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GEOCRES No. _____

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W.P. No. 774-93-00(A)

CONT. No. _____

W. O. No. _____

STR. SITE No. 44-369

HWY. No. 11

LOCATION Trout Creek North Interchange Underpass (McCarthy St.)

No of PAGES - ~~(McCarthy St.)~~

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

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DESIGN REPORT
TROUT CREEK BY-PASS - KING'S HIGHWAY 11
WICK DRAIN DESIGN AND MONITORING PROGRAM
NORTH INTERCHANGE EMBANKMENTS
DISTRICT 54, SUDBURY, ONTARIO
GWP No. 774-93-00

Report
to
Trow Consulting Engineers
1074 Webbwood Drive
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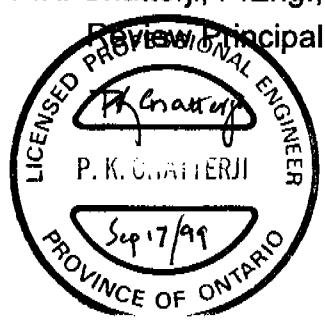

September 17, 1999
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1. Introduction

This report presents the results of a supplementary geotechnical investigation and engineering analysis carried out by Thurber Engineering Ltd. (Thurber) for the design of wick drains and monitoring program for the proposed approaches and embankments at the North Interchange located north of Trout Creek, at the intersection of McCarthy Street and the proposed King's Highway 11 Trout Creek By-Pass.

Thurber carried out the investigation as a sub-consultant to Trow Consulting Engineers (Trow). The Terms of Reference for this work have been included in a letter by Trow to Thurber dated February 23, 1999. Authorization to proceed with this work was given in a letter by Mr. Eric Gonneau, P.Eng. of Trow, dated March 12, 1999.

2. Background Information and Scope of Work

Trow have been retained by Marshall Macklin Monaghan (MMM) to provide geotechnical services as part of the Total Project Management, Detailed Design Services for the above noted project. Trow's scope of work included geotechnical, pavement and foundation investigation and design recommendations for a number of proposed structures along this section of four-laning of Highway 11. The results of Trow's investigation program for the North Interchange were summarized in the following draft report:

- Foundation Investigation, Bridge Structure, Approaches and Embankment Fills - North Interchange (McCarthy Street) - Trout Creek by-Pass, King's Highway 11 - District 54, Sudbury, Ontario, GWP No.774-93-00, January 7, 1999

The investigation by Trow at the North Interchange revealed the presence of thick soft foundation clayey deposits. Trow's analysis indicated that a combination of side berms and wick drains are required for successful construction of the high approach embankments, with final design heights up to 10.5 m. The side berms and wick drains are required to prevent a foundation failure during construction and to accelerate the foundation settlements so that most of the settlements are completed prior to bridge foundation construction and paving of the road.

Thurber Engineering Ltd. (Thurber) has been retained by Trow for the detailed design of the wick drains and to design a geotechnical instrumentation monitoring program to control the embankment performance during and after construction. In order to carry out this task Thurber has been provided with the following:

- portions of the above noted report containing the factual geotechnical data, excluding Trow's recommendations for the embankment design;
- drawings including a site plan, longitudinal profiles and simplified subsurface conditions;
- McCarthy Street Bridge General Arrangement and embankment typical cross sections.

This report should be read in conjunction with Trow's report.

3. Methodology

The work presented herein was developed in the following stages:

- Review of available information;
- Visit to Trow's office in Sudbury for visual inspection of soil samples, on March 18, 1999, by Mr. Scott Peaker, P.Eng. of Thurber. Some soil samples were brought to Thurber's office in Toronto for visual inspection;
- Site visit on March 19, 1999, by Mr. Scott Peaker, P.Eng. of Thurber,

for site reconnaissance and evaluation of site access by a drill rig for piezocone testing
- Piezocone testing on March 25 and 26, 1999
- Engineering Analysis
- Design Recommendations

4. Proposed Interchange

The North Interchange consists of one bridge structure that will carry the proposed McCarthy Street over the proposed realigned and widened Hwy 11, approach embankments to the bridge and access ramp embankments. The proposed bridge consists of a two span structure with integral abutments, with a length of 67.2 m between abutments. A site plan view is shown on Figure A1 in Appendix A.

The embankments at this site will be constructed to a height of up to 10.5 m using blast rock with side slopes of 1.25H:1V and headslopes at the bridge abutments inclined at 2H:1V.

5. Site Description

Details about the site location and surface conditions have been included in Trow's report and they will not be repeated herein.

6. Piezocone Testing

Piezocone testing was carried out with the purpose of:

- confirming the subsurface conditions encountered by Trow
- obtaining continuous strength information at depth
- carrying out pore pressure dissipation tests at selected depths for assessment of the horizontal coefficient of consolidation required for optimizing wick drain design
- measuring the piezometric head at the base of the fine sediments to verify the presence of artesian condition

Piezocone testing (CPTU) was carried out on March 26, 1999, by ConeTec Investigations Ltd. of Vancouver, B.C. The piezocone was pushed using a track mounted CME 75 owned and operated by All Terrain Drilling Ltd. of Waterloo, Ontario.

A total of five CPTUs were carried out at the North Interchange at the approximate locations shown on attached Figure A1. The CPTUs were numbered CPTUN1 through CPTUN5. Table B1 in Appendix B presents approximate coordinates and ground surface elevations at the CPTU locations and the maximum depth of testing where refusal to penetration was encountered.

The results of the CPTUs are summarized in a report by ConeTec included in Appendix C.

Figures A2 to A6 in Appendix A present a summary of both the results of CPTUs and the nearby borehole and laboratory information presented in Trow's report.

7. Description of Subsurface Conditions

7.1 Subsurface Soil Conditions

The subsurface conditions at this site were characterized based on a drilling and laboratory program carried out by Trow and on the results of the CPUTs carried out by ConeTec.

The bridge is located at the western edge of a flat area where the bedrock is overlain by a sequence of non-plastic sediments and a layer of compressible silty clay. The plastic soils are present to the east of the bridge West Abutment. West of the bridge the soil sediments consist mainly of non-plastic silt and sand overlying bedrock.

Of interest to this work is the area located at and east of the bridge, where plastic compressible sediments are present. A description of this area of interest is presented in the following sections. For a detailed analysis of the area west of the bridge the reader should refer to Trow's report.

The subsurface conditions at and east of the bridge consist mainly of a layer of organic soils, to a depth of up to 1 m, overlying loose to compact layers of silty sand, sand, sandy silt and silt. The thickness of these non-plastic deposits increase from 2 m at the bridge to up to 8 m close to the existing Hwy 11.

Of interest to this project is a layer of compressible silty clay that underlies the non-plastic sediments referred to above. The Silty Clay typically increases in thickness and in depth towards the east.

At the bridge site the Silty Clay is absent at the West Abutment but it was encountered underlying the Sand/Silty Sand deposit up to 7.5 m depth at the Central Pier and East Abutment. Several layers of silt, up to 0.5 m thick, were detected by the CPTUN5 in the Silty Clay. The undrained shear strength (Su) interpreted from the CPTU ranged from 40 kPa to 75 kPa, with values higher than 60 kPa typically measured in the silt lenses. The undrained cohesion (Cu) measured using a field vane indicated values of about 30 Kpa. One pore pressure dissipation test carried out in the Silty Clay at 4.0 m depth in CPTUN5 indicated a horizontal coefficient of consolidation (Ch) value of 142 m^2/y. Atterberg limits from tests carried out on two samples indicated that the Silty Clay is medium plastic. The CPTU interpretation of the stratigraphy shows that Silty Clay is sensitive which was confirmed by the field vane tests.

East of the bridge the Silty Clay layer is in a relatively uniform condition, similar to those described above, from the East Abutment to approximate Station 10+120. East of Station 10+120 Silty Clay increases in thickness and in depth and it is underlain by interbedded layers of clayey silt, silt and sandy silt. In the stratigraphic profile presented in Trow's Drawing 1E, the interbedded layers of clayey silt, silt and sandy silt were presented as part of the Silty Clay layer. The undrained shear strength (Su) in the Silty Clay interpreted from the CPTU ranged typically from 45 kPa to 60 kPa The undrained cohesion (Cu) measured with the field vane indicated values ranging from 25 kPa to 50 kPa. Pore pressure dissipation tests carried out in the Silty Clay at eight different locations and depths indicated horizontal coefficient of consolidation (Ch) values of 74 m^2/y to 258 m^2/y. Atterberg Limits obtained from tests carried out on Silty Clay samples indicate that

the material is of low to medium plasticity.

The interpretation of CPTUN1, CPTUN2 and CPTUN3 indicate that south of the proposed McCarthy Street, along the EW-N Ramp, the Silty Clay deposit is 3 m to 6 m thick, and it extends to a depth of 10.5 m at CPTUN3. CPTUN2 did not confirm the stratigraphy encountered at nearby Borehole BH-9BP. With reference to Dwg 11F in Trow's report, the abrupt change in elevation of the Silty Clay layer at BH-9BP, shown in the stratigraphic profile along the centreline of the EW-N Ramp, was not confirmed in CPTUN2, which was carried out relatively close to BH-9BP. The CPTUs south of McCarthy Street indicate a strength profile similar to that described above, along McCarthy Street. One Shelby tube sample collected at 7.7 m depth from BH-10BP, was tested in an oedometer cell and resulted in the following parameters:

Cv (vertical coefficient of consolidation) = 4 .7 m^2/y
eo (initial void ratio) ~ 1.64
Cc (compression index) = 0.57
Cr (reload index) = 0.032

Underlying the Silty Clay interbedded layers of silt and sandy silt, referred to as Lower Silt, was encountered with total thickness ranging from 5m to 8m. The SPT "N" in the Lower Silt, interpreted from the CPTUs, ranged typically from 6 to 12, which is consistent with the SPT "N" values from the augered holes. Pore pressure dissipation tests carried out in the Lower Silt indicated a wide range of horizontal coefficient of consolidation (Ch) values, ranging from 210 m^2/y to 3,574 m^2/y. The higher values of Ch were obtained from tests carried out in sandy lenses.

The Lower Silt is underlain by a silty sand and gravel till. The SPT "N" values in this material were larger than 17.

A more detailed description of the subsurface conditions encountered in the boreholes are presented on the borehole logs in Appendix B of Trow's report. Stratigraphic profiles inferred from the borehole information have been prepared by Trow and are summarized in Appendix A of Trow's report. Laboratory test results are summarized in Appendix C of Trow's

report

7.2 Groundwater

The groundwater level at and east of the bridge, observed in the boreholes after completion of drilling carried out by Trow, was at or 0.3 m below ground surface. The stabilized pore pressure measurements carried out at the bottom of the CPTUs in the Lower Silt or the Silty Sand and Gravel Till deposit indicated a piezometric head at or up to 0.45 m above ground surface, implying a small artesian head.

7.3 Summary

In summary, with the exception of the subsurface condition at BH-9BP, the CPTUs generally confirmed the stratigraphy presented in Trow's report. The CPTUs indicated, however, that the bottom portion of the compressible fine soils consist mostly of silt and sandy silt. The undrained shear strength values were generally higher in the CPTUs.

Of significant importance to the consolidation analysis and wick drain design was the fact that the Ch values obtained from the CPTUs were significantly higher than those obtained from one oedometer test and that a slight artesian condition was encountered below the soft sediments.

8. Engineering Analysis

8.1 General

The engineering analysis was carried out in the following stages:

- Selection of cross sections for analysis that represent typical subsurface conditions and embankment configurations with respect to embankment height and width;
- Stability analysis to identify the required stabilizing berm dimensions, required construction staging and required gain in strength after each construction stage due to consolidation in the clayey layers, for a minimum factor of safety of 1.3 during construction;

- Settlement analysis to identify the required height of surcharge and the need for and the spacing of wick drains to accommodate the construction schedule.

Based on the analysis of the subsurface conditions and the geometry of the embankments the following test holes and embankment geometries were selected for analysis:

- *Bridge East Approach - McCarthy St. (Sta. 10+040 to 10+120) and Hwy 11 at and north of the bridge*:
  Characteristics: High embankment close to structure; Low and wide embankments at Hwy 11
  Subsurface Conditions: CPTUN5
  Embankment Height (excluding surcharge):
  9 m to 10.5 m at McCarthy St.; 2 m along Hwy 11
  Embankment Width (at the top): 17.4 m at McCarthy St. and 60 m at Hwy 11
  Berm Elevation: 6 m below the top of the embankment

- *McCarthy St. (Sta. 10+120 to 10+240) and W-N (Sta. 13+091 to 13+160) and S-EW (Sta.13+630 to 13+540) Ramps:*
  Characteristics: Intermediate embankment height, deep soft deposits
  Subsurface Conditions: CPTUN1
  Embankment Height (excluding surcharge): 6 m to 9 m
  Embankment Width (at the top):
  17.4 m to ~ 40 m (at "T" intersection)
  Berm Elevation: 6 m below the top of the embankment

- *McCarthy St. (Sta. > 10+240)* :
  Characteristics: Intermediate to low embankment height, thick soft deposits
  Subsurface Conditions: CPTUN4
  Embankment Height (excluding surcharge):3 m to 6 m
  Embankment Width (at the top): 17.4 m
  Berm Elevation: No berm

- *EW-N (Sta. 13+160 to 13+270) and S-EW (Sta. 13+540 to 13+450) Ramps:*
  Characteristics: Intermediate to low embankment, thick soft deposits
  Subsurface Conditions: CPTUN2
  Embankment Height (excluding surcharge): 4.5 to 6.0 m
  Embankment Width (at the top): 14 m
  Berm Elevation: no berm

- *EW-N (Sta. 13+270 to 13+350) and S-EW (Sta.13+450 to 13+380) Ramps:*
  Characteristics: Low embankment height, thick soft deposits
  Subsurface Conditions: CPTUN3
  Embankment Height (excluding surcharge): 3.0 m to 4.5 m
  Embankment Width (at the top): 14 m
  Berm Elevation: no berm

- *EW-N (Sta. 13+350 to 13+458) and S-EW (Sta.13+380 to 13+125) Ramps and Hwy 11 south of the bridge:*
  Characteristics: Low embankment height, thick soft deposits
  Subsurface Conditions: BH-11BP
  Embankment Height (excluding surcharge): < 3.0 m
  Embankment Width (at the top): 14 m and 60 m
  Berm Elevation: no berm

Figure A1, Appendix A, shows the Stations used to limit the study regions above.

Table B2, Appendix B, presents a summary of the soil properties used in the stability and settlement analysis for each of the test holes above. The soil properties presented in Table B2 were selected based on the interpretation of the field and laboratory data. In order to avoid an extensive parametric analysis the following criteria was used for the selection of soil properties:

- *Strength*:

  select most likely values in view of the slight conservatism inherent to the undrained analysis and the selected factor of safety during constructions (F.S.~1.3)

- *Pore Pressure Generation*:

  select conservative values of Bbar equal to 1 for cohesive deposits.

- *Time Independent Deformation*:

  Elastic Properties:

  select most likely to conservative values since these parameters, with the exception of selection of the minimum required height of surcharge, have only a minor impact on the cost and performance of the embankment

  Compression Ratio: {$Cc/(1+e_o)$ and $Cs/(1+e_o)$} - same as above.

  Pre-Consolidation Pressure (Pc):

  This parameter impacts both the time-independent and time-dependent settlements. The latter occurs because the coefficient of consolidation (Cv and Ch) values are significantly impacted by the over-consolidation ratio. A Pc value obtained from one oedometer test has been provided in Trow's report (Table 1-2). Due to the importance of properly assessing the Pc values, two Pc values were selected for a sensitivity analysis:

  - Most Likely Value: Pc = Su/0.235 (Su is the undrained shear strength)[1]
  - Reduced Values: 50% of the Most Likely Value above and not lower than the anticipated in situ vertical effective stress

- *Time Dependent Deformation:*

  Coefficient of Consolidation:

  Ch (horizontal): Over-consolidated: select values

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[1] Ladd, C.C. (1991). "Stability Evaluation During Staged Construction", ASCE Journal of Geotechnical Engineering, Vol.17, No.4, 1991

interpreted from the CPTUs
Normally Consolidated: select the minimum Ch value interpreted from the CPTUs in that deposit;

Cv (vertical): 20% of Ch above (lower bound values[2])

Secondary Compression Ratio (Cα):
Select the values measured in the pre-consolidated range of oedometer tests assuming that the surcharge will be removed after 100% completion of primary consolidation.

8.2 Stability Analysis

The stability analysis was carried out based on the following assumptions:

- Embankment Geometry:
  - Side slopes: 1.25H:1V
  - The width of the embankment at the top of the surcharge will be the same as the final design width. Hence, the embankment side slopes above the berm will be temporarily steeper than 1.25H:1V. This is required to maintain the minimum required embankment width at the top after settlements due to primary consolidation take place.
  - The berm height was maintained 6 m below the top of the final embankment height
- Surcharge: Up to 1.5 m above the embankment design height. Actual height of surcharge to be verified based on the settlement analysis
- Site Preparation: All organic soils will be removed within the footprint of the embankment

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2 Hansbo, S. (1979). "Consolidation of clay by band-shaped prefabricated drains". Ground Engineering, July, Vol.12, N0.5, 16-25,1979

- Limit Equilibrium Analysis:

  Bishop Modified using G-Slope, developed by Mitre Software.

- Soil Shear Strength:

  Undrained shear strength (Su) for cohesive soils; Drained (ϕ')for cohesionless soils. Su increases with vertical stress; for vertical stress larger than the pre-consolidation pressure (Pc): use $Su=0.235*\sigma'_v$, for $\sigma'_v > Pc$. The values of σ'_v at depth and at different times were obtained from the consolidation analysis presented in Section 8.3.

- Groundwater Table:

  At the original ground surface

The results of the stability analysis are summarized in Table B3 and Figures A7 to A10. The analysis of Table B3 indicates the following:

Location: East Abutment - McCarthy St. - CPTUN5

- The construction of the embankment to a height of 12 m, including surcharge, with a berm width of 11 m is feasible in one construction stage.
- The construction of the embankment to a height of 12 m, including surcharge, with a berm width of 9 m is feasible in two construction stages:
  - Stage 1: from 0 m to 11.5 m
  - Stage 2: from 11.5 m to 12 m with 75% dissipation of excess pore pressure (EPP) after Stage 1
- The embankment temporary headslopes at the abutment locations will be constructed in two stages according to the above schedule. The temporary headslope crest will be located at the abutment location, with maximum height of 12 m, sloping towards Hwy 11 inclined at 1.25H:1V, provided that the Hwy 11 embankments under the bridge are constructed prior to the temporary abutment embankments.

Location: East Approach to Bridge-McCarthy St. and E-W and S-EW Ramps - CPTUN1

- The construction of the embankment, with a berm width of 8 m, to a height of 9.5 m, including 1.5 m surcharge, is feasible in two construction stages:
  - Stage 1: from 0 m to 8.0 m
  - Stage 2: from 8.0 m to 9.5 m with 100% dissipation of EPP after Stage 1

Due to the fact that it is not practical to wait for 100% consolidation between Stages 1 and 2, different berm widths were considered in the analysis, as follows:

- The construction of the embankment, with a berm width of 9 m, to a height of 9.5 m, including 1.5 m surcharge, is feasible in two construction stages:
  - Stage 1: from 0 m to 8.8 m
  - Stage 2: from 8.8 m to 9.5 m with 75% dissipation of EPP after Stage 1

- The construction of the embankment, with a berm width of 11 m, to a height of 9.5 m, including 1.5 m surcharge, is feasible in two construction stages:
  - Stage 1: from 0 m to 9 m
  - Stage 2: from 9 m to 9.5 m with 75% dissipation of EPP after Stage 1

  It should be noted from an analysis of Table B3 that the Factor of Safety for this case, with a berm width of 11 m is slightly larger than for a berm width of 9 m, as expected.

Location: McCarthy St.-Transition to high embankments- BH-3BP

- The construction of the embankment to a target height of 8.5 m, including 1.5 m of surcharge, is feasible in one stage with a minimum berm width of 8 m.

Location: McCarthy St.- Embankments up to 6m high- BH-3BP to BH4-BP

- The construction of the embankment to a target height of 7.5 m,

including 1.5 m of surcharge, is feasible in one stage without side berms.

Location: EW-N and S-EW Ramps up to 6m high - CPTUN2

- The construction of the embankment to a target height of 8.5 m, including 1.5 m of surcharge, is feasible in one stage with a minimum berm width of 9 m.

8.3 Settlement Analysis

8.3.1 General

The settlement analysis was carried out in the following steps:

- One dimensional primary consolidation analysis: no wick drains
- Pseudo three dimensional consolidation analysis: with wick drains
- One dimensional secondary consolidation analysis

8.3.2 One Dimensional Consolidation Analysis - No Wick Drains

The one dimensional consolidation analysis was carried out in order to:

- establish the required height of surcharge;
- establish the need for wick drains;
- provide input for the vertical consolidation component in the wick drain design
- provide excess pore pressure dissipation at depth for the assessment of gain of shear strength with time for the stability analysis

The analysis was carried out using the finite difference software Consol Version 2.0, developed at Virginia Polytechnic Institute and State University. The program allows the one dimensional consolidation analysis of multilayered soil masses, taking into account non-linear constitutive law, variable parameters as a function of the over-consolidation ratio, impeded drainage and variable boundary conditions. The ability to model impeded drainage was considered a key factor in the selection of this software, due

to the presence of layers of silt above and below the Silty Clay layer deposit.

The vertical stress distribution under the embankment was estimated using Boussinesq's stress distribution under an infinite strip loaded area.

The following simplified embankment construction schedule was used in our analysis:

- Stage 1: the embankment load was applied instantly at time zero
- Stage 2: the additional load was applied instantly at the time after the EPP had dissipated enough for a minimum FS of 1.3 against global stability according to the stability analysis presented in the preceding section.

This is a simplified model of the actual construction process in which several days or weeks will be required to construct the embankment to the specified height. The adopted approach predicts larger settlements and lower EPP in the soft sediments at any point in time provided the time elapsed between the construction stages is adopted as the time elapsed between the end of the embankment construction at Stage 1 and beginning of Stage 2.

Figures A11 to A21, Figures A11B to A21B and Tables B4 to B17 present a summary of the results of the one dimensional consolidation analysis for a range of embankment heights within each representative area. The bottom portion of Tables B4 to B17 show the *"minimum amount of time"* after the end of the embankment construction when the surcharge may be removed for stabilization of settlements due primary consolidation. The *"minimum amount of time"* is defined herein as the time required for the EPP in the cohesive soils to dissipate to values that, when the surcharge is removed, the EPP will disappear due to a relief of vertical total stresses. Therefore, after the removal of the surcharge, the cohesive soils are normally consolidated. However, in order to minimize long term settlements due to secondary consolidation it is desirable that the cohesive soils be slightly overconsolidated after the removal of the surcharge. This is possible with

the full dissipation of EPP and stabilization of settlements due to primary consolidation for an embankment height 0.5 to 1.0 m higher than the final embankment height. Therefore the elapsed times shown in the bottom part of Tables B4 to B17 should be treated as the minimum and not necessarily the ideal elapsed times after the end of construction for removal of the surcharge and reshaping of the embankment.

The construction schedules that Thurber has been requested to analyse are:

Schedule 1:

- Site Preparation: 2 months (removal of organics, wick drain installation)
- Embankment construction to the final target height including surcharge: 3 months
- Waiting period for primary consolidation: 12 months

Schedule 2:

- Site Preparation: 2 months (removal of organics, wick drain installation)
- Embankment construction to the final target height including surcharge and stabilization of settlements: 12 months

Schedule 3:

- Site Preparation: 2 months (removal of organics, wick drain installation)
- Embankment construction to the final target height including surcharge and stabilization of settlements: 6 months

Based on these construction schedules and on the analysis of Figures A11 to A21, Figures A11B to A21B and Tables B4 to B17, the following can be concluded:

- *General:* The pre-consolidation pressure has a significant impact on the magnitude and the time required for the dissipation of EPP

- *Bridge East Approach - McCarthy St. (Sta. 10+040 to 10+120) H=10.5 m plus 1.5 m surcharge - CPTUN5 - Figure A19 and*

Tables B4 and B5:

- Time delay between Stages 1 and 2: 90 days
- Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with surcharge: 400 days
- Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
  4 to 6 months for Most Likely Pc;
  6 to 8 months for Reduced Pc
- Based on time required between Stage 1 and 2 for embankment with berm width <11m, and the time required for stabilization of settlements, wick drains will be required to accommodate the proposed construction Schedules 1 and 3. Wick drains are not required for Schedule 2.

- *Location: Hwy 11 at and north of the bridge - H=2 m plus 1 m surcharge - CPTUN5 - Figure A20; Tables B6 and B7*
  - Time delay between Stages 1 and 2: N/A
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with surcharge: 300 days
  - Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
    1 to 2 months for Most Likely Pc;
    1 to 2 months for Reduced Pc
  - Wick drains are not required for Schedules 1, 2 and 3.

- *Location: McCarthy St. (Sta. 10+120 to 10+240) and W-N (Sta. 13+091 to 13+160) and S-EW (Sta.13+630 to 13+540) Ramps - H=9m and 6m plus 1.5 m surcharge CPTUN1 - Figures A11 and A12, Tables B8 and B9:*
  For H=9m plus 1.5 m surcharge:
  - Time delay between Stages 1 and 2: 60 days
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with

surcharge: 300 days

- Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
  3 to 4 months for Most Likely Pc;
  4 to 6 months for Reduced Pc
- Based on time required between Stage 1 and 2 for embankment with berm width <11m, and the time required for stabilization of settlements, wick drains will be required to accommodate the proposed construction Schedules 1 and 3. Wick drains are not required for Schedule 2.

- *Location: McCarthy St. (Sta. > 10+240) - H=3m and 6m plus 1.0m and 1.5m surcharge - CPTUN4 - Figures A17 and A18, Tables B10 and B11:*
  For H=6m plus 1.5 m surcharge:
  - Time delay between Stages 1 and 2: N/A
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with surcharge: >720 days
  - Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
    8 to 10 months for Most Likely Pc;
    10 to 12 months for Reduced Pc
  - Based on time required for stabilization of settlements, wick drains will be required to accommodate construction Schedule 3. Wick drains are not required for Schedules 1 and 2.

- *EW-N (Sta. 13+160 to 13+270) and S-EW (Sta.13+540 to 13+450) Ramps - H=7.5m and 4.5m plus 1.5 and 1.0 m surcharge - CPTUN2 - Figures A13 and A14, Tables B12 and B13:*
  For H=7.5m plus 1.5 m surcharge:
  - Time delay between Stages 1 and 2: N/A
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with

surcharge: 600 days

- Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
  4 to 6 months for Most Likely Pc;
  6 to 8 months for Reduced Pc
- Based on time required for stabilization of settlements, wick drains will be required to accommodate construction Schedule 3. Wick drains are not required for Schedules 1 and 2.

- *EW-N (Sta. 13+270 to 13+350) and S-EW (Sta.13+450 to 13+380) Ramps - H=4.5m and 3.0m plus 1.0 m surcharge - CPTUN3 - Figures A15 and A16, Tables B14 and B15:*
  For H=4.5m plus 1.0 m surcharge:
  - Time delay between Stages 1 and 2: N/A
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with surcharge: 360 days
  - Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
    3 to 4 months for Most Likely Pc;
    6 to 8 months for Reduced Pc
  - Wick drains are not required for Schedules 1, 2 and 3.

- *EW-N (Sta. 13+350 to 13+458) and S-EW (Sta.13+380 to 13+125) Ramps and*
  Hwy 11 south of the bridge - H=3.0m plus 1m surcharge - BH-11BP - Figure A21, Tables B16 and B17:
  - Time after the end of construction required for stabilization of settlements due to primary consolidation for embankment with surcharge: >720 days
  - Minimum time required after the end of construction for removal of surcharge and stabilization of primary consolidation of embankment at final design elevation:
    2 to 3 months for Most Likely Pc;

10 to 12 months for Reduced Pc

– Wick drains are not required for Schedules 1, 2 and 3.

8.3.3 Settlements due to Primary Consolidation - With Wick Drains

The one-dimensional consolidation analysis above identified that, depending on the construction schedule selected, the following areas will require wick drains to accelerate dissipation of EPP:

- Bridge East Approach - McCarthy St. (Sta. 10+040 to 10+120)
- McCarthy St. (Sta. 10+120 to 10+240) and W-N (Sta. 13+091 to 13+160) and S-EW (Sta.13+630 to 13+540)
- McCarthy St. (Sta. 10+240 to Sta. 10+310)
- EW-N (Sta. 13+160 to 13+270) and S-EW (Sta.13+540 to 13+450)

The presence of slight artesian pressures in the non-plastic silt deposit underlying the Silty Clay deposit poses a potential for loss of fines due to the continuous flow of water around the wick drains. In order to minimize this potential, the wick drains should be terminated within the Silty Clay, about 1 m above the underlying layer of silt.

The wick drain spacing was selected based on the percentage consolidation required within the Silty Clay layer, determined from the stability analysis, for the construction schedules presented in the preceding section.

Two methods were used for the wick drain design:

- Hansbo (1979, opt.cit.)
- Robertson, Campanella and Brown[3] (1988)

The former method includes well resistance and disturbance factors due to the wick drain installation. The latter method uses the original derivation by Hansbo[4] (1960) adjusted for wick drain design based on Ch values

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3 Robertson, P.K., Campanella, R.G., and Brown, P.T. (1988). "Prediction of wick drain performance using piezometer cone data". Canadian Geotechnical Journal 25, 56-61 (1988)

4 Hansbo, S. (1960). "Consolidation of clay, with special reference to influence of vertical sand drains. Swedish Geotechnical Institute, Proceedings No.18 (1960)

interpreted from the CPTU. The wick drain spacing has been selected as the smallest of the two spacings provided by the two methods above. EPP dissipation due to vertical drainage was coupled with EPP due to horizontal drainage into the wick drains according to the following equation:

$$U = 1-(1-Uv)*(1-Uh)$$

where U is the combined total percentage consolidation and Uv and Uh are the percentage consolidation values due to vertical and horizontal drainage only, respectively, divided by 100.

The design parameters and required percentage consolidation at specific times used in the analysis are summarized in Table B18. Since the wick drain design methods described above do not allow inclusion of variable Ch values for the horizontal drainage portion of the analysis, the lowest value of Ch has been assumed for a specific test hole location. It has been assumed that the wick drains will be installed in a triangular pattern. Since the wick drains will be terminated within the Silty Clay, the wick drain drainage length has been assumed equal to the entire length of the wick drain.

The results of the wick drain analysis are presented in Tables B19 to B30. Figures A11-C, A13-C, A17-C A19-C and A19-D present EPP dissipation at depth. These tables and figures present only the analyses carried out for Most Likely Pc values. The analyses carried out with Reduced Pc values yielded results very similar to the Most Likely Pc values due to the fact that the lowest Ch values were selected at the test hole locations, as discussed above.

A summary of the required wick drain spacing for each of the regions studied and different construction schedules is presented in Table 31.

8.3.4 Settlements due to Secondary Consolidation

Settlements due to secondary consolidation have been assessed based on the following equation:

$\Delta T_{cs} = C\alpha\varepsilon * T * \text{Log } t_{sc}/t_p$,

where:

ΔT_{cs} = settlement due to secondary consolidation

$C\alpha\varepsilon$ = secondary compression ratio

T = initial thickness of compressible layer

t_{sc} = time over which secondary consolidation is to be calculated

t_p = time to complete primary consolidation

As indicated in Table B2, a value of 0.002 has been selected for $C\alpha\varepsilon$. This value reflects the fact that upon completion of primary consolidation, a minimum of 0.5 m to 1.0 m will be removed from the embankment top and the compressible soils will be slightly over-consolidated.

The settlements due to secondary consolidation anticipated at the interchange embankments are presented in the table in the following page.

The settlements due to secondary consolidation below indicate that the design requirement of maximum long term settlement of 25 mm, after removal of the surcharge, is met at all locations with the exception of McCarthy St at Stations greater than 10+240. In view of the extended period of time considered in the calculations (35 years) and the fact that the embankments where the design specifications, for on going secondary settlements, are exceeded are not in the proximity of the bridge, these anticipated long term settlements may be acceptable to MTO. This should be discussed with MTO.

Secondary Consolidation Analysis

Location	T (m)	t_{sc} (years)	t_p (years)	ΔT_{cs} (mm)
McCarthy St. (10+040 - 10+120) CPTUN5	4.5	35	1	15
McCarthy (10+120 - 10+240); W-N Ramp (13+091 - 13+160) S-EW Ramp (13+630 - 13+540) CPTUN1	4.5	35	1	15
McCarthy (>10+240) CPTUN4	9	35	1	30
W-N Ramp (13+160 - 13+270) S-EW Ramp (13+540 - 13+450) CPTUN2	7.5	35	1	25
W-N Ramp (13+270 - 13+350) S-EW Ramp (13+450 - 13+380) CPTUN3	7	35	1	25
W-N Ramp (13+350 - 13+458) S-EW Ramp (13+380 - 13+125) Hwy 11 South of Bridge BH-11BP	8.5	35	1	25

8.4 Lateral Displacement at Depth at the East Abutment

Provided that the abutment piles are installed after most of the settlements due to primary consolidation have taken place, relatively small time dependent lateral displacements are anticipated to occur along the piles. For monitoring purposes and verification of the structural capacity of the abutment piles, the maximum outstanding pile lateral deflection should be equal to 20% (Ladd, opt.cit.) of the maximum outstanding settlement of the embankment at the centre of the silty clay layer, at EL. 311. The lateral deflections can be assumed decreasing to zero above and below the point of maximum deflection, at ground surface and at the top of the silty sand & gravel layer, at El. 303, respectively.

9. Embankment Design Recommendations

9.1 Embankment Geometry and Construction Schedule

Based on the analysis presented in the preceding sections, the embankment design, wick drain location and spacing and construction sequence summarized in Table B31 is proposed. It should be noted that recommendations have been provided for a berm width of 9 m, since other berm sizes either required 100% consolidation between construction stages, which is not desirable, or resulted in minor gain in construction time.

9.2 Site Preparation

All organic soils should be removed within the footprint of the embankments, including side berms. Due to the relatively high groundwater table at this site, a NSSP should be included in the contract documents warning the contractor that the removal of organic soils will probably be carried out below water at most locations. Where unwatering of excavation is required, it shall comply with the requirements of OPSS 517

Following the removal of organic soils, at locations where wick drains will be installed, free draining material, complying with the NSSP included in Appendix D, should be placed to an elevation at least 0.5 m above the groundwater table with minimum thickness of 0.5 m.

9.3 Wick Drain Specifications

In order to satisfy the design requirements for discharge capacity, soil retention, permeability and clogging criteria, and installation, the wick drains should be supplied and installed according to the NSSP included in Appendix D.

9.4 Monitoring Program

9.4.1 Types of Instruments

The performance of selected areas of the embankments will be monitored using the following instruments:

- ***Slope Indicator (SI)***: to monitor horizontal displacements at depth at the abutment locations. Due to the potential for large settlements at the abutment locations telescopic casings should be used and selected to accommodate settlements of up to 1 m;
- ***Vibrating Wire Settlement Cells with Pressurized Reservoir (SC)***: for the remote monitoring of settlements of the embankment base at the abutment locations;
- ***Settlement Rods (SR)***: anchored on a steel plate at ground surface, at the base of the embankment, extended to the top of the embankment for monitoring of settlements of the embankment base with conventional survey methods. The rods should be protected by a PVC or ABS pipe of larger diameter, to minimize the development of friction along the rods, and by a 400 mm CMP, for protection against damage during the embankment construction. The rods and protection pipes should be erected in 3 m increments as the embankment increases in height.
- ***Settlement Pins (SP)***: standard steel pins anchored in a concrete block cast on top of the embankment surcharge.
- ***Vibrating Wire Piezometers (VWP)***: installed in the compressible clayey silt and silty clay deposits and underlying sand deposit. The VWPs should be installed as close as possible to the centre of the triangle defined by the nearby three wick drains.
- ***Shallow Standpipe (SSP)***: installed near each of the monitoring sections to monitor the near surface groundwater table
- ***Read-out Unit***: depending on the economics of the monitoring program, the vibrating wire instruments may be read automatically at specified time increments by an automatic acquisition system

9.4.2 Monitoring Sections

The instruments will be installed in the following three typical monitoring sections:

Monitoring Section Type A

Location: at the East Abutment location, 3 m behind the line of piles: ~Sta. 10+043

One SI: at the embankment centreline

Two SC: at the centreline of the E/B and W/B lanes

Two SR: at the centreline of the E/B and W/B lanes (1.0 m from the SC)

Four SP: Two at the top of the surcharge: at the centreline of the E/B and W/B lanes (1.0 m from the SR);
Two: one on each side berm, near the side slope of the main embankment

Two strings of VWP: at the centreline of the E/B and W/B lanes.
One string will include Two VWP installed at the following elevations: EL 311.5 (0.5 m above the bottom of the silty clay layer) and EL 310.5 (0.5 m below the top of the silty clay layer).
The other string of VWPs should include the VWPs above plus one VWP installed in the Sand and Gravel layer, at EL. 302.

One Standpipe: Installed to 3 m depth and slotted in the bottom 1 m

Monitoring Section Type B

Location: McCarthy St. Sta. 10+160

Two SR: at the centreline of the E/B and W/B lanes

Four SP: two at the top of the surcharge: at the centreline of the E/B and W/B lanes (1.0 m from the SR);
Two: one on each side berm, near the side slope of the main embankment

Two strings of VWP: at the centreline of the E/B and W/B lanes.
Each string will include three VWP. One string will include VWs installed at the following elevations: EL 310, EL 308, EL 306. The other string of VWPs should

include VWPs installed at the same elevations above plus one VWP installed in the loose to compact silt layer, at EL. 302.

One Standpipe: Installed to 3 m depth and slotted in the bottom 1 m

Monitoring Section Type C:

Locations:

McCarthy St. Sta. 10+080
McCarthy St. Sta. 10+240
McCarthy St. Sta. 10+310
EW-N Ramp Sta. 13+160 and S-EW Ramp Sta. 13+540
EW-N Ramp Sta. 13+270 and S-EW Ramp Sta. 13+450
EW-N Ramp Sta. 13+350 and S-EW Ramp Sta. 13+380
EW-N Ramp Sta. 13+450 and S-EW Ramp Sta. 13+280
S-EW Ramp Sta. 13+180
Hwy 11 Sta. 13+300
Hwy 11 Sta. 13+400
Hwy 11 Sta. 13+492 (Bridge Centreline)
Hwy 11 Sta. 13+600
Hwy 11 Sta. 13+700

One SR: at the embankment centreline
Two SPs: each at 3 m from the embankment crest; on top of the surcharge

9.4.3 Installation of Instruments

With the exception of the Settlement Pins, all instruments should be installed after the site preparation, construction of the drainage blanket and installation of wick drains. It would be preferable to have the instruments installed before the wick drains but the potential for damaging the instruments during installation of the wick drains is too high.

The Settlement Pins should be installed immediately after the embankment target height (top of surcharge) is reached.

9.4.4 Frequency of Readings

All instruments should be initialized and read at least three times in three different days before placement of any rock fill.

During construction the instruments should be read at least once immediately before the placement of 1 m high fill lifts and at least once a week between construction of 1 m lifts and between Stage 1 and Stage 2.

Upon completion of the embankment construction to the top of surcharge the instruments should be read:

- weekly for a period of 2 months
- monthly thereafter until the removal of the surcharge
- weekly for a period of 1 month after the removal of surcharge
- monthly for a period of one year following the removal of surcharge
- once every three months following the paving of the roads for a period of three years

9.4.5 Monitoring Levels

There are basically three parameters that should be monitored closely during and after construction:

- Excess Pore Pressures (EPP)
- Embankment Base Settlement
- Lateral Displacements at Depth

The EPP requirements for stability purposes during construction are shown in Table B31. The EPP shown have priority over the estimated times shown in Table B31.

The monitoring of settlements after the end of construction of the embankment to top of surcharge, allows the assessment of long term settlements due to primary consolidation and when the surcharge can be removed for the pavement construction. It is recommended that the

Rectangular Hyperbola Method[5] be used for reduction of and prediction of long term settlements due to primary consolidation.

Lateral deflections at the abutment pile locations should also be monitored in order to confirm that the lateral displacements due to primary consolidation have mostly stabilized prior to installation of piles.

9.5 Trial Embankment

Although the CPTUs provided a significant increase in confidence about the foundation material properties and expected performance of the embankment, some issues regarding the pre-consolidation pressures and time required for stabilization of settlements in areas where wick drains are not required remain unanswered.

In order to confirm the design assumptions and possibly further optimize the wick drain and surcharge design, it is recommended that portion of the proposed embankment be constructed in an advance contract.

In our opinion, the trial embankment is a prudent investment that should minimize the potential for construction schedule delays.

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5 Sridharan, A., Murthy, N.S. and Prakash, K (1987)."Rectangular hyperbola method of consolidation analysis". Geotechnicque 37, No. 3, 355-368 and,
Tan, S.A., (1993). "Ultimate Settlement by Hyperbolic Plot for Clays with Vertical Drains". ASCE Journal of Geotechnical Engineering, Vol. 119, No.5, May, 1993, 950-956

APPENDIX A

APPENDIX A

FIGURES

PLATE No
DRAWING No
CONT No
WP No 774-93-00

SHEET

Revised

N

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

LEGEND:
- BH-48P — BOREHOLE
- C-1BF — CONE PENETRATION TEST
- CPTUN1 — PIEZOCONE

FIGURE A1

CPTUN HAVE BEEN INCLUDED BY THURBER ENGINEERING LTD.

TROW CONSULTING ENGINEERS LTD.
SUDBURY, ONTARIO
Trow PROJ. No. S07524GB DWG. No. 1B

MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

SITE PLAN

PROPOSED NORTH INTERCHANGE
AT
McCARTHY STREET
AND
PROPOSED C/L MEDIAN HWY 11

GEOG TWP OF HIMSWORTH SOUTH LOTS 24, 25 & 26 — DIST OF PARRY SOUND CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	ETR	

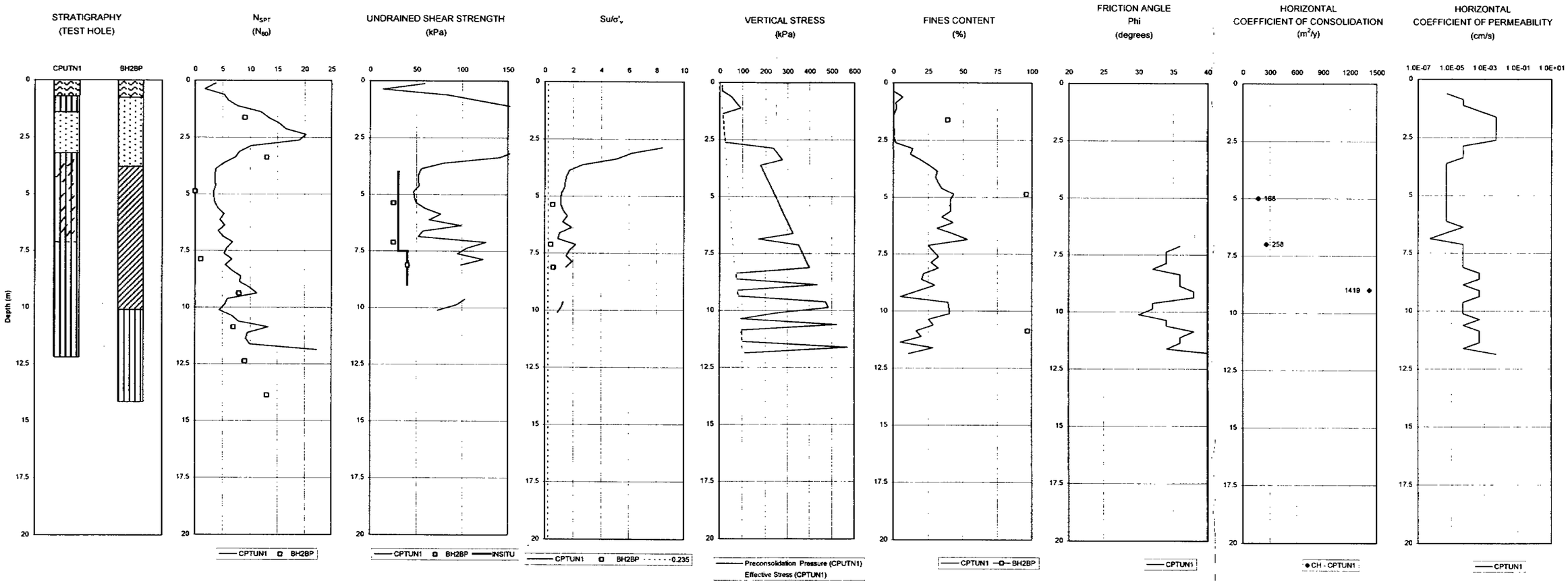
SURVEY DATE	97/10	PLAN DATE	98/10
SITE	PLAN		

PLAN

0 100 200 300 m

(APPROXIMATE SCALE 1:1500)

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
SUMMARY OF SUBSURFACE CONDITIONS
MCCARTHY STREET - APPROXIMATE STATION 10+161

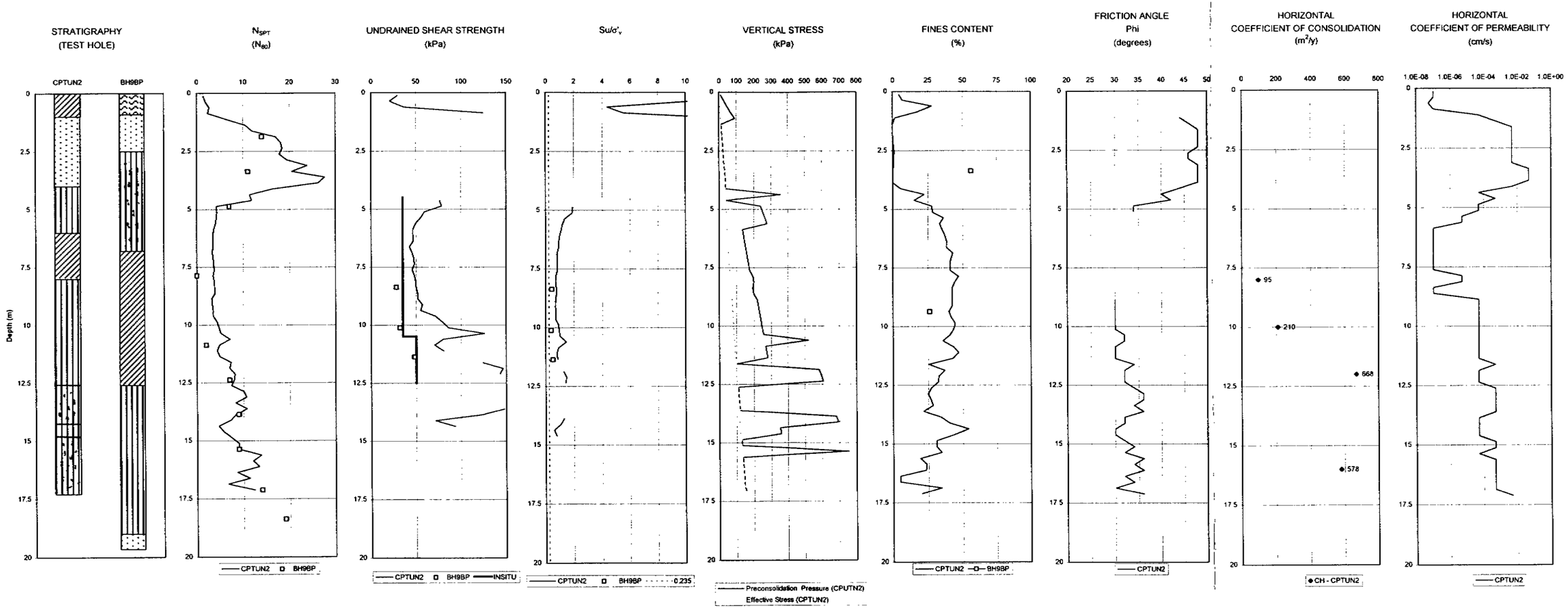


MASTER PLOT

FIGURE A2

26/04/99

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
SUMMARY OF SUBSURFACE CONDITIONS

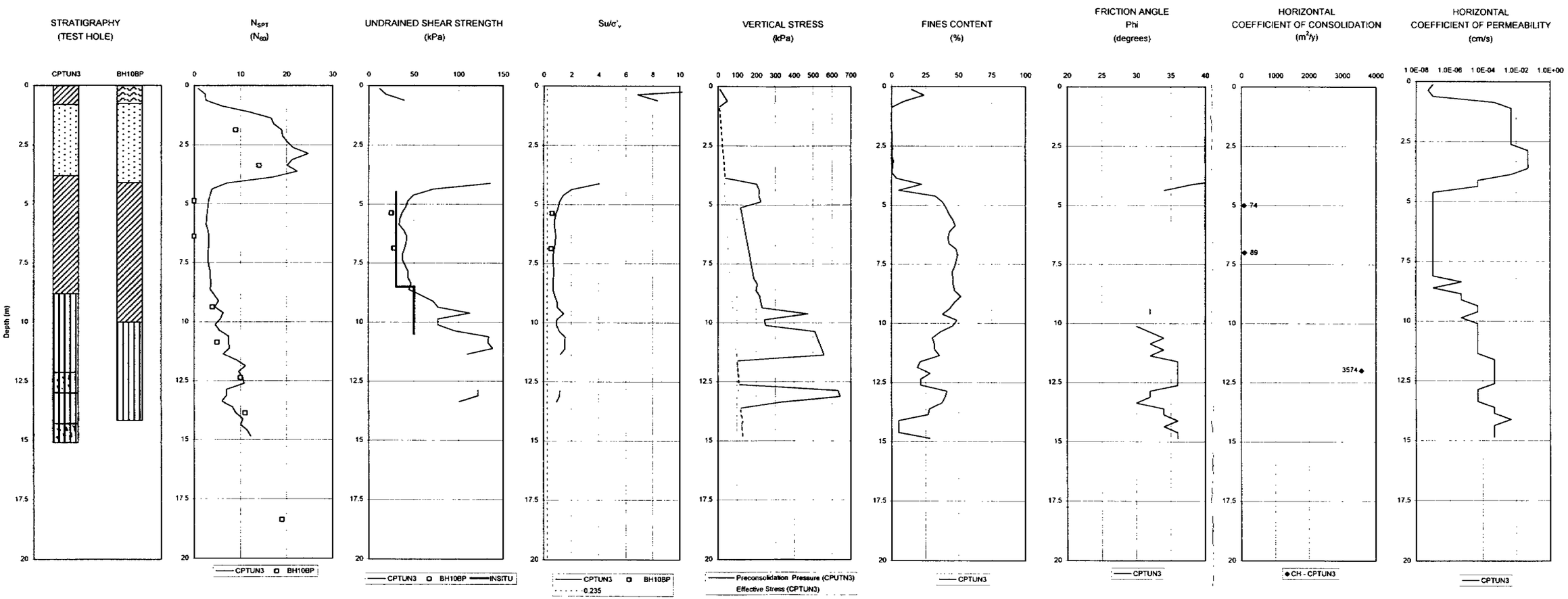


MASTER PLOT

FIGURE A3

26/04/99

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
SUMMARY OF SUBSURFACE CONDITIONS

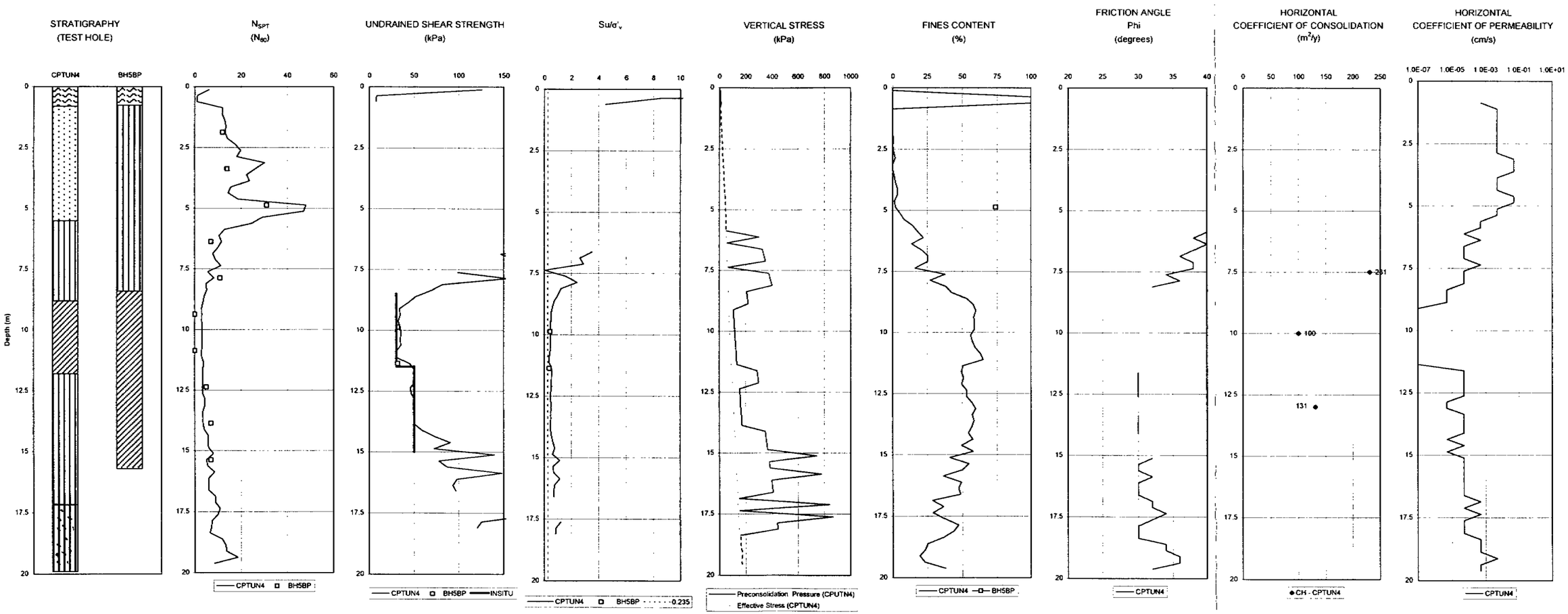


MASTER PLOT

FIGURE A4

26/04/99

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
SUMMARY OF SUBSURFACE CONDITIONS

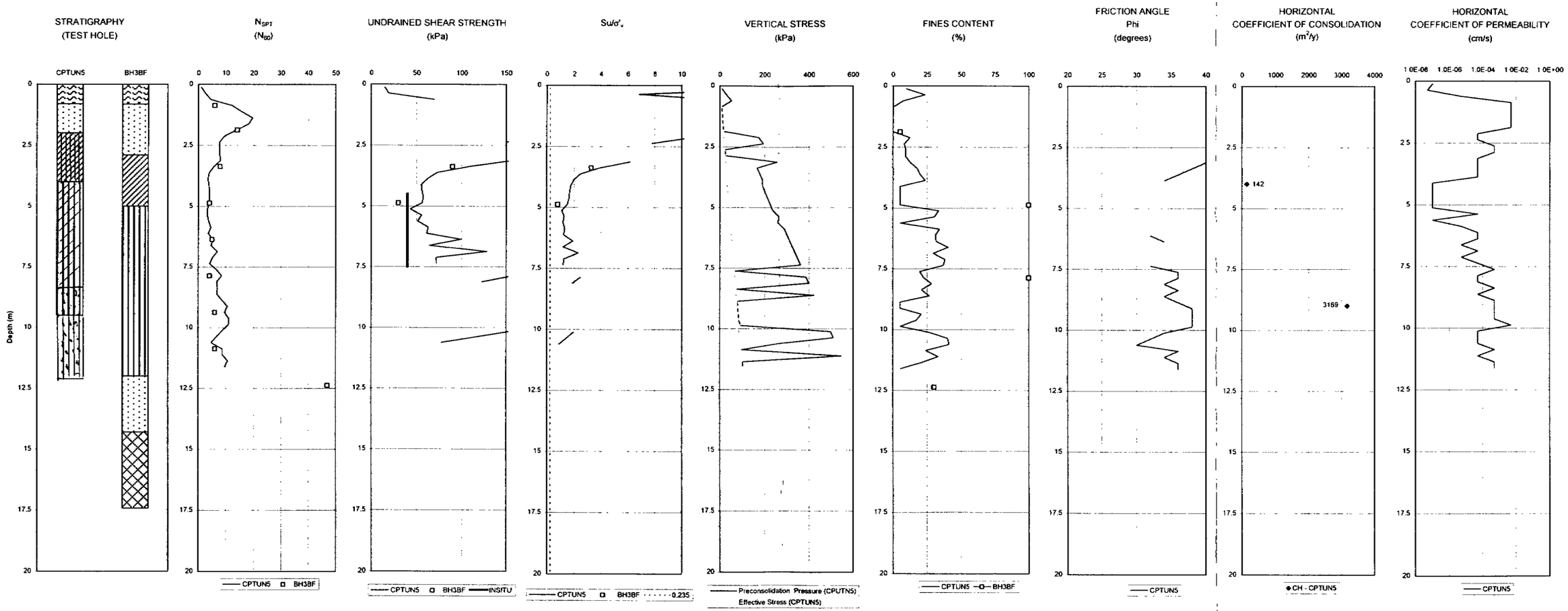


MASTER PLOT

FIGURE A5

26/04/99

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
SUMMARY OF SUBSURFACE CONDITIONS



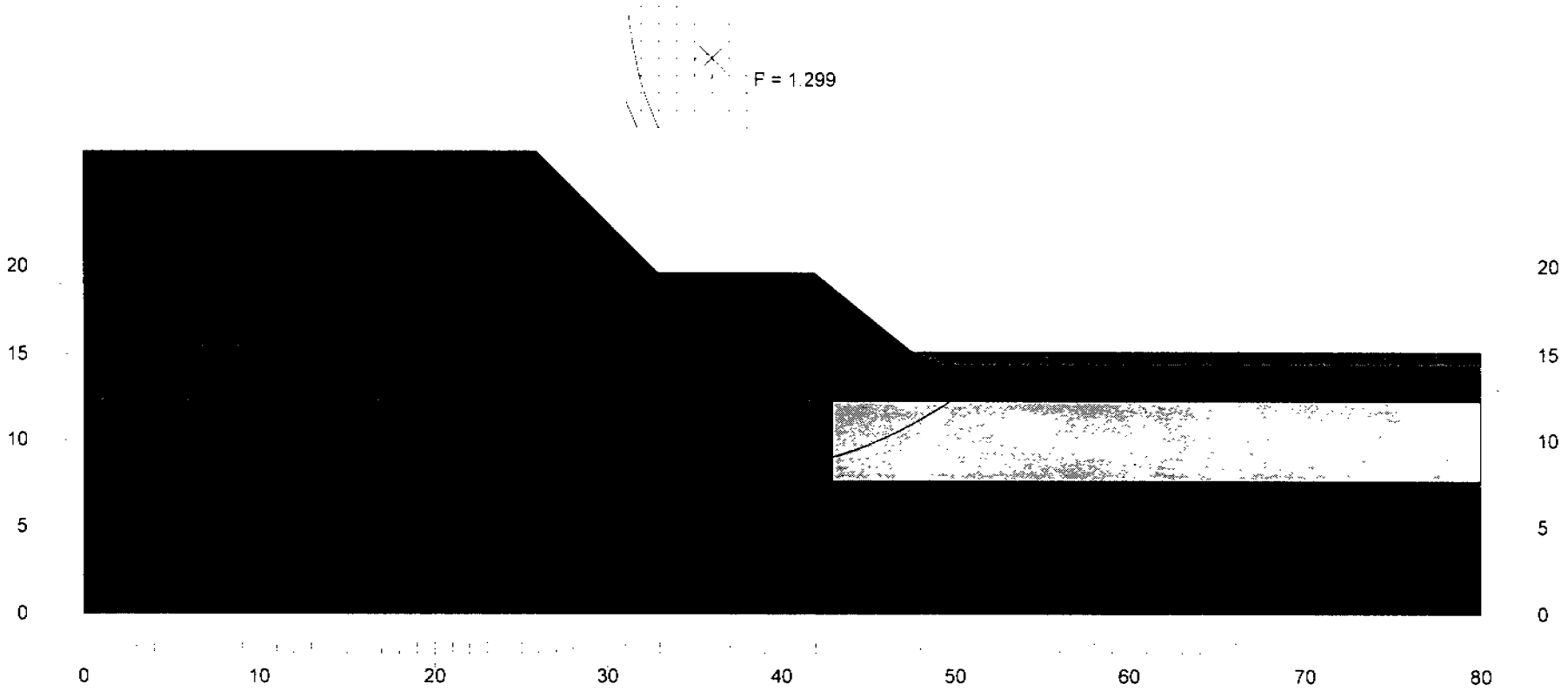
MASTER PLOT

FIGURE A6

26/04/99

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Rock Fill	20	0	42	1	0
Peat	16	10	0	1	0
Granular B Fill	20	0	32	1	0
Sand	19	0	30	1	0
Silty Clay A-1	18	40	0	1	0
Silty Clay A-2	18	40	0	1	0
Silty Clay A-3	18	40	0	1	0
Silt	18	0	30	1	0
Sand and Gravel	22	0	35	1	0
Bedrock	22	500	35	1	0

Thurber Engineering Ltd. - Toronto
19-1104-4
Trout Creek North I.C. BH 3BF East Abutment
April 19, 1999
11.5 m single stage, 9.0 m berm

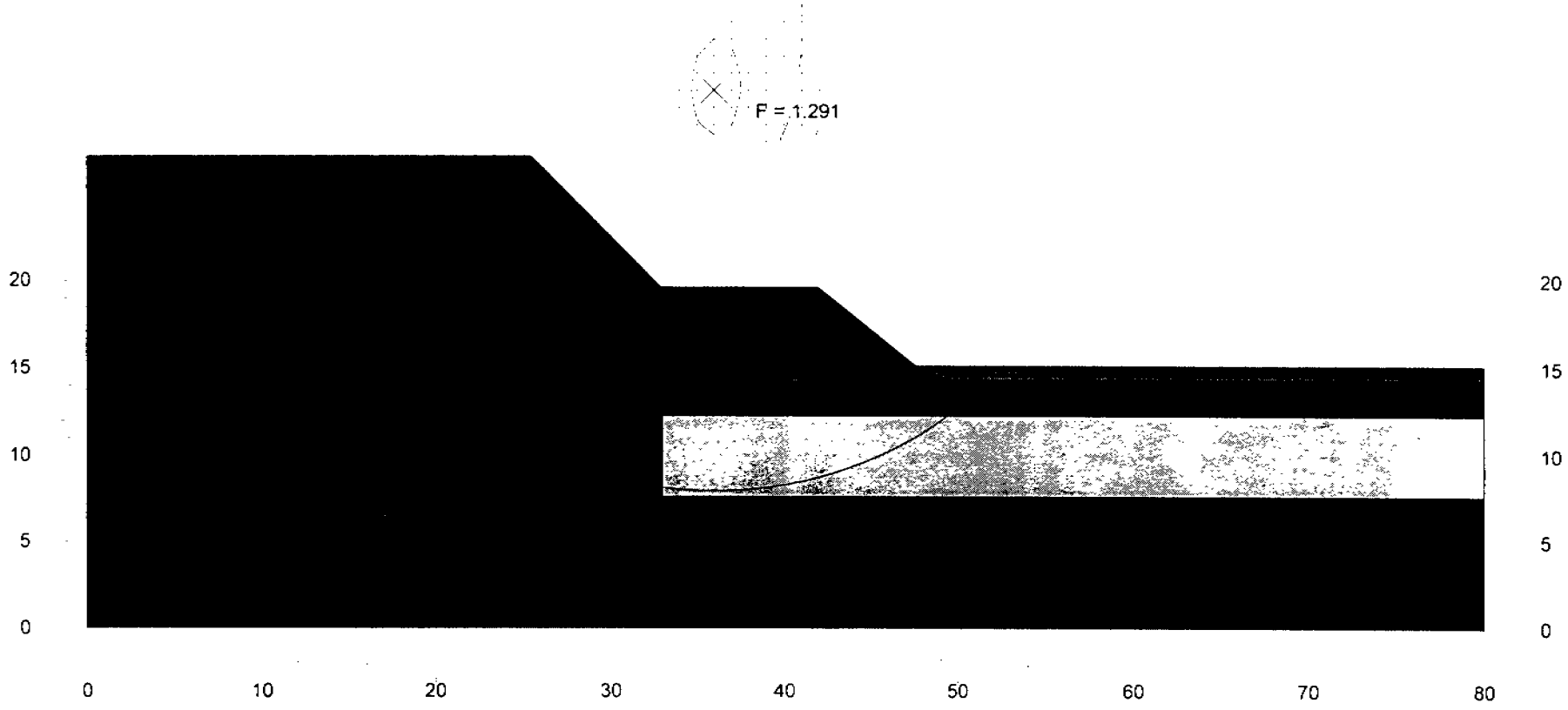


19/04/99 11 31 15 AM A:\TRIAL-65 GSL Thurber Engineering Ltd - Toronto F = 1 299

FIGURE A7

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Rock Fill	20	0	42	1	0
Peat	16	10	0	1	0
Granular B Fill	20	0	32	1	0
Sand	19	0	30	1	0
Silty Clay A-1	18	40	0	1	0
Silty Clay A-2	18	40	0	1	0
Silty Clay A-3	18	51.2	0	1	0
Silt	18	0	30	1	0
Sand and Gravel	22	0	35	1	0
Bedrock	22	500	35	1	0

