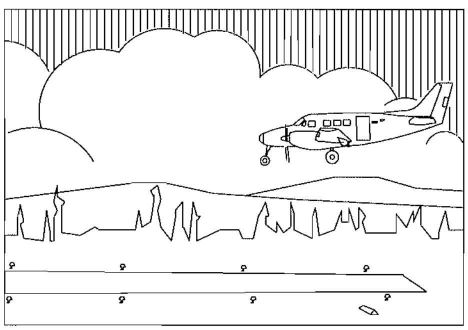
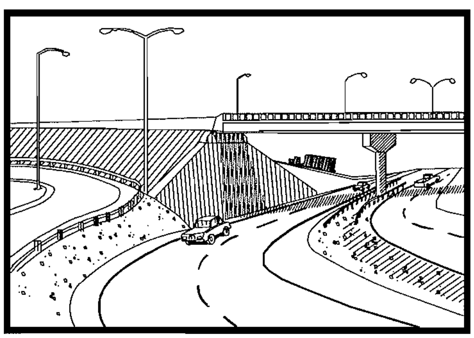
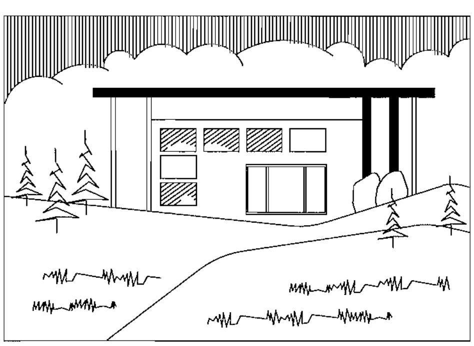
SUPPLEMENTAL GEOTECHNICAL REPORT

DALTON HIGHWAY 9 MILE HILL NORTH

FEDERAL PROJECT NO. NH-F-06502(3) / STATE PROJECT NO. 64899

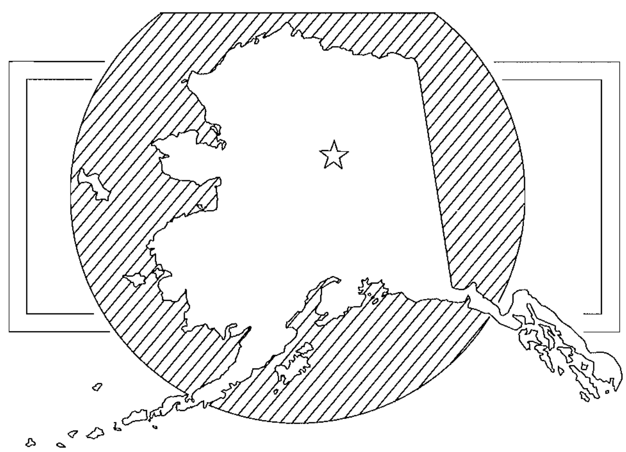






STATE OF ALASKA

Department of Transportation
and Public Facilities



NORTHERN REGION

MAY 2010

V:\Geo\64899\DRAFTING\SupplemntalGEORPT-Model Wed, 12/May/10 09:51am

ALASKA DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES
NORTHERN REGION MATERIAL SECTION

GEOTECHNICAL REPORT - SUPPLEMENTAL
DALTON HIGHWAY 9 MILE NORTH
FEDERAL PROJECT NO. NH-F-06502(3)
STATE PROJECT NO. 64899

PREPARED BY:

S. Masterman for:

JULIE ROWLAND
Engineering Geologist

REVIEWED BY:

S. Masterman

STEVE MASTERMAN
Regional Geologist

APPROVED BY:

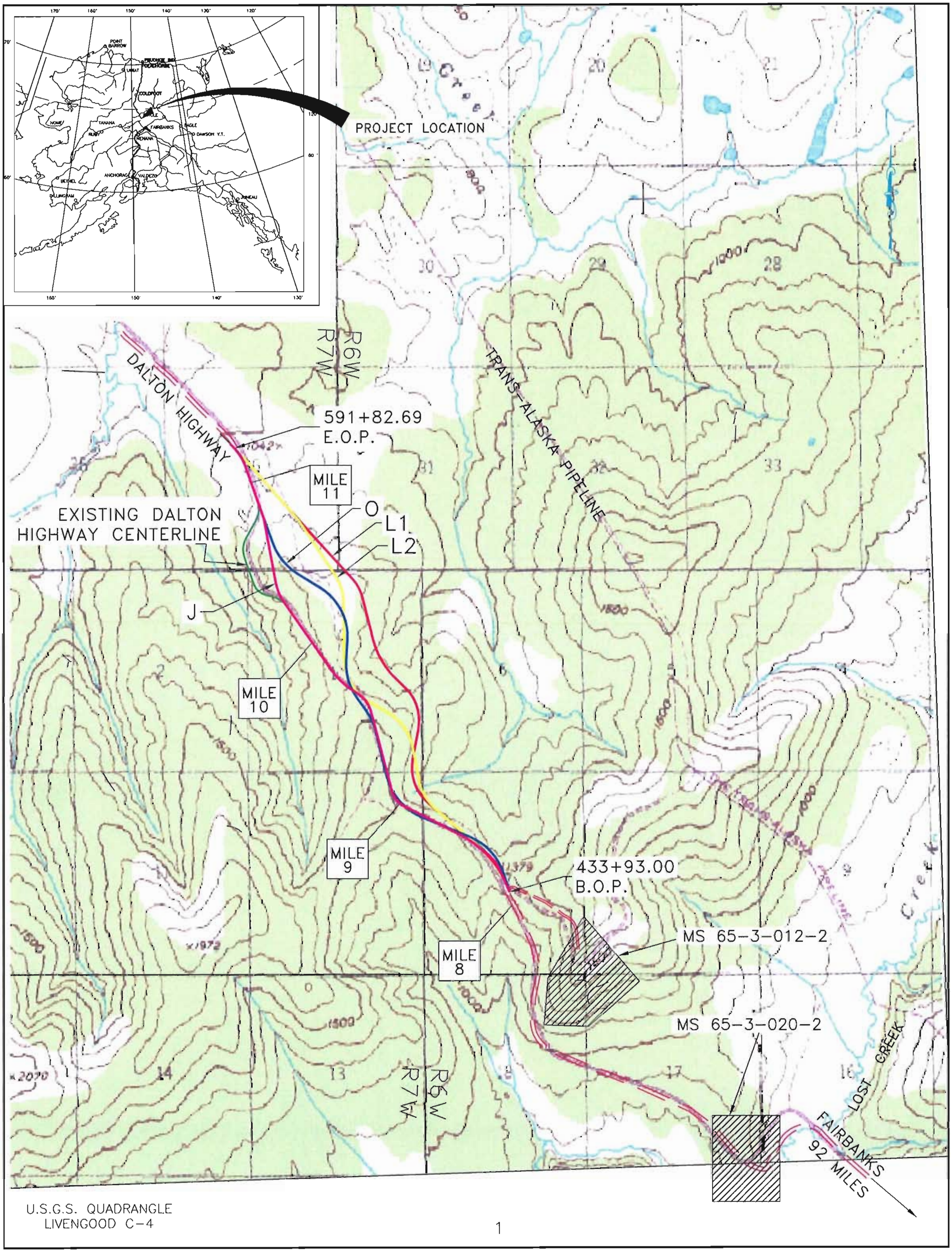
LEO J. WOSTER
C.E. 7160

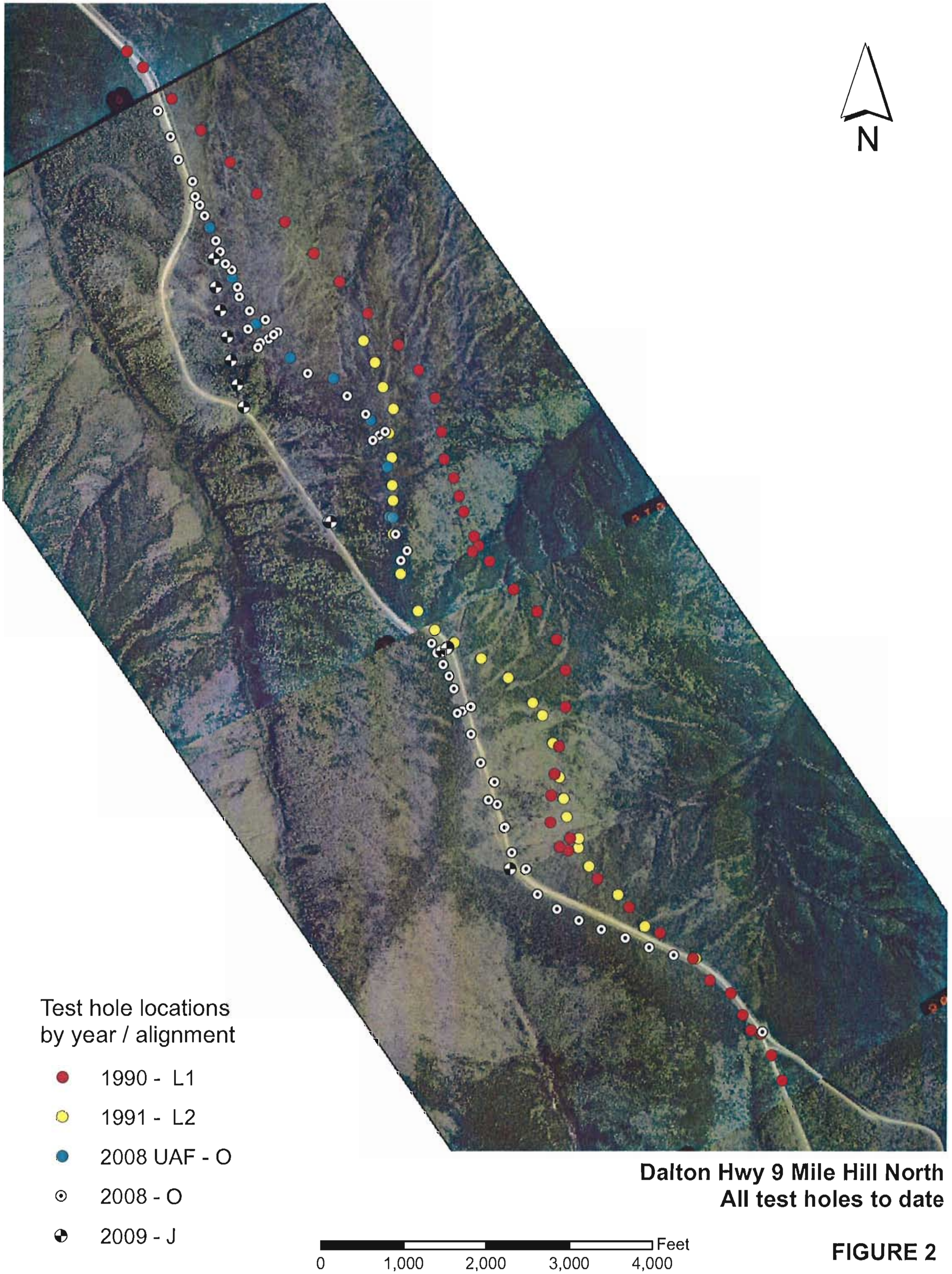
5-13-10

LEO J. WOSTER, P.E.
Materials Engineer

Contents

Figures


PROJECT LOCATION
DALTON HIGHWAY
TRANS-ALASKA PIPELINE
R7W
R6W
591+82.69
E.O.P.
MILE 11
EXISTING DALTON HIGHWAY CENTERLINE
O
L1
L2
J
MILE 10
MILE 9
433+93.00
B.O.P.
MILE 8
MS 65-3-012-2
MS 65-3-020-2
LOST CREEK
FAIRBANKS 92 MILES
U.S.G.S. QUADRANGLE
LIVENGOOD C-4



Dalton Hwy 9 Mile Hill North
All test holes to date

FIGURE 2

Summary

The Alaska Department of Transportation and Public Facilities (ADOT) proposes to reconstruct approximately 3 miles of the Dalton Highway between MP 8 and 11. Northern Region Materials Section (NRMS) has conducted several geotechnical investigations for the 9 Mile Hill North project in the last 20 years. Our *Dalton Highway 9 Mile Hill North Geotechnical Report* (2006) summarizes work done in 1990 on the "L1" alignment and 1991 on the "L2" alignment.

This Supplemental Report presents the results of our 2008 exploration on the "O" alignment and 2009 exploration for the new proposed "J" alignment and updates our geotechnical recommendations based on new data. Most of the J alignment follows the existing road except from Station 540+00 to 570+00 (~MP 10.5) where a large curve will be cut off and the road straightened (over a hill). The project design was preliminary at the time of writing, but plans call for the road to be widened to 36 feet. Also, we understand the road surface will not be paved, but left as an aggregate surface.

Forty-six test holes drilled on or near the J alignment are presented on the plan and profile sheets. This includes all fourteen 2009 holes and thirty-two of the 2008 holes. All other 2008 (O alignment) test hole logs are compiled in Appendix C, to document work done.

Soils conditions are not uniform along the project length. Some sections, primarily on north-facing slopes, are characterized by ice-rich silt and massive ice. These soils are highly thaw unstable and require special design considerations. Other sections are characterized by relatively shallow bedrock and lower-ice-content silt (no massive ice), where thaw settlement potential is lower. The erosion potential throughout the project will be high as all cuts are in silt, usually frozen silt.

The closest material sites are MS 65-3-020-2 (at MP 6), MS 65-3-012-2 (at MP 8) and MS 65-3-013-2 (at MP 19). These sites are discussed in *Dalton Highway 9 Mile Hill North Geotechnical Report* (2006) and *Dalton Highway MP 11-18 Reconstruction Geotechnical Report* (2009). Additional information is available in the material site files located in the ADOT Materials Building at 2301 Peger Road, Fairbanks. Note that ADOT does not currently have a permit for MS 65-3-020-2.

This supplemental geotechnical report documents physical site conditions and subsurface conditions, provides analyses and interpretation of anticipated site conditions, and recommends design and construction criteria for the project. This supplemental report together with the 2006 geotechnical report should serve as a guide and resource during project design and construction.

Field investigations

In 2008, NRMS personnel drilled 54 solid-stem auger holes between May 19 and June 14 using a track-mounted CME-45B drill rig. Test holes ranged from 13 to 84 feet deep. Engineering geologist Ron Brooks logged the holes and collected samples. The same year University of Alaska, Fairbanks (UAF) personnel supervised drilling eight additional hollow-stem auger test holes along the O alignment as part of an Alaska University Transportation Project (AUTC) research project "*Geotechnical Investigation for the Dalton Highway Innovation Project as a Case Study of the Ice-Rich Syngenetic Permafrost*", a final report for this project is in preparation.

In 2009, NRMS personnel drilled 14 test holes between August 4 and 7 using a track-mounted CME-850 drill rig. Test holes ranged from 15 to 39 feet deep. Margaret Darrow, Assistant Professor at UAF, directed drilling of three test holes (09-1401, 09-1402 and 09-1404) near Station 504+00 for a separate AUTC research project to monitor ground temperatures. Engineering geologist Julie Rowland logged the remainder of the holes. Two of the test holes at Sta 504+00 were advanced using 6.5-inch-diameter hollow-stem augers and driven 3-inch-diameter sampling spoons. All other test holes were completed using 6-inch solid-stem augers, and samples were collected from auger cuttings.

In 2008, NRMS personnel installed 1.5 inch diameter slope indicator tubing in TH08-040. Thermistor strings with thermistors on 10-foot spacing were installed in TH08-040 (Serial No. 3528), TH08-046 (Serial No. 3732) and TH08-053 (Serial No.3728). Temperature readings are presented in Appendix E.

Selected samples were submitted to the NR Materials Laboratory for testing. A handheld GPS was used to record test hole locations (NAD 83 datum).

Proposed grade, shown on the plan and profile sheets reflects the J line.

Expected physical site conditions

The following physical site conditions should be expected at the project site and materials sites:

- Expect frozen ground, either seasonal frost or permafrost, to be present at any time of year.
- Expect to encounter massive ice (greater than 1-foot thick) in excavations.
- Expect cutslopes in ice and frozen silt to fail, slump or flow as thawing occurs.
- Expect thawed, wet silt slopes to erode easily.
- Expect that excavations in bedrock or frozen soil may require blasting.

General subsurface conditions

For 46 test holes located near the J line, the generalized soil profile (off road) consists of:

- 2 to 6 inch organic mat,
- 1 to 50+ feet of silt with ice and organics often containing massive ice, over
- 2 to 10 foot thick layer of colluvial soil over

- highly weathered bedrock composed of chert and argillite.

The silt unit was present in all test holes and is the predominant soil type. Measured moisture contents (as ice) ranged from 16 to 250%. Excess visible ice was noted in most test holes. Massive ice, with cumulative thicknesses of 2 to 50 feet, was present in 22 of 46 test holes. Massive ice was generally not found where bedrock was shallower than 10 feet. Also, massive ice appears to be more common under north-facing slopes.

