

Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT05

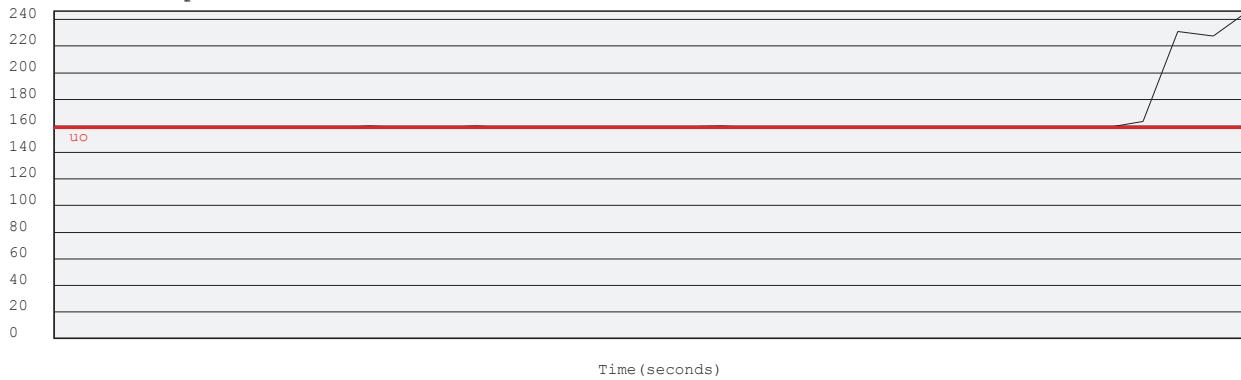
Date: 2012/06/26

Probe: GHANA  
Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 17.639m



(kPa) Dissipation at: 25.109m



(kPa) Dissipation at: 26.104m



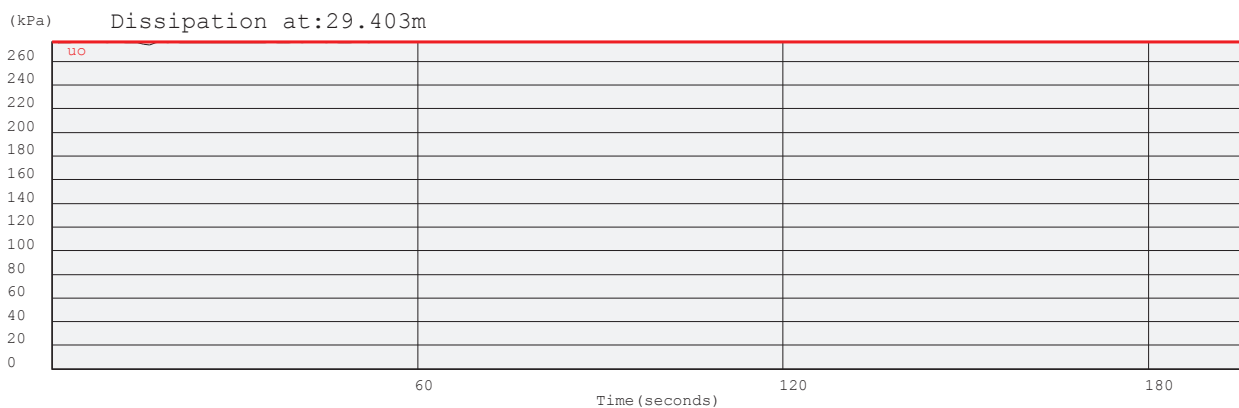
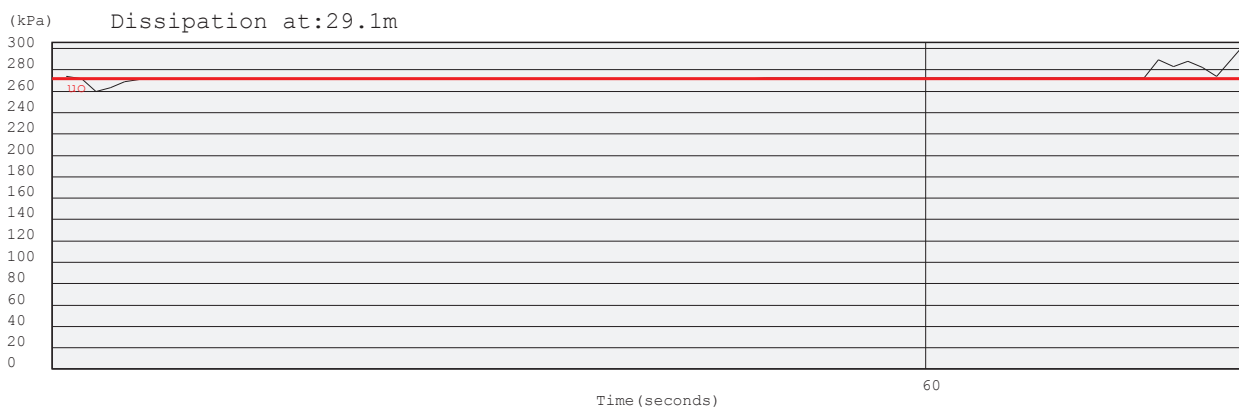
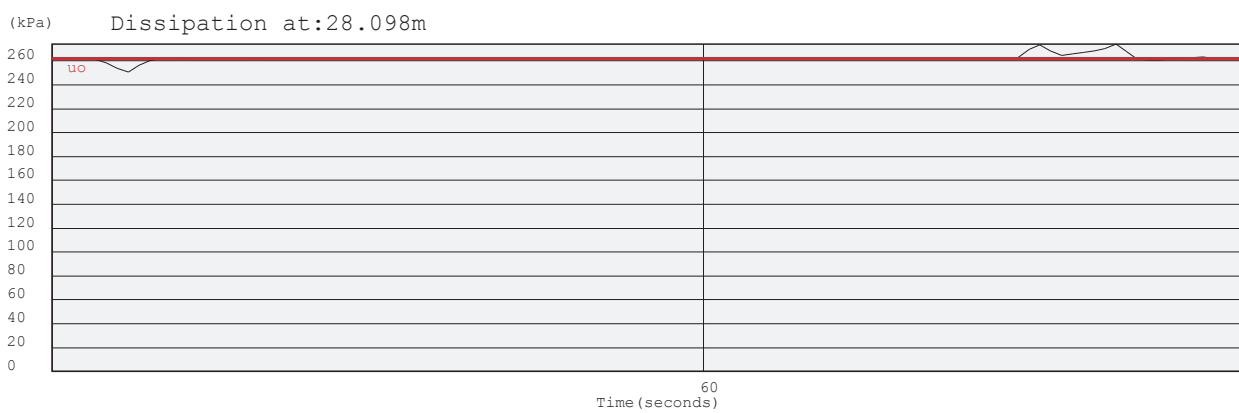
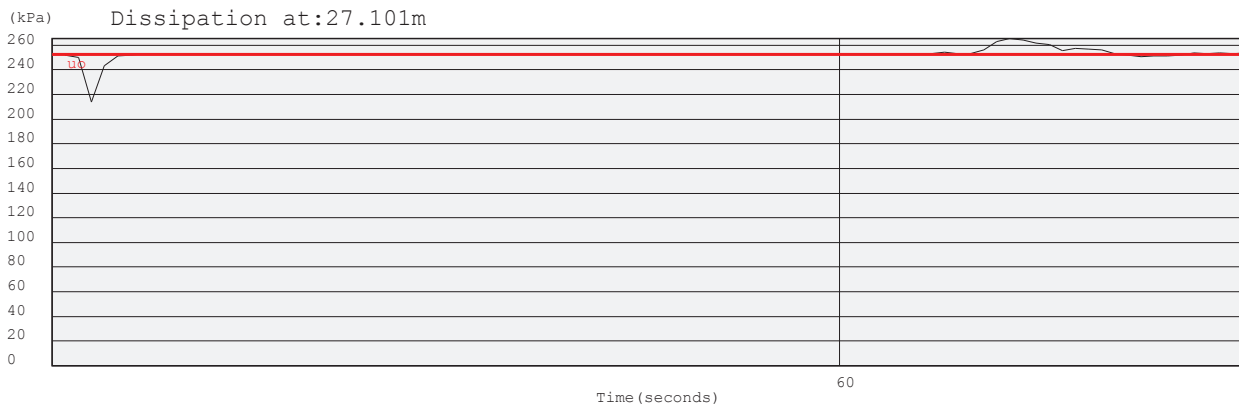
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT05

Date: 2012/06/26

Probe: GHANA  
Page: 2





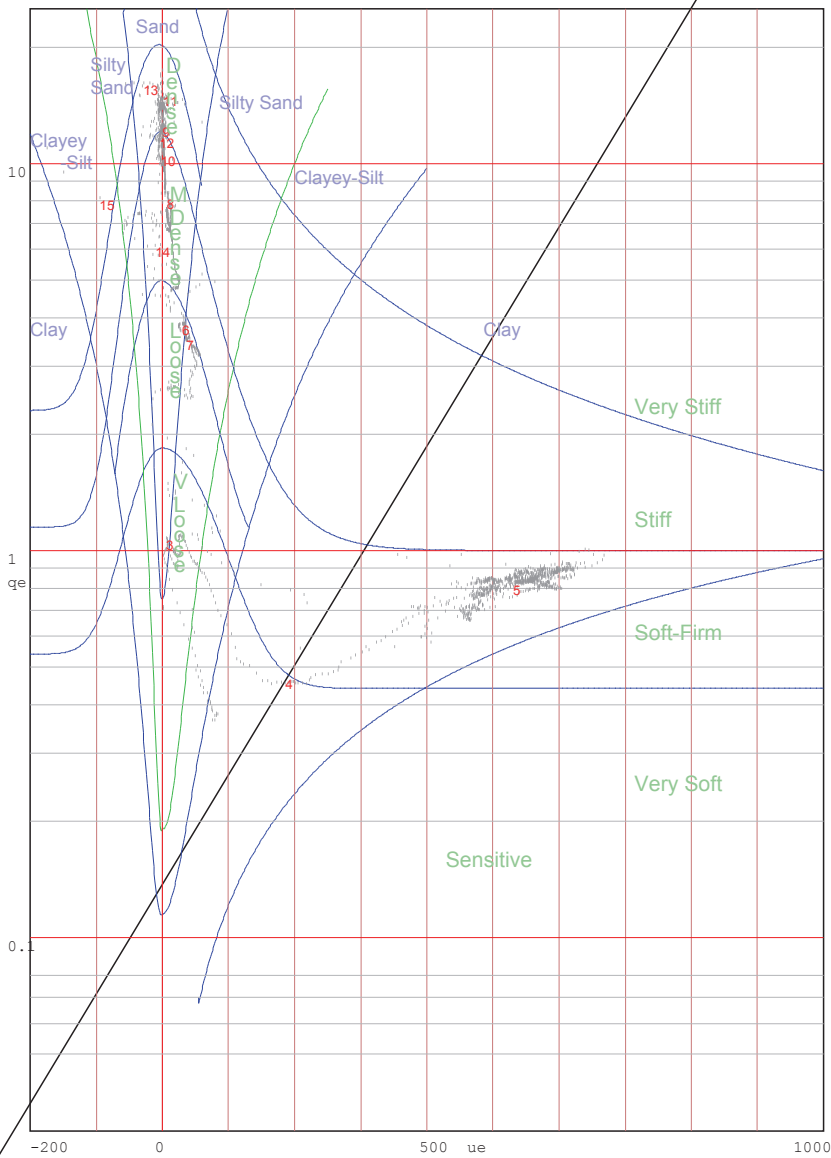
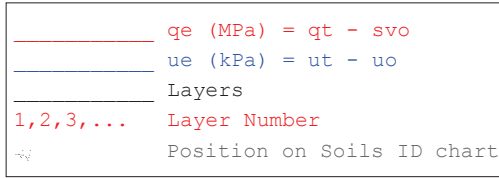
Project: Durban Harbour Over Water

Site: Pier2

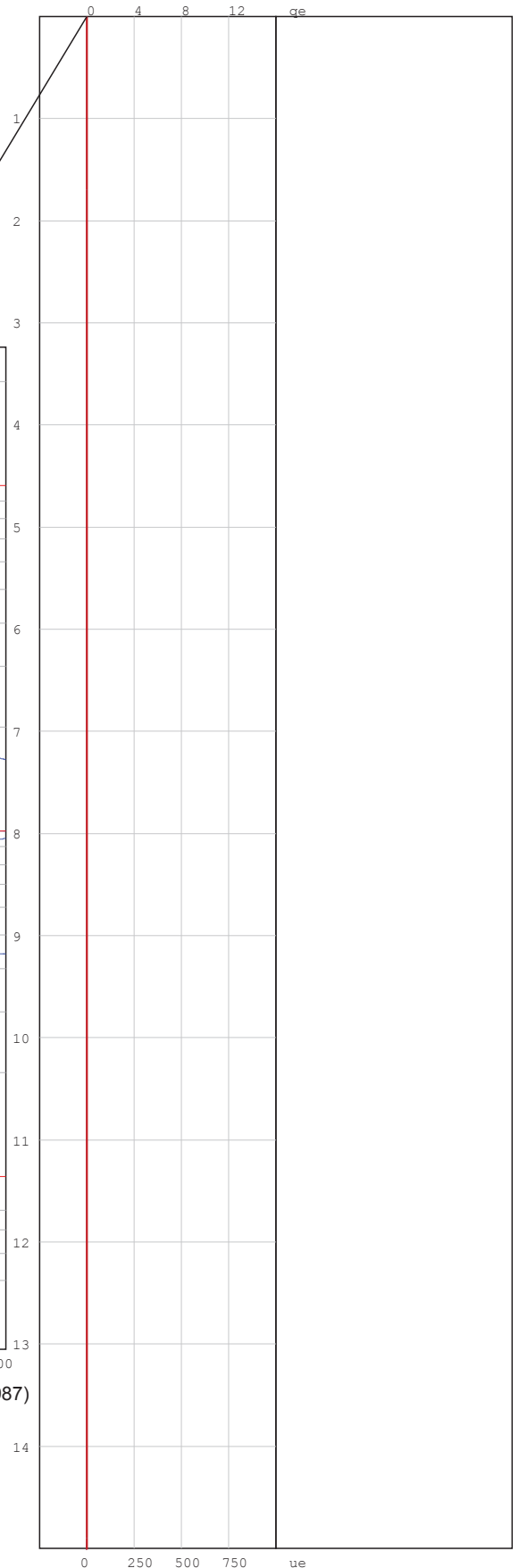
Hole No: CPT05

Date: 2012/06/26

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



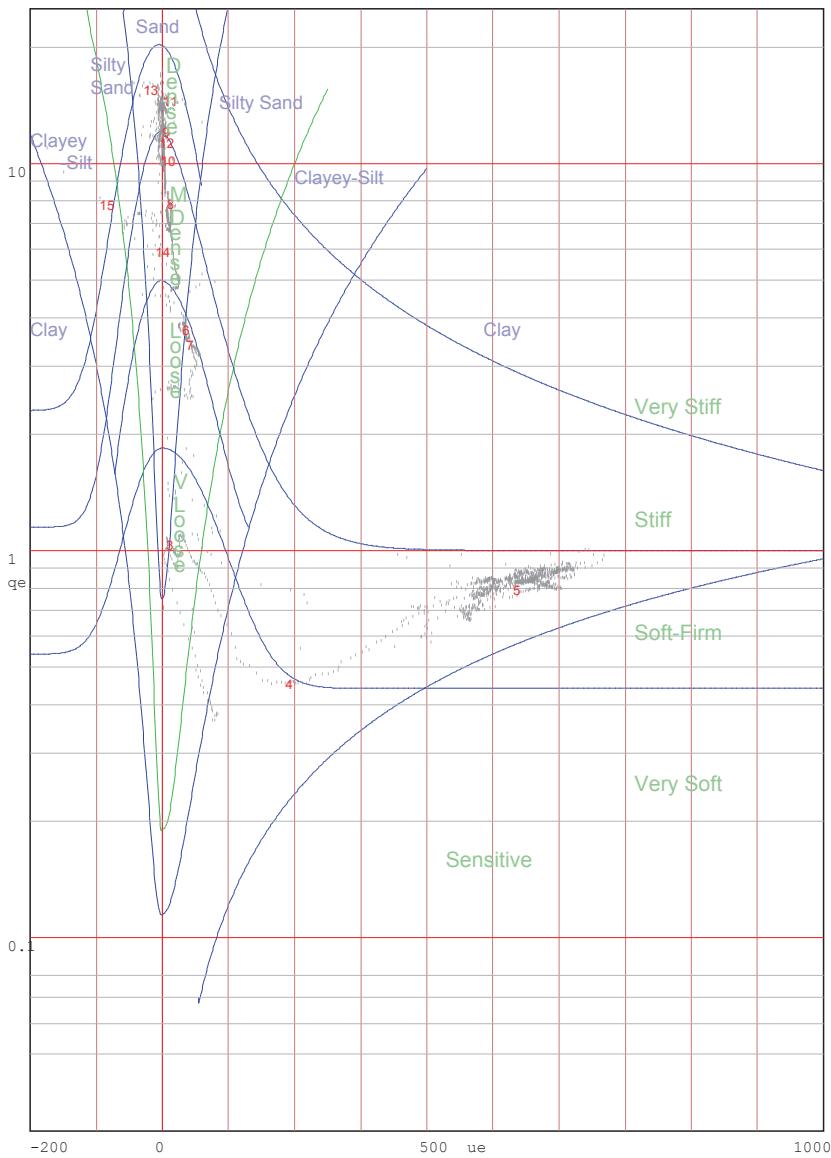
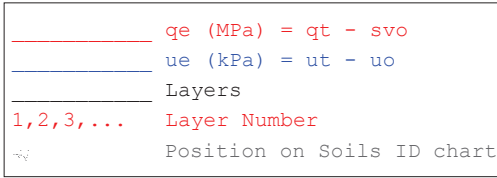
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Site: Pier2

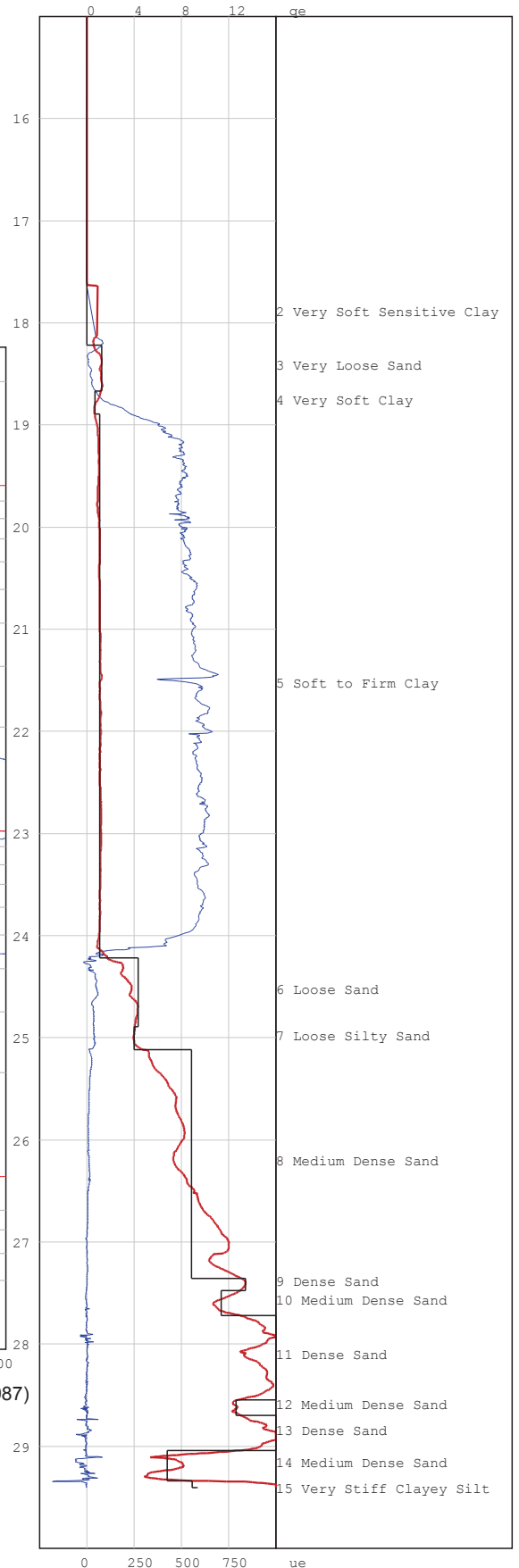
Hole No: CPT05

Date: 2012/06/26

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

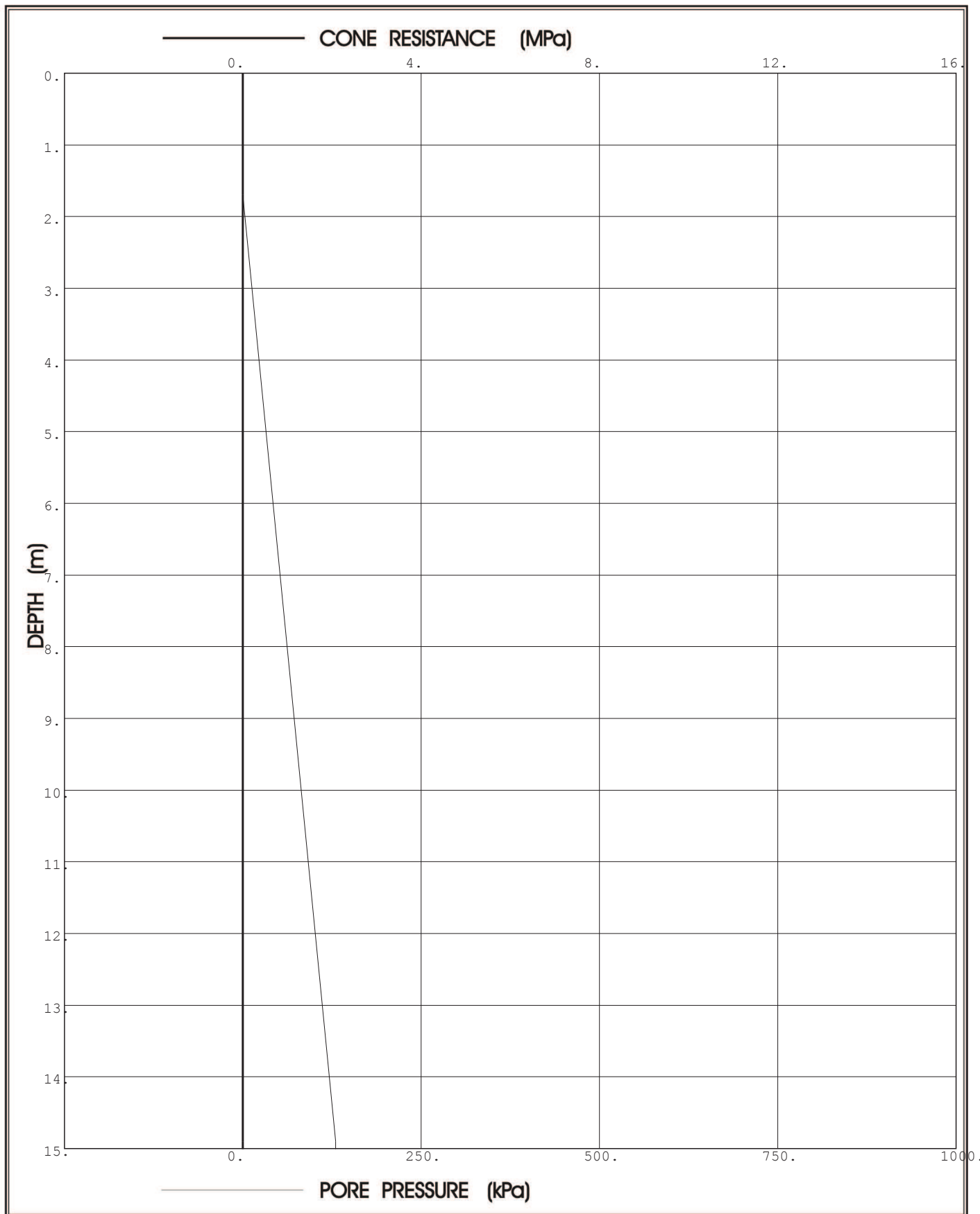
SITE: Pier2

CPTU (RE): CPT06

DATE: 2012/06/22

Probe: GHANA

Page:1



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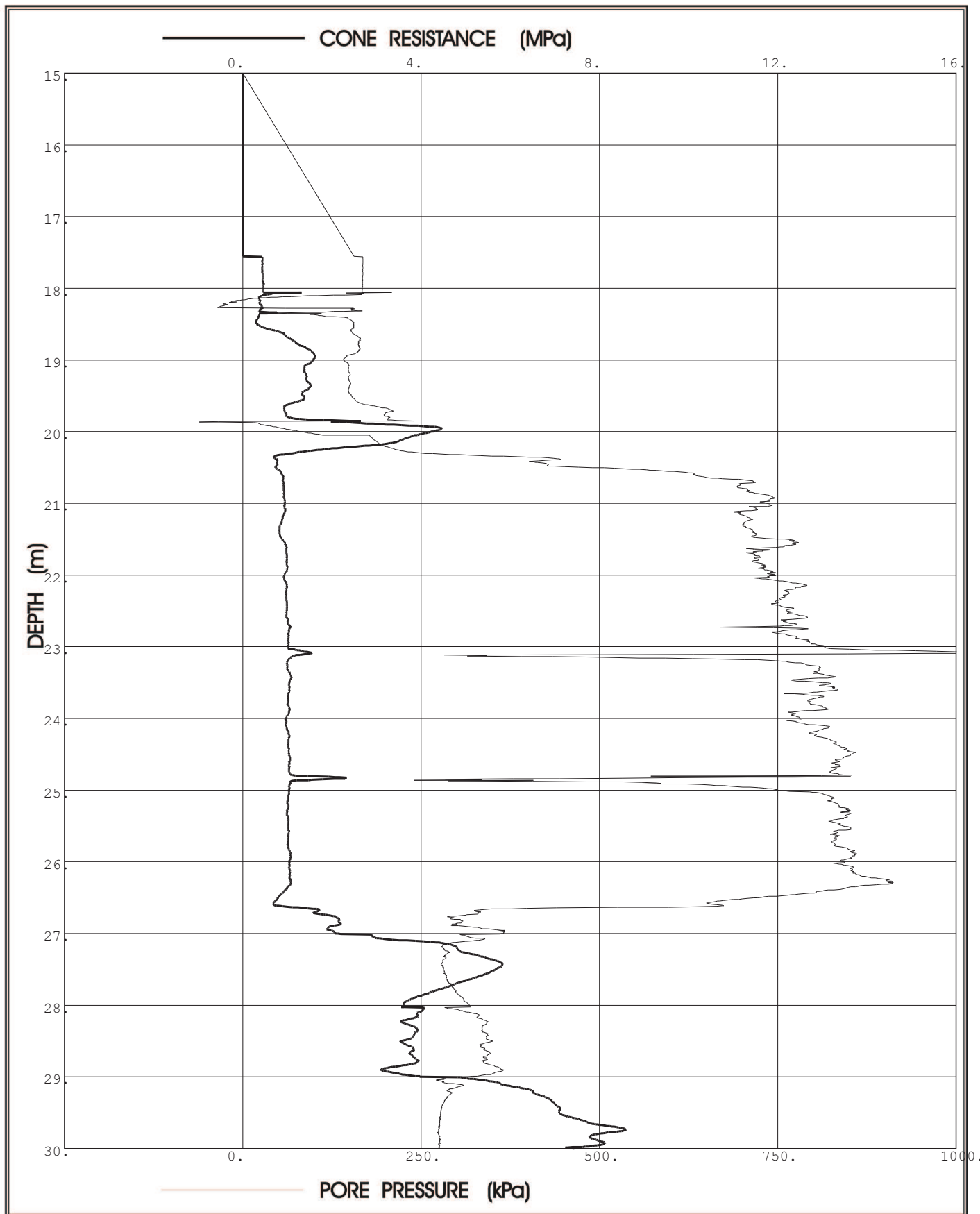
SITE: Pier2

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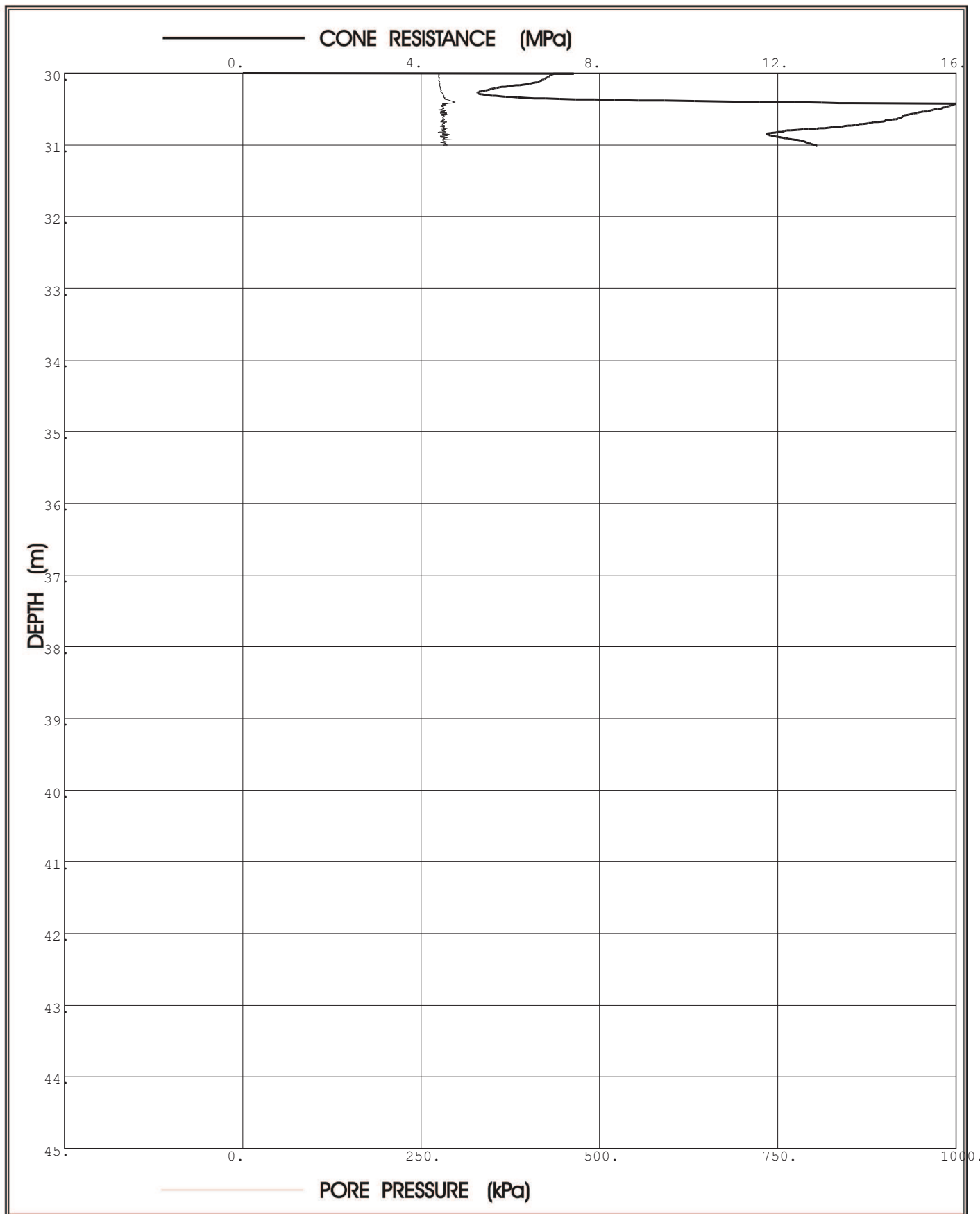
SITE: Pier2

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DATE: 2012/06/22

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Page: 3



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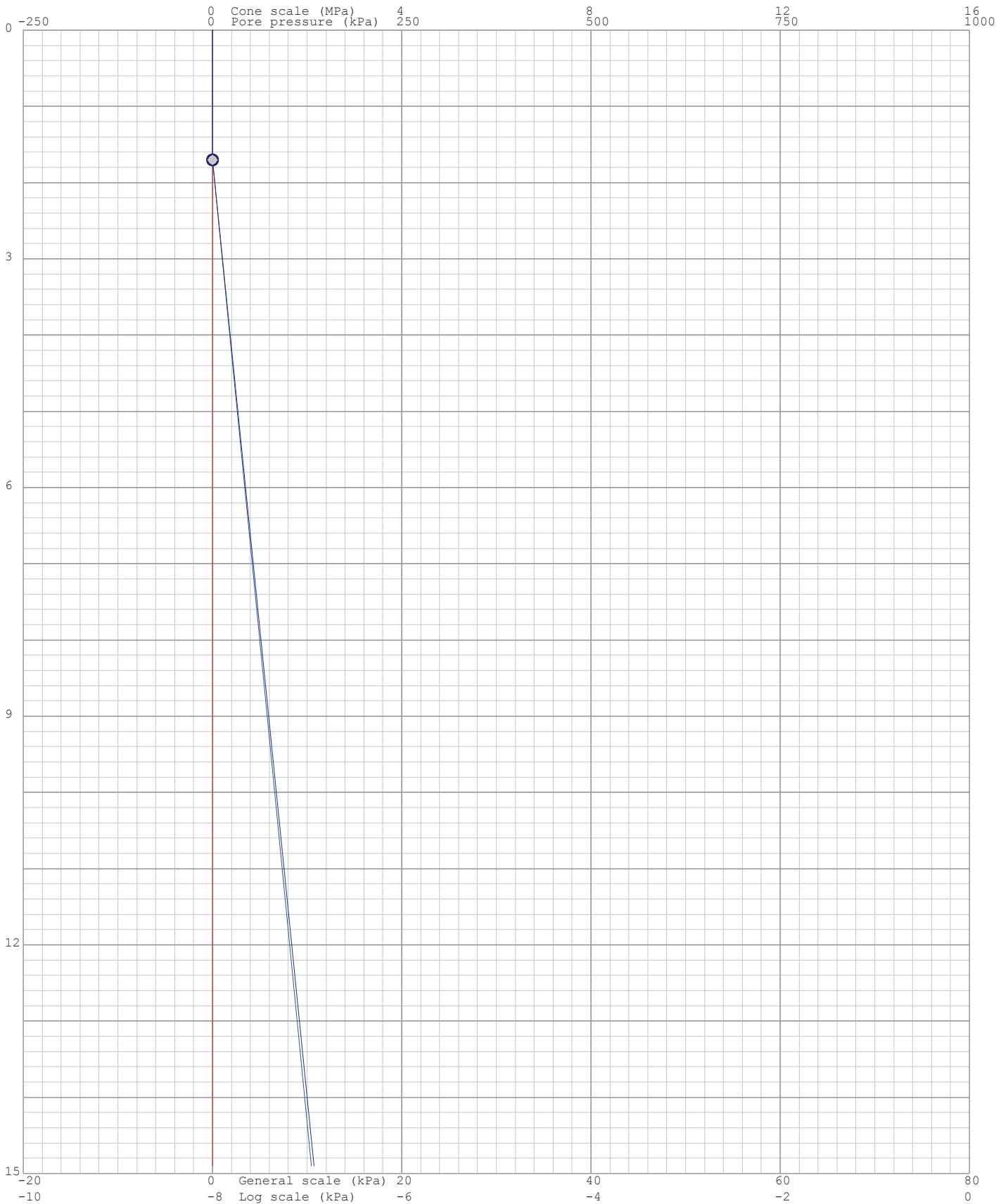
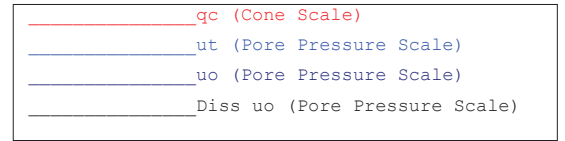
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT06

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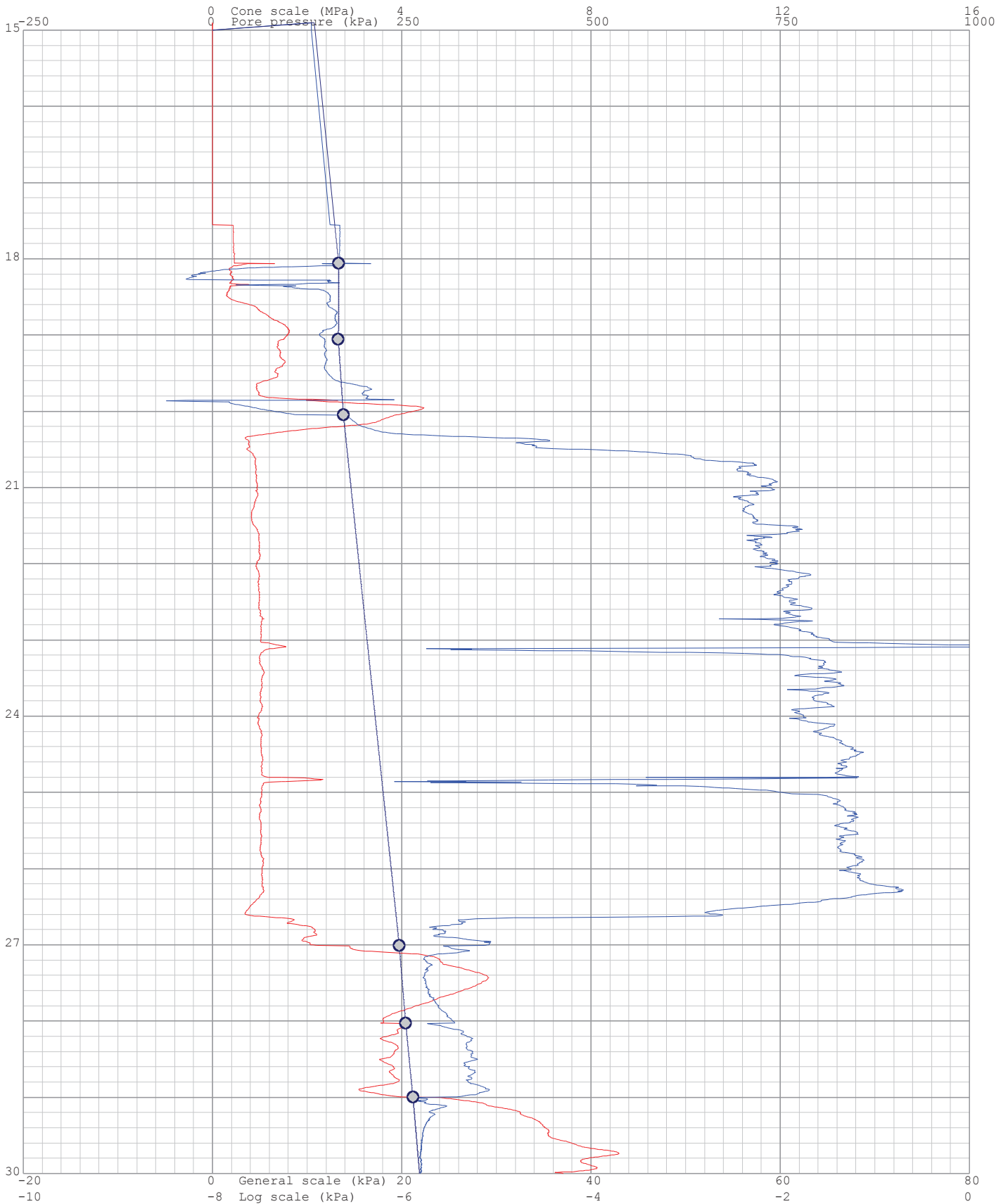
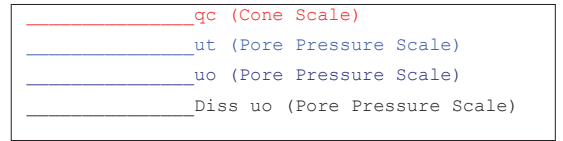
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT06

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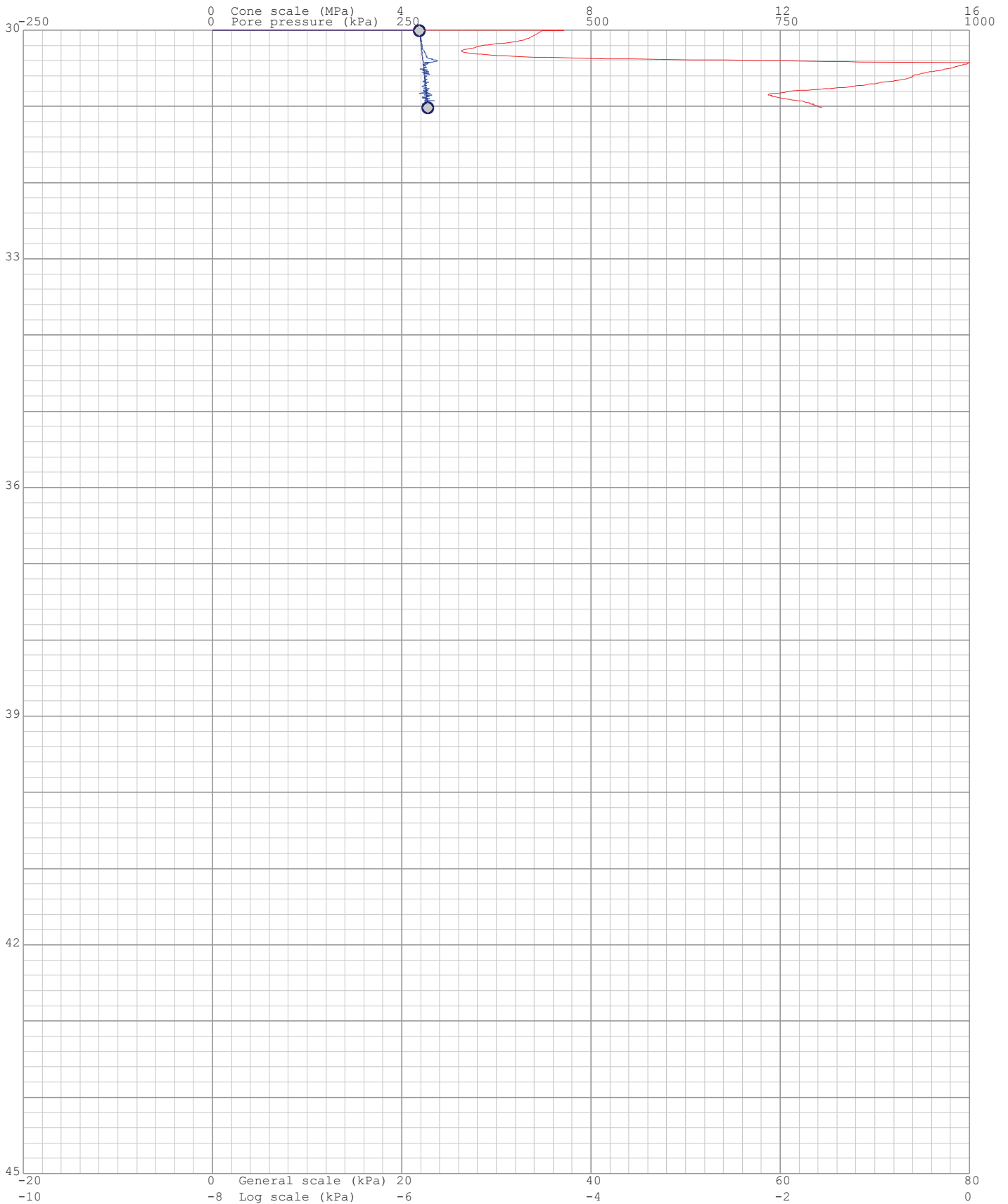
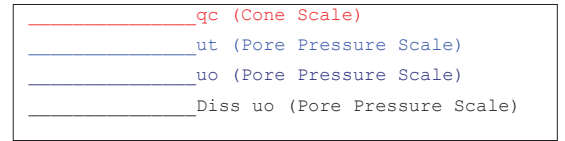
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT06

Date: 2012/06/22

Probe: GHANA





Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT06

Date: 2012/06/22

Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 18.057m



(kPa) Dissipation at: 19.053m



(kPa) Dissipation at: 20.047m



Project: Durban Harbour Over Water

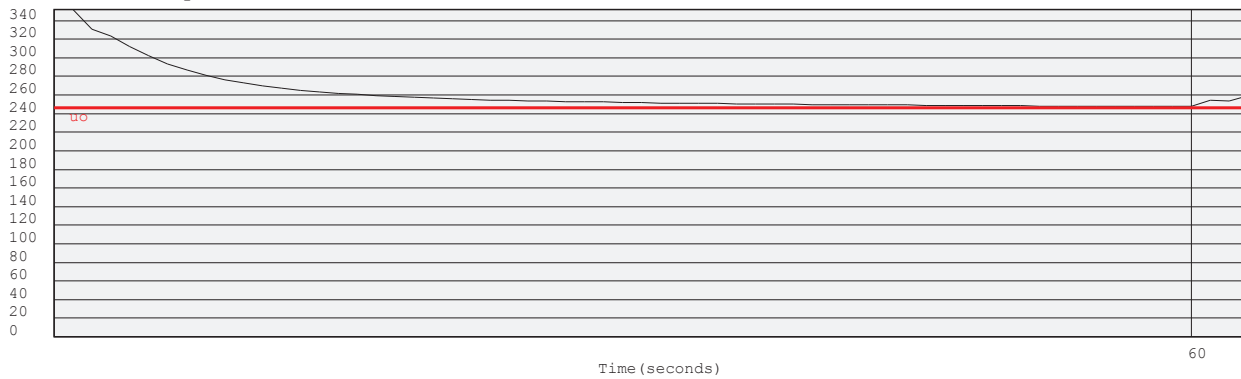
Site: Pier2

Hole: CPT06

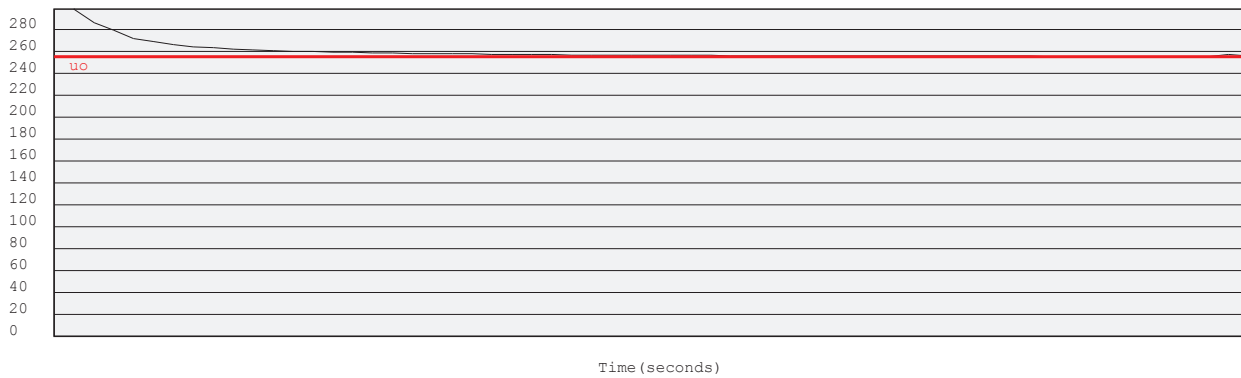
Date: 2012/06/22

Probe: GHANA  
Page: 2

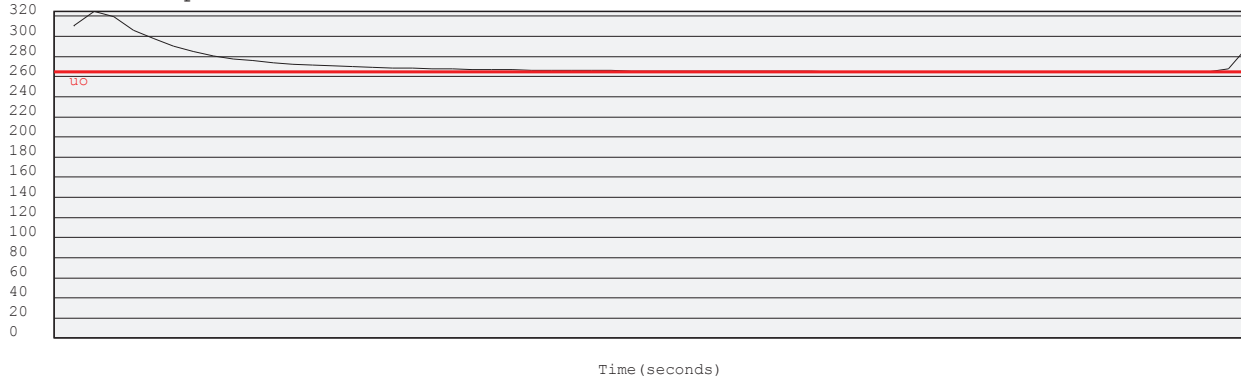
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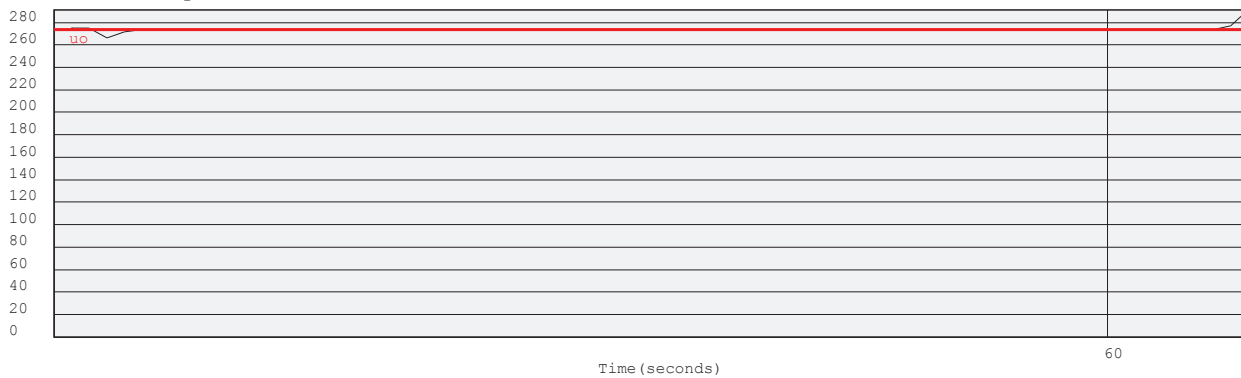
(kPa) Dissipation at: 28.028m



(kPa) Dissipation at: 28.997m



(kPa) Dissipation at: 30.006m



Project: Durban Harbour Over Water

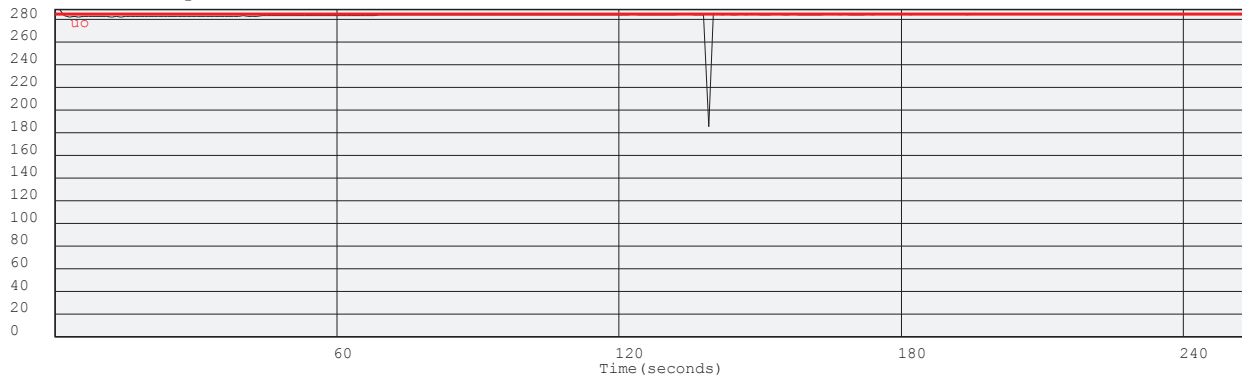
Site: Pier2

Hole: CPT06

Date: 2012/06/22

Probe: GHANA  
Page: 3

(kPa) Dissipation at: 31.019m





Project: Durban Harbour Over Water

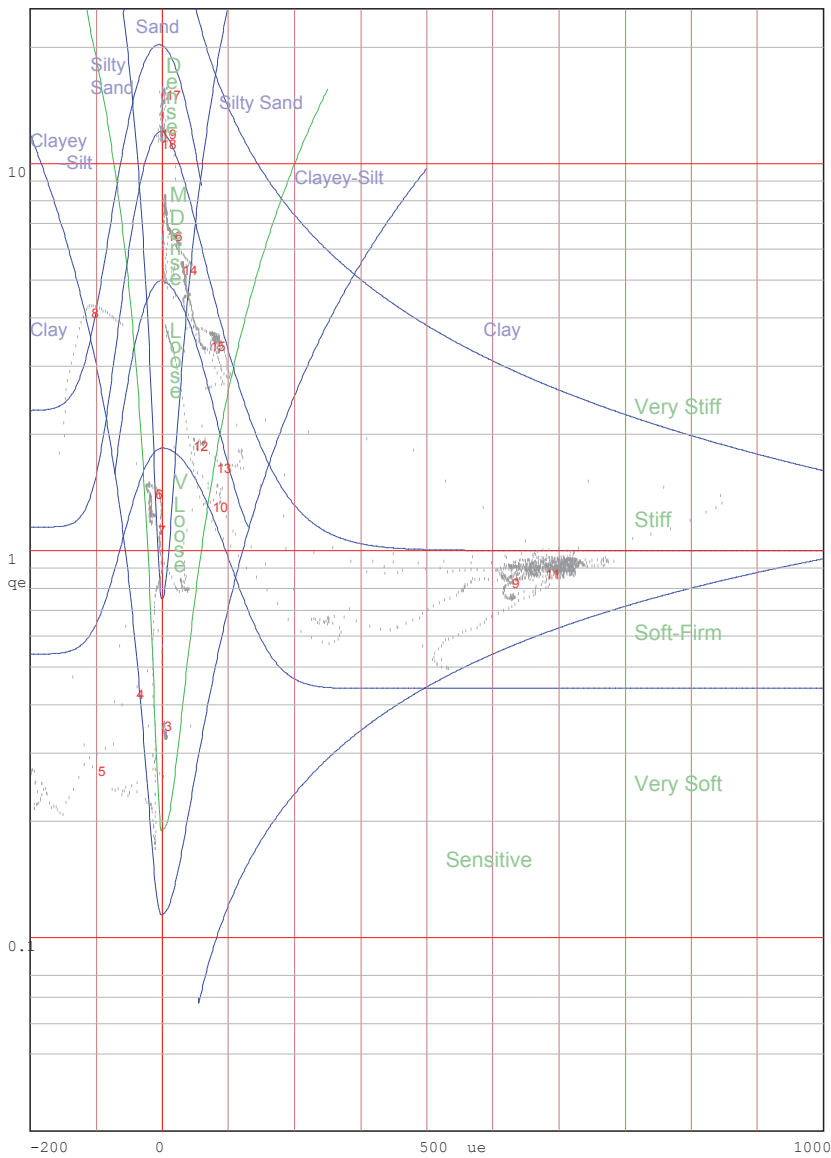
Site: Pier2

Hole No: CPT06

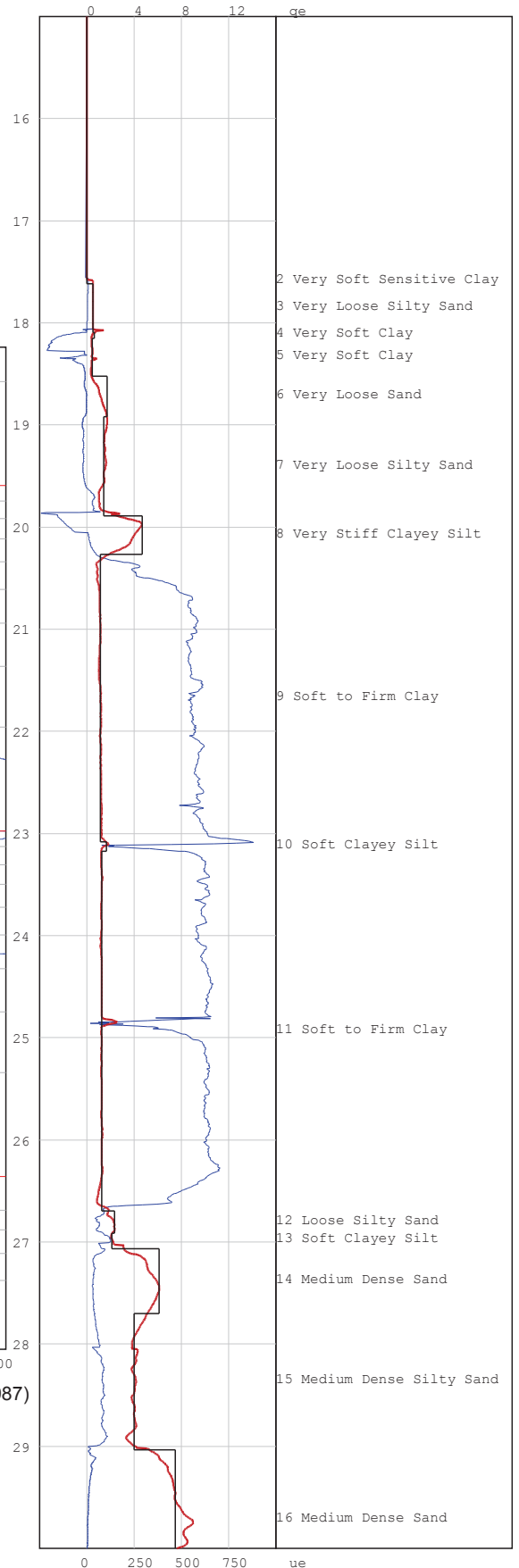
Date: 2012/06/22

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



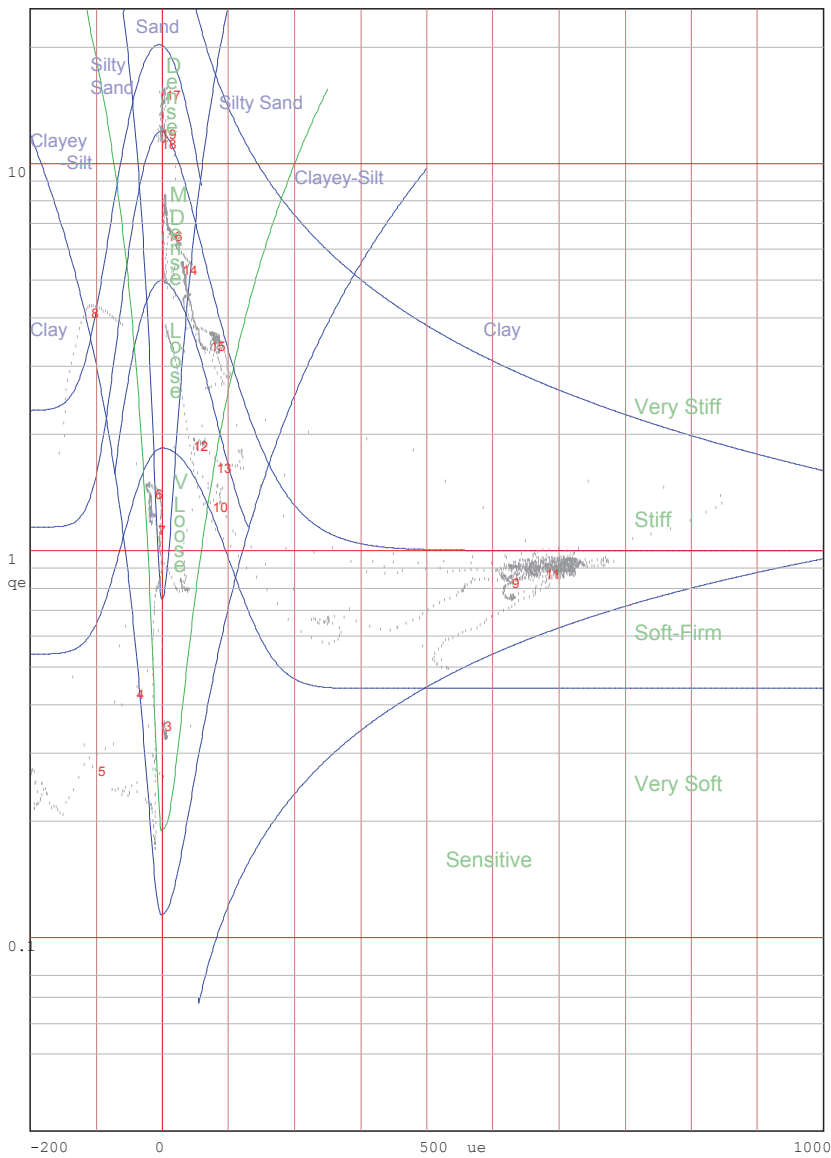
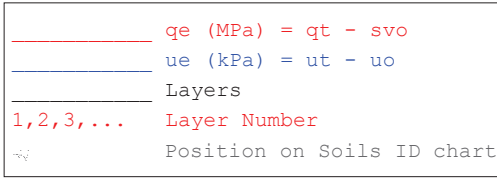
Project: Durban Harbour Over Water

Site: Pier2

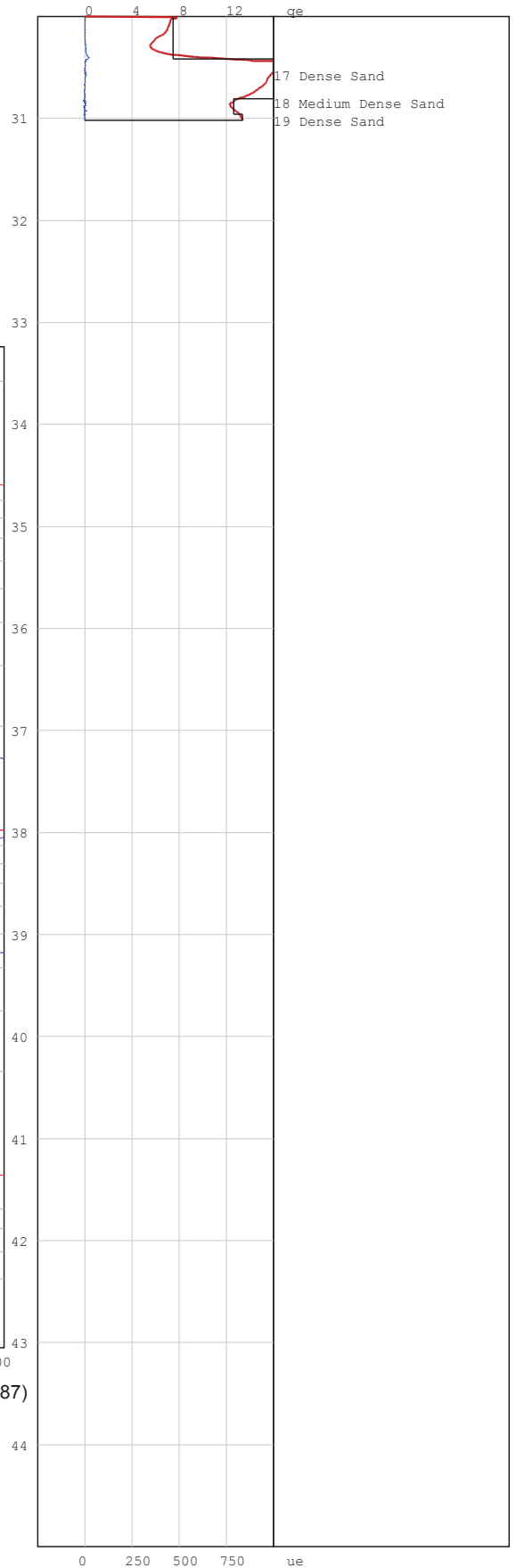
Hole No: CPT06

Date: 2012/06/22

Probe: GHANA



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

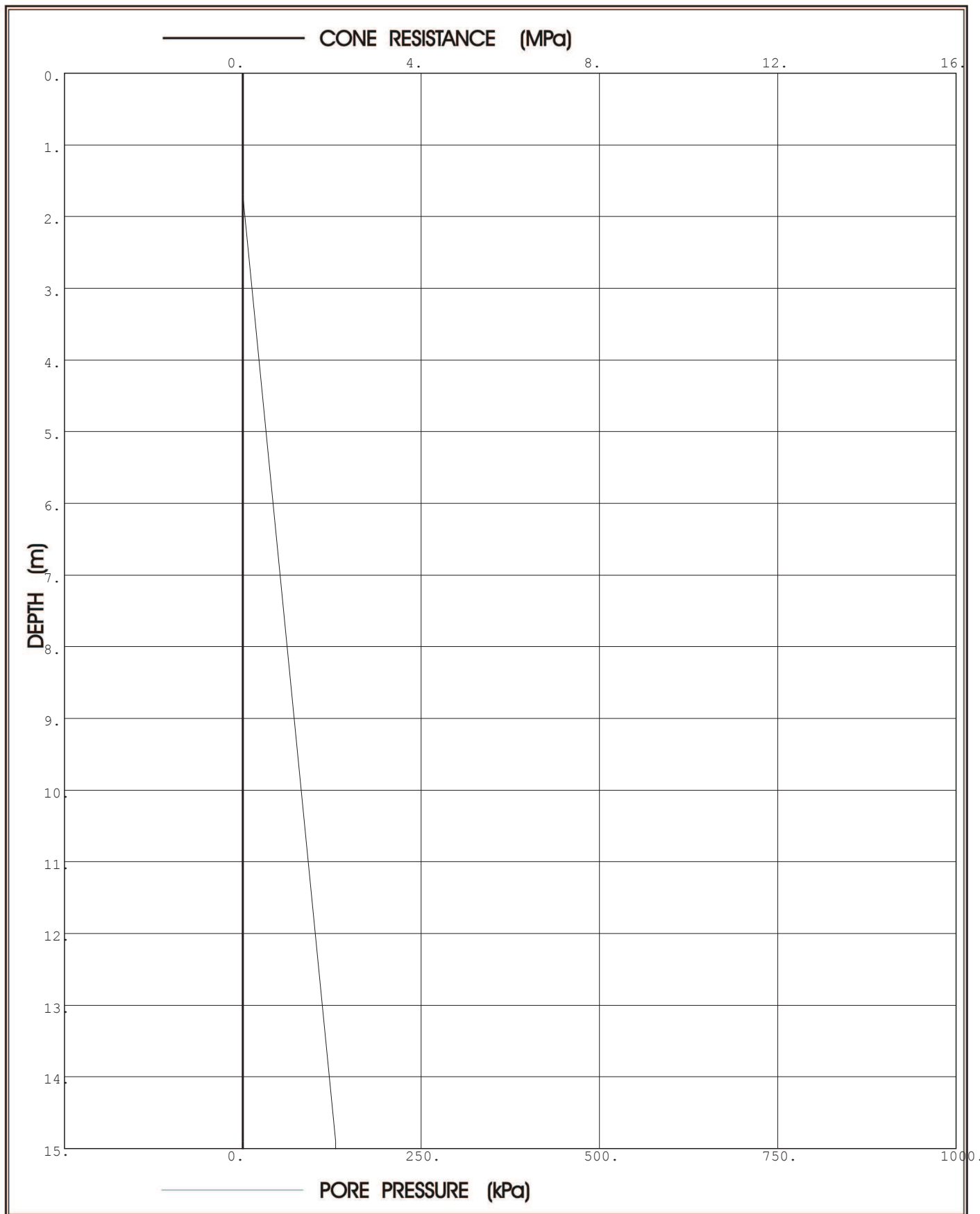
SITE: Pier2

CPTU (RE): CPT07

DATE: 2012/06/24

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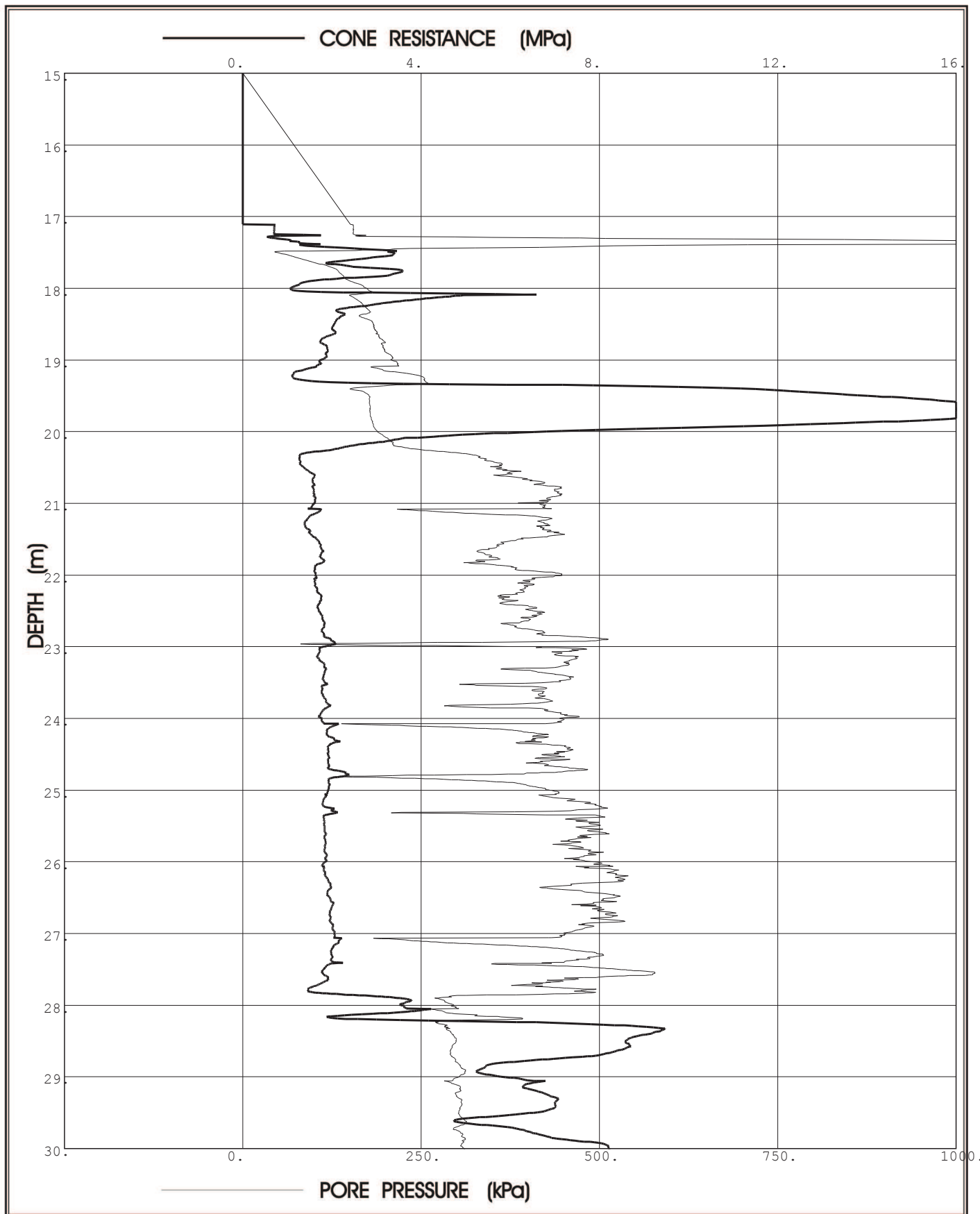
SITE: Pier2

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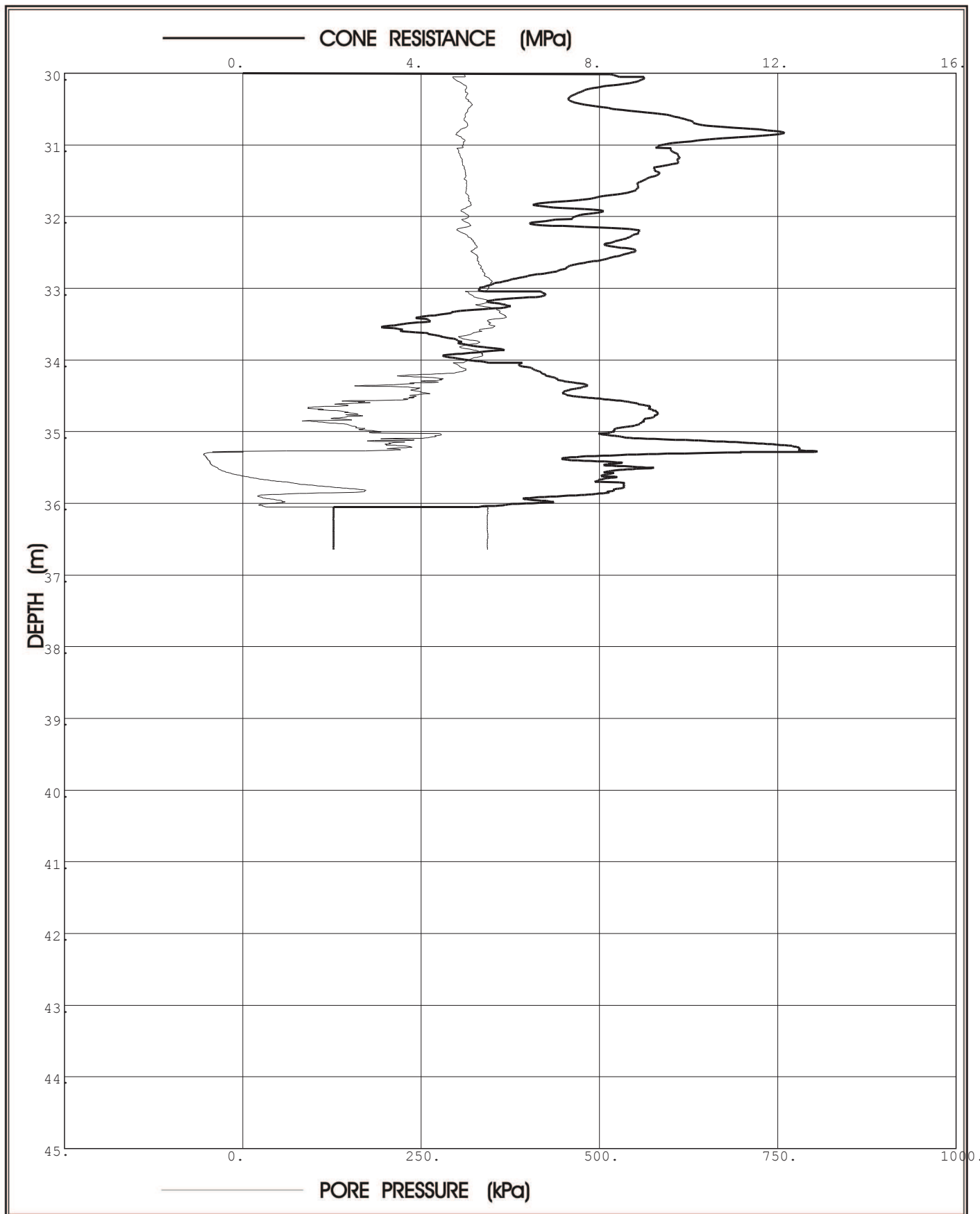
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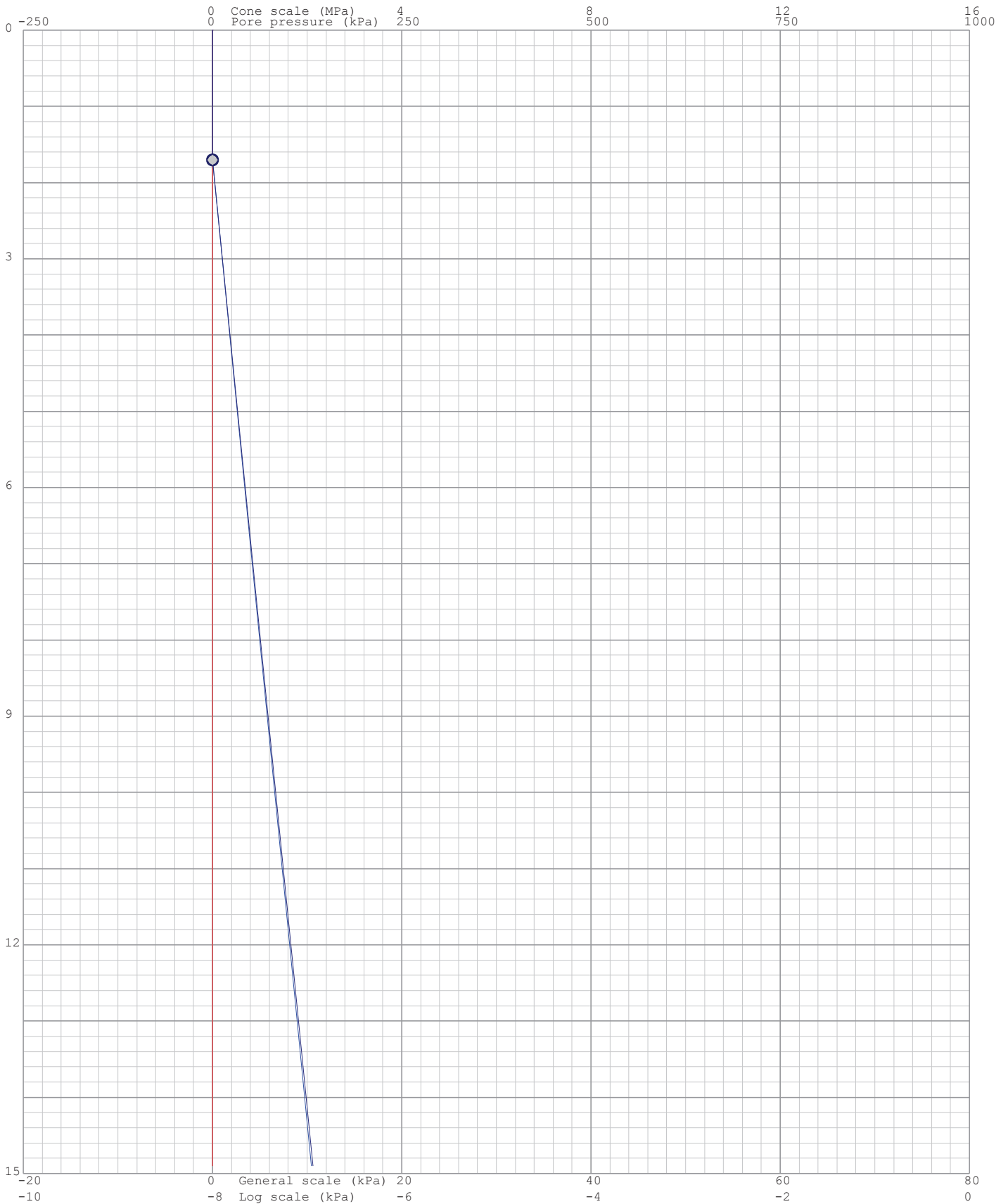
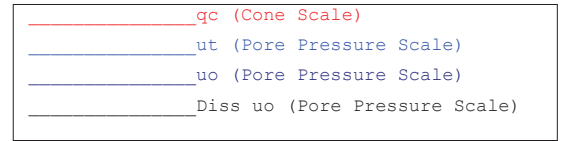
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT07

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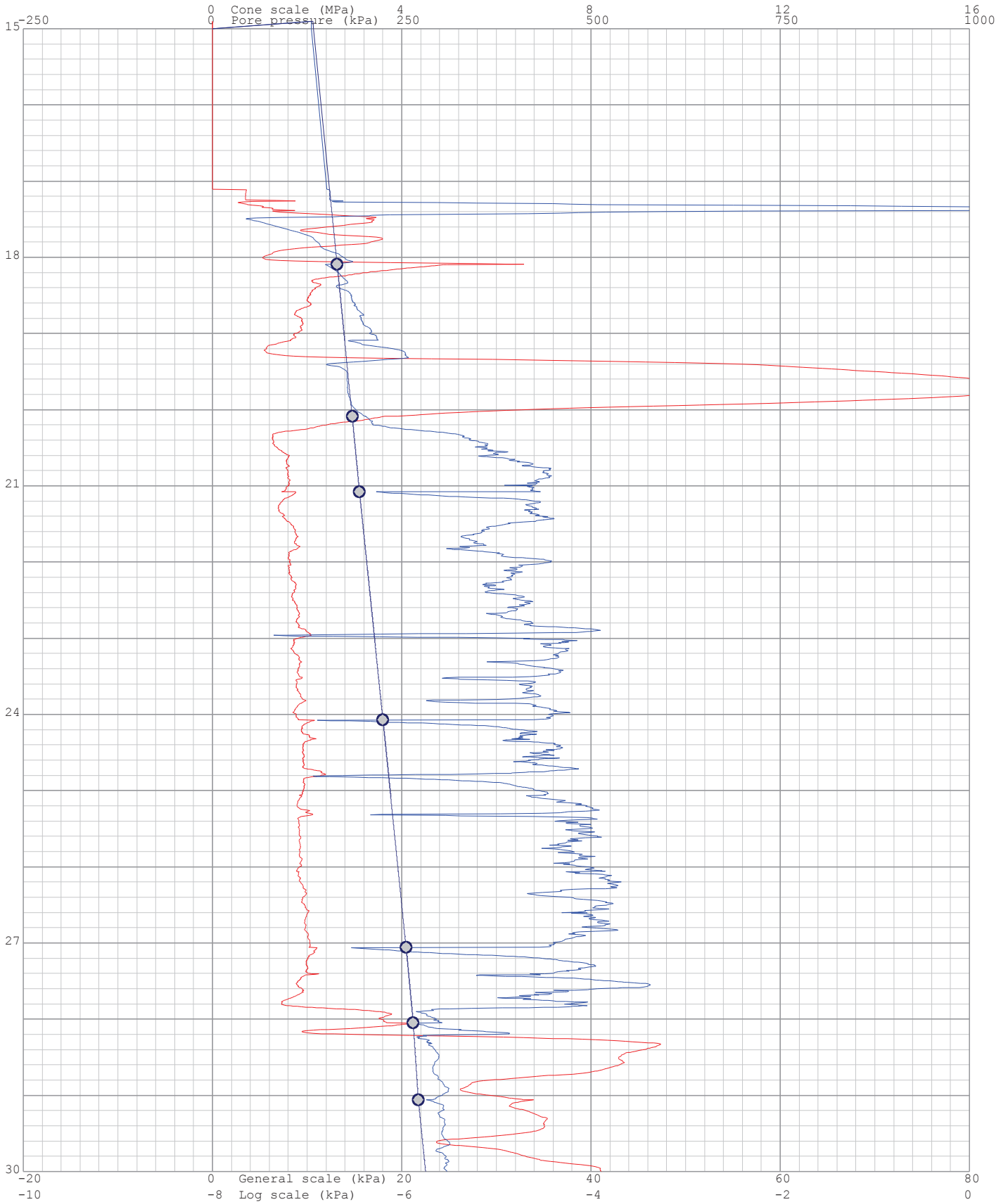
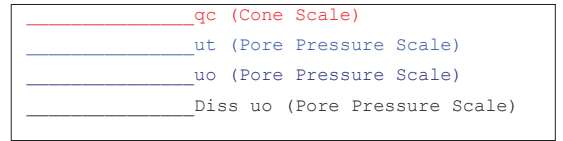


Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT07  
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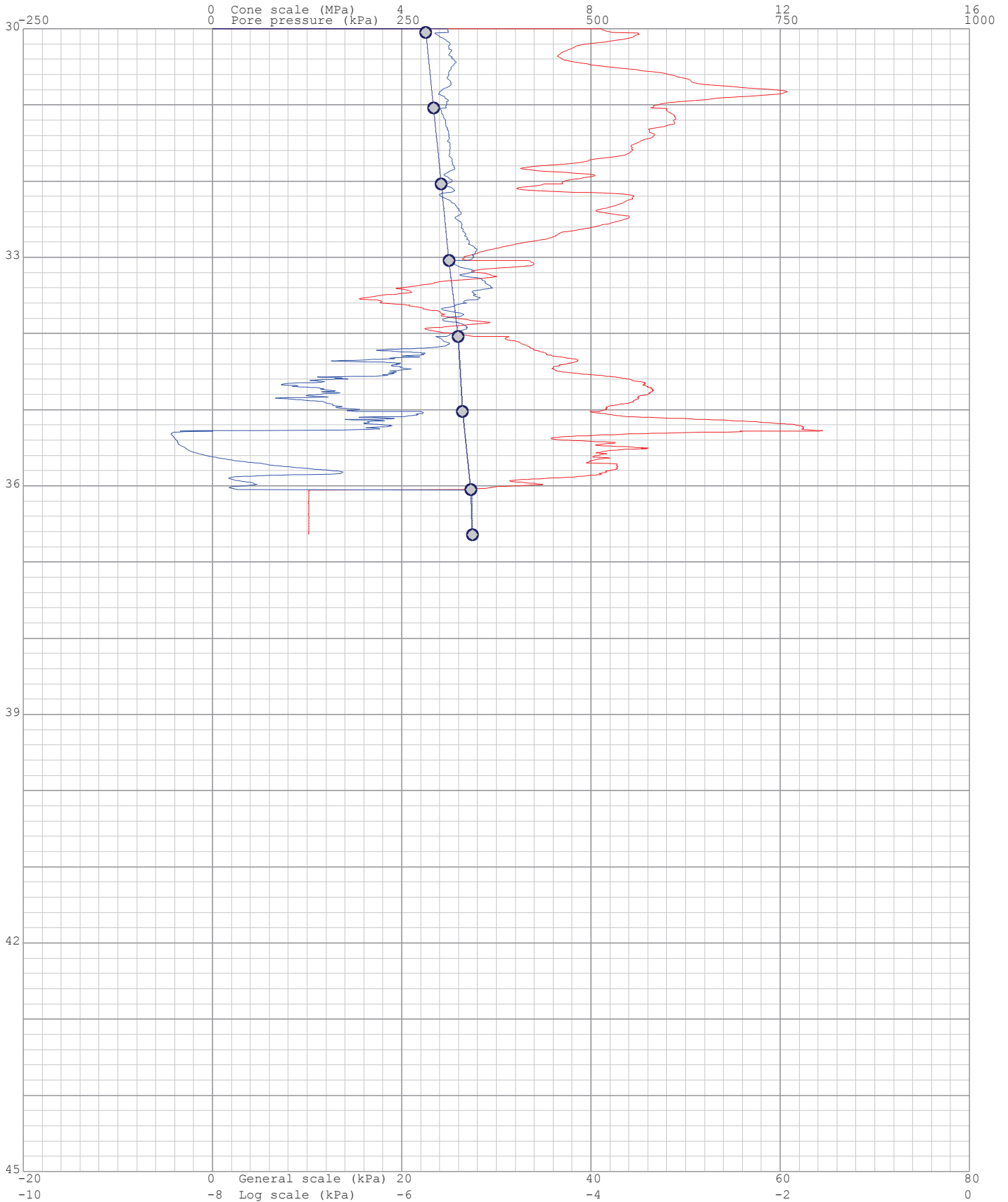
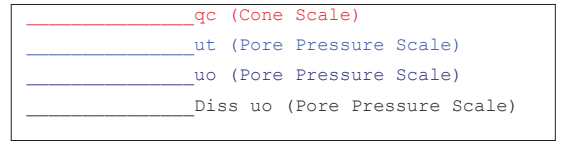
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT07

Date: 2012/06/24

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT07

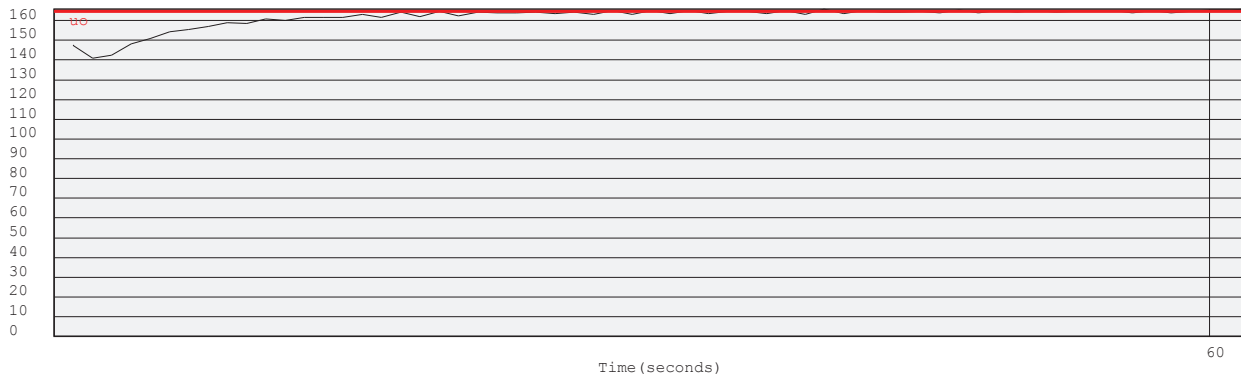
Date: 2012/06/24

Probe: GHANA  
Page: 1

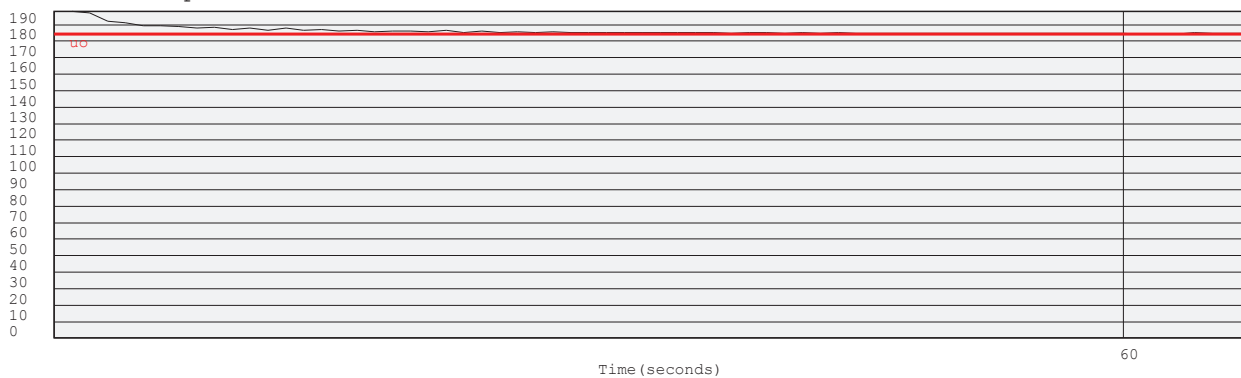
(kPa) Dissipation at: 1.7m



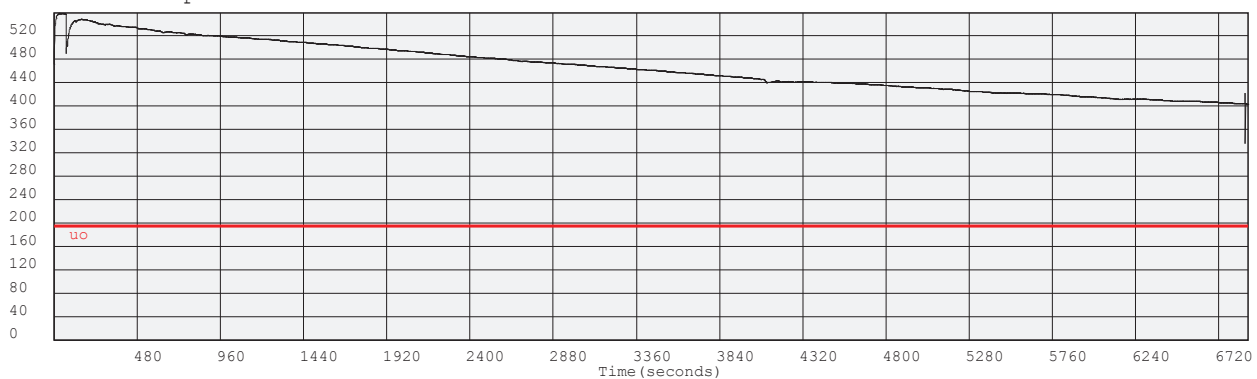
(kPa) Dissipation at: 18.09m



(kPa) Dissipation at: 20.083m



(kPa) Dissipation at: 21.075m



Project: Durban Harbour Over Water

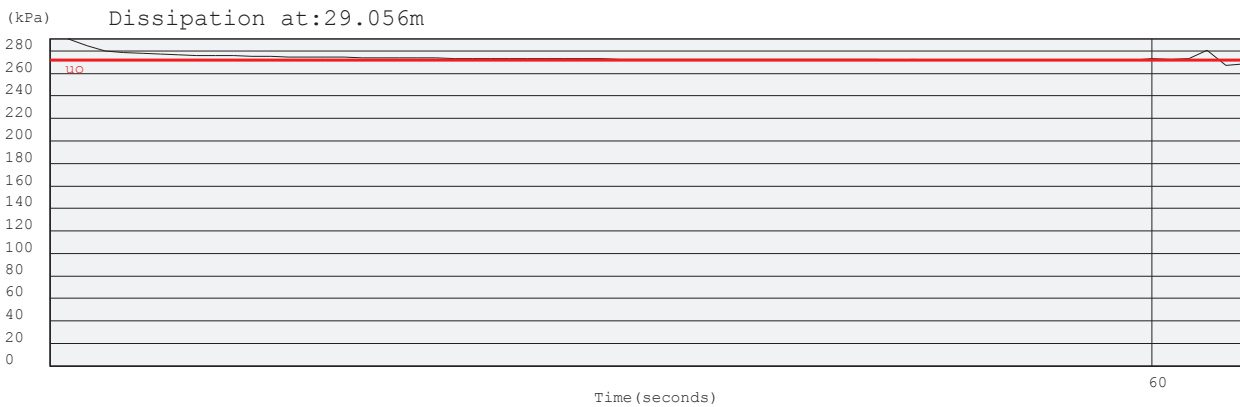
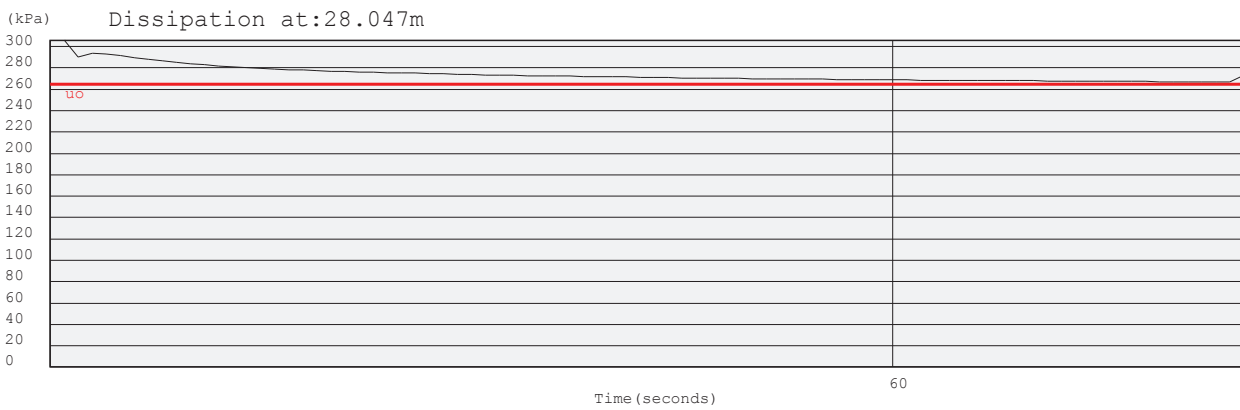
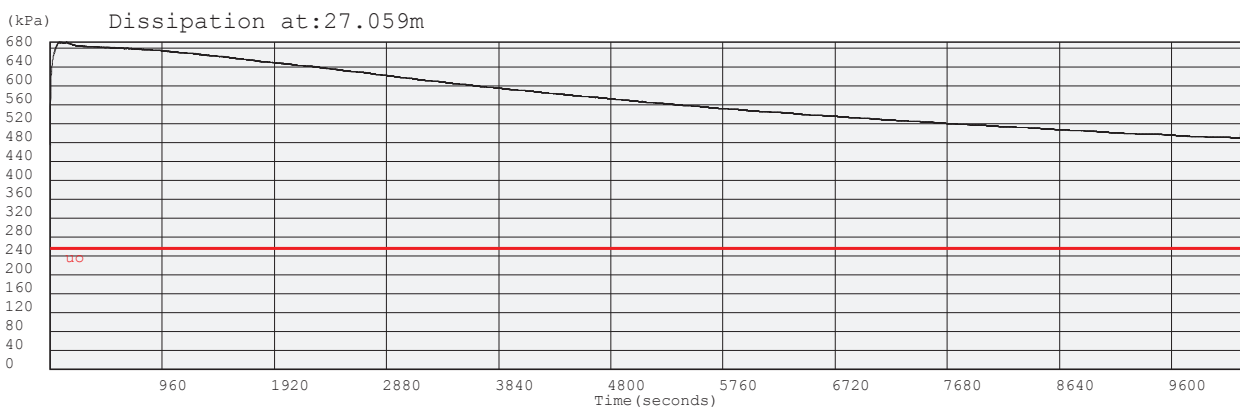
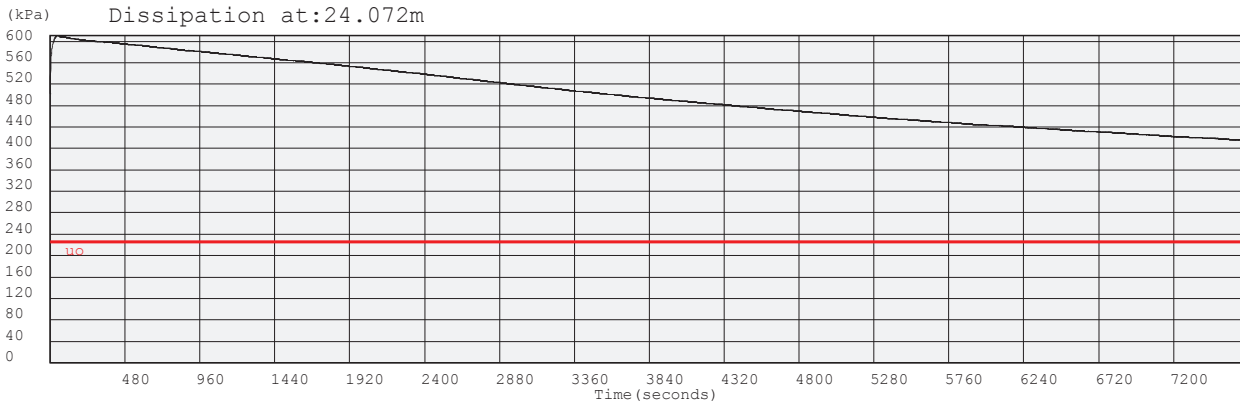
Site: Pier2

Hole: CPT07

Date: 2012/06/24

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Page: 2



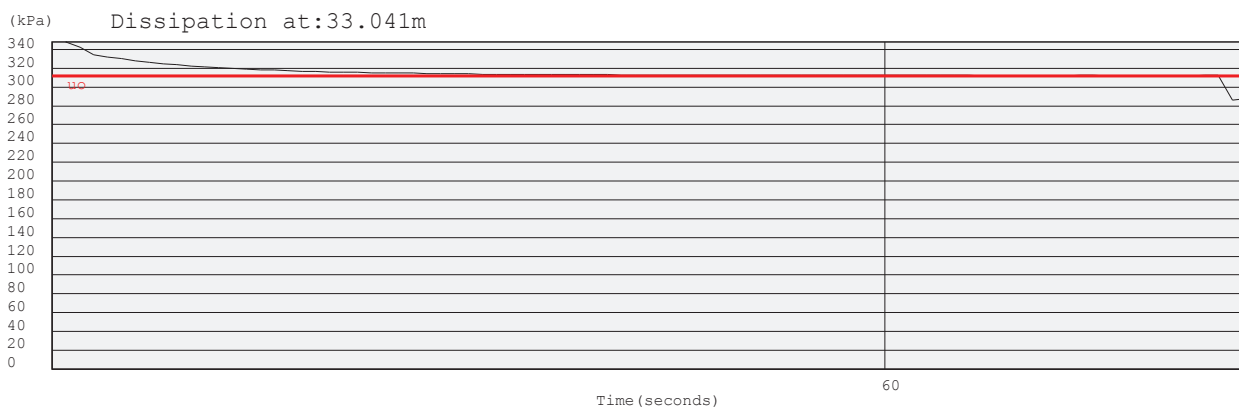
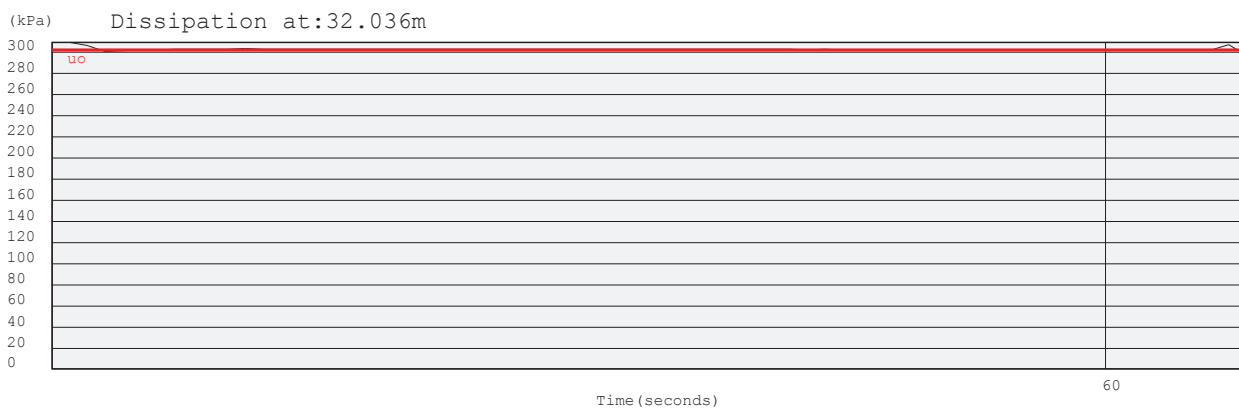
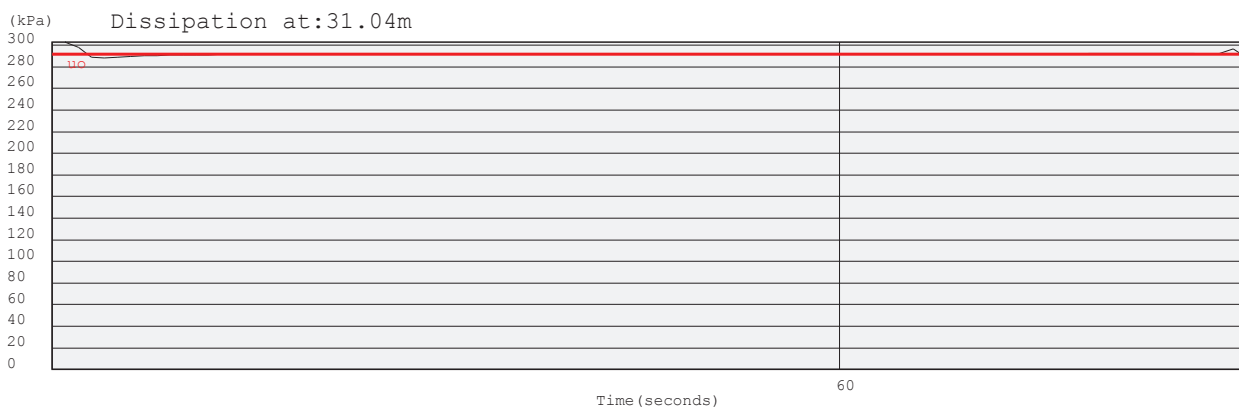
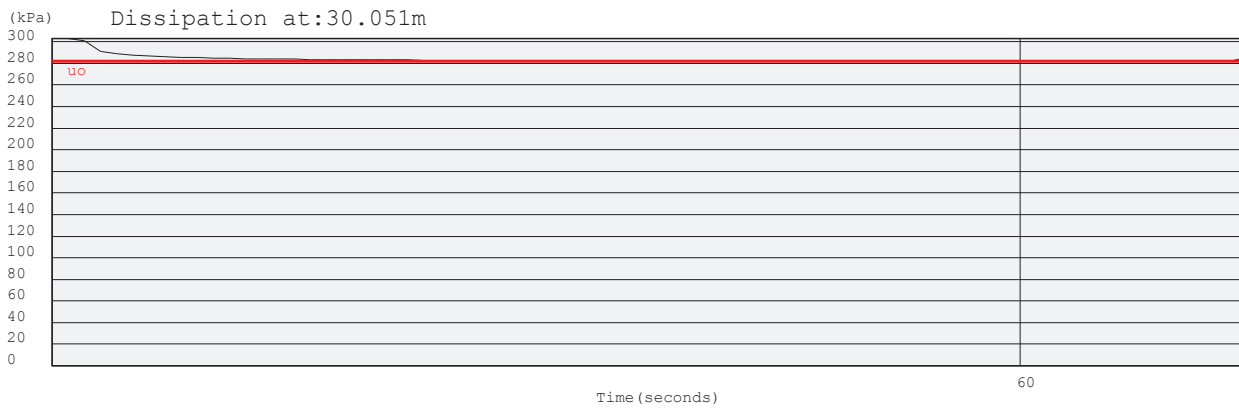
Project: Durban Harbour Over Water

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Page: 3



Project: Durban Harbour Over Water

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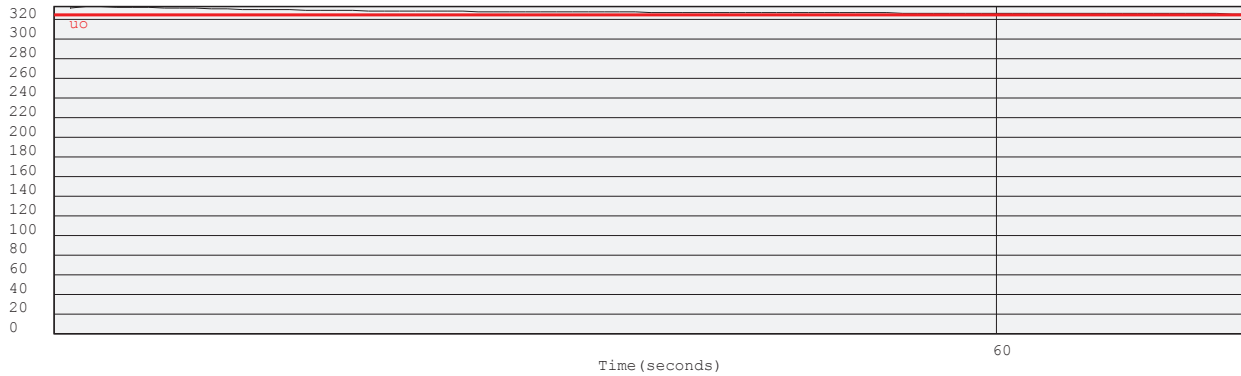
Hole: CPT07

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Page: 4

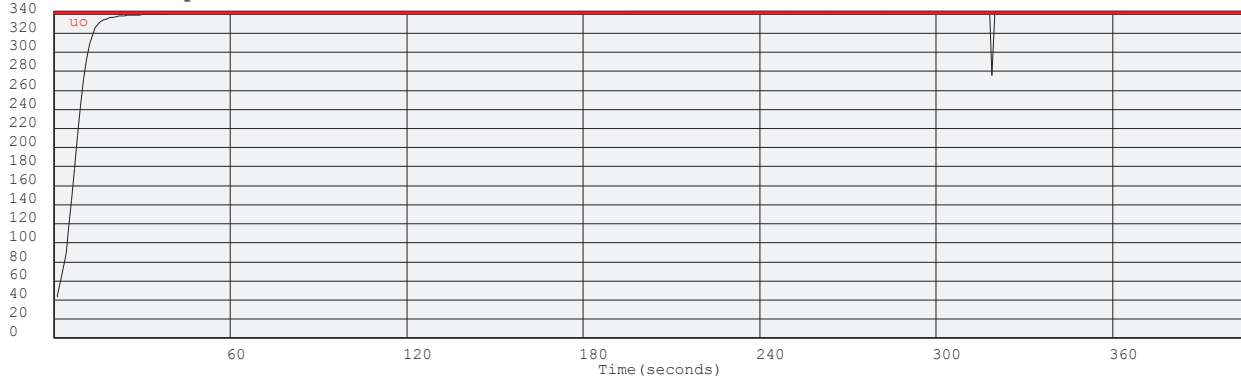
(kPa) Dissipation at: 34.039m



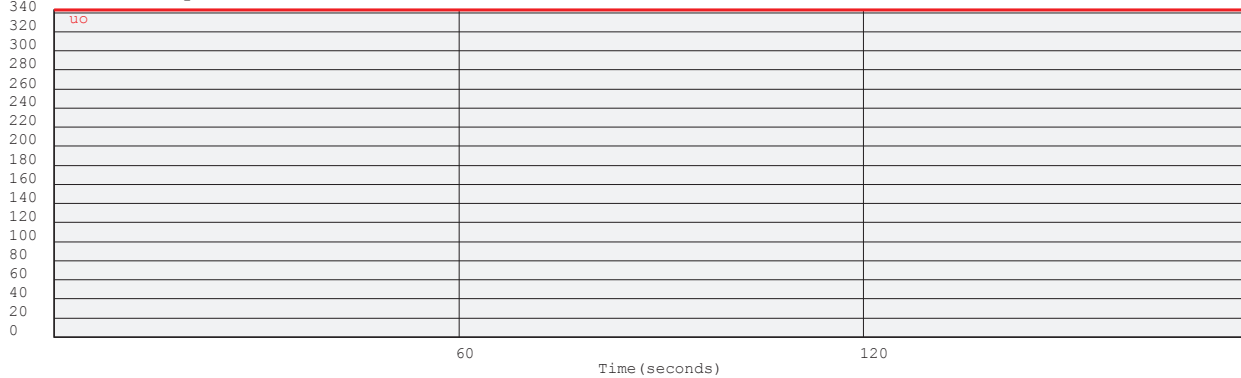
(kPa) Dissipation at: 35.022m



(kPa) Dissipation at: 36.051m



(kPa) Dissipation at: 36.641m





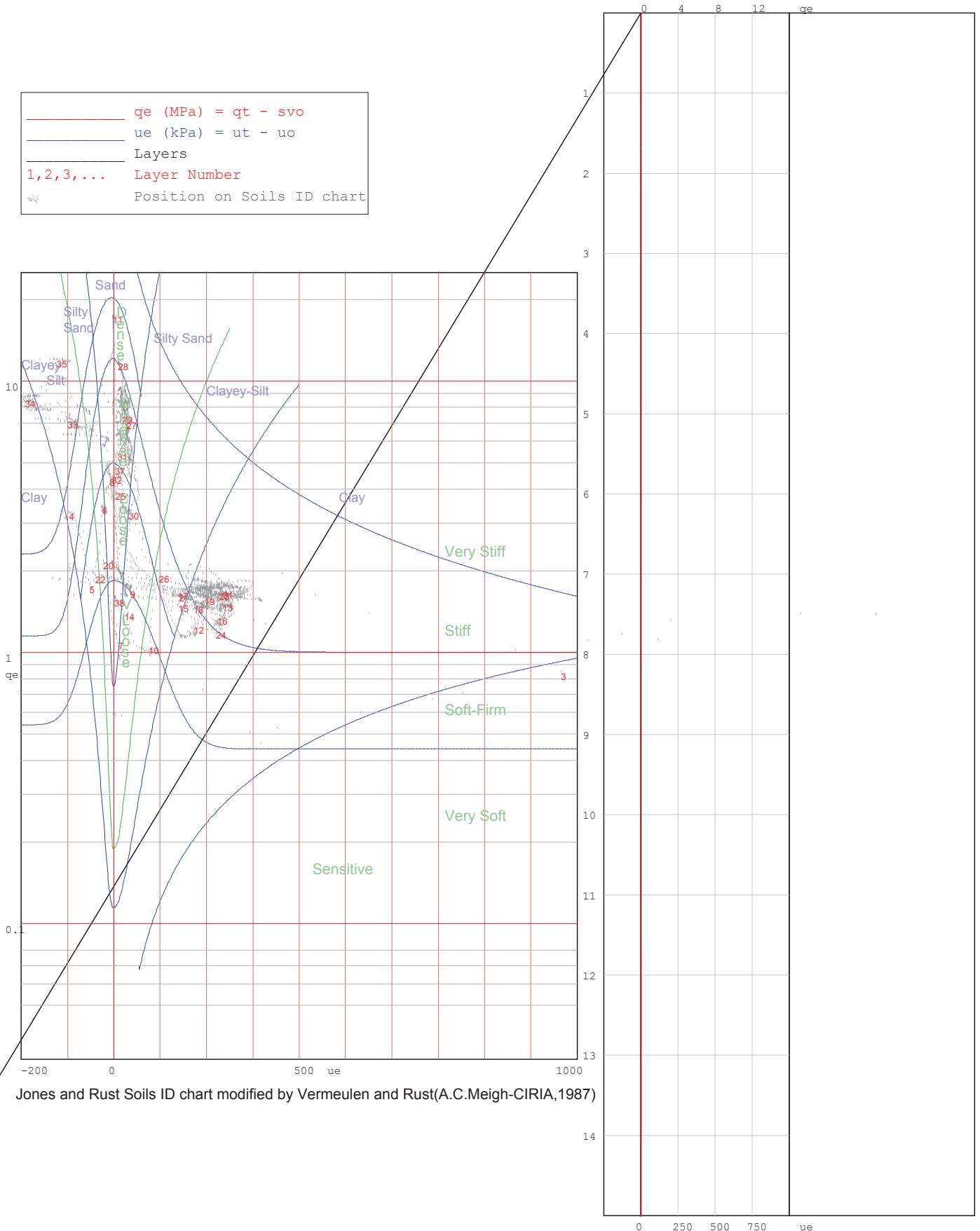
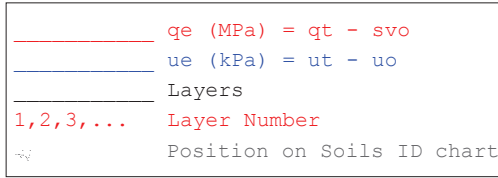
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Probe: GHANA



Project: Durban Harbour Over Water

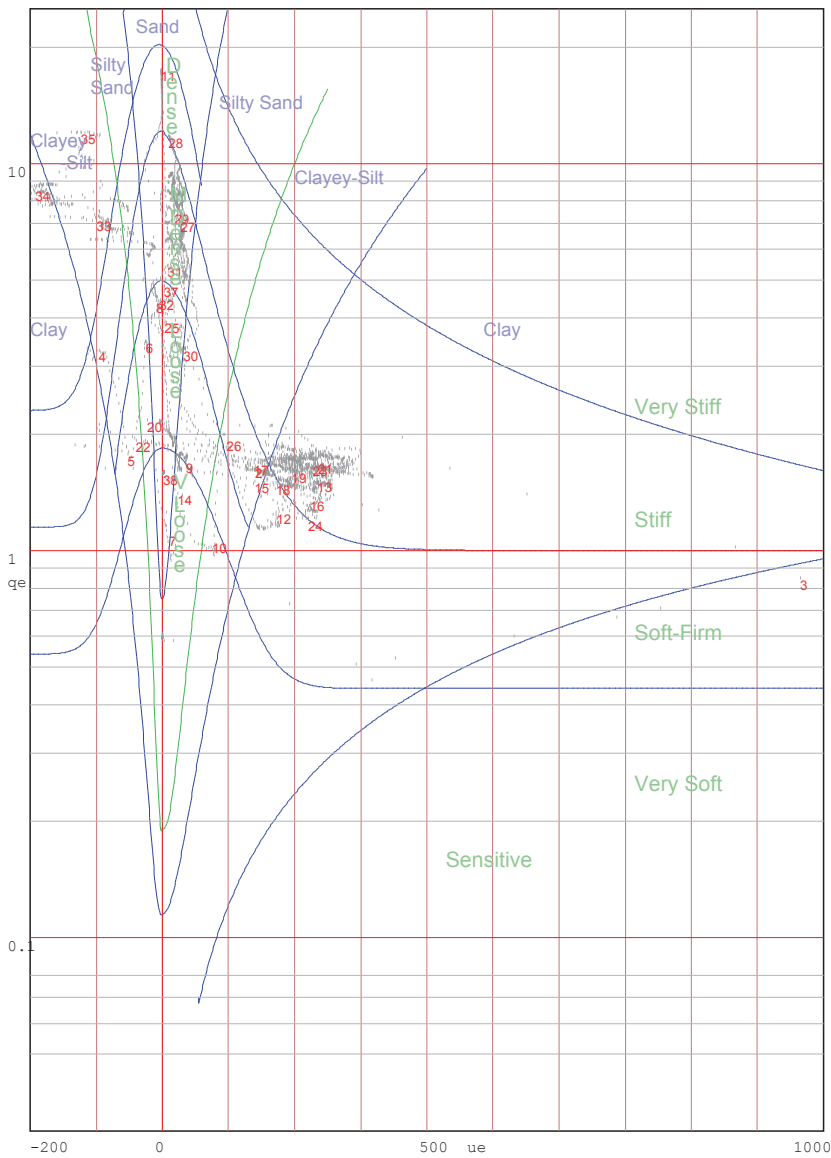
Site: Pier2

Hole No: CPT07

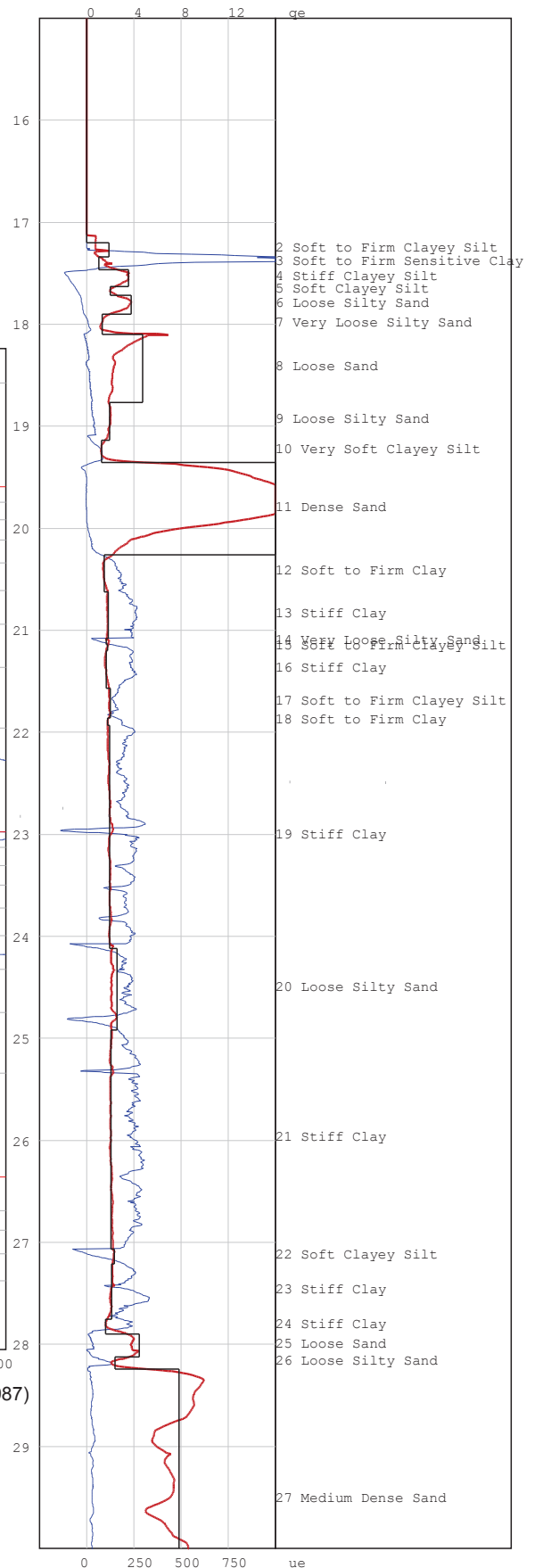
Date: 2012/06/24

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Over Water

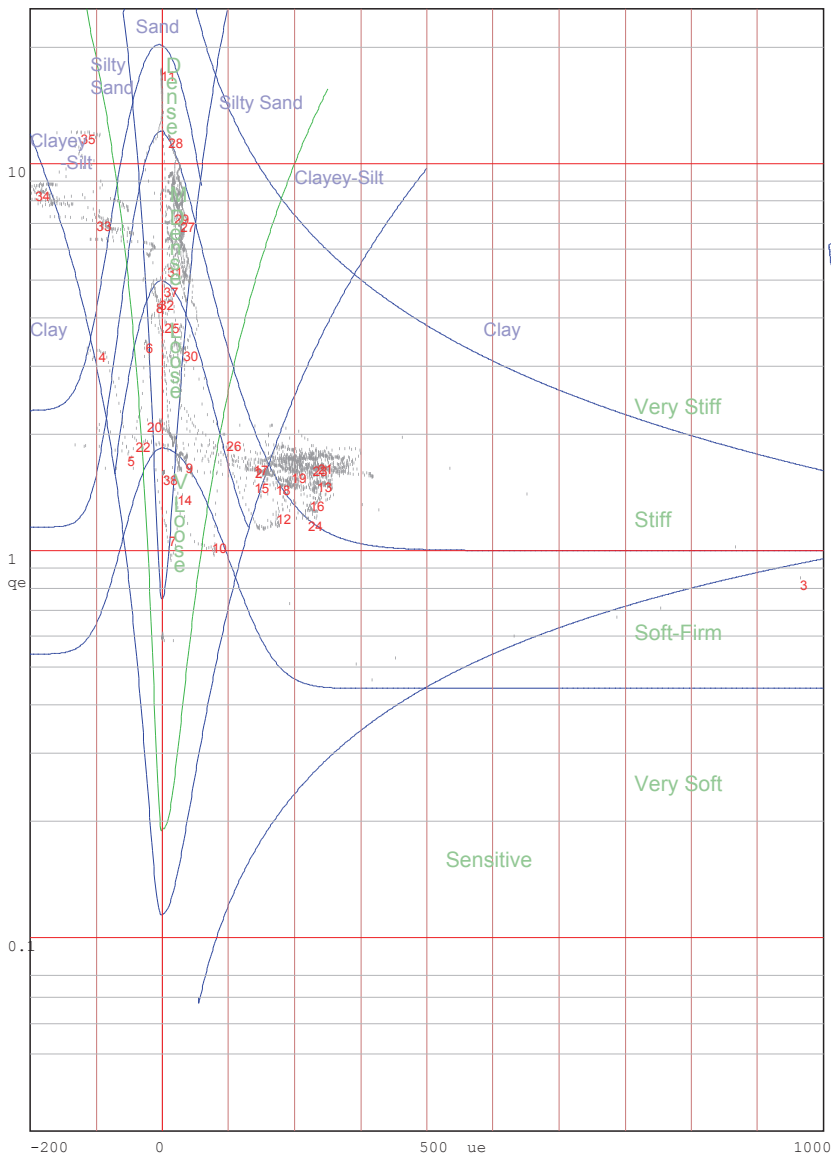
Site: Pier2

Hole No: CPT07

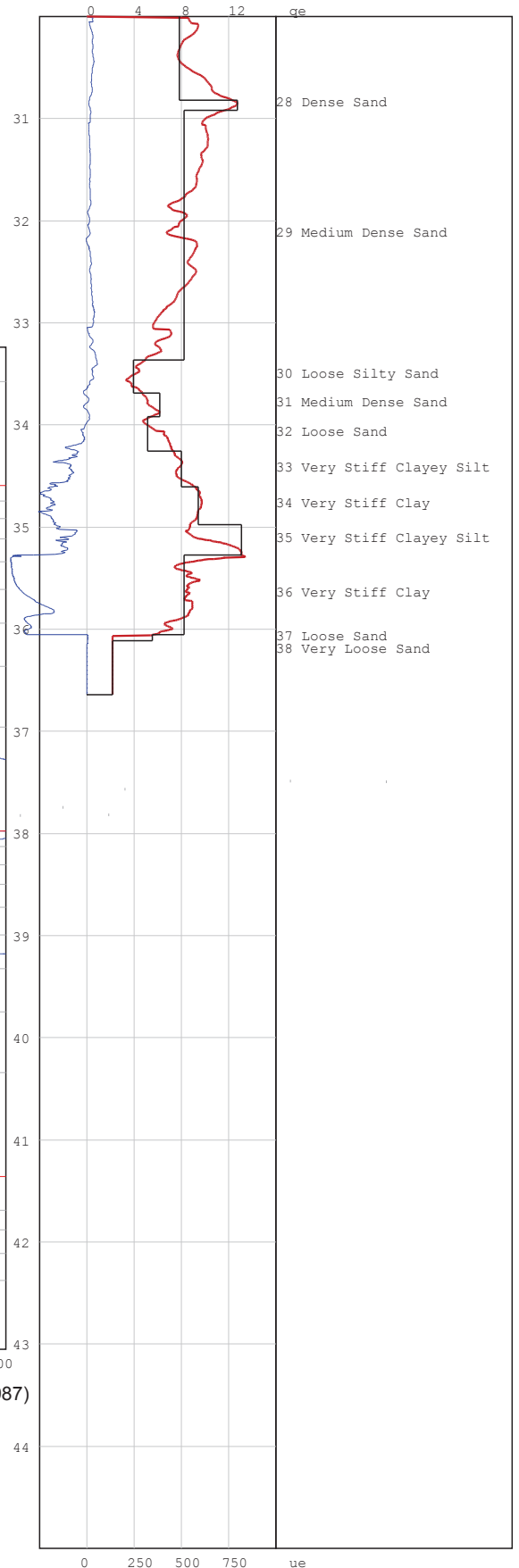
Date: 2012/06/24

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
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# PIEZOCONE PENETRATION TEST



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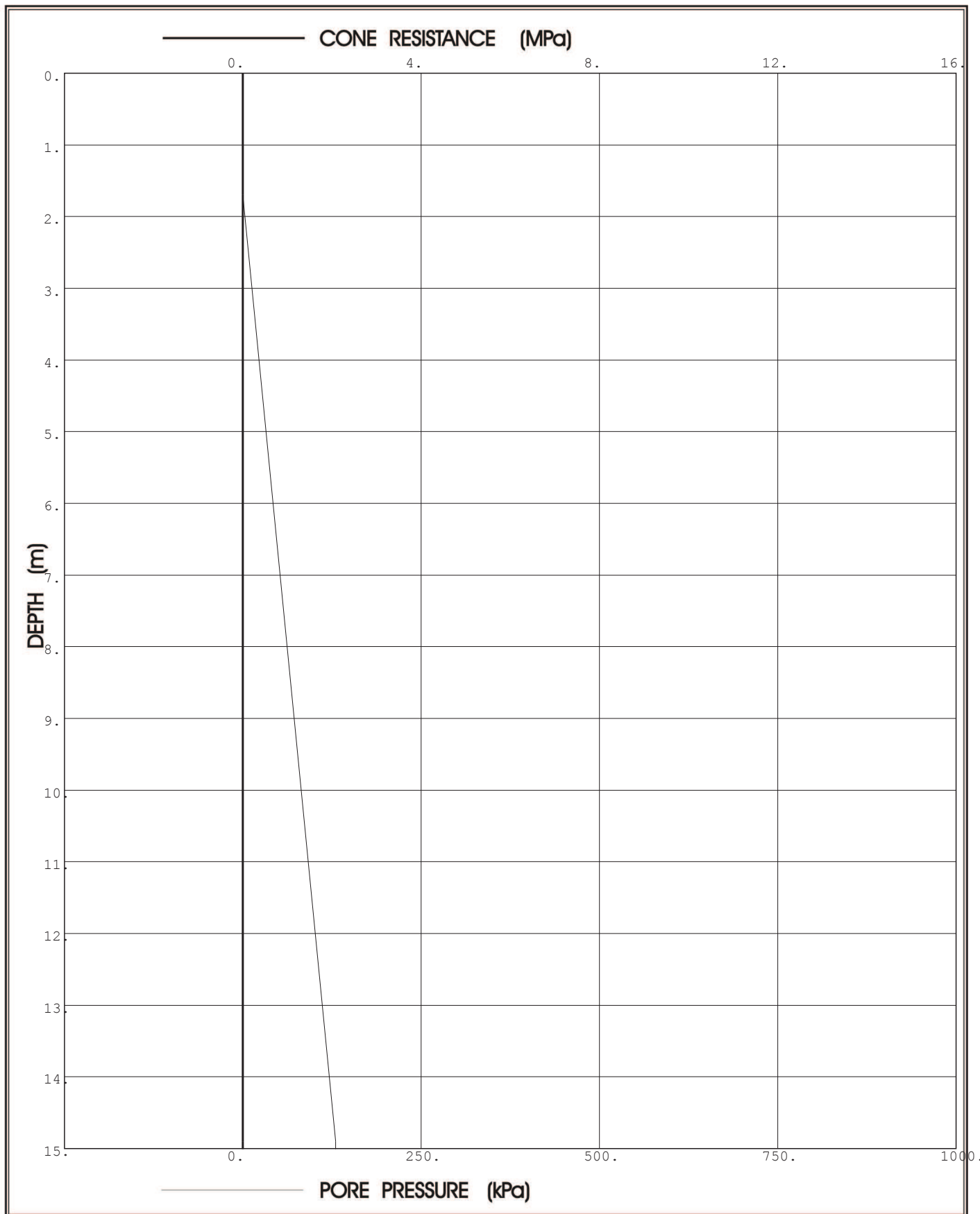
SITE: Pier2

CPTU (RE): CPT08

DATE: 2012/06/23

Probe: GHANA

Page:1



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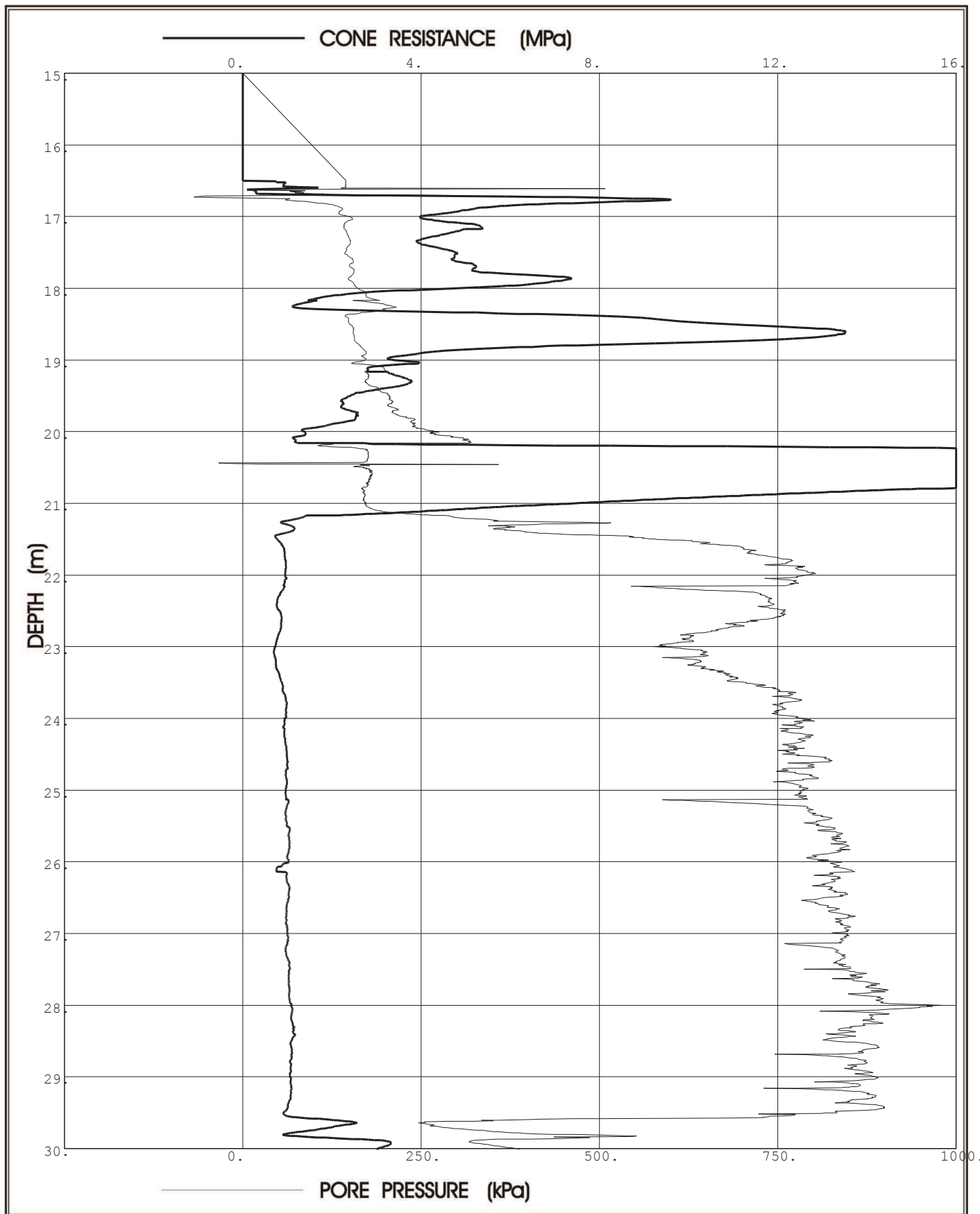
SITE: Pier2

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Page:2



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

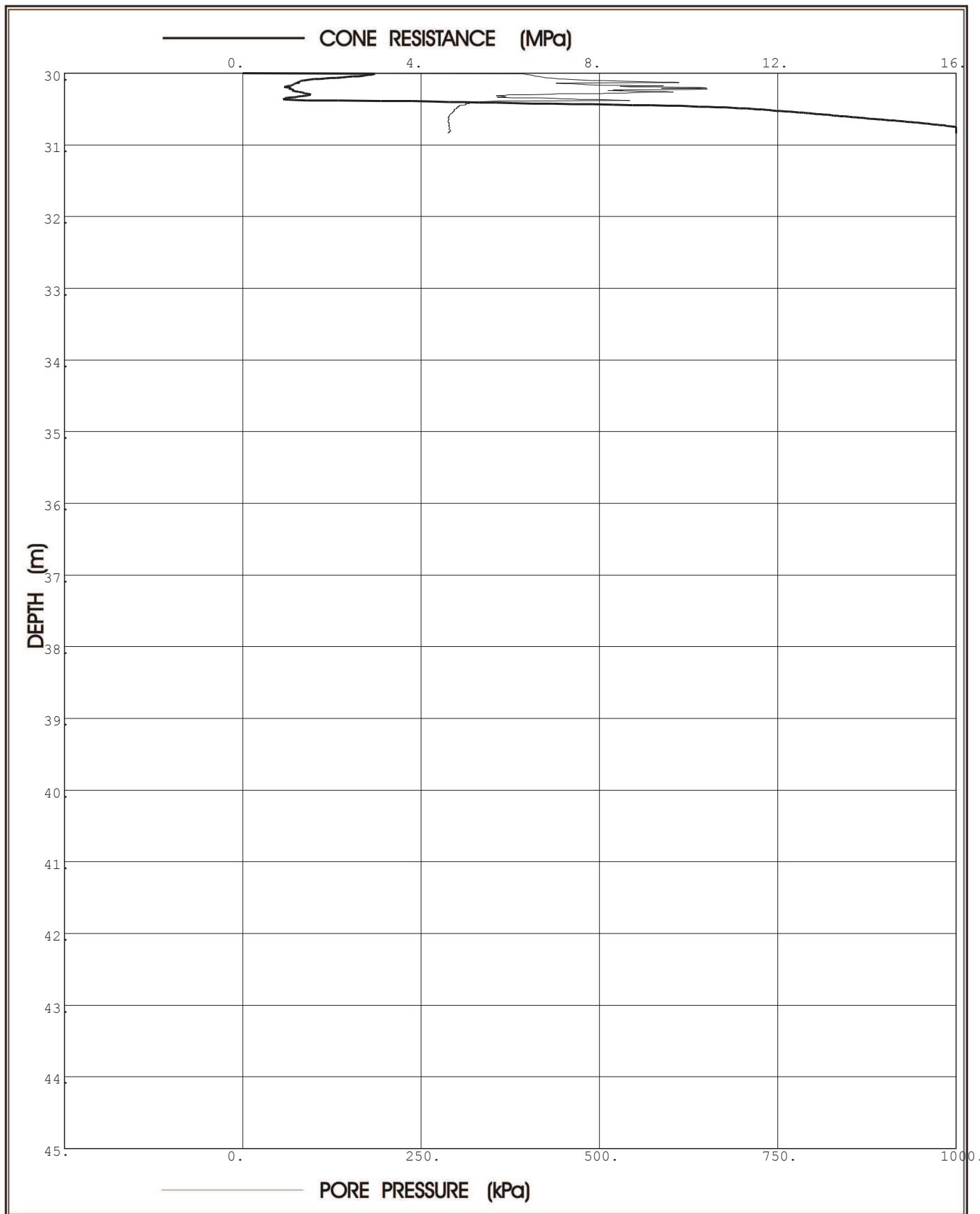
SITE: Pier2

CPTU (RE): CPT08

DATE: 2012/06/23

Probe: GHANA

Page: 3



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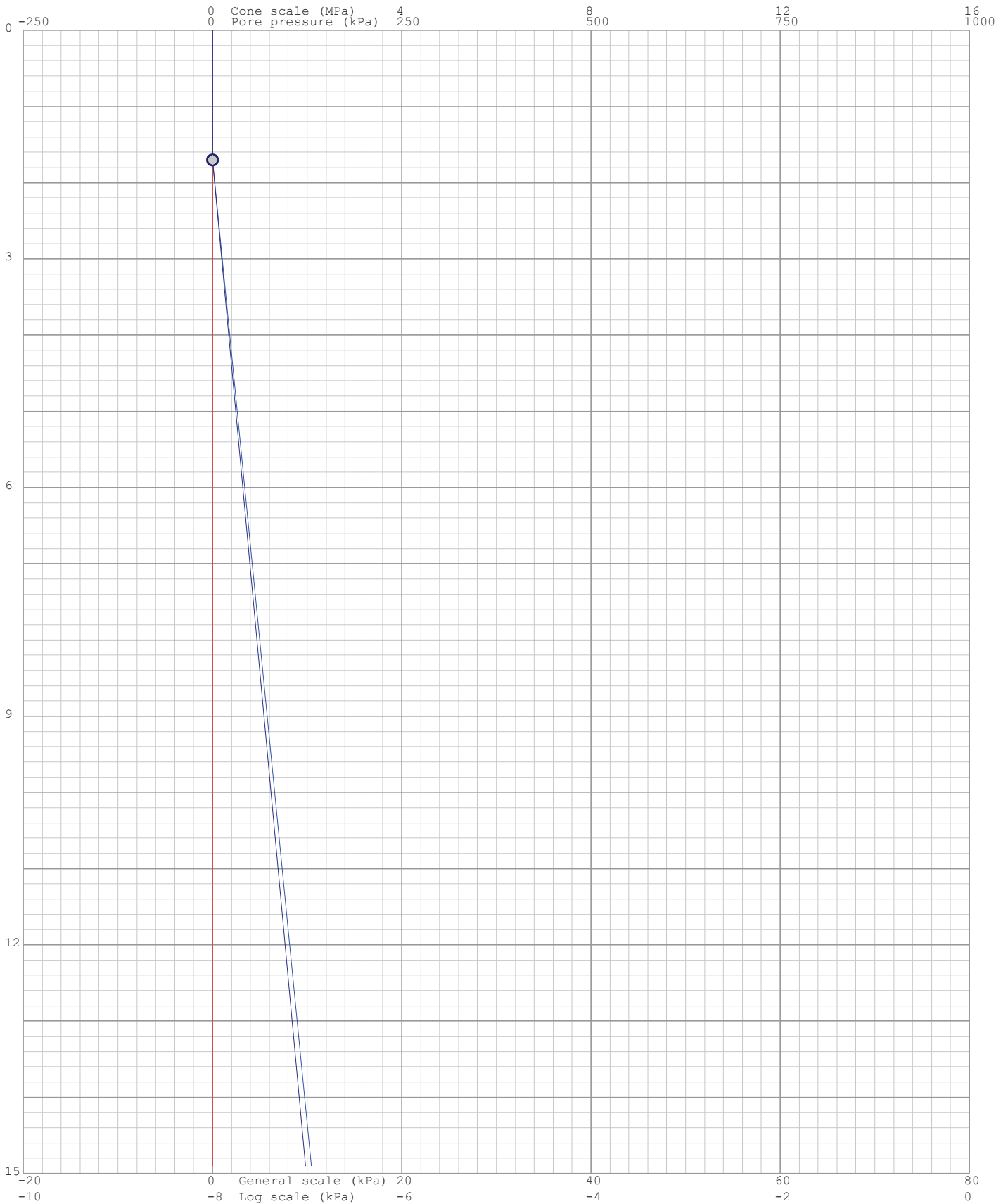
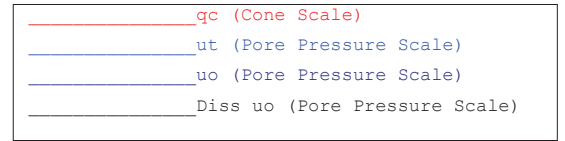
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT08

Date: 2012/06/23

Probe: GHANA



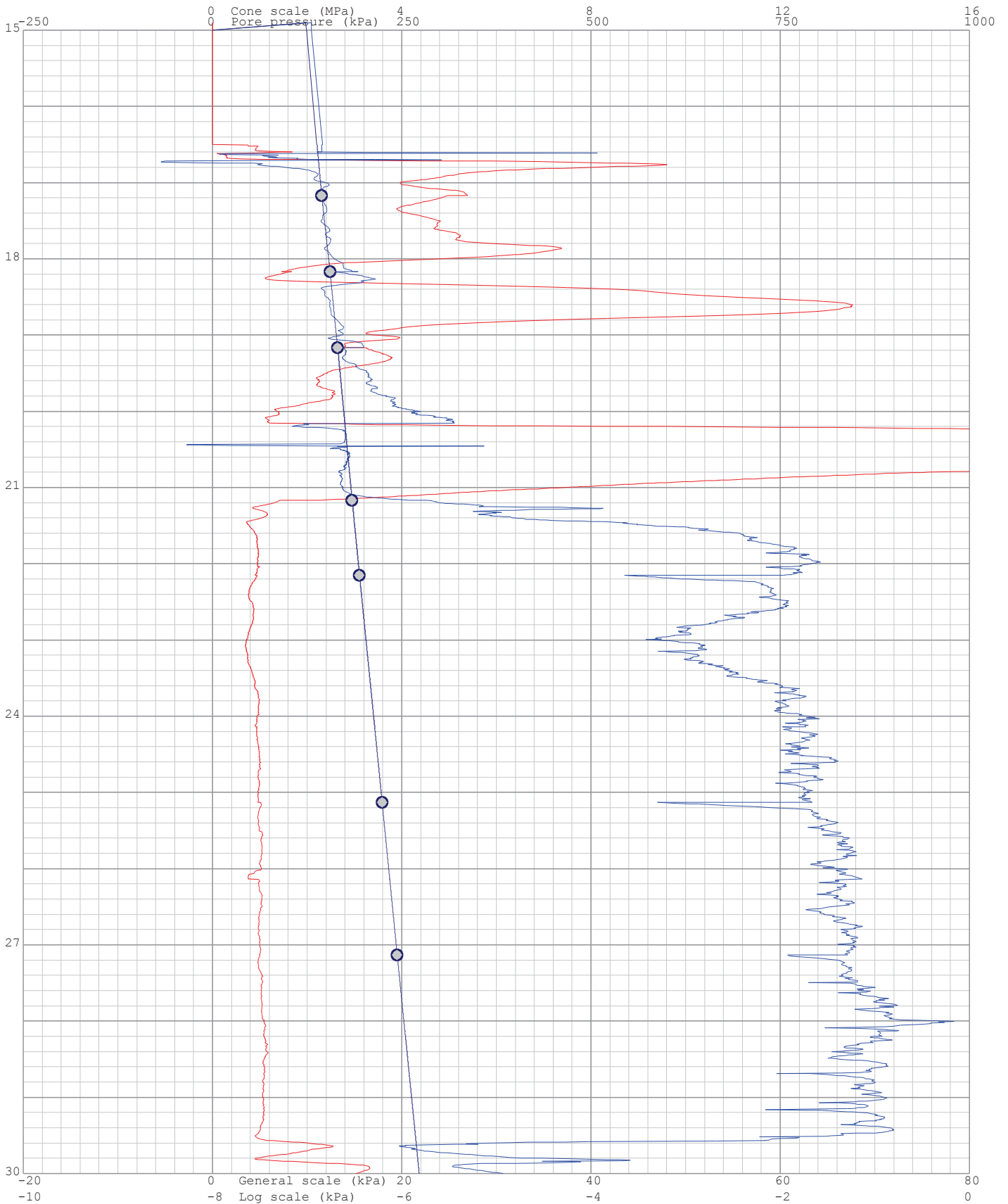
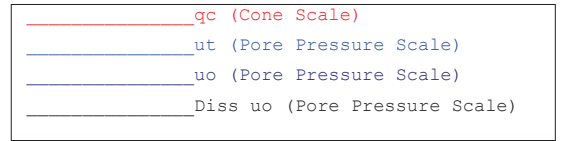
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT08

Date: 2012/06/23

Probe: GHANA





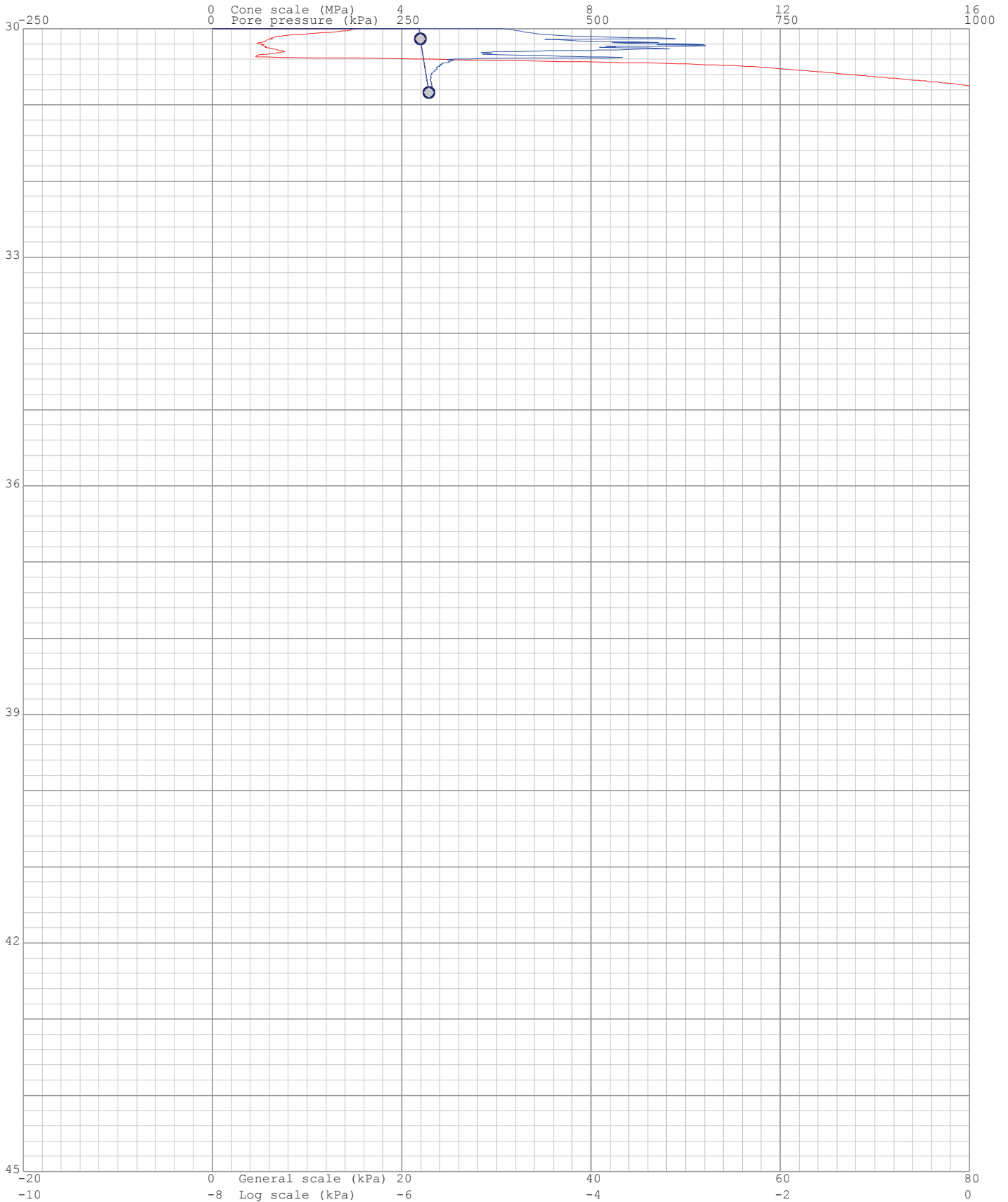
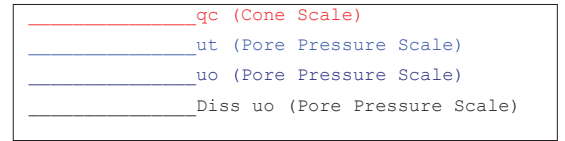
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT08

Date: 2012/06/23

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT08

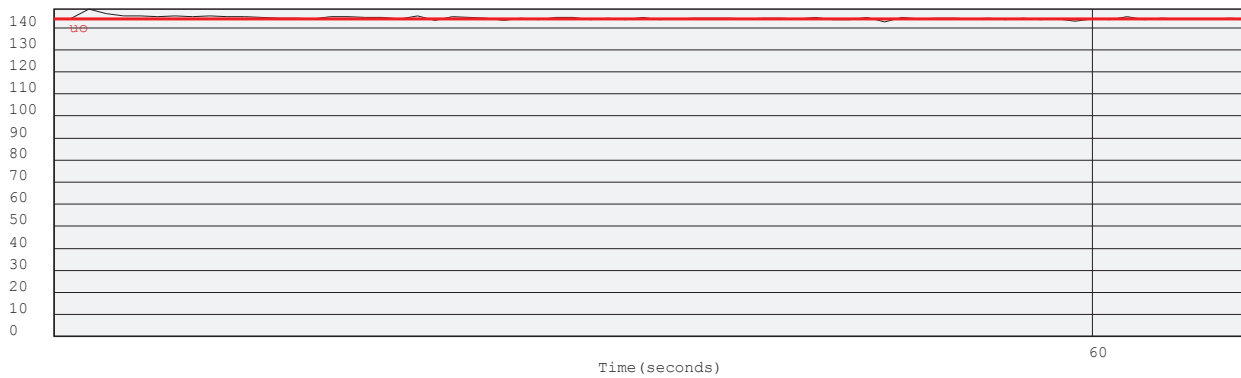
Date: 2012/06/23

Probe: GHANA  
Page: 1

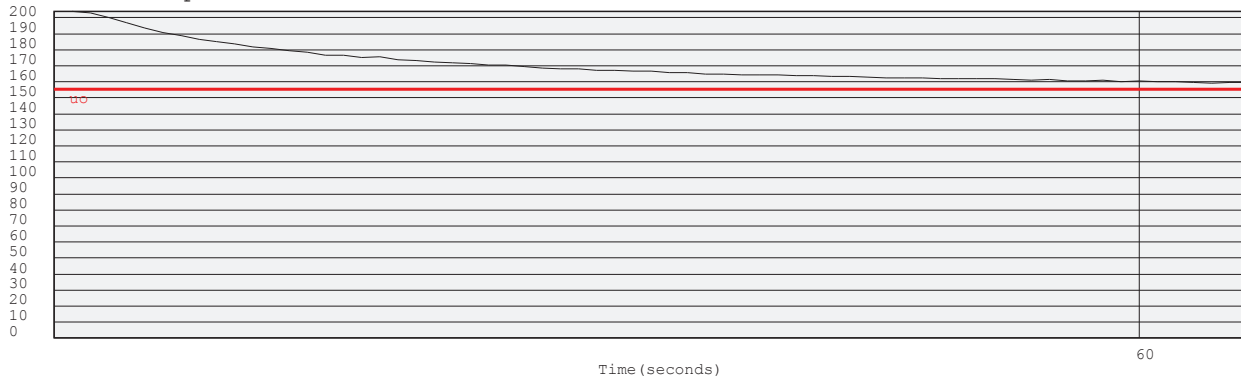
(kPa) Dissipation at: 1.7m



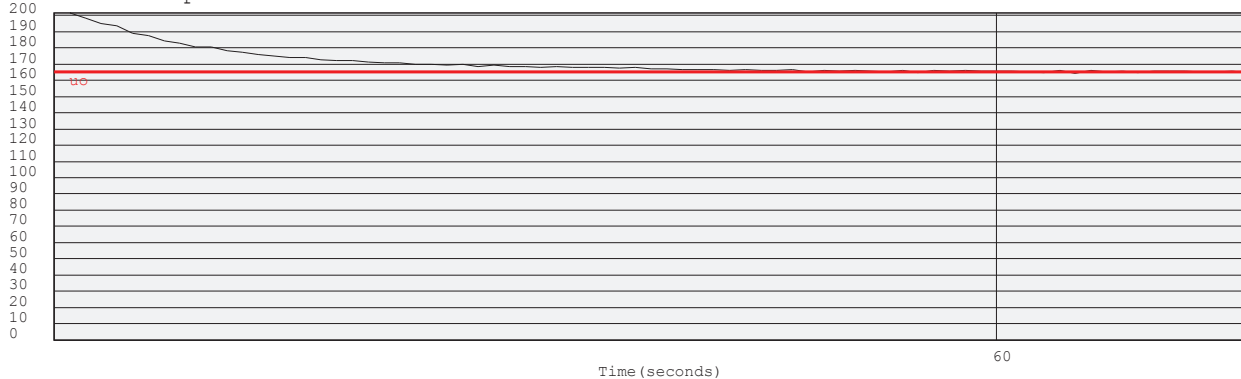
(kPa) Dissipation at: 17.17m



(kPa) Dissipation at: 18.167m



(kPa) Dissipation at: 19.163m



Project: Durban Harbour Over Water

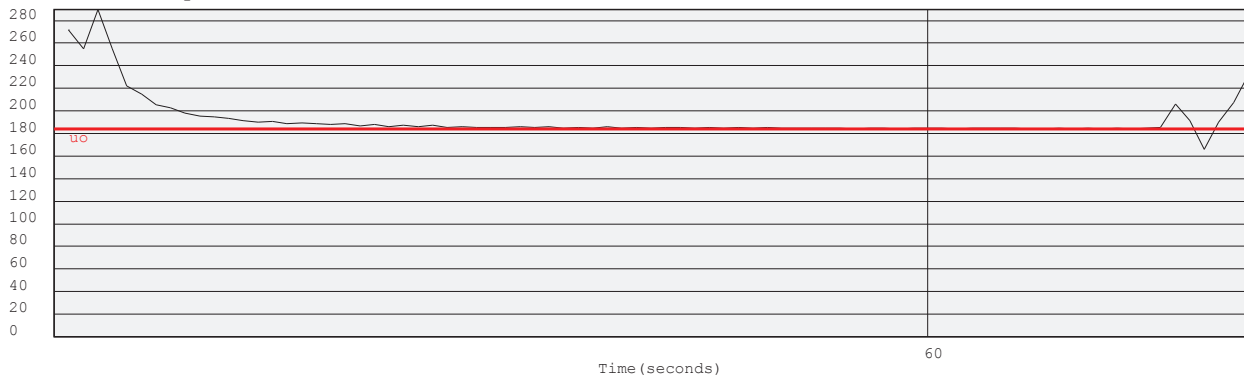
Site: Pier2

Hole: CPT08

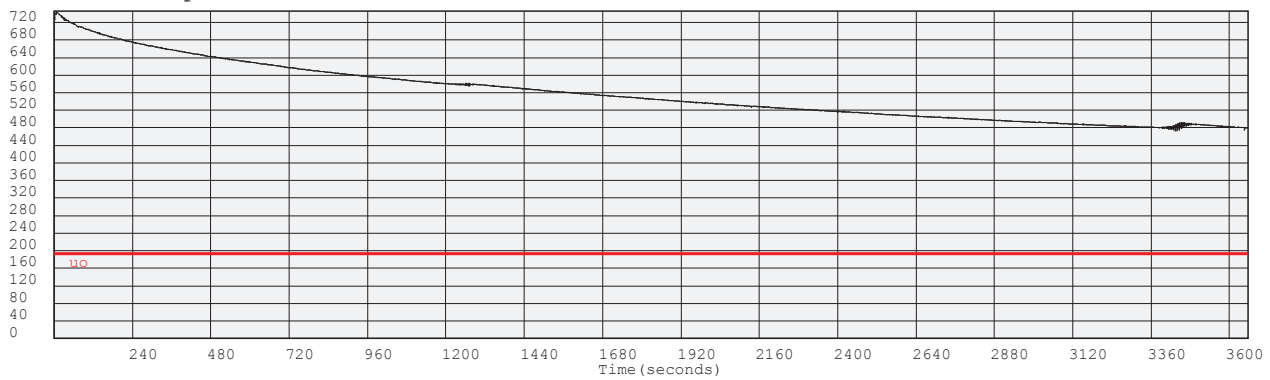
Date: 2012/06/23

Probe: GHANA  
Page: 2

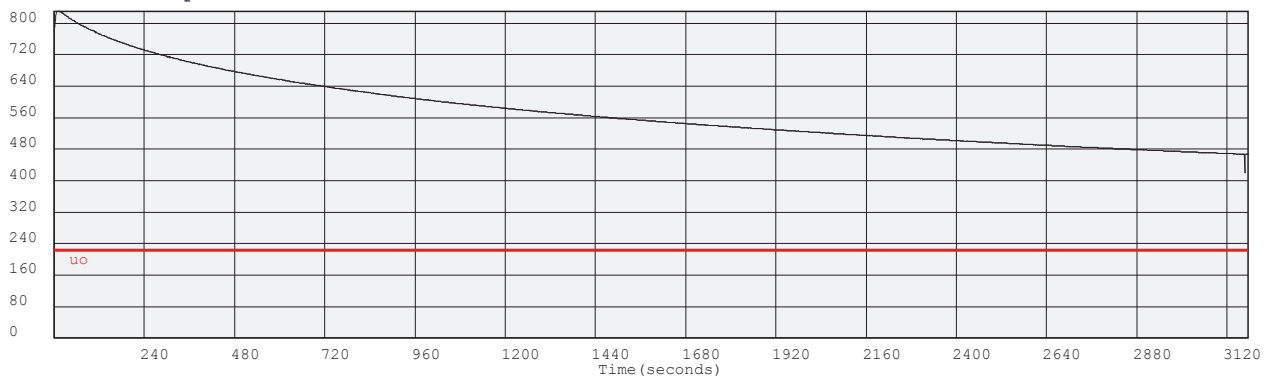
(kPa) Dissipation at: 21.166m



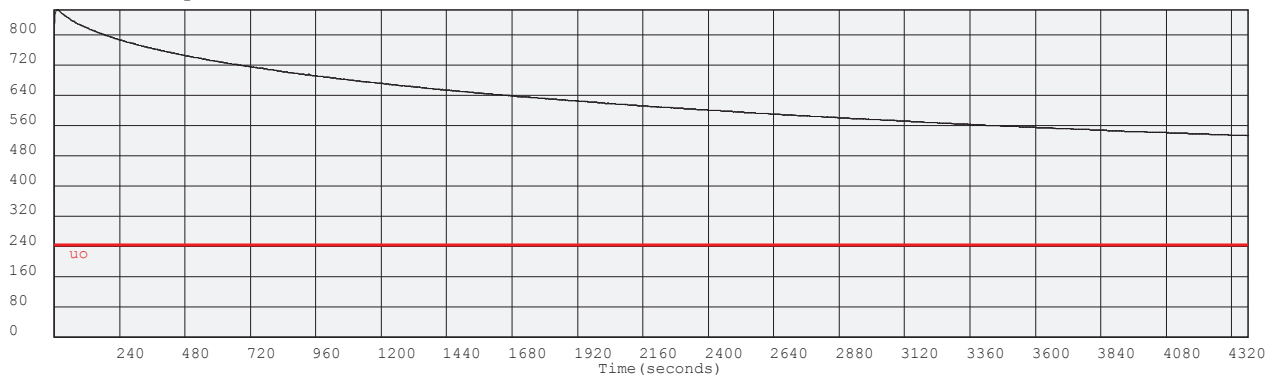
(kPa) Dissipation at: 22.15m



(kPa) Dissipation at: 25.127m



(kPa) Dissipation at: 27.132m



Project: Durban Harbour Over Water

Site: Pier2

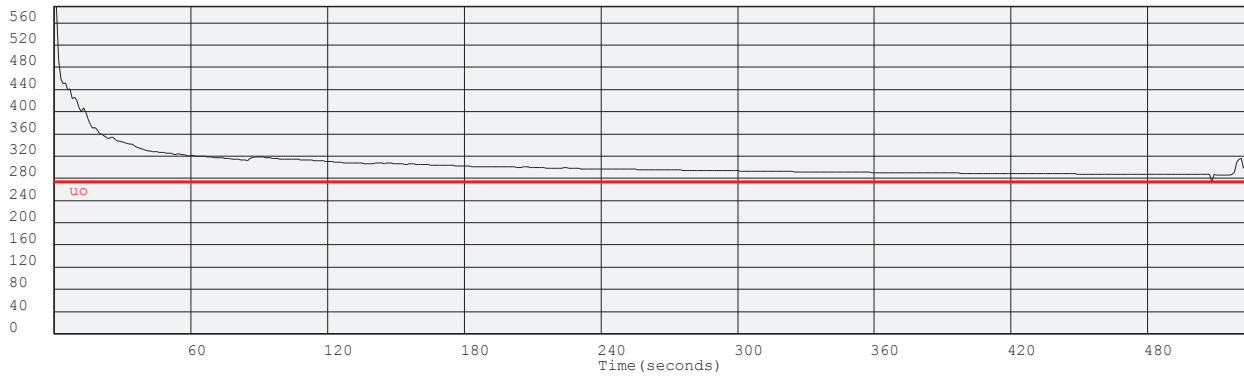
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Date: 2012/06/23

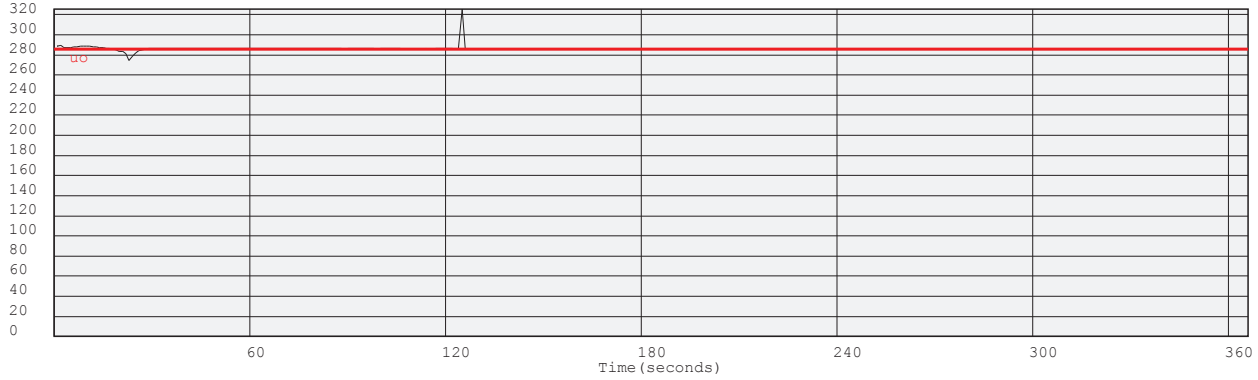
Probe: GHANA

Page: 3

(kPa) Dissipation at: 30.135m



(kPa) Dissipation at: 30.836m



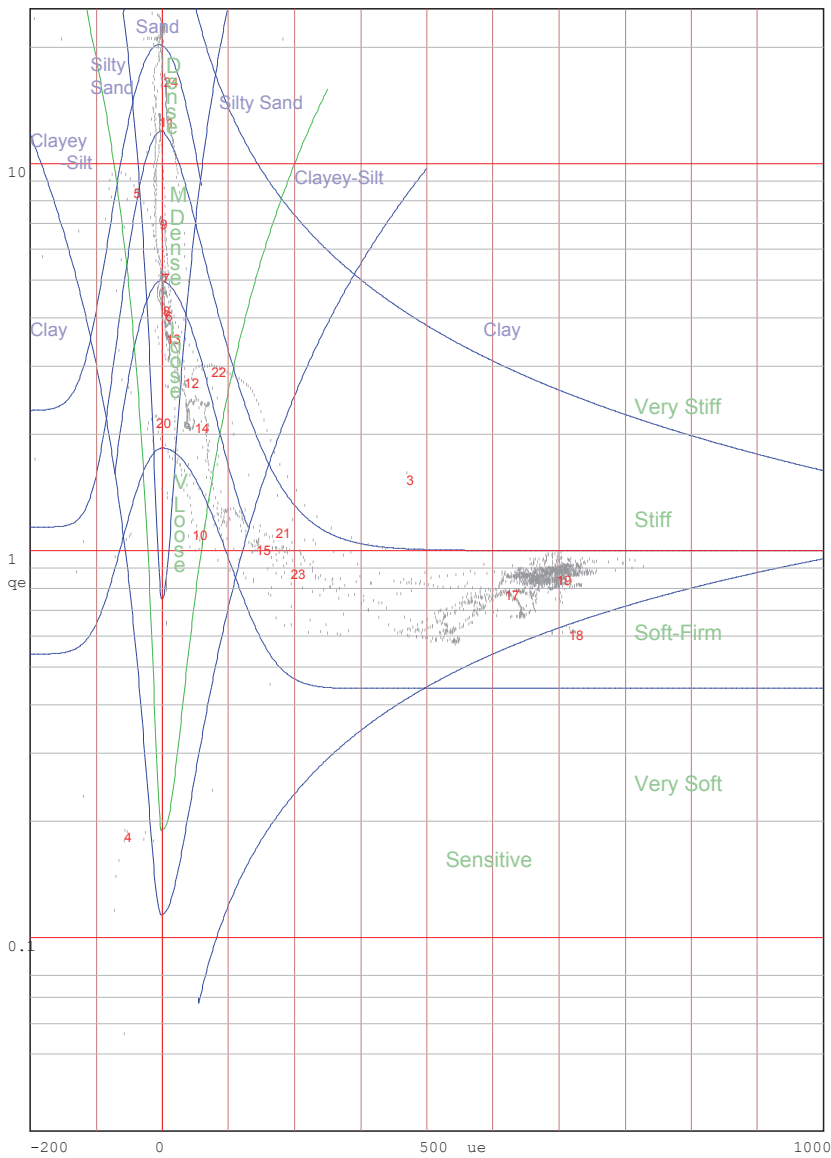
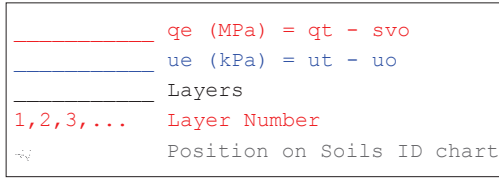
Project: Durban Harbour Over Water

Site: Pier2

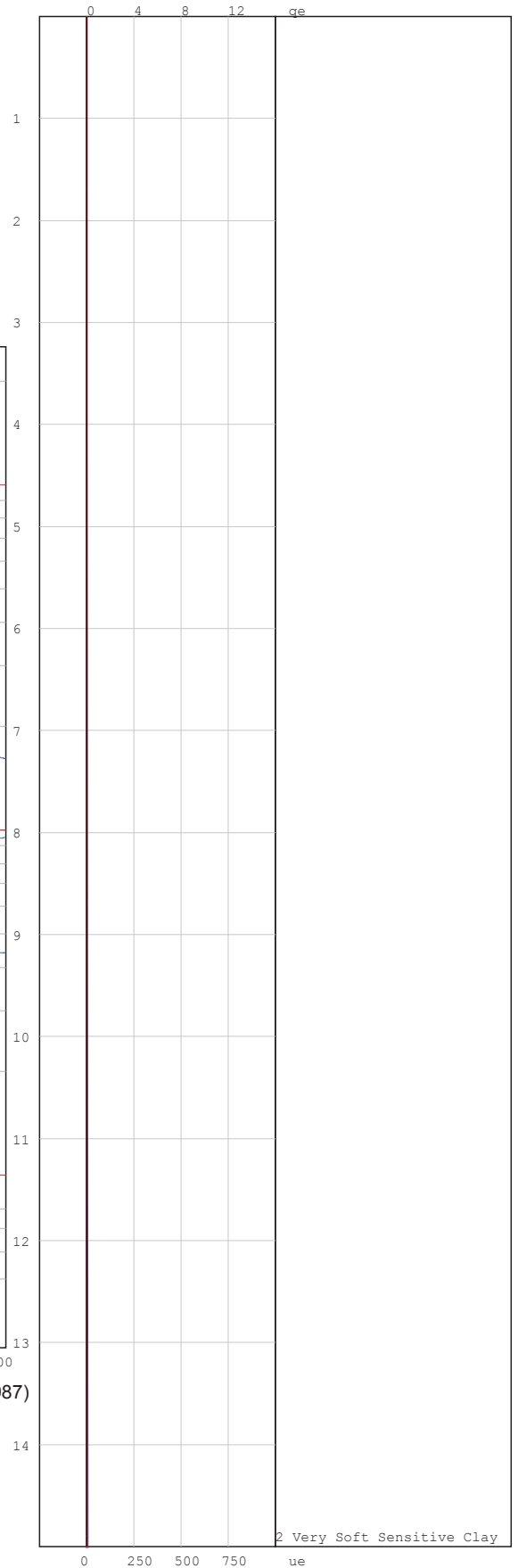
Hole No: CPT08

Date: 2012/06/23

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

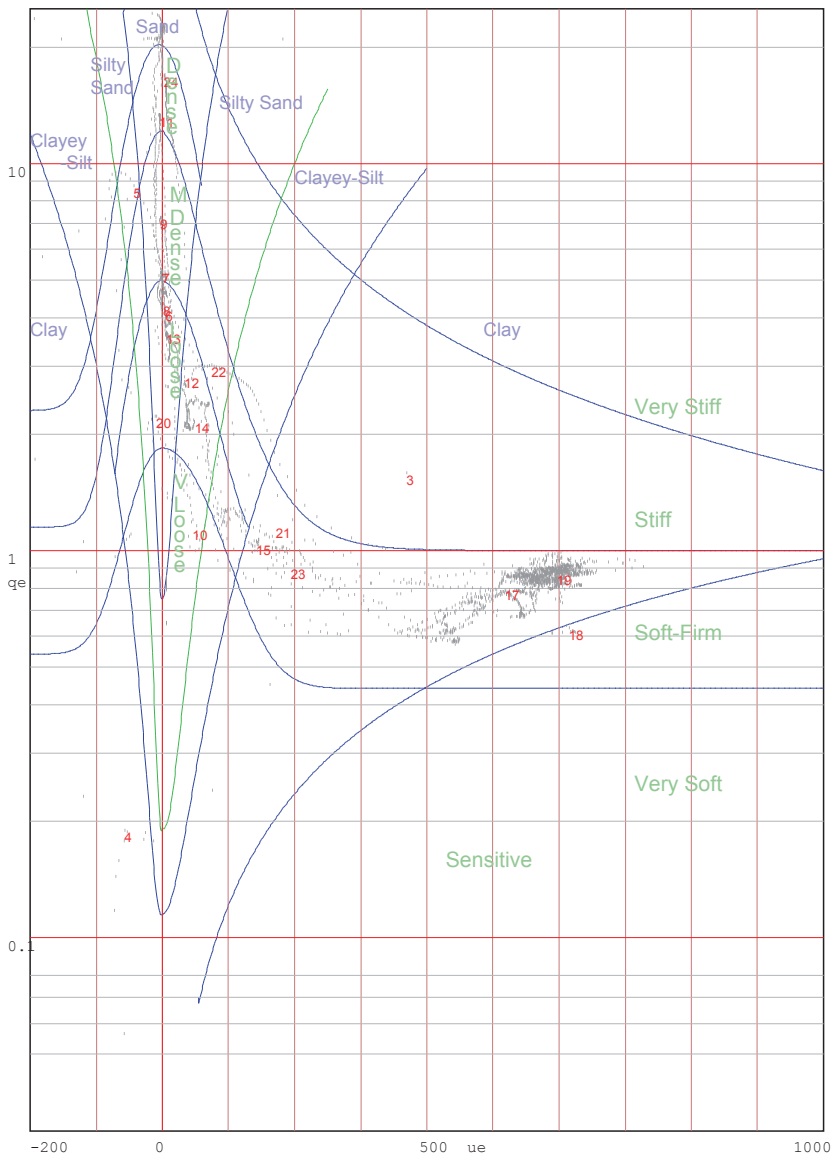
Site: Pier2

Hole No: CPT08

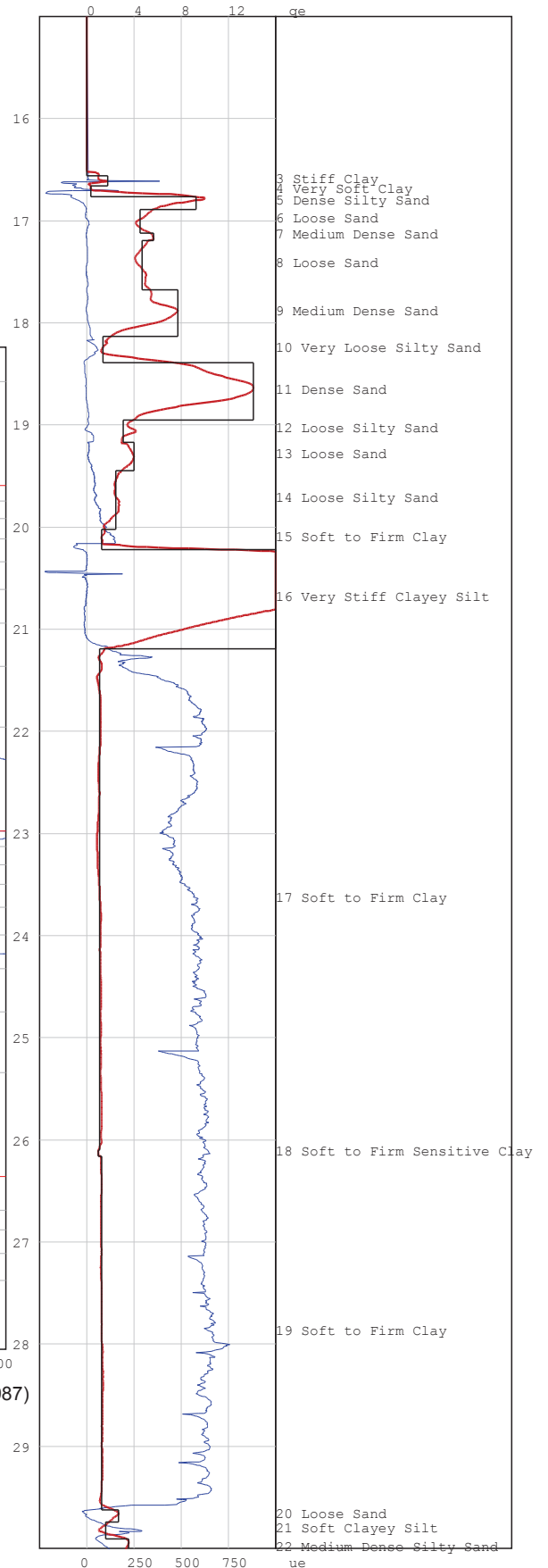
Date: 2012/06/23

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



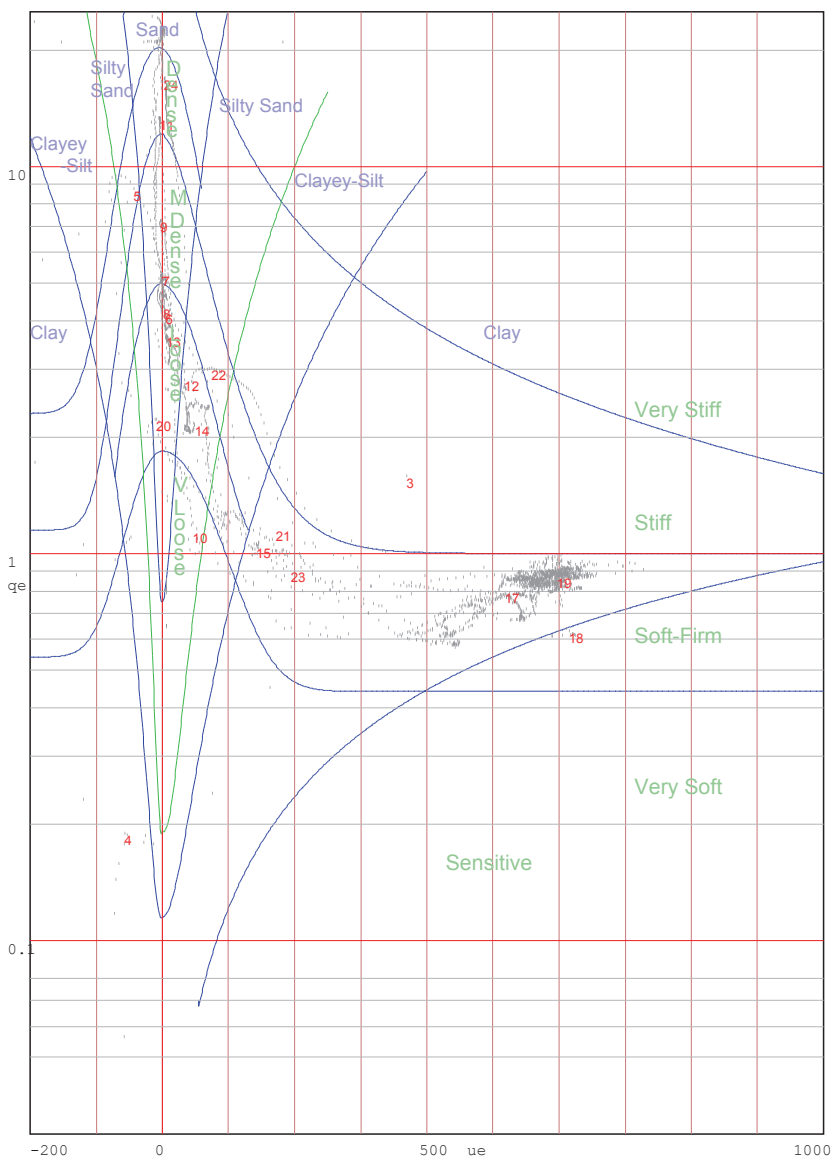
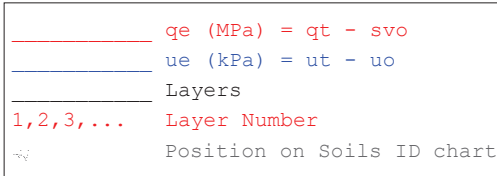
Project: Durban Harbour Over Water

Site: Pier2

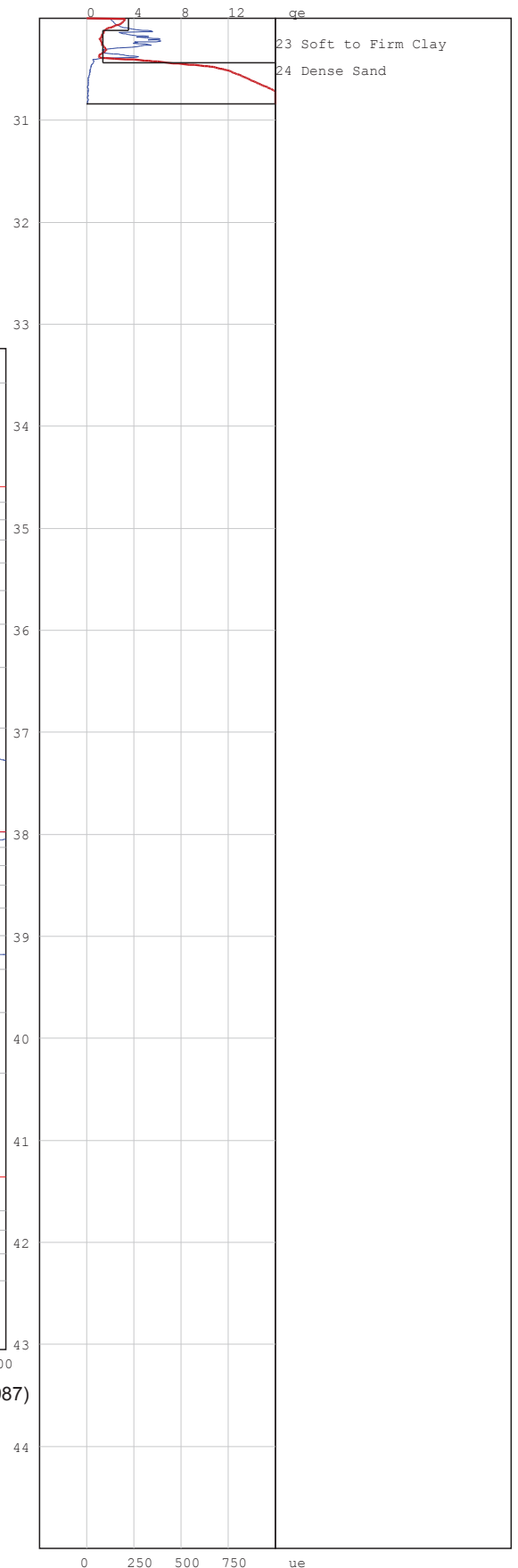
Hole No: CPT08

Date: 2012/06/23

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

PROJECT: Durban Harbour Over Water

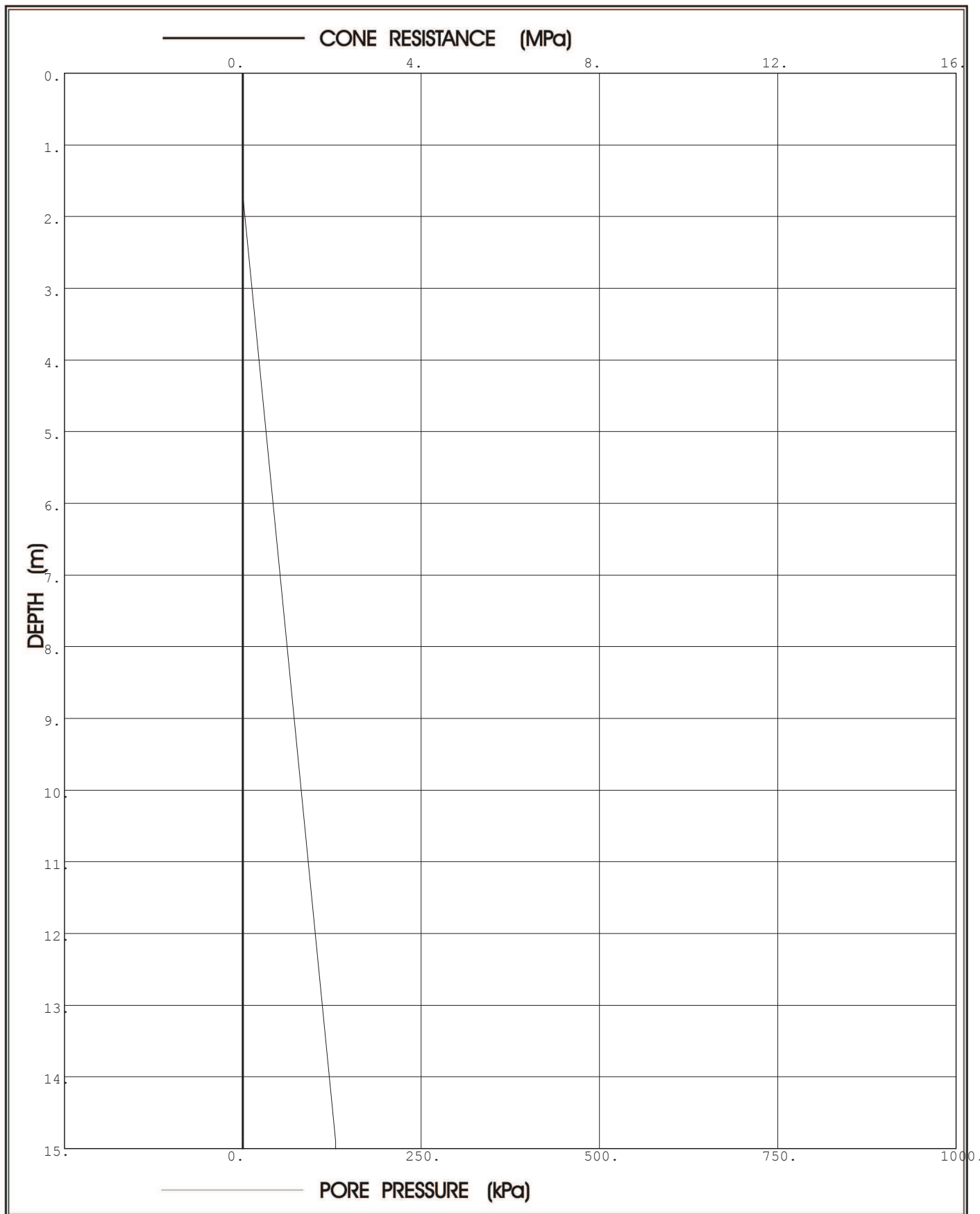
SITE: Pier2

CPTU (RE): CPT09

DATE: 2012/06/06

Probe: KELLER

Page:1



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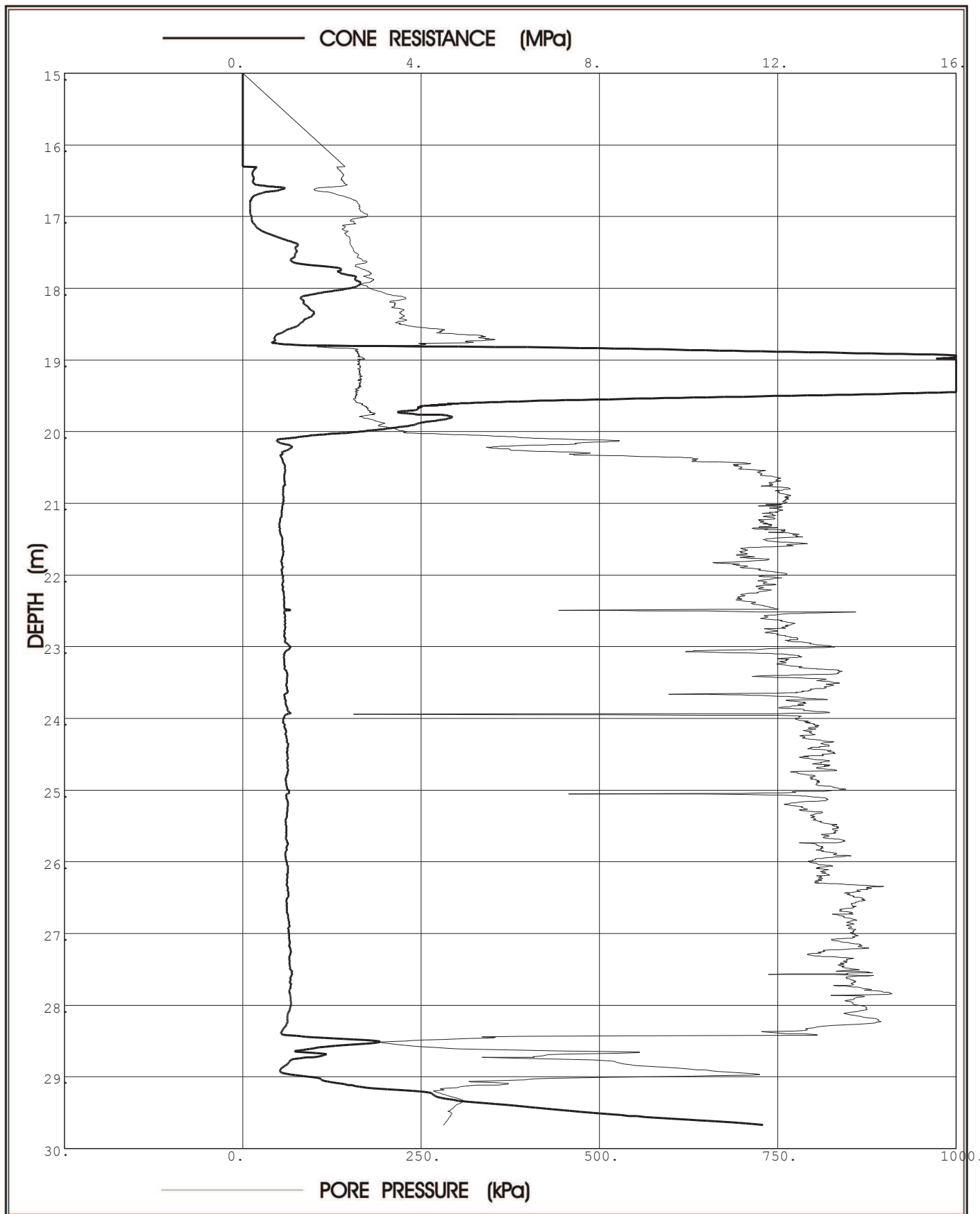
SITE: Pier2

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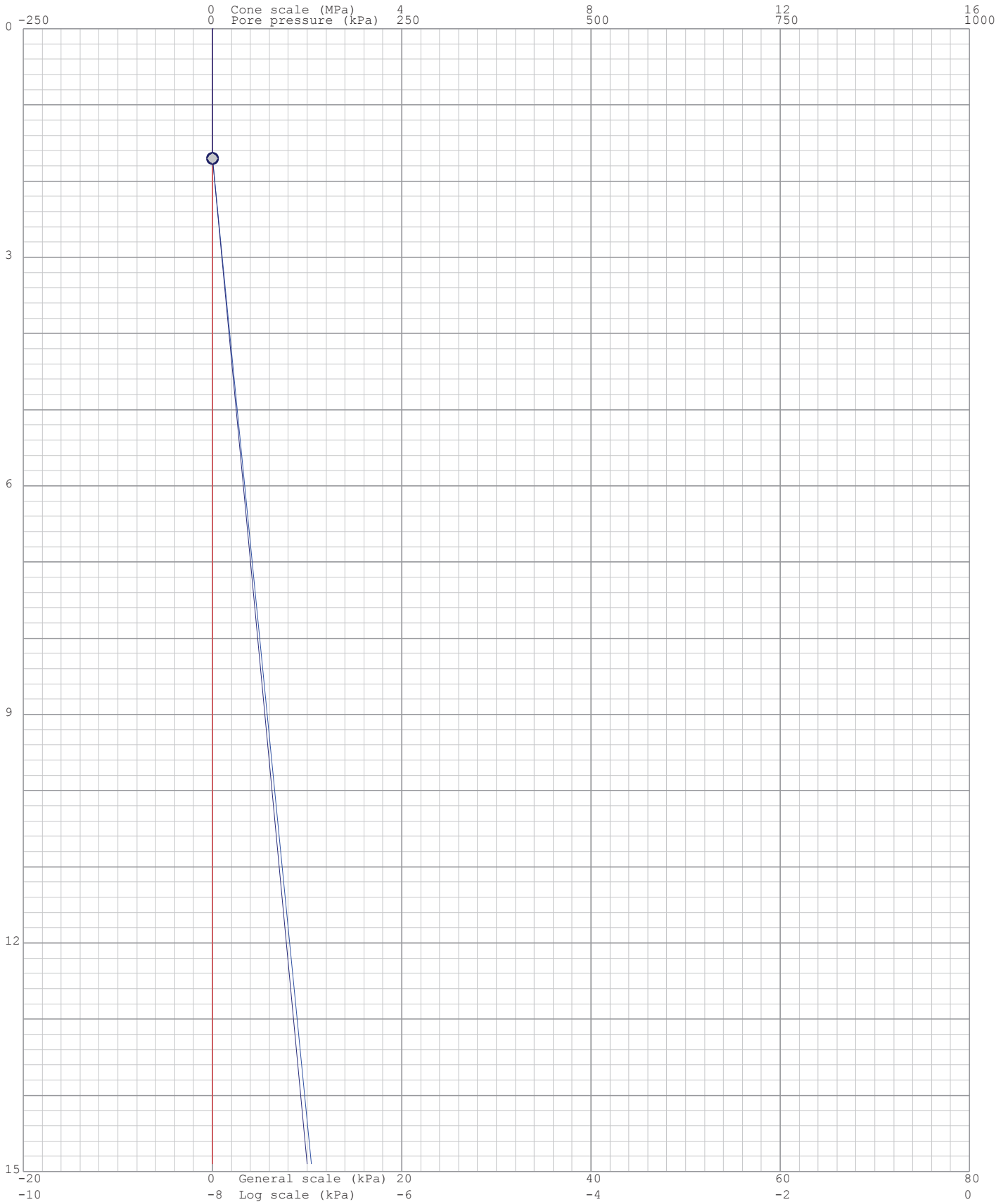
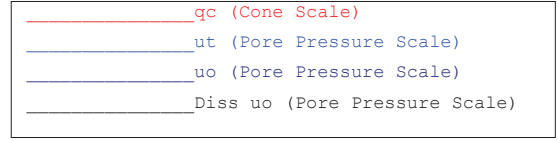
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT09

Date: 2012/06/06

Probe: KELLER



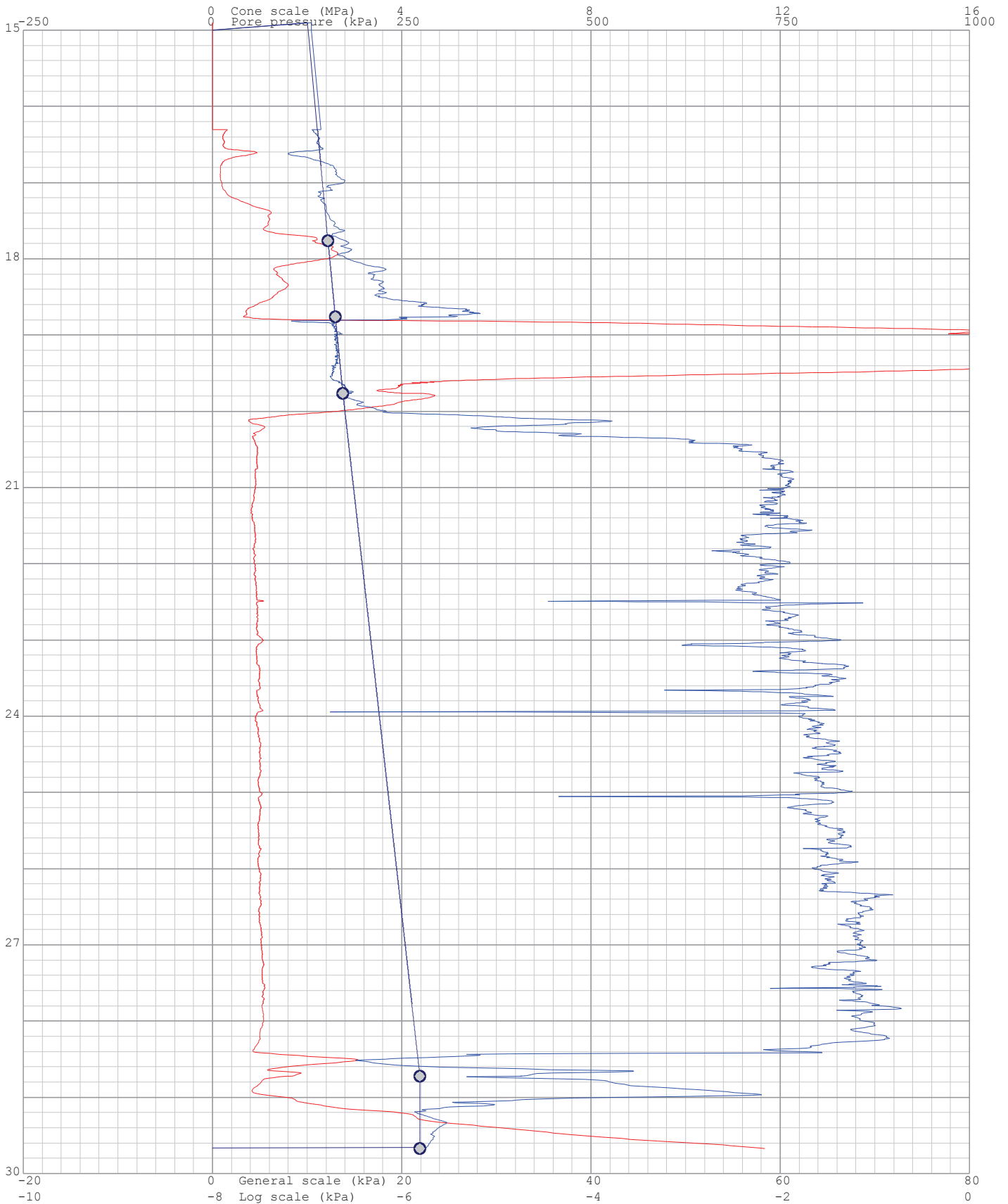
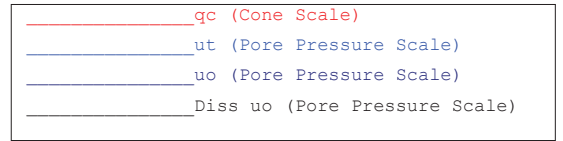
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT09

Date: 2012/06/06

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT09

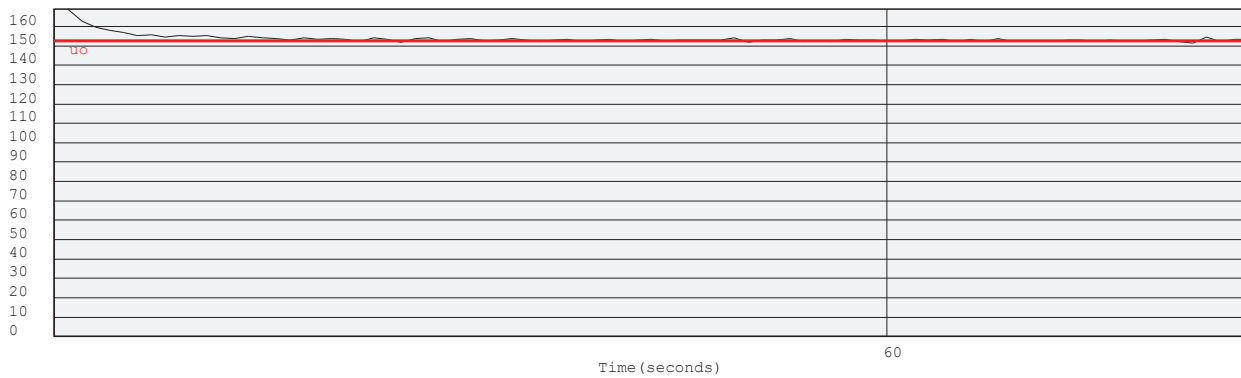
Date: 2012/06/06

Probe: KELLER  
Page: 1

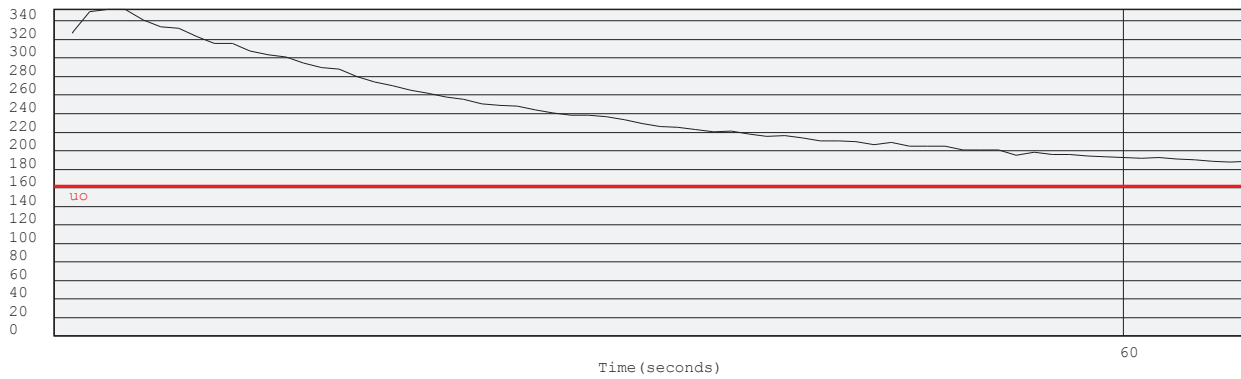
(kPa) Dissipation at: 1.7m



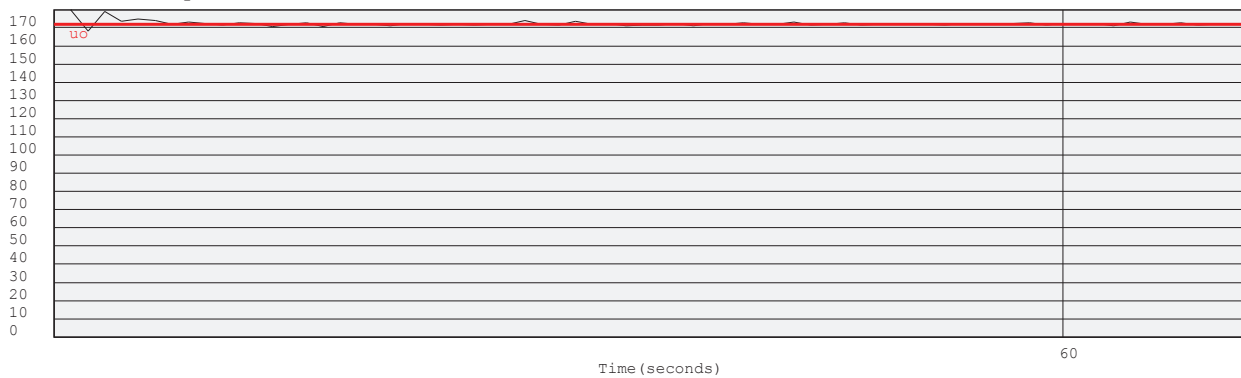
(kPa) Dissipation at: 17.766m



(kPa) Dissipation at: 18.761m



(kPa) Dissipation at: 19.764m



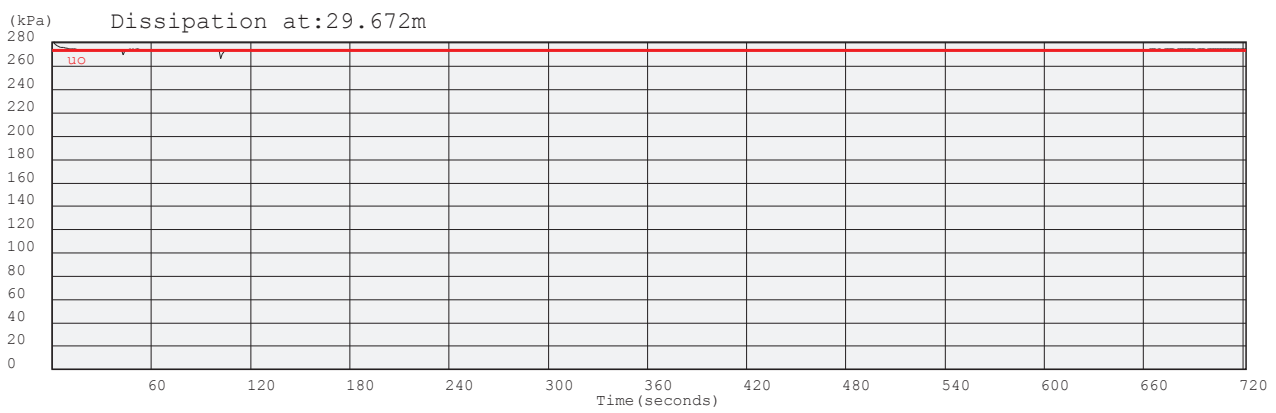
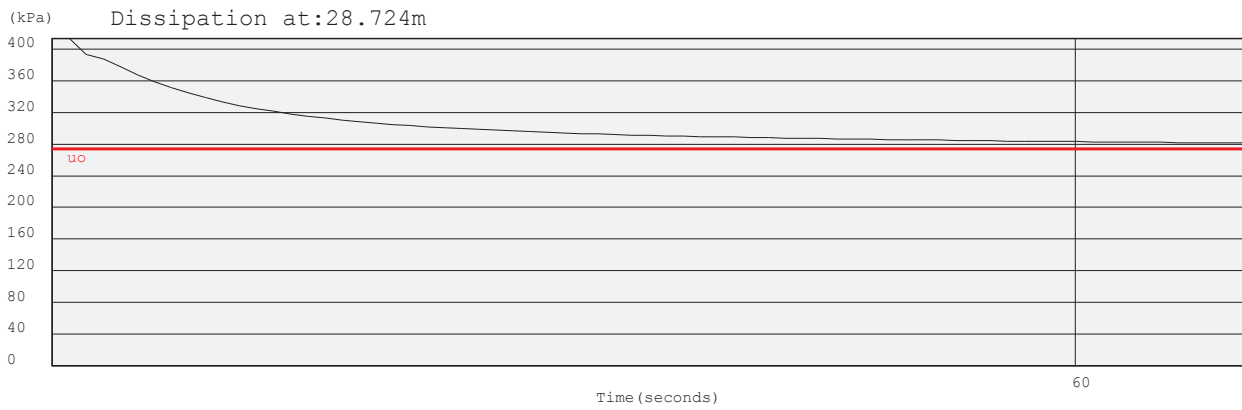
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT09

Date: 2012/06/06

Probe: KELLER  
Page: 2



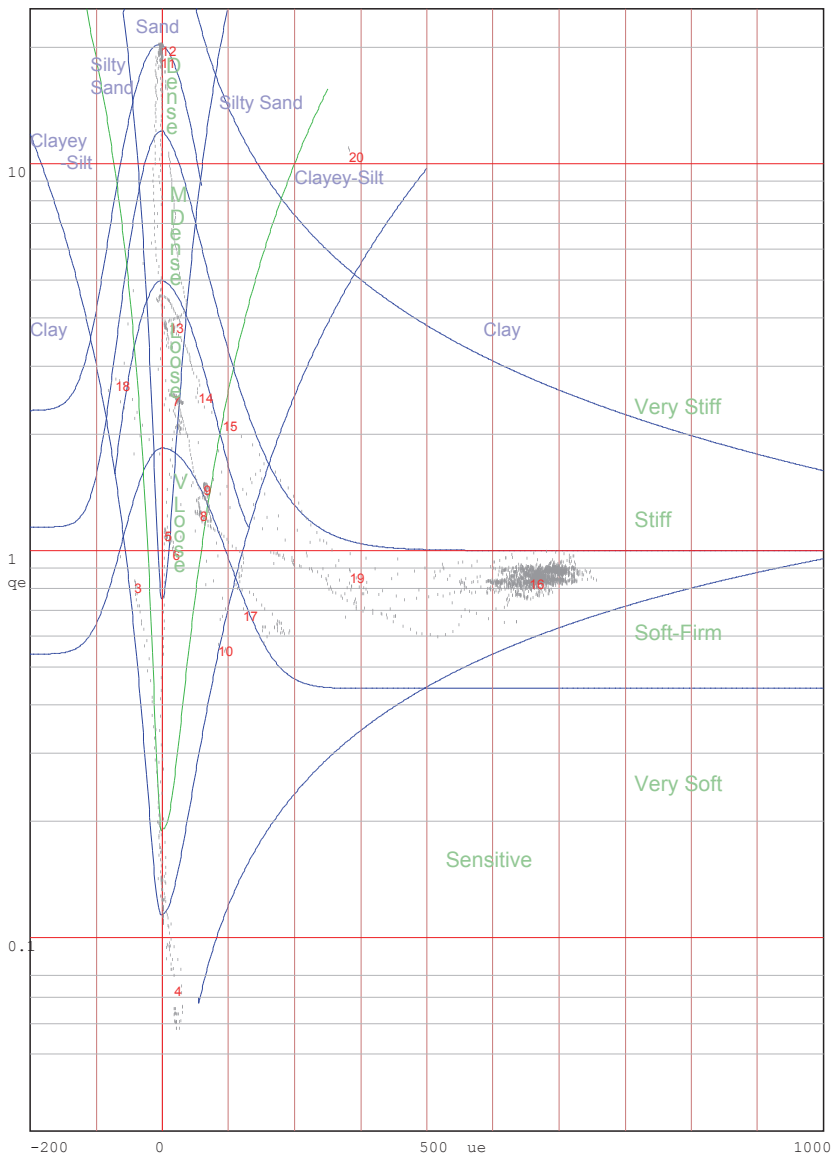
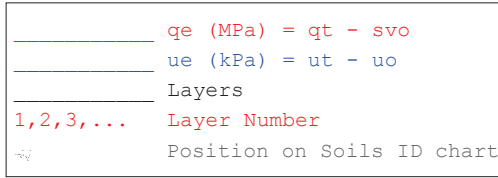
Project: Durban Harbour Over Water

Site: Pier2

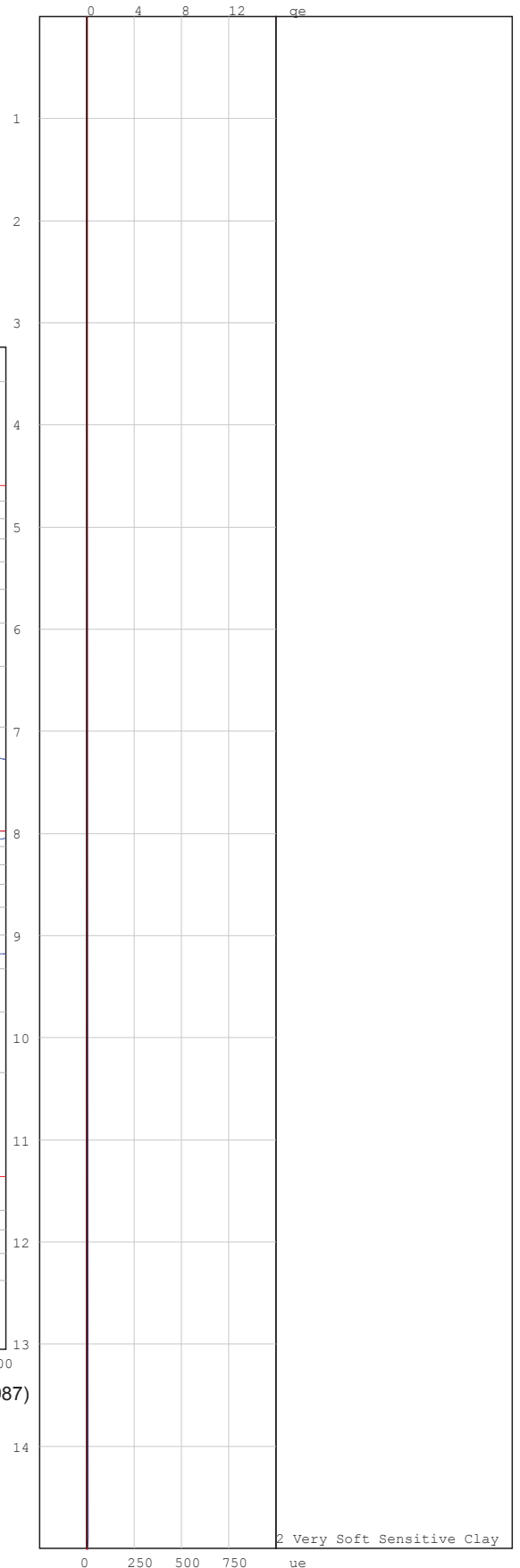
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Date: 2012/06/06

Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



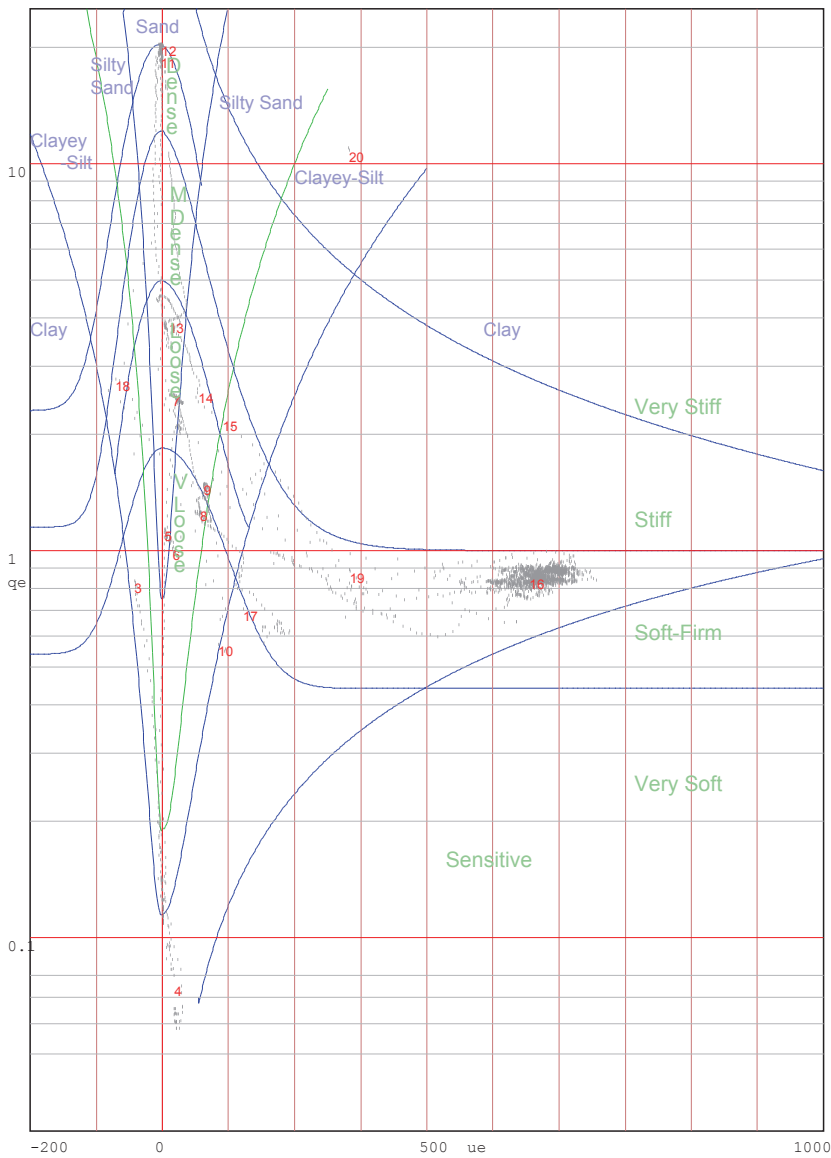
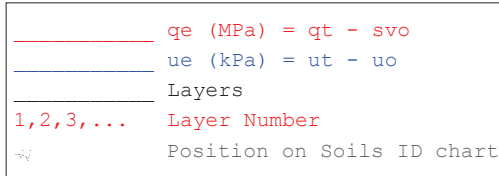
Project: Durban Harbour Over Water

Site: Pier2

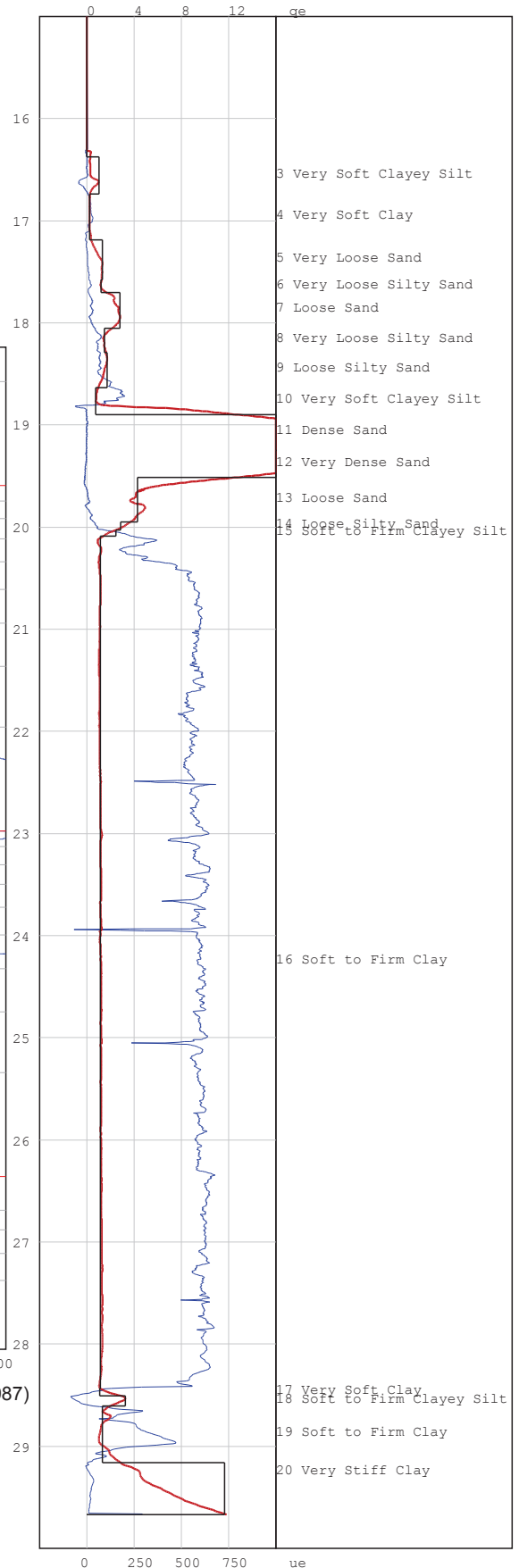
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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

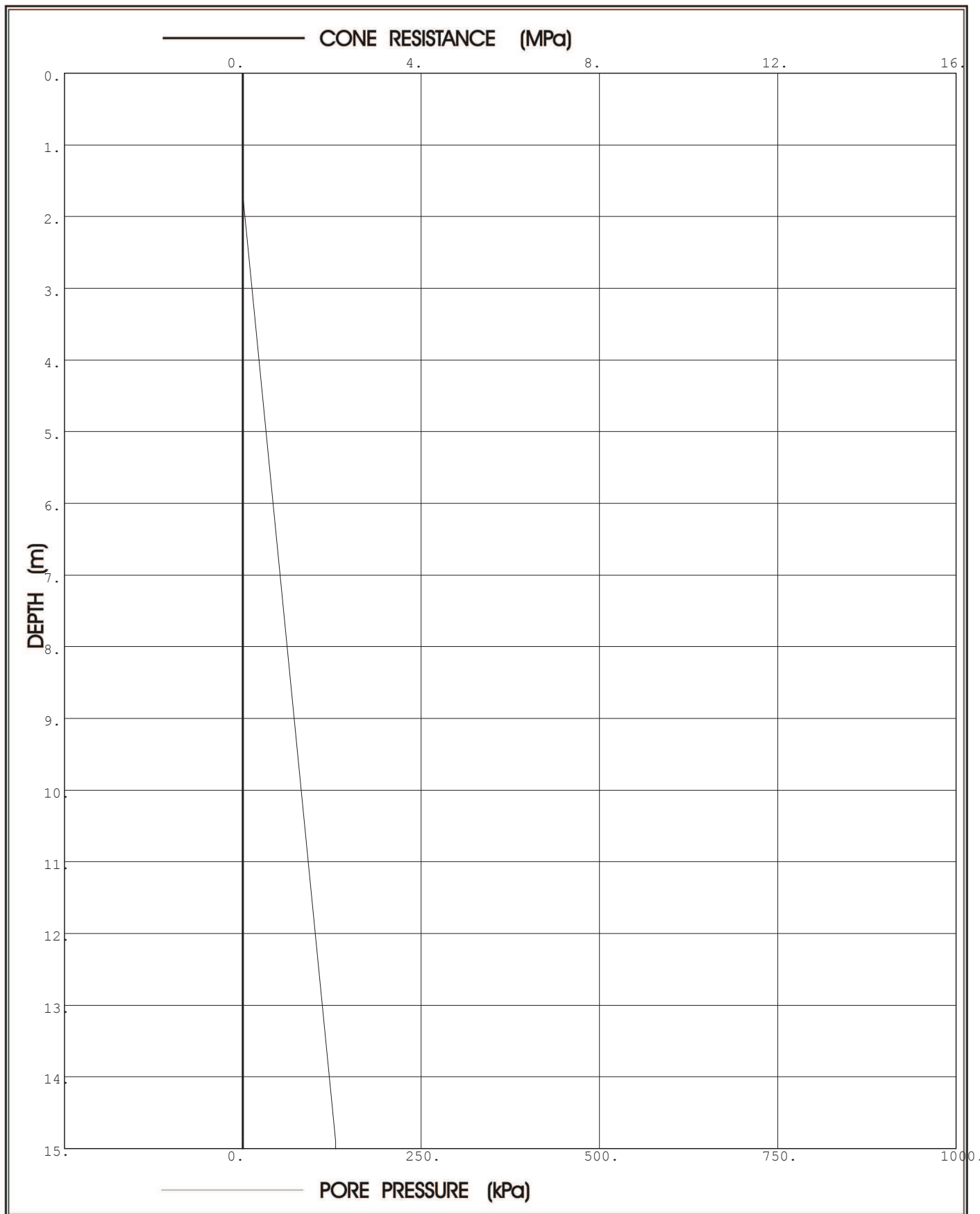
SITE: Pier2

CPTU (RE): CPT10

DATE: 2012-06-28

Probe: GHANA

Page:1



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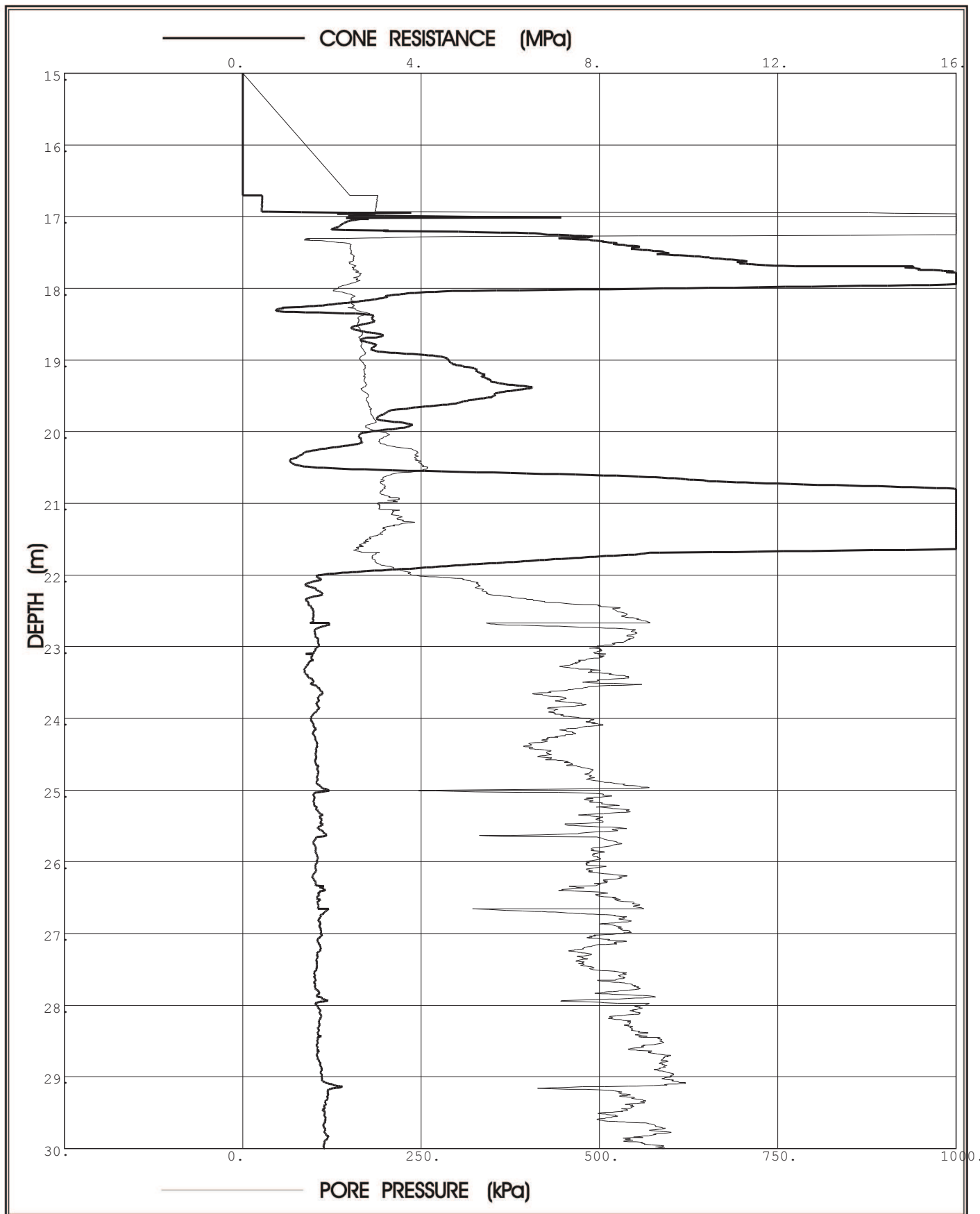
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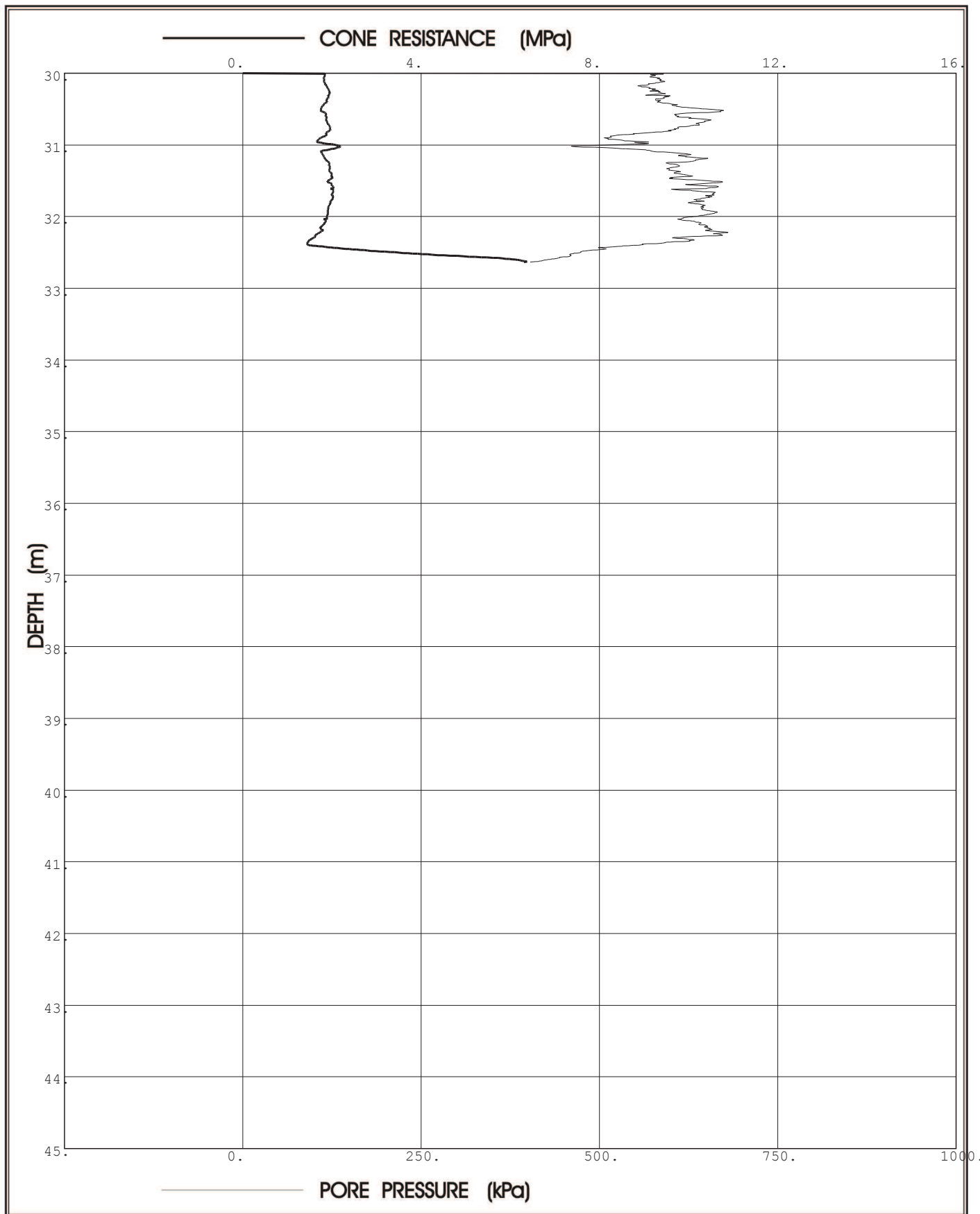
SITE: Pier2

CPTU (RE): CPT10

DATE: 2012-06-28

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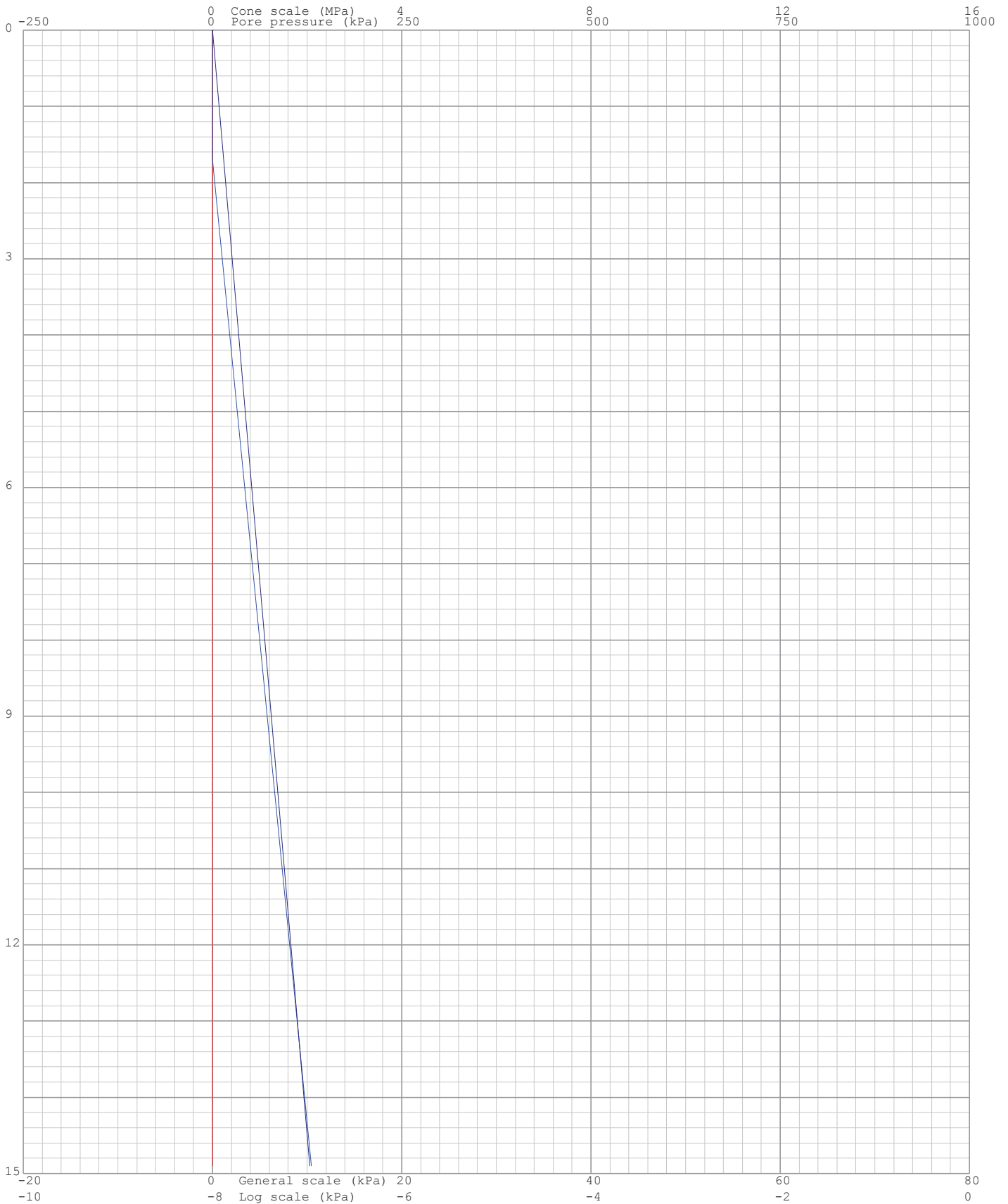
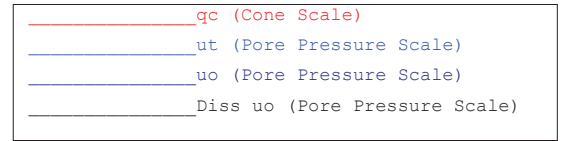
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT10

Date: 2012-06-28

Probe: GHANA



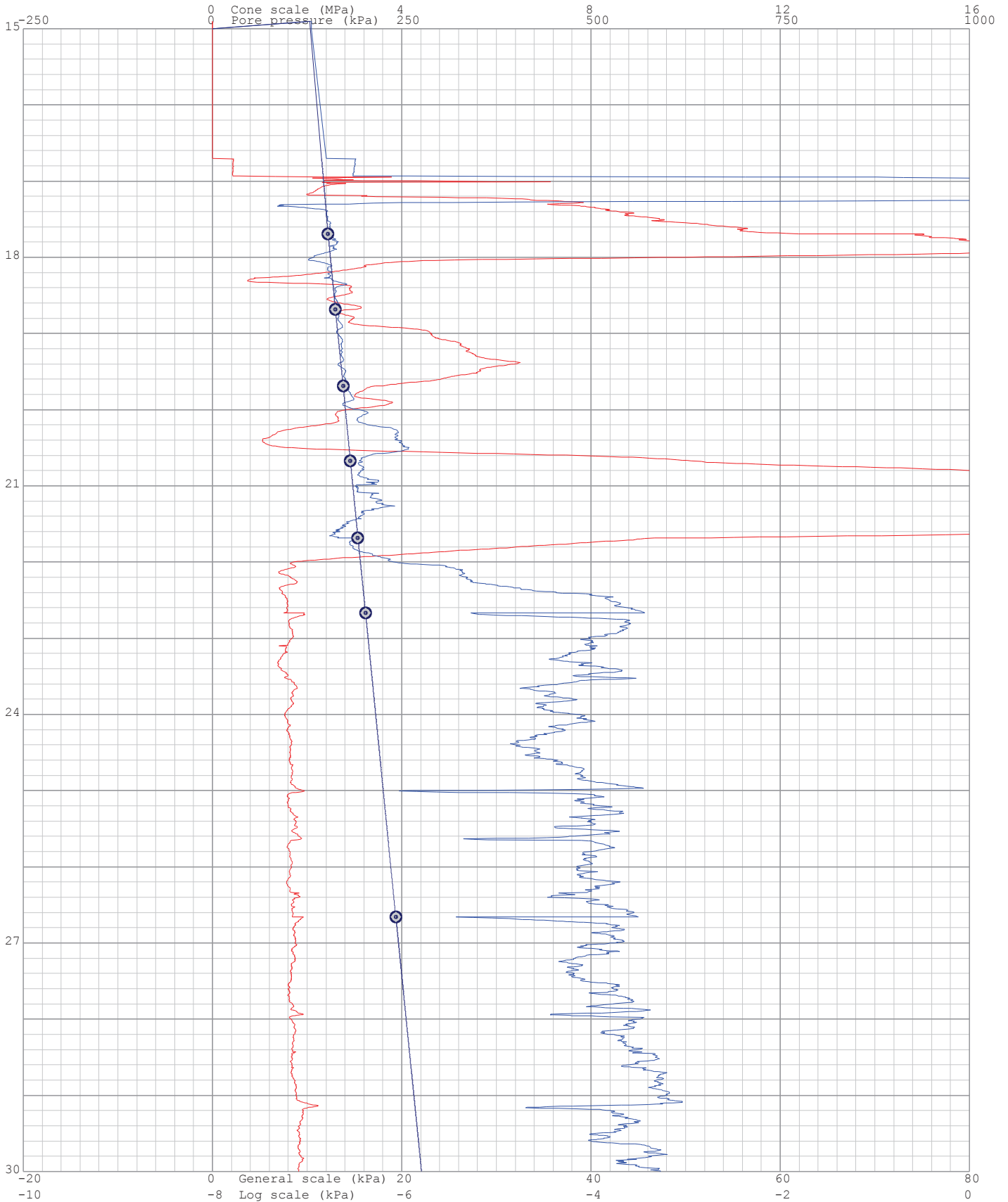
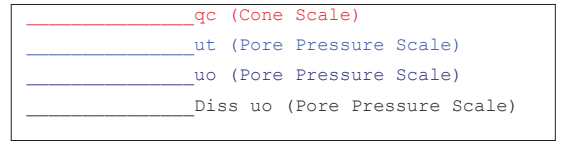
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT10

Date: 2012-06-28

Probe: GHANA



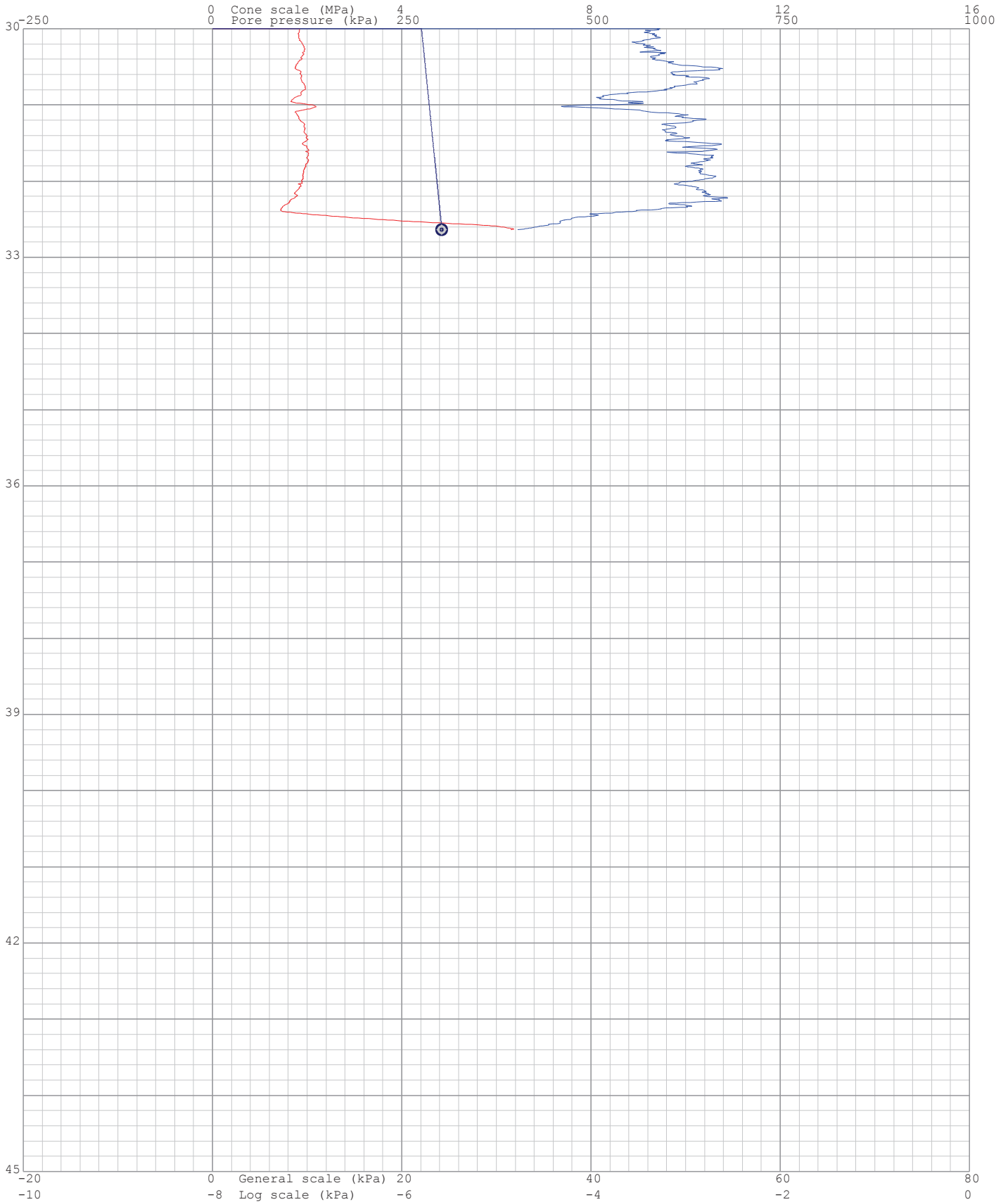
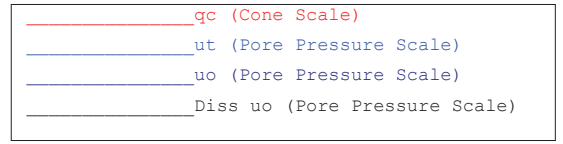
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT10

Date: 2012-06-28

Probe: GHANA



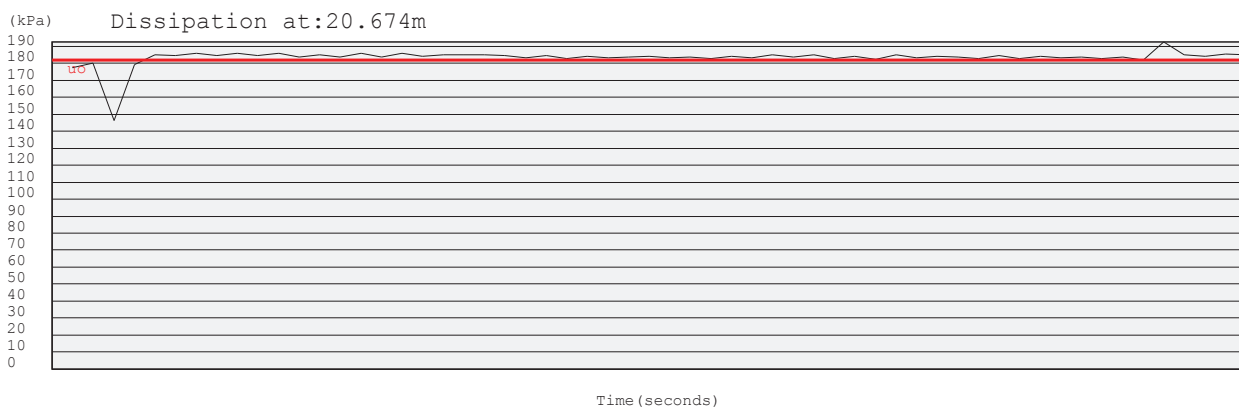
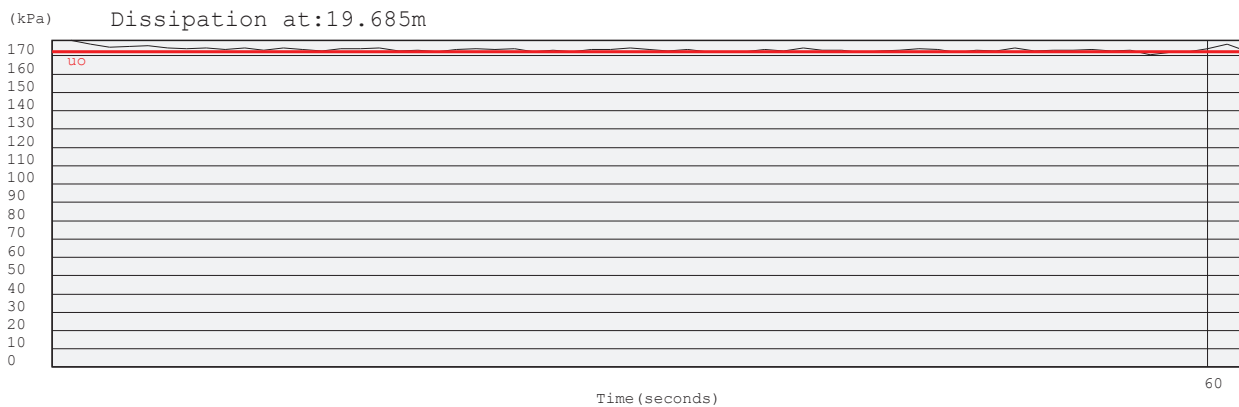
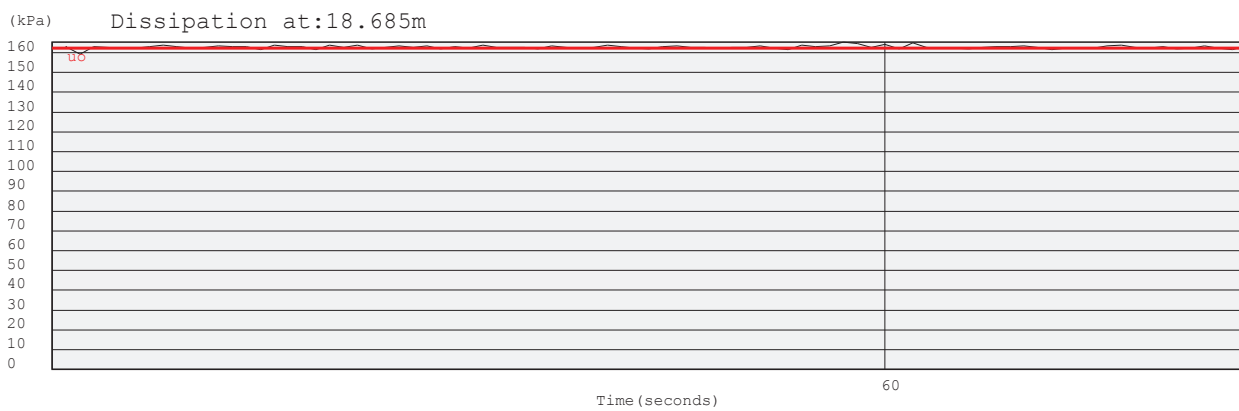
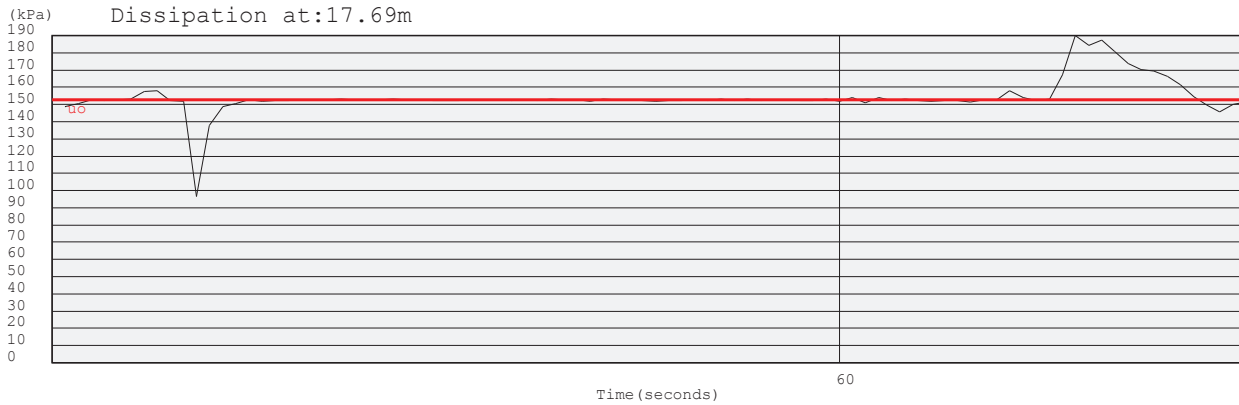
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT10

Date: 2012-06-28

Probe: GHANA  
Page: 1



Project: Durban Harbour Over Water

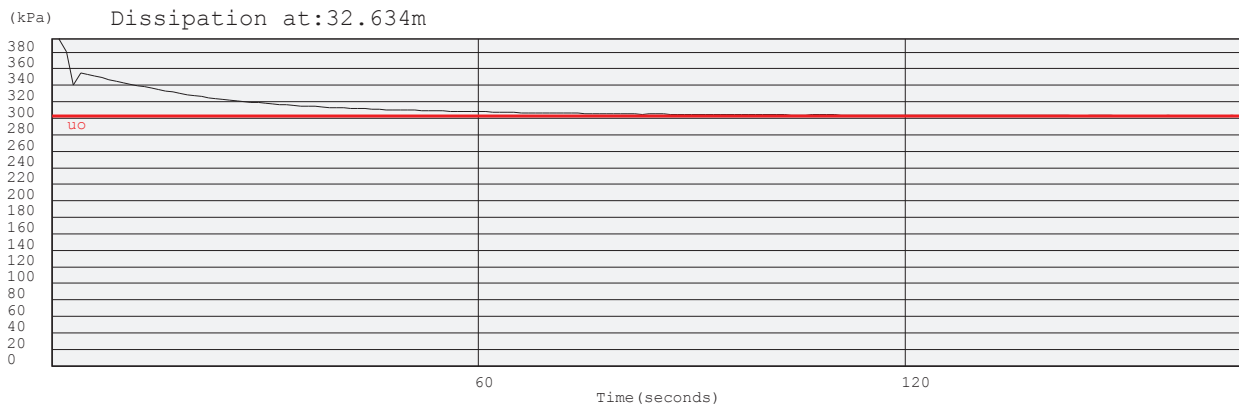
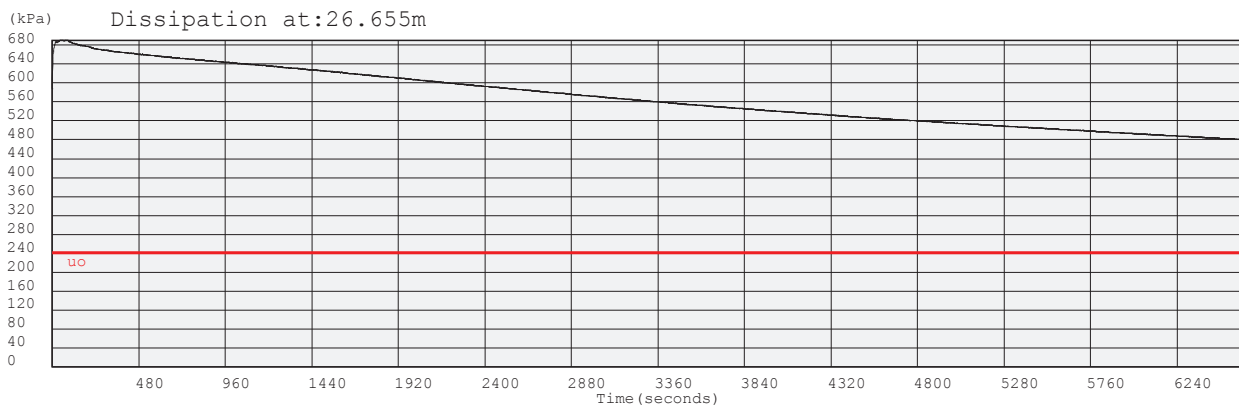
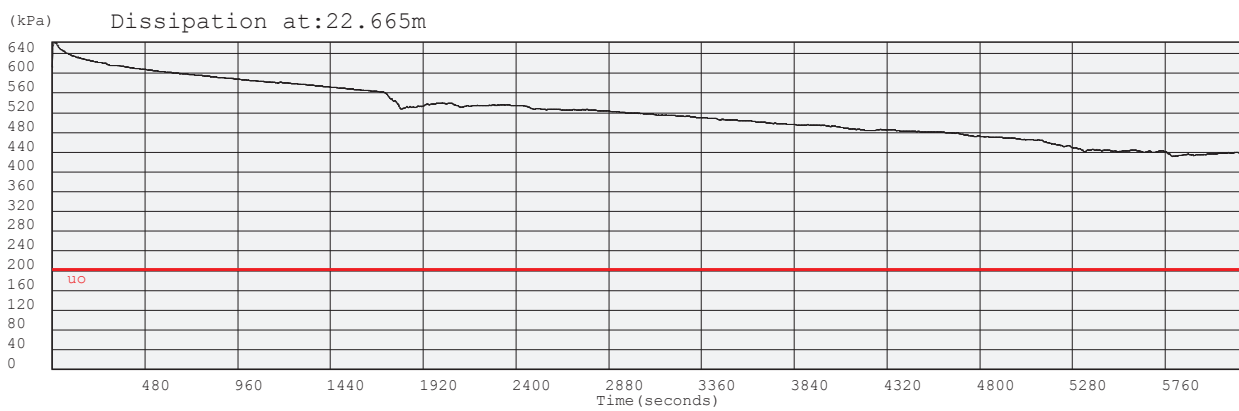
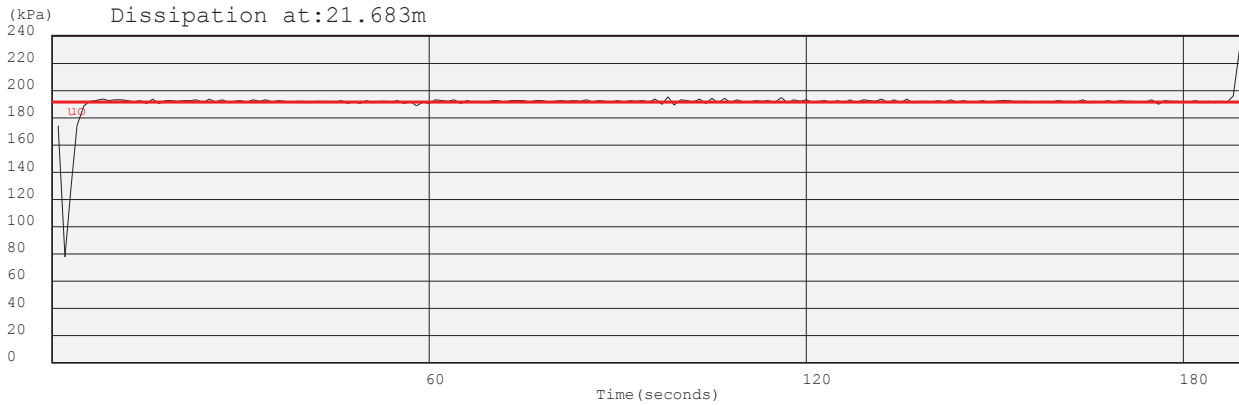
Site: Pier2

Hole: CPT10

Date: 2012-06-28

Probe: GHANA

Page: 2







Project: Durban Harbour Over Water

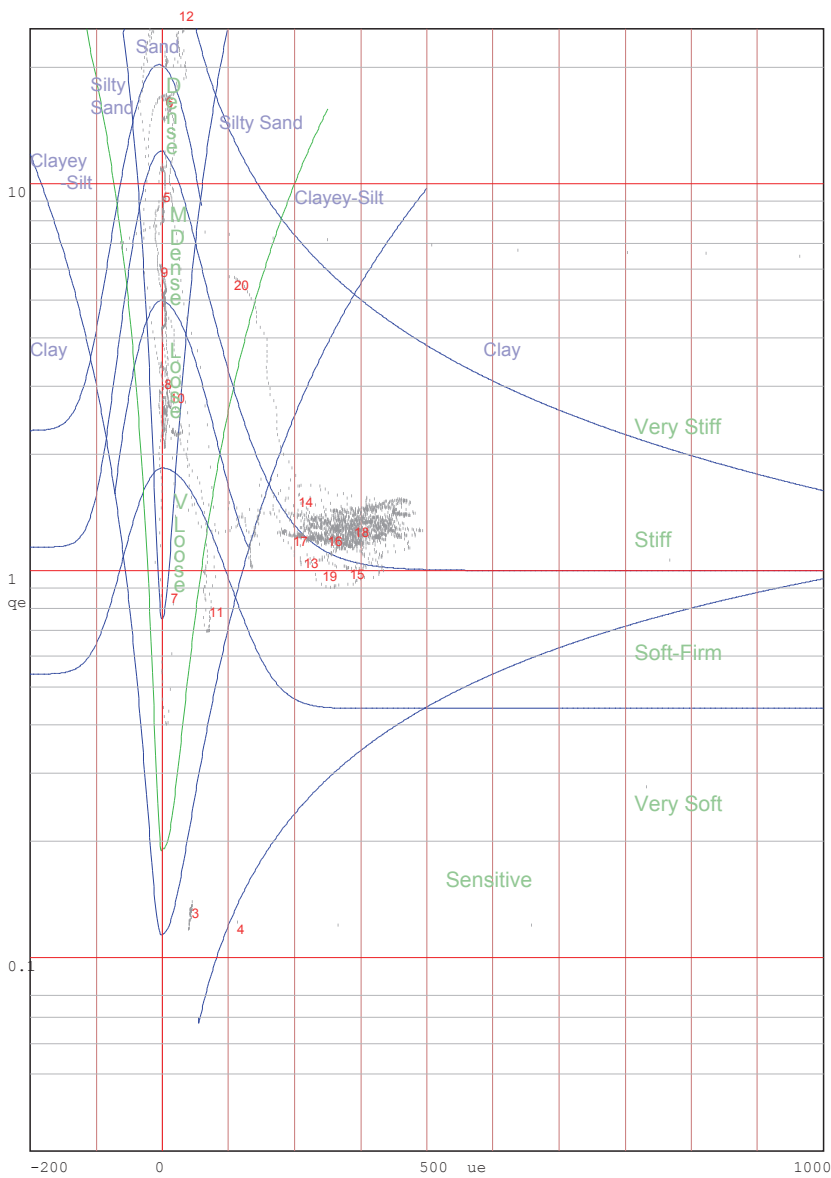
Site: Pier2

Hole No: CPT10

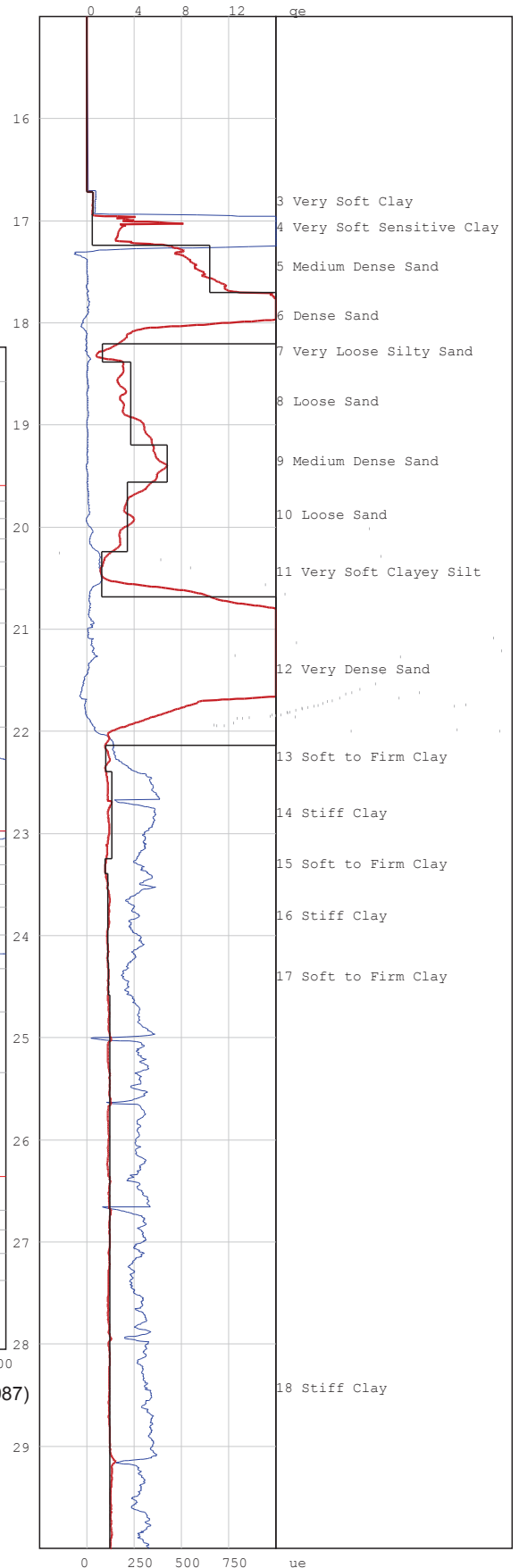
Date: 2012-06-28

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



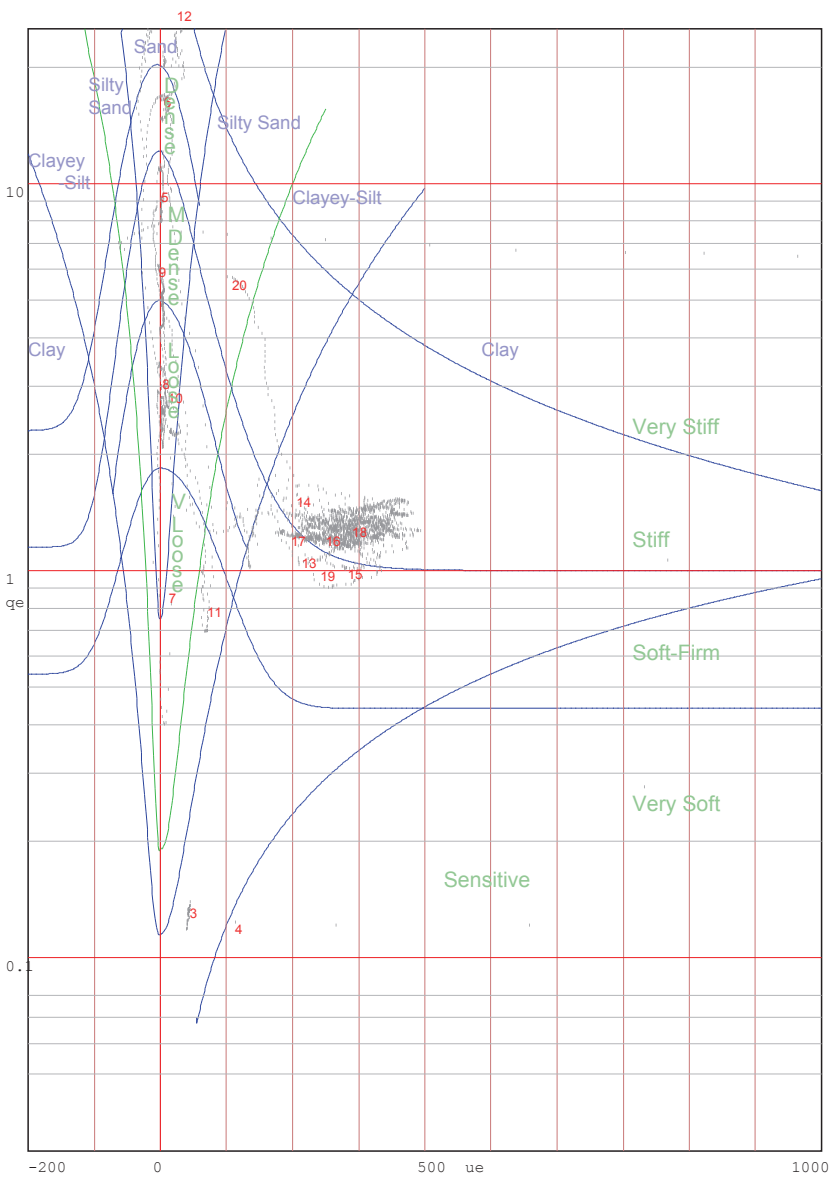
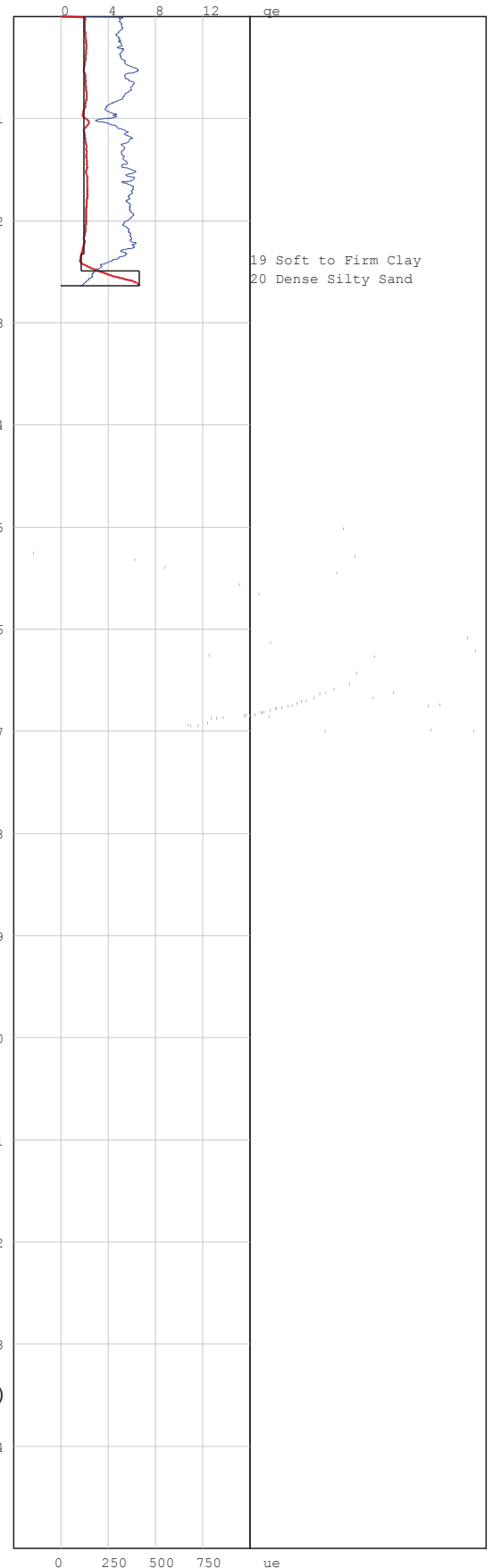
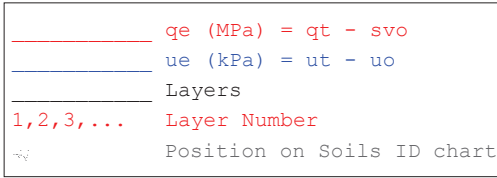
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT10

Date: 2012-06-28

Probe: GHANA



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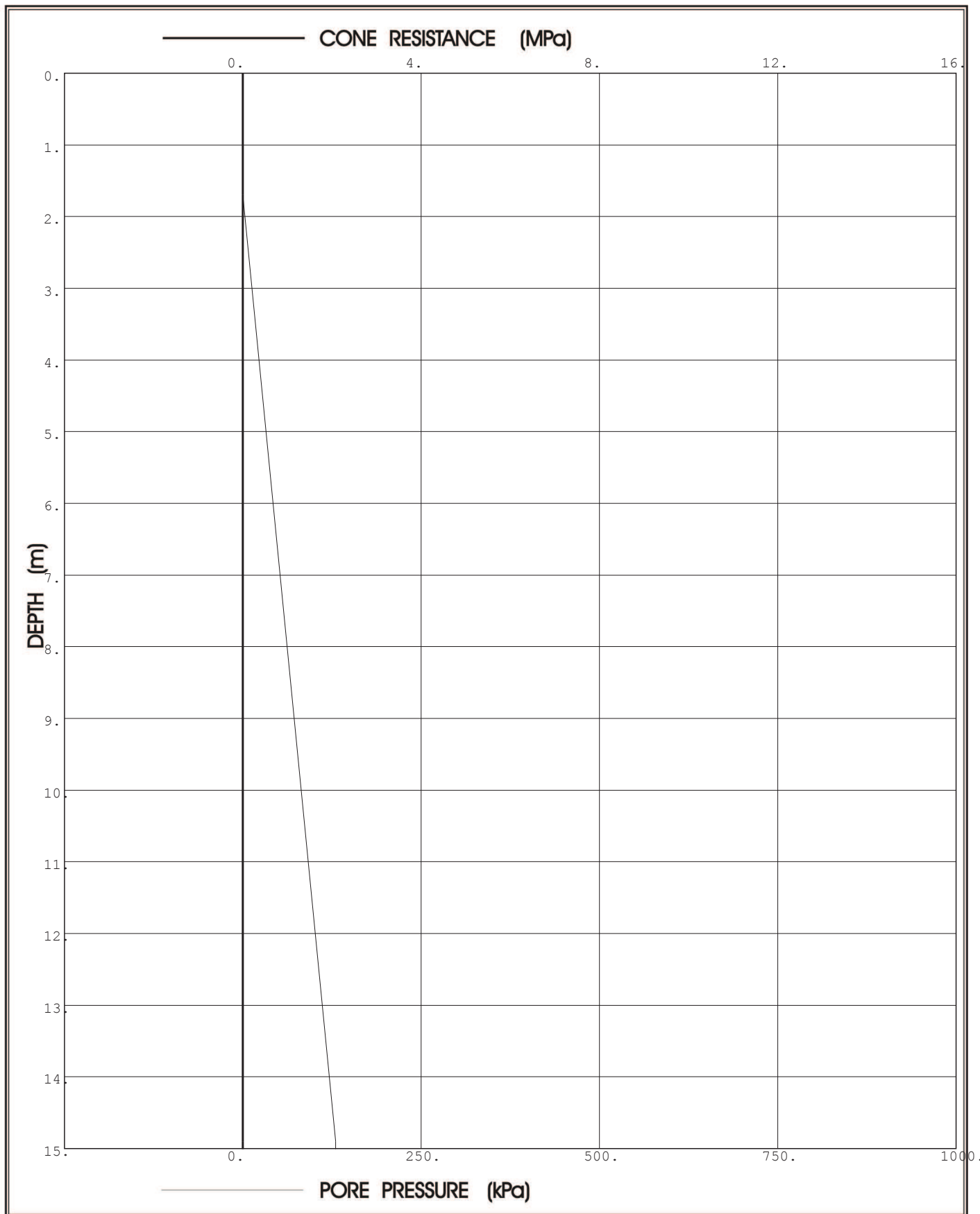
SITE: Pier2

CPTU (RE): CPT11

DATE: 2012/06/14

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

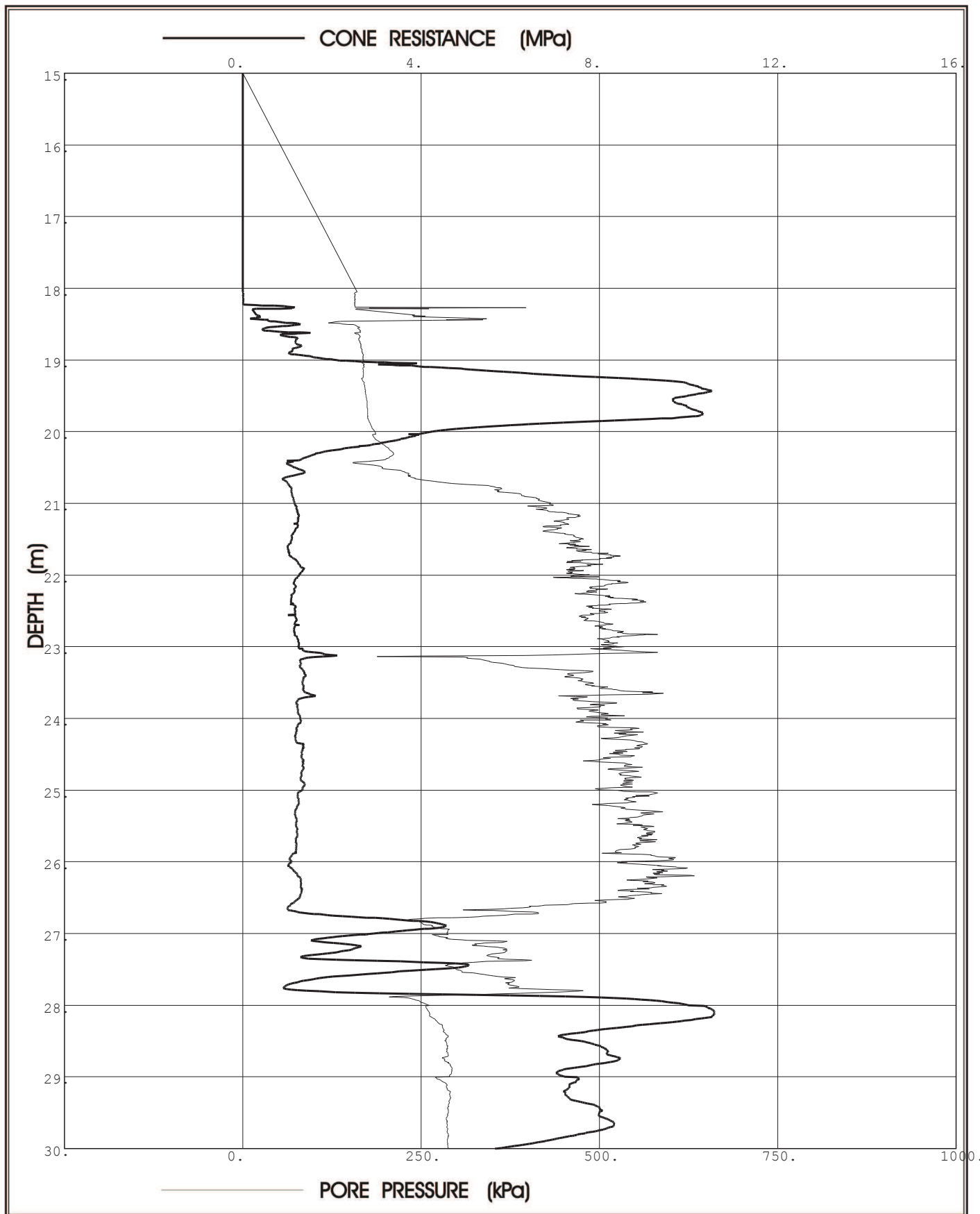
SITE: Pier2

CPTU (RE): CPT11

DATE: 2012/06/14

Probe: KELLER

Page:2



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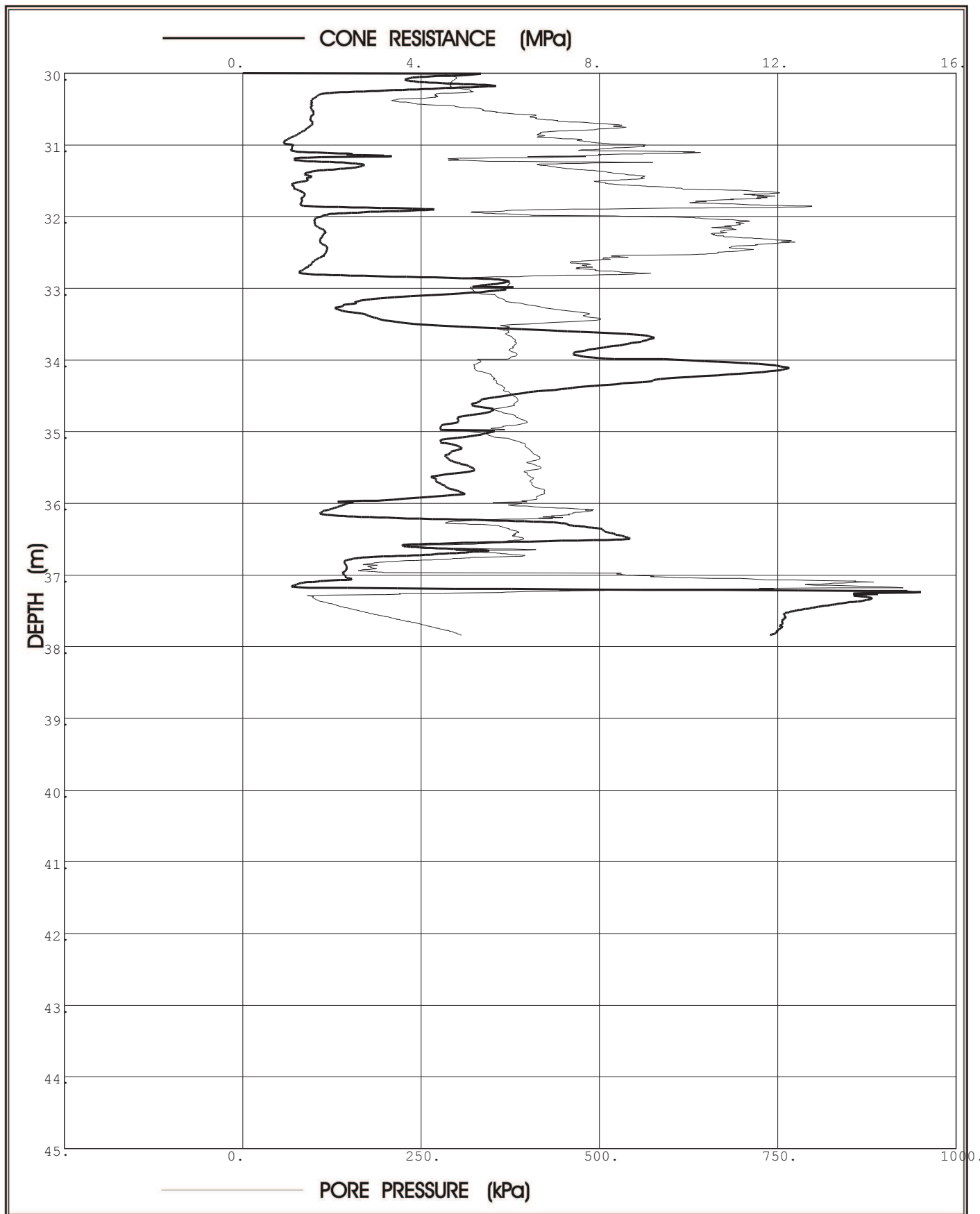
SITE: Pier2

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DATE: 2012/06/14

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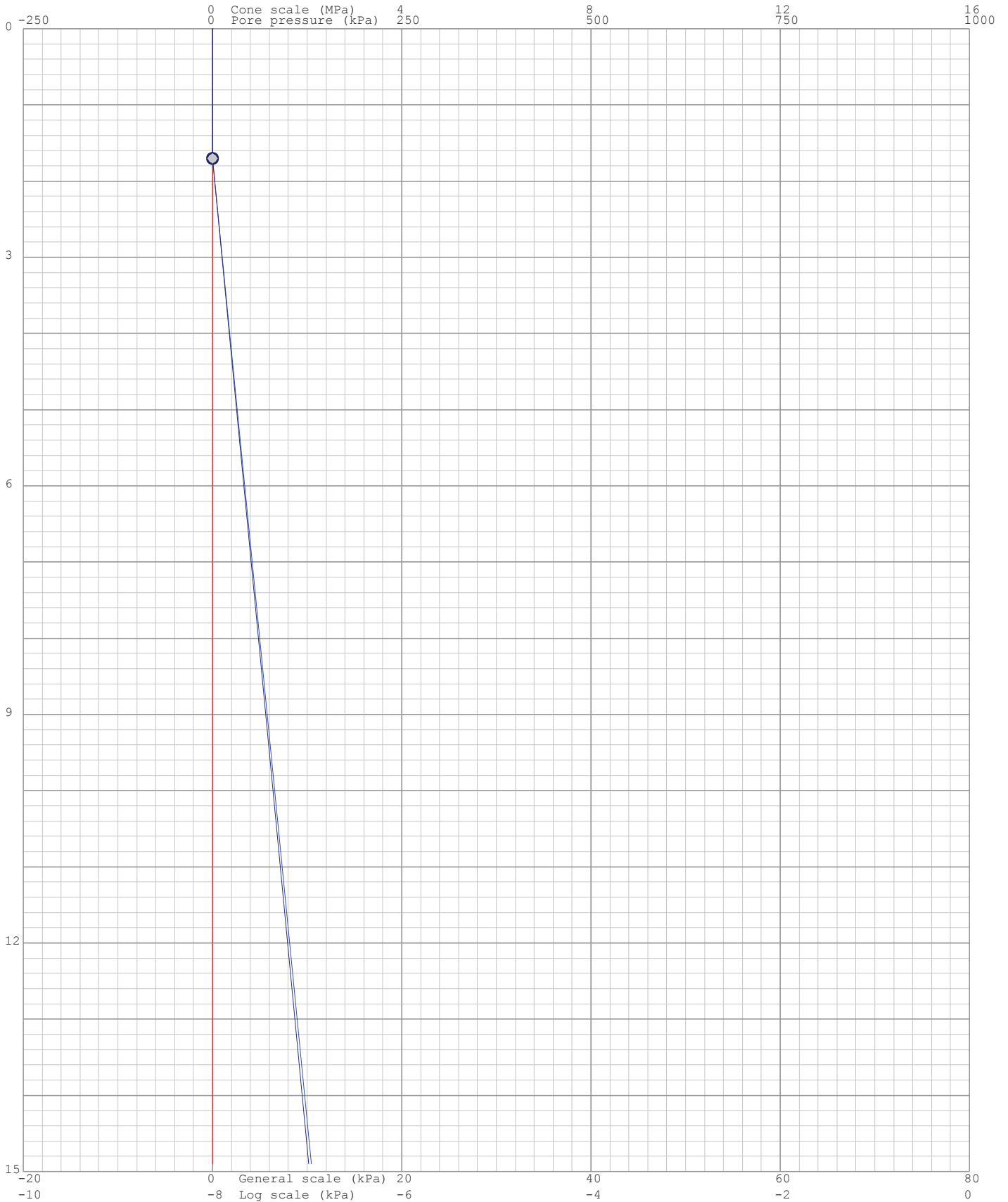
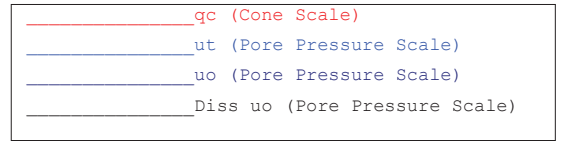
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT11

Date: 2012/06/14

Probe: KELLER



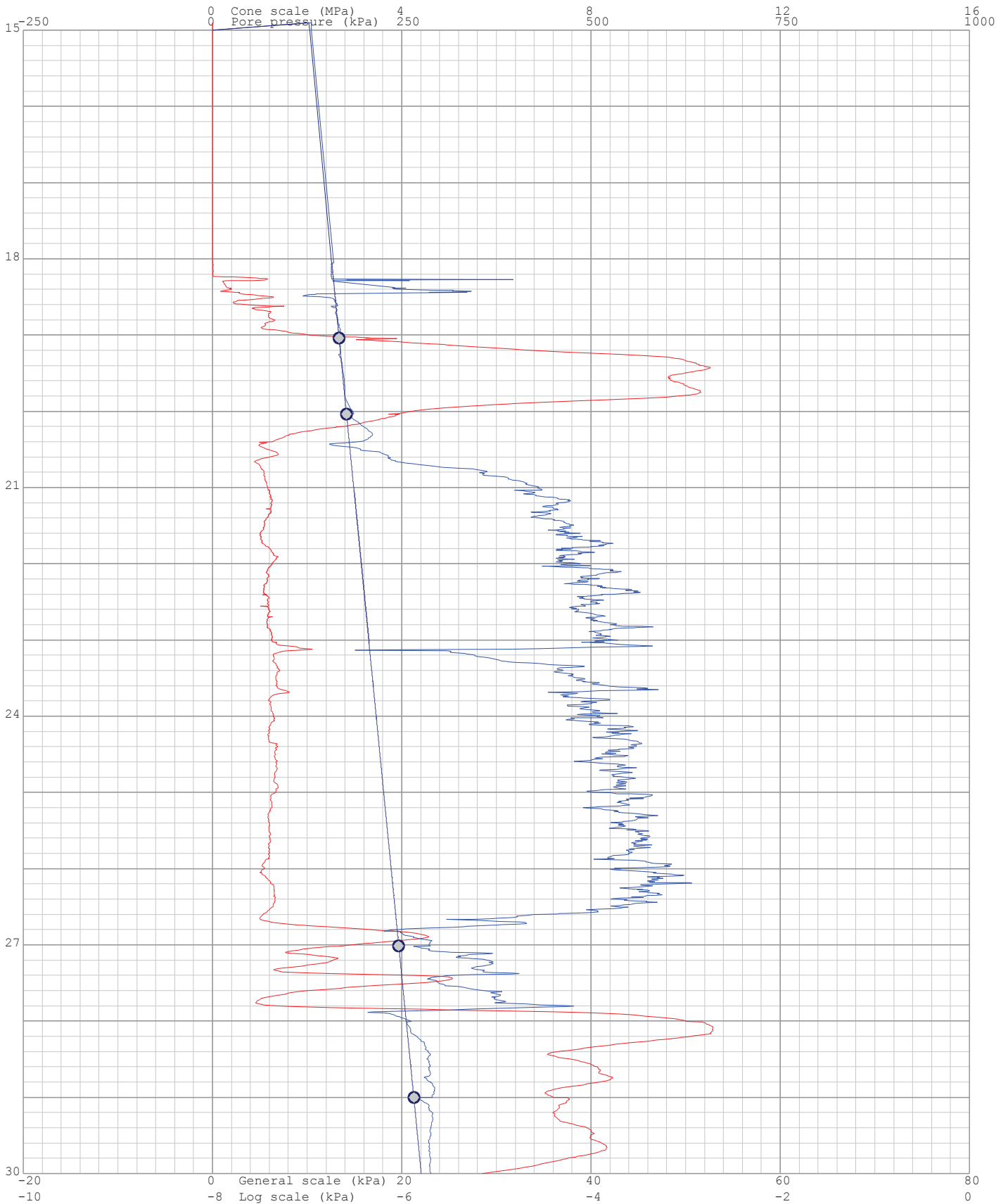
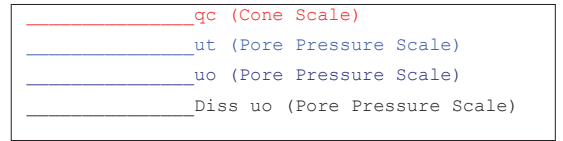
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT11

Date: 2012/06/14

Probe: KELLER



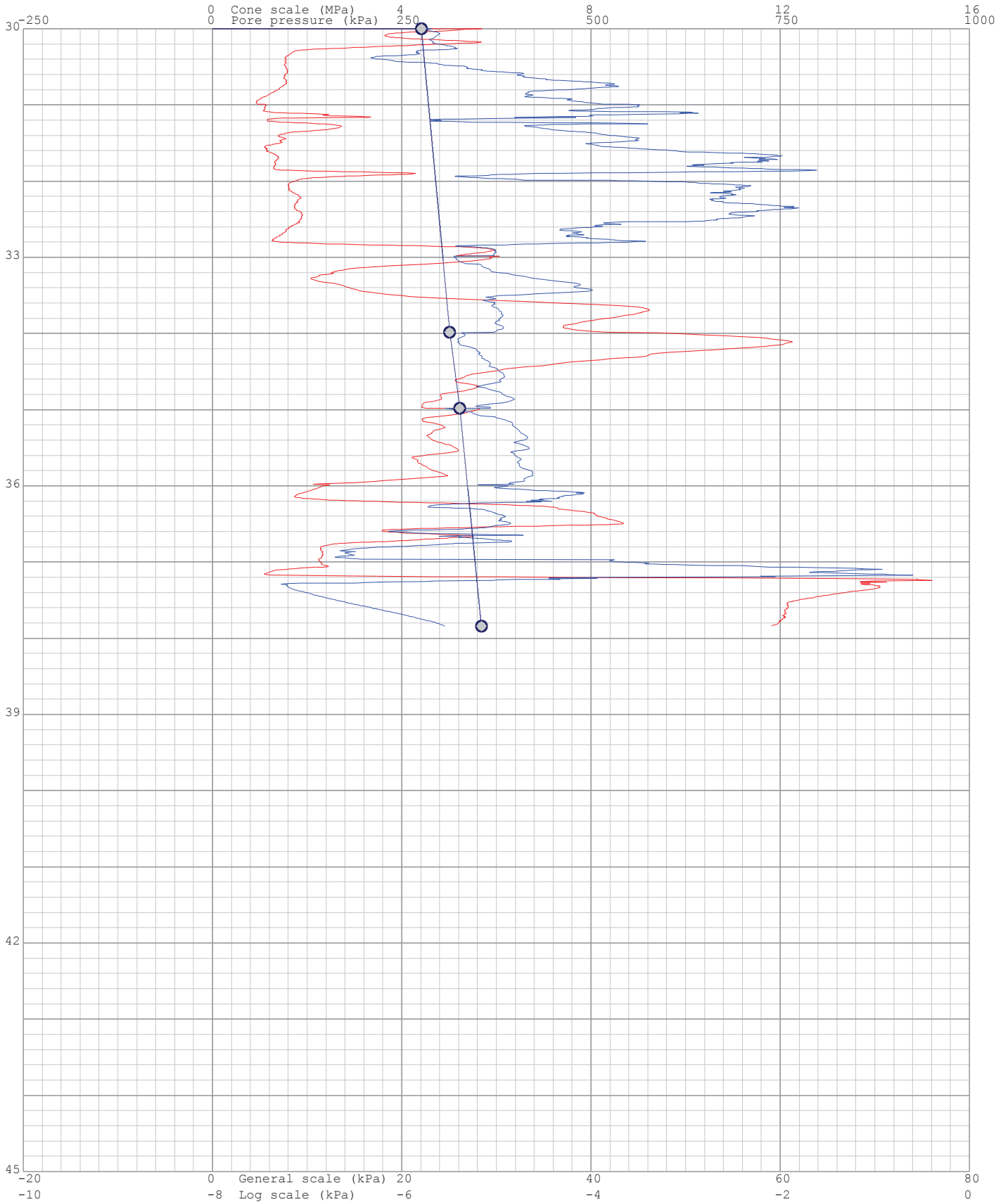
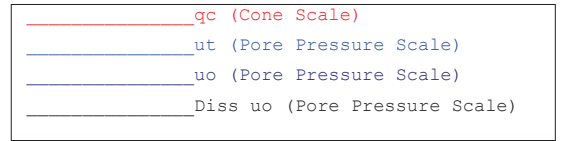
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT11

Date: 2012/06/14

Probe: KELLER





Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT11

Date: 2012/06/14

Probe: KELLER  
Page: 1

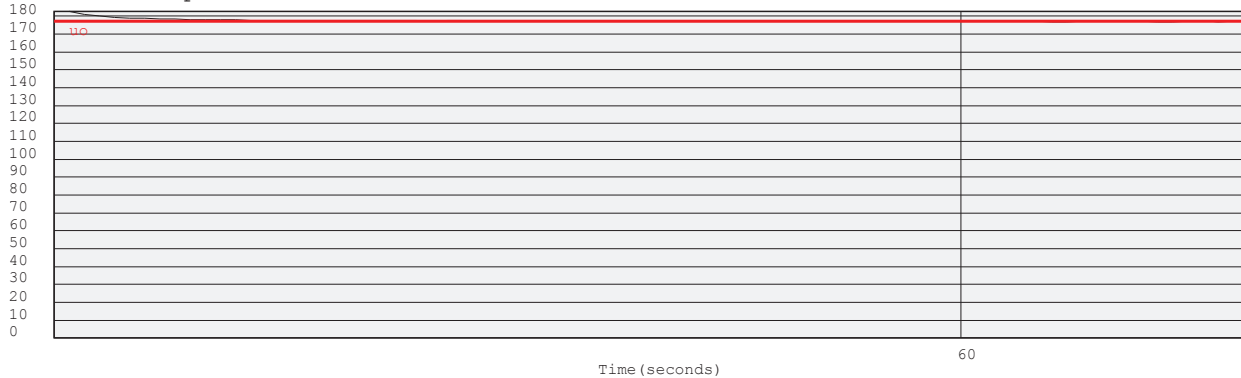
(kPa) Dissipation at: 1.7m



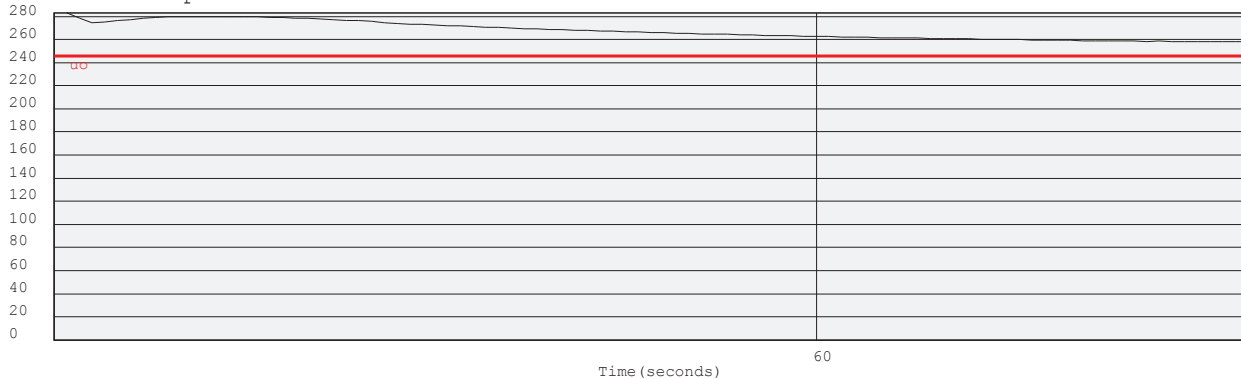
(kPa) Dissipation at: 19.04m



(kPa) Dissipation at: 20.036m



(kPa) Dissipation at: 27.014m



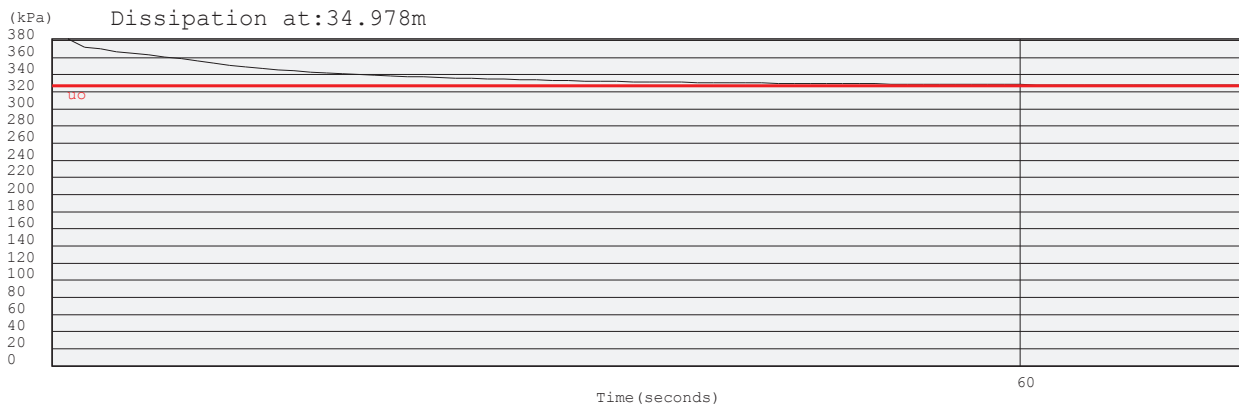
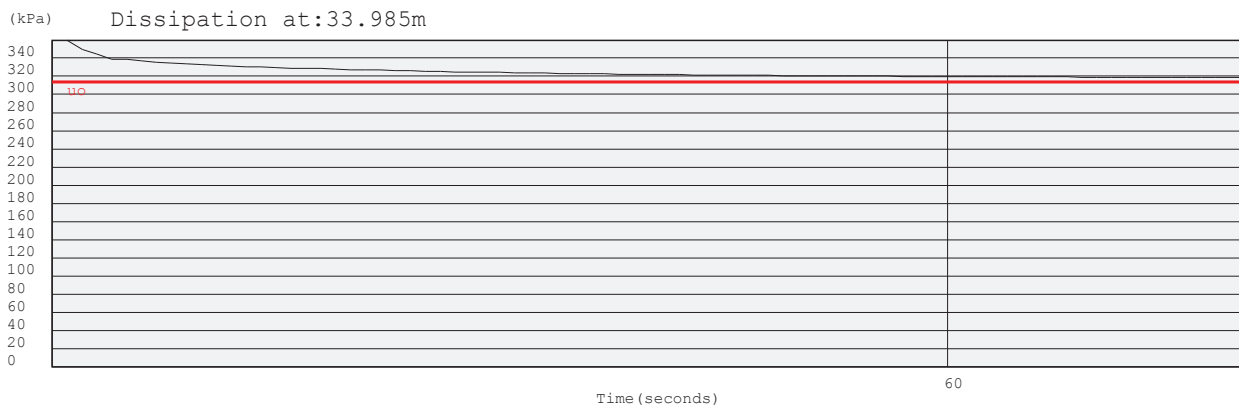
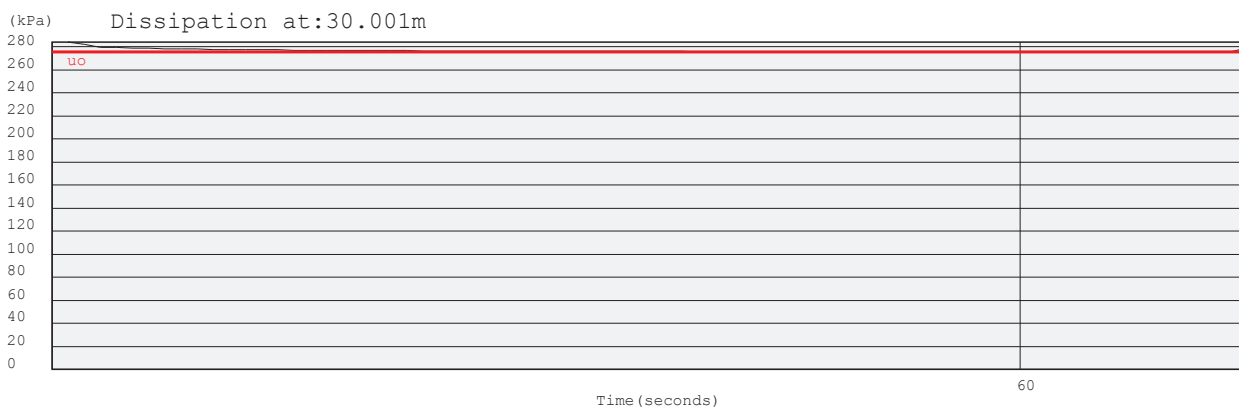
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT11