Thurber Engineering Ltd. - Toronto
19-1104-4
Trout Creek North I.C. BH 38F East Abutment
April 19, 1999
12.0 m (surcharge height - El 327.5), 75% consol.
9.0 m berm at 19.7

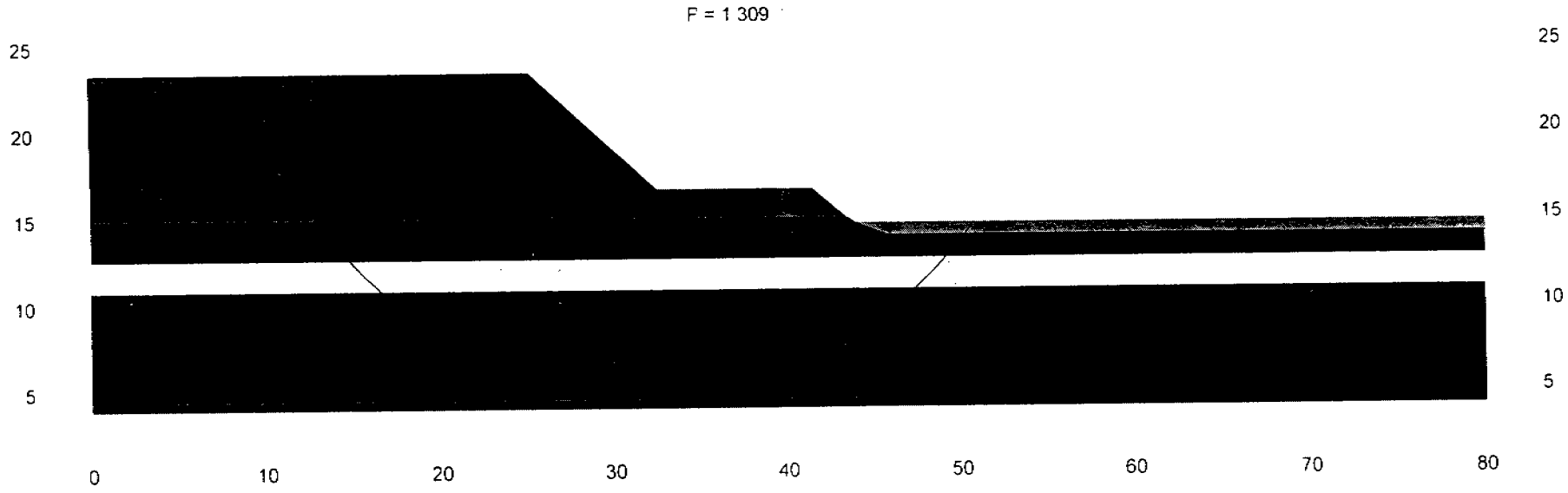


19/04/99 11 52 41 AM A:\TRIAL-67.GSL Thurber Engineering Ltd - Toronto F = 1 291

FIGURE A8

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Rock Fill	20	0	42	0	0
Peat	16	10	0	1	0
Granular B Fill	20	0	32	1	0
Silty Sand	19	0	29	1	0
Sand	19	0	30	1	0
Silty Clay A-1	18	30	0	1	0
Silty Clay A-2	18	30	0	1	0
Silty Clay A-3	18	30	0	1	0
Silty Clay B-1	18	40	0	1	0
Silty Clay B-2	18	40	0	1	0
Silty Clay B-3	18	40	0	1	0
Silt	19	0	30	1	0

Thurber Engineering Ltd. - Toronto
19-1104-4
Trout Creek North I.C. BH 2BP
May 4, 1999
8.8 m above original (El 323.5). Single stage
9.0 m wide berm at El 316.7

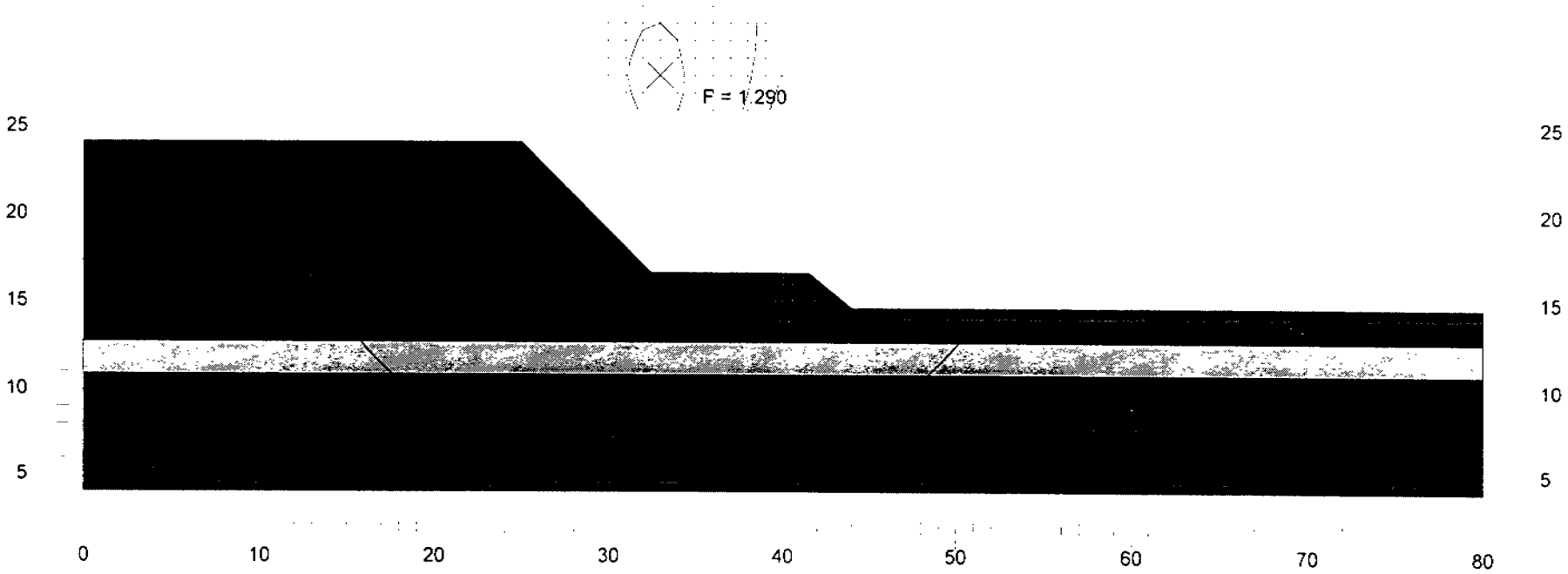


04/05/99 9 56 24 AM C \19\1104\4\TRIAL-85 GSL Thurber Engineering Ltd - Toronto F = 1 309

FIGURE A9

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Rock Fill	20	0	42	0	0
Peat	16	10	0	1	0
Granular B Fill	20	0	32	1	0
Silty Sand	19	0	29	1	0
Sand	19	0	30	1	0
Silty Clay A-1	18	30	0	1	0
Silty Clay A-2	18	30.2	0	1	0
Silty Clay A-3	18	42.2	0	1	0
Silty Clay B-1	18	40	0	1	0
Silty Clay B-2	18	40	0	1	0
Silty Clay B-3	18	48.3	0	1	0
Silt	19	0	30	1	0

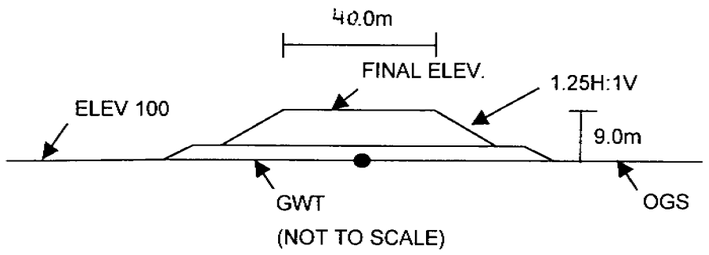
Thurber Engineering Ltd. - Toronto
19-1104-4
Trout Creek North I.C. BH 2BP
May 4, 1999
9.5 m above original (El 324.2) 75% under 8.8m
9.0 m wide berm at El 316.7



04/05/99 10:57.09 AM C:\19\1104\4\TRIAL-87.GSL Thurber Engineering Ltd - Toronto F = 1.290

FIGURE A10

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+161, MCCARHTY STREET (CPTUN1)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

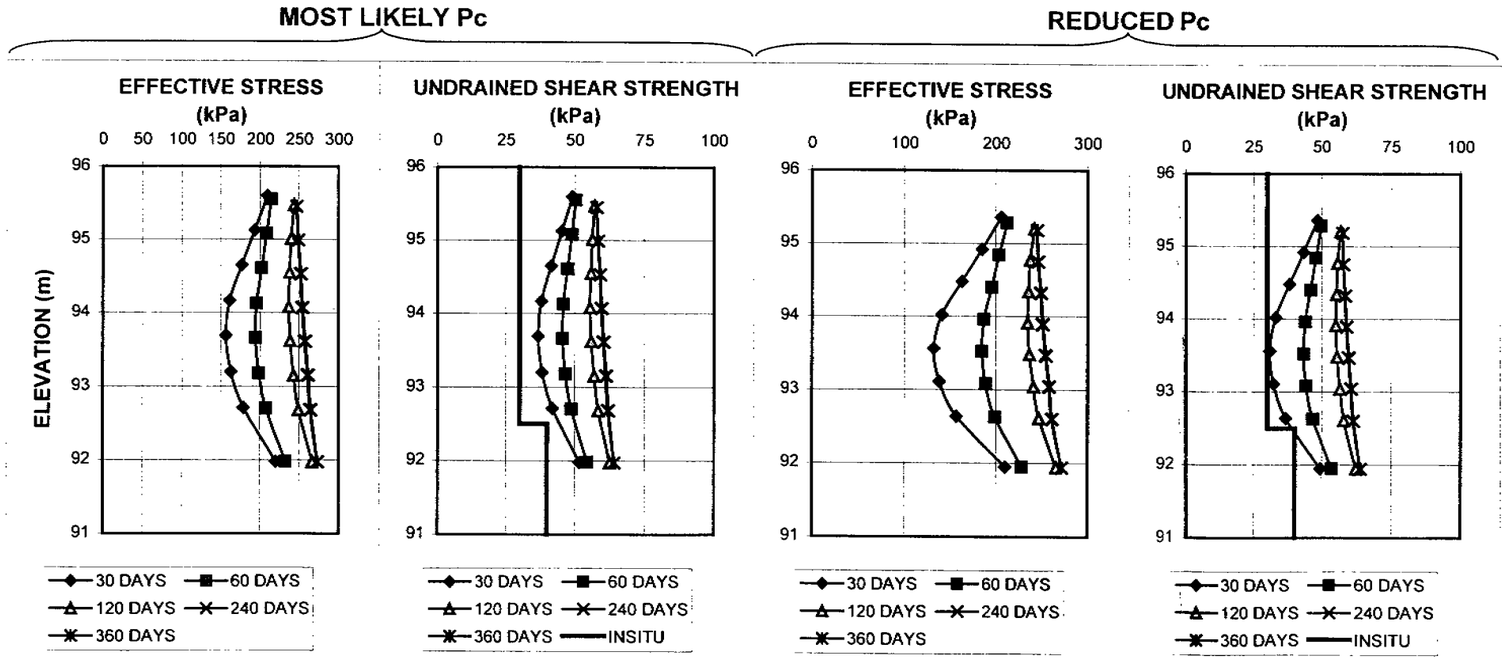


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	9	0
2	10.5	60

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	9	0
2	10.5	60



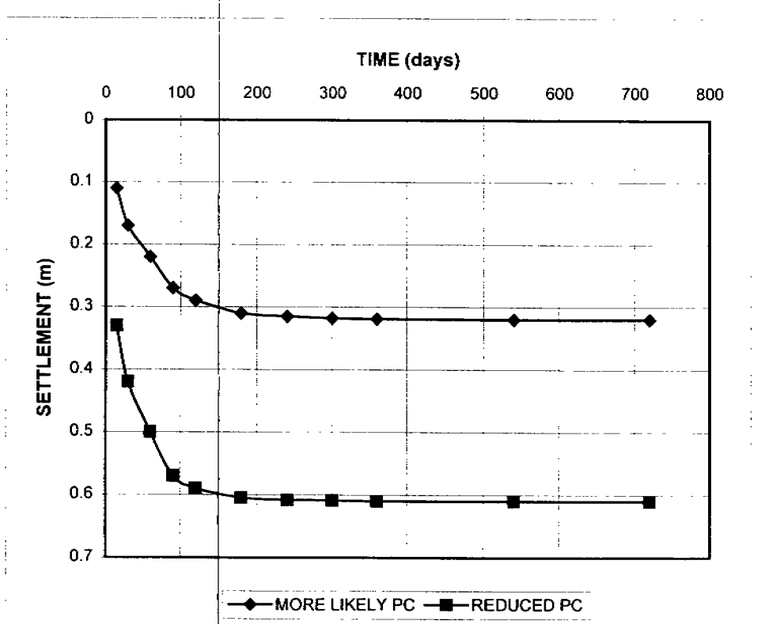
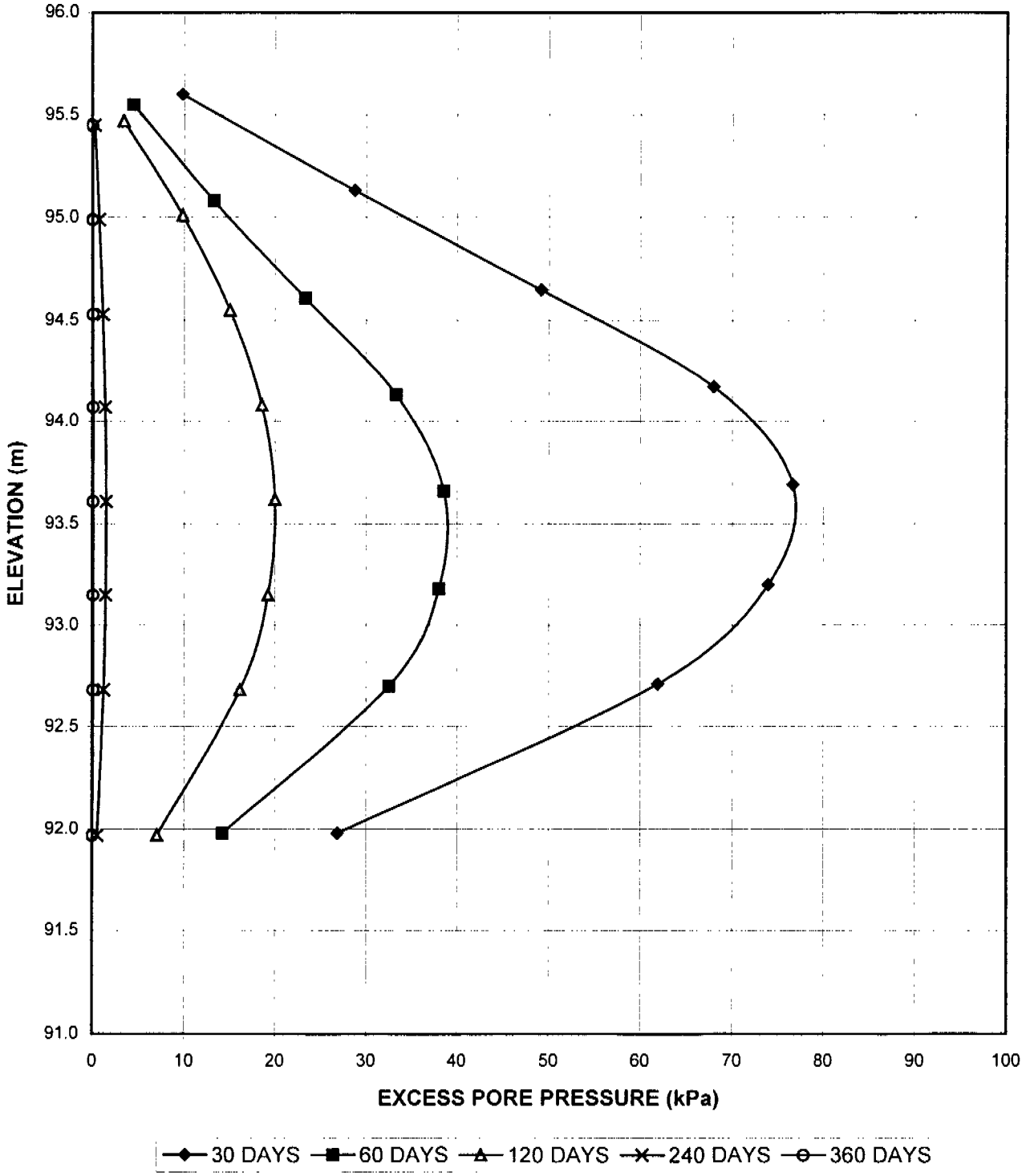


FIGURE A11

23/04/99

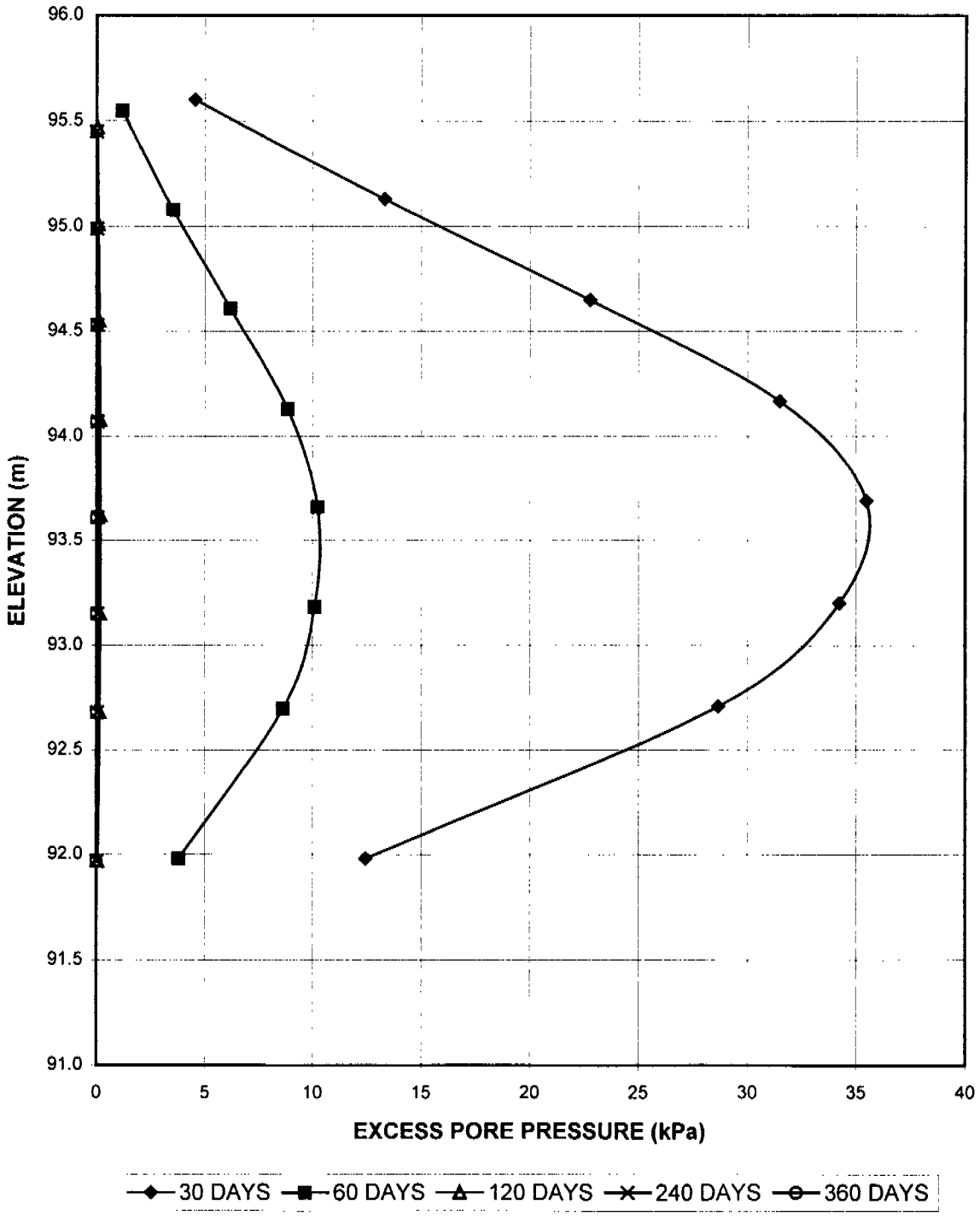
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+161 MCCARTHY ST (CPTUN1)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A11-B

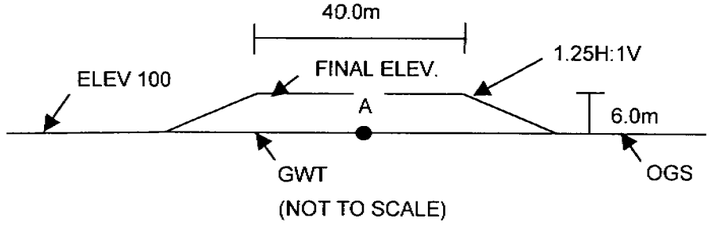
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+161 MCCARTHY ST (CPTUN1)
EXCESS PORE PRESSURES - WICK DRAIN s=4.0m
MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART (2)

FIGURE A11-C

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+161, MCCARTHY STREET (CPTUN1)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

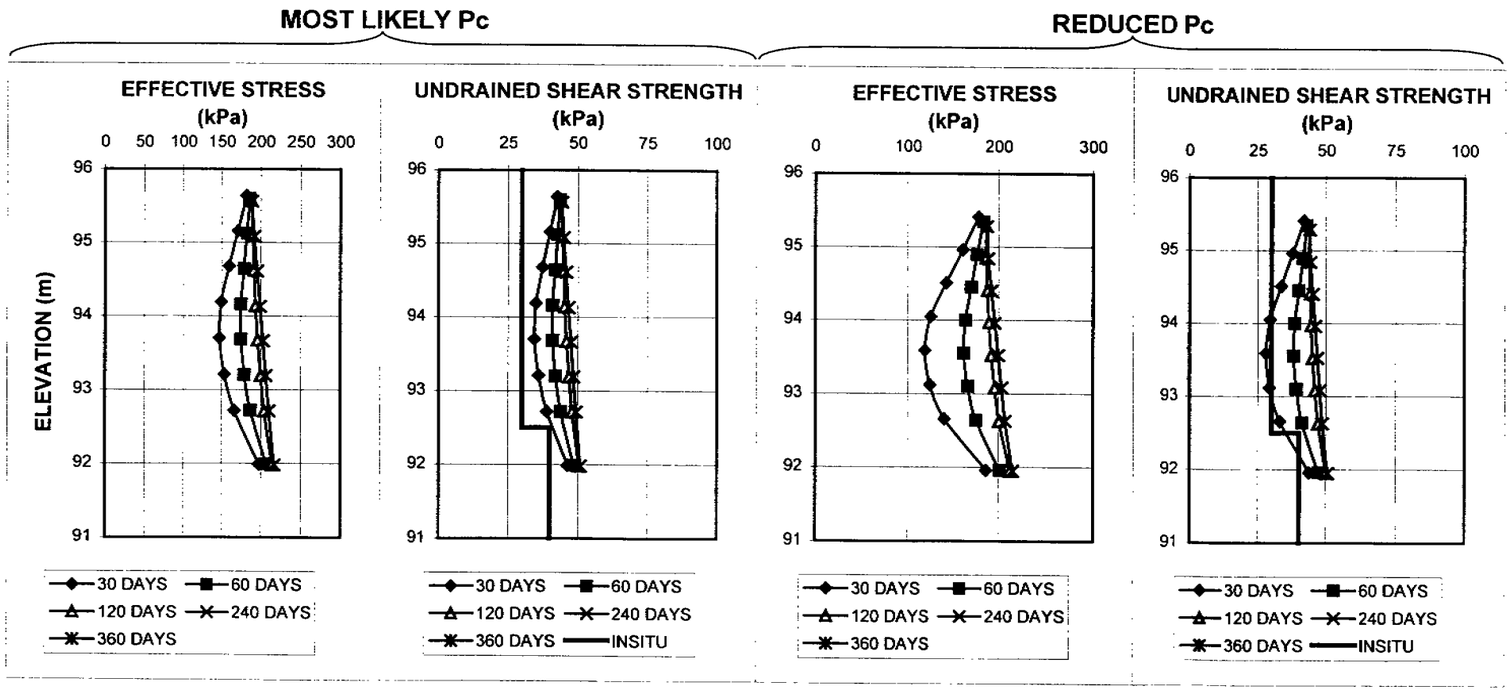


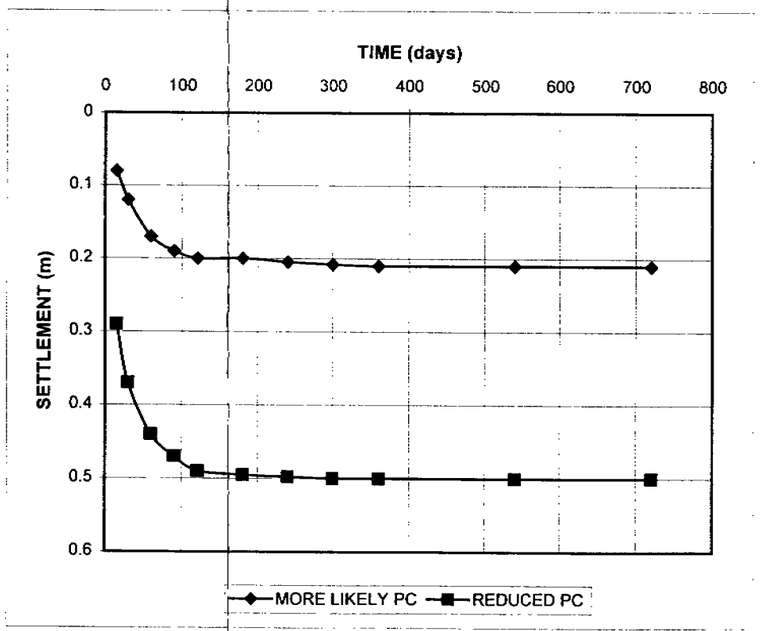
CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	7.5	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	7.5	0



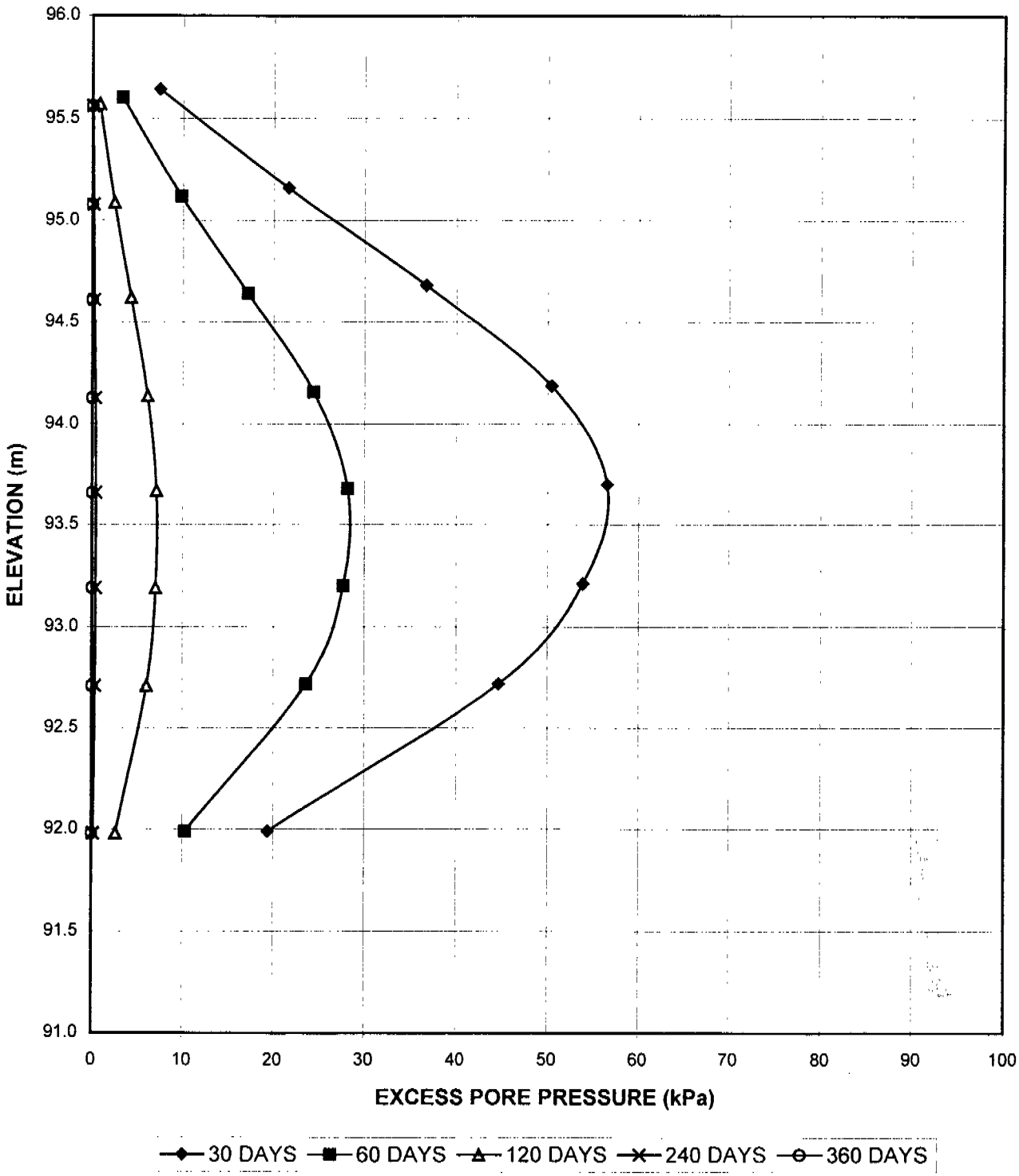


MASTER PLOT

FIGURE A12

23/04/99

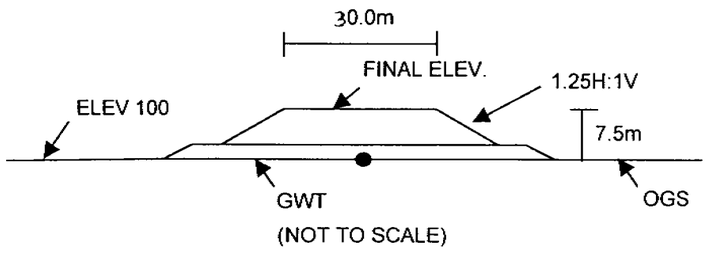
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+161, MCCARTHY ST (CPTUN1)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A12-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+180, E-N RAMP (CPTUN2)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION -NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)



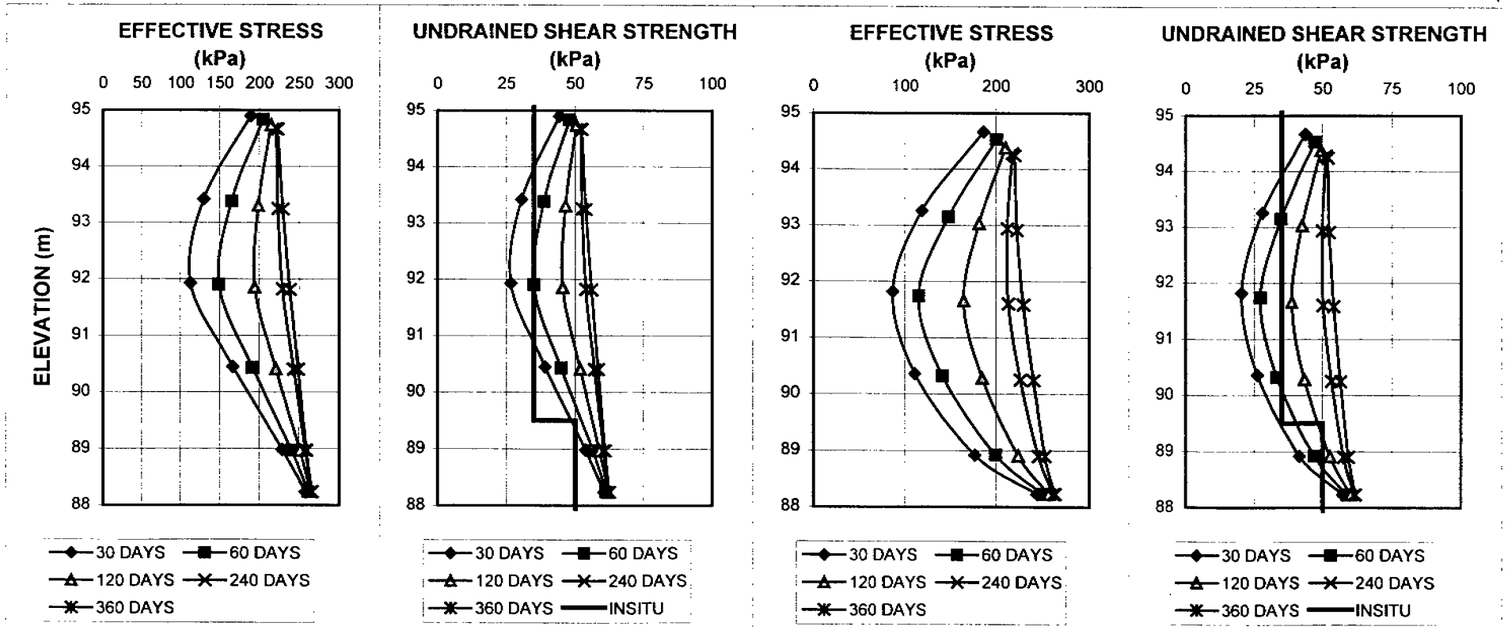
CONSTRUCTION STAGES FOR MOST LIKELY Pc

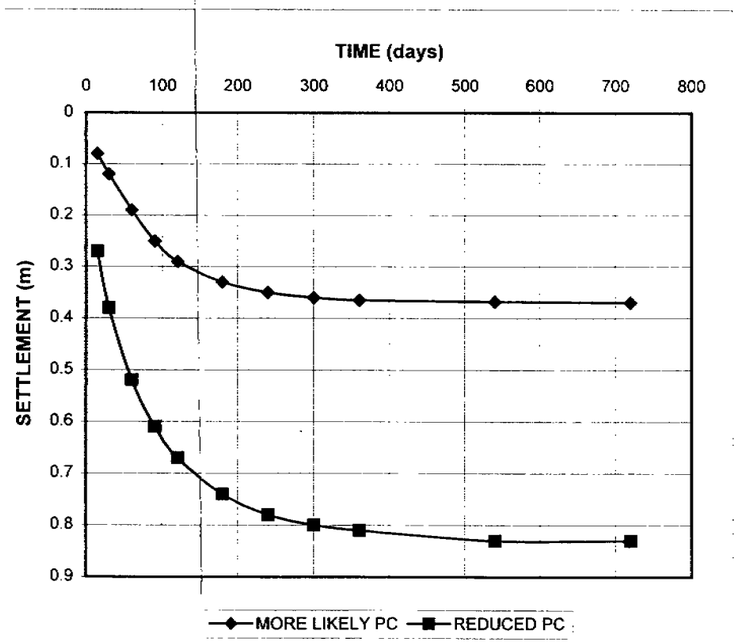
STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	9.0	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	9.0	0

MOST LIKELY Pc **REDUCED Pc**



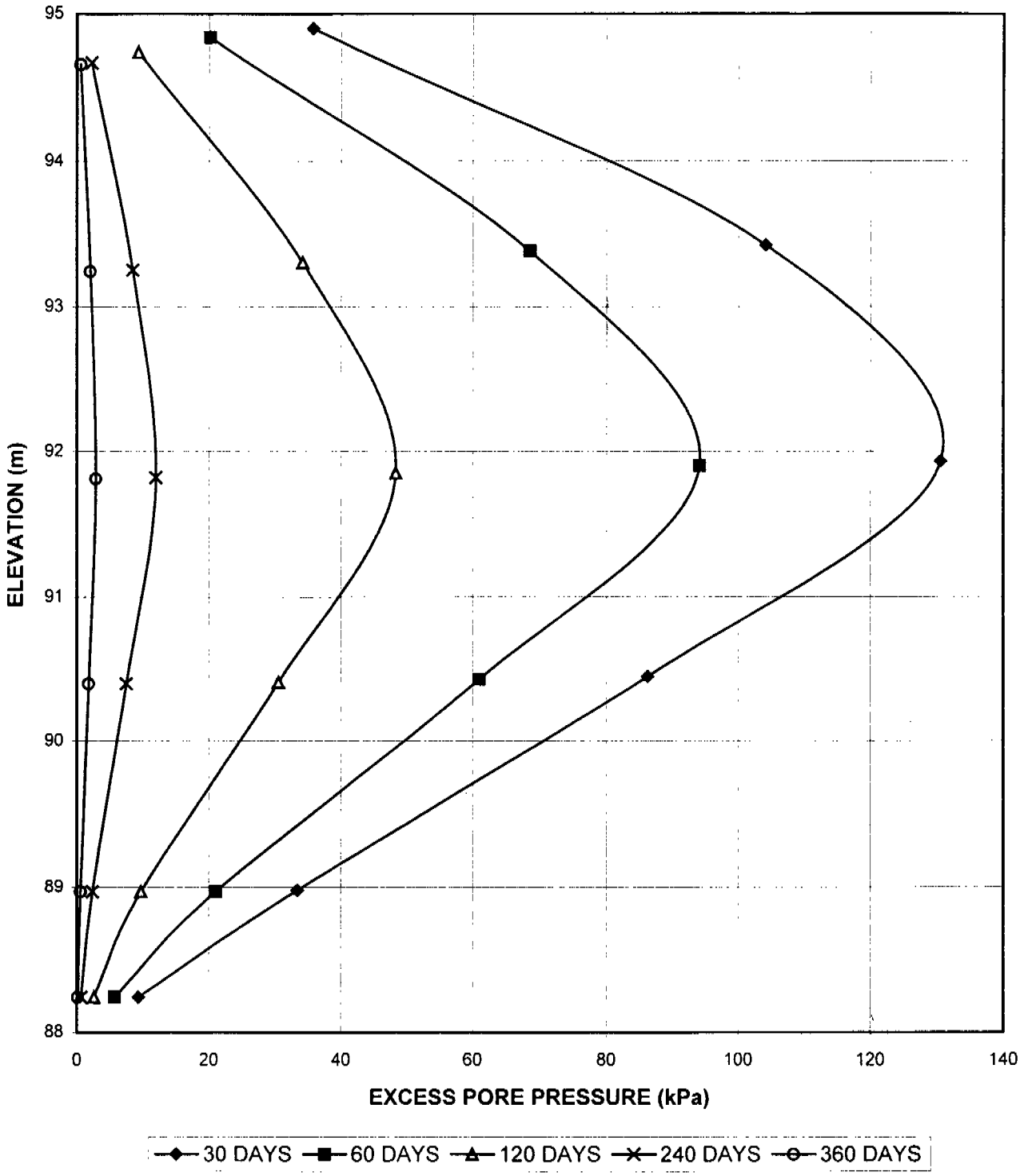


MASTER PLOT

23/04/99

FIGURE A13

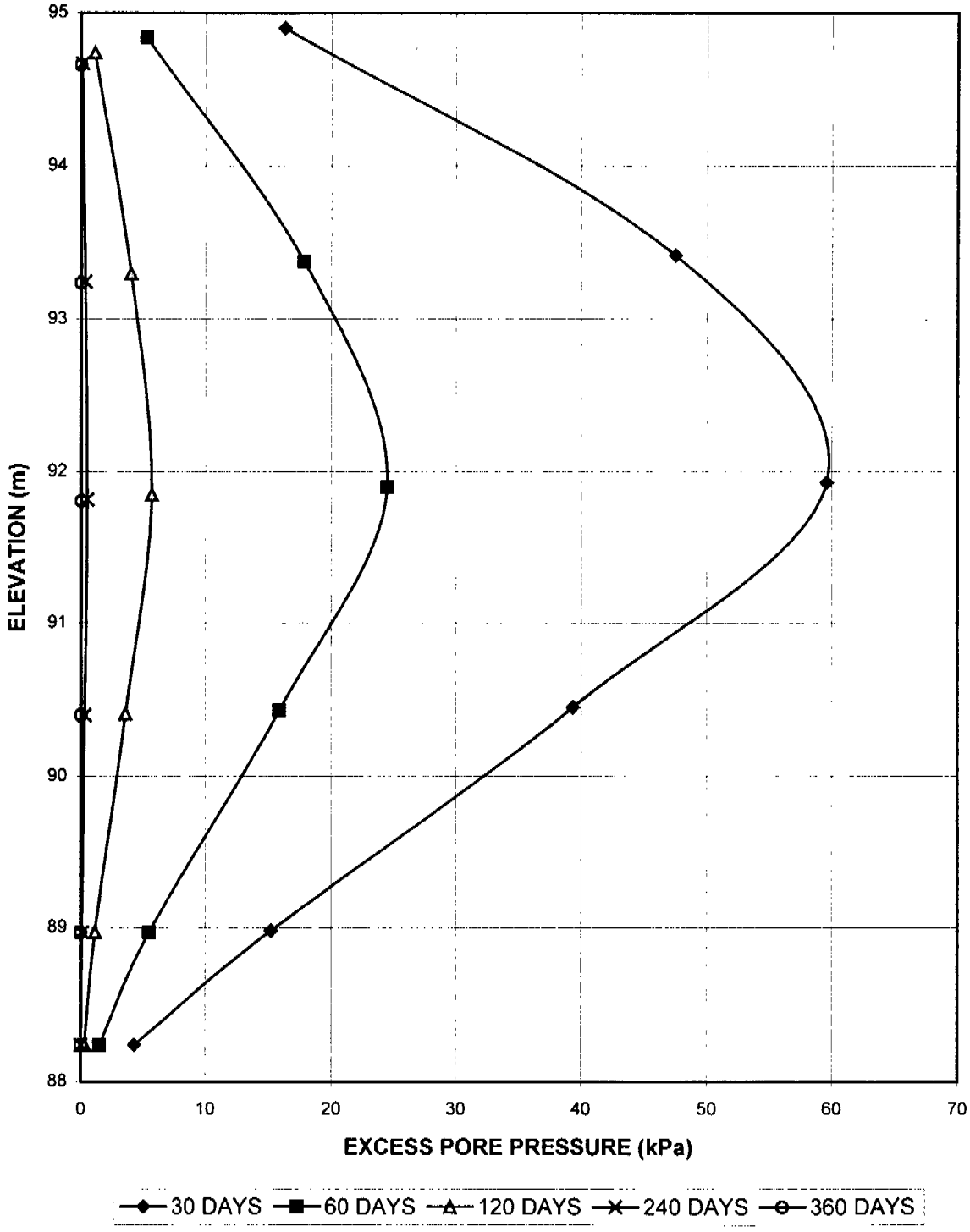
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+180, E-N RAMP (CPTUN2)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A13-B

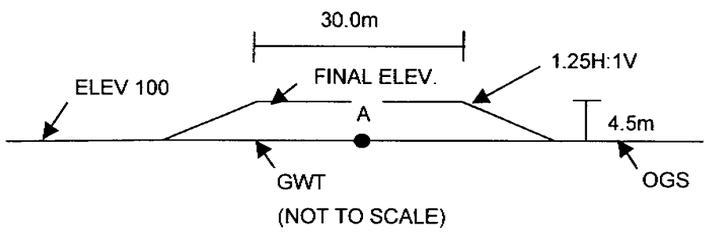
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+180, E-N RAMP (CPTUN2)
EXCESS PORE PRESSURES - WICK DRAINS s=3.1m - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART (2)

FIGURE A13-C

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+180, E-N RAMP (CPTUN2)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

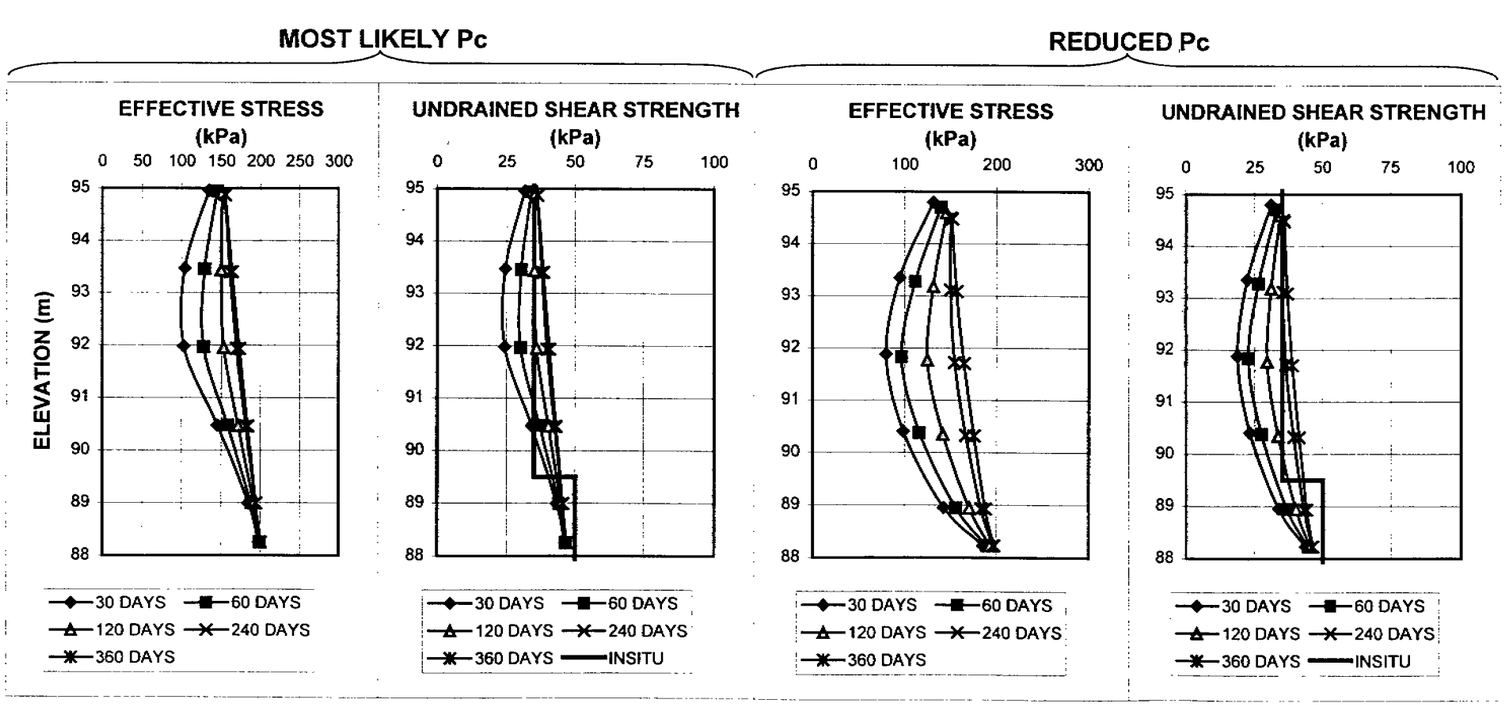


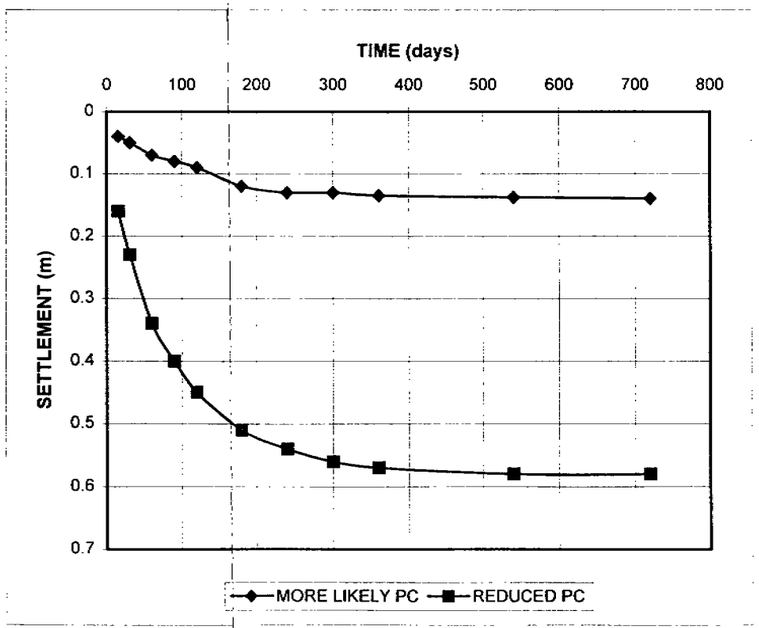
CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	5.5	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	5.5	0



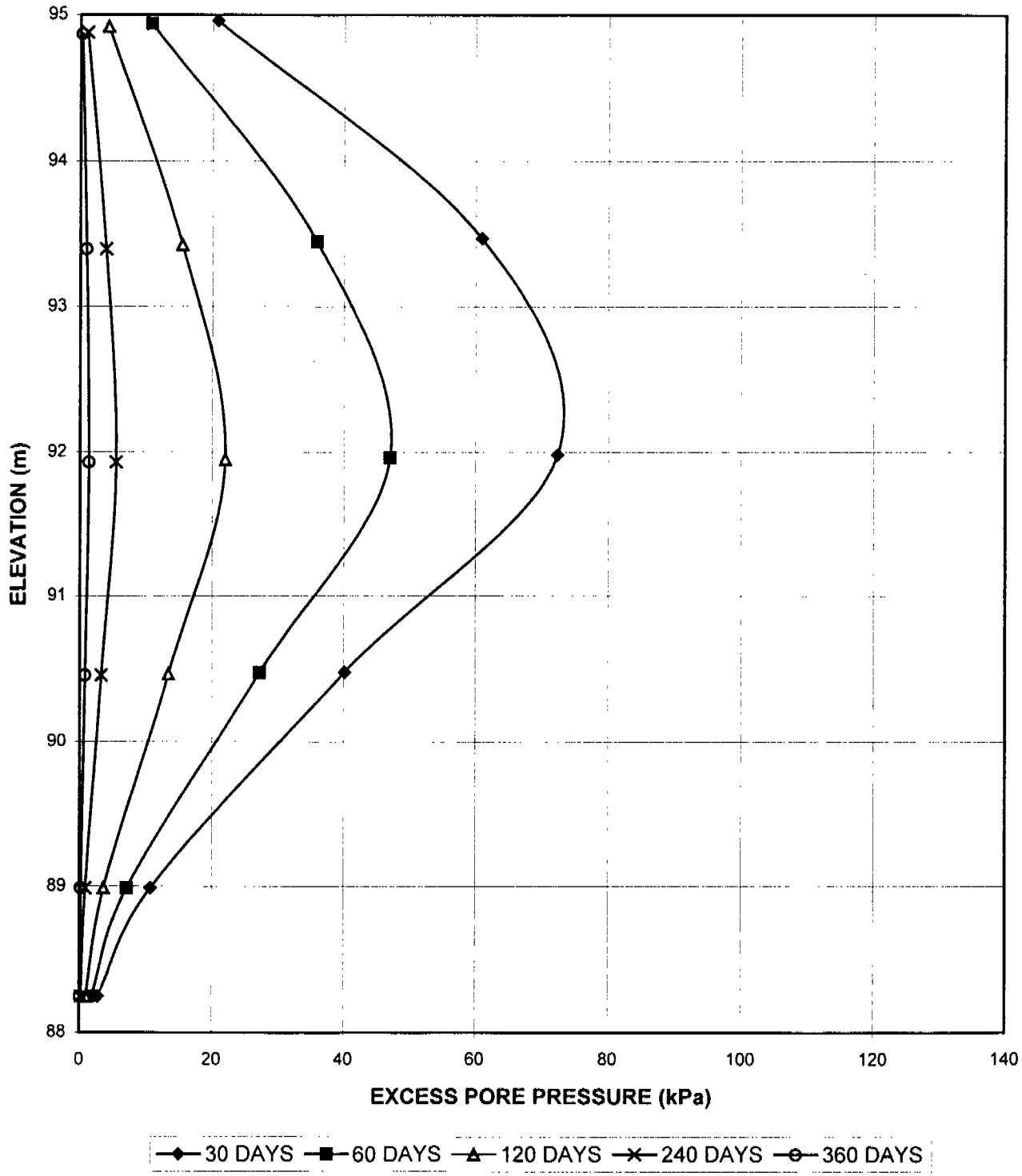


MASTER PLOT

FIGURE A14

23/04/99

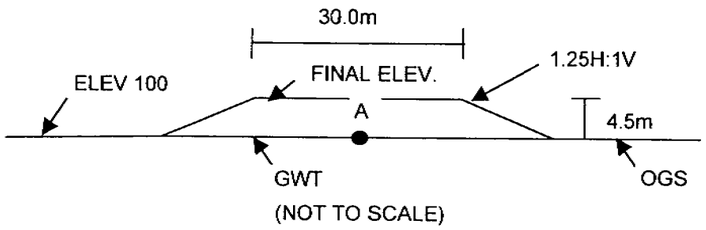
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+180, E-N RAMP (CPTUN2)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A14-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+270, EW-N RAMP (CPTUN3)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

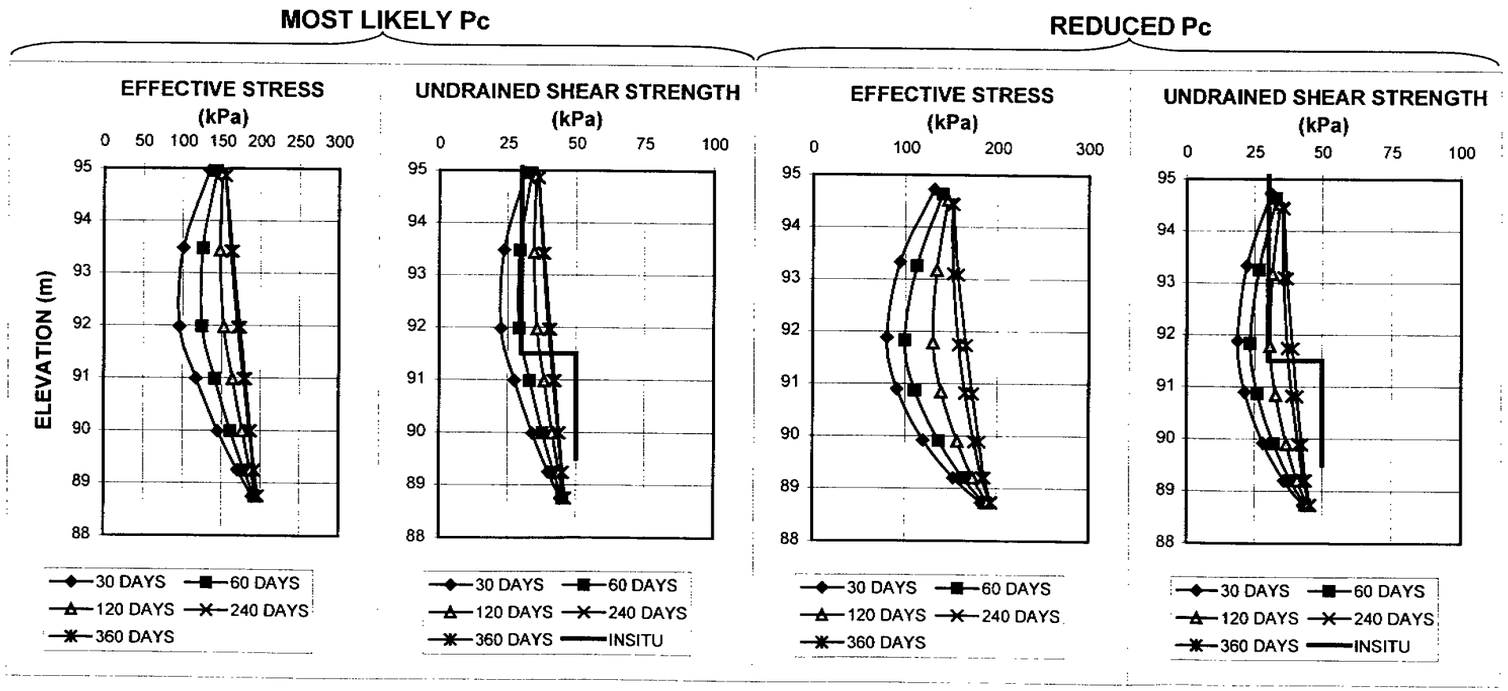


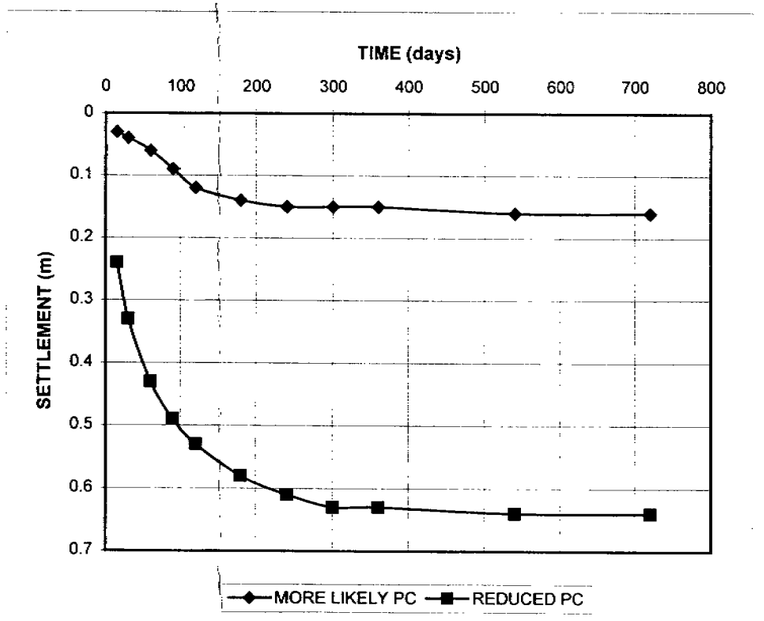
CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	5.5	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	5.5	0



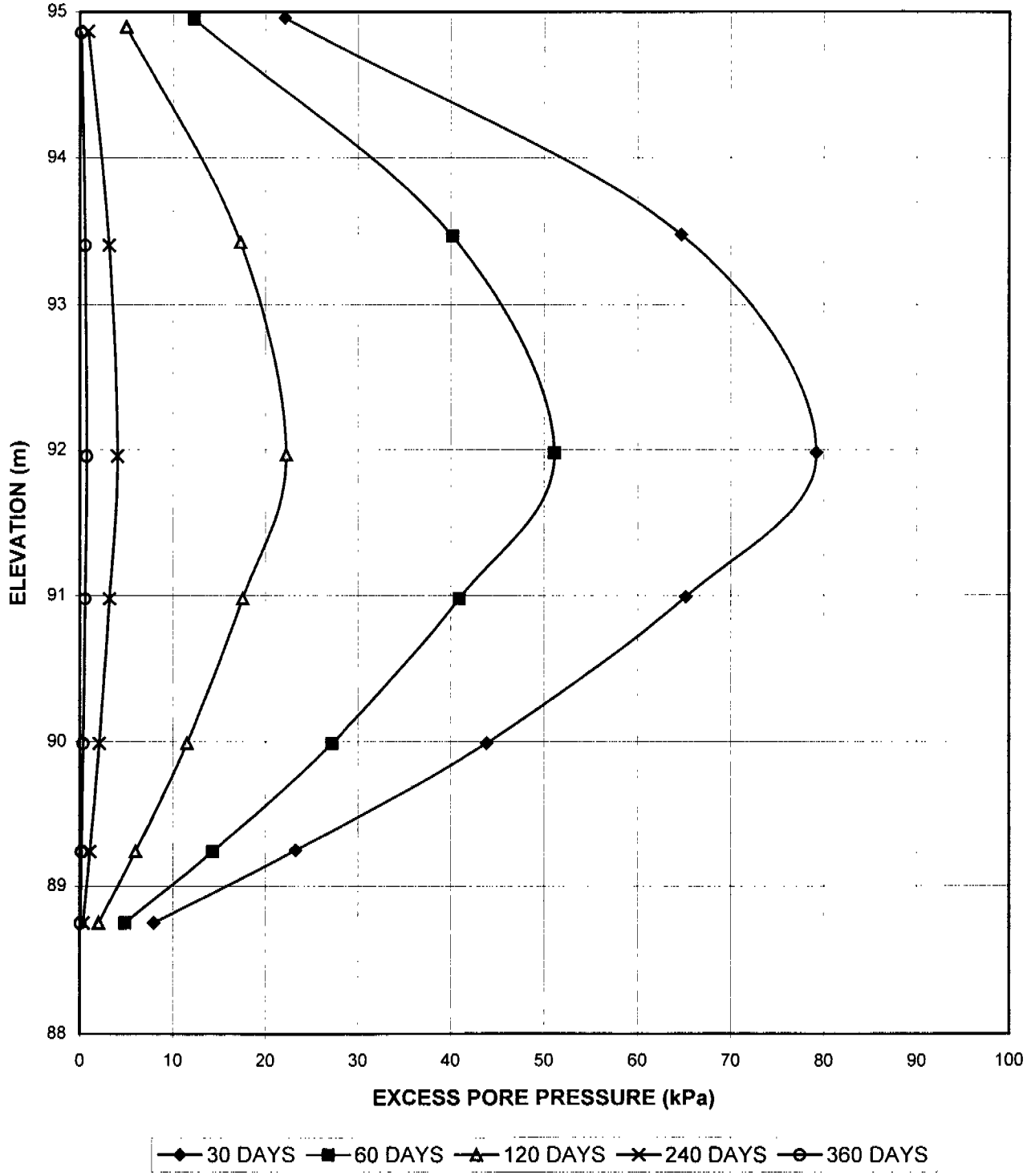


MASTER PLOT

FIGURE A15

23/04/99

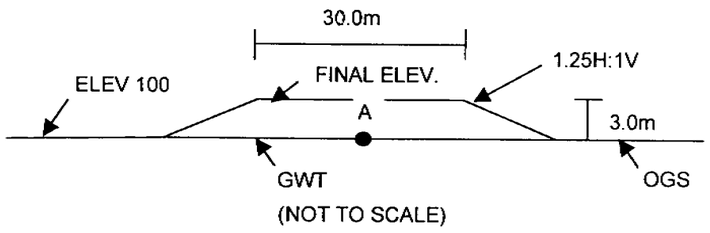
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+270, EW-N RAMP (CPTUN3)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A15-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+270, EW-N RAMP (CPTUN3)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