A colluvial layer was typically present just above bedrock. The colluvium consisted of silt with varying amounts of sand, gravel, clay, ice and organic matter. Thickness of this layer ranged from 1 to 15 feet thick, but was commonly 2 to 5 feet thick.

Depth to bedrock ranged from 4 to 51 feet where intercepted. It was intercepted in 26 of 46 holes. Bedrock, composed of highly weathered chert and argillite, was logged as "soft" because it augered relatively easily.

Permafrost conditions were found in all test holes but three, from the base of the active layer to the depths drilled. The three thawed holes were TH08-033, TH08-034, and TH09-1414, located in disturbed areas next to the highway near BOP.

Permafrost temperatures measured in O line test holes ranged from 29.0 to 31.1 °F. Thermistor data is presented in Appendix E.

Groundwater was not observed in any test holes with the exception of perched water in TH08-04 and TH08-33, both located in the roadside ditch.

Few test holes were drilled through the embankment in 2008/2009. Earlier studies drilled more holes in the embankment (see 2006 report). In general, cleared areas adjacent to the road typically thaw deeper than soils beneath embankments.

Embankment fill material is interpreted as derived from a nearby weathered chert bedrock source. Most field classifications of fill were silty gravel with sand. Where tested fill was classified as silty clayey sand with gravel.

General comments and recommendations

Comments and recommendations presented in this report supersede those presented in the 2006 geotechnical report for the 9 Mile Hill project.

- From a geotechnical standpoint, the J alignment is preferred to previous alignments L1, L2, and O. The amount of new construction over poor ground is greatly reduced, and the depths of cuts and fills have been reduced. Much of the alignment follows the existing highway, which has had many years to thermally stabilize (which is not to say it has fully stabilized).
- We did not perform a thermal analysis for this project, but analyses under similar conditions indicate that an embankment height of 10 feet or more will minimize thawing of frozen foundation soils. The maximum benefit is obtained when embankments are constructed in spring/early summer while the active layer is still frozen and soils are colder than in the fall. We recommend using this embankment height to help preserve permafrost, especially ice-rich permafrost.

- Alternately, substitute insulation for fill according to the rule of thumb: one-inch-thick of rigid foam board insulation for one foot of embankment height reduction. We recommend using insulation in the lower embankment over any areas in or above massive ice where fill thickness is not sufficient, such as cuts or thin fills (<10 feet thick).
- Alternately, experimental features such as Air Convection Embankments (ACE) or passive refrigeration with thermosyphons can be considered to preserve permafrost beneath cuts or thin fills over massive ice.
- Consider flattening slopes, or using thermal berms adjacent the embankment to shift ground thawing outward, away from the toe of structural fill. Thermal berms can be constructed of thawed, drained nonorganic silt or weathered bedrock with high fines. Thermal berms should be a minimum of 5 feet high, but can be larger according to available material. The upper surface of thermal berms should remain below the pavement section.
- We do not have specific recommendations for preserving permafrost along cutslopes. In general, cut slopes in frozen silt will thaw, creating potential short and long term stability and erosion problems. Use appropriate sediment control measures during and after construction. Consider using near-vertical cuts with extra-wide ditches to accommodate sloughing. Limit vertical bench cuts to 15 feet. In general, make ditches 1 to 1.5 the cut height. Slopes generally stabilize at 2.5 to 3(H):1(V) after thawing.
- Ditches cut into ice rich silt are a potential source of future instability for the embankment and cut slopes. Options to reduce embankment deformation due to thaw settlement in the ditch include flatter embankment slopes, subexcavation of upper ditch section and replacing with granular material.
- Preserve the organic mat the extent possible beneath fills and within cleared limits. Use hand-clearing to the extent possible. Minimize equipment traffic within cleared limits to protect the organic mat. Minimize ditch cutting: expect that thaw settlement will create depressions along the toes of the embankment over time.
- To improve constructability (mobility of heavy equipment), use a reinforcing geotextile fabric, or geogrid at the base of excavations in wet silt, as needed.
- For embankment structural fill below the pavement structure, specify Selected Material, Type C Modified with a maximum of 25% passing the No. 200 sieve.
- Plan for and maintain positive drainage throughout the project site.

Station to station descriptions and recommendations

Station 434+00 (BOP) to 488+00

In this segment the alignment climbs about 260 feet. Much of the road sidehills across an east-facing slope. A modest cut/fill will be required to widen the road. Fourteen test holes were drilled along this mile of road, with about half in undisturbed terrain and half within cleared limits adjacent the road.

Ground conditions are characterized by relatively shallow bedrock covered with silt and colluvium. Moisture contents in frozen silt ranged from 10 to 73%, but typically fell between 25 and 50%. Colluvial soils were field classified as silty sand with gravel, but lab testing showed a clay component. Only one sample was tested and classified as silty clayey sand with gravel. Colluvial layer was 1 to 6 feet thick.

Depth to bedrock ranged from 4 to 16 feet. The highly weathered bedrock was considered "soft" based on drill reaction. Rock auger cuttings classified as silty sand, silty clayey sand and well graded sand with silt and gravel. Some clay is present. Moisture contents ranged from 3 to 22%, generally decreasing with depth.

Permafrost was present in all but three test holes. Test holes found relatively low amounts of visible ice in silt layers and no massive ice layers.

Compared to other segments of the alignment, foundation conditions are relatively good with limited potential for thaw settlement.

Comments and Recommendations

- Because of shallow bedrock and lower ice content in overlying soils, the potential for thaw settlement is limited here. Consider striping off the organic mat within the new embankment footprint prior to placement of compacted fill. This will accelerate ground thawing (except under high fills). The hilly terrain should allow for subsurface drainage of thawing soils over time.

- Consider thoroughly compacting the stripped and leveled areas within the new embankment footprint to densify upper foundation soils and allow for better compaction of the initial lifts of embankment fill.

- In new cut areas, consider subexcavating the upper 2 feet or down to bedrock to improve road performance. Subexcavation would also improve performance (reduce compression and settlement) in fill areas, but may not be cost effective.

Station 488+00 to 520+00

In this section, the road crests a hill and proceeds down a north-facing ridge. At about Station 510+00, the road begins to sidehill (and drop) across a west-facing slope. Reconstruction will consist of fills and cut/fills to widen the road. The centerline grade is not expected to change.

We drilled thirteen holes between 488+00 to 506+00, and none from 506+00 to 520+00.

Ground conditions are characterized by ice-rich silt over massive ice. Bedrock was deep, between 35 and 50 feet. Frozen silt contained significant visible ice.

UAF drilling summary: near Station 504+00, we drilled three test holes and placed direct-burial thermistor cables to 30 feet deep. The buried cables all lead to a central instrument panel with a solar-powered data logger. TH09-1401 was drilled in the trees upslope of the road ("undisturbed"). TH09-1402 was drilled in the road shoulder, and TH09-1404 was located at the toe of the embankment. The undisturbed site had 15 feet of silt (frozen below 1 foot) over massive ice to 32 feet, the depth drilled. The road had 10 feet of thawed embankment fill (silty gravel with sand) over 1 foot of silt over massive ice to 35 feet. The toe hole was similar with less fill, and massive ice to 39 feet, the depth drilled.

Comments and Recommendations

- Ice-rich soils and massive ice are thaw unstable with the potential for extensive settlement. Differential settlement between centerline and embankment shoulders/toes and across cut-fill transitions is expected to be high as well.
- Avoid cuts to the extent possible. The general recommendations apply to this section.

Station 520+00 to 540+00

This segment sidehills across a west-facing slope and drops about 100 feet. The reconstruction preliminary design is mostly a sidehill cut/fill with some stretches of thru cut or fill. The centerline grade will remain similar to current. Only two holes were drilled in this section. We drilled two holes near Station 525+00 to compare conditions in the road and ditch. TH09-1412 was drilled in the shoulder (offset right, 7 ft) and TH09-1413 in the ditch (offset right, 30 ft).

The embankment was 3 feet thick composed of silty gravel with sand (probably some clay as well). Foundation soils were 12 feet of silt over 4 feet of silt with sand (colluvium). Bedrock was intercepted at 19 feet. The ditch test hole had similar soil conditions (minus the fill). However the depth to top of permafrost was 10 feet deep at the ditch compared to 7 feet deep under the road. Thawed soils were wet and frozen soils contained excess but little visible ice.

Comments and Recommendations

- Based on limited data, subsurface conditions appear similar to the segment at BOP, with bedrock less than 20 feet deep and lower ice content in silts. However, without additional data, it would be prudent to use the general (more conservative) recommendations.

Station 540+00 to 558+00

This major realignment sidehills up and over a west-facing, gentle to moderate slope. The preliminary design includes a 10- to 20-foot fill at the start and some asymmetrical cuts of up to 22 feet deep at centerline. We drilled six test holes along the propose route at 300-foot spacings.

Soil conditions consisted of silt with excess but not much visible ice, over both shallow and deep bedrock. Moisture (ice) content of silt ranged from 27 to 58 percent, based on eleven samples. Permafrost was present in all holes below depths of 1 to 5 feet. Bedrock was encountered in TH09-1409 and TH09-1411 at 10 feet, but not in other holes within the depth drilled.

Comments and recommendations

- Even though we did not encounter massive ice in this section, it may be present given the nature of the terrain.
- One location where 10-ft-deep bedrock was intercepted (Station 548+00) corresponds to a 5-foot cut, so bedrock may be encountered during excavation, depending on final design, but it probably won't be significant. The bedrock surface is not uniform.

- The cut sections will generate a large volume of frozen silt containing ice and organics. If the material can be thawed and drained it may be used for thermal berms on the project. Otherwise, plan to dispose of the material elsewhere.
- The planned cuts will accelerate thawing leading to long term settlement, though the amount may be limited, based on drill data.

Station 558+00 to 591+00 (EOP)

The major realignment continues downhill as the sidehill becomes a north-facing, gentle slope. The realignment meets the existing road at about Station 570+00 and continues on to the end of project. There is an initial sidehill fill across a drainage, then the preliminary design calls for shallow cuts and fills until the route rejoins the highway. Ten test holes were drilled near this portion of the J alignment.

Subsurface conditions are characterized by ice-rich silt, massive ice, and deep bedrock. These soils are highly thaw unstable. The section from 558+00 to 570+00 will be the most geotechnically challenging of the project as it has the worst soil conditions combined with major ground disturbance.

Comments and Recommendations

- The planned shallow cuts and thin fills will tend to accelerate thawing leading to significant thaw settlement over the short and long term. We recommend using insulation and/or experimental features to minimize ground thawing. Expect ongoing maintenance of the road surface.
- Depending on the design selected, consider incorporating construction scheduling.

References

ADOT&PF, 2009, Geotechnical Report, Dalton Highway Mile 11 to 18 Reconstruction, Federal Project No.: NH-065-2(12), State Project No. 62196, Northern Region, Fairbanks, Alaska.

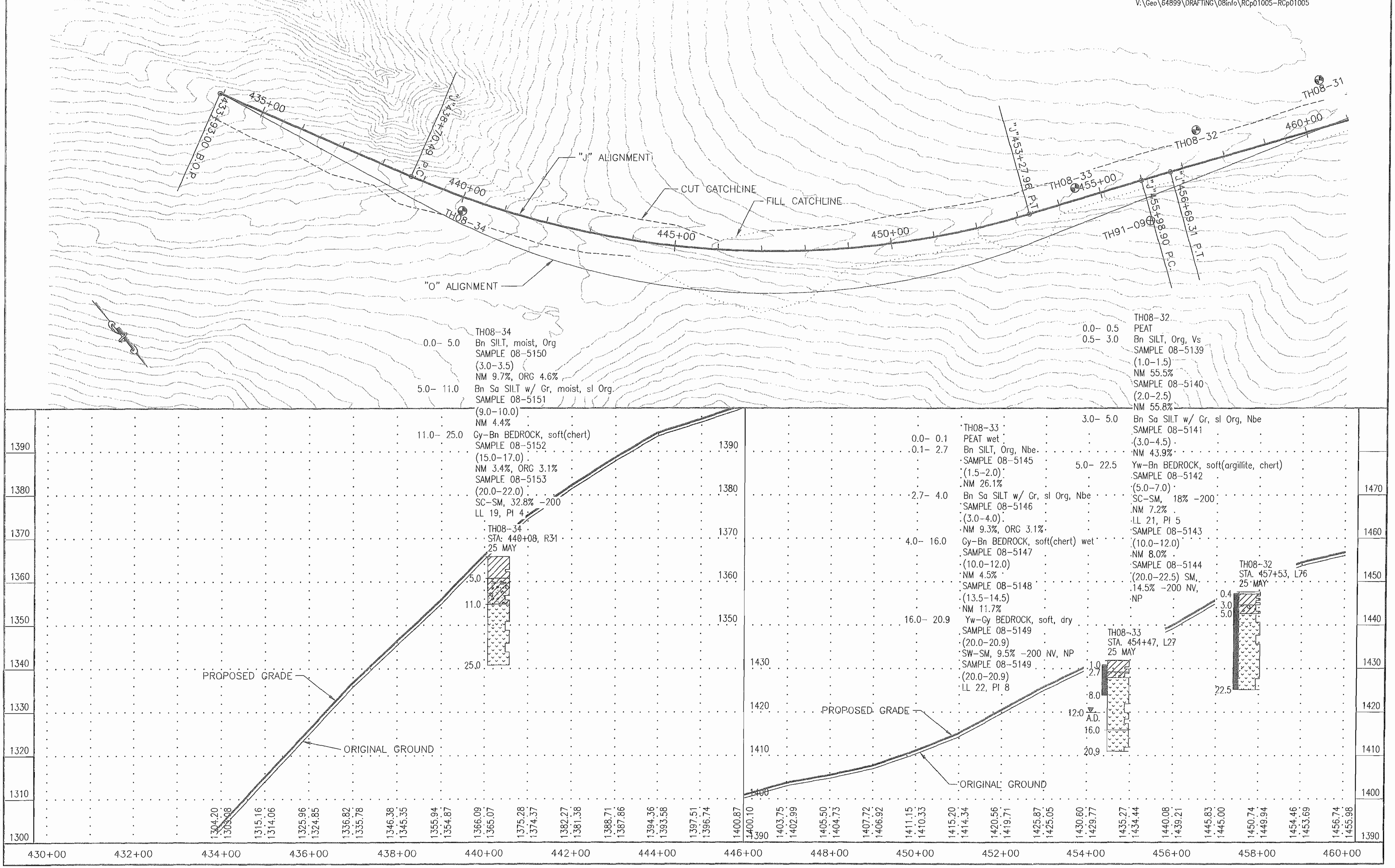
ADOT&PF, 2006, Geotechnical Report, Dalton Highway 9-Mile Hill North, Federal Project No. NH-F-065-2(3), State Project No. 64899, Northern Region, Fairbanks, Alaska.

Shur, Y., M. Kanorevskiy, 2009 draft report (unpublished), Geotechnical Investigations for the Dalton Highway, Innovation Project as a Case Study of the Ice-Rich Syngenetic Permafrost, Alaska University Transportation Center (AUTC project no. 207122), Institute of Northern Engineering, University of Alaska Fairbanks.

STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-F-065-2(3)/64899	2009	1	16

64899

V:\Geo\64899\DRAFTING\08info\RCp01005-RCp01005



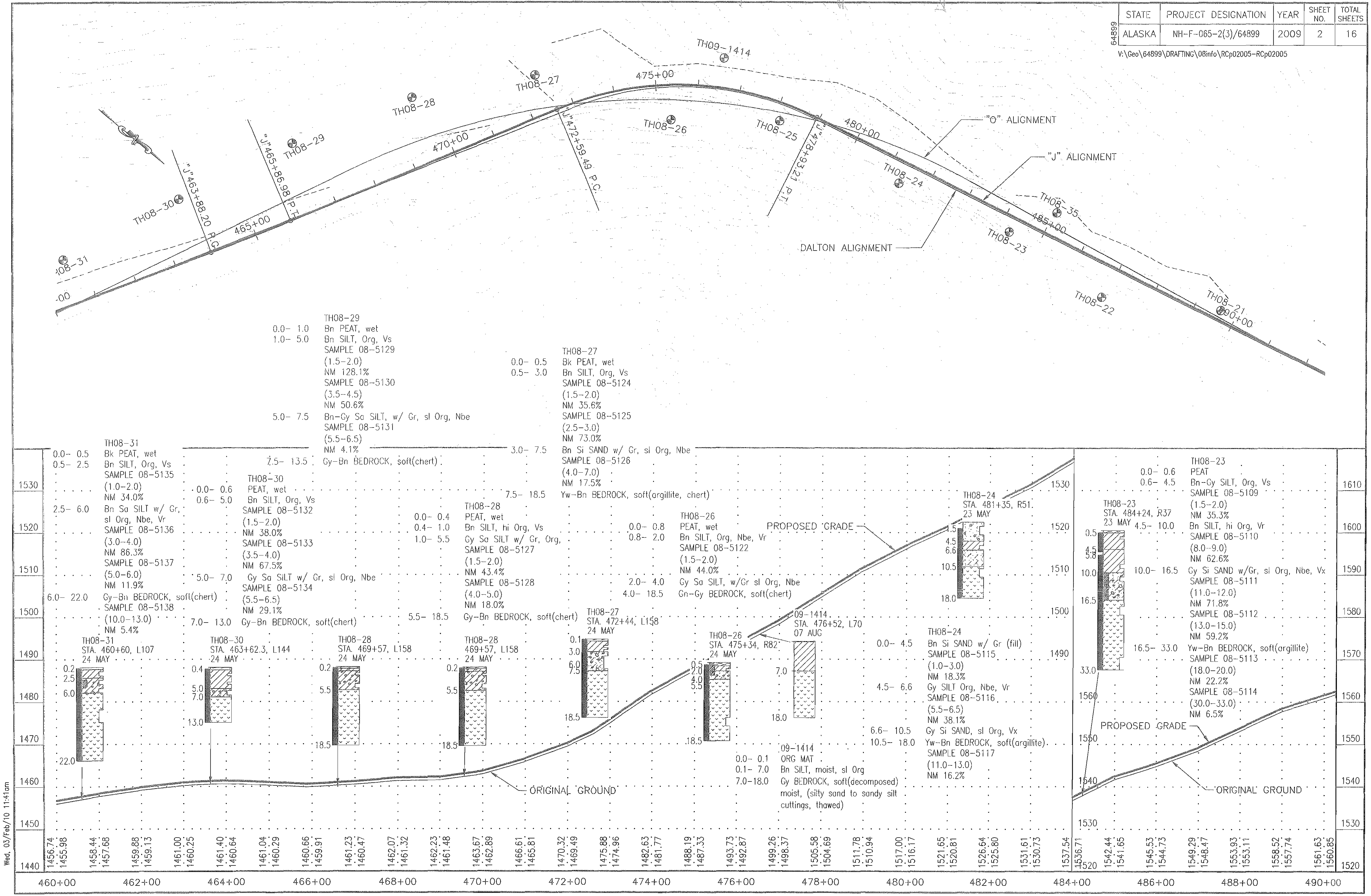
Wed, 03/Feb/10 11:46am

Could the "O" alignment be a different line type?

STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-F-065-2(3)/64899	2009	2	16

64899

V:\Geo\64899\DRAFTING\08info\RCp02005-RCp02005

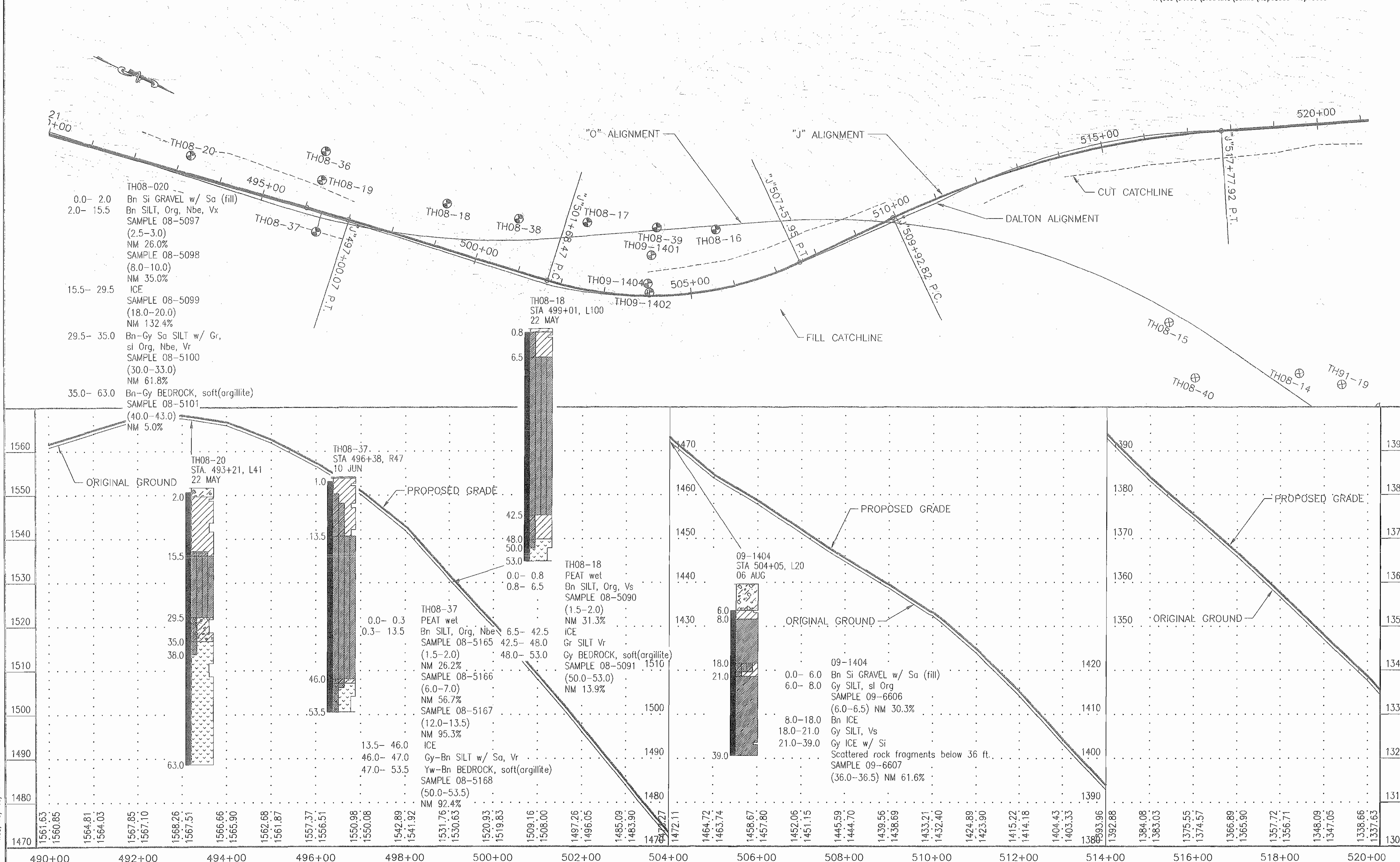


Wed, 03/Feb/10 11:41am

STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-F-065-2(3)/64899	2009	3	16

64899

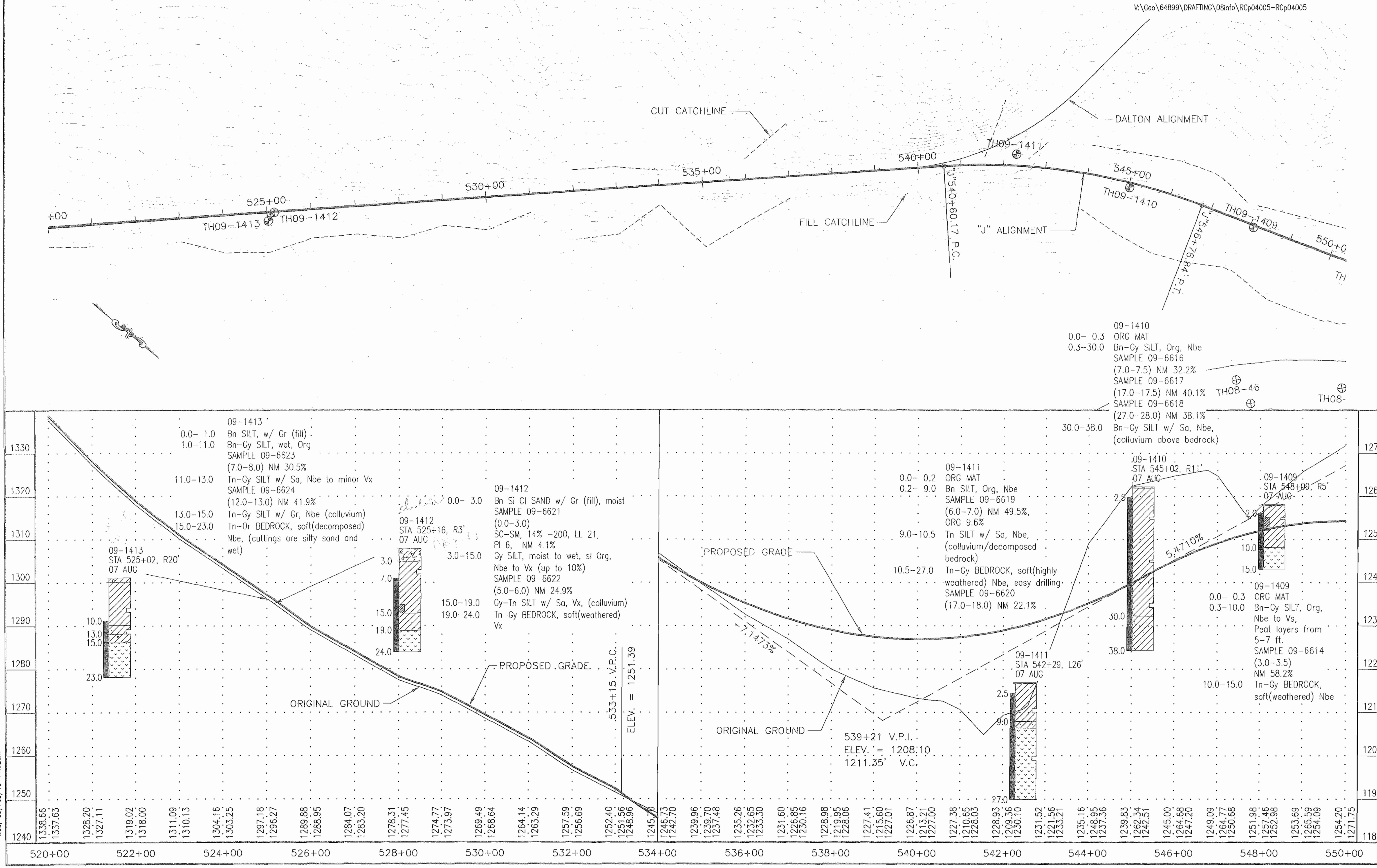
V:\Geo\64899\DRAFTING\08info\RCp03005-RCp03005



STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-F-065-2(3)/64899	2009	4	16

64899

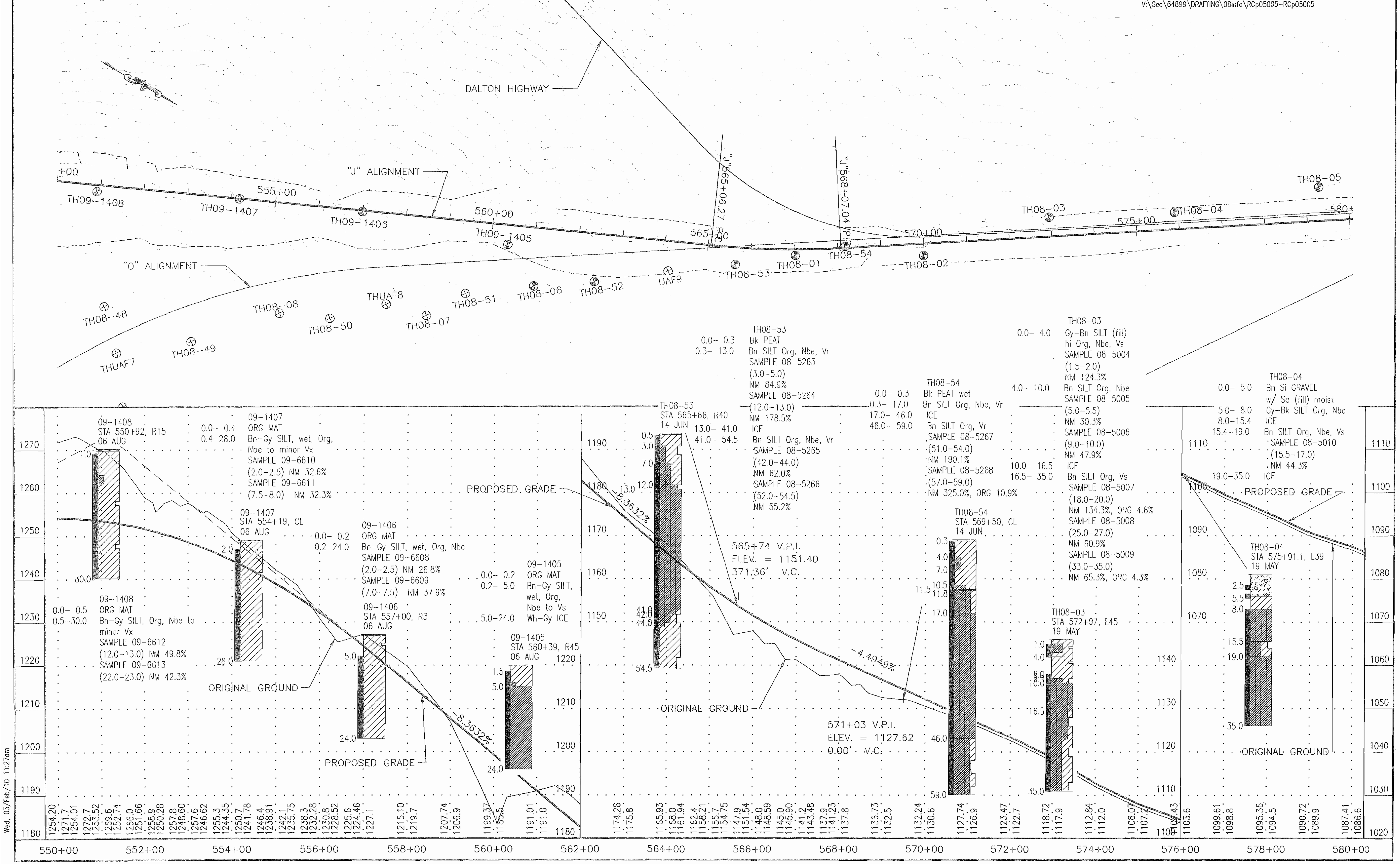
V:\Geo\64899\DRAFTING\08info\RCp04005-RCp04005



64899

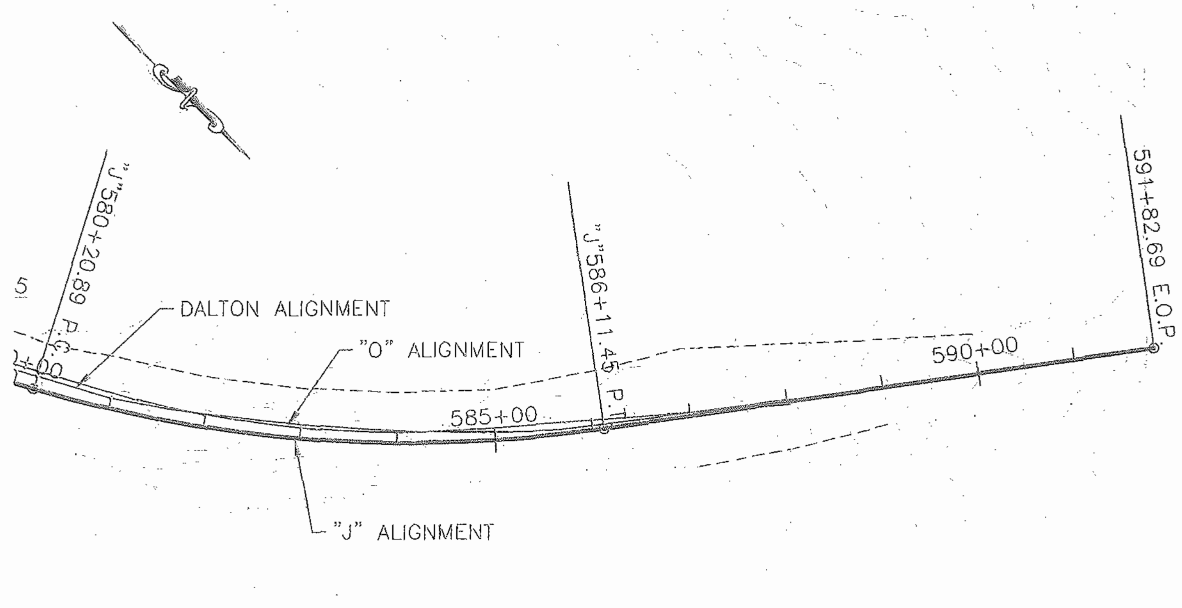
STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-F-065-2(3)/64899	2009	5	16

