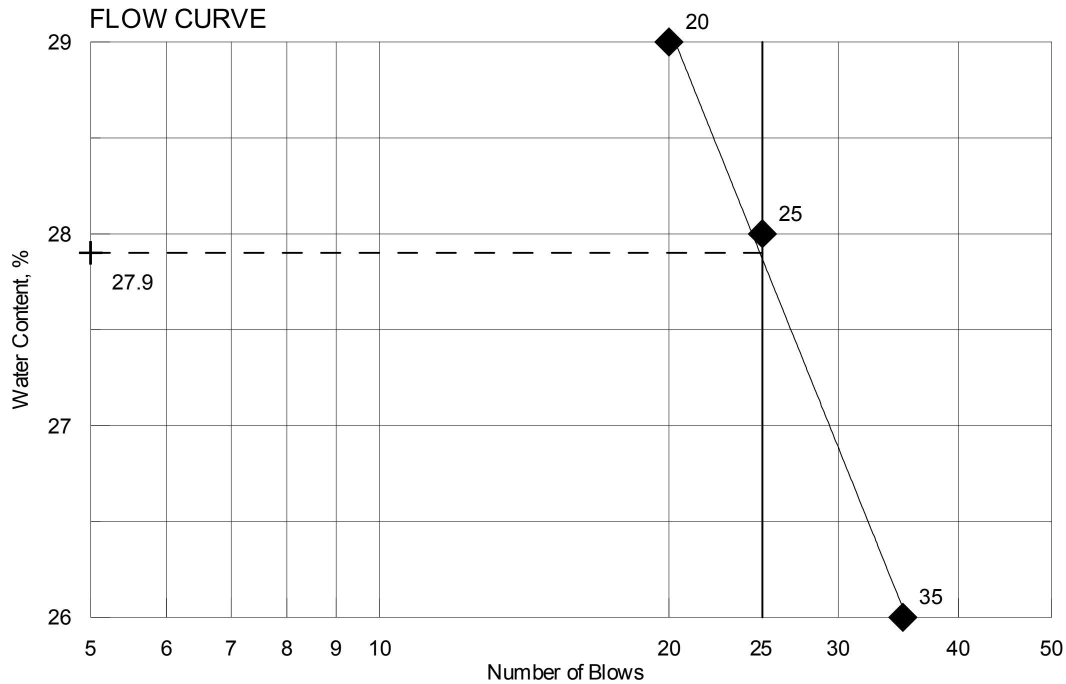


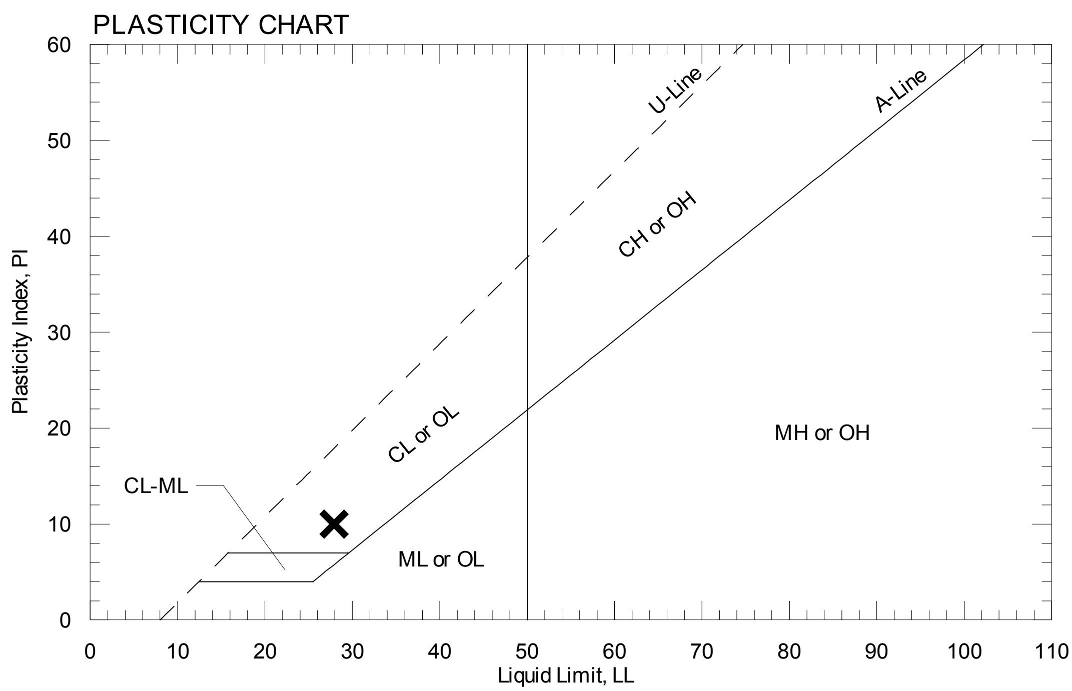
AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **12/3/2008**