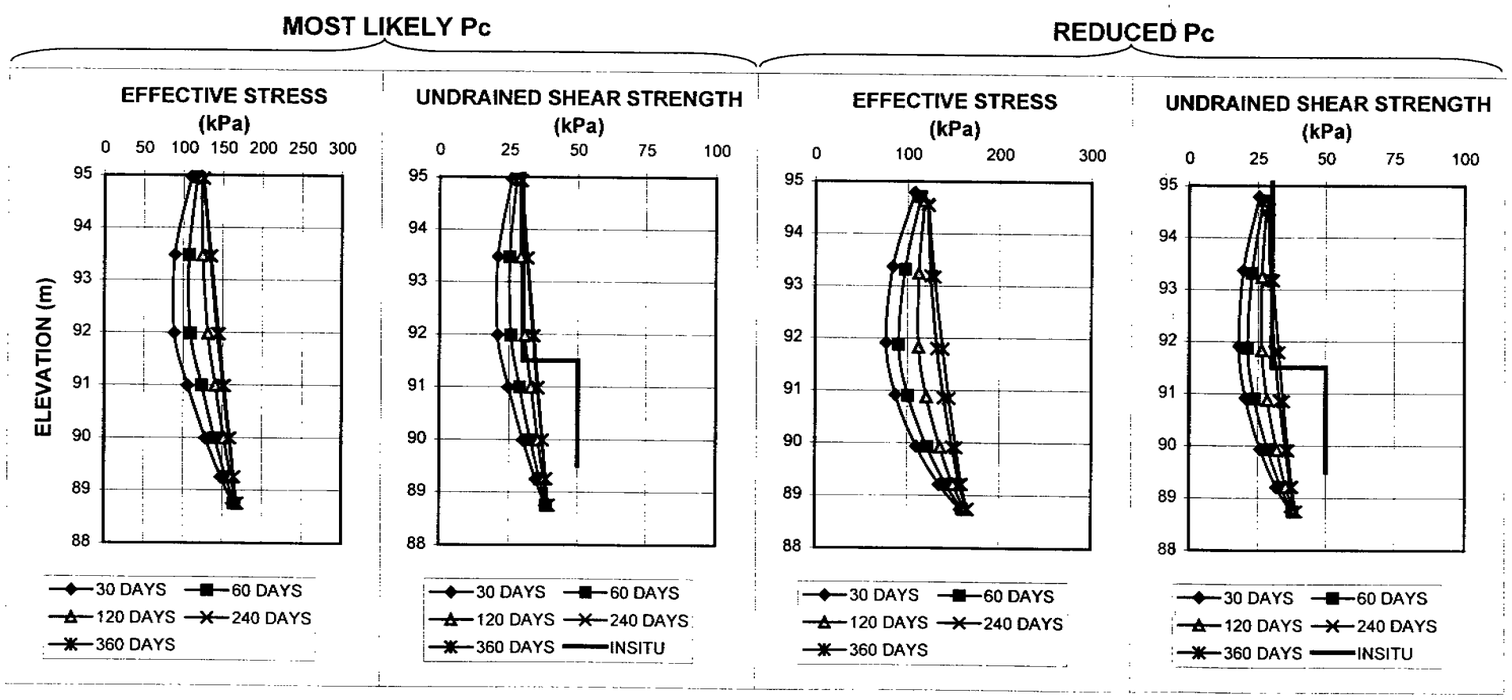


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0



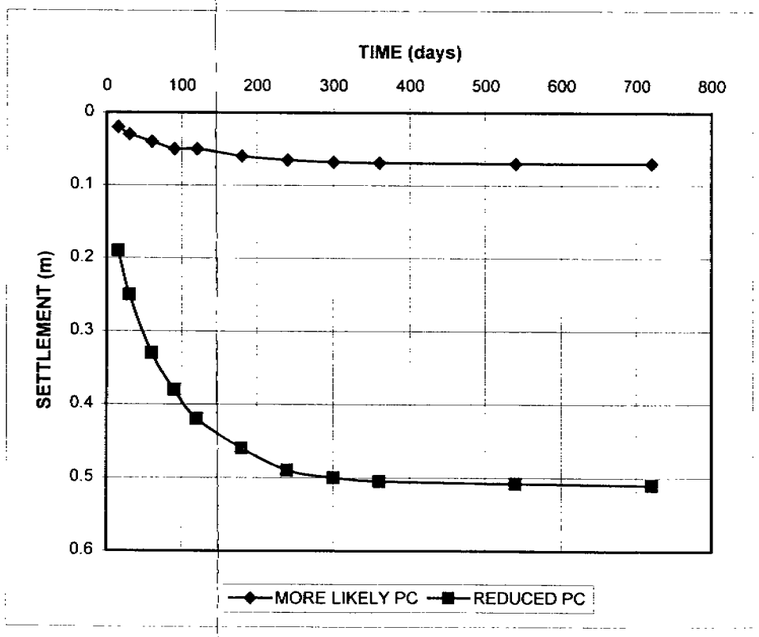
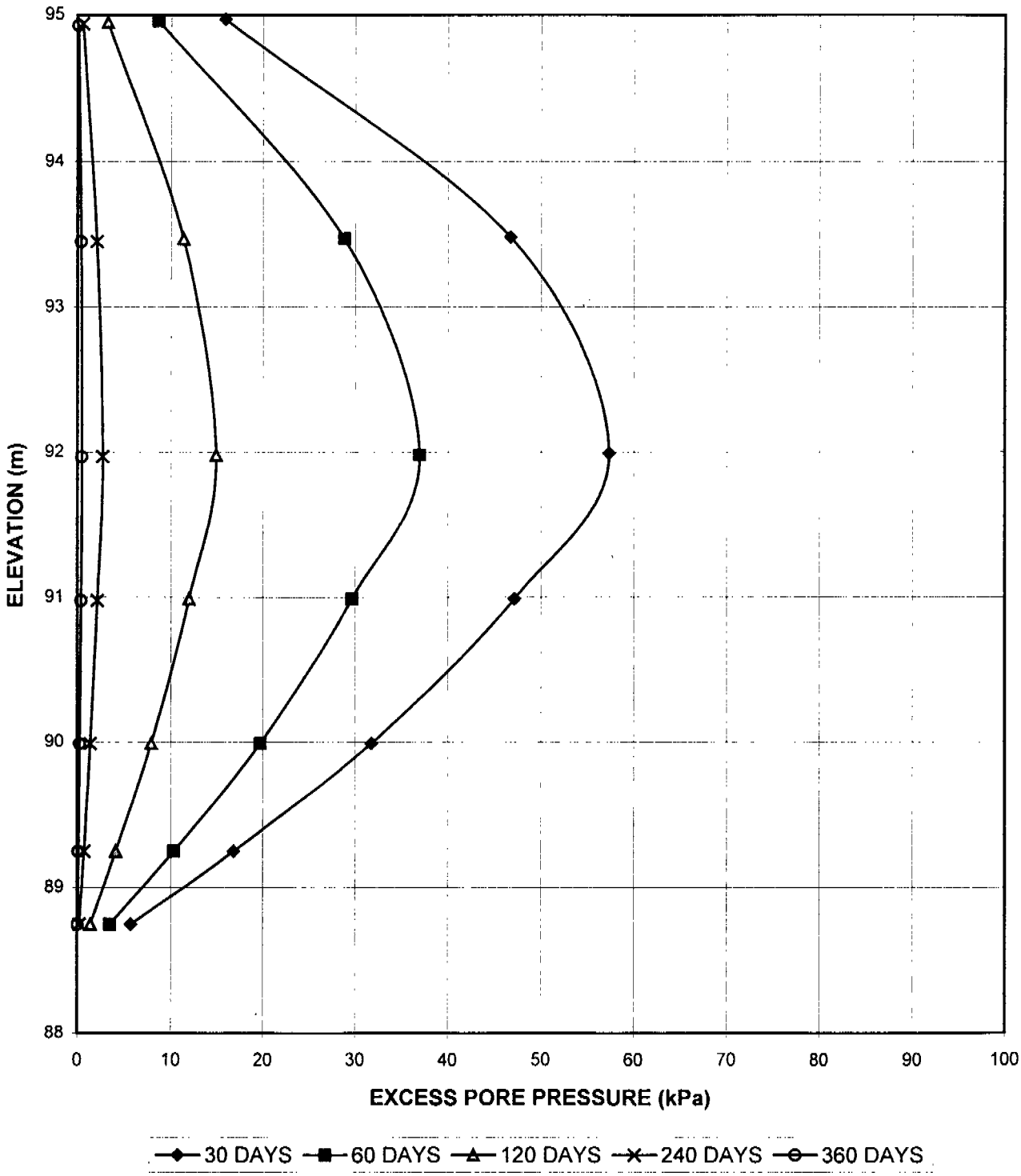


FIGURE A16

23/04/99

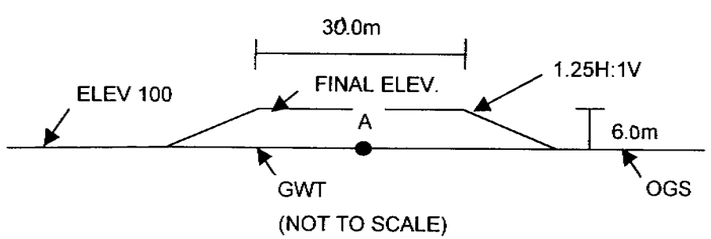
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 13+270, EW-N RAMP (CPTUN3)
EXCESS PORE PRESSURE - NO WICK DRAINS - MOST LIKELY Pc
(AT THE EMBANKMENT CENTRELINE)



EPP - CHART

FIGURE A16-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+ 305 MCCARTHY STREET (CPTUN4)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

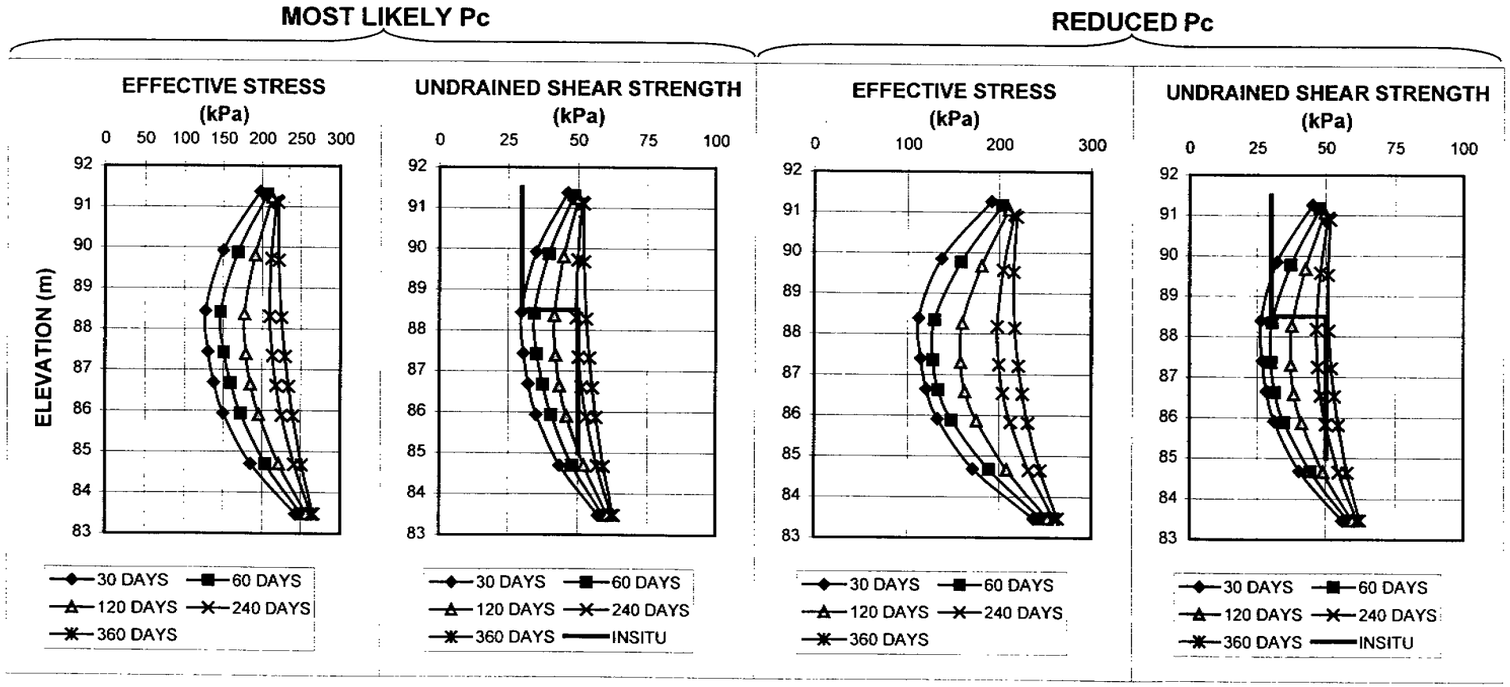


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	7.5	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	7.5	0



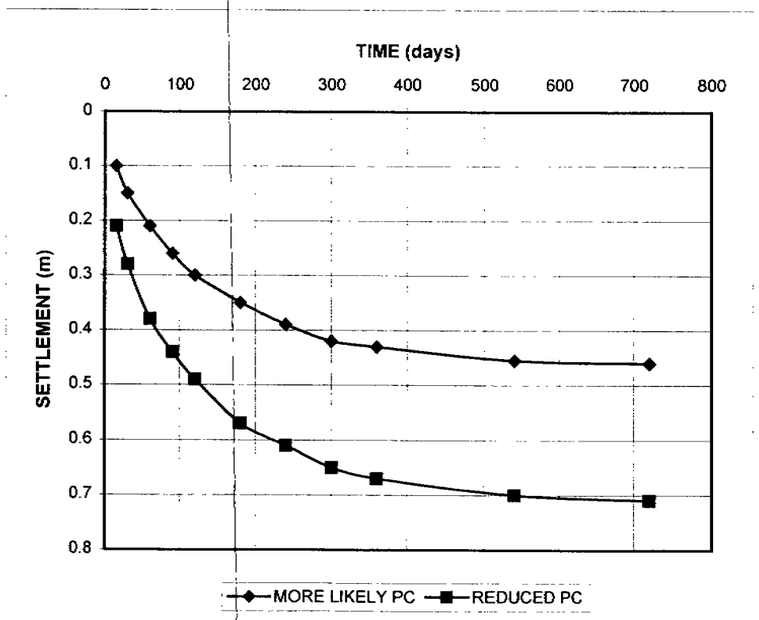


FIGURE A17

23/04/99

MASTER PLOT

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+305 MCCARTHY ST (CPTUN4)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)

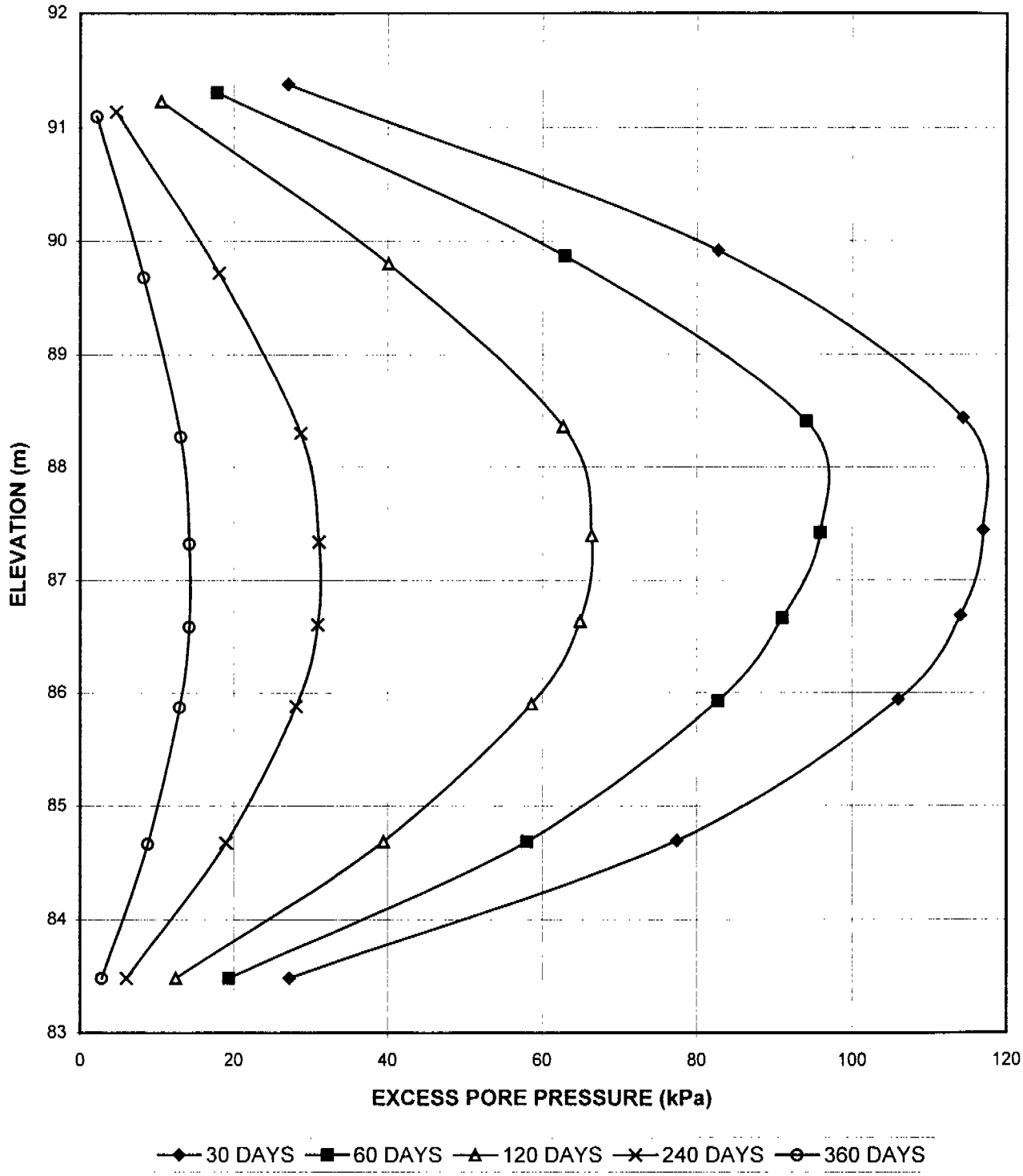
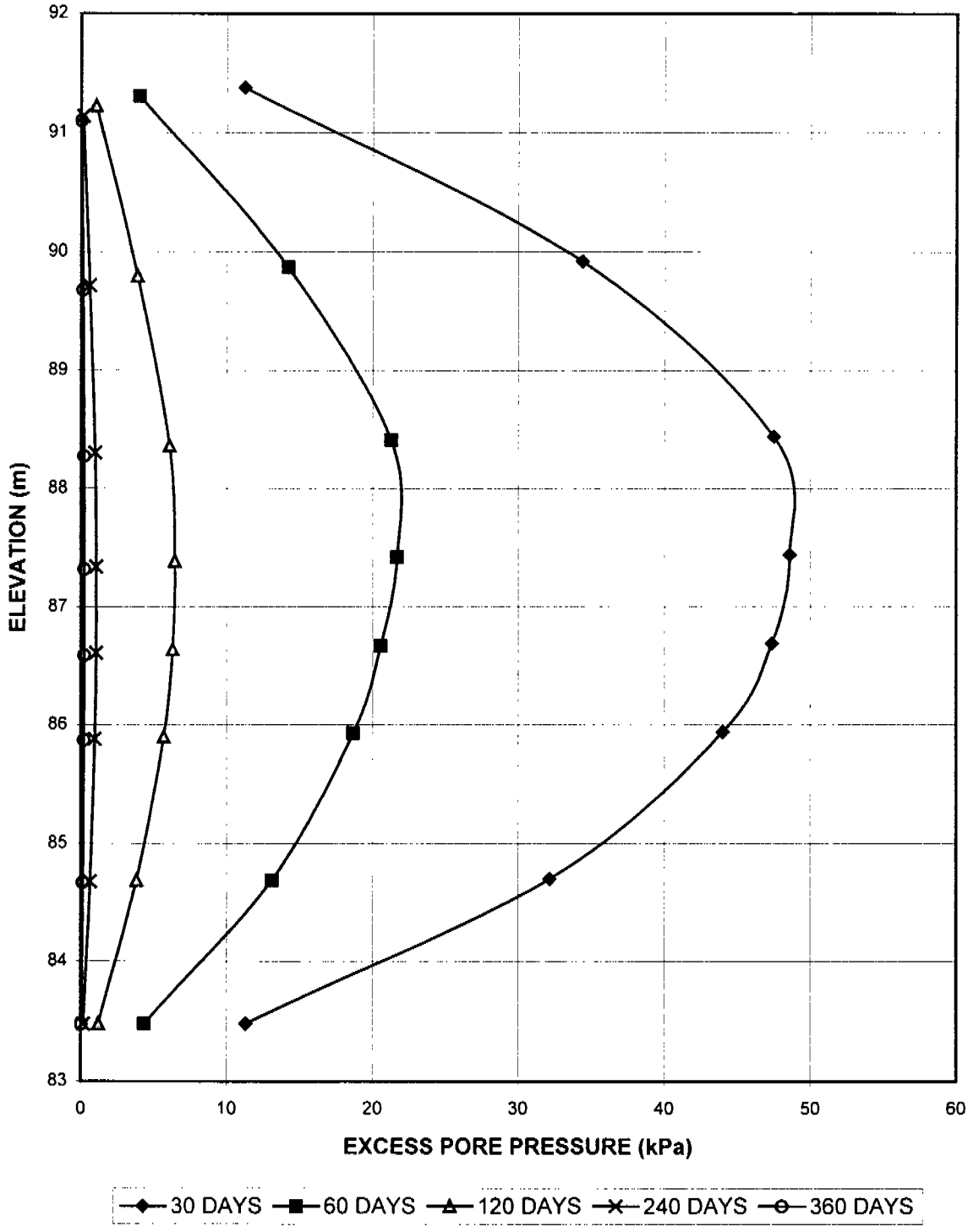


FIGURE A17-B

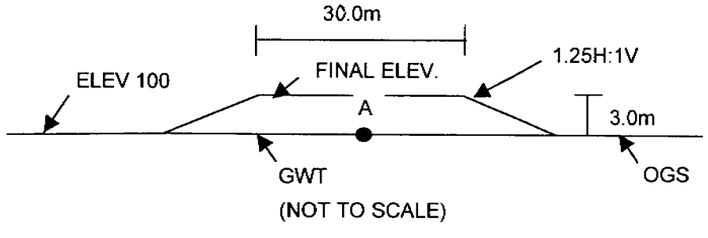
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+305 MCCARTHY ST (CPTUN4)
EXCESS PORE PRESSURES - WICK DRAINS s=2.9m- MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART (2)

FIGURE A17-C

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+305 MCCARTHY STREET (CPTUN4)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

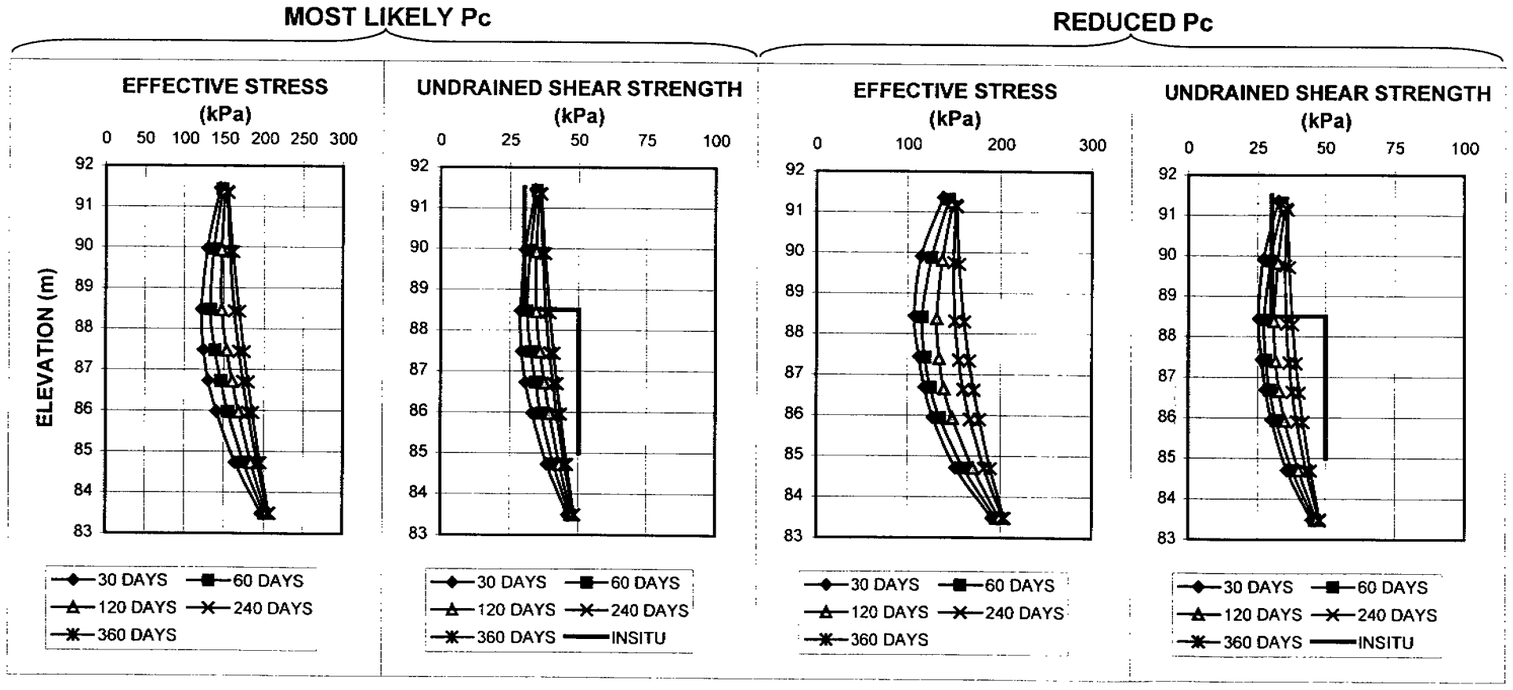


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0



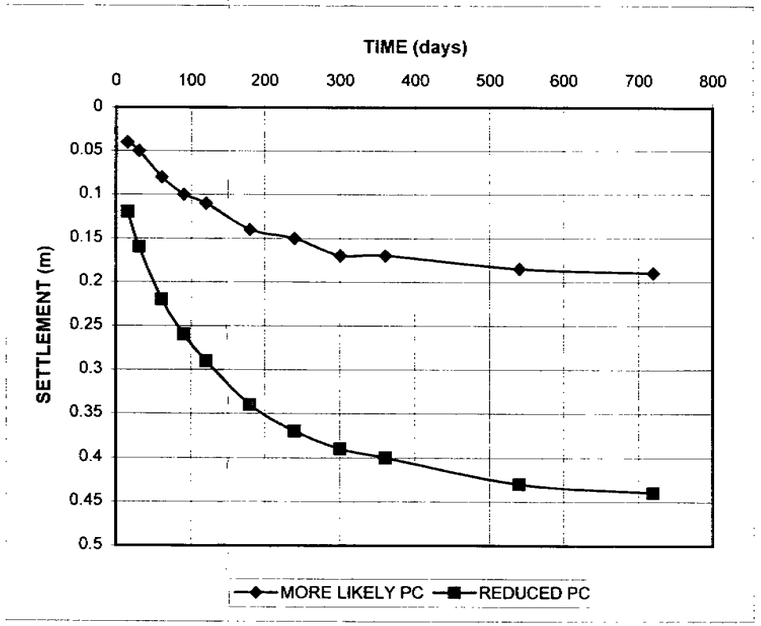
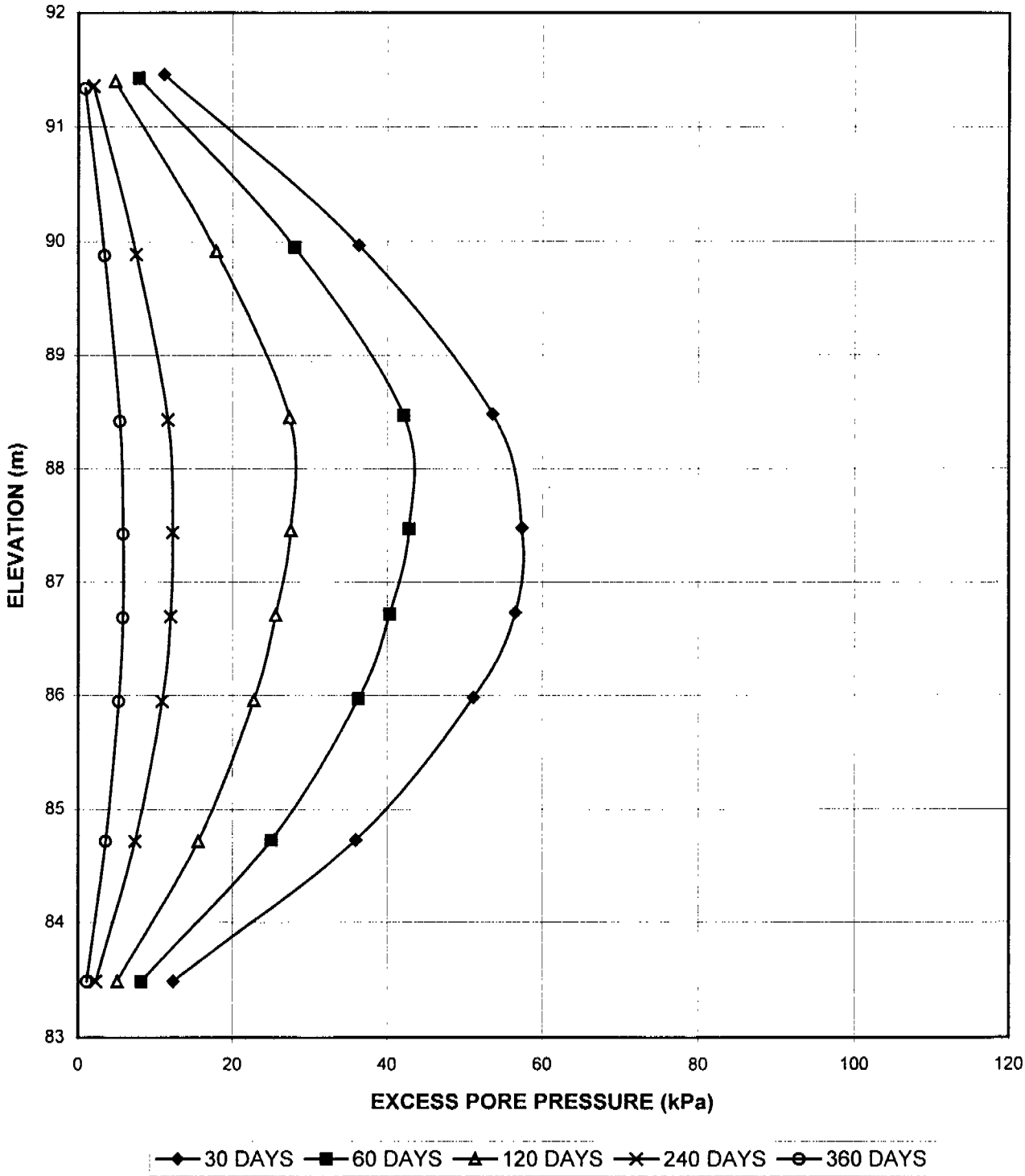


FIGURE A18

23/04/99

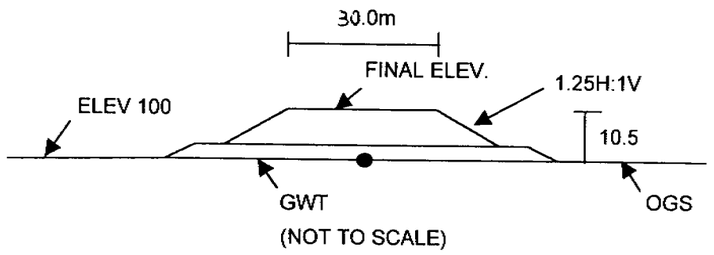
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+305 MCCARTHY ST (CPTUN4)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - GRAPH

FIGURE A18-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY STREET (CPTUN5)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

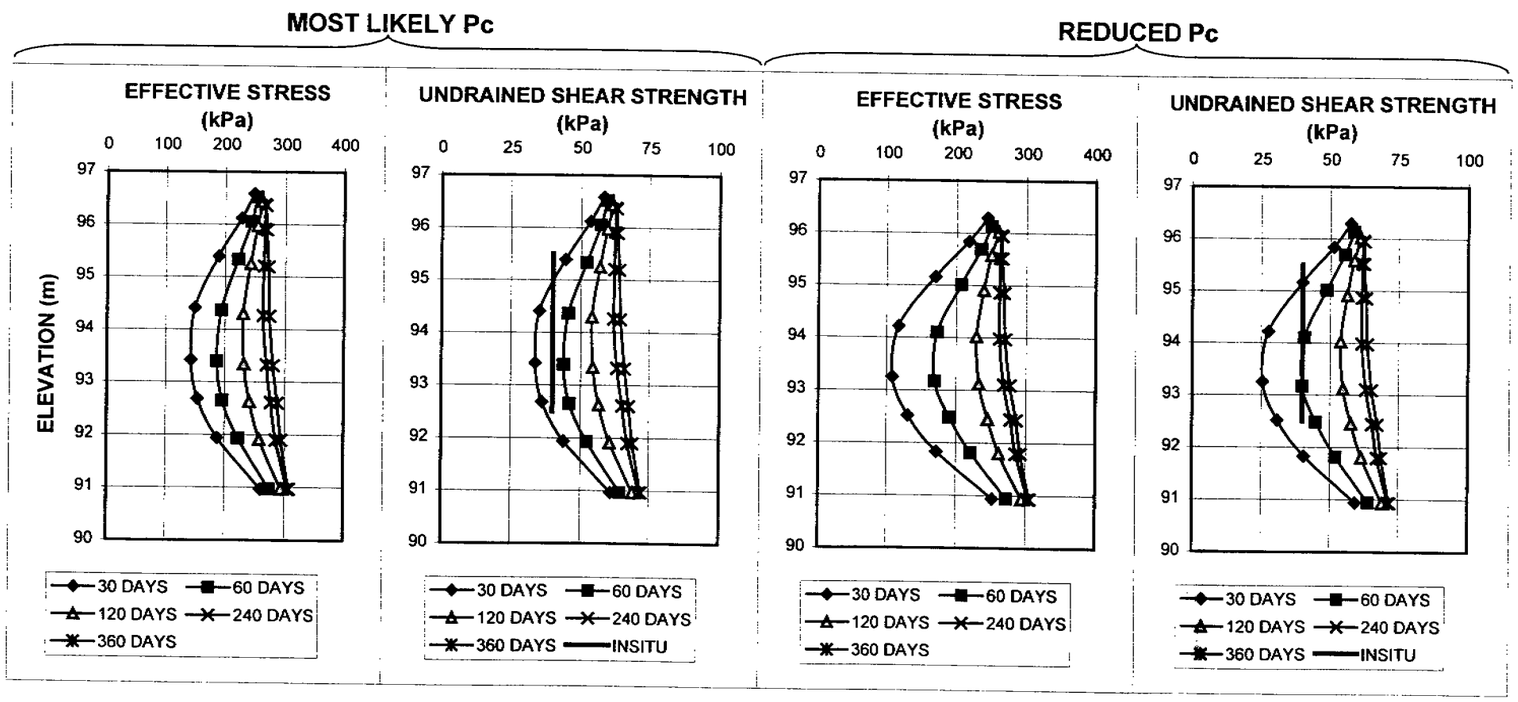


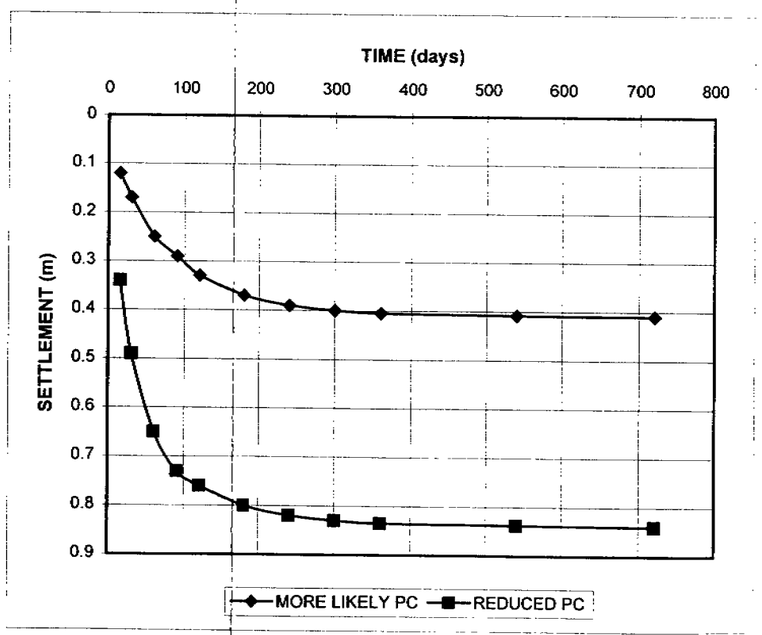
CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	11.5	0
2	0.5	90

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	11.5	0
2	0.5	90



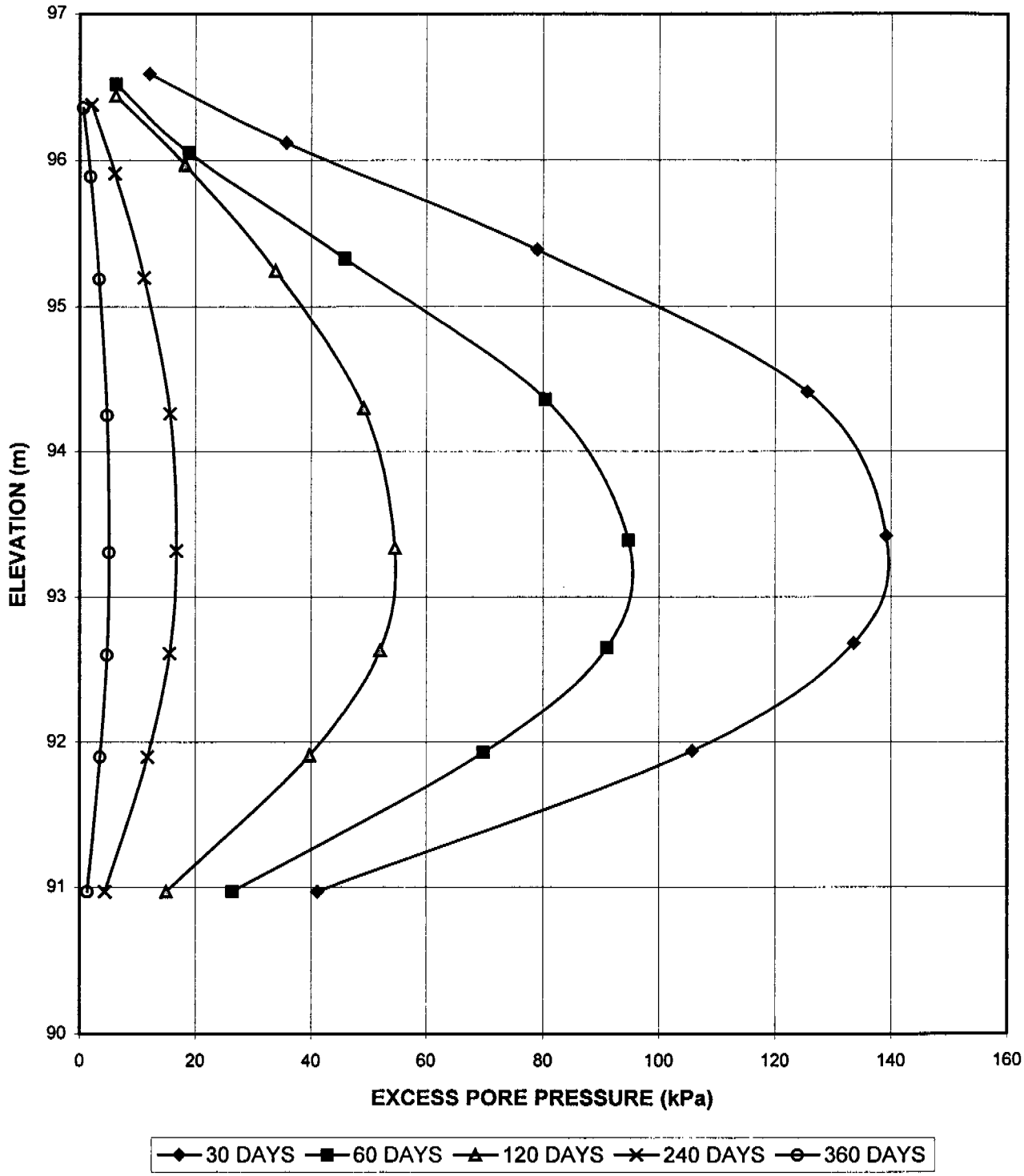


MASTER PLOT

FIGURE A19

23/04/99

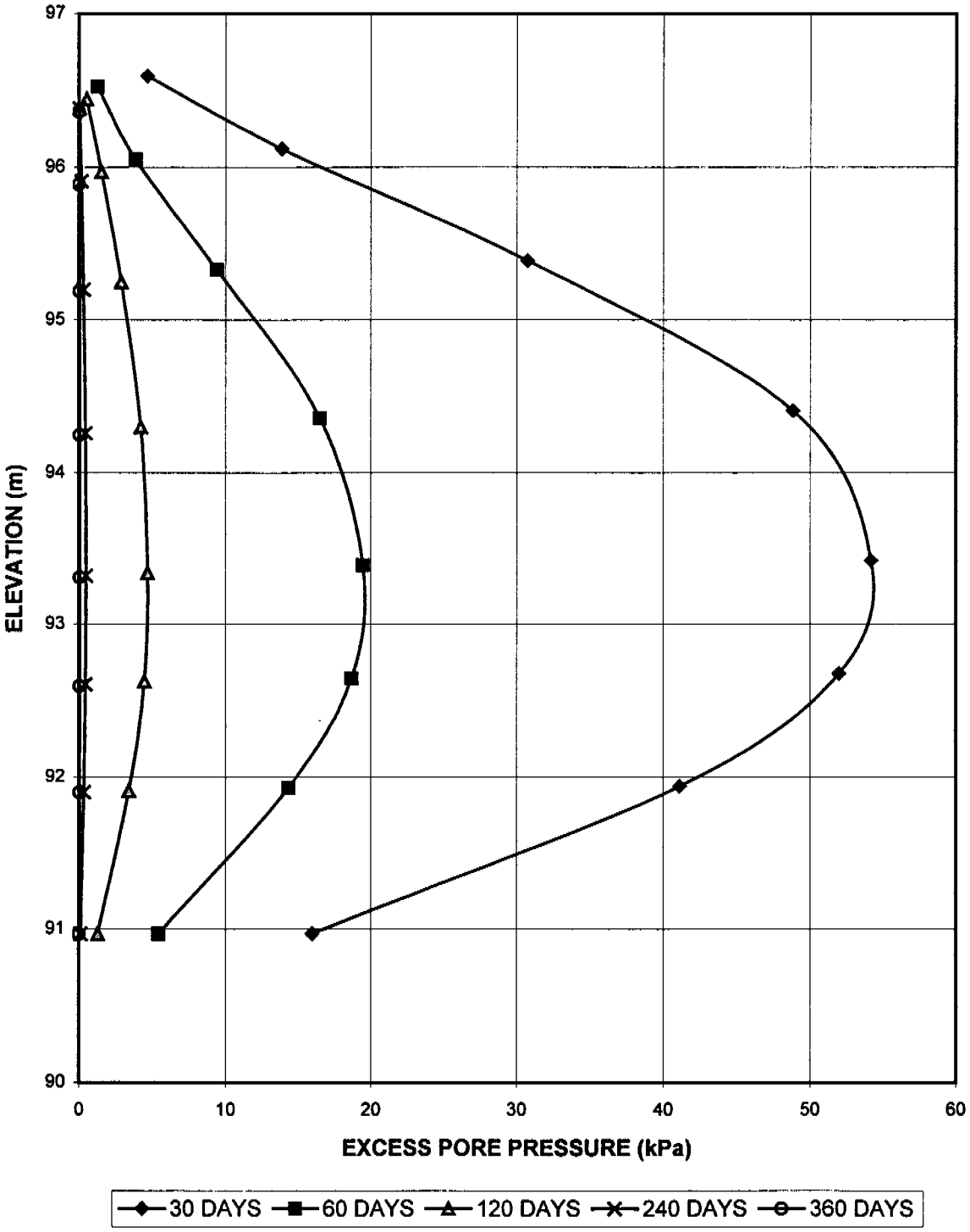
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY ST (CPTUN5)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A19-B

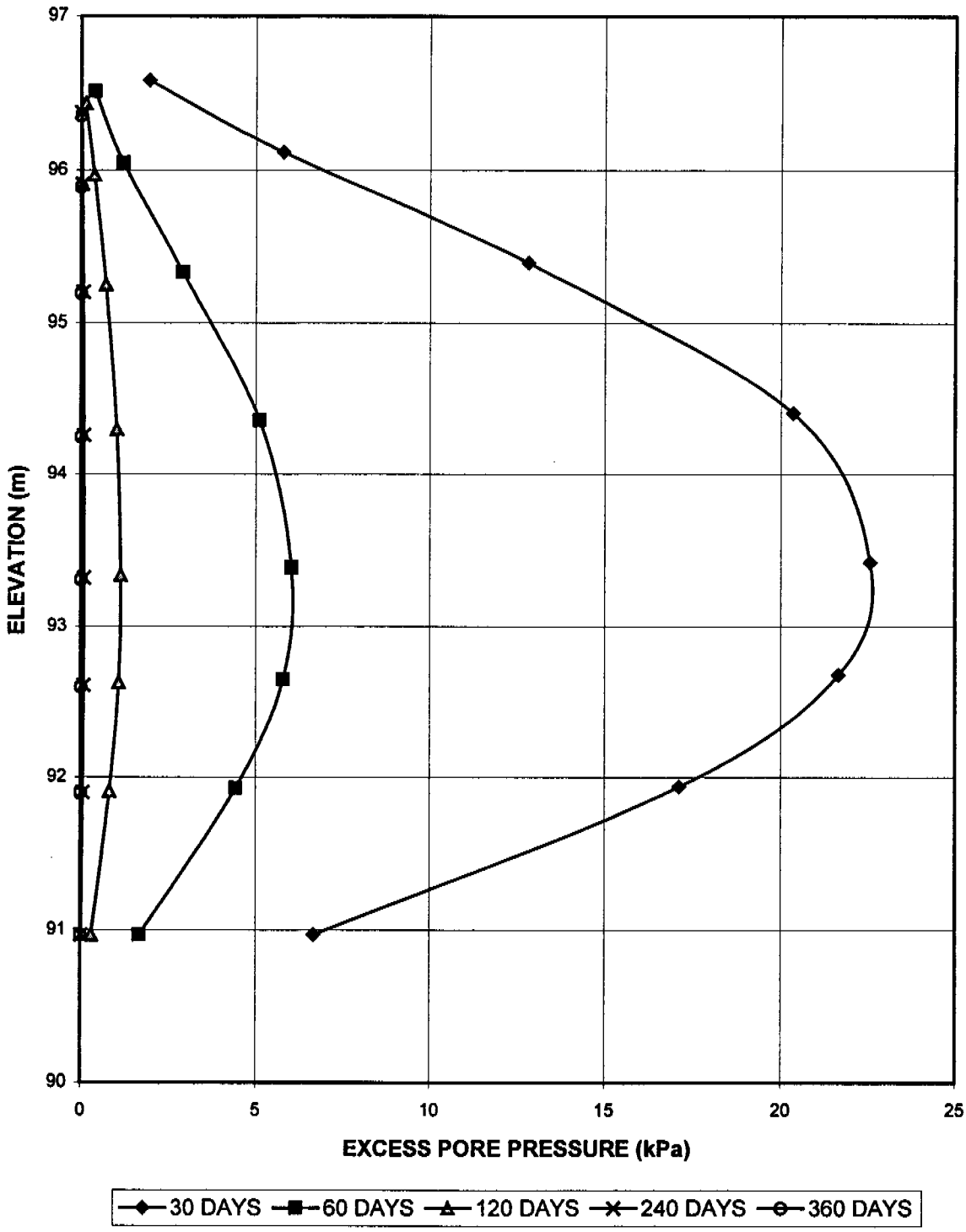
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY ST (CPTUN5)
EXCESS PORE PRESSURES - WICK DRAINS s=3.5m - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART (2)

FIGURE A19-C

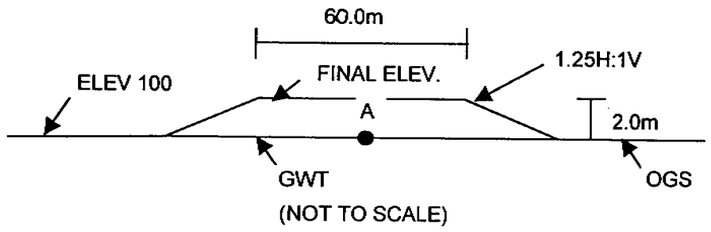
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY ST (CPTUN5)
EXCESS PORE PRESSURES - WICK DRAINS s=2.5m - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART (3)

FIGURE A19-D

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY STREET (CPTUN5)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

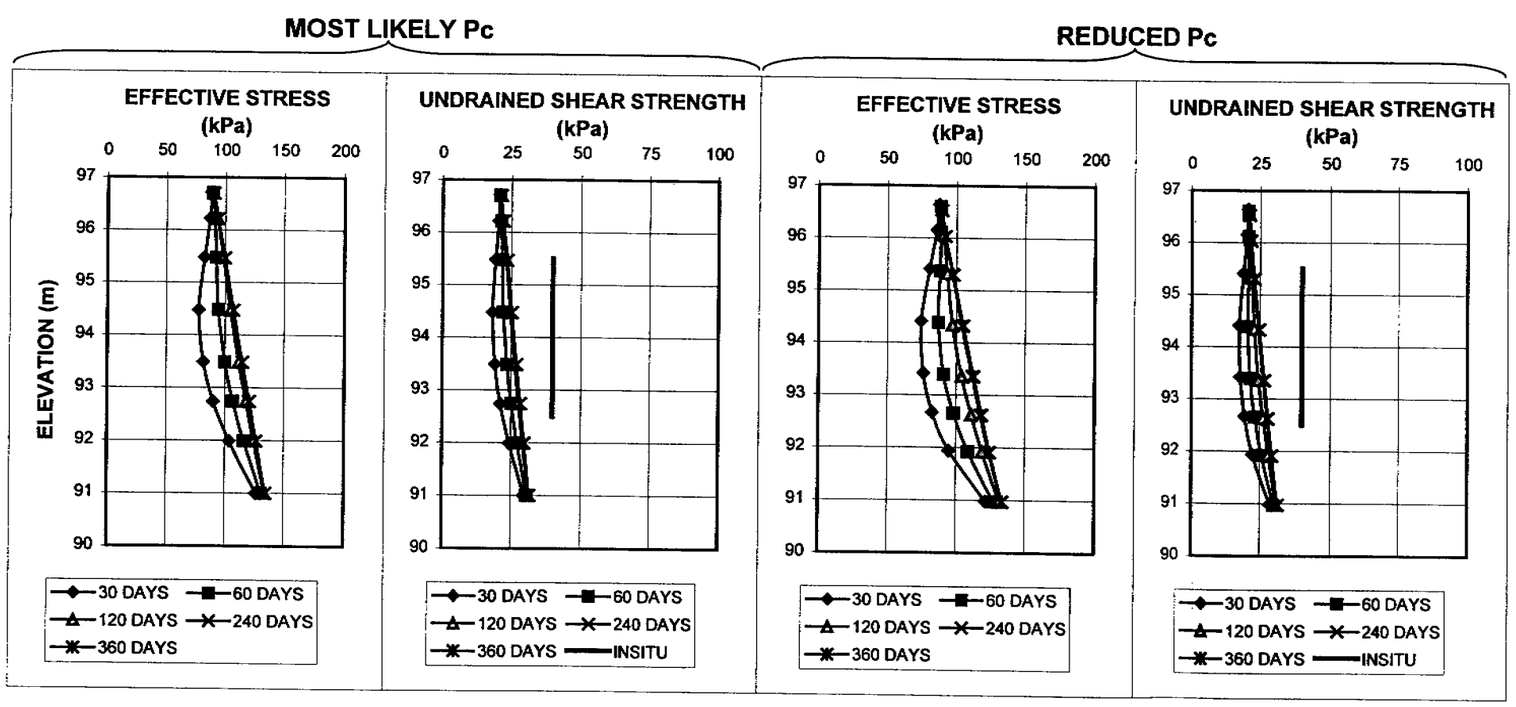


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	3	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	3	0



MASTER PLOT

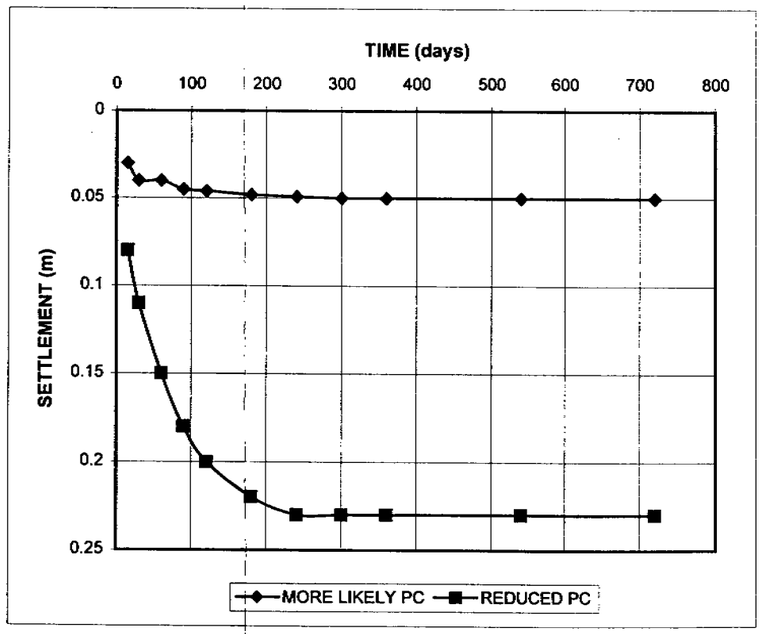
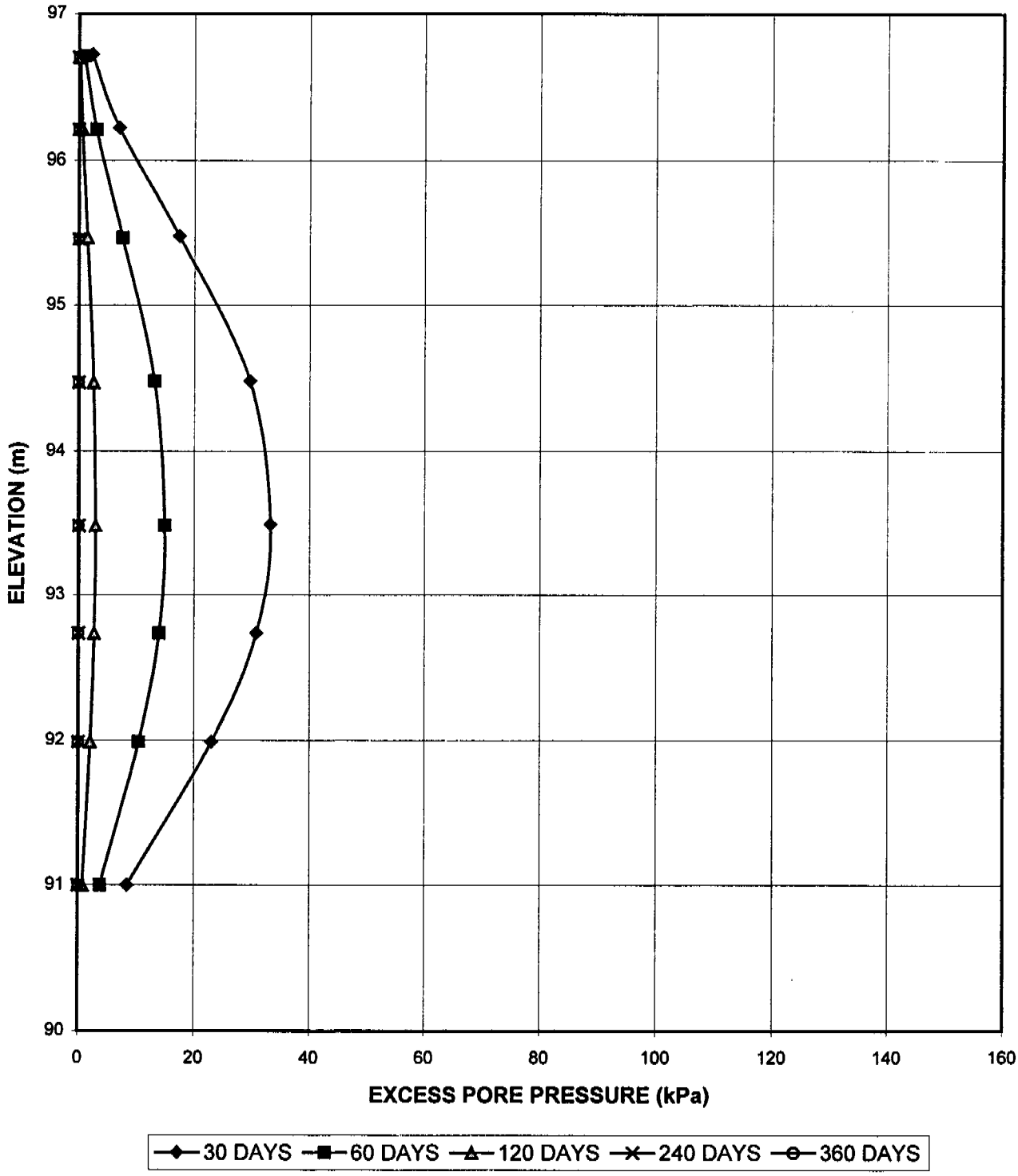


FIGURE A20

23/04/99

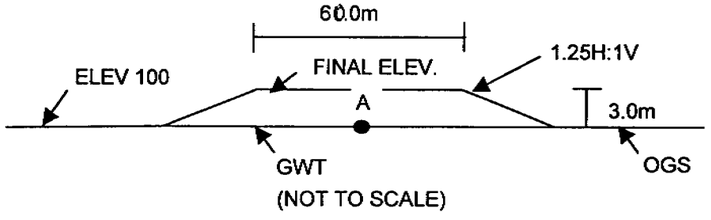
HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+045 MCCARTHY ST (CPTUN5)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A20-B

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+335, EW-N RAMP (BH11BP)
SETTLEMENTS DUE TO PRIMARY CONSOLIDATION - NO WICK DRAINS
(AT THE CENTRELINE OF THE EMBANKMENT)

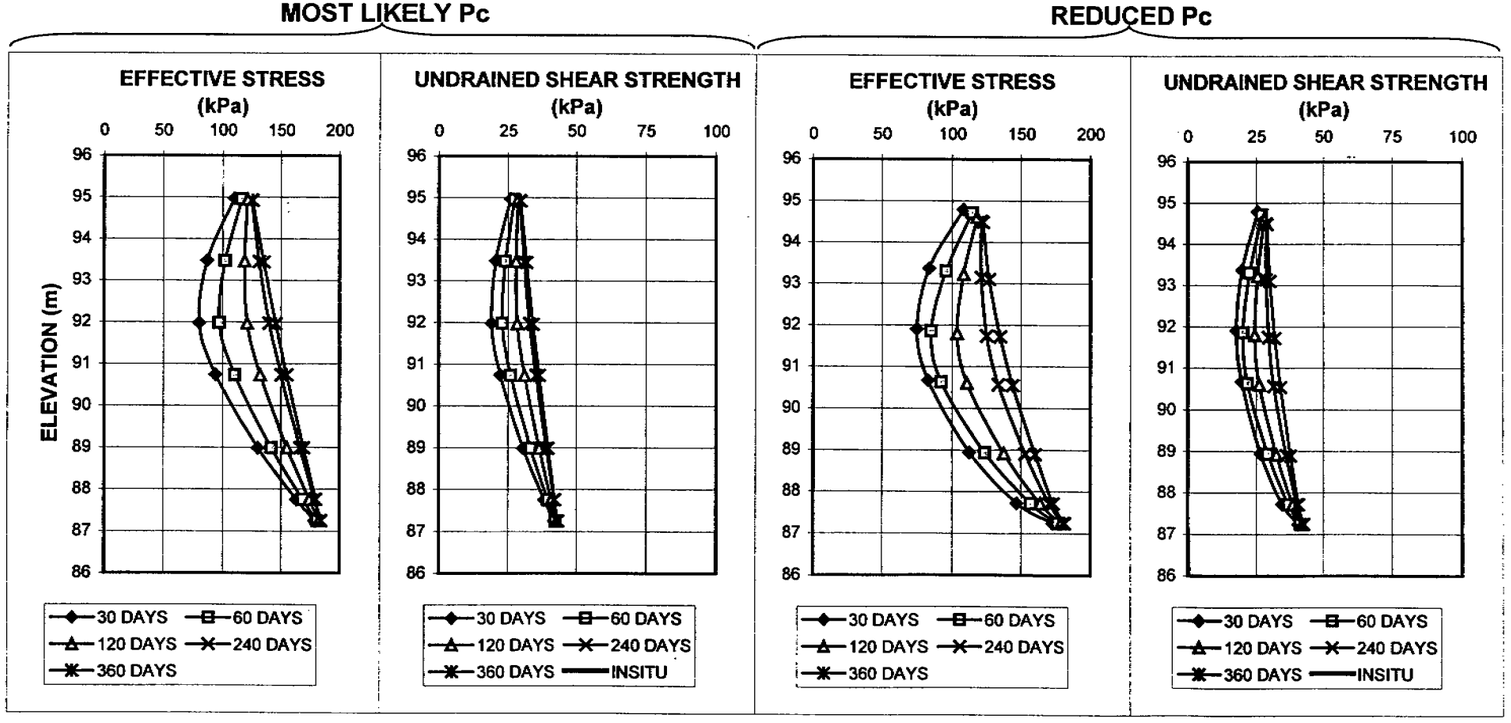


CONSTRUCTION STAGES FOR MOST LIKELY Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0

CONSTRUCTION STAGES FOR REDUCED Pc

STAGE	EMBANKMENT HEIGHT (m)	TIME (DAYS)
1	4	0



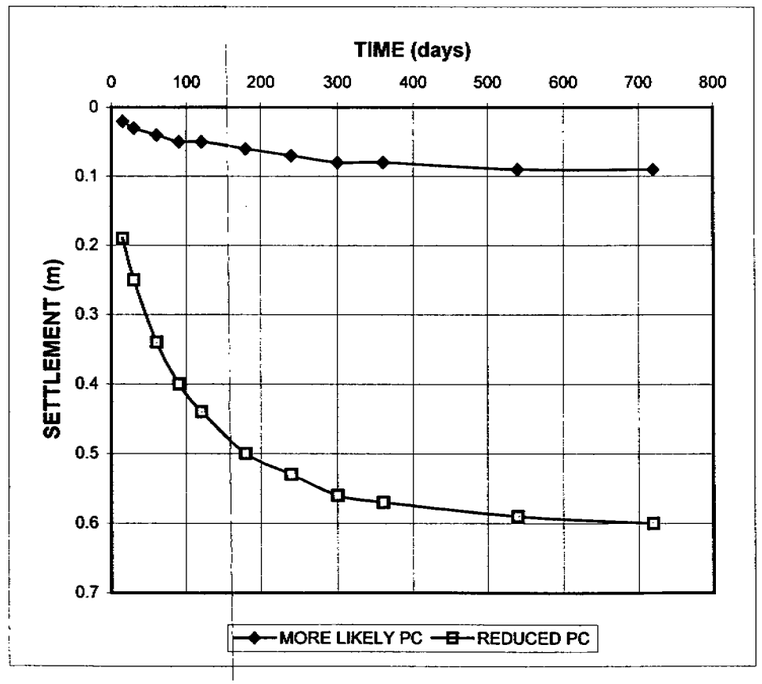
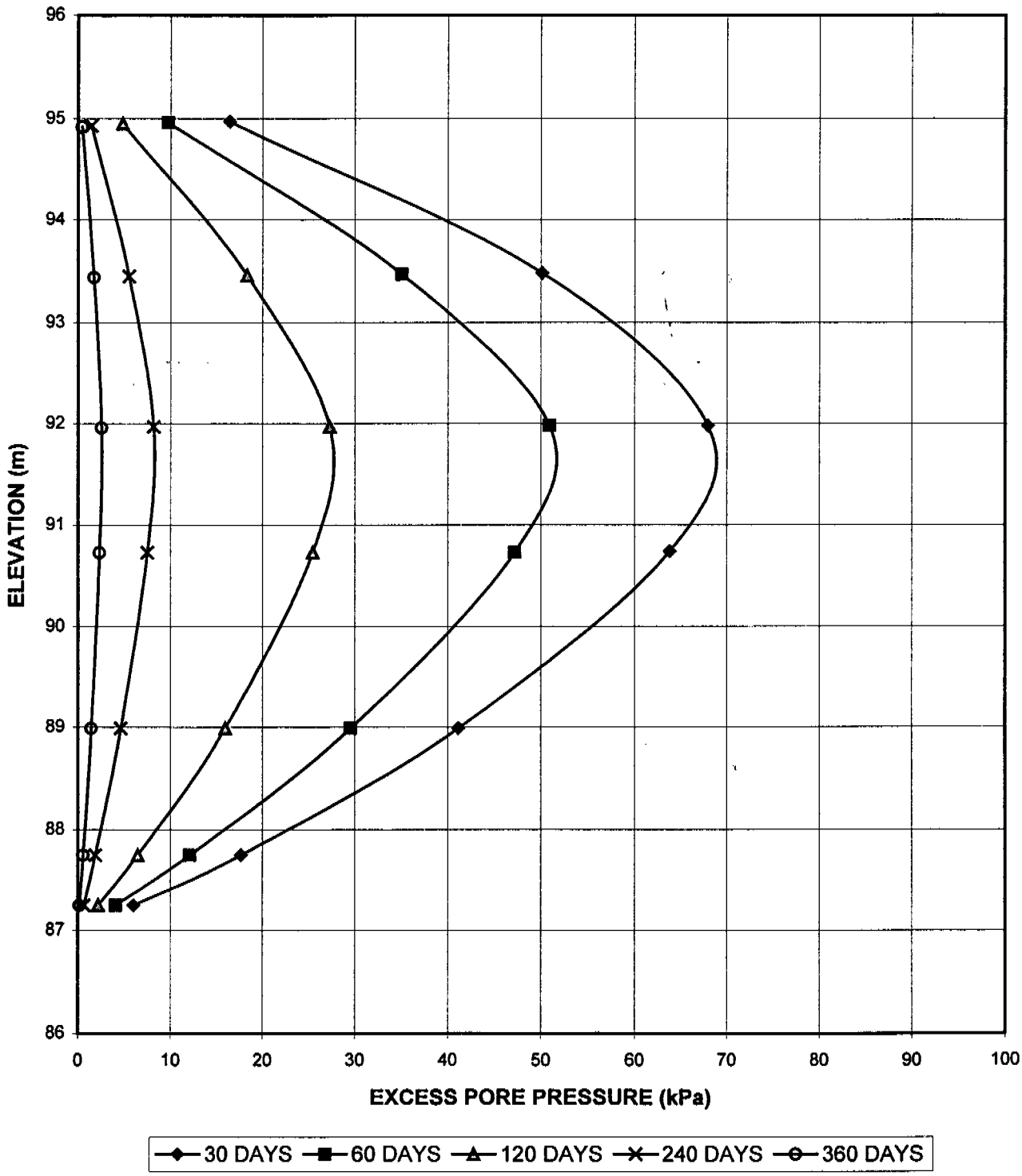