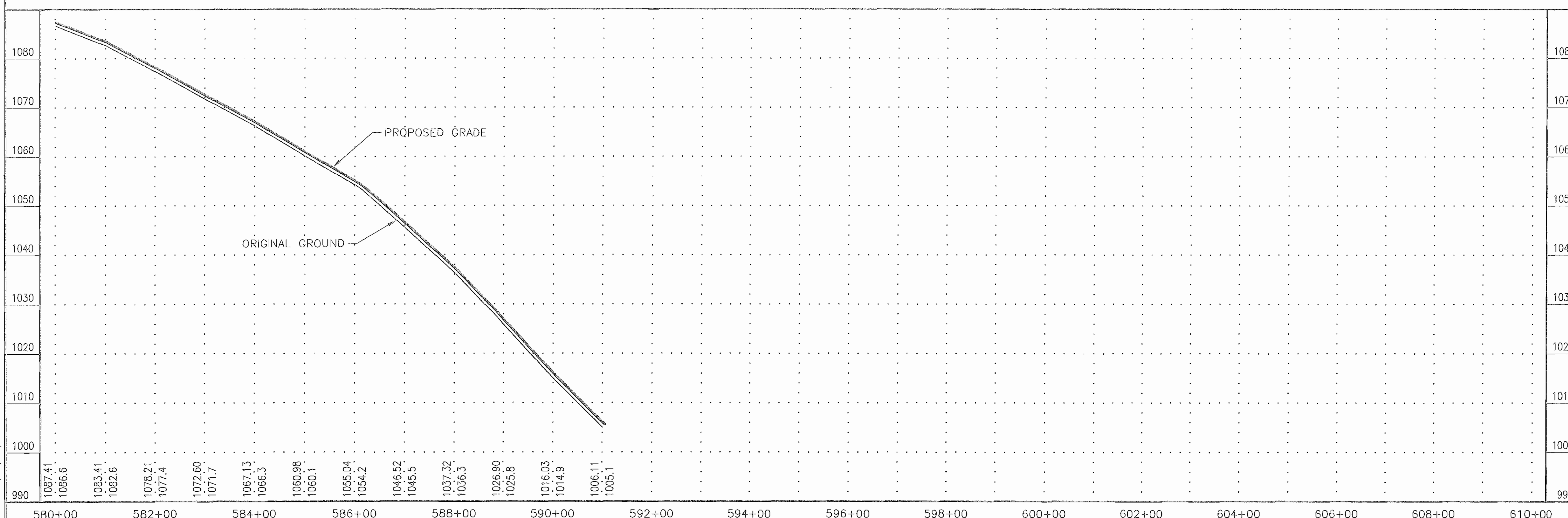
V:\Geo\64899\DRAFTING\08info\RCp05005-RCp05005



	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
64899	ALASKA	NH-F-065-2(3)/64899	2009	6	16

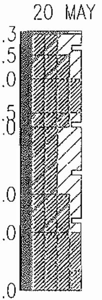
V:\Geo\64899\DRAFTING\08info\RCp06005-RCp06005





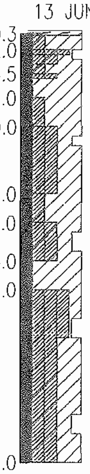
Wed, 03/Feb/10 11:09am

TH08-06
STA 560+08, R135
20 MAY



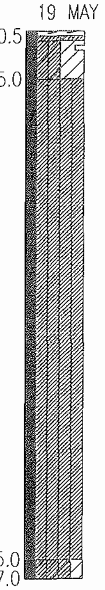
0.0- 0.3 Bk PEAT
0.3- 5.0 Bn SILT, Org, Vs
SAMPLE 08-5016
(1.5-2.0)
NM 34.2%
5.0- 8.5 ICE
8.5- 21.0 Gy-Bn SILT, Org, Vs
SAMPLE 08-5017
(9.5-10.0)
NM 128.4%, ORG 14.6%
SAMPLE 08-5018
(14.5-15.0)
NM 123.0%
SAMPLE 08-5019
(19.5-20.0)
NM 167.0%, ORG 11.2%
21.0-27.0 ICE w/ Si, sl Org
SAMPLE 08-5020
(25.0-27.0)
NM 310.4%

TH08-52
STA 562+45, R111
13 JUN



0.0- 0.5 Bk PEAT, wet
0.5- 45.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5258
(2.0-3.0)
NM 121.6%
SAMPLE 08-5259
(11.0-12.0)
NM 124.4%, ORG 17.7%
SAMPLE 08-5260
(21.0-23.0)
NM 119.9%
SAMPLE 08-5261
(30.0-32.0)
NM 146.8%
SAMPLE 08-5262
(40.0-42.0)
NM 146.4%, ORG 17.4%

TH08-01
STA 567+01.8, R14
19 MAY

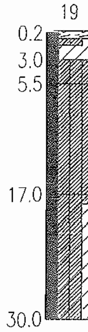


0.0- 0.5 Bk PEAT, wet
0.5- 5.0 Bn SILT, Org, Vs
SAMPLE 08-5001
(1.5-2.0)
NM 97.3%, ORG 12.3%
5.0- 55.0 ICE
55.0- 57.0 Bk SILT, Org, Vs

TH08-02
STA 569+98.5, R28
19 MAY

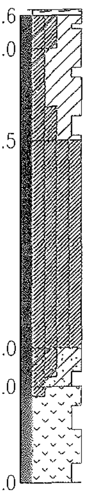
0.0- 0.5 Bk PEAT, wet
0.5- 7.0 Bn SILT, Org, Vs
SAMPLE 08-5002
(1.5-2.0)
NM 26.6%, ORG 7.1%
7.0- 31.0 ICE
31.0- 35.0 Bn SILT, Org, Vs
SAMPLE 08-5003
(32.5-33.0)
NM 197.0%, ORG 5.4%

TH08-05
STA 579+31.2, L78
19 MAY



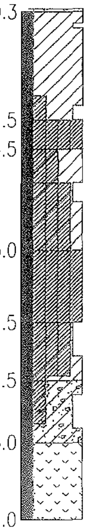
0.0- 0.8 Bk PEAT, wet
0.8- 5.5 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5011
(1.5-2.0)
NM 40.5%, ORG 5.6%
SAMPLE 08-5012
(3.0-4.0)
NM 109.1%
SAMPLE 08-5013
(4.5-5.0)
NM 102.8%
5.5- 17.0 ICE
17.0- 30.0 Bn SILT, Org, Vs
SAMPLE 08-5014
(17.0-17.5)
NM 114.5%
SAMPLE 08-5015
(25.0-27.0)
NM 42.8%, ORG 3.5%

TH08-36
STA 496+08, L134
9 JUN



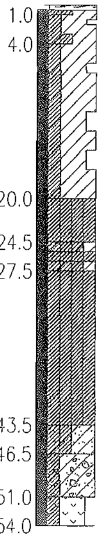
0.0- 0.6 PEAT
0.6- 13.5 Bn SILT, Org, Vr
SAMPLE 08-5159
(1.5-2.0)
NM 113.0%
SAMPLE 08-5160
(6.0-7.0)
NM 41.9%
SAMPLE 08-5161
(11.0-13.0)
NM 79.2%
13.5- 35.0 ICE
35.0- 39.0 Bn SILT w/ Sa sl Org, Vr
SAMPLE 08-5162
(37.5-39.0)
NM 69.8%
39.0- 49.0 Gy BEDROCK, soft(chert)
SAMPLE 08-5163
(41.0-43.5)
NM 17.1%
SAMPLE 08-5164
(47.0-49.0)
NM 9.4%

TH08-19
STA 496+17, L69
22 MAY



0.0- 0.3 PEAT wet
0.3- 11.5 Bn SILT
Org, Nbe, Vs
SAMPLE 08-5092
(1.5-2.0)
NM 35.9%
SAMPLE 08-5093
(10.0-11.5)
NM 58.1%,
ORG 4.4%
11.5- 14.5 ICE
14.5- 25.0 Bn SILT, Org, Vr
SAMPLE 08-5094
(18.0-20.0)
NM 108.7%, ORG 5.4%
25.0- 32.5 ICE
32.5- 38.5 Gy SILT, Org, Vs
SAMPLE 08-5095
(32.5-36.0)
NM 208.7%, ORG 6.4%
38.5- 45.0 Bn-Gy Sa SILT
w/ Gr, sl Org,
Nbe, Vr
SAMPLE 08-5096
(40.0-43.5)
NM 42.4%, ORG 2.9%
45.0- 53.0 Bn-Gy BEDROCK, soft(argillite)
Nbe, Vx

TH08-38
STA 500+66, L115
10 JUN

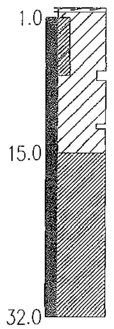


0.0- 0.5 Bn PEAT
0.5- 20.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5169
(1.5-2.0) NM 31.9%
SAMPLE 08-5170
(6.0-7.0)
NM 50.6%, ORG 3.0%
SAMPLE 08-5171
(11.0-13.0) NM 48.0%
SAMPLE 08-5172
(15.0-17.0)
NM 53.6%, ORG 3.8%
20.0- 24.5 ICE
24.5- 25.5 Gy SILT, Org, Vr
25.5- 26.5 ICE
26.5- 27.5 Gy SILT, Org, Vr
27.5- 43.5 ICE
43.5- 46.5 Gy SILT w/ Sa, sl Org
46.5- 51.0 Bn Sa SILT w/ Gr
51.0- 54.0 Yw-Bn BEDROCK,
soft(argillite)
SAMPLE 08-5173
(51.0-54.0) NM 37.2%

TH08-17
STA 502+26, L151
22 MAY

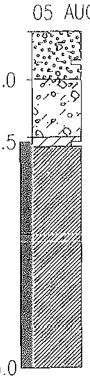
TH08-17
0.0- 0.8 Bk PEAT, wet
0.8- 15.5 Bn SILT, Org, Vs
SAMPLE 08-5083
(1.0-1.5)
NM 142.8%
SAMPLE 08-5084
(2.5-3.5)
NM 79.8%, ORG 3.2%
SAMPLE 08-5085
(8.0-10.0)
NM 61.8%
SAMPLE 08-5086
(13.0-15.0)
NM 63.1%, ORG 6.0%
15.5- 17.5 ICE
17.5- 28.0 Bn SILT, Org, Vs
SAMPLE 08-5087
(25.0-27.0)
NM 242.0%
28.0- 36.5 ICE
36.5- 37.5 Gy SILT, Org, Vr
37.5- 48.5 Gy Sa SILT w/ Gr, sl Org, Nbe, Vr
SAMPLE 08-5088
(40.0-43.0)
NM 157.4%, ORG 4.1%
SAMPLE 08-5089
(46.0-48.5)
NM 49.3%, ORG 2.4%

09-1401
STA 504+09, L70
04 AUG



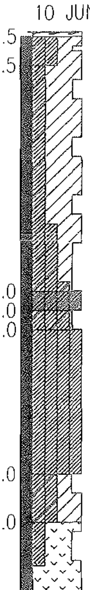
09-1401
0.0- 0.4 ORG MAT
0.4-15.0 Bn-Gy SILT, Org, Nbe to Vs
SAMPLE 09-6601
(6.5-7.5) ML, 90% -200
NM 65.8%
SAMPLE 09-6602
(12.0-12.5) NM 53.8%,
ORG 6.0%
15.0-32.0 Wh-Bn ICE

09-1402
STA 504+05, L7
05 AUG



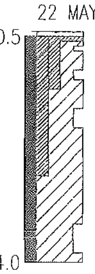
09-1402
0.0- 5.0 Bn WG SAND w/ Cl & Gr (fill), dry
SAMPLE 09-6603
(0.0-3.5)
SW-SC, 11.4% -200
LL 19, PI 4
SAMPLE 09-6604
(3.0-3.5) NM 2.6%
5.0-11.0 Bn PG GRAVEL w/ Si & Sa (fill)
dry to moist
11.0-12.0 Gy SILT, moist, Org, Vs
SAMPLE 09-6605
(11.5-12.0) NM 39.7%, ORG 7.1%
12.0-35.0 Wh-Bn ICE

TH08-39
STA 504+24, L155
10 JUN

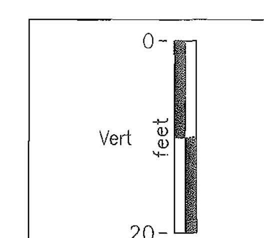


0.0- 0.5 Bk PEAT, wet
0.5- 27.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5174
(1.5-2.0) NM 121.7%
SAMPLE 08-5175
(5.0-7.0) NM 34.8%
SAMPLE 08-5176
(11.0-13.0) NM 61.7%, ORG 6.7%
SAMPLE 08-5177
(17.0-19.0) NM 52.7%
SAMPLE 08-5178
(22.0-29.0) NM 77.6%, ORG 6.8%
27.0- 29.0 ICE
29.0- 31.0 Bn SILT hi Org, Vs
SAMPLE 08-5179
(29.0-31.0)
NM 132.1%, ORG 13.5%
31.0- 46.0 ICE
46.0- 51.0 Gr SILT sl Org, Vr
SAMPLE 08-5180
(46.0-48.0)
NM 83.7%, ORG 1.7%
51.0- 59.0 Yw-Bn BEDROCK, soft(argillite)
SAMPLE 08-5181
(52.0-55.0)
SP-SM, 11.1% -200
NM 14.4% LL 23, NP

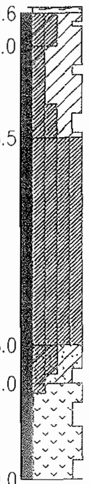
TH08-16
STA 505+86, L134
22 MAY



0.0- 0.5 Bn PEAT wet
0.5- 24.0 Bn-Gy SILT, Org, Nbe, Vs
SAMPLE 08-5079
(1.5-2.0)
NM 155.3%
SAMPLE 08-5080
(4.0-5.0)
NM 47.0%, ORG 3.4%
SAMPLE 08-5081
(8.0-10.0) NM 44.0%
SAMPLE 08-5082
(20.0-23.0) NM 40.5%

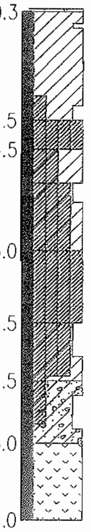


TH08-36
STA 496+08. L134
9 JUN



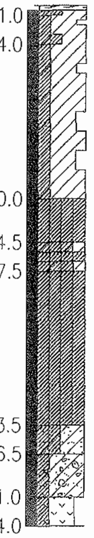
0.0- 0.6 PEAT
0.6- 13.5 Bn SILT, Org, Vr
SAMPLE 08-5159
(1.5-2.0)
NM 113.0%
SAMPLE 08-5160
(6.0-7.0)
NM 41.9%
SAMPLE 08-5161
(11.0-13.0)
NM 79.2%
13.5- 35.0 ICE
35.0- 39.0 Bn SILT w/ Sa sl Org, Vr
SAMPLE 08-5162
(37.5-39.0)
NM 69.8%
39.0- 49.0 Gy BEDROCK, soft(chert)
SAMPLE 08-5163
(41.0-43.5)
NM 17.1%
SAMPLE 08-5164
(47.0-49.0)
NM 9.4%

TH08-19
STA 496+17, L69
22 MAY



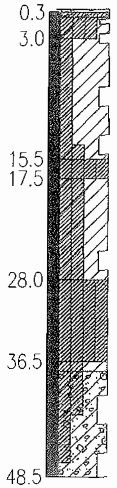
0.0- 0.3 PEAT wet
0.3- 11.5 Bn SILT
Org, Nbe, Vs
SAMPLE 08-5092
(1.5-2.0)
NM 35.9%
SAMPLE 08-5093
(10.0-11.5)
NM 58.1%,
ORG 4.4%
11.5- 14.5 ICE
14.5- 25.0 Bn SILT, Org, Vr
SAMPLE 08-5094
(18.0-20.0)
NM 108.7%, ORG 5.4%
25.0- 32.5 ICE
32.5- 38.5 Gy SILT, Org, Vs
SAMPLE 08-5095
(32.5-36.0)
NM 208.7%, ORG 6.4%
38.5- 45.0 Bn-Gy Sa SILT
w/ Gr, sl Org,
Nbe, Vr
SAMPLE 08-5096
(40.0-43.5)
NM 42.4%, ORG 2.9%
45.0- 53.0 Bn-Gy BEDROCK, soft(argillite)
Nbe, Vx