Paper Copy: Lab File; Project File; Geotech File

TOWN	Ellsworth	Reference No.	211455
PIN	010007.00	Water Content, %	32.8
Sampled	9/4/2008	Plastic Limit	18
Boring No./Sample No.	HB-ELL-301A/3D	Liquid Limit	28
Station	6+969.5	Plasticity Index	10
Depth	3.05-3.66	Tested By	BBURR





Page 2 of 2

AUTHORIZATION AND DISTRIBUTION

Reported by: **FOGG, BRIAN** Date Reported: **12/3/2008**

Paper Copy: Lab File; Project File; Geotech File

APPENDIX - D

Calculations

PCMG WALL PASSIVE AND ACTIVE EARTH PRESSURES:

Coulomb Theory - Active Earth Pressure from MaineDOT Bridge Design Guide
Section 3.6.5.2, pg. 3-7

For gravity walls , semi-gravity walls, prefabricated modular walls, and cantilever walls and abutments with short heels where wall and backfill interface friction is considered, use Coulomb Theory

Angle of back face of wall: $\alpha := 90deg$

Soil angle of internal friction: $\phi := 32deg$

Slope angle of backfill soil from horizontal: $\beta := 27deg$

$\delta = \beta$ $\delta := \beta$

$$K_a := \frac{\sin(\alpha+\phi)^2}{\sin(\alpha)^2 \cdot \sin(\alpha-\delta)\cdot\left(1+\sqrt{\frac{\sin(\phi+\delta)\cdot\sin(\phi-\beta)}{\sin(\alpha-\delta)\cdot\sin(\beta+\alpha)}}\right)^2}$$

$K_a = 0.47$

Coulomb Theory - Passive Earth Pressure from MaineDOT Bridge Design Guide
Section 3.6.6, pg. 3-8

Angle of back face of wall: $\alpha := 90deg$

Soil angle of internal friction: $\phi := 32deg$

Friction angle between fill and wall:
From LRFD Table 3.11.5.3-1, pg. 3-74, δ ranges from 17 to 22 $\delta := 20deg$

Angle of backfill from horizontal: $\beta := 27deg$

$$K_p := \frac{\sin(\alpha-\phi)^2}{\sin(\alpha)^2 \cdot \sin(\alpha+\delta)\cdot\left(1-\sqrt{\frac{\sin(\phi+\delta)\cdot\sin(\phi-\beta)}{\sin(\alpha-\delta)\cdot\sin(\beta+\alpha)}}\right)^2}$$

$K_p = 1.5$

Frost Protection:

From the Maine Design Freezing Index Map: DFI = 1400 degree-days
Wall Site has Fine-Grained Soils With Wn = 20%

From the 2003 Bridge Design Guide Table 5-1:

Frost_depth := 48.5in

Frost_depth = 48.5·in

Frost_depth = 4.04·ft

Use 4.0 feet

BEARING RESISTANCE - FOOTINGS ON COMPACTED FILL SOILS:

Consider this for use with PCMG Walls; however it's possible that footings will bear on bedrock.