FIGURE A21

23/04/99

MASTER PLOT

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - APPROX. STATION 10+335, EW-N RAMP (BH11FP)
EXCESS PORE PRESSURES - NO WICK DRAINS - MOST LIKELY Pc
(AT THE CENTRELINE OF THE EMBANKMENT)



EPP - CHART

FIGURE A21-B

APPENDIX B

APPENDIX B

TABLES

Table B1 - Piezocone Test Locations and Depths

Piezocone No.	Coordinates		Ground Surface Elevation (m)	Maximum Testing Depth (m)
	N	E		
CPTUN1	5095283.0	315381.7	314.7	12.1
CPTUN2	5095204.2	315333.8	314.7	17.3
CPTUN3	5095204.5	315214.2	315.0	15.1
CPTUN4	5095222.5	315507.7	314.6	20.6
CPTUN5	5095315.0	315272.0	315.2	12.6

HIGHWAY 11 - TROUT CREEK BY PASS - NORTH INTERCHANGE
SOIL PROPERTIES FOR STABILITY AND SETTLEMENT ANALYSIS

Location	Soil Layer	Depth Interval		Unit Weight	Undrained Shear Strength	Friction Angle	Poisson's Ratio	Young's Modulus	Compression Ratio		Pre-Consolidation Pressure		Coeff. Of Consolidation (m2/y)				Secondary Compression Ratio
		From (m)	To (m)	(kN/m3)	(kPa)	(deg)		(MPa)	Cc/(1+eo)	Cr/(1+eo)	Most Likely (kPa)	Reduced (kPa)	Cv		Ch		
													O.C.	N.C.	O.C.	N.C.	
East Abutment and Hwy11 at and north of the bridge Sta.10+040 to10+120 CPTUN5	Rock Fill	top of fill	-0.2	20	---	42	0.3	150	N/A	---	---	---	---	---	---	---	---
	Peat	0	0.8	16	10	---	N/A	---	---	---	---	---	---	---	---	---	---
	Granular B	-0.2	0.8	20	---	32	0.3	20	---	---	---	---	---	---	---	---	---
	Sand	0.8	2.9	19	---	30	0.3	25	N/A	---	---	---	---	---	---	---	---
	Silty Clay	2.9	4	18	40	---	0.4	12	0.23	0.023	170	85	46	15	231	74	0.002
		4	6	17.5	40	---	0.45	12	0.23	0.023	170	85	28	15	142	74	0.002
		6	7.5	18	40	---	0.4	12	0.23	0.023	170	85	46	15	231	74	0.002
	Lower Silt	7.5	9.5	18	---	30	0.35	15	0.23	0.023	170	N.C.	46	15	231	74	0.002
		9.5	12	18	---	30	0.35	15	0.23	0.023	170	N.C.	634	15	3169	74	0.002
	Sand & Gravel	12	14.3	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	14.3	>14.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
East Approach: Sta.10+120-10+240 W-N Ramp(13+091-13+160) S-EW Ramp(13+630-13+540) CPTUN1	Rock Fill	top of fill	-0.3	20	---	42	0.3	150	---	---	---	---	---	---	---	---	---
	Peat	0	0.7	16	10	---	---	---	---	---	---	---	---	---	---	---	---
	Granular B	-0.3	0.7	20	---	32	0.3	20	---	---	---	---	---	---	---	---	---
	Silty Sand	0.7	2	19	---	29	0.3	25	---	---	---	---	---	---	---	---	---
	Sand	2	4	19	---	30	0.3	25	---	---	---	---	---	---	---	---	---
	Silty Clay	4	5	18	30	---	0.4	9	0.23	0.023	128	60	52	15	258	74	0.002
		5	6	17.5	30	---	0.45	9	0.23	0.023	128	60	34	15	168	74	0.002
		6	7	18	30	---	0.4	9	0.23	0.023	128	60	52	15	258	74	0.002
	Silty Clay	7	8.5	18	40	---	0.4	12	0.23	0.023	170	85	52	15	258	74	0.002
		8.5	10	18	40	---	0.4	12	0.23	0.023	170	85	284	284	1419	1419	---
	Lower Silt	10	16	19	---	30	0.35	15	---	---	---	---	---	---	---	---	---
	Sand & Gravel	14	16	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	16	>16	---	---	---	---	---	---	---	---	---	---	---	---	---	---
East Approach Sta.>10+240 CPTUN4	Rock Fill	top of fill	-0.2	20	---	42	0.3	150	---	---	---	---	---	---	---	---	---
	Granular B	-0.2	0.8	20	---	32	0.3	20	---	---							
	Peat	0	0.8	16	10	---	---	---	---	---	---	---	---	---	---	---	---
	Sandy Silt/Sand	0.8	5.5	19	---	29	0.3	25	---	---	---	---	---	---	---	---	---
	Upper Silt	5.5	8	18	---	28	0.35	22	---	---	---	---	---	---	---	---	---
	Silty Clay	8	12	17.5	30	---	0.45	9	0.23	0.023	128	N.C.	46	15	231	74	0.002
	Silty Clay	12	13.5	18	40	---	0.4	12	0.23	0.023	170	N.C.	20	15	100	74	0.002
	Lower Silt	13.5	17	18	---	30	0.35	15	0.23	0.023	170	N.C.	26	15	131	74	0.002
	Sandy Silt	17	20	18.5	---	30	0.35	20	---	---	---	---	46	15	231	74	0.002
	Silty Sand/Sand	20	23	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	23	>23	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EW-N Ramp (Sta.13+160-13+270) S-EW Ramp (13+540-13+450) CPTUN2	Rock Fill	top of fill	-0.1	20	---	42	0.3	150	---	---	---	---	---	---	---	---	---
	Peat	0	0.9	16	10	---	---	---	---	---	---	---	---	---	---	---	---
	Granular B	-0.1	0.9	20	---	32	0.3	20	---	---	---	---	---	---	---	---	---
	Sand	0.9	2.5	19	---	29	0.3	25	---	---	---	---	---	---	---	---	---
	Upper Silty Sand	2.5	4.5	19	---	30	0.3	25	---	---	---	---	---	---	---	---	---
	Silty Clay	4.5	8.5	17.5	35	---	0.45	10.5	0.23	0.023	150	75	19	15	95	74	0.002
	Silty Clay	8.5	10.5	18	35	---	0.4	10.5	0.23	0.023	150	N.C.	42	15	210	74	0.002
		10.5	12	18	50	---	0.4	15	0.23	0.023	210	N.C.	134	15	668	74	0.002
	Sandy Silt	12	19	19	---	30	0.3	20	---	---	---	---	---	---	---	---	---
	Sand & Gravel	19	20	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	20	>20	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EW-N Ramp (Sta.13+270-13+350) S-EW Ramp (Sta.13+450-13+380) CPTUN3	Rock Fill	top of fill	-0.2	20	---	42	0.3	150	---	---	---	---	---	---	---	---	---
	Peat	0	0.8	16	10	---	---	---	---	---	---	---	---	---	---	---	---
	Granular B	-0.2	0.8	20	---	32	0.3	20	---	---	---	---	---	---	---	---	---
	Silty Sand & Sand	0.8	4.5	18	---	32	0.3	25	---	---	---	---	---	---	---	---	---
	Silty Clay	4.5	8.5	17.5	30	---	0.45	9	0.23	0.023	128	N.C.	18	15	89	74	0.002
	Silty Clay	8.5	10.5	18	50	---	0.4	15	0.23	0.023	210	N.C.	42	15	210	74	0.002
	Lower Silt	10.5	11.5	19	---	30	0.35	20	0.23	0.023	210	N.C.	46	15	231	74	0.002
	Sandy Silt	11.5	15 (?)	19	---	32	0.3	20	---	---	---	---	715	715	3574	3574	---
	Sand & Gravel	15 (?)	18 (?)	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	18 (?)	>18 (?)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EW-N Ramp (Sta.13+350-13+458) S-EW Ramp (Sta.13+380-13+125) Hwy 11 (south of bridge) BH-11BP	Rock Fill	top of fill	-0.2	20	---	42	0.3	150	---	---	---	---	---	---	---	---	---
	Peat	0	0.8	16	10	---	---	---	---	---	---	---	---	---	---	---	---
	Granular B	-0.2	0.8	20	---	32	0.3	20	---	---	---	---	---	---	---	---	---
	Silty Sand & Sand	0.8	4.5	18	---	32	0.3	25	---	---	---	---	---	---	---	---	---
	Silty Clay	4.5	8.5	17.5	30	---	0.45	9	0.23	0.023	128	N.C.	18	15	89	74	0.002
	Silty Clay	8.5	12	18	30	---	0.4	15	0.23	0.023	210	N.C.	42	15	210	74	0.002
	Lower Silt	12	13	19	---	30	0.35	20	0.23	0.023	210	N.C.	46	15	231	74	0.002
	Sandy Silt	13	14	19	---	32	0.3	20	---	---	---	---	715	715	3574	3574	---
	Sand & Gravel	14	16 (?)	21	---	35	0.3	30	---	---	---	---	---	---	---	---	---
	Bedrock	16 (?)	>16 (?)	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

O.C.: Over Consolidated Soil
N.C.: Normally Consolidated Soil

HIGHWAY 11 - TROUT CREEK BY PASS - NORTH INTERCHANGE
SUMMARY OF STABILITY ANALYSIS

Location	Design Height (m)	Target Height (m)	Berm Height (m)	Berm Width (m)	Height at this Stage (m)	Height at Previous Stage (m)	EPP dissipation before this stage	Factor of Safety	Reference Figure
East Abutment	10.5	12	4.5	11	12	0	0%	1.33	
McCarthy St.				9	11.5	0	0%	1.30	A7
CPTUN5					12	11.5	100%	1.36	
BH-3BF					12	11.5	75%	1.29	A8
Head Slope @ 1.25H:1V	10.5	12	0	0	12	0	0%	<1.3	
East Approach	8	9.5	2	12	9.5	0	0%	1.28	
to Bridge				11	9	0	0%	1.33	
McCarthy St.					9.5	9	100%	1.41	
E-W and S-EW Ramps					9.5	9	75%	1.33	
CPTUN1					9.5	9	50%	1.28	
				9	8.8	0	0%	1.31	A9
					9.5	8.8	100%	1.36	
					9.5	8.8	75%	1.29	A10
					9.5	8.8	50%	1.24	
				8	8	0	0%	1.33	
					9.5	8	100%	1.33	
McCarthy St. transition	7	8.5	1	11	8.5	0	0%	1.35	
to high emb./BH-3BP				8	8.5	0	0%	1.32	
McC.H<6m/BH-3BP/4BP	6	7.5	0	0	7.5	0	0%	1.30	
EW-N and S-EW Ramps	7	8.5	1	11	8.5	0	0%	1.31	
CPTUN2				9	8.5	0	0%	1.28	

Note: EPP - Excess Pore Pressure

TABLE B3

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Abutment Sta. 10+040 to 10+120 - CPTUN5
Most Likely Pre-Consolidation Pressures -30 m wide embankment top

Initial Fill Height (m)	9 m	10 m	11 m	12 m	13 m	14 m
Immediate Settlement (mm)	84 mm	94 mm	103 mm	113 mm	122 mm	131 mm
Primary Consol. Settl.(mm)	279 mm	333 mm	384 mm	431 mm	475 mm	516 mm
Total Settlement (mm) (*)	363 mm	427 mm	487 mm	544 mm	597 mm	647 mm
Final Height above O.G.S. (m)	8.637 m	9.573 m	10.513 m	11.456 m	12.403 m	13.353 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	28.9	165	8.835	190	9.810	214	10.786	238	11.762	259	12.741	280	13.720
30	1.00	41	198	8.802	231	9.769	260	10.740	290	11.710	317	12.683	343	13.657
60	2.00	60.2	252	8.748	294	9.706	334	10.666	372	11.628	408	12.592	442	13.558
90	3.00	69.9	279	8.721	327	9.673	371	10.629	414	11.586	454	12.546	492	13.508
120	4.00	79.5	306	8.694	359	9.641	408	10.592	456	11.544	500	12.500	541	13.459
180	6.00	89.2	333	8.667	391	9.609	446	10.554	497	11.503	546	12.454	591	13.409
240	8.00	94	346	8.654	407	9.593	464	10.536	518	11.482	569	12.432	616	13.384
300	10.00	96.4	353	8.647	415	9.585	473	10.527	528	11.472	580	12.420	628	13.372
360	12.00	97.6	356	8.644	419	9.581	478	10.522	534	11.466	586	12.414	635	13.365
540	18.00	98.8	360	8.640	423	9.577	482	10.518	539	11.461	591	12.409	641	13.359
720	24.00	100	363	8.637	427	9.573	487	10.513	544	11.456	597	12.403	647	13.353

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	9	10	11	12	13	14
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
8.637	> 24.00	> 4.00	> 2.00	> 1.00	> 1.00	> 1.00
9.573		> 24.00	> 4.00	> 3.00	> 2.00	> 1.00
10.513			> 24.00	> 4.00	> 3.00	> 2.00
11.456				> 24.00	> 4.00	> 4.00
12.403					> 24.00	> 6.00
13.353						> 24.00

TABLE B4

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Abutment Sta. 10+040 to 10+120 - CPTUN5
Reduced Pre-Consolidation Pressures -30 m wide embankment top

Initial Fill Height (m)	9 m	10 m	11 m	12 m	13 m	14 m
Immediate Settlement (mm)	84 mm	94 mm	103 mm	113 mm	122 mm	131 mm
Primary Consol. Settl.(mm)	690 mm	745 mm	795 mm	842 mm	886 mm	927 mm
Total Settlement (mm) (*)	774 mm	839 mm	898 mm	955 mm	1008 mm	1058 mm
Final Height above O.G.S. (m)	8.226 m	9.161 m	10.102 m	11.045 m	11.992 m	12.942 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	28.9	283	8.717	309	9.691	333	10.667	356	11.644	378	12.622	399	13.601
30	1.00	41	367	8.633	399	9.601	429	10.571	458	11.542	485	12.515	511	13.489
60	2.00	60.2	499	8.501	542	9.458	582	10.418	620	11.380	655	12.345	689	13.311
90	3.00	69.9	566	8.434	615	9.385	659	10.341	702	11.298	741	12.259	779	13.221
120	4.00	79.5	633	8.367	686	9.314	735	10.265	782	11.218	826	12.174	868	13.132
180	6.00	89.2	699	8.301	759	9.241	812	10.188	864	11.136	912	12.088	958	13.042
240	8.00	94	733	8.267	794	9.206	850	10.150	904	11.096	955	12.045	1002	12.998
300	10.00	96.4	749	8.251	812	9.188	869	10.131	925	11.075	976	12.024	1025	12.975
360	12.00	97.6	757	8.243	821	9.179	879	10.121	935	11.065	987	12.013	1036	12.964
540	18.00	98.8	766	8.234	830	9.170	888	10.112	945	11.055	997	12.003	1047	12.953
720	24.00	100	774	8.226	839	9.161	898	10.102	955	11.045	1008	11.992	1058	12.942

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	9	10	11	12	13	14
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
8.226	> 24.00	> 6.00	> 4.00	> 3.00	> 3.00	> 2.00
9.161		> 24.00	> 6.00	> 4.00	> 4.00	> 3.00
10.102			> 24.00	> 6.00	> 4.00	> 4.00
11.045				> 24.00	> 8.00	> 4.00
11.992					> 24.00	> 8.00
12.942						> 24.00

TABLE B5

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
Highway 11 North of Bridge - CPTUN5
Most Likely Pre-Consolidation Pressures - 60 m wide embankment top

Initial Fill Height (m)	2 m	3 m	4 m	5 m	5 m	5 m
Immediate Settlement (mm)	19 mm	29 mm	38 mm	48 mm	48 mm	48 mm
Primary Consol. Settl.(mm)	39 mm	52 mm	63 mm	72 mm	72 mm	72 mm
Total Settlement (mm) (*)	58 mm	81 mm	101 mm	120 mm	120 mm	120 mm
Final Height above O.G.S. (m)	1.942 m	2.919 m	3.899 m	4.88 m	4.88 m	4.88 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	28.9	30	1.970	44	2.956	56	3.944	69	4.931	69	4.931	69	4.931
30	1.00	41	35	1.965	50	2.950	64	3.936	78	4.922	78	4.922	78	4.922
60	2.00	60.2	42	1.958	60	2.940	76	3.924	91	4.909	91	4.909	91	4.909
90	3.00	69.9	46	1.954	65	2.935	82	3.918	98	4.902	98	4.902	98	4.902
120	4.00	79.5	50	1.950	70	2.930	88	3.912	105	4.895	105	4.895	105	4.895
180	6.00	89.2	54	1.946	75	2.925	94	3.906	112	4.888	112	4.888	112	4.888
240	8.00	94	56	1.944	78	2.922	97	3.903	116	4.884	116	4.884	116	4.884
300	10.00	96.4	57	1.943	79	2.921	99	3.901	117	4.883	117	4.883	117	4.883
360	12.00	97.6	57	1.943	80	2.920	99	3.901	118	4.882	118	4.882	118	4.882
540	18.00	98.8	58	1.942	80	2.920	100	3.900	119	4.881	119	4.881	119	4.881
720	24.00	100	58	1.942	81	2.919	101	3.899	120	4.880	120	4.880	120	4.880

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) →	2	3	4	5	5	5
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
1.942	> 24.00	> 1.00	> 0.50	#N/A	#N/A	#N/A
2.919		> 24.00	> 2.00	> 1.00	> 1.00	> 1.00
3.899			> 24.00	> 3.00	> 3.00	> 3.00
4.88				> 24.00	> 24.00	> 24.00
4.88					> 24.00	> 24.00
4.88						> 24.00

TABLE B6

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
Highway 11 North of Bridge - CPTUN5
Reduced Pre-Consolidation Pressures - 60 m wide embankment top

Initial Fill Height (m)	2 m	3 m	4 m	5 m	5 m	5 m
Immediate Settlement (mm)	19 mm	29 mm	38 mm	48 mm	48 mm	48 mm
Primary Consol. Settl.(mm)	103 mm	213 mm	322 mm	416 mm	416 mm	416 mm
Total Settlement (mm) (*)	122 mm	242 mm	360 mm	464 mm	464 mm	464 mm
Final Height above O.G.S. (m)	1.878 m	2.758 m	3.64 m	4.536 m	4.536 m	4.536 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	28.9	49	1.951	91	2.909	131	3.869	168	4.832	168	4.832	168	4.832
30	1.00	41	61	1.939	116	2.884	170	3.830	219	4.781	219	4.781	219	4.781
60	2.00	60.2	81	1.919	157	2.843	232	3.768	298	4.702	298	4.702	298	4.702
90	3.00	69.9	91	1.909	178	2.822	263	3.737	339	4.661	339	4.661	339	4.661
120	4.00	79.5	101	1.899	198	2.802	294	3.706	379	4.621	379	4.621	379	4.621
180	6.00	89.2	111	1.889	219	2.781	325	3.675	419	4.581	419	4.581	419	4.581
240	8.00	94	116	1.884	229	2.771	341	3.659	439	4.561	439	4.561	439	4.561
300	10.00	96.4	118	1.882	234	2.766	348	3.652	449	4.551	449	4.551	449	4.551
360	12.00	97.6	120	1.880	237	2.763	352	3.648	454	4.546	454	4.546	454	4.546
540	18.00	98.8	121	1.879	239	2.761	356	3.644	459	4.541	459	4.541	459	4.541
720	24.00	100	122	1.878	242	2.758	360	3.640	464	4.536	464	4.536	464	4.536

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	2	3	4	5	5	5
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
1.878	> 24.00	> 1.00	#N/A	#N/A	#N/A	#N/A
2.758		> 24.00	> 2.00	> 1.00	> 1.00	> 1.00
3.64			> 24.00	> 3.00	> 3.00	> 3.00
4.536				> 24.00	> 24.00	> 24.00
4.536					> 24.00	> 24.00
4.536						> 24.00

TABLE B7

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Approach - Sta.10+120 to 10+240 - CPTUN1
Most Likely Pre-Consolidation Pressures - 40 m wide embankment top

Initial Fill Height (m)	6 m	7 m	8 m	9 m	10 m	11 m
Immediate Settlement (mm)	77 mm	90 mm	104 mm	117 mm	130 mm	143 mm
Primary Consol. Settl.(mm)	169 mm	232 mm	290 mm	342 mm	390 mm	435 mm
Total Settlement (mm) (*)	246 mm	322 mm	394 mm	459 mm	520 mm	578 mm
Final Height above O.G.S. (m)	5.754 m	6.678 m	7.606 m	8.541 m	9.48 m	10.422 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	34.4	135	5.865	170	6.830	204	7.796	235	8.765	264	9.736	293	10.707
30	1.00	53.1	167	5.833	213	6.787	258	7.742	299	8.701	337	9.663	374	10.626
60	2.00	68.8	193	5.807	250	6.750	304	7.696	352	8.648	398	9.602	442	10.558
90	3.00	84.4	220	5.780	286	6.714	349	7.651	406	8.594	459	9.541	510	10.490
120	4.00	90.6	230	5.770	300	6.700	367	7.633	427	8.573	483	9.517	537	10.463
180	6.00	96.9	241	5.759	315	6.685	385	7.615	448	8.552	508	9.492	565	10.435
240	8.00	98.1	243	5.757	318	6.682	388	7.612	453	8.547	513	9.487	570	10.430
300	10.00	99.1	244	5.756	320	6.680	391	7.609	456	8.544	516	9.484	574	10.426
360	12.00	99.7	245	5.755	321	6.679	393	7.607	458	8.542	519	9.481	577	10.423
540	18.00	100	246	5.754	322	6.678	394	7.606	459	8.541	520	9.480	578	10.422
720	24.00	100	246	5.754	322	6.678	394	7.606	459	8.541	520	9.480	578	10.422

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	6	7	8	9	10	11
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
5.754	> 24.00	> 1.00	> 0.50	> 0.50	#N/A	#N/A
6.678		> 24.00	> 2.00	> 1.00	> 0.50	> 0.50
7.606			> 24.00	> 2.00	> 1.00	> 1.00
8.541				> 24.00	> 2.00	> 2.00
9.48					> 24.00	> 3.00
10.422						> 24.00

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Approach - Sta.10+120 to 10+240 - CPTUN1
Reduced Pre-Consolidation Pressures - 40 m wide embankment top

Initial Fill Height (m)	6 m	7 m	8 m	9 m	10 m	11 m
Immediate Settlement (mm)	77 mm	90 mm	104 mm	117 mm	130 mm	143 mm
Primary Consol. Settl.(mm)	560 mm	624 mm	681 mm	734 mm	781 mm	826 mm
Total Settlement (mm) (*)	637 mm	714 mm	785 mm	851 mm	911 mm	969 mm
Final Height above O.G.S. (m)	5.363 m	6.286 m	7.215 m	8.149 m	9.089 m	10.031 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	34.4	270	5.730	305	6.695	338	7.662	369	8.631	399	9.601	427	10.573
30	1.00	53.1	374	5.626	421	6.579	466	7.534	507	8.493	545	9.455	582	10.418
60	2.00	68.8	462	5.538	519	6.481	573	7.427	622	8.378	667	9.333	711	10.289
90	3.00	84.4	550	5.450	617	6.383	679	7.321	736	8.264	789	9.211	840	10.160
120	4.00	90.6	584	5.416	655	6.345	721	7.279	782	8.218	838	9.162	891	10.109
180	6.00	96.9	620	5.380	695	6.305	764	7.236	828	8.172	887	9.113	943	10.057
240	8.00	98.1	626	5.374	702	6.298	772	7.228	837	8.163	896	9.104	953	10.047
300	10.00	99.1	632	5.368	708	6.292	779	7.221	844	8.156	904	9.096	962	10.038
360	12.00	99.7	635	5.365	712	6.288	783	7.217	849	8.151	909	9.091	967	10.033
540	18.00	100	637	5.363	714	6.286	785	7.215	851	8.149	911	9.089	969	10.031
720	24.00	100	637	5.363	714	6.286	785	7.215	851	8.149	911	9.089	969	10.031

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	6	7	8	9	10	11
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
5.363	> 24.00	> 3.00	> 2.00	> 2.00	> 1.00	> 1.00
6.286		> 24.00	> 3.00	> 2.00	> 2.00	> 2.00
7.215			> 24.00	> 4.00	> 2.00	> 2.00
8.149				> 24.00	> 4.00	> 3.00
9.089					> 24.00	> 4.00
10.031						> 24.00

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Approach - Sta.>10+240 - CPTUN4
Most Likely Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	3 m	4 m	5 m	6 m	7 m	8 m
Immediate Settlement (mm)	39 mm	53 mm	66 mm	80 mm	93 mm	107 mm
Primary Consol. Settl.(mm)	87 mm	179 mm	270 mm	354 mm	430 mm	501 mm
Total Settlement (mm) (*)	126 mm	232 mm	336 mm	434 mm	523 mm	608 mm
Final Height above O.G.S. (m)	2.874 m	3.768 m	4.664 m	5.566 m	6.477 m	7.392 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	21.3	58	2.942	91	3.909	124	4.876	155	5.845	185	6.815	214	7.786		
30	1.00	31.9	67	2.933	110	3.890	152	4.848	193	5.807	230	6.770	267	7.733		
60	2.00	44.7	78	2.922	133	3.867	187	4.813	238	5.762	285	6.715	331	7.669		
90	3.00	55.3	87	2.913	152	3.848	215	4.785	276	5.724	331	6.669	384	7.616		
120	4.00	63.8	95	2.905	167	3.833	238	4.762	306	5.694	367	6.633	427	7.573		
180	6.00	74.5	104	2.896	186	3.814	267	4.733	344	5.656	413	6.587	480	7.520		
240	8.00	83	111	2.889	202	3.798	290	4.710	374	5.626	450	6.550	523	7.477		
300	10.00	89.4	117	2.883	213	3.787	307	4.693	396	5.604	477	6.523	555	7.445		
360	12.00	91.5	119	2.881	217	3.783	313	4.687	404	5.596	486	6.514	565	7.435		
540	18.00	97.9	124	2.876	228	3.772	330	4.670	427	5.573	514	6.486	597	7.403		
720	24.00	98.7	125	2.875	230	3.770	332	4.668	429	5.571	517	6.483	601	7.399		

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	3	4	5	6	7	8
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
2.874	> maximum time above	> 1.00	> 0.50	#N/A	#N/A	#N/A
3.768		> maximum time above	> 3.00	> 1.00	> 1.00	> 0.50
4.664			> maximum time above	> 4.00	> 3.00	> 2.00
5.566				> maximum time above	> 6.00	> 4.00
6.477					> maximum time above	> 8.00
7.392						> maximum time above

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
East Approach - Sta.>10+240 - CPTUN4
Reduced Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	3 m	4 m	5 m	6 m	7 m	8 m
Immediate Settlement (mm)	39 mm	53 mm	66 mm	80 mm	93 mm	107 mm
Primary Consol. Settl.(mm)	382 mm	482 mm	573 mm	656 mm	733 mm	804 mm
Total Settlement (mm) (*)	421 mm	535 mm	639 mm	736 mm	826 mm	911 mm
Final Height above O.G.S. (m)	2.579 m	3.465 m	4.361 m	5.264 m	6.174 m	7.089 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	21.3	120	2.880	156	3.844	188	4.812	220	5.780	249	6.751	278	7.722
30	1.00	31.9	161	2.839	207	3.793	249	4.751	289	5.711	327	6.673	363	7.637
60	2.00	44.7	210	2.790	268	3.732	322	4.678	373	5.627	421	6.579	466	7.534
90	3.00	55.3	250	2.750	320	3.680	383	4.617	443	5.557	498	6.502	552	7.448
120	4.00	63.8	283	2.717	361	3.639	432	4.568	499	5.501	561	6.439	620	7.380
180	6.00	74.5	324	2.676	412	3.588	493	4.507	569	5.431	639	6.361	706	7.294
240	8.00	83	356	2.644	453	3.547	542	4.458	624	5.376	701	6.299	774	7.226
300	10.00	89.4	381	2.619	484	3.516	578	4.422	666	5.334	748	6.252	826	7.174
360	12.00	91.5	389	2.611	494	3.506	590	4.410	680	5.320	764	6.236	843	7.157
540	18.00	97.9	413	2.587	525	3.475	627	4.373	722	5.278	811	6.189	894	7.106
720	24.00	98.7	416	2.584	529	3.471	632	4.368	727	5.273	816	6.184	901	7.099

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	3	4	5	6	7	8
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
2.579	> maximum time above	> 6.00	> 3.00	> 2.00	> 2.00	> 1.00
3.465		> maximum time above	> 6.00	> 4.00	> 3.00	> 2.00
4.361			> maximum time above	> 8.00	> 4.00	> 4.00
5.264				> maximum time above	> 8.00	> 6.00
6.174					> maximum time above	> 10.00
7.089						> maximum time above

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N & SW Ramps - Sta.13+160 to 13+270 - CPTUN2
Most Likely Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	5 m	6 m	7 m	8 m	9 m	10 m
Immediate Settlement (mm)	61 mm	74 mm	87 mm	99 mm	112 mm	125 mm
Primary Consol. Settl.(mm)	107 mm	177 mm	250 mm	318 mm	381 mm	439 mm
Total Settlement (mm) (*)	168 mm	251 mm	337 mm	417 mm	493 mm	564 mm
Final Height above O.G.S. (m)	4.832 m	5.749 m	6.663 m	7.583 m	8.507 m	9.436 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	21	83	4.917	111	5.889	140	6.861	166	7.834	192	8.808	217	9.783
30	1.00	31.6	95	4.905	130	5.870	166	6.834	199	7.801	232	8.768	264	9.736
60	2.00	50	115	4.886	163	5.838	212	6.788	258	7.742	303	8.698	345	9.656
90	3.00	65.8	131	4.869	190	5.810	252	6.749	308	7.692	363	8.637	414	9.586
120	4.00	76.3	143	4.857	209	5.791	278	6.722	342	7.658	403	8.597	460	9.540
180	6.00	86.8	154	4.846	228	5.772	304	6.696	375	7.625	443	8.557	506	9.494
240	8.00	92.1	160	4.840	237	5.763	317	6.683	392	7.608	463	8.537	529	9.471
300	10.00	94.7	162	4.838	242	5.758	324	6.676	400	7.600	473	8.527	541	9.459
360	12.00	96.1	164	4.836	244	5.756	327	6.673	405	7.595	478	8.522	547	9.453
540	18.00	97.4	165	4.835	246	5.754	331	6.670	409	7.591	483	8.517	553	9.447
720	24.00	98.4	166	4.834	248	5.752	333	6.667	412	7.588	487	8.513	557	9.443

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	5	6	7	8	9	10
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
4.832	> maximum time above	> 2.00	> 1.00	> 0.50	#N/A	#N/A
5.749		> maximum time above	> 2.00	> 1.00	> 1.00	> 0.50
6.663			> maximum time above	> 3.00	> 2.00	> 1.00
7.583				> maximum time above	> 4.00	> 3.00
8.507					> maximum time above	> 4.00
9.436						> maximum time above

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N & SW Ramps - Sta.13+160 to 13+270 - CPTUN2
Reduced Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	5 m	6 m	7 m	8 m	9 m	10 m
Immediate Settlement (mm)	61 mm	74 mm	87 mm	99 mm	112 mm	125 mm
Primary Consol. Settl.(mm)	561 mm	644 mm	719 mm	788 mm	851 mm	909 mm
Total Settlement (mm) (*)	622 mm	718 mm	806 mm	887 mm	963 mm	1034 mm
Final Height above O.G.S. (m)	4.378 m	5.282 m	6.194 m	7.113 m	8.037 m	8.966 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	31.8	239	4.761	279	5.721	316	6.684	350	7.650	383	8.617	414	9.586
30	1.00	44.7	312	4.688	362	5.638	408	6.592	451	7.549	492	8.508	531	9.469
60	2.00	61.2	404	4.596	468	5.532	527	6.473	581	7.419	633	8.367	681	9.319
90	3.00	71.8	464	4.536	536	5.464	603	6.397	665	7.335	723	8.277	778	9.222
120	4.00	78.8	503	4.497	581	5.419	654	6.346	720	7.280	783	8.217	841	9.159
180	6.00	87	549	4.451	634	5.366	713	6.287	785	7.215	852	8.148	916	9.084
240	8.00	91.8	576	4.424	665	5.335	747	6.253	822	7.178	893	8.107	959	9.041
300	10.00	94.1	589	4.411	680	5.320	764	6.236	841	7.159	913	8.087	980	9.020
360	12.00	95.3	596	4.404	688	5.312	772	6.228	850	7.150	923	8.077	991	9.009
540	18.00	97.1	606	4.394	699	5.301	785	6.215	864	7.136	938	8.062	1008	8.992
720	24.00	97.7	609	4.391	703	5.297	789	6.211	869	7.131	943	8.057	1013	8.987

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	5	6	7	8	9	10
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
4.378	> maximum time above	> 4.00	> 3.00	> 2.00	> 1.00	> 1.00
5.282		> maximum time above	> 6.00	> 3.00	> 2.00	> 2.00
6.194			> maximum time above	> 6.00	> 4.00	> 3.00
7.113				> maximum time above	> 6.00	> 4.00
8.037					> maximum time above	> 8.00
8.966						> maximum time above

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N & SW Ramps - Sta.13+270 to 13+350 - CPTUN3
Most Likely Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	3 m	4 m	5 m	6 m	7 m	7 m
Immediate Settlement (mm)	31 mm	42 mm	52 mm	63 mm	74 mm	74 mm
Primary Consol. Settl.(mm)	46 mm	70 mm	124 mm	177 mm	228 mm	228 mm
Total Settlement (mm) (*)	77 mm	112 mm	176 mm	240 mm	302 mm	302 mm
Final Height above O.G.S. (m)	2.923 m	3.888 m	4.824 m	5.76 m	6.698 m	6.698 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	18.8	40	2.960	55	3.945	75	4.925	96	5.904	117	6.883	117	6.883
30	1.00	25	43	2.958	60	3.941	83	4.917	107	5.893	131	6.869	131	6.869
60	2.00	37.5	48	2.952	68	3.932	99	4.902	129	5.871	160	6.841	160	6.841
90	3.00	56.3	57	2.943	81	3.919	122	4.878	163	5.837	202	6.798	202	6.798
120	4.00	75	66	2.935	95	3.906	145	4.855	196	5.804	245	6.755	245	6.755
180	6.00	87.5	71	2.929	103	3.897	161	4.840	218	5.782	274	6.727	274	6.727
240	8.00	90.6	73	2.927	105	3.895	164	4.836	223	5.777	281	6.719	281	6.719
300	10.00	93.8	74	2.926	108	3.892	168	4.832	229	5.771	288	6.712	288	6.712
360	12.00	96.9	76	2.924	110	3.890	172	4.828	235	5.765	295	6.705	295	6.705
540	18.00	98.8	76	2.924	111	3.889	175	4.825	238	5.762	299	6.701	299	6.701
720	24.00	100	77	2.923	112	3.888	176	4.824	240	5.760	302	6.698	302	6.698

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) →	3	4	5	6	7	7
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
2.923	> 24.00	> 2.00	> 0.50	#N/A	#N/A	#N/A
3.888		> 24.00	> 2.00	> 1.00	#N/A	#N/A
4.824			> 24.00	> 3.00	> 2.00	> 2.00
5.76				> 24.00	> 3.00	> 3.00
6.698					> 24.00	> 24.00
6.698						> 24.00

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N & SW Ramps - Sta.13+270 to 13+350 - CPTUN3
Reduced Pre-Consolidation Pressures - 30 m wide embankment top

Initial Fill Height (m)	3 m	4 m	5 m	6 m	7 m	7 m
Immediate Settlement (mm)	31 mm	42 mm	52 mm	63 mm	74 mm	74 mm
Primary Consol. Settl. (mm)	463 mm	568 mm	659 mm	740 mm	813 mm	813 mm
Total Settlement (mm) (*)	494 mm	610 mm	711 mm	803 mm	887 mm	887 mm
Final Height above O.G.S. (m)	2.506 m	3.39 m	4.289 m	5.197 m	6.113 m	6.113 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	35.8	197	2.803	245	3.755	288	4.712	328	5.672	365	6.635	365	6.635
30	1.00	49.3	259	2.741	322	3.678	377	4.623	428	5.572	475	6.525	475	6.525
60	2.00	64.2	328	2.672	407	3.593	475	4.525	538	5.462	596	6.404	596	6.404
90	3.00	73.1	369	2.631	457	3.543	534	4.466	604	5.396	668	6.332	668	6.332
120	4.00	79.1	397	2.603	491	3.509	573	4.427	648	5.352	717	6.283	717	6.283
180	6.00	86.6	432	2.568	534	3.466	623	4.377	704	5.296	778	6.222	778	6.222
240	8.00	91	452	2.548	559	3.441	652	4.348	736	5.264	814	6.186	814	6.186
300	10.00	93.3	463	2.537	572	3.428	667	4.333	753	5.247	833	6.167	833	6.167
360	12.00	94	466	2.534	576	3.424	671	4.329	759	5.241	838	6.162	838	6.162
540	18.00	94.8	470	2.530	580	3.420	677	4.323	765	5.235	845	6.155	845	6.155
720	24.00	95.5	473	2.527	584	3.416	681	4.319	770	5.230	850	6.150	850	6.150

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	3	4	5	6	7	7
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
2.506	> maximum time above	> 4.00	> 2.00	> 1.00	> 1.00	> 1.00
3.39		> maximum time above	> 4.00	> 3.00	> 2.00	> 2.00
4.289			> maximum time above	> 6.00	> 3.00	> 3.00
5.197				> maximum time above	> 6.00	> 6.00
6.113					> maximum time above	> maximum time above
6.113						> maximum time above

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N Ramp Sta. 13+350 to 13+458 & Hwy 1 South of Bridge - BH11BP
Most Likely Pre-Consolidation Pressures - 60 m wide embankment top

Initial Fill Height (m)	2 m	3 m	4 m	5 m	6 m	6 m
Immediate Settlement (mm)	19 mm	29 mm	38 mm	48 mm	58 mm	58 mm
Primary Consol. Settl.(mm)	40 mm	54 mm	82 mm	139 mm	197 mm	197 mm
Total Settlement (mm) (*)	59 mm	83 mm	120 mm	187 mm	255 mm	255 mm
Final Height above O.G.S. (m)	1.941 m	2.917 m	3.88 m	4.813 m	5.745 m	5.745 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	22.2	28	1.972	41	2.959	56	3.944	79	4.921	102	5.898	102	5.898
30	1.00	33.3	32	1.968	47	2.953	65	3.935	94	4.906	124	5.876	124	5.876
60	2.00	44.4	37	1.963	53	2.947	74	3.926	110	4.890	145	5.855	145	5.855
90	3.00	55.6	41	1.959	59	2.941	84	3.916	125	4.875	168	5.832	168	5.832
120	4.00	61.1	43	1.957	62	2.938	88	3.912	133	4.867	178	5.822	178	5.822
180	6.00	66.7	46	1.954	65	2.935	93	3.907	141	4.859	189	5.811	189	5.811
240	8.00	77.8	50	1.950	71	2.929	102	3.898	156	4.844	211	5.789	211	5.789
300	10.00	83.3	52	1.948	74	2.926	106	3.894	164	4.836	222	5.778	222	5.778
360	12.00	88.9	55	1.945	77	2.923	111	3.889	172	4.828	233	5.767	233	5.767
540	18.00	94.4	57	1.943	80	2.920	115	3.885	179	4.821	244	5.756	244	5.756
720	24.00	100	59	1.941	83	2.917	120	3.880	187	4.813	255	5.745	255	5.745

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	2	3	4	5	6	6
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
1.941	> 24.00	> 2.00	> 0.50	#N/A	#N/A	#N/A
2.917		> 24.00	> 2.00	> 0.50	#N/A	#N/A
3.88			> 24.00	> 2.00	> 0.50	> 0.50
4.813				> 24.00	> 4.00	> 4.00
5.745					> 24.00	> 24.00
5.745						> 24.00

TABLE B16

HIGHWAY 11 - TROUT CREEK BY-PASS
NORTH INTERCHANGE - SURCHARGE ANALYSIS
EW-N Ramp Sta. 13+350 to 13+458 & Hwy 1 South of Bridge - BH11BP
Reduced Pre-Consolidation Pressures - 60 m wide embankment top

Initial Fill Height (m)	2 m	3 m	4 m	5 m	6 m	6 m
Immediate Settlement (mm)	19 mm	29 mm	38 mm	48 mm	58 mm	58 mm
Primary Consol. Settl.(mm)	399 mm	544 mm	667 mm	774 mm	869 mm	869 mm
Total Settlement (mm) (*)	418 mm	573 mm	705 mm	822 mm	927 mm	927 mm
Final Height above O.G.S. (m)	1.582 m	2.427 m	3.295 m	4.178 m	5.073 m	5.073 m

Time		% Consolidation	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above	Settlement	Height Above
(days)	(months)	U%	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)	(mm)	O.G.S. (m)
15	0.50	22.2	108	1.892	150	2.850	186	3.814	220	4.780	251	5.749	251	5.749		
30	1.00	33.3	152	1.848	210	2.790	260	3.740	306	4.694	347	5.653	347	5.653		
60	2.00	44.4	196	1.804	271	2.729	334	3.666	392	4.608	444	5.556	444	5.556		
90	3.00	55.6	241	1.759	331	2.669	409	3.591	478	4.522	541	5.459	541	5.459		
120	4.00	61.1	263	1.737	361	2.639	446	3.554	521	4.479	589	5.411	589	5.411		
180	6.00	66.7	285	1.715	392	2.608	483	3.517	564	4.436	638	5.362	638	5.362		
240	8.00	77.8	329	1.671	452	2.548	557	3.443	650	4.350	734	5.266	734	5.266		
300	10.00	83.3	351	1.649	482	2.518	594	3.406	693	4.307	782	5.218	782	5.218		
360	12.00	88.9	374	1.626	513	2.487	631	3.369	736	4.264	831	5.169	831	5.169		
540	18.00	94.4	396	1.604	543	2.457	668	3.332	779	4.221	878	5.122	878	5.122		
720	24.00	100	418	1.582	573	2.427	705	3.295	822	4.178	927	5.073	927	5.073		

Note: (*) Does not include settlements due to secondary consolidation

Summary of Surcharge Requirements

Initial Fill Height (m) ⟶	2	3	4	5	6	6
Final Height above O.G.S. (m)	Approximate Time for 100% Consolidation (months)					
1.582	> 24.00	> 6.00	> 3.00	> 2.00	> 1.00	> 1.00
2.427		> 24.00	> 8.00	> 6.00	> 3.00	> 3.00
3.295			> 24.00	> 10.00	> 6.00	> 6.00
4.178				> 24.00	> 10.00	> 10.00
5.073					> 24.00	> 24.00
5.073						> 24.00

TABLE B17

HIGHWAY 11 - TROUT CREEK BY PASS - NORTH INTERCHANGE
WICK DRAIN DESIGN ASSUMPTIONS

Site Location	Test Hole	Ch (m2/y)	Cv (m2/y)	Equiv. Diameter Ratio (de/dw)	Wick Drain Drainage Length (m)	Disturbance Ratios		Discharge Capacity qw (m3/s)
						Diameter Ratio (s)	Permeability Ratio (kc/kc')	
McCarthy St - Sta. 10+014 to 10+120	CPTUN5	142	28	240	5	3	3	1.00E-05
McCarthy St (Sta. 10+120 to 10+240); W-N Ramp (13+091 to 13+160); S-W Ramp(13+630 to 13+540)	CPTUN1	168	34	210	10	3	3	1.00E-05
East Approach - Sta.10+240 to 10+310	CPTUN4	100	20	150	17	3	3	1.00E-05
EW-N Ramp 13+160 to 13+270; S-W Ramp (Sta.13+540 to 13+450)	CPTUN2	95	19	180	12	3	3	1.00E-05

Site Location	Test Hole	Target Percentage Consol. and Time				
		Schedule 1		Schedule 2	Schedule 3	
		After Stage1	After Stage2		After Stage1	After Stage2
McCarthy St - Sta. 10+014 to 10+120	CPTUN5	75% in 1 month	100% in 12 months	No wicks required	75%before Stage 2	100% in 6 months
McCarthy St (Sta. 10+120 to 10+240); W-N Ramp (13+091 to 13+160); S-W Ramp(13+630 to 13+540)	CPTUN1	75% in 1 month	100% in 12 months	No wicks required	75% before Stage 2	100% in 6 months
East Approach - Sta.10+240 to 10+310	CPTUN4	No wicks required		No wicks required	100% in 6 months	
EW-N Ramp 13+160 to 13+270; S-W Ramp (Sta.13+540 to 13+450)	CPTUN2	No wicks required		No wicks required	100% in 6 months	

Schedule 1: 2 months: Site preparation (includes installation of wick drains)
3 months: Embankment Construction
12 months: Waiting period for stabilization of settlements

Schedule 2: Embankment construction and stabilization of settlements in 12 months

Schedule 3: Embankment construction and stabilization of settlements in 6 months

TABLE B18

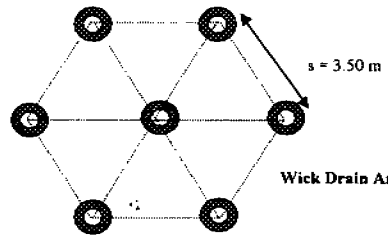
NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN5- East Abutment - Sta.10+040 to 10+120 - Most Likely Pc
Construction Schedule 1 - Target 75% in one month and 100% in one year
Berm Width = 9 m

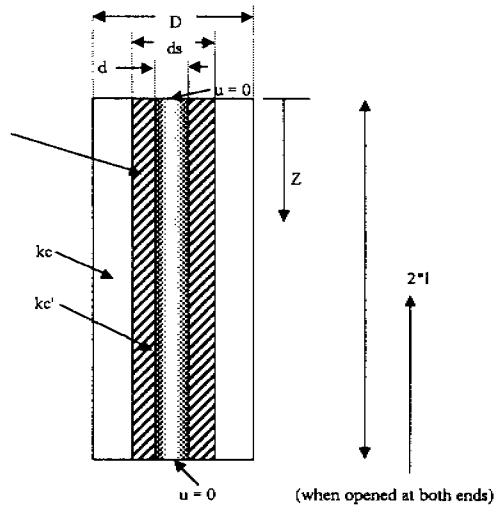
INPUT PARAMETERS

D	3.67	m	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 3.50 m)
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 56.5
C_H	4.50E-06	m^2/s	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	9.01E-07	m^2/s	determined by the oedometer test
λ	9.01E-07	m^2/s	$=k_h/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	m	diameter of the smear zone (typically equal to 1.5 to 3 times d); s=ds/d = 3
k_h	1.00E-09	m/s	undisturbed soil permeability
k'_s	3.33E-10	m/s	soil permeability within the smear zone; kc/k'c = 3.00
q_w	1.00E-05	m^3/s	drain discharge capacity; kc/qw = 1.00E-04 ;well resistance cannot be ignored if kc/qw>3.33e-04
l	5.00	m	length of the drain when open at one end only half length of the drain when open at both ends

Layer	ML-CL				
Surcharge (kPa)	240.00	**kPa**	Uv target:	41	%
Drainage Path (m)	4.50	**m**	TargetTime (days):	30	days
Settlement due to Primary Consolidation	431	**mm**	Time for Drainage Path:	30	days
n	56	(D/d; should always be >12)			
α	0.3759384	f(D/d); regression from Figure 3 of the paper)			



Wick Drain Arrangement - Plan View



Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	0.67
75	0.83	1.17
90	1.50	1.83
98	2.50	3.17

TABLE B19

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number:	19-1104-4
Title:	Highway 11 - Trout Creek By-Pass
Case:	North Interchange
Sub-case:	Test Hole CPTUN5- East Abutment - Sta.10+040 to 10+120 - Most Likely Pc
	Construction Schedule 1 - Target: 75% in one month and 100% in one year
	Berm Width = 9 m

INPUT PARAMETERS

D	3.67	**m**	diameter of dewatered soil cylinder (Triangular Spacing) s = 3.50 m
d	0.065	**m**	equivalent diameter of band-shaped drain: $2(b+t)/\pi$
C_H	4.50E-06	**m2/s**	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5
C_V	9.01E-07	**m2/s**	determined by the oedometer test
λ	4.50E-07	**m2/s**	$=k_h/(\gamma_w * m_v)$; for Piezocone $\gamma = 0.1*Ch$ (Robertson & Campanela, 1988)
Layer	ML-CL		
Surcharge (kPa)	240.00	**kPa**	
Drainage Path (m)	4.50	**m**	
Settlement due to Primary Consolidation	431	**mm**	
n	56		(D/d; should always be >12)
α	0.3759384		f(D/d); regression from Figure 3 of the paper)

Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	0.83
75	1.00	1.67
90	2.00	3.67
98	4.17	10.17

TABLE B20

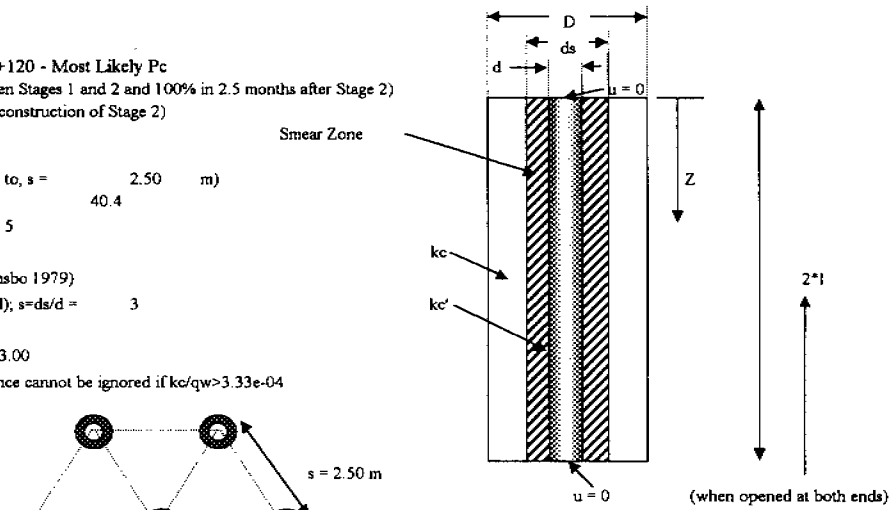
NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

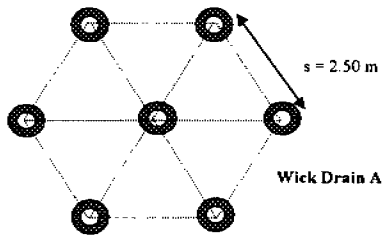
Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN5- East Abutment - Sta.10+040 to 10+120 - Most Likely Pc
Construction Schedule 3: Complete construction in 6 months (75% in 1 month between Stages 1 and 2 and 100% in 2.5 months after Stage 2)
(allowing 6 weeks for construction of Stage 1 and 1 week for construction of Stage 2)
9 m wide berm

INPUT PARAMETERS

D	2.625	m	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 2.50 m)
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 40.4
C_H	4.50E-06	m^2/s	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	9.01E-07	m^2/s	determined by the oedometer test
λ	9.01E-07	m^2/s	$=k_h/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	m	diameter of the smear zone (typically equal to 1.5 to 3 times d); s=ds/d = 3
k_c	1.00E-09	m/s	undisturbed soil permeability
k'_c	3.33E-10	m/s	soil permeability within the smear zone; kc/k'c = 3.00
q_w	1.00E-05	m^3/s	drain discharge capacity; kc/qw = 1.00E-04 ;well resistance cannot be ignored if kc/qw>3.33e-04
l	5.00	m	length of the drain when open at one end only half length of the drain when open at both ends

Layer	ML-CL				
Surcharge (kPa)	240.00	kPa	Uv target:	41	%
Drainage Path (m)	4.50	m	TargetTime (days):	30	days
Settlement due to Primary Consolidation	431	mm	Time for Drainage Path:	30	days
n	40	(D/d; should always be >12)			
α	0.3532756	f(D/d); regression from Figure 3 of the paper)			





Wick Drain Arrangement - Plan View

Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.33	0.33
75	0.50	0.67
90	0.83	1.00
98	1.33	1.50

TABLE B21

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number:	19-1104-4
Title:	Highway 11 - Trout Creek By-Pass
Case:	North Interchange
Sub-case:	Test Hole CPTUN5- East Abutment - Sta.10+040 to 10+120 - Most Likely Pc
	Construction Schedule 3: Complete construction in 6 months (75% in 1 month between Stages 1 and 2 and 100% in 2.5 months after Stage 2)
	(allowing 6 weeks for construction of Stage 1 and 1 week for construction of Stage 2)
	9 m wide berm

INPUT PARAMETERS

D	2.625	**m**	diameter of dewatered soil cylinder (Triangular Spacing) s = 2.50 m
d	0.065	**m**	equivalent diameter of band-shaped drain: 2(b+t)/π
C_H	4.50E-06	**m2/s**	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5
C_V	9.01E-07	**m2/s**	determined by the oedometer test
λ	4.50E-07	**m2/s**	$=k_v/(\gamma_w * m_v)$; for Piezocone $\gamma = 0.1 * Ch$ (Robertson & Campanela, 1988)
Layer	ML-CL		
Surcharge (kPa)	240.00	**kPa**	
Drainage Path (m)	4.50	**m**	
Settlement due to Primary Consolidation	431	**mm**	
n	40		(D/d; should always be >12)
α	0.3532756		f(D/d); regression from Figure 3 of the paper)

Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.33	0.33
75	0.50	0.83
90	1.00	1.50
98	2.50	4.17

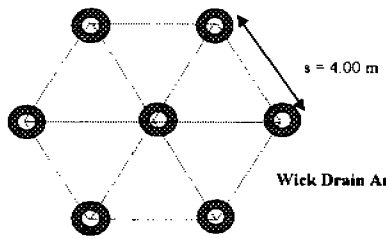
TABLE B22

NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

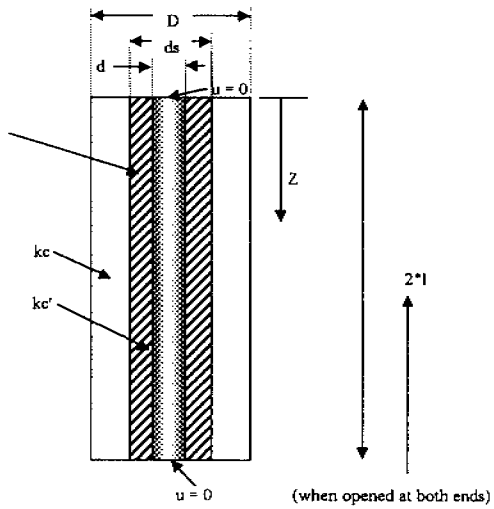
Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN1- East Approach - Sta.10+120 to 10+240 - Most Likely Pc
Construction Schedule 1:Target: 75% in one month and 100% in one year
Berm Width: 9m

INPUT PARAMETERS

D	4.2	**m**	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 4.00 m)
d	0.065	**m**	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 64.6
C_R	5.33E-06	**m^2/s**	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	1.07E-06	**m^2/s**	determined by the oedometer test
λ	1.07E-06	**m^2/s**	$=k_h/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	**m**	diameter of the smear zone (typically equal to 1.5 to 3 times d); s=ds/d = 3
k_c	5.00E-08	**m/s**	undisturbed soil permeability
k'_c	1.67E-08	**m/s**	soil permeability within the smear zone; kc/k'c = 3.00
q_w	1.00E-05	**m^3/s**	drain discharge capacity; kc/qw = 5.00E-03 ,well resistance cannot be ignored if kc/qw>3.33e-04
l	10.00	**m**	length of the drain when open at one end only half length of the drain when open at both ends
Layer	ML-CL		
Surcharge (kPa)	210.00	**kPa**	Uv target. 53 %
Drainage Path (m)	3.60	**m**	TargetTime (days): 30 days
Settlement due to Primary Consolidation	435	**mm**	Time for Drainage Path. 30 days
n	65	(D/d; should always be >12)	
α	0.3814703	f(D/d); regression from Figure 3 of the paper)	



Wick Drain Arrangement - Plan View



Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	0.83
75	0.83	1.50
90	1.50	2.50
98	2.50	4.17

TABLE B23

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN1- East Approach - Sta.10+120 to 10+240 - Most Likely Pc
Construction Schedule 1:Target: 75% in one month and 100% in one year
Berm Width: 9m

INPUT PARAMETERS

D	4.2	**m**	diameter of dewatered soil cylinder (Triangular Spacing) s = 4.00 m
d	0.065	**m**	equivalent diameter of band-shaped drain: $2(b+t)/\pi$
C_H	5.33E-06	**m2/s**	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5
C_V	1.07E-06	**m2/s**	determined by the oedometer test
λ	5.33E-07	**m2/s**	$=k_h/(\gamma_w * m_v)$; for Piezocone $\gamma = 0.1*Ch$ (Robertson & Campanela, 1988)
Layer	ML-CL		
Surcharge (kPa)	210.00	**kPa**	
Drainage Path (m)	3.60	**m**	
Settlement due to Primary Consolidation	435	**mm**	
n	65		(D/d; should always be >12)
α	0.3814703		f(D/d); regression from Figure 3 of the paper)

Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	1.00
75	1.00	2.17
90	1.83	4.67
98	3.50	more than maximum time entered

TABLE B24

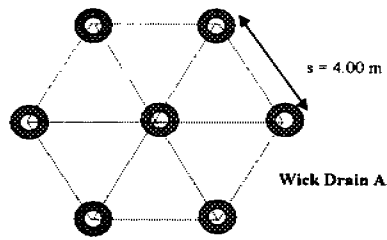
NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN1- East Approach - Sta.10+120 to 10+240 - Most Likely Pc
Construction Schedule 3: Complete construction in 6 months (75% in 1 month between Stages 1 and 2 and 100% in 2.5 months after Stage 2)
(allowing 5 weeks for construction of Stage 1 and 1 week for construction of Stage 2)
9 m wide berm

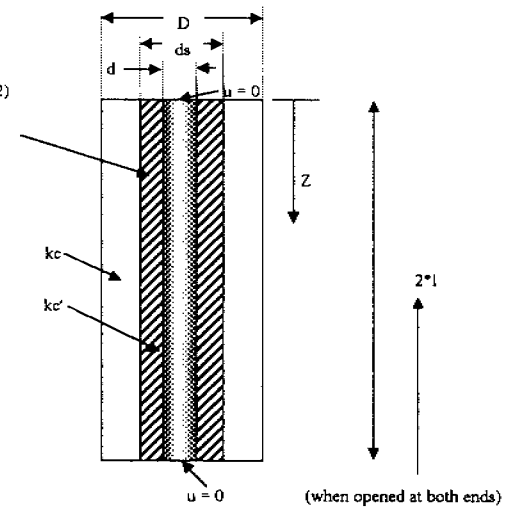
INPUT PARAMETERS

D	4.2	m	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 4.00 m)
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 64.6
C_H	5.33E-06	m^2/s	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	1.07E-06	m^2/s	determined by the oedometer test
λ	1.07E-06	m^2/s	$=k_H/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	m	diameter of the smear zone (typically equal to 1.5 to 3 times d); s=ds/d = 3
k_c	5.00E-08	m/s	undisturbed soil permeability
k'_c	1.67E-08	m/s	soil permeability within the smear zone; kc/k'c = 3.00
q_w	1.00E-05	m^3/s	drain discharge capacity; kc/qw = 5.00E-03 ;well resistance cannot be ignored if kc/qw>3.33e-04
l	10.00	m	length of the drain when open at one end only half length of the drain when open at both ends
Layer	ML-CL		
Surcharge (kPa)	210.00	kPa	
Drainage Path (m)	3.60	m	
Settlement due to Primary Consolidation	435	mm	
n	65		(D/d; should always be >12)
α	0.3814703		f(D/d); regression from Figure 3 of the paper)

Uv target: 53 %
TargetTime (days): 30 days
Time for Drainage Path: 30 days



Wick Drain Arrangement - Plan View



Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	0.83
75	0.83	1.50
90	1.50	2.50
98	2.50	4.17

TABLE B25

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number:	19-1104-4
Title:	Highway 11 - Trout Creek By-Pass
Case:	North Interchange
Sub-case:	Test Hole CPTUN1- East Approach - Sta.10+120 to 10+240 - Most Likely Pc
	Construction Schedule 3: Complete construction in 6 months (75% in 1 month between Stages 1 and 2 and 100% in 2.5 months after Stage 2)
	(allowing 5 weeks for construction of Stage 1 and 1 week for construction of Stage 2)
	9 m wide berm

INPUT PARAMETERS

D	4.2	**m**	diameter of dewatered soil cylinder (Triangular Spacing) s = 4.00 m
d	0.065	**m**	equivalent diameter of band-shaped drain: 2(b+t)/π
C_H	5.33E-06	**m2/s**	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5
C_V	1.07E-06	**m2/s**	determined by the oedometer test
λ	5.33E-07	**m2/s**	$=k_h/(\gamma_w * m_v)$; for Piezocone γ = 0.1*Ch (Robertson & Campanela, 1988)
Layer	ML-CL		
Surcharge (kPa)	210.00	**kPa**	
Drainage Path (m)	3.60	**m**	
Settlement due to Primary Consolidation	435	**mm**	
n	65		(D/d; should always be >12)
α	0.3814703		f(D/d); regression from Figure 3 of the paper)

Time Increment for table below = 0.17 **month**
Resultant Maximum Time = 10.17 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	1.00
75	1.00	2.17
90	1.83	4.67
98	3.50	more than maximum time entered

TABLE B26

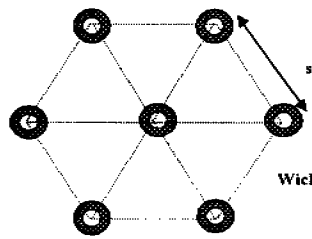
NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN4- East Approach - Sta.10+240 to Sta. 10+310 - Most Likely Pc
Construction Schedule 3: Target. 100% in 6 months (3 weeks for construction and 21 weeks for 100% consolidation)