TH08-38
STA 500+66, L115
10 JUN



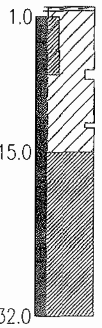
0.0- 0.5 Bn PEAT
0.5- 20.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5169
(1.5-2.0) NM 31.9%
SAMPLE 08-5170
(6.0-7.0)
NM 50.6%, ORG 3.0%
SAMPLE 08-5171
(11.0-13.0) NM 48.0%
SAMPLE 08-5172
(15.0-17.0)
NM 53.6%, ORG 3.8%
20.0- 24.5 ICE
24.5- 25.5 Gy SILT, Org, Vr
25.5- 26.5 ICE
26.5- 27.5 Gy SILT, Org, Vr
27.5- 43.5 ICE
43.5- 46.5 Gy SILT w/ Sa, sl Org
46.5- 51.0 Bn Sa SILT w/ Gr
51.0- 54.0 Yw-Bn BEDROCK,
soft(argillite)
SAMPLE 08-5173
(51.0-54.0) NM 37.2%

TH08-17
STA 502+26, L151
22 MAY



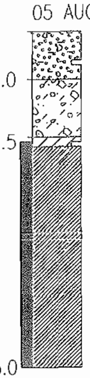
TH08-17
0.0- 0.8 Bk PEAT, wet
0.8- 15.5 Bn SILT, Org, Vs
SAMPLE 08-5083
(1.0-1.5)
NM 142.8%
SAMPLE 08-5084
(2.5-3.5)
NM 79.8%, ORG 3.2%
SAMPLE 08-5085
(8.0-10.0)
NM 61.8%
SAMPLE 08-5086
(13.0-15.0)
NM 63.1%, ORG 6.0%
15.5- 17.5 ICE
17.5- 28.0 Bn SILT, Org, Vs
SAMPLE 08-5087
(25.0-27.0)
NM 242.0%
28.0- 36.5 ICE
36.5- 37.5 Gy SILT, Org, Vr
37.5- 48.5 Gy Sa SILT w/ Gr, sl Org, Nbe, Vr
SAMPLE 08-5088
(40.0-43.0)
NM 157.4%, ORG 4.1%
SAMPLE 08-5089
(46.0-48.5)
NM 49.3%, ORG 2.4%

09-1401
STA 504+09, L70
04 AUG



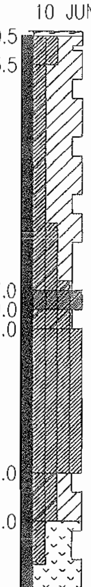
09-1401
0.0- 0.4 ORG MAT
0.4-15.0 Bn-Gy SILT, Org, Nbe to Vs
SAMPLE 09-6601
(6.5-7.5) ML, 90% -200
NM 65.8%
SAMPLE 09-6602
(12.0-12.5) NM 53.8%,
ORG 6.0%
15.0-32.0 Wh-Bn ICE

09-1402
STA 504+05, L7
05 AUG



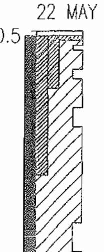
09-1402
0.0- 5.0 Bn WG SAND w/ Cl & Gr (fill), dry
SAMPLE 09-6603
(0.0-3.5)
SW-SC, 11.4% -200
LL 19, PI 4
SAMPLE 09-6604
(3.0-3.5) NM 2.6%
5.0-11.0 Bn PG GRAVEL w/ Si & Sa (fill)
dry to moist
11.0-12.0 Gy SILT, moist, Org, Vs
SAMPLE 09-6605
(11.5-12.0) NM 39.7%, ORG 7.1%
12.0-35.0 Wh-Bn ICE

TH08-39
STA 504+24, L155
10 JUN

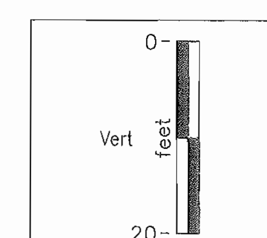


0.0- 0.5 Bk PEAT, wet
0.5- 27.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5174
(1.5-2.0) NM 121.7%
SAMPLE 08-5175
(5.0-7.0) NM 34.8%
SAMPLE 08-5176
(11.0-13.0) NM 61.7%, ORG 6.7%
SAMPLE 08-5177
(17.0-19.0) NM 52.7%
SAMPLE 08-5178
(22.0-29.0) NM 77.6%, ORG 6.8%
27.0- 29.0 ICE
29.0- 31.0 Bn SILT hi Org, Vs
SAMPLE 08-5179
(29.0-31.0)
NM 132.1%, ORG 13.5%
31.0- 46.0 ICE
46.0- 51.0 Gr SILT sl Org, Vr
SAMPLE 08-5180
(46.0-48.0)
NM 83.7%, ORG 1.7%
51.0- 59.0 Yw-Bn BEDROCK, soft(argillite)
SAMPLE 08-5181
(52.0-55.0)
SP-SM, 11.1% -200
NM 14.4% LL 23, NP

TH08-16
STA 505+86, L134
22 MAY



0.0- 0.5 Bn PEAT wet
0.5- 24.0 Bn-Gy SILT, Org, Nbe, Vs
SAMPLE 08-5079
(1.5-2.0)
NM 155.3%
SAMPLE 08-5080
(4.0-5.0)
NM 47.0%, ORG 3.4%
SAMPLE 08-5081
(8.0-10.0) NM 44.0%
SAMPLE 08-5082
(20.0-23.0) NM 40.5%

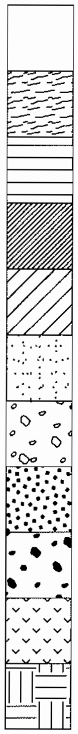


Appendix A

Symbols and definitions

SYMBOLS AND DEFINITIONS

BASIC MATERIAL SYMBOLS



ASPHALT
PEAT
CLAY (Cl)
ICE
SILT (Si)
POORLY GRADED SAND (Sa)
POORLY GRADED GRAVEL (Gr)
WELL GRADED SAND
WELL GRADED GRAVEL
BEDROCK (Bx), soft(Type)
BEDROCK (Bx), hard(Type)

SOFT OR HARD BEDROCK BASED ON DRILLING RATE

NOTE

MAIN COMPONENT (UPPER CASE ... SOLID LINES)
MINOR COMPONENT (Title Case ... DASHED LINES OR SPARSER PATTERN)

USCS SIZE DEFINITIONS

BOULDERS (Boulders)	12"+
COBBLES (Cobbles)	3" TO 12"
GRAVEL	#4 TO 3"
ANGULAR FRAGMENTS	#10 +
SAND	#200 TO #4
SILT	#200 TO 0.005 mm
CLAY	MINUS 0.005 mm

TEST RESULTS

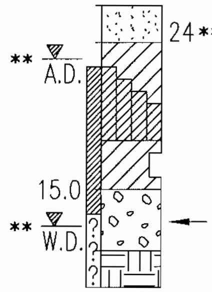
_._%-200	= % PASSING #200 SIEVE
NM _._%	= NATURAL MOISTURE
ORG _._%	= ORGANIC CONTENT
SSc _	= SODIUM SULFATE LOSS(coarse)
SSf _	= SODIUM SULFATE LOSS(fine)
LA _	= LOS ANGELES ABRASION
DEG _	= DEGRADATION
LL _	= LIQUID LIMIT (NV = no value)
PI _	= PLASTIC INDEX (NP = non-plastic)

MISC.

Tr	= TRACE
sl	= SLIGHTLY
hi	= HIGHLY
w/_	= WITH UNSPECIFIED AMOUNT
X'tls	= CRYSTALS
TH	= TEST HOLE
TT	= TEST TRENCH
TP	= TEST PIT

TYPICAL LOG

YEAR-HOLE NUMBER	05-41
LAT/LONG OR STATION, OFFSET	* Sta 210+53, Lt 3
ELEVATION (ft)	Elev 375
DATE LOGGED	16 JUN

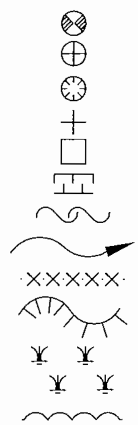


* Station value may also be on centerline – Sta 210+53, CL or lat-long format – N64.56789, W145.67890

** W.D.= WHILE DRILLING, A.D.= AFTER DRILLING

*** "N VALUE" INDICATES STANDARD PENETRATION TEST (1.4" I.D., 2.0" O.D. SAMPLER DRIVEN WITH 140 LB. HAMMER, 30" FREE FALL) AND IS SUM OF 2nd AND 3rd 6" OF PENETRATION.

PLAN VIEW SYMBOLS



POWER AUGER TEST HOLE (TH)
HAND AUGER TEST HOLE (TH)
EXPOSED MATERIAL
PROBE
HAND DUG TEST PIT (TP)
DOZER/BACKHOE TEST TRENCH (TT)
BODY OF WATER
FLOW DIRECTION
WASTE BERM
BANK
SWAMP
TREELINE

SOIL DENSITY/CONSISTENCY DESCRIPTORS

NON-COHESIVE		COHESIVE	
RELATIVE DENSITY	BLOWS/FOOT (N) VALUE	CONSISTENCY	BLOWS/FOOT (N) VALUE
VERY LOOSE	< 4	VERY SOFT	< 2
LOOSE	5–10	SOFT	2–4
MEDIUM DENSE	11–30	FIRM	5–8
DENSE	31–50	STIFF	9–15
VERY DENSE	> 50	VERY STIFF	16–30
		HARD	> 30

COLOR

Bk = BLACK	Gy = GRAY	Tn = TAN
Bl = BLUE	Or = ORANGE	Wh = WHITE
Bn = BROWN	Rd = RED	Yw = YELLOW
Gn = GREEN		

MOISTURE

dry	= < OPTIMUM*	DUSTY, DRY TO THE TOUCH
moist	~ OPTIMUM*	DAMP, NO VISIBLE WATER
wet	= > OPTIMUM*	VISIBLE FREE WATER

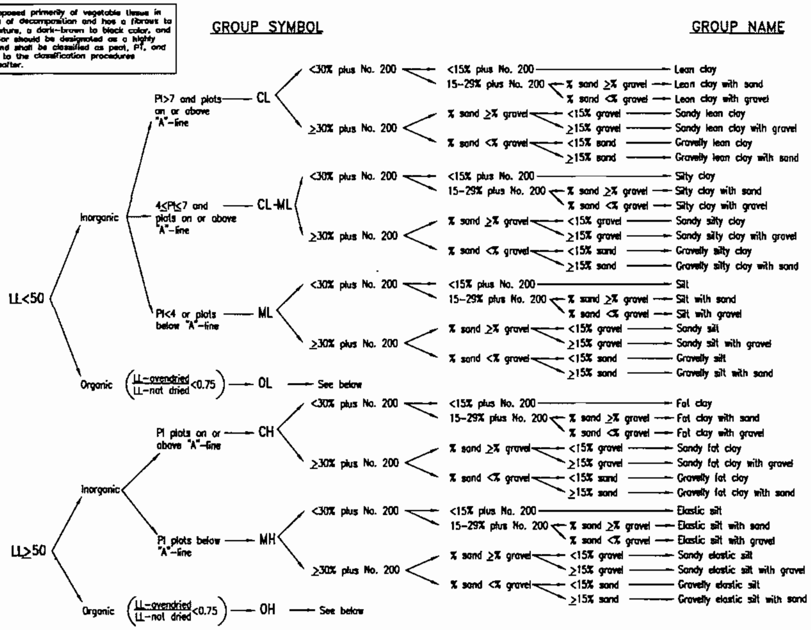
* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

Q:\Geo\SYMB\GEOLOG-GeoLog rev 1/06

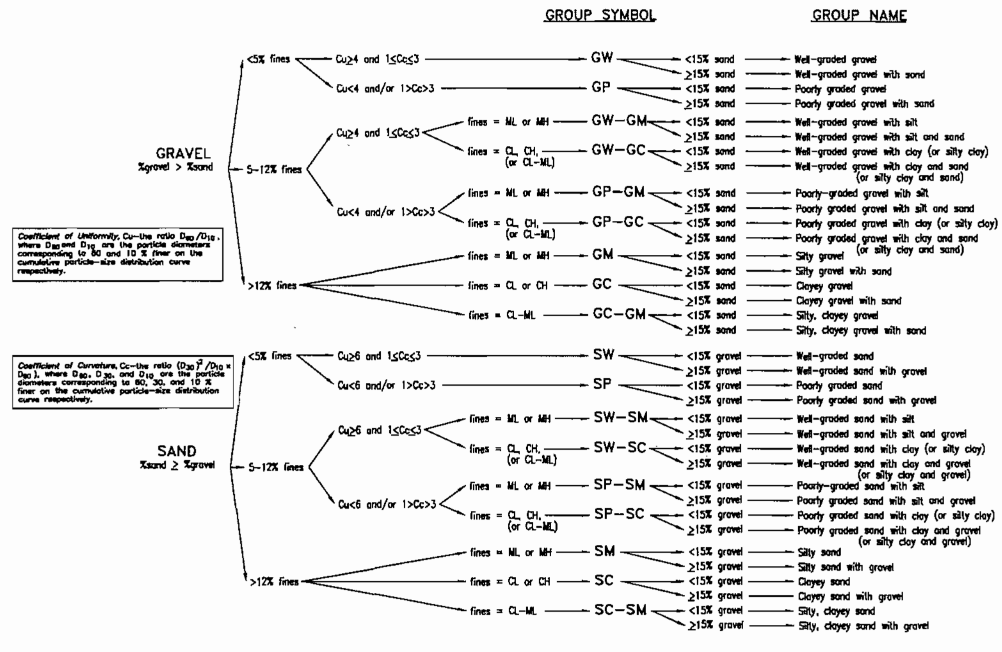
Classification of Soils for Engineering Purposes (Unified Soil Classification System)

(After ASTM D 2487)

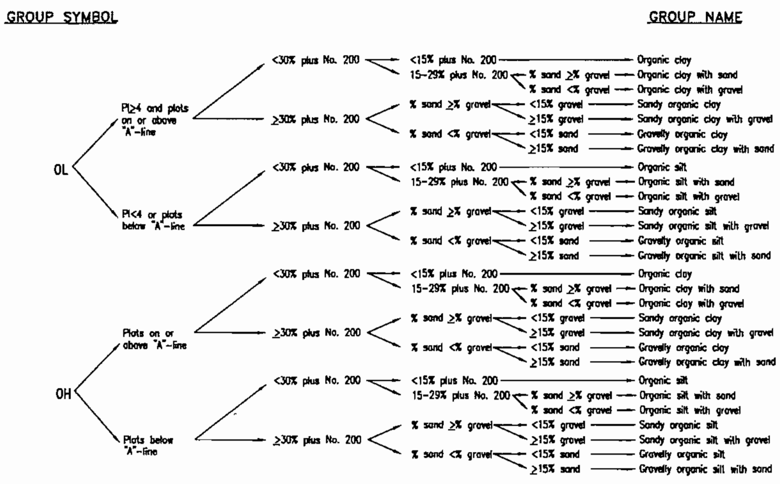
A sample composed primarily of vegetable tissue in various stages of decomposition and has a fibrous to amorphous texture, a dark-brown to black color, and an organic odor should be designated as a highly organic soil and shall be classified as peat, PT, and not subjected to the classification procedures described hereafter.