Date: 2012/06/14

Probe: KELLER  
Page: 2



Project: Durban Harbour Over Water

Site: Pier2

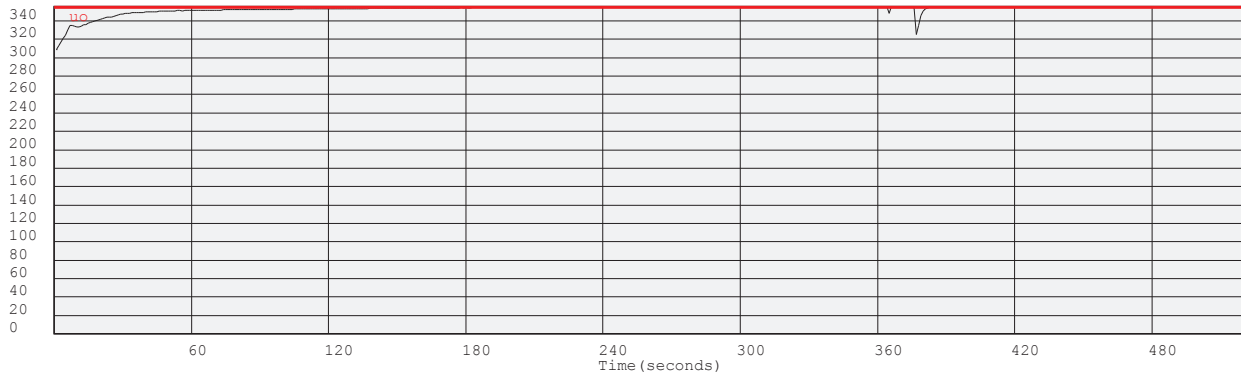
Hole: CPT11

Date: 2012/06/14

Probe: KELLER

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(kPa) Dissipation at: 37.839m



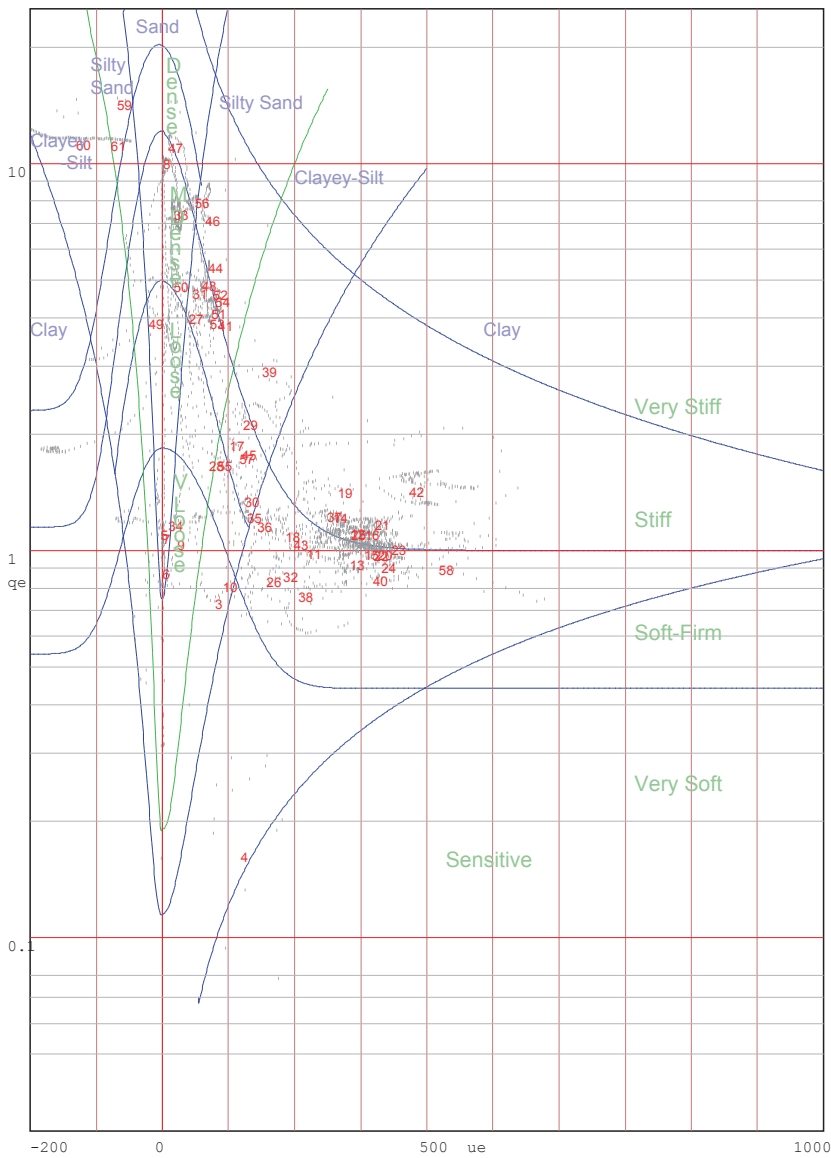
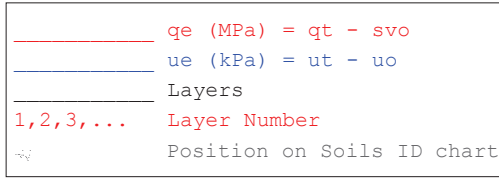
Project: Durban Harbour Over Water

Site: Pier2

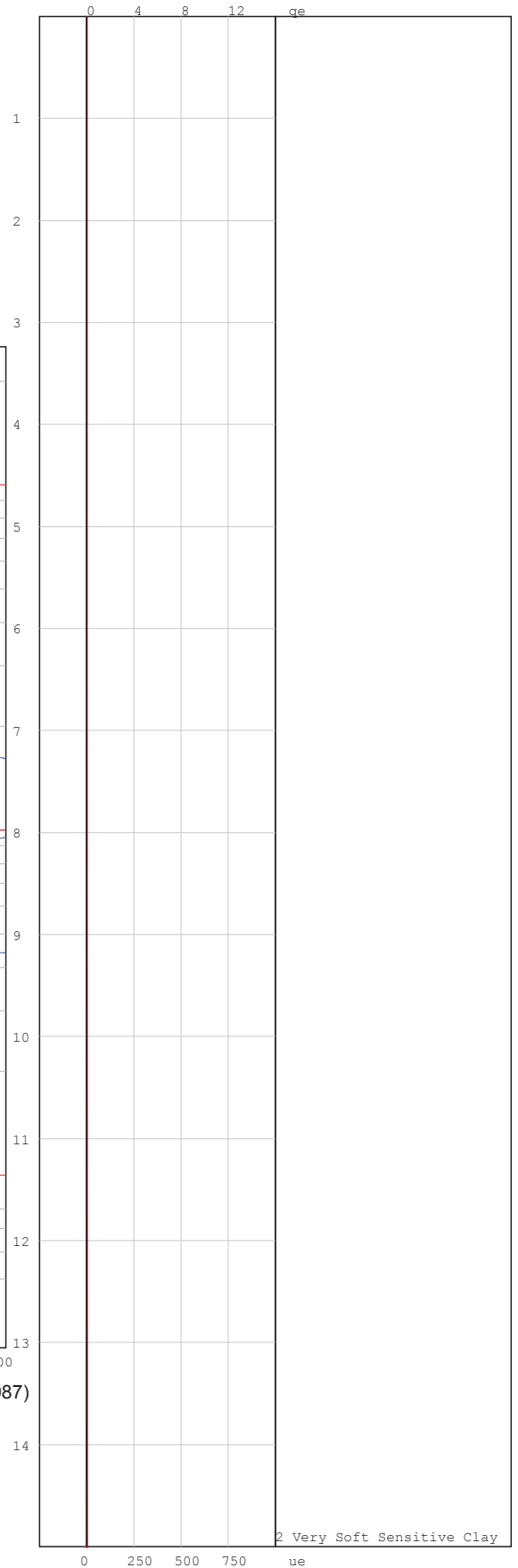
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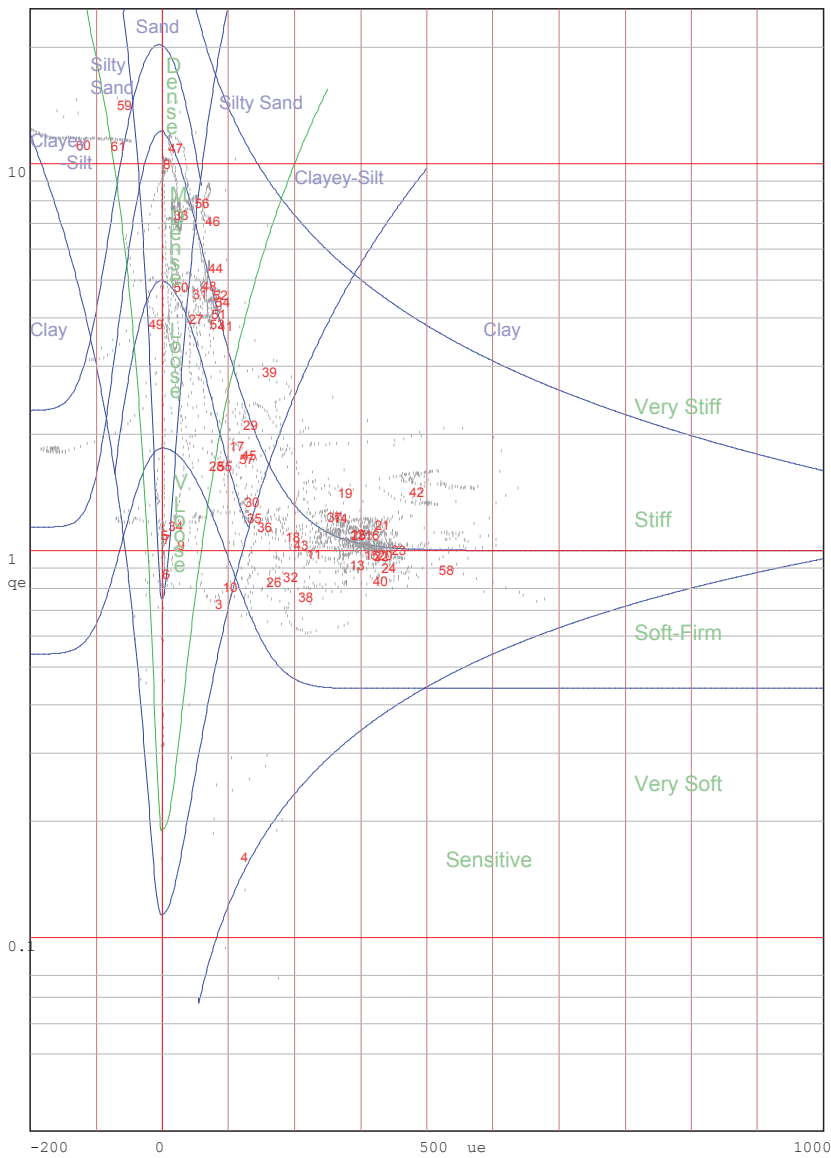
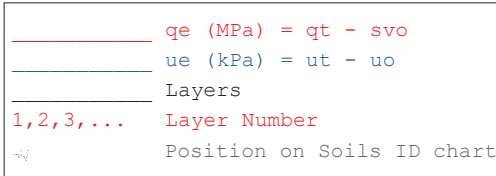
Date: 2012/06/14

Probe: KELLER

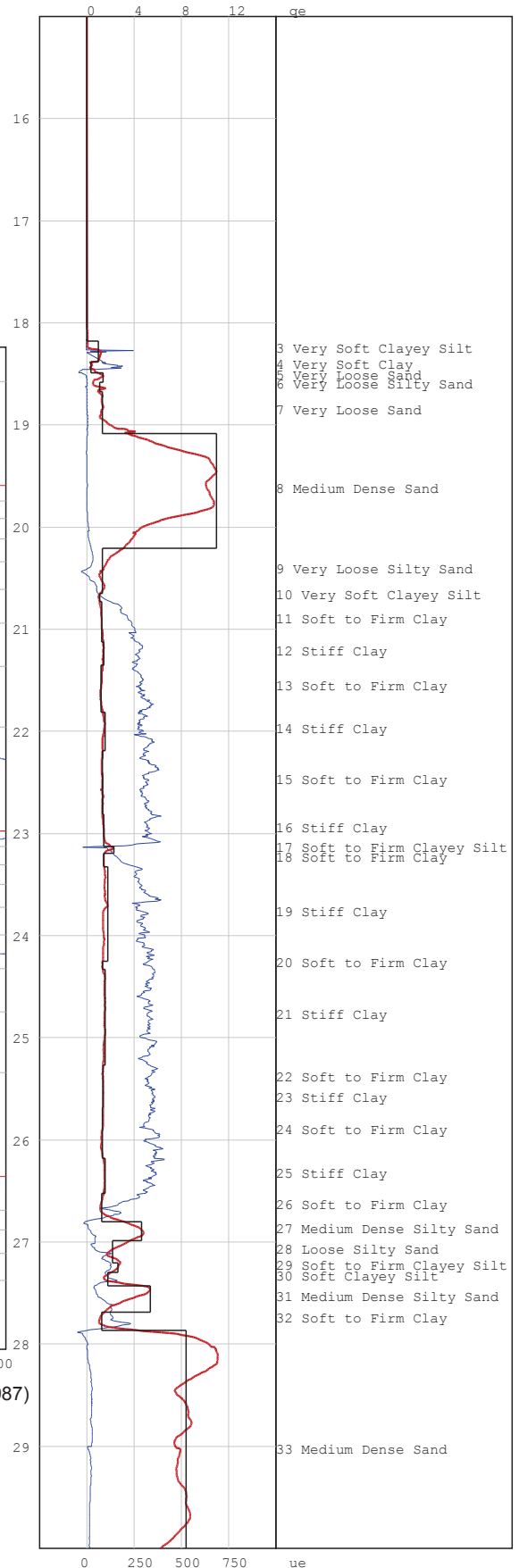


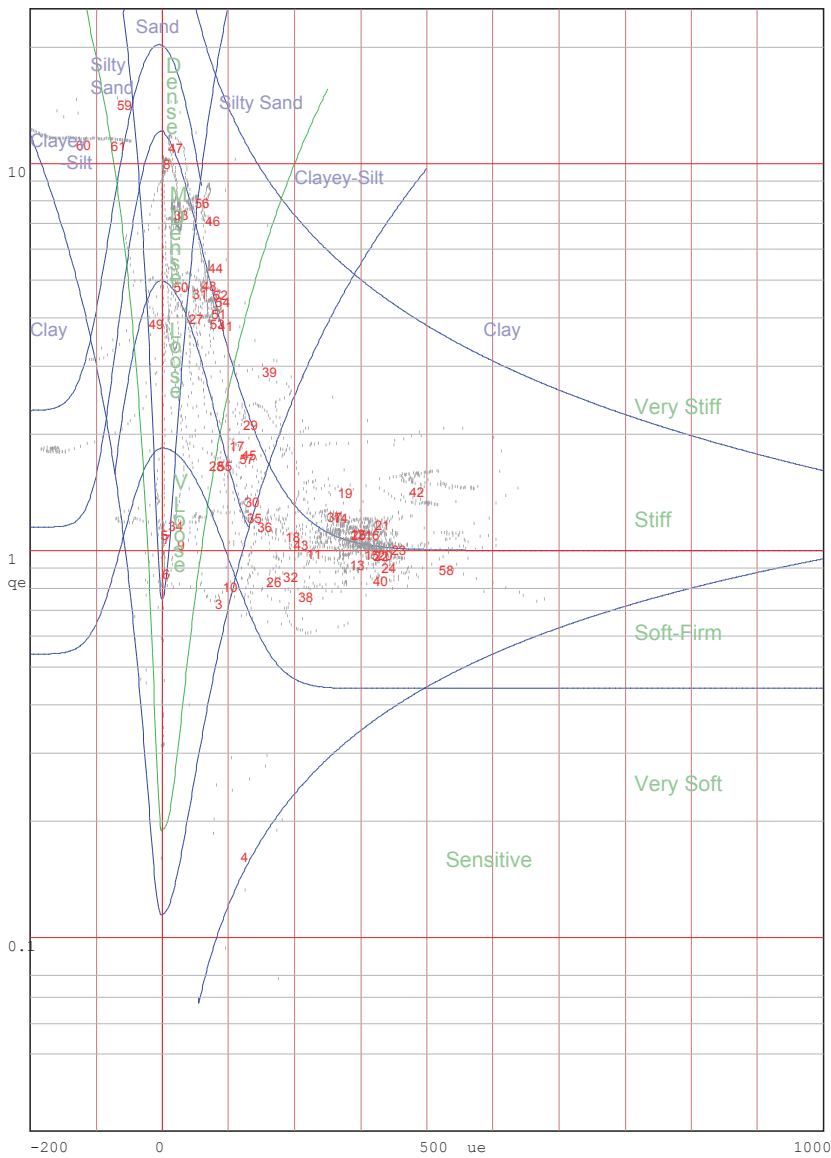
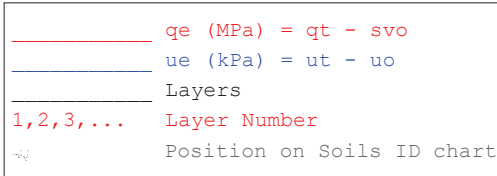
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



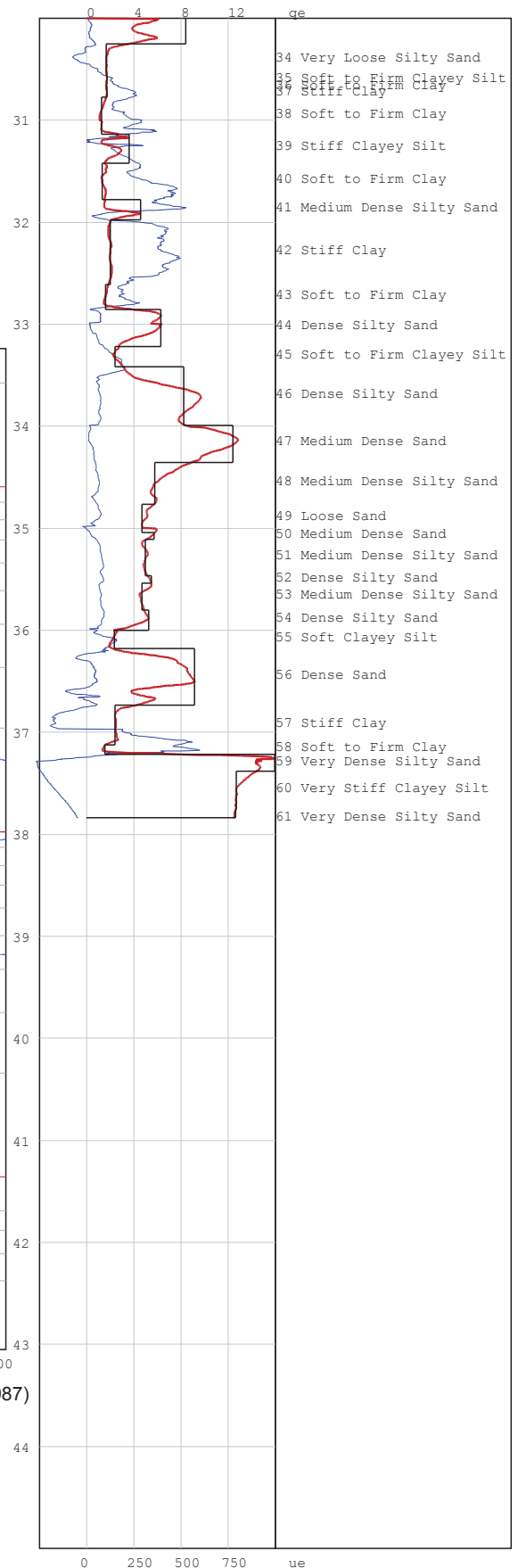


Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

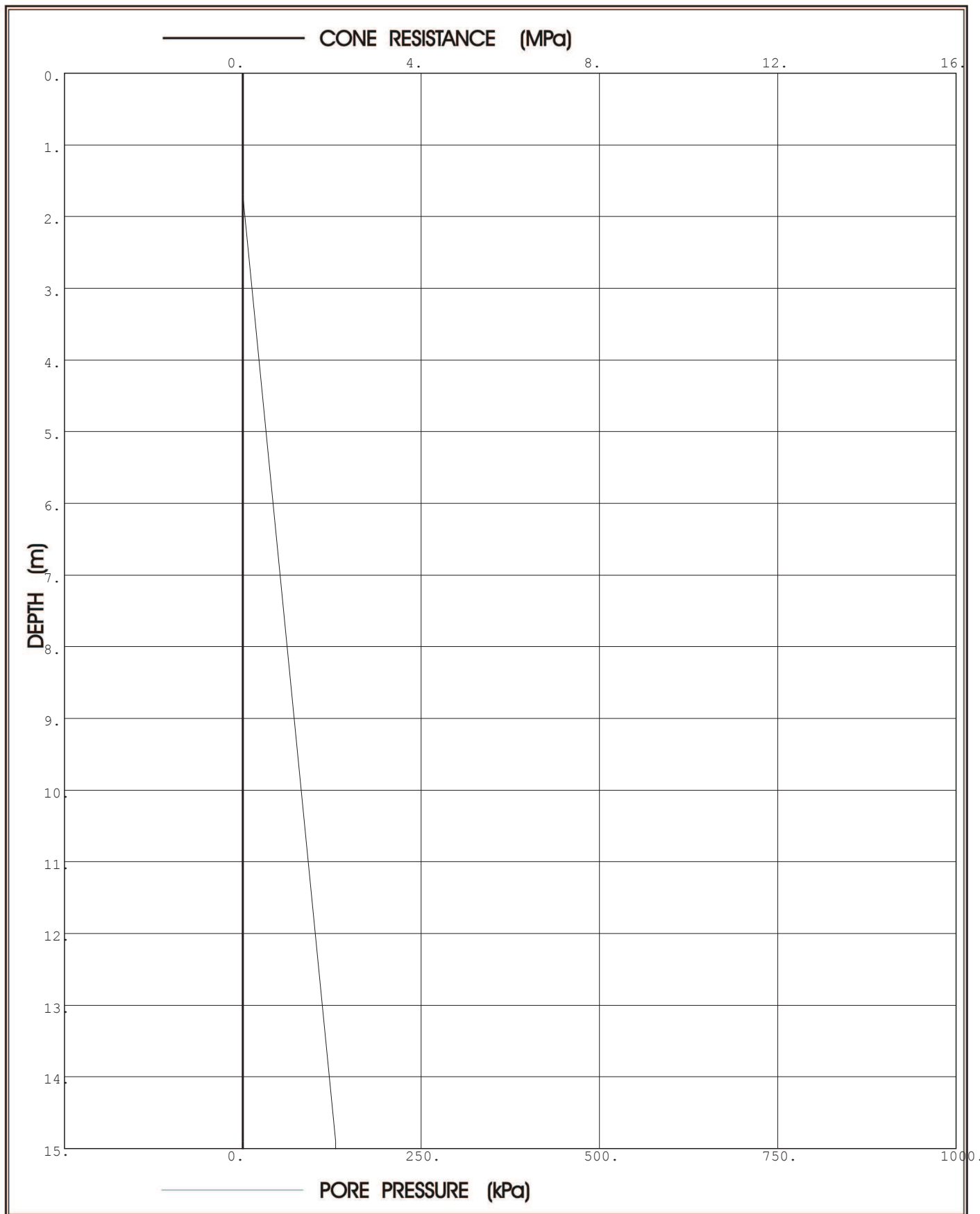
SITE: Pier2

CPTU (RE): CPT12

DATE: 2012/06/15

Probe: GHANA

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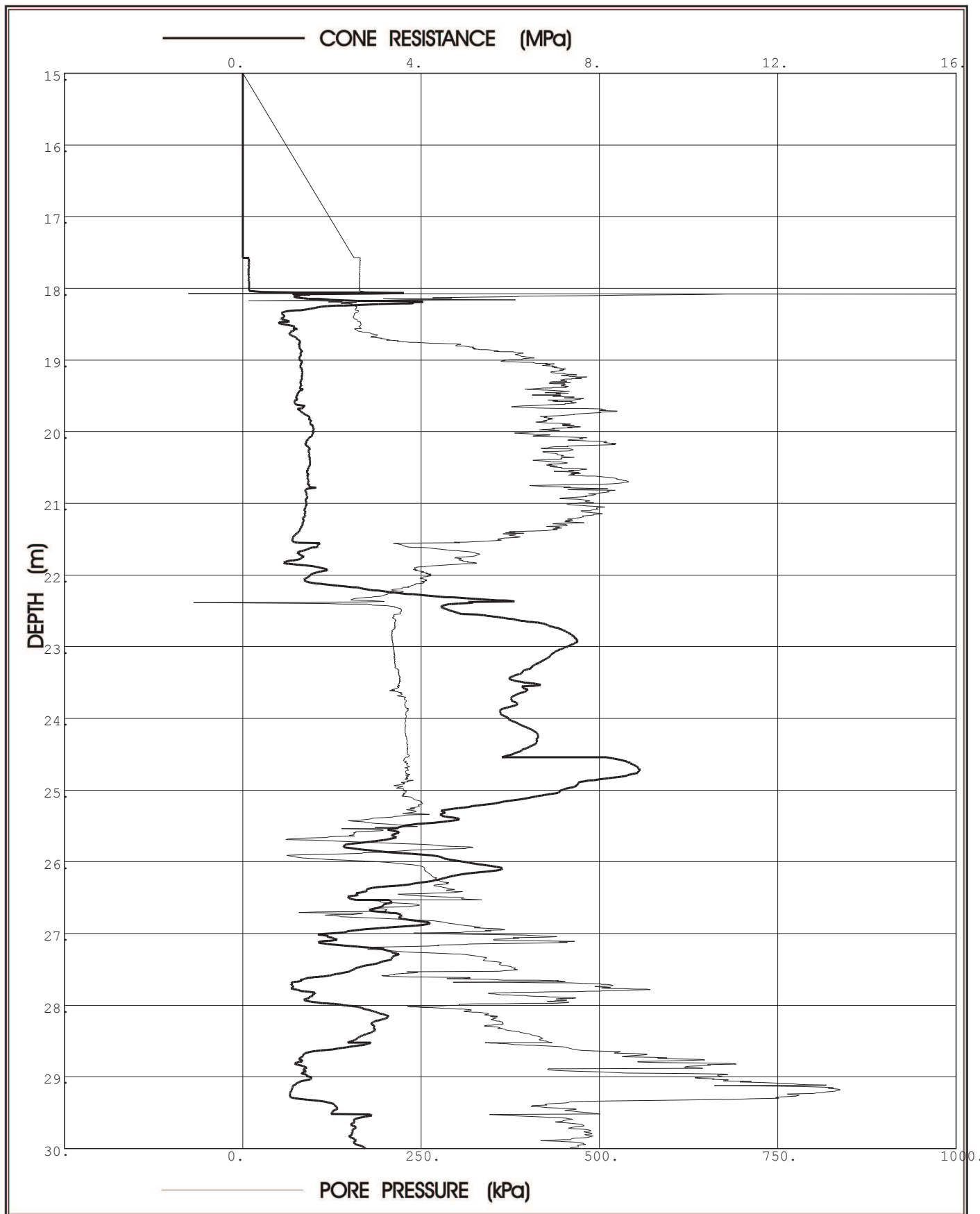
SITE: Pier2

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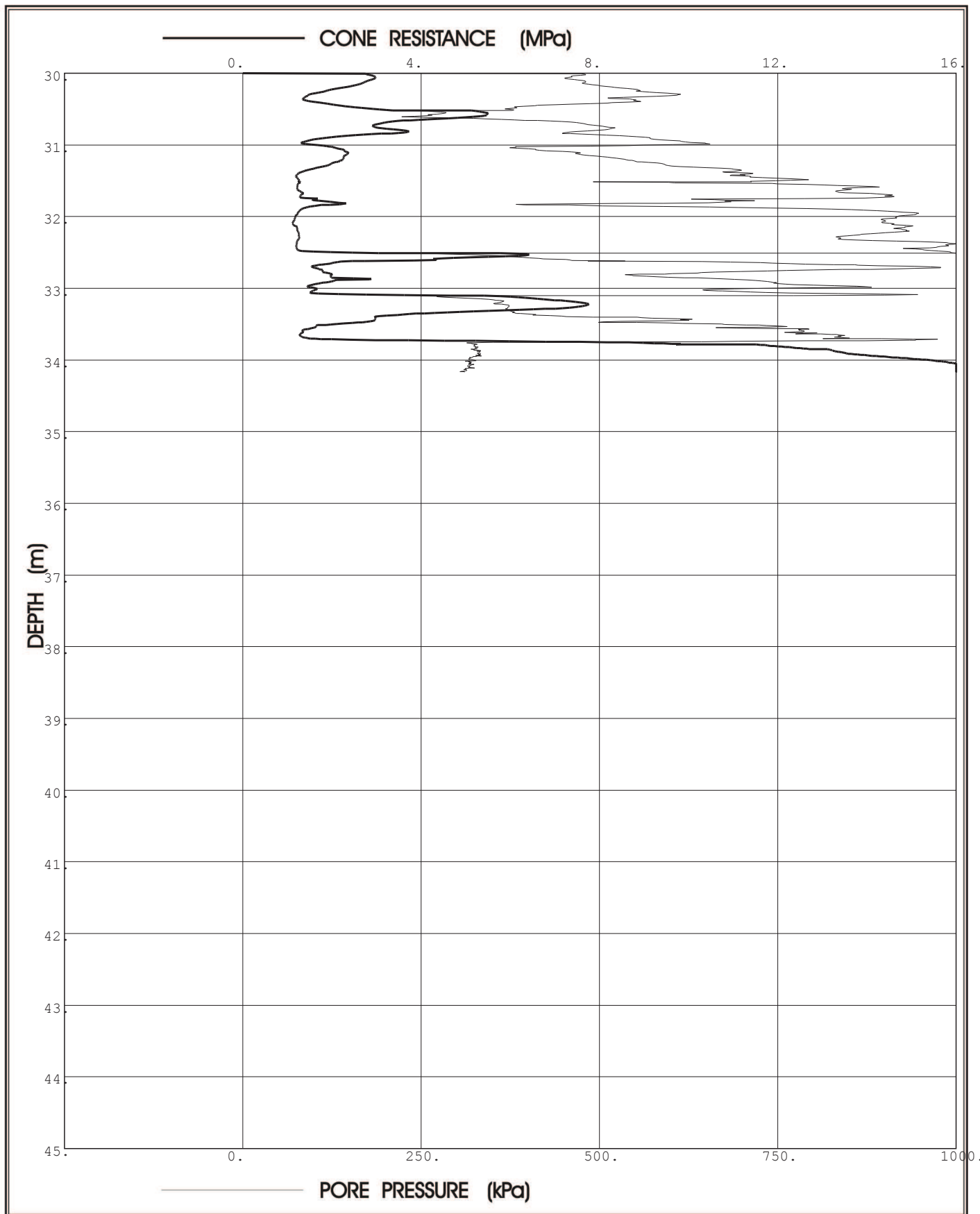
SITE: Pier2

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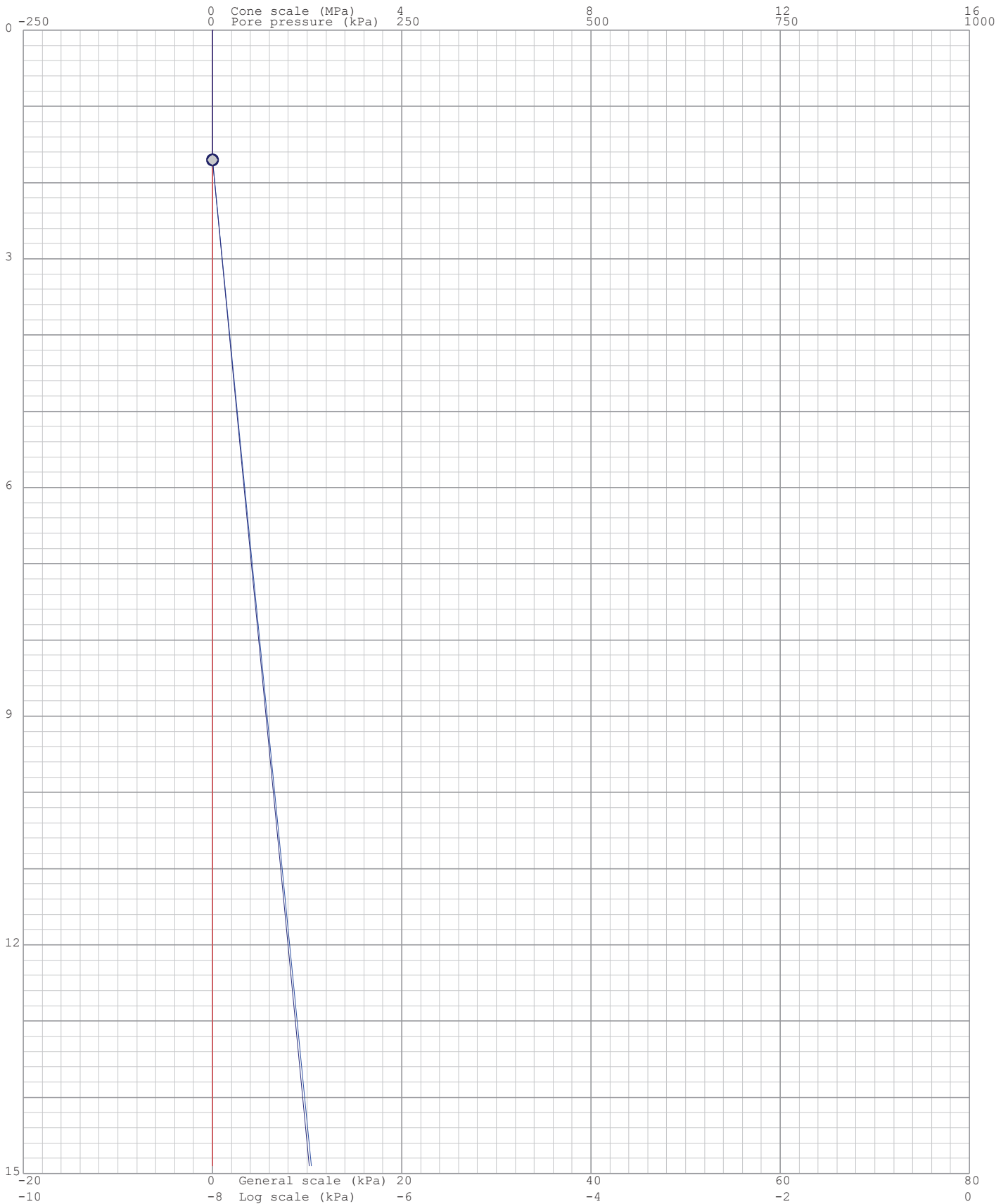
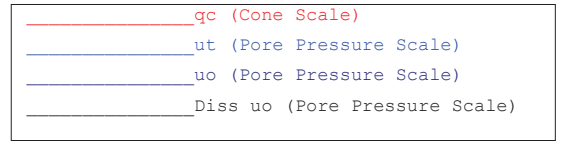
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT12

Date: 2012/06/15

Probe: GHANA



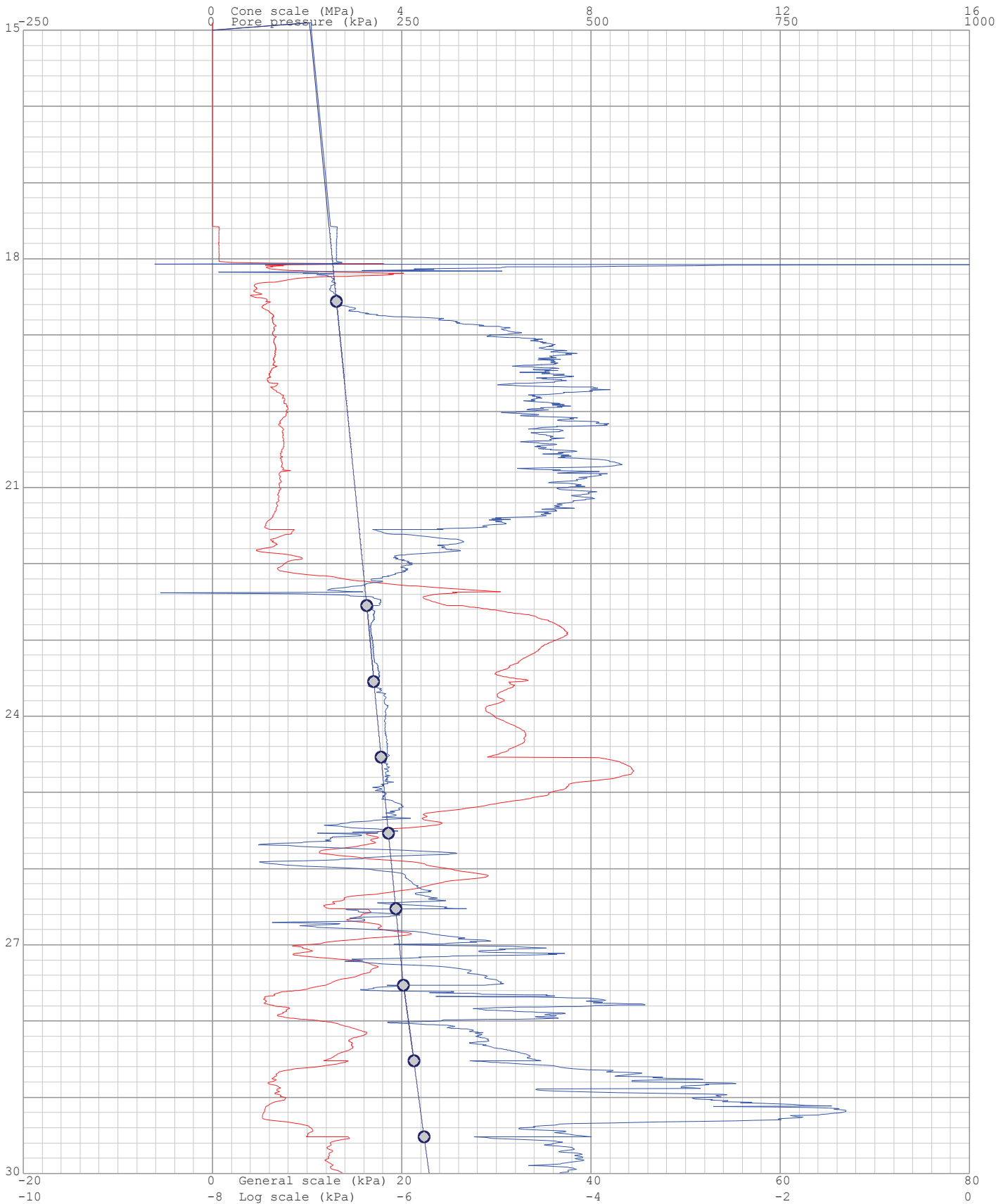
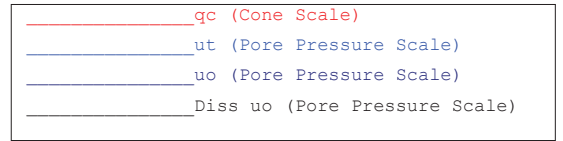
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT12

Date: 2012/06/15

Probe: GHANA



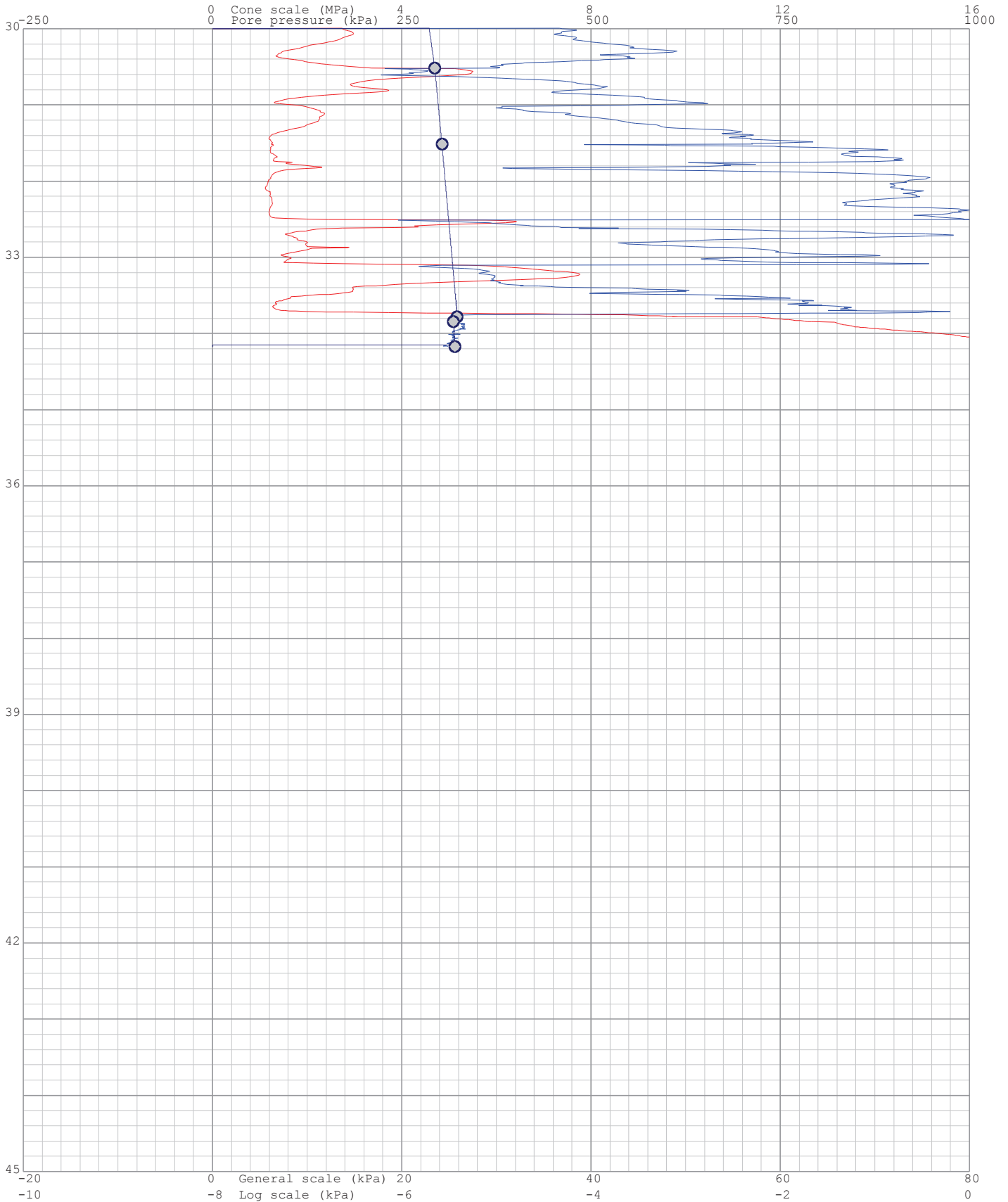
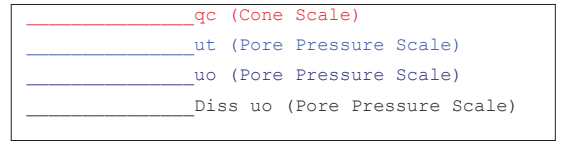
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT12

Date: 2012/06/15

Probe: GHANA



Project:Durban Harbour Over Water

Site: Pier2

Hole: CPT12

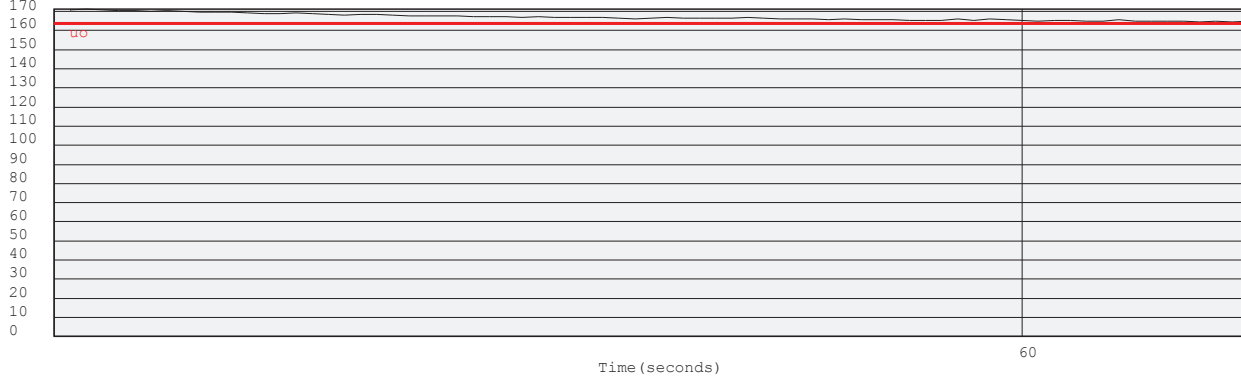
Date: 2012/06/15

Probe: GHANA  
Page: 1

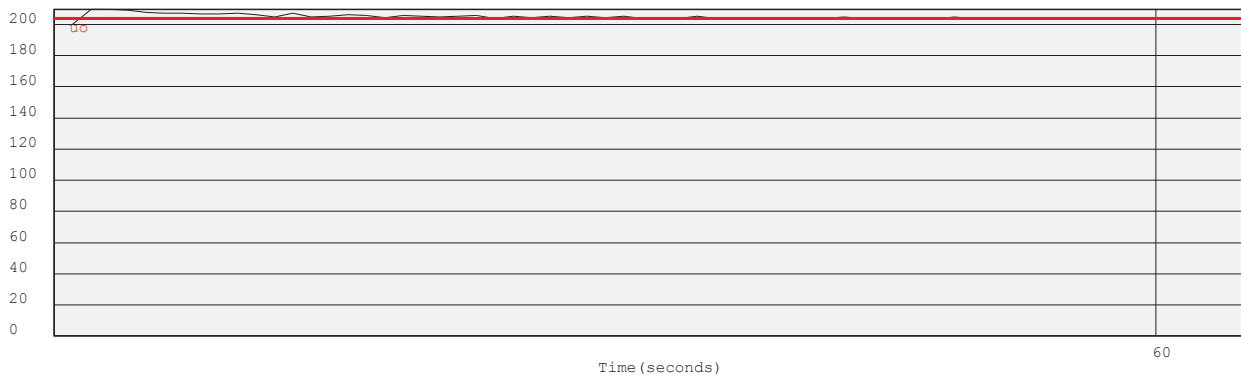
(kPa) Dissipation at:1.7m



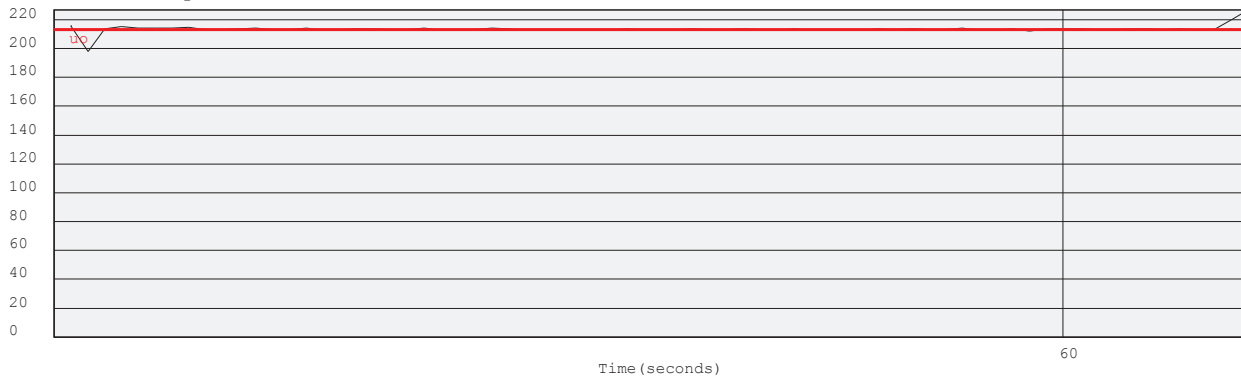
(kPa) Dissipation at:18.56m



(kPa) Dissipation at:22.547m



(kPa) Dissipation at:23.549m



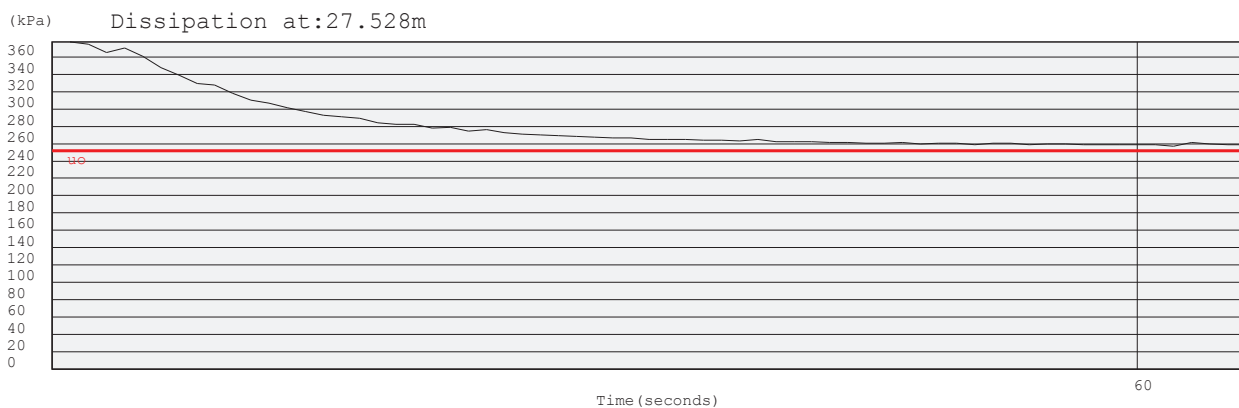
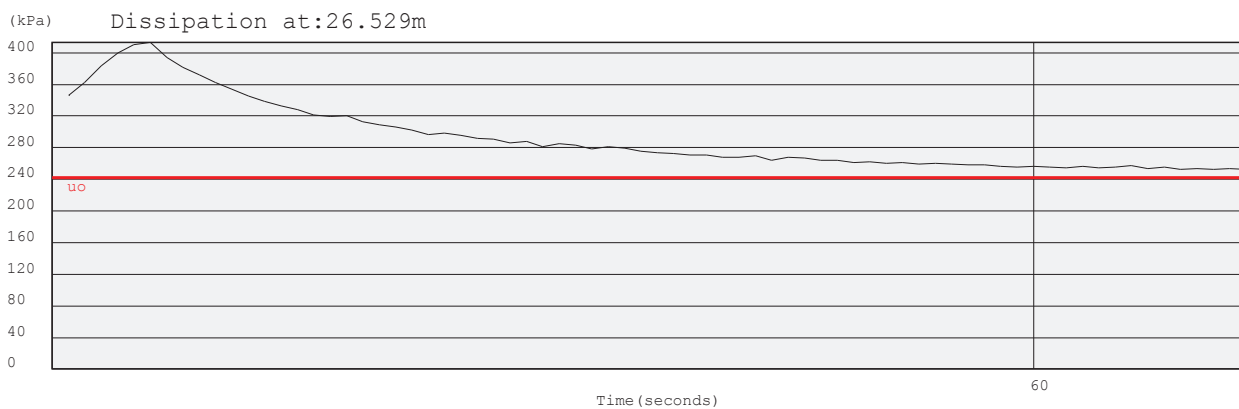
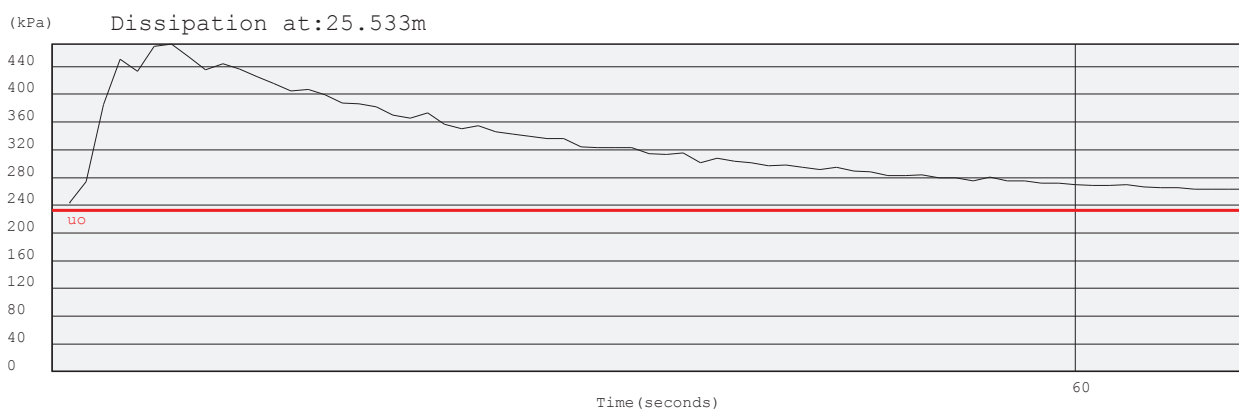
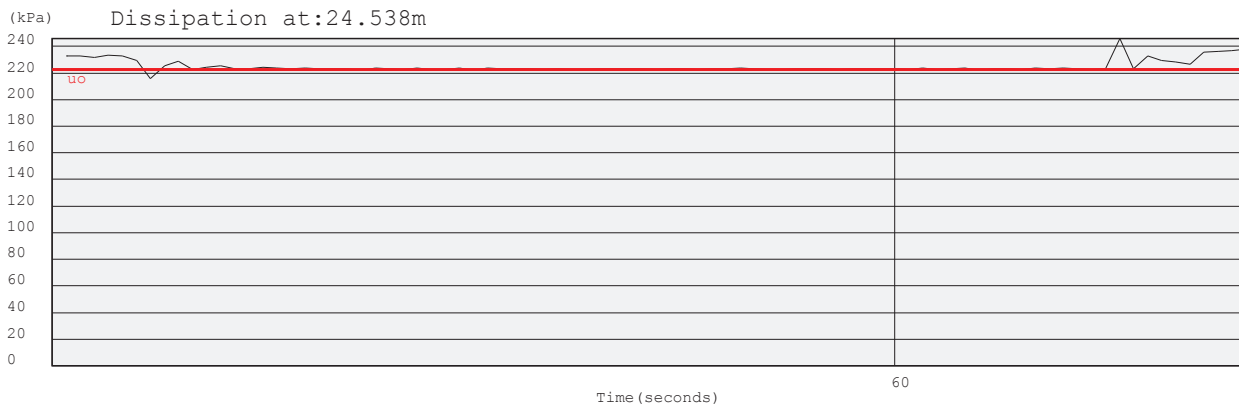
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT12

Date: 2012/06/15

Probe: GHANA  
Page: 2



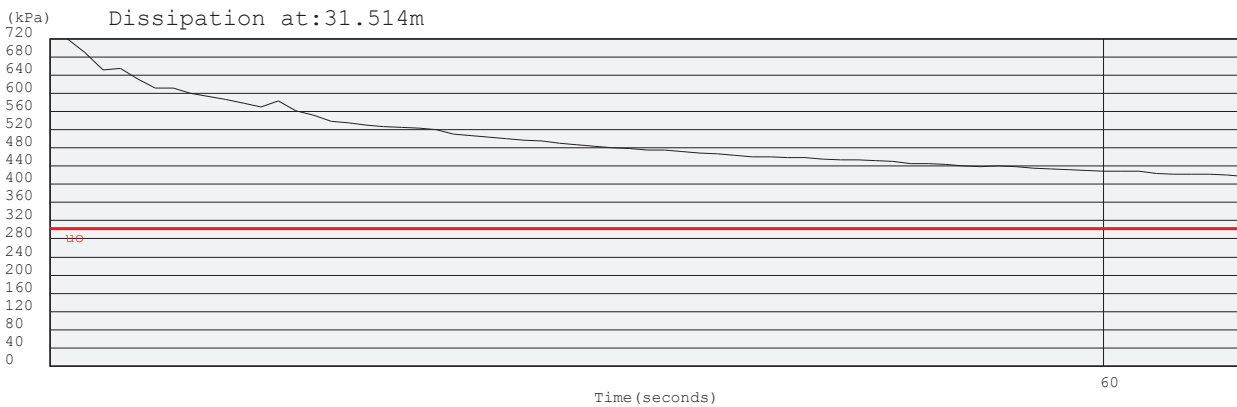
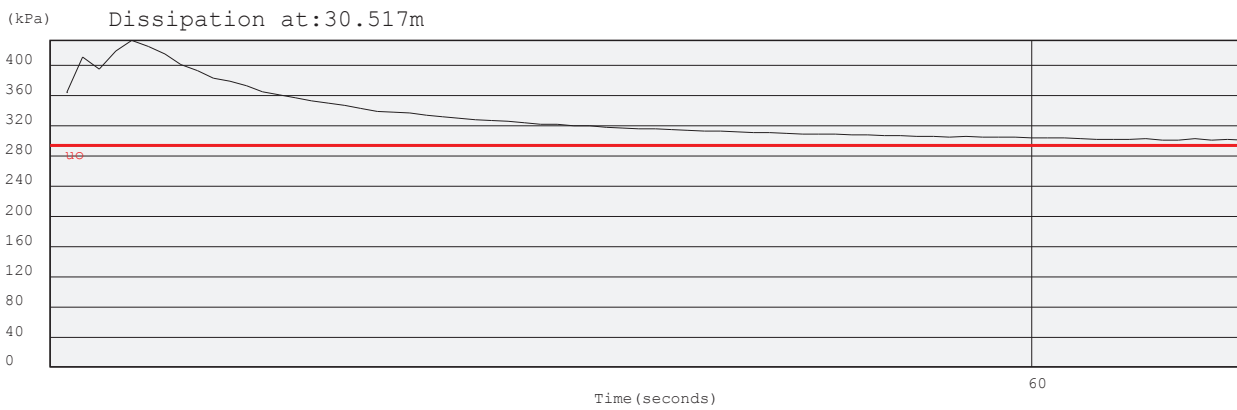
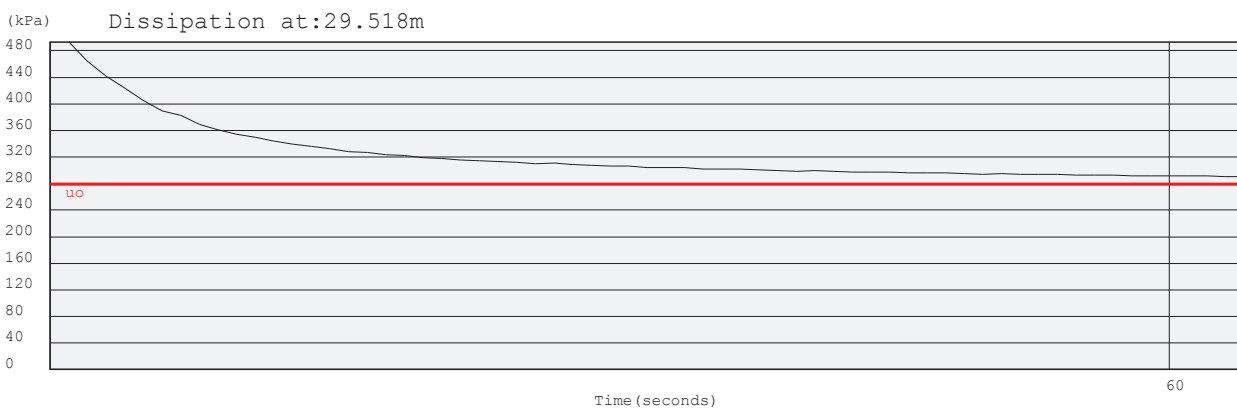
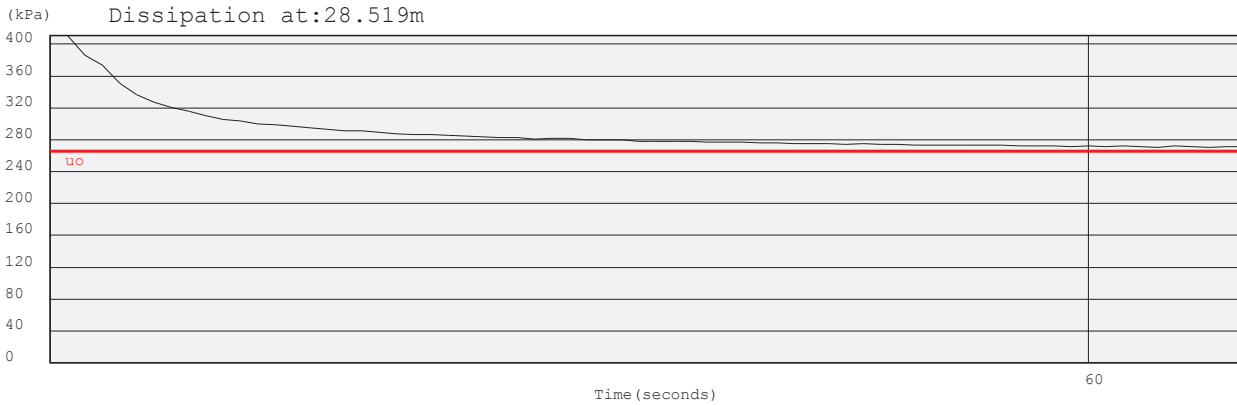
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT12

Date: 2012/06/15

Probe: GHANA  
Page: 3



Project: Durban Harbour Over Water

Site: Pier2

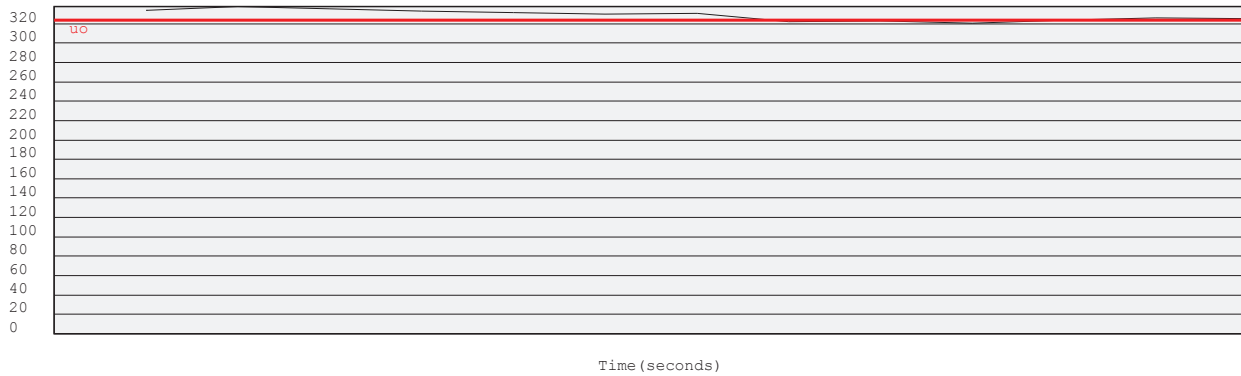
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Date: 2012/06/15

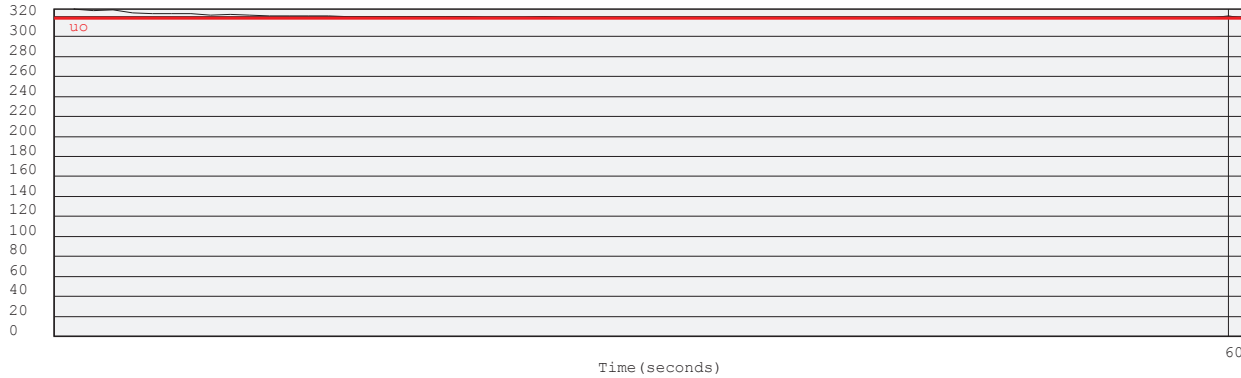
Probe: GHANA

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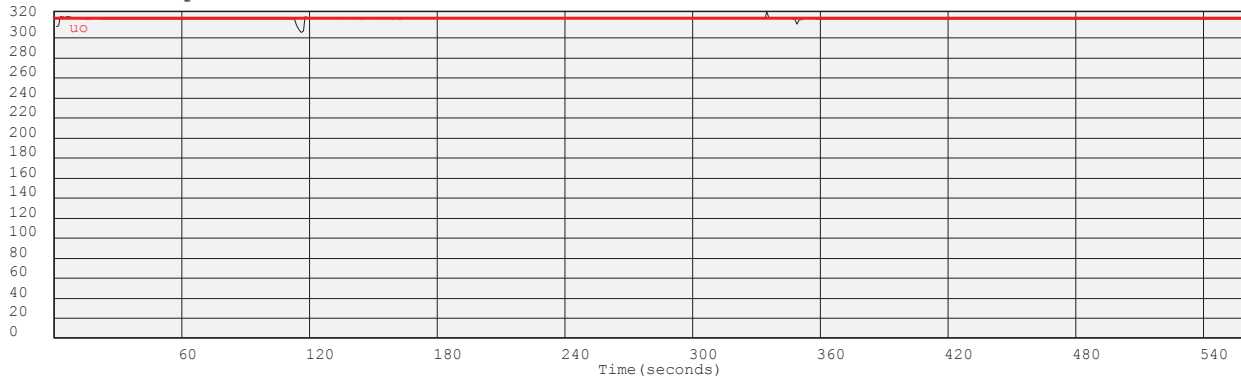
(kPa) Dissipation at: 33.782m



(kPa) Dissipation at: 33.847m



(kPa) Dissipation at: 34.17m





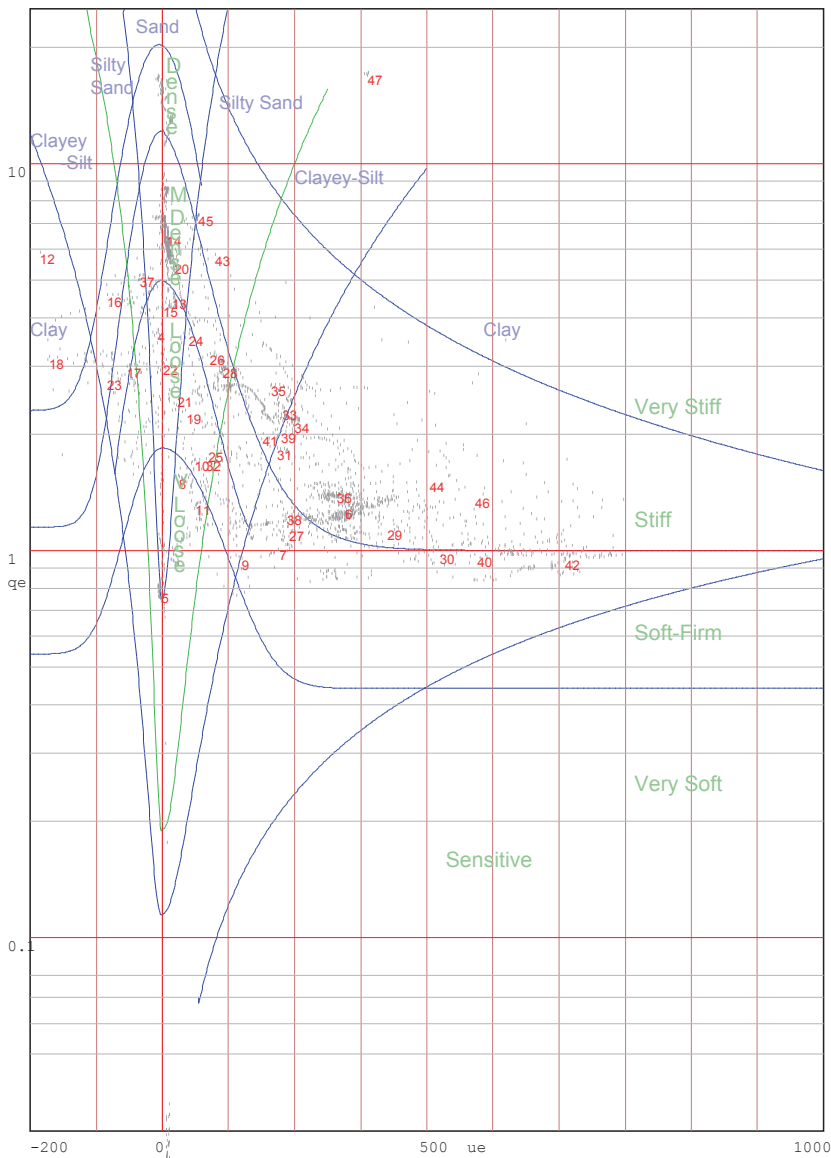
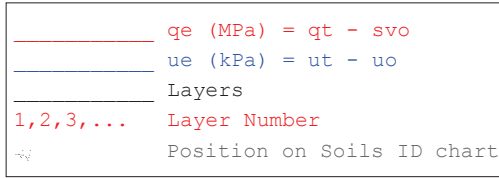
Project: Durban Harbour Over Water

Site: Pier2

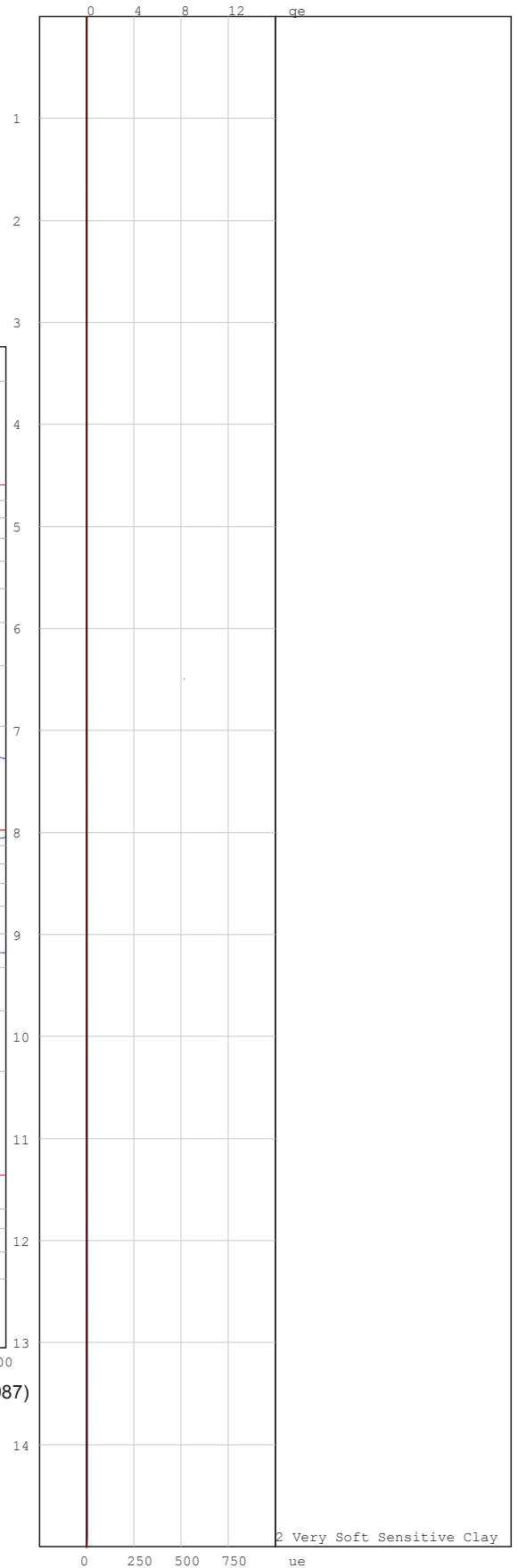
Hole No: CPT12

Date: 2012/06/15

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



2 Very Soft Sensitive Clay

Project: Durban Harbour Over Water

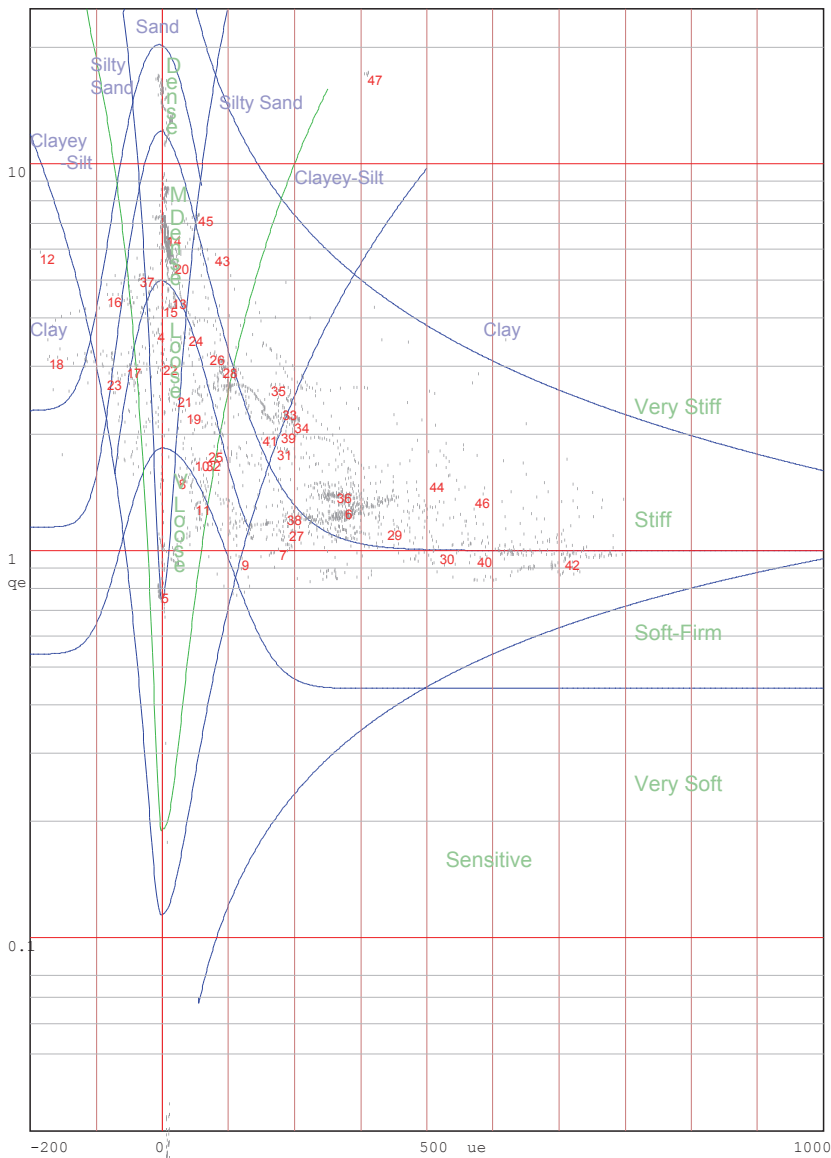
Site: Pier2

Hole No: CPT12

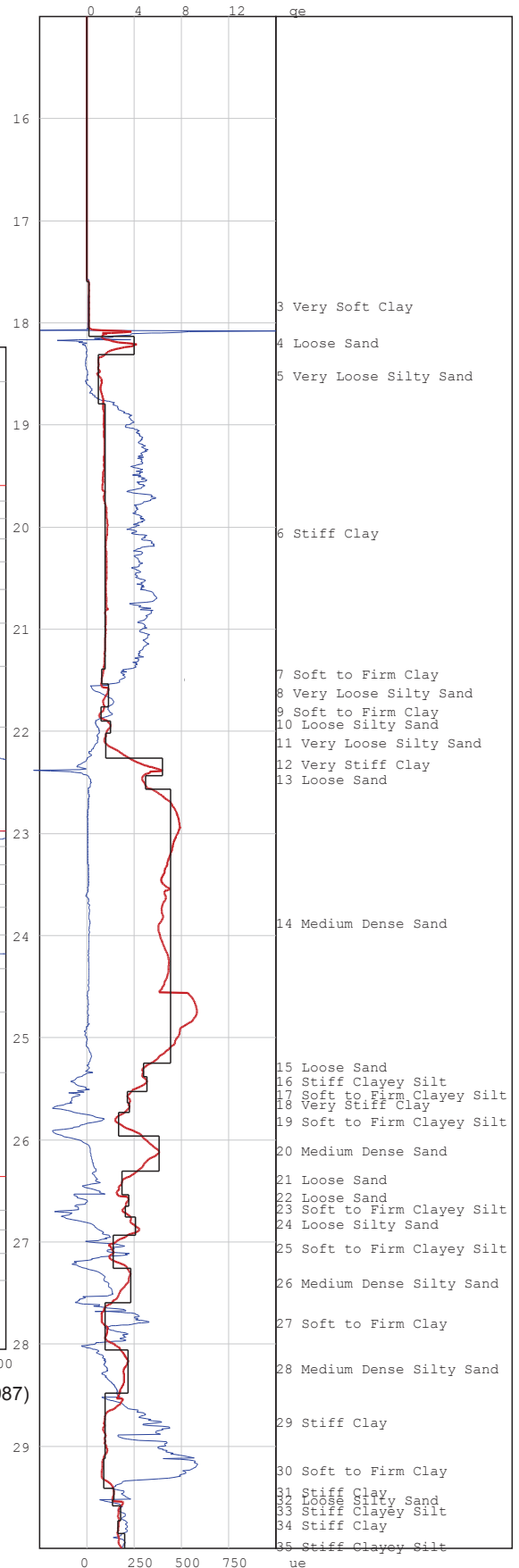
Date: 2012/06/15

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Over Water

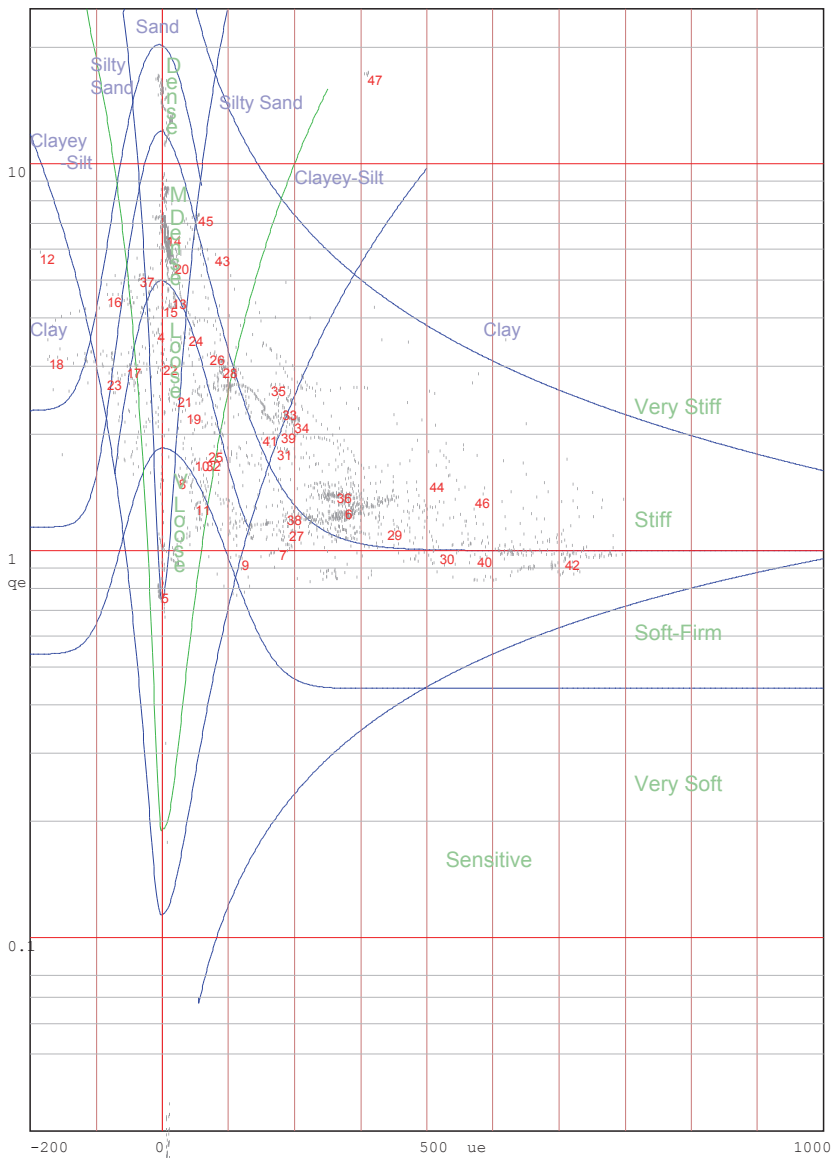
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Hole No: CPT12

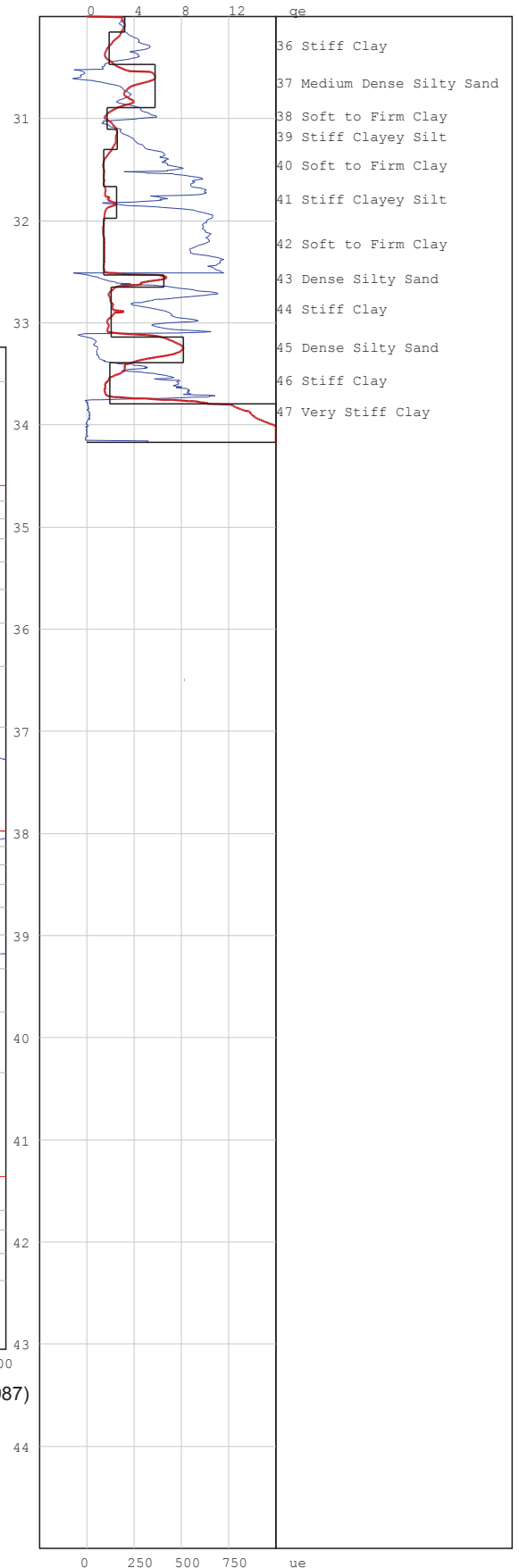
Date: 2012/06/15

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

PROJECT: Durban Harbour Over Water

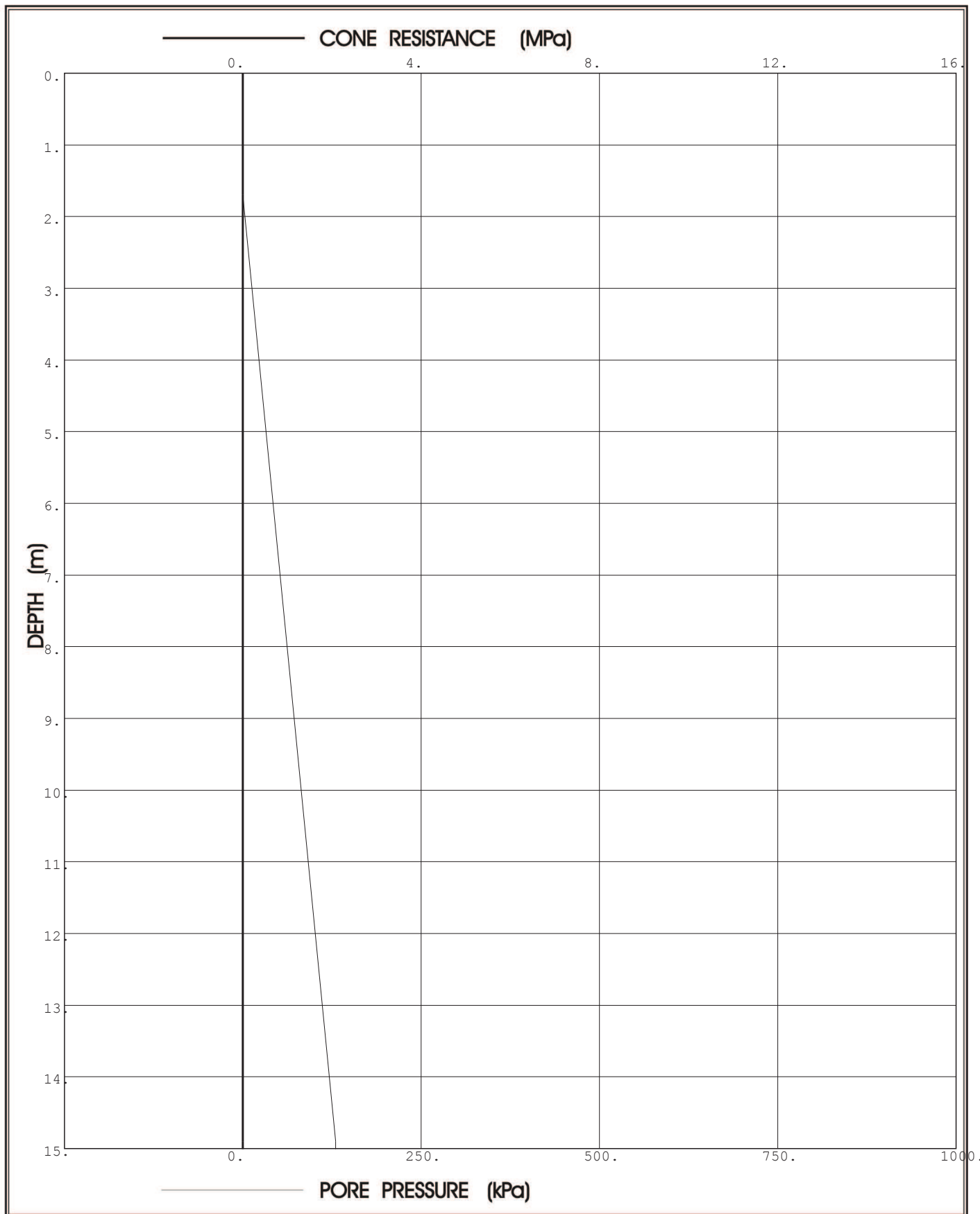
SITE: Pier2

CPTU (RE): CPT13

DATE: 2012/06/16

Probe: KELLER

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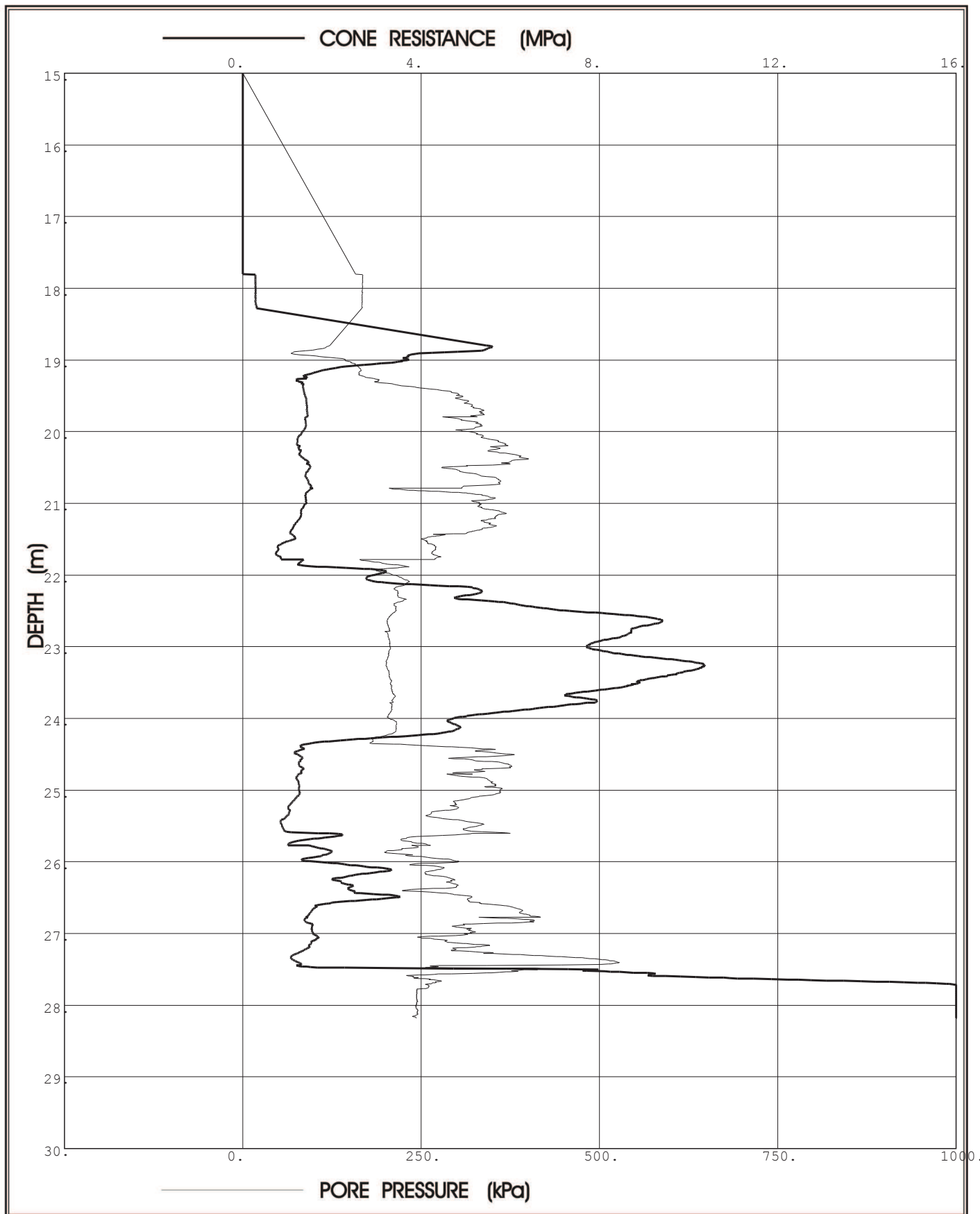
SITE: Pier2

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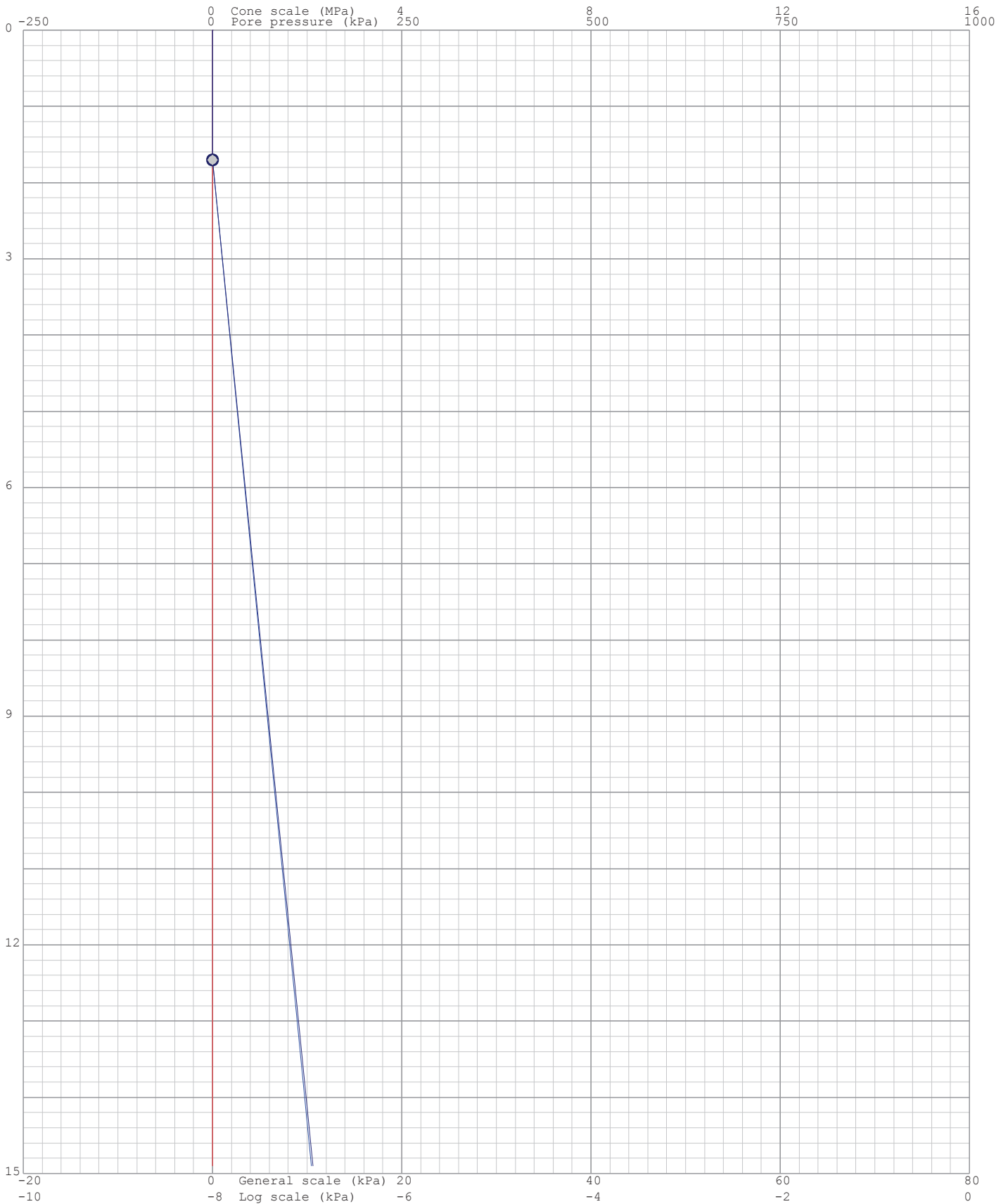
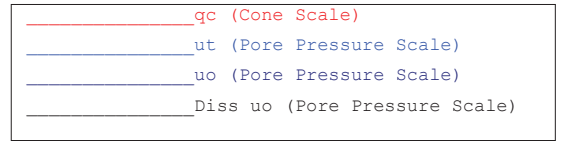
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT13

Date: 2012/06/16

Probe: KELLER



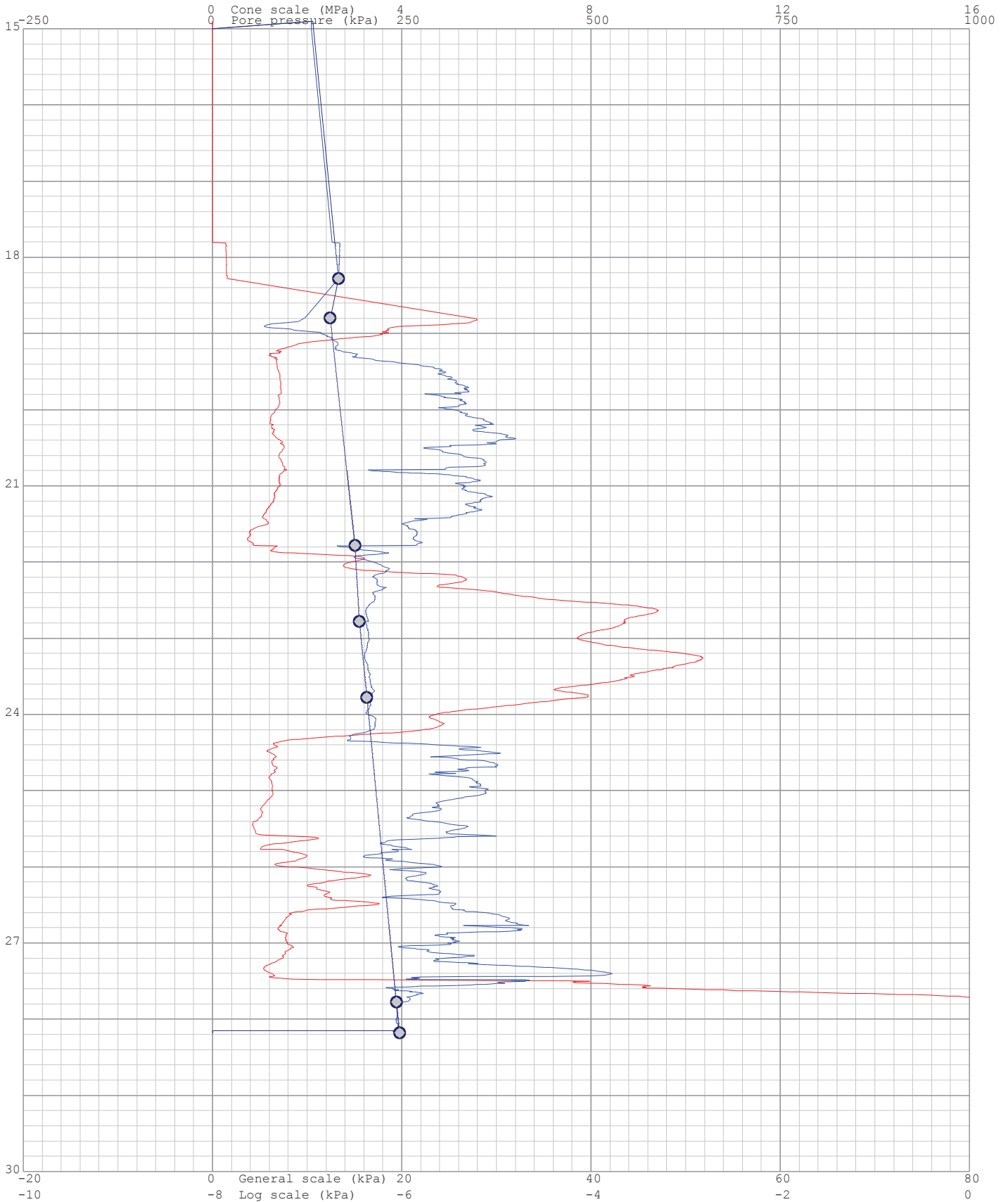
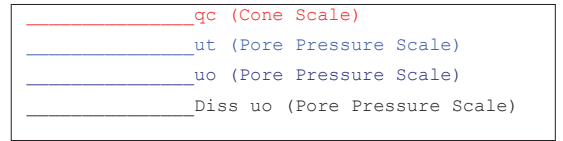
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT13

Date: 2012/06/16

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT13

Date: 2012/06/16

Probe: KELLER

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(kPa) Dissipation at: 1.7m



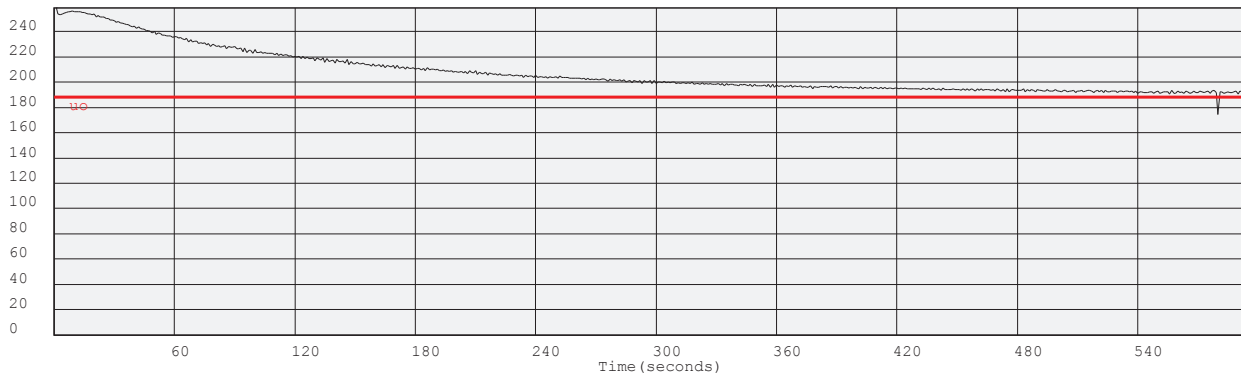
(kPa) Dissipation at: 18.277m



(kPa) Dissipation at: 18.794m



(kPa) Dissipation at: 21.781m





Project: Durban Harbour Over Water

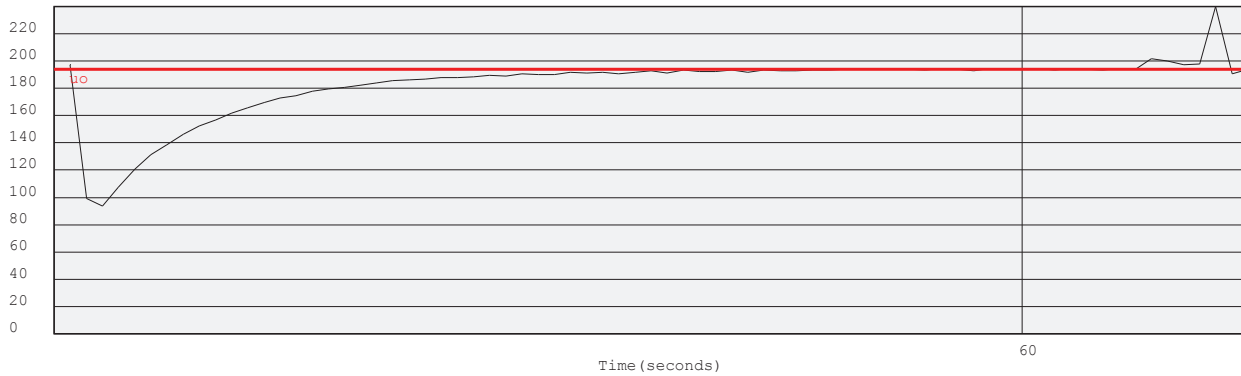
Site: Pier2

Hole: CPT13

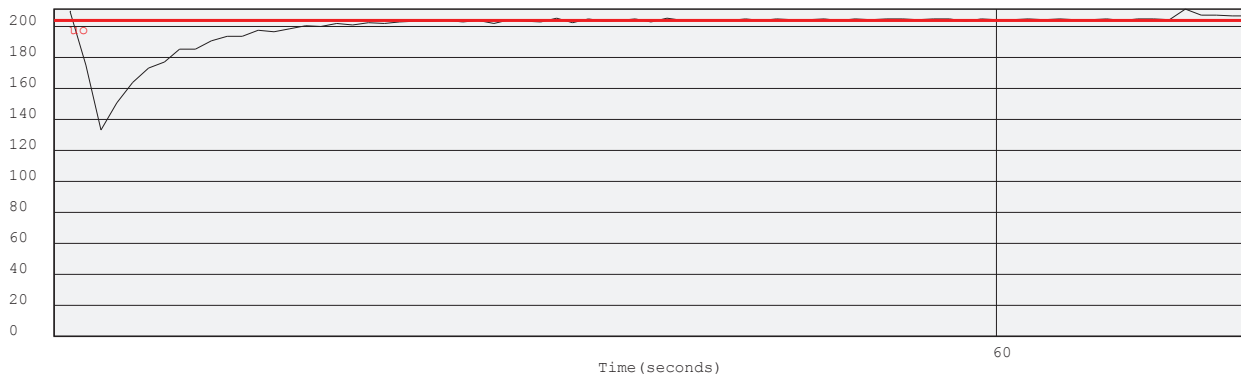
Date: 2012/06/16

Probe: KELLER  
Page: 2

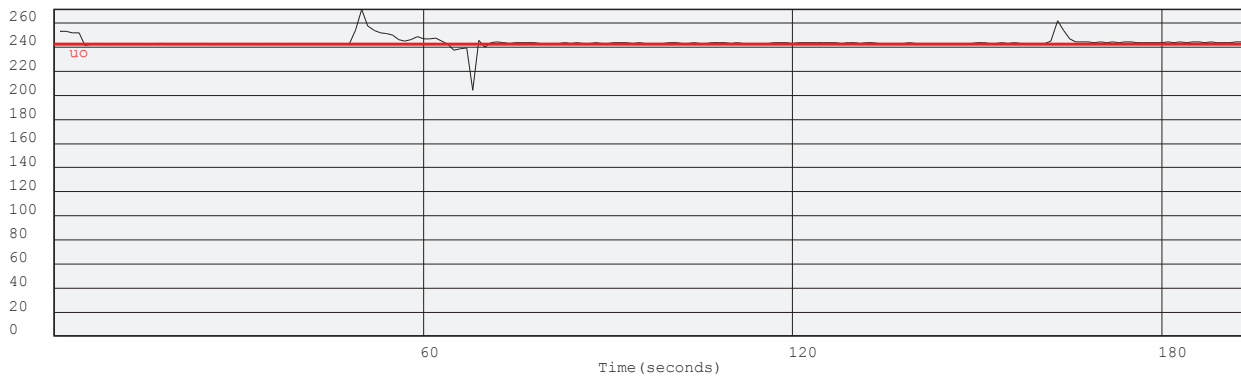
(kPa) Dissipation at: 22.782m



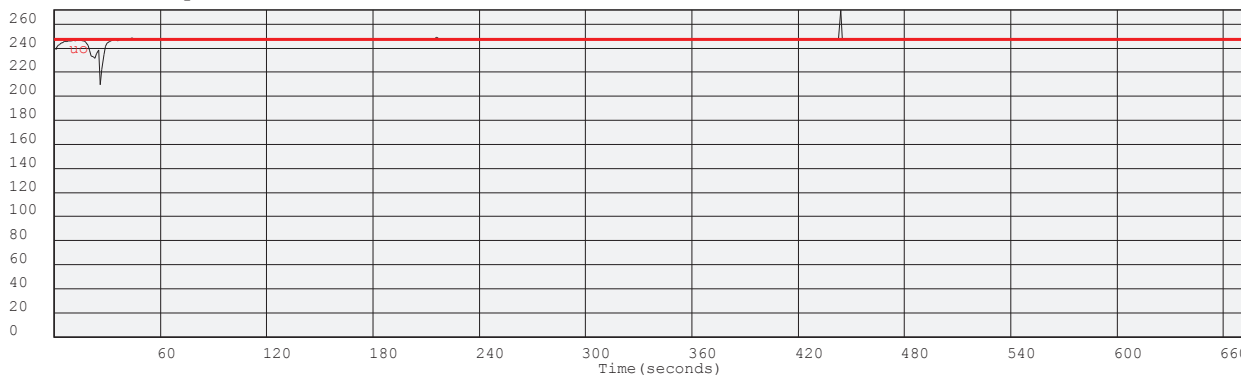
(kPa) Dissipation at: 23.779m



(kPa) Dissipation at: 27.771m



(kPa) Dissipation at: 28.18m



Project: Durban Harbour Over Water

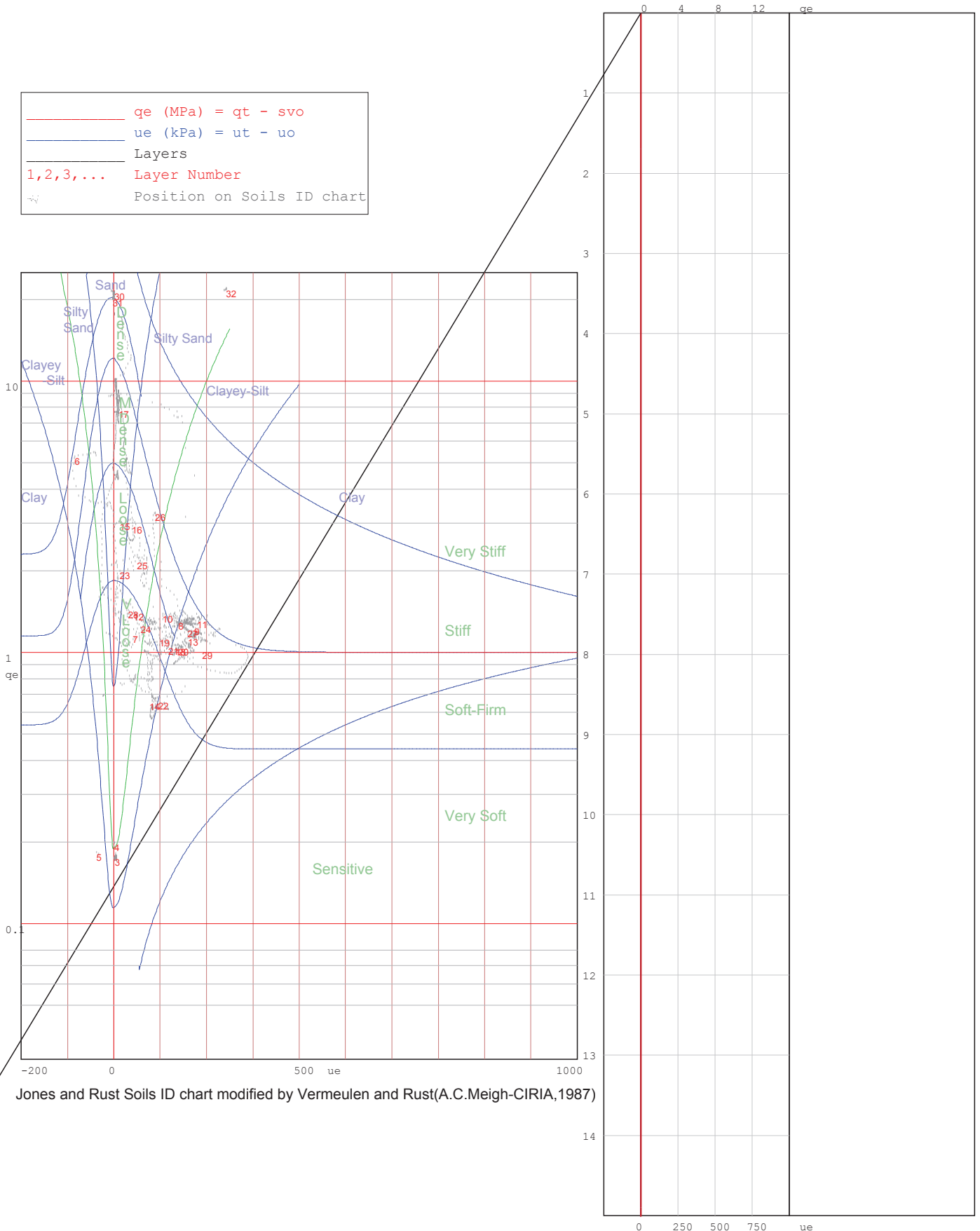
Site: Pier2

Hole No: CPT13

Date: 2012/06/16

Probe: KELLER

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

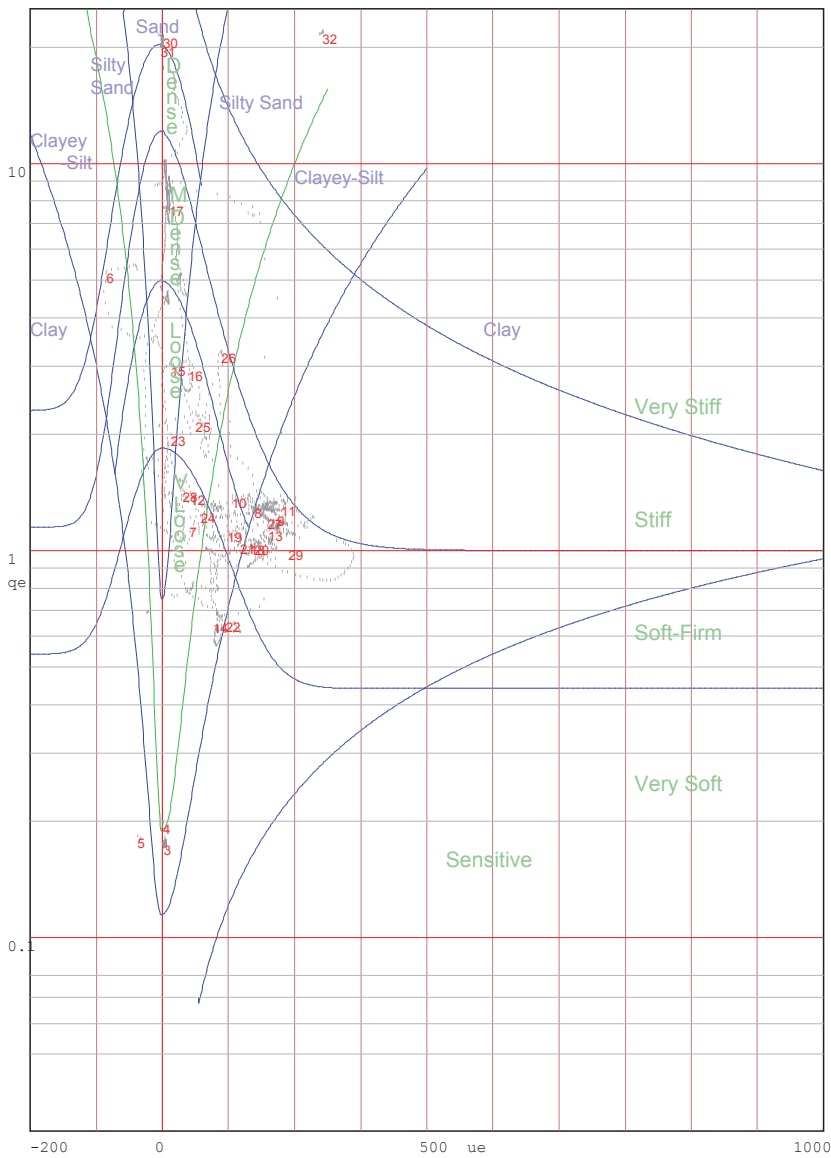
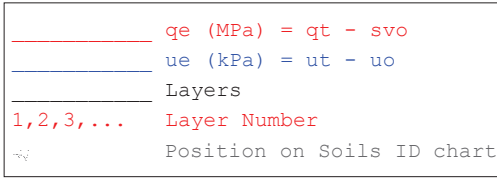
Project: Durban Harbour Over Water

Site: Pier2

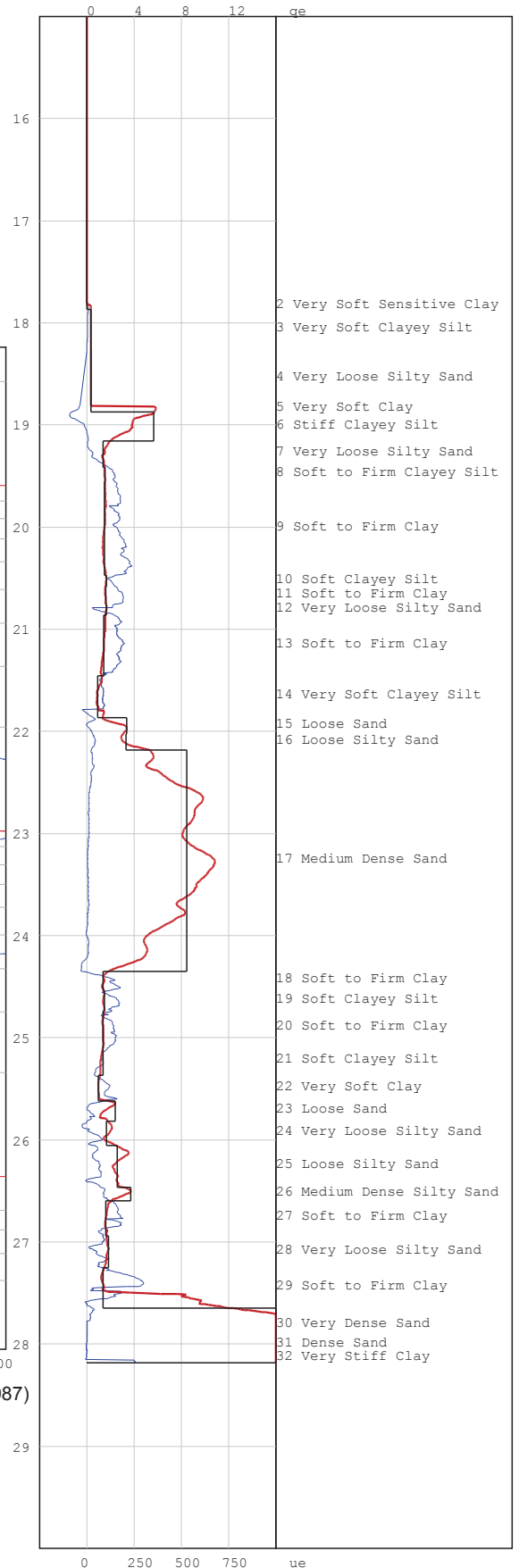
Hole No: CPT13

Date: 2012/06/16

Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

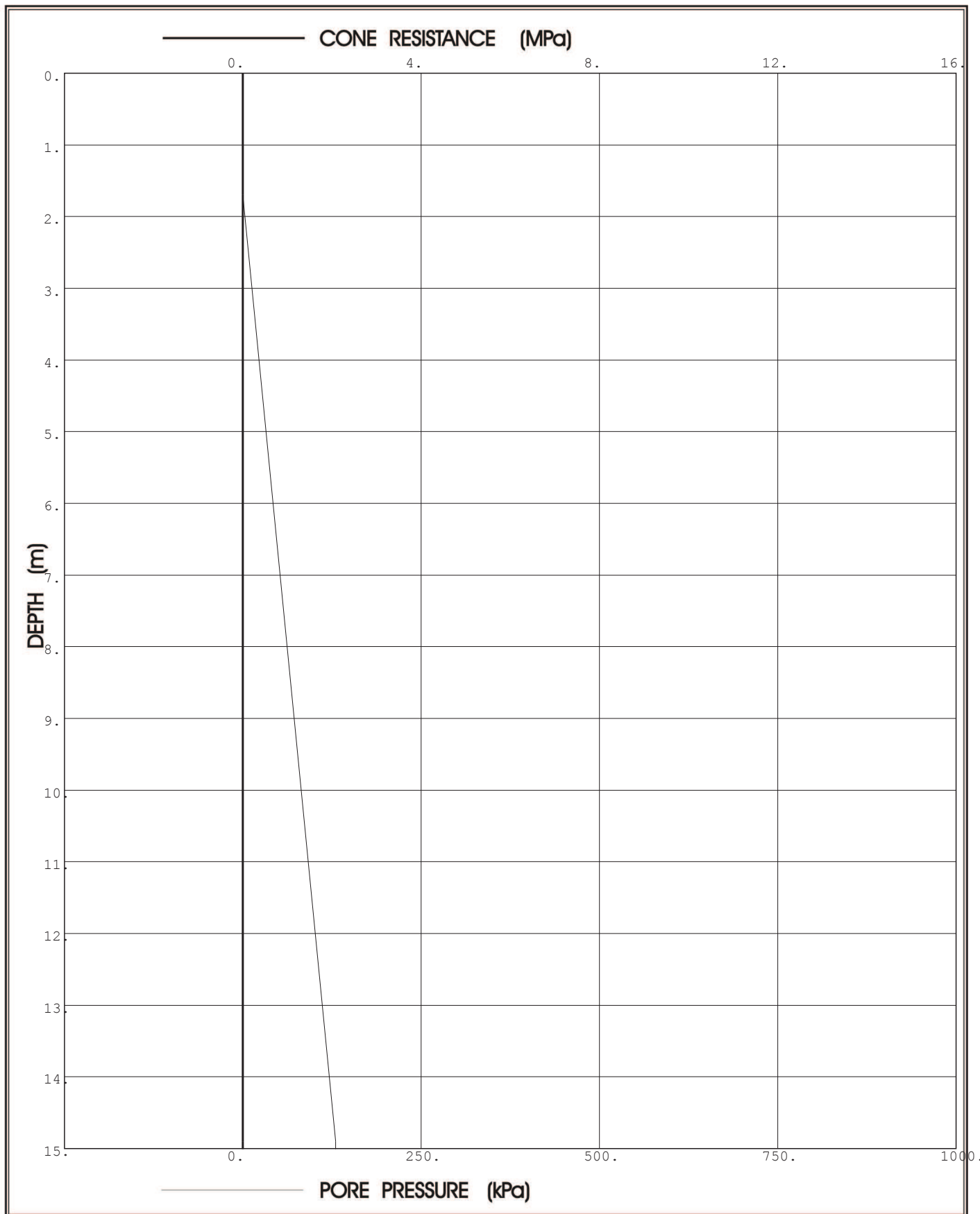
SITE: Pier2

CPTU (RE): CPT14

DATE: 2012/07/04

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

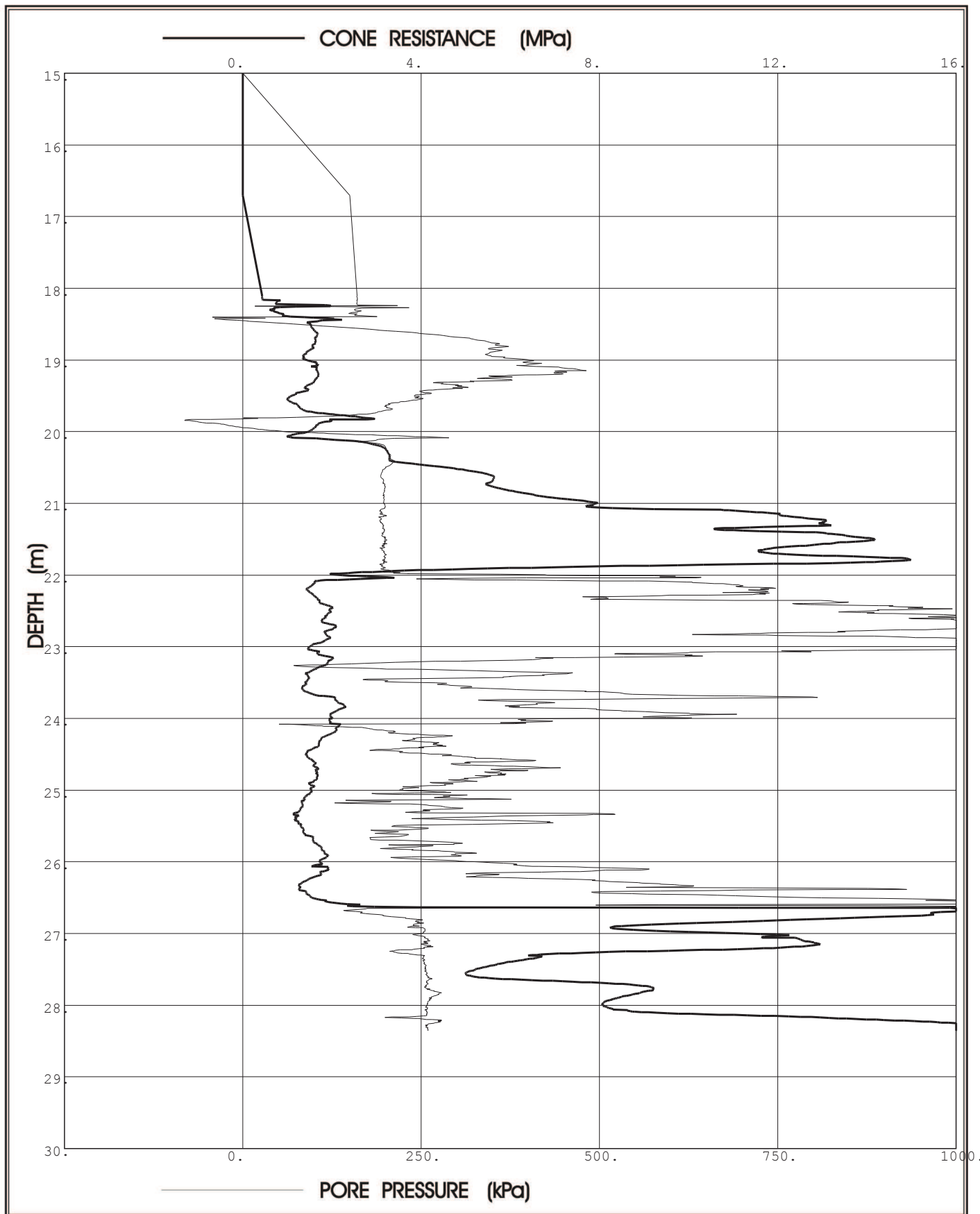
SITE: Pier2

CPTU (RE): CPT14

DATE: 2012/07/04

Probe: GHANA

Page:2



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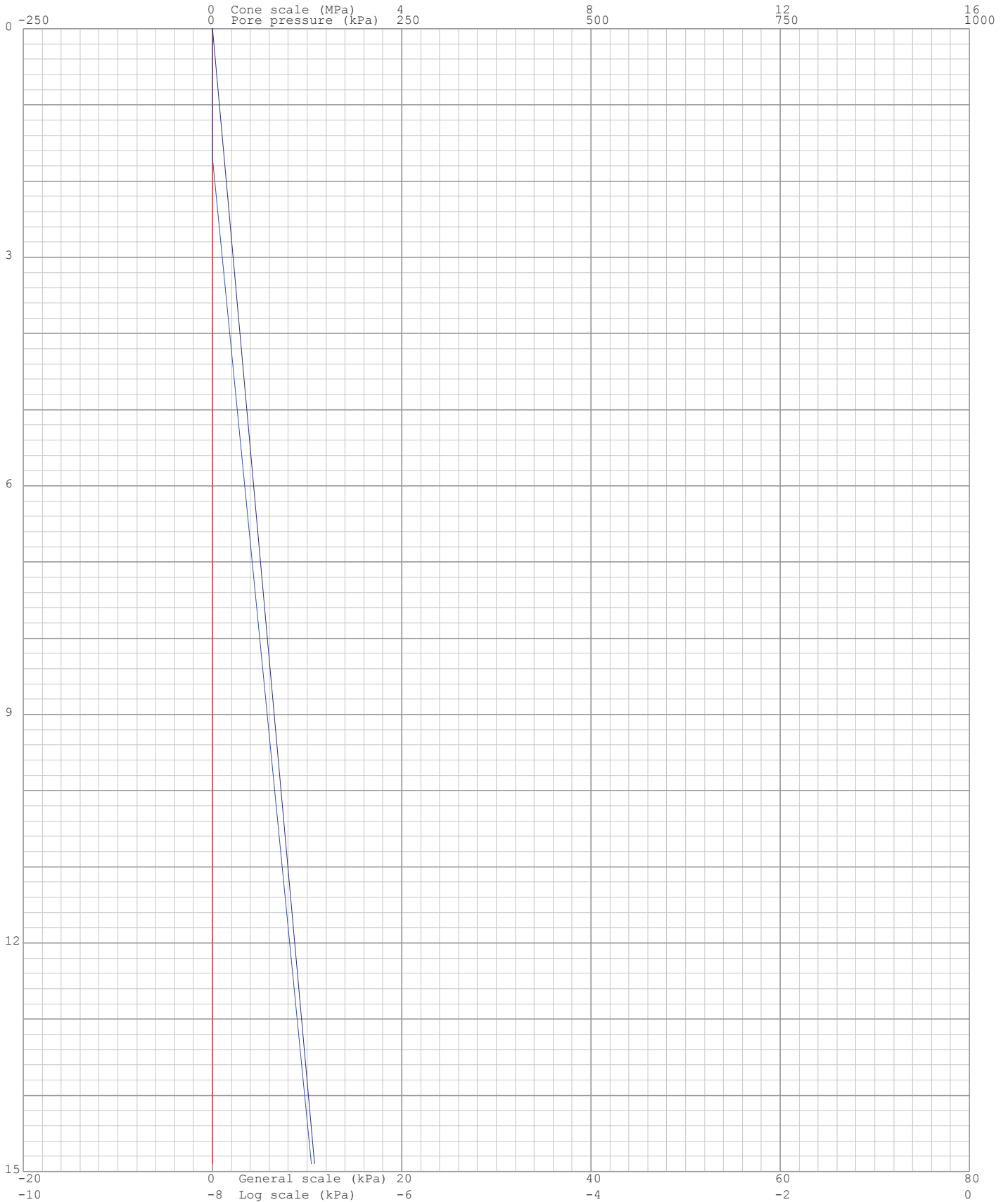
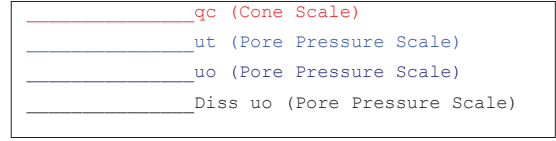
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT14

Date: 2012/07/04

Probe: GHANA



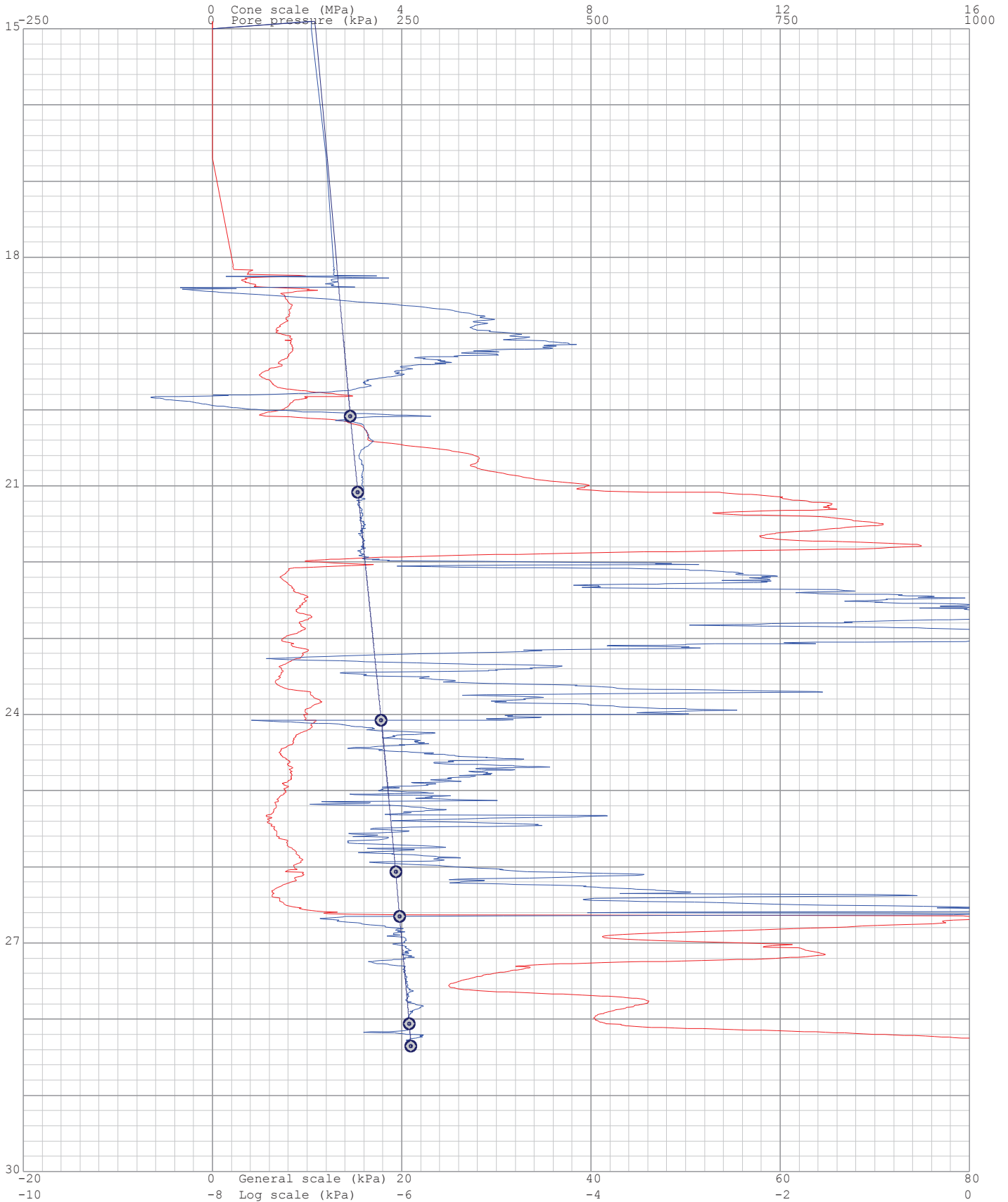
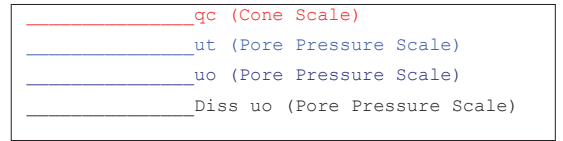
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT14

Date: 2012/07/04

Probe: GHANA



Project: Durban Harbour Over Water

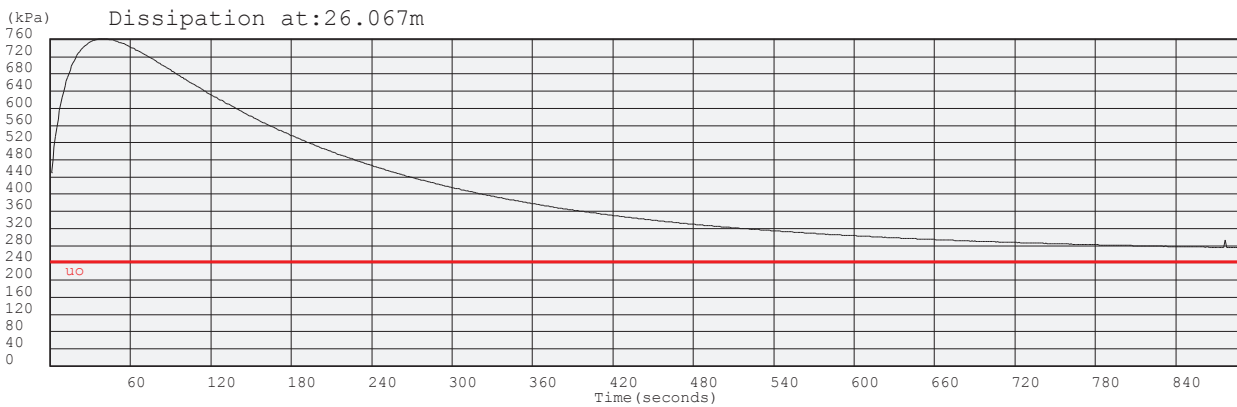
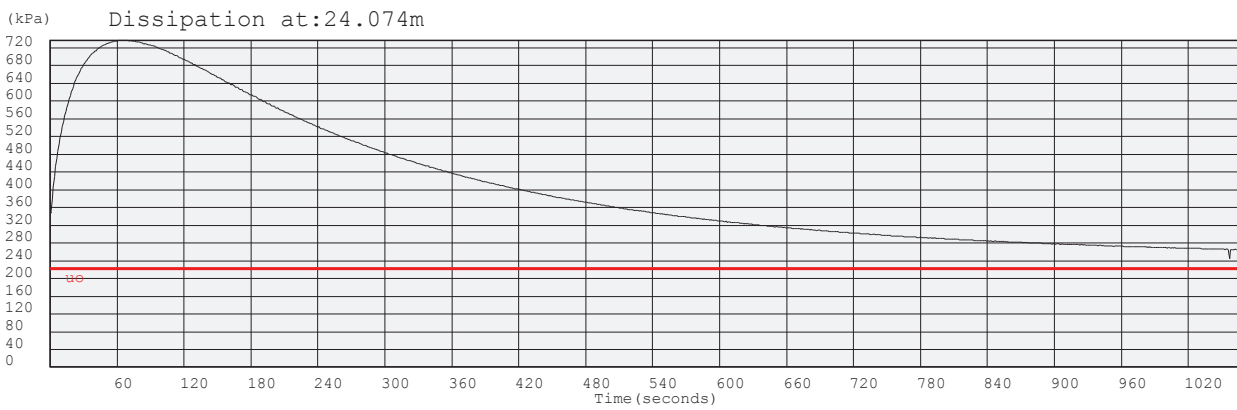
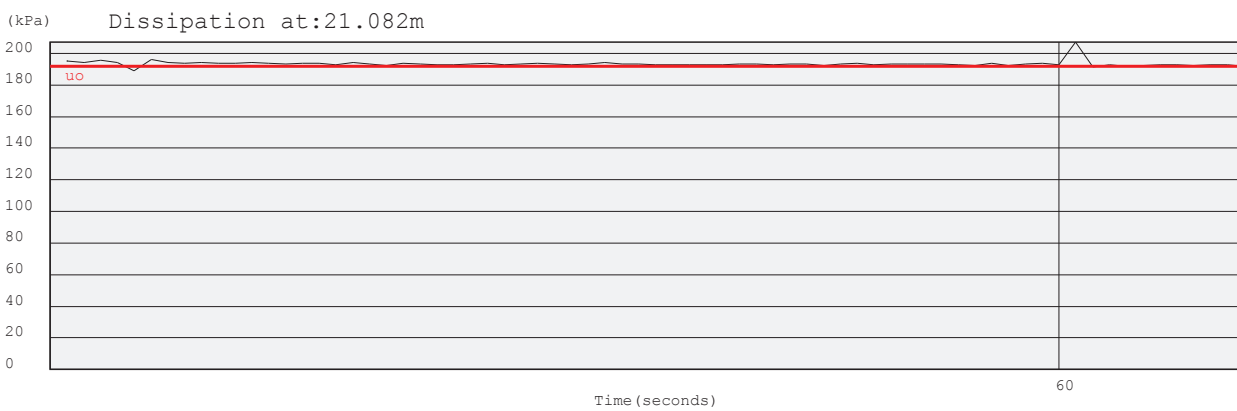
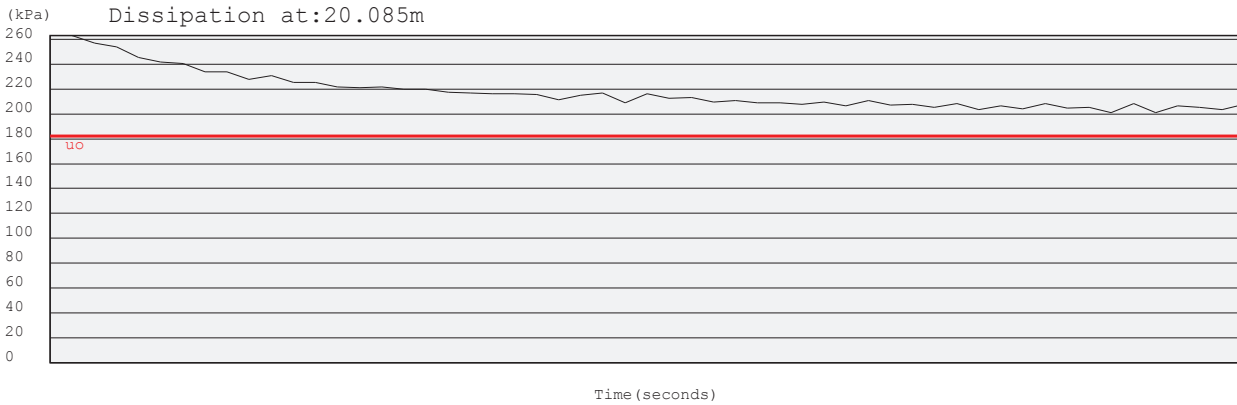
Site: Pier2

Hole: CPT14

Date: 2012/07/04

Probe: GHANA

Page: 1





Project: Durban Harbour Over Water

Site: Pier2

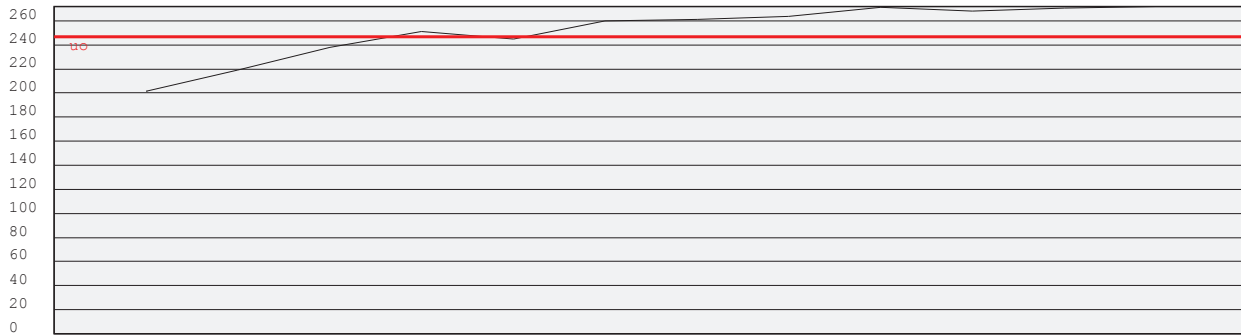
Hole: CPT14

Date: 2012/07/04

Probe: GHANA

Page: 2

(kPa) Dissipation at: 26.649m



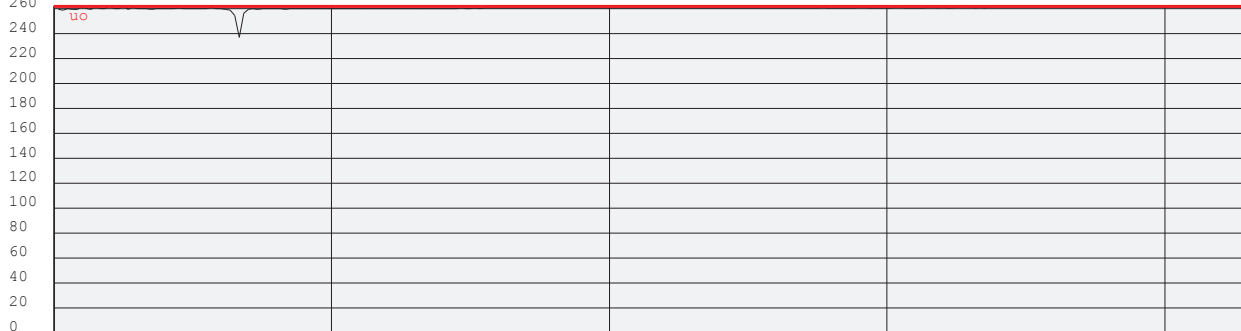
Time (seconds)

(kPa) Dissipation at: 28.062m



Time (seconds)

(kPa) Dissipation at: 28.353m



Time (seconds)

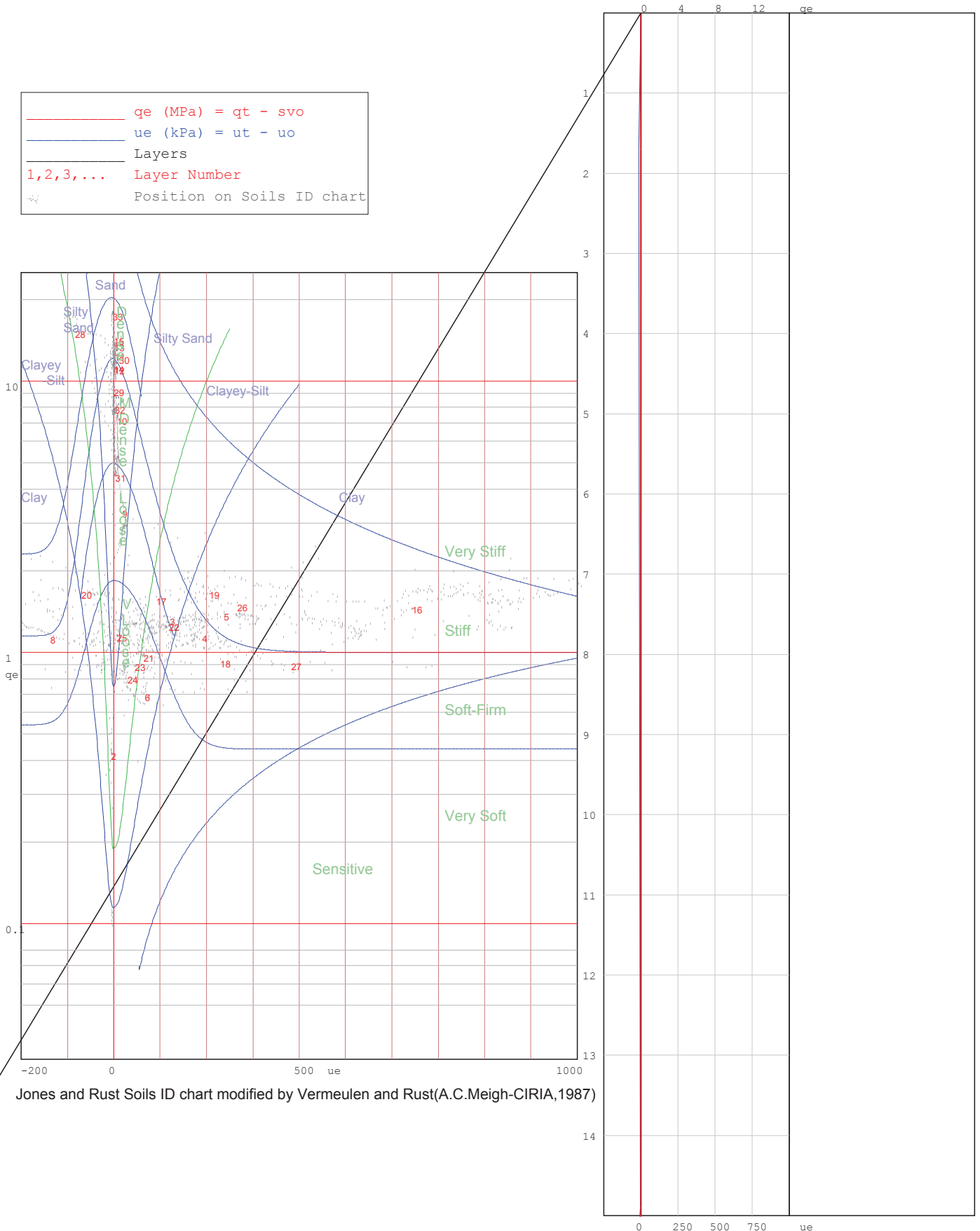
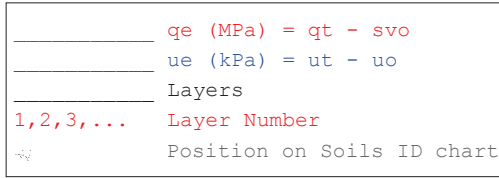
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT14

Date: 2012/07/04

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

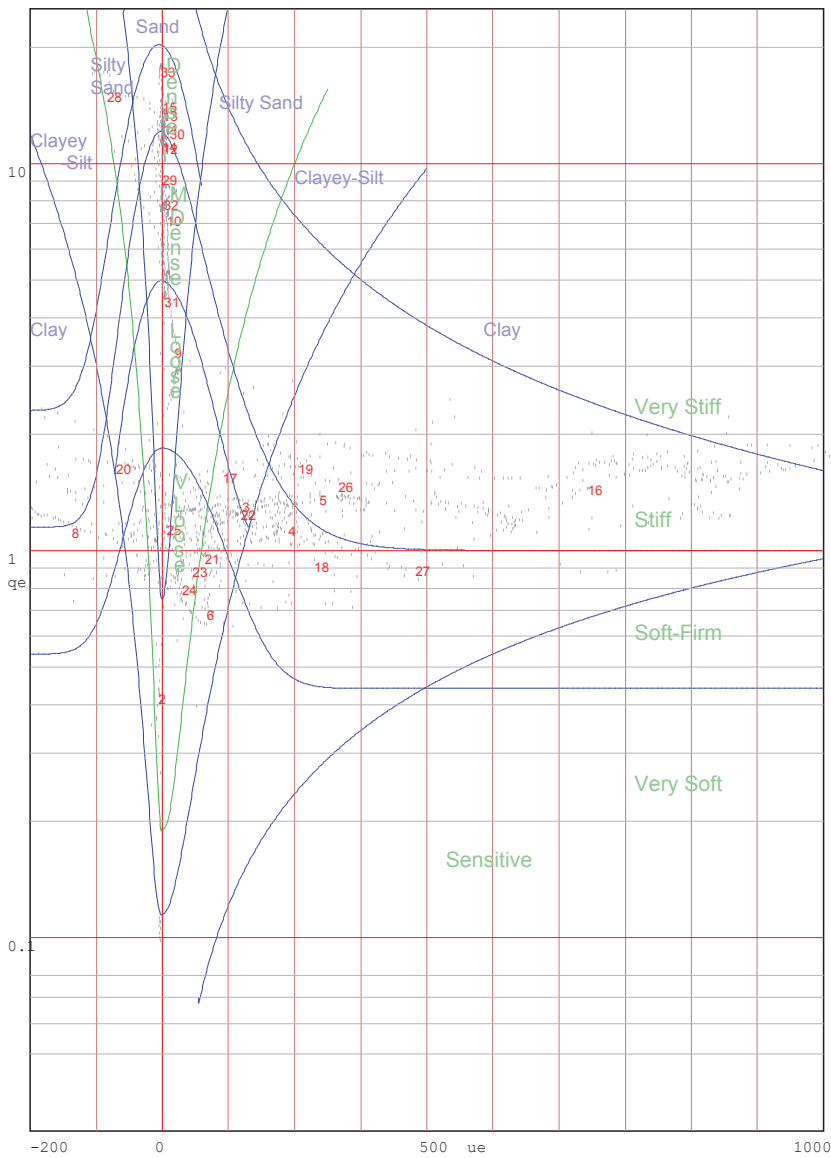
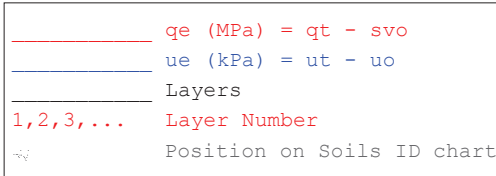
Project: Durban Harbour Over Water

Site: Pier2

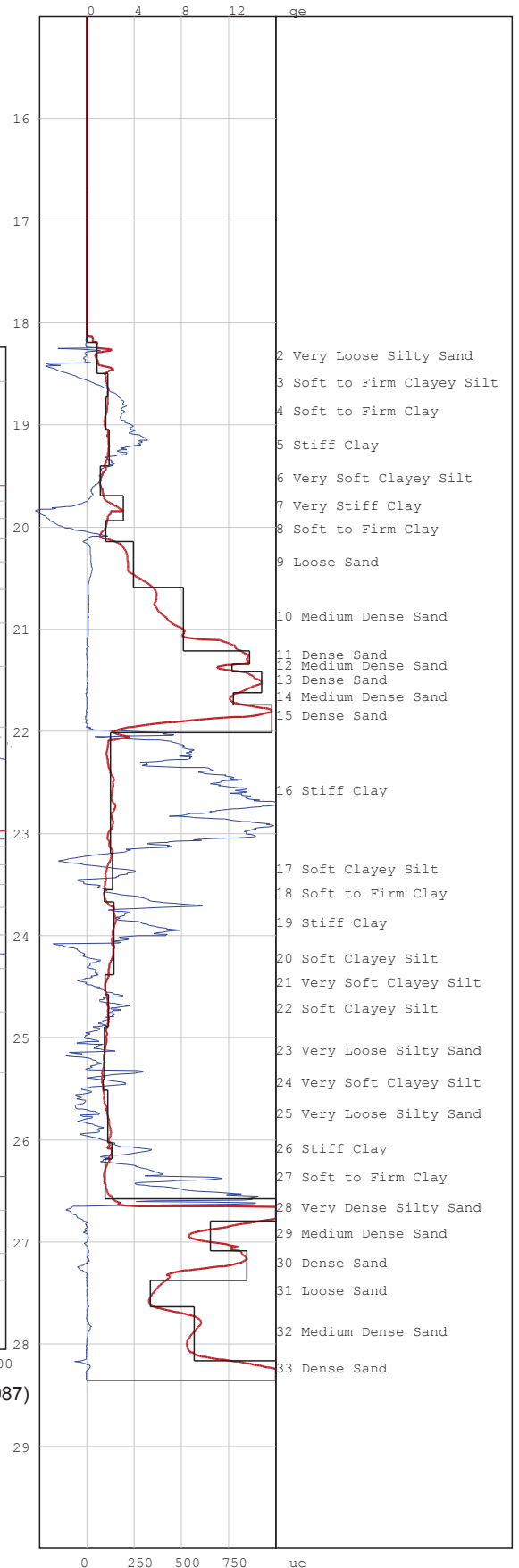
Hole No: CPT14

Date: 2012/07/04

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

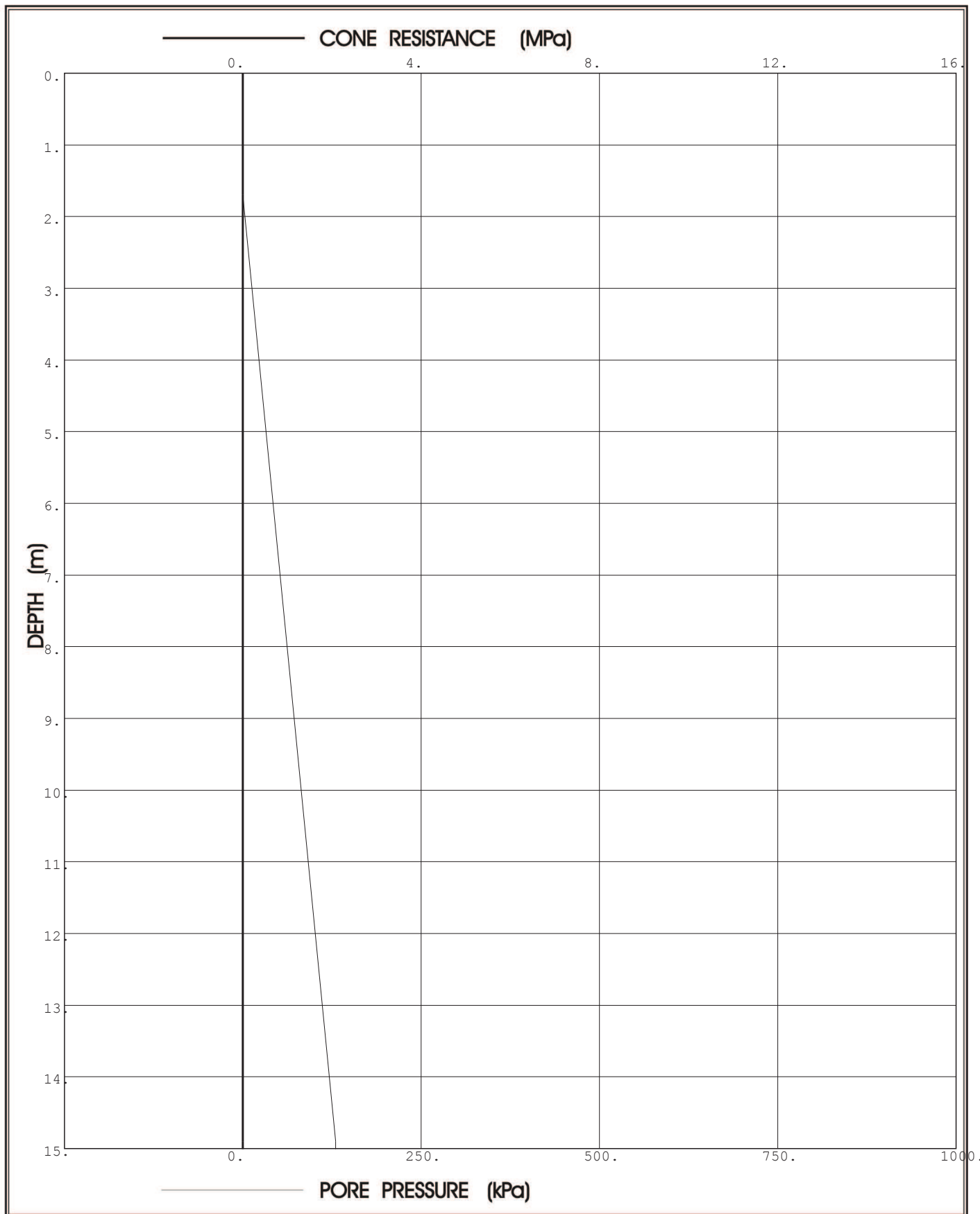
SITE: Pier2

CPTU (RE): CPT15

DATE: 2012/07/05

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



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PROJECT: Durban Harbour Over Water

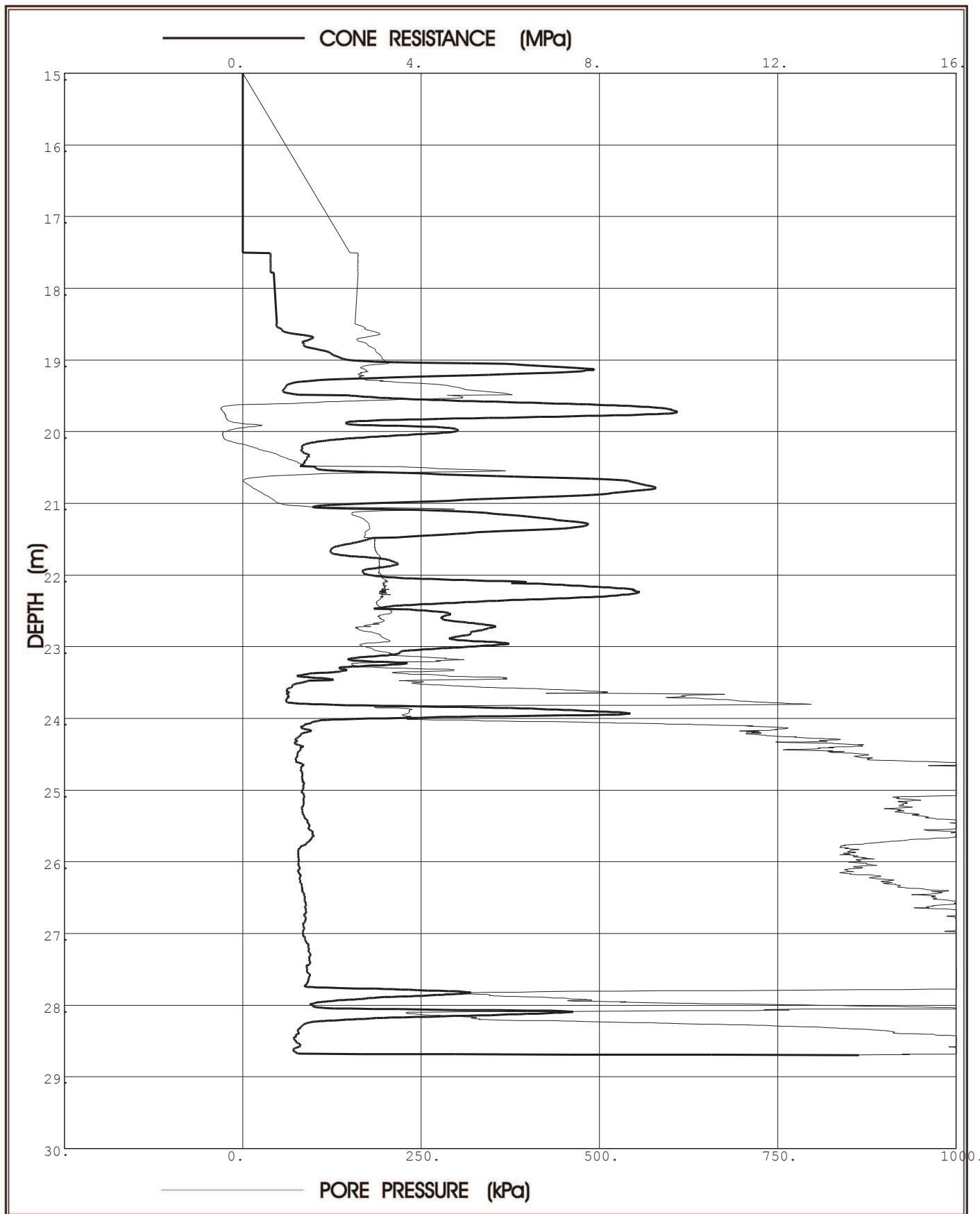
SITE: Pier2

CPTU (RE): CPT15

DATE: 2012/07/05

Probe: GHANA

Page:2



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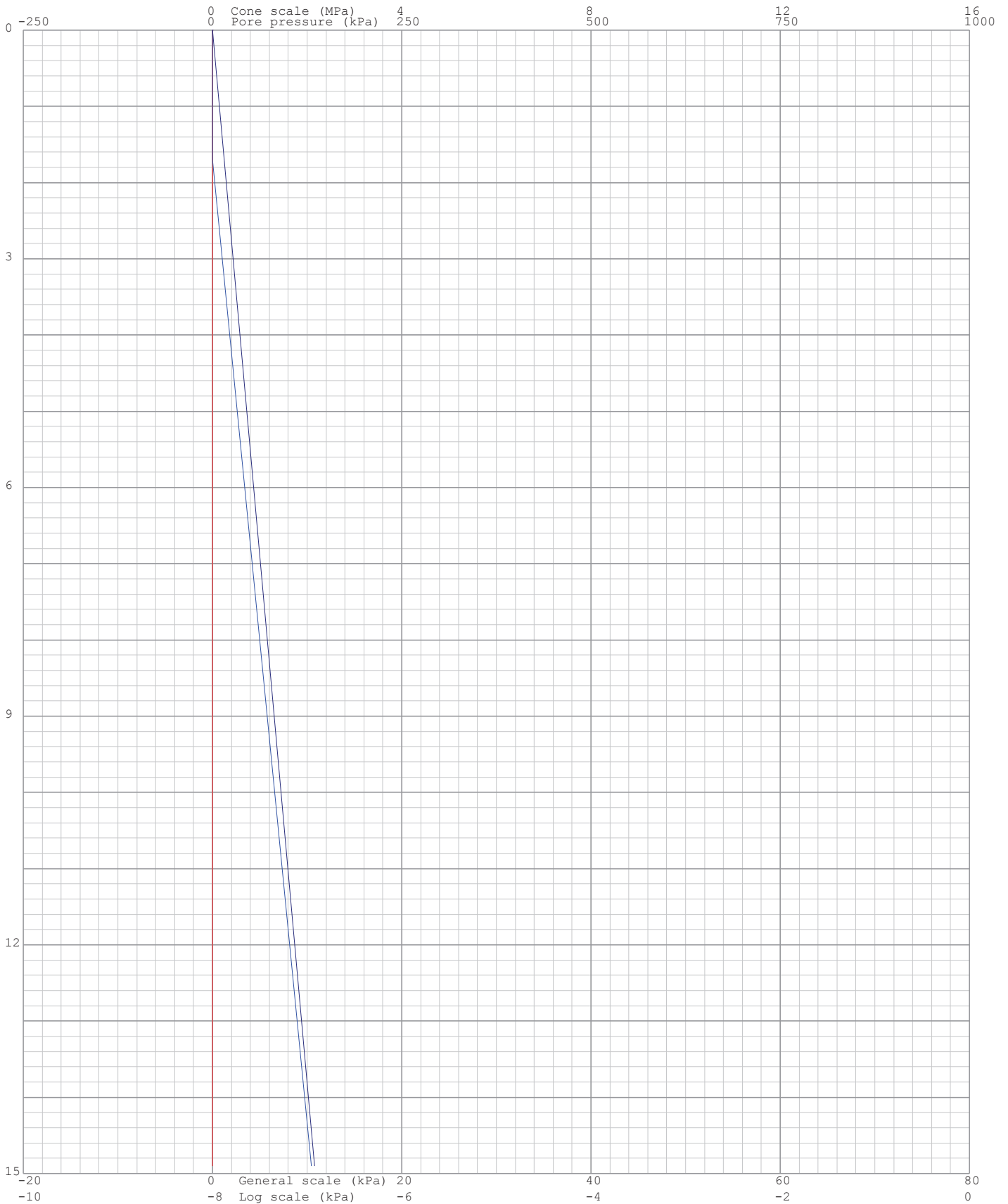
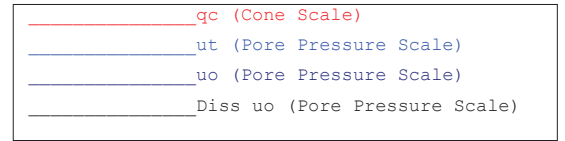
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT15

Date: 2012/07/05

Probe: GHANA



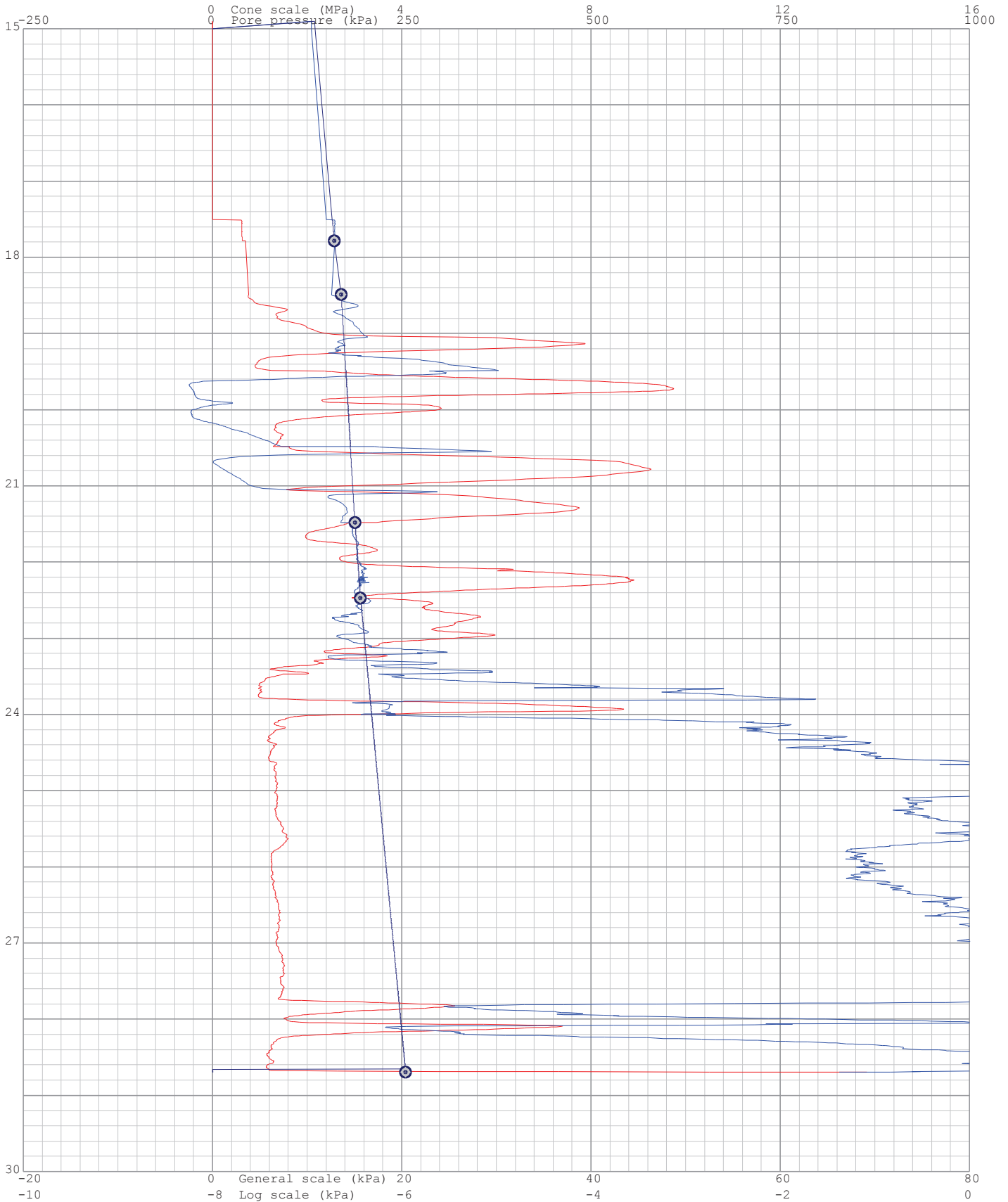
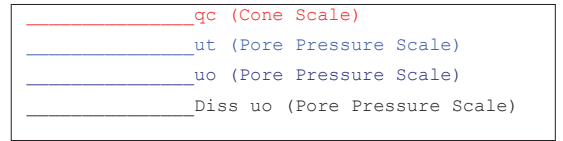
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT15

Date: 2012/07/05

Probe: GHANA



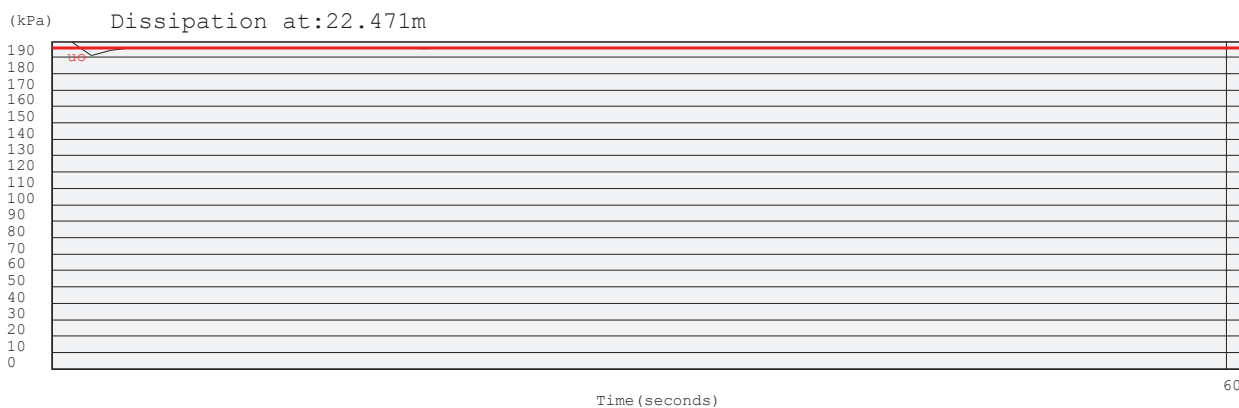
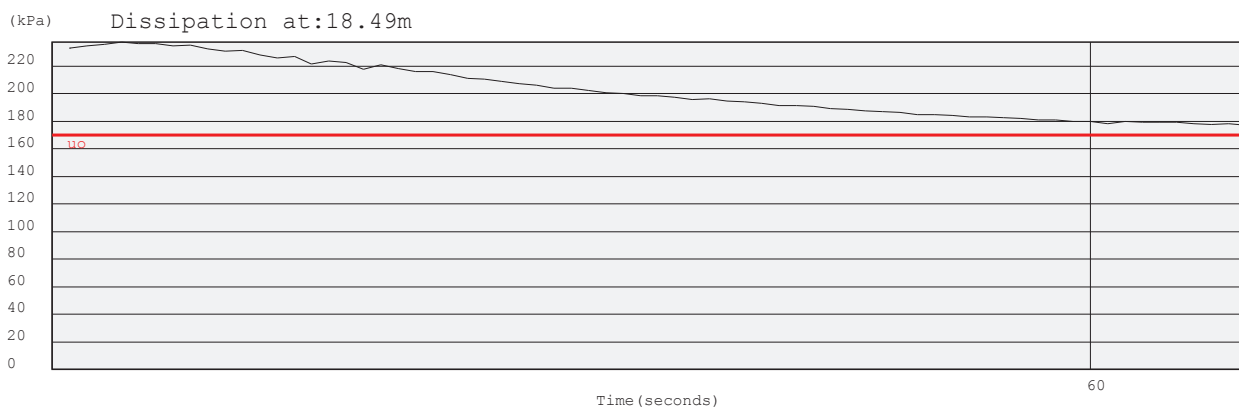
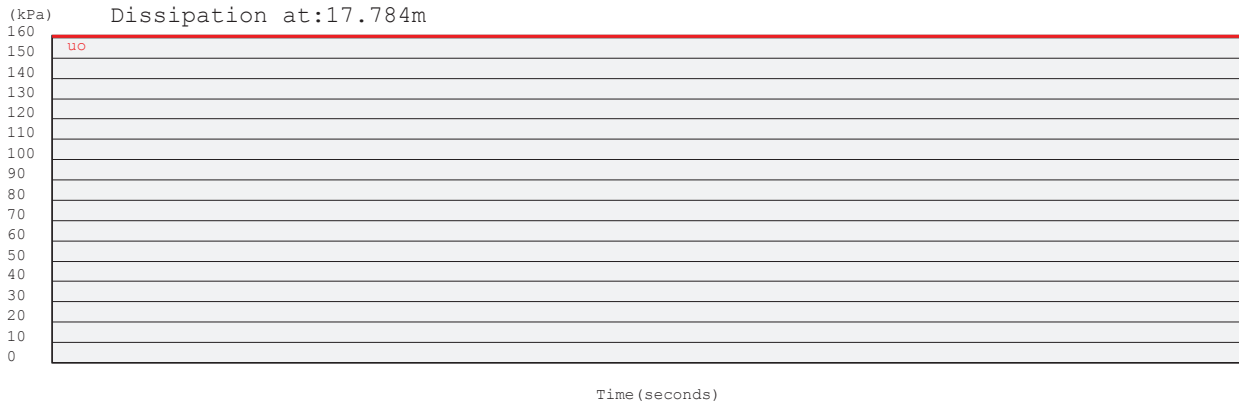
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT15

Date: 2012/07/05

Probe: GHANA  
Page: 1





Project: Durban Harbour Over Water

Site: Pier2

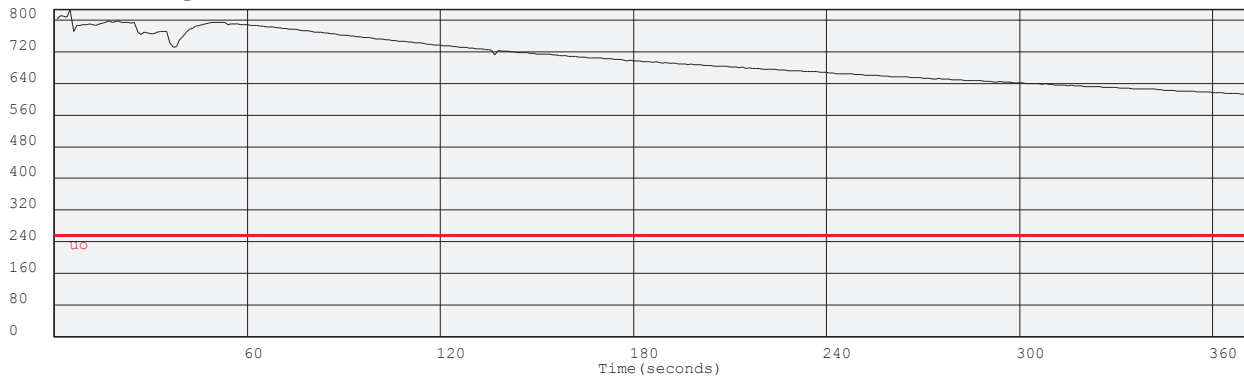
Hole: CPT15

Date: 2012/07/05

Probe: GHANA

Page: 2

(kPa) Dissipation at: 28.698m



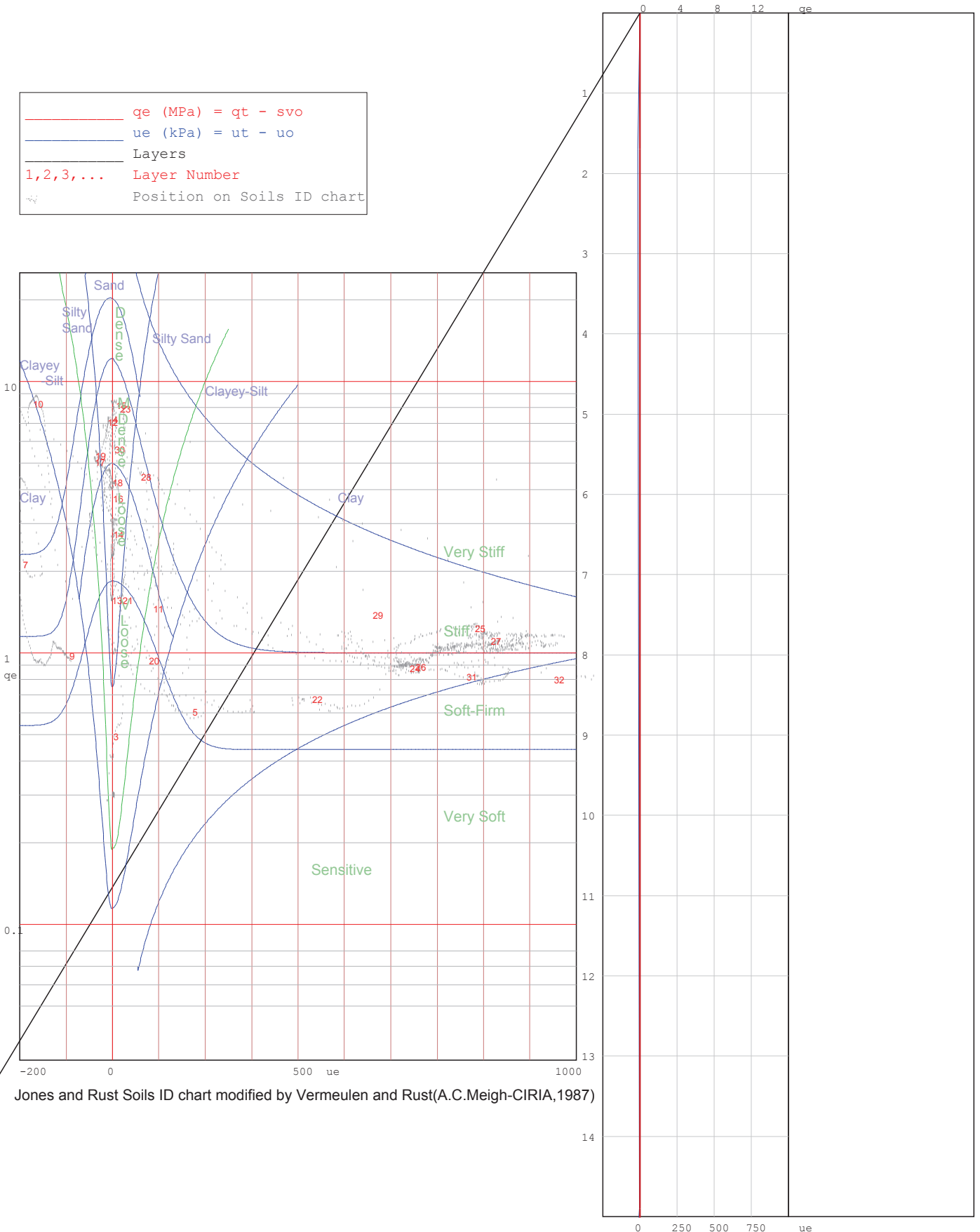
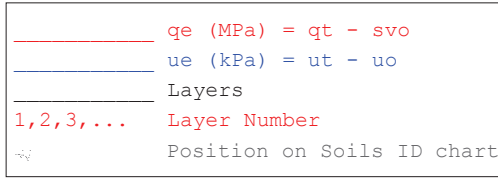
Project: Durban Harbour Over Water

Site: Pier2

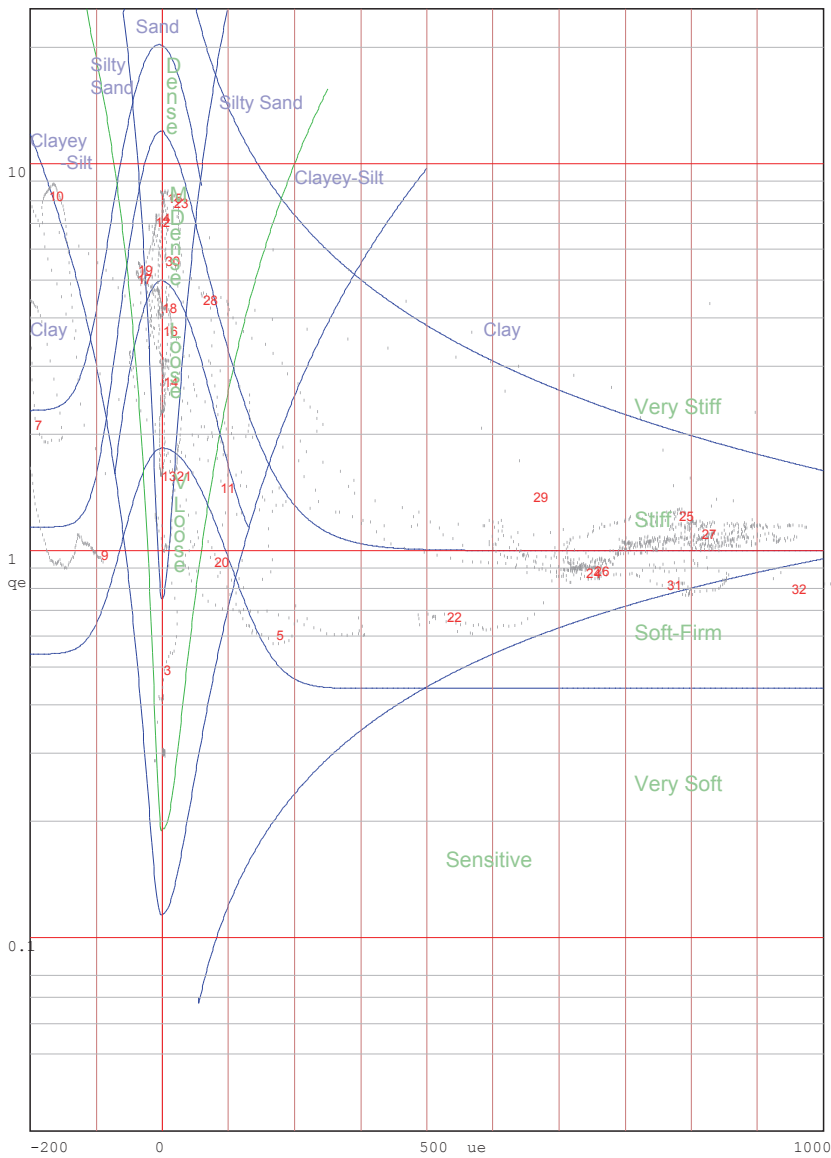
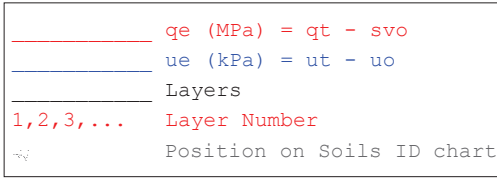
Hole No: CPT15

Date: 2012/07/05

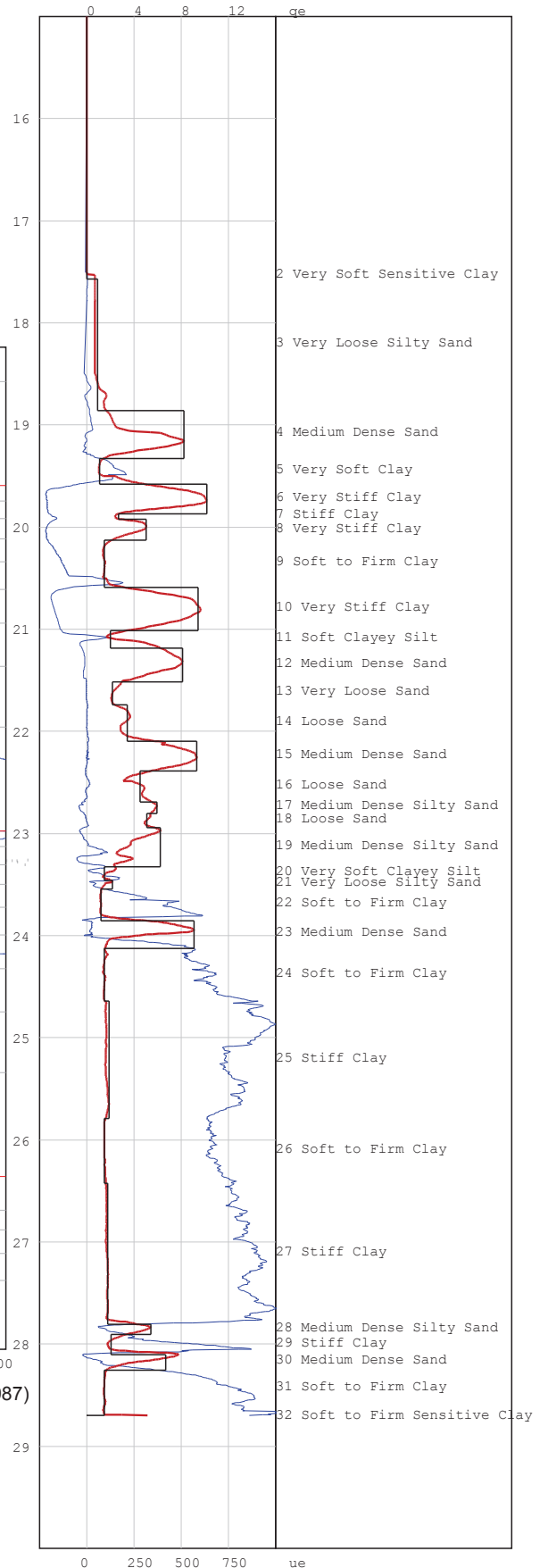
Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

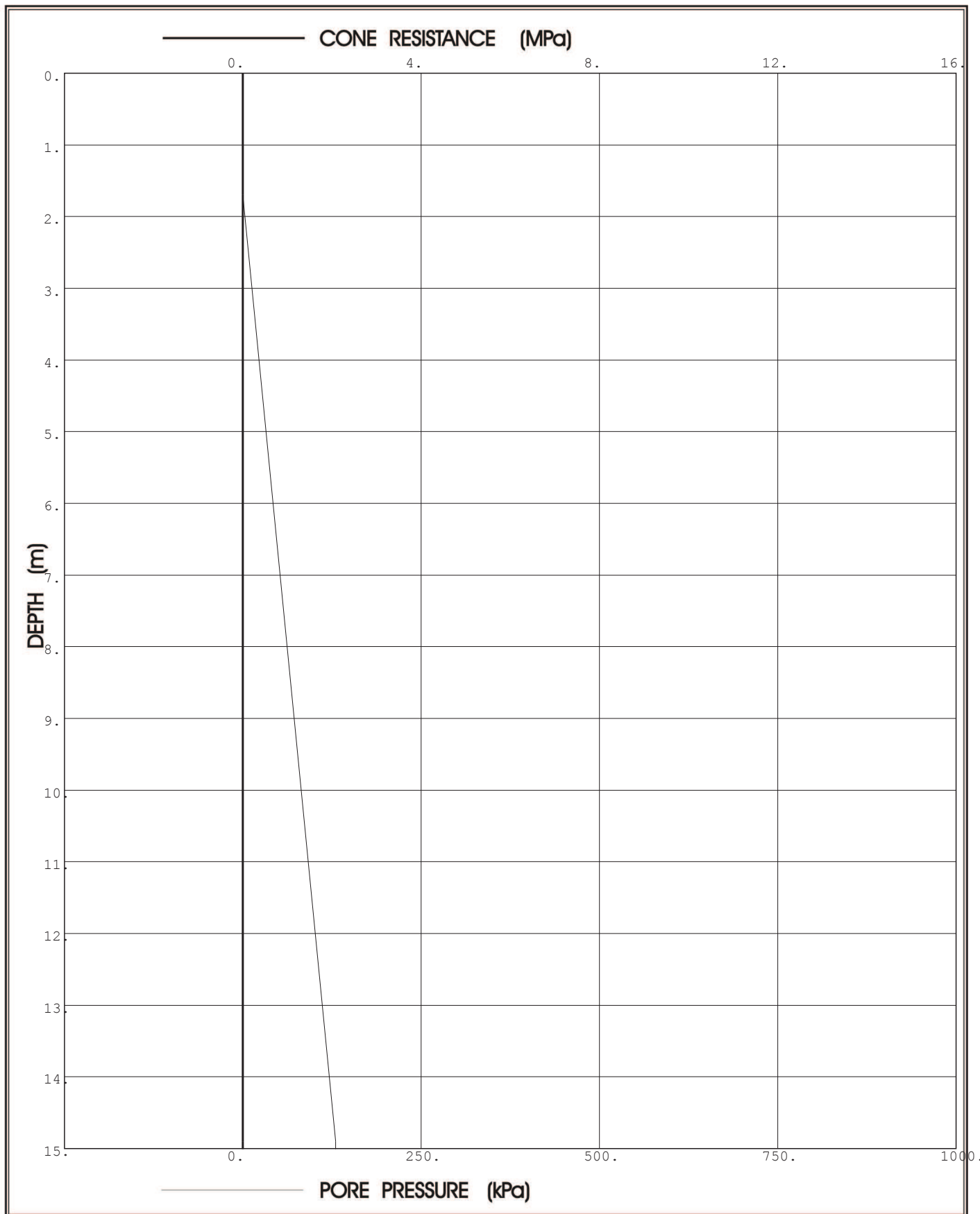
SITE: Pier2

CPTU (RE): CPT16

DATE: 2012-06-27

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

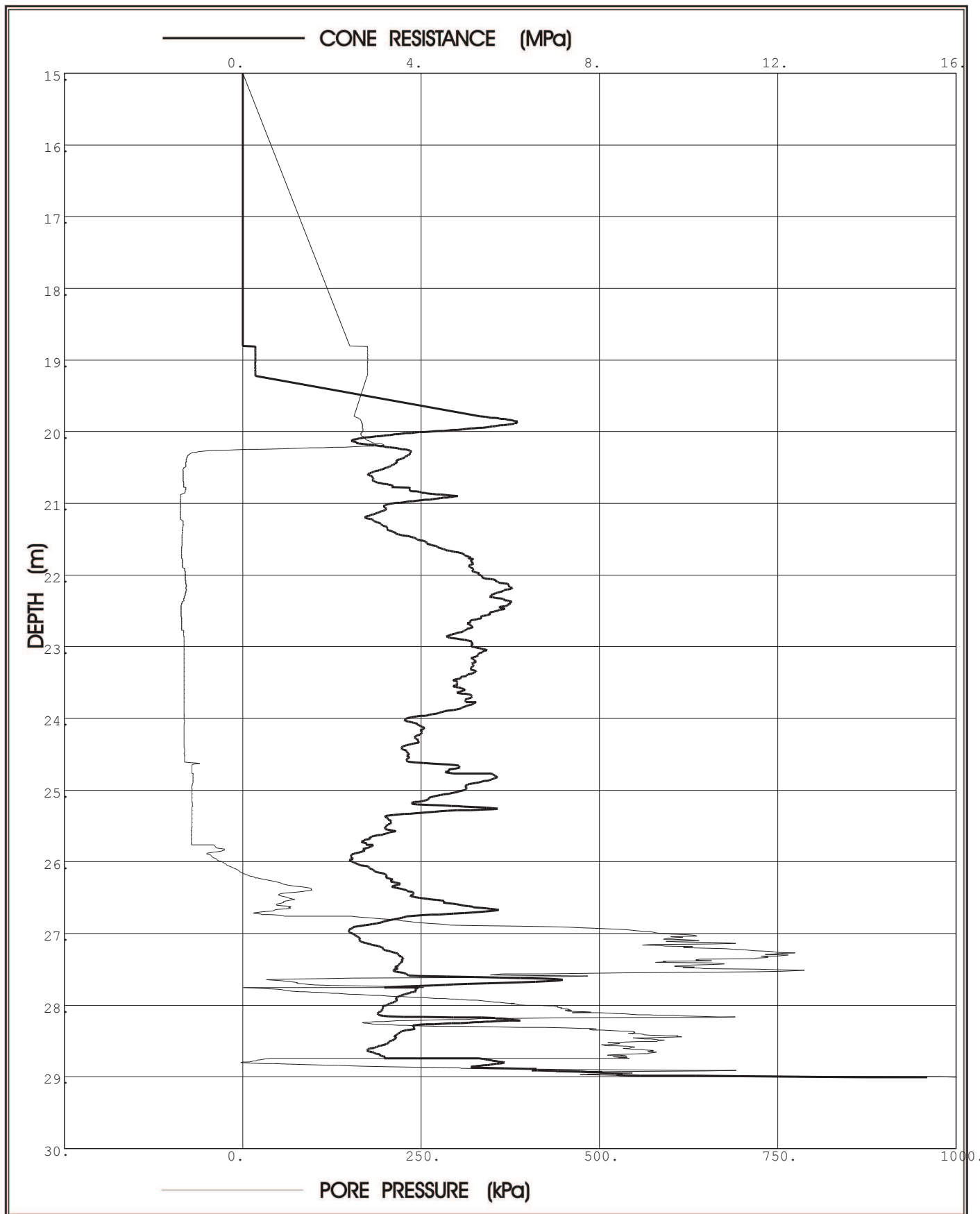
SITE: Pier2

CPTU (RE): CPT16

DATE: 2012-06-27

Probe: KELLER

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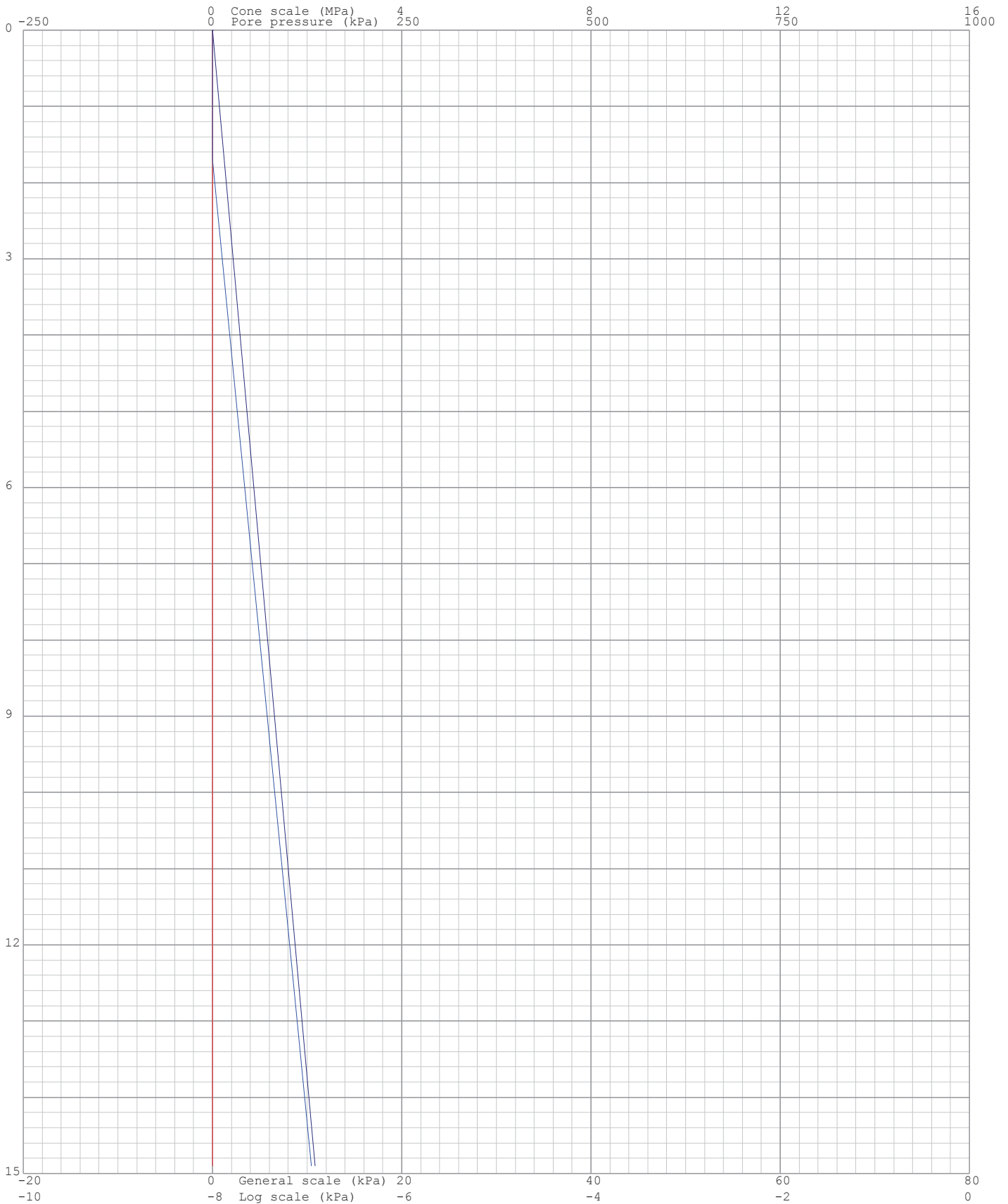
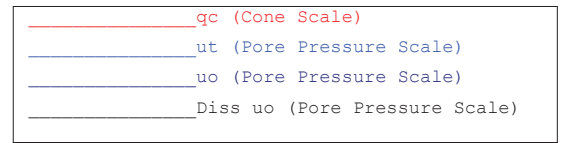
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT16

Date: 2012-06-27

Probe: KELLER



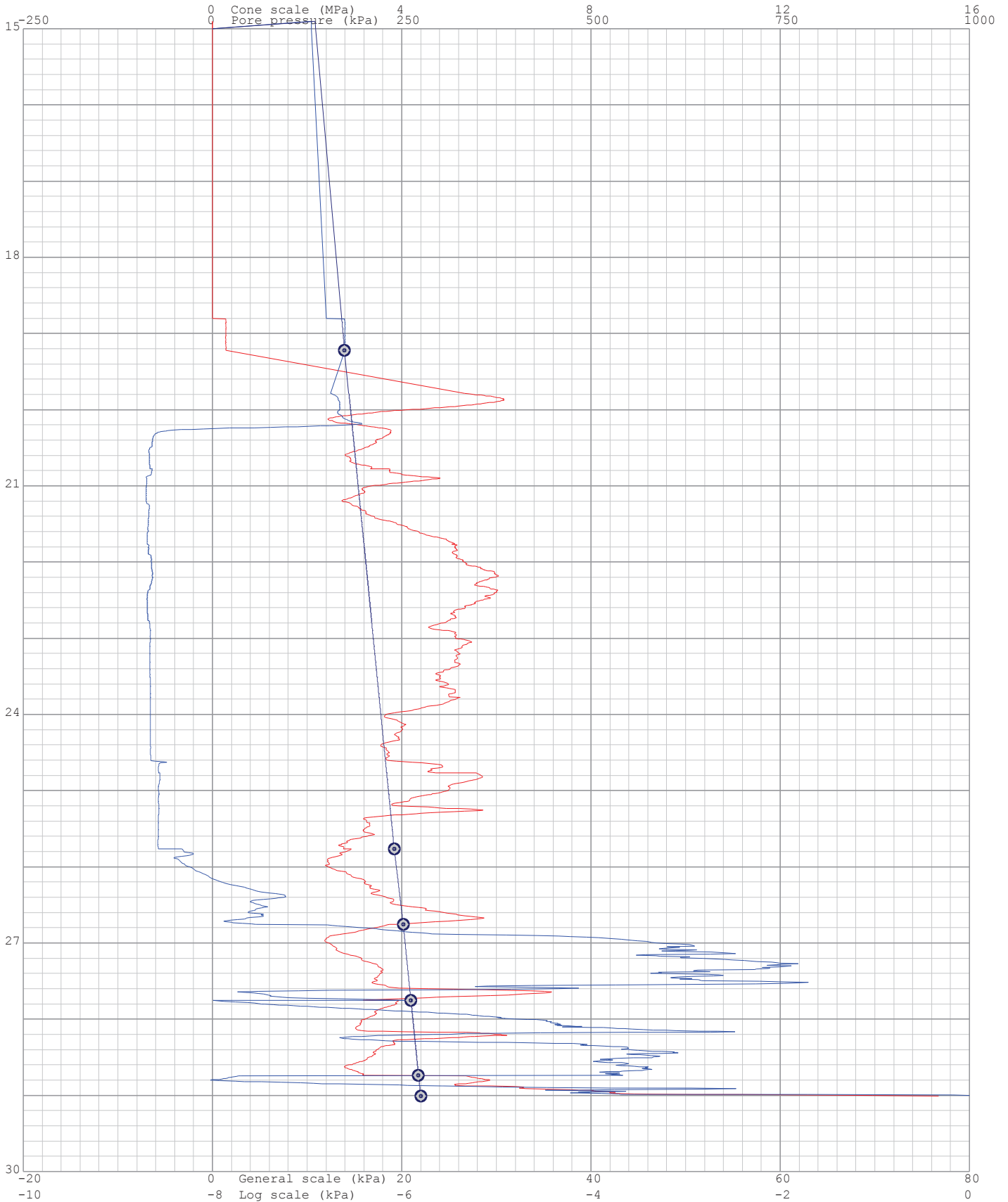
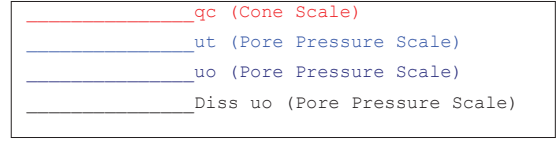
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT16

Date: 2012-06-27

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT16

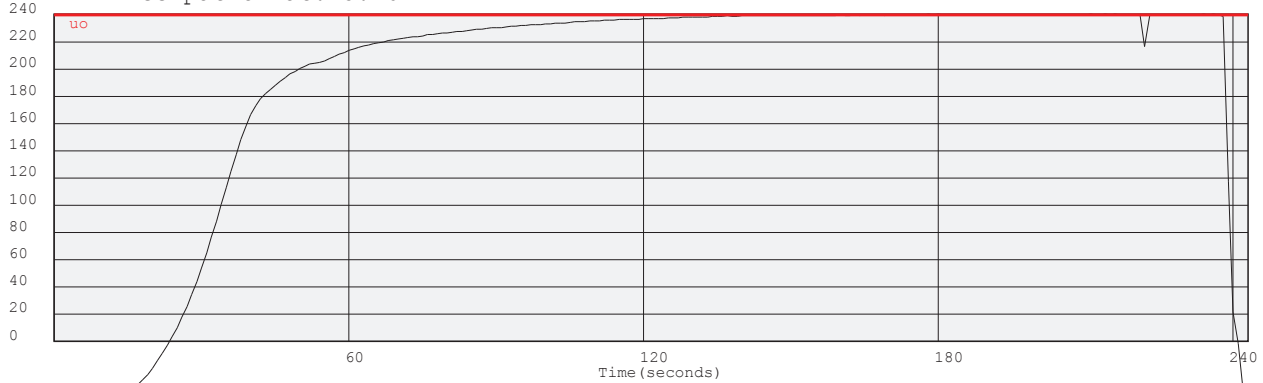
Date: 2012-06-27

Probe: KELLER  
Page: 1

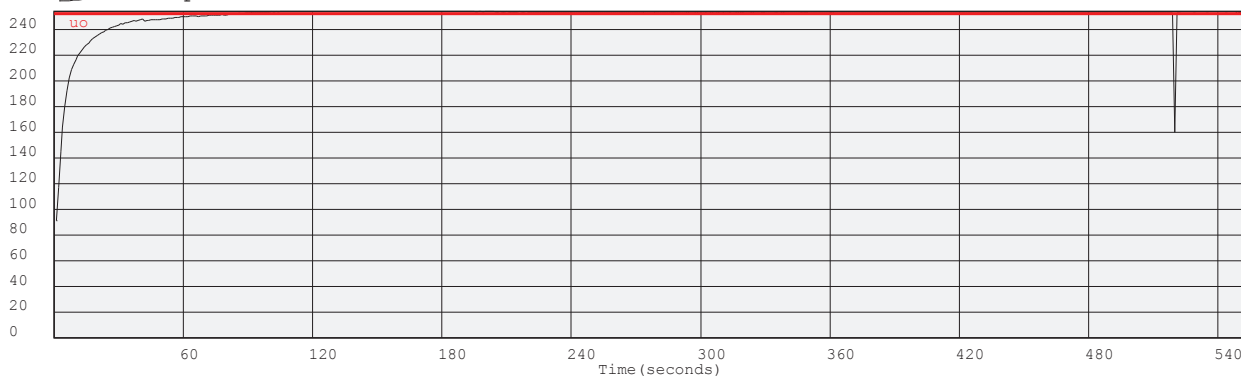
(kPa) Dissipation at: 19.222m



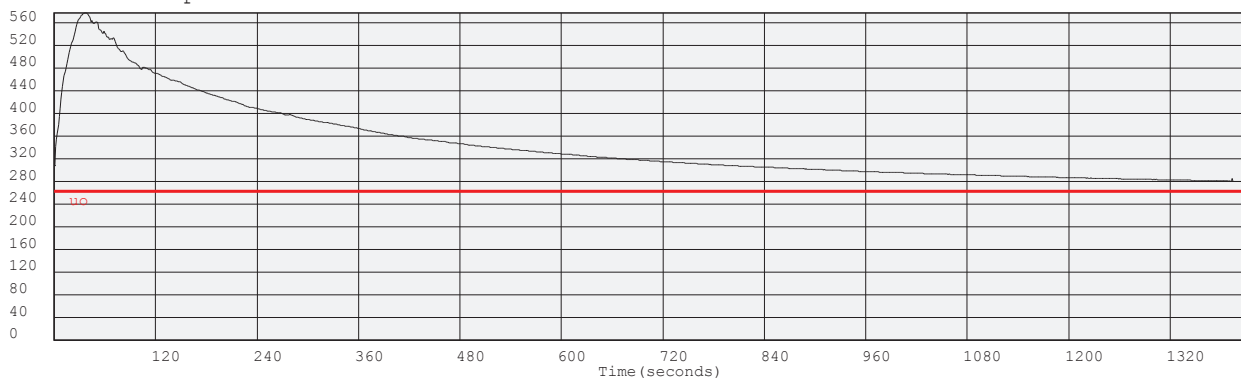
(kPa) Dissipation at: 25.764m



(kPa) Dissipation at: 26.758m



(kPa) Dissipation at: 27.752m





Project: Durban Harbour Over Water

Site: Pier2

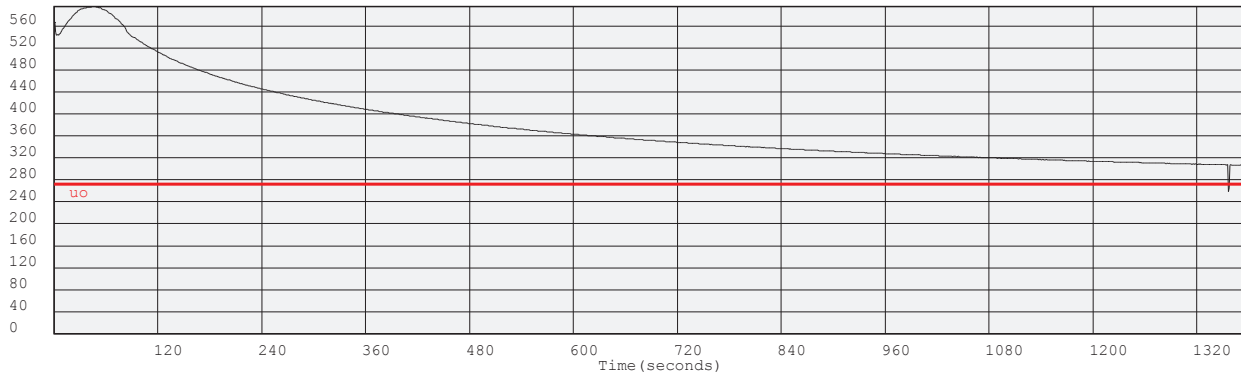
Hole: CPT16

Date: 2012-06-27

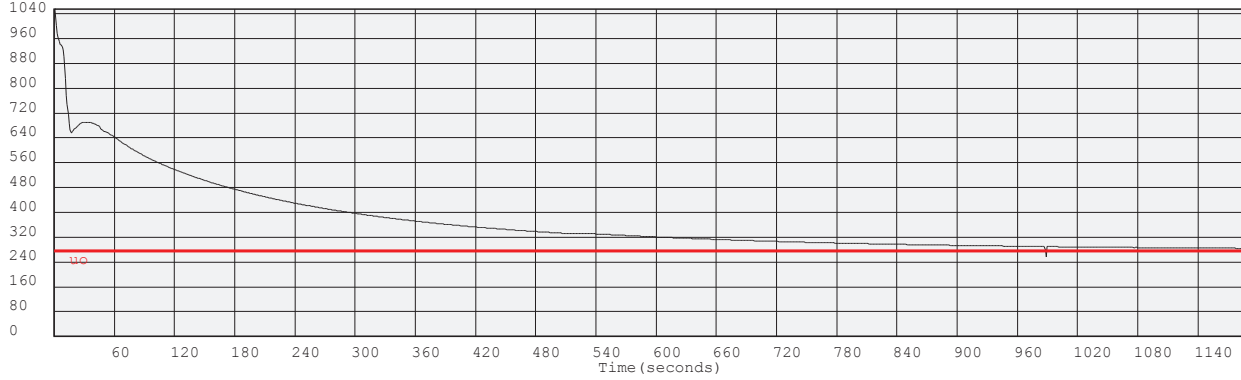
Probe: KELLER

Page: 2

(kPa) Dissipation at: 28.738m



(kPa) Dissipation at: 29.008m



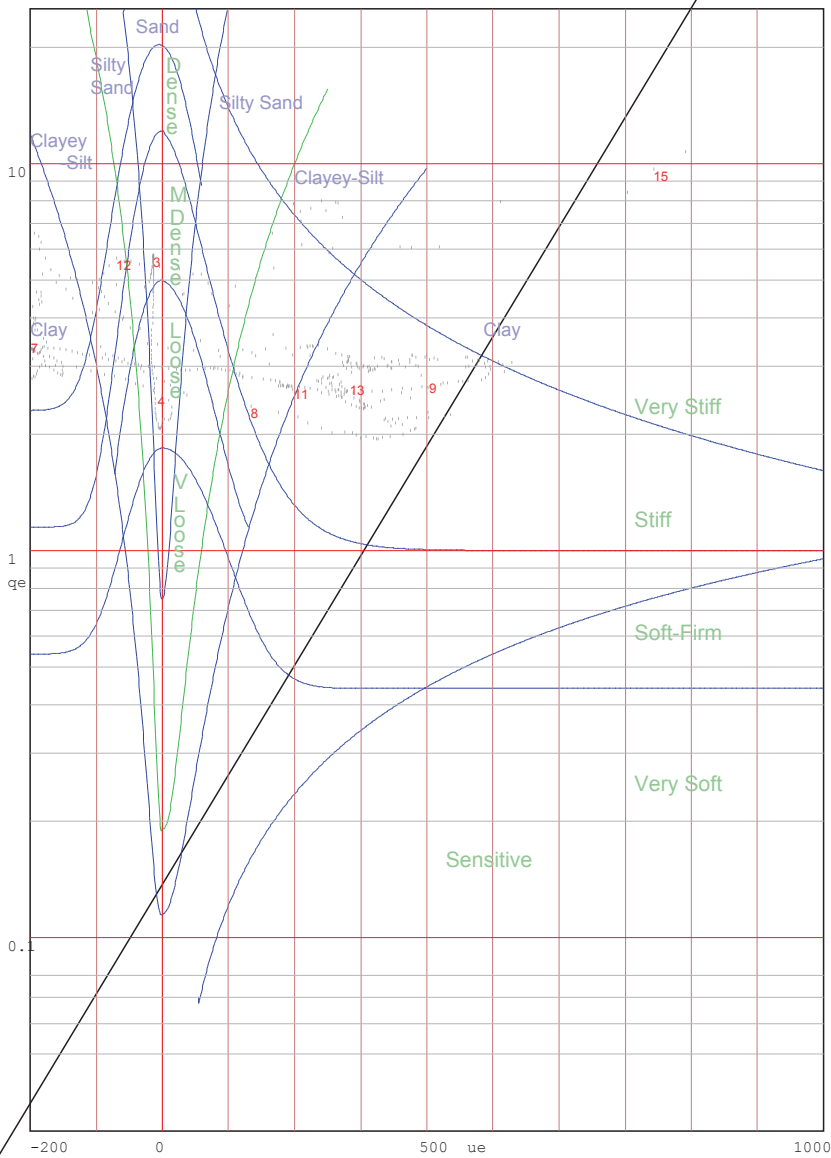
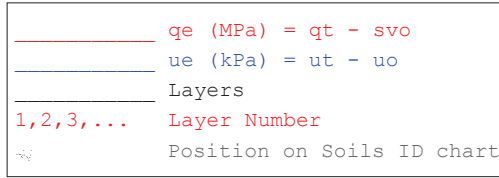
Project: Durban Harbour Over Water

Site: Pier2

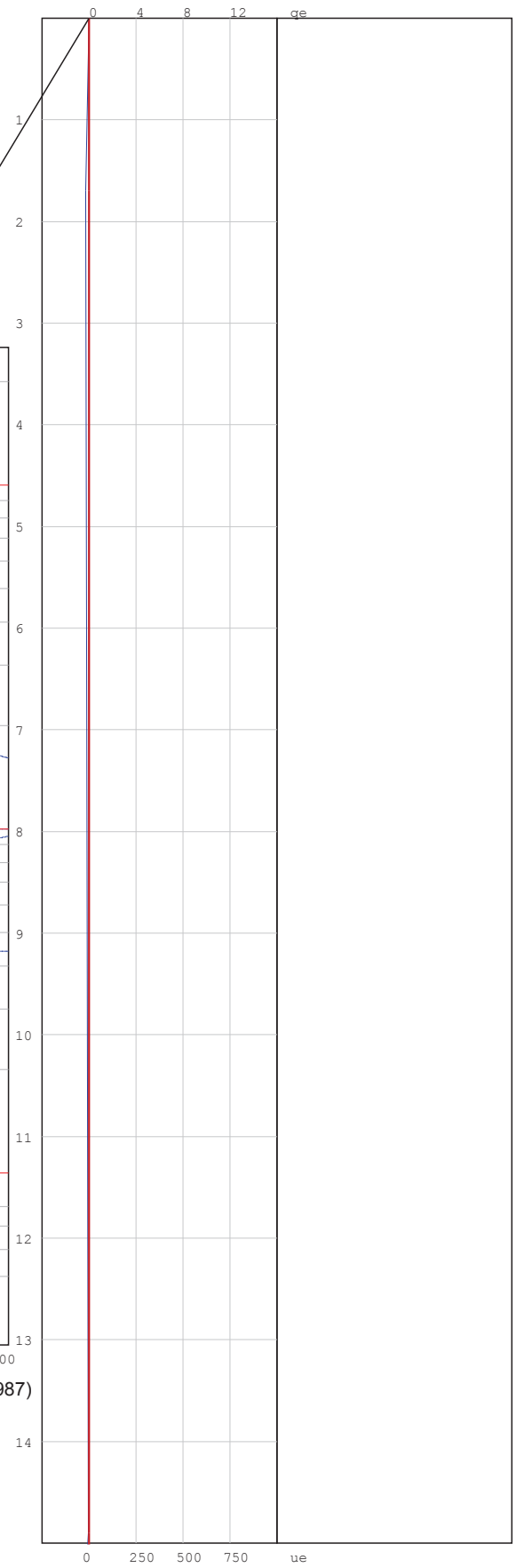
Hole No: CPT16

Date: 2012-06-27

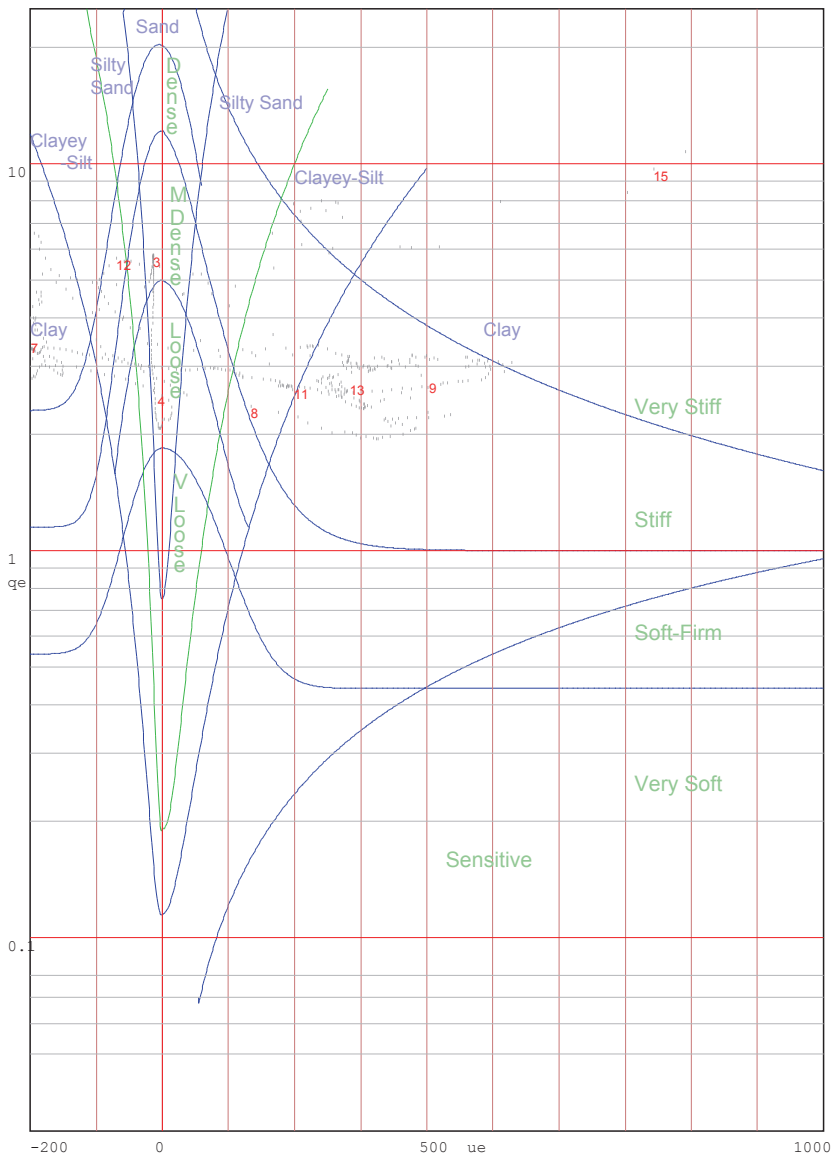
Probe: KELLER



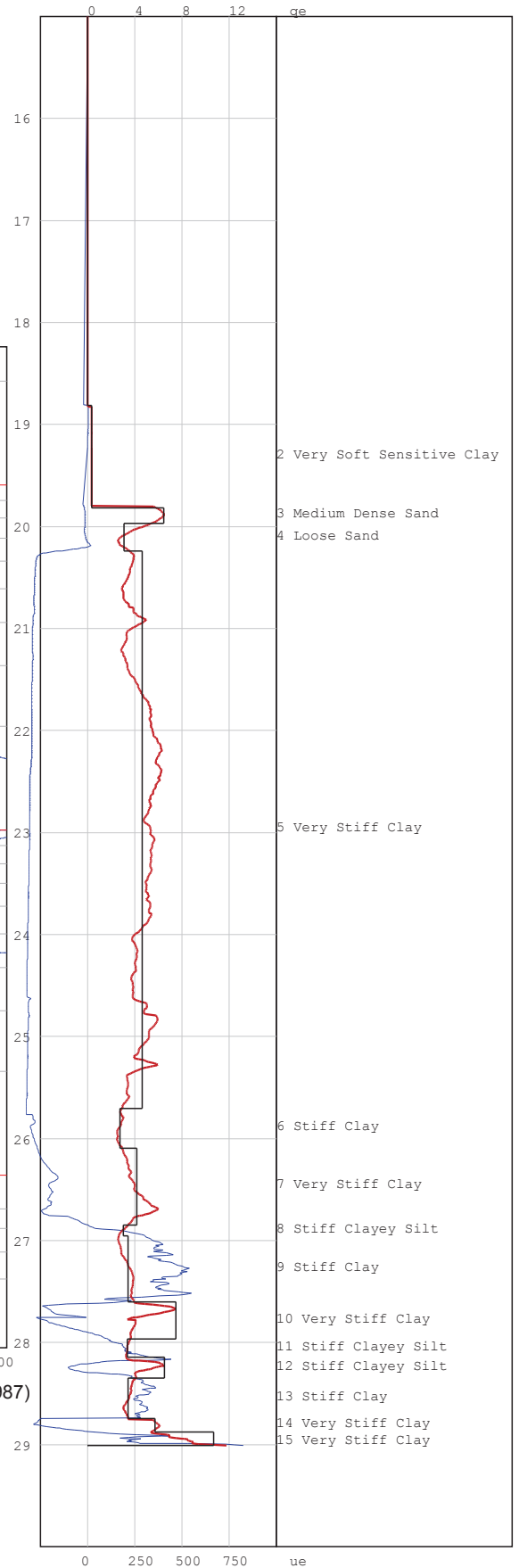
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

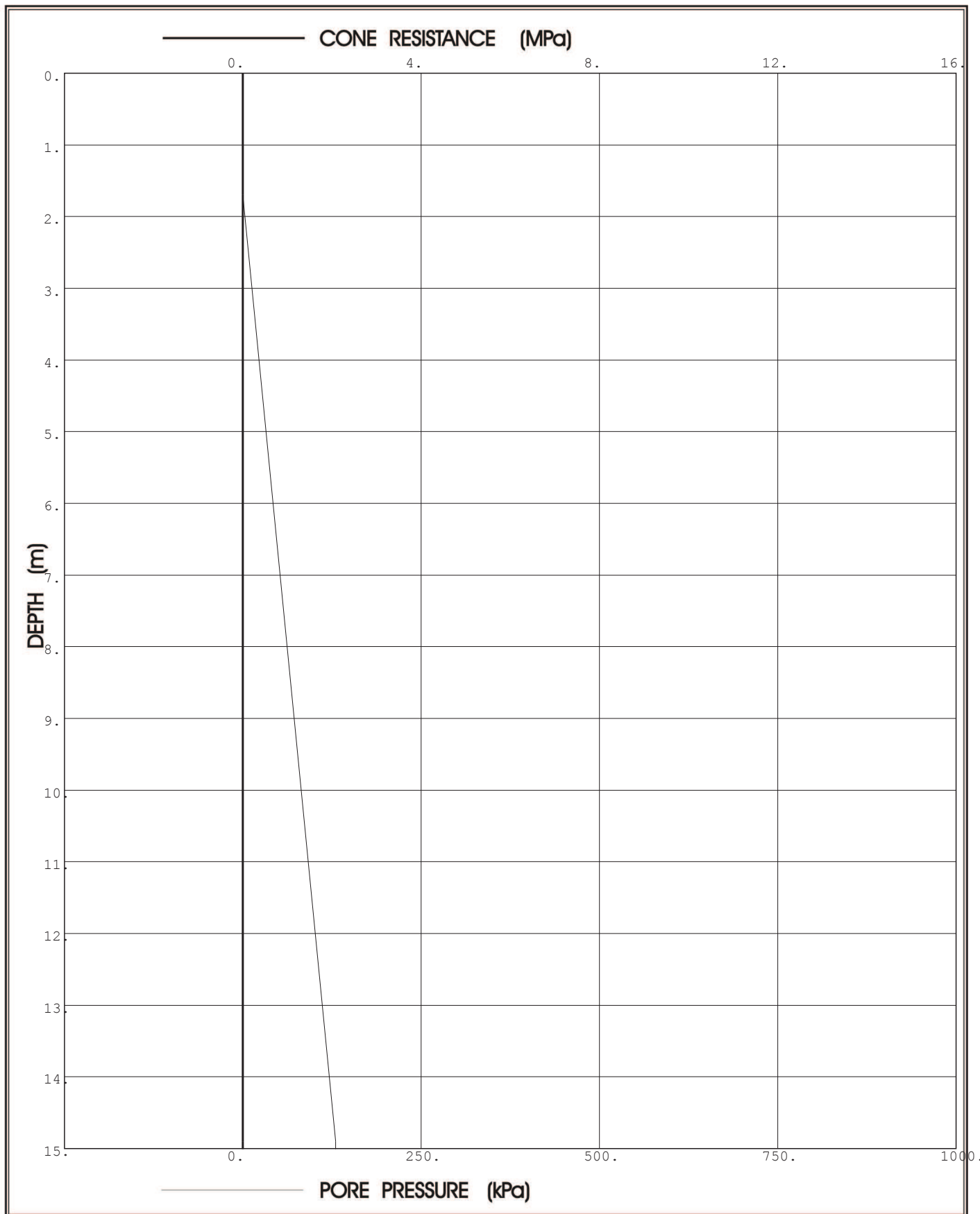
SITE: Pier2

CPTU (RE): CPT17

DATE: 2012/07/05

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

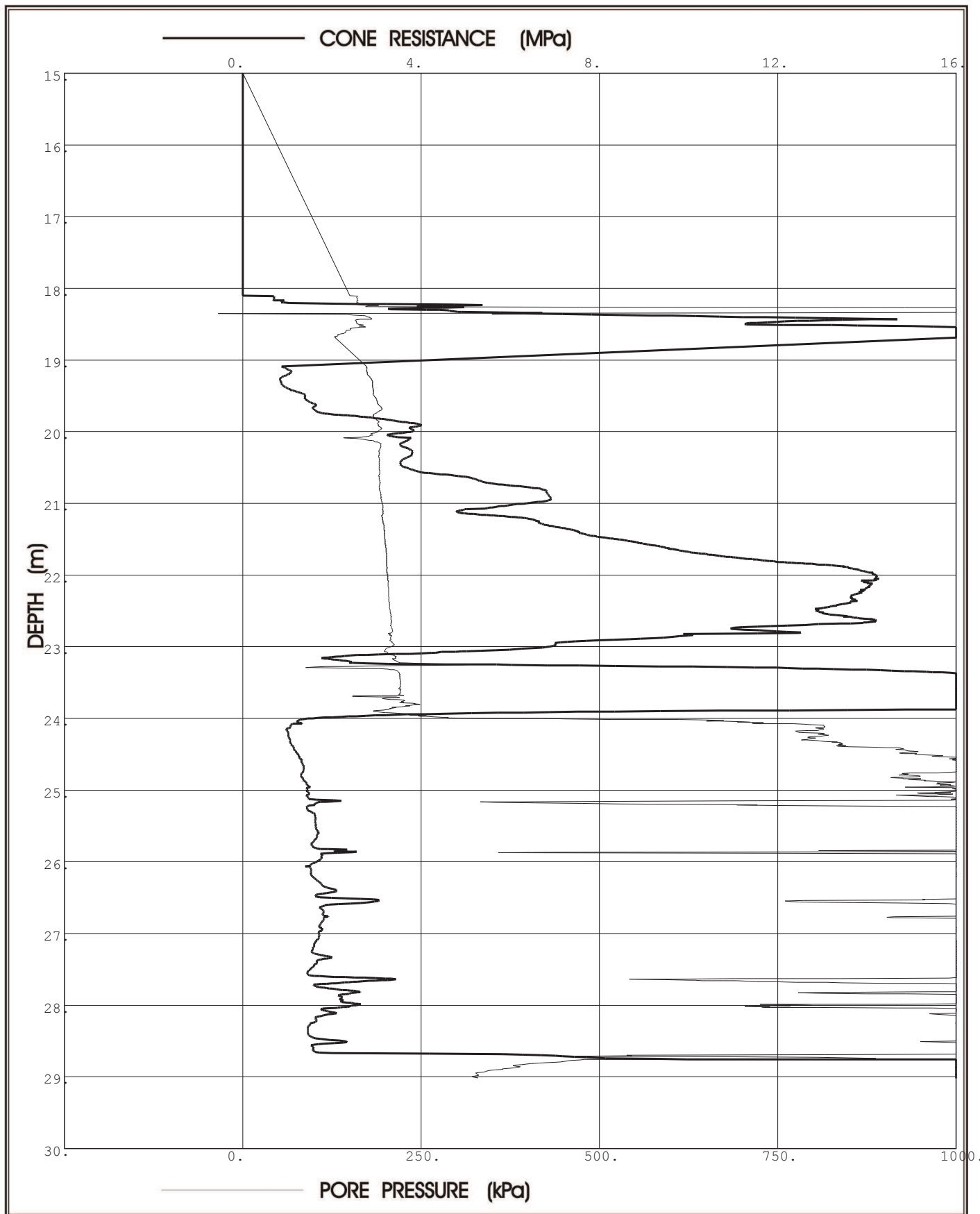
SITE: Pier2

CPTU (RE): CPT17

DATE: 2012/07/05

Probe: GHANA

Page:2



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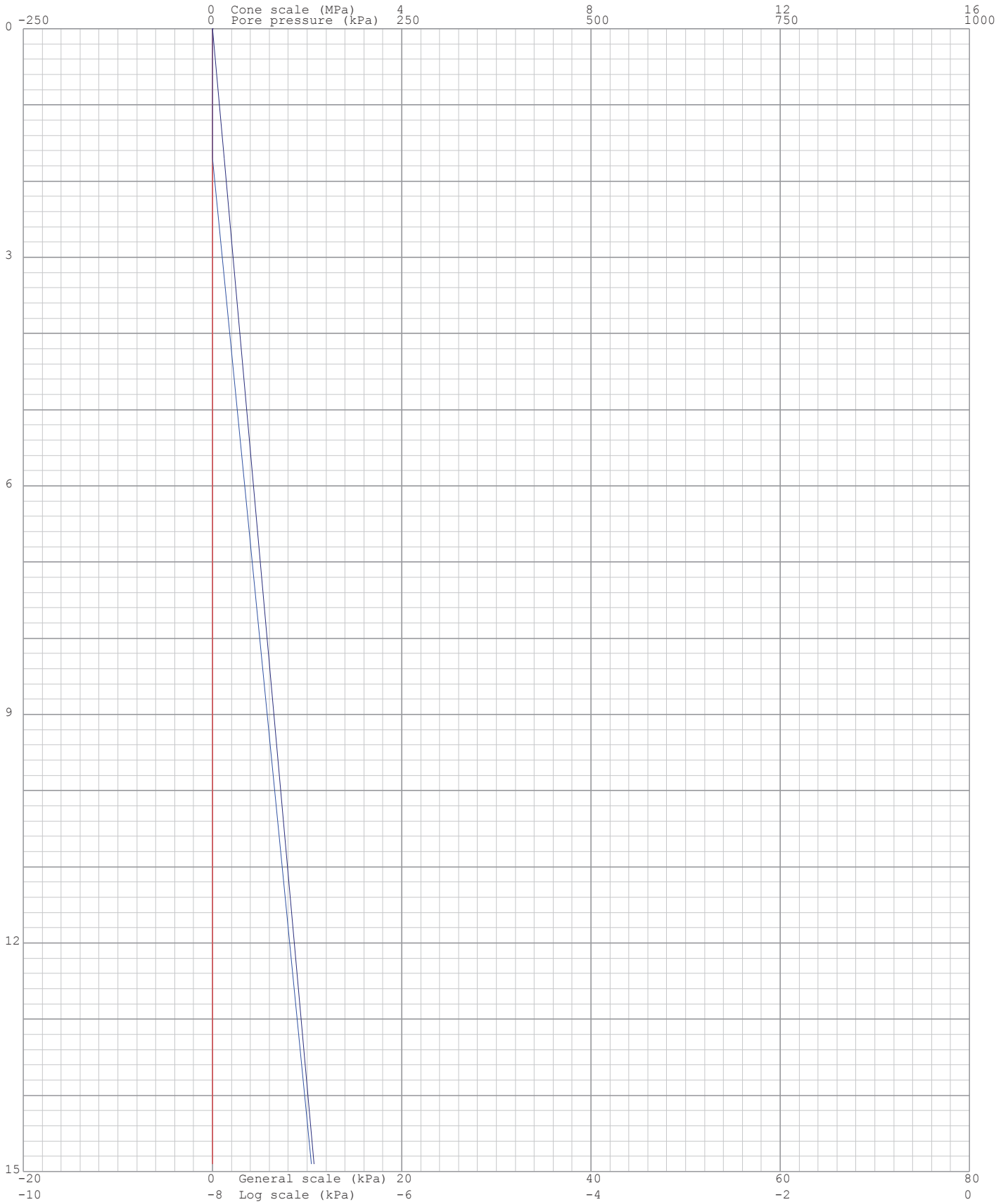
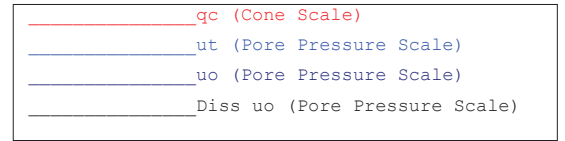
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT17

Date: 2012/07/05

Probe: GHANA



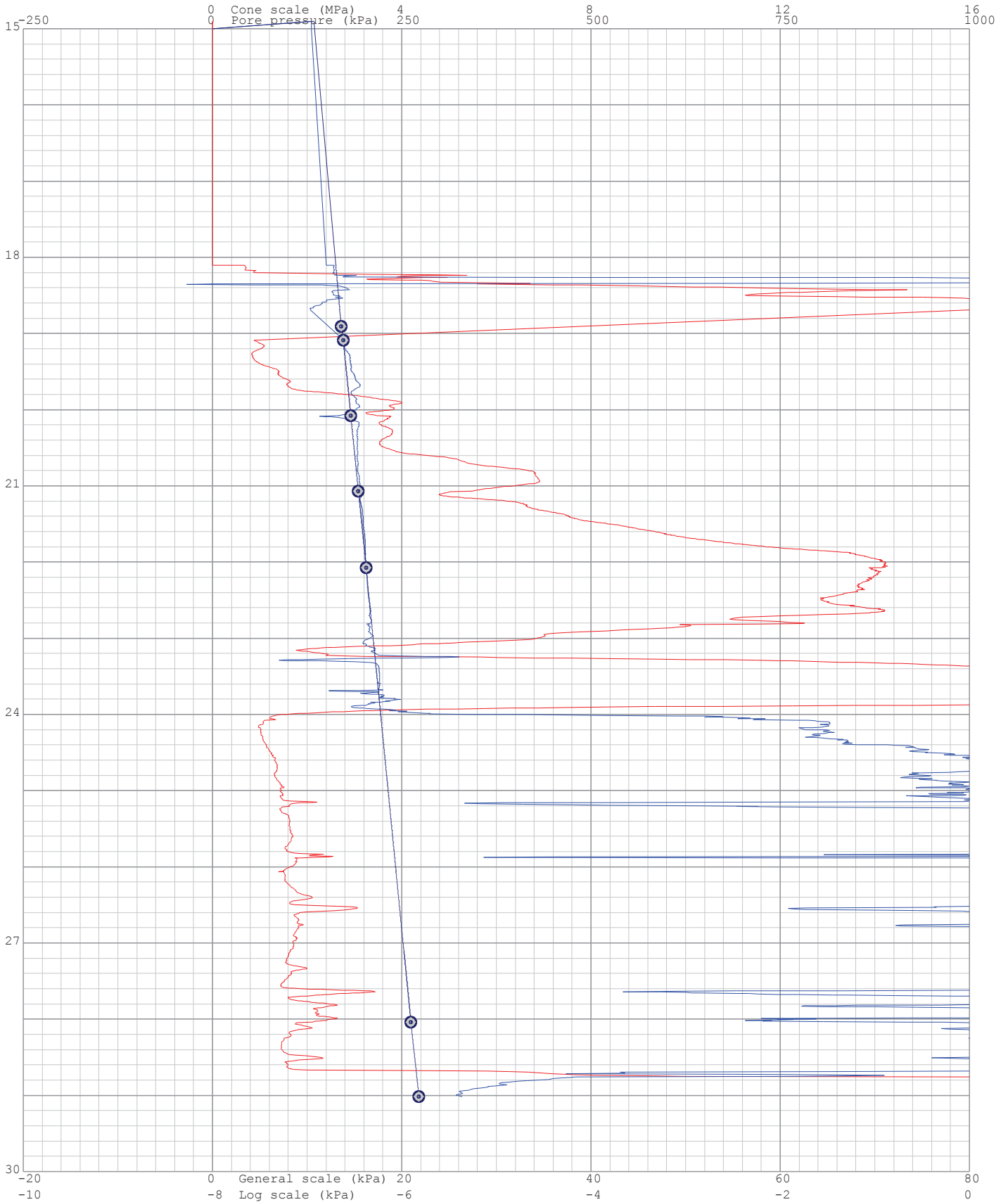
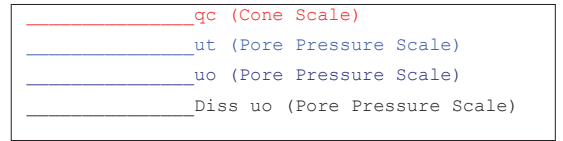
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT17

Date: 2012/07/05

Probe: GHANA



Project: Durban Harbour Over Water

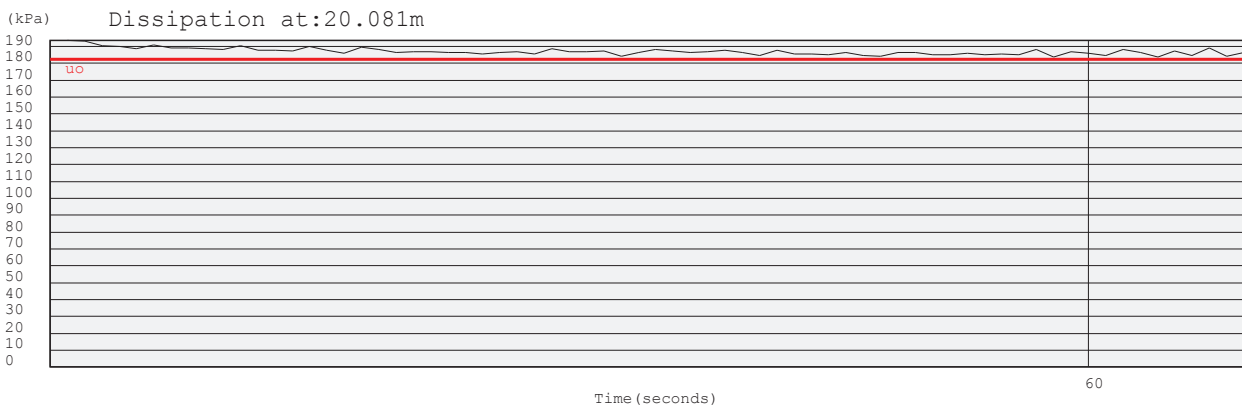
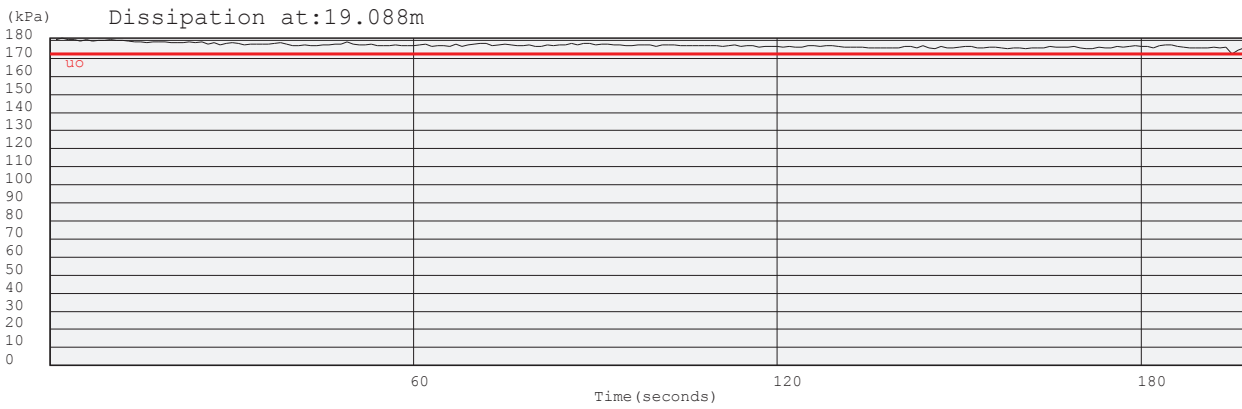
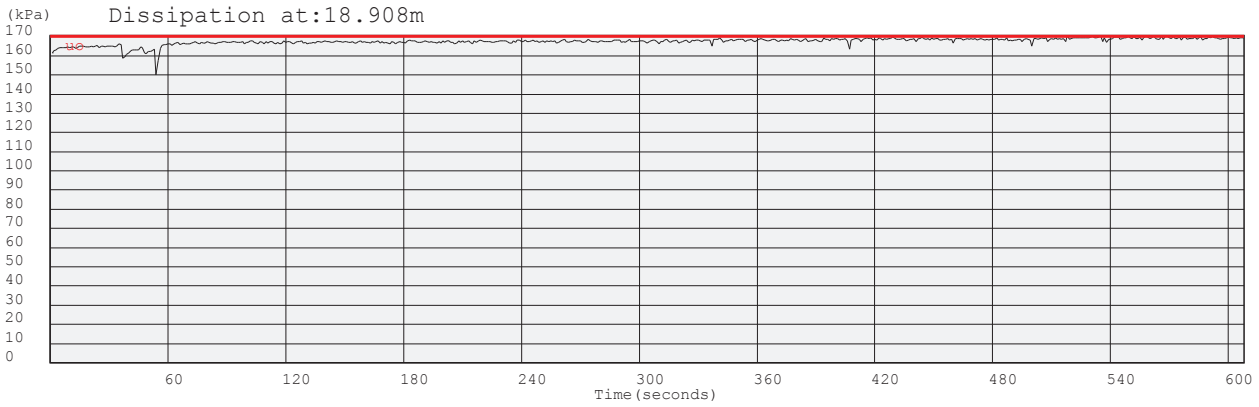
Site: Pier2

Hole: CPT17

Date: 2012/07/05

Probe: GHANA

Page: 1





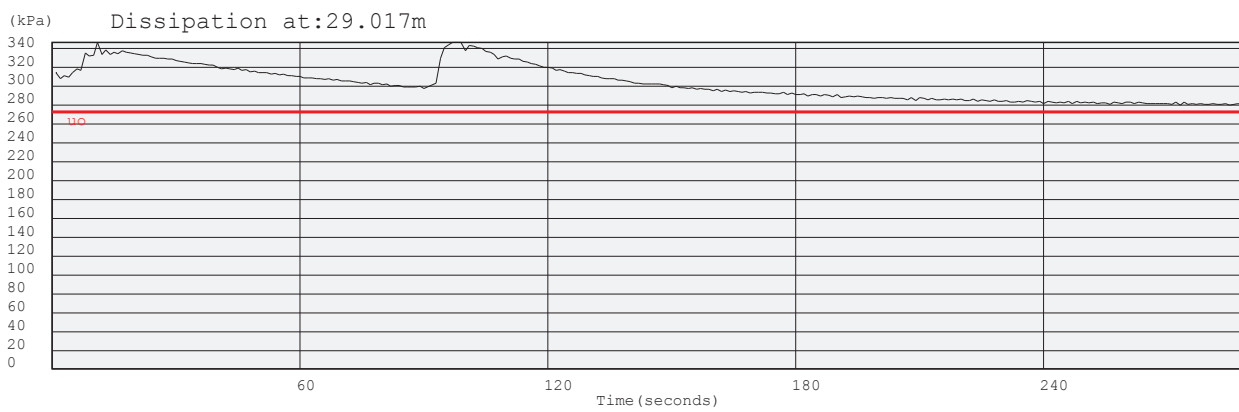
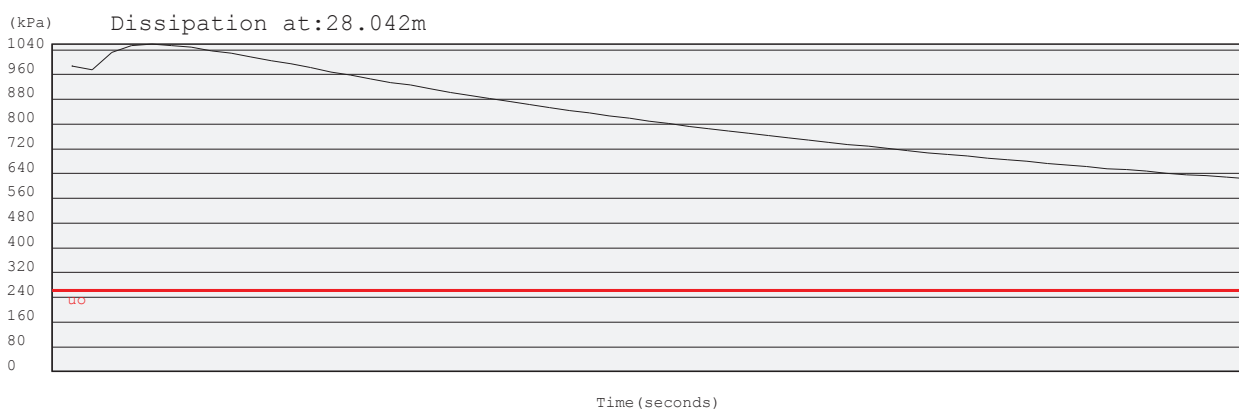
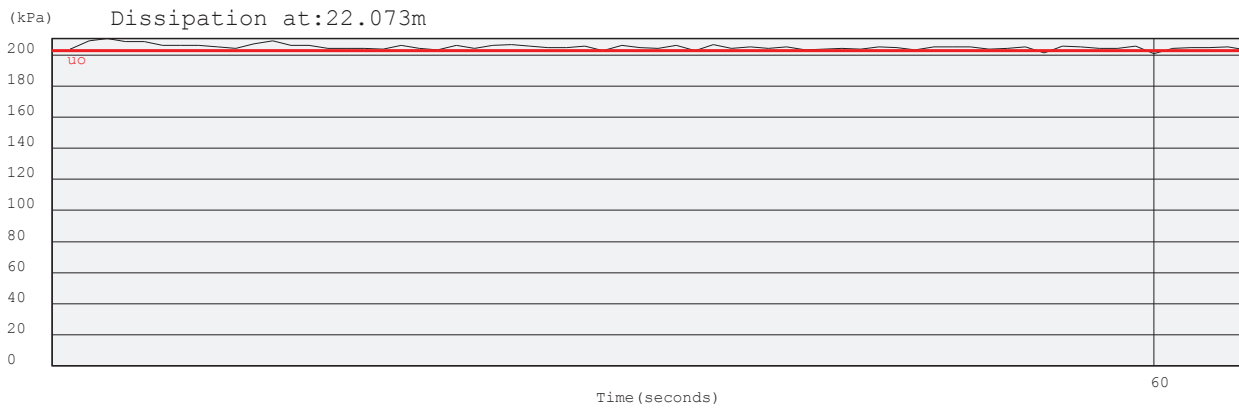
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT17

Date: 2012/07/05

Probe: GHANA  
Page: 2



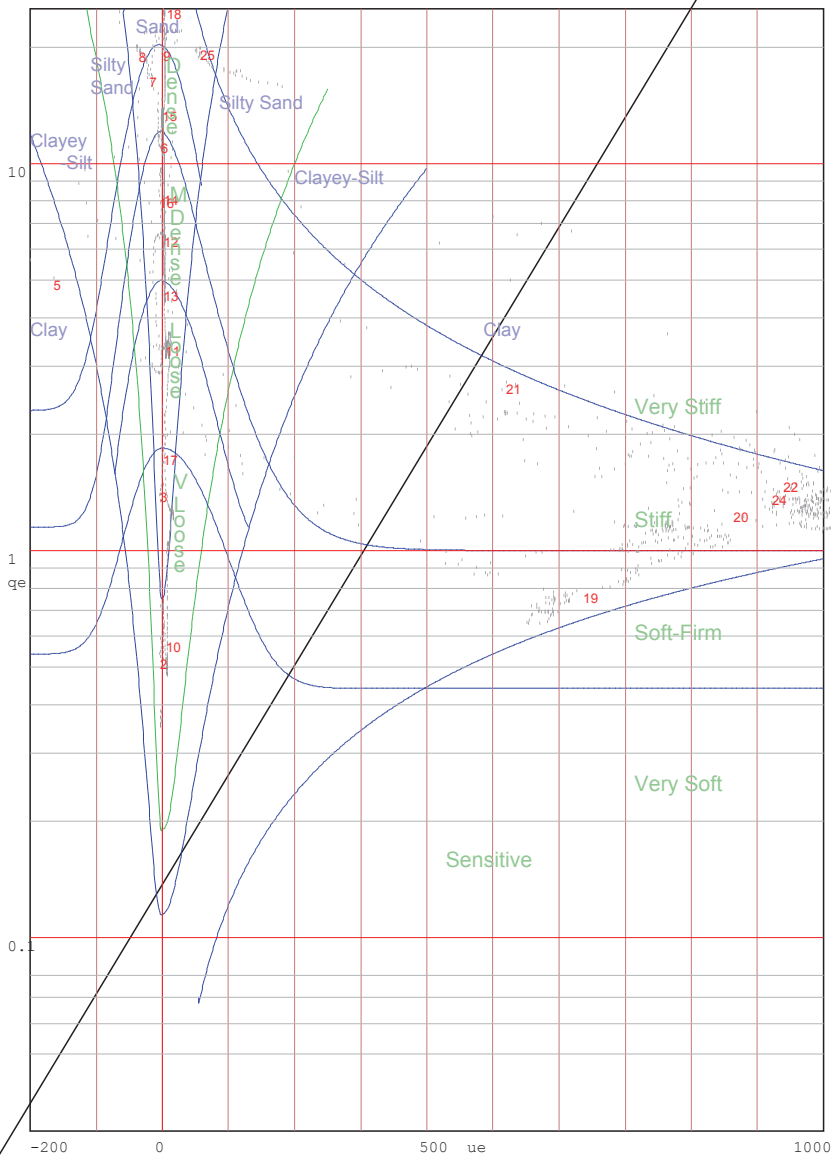
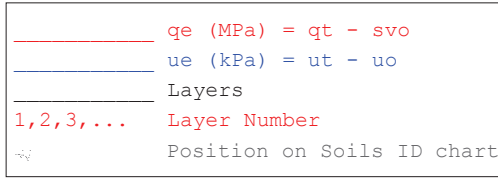
Project: Durban Harbour Over Water

Site: Pier2

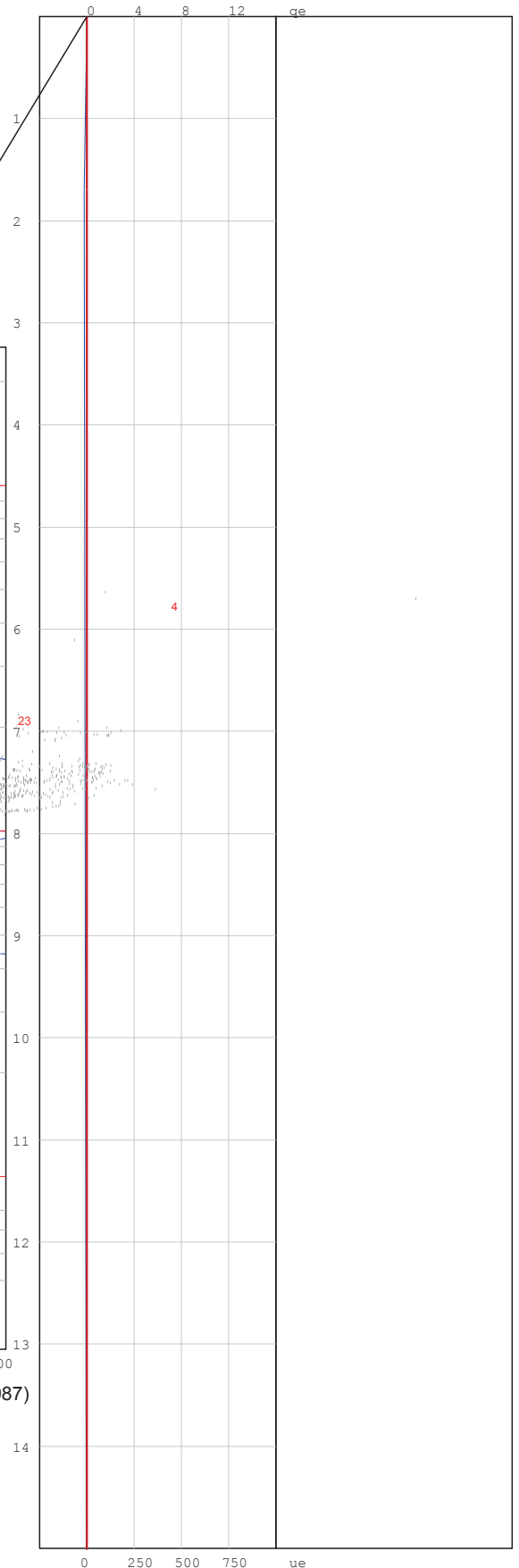
Hole No: CPT17

Date: 2012/07/05

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



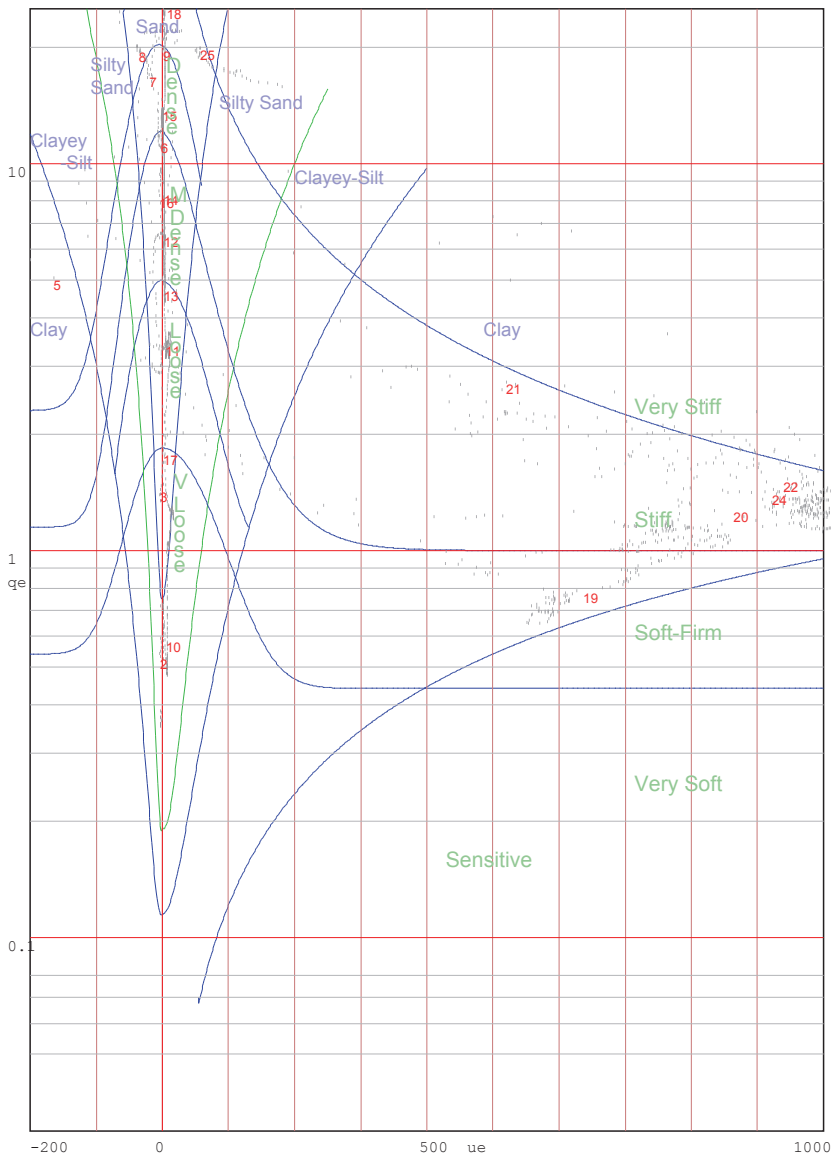
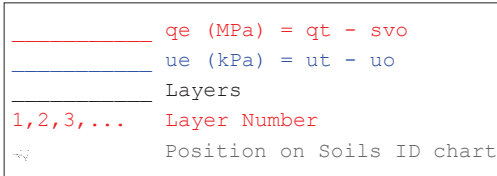
Project: Durban Harbour Over Water

Site: Pier2

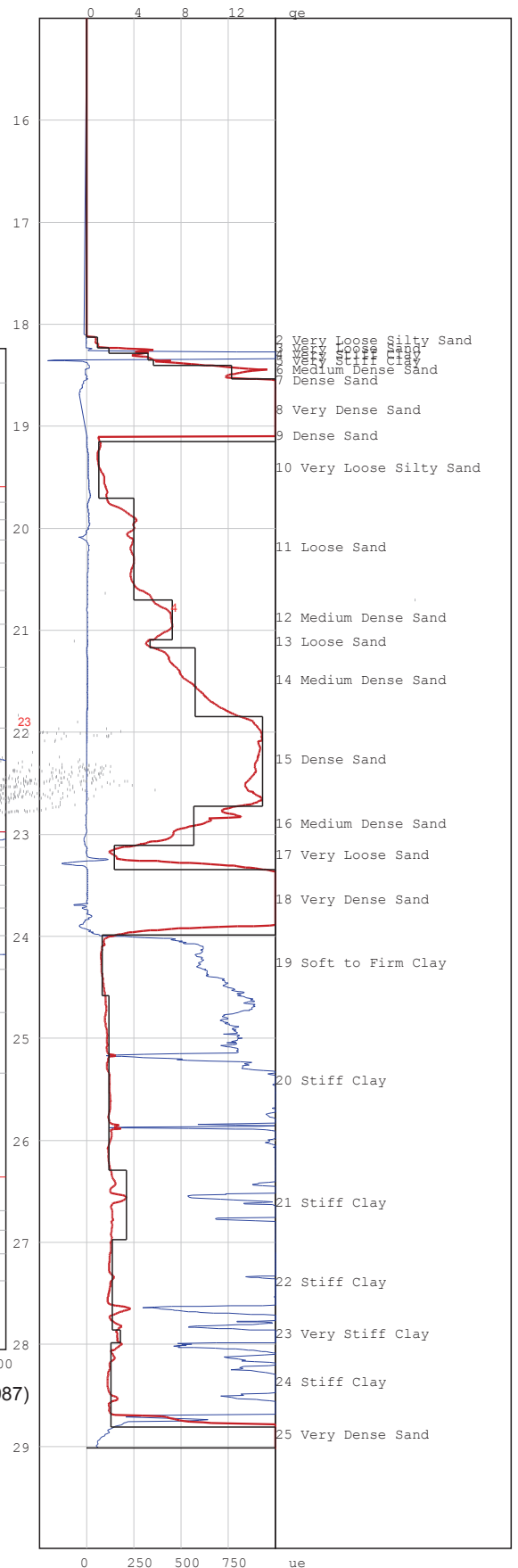
Hole No: CPT17

Date: 2012/07/05

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

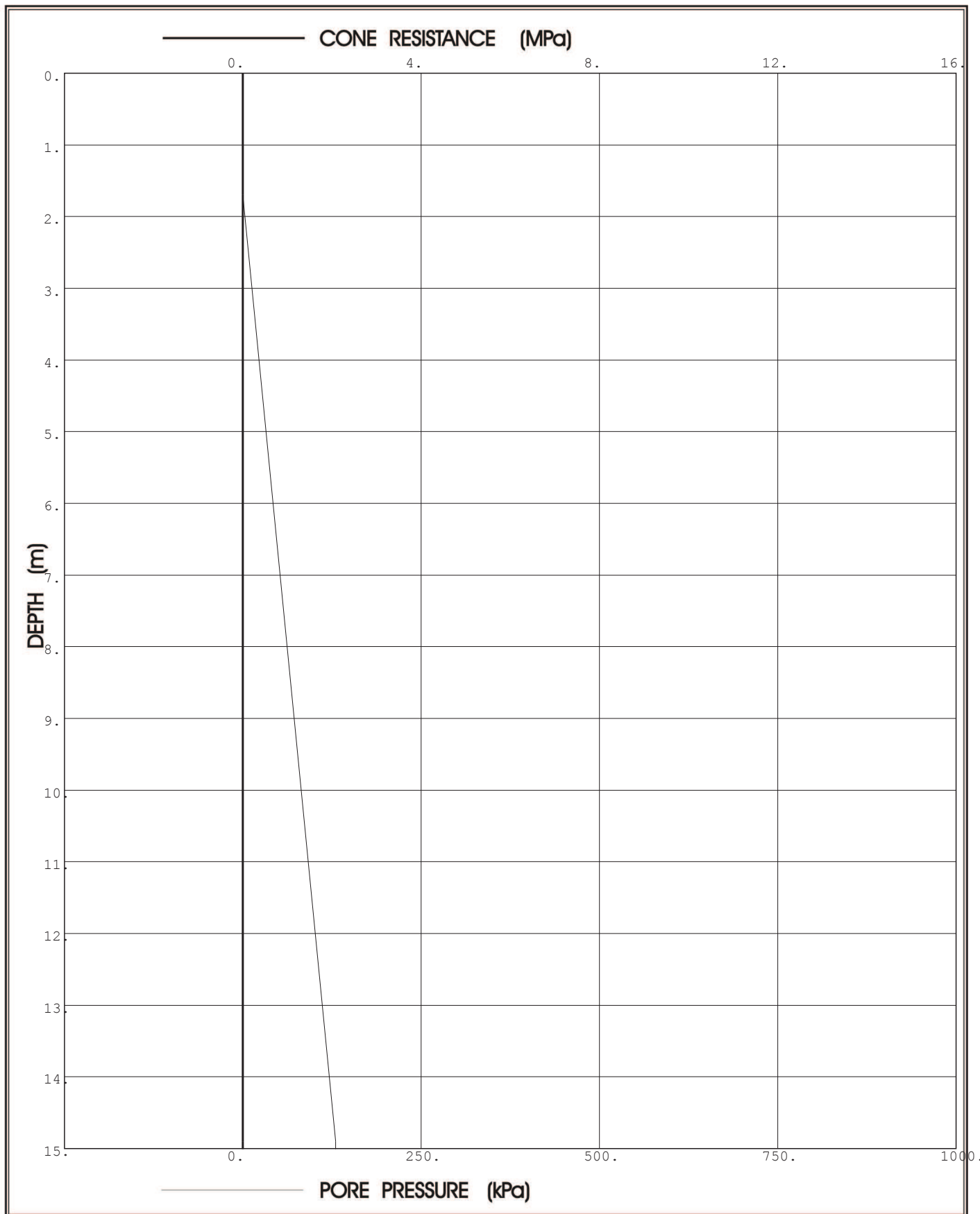
SITE: Pier2

CPTU (RE): CPT18

DATE: 2012/06/27

Probe: GHANA

Page:1



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PROJECT: Durban Harbour Over Water

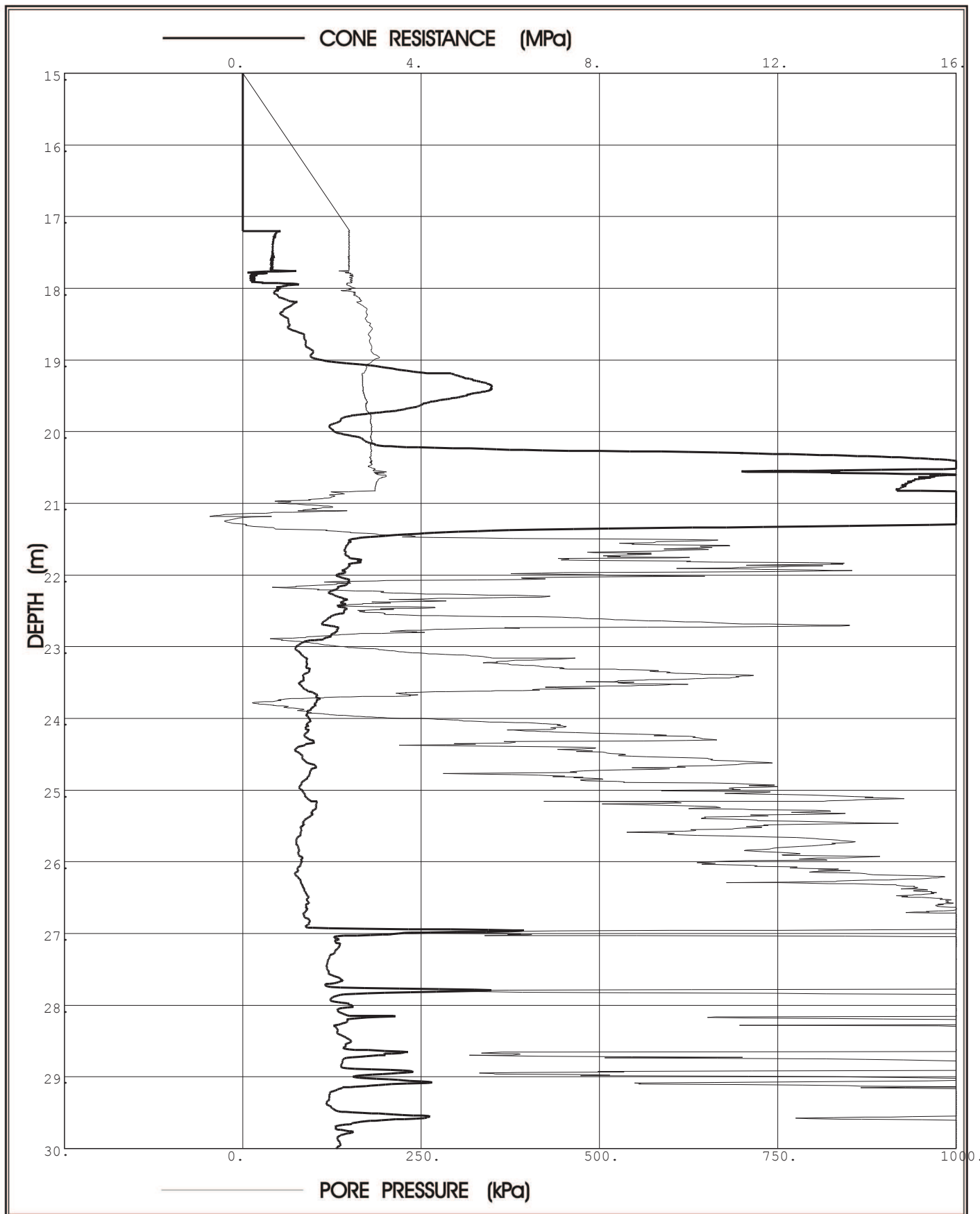
SITE: Pier2

CPTU (RE): CPT18

DATE: 2012/06/27

Probe: GHANA

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PROJECT: Durban Harbour Over Water

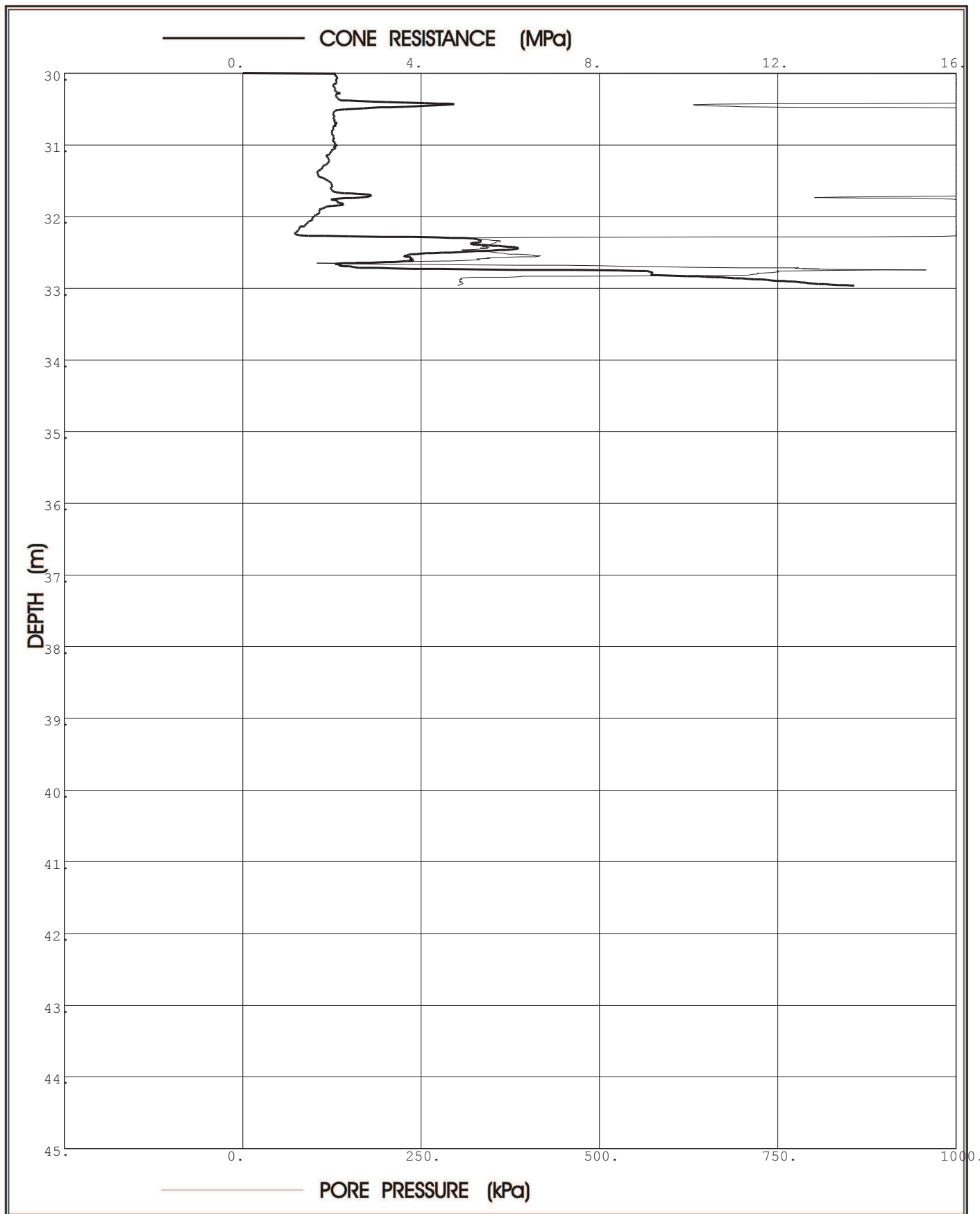
SITE: Pier2

CPTU (RE): CPT18

DATE: 2012/06/27

Probe: GHANA

Page: 3



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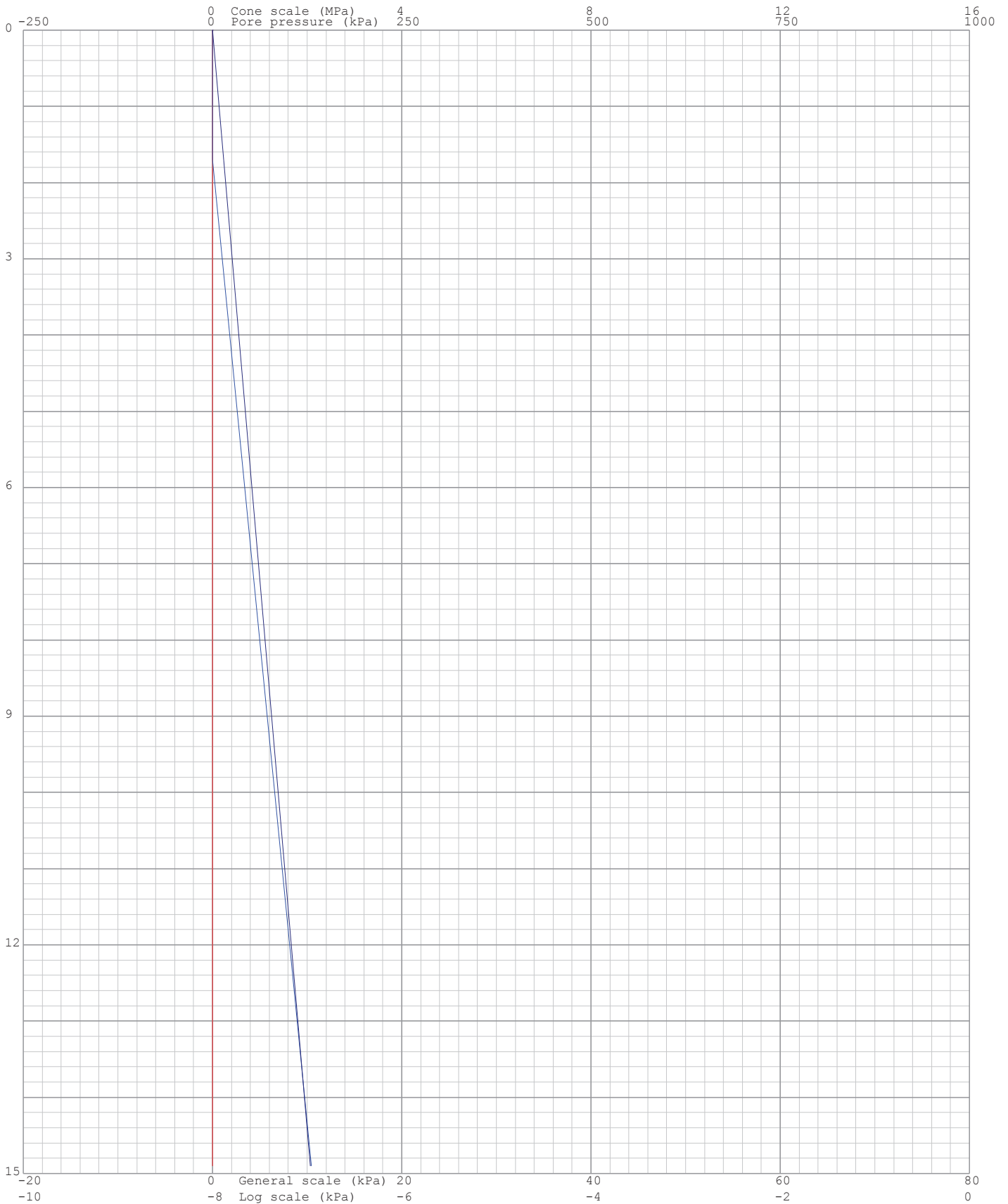
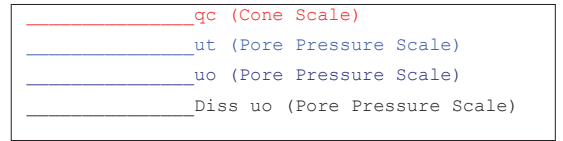
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT18

Date: 2012/06/27

Probe: GHANA



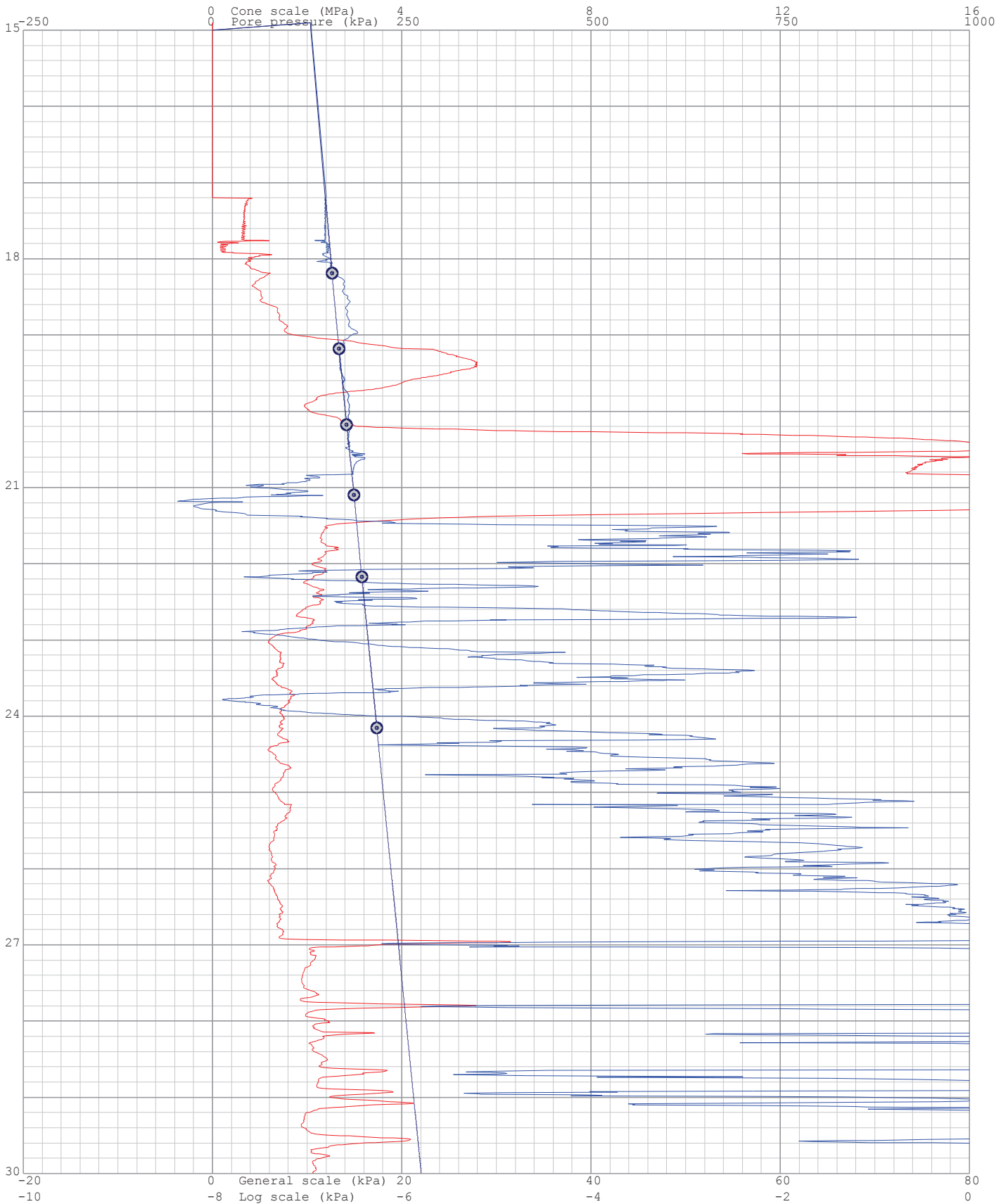
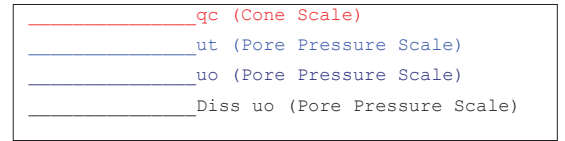
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT18

Date: 2012/06/27

Probe: GHANA





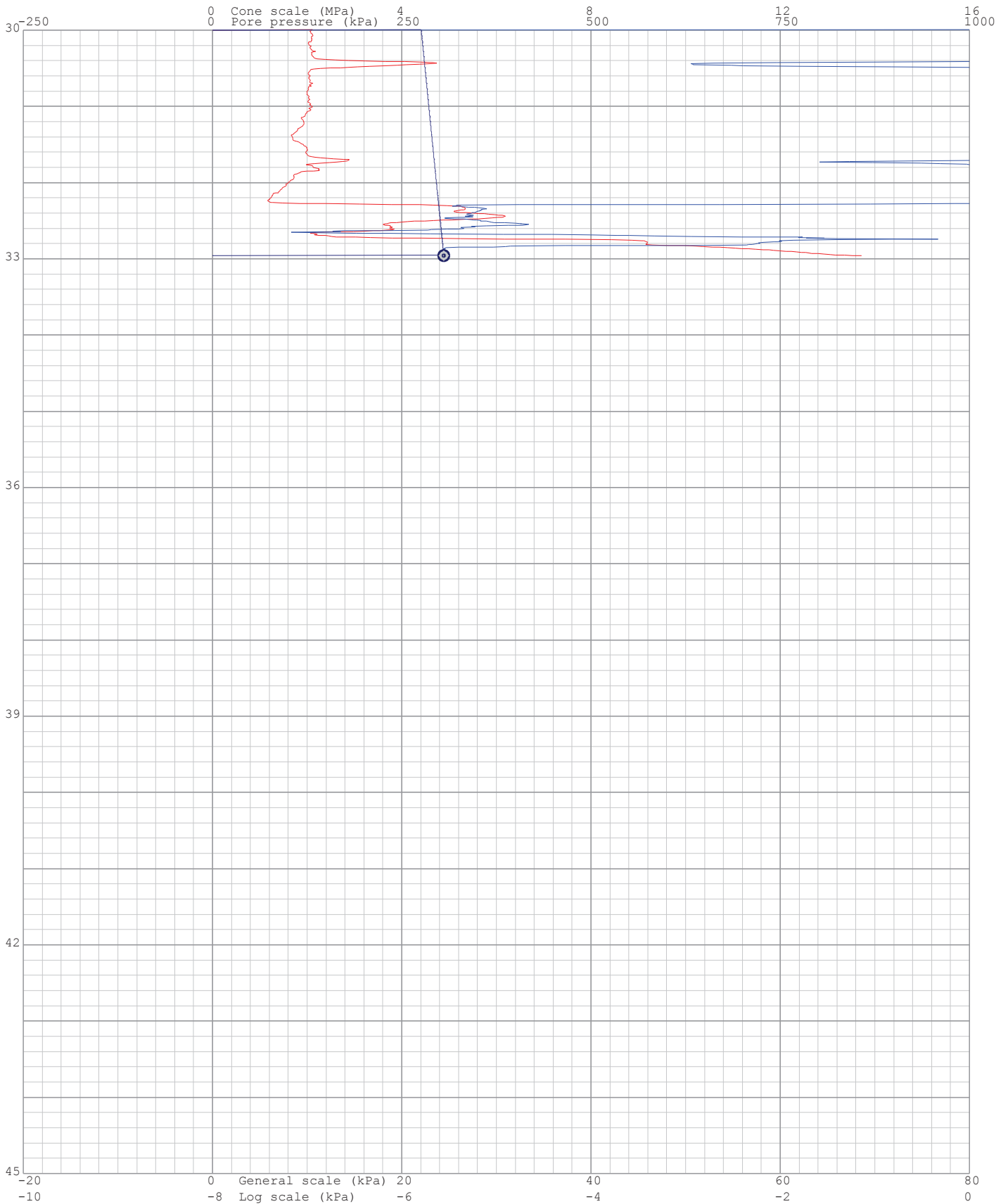
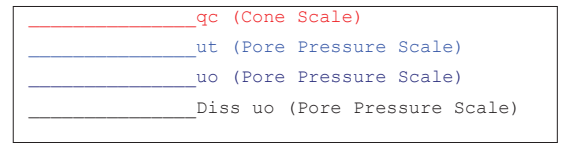
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT18

Date: 2012/06/27

Probe: GHANA



Project: Durban Harbour Over Water

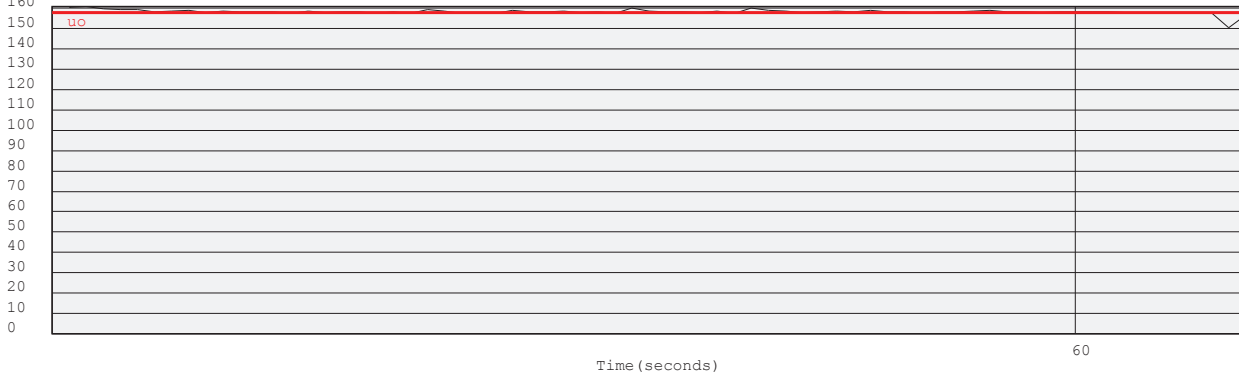
Site: Pier2

Hole: CPT18

Date: 2012/06/27

Probe: GHANA  
Page: 1

(kPa) Dissipation at: 18.188m



(kPa) Dissipation at: 19.182m



(kPa) Dissipation at: 20.177m



(kPa) Dissipation at: 21.101m



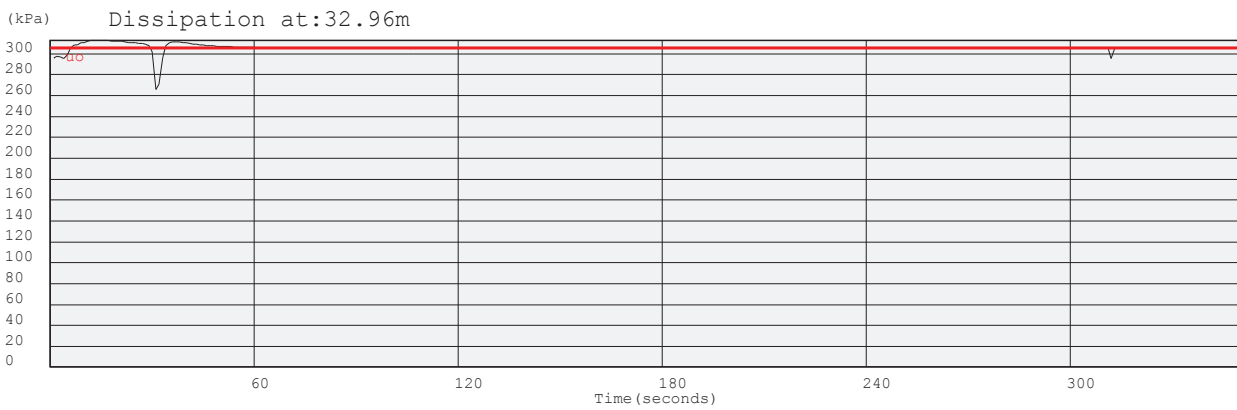
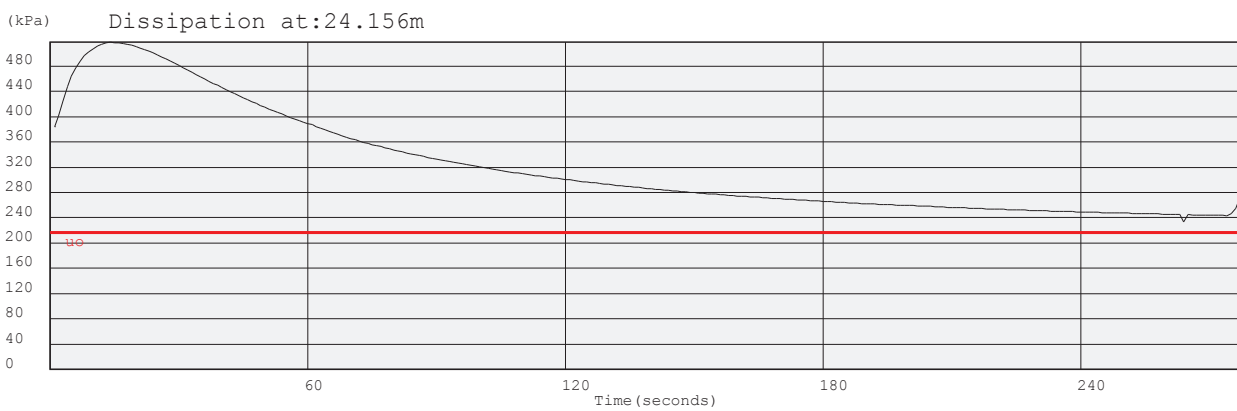
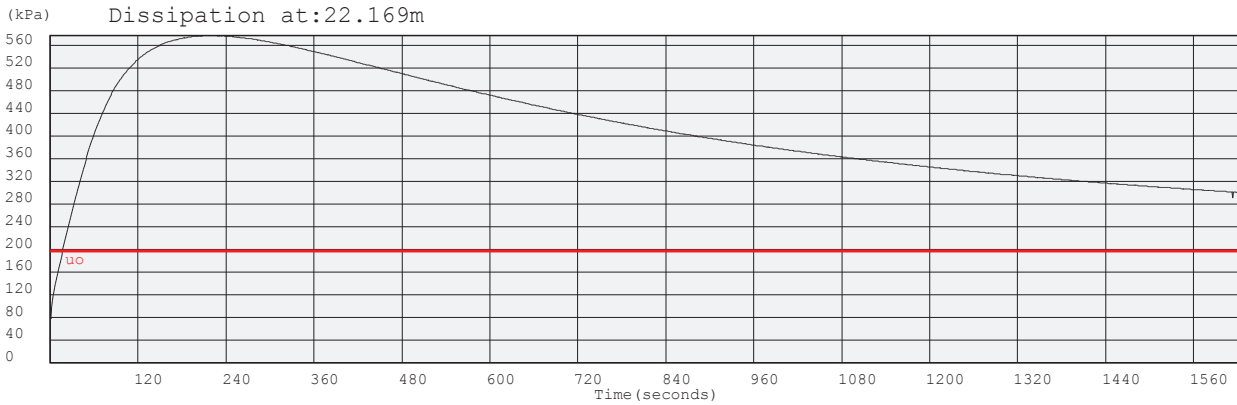
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT18

Date: 2012/06/27

Probe: GHANA  
Page: 2



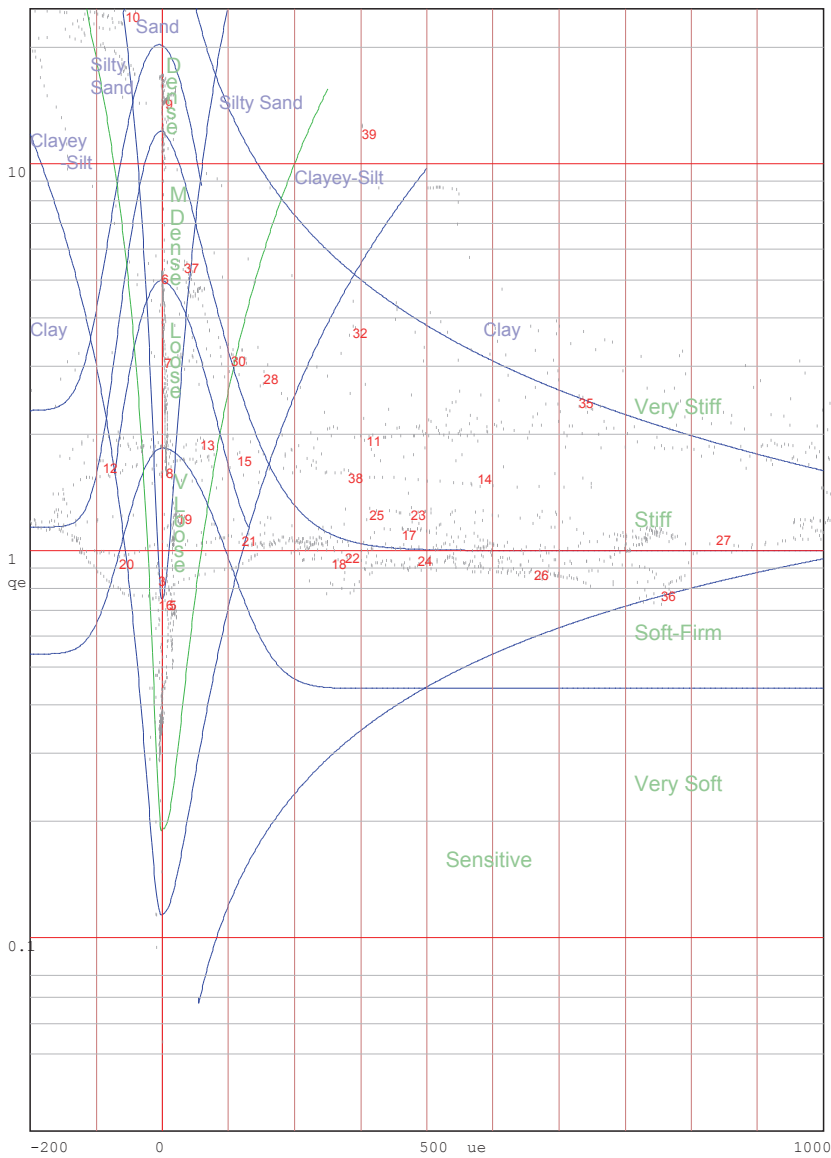
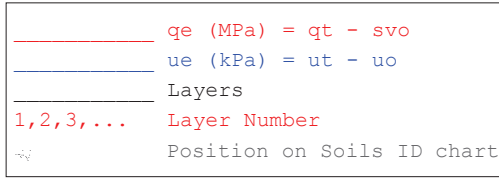
Project: Durban Harbour Over Water