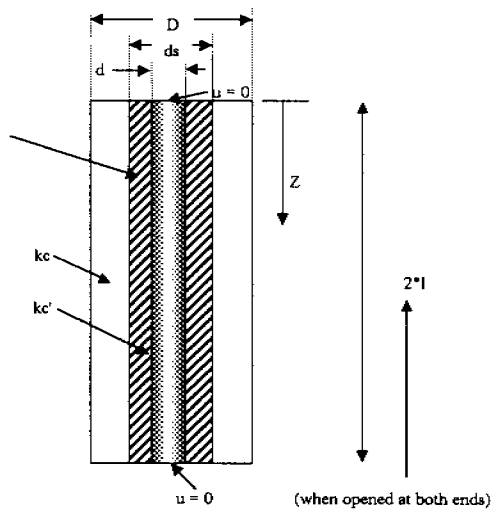
INPUT PARAMETERS

D	3.045	m	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 2.90 m)
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 46.8
C_H	3.17E-06	m^2/s	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	6.34E-07	m^2/s	determined by the oedometer test
λ	6.34E-07	m^2/s	$=k_v/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	m	diameter of the smear zone (typically equal to 1.5 to 3 times d); s=ds/d = 3
k_c	1.00E-09	m/s	undisturbed soil permeability
k'_c	3.33E-10	m/s	soil permeability within the smear zone, kc/k'c = 3.00
q_w	1.00E-05	m^3/s	drain discharge capacity; kc/qw = 1.00E-04 ;well resistance cannot be ignored if kc/qw>3.33e-04
l	17.00	m	length of the drain when open at one end only half length of the drain when open at both ends

Layer	ML-CL		
Surcharge (kPa)	150.00	**kPa**	Uv target: 45 %
Drainage Path (m)	4.60	**m**	TargetTime (days): 60 days
Settlement due to Primary Consolidation	465	**mm**	Time for Drainage Path: 60 days
n	47		(D/d; should always be >12)
α	0.3649627		f(D/d); regression from Figure 3 of the paper)



Wick Drain Arrangement - Plan View



Time Increment for table below = 0.25 **month**
Resultant Maximum Time = 15 25 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	0.75
75	1.00	1.25
90	1.50	1.75
98	2.50	3.00

TABLE B27

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number:	19-1104-4
Title:	Highway 11 - Trout Creek By-Pass
Case:	North Interchange
Sub-case:	Test Hole CPTUN4- East Approach - Sta.10+240 to Sta. 10+310 - Most Likely Pc
	Construction Schedule 3: Target: 100% in 6 months (3 weeks for construction and 21 weeks for 100% consolidation)

INPUT PARAMETERS

D	3.045	m	diameter of dewatered soil cylinder (Triangular Spacing) s = 2.90 m
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π
C_H	3.17E-06	m2/s	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5
C_V	6.34E-07	m2/s	determined by the oedometer test
λ	3.17E-07	m2/s	$=k_h/(\gamma_w * m_v)$; for Piezocone γ = 0.1*Ch (Robertson & Campanela, 1988)
Layer	ML-CL		
Surcharge (kPa)	150.00	kPa	
Drainage Path (m)	4.60	m	
Settlement due to Primary Consolidation	465	mm	
n	47		(D/d; should always be >12)
α	0.3649627		f(D/d); regression from Figure 3 of the paper)

Time Increment for table below = 0.25 month
Resultant Maximum Time = 15.25 months

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	1.00
75	1.25	2.00
90	2.50	4.00
98	5.25	11.25

TABLE B28

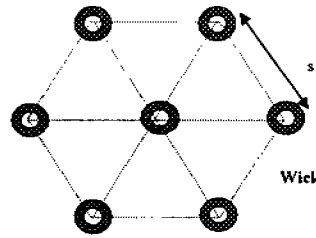
NEW HANSBO METHOD (combined with Lambe & Whitman's book) recommendations
"Consolidation of Clay by Band-Shaped Prefabricated Drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 1 - Including well resistance and smearing

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN2- EW-N Ramps 13+160 to 13+270 - Most Likely Pc
Construction Schedule 3: Target: 100% in 6 months (3 weeks for construction and 21 weeks for 100% consolidation)

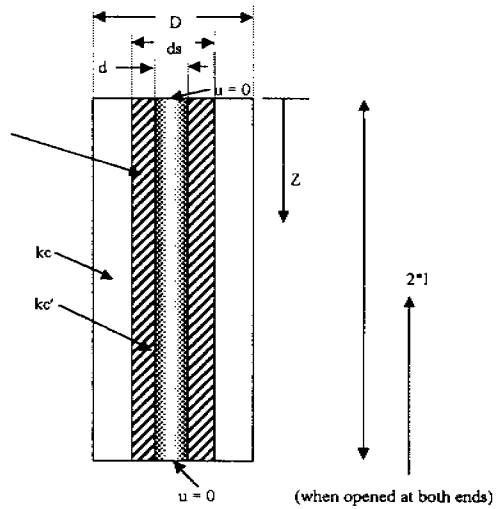
INPUT PARAMETERS

D	3.255	m	diameter of dewatered soil cylinder (Triangular Spacing equal to, s = 3.10 m)
d	0.065	m	equivalent diameter of band-shaped drain: 2(b+t)/π; n = 50.1
C_H	3.01E-06	m^2/s	consider reducing c_h to account for smear; Ch/Cv is often 2 to 5
C_V	6.02E-07	m^2/s	determined by the oedometer test
λ	6.02E-07	m^2/s	$=k_h/(\gamma_w * m_v)$; or λ = Cv obtained from the oedometer test (Hansbo 1979)
d_s	0.20	m	diameter of the smear zone (typically equal to 1.5 to 3 times d), s=ds/d = 3
k_c	5.00E-08	m/s	undisturbed soil permeability
k'_c	1.67E-08	m/s	soil permeability within the smear zone; kc/k'c = 3.00
q_w	1.00E-05	m^3/s	drain discharge capacity; kc/qw = 5.00E-03 ;well resistance cannot be ignored if kc/qw>3.33e-04
l	12.00	m	length of the drain when open at one end only half length of the drain when open at both ends
Layer	ML-CL		
Surcharge (kPa)	180.00	kPa	
Drainage Path (m)	4.10	m	
Settlement due to Primary Consolidation	284	mm	
n	50	(D/d; should always be >12)	
α	0.3693519	f(D/d); regression from Figure 3 of the paper)	

Uv target: 50 %
TargetTime (days): 60 days
Time for Drainage Path: 60 days



Wick Drain Arrangement - Plan View



Time Increment for table below = 0.25 **month**
Resultant Maximum Time = 15.25 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	1.00
75	1.25	1.75
90	2.00	2.75
98	3.50	4.75

TABLE B29

NEW HANSBO METHOD ACCORDING TO ROBERTSON & CAMPANELLA 1988
(combined with Lambe & Whitman's book recommendations)

Hansbo 1979,"Consolidation of Clay by band-shaped prefabricated drains"
Ground Engineering, Vol.12 No.5, 1979
Formulation according to Equation 2 - No well resistance

Robertson and Campanella, 1988, "Prediction of wick drain performance using piezometer cone data
Canadian Geotechnical Journal, 25, 56-61 (1988)

Job Number: 19-1104-4
Title: Highway 11 - Trout Creek By-Pass
Case: North Interchange
Sub-case: Test Hole CPTUN2- EW-N Ramps 13+160 to 13+270 - Most Likely Pc
Construction Schedule 3: Target: 100% in 6 months (3 weeks for construction and 21 weeks for 100% consolidation)

INPUT PARAMETERS

D	3.255	**m**	diameter of dewatered soil cylinder (Triangular Spacing)	s = 3.10 m
d	0.065	**m**	equivalent diameter of band-shaped drain: 2(b+t)/π	
C_H	3.01E-06	**m2/s**	consider reducing C_h to account for smear; Ch/Cv is often 2 to 5	
C_V	6.02E-07	**m2/s**	determined by the oedometer test	
λ	3.01E-07	**m2/s**	$=k_H/(\gamma_w * m_v)$; for Piezocone γ = 0.1*Ch (Robertson & Campanela, 1988)	
Layer	ML-CL			
Surcharge (kPa)	180.00	**kPa**		
Drainage Path (m)	4.10	**m**		
Settlement due to Primary Consolidation	284	**mm**		
n	50		(D/d; should always be >12)	
α	0.3693519		f(D/d); regression from Figure 3 of the paper)	

Time Increment for table below = 0.25 **month**
Resultant Maximum Time = 15.25 **months**

% Consolidation	Time required (months)	
	Uv and Uh	Uh only
50	0.50	1.00
75	1.25	2.25
90	2.50	4.75
98	5.25	12.75

TABLE B30

HIGHWAY 11 - TROUT CREEK BY-PASS - NORTH INTERCHANGE
DESIGN RECOMMENDATIONS FOR DIFFERENT CONSTRUCTION SCHEDULES
MAXIMUM BERM WIDTH = 9 m

Schedule 1: 2 months: Site preparation (includes installation of wick drains)
3 months: Embankment Construction
12 months: Waiting period for stabilization of settlements

Schedule 2: Embankment construction and stabilization of settlements in 12 months

Schedule 3: Embankment construction and stabilization of settlements in 6 months

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Location: East Abutment - McCarthy St. (St.10+040 to 10+120) - Height = 9 to 10.5 m plus surcharge
Surcharge: 1.5 m
Berm Height: 6 m below the pavement final design elevation
Berm Width: 9 m

Construction Sequence	Description	Elapsed Time from Beginning of Construction			Monitoring Requirements: Maximum EPP before this stage
		Schedule 1	Schedule 2	Schedule 3	
		Wick Spacing = 3.5 m	Wick Spacing = N/A	Wick Spacing = 2.5 m	
Stage 1	H=0 to 11.5 m	0 to 6 weeks	0 to 6 weeks	0 to 6 weeks	No EPP requirement
Stage 2	Wait - No construction	6 to 10 weeks	6 to 19 weeks	6 to 8 weeks	-
Stage 3	Complete Embankment to top of surcharge	10 to 11 weeks	19 to 20 weeks	8 to 9 weeks	57 kPa
Stage 4	Wait - No construction	11 to 28 weeks	20 to 52 weeks	9 to 19 weeks	-
Stage 5	Trim to Final Elevation	Start after 28 weeks	Start after 52 weeks	Start after 19 weeks	0 kPa

Location: McCarthy St. (St.10+120 - 10+240); W-N Ramp (St.13+091- 13+160); S-EW Ramp (13+630 - 13+540) -Height=6 m to 9 m plus surcharge
Surcharge: 1.5 m
Berm Width: 9 m
Berm Height: 6 m below the pavement final design elevation

Construction Sequence	Description	Elapsed Time from Beginning of Construction			Monitoring Requirements: Maximum EPP before this stage
		Schedule 1	Schedule 2	Schedule 3	
		Wick Spacing = 4.0 m	Wick Spacing = N/A	Wick Spacing = 4.0 m	
Stage 1	H=0 to 8.8 m	0 to 5 weeks	0 to 5 weeks	0 to 5 weeks	No EPP requirement
Stage 2	Wait - No construction	5 to 9 weeks	5 to 20 weeks	5 to 9 weeks	-
Stage 3	Complete Embankment to top of surcharge	9 to 10 weeks	20 to 21 weeks	9 to 10 weeks	44 kPa
Stage 4	Wait - No construction	10 to 24 weeks	21 to 52 weeks	10 to 24 weeks	-
Stage 5	Trim to Final Elevation	Start after 24 weeks	Start after 52 weeks	Start after 24 weeks	0 kPa (*)

Location: McCarthy St.(St.10+240 - 10+310); W-N Ramp (Sta. 13+160 - 13+270); S-EW Ramp (St.13+540 - 13+450) -Height=4.5 m to 6 m plus surcharge
Surcharge: 1.5 m
Berm Height: None

Construction Sequence	Description	Elapsed Time from Beginning of Construction			Monitoring Requirements: Maximum EPP before this stage
		Schedule 1	Schedule 2	Schedule 3	
		Wick Spacing = N/A	Wick Spacing = N/A	Wick Spacing = 3.0 m	
Stage 1	Complete Embankment to top of surcharge	0 to 3 weeks	0 to 3 weeks	0 to 3 weeks	No EPP requirement
Stage 2	Wait - No construction	3 to 52 weeks	3 to 52 weeks	3 to 23 weeks	-
Stage 3	Trim to Final Elevation	Start after 52 weeks	Start after 52 weeks	Start after 23 weeks	0 kPa (*)

Location: McCarthy St. -Sta.> 10+310; W-N Ramp (Sta. > 13+270); S-EW Ramp (St.>13<450); Hwy 11 - Height<4.5 m plus surcharge
Surcharge: See table below
Berm Height: None

Construction Sequence	Description	Elapsed Time from Beginning of Construction			Monitoring Requirements: Maximum EPP before this stage
		Schedule 1	Schedule 2	Schedule 3	
		Wick Spacing = N/A	Wick Spacing = N/A	Wick Spacing = N/A	
		Surcharge = 1.5 m	Surcharge = 1.5 m	Surcharge = 2.5 m	-
Stage 1	Complete Embankment to top of surcharge	0 to 2 weeks	0 to 2 weeks	0 to 2 weeks	No EPP requirement
Stage 2	Wait - No construction	2 to 52 weeks	2 to 52 weeks	3 to 24 weeks	-
Stage 3	Trim to Final Elevation	Start after 52 weeks	Start after 52 weeks	Start after 24 weeks	0 kPa (*)

Note: (*) Trimming to final elevation can only be carried out after both EPP and settlements due to primary consolidation have stabilized within 2% of the value assessed according to the hyperboli

APPENDIX C

APPENDIX C

ConeTec Report

(North Interchange Test Holes Only)

PRESENTATION OF CONE PENETRATION TEST DATA,
Trout Creek Interchanges

Trout Creek, Ontario

Prepared for:

Thurber Engineering Ltd.
Etobicoke, Ontario

Prepared by:

CONETEC INVESTIGATIONS LTD.

March 31, 1999

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a cone penetration testing (CPT) program carried out at the location of the South and North Trout Creek Interchanges, near Trout Creek, Ontario. A total of 10 CPT's with pore pressure dissipation tests were performed for this investigation, with 5 CPTs at each of the south and north interchange sites between the period of March 25th and March 26th, 1999.

2.0 FIELD EQUIPMENT AND PROCEDURES

2.1 CPT Procedures

The cone penetration tests (CPT's) were carried out by ***ConeTec Investigations Ltd.*** of Vancouver, B.C. using an integrated electronic cone system. A 20 ton compression type cone was used for all of the soundings. The 20 ton cone has a tip area of 15 sq cm and friction sleeve area of 225 sq cm. A piezometer element 6 mm thick is located immediately behind the cone tip. The compression cones are designed with an equal end area friction sleeve and a tip end area ratio of 0.85. The cone system used during the program recorded the following parameters at 2.5 cm depth increments:

- Tip Resistance (Qc) in bars
- Sleeve Friction (Fs) in bars
- Dynamic Pore Pressure (Ut) in metres of water

The above parameters were printed simultaneously on a printer and stored on digital media for future analysis and reference.

The porous plastic pore pressure element was located directly behind the cone tip. Each of the elements were saturated in glycerin under vacuum pressure prior to penetration. Pore pressure dissipations were recorded at 5 second intervals during all pauses in the penetration.

A complete set of baseline readings were taken prior to and after each sounding to determine if any zero load offsets had occurred due a temperature change of the probe. Establishing the presence of temperature shifts and load offsets enables the operator to make corrections to the cone data if necessary. These corrections can be important, especially where the load conditions are relatively low, and generally are the single largest source of error with respect to the accuracy of cone data. Since the probes are temperature compensated, load shifts due to changes in probe

temperature are only a problem when there are extreme temperature changes from before the test is started and while the probe is in situ. For the testing done on this project keeping the cone within an operating temperature range that did not produce load offsets was not a problem. The cone was pushed using track mounted CME 75 provided by All Terrain Drilling. All CPTs where pushed to refusal.

The following is a list of the CPT names, test depths and water tables. The bracketed values in the water table column are from dissipation tests at refusal.

CPT File	CPT Test Name	Depth (m)	Water Table (m)
141cps1	CPT-S1	13.05	0.0 (-0.3)
141cps2	CPT-S2	9.75	0.0 (-0.05)
141cps3	CPT-S3	16.925	0.0 (-0.2)
141cps4	CPT-S4	15.275	0.0
141cps5	CPT-S5	22.075	0.0 (-0.3)
141cpn1	CPT-N1	12.10	0.0 (-0.3)
141cpn2	CPT-N2	17.325	0.0 (0.1)
141cpn3	CPT-N3	15.125	0.0 (0.0)
141cpn4	CPT-N4	19.925 (20.6)*	0.0 (-0.4)
141cpn5	CPT-N5	11.85 (12.55)*	0.0 (-0.45)

* Pore pressure data at depths below recorded CPT Data (CPT data not recorded)

3.0 CONE PENETRATION TEST DATA

3.1 CPT Data

The cone penetration test data is presented in graphical form in Appendix A following the text of this report. For each test there are two sets of plots. The first plot consists of Tip Resistance (Qt) in bars, Sleeve Friction (Fs) in bars, Pore Pressure (U) in metres of water, and Friction Ratio (Rf) plotted versus depth. The second plot consists of Qt, SPT N60, SPT (N1)60, and Undrained Strength (Su) in kPa. The CPT data is also stored as ASCII text on the accompanying data disk. Penetration data is referenced to existing ground. Stratigraphic interpretations appears on the right side of both plot

sets. The stratigraphic interpretation is based on a chart relating cone bearing Qc, and sleeve friction Fs developed by Robertson et al, 1986 as shown in Figure 1. Detailed interpretations of the CPT data are included in Appendix B. A description of the interpretation methods is included at the end of Appendix B.

3.2 Pore Pressure Dissipation Test Results

Pore pressure dissipations were recorded during selected pauses in penetration for all CPTs tests. The pore pressure data was recorded at 5 second intervals. The pore pressure dissipation data for each CPT is included on the data disk. Pore pressure dissipation data in fine grained soils provides a good indication of the consolidation characteristics. Data from pore pressure dissipation tests in tabular format is presented in Appendix C. The coefficient of consolidation in the horizontal direction, c_h, was calculated using the equation following equation.

$$c_h = \frac{T^* r^2 \sqrt{I_r}}{t}$$

where:

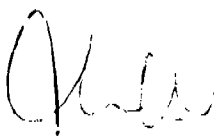
	T^*	-	time constant = 0.245 for 50% dissipation
	r	-	radius of the cone
	Ir	-	Rigidity Index = G/Su
	t	-	time for dissipation

For all the dissipations the time for 50 percent dissipation was used to calculate c_h. A value of 200 for the rigidity index was used in all calculations. The resulting values of c_h ranged from 1.8 cm^2/min to 110 cm^2/min, with most values falling between 2 cm^2/min to 9 cm^2/min. Pore pressure dissipation tests in the highly permeable sand layer below the clayey silt reached equilibrium almost instantaneously. The equilibrium values of pore pressure indicate the water table was at the surface to about 0.3 above the surface.

We trust that the information presented in this report is sufficient for your purposes. If you have any questions regarding the contents of this report, please do not hesitate to contact our office.

Yours truly,

ConeTec Investigations Ltd.

Per: 

Ilmar Weemees, P.Eng.

ref: 99-141.wpd

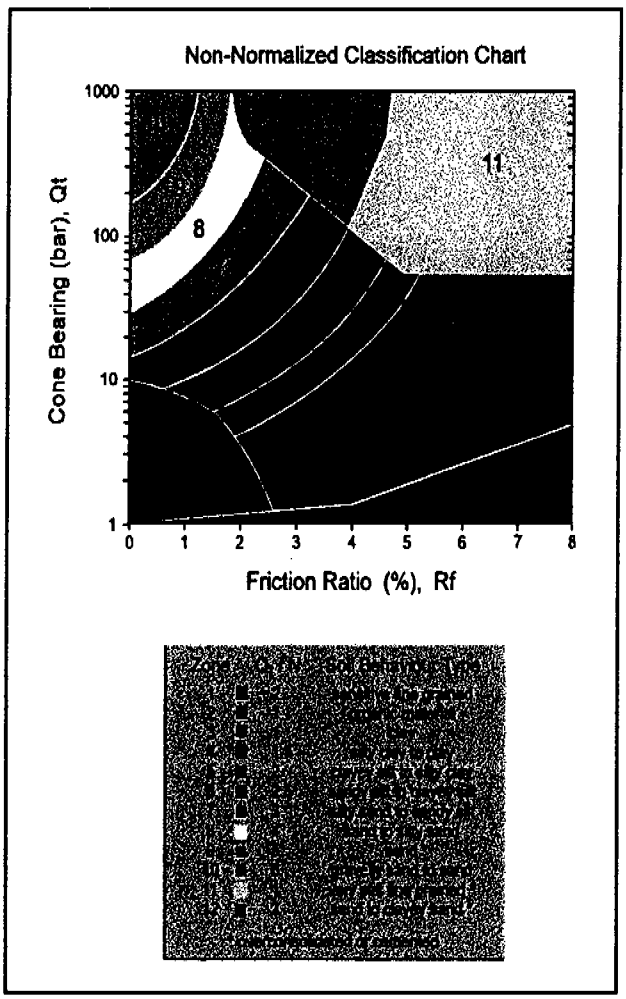


Figure 1. Soil Behaviour Type Classification Chart

APPENDIX A

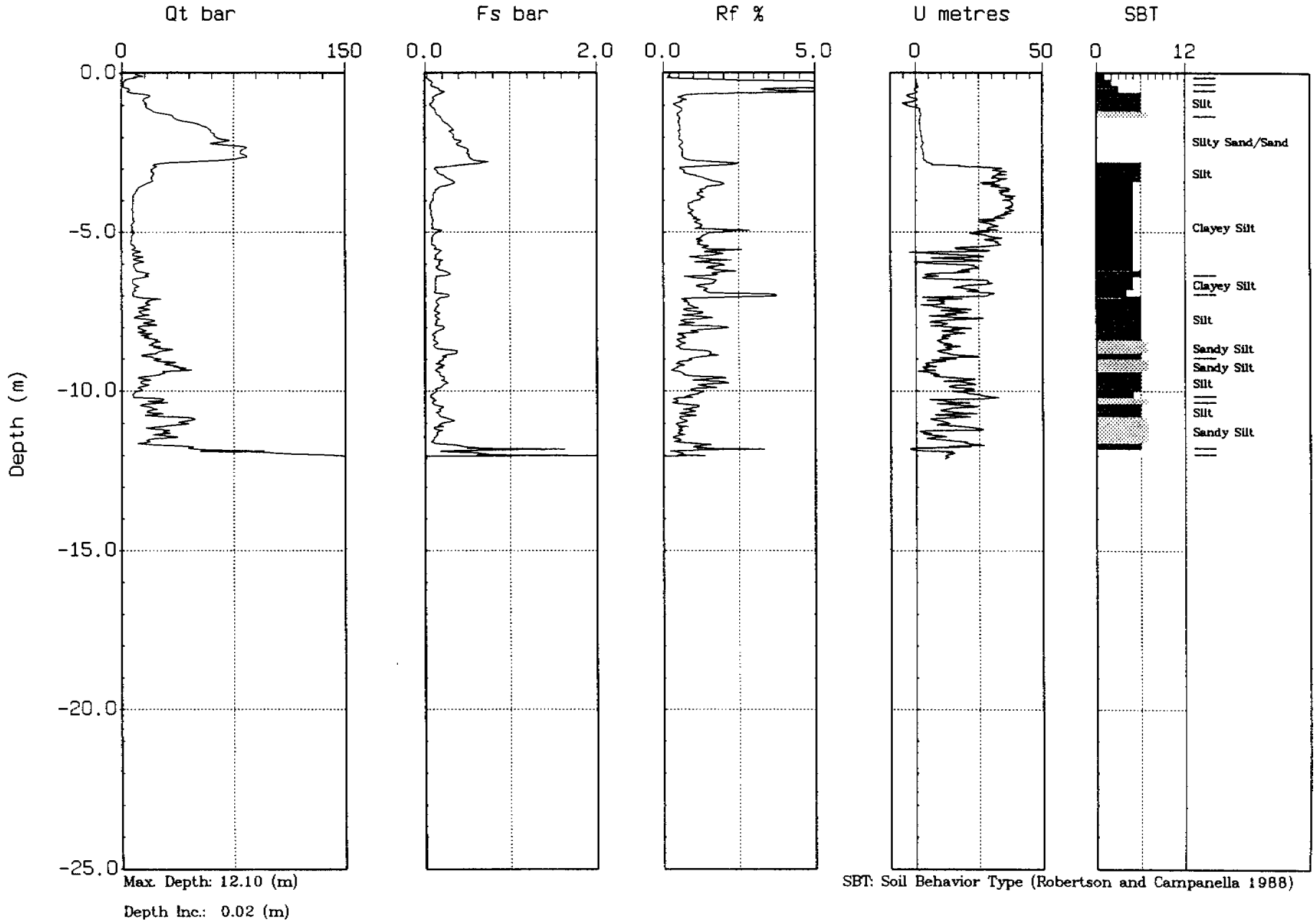
CPT Plots

CONETEC

Thurber Engineering

Site: 99-141 CPT-N1
Location: N.INTERCHANGE

Cone: 20 TON A 058
Date: 03:26:99 08:19



Max. Depth: 12.10 (m)

Depth Inc.: 0.02 (m)

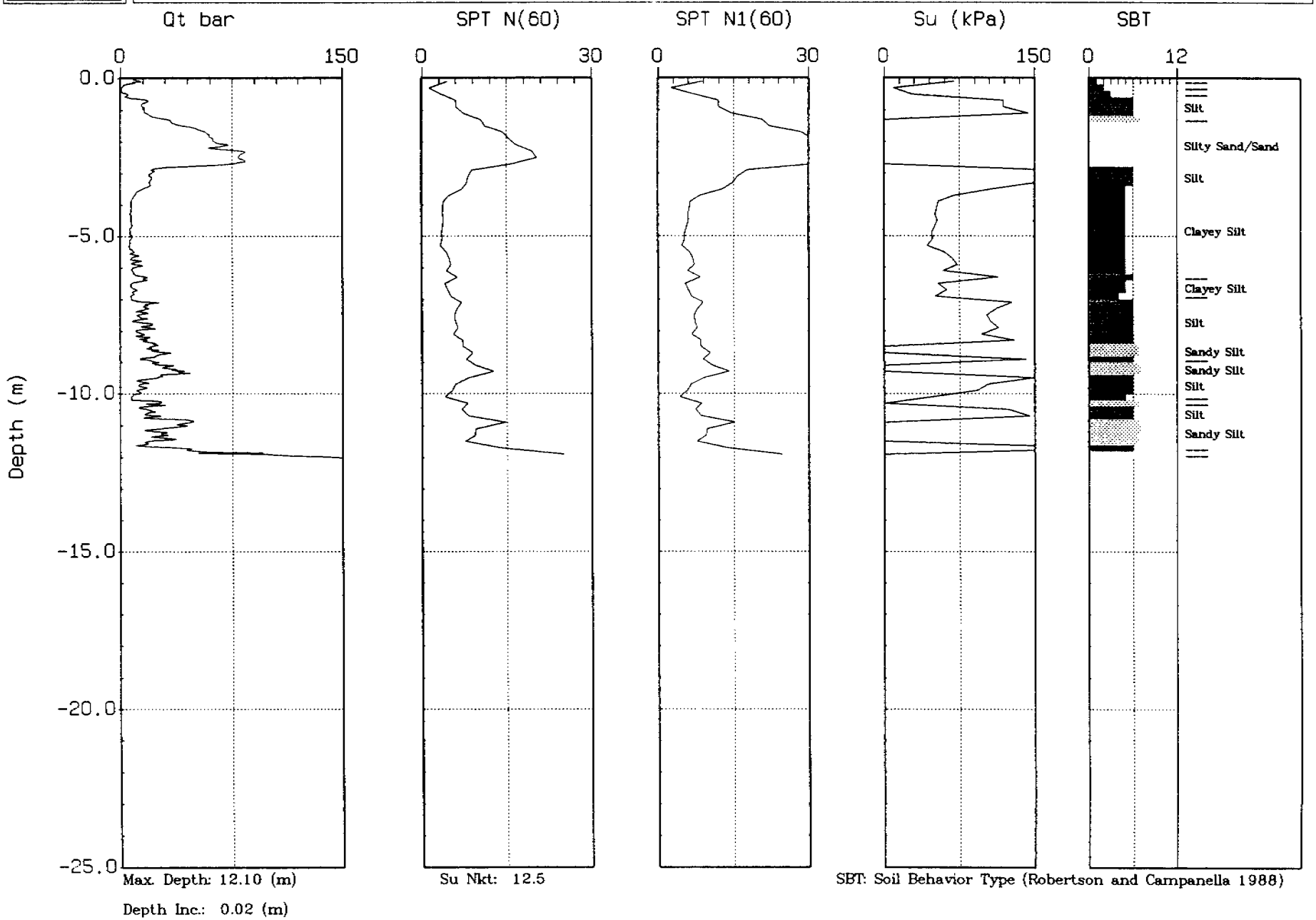
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N1
Location: N.INTERCHANGE

Cone: 20 TON A 058
Date: 03:26:99 08:19



Max. Depth: 12.10 (m)
Depth Inc.: 0.02 (m)

Su Nkt: 12.5

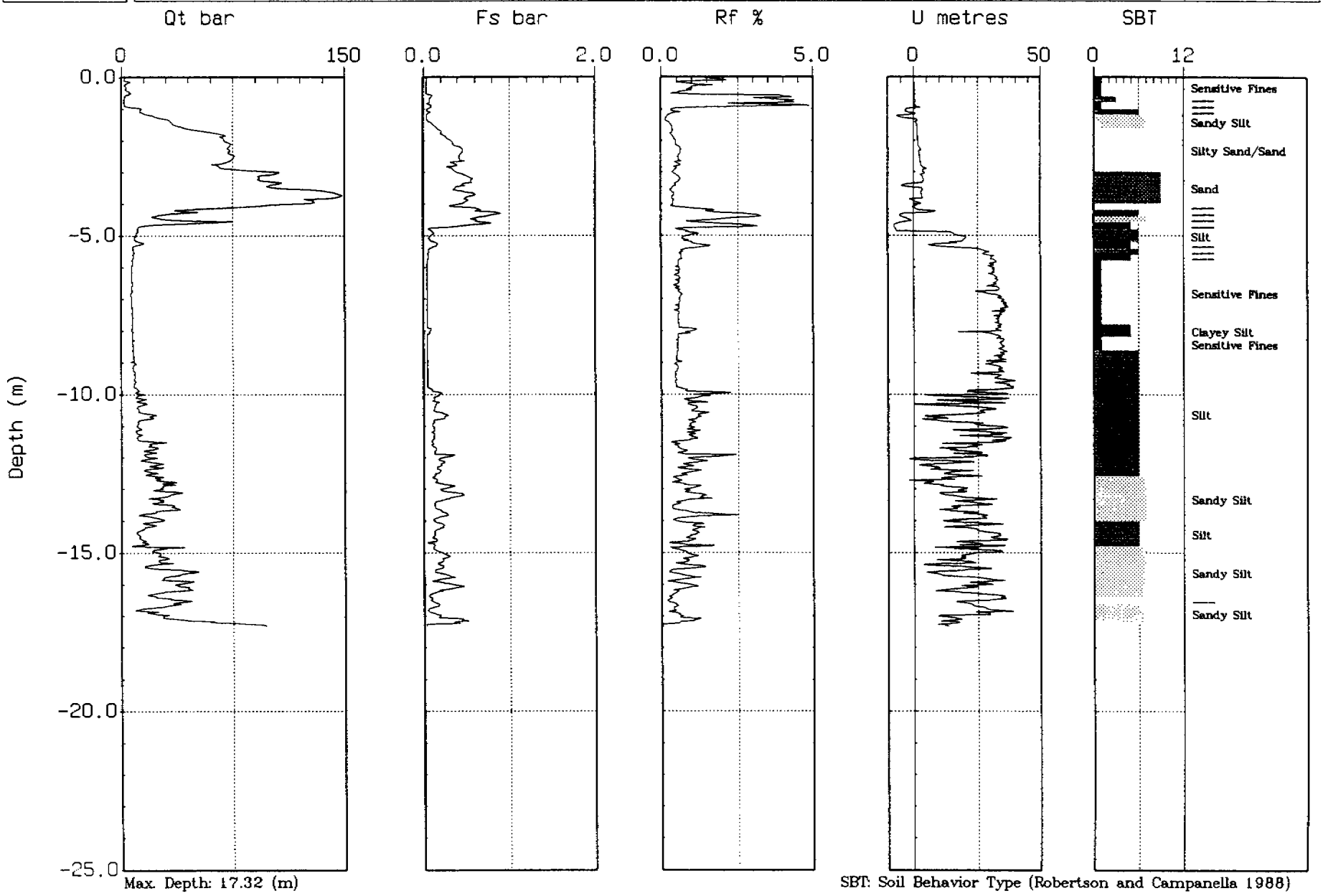
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N2
Location: N.INTERCHANGE

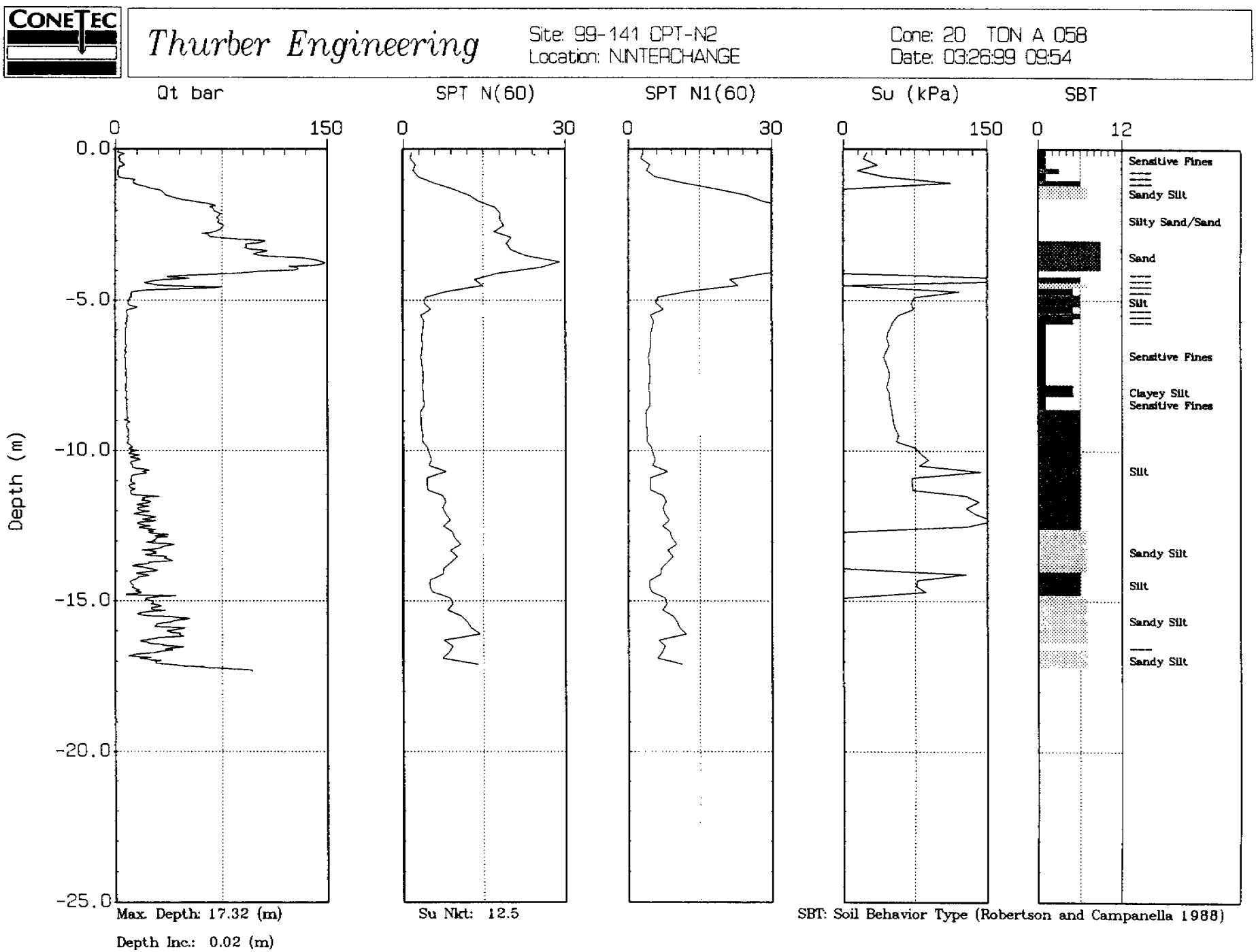
Cone: 20 TON A 058
Date: 03:26:99 09:54



Max. Depth: 17.32 (m)

Depth Inc.: 0.02 (m)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

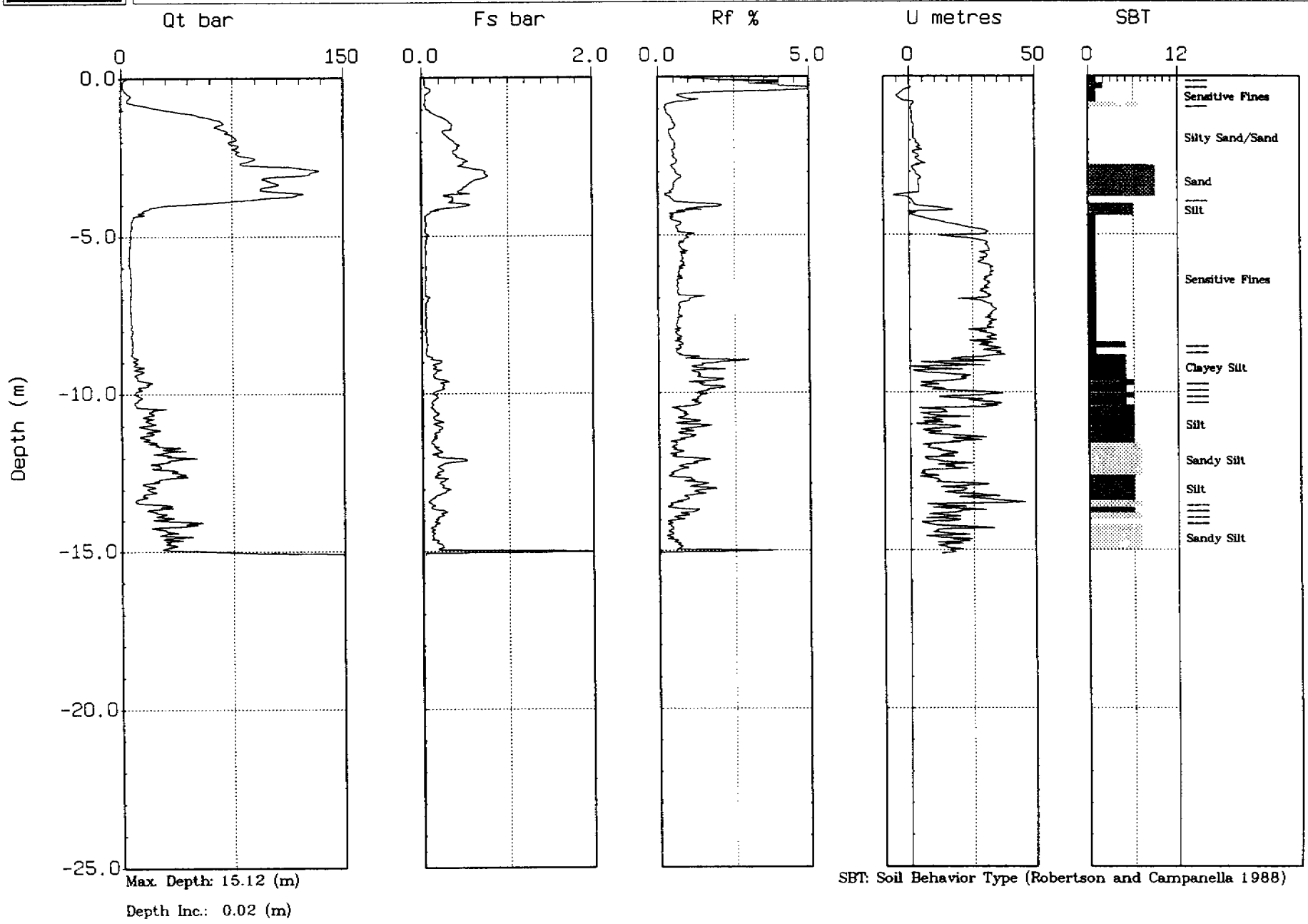

CONETEC
Thurber Engineering
Site: 99-141 CPT-N2
Location: N.INTERCHANGE
Cone: 20 TON A 058
Date: 03:26:99 09:54
Qt bar
SPT N(60)
SPT N1(60)
Su (kPa)
SBT
0
150
0
30
0
30
0
150
0
12
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m)
Sensitive Fines
Sandy Silt
Silty Sand/Sand
Sand
Silt
Sensitive Fines
Clayey Silt
Sensitive Fines
Silt
Sandy Silt
Silt
Sandy Silt
Sandy Silt
Max. Depth: 17.32 (m)
Depth Inc.: 0.02 (m)
Su Nkt: 12.5
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N3
Location: N.INTERCHANGE

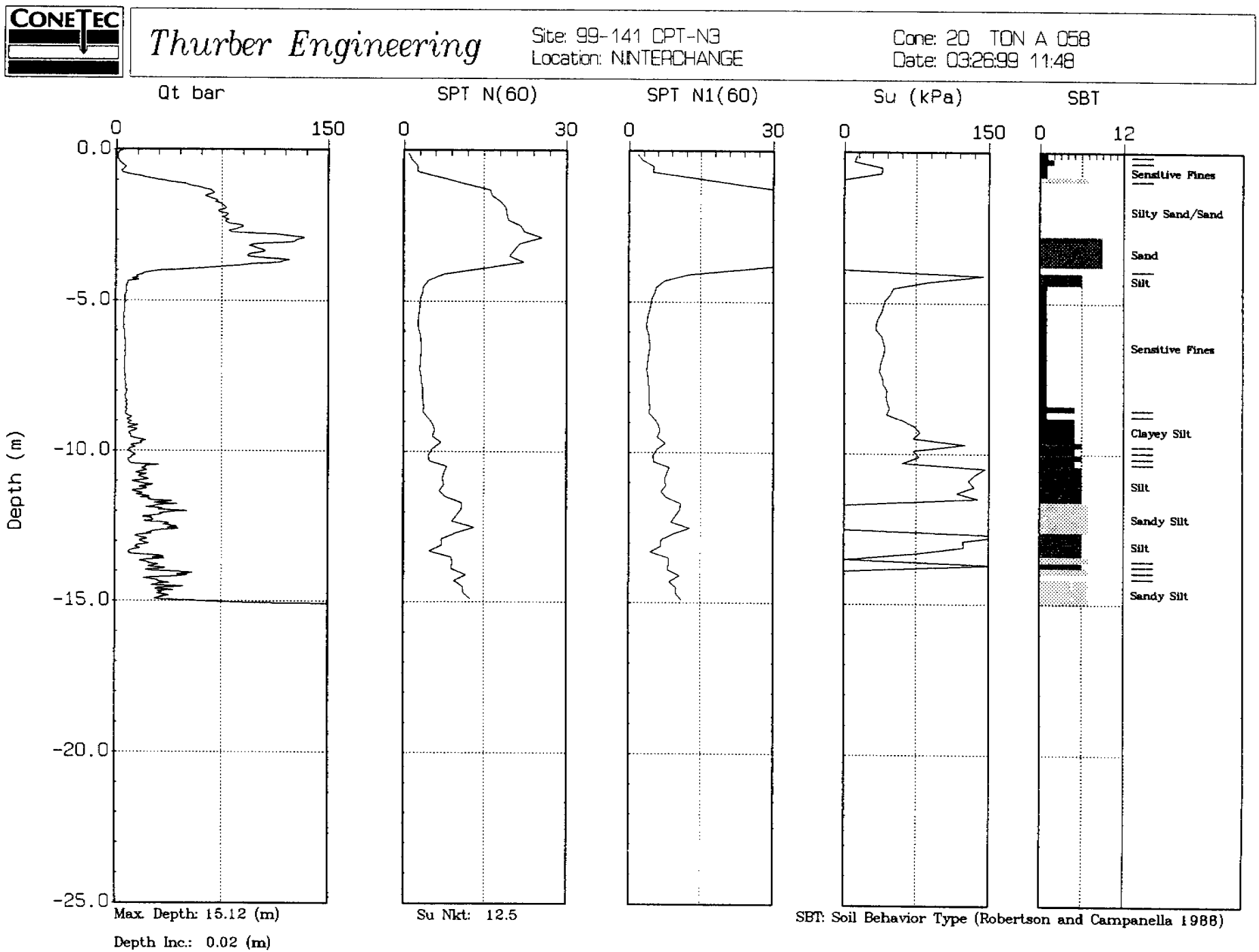
Cone: 20 TON A 058
Date: 03:26:99 11:48



Max. Depth: 15.12 (m)

Depth Inc.: 0.02 (m)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

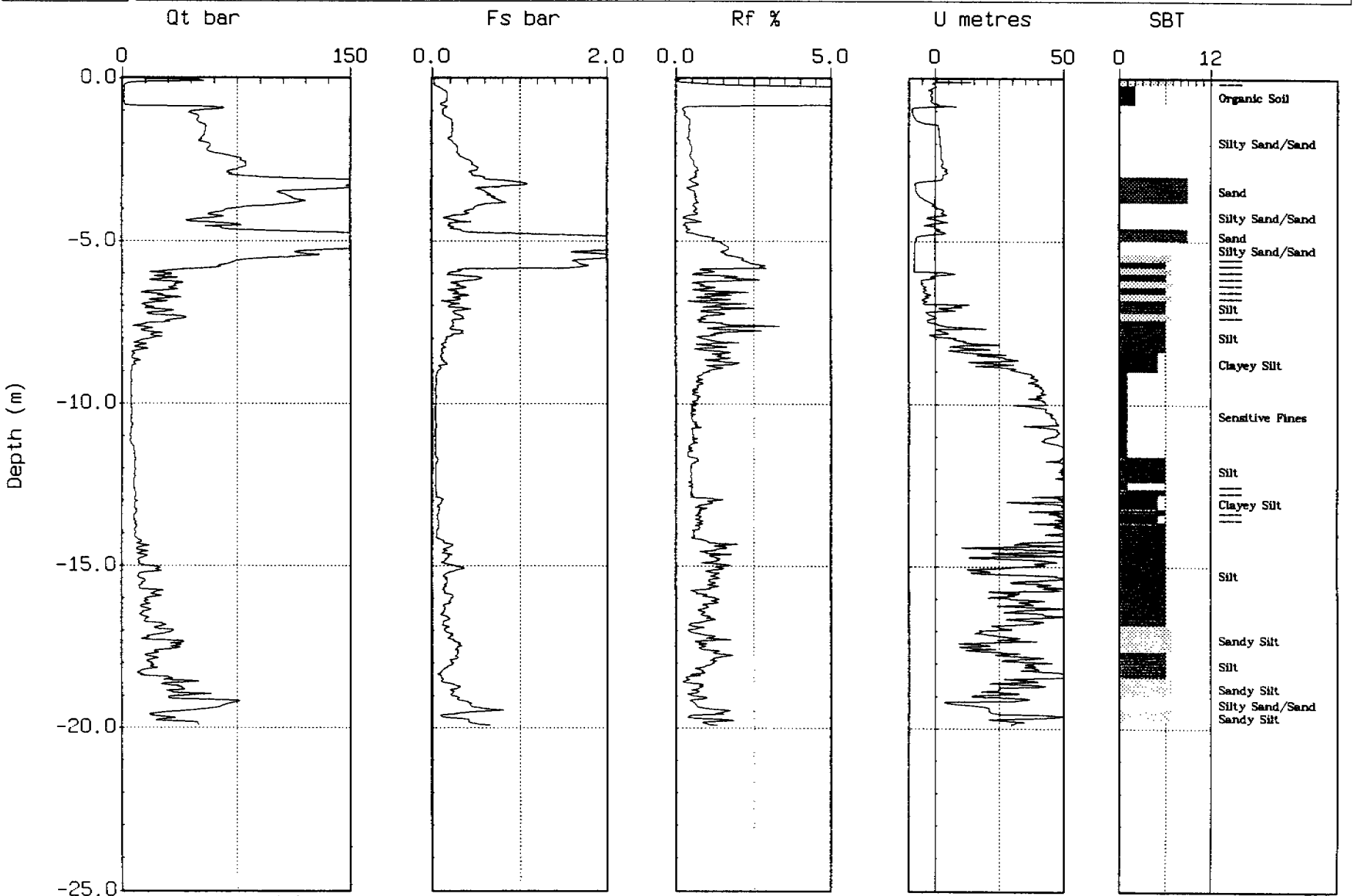

CONETEC
Thurber Engineering
Site: 99-141 CPT-N3
Location: N.INTERCHANGE
Cone: 20 TON A 058
Date: 03:26:99 11:48
Qt bar
SPT N(60)
SPT N1(60)
Su (kPa)
SBT
0
150
30
12
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m)
Sensitive Fines
Silty Sand/Sand
Sand
Silt
Sensitive Fines
Clayey Silt
Silt
Sandy Silt
Silt
Sandy Silt
Max. Depth: 15.12 (m)
Depth Inc.: 0.02 (m)
Su Nkt: 12.5
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N4
Location: N.INTERCHANGE

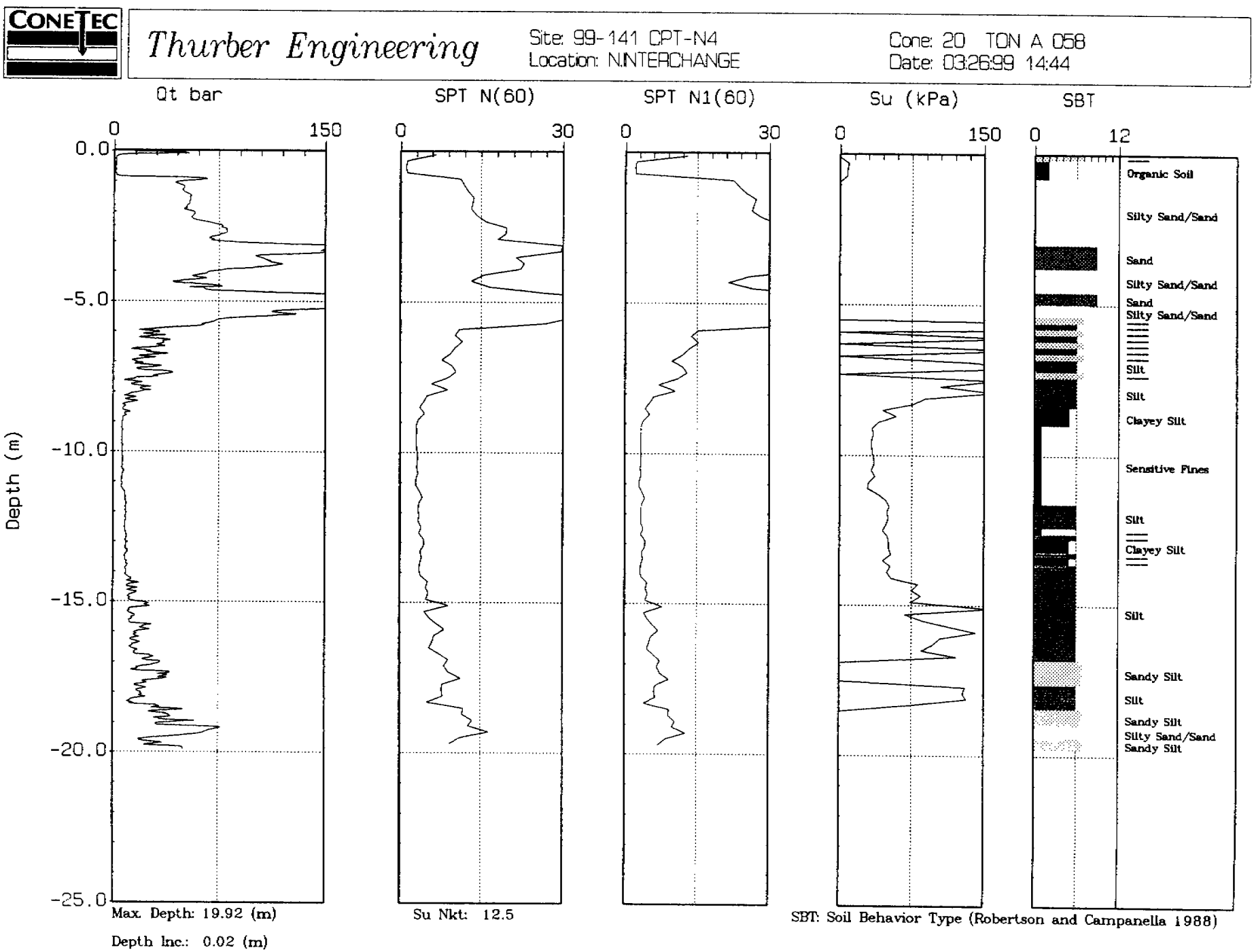
Cone: 20 TON A 058
Date: 03:26:99 14:44



Max. Depth: 19.92 (m)

Depth Inc.: 0.02 (m)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

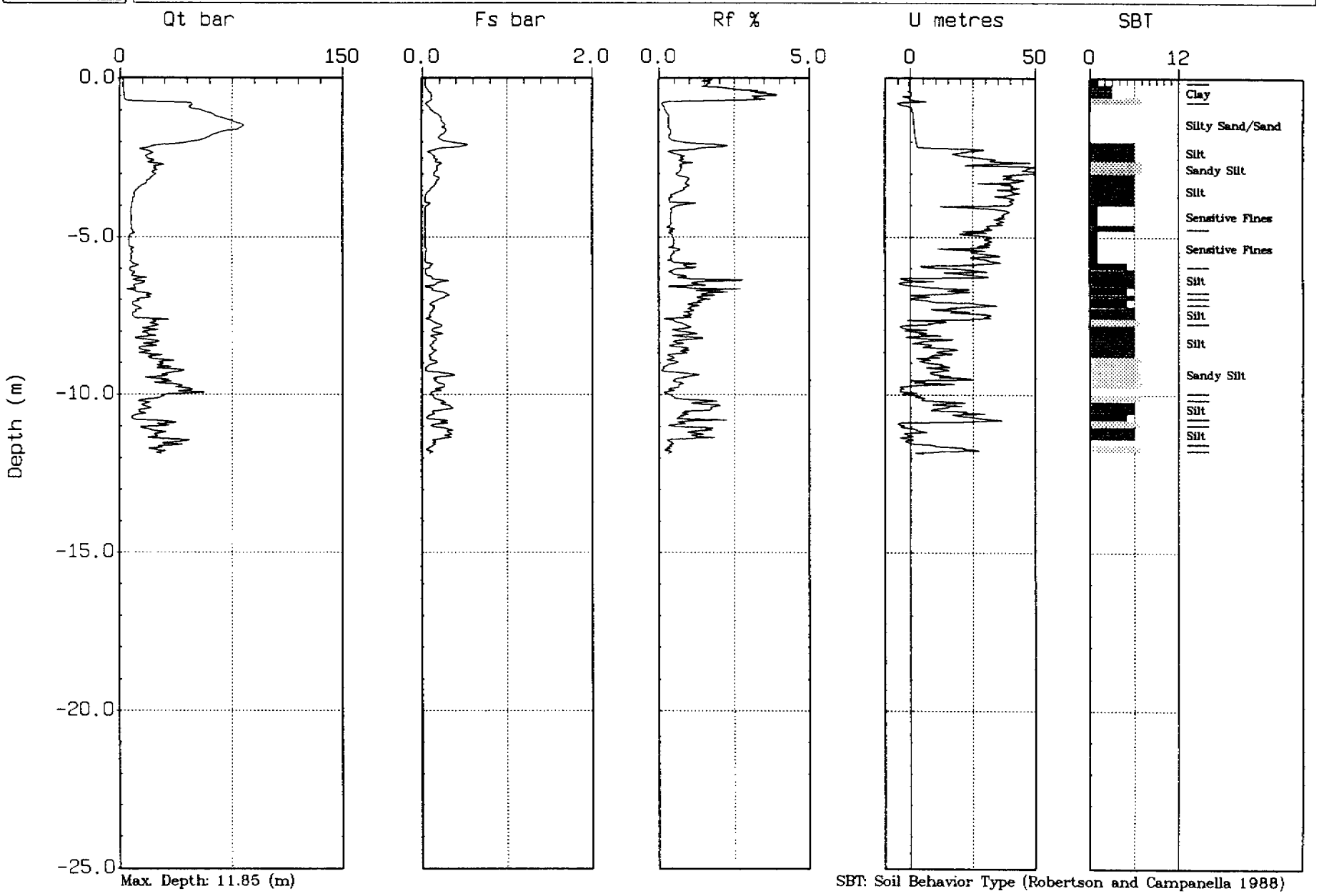

CONETEC
Thurber Engineering
Site: 99-141 CPT-N4
Location: N.INTERCHANGE
Cone: 20 TON A 058
Date: 03:26:99 14:44
Qt bar
SPT N(60)
SPT N1(60)
Su (kPa)
SBT
0
150
0
30
0
30
0
150
0
12
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Depth (m)
Organic Soil
Silty Sand/Sand
Sand
Silty Sand/Sand
Sand
Silty Sand/Sand
Silt
Silt
Clayey Silt
Sensitive Fines
Silt
Clayey Silt
Silt
Sandy Silt
Silt
Sandy Silt
Silty Sand/Sand
Sandy Silt
Max. Depth: 19.92 (m)
Depth Inc.: 0.02 (m)
Su Nkt: 12.5
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N5
Location: N.INTERCHANGE

Cone: 20 TON A 058
Date: 03:26:99 13:39



Max. Depth: 11.85 (m)

Depth Inc.: 0.02 (m)

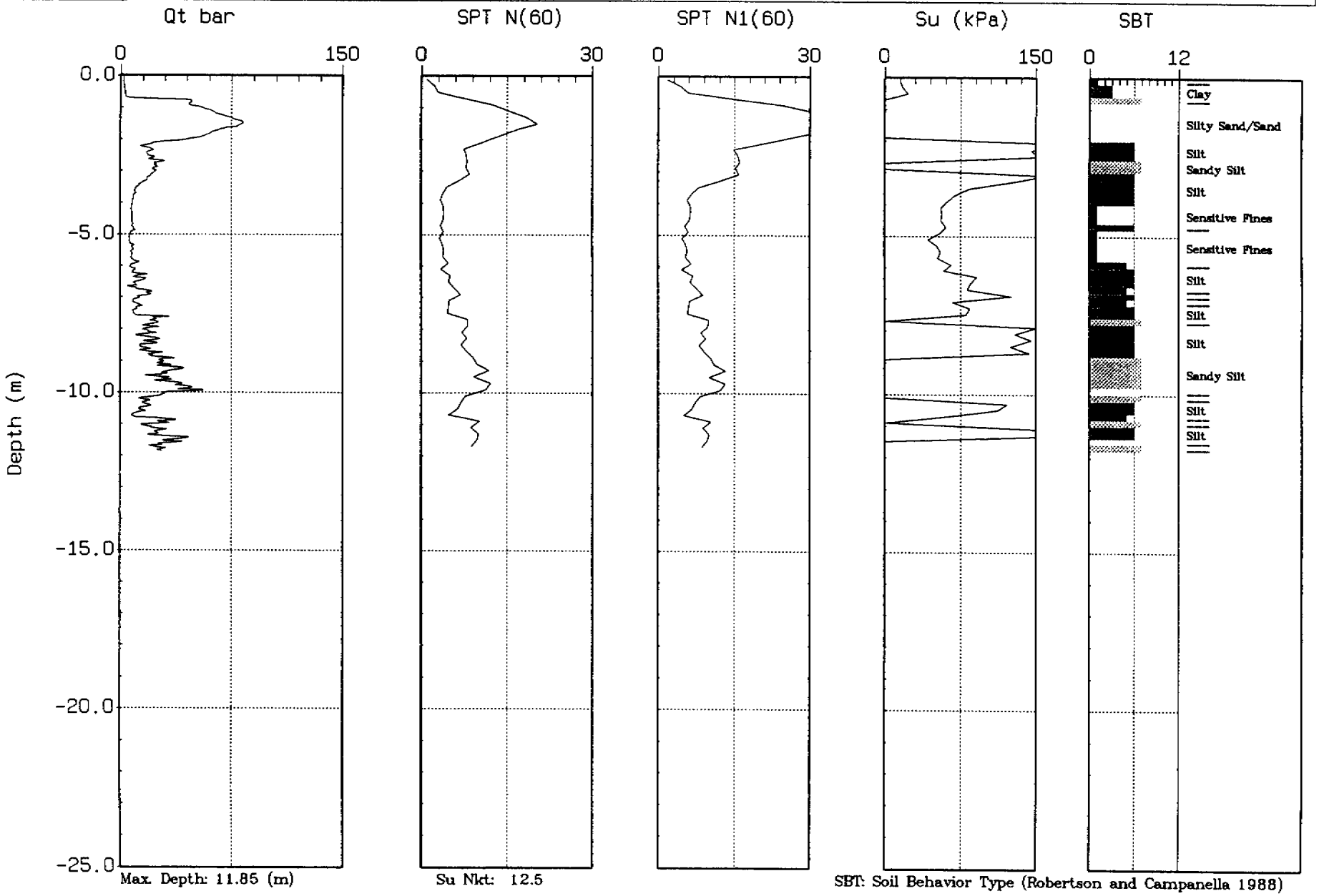
SBT: Soil Behavior Type (Robertson and Campanella 1988)

CONETEC

Thurber Engineering

Site: 99-141 CPT-N5
Location: N.INTERCHANGE

Cone: 20 TON A 058
Date: 03:26:99 13:39



Max. Depth: 11.85 (m)

Depth Inc.: 0.02 (m)

Su Nkt: 12.5

SBT: Soil Behavior Type (Robertson and Campanella 1988)

APPENDIX B

CPT Interpretations

ConeTec CPT Interpretations as of January 7, 1999 (Release 1.00.19)

ConeTec's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that Qt is the recorded tip value, Qc, corrected for pore pressure effects. Since all ConeTec cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, Fs, are not required.

The tip correction is: $Qt = Qc + (1-a) \bullet Ud$

where: *Qt* is the corrected tip load
Qc is the recorded tip load
Ud is the recorded dynamic pore pressure
a is the Net Area Ratio for the cone (typically 0.85 for ConeTec cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT dissipation tests). The stress calculations use unit weights assigned to the Soil Behaviour Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters is given in table 1. The appropriate references referred to in table 1 are listed in table 2.

The estimated Soil Behaviour Type is based on the charts developed by Robertson and Campanella shown in figure 1.