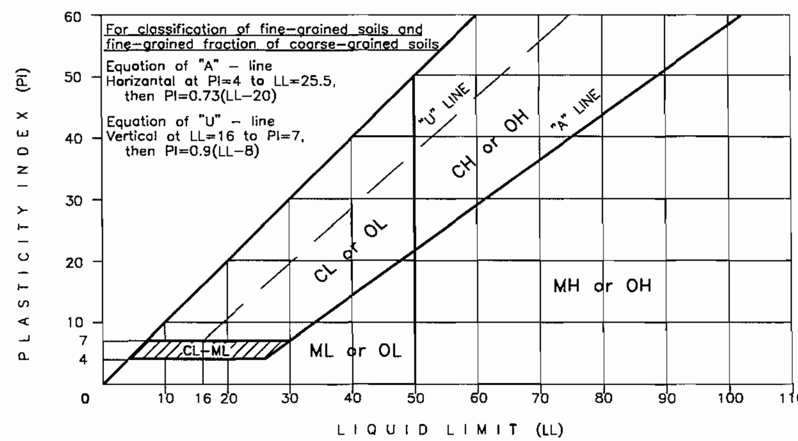
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)



Flow Chart for Classifying Coarse-Grained Soil (More Than 50% Retained on No. 200 Sieve)



Flow Chart for Classifying Organic Fine-Grained Soil (50% or More Passes No. 200 Sieve)



Plasticity Chart

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

Part I Description of Soil Phase (a) (Independent of Frozen State)	Major Group		Sub-Group		Field Identification (6)	Pertinent Properties of Frozen Materials which may be measured by physical tests to supplement field identification. (7)	Guide for Construction on Soils Subject to Freezing and Thawing	
	Description (2)	Designation (3)	Description (4)	Designation (5)			Thaw Characteristics (8)	Criteria (9)
Part II Description of Frozen Soil	Segregated ice is not visible by eye (b)	N	Poorly Bonded or Friable	Nf	Identify by visual examination. To determine presence of excess ice, use procedure under note (c) below and hand magnifying lens as necessary. For soils not fully saturated, estimate degree of ice saturation: Medium, Low. Note presence of crystals, or of ice coatings around larger particles.	In-Place Temperature Density and Void Ratio a) In Frozen State b) After Thawing in Place Water Content (Total H_2O, including ice) a) Average b) Distribution Strength a) Compressive b) Tensile c) Shear d) Adfreeze Elastic Properties Plastic Properties Thermal Properties Ice Crystal Structure (using optional instruments.) a) Orientation of Axes b) Crystal size c) Crystal shape d) Pattern of Arrangement	Usually Thaw-Stable	The potential intensity of ice segregation in a soil is dependent to a large degree on its void sizes and may be expressed as an empirical function of grain size as follows: Most inorganic soils containing 3 percent or more of grains finer than 0.02 mm in diameter by weight are frost-susceptible. Gravels, well-graded sands and silty sands, especially those approaching the theoretical maximum density curve, which contain 1.5 to 3 percent finer than 0.02 mm by weight without being frost-susceptible. However, their tendency to occur interbedded with other soils usually makes it impractical to consider them separately. Soils classed as frost-susceptible under the above criteria are likely to develop significant ice segregation and frost heave if frozen at normal rates with free water readily available. Soils so frozen will fall into the thaw-unstable category. However, they may also be classed as thaw-stable if frozen with insufficient water to permit ice segregation. Soils classed as non-frost-susceptible (*NFS) under the above criteria usually occur without significant ice segregation and are not exact and may be inadequate for some structure applications: exceptions may also result from minor soil variations. In permafrost areas, ice wedges, pockets, veins, or other ice bodies may be found whose mode of origin is different from that described above. Such ice may be the result of long-time surface expansion and contraction phenomena or may be glacial or other ice which has been buried under a protective earth cover.
			No excess ice Well Bonded	Nb n				
			Excess ice	Nb e				
	Segregated ice is visible by eye. (Ice 1 inch or less in thickness) (b)	V	Individual ice crystals or inclusions	Vx	For ice phase, record the following as applicable: Location / Size Orientation / Shape Thickness Spacing / Pattern of arrangement Length Hardness } Structure } per part III Below Color } Estimate volume of visible segregated ice present as percent of total sample volume		Usually Thaw-Unstable	
			Ice coatings on particles	Vc				
			Random or irregularly oriented ice formations	Vr				
			Stratified or distinctly oriented ice formations	Vs				
Part III Description of Substantial Ice Strata	Ice (Greater than 1 inch in thickness)	Ice	Ice with soil inclusions	Ice + Soil Type	Designate material as ICE (d) and use descriptive terms as follows, usually one item from each group, as applicable:			
			Ice without soil inclusions	Ice	Hardness: Hard, Soft (mass, not indi-crystals) Structure: Clear, Cloudy, Porous, Candled, Granular, Stratified Color: e.g.: Color-less, Gray, Blue Admixtures: e.g.: Contains Thin Silt Inclus-ions	Same as Part II above, as applicable, with special emphasis on Ice Crystal Structure.		

DEFINITIONS:

Ice Coatings on Particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Clear ice is transparent and contains only a moderate number of air bubbles. (e)

Cloudy Ice is translucent, but essentially sound and non-pervious

Porous Ice contains numerous voids, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Candled ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

Excess Ice is the volume of ice in soil which exceeds the total pore volume that the soil would have under natural unfrozen conditions.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins and masses in soils, commonly but not always oriented normal to direction of heat loss.

Well-bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

Poorly-bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

Modified from: Linell, K. A. and Kaplar, C. W., 1966, *Description and Classification of Frozen Soils,* Proc. International Conference on Permafrost (1963), Lafayette, IN, U.S. National Academy of Sciences, Publ. 1287, pp 481-487.

NOTES:

(a) When rock is encountered, standard rock classification terminology should be used.

(b) Frozen soils in the N group may on close examination indicate presence of ice within the voids of the material by crystalline reflections or by a sheen on fractured or trimmed surfaces. However, the impression to the unaided eye is that none of the frozen water occupies space in excess of the original voids in the soil. The opposite is true of frozen soils in the V group.

(c) When visual methods may be inadequate, a simple field test to aid evaluation of volume of excess ice can be made by placing some frozen soil in a small jar, allowing it to melt and observing the quantity of supernatant water as a percent of total volume.

(d) Where special forms of ice, such as hoarfrost, can be distinguished, more explicit description should be given.

(e) Observer should be careful to avoid being misled by surface scratches or frost coating on the ice.

Appendix B

Laboratory test result

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	DALTON HWY 9 MILE HILL NORTH
PROJECT NUMBER:	NH-F-065-2(3)
AKSAS NUMBER:	64899
SAMPLED BY:	RON BROOKS
MATERIAL SOURCE:	CENTERLINE

TEST HOLE NUMBER		08-32	08-32	08-33	08-34	08-35	08-39	
DEPTH (feet)		5.0-7.0	20.0-22.5	20.0-20.9	20.0-22.0	26.0-28.0	52.0-55.0	
STATION		458+00	458+00	454+90	442+00	485+80	504+50	
OFFSET		L10	L10	R05	R25	L90	CL	
LAB NUMBER		**08-5142**	**08-5144**	**08-5149**	**08-5153**	**08-5158**	**08-5181**	
DATE SAMPLED		25-May-08	25-May-08	25-May-08	25-May-08	9-Jun-08	10-Jun-08	
% Passing	**3"**							
	2"							
	1.5"							
	1.0"	100	100					
Gravel	**0.75"**	99	99					
	0.5"	91	96		100	100	100	
	0.375"	84	90	100	99	98	99	
	#4	60	71	94	90	92	86	
	#8	45	53	81	81	83	60	
	#10	42	50	76	79	81	55	
	#16	35	39	55	72	73	35	
	#30	30	31	34	62	64	21	
Sand	**#40**	28	28	26	57	61	17	
	#50	26	24	21	52	57	15	
	#60	25	23	18	50	56	14	
	#80	23	20	15	45	54	13	
	#100	22	19	13	43	52	13	
Silt/Clay	**#200**	18.0	14.5	9.5	32.8	47.7	11.1	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		21	NV	NV	19	22	23	
PLASTIC INDEX		5	NP	NP	4	4	NP	
USCS CLASSIFICATION		SC-SM	SM	SW-SM	SC-SM	SC-SM	SP-SM	
FIELD DESCRIPTION		(Bx-soft)	(Bx-soft)	(Bx-soft)	(Bx-soft)		(Bx-soft)	
NATURAL MOISTURE		7.2				29.1	14.4	
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Dalton Hwy 9 Mile Hill North
PROJECT NUMBER:	NH-F-065-2(3)
AKSAS NUMBER:	64899
SAMPLED BY:	J. ROWLAND
MATERIAL SOURCE:	CENTERLINE, "J" LINE

TEST HOLE NUMBER		09-1401	09-1402	09-1412				
DEPTH (feet)		6.5-7.5	0.0-3.5	0.0-3.0				
STATION		504+10	504+05	525+10				
OFFSET		L100	L8	R7				
LAB NUMBER		**09-6601**	**09-6603**	**09-6621**				
DATE SAMPLED		4-Aug-09	5-Aug-09	7-Aug-09				
% Passing	**3"**							
	2"			100				
	1.5"		100	98				
Gravel	**1.0"**		99	95				
	0.75"		96	91				
	0.5"		88	83				
	0.375"		81	78				
	#4		64	62				
	#8		48	47				
	#10		46	45				
	#16		37	35				
	#30		28	27				
Sand	**#40**	100	25	24				
	#50	99	22	21				
	#60	98	21	20				
	#80	97	18	18				
	#100	95	16	17				
Silt/Clay	**#200**	90.0	11.4	14.0				
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	19	21				
PLASTIC INDEX		NP	4	6				
USCS CLASSIFICATION		ML	SW-SC	SC-SM				
USCS SOIL DESCRIPTION								
NATURAL MOISTURE		65.8		4.1				
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

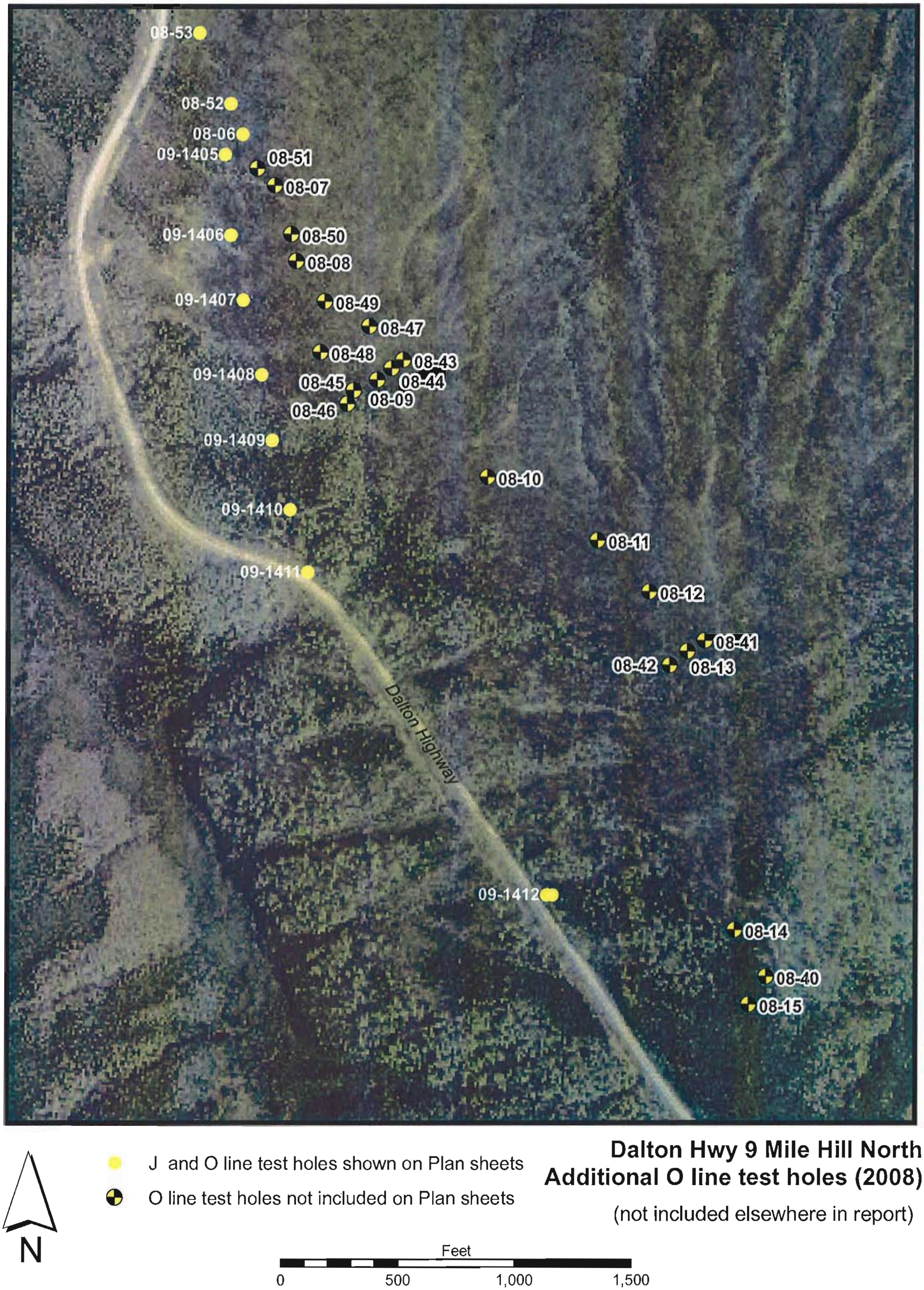
[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

Appendix C

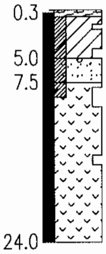
All other 2008 test holes (O line)
beyond current alignment



Dalton Hwy 9 Mile Hill North
Additional O line test holes (2008)

(not included elsewhere in report)

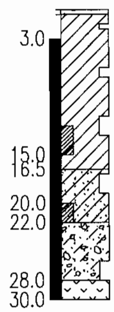
TH08-25
STA. 478+14, R42
24 MAY



TH08-25

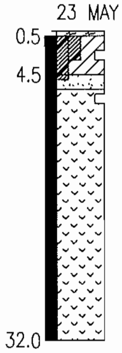
0.0– 0.7	PEAT	
0.7– 5.0	Bn SILT, Org, Vs SAMPLE 08-5118 (1.5–2.0) NM 31.4% SAMPLE 08-5119 (4.0–5.0) NM 28.6%	
5.0– 7.5	Gy-Bn Si SAND w/ Gr sl Org, Vr	
7.5– 24.0	Yw-Bn BEDROCK, soft(chert) SAMPLE 08-5120 (8.0–10.0) NM 9.3% SAMPLE 08-5121 (15.0–16.0) NM 4.3%	

TH08-35
STA. 485+07, L54
09 JUN



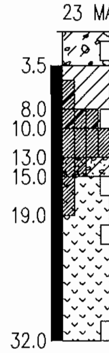
0.0– 0.5	PEAT wet, Vs
0.5– 16.5	Bn SILT Org, Nbe SAMPLE 08-5154 (1.5–2.0) NM 23.3% SAMPLE 08-5155 (6.0–7.0) NM 34.5% SAMPLE 08-5156 (11.0–13.0) NM 38.9%
16.5– 22.0	Bn SILT w/ Sa sl Org, Nbe SAMPLE 08-5157 (17.0–19.0) NM 36.9%
22.0– 28.0	Gy-Bn Si Cl SAND w/ Gr Vx SAMPLE 08-5158 (26.0–28.0) SC-SM, 47.7% -200 NM 29.1% LL 22, PI 4
28.0– 30.0	Gy-Bn BEDROCK, soft(chert)

TH08-22
STA. 486+92, R76
23 MAY

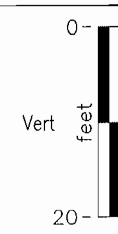


0.0– 0.5	PEAT, wet
0.5– 4.5	Bn SILT Org, Vs SAMPLE 08-5107 (2.0–3.0) NM 52.1%
4.5– 6.0	Bn Si SAND w/ Gr sl Org, Nbe
6.0– 32.0	Yw-Bn BEDROCK, soft(argillite) SAMPLE 08-5108 (6.5–7.5) NM 22.8%

TH08-21
STA. 489+61, L22
23 MAY

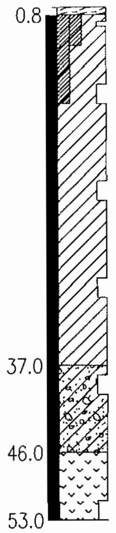


0.0– 3.5	Bn Si GRAVEL (fill) SAMPLE 08-5102 (1.0–3.0) NM 12.5%
3.5– 10.0	Bn SILT Org, Vs SAMPLE 08-5103 (8.0–10.0) NM 212.9%
10.0– 13.0	ICE
13.0– 15.0	Bn Sa SILT w/ Gr sl Org, Nbe
15.0– 32.0	Yw-Bn BEDROCK, soft(argillite) Vx SAMPLE 08-5104 (15.0–17.0) NM 17.6% SAMPLE 08-5105 (20.0–22.0) NM 8.9% SAMPLE 08-5106 (30.0–32.0) NM 4.1%



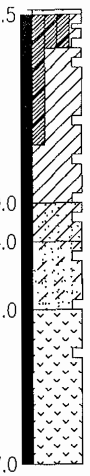
Feb 02, 2010 - 11:57am

TH08-15
STA 515+92, R420
21 MAY



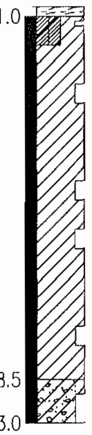
TH08-15
0.0- 0.8 Bn PEAT, wet
0.8- 37.0 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5073
(1.5-2.0) NM 181.3%, ORG 11.7%
SAMPLE 08-5074
(8.0-10.0) NM 49.8%, ORG 3.6%
SAMPLE 08-5075
(18.0-20.0) NM 43.0%, ORG 3.4%
SAMPLE 08-5076
(28.0-30.0) NM 43.3%, ORG 5.9%
37.0- 46.0 Bn-Gy Sa SILT w/ Gr, sl Org, Nbe, Vx
SAMPLE 08-5077
(38.0-40.0)
NM 26.6%, ORG 3.7%
46.0- 53.0 Bk-Bn BEDROCK, soft(argillite)
SAMPLE 08-5078
(51.0-53.0) NM 8.4%