STRENGTH LIMIT STATE:

Nominal and Factored Bearing Resistance for spread footings on fill soils At the Strength Limit State:

Assumptions:

1. Footings will be embedded 4.0 feet for frost protection.

$D_f := 4.0ft$

2. Assumed parameters for soils:
   Assume granular fill placed and compacted beneath footings

Moist unit weight: $\gamma_m := 125pcf$

Saturated unit weight: $\gamma_{sat} := 130pcf$

Soil angle of internal friction: $\phi_{ns} := 32$

Undrained shear strength (cohesion): $c_{ns} := 0psf$

3. Use Terzaghi strip equations as L > B

Depth to Groundwater table based on boring data: $D_w := -3 \cdot ft$

Unit weight of water: $\gamma_w := 62.4pcf$

Effective Stress at the footing bearing level: $q_{eff\_str} := D_w \cdot \gamma_m + (D_f - D_w) \cdot (\gamma_{sat} - \gamma_w)$

$q_{eff\_str} = 0.1 \cdot ksf$

Look at several wall base widths: $B := \begin{pmatrix} 6 \\ 8 \\ 10 \\ 12 \\ 14 \\ 16 \end{pmatrix} ft$

Terzaghi Shape Factors from Table 4-1, p. 220
For strip footing:

$s_c := 1.0$

$s_\gamma := 1.0$

Meyerhof Bearing Capacity Factors For ϕ = 32 deg   Bowles 5th Ed. Table 4-4 pg. 223

$N_c := 35.47$ $N_q := 23.2$ $N_\gamma := 22.0$

Nominal Bearing Resistance per Terzaghi equation   Bowles 5th Ed. Table 4-1 pg. 220

$$q_{nom} := c_{ns} \cdot N_c \cdot s_c + q_{eff\_str} \cdot N_q + 0.5(\gamma_{sat} - \gamma_w) \cdot B \cdot N_\gamma \cdot s_\gamma$$

$$q_{nom} = \begin{pmatrix} 6.7 \\ 8.2 \\ 9.7 \\ 11.2 \\ 12.7 \\ 14.2 \end{pmatrix} \cdot ksf$$

Resistance Factor from LRFD Table 10.5.5.2.2-1 pg. 10-32: $\phi_b := 0.45$

$$q_{fac} := q_{nom} \cdot \phi_b$$

$$q_{fac} = \begin{pmatrix} 3.0 \\ 3.7 \\ 4.4 \\ 5.0 \\ 5.7 \\ 6.4 \end{pmatrix} \cdot ksf$$

Recommend **3.0 ksf** for **Strength Limit State** Factored Bearing Resistance for wall bases 6 to 10-foot wide.
Recommend **5.0 ksf** for **Strength Limit State** Factored Bearing Resistance for wall bases 12 to 16-foot wide.

SERVICE LIMIT STATE:

LRFD Table C10.6.2.6.1-1, (Based on NAVFAC DM 7.2, 1982) - "Presumptive Bearing Resistances for Spread Footing Foundations at the Service Limit State"

Bearing Material	Consistency in Place	Allowable Bearing Pressure (tons per sq. foot)	Recommended Value
Coarse to Medium sand, little gravel	Very compact	4 to 6	4 tsf (8 ksf)
	Medium to compact	2 to 4	3 tsf (6 ksf)
	Loose	1 to 3	1.5 tsf (3 ksf)

Recommend **6.0 ksf** to control settlements for **Service Limit State** analyses and for preliminary footing sizing.

SETTLEMENT ANALYSIS:

Estimate Settlement for PCMG Wall Base Using Hough Method:

Ref. LRFD Section 10.6.2.4.2, pg. 10-49

Assumptions:
B = 6 ft
Maximum grade rise is 3 feet or less
Soil thickness below footing is 4 feet
Use N1 of 40 (assumed corrected N_{60} value for very dense till or compacted fill)
I Influence factors from LRFD Figure 10.6.2.4.1-1, pg. 10-49
Bearing Capacity Indices (C') from LRFD Figure 10.6.2.4.2-1, pg. 10-52