Site: Pier2

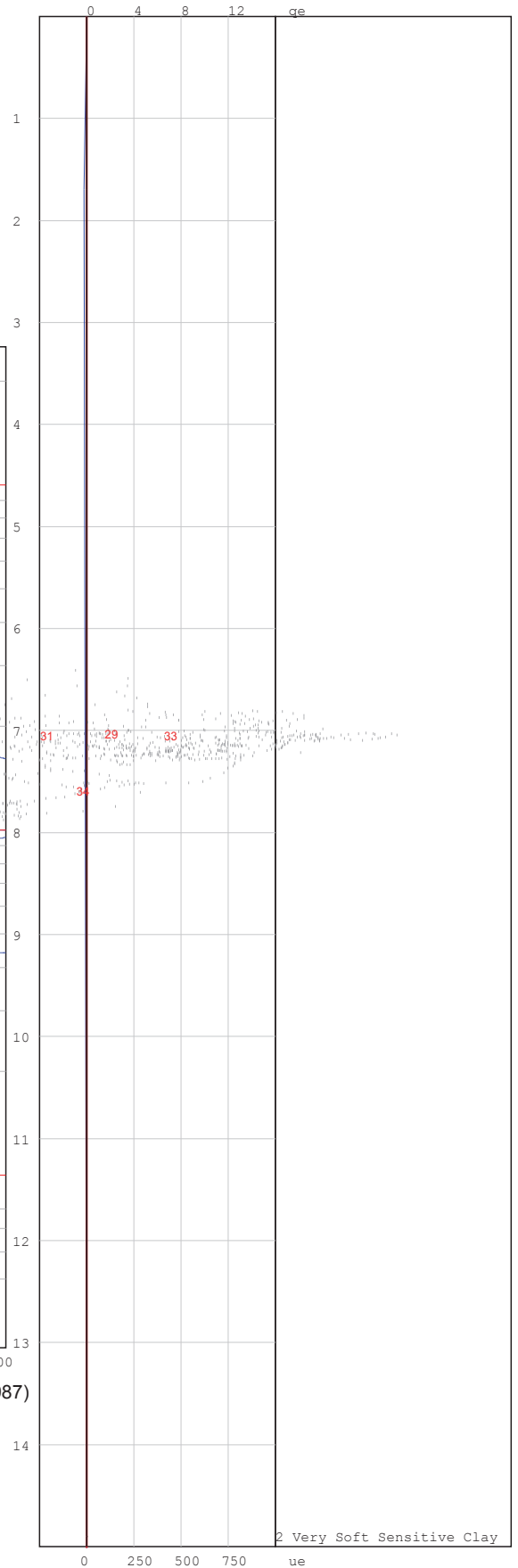
Hole No: CPT18

Date: 2012/06/27

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



2 Very Soft Sensitive Clay

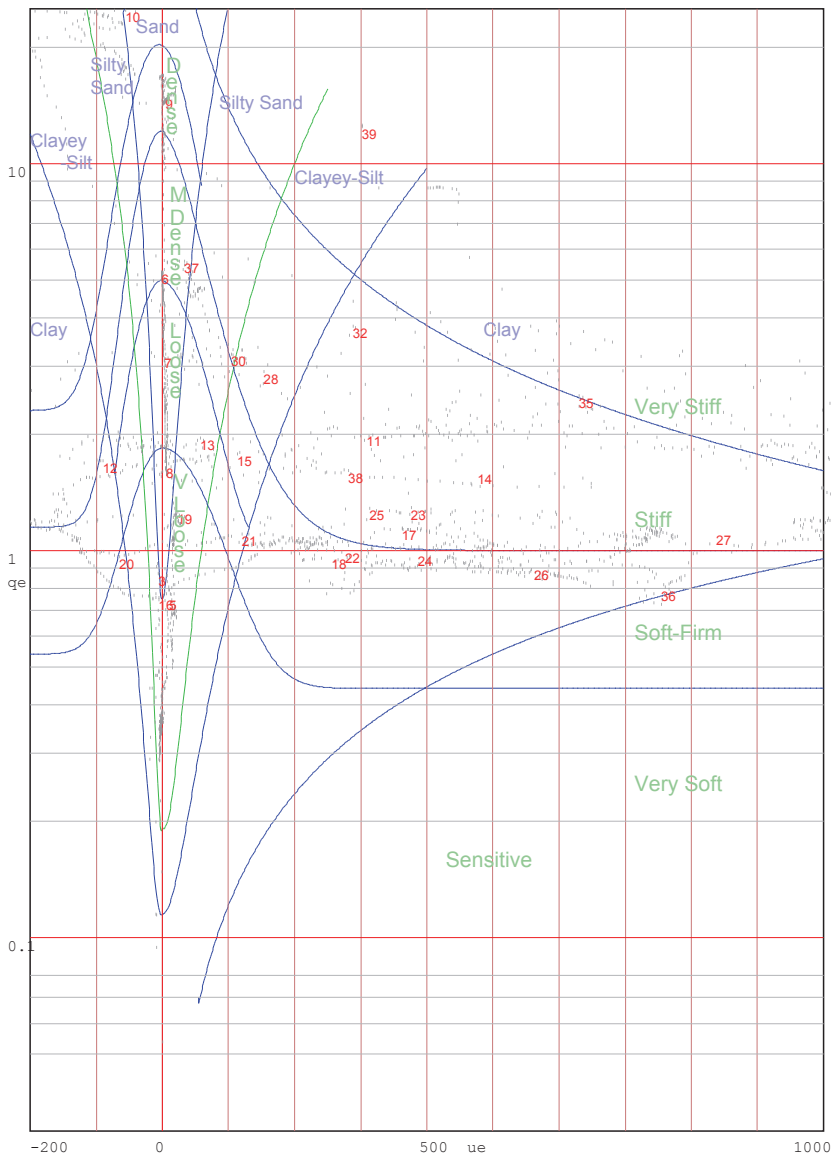
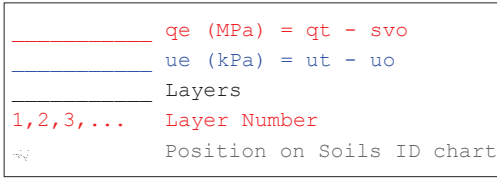
Project: Durban Harbour Over Water

Site: Pier2

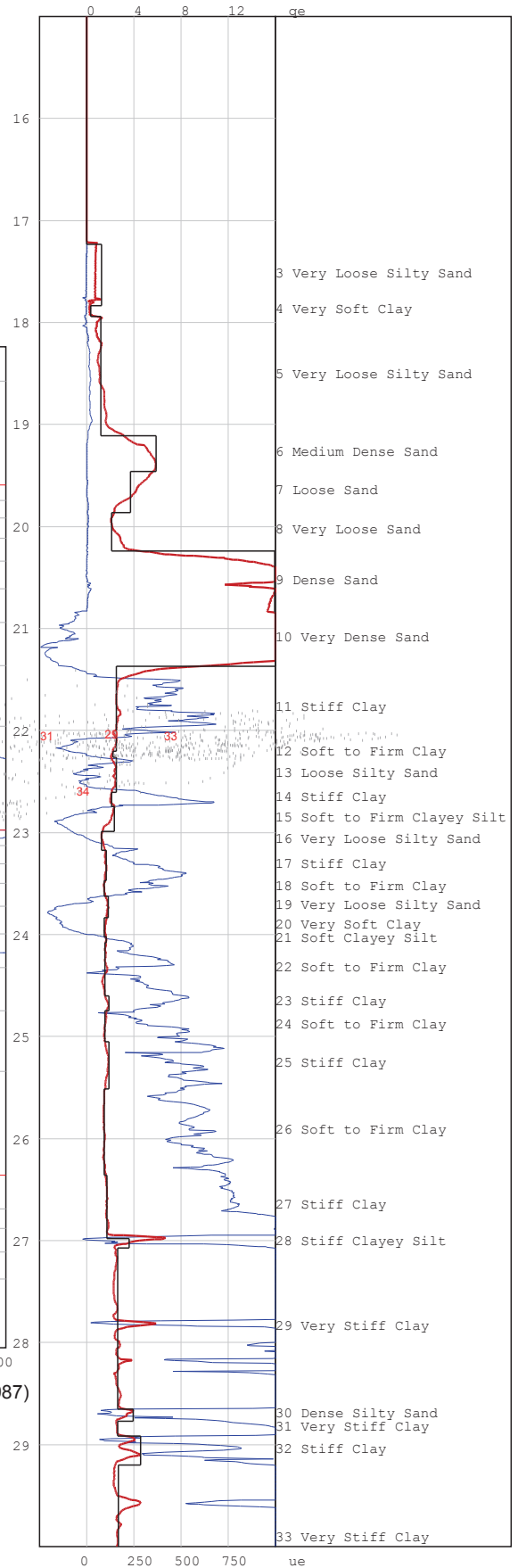
Hole No: CPT18

Date: 2012/06/27

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



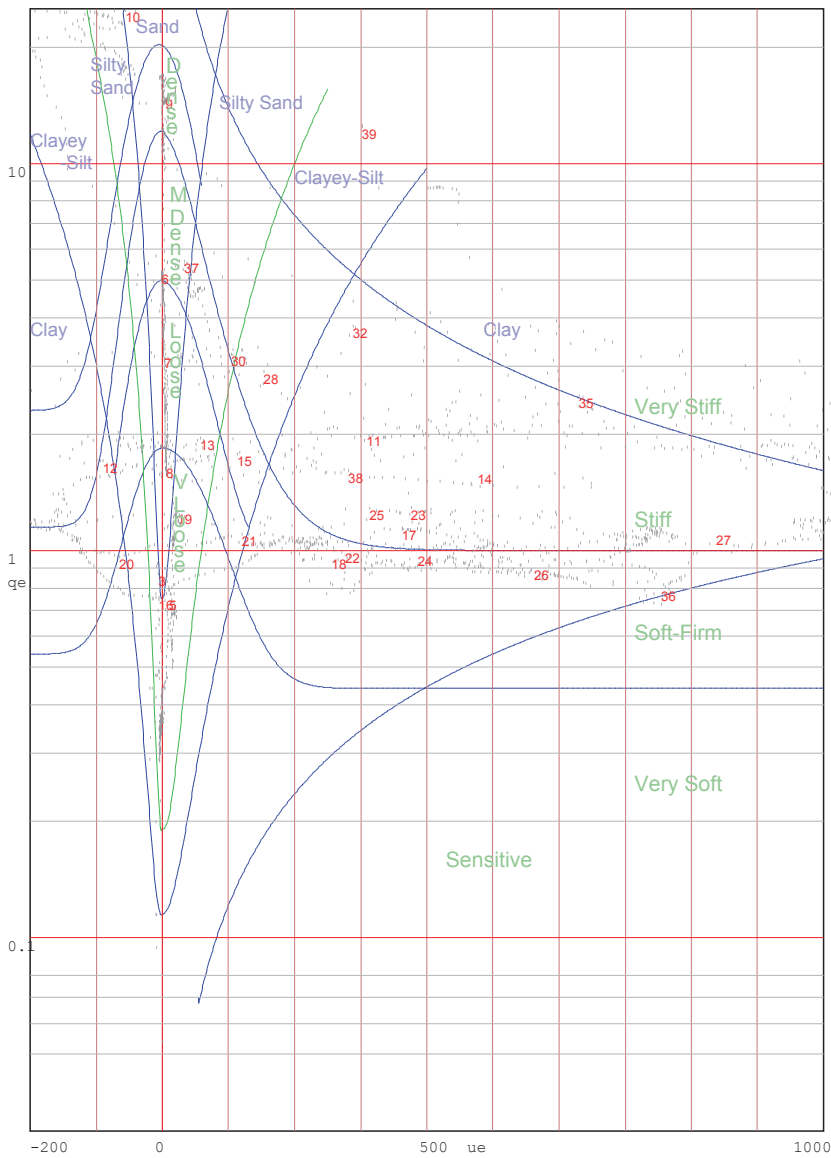
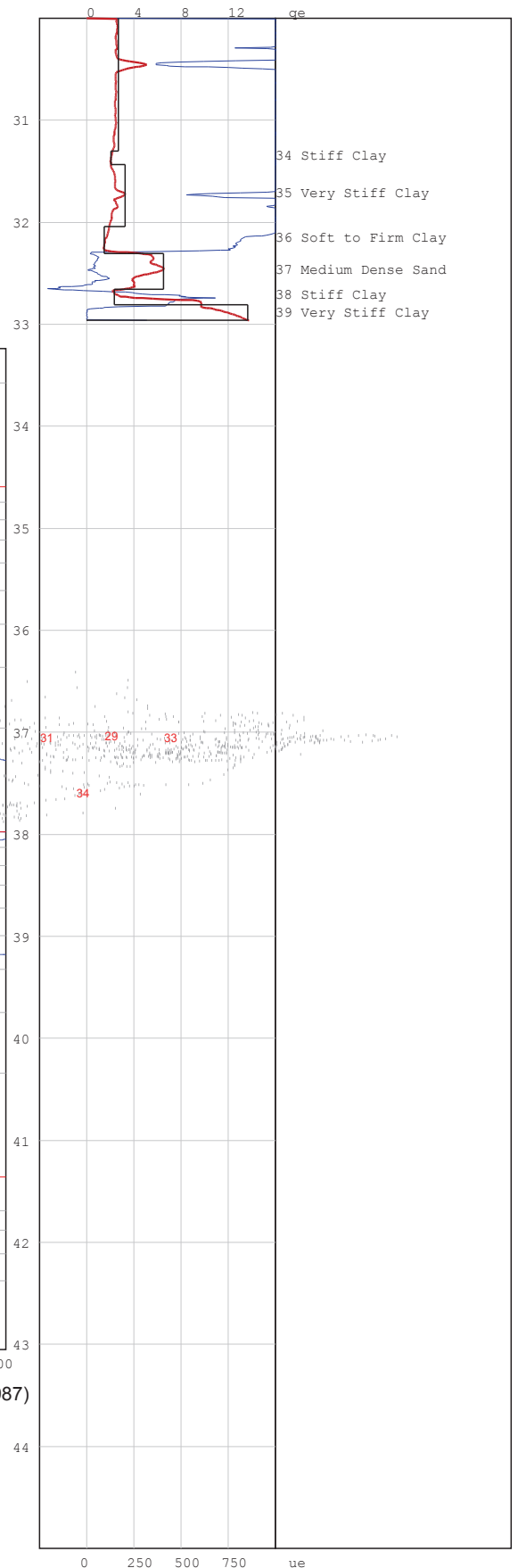
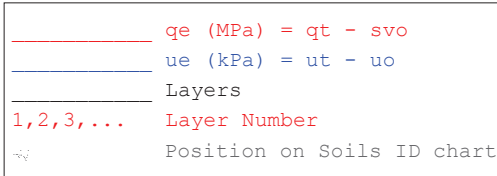
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT18

Date: 2012/06/27

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

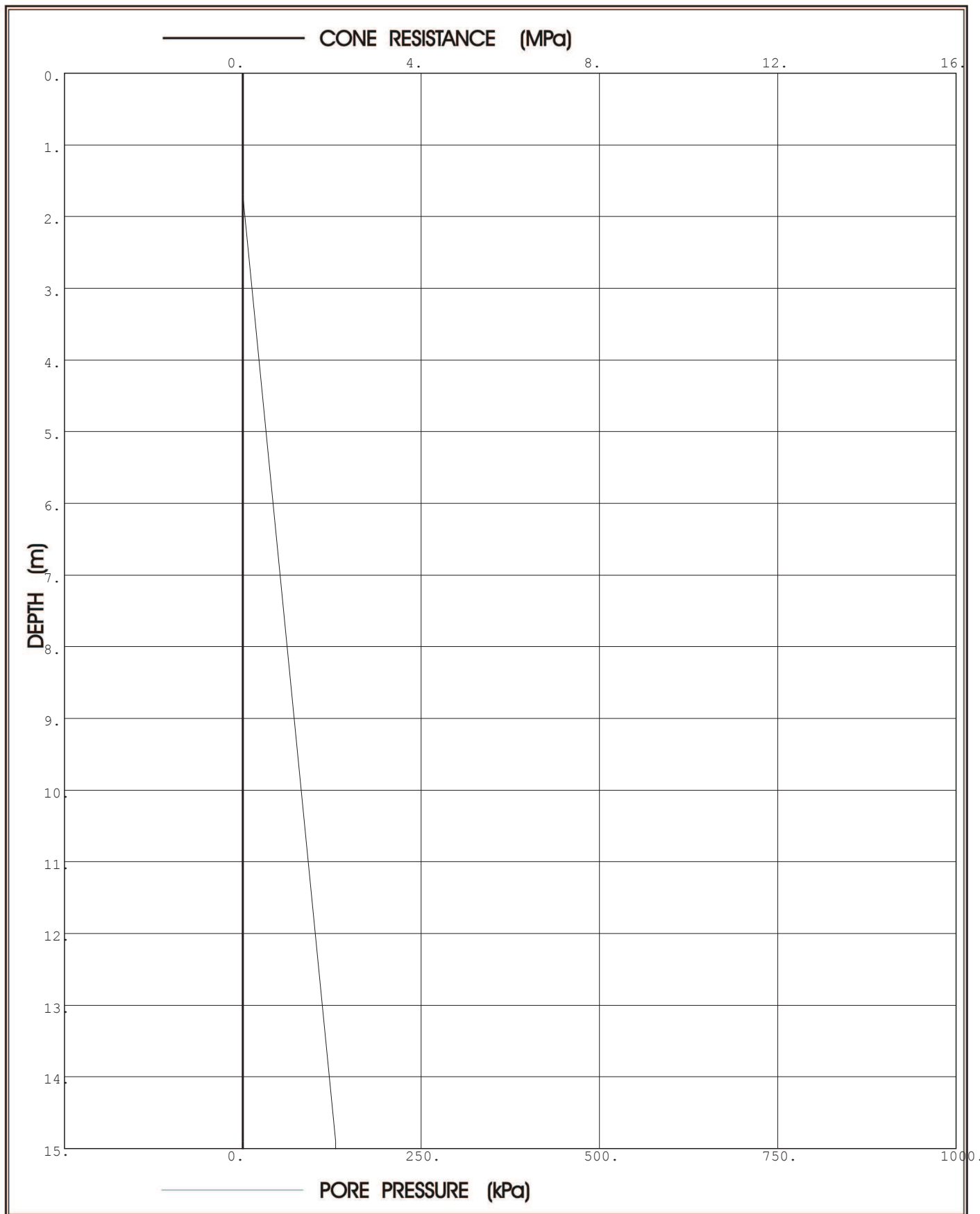
SITE: Pier2

CPTU (RE): CPT19

DATE: 2012/06/26

Probe: GHANA

Page:1



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P O Box 39108  
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PROJECT: Durban Harbour Over Water

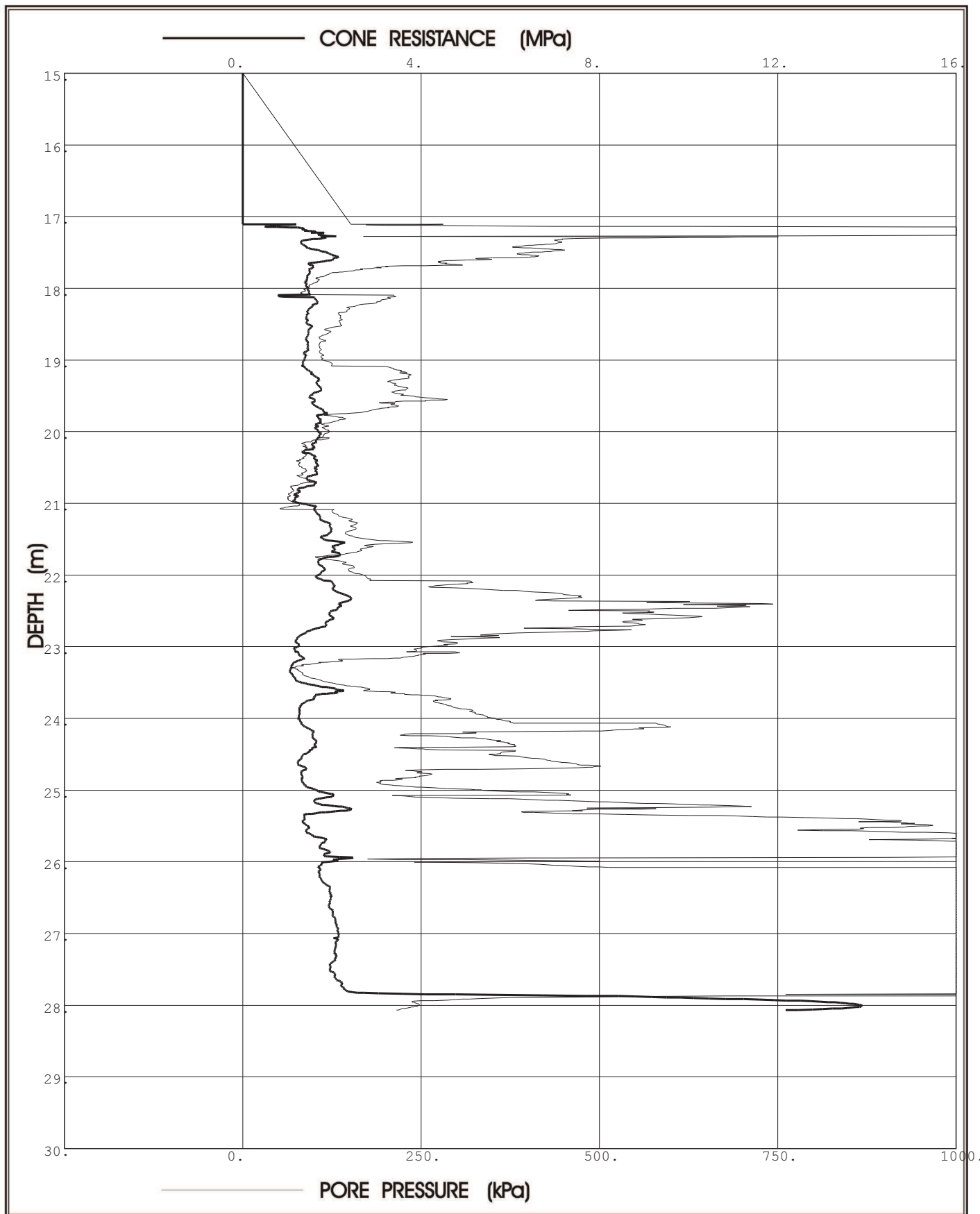
SITE: Pier2

CPTU (RE): CPT19

DATE: 2012/06/26

Probe: GHANA

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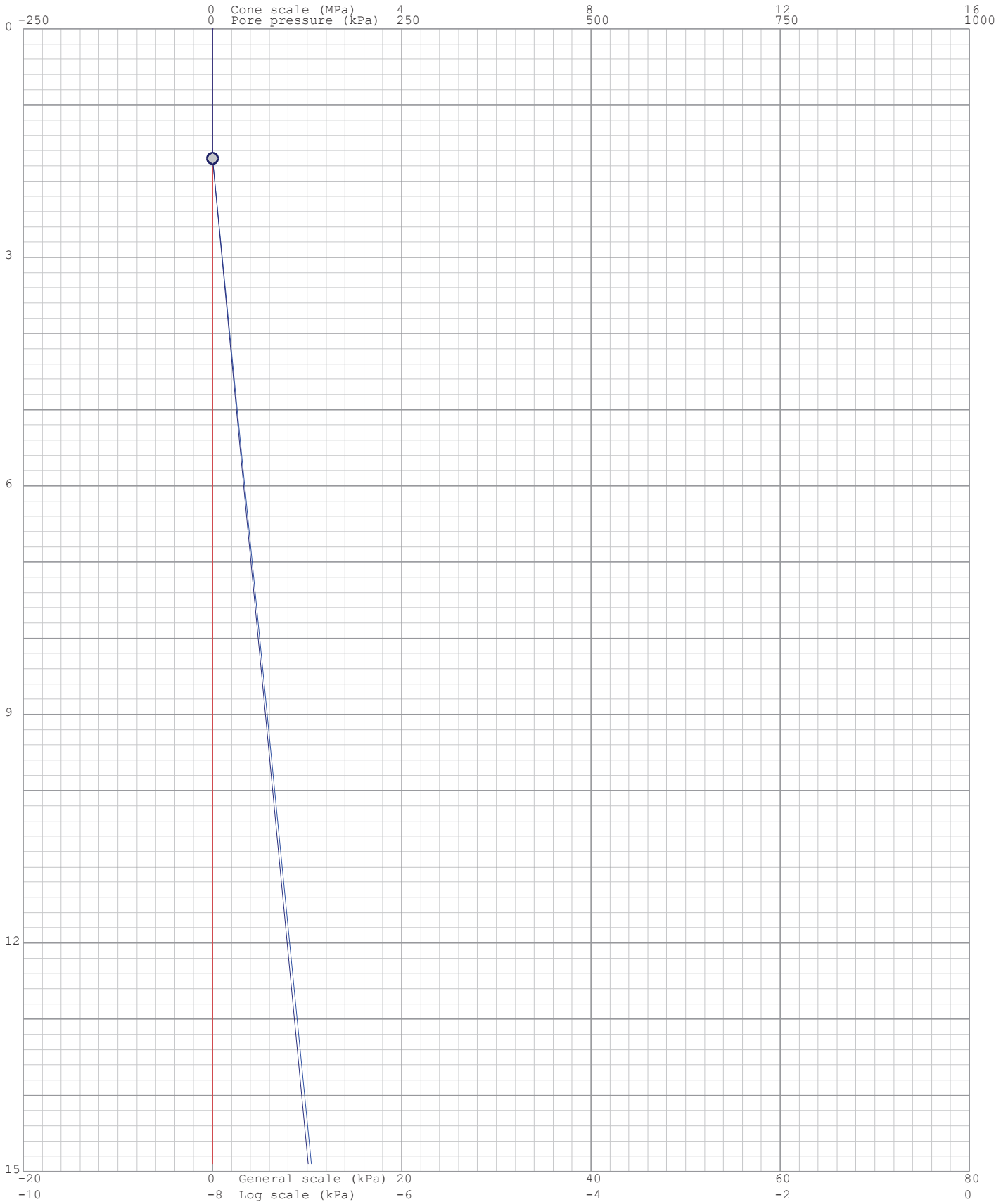
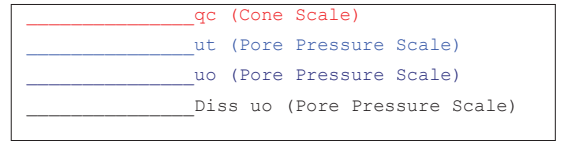
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT19

Date: 2012/06/26

Probe: GHANA



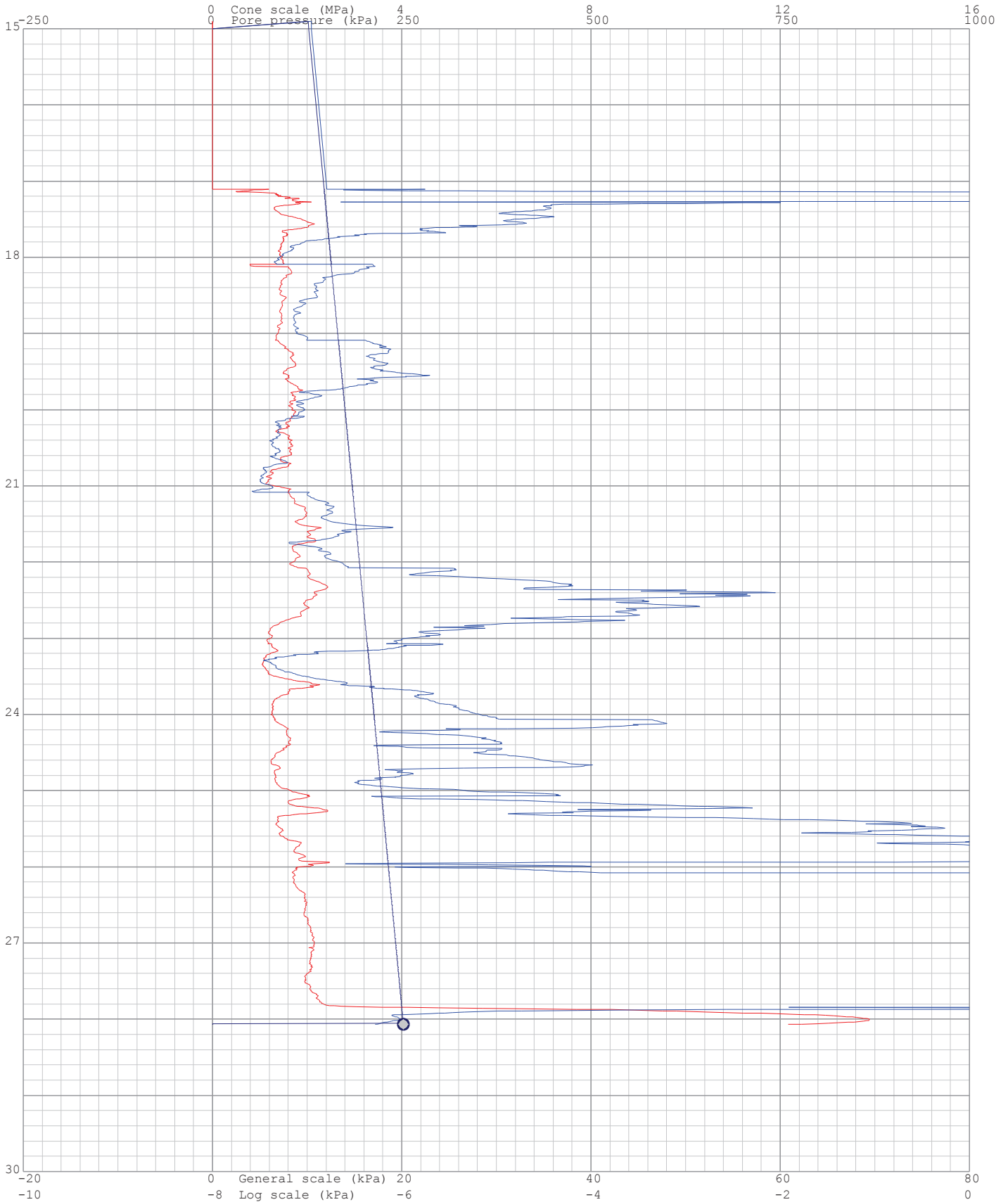
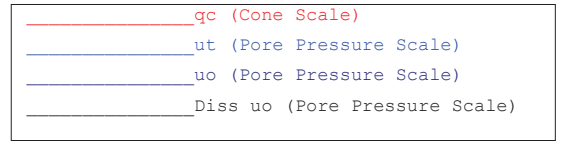
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT19

Date: 2012/06/26

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT19

Date: 2012/06/26

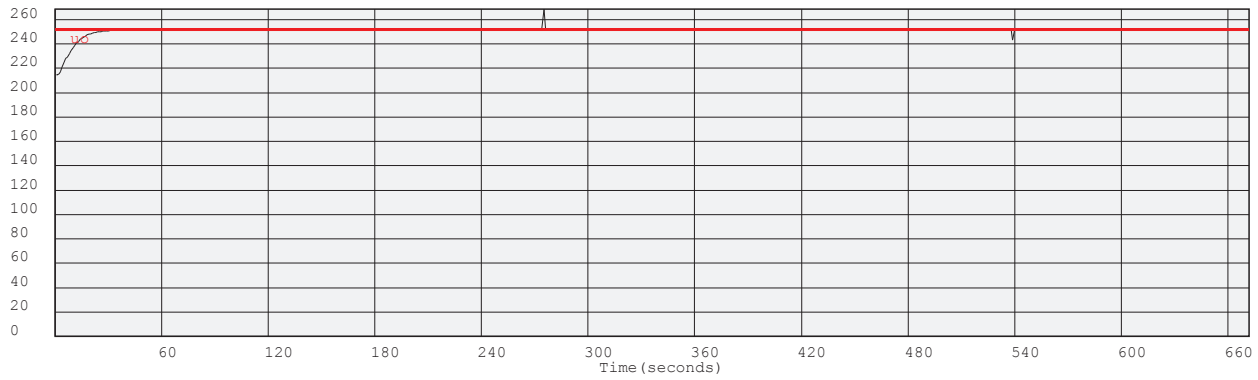
Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 28.068m



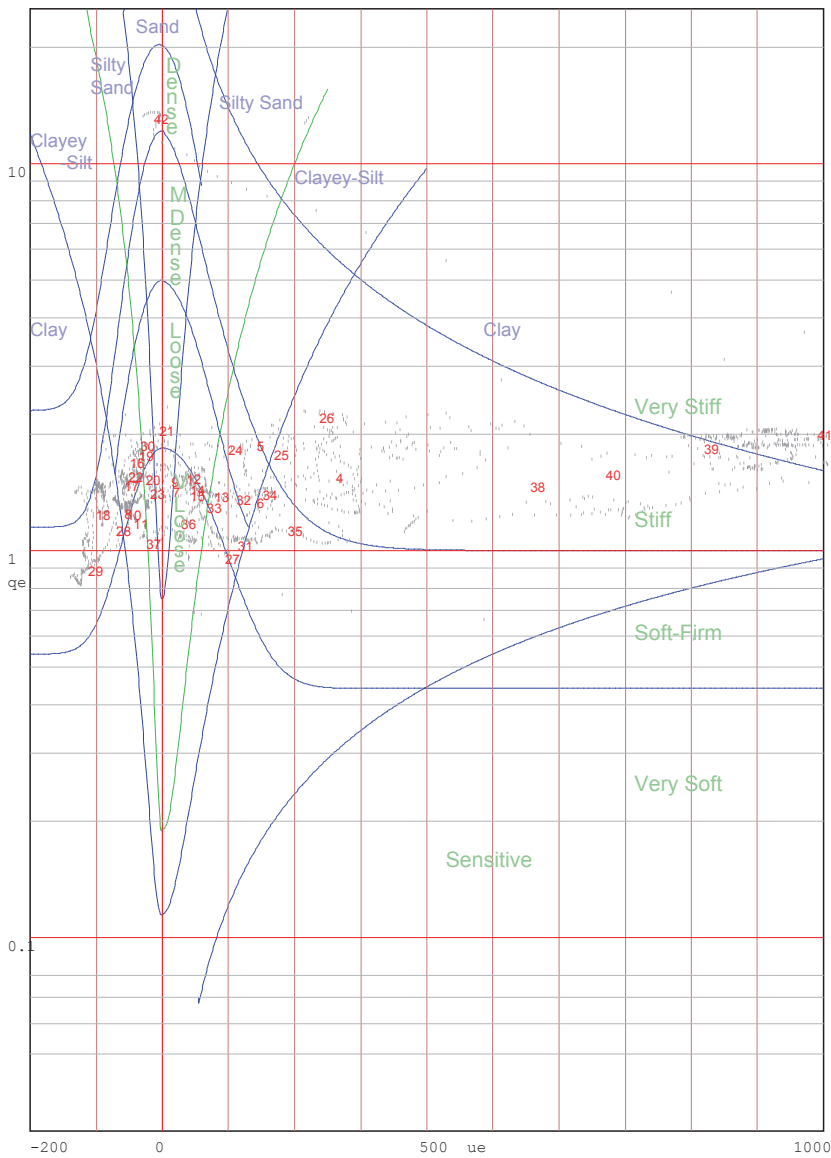
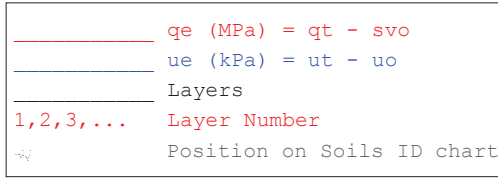
Project: Durban Harbour Over Water

Site: Pier2

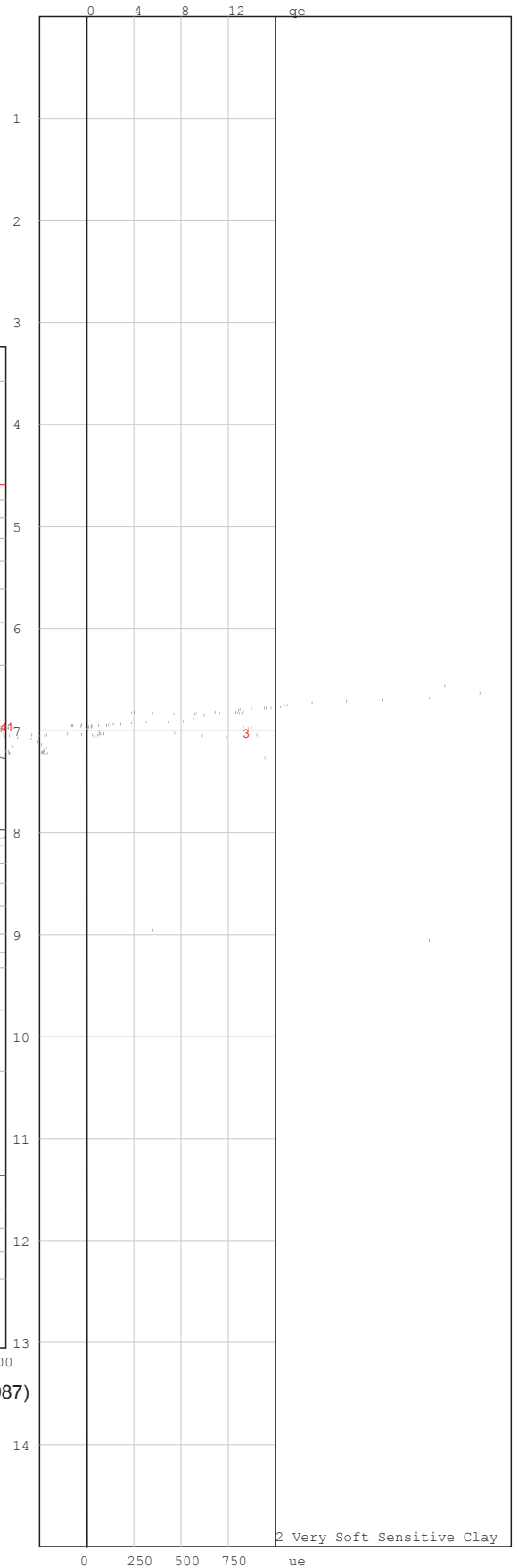
Hole No: CPT19

Date: 2012/06/26

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



2 Very Soft Sensitive Clay

Project: Durban Harbour Over Water

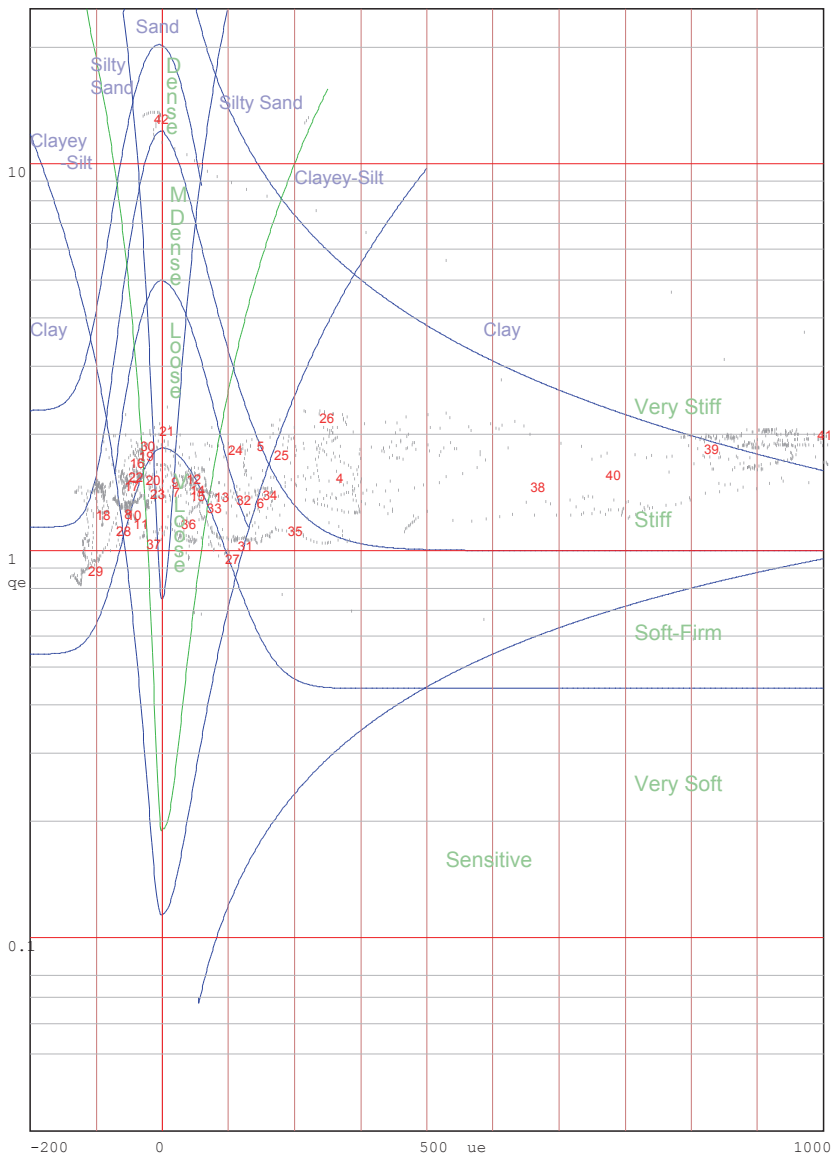
Site: Pier2

Hole No: CPT19

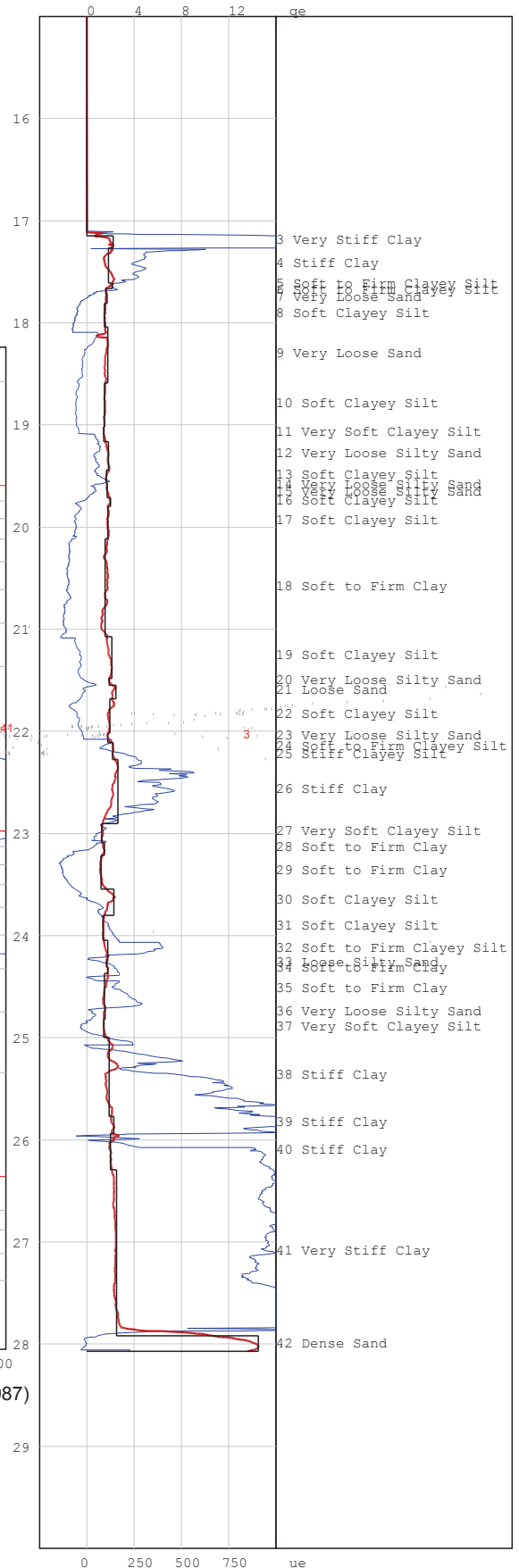
Date: 2012/06/26

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

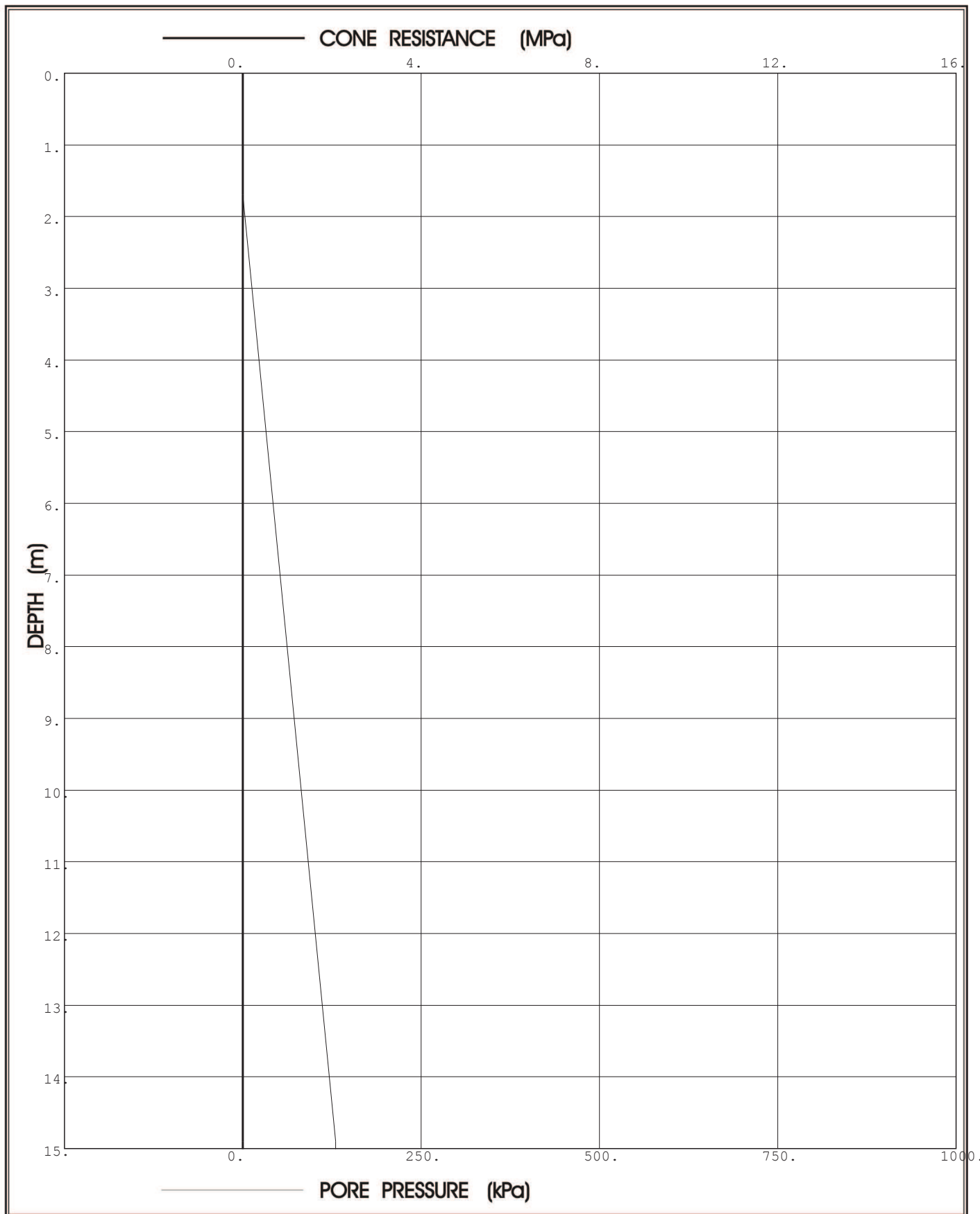
SITE: Pier2

CPTU (RE): CPT20

DATE: 2012-06-29

Probe: GHANA

Page:1



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PROJECT: Durban Harbour Over Water

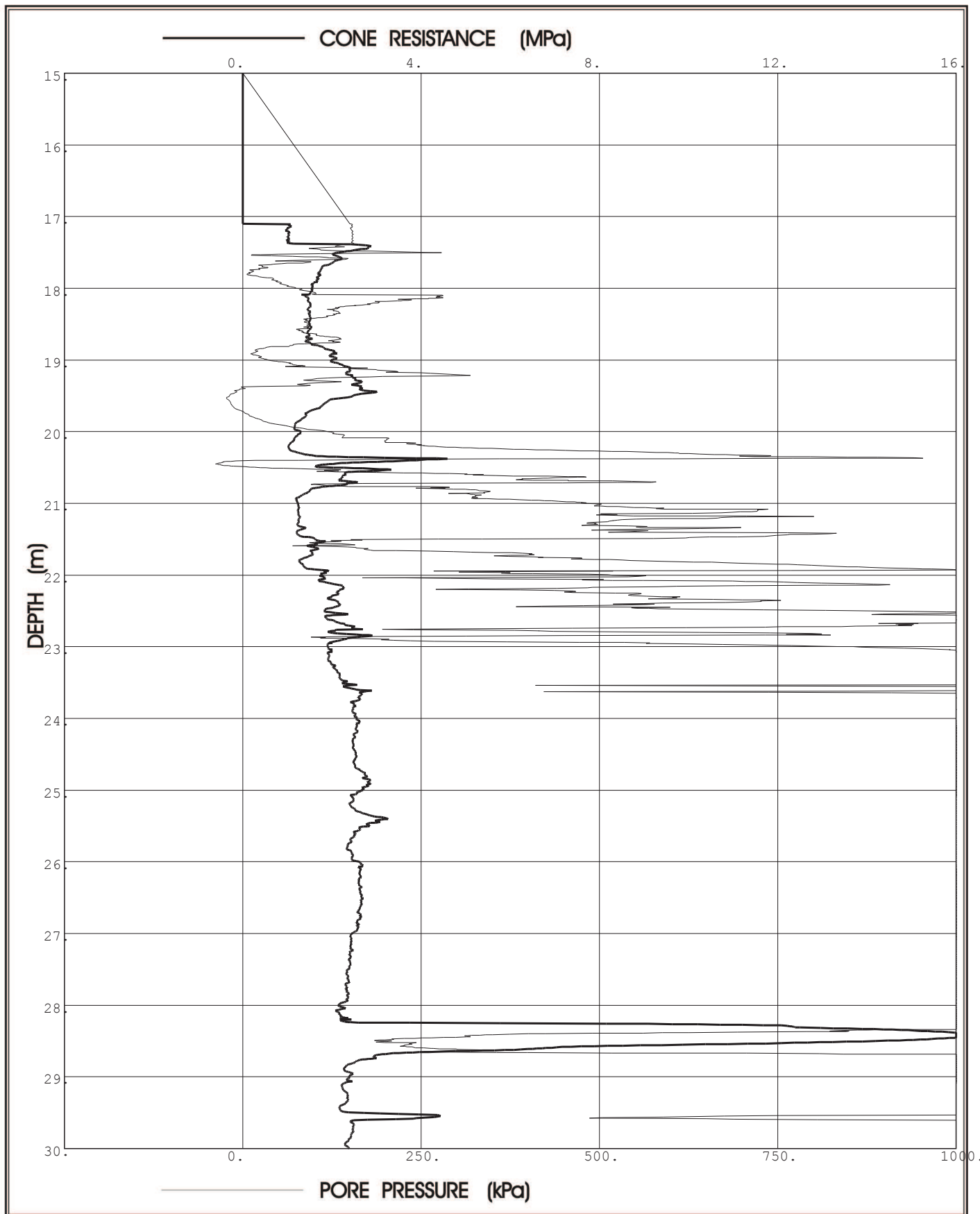
SITE: Pier2

CPTU (RE): CPT20

DATE: 2012-06-29

Probe: GHANA

Page:2



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P O Box 39108  
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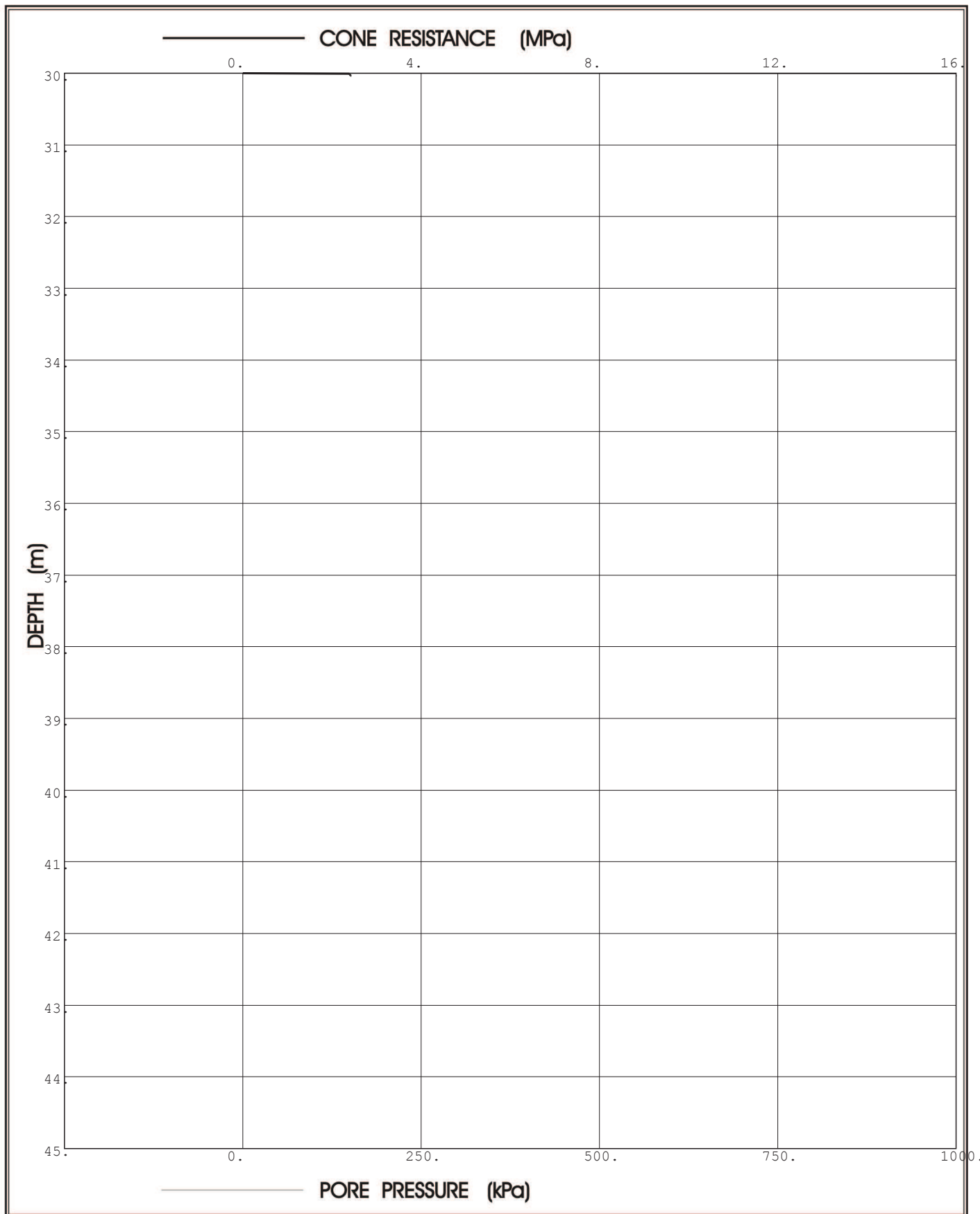
SITE: Pier2

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Page: 3



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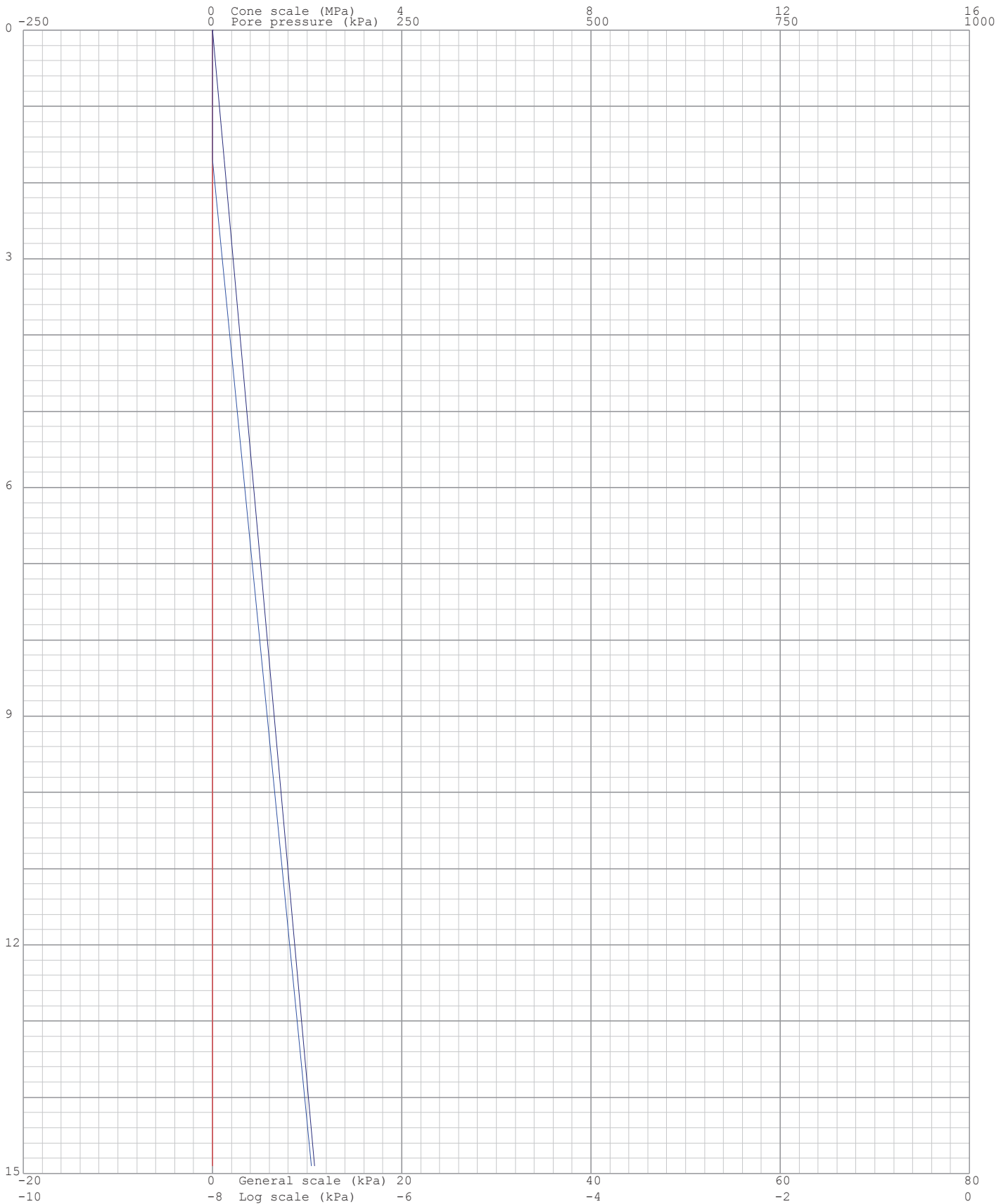
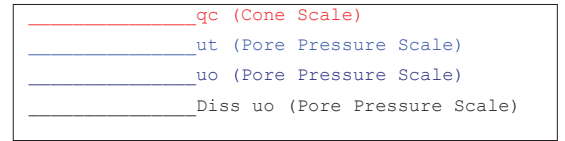
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT20

Date: 2012-06-29

Probe: GHANA



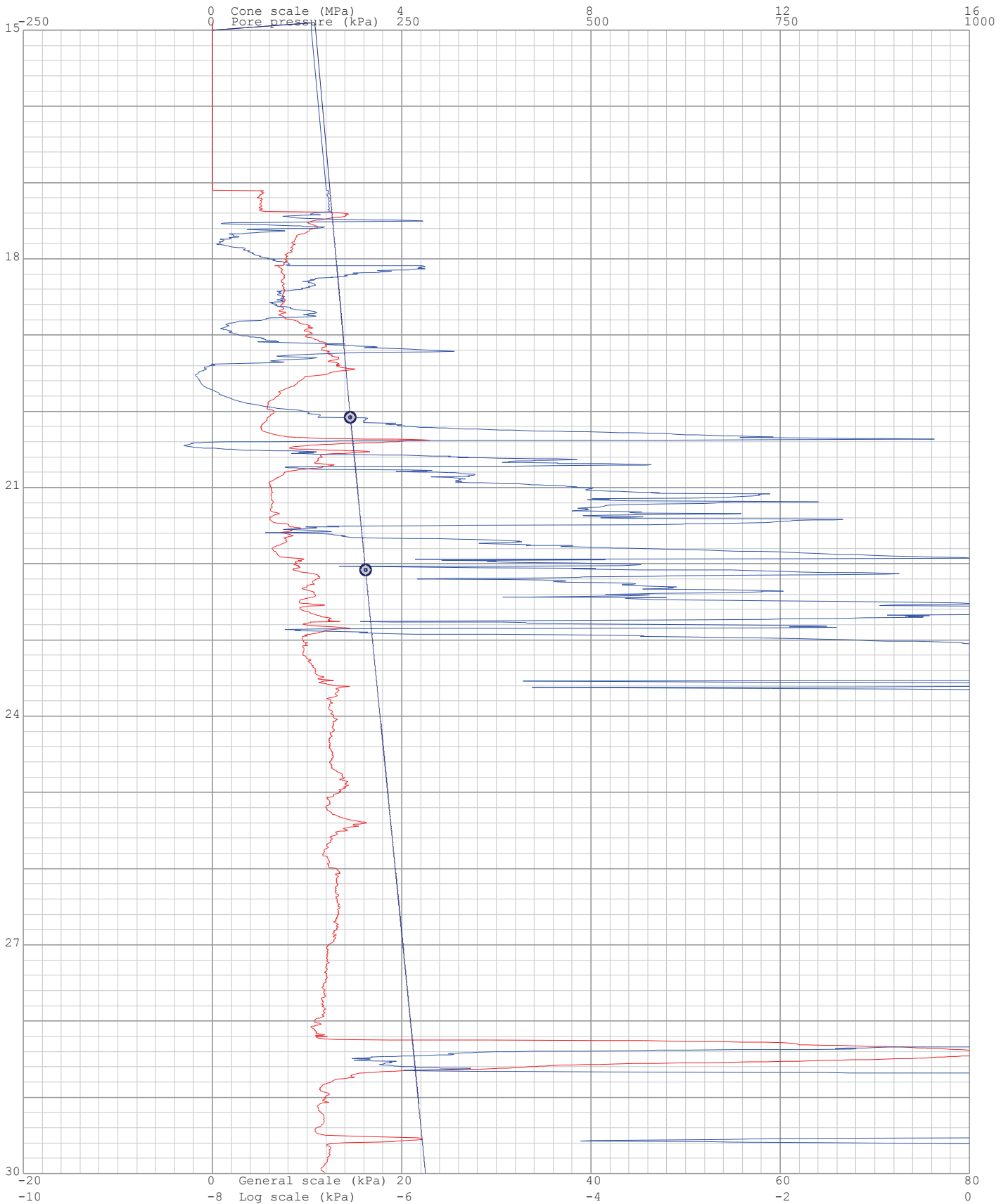
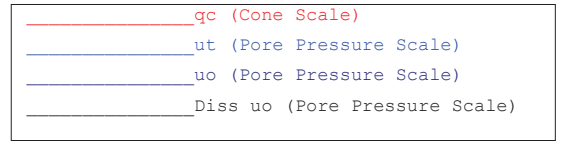
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT20

Date: 2012-06-29

Probe: GHANA



Project: Durban Harbour Over Water

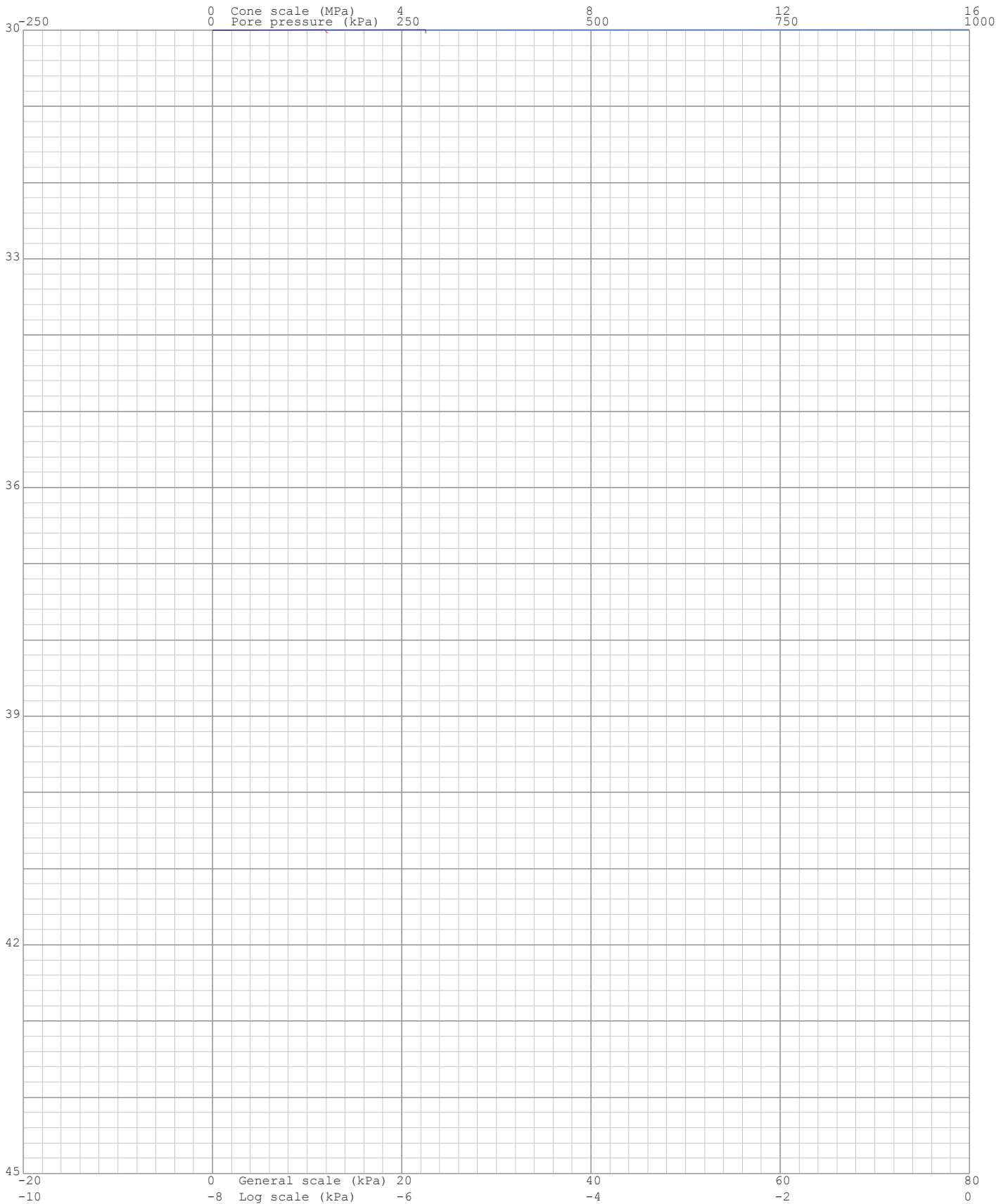
Site: Pier2

Hole No: CPT20

Date: 2012-06-29

Probe: GHANA

|   |                               |
|---|-------------------------------|
| — | qc (Cone Scale)               |
| — | ut (Pore Pressure Scale)      |
| — | uo (Pore Pressure Scale)      |
| — | Diss uo (Pore Pressure Scale) |



Project: Durban Harbour Over Water

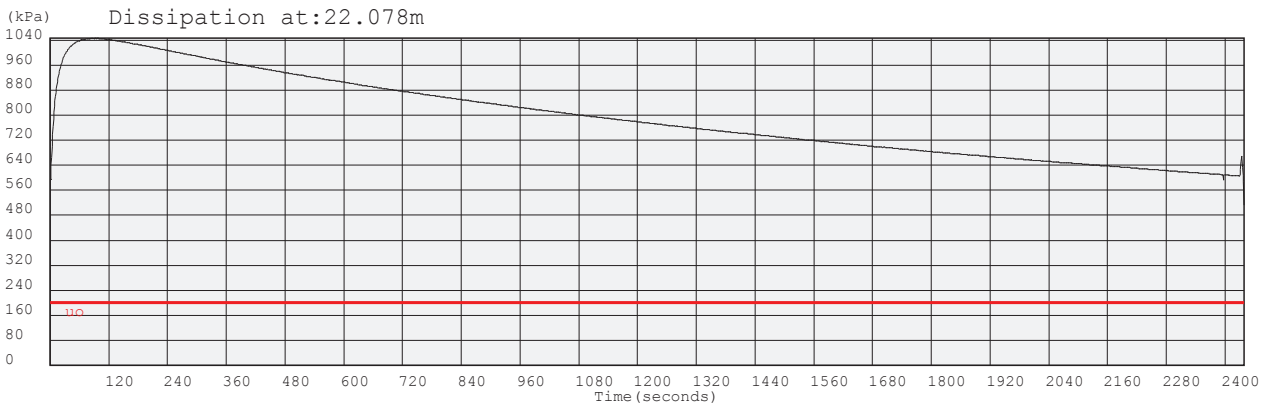
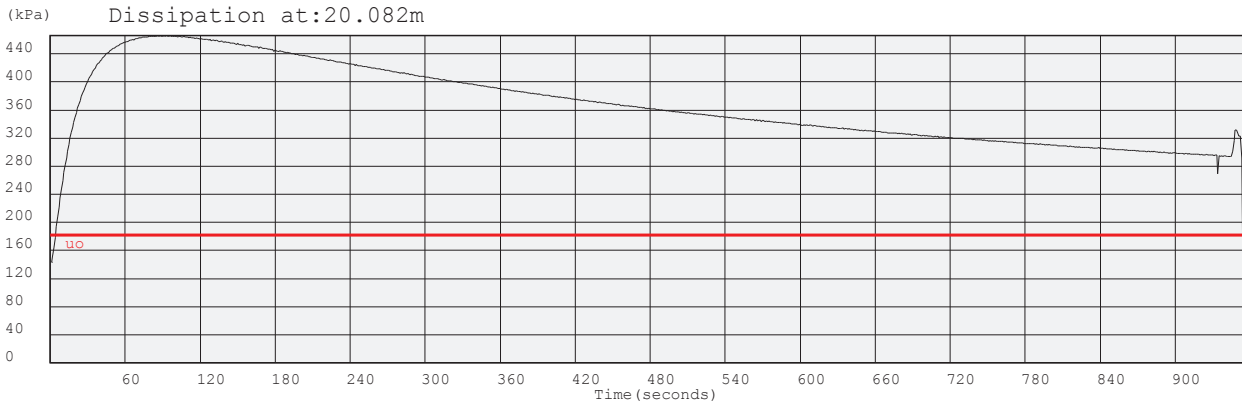
Site: Pier2

Hole: CPT20

Date: 2012-06-29

Probe: GHANA

Page: 1



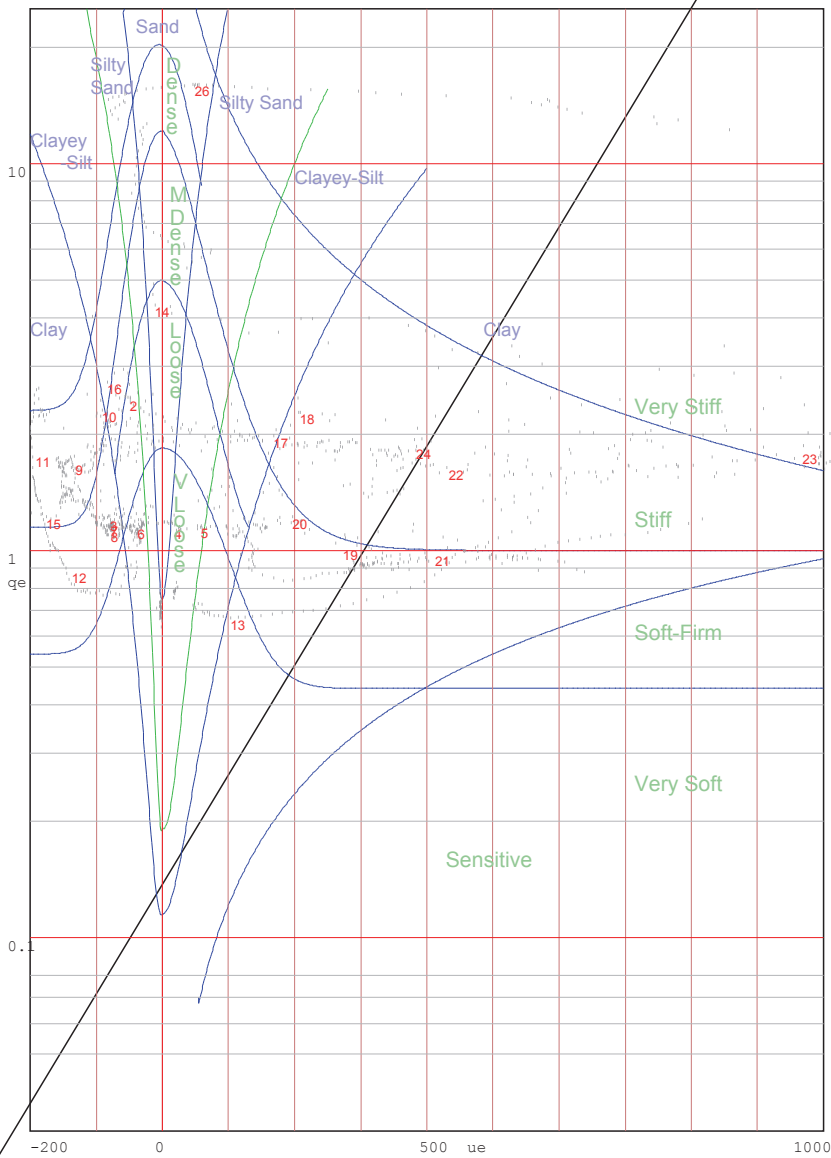
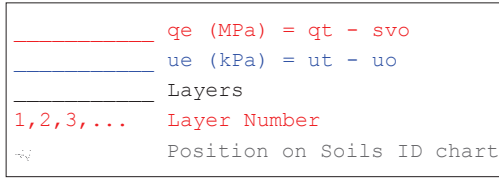
Project: Durban Harbour Over Water

Site: Pier2

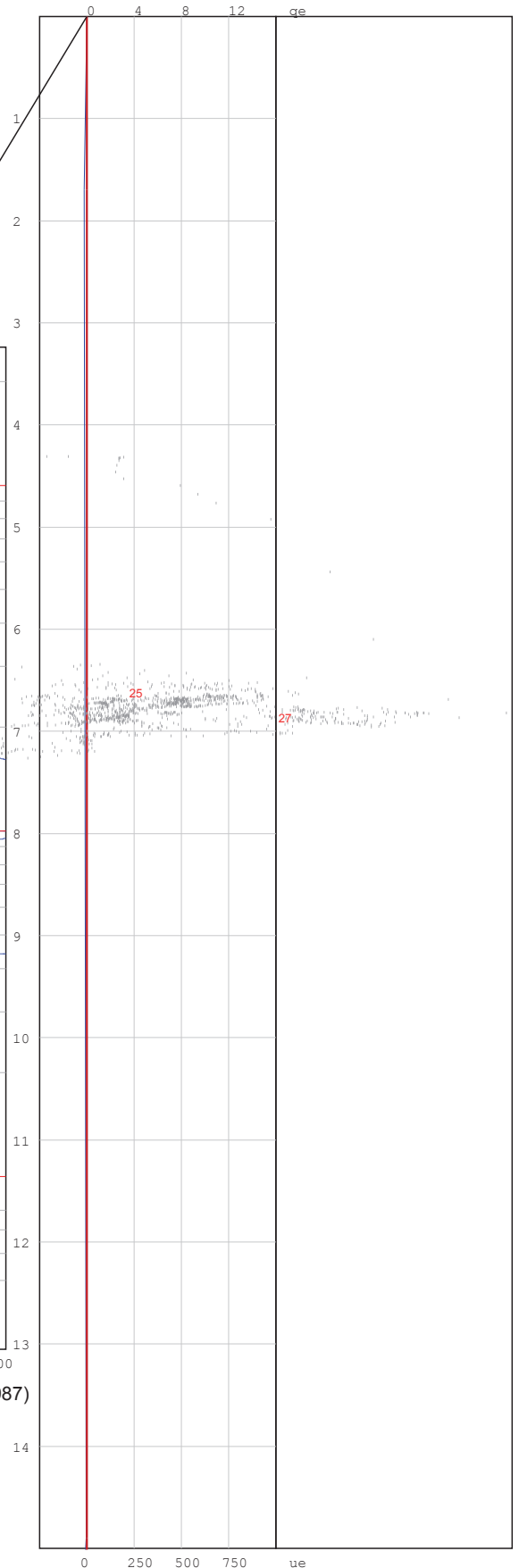
Hole No: CPT20

Date: 2012-06-29

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



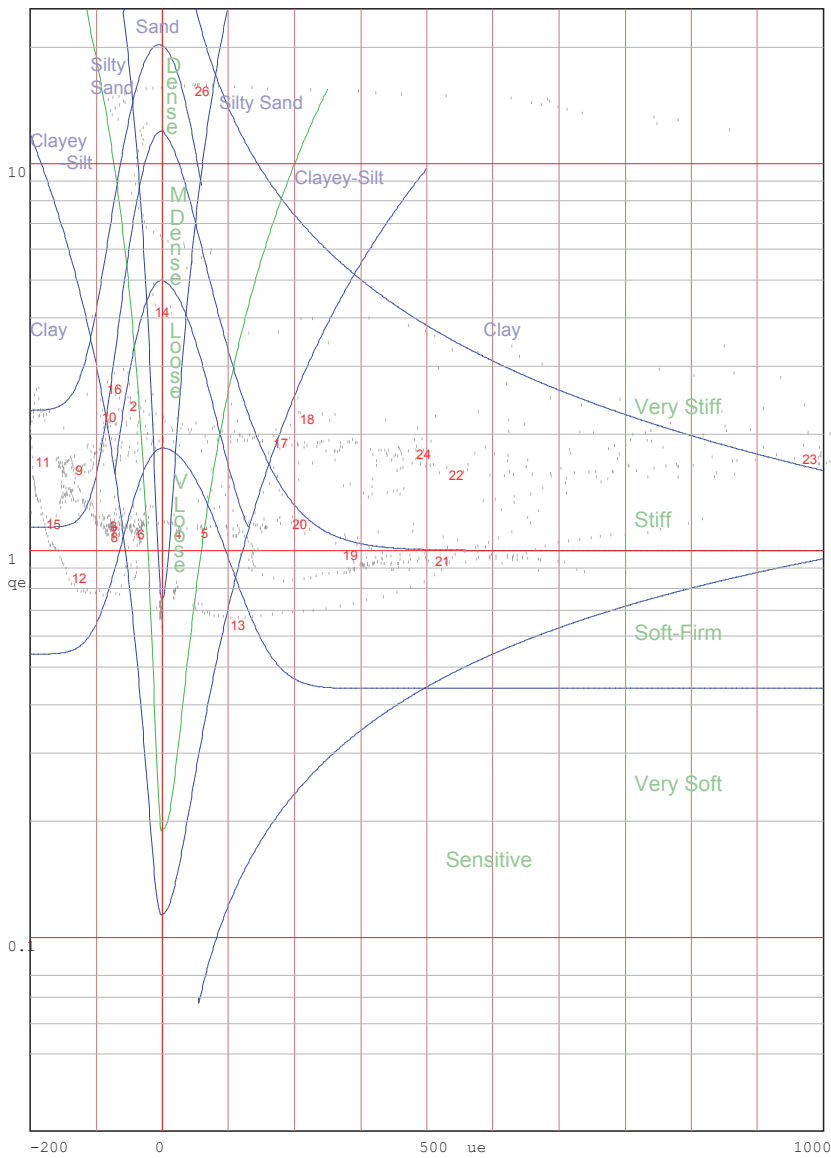
Site: Pier2

Hole No: CPT20

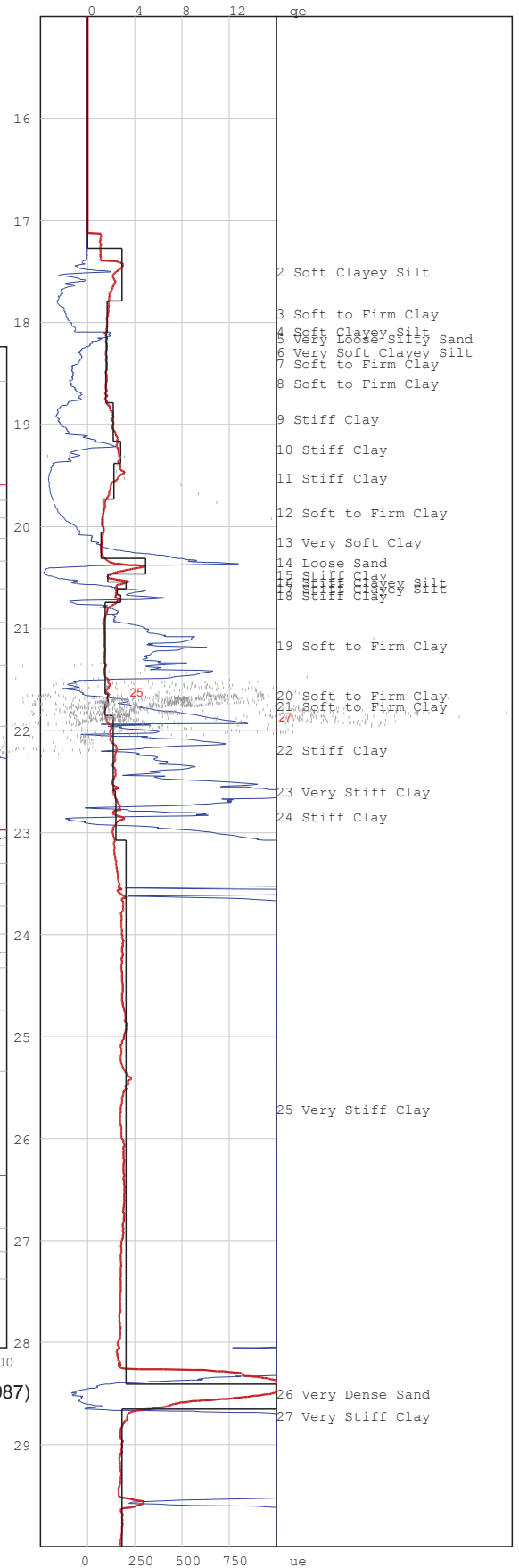
Date: 2012-06-29

Prob

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

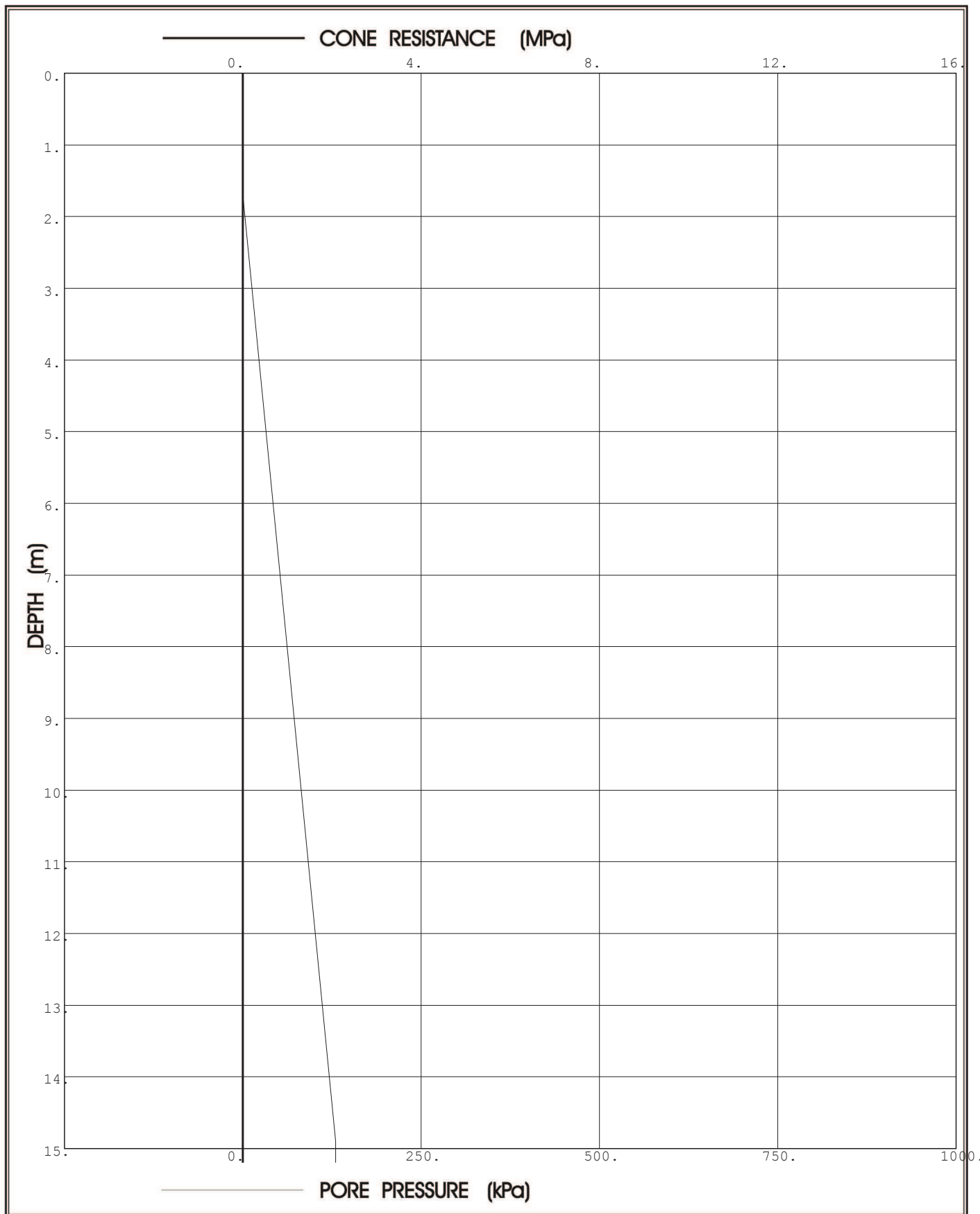
SITE: Pier2

CPTU (RE): CPT21

DATE: 2012/07/02

Probe: GHANA

Page:1



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PROJECT: Durban Harbour Over Water

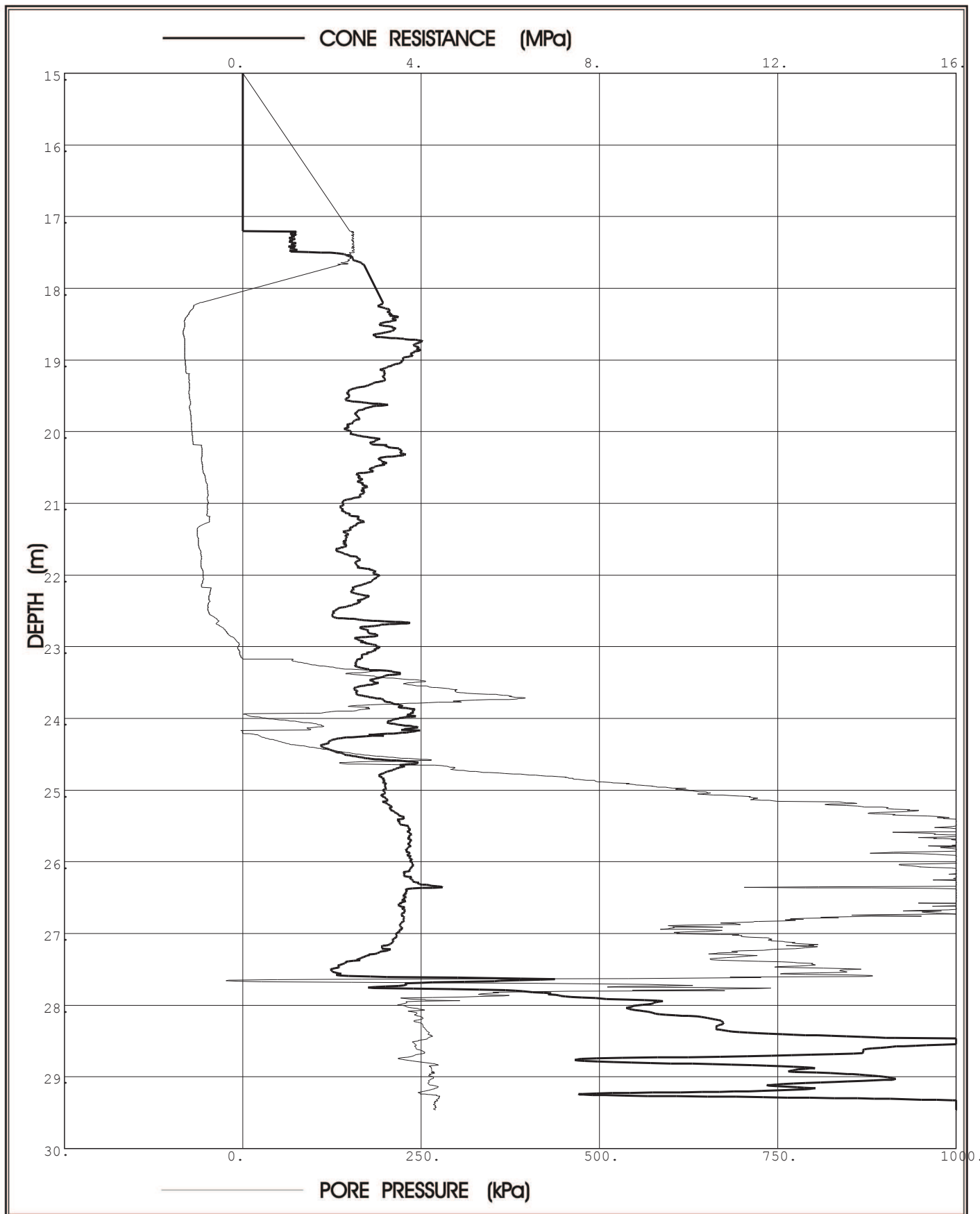
SITE: Pier2

CPTU (RE): CPT21

DATE: 2012/07/02

Probe: GHANA

Page:2



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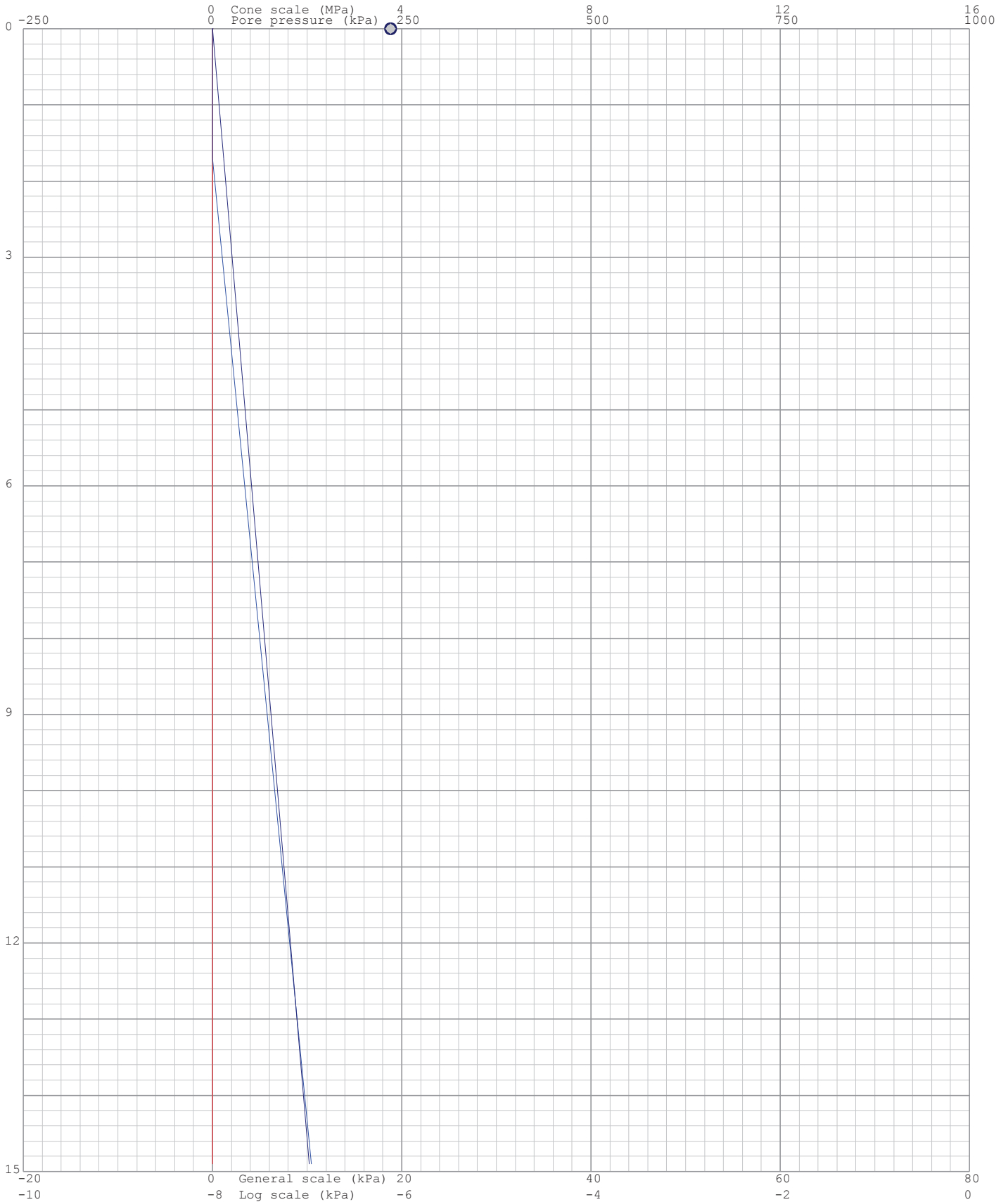
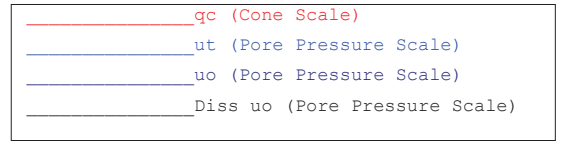
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT21

Date: 2012/07/02

Probe: GHANA



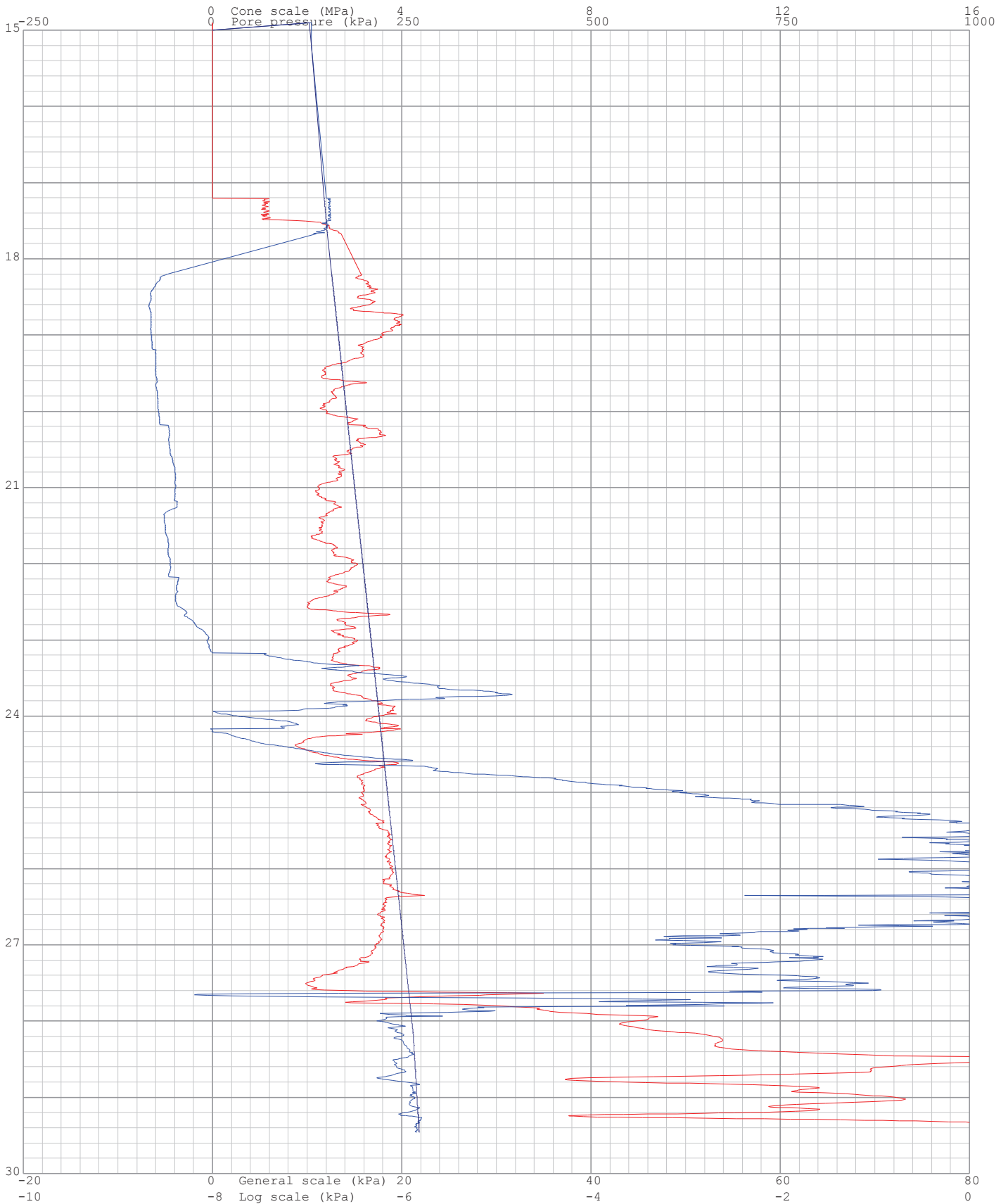
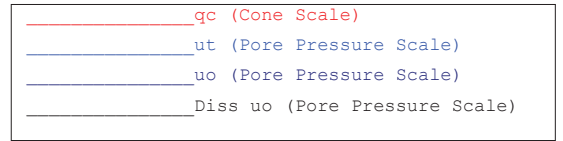
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT21

Date: 2012/07/02

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

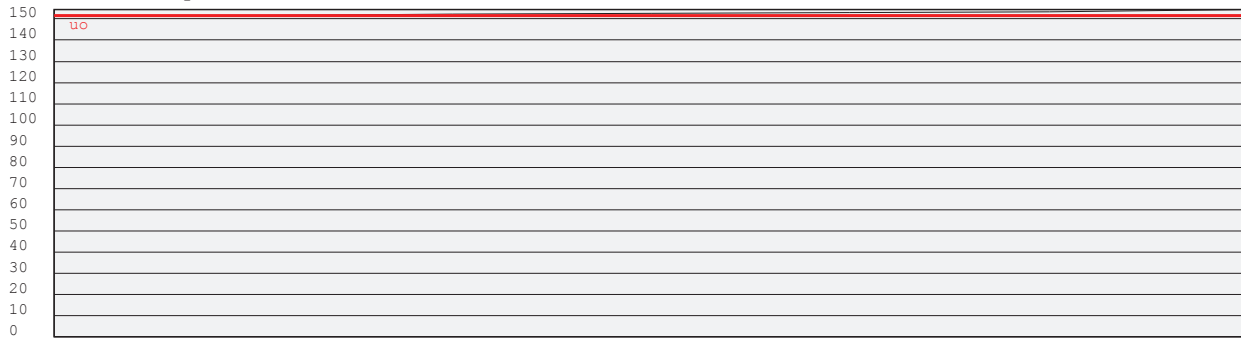
Hole: CPT21

Date: 2012/07/02

Probe: GHANA

Page: 1

(kPa) Dissipation at: 17.673m



Time (seconds)

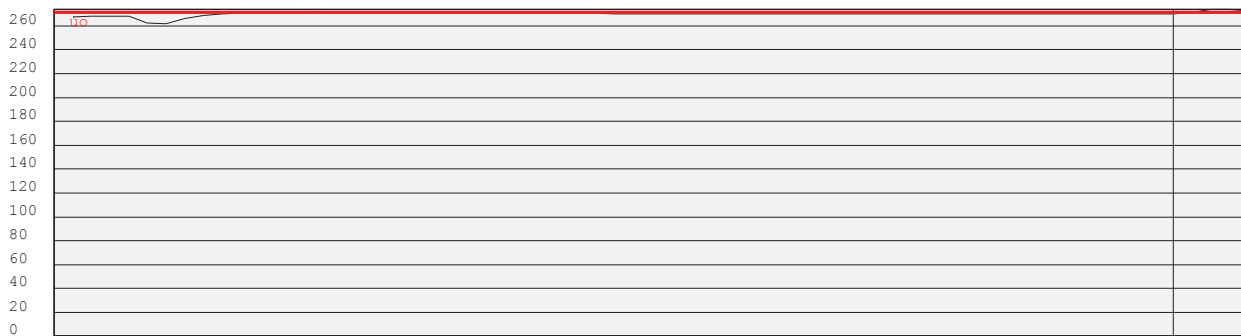
(kPa) Dissipation at: 28.152m



Time (seconds)

60

(kPa) Dissipation at: 29.152m



Time (seconds)

60

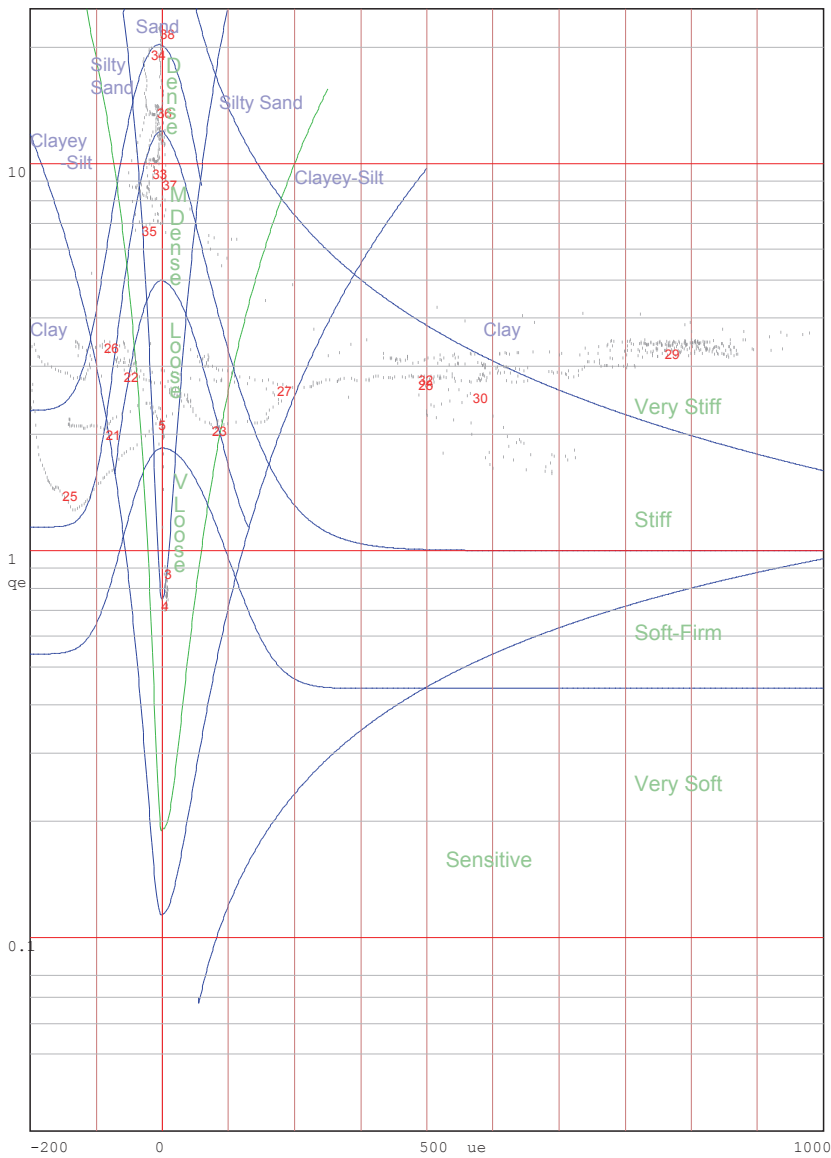
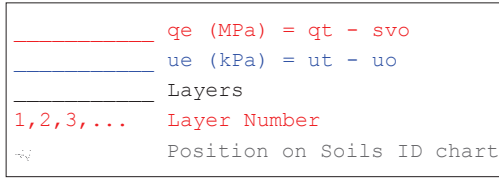
Project: Durban Harbour Over Water

Site: Pier2

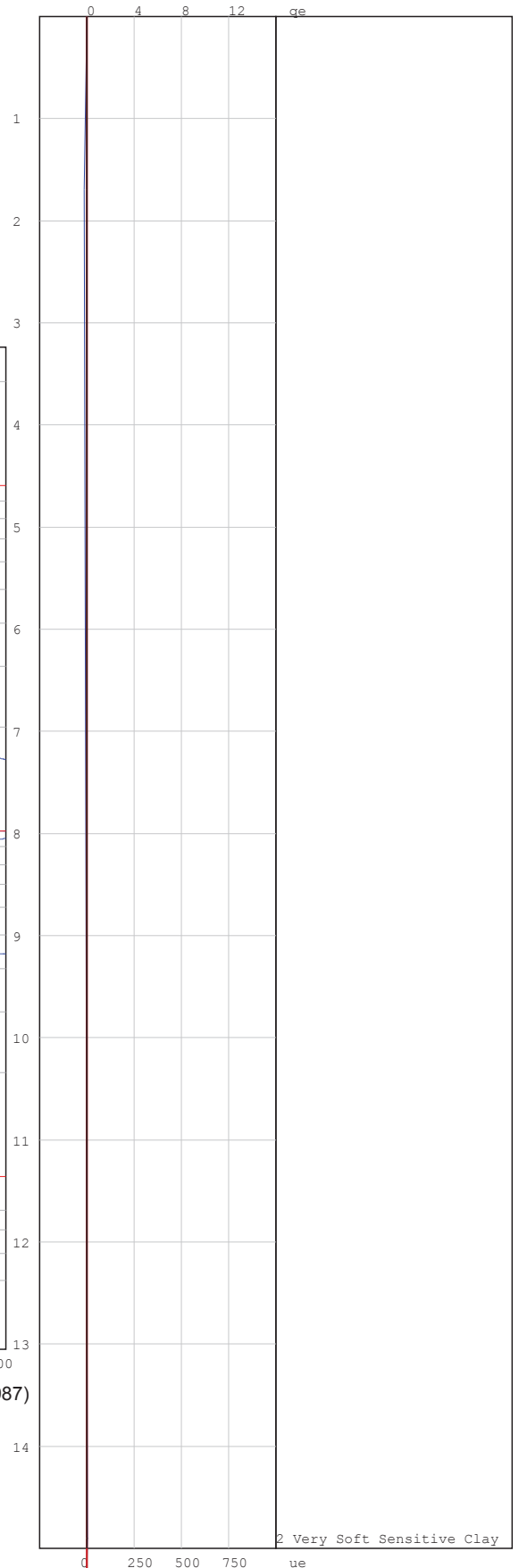
Hole No: CPT21

Date: 2012/07/02

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





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P O Box 39108  
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0044

PROJECT: Durban Harbour Over Water

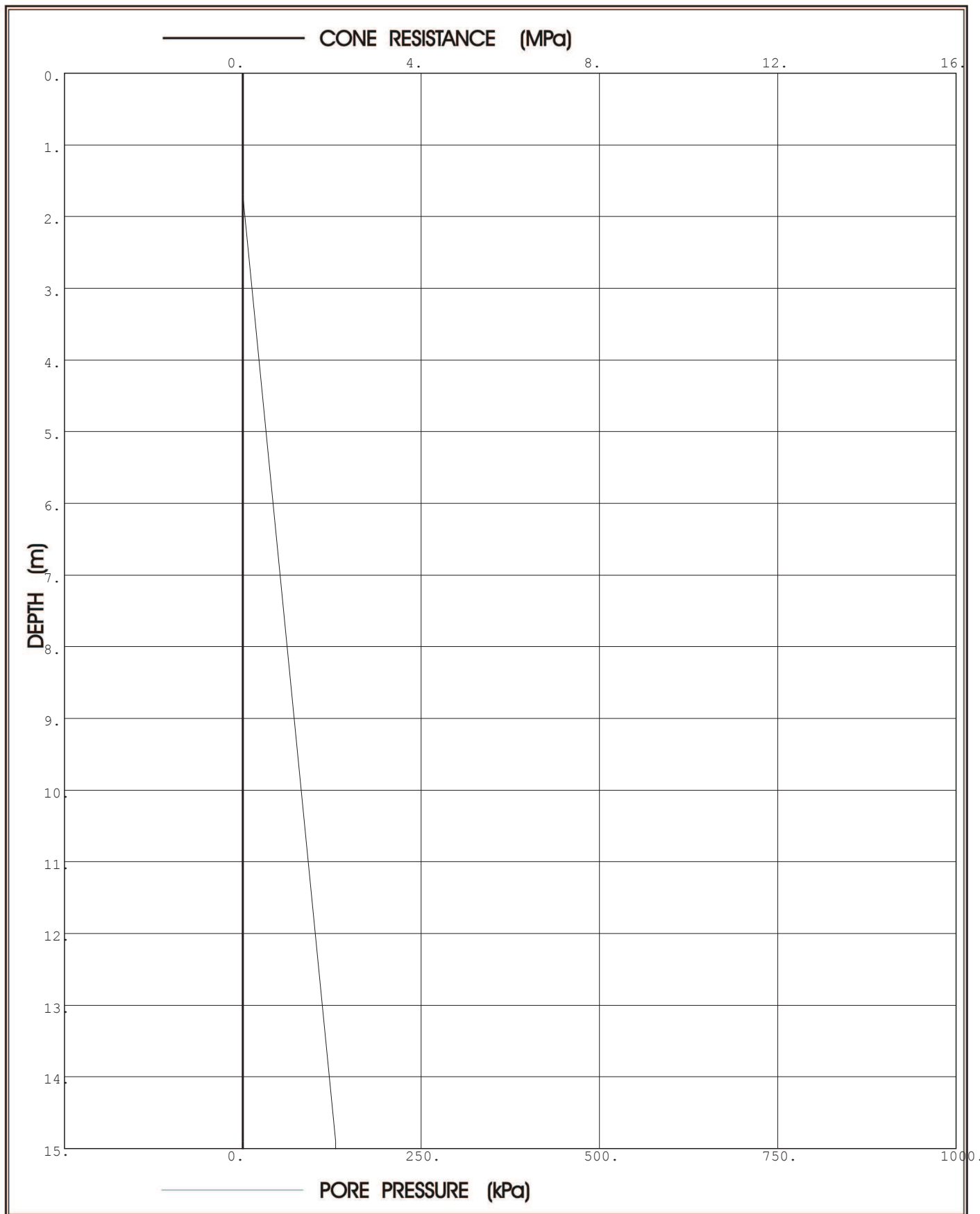
SITE: Pier2

CPTU (RE): CPT22

DATE: 2012/07/02

Probe: GHANA

Page:1



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PROJECT: Durban Harbour Over Water

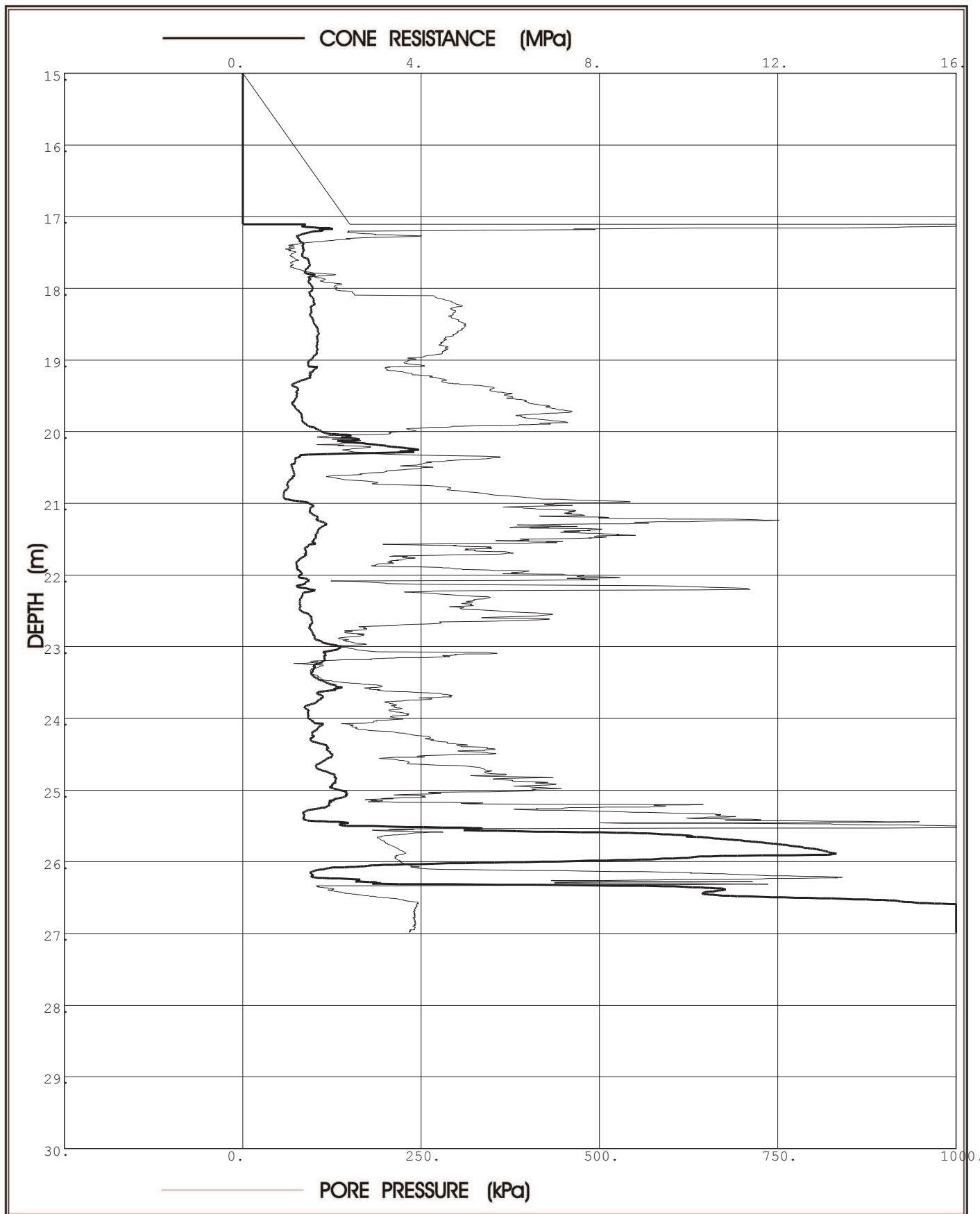
SITE: Pier2

CPTU (RE): CPT22

DATE: 2012/07/02

Probe: GHANA

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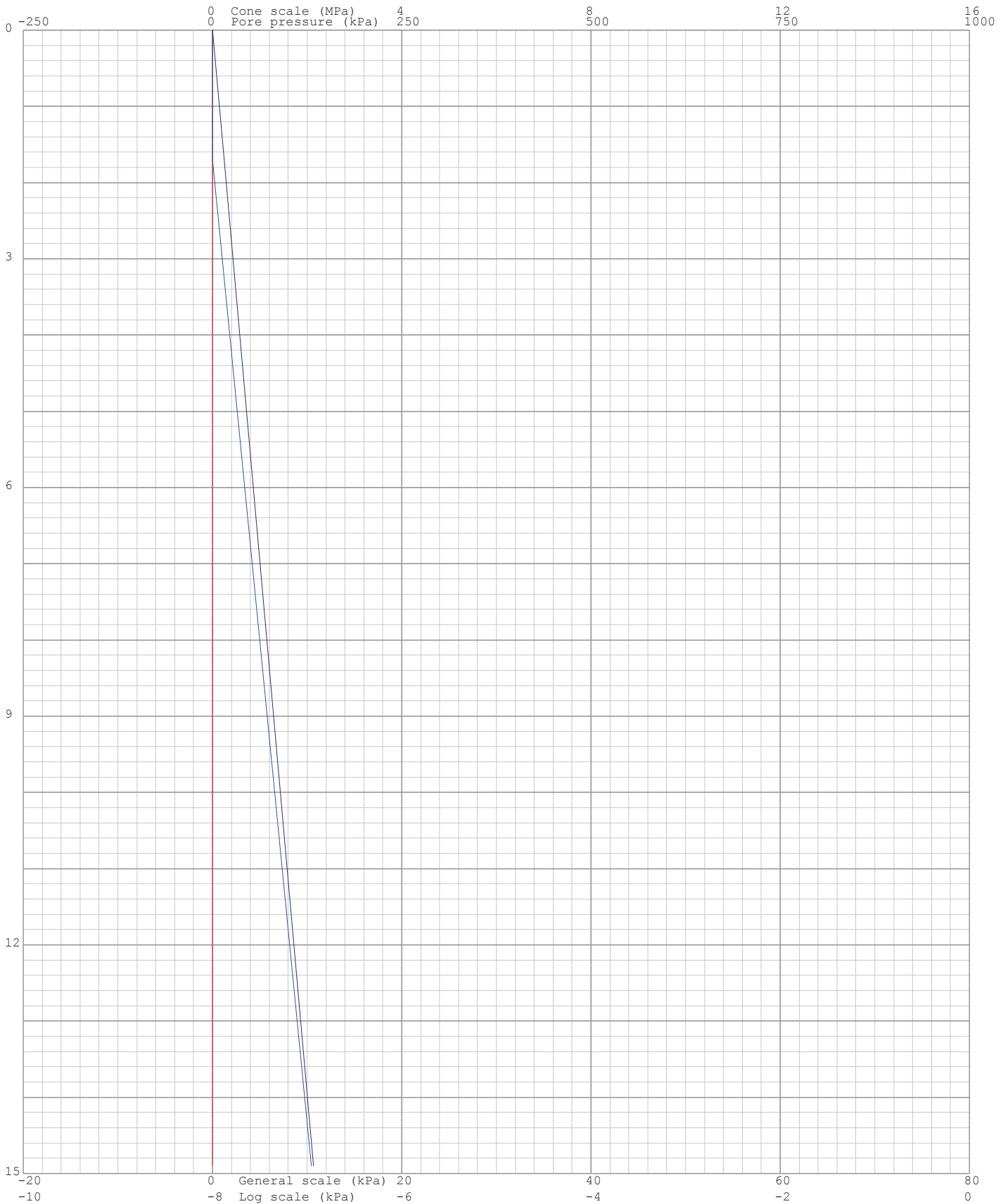
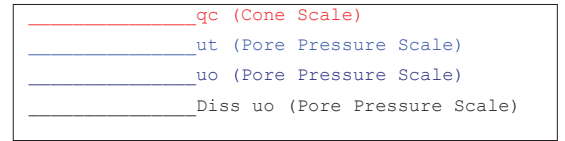
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT22

Date: 2012/07/02

Probe: GHANA



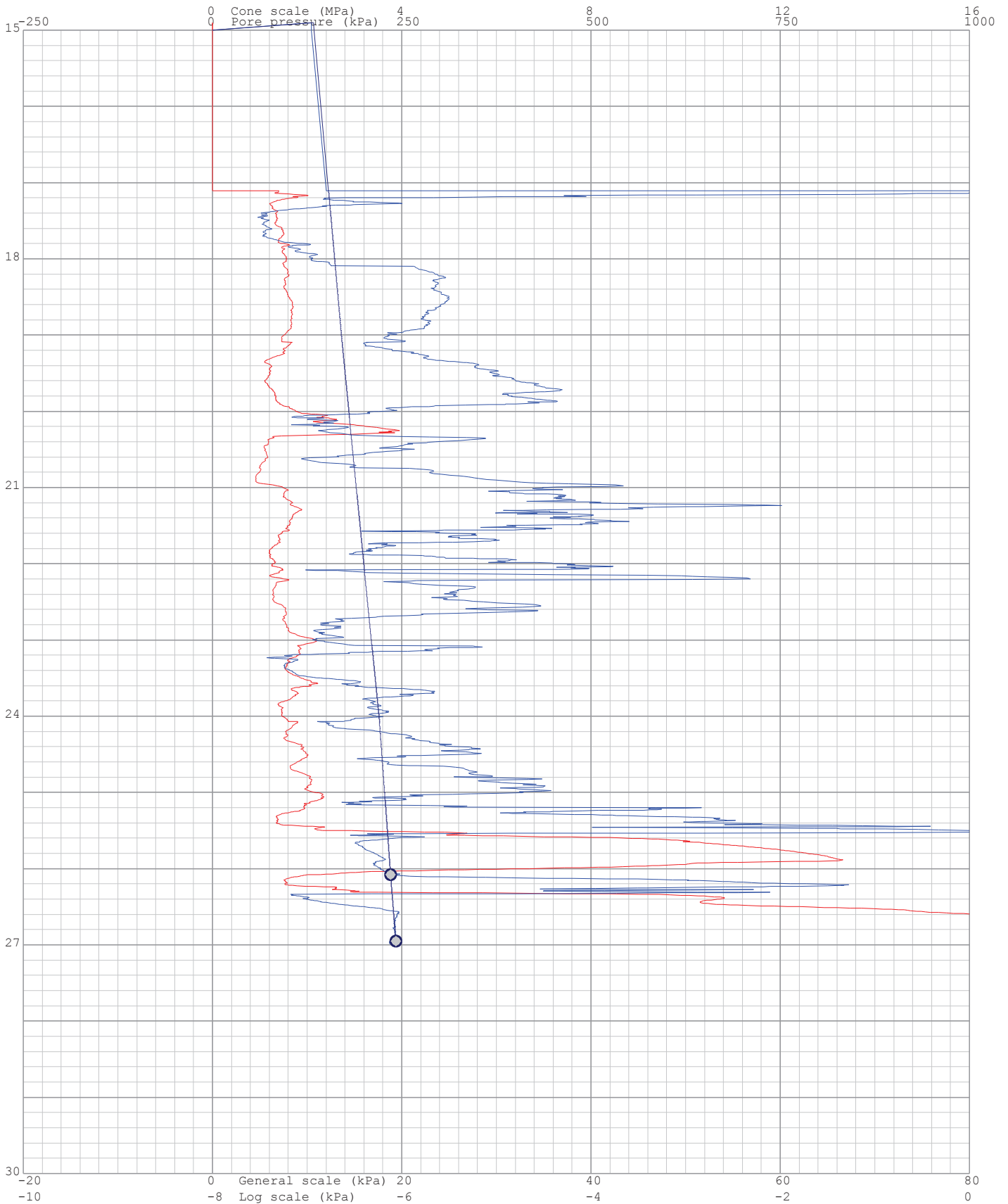
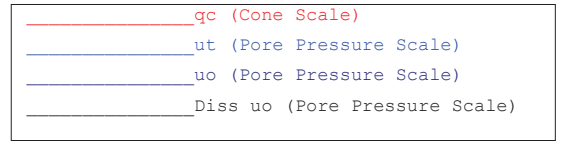
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT22

Date: 2012/07/02

Probe: GHANA



Project: Durban Harbour Over Water

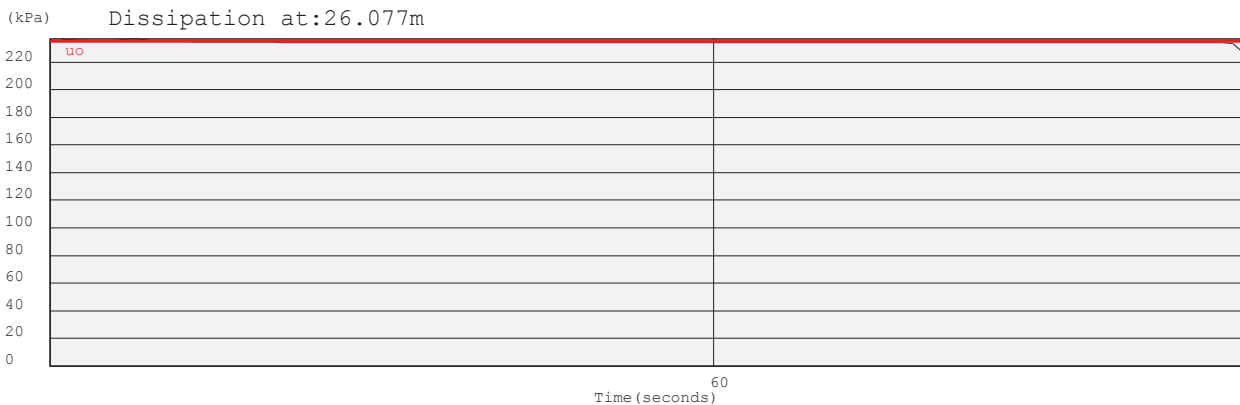
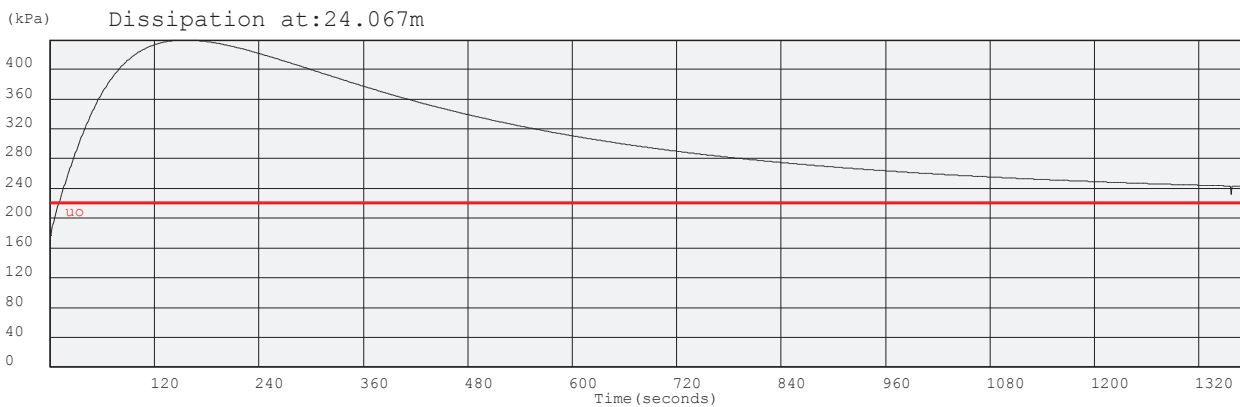
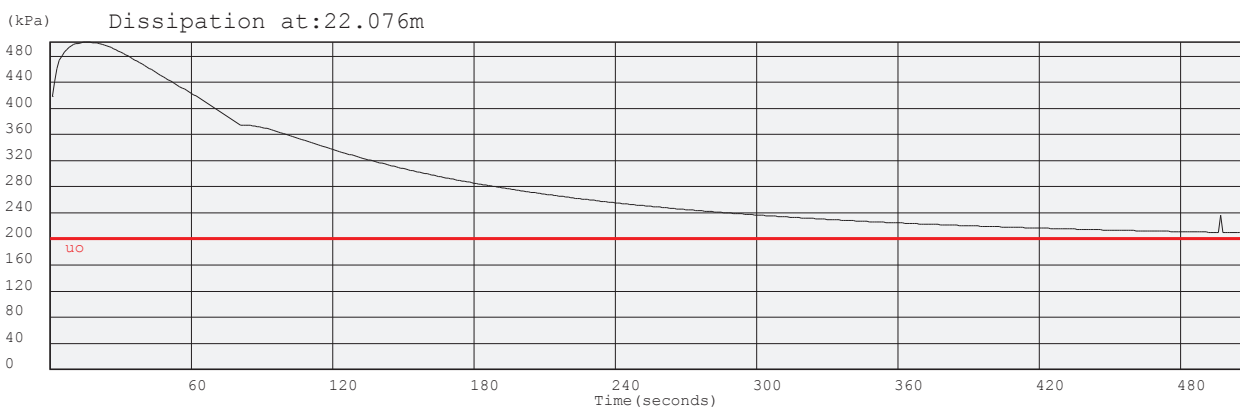
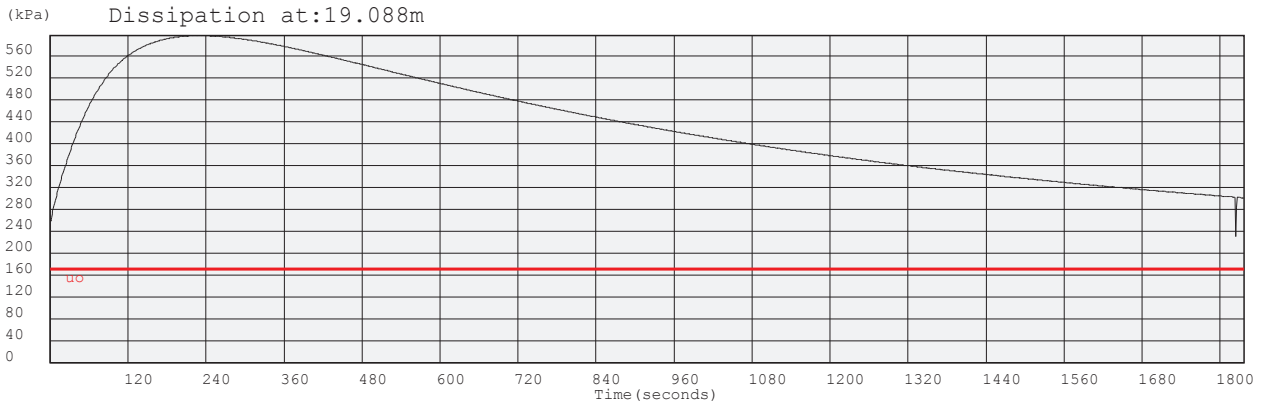
Site: Pier2

Hole: CPT22

Date: 2012/07/02

Probe: GHANA

Page: 1



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT22

Date: 2012/07/02

Probe: GHANA  
Page: 2

(kPa) Dissipation at: 26.949m



Time (seconds)

Project: Durban Harbour Over Water

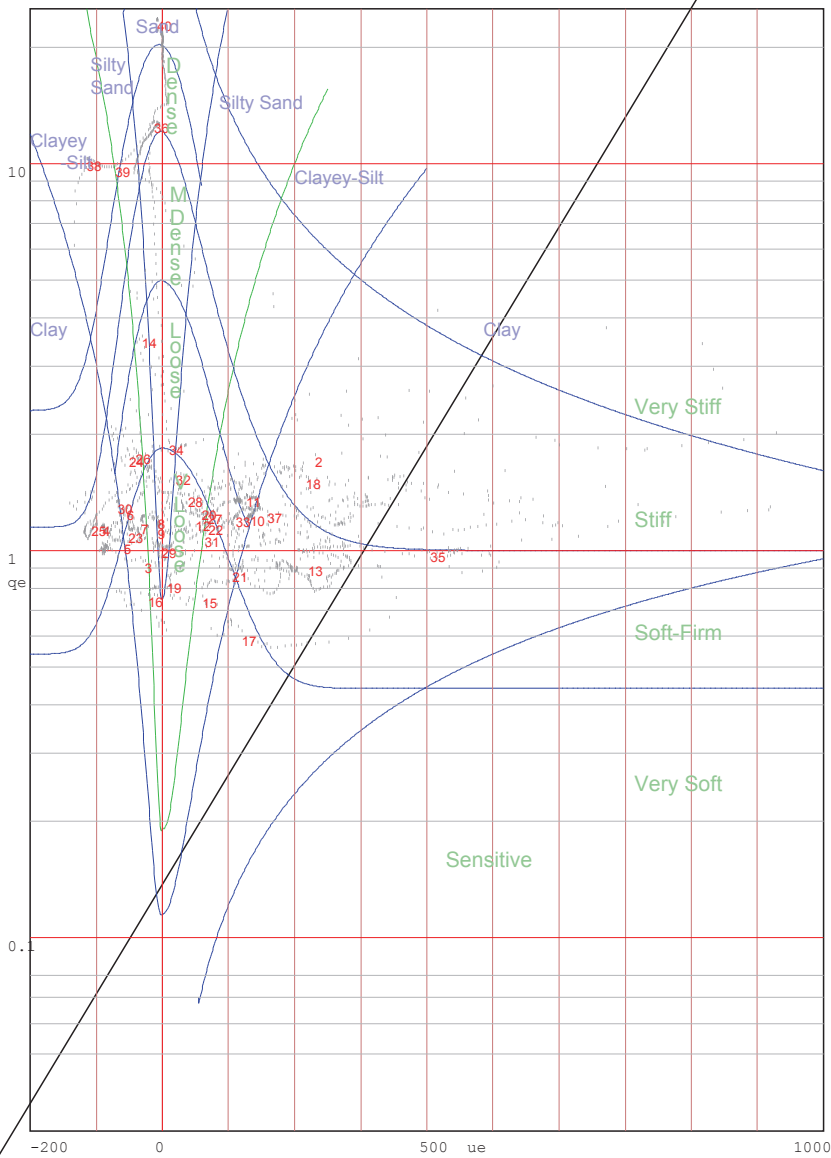
Site: Pier2

Hole No: CPT22

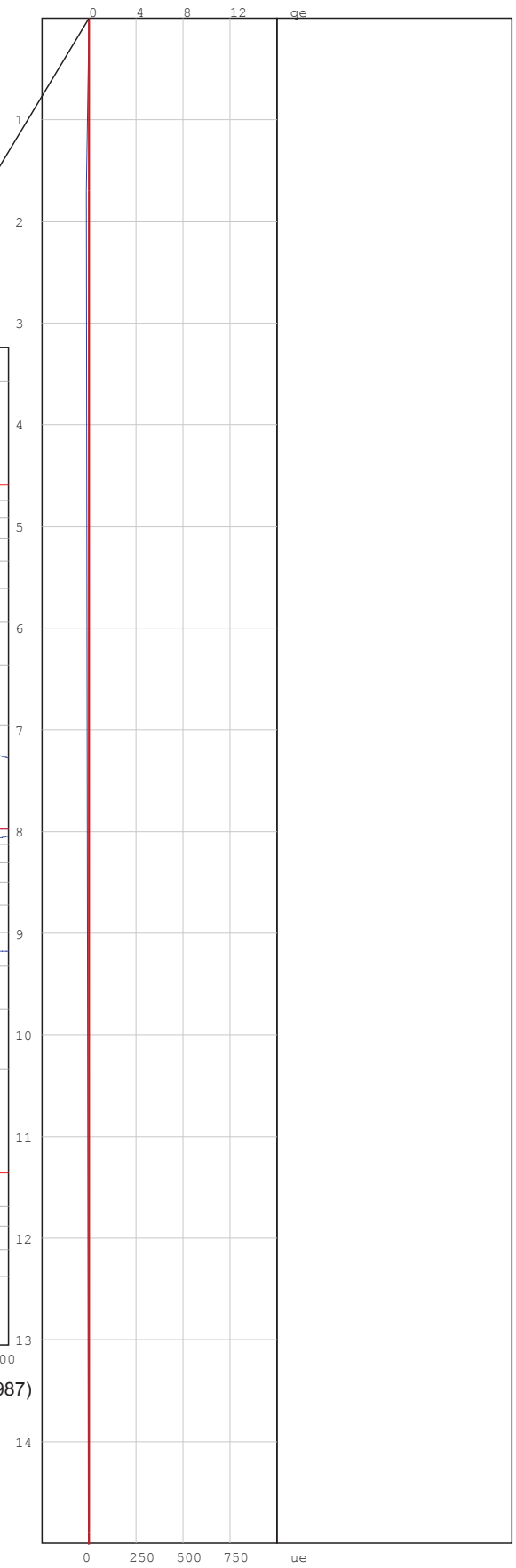
Date: 2012/07/02

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

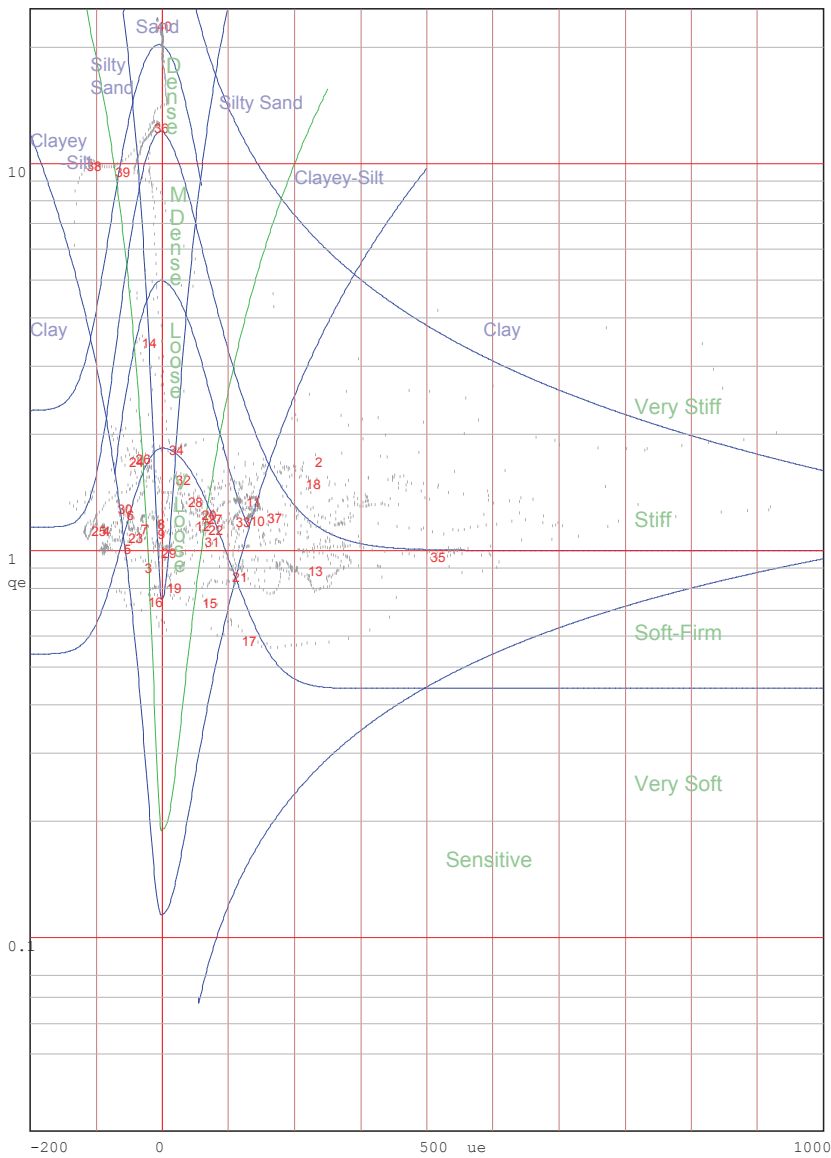
Site: Pier2

Hole No: CPT22

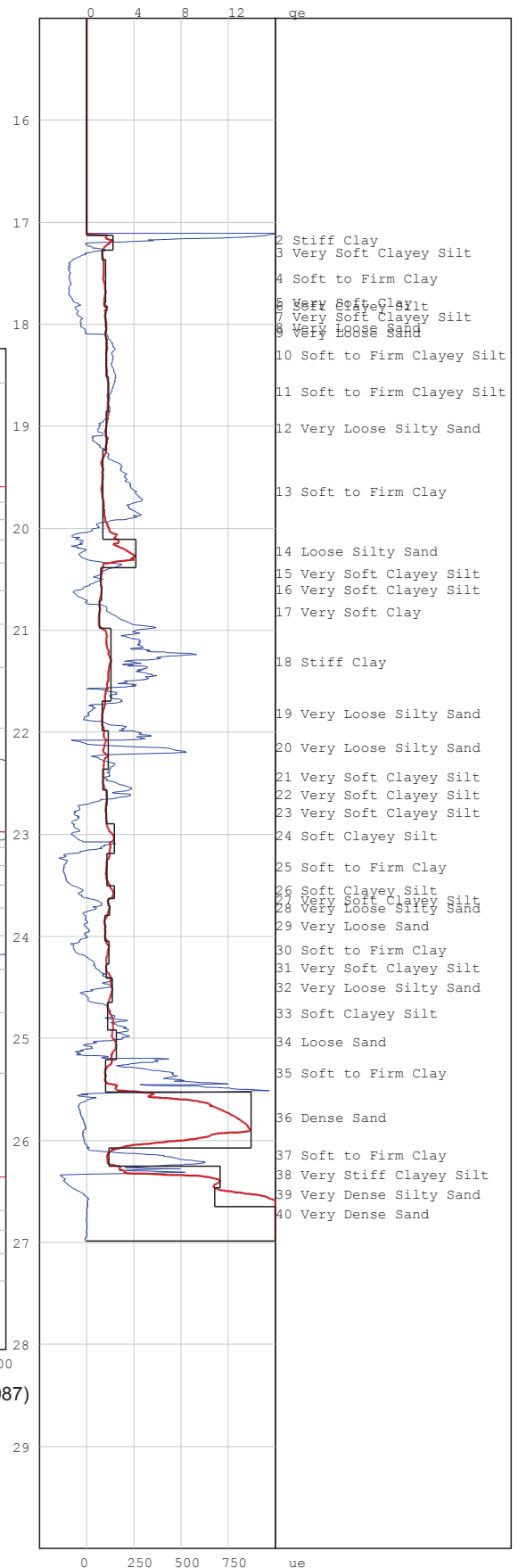
Date: 2012/07/02

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
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P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

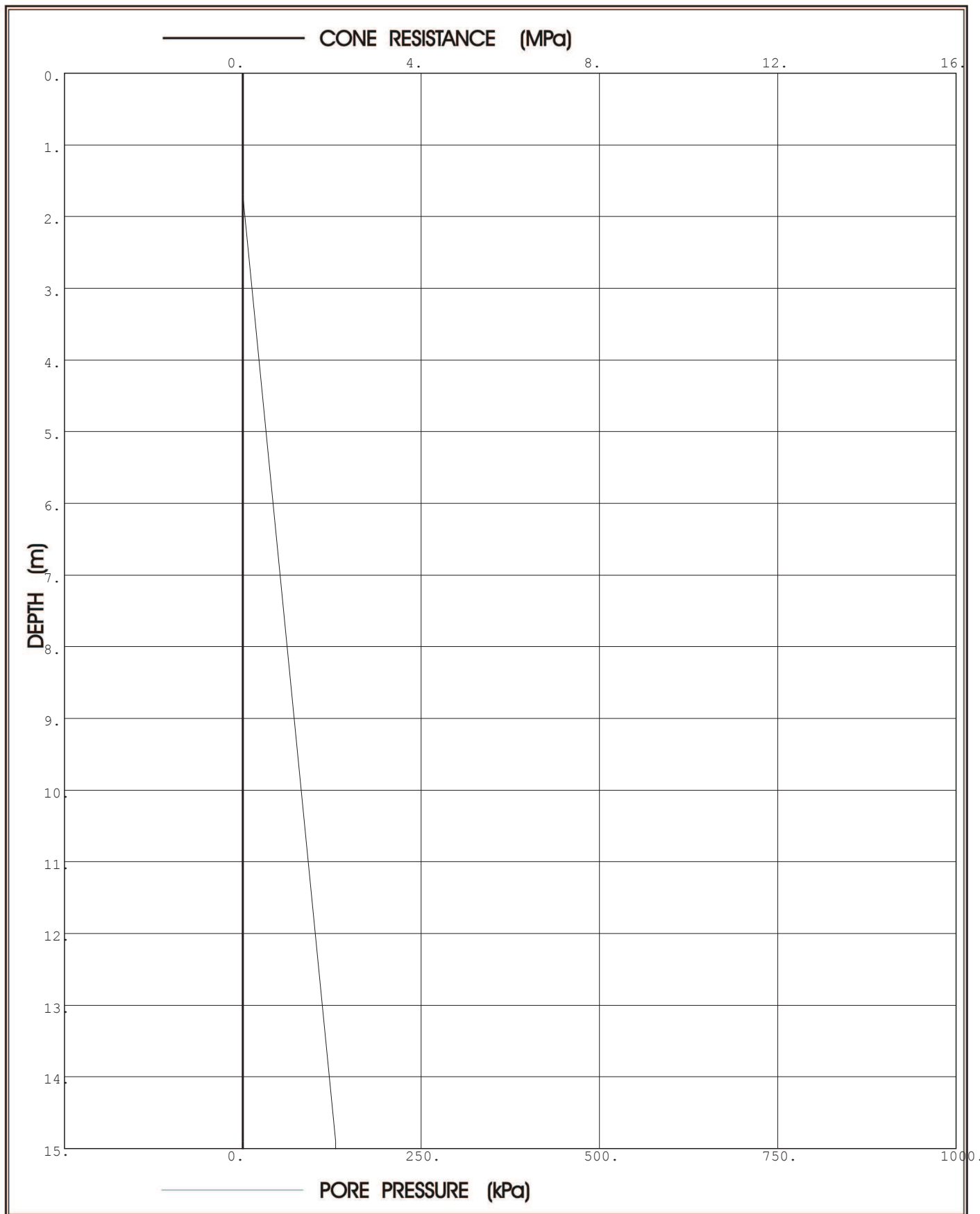
SITE: Pier2

CPTU (RE): CPT23

DATE: 2012-06-13

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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PROJECT: Durban Harbour Over Water

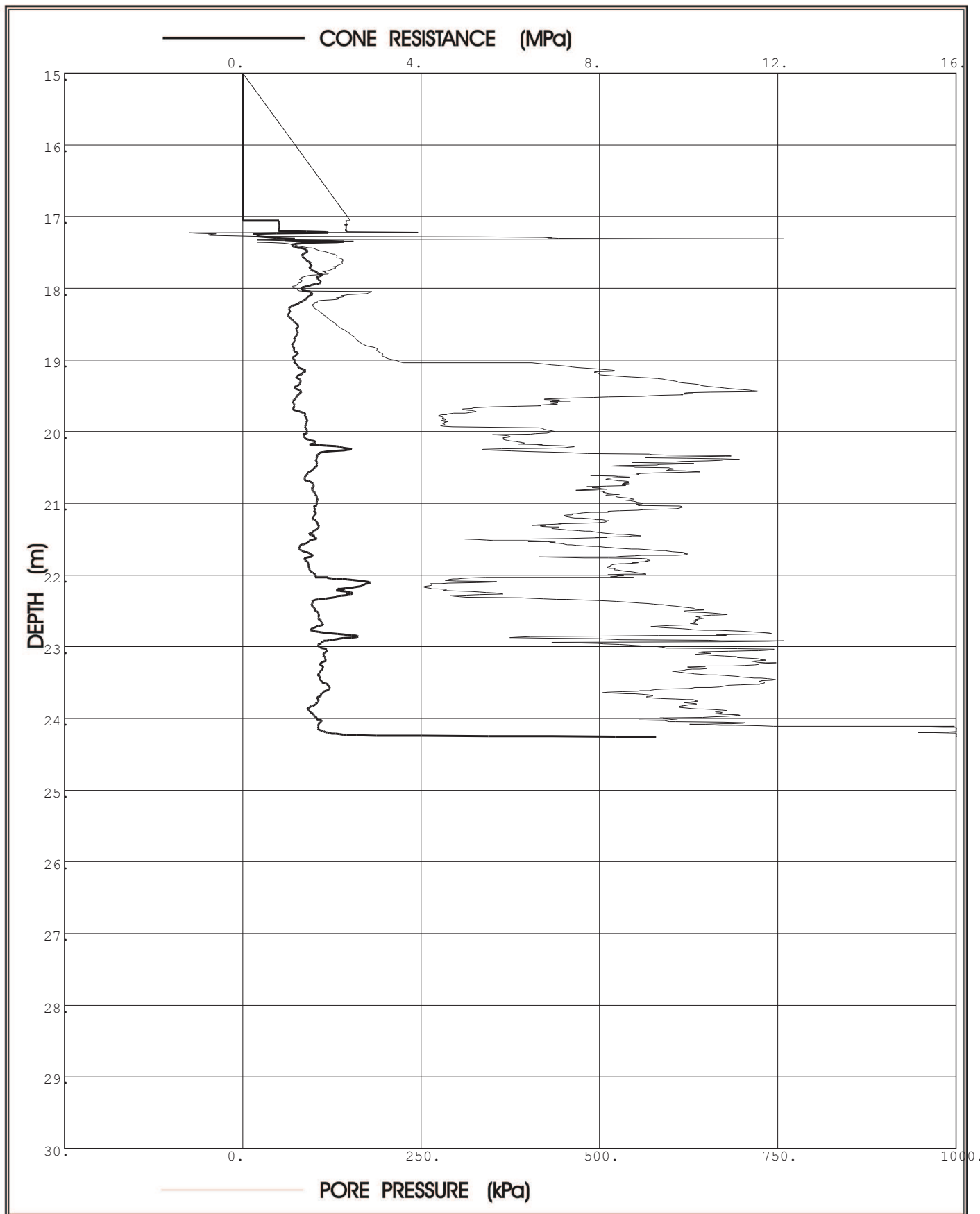
SITE: Pier2

CPTU (RE): CPT23

DATE: 2012-06-13

Probe: GHANA

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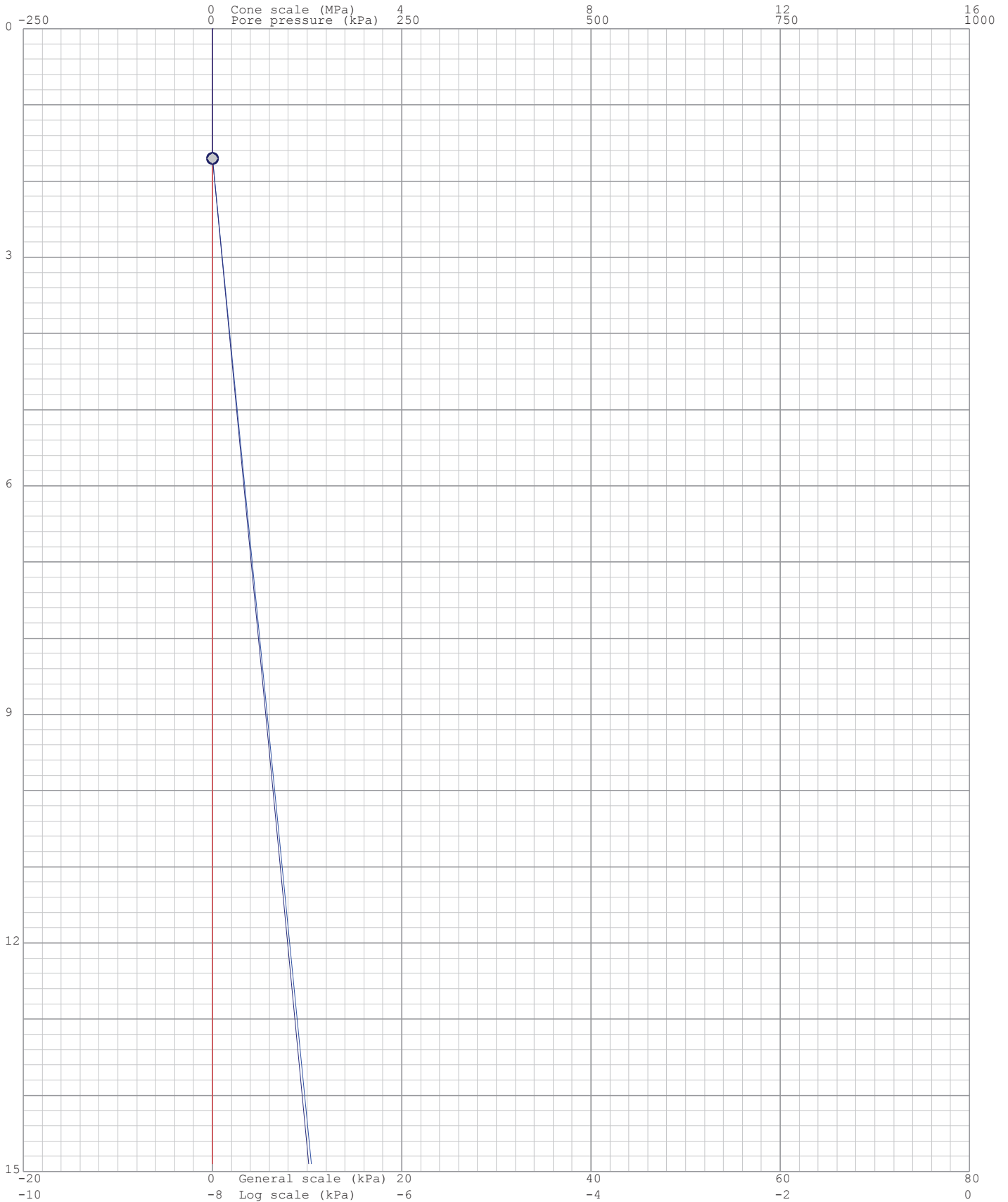
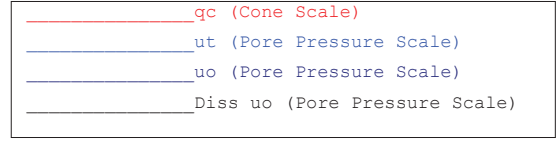
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT23

Date: 2012-06-13

Probe: GHANA



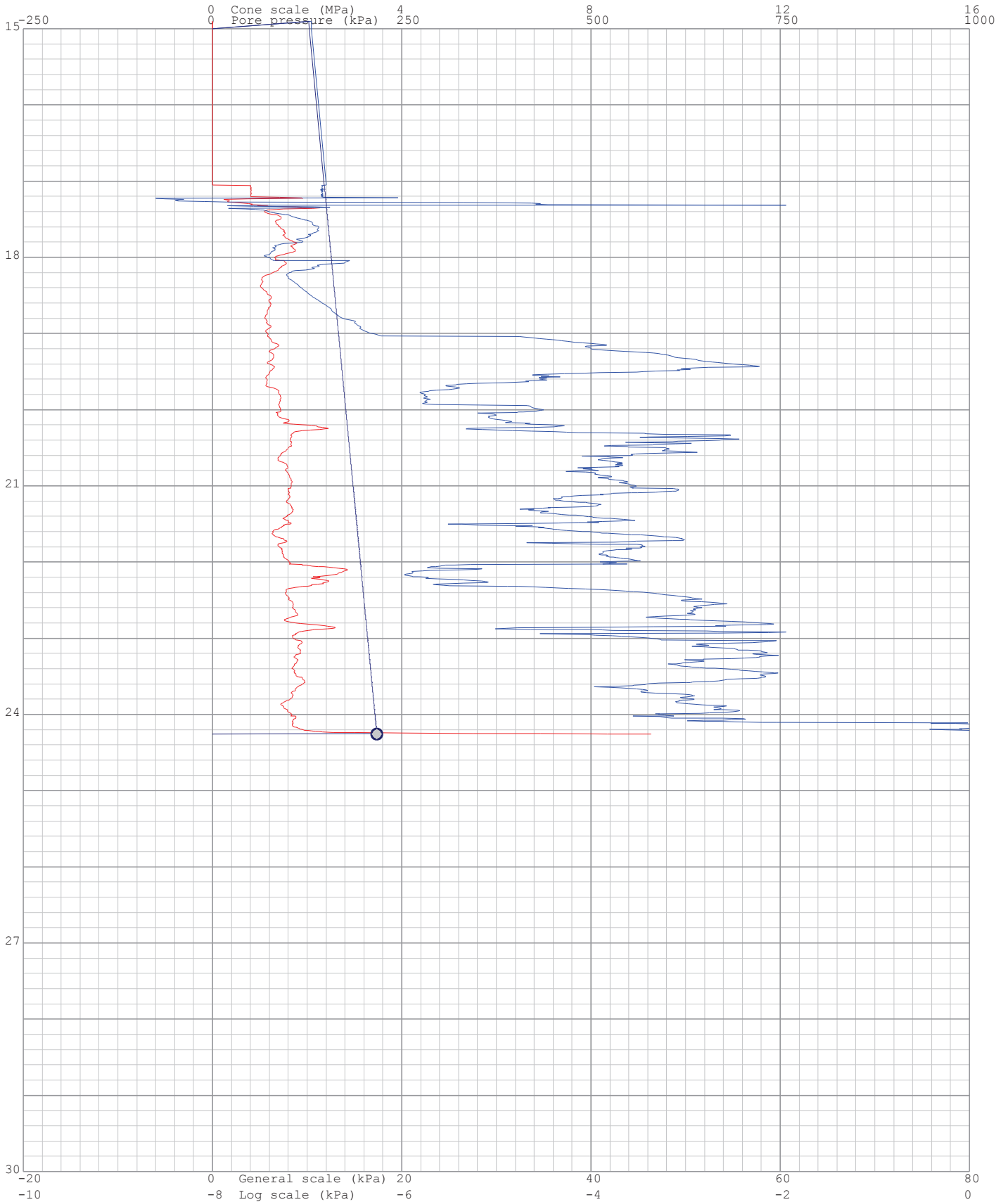
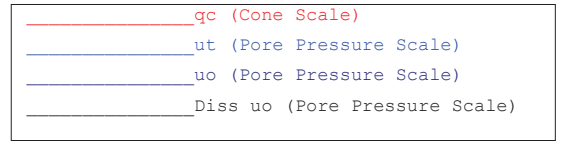
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT23

Date: 2012-06-13

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT23

Date: 2012-06-13

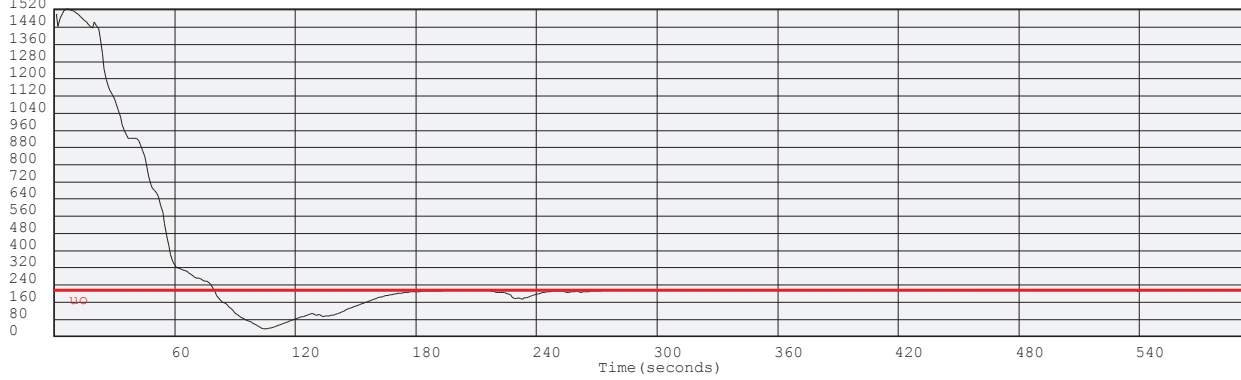
Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 24.259m



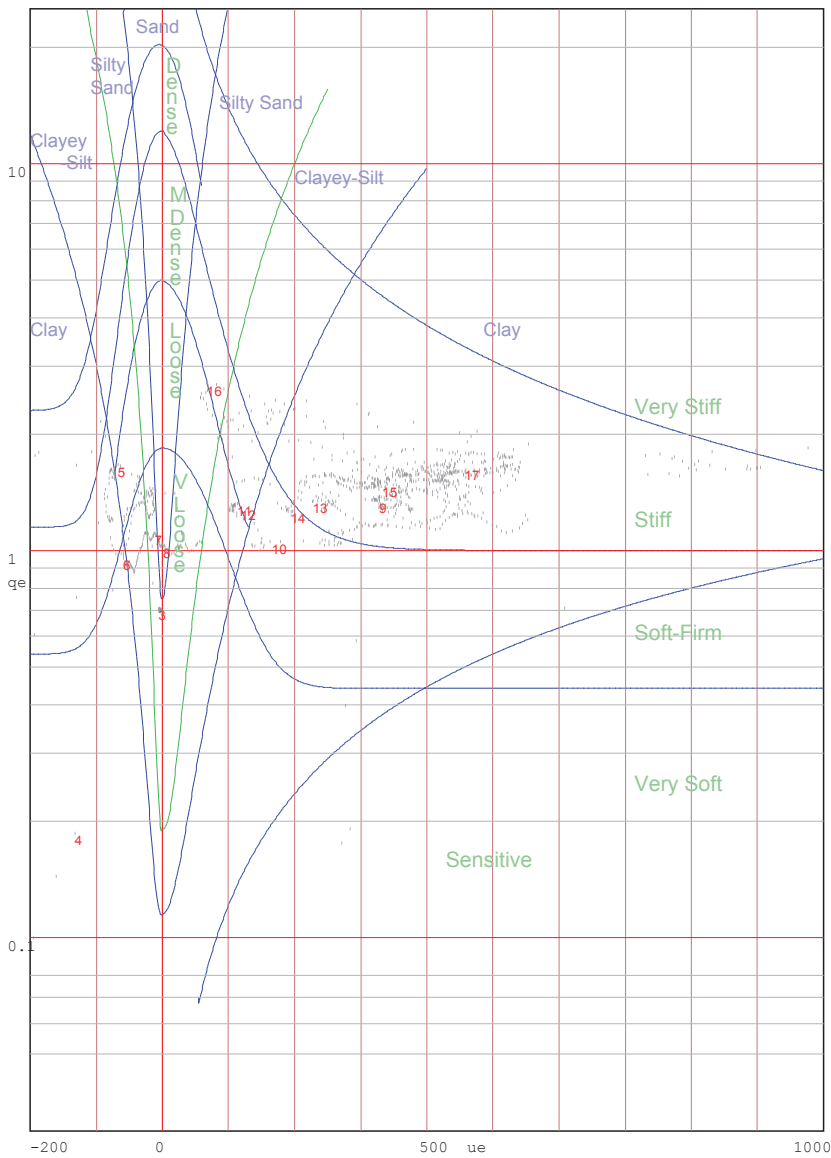
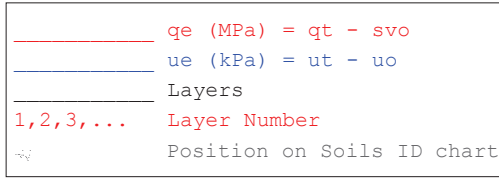
Project: Durban Harbour Over Water

Site: Pier2

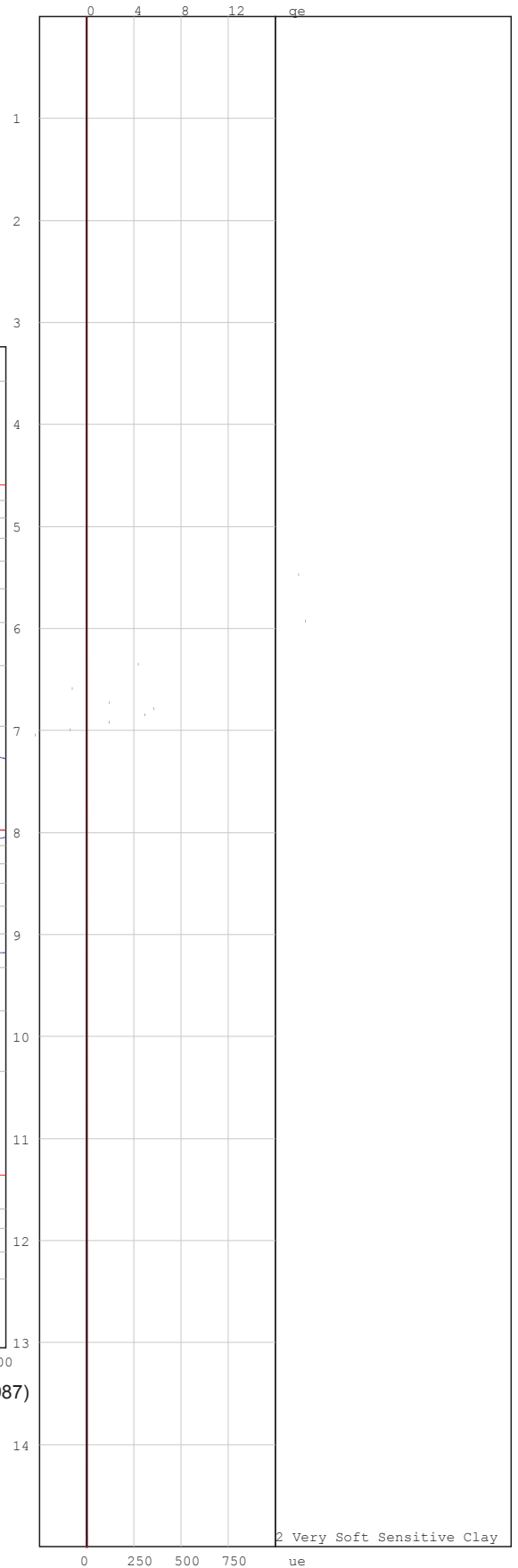
Hole No: CPT23

Date: 2012-06-13

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

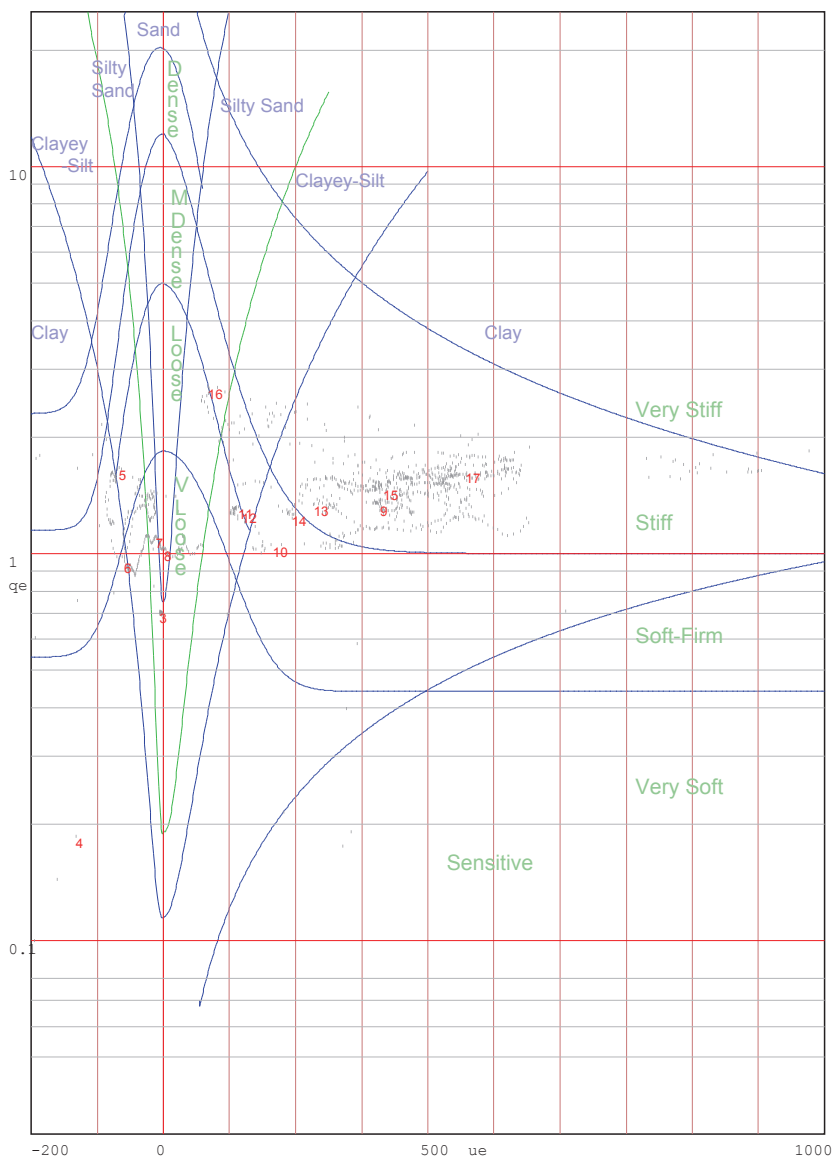
Site: Pier2

Hole No: CPT23

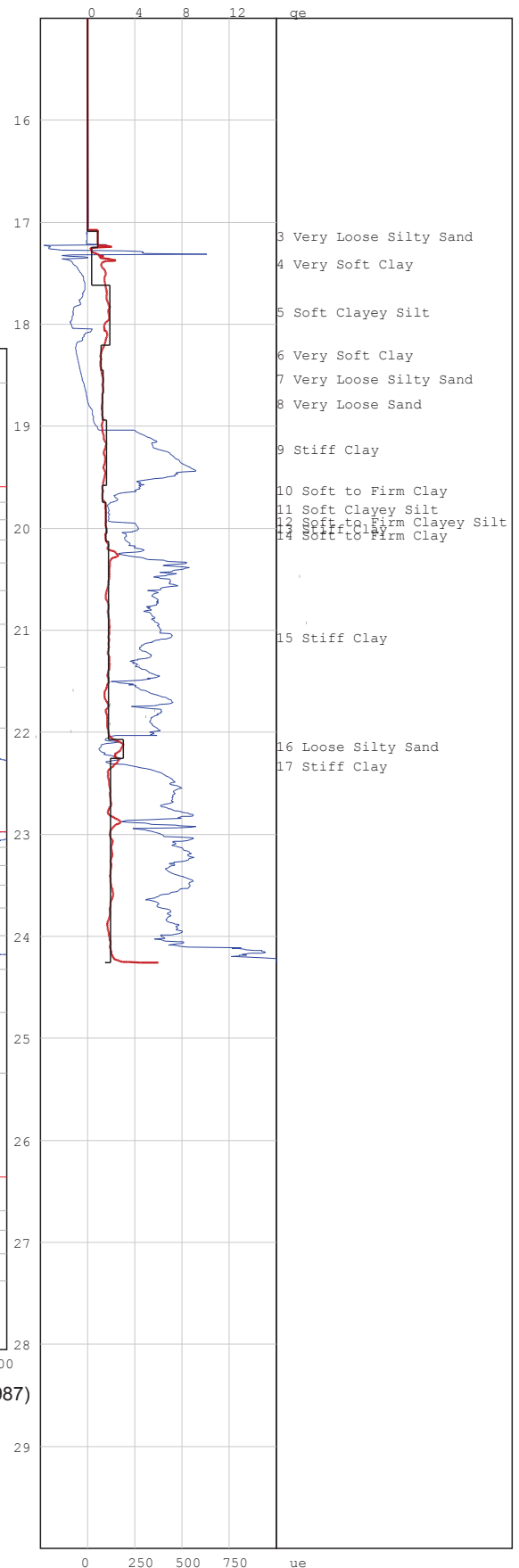
Date: 2012-06-13

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
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P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

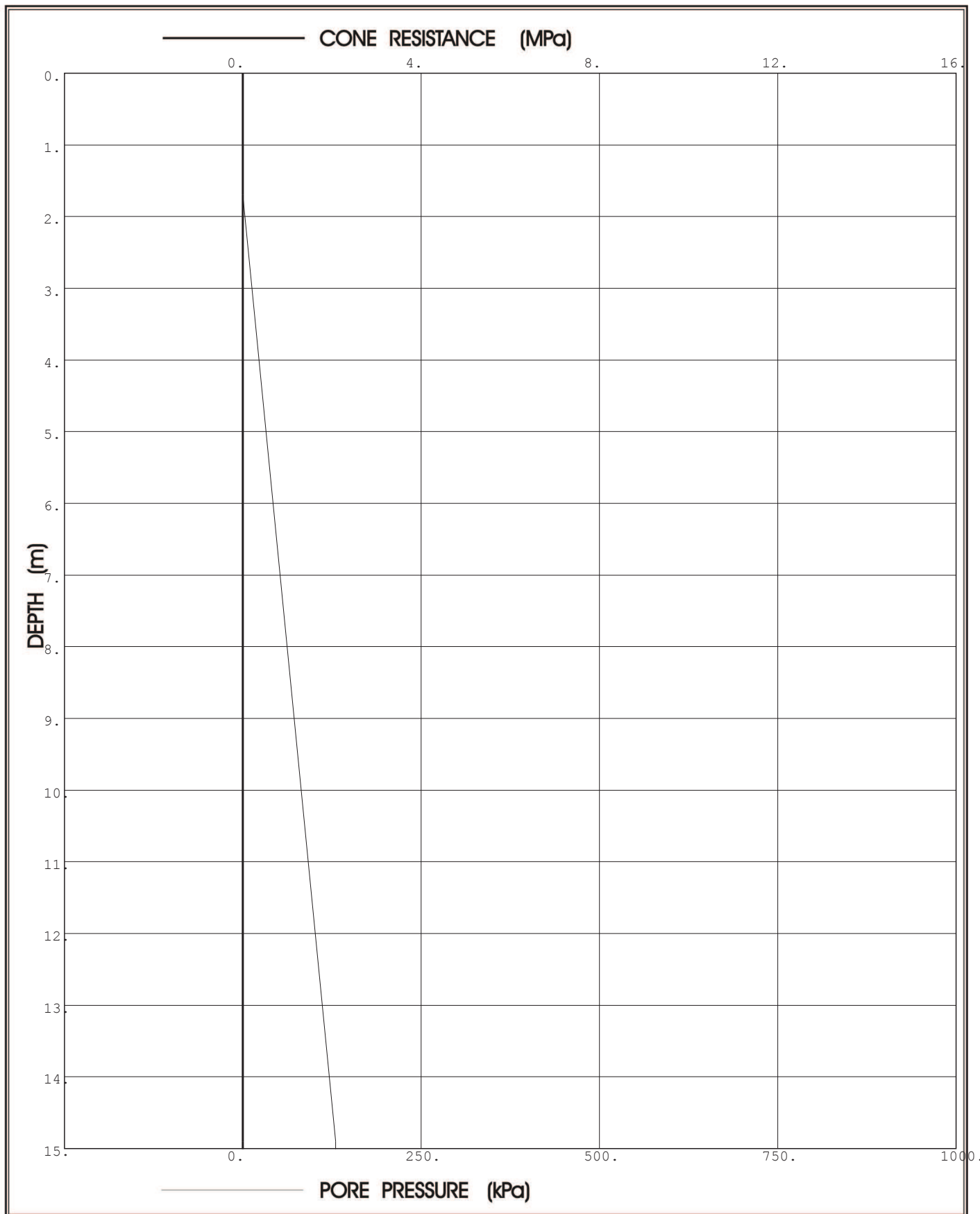
SITE: Pier2

CPTU (RE): CPT24

DATE: 2012/06/14

Probe: KELLER

Page:1



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0044

PROJECT: Durban Harbour Over Water

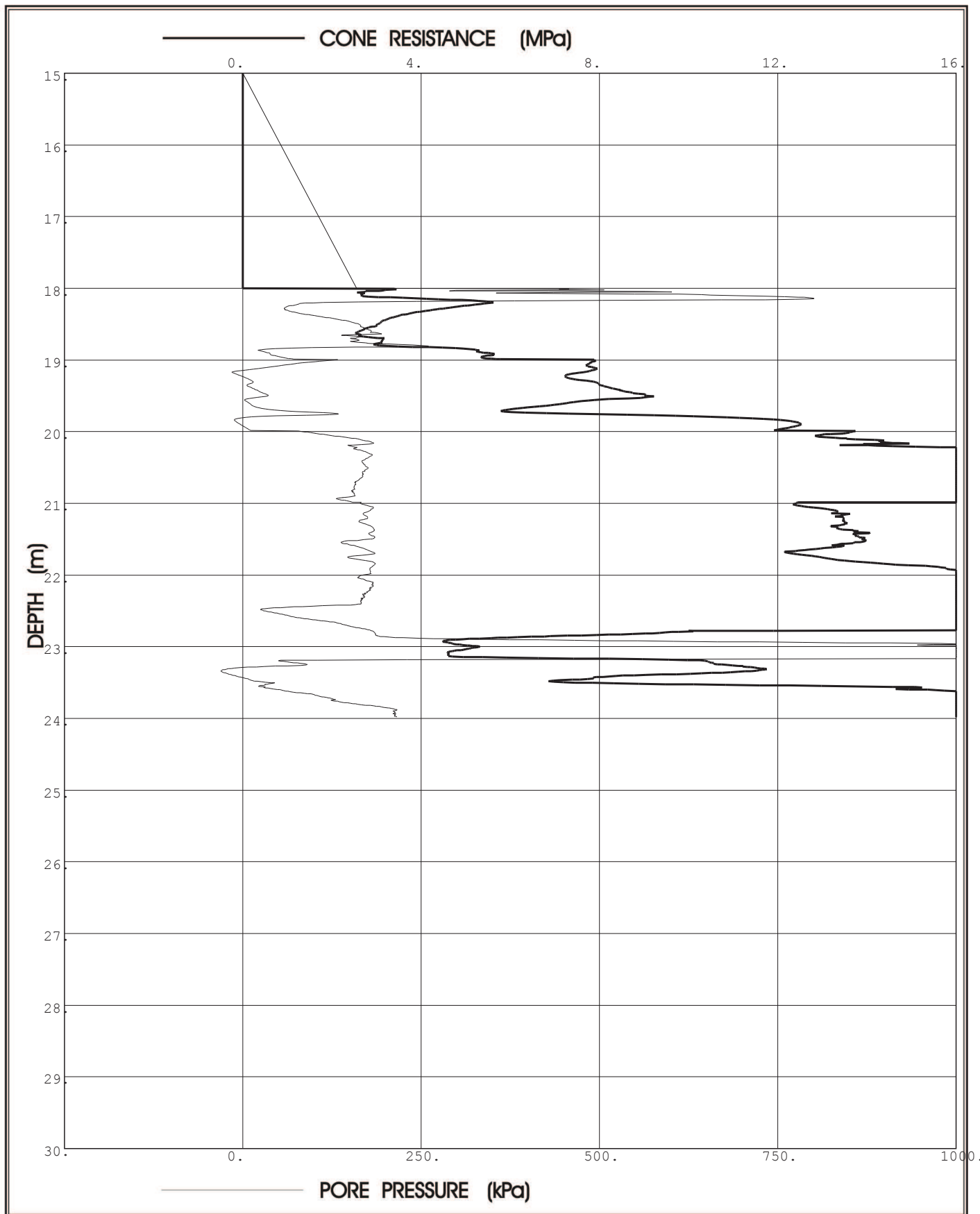
SITE: Pier2

CPTU (RE): CPT24

DATE: 2012/06/14

Probe: KELLER

Page:2



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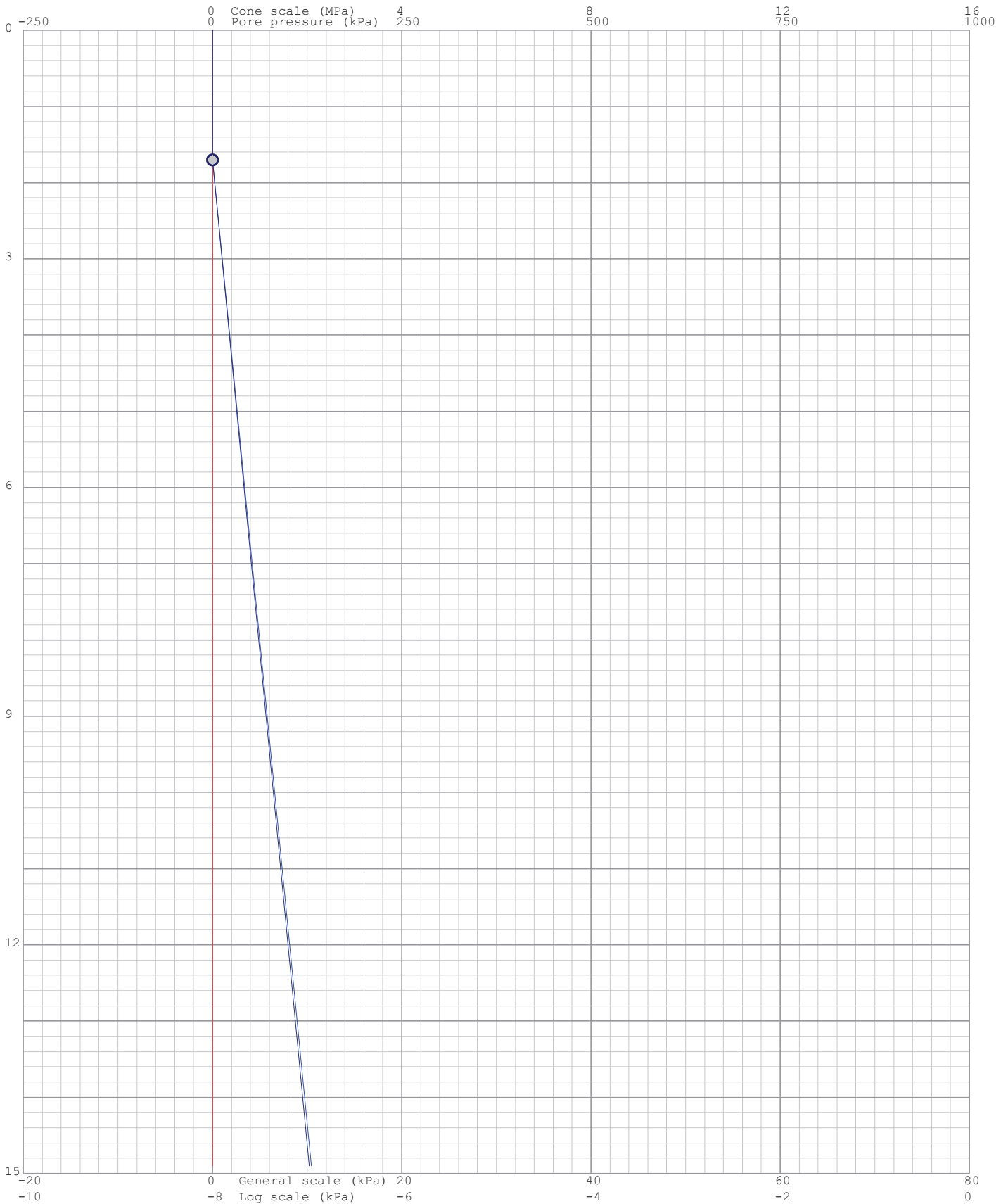
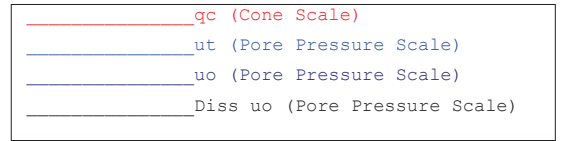
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT24

Date: 2012/06/14

Probe: KELLER





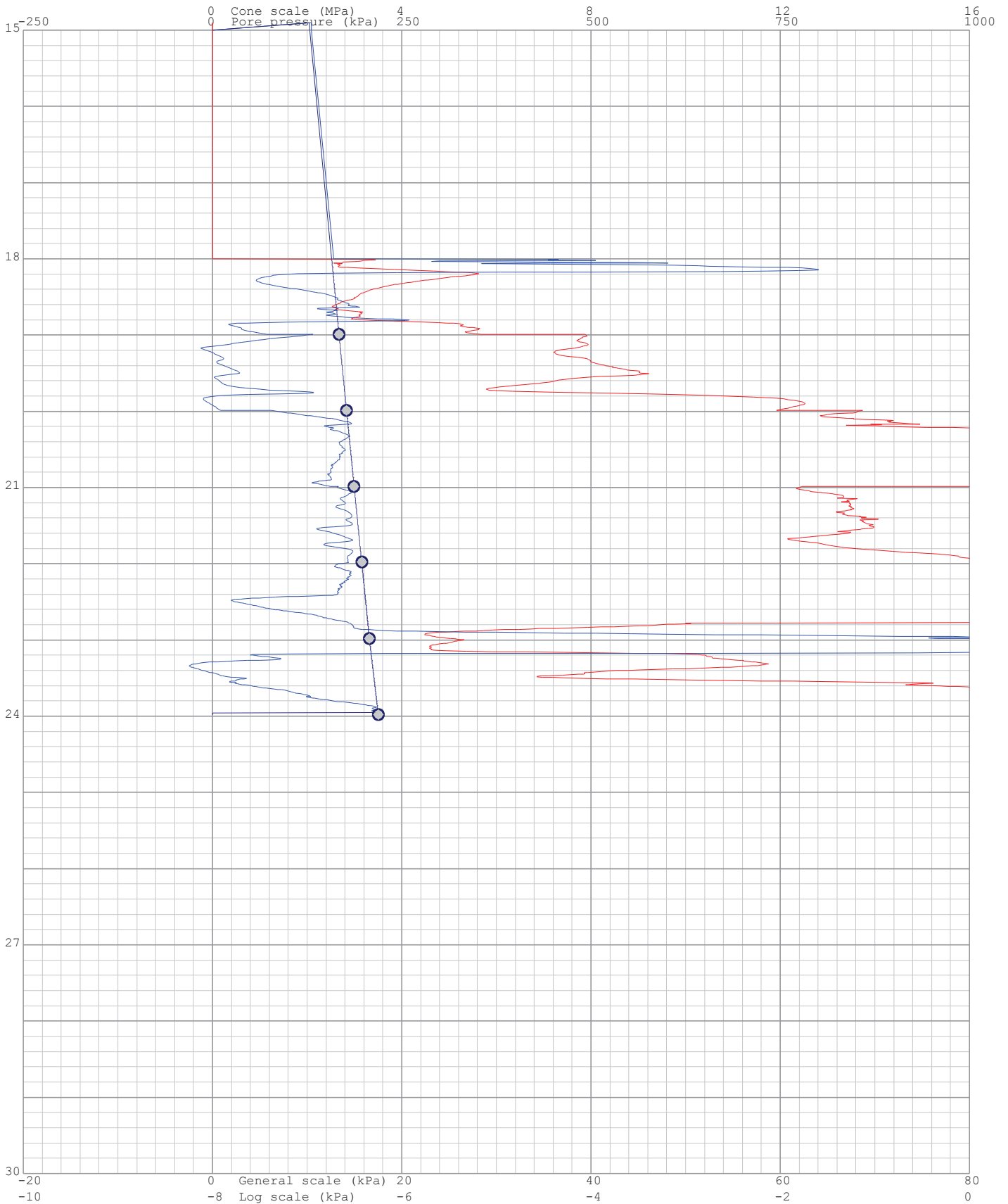
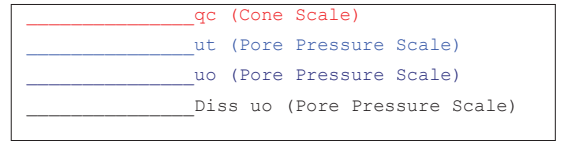
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT24

Date: 2012/06/14

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT24

Date: 2012/06/14

Probe: KELLER  
Page: 1

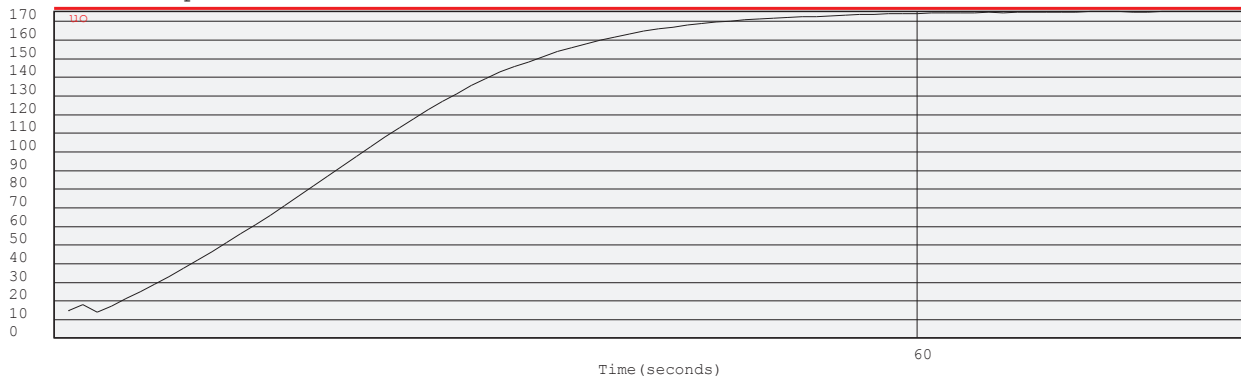
(kPa) Dissipation at: 1.7m



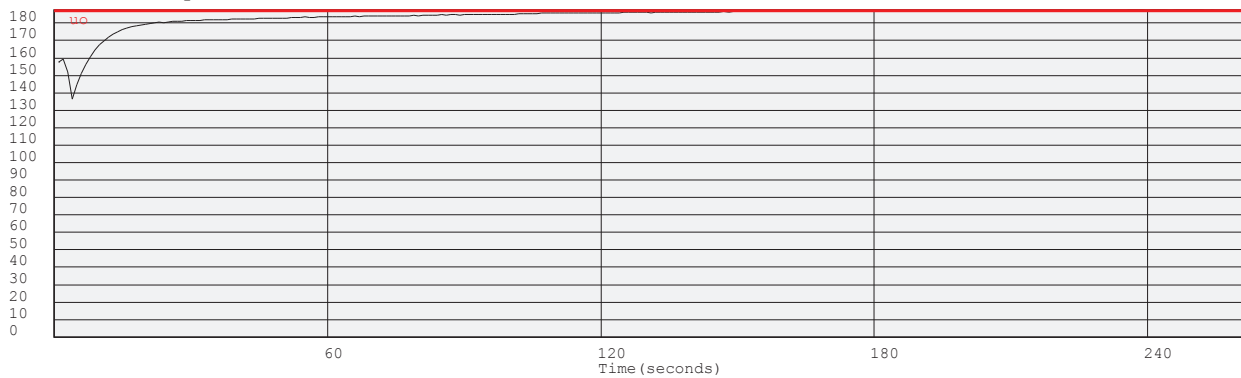
(kPa) Dissipation at: 18.99m



(kPa) Dissipation at: 19.986m



(kPa) Dissipation at: 20.986m



Project: Durban Harbour Over Water

Site: Pier2

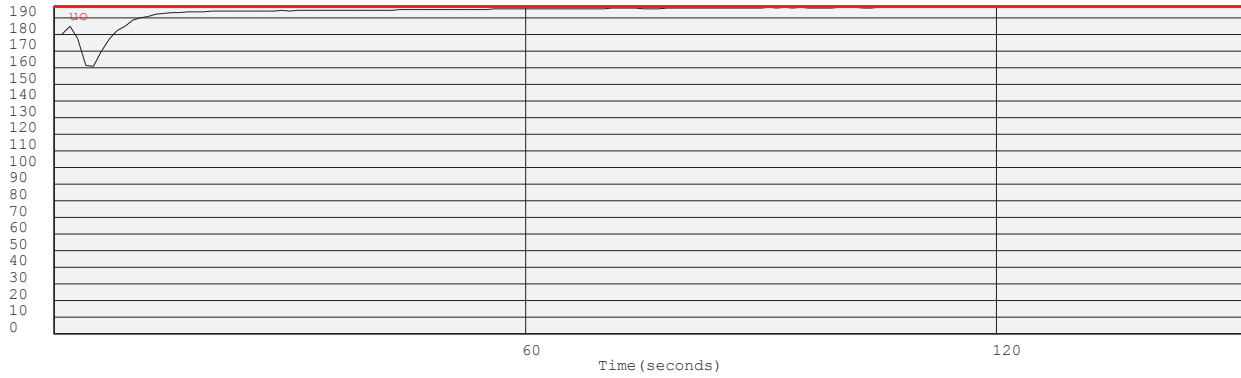
Hole: CPT24

Date: 2012/06/14

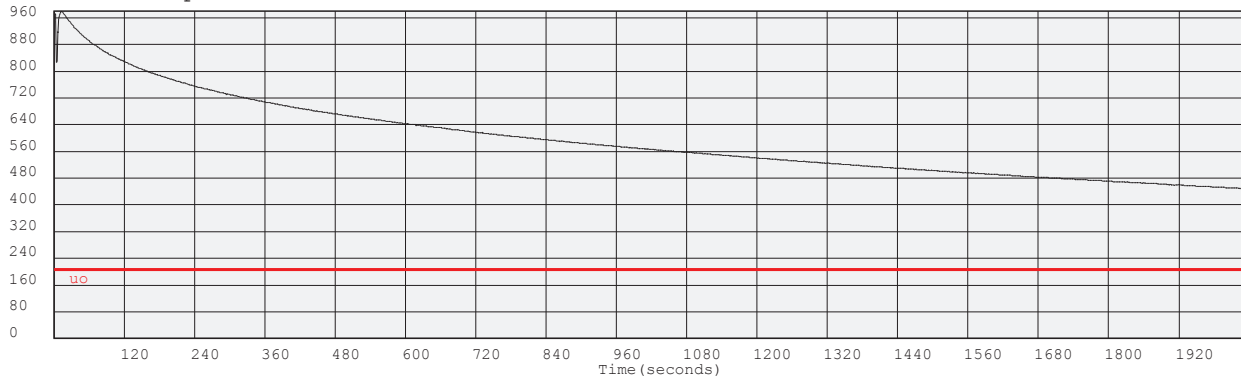
Probe: KELLER

Page: 2

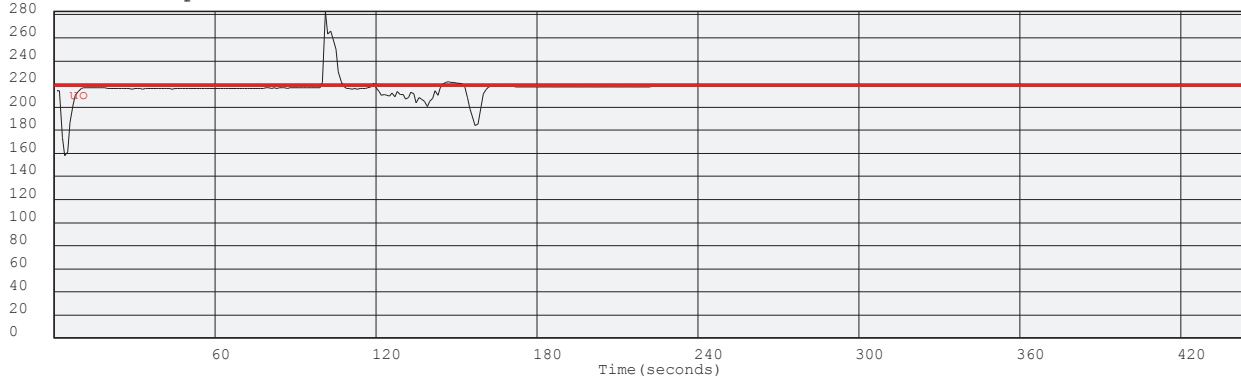
(kPa) Dissipation at: 21.979m



(kPa) Dissipation at: 22.98m



(kPa) Dissipation at: 23.977m



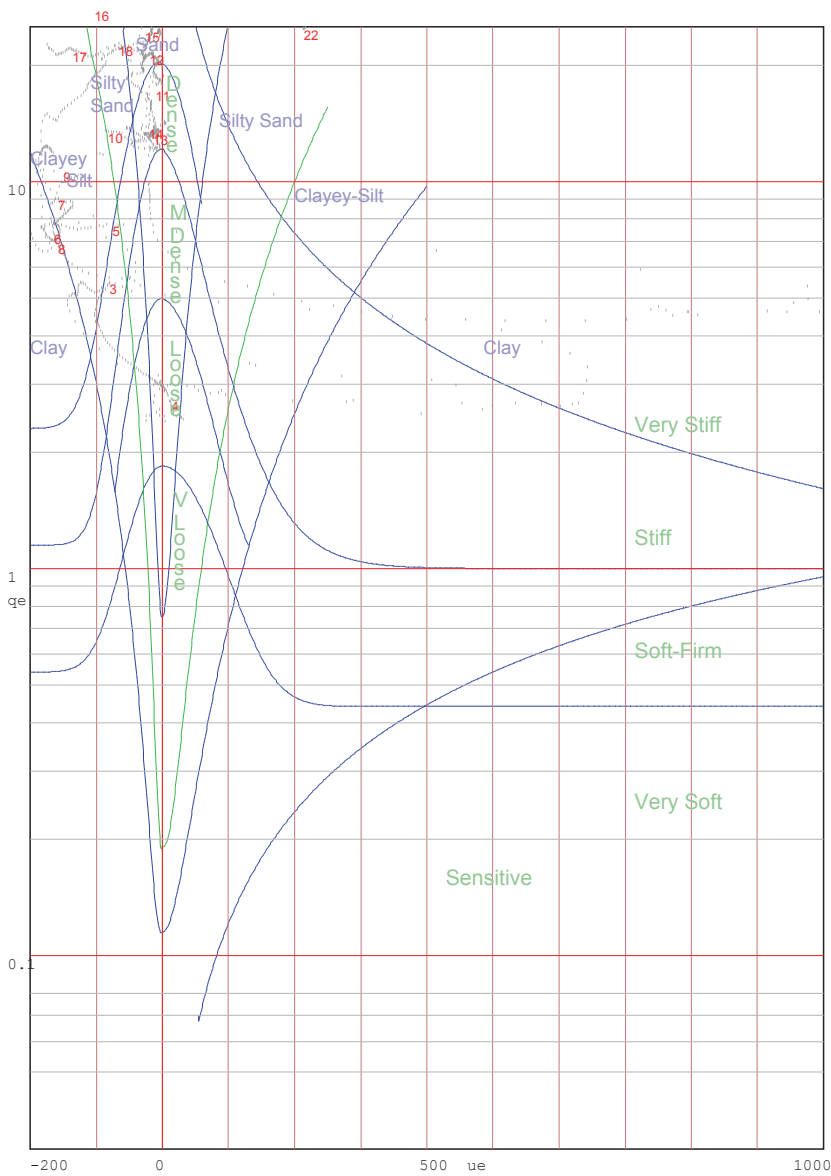
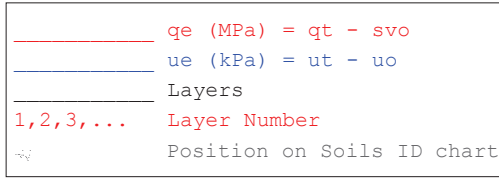
Project: Durban Harbour Over Water

Site: Pier2

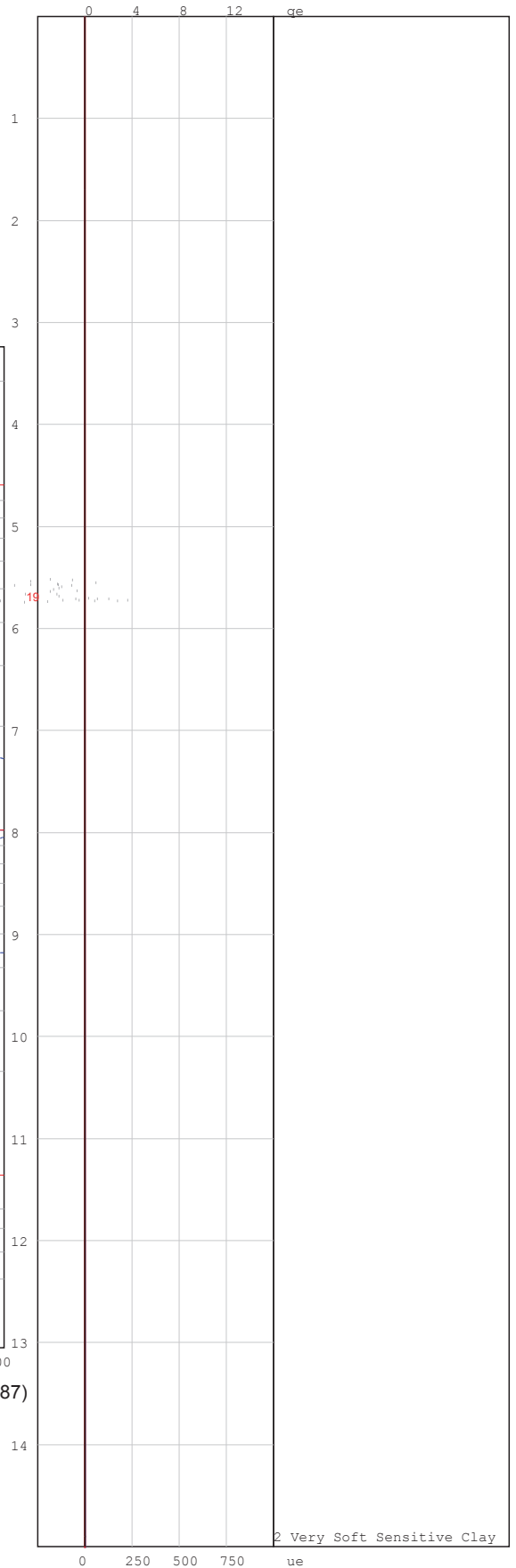
Hole No: CPT24

Date: 2012/06/14

Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



2 Very Soft Sensitive Clay

Project: Durban Harbour Over Water

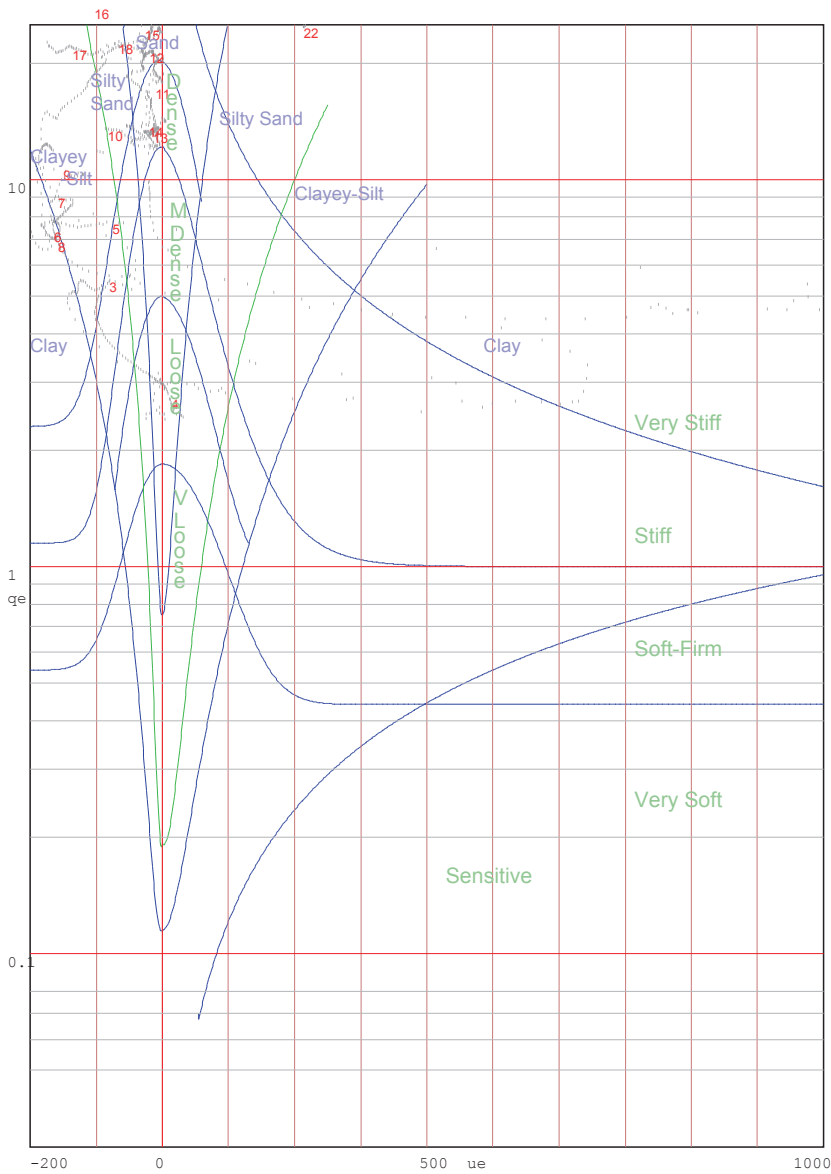
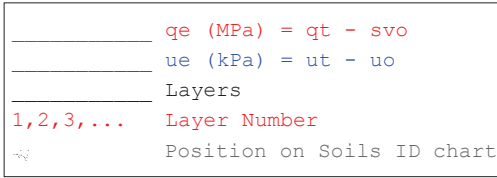
Site: Pier2

Hole No: CPT24

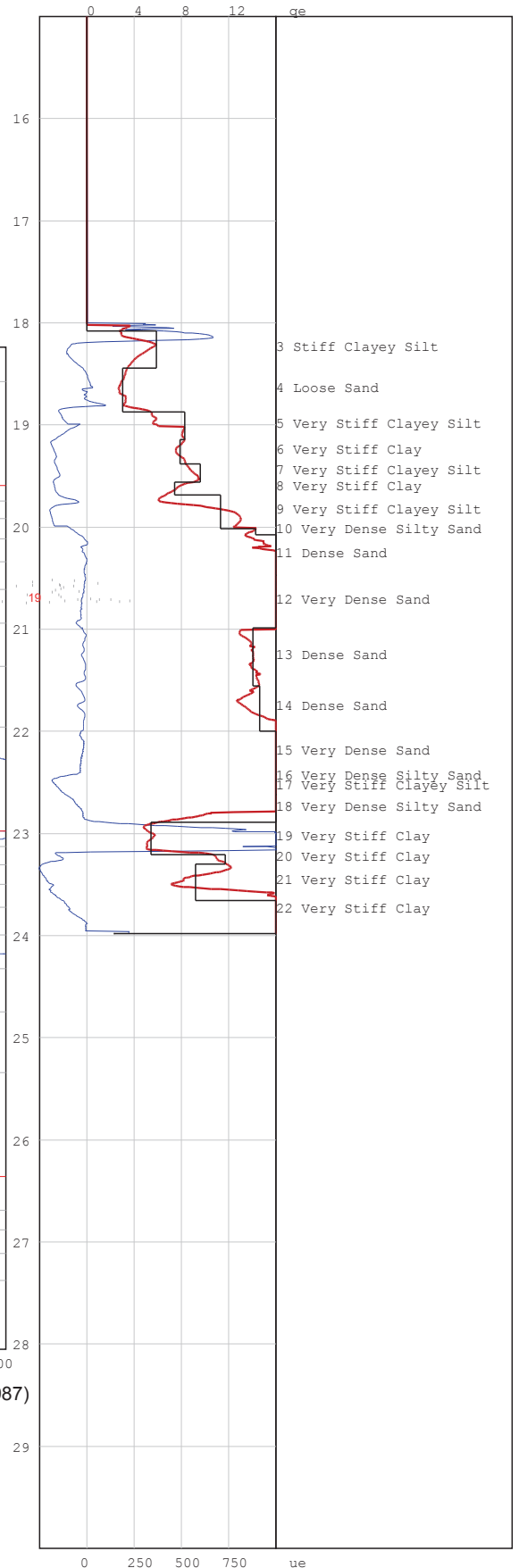
Date: 2012/06/14

Probe: KELLER

Page



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

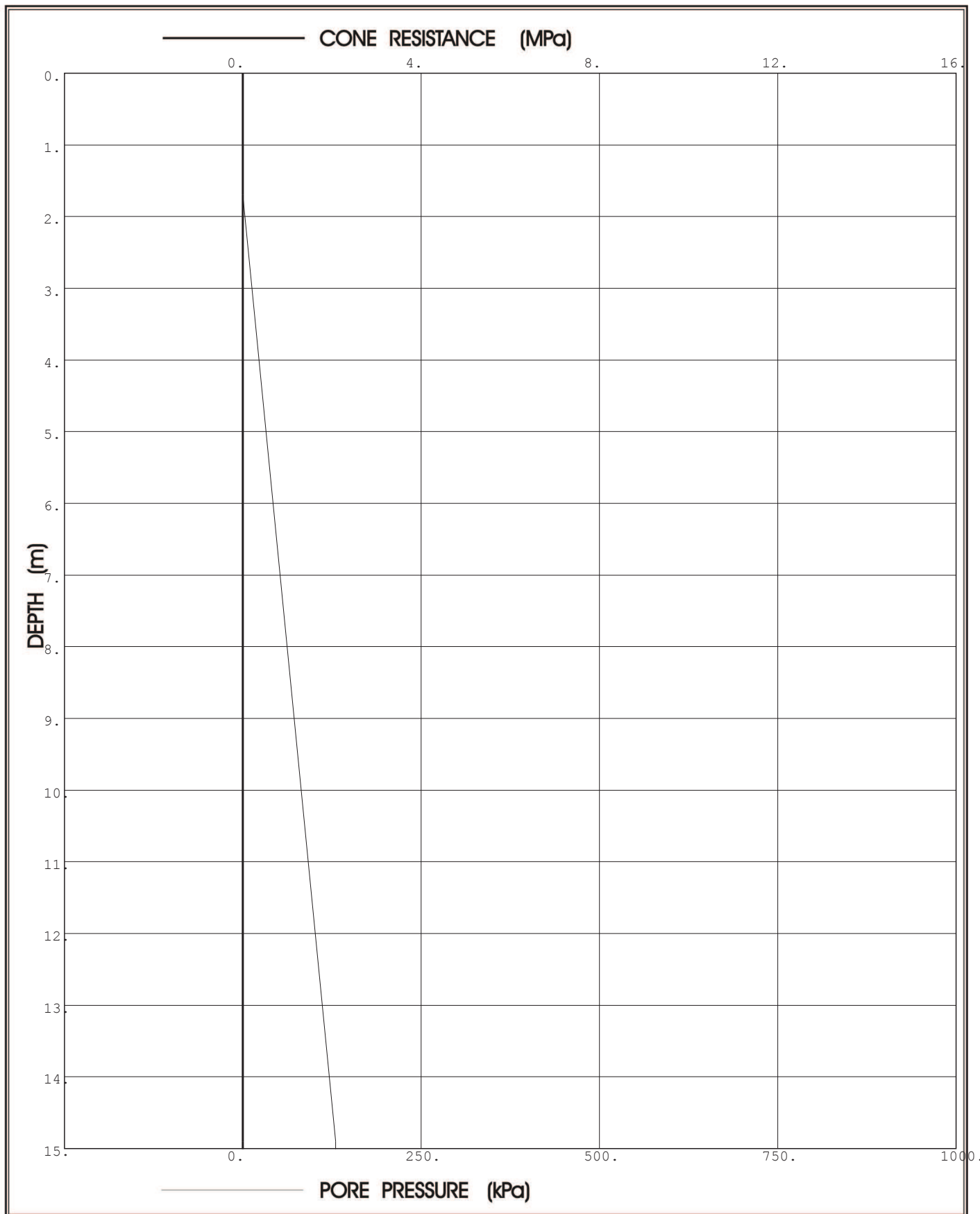
SITE: Pier2

CPTU (RE): CPT25

DATE: 2012-07-04

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

PROJECT: Durban Harbour Over Water

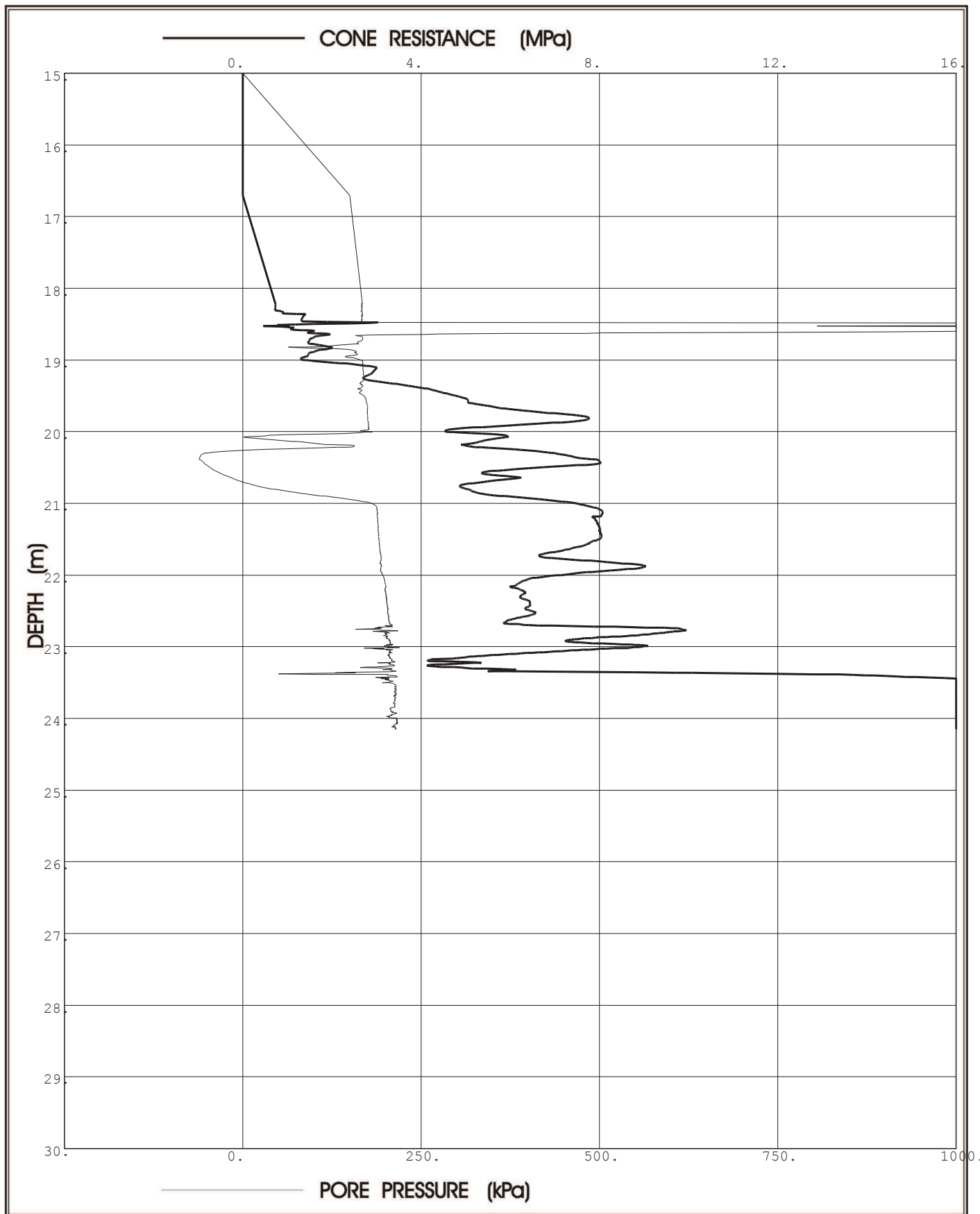
SITE: Pier2

CPTU (RE): CPT25

DATE: 2012-07-04

Probe: GHANA

Page:2



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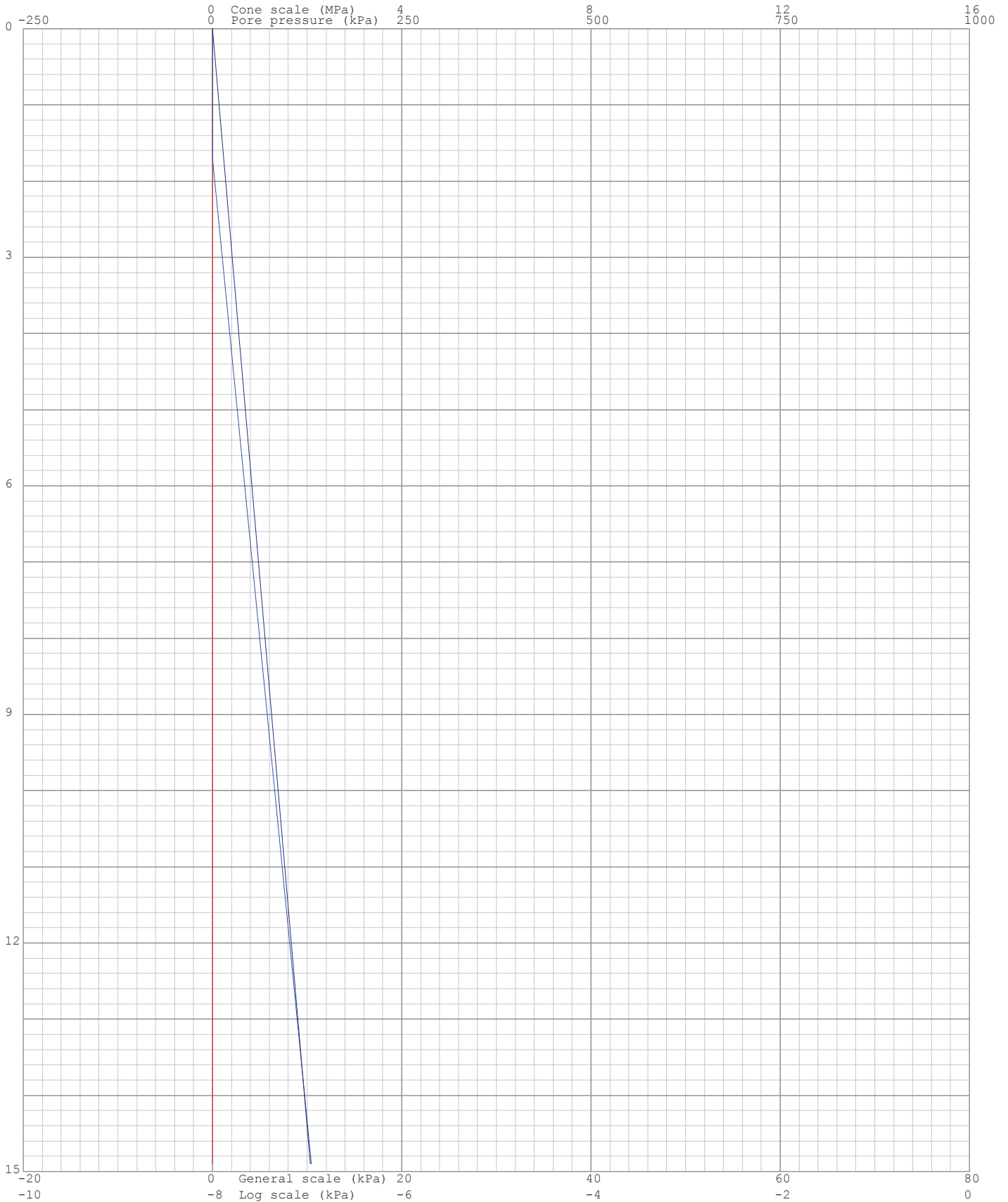
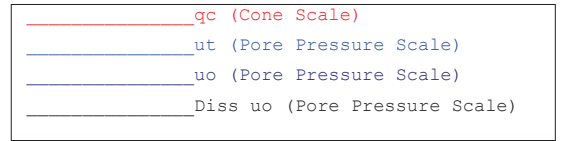
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT25

Date: 2012-07-04

Probe: GHANA





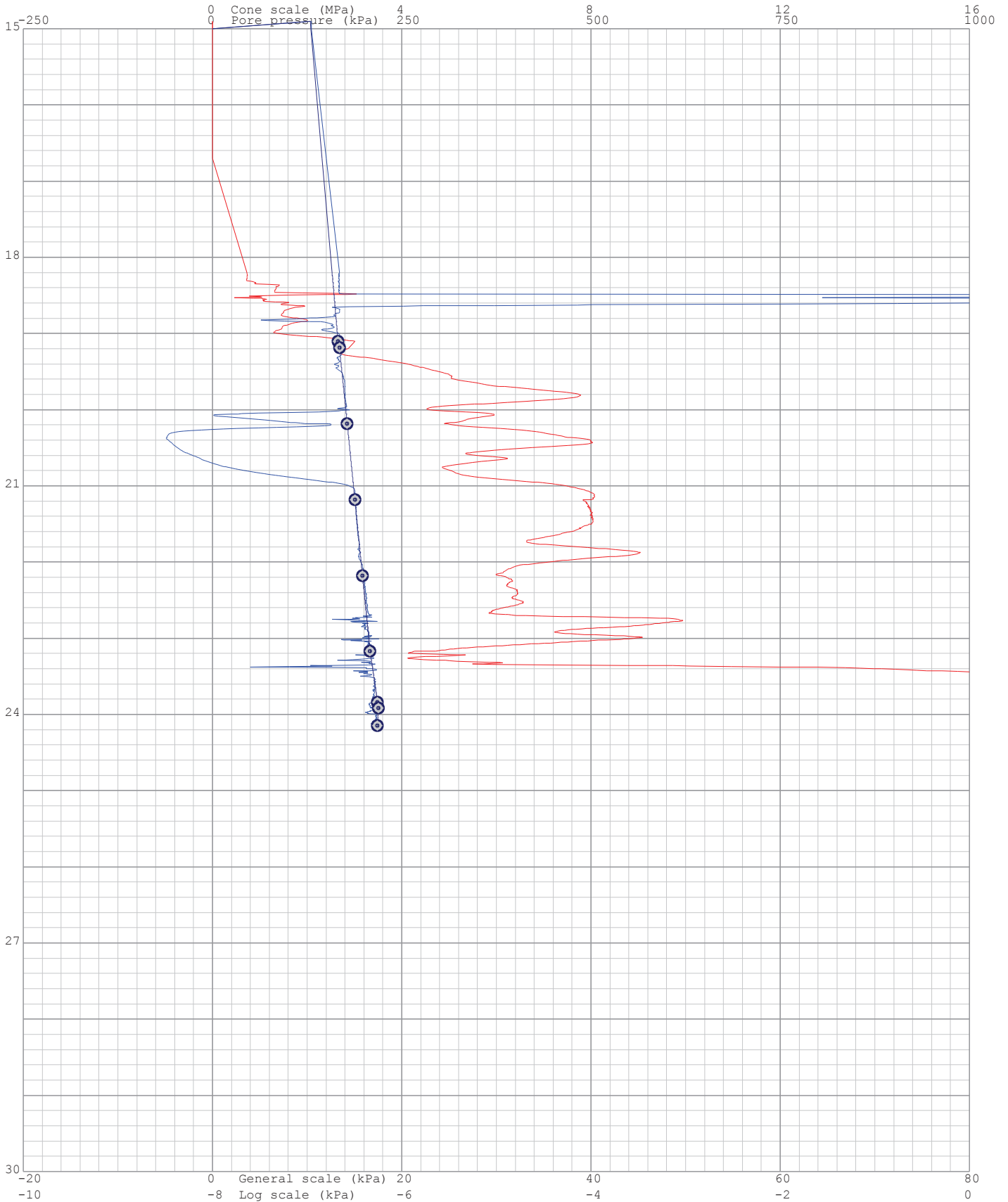
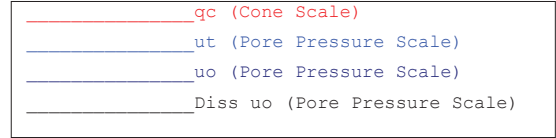
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT25

Date: 2012-07-04

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

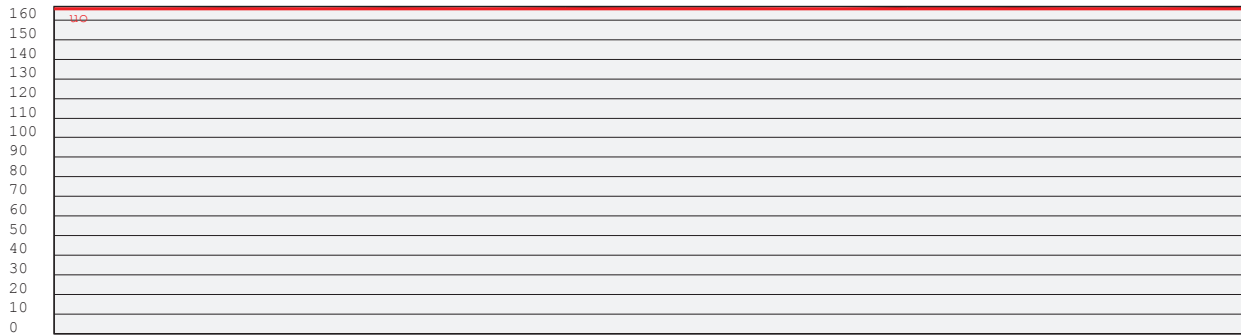
Hole: CPT25

Date: 2012-07-04

Probe: GHANA

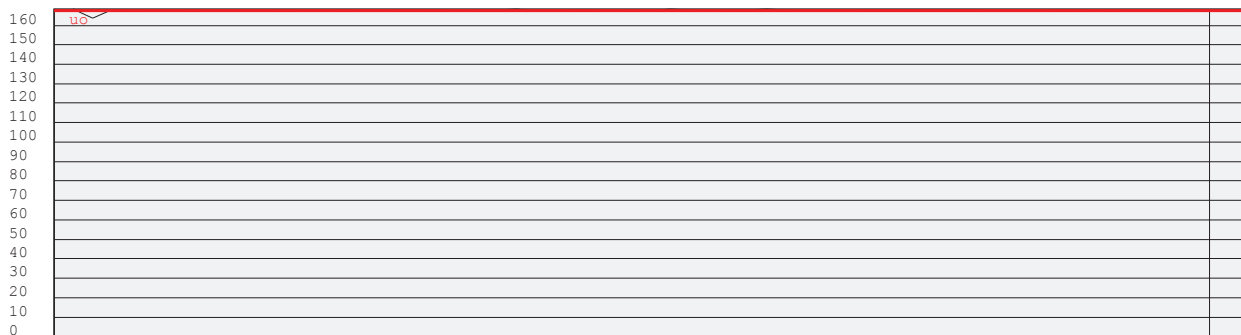
Page: 1

(kPa) Dissipation at: 19.104m



Time (seconds)

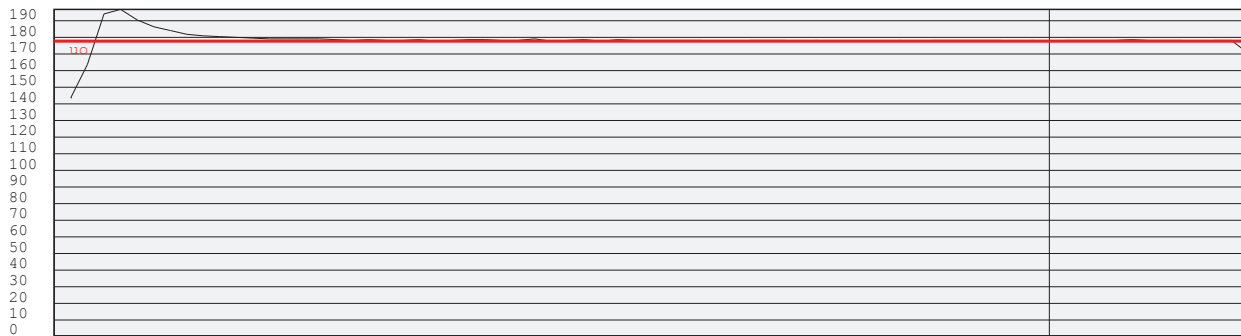
(kPa) Dissipation at: 19.187m



Time (seconds)

60

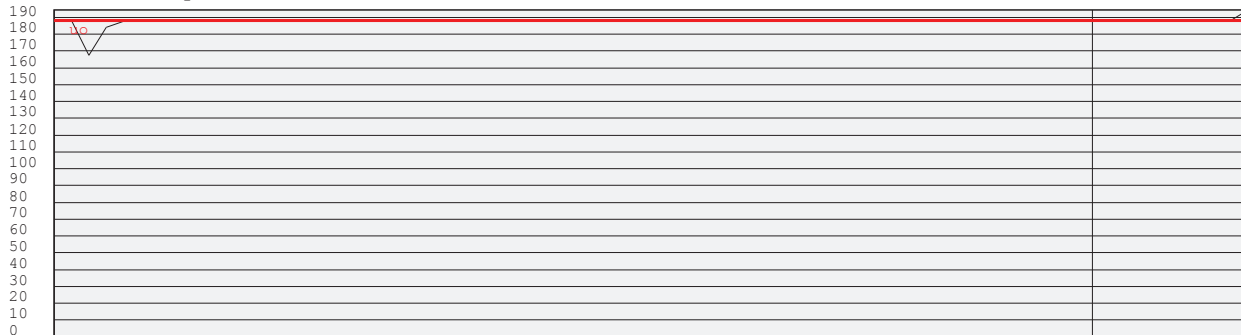
(kPa) Dissipation at: 20.183m



Time (seconds)

60

(kPa) Dissipation at: 21.18m



Time (seconds)

60

Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT25

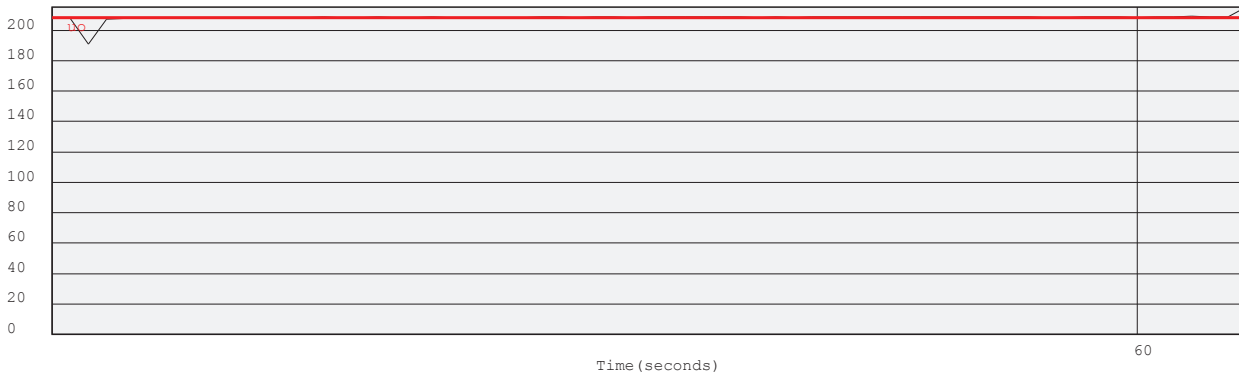
Date: 2012-07-04

Probe: GHANA  
Page: 2

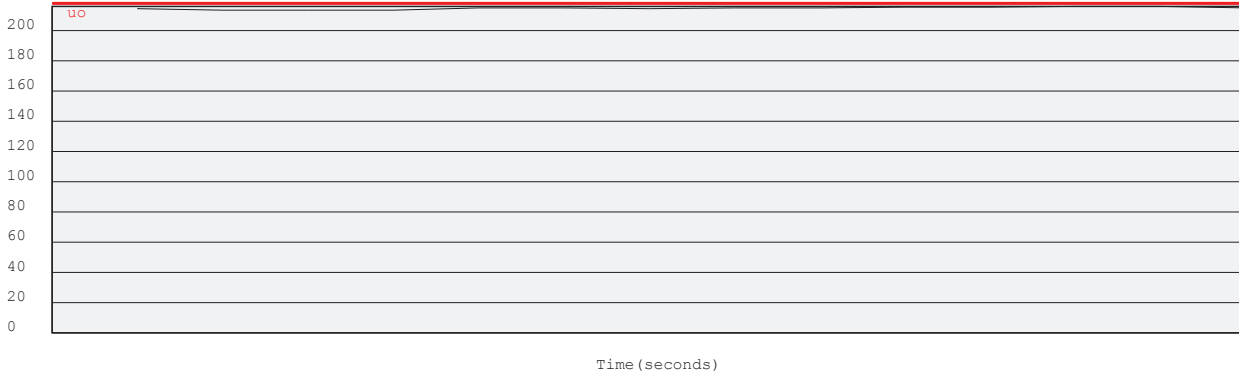
(kPa) Dissipation at: 22.178m



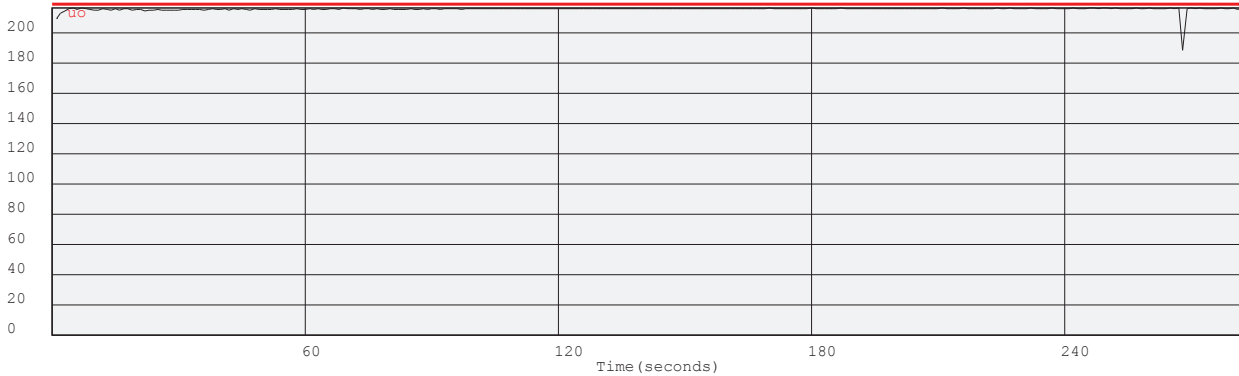
(kPa) Dissipation at: 23.167m



(kPa) Dissipation at: 23.841m



(kPa) Dissipation at: 23.919m



Project: Durban Harbour Over Water

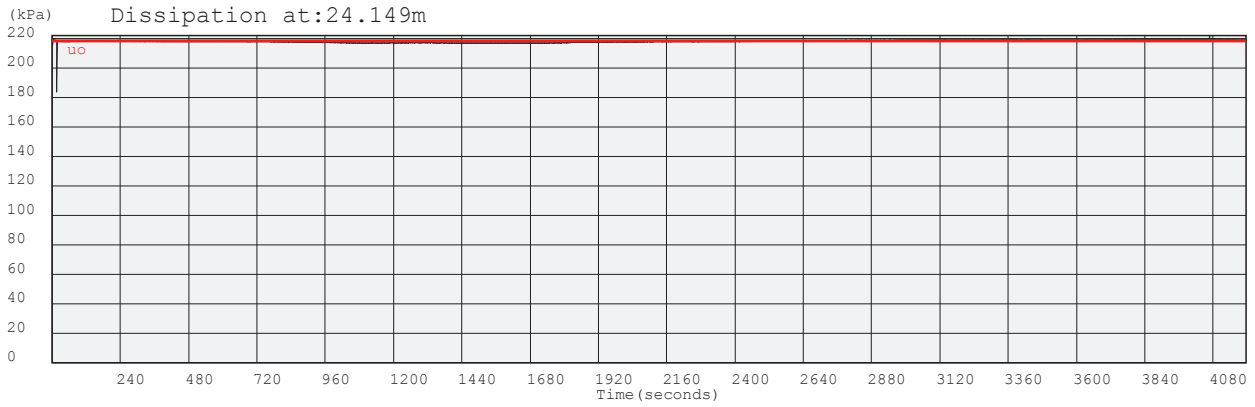
Site: Pier2

Hole: CPT25

Date: 2012-07-04

Probe: GHANA

Page: 3





Project: Durban Harbour Over Water

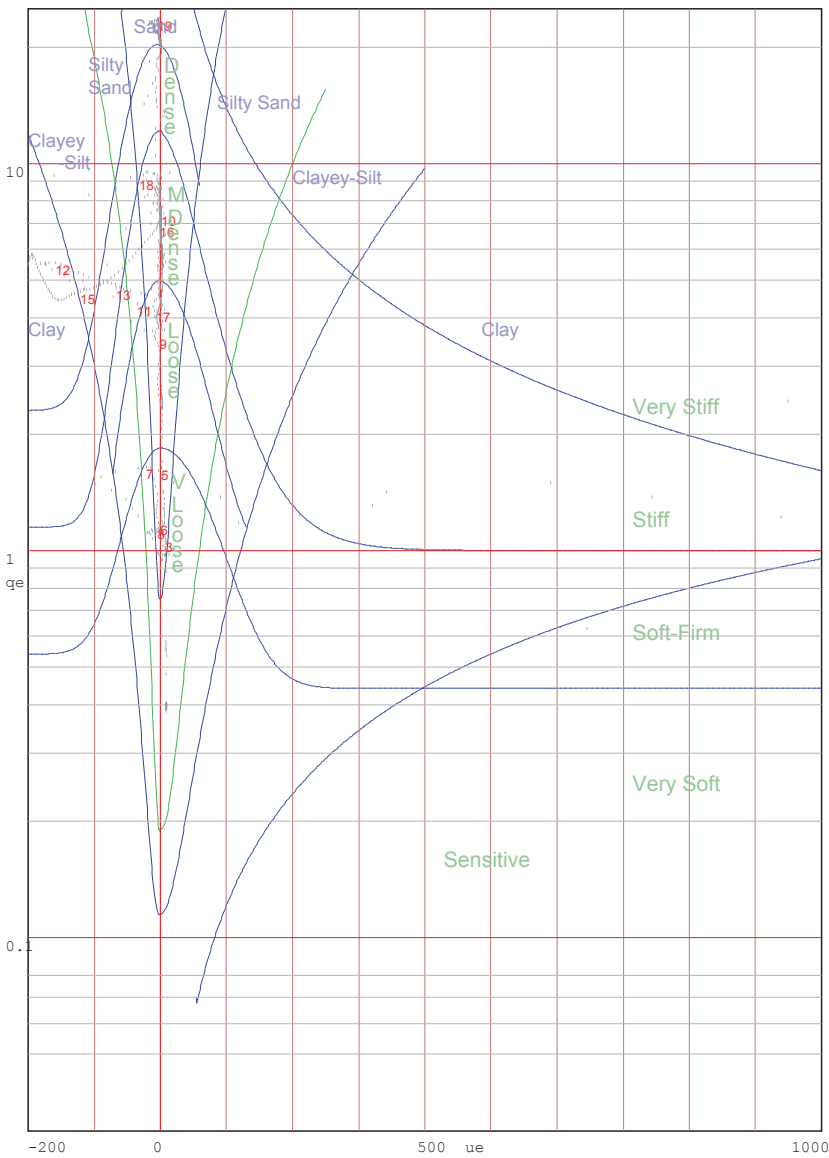
Site: Pier2

Hole No: CPT25

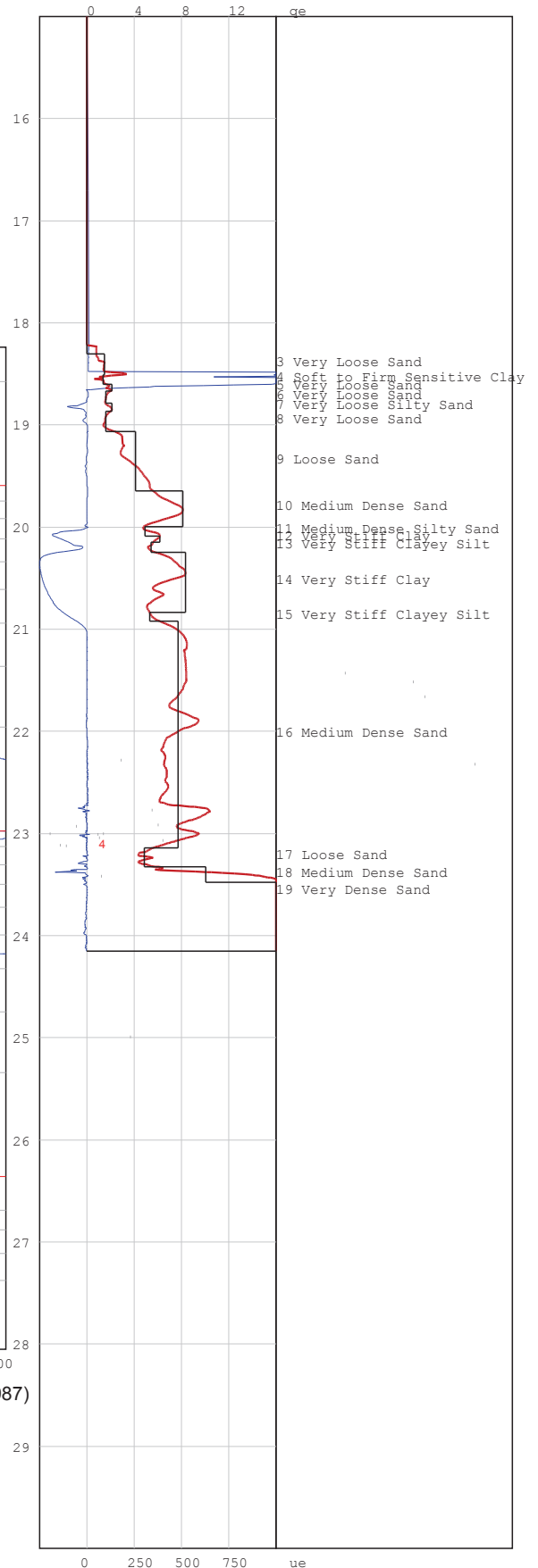
Date: 2012-07-04

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

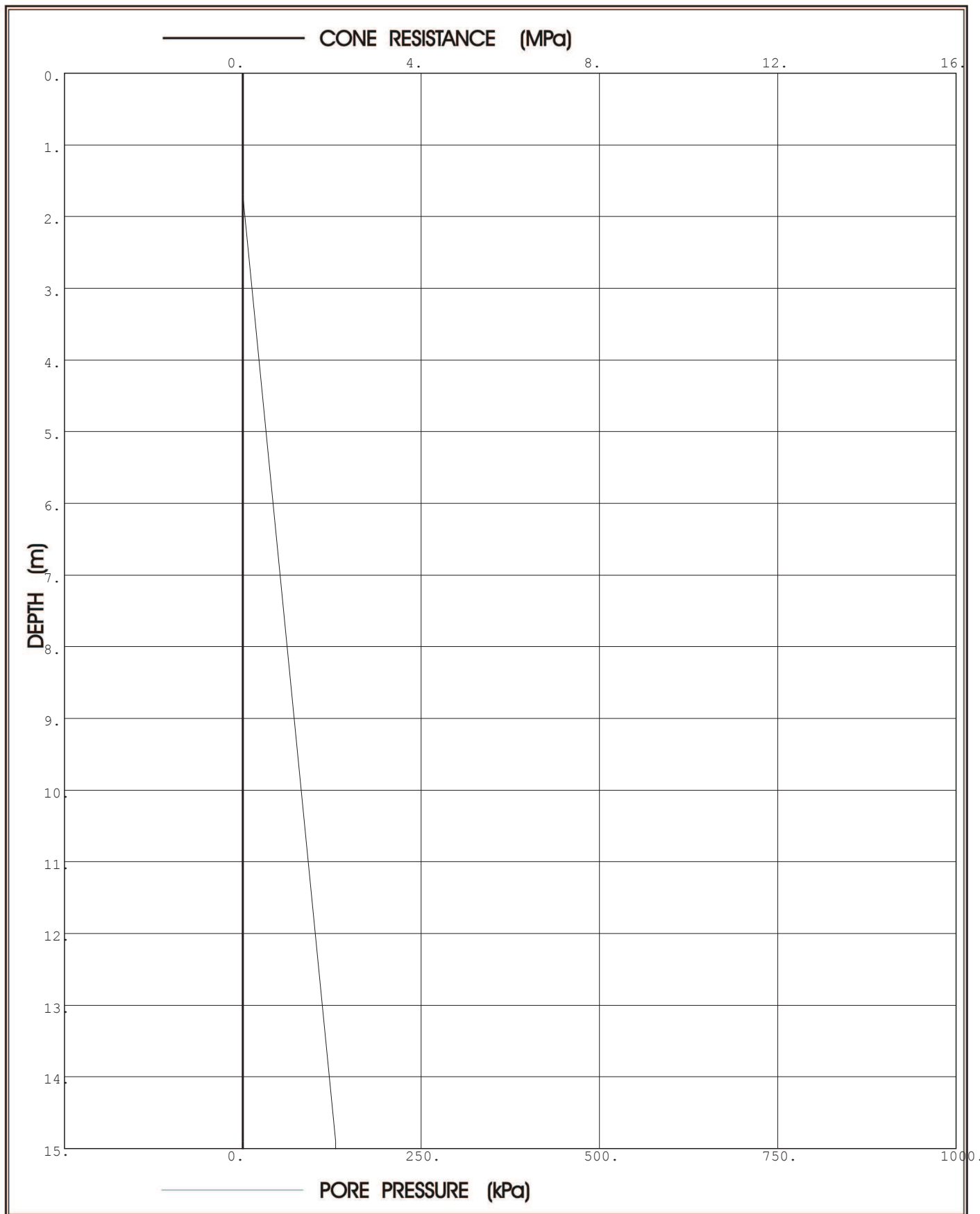
SITE: Pier2

CPTU (RE): CPT26

DATE: 2012-07-03

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

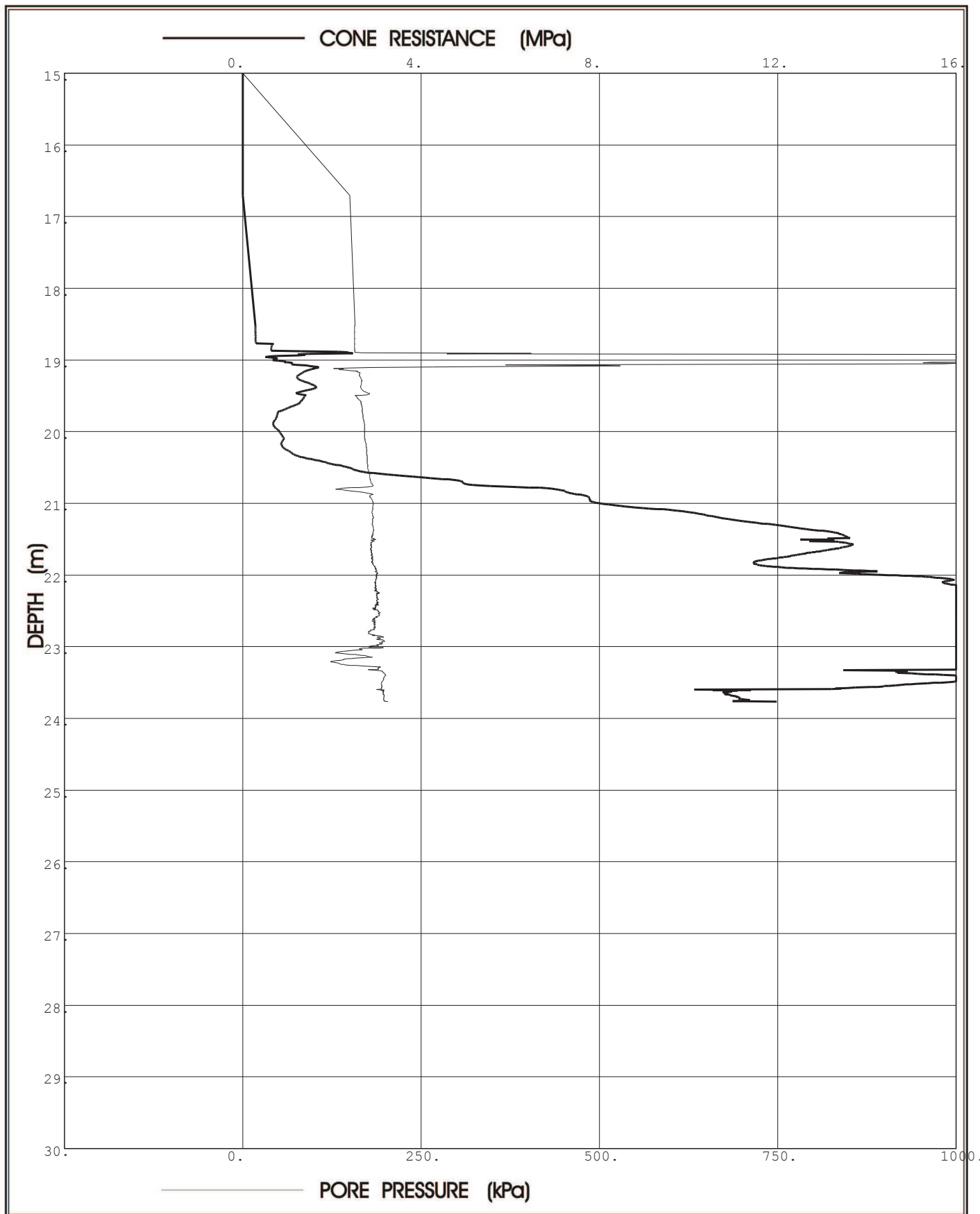
SITE: Pier2

CPTU (RE): CPT26

DATE: 2012-07-03

Probe: GHANA

Page:2



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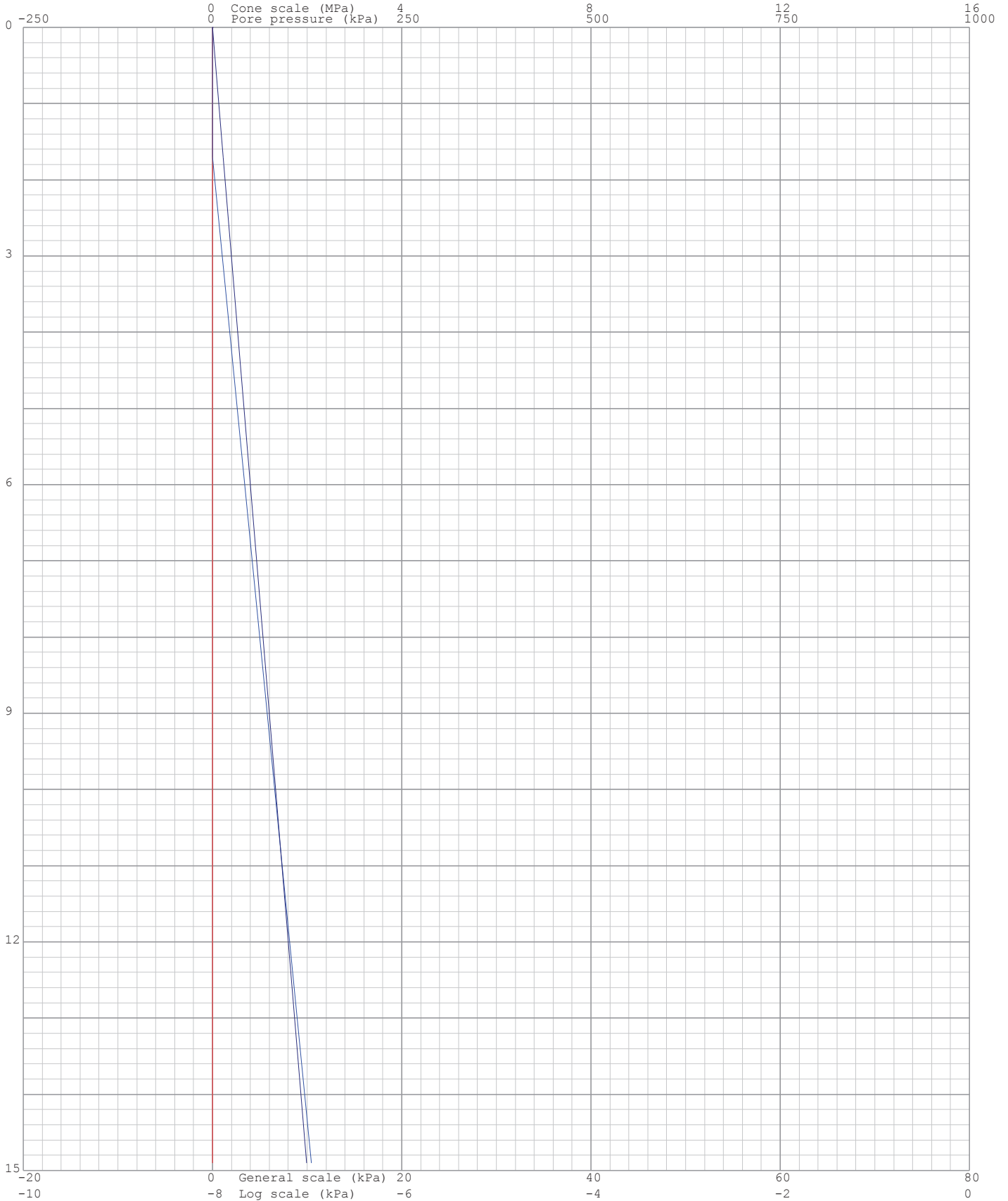
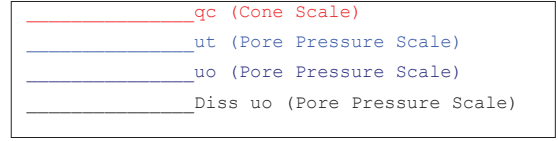
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT26

Date: 2012-07-03

Probe: GHANA



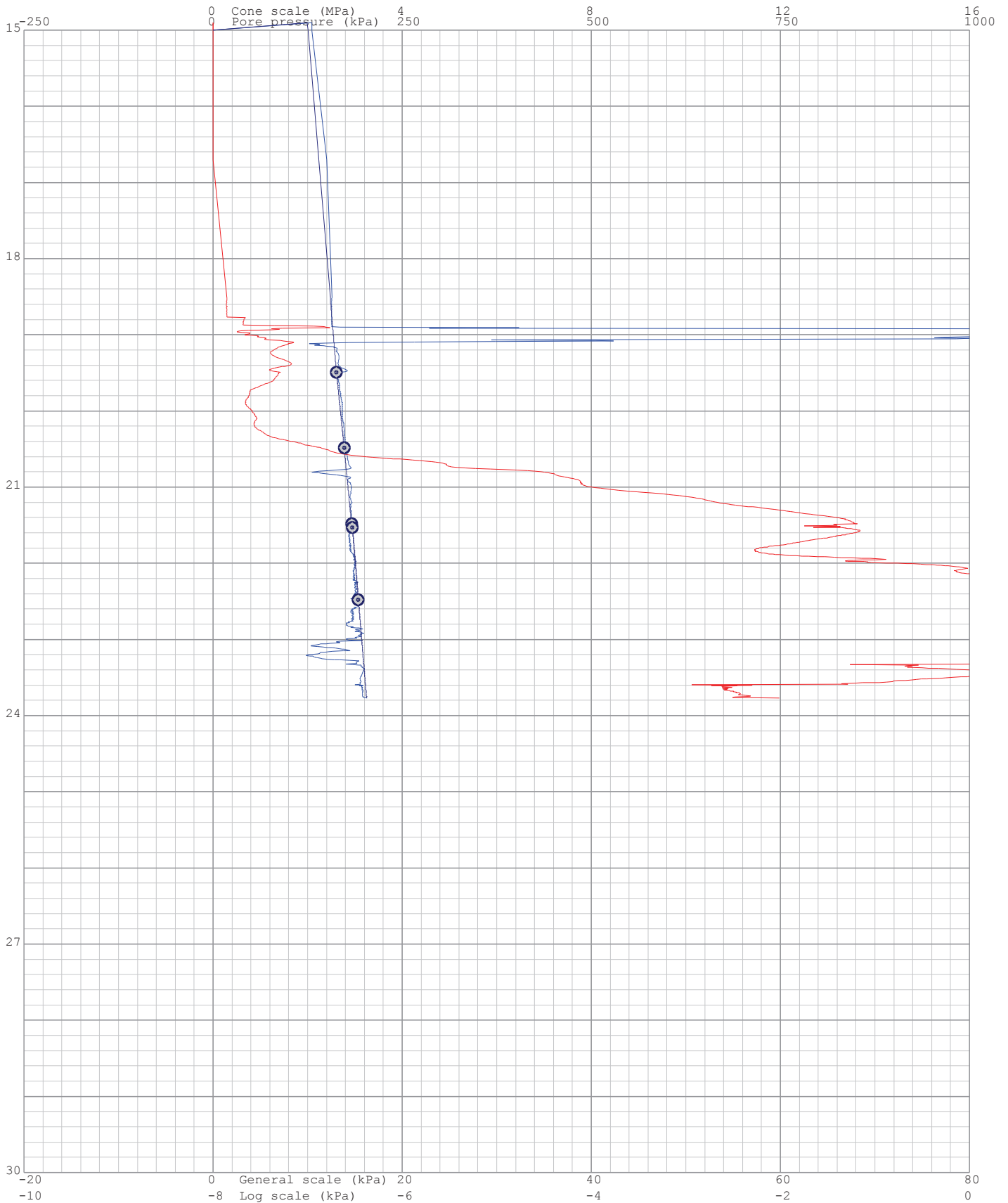
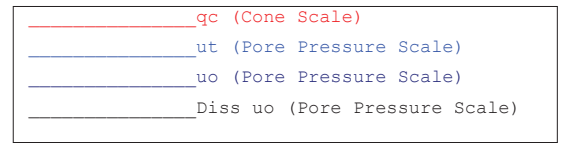
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT26

Date: 2012-07-03

Probe: GHANA



Project: Durban Harbour Over Water

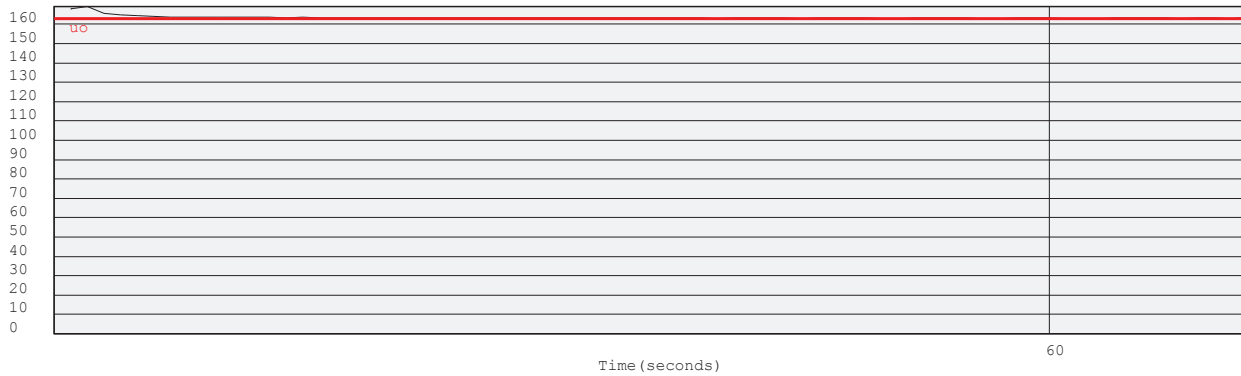
Site: Pier2

Hole: CPT26

Date: 2012-07-03

Probe: GHANA  
Page: 1

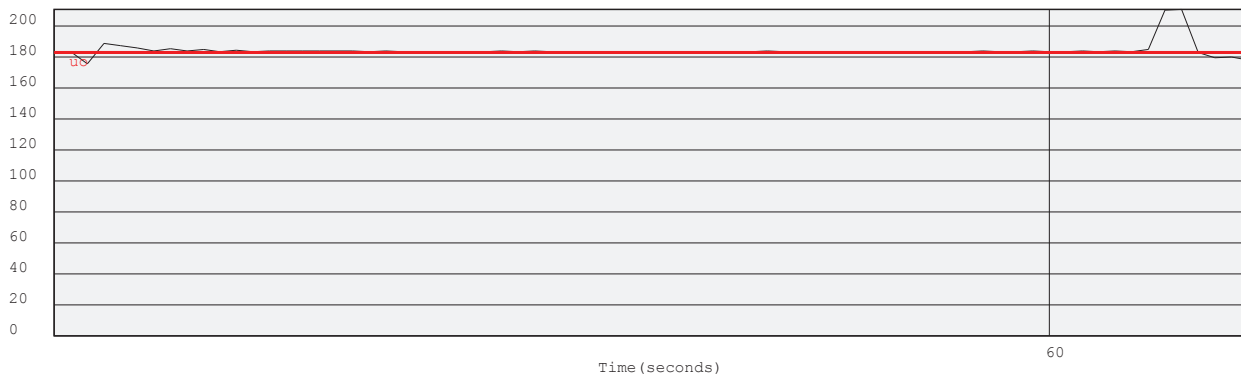
(kPa) Dissipation at: 19.49m



(kPa) Dissipation at: 20.485m



(kPa) Dissipation at: 21.483m



(kPa) Dissipation at: 21.529m



Project: Durban Harbour Over Water

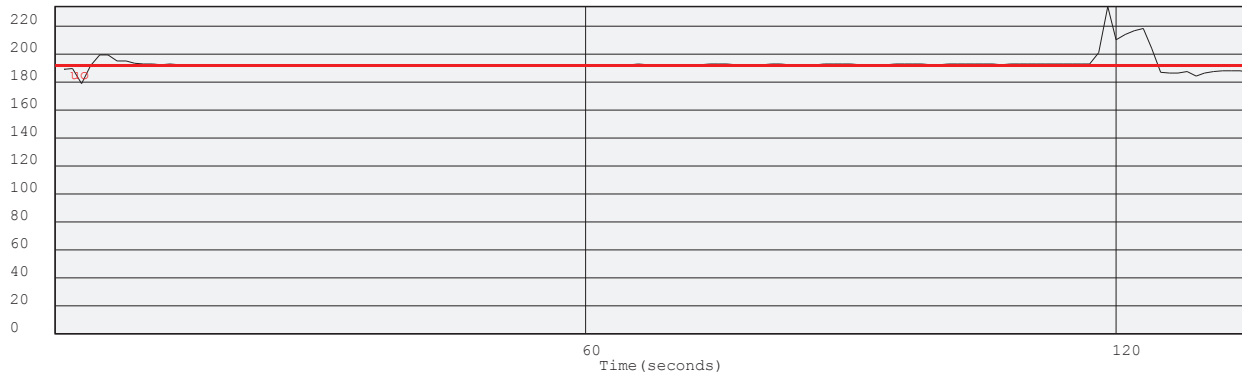
Site: Pier2

Hole: CPT26

Date: 2012-07-03

Probe: GHANA  
Page: 2

(kPa) Dissipation at: 22.482m



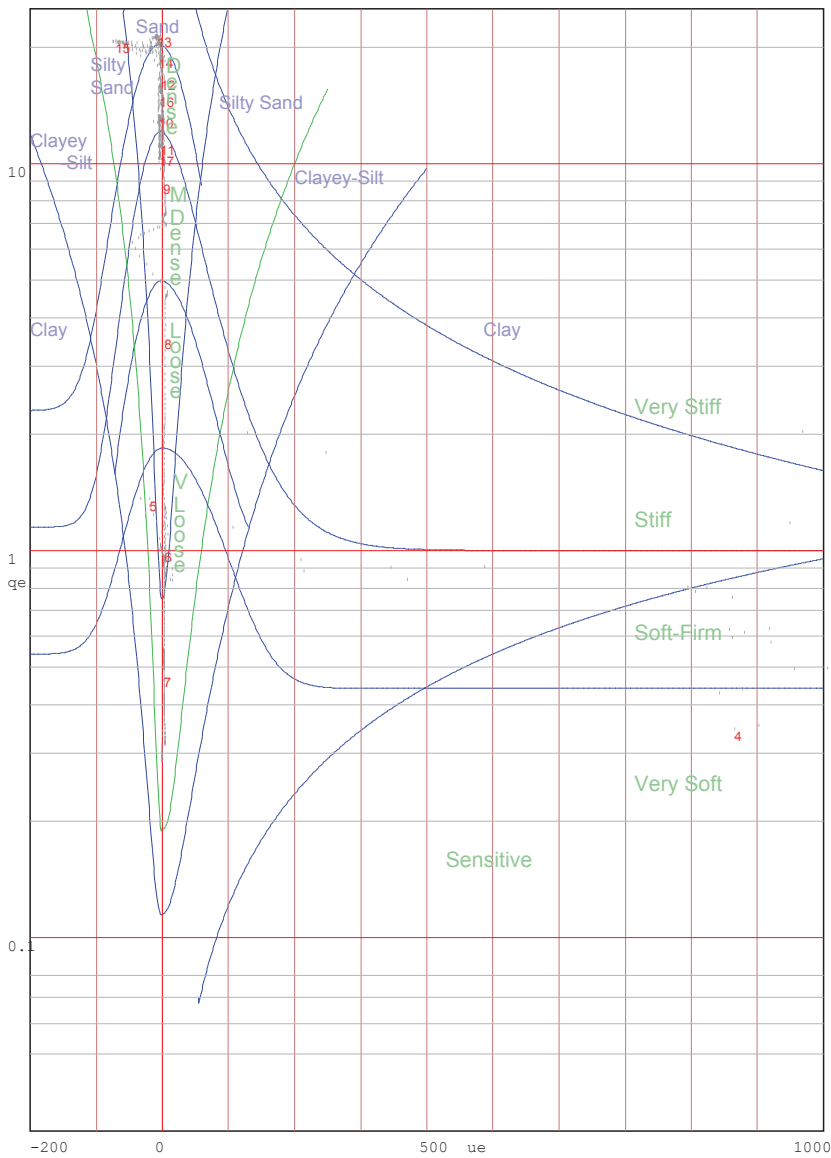
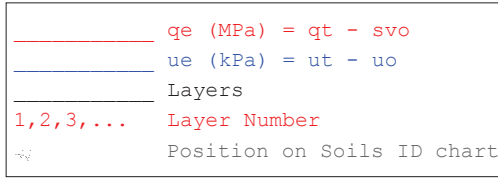
Project: Durban Harbour Over Water

Site: Pier2

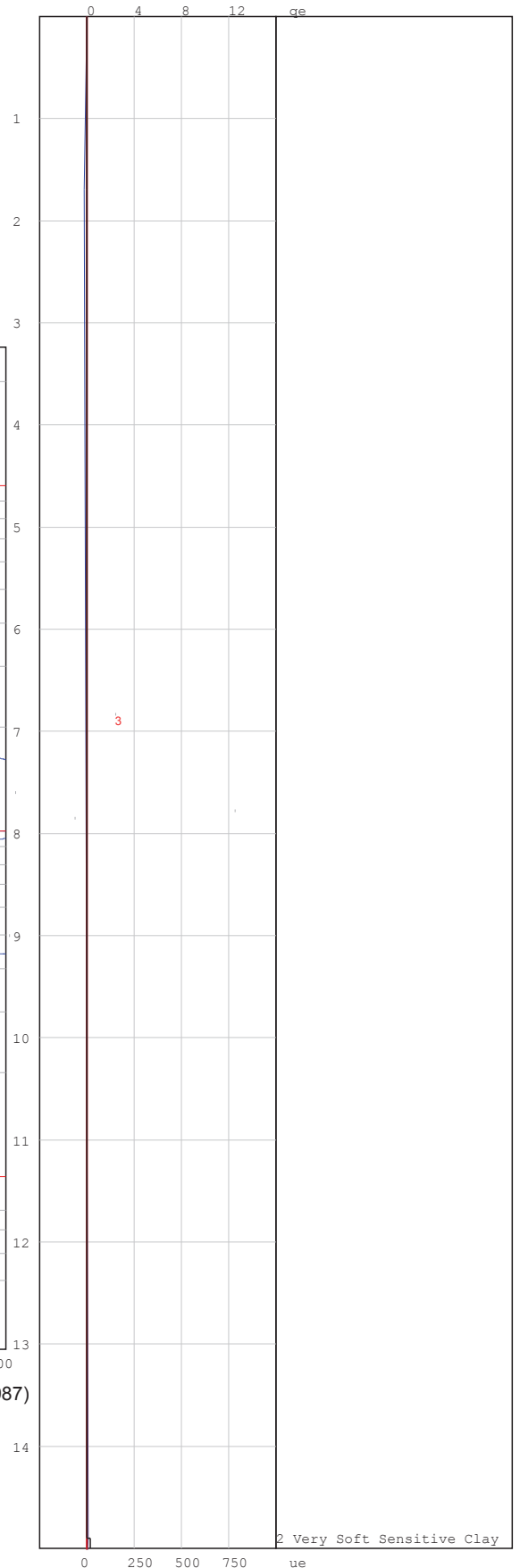
Hole No: CPT26

Date: 2012-07-03

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

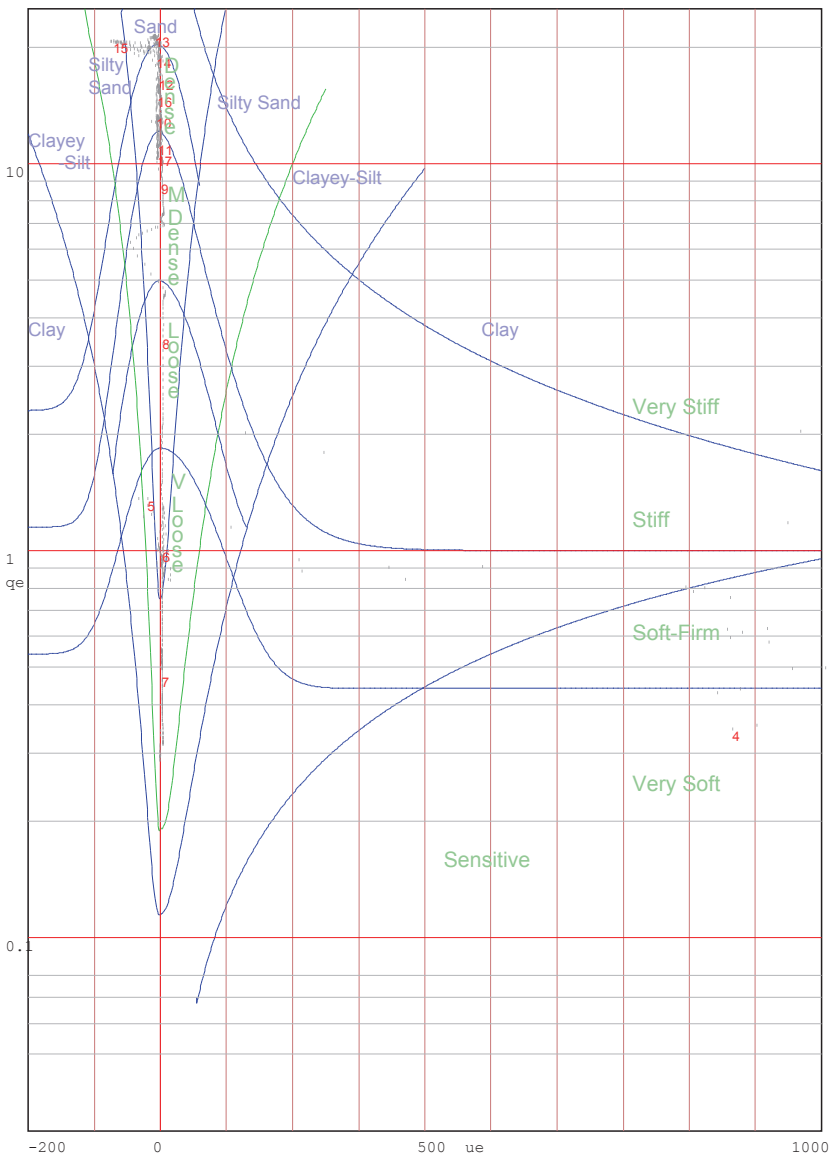
Site: Pier2

Hole No: CPT26

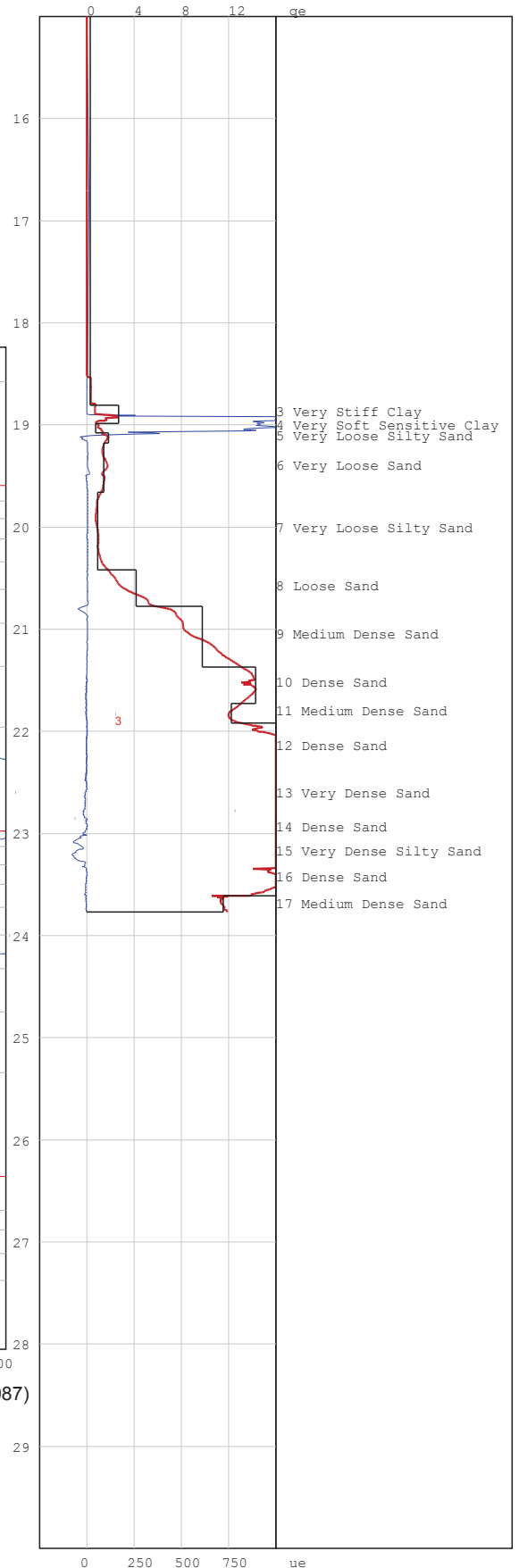
Date: 2012-07-03

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

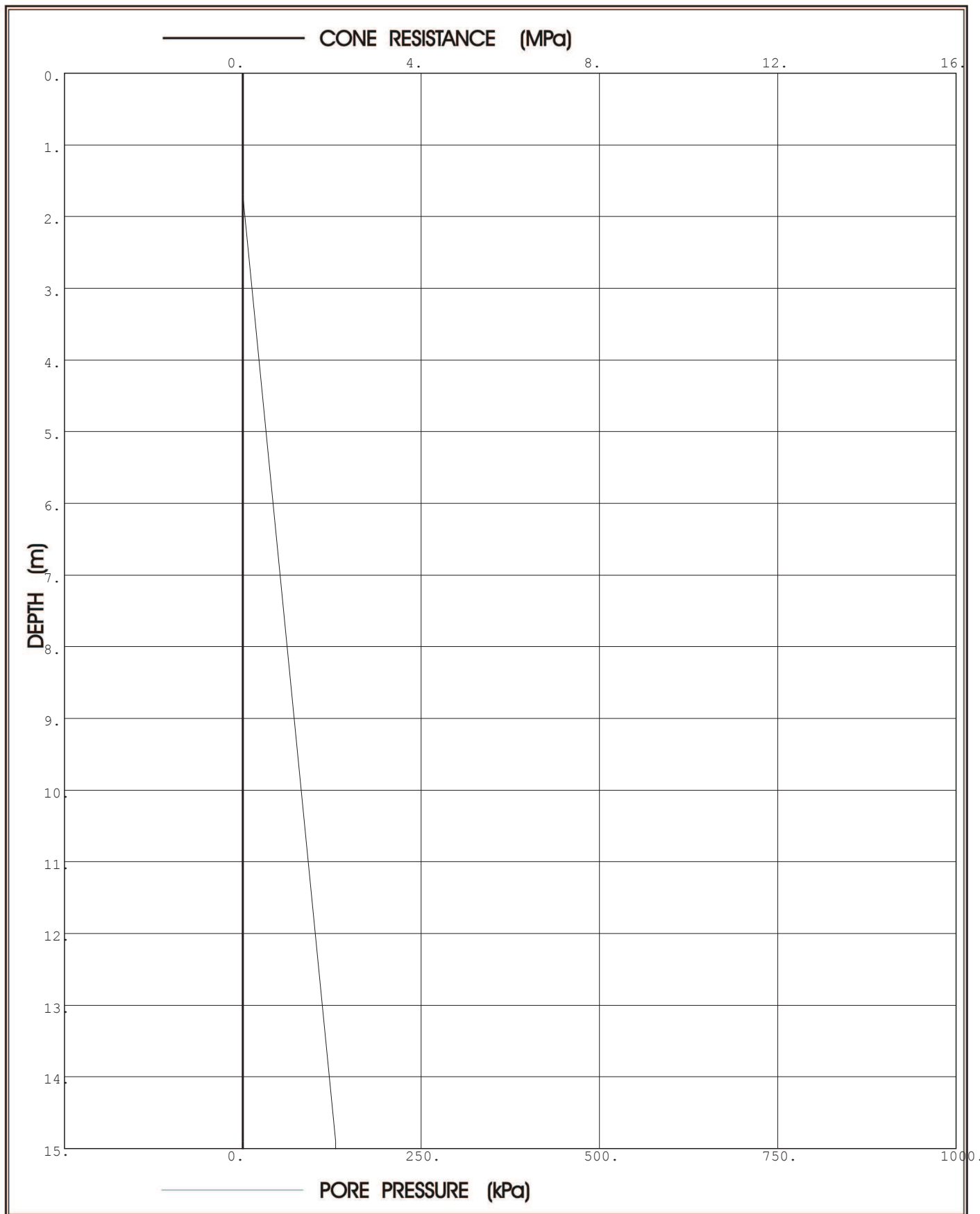
SITE: Pier2

CPTU (RE): CPT27

DATE: 2012-06-29

Probe: GHANA

Page:1



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0044

PROJECT: Durban Harbour Over Water

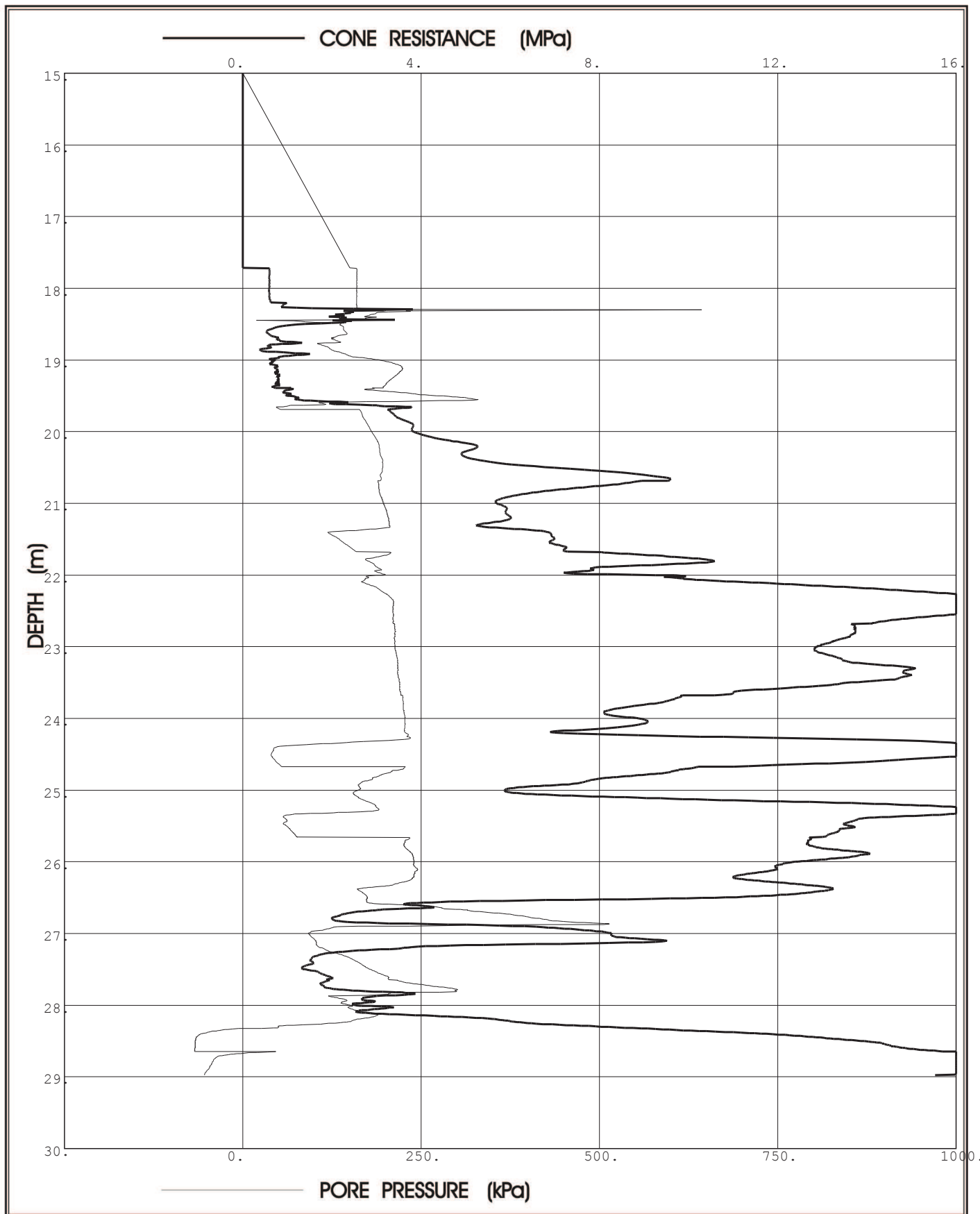
SITE: Pier2

CPTU (RE): CPT27

DATE: 2012-06-29

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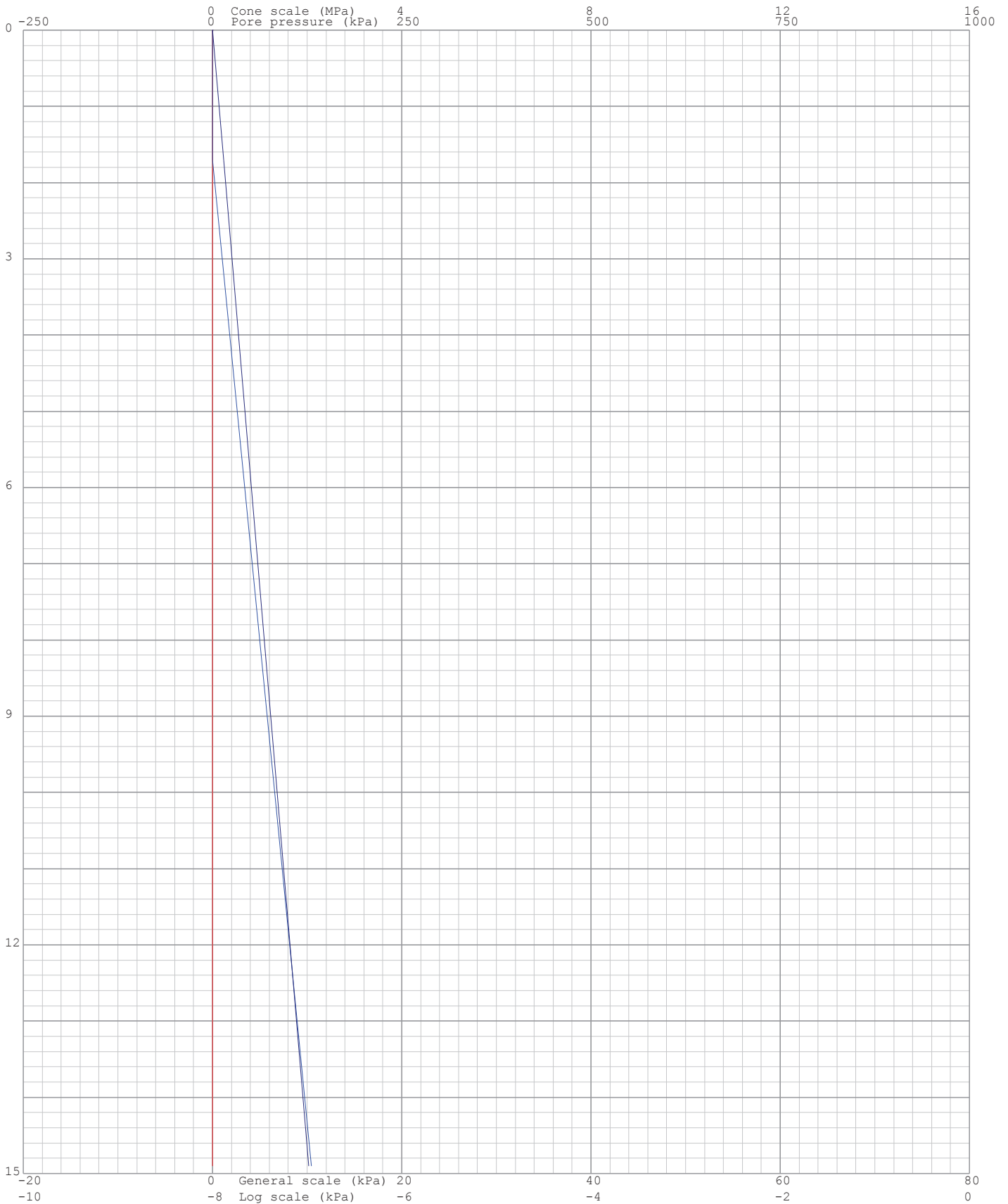
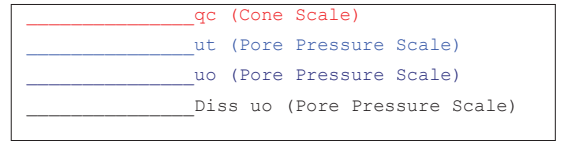
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT27

Date: 2012-06-29

Probe: GHANA



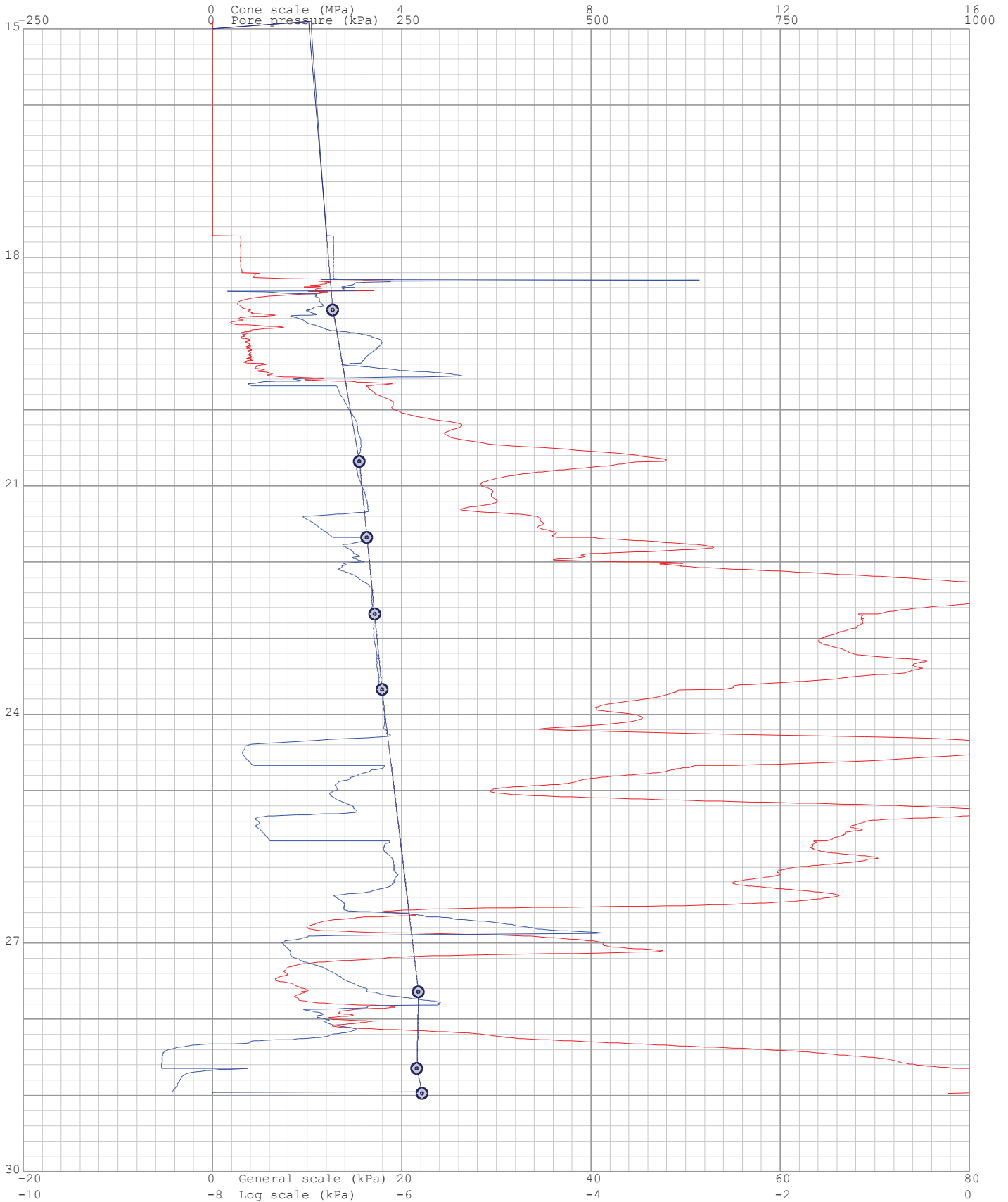
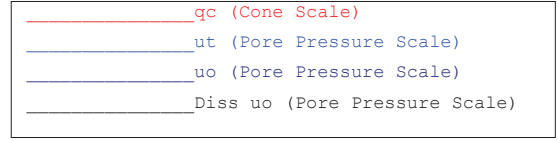
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT27

Date: 2012-06-29

Probe: GHANA



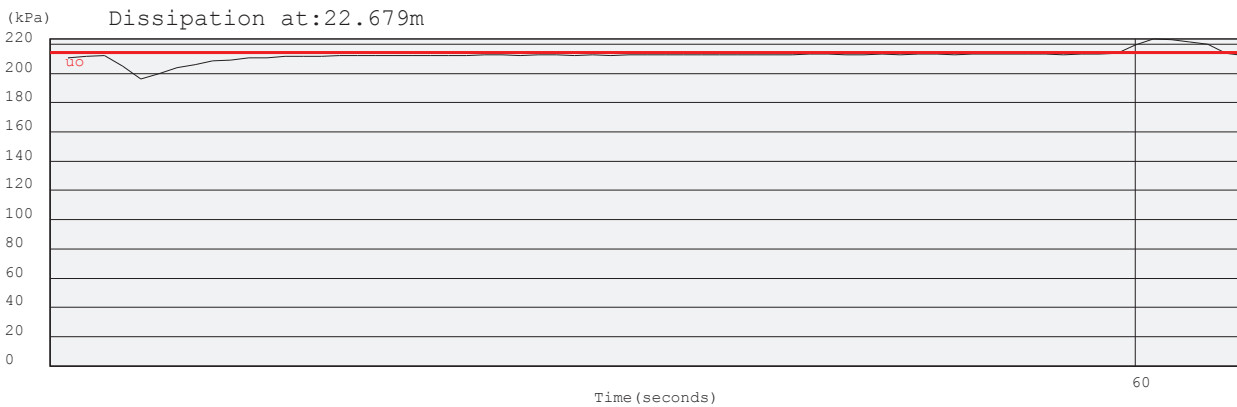
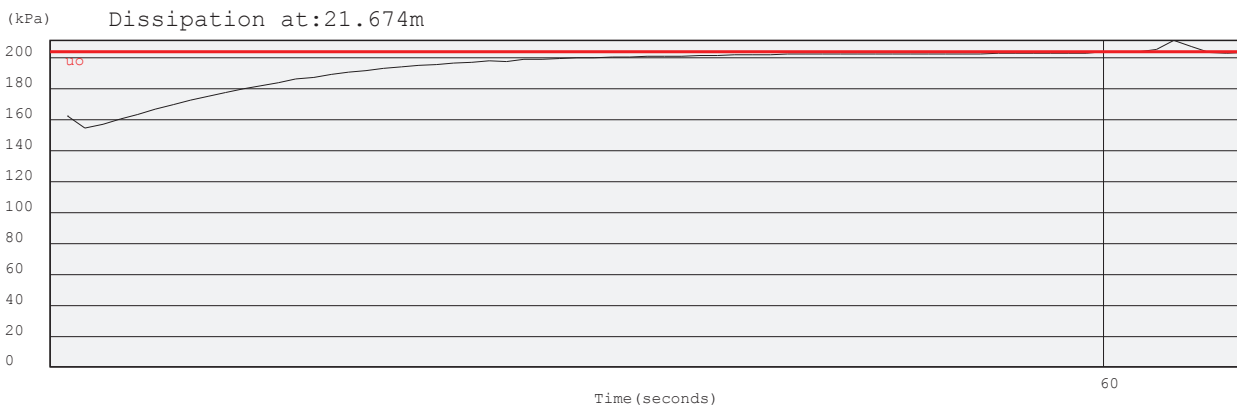
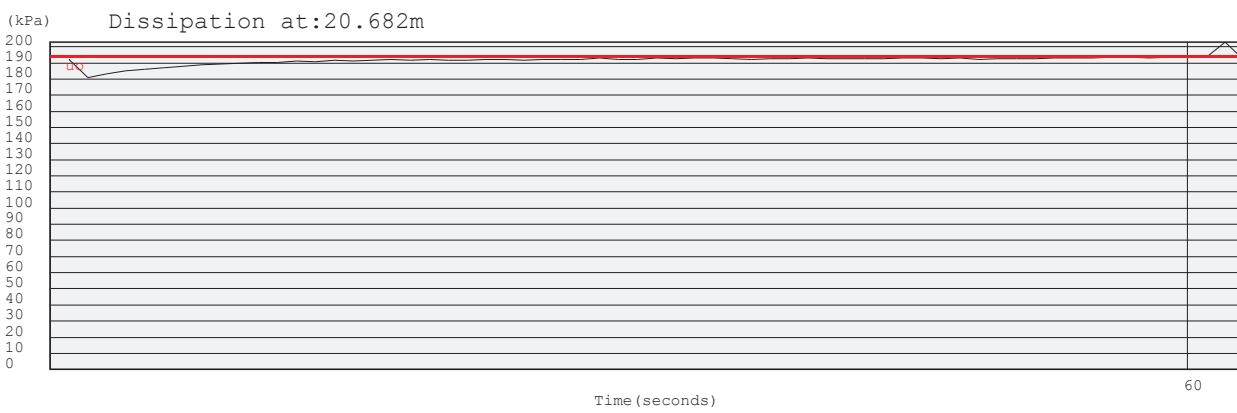
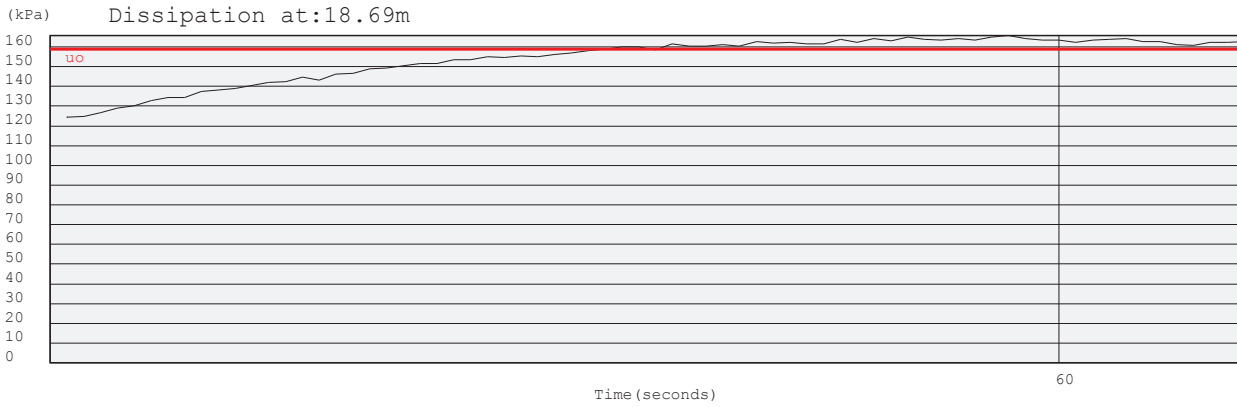
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT27