Table 1 CPT Interpretation Methods

Interpreted Parameter	Description	Equation	Ref
Depth	mid layer depth		
AvgQt	Averaged corrected tip (Qt)	$AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$	
AvgFs	Averaged sleeve friction (Fs)	$AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$	
AvgRf	Averaged friction ratio (Rf)	$AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$	
AvgUd	Averaged dynamic pore pressure (Ud)	$AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$	
SBT	Soil Behavior Type as defined by Robertson and Campanella		1

U.Wt.	Unit Weight of soil determined from: 1) uniform value or 2) value assigned to each SBT zone 3) user supplied unit weight profile		
TStress	Total vertical overburden stress at mid layer depth	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ where γ_i is layer unit weight h_i is layer thickness	
EStress	Effective vertical overburden stress at mid layer depth	$EStress = TStress - Ueq$	
Ueq	Equilibrium pore pressure determined from: 1) hydrostatic from water table depth 2) user supplied profile		
Cn	SPT N_{60} overburden correction factor	$Cn=(\sigma_v')^{-0.5}$ where σ_v' is in tsf $0.5 < C_n < 2.0$	
N_{60}	SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone		3
$(N1)_{60}$	SPT N_{60} value corrected for overburden pressure	$N1_{60} = Cn \bullet N_{60}$	3
$\Delta(N1)_{60}$	Equivalent Clean Sand Correction to $(N1)_{60}$	$\Delta(N1)_{60} = \frac{K_{SPT}}{1 - K_{SPT}} \bullet (N1)_{60}$ Where: K_{SPT} is defined as: 0.0 for FC < 5% 0.0167 • (FC - 5) for 5% < FC < 35% 0.5 for FC > 35% FC - Fines Content in %	7
$(N1)_{60cs}$	Equivalent Clean Sand $(N1)_{60}$	$(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$	7
Su	Undrained shear strength - Nkt is use selectable	$Su = \frac{Qt - \sigma_v}{Nkt}$	2
k	Coefficient of permeability (assigned to each SBT zone)		6
Bq	Pore pressure parameter	$Bq = \frac{\Delta u}{Qt - \sigma_v}$	2
Qtn	Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990	$Qtn = \frac{Qt - \sigma_v}{\sigma'_v}$	4
Rfn	Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990	$Rfn = 100\% \bullet \frac{f_s}{Qt - \sigma_v}$	4
SBTn	Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see figure 1)		4
Qc1	Normalized Qt for seismic analysis	$qc1 = qc \bullet (Pa/\sigma_v')^{0.5}$ where: Pa = atm. pressure	5
Qc1N	Dimensionless Normalized Qt1	qc1N = qc1 / Pa where: Pa = atm. pressure	

ΔQc1N1	Equivalent clean sand correction	$\Delta qc1N = \frac{K_{CPT}}{1 - K_{CPT}} \bullet qc1N$ Where: K_{CPT} is defined as: 0.0 for FC < 5% 0.0267 • (FC - 5) for 5% < FC < 35% 0.5 for FC > 35% FC - Fines Content in %	5
Qc1Ncs	Clean Sand equivalent Qc1N	$qc1Ncs = qc1N + \Delta qc1N$	5
Ic	Soil index for estimating grain characteristics	$Ic = [(3.47 - logQ)^2 + (log F + 1.22)^2]^{0.5}$	5
FC	Fines content (%)	$FC=1.75(Ic^{3.25}) - 3.7$ $FC=100$ for $Ic > 3.5$ $FC=0$ for $Ic < 1.26$ $FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$	8
PHI	Friction Angle	Campanella and Robertson Durunoglu and Mitchel Janbu	1
Dr	Relative Density	Ticino Sand Hokksund Sand Schmertmann 1976 Jamiolkowski - All Sands	1
OCR	Over Consolidation Ratio		1
State Parameter			9
CRR	Cyclic Resistance Ratio		7

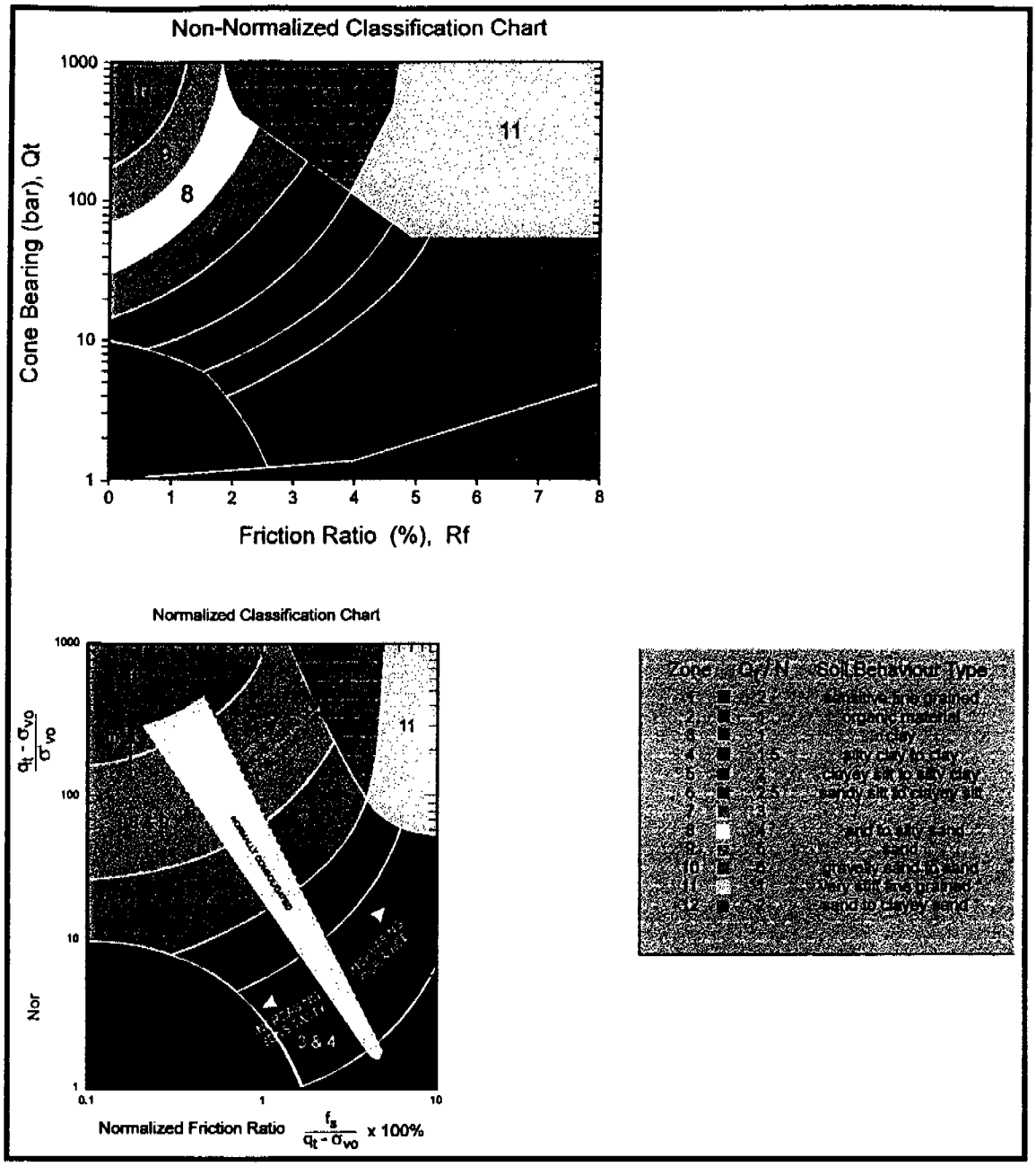


Figure 1 Non-Normalized and Normalized Soil Behaviour Type Classification Charts

Table 2 References

No.	Reference
1	Robertson, P.K. and Campanella, R.G., 1986, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., Canada
2	Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.
3	Robertson, P.K. and Campanella, R.G., 1989, "Guidelines for Geotechnical Design Using CPT and CPTU", UBC, Soil Mechanics Series No. 120, Civil Eng. Dept., Vancouver, B.C., Canada
4	Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27.
5	Robertson, P.K. and Fear, C.E., 1995, "Liquefaction of Sands and its Evaluation", Keynote Lecture, First International Conference on Earthquake Geotechnical Enginnering, Tokyo, Japan.
6	ConeTec Internal Report
7	Robertson, P.K. and Wride, C.E., 1997, "Cyclic Liquefaction and its Evaluation Based on SPT and CPT", NCEER Workshop Paper, January 22, 1997
8	Wride, C.E. and Robertson, P.K., 1997, "Phase II Data Review Report (Massey and Kidd Sites, Fraser River Delta)", Volume 1 - Data Report (June 1997), University of Alberta.
9	Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992.

ConeTec Investigations Ltd. - CPT Interpretation
Interpretation Output - Release 1.00.17
Run No: 99-0331-0824-2828
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N1
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 08:19
CPT File: 141CPN1.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
0.12	7.4	0.03	0.42	0.01	1	17.5	2.2	1.0	1.23	2.00	3.7	7.4	58.7	0.00
0.38	1.7	0.10	5.74	0.31	2	12.5	5.9	2.3	3.68	2.00	1.7	3.5	13.5	0.00
0.62	10.6	0.16	1.50	-1.38	5	18.0	9.8	3.6	6.13	2.00	5.3	10.6	84.4	0.00
0.88	15.0	0.08	0.51	-2.11	6	18.0	14.2	5.7	8.58	2.00	6.0	12.0	118.9	0.08
1.12	19.3	0.11	0.55	0.77	6	18.0	18.8	7.7	11.04	2.00	7.7	15.5	153.3	0.09
1.38	35.6	0.18	0.50	1.69	7	18.5	23.3	9.8	13.49	2.00	11.9	23.7	UnDef	0.11
1.62	53.3	0.28	0.53	1.65	8	19.0	28.0	12.1	15.94	2.00	13.3	26.7	UnDef	0.19
1.88	61.0	0.32	0.53	2.08	8	19.0	32.8	14.4	18.39	2.00	15.3	30.5	UnDef	0.25
2.12	66.0	0.38	0.58	2.57	8	19.0	37.5	16.7	20.85	2.00	16.5	33.0	UnDef	0.29
2.38	80.8	0.48	0.59	2.57	8	19.0	42.2	19.0	23.30	2.00	20.2	40.4	UnDef	0.00
2.62	75.8	0.54	0.71	3.20	8	19.0	47.0	21.2	25.75	2.00	19.0	37.9	UnDef	0.40
2.88	25.3	0.40	1.58	15.90	6	18.0	51.6	23.4	28.20	2.00	10.1	20.3	198.4	0.11
3.12	20.2	0.17	0.85	32.82	6	18.0	56.1	25.5	30.66	1.94	8.1	15.7	157.5	0.09
3.38	18.2	0.31	1.68	31.61	6	18.0	60.6	27.5	33.11	1.87	7.3	13.6	140.8	0.10
3.62	10.5	0.14	1.37	34.13	5	18.0	65.1	29.6	35.56	1.80	5.3	9.5	79.1	0.09
3.88	7.6	0.09	1.21	36.62	5	18.0	69.6	31.6	38.01	1.74	3.8	6.6	55.1	0.09
4.12	7.3	0.06	0.85	37.73	5	18.0	74.1	33.7	40.47	1.69	3.6	6.1	52.1	0.09
4.38	7.2	0.07	0.93	35.79	5	18.0	78.6	35.7	42.92	1.64	3.6	5.9	51.5	0.09
4.62	7.4	0.08	1.12	29.52	5	18.0	83.1	37.8	45.37	1.59	3.7	5.9	52.8	0.10
4.88	6.7	0.11	1.70	29.03	5	18.0	87.6	39.8	47.82	1.55	3.4	5.2	46.8	0.09
5.12	6.8	0.09	1.30	28.26	5	18.0	92.1	41.8	50.28	1.51	3.4	5.2	47.3	0.09
5.38	7.2	0.09	1.30	28.50	5	18.0	96.6	43.9	52.73	1.48	3.6	5.3	49.7	0.09
5.62	8.5	0.14	1.69	16.67	5	18.0	101.1	45.9	55.18	1.44	4.2	6.1	59.6	0.10
5.88	10.6	0.15	1.38	12.94	5	18.0	105.6	48.0	57.63	1.41	5.3	7.5	76.4	0.12
6.12	9.0	0.17	1.85	21.72	5	18.0	110.1	50.0	60.09	1.38	4.5	6.3	63.5	0.10
6.38	13.5	0.18	1.37	9.34	6	18.0	114.6	52.1	62.54	1.36	5.4	7.3	98.7	0.10
6.62	8.3	0.12	1.40	23.94	5	18.0	119.1	54.1	64.99	1.33	4.2	5.5	56.9	0.10
6.88	7.7	0.18	2.28	25.95	4	18.0	123.6	56.2	67.44	1.31	5.1	6.7	51.8	0.09
7.12	17.1	0.15	0.88	9.65	6	18.0	128.1	58.2	69.90	1.28	6.8	8.8	126.3	0.09
7.38	14.5	0.13	0.88	12.13	6	18.0	132.6	60.3	72.35	1.26	5.8	7.3	105.0	0.09
7.62	13.2	0.14	1.04	15.96	6	18.0	137.1	62.3	74.80	1.24	5.3	6.5	94.7	0.10
7.88	16.8	0.15	0.89	10.25	6	18.0	141.6	64.4	77.25	1.22	6.7	8.2	123.1	0.09
8.12	13.7	0.13	0.97	15.07	6	18.0	146.1	66.4	79.71	1.20	5.5	6.6	98.2	0.10
8.38	20.0	0.11	0.57	10.48	7	18.5	150.7	68.5	82.16	1.18	6.7	7.9	UnDef	0.09
8.62	25.0	0.18	0.72	12.69	7	18.5	155.3	70.7	84.61	1.16	8.3	9.7	UnDef	0.09
8.88	20.2	0.27	1.33	15.30	6	18.0	159.9	72.8	87.06	1.15	8.1	9.2	148.5	0.11
9.12	29.6	0.17	0.58	6.11	7	18.5	164.4	74.9	89.52	1.13	9.9	11.2	UnDef	0.09
9.38	33.6	0.15	0.44	5.09	7	18.5	169.1	77.1	91.97	1.11	11.2	12.5	UnDef	0.09
9.62	14.6	0.21	1.45	15.63	6	18.0	173.6	79.2	94.42	1.10	5.9	6.4	103.3	0.13

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60 (blows/ft)	Su (kPa)	CRR
9.88	13.5	0.17	1.26	19.24	6	18.0	178.1	81.3	96.87	1.09	5.4	5.9	93.8	0.12
10.12	10.9	0.08	0.74	24.84	6	18.0	182.6	83.3	99.33	1.07	4.4	4.7	72.5	0.10
10.38	20.0	0.11	0.57	15.60	7	18.5	187.2	85.4	101.78	1.06	6.7	7.1	UnDef	0.09
10.62	19.8	0.16	0.80	13.32	6	18.0	191.8	87.5	104.23	1.05	7.9	8.3	143.1	0.10
10.88	39.9	0.25	0.62	12.07	7	18.5	196.3	89.6	106.68	1.03	13.3	13.7	UnDef	0.10
11.12	28.4	0.15	0.52	15.64	7	18.5	200.9	91.8	109.14	1.02	9.5	9.7	UnDef	0.09
11.38	27.6	0.12	0.43	6.20	7	18.5	205.6	94.0	111.59	1.01	9.2	9.3	UnDef	0.00
11.62	24.8	0.25	1.01	17.77	6	18.0	210.1	96.1	114.04	1.00	9.9	9.9	181.9	0.11
11.88	89.3	0.76	0.85	7.74	8	19.0	214.8	98.3	116.49	0.99	22.3	22.0	UnDef	0.19

ConeTec Investigations Ltd. - CPT Interpretation
Interpretation Output - Release 1.00.17
Run No: 99-0331-0824-2828
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N1
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 08:19
CPT File: 141CPN1.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60 (N1
0.12	1.0E-07	0.00	762.8	0.42	10	14.7	0.0	14.7	0.0	UnDef	UnDef	10.0	UnDef	0.0
0.38	1.0E-15	0.00	74.6	5.94	11	3.5	UnDef	UnDef	0.0	UnDef	UnDef	10.0	UnDef	UnDef
0.62	5.0E-06	-0.02	291.4	1.52	9	21.3	0.9	22.2	6.6	UnDef	UnDef	10.0	UnDef	0.3
0.88	5.0E-05	-0.02	262.3	0.52	9	30.0	0.0	30.0	1.6	46	54.0	10.0	-0.22	0.0
1.12	5.0E-05	0.00	248.4	0.56	9	38.7	0.0	38.7	2.1	46	56.9	10.0	-0.22	0.0
1.38	5.0E-04	0.00	360.0	0.51	10	71.2	0.0	71.2	0.4	48	70.9	1.0	-0.24	0.0
1.62	5.0E-03	0.00	439.7	0.53	10	106.6	0.0	106.6	0.0	48	79.6	1.0	-0.26	0.0
1.88	5.0E-03	0.00	422.9	0.53	10	122.1	0.0	122.1	0.1	48	80.9	1.0	-0.26	0.0
2.12	5.0E-03	0.00	394.3	0.58	10	132.1	0.0	132.1	0.6	48	81.1	1.0	-0.26	0.0
2.38	5.0E-03	0.00	424.0	0.60	10	161.6	0.0	161.6	0.4	48	85.0	1.0	-0.27	0.0
2.62	5.0E-03	0.00	354.6	0.72	9	151.6	0.0	151.6	1.7	48	81.5	1.0	-0.27	0.0
2.88	5.0E-05	0.05	105.9	1.62	7	50.6	15.6	66.3	13.8	42	48.7	10.0	-0.24	3.5
3.12	5.0E-05	0.15	77.3	0.87	9	40.1	9.1	49.3	12.0	42	41.1	10.0	-0.14	2.1
3.38	5.0E-05	0.16	64.0	1.74	7	34.7	21.8	56.5	19.5	40	36.9	10.0	-0.18	4.3
3.62	5.0E-06	0.30	33.5	1.46	7	19.4	24.4	43.8	25.9	UnDef	UnDef	6.0	UnDef	5.1
3.88	5.0E-06	0.47	21.8	1.34	7	13.5	33.2	46.7	31.6	UnDef	UnDef	6.0	UnDef	5.3
4.12	5.0E-06	0.51	19.3	0.95	7	12.5	25.9	38.4	30.3	UnDef	UnDef	6.0	UnDef	4.5
4.38	5.0E-06	0.48	18.0	1.04	7	12.1	32.6	44.7	32.3	UnDef	UnDef	6.0	UnDef	5.0
4.62	5.0E-06	0.37	17.5	1.26	6	12.1	47.4	59.5	34.8	UnDef	UnDef	6.0	UnDef	5.9
4.88	5.0E-06	0.41	14.7	1.95	6	10.7	42.6	53.3	43.4	UnDef	UnDef	6.0	UnDef	5.2
5.12	5.0E-06	0.38	14.1	1.51	6	10.6	42.2	52.8	40.9	UnDef	UnDef	6.0	UnDef	5.2
5.38	5.0E-06	0.37	14.1	1.50	6	10.8	43.3	54.2	40.8	UnDef	UnDef	6.0	UnDef	5.3
5.62	5.0E-06	0.15	16.2	1.92	6	12.5	49.9	62.4	41.2	UnDef	UnDef	6.0	UnDef	6.1
5.88	5.0E-06	0.07	19.9	1.53	6	15.3	58.2	73.5	34.7	UnDef	UnDef	6.0	UnDef	7.4
6.12	5.0E-06	0.19	15.9	2.10	6	12.8	51.1	63.9	42.9	UnDef	UnDef	6.0	UnDef	6.3
6.38	5.0E-05	0.02	23.7	1.49	7	18.7	44.8	63.5	31.4	34	30.0	6.0	-0.08	5.8
6.62	5.0E-06	0.24	13.1	1.63	6	11.3	45.2	56.4	43.3	UnDef	UnDef	6.0	UnDef	5.5
6.88	5.0E-07	0.29	11.5	2.72	4	10.3	41.2	51.5	53.3	UnDef	UnDef	3.0	UnDef	6.7
7.12	5.0E-05	0.02	27.1	0.95	7	22.4	25.4	47.8	24.9	36	30.0	6.0	-0.06	4.4
7.38	5.0E-05	0.04	21.8	0.97	7	18.6	31.2	49.9	28.5	34	30.0	6.0	-0.04	4.7
7.62	5.0E-05	0.07	19.0	1.16	7	16.7	46.2	62.9	32.5	34	30.0	6.0	-0.03	5.6
7.88	5.0E-05	0.02	23.9	0.97	7	20.9	29.8	50.8	27.0	34	30.0	6.0	-0.05	4.8
8.12	5.0E-05	0.06	18.5	1.08	7	16.8	45.4	62.2	32.3	32	30.0	6.0	-0.03	5.5
8.38	5.0E-04	0.01	27.0	0.62	7	24.2	19.3	43.4	21.6	36	30.0	1.0	-0.03	3.0
8.62	5.0E-04	0.02	33.2	0.77	7	29.7	20.8	50.6	20.4	36	32.5	1.0	-0.06	3.4
8.88	5.0E-05	0.03	25.5	1.44	7	23.6	46.9	70.5	29.9	36	30.0	6.0	-0.08	6.6
9.12	5.0E-04	-0.01	37.4	0.61	7	34.2	16.7	51.0	17.3	38	36.6	1.0	-0.06	2.9
9.38	5.0E-04	-0.01	41.4	0.47	9	38.2	0.0	38.2	5.0	38	39.7	1.0	-0.04	0.0
9.62	5.0E-05	0.05	16.3	1.65	6	16.5	65.8	82.3	39.2	32	30.0	6.0	-0.05	6.4

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60 (N
9.88	5.0E-05	0.08	14.4	1.45	6	15.0	60.0	74.9	40.0	32	30.0	6.0	-0.02	5.9
10.12	5.0E-05	0.16	10.9	0.89	6	11.9	47.7	59.6	40.5	30	30.0	3.0	0.05	4.7
10.38	5.0E-04	0.03	21.3	0.63	7	21.7	25.6	47.3	25.3	34	30.0	1.0	0.00	3.6
10.62	5.0E-05	0.01	20.4	0.88	7	21.2	36.4	57.6	28.7	34	30.0	6.0	-0.03	5.4
10.88	5.0E-04	0.00	42.3	0.65	7	42.1	18.0	60.2	16.2	38	42.5	1.0	-0.07	3.2
11.12	5.0E-04	0.02	28.8	0.56	7	29.7	19.9	49.6	20.0	36	32.4	1.0	-0.02	3.2
11.38	5.0E-04	-0.02	27.2	0.47	7	28.5	0.0	28.5	5.0	36	31.3	1.0	-0.01	0.0
11.62	5.0E-05	0.03	23.7	1.10	7	25.3	42.0	67.4	28.4	34	30.0	6.0	-0.06	6.3
11.88	5.0E-03	0.00	88.7	0.87	9	90.1	16.4	106.4	10.8	42	64.3	1.0	-0.16	2.3

ConeTec Investigations Ltd. - CPT Interpretation
Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-2069
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N2
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 09:54
CPT File: 141CPN2.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
0.12	2.9	0.03	1.05	0.13	1	17.5	2.2	1.0	1.23	2.00	1.4	2.9	22.7	0.00
0.38	3.8	0.03	0.72	0.28	1	17.5	6.6	2.9	3.68	2.00	1.9	3.8	29.7	0.00
0.62	2.7	0.08	2.87	0.34	3	17.5	10.9	4.8	6.13	2.00	2.7	5.4	20.6	0.00
0.88	4.8	0.07	1.43	0.24	1	17.5	15.3	6.7	8.58	2.00	2.4	4.8	36.8	0.00
1.12	15.8	0.05	0.30	-3.13	6	18.0	19.8	8.7	11.04	2.00	6.3	12.6	124.6	0.08
1.38	31.6	0.06	0.21	0.14	7	18.5	24.3	10.8	13.49	2.00	10.5	21.1	UnDef	0.10
1.62	47.5	0.17	0.35	1.29	8	19.0	29.0	13.1	15.94	2.00	11.9	23.8	UnDef	0.16
1.88	68.1	0.26	0.38	1.50	8	19.0	33.8	15.4	18.39	2.00	17.0	34.0	UnDef	0.31
2.12	72.3	0.38	0.52	1.83	8	19.0	38.5	17.7	20.85	2.00	18.1	36.2	UnDef	0.36
2.38	73.6	0.44	0.60	2.29	8	19.0	43.2	20.0	23.30	2.00	18.4	36.8	UnDef	0.38
2.62	71.4	0.39	0.55	2.52	8	19.0	48.0	22.2	25.75	2.00	17.8	35.7	UnDef	0.35
2.88	77.7	0.35	0.45	3.67	8	19.0	52.8	24.5	28.20	1.98	19.4	38.4	UnDef	0.43
3.12	95.7	0.51	0.53	3.53	8	19.0	57.5	26.8	30.66	1.89	23.9	45.2	UnDef	0.00
3.38	102.0	0.46	0.45	-0.08	9	19.5	62.3	29.2	33.11	1.81	20.4	37.0	UnDef	0.00
3.62	138.1	0.49	0.36	3.08	9	19.5	67.2	31.6	35.56	1.74	27.6	48.1	UnDef	0.00
3.88	130.9	0.48	0.37	1.36	9	19.5	72.1	34.0	38.01	1.68	26.2	43.9	UnDef	0.00
4.12	65.4	0.53	0.82	2.18	8	19.0	76.9	36.4	40.47	1.62	16.4	26.5	UnDef	0.20
4.38	28.4	0.71	2.50	-3.09	6	18.0	81.5	38.6	42.92	1.58	11.4	17.9	220.8	0.14
4.62	35.3	0.52	1.48	-5.94	7	18.5	86.1	40.7	45.37	1.53	11.8	18.1	UnDef	0.12
4.88	10.4	0.09	0.84	6.62	6	18.0	90.6	42.8	47.82	1.50	4.2	6.2	76.2	0.09
5.12	10.8	0.09	0.88	17.76	6	18.0	95.1	44.8	50.28	1.46	4.3	6.3	78.8	0.09
5.38	8.5	0.09	1.05	19.09	5	18.0	99.6	46.9	52.73	1.43	4.2	6.0	59.7	0.10
5.62	7.9	0.05	0.62	29.46	5	18.0	104.1	48.9	55.18	1.40	4.0	5.6	55.2	0.09
5.88	7.3	0.04	0.54	30.99	1	17.5	108.6	50.9	57.63	1.37	3.6	5.0	49.3	0.09
6.12	6.9	0.04	0.53	31.06	1	17.5	112.9	52.9	60.09	1.35	3.5	4.7	46.3	0.09
6.38	7.0	0.04	0.56	32.27	1	17.5	117.3	54.8	62.54	1.32	3.5	4.6	46.3	0.09
6.62	7.1	0.04	0.51	31.46	1	17.5	121.7	56.7	64.99	1.30	3.5	4.6	46.7	0.09
6.88	6.6	0.04	0.61	31.59	1	17.5	126.1	58.6	67.44	1.28	3.3	4.2	42.5	0.09
7.12	6.9	0.04	0.56	35.77	1	17.5	130.4	60.5	69.90	1.26	3.5	4.4	45.1	0.09
7.38	7.2	0.04	0.54	34.34	1	17.5	134.8	62.5	72.35	1.24	3.6	4.5	47.2	0.09
7.62	7.4	0.04	0.54	32.81	1	17.5	139.2	64.4	74.80	1.22	3.7	4.5	47.9	0.09
7.88	7.1	0.05	0.77	33.46	5	18.0	143.6	66.4	77.25	1.20	3.5	4.3	45.3	0.09
8.12	7.5	0.05	0.63	30.58	5	18.0	148.1	68.4	79.71	1.18	3.7	4.4	47.8	0.09
8.38	7.7	0.04	0.52	34.79	1	17.5	152.6	70.4	82.16	1.17	3.8	4.5	49.3	0.09
8.62	7.8	0.04	0.51	34.86	1	17.5	156.9	72.3	84.61	1.15	3.9	4.5	50.0	0.09
8.88	8.1	0.04	0.51	32.97	6	18.0	161.4	74.3	87.06	1.14	3.2	3.7	51.6	0.09
9.12	8.1	0.04	0.49	32.45	6	18.0	165.9	76.4	89.52	1.12	3.3	3.6	51.8	0.09
9.38	8.9	0.04	0.45	31.28	6	18.0	170.4	78.4	91.97	1.11	3.5	3.9	57.2	0.09
9.62	8.6	0.04	0.46	36.69	6	18.0	174.9	80.5	94.42	1.09	3.5	3.8	55.1	0.09

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
9.88	10.7	0.11	1.06	31.03	6	18.0	179.4	82.5	96.87	1.08	4.3	4.6	71.6	0.10
10.12	11.8	0.13	1.12	21.73	6	18.0	183.9	84.5	99.33	1.06	4.7	5.0	79.3	0.10
10.38	12.6	0.13	1.00	21.16	6	18.0	188.4	86.6	101.78	1.05	5.1	5.3	86.0	0.11
10.62	17.7	0.22	1.23	16.88	6	18.0	192.9	88.6	104.23	1.04	7.1	7.3	125.9	0.16
10.88	12.0	0.12	0.98	18.30	6	18.0	197.4	90.7	106.68	1.03	4.8	4.9	80.1	0.10
11.12	10.9	0.11	0.99	29.29	6	18.0	201.9	92.7	109.14	1.02	4.3	4.4	70.7	0.10
11.38	12.2	0.11	0.86	32.36	6	18.0	206.4	94.8	111.59	1.01	4.9	4.9	80.8	0.10
11.62	21.8	0.11	0.50	19.89	7	18.5	210.9	96.9	114.04	0.99	7.3	7.2	UnDef	0.09
11.88	17.6	0.19	1.09	22.58	6	18.0	215.5	99.0	116.49	0.98	7.0	6.9	123.6	0.14
12.12	20.5	0.20	0.96	8.70	6	18.0	220.0	101.1	118.95	0.97	8.2	8.0	146.2	0.12
12.38	20.1	0.17	0.84	12.28	6	18.0	224.5	103.1	121.40	0.96	8.0	7.7	142.8	0.11
12.62	22.1	0.12	0.55	12.92	7	18.5	229.1	105.2	123.85	0.95	7.4	7.0	UnDef	0.09
12.88	30.0	0.24	0.79	12.05	7	18.5	233.7	107.4	126.30	0.94	10.0	9.4	UnDef	0.10
13.12	31.8	0.34	1.06	15.39	7	18.5	238.3	109.6	128.76	0.94	10.6	9.9	UnDef	0.12
13.38	24.8	0.19	0.75	25.33	7	18.5	242.9	111.7	131.21	0.93	8.3	7.7	UnDef	0.10
13.62	32.1	0.16	0.50	16.64	7	18.5	247.6	113.9	133.66	0.92	10.7	9.8	UnDef	0.09
13.88	21.0	0.18	0.87	22.96	6	18.0	252.1	116.0	136.11	0.91	8.4	7.6	147.9	0.14
14.12	17.9	0.19	1.06	22.06	6	18.0	256.6	118.1	138.57	0.90	7.2	6.5	122.7	0.13
14.38	11.5	0.12	1.03	29.87	6	18.0	261.1	120.1	141.02	0.89	4.6	4.1	71.0	0.09
14.62	14.4	0.10	0.73	26.36	6	18.0	265.6	122.2	143.47	0.89	5.7	5.1	93.6	0.11
14.88	22.3	0.13	0.60	26.64	7	18.5	270.2	124.3	145.92	0.88	7.4	6.5	UnDef	0.11
15.12	27.1	0.24	0.90	18.32	7	18.5	274.8	126.4	148.38	0.87	9.0	7.9	UnDef	0.12
15.38	22.4	0.19	0.83	18.81	6	18.0	279.4	128.5	150.83	0.86	9.0	7.7	156.9	0.15
15.62	41.5	0.20	0.48	12.29	7	18.5	283.9	130.7	153.28	0.86	13.8	11.8	UnDef	0.10
15.88	35.9	0.22	0.63	28.70	7	18.5	288.6	132.8	155.73	0.85	12.0	10.2	UnDef	0.10
16.12	39.9	0.29	0.72	17.22	7	18.5	293.2	135.0	158.19	0.84	13.3	11.2	UnDef	0.11
16.38	25.8	0.07	0.28	31.83	7	18.5	297.8	137.2	160.64	0.84	8.6	7.2	UnDef	0.00
16.62	33.8	0.12	0.37	22.58	7	18.5	302.4	139.3	163.09	0.83	11.3	9.3	UnDef	0.00
16.88	19.8	0.09	0.47	26.55	7	18.5	307.1	141.5	165.54	0.82	6.6	5.4	UnDef	0.13
17.12	49.5	0.32	0.65	14.83	8	19.0	311.8	143.8	168.00	0.82	12.4	10.1	UnDef	0.11

Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-2069
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N2
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 09:54
CPT File: 141CPN2.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
0.12	1.0E-07	0.00	295.8	1.06	9	5.7	0.0	5.7	4.3	UnDef	UnDef	10.0	UnDef	0.0	
0.38	1.0E-07	0.00	128.6	0.73	9	7.5	0.4	7.9	6.9	UnDef	UnDef	10.0	UnDef	0.1	
0.62	5.0E-08	-0.01	53.6	2.99	7	5.4	8.2	13.6	27.7	UnDef	UnDef	10.0	UnDef	3.3	
0.88	1.0E-07	-0.01	68.4	1.48	7	9.5	4.6	14.1	17.2	UnDef	UnDef	10.0	UnDef	1.2	
1.12	5.0E-05	-0.03	178.8	0.30	9	31.5	0.0	31.5	1.6	44	49.3	10.0	-0.14	0.0	
1.38	5.0E-04	0.00	290.1	0.21	10	63.3	0.0	63.3	0.0	46	66.2	1.0	-0.15	0.0	
1.62	5.0E-03	0.00	361.9	0.36	10	95.1	0.0	95.1	0.0	48	75.1	1.0	-0.21	0.0	
1.88	5.0E-03	0.00	441.3	0.38	10	136.2	0.0	136.2	0.0	48	83.1	1.0	-0.24	0.0	
2.12	5.0E-03	0.00	407.6	0.52	10	144.7	0.0	144.7	0.1	48	82.8	1.0	-0.26	0.0	
2.38	5.0E-03	0.00	366.7	0.60	10	147.2	0.0	147.2	0.9	48	81.6	1.0	-0.26	0.0	
2.62	5.0E-03	0.00	318.5	0.56	9	142.7	0.0	142.7	1.1	46	79.1	1.0	-0.24	0.0	
2.88	5.0E-03	0.00	314.3	0.45	10	155.3	0.0	155.3	0.5	46	80.2	1.0	-0.22	0.0	
3.12	5.0E-03	0.00	354.2	0.53	10	184.6	0.0	184.6	0.6	48	84.9	1.0	-0.25	0.0	
3.38	5.0E-02	0.00	347.3	0.46	10	188.8	0.0	188.8	0.2	48	85.5	1.0	-0.23	0.0	
3.62	5.0E-02	0.00	434.4	0.36	10	245.5	0.0	245.5	0.0	48	93.0	1.0	-0.23	0.0	
3.88	5.0E-02	0.00	382.3	0.37	10	224.3	0.0	224.3	0.0	48	90.4	1.0	-0.22	0.0	
4.12	5.0E-03	0.00	177.6	0.83	9	108.5	1.6	110.0	5.5	44	69.6	1.0	-0.22	0.2	
4.38	5.0E-05	-0.03	71.5	2.57	7	45.7	39.4	85.2	22.3	40	44.9	10.0	-0.27	7.3	
4.62	5.0E-04	-0.03	84.6	1.52	7	55.3	21.0	76.4	15.3	42	50.3	1.0	-0.22	3.8	
4.88	5.0E-05	0.02	22.2	0.92	7	15.9	24.6	40.5	27.7	34	30.0	6.0	-0.04	3.8	
5.12	5.0E-05	0.13	22.0	0.96	7	16.1	26.5	42.7	28.3	34	30.0	6.0	-0.03	4.0	
5.38	5.0E-06	0.18	15.9	1.19	6	12.4	49.4	61.8	36.0	UnDef	UnDef	6.0	UnDef	6.0	
5.62	5.0E-06	0.34	14.1	0.71	7	11.4	34.9	46.2	33.3	UnDef	UnDef	6.0	UnDef	5.0	
5.88	1.0E-07	0.40	12.1	0.63	7	10.2	40.6	50.8	35.2	UnDef	UnDef	3.0	UnDef	5.0	
6.12	1.0E-07	0.42	11.0	0.64	6	9.5	38.1	47.6	37.2	UnDef	UnDef	3.0	UnDef	4.7	
6.38	1.0E-07	0.44	10.6	0.67	6	9.4	37.6	47.0	38.4	UnDef	UnDef	3.0	UnDef	4.6	
6.62	1.0E-07	0.42	10.3	0.62	6	9.4	37.5	46.9	38.2	UnDef	UnDef	3.0	UnDef	4.6	
6.88	1.0E-07	0.46	9.1	0.75	6	8.6	34.4	42.9	42.7	UnDef	UnDef	3.0	UnDef	4.2	
7.12	1.0E-07	0.50	9.3	0.69	6	8.9	35.7	44.6	41.4	UnDef	UnDef	3.0	UnDef	4.4	
7.38	1.0E-07	0.45	9.4	0.66	6	9.2	36.7	45.8	40.6	UnDef	UnDef	3.0	UnDef	4.5	
7.62	1.0E-07	0.41	9.3	0.67	6	9.2	36.8	46.0	41.0	UnDef	UnDef	3.0	UnDef	4.5	
7.88	5.0E-06	0.44	8.5	0.97	6	8.7	34.9	43.6	46.7	UnDef	UnDef	3.0	UnDef	4.3	
8.12	5.0E-06	0.37	8.7	0.79	6	9.0	36.0	45.1	44.0	UnDef	UnDef	3.0	UnDef	4.4	
8.38	1.0E-07	0.42	8.8	0.65	6	9.2	36.7	45.8	42.1	UnDef	UnDef	3.0	UnDef	4.5	
8.62	1.0E-07	0.41	8.6	0.64	6	9.2	36.8	46.0	42.3	UnDef	UnDef	3.0	UnDef	4.5	
8.88	5.0E-05	0.37	8.7	0.64	6	9.4	37.4	46.8	42.1	30	30.0	3.0	0.12	3.7	
9.12	5.0E-05	0.35	8.5	0.62	6	9.3	37.2	46.6	42.3	30	30.0	3.0	0.12	3.6	
9.38	5.0E-05	0.30	9.1	0.56	6	10.0	40.0	50.0	39.9	30	30.0	3.0	0.11	3.9	
9.62	5.0E-05	0.39	8.6	0.58	6	9.6	38.5	48.2	41.6	30	30.0	3.0	0.13	3.8	

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
9.88	5.0E-05	0.23	10.9	1.27	6	11.8	47.3	59.2	44.4	30	30.0	3.0	0.03	4.6	
10.12	5.0E-05	0.11	11.7	1.33	6	12.8	51.1	63.9	43.3	30	30.0	3.0	0.01	5.0	
10.38	5.0E-05	0.10	12.4	1.17	6	13.6	54.3	67.9	40.6	32	30.0	3.0	0.01	5.3	
10.62	5.0E-05	0.04	17.8	1.38	6	18.8	75.1	93.9	35.5	32	30.0	6.0	-0.04	7.3	
10.88	5.0E-05	0.07	11.0	1.17	6	12.6	50.4	63.0	43.0	30	30.0	3.0	0.02	4.9	
11.12	5.0E-05	0.20	9.5	1.22	6	11.3	45.1	56.4	46.8	30	30.0	3.0	0.04	4.4	
11.38	5.0E-05	0.20	10.7	1.04	6	12.5	50.0	62.5	42.5	30	30.0	3.0	0.04	4.9	
11.62	5.0E-04	0.04	20.3	0.56	7	22.1	25.8	47.9	25.2	34	30.0	1.0	0.01	3.7	
11.88	5.0E-05	0.07	15.6	1.24	6	17.7	70.8	88.5	36.8	32	30.0	6.0	-0.02	6.9	
12.12	5.0E-05	-0.02	18.1	1.08	7	20.4	57.2	77.6	32.6	32	30.0	6.0	-0.03	6.8	
12.38	5.0E-05	0.00	17.3	0.94	7	19.8	51.6	71.4	32.1	32	30.0	6.0	-0.02	6.4	
12.62	5.0E-04	0.00	18.8	0.62	7	21.5	31.0	52.5	27.1	34	30.0	1.0	0.01	4.1	
12.88	5.0E-04	0.00	25.7	0.85	7	28.9	32.4	61.3	24.8	36	31.7	1.0	-0.05	4.7	
13.12	5.0E-04	0.01	26.8	1.15	7	30.3	42.4	72.7	26.8	36	33.1	1.0	-0.07	5.7	
13.38	5.0E-04	0.05	20.1	0.83	7	23.5	39.3	62.8	28.4	34	30.0	1.0	-0.02	4.9	
13.62	5.0E-04	0.01	26.0	0.54	7	30.1	23.1	53.2	21.3	36	32.8	1.0	-0.01	3.7	
13.88	5.0E-05	0.05	15.9	0.98	7	19.5	66.8	86.3	34.0	32	30.0	6.0	-0.01	7.2	
14.12	5.0E-05	0.05	13.0	1.24	6	16.5	65.9	82.4	40.3	32	30.0	6.0	0.00	6.5	
14.38	5.0E-05	0.17	7.4	1.33	6	10.5	41.9	52.4	53.8	30	30.0	3.0	0.06	4.1	
14.62	5.0E-05	0.10	9.6	0.90	6	13.0	51.9	64.9	43.2	30	30.0	3.0	0.05	5.1	
14.88	5.0E-04	0.06	15.8	0.68	7	20.0	45.0	65.0	30.9	32	30.0	1.0	0.02	5.0	
15.12	5.0E-04	0.01	19.2	1.00	7	24.1	53.4	77.5	30.8	34	30.0	1.0	-0.03	6.0	
15.38	5.0E-05	0.02	15.3	0.95	6	19.8	73.0	92.8	34.5	32	30.0	6.0	0.00	7.5	
15.62	5.0E-04	-0.01	29.6	0.51	7	36.3	22.0	58.2	19.1	36	38.2	1.0	-0.02	3.7	
15.88	5.0E-04	0.04	24.9	0.68	7	31.2	30.4	61.6	23.5	34	33.9	1.0	-0.02	4.5	
16.12	5.0E-04	0.00	27.4	0.78	7	34.4	32.1	66.5	23.1	36	36.6	1.0	-0.05	4.9	
16.38	5.0E-04	0.07	16.6	0.31	7	22.0	0.0	22.0	5.0	32	30.0	1.0	0.07	0.0	
16.62	5.0E-04	0.02	22.1	0.40	7	28.6	0.0	28.6	5.0	34	31.4	1.0	0.03	0.0	
16.88	5.0E-04	0.06	11.8	0.55	7	16.6	62.1	78.8	34.5	30	30.0	1.0	0.06	5.3	
17.12	5.0E-03	0.00	32.3	0.69	7	41.3	27.6	68.9	20.0	36	41.9	1.0	-0.05	3.4	

ConeTec Investigations Ltd. - CPT Interpretation
Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-2553
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N3
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 11:48
CPT File: 141CPN3.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
0.12	1.5	0.03	2.33	-0.04	1	17.5	2.2	1.0	1.23	2.00	0.8	1.5	11.9	0.00
0.38	2.4	0.08	3.23	-1.49	3	17.5	6.6	2.9	3.68	2.00	2.4	4.9	19.1	0.00
0.62	5.0	0.04	0.81	-3.92	1	17.5	10.9	4.8	6.13	2.00	2.5	5.0	39.5	0.00
0.88	18.3	0.05	0.26	1.00	7	18.5	15.4	6.9	8.58	2.00	6.1	12.2	UnDef	0.08
1.12	48.1	0.15	0.32	0.82	8	19.0	20.1	9.1	11.04	2.00	12.0	24.1	UnDef	0.16
1.38	66.5	0.32	0.48	1.05	8	19.0	24.9	11.4	13.49	2.00	16.6	33.2	UnDef	0.30
1.62	68.9	0.30	0.44	1.54	8	19.0	29.6	13.7	15.94	2.00	17.2	34.4	UnDef	0.32
1.88	75.8	0.32	0.43	1.69	8	19.0	34.4	16.0	18.39	2.00	18.9	37.9	UnDef	0.40
2.12	76.5	0.41	0.54	3.19	8	19.0	39.1	18.3	20.85	2.00	19.1	38.3	UnDef	0.41
2.38	80.5	0.39	0.48	2.96	8	19.0	43.9	20.6	23.30	2.00	20.1	40.3	UnDef	0.00
2.62	85.7	0.48	0.56	3.66	8	19.0	48.6	22.9	25.75	2.00	21.4	42.8	UnDef	0.00
2.88	123.5	0.62	0.50	1.88	9	19.5	53.4	25.2	28.20	1.95	24.7	48.1	UnDef	0.00
3.12	105.8	0.69	0.65	3.44	9	19.5	58.3	27.7	30.66	1.86	21.2	39.4	UnDef	0.00
3.38	100.3	0.52	0.52	3.50	9	19.5	63.2	30.1	33.11	1.78	20.1	35.8	UnDef	0.00
3.62	111.1	0.39	0.35	0.71	9	19.5	68.1	32.5	35.56	1.72	22.2	38.2	UnDef	0.00
3.88	68.0	0.40	0.59	0.61	8	19.0	72.9	34.9	38.01	1.66	17.0	28.2	UnDef	0.22
4.12	17.7	0.26	1.45	8.62	6	18.0	77.5	37.0	40.47	1.61	7.1	11.4	135.6	0.09
4.38	9.7	0.04	0.44	3.20	6	18.0	82.0	39.1	42.92	1.57	3.9	6.1	71.1	0.00
4.62	7.0	0.04	0.64	15.96	1	17.5	86.4	41.1	45.37	1.53	3.5	5.4	49.2	0.09
4.88	6.3	0.05	0.80	28.89	1	17.5	90.8	43.0	47.82	1.49	3.1	4.7	43.0	0.09
5.12	6.1	0.05	0.84	23.79	1	17.5	95.2	44.9	50.28	1.46	3.0	4.4	40.9	0.09
5.38	5.6	0.04	0.75	31.13	1	17.5	99.6	46.8	52.73	1.43	2.8	4.0	36.8	0.09
5.62	5.3	0.04	0.77	29.90	1	17.5	103.9	48.8	55.18	1.40	2.7	3.7	34.4	0.09
5.88	5.3	0.04	0.78	29.45	1	17.5	108.3	50.7	57.63	1.37	2.6	3.6	33.6	0.08
6.12	6.0	0.04	0.68	32.42	1	17.5	112.7	52.6	60.09	1.35	3.0	4.1	39.1	0.09
6.38	6.4	0.04	0.67	30.95	1	17.5	117.1	54.5	62.54	1.33	3.2	4.3	42.1	0.09
6.62	6.4	0.04	0.63	30.31	1	17.5	121.4	56.4	64.99	1.30	3.2	4.2	41.3	0.09
6.88	6.2	0.05	0.87	30.46	1	17.5	125.8	58.4	67.44	1.28	3.1	4.0	39.6	0.09
7.12	6.0	0.05	0.79	28.64	1	17.5	130.2	60.3	69.90	1.26	3.0	3.8	37.4	0.09
7.38	6.0	0.04	0.66	33.29	1	17.5	134.6	62.2	72.35	1.24	3.0	3.7	37.4	0.09
7.62	6.4	0.04	0.65	32.22	1	17.5	138.9	64.1	74.80	1.22	3.2	3.9	40.3	0.09
7.88	6.9	0.04	0.61	30.72	1	17.5	143.3	66.1	77.25	1.20	3.5	4.2	43.7	0.09
8.12	6.9	0.04	0.62	30.86	1	17.5	147.7	68.0	79.71	1.19	3.5	4.1	43.4	0.09
8.38	7.4	0.05	0.68	29.85	5	18.0	152.1	70.0	82.16	1.17	3.7	4.3	46.6	0.09
8.62	7.1	0.04	0.62	33.56	1	17.5	156.6	72.0	84.61	1.15	3.5	4.1	44.2	0.09
8.88	8.8	0.14	1.53	27.45	5	18.0	161.0	73.9	87.06	1.14	4.4	5.0	57.9	0.09
9.12	10.5	0.16	1.48	11.48	5	18.0	165.5	76.0	89.52	1.12	5.3	5.9	70.9	0.10
9.38	11.3	0.14	1.25	12.94	6	18.0	170.0	78.0	91.97	1.11	4.5	5.0	76.6	0.10
9.62	15.8	0.23	1.48	14.10	6	18.0	174.5	80.1	94.42	1.09	6.3	6.9	112.7	0.14

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60 (blows/ft)	Su (kPa)	CRR
9.88	11.3	0.19	1.69	12.92	5	18.0	179.0	82.1	96.87	1.08	5.7	6.1	76.3	0.10
10.12	11.4	0.15	1.27	24.62	6	18.0	183.5	84.2	99.33	1.07	4.6	4.9	76.6	0.10
10.38	13.7	0.11	0.81	28.96	6	18.0	188.0	86.2	101.78	1.05	5.5	5.8	94.9	0.12
10.62	18.7	0.15	0.80	10.73	6	18.0	192.5	88.3	104.23	1.04	7.5	7.8	134.0	0.10
10.88	18.6	0.17	0.90	9.12	6	18.0	197.0	90.3	106.68	1.03	7.4	7.7	132.9	0.11
11.12	19.3	0.19	0.97	11.68	6	18.0	201.5	92.4	109.14	1.02	7.7	7.9	138.5	0.11
11.38	15.7	0.13	0.84	19.07	6	18.0	206.0	94.4	111.59	1.01	6.3	6.3	109.3	0.13
11.62	27.4	0.14	0.50	10.41	7	18.5	210.6	96.5	114.04	1.00	9.1	9.1	UnDef	0.09
11.88	33.4	0.18	0.53	15.05	7	18.5	215.2	98.7	116.49	0.99	11.1	11.0	UnDef	0.09
12.12	28.9	0.35	1.21	12.20	7	18.5	219.8	100.9	118.95	0.97	9.6	9.4	UnDef	0.12
12.38	31.5	0.19	0.61	11.85	7	18.5	224.4	103.0	121.40	0.96	10.5	10.1	UnDef	0.10
12.62	32.5	0.20	0.62	7.58	7	18.5	229.1	105.2	123.85	0.95	10.8	10.3	UnDef	0.10
12.88	17.6	0.24	1.35	19.80	6	18.0	233.6	107.3	126.30	0.94	7.0	6.7	122.1	0.14
13.12	17.7	0.21	1.17	22.80	6	18.0	238.1	109.4	128.76	0.94	7.1	6.6	122.2	0.14
13.38	15.0	0.09	0.59	30.20	6	18.0	242.6	111.4	131.21	0.93	6.0	5.6	100.8	0.11
13.62	24.9	0.17	0.67	17.38	7	18.5	247.2	113.5	133.66	0.92	8.3	7.6	UnDef	0.10
13.88	27.1	0.19	0.69	13.64	7	18.5	251.8	115.7	136.11	0.91	9.0	8.2	UnDef	0.10
14.12	41.8	0.14	0.33	10.69	8	19.0	256.5	117.9	138.57	0.90	10.5	9.4	UnDef	0.09
14.38	30.4	0.11	0.37	17.06	7	18.5	261.2	120.2	141.02	0.89	10.1	9.1	UnDef	0.00
14.62	34.5	0.14	0.41	16.21	7	18.5	265.8	122.3	143.47	0.88	11.5	10.2	UnDef	0.08
14.88	36.5	0.46	1.27	15.49	7	18.5	270.4	124.5	145.92	0.88	12.2	10.7	UnDef	0.14

Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-2553
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N3
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 11:48
CPT File: 141CPN3.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
0.12	1.0E-07	-0.01	154.3	2.36	7	3.0	1.0	4.0	14.2	UnDef	UnDef	10.0	UnDef	0.3	
0.38	5.0E-08	-0.08	82.6	3.32	7	4.9	4.9	9.8	23.8	UnDef	UnDef	10.0	UnDef	2.2	
0.62	1.0E-07	-0.09	102.7	0.83	9	10.1	1.3	11.4	9.2	UnDef	UnDef	10.0	UnDef	0.4	
0.88	5.0E-04	0.00	265.5	0.26	10	36.7	0.0	36.7	0.0	46	57.1	1.0	-0.16	0.0	
1.12	5.0E-03	0.00	527.5	0.32	10	96.3	0.0	96.3	0.0	48	80.7	1.0	-0.24	0.0	
1.38	5.0E-03	0.00	581.4	0.48	10	132.9	0.0	132.9	0.0	50	86.7	1.0	-0.28	0.0	
1.62	5.0E-03	0.00	501.1	0.44	10	137.7	0.0	137.7	0.0	48	85.1	1.0	-0.26	0.0	
1.88	5.0E-03	0.00	471.9	0.43	10	151.5	0.0	151.5	0.0	48	85.6	1.0	-0.25	0.0	
2.12	5.0E-03	0.00	416.6	0.54	10	153.1	0.0	153.1	0.2	48	84.0	1.0	-0.26	0.0	
2.38	5.0E-03	0.00	389.1	0.48	10	161.0	0.0	161.0	0.0	48	83.7	1.0	-0.25	0.0	
2.62	5.0E-03	0.00	372.5	0.57	10	171.4	0.0	171.4	0.7	48	84.0	1.0	-0.26	0.0	
2.88	5.0E-02	0.00	487.5	0.50	10	245.9	0.0	245.9	0.0	48	93.1	1.0	-0.27	0.0	
3.12	5.0E-02	0.00	380.5	0.66	9	201.2	0.0	201.2	1.1	48	87.3	1.0	-0.27	0.0	
3.38	5.0E-02	0.00	331.4	0.52	10	182.9	0.0	182.9	0.8	48	84.6	1.0	-0.24	0.0	
3.62	5.0E-02	0.00	339.9	0.35	10	194.9	0.0	194.9	0.0	48	86.4	1.0	-0.21	0.0	
3.88	5.0E-03	0.00	193.1	0.60	9	115.2	0.0	115.2	3.5	44	71.3	1.0	-0.20	0.0	
4.12	5.0E-05	0.03	45.8	1.52	7	29.1	24.4	53.6	22.1	38	31.9	6.0	-0.15	4.6	
4.38	5.0E-05	-0.01	22.8	0.48	7	15.5	0.0	15.5	5.0	34	30.0	6.0	0.01	0.0	
4.62	1.0E-07	0.18	15.0	0.73	7	10.9	29.9	40.9	32.4	UnDef	UnDef	6.0	UnDef	4.5	
4.88	1.0E-07	0.44	12.5	0.93	6	9.6	38.4	47.9	38.0	UnDef	UnDef	6.0	UnDef	4.7	
5.12	1.0E-07	0.36	11.4	1.00	6	9.1	36.2	45.3	40.7	UnDef	UnDef	3.0	UnDef	4.4	
5.38	1.0E-07	0.55	9.8	0.91	6	8.2	32.7	40.9	42.8	UnDef	UnDef	3.0	UnDef	4.0	
5.62	1.0E-07	0.55	8.8	0.95	6	7.6	30.6	38.2	45.7	UnDef	UnDef	3.0	UnDef	3.7	
5.88	1.0E-07	0.55	8.3	0.98	6	7.4	29.7	37.1	47.4	UnDef	UnDef	3.0	UnDef	3.6	
6.12	1.0E-07	0.53	9.3	0.84	6	8.3	33.1	41.4	43.3	UnDef	UnDef	3.0	UnDef	4.1	
6.38	1.0E-07	0.46	9.7	0.82	6	8.7	34.9	43.6	42.1	UnDef	UnDef	3.0	UnDef	4.3	
6.62	1.0E-07	0.45	9.1	0.78	6	8.5	33.9	42.4	42.8	UnDef	UnDef	3.0	UnDef	4.2	
6.88	1.0E-07	0.47	8.5	1.09	6	8.1	32.5	40.6	48.1	UnDef	UnDef	3.0	UnDef	4.0	
7.12	1.0E-07	0.45	7.8	1.00	6	7.7	30.8	38.5	49.2	UnDef	UnDef	3.0	UnDef	3.8	
7.38	1.0E-07	0.54	7.5	0.86	6	7.6	30.5	38.2	48.2	UnDef	UnDef	3.0	UnDef	3.7	
7.62	1.0E-07	0.48	7.9	0.83	6	8.0	32.1	40.1	46.9	UnDef	UnDef	3.0	UnDef	3.9	
7.88	1.0E-07	0.41	8.3	0.77	6	8.5	34.0	42.5	44.9	UnDef	UnDef	3.0	UnDef	4.2	
8.12	1.0E-07	0.41	8.0	0.79	6	8.4	33.5	41.9	46.0	UnDef	UnDef	3.0	UnDef	4.1	
8.38	5.0E-06	0.36	8.3	0.86	6	8.8	35.1	43.9	45.9	UnDef	UnDef	3.0	UnDef	4.3	
8.62	1.0E-07	0.44	7.7	0.80	6	8.4	33.4	41.8	47.0	UnDef	UnDef	3.0	UnDef	4.1	
8.88	5.0E-06	0.25	9.8	1.86	6	10.3	41.2	51.5	51.6	UnDef	UnDef	3.0	UnDef	5.0	
9.12	5.0E-06	0.03	11.7	1.76	6	12.1	48.3	60.3	46.9	UnDef	UnDef	3.0	UnDef	5.9	
9.38	5.0E-05	0.04	12.3	1.47	6	12.8	51.0	63.8	43.5	32	30.0	3.0	-0.01	5.0	
9.62	5.0E-05	0.03	17.6	1.66	6	17.7	70.8	88.5	37.9	32	30.0	6.0	-0.06	6.9	

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
9.88	5.0E-06	0.03	11.6	2.00	6	12.5	50.0	62.5	48.7	UnDef	UnDef	3.0	UnDef	6.1	
10.12	5.0E-05	0.15	11.4	1.51	6	12.4	49.7	62.2	45.5	30	30.0	3.0	0.01	4.9	
10.38	5.0E-05	0.15	13.8	0.94	6	14.8	59.2	74.0	36.2	32	30.0	6.0	0.02	5.8	
10.62	5.0E-05	0.00	19.0	0.89	7	19.9	39.8	59.7	30.0	34	30.0	6.0	-0.02	5.6	
10.88	5.0E-05	-0.01	18.4	1.01	7	19.6	48.2	67.8	31.6	32	30.0	6.0	-0.03	6.1	
11.12	5.0E-05	0.00	18.7	1.08	7	20.1	52.1	72.2	32.0	34	30.0	6.0	-0.03	6.5	
11.38	5.0E-05	0.06	14.5	0.97	6	16.2	64.7	80.9	35.6	32	30.0	6.0	0.00	6.3	
11.62	5.0E-04	0.00	26.2	0.54	7	27.8	21.1	48.9	21.1	36	30.6	1.0	-0.01	3.4	
11.88	5.0E-04	0.01	31.6	0.57	7	33.6	19.9	53.5	18.9	36	36.0	1.0	-0.03	3.3	
12.12	5.0E-04	0.00	26.5	1.31	7	28.8	47.5	76.3	28.3	36	31.6	1.0	-0.08	6.0	
12.38	5.0E-04	0.00	28.4	0.66	7	31.0	24.0	55.1	21.3	36	33.7	1.0	-0.04	3.8	
12.62	5.0E-04	-0.02	28.7	0.67	7	31.7	24.5	56.2	21.3	36	34.3	1.0	-0.04	3.9	
12.88	5.0E-05	0.04	14.2	1.56	6	17.0	68.0	85.0	41.2	32	30.0	6.0	-0.03	6.7	
13.12	5.0E-05	0.06	14.0	1.35	6	16.9	67.5	84.4	39.9	32	30.0	6.0	-0.02	6.6	
13.38	5.0E-05	0.13	11.3	0.71	6	14.2	56.9	71.2	37.5	30	30.0	3.0	0.06	5.6	
13.62	5.0E-04	0.02	19.7	0.74	7	23.3	36.2	59.5	27.8	34	30.0	1.0	-0.01	4.7	
13.88	5.0E-04	0.00	21.3	0.76	7	25.2	35.0	60.2	26.8	34	30.0	1.0	-0.02	4.7	
14.12	5.0E-03	-0.01	33.3	0.35	7	38.5	0.0	38.5	5.0	36	39.9	1.0	0.00	0.0	
14.38	5.0E-04	0.01	23.1	0.40	7	27.8	0.0	27.8	5.0	34	30.5	1.0	0.02	0.0	
14.62	5.0E-04	0.00	26.0	0.44	7	31.2	0.0	31.2	5.0	36	33.9	1.0	0.00	0.0	
14.88	5.0E-04	0.00	27.1	1.37	7	32.7	54.5	87.1	28.4	36	35.2	1.0	-0.09	6.8	

Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-3041
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N4
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 14:44
CPT File: 141CPN4.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
0.12	15.8	0.03	0.16	1.28	6	18.0	2.2	1.0	1.23	2.00	6.3	12.6	126.1	0.08
0.38	1.1	0.13	12.54	-1.51	2	12.5	6.1	2.4	3.68	2.00	1.1	2.2	8.1	0.00
0.62	1.0	0.16	15.93	-1.50	2	12.5	9.2	3.1	6.13	2.00	1.0	2.0	7.2	0.00
0.88	35.9	0.12	0.34	-3.65	7	18.5	13.1	4.5	8.58	2.00	12.0	24.0	UnDef	0.11
1.12	47.7	0.14	0.30	-8.46	8	19.0	17.8	6.7	11.04	2.00	11.9	23.9	UnDef	0.16
1.38	51.9	0.22	0.43	-2.65	8	19.0	22.5	9.0	13.49	2.00	13.0	26.0	UnDef	0.18
1.62	54.0	0.22	0.41	1.38	8	19.0	27.2	11.3	15.94	2.00	13.5	27.0	UnDef	0.20
1.88	52.5	0.21	0.40	1.75	8	19.0	32.0	13.6	18.39	2.00	13.1	26.3	UnDef	0.19
2.12	56.4	0.28	0.49	2.07	8	19.0	36.8	15.9	20.85	2.00	14.1	28.2	UnDef	0.21
2.38	69.9	0.33	0.47	2.28	8	19.0	41.5	18.2	23.30	2.00	17.5	35.0	UnDef	0.33
2.62	79.4	0.46	0.58	2.92	8	19.0	46.2	20.5	25.75	2.00	19.8	39.7	UnDef	0.45
2.88	72.4	0.47	0.64	3.85	8	19.0	51.0	22.8	28.20	2.00	18.1	36.2	UnDef	0.36
3.12	150.4	0.83	0.55	-2.42	9	19.5	55.8	25.2	30.66	1.95	30.1	58.7	UnDef	0.00
3.38	130.2	0.64	0.49	-7.50	9	19.5	60.7	27.6	33.11	1.86	26.0	48.5	UnDef	0.00
3.62	111.3	0.70	0.63	-5.21	9	19.5	65.6	30.0	35.56	1.79	22.3	39.8	UnDef	0.00
3.88	93.9	0.58	0.62	-0.22	8	19.0	70.4	32.4	38.01	1.72	23.5	40.4	UnDef	0.00
4.12	62.2	0.32	0.52	2.22	8	19.0	75.1	34.7	40.47	1.66	15.6	25.9	UnDef	0.19
4.38	57.8	0.23	0.39	-0.06	8	19.0	79.9	37.0	42.92	1.61	14.4	23.3	UnDef	0.16
4.62	93.0	0.35	0.38	1.48	9	19.5	84.7	39.3	45.37	1.56	18.6	29.0	UnDef	0.38
4.88	239.2	2.48	1.04	-6.28	9	19.5	89.6	41.7	47.82	1.51	47.8	72.5	UnDef	0.00
5.12	187.6	2.95	1.57	-7.89	8	19.0	94.4	44.1	50.28	1.47	46.9	69.1	UnDef	0.00
5.38	116.5	1.93	1.66	-7.94	8	19.0	99.1	46.4	52.73	1.44	29.1	41.9	UnDef	0.00
5.62	73.3	1.71	2.34	-8.05	7	18.5	103.8	48.6	55.18	1.40	24.4	34.3	UnDef	0.34
5.88	38.8	0.68	1.74	-3.92	7	18.5	108.4	50.8	57.63	1.37	12.9	17.8	UnDef	0.13
6.12	26.4	0.41	1.55	-2.52	6	18.0	113.0	52.9	60.09	1.35	10.5	14.2	201.8	0.11
6.38	34.8	0.28	0.79	-4.36	7	18.5	117.6	55.0	62.54	1.32	11.6	15.3	UnDef	0.10
6.62	25.0	0.28	1.12	-3.46	6	18.0	122.1	57.1	64.99	1.29	10.0	13.0	190.4	0.10
6.88	19.6	0.23	1.15	-0.13	6	18.0	126.6	59.2	67.44	1.27	7.8	10.0	146.5	0.10
7.12	22.2	0.28	1.27	1.46	6	18.0	131.1	61.2	69.90	1.25	8.9	11.1	167.1	0.10
7.38	34.0	0.29	0.84	-1.66	7	18.5	135.7	63.3	72.35	1.23	11.3	13.9	UnDef	0.10
7.62	13.8	0.23	1.65	4.36	6	18.0	140.2	65.4	74.80	1.21	5.5	6.7	98.8	0.14
7.88	20.8	0.25	1.19	2.95	6	18.0	144.8	67.5	77.25	1.19	8.3	9.9	154.6	0.10
8.12	11.7	0.13	1.12	12.56	6	18.0	149.2	69.5	79.71	1.17	4.7	5.5	81.6	0.11
8.38	10.2	0.11	1.10	14.91	5	18.0	153.8	71.6	82.16	1.16	5.1	5.9	69.1	0.10
8.62	8.1	0.11	1.39	23.73	5	18.0	158.2	73.6	84.61	1.14	4.0	4.6	51.8	0.09
8.88	7.1	0.09	1.33	27.53	5	18.0	162.8	75.7	87.06	1.12	3.5	4.0	43.6	0.09
9.12	5.9	0.05	0.80	37.74	1	17.5	167.2	77.7	89.52	1.11	2.9	3.3	33.6	0.08
9.38	6.1	0.04	0.73	39.56	1	17.5	171.6	79.6	91.97	1.10	3.0	3.3	34.7	0.08
9.62	5.8	0.03	0.59	41.62	1	17.5	175.9	81.5	94.42	1.08	2.9	3.1	32.1	0.08