$N1 := 30 \qquad I := 0.6 \qquad C' := 100$

$\sigma_o := (120pcf - 62.4pcf) \cdot 4.0ft$

$\Delta\sigma_v := 3ft \cdot 125pcf \cdot I \qquad \Delta\sigma_v = 0.23 \cdot ksf$

$$\Delta H := 4ft \cdot \left(\frac{1}{C'}\right) \cdot \log\left(\frac{\sigma_o + \Delta\sigma_v}{\sigma_o}\right)$$

$\Delta H = 0.14 \cdot in$

OK, Say 1/4 inch or less settlement below PCMG wall base

Embankment Consolidation Settlement, Approx STA 6+976:

$\Delta H = C'_c H \log\left[(p_o + \Delta p)/p_o\right]$ Bowles, 5th Ed., 1996, p. 83, 89

We have NC Clay-Silt under old fill embankment and raising grade 2 feet.

Estimate C_c: $W_n := 33 \qquad W_L := 28 \qquad I_p := 10 \qquad e_0 := 2.72 \cdot 0.33 = 0.8976$

$C_{c1} := 0.009 \cdot (W_L - 10) \qquad C_{c1} = 0.16$ Terzaghi & Peck (1967)

$C_{c2} := 0.046 + 0.0104 \cdot I_p \qquad C_{c2} = 0.15$ Nakase et.al. (1988)

Say $C_c = 0.15$

$$C'_c := \frac{C_{c2}}{1 + e_0} = 0.079$$

$H := 9ft \qquad p_o := 125pcf \cdot 4ft = 500 \cdot psf \qquad \Delta p := 125pcf \cdot 2ft = 250 \cdot psf$

$$\Delta H := C'_c \cdot H \cdot \log\left(\frac{p_o + \Delta p}{p_o}\right) \cdot 12 \frac{in}{ft} \qquad \Delta H = 1.5 \cdot in$$

Say 1 to 2 inches of Settlement As Result of new Embankment Fill

APPENDIX - E

Special Provisions

SPECIAL PROVISION
SECTION 203
EXCAVATION and EMBANKMENT
(Shatter Blasting of Solid Rock Subgrade)

Standard Specification Section 203.17 Preparation and Protection of Subgrade shall be amended as follows:

Drilling and Blasting of Solid Rock Subgrade. Subgrade areas shall be shattered to the dimensions shown on the Plans or directed by the Resident.

The area of blasted rock subgrade shall extend sufficiently beyond the beginning and end of cut areas to ensure the shattering of all rock to a depth of 1.2 m (4 feet) below subgrade elevation to eliminate water pockets.

After detonation, any rock that protrudes above the subgrade elevation shall be removed. When directed by the Resident, the Contractor shall excavate a trench across the blasted rock to determine if the rock is broken and rearranged to a depth of 1.2 m (4 feet) below subgrade. Afterwards, the trench shall be backfilled with the rock removed.

Method of Measurement. The quantity of Drilling and Blasting of Solid Rock Subgrade to be measured for payment will be the number of square meters (square yards) of subgrade plan area drilled and detonated in accordance with this Section, measured at subgrade level.

The number of cubic meters (cubic yards) of excavation required by the Resident to inspect the depth of shattered and rearranged rock, computed at a maximum width of 750 mm (30 inches) will be measured for payment as Structural Earth Excavation – Drainage and Minor Structures Below Grade.

When Structural Rock Excavation – Drainage and Minor Structures, and Drilling and Blasting of Solid Rock Subgrade occur at the same location, measurement and payment for Structural Rock Excavation - Drainage and Minor Structures will be made for the required trench. This area will not be included in the measurement and payment for Drilling and Blasting of Solid Rock Subgrade.

Basis of Payment. The accepted quantities as measured will be paid for at the Contract unit price per square meter (square yard) for the specified Contract items. Payment will be full compensation for performing the work specified including any necessary stripping of rock below subgrade, the removal of blasted subgrade rock that may swell above subgade, and its disposition on the project as directed by the Resident.

Excavation and backfill required to inspect the depth of broken rock below subgrade will be paid for at the Contract unit price per cubic meter (cubic yard) for Structural Rock Excavation – Drainage and Minor Structures.