TH08-40
STA 516+46, R554
10 JUN



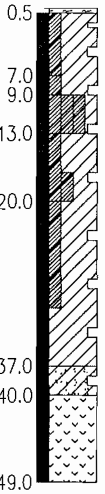
TH08-40
0.0- 0.5 PEAT
0.5- 20.0 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5182
(1.5-2.0) NM 141.8%
SAMPLE 08-5183
(3.0-4.0) NM 101.2%
SAMPLE 08-5184
(5.0-6.0) NM 68.5%
SAMPLE 08-5185
(11.0-12.0) NM 59.2%
SAMPLE 08-5186
(15.0-16.0) NM 36.6%
SAMPLE 08-5187
(19.0-20.0) NM 31.3%
20.0- 24.0 Gy-Bn SILT w/ Sa, sl Org, Nbe
SAMPLE 08-5188
(21.0-22.0) NM 21.2%
24.0- 31.0 Yw-Bn Si SAND, Nbe
SAMPLE 08-5189
(25.0-26.0) SM, 28% -200, LL 24, NP
SAMPLE 08-5190
(30.0-31.0) NM 8.0%
31.0- 47.0 Yw-Bn BEDROCK, soft(argillite)
SAMPLE 08-5191
(35.0-36.0) NM 4.0%

TH08-14
STA 519+22, R564
21 MAY



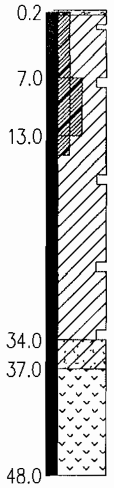
TH08-14
0.0- 1.0 Bk PEAT, wet
1.0- 38.5 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5067
(1.5-2.0) NM 139.9%
SAMPLE 08-5068
(8.0-10.0) NM 21.6%, ORG 5.0%
SAMPLE 08-5069
(18.0-20.0) NM 47.8%, ORG 2.3%
SAMPLE 08-5070
(23.0-25.0) NM 39.6%
SAMPLE 08-5071
(33.0-35.0) NM 32.2%, ORG 4.9%
38.5- 43.0 Bn Sa SILT w/ Gr, Nbe
SAMPLE 08-5072
(40.0-43.0) NM 13.6%, ORG 2.7%

TH08-41
STA 529+91 R1185
11 JUN



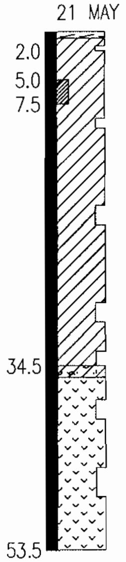
TH08-41
0.0- 0.5 PEAT
0.5- 37.0 Bn-Gy SILT, Org, Nbe, Vr
SAMPLE 08-5192
(1.5-2.0) NM 48.0%
SAMPLE 08-5193
(4.0-5.0) NM 60.0%
SAMPLE 08-5194
(8.0-9.0) NM 69.4%
SAMPLE 08-5195
(12.0-13.0) NM 109.9%
SAMPLE 08-5196
(17.0-18.0) NM 149.2%
SAMPLE 08-5197
(23.0-24.0) NM 60.5%
SAMPLE 08-5198
(28.0-29.0) NM 58.6%
SAMPLE 08-5199
(33.0-34.0) NM 35.6%
37.0- 40.0 Gy Sa SILT sl Org, Nbe
SAMPLE 08-5200
(38.0-39.0) NM 11.9%
40.0- 49.0 Yw-Bk BEDROCK, soft(argillite)

TH08-42
STA 529+95, R1001
11 JUN



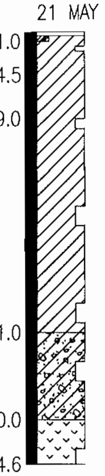
TH08-42
0.0- 0.5 Bk PEAT, wet
0.5- 34.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5201
(1.5-2.0) NM 41.7%
SAMPLE 08-5202
(7.0-8.0) NM 94.1%
SAMPLE 08-5203
(17.0-18.0) NM 48.4%
SAMPLE 08-5204
(26.0-27.0) NM 35.9%
SAMPLE 08-5205
(33.0-34.0) NM 24.0%
34.0- 37.0 Yw-Bn Sa SILT, sl Org
37.0- 48.0 Yw-Gy BEDROCK,soft(argillite)

TH08-13
STA 529+99, R1098
21 MAY



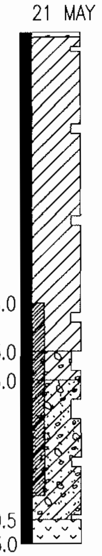
TH08-13
0.0- 0.7 Bk PEAT
0.7- 34.5 Bn SILT, Org, Vs
SAMPLE 08-5059
(1.5-2.0) NM 36.9%
SAMPLE 08-5060
(9.0-10.0) NM 37.3%
SAMPLE 08-5061
(18.0-20.0) NM 54.1%
SAMPLE 08-5062
(28.0-30.0) NM 35.2%
SAMPLE 08-5063
(33.0-34.5) NM 16.9%
34.5- 35.7 Gy-Bn SILT w/ Gr
35.7- 53.5 Yw-Bn BEDROCK, soft(argillite) Nbe
SAMPLE 08-5064
(38.0-40.0) NM 6.5%
SAMPLE 08-5065
(45.0-48.0) NM 8.4%

TH08-12
STA 533+00, R1116
21 MAY



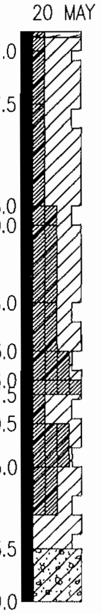
TH08-12
0.0- 0.4 PEAT, wet
0.4- 31.0 SILT, Org, Nbe, Vr
SAMPLE 08-5053
(1.5-2.0) NM 21.8%
SAMPLE 08-5054
(9.0-10.0) NM 38.0%, ORG 2.8%
SAMPLE 08-5055
(18.0-20.0) NM 65.4%, ORG 12.7%
SAMPLE 08-5056
(28.0-30.0) NM 49.7%, ORG 2.9%
31.0- 40.0 Sa SILT w/ Gr, Org, Vr
SAMPLE 08-5057
(34.0-36.0) NM 17.2%
40.0- 44.6 Gy-Bn BEDROCK, soft(argillite)
SAMPLE 08-5058
(43.0-44.6) NM 18.3%

TH08-11
STA 536+09, R1064
21 MAY



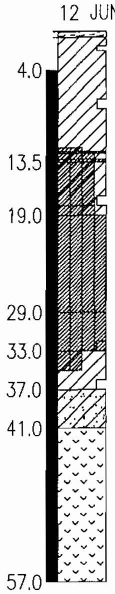
TH08-11
0.0- 0.5 PEAT, wet
0.5- 33.0 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5045
(1.5-2.0) NM 26.5%
SAMPLE 08-5046
(9.5-10.5) NM 55.6%
SAMPLE 08-5047
(19.0-20.0) NM 45.4%, ORG 4.7%
SAMPLE 08-5048
(29.0-30.0) NM 62.1%
33.0- 36.0 Bn SILT w/ Gr, Org, Vr
SAMPLE 08-5049
(33.0-35.0) NM 149.9%, ORG 12.3%
36.0- 50.5 Bn Sa SILT w/ Gr, Org, Nbe
SAMPLE 08-5050
(38.0-40.0) ML, 61.8% -200, LL NM 61.4%, ORG 5.4%
SAMPLE 08-5051
(44.0-45.0) NM 29.7%, ORG 2.4%
SAMPLE 08-5052
(50.0-50.7) NM 5.5%
50.5- 53.0 Gy-Bn BEDROCK, soft(chert)

TH08-10
STA 541+69, R842
20 MAY



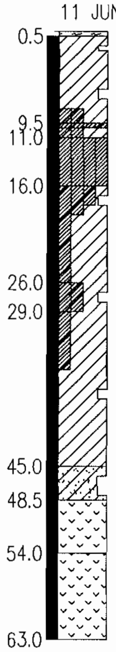
TH08-10
0.0- 0.6 Bn PEAT
0.6- 36.0 Bn SILT, Org, Nbe, Vs
SAMPLE 08-5036
(2.0-3.0) NM 71.0%
SAMPLE 08-5037
(8.0-10.0) NM 57.3%
SAMPLE 08-5038
(18.0-20.0) NM 77.1%, ORG 4.2%
SAMPLE 08-5039
(28.0-30.0) NM 91.3%
SAMPLE 08-5040
(33.0-35.0) NM 123.7%, ORG 5.6%
36.0- 37.5 ICE
37.5- 53.5 Bn SILT, Org, Vs, Vx
SAMPLE 08-5041
(38.0-40.0) NM 78.6%
SAMPLE 08-5042
(43.0-45.0) NM 545.2%
SAMPLE 08-5043
(48.0-50.0) NM 68.7%
SAMPLE 08-5044
(52.0-53.5) NM 34.5%, ORG 5.4%
53.5- 59.0 Bk Sa SILT w/ Gr, sl Org, Vs

TH08-46
STA 548+97, R349
12 JUN



TH08-46
0.0- 0.6 Bk PEAT, wet
0.6- 19.0 Bn SILT, wet, loose, Org, Nbe, Vr
SAMPLE 08-5224
(1.5-2.0) NM 25.5%
SAMPLE 08-5225
(7.0-8.0) NM 51.4%
SAMPLE 08-5226
(17.0-18.0) NM 113.9%
19.0- 29.0 ICE
29.0- 33.0 Bn ICE w/ Si & Sa
SAMPLE 08-5227
(32.0-33.0) NM 174.6%
33.0- 37.0 Bn SILT, sl Org, Vr
SAMPLE 08-5228
(36.0-37.0) NM 39.9%
37.0- 41.0 Gy Sa SILT, sl Org
41.0- 57.0 Yw-Bn BEDROCK, soft(argillite)

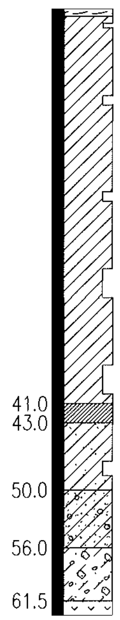
TH08-45
STA 549+48 R388
11 JUN



TH08-45
0.0- 0.5 Bk PEAT, wet
0.5- 11.0 Bn SILT, Org, Nbe, Vr
SAMPLE 08-5218
(1.5-2.0) NM 24.5%
SAMPLE 08-5219
(6.0-7.0) NM 53.0%
11.0- 16.0 ICE
16.0- 45.0 Bn SILT, sl Org, Nbe, Vr
SAMPLE 08-5220
(17.0-18.0) NM 189.5%
SAMPLE 08-5221
(27.0-28.0) NM 122.0%
SAMPLE 08-5222
(37.0-38.0) NM 54.2%
45.0- 48.5 Gy Sa SILT, sl Org, Vx
SAMPLE 08-5223
(46.0-48.0) NM 19.0%
48.5- 54.0 Yw-Bn BEDROCK, soft(argillite) Vs, Highly weathered w/ clay
54.0- 63.0 Bn-Gy BEDROCK, soft(argillite)

Dec 28, 2009 - 10:28am - Tab: RCp04005TH1

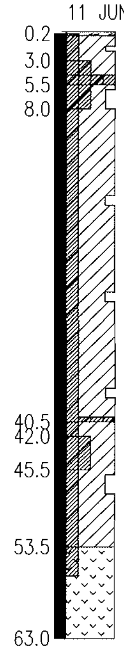
TH08-09
STA 549+75, R496
20 MAY



TH08-009

0.0- 0.8	Bk PEAT, wet
0.8-41.0	Bn SILT, Org, Vs SAMPLE 08-5030 (1.5-2.0) NM 132.9%, ORG 3.5% SAMPLE 08-5031 (9.0-10.0) NM 76.2% SAMPLE 08-5032 (19.0-20.0) NM 72.1%, ORG 5.0% SAMPLE 08-5033 (27.0-30.0) NM 75.7% SAMPLE 08-5034 (37.0-40.0) NM 107.3%, ORG 8.7%
41.0-43.0	ICE
43.0-50.0	Bn SILT w/ Sa, Org, Vr SAMPLE 08-5035 (47.0-48.5) NM 33.5%, ORG 5.5%
50.0-56.0	Sa SILT w/ Gr, sl Org
56.0-61.5	Gy-Bn Si GRAVEL w/ Sa sl Org
61.5-63.0	Gy-Bn BEDROCK, soft(chert)

TH08-44
STA 550+08, R564
11 JUN



TH08-44

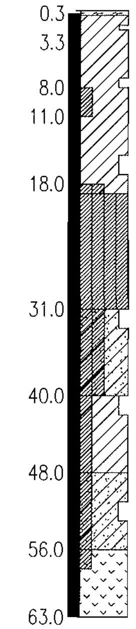
0.0- 0.4	Bn PEAT, wet
0.4- 53.5	Bn SILT, Org, Nbe, Vr SAMPLE 08-5212 (1.5-2.0) NM 67.4% SAMPLE 08-5213 (6.0-8.0) NM 110.2% SAMPLE 08-5214 (17.0-18.0) NM 63.7% SAMPLE 08-5215 (27.0-28.0) NM 64.4% SAMPLE 08-5216 (37.0-38.0) NM 87.4% SAMPLE 08-5217 (46.0-48.0) NM 76.5%
53.5- 63.0	Yw-Bn BEDROCK, soft(argillite)

TH08-48
STA 551+35, R279
12 JUN

TH08-48

0.0- 0.5	PEAT
0.5- 23.0	Bn SILT, Org, Nbe SAMPLE 08-5234 (1.5-2.0) M 33.4% SAMPLE 08-5235 (7.0-8.0) NM 37.2% SAMPLE 08-5236 (17.0-18.0) NM 39.4%
23.0- 25.0	ICE
25.0- 33.0	Gy-Bn SILT, sl Org, Vs SAMPLE 08-5237 (27.0-28.0) NM 117.2%
33.0- 36.0	ICE
36.0- 39.0	Gy-Bn SILT, sl Org, Vr SAMPLE 08-5238 (37.0-38.0) NM 91.7%
39.0- 44.0	Gy Sa SILT, sl Org, Vr
44.0- 48.0	Gy-Bn BEDROCK, soft(argillite) SAMPLE 08-5239 (46.0-48.0) NM 32.9%

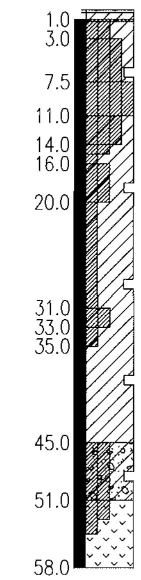
TH08-43
STA 550+36, R620
11 JUN



TH08-43

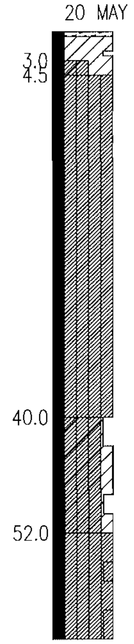
0.0- 0.5	Bn PEAT, wet
0.5- 19.0	Bn SILT, Org, Nbe, Vr SAMPLE 08-5206 (1.5-2.0) NM 35.9% SAMPLE 08-5207 (7.0-8.0) NM 76.1% SAMPLE 08-5208 (15.0-17.0) NM 43.0%
19.0- 31.0	ICE
31.0- 40.0	Gy-Bn SILT w/ Sa, sl Org, Vr SAMPLE 08-5209 (31.0-33.0) NM 170.0%
40.0- 48.0	Gy-Bn SILT, sl Org, Nbe, Vs SAMPLE 08-5210 (40.0-42.0) NM 139.4%
48.0- 56.0	Gy-Bn SILT w/ Sa, sl Org SAMPLE 08-5211 (51.0-53.0) NM 82.3%
56.0- 63.0	Yw-Bn BEDROCK, soft(argillite)

TH08-47
STA 552+02, R507
12 JUN



0.0- 0.3	PEAT
0.3- 7.5	Bn SILT, Org, Vs SAMPLE 08-5229 (6.0-7.0) NM 141.5%
7.5- 11.0	ICE
11.0- 45.0	Bn-Gy SILT, Org, Nbe, Vs SAMPLE 08-5230 (18.0-19.0) NM 139.5% SAMPLE 08-5231 (28.0-29.0) NM 71.7% SAMPLE 08-5232 (38.0-39.0) NM 63.4%
45.0- 51.0	Gy Sa SILT w/ Gr, Vr SAMPLE 08-5233 (48.0-49.0) NM 91.2%
51.0- 58.0	Yw-Bn BEDROCK, soft(argillite)