Date: 2012-06-29

Probe: GHANA  
Page: 1



Project: Durban Harbour Over Water

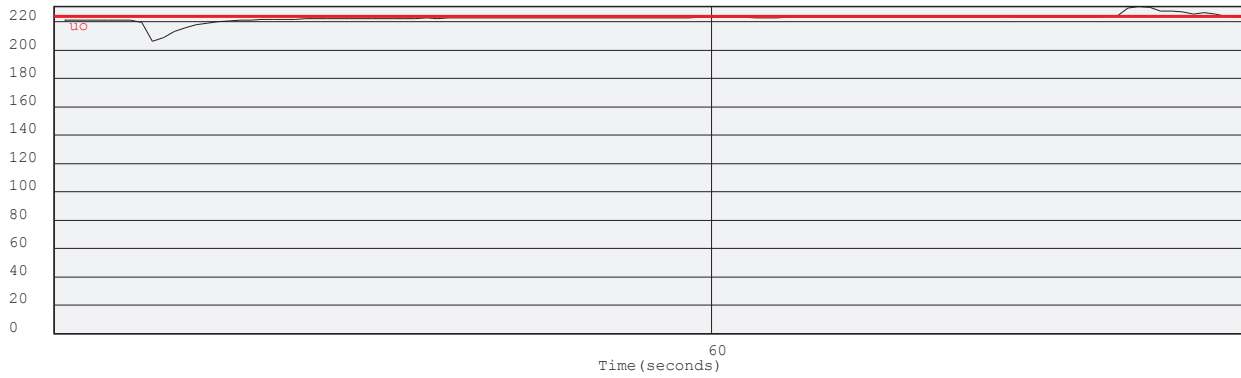
Site: Pier2

Hole: CPT27

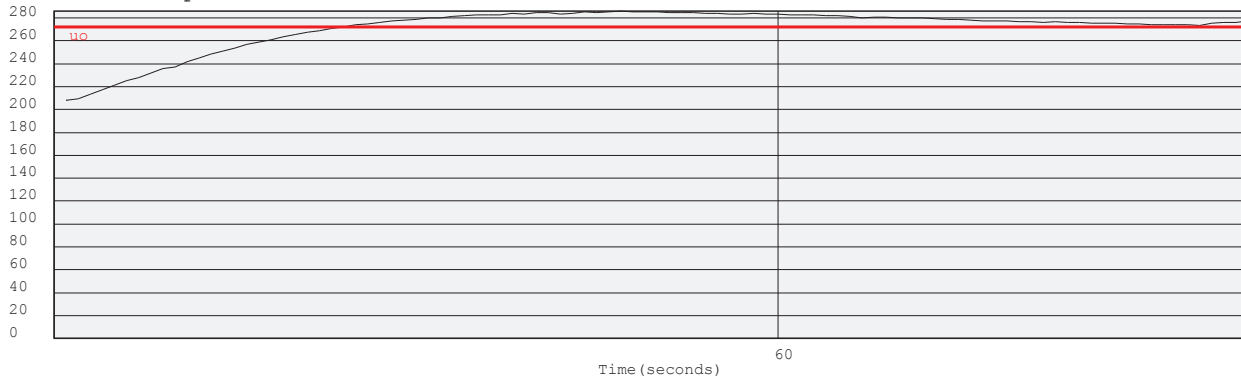
Date: 2012-06-29

Probe: GHANA  
Page: 2

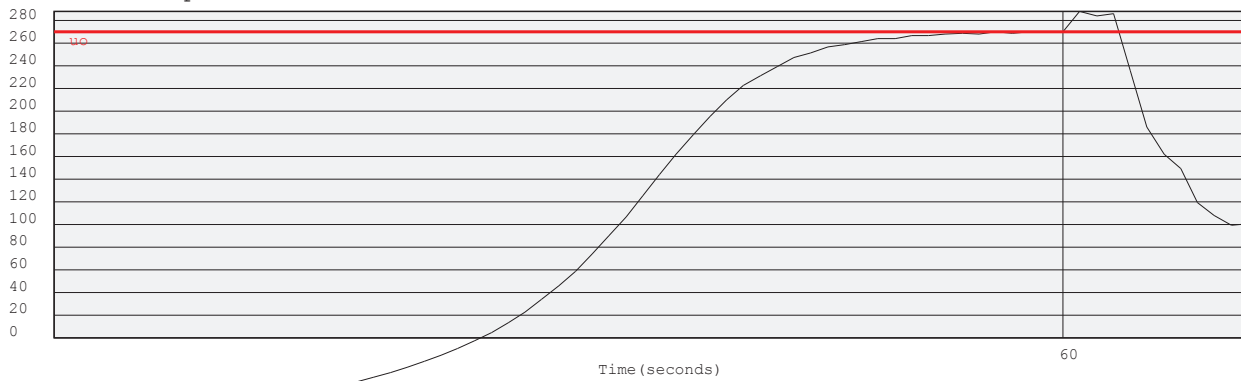
(kPa) Dissipation at: 23.675m



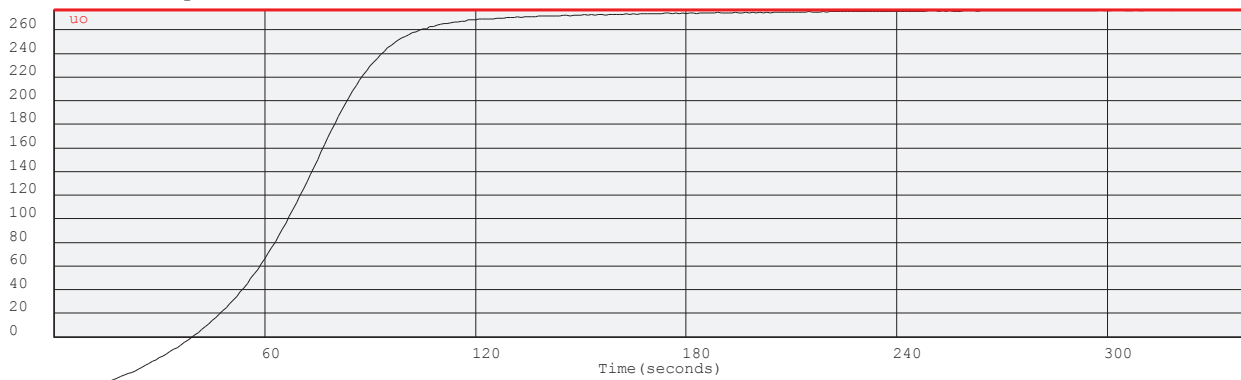
(kPa) Dissipation at: 27.643m



(kPa) Dissipation at: 28.644m



(kPa) Dissipation at: 28.972m



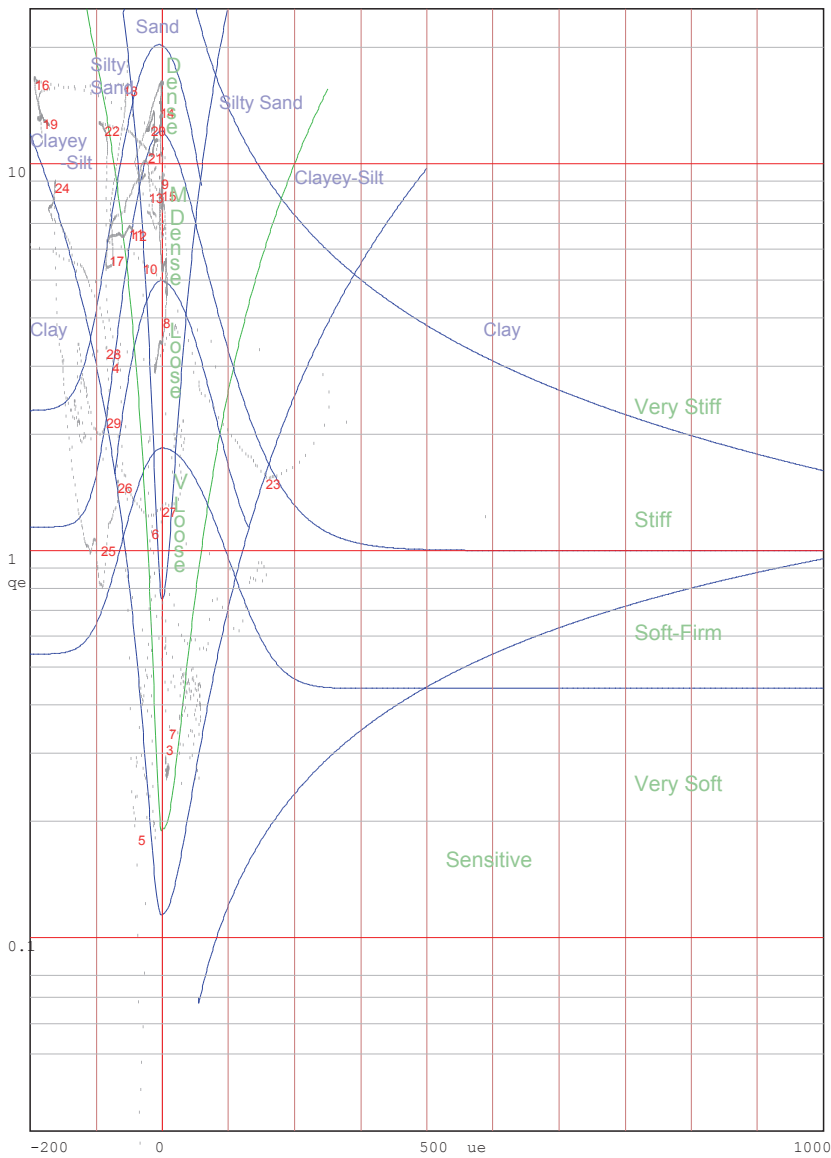
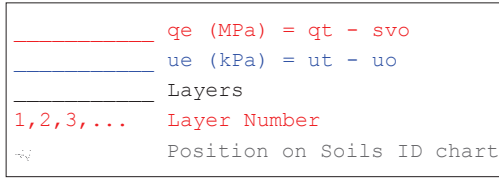
Project: Durban Harbour Over Water

Site: Pier2

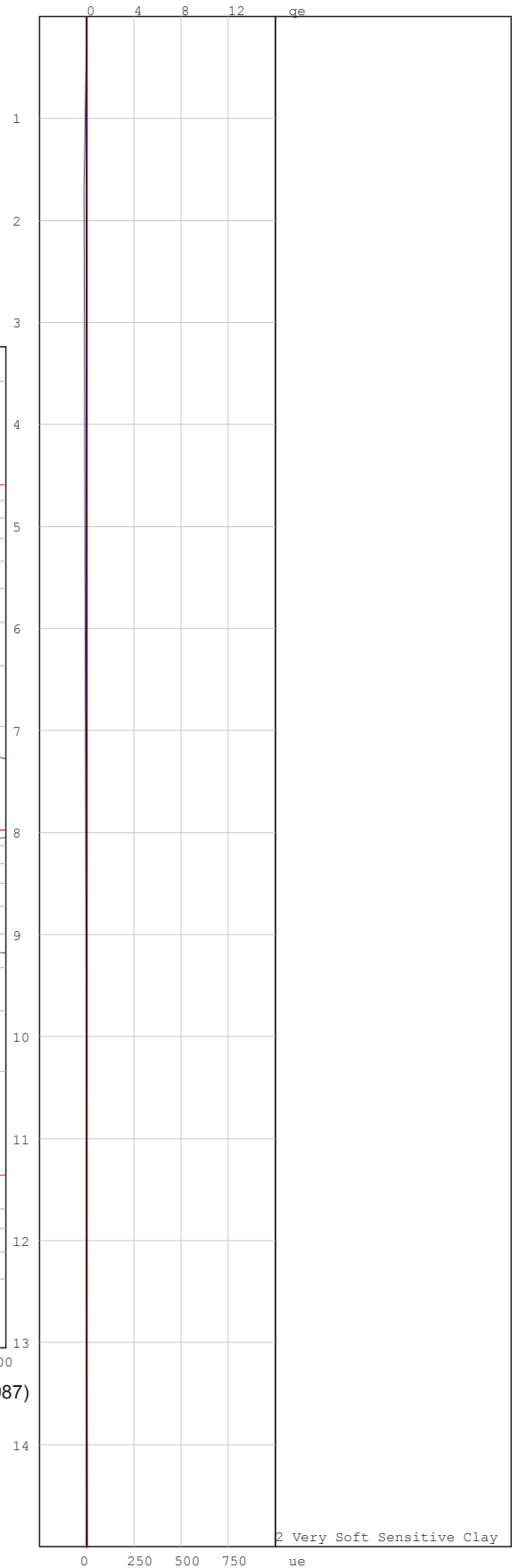
Hole No: CPT27

Date: 2012-06-29

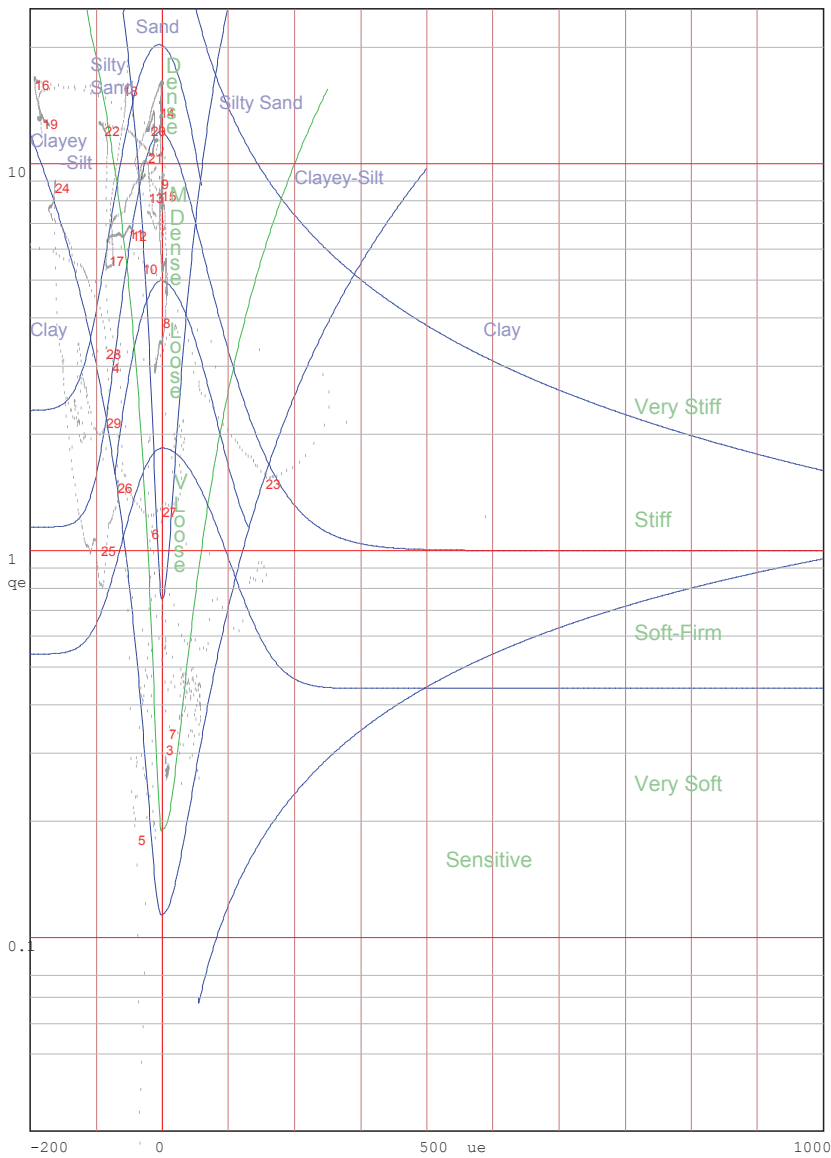
Probe: GHANA



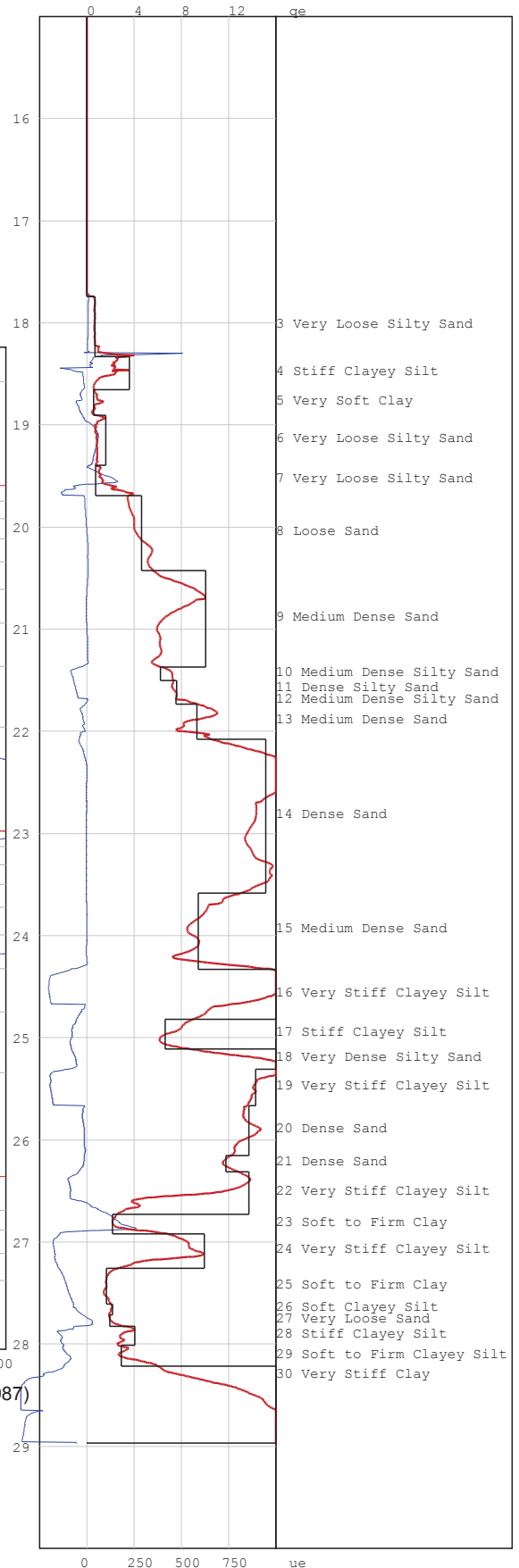
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

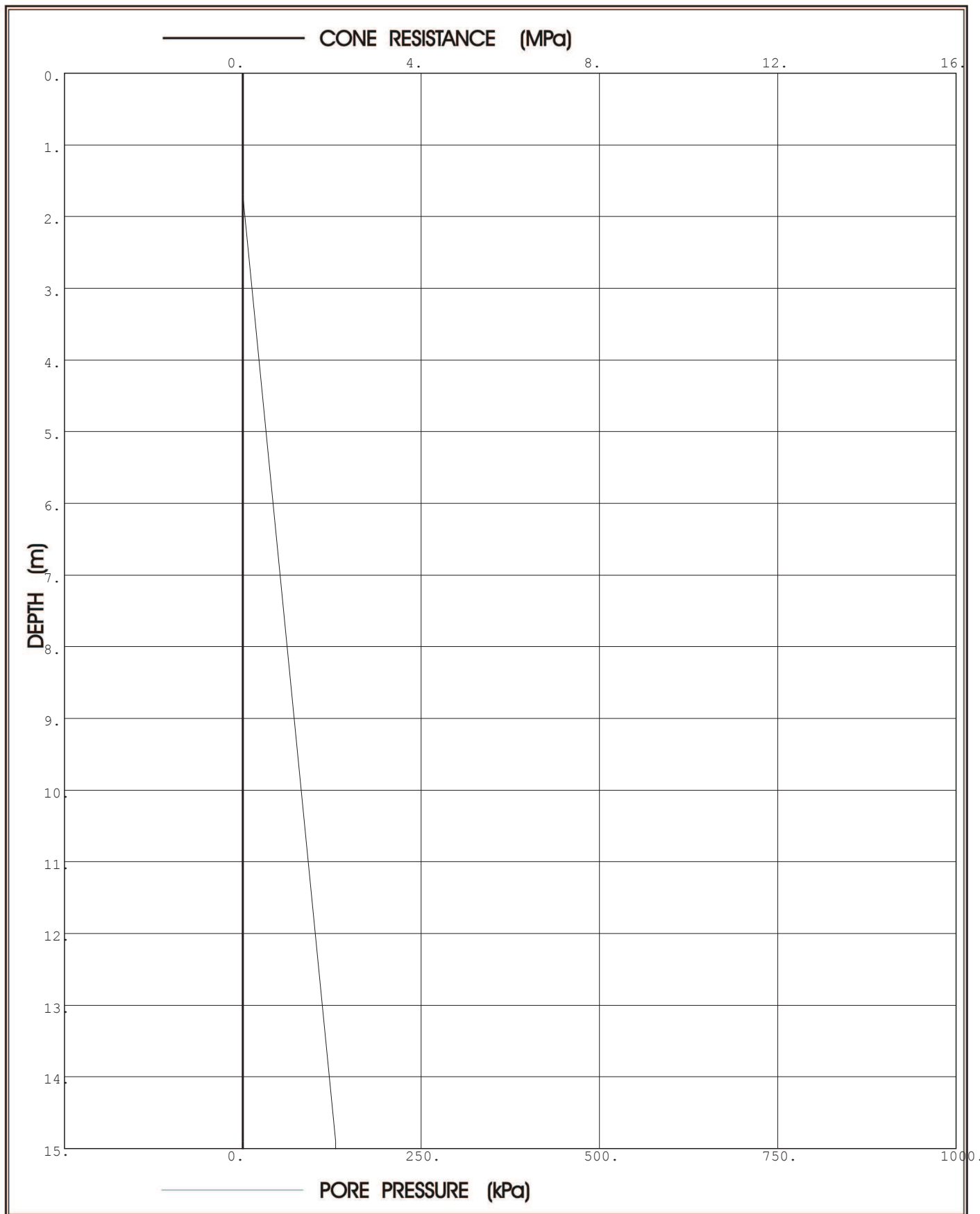
SITE: Pier2

CPTU (RE): CPT28

DATE: 2012-06-30

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

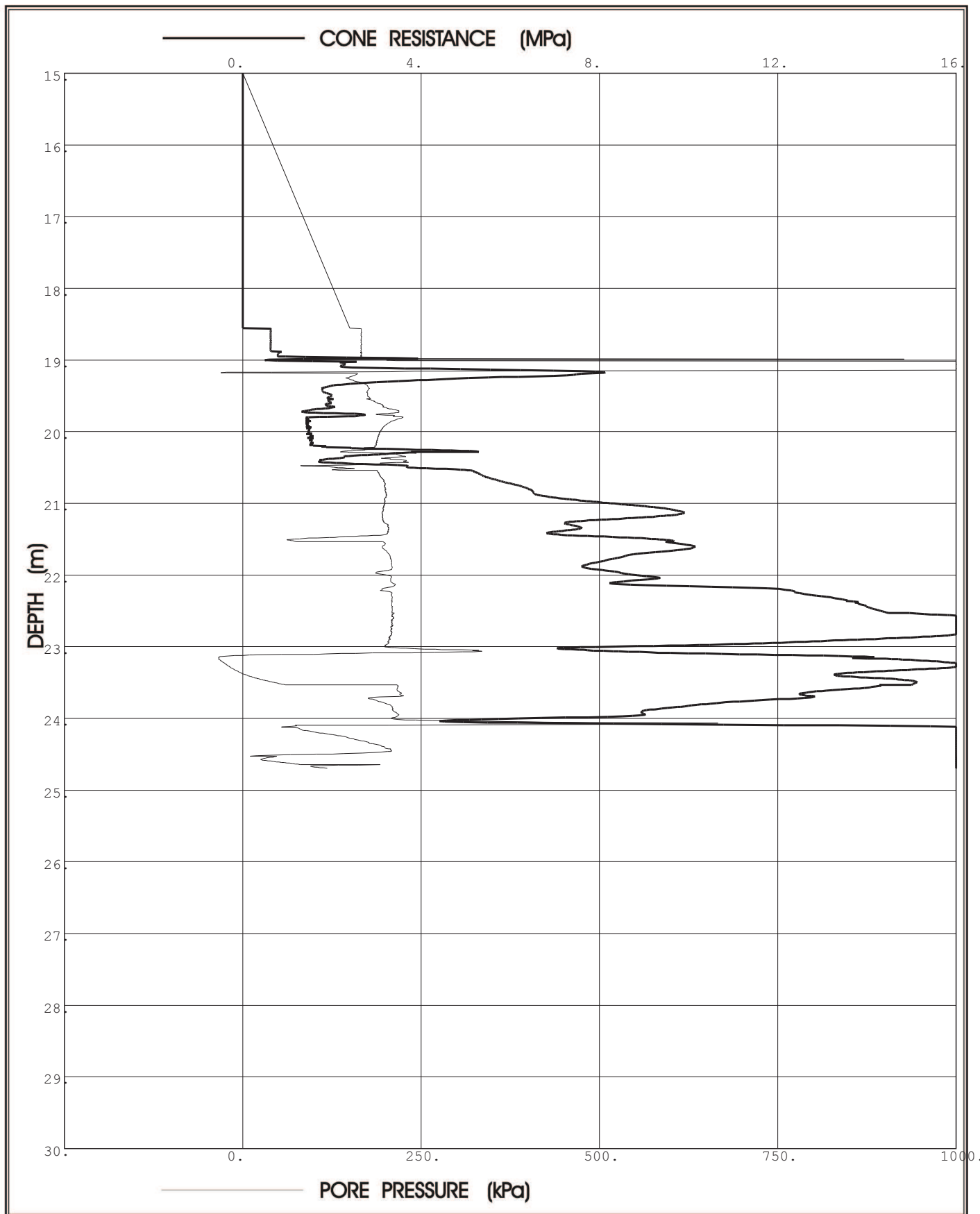
SITE: Pier2

CPTU (RE): CPT28

DATE: 2012-06-30

Probe: GHANA

Page:2



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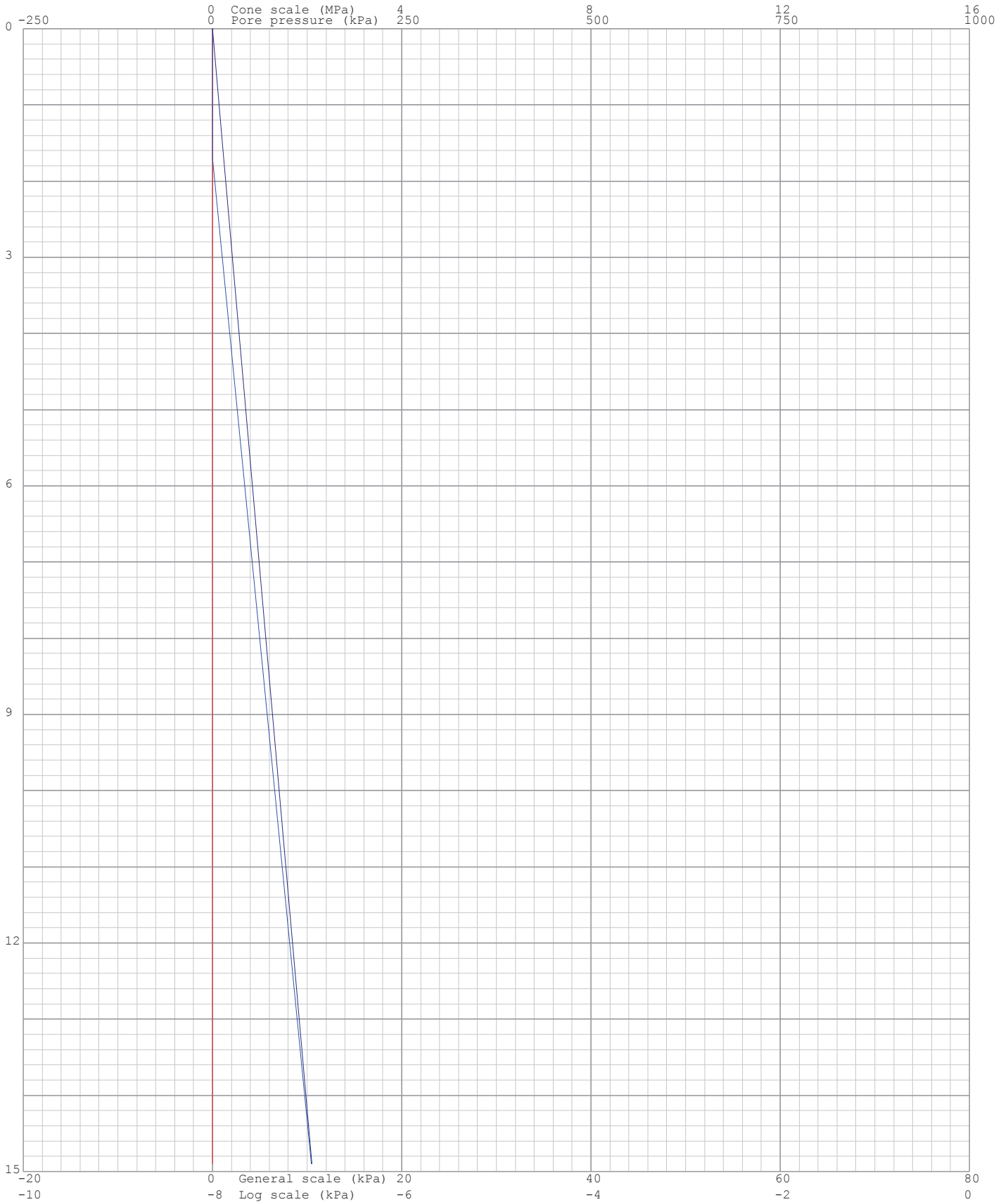
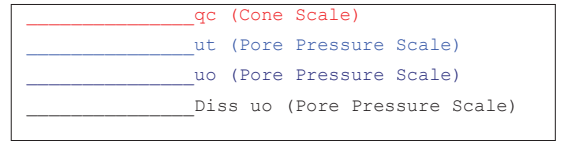
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT28

Date: 2012-06-30

Probe: GHANA



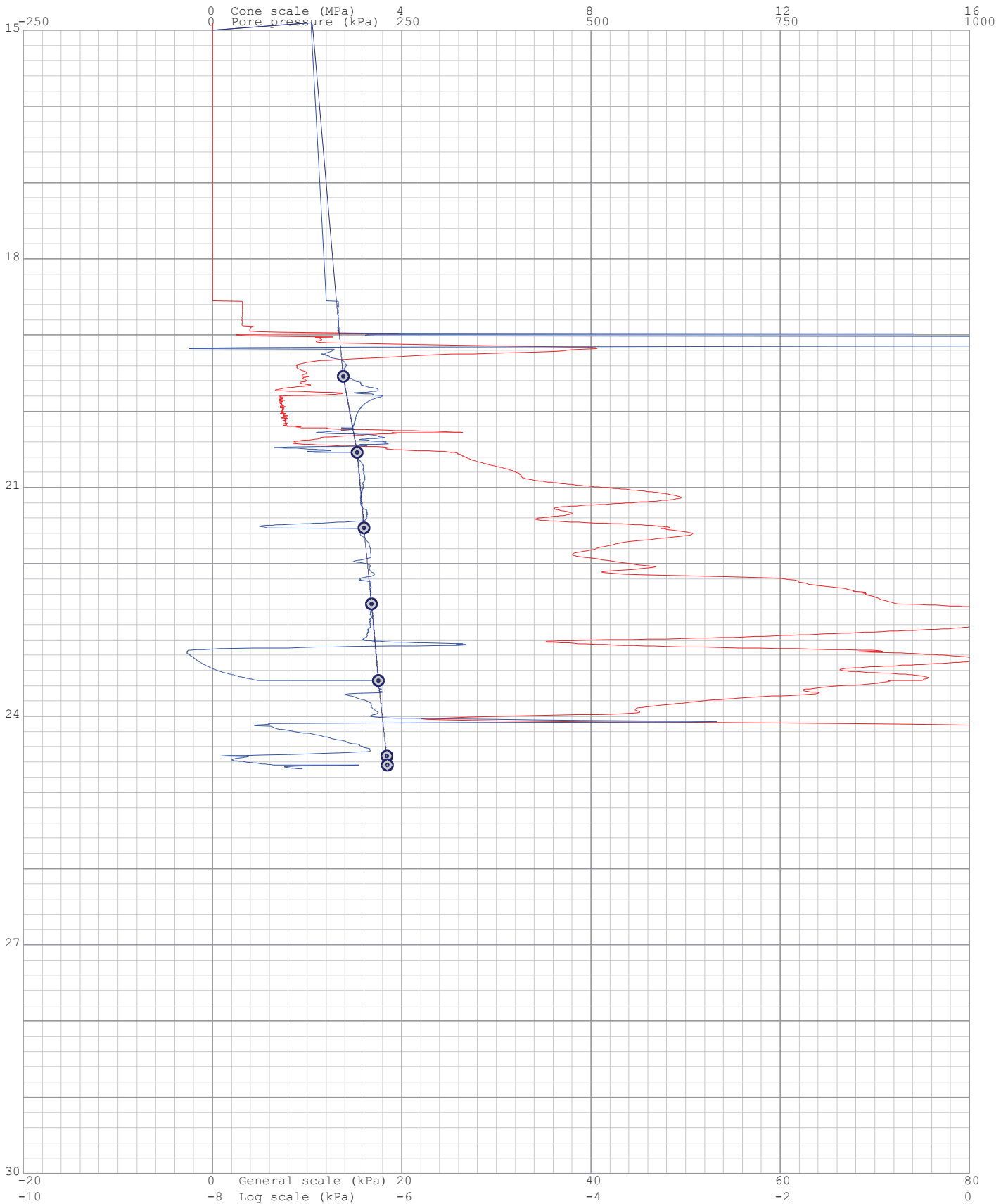
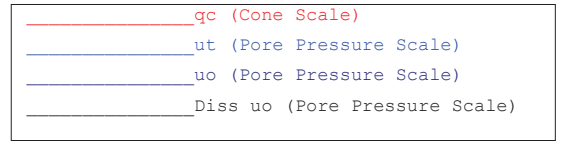
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT28

Date: 2012-06-30

Probe: GHANA



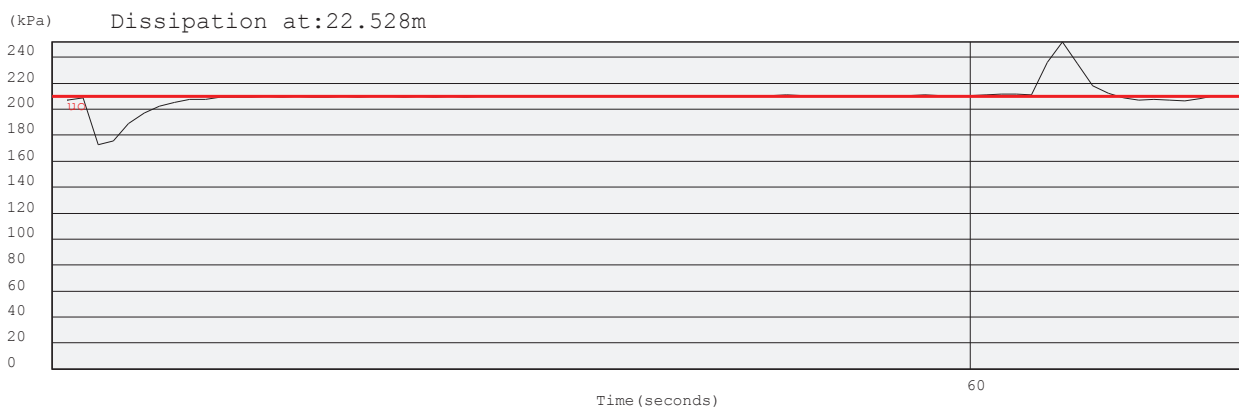
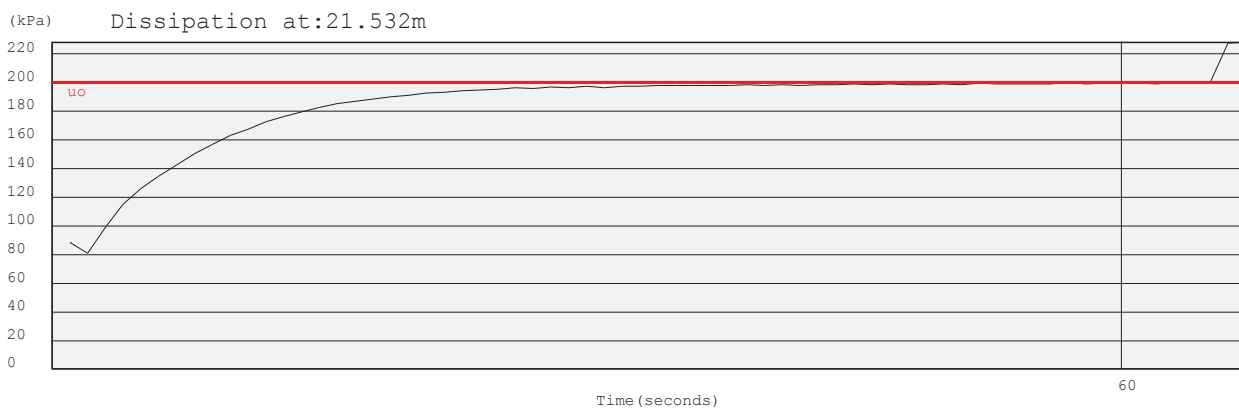
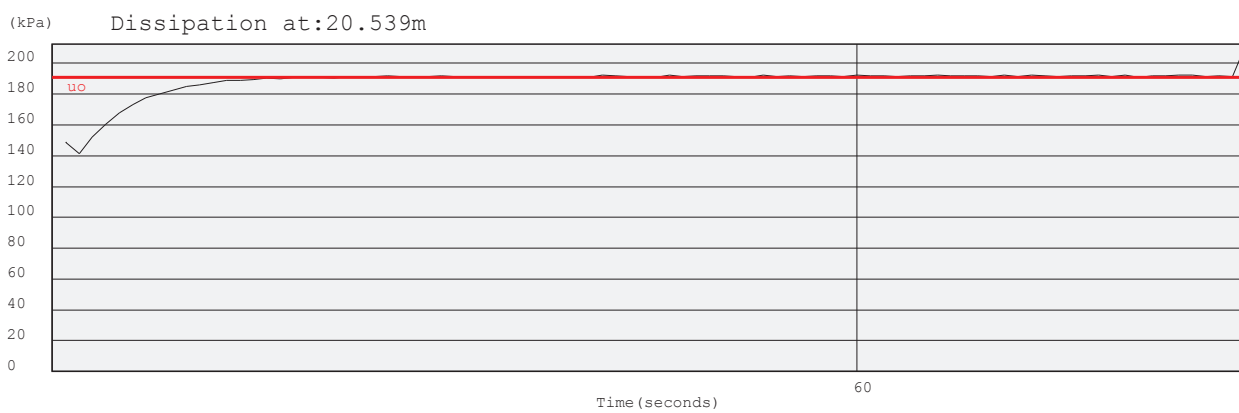
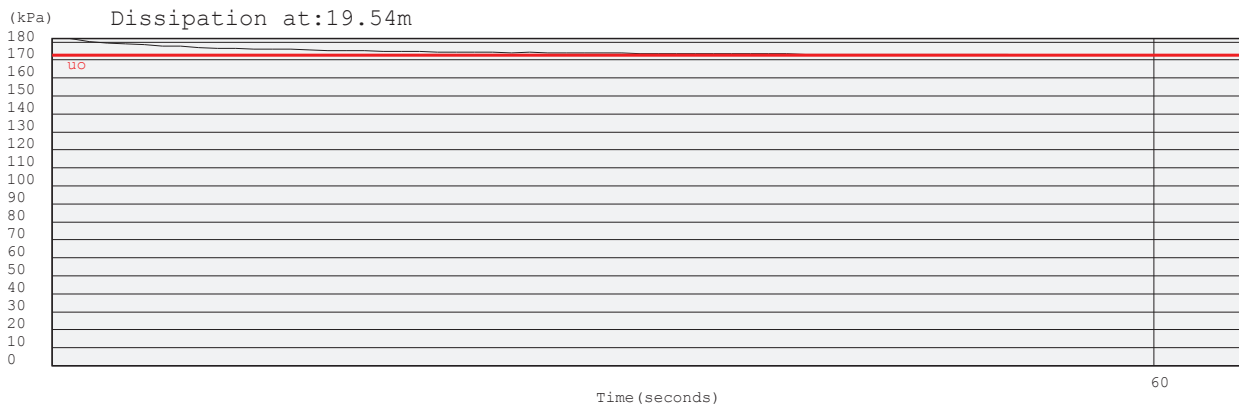
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT28

Date: 2012-06-30

Probe: GHANA  
Page: 1



Project: Durban Harbour Over Water

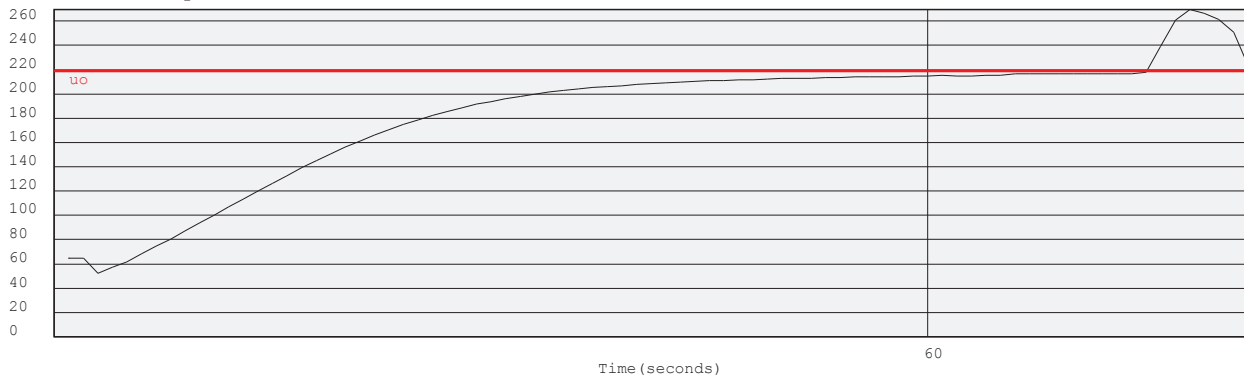
Site: Pier2

Hole: CPT28

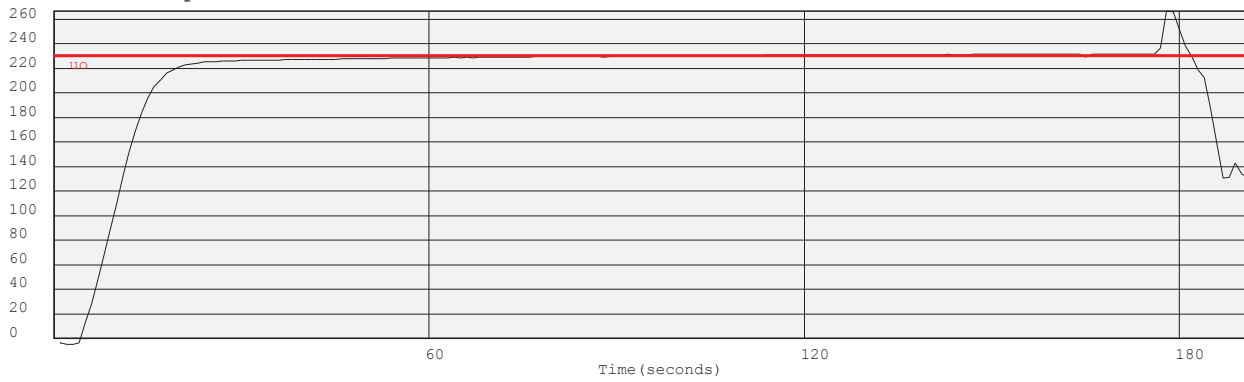
Date: 2012-06-30

Probe: GHANA  
Page: 2

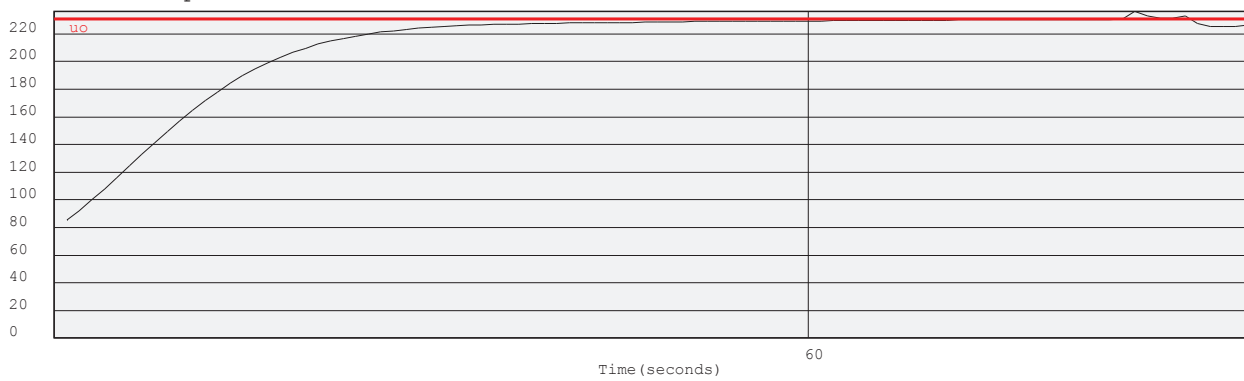
(kPa) Dissipation at: 23.532m



(kPa) Dissipation at: 24.525m



(kPa) Dissipation at: 24.642m



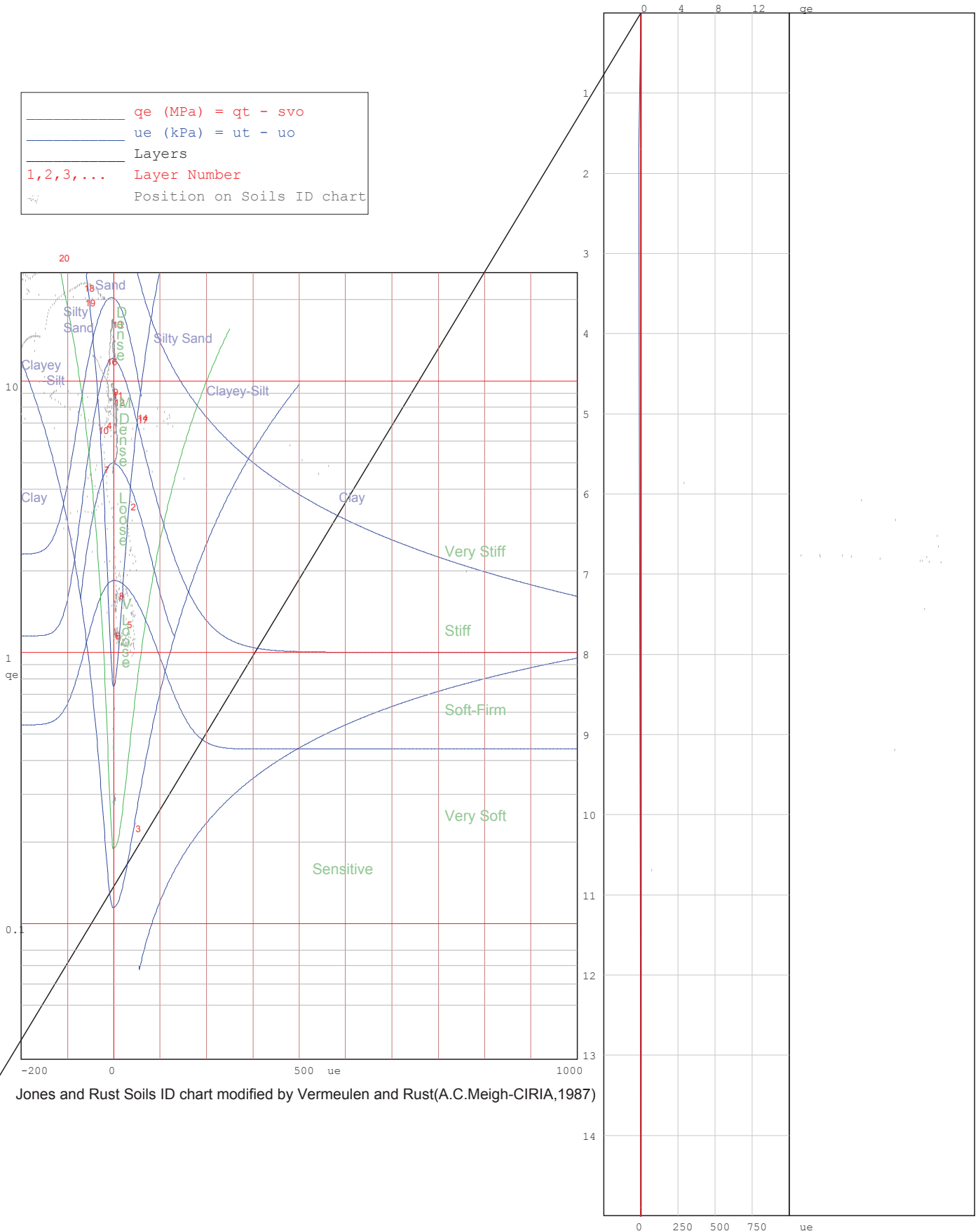
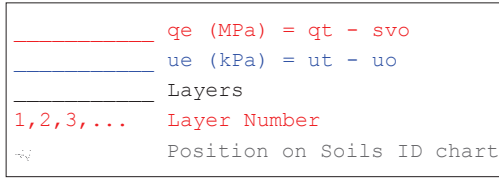
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT28

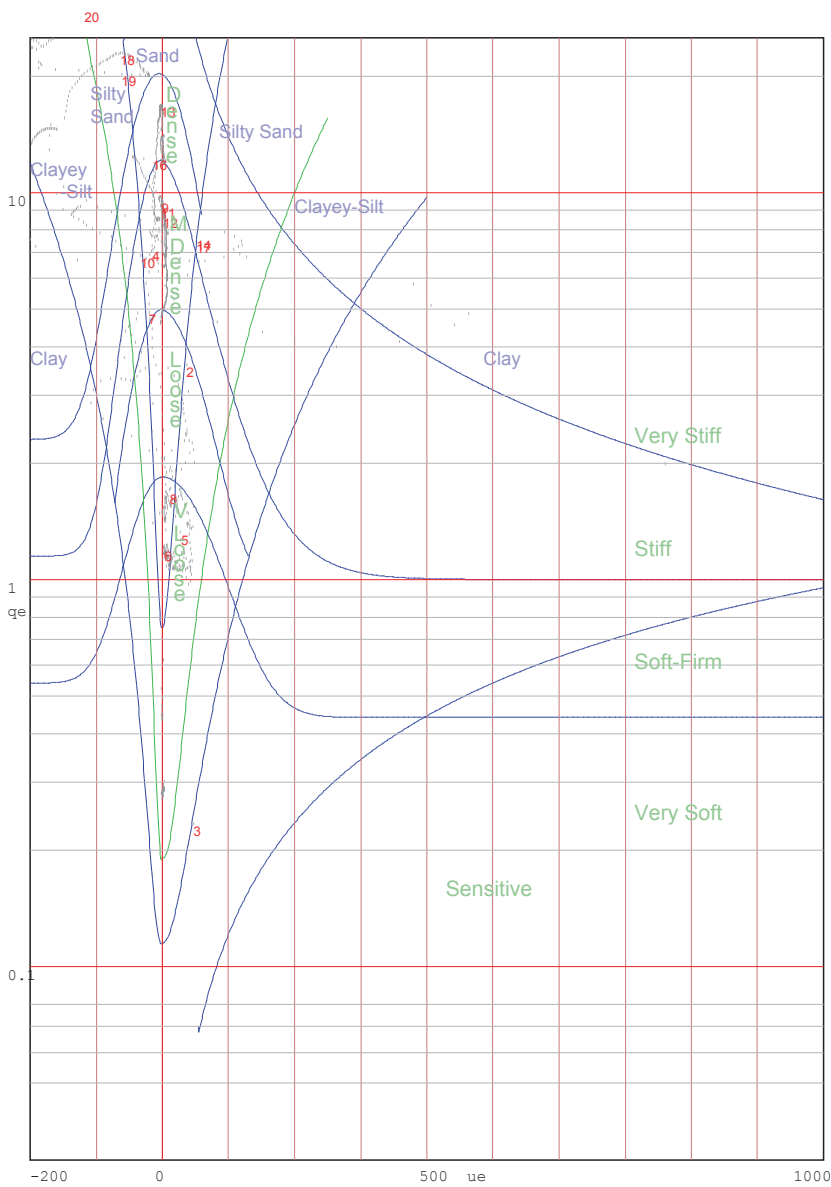
Date: 2012-06-30

Probe: GHANA

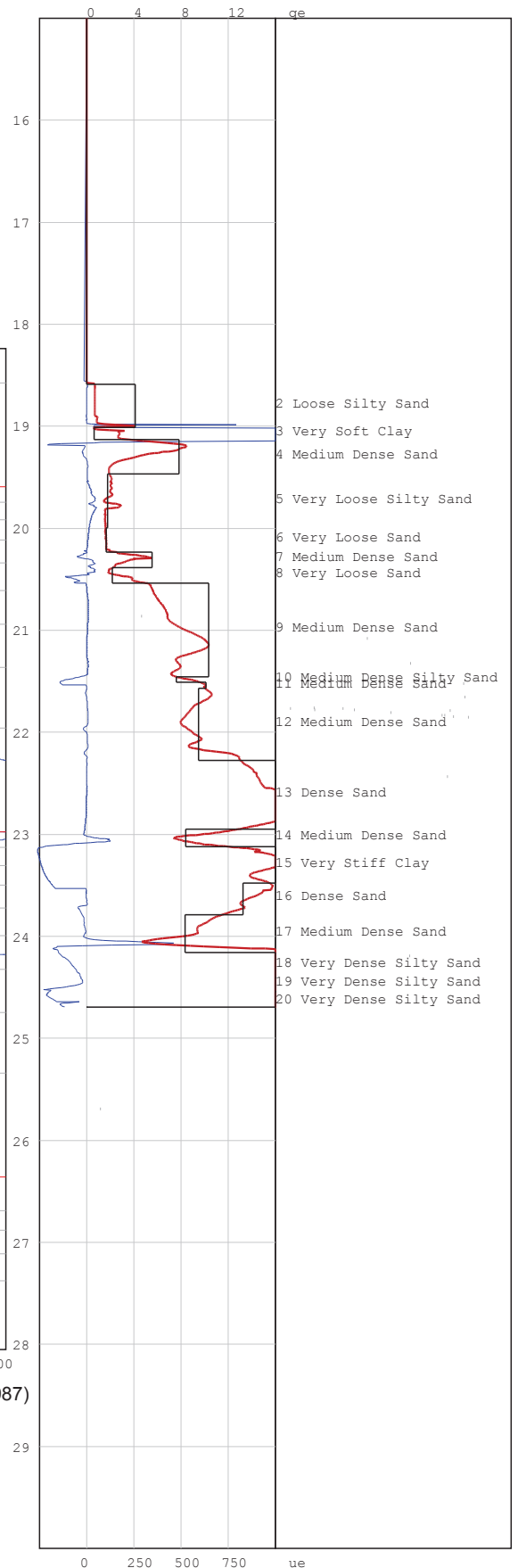


Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

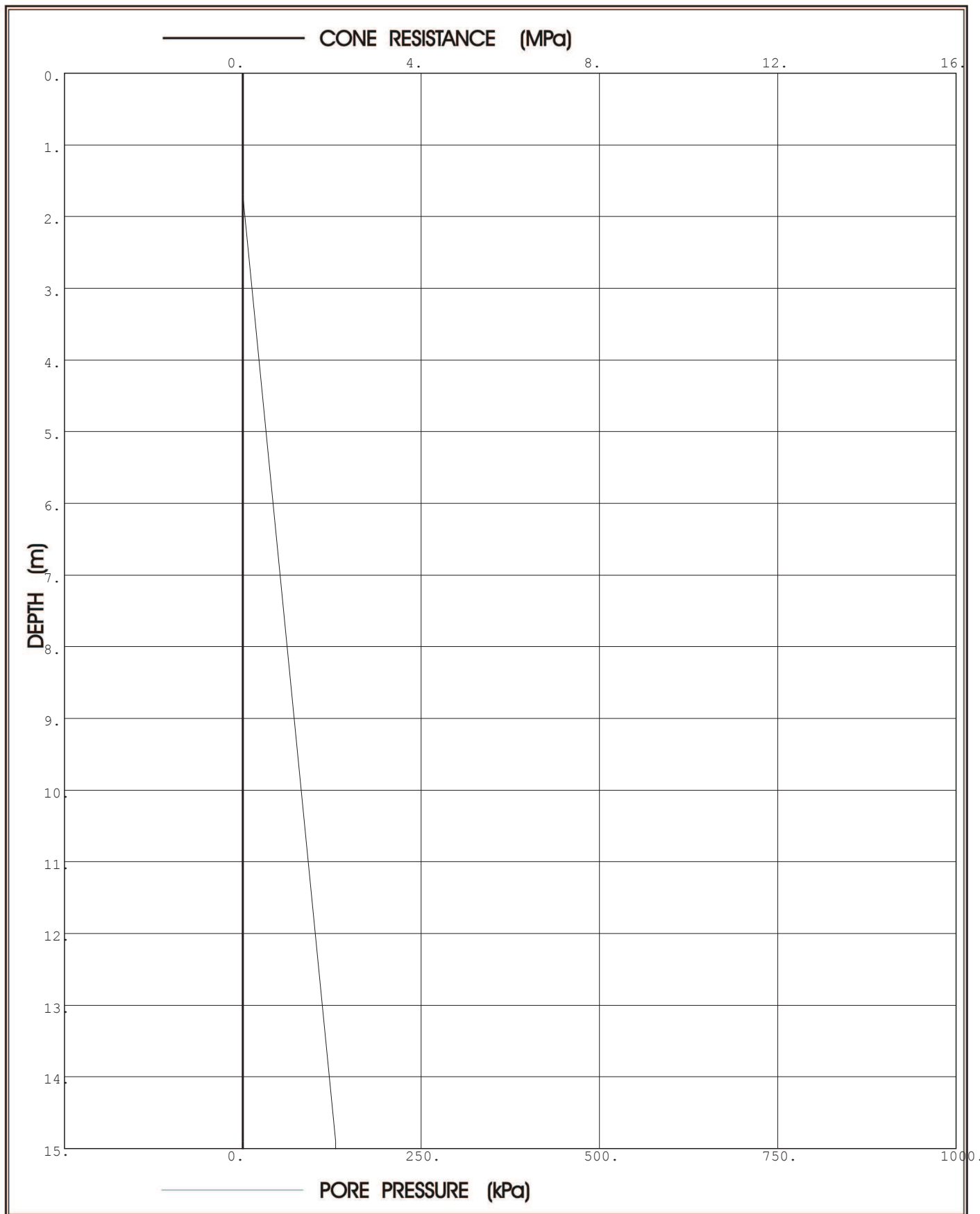
SITE: Pier2

CPTU (RE): CPT29

DATE: 2012/06/12

Probe: GHANA

Page:1



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P O Box 39108  
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PROJECT: Durban Harbour Over Water

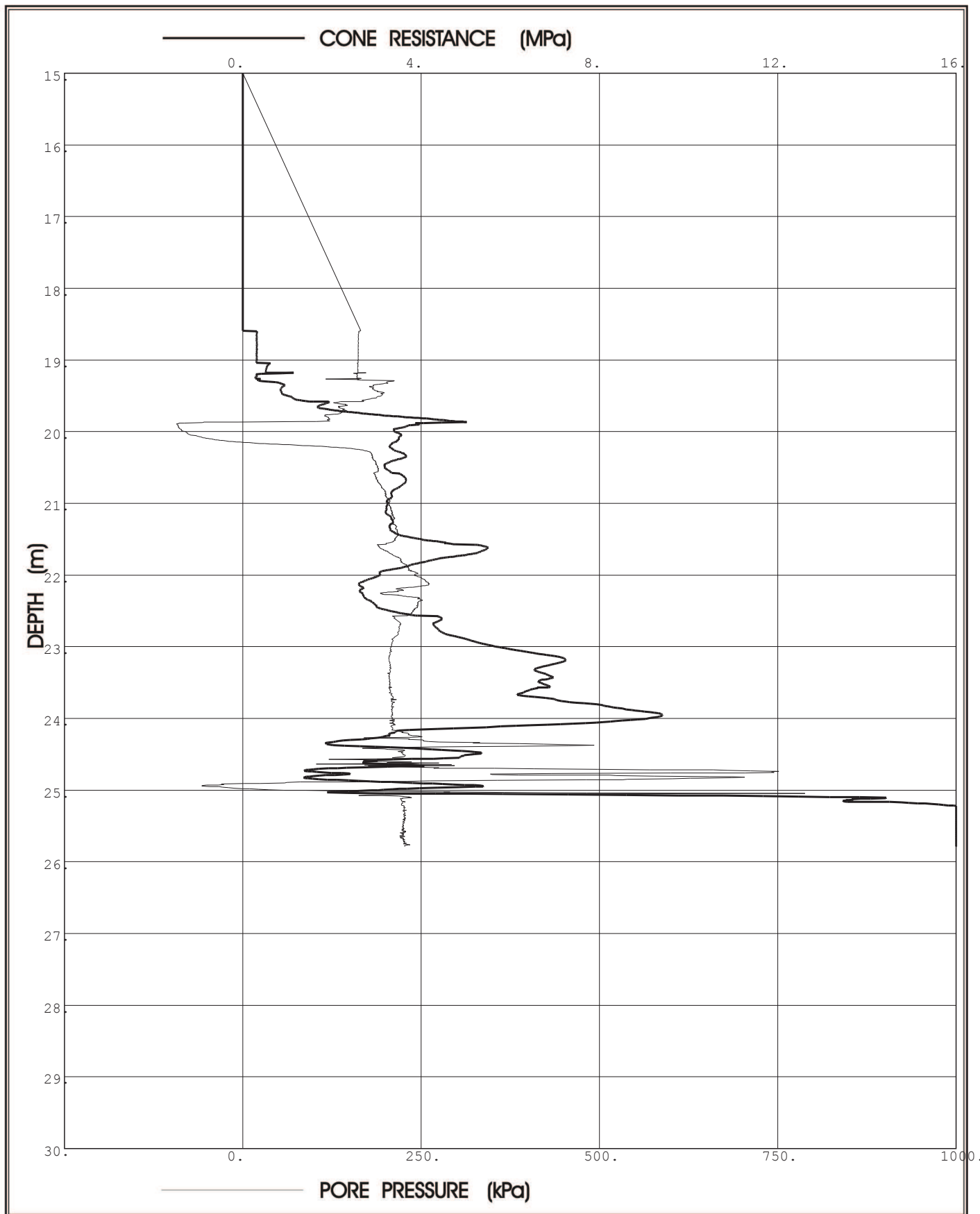
SITE: Pier2

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DATE: 2012/06/12

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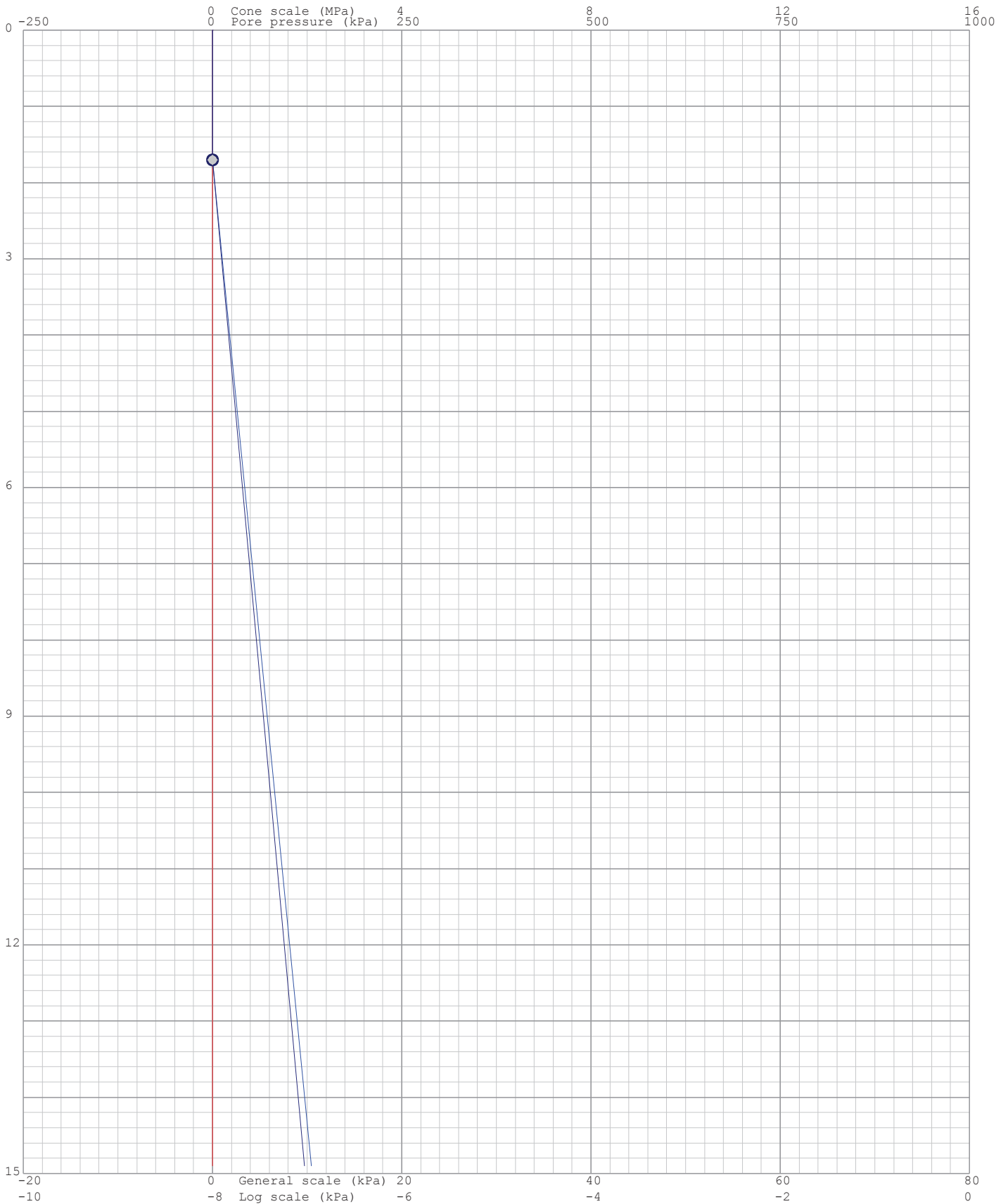
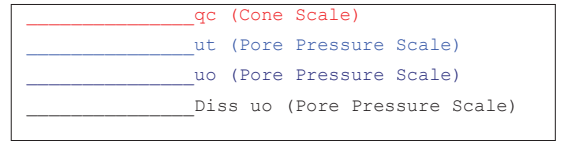
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT29

Date: 2012/06/12

Probe: GHANA



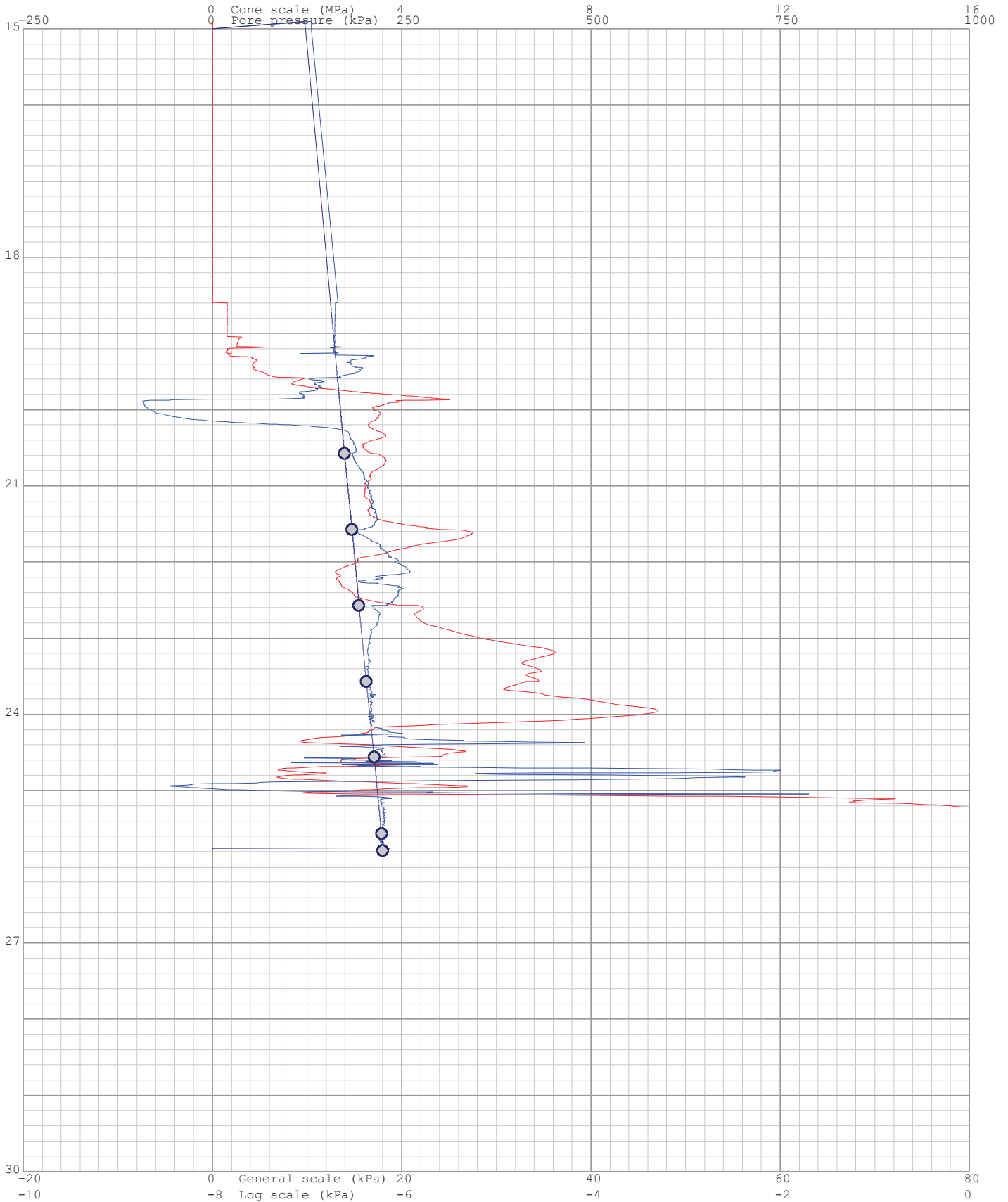
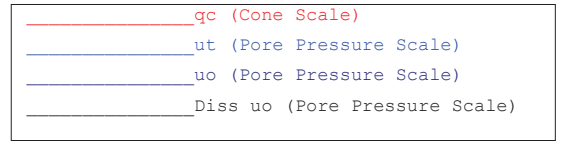
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT29

Date: 2012/06/12

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT29

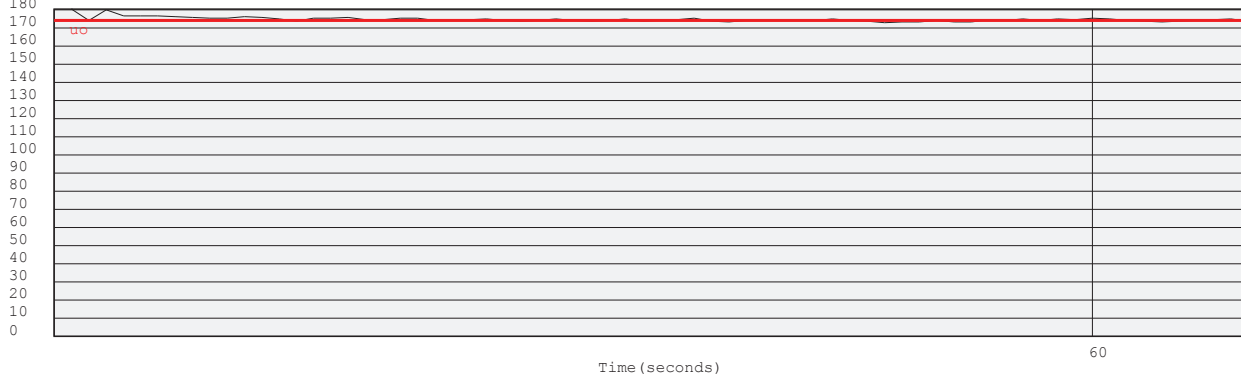
Date: 2012/06/12

Probe: GHANA  
Page: 1

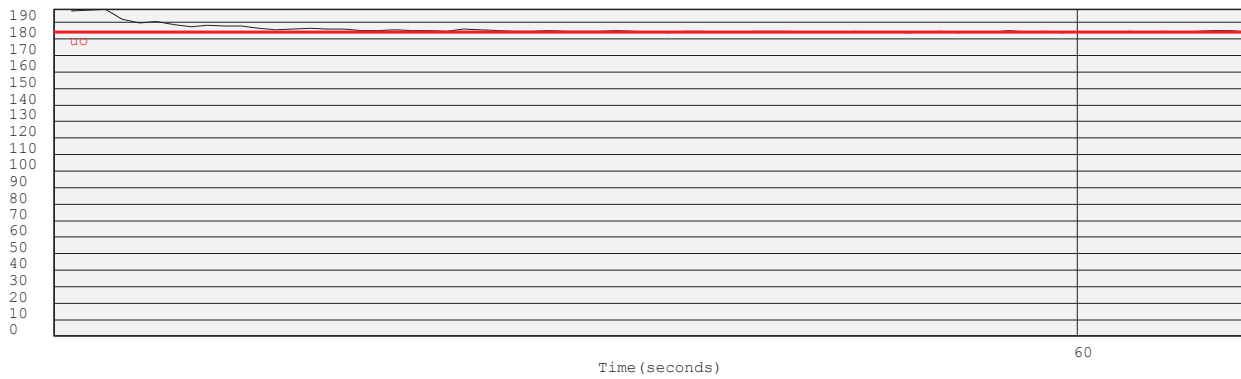
(kPa) Dissipation at: 1.7m



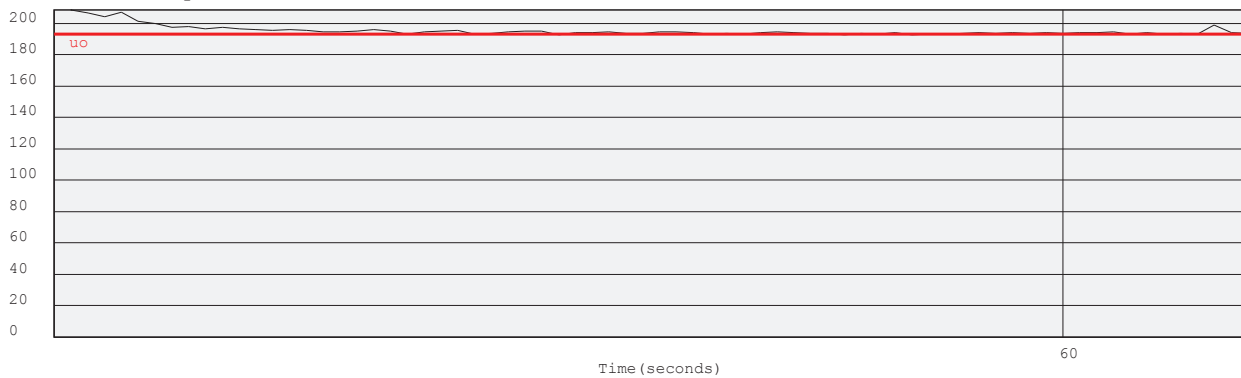
(kPa) Dissipation at: 20.576m



(kPa) Dissipation at: 21.572m



(kPa) Dissipation at: 22.568m



Project: Durban Harbour Over Water

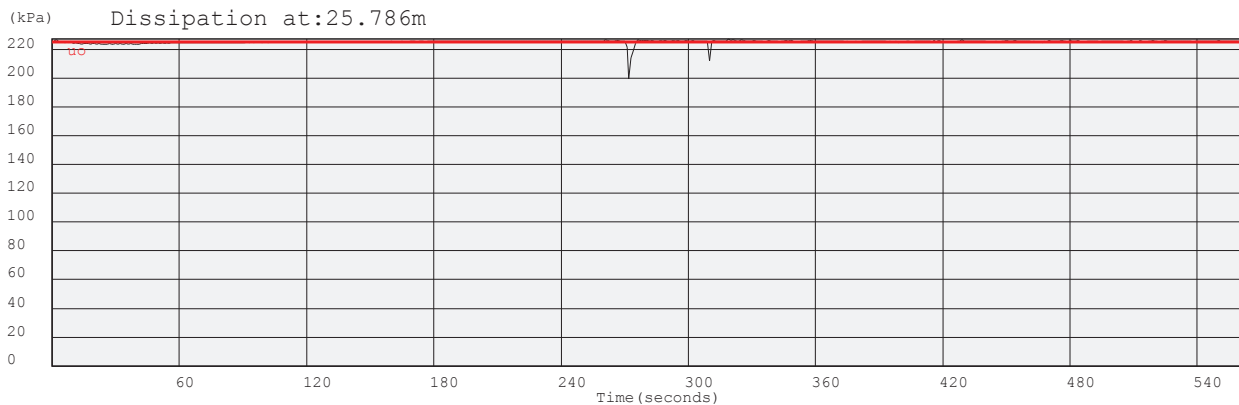
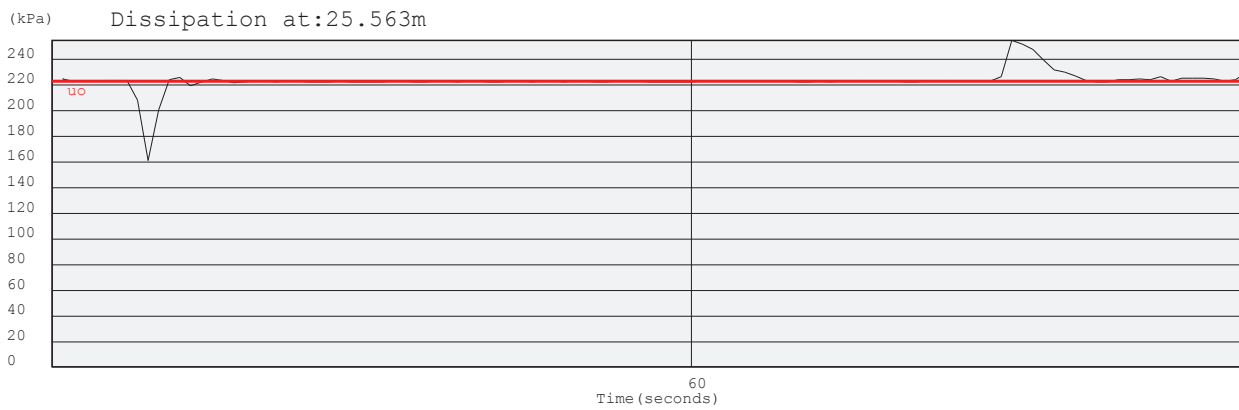
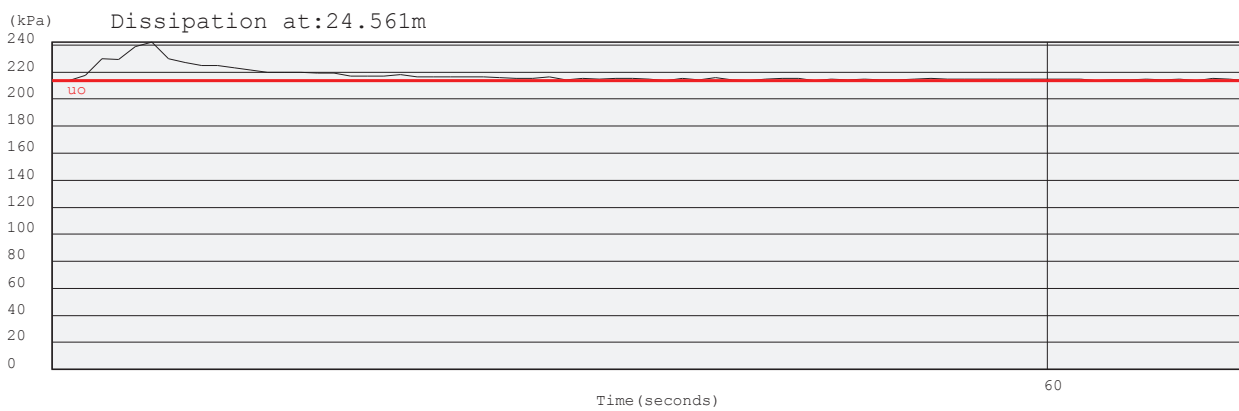
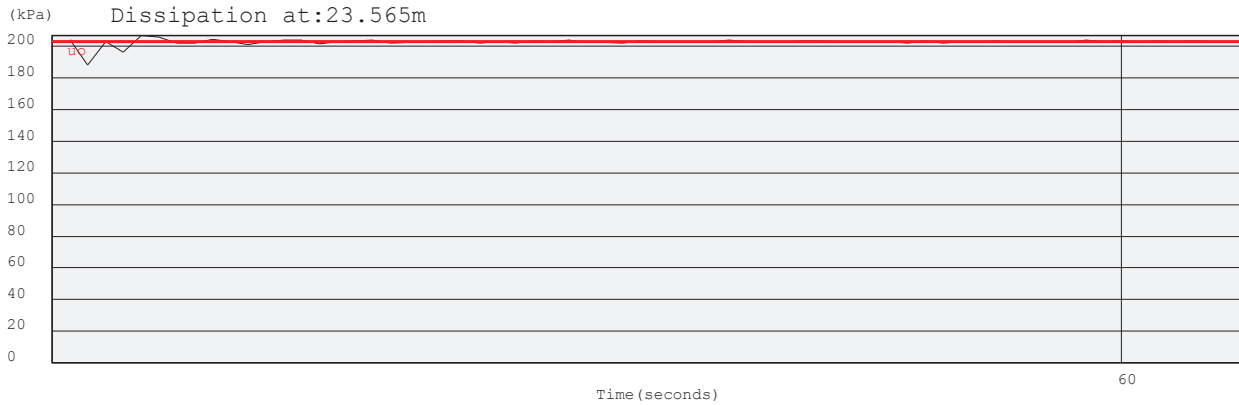
Site: Pier2

Hole: CPT29

Date: 2012/06/12

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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

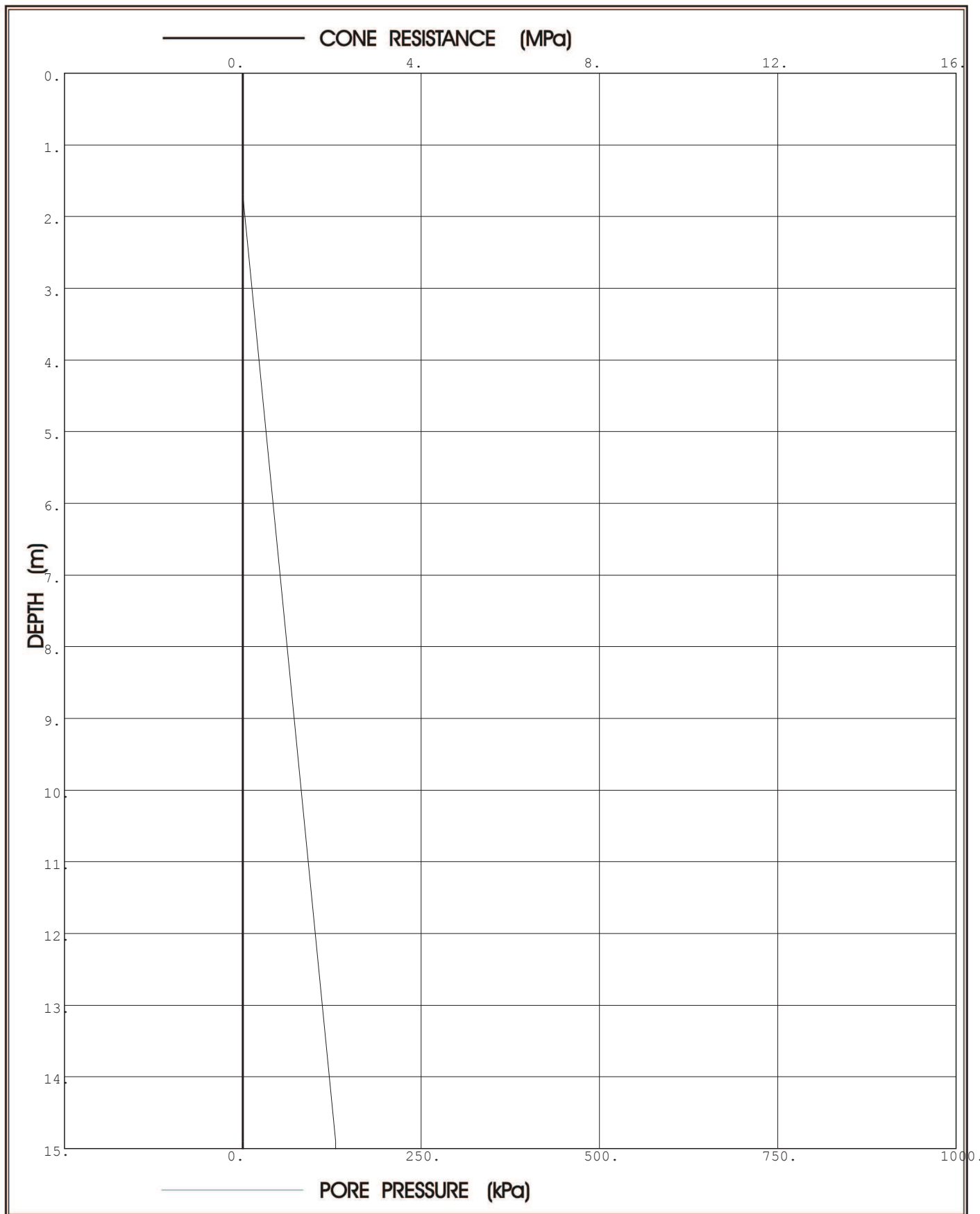
SITE: Pier2

CPTU (RE): CPT30

DATE: 2012/06/12

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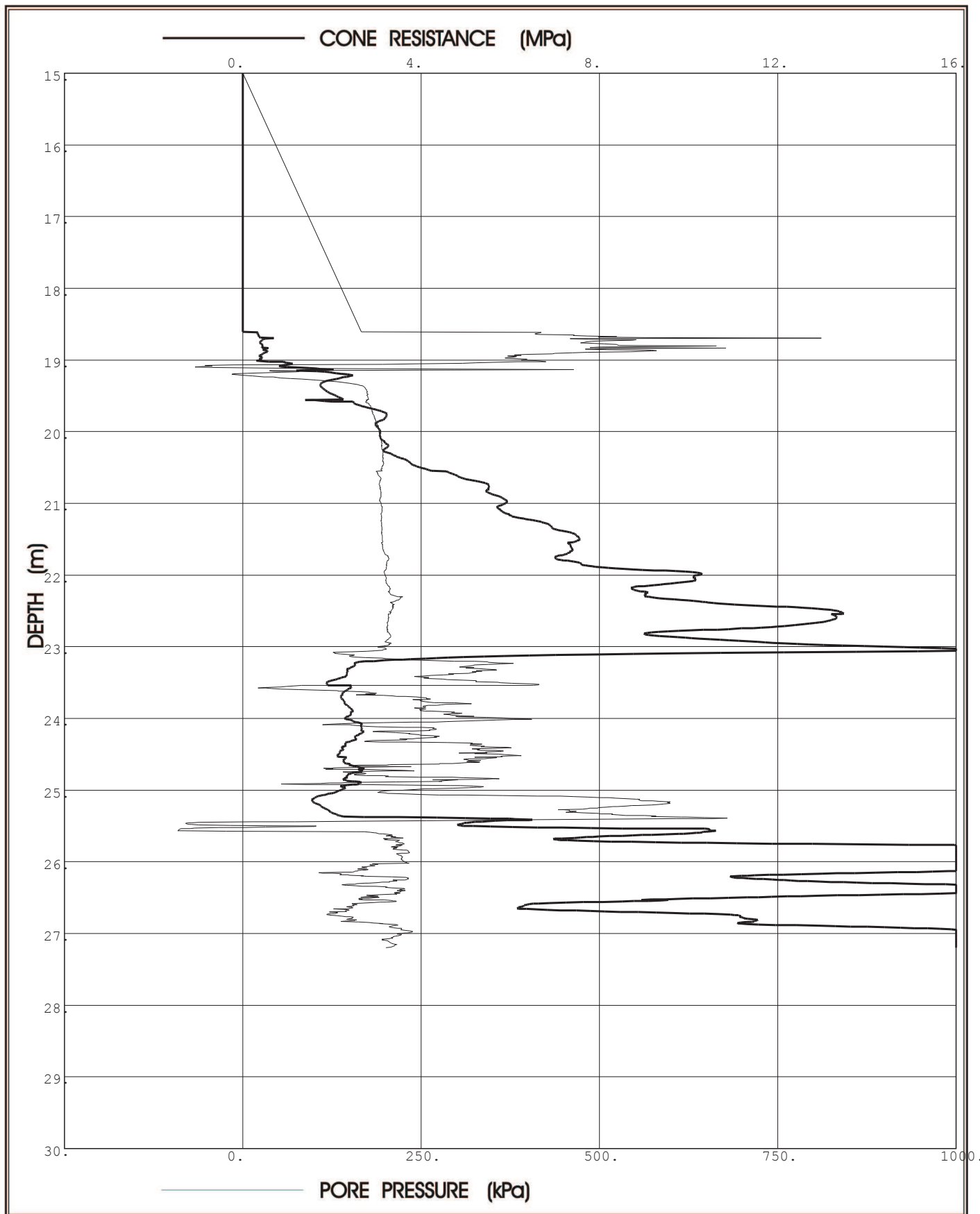
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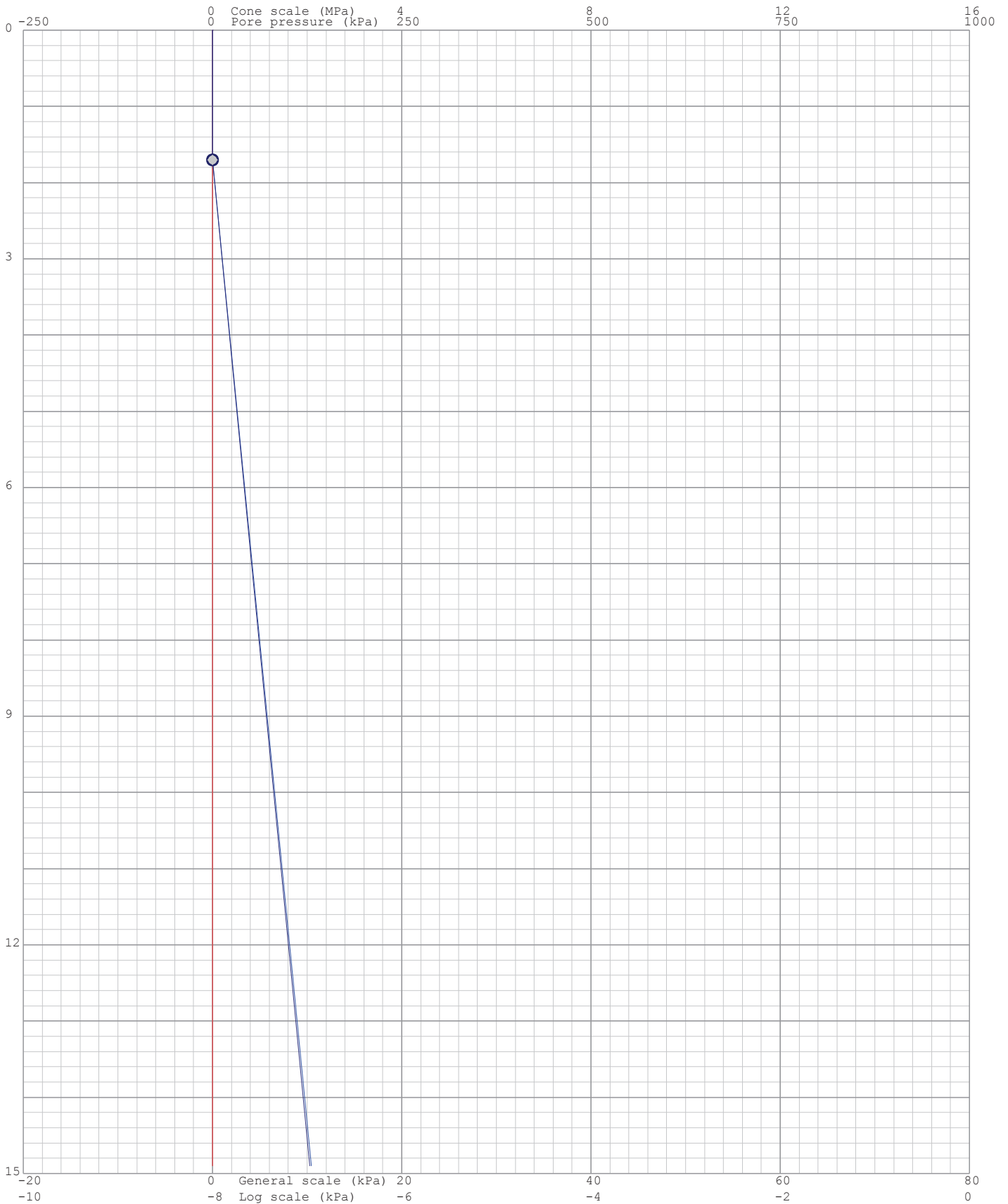
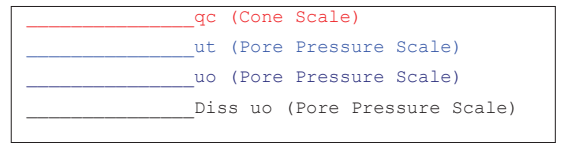
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT30

Date: 2012/06/12

Probe: GHANA



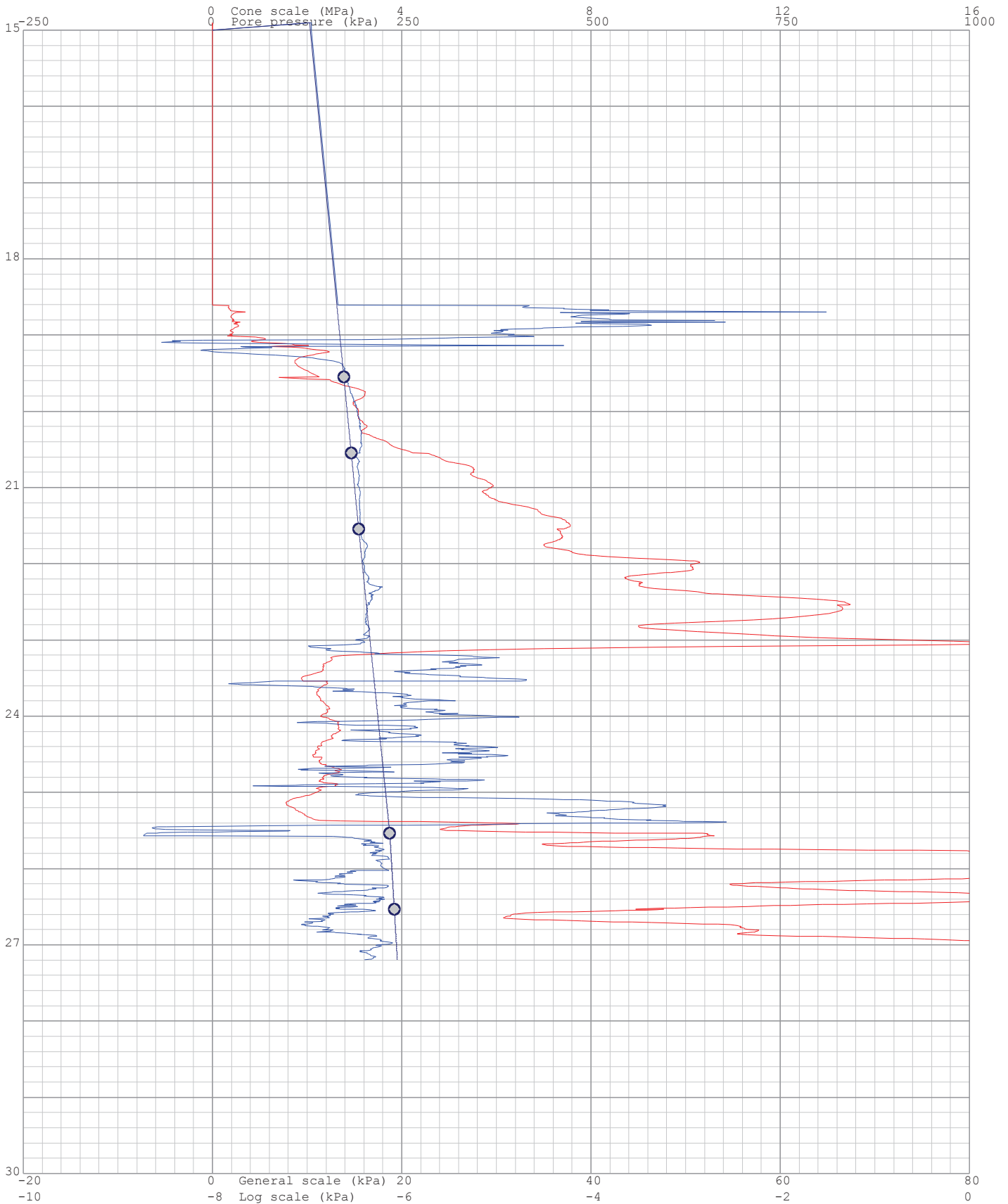
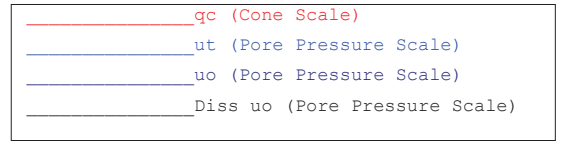
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT30

Date: 2012/06/12

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT30

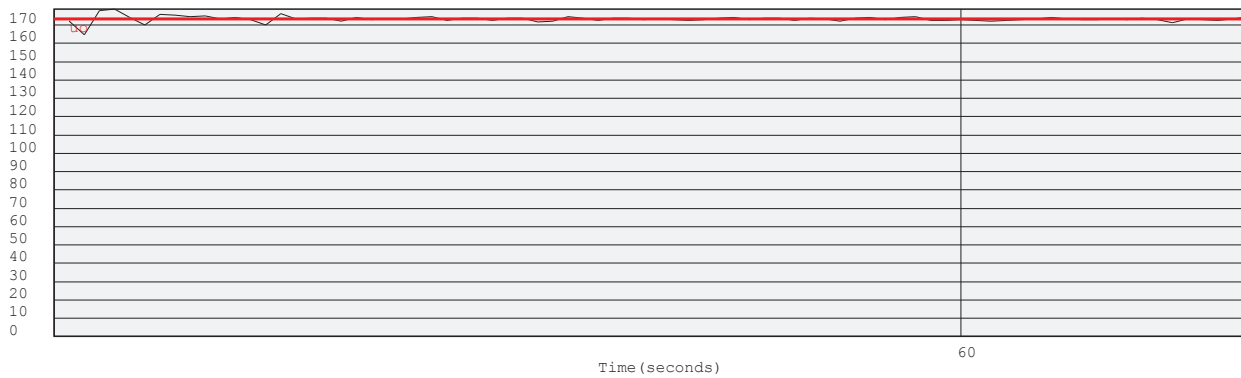
Date: 2012/06/12

Probe: GHANA  
Page: 1

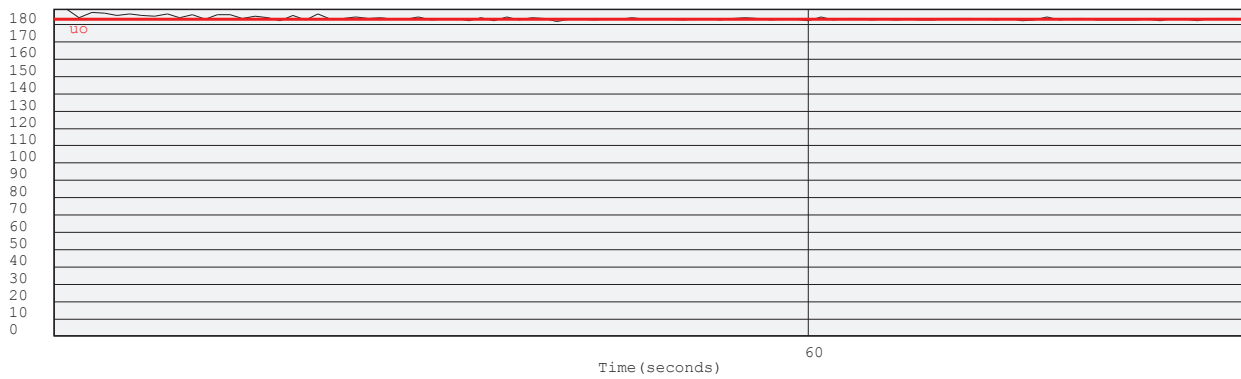
(kPa) Dissipation at: 1.7m



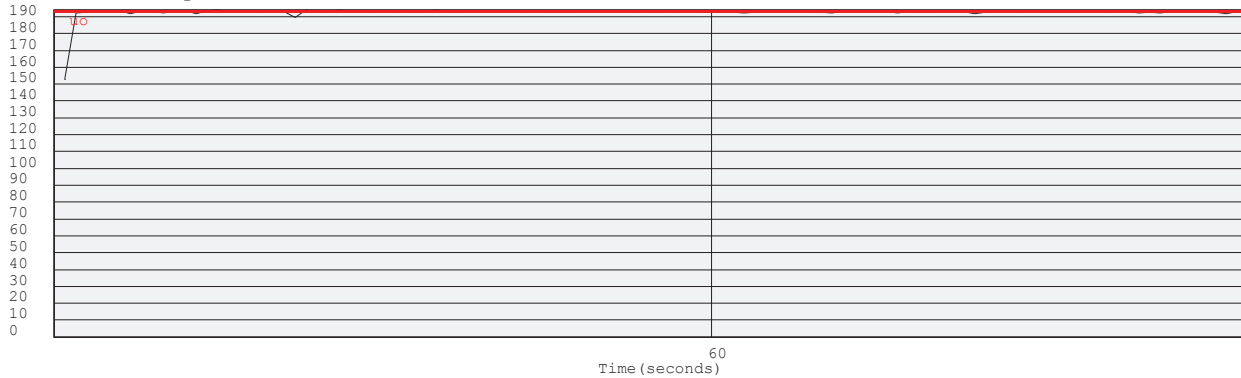
(kPa) Dissipation at: 19.551m



(kPa) Dissipation at: 20.548m



(kPa) Dissipation at: 21.544m



Project: Durban Harbour Over Water

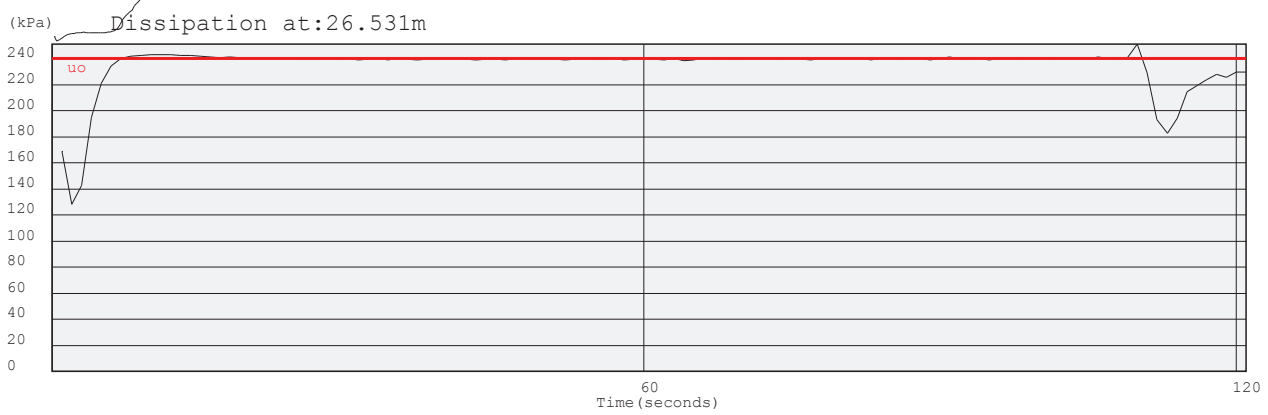
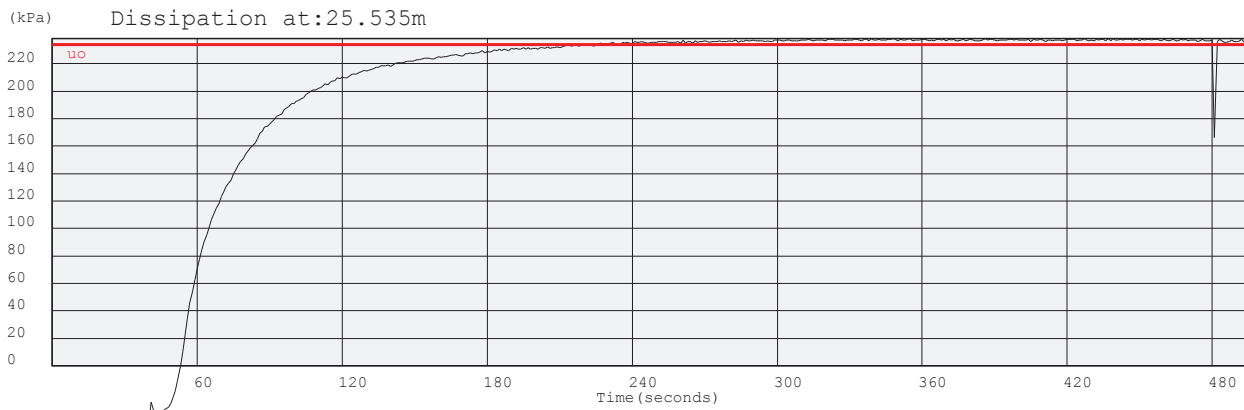
Site: Pier2

Hole: CPT30

Date: 2012/06/12

Probe: GHANA

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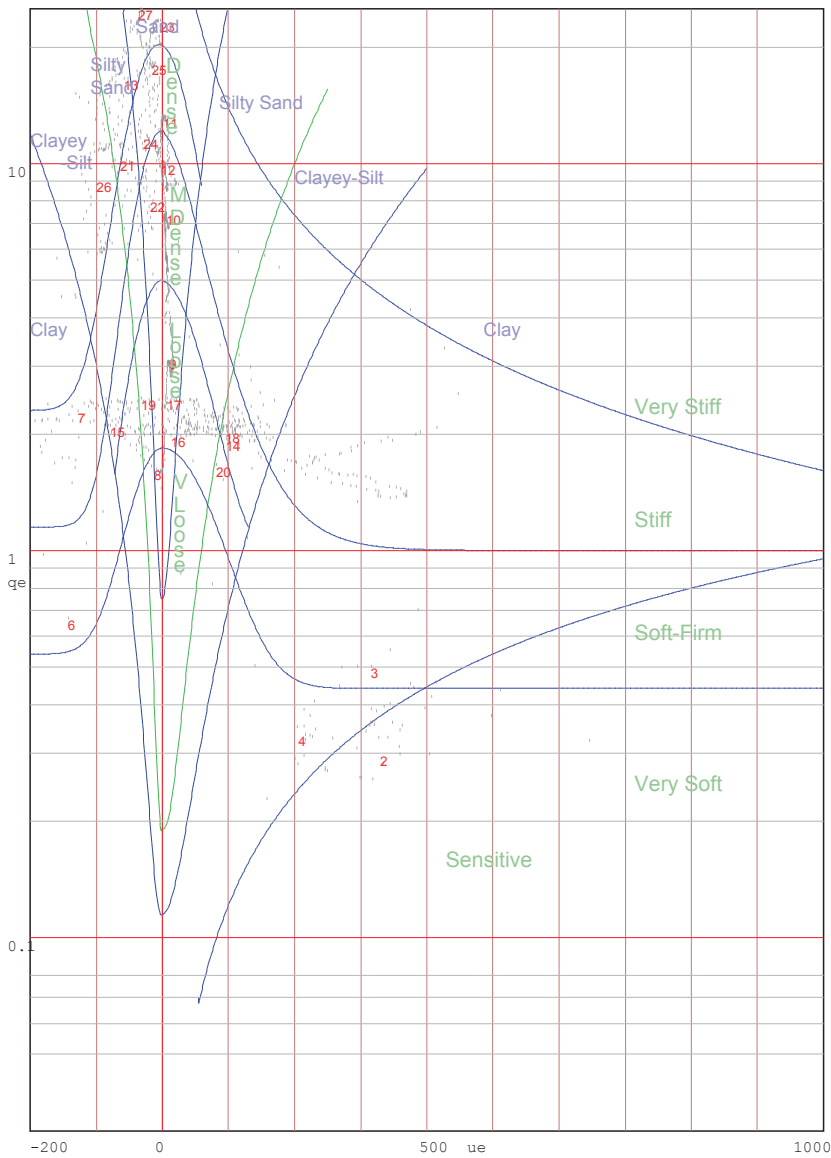
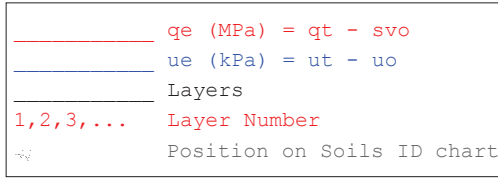
Project: Durban Harbour Over Water

Site: Pier2

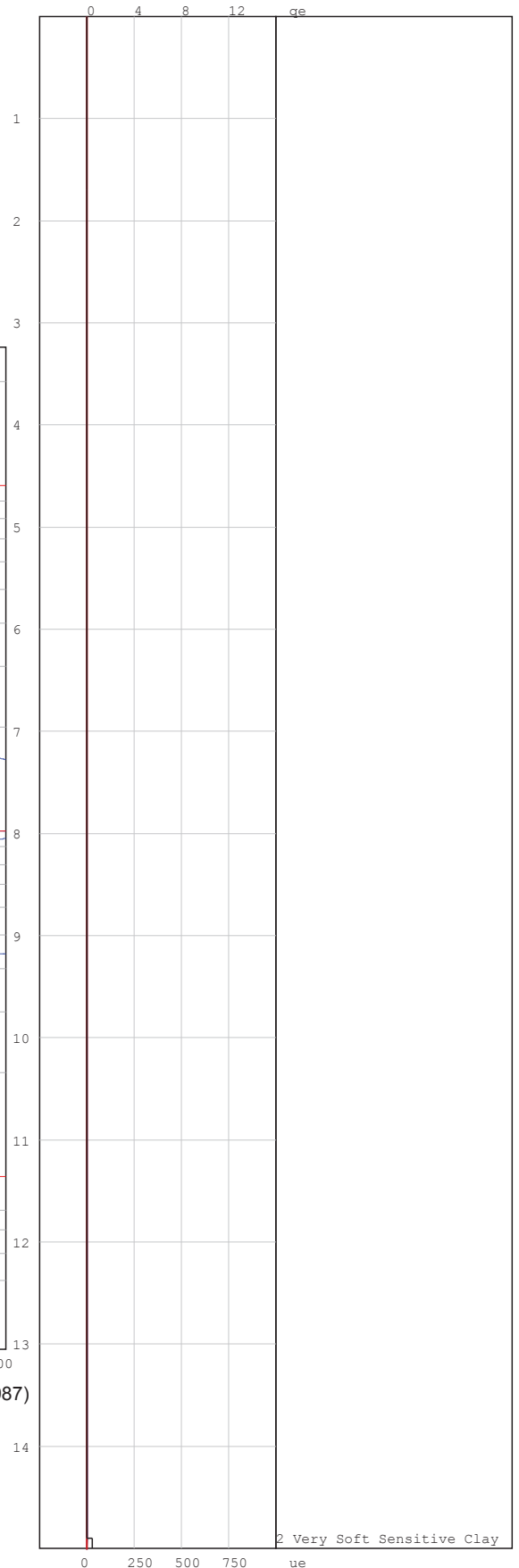
Hole No: CPT30

Date: 2012/06/12

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

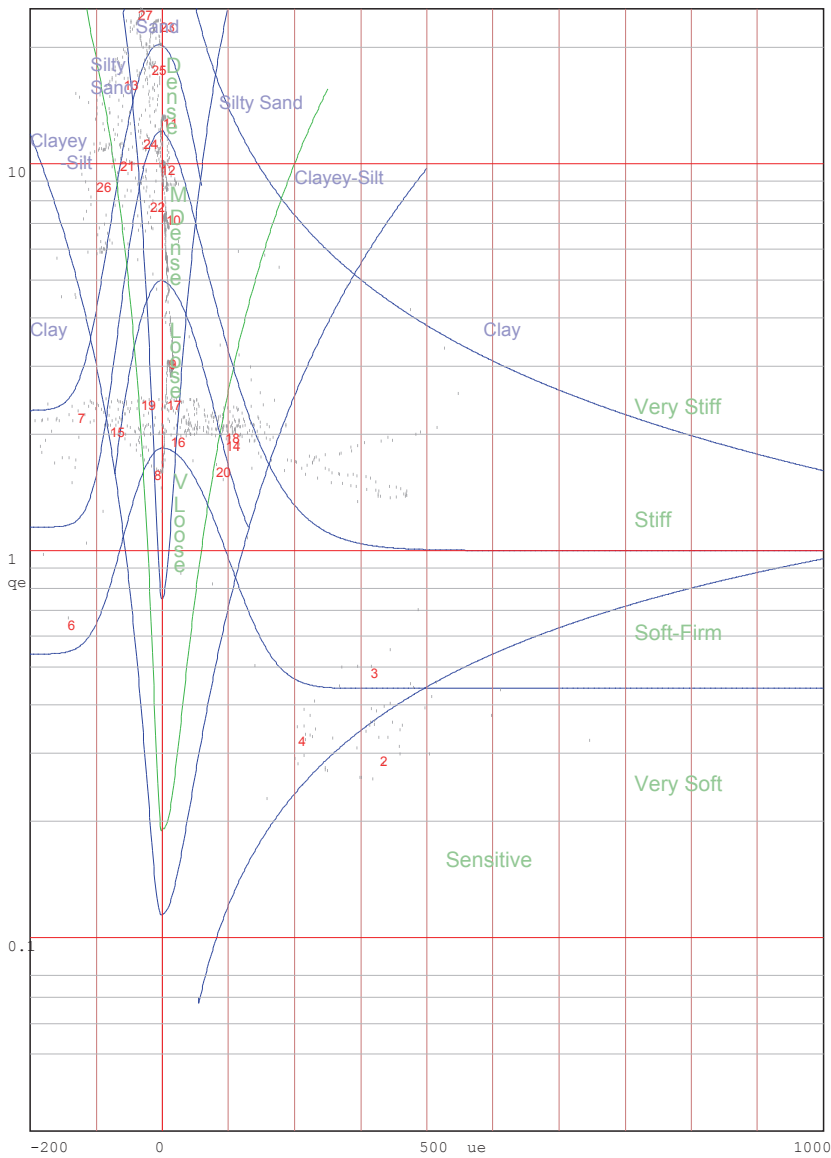
Site: Pier2

Hole No: CPT30

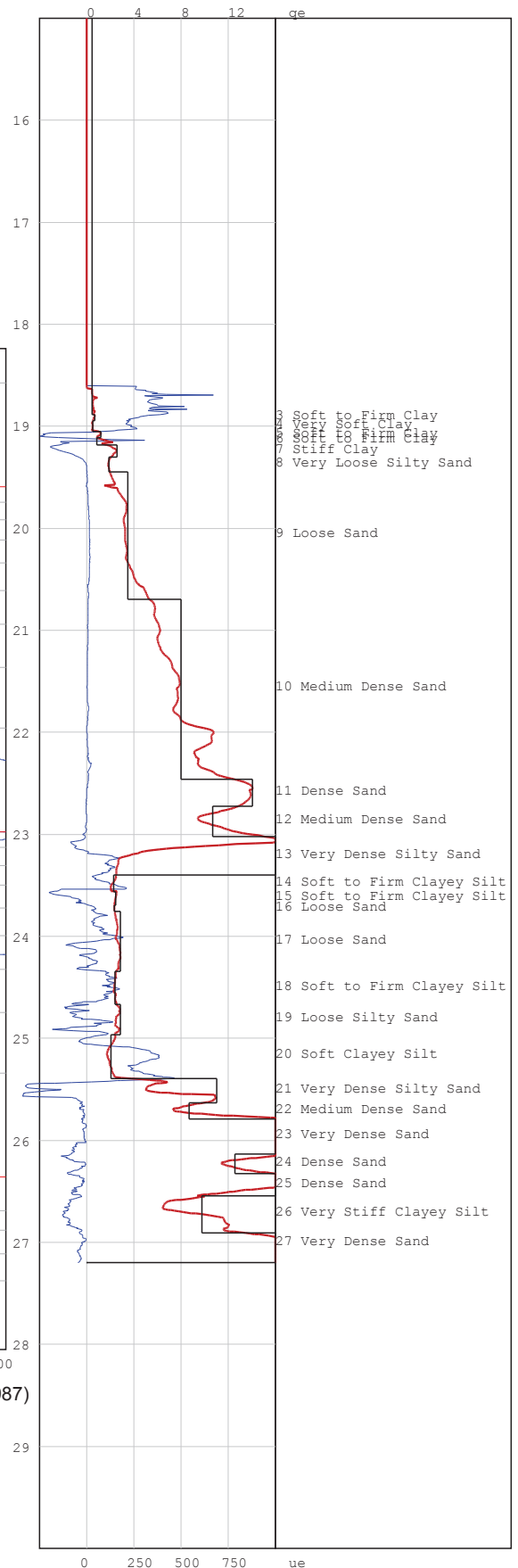
Date: 2012/06/12

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
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 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

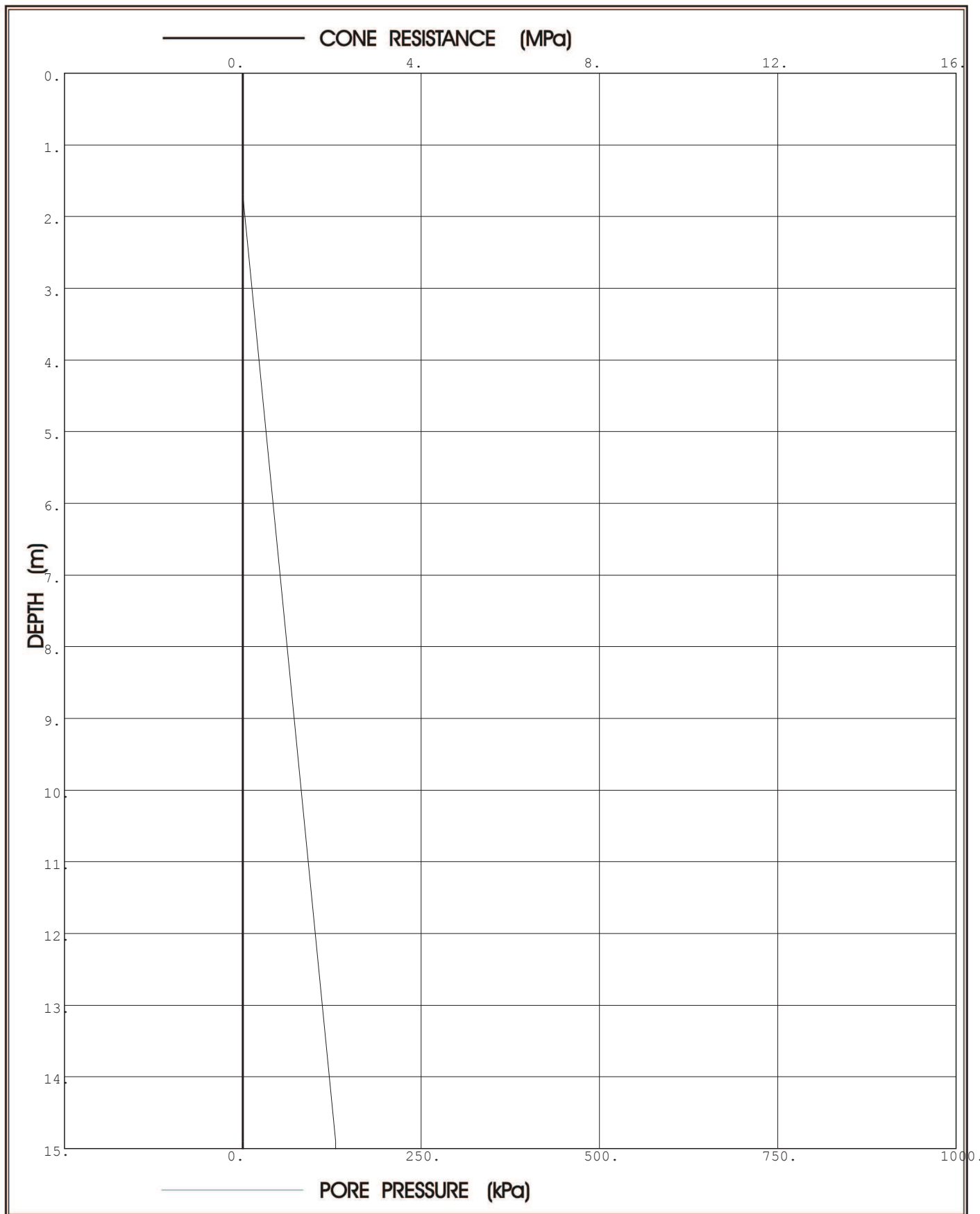
SITE: Pier2

CPTU (RE): CPT31

DATE: 2012/06/09

Probe: GHANA

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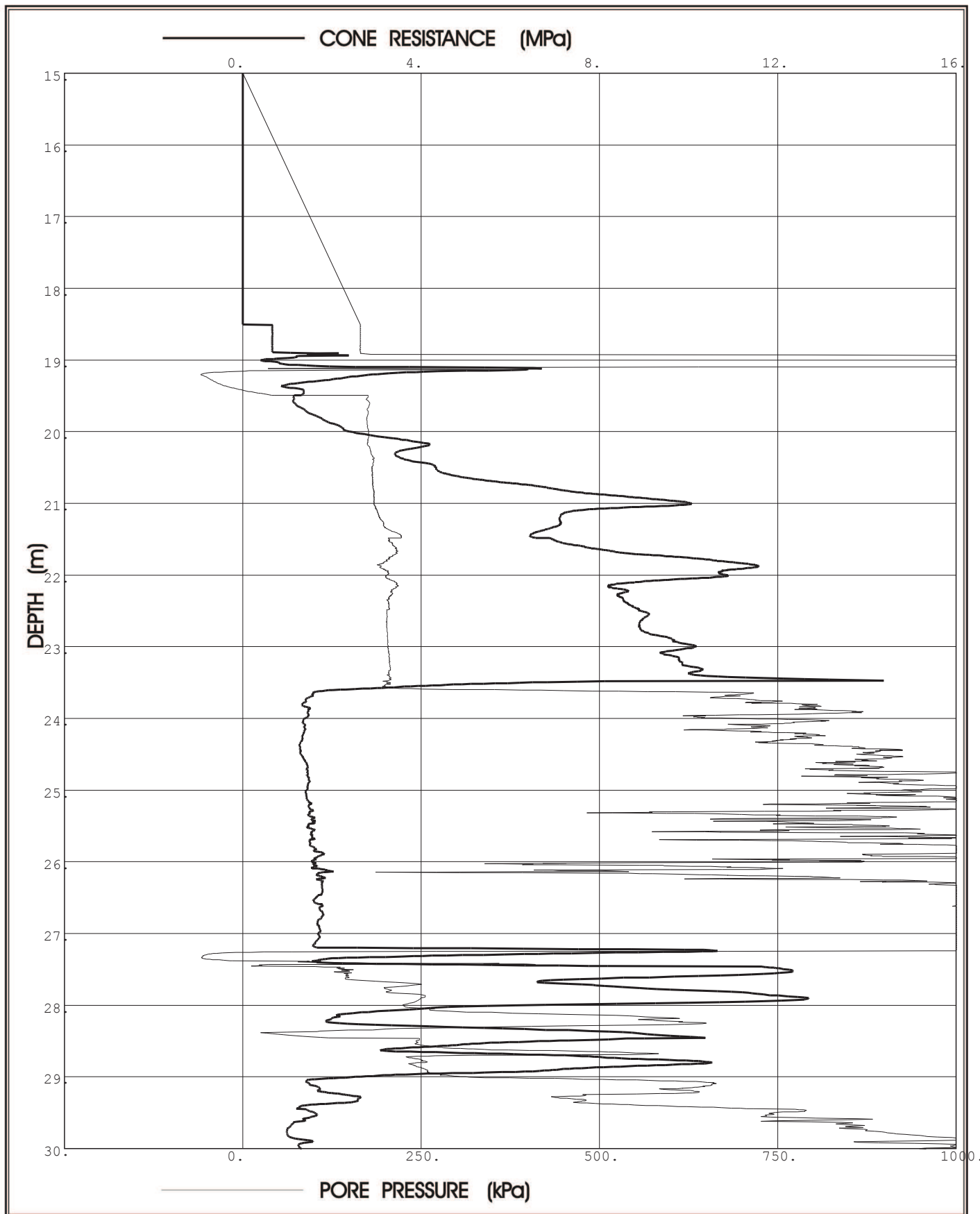
SITE: Pier2

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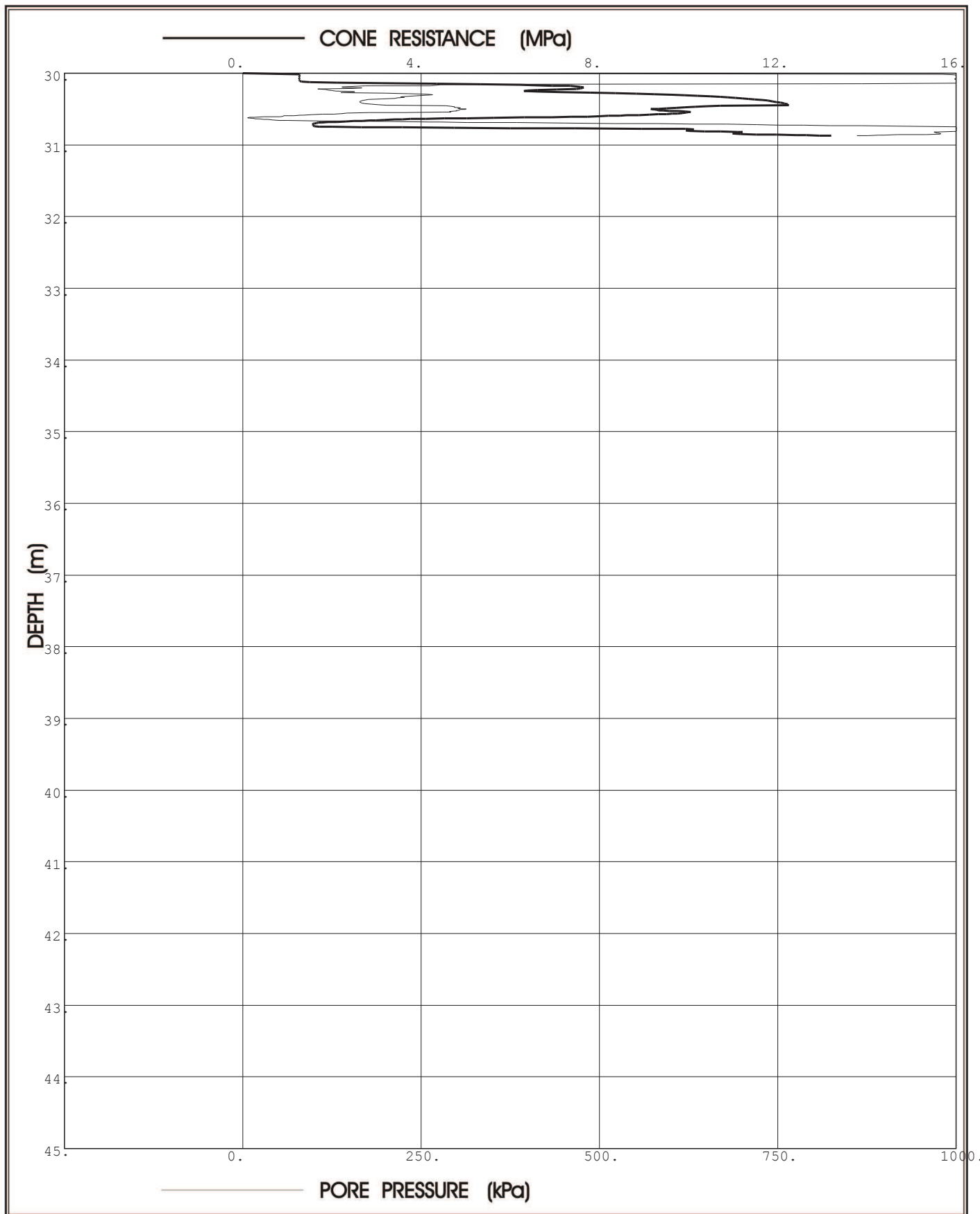
SITE: Pier2

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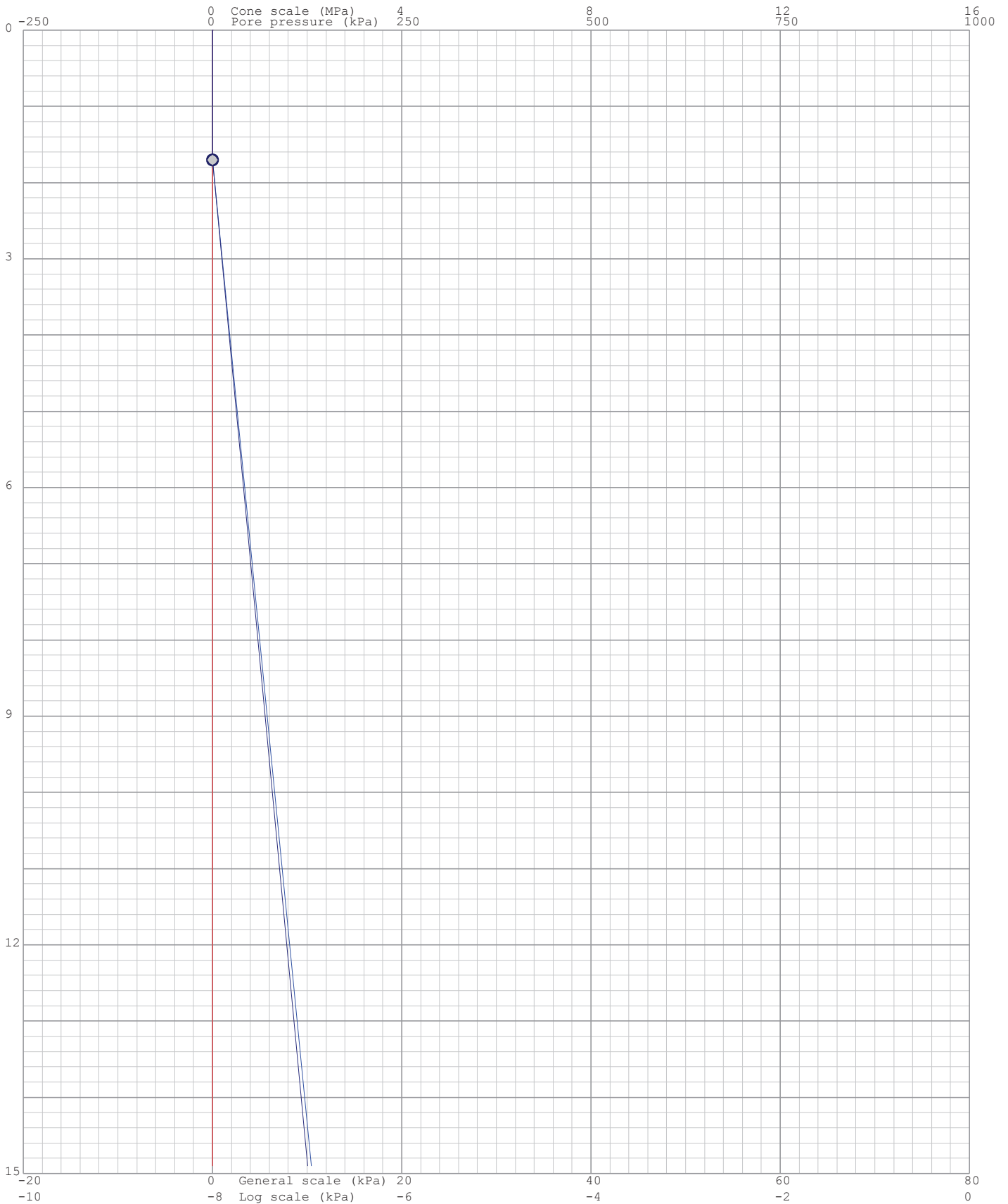
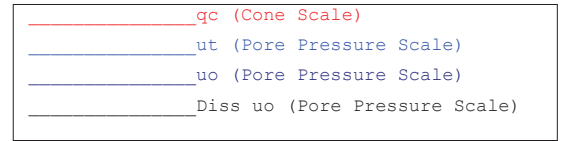
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT31

Date: 2012/06/09

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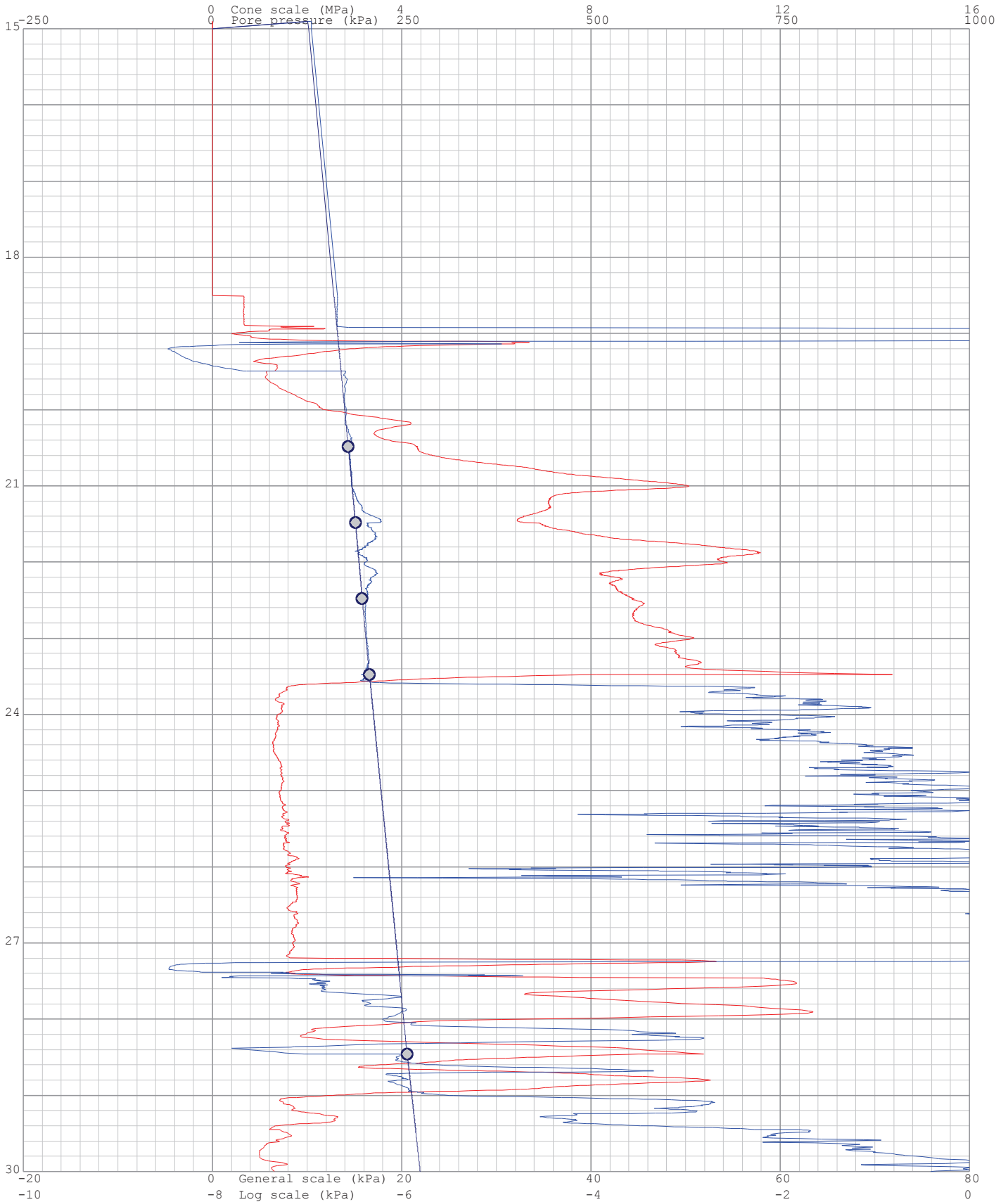
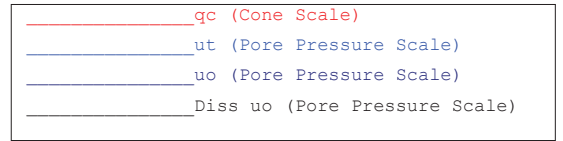
Project: Durban Harbour Over Water

Site: Pier2

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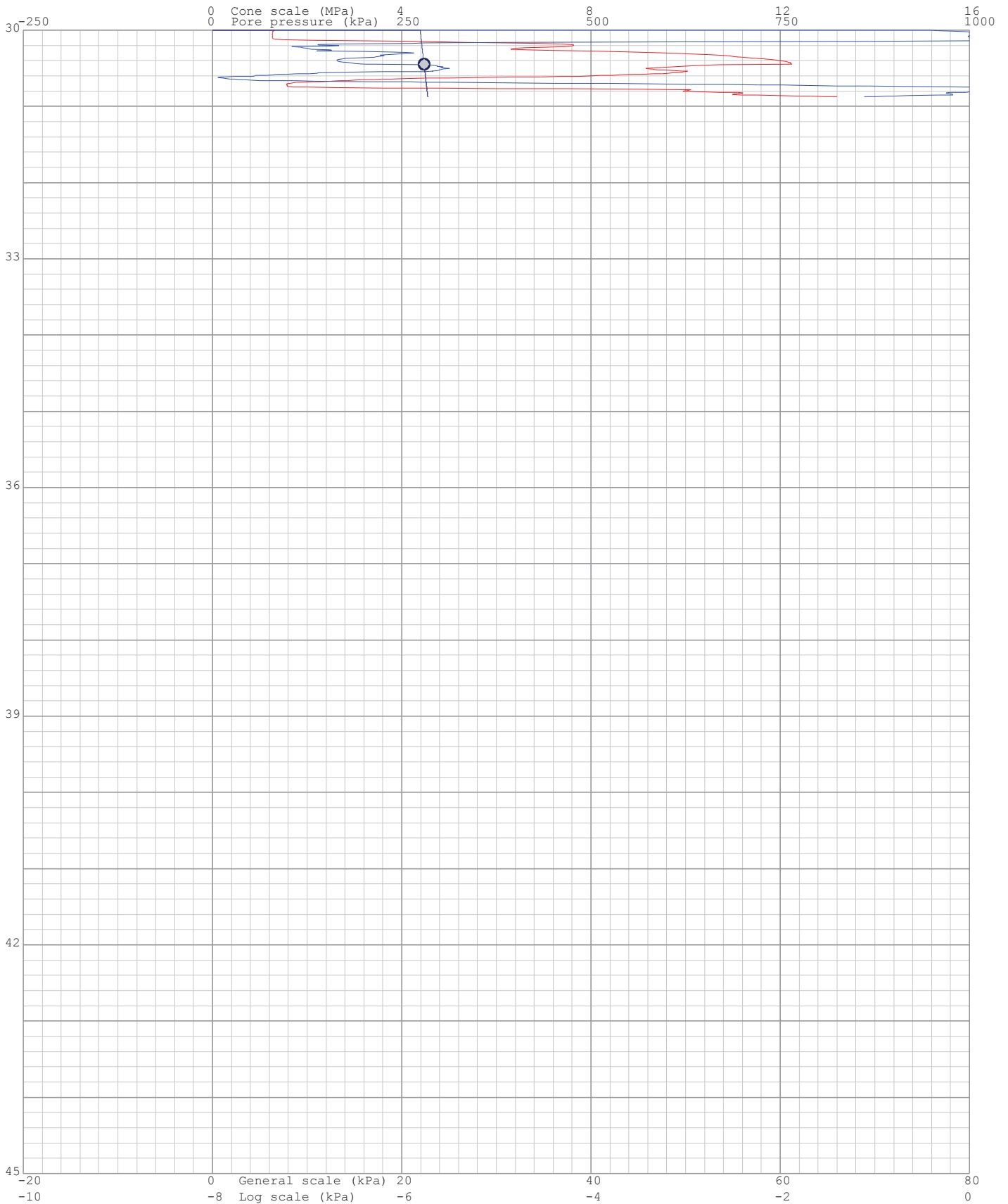
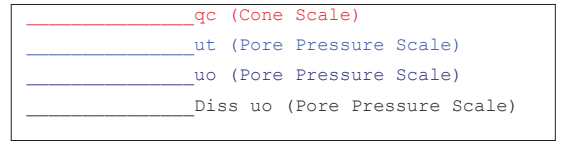
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT31

Date: 2012/06/09

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Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT31

Date: 2012/06/09

Probe: GHANA  
Page: 1

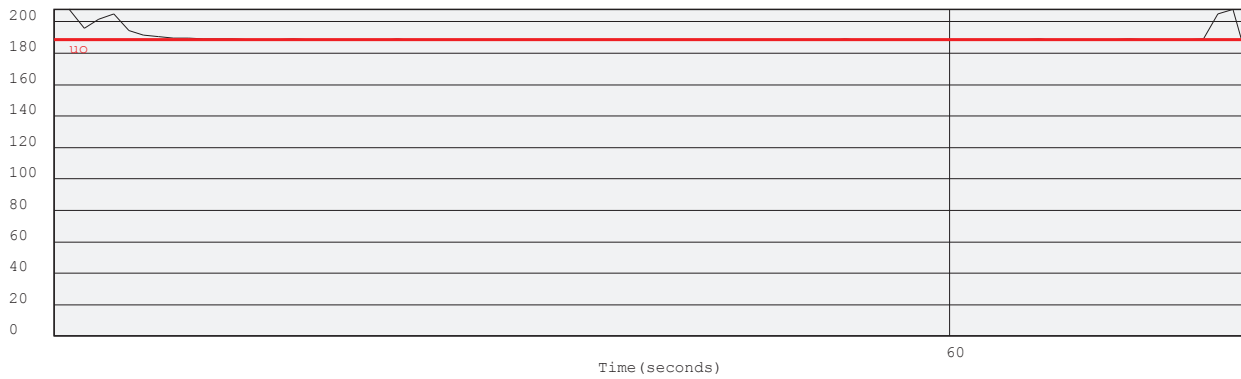
(kPa) Dissipation at: 1.7m



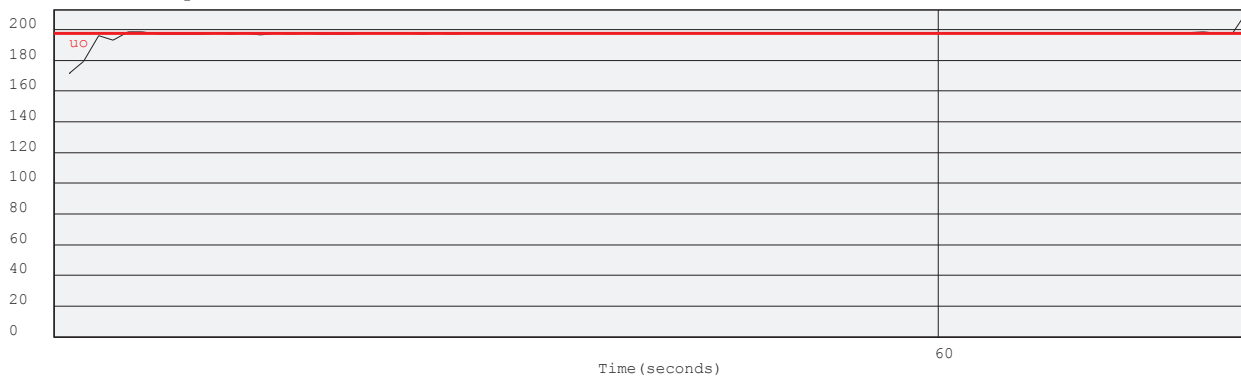
(kPa) Dissipation at: 20.486m



(kPa) Dissipation at: 21.481m



(kPa) Dissipation at: 22.478m



Project: Durban Harbour Over Water

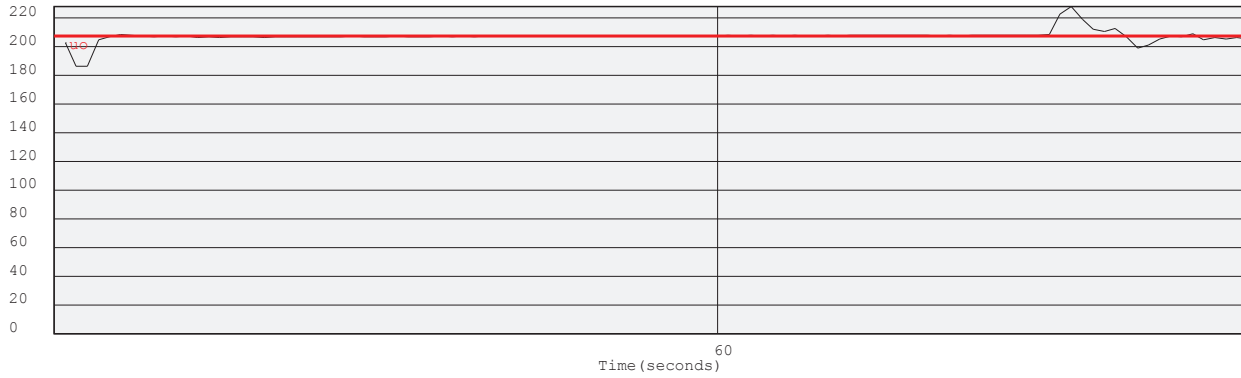
Site: Pier2

Hole: CPT31

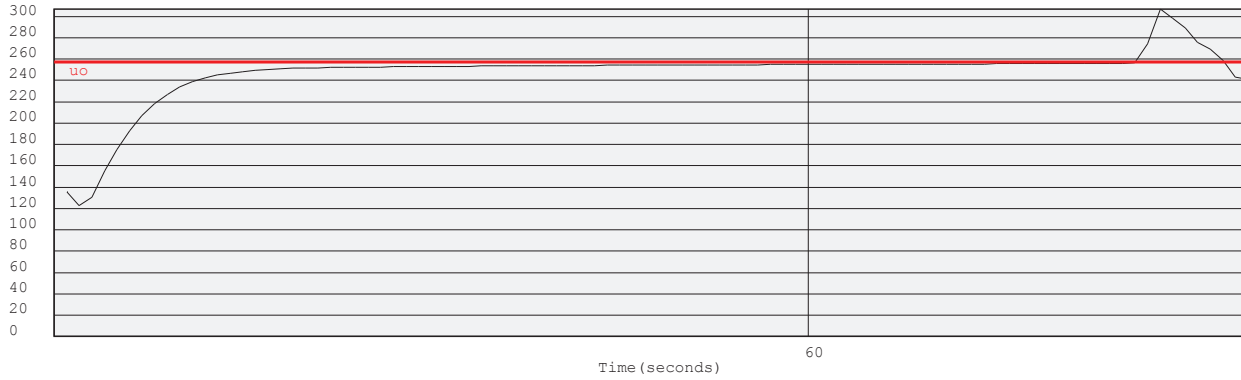
Date: 2012/06/09

Probe: GHANA  
Page: 2

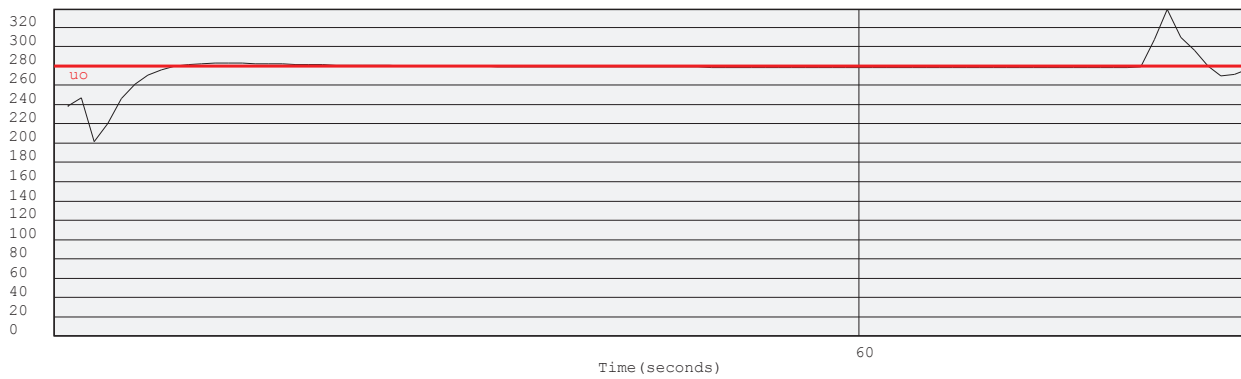
(kPa) Dissipation at: 23.475m



(kPa) Dissipation at: 28.456m



(kPa) Dissipation at: 30.448m



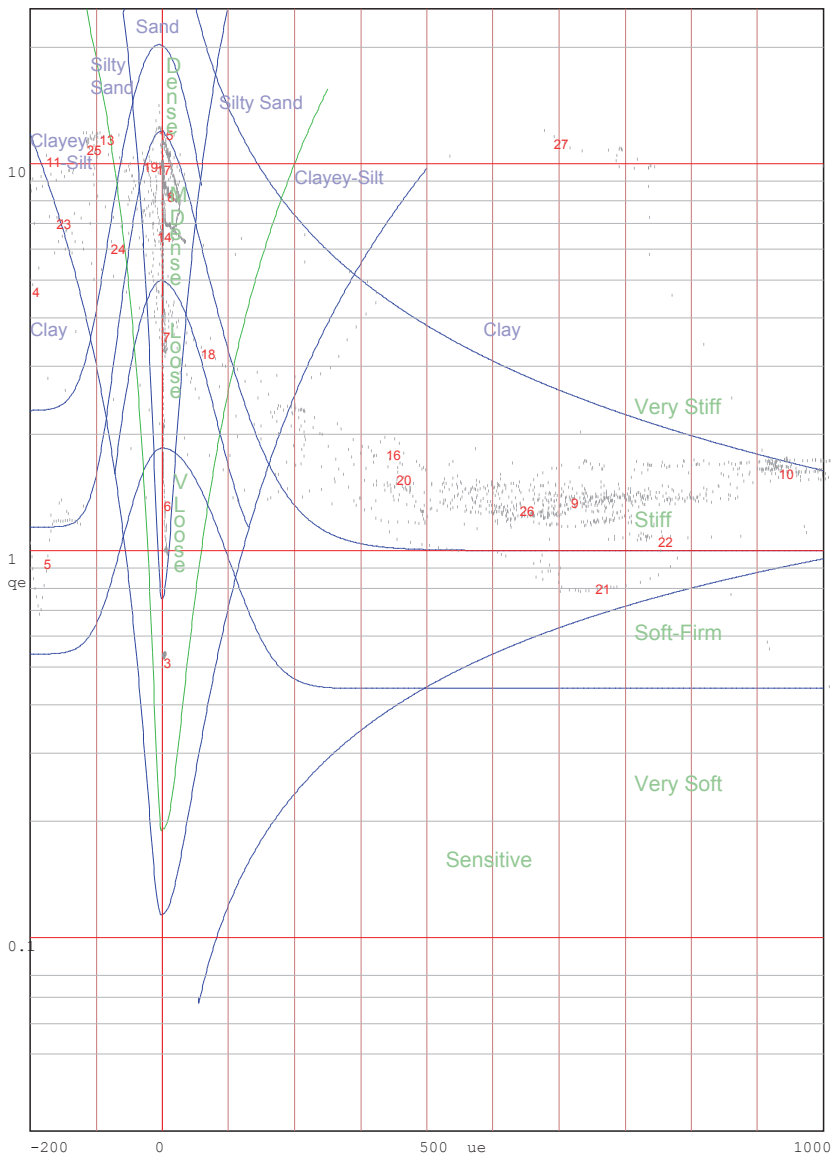
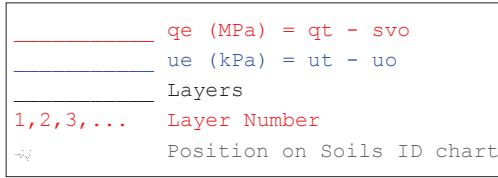
Project: Durban Harbour Over Water

Site: Pier2

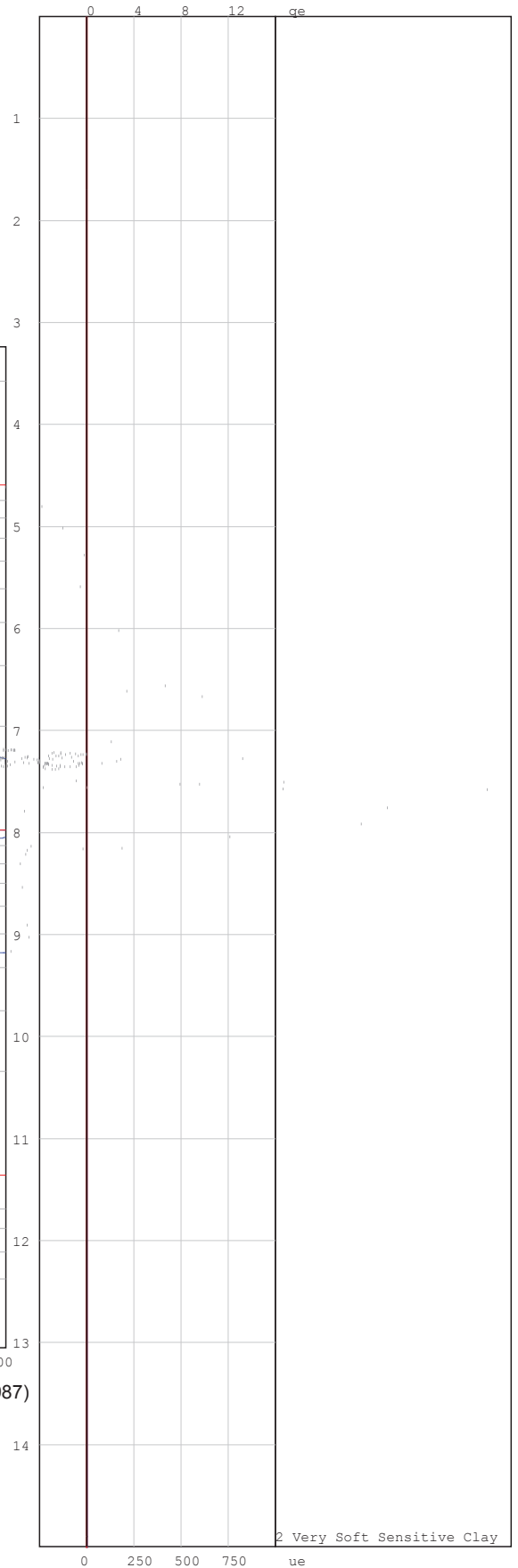
Hole No: CPT31

Date: 2012/06/09

Probe: GHANA



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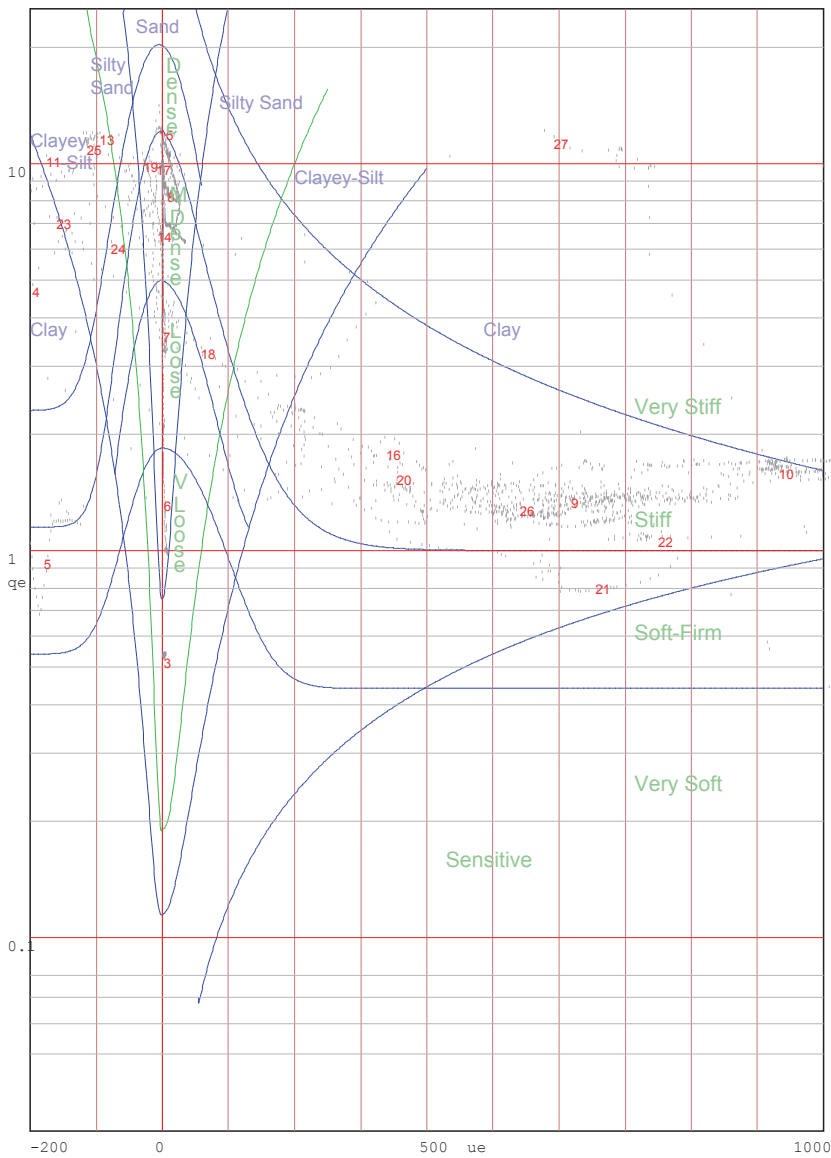
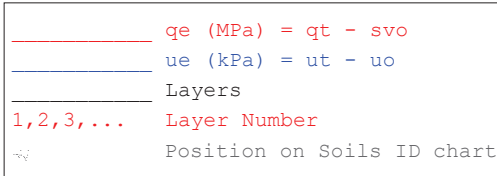
Project: Durban Harbour Over Water

Site: Pier2

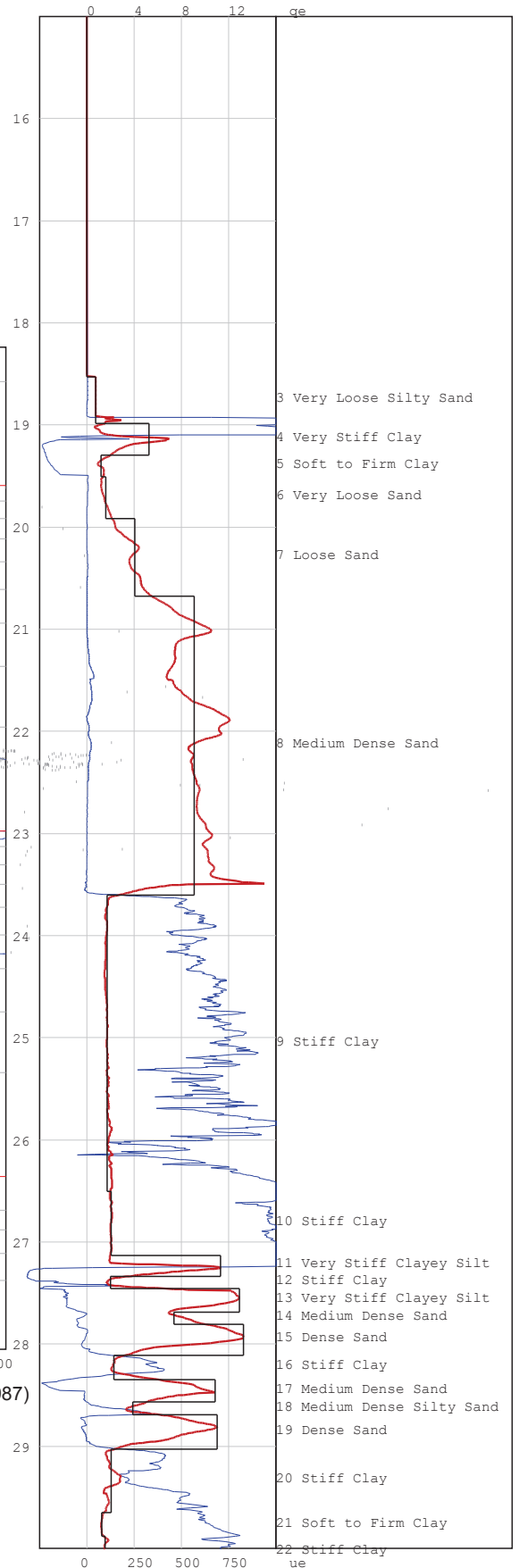
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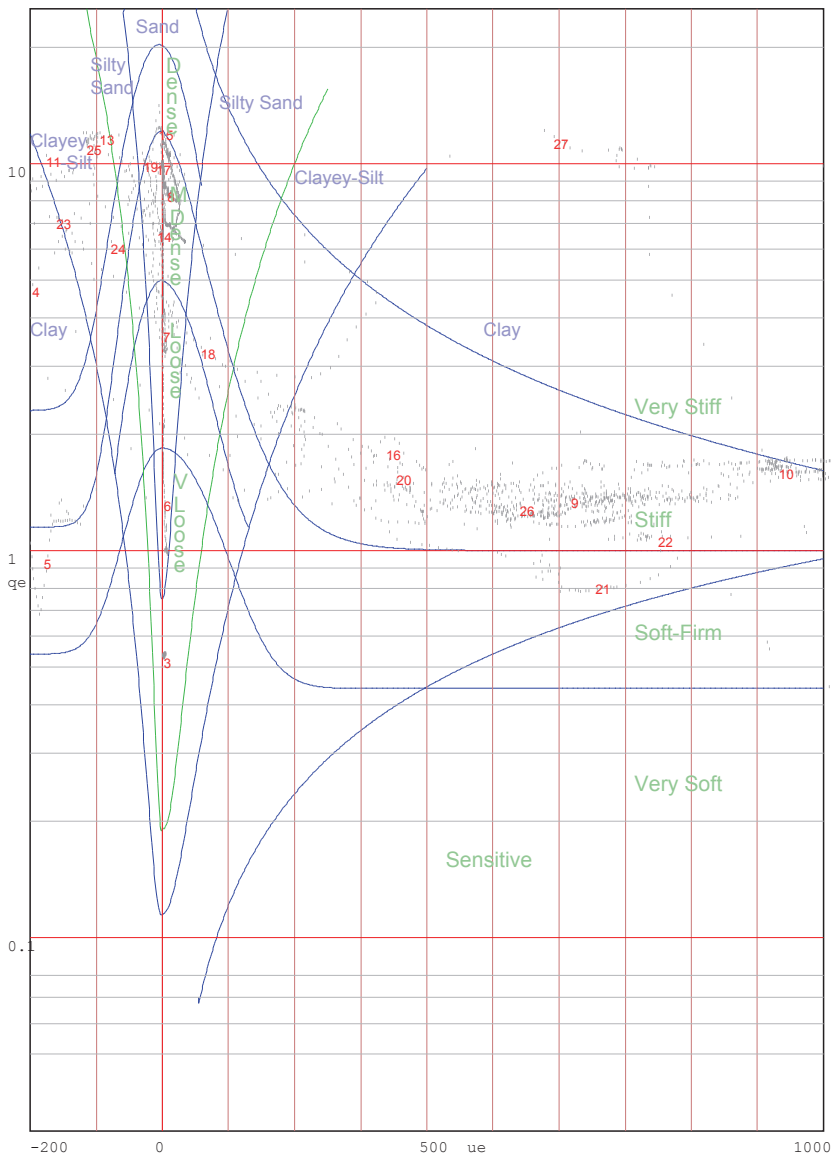
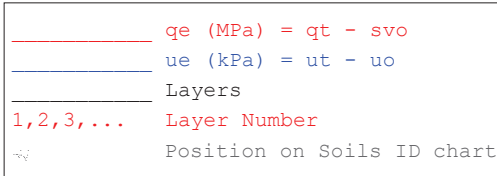
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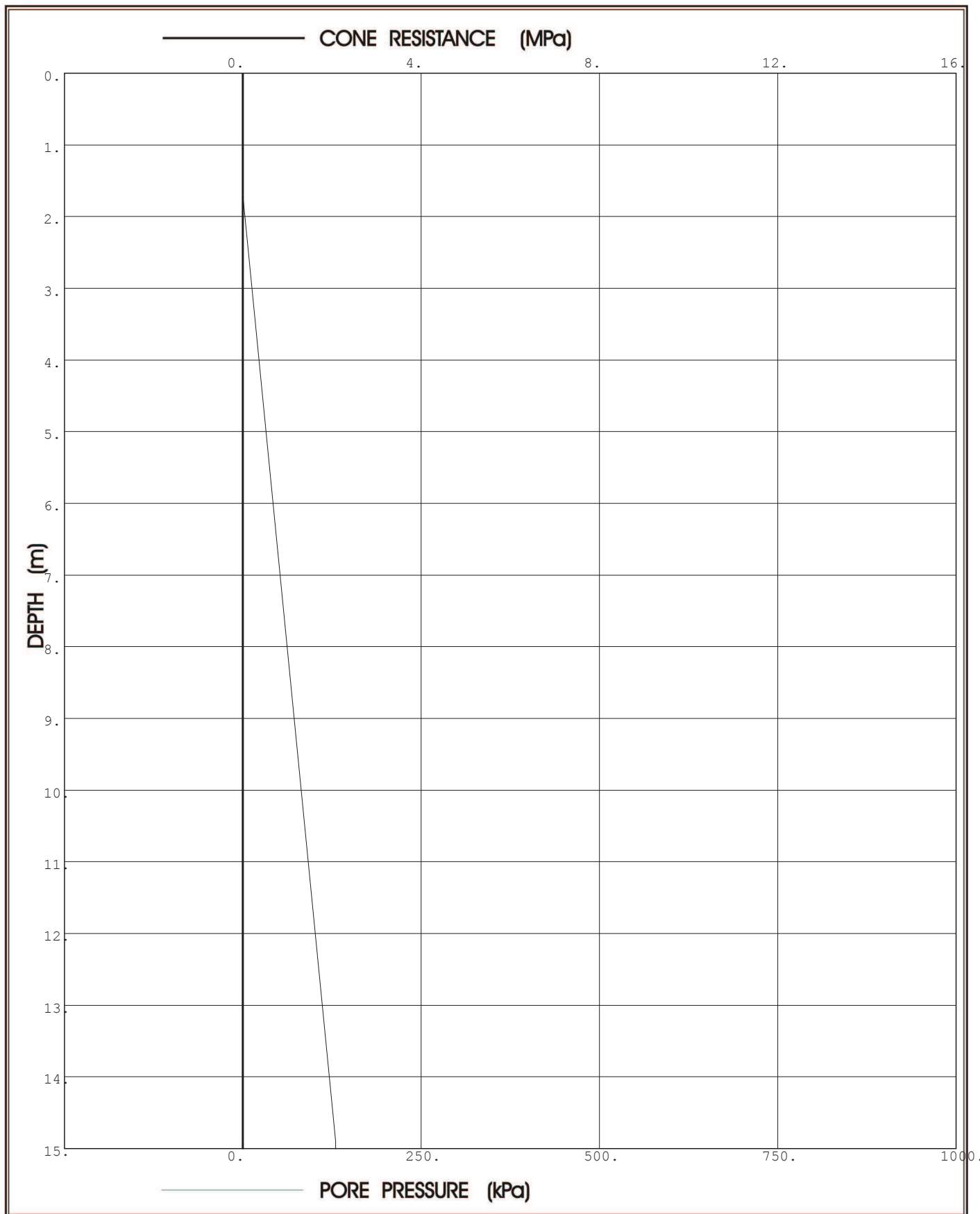
SITE: Pier2

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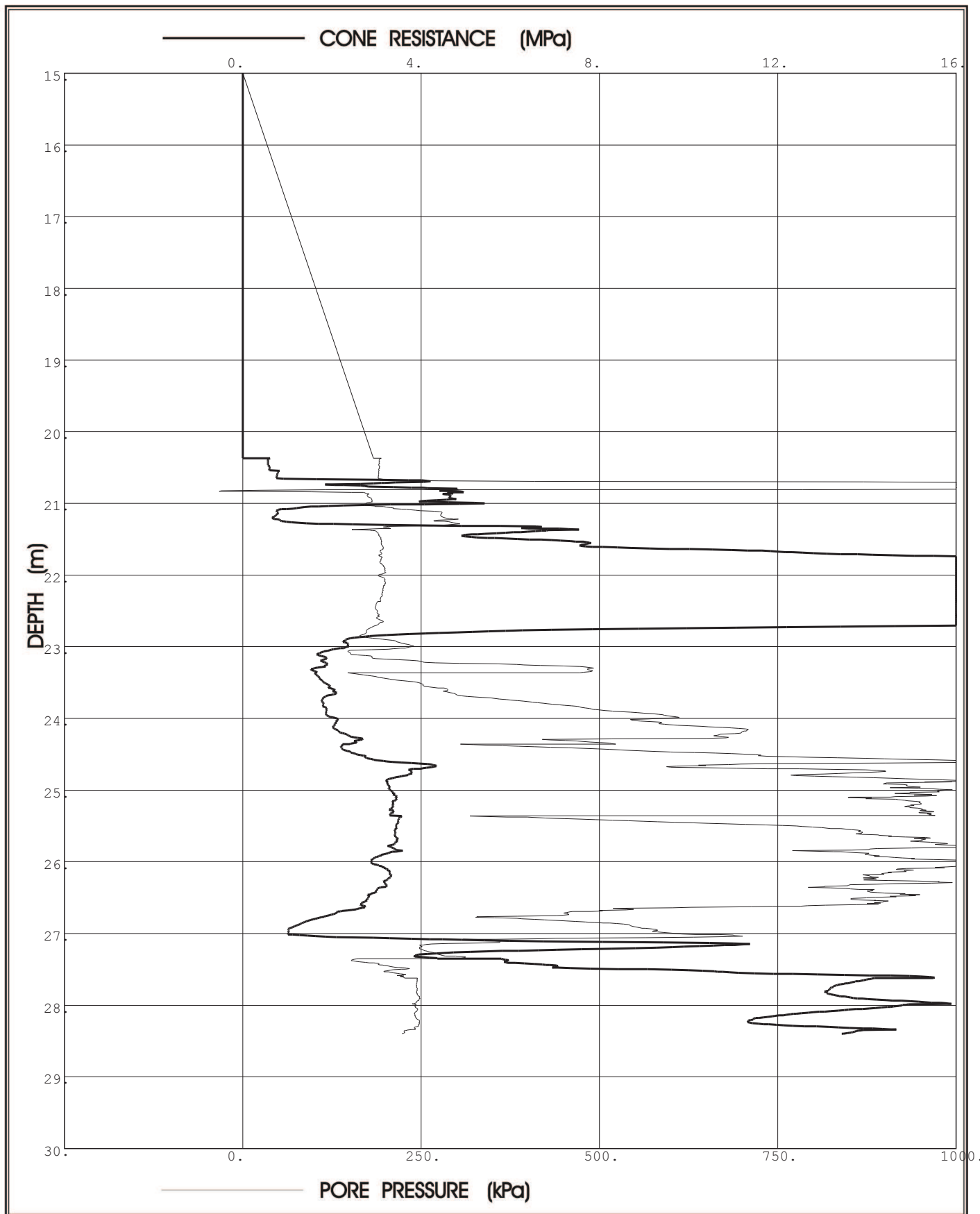
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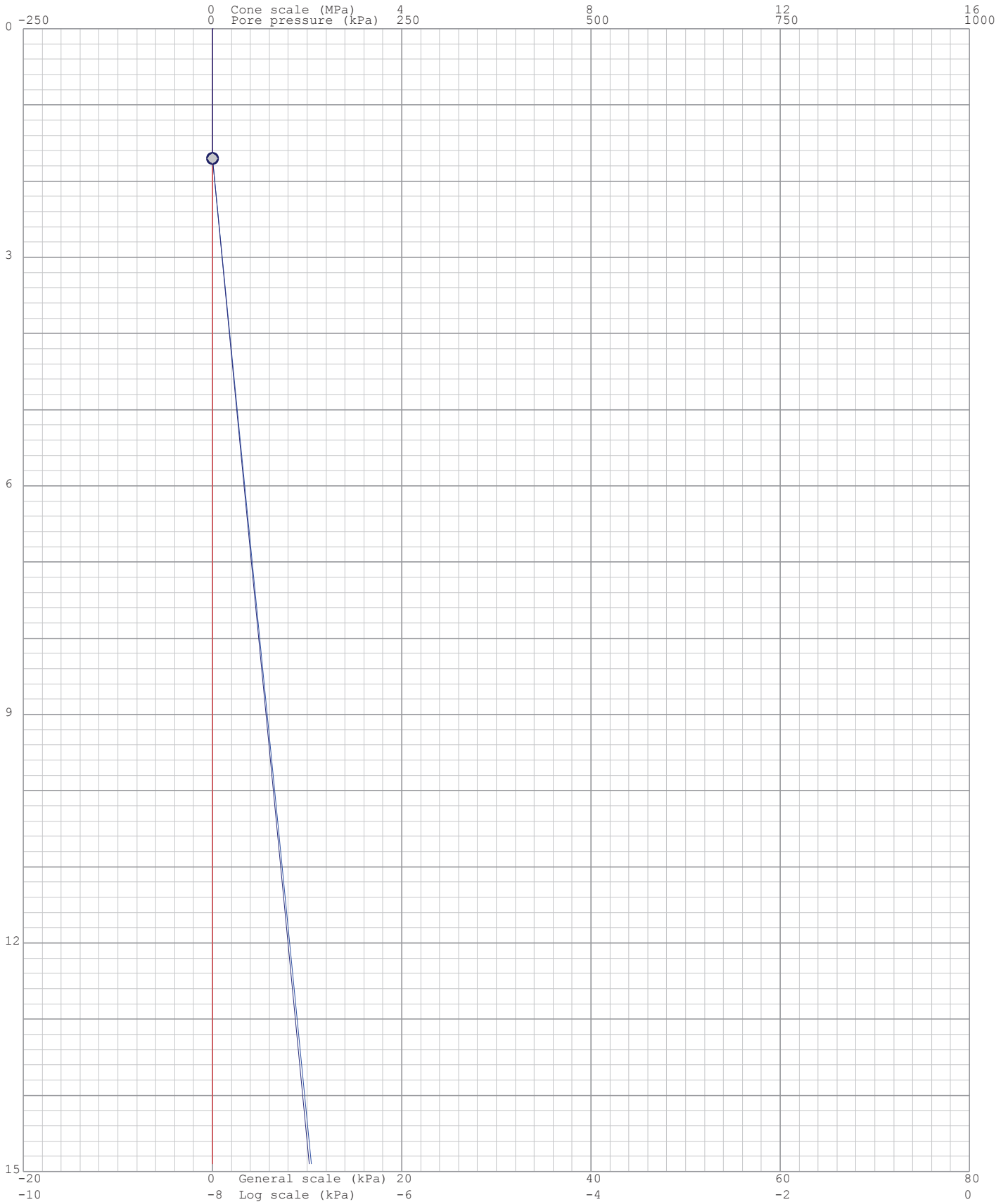
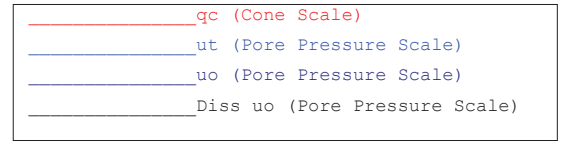
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT32

Date: 2012/06/10

Probe: GHANA



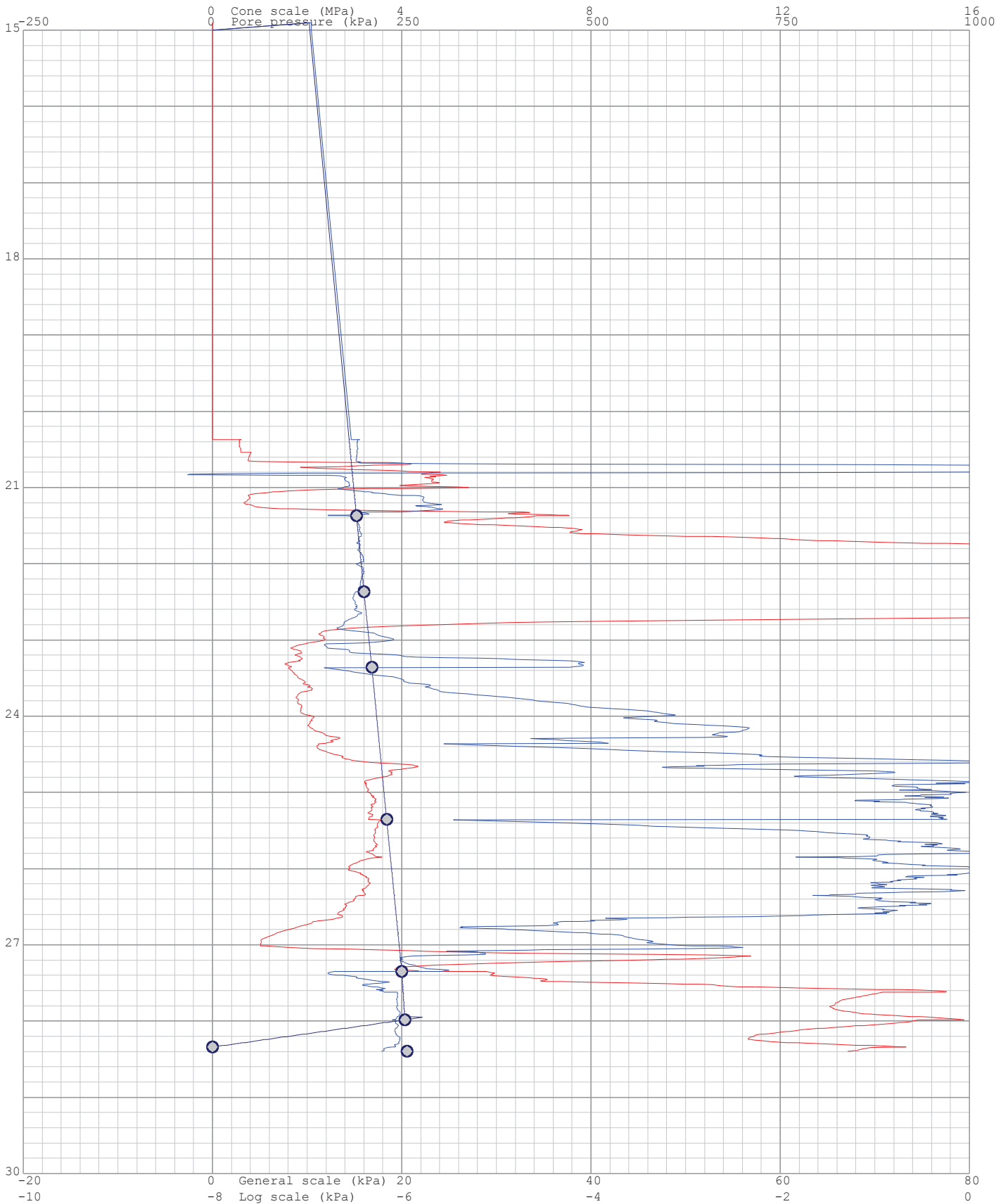
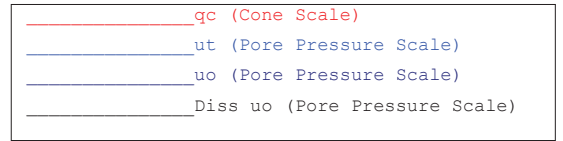
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT32

Date: 2012/06/10

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT32

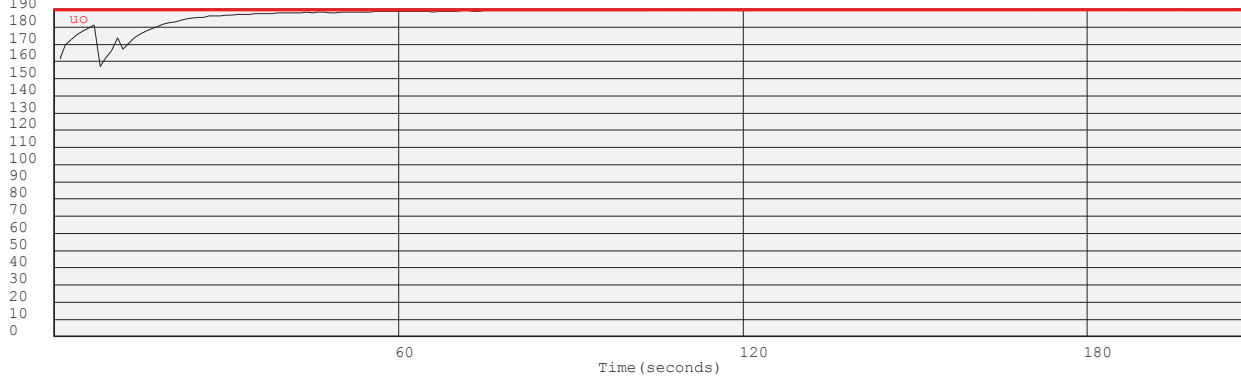
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Probe: GHANA  
Page: 1

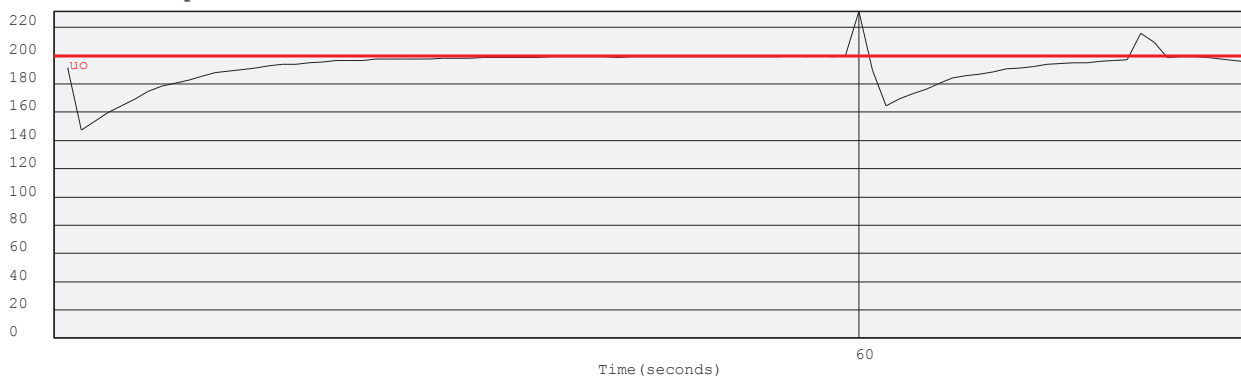
(kPa) Dissipation at: 1.7m



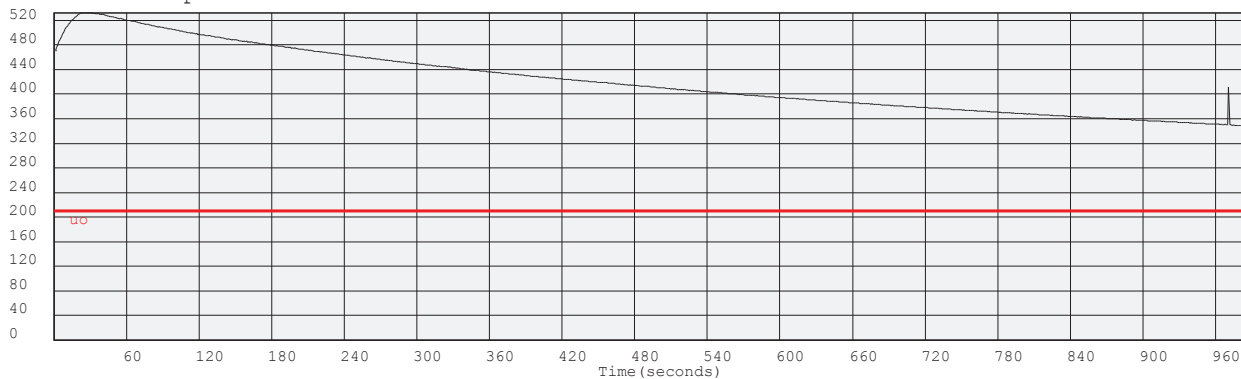
(kPa) Dissipation at: 21.369m



(kPa) Dissipation at: 22.366m



(kPa) Dissipation at: 23.361m



Project: Durban Harbour Over Water

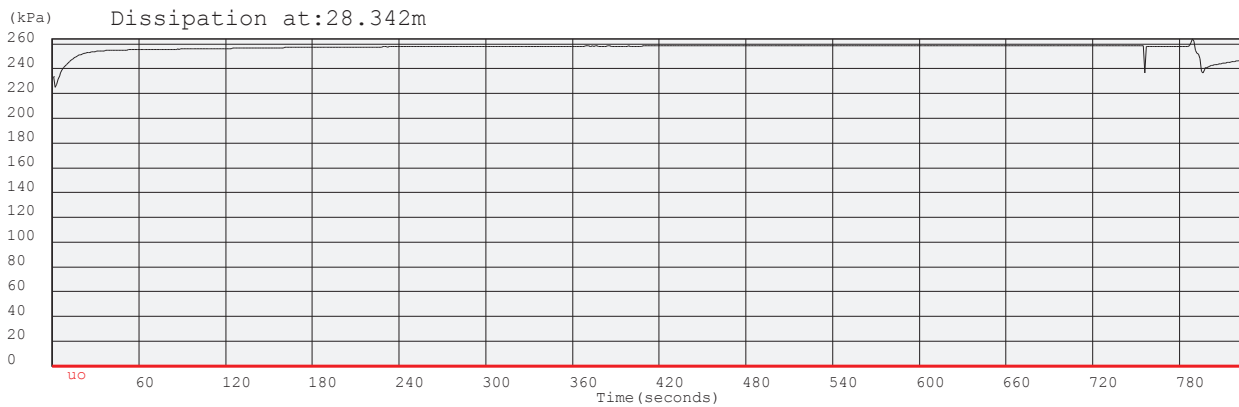
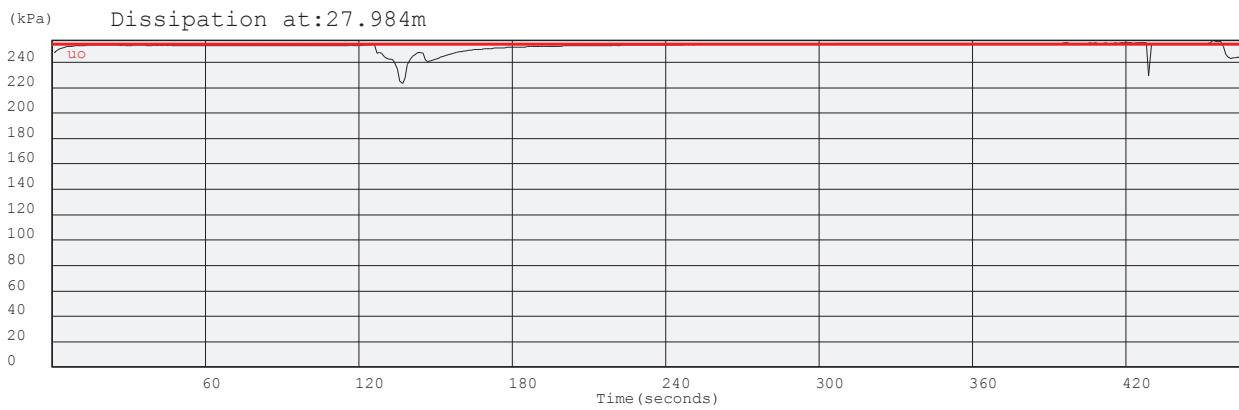
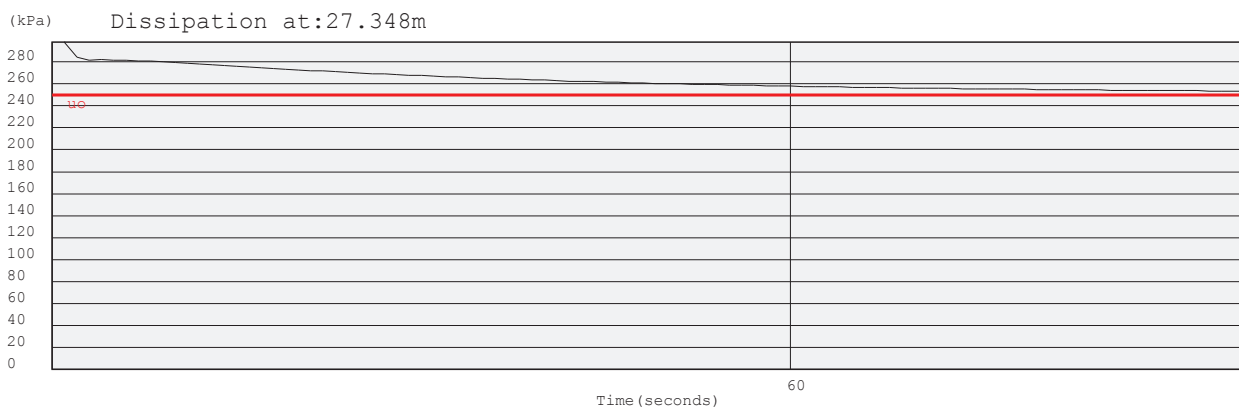
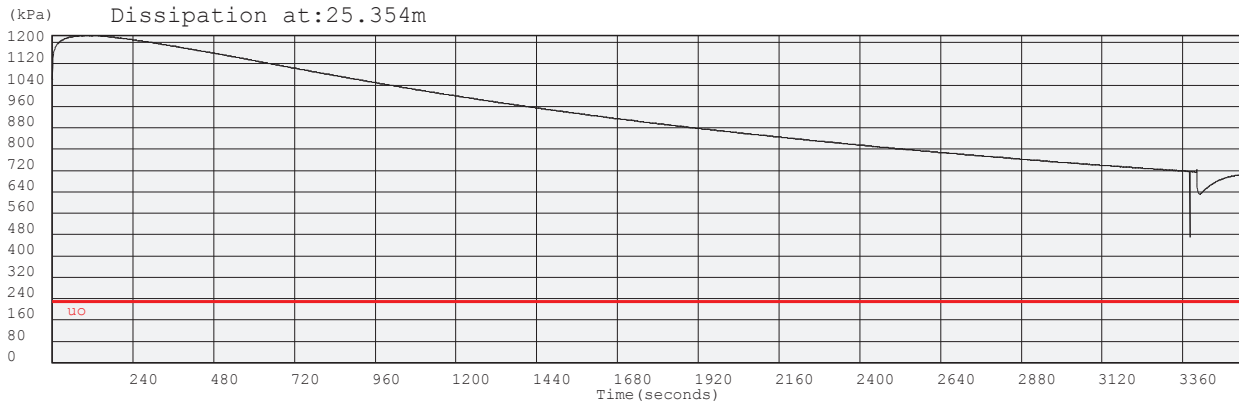
Site: Pier2

Hole: CPT32

Date: 2012/06/10

Probe: GHANA

Page: 2



Project: Durban Harbour Over Water

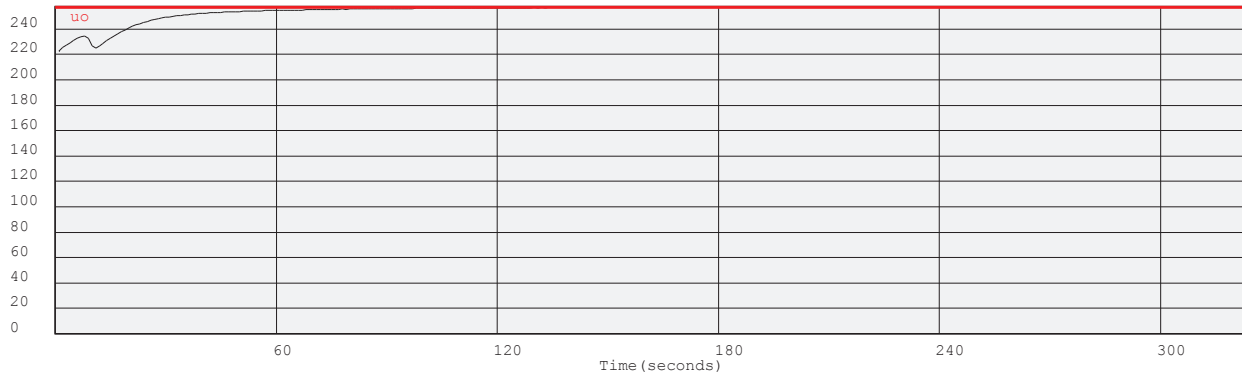
Site: Pier2

Hole: CPT32

Date: 2012/06/10

Probe: GHANA  
Page: 3

(kPa) Dissipation at: 28.398m





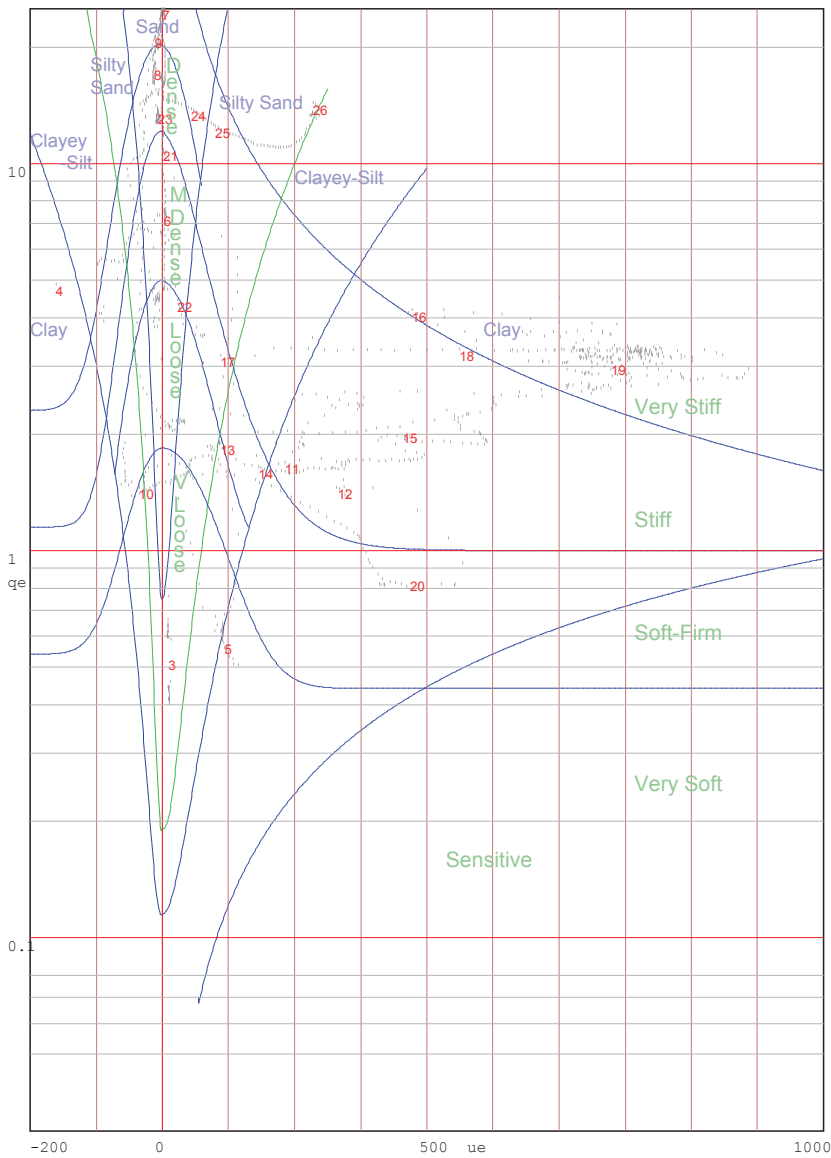
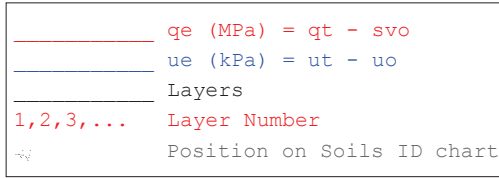
Project: Durban Harbour Over Water

Site: Pier2

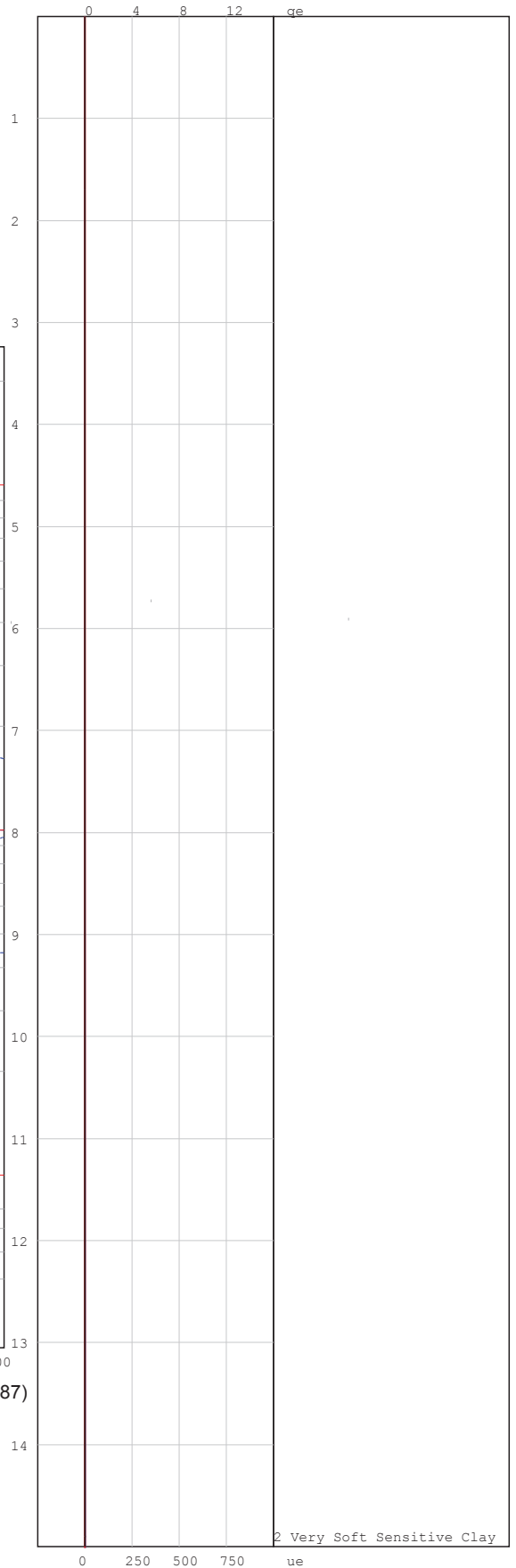
Hole No: CPT32

Date: 2012/06/10

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



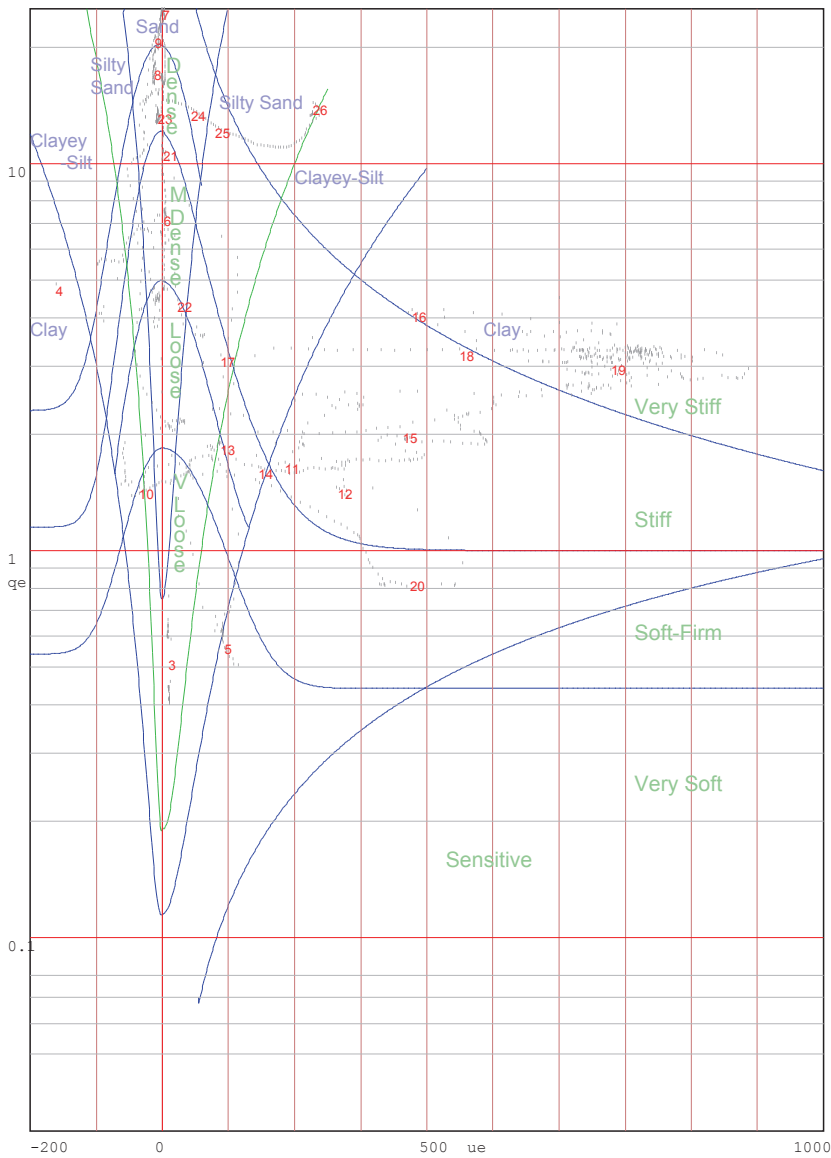
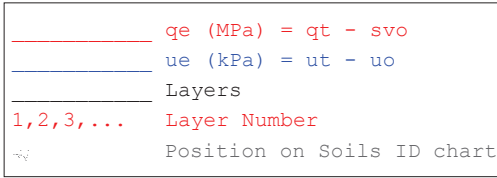
Project: Durban Harbour Over Water

Site: Pier2

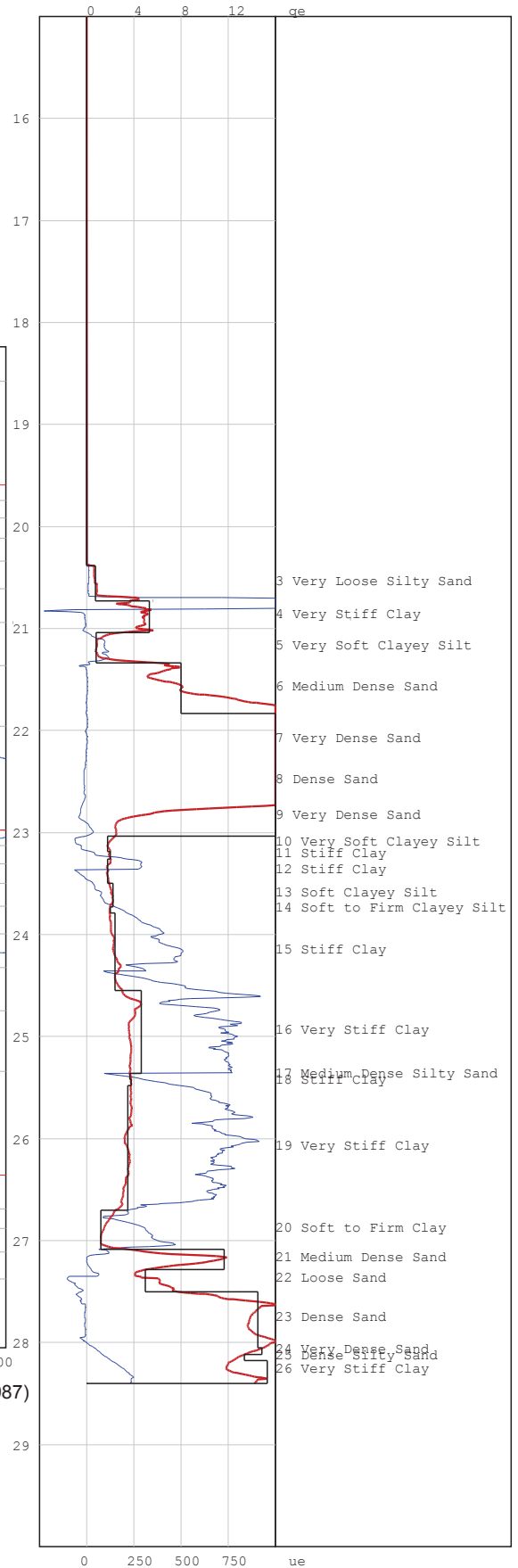
Hole No: CPT32

Date: 2012/06/10

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

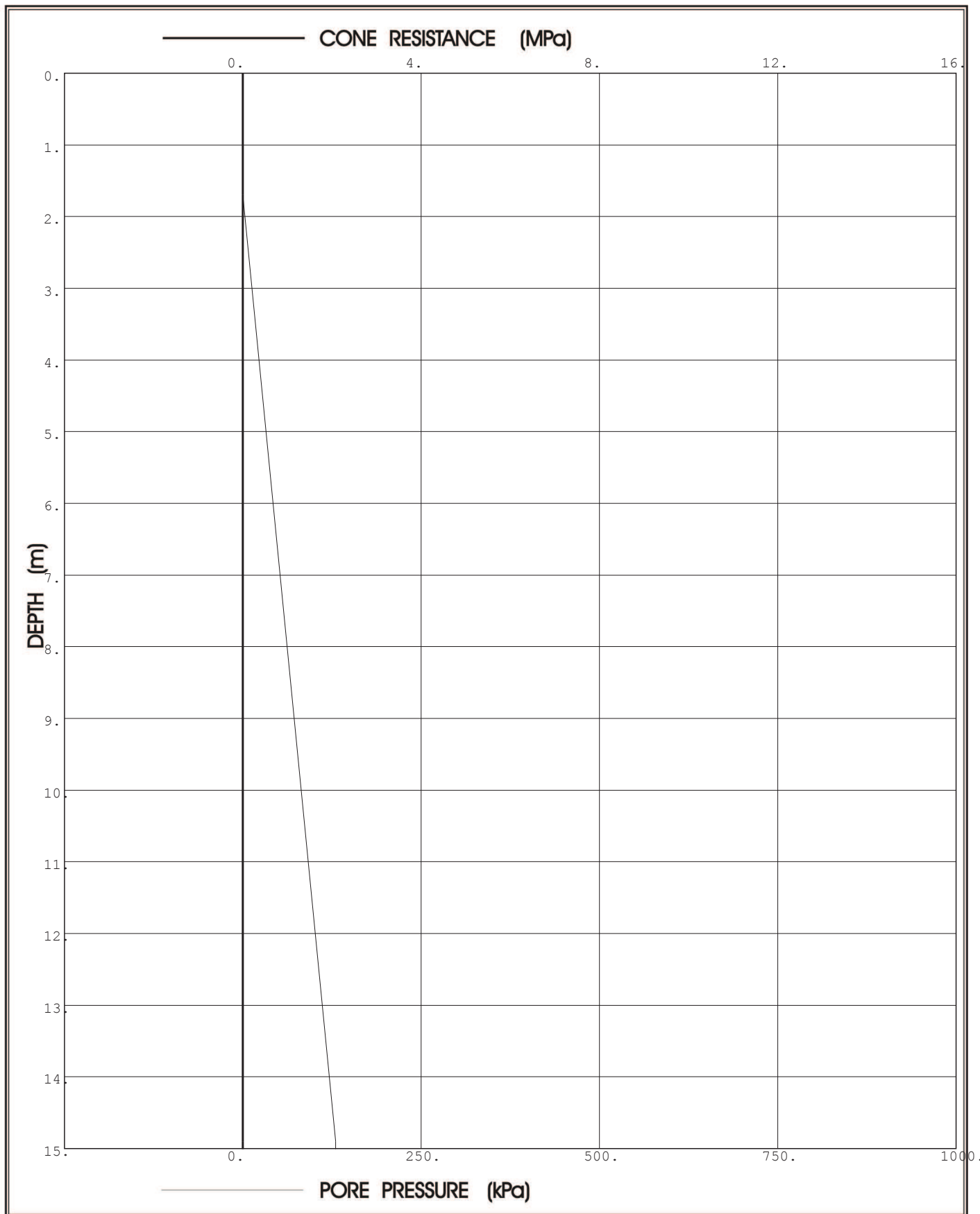
SITE: Pier2

CPTU (RE): CPT33B

DATE: 2012/06/07

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

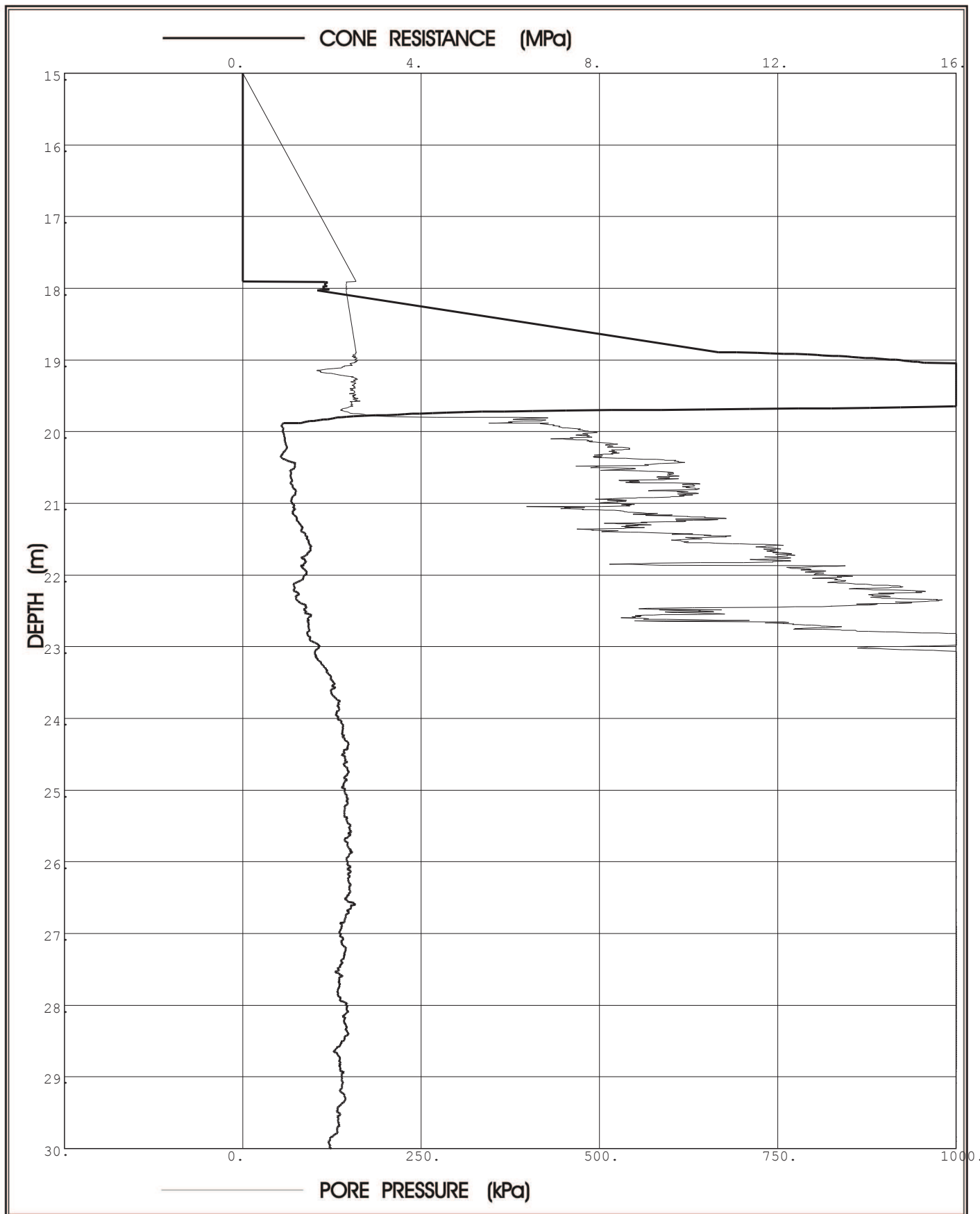
SITE: Pier2

CPTU (RE): CPT33B

DATE: 2012/06/07

Probe: GHANA

Page:2



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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PROJECT: Durban Harbour Over Water

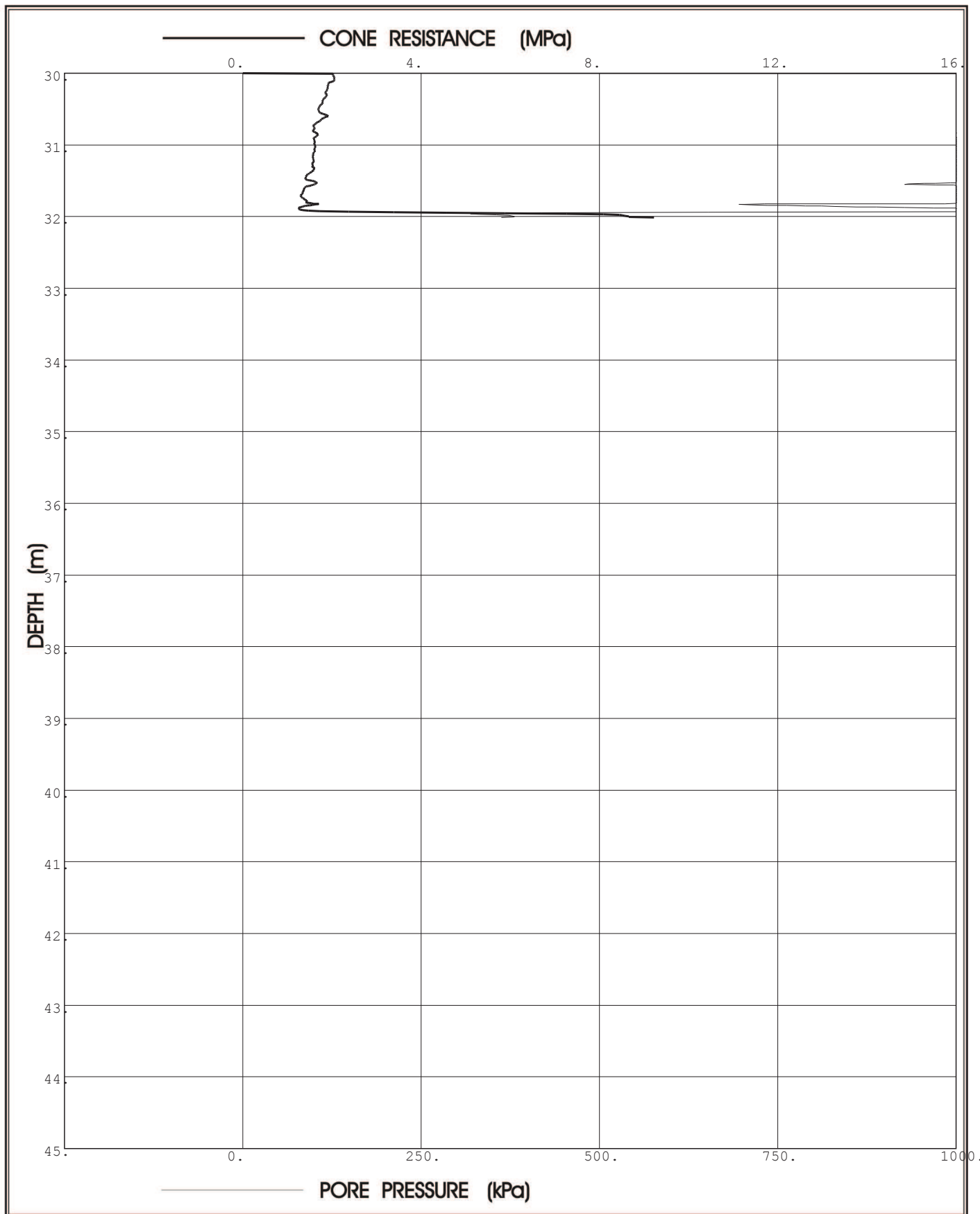
SITE: Pier2

CPTU (RE): CPT33B

DATE: 2012/06/07

Probe: GHANA

Page: 3



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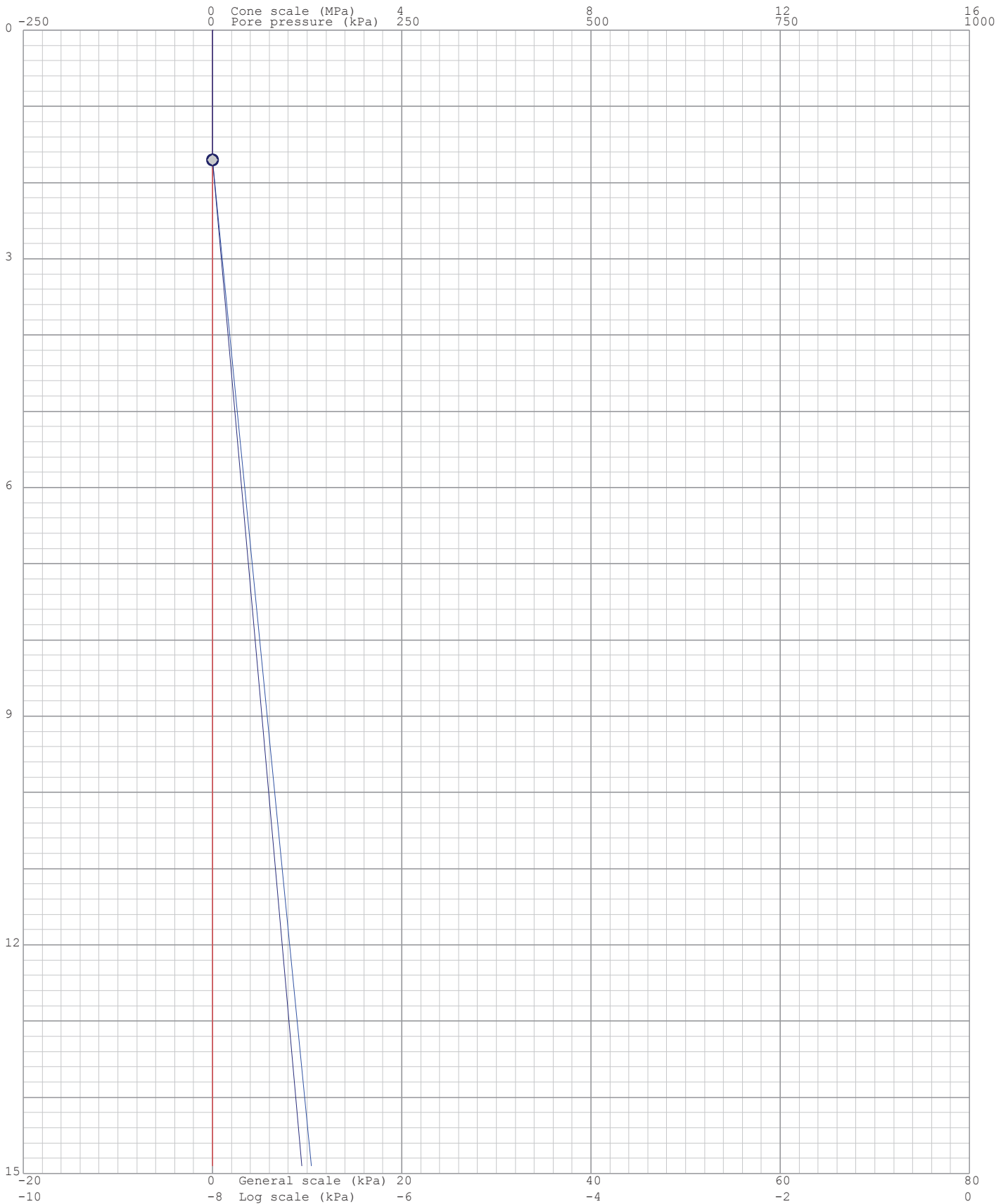
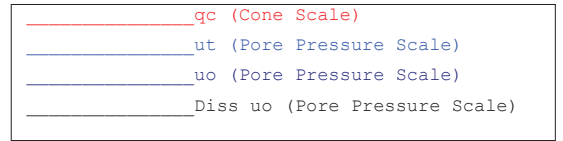
rust@global.co.za

Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT33B  
Date: 2012/06/07

Probe: GHANA

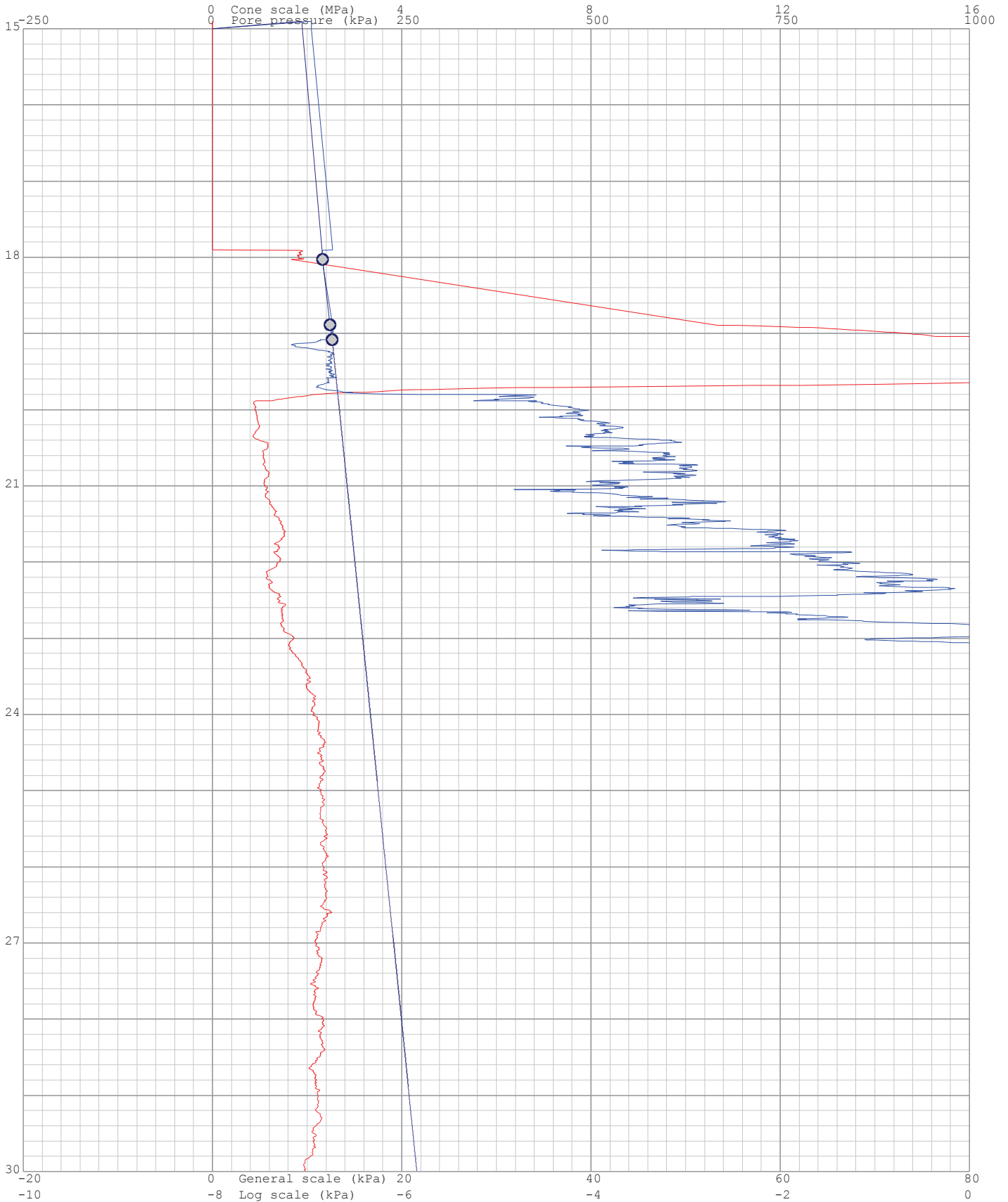
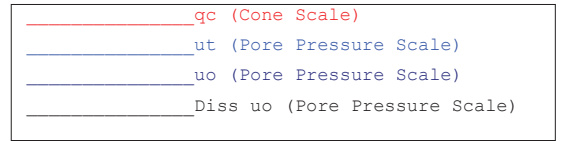


Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT33B  
Date: 2012/06/07

Probe: GHANA

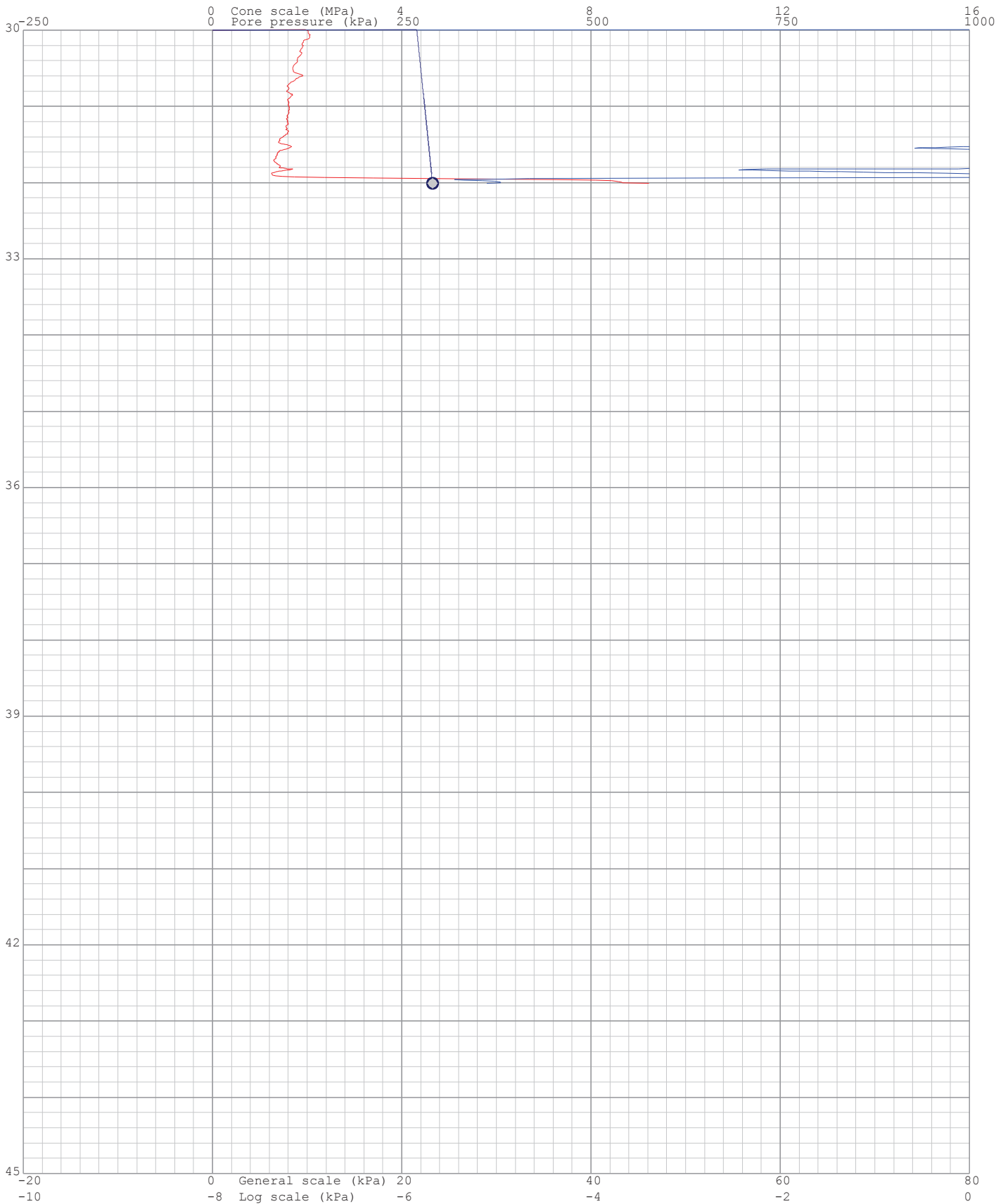
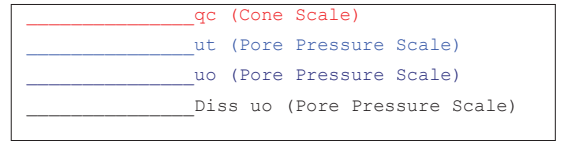


Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT33B  
Date: 2012/06/07

Probe: GHANA





Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT33B

Date: 2012/06/07

Probe: GHANA  
Page: 1

(kPa) Dissipation at: 1.7m



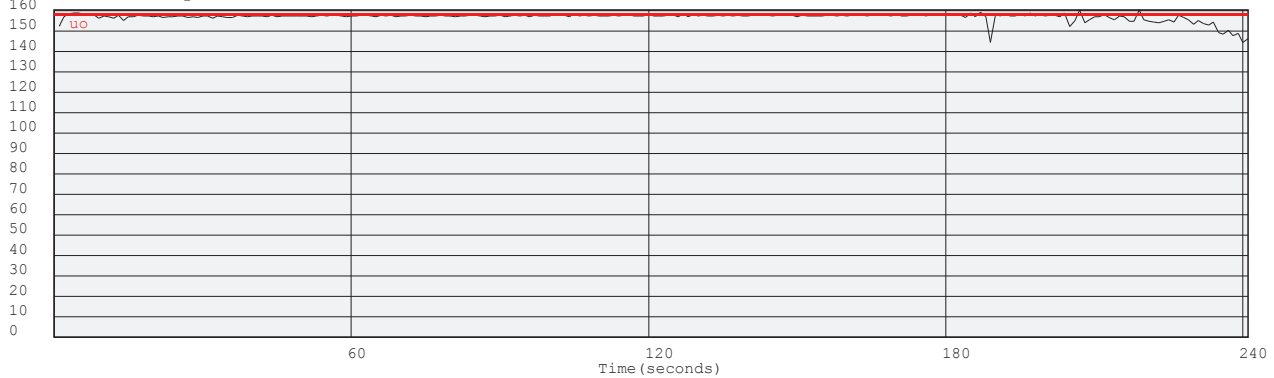
(kPa) Dissipation at: 18.029m



(kPa) Dissipation at: 18.886m



(kPa) Dissipation at: 19.079m



Project: Durban Harbour Over Water

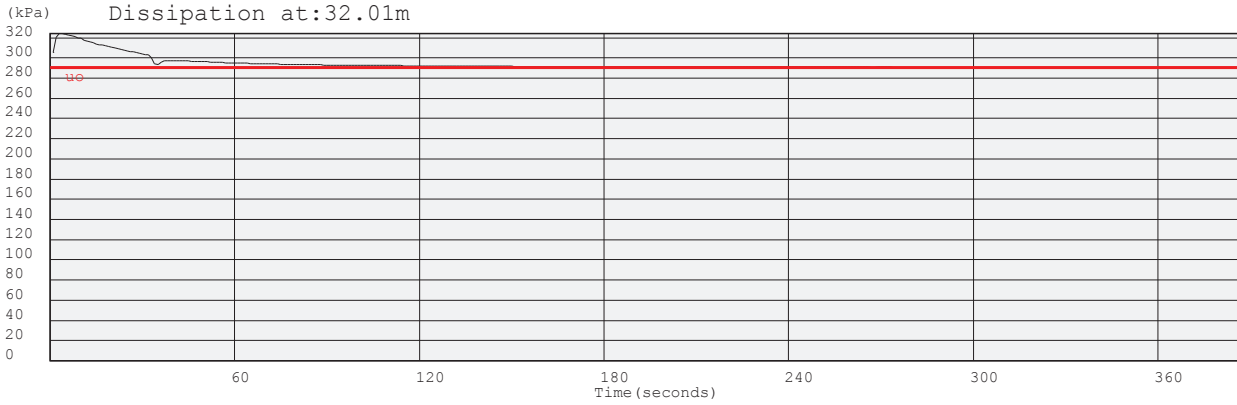
Site: Pier2

Hole: CPT33B

Date: 2012/06/07

Probe: GHANA

Page: 2







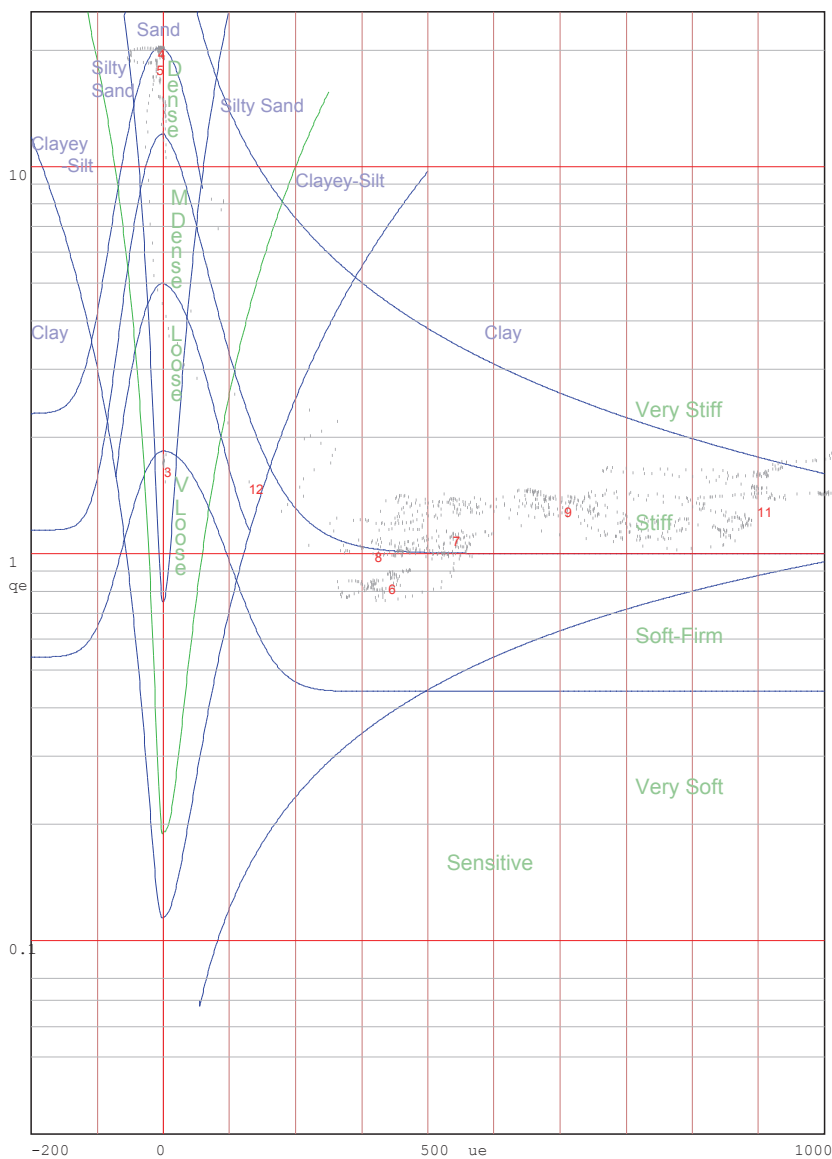
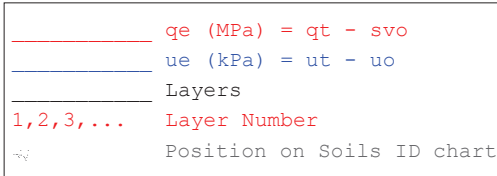
Project: Durban Harbour Over Water

Site: Pier2

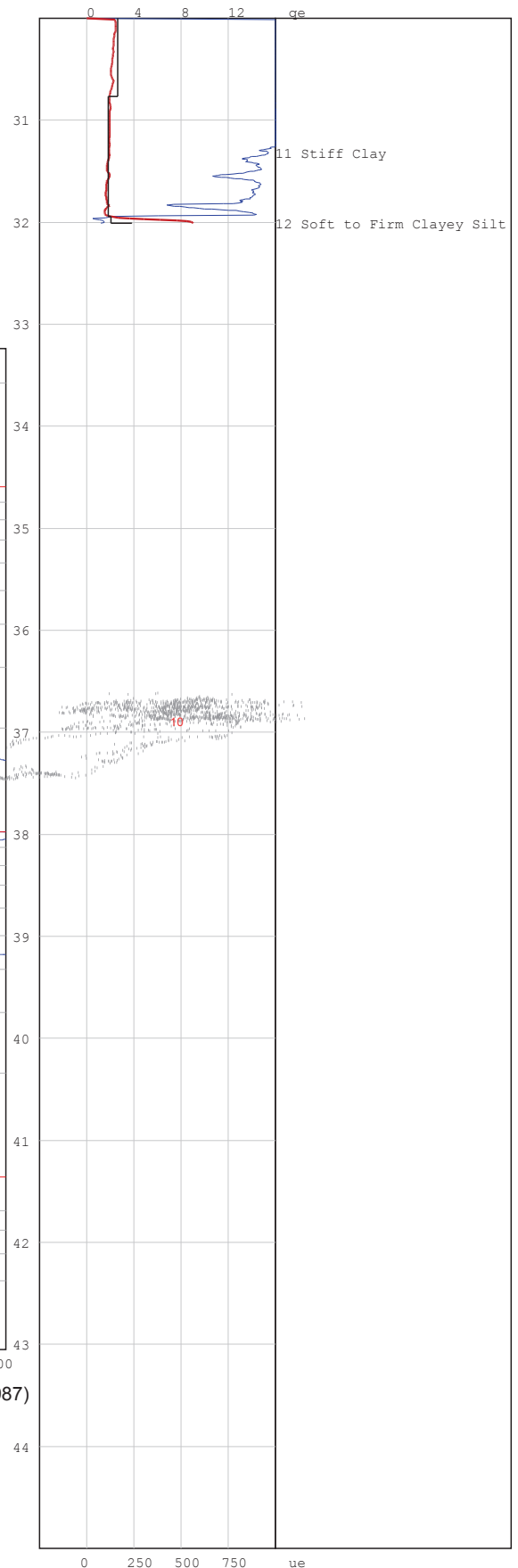
Hole No: CPT33B

Date: 2012/06/07

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

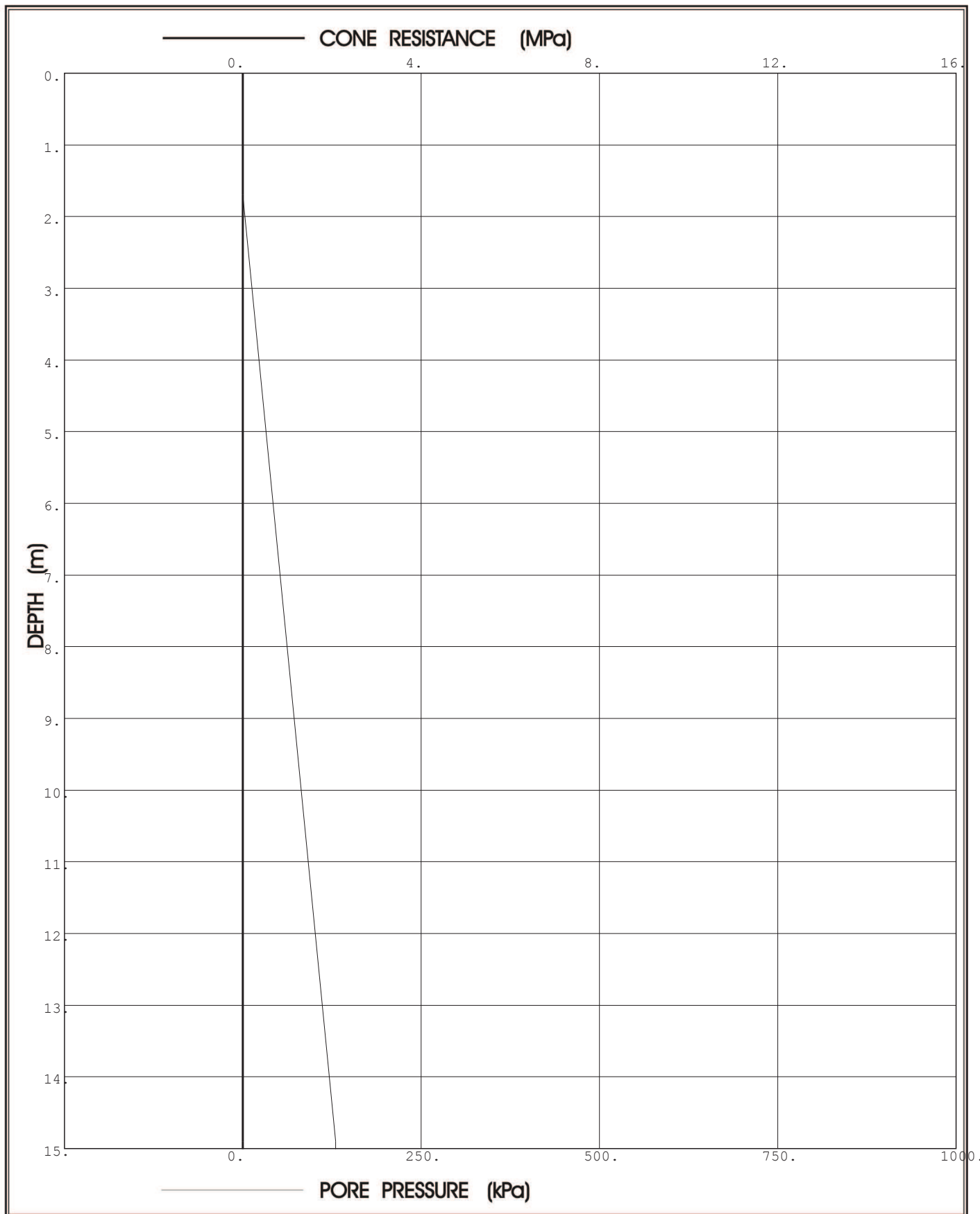
SITE: Pier2

CPTU (RE): CPT34

DATE: 2012/06/08

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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PROJECT: Durban Harbour Over Water

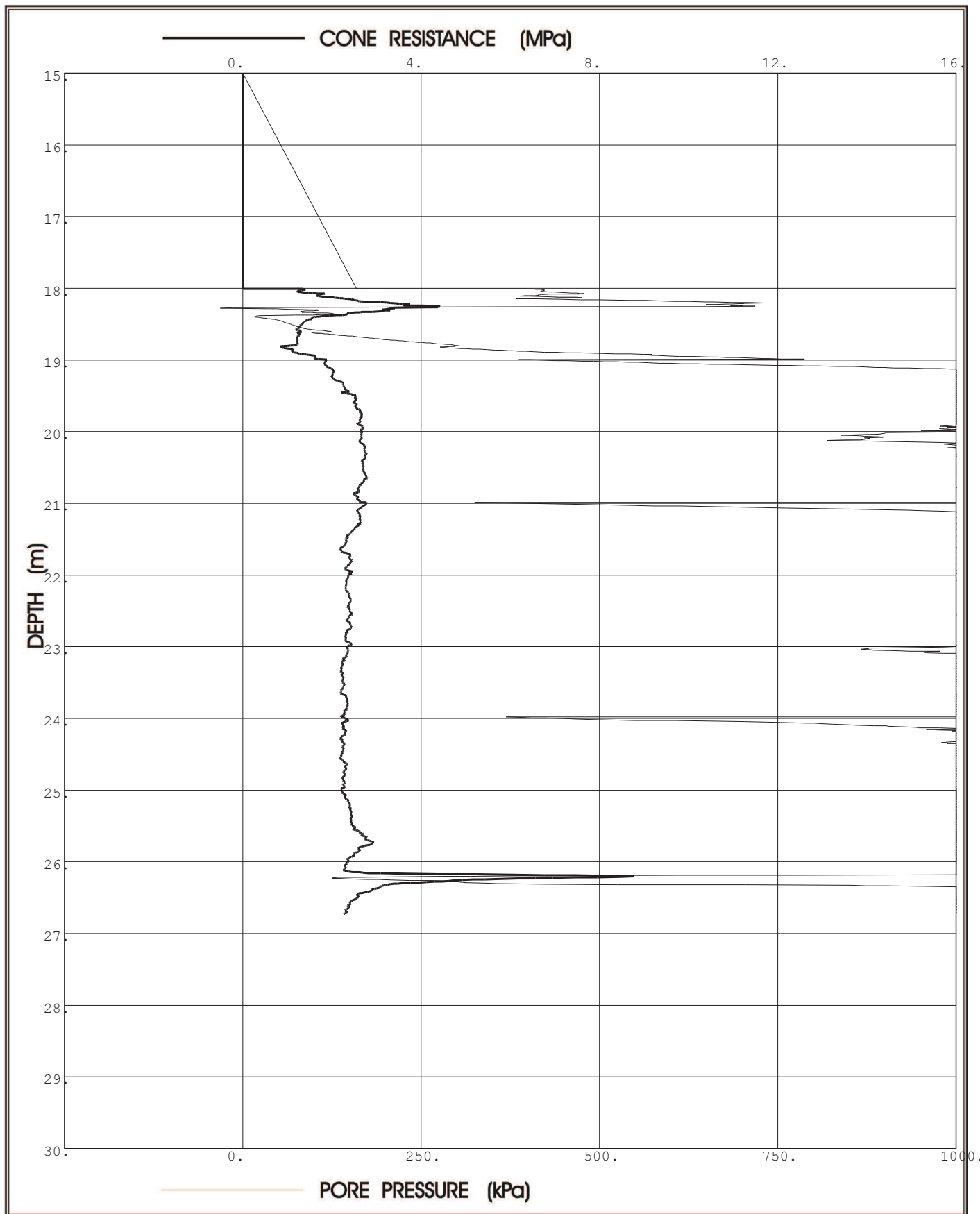
SITE: Pier2

CPTU (RE): CPT34

DATE: 2012/06/08

Probe: KELLER

Page:2



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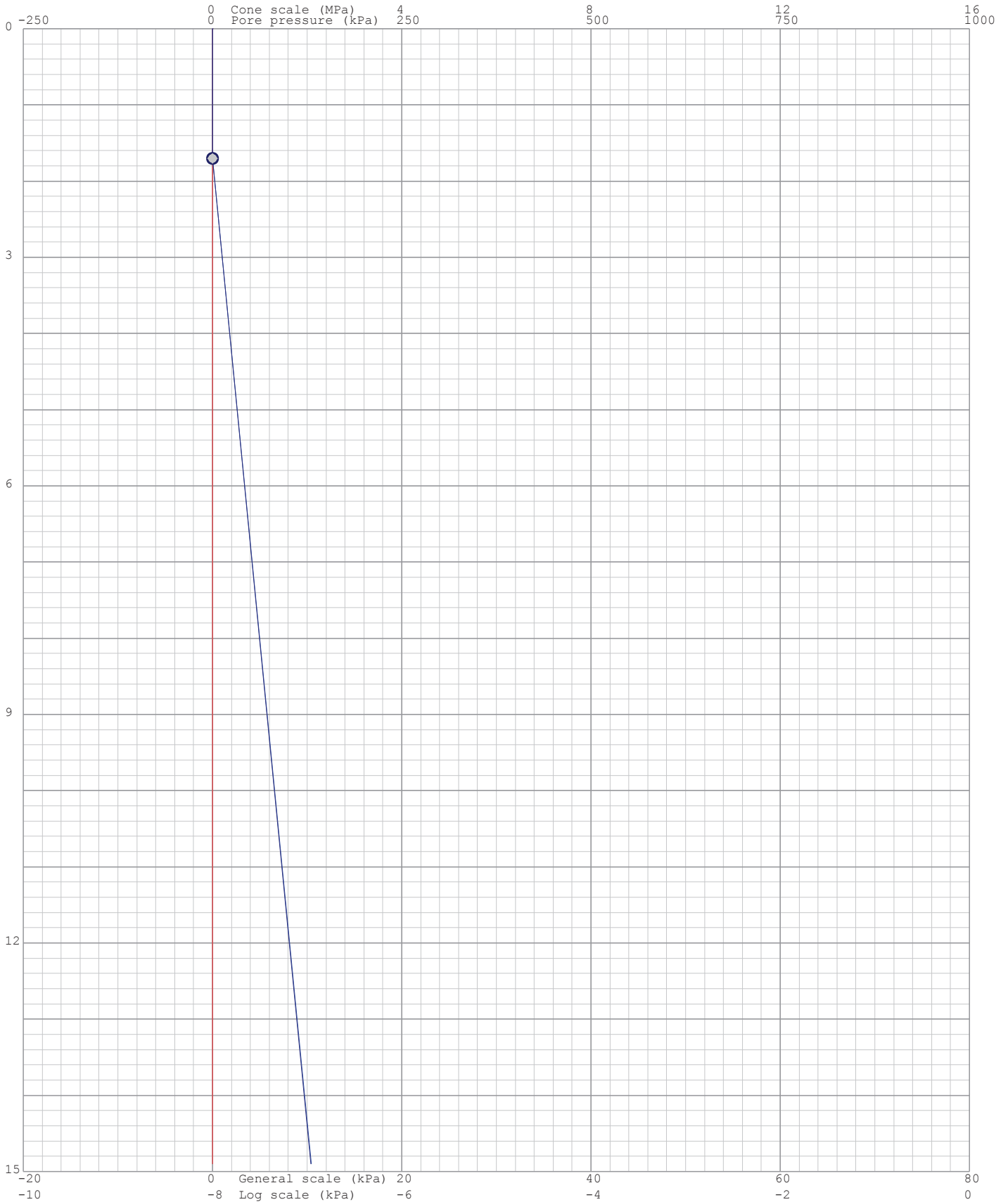
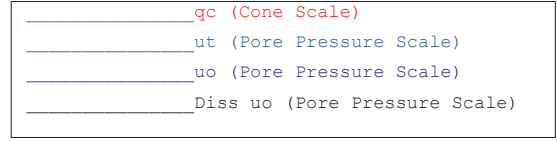
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT34

Date: 2012/06/08

Probe: KELLER





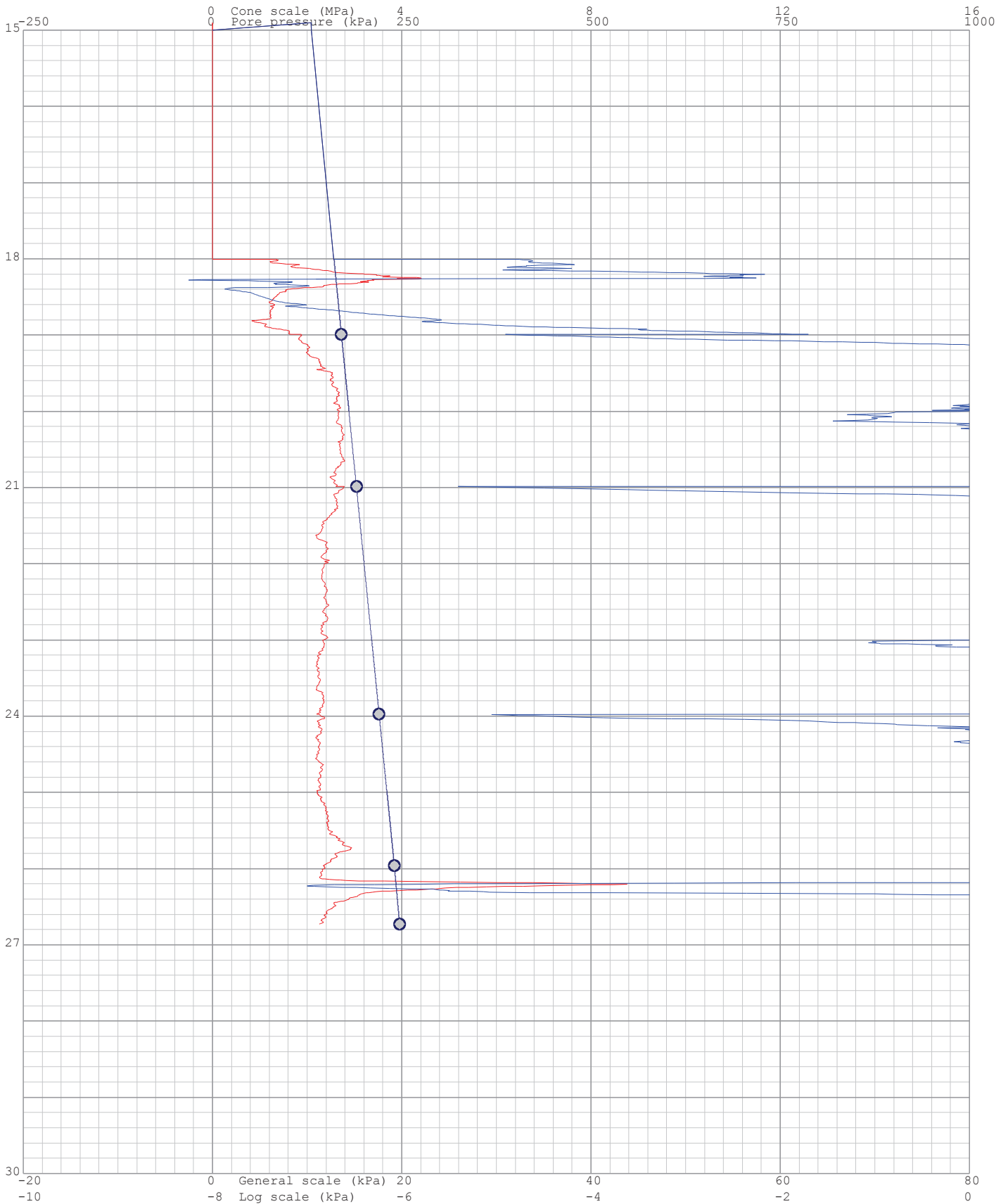
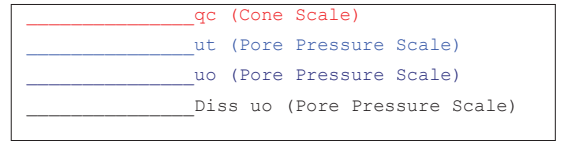
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT34

Date: 2012/06/08

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT34

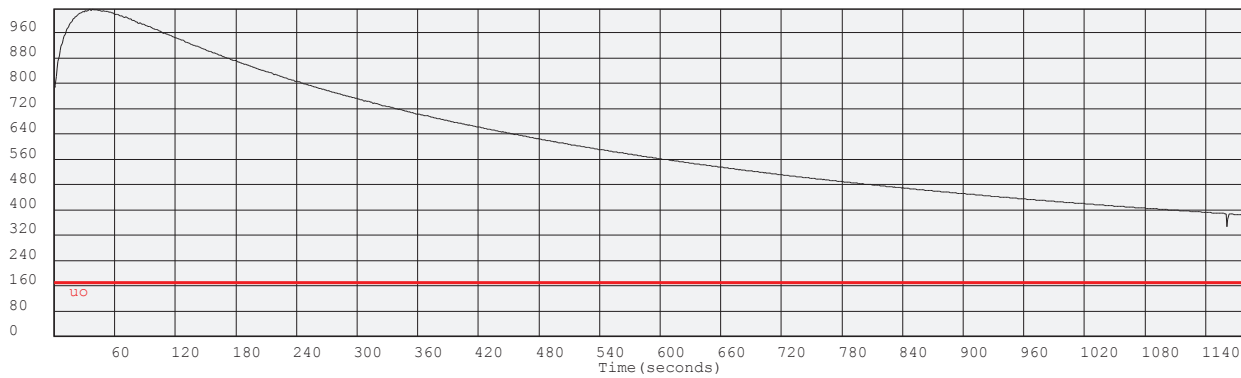
Date: 2012/06/08

Probe: KELLER  
Page: 1

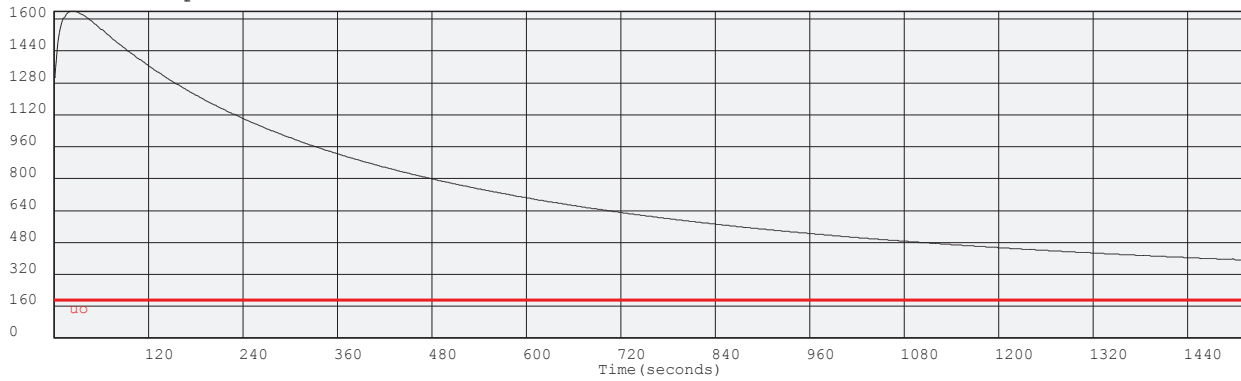
(kPa) Dissipation at: 1.7m



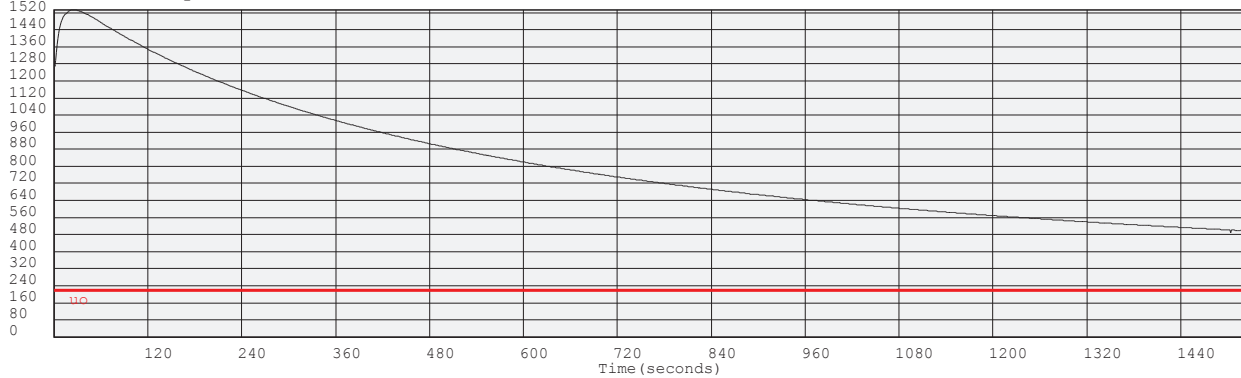
(kPa) Dissipation at: 18.99m



(kPa) Dissipation at: 20.983m



(kPa) Dissipation at: 23.975m



Project: Durban Harbour Over Water

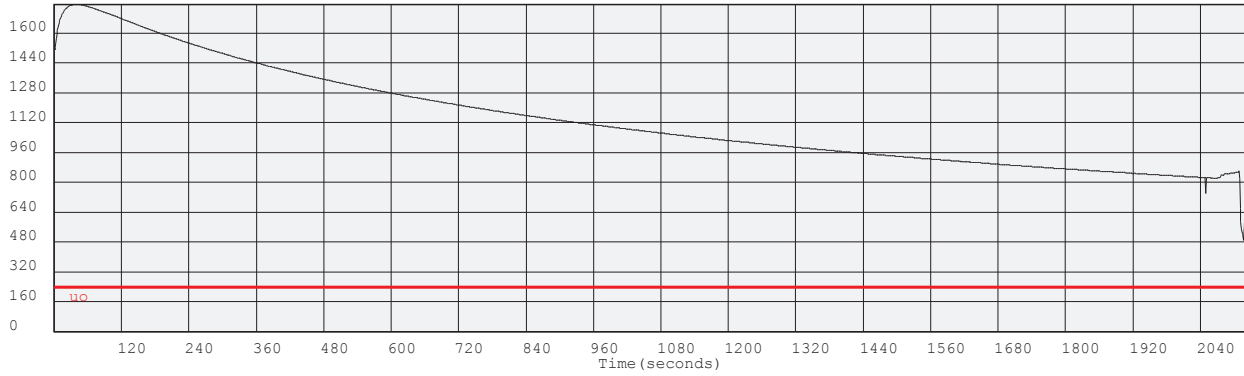
Site: Pier2

Hole: CPT34

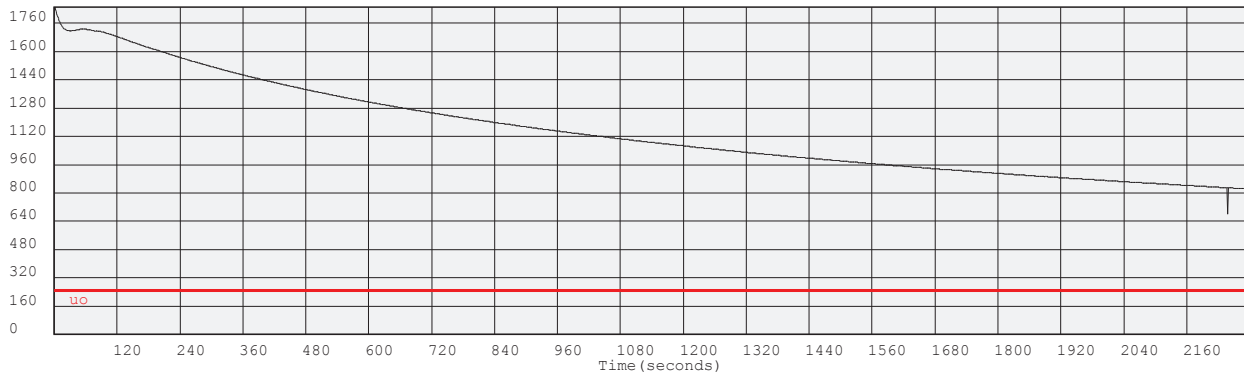
Date: 2012/06/08

Probe: KELLER  
Page: 2

(kPa) Dissipation at: 25.961m



(kPa) Dissipation at: 26.728m



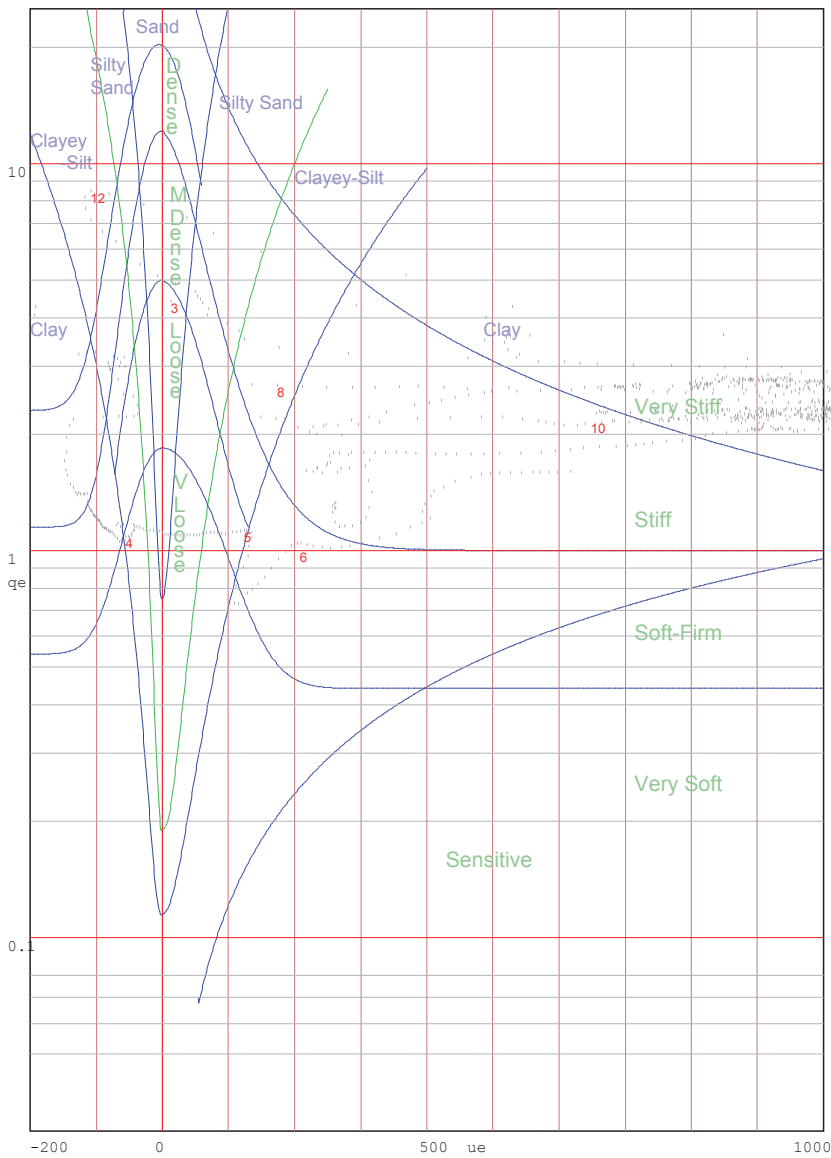
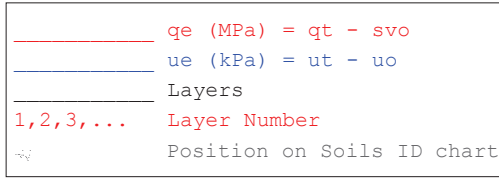
Project: Durban Harbour Over Water

Site: Pier2

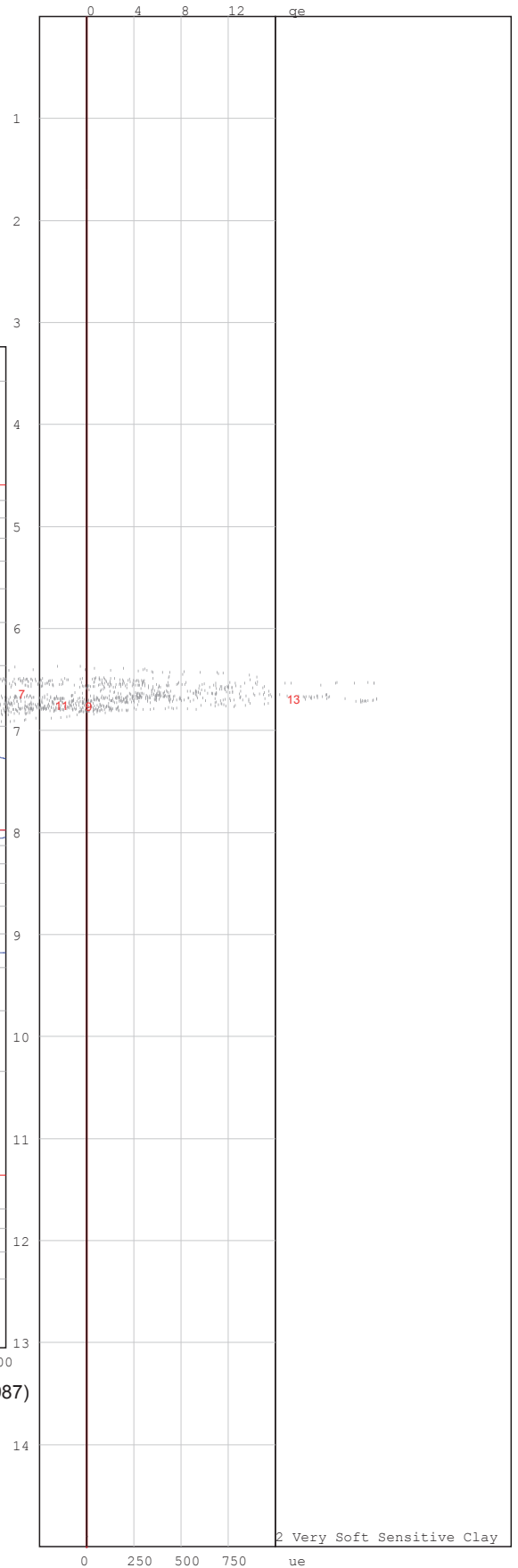
Hole No: CPT34

Date: 2012/06/08

Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



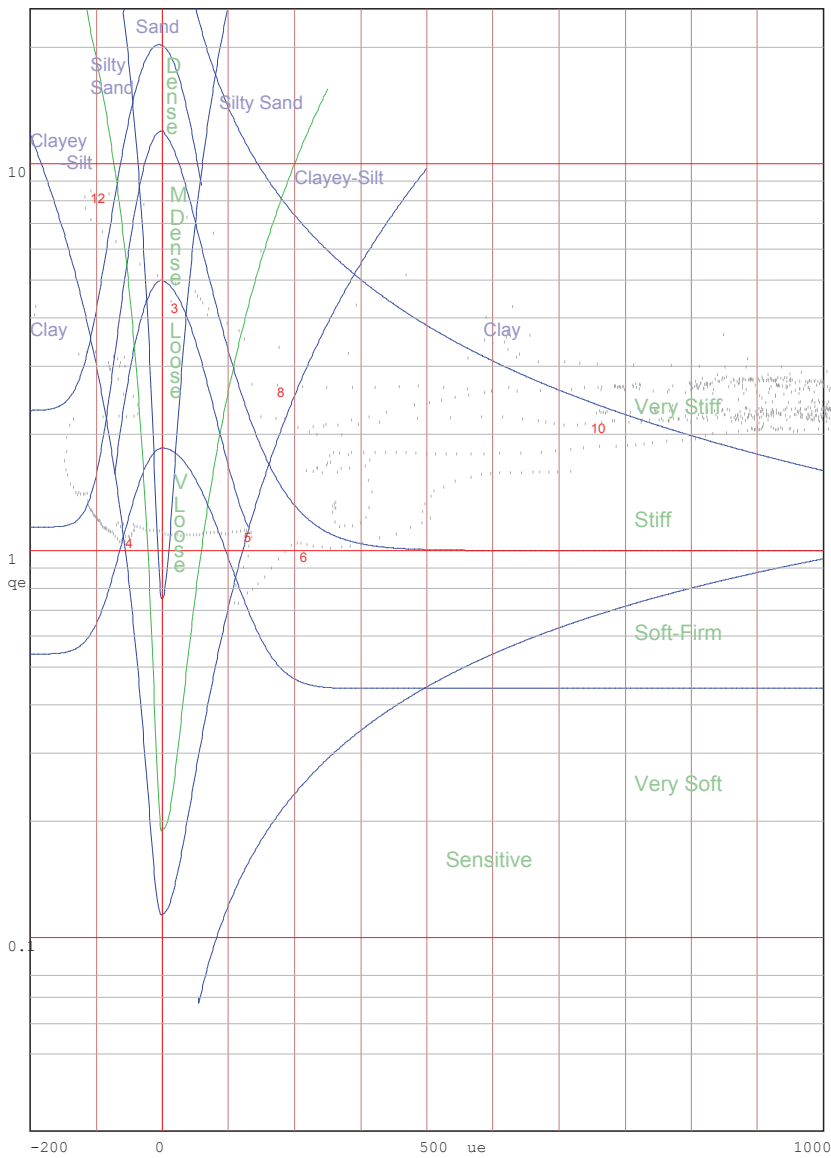
Site: Pier2

Hole No: CPT34

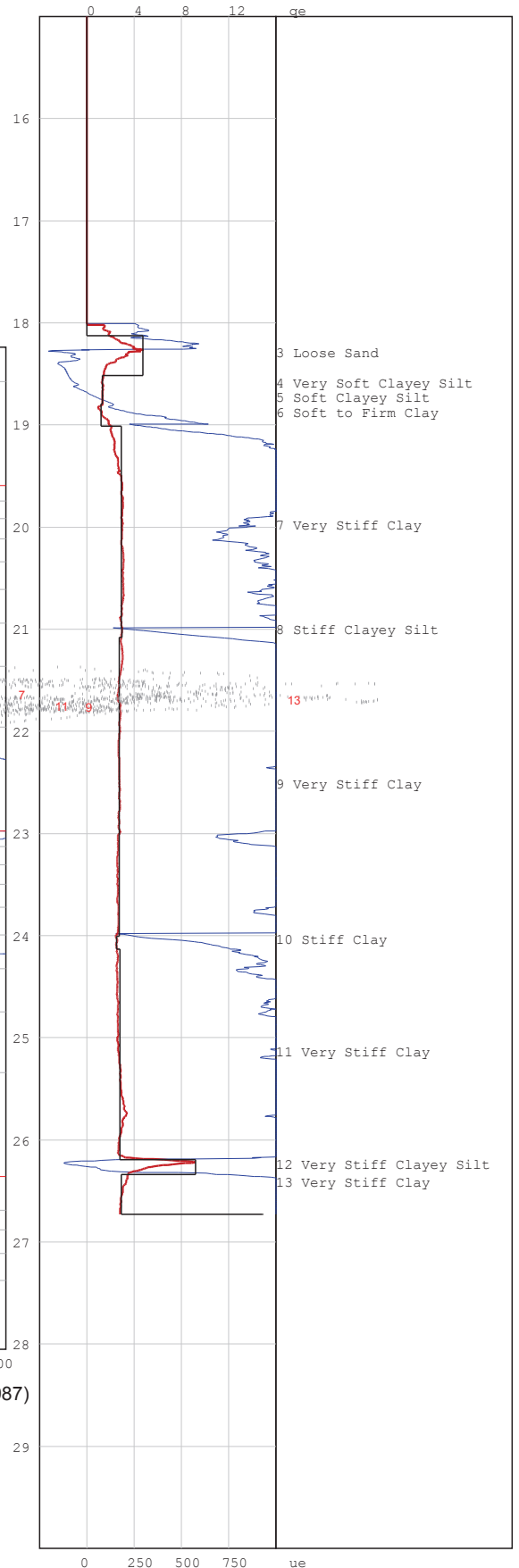
Date: 2012/06/08

Pro

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

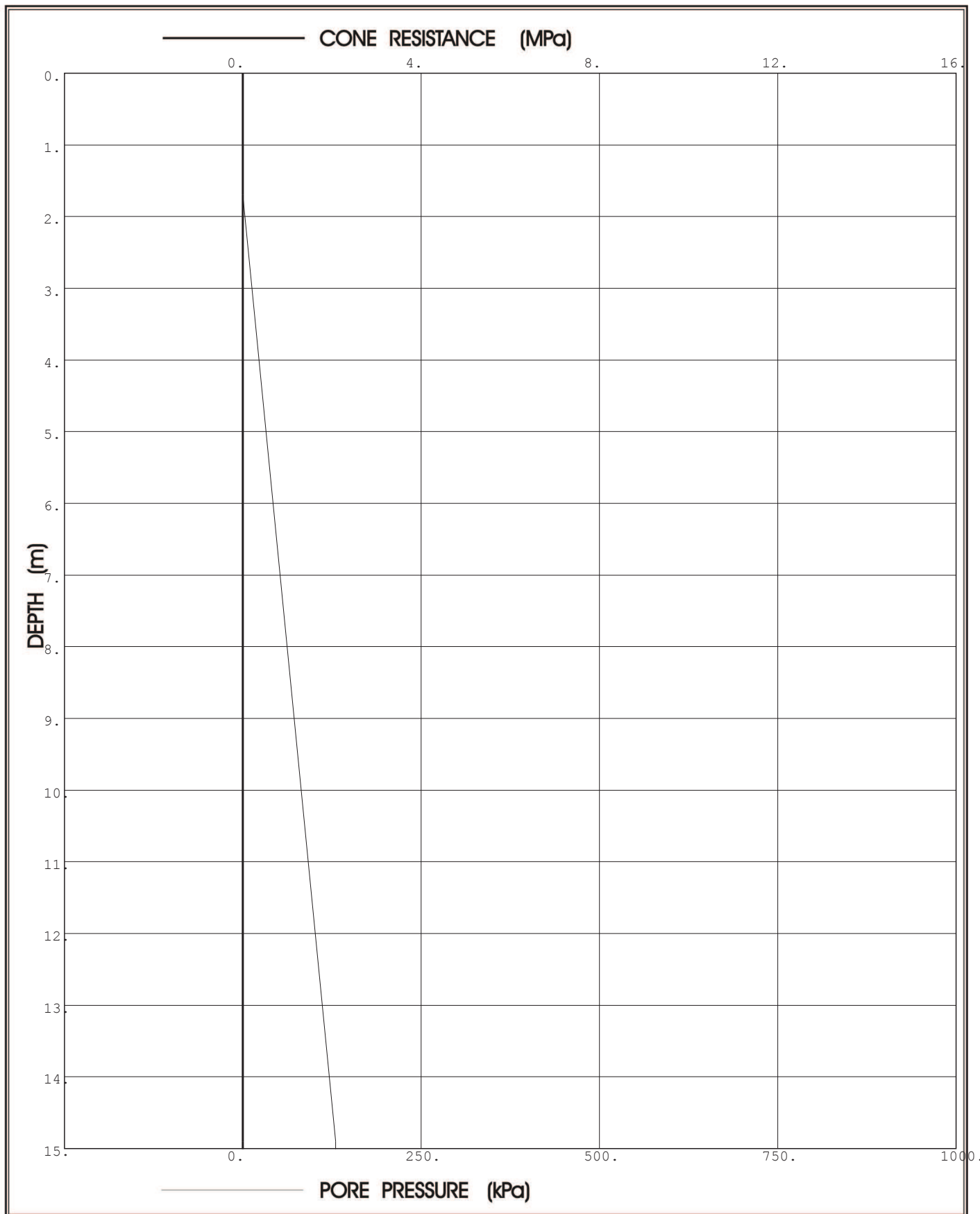
SITE: Pier2

CPTU (RE): CPT35

DATE: 2012/06/03

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

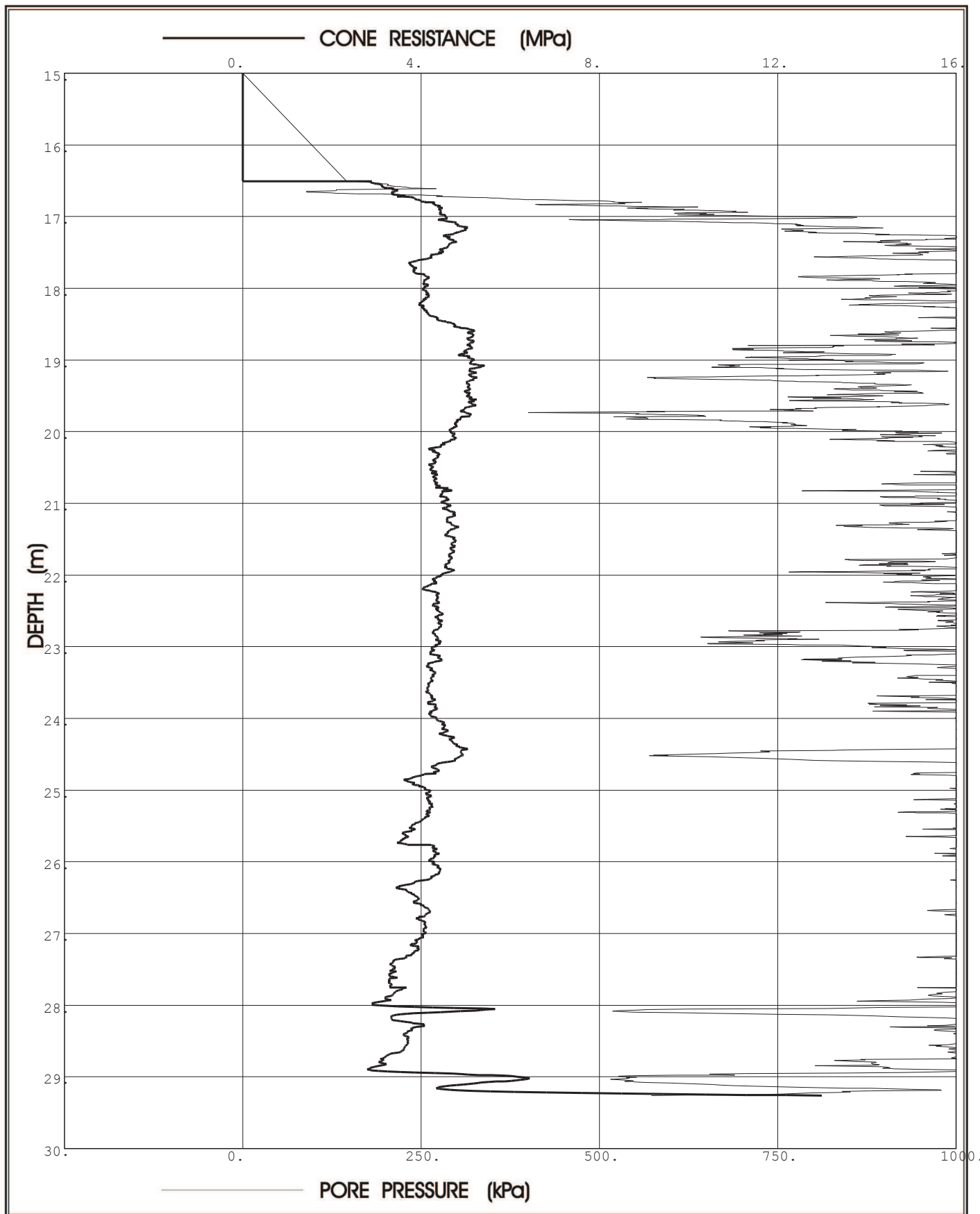
SITE: Pier2

CPTU (RE): CPT35

DATE: 2012/06/03

Probe: GHANA

Page:2



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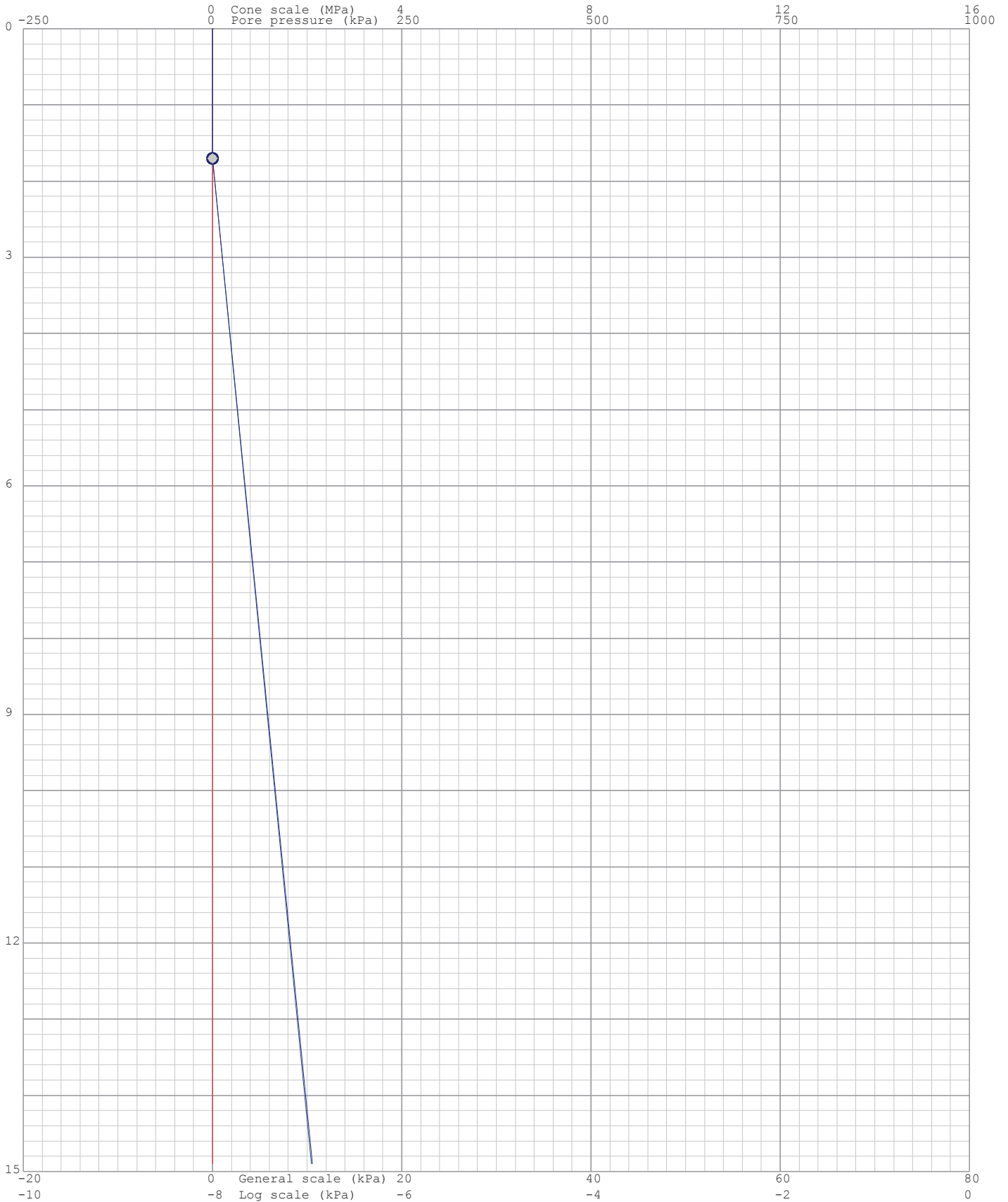
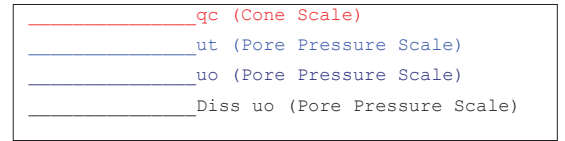
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT35

Date: 2012/06/03

Probe: GHANA





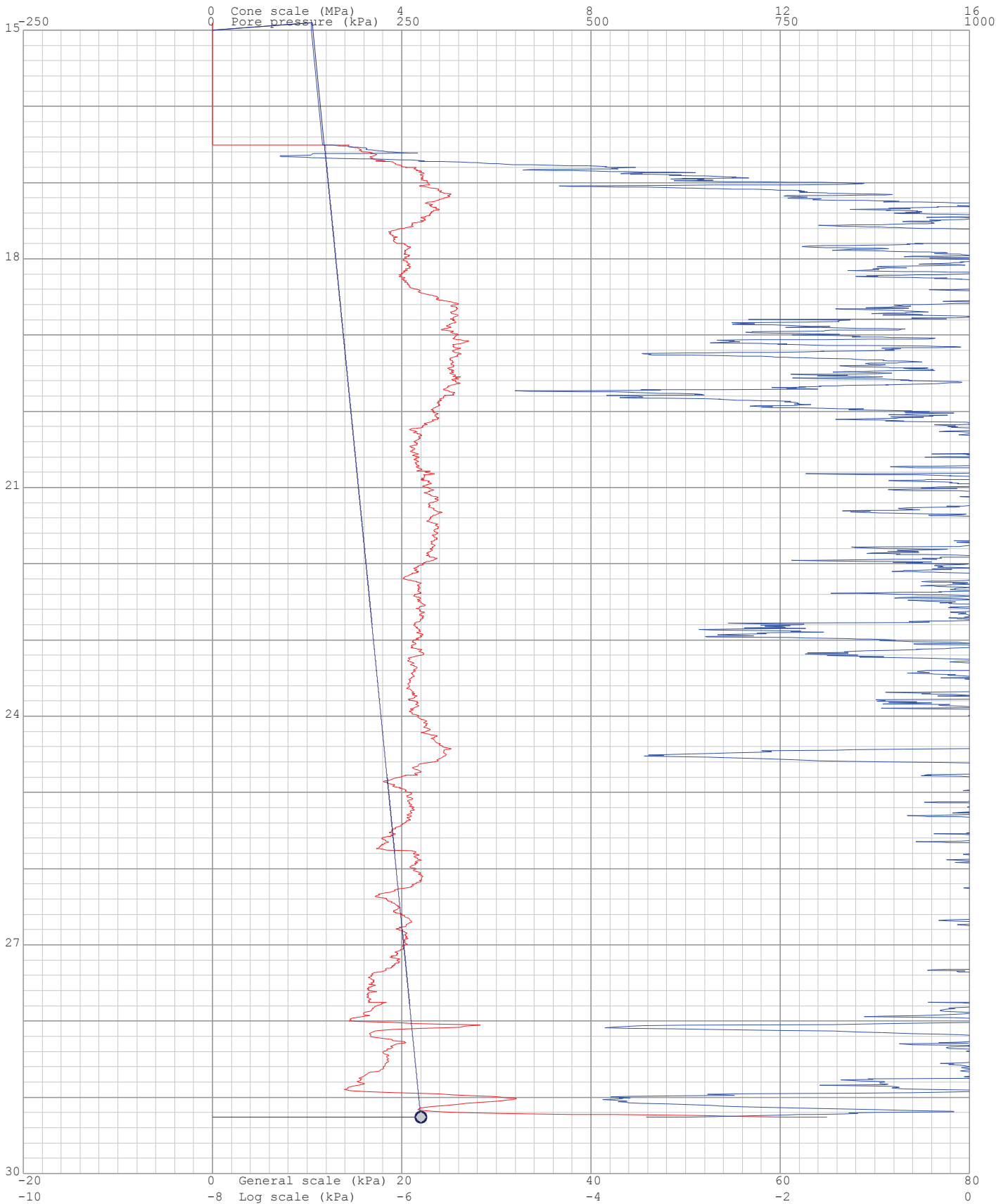
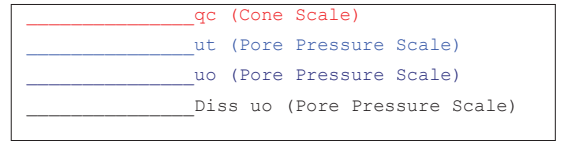
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT35

Date: 2012/06/03

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT35

Date: 2012/06/03

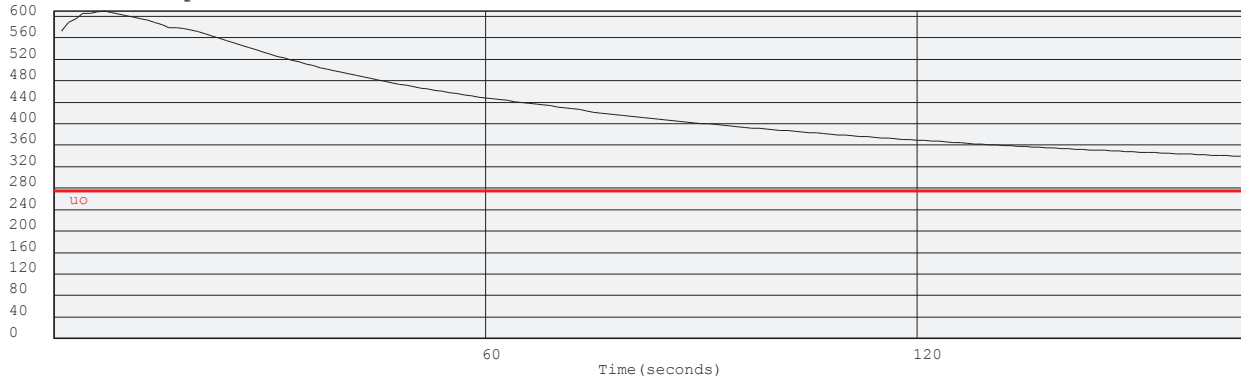
Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 29.26m



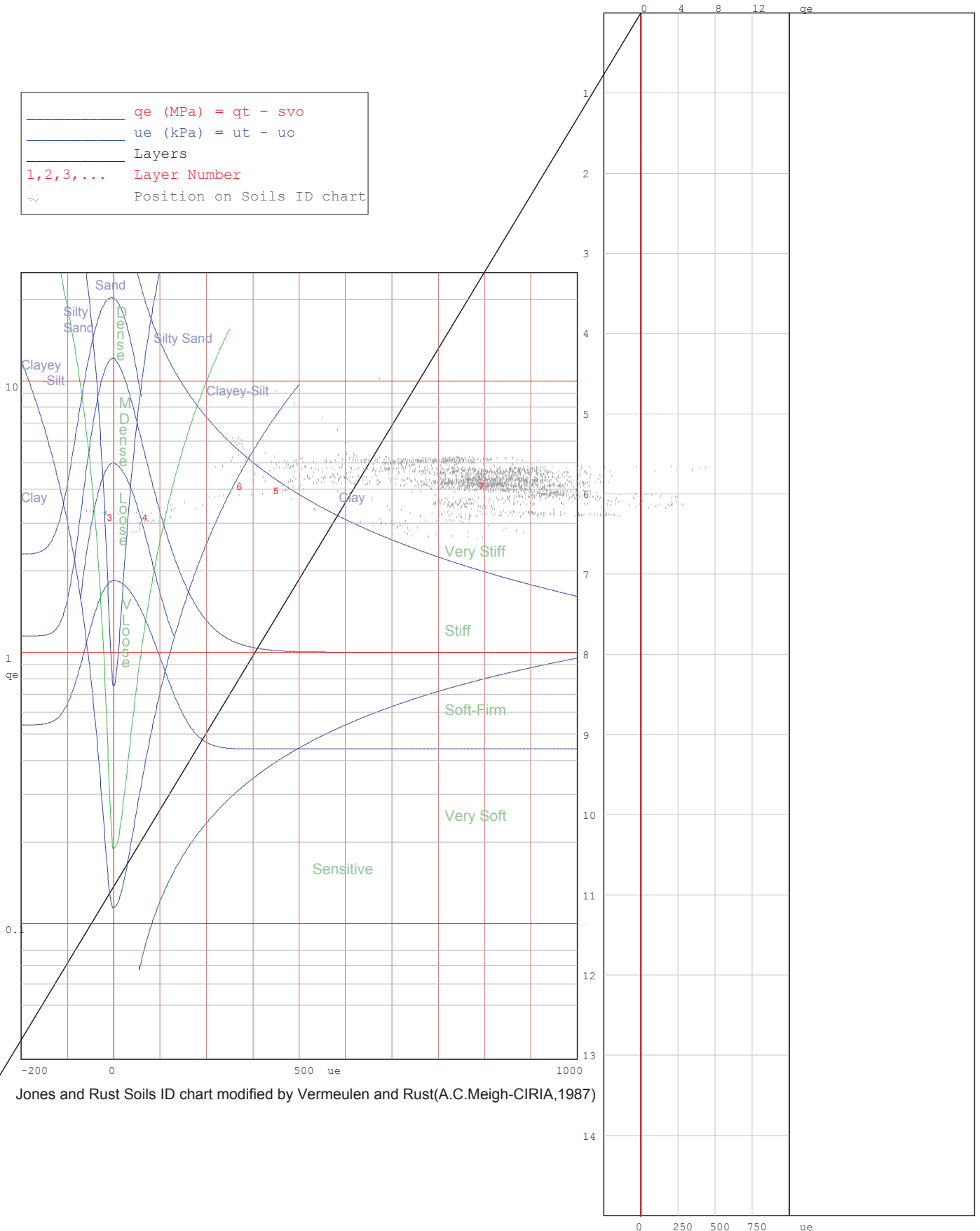
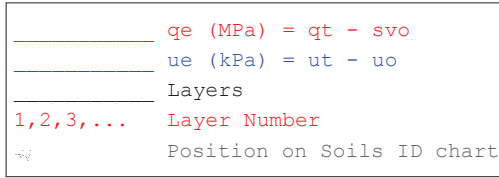
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT35

Date: 2012/06/03

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

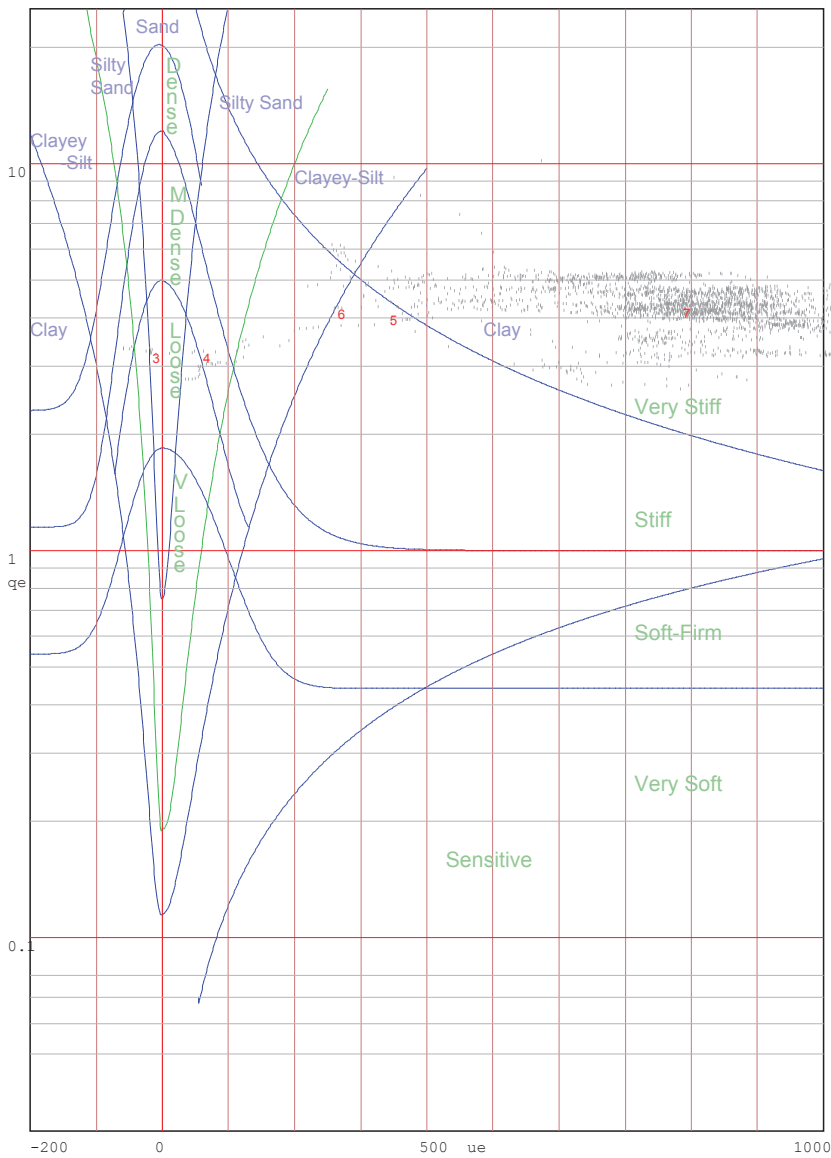
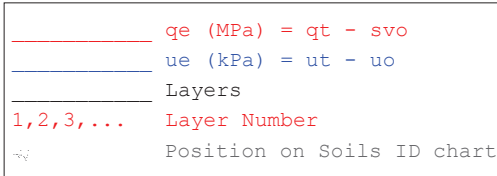
Project: Durban Harbour Over Water