Payment will be made under:

Pay Item	Pay Unit
Drilling and Blasting of Solid Rock Subgrade	Square meter (square yard)

SPECIAL PROVISION
SECTION 304
AGGREGATE BASE AND SUBBASE COURSE

The following replaces Section 304.02, Aggregate, in the Standard Specifications.

304.02 Aggregate. Aggregates shall conform to the requirements specified in Standard Specification Section 703.06, Aggregate for Base and Subbase.

Aggregate Base

Aggregate base shall be material meeting 703.06 Type B aggregate for the entire 23-inch depth of the base layer in the travel lane and 27-inch depth below shoulder pavement in the full construction sections. For this project, Type E aggregate is not a Contractor option for aggregate base within the depths described above. Type B aggregate shall be paid for under Pay Item 304.09.

The portion of the material passing a 3-inch sieve at the time it is deposited on the roadway shall conform to the gradation requirements of the contract. Oversized stones shall be removed before depositing on the roadway. Oversized stones are stones that will not pass a 4-inch square mesh sieve.

Aggregate base for Rehabilitation Sections and Variable Gravel Sections shall also conform to the requirements of 703.06, Type B.

The following is made part of Section 304:

If the Contractor wishes to route public traffic over the completed aggregate base course, the course shall be constructed with a minimum 2-inch surcharge above the design grade. Whenever the surcharge is used, it shall be constructed with material meeting the requirements of Section 703.06, Type D Aggregate. Also, whenever, the surcharge is used, it shall be placed on all the aggregate base course subjected to public traffic including driveways, sidewalks, approach roads, or the outer portions of the shoulders. Removal of the surcharge shall be followed immediately in succession by the fine grading of the aggregate base and construction of the next course.

The furnishing, placing, maintaining, and removal of the surcharge will not be paid for directly, but will be considered incidental to the Aggregate Base Course pay item.

SPECIAL PROVISION
SECTION 635
PREFABRICATED BIN TYPE RETAINING WALL
(Prefabricated Concrete Modular Gravity Wall)

635.01 Description. This work shall consist of the construction of a prefabricated modular reinforced concrete gravity wall in accordance with these specifications and in reasonably close conformance with the lines and grades shown on the plans, or established by the Resident.

Included in the scope of the Prefabricated Concrete Modular Gravity Wall construction are**:** all grading necessary for wall construction, excavation, compaction of the wall foundation, backfill, construction of leveling pads, placement of geotextile, segmental unit erection, and all incidentals necessity to complete the work.

The Prefabricated Concrete Modular Gravity Wall design shall follow the general dimensions of the wall envelope shown in the contract plans. The top of the leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be at or below the elevation shown on the plans. The top of the face panels shall be at or above the top of the panel elevation shown on the plans.

The Contractor shall require the design-supplier to supply an on-site, qualified experienced technical representative to advise the Contractor concerning proper installation procedures. The technical representative shall be on-site during initial stages of installation and thereafter shall remain available for consultation as necessary for the Contractor or as required by the Resident. The work done by this representative is incidental.

635.02 Materials. Materials shall meet the requirements of the following subsections of Division 700 - Materials:

Gravel Borrow	703.20
Preformed Expansion Joint Material	705.01
Reinforcing Steel	709.01
Structural Pre-cast Concrete Units	712.061
Drainage Geotextile	722.02

The Contractor is cautioned that all of the materials listed are not required for every Prefabricated Concrete Modular Gravity Wall. The Contractor shall furnish the Resident a Certificate of Compliance certifying that the applicable materials comply with this section of the specifications. Materials shall meet the following additional requirements:

Concrete Units:

Tolerances. In addition to meeting the requirements of 712.061, all prefabricated units shall be manufactured with the following tolerances. All units not meeting the listed tolerances will be rejected.

1. All dimensions shall be within (edge to edge of concrete) ±3/16 in.

2. Squareness. The length differences between the two diagonals shall not exceed 5/16 in.
3. Surface Tolerances. For steel formed surfaces, and other formed surface, any surface defects in excess of 0.08 in. in 4 ft will be rejected. For textured surfaces, any surface defects in excess of 5/16 in. in 5 ft shall be rejected.