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60 (blows/ft)	Su (kPa)	CRR
9.88	6.1	0.04	0.65	41.49	1	17.5	180.3	83.4	96.87	1.07	3.1	3.3	34.5	0.08
10.12	6.3	0.03	0.52	40.52	1	17.5	184.7	85.4	99.33	1.06	3.1	3.3	35.6	0.08
10.38	6.2	0.03	0.50	45.80	1	17.5	189.1	87.3	101.78	1.05	3.1	3.2	34.4	0.08
10.62	6.3	0.04	0.61	43.99	1	17.5	193.4	89.2	104.23	1.04	3.2	3.3	35.3	0.08
10.88	5.8	0.03	0.52	47.45	1	17.5	197.8	91.1	106.68	1.03	2.9	3.0	30.3	0.08
11.12	5.7	0.03	0.56	44.07	1	17.5	202.2	93.1	109.14	1.01	2.9	2.9	29.6	0.00
11.38	7.7	0.03	0.43	52.01	1	17.5	206.6	95.0	111.59	1.00	3.8	3.9	45.0	0.09
11.62	8.4	0.04	0.50	49.36	6	18.0	211.0	97.0	114.04	0.99	3.4	3.3	50.2	0.09
11.88	8.4	0.04	0.53	50.55	6	18.0	215.5	99.0	116.49	0.98	3.3	3.3	49.7	0.09
12.12	8.6	0.04	0.47	50.96	6	18.0	220.0	101.1	118.95	0.97	3.4	3.3	51.0	0.09
12.38	8.0	0.04	0.48	52.15	6	18.0	224.5	103.1	121.40	0.96	3.2	3.1	46.0	0.09
12.62	8.2	0.04	0.48	52.76	6	18.0	229.0	105.1	123.85	0.95	3.3	3.1	47.0	0.09
12.88	8.7	0.07	0.80	49.72	5	18.0	233.5	107.2	126.30	0.95	4.4	4.1	51.1	0.09
13.12	8.7	0.08	0.92	46.21	5	18.0	238.0	109.2	128.76	0.94	4.3	4.1	50.5	0.09
13.38	8.8	0.06	0.73	47.22	6	18.0	242.5	111.3	131.21	0.93	3.5	3.2	50.7	0.09
13.62	8.6	0.06	0.73	49.71	6	18.0	247.0	113.3	133.66	0.92	3.5	3.2	49.4	0.09
13.88	8.9	0.06	0.64	50.32	6	18.0	251.5	115.4	136.11	0.91	3.5	3.2	50.7	0.09
14.12	9.9	0.07	0.73	50.95	6	18.0	256.0	117.4	138.57	0.90	4.0	3.6	58.9	0.09
14.38	11.7	0.17	1.43	34.76	5	18.0	260.5	119.5	141.02	0.90	5.8	5.2	72.7	0.09
14.62	14.0	0.16	1.17	33.45	6	18.0	265.0	121.5	143.47	0.89	5.6	5.0	90.7	0.10
14.88	11.7	0.16	1.36	40.43	5	18.0	269.5	123.6	145.92	0.88	5.9	5.2	72.2	0.09
15.12	20.2	0.25	1.25	19.73	6	18.0	274.0	125.6	148.38	0.87	8.1	7.1	139.7	0.15
15.38	12.5	0.14	1.15	42.34	6	18.0	278.5	127.7	150.83	0.87	5.0	4.3	77.6	0.10
15.62	13.7	0.14	0.99	44.75	6	18.0	283.0	129.7	153.28	0.86	5.5	4.7	86.9	0.10
15.88	21.4	0.18	0.85	26.89	6	18.0	287.5	131.8	155.73	0.85	8.6	7.3	148.0	0.16
16.12	15.2	0.17	1.11	35.81	6	18.0	292.0	133.8	158.19	0.85	6.1	5.1	98.0	0.11
16.38	14.7	0.12	0.84	39.32	6	18.0	296.5	135.9	160.64	0.84	5.9	4.9	93.6	0.10
16.62	15.1	0.15	0.98	39.04	6	18.0	301.0	137.9	163.09	0.83	6.1	5.0	97.0	0.10
16.88	26.6	0.14	0.51	25.39	7	18.5	305.6	140.0	165.54	0.83	8.9	7.3	UnDef	0.10
17.12	22.4	0.19	0.82	23.74	6	18.0	310.1	142.1	168.00	0.82	9.0	7.4	154.8	0.16
17.38	33.0	0.28	0.84	20.34	7	18.5	314.7	144.2	170.45	0.81	11.0	9.0	UnDef	0.12
17.62	25.0	0.27	1.10	22.24	6	18.0	319.2	146.3	172.90	0.81	10.0	8.1	174.6	0.18
17.88	18.9	0.24	1.27	36.16	6	18.0	323.8	148.4	175.35	0.80	7.5	6.1	124.9	0.12
18.12	18.3	0.16	0.85	38.89	6	18.0	328.2	150.4	177.81	0.80	7.3	5.8	120.1	0.12
18.38	19.7	0.09	0.46	46.81	7	18.5	332.8	152.6	180.26	0.79	6.6	5.2	UnDef	0.13
18.62	35.7	0.20	0.55	33.03	7	18.5	337.4	154.7	182.71	0.79	11.9	9.4	UnDef	0.10
18.88	40.2	0.22	0.55	23.56	7	18.5	342.1	156.9	185.16	0.78	13.4	10.5	UnDef	0.10
19.12	54.7	0.33	0.60	21.38	8	19.0	346.8	159.1	187.62	0.78	13.7	10.6	UnDef	0.11
19.38	55.9	0.55	0.98	19.36	7	18.5	351.4	161.4	190.07	0.77	18.6	14.4	UnDef	0.14
19.62	25.1	0.23	0.92	34.85	7	18.5	356.1	163.5	192.52	0.77	8.4	6.4	UnDef	0.17

ConeTec Investigations Ltd. - CPT Interpretation
Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-3041
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N4
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 14:44
CPT File: 141CPN4.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
0.12	5.0E-05	0.01	1000.0	0.17	10	31.6	0.0	31.6	0.0	50	80.0	10.0	-0.23	0.0	
0.38	1.0E-15	-0.18	42.6	10.00	1	2.2	UnDef	UnDef	100.0	UnDef	UnDef	6.0	UnDef	UnDef	
0.62	1.0E-15	-0.23	29.4	10.00	1	2.0	UnDef	UnDef	100.0	UnDef	UnDef	6.0	UnDef	UnDef	
0.88	5.0E-04	-0.01	799.4	0.34	10	71.9	0.0	71.9	0.0	50	82.4	1.0	-0.28	0.0	
1.12	5.0E-03	-0.02	708.0	0.30	10	95.4	0.0	95.4	0.0	50	84.8	1.0	-0.26	0.0	
1.38	5.0E-03	-0.01	573.5	0.43	10	103.8	0.0	103.8	0.0	50	83.0	1.0	-0.27	0.0	
1.62	5.0E-03	0.00	474.8	0.41	10	107.9	0.0	107.9	0.0	48	80.8	1.0	-0.25	0.0	
1.88	5.0E-03	0.00	383.7	0.40	10	105.1	0.0	105.1	0.0	48	77.4	1.0	-0.23	0.0	
2.12	5.0E-03	0.00	352.5	0.49	10	112.9	0.0	112.9	0.4	48	77.2	1.0	-0.24	0.0	
2.38	5.0E-03	0.00	381.8	0.47	10	139.8	0.0	139.8	0.0	48	81.4	1.0	-0.24	0.0	
2.62	5.0E-03	0.00	384.9	0.59	10	158.7	0.0	158.7	0.7	48	83.4	1.0	-0.26	0.0	
2.88	5.0E-03	0.00	315.5	0.65	9	144.9	0.0	144.9	1.7	46	79.2	1.0	-0.25	0.0	
3.12	5.0E-02	0.00	595.5	0.55	10	299.8	0.0	299.8	0.0	50	95.0	1.0	-0.30	0.0	
3.38	5.0E-02	-0.01	469.8	0.49	10	247.9	0.0	247.9	0.0	48	93.3	1.0	-0.26	0.0	
3.62	5.0E-02	-0.01	368.7	0.63	9	203.1	0.0	203.1	1.1	48	87.6	1.0	-0.26	0.0	
3.88	5.0E-03	0.00	288.1	0.62	9	165.1	0.0	165.1	1.9	46	81.6	1.0	-0.24	0.0	
4.12	5.0E-03	0.00	177.4	0.53	9	105.7	0.0	105.7	3.4	44	68.9	1.0	-0.18	0.0	
4.38	5.0E-03	-0.01	154.2	0.40	9	95.1	0.0	95.1	3.2	44	65.8	1.0	-0.15	0.0	
4.62	5.0E-02	0.00	234.4	0.38	9	148.3	0.0	148.3	1.1	46	78.6	1.0	-0.18	0.0	
4.88	5.0E-02	0.00	571.0	1.04	9	370.3	0.0	370.3	1.9	50	95.0	1.0	-0.36	0.0	
5.12	5.0E-03	-0.01	423.3	1.58	9	282.5	1.6	284.1	5.2	48	95.0	1.0	-0.38	0.2	
5.38	5.0E-03	-0.01	249.0	1.67	9	171.1	15.4	186.4	8.1	46	82.7	1.0	-0.34	2.3	
5.62	5.0E-04	-0.02	148.5	2.37	7	105.1	35.9	140.9	14.5	44	68.7	1.0	-0.34	6.5	
5.88	5.0E-04	-0.03	74.3	1.79	7	54.5	29.4	83.9	18.1	40	49.9	1.0	-0.22	5.0	
6.12	5.0E-05	-0.03	47.7	1.62	7	36.2	30.8	67.0	22.2	38	38.2	6.0	-0.16	5.7	
6.38	5.0E-04	-0.03	61.2	0.82	9	47.0	14.3	61.3	13.8	40	45.6	1.0	-0.13	2.6	
6.62	5.0E-05	-0.04	41.7	1.18	7	33.1	24.5	57.6	20.9	38	35.6	6.0	-0.12	4.7	
6.88	5.0E-05	-0.04	30.9	1.23	7	25.4	30.4	55.8	25.4	36	30.0	6.0	-0.10	5.1	
7.12	5.0E-05	-0.03	34.1	1.35	7	28.4	32.0	60.4	24.9	38	31.2	6.0	-0.11	5.5	
7.38	5.0E-04	-0.03	51.5	0.88	7	42.7	17.9	60.6	16.1	38	42.9	1.0	-0.12	3.2	
7.62	5.0E-05	-0.03	18.9	1.84	6	17.0	68.0	85.0	37.8	34	30.0	6.0	-0.08	6.7	
7.88	5.0E-05	-0.03	28.6	1.28	7	25.3	35.4	60.7	26.9	36	30.0	6.0	-0.09	5.7	
8.12	5.0E-05	0.04	14.7	1.29	6	14.0	56.1	70.1	38.3	32	30.0	6.0	-0.02	5.5	
8.38	5.0E-06	0.07	12.1	1.30	6	12.0	48.1	60.2	42.3	UnDef	UnDef	3.0	UnDef	5.9	
8.62	5.0E-06	0.23	8.8	1.73	6	9.4	37.5	46.9	53.1	UnDef	UnDef	3.0	UnDef	4.6	
8.88	5.0E-06	0.34	7.2	1.73	4	8.1	32.5	40.7	57.9	UnDef	UnDef	3.0	UnDef	4.0	
9.12	1.0E-07	0.67	5.4	1.12	4	6.7	26.6	33.3	59.7	UnDef	UnDef	1.5	UnDef	3.3	
9.38	1.0E-07	0.68	5.4	1.01	4	6.8	27.1	33.9	58.2	UnDef	UnDef	1.5	UnDef	3.3	
9.62	1.0E-07	0.78	4.9	0.85	4	6.4	25.6	32.0	58.8	UnDef	UnDef	1.5	UnDef	3.1	

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
9.88	1.0E-07	0.72	5.2	0.93	4	6.7	26.8	33.5	58.6	UnDef	UnDef	1.5	UnDef	3.3	
10.12	1.0E-07	0.67	5.2	0.74	6	6.8	27.3	34.1	55.9	UnDef	UnDef	1.5	UnDef	3.3	
10.38	1.0E-07	0.81	4.9	0.72	6	6.6	26.5	33.1	57.1	UnDef	UnDef	1.5	UnDef	3.2	
10.62	1.0E-07	0.74	4.9	0.88	4	6.7	26.9	33.6	59.2	UnDef	UnDef	1.5	UnDef	3.3	
10.88	1.0E-07	0.95	4.2	0.79	4	6.0	24.1	30.2	62.9	UnDef	UnDef	1.5	UnDef	3.0	
11.12	1.0E-07	0.87	4.0	0.86	4	5.9	23.7	29.7	65.1	UnDef	UnDef	1.5	UnDef	2.9	
11.38	1.0E-07	0.71	5.9	0.59	6	7.9	31.6	39.4	50.3	UnDef	UnDef	1.5	UnDef	3.9	
11.62	5.0E-05	0.59	6.5	0.67	6	8.5	34.1	42.6	49.3	30	30.0	3.0	0.18	3.3	
11.88	5.0E-05	0.61	6.3	0.71	6	8.4	33.6	42.0	50.7	30	30.0	3.0	0.18	3.3	
12.12	5.0E-05	0.60	6.3	0.63	6	8.5	34.1	42.7	49.4	30	30.0	3.0	0.19	3.3	
12.38	5.0E-05	0.68	5.6	0.66	6	7.9	31.5	39.4	53.0	30	30.0	1.5	0.21	3.1	
12.62	5.0E-05	0.67	5.6	0.66	6	8.0	31.9	39.8	52.9	30	30.0	1.5	0.21	3.1	
12.88	5.0E-06	0.57	6.0	1.10	6	8.4	33.7	42.1	56.8	UnDef	UnDef	1.5	UnDef	4.1	
13.12	5.0E-06	0.51	5.8	1.27	4	8.3	33.2	41.6	59.5	UnDef	UnDef	1.5	UnDef	4.1	
13.38	5.0E-05	0.52	5.7	1.01	6	8.3	33.2	41.5	57.0	30	30.0	1.5	0.15	3.2	
13.62	5.0E-05	0.57	5.4	1.02	4	8.1	32.5	40.6	58.3	30	30.0	1.5	0.17	3.2	
13.88	5.0E-05	0.56	5.5	0.90	6	8.2	33.0	41.2	56.6	30	30.0	1.5	0.17	3.2	
14.12	5.0E-05	0.49	6.3	0.98	6	9.2	36.6	45.8	54.2	30	30.0	3.0	0.14	3.6	
14.38	5.0E-06	0.22	7.6	1.84	4	10.7	42.8	53.5	57.4	UnDef	UnDef	3.0	UnDef	5.2	
14.62	5.0E-05	0.16	9.3	1.44	6	12.7	50.7	63.4	49.2	30	30.0	3.0	0.03	5.0	
14.88	5.0E-06	0.28	7.3	1.76	4	10.5	42.2	52.7	57.8	UnDef	UnDef	3.0	UnDef	5.2	
15.12	5.0E-05	0.03	13.9	1.45	6	18.0	72.1	90.1	40.8	32	30.0	6.0	-0.02	7.1	
15.38	5.0E-05	0.27	7.6	1.48	6	11.1	44.2	55.3	54.5	30	30.0	3.0	0.06	4.3	
15.62	5.0E-05	0.26	8.4	1.24	6	12.0	48.1	60.1	49.9	30	30.0	3.0	0.06	4.7	
15.88	5.0E-05	0.06	14.0	0.98	6	18.6	74.5	93.1	36.3	32	30.0	6.0	0.01	7.3	
16.12	5.0E-05	0.16	9.2	1.38	6	13.1	52.5	65.6	49.1	30	30.0	3.0	0.04	5.1	
16.38	5.0E-05	0.19	8.6	1.05	6	12.6	50.3	62.9	47.3	30	30.0	3.0	0.06	4.9	
16.62	5.0E-05	0.18	8.8	1.23	6	12.9	51.6	64.4	48.6	30	30.0	3.0	0.05	5.0	
16.88	5.0E-04	0.04	16.8	0.58	7	22.5	37.7	60.2	28.4	32	30.0	1.0	0.02	4.7	
17.12	5.0E-05	0.03	13.6	0.96	6	18.8	75.3	94.1	36.7	32	30.0	6.0	0.01	7.4	
17.38	5.0E-04	0.01	20.7	0.93	7	27.4	48.5	76.0	28.9	34	30.2	1.0	-0.03	6.0	
17.62	5.0E-05	0.02	14.9	1.26	6	20.7	82.7	103.4	37.8	32	30.0	6.0	-0.02	8.1	
17.88	5.0E-05	0.11	10.5	1.53	6	15.5	61.9	77.4	47.3	30	30.0	3.0	0.01	6.1	
18.12	5.0E-05	0.14	10.0	1.04	6	14.9	59.7	74.6	43.9	30	30.0	3.0	0.04	5.8	
18.38	5.0E-04	0.17	10.7	0.56	6	15.9	63.7	79.7	36.5	30	30.0	1.0	0.08	5.2	
18.62	5.0E-04	0.04	20.9	0.61	7	28.7	34.1	62.8	25.3	34	31.5	1.0	0.00	4.8	
18.88	5.0E-04	0.01	23.4	0.60	7	32.1	31.3	63.4	23.5	34	34.7	1.0	-0.01	4.7	
19.12	5.0E-03	0.00	32.2	0.64	7	43.3	27.5	70.8	19.5	36	43.3	1.0	-0.05	3.4	
19.38	5.0E-04	0.00	32.5	1.05	7	44.0	41.7	85.7	23.2	36	43.7	1.0	-0.08	6.3	
19.62	5.0E-04	0.07	13.2	1.07	6	19.6	78.5	98.2	38.4	32	30.0	1.0	0.01	6.4	

Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-3514
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N5
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 13:39
CPT File: 141CPN5.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60	Su (kPa)	CRR
0.12	1.9	0.03	1.59	-0.54	1	17.5	2.2	1.0	1.23	2.00	0.9	1.9	14.9	0.00
0.38	2.4	0.07	3.05	-0.27	3	17.5	6.6	2.9	3.68	2.00	2.4	4.8	18.9	0.00
0.62	8.8	0.09	1.07	0.11	5	18.0	11.0	4.9	6.13	2.00	4.4	8.8	69.6	0.00
0.88	48.7	0.07	0.15	-1.68	8	19.0	15.6	7.0	8.58	2.00	12.2	24.3	UnDef	0.17
1.12	62.5	0.18	0.28	0.94	8	19.0	20.4	9.3	11.04	2.00	15.6	31.3	UnDef	0.26
1.38	78.0	0.25	0.31	1.22	8	19.0	25.1	11.6	13.49	2.00	19.5	39.0	UnDef	0.43
1.62	72.6	0.26	0.36	1.59	8	19.0	29.9	13.9	15.94	2.00	18.2	36.3	UnDef	0.36
1.88	55.6	0.23	0.41	2.01	8	19.0	34.6	16.2	18.39	2.00	13.9	27.8	UnDef	0.21
2.12	23.8	0.37	1.57	7.91	6	18.0	39.2	18.4	20.85	2.00	9.5	19.0	187.3	0.10
2.38	19.2	0.11	0.56	22.25	6	18.0	43.8	20.5	23.30	2.00	7.7	15.3	149.9	0.09
2.62	23.0	0.18	0.78	33.78	7	18.5	48.3	22.6	25.75	2.00	7.7	15.3	UnDef	0.09
2.88	23.4	0.16	0.68	49.33	7	18.5	52.9	24.7	28.20	1.97	7.8	15.3	UnDef	0.09
3.12	20.3	0.17	0.84	41.05	6	18.0	57.5	26.8	30.66	1.89	8.1	15.3	157.7	0.09
3.38	14.2	0.13	0.89	38.18	6	18.0	62.0	28.9	33.11	1.82	5.7	10.3	108.7	0.09
3.62	9.7	0.05	0.51	39.62	6	18.0	66.5	30.9	35.56	1.76	3.9	6.8	72.5	0.00
3.88	8.5	0.05	0.55	40.35	6	18.0	71.0	33.0	38.01	1.70	3.4	5.8	62.2	0.00
4.12	7.6	0.03	0.42	32.28	1	17.5	75.4	35.0	40.47	1.65	3.8	6.3	55.1	0.00
4.38	7.8	0.03	0.39	36.35	1	17.5	79.8	36.9	42.92	1.61	3.9	6.3	55.9	0.00
4.62	8.0	0.03	0.39	32.83	1	17.5	84.2	38.8	45.37	1.57	4.0	6.3	57.2	0.00
4.88	7.9	0.03	0.40	26.94	1	17.5	88.6	40.7	47.82	1.53	4.0	6.1	56.2	0.00
5.12	6.3	0.03	0.47	30.71	1	17.5	92.9	42.7	50.28	1.50	3.2	4.7	43.1	0.09
5.38	7.9	0.04	0.52	24.53	6	18.0	97.4	44.6	52.73	1.46	3.2	4.6	55.4	0.08
5.62	7.4	0.03	0.39	29.91	1	17.5	101.8	46.6	55.18	1.43	3.7	5.3	51.3	0.00
5.88	8.9	0.08	0.89	19.86	5	18.0	106.2	48.6	57.63	1.40	4.5	6.3	62.8	0.10
6.12	8.7	0.05	0.54	24.53	6	18.0	110.8	50.7	60.09	1.37	3.5	4.8	61.0	0.09
6.38	13.6	0.18	1.35	1.52	6	18.0	115.2	52.7	62.54	1.35	5.4	7.3	99.2	0.10
6.62	9.2	0.12	1.32	13.56	5	18.0	119.8	54.8	64.99	1.32	4.6	6.1	63.8	0.10
6.88	17.3	0.25	1.46	5.48	6	18.0	124.2	56.8	67.44	1.30	6.9	9.0	128.5	0.11
7.12	10.2	0.12	1.16	21.35	5	18.0	128.8	58.9	69.90	1.28	5.1	6.5	71.6	0.11
7.38	10.3	0.10	0.98	21.14	6	18.0	133.2	60.9	72.35	1.25	4.1	5.2	72.0	0.11
7.62	20.0	0.10	0.50	18.39	7	18.5	137.8	63.0	74.80	1.23	6.7	8.2	UnDef	0.09
7.88	21.2	0.16	0.78	-0.05	6	18.0	142.4	65.1	77.25	1.21	8.5	10.3	158.0	0.09
8.12	16.8	0.16	0.92	5.58	6	18.0	146.9	67.2	79.71	1.19	6.7	8.0	122.7	0.09
8.38	21.0	0.11	0.54	6.18	7	18.5	151.4	69.3	82.16	1.18	7.0	8.2	UnDef	0.09
8.62	17.1	0.12	0.70	14.13	6	18.0	156.0	71.4	84.61	1.16	6.8	7.9	124.2	0.09
8.88	25.7	0.11	0.45	6.15	7	18.5	160.6	73.5	87.06	1.14	8.6	9.8	UnDef	0.08
9.12	31.8	0.06	0.18	12.26	7	18.5	165.2	75.7	89.52	1.13	10.6	11.9	UnDef	0.08
9.38	28.9	0.24	0.81	12.74	7	18.5	169.8	77.8	91.97	1.11	9.6	10.7	UnDef	0.10
9.62	33.3	0.20	0.60	6.75	7	18.5	174.4	80.0	94.42	1.09	11.1	12.1	UnDef	0.09

Depth (m)	AvgQt (bar)	AvgFs (bar)	AvgRf (%)	AvgUd (m)	SBT	U.Wt. (kN/m^3)	TStress (kPa)	EStress (kPa)	Ueq (kPa)	Cn	N60 (blows/ft)	(N1)60 (blows/ft)	Su (kPa)	CRR
9.88	44.1	0.15	0.34	-2.83	8	19.0	179.1	82.3	96.87	1.08	11.0	11.9	UnDef	0.09
10.12	21.9	0.17	0.80	7.49	6	18.0	183.8	84.4	99.33	1.07	8.8	9.3	160.6	0.10
10.38	16.8	0.28	1.69	12.46	6	18.0	188.2	86.5	101.78	1.05	6.7	7.1	119.7	0.15
10.62	11.5	0.09	0.78	22.97	6	18.0	192.8	88.5	104.23	1.04	4.6	4.8	76.9	0.10
10.88	26.1	0.19	0.74	9.58	7	18.5	197.3	90.6	106.68	1.03	8.7	9.0	UnDef	0.10
11.12	21.9	0.29	1.33	0.69	6	18.0	201.9	92.7	109.14	1.02	8.8	8.9	158.9	0.15
11.38	32.2	0.22	0.68	-1.11	7	18.5	206.4	94.8	111.59	1.00	10.7	10.8	UnDef	0.10
11.62	28.7	0.09	0.33	14.28	7	18.5	211.1	97.0	114.04	0.99	9.6	9.5	UnDef	0.00

Interpretation Output - Release 1.00.17
Run No: 99-0331-0827-3514
Job No: 99-141
Client: Thurber Engineering
Project: Trout Lake By-Pass
Site: 99-141 CPT-N5
Location: N.INTERCHANGE
Cone: 20 TON A 058
CPT Date: 99/26/03
CPT Time: 13:39
CPT File: 141CPN5.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 0.00 (ft): 0.0
Su Nkt used: 12.50
Averaging Increment (m): 0.25
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
0.12	1.0E-07	-0.04	194.3	1.61	9	3.8	0.5	4.3	9.3	UnDef	UnDef	10.0	UnDef	0.1	
0.38	5.0E-08	-0.03	81.8	3.14	7	4.8	4.6	9.4	23.2	UnDef	UnDef	10.0	UnDef	2.1	
0.62	5.0E-06	-0.01	178.7	1.08	9	17.6	1.0	18.6	7.0	UnDef	UnDef	10.0	UnDef	0.3	
0.88	5.0E-03	-0.01	688.9	0.15	10	97.3	0.0	97.3	0.0	50	84.7	1.0	-0.19	0.0	
1.12	5.0E-03	0.00	667.4	0.28	10	125.1	0.0	125.1	0.0	50	87.8	1.0	-0.25	0.0	
1.38	5.0E-03	0.00	668.6	0.31	10	156.1	0.0	156.1	0.0	50	91.0	1.0	-0.25	0.0	
1.62	5.0E-03	0.00	519.0	0.36	10	145.2	0.0	145.2	0.0	48	86.3	1.0	-0.25	0.0	
1.88	5.0E-03	0.00	340.2	0.41	10	111.1	0.0	111.1	0.0	48	76.5	1.0	-0.22	0.0	
2.12	5.0E-05	0.02	127.2	1.59	9	47.6	11.3	58.9	12.2	44	50.4	10.0	-0.26	2.6	
2.38	5.0E-05	0.10	91.6	0.58	9	38.3	3.5	41.8	8.1	42	42.7	10.0	-0.12	0.8	
2.62	5.0E-04	0.14	99.6	0.80	9	45.9	5.8	51.8	9.2	42	46.4	1.0	-0.15	1.2	
2.88	5.0E-04	0.20	92.4	0.69	9	46.8	5.6	52.4	9.0	42	45.6	1.0	-0.13	1.1	
3.12	5.0E-05	0.19	73.4	0.87	9	39.2	9.6	48.8	12.4	40	40.4	10.0	-0.13	2.2	
3.38	5.0E-05	0.25	47.0	0.93	7	26.4	13.2	39.7	17.5	38	30.0	6.0	-0.08	2.7	
3.62	5.0E-05	0.39	29.3	0.55	7	17.5	11.4	28.8	19.7	36	30.0	6.0	0.02	2.2	
3.88	5.0E-05	0.46	23.6	0.60	7	14.8	14.3	29.1	23.4	34	30.0	6.0	0.04	2.6	
4.12	1.0E-07	0.40	19.7	0.46	7	12.9	0.0	12.9	5.0	UnDef	UnDef	6.0	UnDef	0.0	
4.38	1.0E-07	0.45	19.0	0.43	7	12.8	0.0	12.8	5.0	UnDef	UnDef	6.0	UnDef	0.0	
4.62	1.0E-07	0.39	18.4	0.43	7	12.8	0.0	12.8	5.0	UnDef	UnDef	6.0	UnDef	0.0	
4.88	1.0E-07	0.31	17.3	0.46	7	12.4	0.0	12.4	5.0	UnDef	UnDef	6.0	UnDef	0.0	
5.12	1.0E-07	0.47	12.6	0.56	7	9.7	30.0	39.7	33.3	UnDef	UnDef	6.0	UnDef	4.2	
5.38	5.0E-05	0.27	15.5	0.59	7	11.8	23.9	35.7	30.1	32	30.0	6.0	0.06	3.3	
5.62	1.0E-07	0.37	13.8	0.45	7	10.9	0.0	10.9	5.0	UnDef	UnDef	6.0	UnDef	0.0	
5.88	5.0E-06	0.17	16.2	1.01	7	12.8	43.6	56.3	34.0	UnDef	UnDef	6.0	UnDef	5.9	
6.12	5.0E-05	0.24	15.0	0.62	7	12.3	27.6	39.8	30.9	32	30.0	6.0	0.05	3.7	
6.38	5.0E-05	-0.04	23.5	1.48	7	18.7	44.7	63.4	31.4	34	30.0	6.0	-0.08	5.8	
6.62	5.0E-06	0.09	14.6	1.52	6	12.4	49.6	62.0	40.4	UnDef	UnDef	6.0	UnDef	6.1	
6.88	5.0E-05	-0.01	28.3	1.58	7	23.0	42.0	64.9	29.2	36	30.0	6.0	-0.11	6.1	
7.12	5.0E-06	0.16	15.2	1.33	6	13.3	53.4	66.7	38.0	UnDef	UnDef	6.0	UnDef	6.5	
7.38	5.0E-05	0.15	14.8	1.12	6	13.2	53.0	66.2	36.7	32	30.0	6.0	0.00	5.2	
7.62	5.0E-04	0.06	29.6	0.54	7	25.2	15.8	41.0	19.4	36	30.0	1.0	-0.02	2.6	
7.88	5.0E-05	-0.04	30.3	0.84	7	26.2	22.4	48.7	22.3	36	30.0	6.0	-0.06	4.2	
8.12	5.0E-05	-0.02	22.8	1.01	7	20.5	33.0	53.5	28.1	34	30.0	6.0	-0.05	5.0	
8.38	5.0E-04	-0.01	28.1	0.59	7	25.2	18.2	43.4	20.7	36	30.0	1.0	-0.03	2.9	
8.62	5.0E-05	0.03	21.7	0.77	7	20.2	27.2	47.4	26.5	34	30.0	6.0	-0.02	4.4	
8.88	5.0E-04	-0.01	32.8	0.48	7	30.0	0.0	30.0	5.0	36	32.8	1.0	-0.03	0.0	
9.12	5.0E-04	0.01	39.8	0.19	9	36.5	0.0	36.5	5.0	38	38.4	1.0	0.03	0.0	
9.38	5.0E-04	0.01	34.9	0.86	7	32.8	23.4	56.2	20.6	38	35.3	1.0	-0.08	3.8	
9.62	5.0E-04	-0.01	39.4	0.63	7	37.2	17.2	54.4	16.9	38	38.9	1.0	-0.06	3.0	

Depth (m)	k (cm/s)	Bq	Qtn	Rfn (%)	SBTn	Qc1N	DeltaQc1N	Qc1Ncs	Fc (%)	Phi (Deg)	Dr (%)	OCR	State Param	Del(n1)60	(N1
9.88	5.0E-03	-0.03	51.4	0.35	9	48.6	0.0	48.6	5.0	38	46.6	1.0	-0.04	0.0	
10.12	5.0E-05	-0.01	23.8	0.87	7	23.8	31.0	54.8	26.2	34	30.0	6.0	-0.04	5.1	
10.38	5.0E-05	0.01	17.3	1.90	6	18.1	72.5	90.6	39.8	32	30.0	6.0	-0.07	7.1	
10.62	5.0E-05	0.13	10.9	0.94	6	12.3	49.1	61.3	41.0	30	30.0	3.0	0.04	4.8	
10.88	5.0E-04	-0.01	26.7	0.80	7	27.5	27.4	54.9	23.7	36	30.2	1.0	-0.05	4.1	
11.12	5.0E-05	-0.05	21.4	1.46	7	22.7	66.5	89.2	32.9	34	30.0	6.0	-0.08	7.8	
11.38	5.0E-04	-0.04	31.7	0.73	7	33.0	23.6	56.6	20.6	36	35.5	1.0	-0.06	3.8	
11.62	5.0E-04	0.01	27.5	0.36	7	29.2	0.0	29.2	5.0	36	32.0	1.0	0.01	0.0	

APPENDIX C

Summary of Dissipations and Pore Pressure Plots

Summary of Pore Pressure Dissipation Plots

Test CPT - S1

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo (m)
2.5	8.8	115	---
4.5	5.2	196	---
6.5	3.4	295	---
8.5	7.6	134	---
10.5	25.0	41	---
13.0	---	---	13.3

Test CPT - S2

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
3.5	8.3	121	---
5.5	2.4	415	---
6.5	4.5	225	---
8.5	4.8	213	---
9.75	---	---	9.8

Test CPT - S3

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
3.5	13.2	77	---
5.5	3.5	290	---
7.7	2.7	860	---
9.5	5.1	200	---
11.5	17.6	58	---
16.93	---	---	17.1

Test CPT - S4

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
3.5	3.5	290	---
5.5	2.5	398	---
7.5	2.6	383	---
9.5	2.4	423	---
11.3	11.3	90	---

Test CPT - S5

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
7.0	11.2	91	---
15.0	6.4	159	---
22.08	---	---	22.4

Test CPT - N1

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
5.0	3.2	316	---
7.0	4.9	205	---
9.0	27.0	38	---
12.1	---	---	12.4

Test CPT - N2

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
8.0	1.8	560	---
10.0	4.0	253	---
12.0	12.7	80	---
16.0	110	9	---
17.3	---	---	17.2

Test CPT - N3

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
5.0	1.4	703	---
7.0	1.7	603	---
12.0	68.0	15	---
15.12	---	---	15.1

Test CPT - N4

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
7.5	4.4	230	---
10.0	1.9	534	---
13.0	2.5	403	---
20.6	---	---	21.0

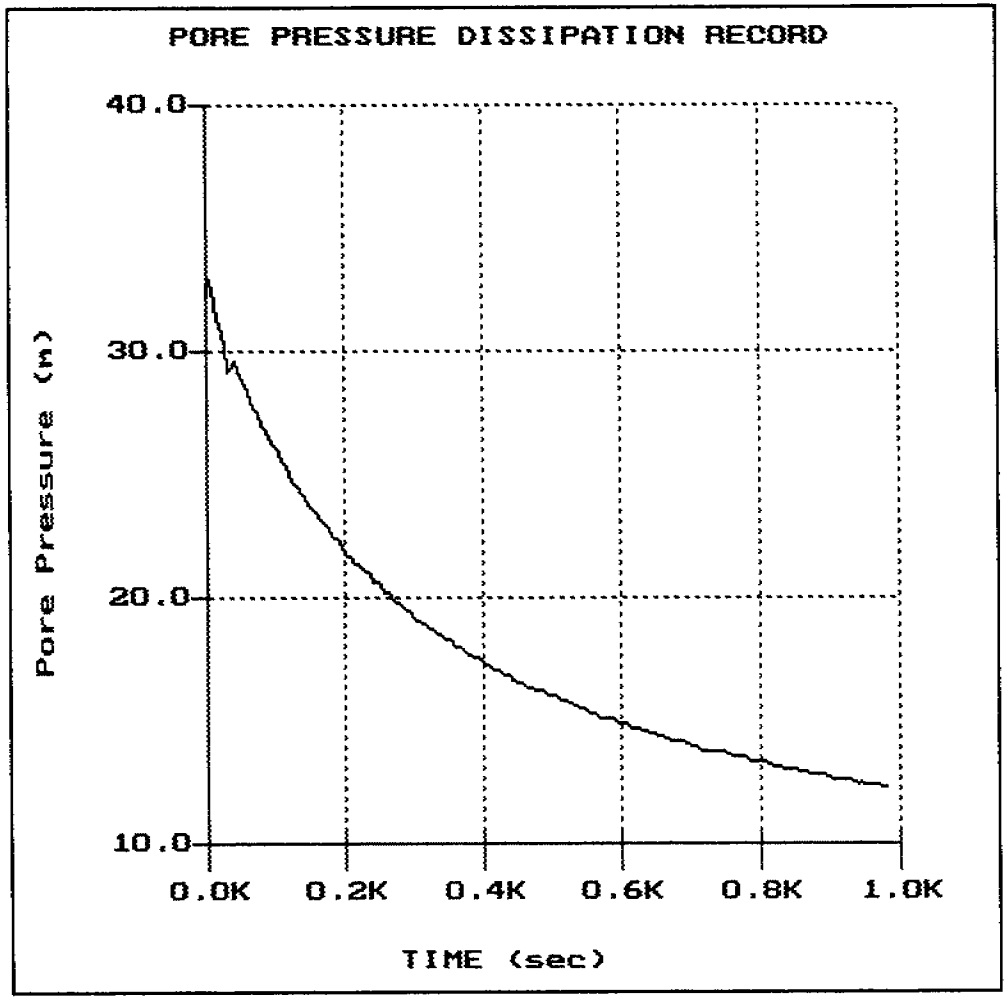
Test CPT - N5

Depth (m)	c_h(cm²/min)	t-50 (sec)	Uo(m)
4.0	2.7	373	---
9.0	60.3	17	---
12.55	---	---	13.0

Thurber Engineering

Hole:CPTUN1
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 08:19

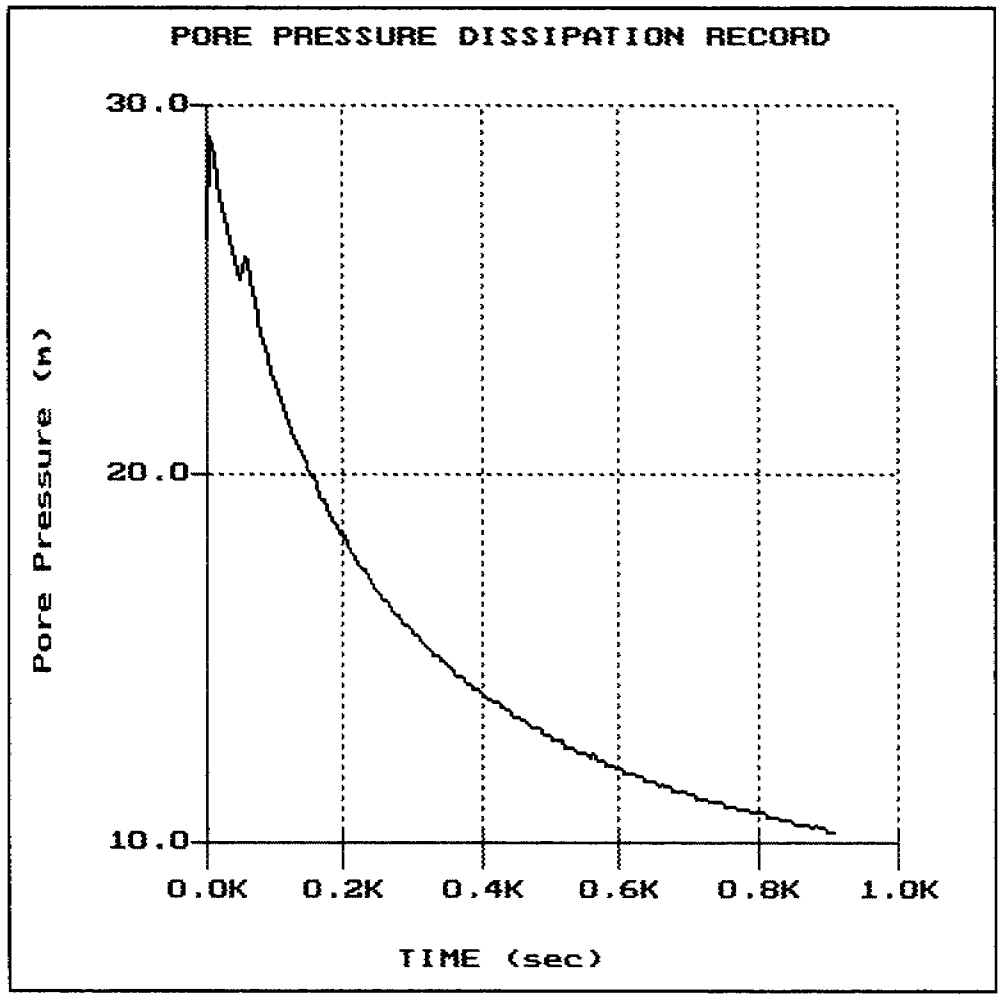


File: 141CPN1.PPD
Depth (m): 5.00
(ft): 16.40
Duration : 980.0s

Thurber Engineering

Hole:CPTUN1
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 08:19



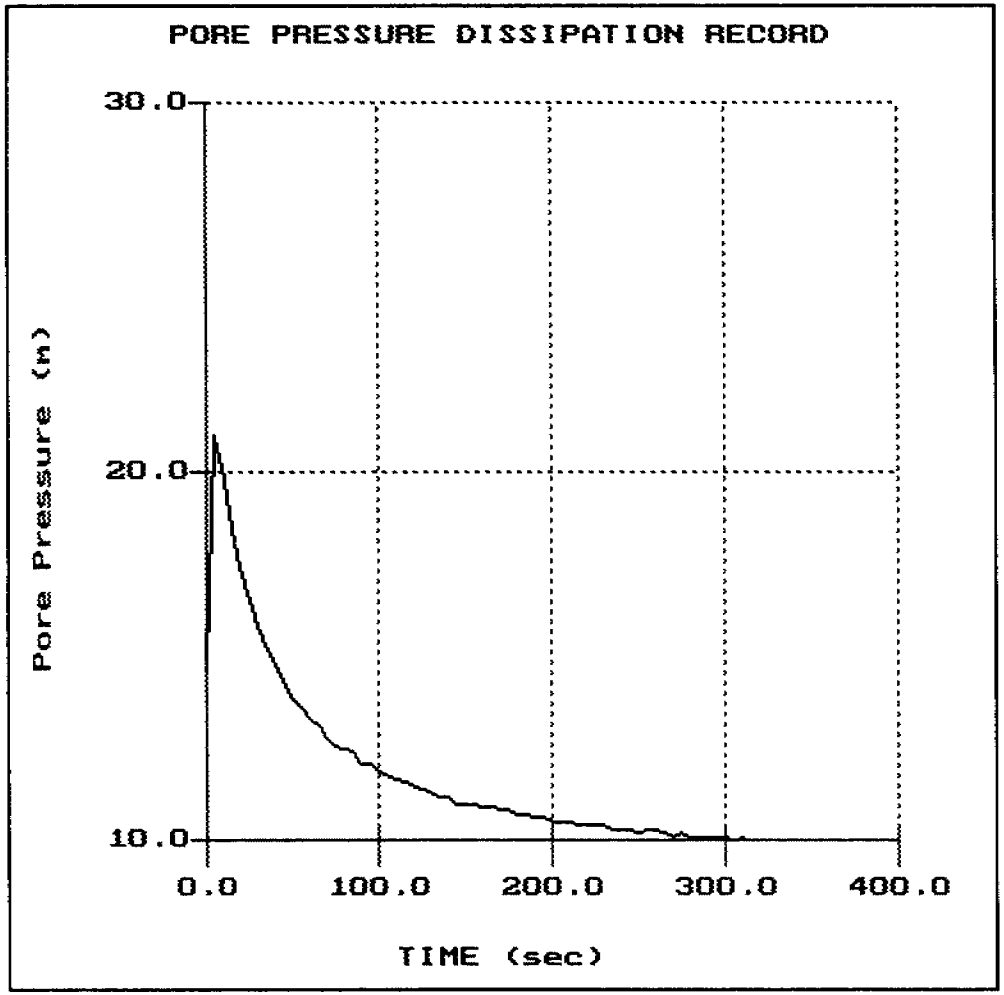
File: 141CPN1.PPD
Depth (m): 7.00
(ft): 22.97
Duration : 905.0s

Thurber Engineering

Hole:CPTUN1
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 08:19

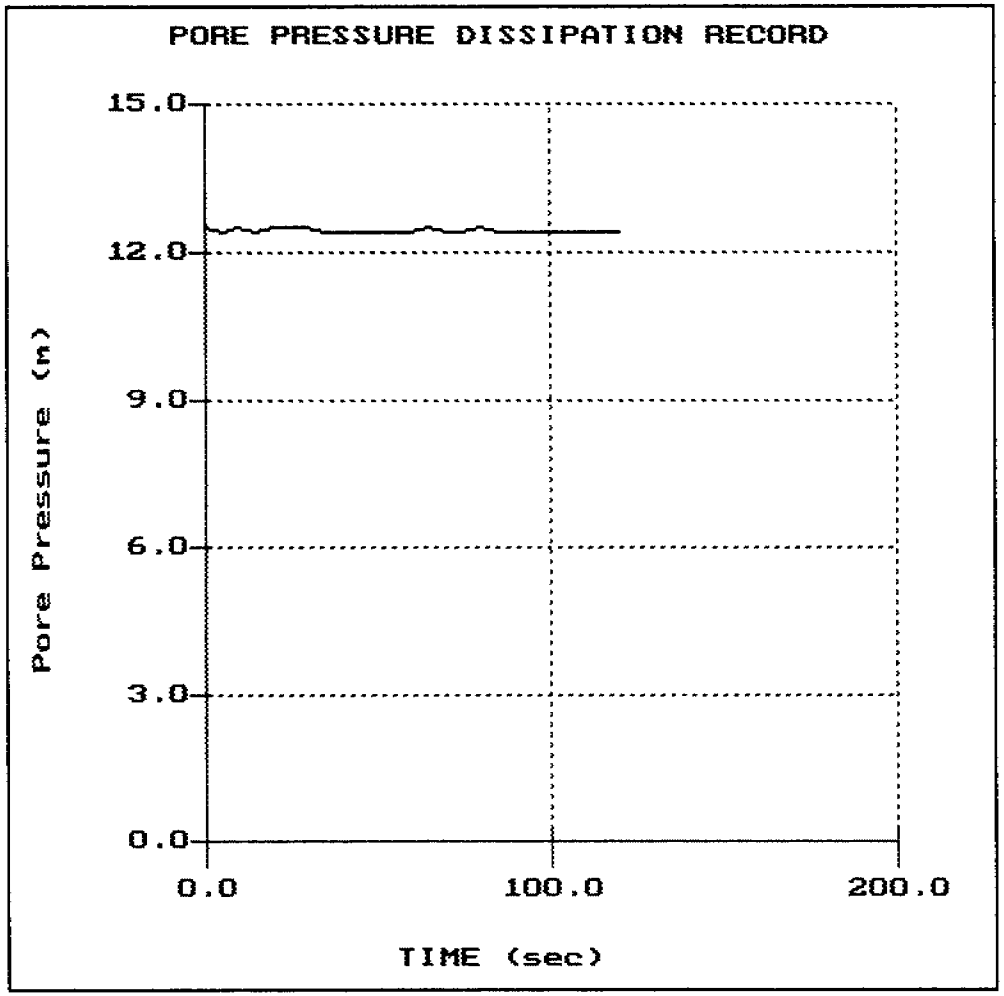
File: 141CPN1.PPD
Depth (m): 9.00
(ft): 29.53
Duration : 310.0s



Thurber Engineering

Hole:CPTUN1
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 08:19

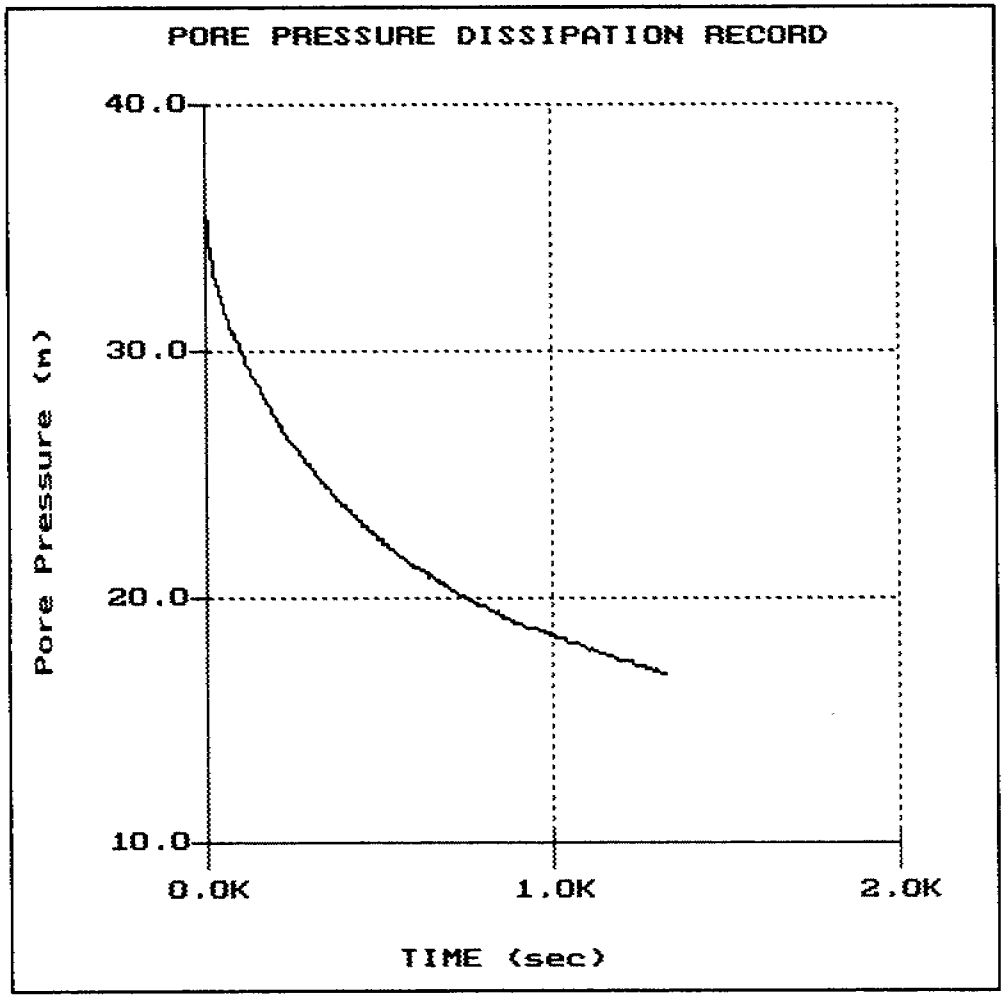


File: 141CPN1.PPD
Depth (m): 12.10
(ft): 39.70
Duration : 120.0s

Thurber Engineering

Hole:CPTUN2
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 09:54

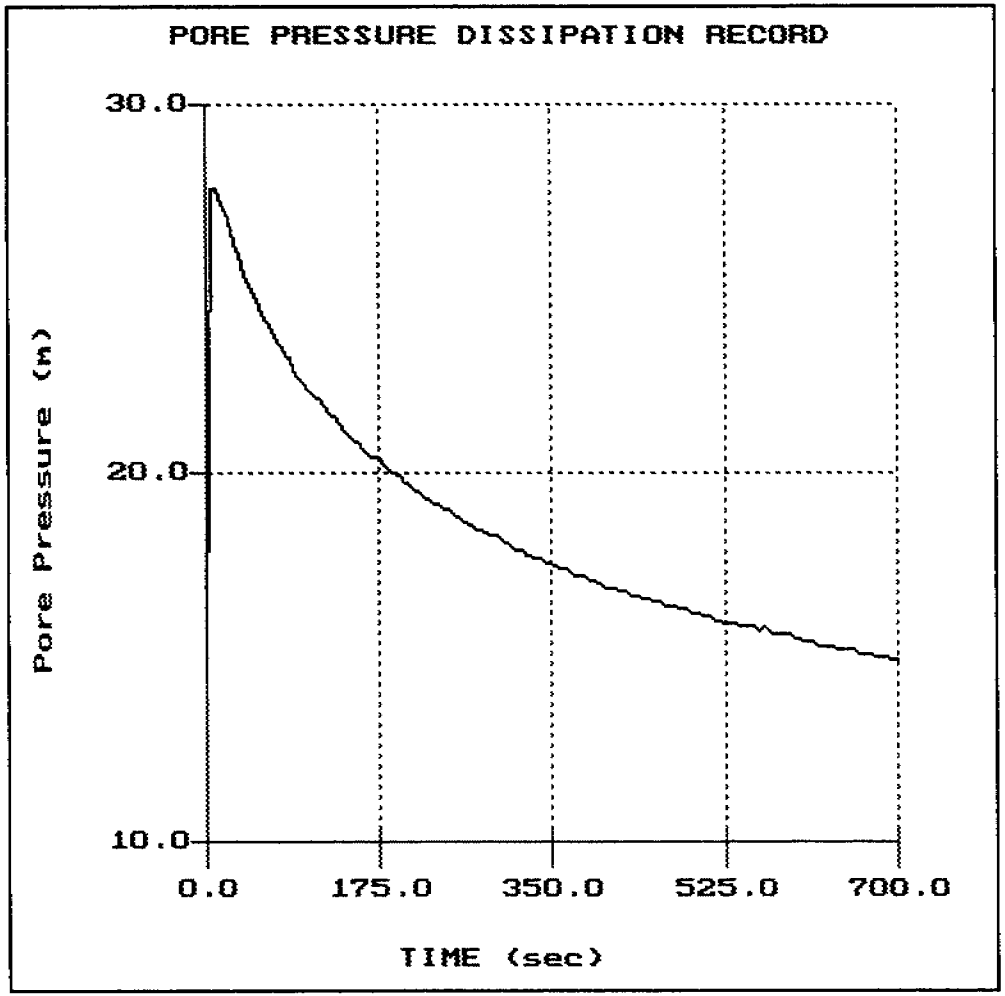


File: 141CPN2.PPD
Depth (m): 8.00
(ft): 26.25
Duration : 1325.0s

Thurber Engineering

Hole:CPTUN2
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 09:54



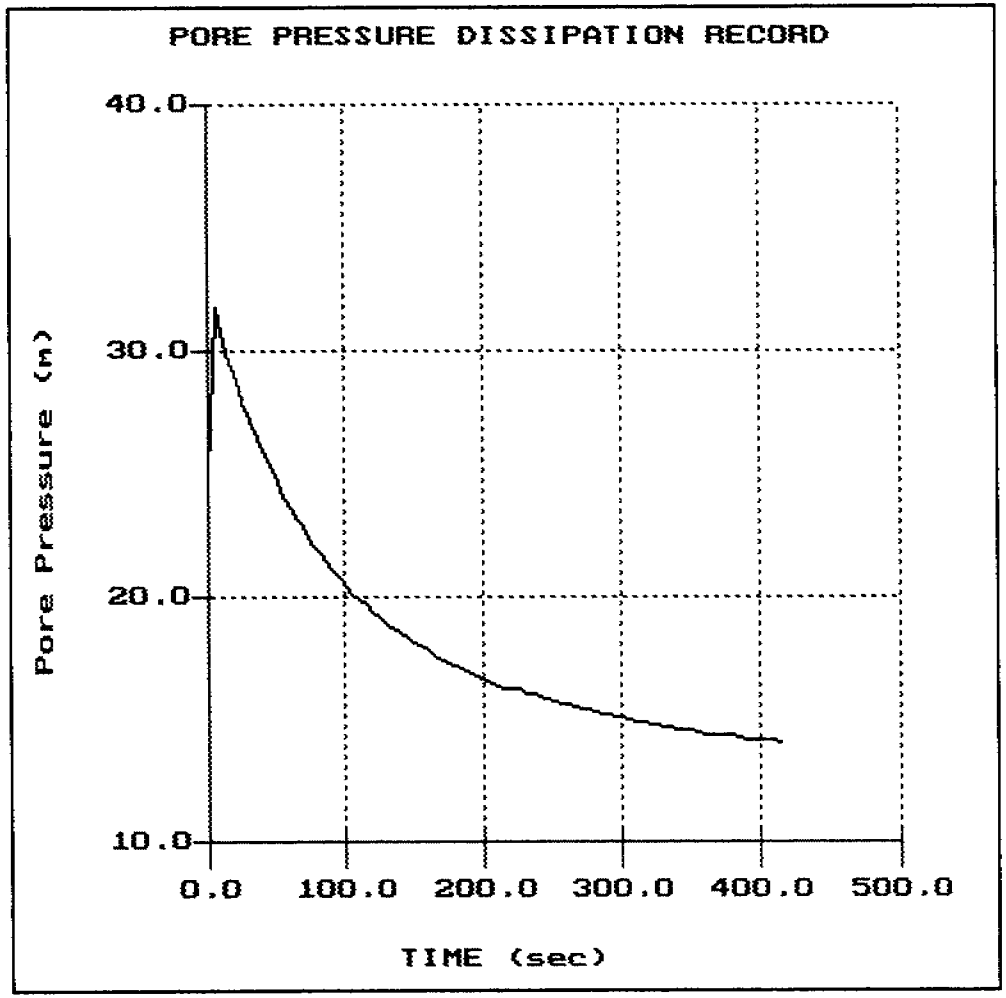
File: 141CPN2.PPD
Depth (m): 10.00
(ft): 32.81
Duration : 700.0s

Thurber Engineering

Hole:CPTUN2
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 09:54

File: 141CPN2.PPD
Depth (m): 12.00
(ft): 39.37
Duration : 415.0s

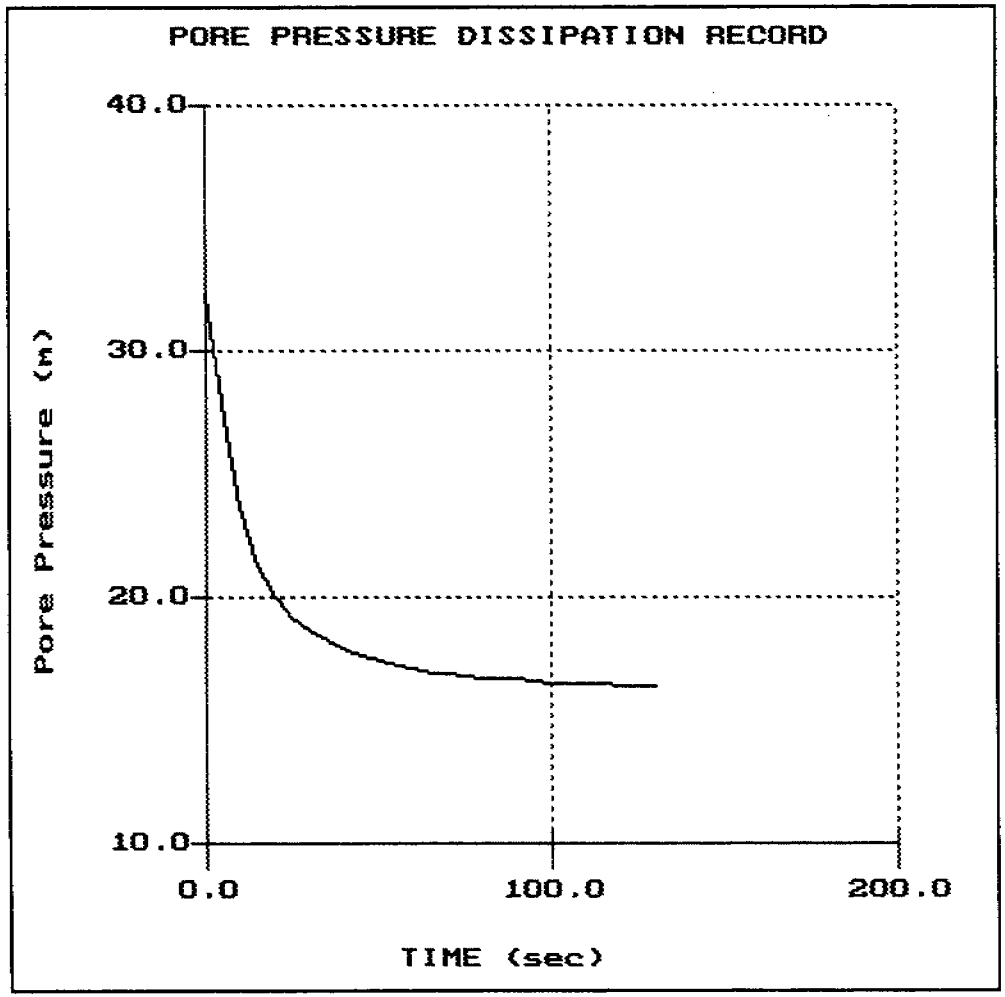


Thurber Engineering

Hole:CPTUN2
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 09:54

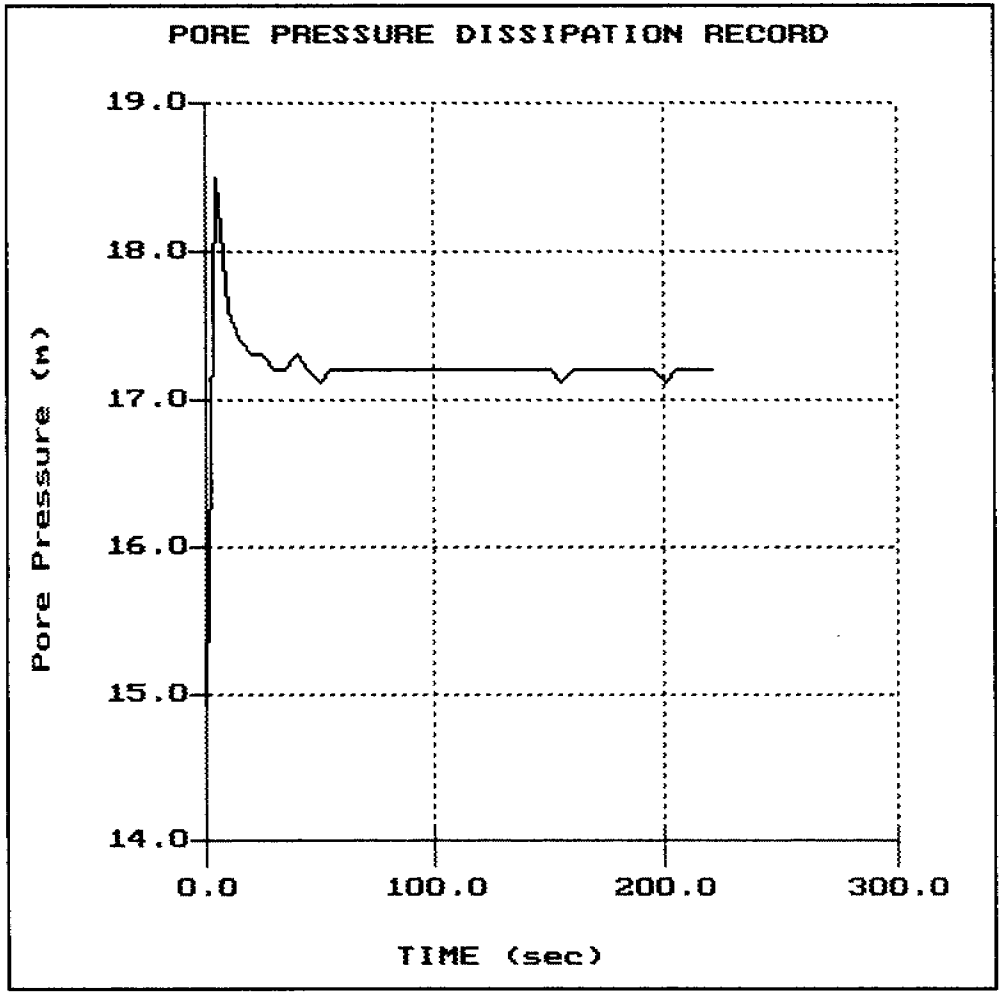
File: 141CPN2.PPD
Depth (m): 16.00
(ft): 52.49
Duration : 130.0s