Site: Pier2

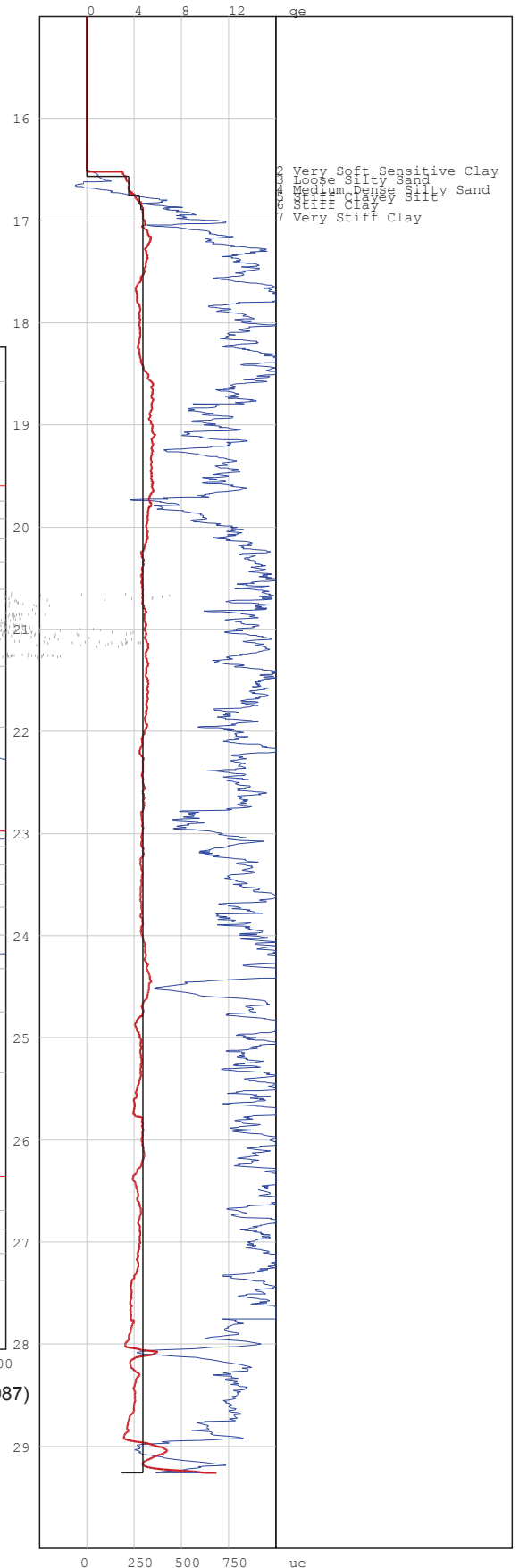
Hole No: CPT35

Date: 2012/06/03

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

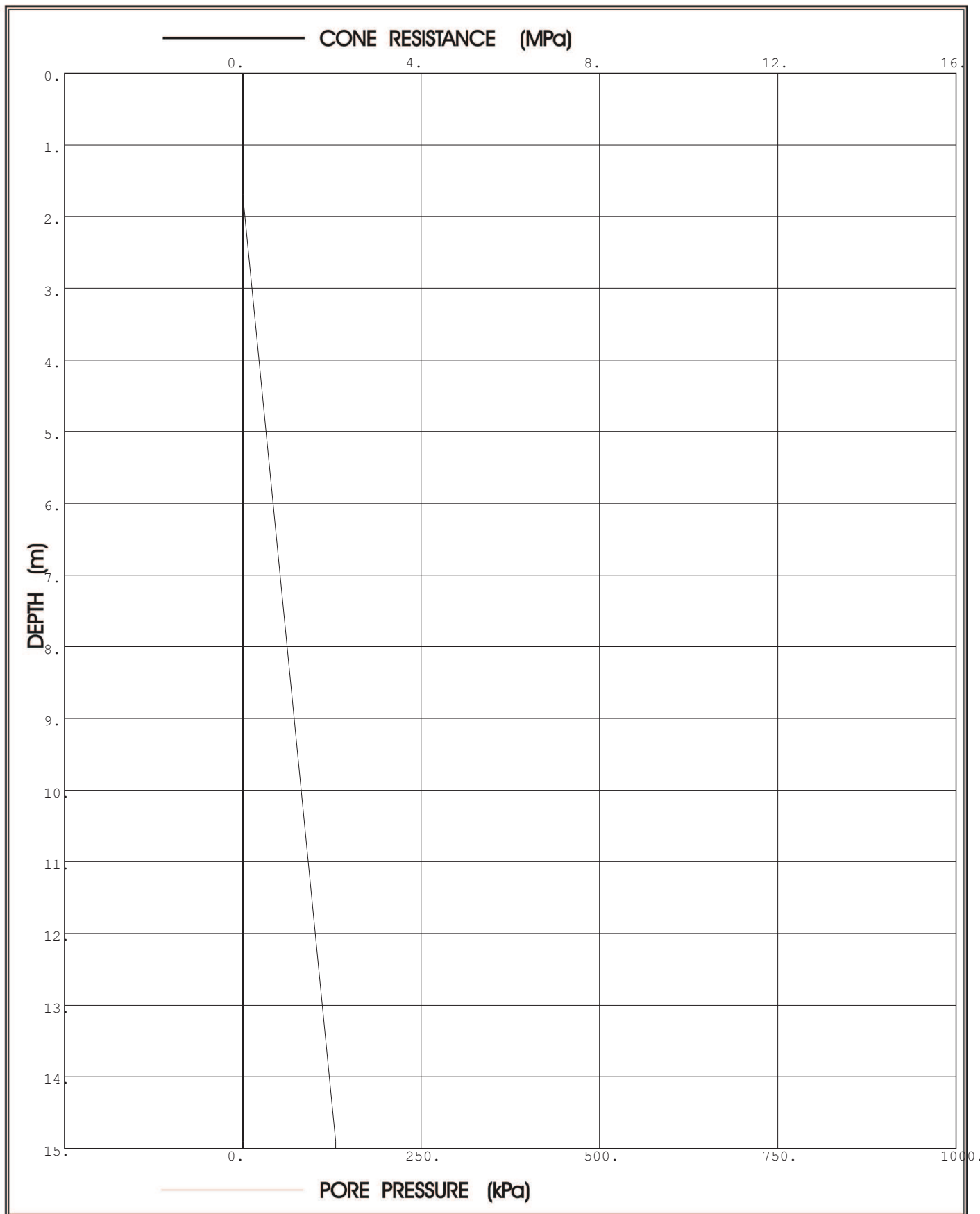
SITE: Pier2

CPTU (RE): CPT36

DATE: 2012/06/02

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

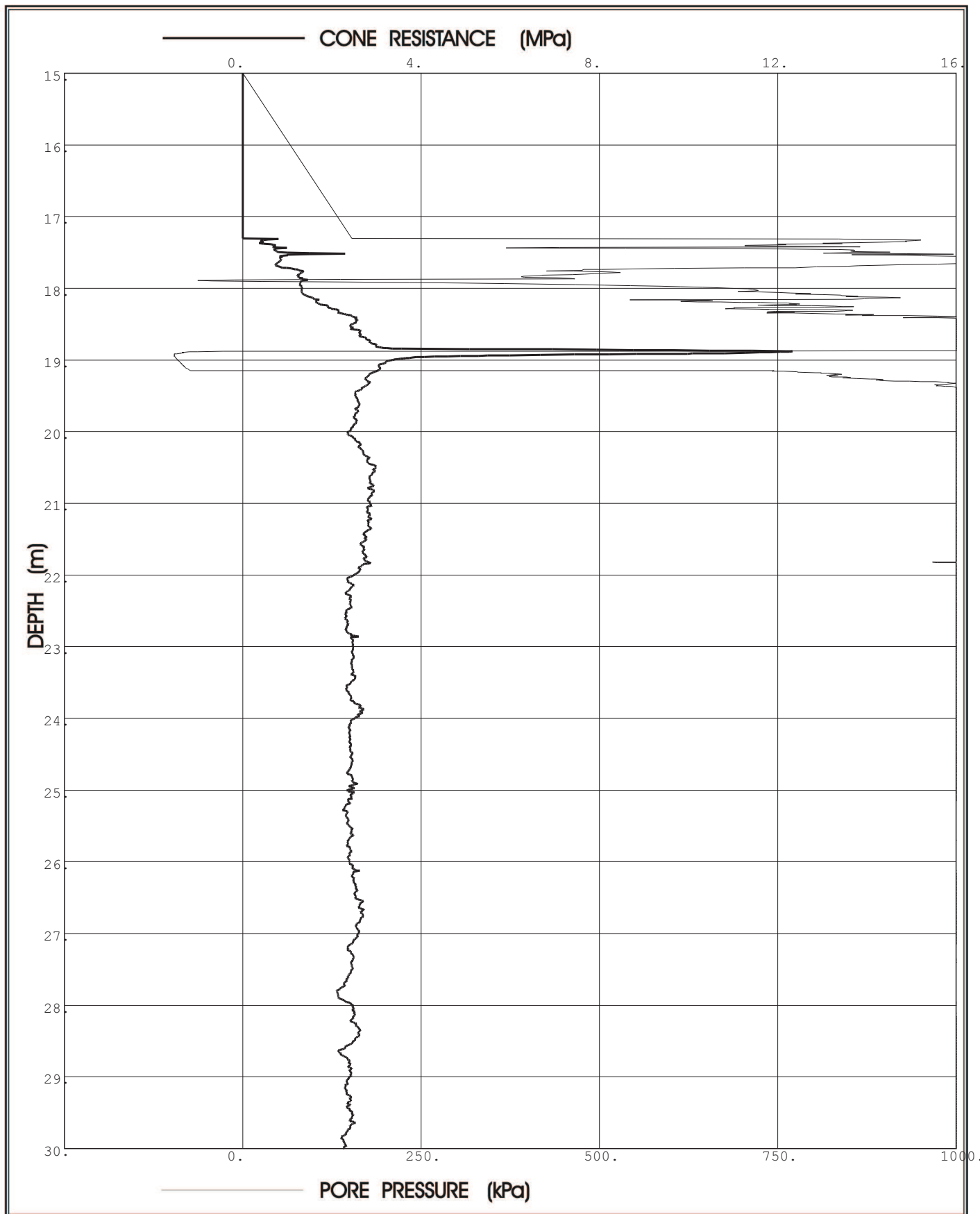
SITE: Pier2

CPTU (RE): CPT36

DATE: 2012/06/02

Probe: GHANA

Page:2



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

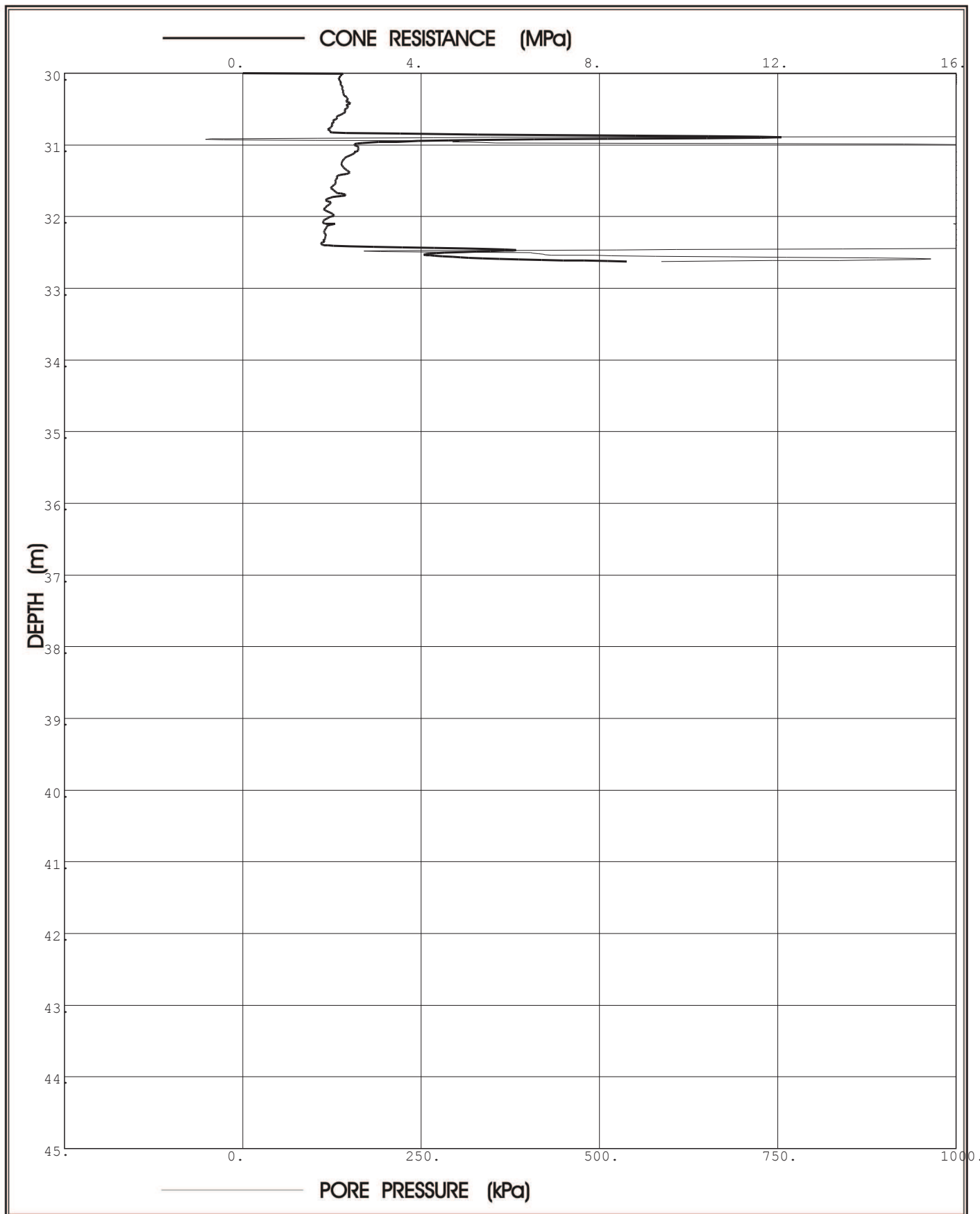
SITE: Pier2

CPTU (RE): CPT36

DATE: 2012/06/02

Probe: GHANA

Page: 3



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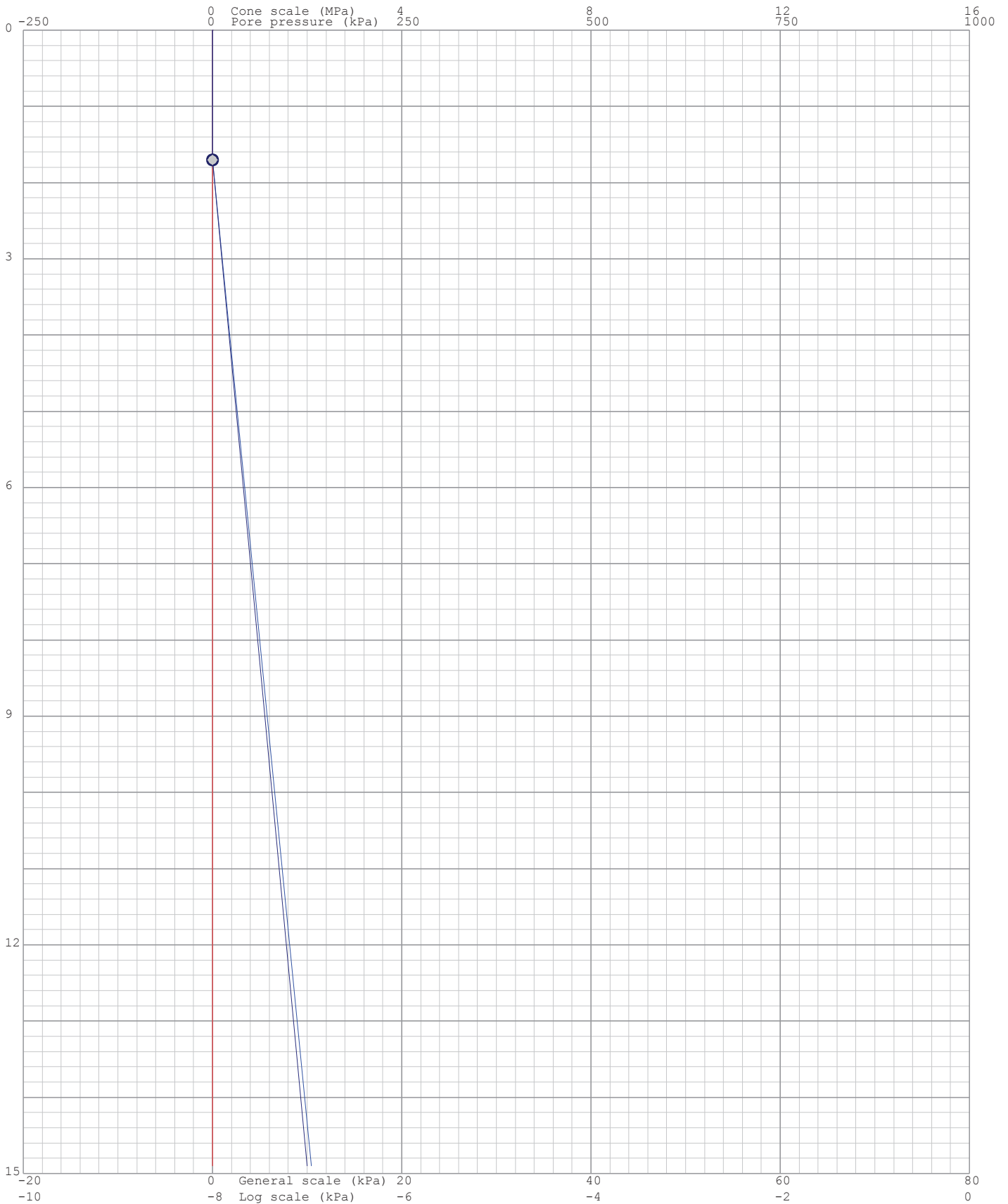
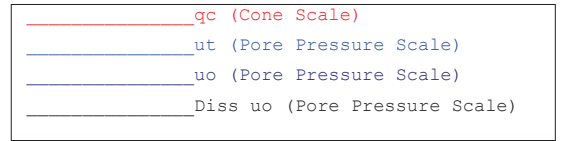
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT36

Date: 2012/06/02

Probe: GHANA





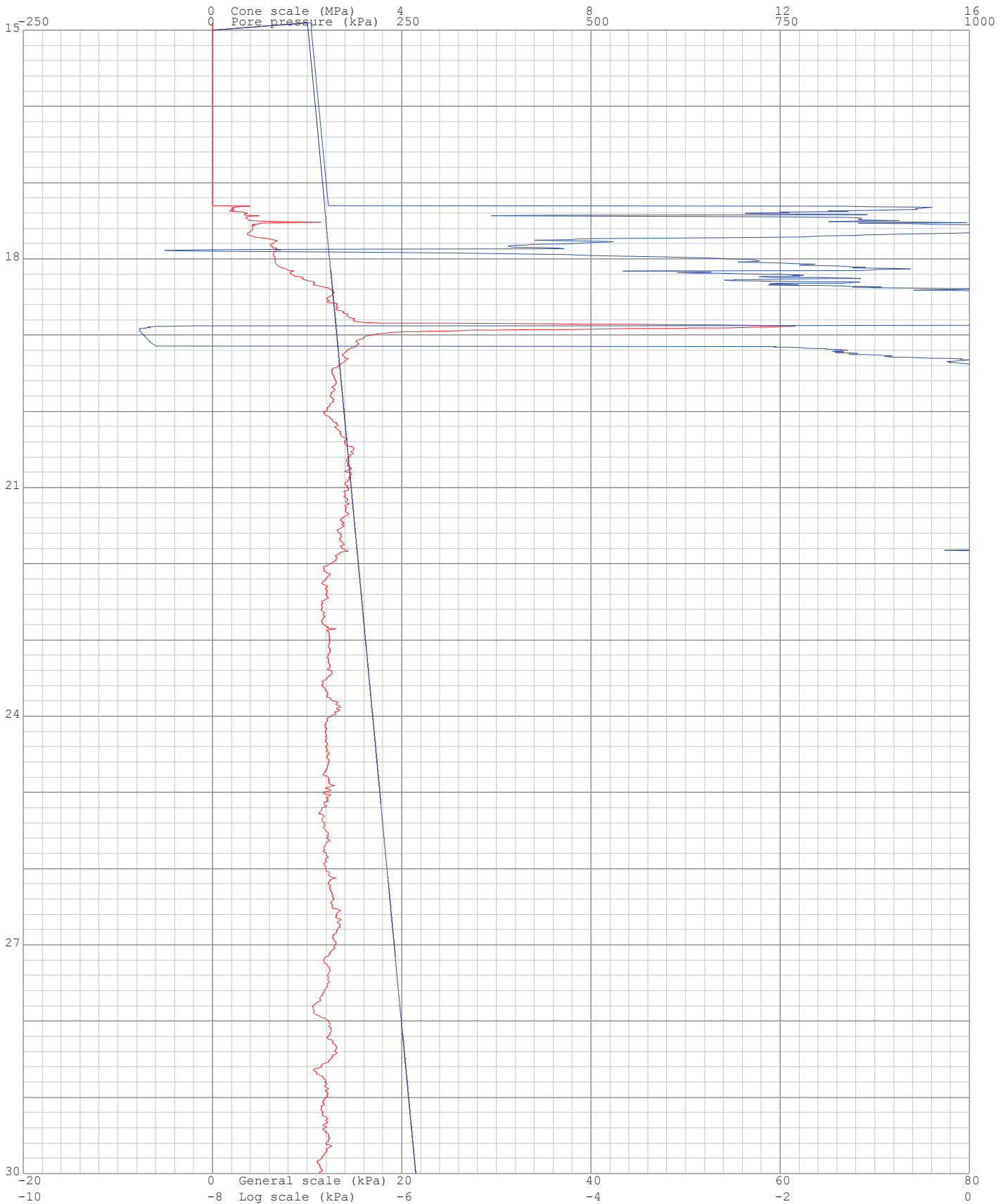
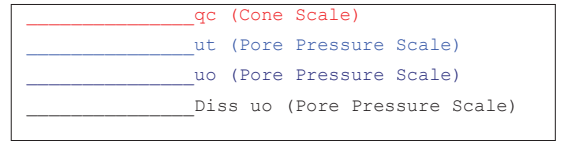
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT36

Date: 2012/06/02

Probe: GHANA



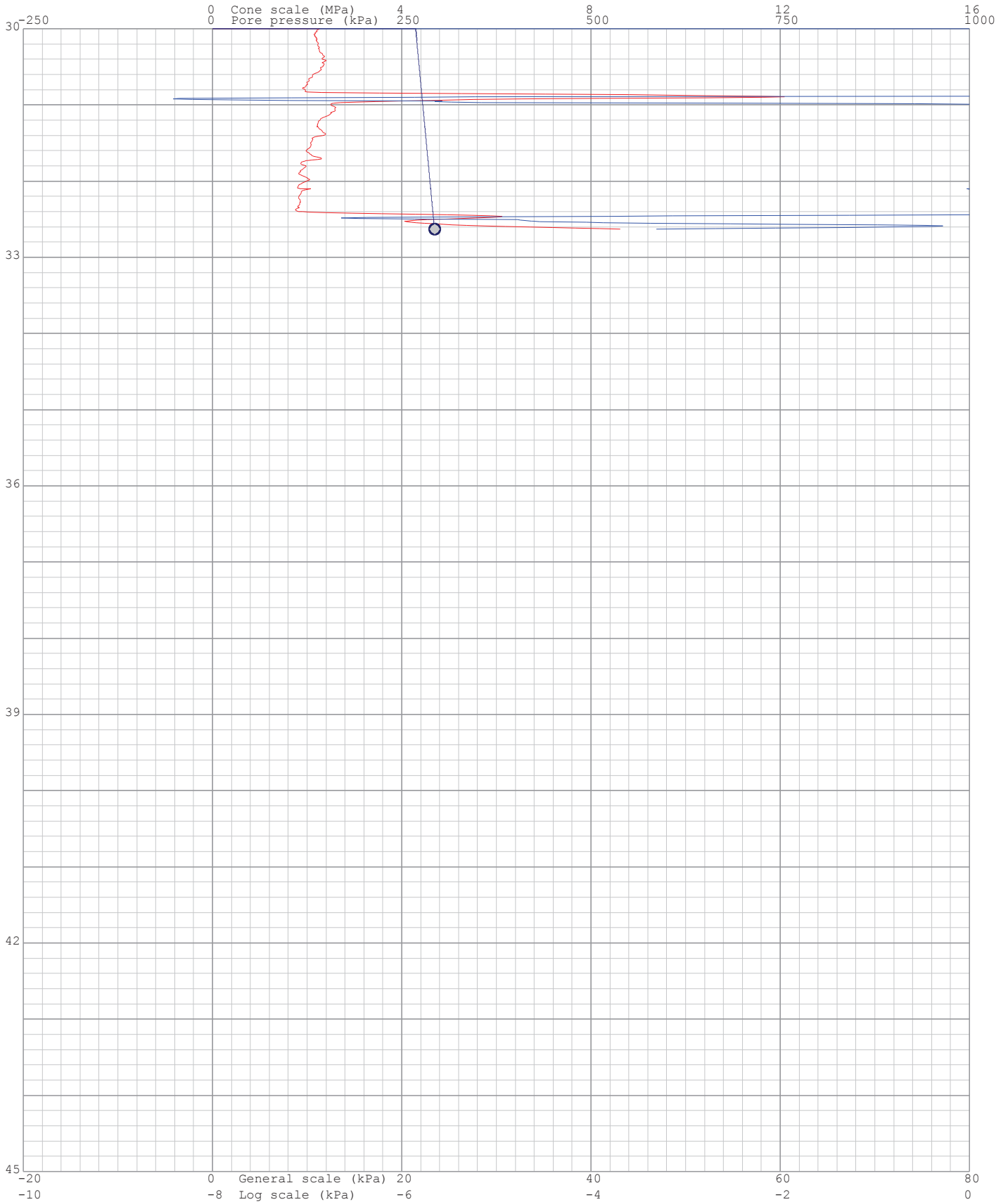
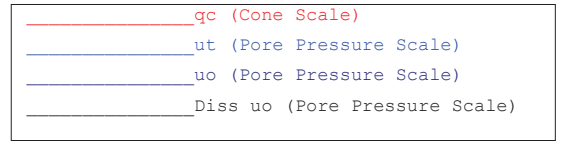
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT36

Date: 2012/06/02

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT36

Date: 2012/06/02

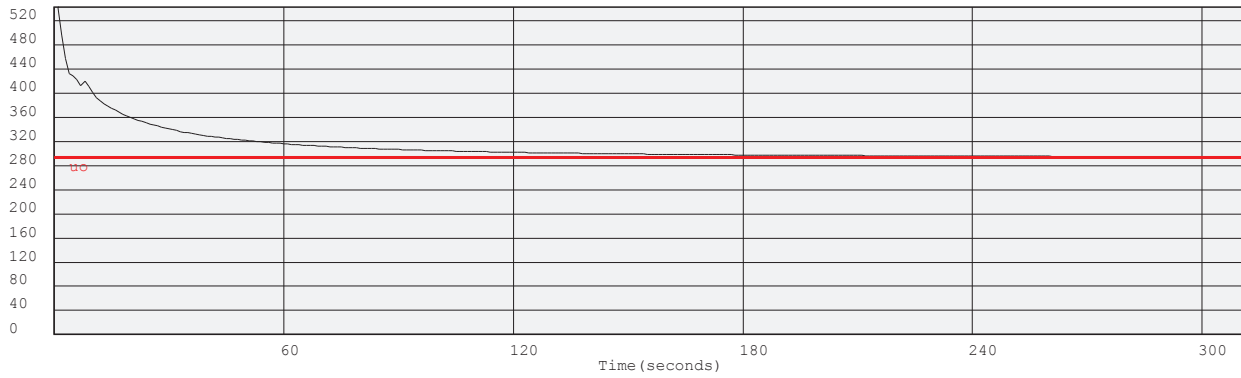
Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.7m



(kPa) Dissipation at: 32.629m



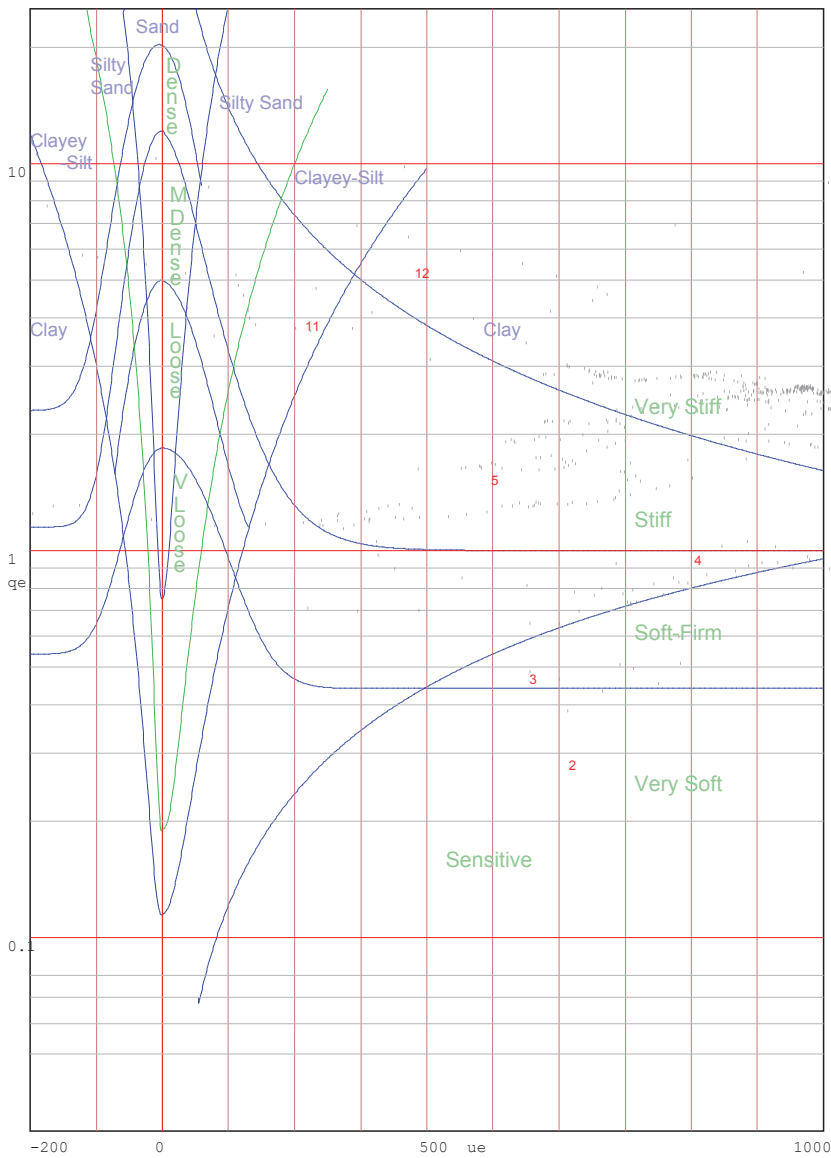
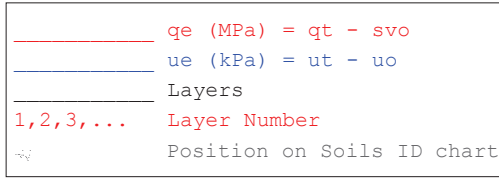
Project: Durban Harbour Over Water

Site: Pier2

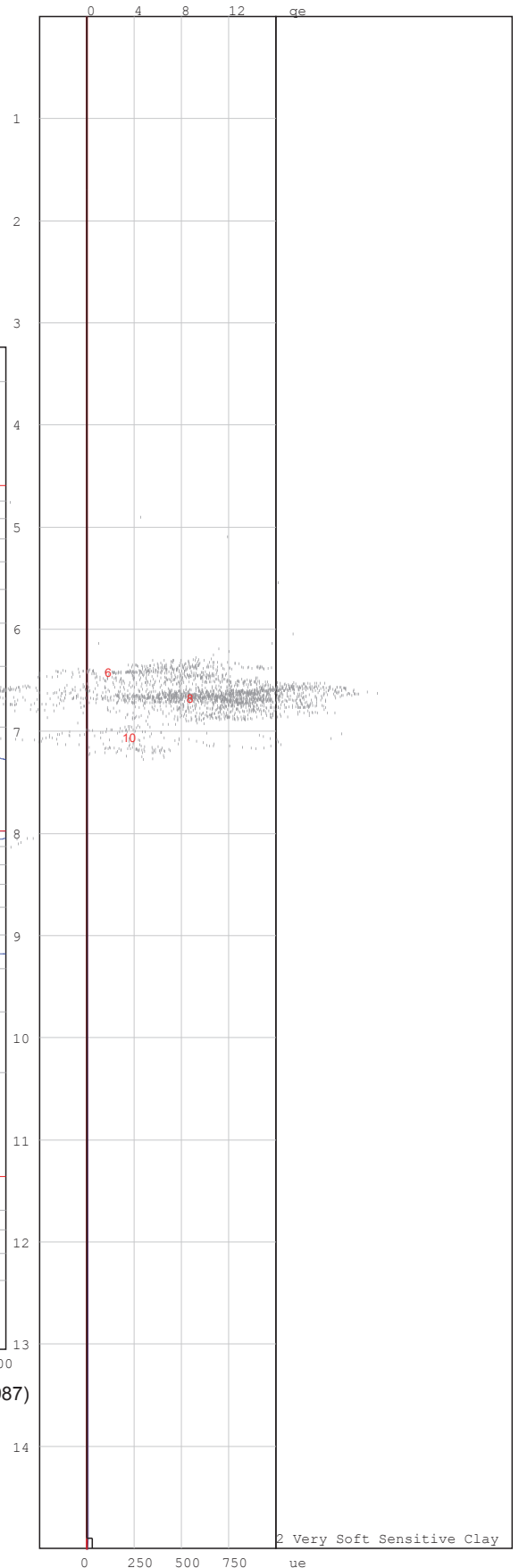
Hole No: CPT36

Date: 2012/06/02

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



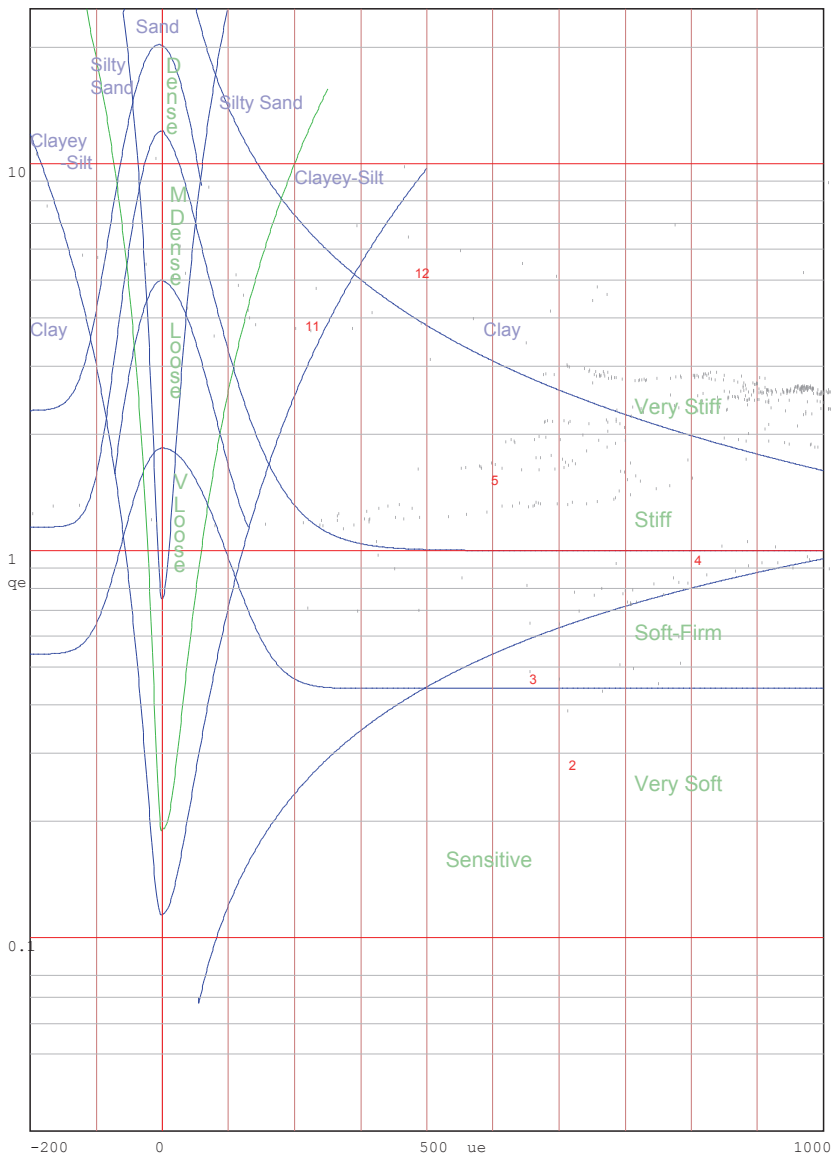
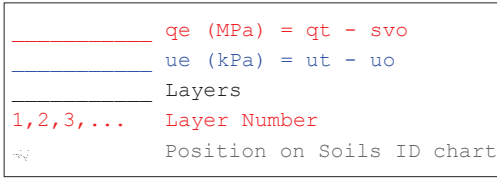
Project: Durban Harbour Over Water

Site: Pier2

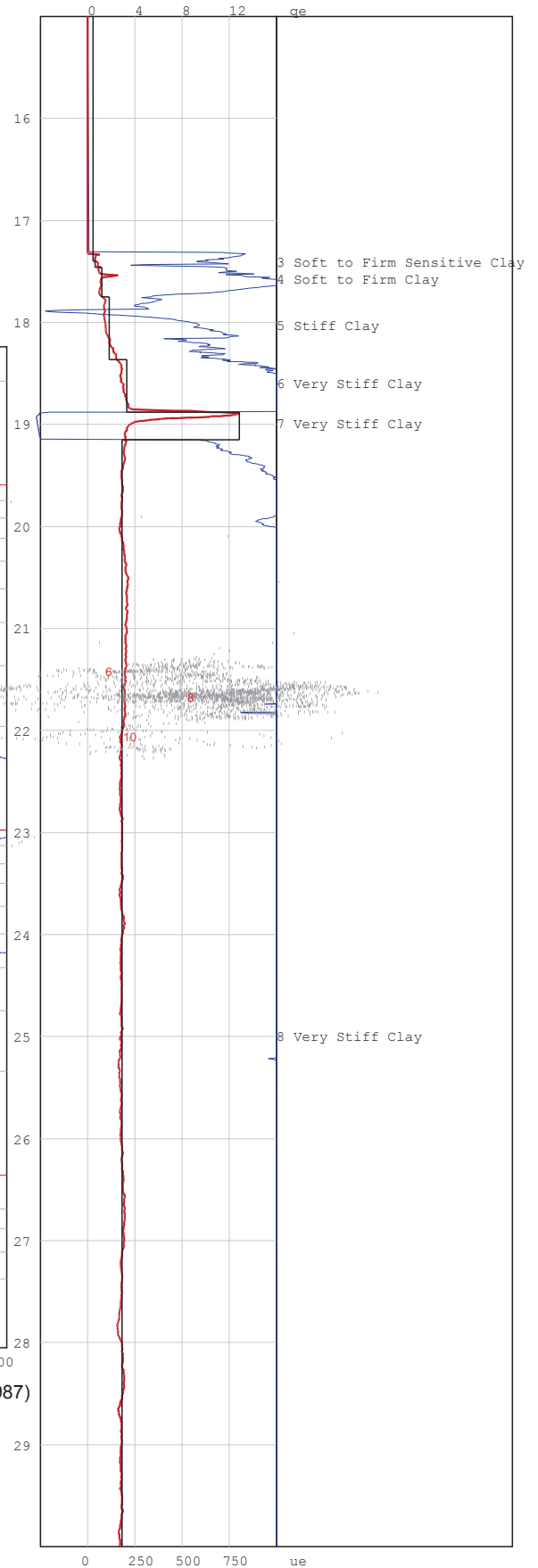
Hole No: CPT36

Date: 2012/06/02

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



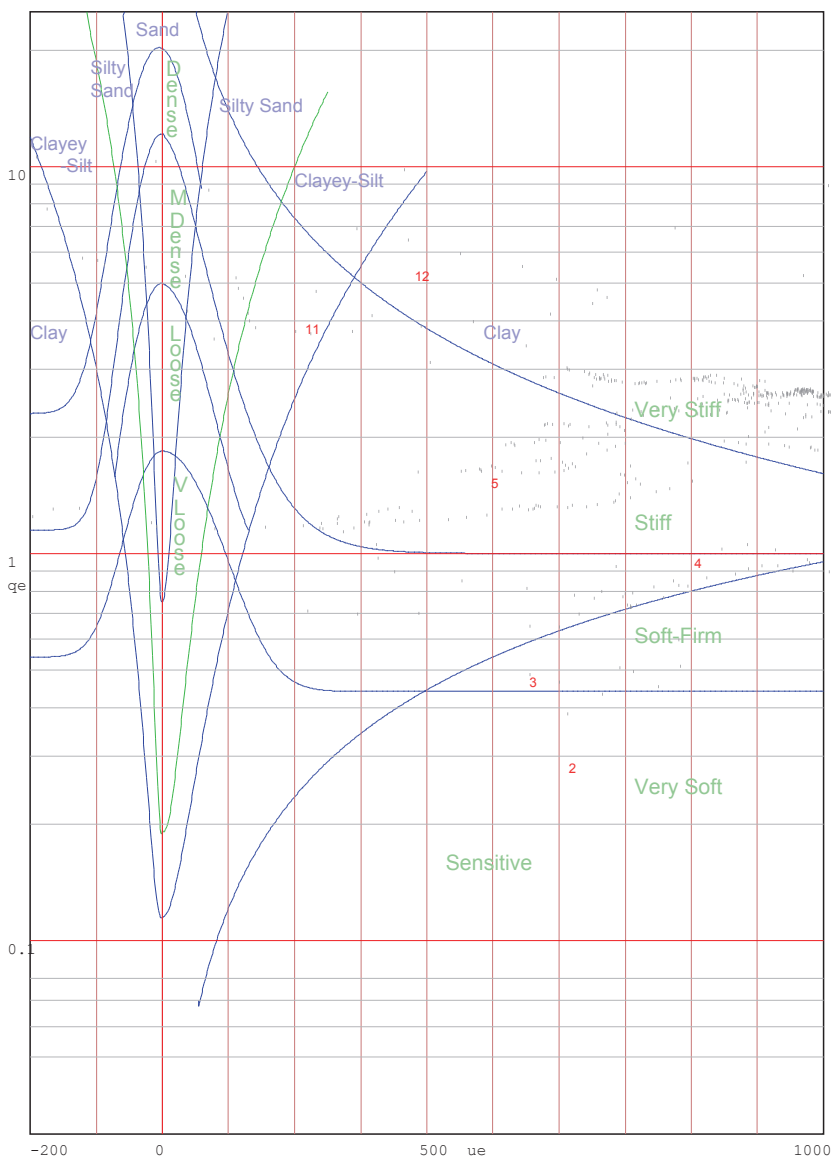
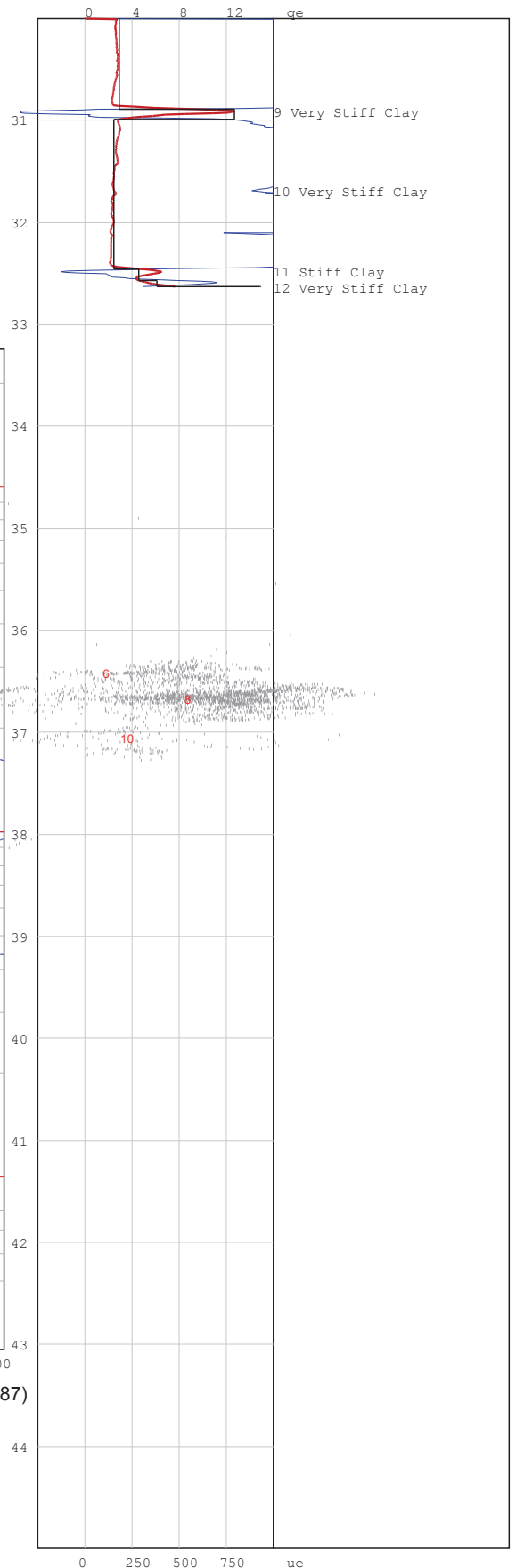
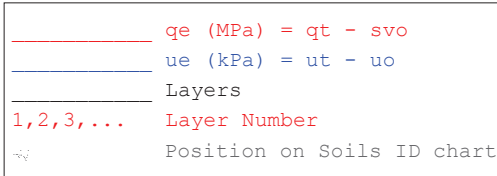
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT36

Date: 2012/06/02

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

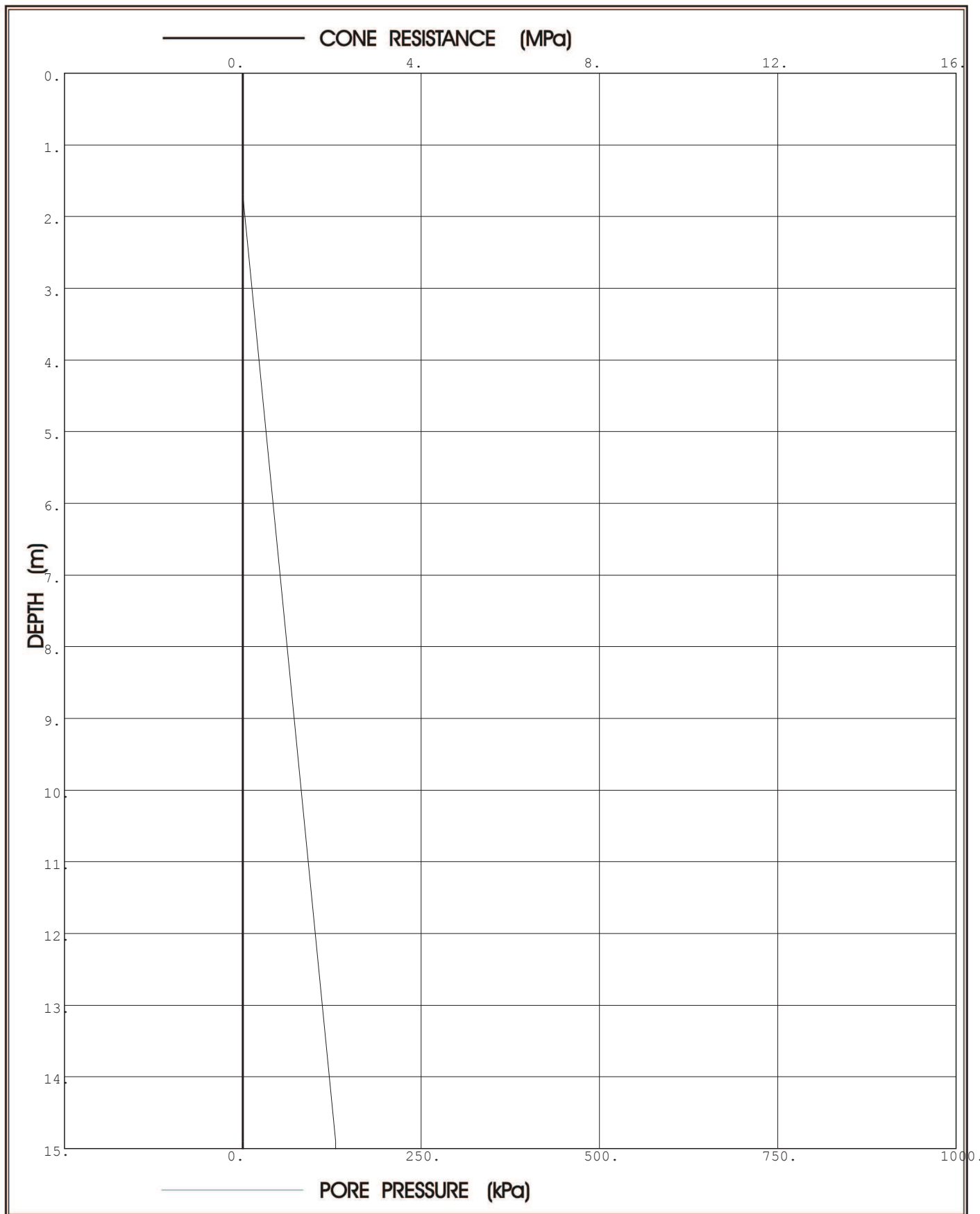
SITE: Pier2

CPTU (RE): CPT37

DATE: 2012/06/01

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

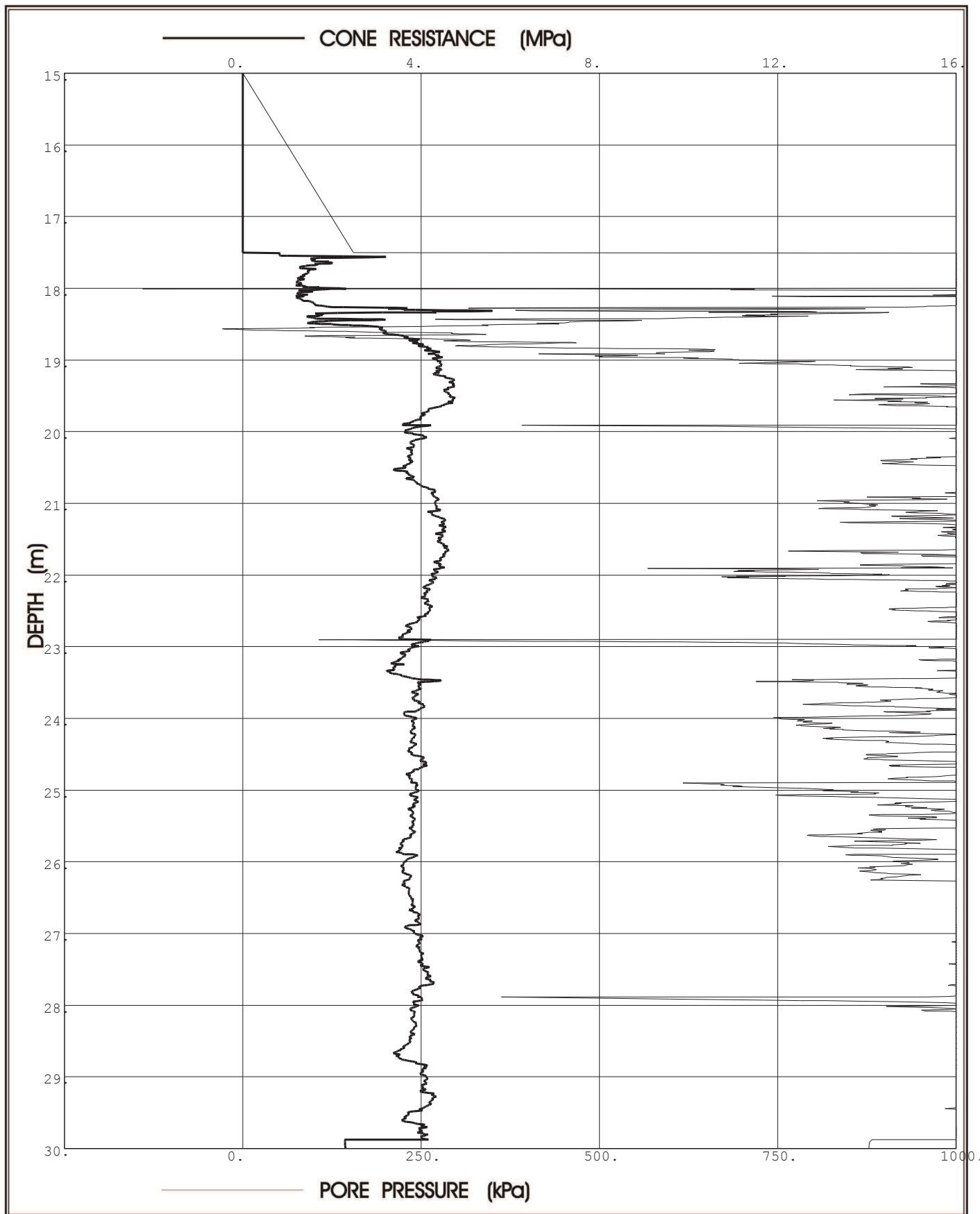
SITE: Pier2

CPTU (RE): CPT37

DATE: 2012/06/01

Probe: GHANA

Page:2



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

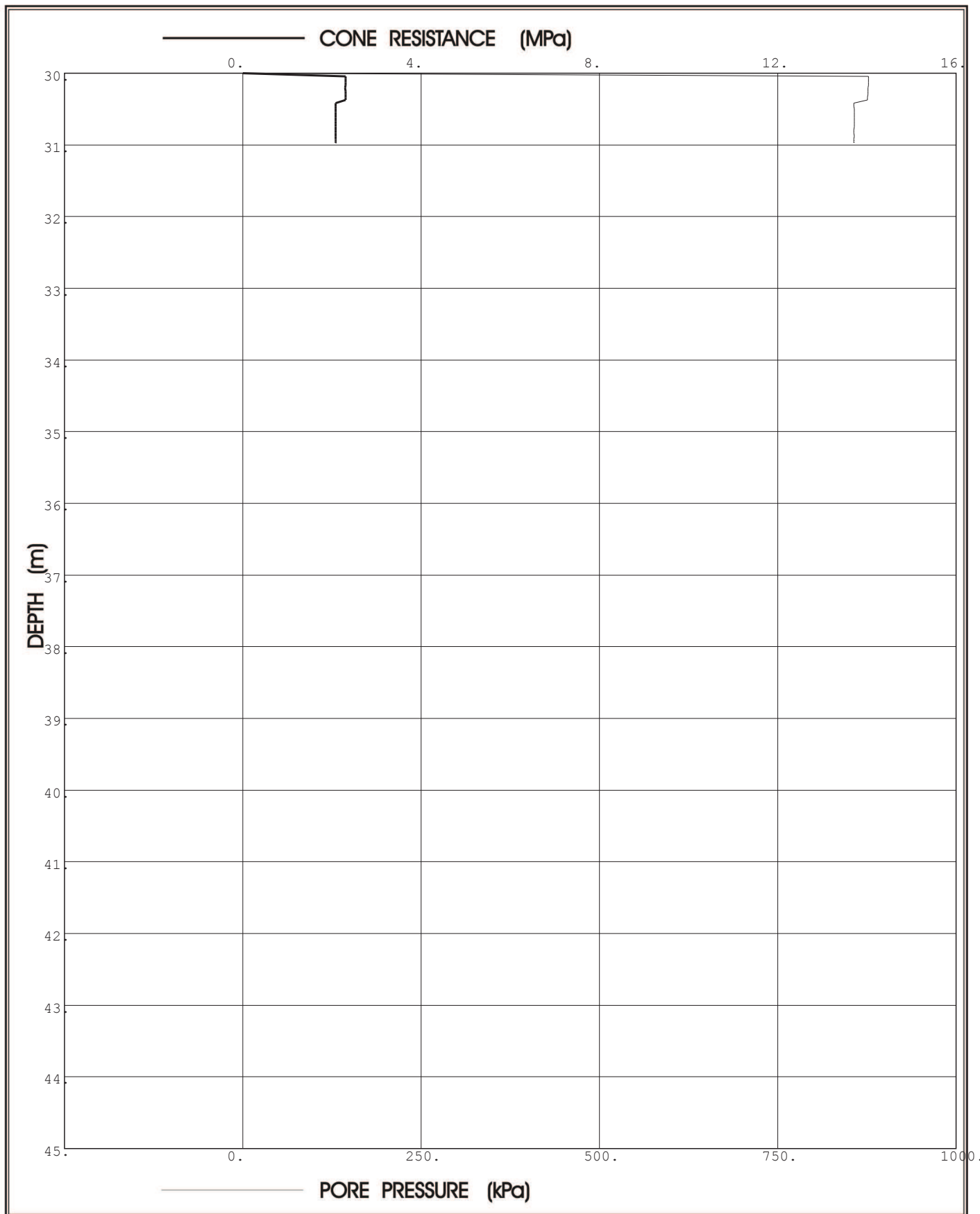
SITE: Pier2

CPTU (RE): CPT37

DATE: 2012/06/01

Probe: GHANA

Page: 3



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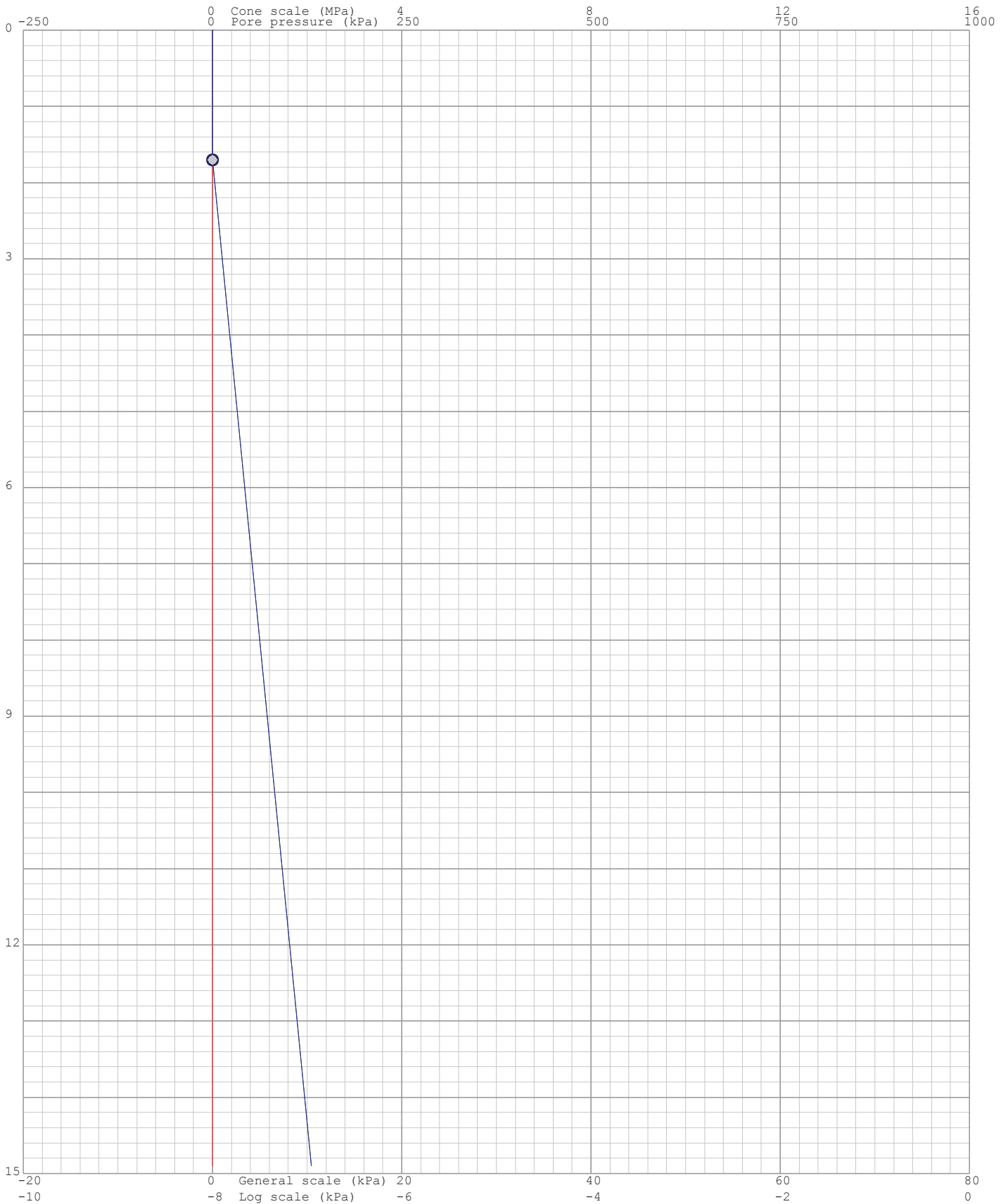
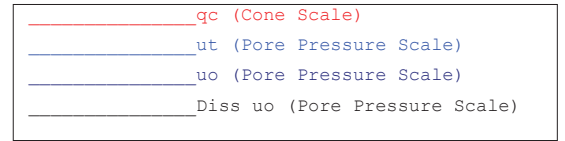
rust@global.co.za

Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT37  
Date: 2012/06/01

Probe: GHANA



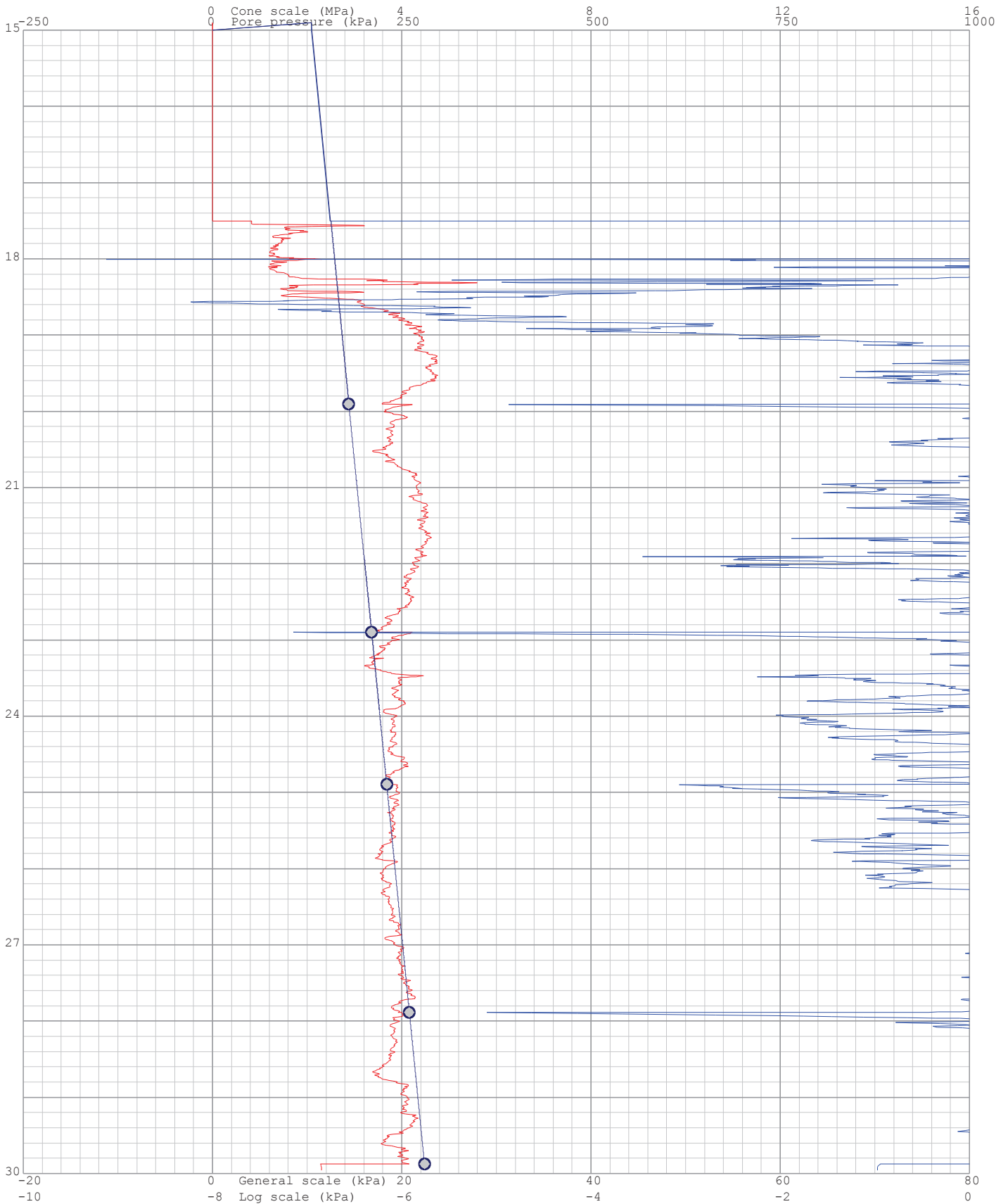
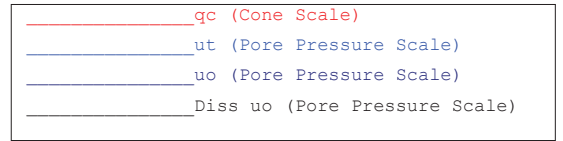
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT37

Date: 2012/06/01

Probe: GHANA



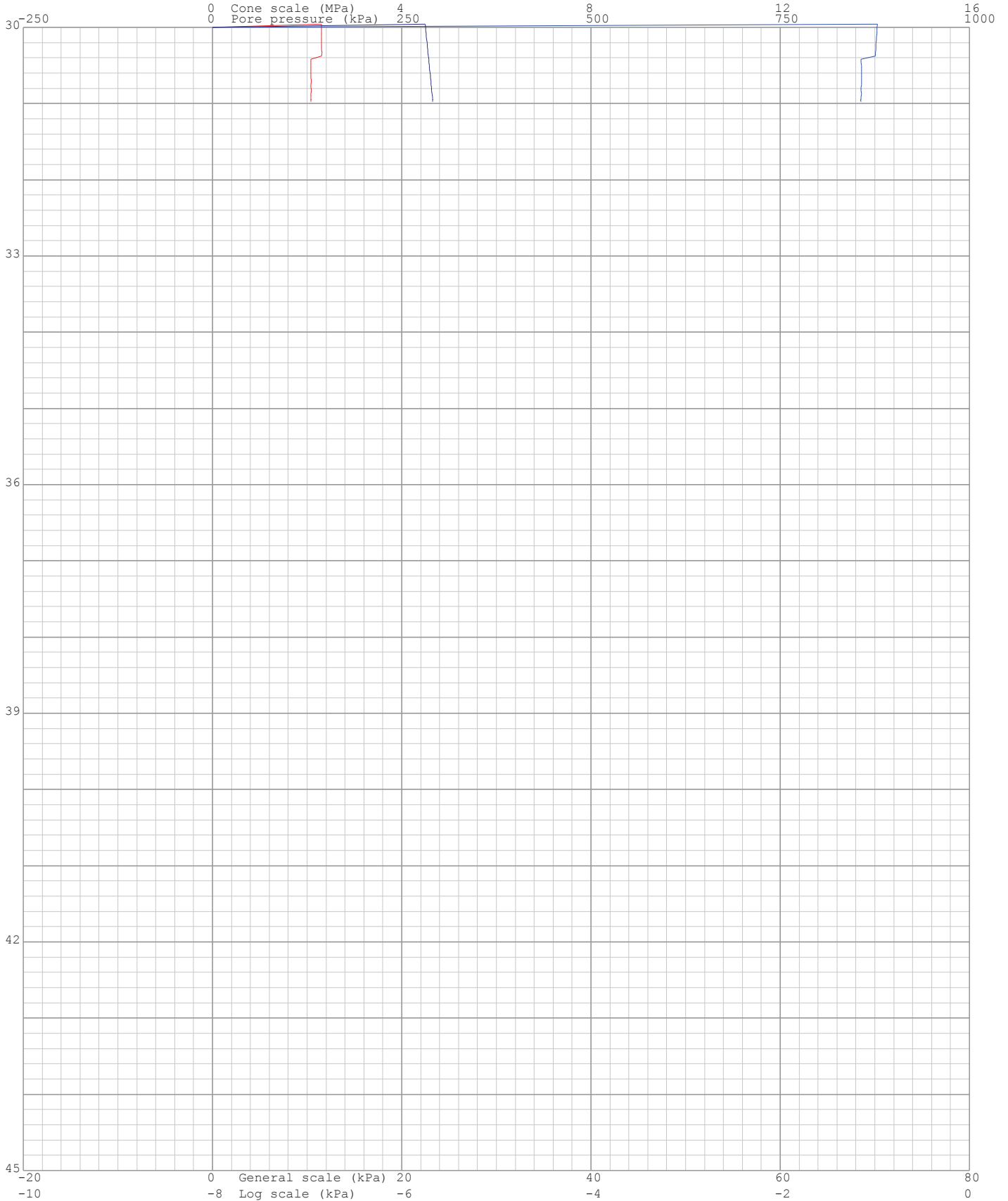
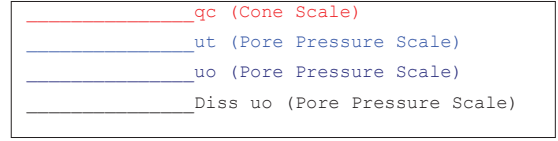
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT37

Date: 2012/06/01

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT37

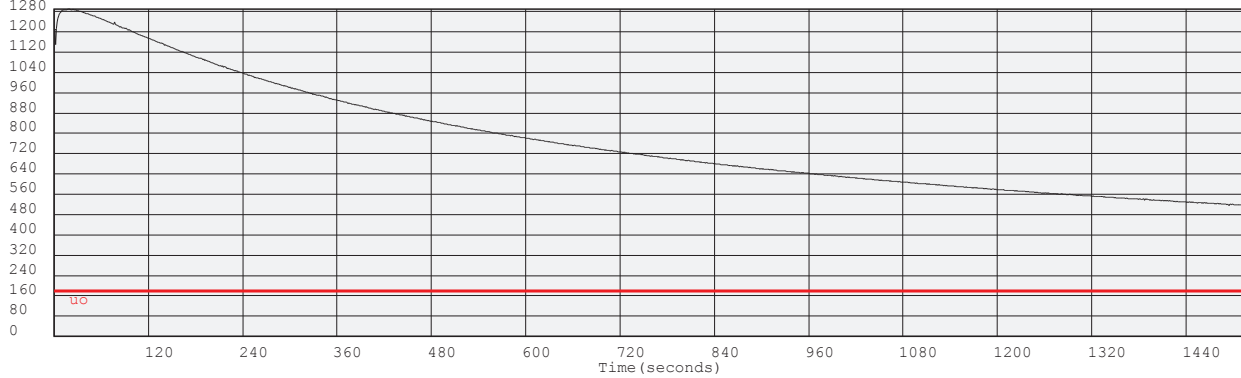
Date: 2012/06/01

Probe: GHANA  
Page: 1

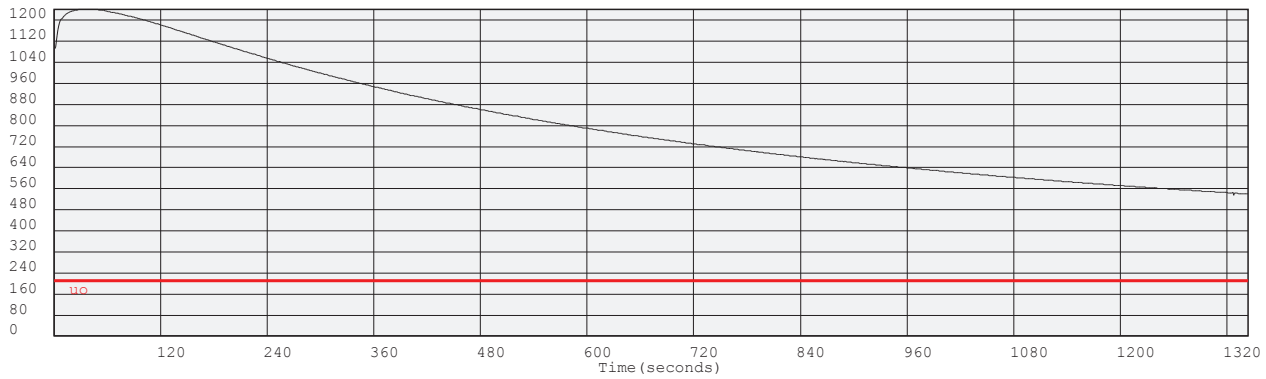
(kPa) Dissipation at: 1.7m



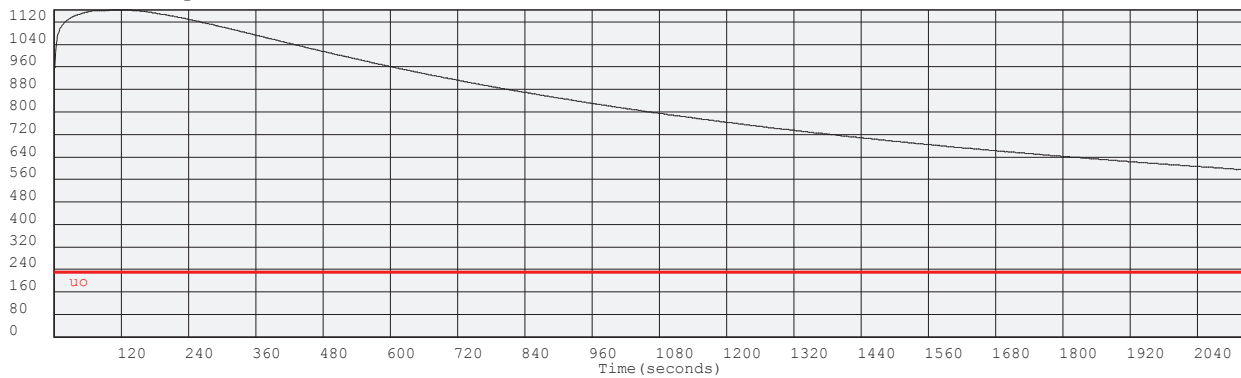
(kPa) Dissipation at: 19.908m



(kPa) Dissipation at: 22.896m



(kPa) Dissipation at: 24.896m



Project: Durban Harbour Over Water

Site: Pier2

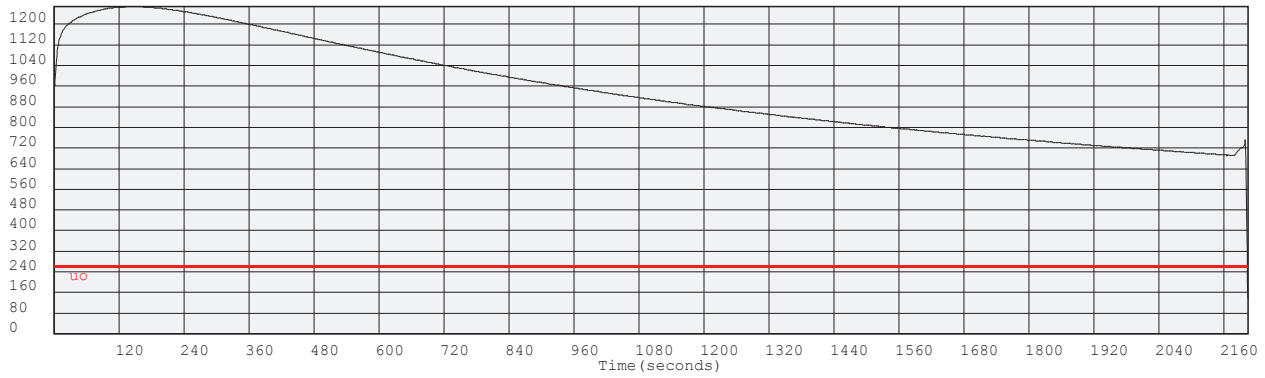
Hole: CPT37

Date: 2012/06/01

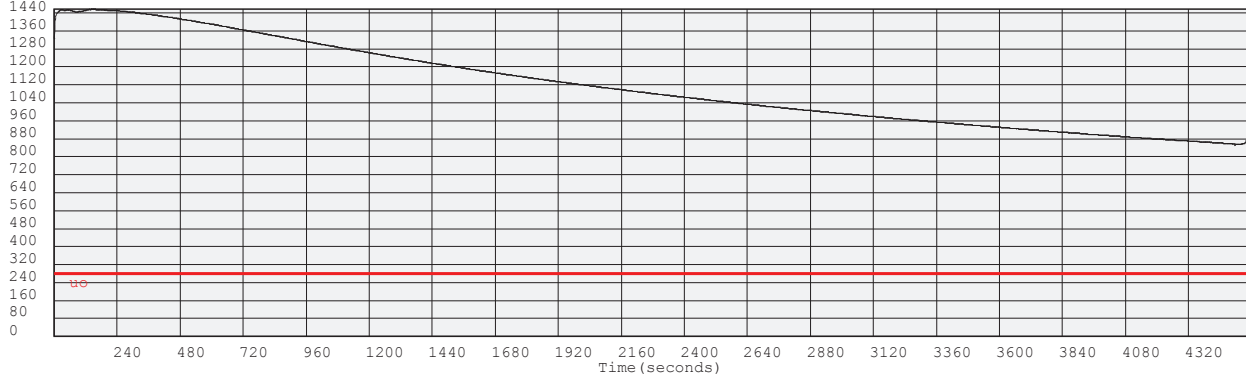
Probe: GHANA

Page: 2

(kPa) Dissipation at: 27.885m



(kPa) Dissipation at: 29.872m





Project: Durban Harbour Over Water

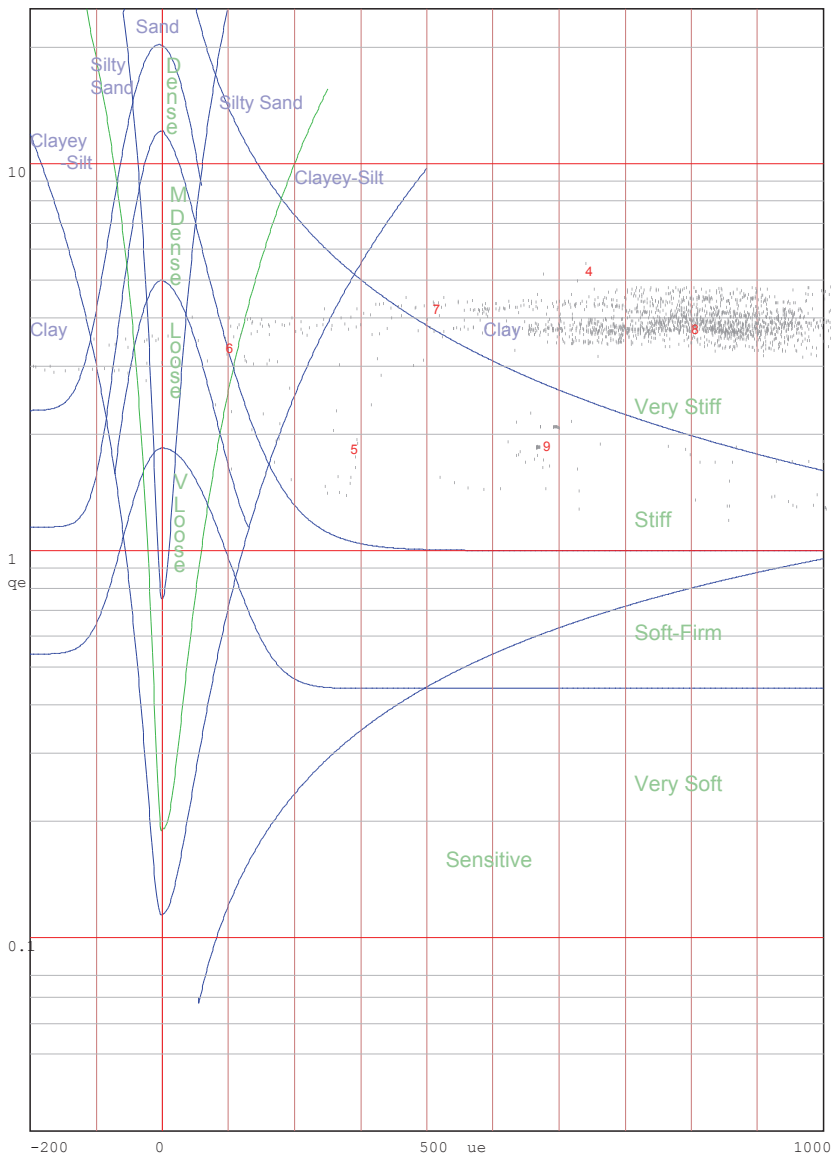
Site: Pier2

Hole No: CPT37

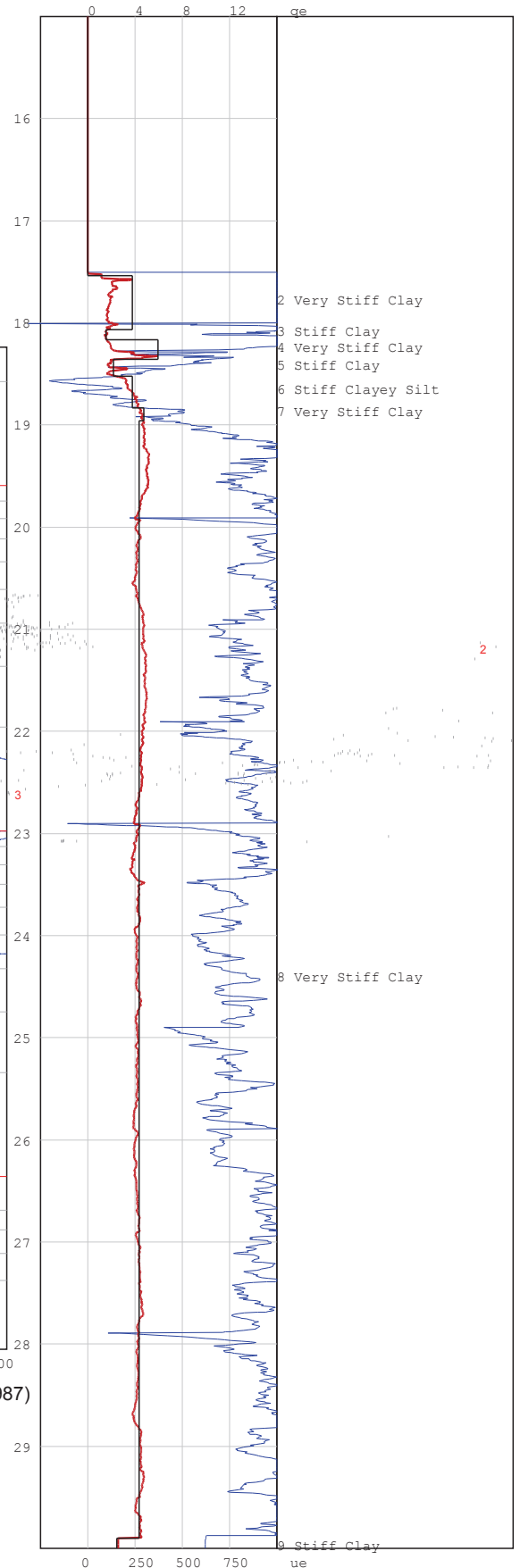
Date: 2012/06/01

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





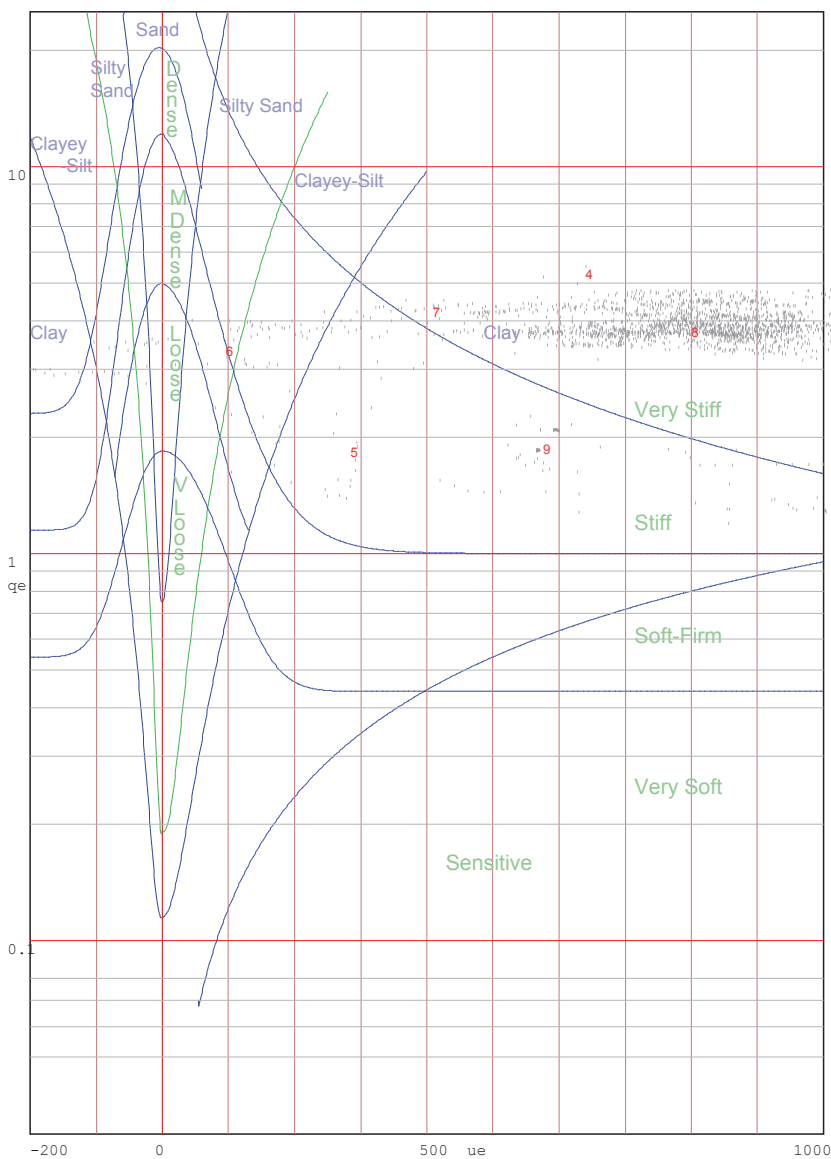
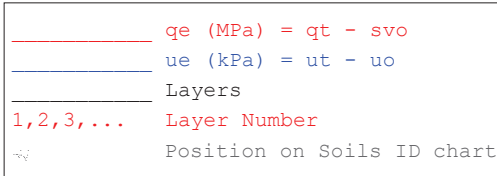
Project: Durban Harbour Over Water

Site: Pier2

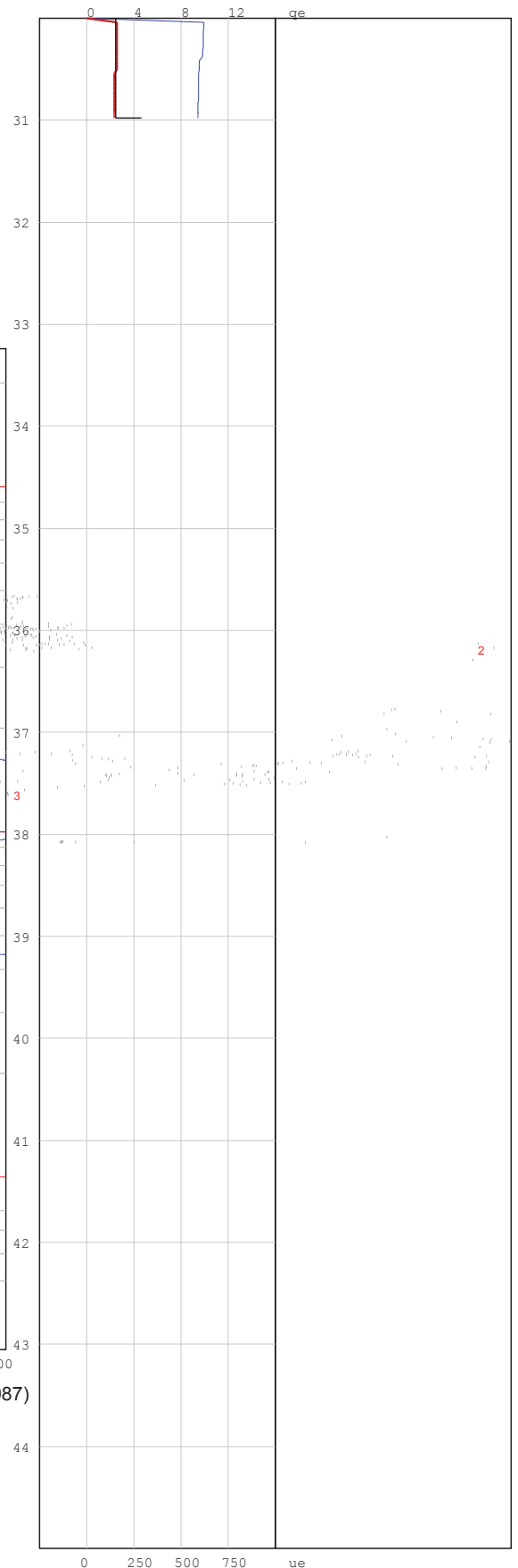
Hole No: CPT37

Date: 2012/06/01

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

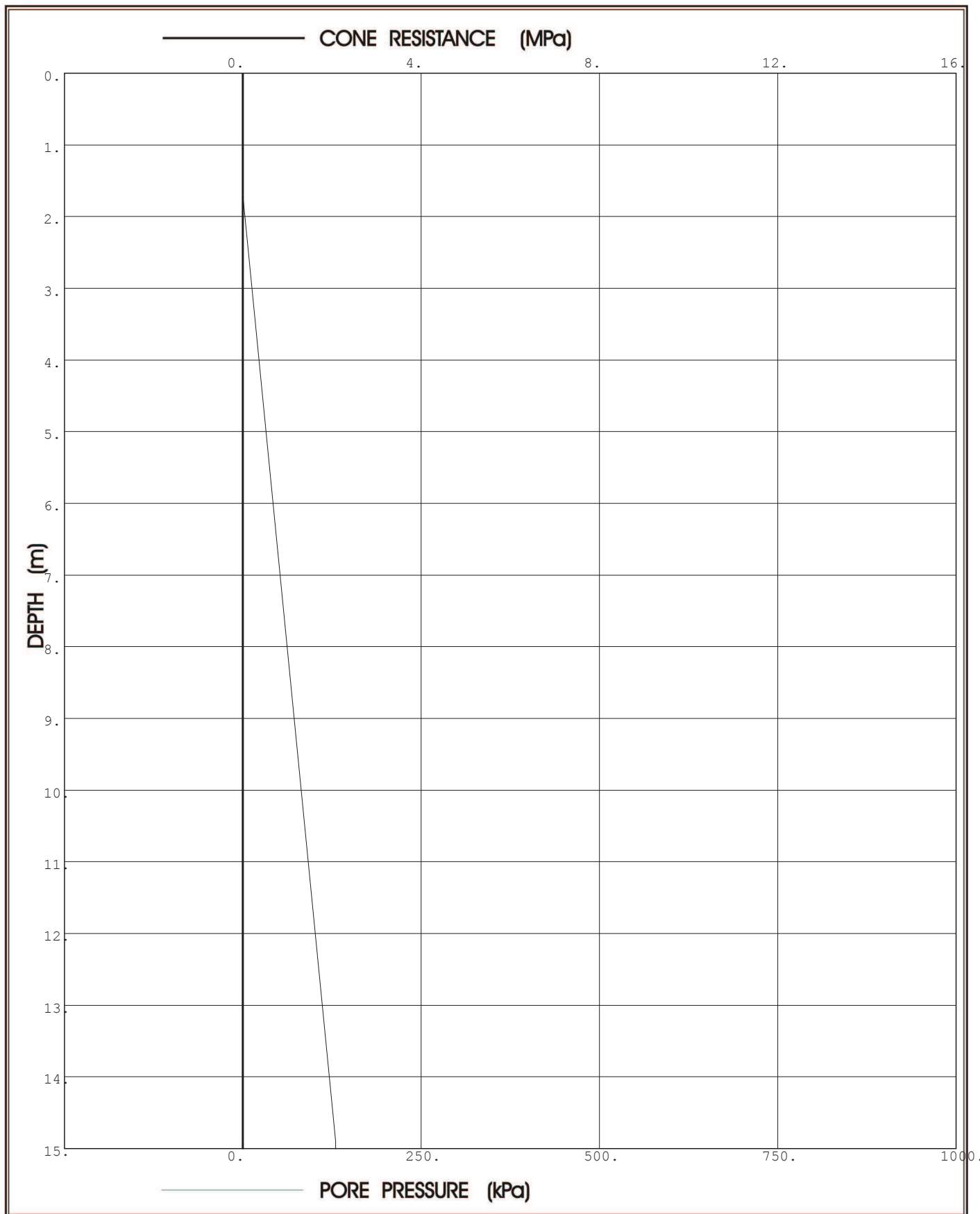
SITE: Pier2

CPTU (RE): CPT38

DATE: 2012-05-31

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

PROJECT: Durban Harbour Over Water

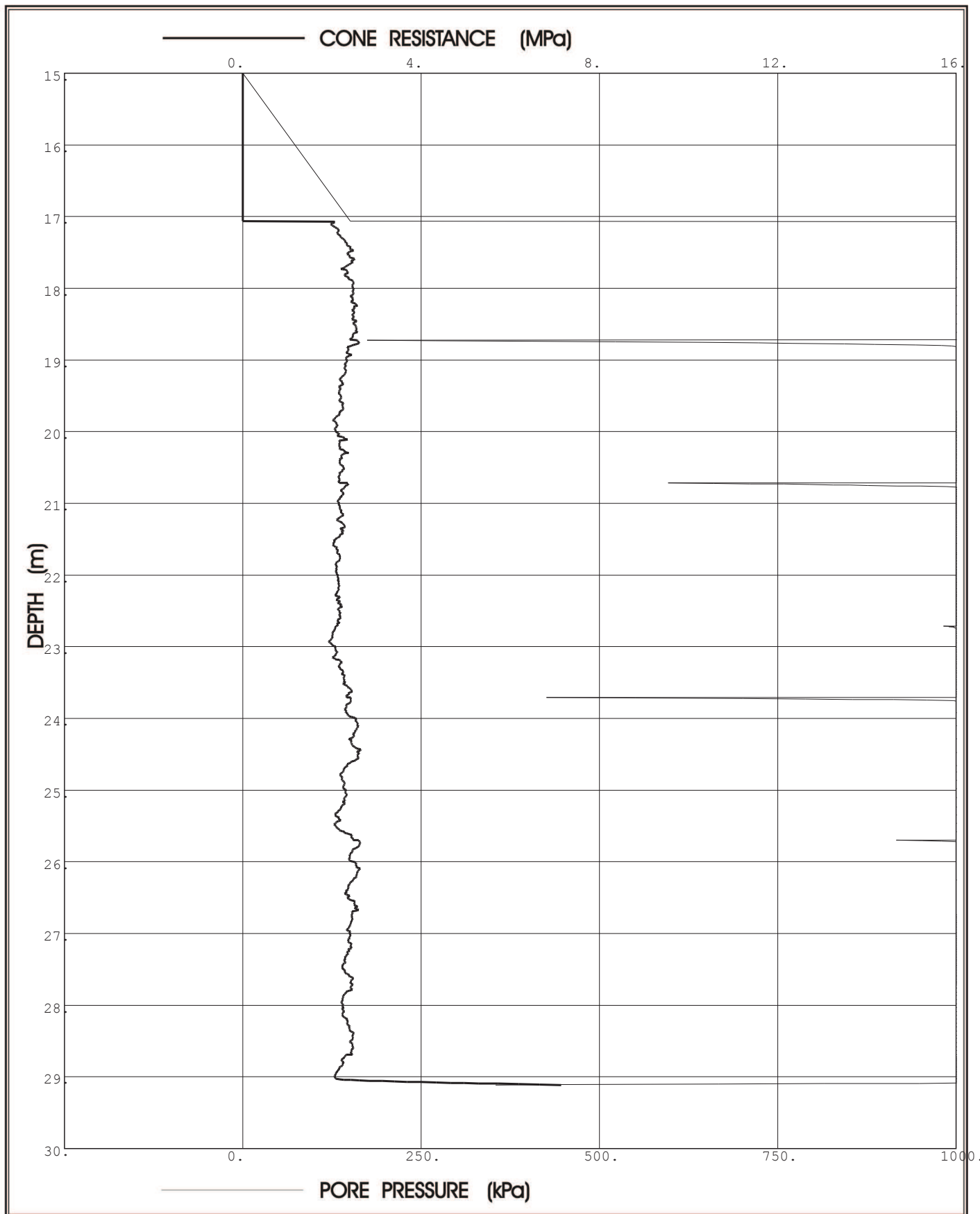
SITE: Pier2

CPTU (RE): CPT38

DATE: 2012-05-31

Probe: GHANA

Page:2



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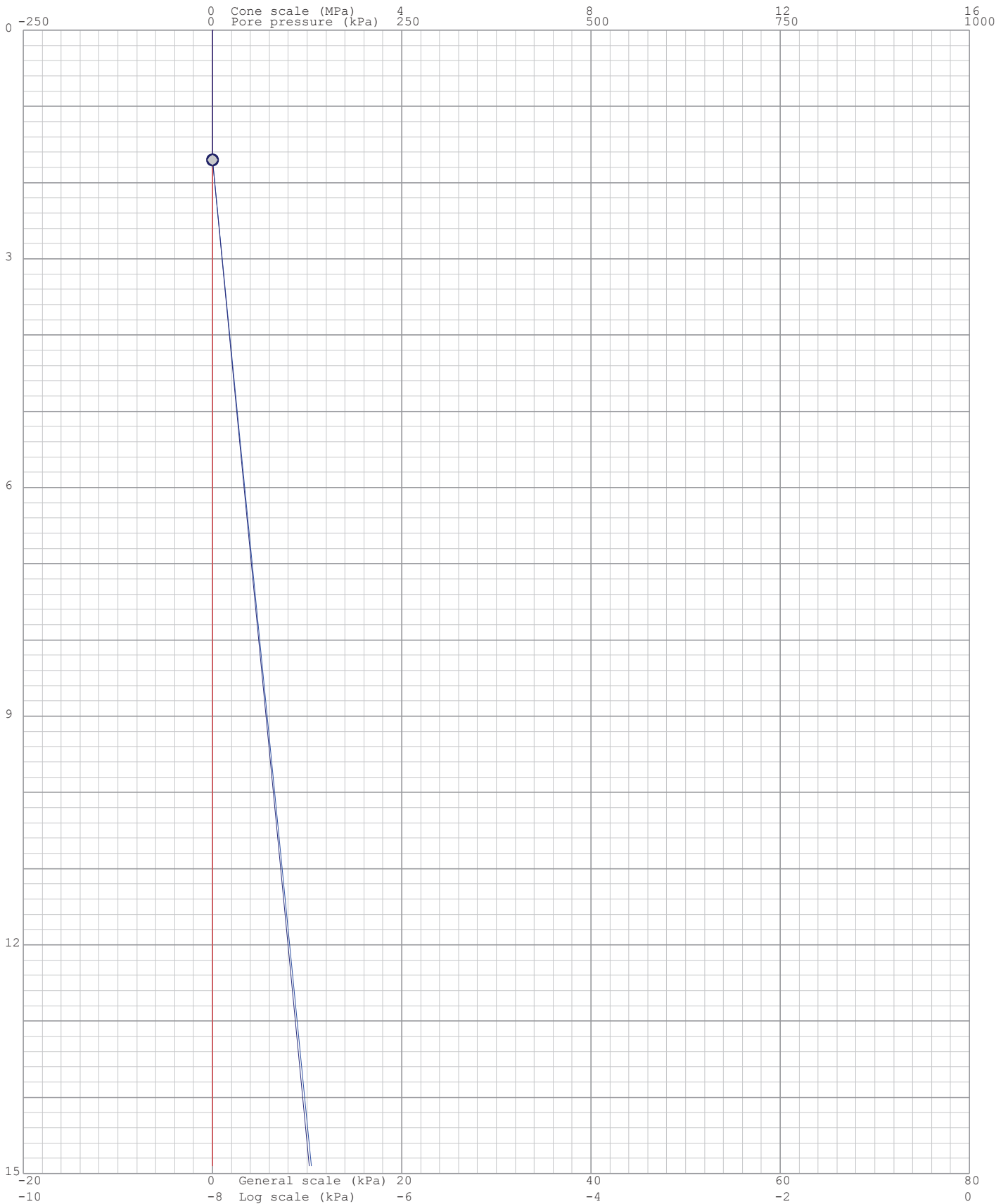
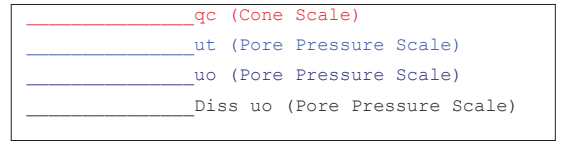
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT38

Date: 2012-05-31

Probe: GHANA



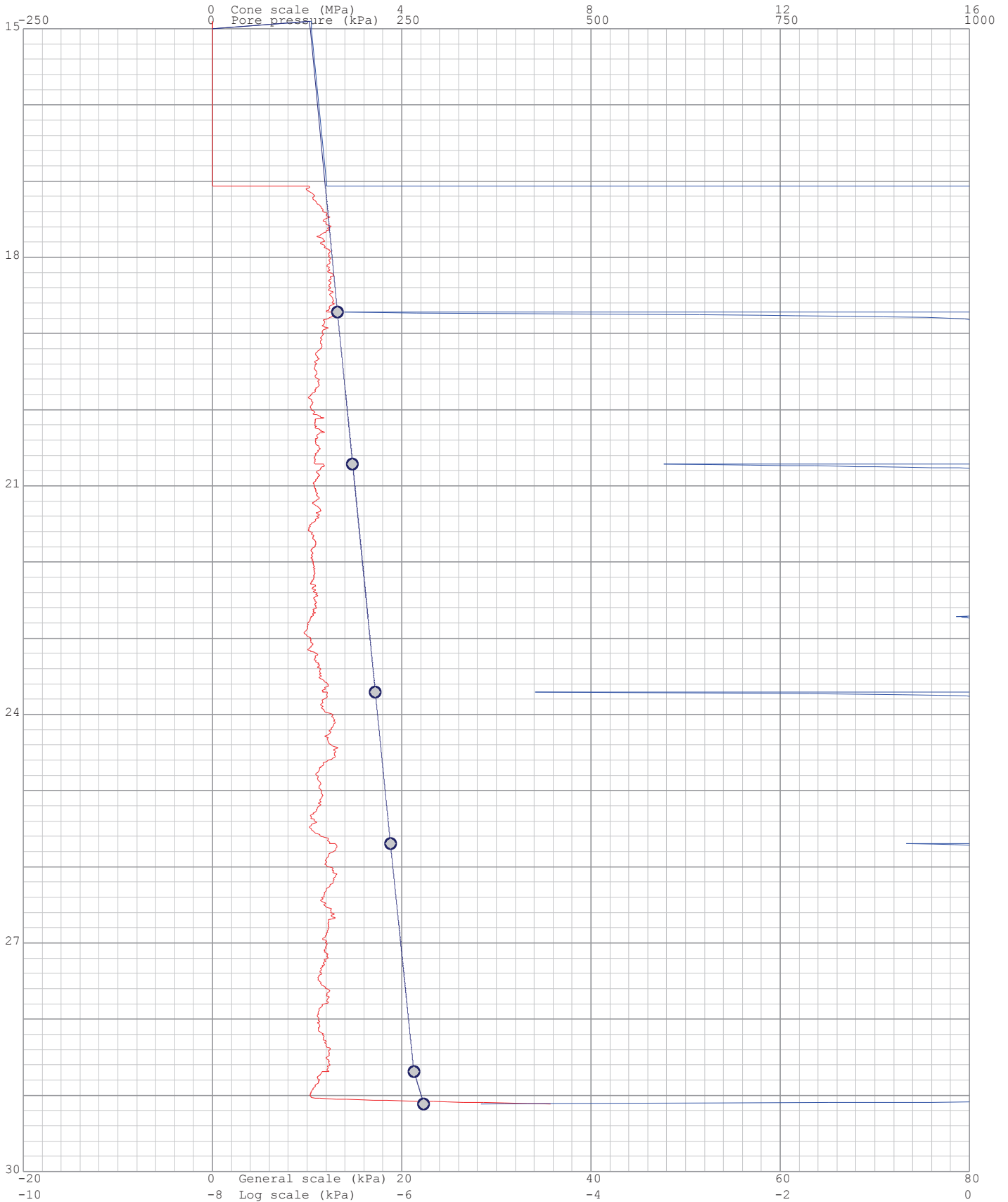
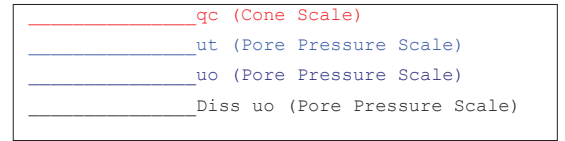
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT38

Date: 2012-05-31

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT38

Date: 2012-05-31

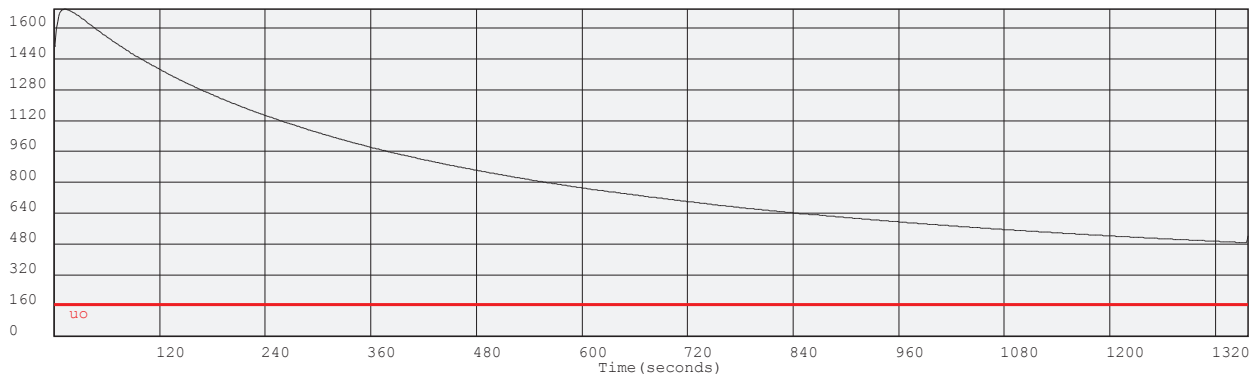
Probe: GHANA

Page: 1

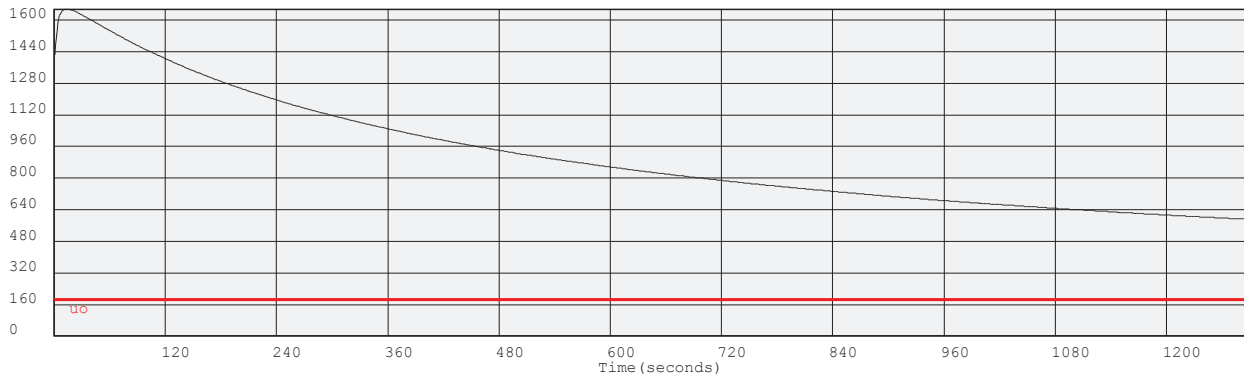
(kPa) Dissipation at: 1.7m



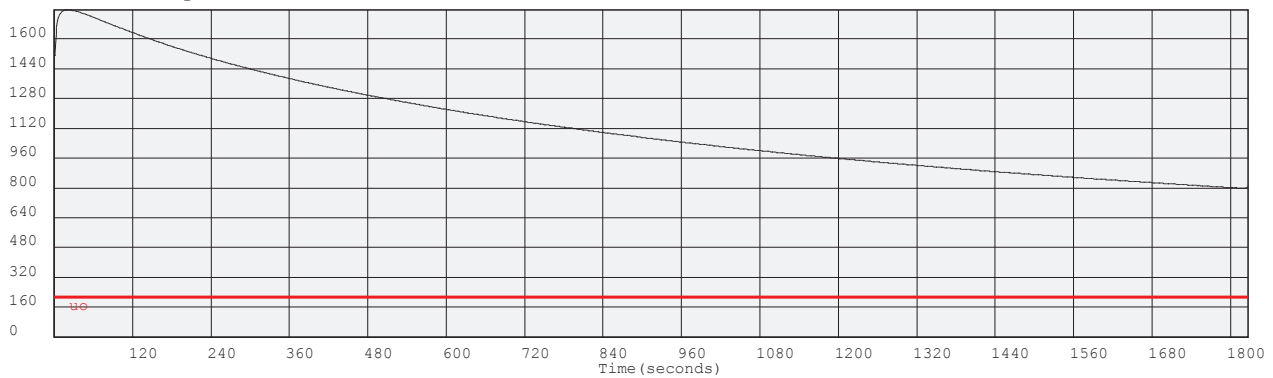
(kPa) Dissipation at: 18.719m



(kPa) Dissipation at: 20.715m



(kPa) Dissipation at: 23.705m



Project: Durban Harbour Over Water

Site: Pier2

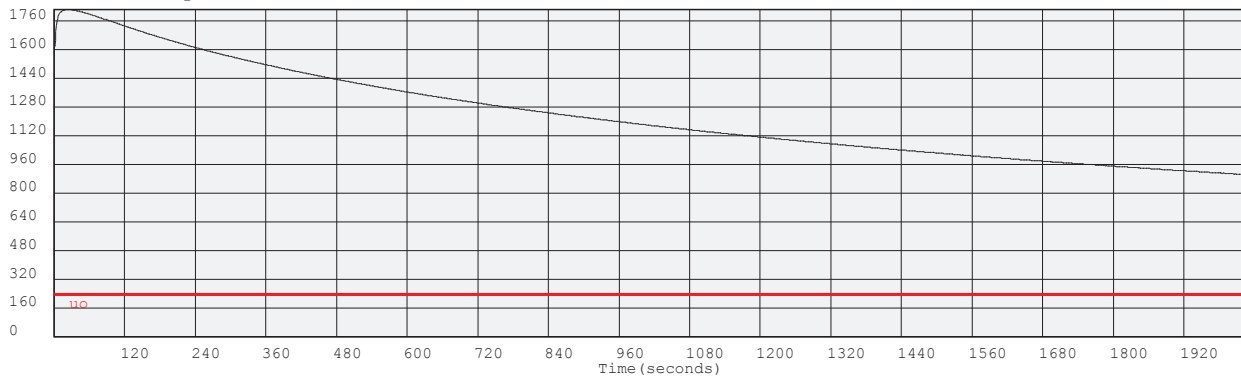
Hole: CPT38

Date: 2012-05-31

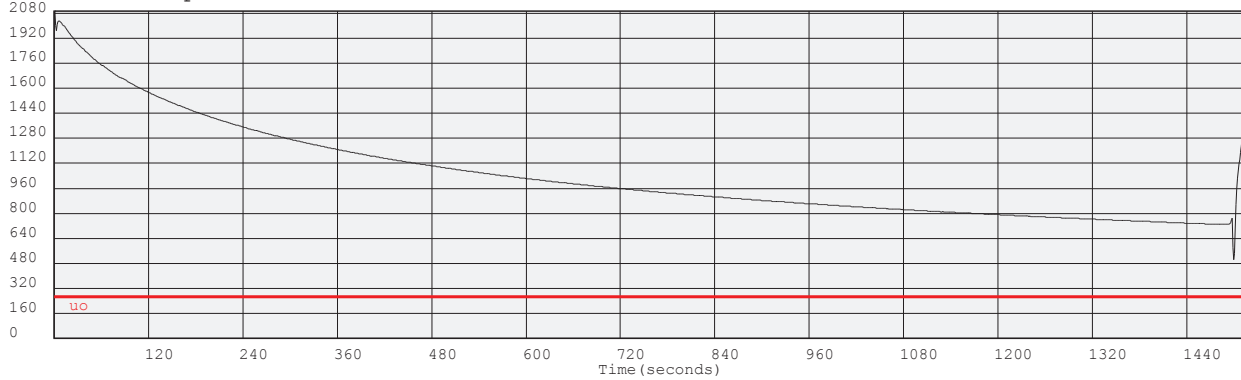
Probe: GHANA

Page: 2

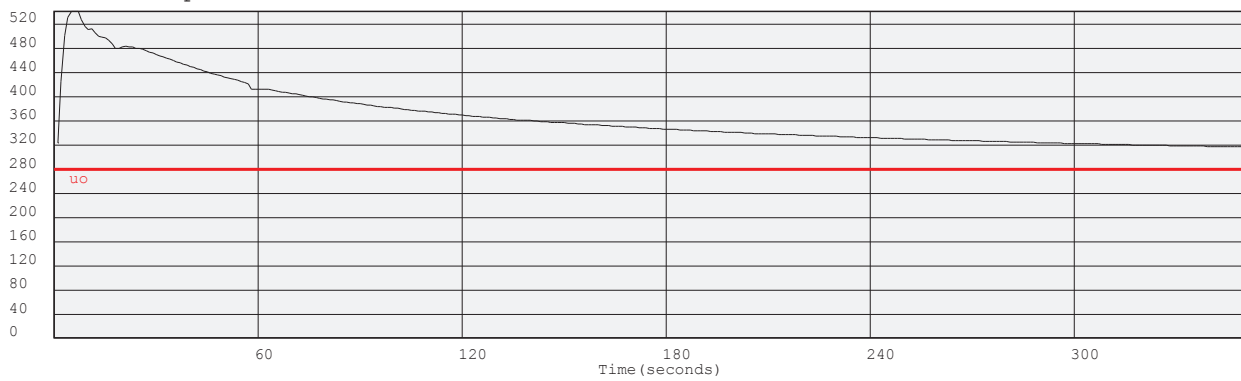
(kPa) Dissipation at: 25.695m



(kPa) Dissipation at: 28.687m



(kPa) Dissipation at: 29.111m



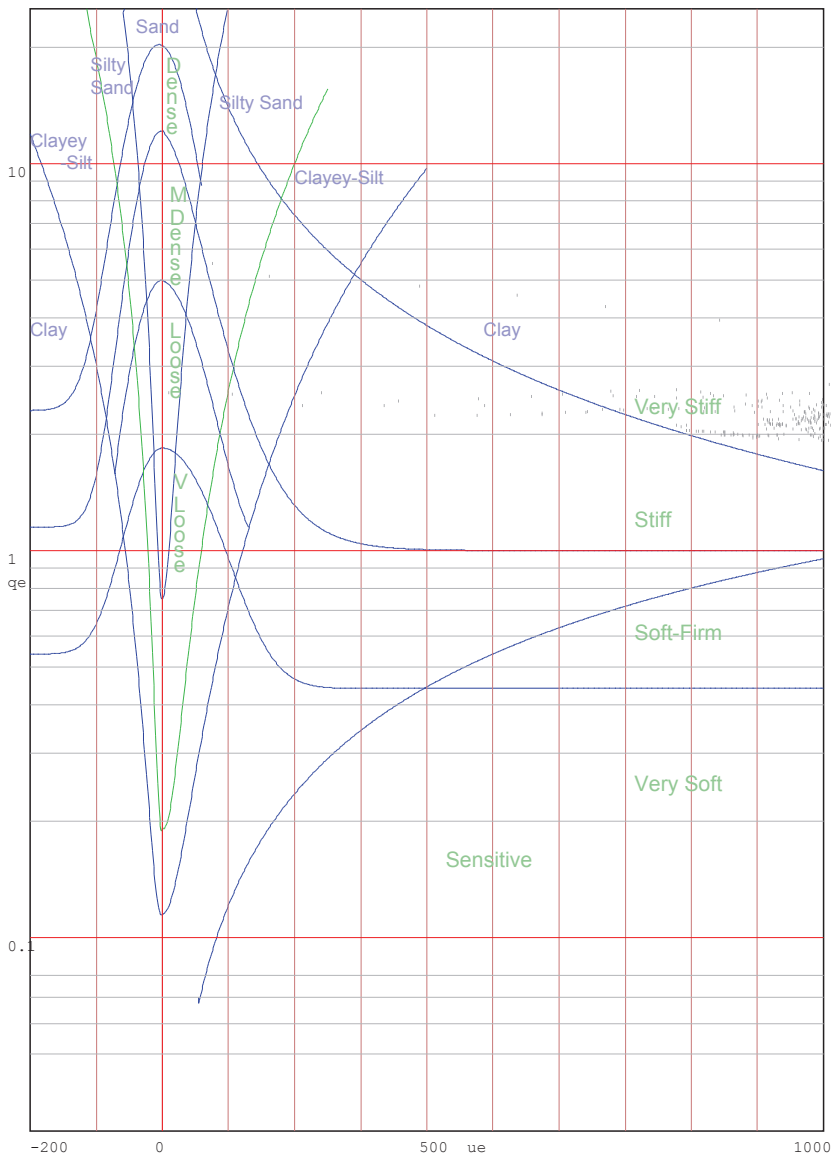
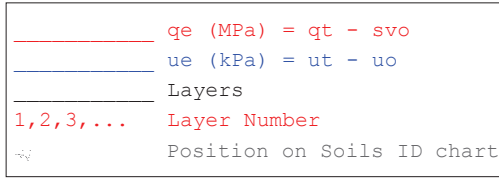
Project: Durban Harbour Over Water

Site: Pier2

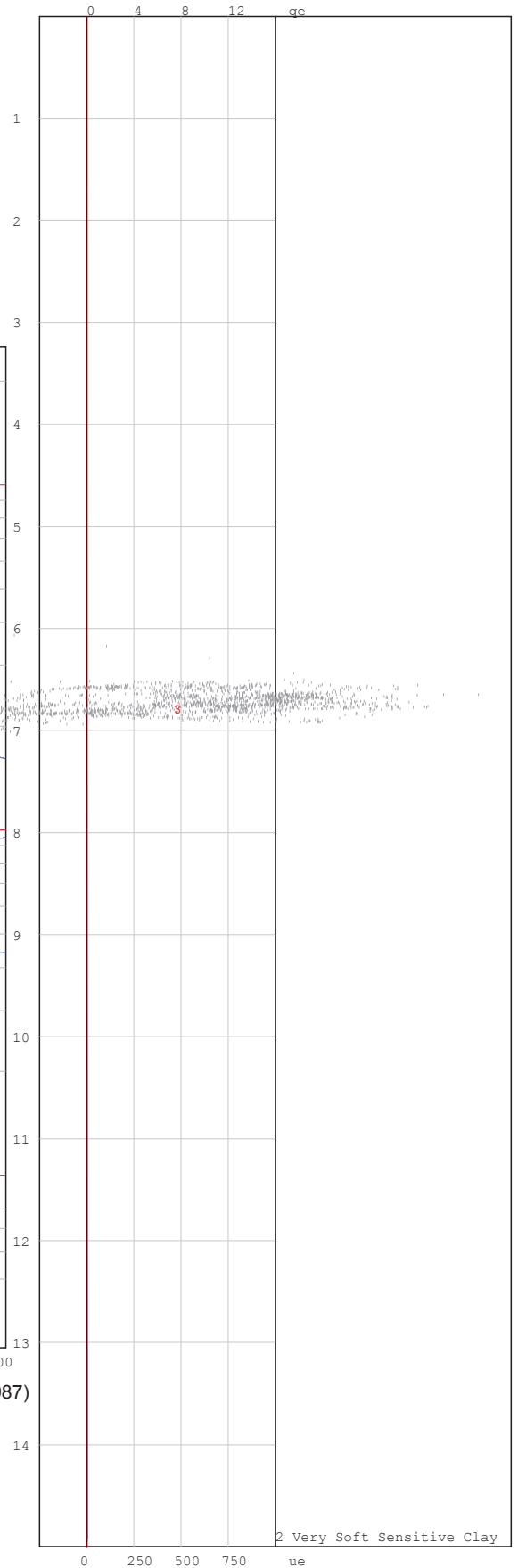
Hole No: CPT38

Date: 2012-05-31

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





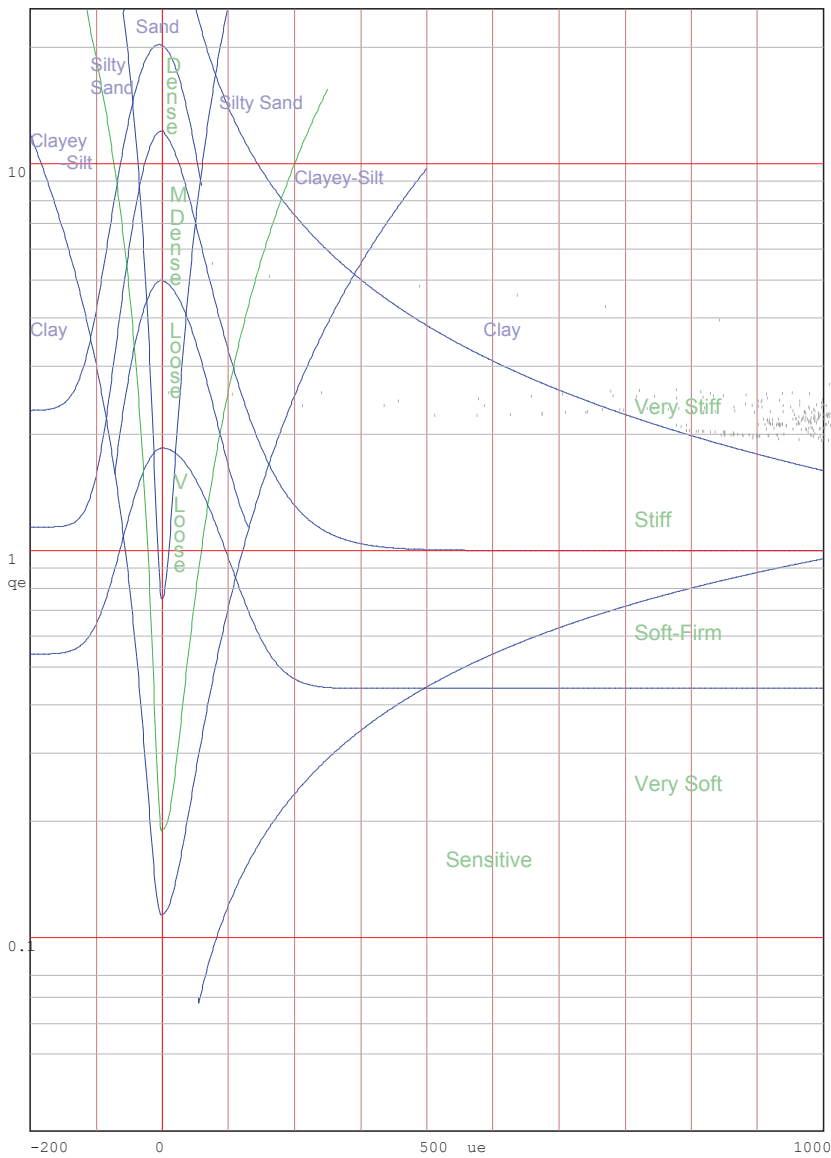
Site: Pier2

Hole No: CPT38

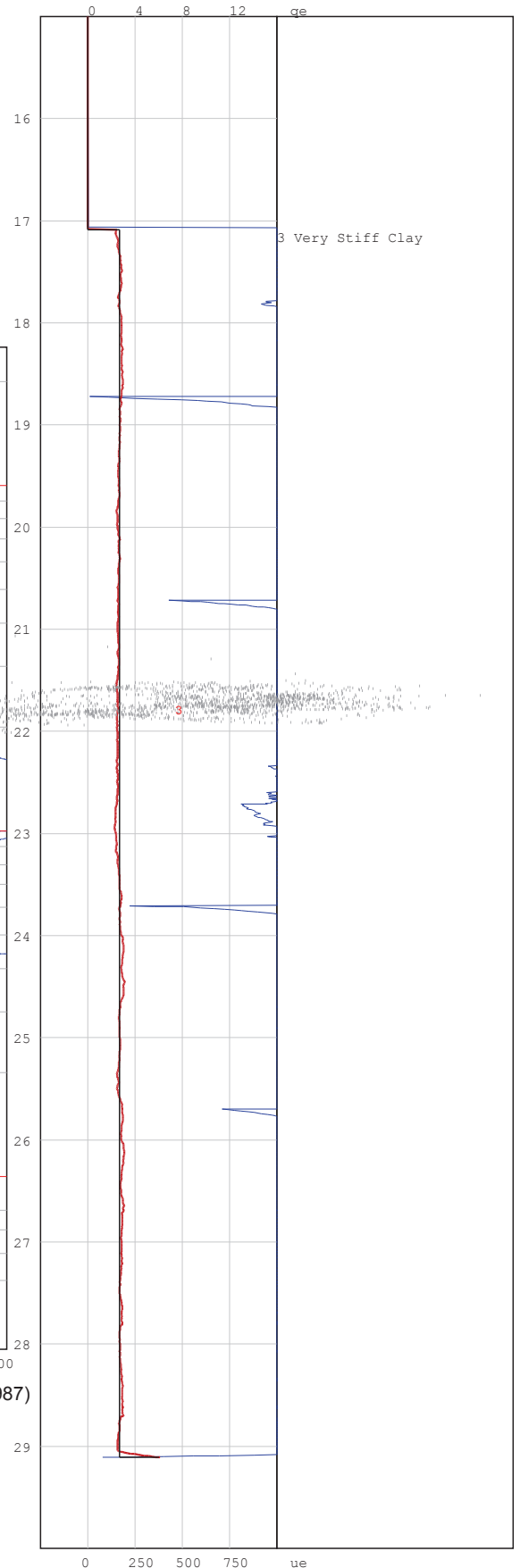
Date: 2012-05-31

Probe: GHAN

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

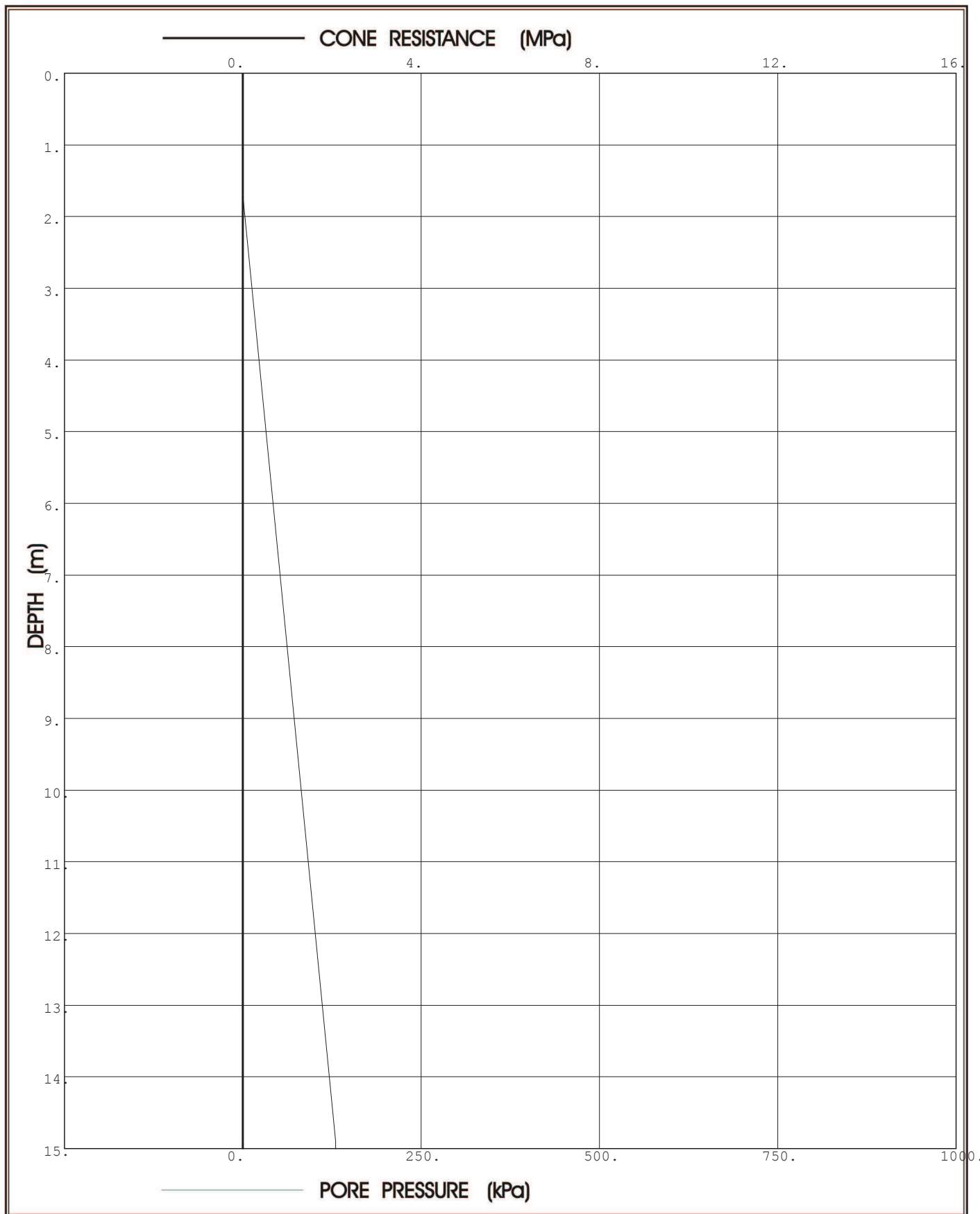
SITE: Pier2

CPTU (RE): CPT39

DATE: 2012-05-30

Probe: GHANA

Page:1



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Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

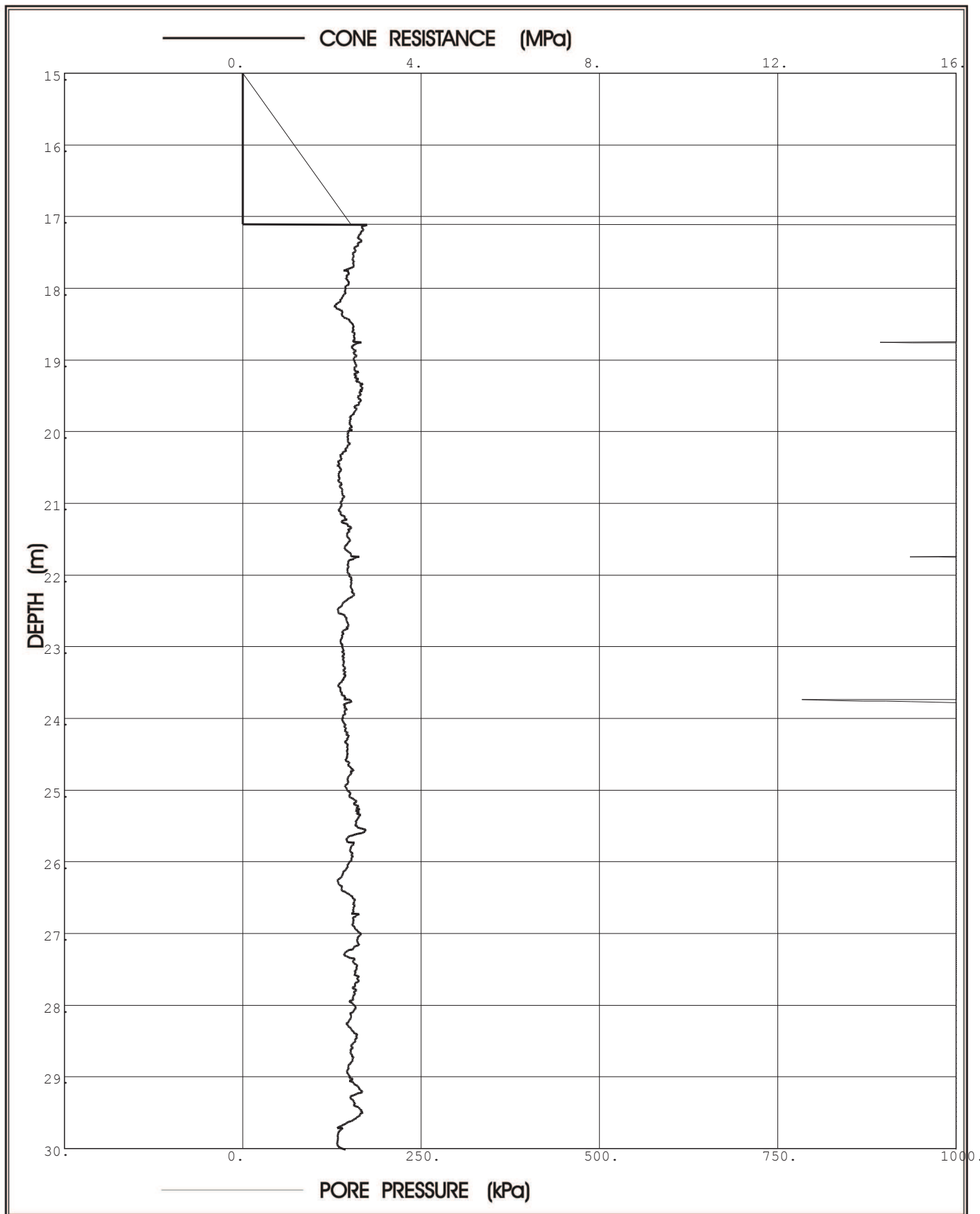
SITE: Pier2

CPTU (RE): CPT39

DATE: 2012-05-30

Probe: GHANA

Page:2



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Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

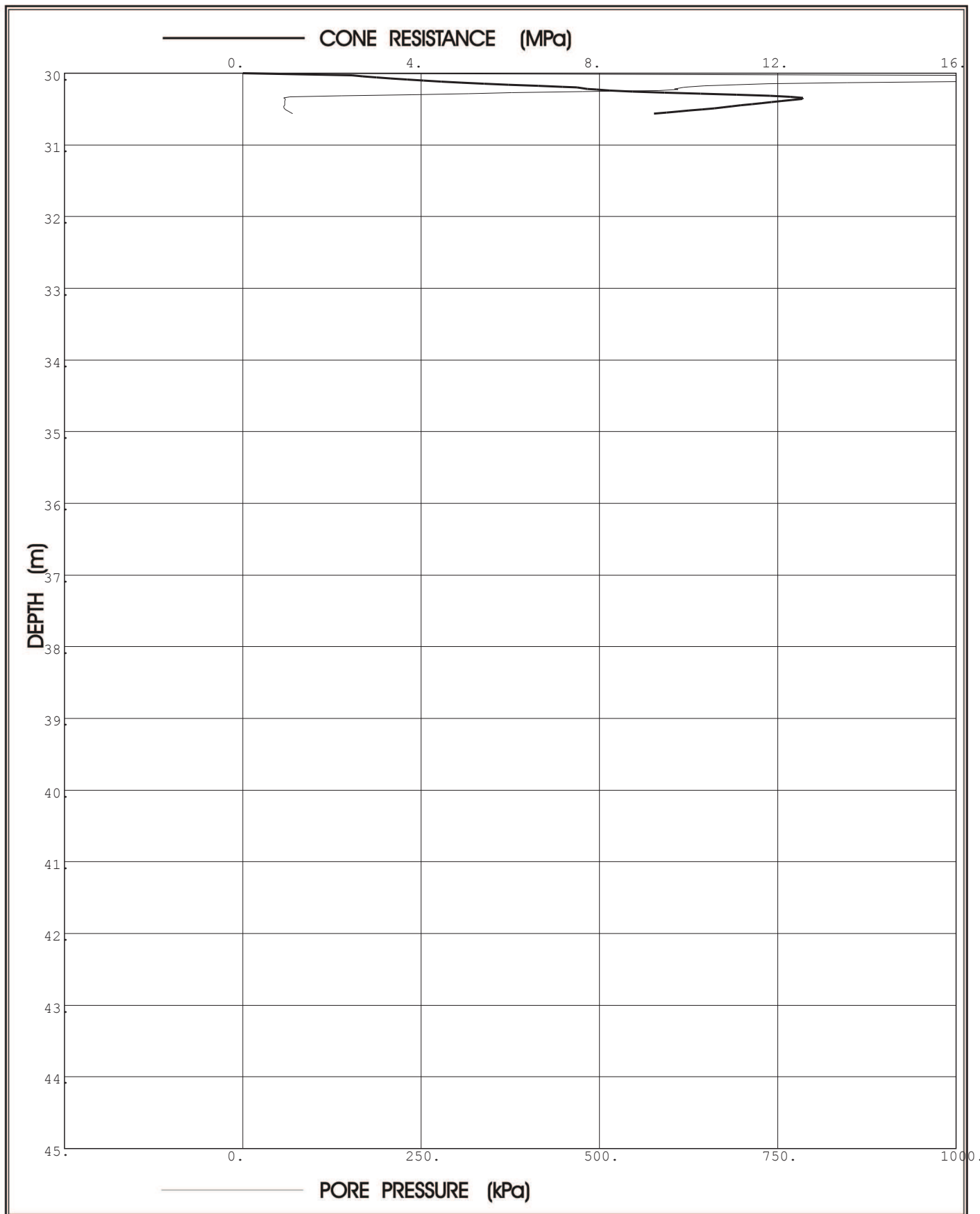
SITE: Pier2

CPTU (RE): CPT39

DATE: 2012-05-30

Probe: GHANA

Page: 3



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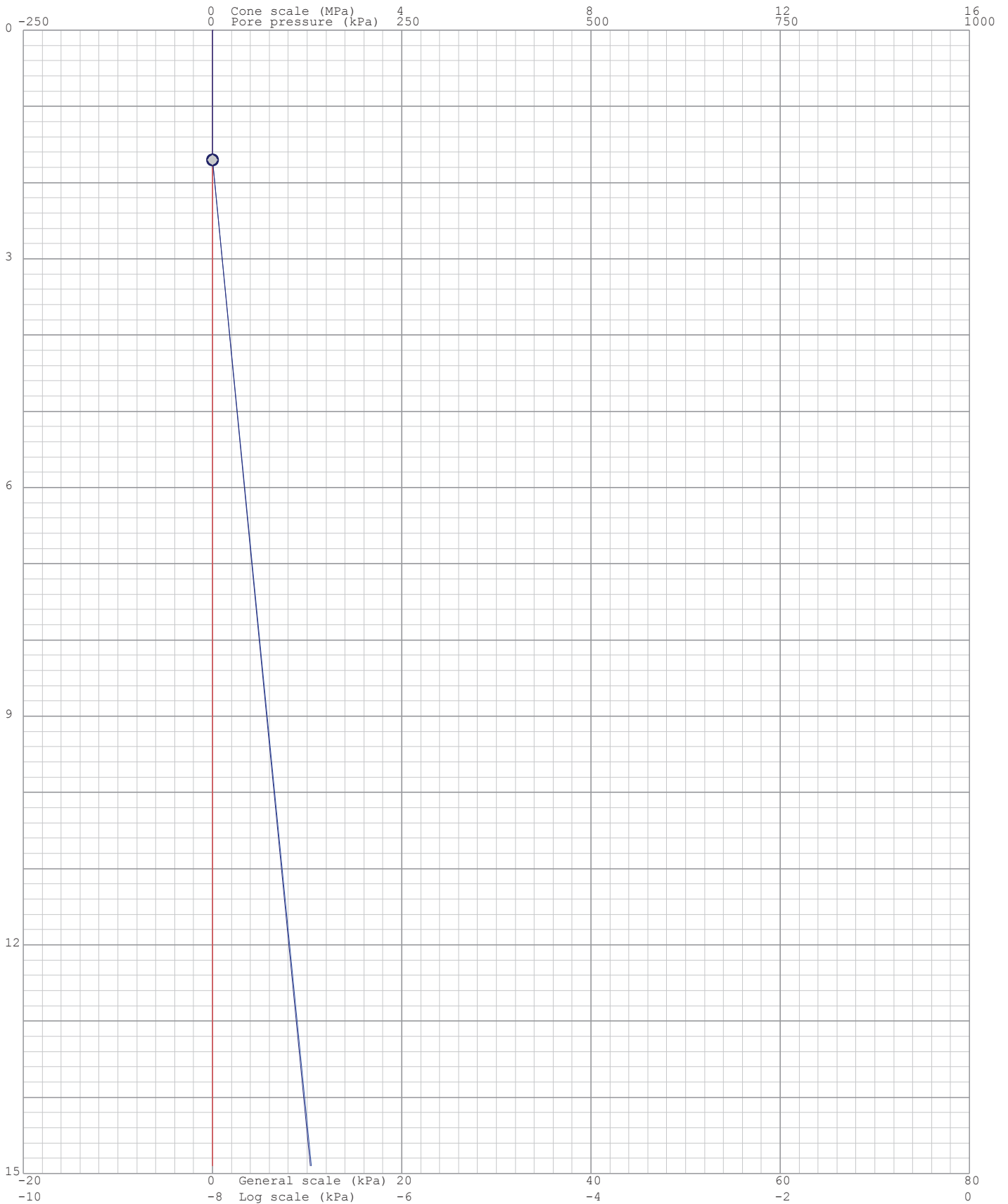
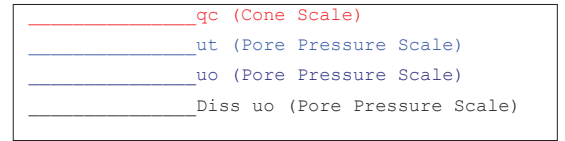
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT39

Date: 2012-05-30

Probe: GHANA



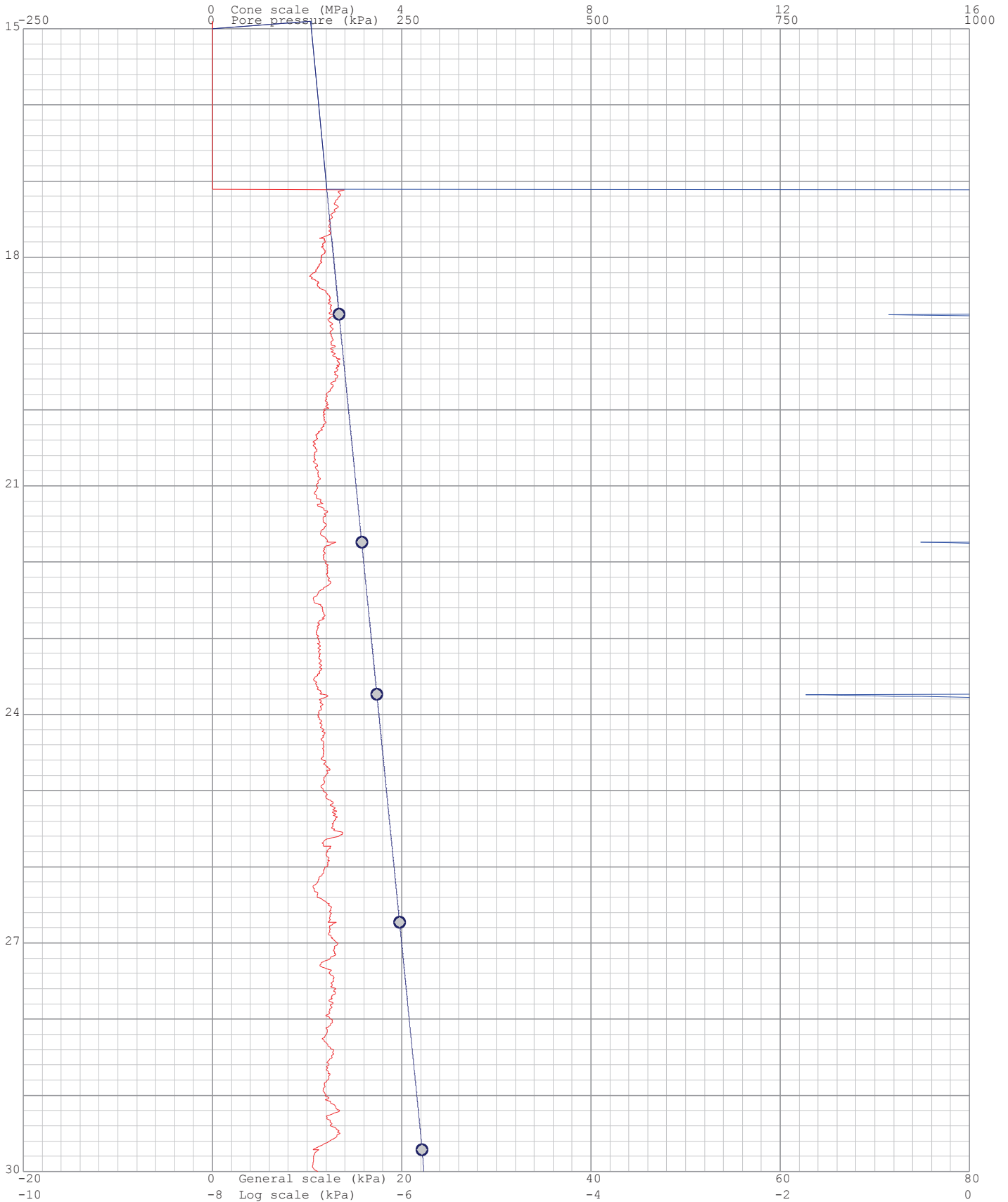
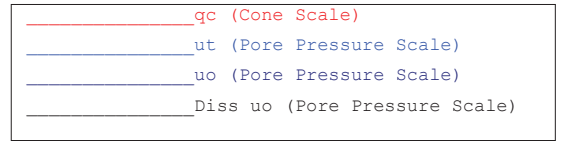
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT39

Date: 2012-05-30

Probe: GHANA



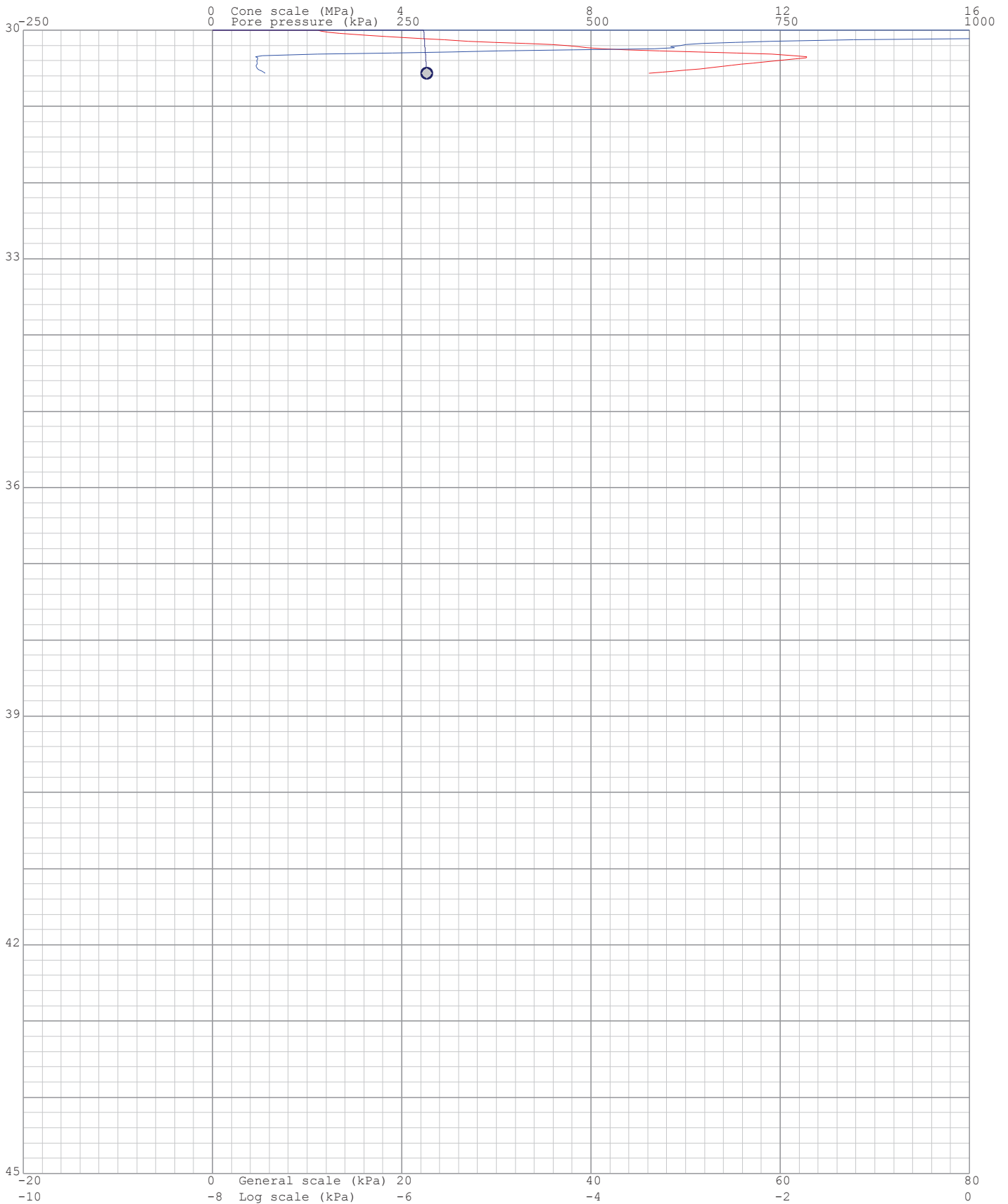
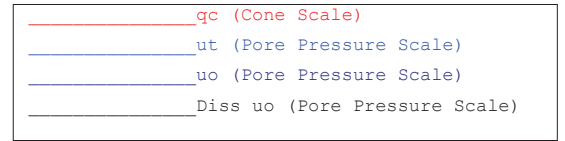
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT39

Date: 2012-05-30

Probe: GHANA



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT39

Date: 2012-05-30

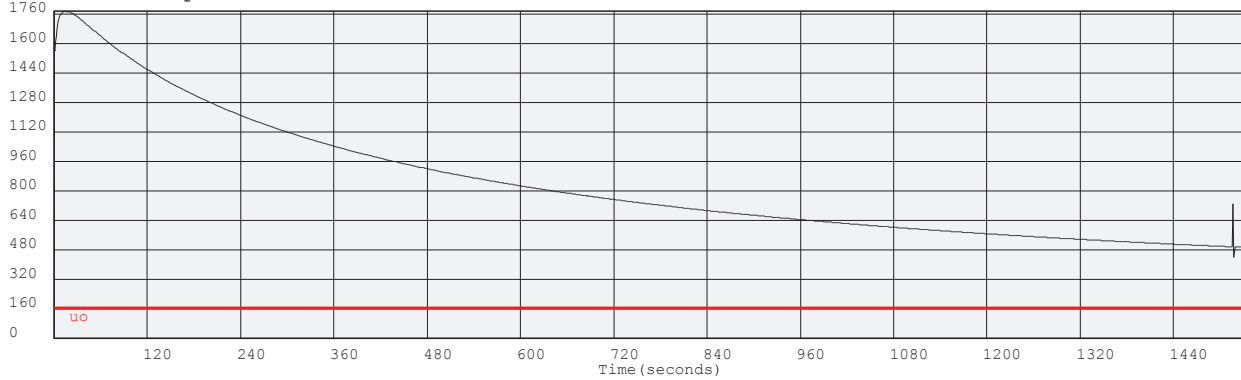
Probe: GHANA

Page: 1

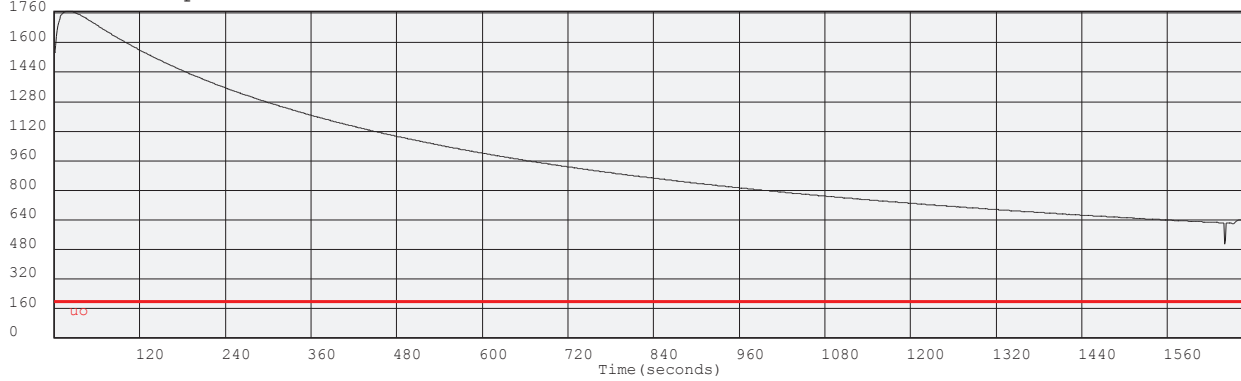
(kPa) Dissipation at: 1.7m



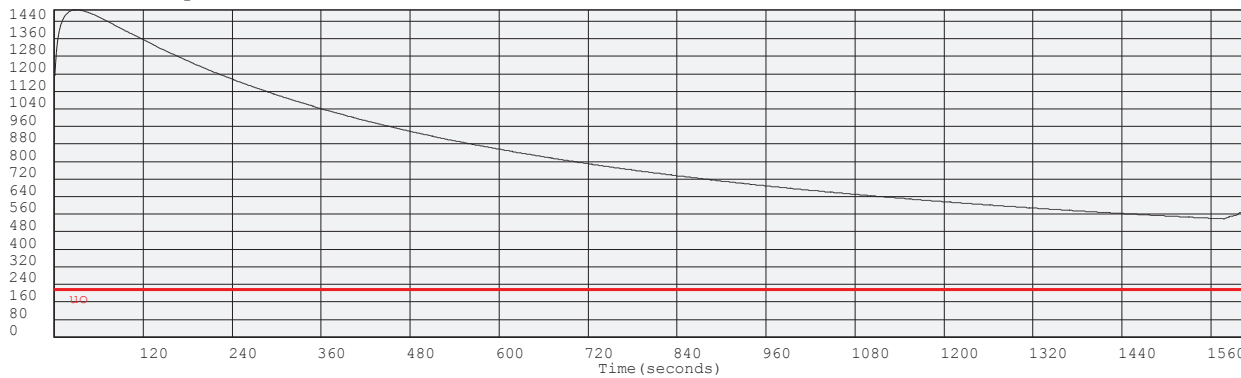
(kPa) Dissipation at: 18.748m



(kPa) Dissipation at: 21.739m



(kPa) Dissipation at: 23.736m





Project: Durban Harbour Over Water

Site: Pier2

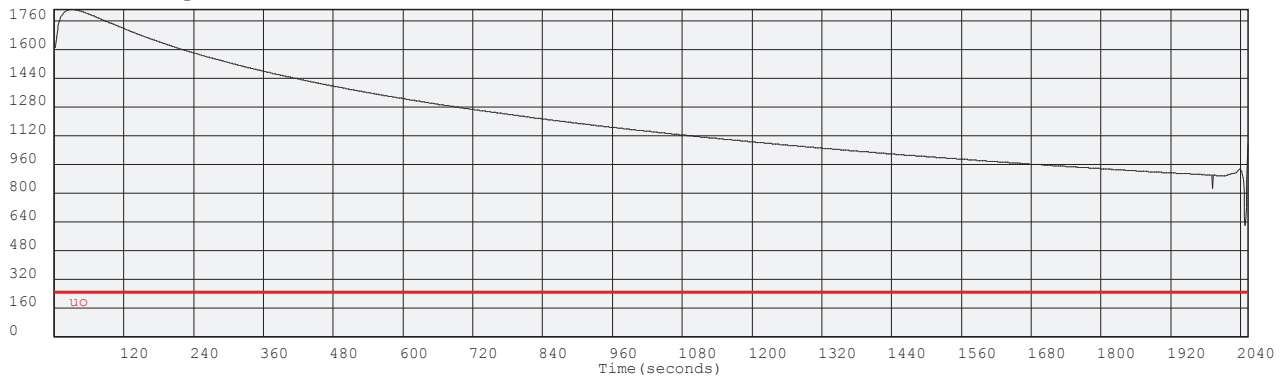
Hole: CPT39

Date: 2012-05-30

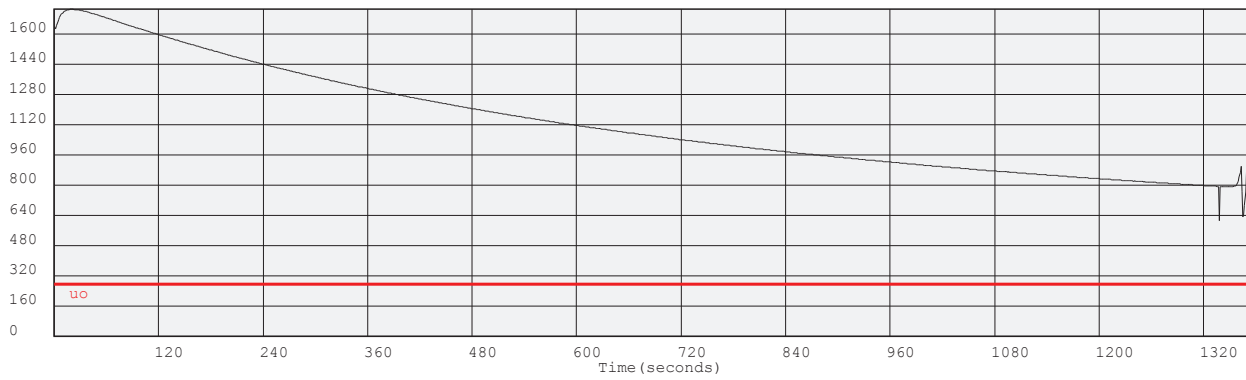
Probe: GHANA

Page: 2

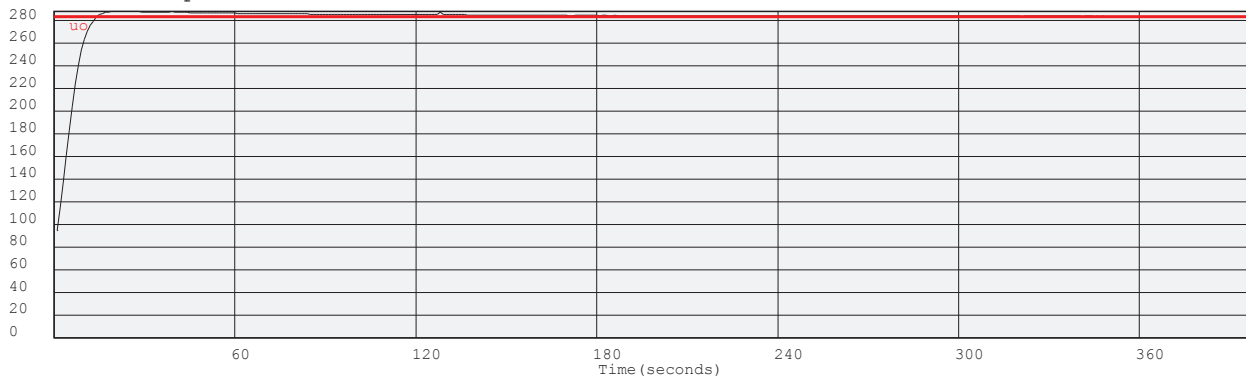
(kPa) Dissipation at: 26.725m



(kPa) Dissipation at: 29.713m



(kPa) Dissipation at: 30.564m



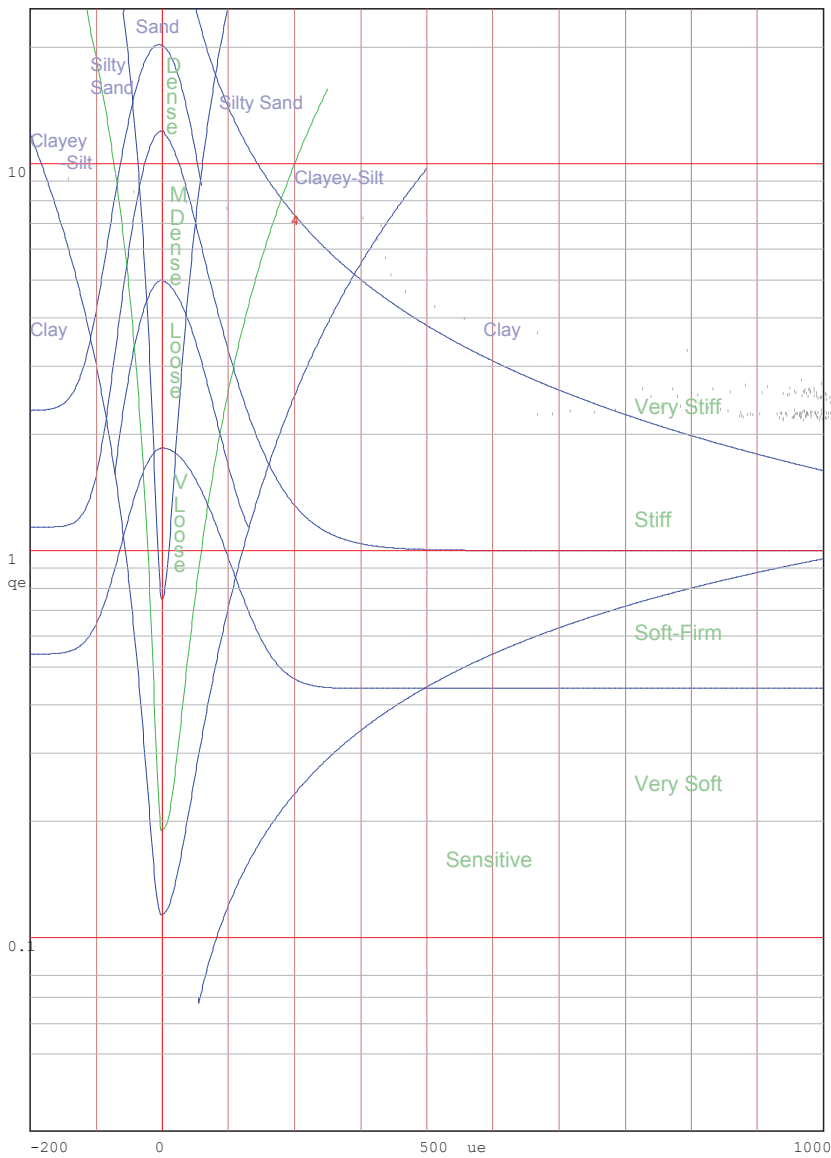
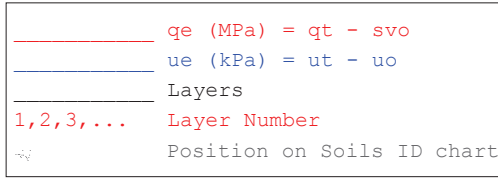
Project: Durban Harbour Over Water

Site: Pier2

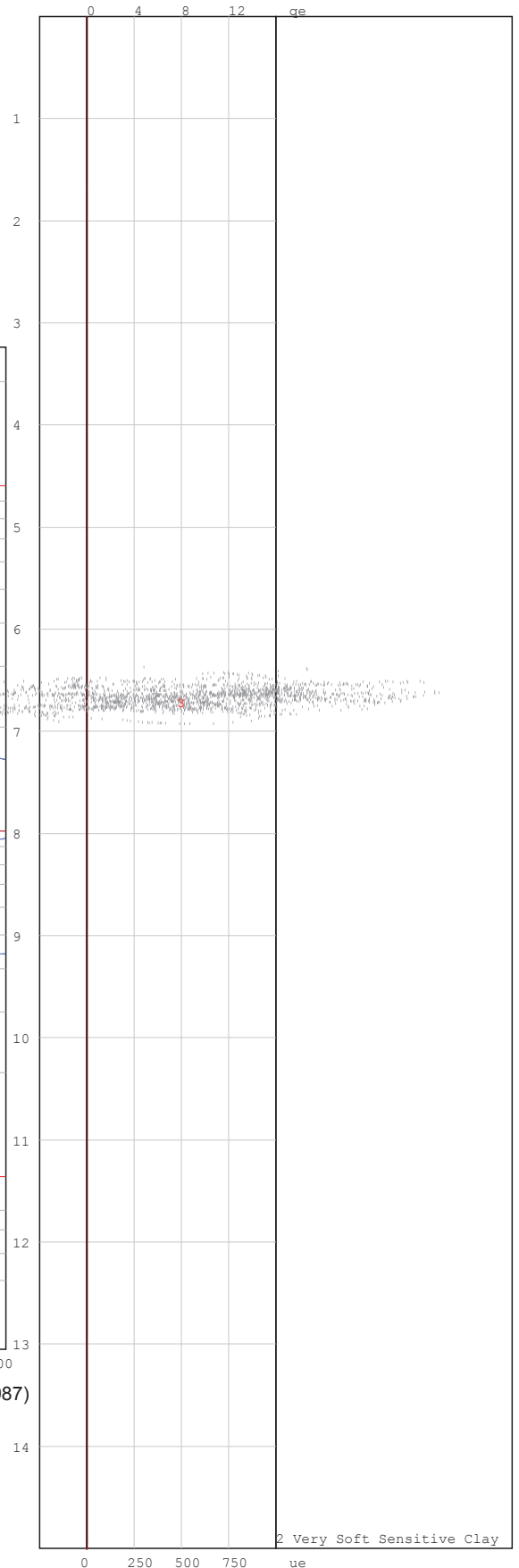
Hole No: CPT39

Date: 2012-05-30

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Over Water

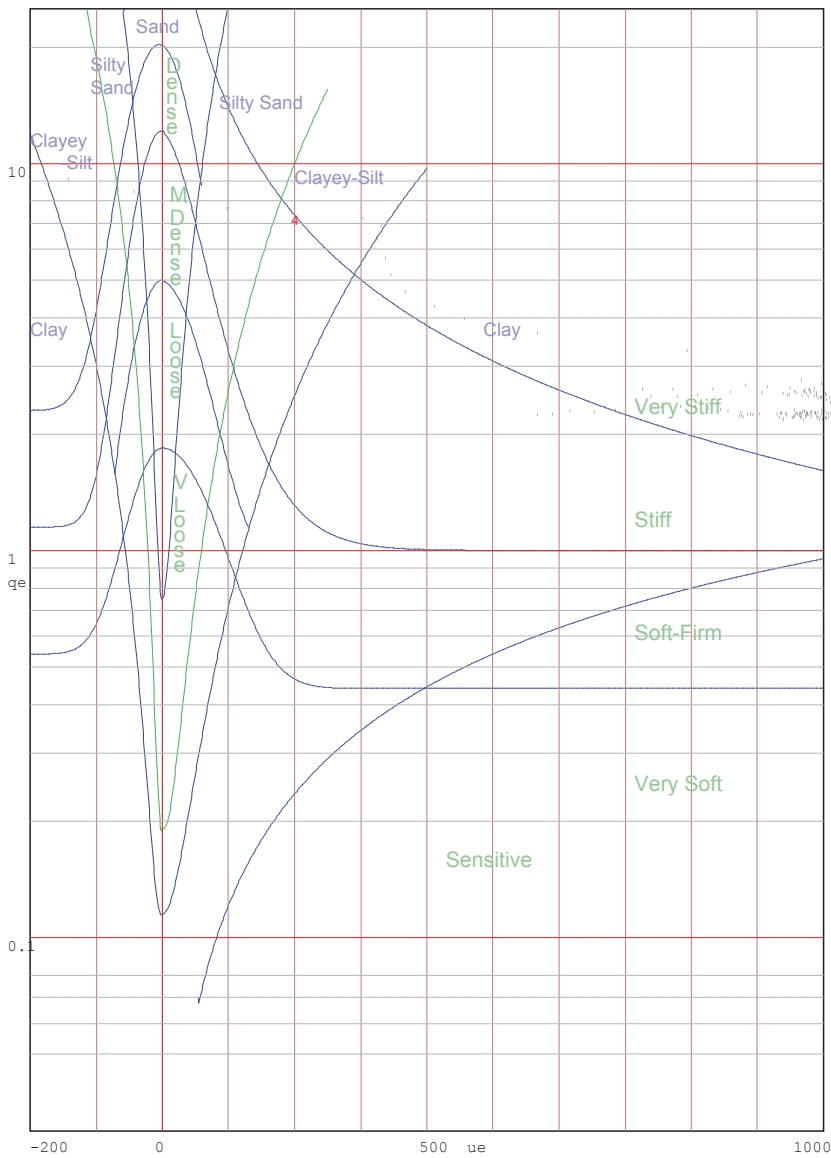
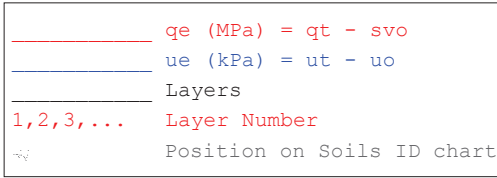
Site: Pier2

File No: CPT39

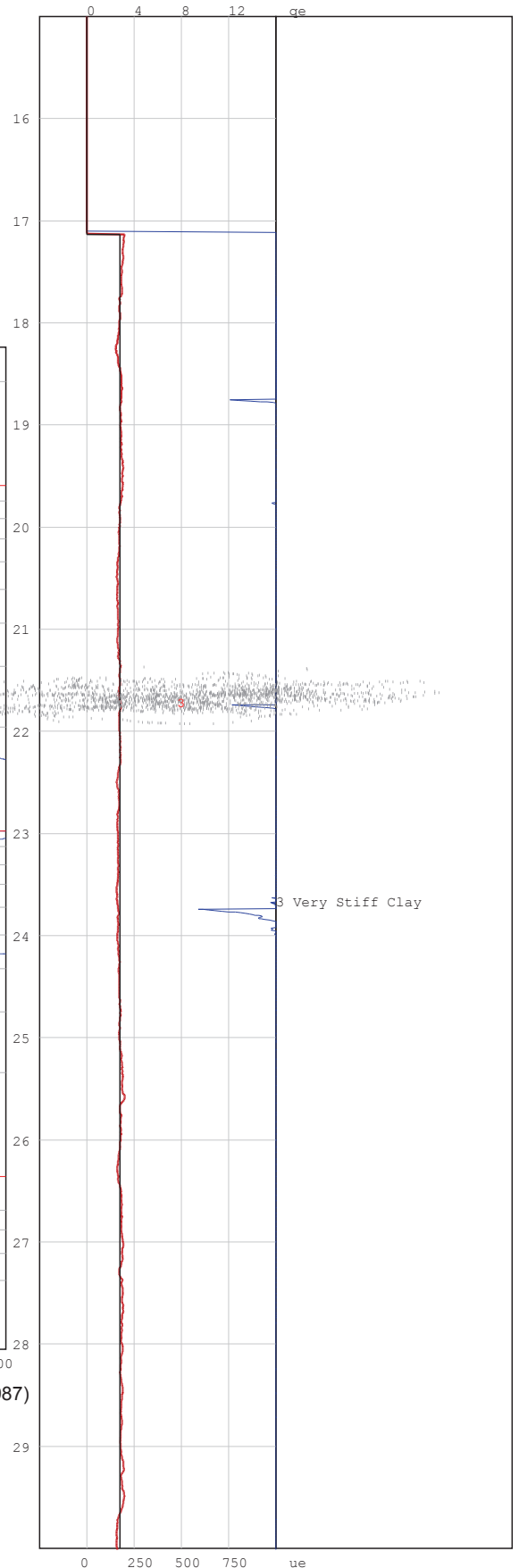
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Date: 2012-05-30

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Project: Durban Harbour Over Water

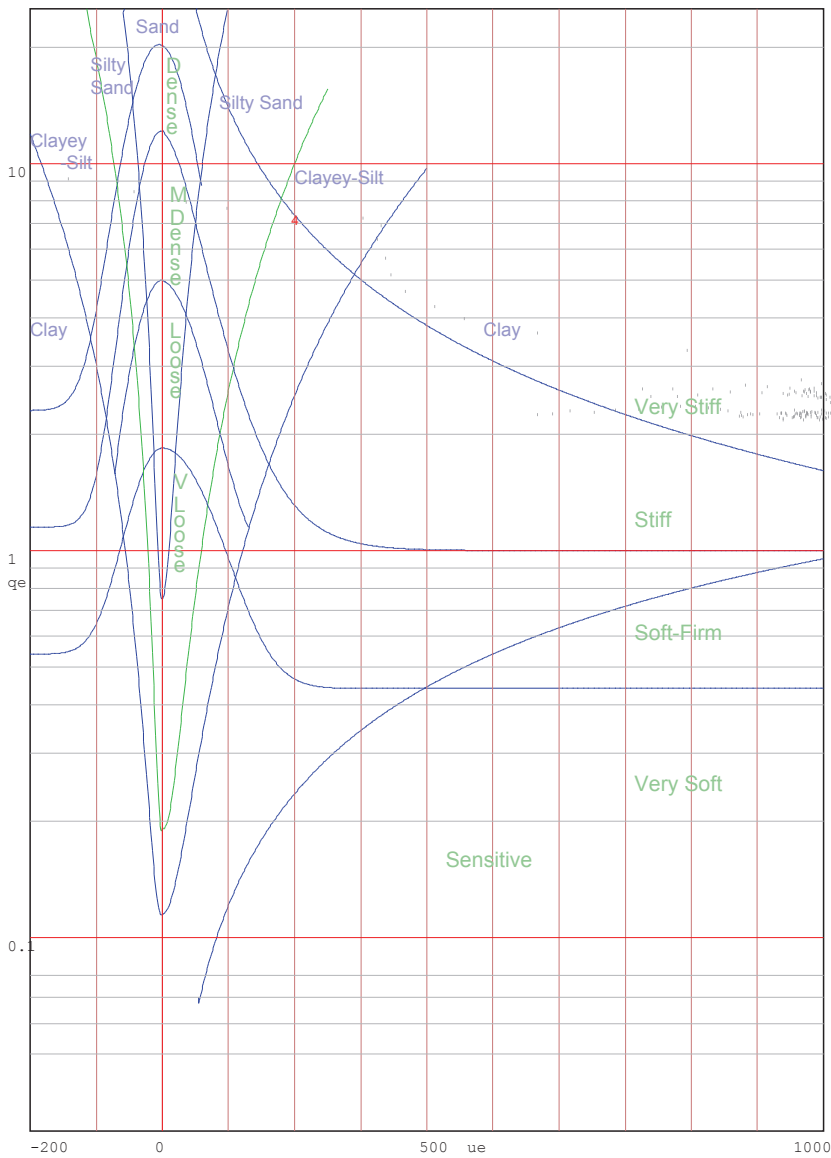
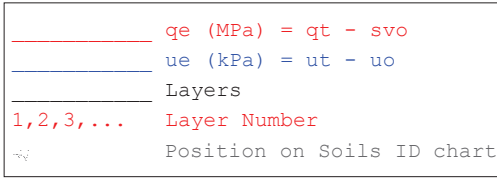
Site: Pier2

File No: CPT39

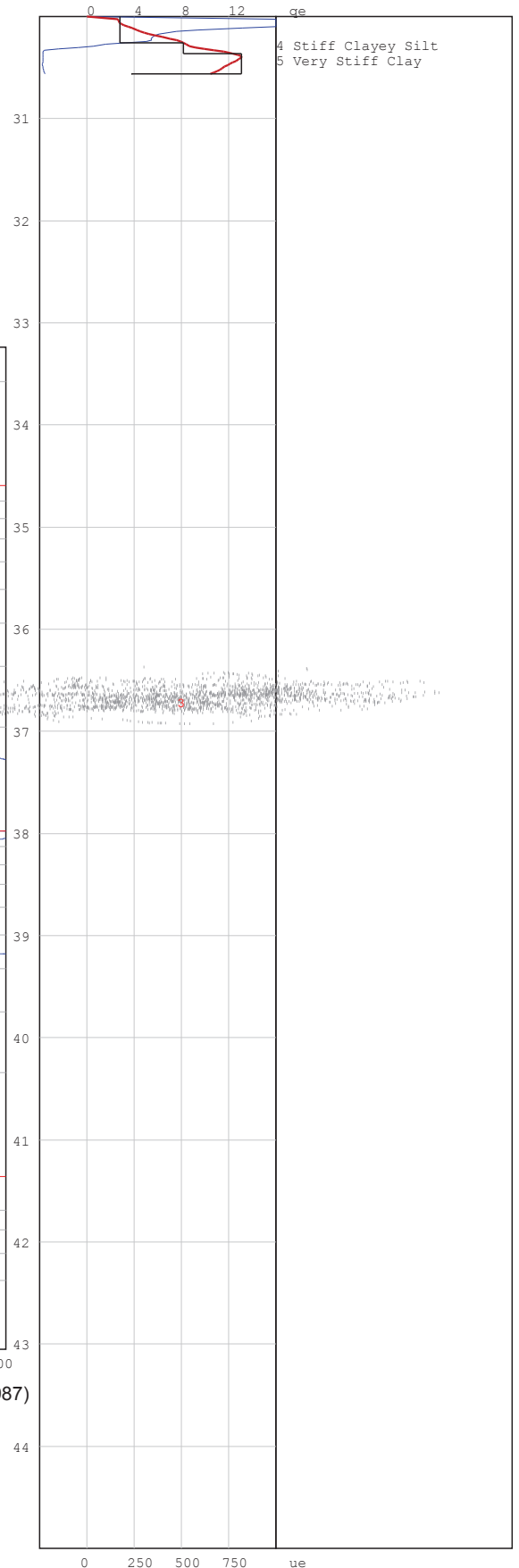
Page:3

Date: 2012-05-30

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water

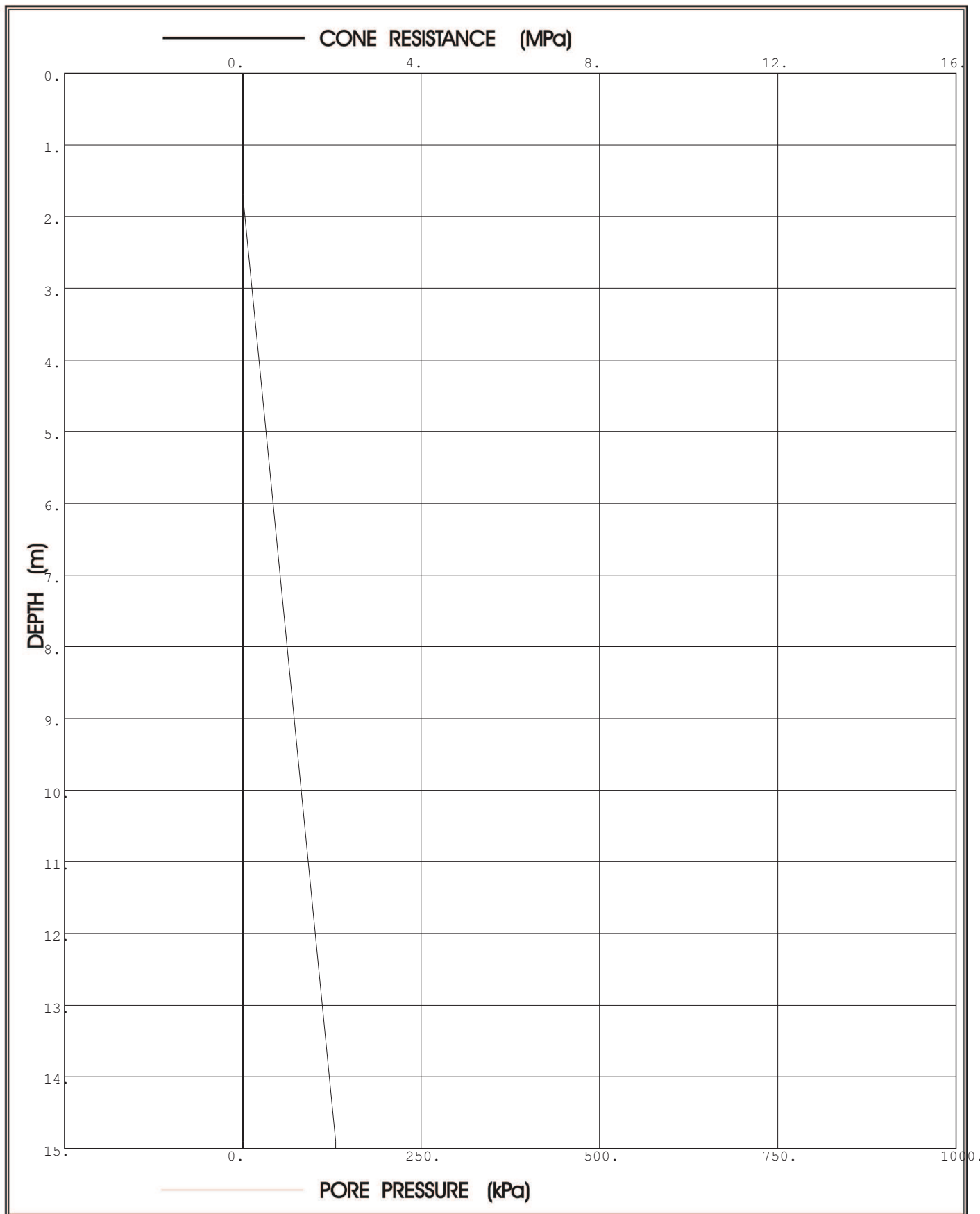
SITE: Pier2

CPTU (RE): CPT40

DATE: 2012/05/29

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST



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PROJECT: Durban Harbour Over Water

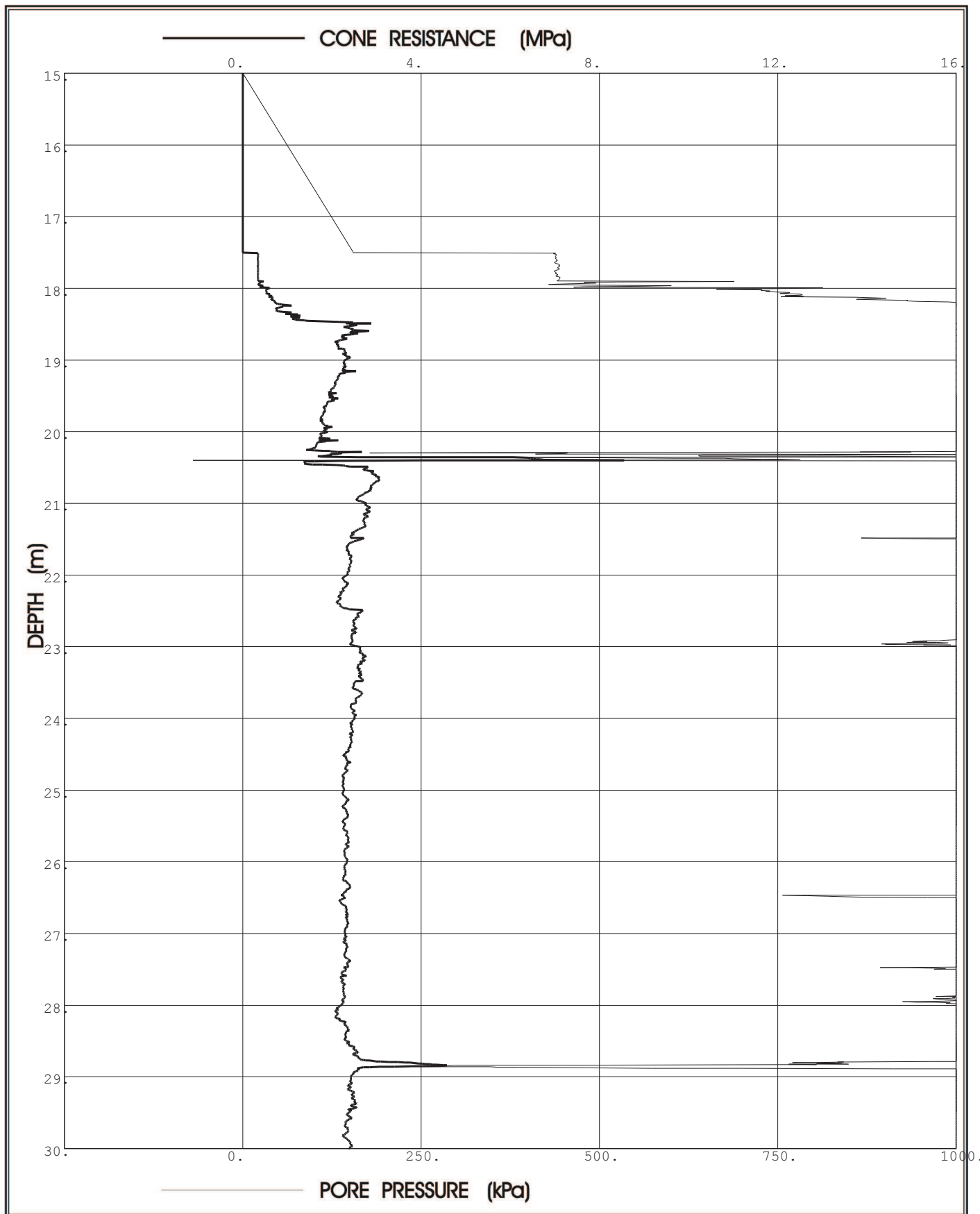
SITE: Pier2

CPTU (RE): CPT40

DATE: 2012/05/29

Probe: KELLER

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# PIEZOCONE PENETRATION TEST



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PROJECT: Durban Harbour Over Water

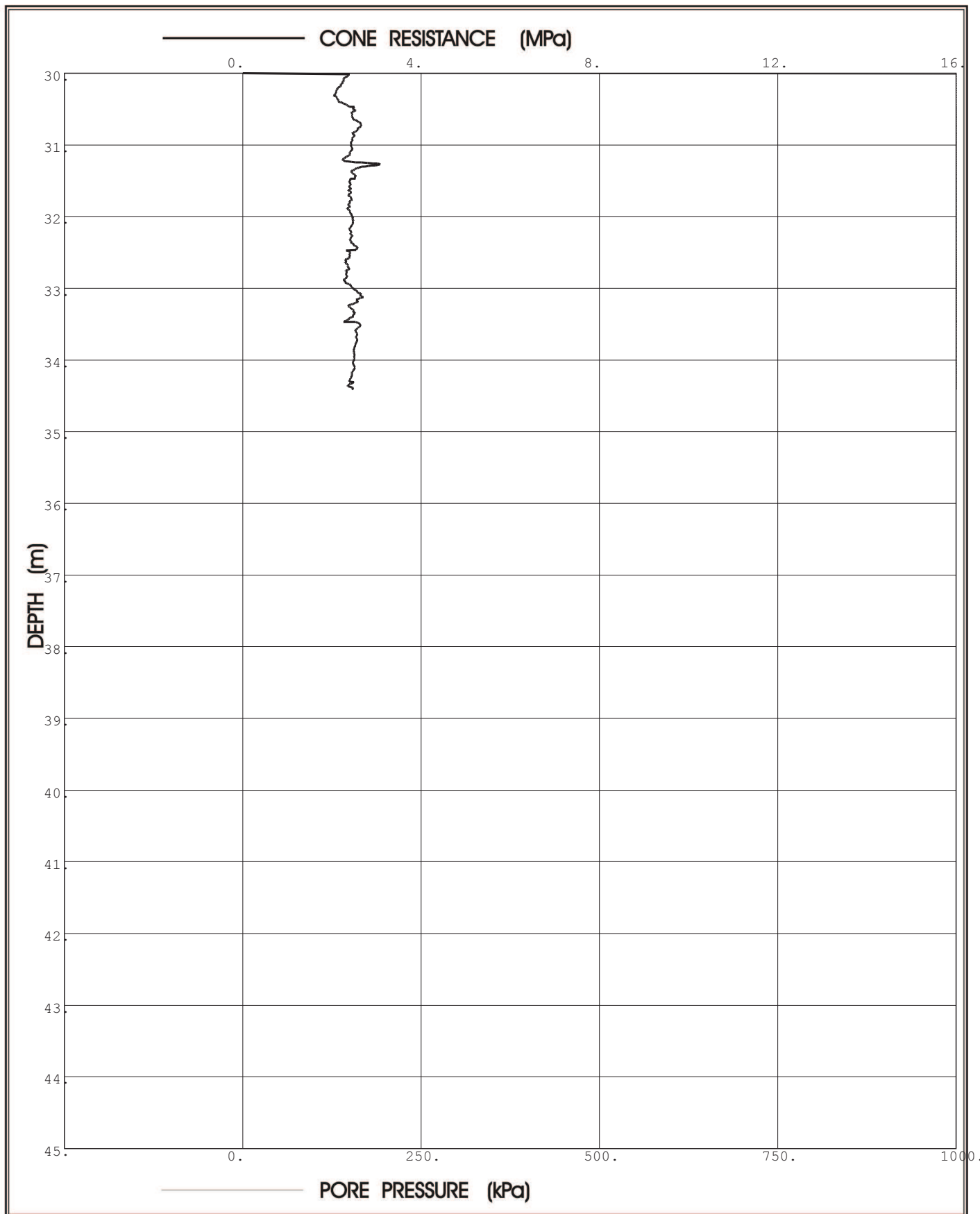
SITE: Pier2

CPTU (RE): CPT40

DATE: 2012/05/29

Probe: KELLER

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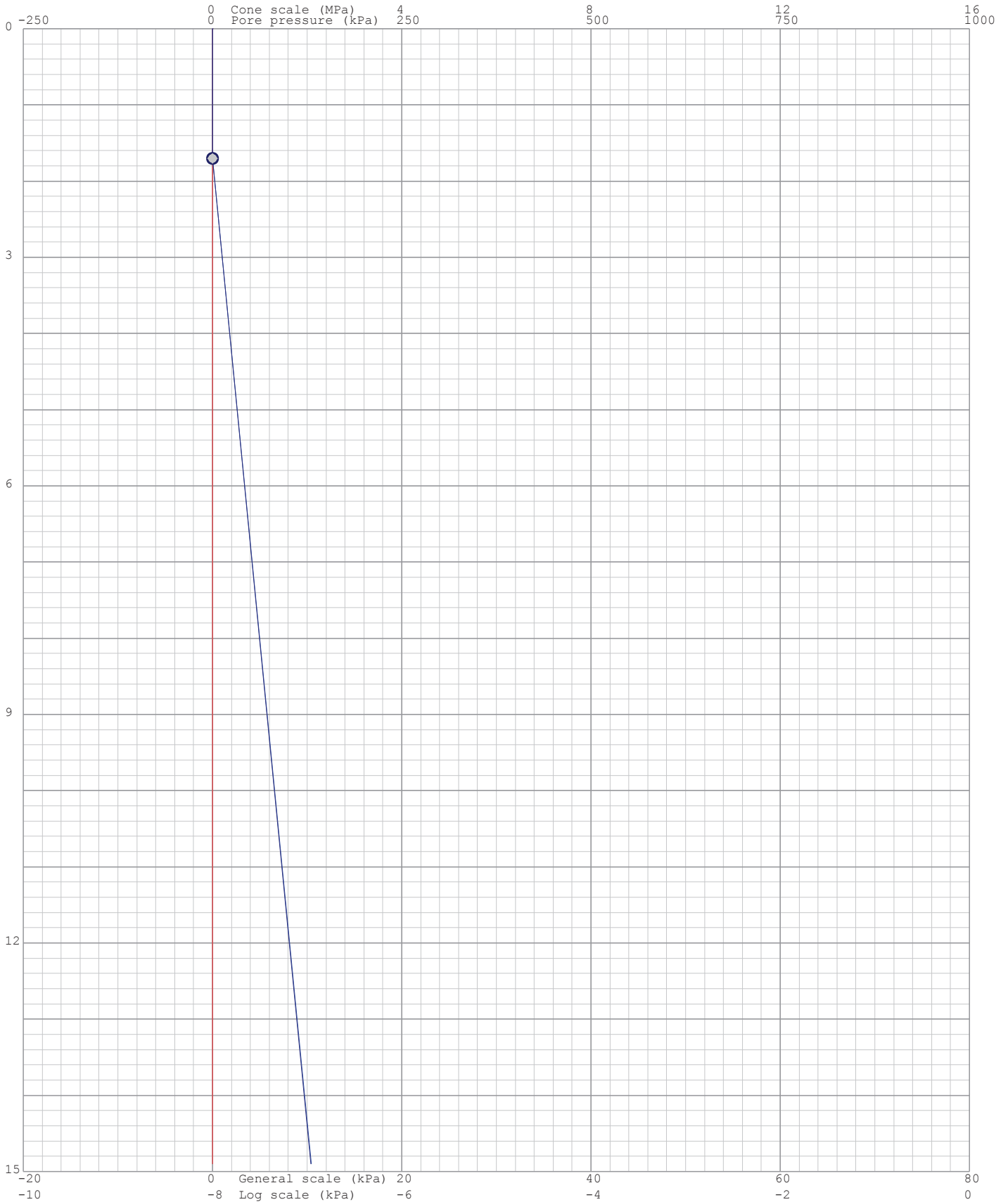
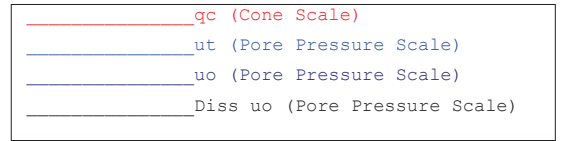
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT40

Date: 2012/05/29

Probe: KELLER





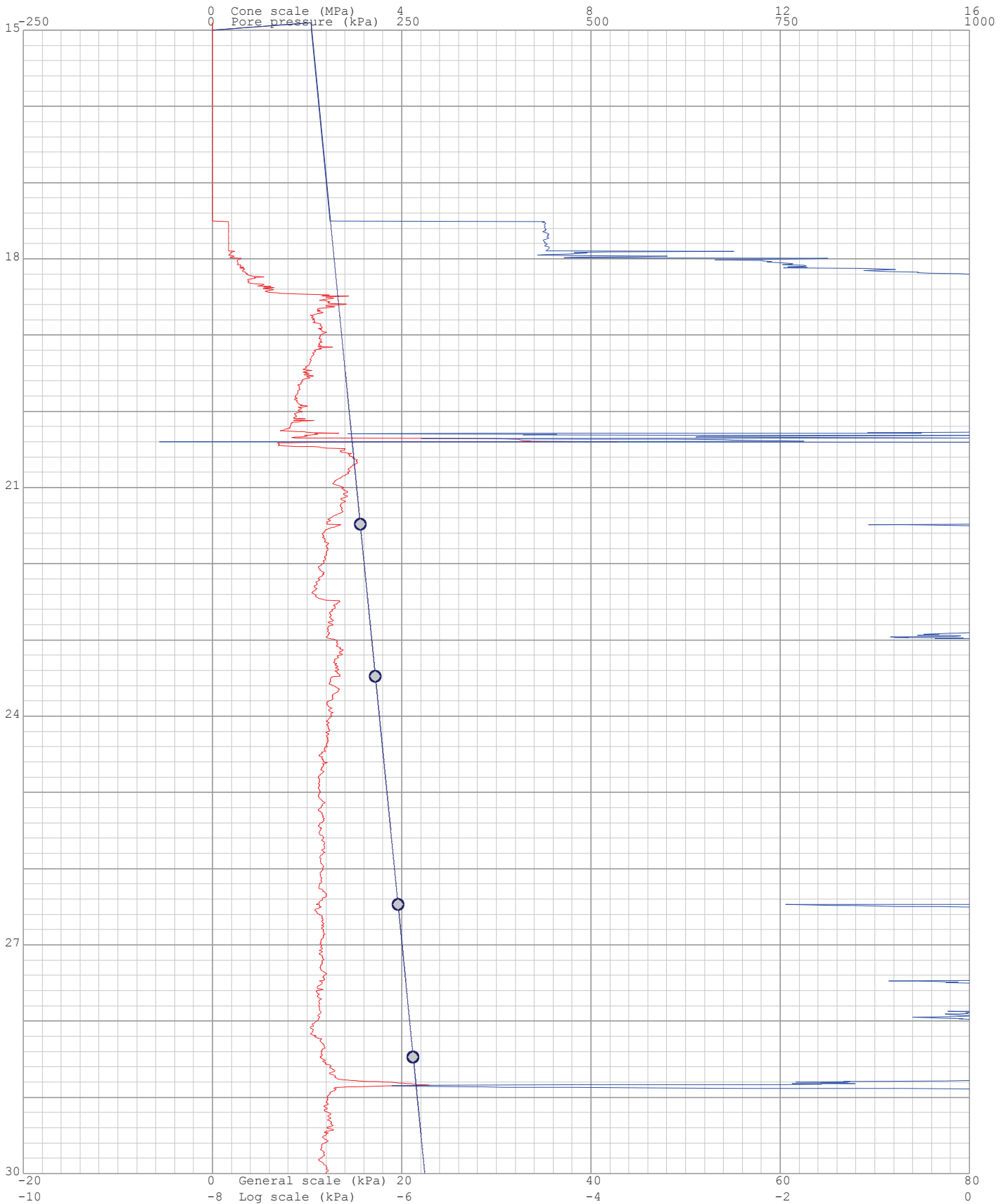
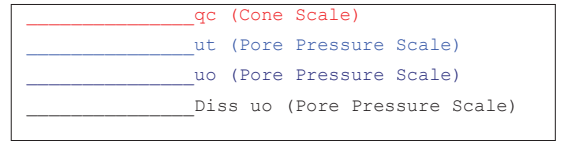
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT40

Date: 2012/05/29

Probe: KELLER



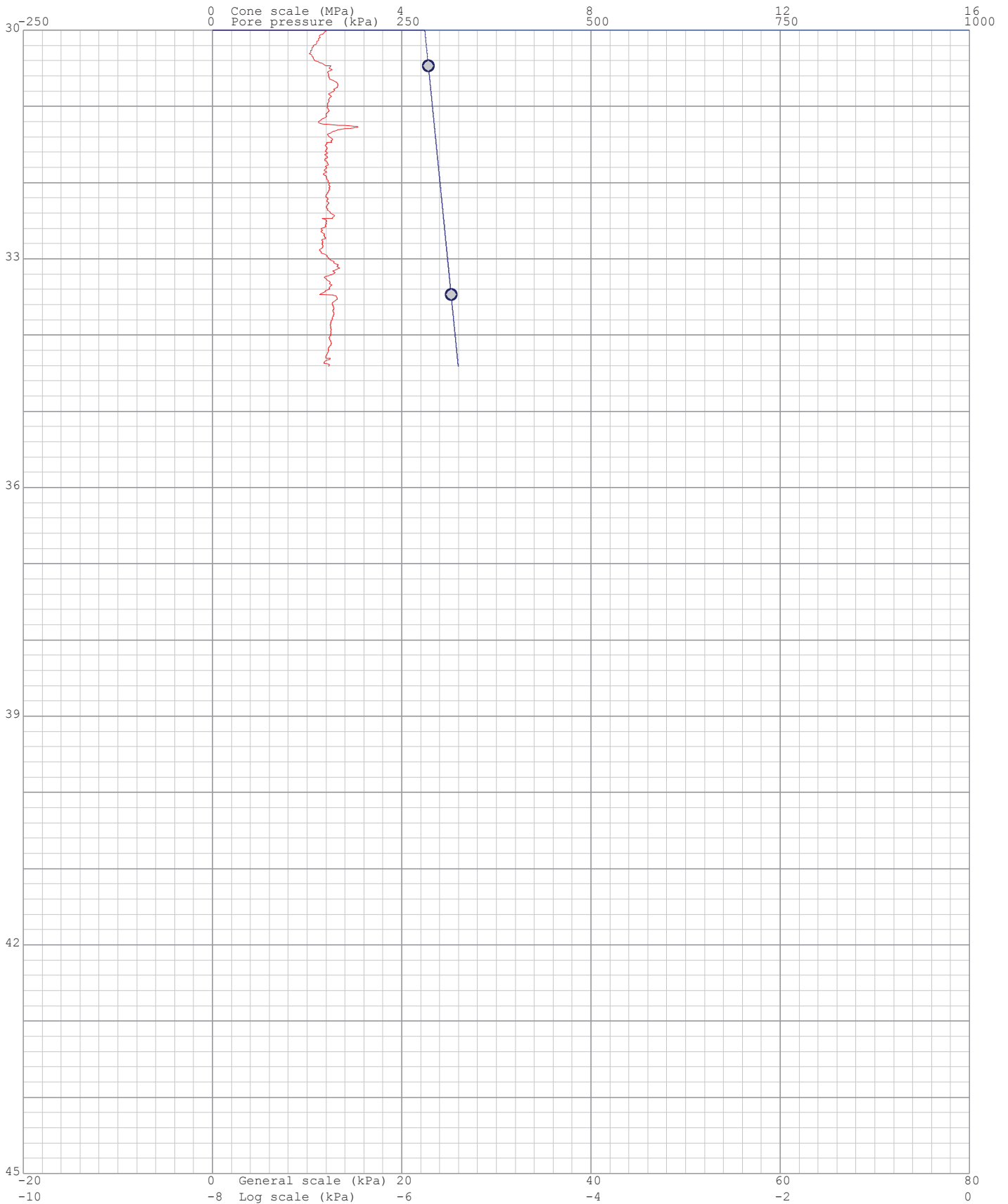
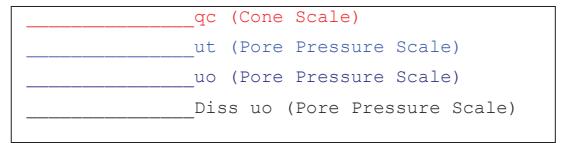
Project: Durban Harbour Over Water

Site: Pier2

Hole No: CPT40

Date: 2012/05/29

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT40

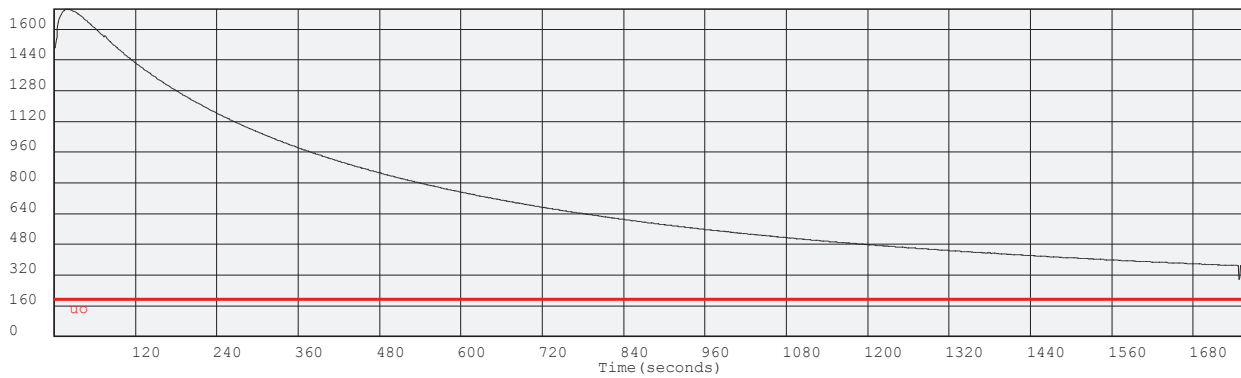
Date: 2012/05/29

Probe: KELLER  
Page: 1

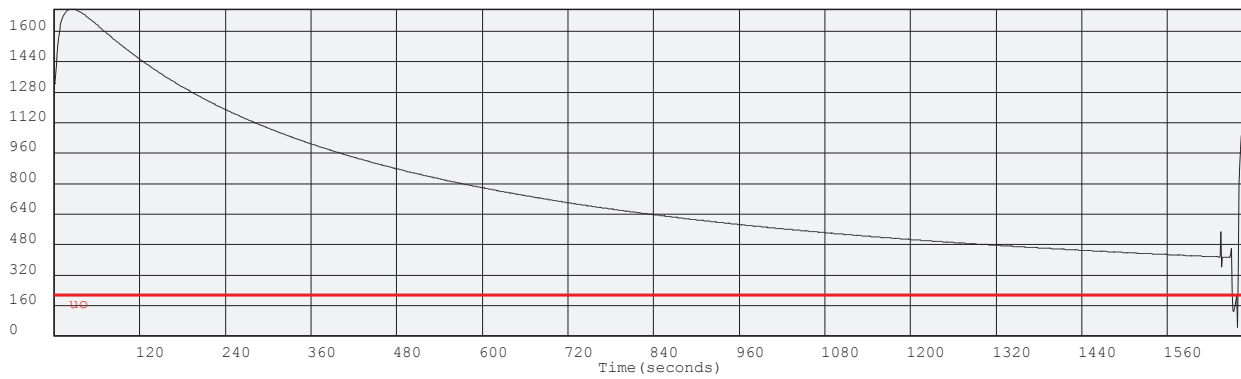
(kPa) Dissipation at: 1.7m



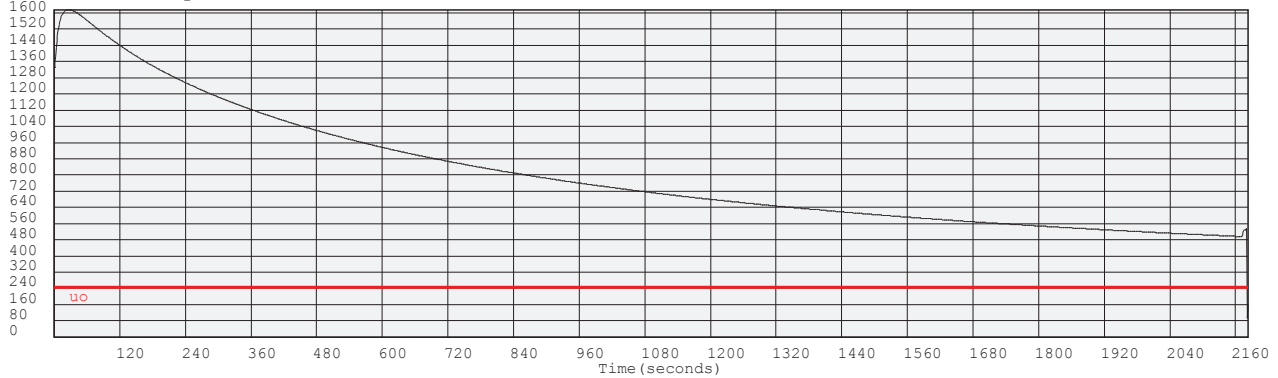
(kPa) Dissipation at: 21.483m



(kPa) Dissipation at: 23.479m



(kPa) Dissipation at: 26.467m



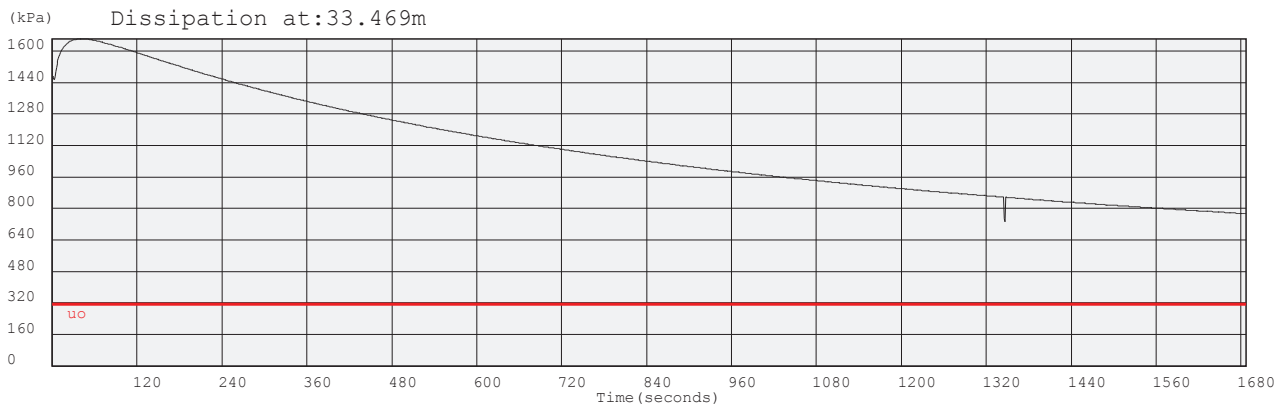
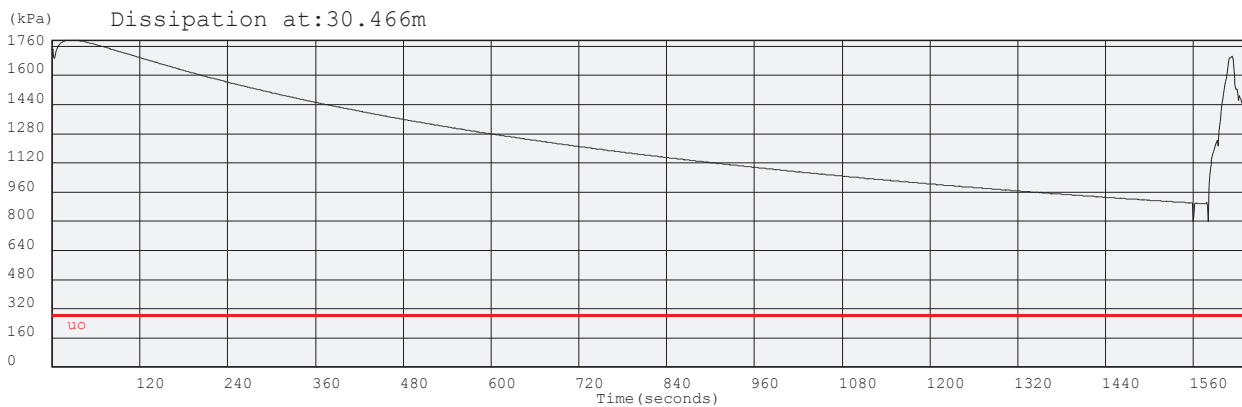
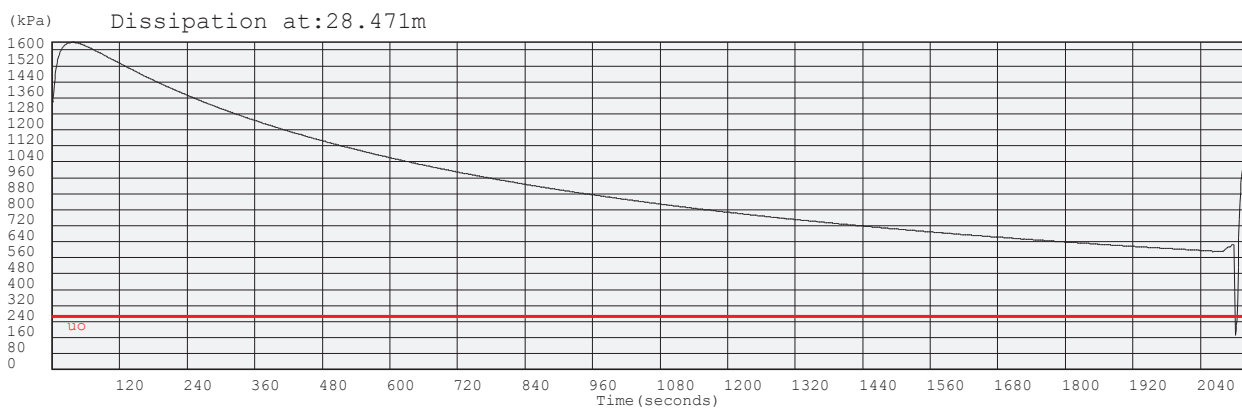
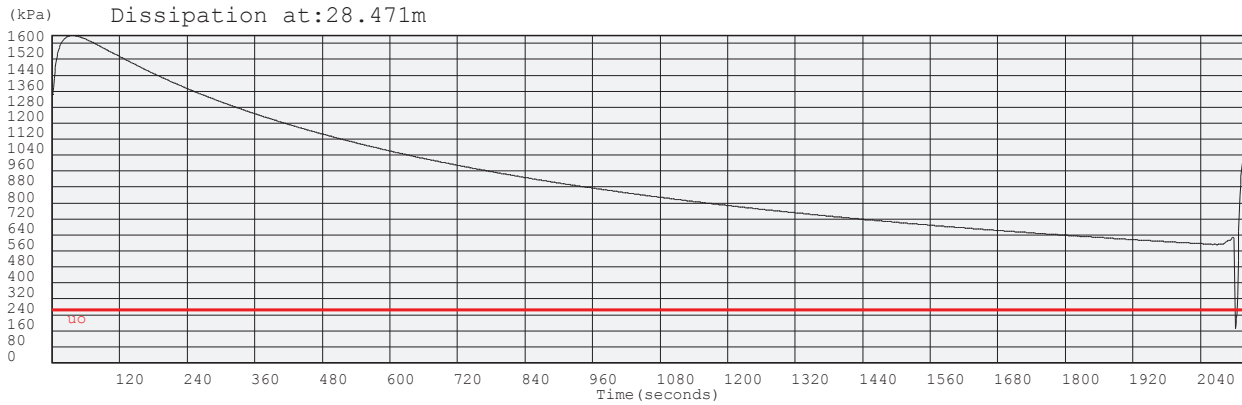
Project: Durban Harbour Over Water

Site: Pier2

Hole: CPT40

Date: 2012/05/29

Probe: KELLER  
Page: 2







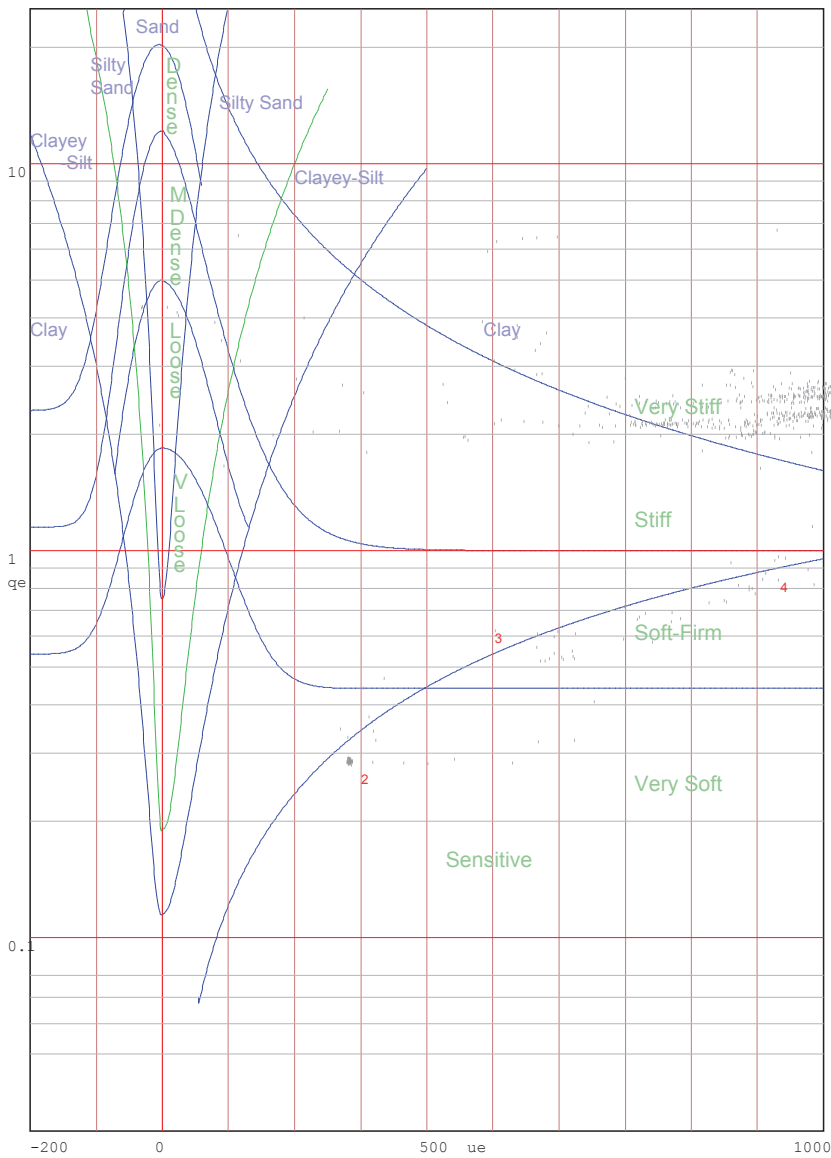
Site: Pier2

Hole No: CPT40

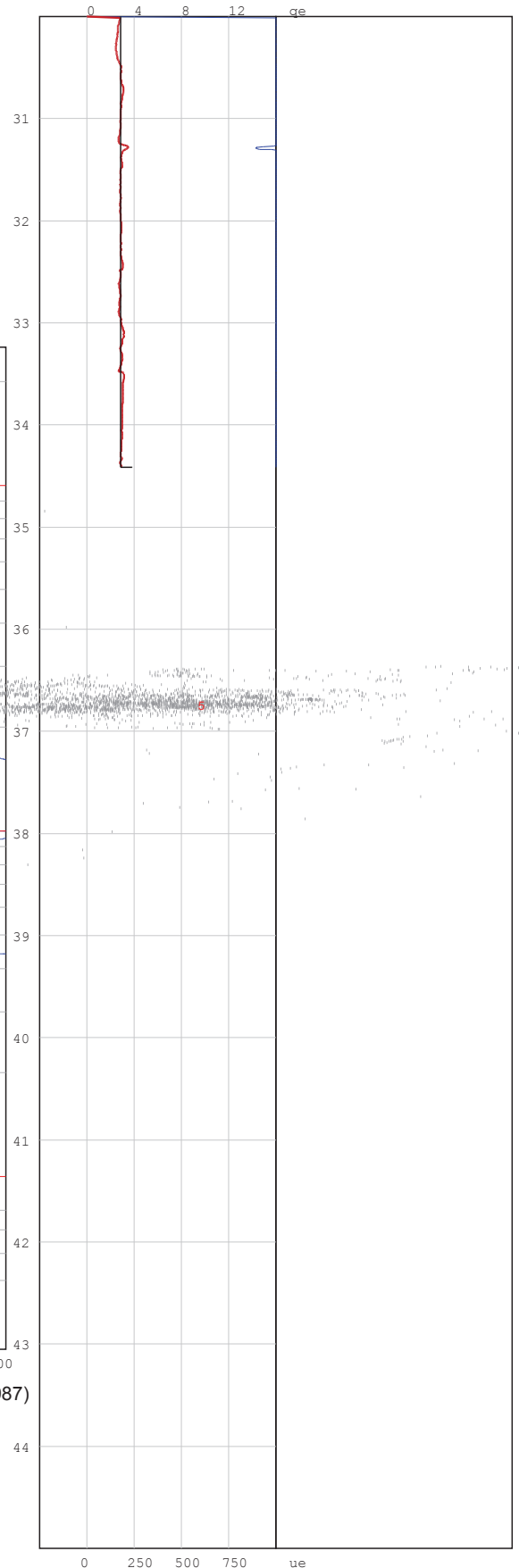
Date: 2012/05/29

Probe: KE

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST

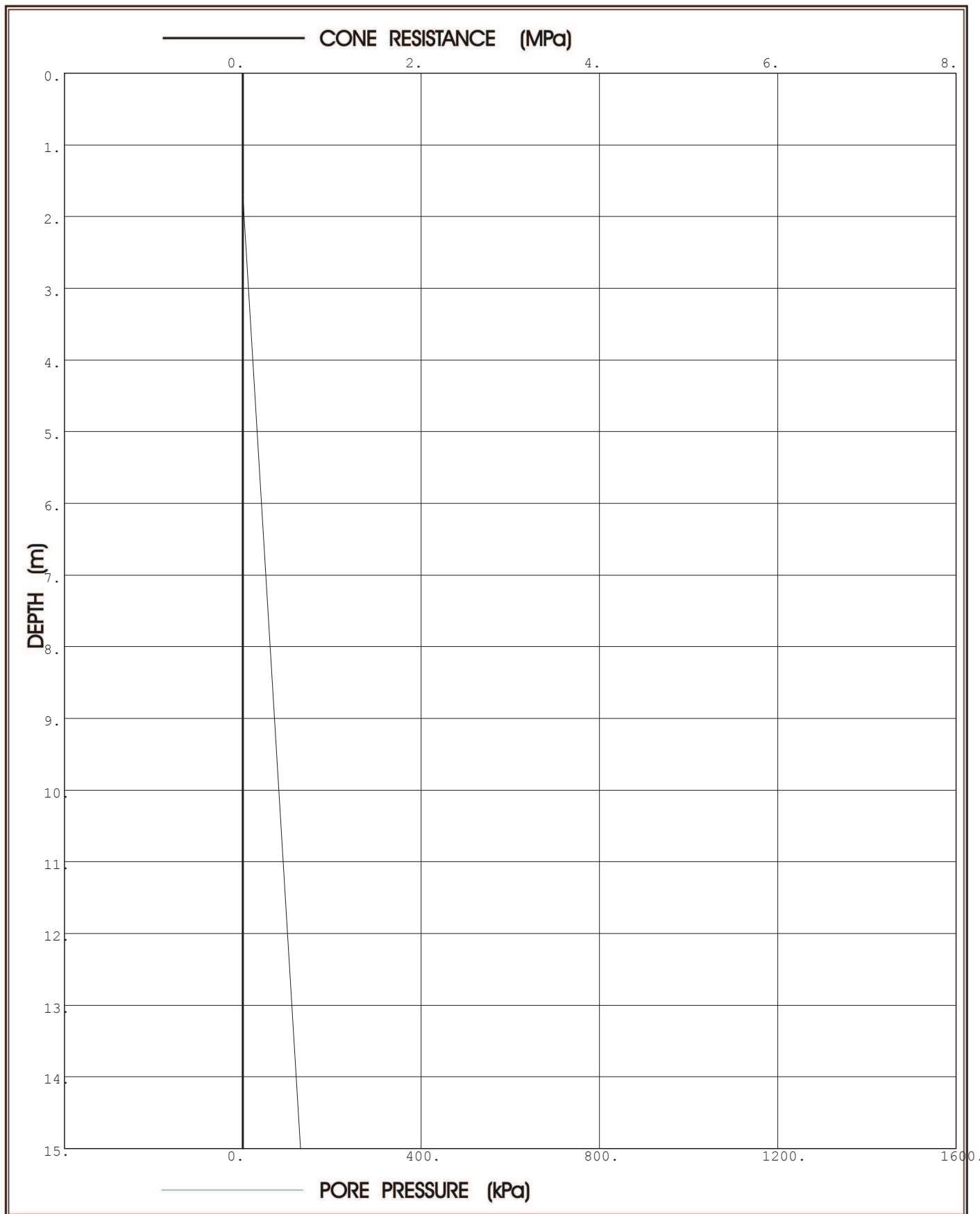


P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water  
SITE: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"  
CPTU (RE): CPT41  
DATE: 2012/05/14

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST

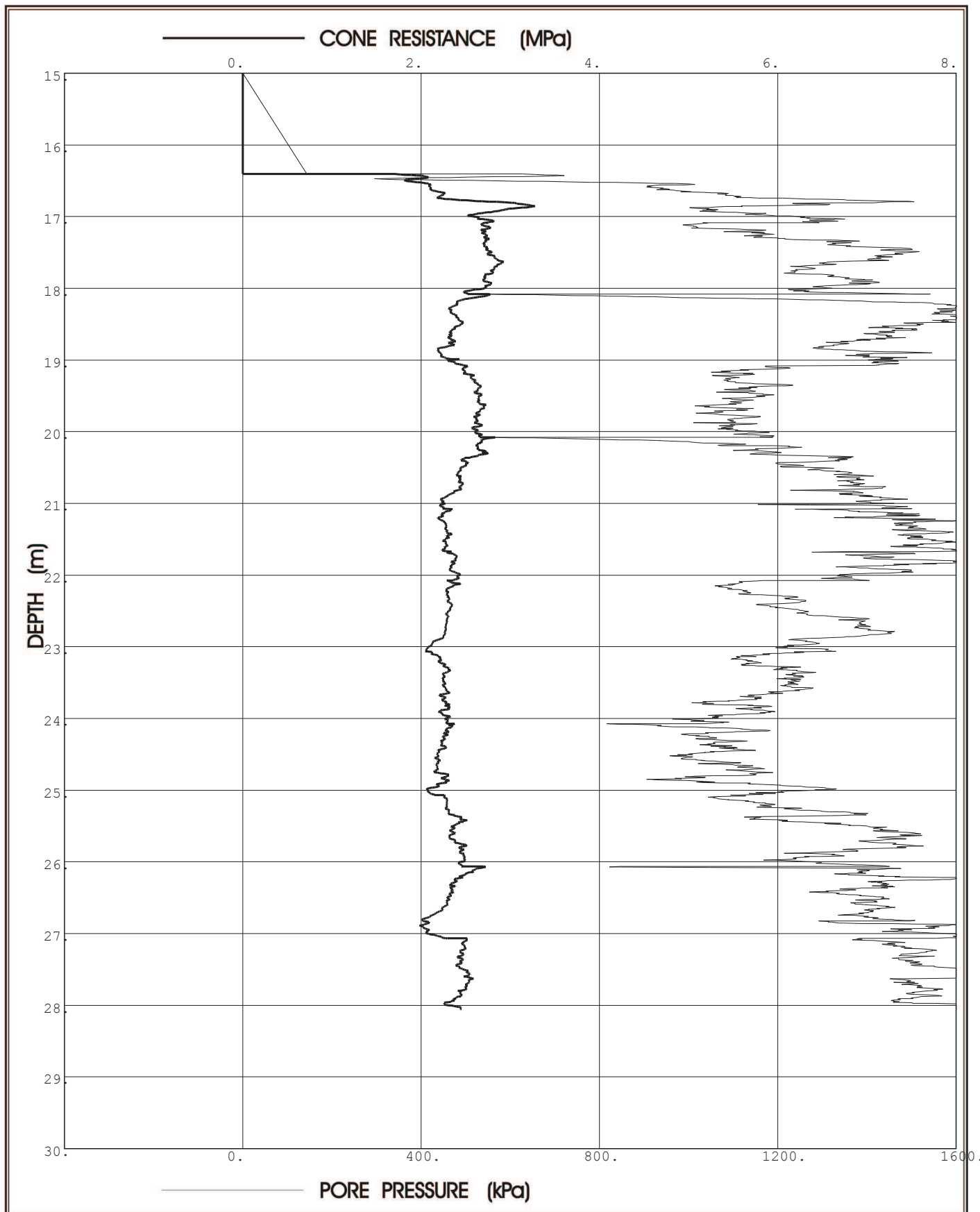


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Moreleta Park  
0044

PROJECT: Durban Harbour Over Water  
SITE: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"  
CPTU (RE): CPT41  
DATE: 2012/05/14

Probe: KELLER

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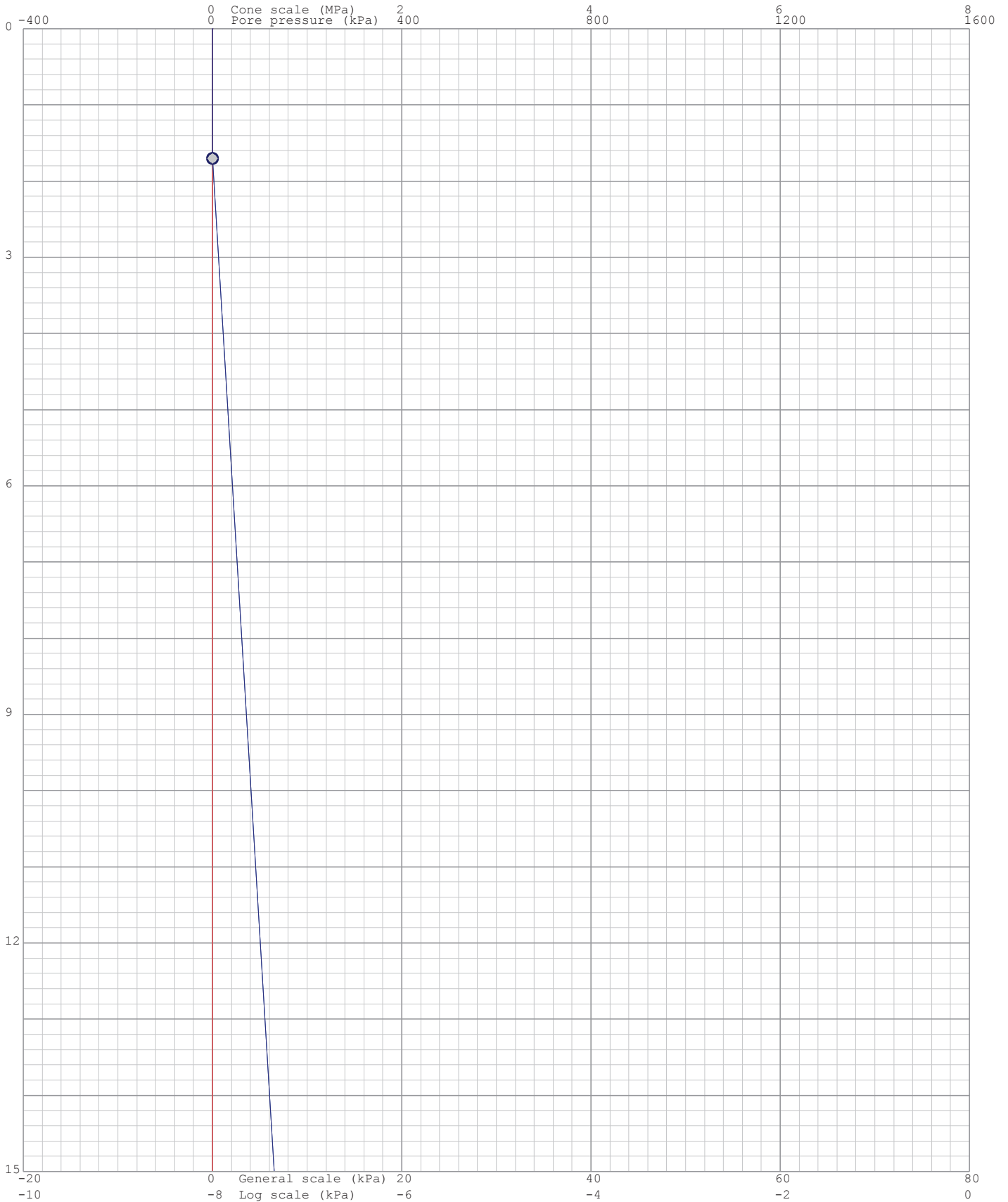
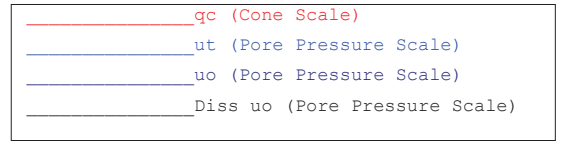
Project: Durban HARbour Over Water

Site: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"

Hole No: CPT41

Date: 2012/05/14

Probe: KELLER



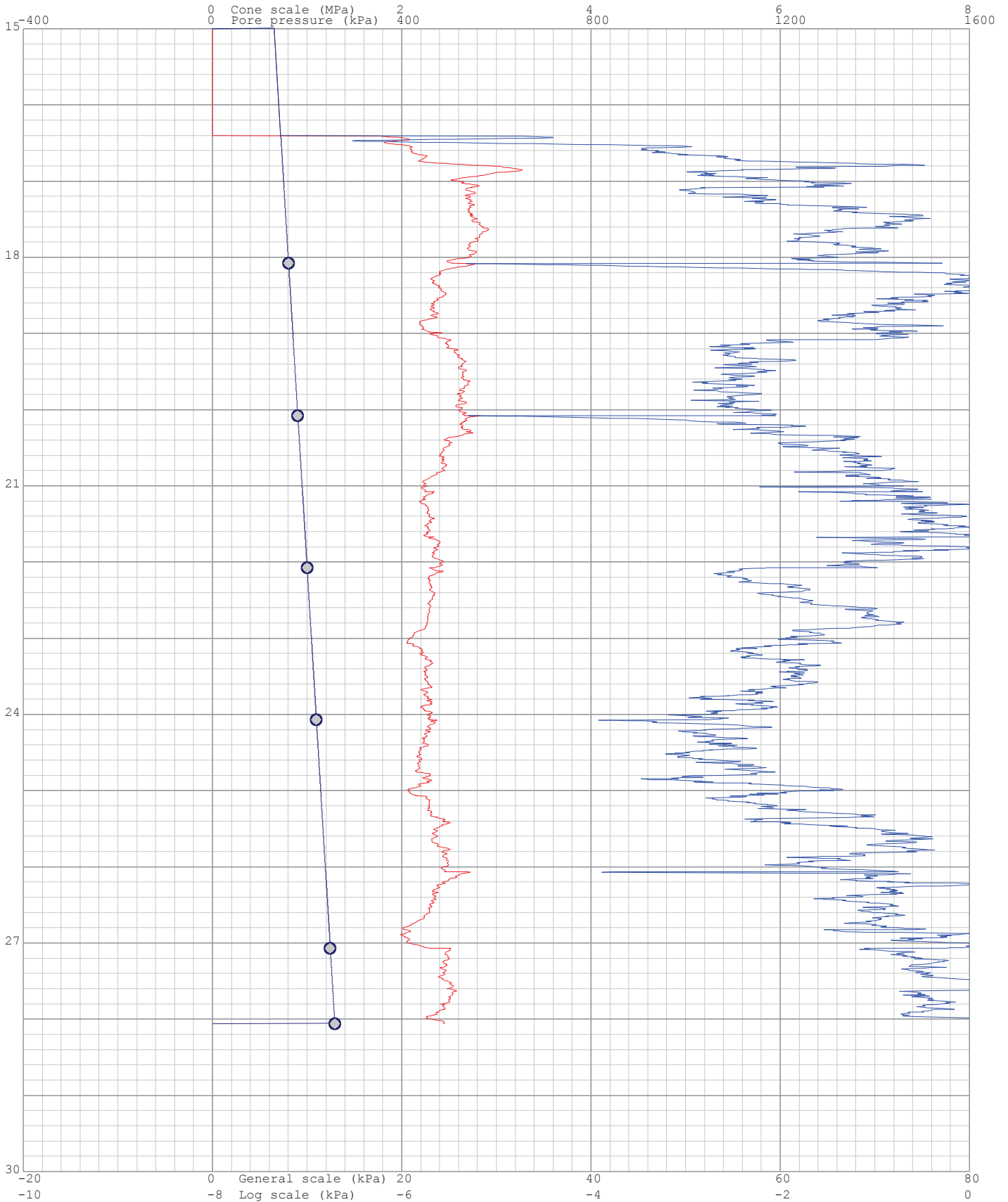
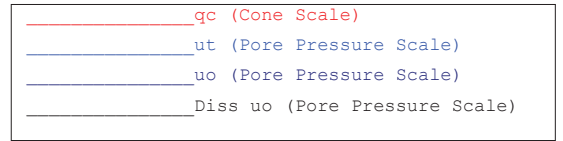
Project: Durban HARbour Over Water

Site: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"

Hole No: CPT41

Date: 2012/05/14

Probe: KELLER



Project:Durban HARbour Over Water

Site: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"

Hole: CPT41

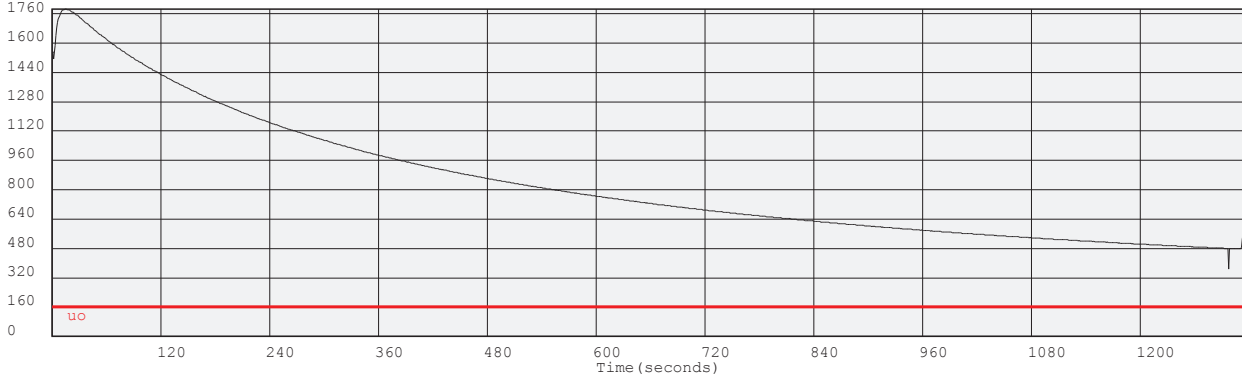
Date: 2012/05/14

Probe: KELLER  
Page: 1

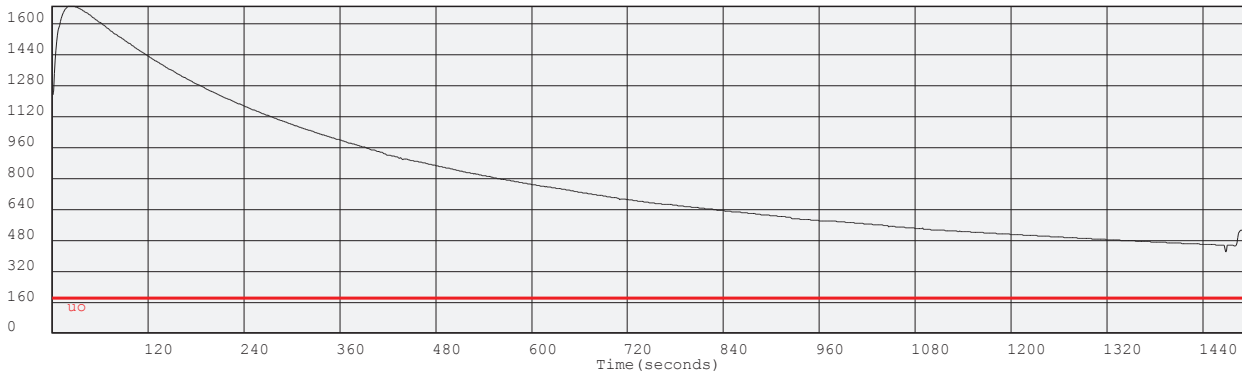
(kPa) Dissipation at:1.7m



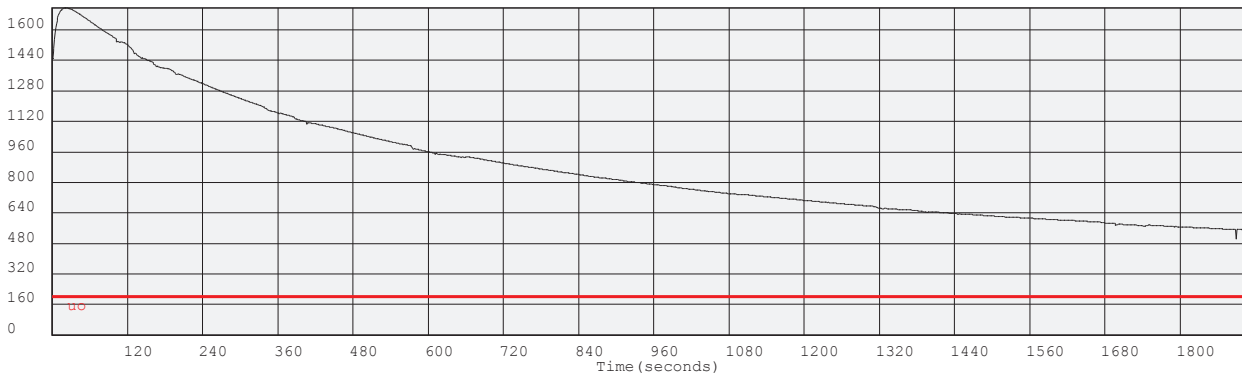
(kPa) Dissipation at:18.079m



(kPa) Dissipation at:20.076m



(kPa) Dissipation at:22.072m



Project: Durban Harbour Over Water

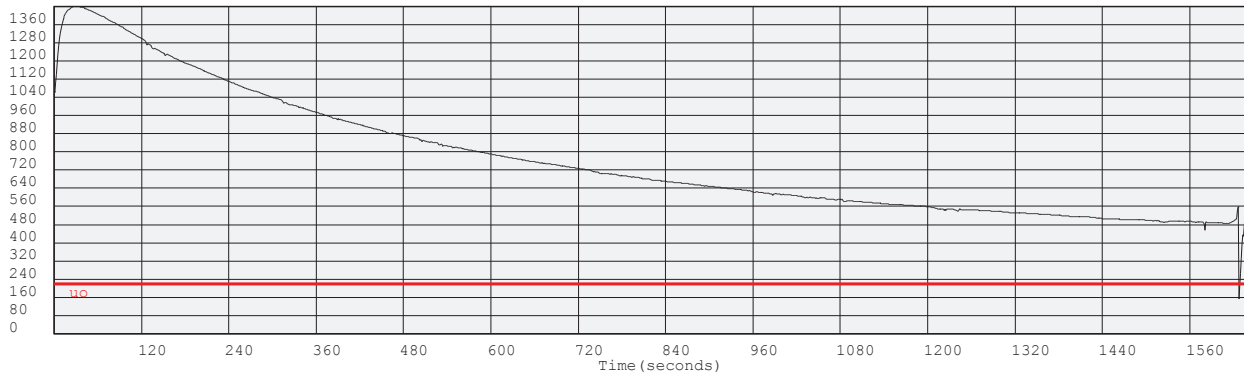
Site: Pier2 Long: 29° 52' 38.6" Lat: 31° 1' 27.5"

Hole: CPT41

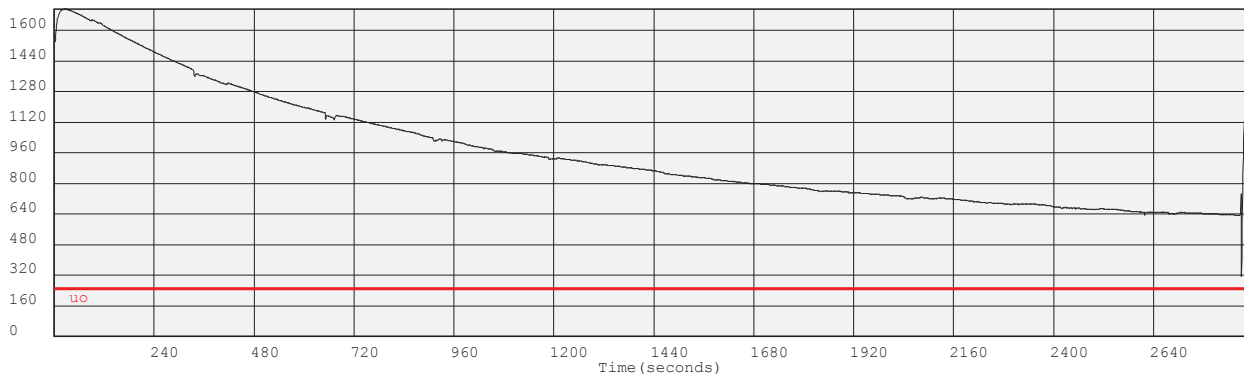
Date: 2012/05/14

Probe: KELLER  
Page: 2

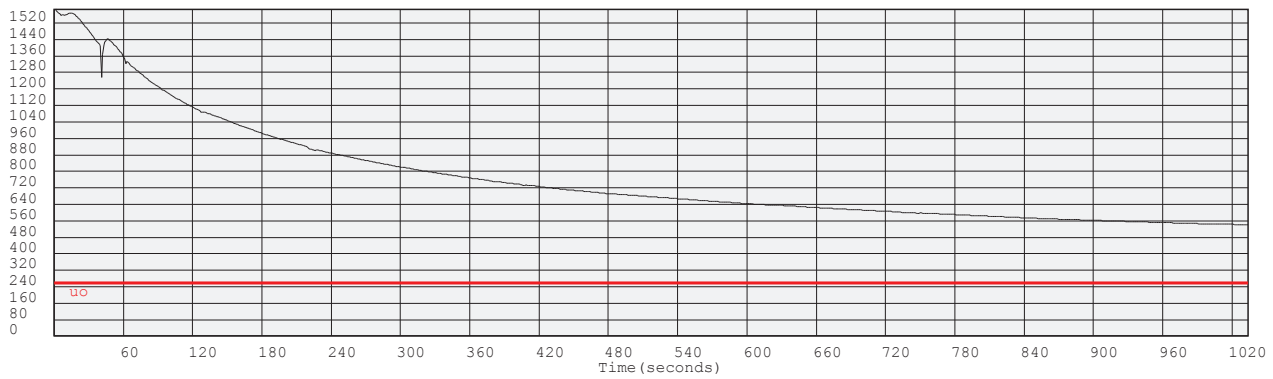
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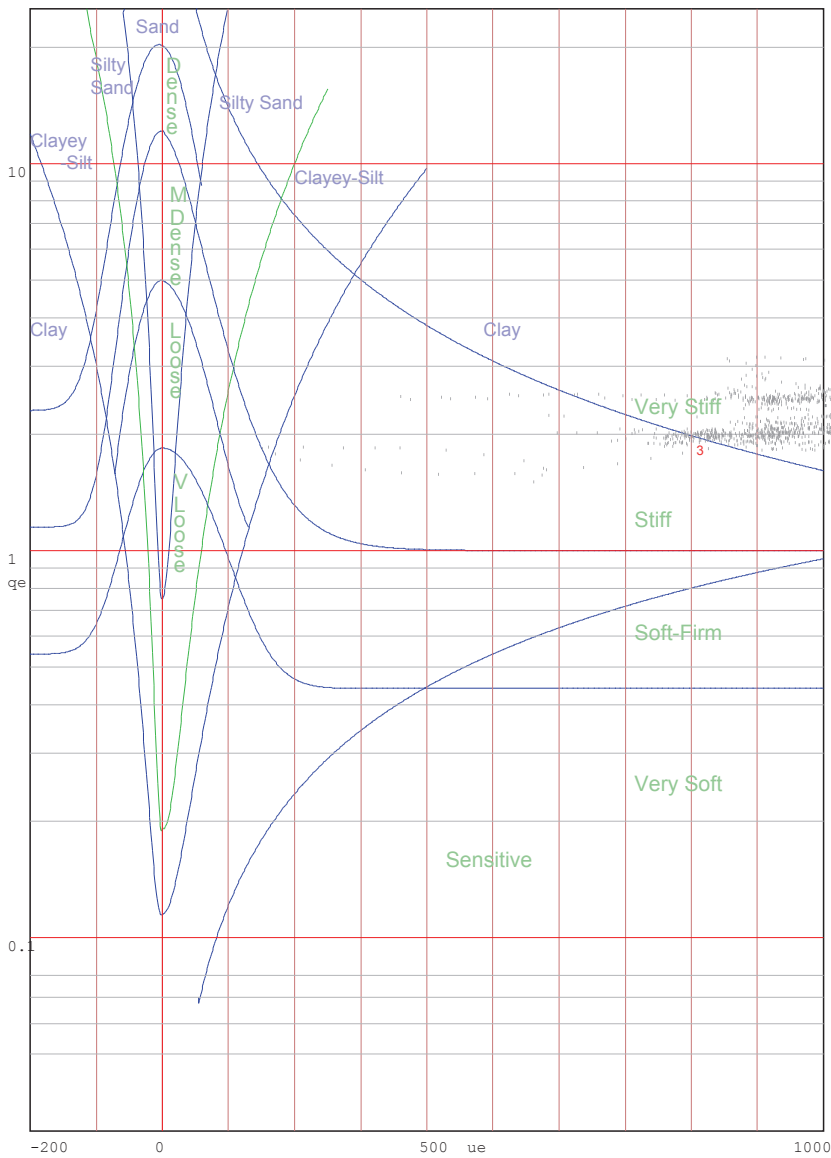
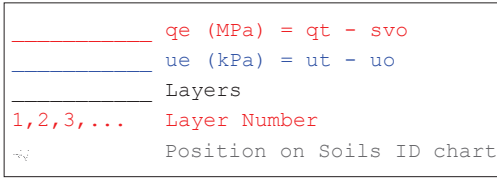
(kPa) Dissipation at: 27.067m



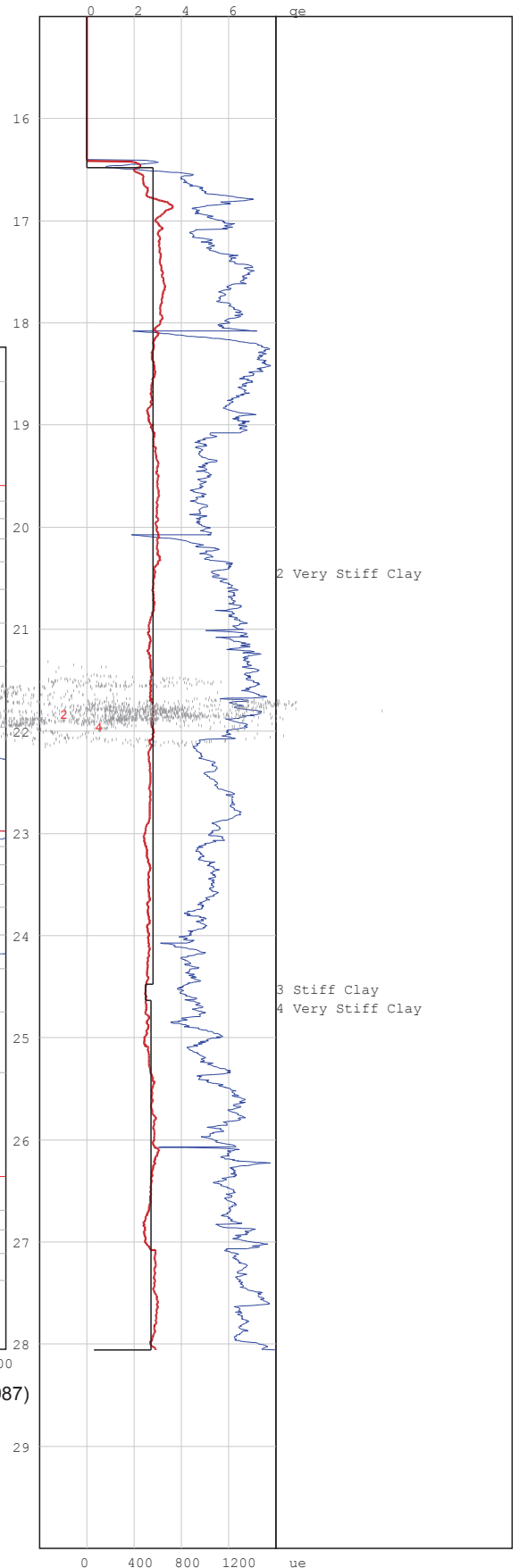
(kPa) Dissipation at: 28.057m







Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST

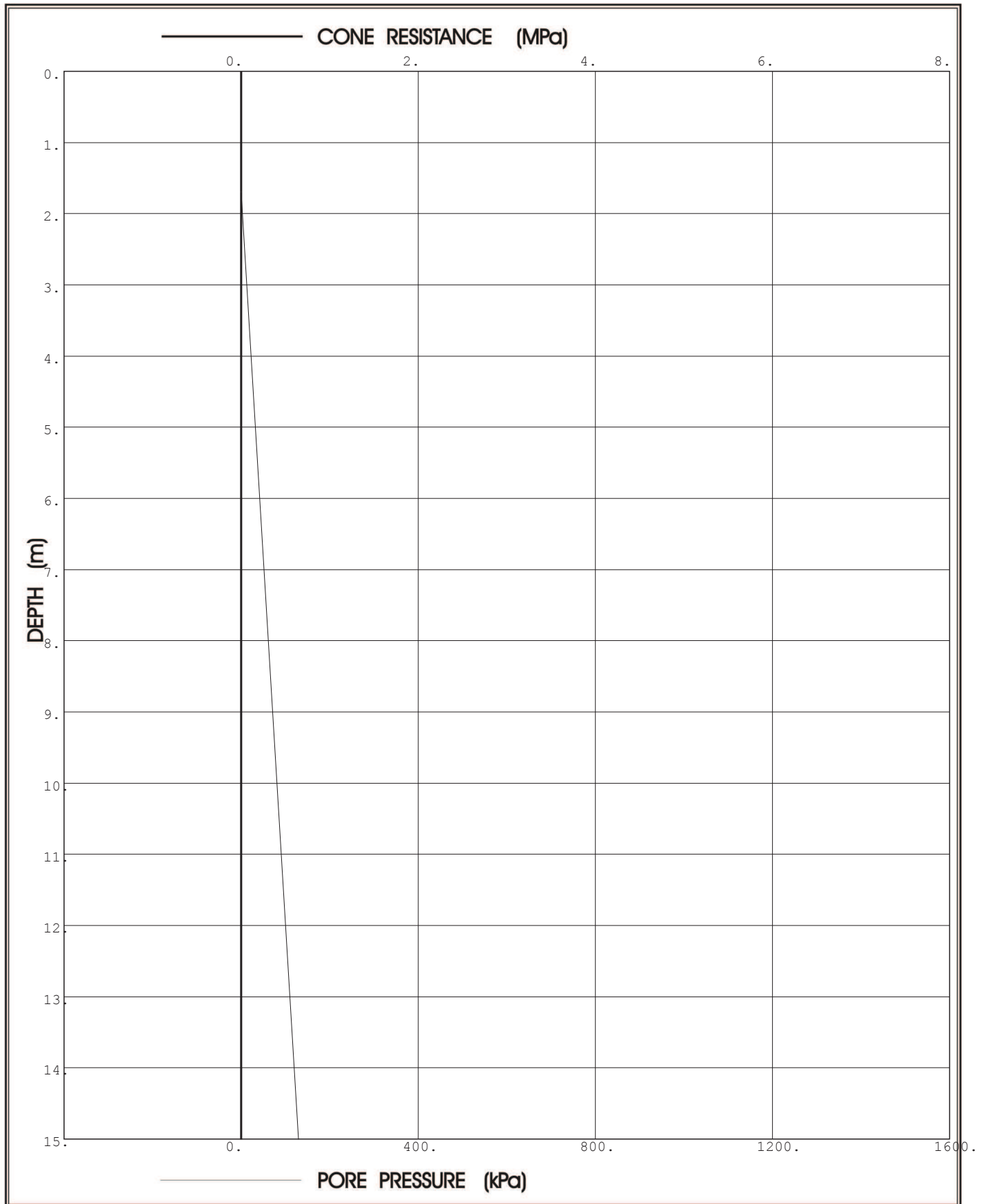


P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Over Water  
SITE: Pier2 Long: 29° 52' 38.4" Lat: 31° 1' 27.5"  
CPTU (RE): CPT41B  
DATE: 2012/05/17

Probe: KELLER

Page:1



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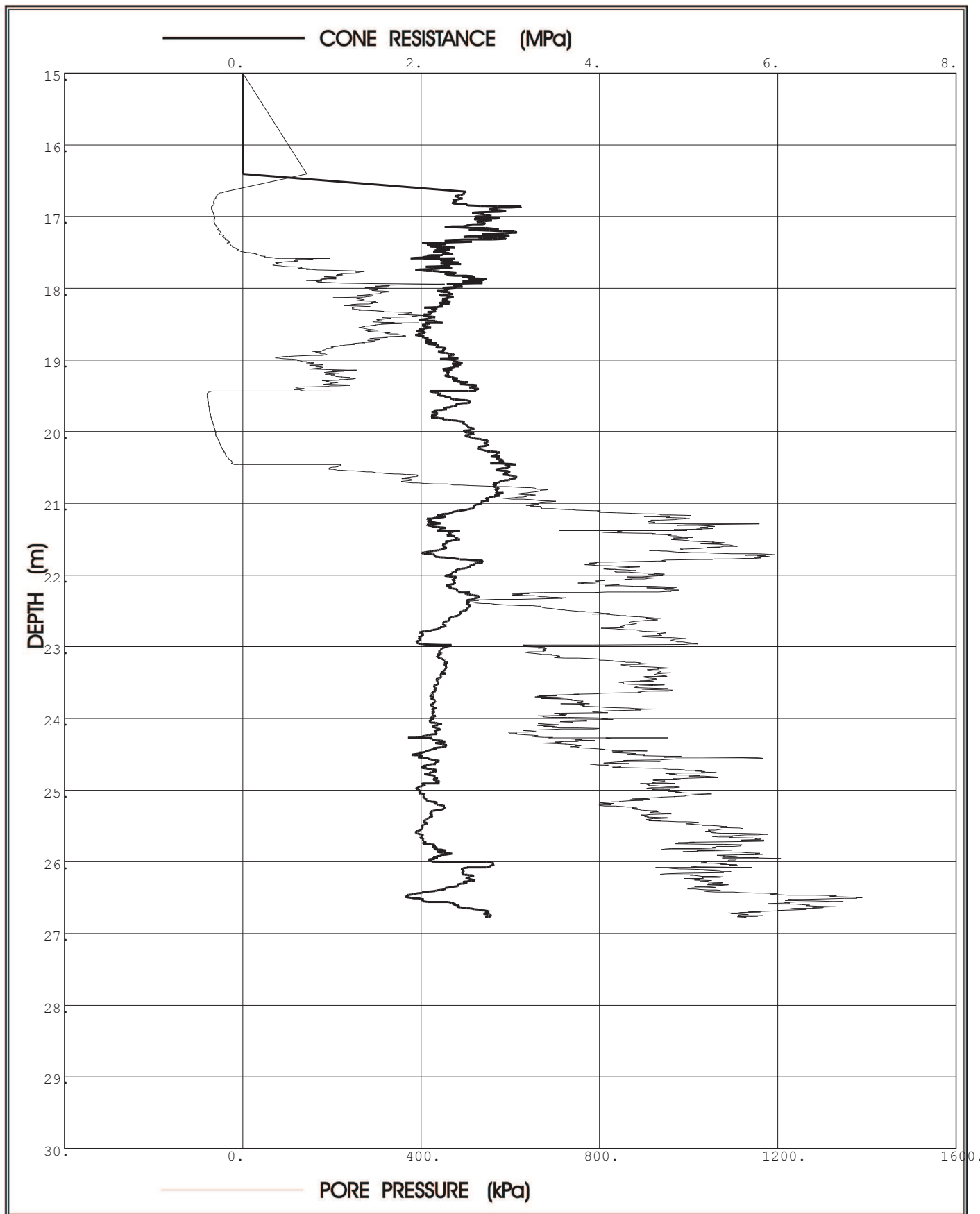


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PROJECT: Durban Harbour Over Water  
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DATE: 2012/05/17

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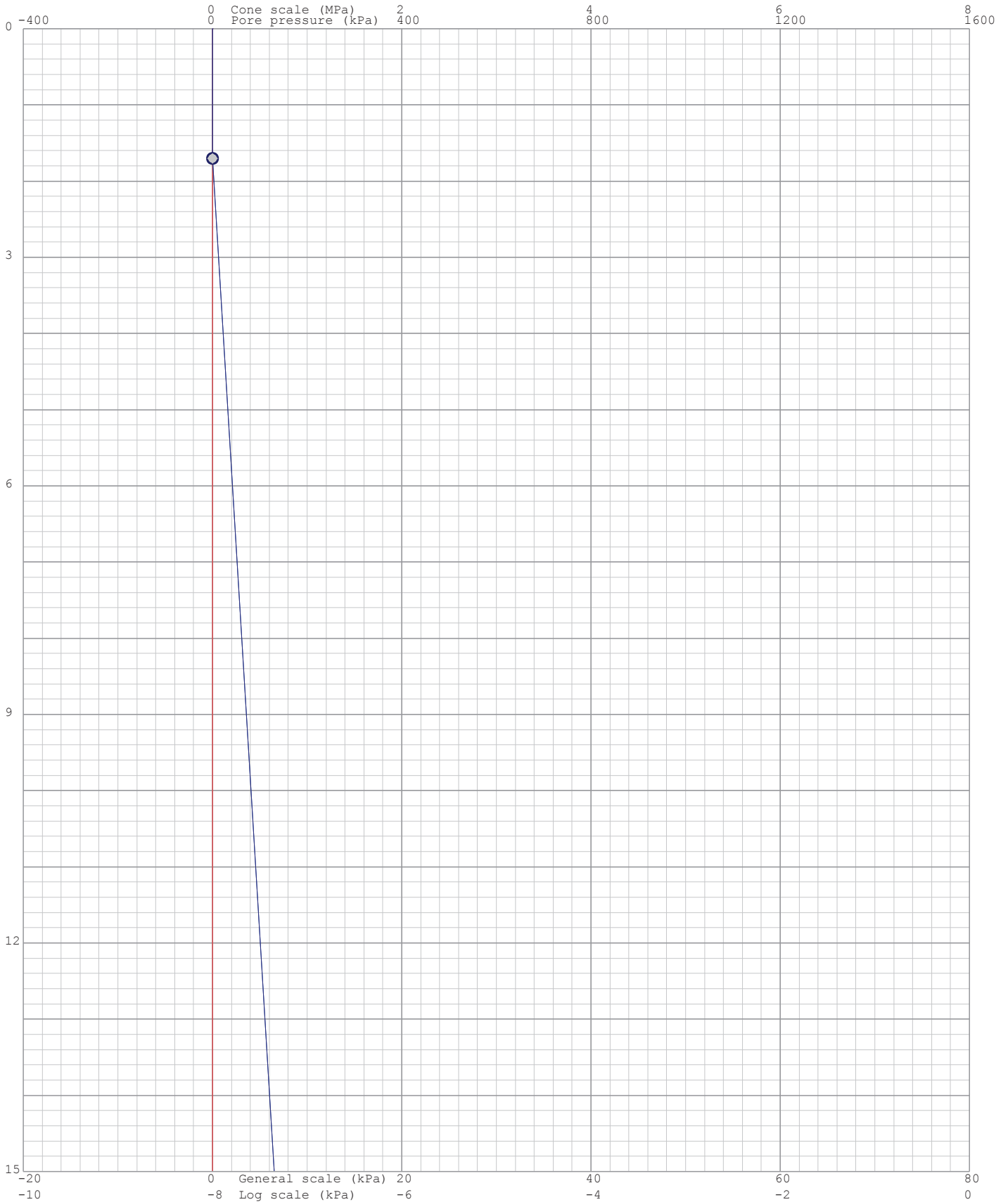
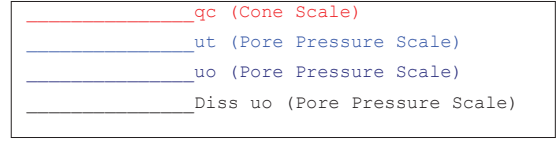
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rust@global.co.za

Project: Durban HARbour Over Water

Site: Pier2 Long: 29° 52' 38.4" Lat: 31° 1' 27.5"

Hole No: CPT41B  
Date: 2012/05/17

Probe: KELLER

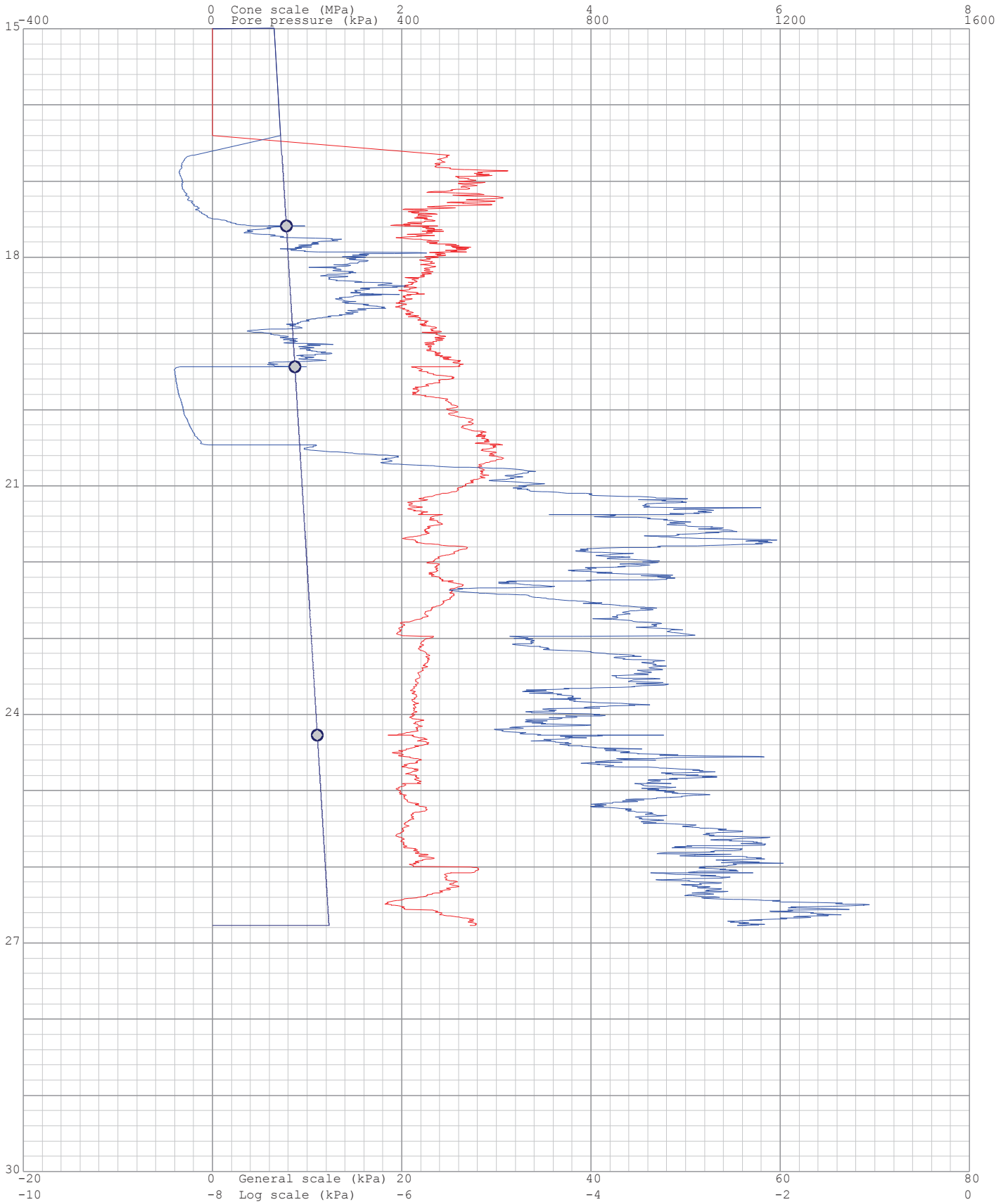
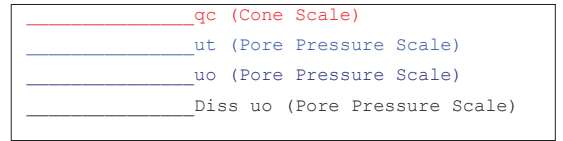


Project: Durban HARbour Over Water

Site: Pier2 Long: 29° 52' 38.4" Lat: 31° 1' 27.5"

Hole No: CPT41B  
Date: 2012/05/17

Probe: KELLER



Project: Durban Harbour Over Water

Site: Pier2 Long: 29° 52' 38.4" Lat: 31° 1' 27.5"

Hole: CPT41B

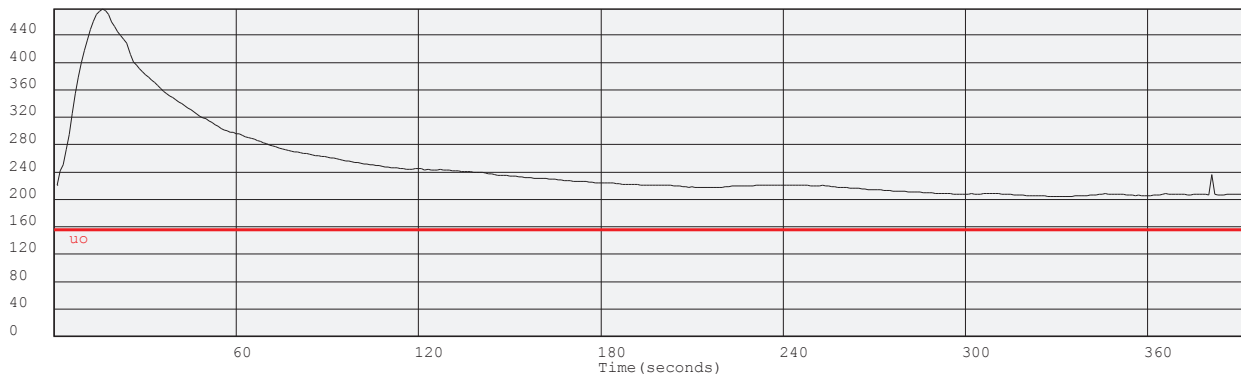
Date: 2012/05/17

Probe: KELLER  
Page: 1

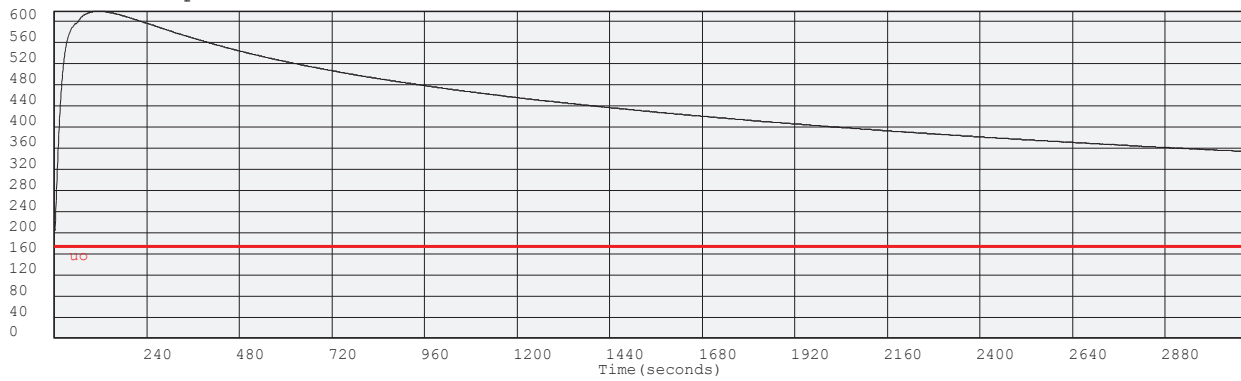
(kPa) Dissipation at: 1.7m



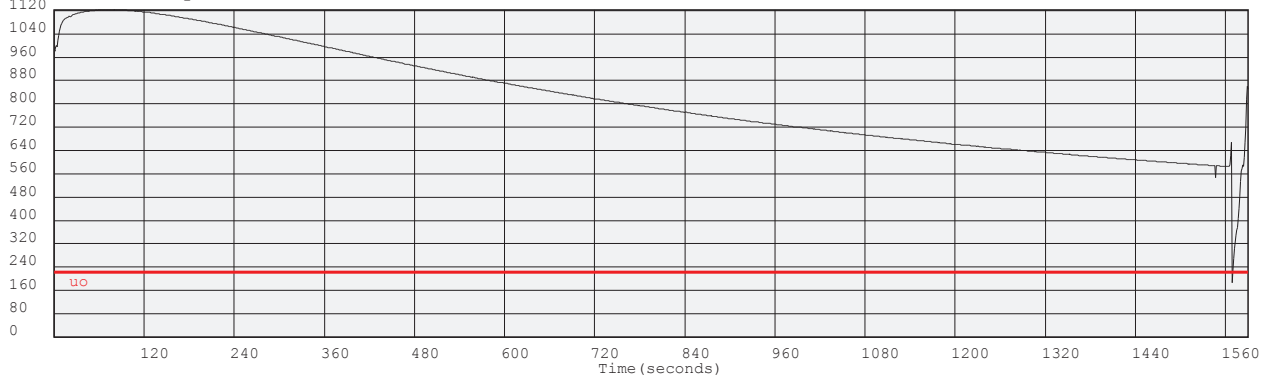
(kPa) Dissipation at: 17.585m



(kPa) Dissipation at: 19.435m



(kPa) Dissipation at: 24.271m

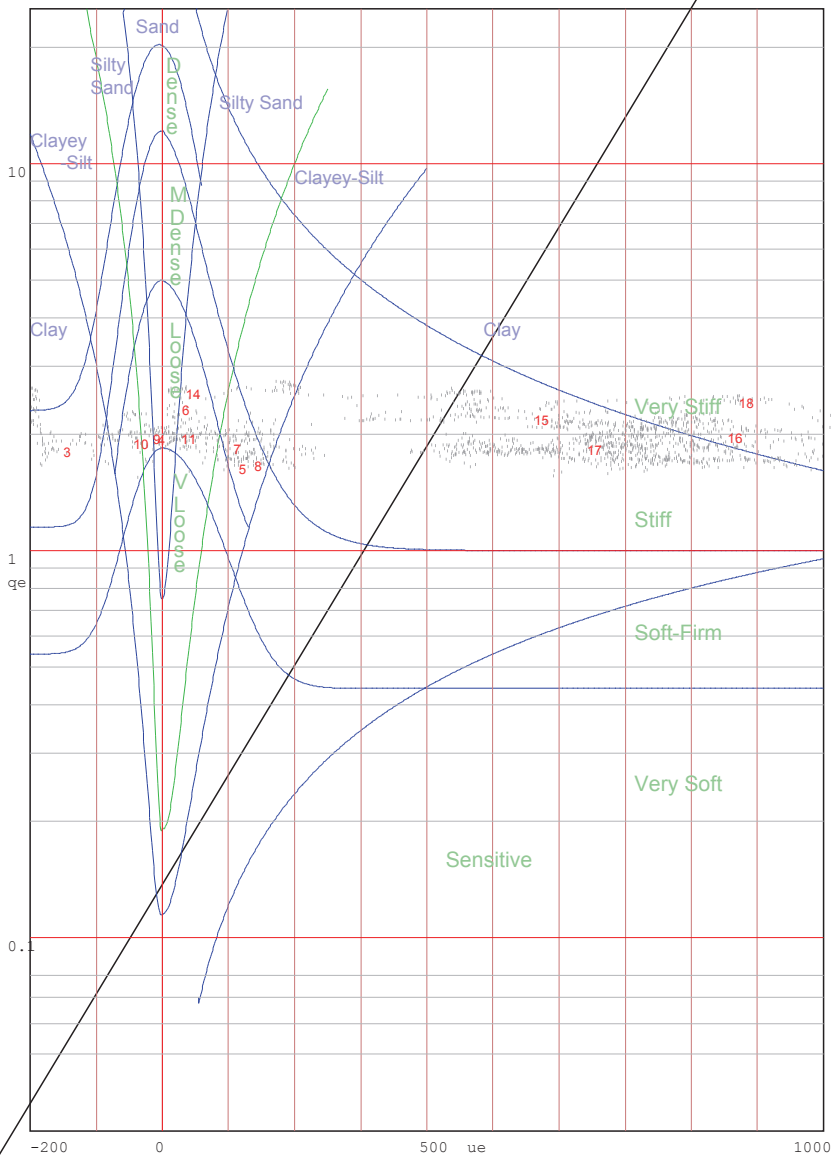
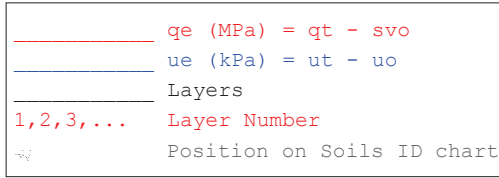


Project: Durban HARbour Over Water

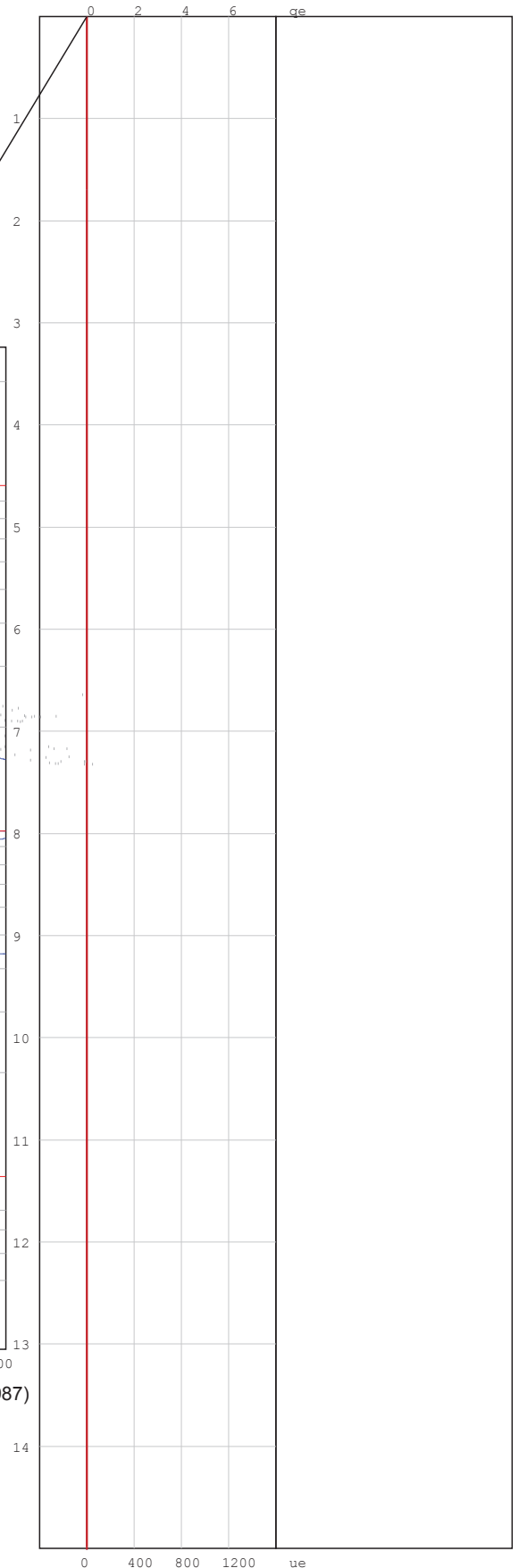
Site: Pier2 Long: 29° 52' 38.4" Lat: 31° 1' 27.5"

Hole No: CPT41B  
Date: 2012/05/17

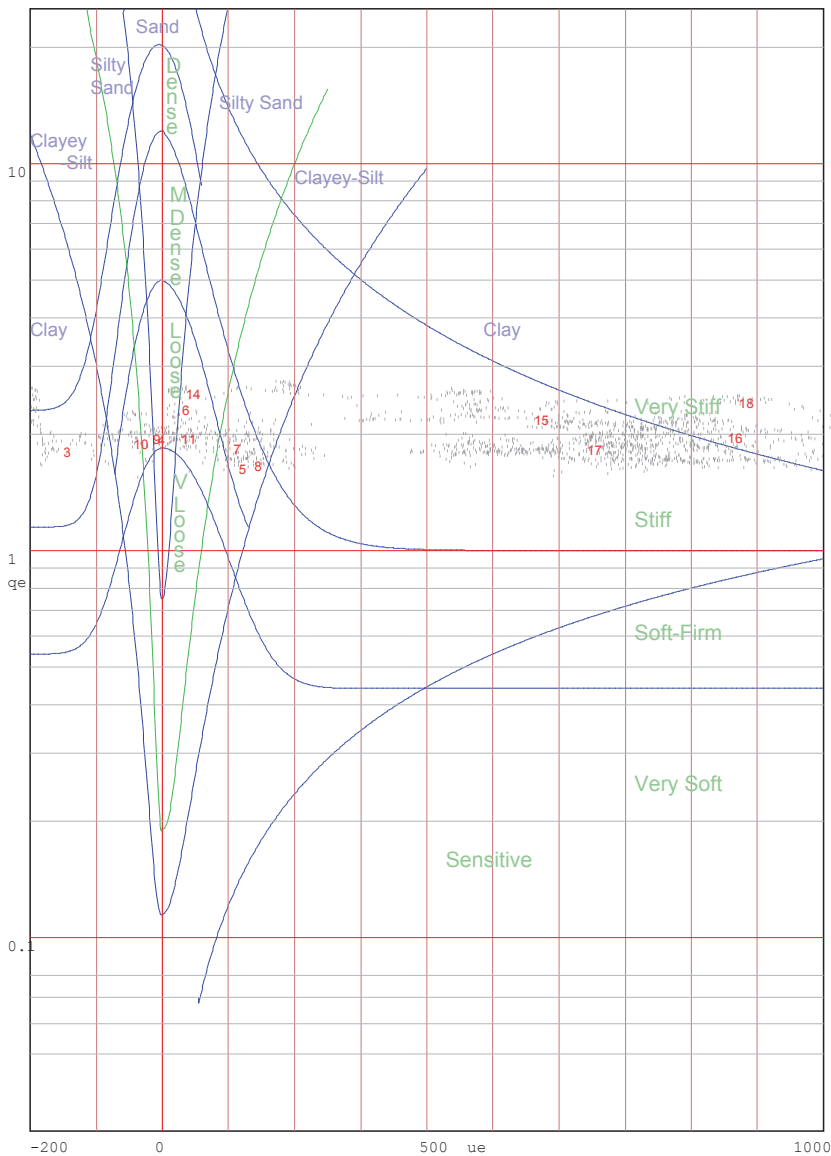
Probe: KELLER



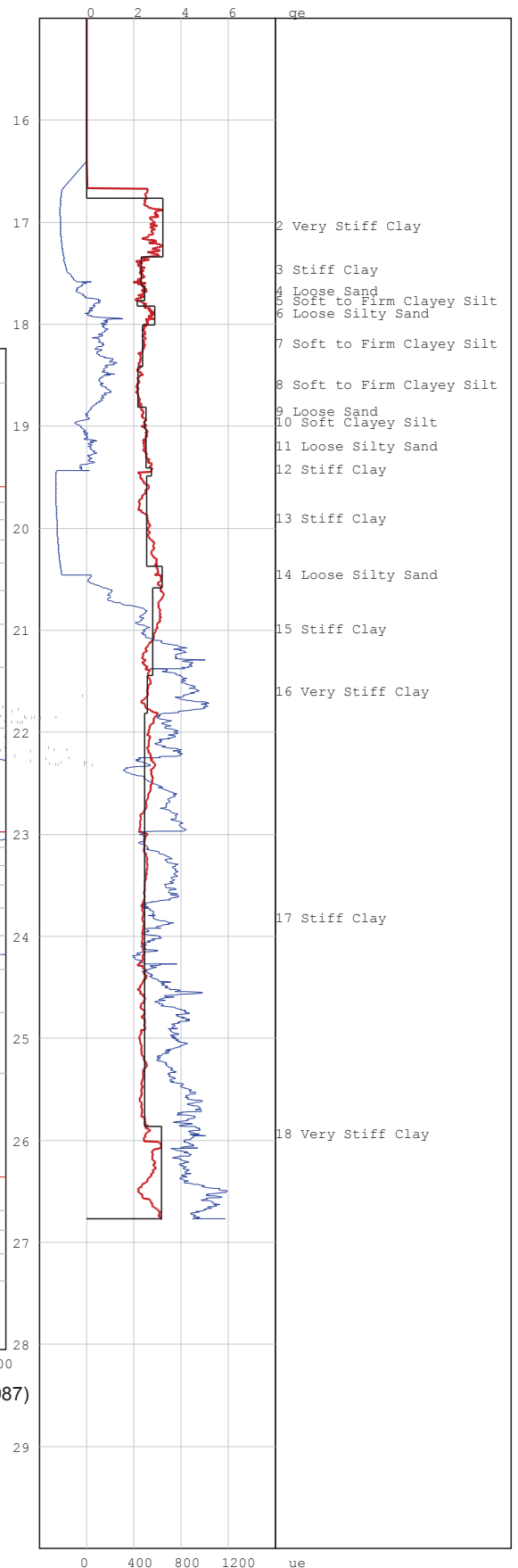
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

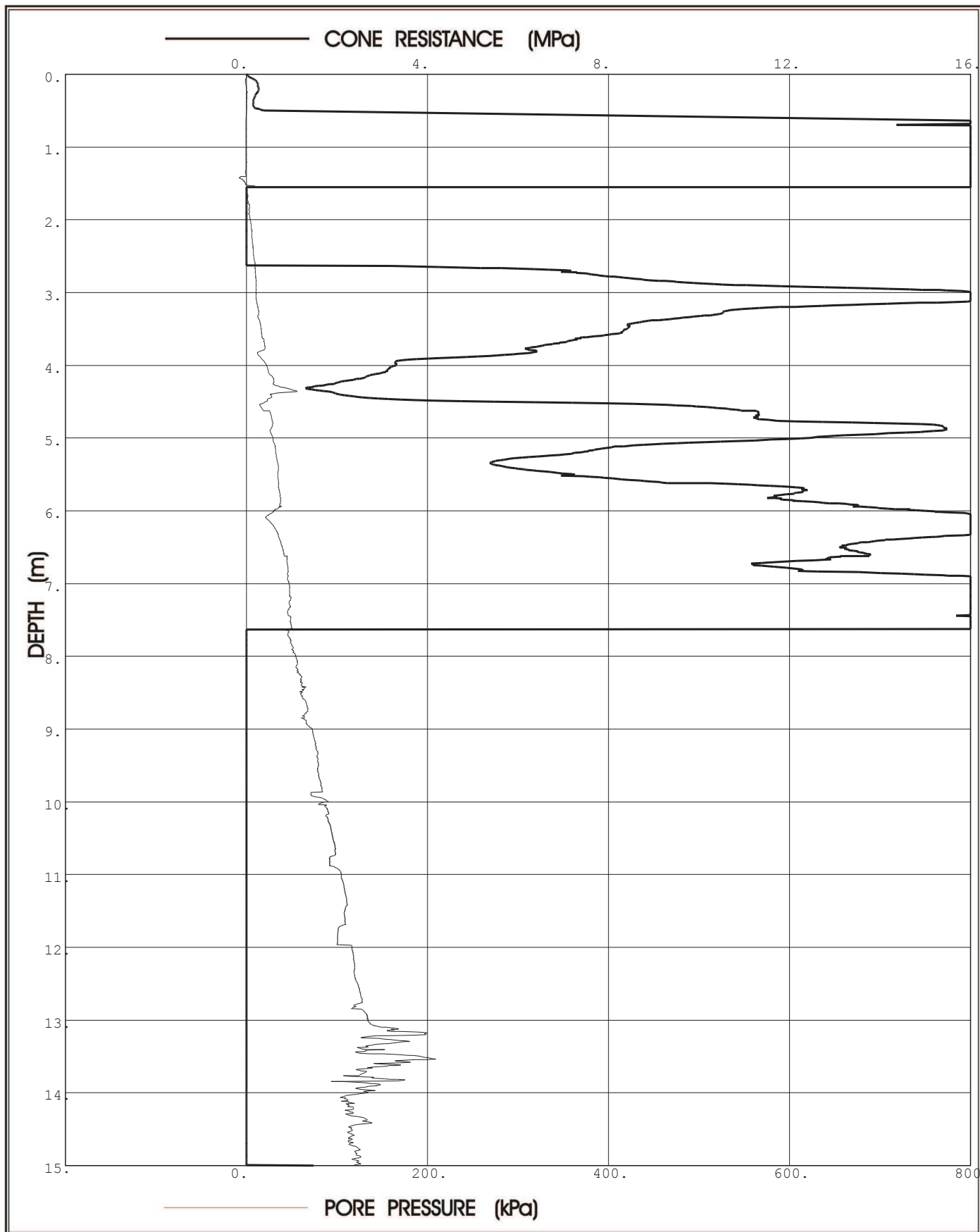
SITE: Pier 2 Long:29°52.789' Lat:031°00.731'

CPTU (RE): 43

DATE: 2012-03-09

Probe: GHANA

Page:1



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P O Box 39108  
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0044

PROJECT: Durban Harbour Land Based CPTu

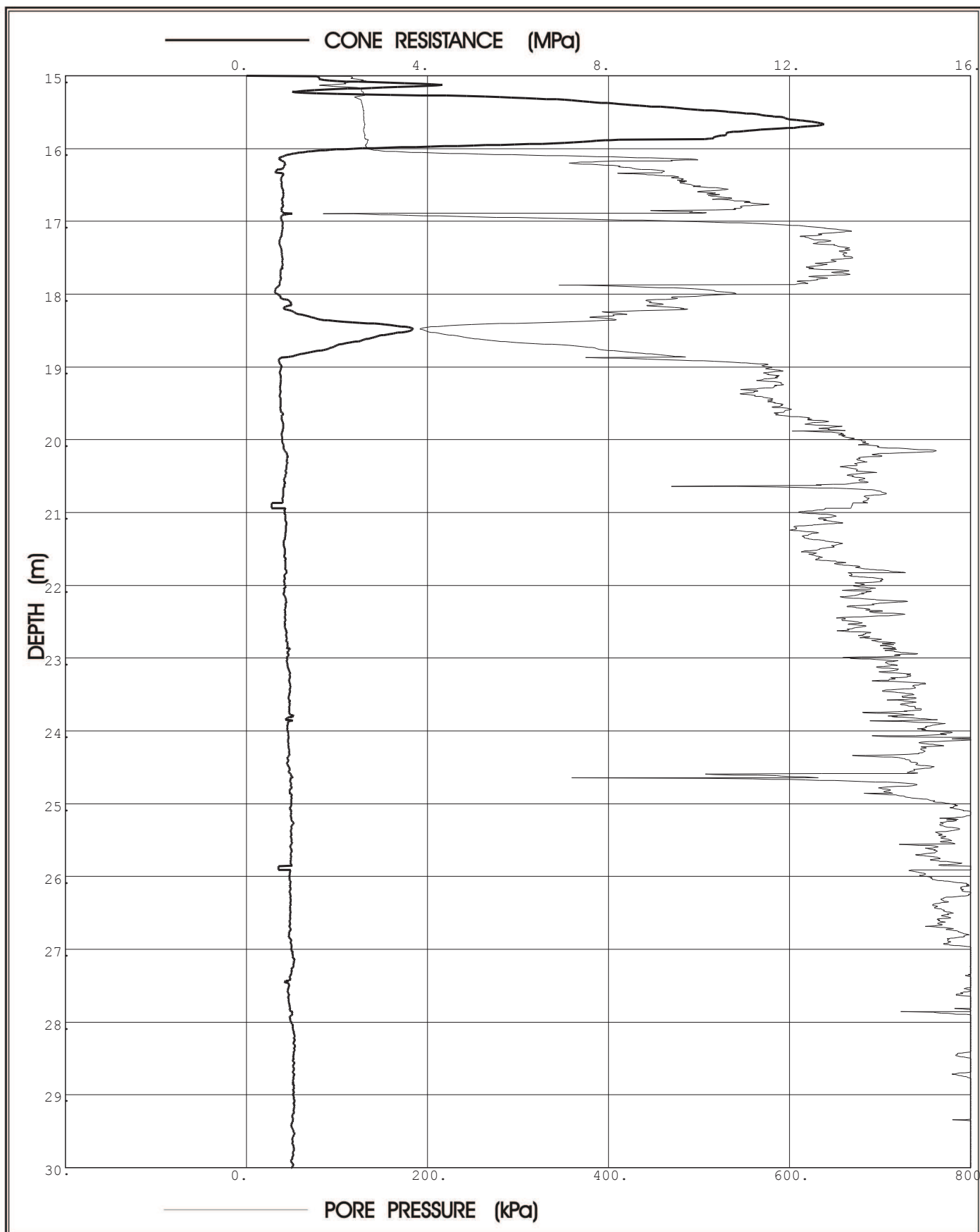
SITE: Pier 2 Long:29°52.789' Lat:031°00.731'

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PROJECT: Durban Harbour Land Based CPTu

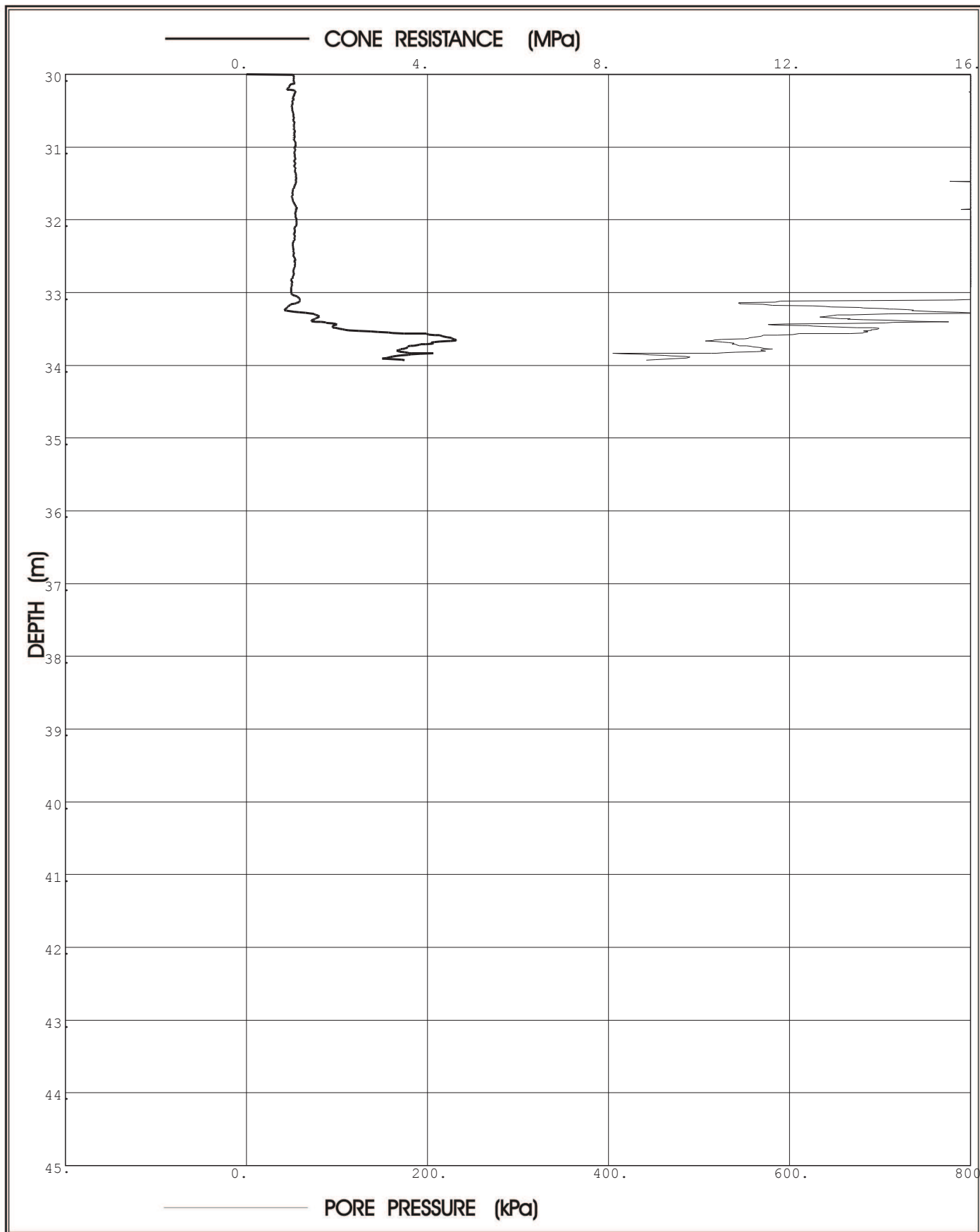
SITE: Pier 2 Long:29°52.789' Lat:031°00.731'