Joint Filler. (where applicable) Joints shall be filled with material approved by the Resident and supplied by the approved Prefabricated Concrete Modular Gravity Wall supplier. 4 in. wide, by 0.5 in. preformed expansion joint filler shall be placed in all horizontal joints between facing units. In all vertical joints, a space of 0.25 in. shall be provided. All Preformed Expansion Joint Material shall meet the requirements of subsection 502.03.

Woven Drainage Geotextile. Woven drainage geotextile 12 in. wide shall be bonded with an approved adhesive compound to the back face, covering all joints between units, including joints abutting concrete structures. Geotextile seam laps shall be 6 in., minimum. The fabric shall be secured to the concrete with an adhesive satisfactory to the Resident. Dimensions may be modified per the wall supplier's recommendations, with written approval of the Resident.

Concrete Shear Keys. (where applicable) Shear keys shall have a thickness at least equal to the pre-cast concrete stem.

Concrete Leveling Pad. Cast-in-place concrete shall be Fill Concrete conforming to the requirements of Section 502 Structural Concrete. The horizontal tolerance on the surface of the pad shall be 0.25 in. in 10 ft. Dimensions may be modified per the wall supplier's recommendations, with written approval of the Resident.

Backfill and Bedding Material. Bedding and backfill material placed behind and within the reinforced concrete modules shall be gravel borrow conforming to the requirements of Subsection 703.20. The backfill materials shall conform to the following additional requirements: backfill and bedding material shall only contain particles that will pass the 3-inch square mesh sieve and the plasticity index (PI) as determined by AASHTO T90 shall not exceed 6. Compliance with the gradation and plasticity requirements shall be the responsibility of the Contractor, who shall furnish a copy of the backfill test results prior to construction.

The backfilling of the interior of the wall units and behind the wall shall progress simultaneously. The material shall be placed in layers not over 8 in. in depth, loose measure, and thoroughly compacted by mechanical or vibratory compactors. Puddling for compaction will not be allowed.

Materials Certificate Letter. The Contractor, or the supplier as his agent, shall furnish the Resident a Materials Certificate Letter for the above materials, including the backfill material, in accordance with Section 700 of the Standard Specifications. A copy of all test results performed by the Contractor or his supplier necessary to assure contract compliance shall also be furnished to the Resident. Acceptance will be based upon the materials Certificate Letter, accompanying test reports, and visual inspection by the Resident.

635.03 Design Requirements. The Prefabricated Concrete Modular Gravity Wall shall be designed and sealed by a licensed Professional Engineer registered in accordance with the laws of the State of Maine. The design to be performed by the wall system supplier shall be in accordance with AASHTO LRFD Bridge Design Specifications, current edition, except as required herein. Design shall consider Strength and Extreme Limit States. Thirty days prior to beginning construction of the wall, the design computations shall be submitted to the Resident for review by the Department. Design calculations that consist of computer generated output shall be supplemented with at least one hand calculation and graphic demonstrating the design methodology used. Design calculations shall provide thorough documentation of the sources of equations used and material properties. The design by the wall system supplier shall consider the stability of the wall as outlined below:

A. Stability Analysis:
   1. Overturning: Location of the resultant of the reaction forces shall be within the middle one-half of the base width.
   2. Sliding: $R_R \geq \gamma_{p(max)} \cdot (EH+ES)$
      Where: R_R = Factored Sliding Resistance
      $\gamma_{p(max)}$ = Maximum Load Factor
      EH = Horizontal Earth Pressure
      ES = Earth Surcharge (as applicable)
   3. Bearing Pressure: $q_R \geq$ Factored Bearing Pressure
      Where: q_R = Factored Bearing Resistance, as shown on the plans
      Factored Bearing Pressure = Determined considering the applicable loads and load factors which result in the maximum calculated bearing pressure.
   4. Pullout Resistance: Pullout resistance shall be determined using nominal resistances and forces. The ratio of the sum of the nominal resistances to the sum of the nominal forces shall be greater than, or equal to, 1.5.