Thurber Engineering

Hole:CPTUN2
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 09:54

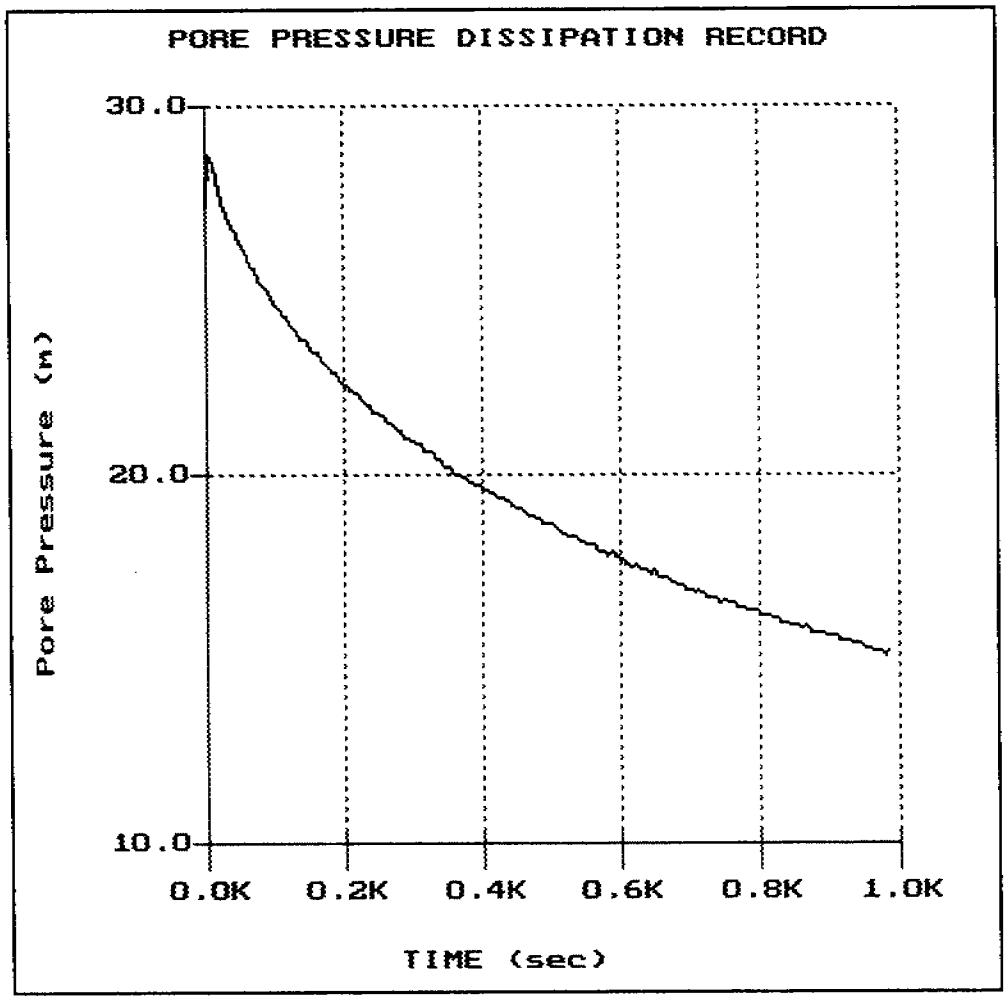


File: 141CPN2.PPD
Depth (m): 17.33
(ft): 56.86
Duration : 220.0s

Thurber Engineering

Hole:CPTUN3
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 11:48



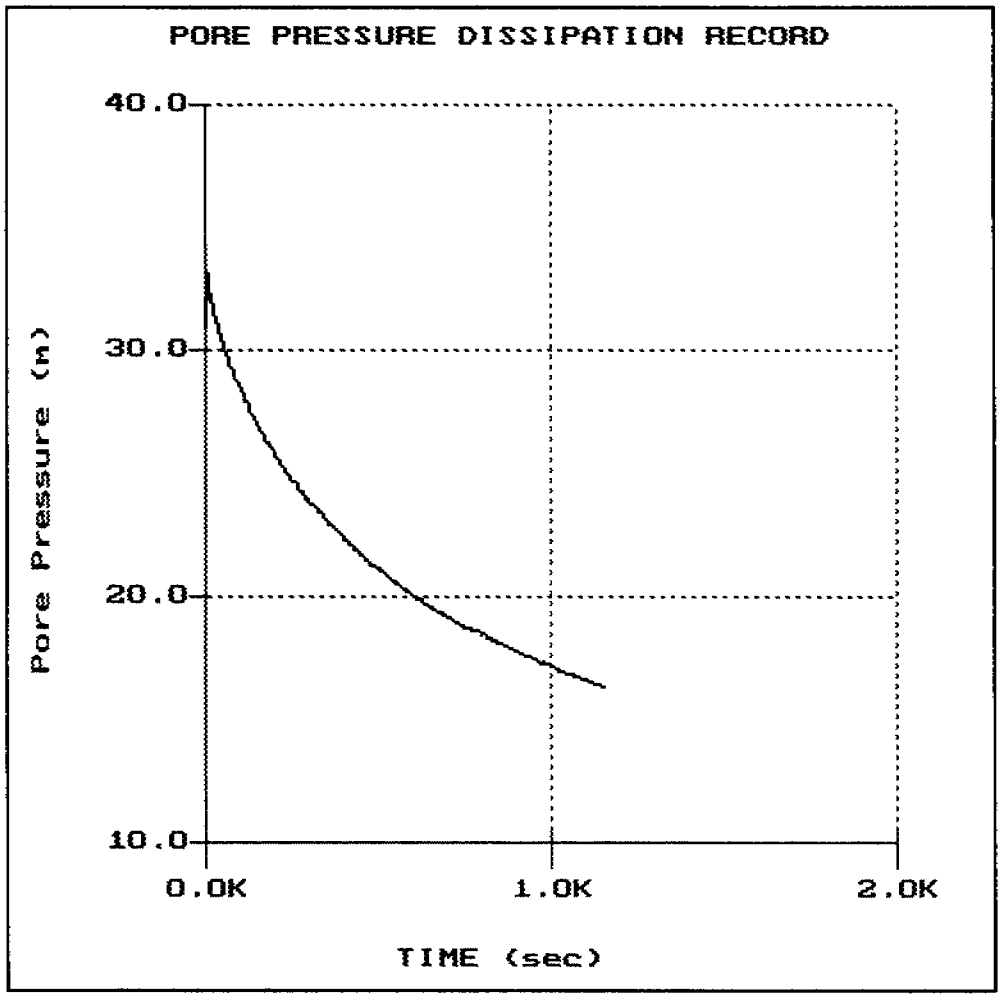
File: 141CPN3.PPD
Depth (m): 5.00
(ft): 16.40
Duration : 985.0s

Thurber Engineering

Hole:CPTUN3
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 11:48

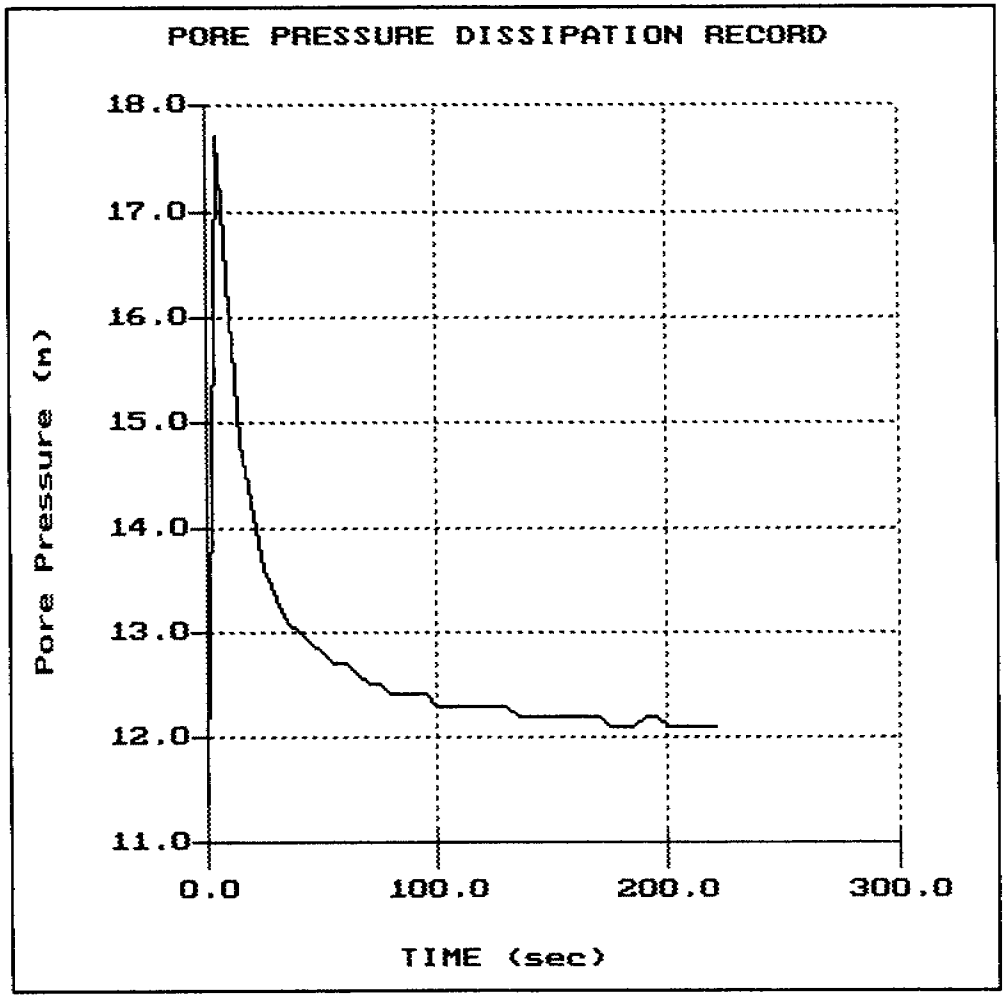
File: 141CPN3.PPD
Depth (m): 7.00
(ft): 22.97
Duration : 1155.0s



Thurber Engineering

Hole:CPTUN3
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 11:48

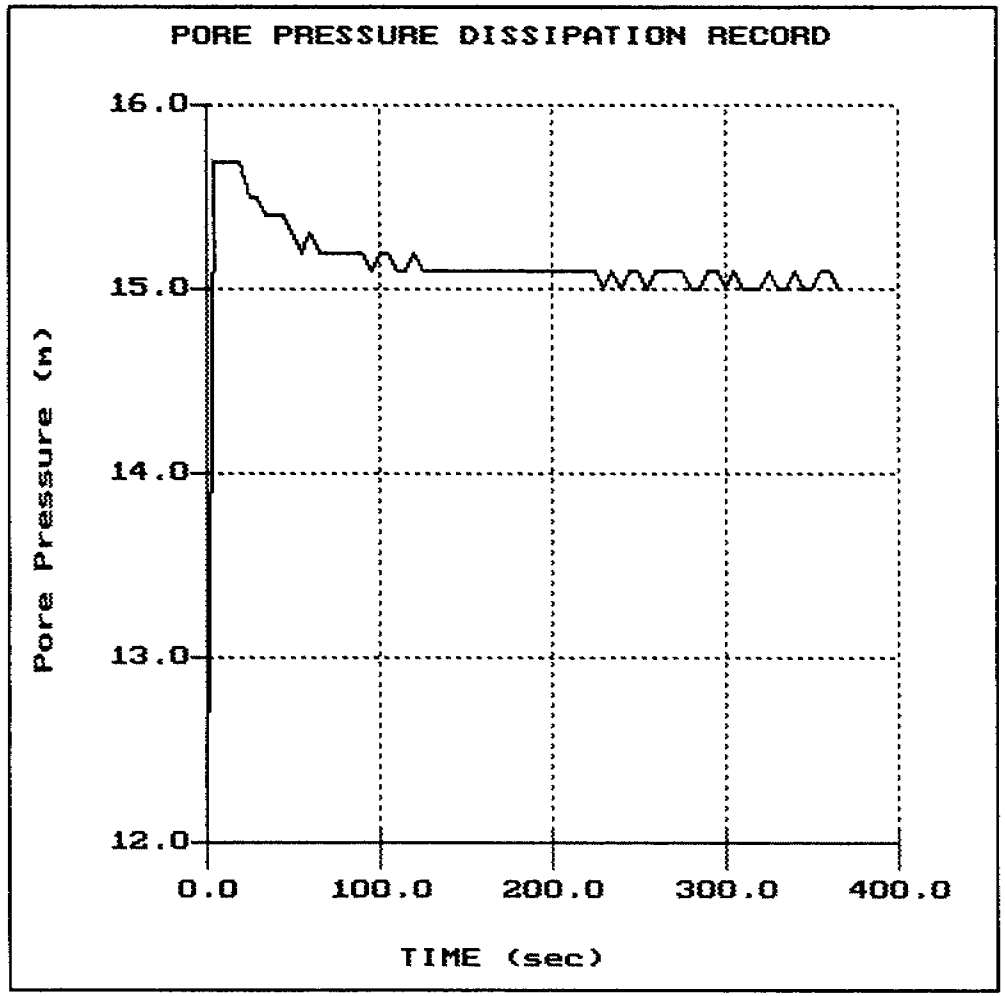


File: 141CPN3.PPD
Depth (m): 12.00
(ft): 39.37
Duration : 220.0s

Thurber Engineering

Hole:CPTUN3
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 11:48

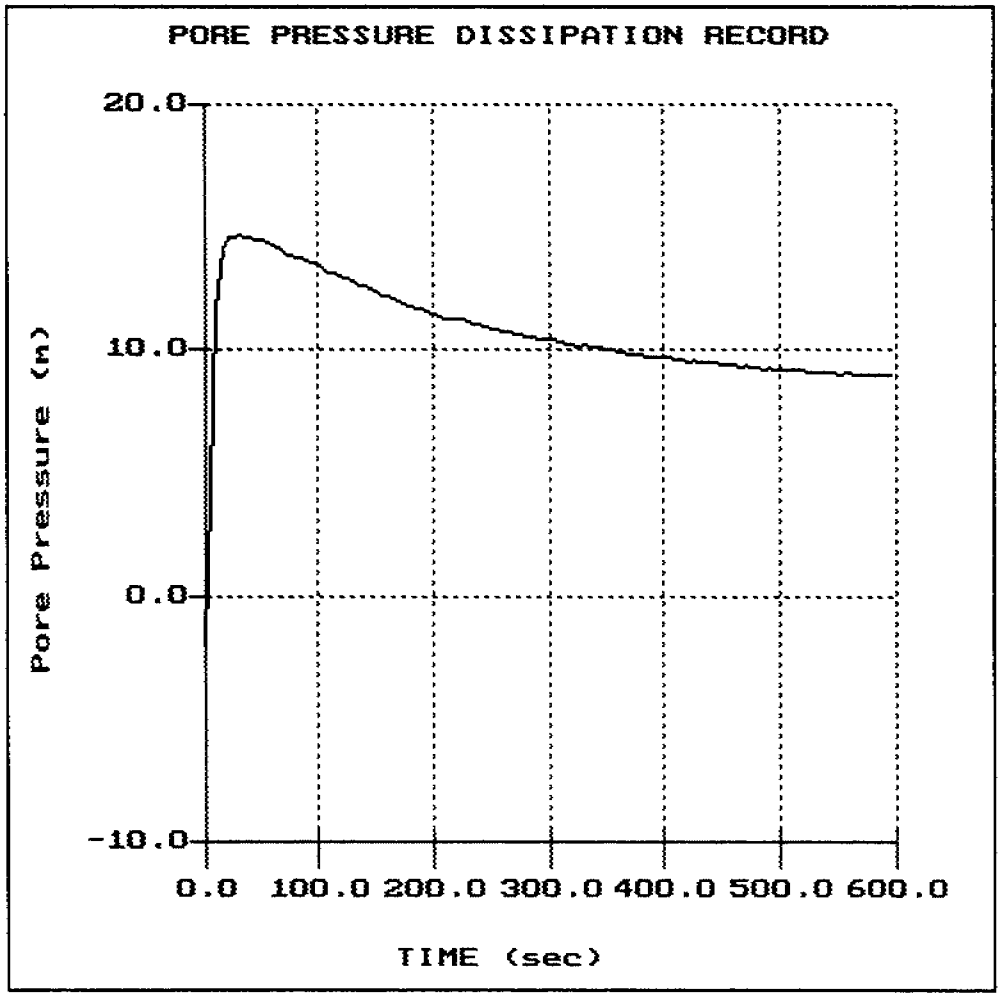


File: 141CPN3.PPD
Depth (m): 15.12
(ft): 49.61
Duration : 365.0s

Thurber Engineering

Hole:CPTUN4
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 14:44

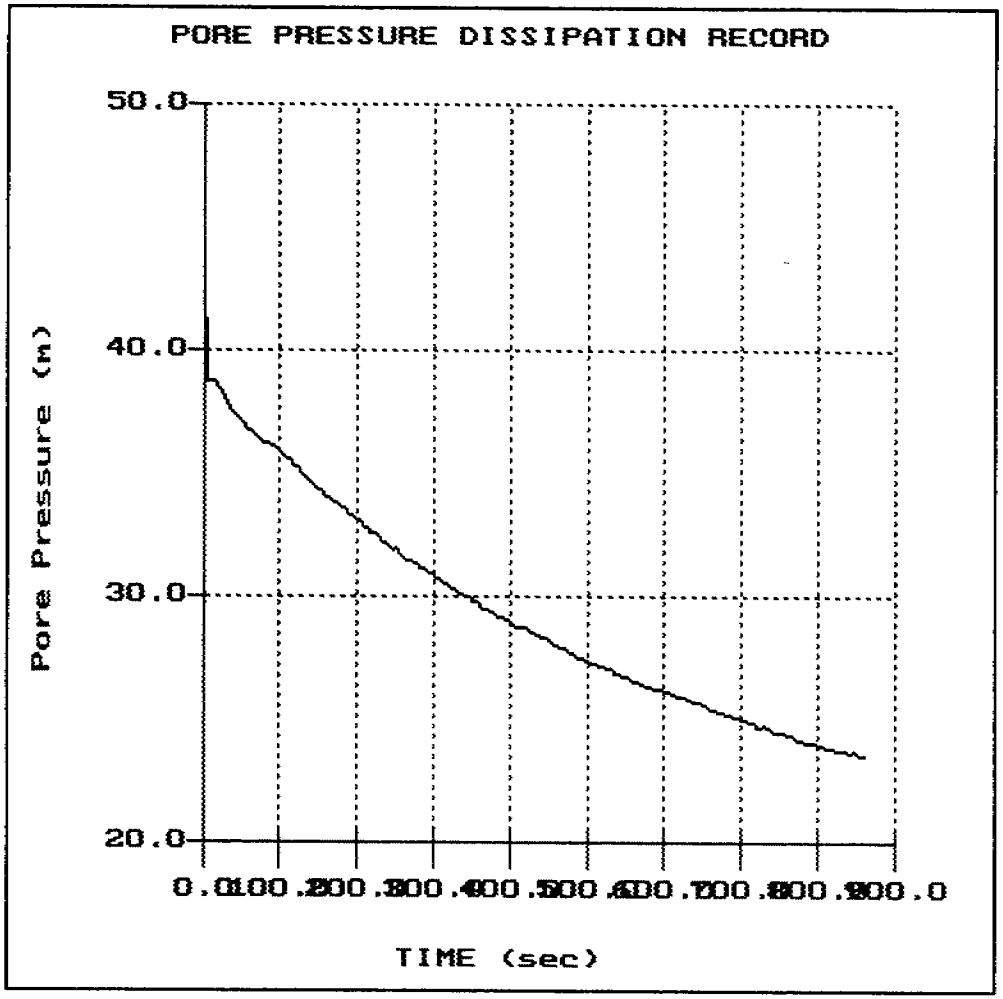


File: 141CPN4.PPD
Depth (m): 7.50
(ft): 24.61
Duration : 595.0s

Thurber Engineering

Hole:CPTUN4
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 14:44

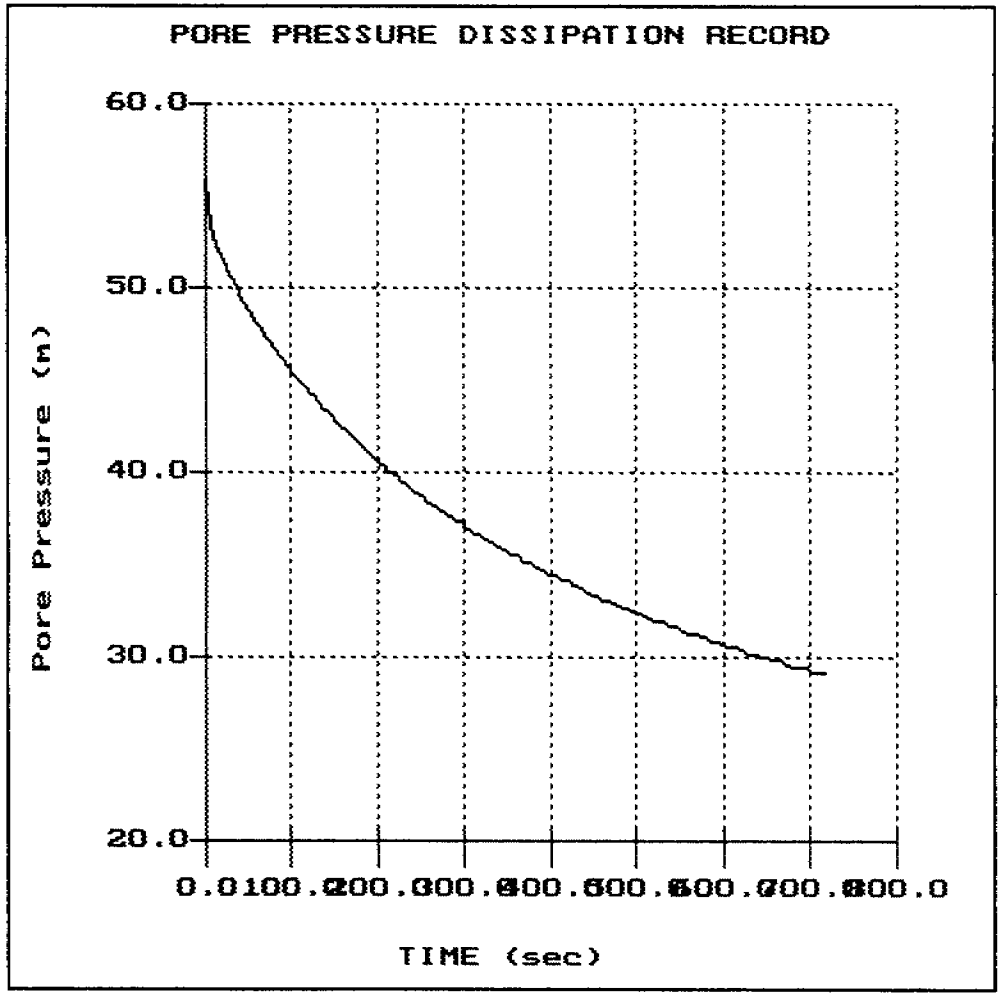


File: 141CPN4.PPD
Depth (m): 10.00
(ft): 32.81
Duration : 860.0s

Thurber Engineering

Hole:CPTUN4
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 14:44

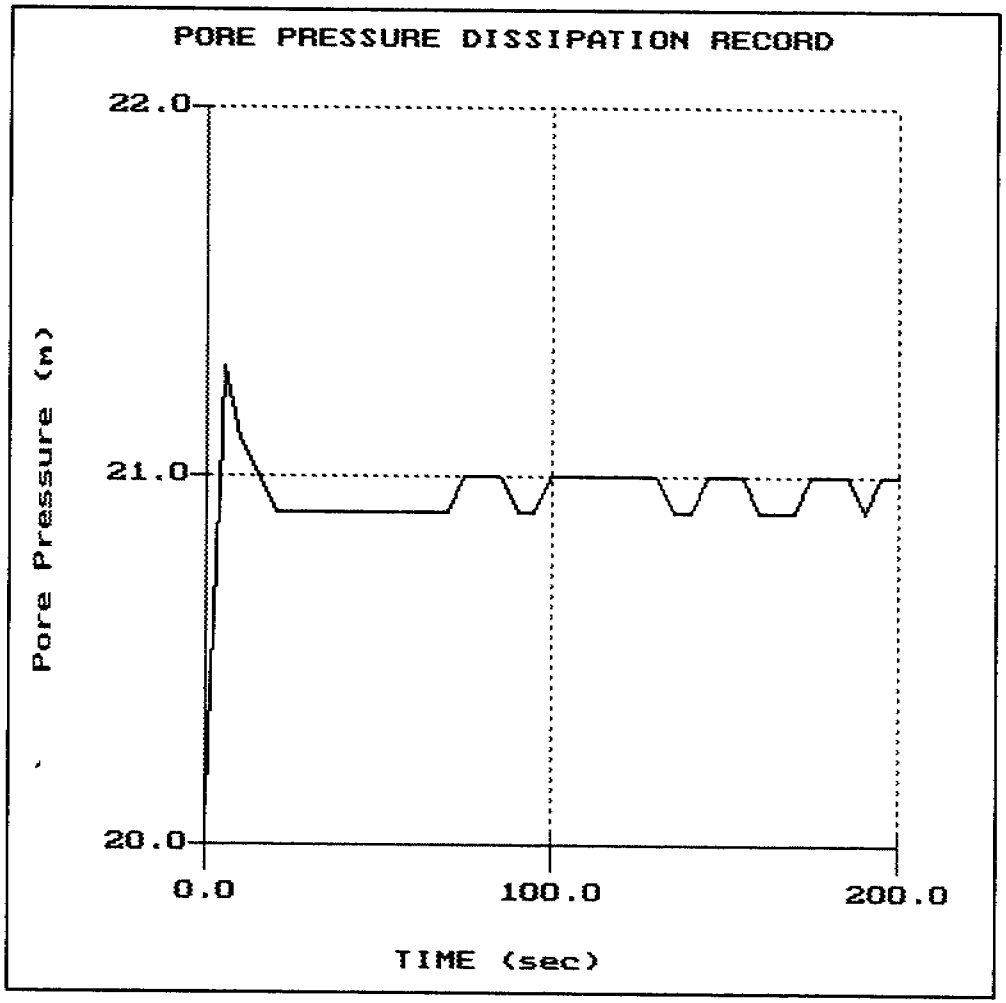


File: 141CPN4.PPD
Depth (m): 13.00
(ft): 42.65
Duration : 715.0s

Thurber Engineering

Hole:CPTUN4
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 14:44

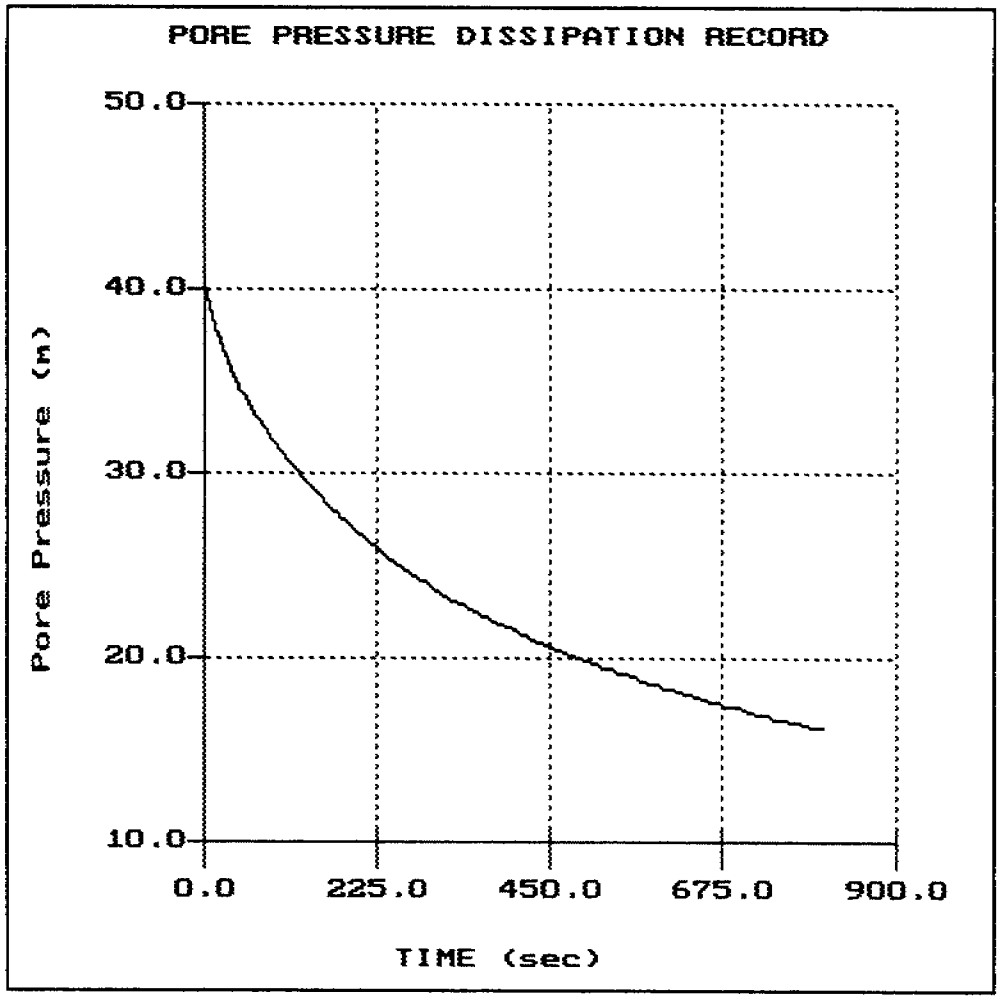


File: 141CPN4.PPD
Depth (m): 20.62
(ft): 67.65
Duration : 200.0s

Thurber Engineering

Hole:CPTUN5
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 13:39

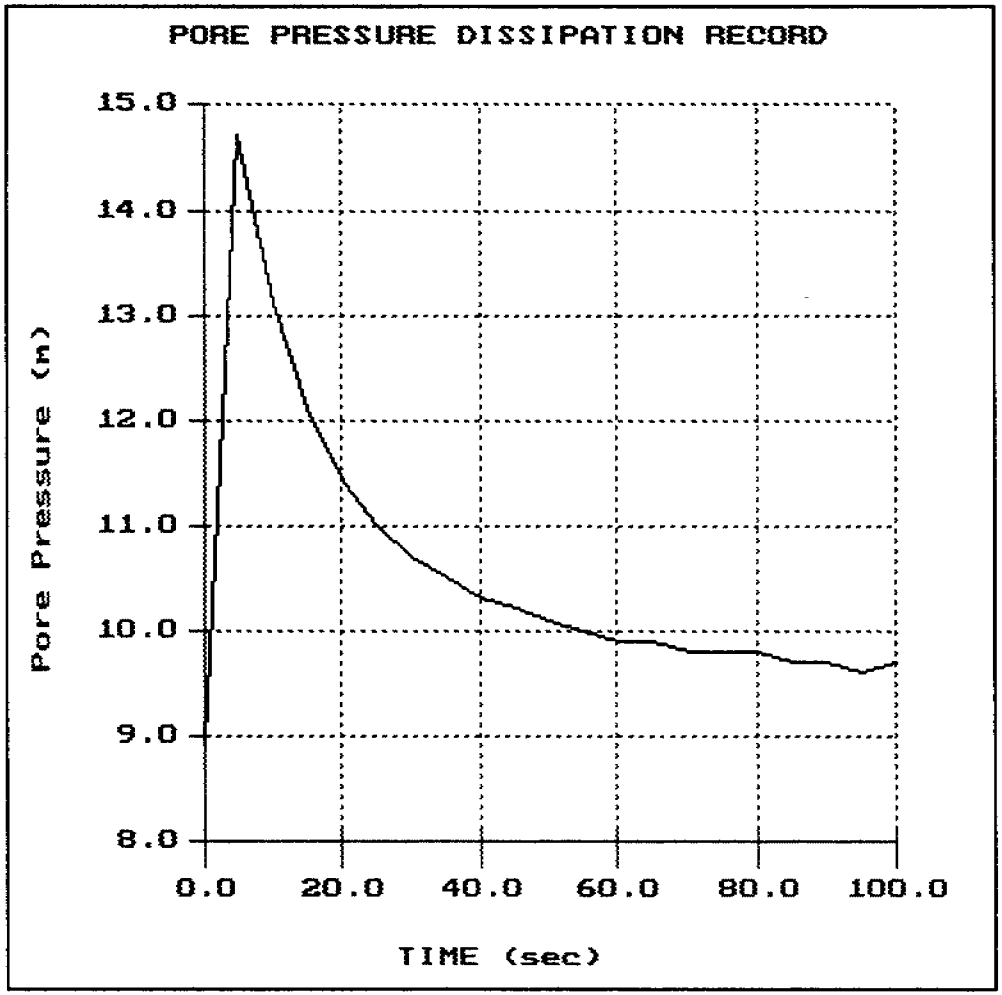


File: 141CPN5.PPD
Depth (m): 4.00
(ft): 13.12
Duration : 805.0s

Thurber Engineering

Hole:CPTUN5
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 13:39

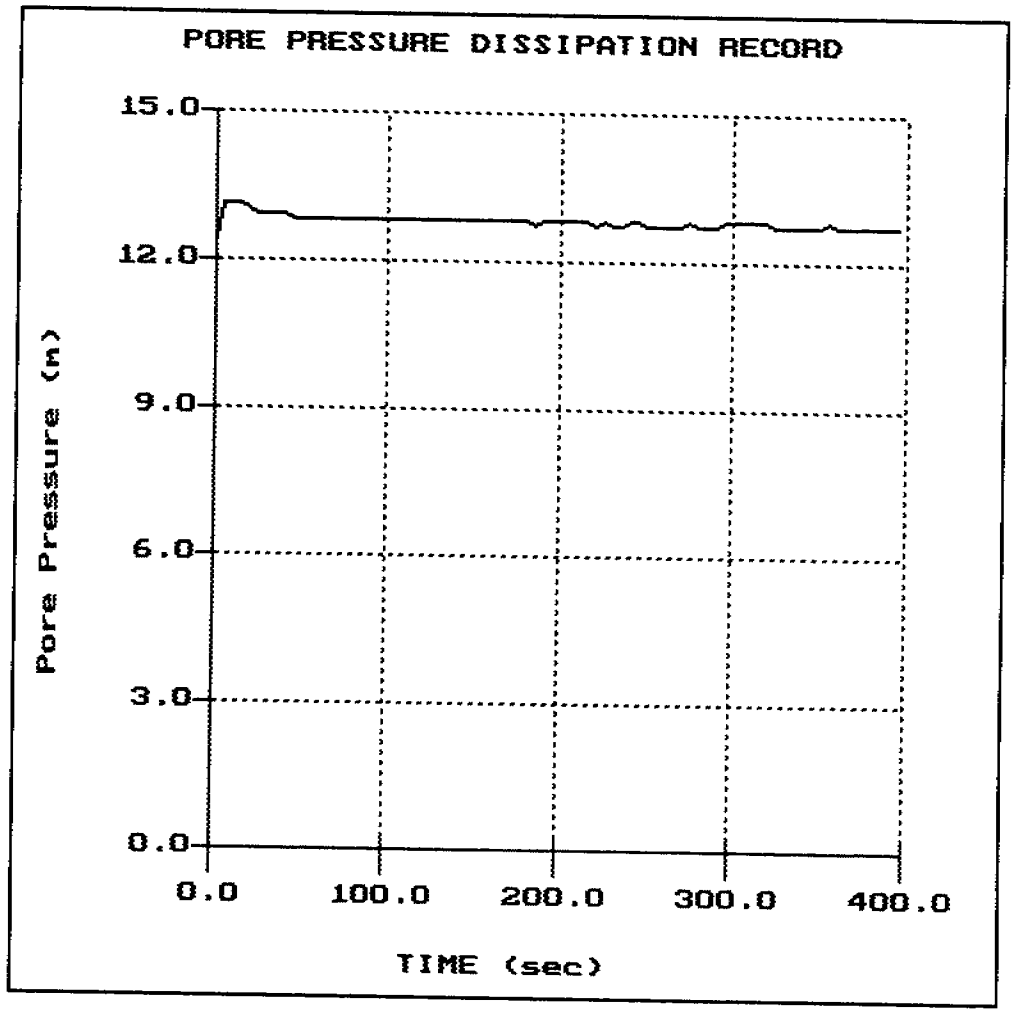


File: 141CPN5.PPD
Depth (m): 9.00
(ft): 29.53
Duration : 100.0s

Thurber Engineering

Hole:CPTUN5
Location:N.INTERCHANGE

Cone:20 TON A 058
Date:03:26:99 13:39



File: 141CPN5.PPD
Depth (m): 12.55
(ft): 41.17
Duration : 395.0s

APPENDIX D

APPENDIX D

NON STANDARD SPECIAL PROVISIONS

Granular Blanket

Wick Drains

GRANULAR FILTER BLANKET **ITEM NO. __**

Special Provision

1.0 SCOPE

This non-standard special provision specifies the requirements for the surface preparation, supply, placement and compaction of the Granular Filter blanket in connection with the installation of the prefabricated vertical drains.

2.0 MATERIALS

The Granular Filter Blanket shall be Granular'A' material and shall satisfy the physical and gradation requirements as specified in OPSS 1010.

3.0 CONSTRUCTION

3.1 The Granular 'A' blanket shall be placed and compacted to the limits and, grades shown on the plans or as directed by the Contract Administrator.

3.2 The Granular 'A' blanket shall be placed subsequent to the required subexcavation.

3.3 The Granular 'A' blanket shall be placed and compacted in lift thicknesses not exceeding 250 mm.

3.4 The Granular 'A' blanket shall be compacted to 90% ± 2% of its standard proctor density.

4.0 PAYMENT

4.1 Measurement of Payment

Measurement of payment shall be by the tonne. The method of determining the mass of materials for payment shall conform to OPSS 102.

4.2 Basis of Payment

Granular 'A' Blanket - Item

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material required to do the, work.

Special Provision

1.0 GENERAL

1.1 Scope

This non-standard special provision specifies the requirements for the supply and installation of wick drains in accordance with the details shown on the plans and with the requirements of these specifications.

1.2 Qualifications

This work shall be undertaken by a recognized specialist subcontractor with at least 5 years of proven satisfactory experience in work of this type and magnitude.

2.0 SITE CONDITIONS

The Contractor shall refer to the following reports in the Contract Documents for a description of subsurface conditions at this site:

- Foundation Investigation, Bridge Structure, Approaches and Embankment Fills - North Interchange (McCarthy Street) - Trout Creek by-Pass, King's Highway 11 - District 54, Sudbury, Ontario, GWP No.774-93-00 by Trow Consulting Engineers

- Design Report -Trout Creek By-pass - King's Highway 11 -Wick Drain Design and Monitoring Program - North Interchange Embankments - District 54, Sudbury, Ontario - GWP No. 774-93-00 by Thurber Engineering Ltd.

The Record of Borehole sheets are not represented as a complete description of the subsurface conditions, but only present what was found in borings at the indicated locations on the date boreholes were drilled. The subsurface conditions may be variable between the borehole locations.

The Contractor should verify existing surface conditions.

3.0 MATERIALS

3.1 The prefabricated drain shall consist of a continuous plastic drainage core wrapped in a non-woven geotextile material. The core configuration should be 'Studded' or 'Grooved' ('Filament ' or 'Cuspated' are not acceptable).

The Contractor shall submit samples of the prefabricated drain for evaluation and approval to the Contract Administrator at least one month prior to commencement of work under this item.

Fabricated wick drain material shall meet the minimum Specifications included in the table attached at the end of this text.

3.3 The Contractor shall submit a 1 m sample of the vertical drain material to the Contract Administrator prior to usage and shall allow two weeks for the Contract Administrator to evaluate the material. The sample shall be stamped or labelled by the manufacturer as being representative of the drain material having the specified trade name. Documentation indicating the source of the drain shall be provided. Approval of the sample by the Contract Administrator shall be required prior to site delivery of the vertical drain material.

3.4 Manufacturer certification shall be provided for all drain material delivered to the project.

3.5 All drains supplied shall be free of defects, rips, holes or flaws. During shipment the drain shall be protected from damage. During on-site storage the storage area shall be such that the drain is protected from sunlight, dirt, dust, mud, debris and any other detrimental substances.

4.0 EQUIPMENT

4.1 Vertical drains shall be installed with equipment which will minimise disturbance to the granular 'A' blanket or the native subsoil during the installation operation. Static or vibratory methods are considered acceptable. Falling weight impact hammers will not be allowed.

4.2 The Contractor is advised that the site is considered as an environmentally sensitive area and therefore the control of any water effluent needs to be carefully planned and organized. Jetting techniques, therefore, shall be subjected to the approval of the Contract Administrator.

4.3 The Contractor shall be permitted to use augering equipment to predrill or to loosen the native soils and the granular 'A' blanket if required to facilitate the installation of the wick drains.

4.4 Each prefabricated wick drain shall be installed using a mandrel or sleeve which shall be advanced through the underlying soil and the granular blanket. The mandrel shall protect the prefabricated drain material from tears, cuts and abrasions during installation and shall be withdrawn after the installation on the drain. The mandrel shall be provided with an "anchor" rod or plate at the bottom to prevent the soil from entering the bottom of the mandrel during installation of the drain and to anchor the bottom of the drain at the required depth at the time of mandrel removal. The projected cross-sectional area of the mandrel and anchor combination shall not exceed 7700 mm2.

5.0 INSTALLATION

5.1 Installation Method Proposal Submission

At least three weeks prior to the installation of the drainage strips, the Contractor shall submit to the Contract Administrator, for review and approval, details of the sequence and method of installation. The submittals shall satisfy the specifications and at a minimum contain the following specific information:

- Size, type, weight, maximum pushing force, and configuration of the installation rig.
- Dimensions and length of mandrel.
- Details of drain anchorage.
- Detailed description of proposed installation procedures.

- Proposed methods for overcoming obstructions.

- Proposed methods for splicing drains.

Approval by the Engineer will not relieve the Contractor of his responsibilities to install vertical drain strips in accordance with the plans and specifications.

5.2 Construction Sequence

Vertical drains shall be installed subsequent to the construction of the granular 'A' blanket and prior to installation of monitoring instruments and placement of the embankment material.

5.3 Trial Drains

Prior to the installation of prefabricated drains within the areas designated on the plans, the Contractor shall demonstrate that the proposed materials, equipment and installation method produces a satisfactory drain installation in accordance with these specifications. The Contractor will be required to install a total of ten trial drains at locations within the work area as designated by the Contractor Administrator.

Should the ten trial drains be installed to the satisfaction of the Contract Administrator, the trial drains can be incorporated as part of the permanent installation. The Contractor will be compensated for each trial drain if the installation satisfies the requirements of this specification, at the same unit price as the production drains. The Contractor shall not be compensated for unsatisfactory trial drains.

Approval by the Contract Administrator of the method and equipment used to install the trial drains shall not constitute, necessarily, acceptance of the method for the remainder of the project. If, at any time, the Contractor Administrator installation considers that the method of installation does not produce a drain which satisfies the project requirements, the Contractor shall alter his method and/or equipment as necessary to comply with these specifications.

5.4 Layout

Prefabricated drains shall be located and staked out by the Contractor. The location of the drains shall not vary by more than 150 mm from the locations indicated on the drawings.

5.5 Plumbness

Drains shall be installed vertically, within a tolerance of not more than 10 mm per 500 mm. The equipment shall be carefully checked for plumbness, and the Contractor shall provide the Contract Administrator with a suitable means of verifying the plumbness of the mandrel and of determining the depth of the drain at any time.

5.6 Splices

Splices or connections in the vertical drain material shall be done in a professional manner so as to ensure continuity and to avoid any reduction of the flow characteristics of the wick material. Splices shall be a minimum of 150 mm in length.

5.7 Cut-off

The prefabricated drain shall be cut at the surface such that at least a 150 mm length protrudes above the top of the granular blanket at each drain location.

5.8 Obstructions

Where obstructions are encountered below the working surface which cannot be penetrated by the drain installation equipment, the Contractor shall complete the drain from the elevation of the obstruction to the working surface and notify the Contract Administrator. At the direction of the Contract Administrator, the Contractor shall attempt to install a new drain within a 500 mm radius of the obstructed drain. A maximum of two attempts shall be made as directed by the Contract Administrator. The Contractor will be compensated for each obstructed drain unless the drain is improperly completed, in which case no compensation will be allowed.

5.9 Preaugering

Preaugering will likely not be required at this site. If however, the Contractor judges that preaugering is required, the drilling shall not extend more than 1m into the Silty Clay deposit at the site. Any additional cost for preaugering, shall be incorporated into the unit price.

5.10 Rejected Drains

Prefabricated drains that are installed beyond the plan location by more than 150 mm, or that are damaged or are not installed in accordance with the specifications described above shall be rejected. Rejected drains may be removed at the Contractor's own expense and time. The Contractor shall not be compensated for the materials and work associated with rejected drains.

Replacement drains shall be installed within a 50 cm radius from the location of the rejected drain as directed by the Contract Administrator.

5.11 Geotechnical Instrumentation

Installation of the drains should be coordinated with the placement of geotechnical instrumentation as shown on the drawings. Special care should be taken to install drains in such a manner so as not to disturb instrumentation already in place. The replacement of instrumentation damaged as a result of the Contractor's activities will be the responsibility of the Contractor.

6.0 PAYMENT

6.1 Measurement of Payment

Measurement of the item "WICK DRAINS" is by Plan Quantity, as may be revised by Adjusted Plan Quantity shall be by the linear metre for all accepted drains installed including the protruding portion. Properly completed obstructed wick drains and properly installed replacement wick drains and trial drains will be measured for payment.

6.2 Basis for Payment

Item - Wick Drains

Payment at the contract unit price per linear metre for the above item shall be full compensation for all labour, materials and equipment to complete the work in accordance with the Plans and Specifications.

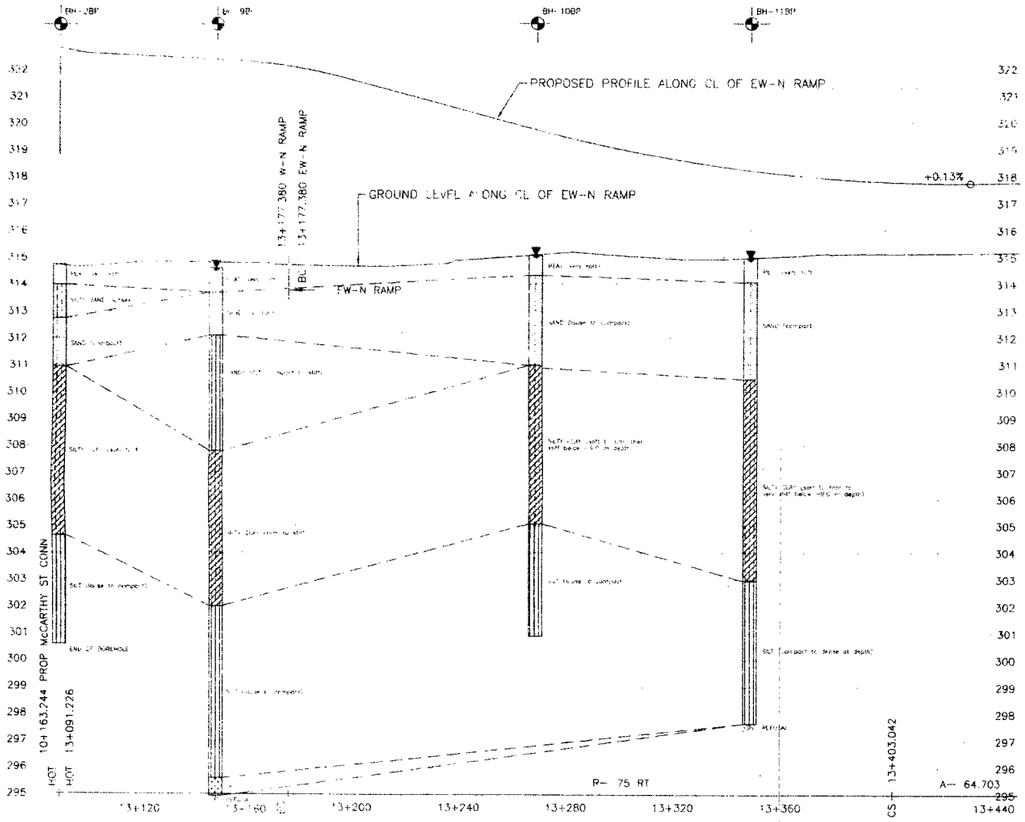
No payment shall be made for unacceptable drains or delays or expenses incurred by the Contractor as a result of improper or unacceptable material or installation.

PRODUCT SPECIFICATIONS			
	TEST METHOD	**UNITS**	**VALUE**
PHYSICAL PROPERTIES			
Drain Body Material		Studded or Groved	Polypropylene
Filter Material		Non-Woven	Polypropylene
Weight	ASTM-D-1777	g/m	75
Width		mm	not less than 100
Thickness	ASTM-D-5199	mm	not less than 3
Mass of Filter	ASTM-D-1777	g/m2	154
MECHANICAL PROPERTIES			
Drain composite Tensile Strength	ASTM D-4595	kN	0.375 @ 10%
Filter Puncture Strength	ASTM-D-751-68	kN	0.335
Filter Grab Strength	ASTM-D-1682	kN	0.8
Filter Trapezoidal Tear	ASTM-D-1117	kN	0.22
Filter Burst Strength	ASTM-D-751-68	kPa	2000
Discharge Capacity @ 70 kPa	ASTM-D4716	m3/s	$100x10^{-6}$
FOS	CAN/CGSB-148.1 No. 10.2	μm	15 to 100
Minimum elongation at break (%)	CAN/CGSB-148.1 No. 7.3	%	15
Water Permeability	ASTM D-4491	m/s	0.000005

PLATE No.
DRAWING No.
CONT No.
WP No. 774-93-00

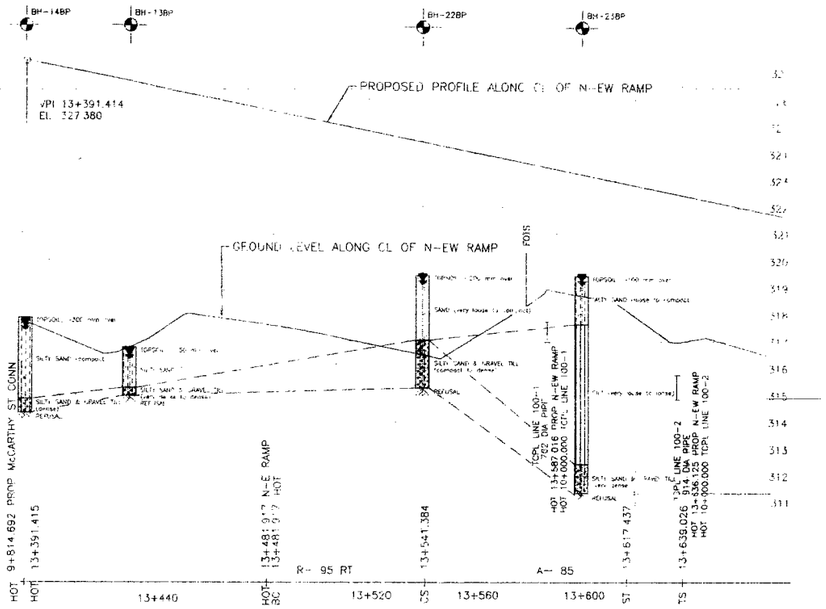
SHEET

Revised



PROFILE ALONG C/L OF EW-N RAMP

0 50 100 m
APPROXIMATE HORIZONTAL SCALE 1:1000
APPROXIMATE VERTICAL SCALE 1:100



PROFILE ALONG C/L OF N-EW RAMP

0 50 100 m
APPROXIMATE HORIZONTAL SCALE 1:1000
APPROXIMATE VERTICAL SCALE 1:100

- NOTE -

The boundaries and soil types have been established only at Test Hole locations. Between Test Holes they are assumed and may be subject to considerable error.

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

TROW CONSULTING ENGINEERS LTD.
SUDBURY, ONTARIO
Trow PROJ. No. SUT52406 DWG. No. 1F

MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

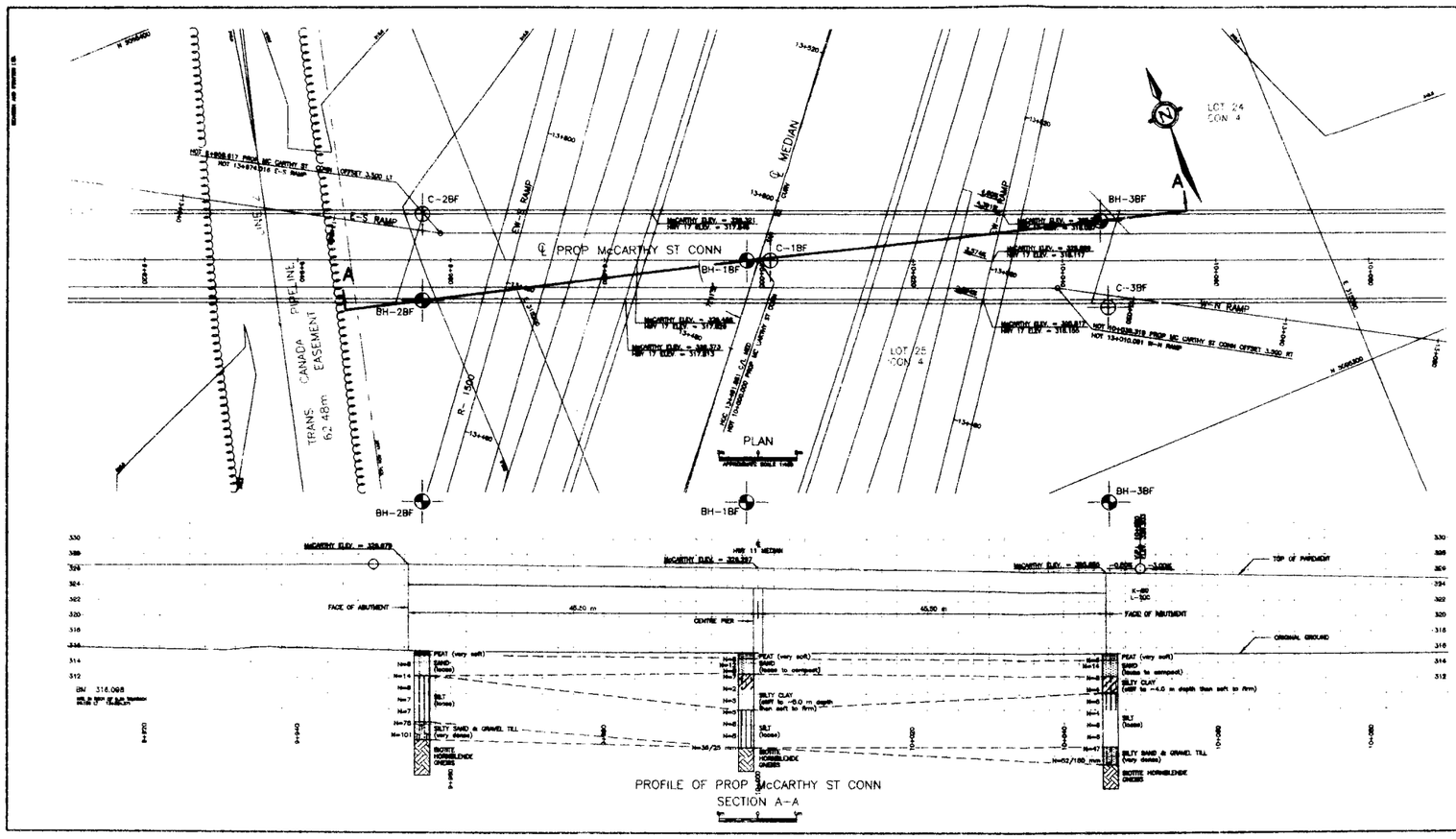
PROFILES ALONG RAMPS

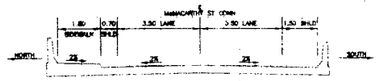
PROPOSED NORTH INTERCHANGE
AT
McCARTHY STREET
AND
PROPOSED C/L MEDIAN HWY 11

GEOG. TWP. OF HEMSWORTH SOUTH
LOTS 24, 25 & 26
DIST OF PARRY SOUND
CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	ETR	

SURVEY DATE	97/10	PLAN DATE	98/10
SITE	PLAN		





BRIDGE CROSS SECTION

- NOTE -

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METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
WP No 771-93-00

SHEET

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Trow PROJ. No. S07524GB DWG No. 1C

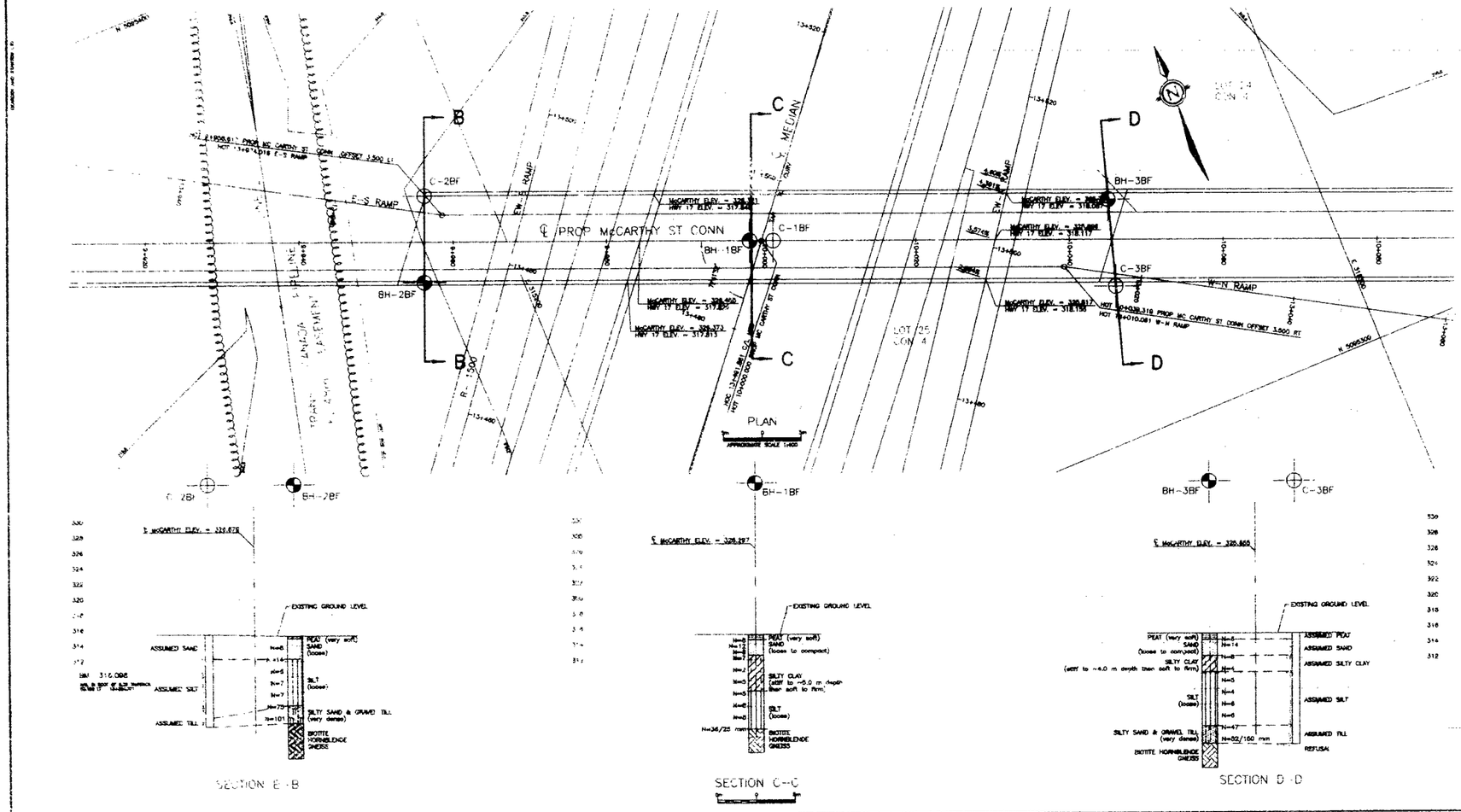
MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

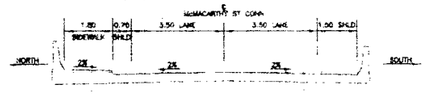
BRIDGE SITE PLAN & PROFILE

PROPOSED CROSSING
AT
PROP McCARTHY ST CONN
AND
PROPOSED C/L MEDIAN HWY 11

GEOG. TWP SOUTH HINMSWORTH LOT 25 — DIST OF PARRY SOUND CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	EXP. 509-11	
SURVEY DATE 97/10	PLAN DATE 97/10	
SITE 44-389	PLAN E-509-11-13	





BRIDGE CROSS SECTION
N.T.S.

NOTE

The information and soil types shown were established from Test Hole locations. Between Test Holes this are assumed and may be subject to considerable variation.

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No.
WP No.
SHEET

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Trow PROJ. No. S07524GB DWG. No. 1D

MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

GROSS SECTIONS B-B, C-C & D-D

PROPOSED CROSSING
AT
PROP. McCARTHY ST CONN
AND
PROPOSED C/L MEDIAN HWY 11

GEOG TWP SOUTH HAMSWORTH — DIST OF PARRY SOUND
LOT 25 — CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	CTR 509-...	
SURVEY DATE 97/10	PLAN DATE 97/10	
SITE 44 389	PLANE 509-11-13	

PLATE No
DRAWING No
CONT No
WP No 774-93-00

SHEET

Revised

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

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MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

SITE PLAN

PROPOSED NORTH INTERCHANGE
AT
McCARTHY STREET
AND
PROPOSED C/L MEDIAN HWY 11

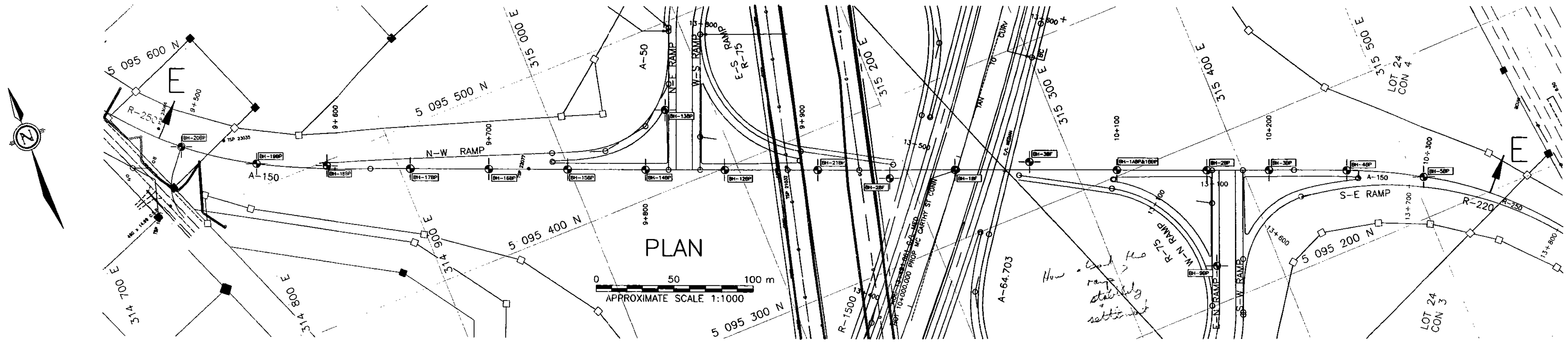
GEOG TWP OF HUMSWORTH SOUTH — DIST OF PARRY SOUND
LOTS 24, 25 & 26 — CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	ETR	
SURVEY DATE 97/10	PLAN DATE 98/10	
SITE	PLAN	

PLAN

0 100 200 300 m

(APPROXIMATE SCALE 1:1500)



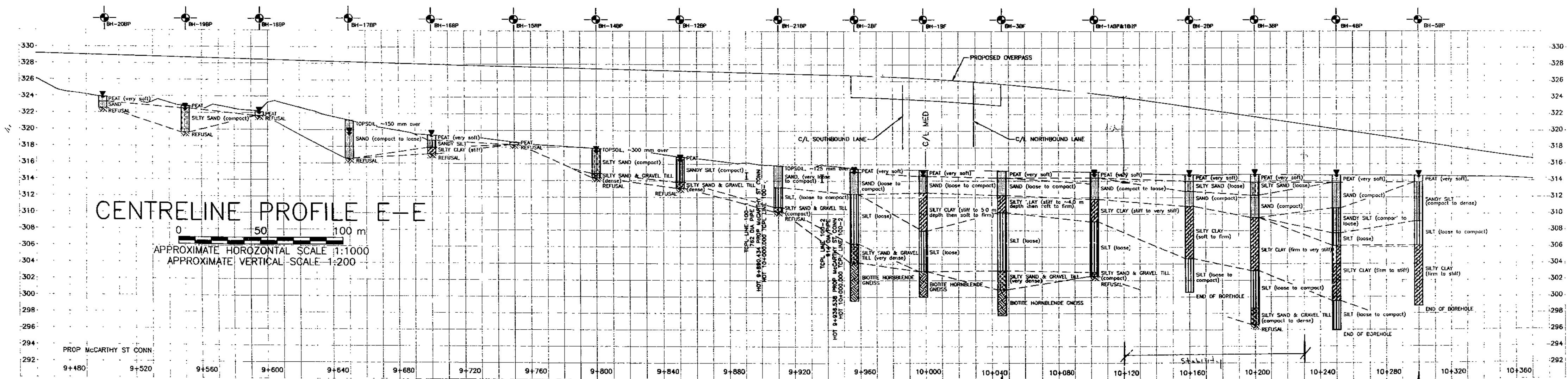


PLATE No
DRAWING No
CONT No
WP No 774-93-00

SHEET

Revised

– NOTE –

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METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

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SUDBURY, ONTARIO
Trow PROJ. No. S07524GB DWG. No. 1E

MINISTRY OF TRANSPORTATION
ENGINEERING OFFICE
SURVEYS AND PLANS SECTION

CENTRELINE PROFILE E–E

PROPOSED NORTH INTERCHANGE
AT
McCARTHY STREET
AND
PROPOSED C/L MEDIAN HWY 11

GEOG TWP OF HIMSWORTH SOUTH LOTS 24, 25 & 26 — DIST OF PARRY SOUND CON 4

SCALE	DISTRICT	REGION
AS SHOWN	PARRY SOUND	NORTHERN
	ETR	

SURVEY DATE	97/10	PLAN DATE	97/10
SITE	PLAN		