CPTU (RE): 43

DATE: 2012-03-09

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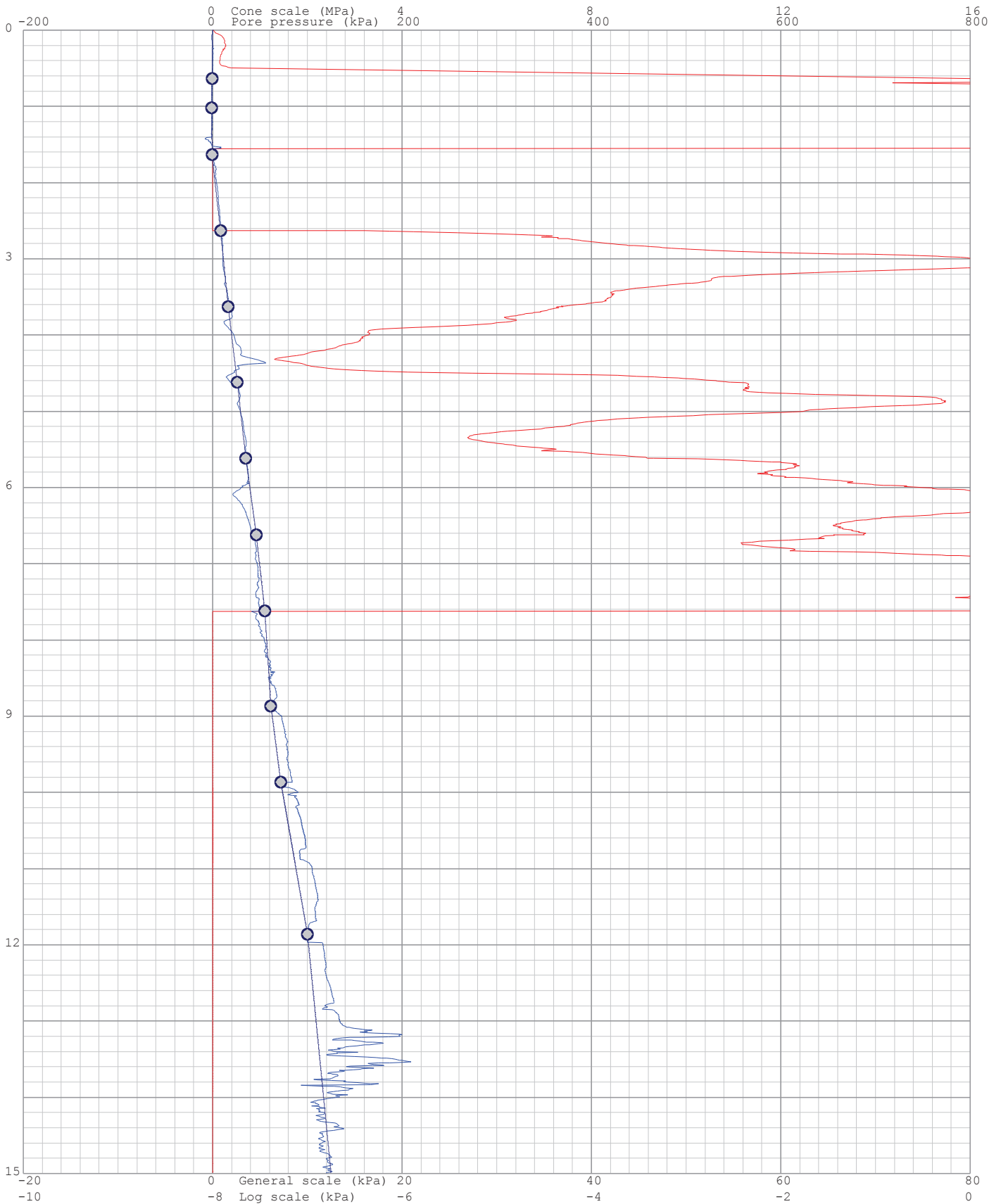
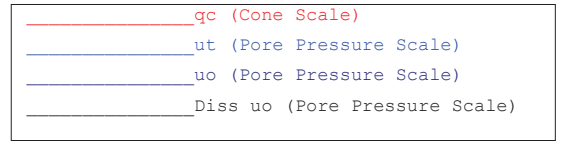
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.789' Lat:031°00.731'

Hole No: 43

Date: 2012-03-09

Probe: GHANA



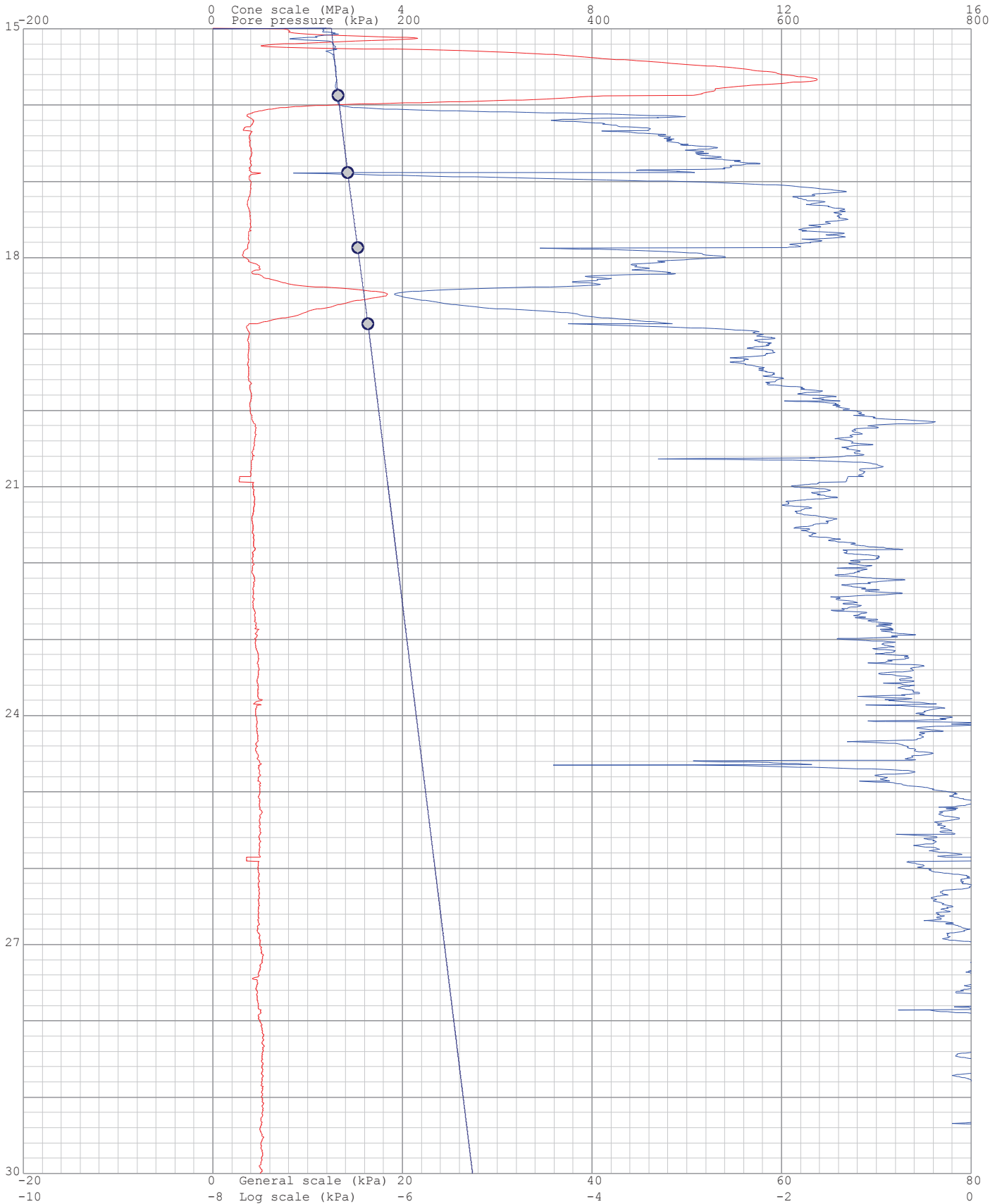
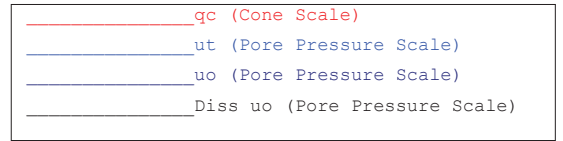
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.789' Lat:031°00.731'

Hole No: 43

Date: 2012-03-09

Probe: GHANA



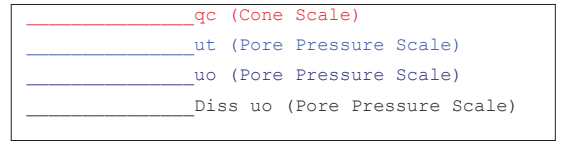
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.789' Lat:031°00.731'

Hole No: 43

Date: 2012-03-09

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.789' Lat: 031°00.731'

Hole: 43

Date: 2012-03-09

Probe: GHANA

Page: 1

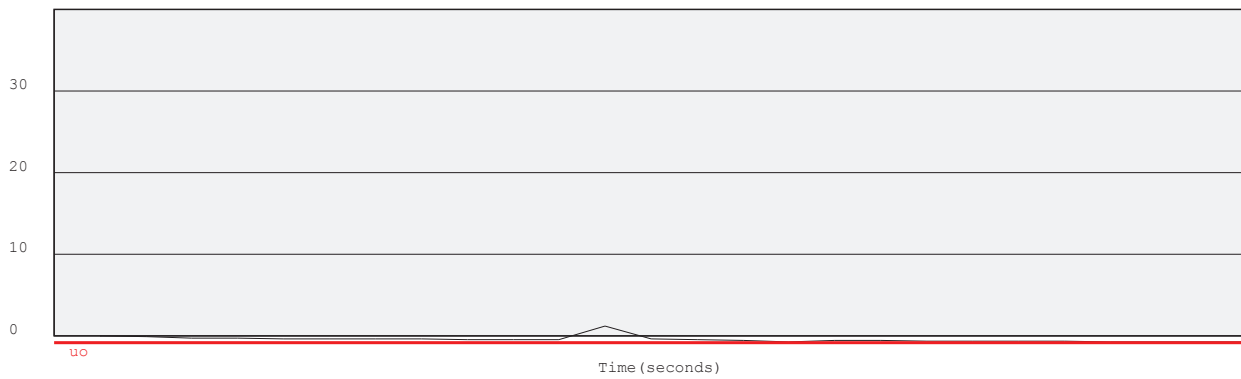
(kPa) Dissipation at: 0.634m



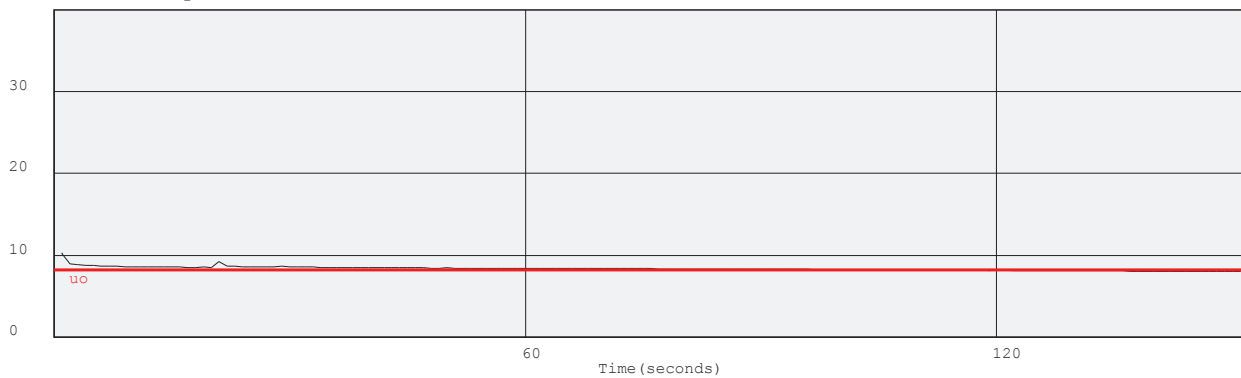
(kPa) Dissipation at: 1.019m



(kPa) Dissipation at: 1.634m



(kPa) Dissipation at: 2.63m



Project:Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.789' Lat:031°00.731'

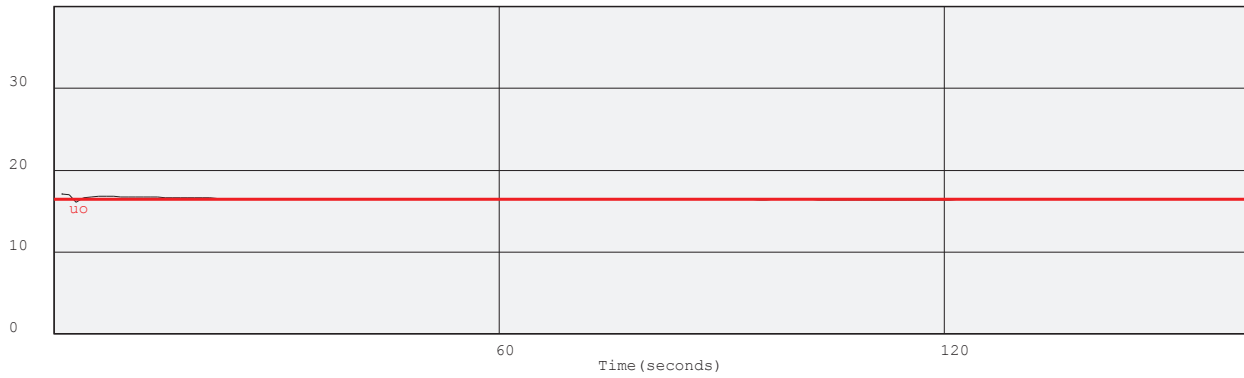
Hole: 43

Date: 2012-03-09

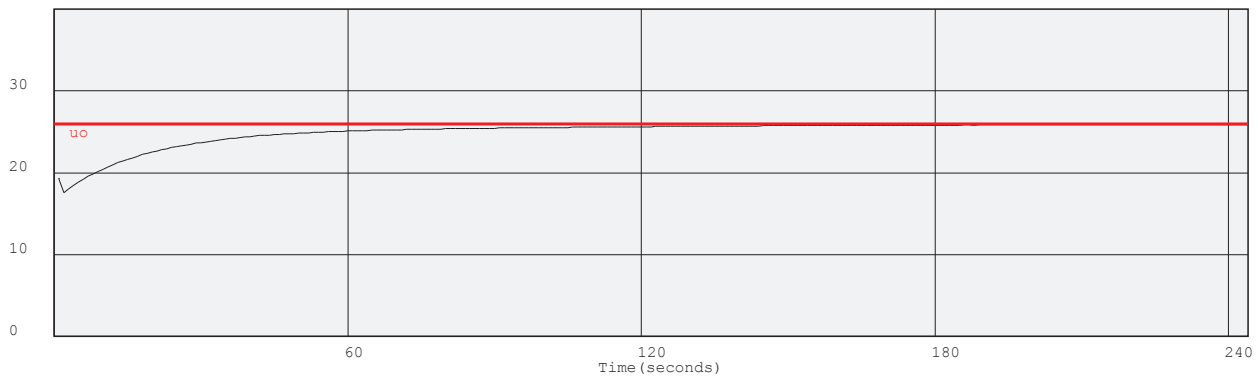
Probe: GHANA

Page: 2

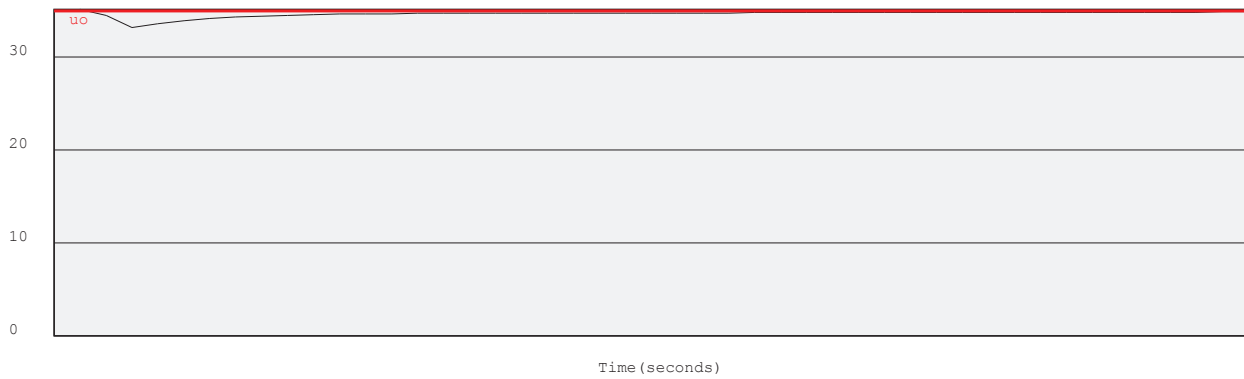
(kPa) Dissipation at:3.627m



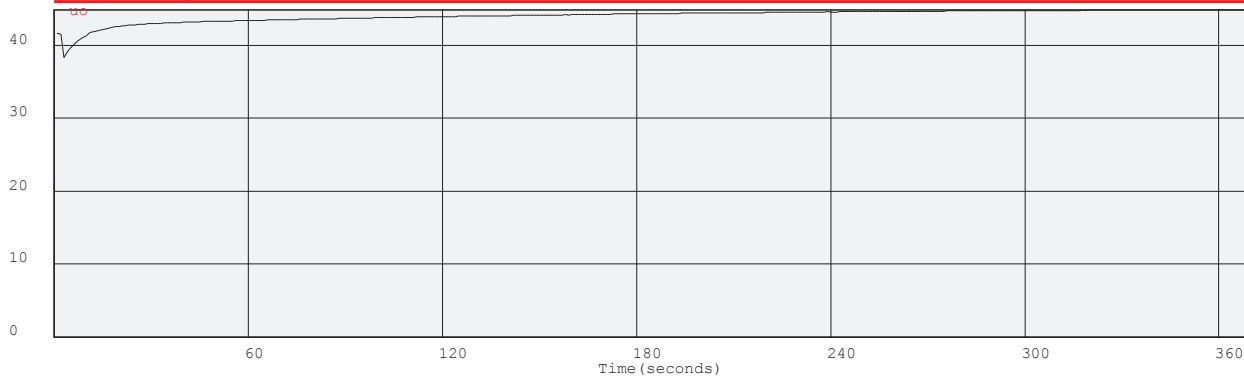
(kPa) Dissipation at:4.622m



(kPa) Dissipation at:5.616m



(kPa) Dissipation at:6.619m



Project: Durban Harbour Land Based CPTu

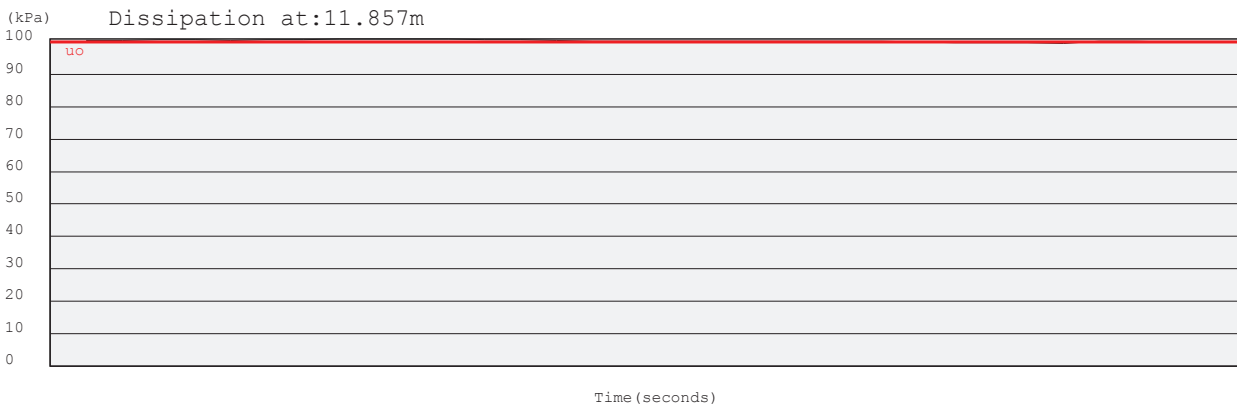
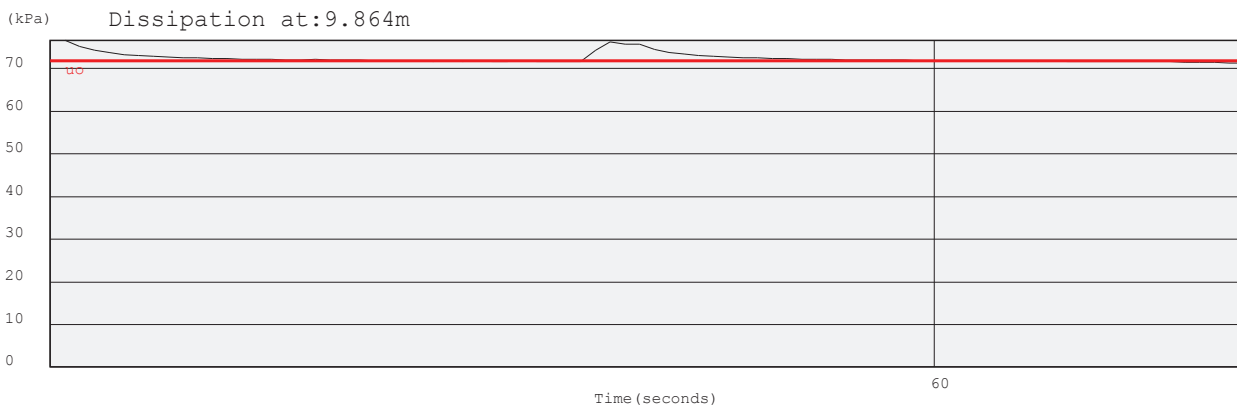
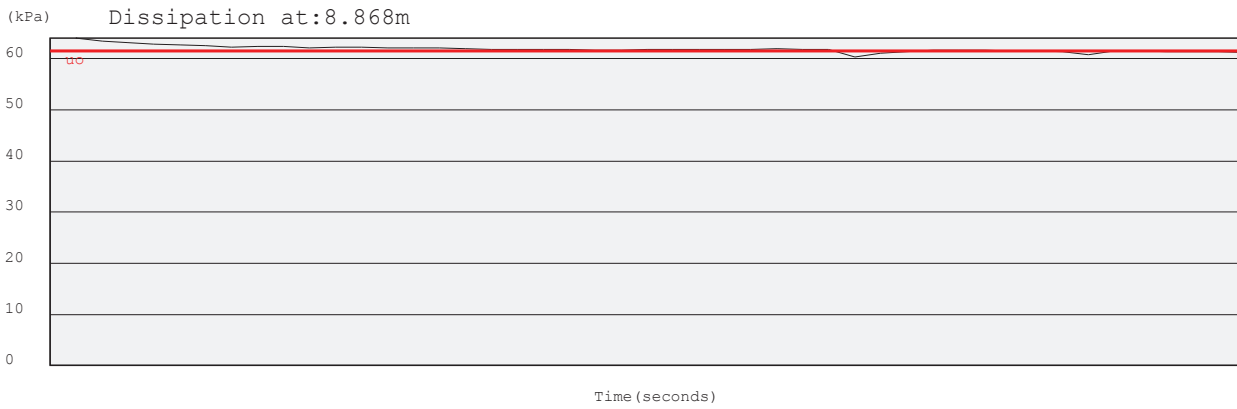
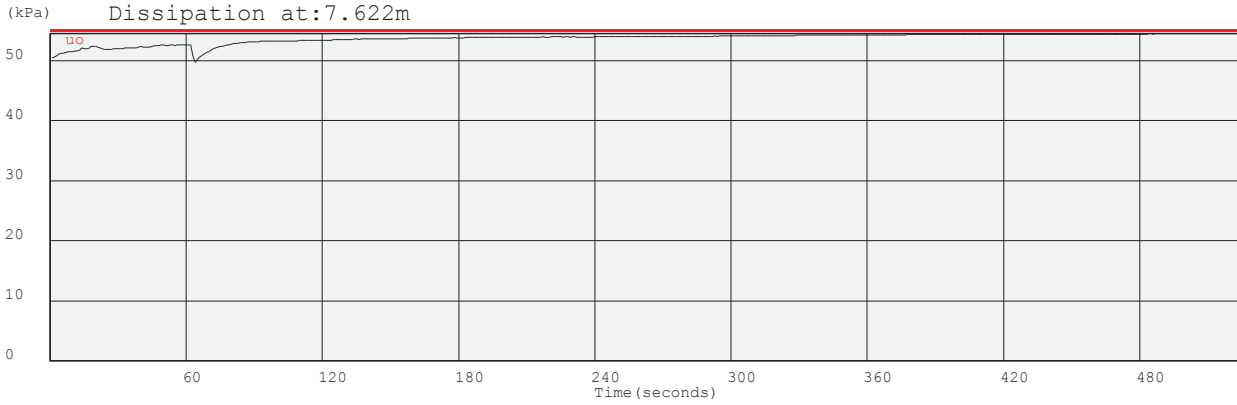
Site: Pier 2 Long: 29°52.789' Lat: 031°00.731'

Hole: 43

Date: 2012-03-09

Probe: GHANA

Page: 3



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.789' Lat: 031°00.731'

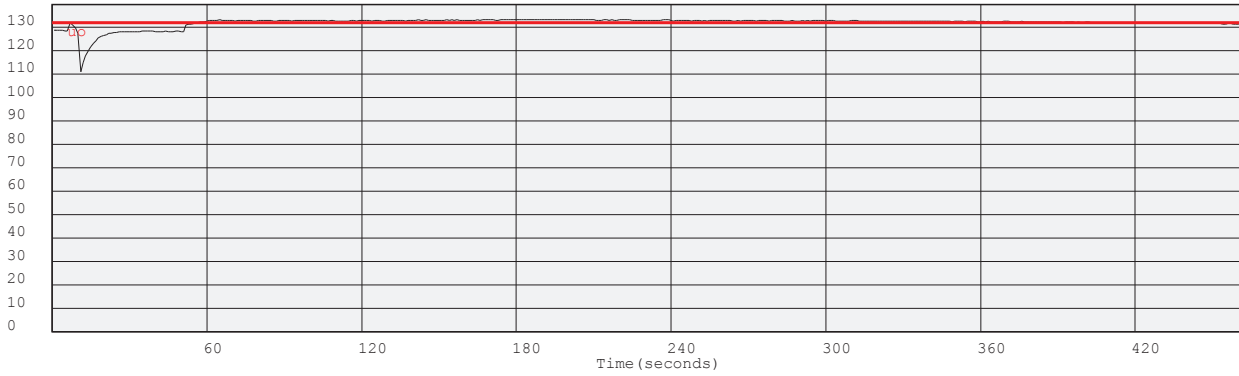
Hole: 43

Date: 2012-03-09

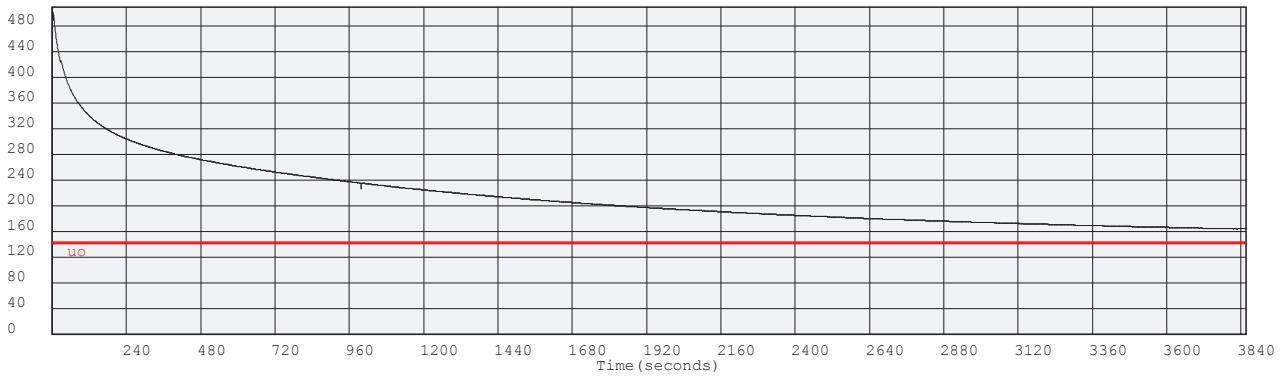
Probe: GHANA

Page: 4

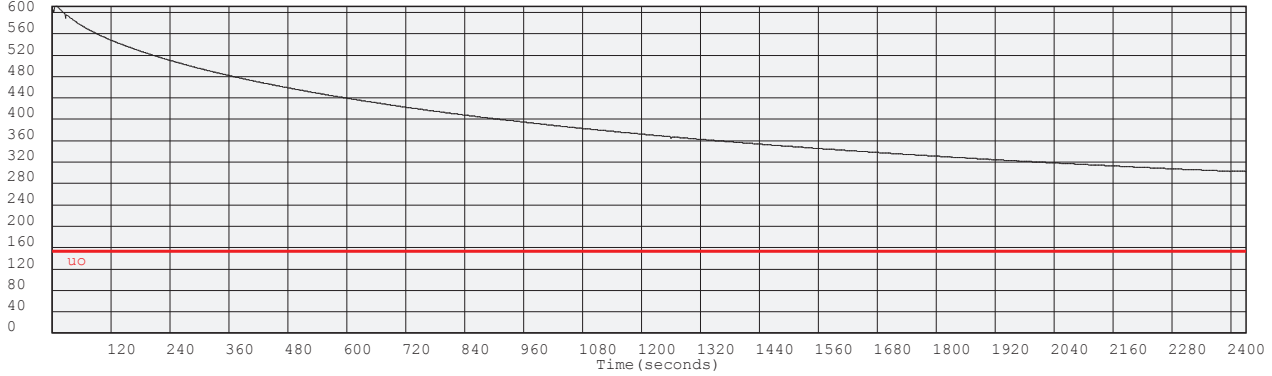
(kPa) Dissipation at: 15.873m



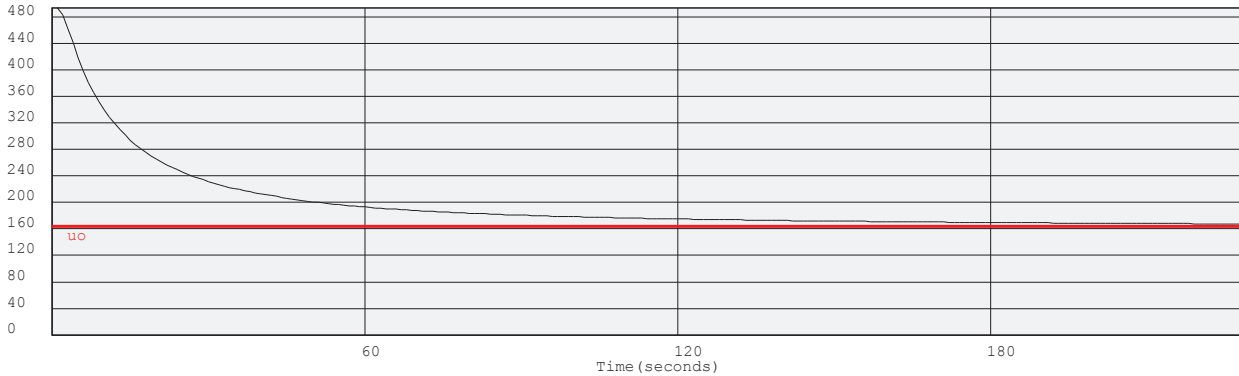
(kPa) Dissipation at: 16.885m



(kPa) Dissipation at: 17.869m



(kPa) Dissipation at: 18.865m





Project: Durban Harbour Land Based CPTu

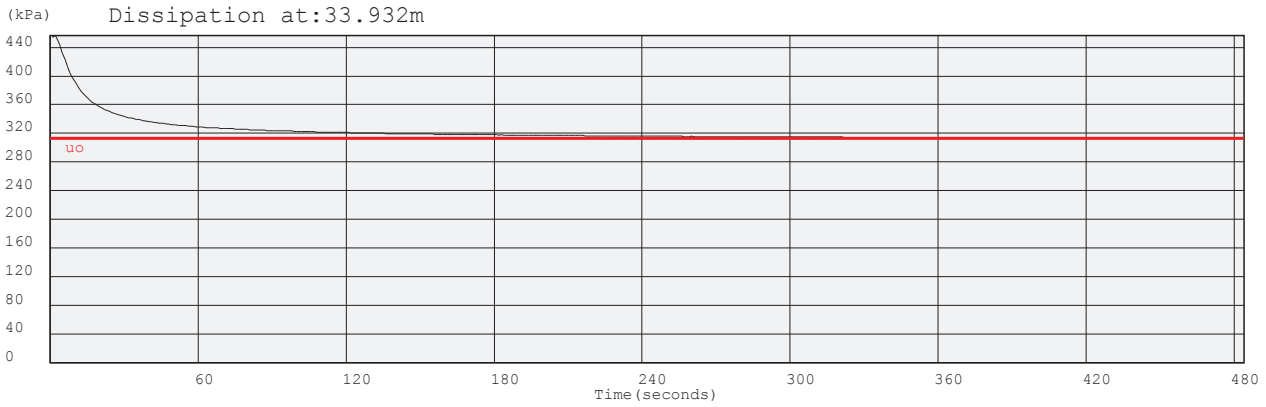
Site: Pier 2 Long: 29°52.789' Lat: 031°00.731'

Hole: 43

Date: 2012-03-09

Probe: GHANA

Page: 5



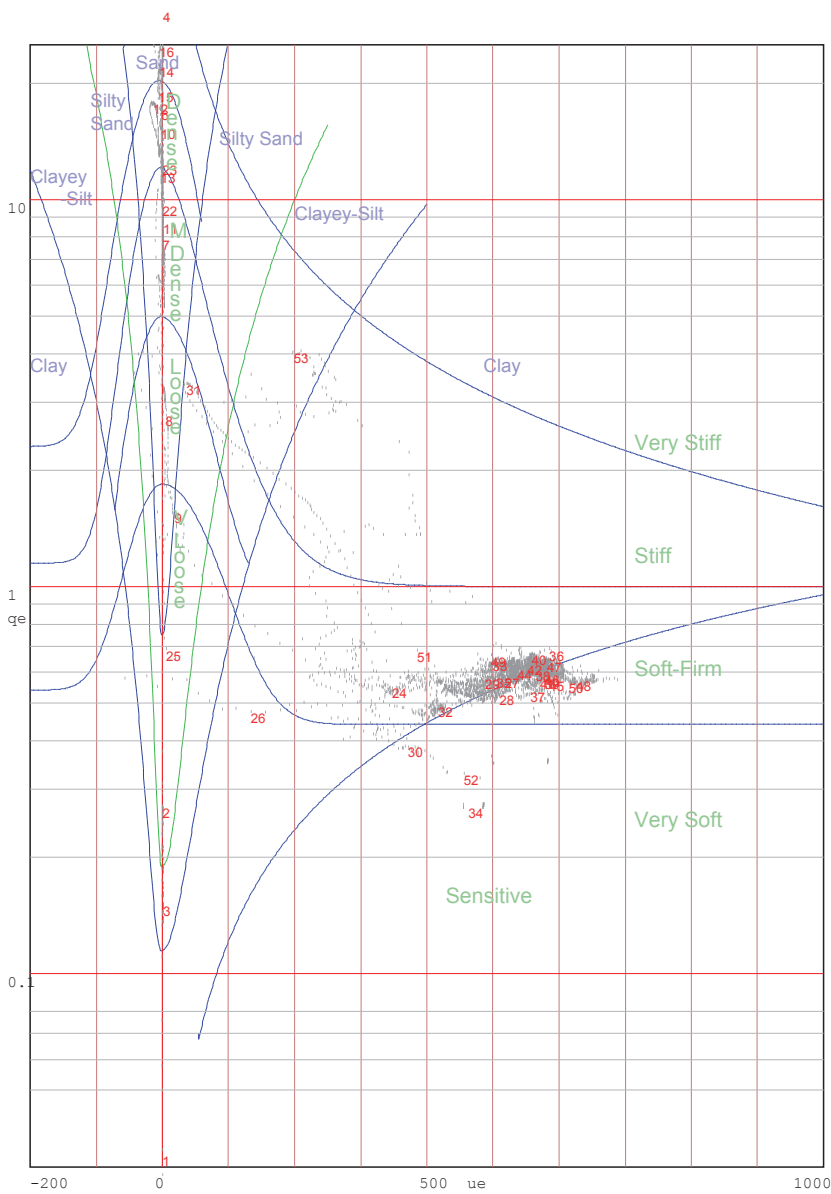
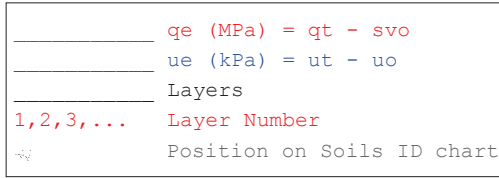
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.789' Lat:031°00.731'

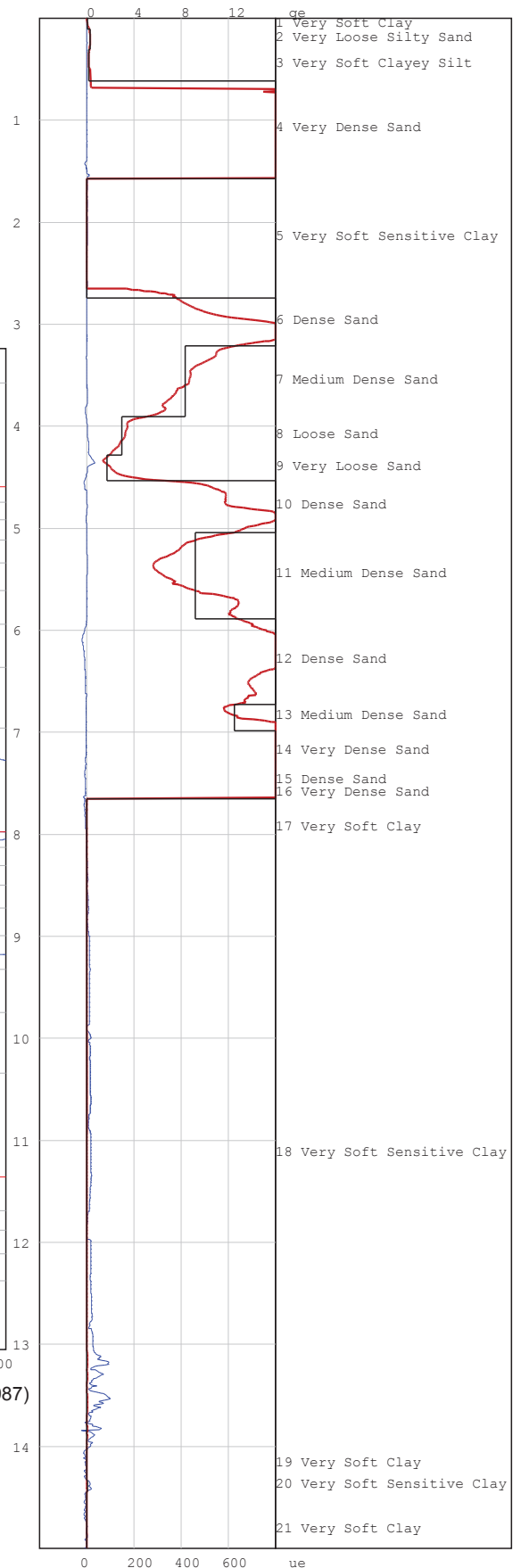
Hole No: 43

Date: 2012-03-09

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

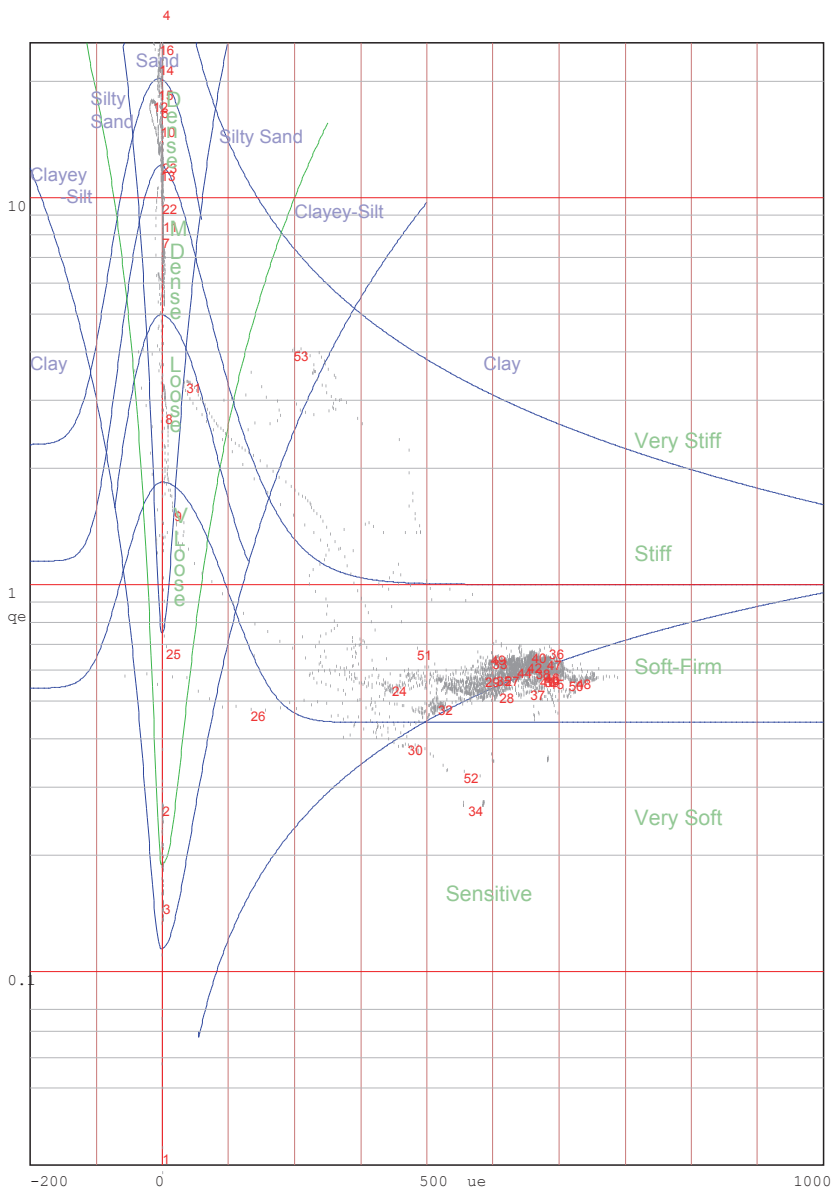
Site: Pier 2 Long:29°52.789' Lat:031°00.731'

Hole No: 43

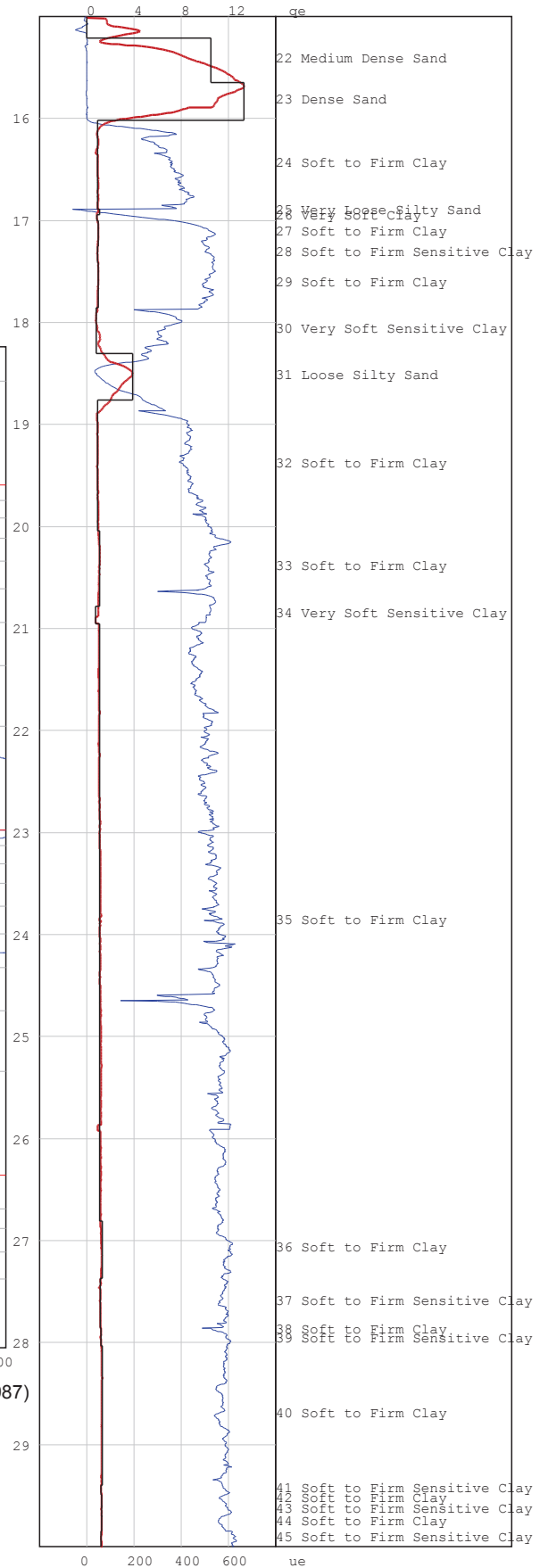
Date: 2012-03-09

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

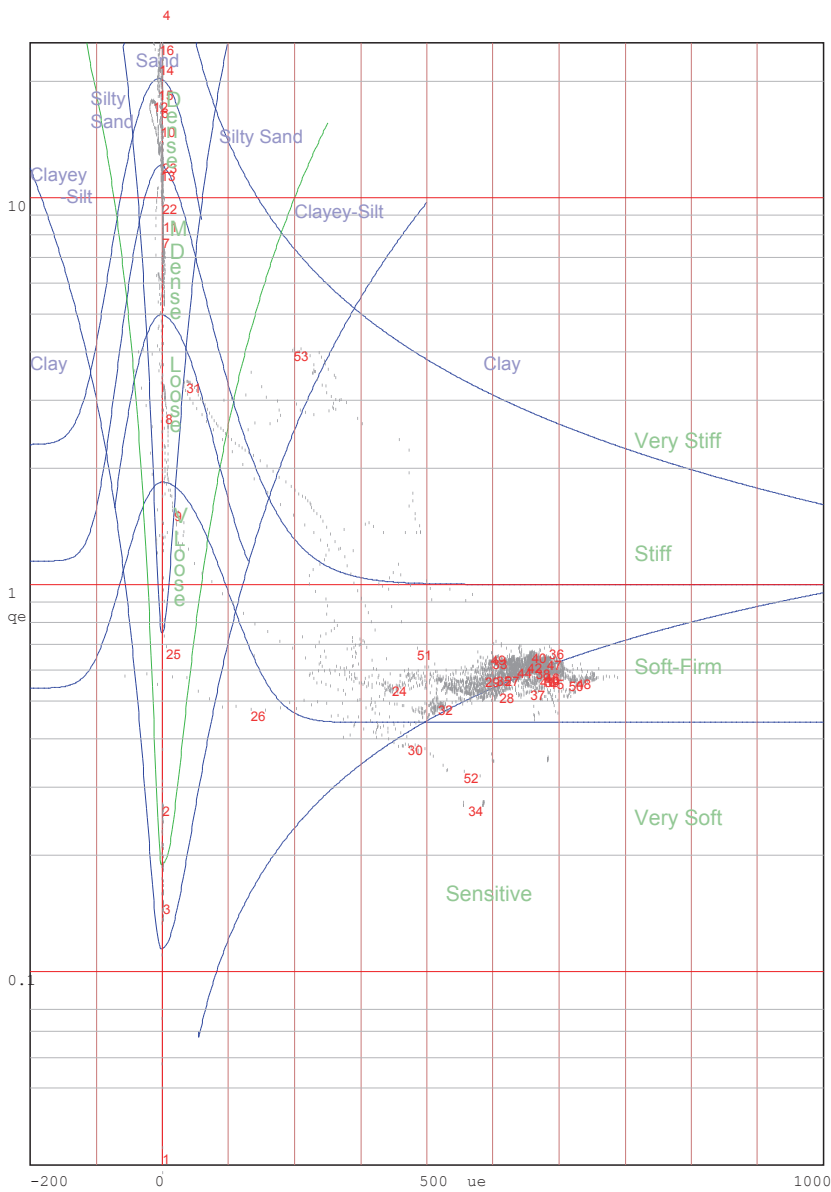
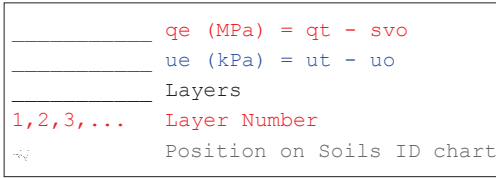
Site: Pier 2 Long:29°52.789' Lat:031°00.731'

Hole No: 43

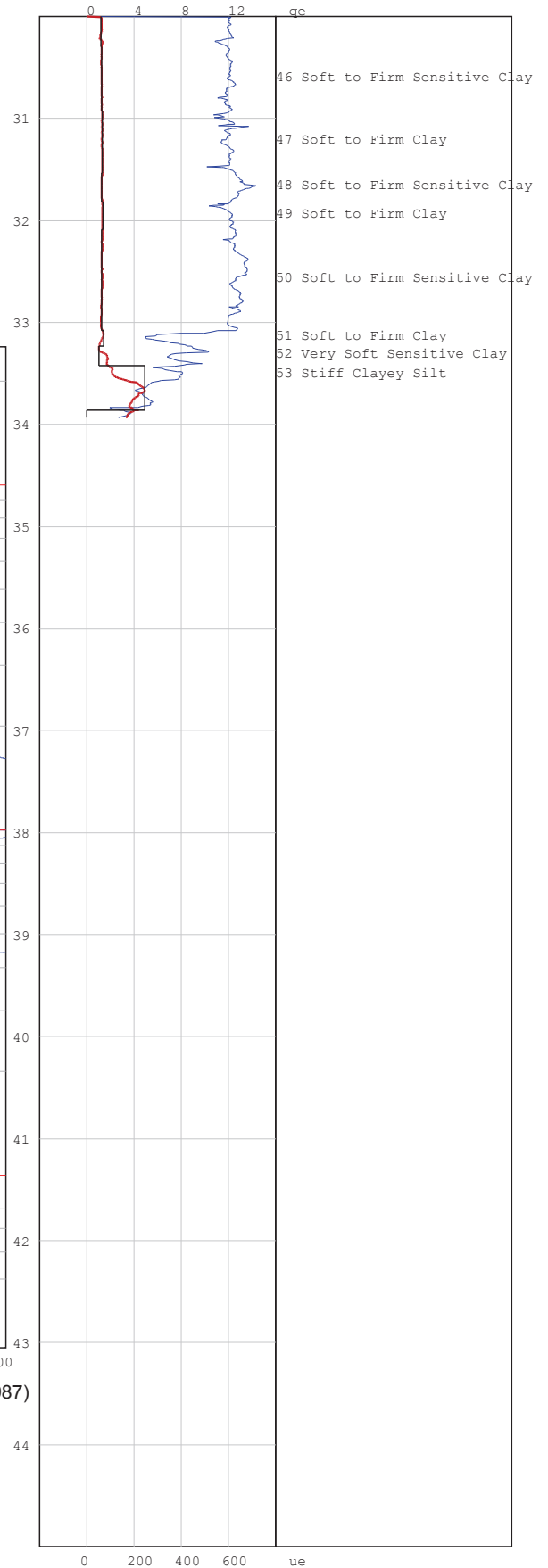
Date: 2012-03-09

Probe: GHANA

Page



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

PROJECT: Durban Harbour Land Based CPTu

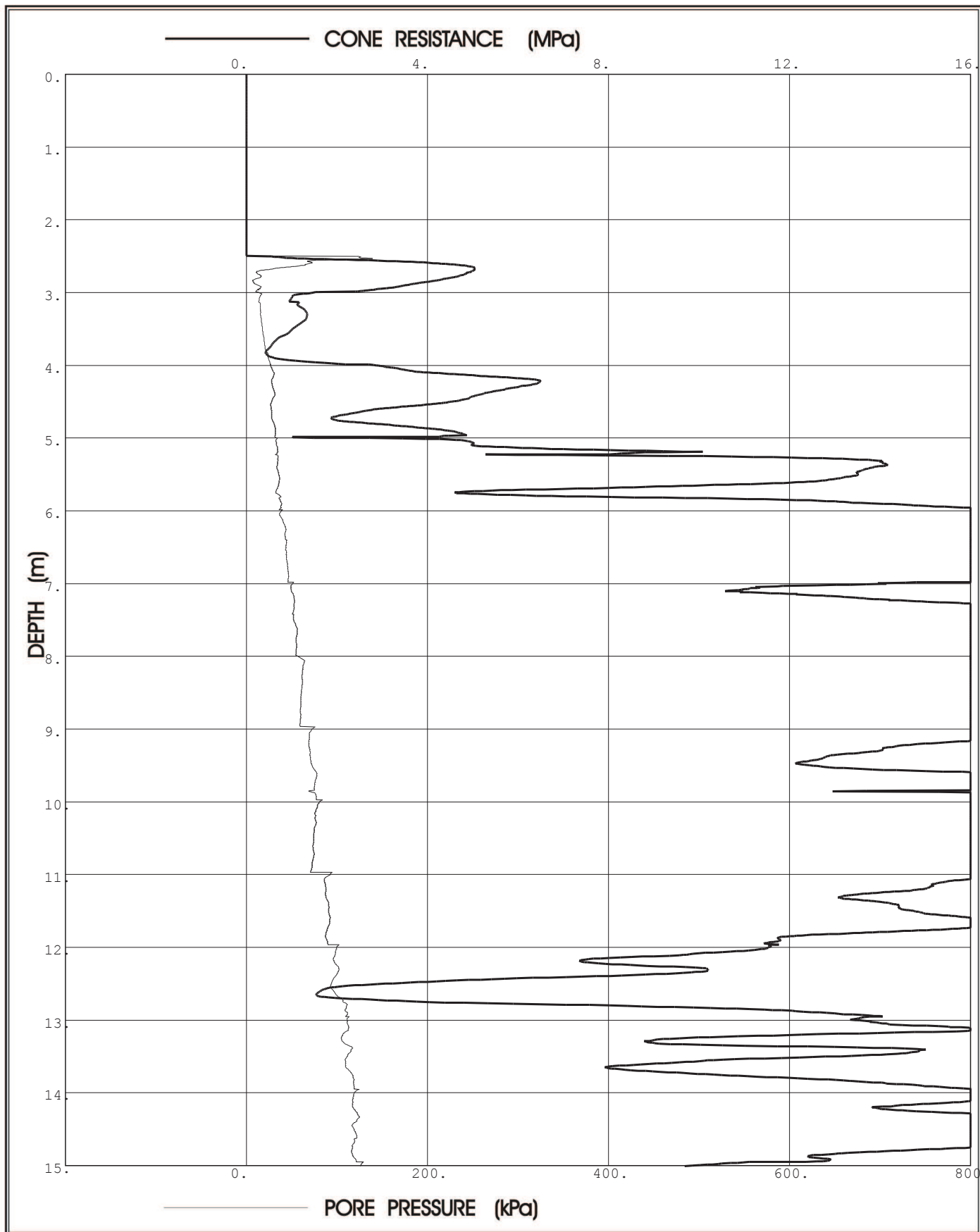
SITE: Pier 2 Long:29°52.781' Lat:031°00.741'

CPTU (RE): 44

DATE: 2012-03-12

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



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PROJECT: Durban Harbour Land Based CPTu

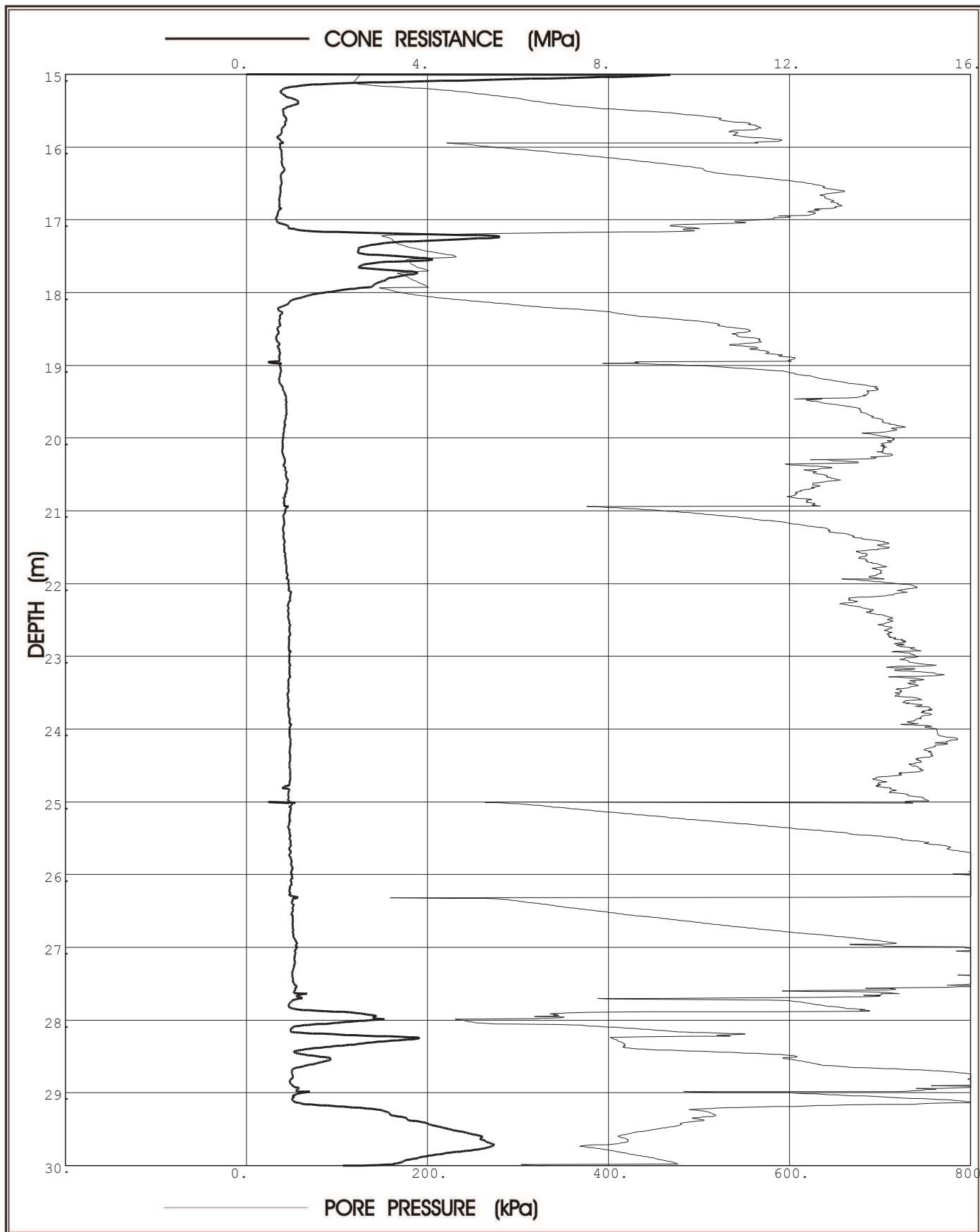
SITE: Pier 2 Long:29°52.781' Lat:031°00.741'

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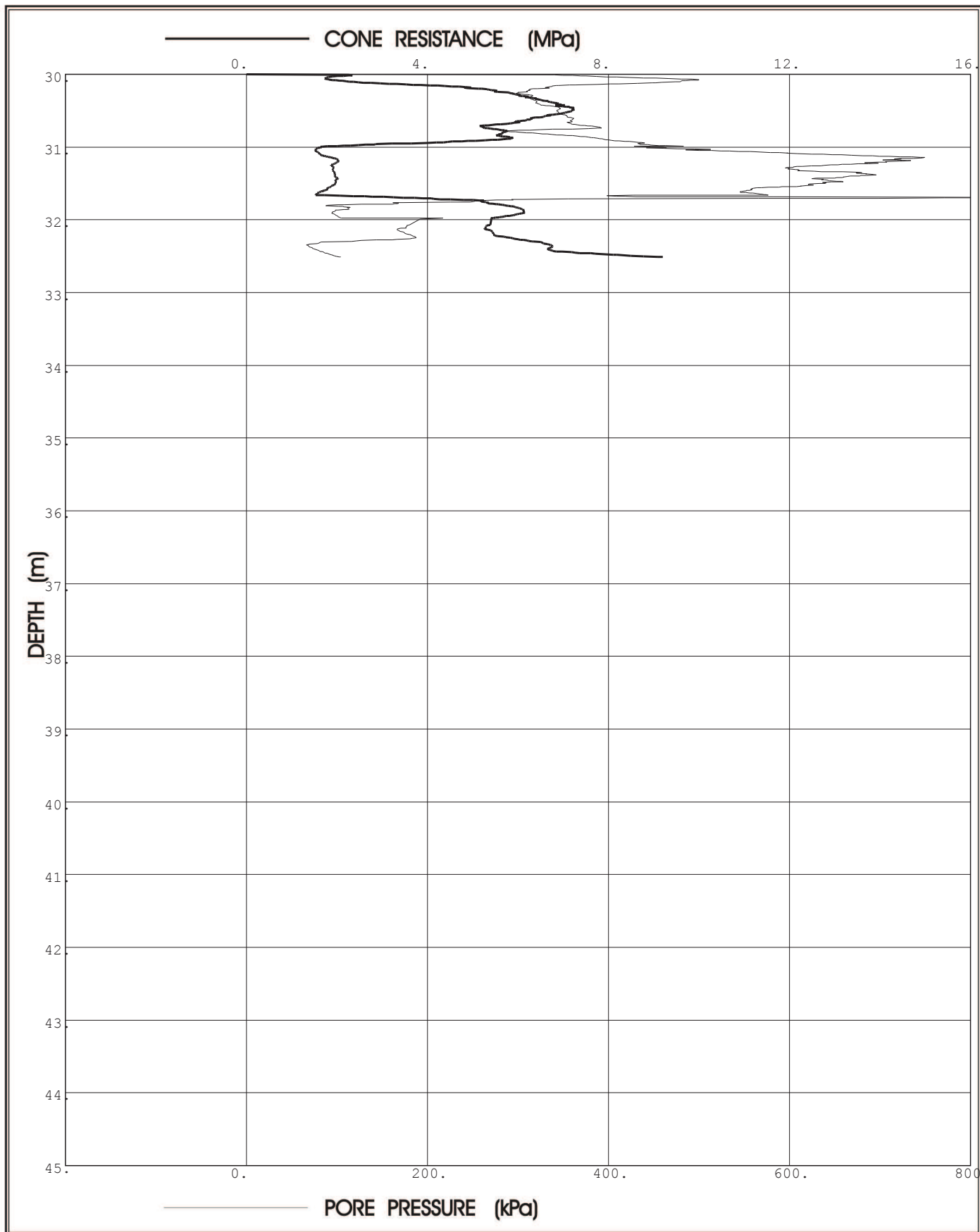
SITE: Pier 2 Long:29°52.781' Lat:031°00.741'

CPTU (RE): 44

DATE: 2012-03-12

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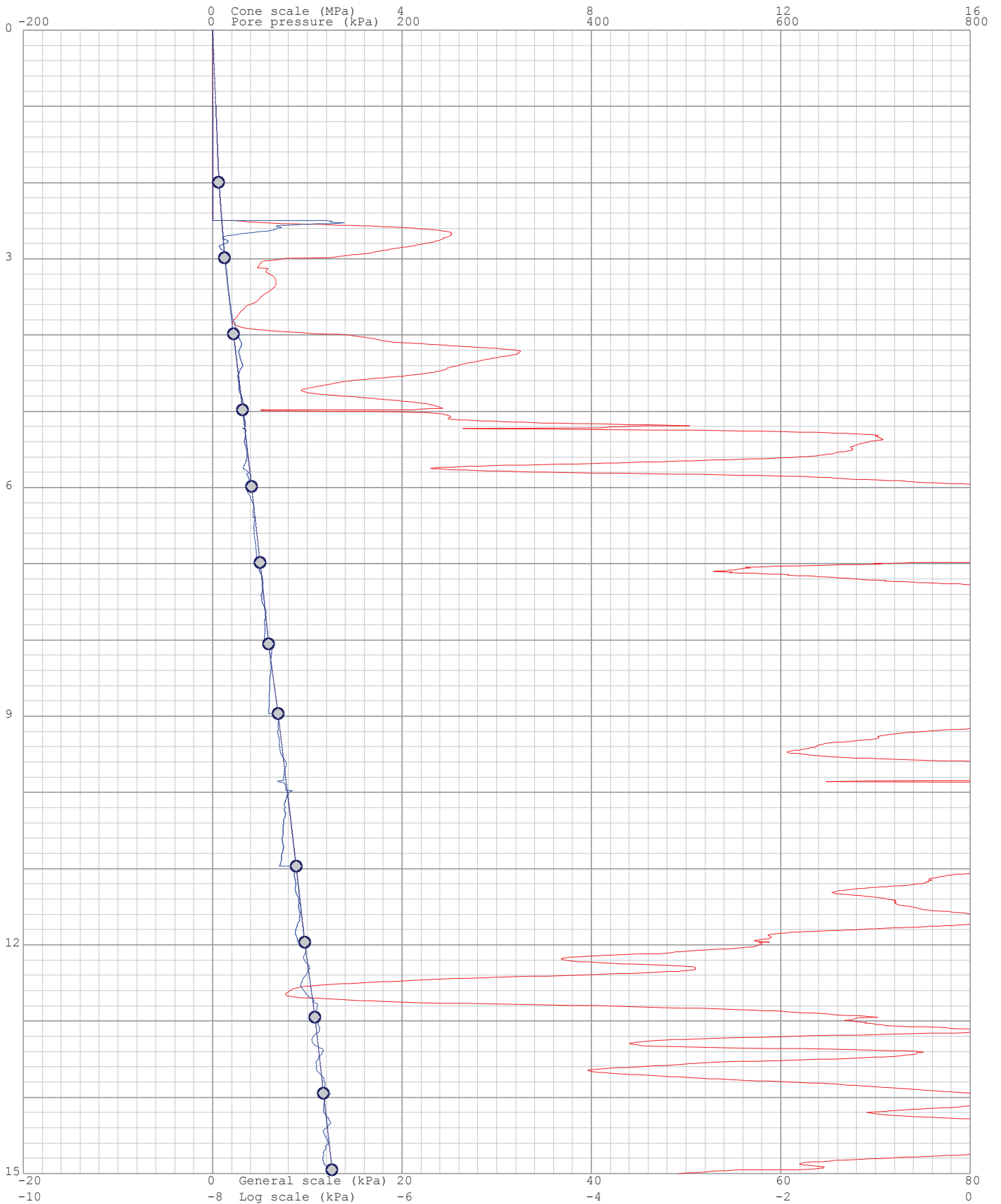
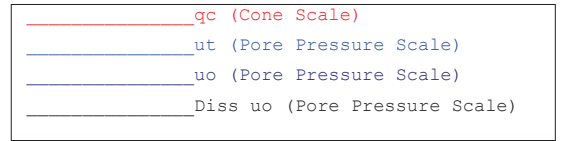
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.781' Lat:031°00.741'

Hole No: 44

Date: 2012-03-12

Probe: GHANA





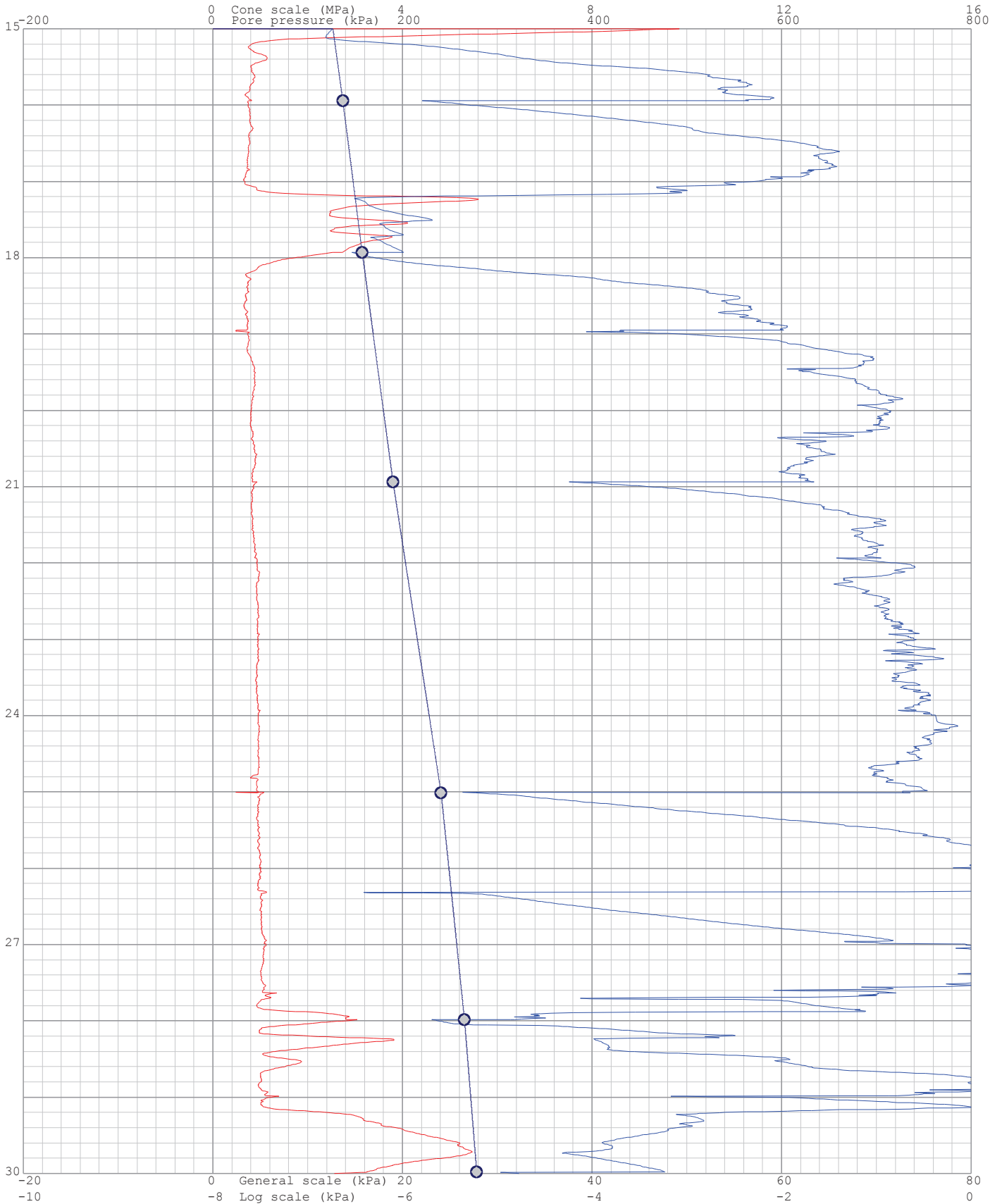
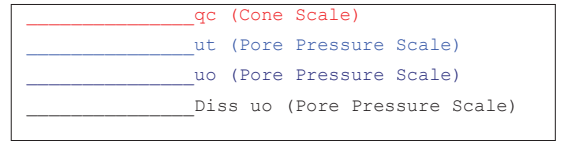
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.781' Lat:031°00.741'

Hole No: 44

Date: 2012-03-12

Probe: GHANA



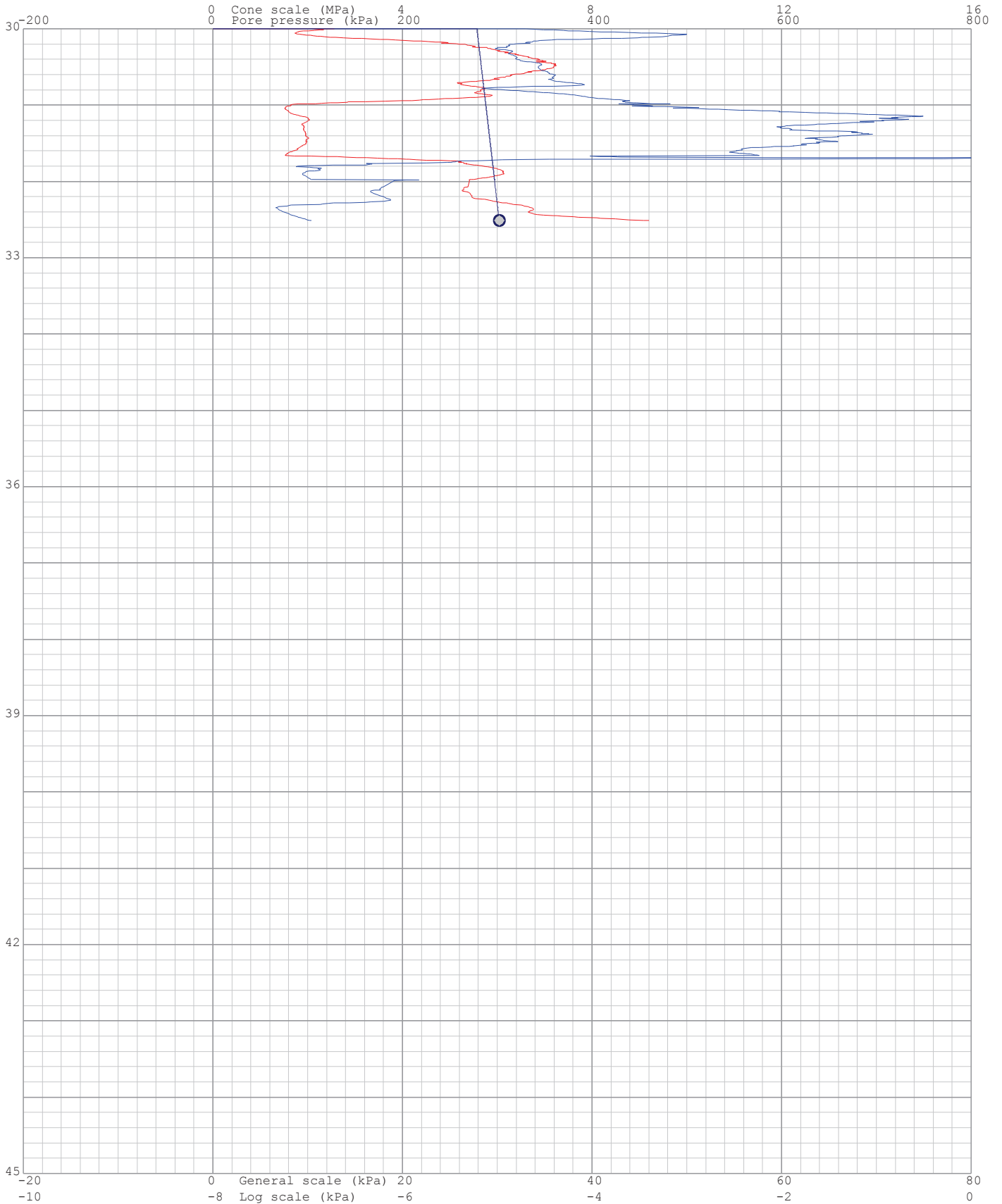
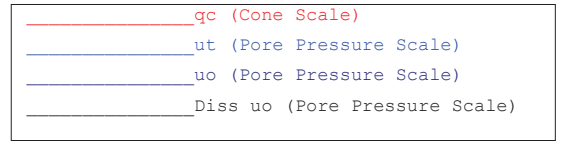
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.781' Lat:031°00.741'

Hole No: 44

Date: 2012-03-12

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.781' Lat: 031°00.741'

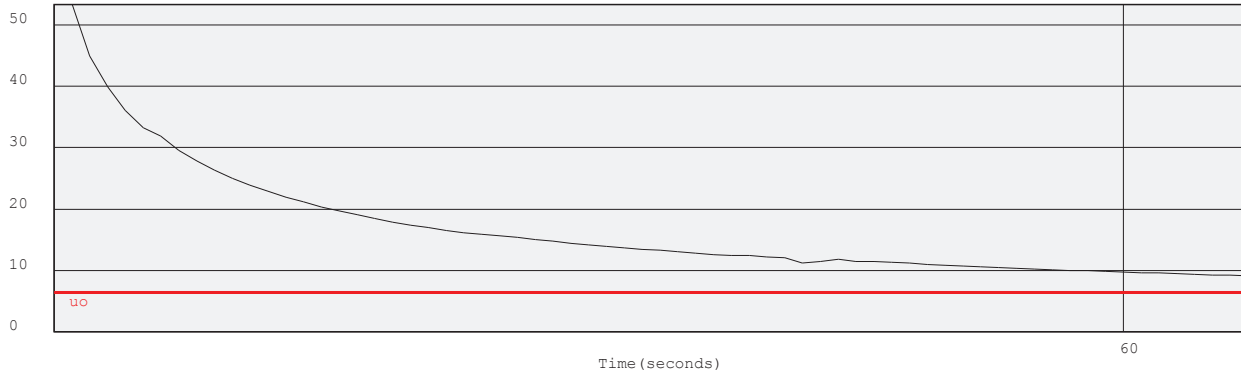
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Date: 2012-03-12

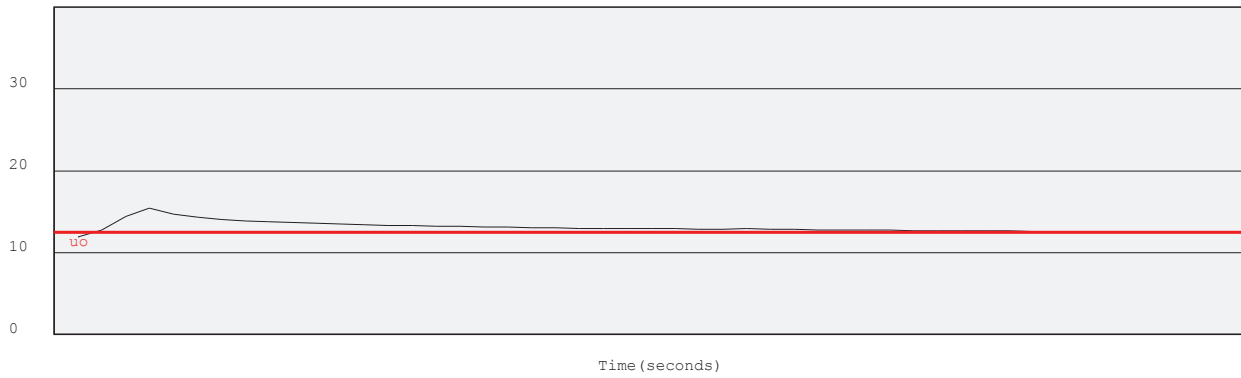
Probe: GHANA

Page: 1

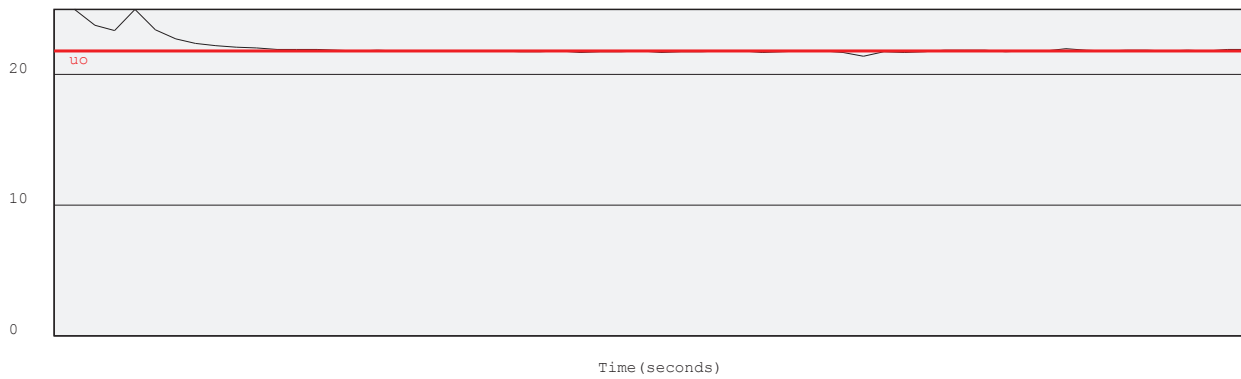
(kPa) Dissipation at: 1.992m



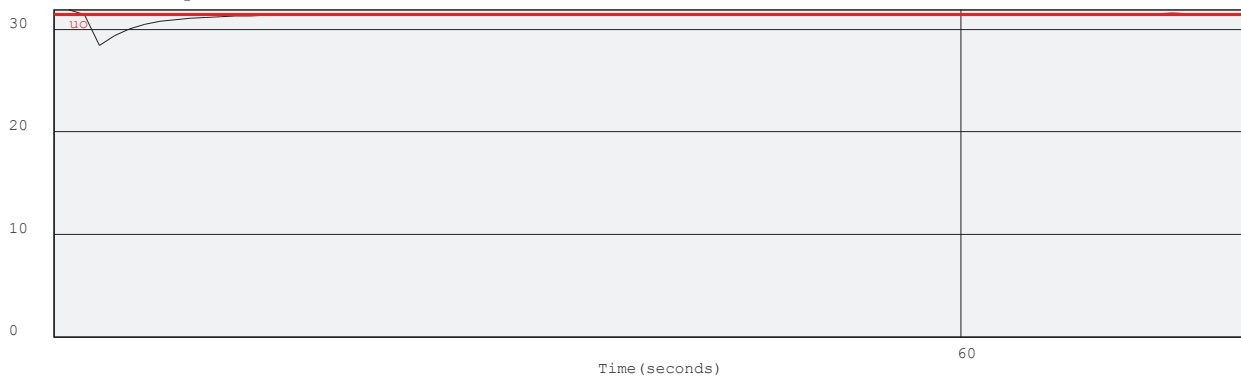
(kPa) Dissipation at: 2.988m



(kPa) Dissipation at: 3.985m



(kPa) Dissipation at: 4.98m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.781' Lat: 031°00.741'

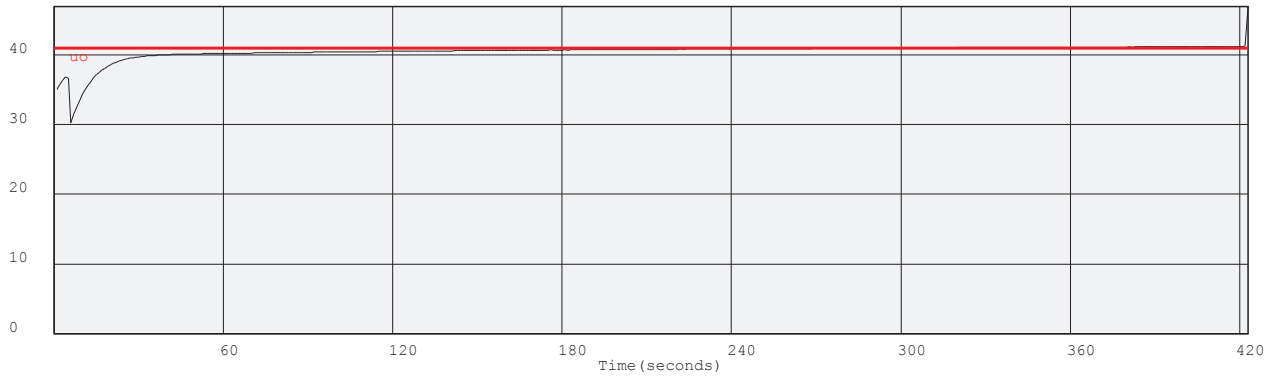
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Date: 2012-03-12

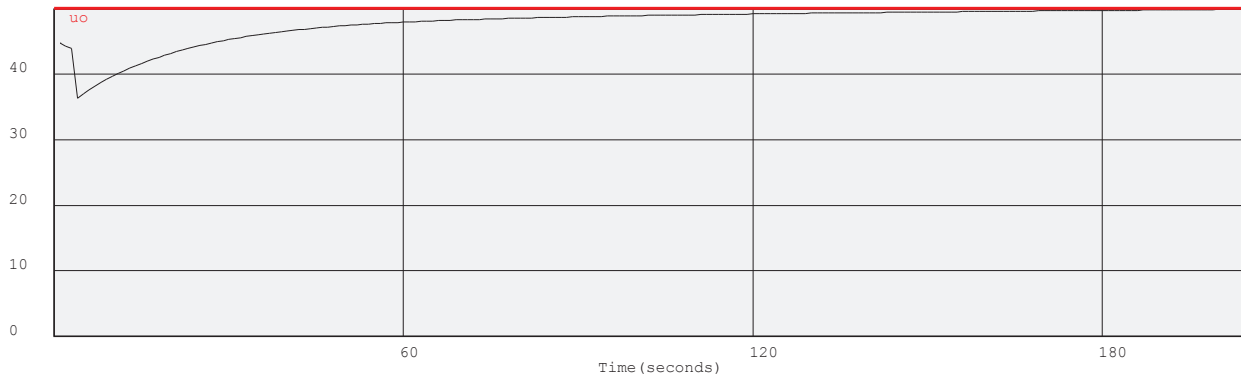
Probe: GHANA

Page: 2

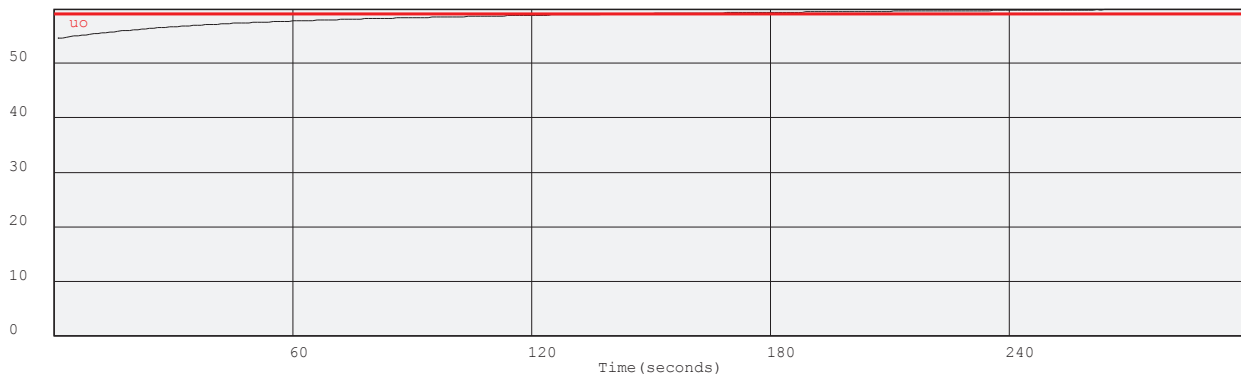
(kPa) Dissipation at: 5.985m



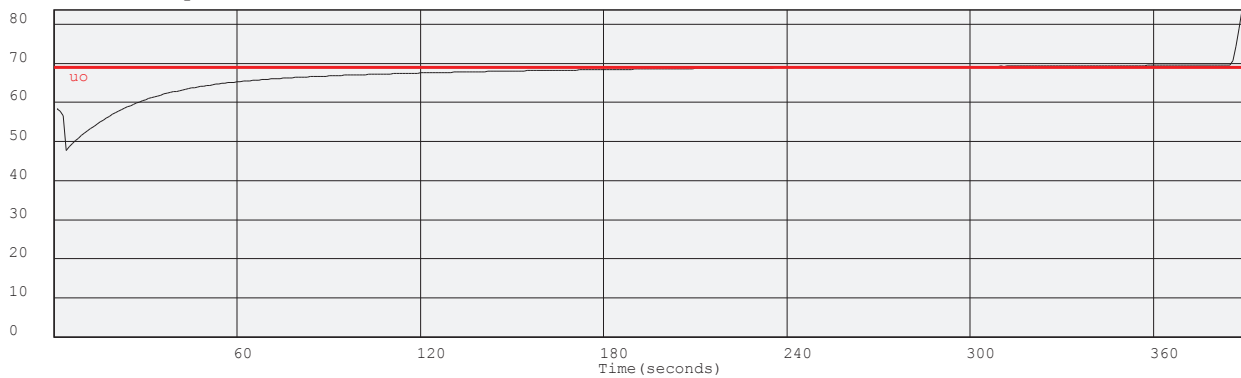
(kPa) Dissipation at: 6.982m



(kPa) Dissipation at: 8.052m



(kPa) Dissipation at: 8.966m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.781' Lat: 031°00.741'

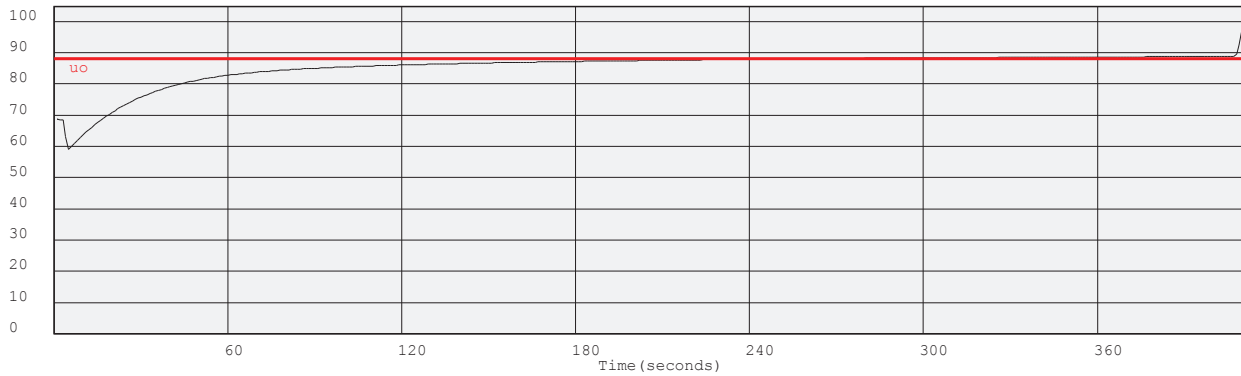
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Date: 2012-03-12

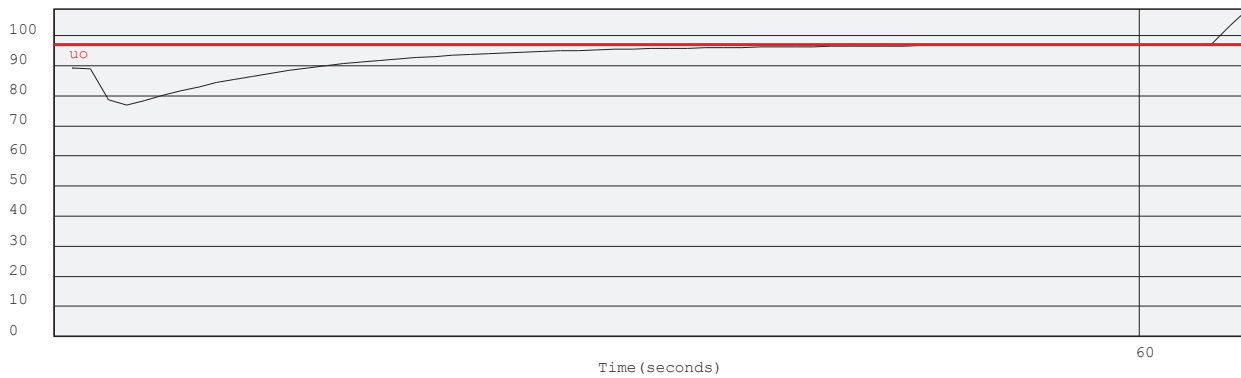
Probe: GHANA

Page: 3

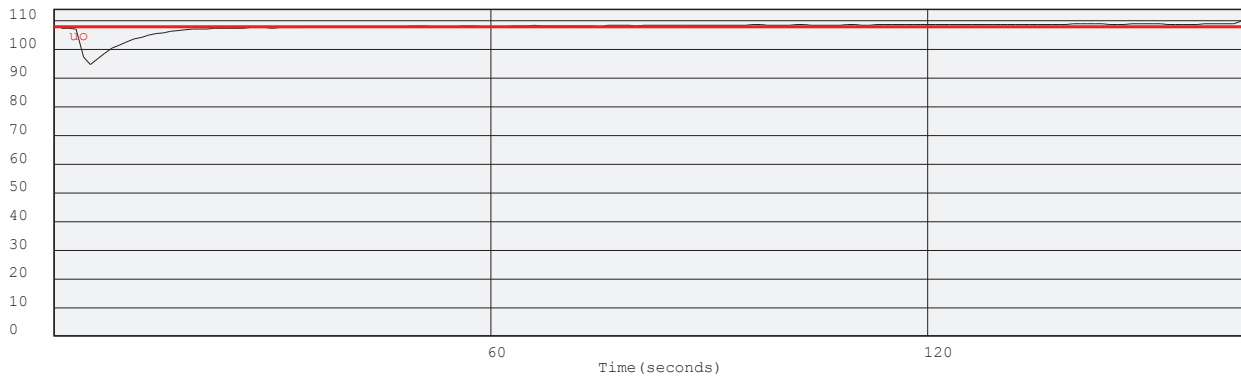
(kPa) Dissipation at: 10.968m



(kPa) Dissipation at: 11.964m



(kPa) Dissipation at: 12.95m



(kPa) Dissipation at: 13.949m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.781' Lat: 031°00.741'

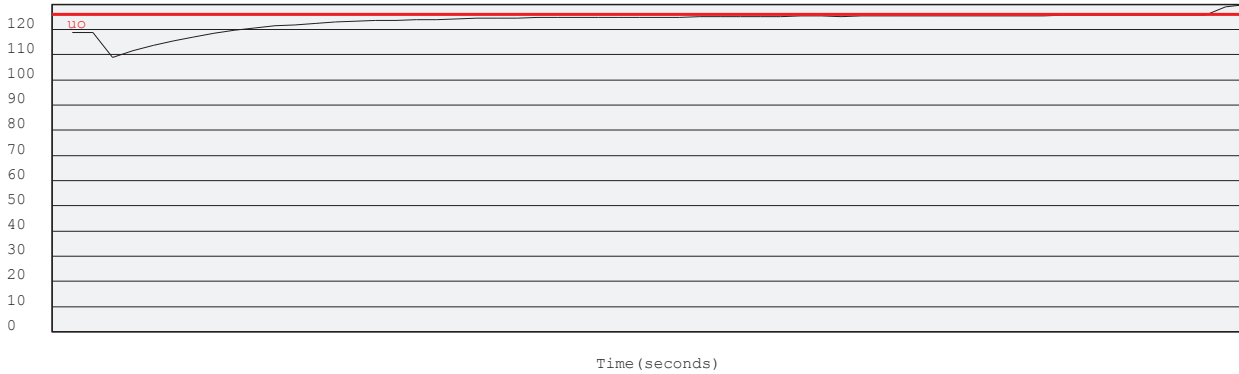
Hole: 44

Date: 2012-03-12

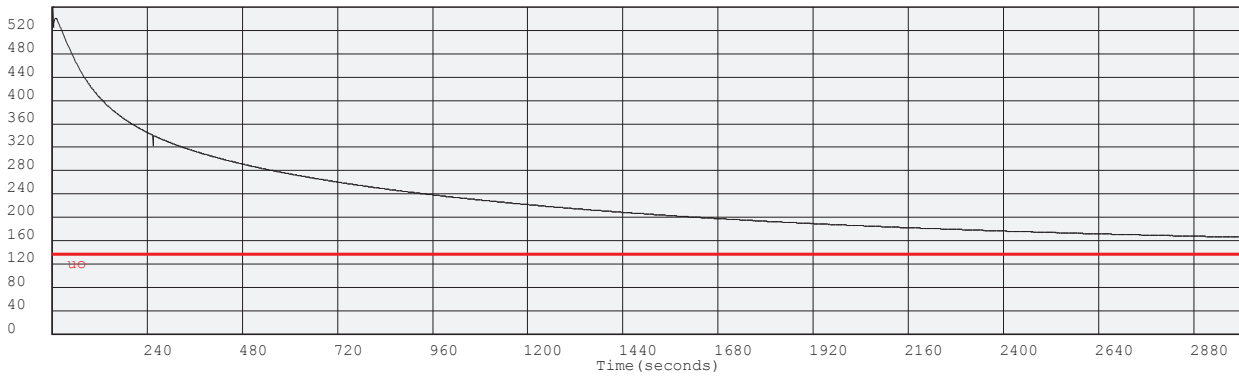
Probe: GHANA

Page: 4

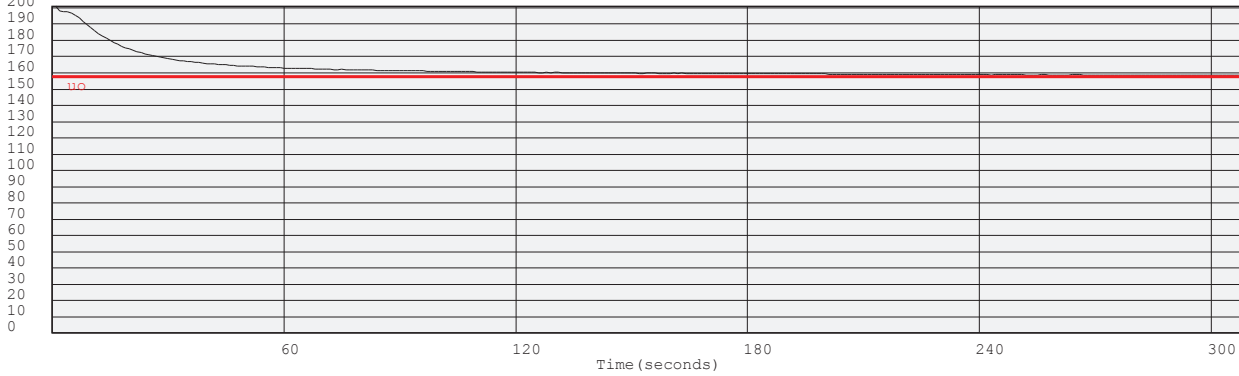
(kPa) Dissipation at: 14.949m



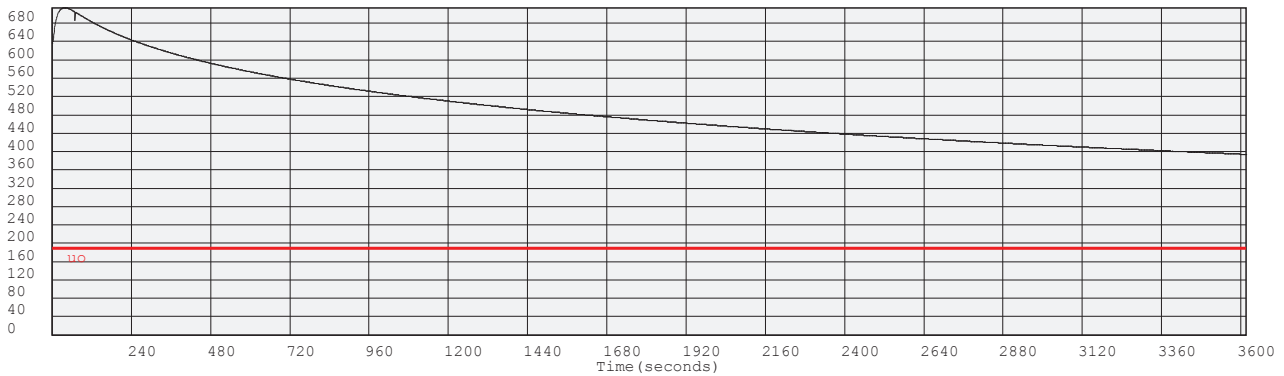
(kPa) Dissipation at: 15.942m



(kPa) Dissipation at: 17.93m



(kPa) Dissipation at: 20.937m



Project: Durban Harbour Land Based CPTu

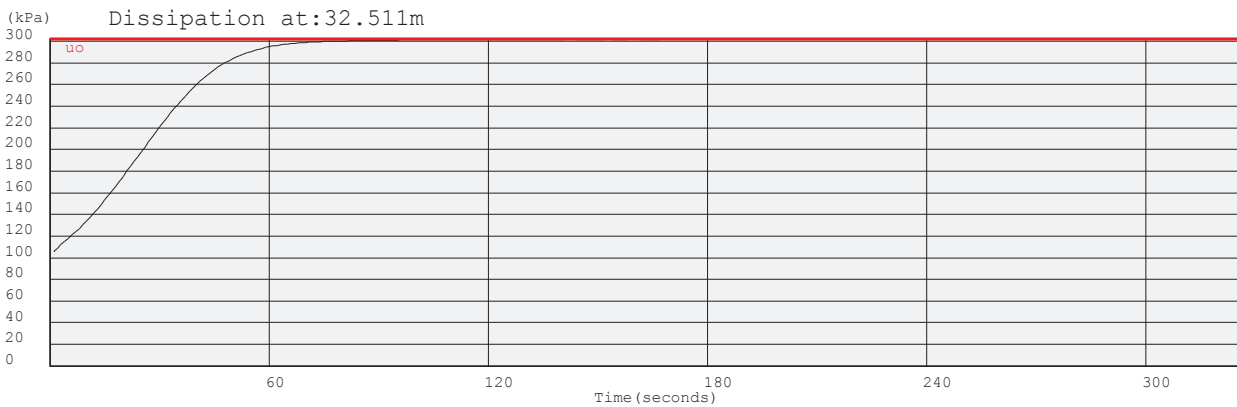
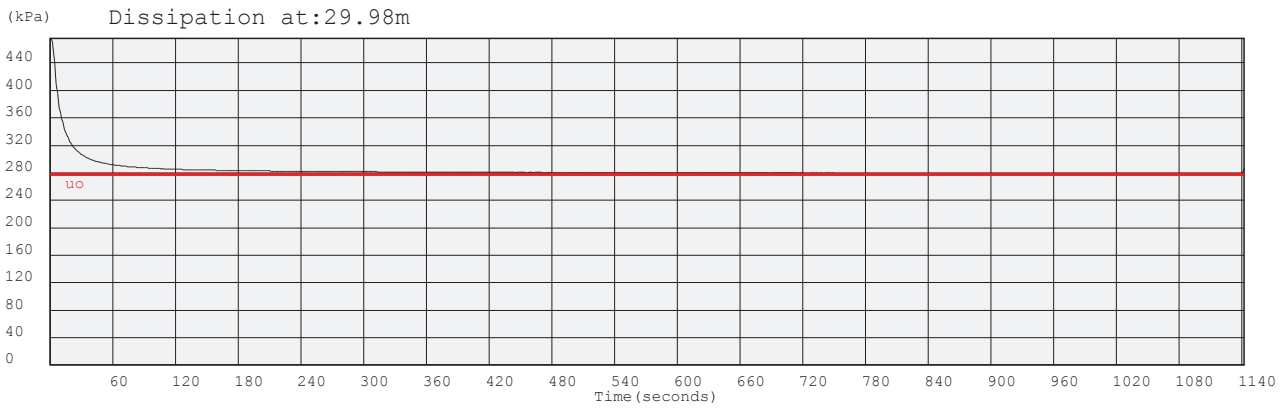
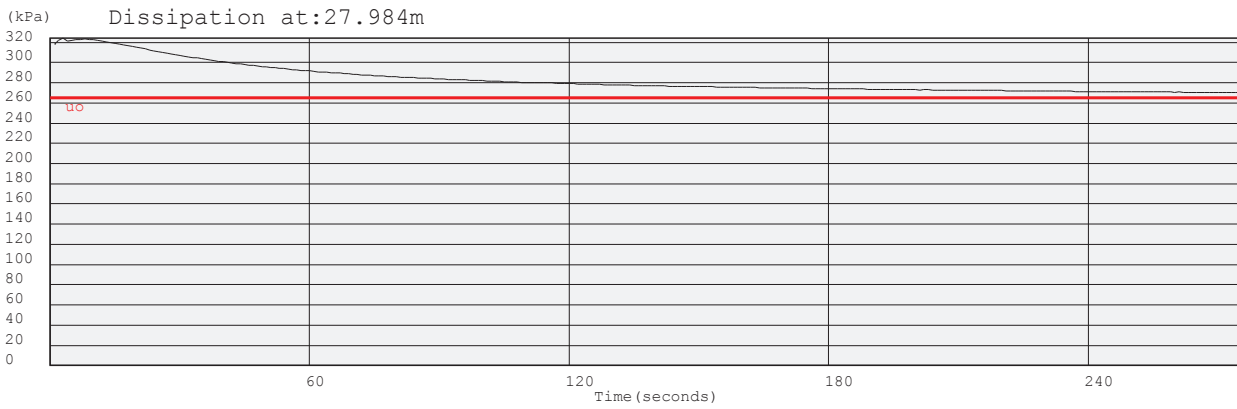
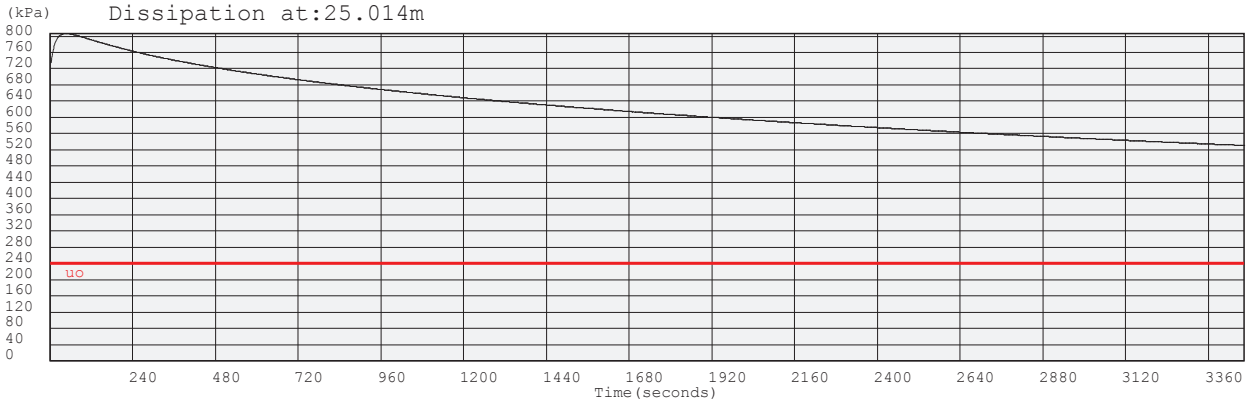
Site: Pier 2 Long: 29°52.781' Lat: 031°00.741'

Hole: 44

Date: 2012-03-12

Probe: GHANA

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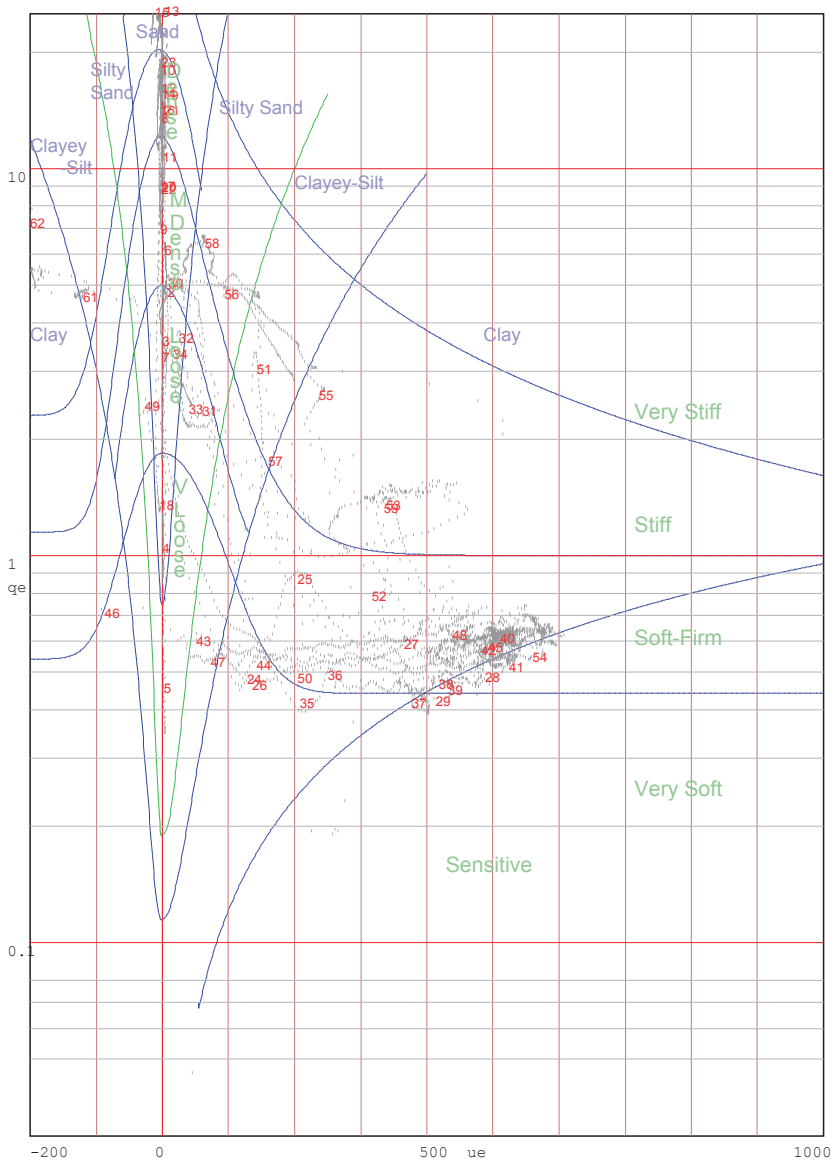
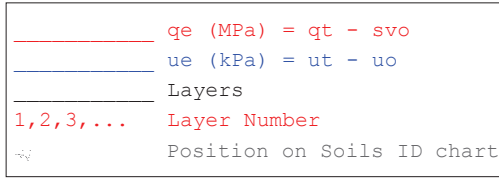
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.781' Lat:031°00.741'

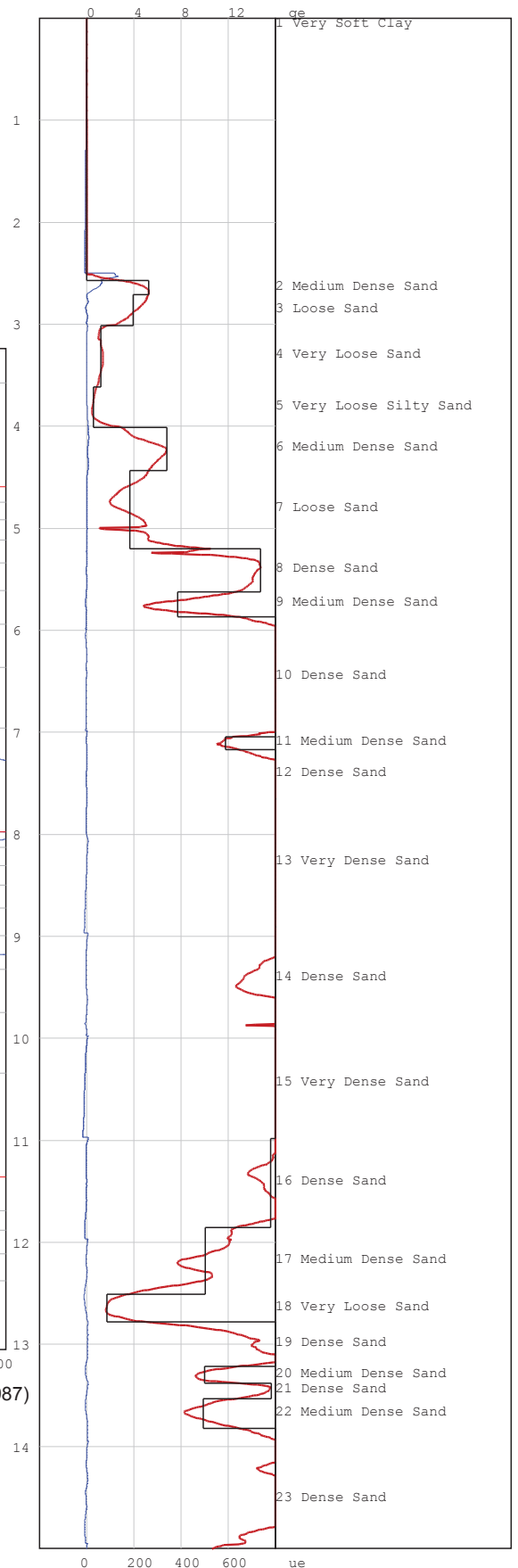
Hole No: 44

Date: 2012-03-12

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





Project: Durban Harbour Land Based CPTu

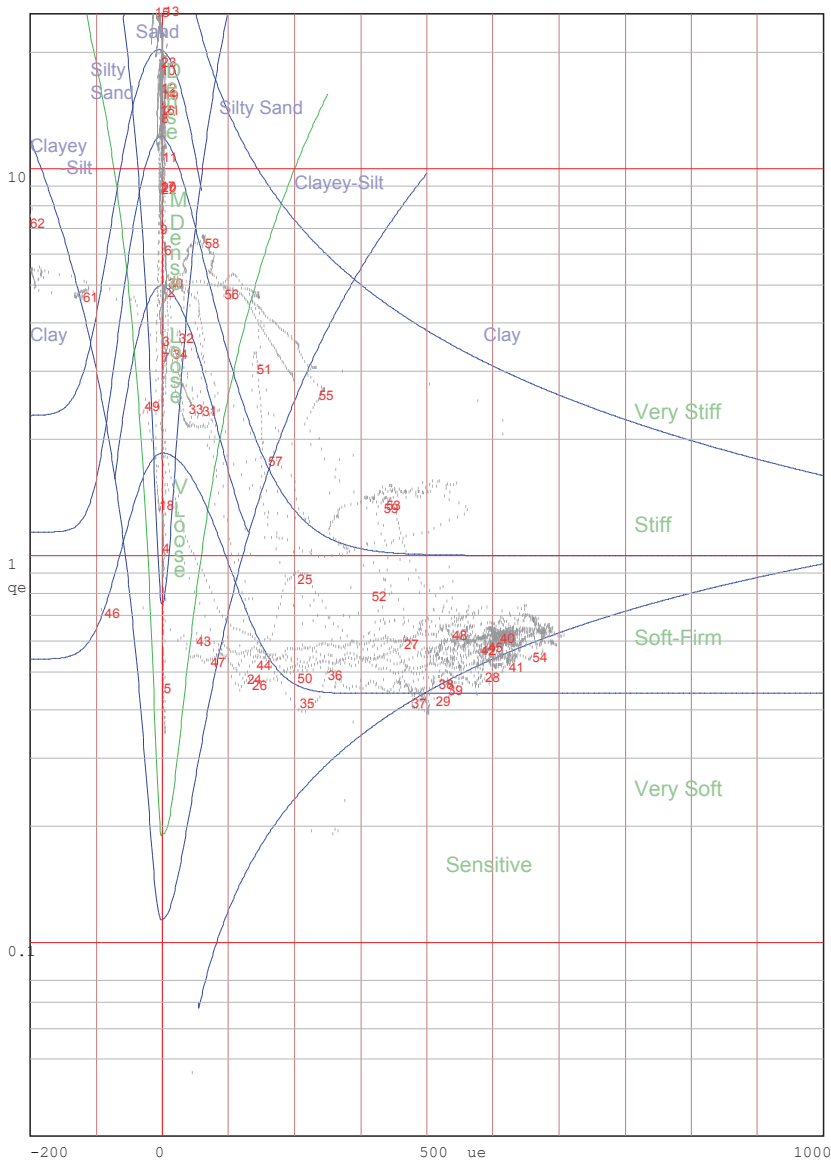
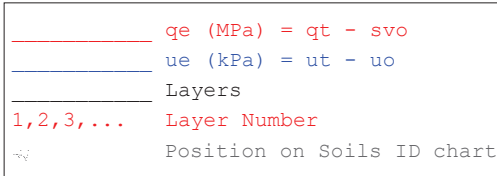
Site: Pier 2 Long:29°52.781' Lat:031°00.741'

Hole No: 44

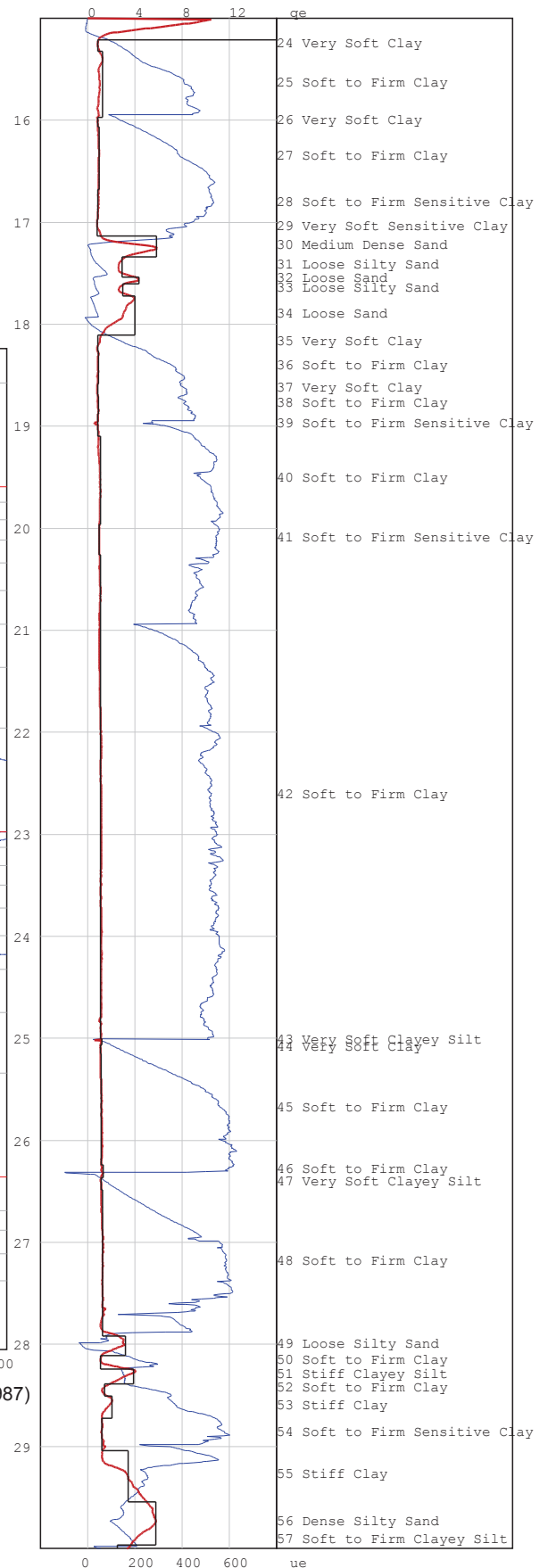
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Date: 2012-03-12

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

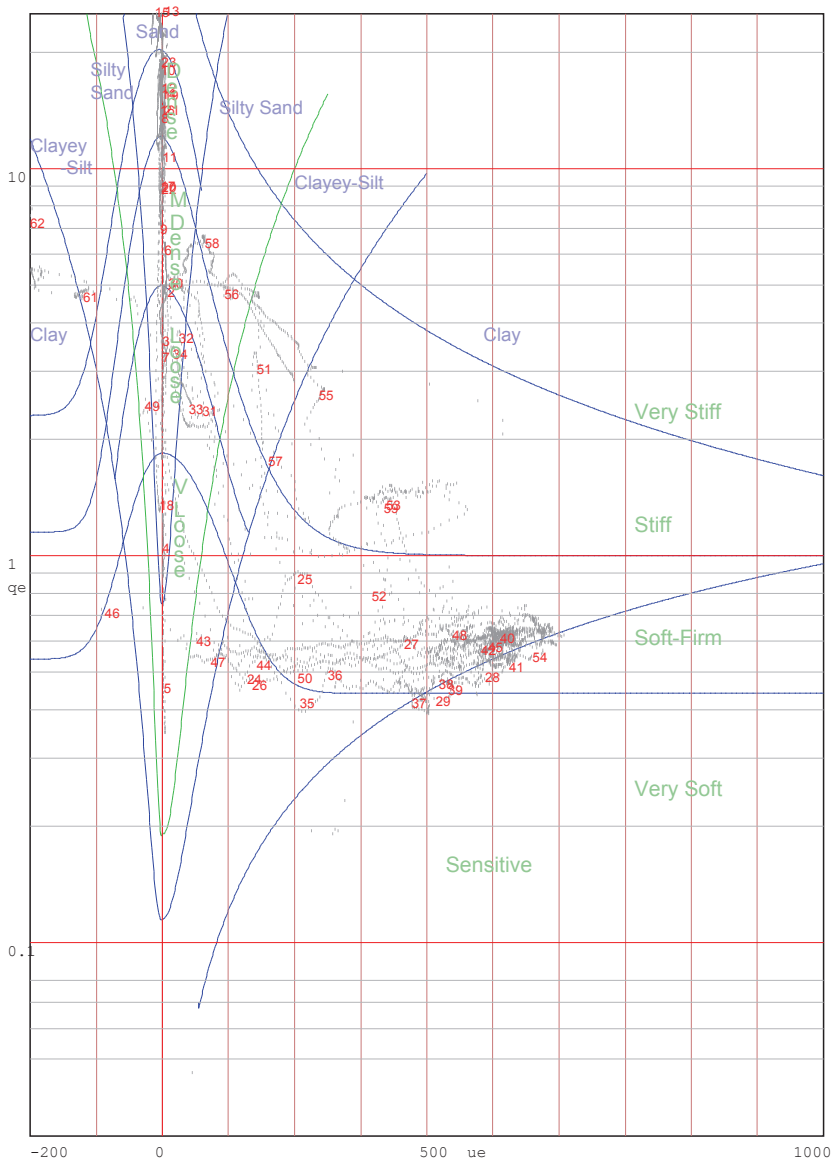
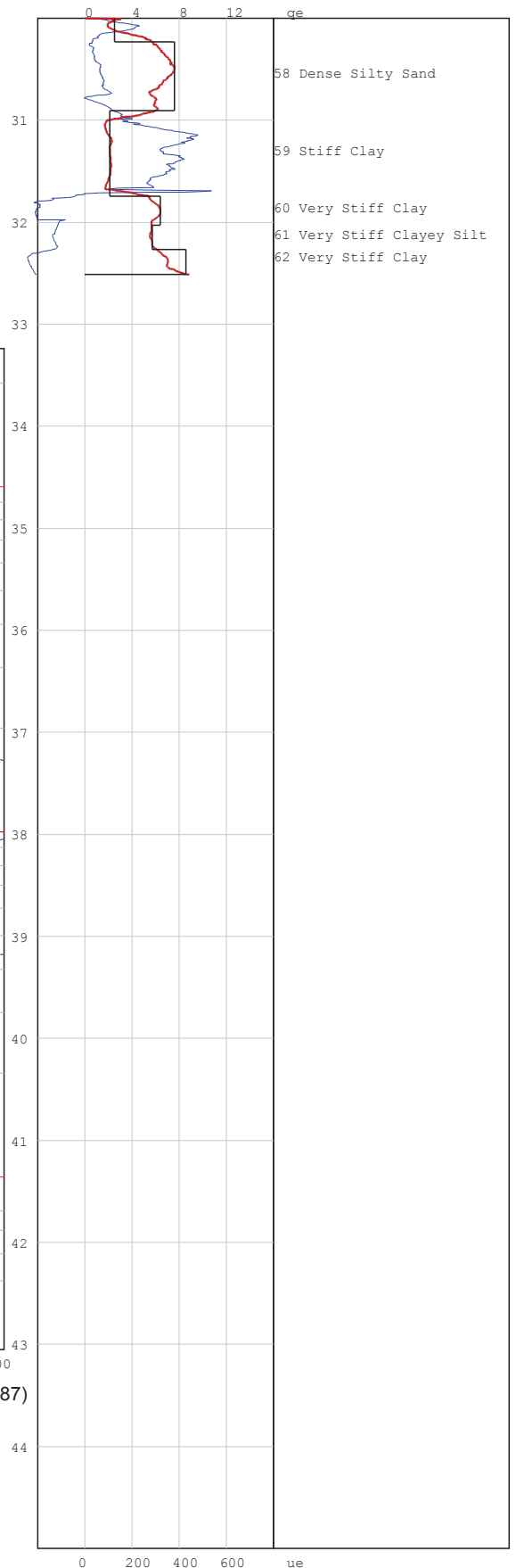
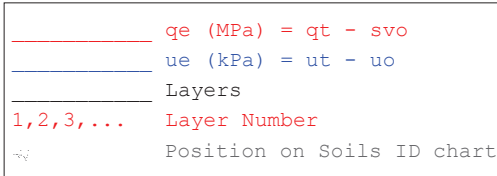
Site: Pier 2 Long:29°52.781' Lat:031°00.741'

Hole No: 44

Page:3

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Probe: GHANA



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

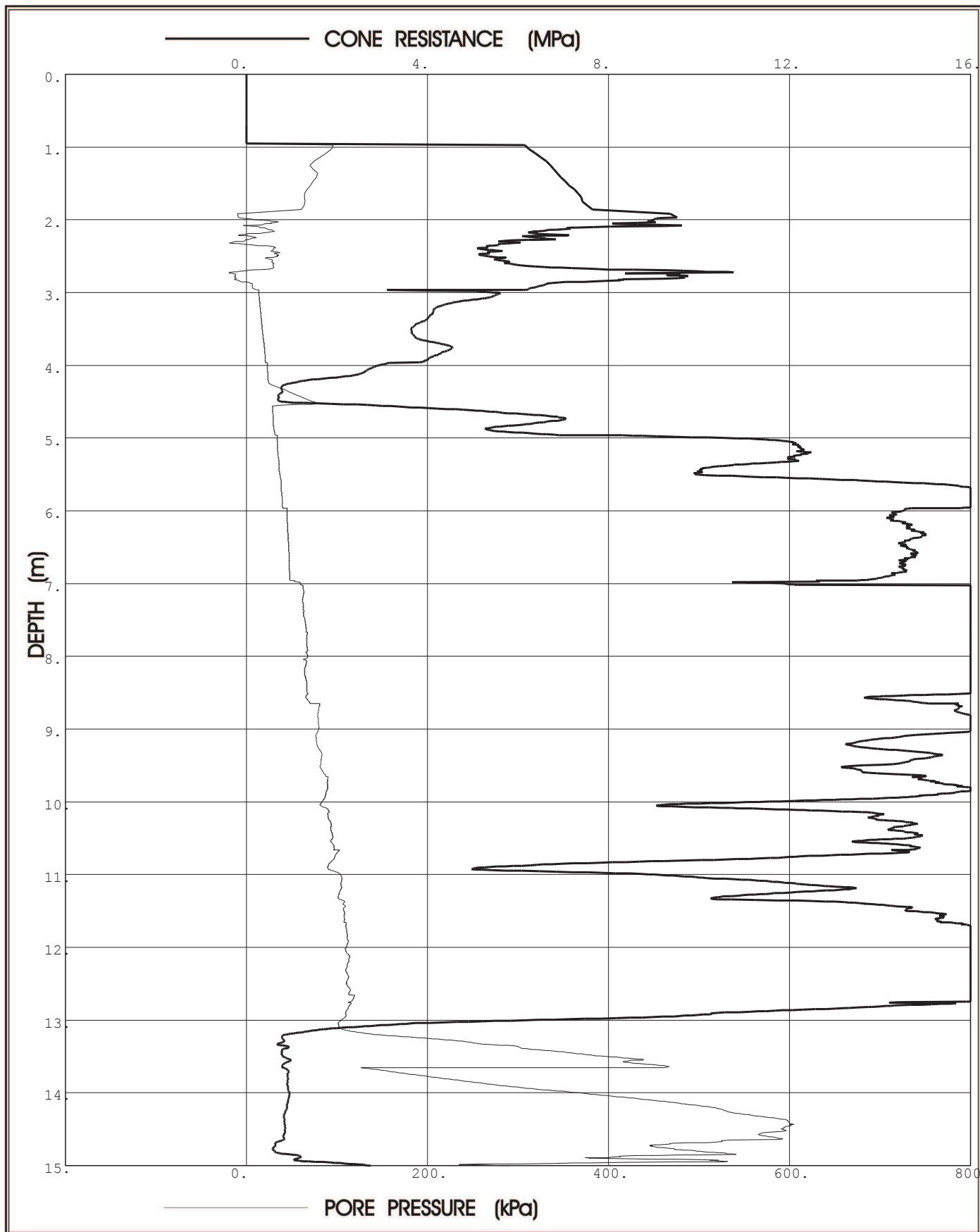
SITE: Pier 2 Long:29°52.778' Lat:031°00.752'

CPTU (RE): 45

DATE: 2012-03-13

Probe: GHANA

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

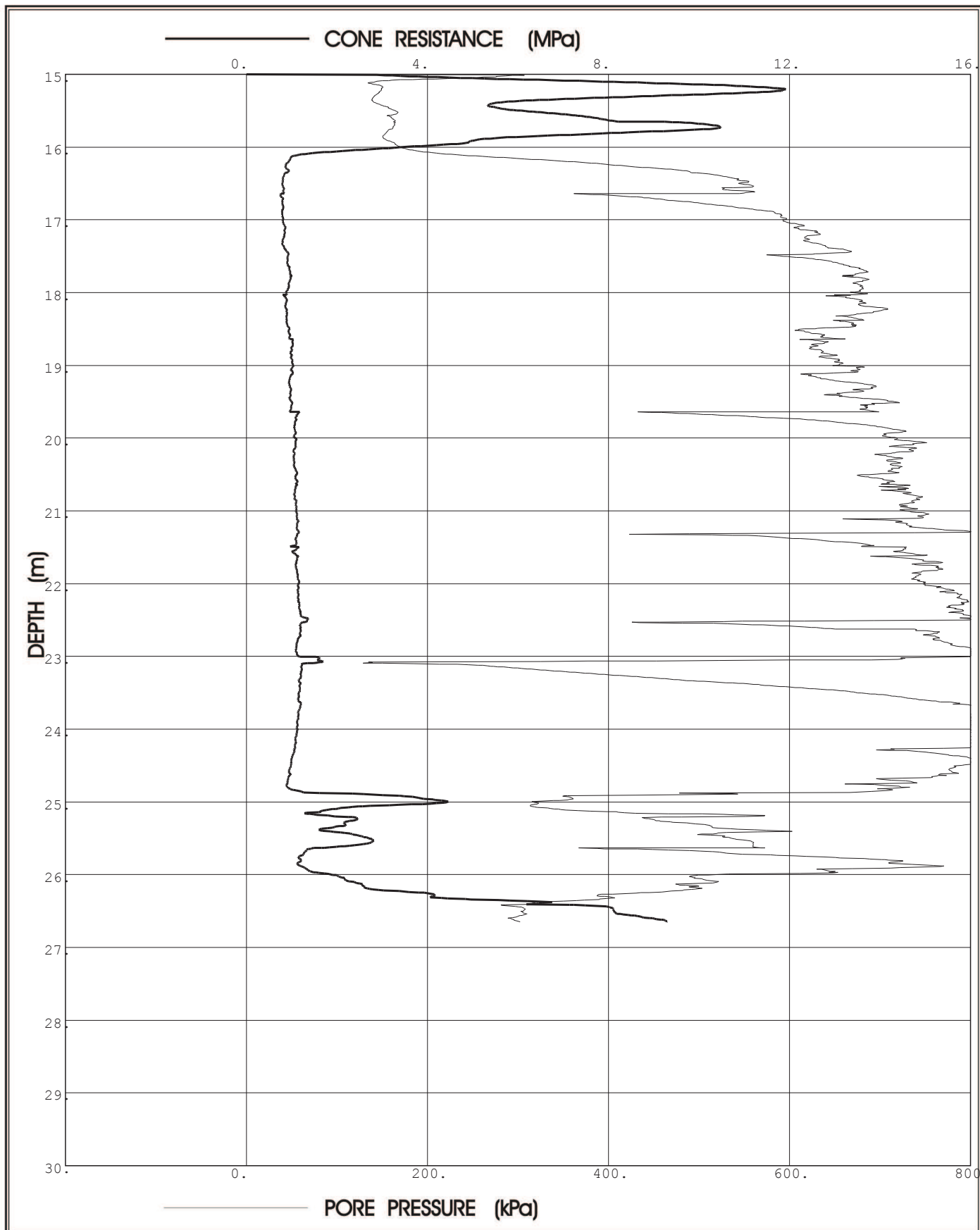
SITE: Pier 2 Long:29°52.778' Lat:031°00.752'

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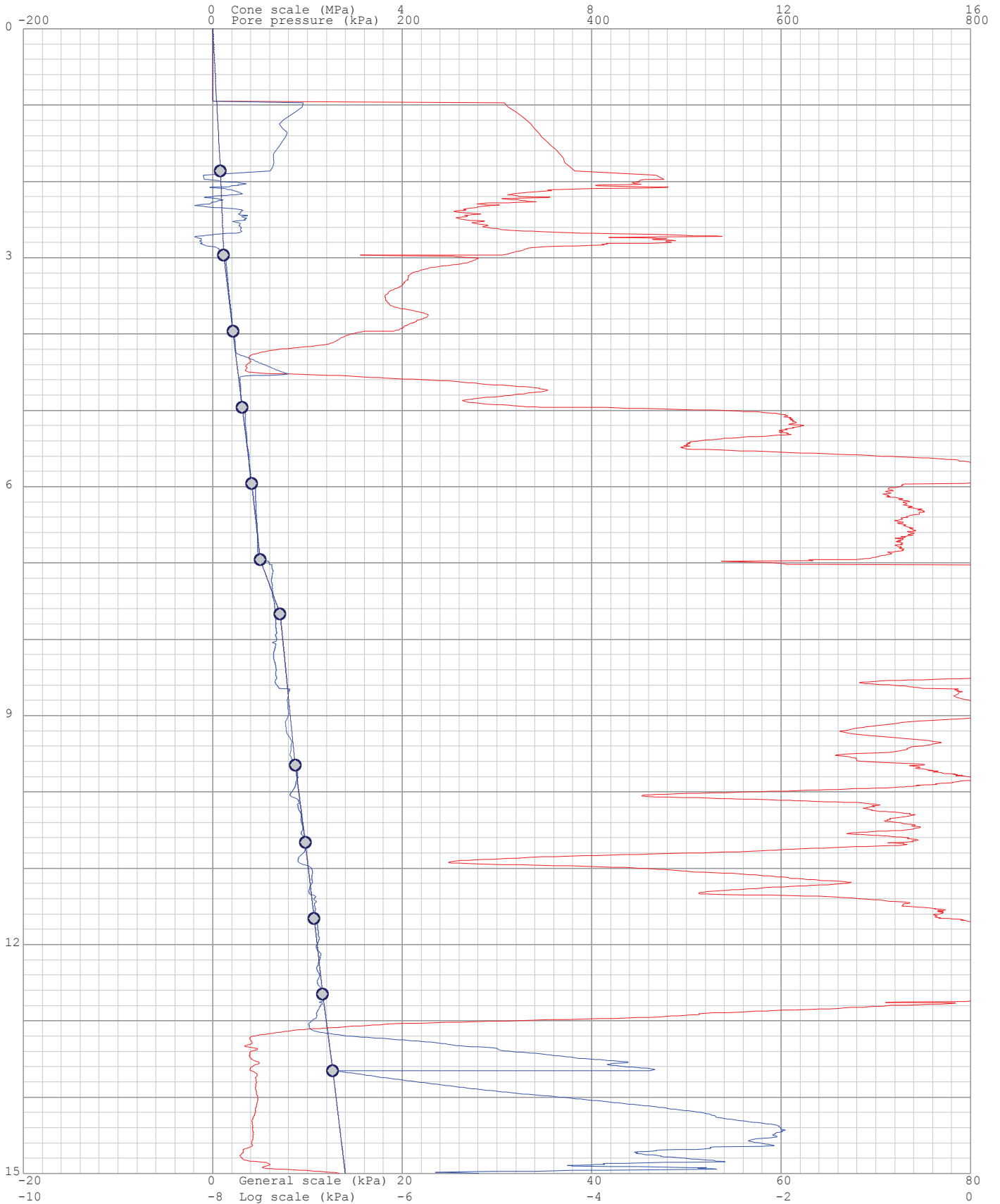
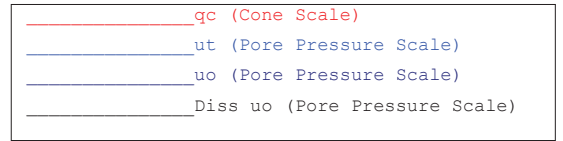
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.778' Lat:031°00.752'

Hole No: 45

Date: 2012-03-13

Probe: GHANA



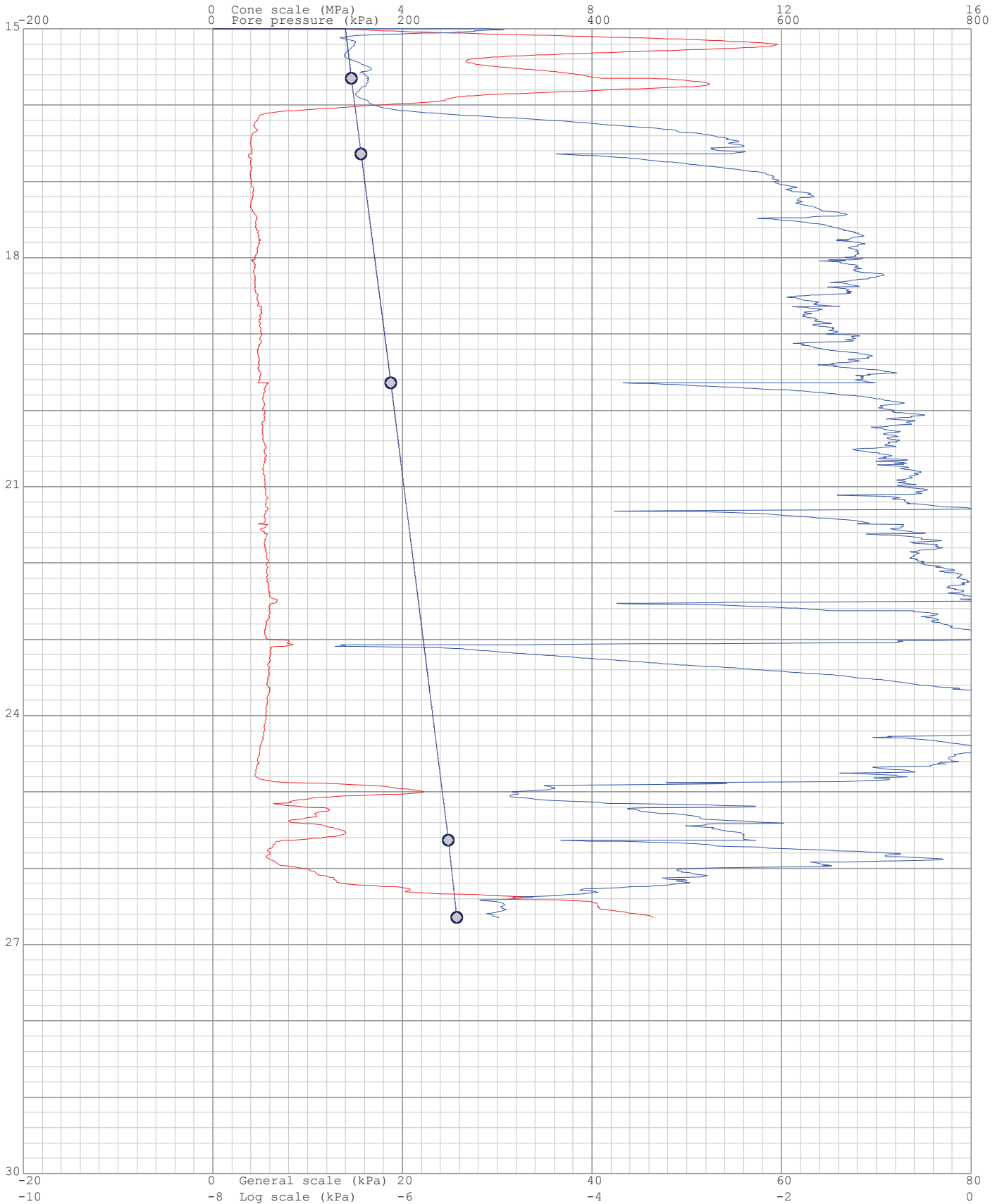
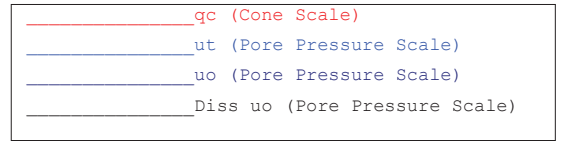
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.778' Lat:031°00.752'

Hole No: 45

Date: 2012-03-13

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.778' Lat: 031°00.752'

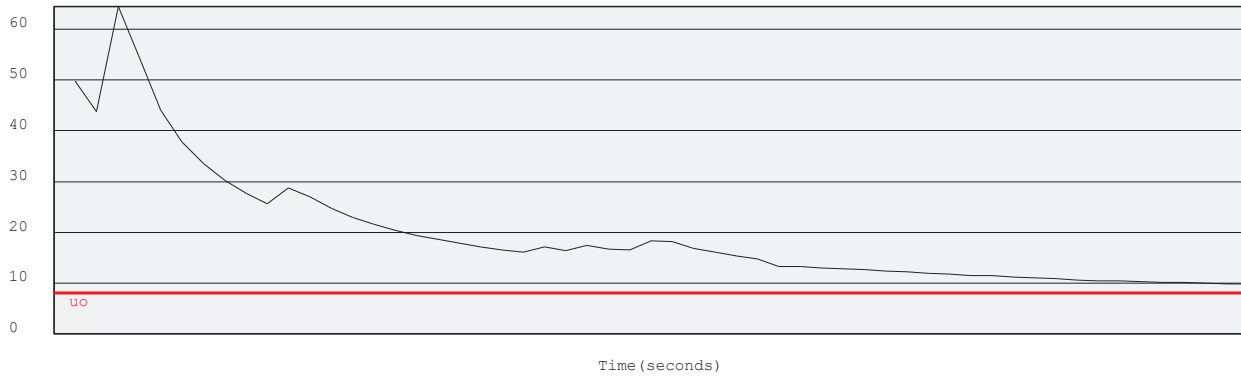
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Date: 2012-03-13

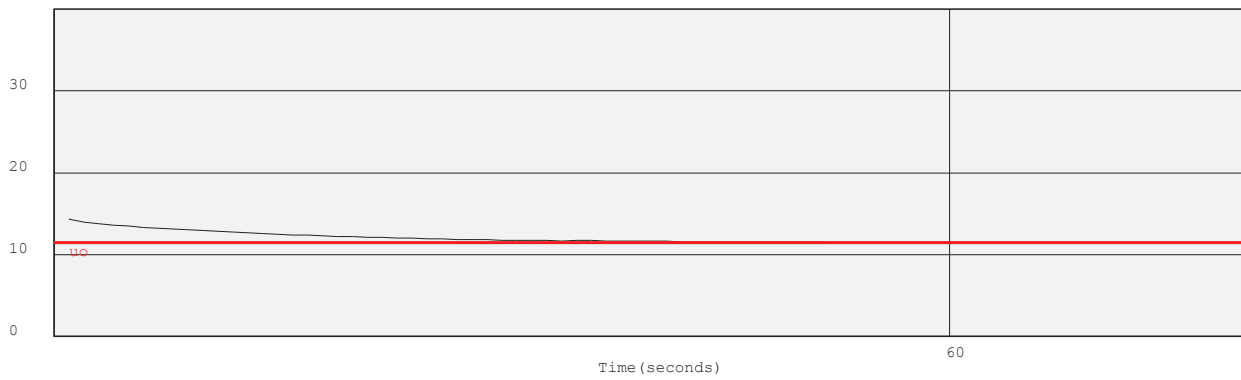
Probe: GHANA

Page: 1

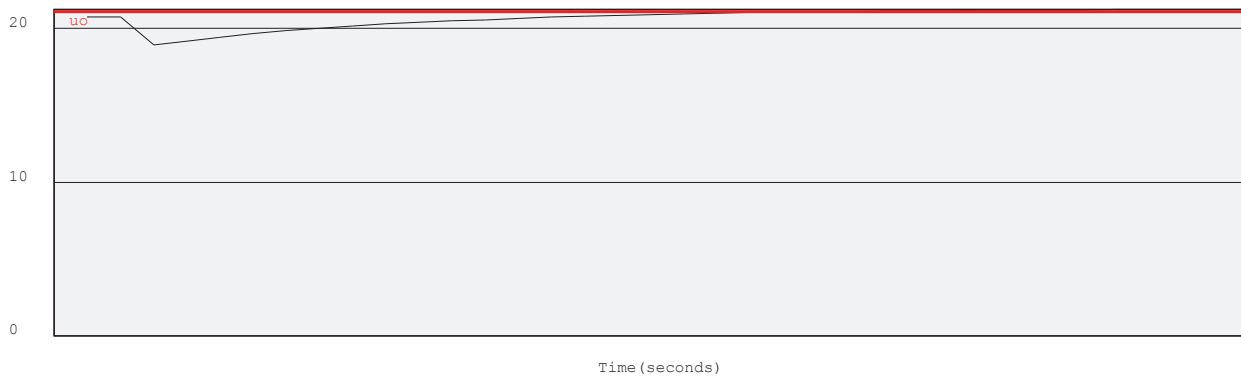
(kPa) Dissipation at: 1.86m



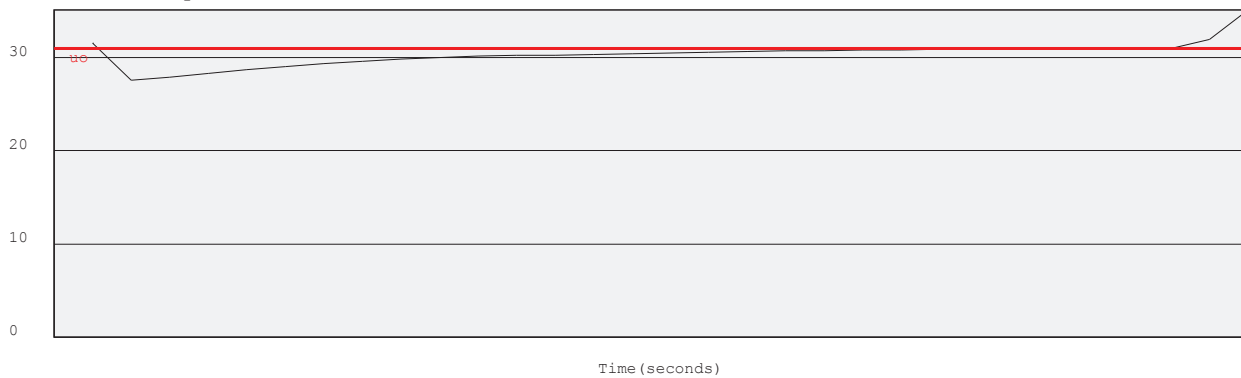
(kPa) Dissipation at: 2.963m



(kPa) Dissipation at: 3.961m



(kPa) Dissipation at: 4.958m



Project: Durban Harbour Land Based CPTu

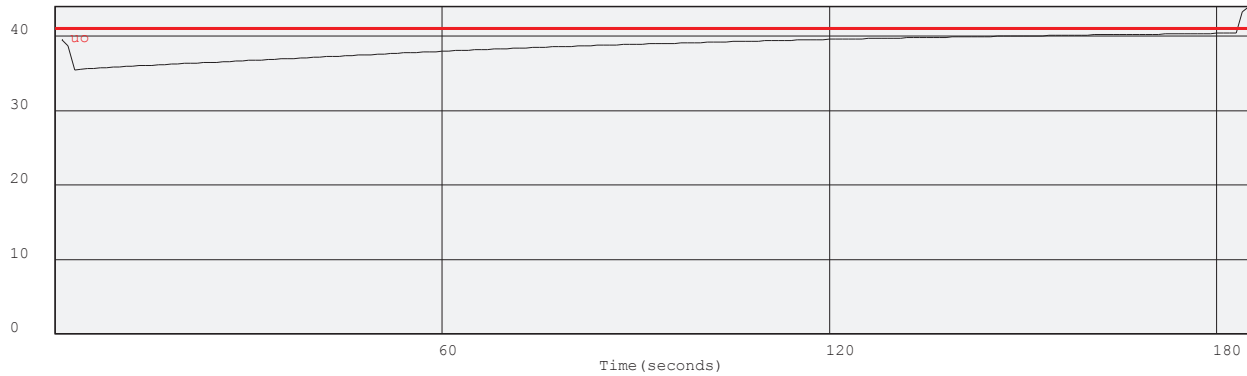
Site: Pier 2 Long: 29°52.778' Lat: 031°00.752'

Hole: 45

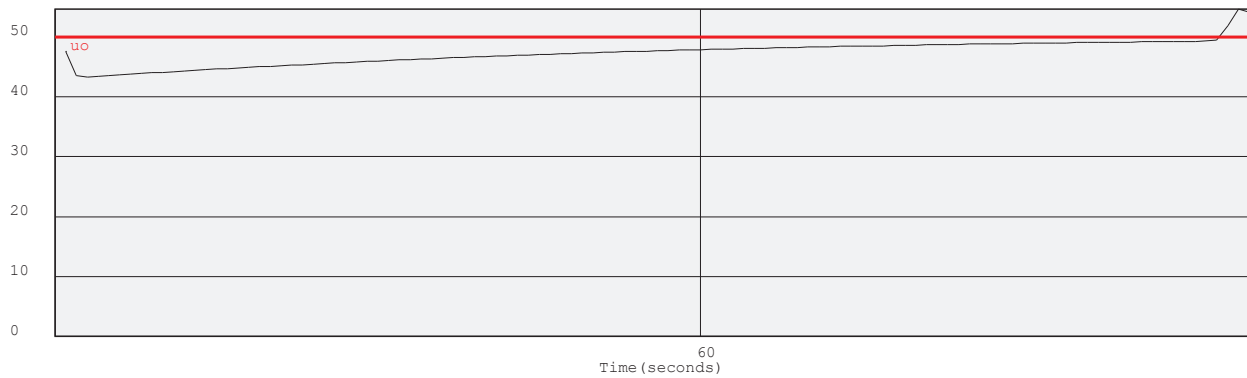
Date: 2012-03-13

Probe: GHANA  
Page: 2

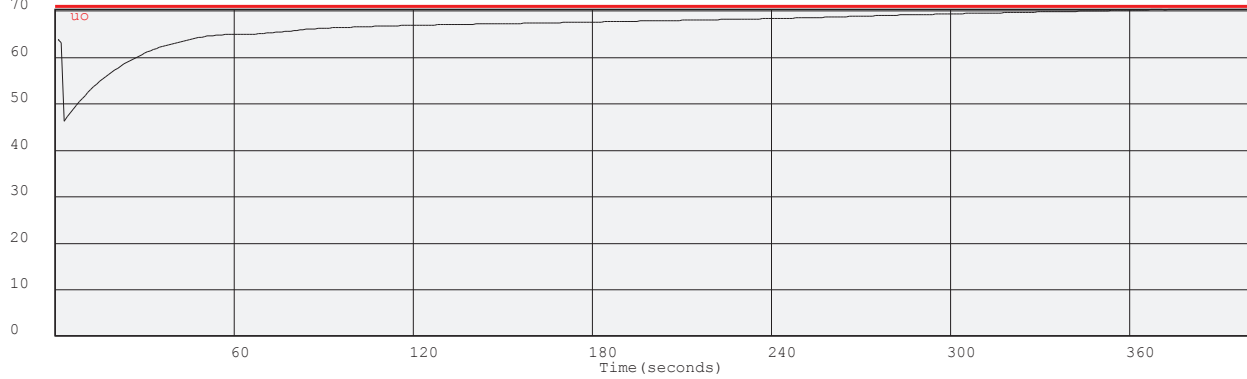
(kPa) Dissipation at: 5.961m



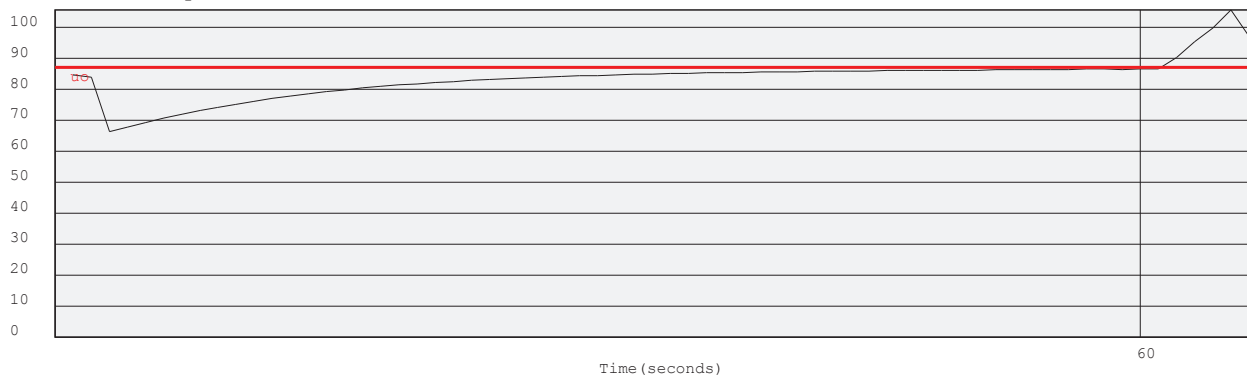
(kPa) Dissipation at: 6.955m



(kPa) Dissipation at: 7.665m



(kPa) Dissipation at: 9.651m





Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.778' Lat: 031°00.752'

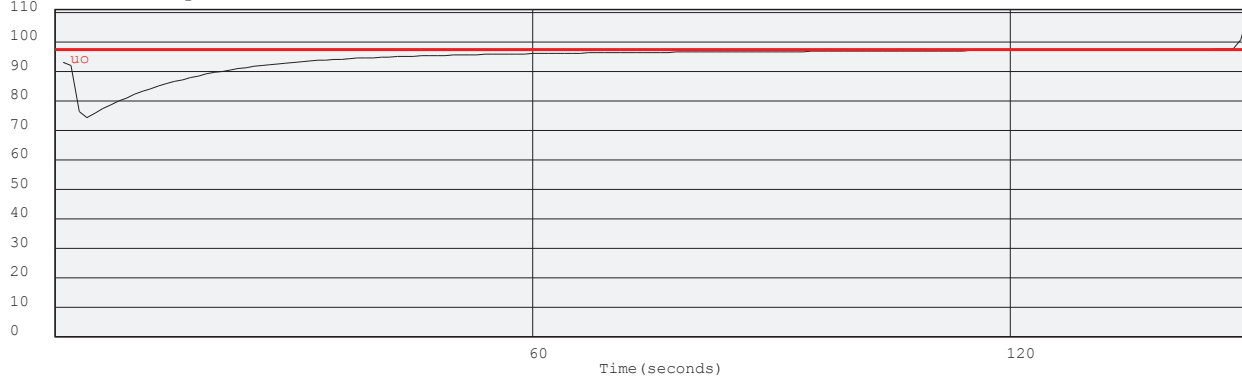
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Date: 2012-03-13

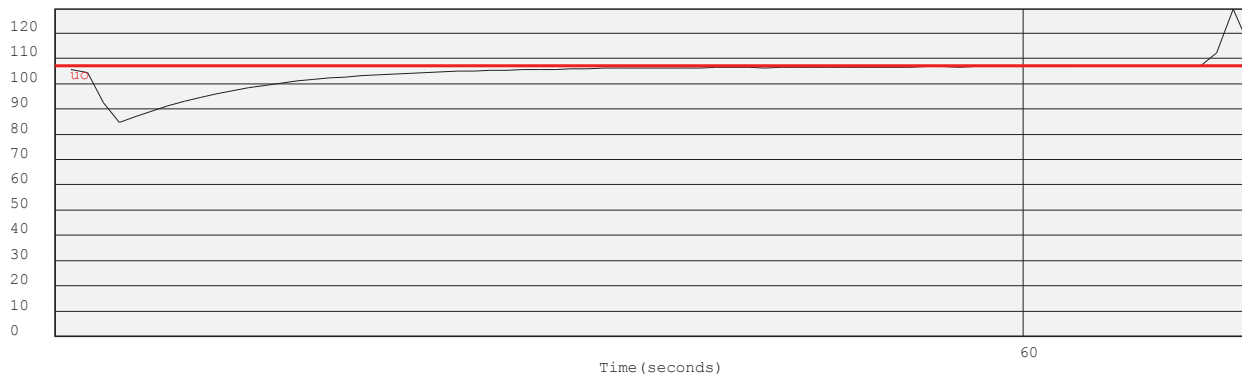
Probe: GHANA

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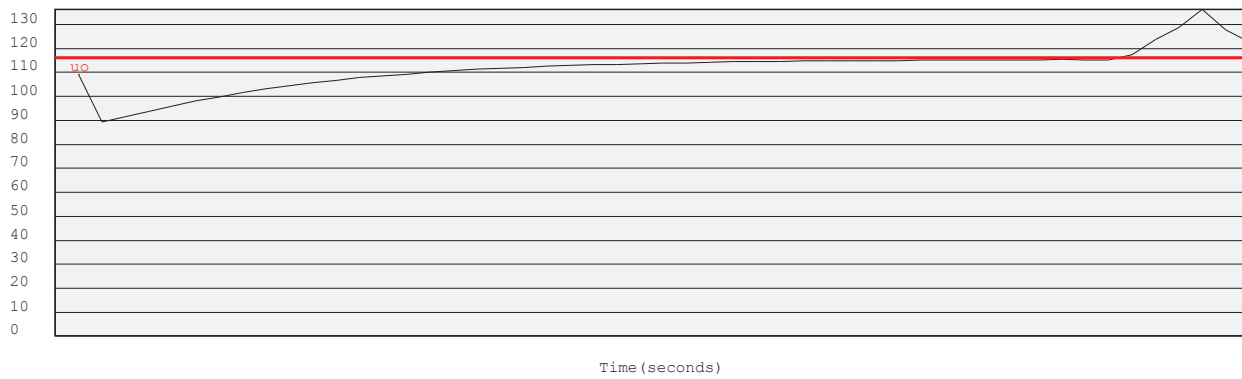
(kPa) Dissipation at: 10.661m



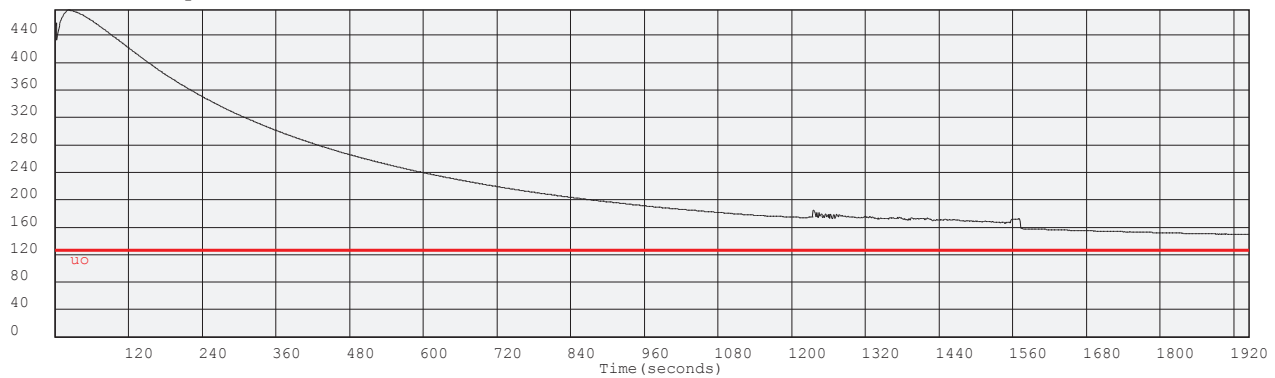
(kPa) Dissipation at: 11.655m



(kPa) Dissipation at: 12.652m



(kPa) Dissipation at: 13.651m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.778' Lat: 031°00.752'

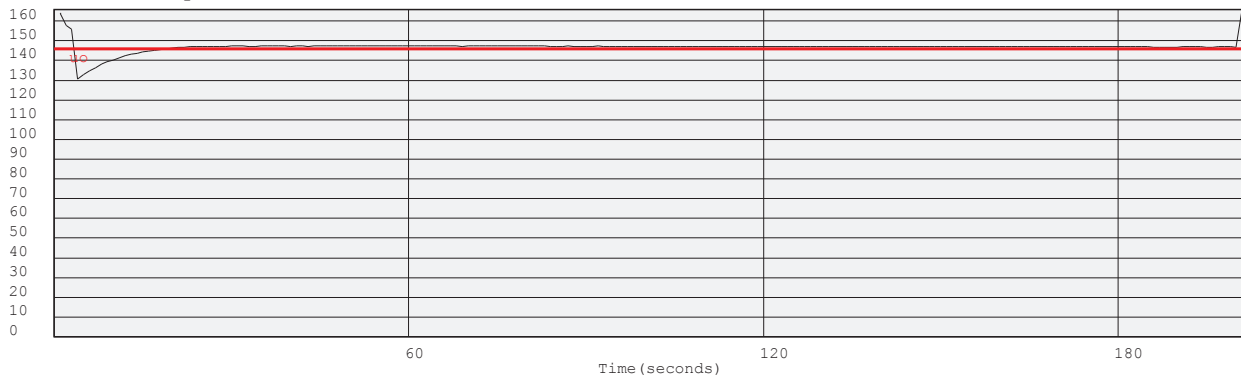
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Date: 2012-03-13

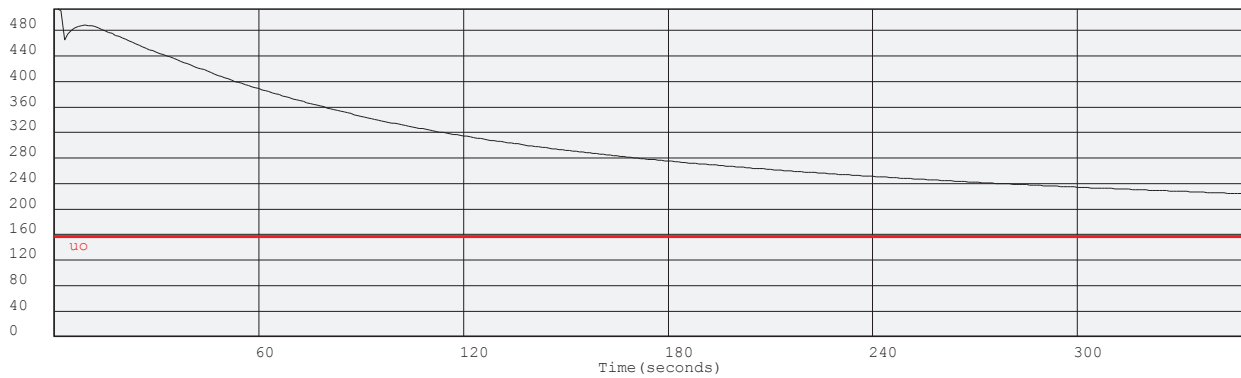
Probe: GHANA

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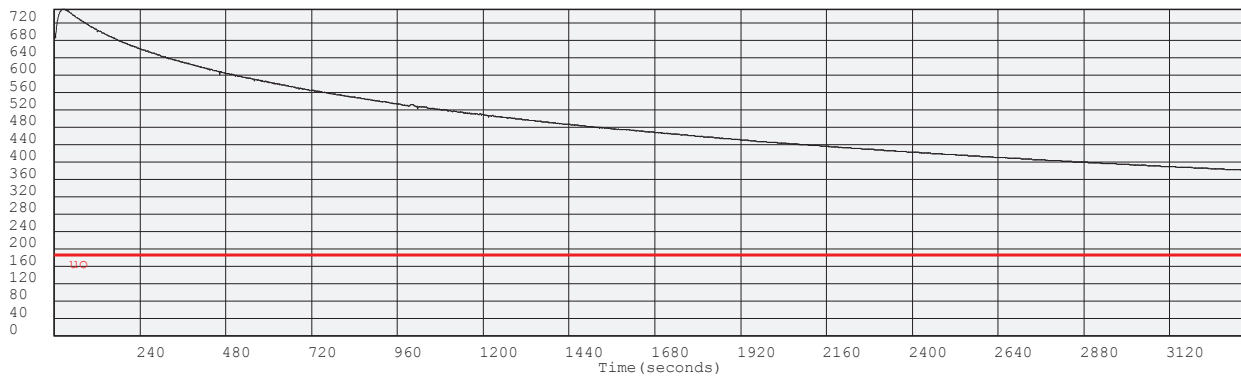
(kPa) Dissipation at: 15.648m



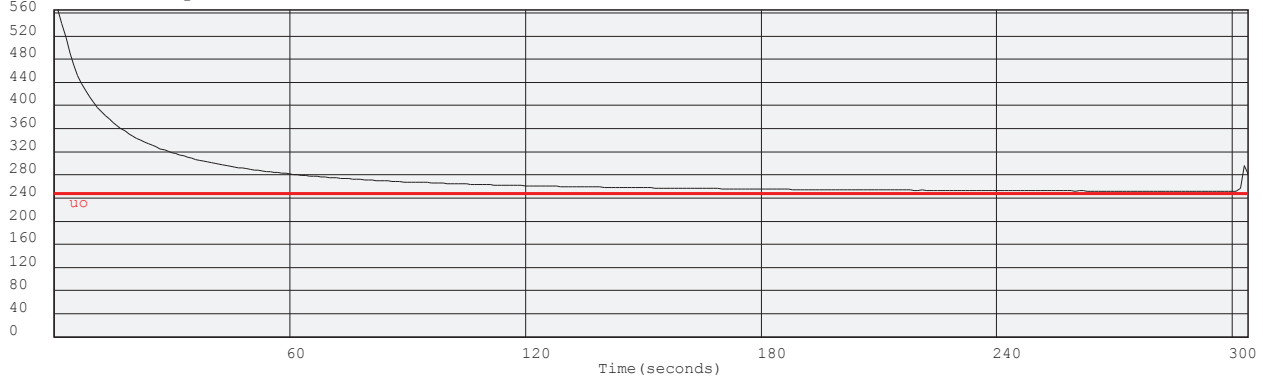
(kPa) Dissipation at: 16.637m



(kPa) Dissipation at: 19.637m



(kPa) Dissipation at: 25.631m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.778' Lat: 031°00.752'

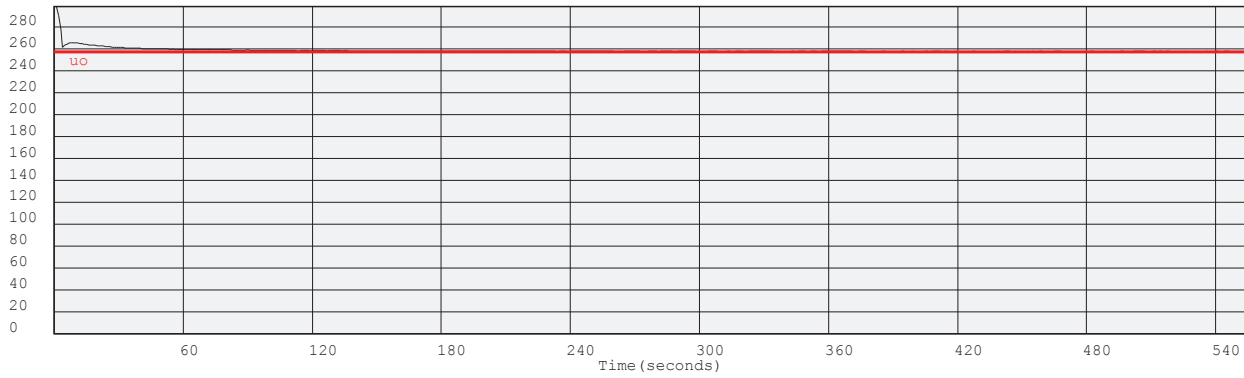
Hole: 45

Date: 2012-03-13

Probe: GHANA

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(kPa) Dissipation at: 26.646m



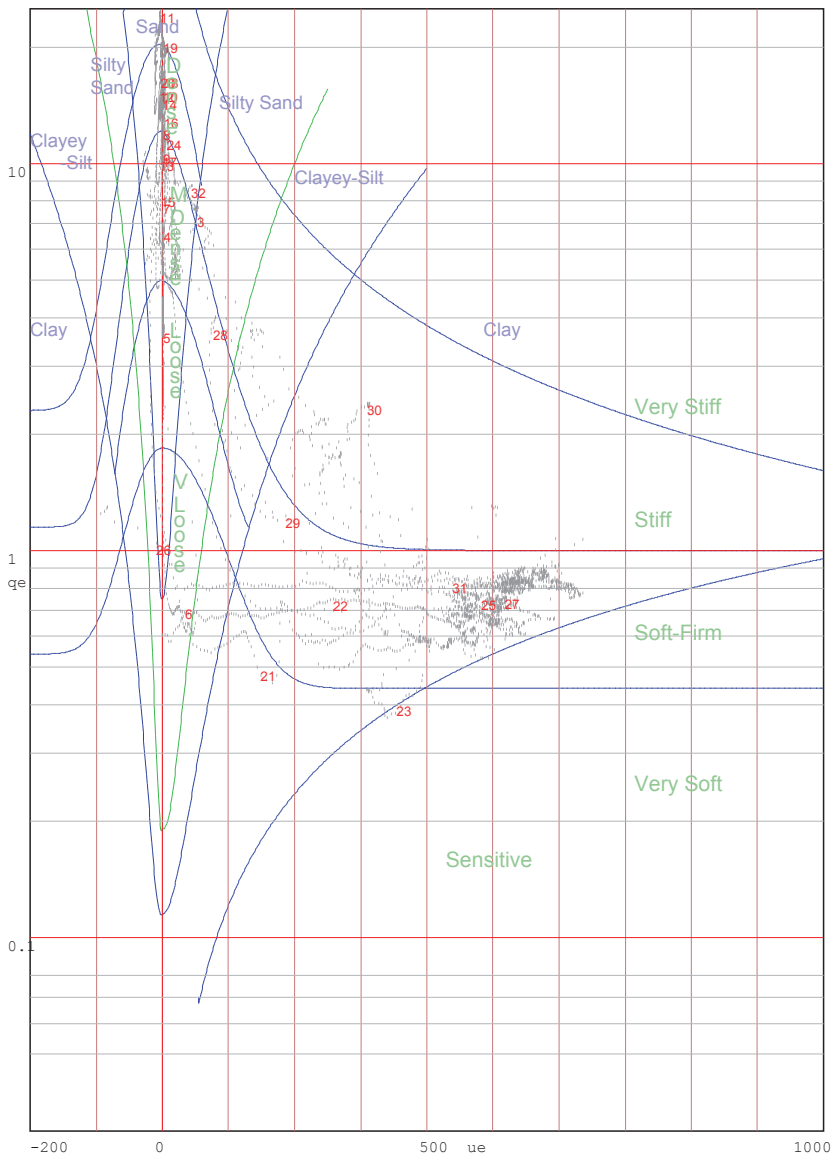
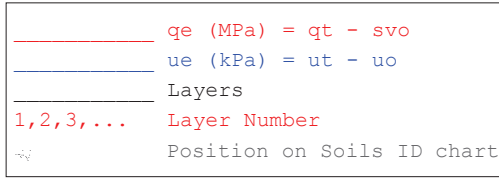
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.778' Lat:031°00.752'

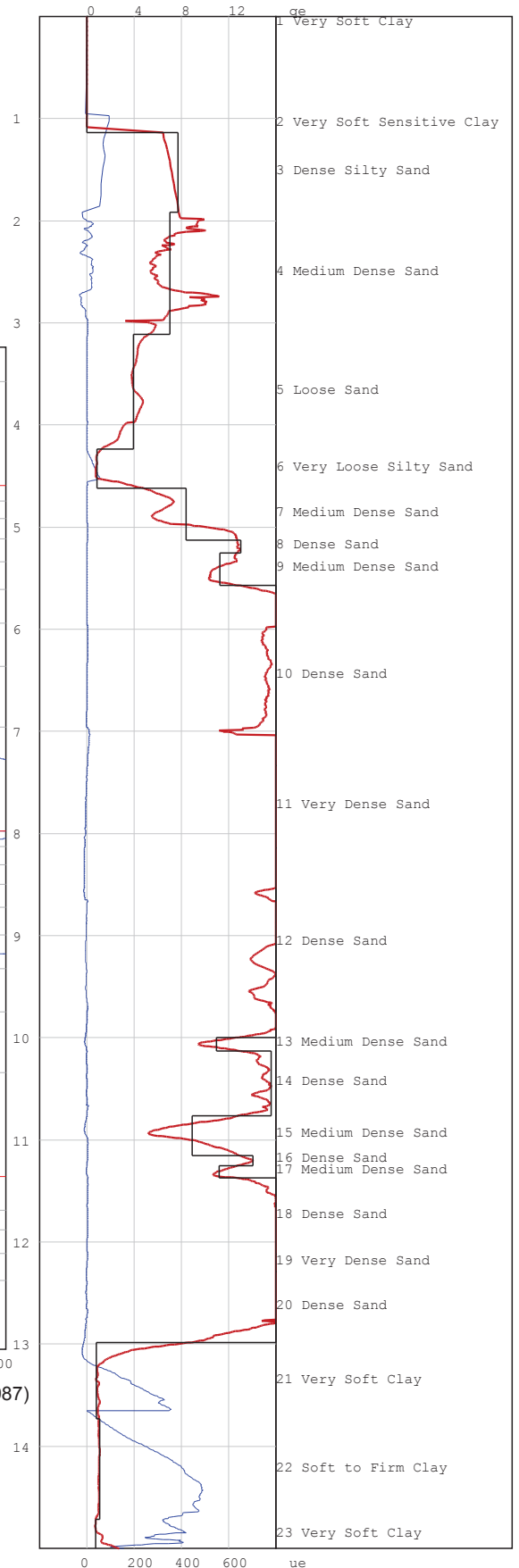
Hole No: 45

Date: 2012-03-13

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



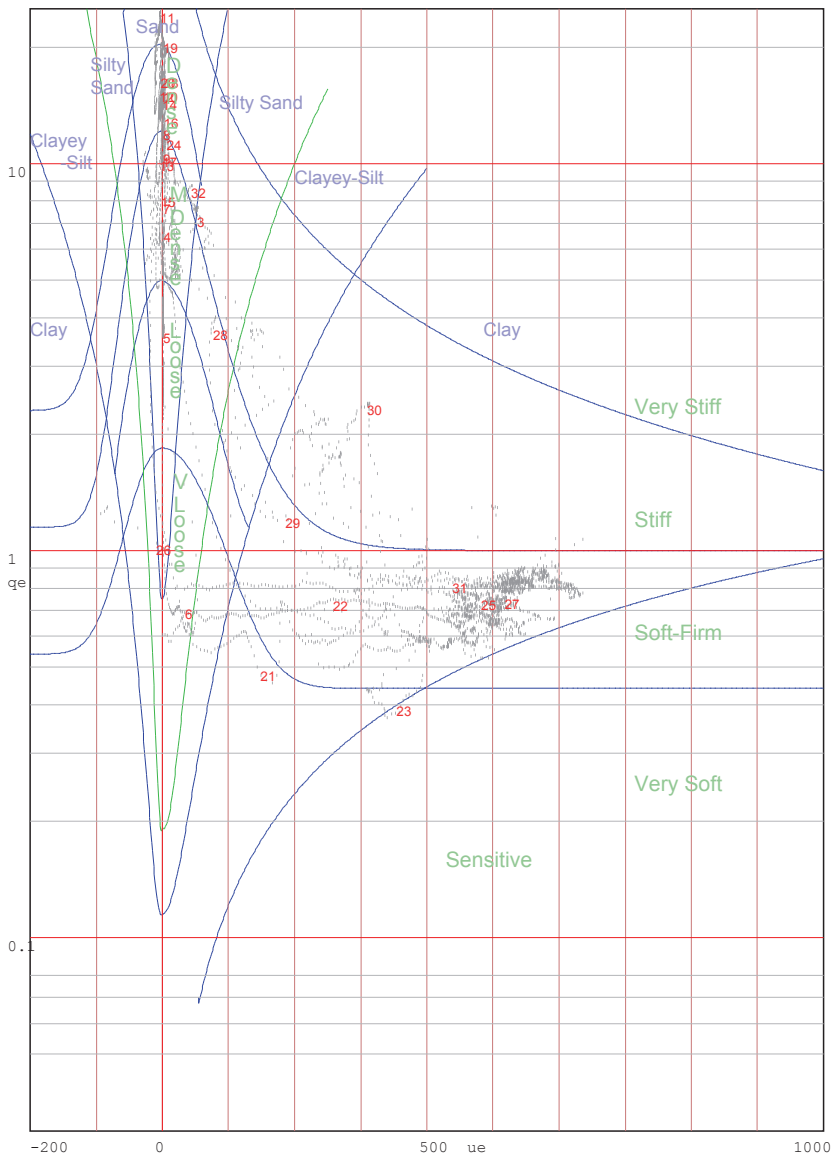
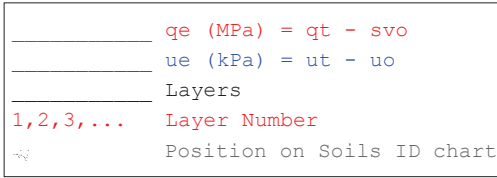
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.778' Lat:031°00.752'

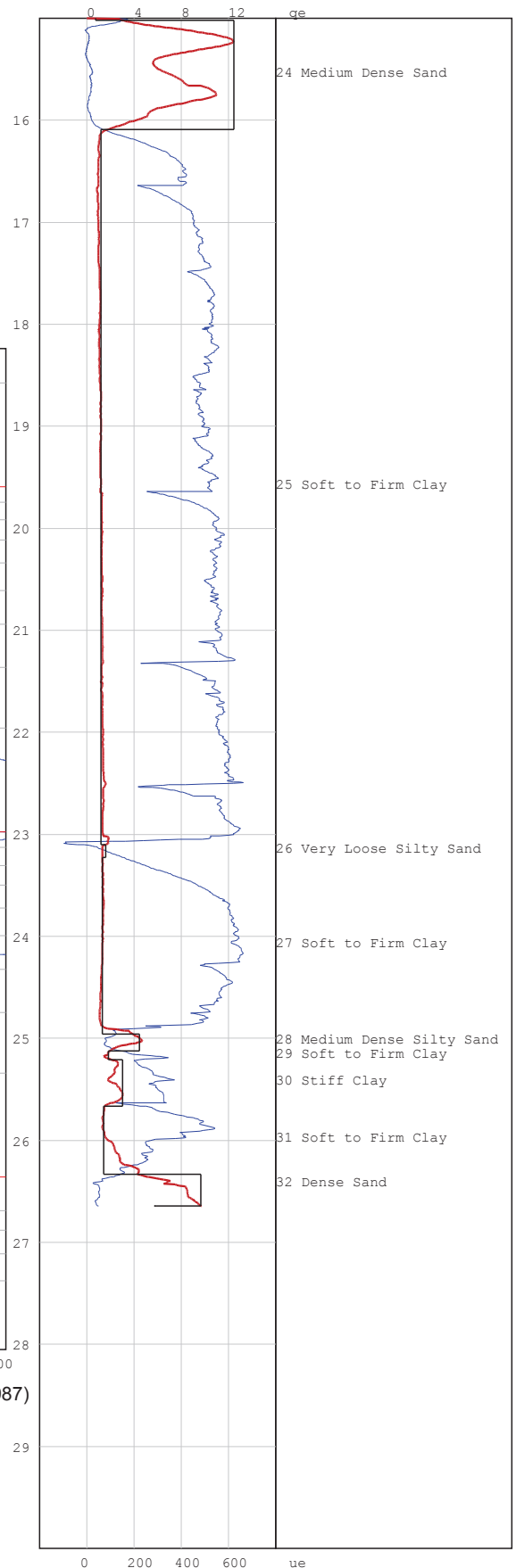
Hole No: 45

Date: 2012-03-13

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

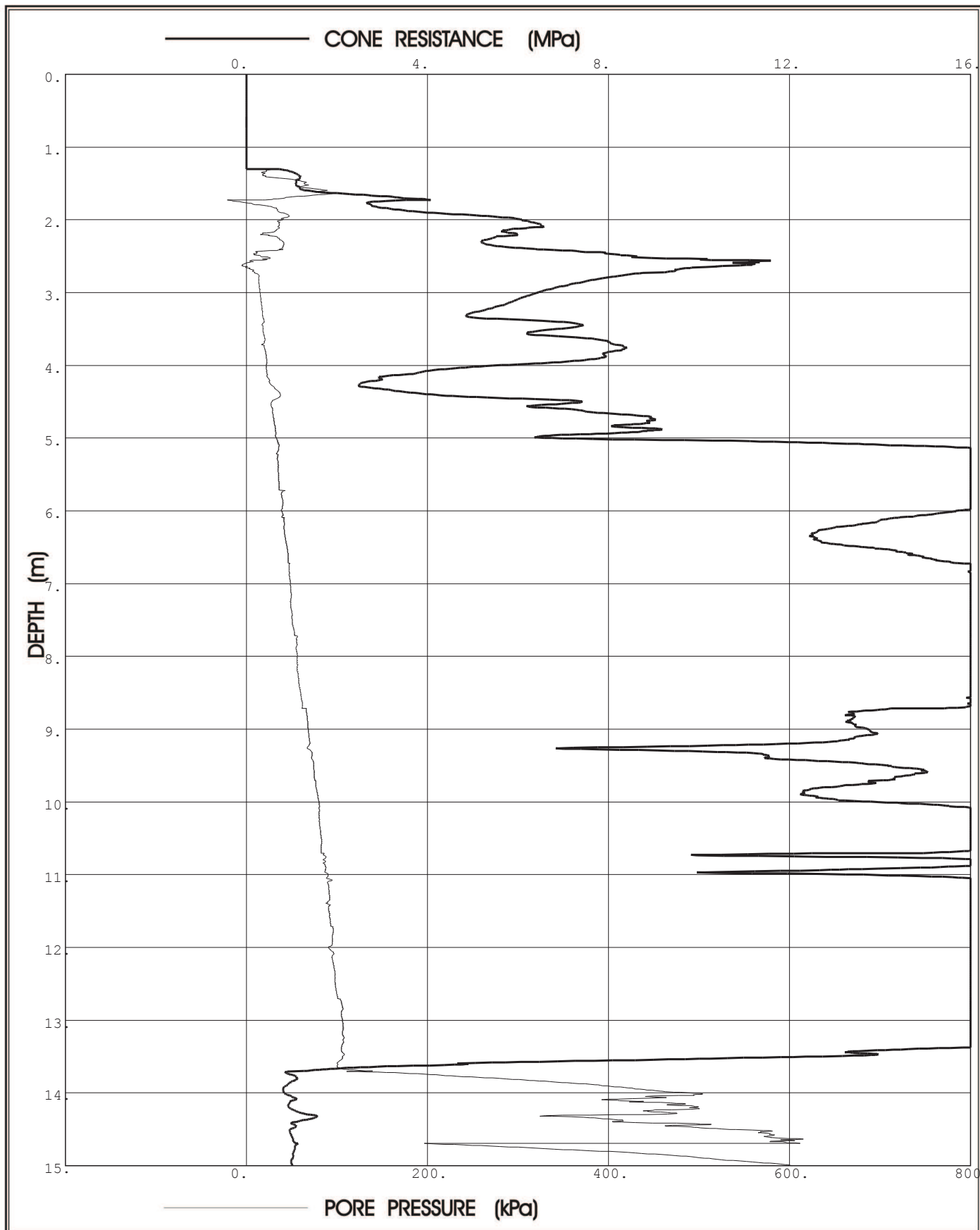
SITE: Lot 10 Long:29°52.777' Lat:031°00.768'

CPTU (RE): 46

DATE: 2012-03-14

Probe: GHANA

Page:1



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Fax: 012 420 4940  
rust@global.co.za

# PIEZOCONE PENETRATION TEST

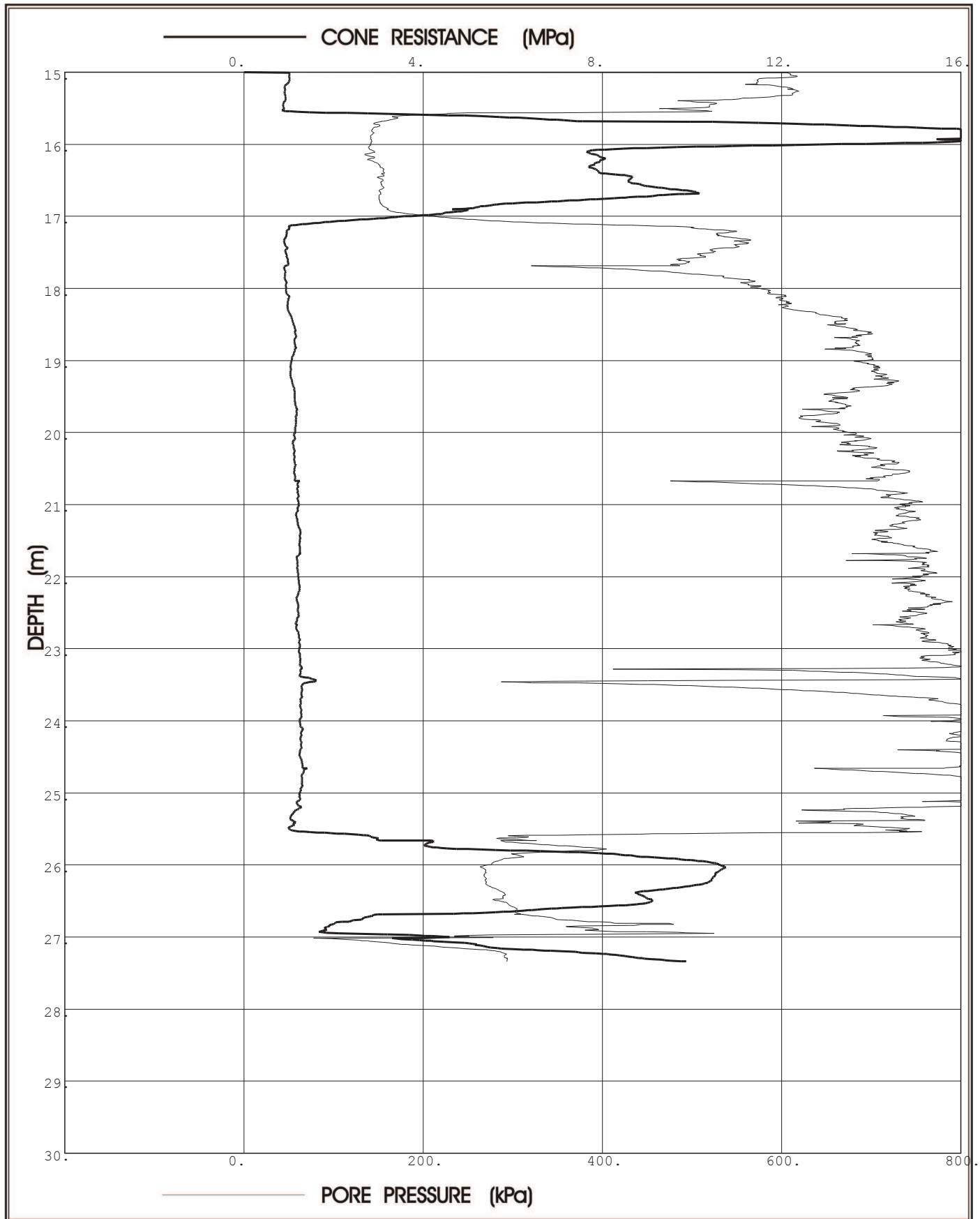


P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu  
SITE: Lot 10 Long:29°52.777' Lat:031°00.768'  
CPTU (RE): 46  
DATE: 2012-03-14

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Page:2



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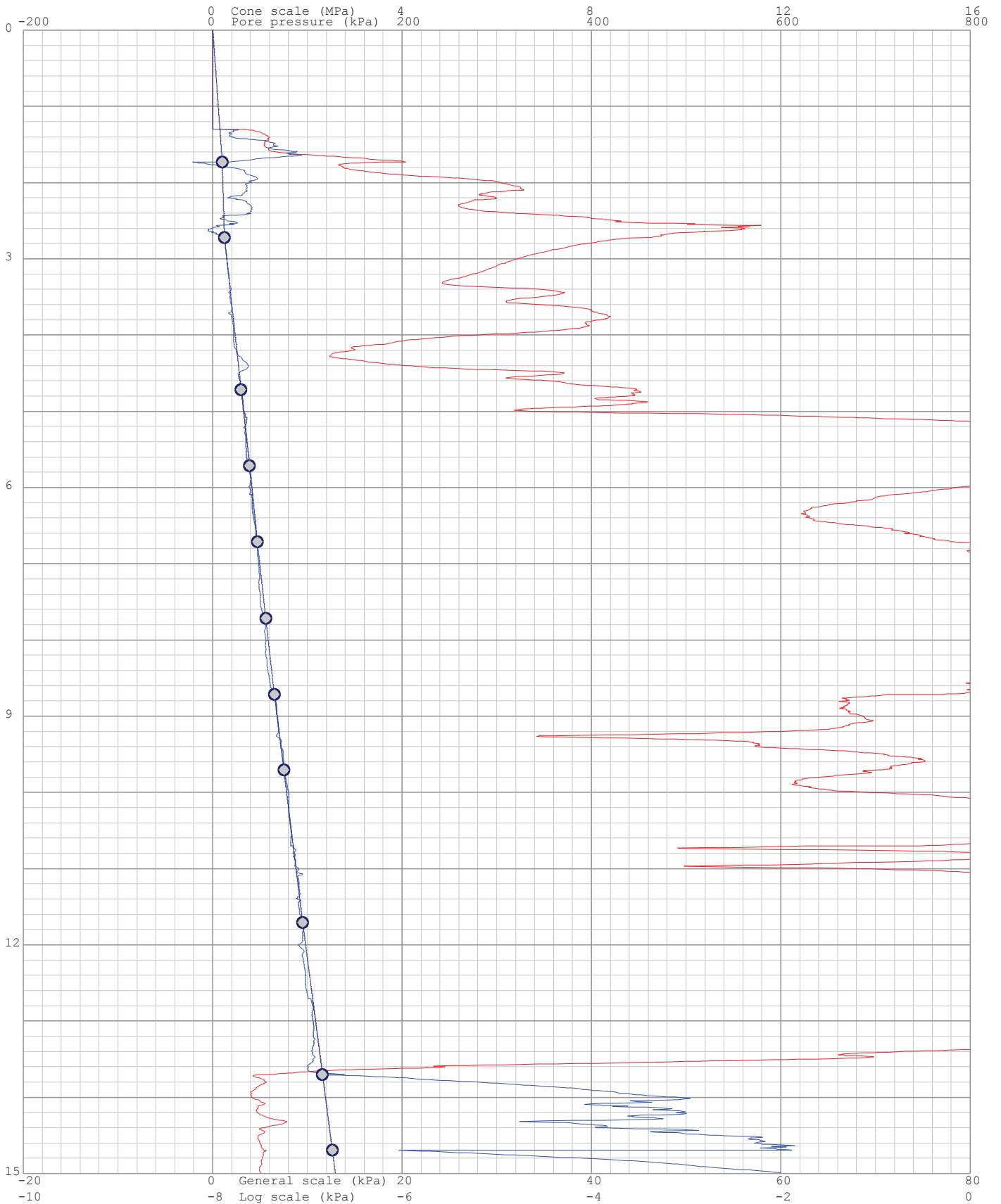
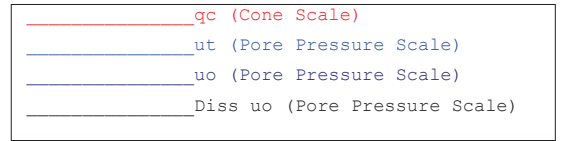
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°52.777' Lat:031°00.768'

Hole No: 46

Date: 2012-03-14

Probe: GHANA





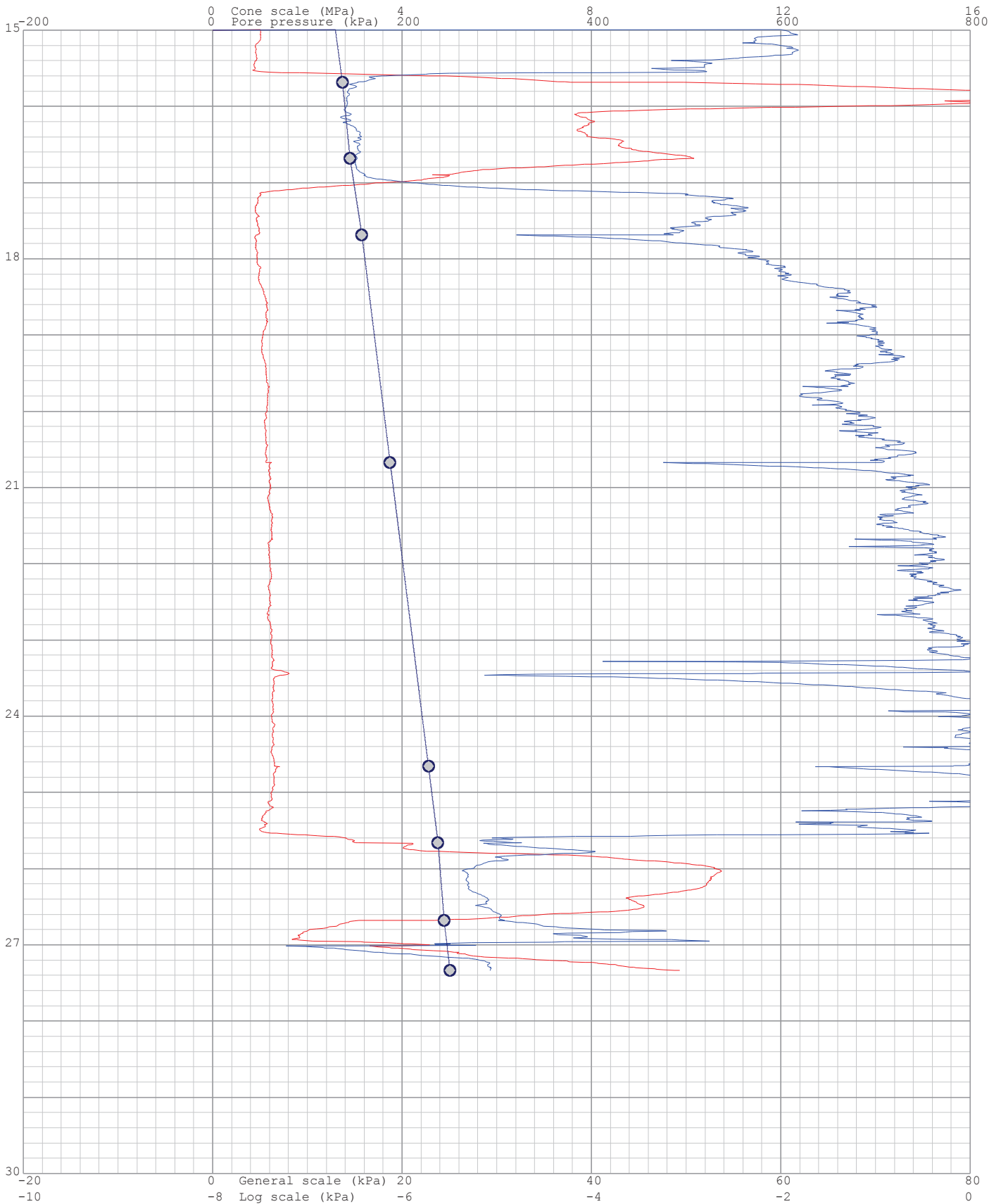
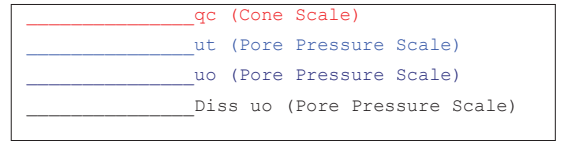
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°52.777' Lat:031°00.768'

Hole No: 46

Date: 2012-03-14

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°52.777' Lat: 031°00.768'

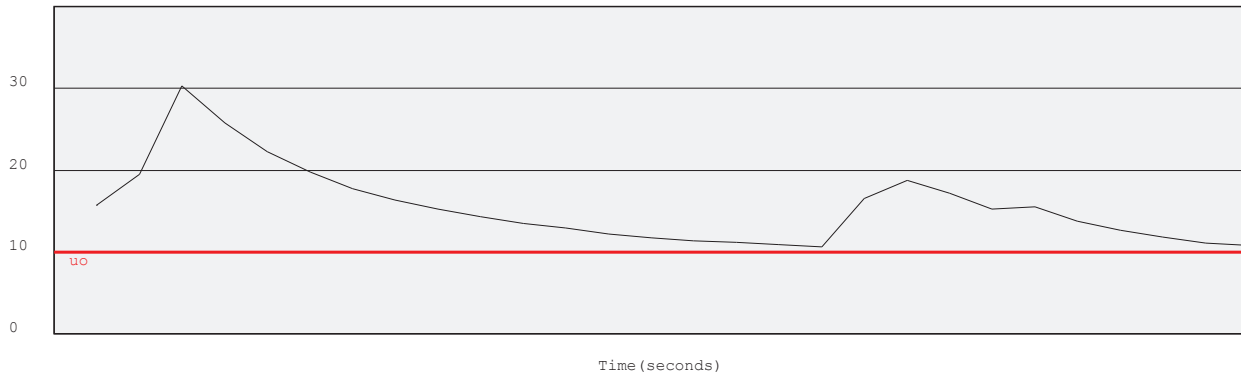
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Date: 2012-03-14

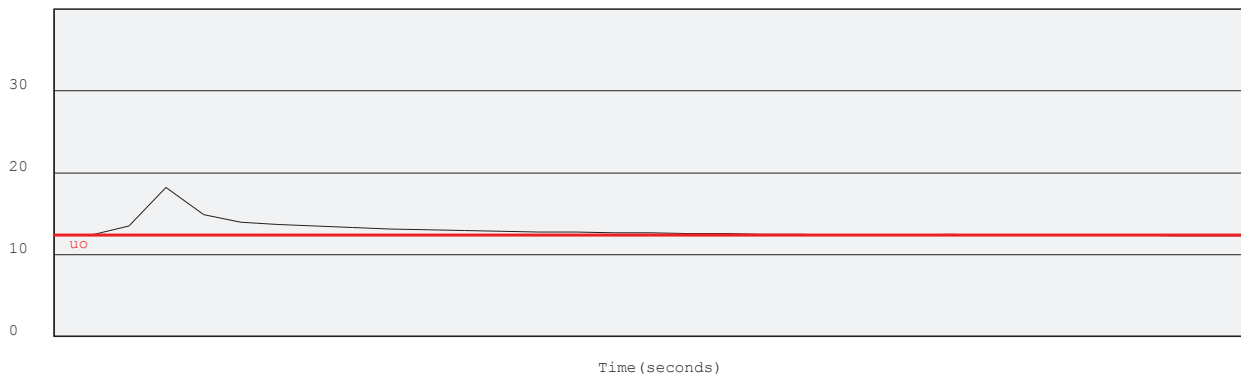
Probe: GHANA

Page: 1

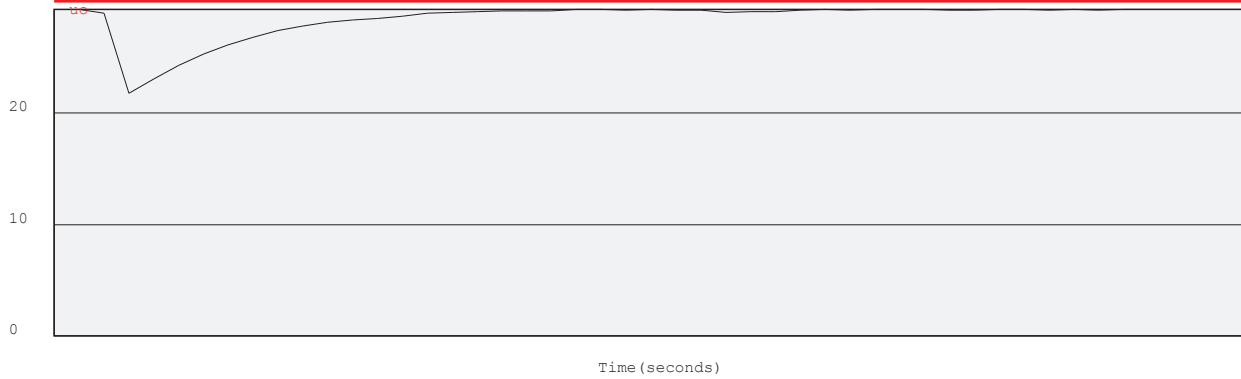
(kPa) Dissipation at: 1.727m



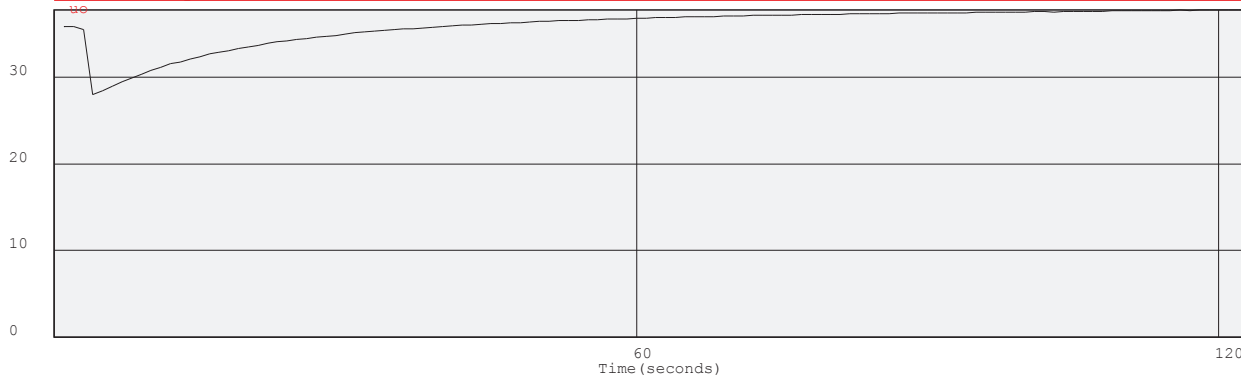
(kPa) Dissipation at: 2.724m



(kPa) Dissipation at: 4.719m



(kPa) Dissipation at: 5.717m



Project: Durban Harbour Land Based CPTu

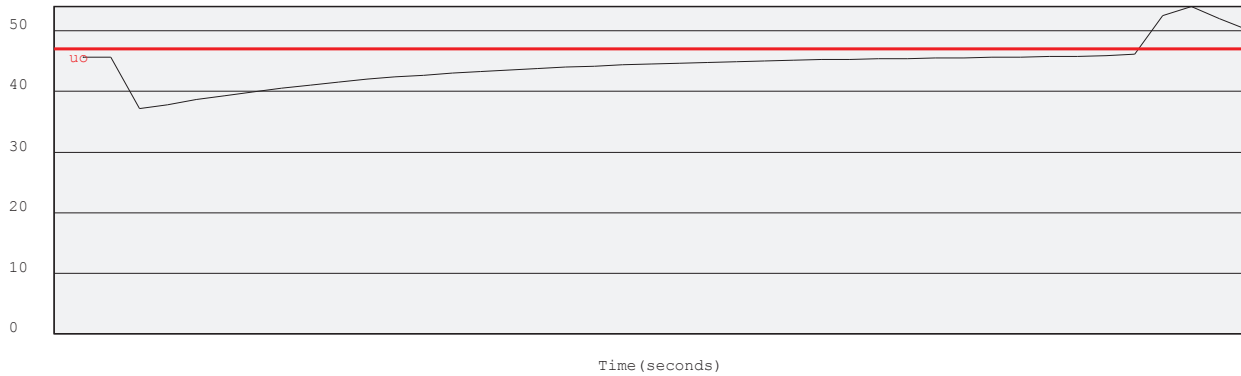
Site: Lot 10 Long: 29°52.777' Lat: 031°00.768'

Hole: 46

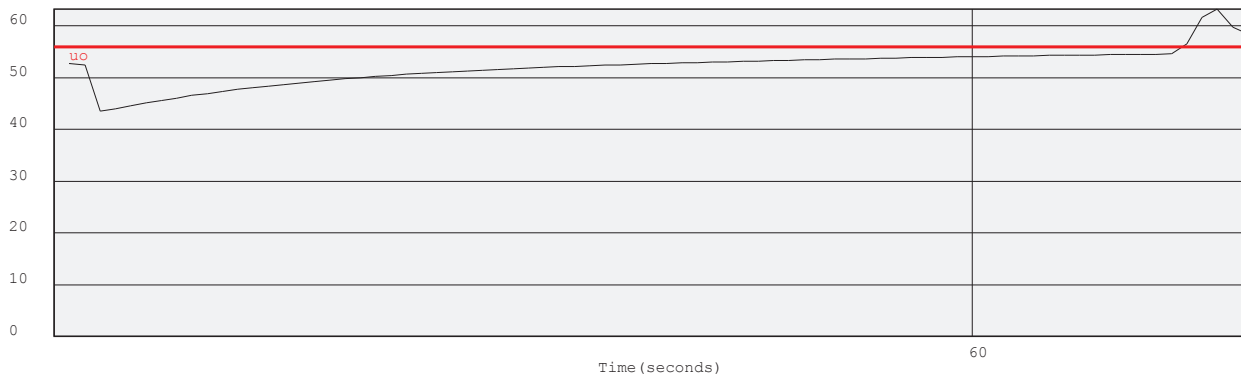
Date: 2012-03-14

Probe: GHANA  
Page: 2

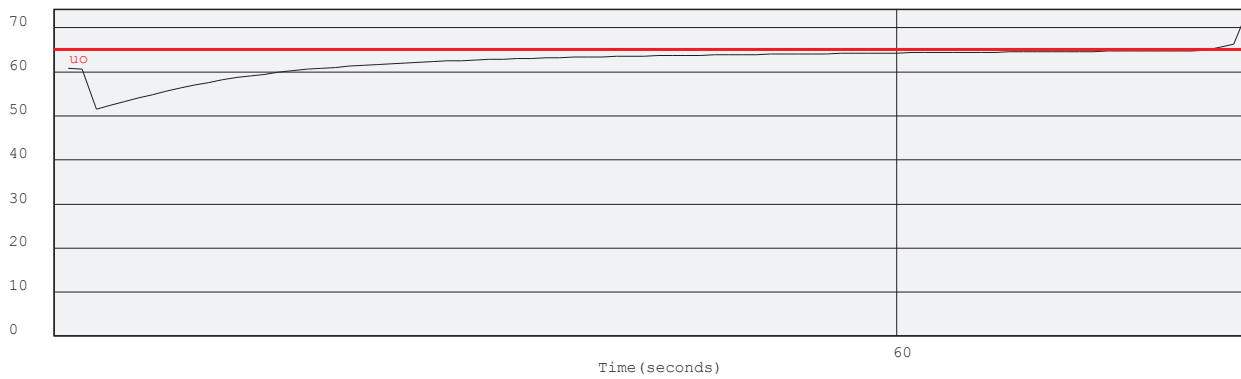
(kPa) Dissipation at: 6.714m



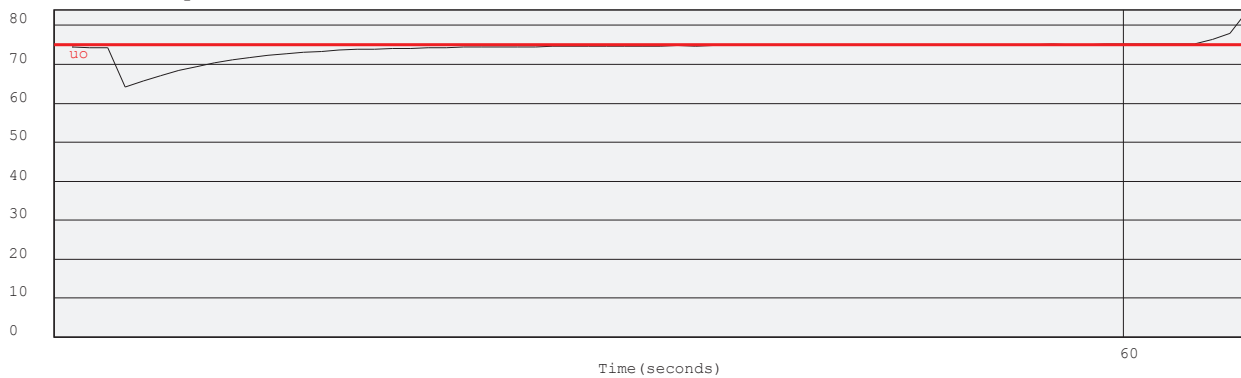
(kPa) Dissipation at: 7.715m



(kPa) Dissipation at: 8.712m



(kPa) Dissipation at: 9.706m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°52.777' Lat: 031°00.768'

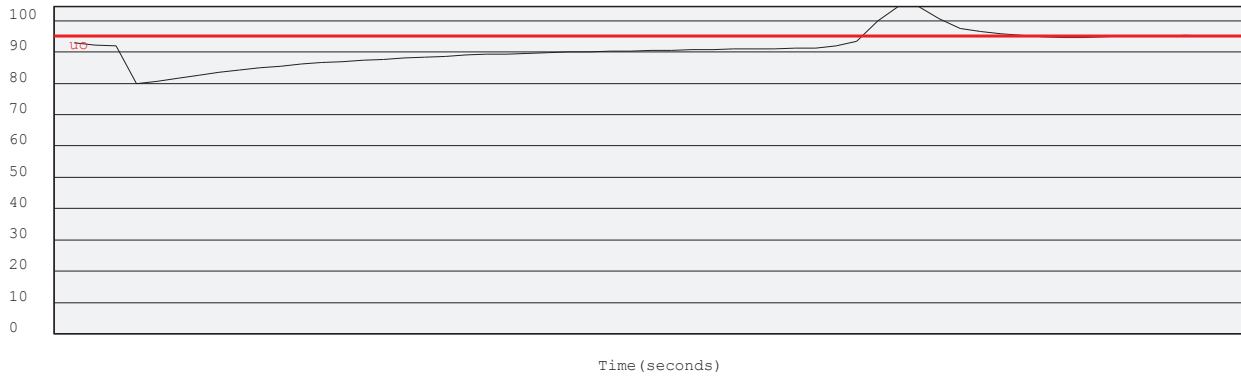
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Date: 2012-03-14

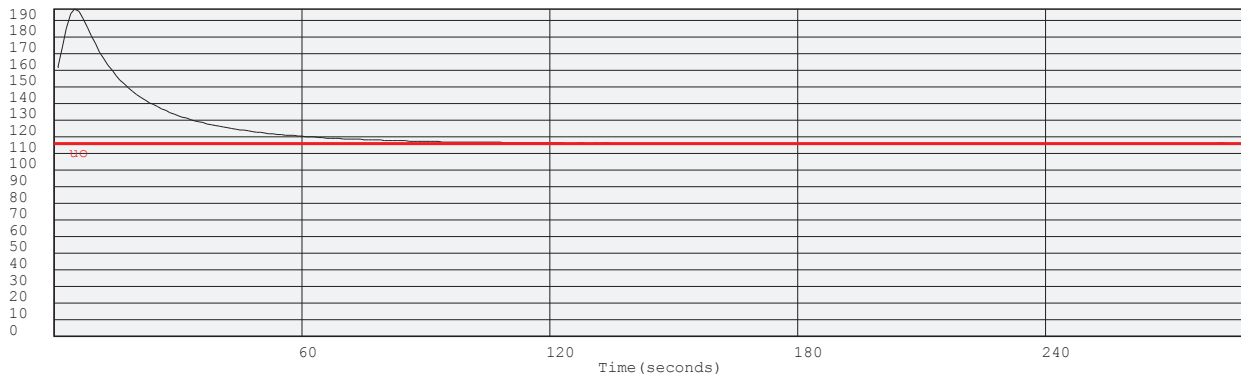
Probe: GHANA

Page: 3

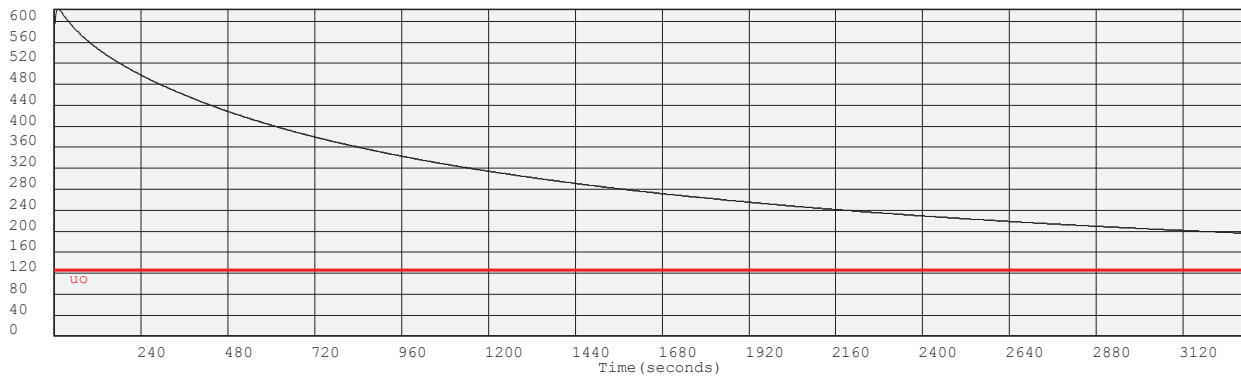
(kPa) Dissipation at: 11.71m



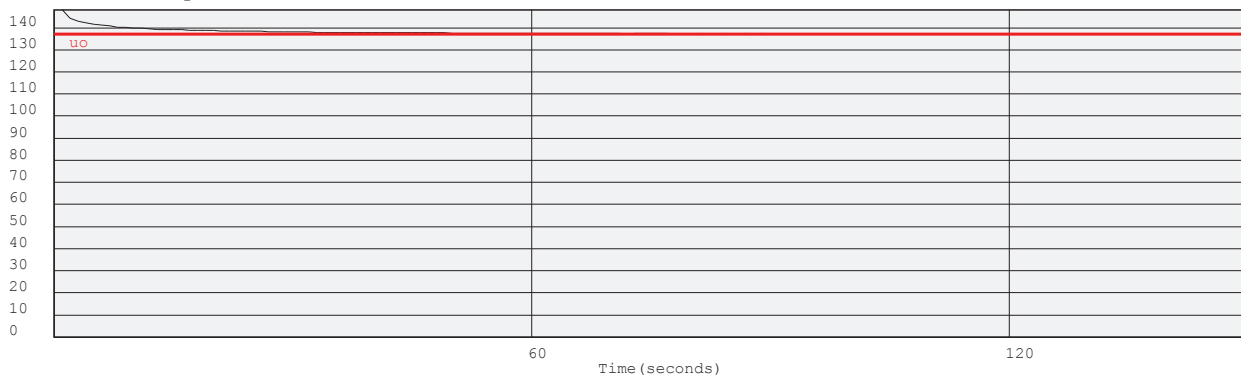
(kPa) Dissipation at: 13.699m



(kPa) Dissipation at: 14.693m



(kPa) Dissipation at: 15.682m



Project: Durban Harbour Land Based CPTu

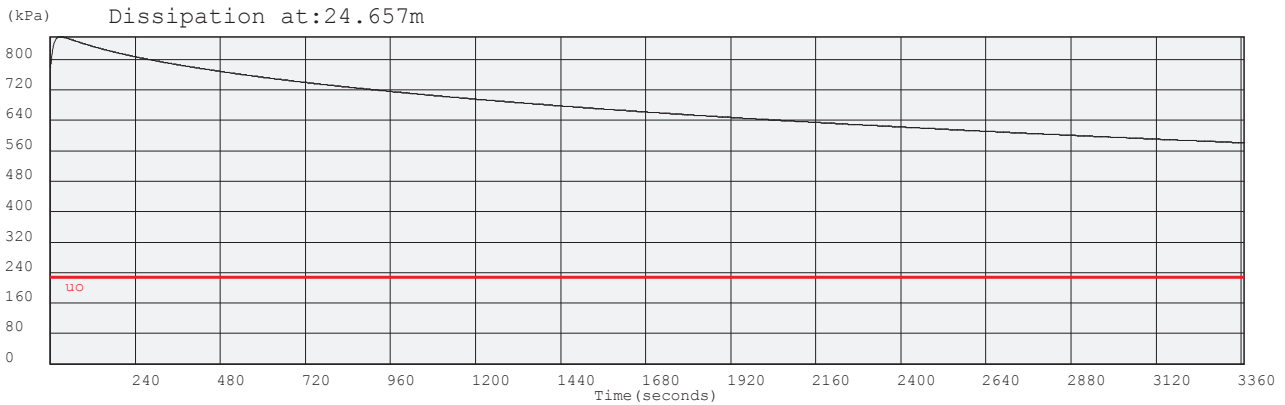
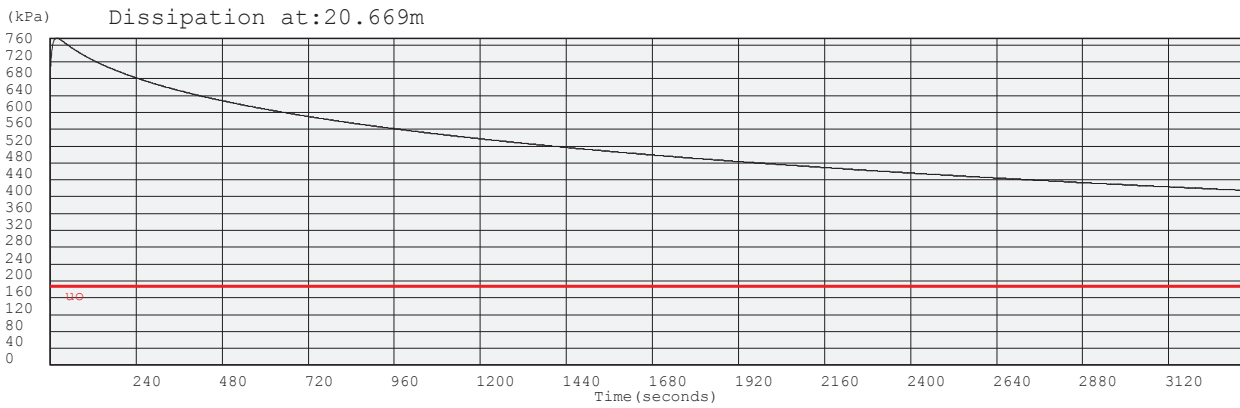
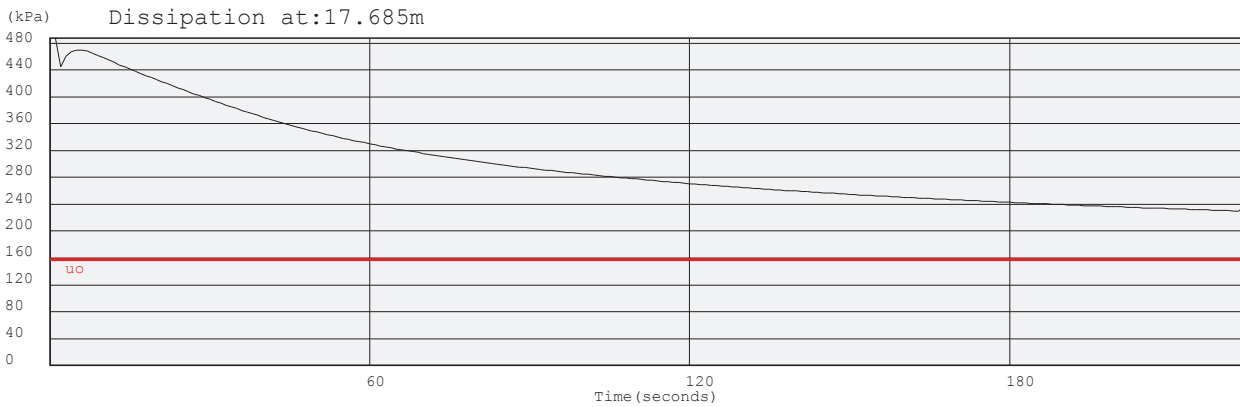
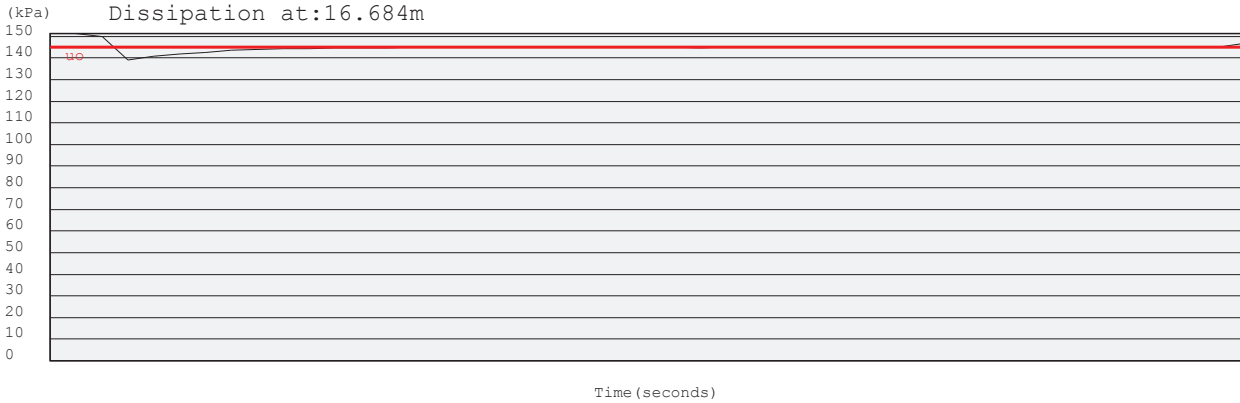
Site: Lot 10 Long: 29°52.777' Lat: 031°00.768'

Hole: 46

Date: 2012-03-14

Probe: GHANA

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Project: Durban Harbour Land Based CPTu

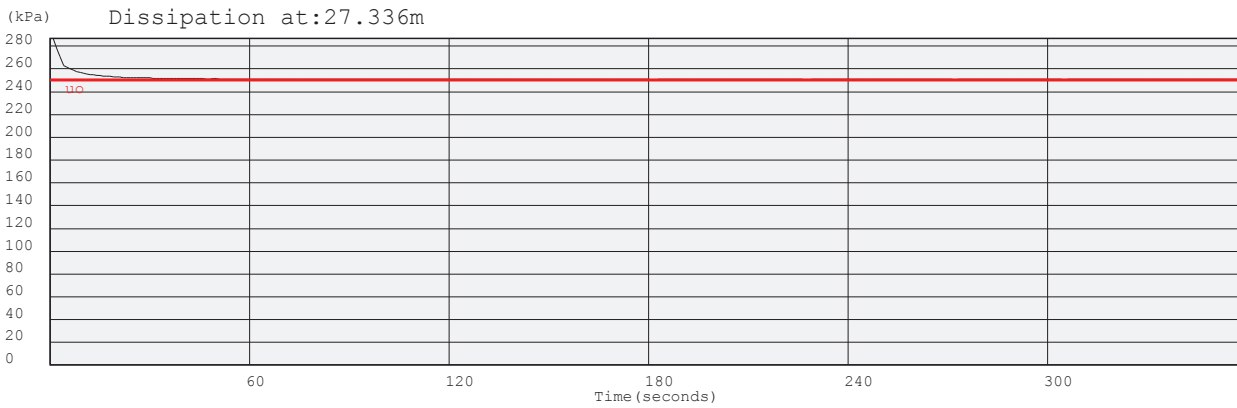
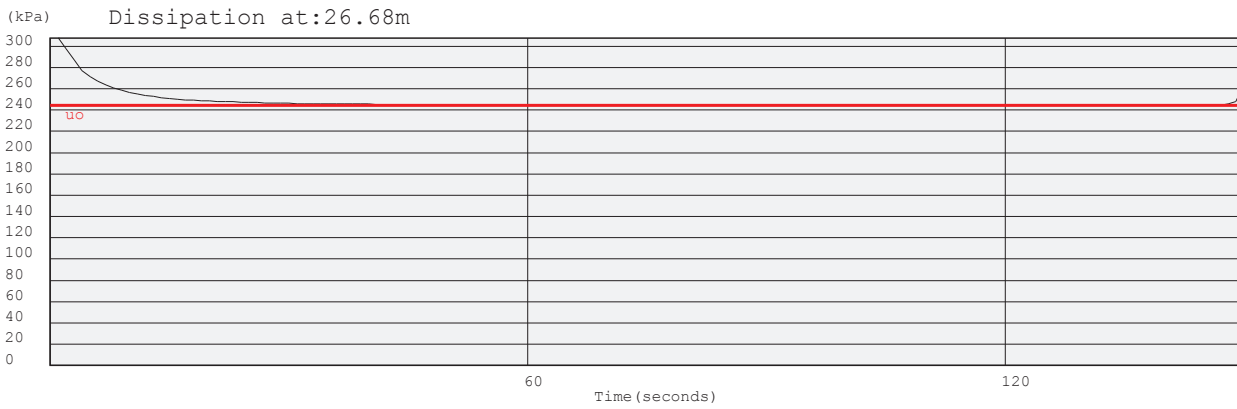
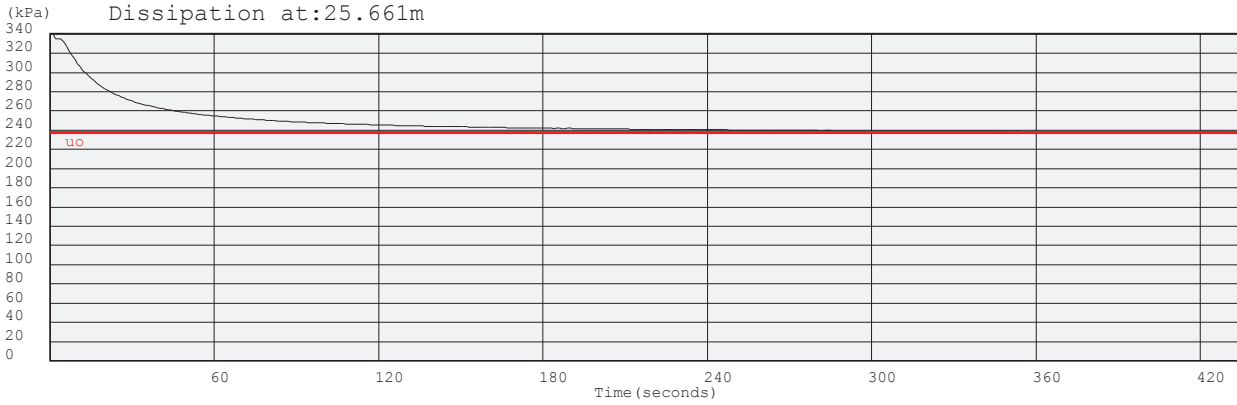
Site: Lot 10 Long: 29°52.777' Lat: 031°00.768'

Hole: 46

Date: 2012-03-14

Probe: GHANA

Page: 5



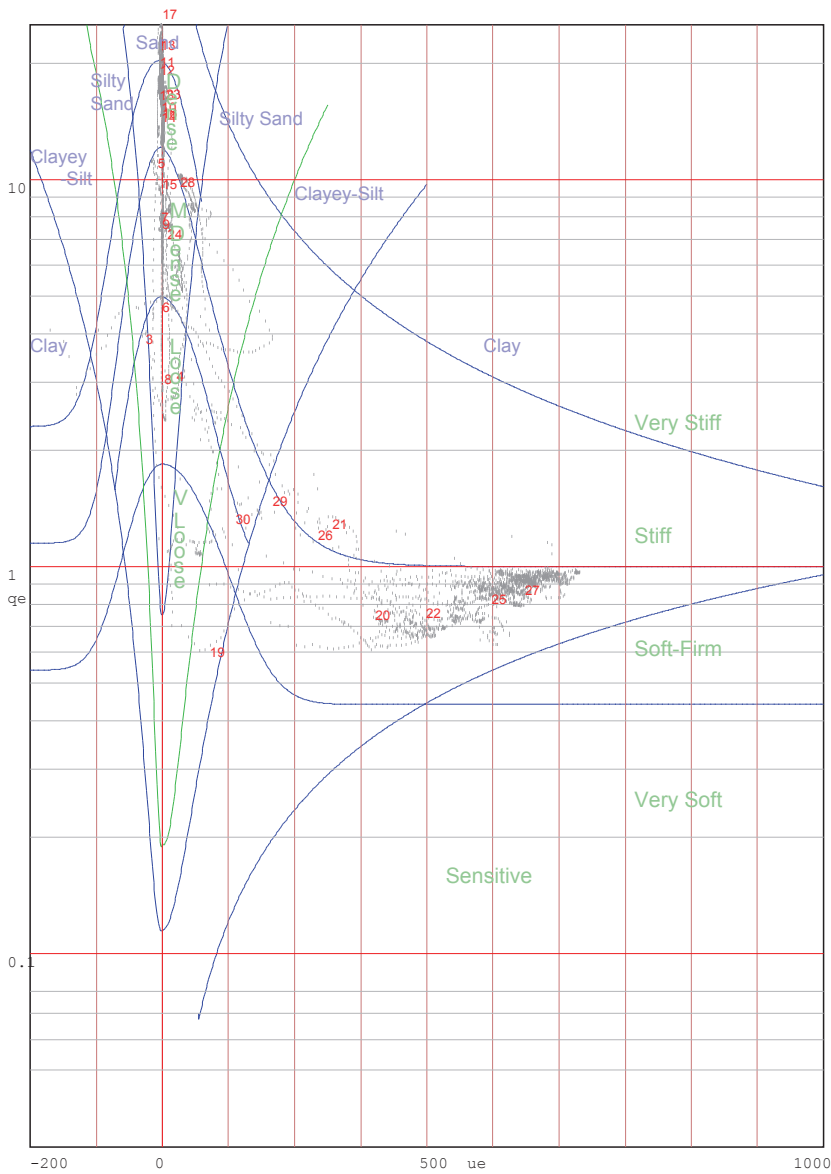
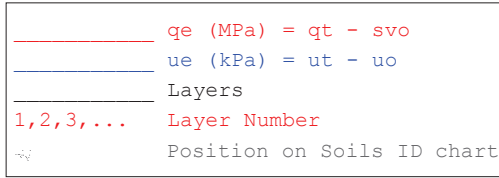
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°52.777' Lat:031°00.768'

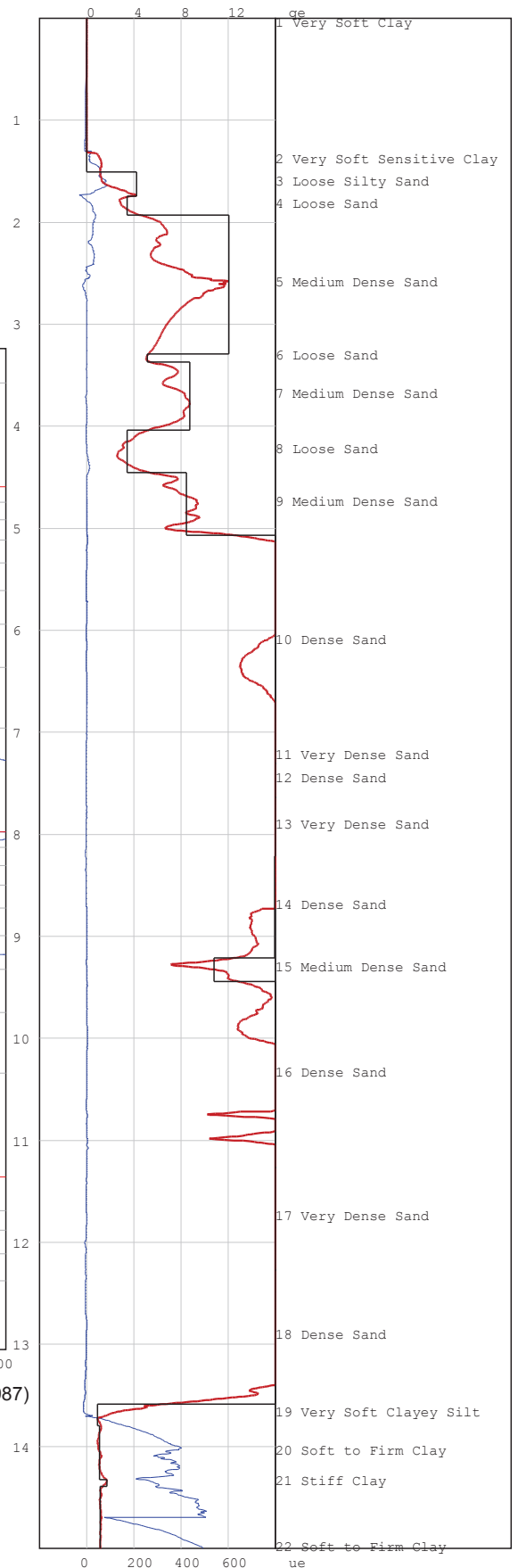
Hole No: 46

Date: 2012-03-14

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



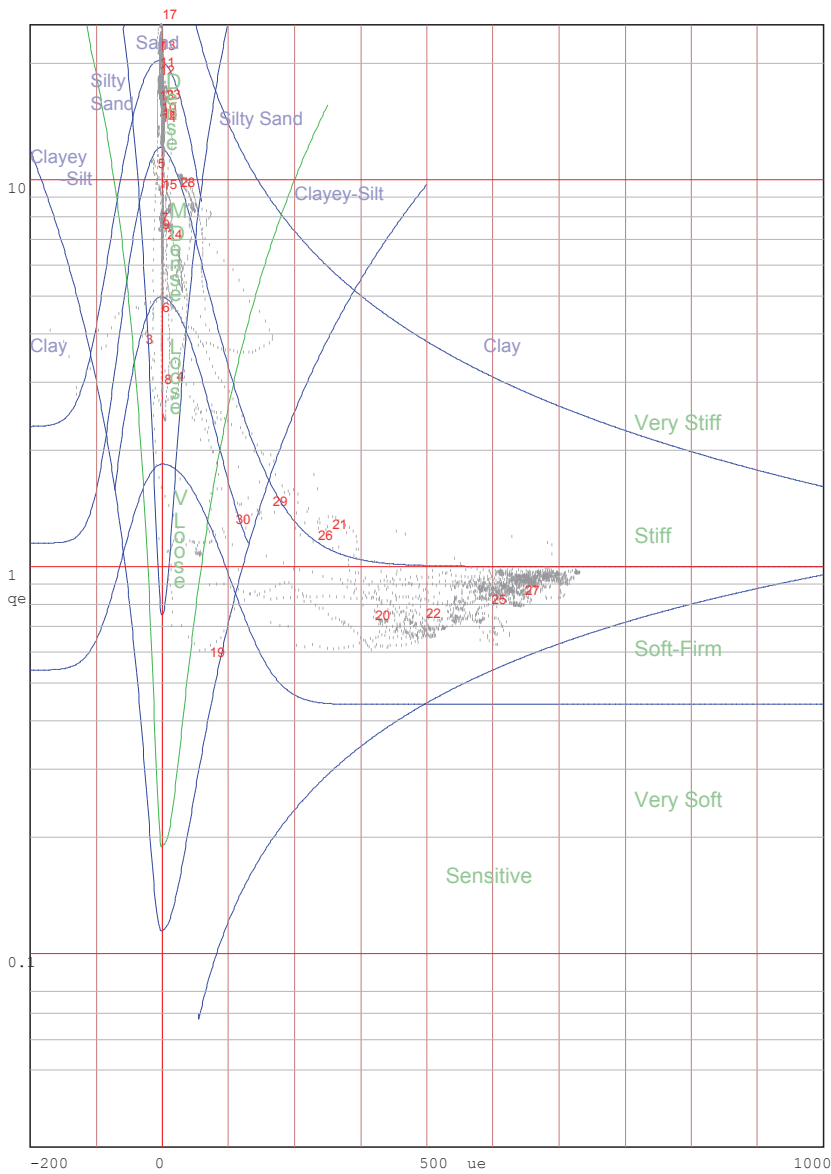
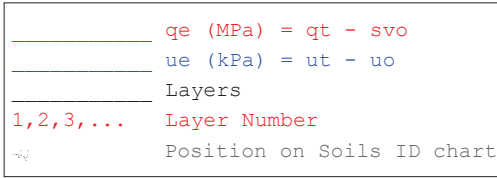
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°52.777' Lat:031°00.768'

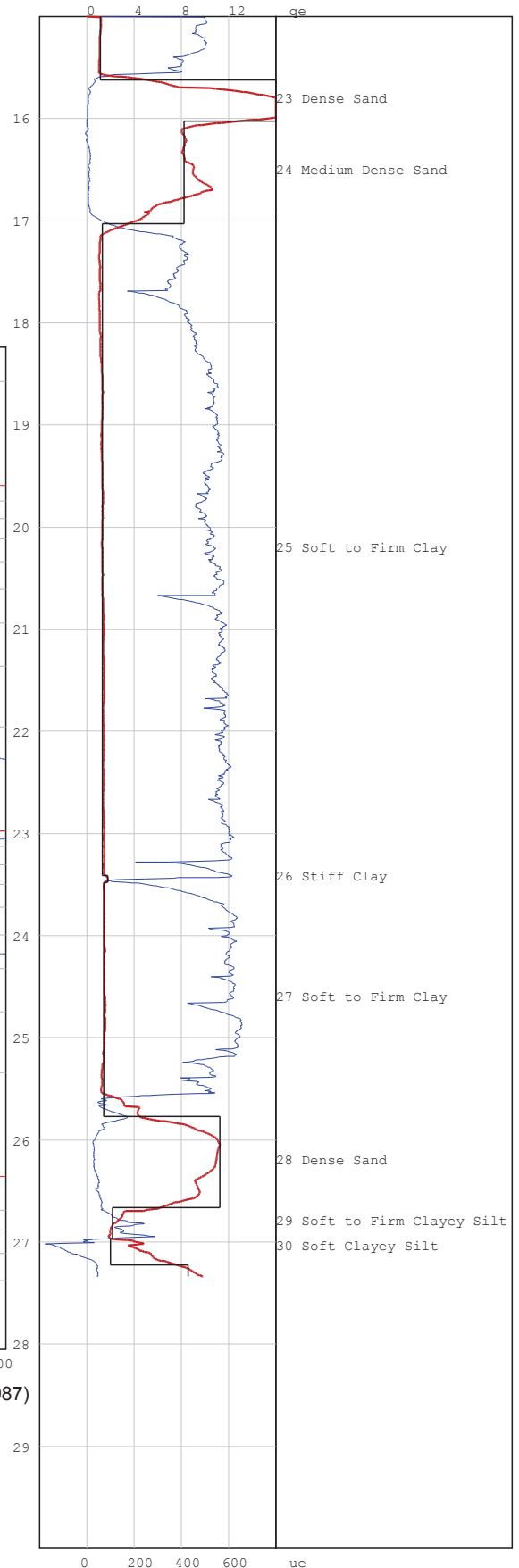
Hole No: 46

Date: 2012-03-14

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

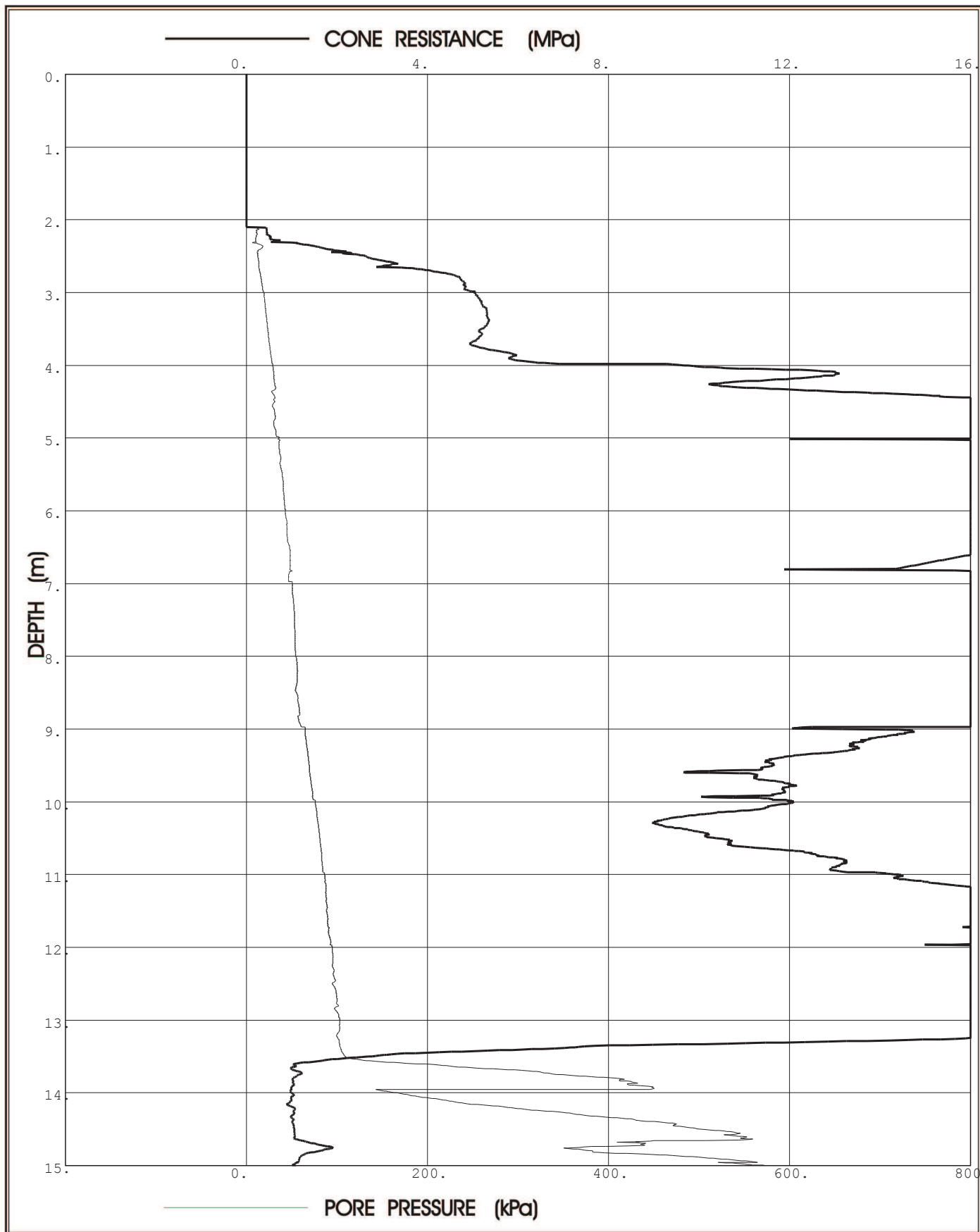
SITE: Pier 2 Long:29°52.774' Lat:031°00.782'

CPTU (RE): 47

DATE: 2012-03-14

Probe: GHANA

Page:1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

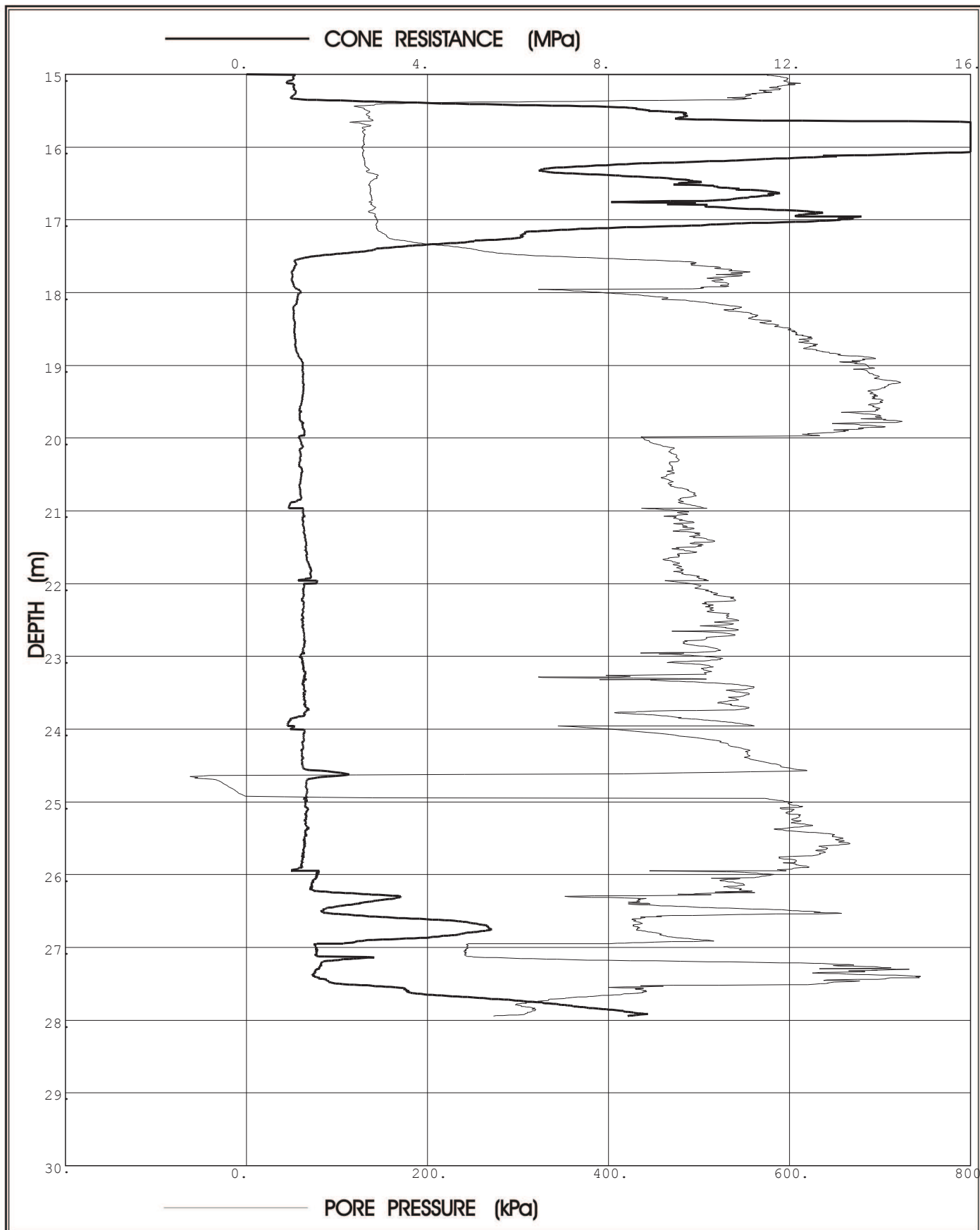
SITE: Pier 2 Long:29°52.774' Lat:031°00.782'

CPTU (RE): 47

DATE: 2012-03-14

Probe: GHANA

Page:2



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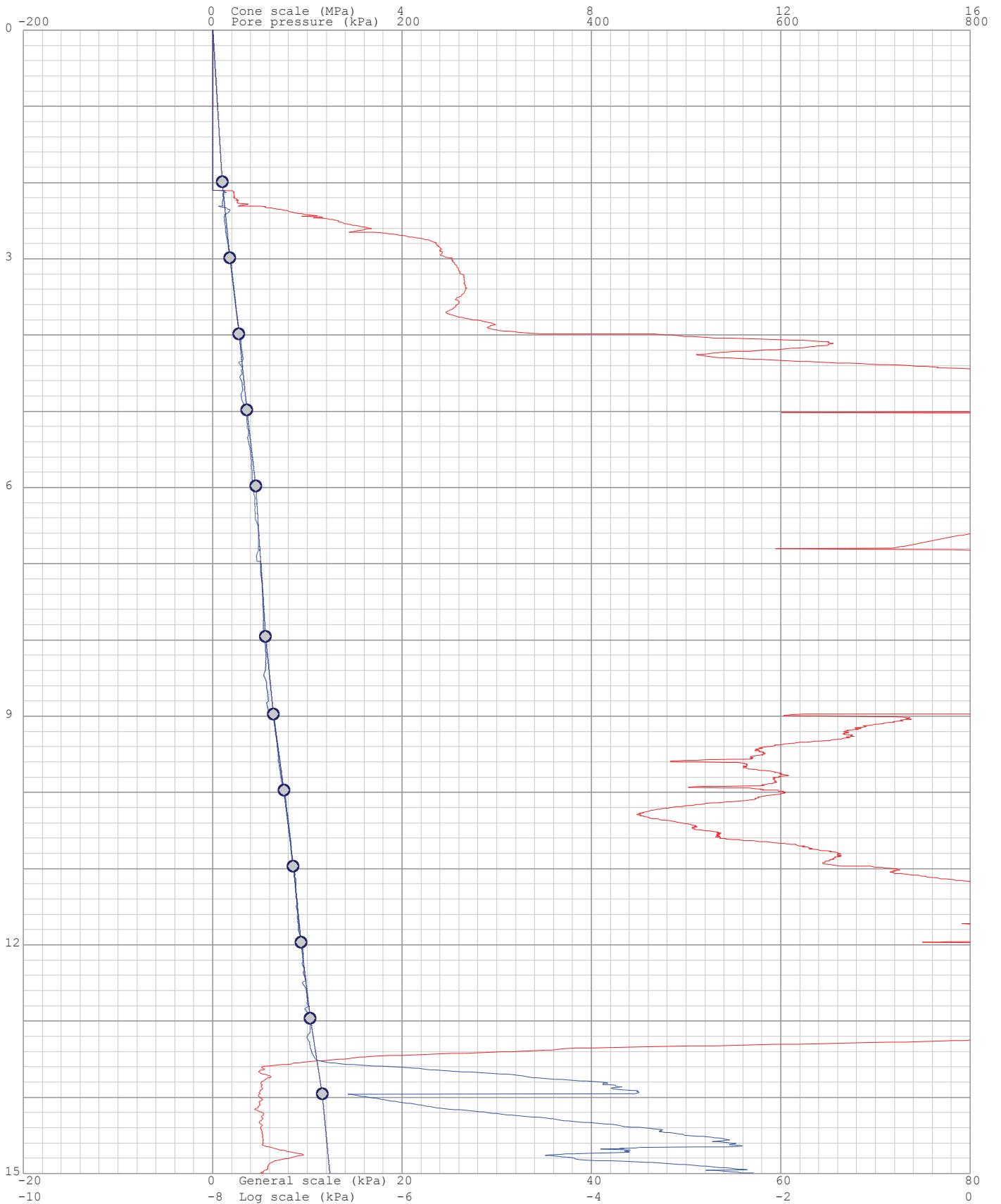
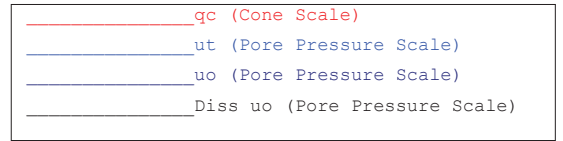
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.774' Lat:031°00.782'

Hole No: 47

Date: 2012-03-14

Probe: GHANA



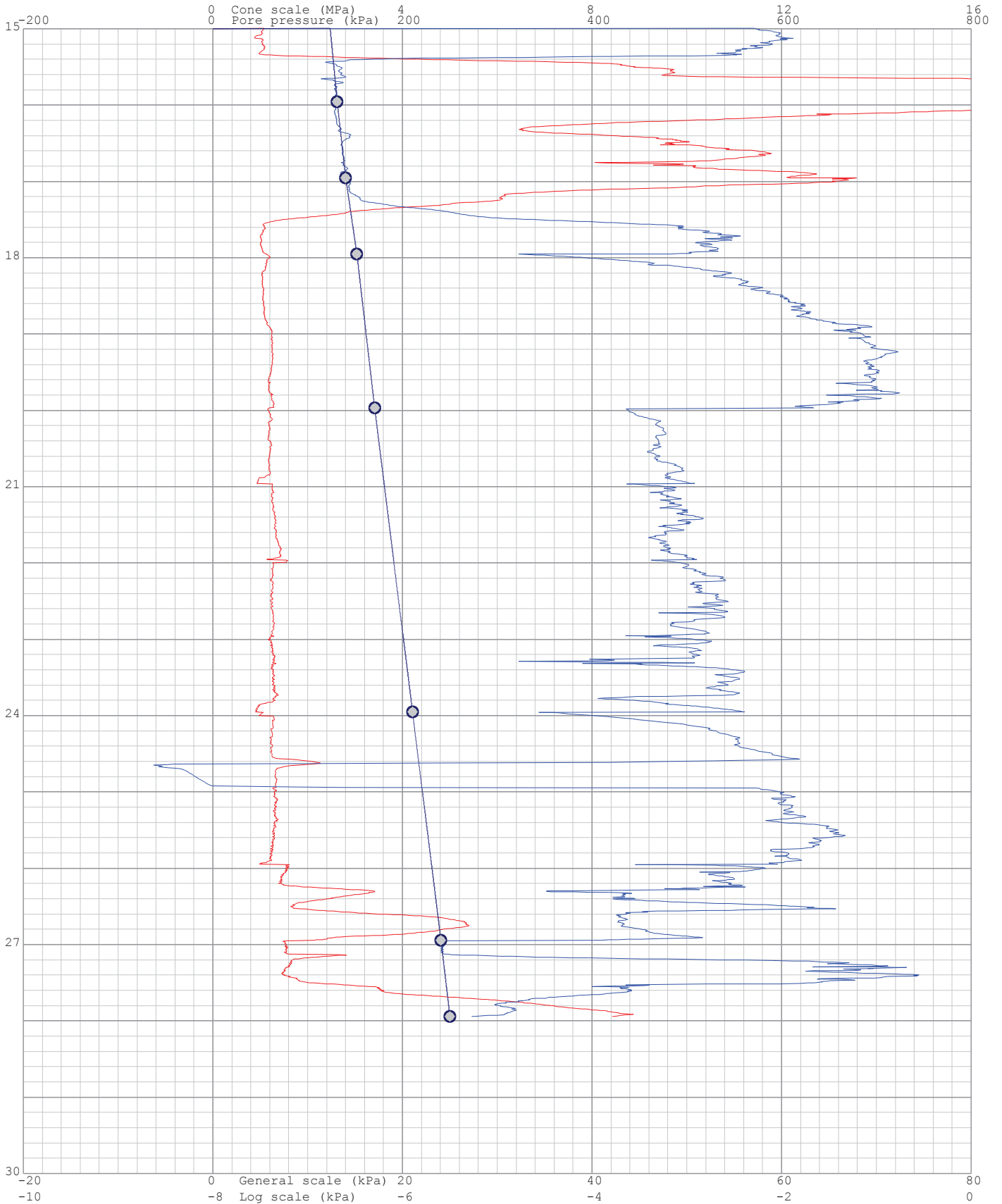
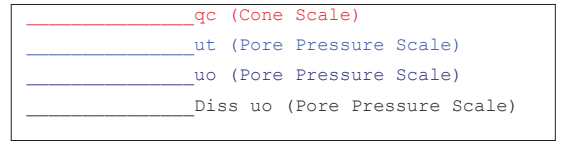
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.774' Lat:031°00.782'

Hole No: 47

Date: 2012-03-14

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.774' Lat: 031°00.782'

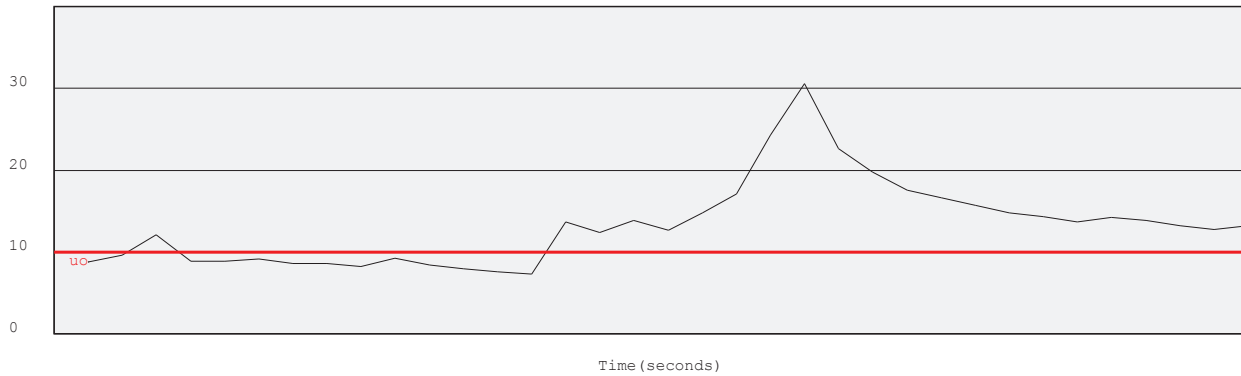
Hole: 47

Date: 2012-03-14

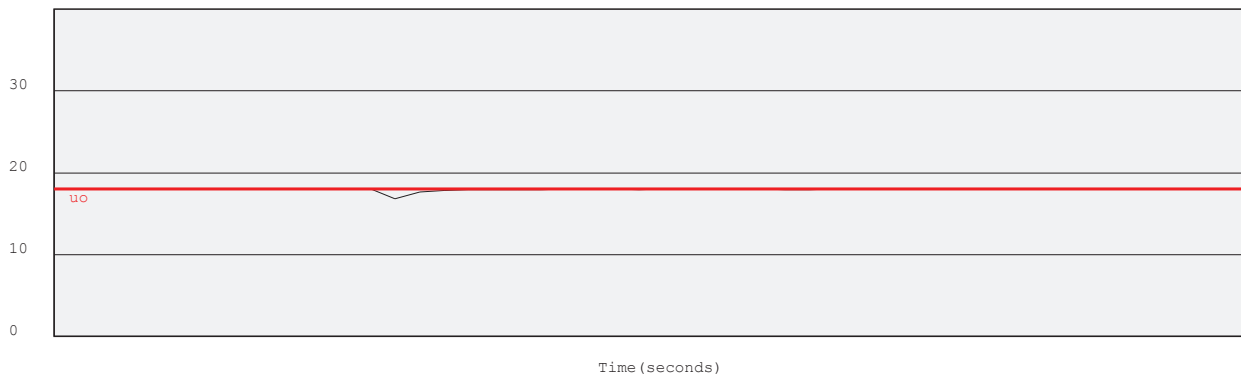
Probe: GHANA

Page: 1

(kPa) Dissipation at: 1.988m



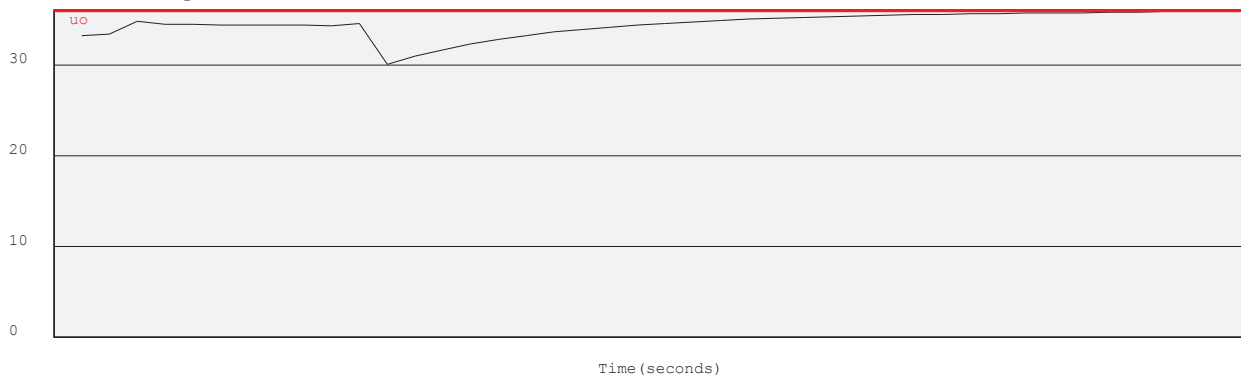
(kPa) Dissipation at: 2.987m



(kPa) Dissipation at: 3.981m



(kPa) Dissipation at: 4.979m



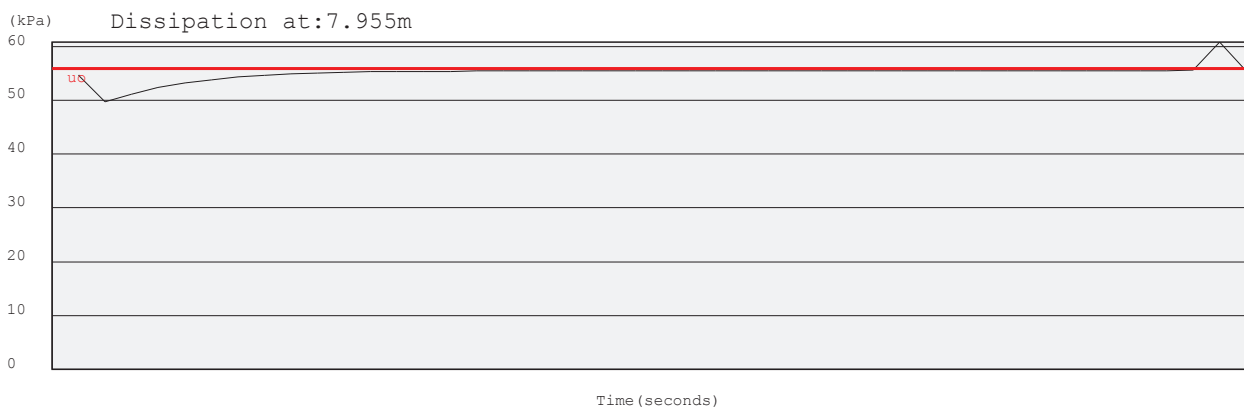
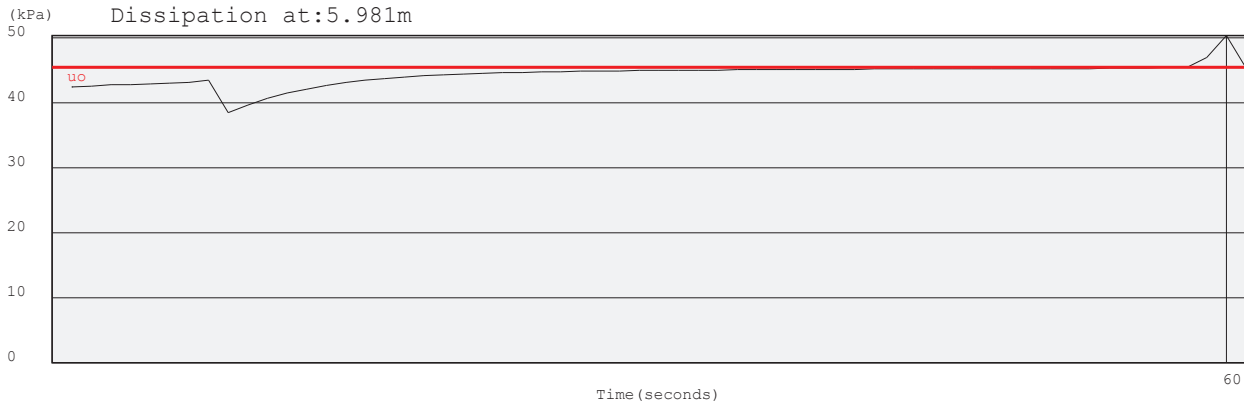
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.774' Lat: 031°00.782'

Hole: 47

Date: 2012-03-14

Probe: GHANA  
Page: 2



Project: Durban Harbour Land Based CPTu

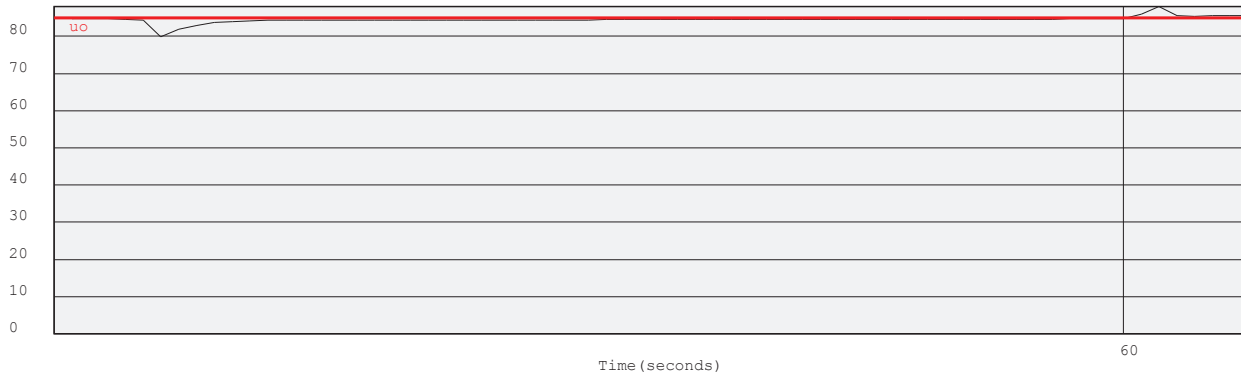
Site: Pier 2 Long: 29°52.774' Lat: 031°00.782'

Hole: 47

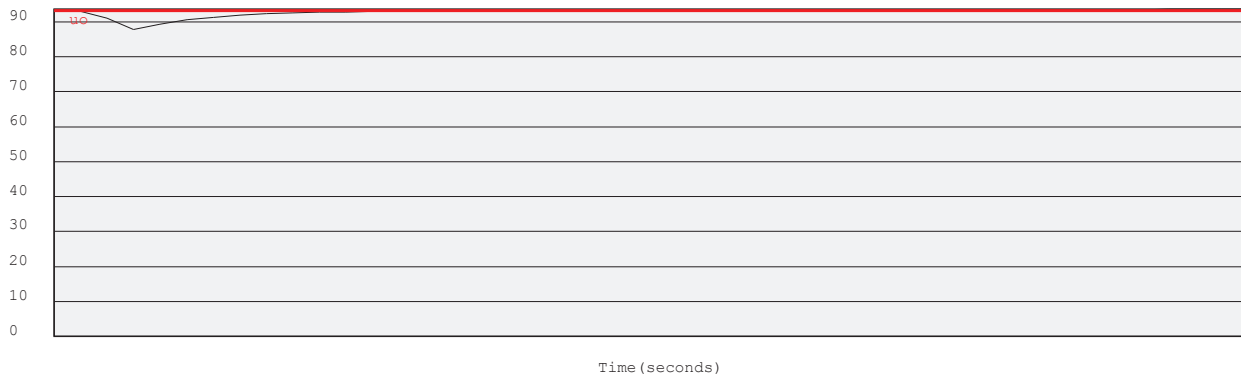
Date: 2012-03-14

Probe: GHANA  
Page: 3

(kPa) Dissipation at: 10.966m



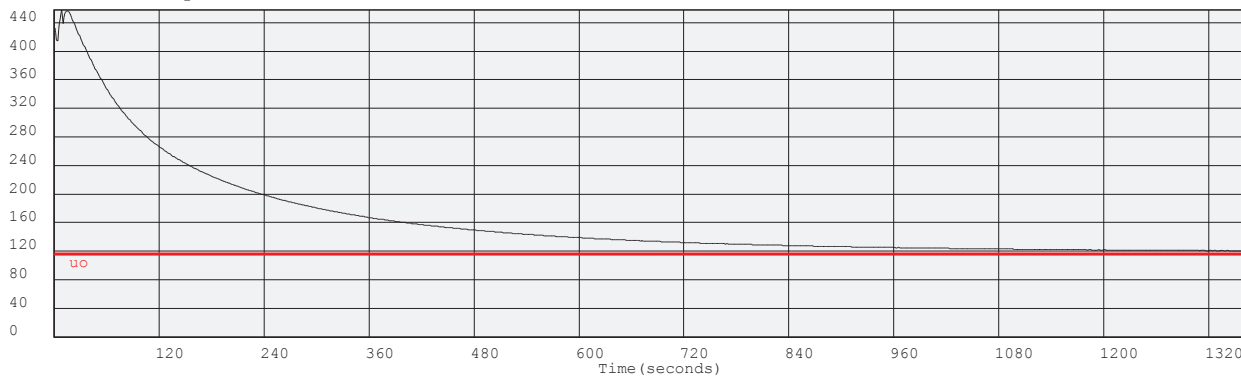
(kPa) Dissipation at: 11.967m



(kPa) Dissipation at: 12.961m



(kPa) Dissipation at: 13.955m



Project: Durban Harbour Land Based CPTu

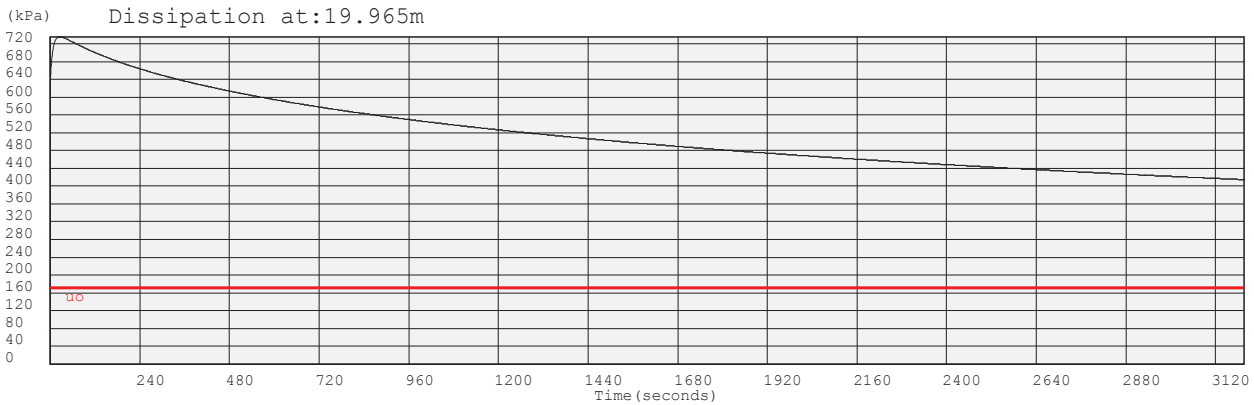
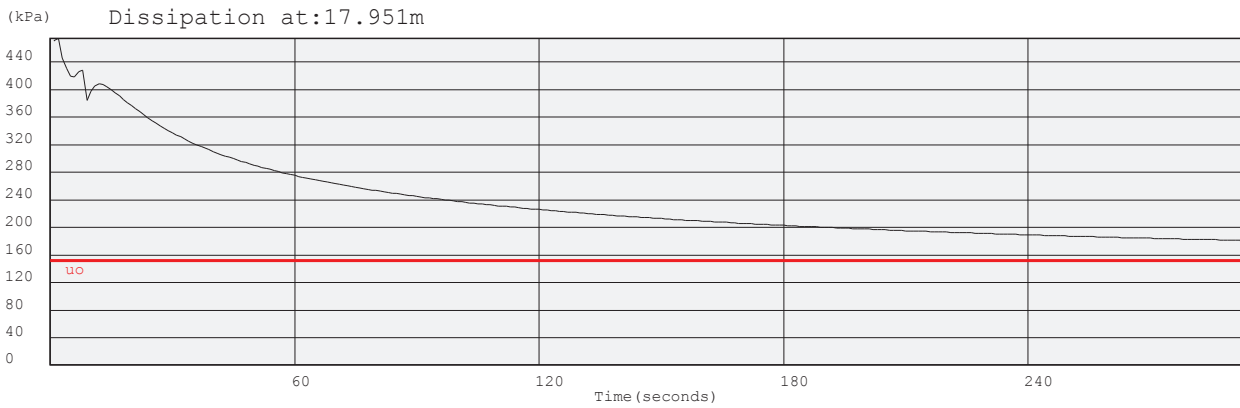
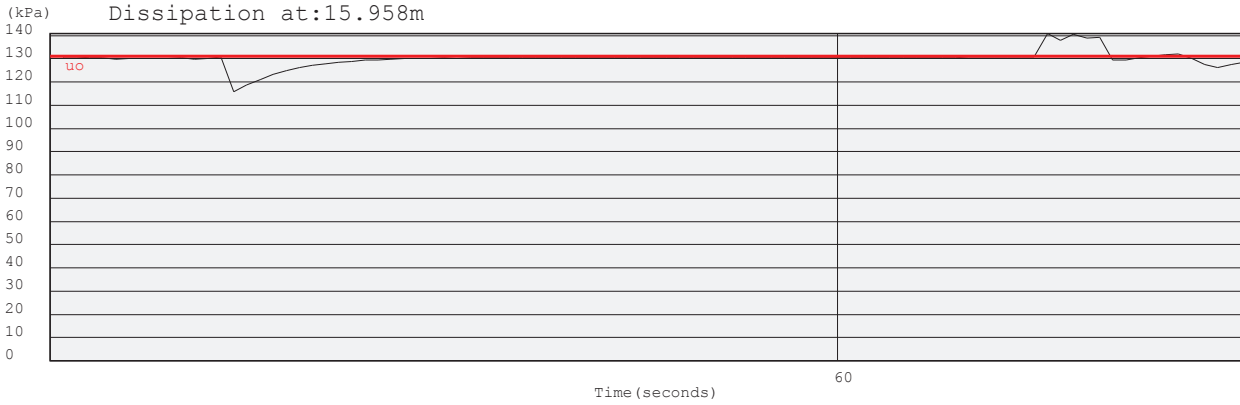
Site: Pier 2 Long: 29°52.774' Lat: 031°00.782'

Hole: 47

Date: 2012-03-14

Probe: GHANA

Page: 4





Project: Durban Harbour Land Based CPTu

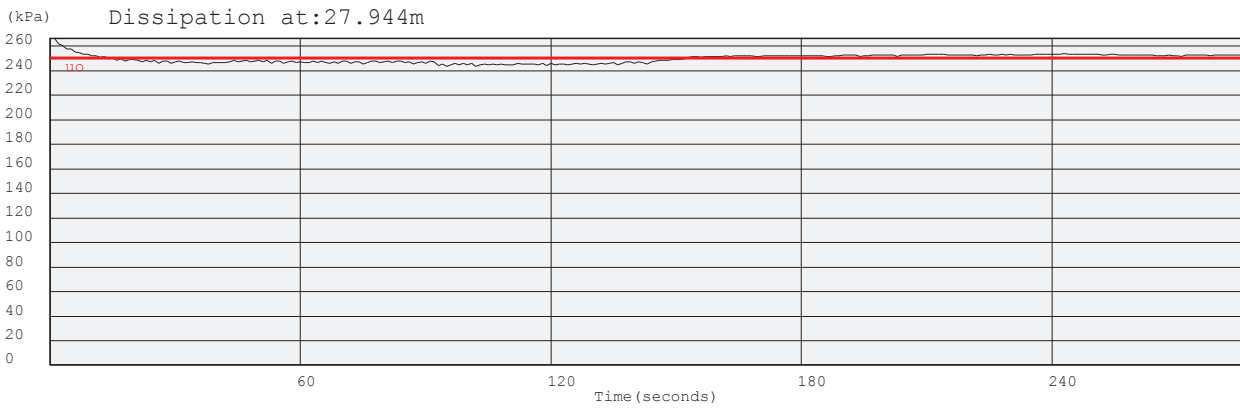
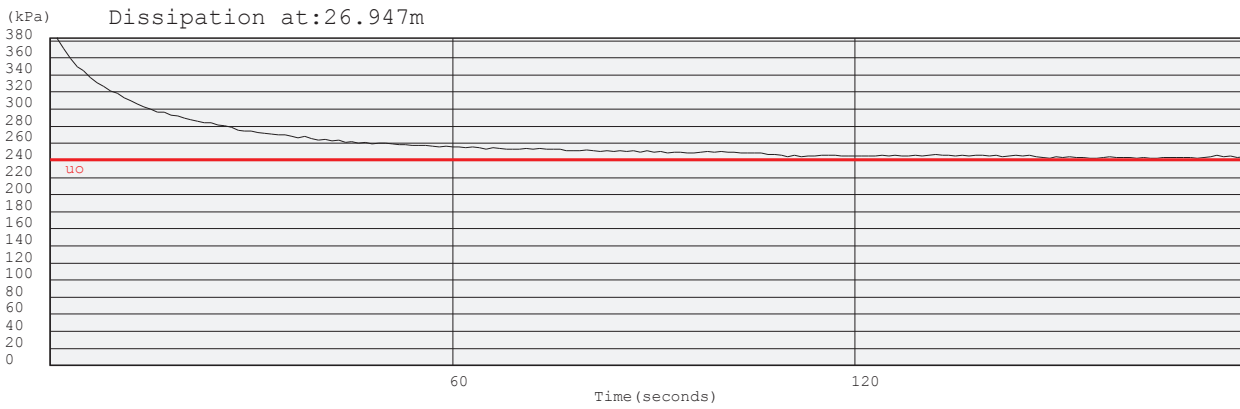
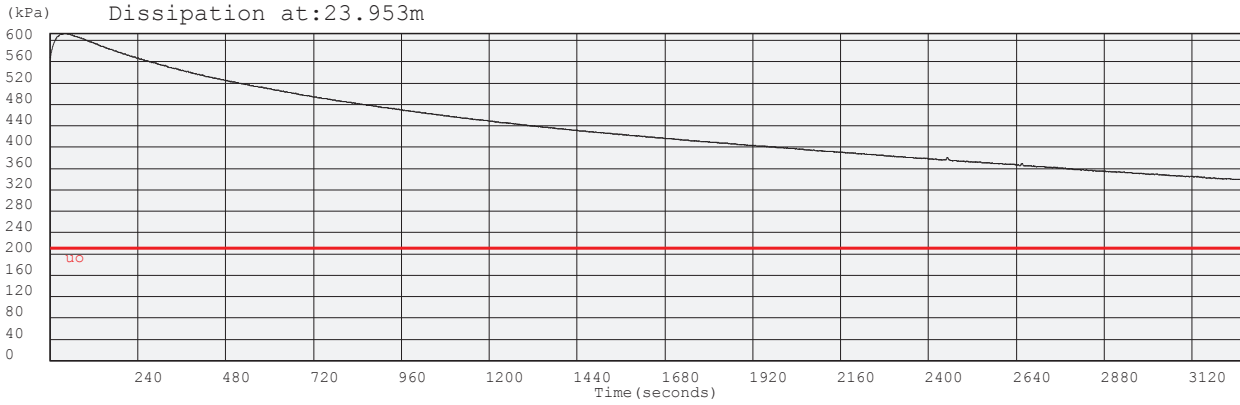
Site: Pier 2 Long: 29°52.774' Lat: 031°00.782'

Hole: 47

Date: 2012-03-14

Probe: GHANA

Page: 5



Project: Durban Harbour Land Based CPTu

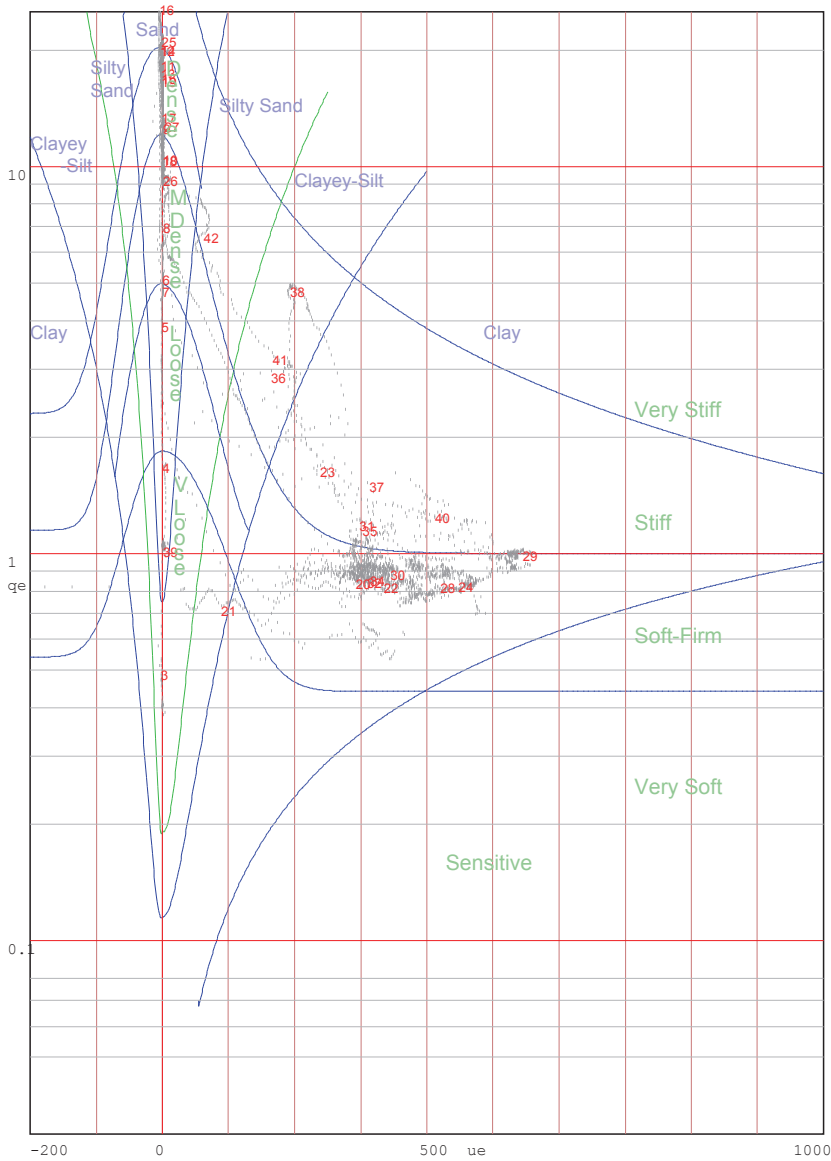
Site: Pier 2 Long:29°52.774' Lat:031°00.782'

Hole No: 47

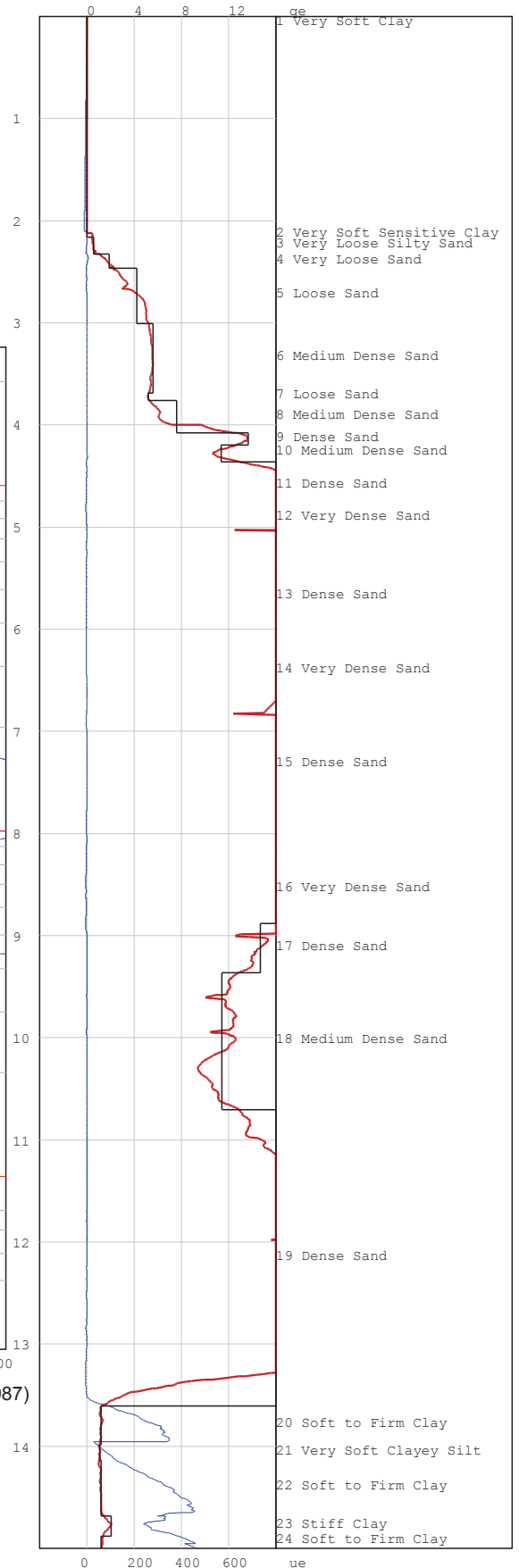
Date: 2012-03-14

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

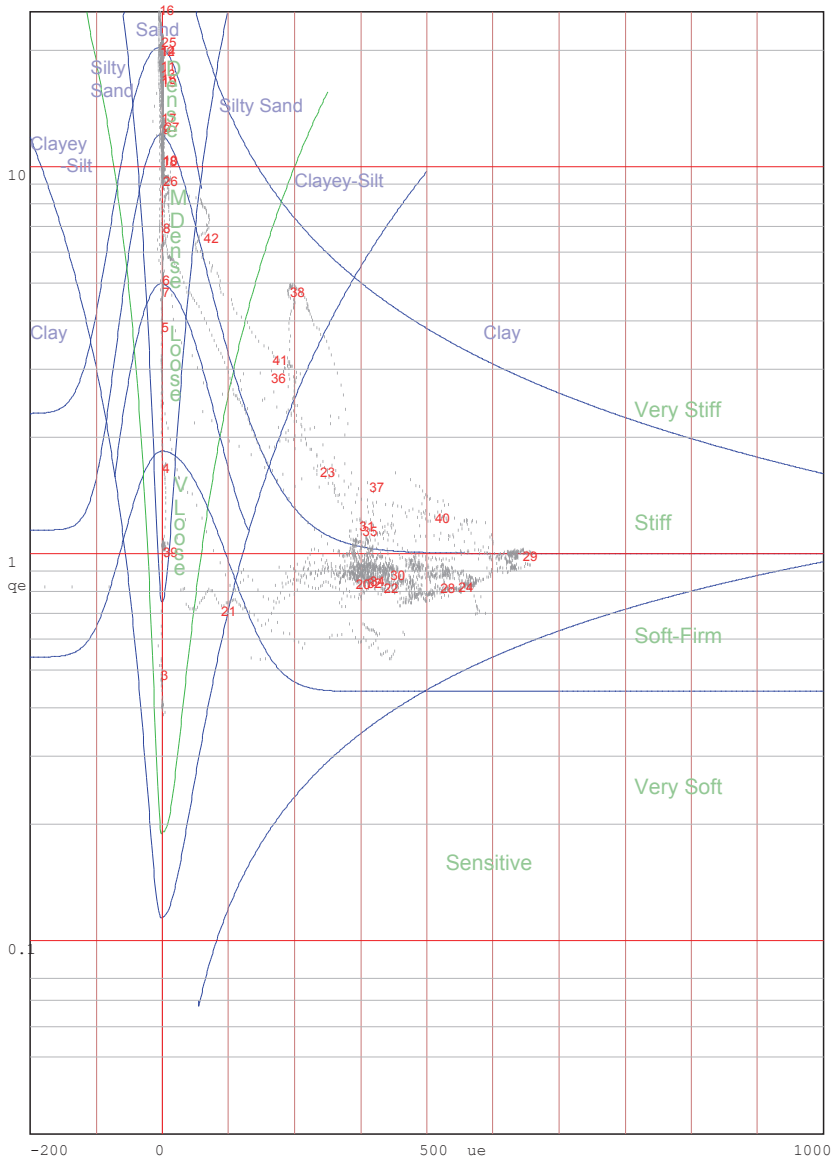
Site: Pier 2 Long:29°52.774' Lat:031°00.782'

Hole No: 47

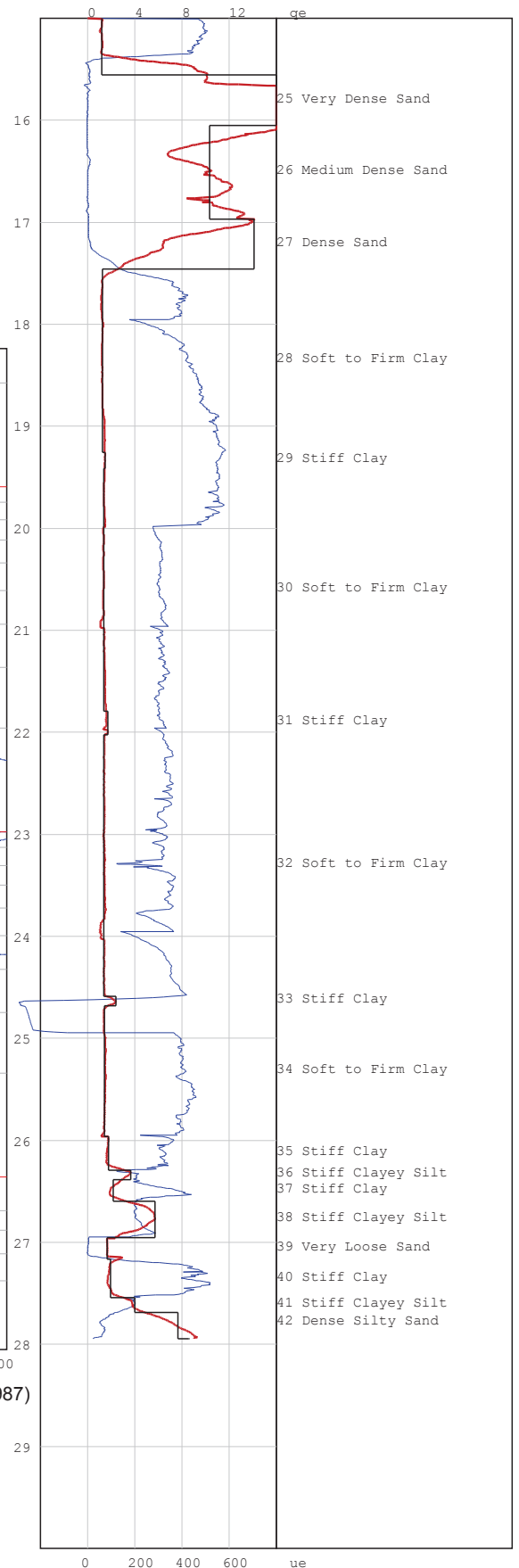
Date: 2012-03-14

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

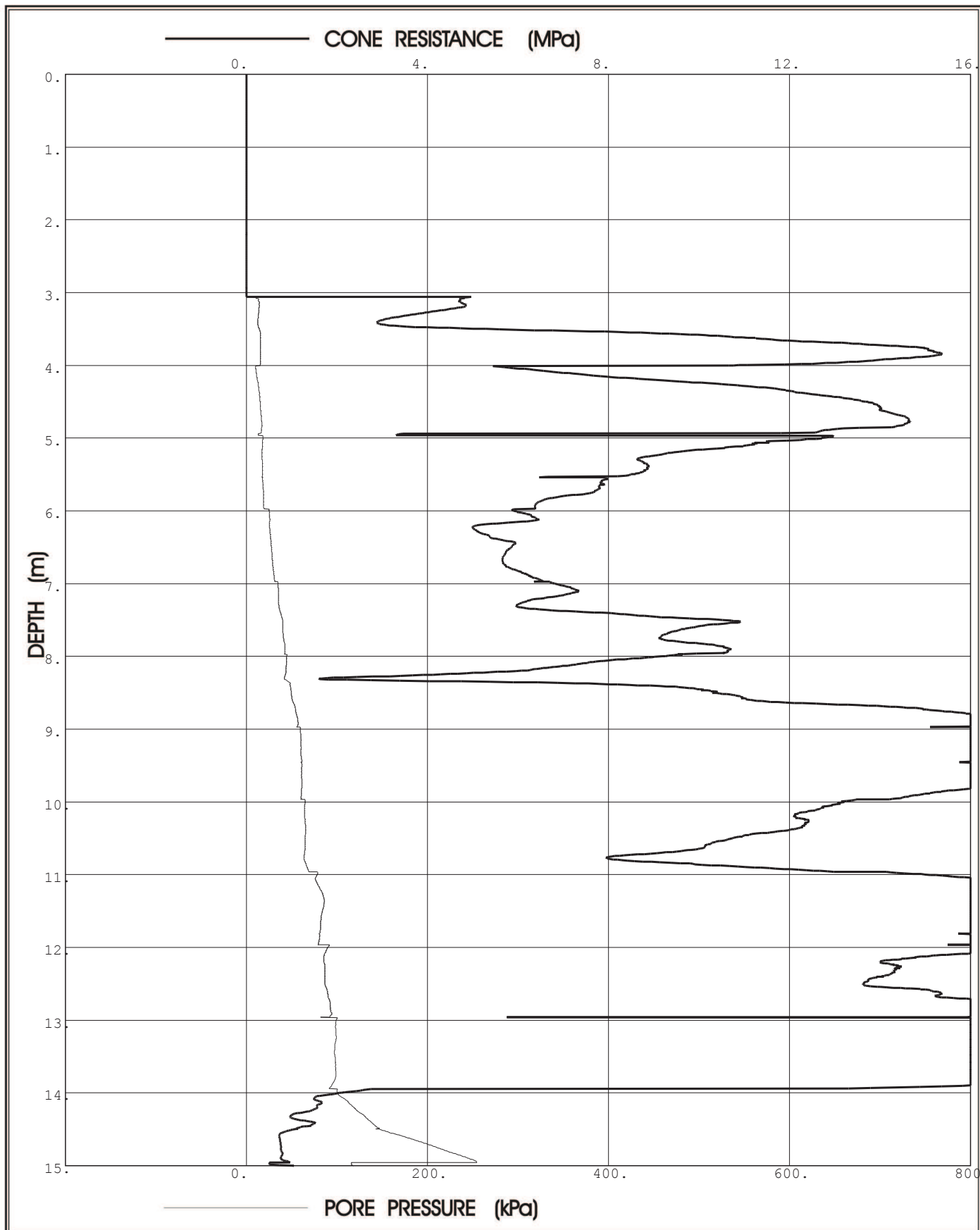
SITE: Pier 2 Long:29°52.772' Lat:031°00.804'