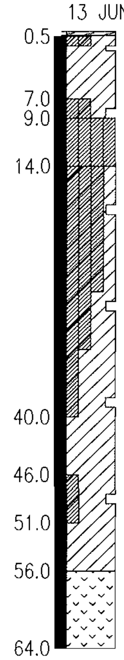
TH08-08
STA 555+35, R255
20 MAY



TH08-08

0.0- 0.5	PEAT, wet
0.5- 4.5	Bn SILT, Org, Nbe, Vr SAMPLE 08-5025 (2.0-2.5) NM 27.5%
4.5- 40.0	ICE
40.0- 52.0	Bn SILT, Org, Vs SAMPLE 08-5026 (40.0-43.0) NM 214.1% SAMPLE 08-5027 (48.0-50.0) NM 85.6%, ORG 4.6%
52.0- 63.0	ICE SAMPLE 08-5028 (55.0-57.0) NM 372.7% SAMPLE 08-5029 (60.0-63.0) NM 322.0%

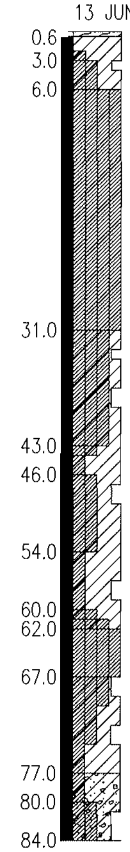
TH08-49
STA 553+42, R341
13 JUN



TH08-49

0.0- 0.4	Bn PEAT
0.4- 9.0	Bn SILT, Org, Nbe SAMPLE 08-5240 (1.5-2.0) NM 30.3% SAMPLE 08-5241 (8.0-9.0) NM 81.8%, ORG 14.5%
9.0- 14.0	ICE
14.0- 56.0	Bn SILT, Org, Nbe, Vr SAMPLE 08-5242 (18.0-19.0) NM 293.7% SAMPLE 08-5243 (28.0-29.0) NM 152.7%, ORG 10.6% SAMPLE 08-5244 (38.0-39.0) NM 84.1% SAMPLE 08-5245 (48.0-49.0) NM 72.3%, ORG 4.3%
56.0- 64.0	Gy BEDROCK, soft(argillite)

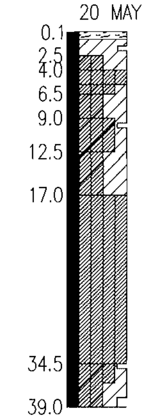
TH08-50
STA 556+51, R256
13 JUN



TH08-50

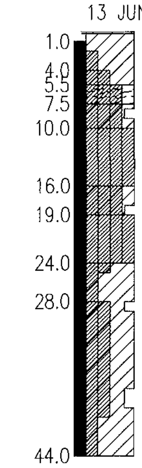
0.0- 0.5	Bn PEAT, wet
0.5- 6.0	Bn SILT, Org, Vs SAMPLE 08-5246 (3.0-4.0) NM 96.2%
6.0- 31.0	ICE
31.0- 62.0	Bn SILT, Org, Vr SAMPLE 08-5247 (33.0-34.0) NM 192.9% SAMPLE 08-5248 (37.0-39.0) NM 187.3%, ORG 20.6% SAMPLE 08-5249 (47.0-49.0) NM 195.5%, ORG 11.9% SAMPLE 08-5250 (57.0-59.0) NM 96.1%
62.0- 67.0	ICE
67.0- 77.0	Gy-Bn SILT, sl Org, Vr SAMPLE 08-5251 (67.0-69.0) NM 317.3% SAMPLE 08-5252 (72.0-74.0) NM 119.3%, ORG 5.8%
77.0- 84.0	Gy-Bn SILT w/ Sa, Nbe SAMPLE 08-5253 (81.0-84.0) NM 97.3%

TH08-07
STA 558+69, R228
20 MAY



0.0- 0.8	Bk PEAT, wet, Vr
0.8- 4.0	Bn SILT, Org, Nbe, Vs SAMPLE 08-5021 (1.5-2.0) NM 48.2%
4.0- 5.5	ICE
5.5- 17.0	Bn SILT, Org, Vs SAMPLE 08-5022 (9.5-10.0) NM 153.6%
17.0- 34.5	ICE
34.5- 39.0	Bn SILT, Org, Vs SAMPLE 08-5023 (34.5-35.0) NM 124.4%, ORG 2.8% SAMPLE 08-5024 (38.0-39.0) NM 79.1%

TH08-51
STA 559+54, R168
13 JUN



0.0- 0.2	Bn PEAT
0.2- 5.5	Bn SILT, wet, Org, Vs
5.5- 7.5	Bn PEAT, Vr
7.5- 10.0	Bn SILT, Org, Vs SAMPLE 08-5254 (8.0-9.0) NM 227.7%
10.0- 16.0	ICE
16.0- 19.0	Gy-Bn SILT, sl Org, Vs SAMPLE 08-5255 (18.0-19.0) NM 203.8%
19.0- 24.0	ICE
24.0- 44.0	Gy-Bn SILT, sl Org, Vs SAMPLE 08-5256 (28.0-29.0) NM 96.7% SAMPLE 08-5257 (37.0-39.0) NM 145.2%

Dec 23, 2009 – 11:07am – Tab: RCp04005TH2

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	DALTON HWY 9 MILE HILL NORTH
PROJECT NUMBER:	NH-F-065-2(3)
AKSAS NUMBER:	64899
SAMPLED BY:	RON BROOKS
MATERIAL SOURCE:	O LINE

TEST HOLE NUMBER		08-11	08-40					
DEPTH (feet)		38.0-40.0	25.0-26.0					
LATITUDE		N65.55508°	N65.55007°					
LONGITUDE		W148.90062°	W148.89545°					
LAB NUMBER		**08-5050**	**08-5189**					
DATE SAMPLED		21-May-08	10-Jun-08					
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**	100						
	0.75"	99	100					
	0.5"	97	99					
	0.375"	94	98					
	#4	84	89					
	#8	77	74					
	#10	76	71					
	#16	71	57					
	#30	67	43					
Sand	**#40**	66	38					
	#50	65	35					
	#60	64	34					
	#80	64	32					
	#100	63	31					
Silt/Clay	**#200**	61.8	28.0					
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		30	24					
PLASTIC INDEX		NP	NP					
USCS CLASSIFICATION		ML	SM					
USCS SOIL DESCRIPTION								
NATURAL MOISTURE		61.4						
ORGANICS		5.4						
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		Org[1]						

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, aeeording to Alaska Test Method T-7.

[1] Organic content determination is based on the rcsults of thc ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

Appendix D

Test hole Coordinates (NAD83)

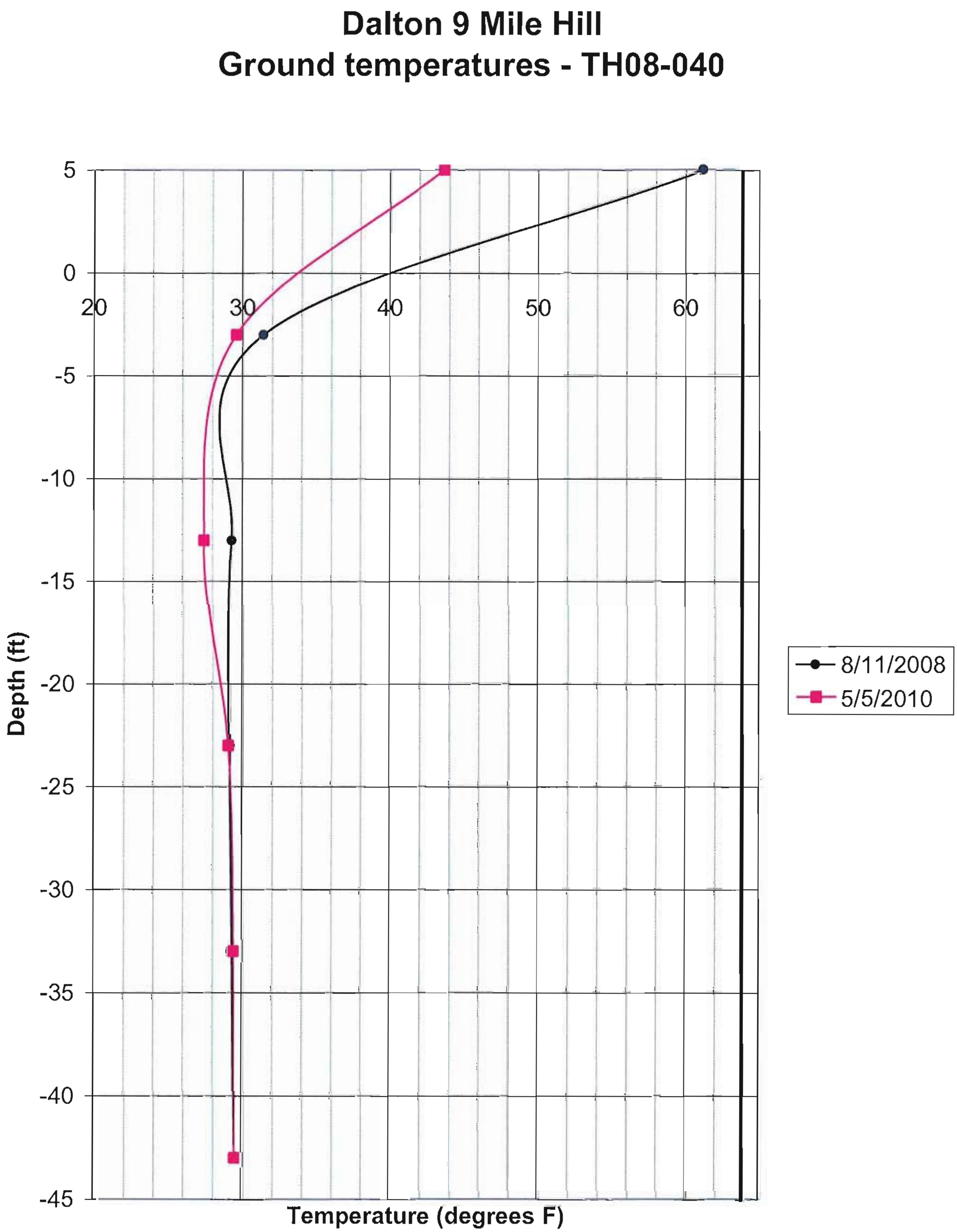
All test hole coordinates are NAND83 decimal degrees, obtained using recreational grade GPS units with specified accuracies of +/- 50 feet.

Test Hole	Latitude	Longitude
08-01	65.56117	-148.91277
08-02	65.56194	-148.91341
08-03	65.56262	-148.91460
08-04	65.56337	-148.91530
08-05	65.56419	-148.91639
08-06	65.55967	-148.91104
08-07	65.55909	-148.91007
08-08	65.55822	-148.90939
08-09	65.55688	-148.90700
08-10	65.55578	-148.90378
08-11	65.55508	-148.90062
08-12	65.55450	-148.89910
08-13	65.55382	-148.89797
08-14	65.55060	-148.89639
08-15	65.54974	-148.89592
08-16	65.54706	-148.89324
08-17	65.54637	-148.89225
08-18	65.54559	-148.89132
08-19	65.54487	-148.89058
08-20	65.54412	-148.88981
08-21	65.54320	-148.88897
08-22	65.54258	-148.88781
08-23	65.54185	-148.88752
08-24	65.54111	-148.88685
08-25	65.54028	-148.88625
08-26	65.53977	-148.88508
08-27	65.53894	-148.88411
08-28	65.53847	-148.88254
08-29	65.53813	-148.88076
08-30	65.53786	-148.87894
08-31	65.53760	-148.87703
08-32	65.53732	-148.87511
08-33	65.53709	-148.87314
08-34	65.53466	-148.86588

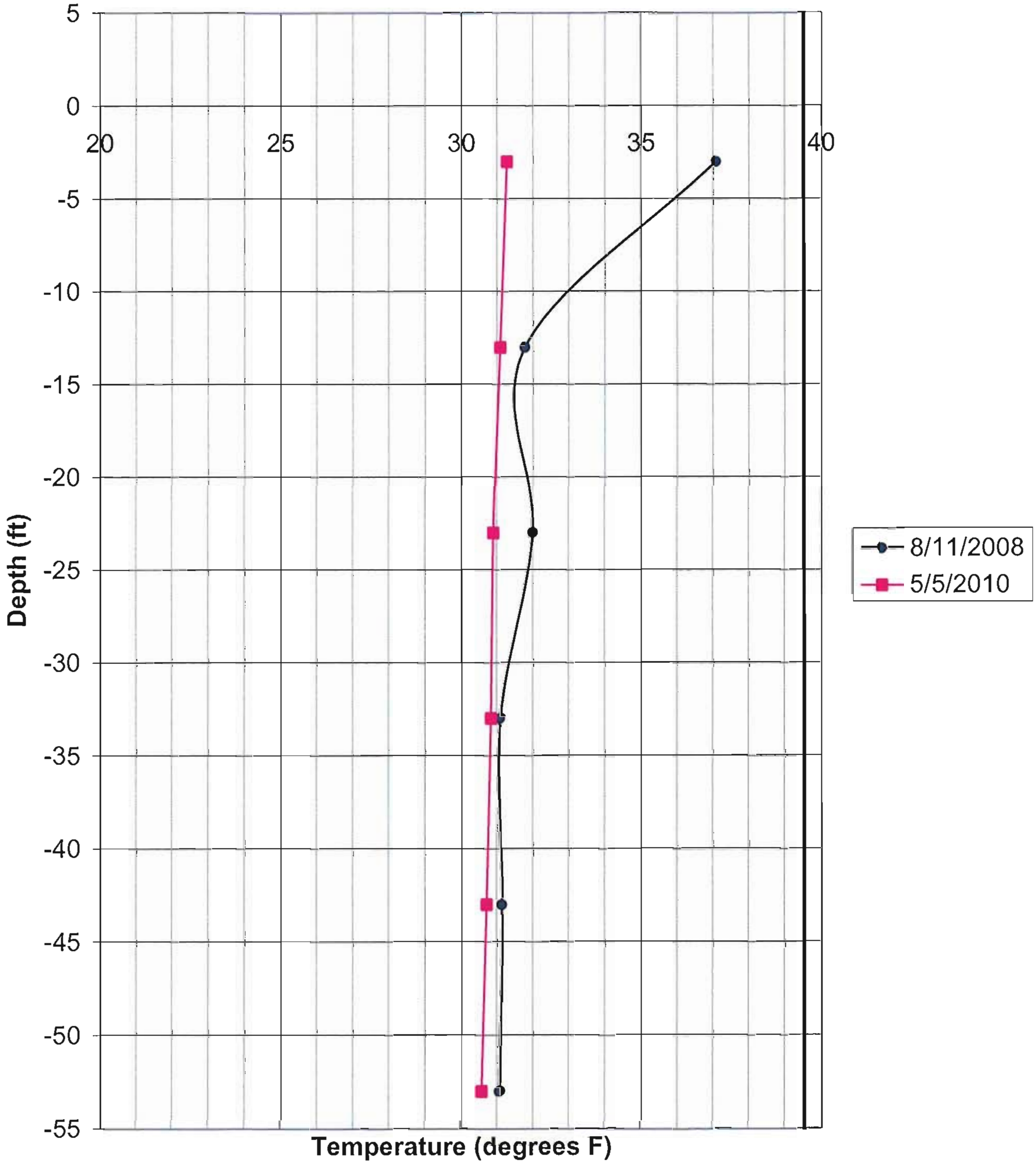
Test Hole	Latitude	Longitude
08-35	65.54199	-148.88826
08-36	65.54479	-148.89097
08-37	65.54502	-148.88989
08-38	65.54601	-148.89173
08-39	65.54675	-148.89277
08-40	65.55007	-148.89545
08-41	65.55395	-148.89749
08-42	65.55365	-148.89846
08-43	65.55712	-148.90629
08-44	65.55701	-148.90661
08-45	65.55674	-148.90765
08-46	65.55658	-148.90782
08-47	65.55749	-148.90727
08-48	65.55717	-148.90863
08-49	65.55776	-148.90855
08-50	65.55853	-148.90956
08-51	65.55928	-148.91058
08-52	65.56002	-148.91139
08-53	65.56083	-148.91234
08-54	65.56145	-148.91315
09-1401	65.54682	-148.89238
09-1402	65.54694	-148.89198
09-1404	65.54690	-148.892
09-1405	65.55943	-148.9115
09-1406	65.55850	-148.91127
09-1407	65.55775	-148.91086
09-1408	65.55688	-148.91026
09-1409	65.55613	-148.9099
09-1410	65.55533	-148.90933
09-1411	65.55460	-148.90877
09-1412	65.55094	-148.90172
09-1413	65.55094	-148.90157
09-1414	65.53974	-148.88634

Appendix E

Thermistor Data


Dalton 9 Mile Hill
Ground temperatures - TH08-040
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
20
30
40
50
60
Depth (ft)
Temperature (degrees F)
8/11/2008
5/5/2010

Dalton 9 Mile Hill
Ground temperatures - TH08-046



Dalton 9 Mile Hill
Ground temperatures - TH08-053