   Traffic impact loads transmitted to the wall through guardrail posts shall be calculated and applied in compliance with LRFD Section 11, where Article 11.10.10.2 is modified such that the upper 3.5 ft of concrete modular units shall be designed for an additional horizontal load of $\gamma P_{H1,}$ where γP_{H1}=300 lbs per linear ft of wall.

B. Backfill and Wall Unit Soil Parameters. For overturning and sliding stability calculations, earth pressure shall be assumed acting on a vertical plane rising from the back of the lowest wall stem. For overturning, the unit weight of the backfill within the wall units shall be limited to 96 pcf. For sliding analyses, the unit weight of the backfill within the wall units can be assumed to be 120 pcf. Both analyses may assume a friction angle of 34 degrees for backfill within the wall units.

   These unit weights and friction angles are based on a wall unit backfill meeting the requirements for select backfill in this specification. Backfill behind the wall units shall be assumed to have a unit weight of 120 pcf and a friction angle of 30 degrees.

The friction angle of the foundation soils shall be assumed to be 30 degrees unless otherwise noted on the plans.

C. Internal Stability. Internal stability of the wall shall be demonstrated using accepted methods, such as Elias' Method, 1991. Shear keys shall not contribute to pullout resistance. Soil-to-soil frictional component along stem shall not contribute to pullout resistance. The failure plane used to determine pullout resistance shall be found by the Rankine theory only for vertical walls with level backfills. When walls are battered or with backslopes > 0 degrees are considered, the angle of the failure plane shall be per Jumikus Method. For computation of pullout force, the width of the backface of each unit shall be no greater than 4.5 ft. A unit weight of the soil inside the units shall be assumed no greater than 120 pcf when computing pullout. Coulomb theory may be used.

D. External loads which affect the internal stability such as those applied through piling, bridge footings, traffic, slope surcharge, hydrostatic and seismic loads shall be accounted for in the design.

E. The maximum calculated factored bearing pressure under the Prefabricated Concrete Modular Gravity block wall shall be clearly indicated on the design drawings.

F. Stability During Construction. Stability during construction shall be considered during design, and shall meet the requirements of the AASHTO LRFD Bridge Design Specifications, Extreme Limit State.

G. Hydrostatic forces. Unless specified otherwise, when a design high water surface is shown on the plans at the face of the wall, the design stresses calculated from that elevation to the bottom of wall must include a 3 ft minimum differential head of saturated backfill. In addition, the buoyant weight of saturated soil shall be used in the calculation of pullout resistance.

H. Design Life. The wall design life shall be a minimum of 75 years.

I. Not more than two vertically consecutive units shall have the same stem length, or the same unit depth. Walls with units with extended height curbs shall be designed for the added earth pressure. A separate computation for pullout of each unit with extended height curbs, or extended height coping, shall be prepared and submitted in the design package described above.

635.04 Submittals. The Contractor shall supply wall design computations, wall details, dimensions, quantities, and cross sections necessary to construct the wall. Thirty (30) days prior to beginning construction of the wall, the design computations and wall details shall be submitted to the Resident for review. The fully detailed plans shall be prepared in conformance with Subsection 105.7 of the Standard Specifications and shall include, but not be limited to the following items:

A. A plan and elevation sheet or sheets for each wall, containing the following: elevations at the top of leveling pads, the distance along the face of the wall to all steps in the leveling pads, the designation as to the type of prefabricated module, the distance along the face of the wall to where changes in length of the units occur, the location of the original and final ground line.

B. All details, including reinforcing bar bending details, shall be provided. Bar bending details shall be in accordance with Department standards.

C. All details for foundations and leveling pads, including details for steps in the leveling pads, as well as allowable and actual maximum bearing pressures shall be provided.

D. All prefabricated modules shall be detailed. The details shall show all dimensions necessary to construct the element, and all reinforcing steel in the element.

E. The wall plans shall be prepared and stamped by a Professional Engineer. Four sets of design drawings and detail design computations shall be submitted to the Resident.

F. Four weeks prior to the beginning of construction, the contractor shall supply the Resident with two copies of the design-supplier's Installation Manual. In addition, the Contractor shall have two copies of the Installation Manual on the project site.