CPTU (RE): 48

DATE: 2012-03-15

Probe: GHANA

Page:1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

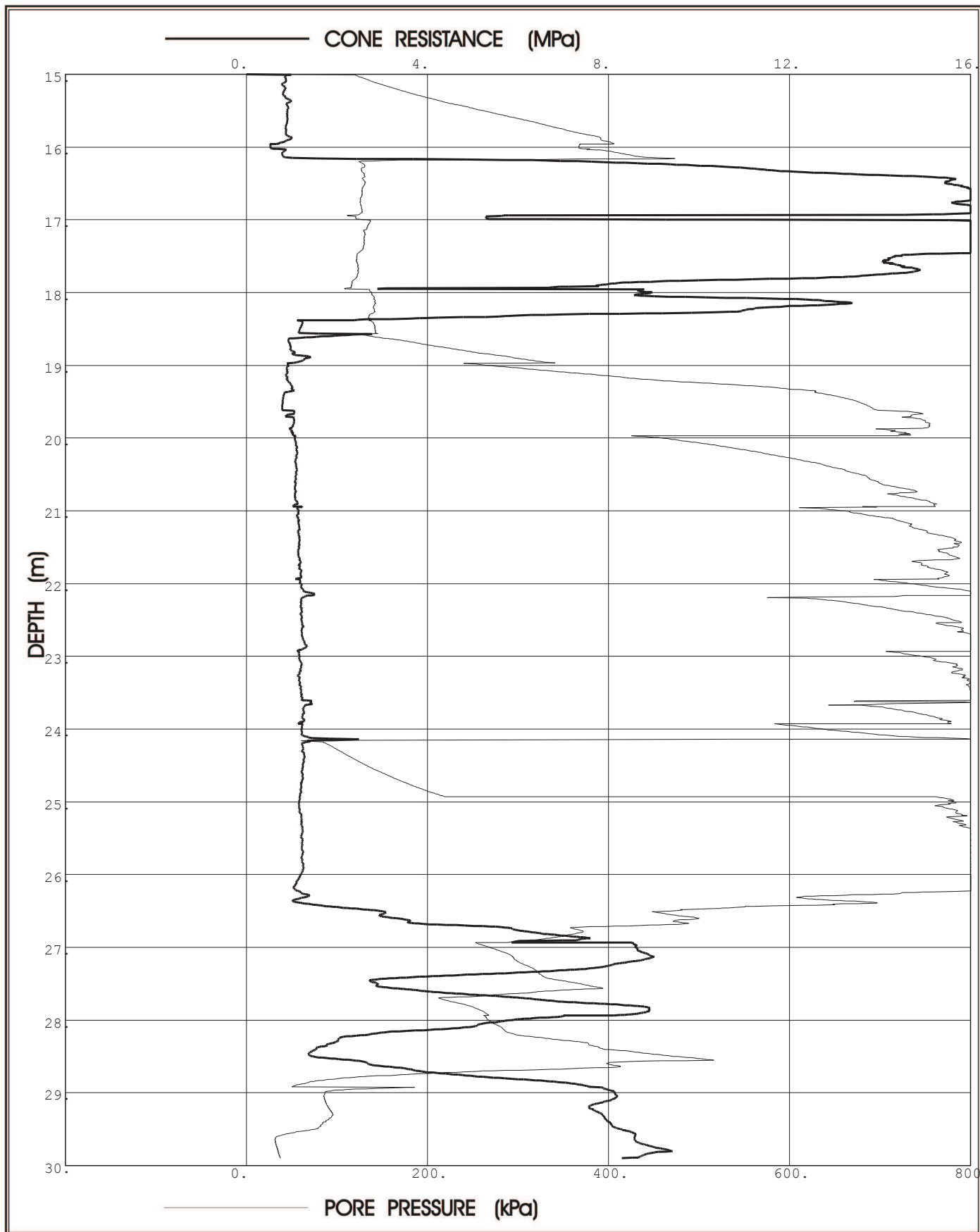
SITE: Pier 2 Long:29°52.772' Lat:031°00.804'

CPTU (RE): 48

DATE: 2012-03-15

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Page:2



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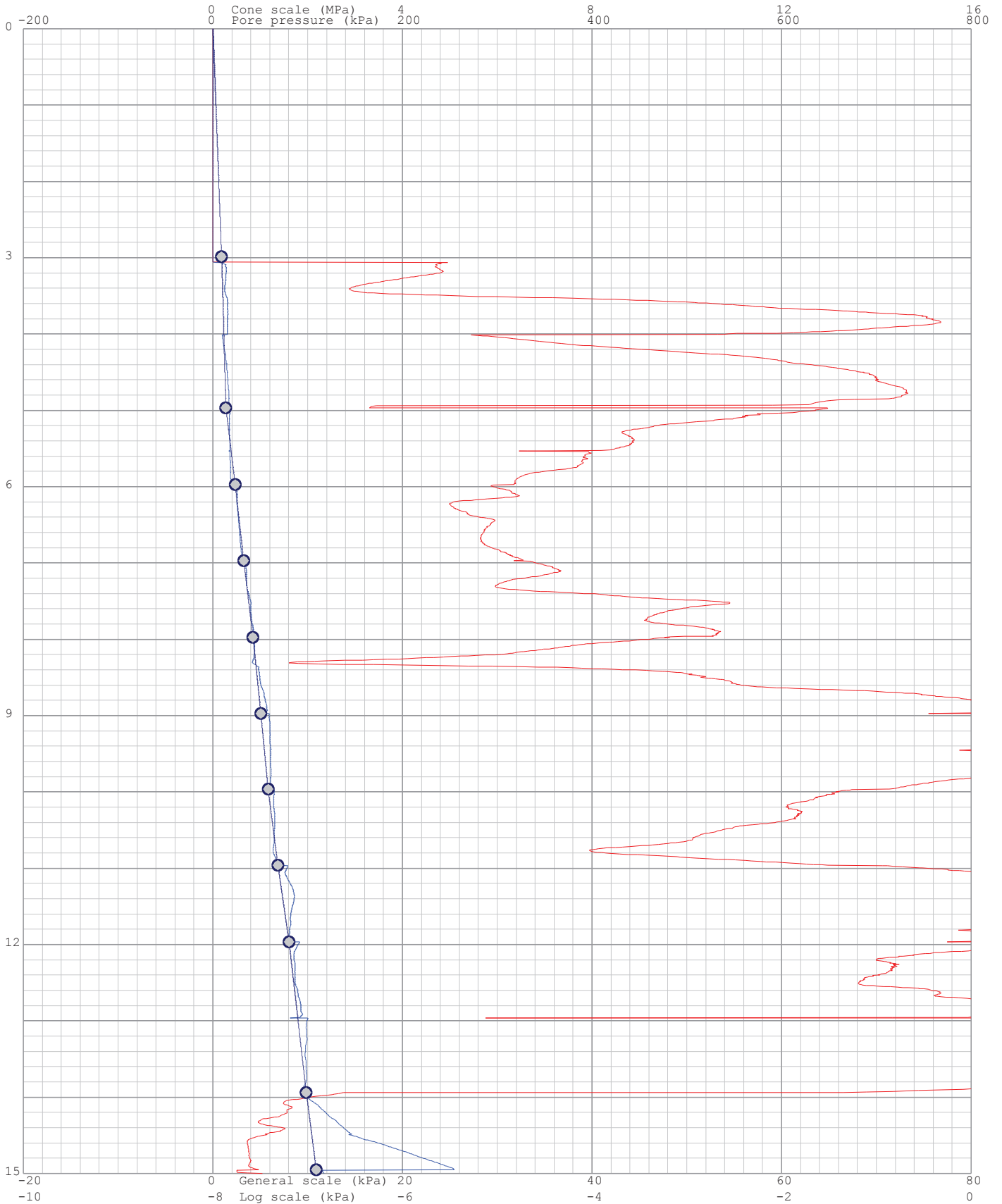
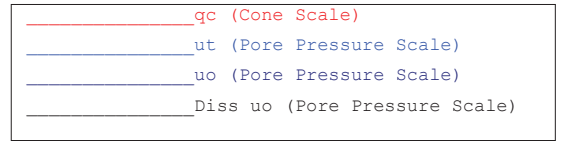
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.772' Lat:031°00.804'

Hole No: 48

Date: 2012-03-15

Probe: GHANA



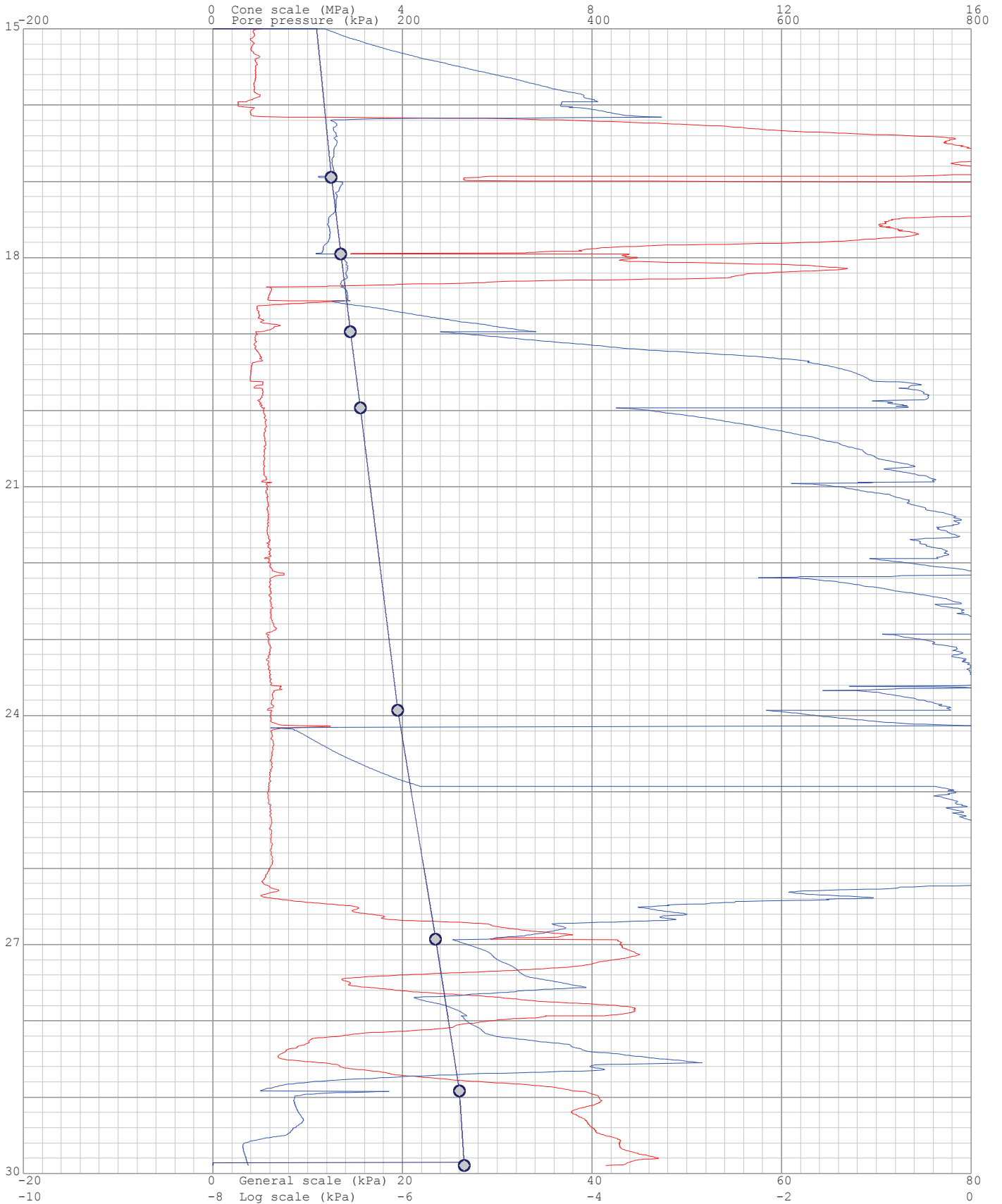
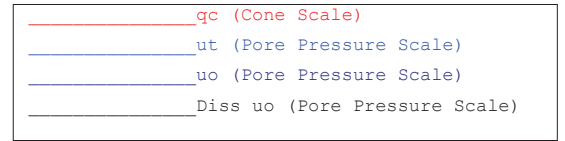
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.772' Lat:031°00.804'

Hole No: 48

Date: 2012-03-15

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.772' Lat: 031°00.804'

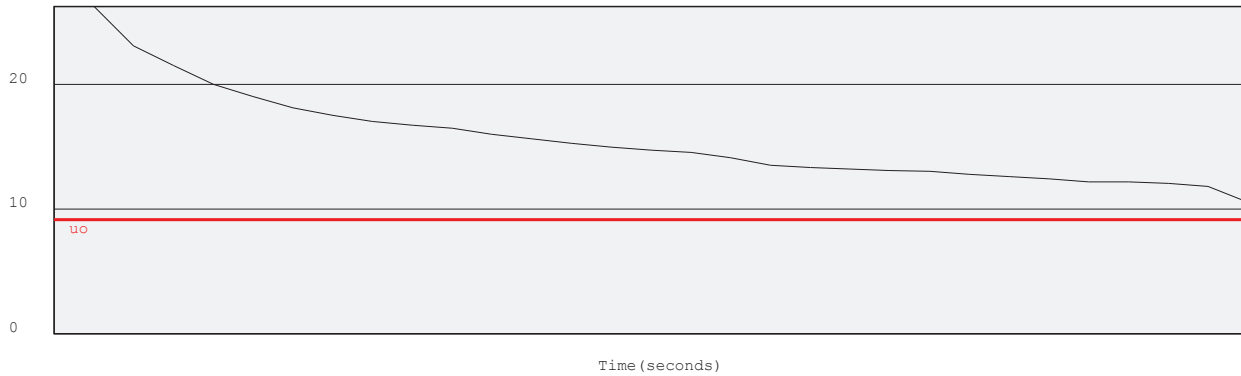
Hole: 48

Date: 2012-03-15

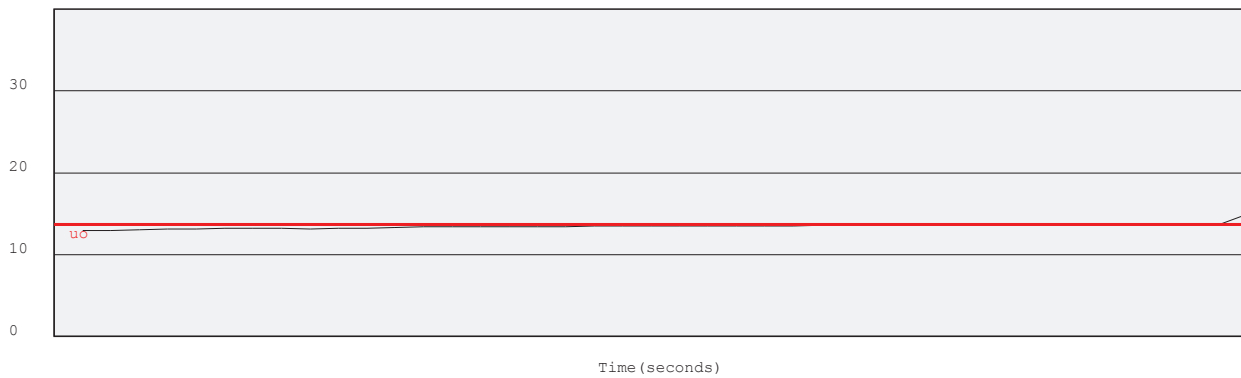
Probe: GHANA

Page: 1

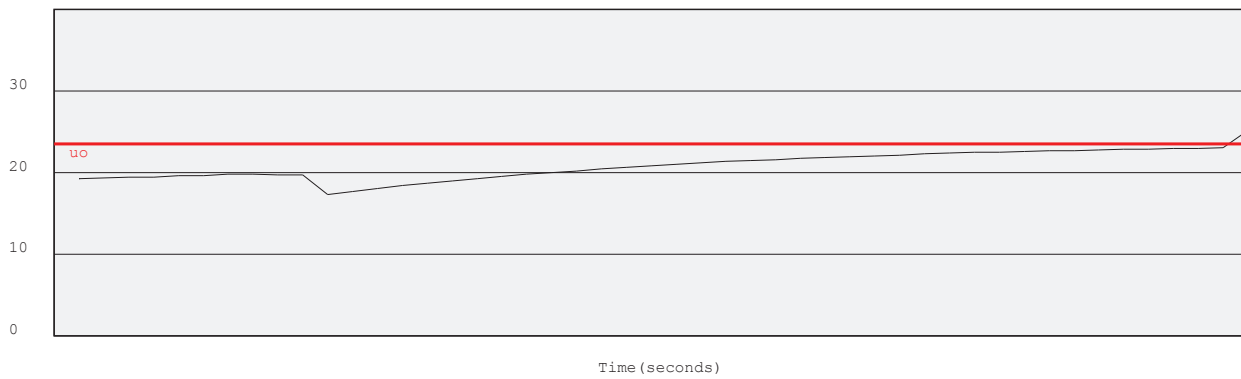
(kPa) Dissipation at: 2.983m



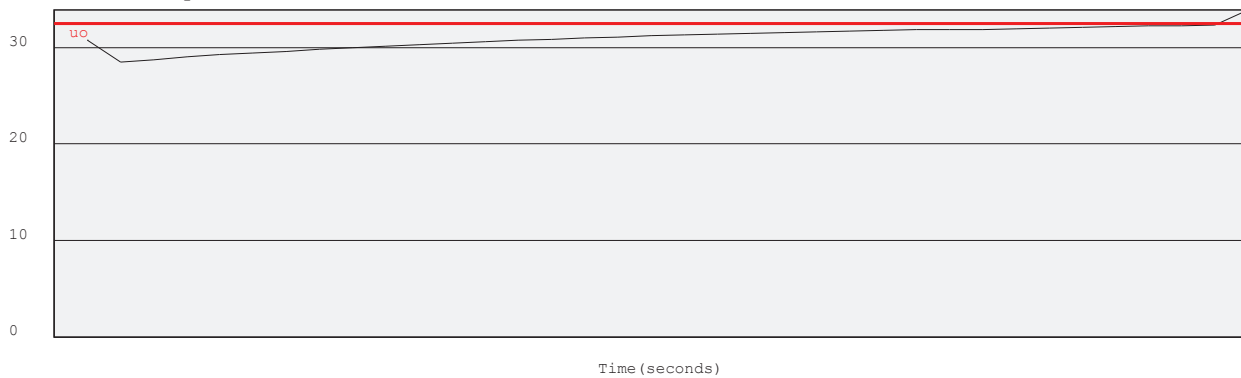
(kPa) Dissipation at: 4.964m



(kPa) Dissipation at: 5.974m



(kPa) Dissipation at: 6.972m





Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.772' Lat: 031°00.804'

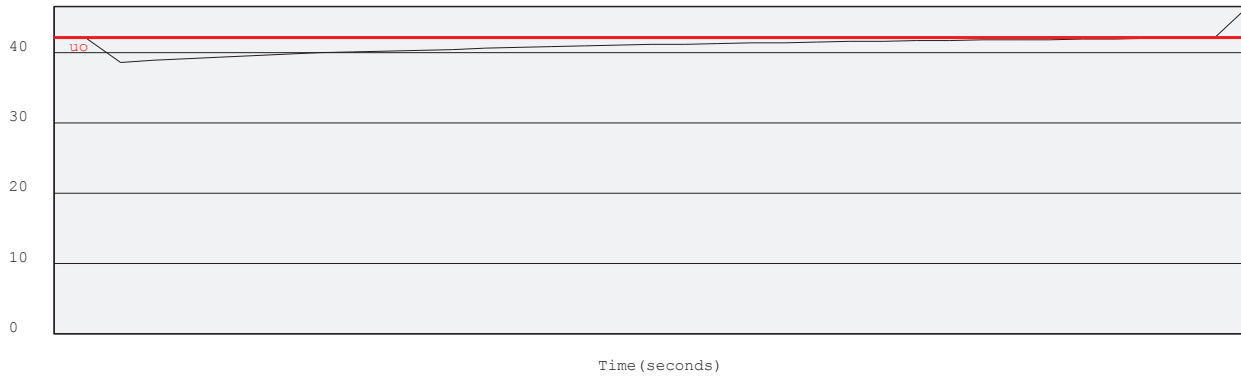
Hole: 48

Date: 2012-03-15

Probe: GHANA

Page: 2

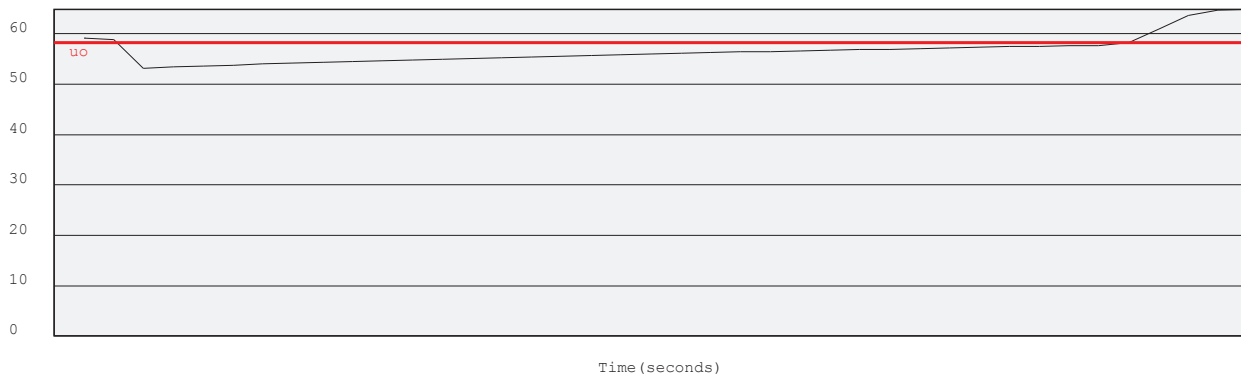
(kPa) Dissipation at: 7.971m



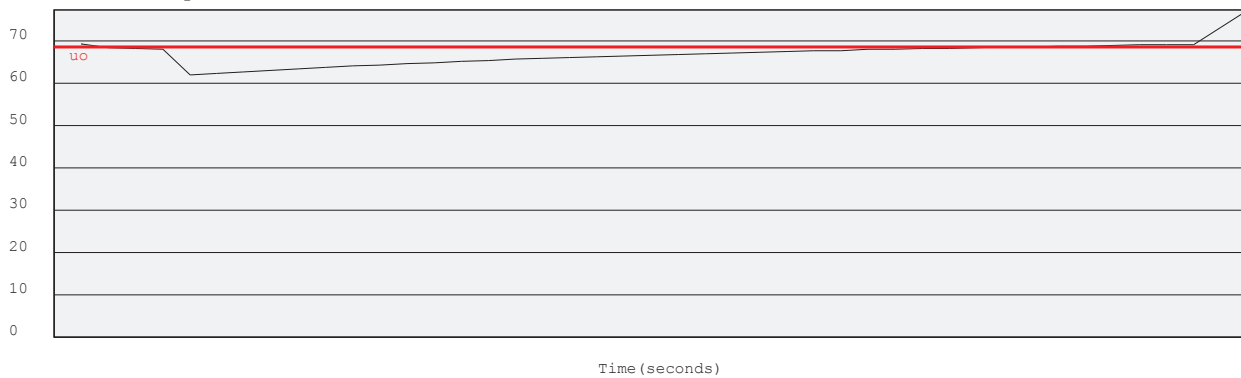
(kPa) Dissipation at: 8.97m



(kPa) Dissipation at: 9.965m



(kPa) Dissipation at: 10.961m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.772' Lat: 031°00.804'

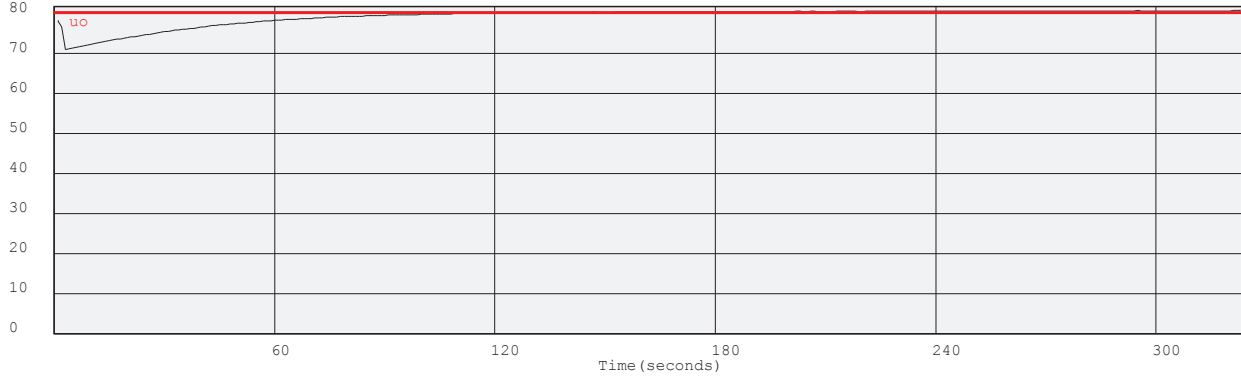
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Date: 2012-03-15

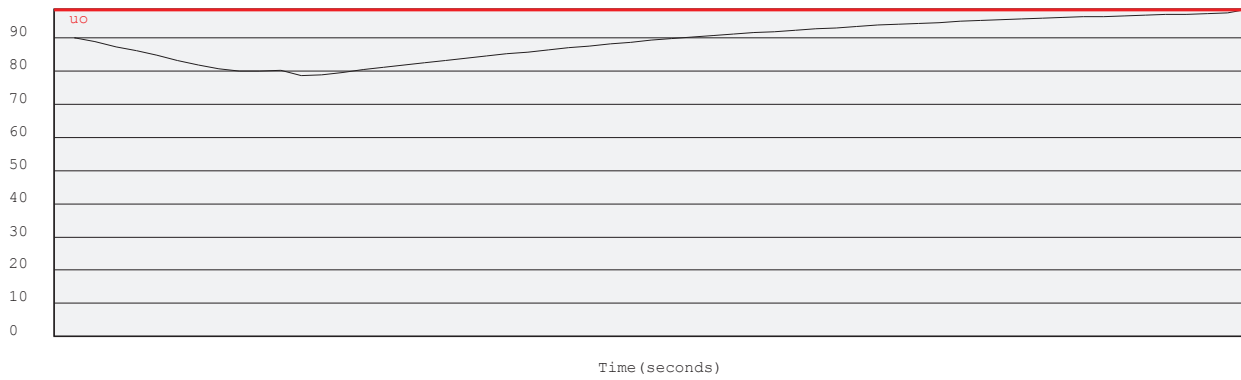
Probe: GHANA

Page: 3

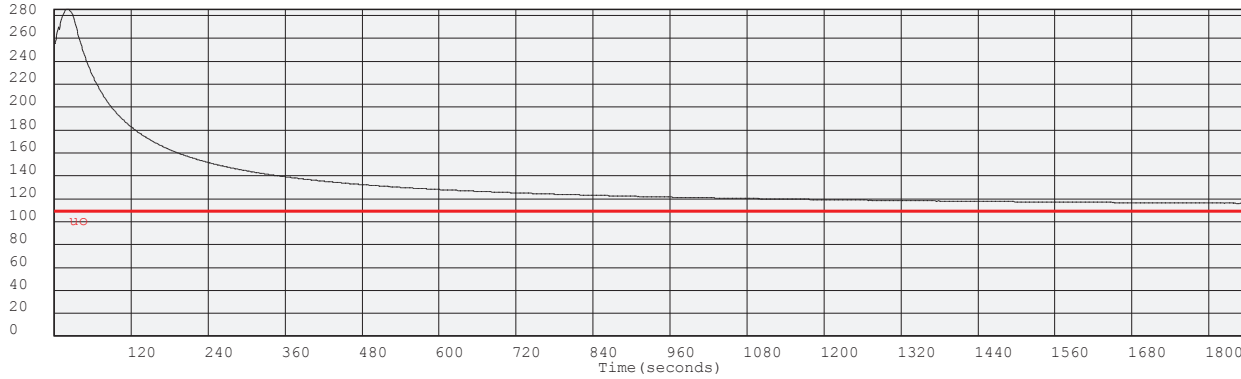
(kPa) Dissipation at: 11.963m



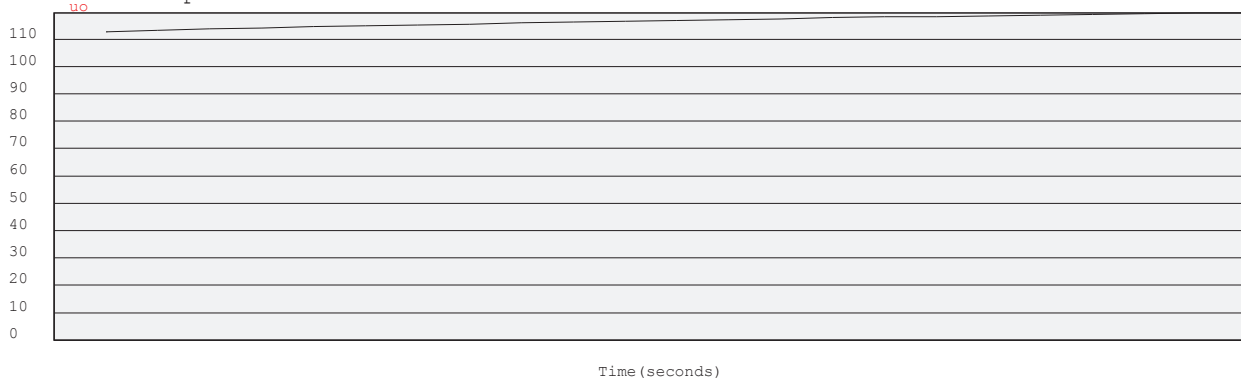
(kPa) Dissipation at: 13.939m



(kPa) Dissipation at: 14.953m



(kPa) Dissipation at: 16.949m



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.772' Lat: 031°00.804'

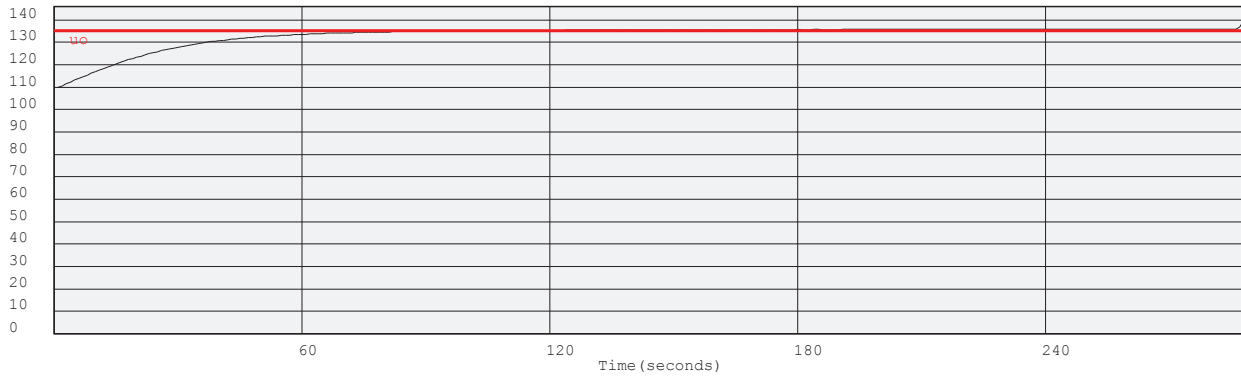
Hole: 48

Date: 2012-03-15

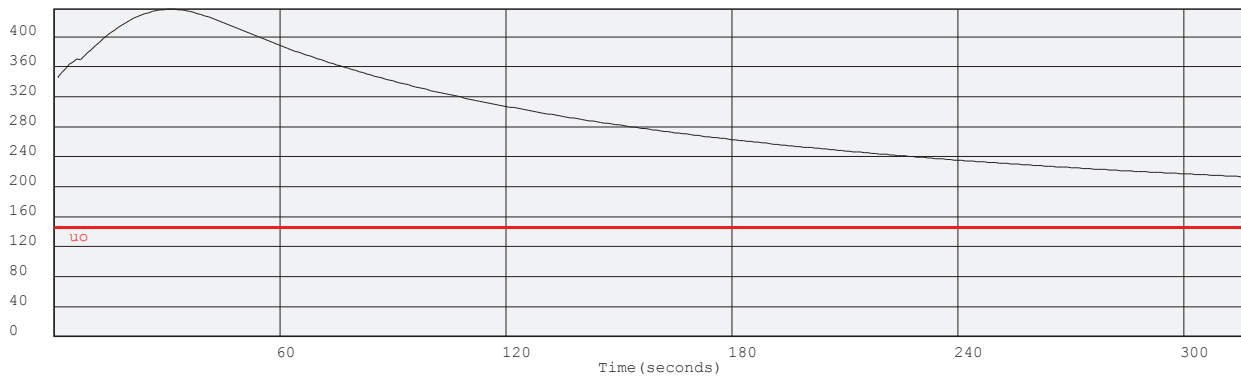
Probe: GHANA

Page: 4

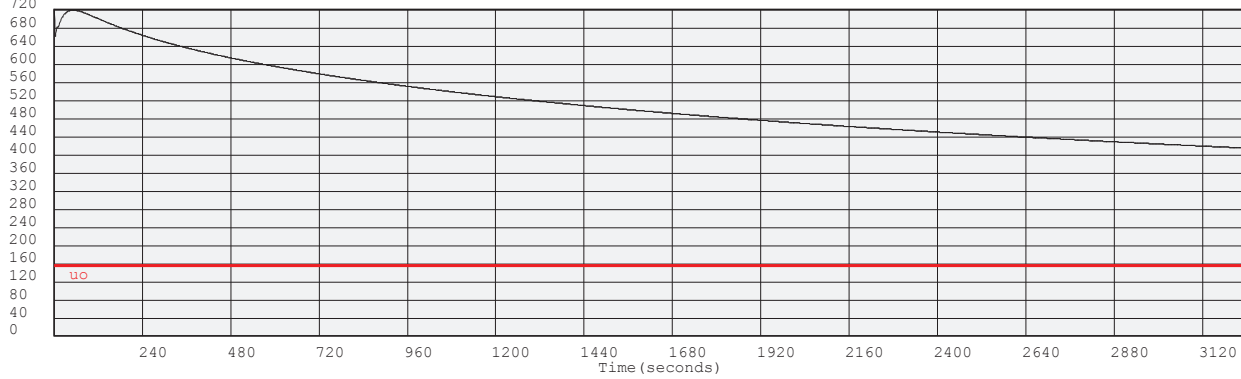
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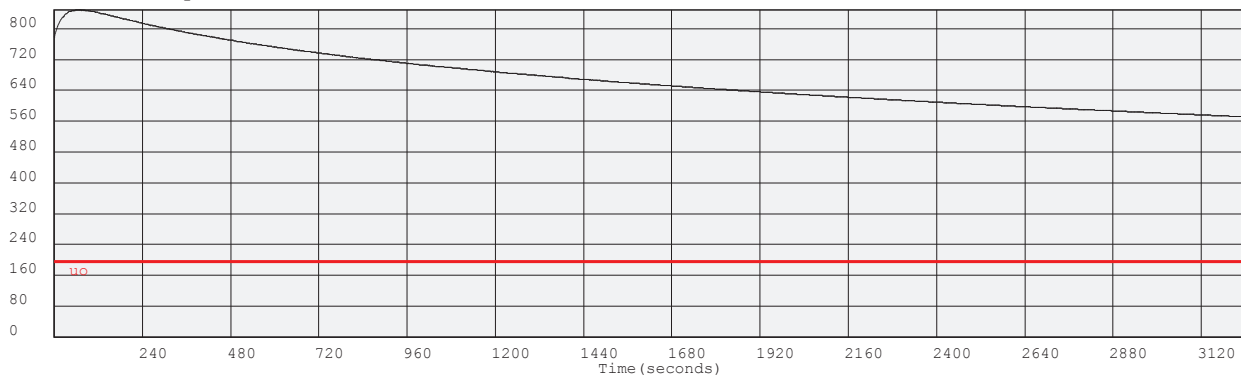
(kPa) Dissipation at: 18.968m



(kPa) Dissipation at: 19.965m



(kPa) Dissipation at: 23.927m



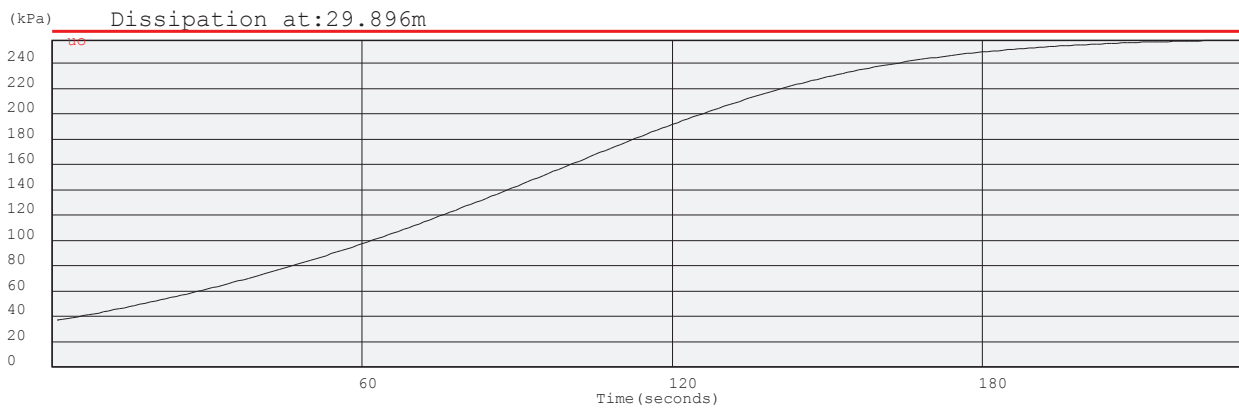
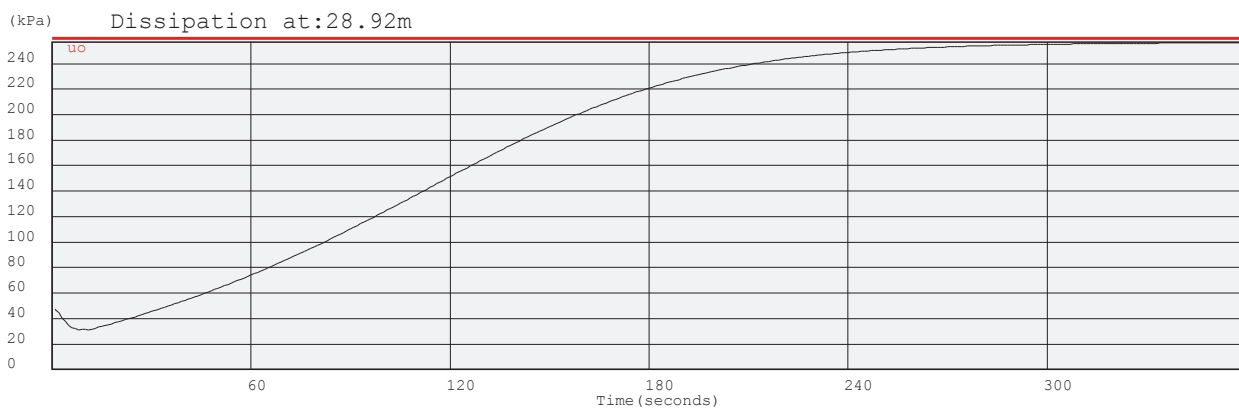
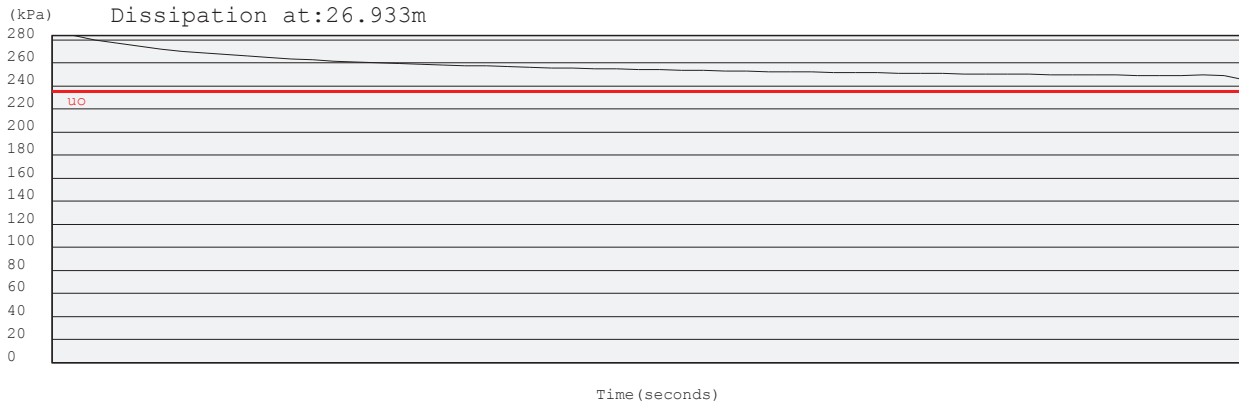
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.772' Lat: 031°00.804'

Hole: 48

Date: 2012-03-15

Probe: GHANA  
Page: 5



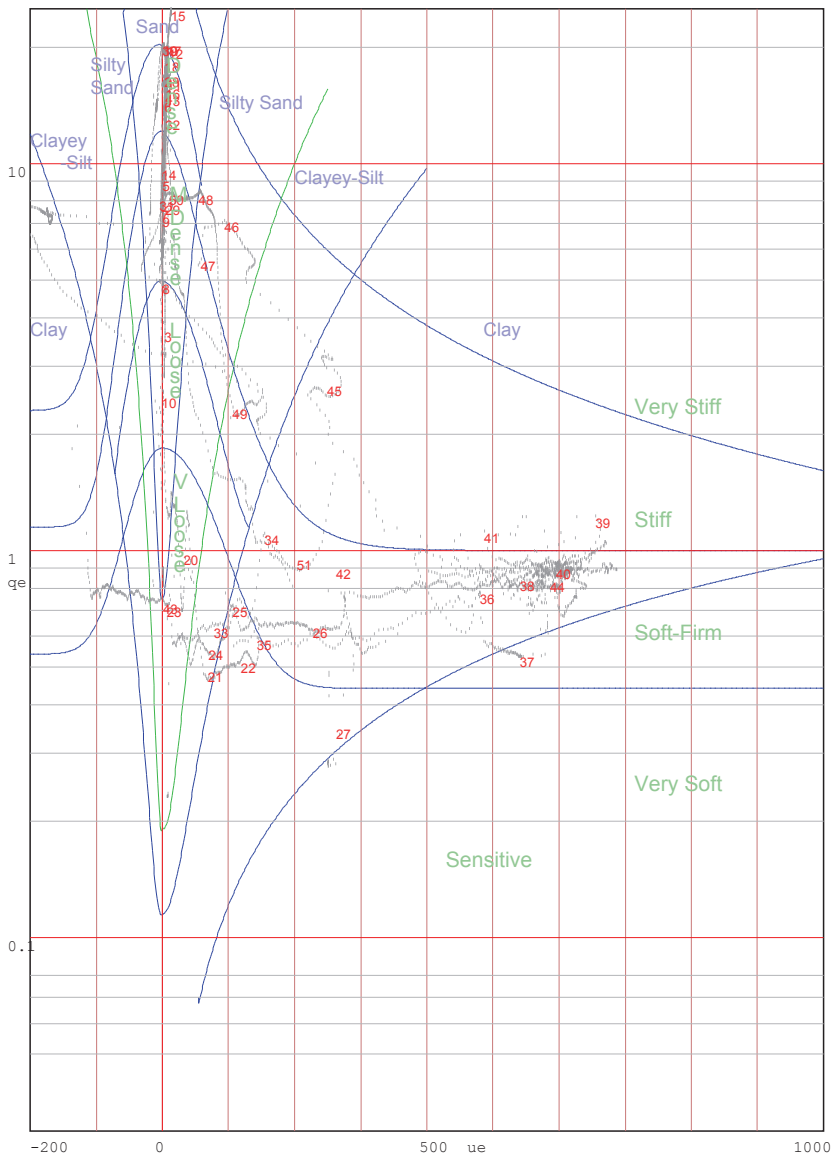
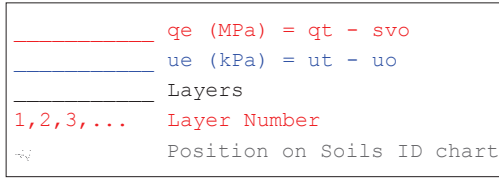
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.772' Lat:031°00.804'

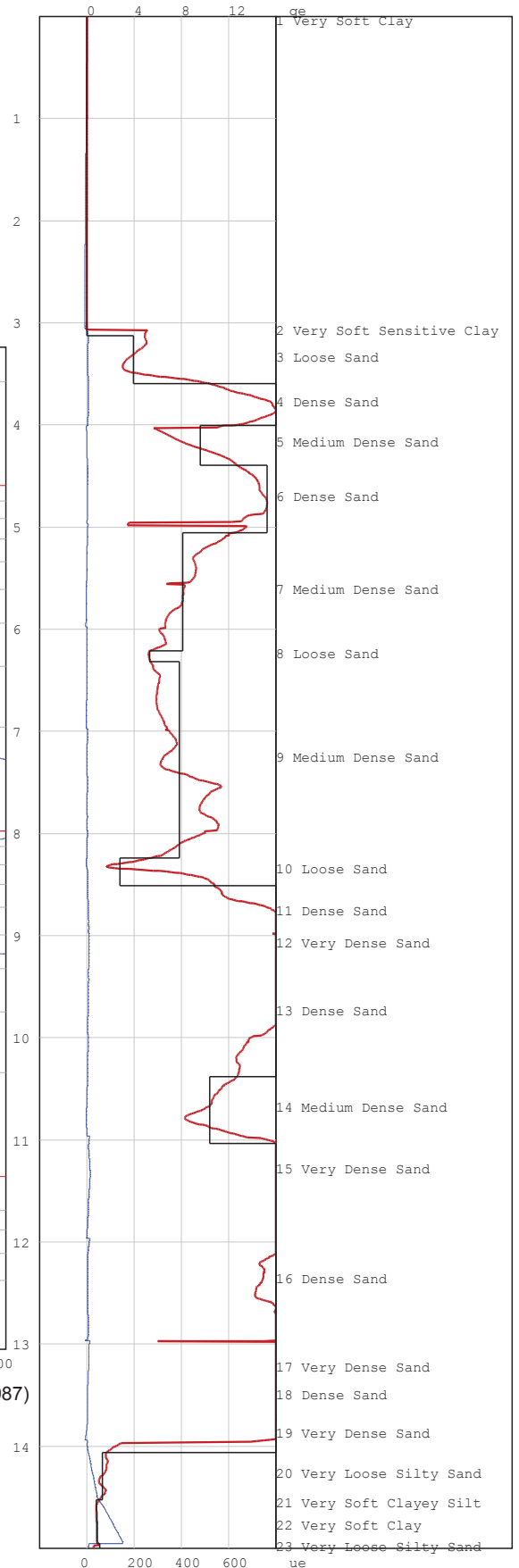
Hole No: 48

Date: 2012-03-15

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

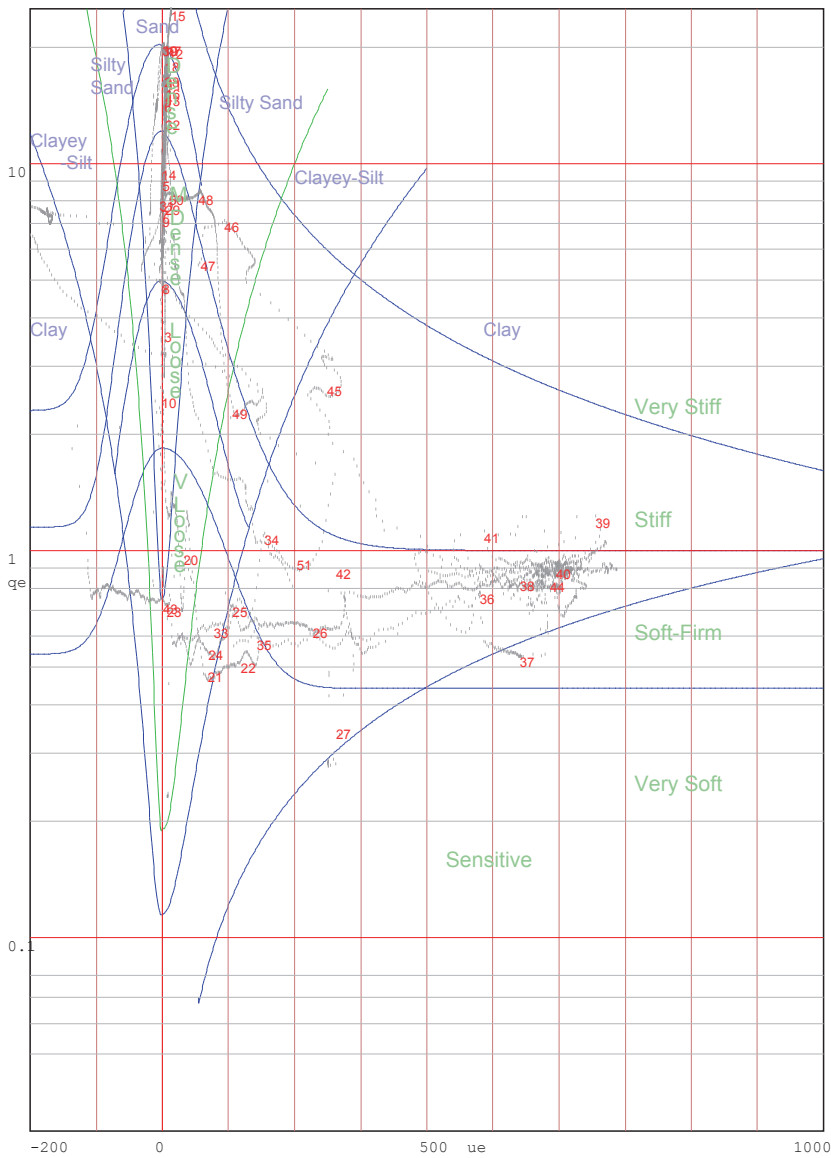
Site: Pier 2 Long:29°52.772' Lat:031°00.804'

Core No: 48

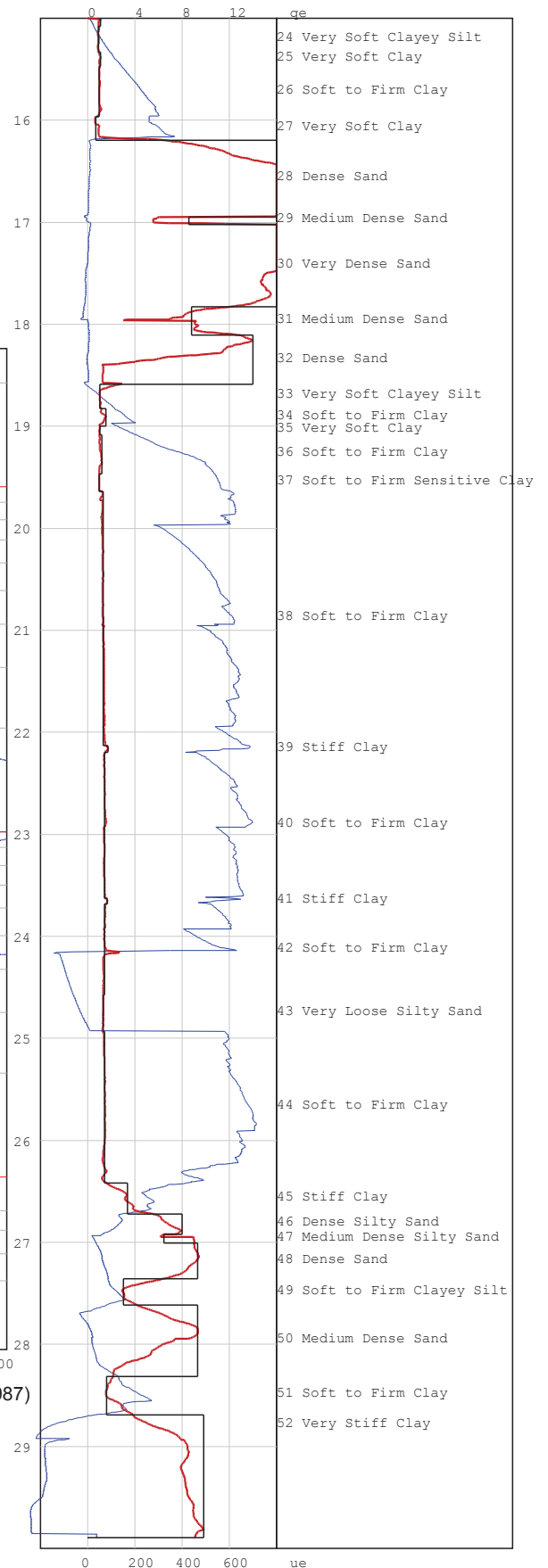
Date: 2012-03-15

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

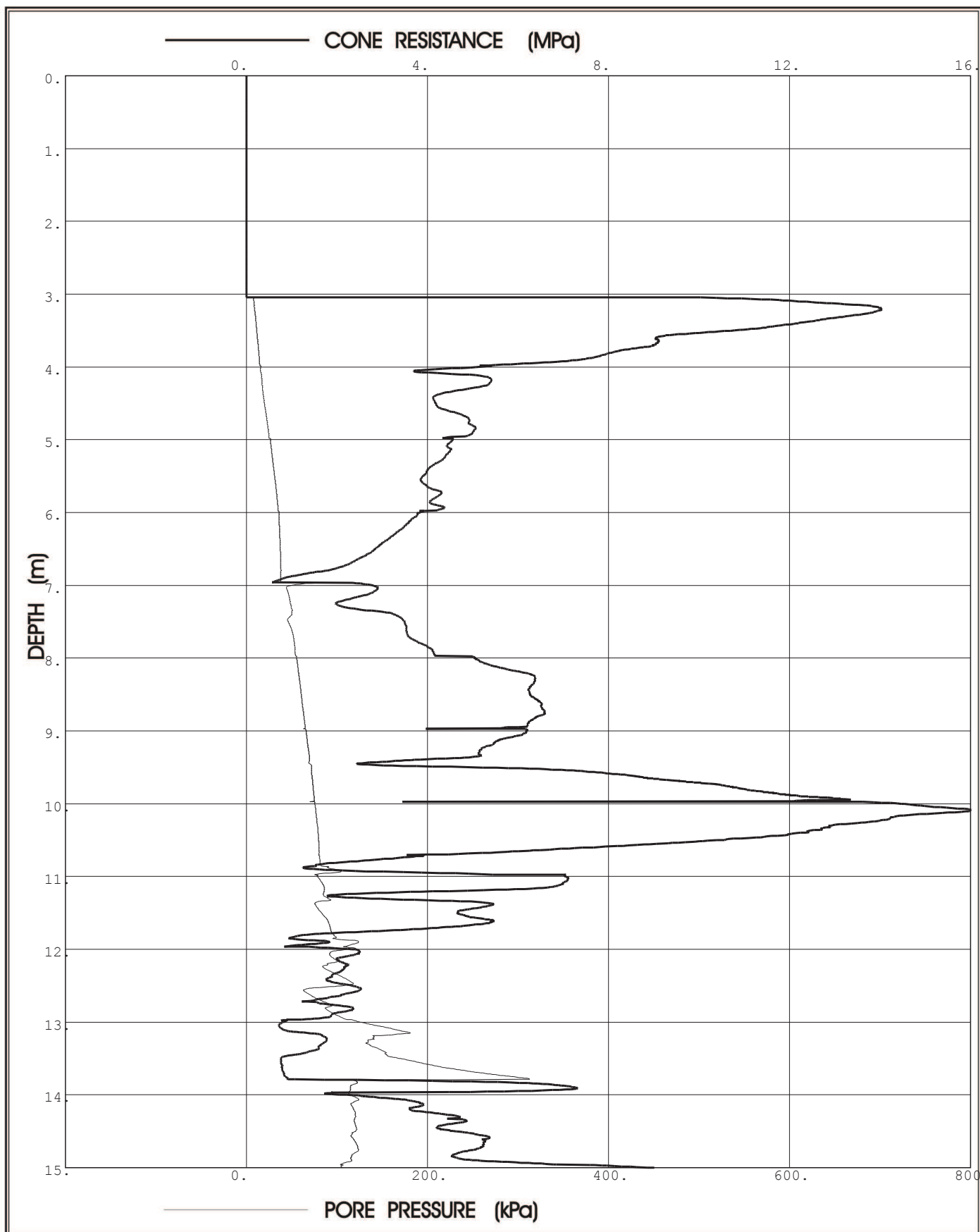
SITE: Pier 2 Long:29°52.774' Lat:031°00.813'

CPTU (RE): 49

DATE: 2012/03/16

Probe: KELLER

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

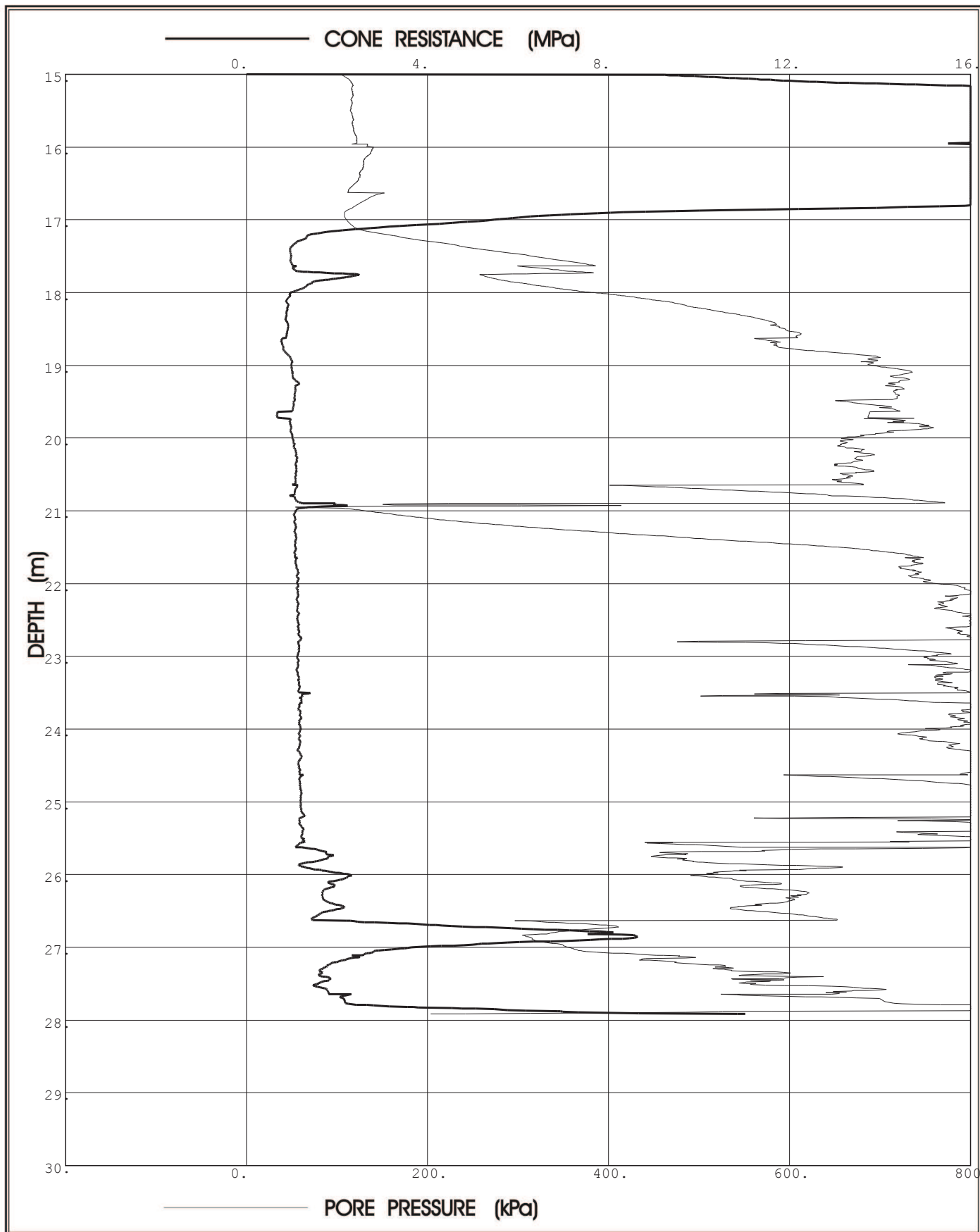
SITE: Pier 2 Long:29°52.774' Lat:031°00.813'

CPTU (RE): 49

DATE: 2012/03/16

Probe: KELLER

Page:2



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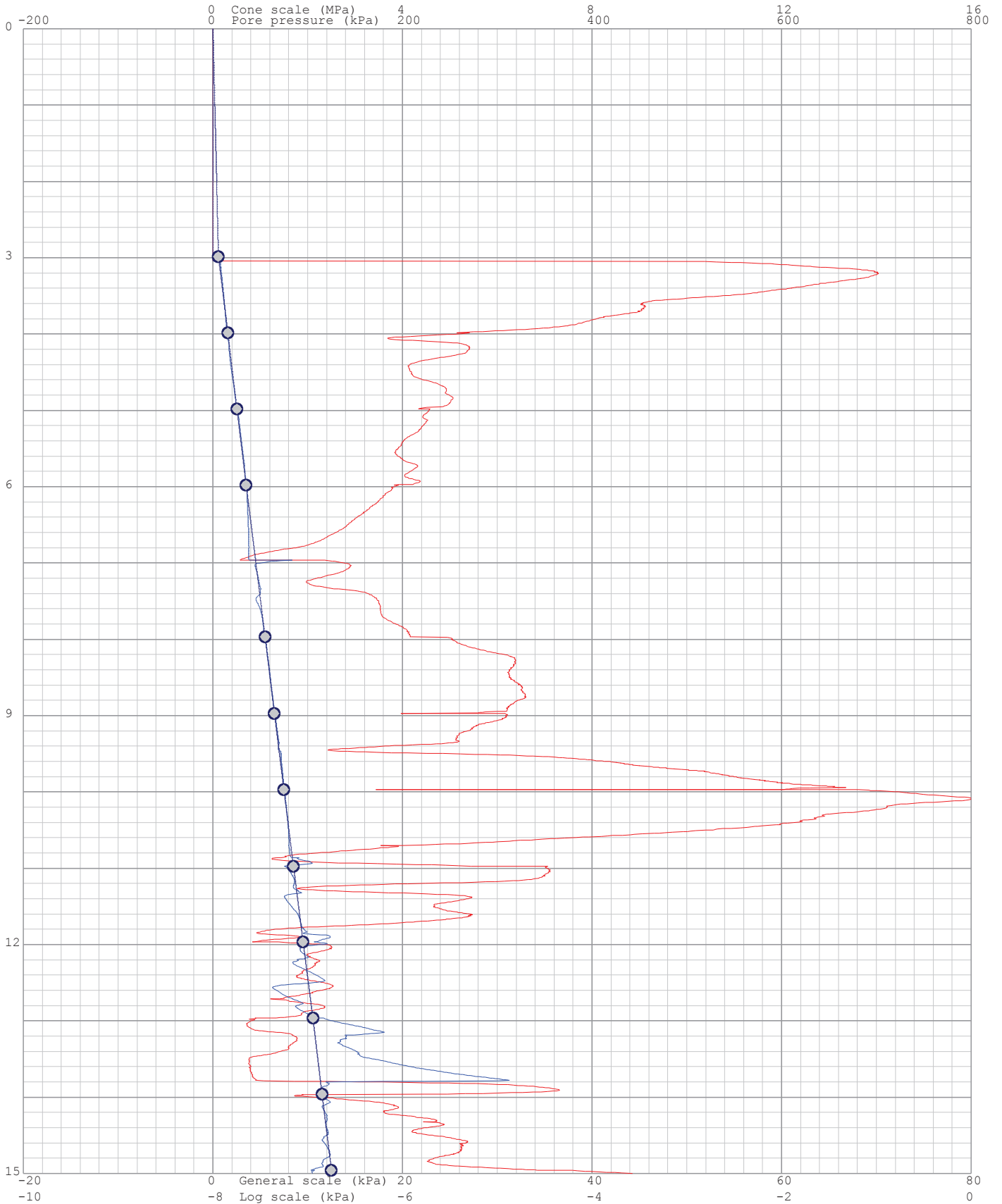
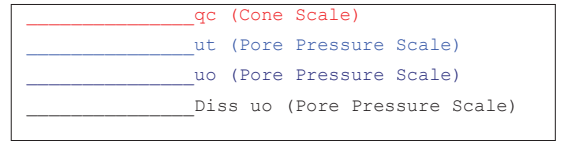
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.774' Lat:031°00.813'

Hole No: 49

Date: 2012/03/16

Probe: KELLER



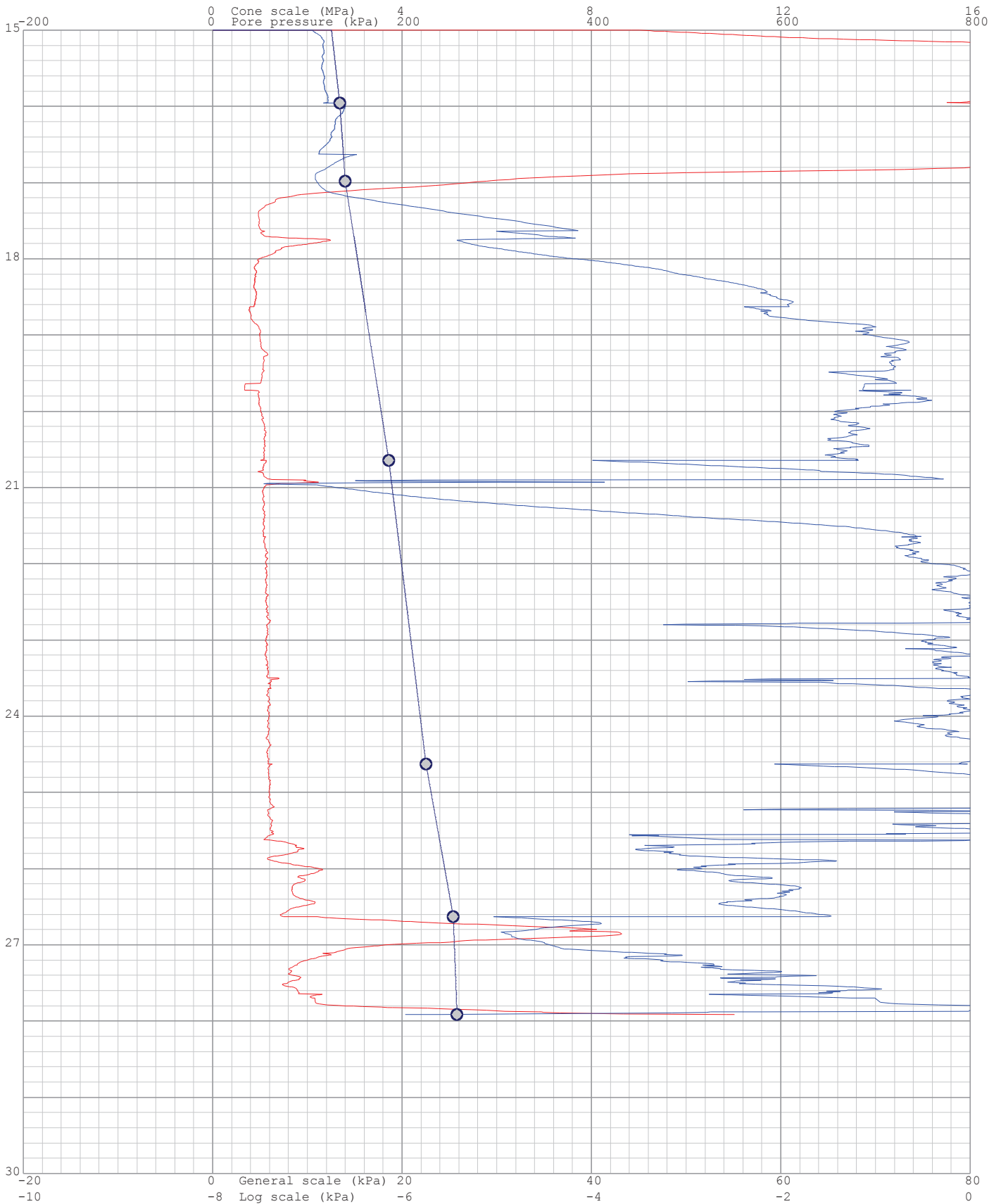
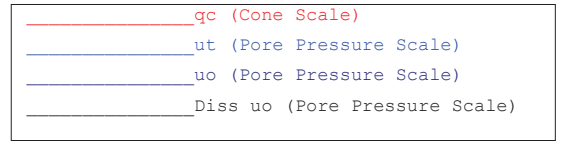
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.774' Lat:031°00.813'

Hole No: 49

Date: 2012/03/16

Probe: KELLER



Project: Durban Harbour Land Based CPTu

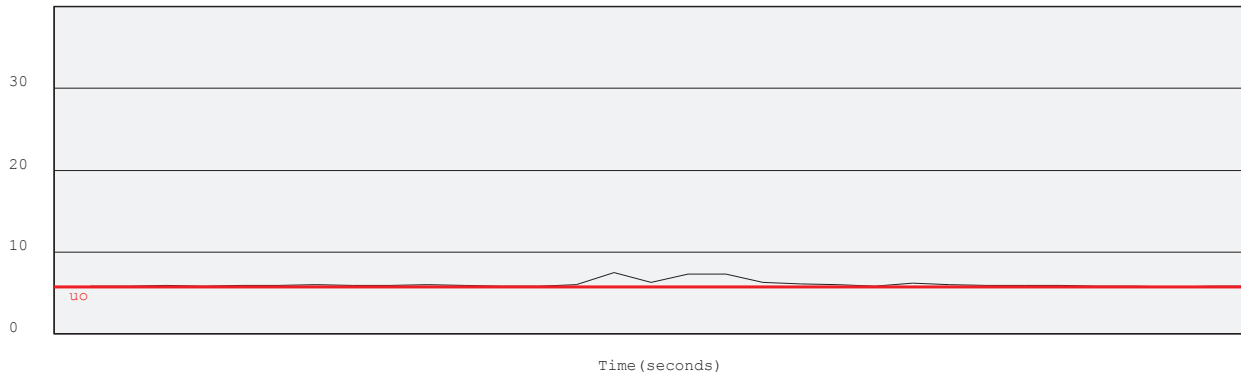
Site: Pier 2 Long: 29°52.774' Lat: 031°00.813'

Hole: 49

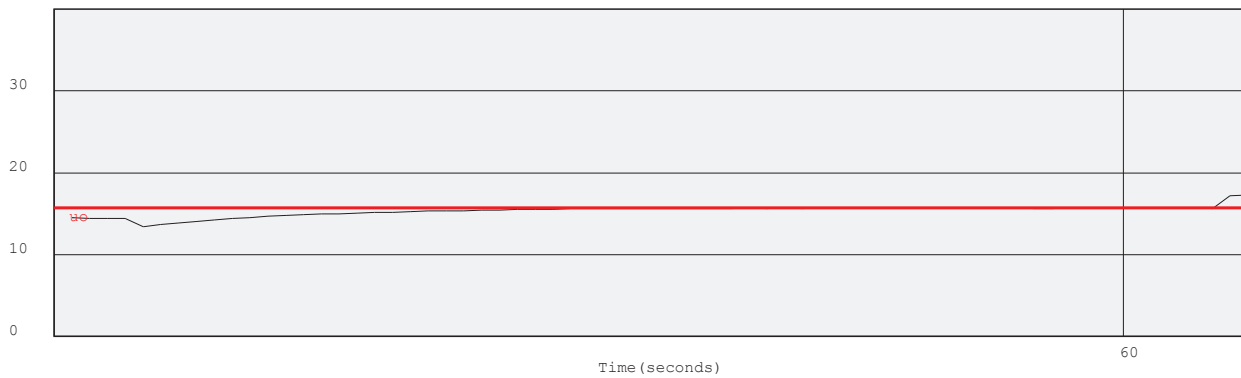
Date: 2012/03/16

Probe: KELLER  
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(kPa) Dissipation at: 2.984m



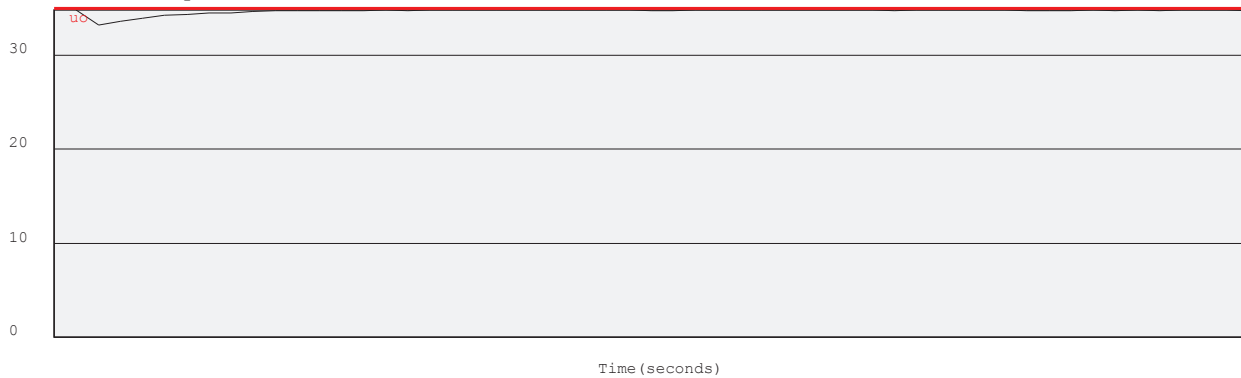
(kPa) Dissipation at: 3.983m



(kPa) Dissipation at: 4.978m



(kPa) Dissipation at: 5.977m



Project: Durban Harbour Land Based CPTu

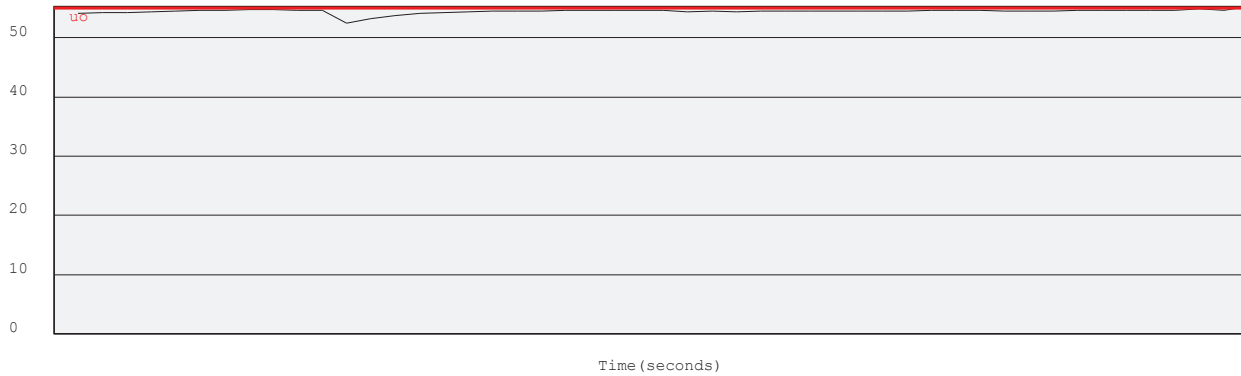
Site: Pier 2 Long: 29°52.774' Lat: 031°00.813'

Hole: 49

Date: 2012/03/16

Probe: KELLER  
Page: 2

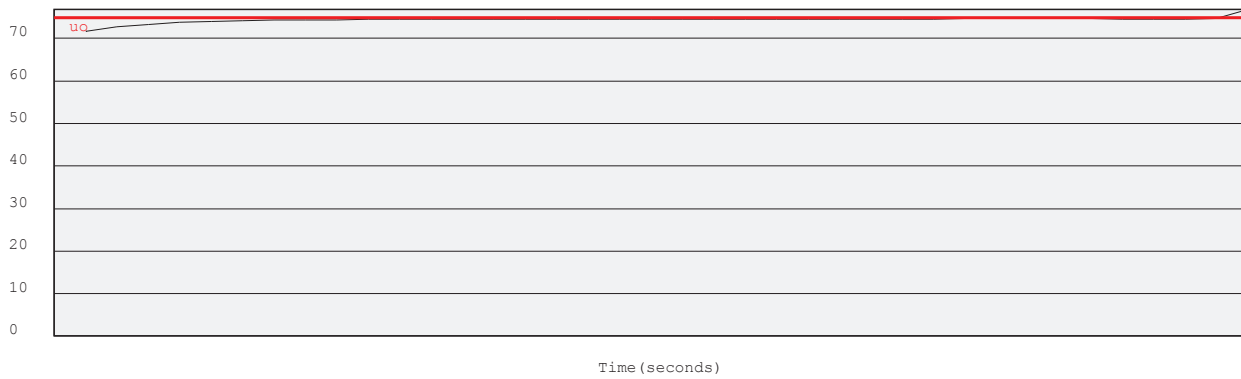
(kPa) Dissipation at: 7.969m



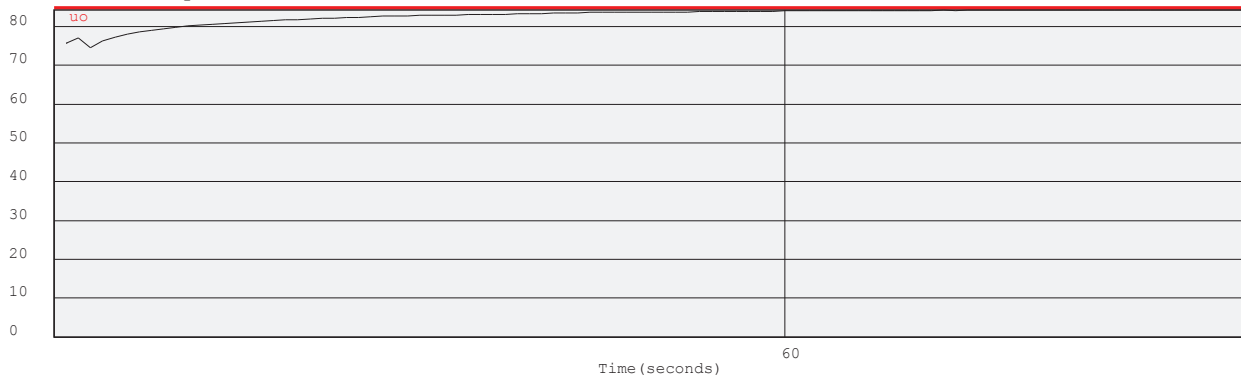
(kPa) Dissipation at: 8.971m



(kPa) Dissipation at: 9.971m



(kPa) Dissipation at: 10.972m



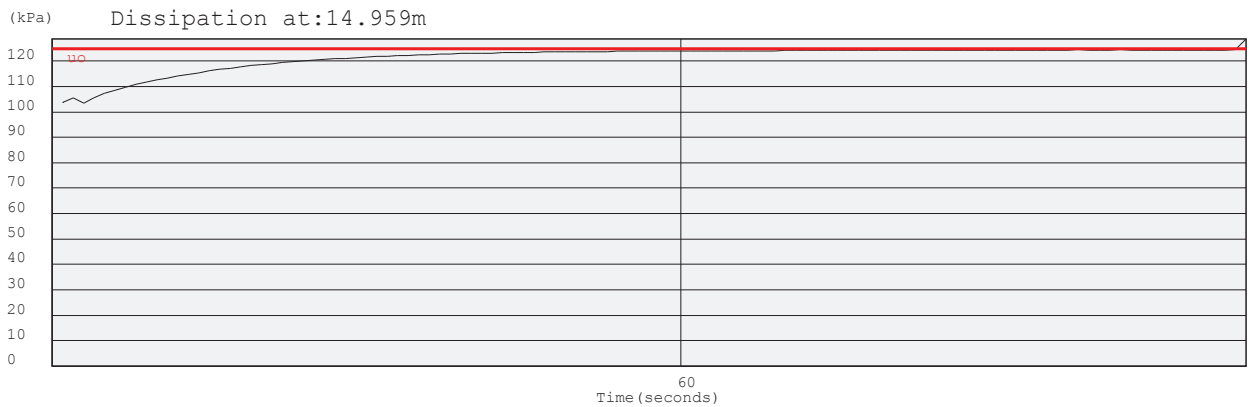
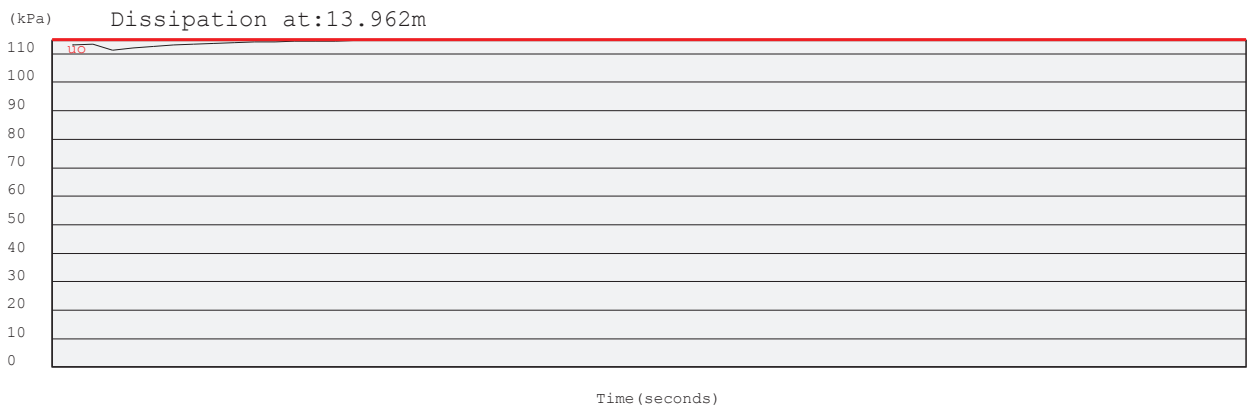
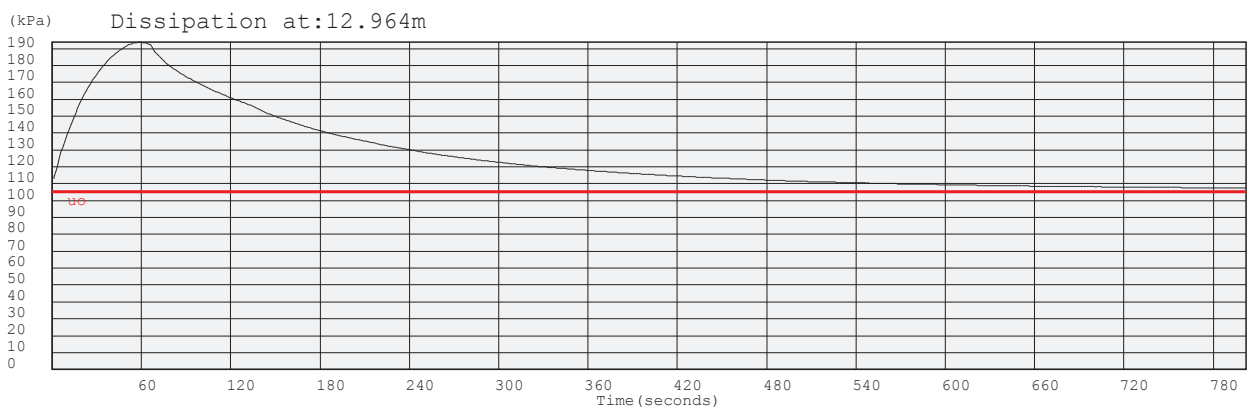
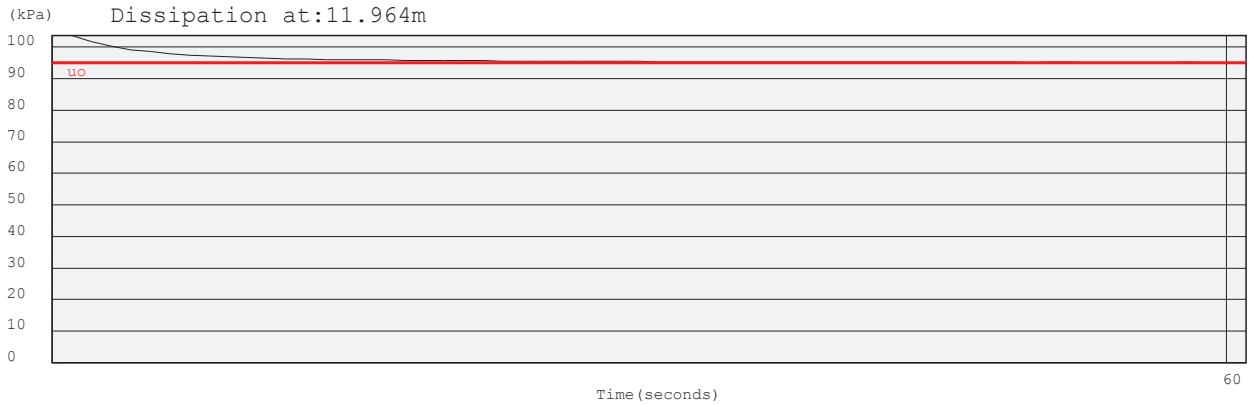
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.774' Lat: 031°00.813'

Hole: 49

Date: 2012/03/16

Probe: KELLER  
Page: 3



Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.774' Lat: 031°00.813'

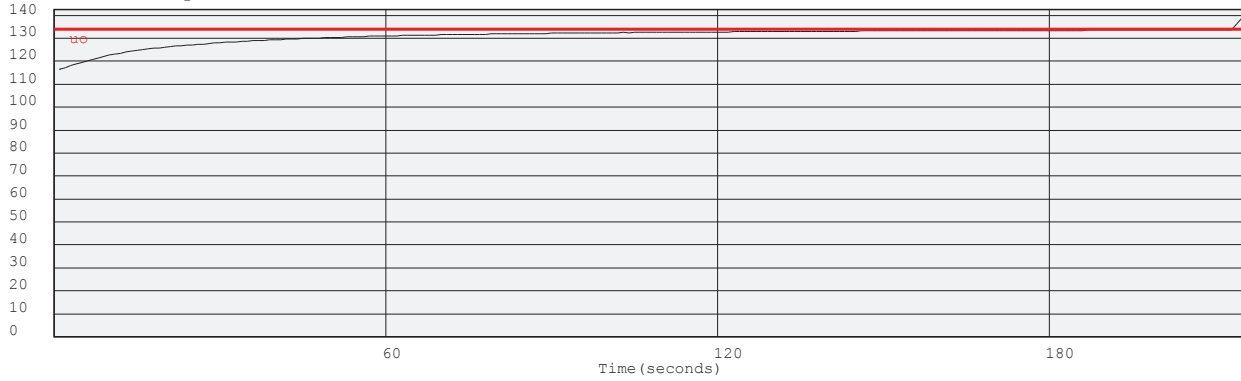
Hole: 49

Date: 2012/03/16

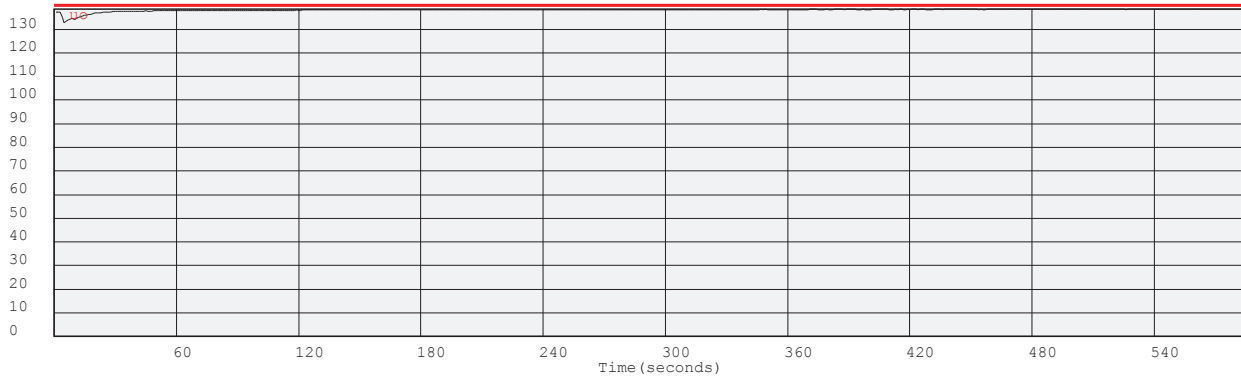
Probe: KELLER

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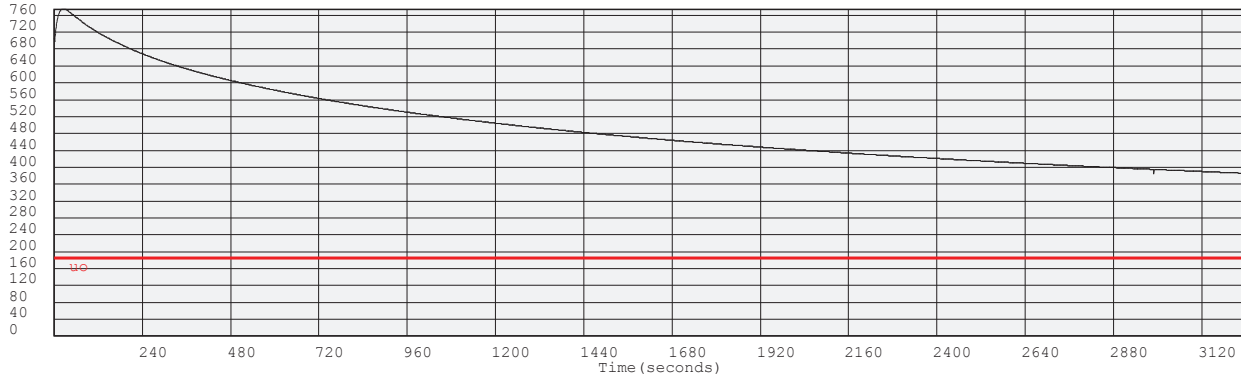
(kPa) Dissipation at: 15.955m



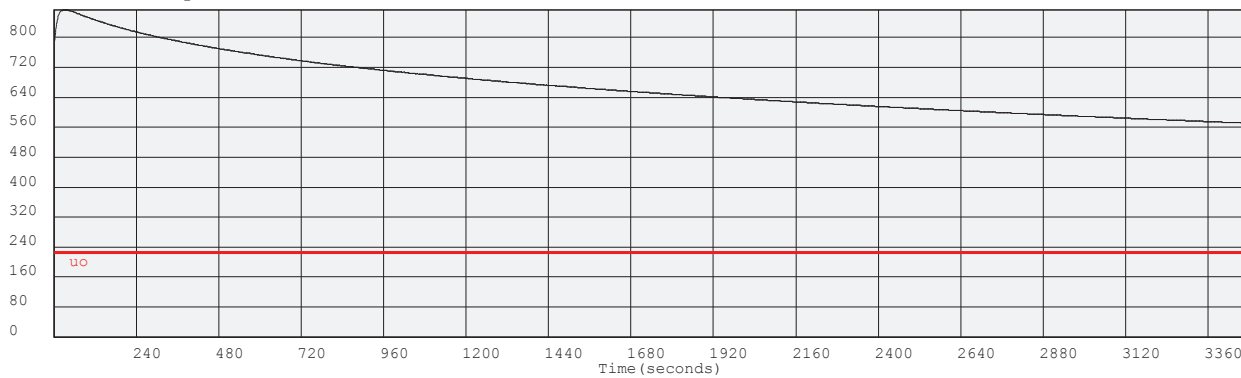
(kPa) Dissipation at: 16.982m



(kPa) Dissipation at: 20.643m



(kPa) Dissipation at: 24.628m



Project: Durban Harbour Land Based CPTu

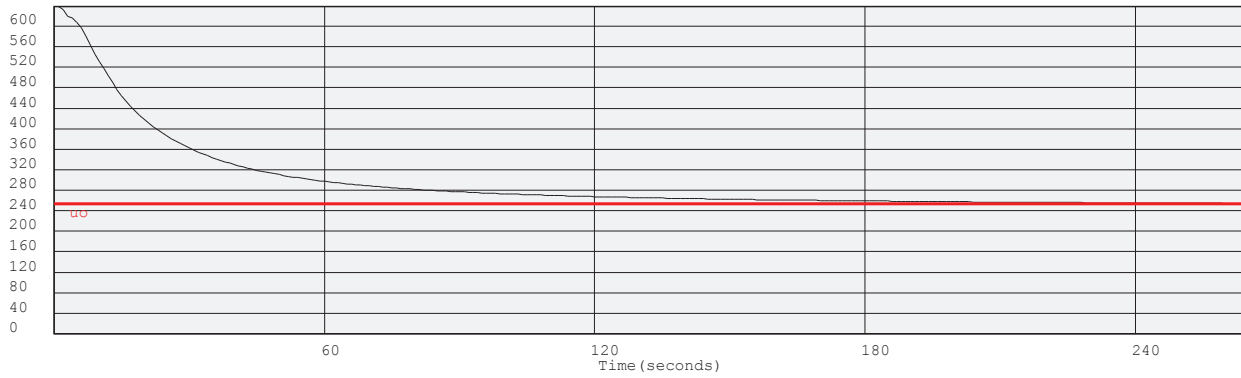
Site: Pier 2 Long: 29°52.774' Lat: 031°00.813'

Hole: 49

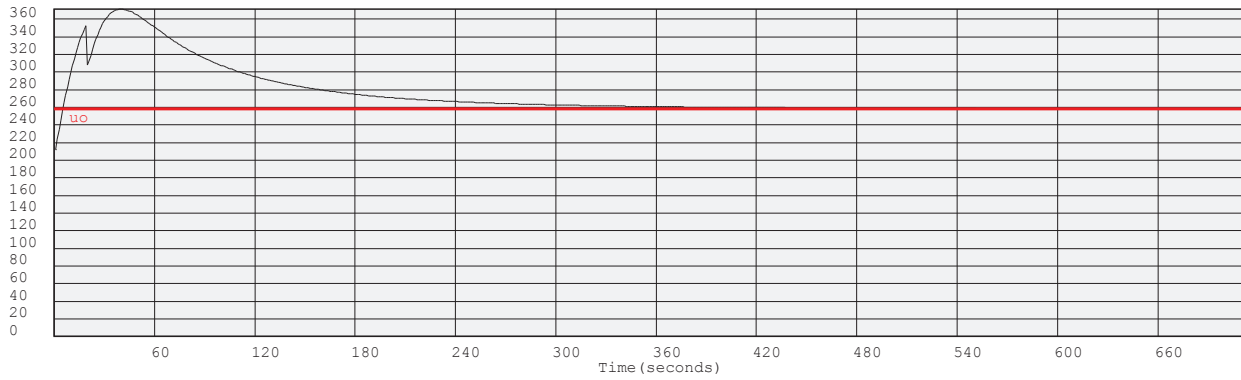
Date: 2012/03/16

Probe: KELLER  
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(kPa) Dissipation at: 26.629m



(kPa) Dissipation at: 27.913m



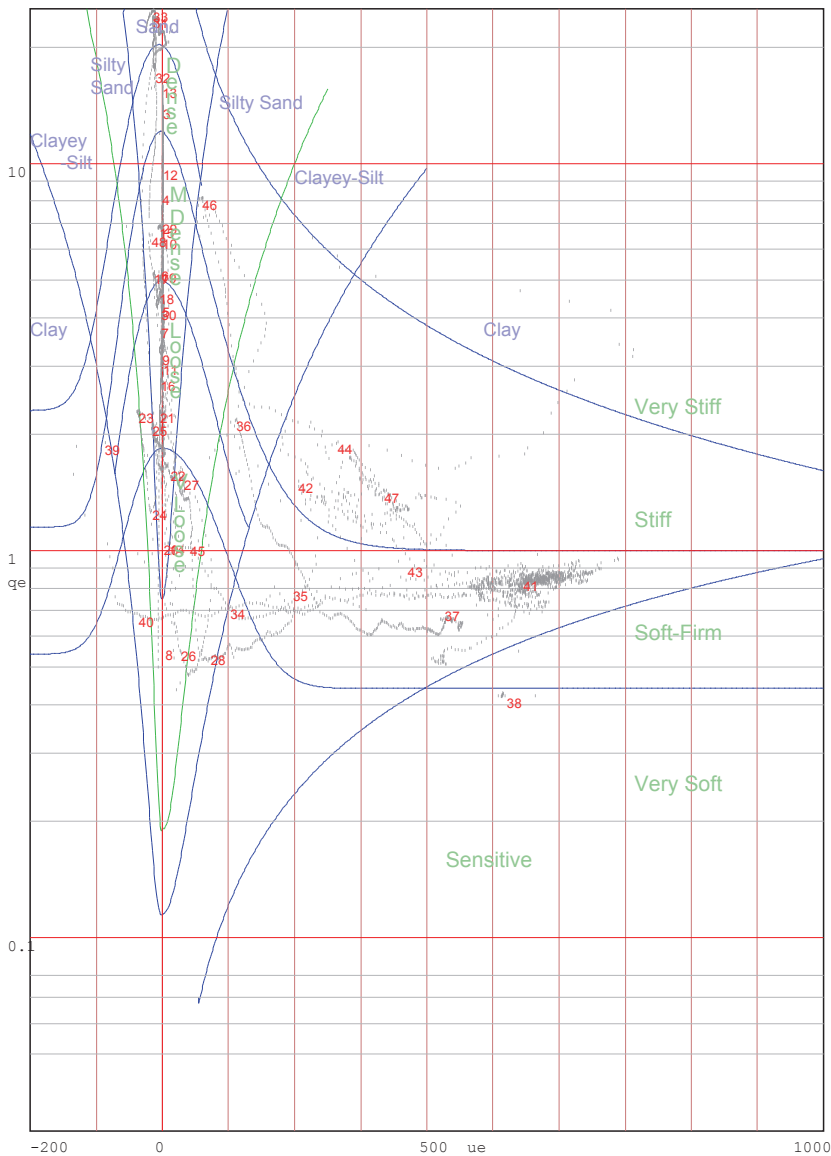
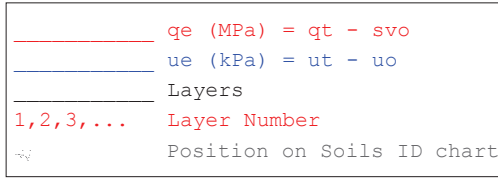
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.774' Lat:031°00.813'

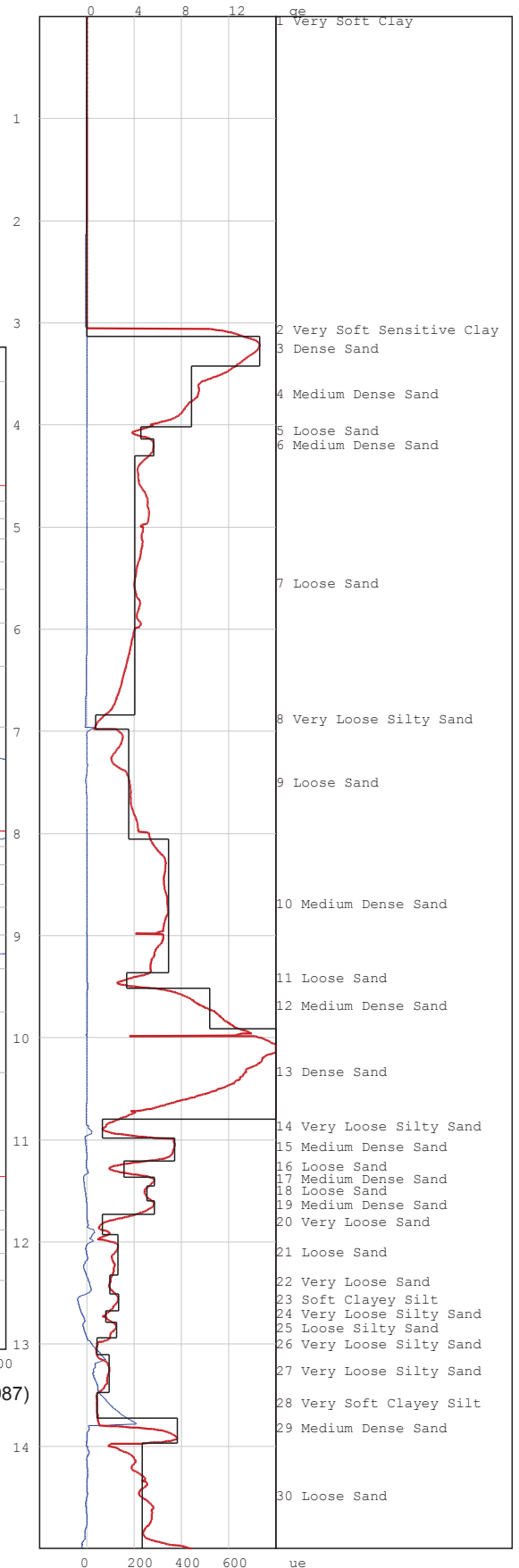
Hole No: 49

Date: 2012/03/16

Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





Project: Durban Harbour Land Based CPTu

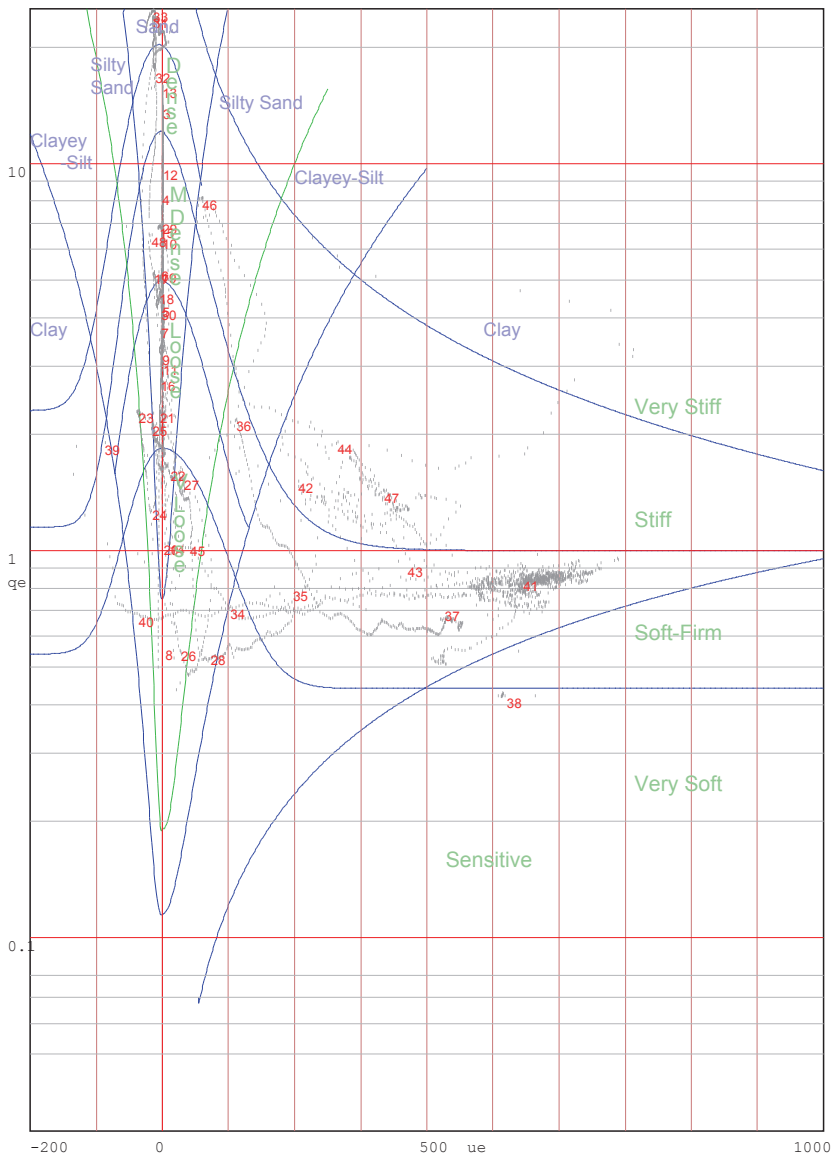
Site: Pier 2 Long:29°52.774' Lat:031°00.813'

Hole No: 49

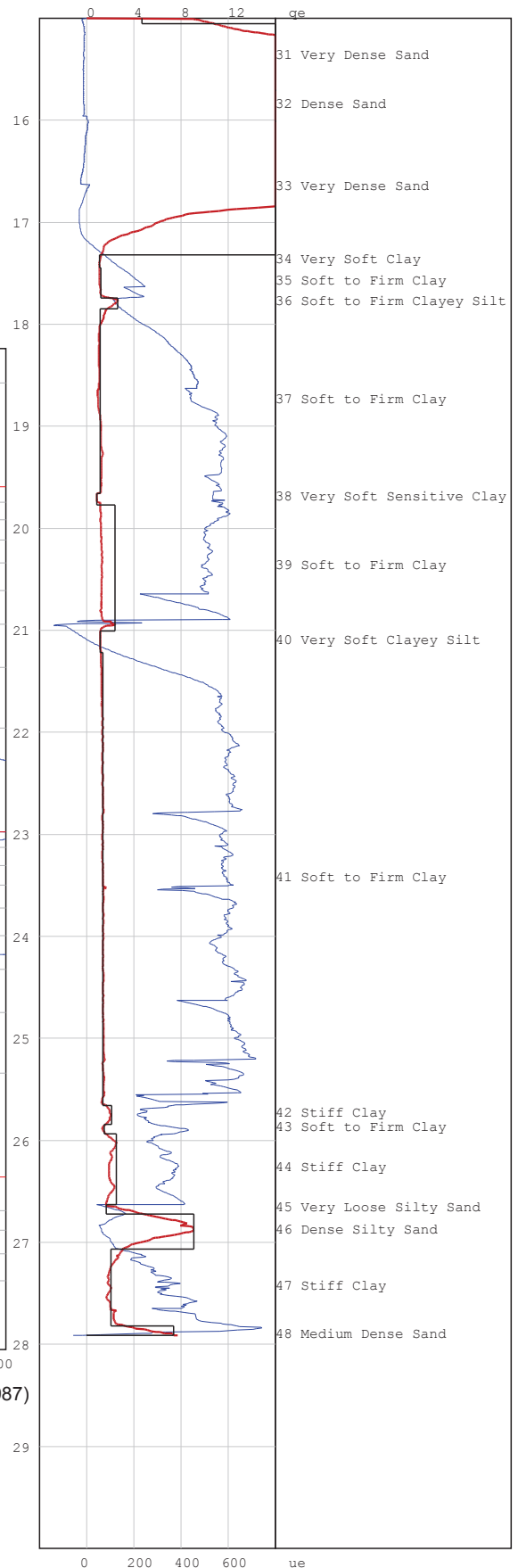
Date: 2012/03/16

Probe: KELLER

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

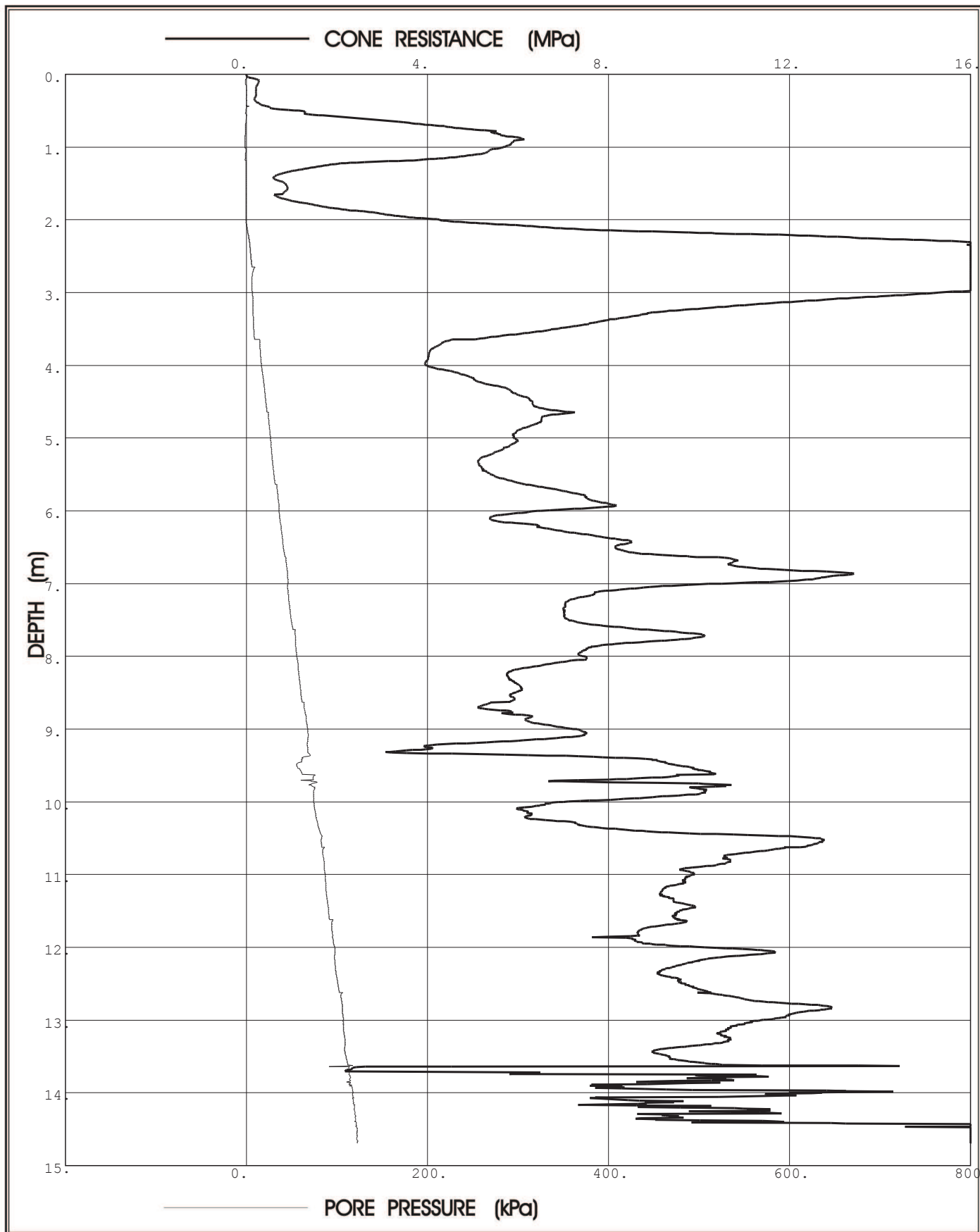
SITE: Pier 2 Long:29°52.785' Lat:031°00.826'

CPTU (RE): 50

DATE: 2012/03/16

Probe: KELLER

Page:1



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Eben.rust@up.ac.za

**Jeanne Rust** Information Technology

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082 570 6446

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rust@global.co.za

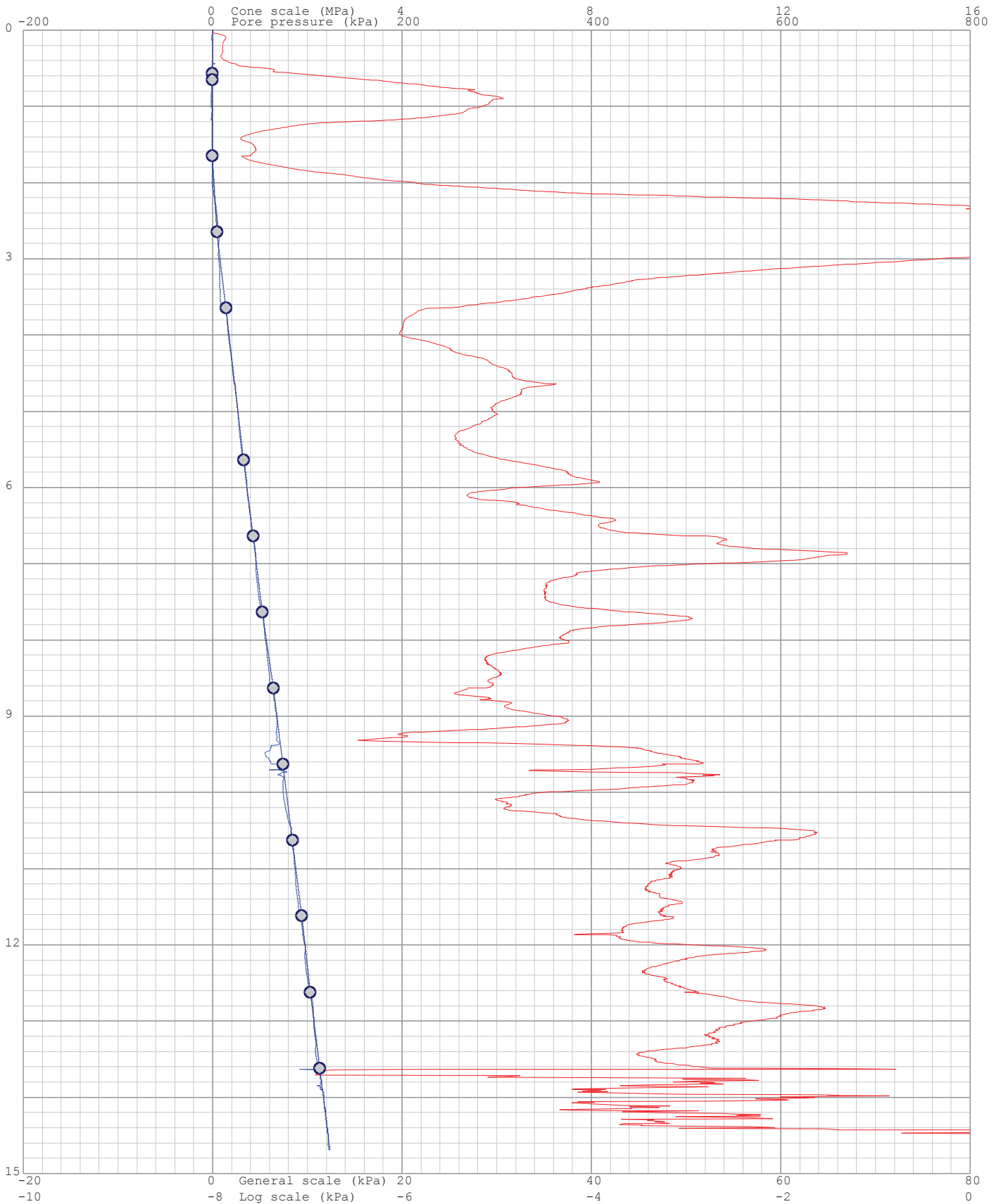
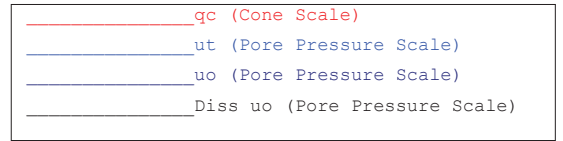
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.785' Lat:031°00.826'

Hole No: 50

Date: 2012/03/16

Probe: KELLER



Project:Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.785' Lat:031°00.826'

Hole: 50

Date: 2012/03/16

Probe: KELLER

Page: 1

(kPa) Dissipation at:0.564m



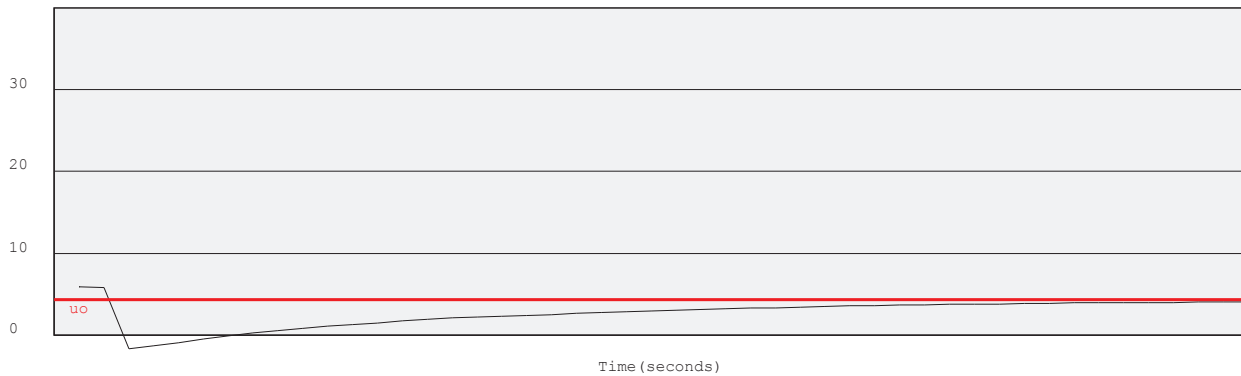
(kPa) Dissipation at:0.651m



(kPa) Dissipation at:1.649m



(kPa) Dissipation at:2.647m



Project: Durban Harbour Land Based CPTu

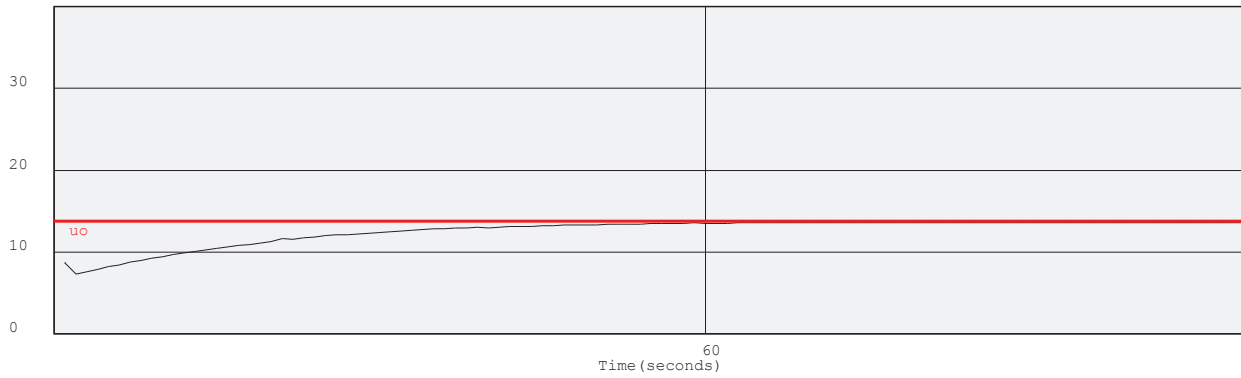
Site: Pier 2 Long: 29°52.785' Lat: 031°00.826'

Hole: 50

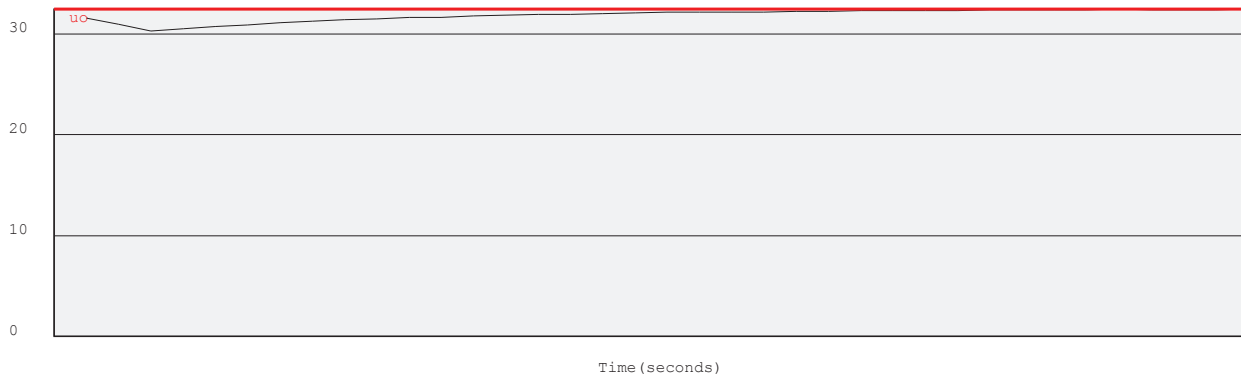
Date: 2012/03/16

Probe: KELLER  
Page: 2

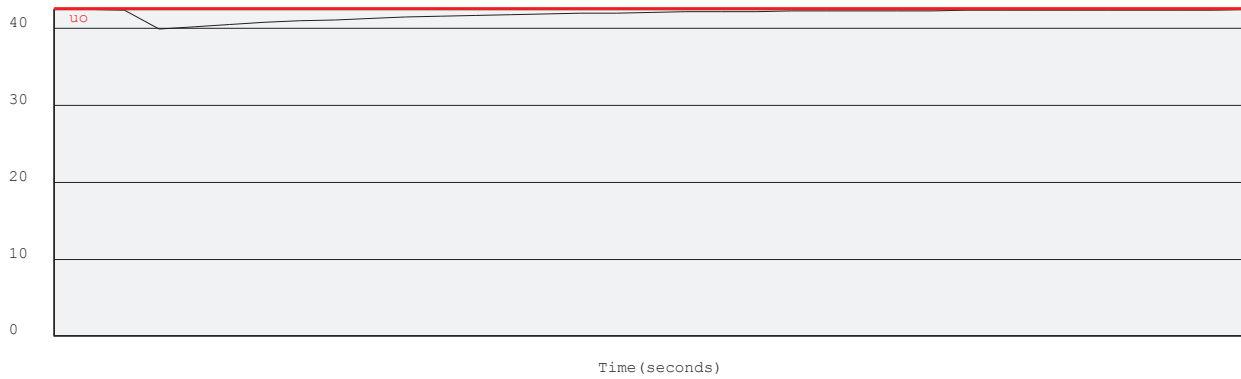
(kPa) Dissipation at: 3.643m



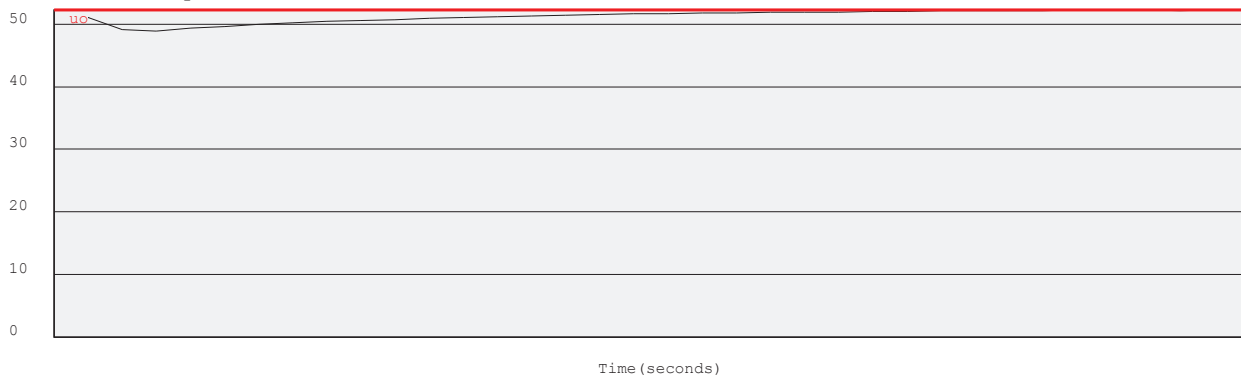
(kPa) Dissipation at: 5.636m



(kPa) Dissipation at: 6.634m



(kPa) Dissipation at: 7.631m



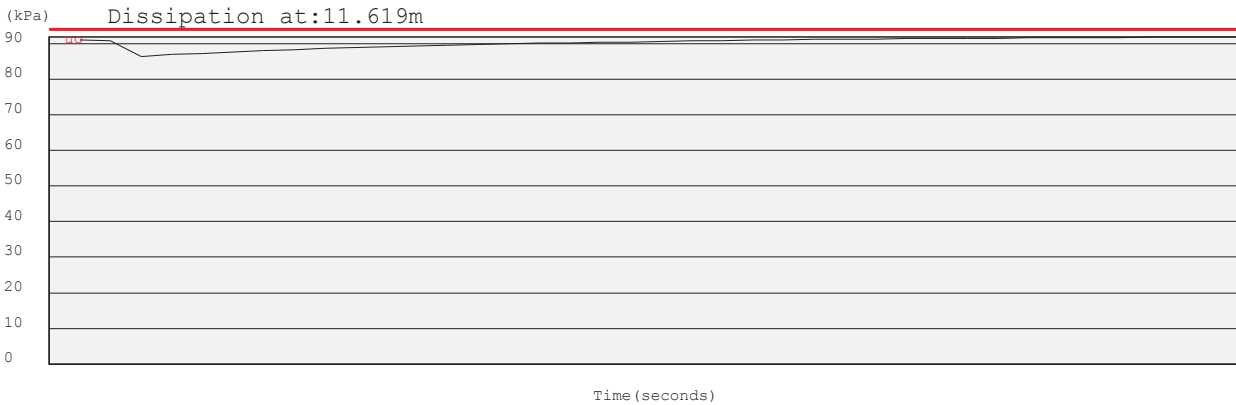
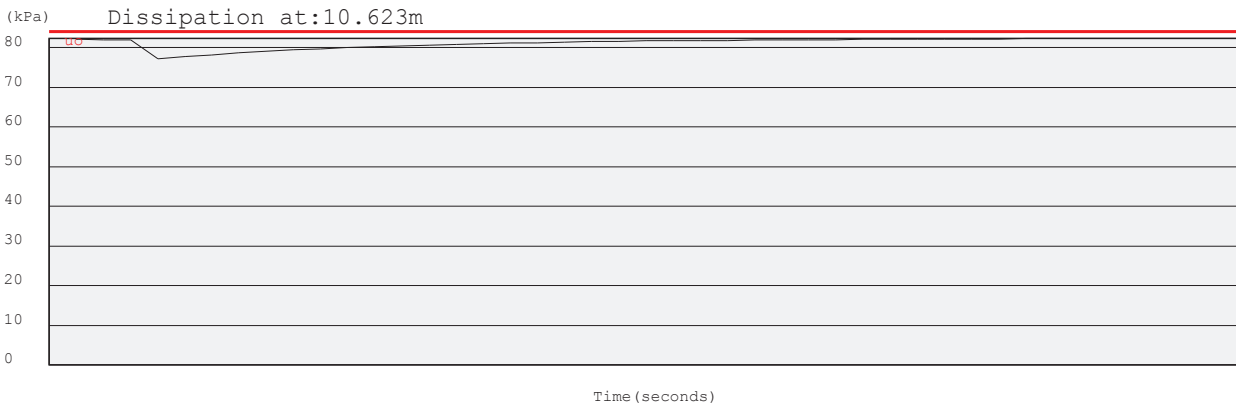
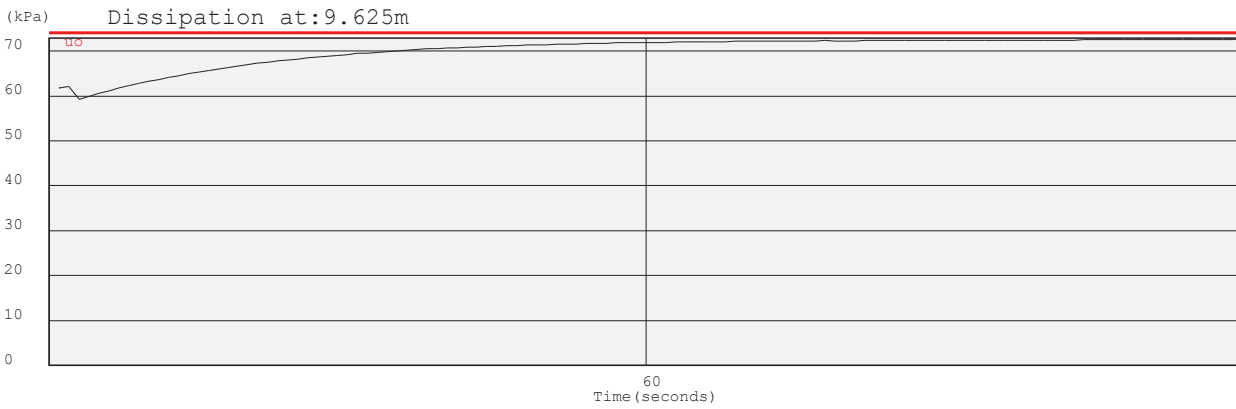
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long: 29°52.785' Lat: 031°00.826'

Hole: 50

Date: 2012/03/16

Probe: KELLER  
Page: 3



Project: Durban Harbour Land Based CPTu

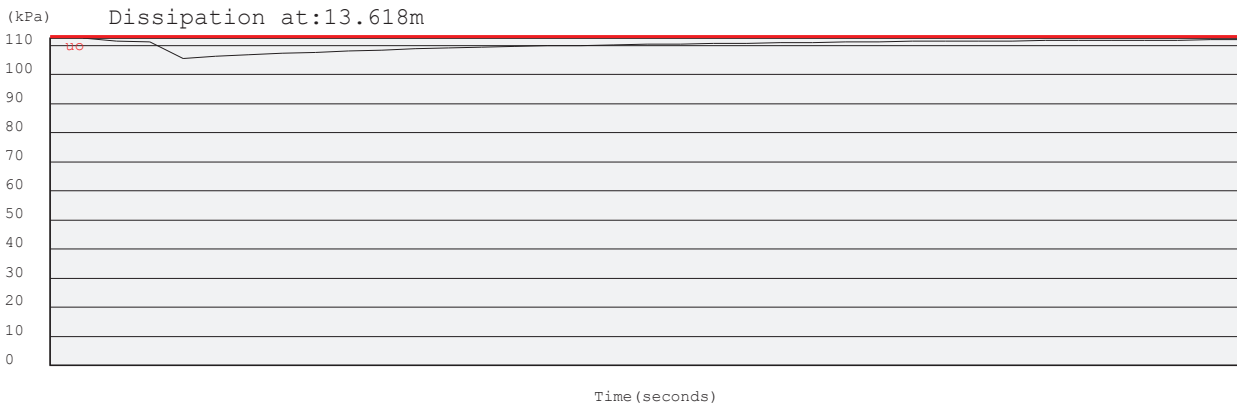
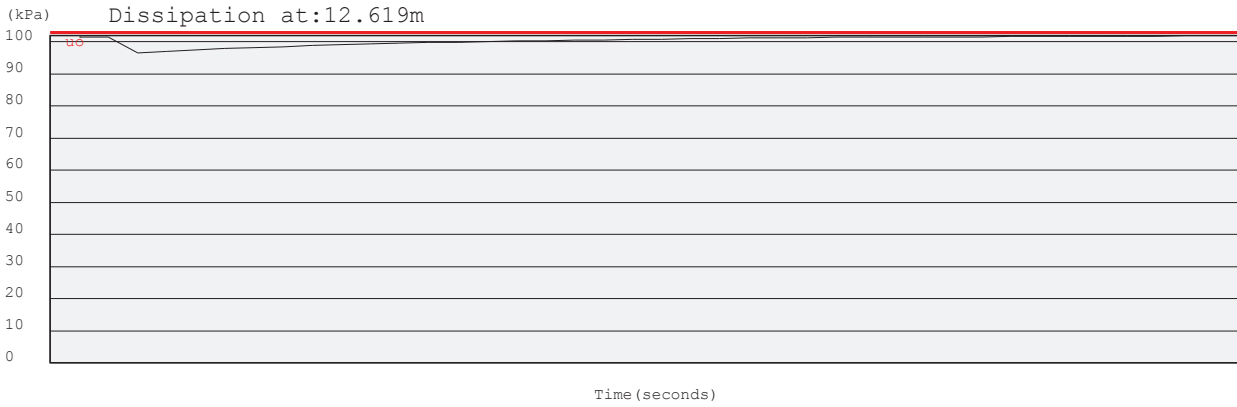
Site: Pier 2 Long: 29°52.785' Lat: 031°00.826'

Hole: 50

Date: 2012/03/16

Probe: KELLER

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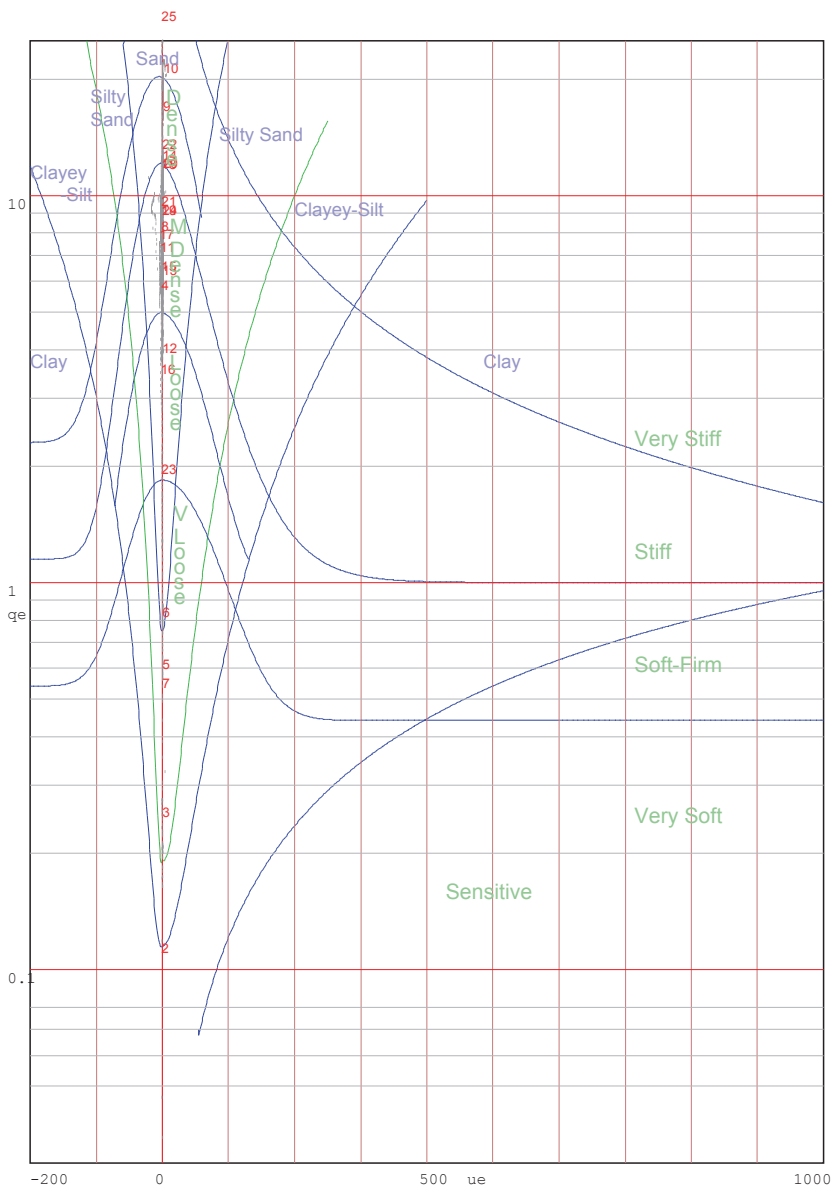
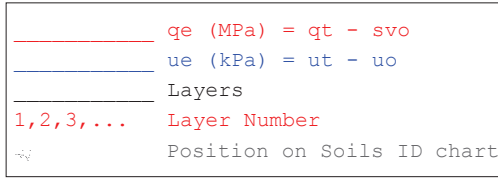
Project: Durban Harbour Land Based CPTu

Site: Pier 2 Long:29°52.785' Lat:031°00.826'

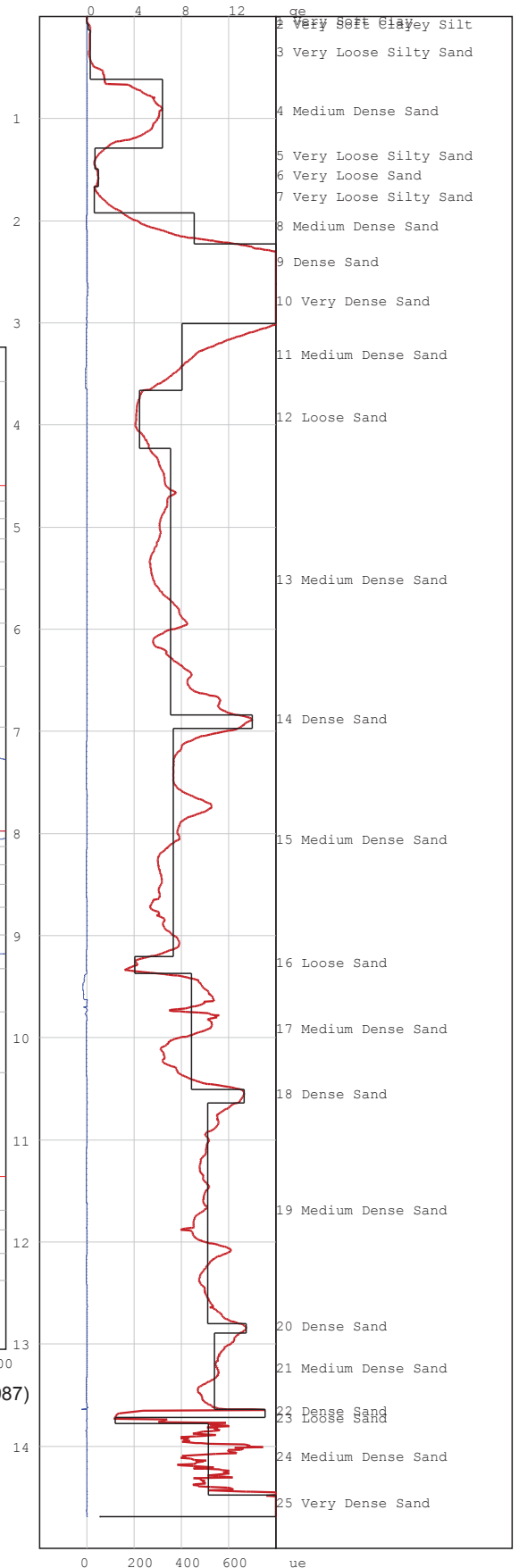
Hole No: 50

Date: 2012/03/16

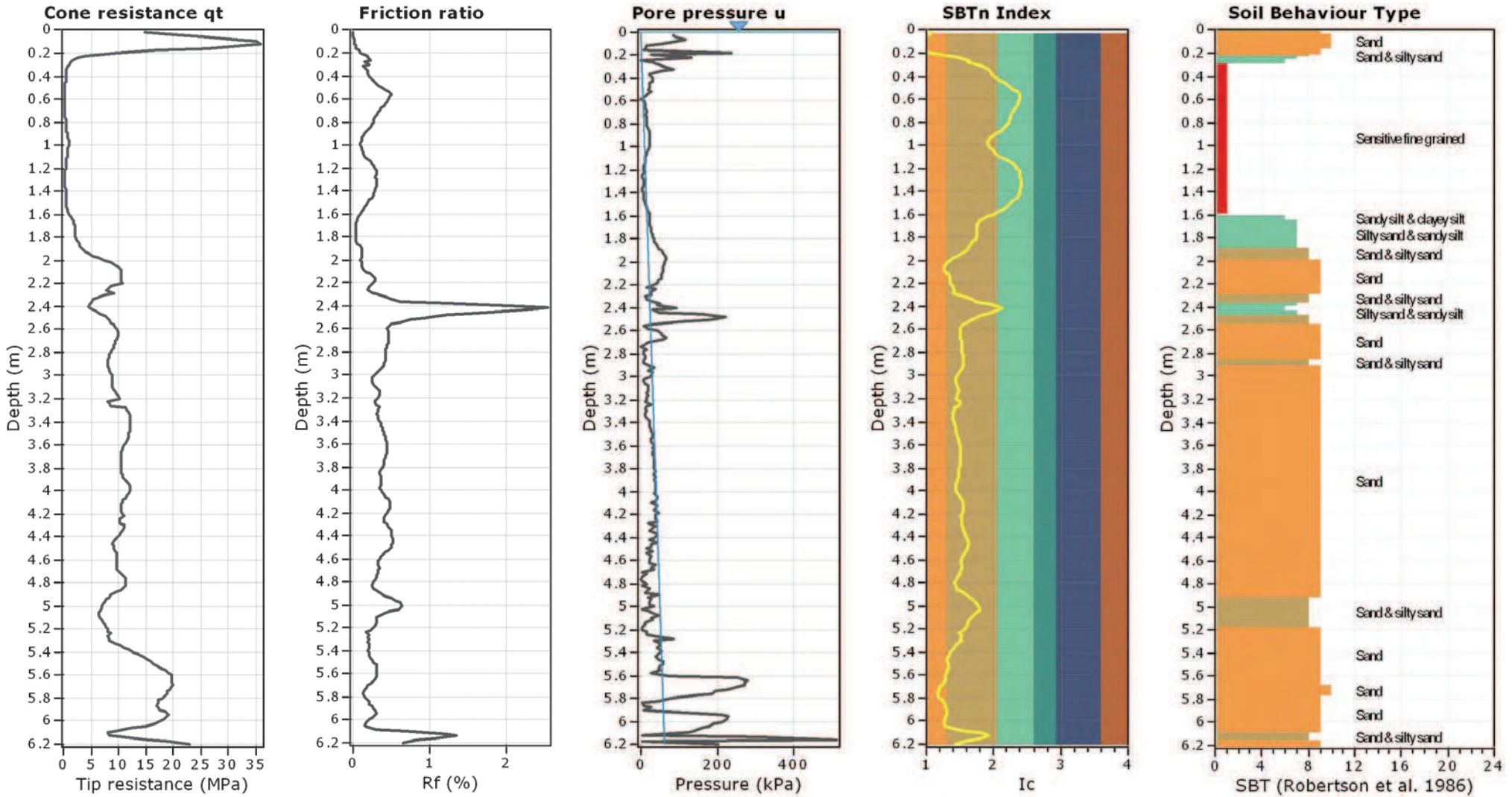
Probe: KELLER



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)







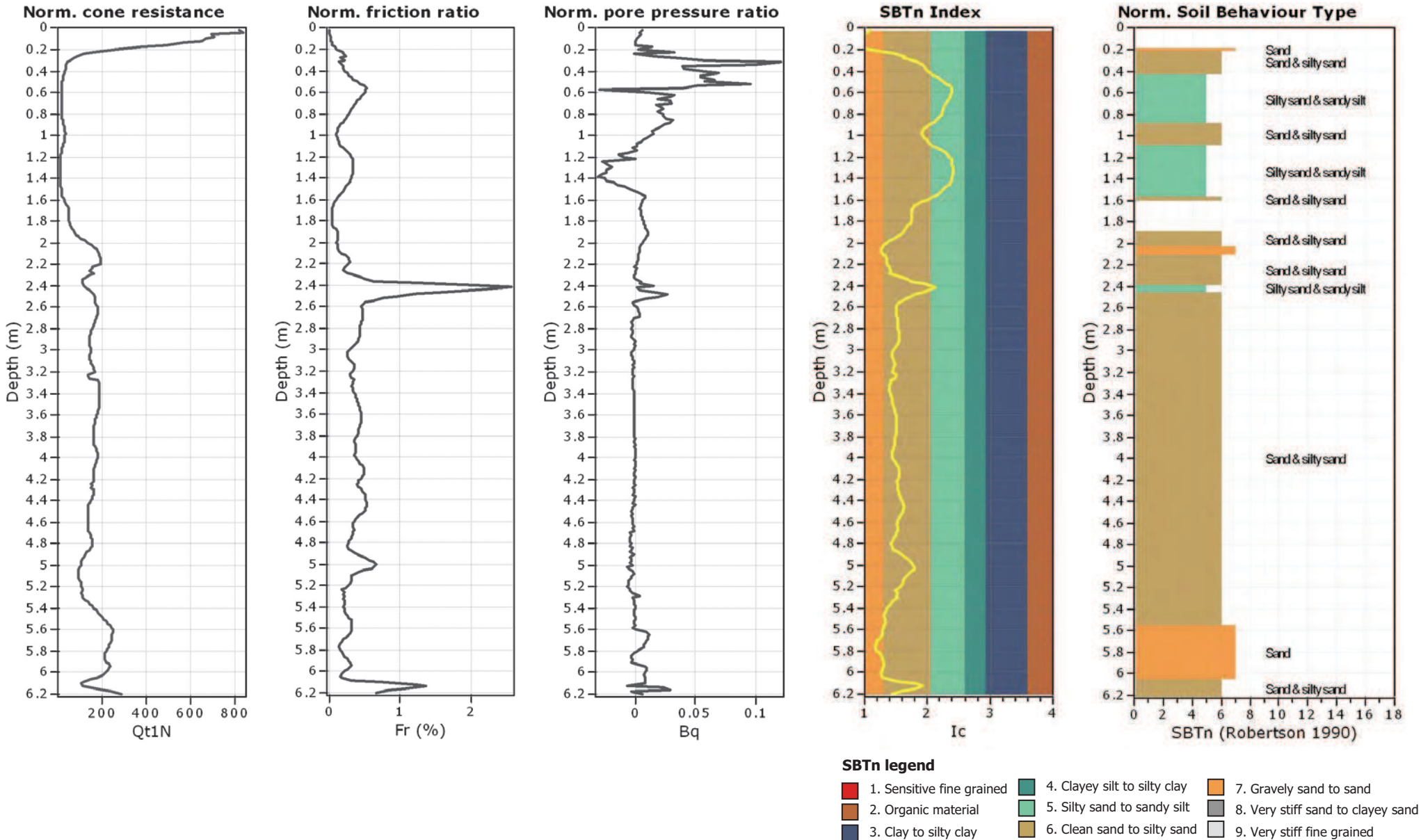
**SBT legend**

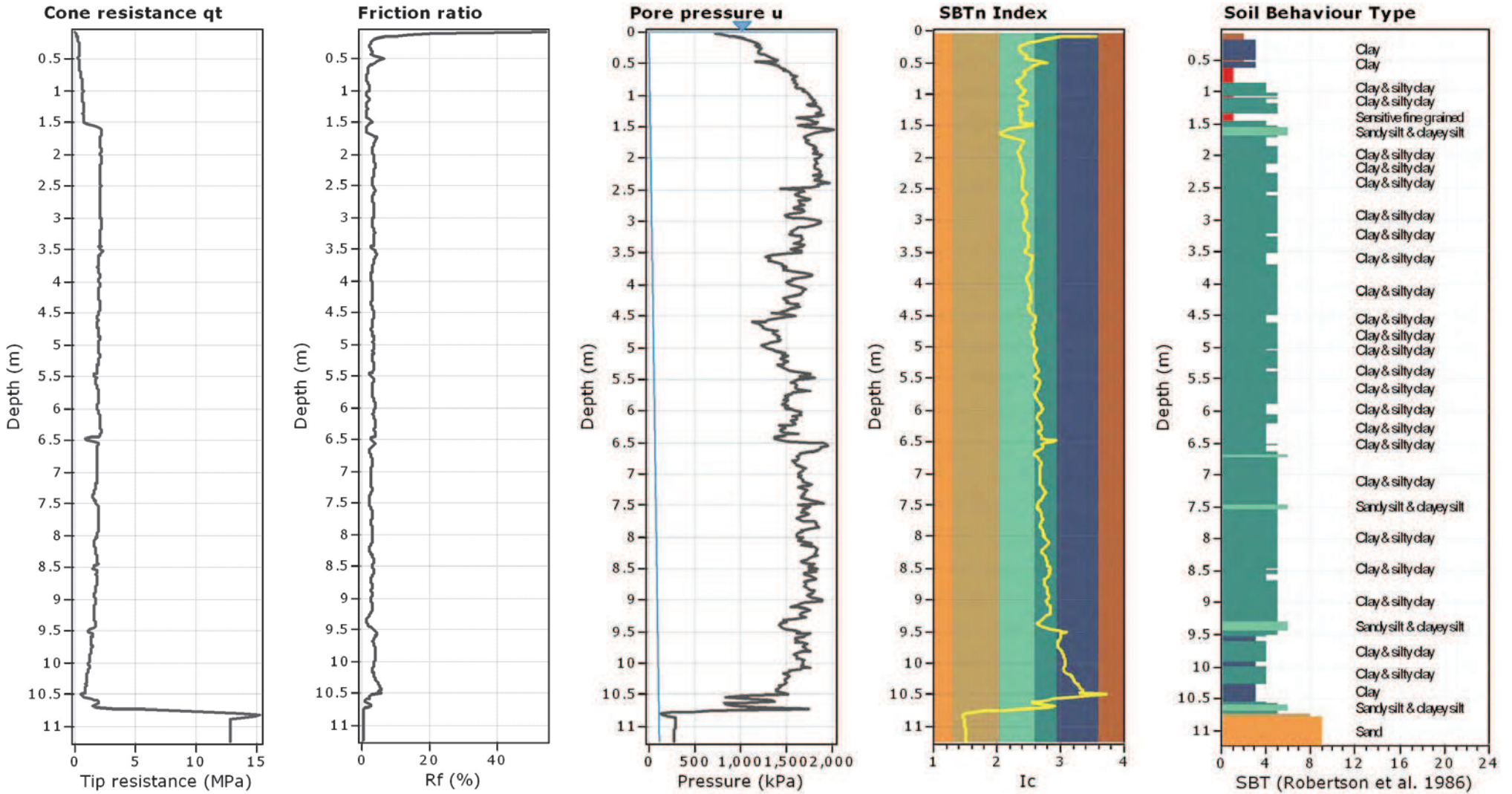
- |                           |                             |                            |                           |
|---------------------------|-----------------------------|----------------------------|---------------------------|
| 1. Sensitive fine grained | 4. Clay & silty clay        | 7. Silty sand & sandy silt | 10. Sand                  |
| 2. Organic material       | 5. Clay & silty clay        | 8. Sand & silty sand       | 11. Very dense/stiff soil |
| 3. Clay                   | 6. Sandy silt & clayey silt | 9. Sand                    | 12. Very dense/stiff soil |



Project: Durban Harbour CPT's

CPT: BD-CPTM207 - Total depth: 6.20 (m)

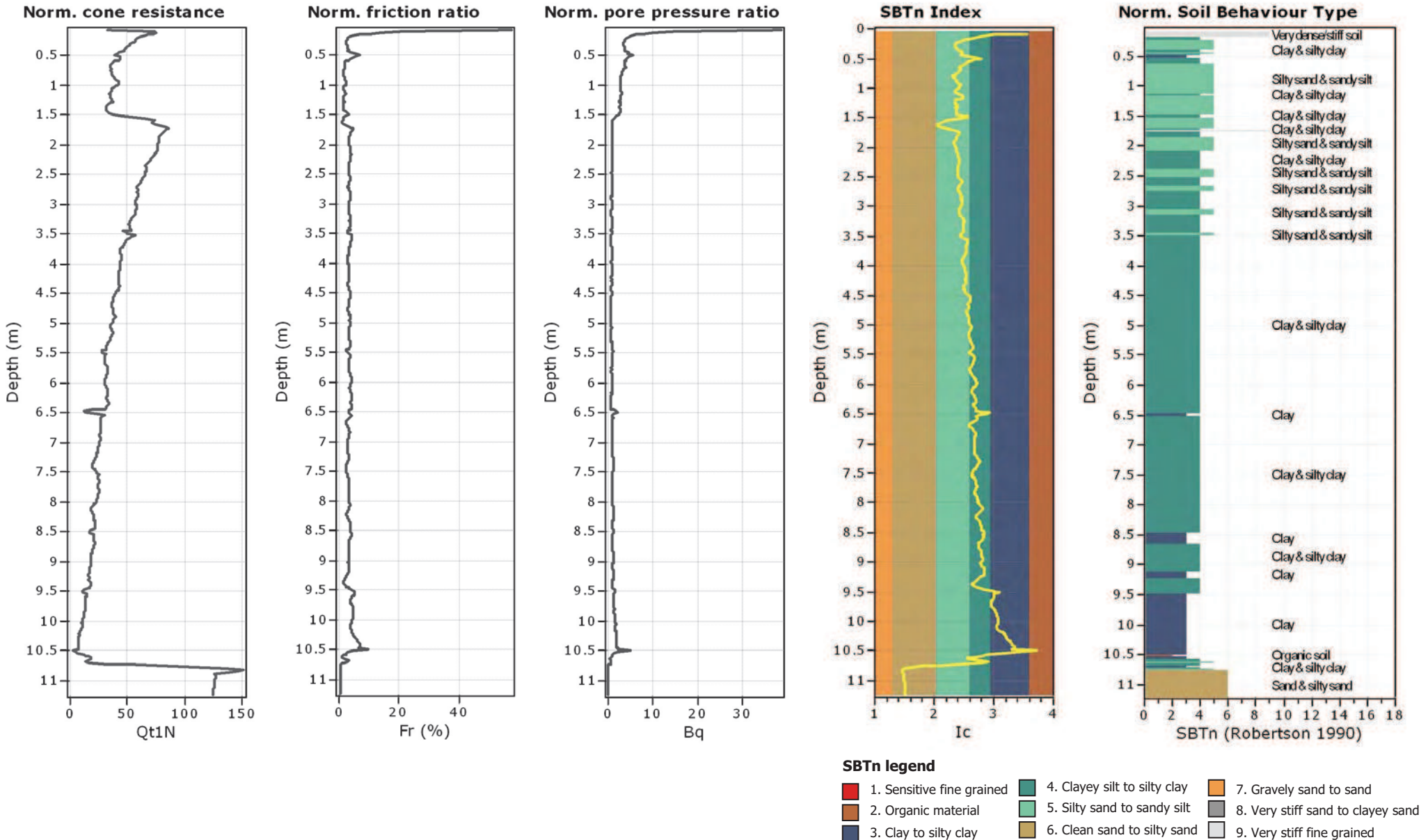




**SBT legend**

- |                           |                             |                            |                           |
|---------------------------|-----------------------------|----------------------------|---------------------------|
| 1. Sensitive fine grained | 4. Clay & silty clay        | 7. Silty sand & sandy silt | 10. Sand                  |
| 2. Organic material       | 5. Clay & silty clay        | 8. Sand & silty sand       | 11. Very dense/stiff soil |
| 3. Clay                   | 6. Sandy silt & clayey silt | 9. Sand                    | 12. Very dense/stiff soil |







### 3.4: CPTu LOGS – BASIN DREDGE AREA



EXPLORATORY BOREHOLE LOGS – BASIN DREDGE AREA

| CPT  | Location | Date       | Start depth | End depth | y        | x          |
|------|----------|------------|-------------|-----------|----------|------------|
| -    | -        | -          | CDP         | CDP       | -        | -          |
| P01b | Marine   | 2012/08/11 | 3.075       | -20.925   | -1404.00 | 3306653.00 |
| P02  | Marine   | 2012/08/10 | 3.570       | -20.430   | -1600.85 | 3306663.84 |
| P03  | Marine   | 2012/08/13 | 3.380       | -19.620   | -1604.00 | 3306450.00 |
| P04  | Marine   | 2012/08/16 | 2.937       | -21.063   | -1796.00 | 3306450.00 |
| P05  | Marine   | 2012/08/20 | 2.710       | -18.290   | -2002.00 | 3306449.00 |
| P06  | Marine   | 2012/08/21 | 2.530       | -20.470   | -1996.00 | 3306250.00 |
| P07  | Marine   | 2012/08/20 | 2.605       | -21.395   | -2207.00 | 3306447.00 |
| P08  | Marine   | 2012/08/22 | 3.195       | -21.805   | -2207.00 | 3306251.00 |
| P09  | Marine   | 2012/08/25 | 3.405       | -20.595   | -2404.00 | 3306446.00 |
| P10b | Marine   | 2012/08/24 | 2.900       | -20.100   | -2400.00 | 3306255.00 |
| P11  | Marine   | 2012/09/02 | 2.780       | -21.220   | -2603.00 | 3306450.00 |
| P12  | Marine   | 2012/08/30 | 2.510       | -20.490   | -2601.00 | 3306250.00 |
| P13  | Marine   | 2012/08/27 | 3.525       | -19.475   | -2602.00 | 3306055.00 |
| P14  | Marine   | 2012/09/08 | 2.930       | -21.070   | -2800.00 | 3306248.00 |
| P15  | Marine   | 2012/09/08 | 3.160       | -21.840   | -2802.00 | 3306048.00 |
| P16b | Marine   | 2012/09/20 | 3.130       | -19.870   | -2786.00 | 3305878.00 |
| P17  | Marine   | 2012/09/23 | 3.070       | -18.930   | -2811.00 | 3305657.00 |
| P18  | Marine   | 2012/09/12 | 3.065       | -20.935   | -3001.00 | 3306252.00 |
| P19  | Marine   | 2012/09/11 | 2.997       | -21.003   | -2999.00 | 3306052.00 |
| P20  | Marine   | 2012/09/25 | 3.315       | -20.685   | -3010.00 | 3305887.00 |
| P21  | Marine   | 2012/09/23 | 3.010       | -18.490   | -2990.00 | 3305660.00 |
| P22  | Marine   | 2012/09/19 | 2.220       | -19.780   | -3201.00 | 3306246.00 |
| P23  | Marine   | 2012/09/26 | 3.455       | -17.545   | -3195.00 | 3306067.00 |
| P24  | Marine   | 2012/09/25 | 2.910       | -19.090   | -3193.00 | 3305858.00 |
| S01  | Marine   | 2012/08/11 | 3.387       | -20.613   | -1493.00 | 3306454.00 |
| S02  | Marine   | 2012/08/11 | 3.060       | -19.940   | -1502.00 | 3306548.00 |
| S03  | Marine   | 2012/08/10 | 3.470       | -19.530   | -1508.97 | 3306646.58 |
| S04  | Marine   | 2012/08/13 | 3.400       | -19.600   | -1601.00 | 3306554.00 |
| S05  | Marine   | 2012/08/13 | 2.860       | -20.140   | -1699.00 | 3306348.00 |
| S06  | Marine   | 2012/08/14 | 3.400       | -20.600   | -1702.00 | 3306454.00 |
| S07  | Marine   | 2012/08/16 | 2.575       | -19.425   | -1694.00 | 3306551.00 |
| S08  | Marine   | 2012/08/14 | 2.950       | -20.050   | -1802.00 | 3306343.00 |
| S09  | Marine   | 2012/08/16 | 3.630       | -20.370   | -1804.00 | 3306550.00 |
| S10  | Marine   | 2012/08/17 | 2.665       | -20.335   | -1893.00 | 3306353.00 |
| S11  | Marine   | 2012/08/17 | 2.740       | -20.260   | -1905.00 | 3306446.00 |
| S12  | Marine   | 2012/08/17 | 3.545       | -20.455   | -1900.00 | 3306551.00 |
| S13  | Marine   | 2012/08/21 | 2.895       | -19.105   | -2001.00 | 3306349.00 |

| CPT | Location | Date       | Stard depth | End depth | y        | x          |
|-----|----------|------------|-------------|-----------|----------|------------|
| -   | -        | -          | CDP         | CDP       | -        | -          |
| S28 | Marine   | 2012/08/29 | 2.455       | -17.545   | -2498.00 | 3306247.00 |
| S29 | Marine   | 2012/08/27 | 2.860       | -19.140   | -2502.00 | 3306152.00 |
| S30 | Marine   | 2012/08/27 | 3.625       | -20.375   | -2596.00 | 3306148.00 |
| S31 | Marine   | 2012/08/31 | 3.770       | -21.230   | -2598.00 | 3306354.00 |
| S32 | Marine   | 2012/09/02 | 2.255       | -20.745   | -2697.00 | 3306349.00 |
| S33 | Marine   | 2012/08/31 | 2.230       | -20.770   | -2696.00 | 3306248.00 |
| S34 | Marine   | 2012/08/30 | 3.585       | -20.415   | -2698.00 | 3306151.00 |
| S35 | Marine   | 2012/08/30 | 2.808       | -20.193   | -2701.00 | 3306052.00 |
| S36 | Marine   | 2012/09/20 | 3.150       | -19.850   | -2697.00 | 3305946.00 |
| S37 | Marine   | 2012/09/20 | 3.280       | -16.720   | -2702.00 | 3305858.00 |
| S38 | Marine   | 2012/09/20 | 2.620       | -17.880   | -2800.00 | 3305741.00 |
| S39 | Marine   | 2012/09/21 | 2.670       | -20.330   | -2806.00 | 3305966.00 |
| S40 | Marine   | 2012/09/08 | 2.845       | -21.155   | -2803.00 | 3306149.00 |
| S41 | Marine   | 2012/09/10 | 2.885       | -22.115   | -2805.00 | 3306346.00 |
| S42 | Marine   | 2012/09/16 | 2.180       | -20.820   | -2898.00 | 3306347.00 |
| S43 | Marine   | 2012/09/11 | 3.260       | -20.740   | -2900.00 | 3306246.00 |
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| S46 | Marine   | 2012/09/21 | 2.640       | -18.360   | -2911.00 | 3305962.00 |
| S47 | Marine   | 2012/09/25 | 3.120       | -20.880   | -2888.00 | 3305865.00 |
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| S51 | Marine   | 2012/09/26 | 3.130       | -17.870   | -3019.00 | 3305968.00 |
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| S56 | Marine   | 2012/09/19 | 3.355       | -20.645   | -3093.00 | 3306147.00 |
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| S60 | Marine   | 2012/09/24 | 3.220       | -19.780   | -3113.00 | 3305766.00 |
| S61 | Marine   | 2012/09/26 | 2.800       | -17.200   | -3208.00 | 3305955.00 |
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| S63 | Marine   | 2012/09/26 | 3.535       | -17.465   | -3277.00 | 3306027.00 |
| S64 | Marine   | 2012/09/27 | 3.480       | -17.520   | -3229.00 | 3306345.00 |

# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

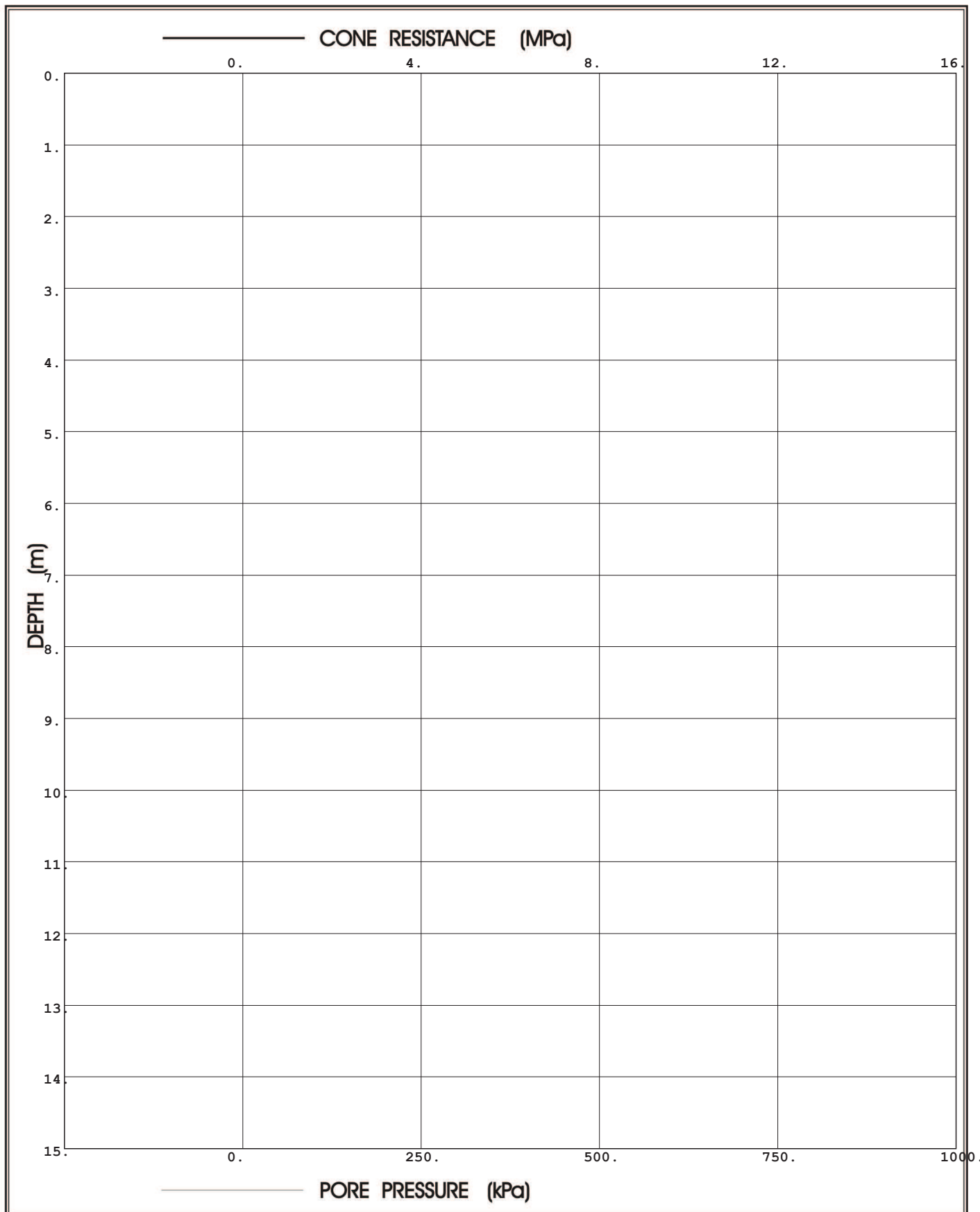
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 01 B

DATE: 2012/08/11

Page:1



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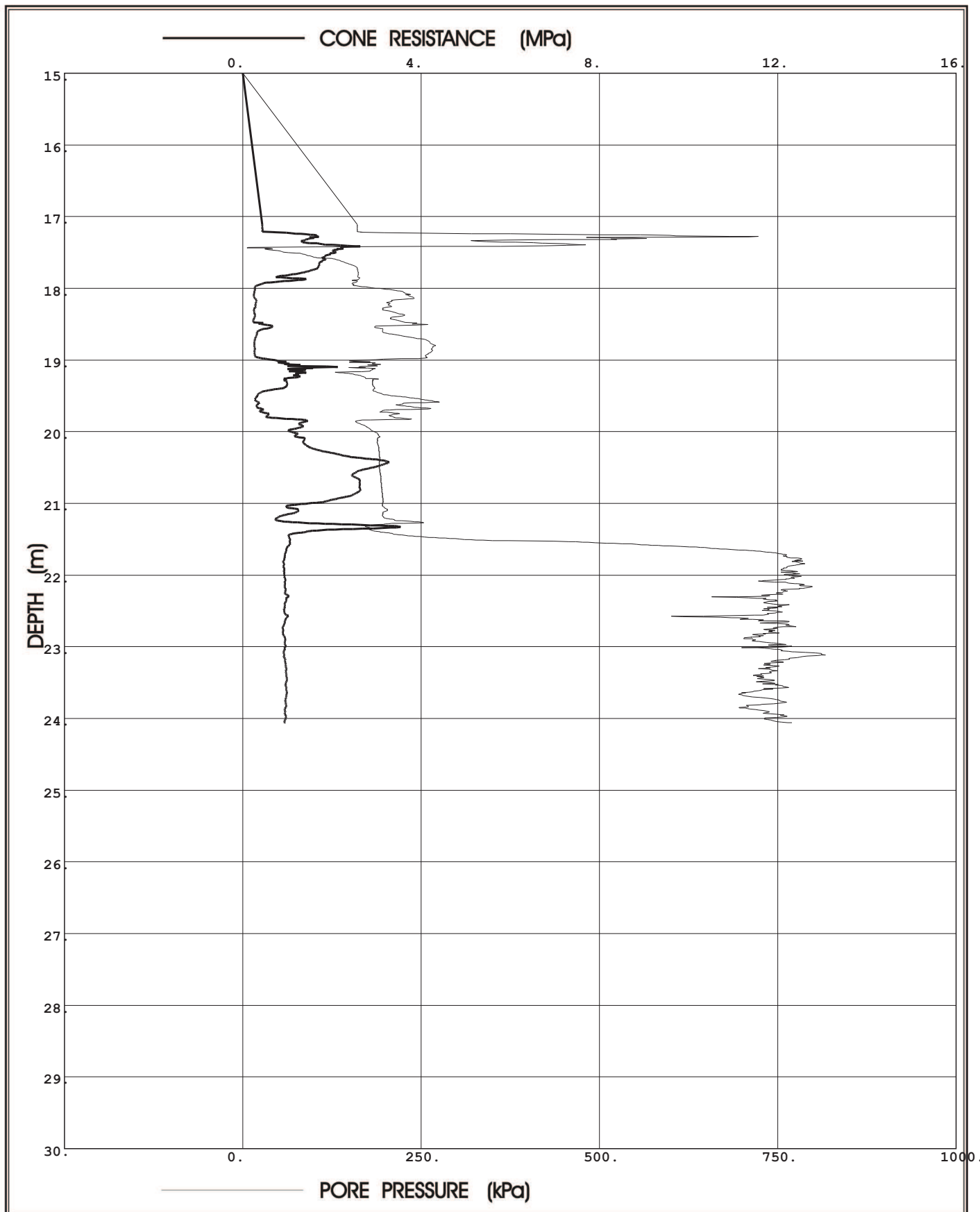
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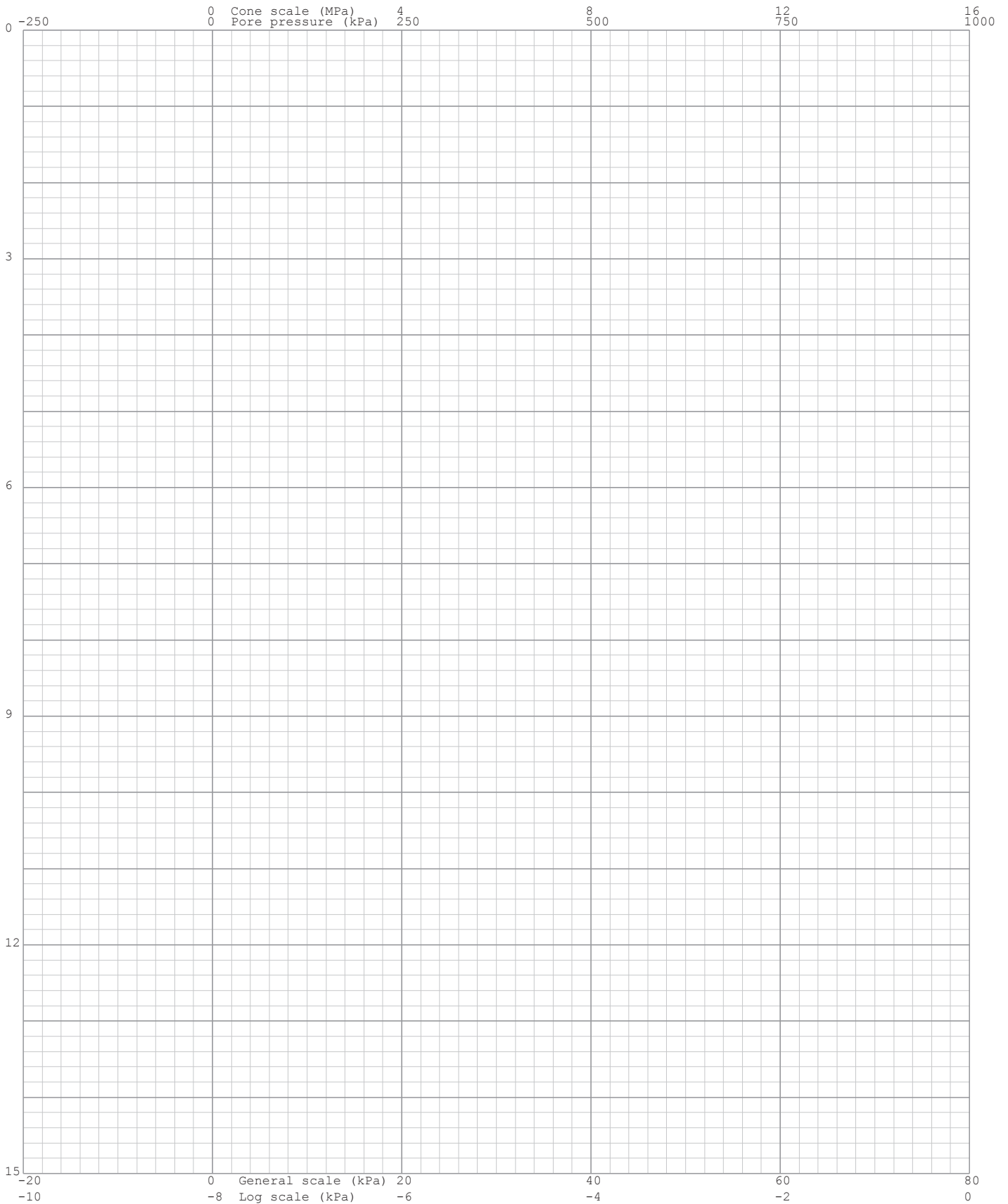
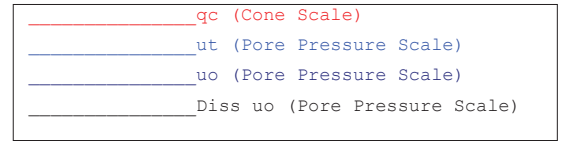
Fax: 012 420 4940

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Site: Durban Harbour over water

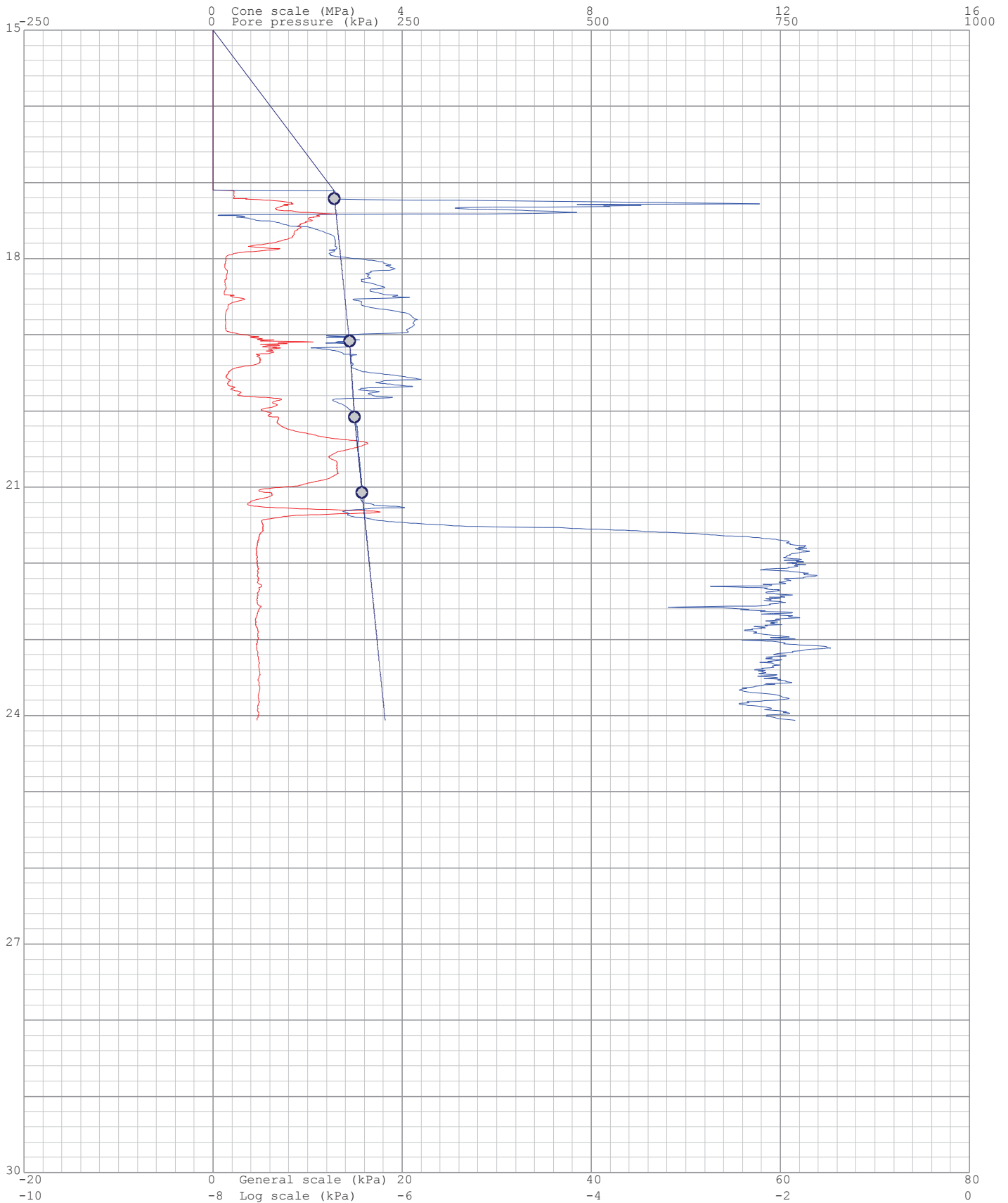
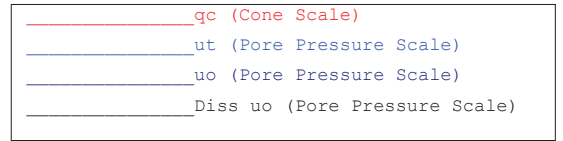
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Site: Durban Harbour over water

Hole No: P 01 B  
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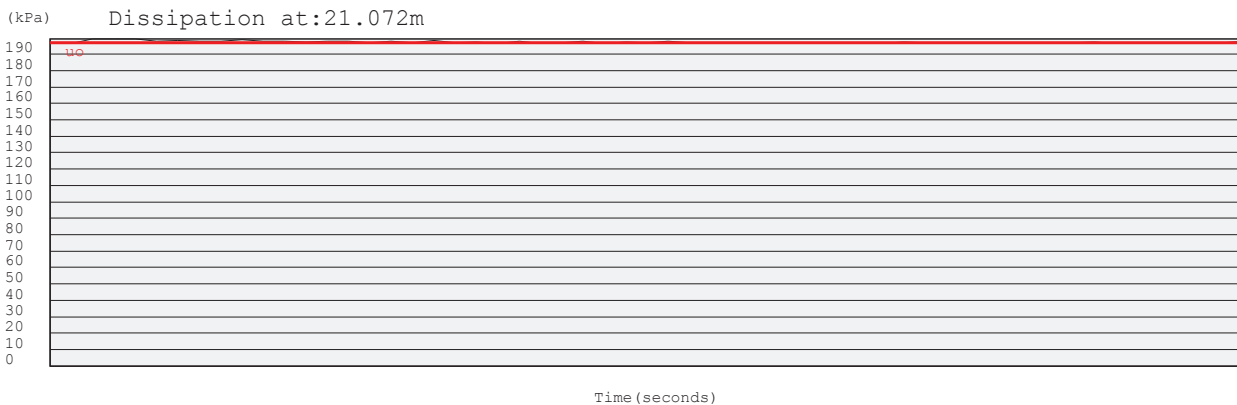
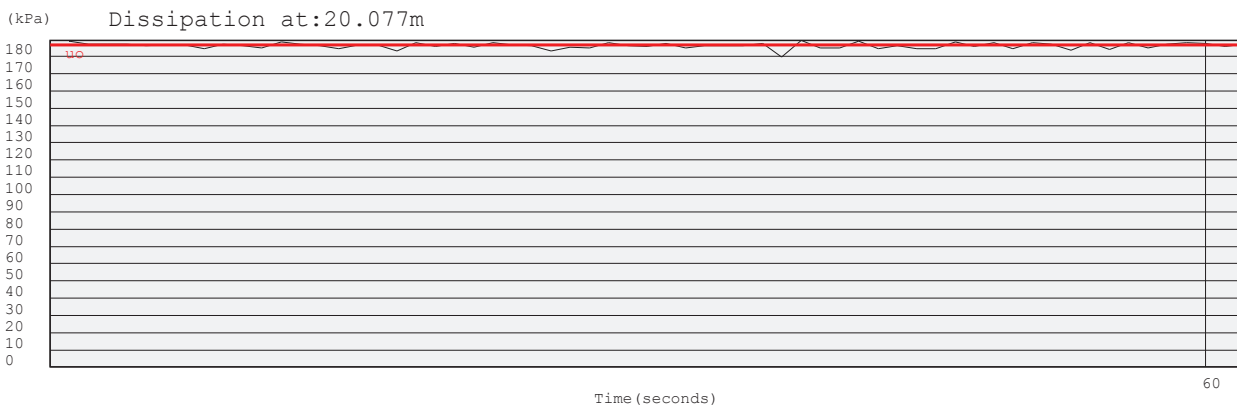
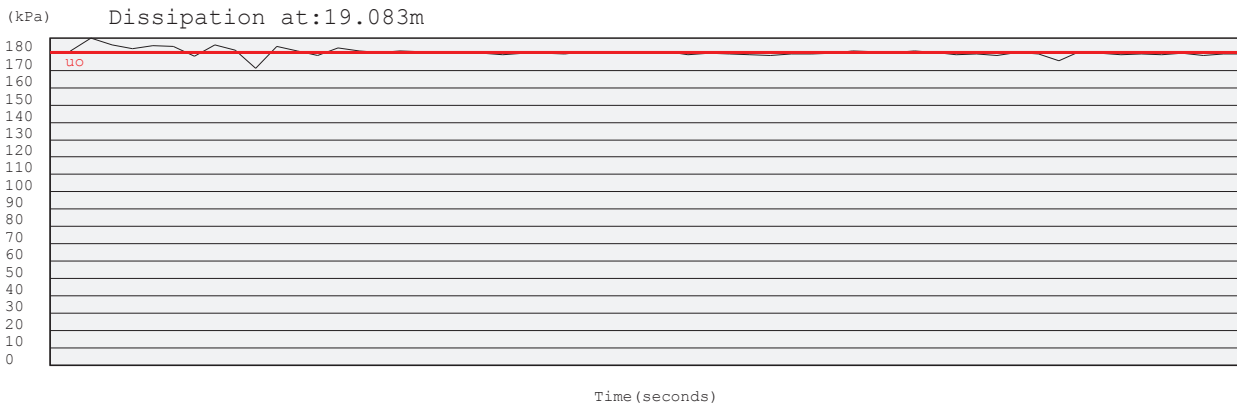
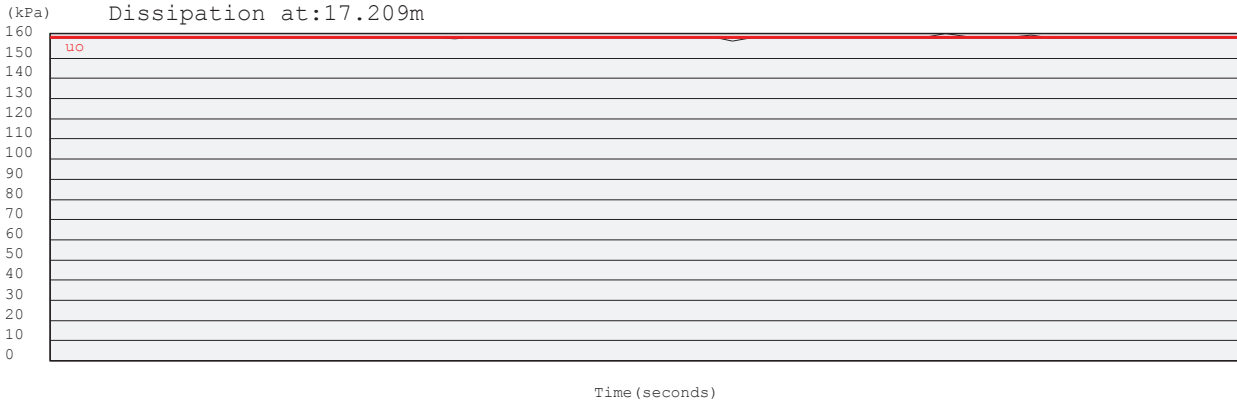
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 01 B

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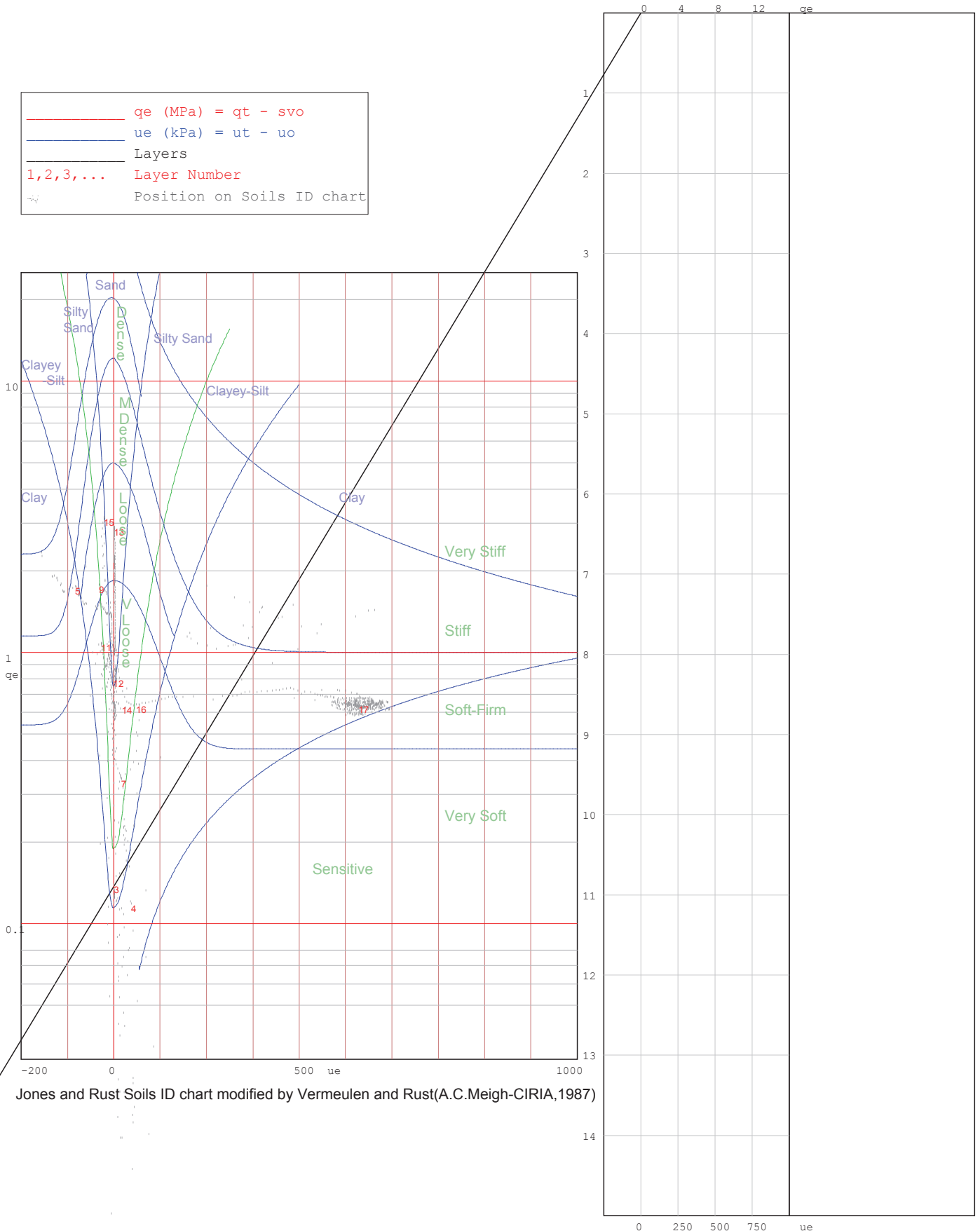


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Site: Durban Harbour over water

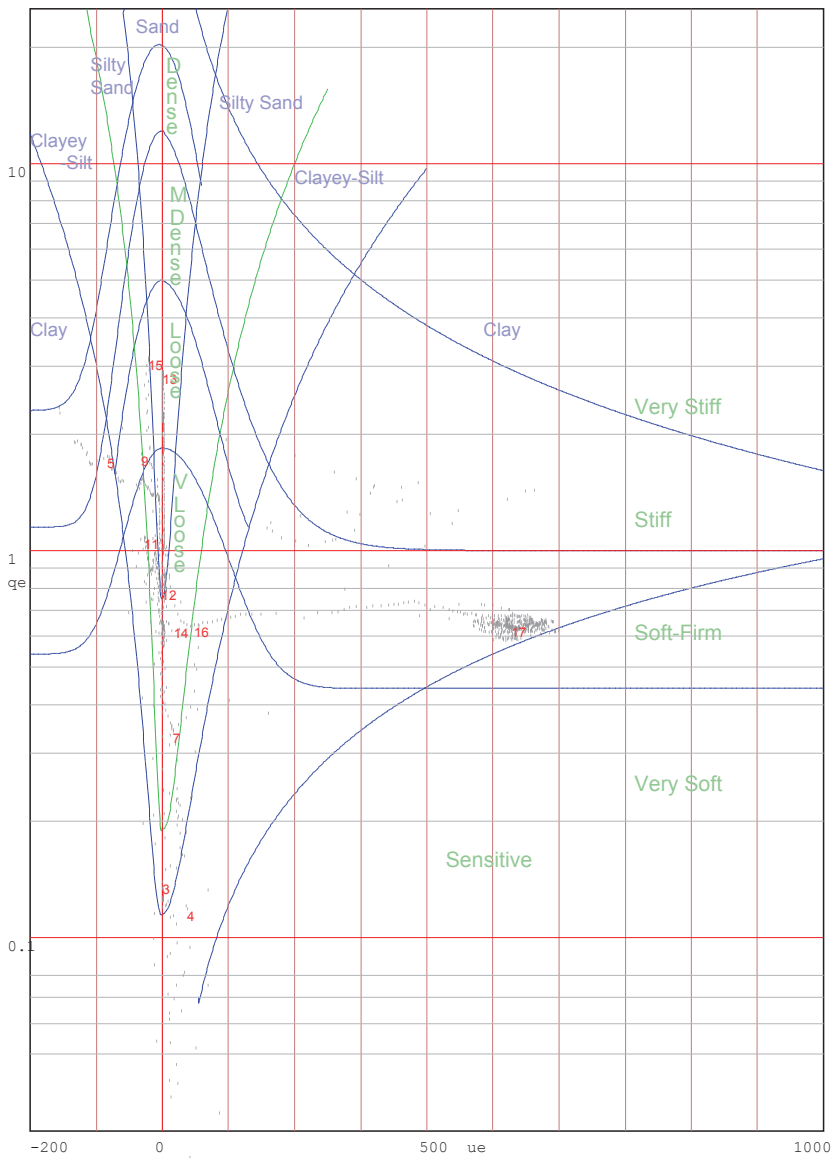
Hole No: P 01 B  
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$q_e$  (MPa) =  $q_t - s_{vo}$   
 $u_e$  (kPa) =  $u_t - u_o$   
 Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart

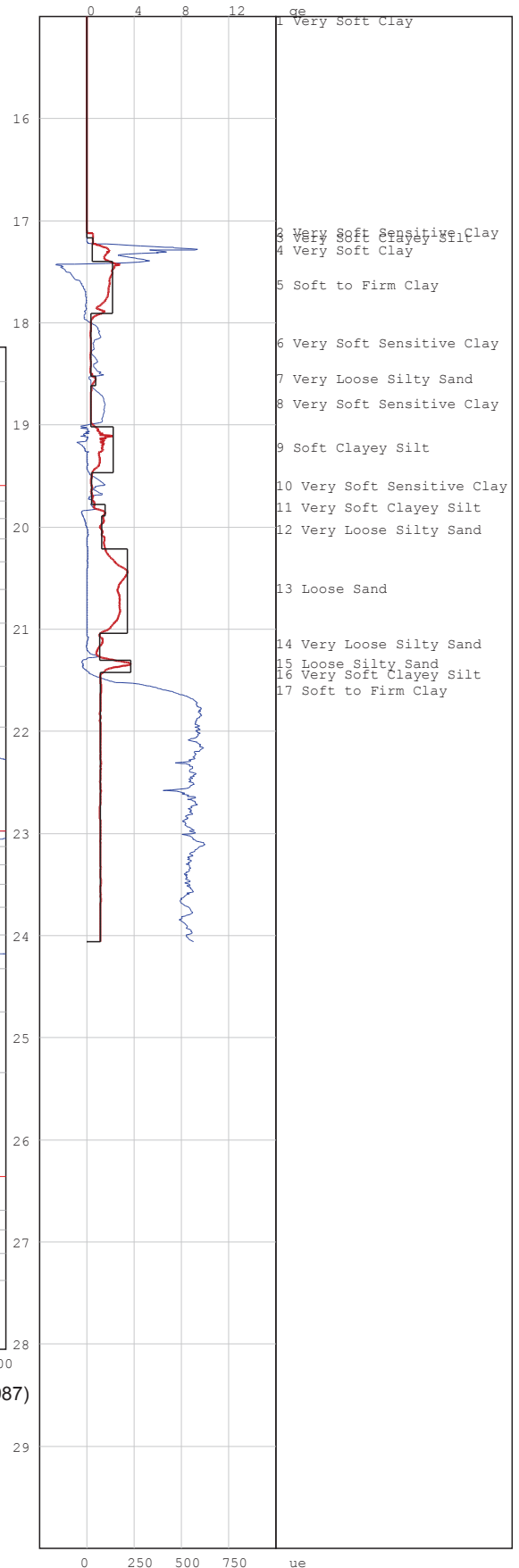


Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



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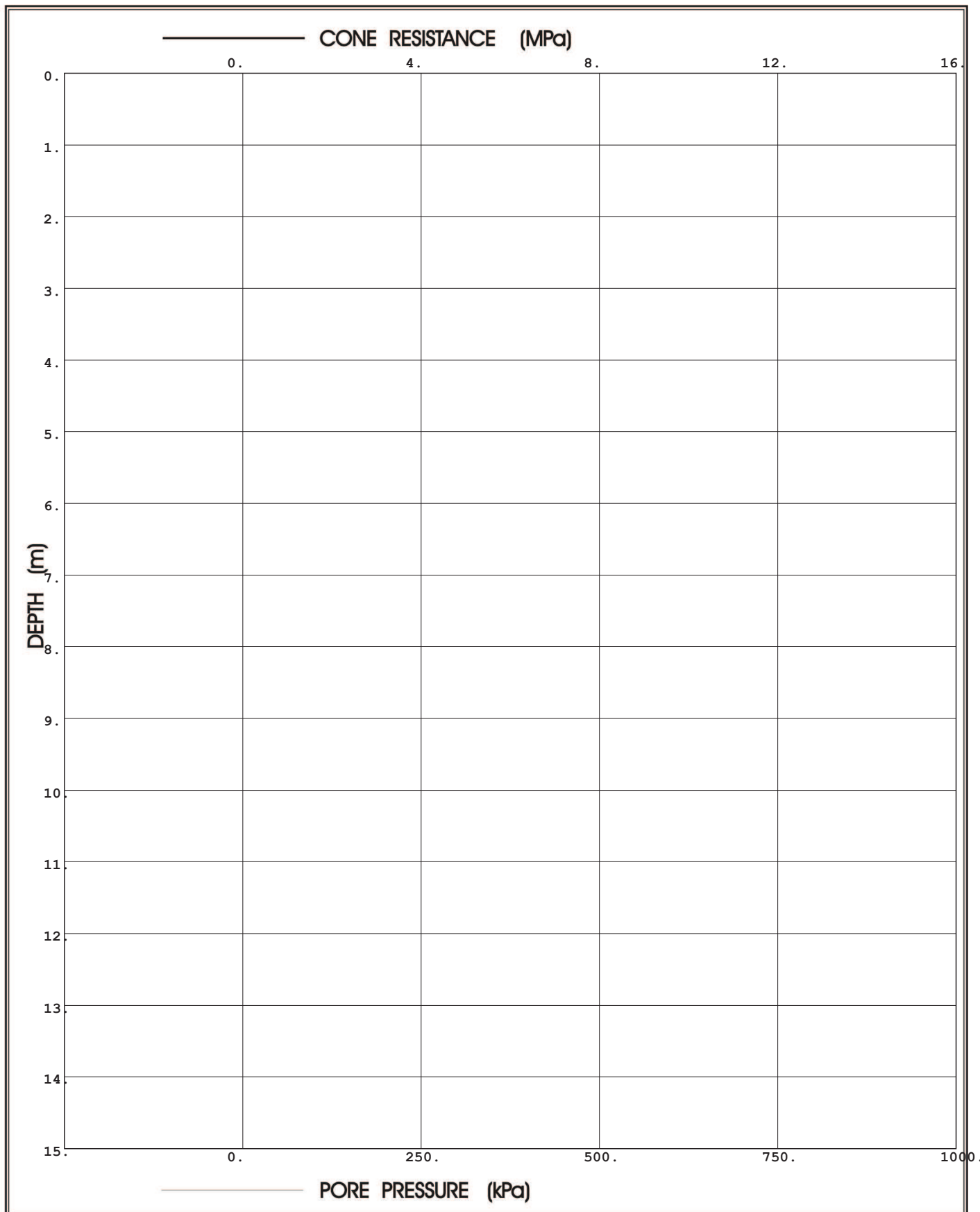
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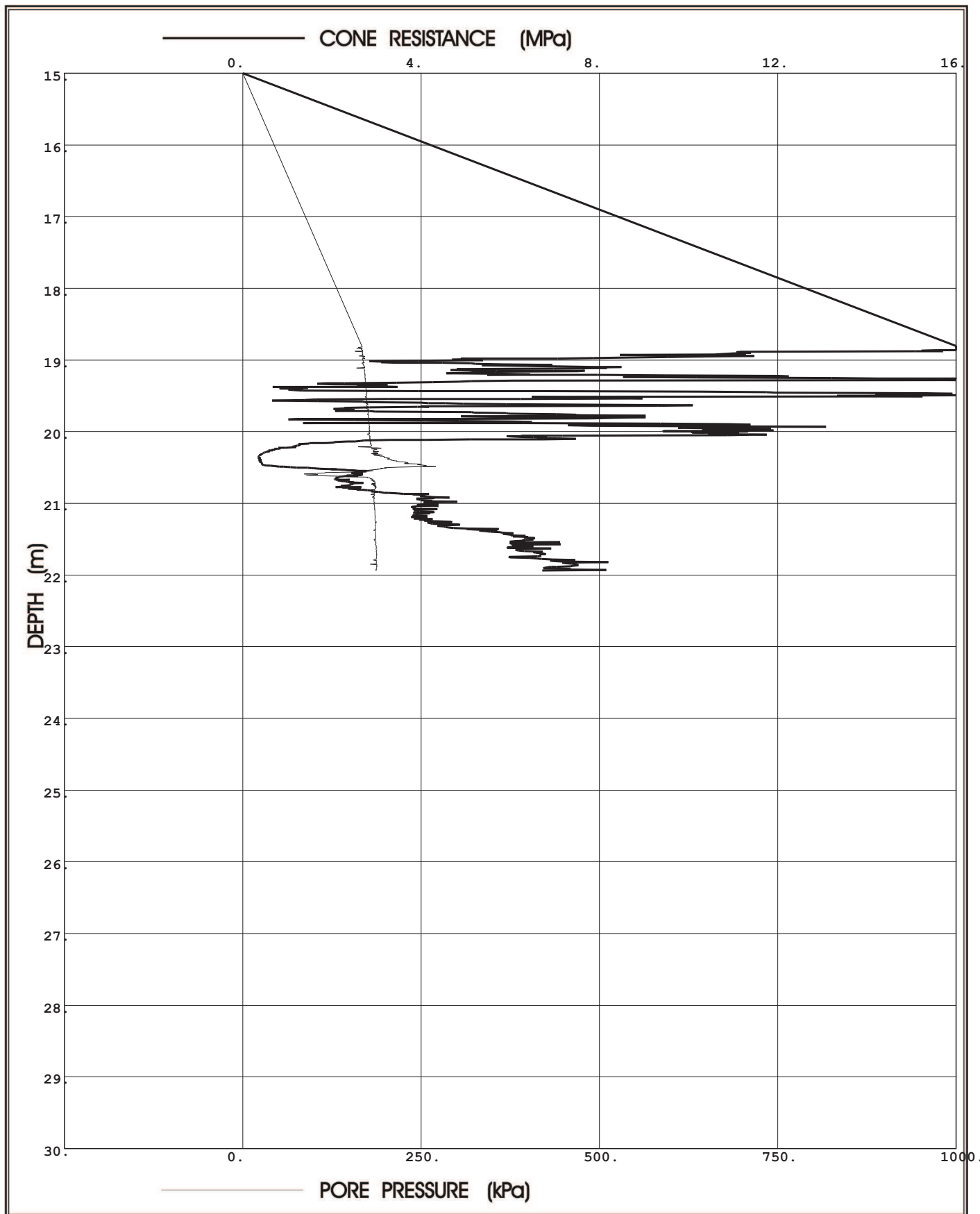
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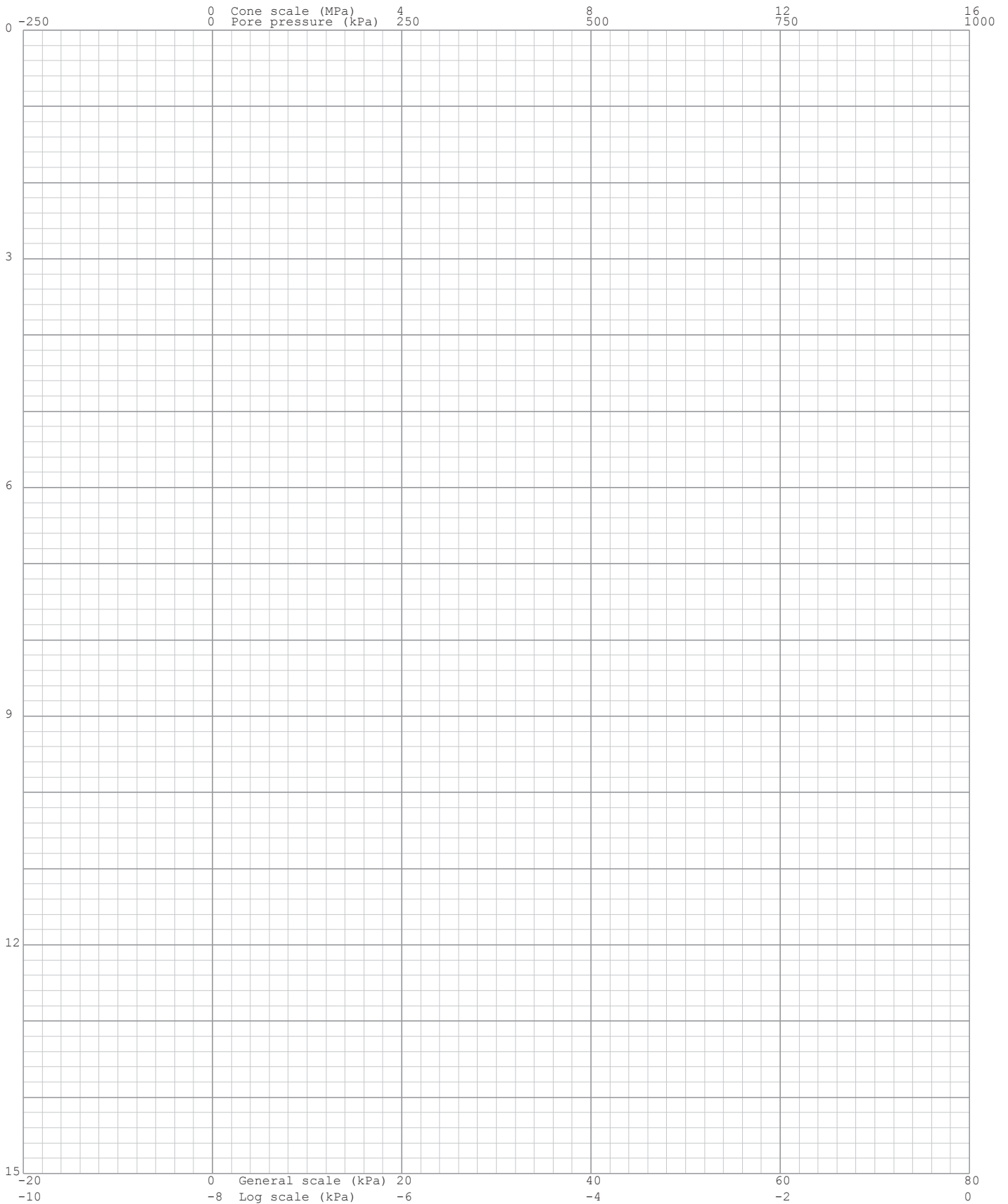
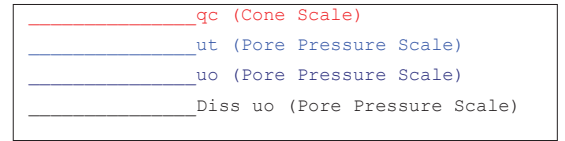


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Site: Durban Harbour over water

Hole No: P 01

Date: 2012/08/09

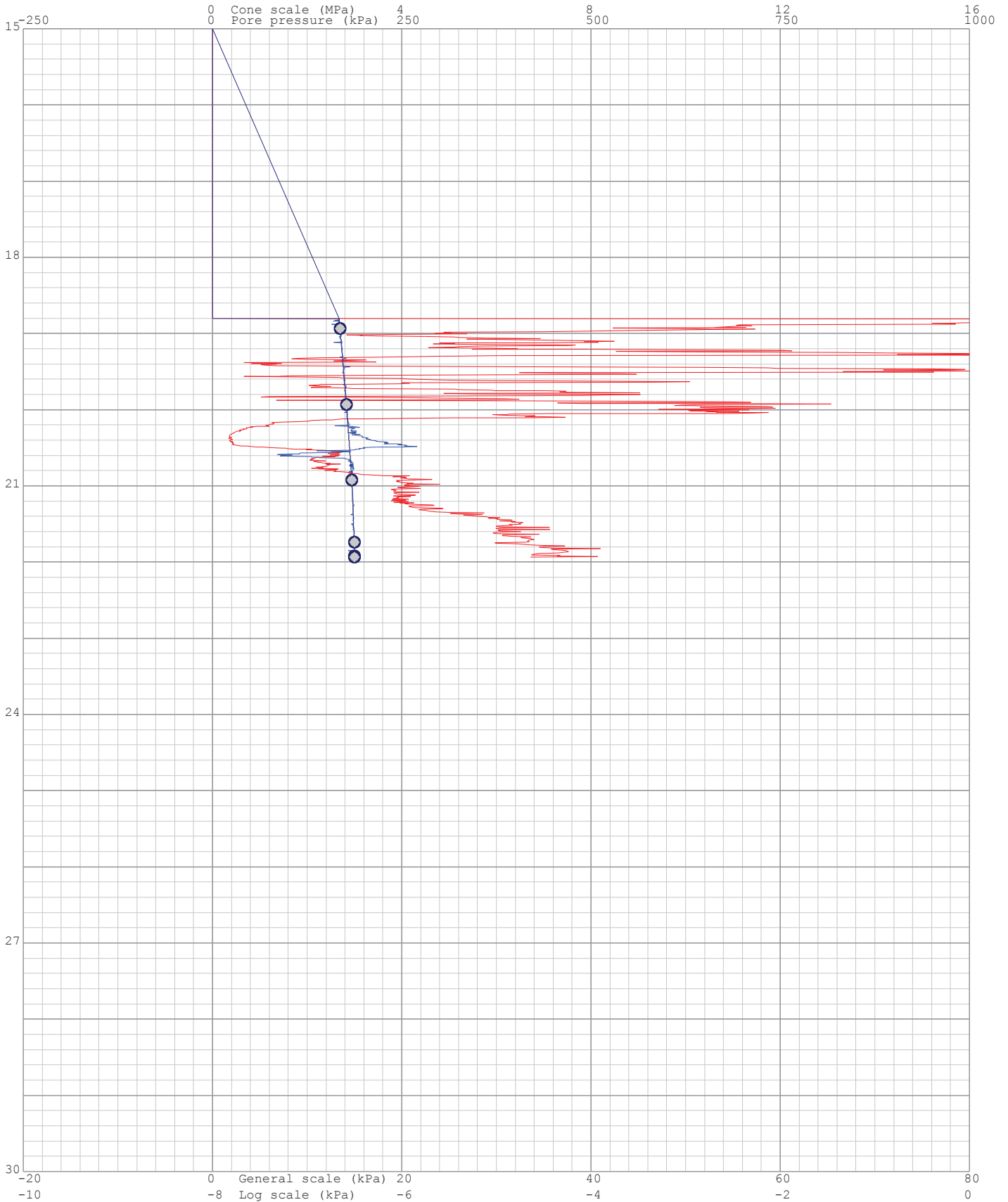
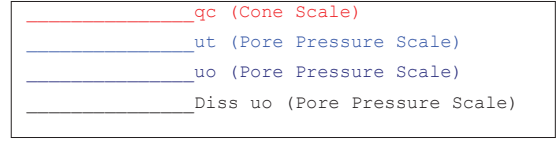


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 01

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Project: Durban Harbour Piezocone Investigation for Dredging

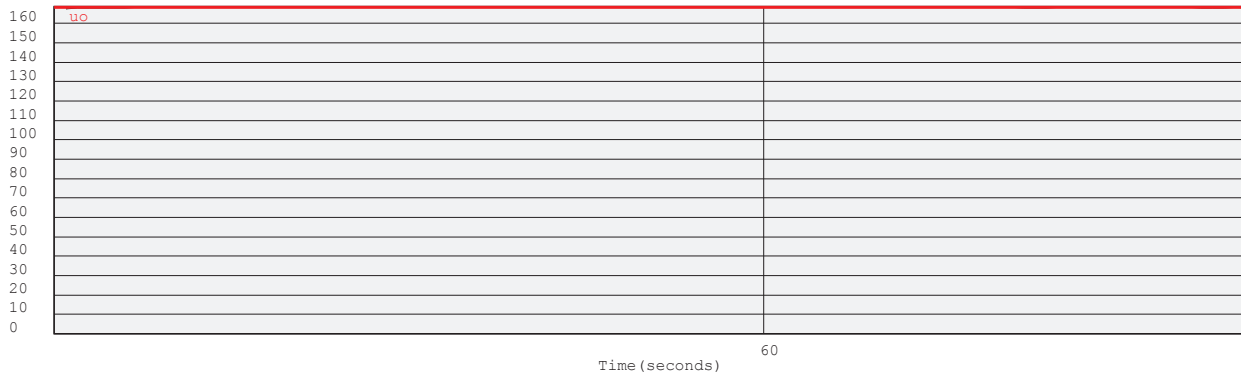
Site: Durban Harbour over water

Hole: P 01

Date: 2012/08/09

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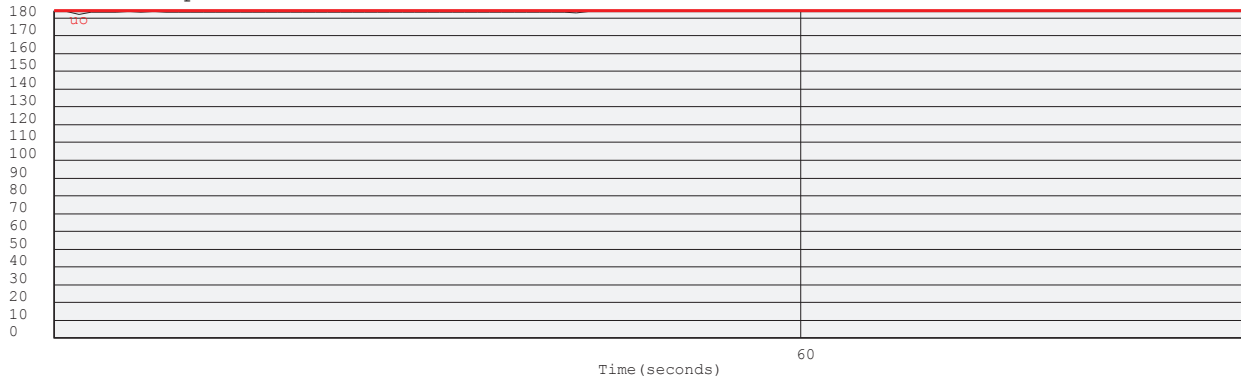
(kPa) Dissipation at: 18.935m



(kPa) Dissipation at: 19.932m



(kPa) Dissipation at: 20.926m



(kPa) Dissipation at: 21.74m



Project: Durban Harbour Piezocone Investigation for Dredging

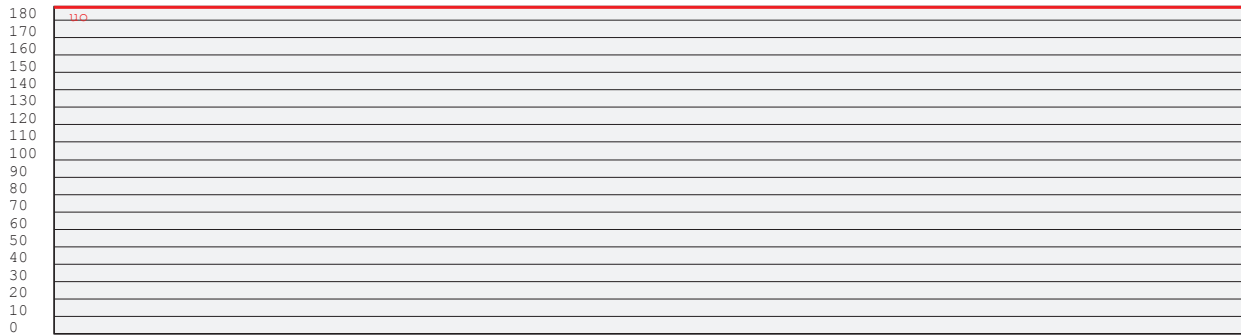
Site: Durban Harbour over water

Hole: P 01

Date: 2012/08/09

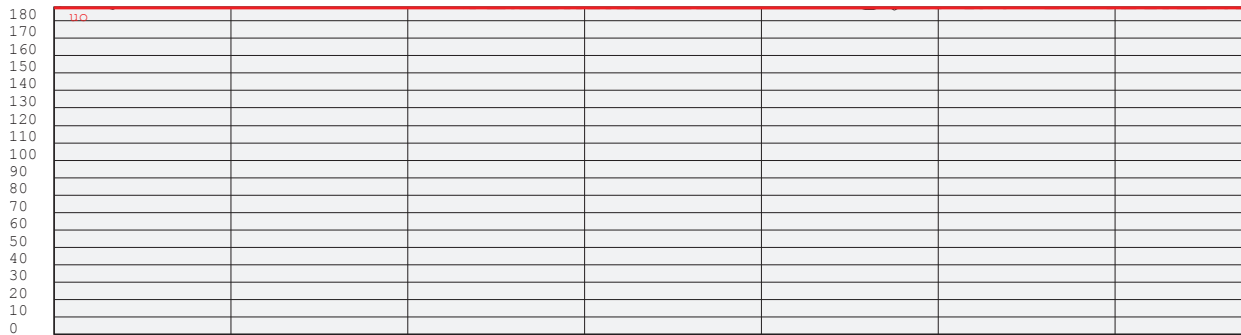
Page: 2

(kPa) Dissipation at: 21.923m



Time (seconds)

(kPa) Dissipation at: 21.937m



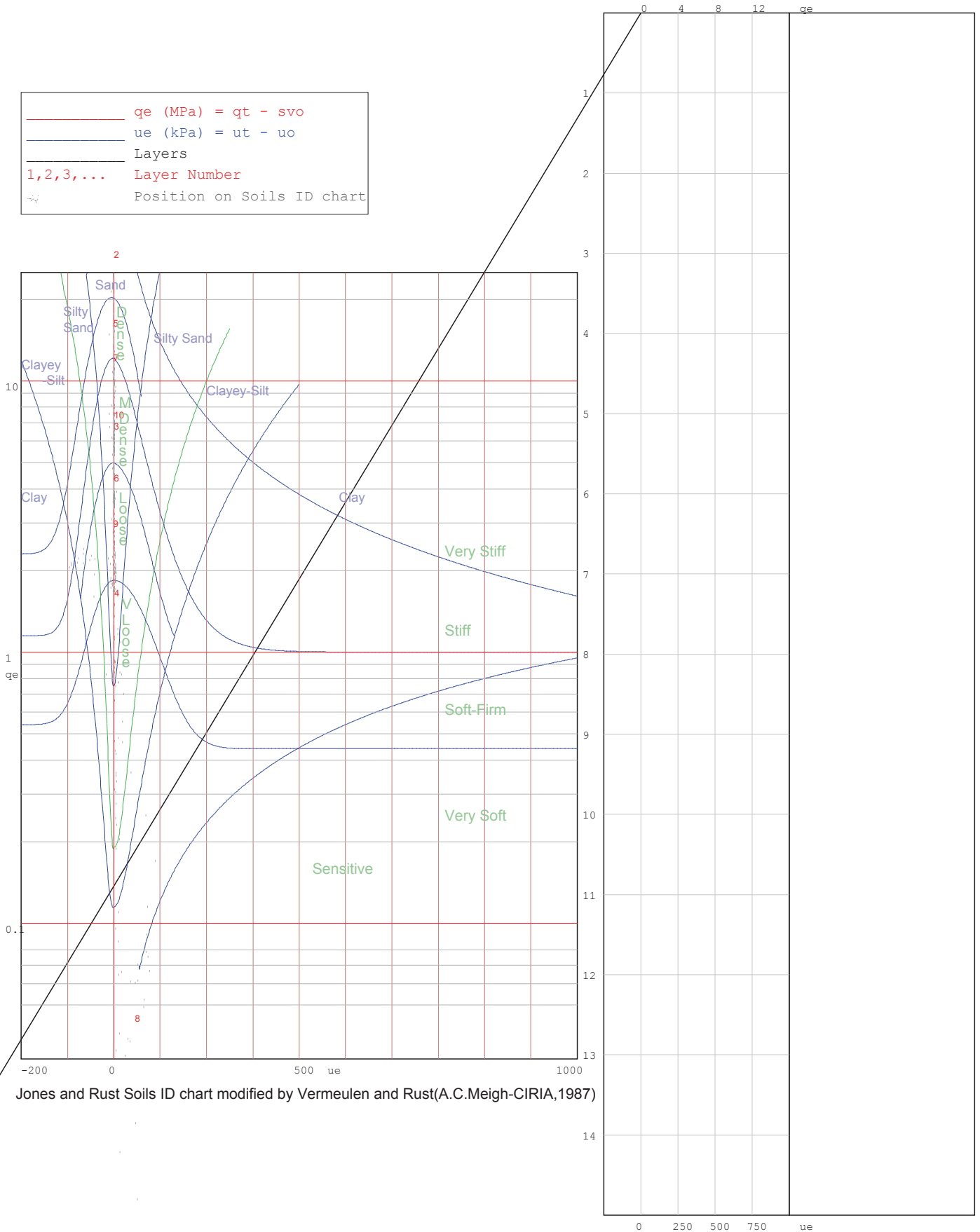
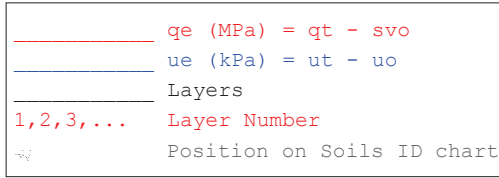
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Time (seconds)

Project: Durban Harbour Piezocone Investigation for Dredging

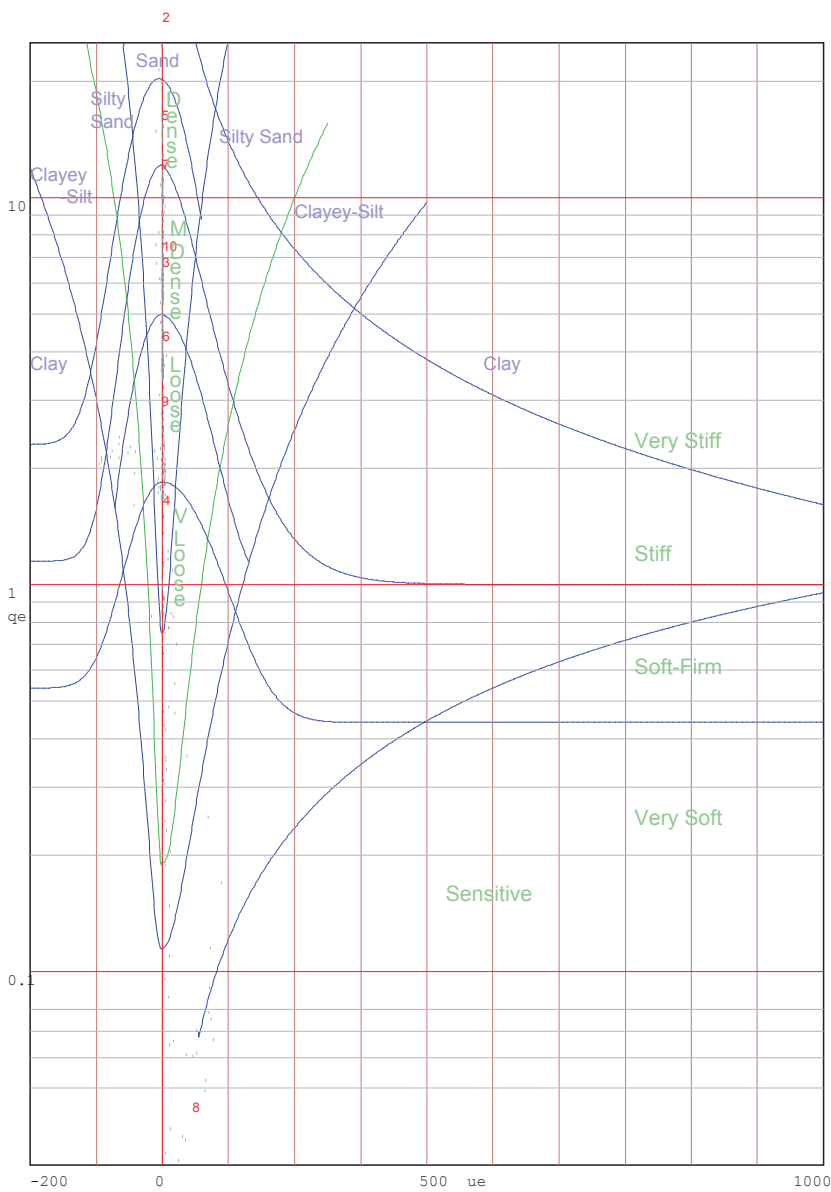
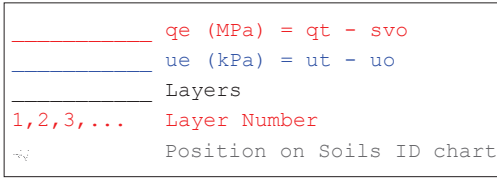
Site: Durban Harbour over water

Hole No: P 01

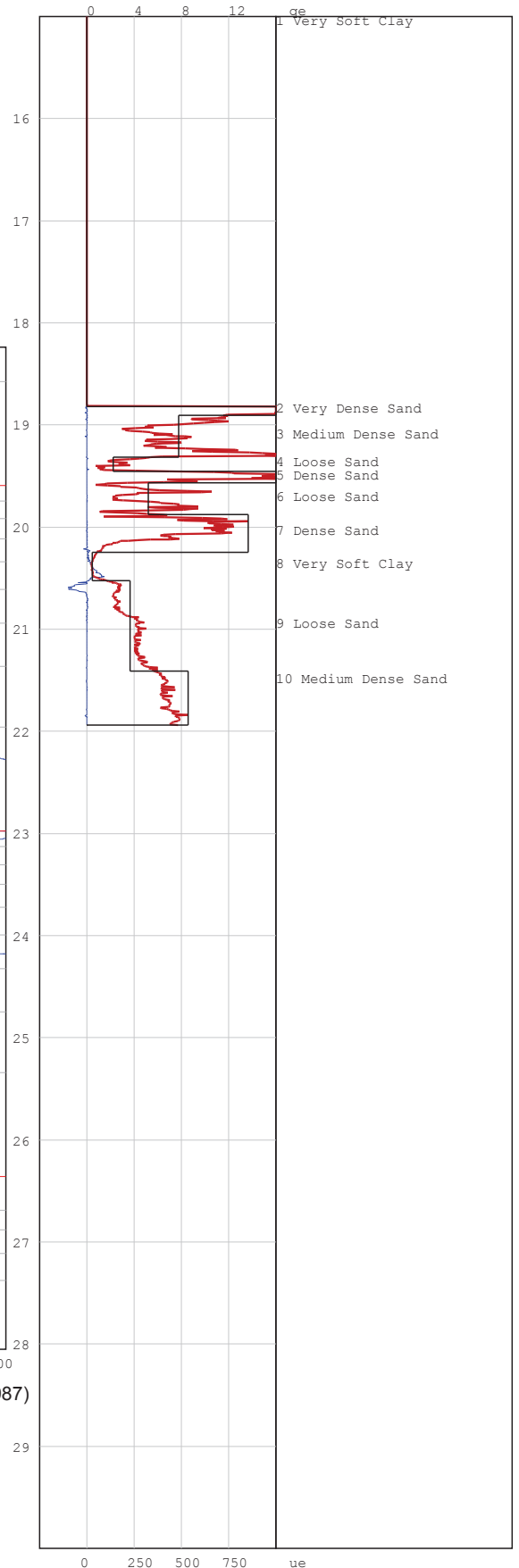
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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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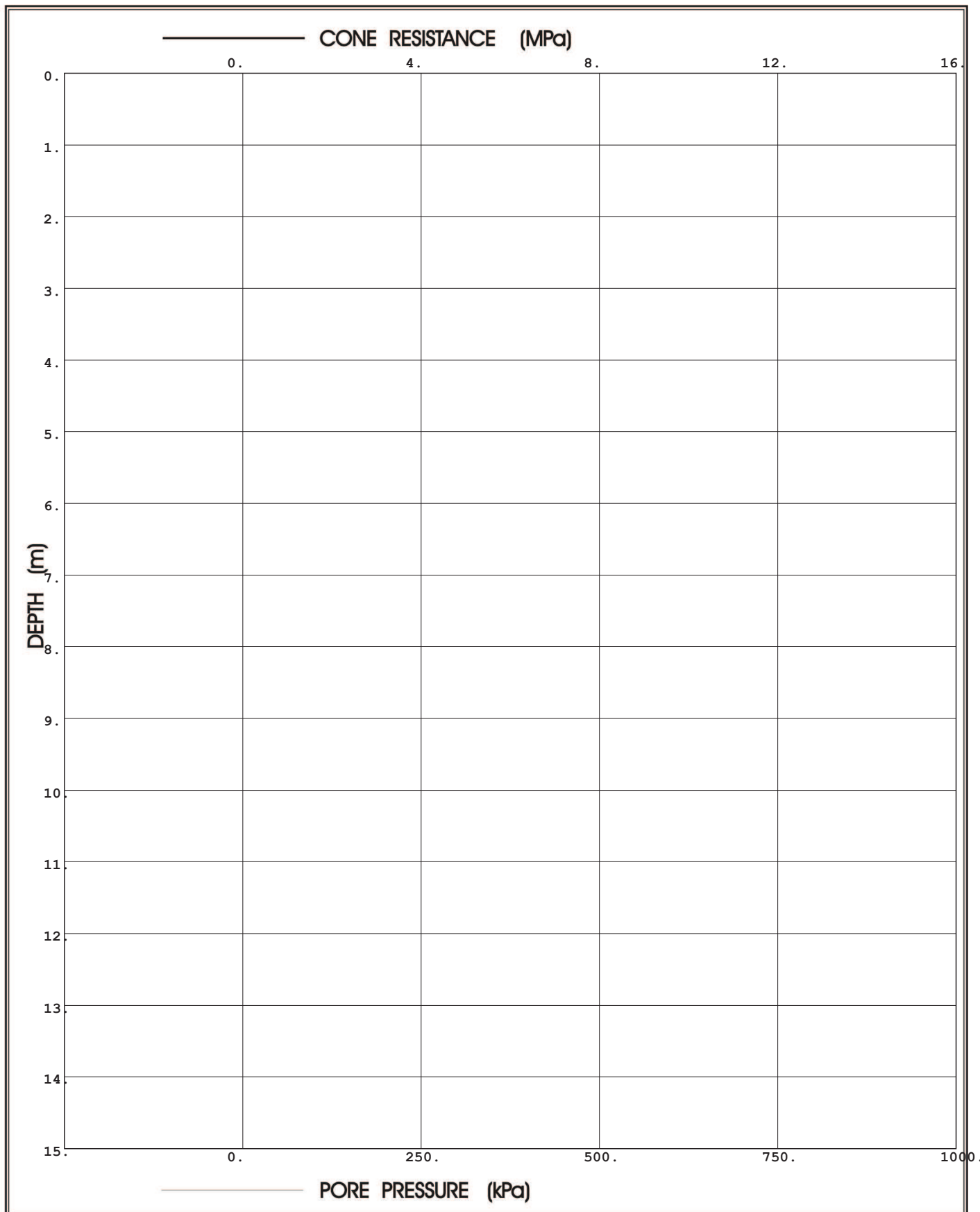
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 02

DATE: 2012/08/10

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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

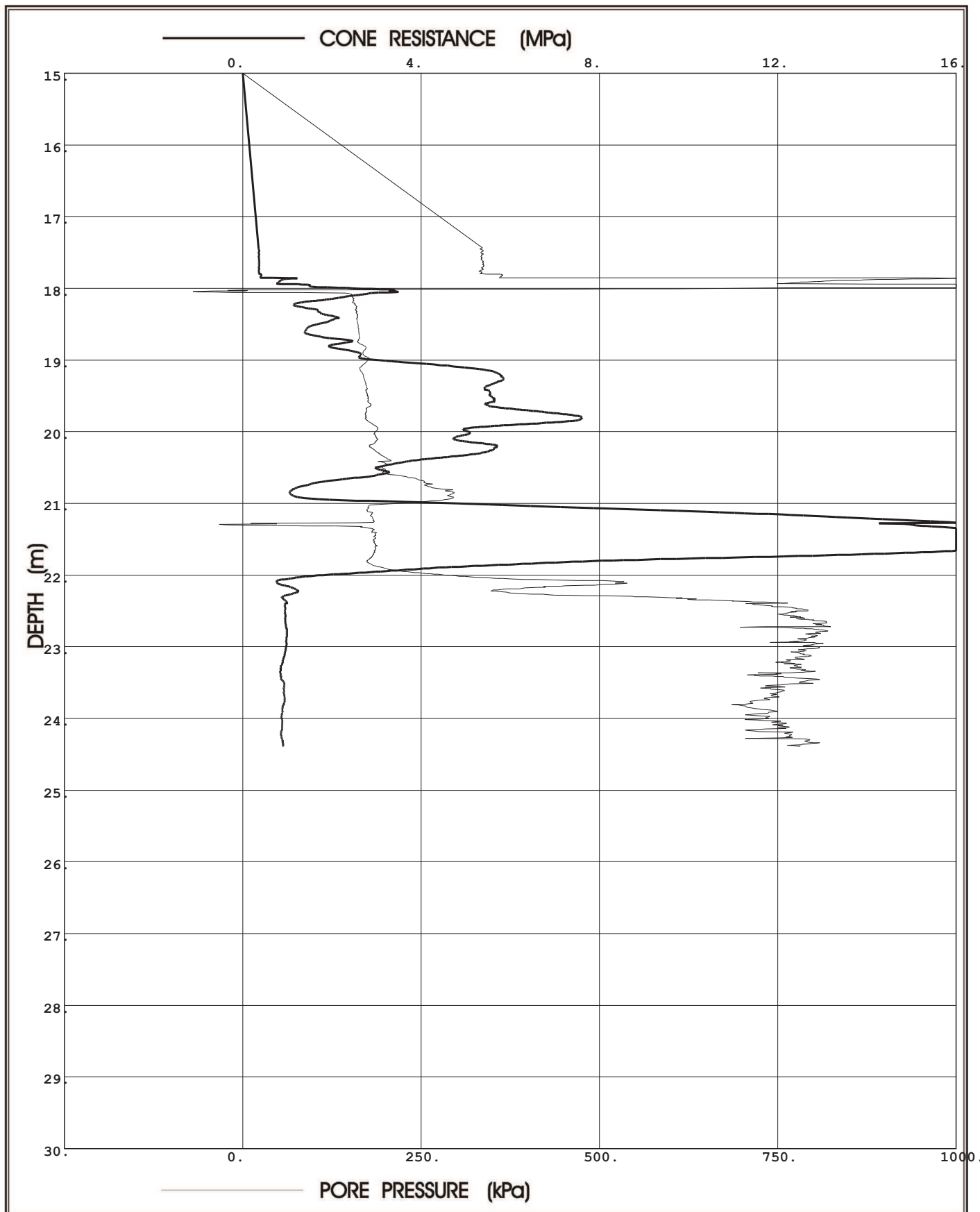
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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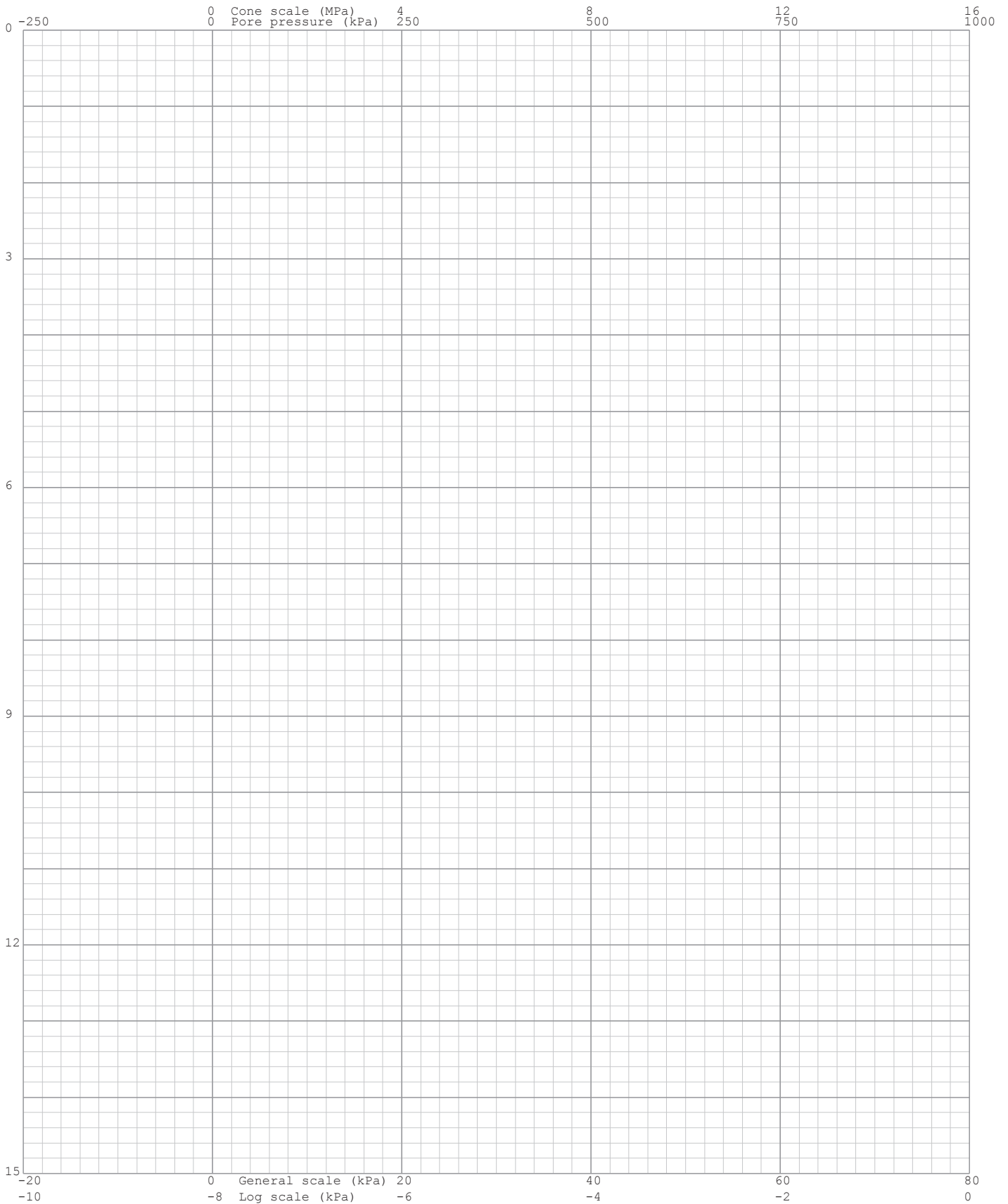
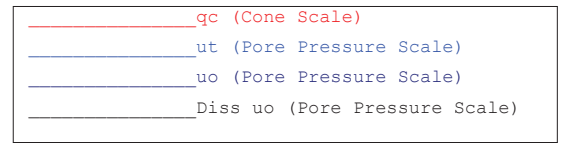
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

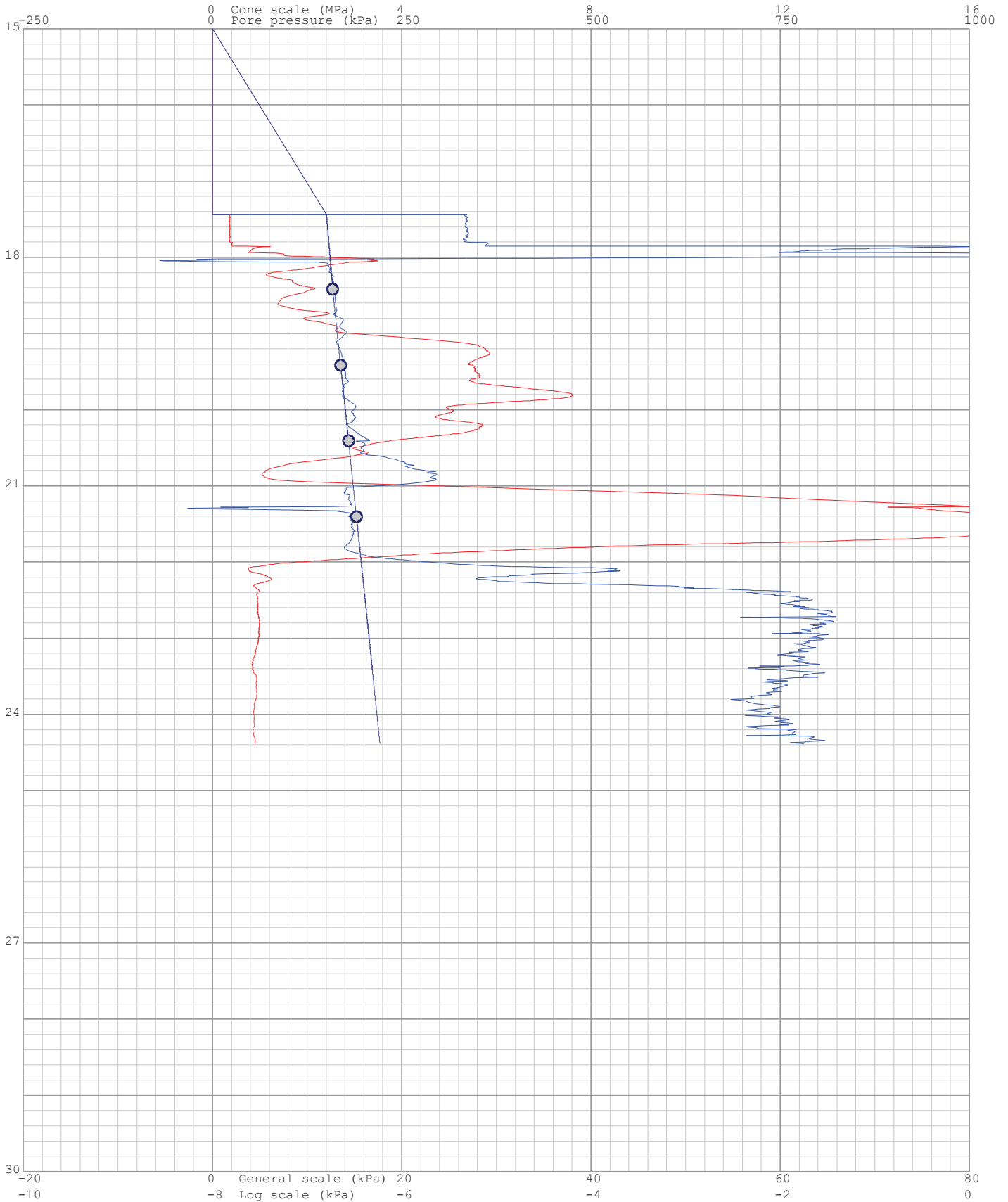
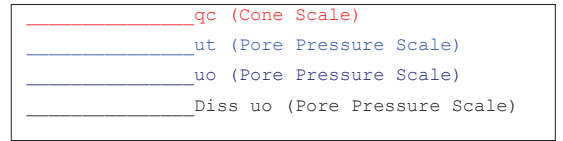
Hole No: P 02  
Date: 2012/08/10



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 02  
Date: 2012/08/10



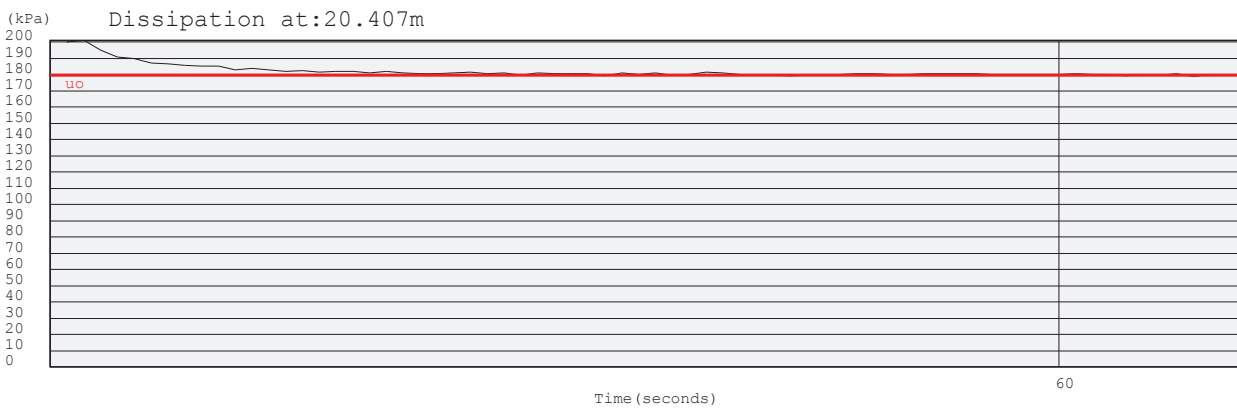
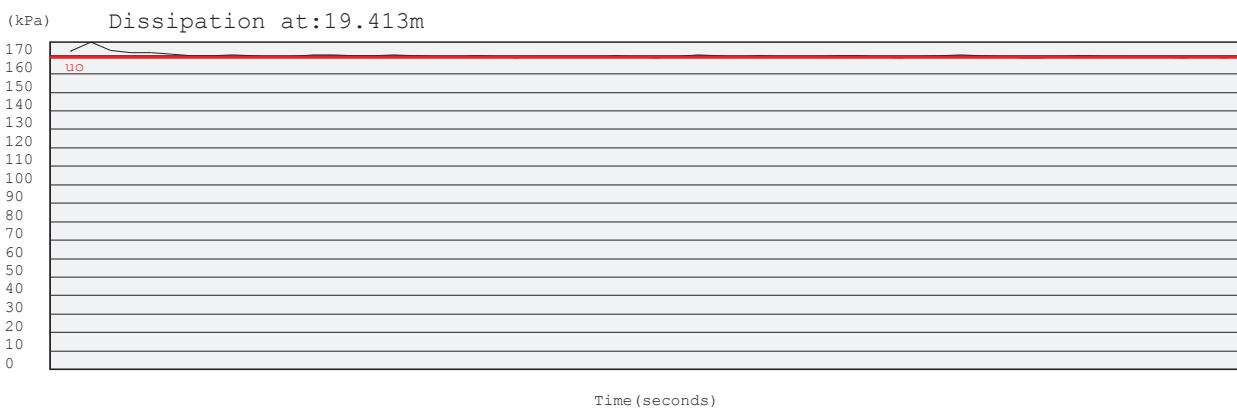
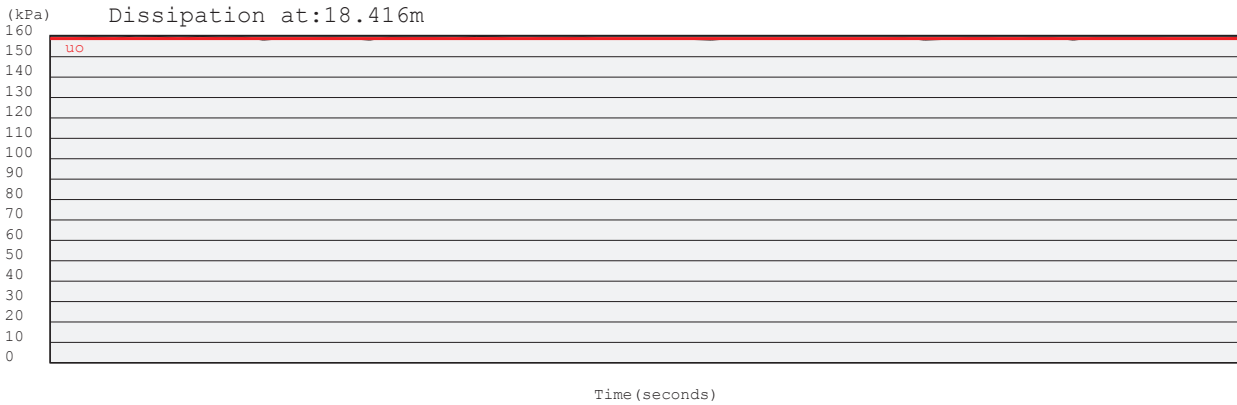
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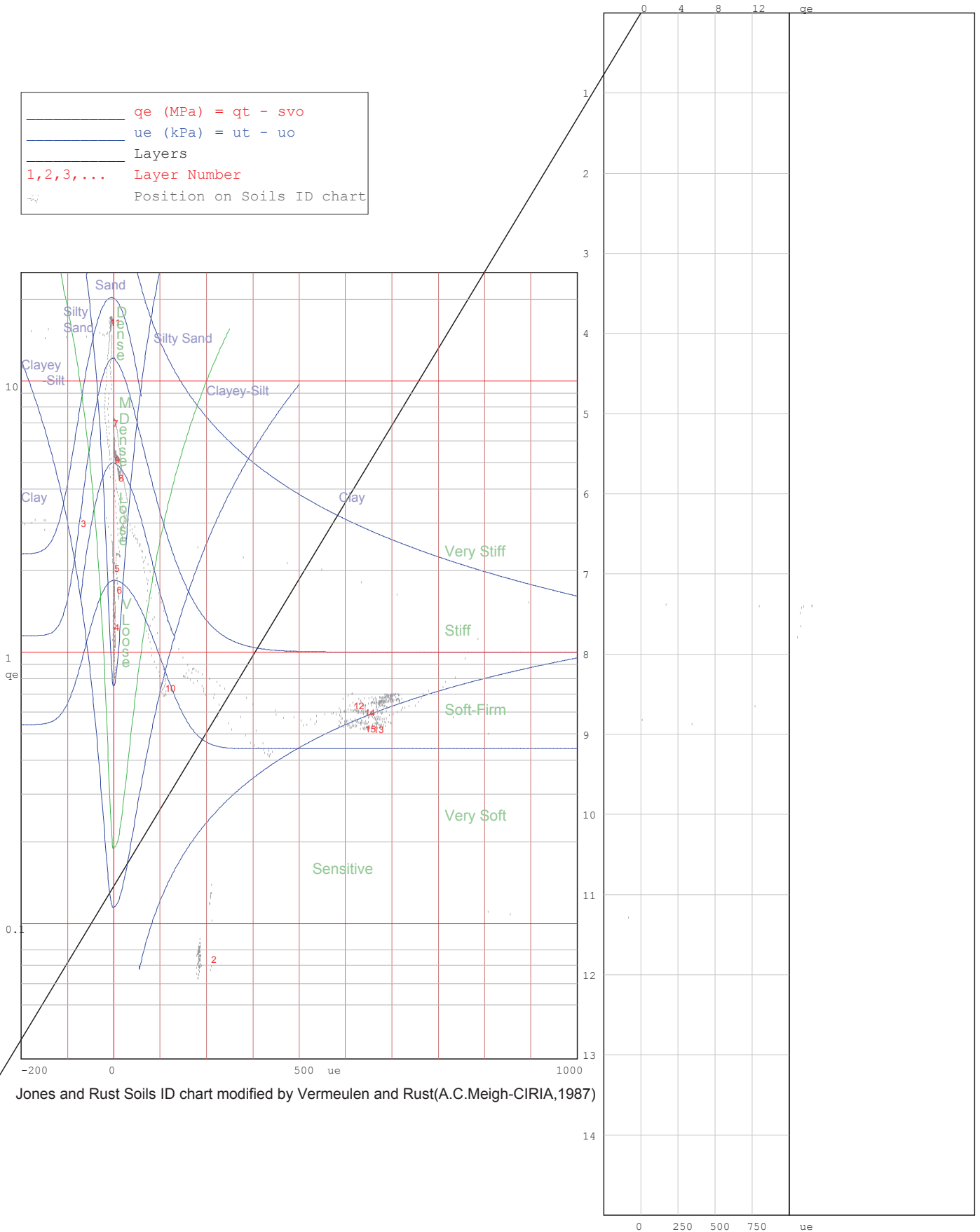
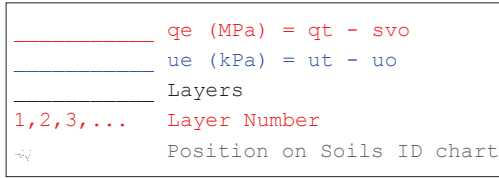


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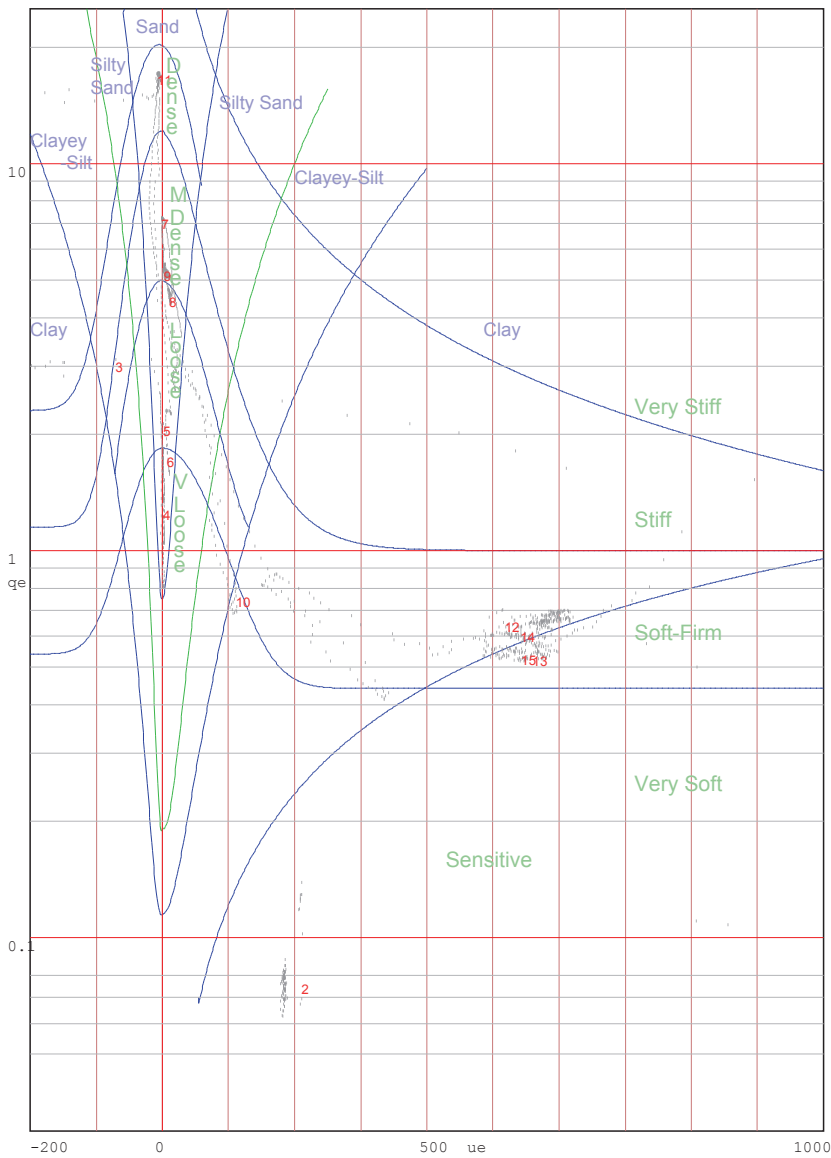
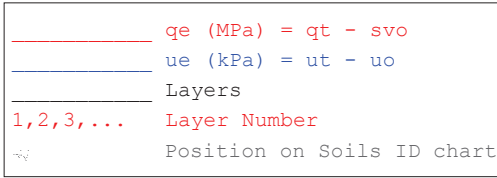
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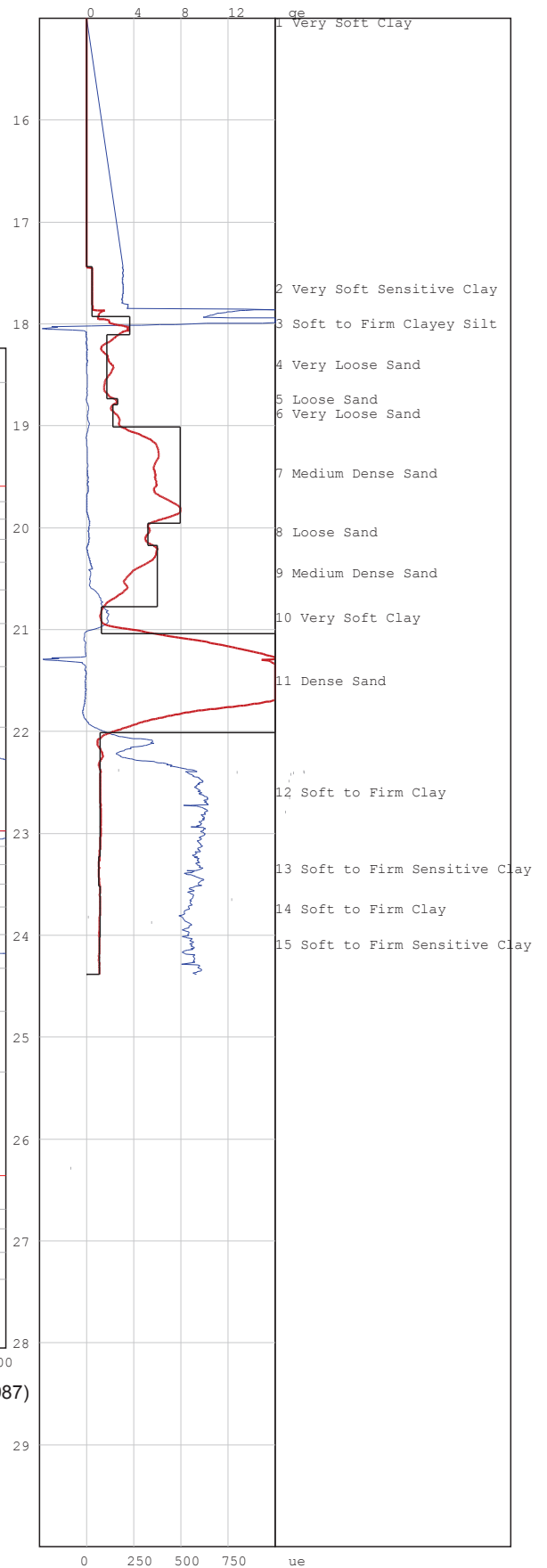
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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



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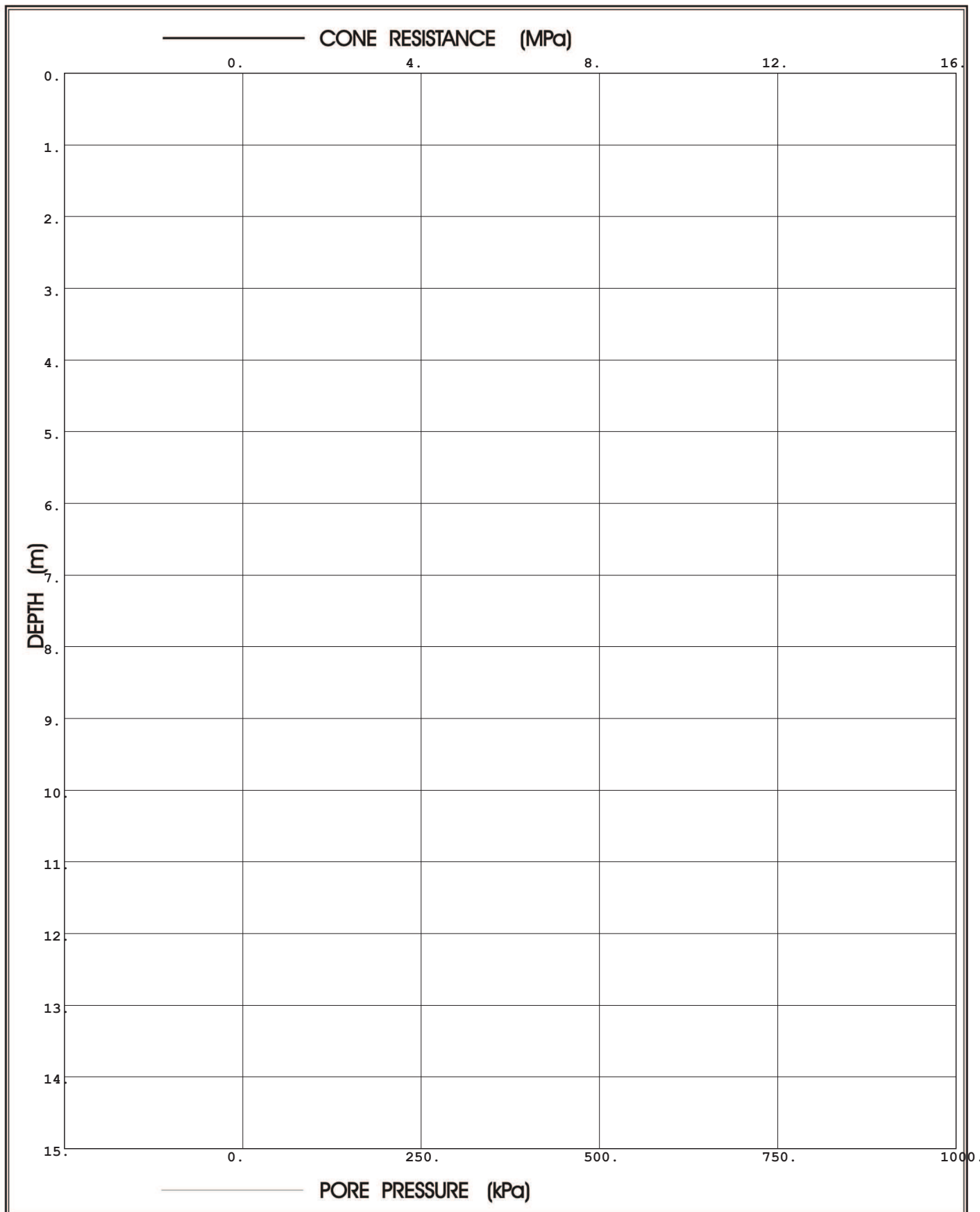
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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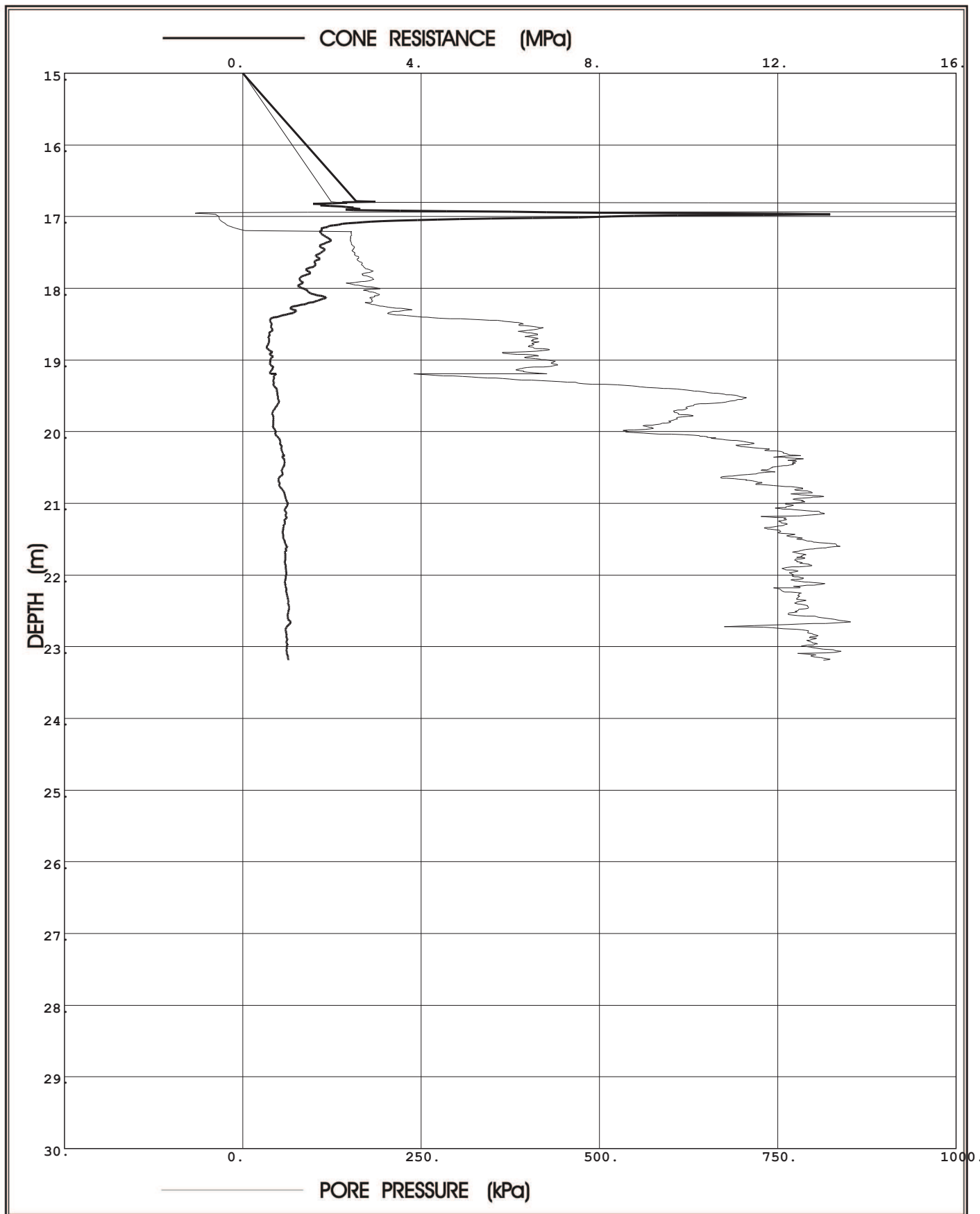
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CPTU (RE): P 03

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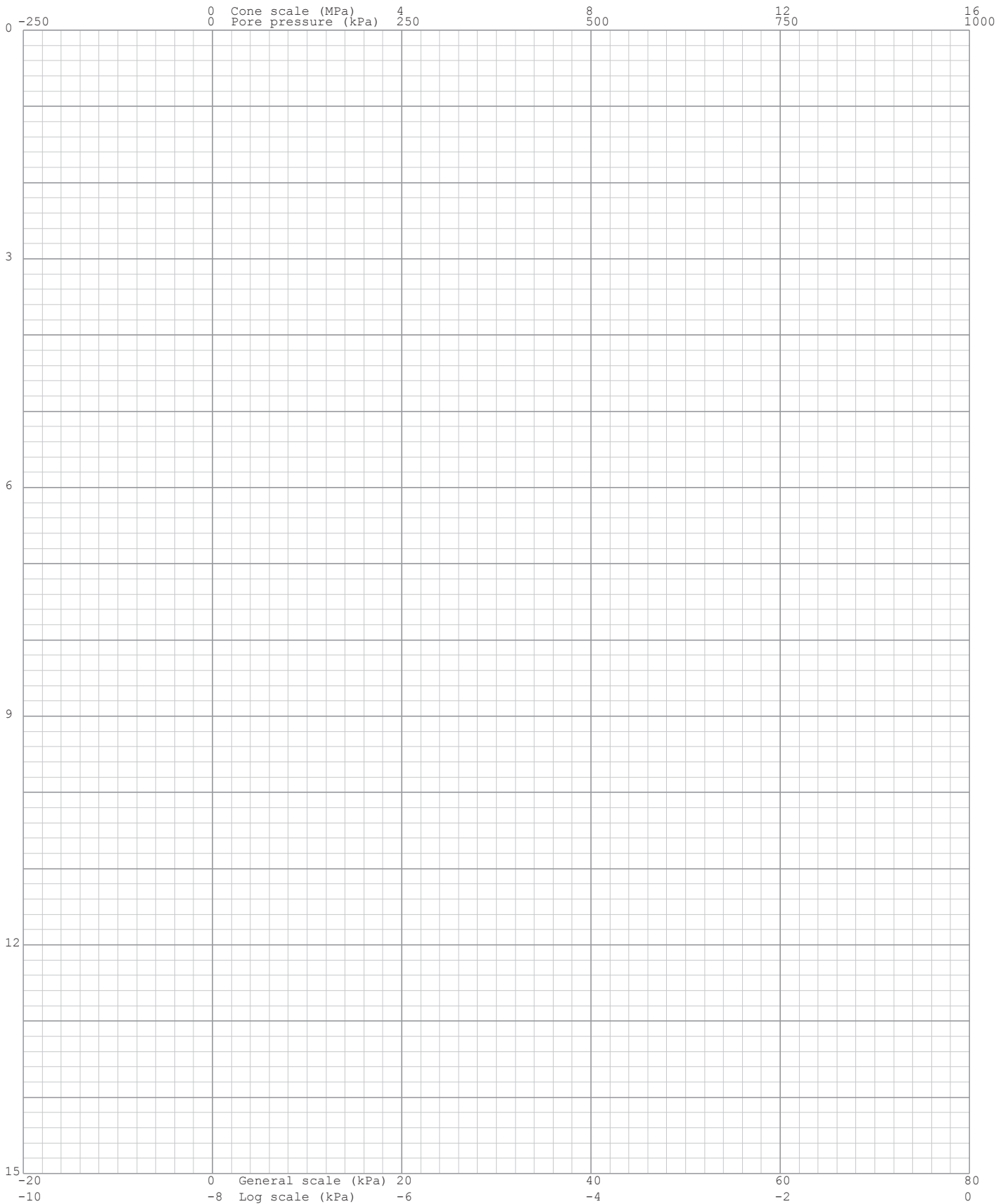
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 03

Date: 2012/08/13

|       |                               |
|-------|-------------------------------|
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| _____ | ut (Pore Pressure Scale)      |
| _____ | uo (Pore Pressure Scale)      |
| _____ | Diss uo (Pore Pressure Scale) |

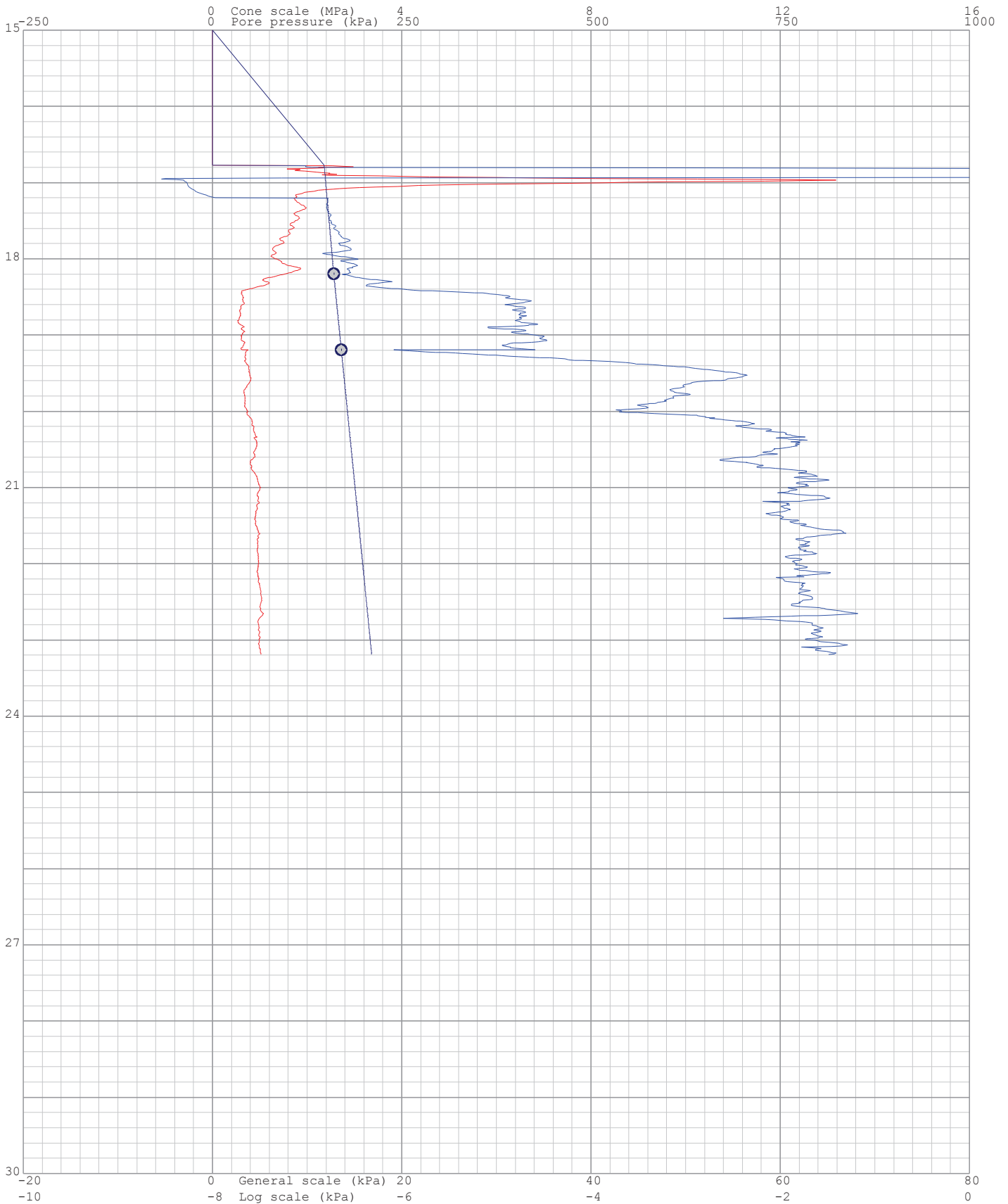
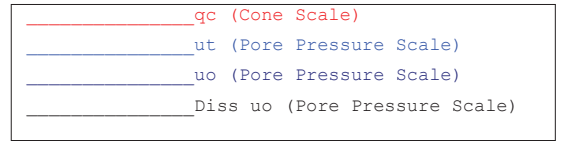




Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 03  
Date: 2012/08/13



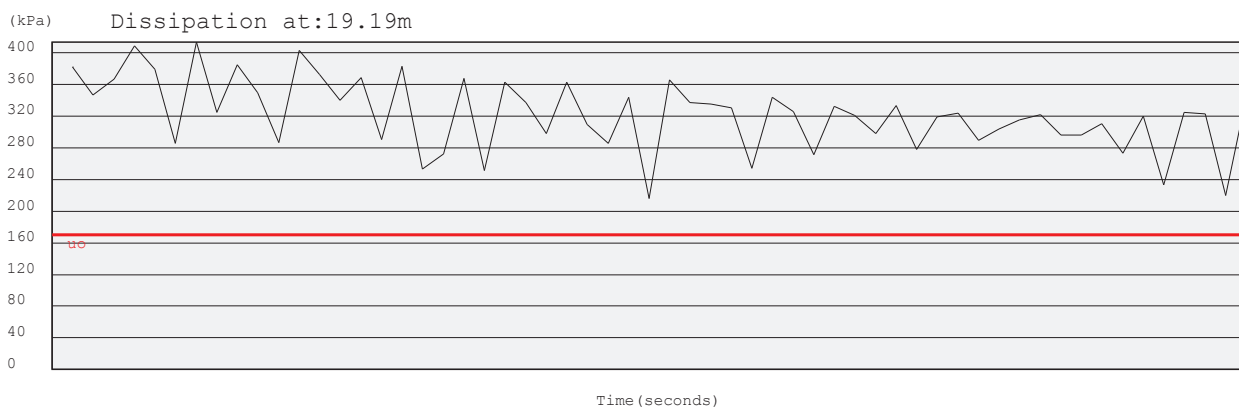
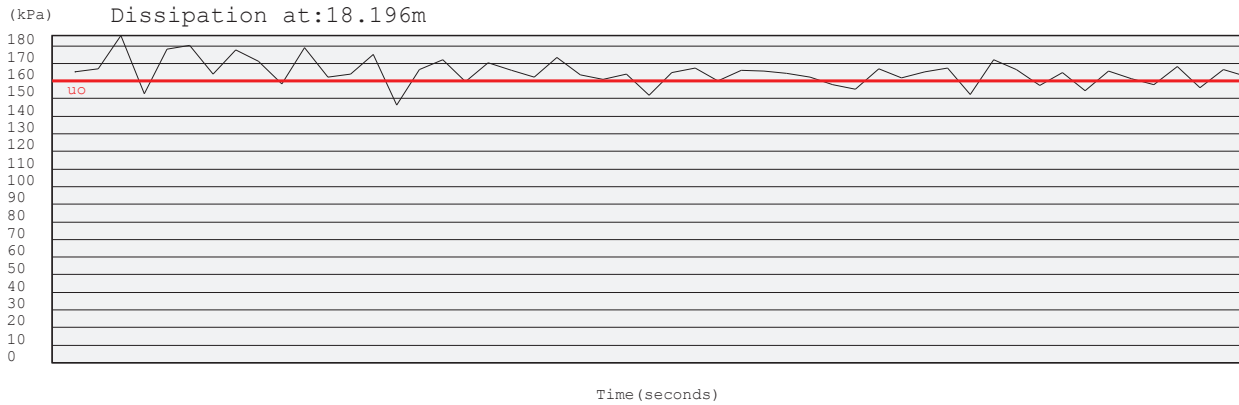
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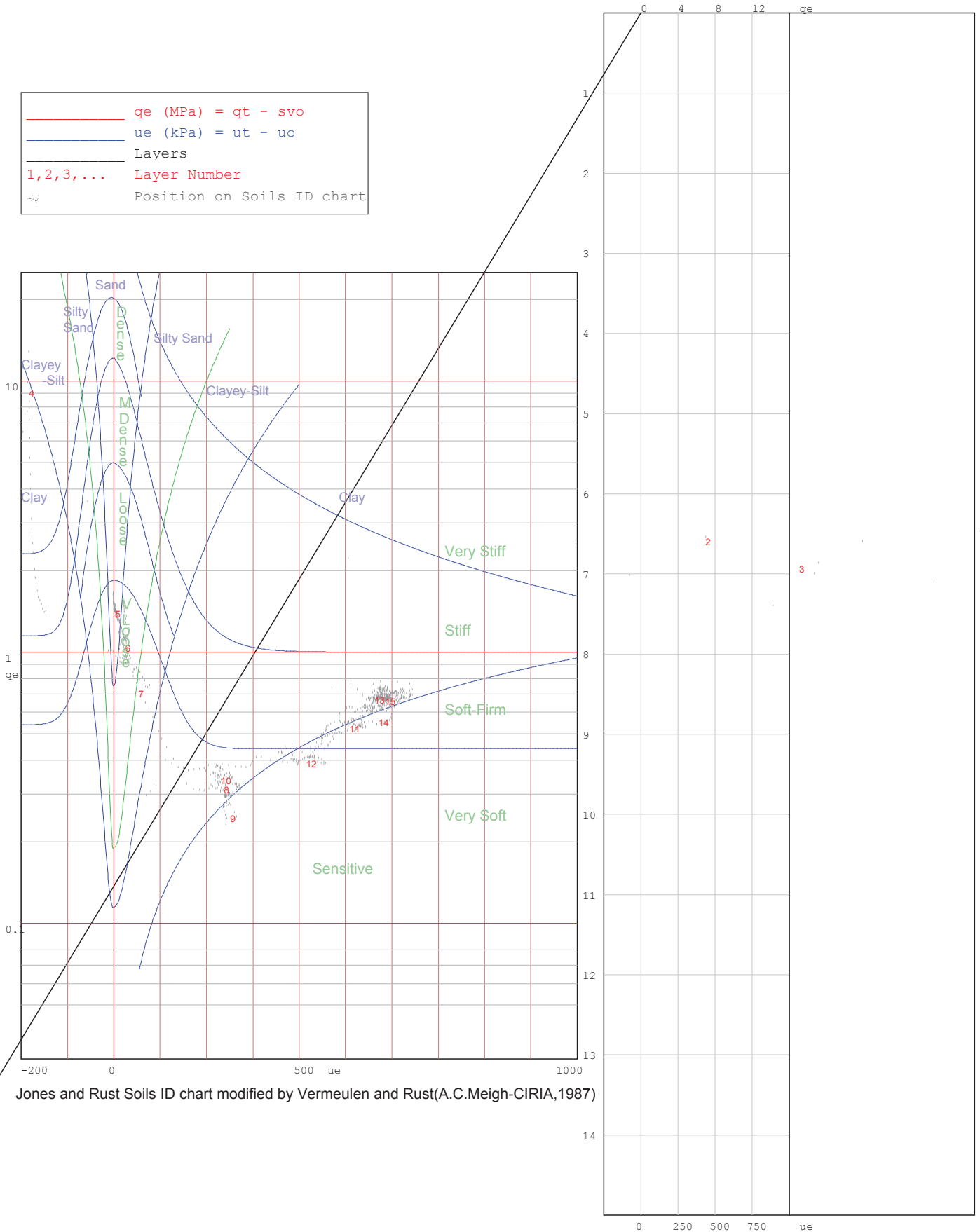
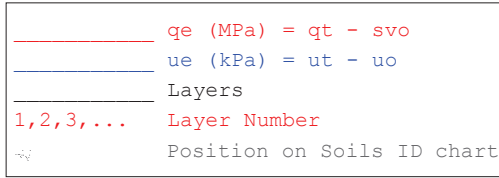


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Date: 2012/08/13



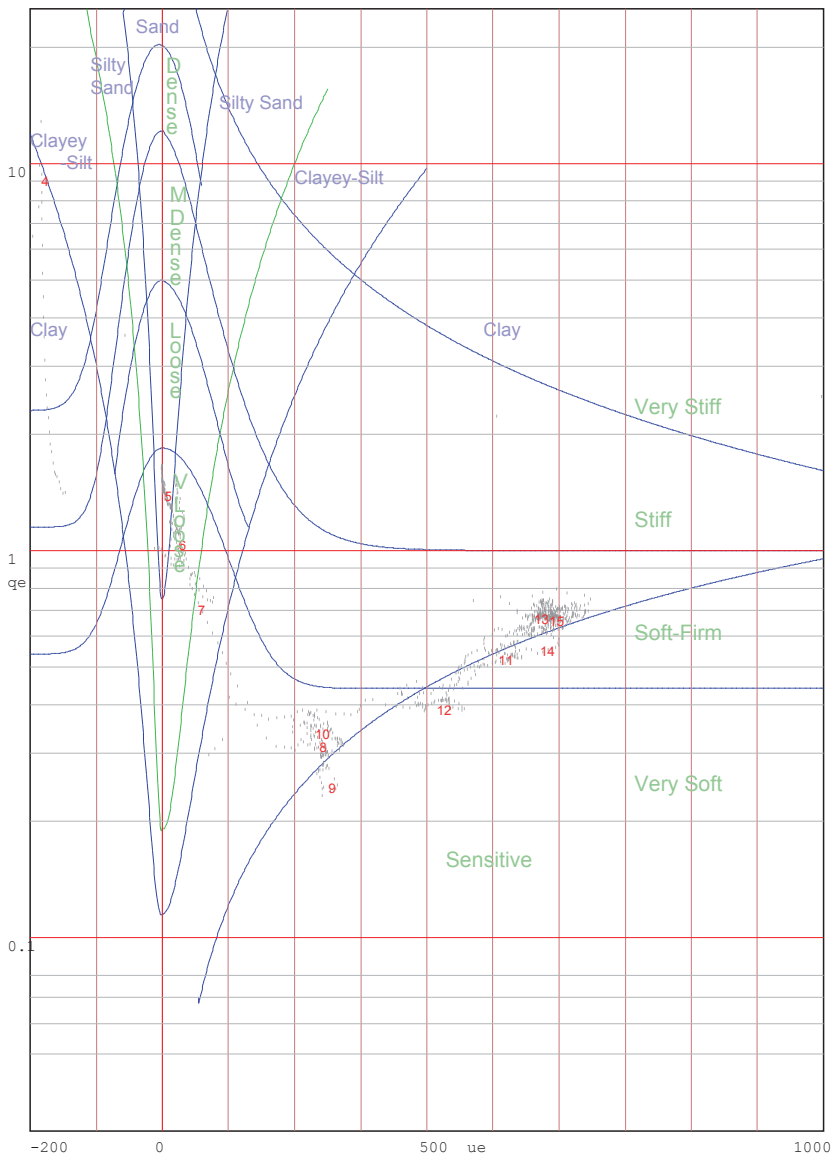
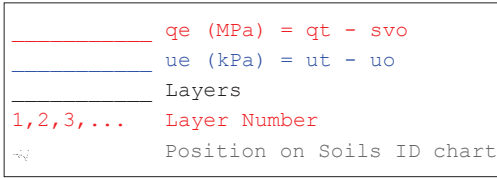
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

Project: Durban Harbour Piezocone Investigation

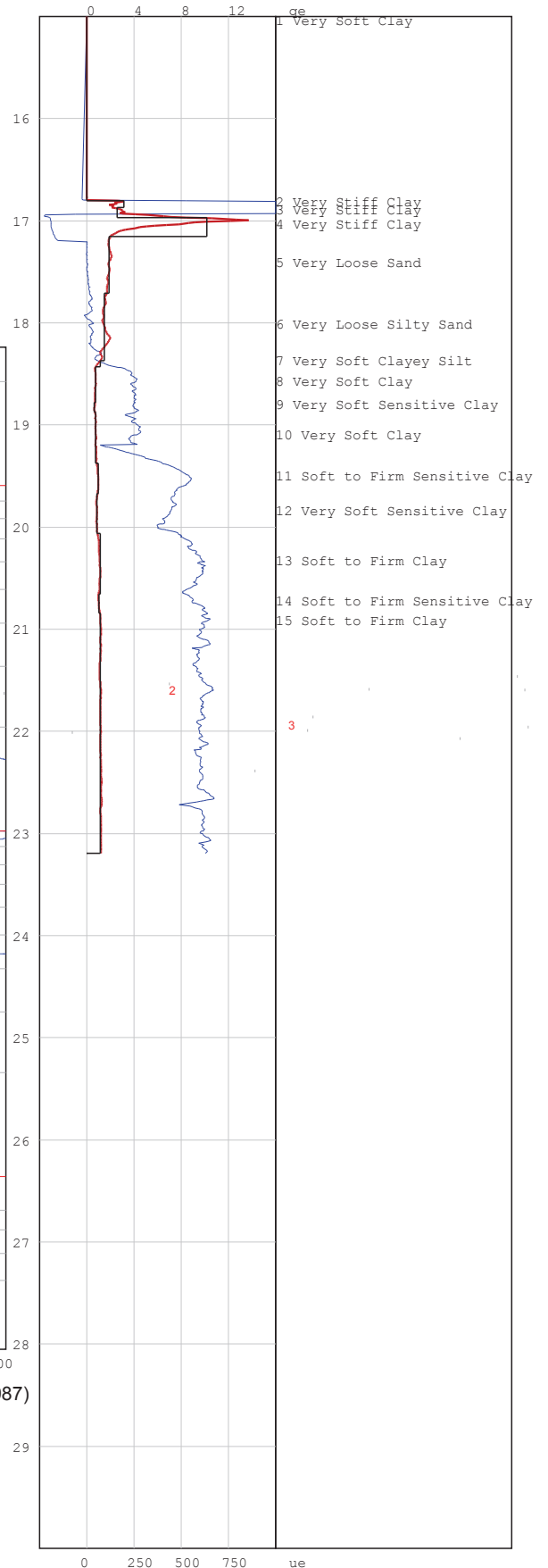
Site: Durban Harbour over water

Hole No: P 03

Date: 2012/08/13



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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0044

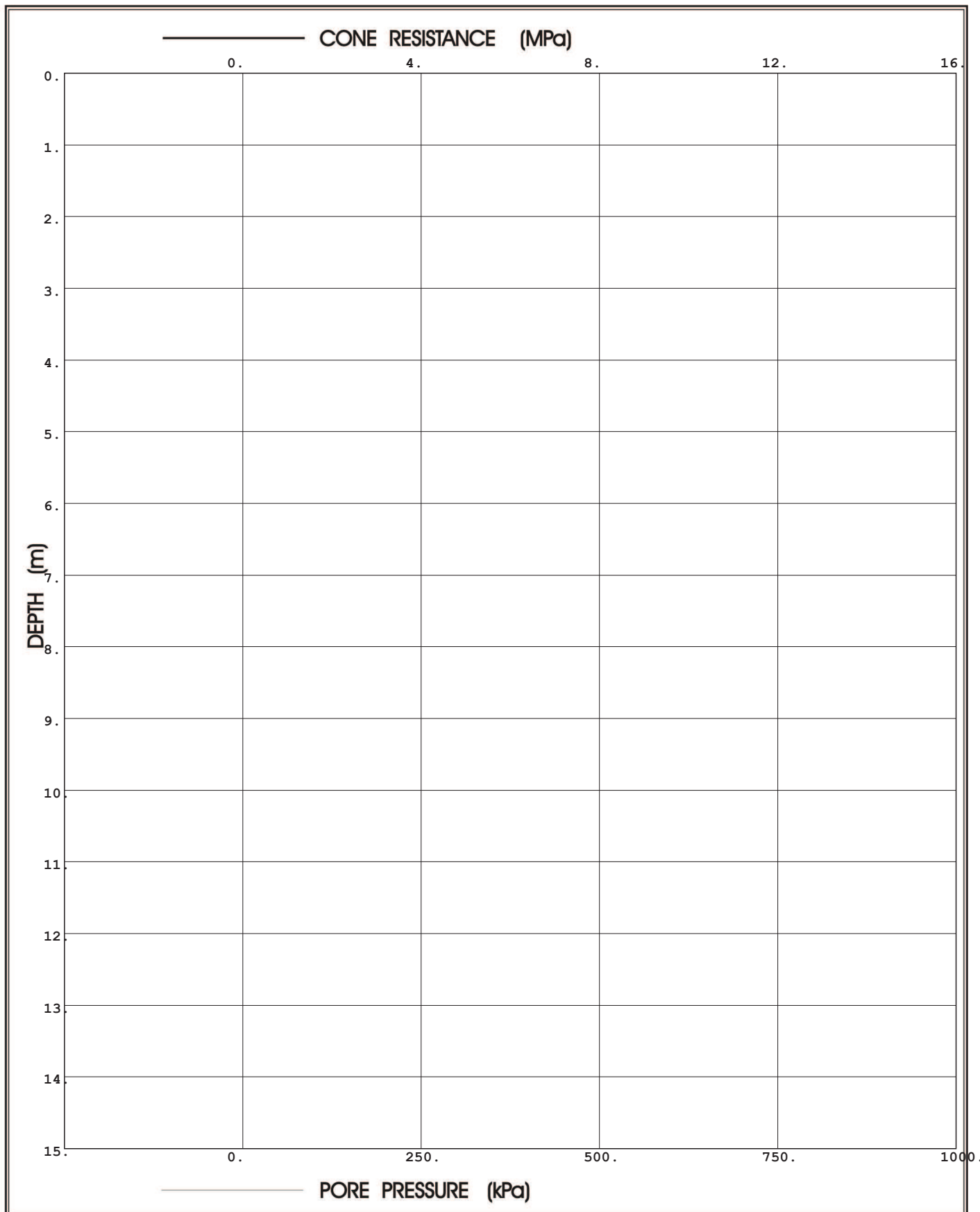
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 04

DATE: 2012/08/16

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# PIEZOCONE PENETRATION TEST



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0044

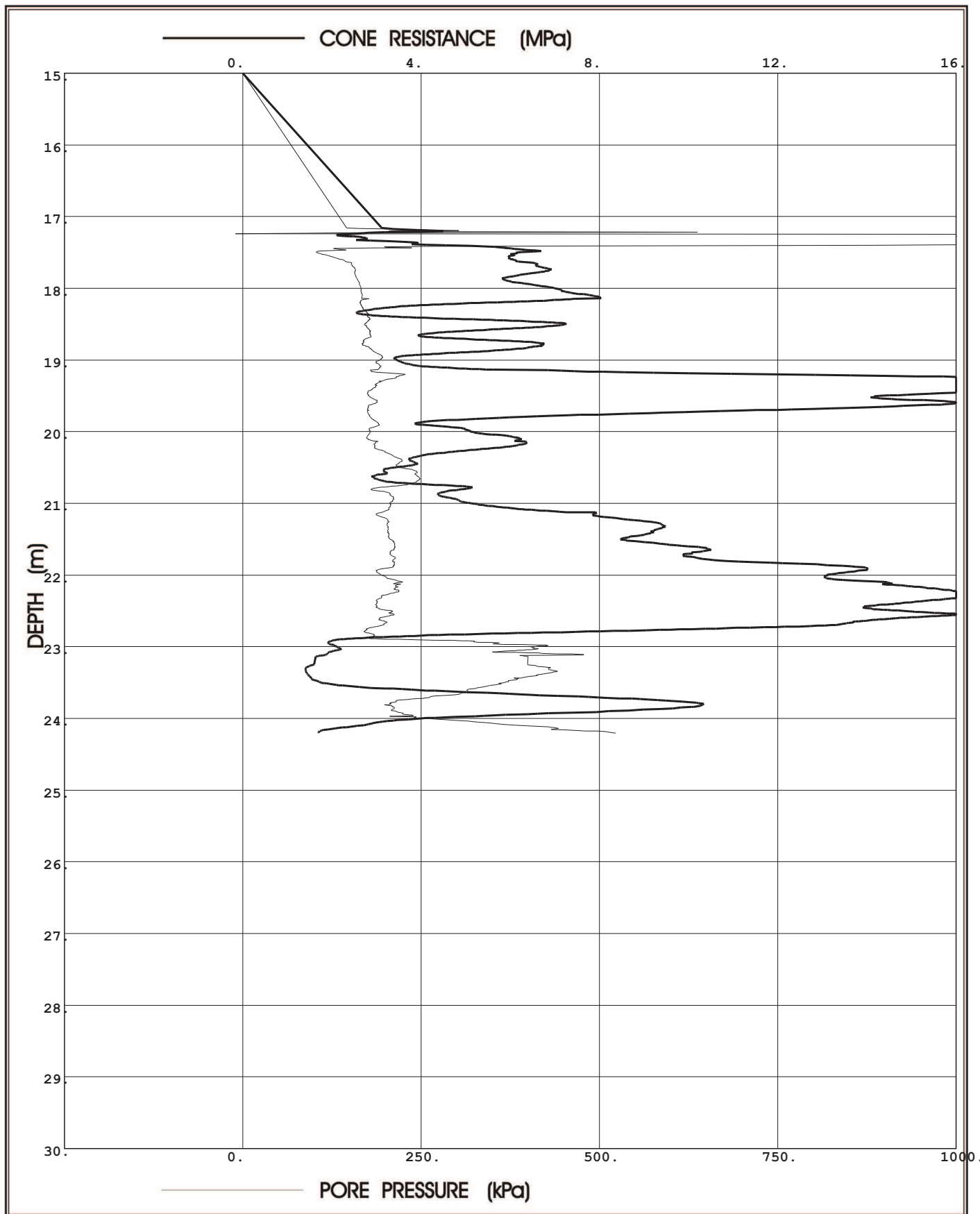
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 04

DATE: 2012/08/16

Page:2



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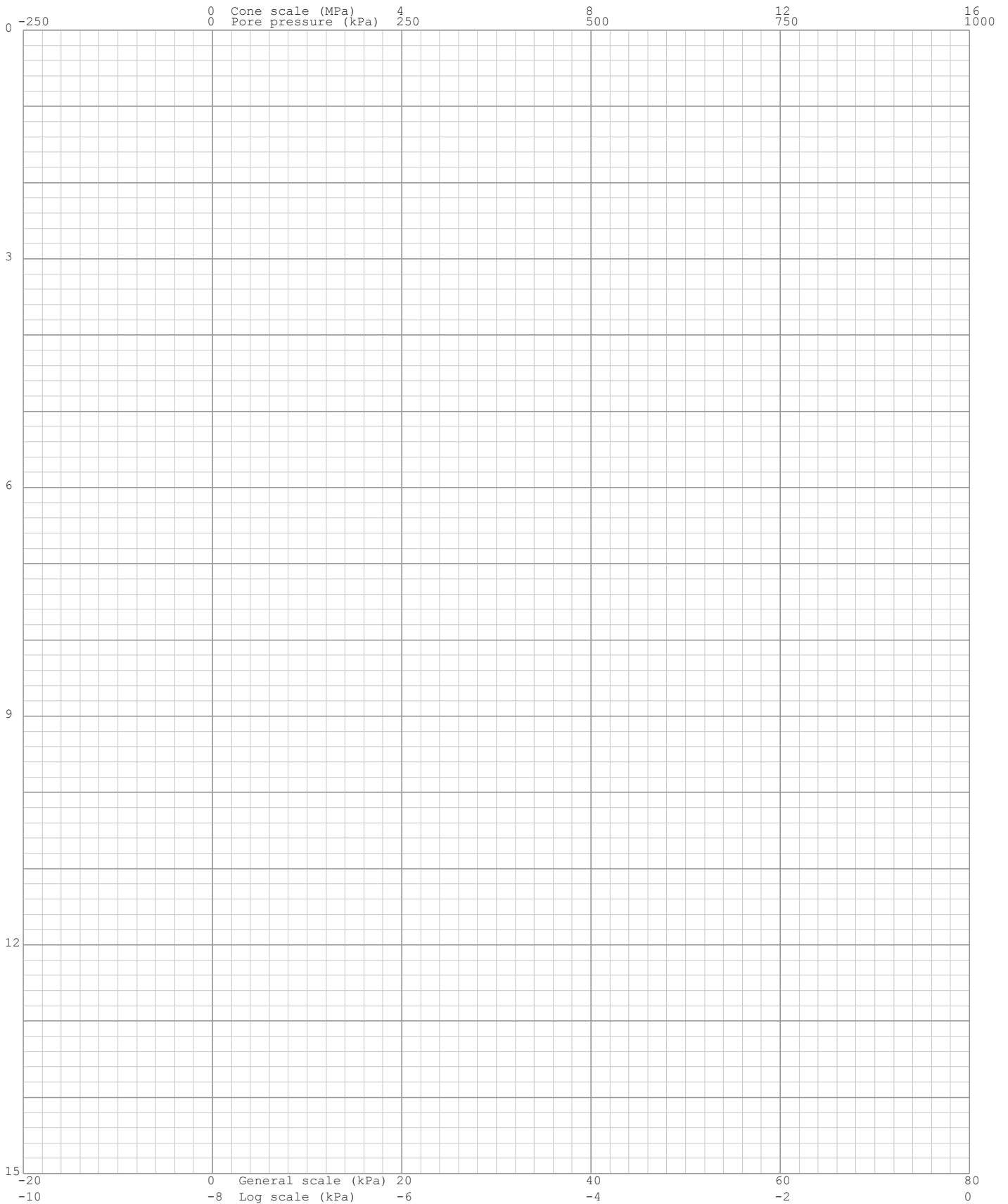
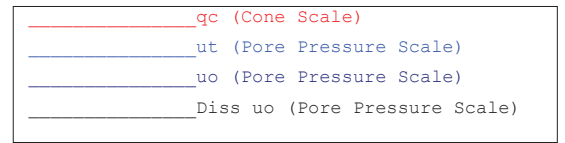
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 04