635.05 Construction Requirements

Excavation. The excavation and use as fill disposal of all excavated material shall meet the requirements of Section 203 -- Excavation and Embankment, except as modified herein.

Foundation. The area upon which the modular gravity wall structure is to rest, and within the limits shown on the submitted plans, shall be graded for a width equal to, or exceeding, the length of the module. Prior to wall and leveling pad construction, this foundation material shall be compacted to at least 95 percent of maximum laboratory dry density, determined using AASHTO T180, Method C or D. Frozen soils and soils unsuitable or incapable of sustaining the required compaction, shall be removed and replaced.

A concrete leveling pad shall be constructed as indicated on the plans. The leveling pad shall be cast to the design elevations as shown on the plans, or as required by the wall supplier upon written approval of the Resident. Allowable elevation tolerances are +0.01 ft and -0.02 ft from the design elevations. Leveling pads which do not meet this requirement shall be repaired or replaced as directed by the Resident at no additional cost to the Department. Placement of wall units may begin after 24 hours curing time of the concrete leveling pad.

Method and Equipment. Prior to erection of the Prefabricated Concrete Modular Gravity Wall, the Contractor shall furnish the Resident with detailed information concerning the proposed construction method and equipment to be used. The erection procedure shall be in accordance with the manufacturer's instructions. Any pre-cast units that are damaged due to handling will be replaced at the Contractor's expense.

Installation of Wall Units. A field representative from the wall system being used shall be available, as needed, during the erection of the wall. The services of the representative shall be at no additional cost to the Department. Vertical and horizontal joint fillers shall be installed as shown on the plans.

The maximum offset in any unit joint shall be 3/4 in. The overall vertical tolerance of the wall, plumb from top to bottom, shall not exceed 1/2 in per 10 ft of wall height. The prefabricated wall units shall be installed to a tolerance of plus or minus 3/4 inch in 10 ft in vertical alignment and horizontal alignment.

Select Backfill Placement. Backfill placement shall closely follow the erection of each row of prefabricated wall units. The Contractor shall decrease the lift thickness if necessary to obtain the specified density. The maximum lift thickness shall be 8 in. (loose). Gravel borrow backfill shall be compacted in accordance with Subsection 203.12 except that the minimum required compaction shall be 92 percent of maximum density as determined by AASHTO T180 Method C or D. Backfill compaction shall be accomplished without disturbance or displacement of the wall units. Sheepsfoot rollers will not be allowed. Whenever a compaction test fails, no additional backfill shall be placed over the area until the lift is recompacted and a passing test achieved.

The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T180, Method C or D. At the end of the day's operations, the Contractor shall shape the last level of backfill so as to direct runoff of rain water away from the wall face.

635.06 Method of Measurement. Prefabricated Concrete Modular Gravity Wall will be measured by the square meter of front surface not to exceed the dimensions shown on the contract plans or authorized by the Resident. Vertical and horizontal dimensions will be from the edges of the facing units. No field measurements for computations will be made unless the Resident specifies, in writing, a change in the limits indicated on the plans.

635.07 Basis of Payment. The accepted quantity of Prefabricated Concrete Modular Gravity Retaining Wall will be paid for at the contract unit price per square meter complete in place. Payment shall be full compensation for furnishing all labor, equipment and materials including excavation, foundation material, backfill material, pre-cast concrete units hardware, joint fillers, woven drainage geotextile, cast-in-place coping or traffic barrier and technical field representative. Cost of cast-in-place concrete for leveling pad will not be paid for separately, but will be considered incidental to the Prefabricated Concrete Modular Gravity Wall.

There will be no allowance for excavating and backfilling for the Prefabricated Concrete Modular Gravity Wall beyond the limits shown on the approved submitted plans, except for excavation required to remove unsuitable subsoil in preparation for the foundation, as approved by the Resident. Payment for excavating unsuitable material shall be full compensation for all costs of pumping, drainage, sheeting, bracing and incidentals for proper execution of the work.

Payment will be made under:

Pay Item	Pay Unit
635.14 Prefabricated Concrete Modular Gravity Wall	Square Meter [Square Foot]