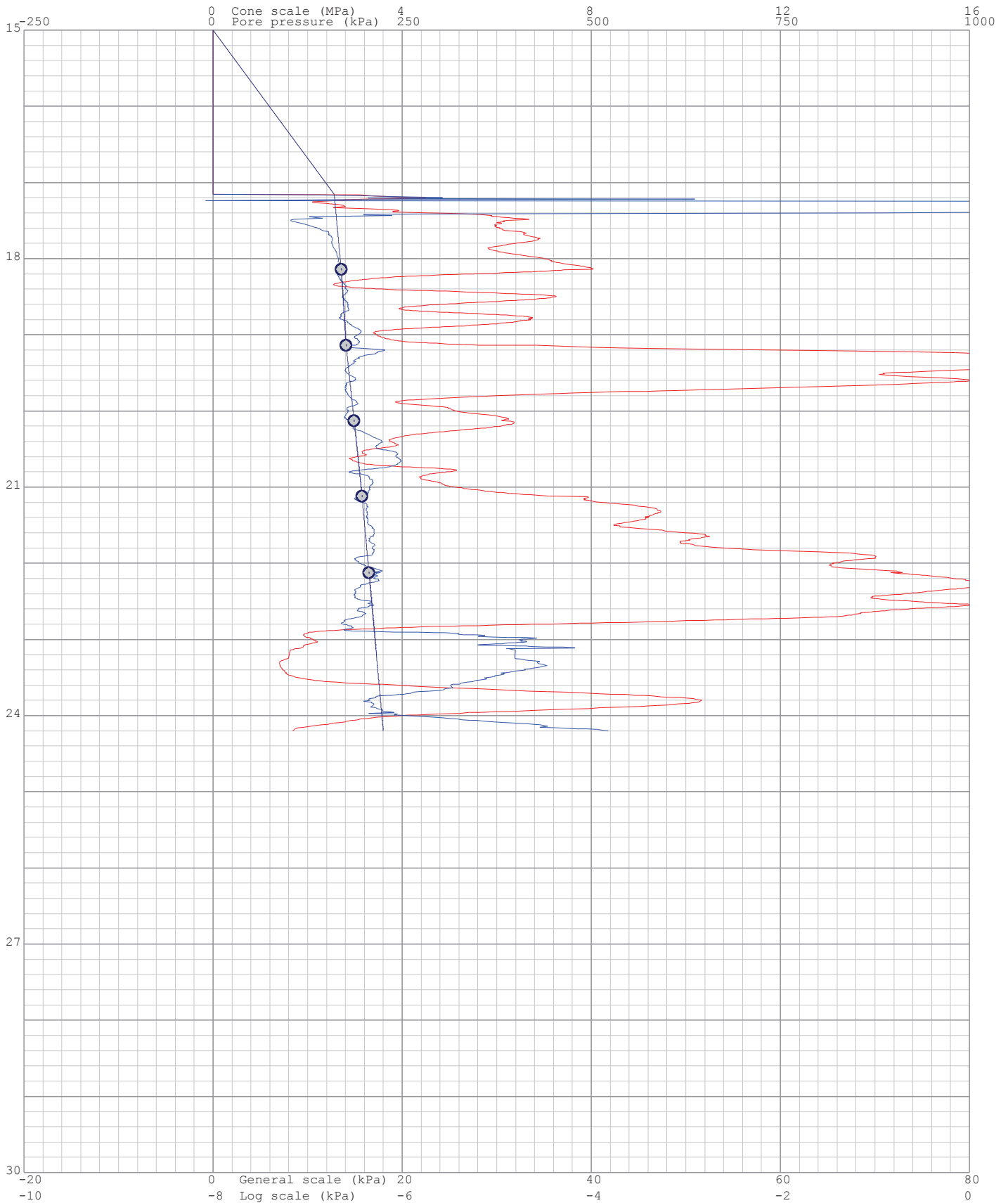
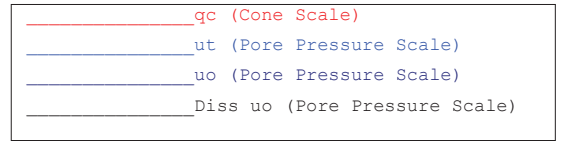
Date: 2012/08/16



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 04  
Date: 2012/08/16





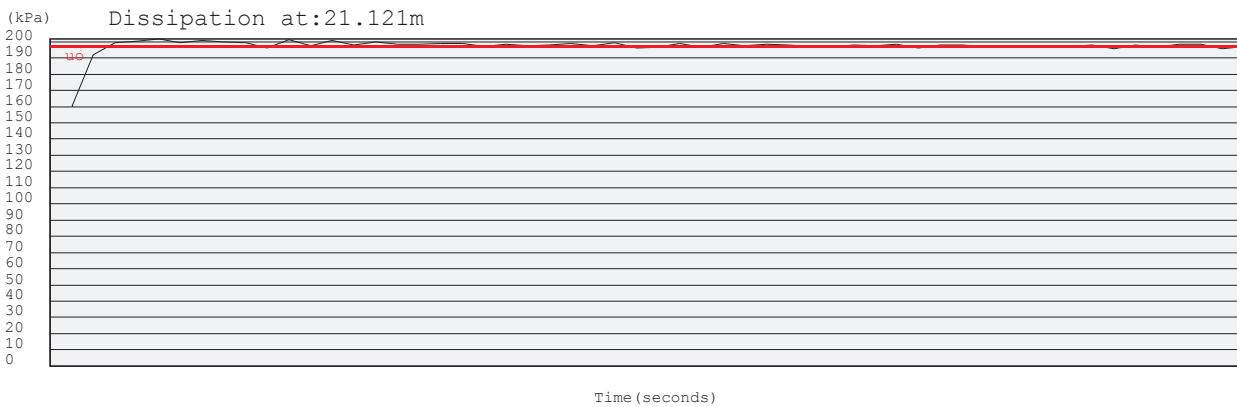
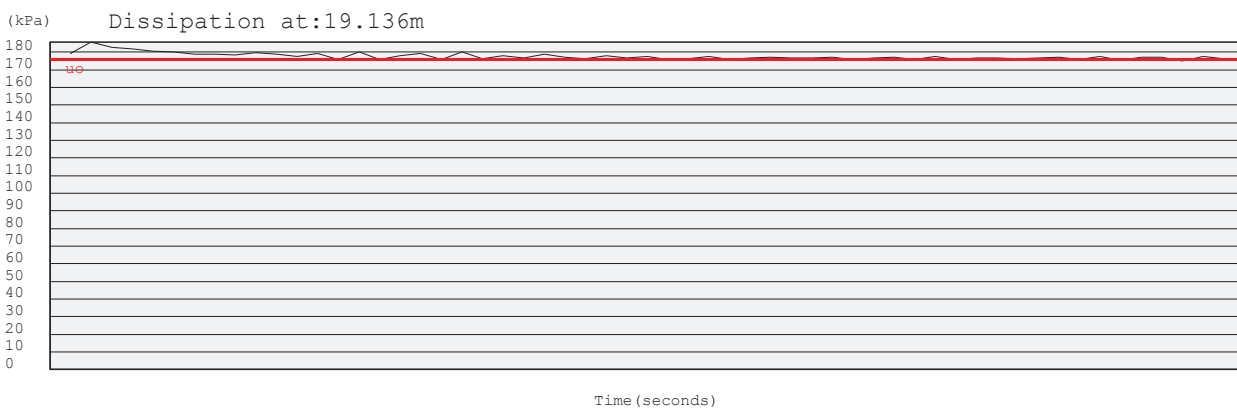
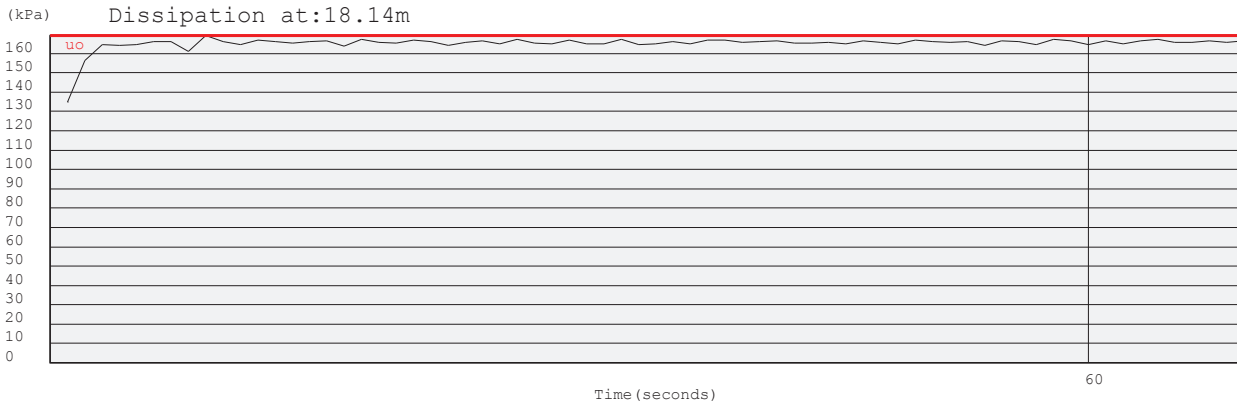
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 04

Date: 2012/08/16

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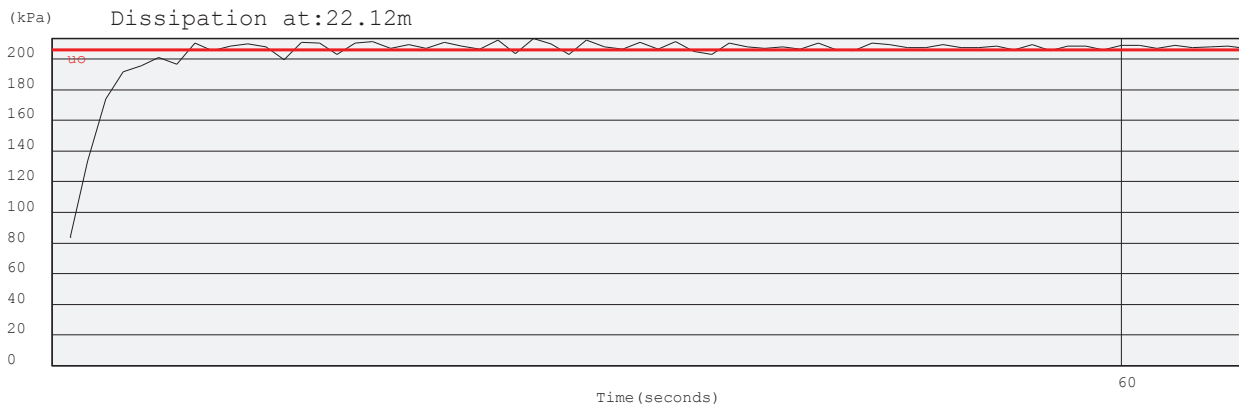
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 04

Date: 2012/08/16

Page: 2

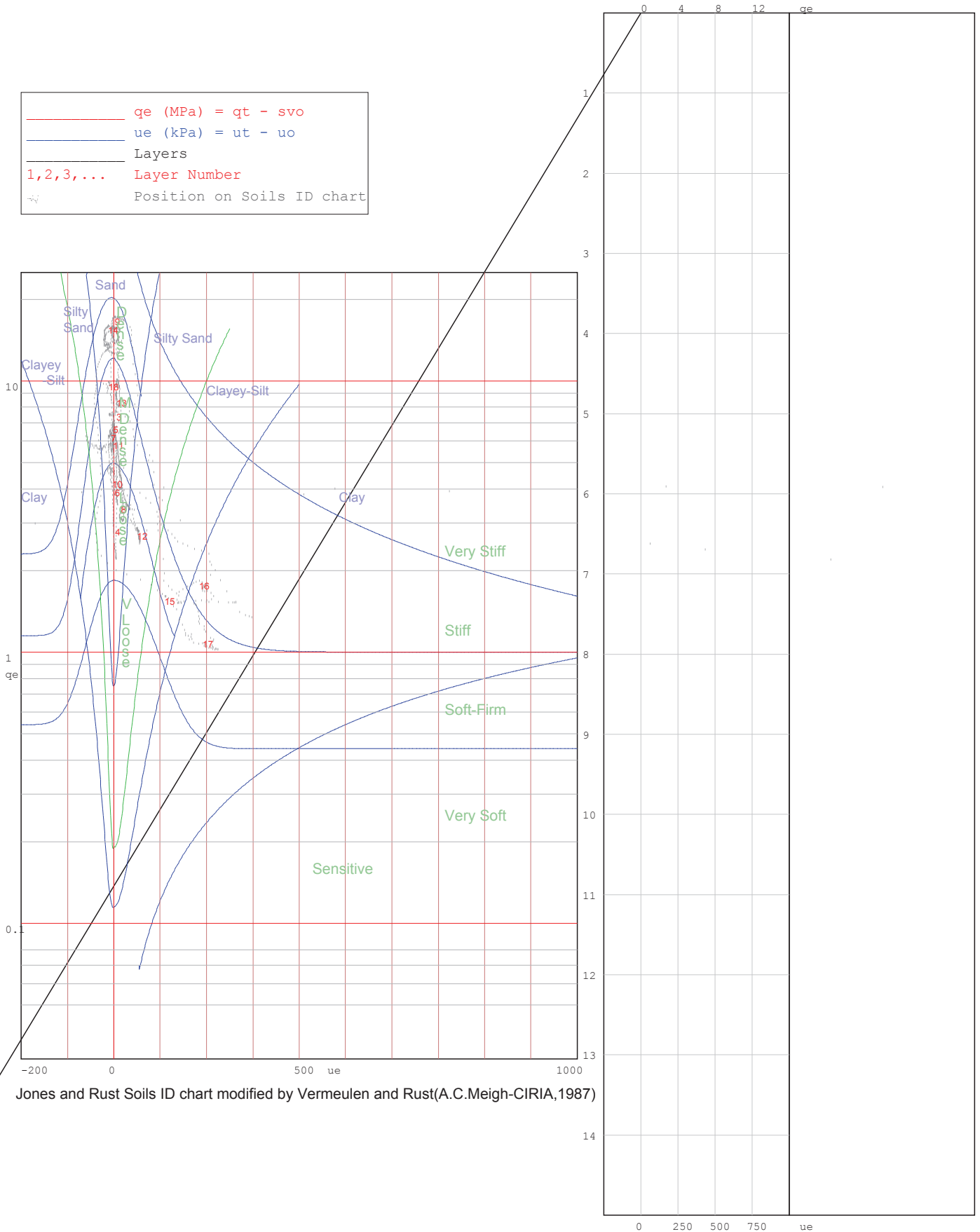
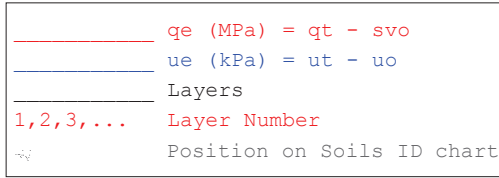


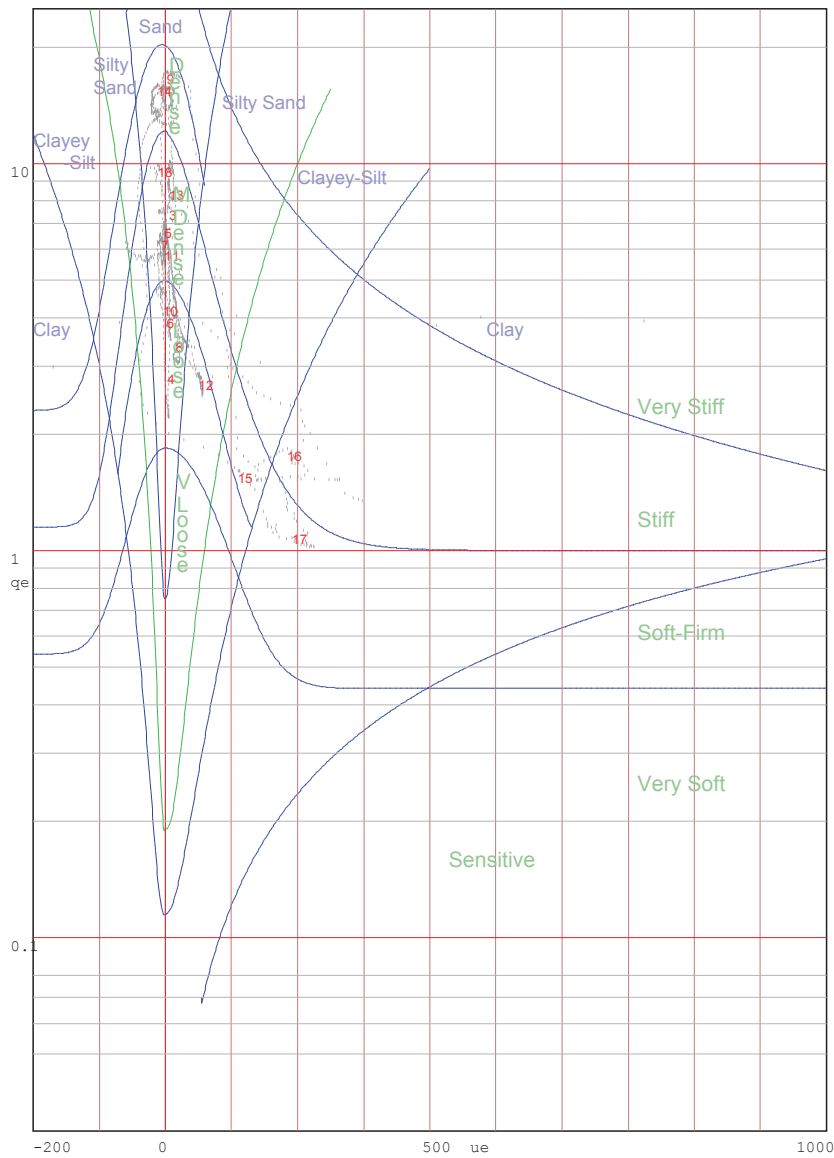
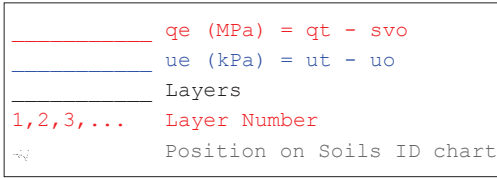
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

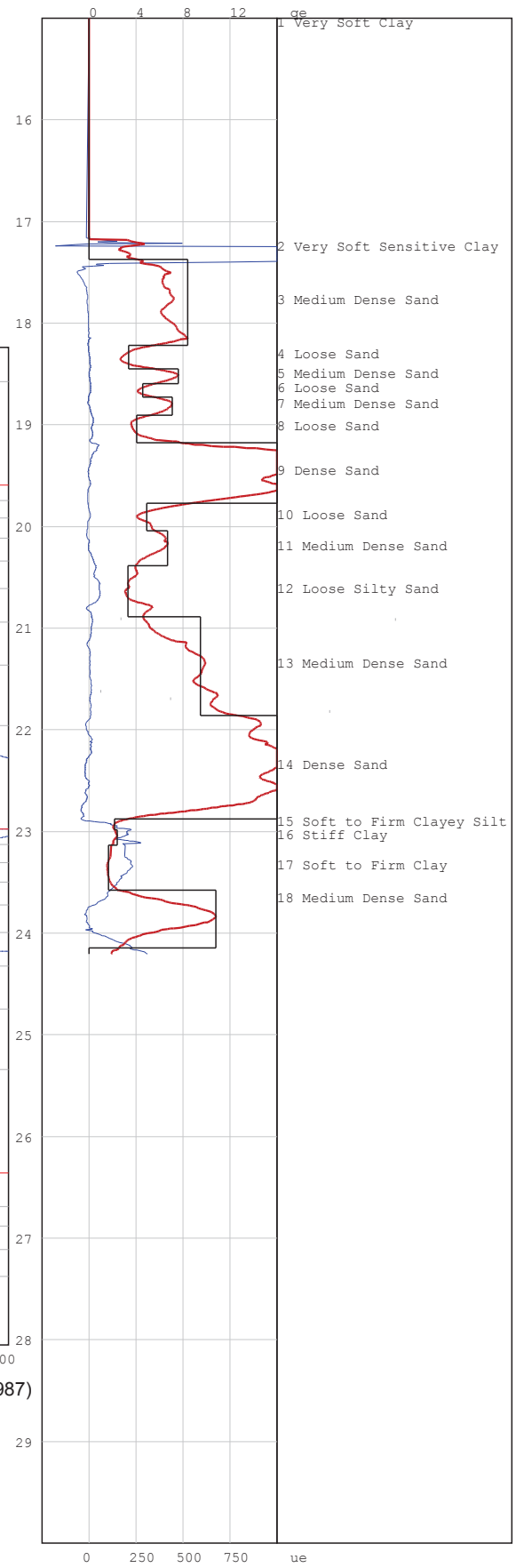
Hole No: P 04

Date: 2012/08/16





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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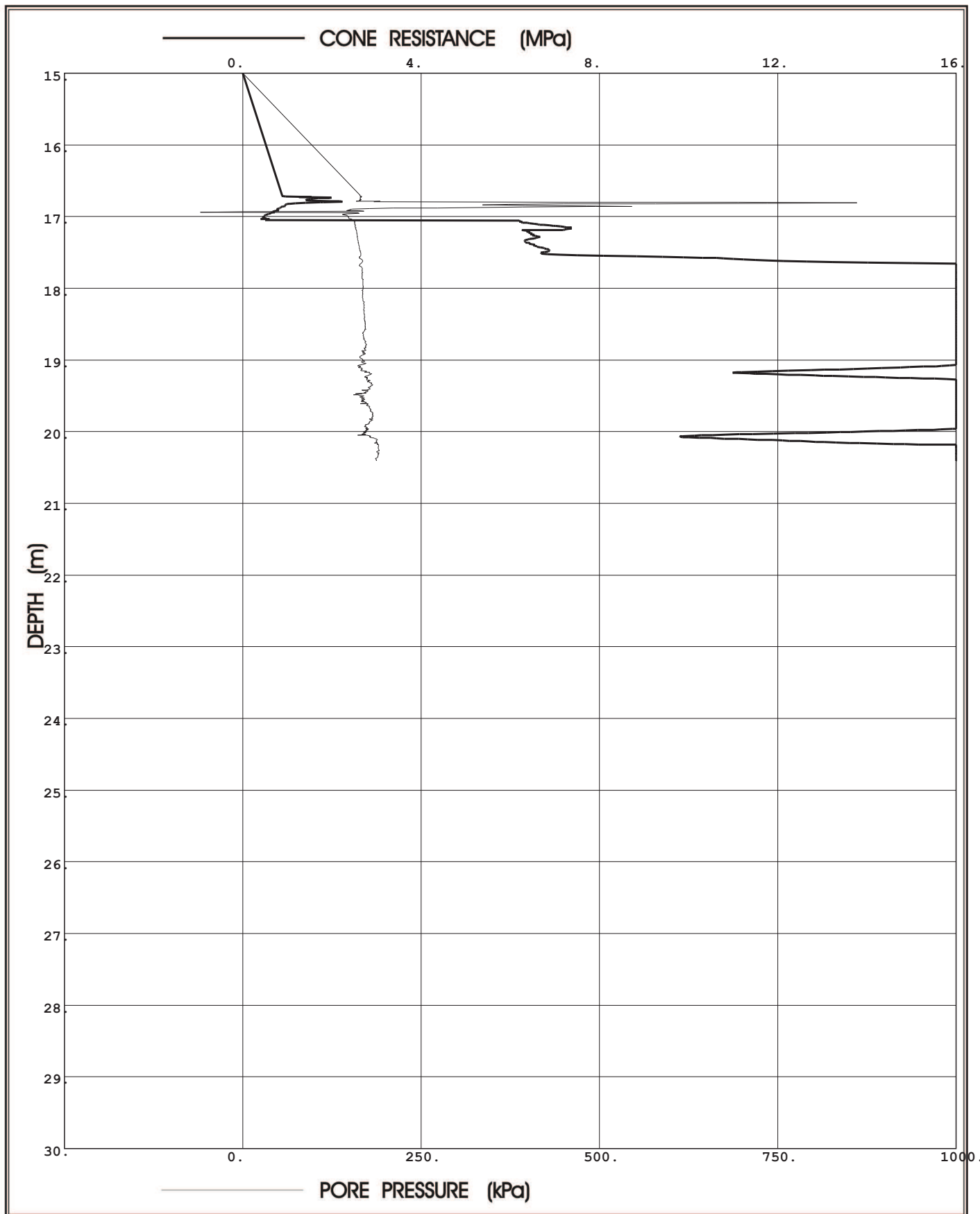
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 05

DATE: 2012/08/20

Page:2



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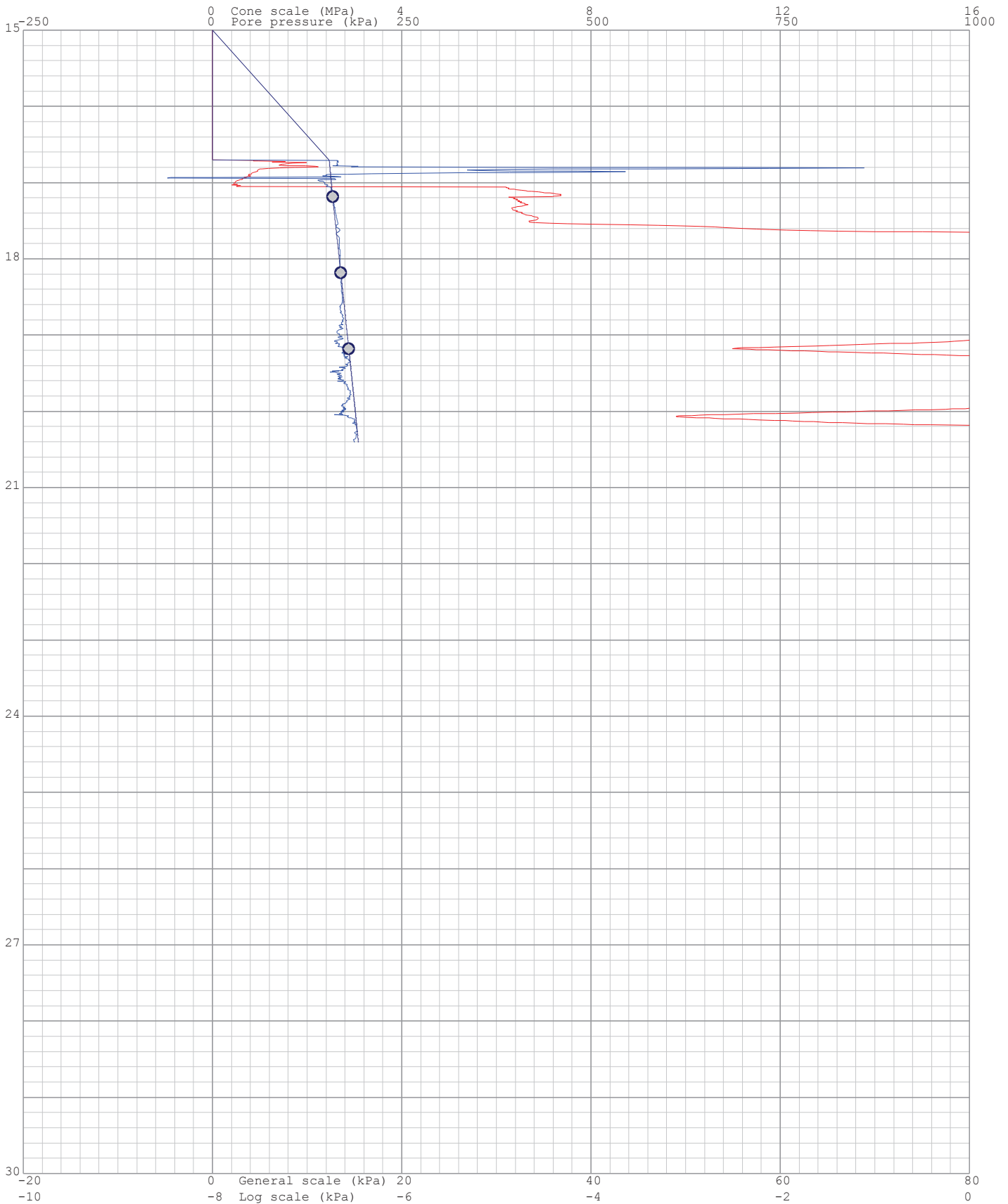
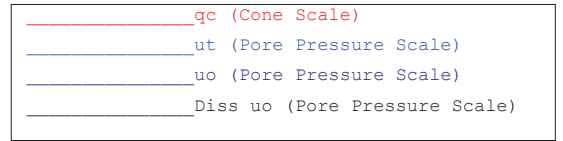
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 05  
Date: 2012/08/20



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 05

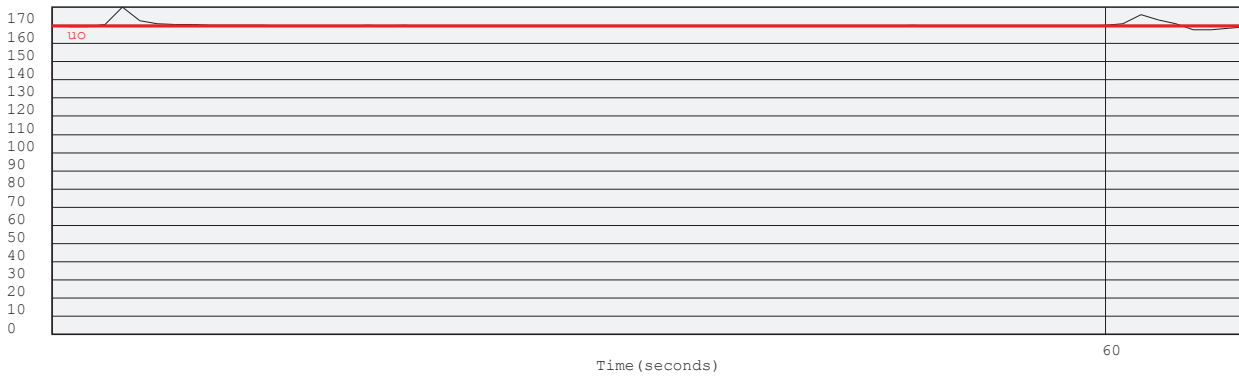
Date: 2012/08/20

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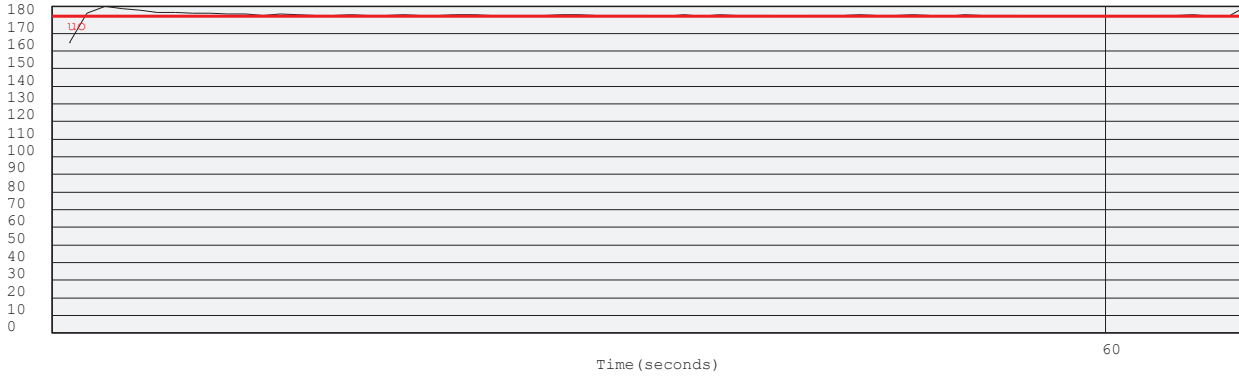
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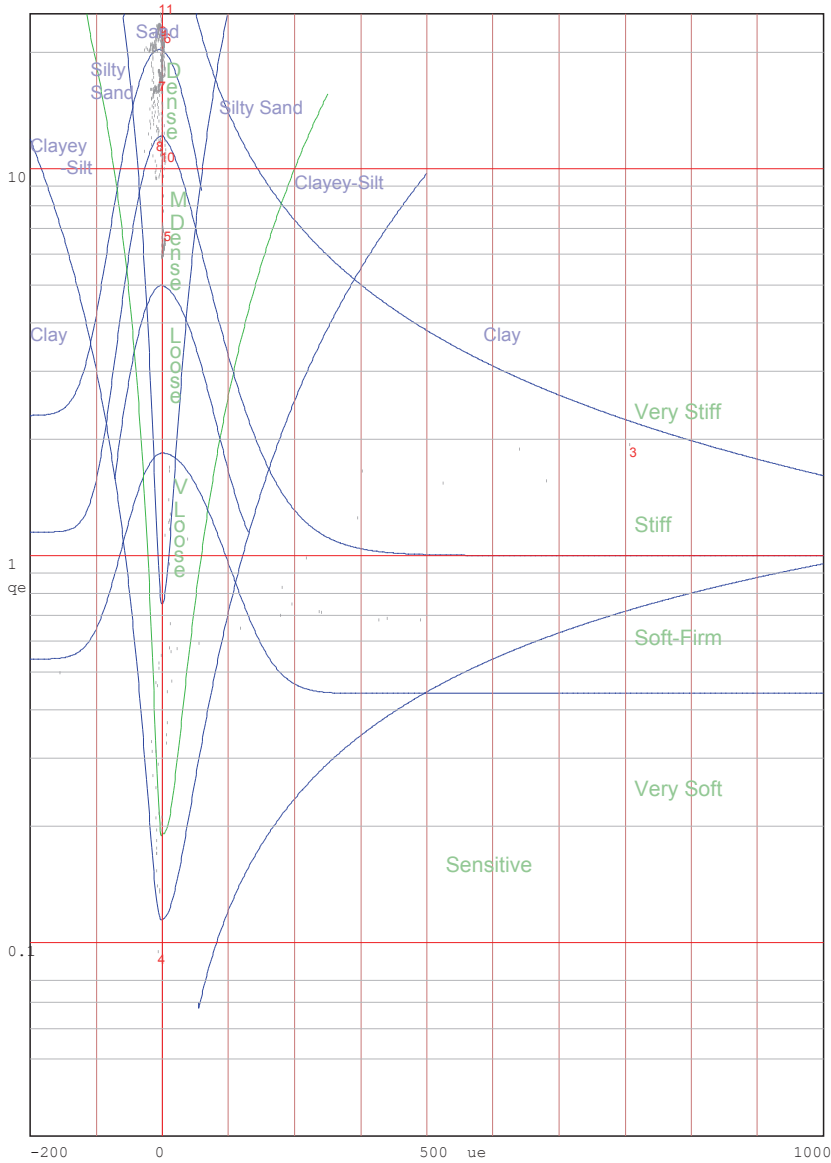
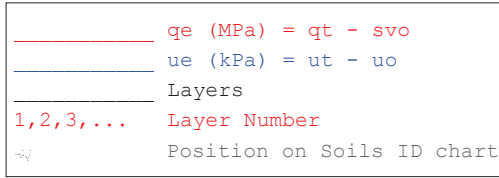


(kPa) Dissipation at: 18.183m

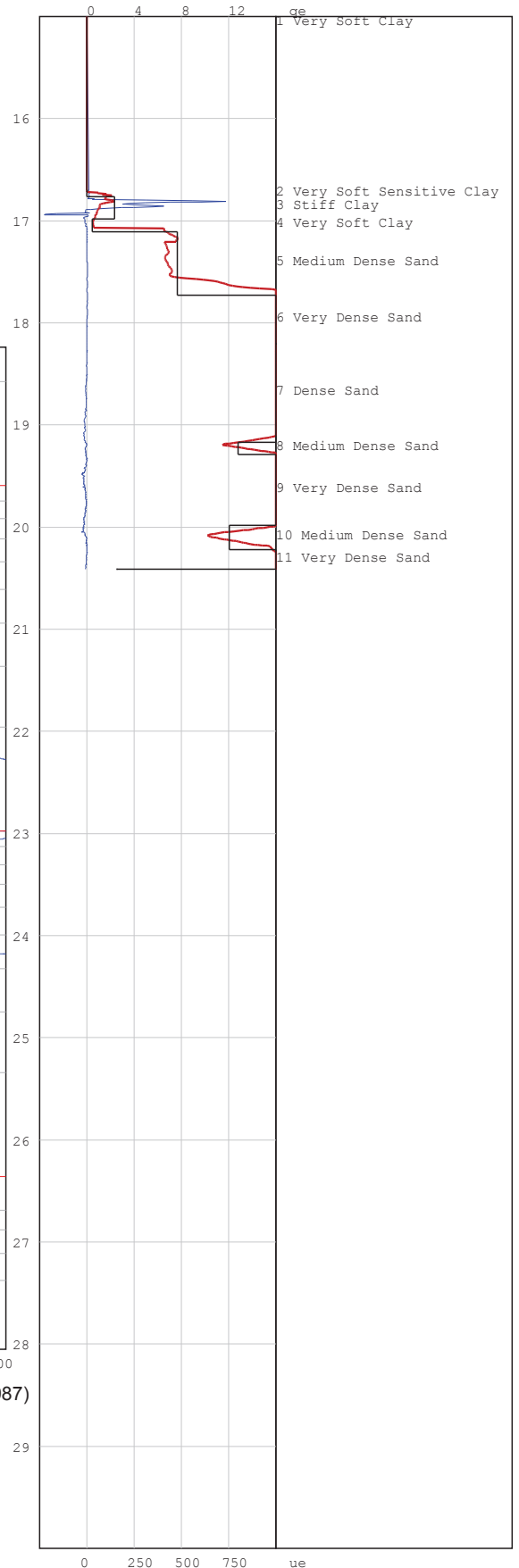


(kPa) Dissipation at: 19.181m





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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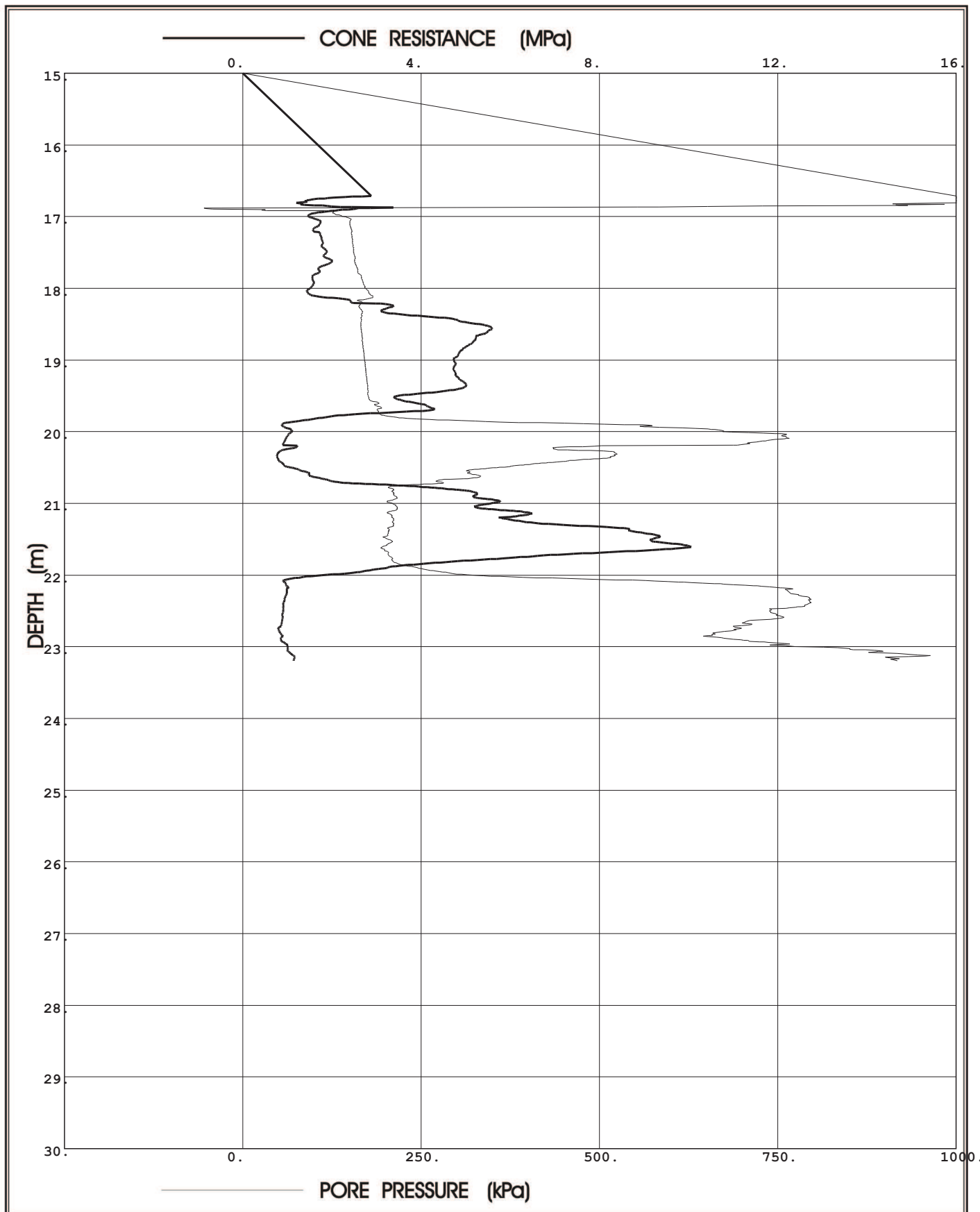
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 06

DATE: 2012/08/21

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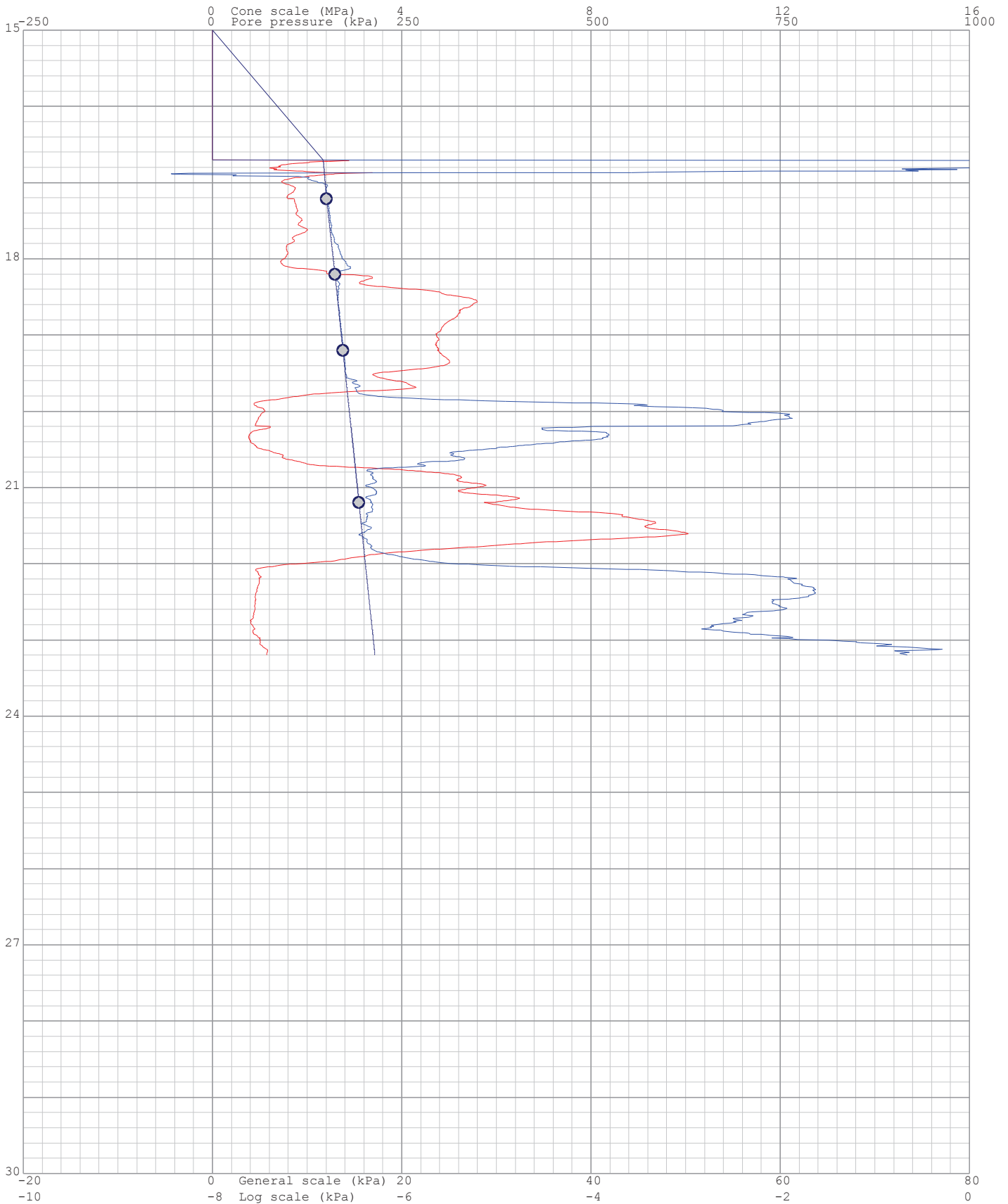
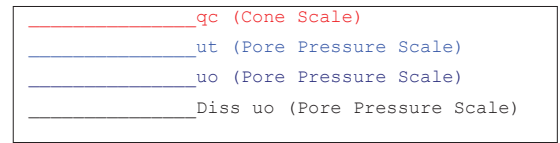
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 06  
Date: 2012/08/21



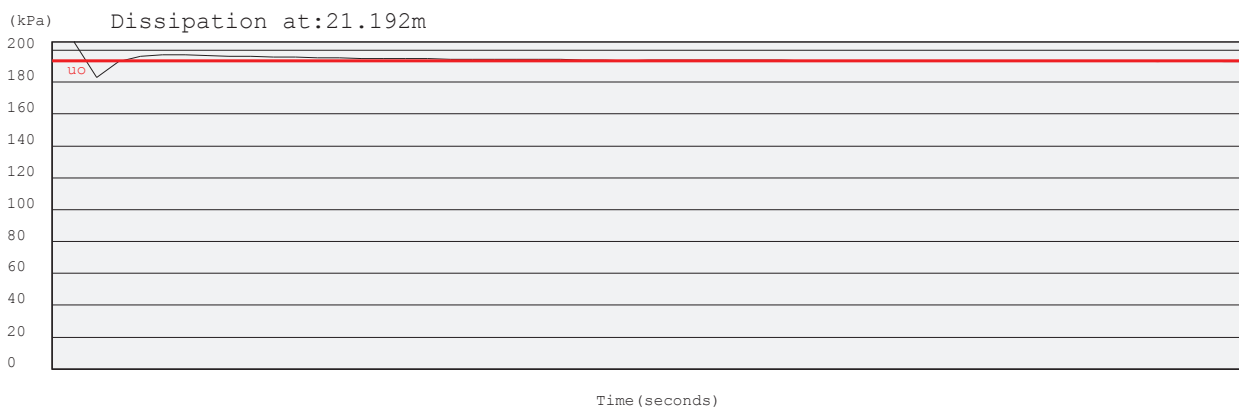
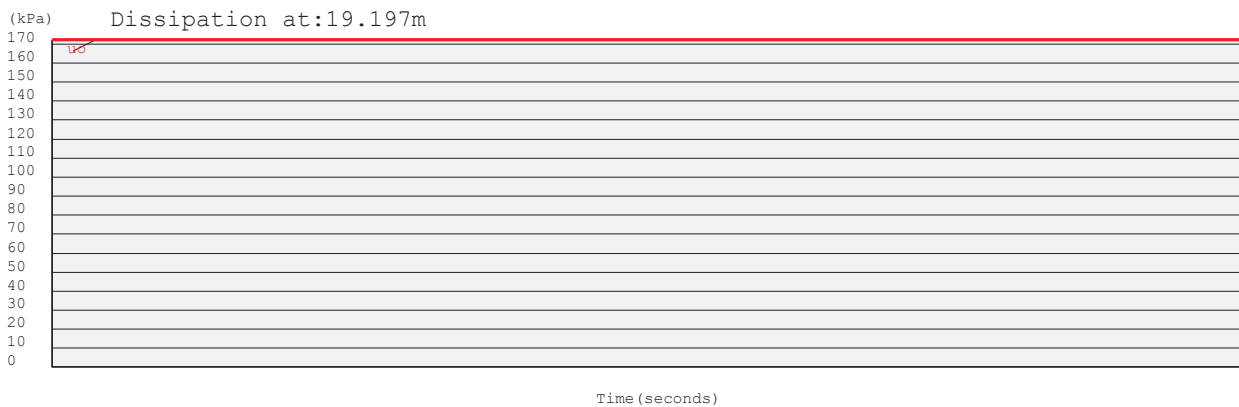
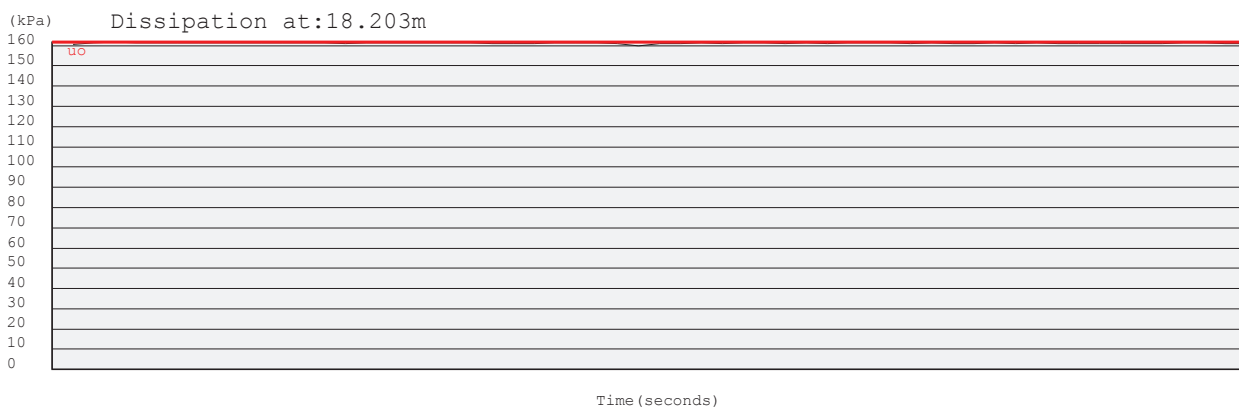
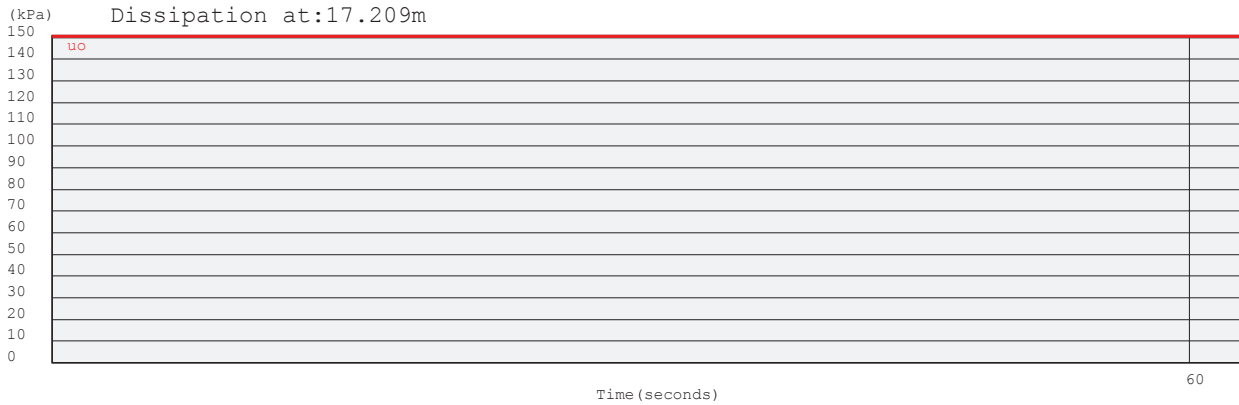
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

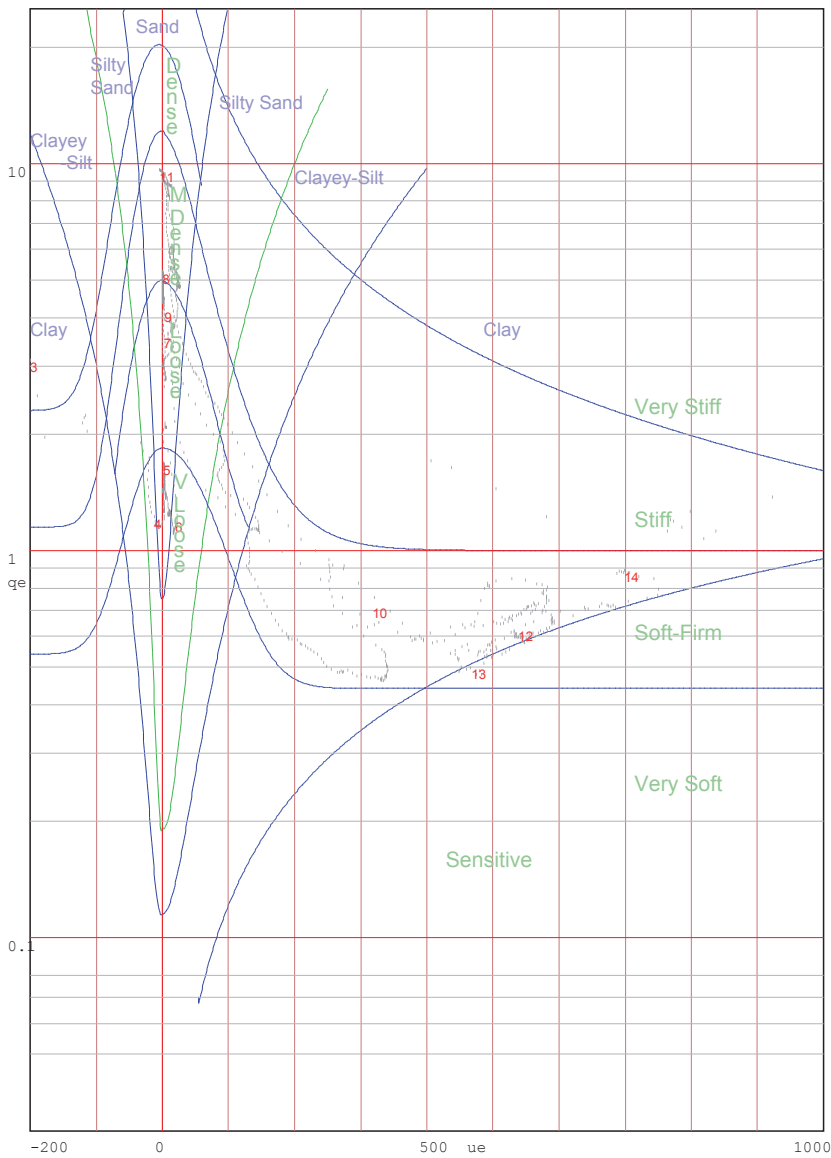
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Date: 2012/08/21

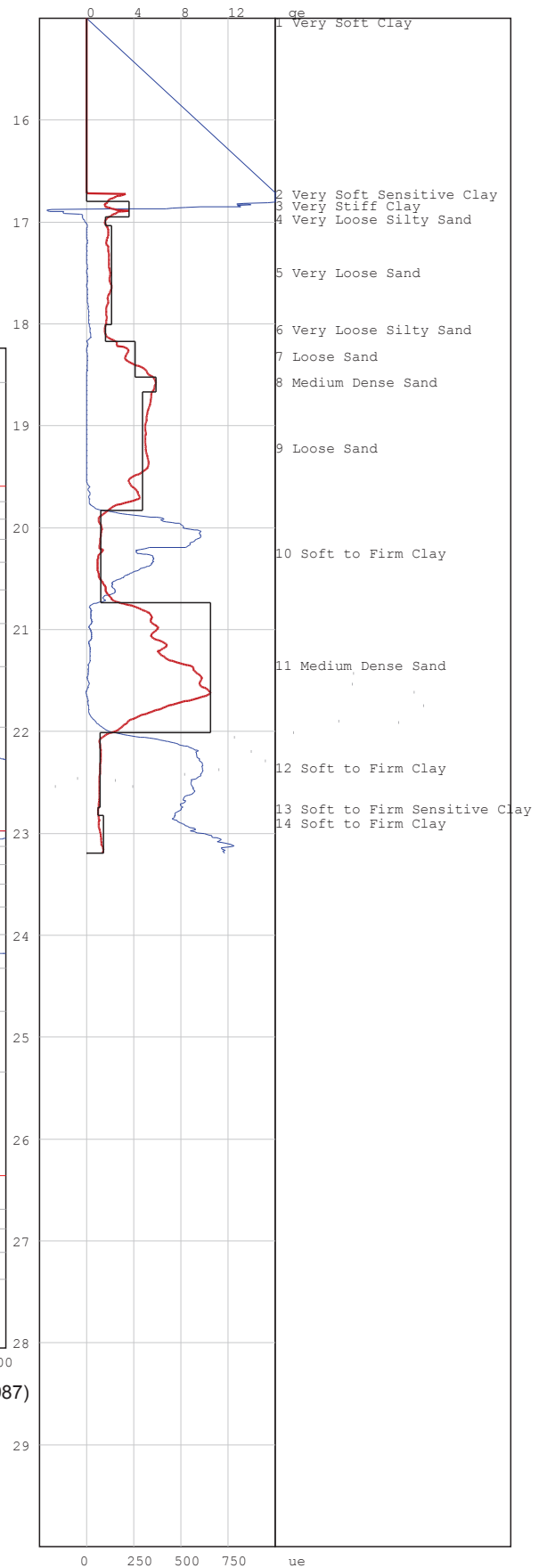
Page: 1



—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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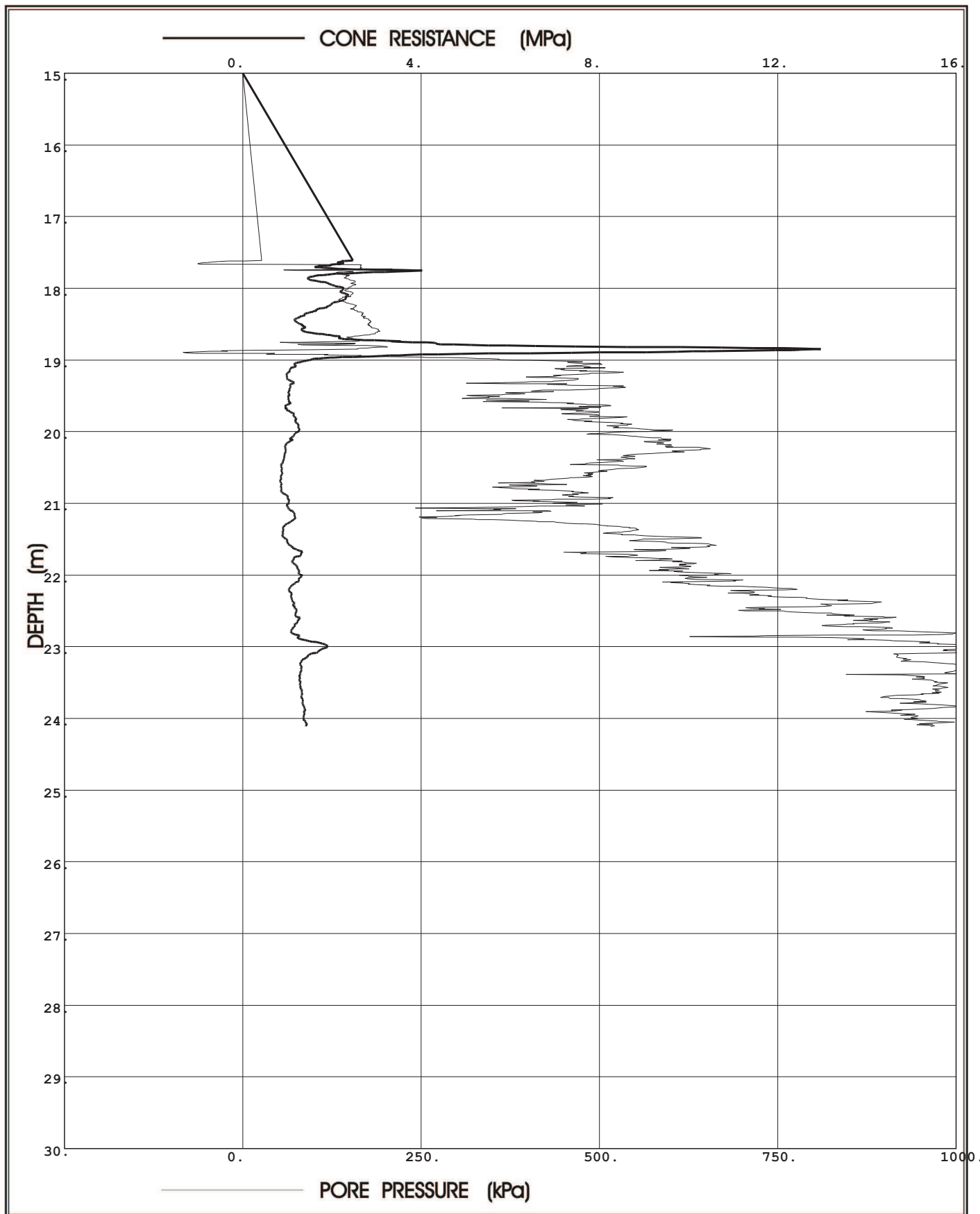
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 07

DATE: 2012/08/20

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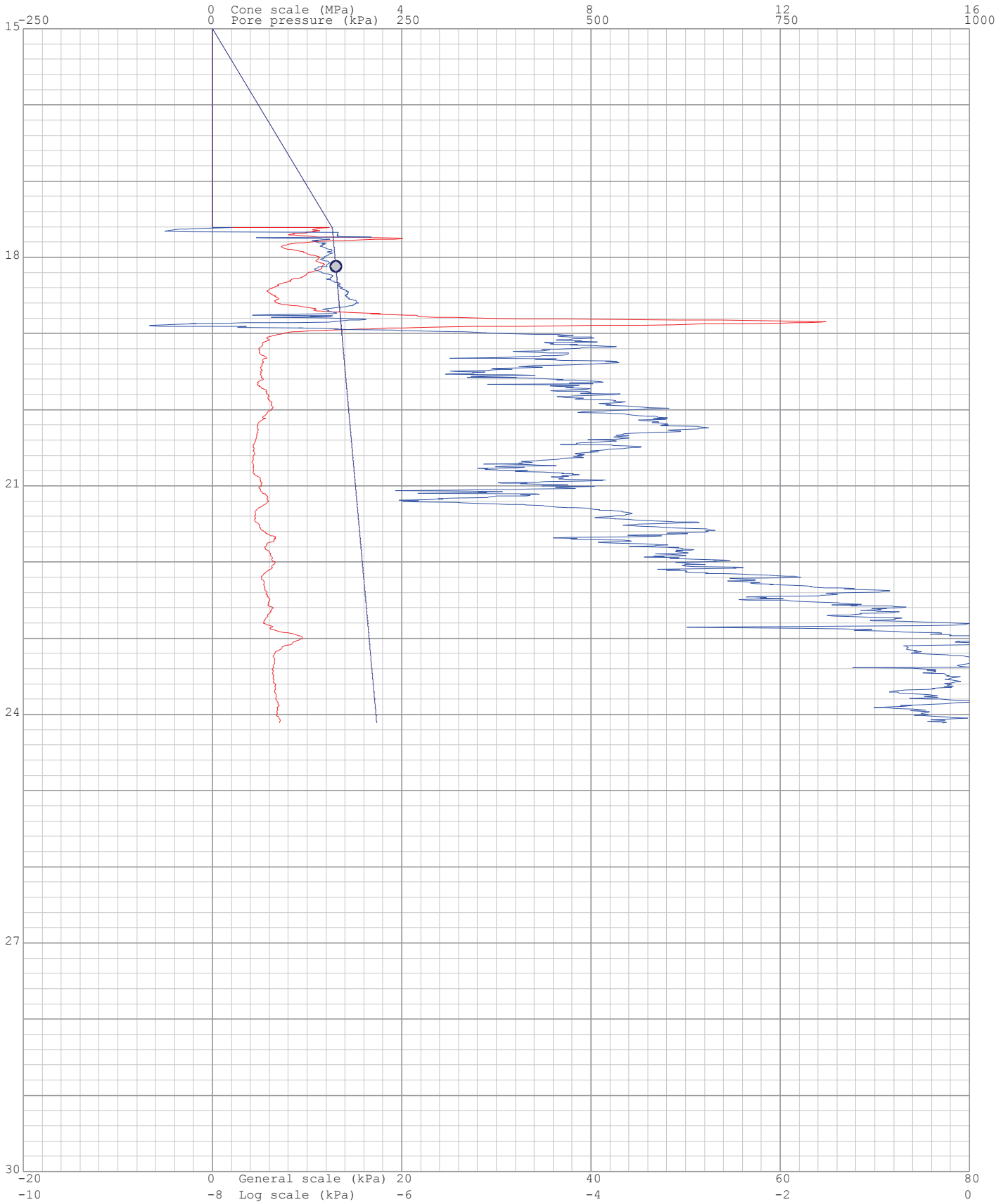
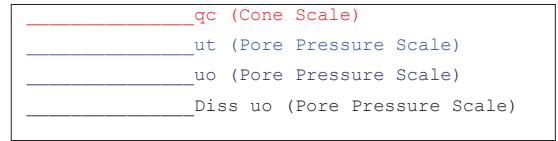
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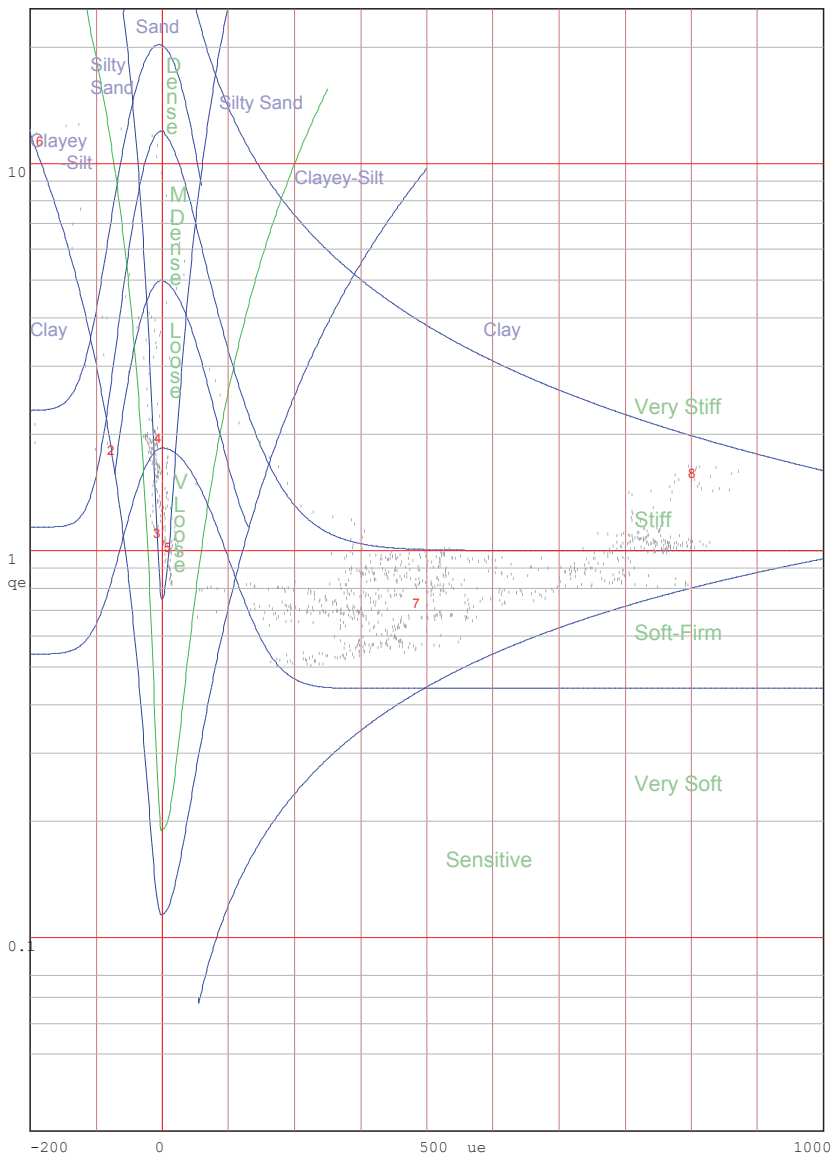


Project: Durban Harbour Piezocone Investigation for Dredging

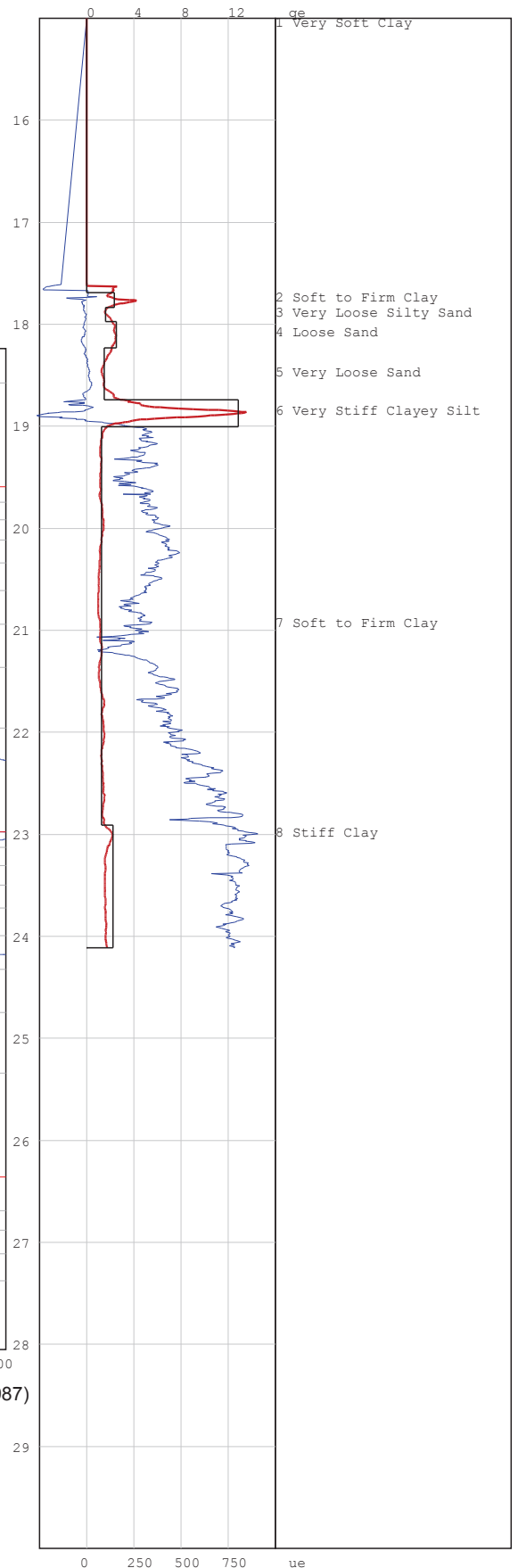
Site: Durban Harbour over water

Hole No: P 07  
Date: 2012/08/20

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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0044

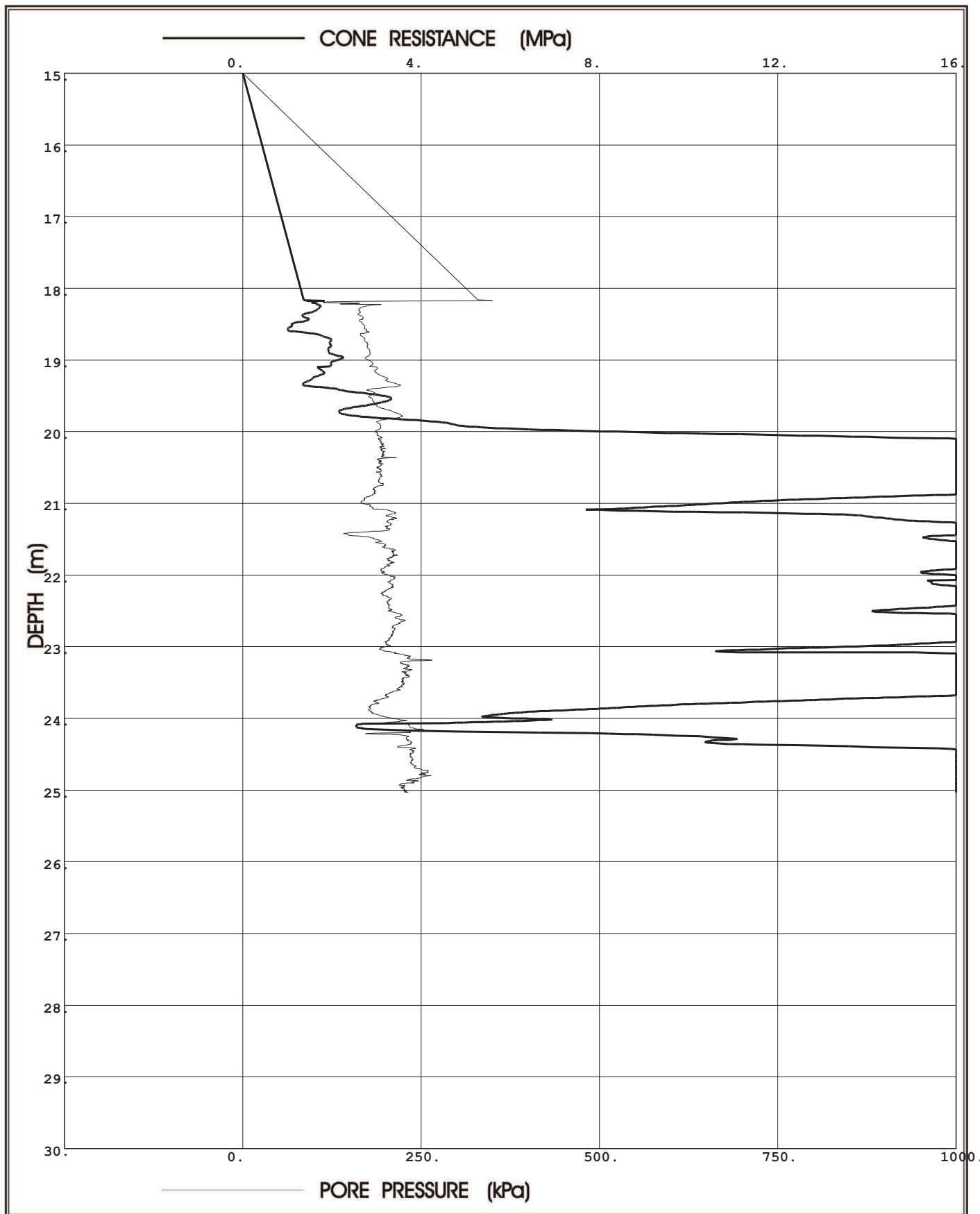
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 08

DATE: 2012/08/22

Page:2



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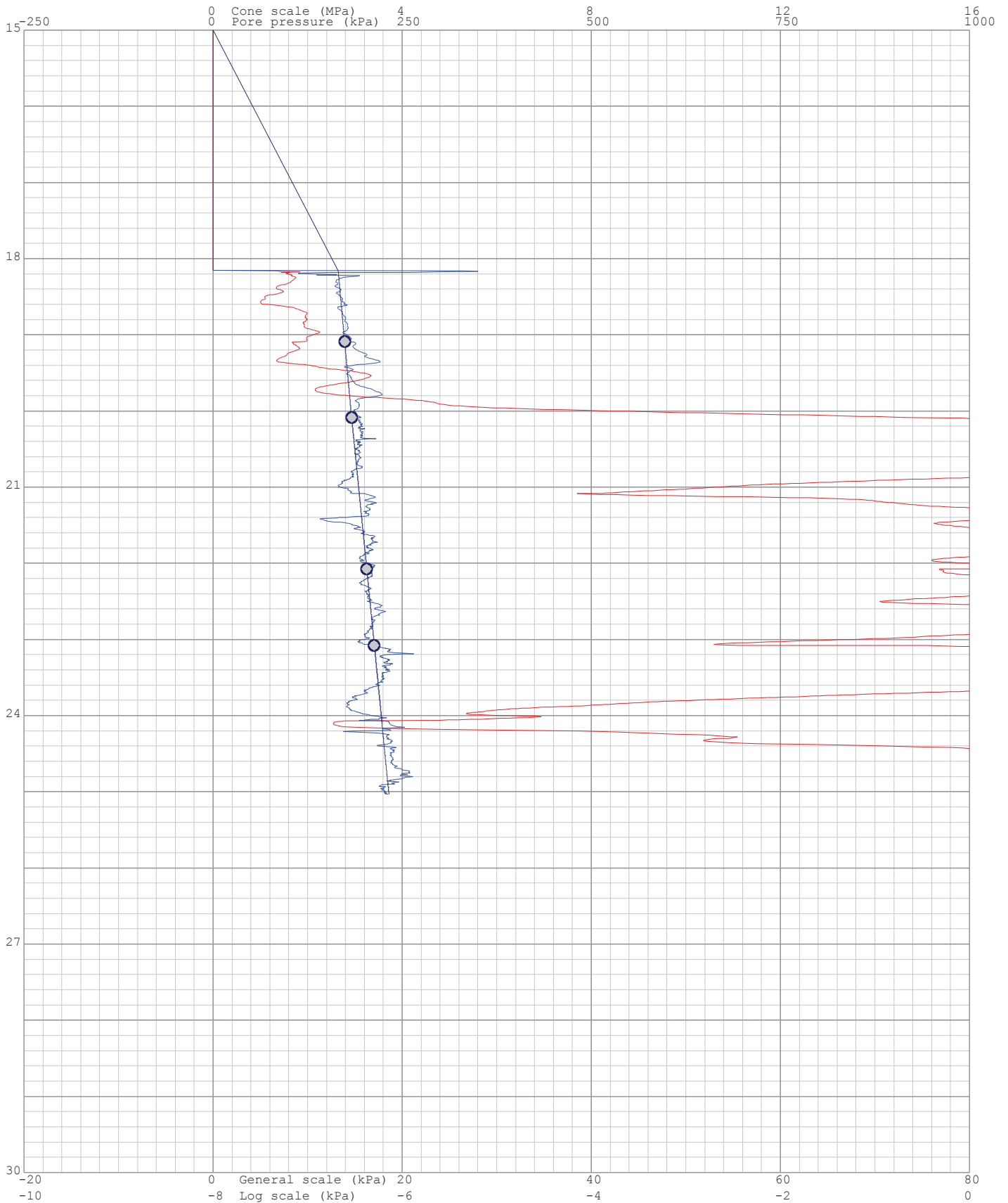
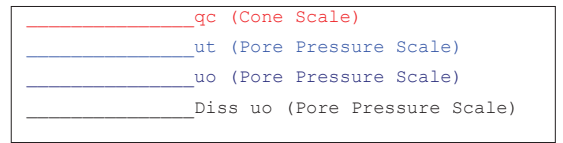


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 08

Date: 2012/08/22



Project: Durban Harbour Piezocone Investigation for Dredging

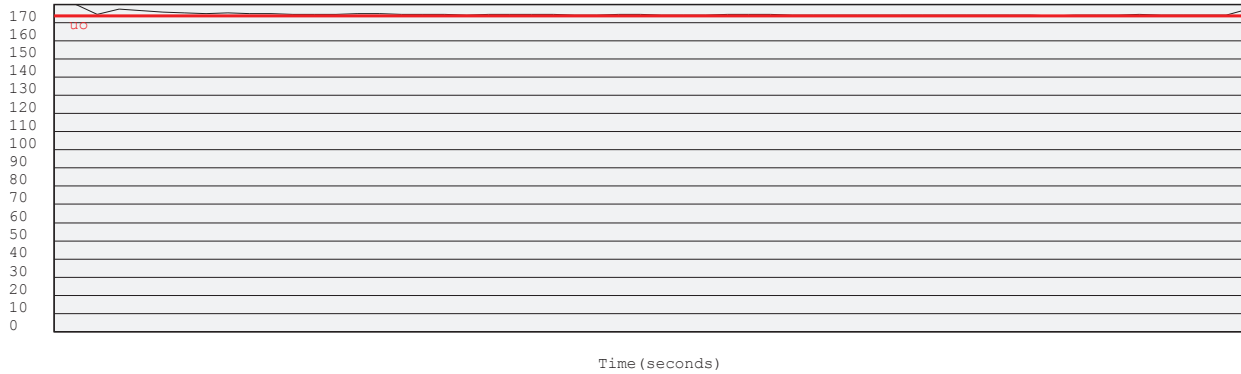
Site: Durban Harbour over water

Hole: P 08

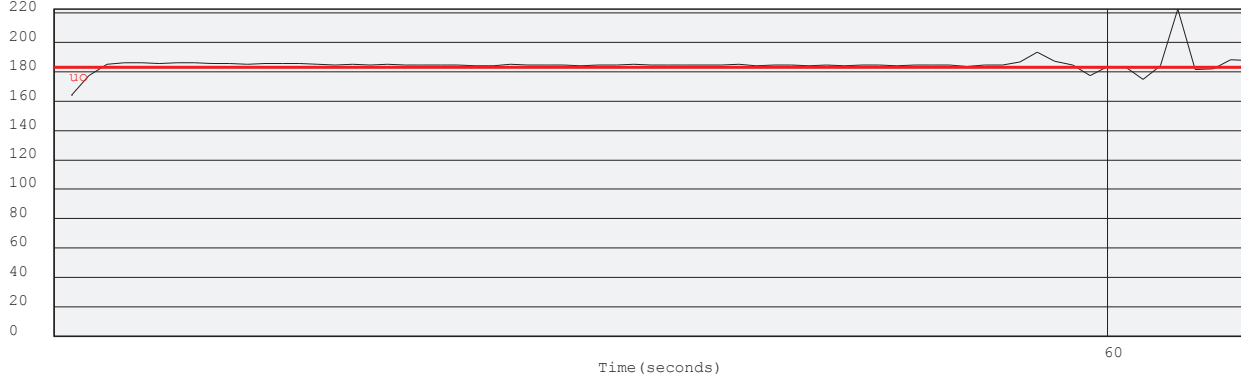
Date: 2012/08/22

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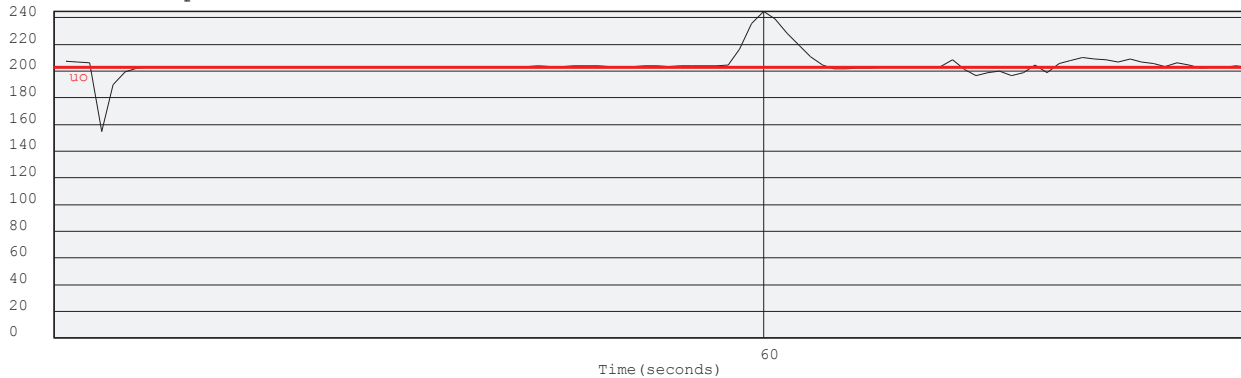
(kPa) Dissipation at:19.09m



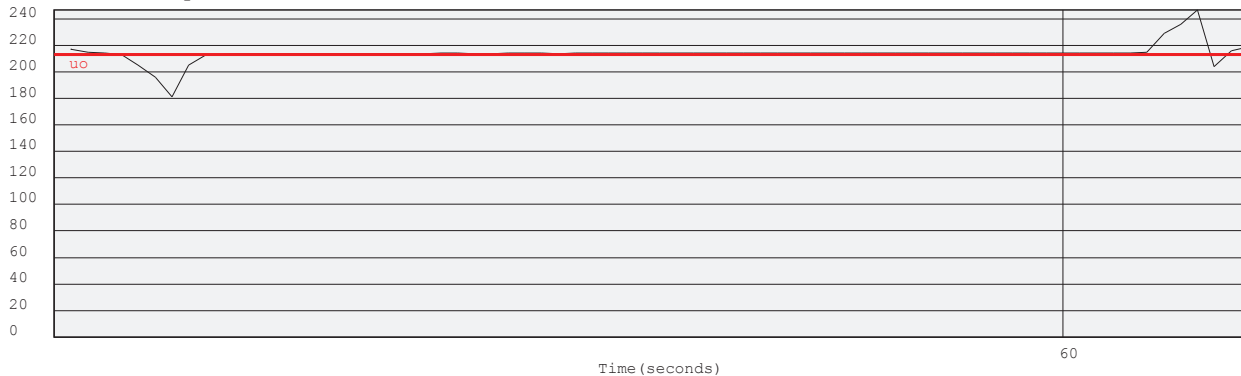
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(kPa) Dissipation at:22.071m



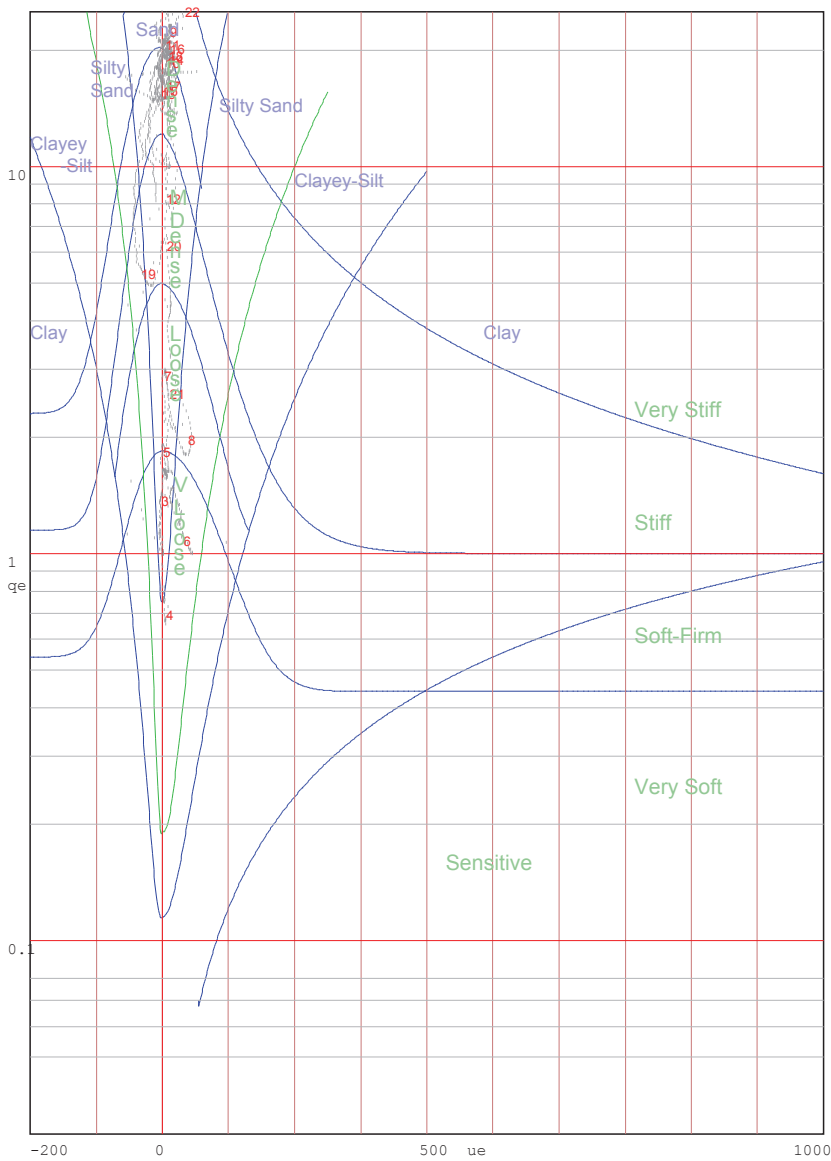
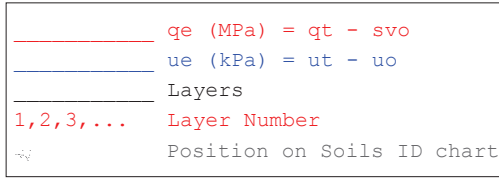
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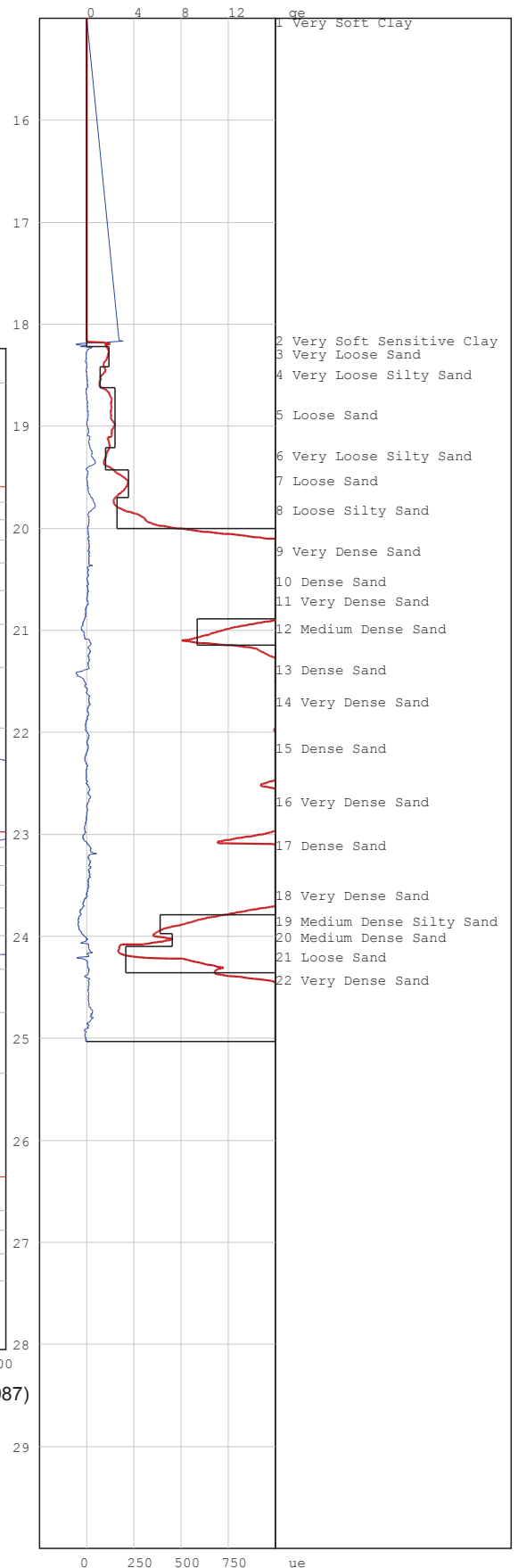
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 08  
Date: 2012/08/22



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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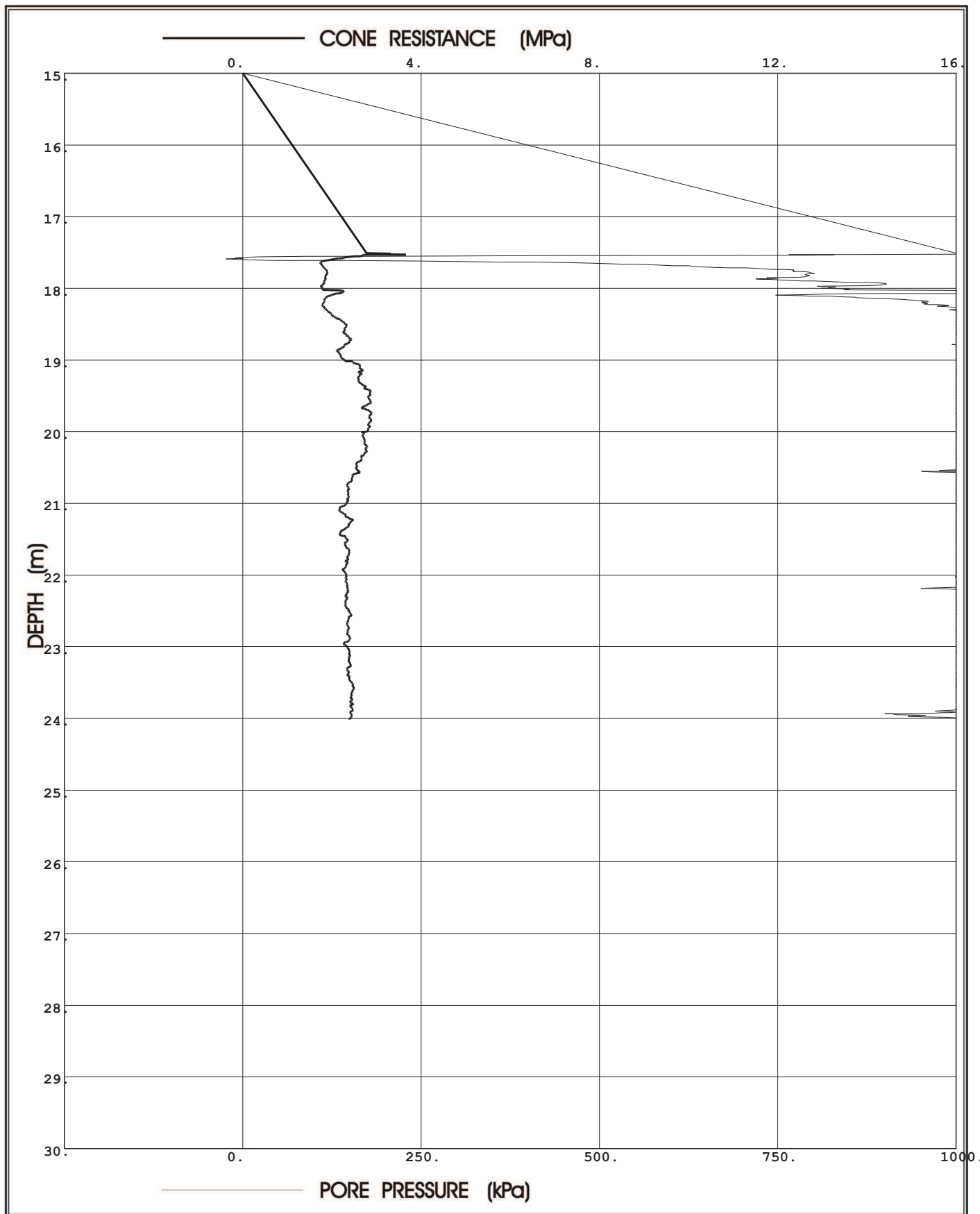
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 09

DATE: 2012/08/25

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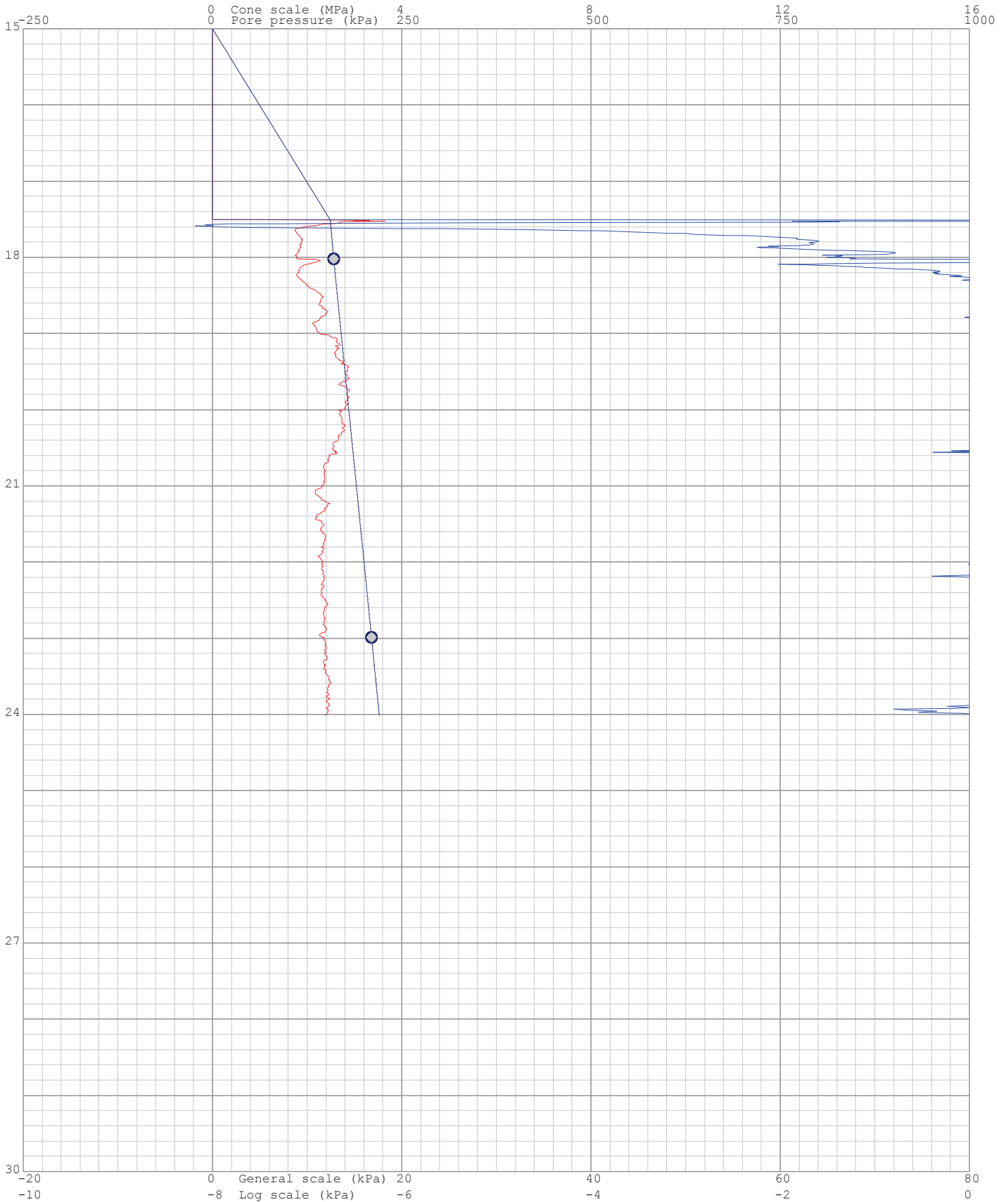
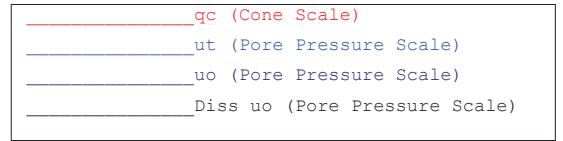
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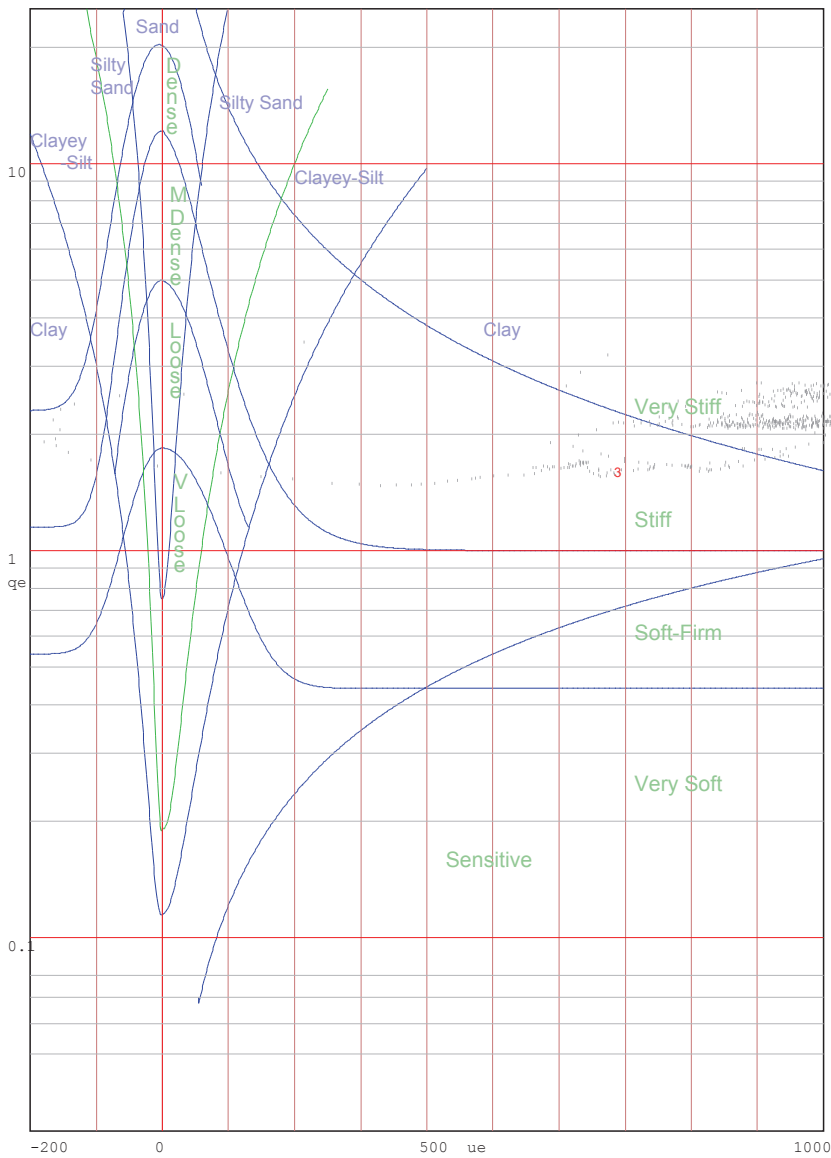
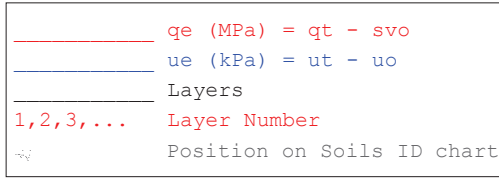
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

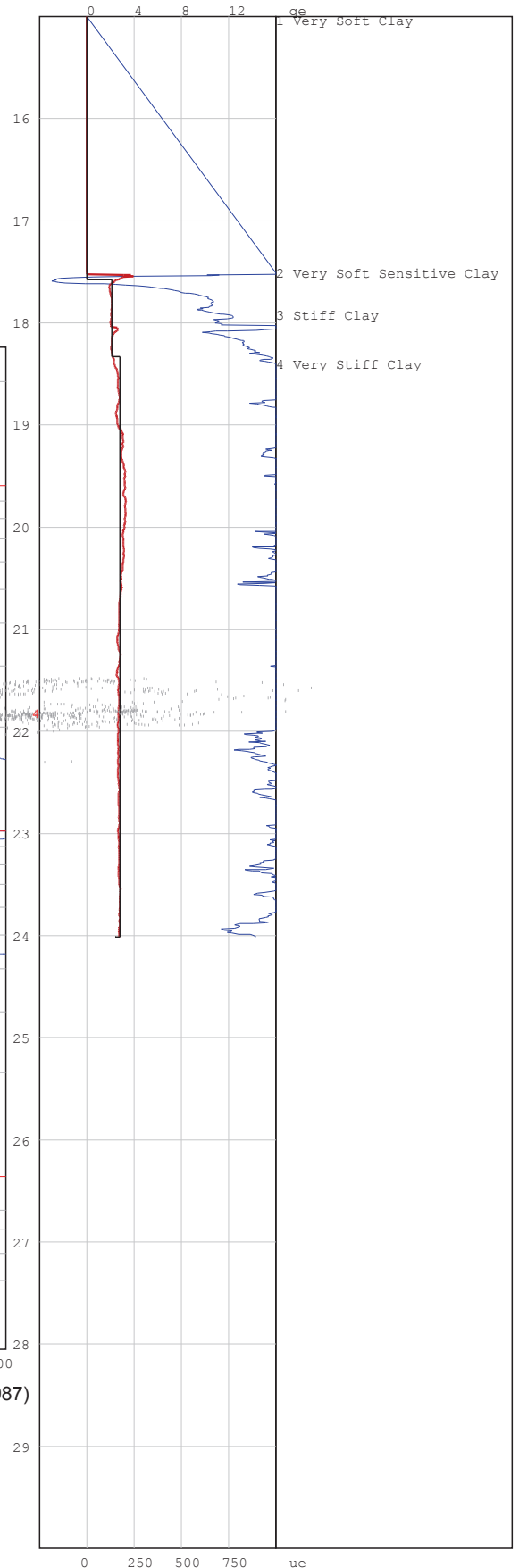
Hole No: P 09

Date: 2012/08/25





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

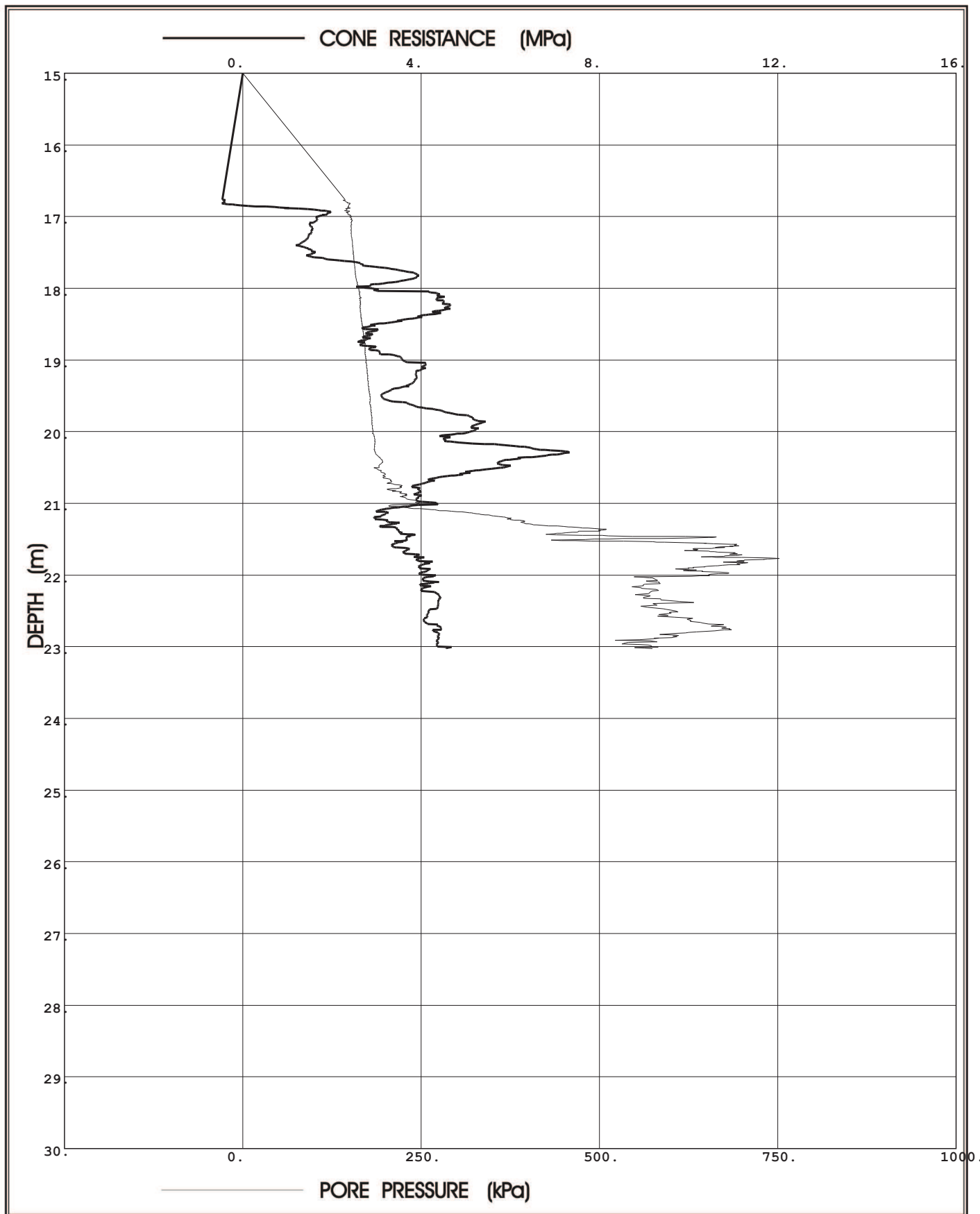
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 10

DATE: 2012/08/24

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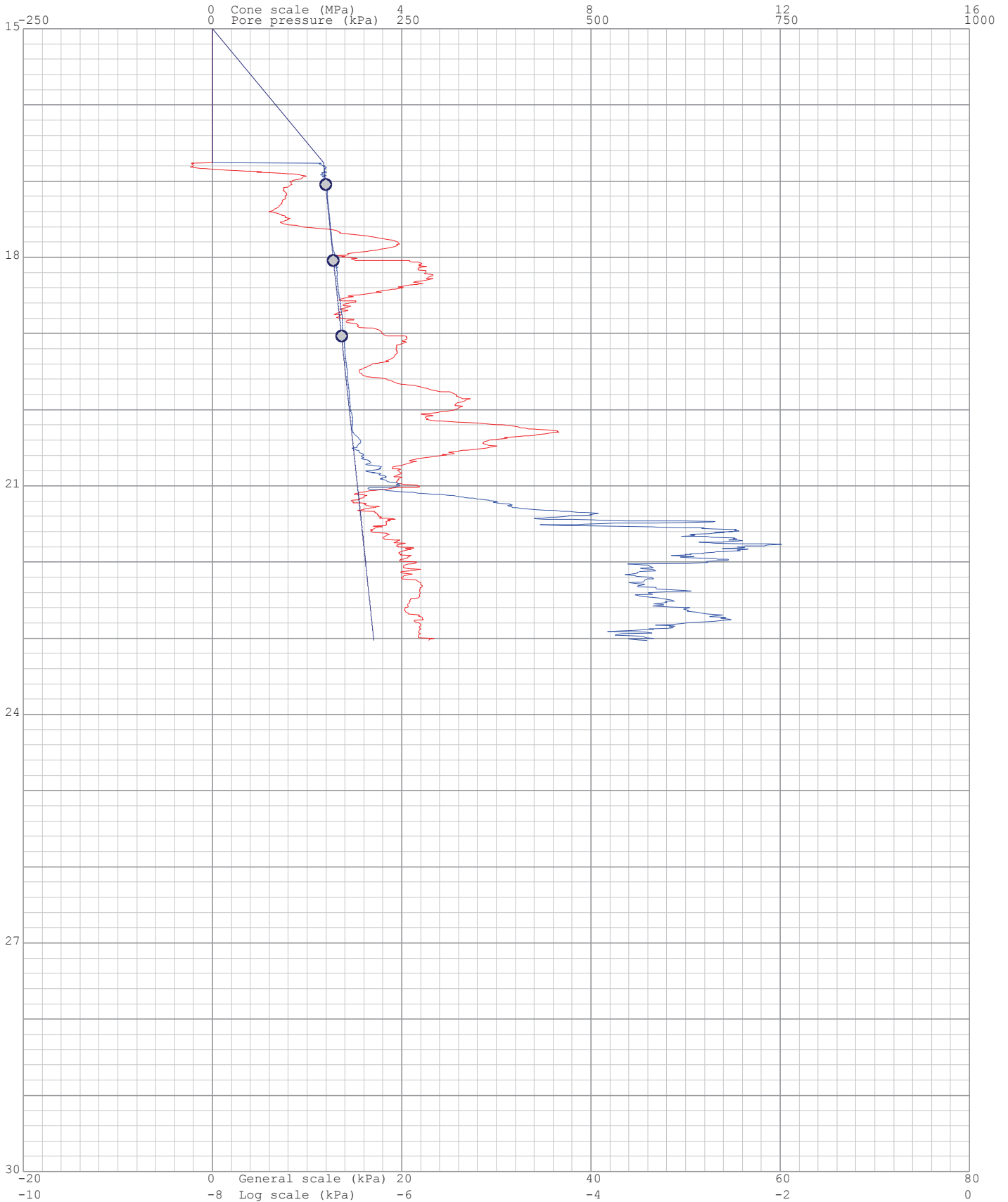
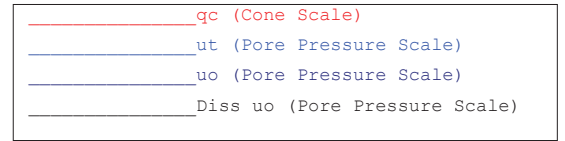
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 10  
Date: 2012/08/24





Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 10

Date: 2012/08/24

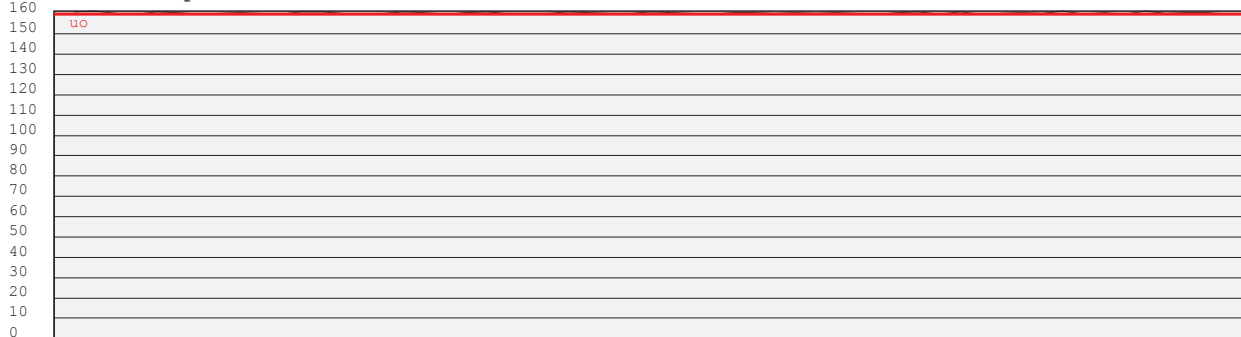
Page: 1

(kPa) Dissipation at: 17.042m



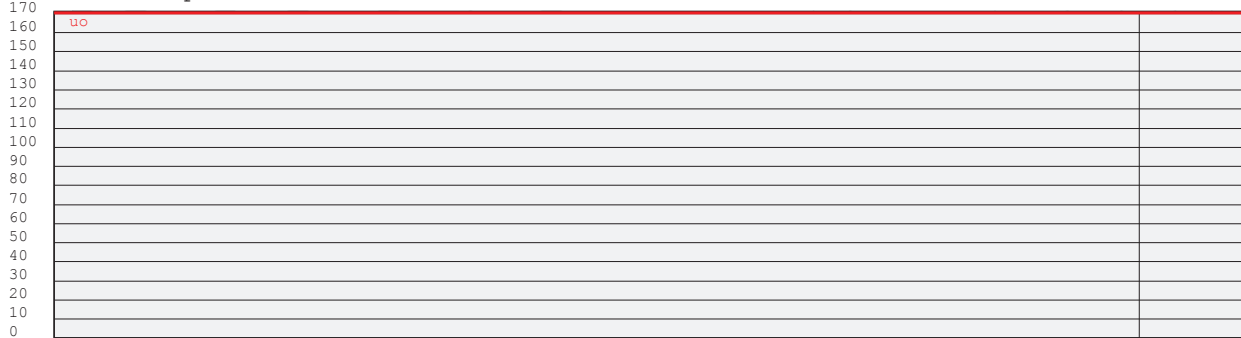
Time (seconds)

(kPa) Dissipation at: 18.039m



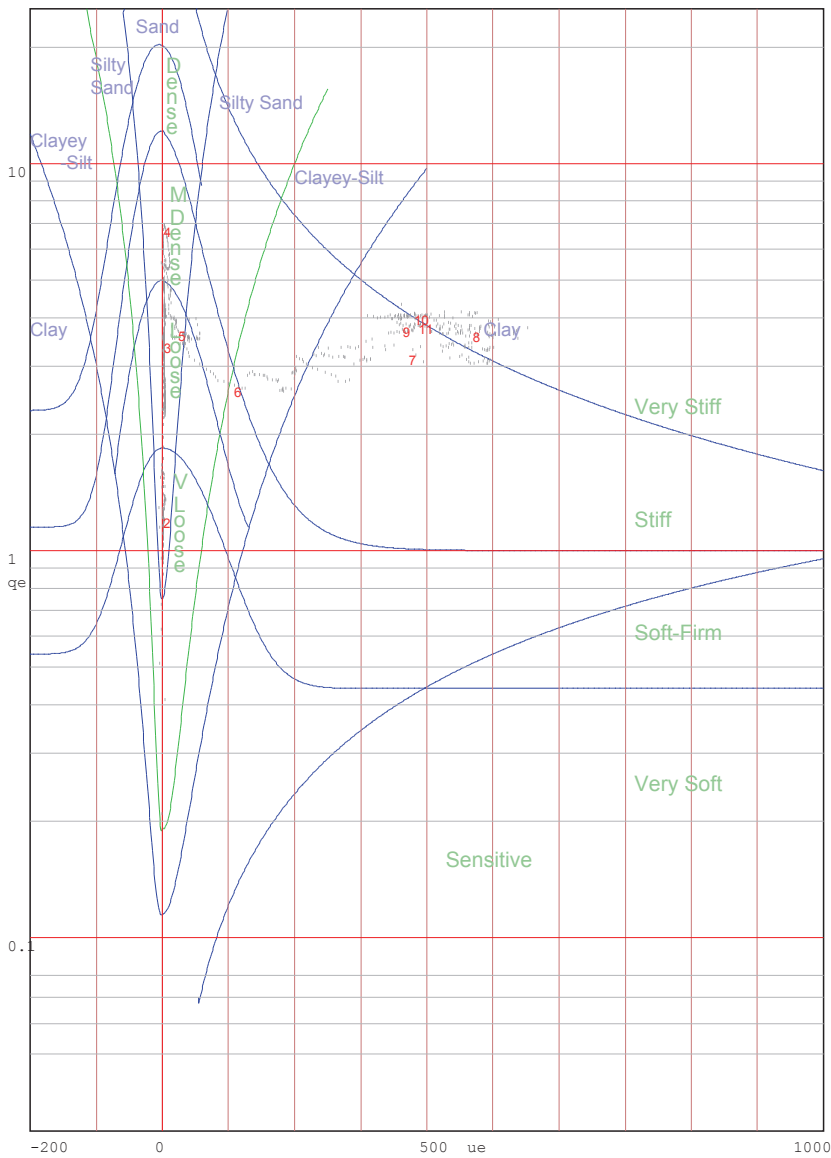
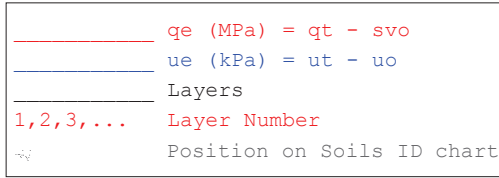
Time (seconds)

(kPa) Dissipation at: 19.031m

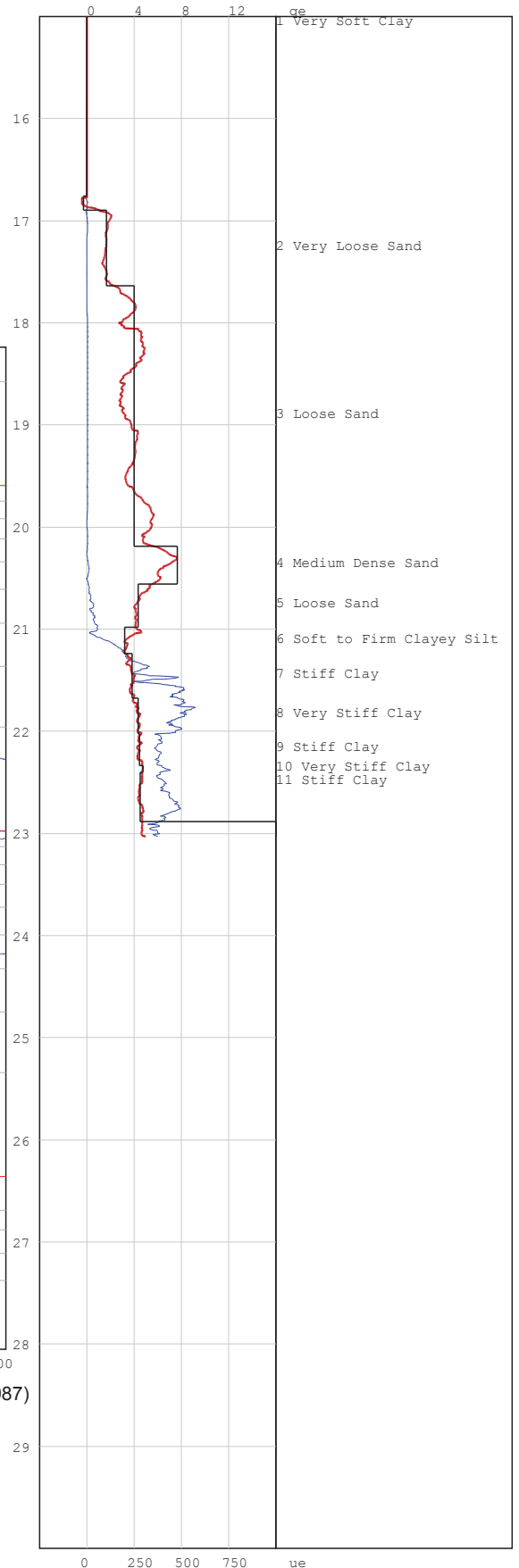


Time (seconds)

60



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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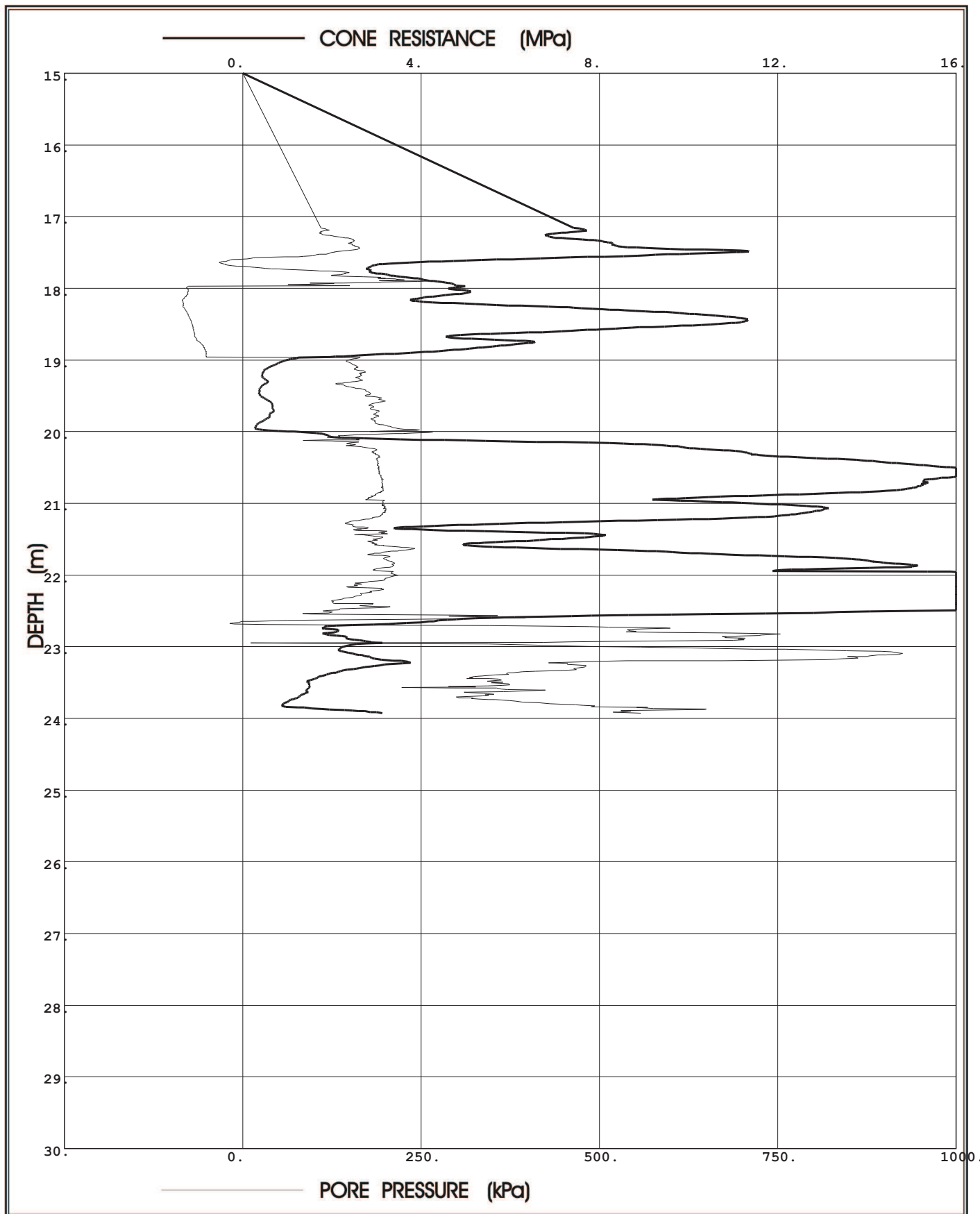
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 11

DATE: 2012/09/02

Page:2



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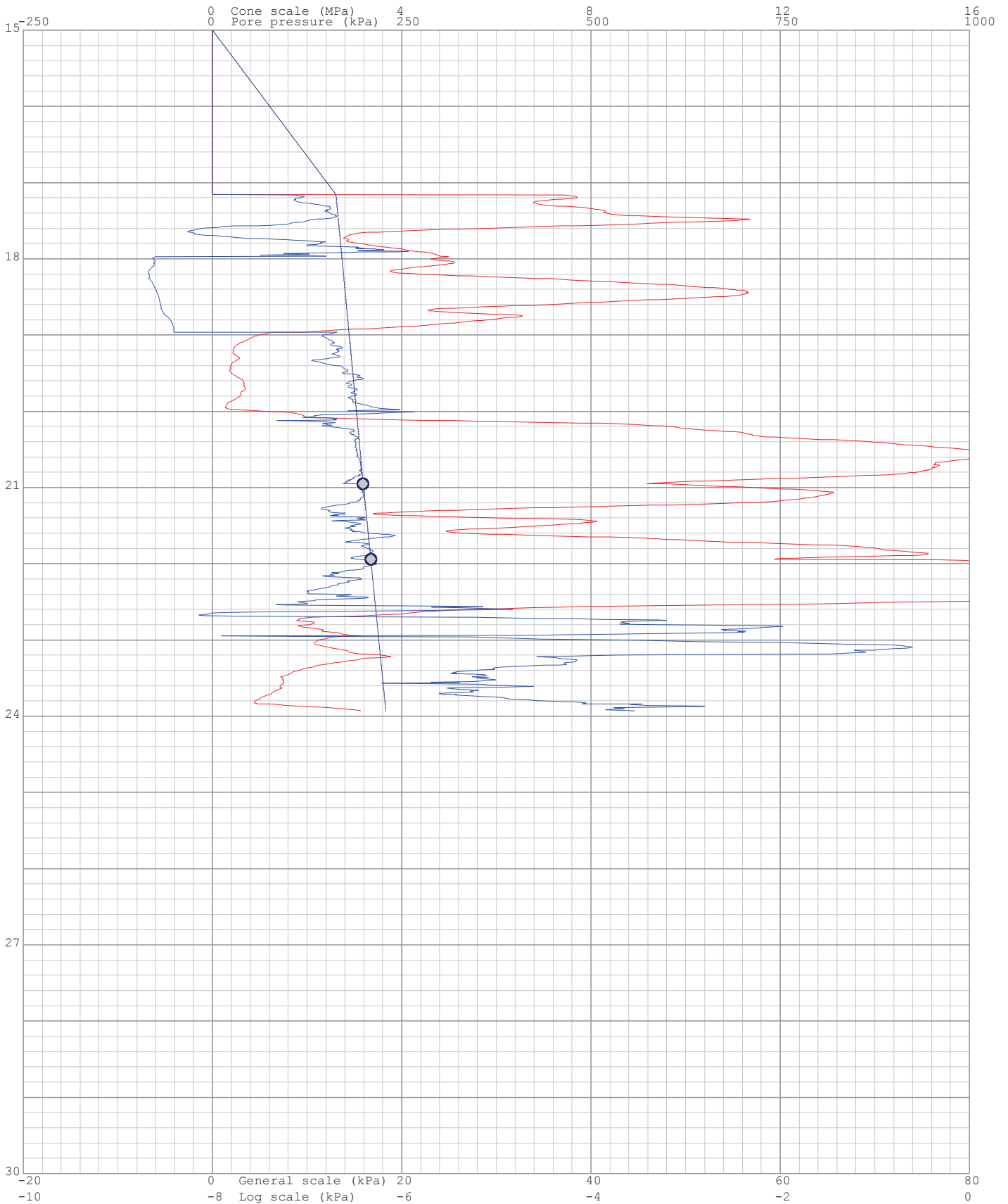
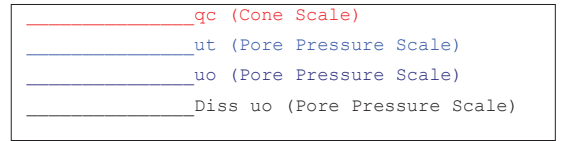
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 11  
Date: 2012/09/02



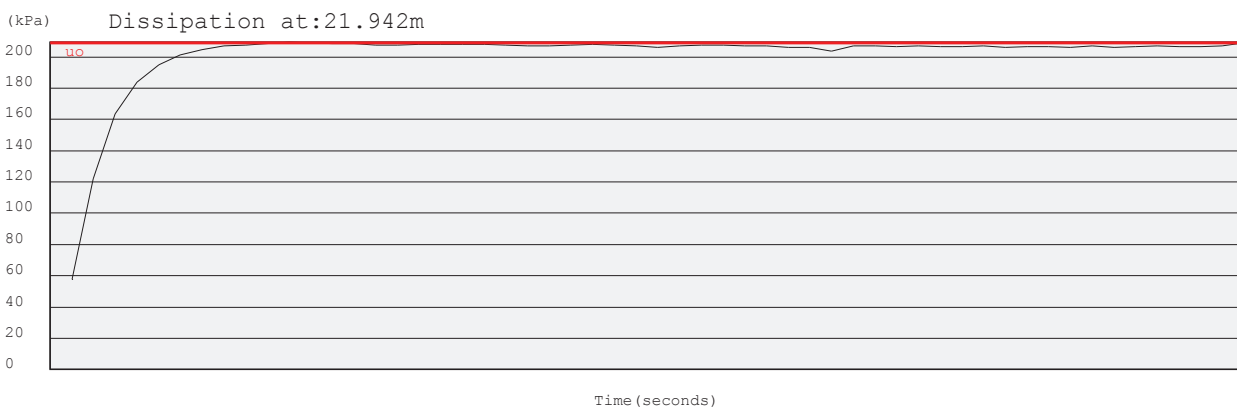
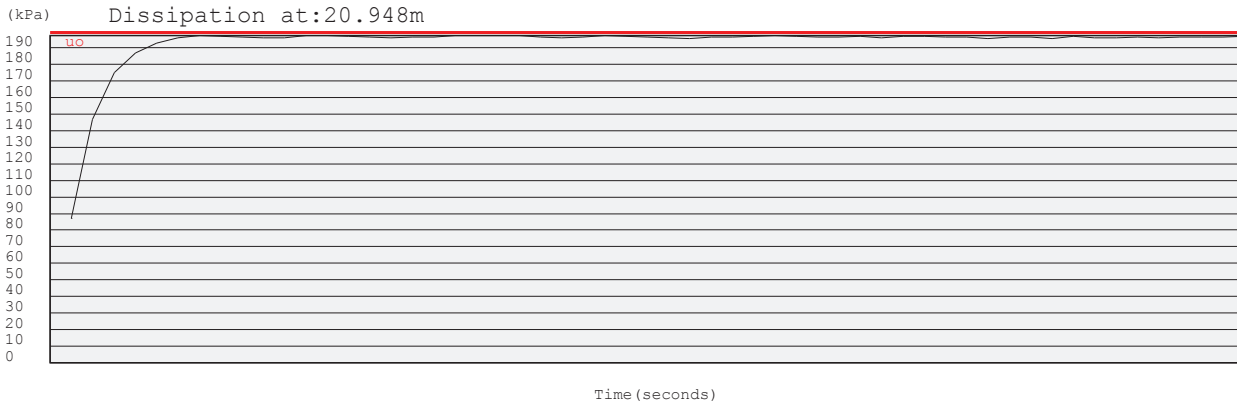
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

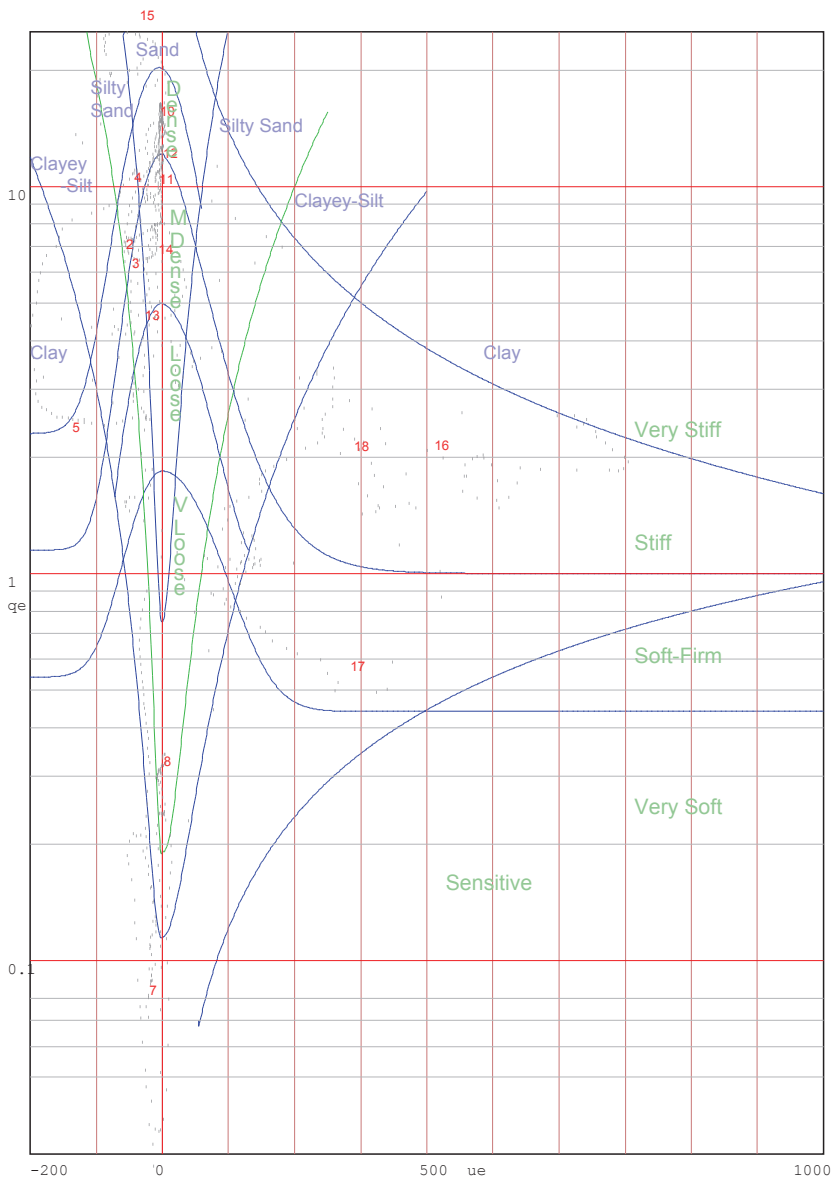
Hole: P 11

Date: 2012/09/02

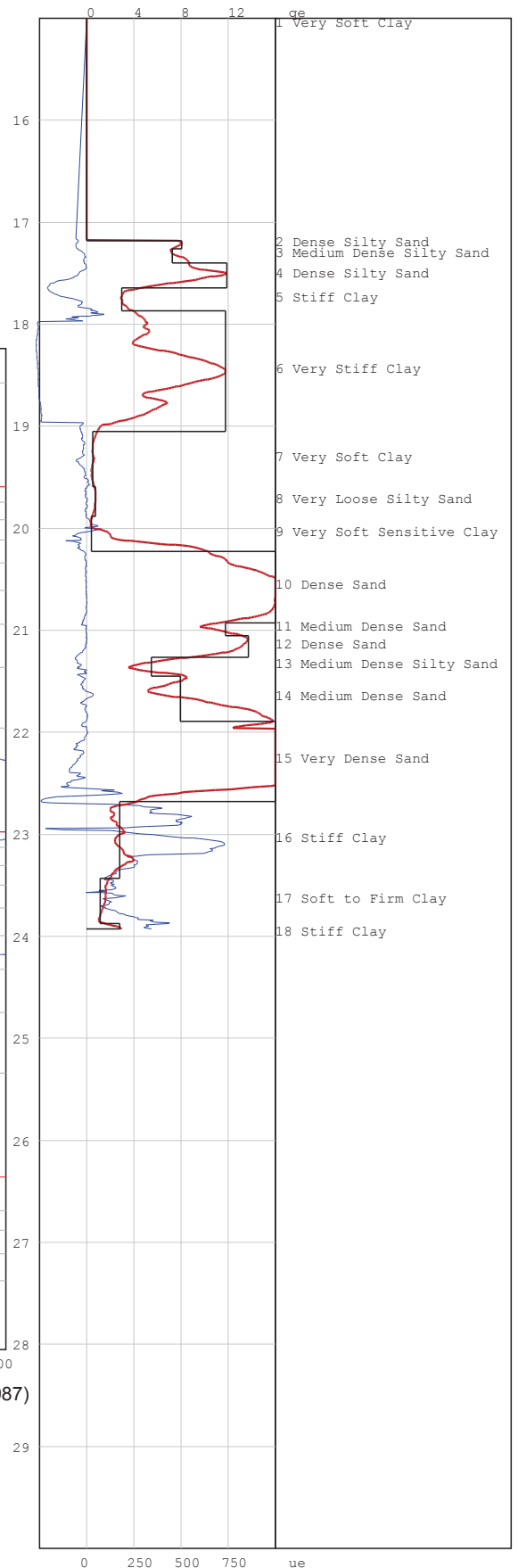
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—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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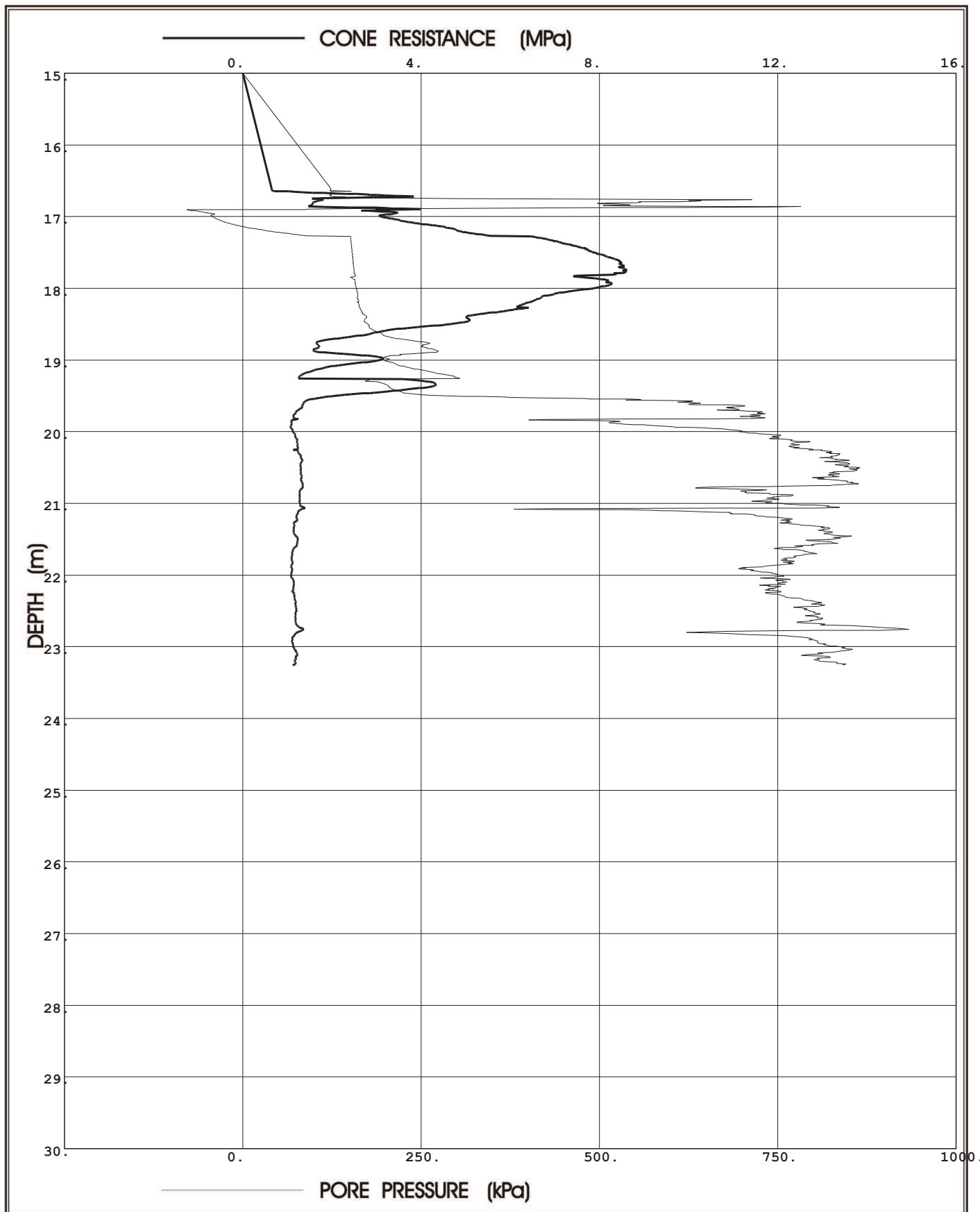
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 12

DATE: 2012/08/30

Page:2



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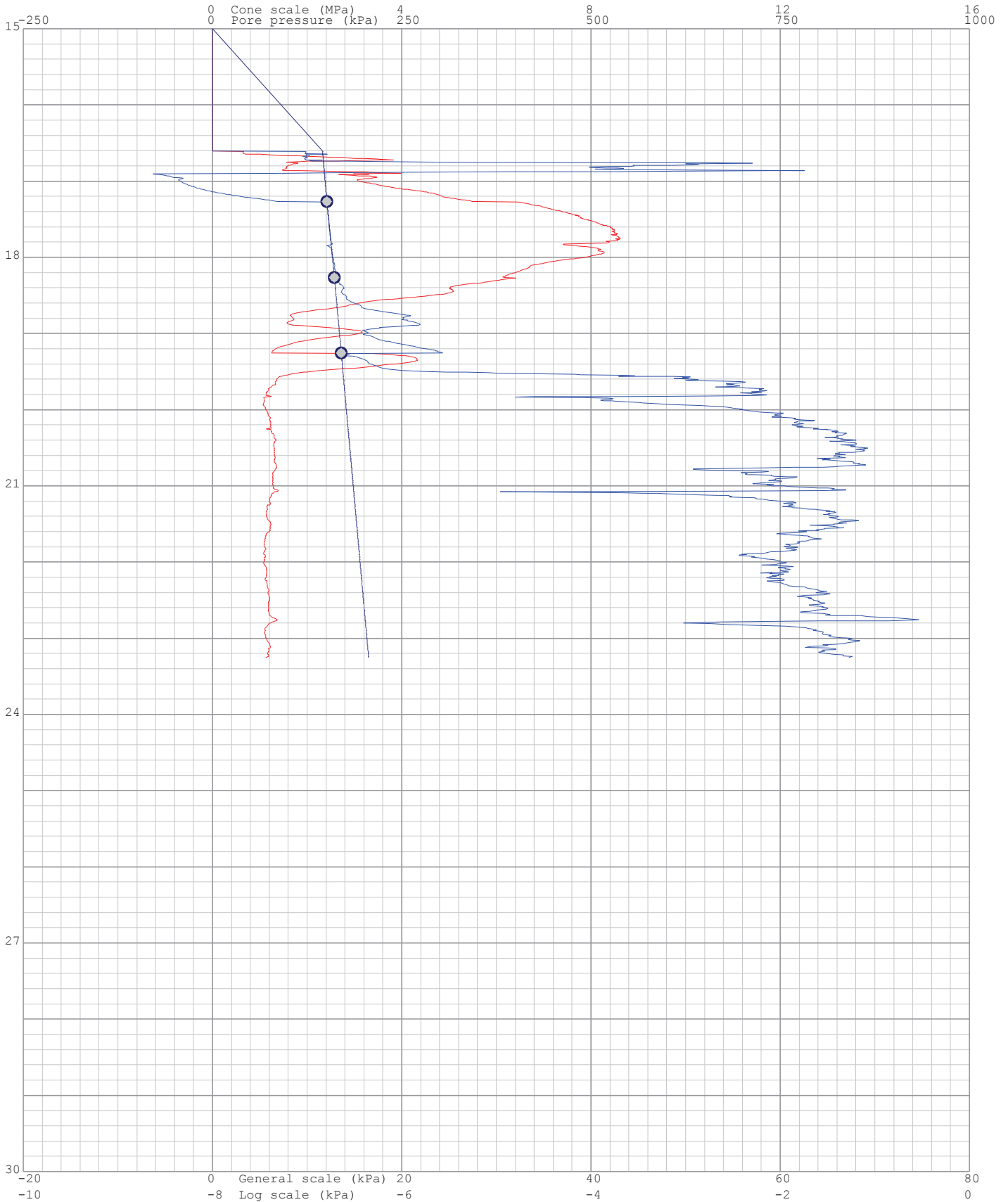
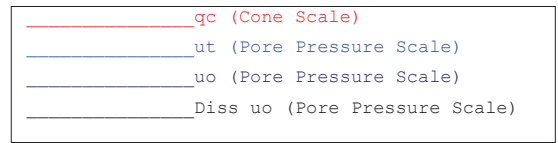
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 12  
Date: 2012/08/30





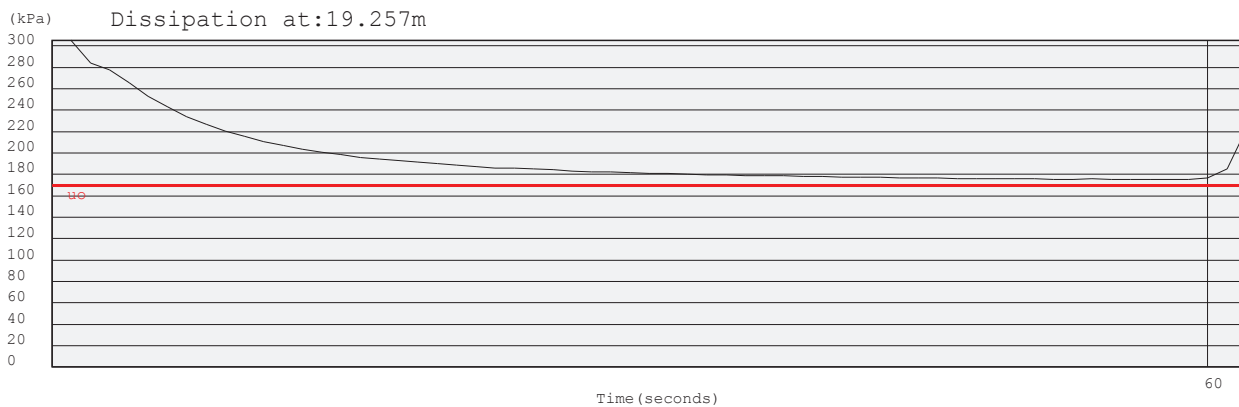
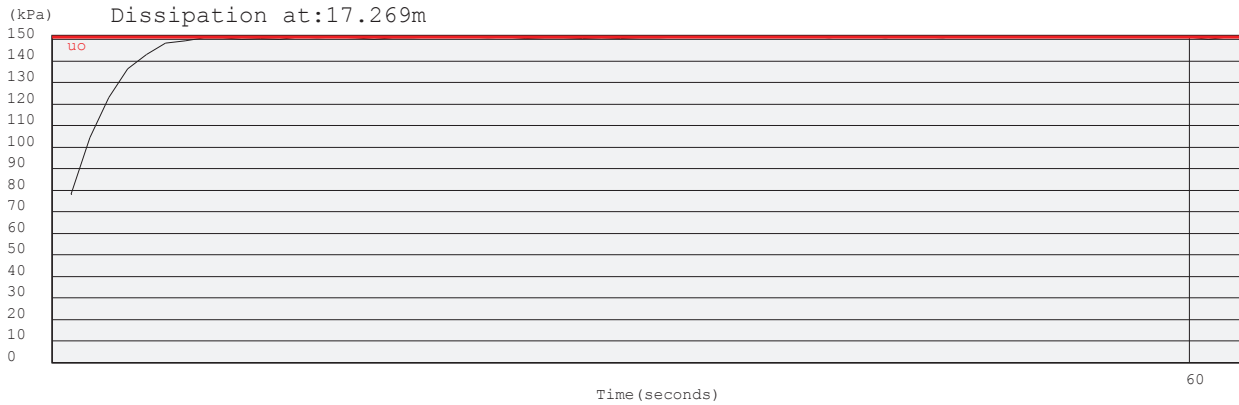
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 12

Date: 2012/08/30

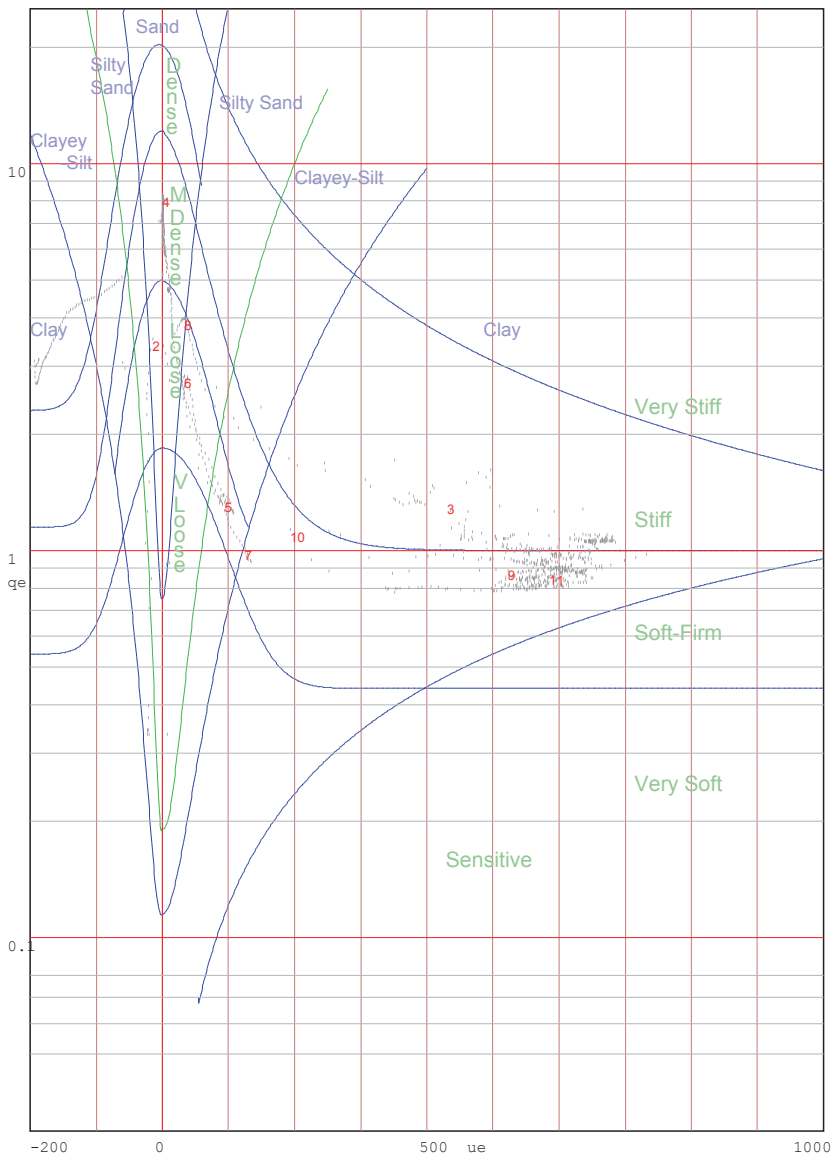
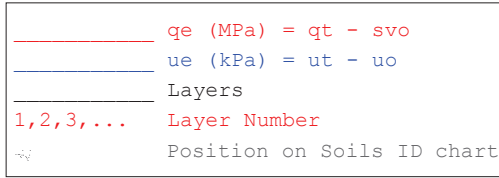
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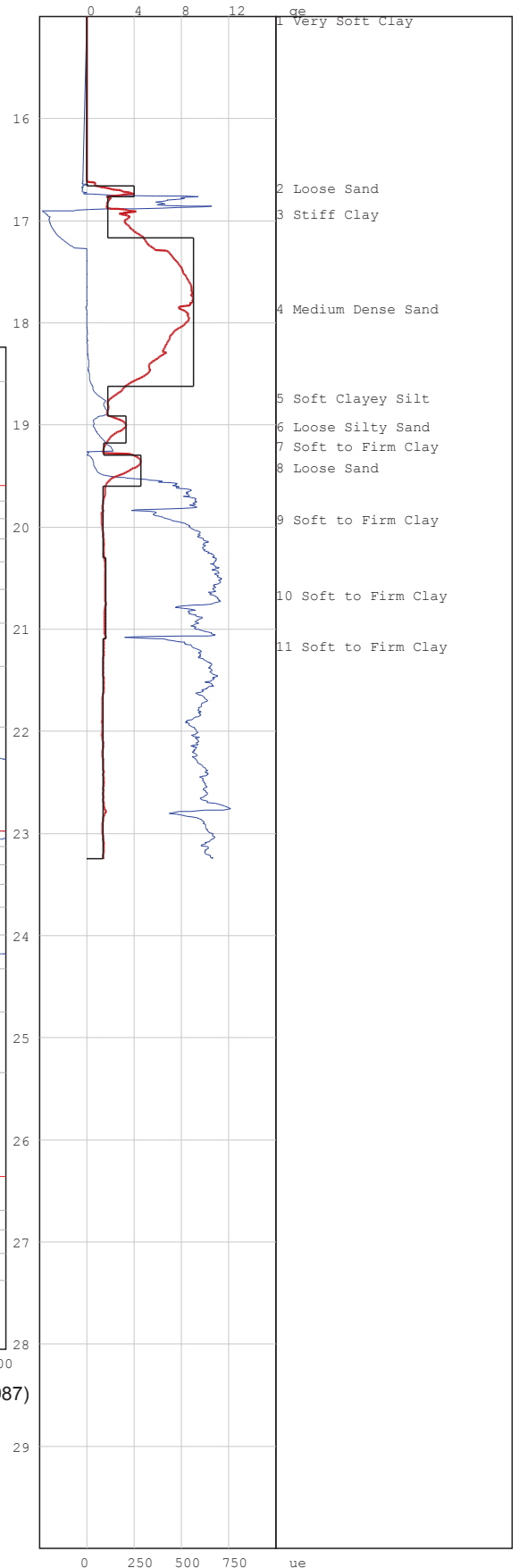
Project: Durban Harbour Piezocone Investigation for Dredging

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Date: 2012/08/30



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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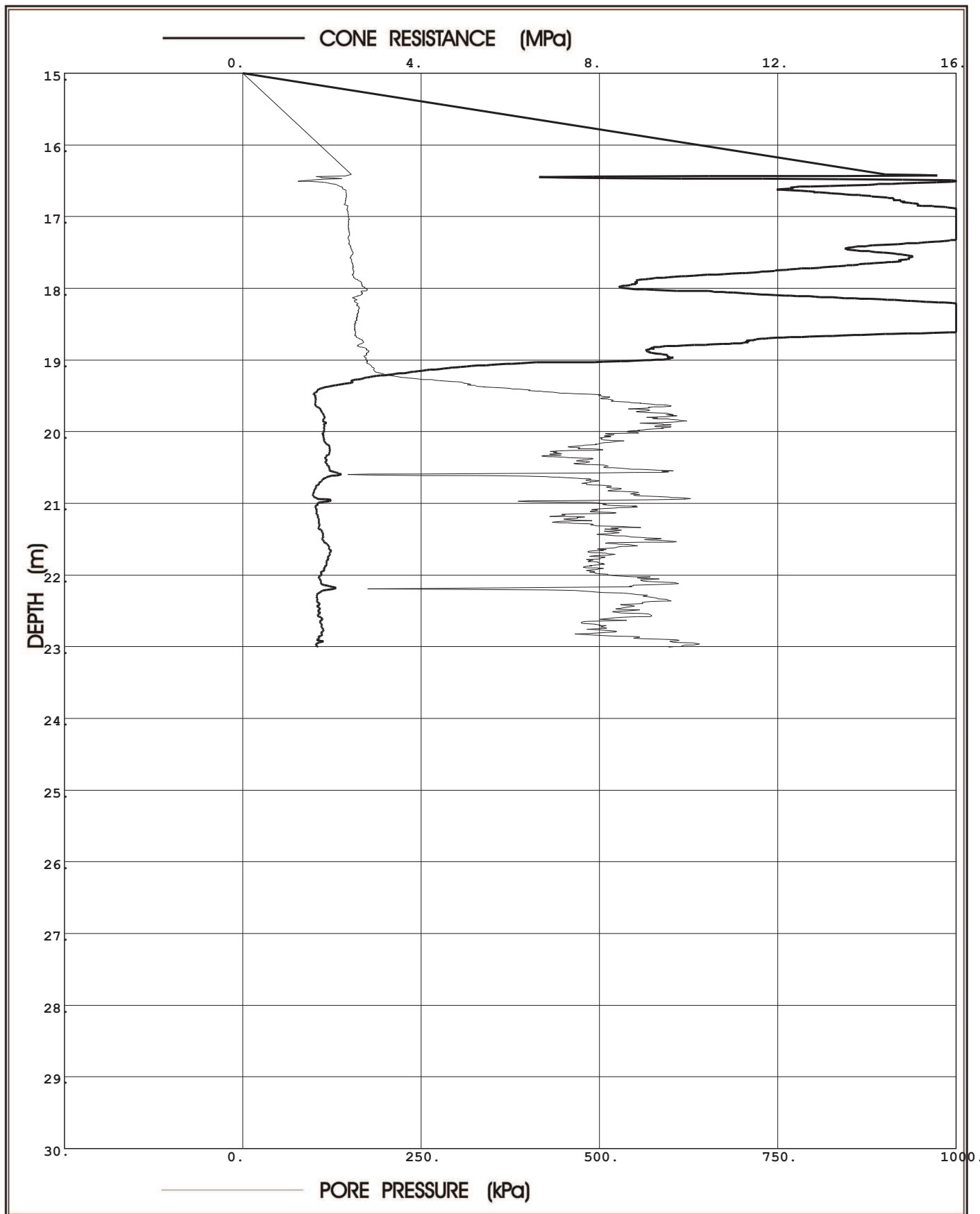
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 13

DATE: 2012/08/27

Page:2



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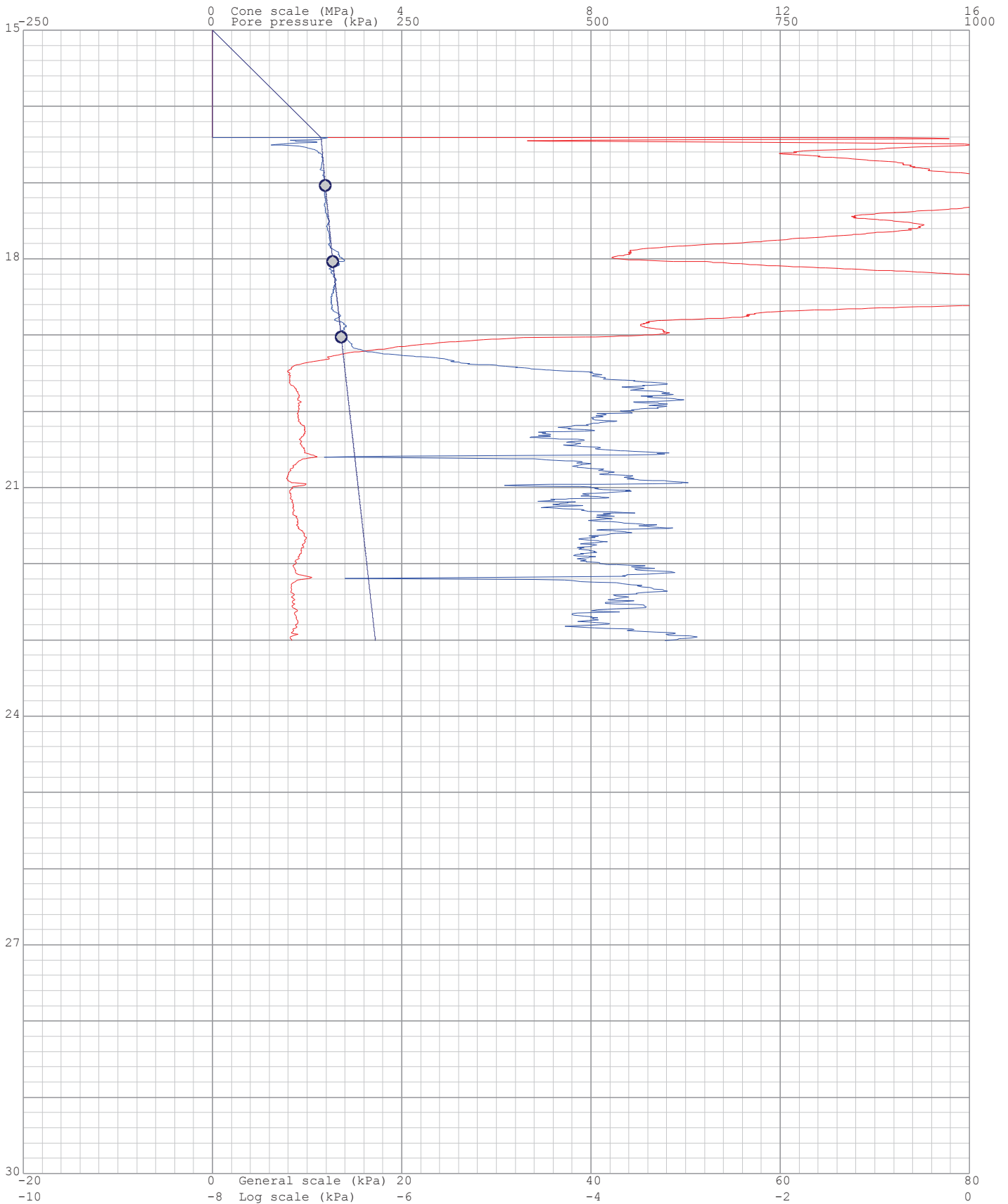
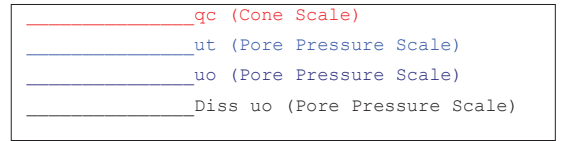
**Jeanne Rust** Information Technology

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 13  
Date: 2012/08/27



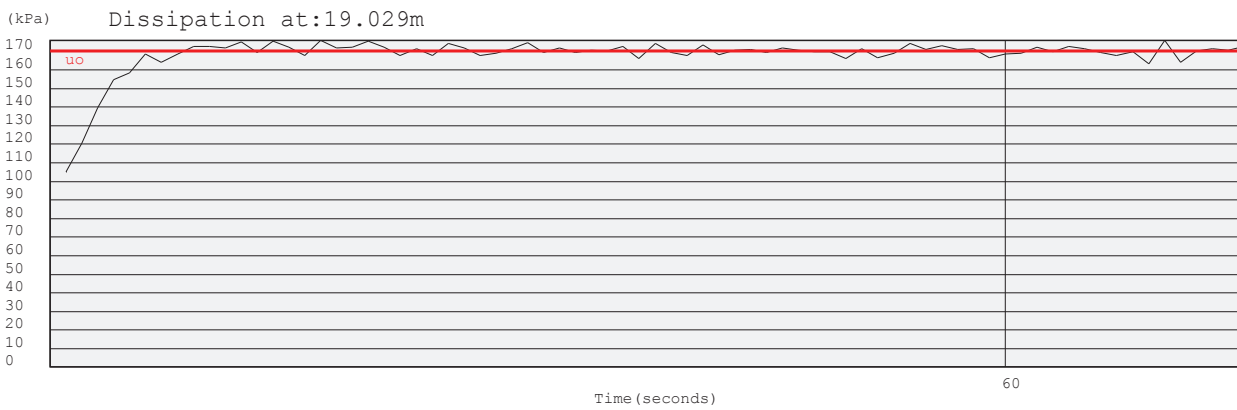
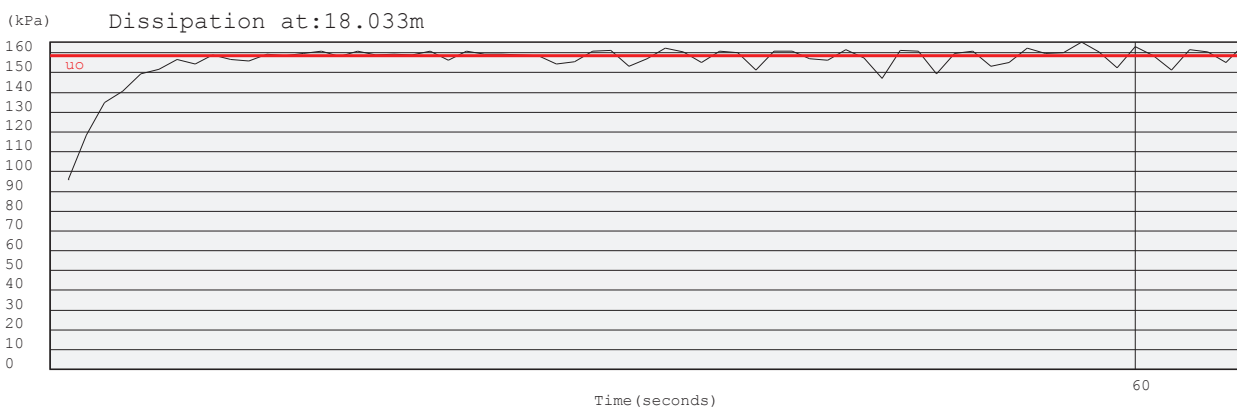
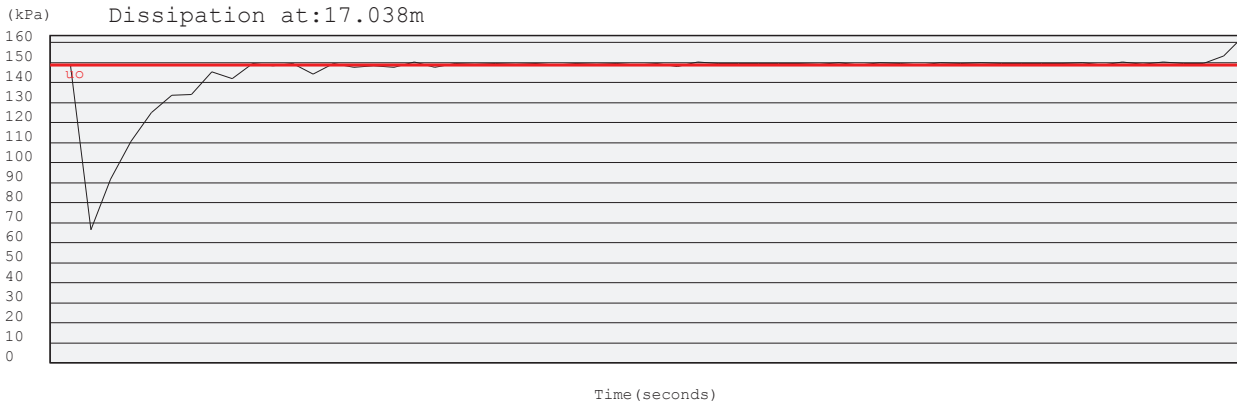
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

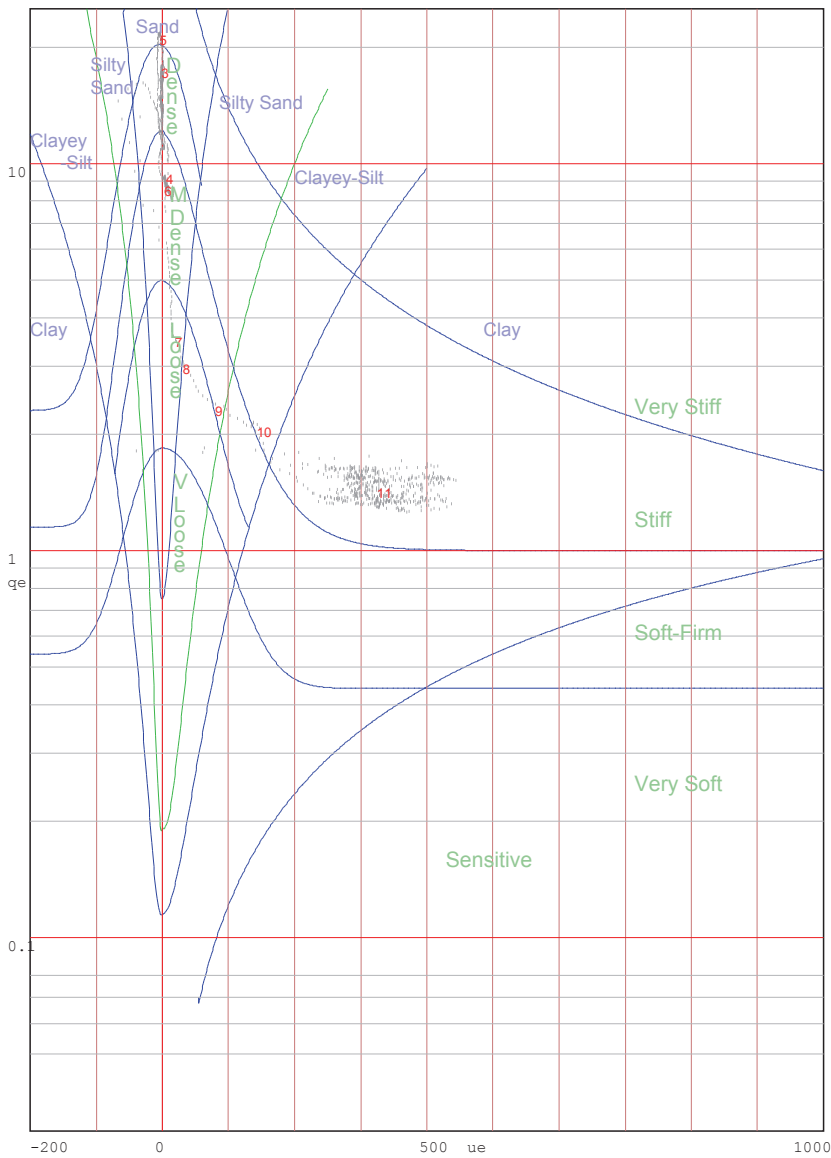
Hole: P 13

Date: 2012/08/27

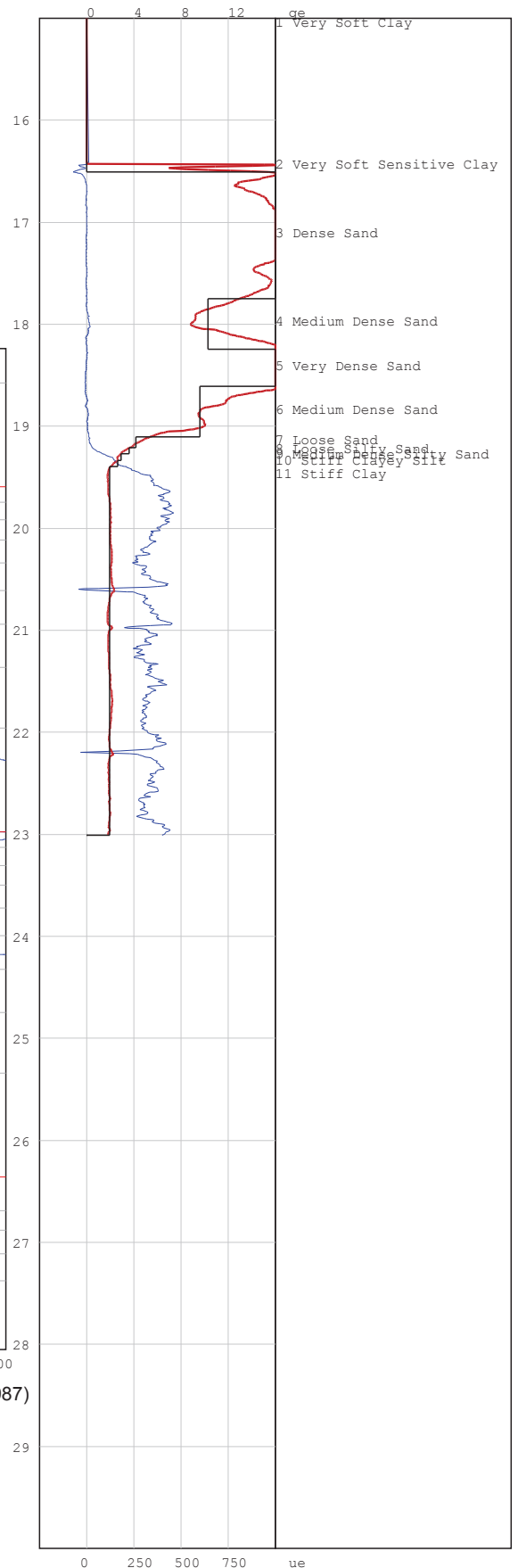
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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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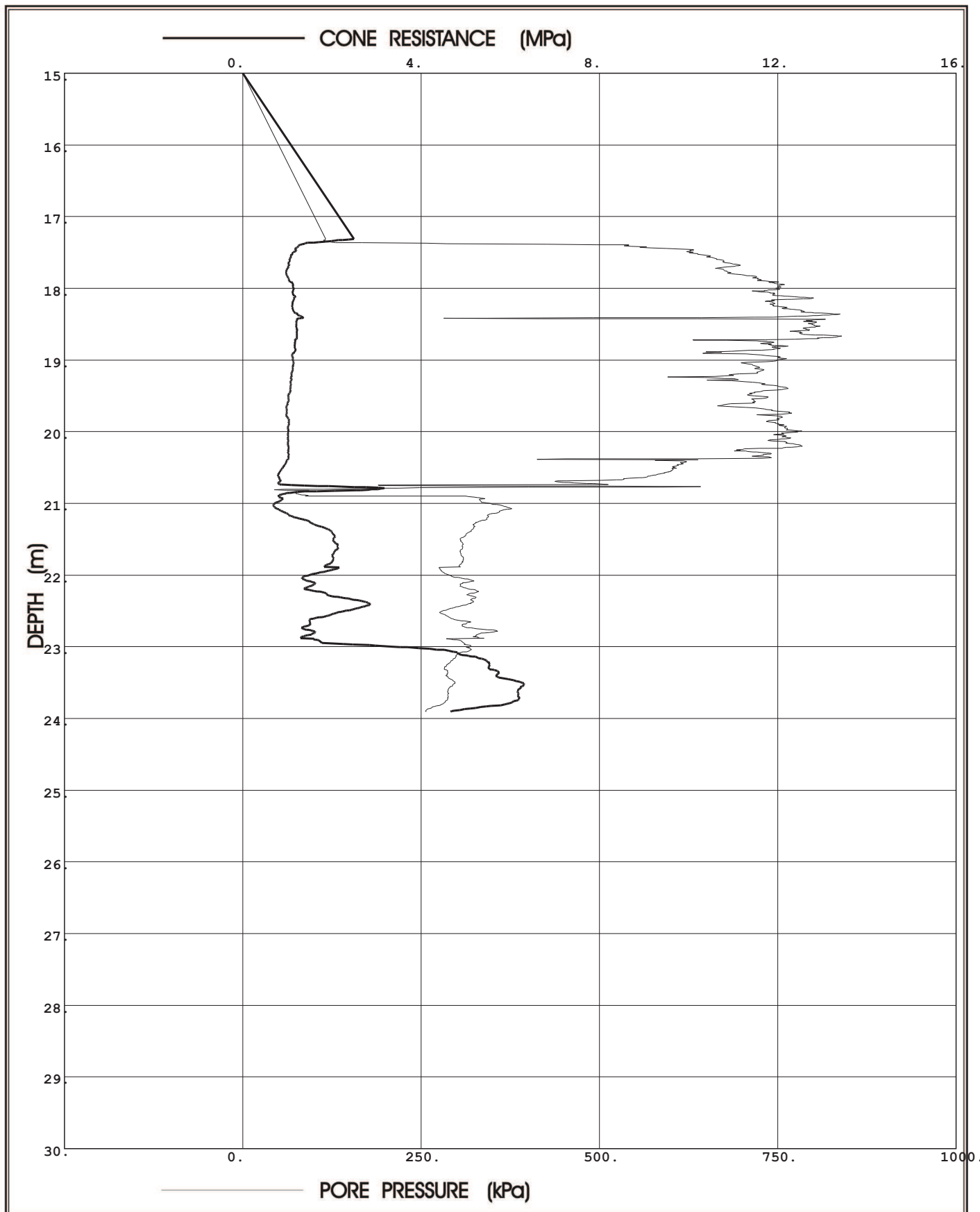
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 14

DATE: 2012/09/08

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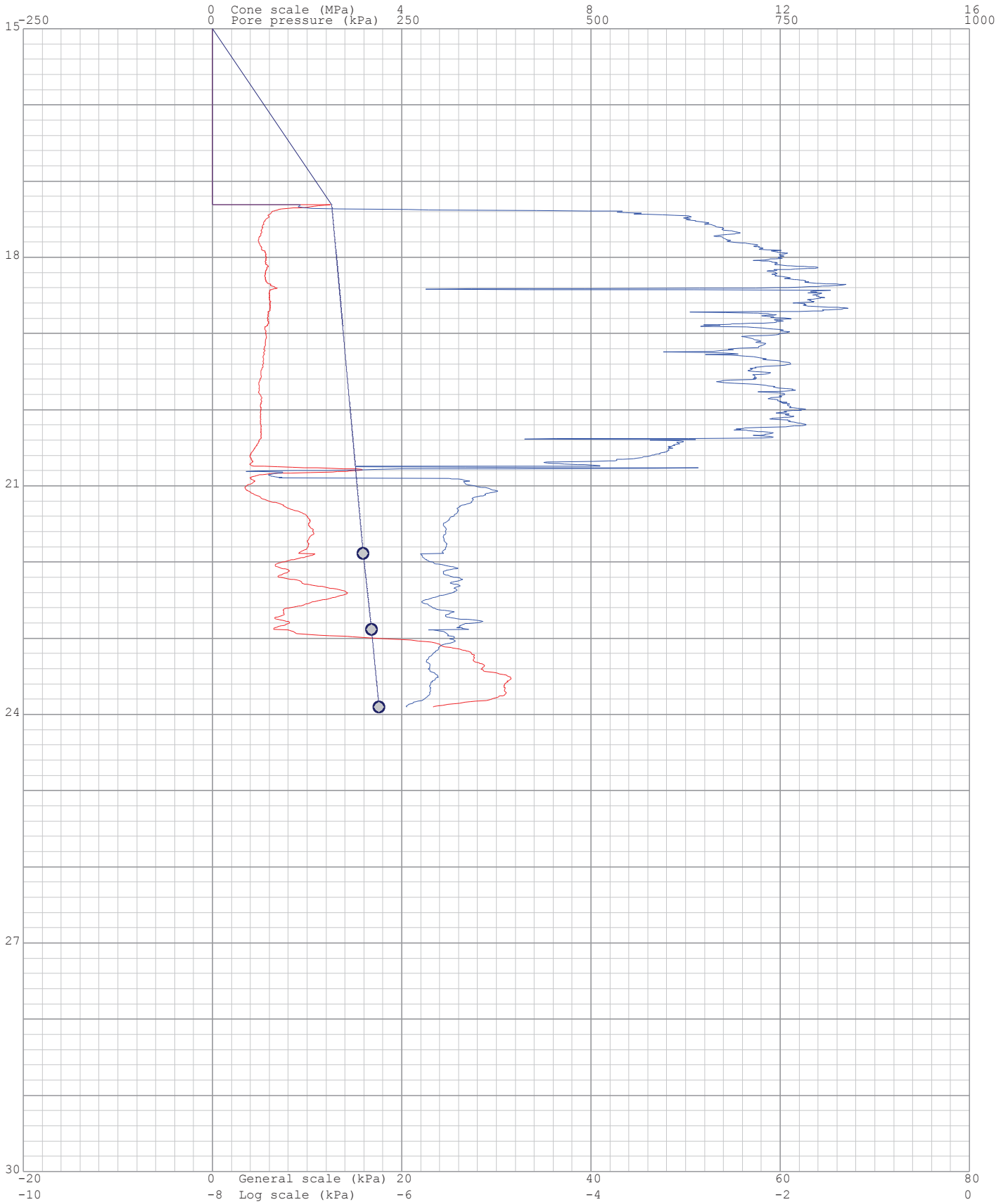
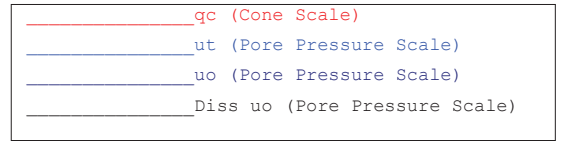
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 14  
Date: 2012/09/08





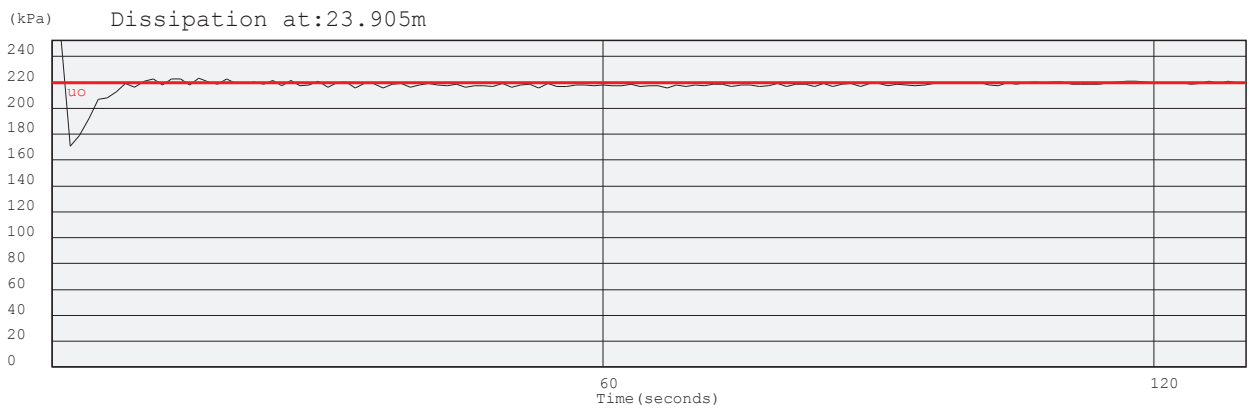
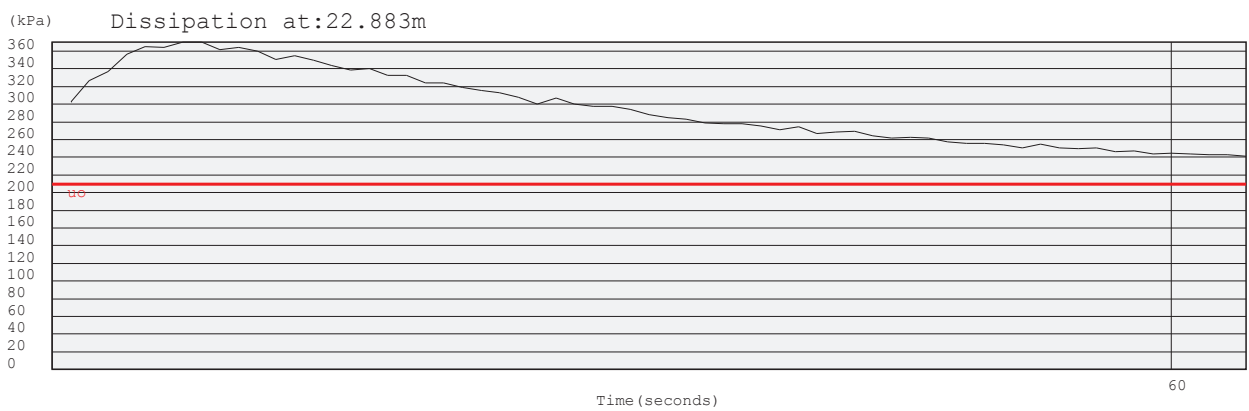
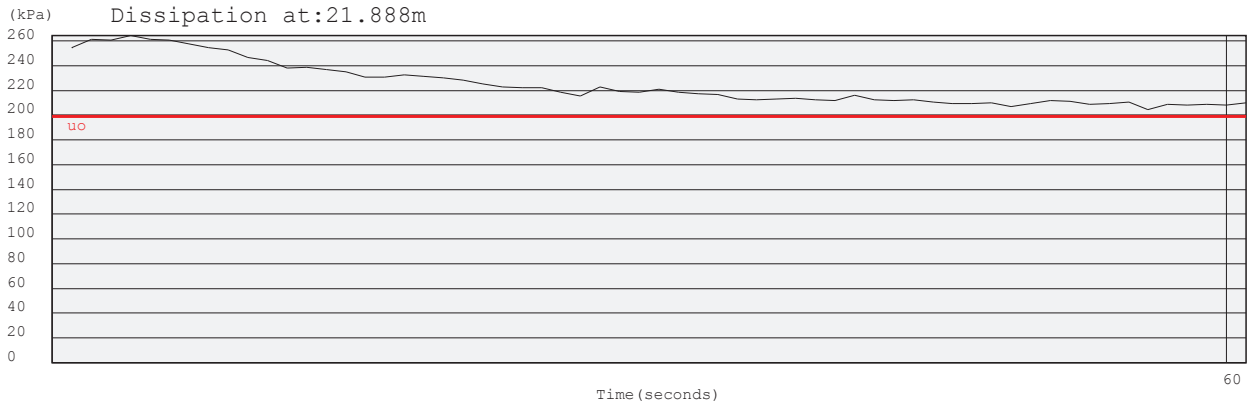
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

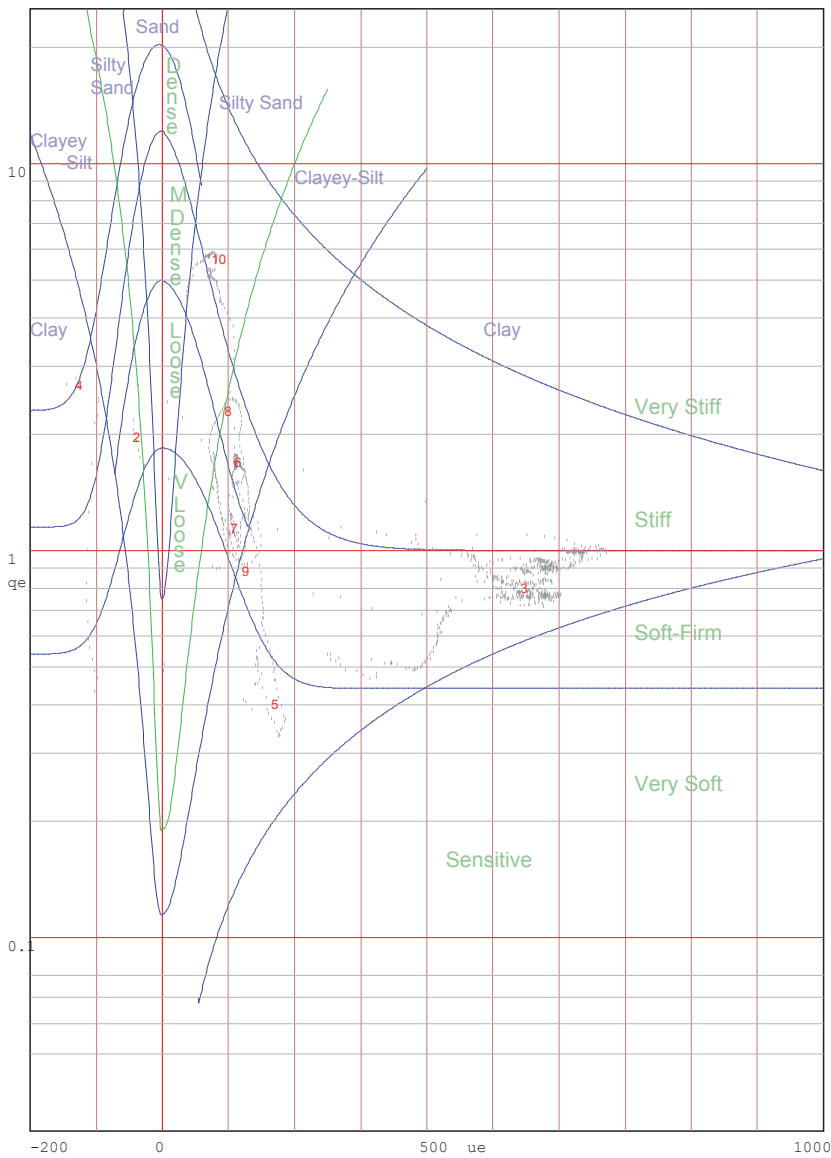
Hole: P 14

Date: 2012/09/08

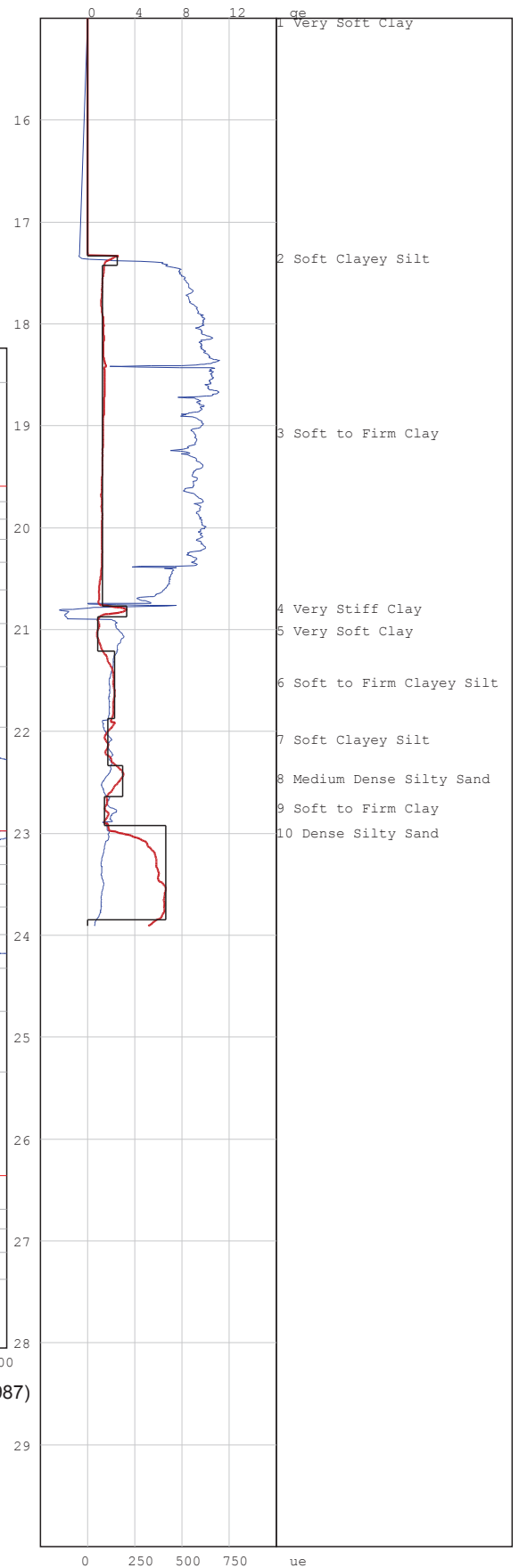
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—  $q_e$  (MPa) =  $q_t - s_{vo}$   
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 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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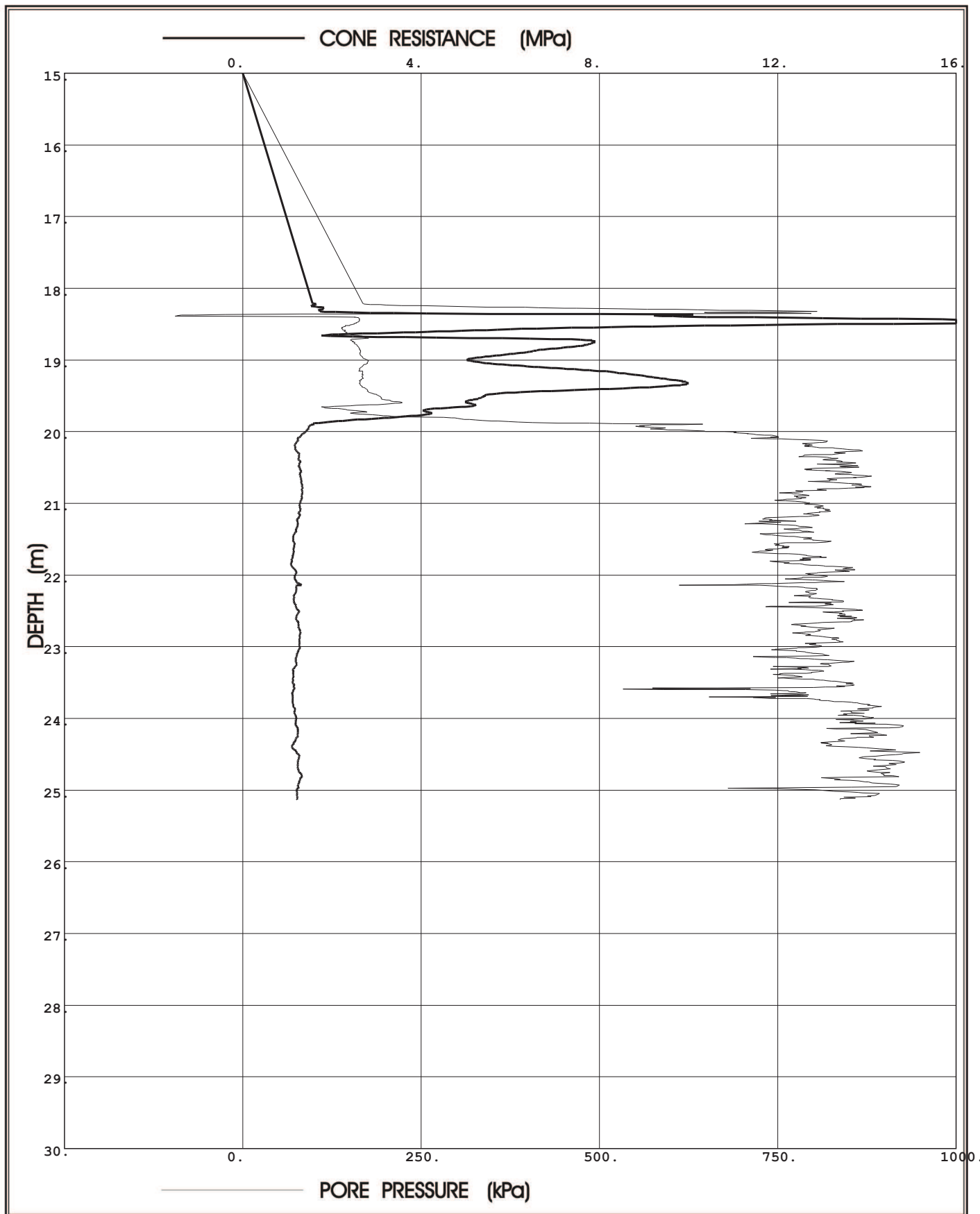
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 15

DATE: 2012/09/08

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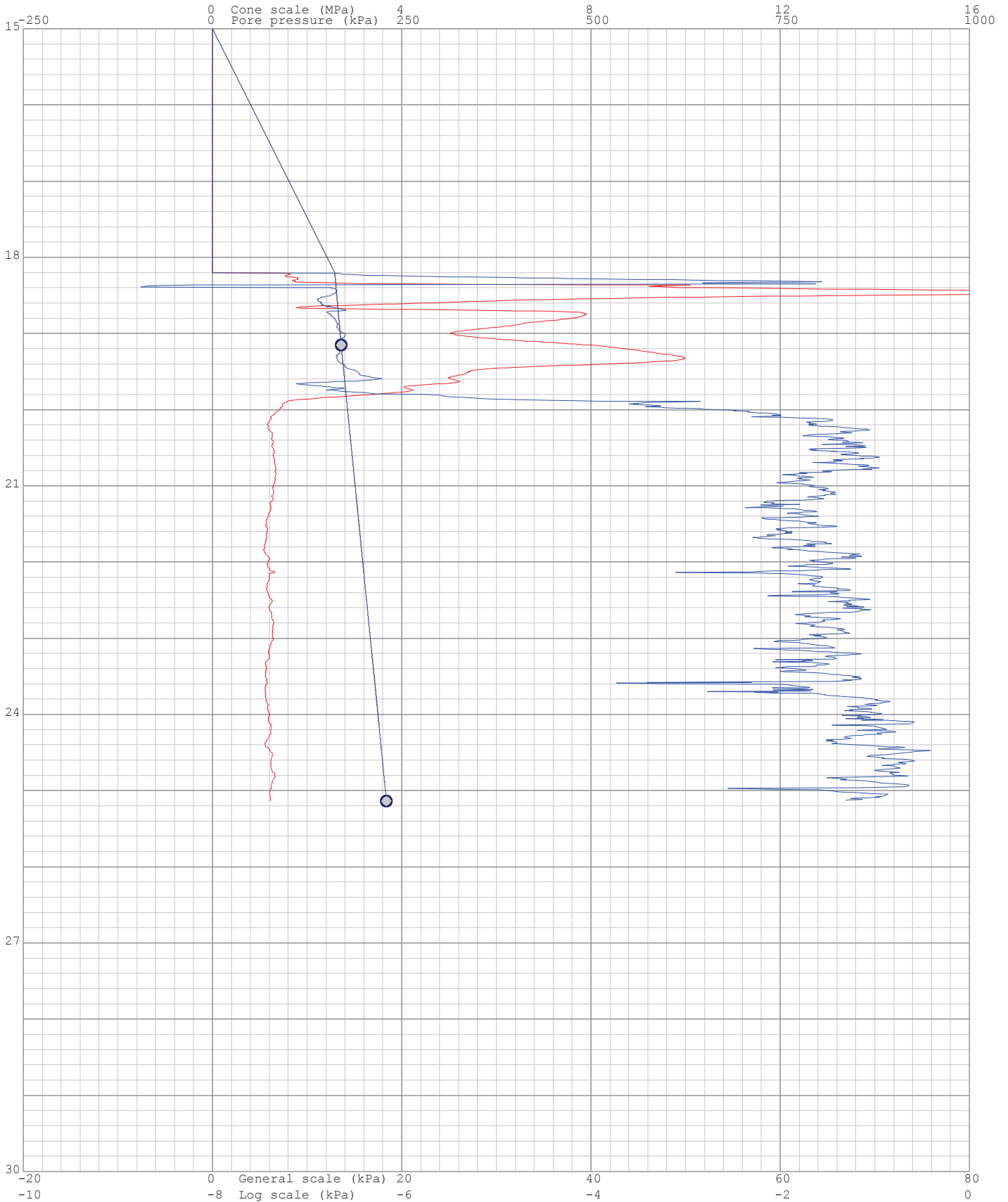
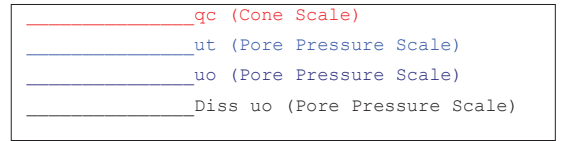
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 15  
Date: 2012/09/08



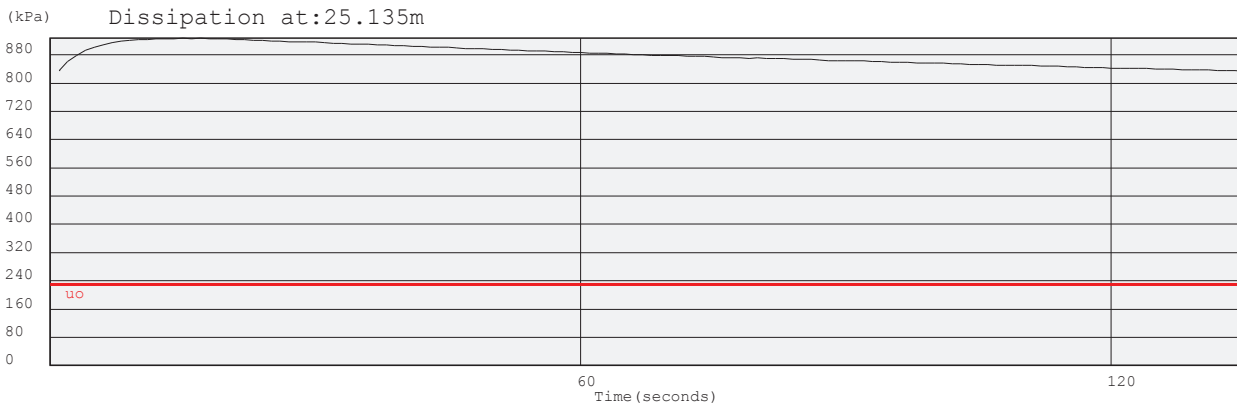
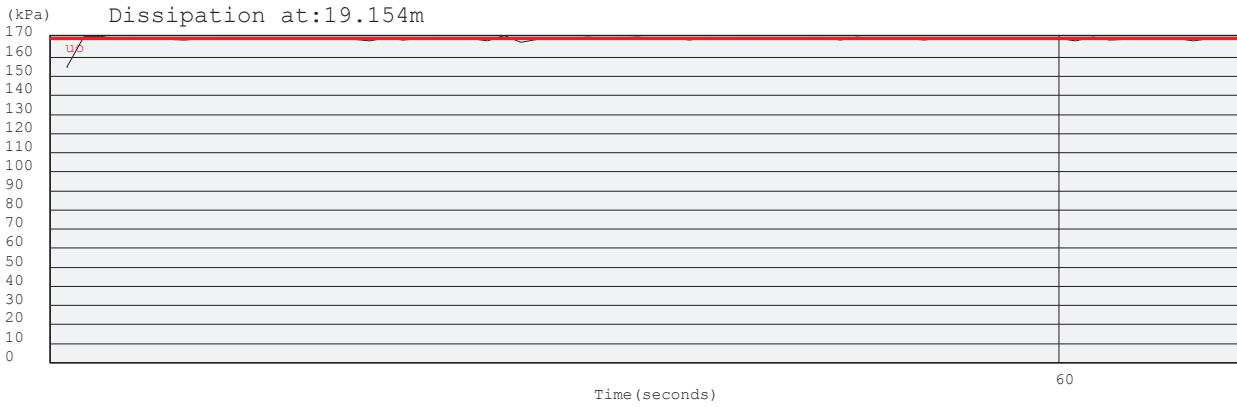
Project: Durban Harbour Piezocone Investigation for Dredging

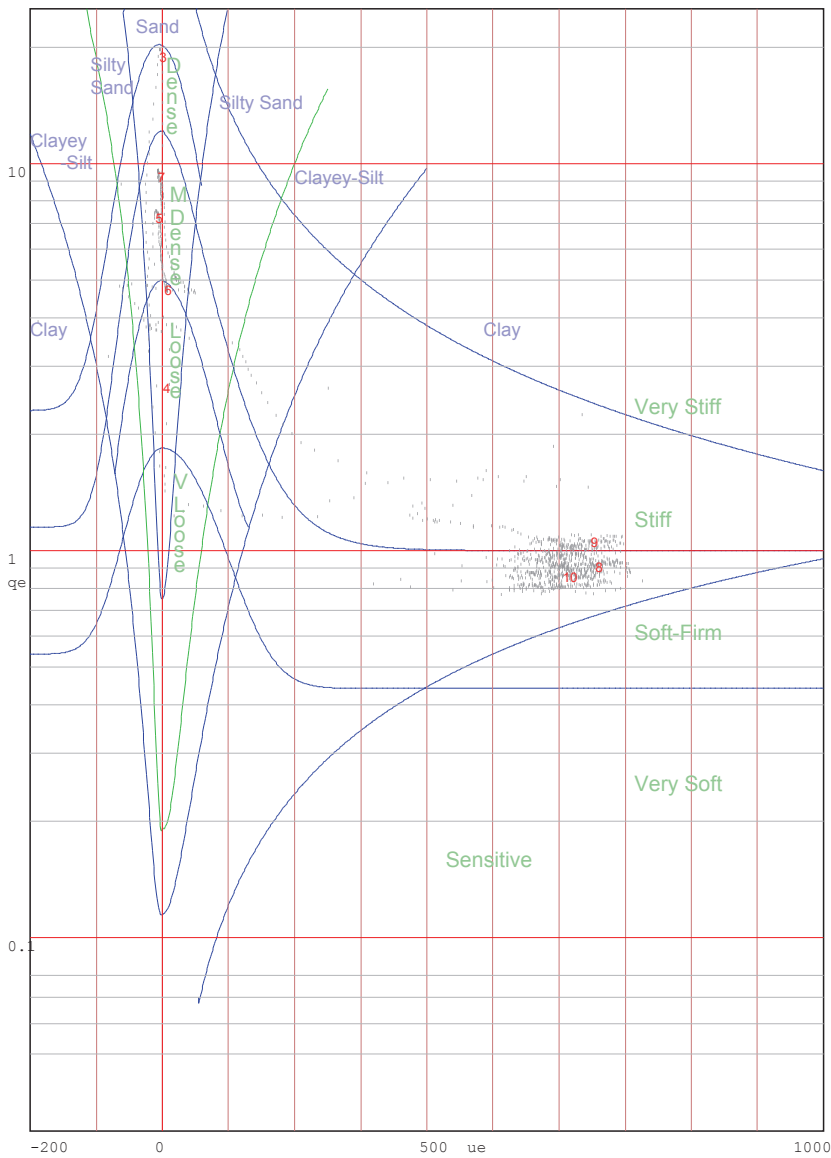
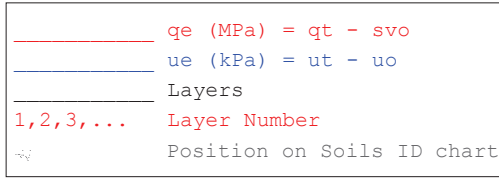
Site: Durban Harbour over water

Hole: P 15

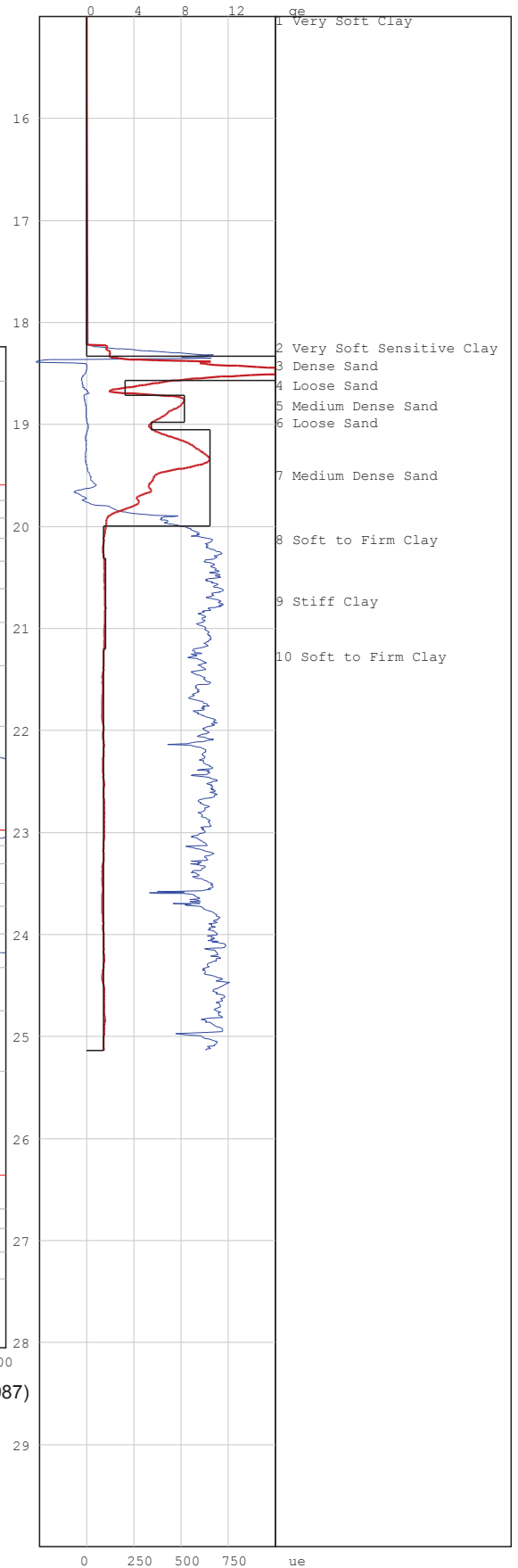
Date: 2012/09/08

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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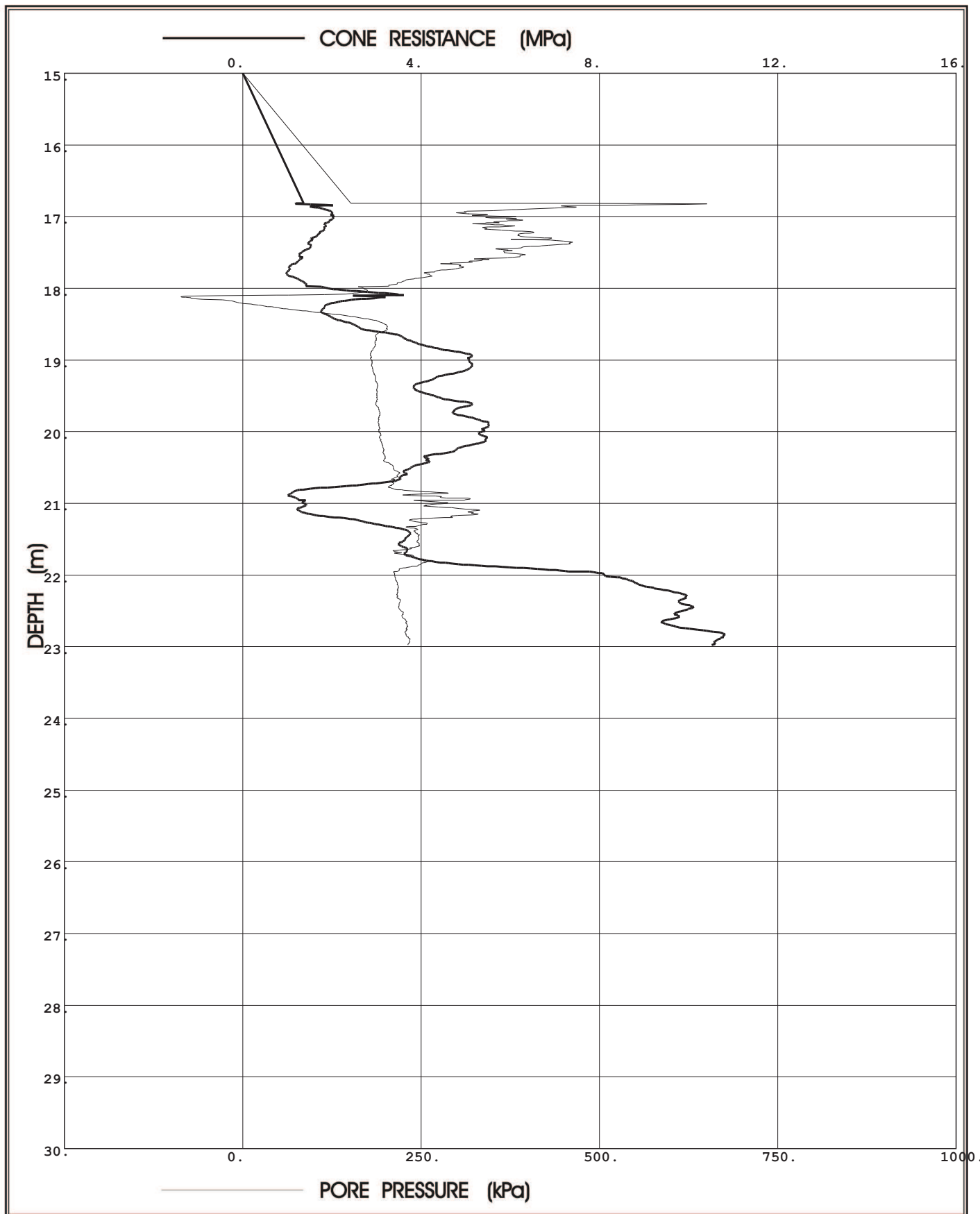
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 16

DATE: 2012/09/20

Page:2



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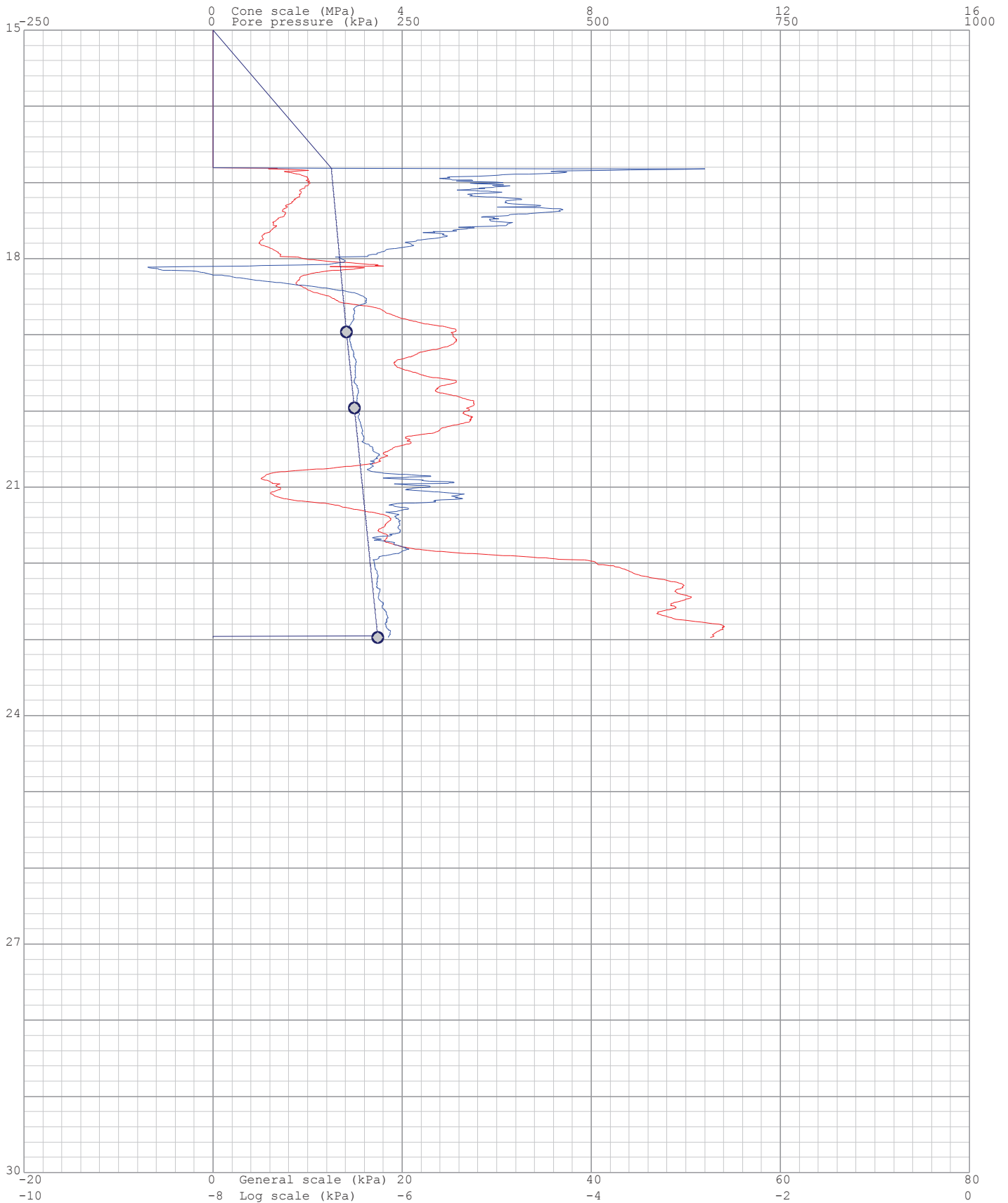
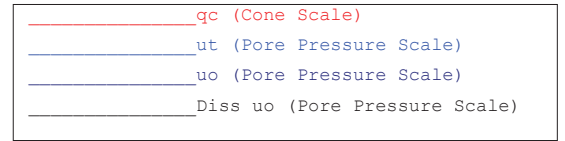
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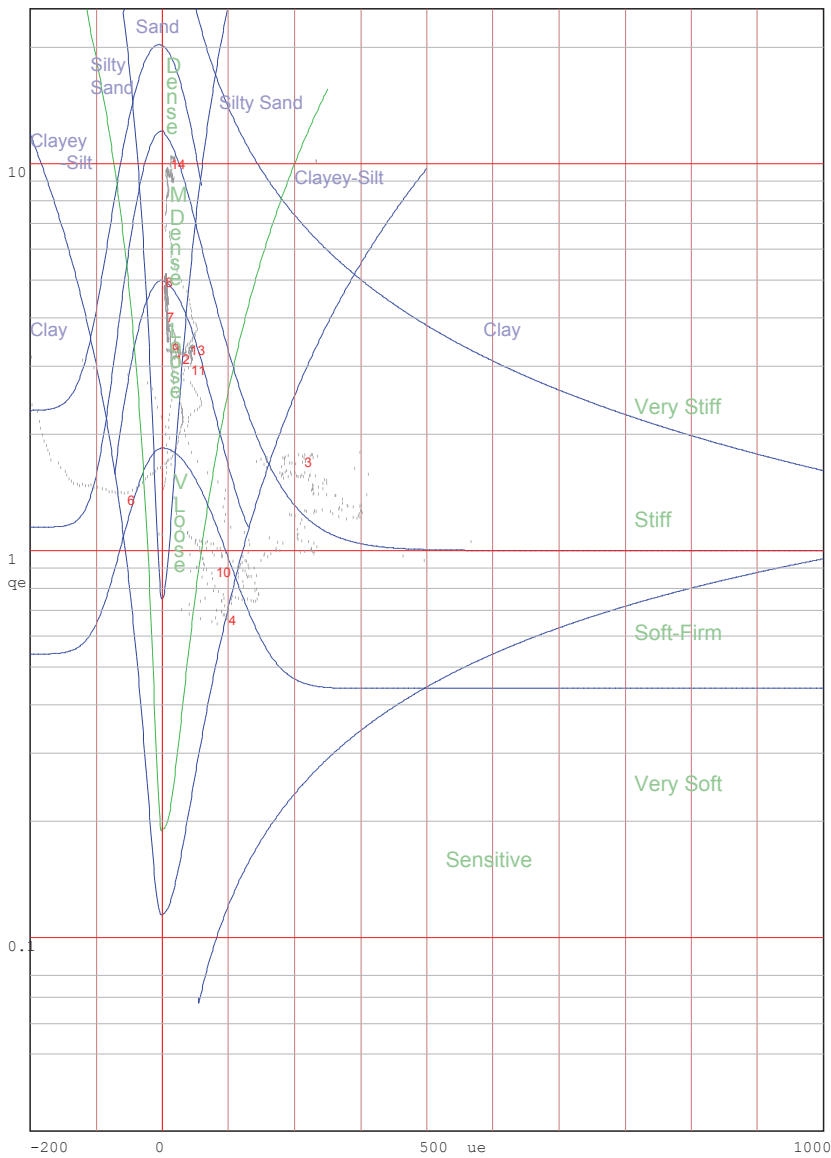
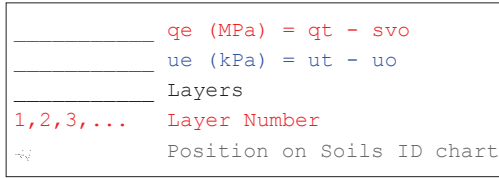
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

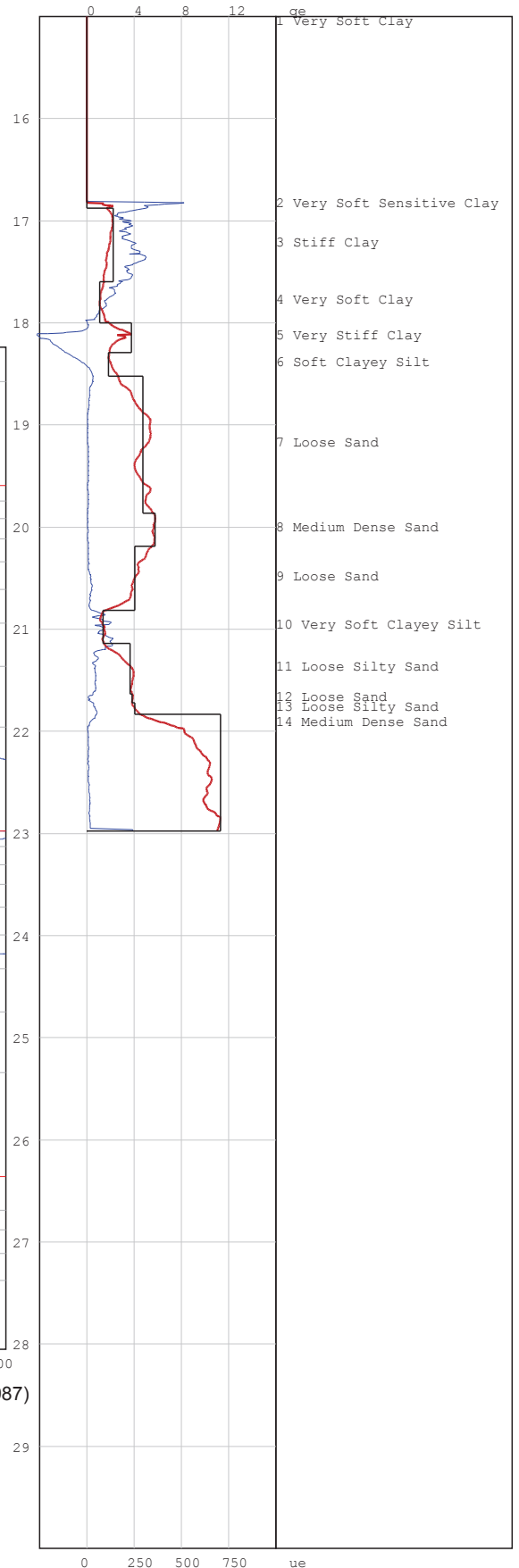
Hole No: P 16  
Date: 2012/09/20







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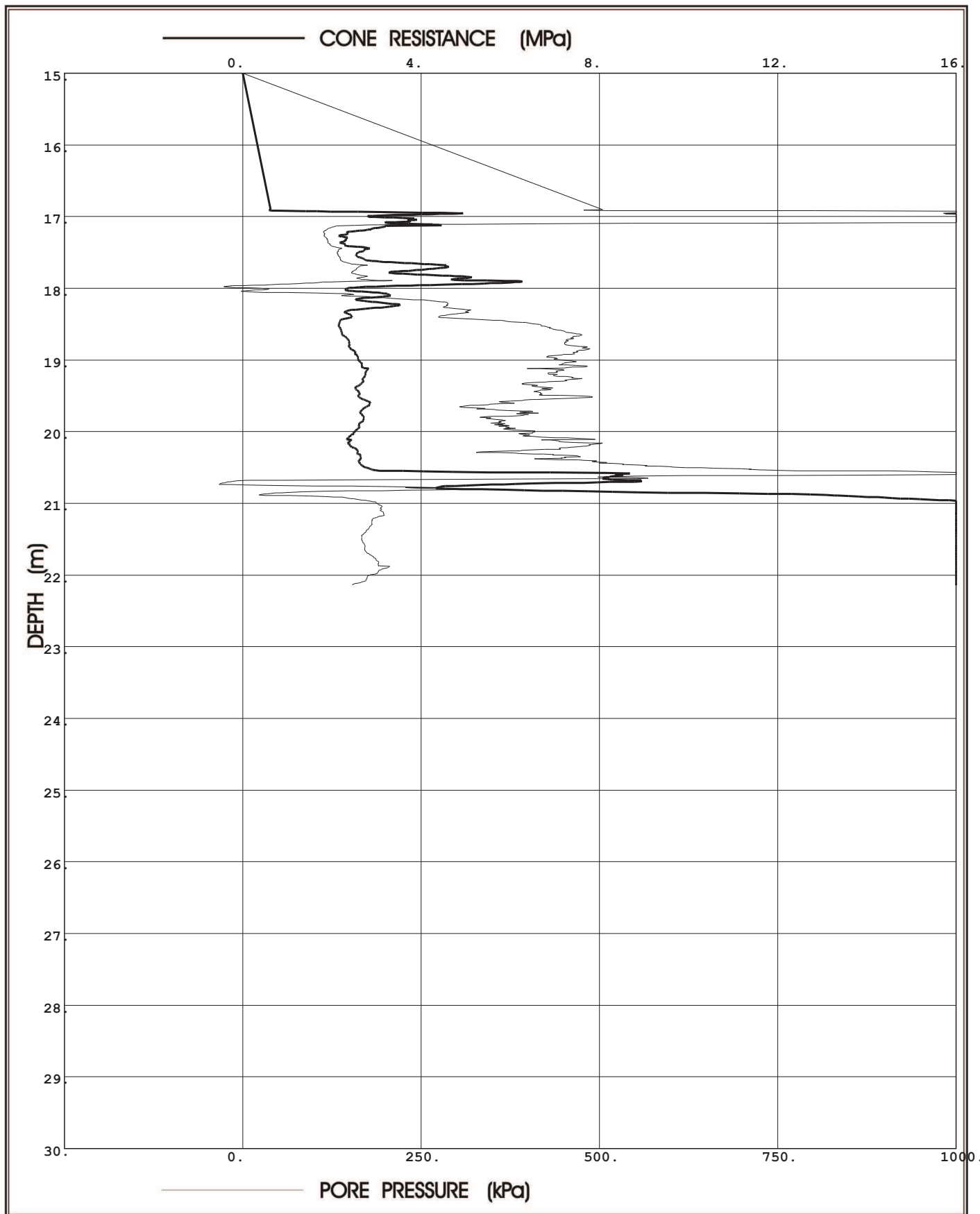
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 17

DATE: 2012/09/23

Page:2



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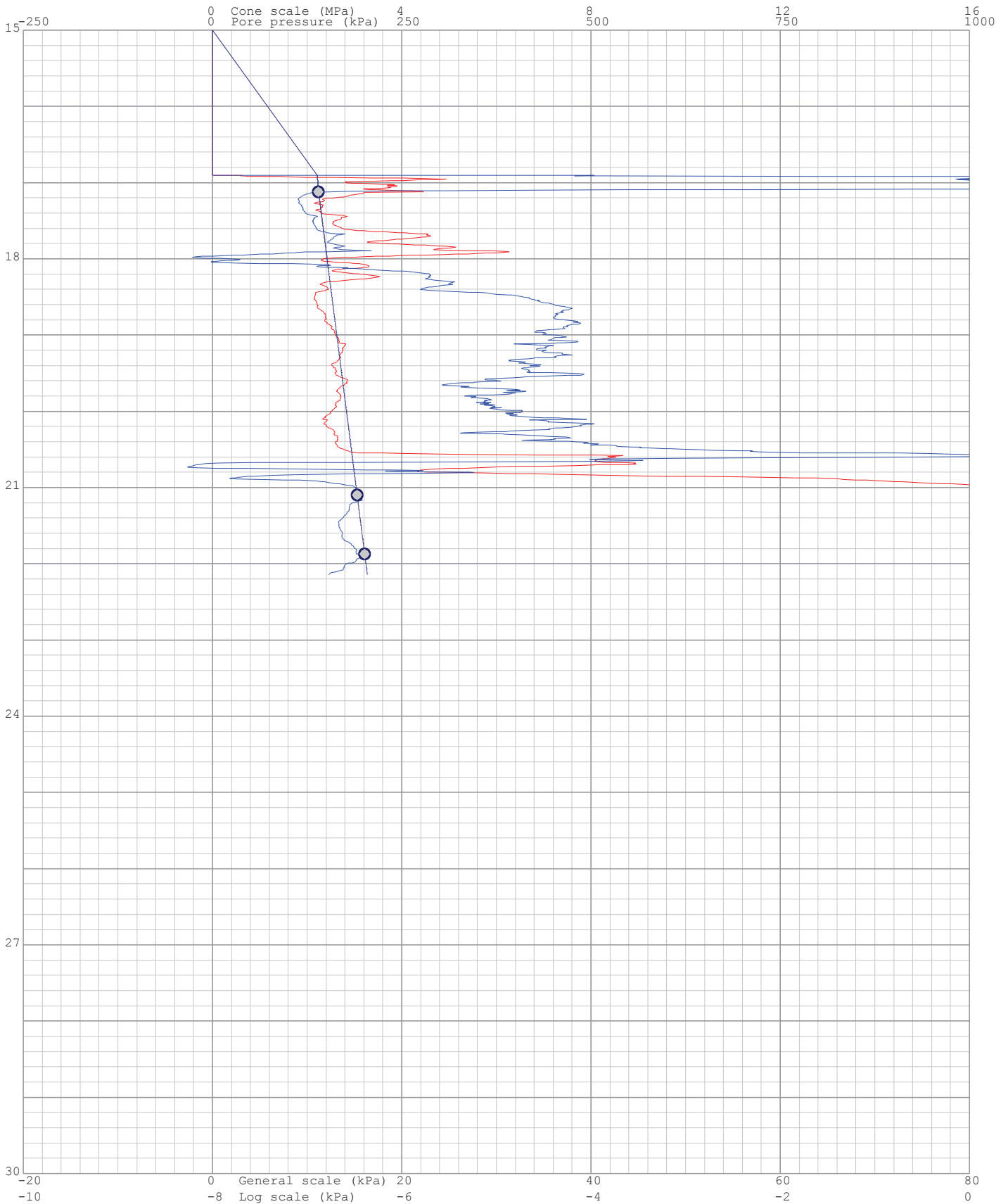
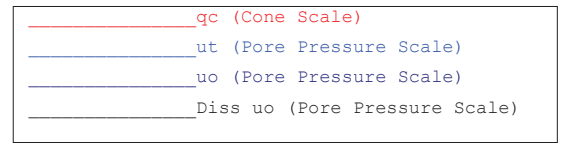
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

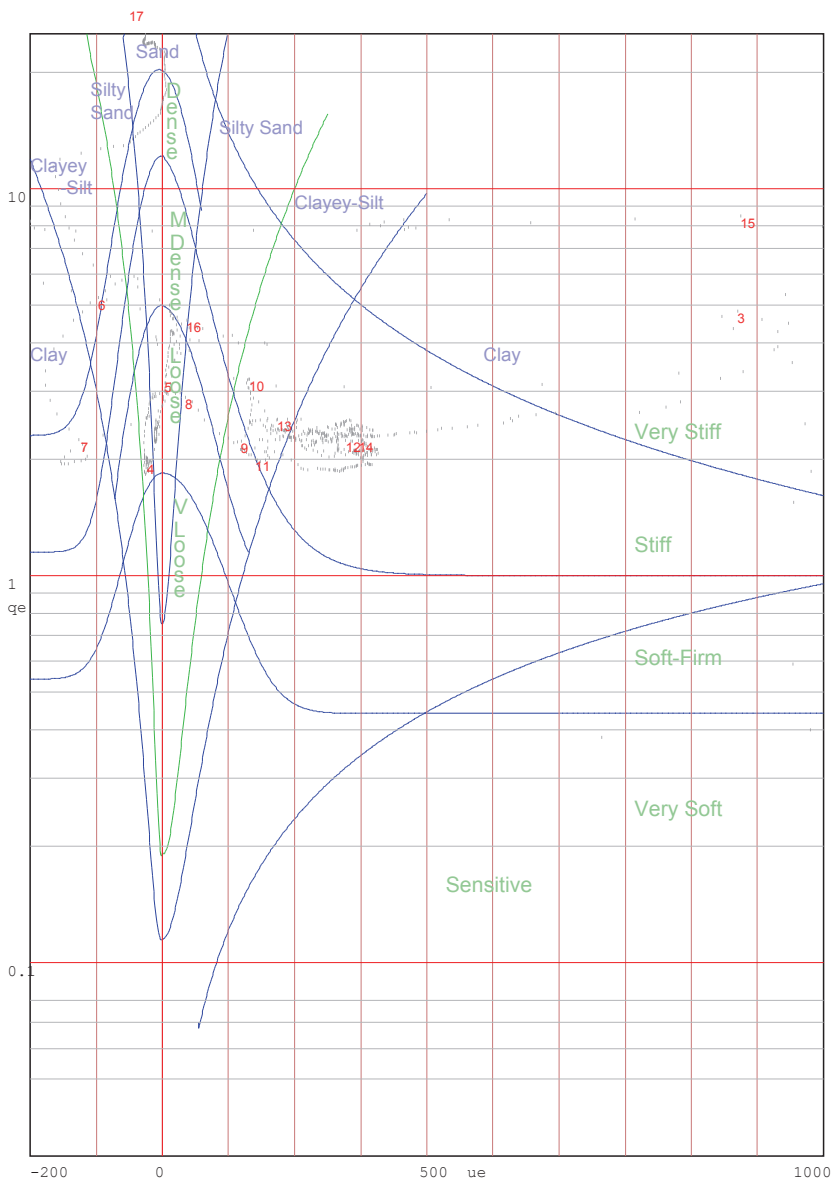
Site: Durban Harbour over water

Hole No: P 17

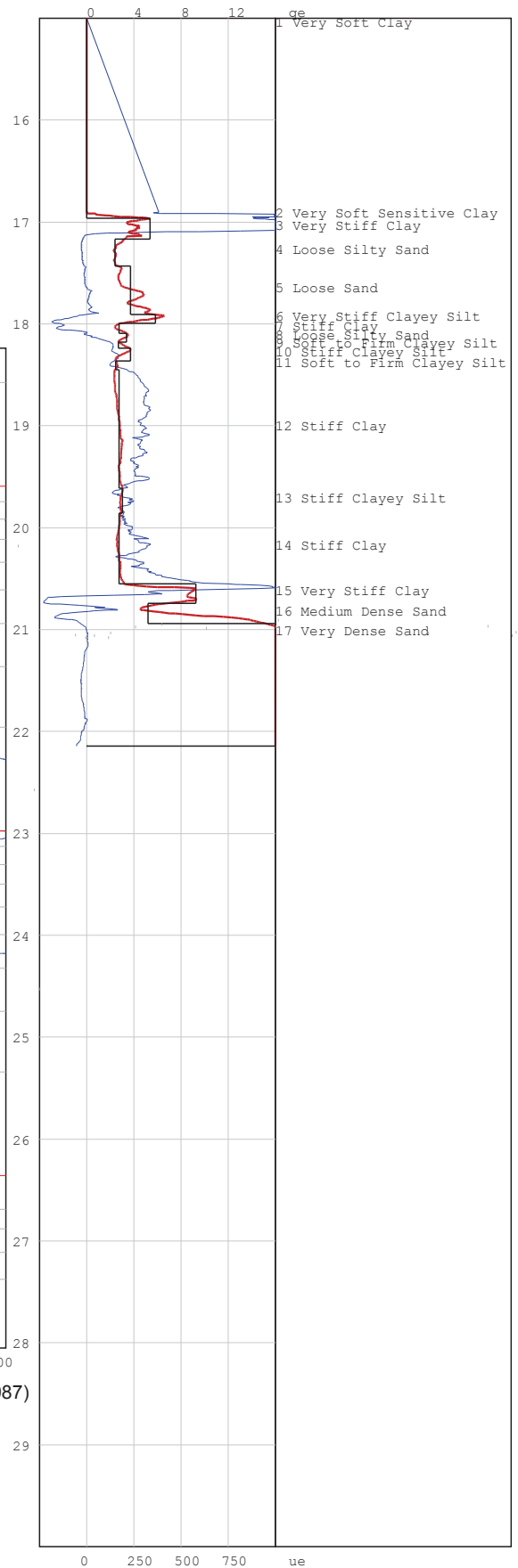
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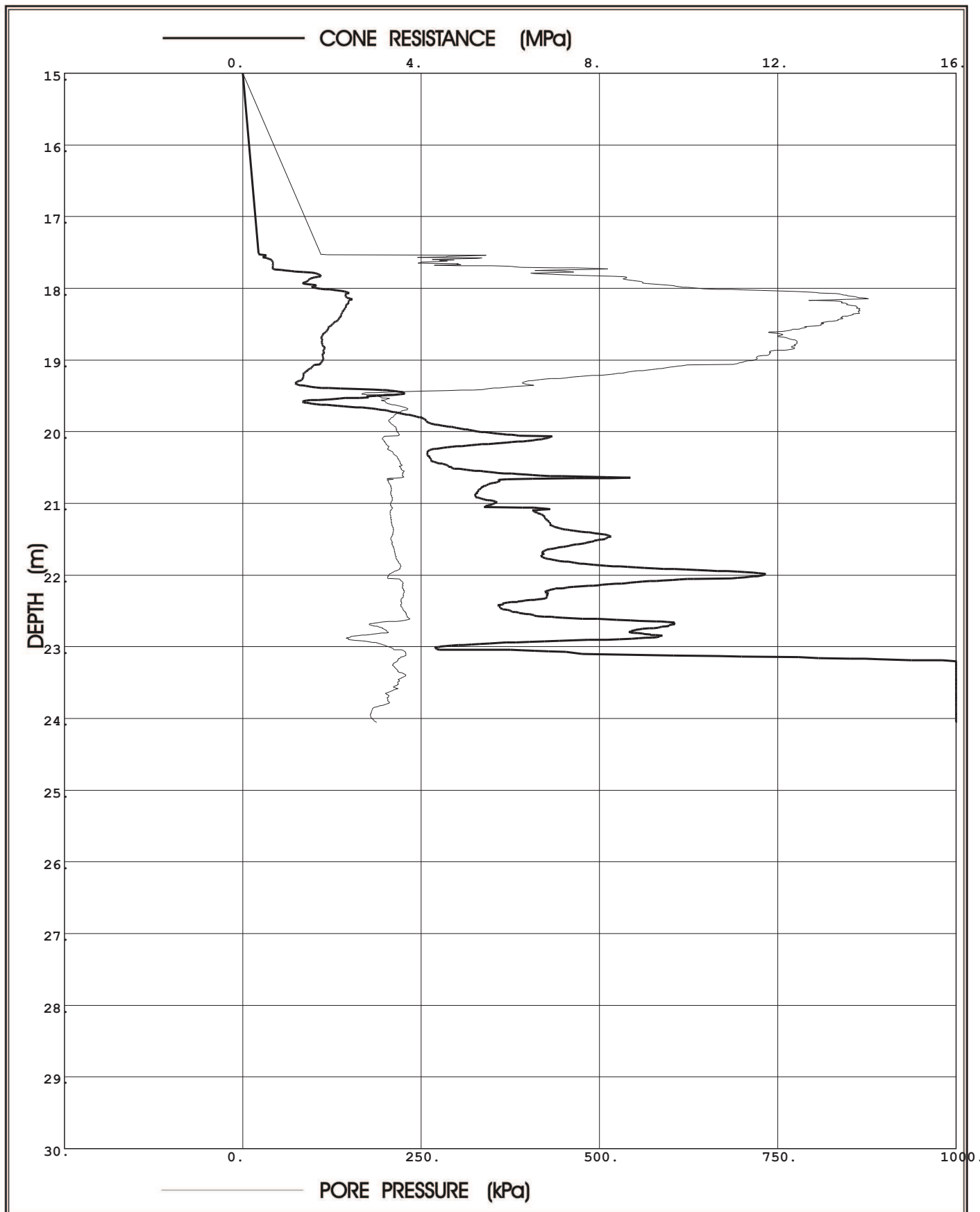
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 18

DATE: 2012/09/12

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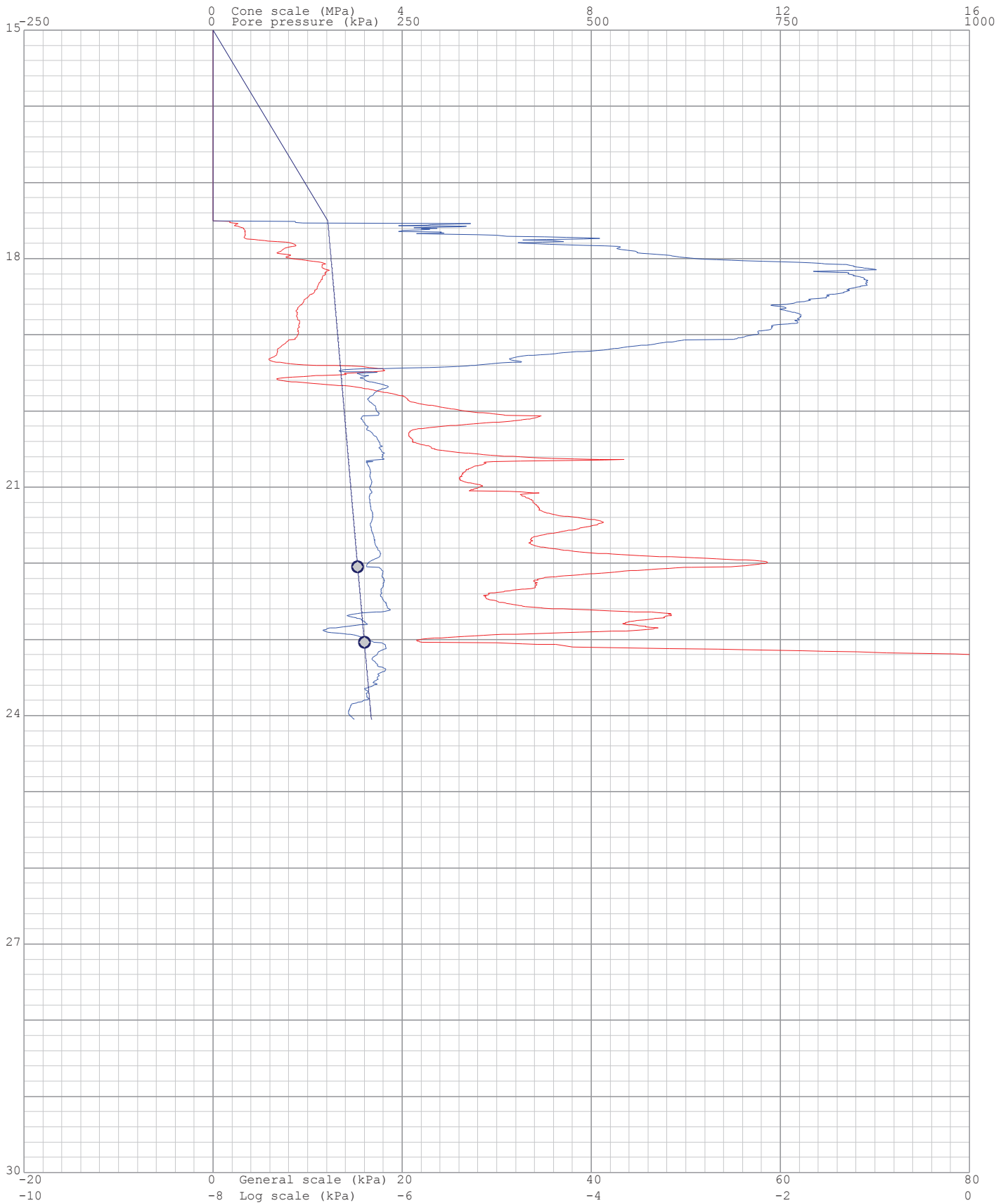
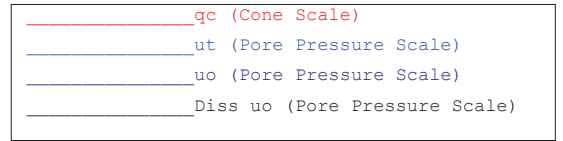
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 18  
Date: 2012/09/12



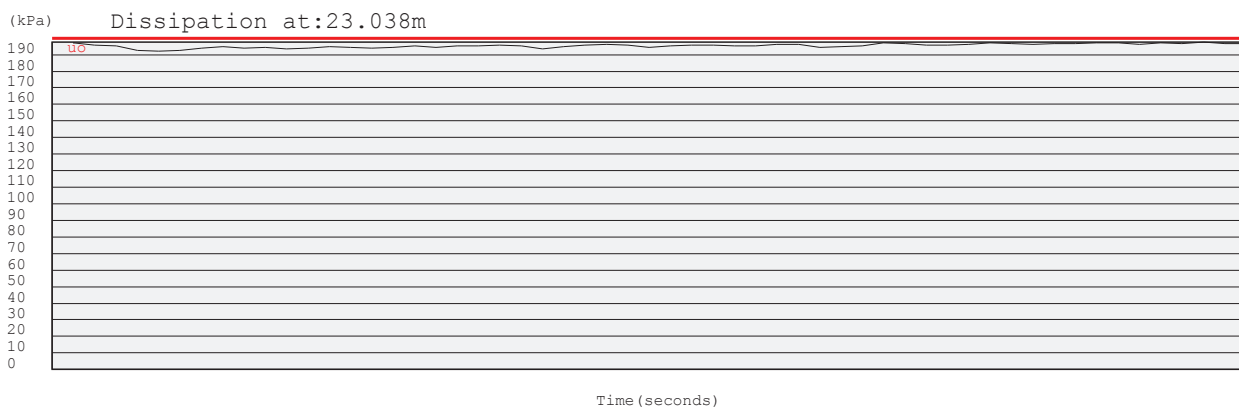
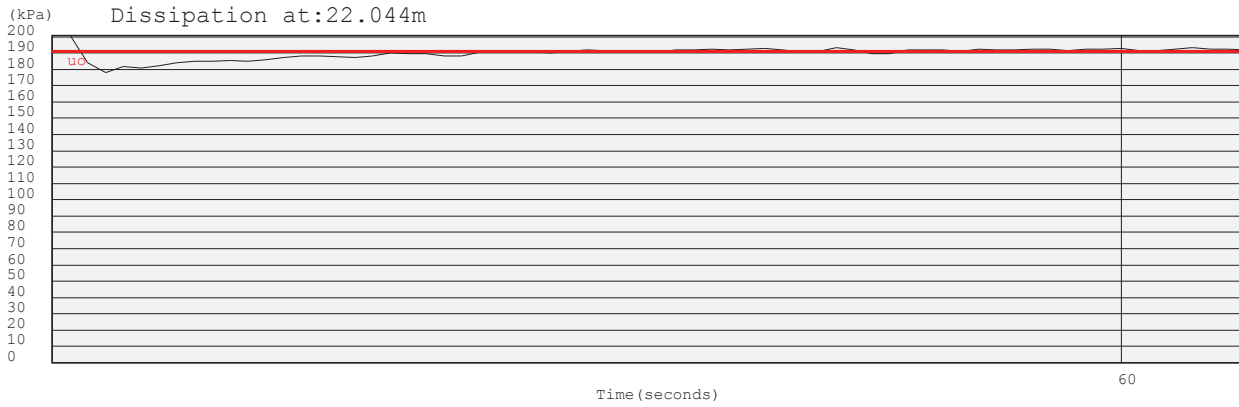
Project: Durban Harbour Piezocone Investigation for Dredging

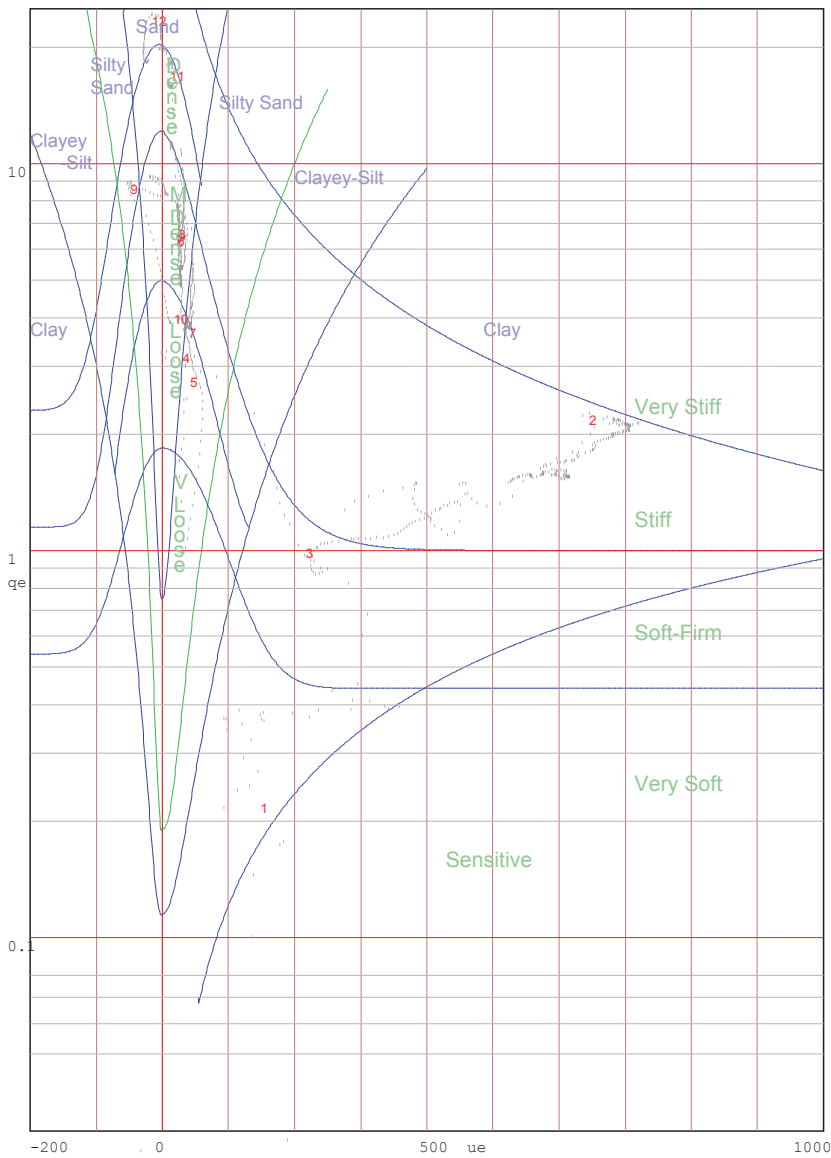
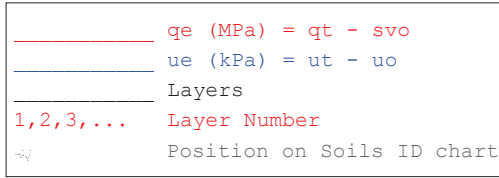
Site: Durban Harbour over water

Hole: P 18

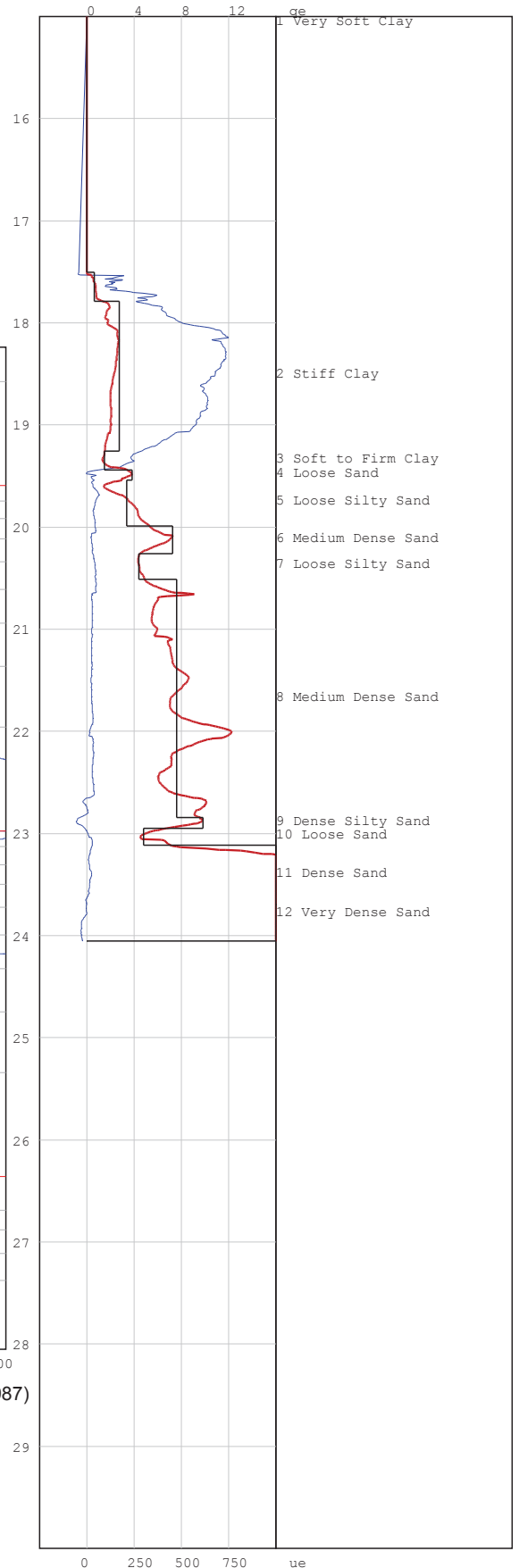
Date: 2012/09/12

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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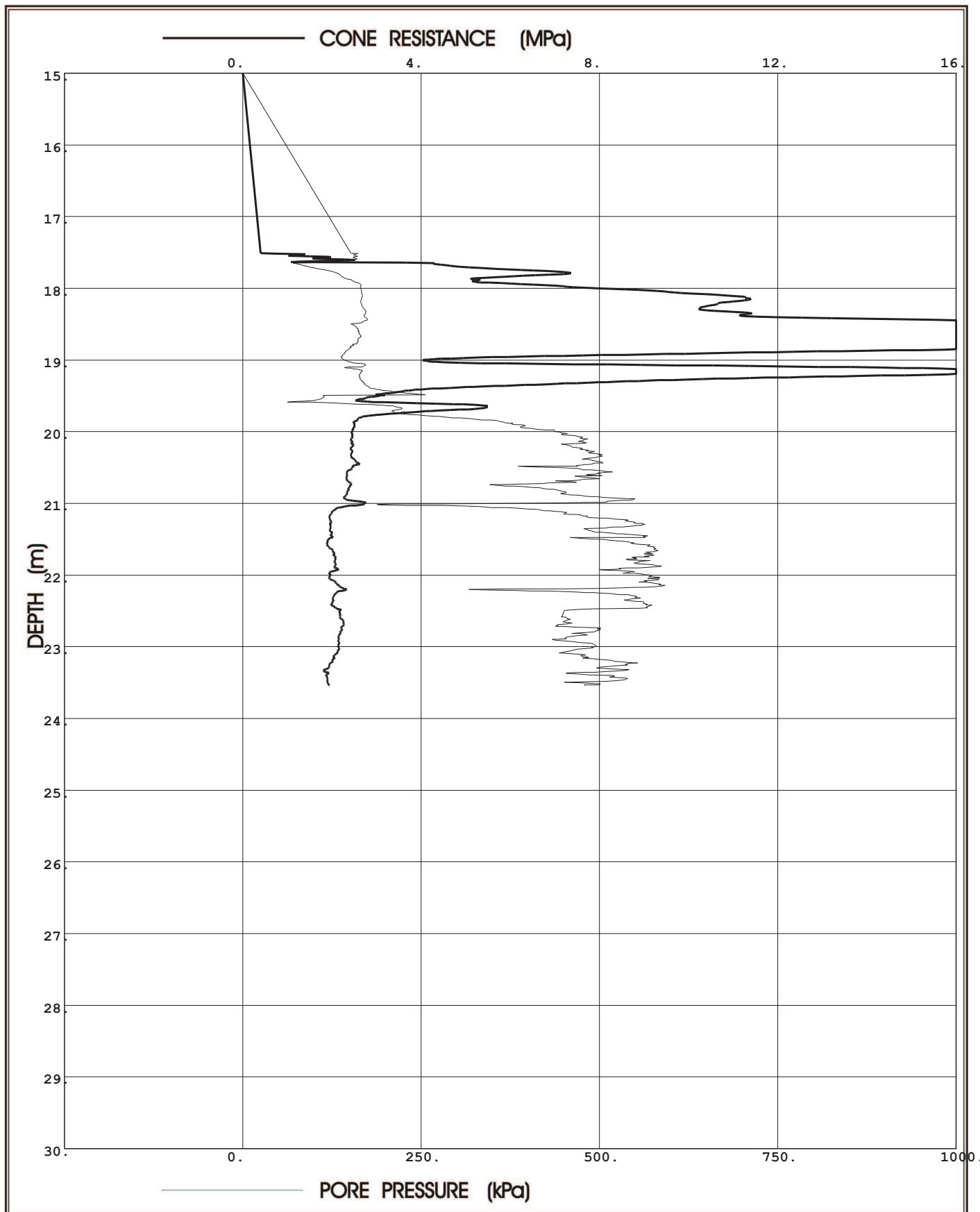
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 19

DATE: 2012/09/11

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082 570 6446

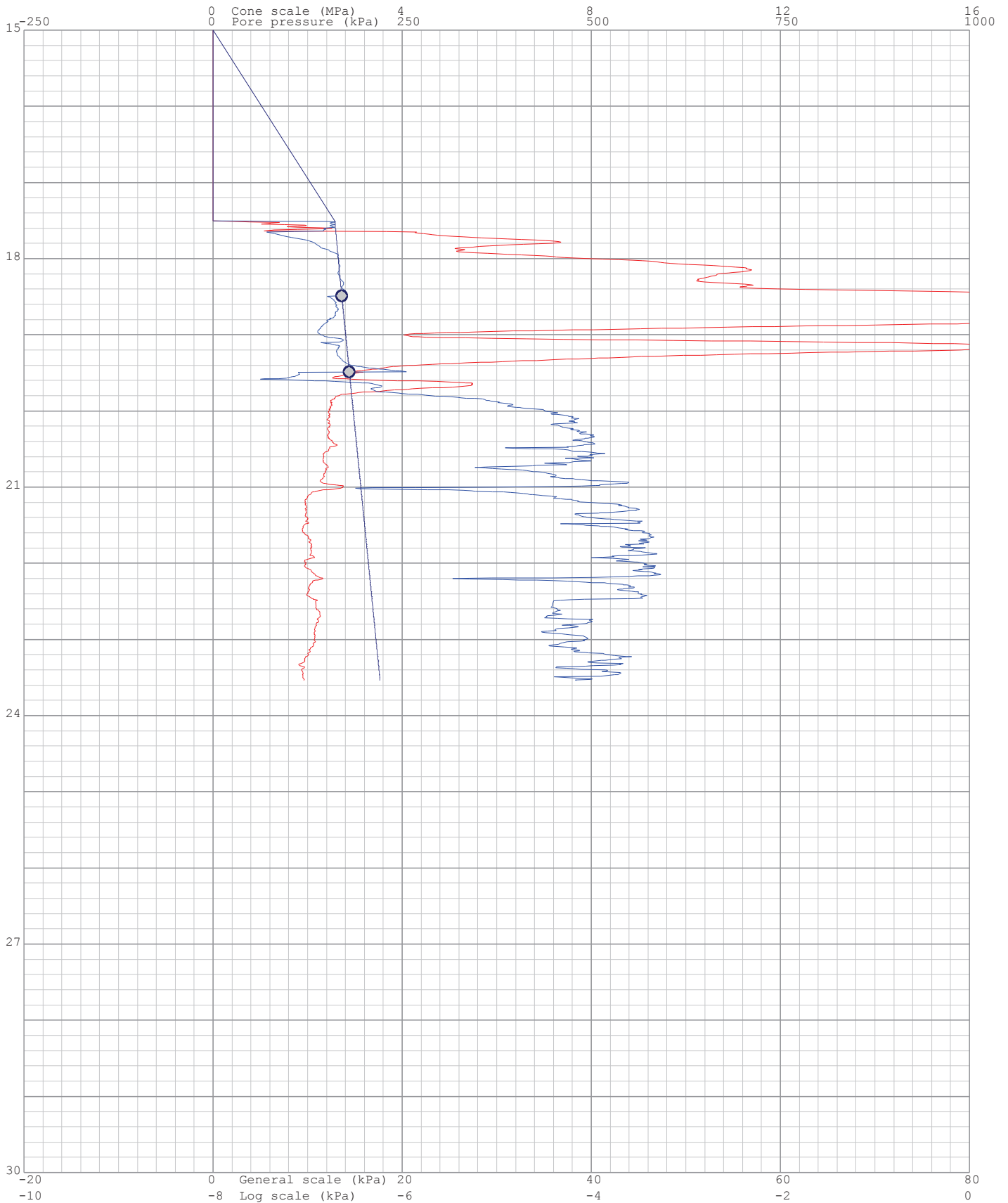
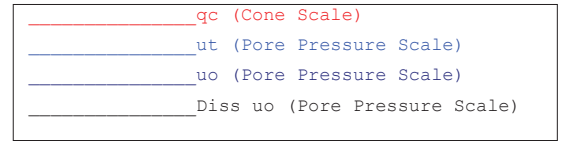
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 19  
Date: 2012/09/11



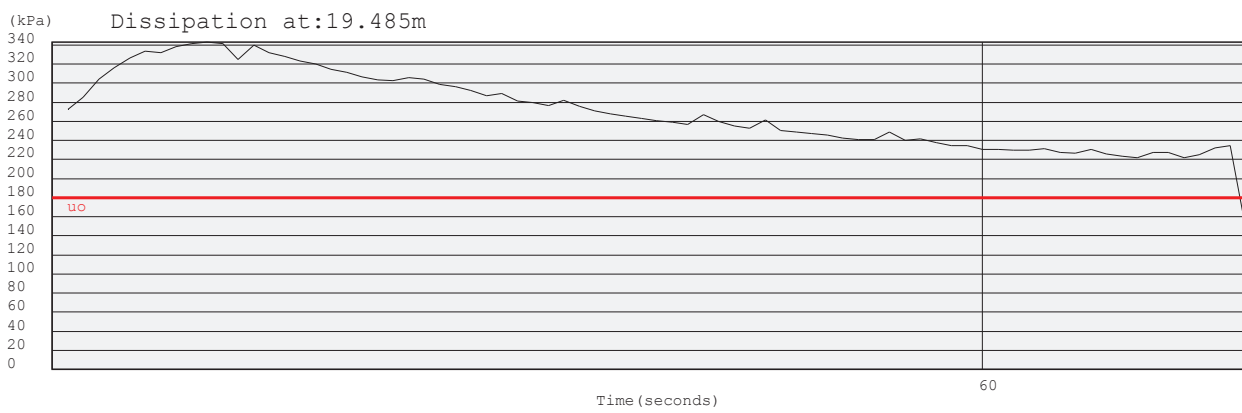
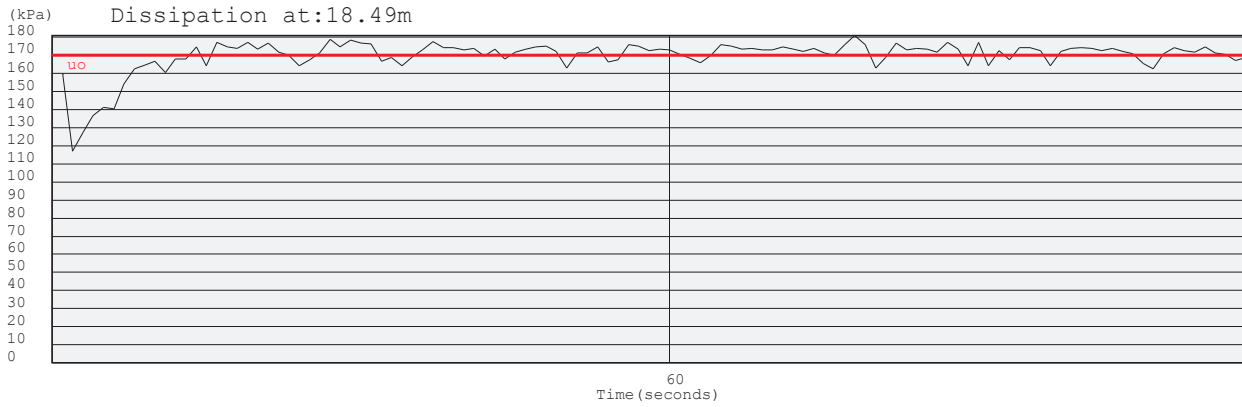
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: P 19

Date: 2012/09/11

Page: 1





# PIEZOCONE PENETRATION TEST



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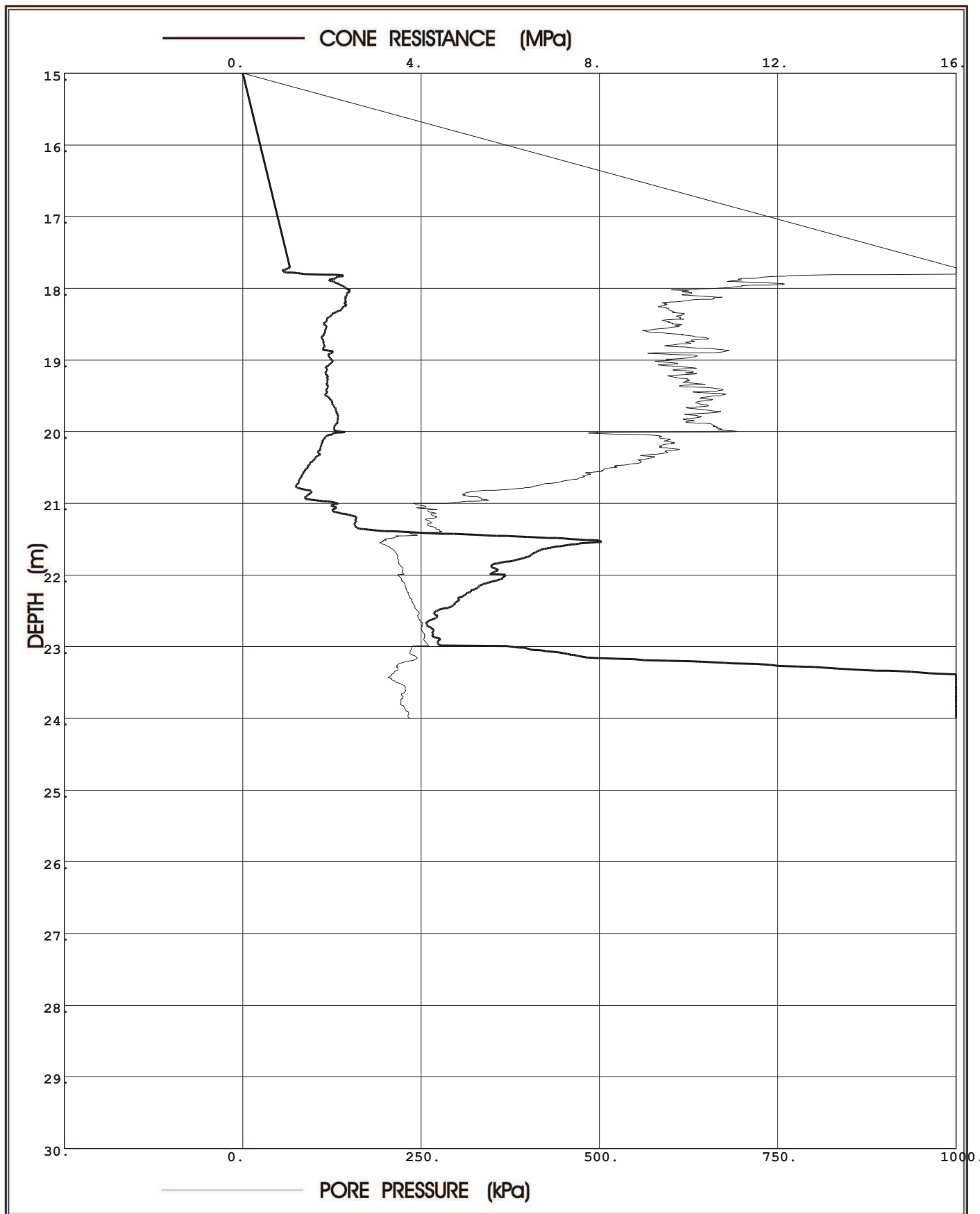
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 20

DATE: 2012/09/25

Page:2



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082 570 6446

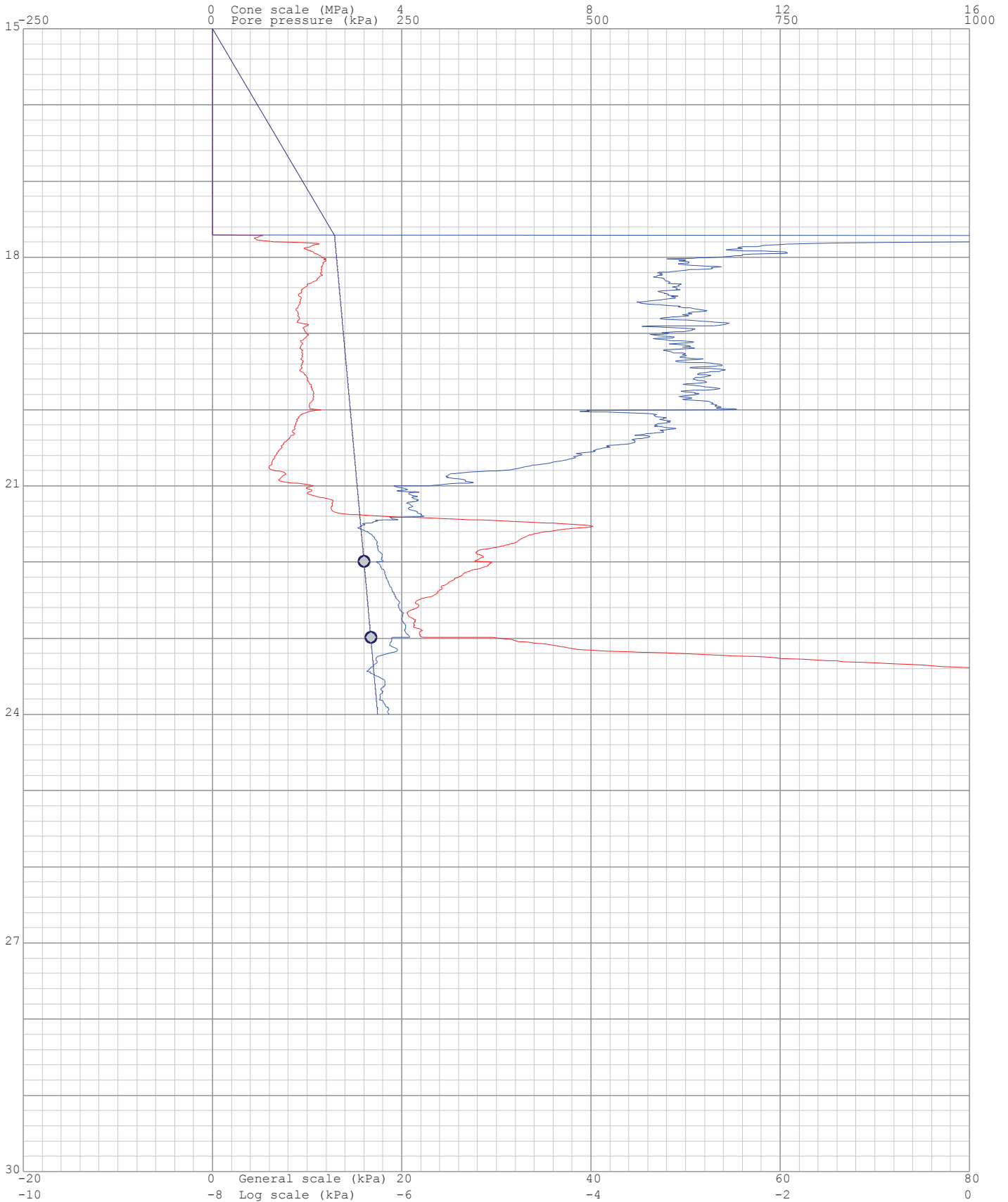
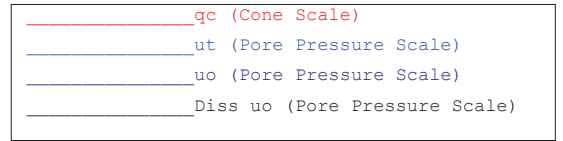
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

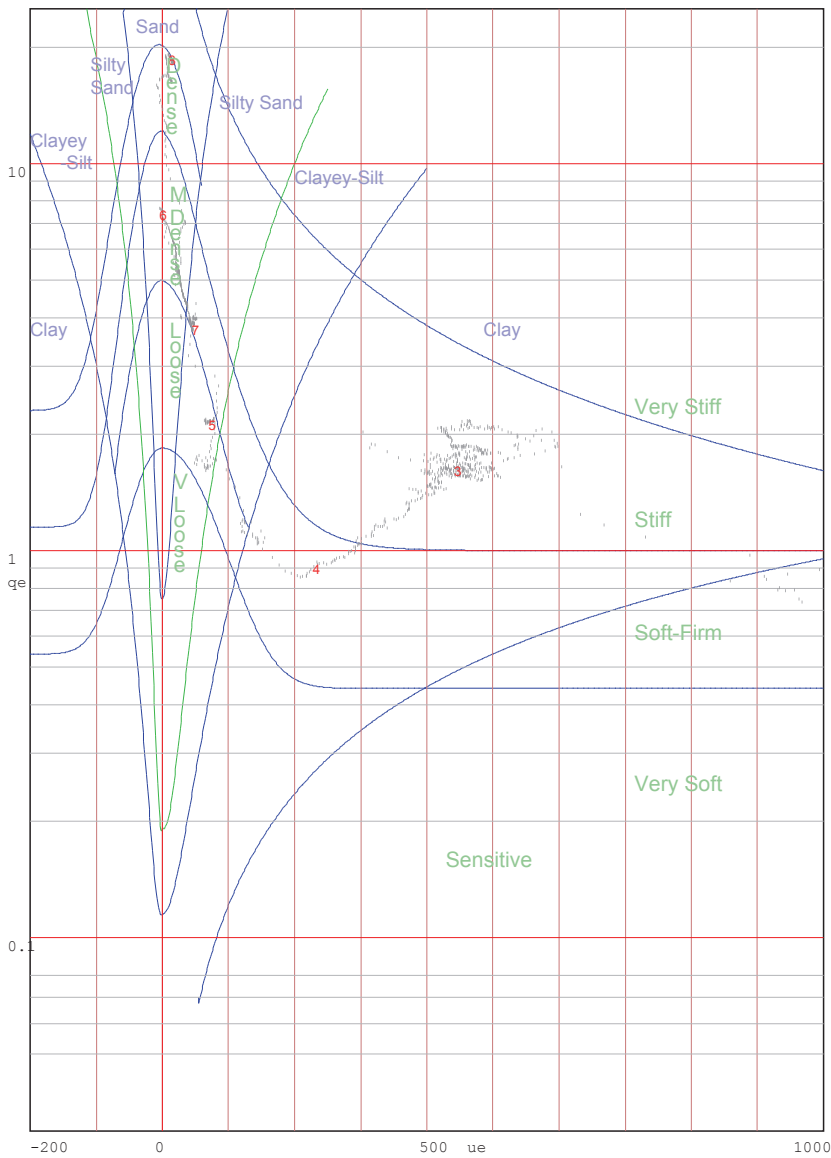
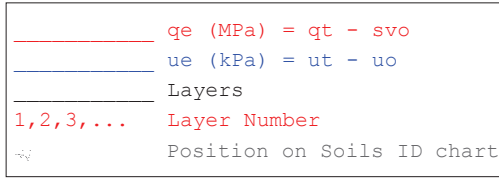
Hole No: P 20  
Date: 2012/09/25



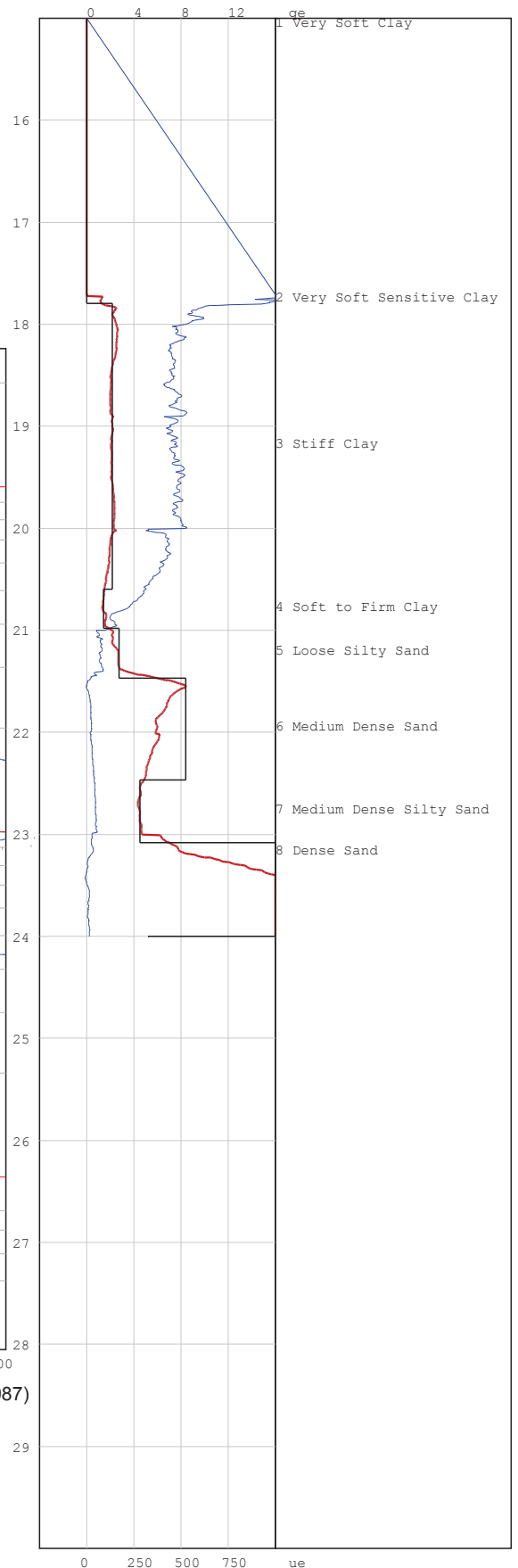
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 20  
Date: 2012/09/25



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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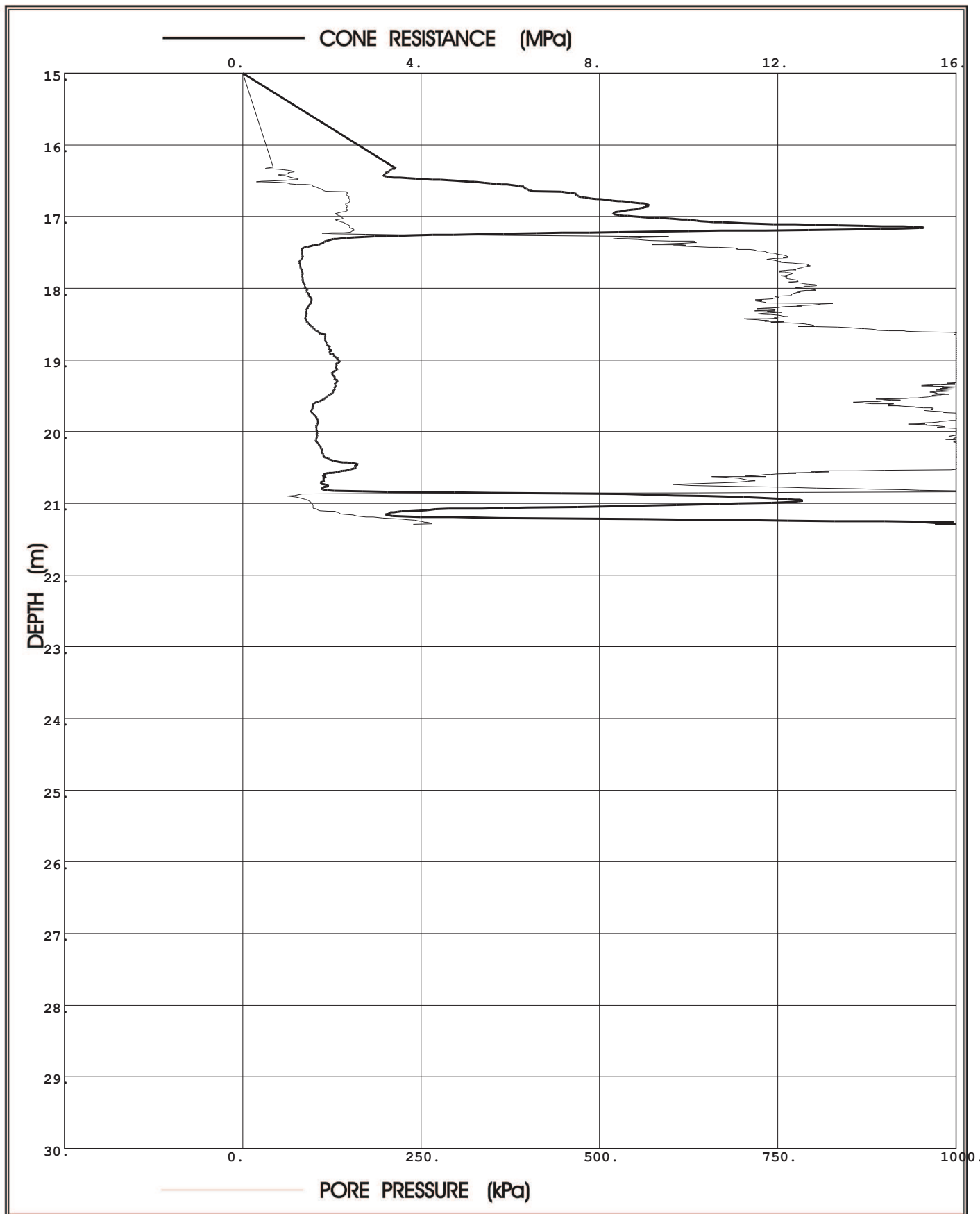
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 21

DATE: 2012/09/23

Page:2



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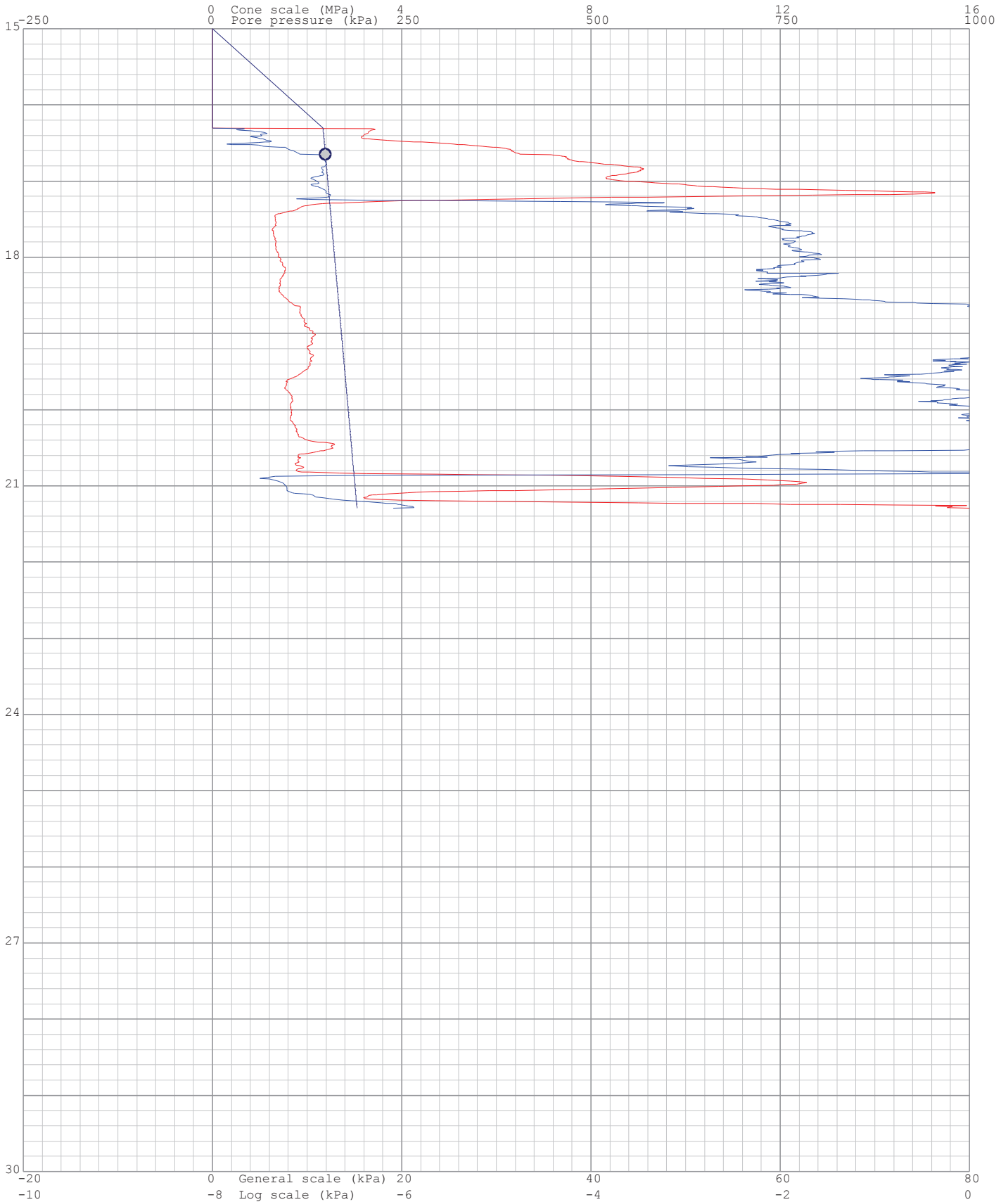
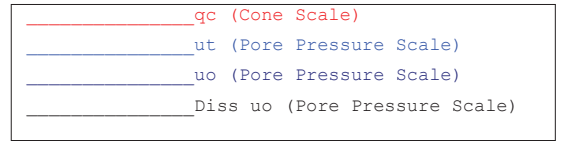
Tel: 012 997 2250  
082 570 6446  
Fax: 012 420 4940  
rust@global.co.za



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 21  
Date: 2012/09/23

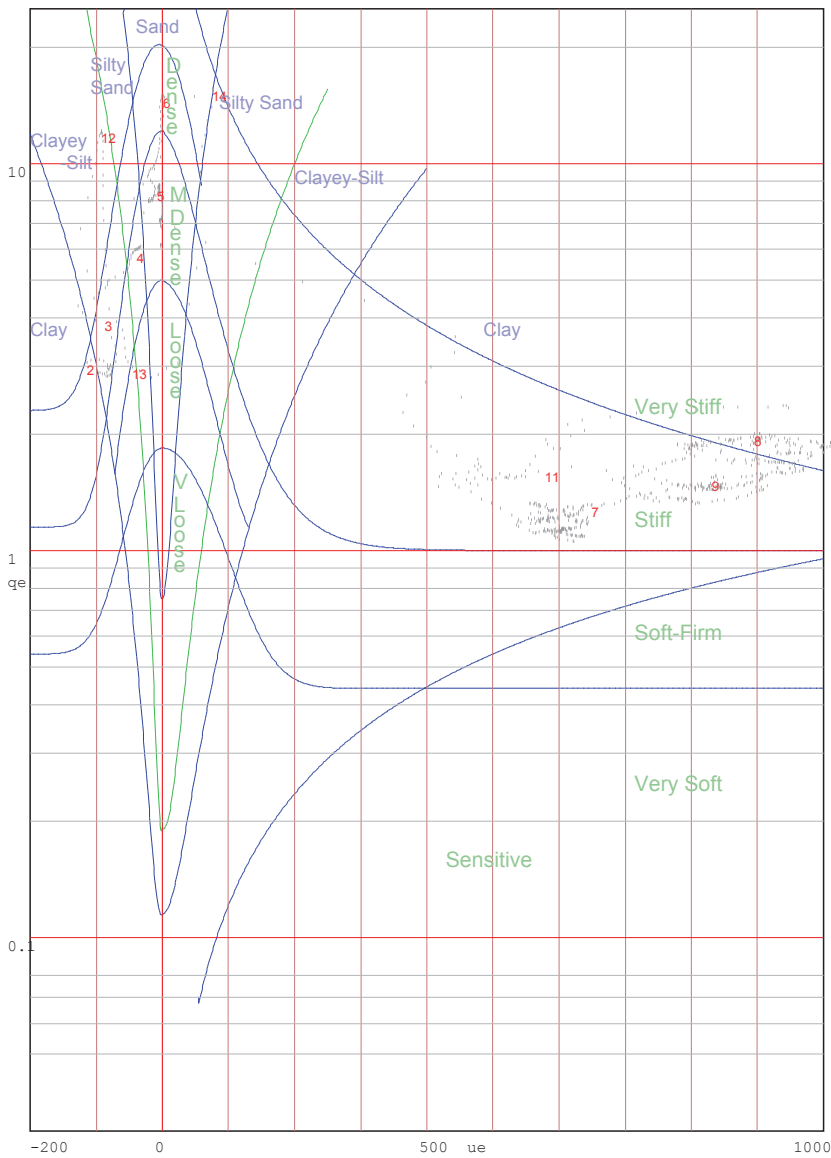
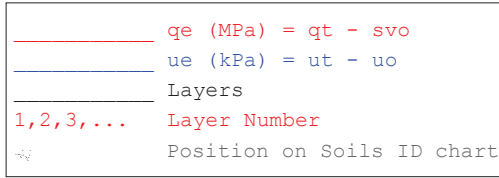


Project: Durban Harbour Piezocone Investigation for Dredging

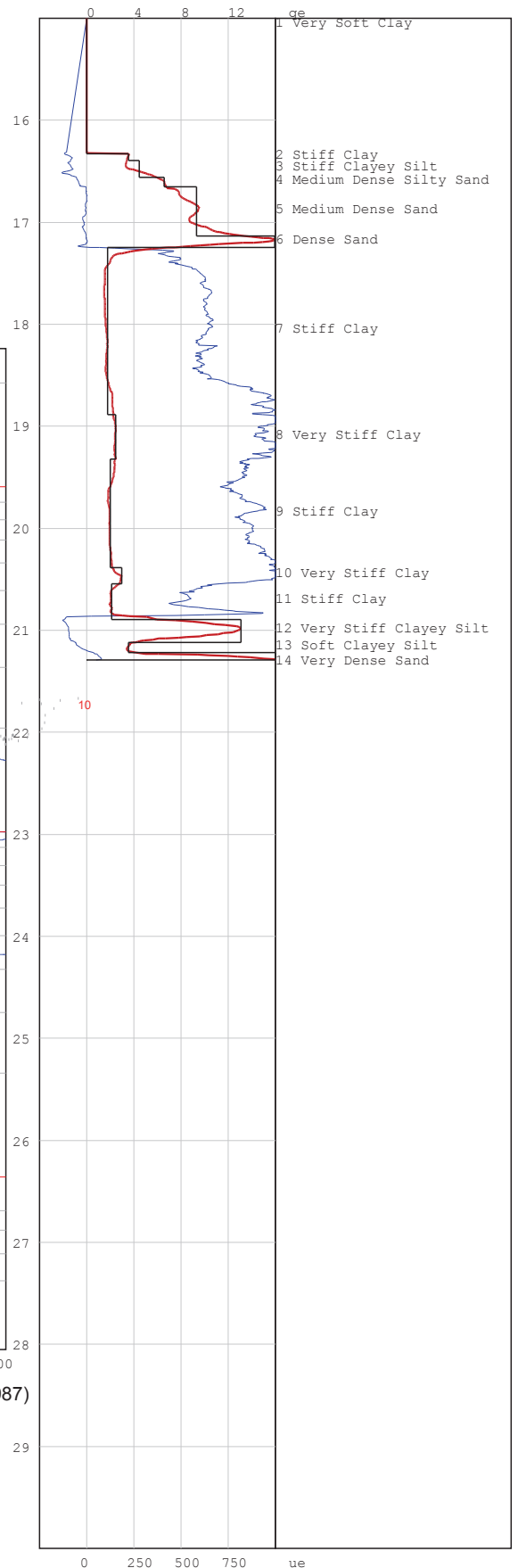
Site: Durban Harbour over water

Hole No: P 21

Date: 2012/09/23



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# PIEZOCONE PENETRATION TEST



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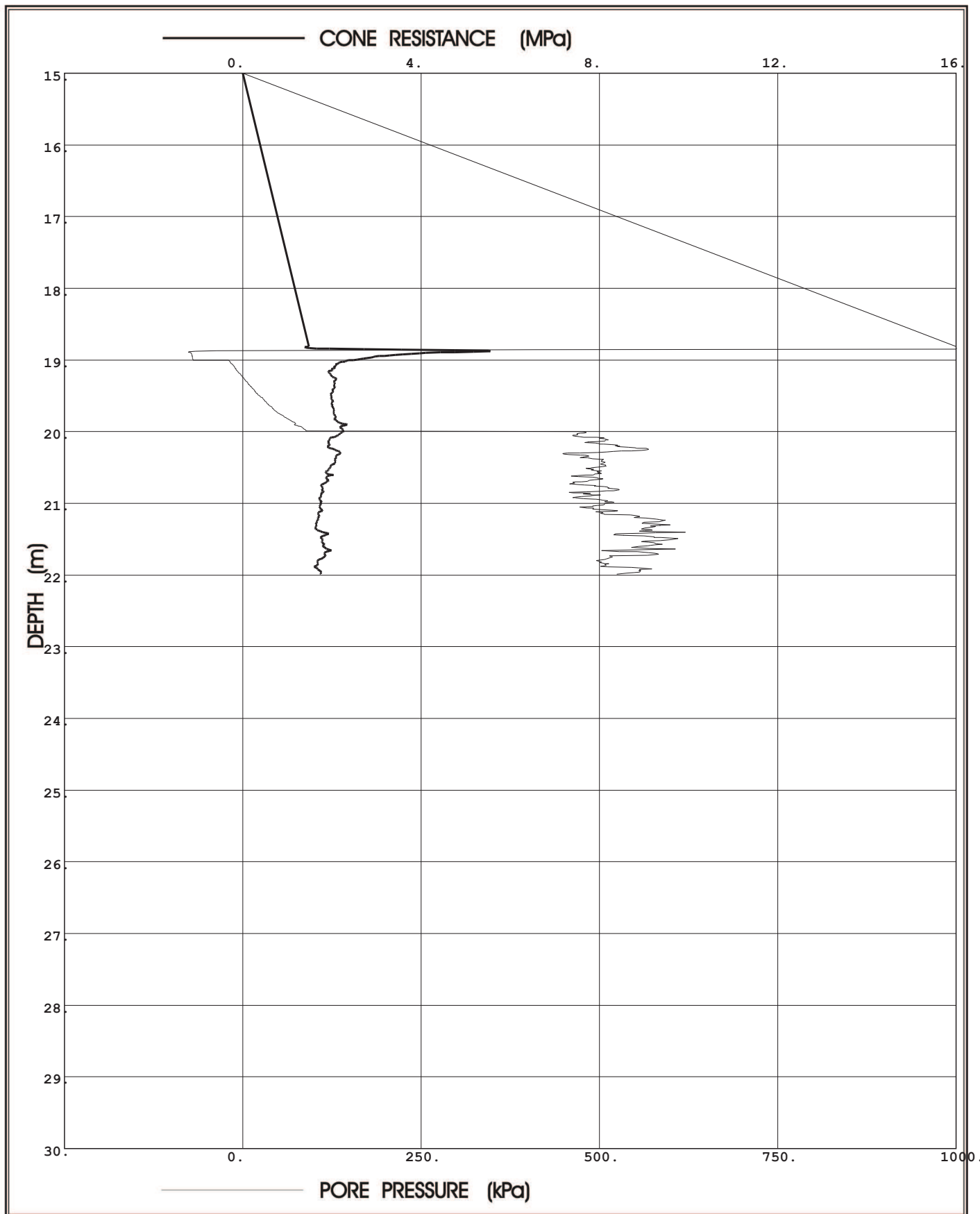
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 22

DATE: 2012/09/19

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**Prof. Eben Rust** Geotechnical Engineering

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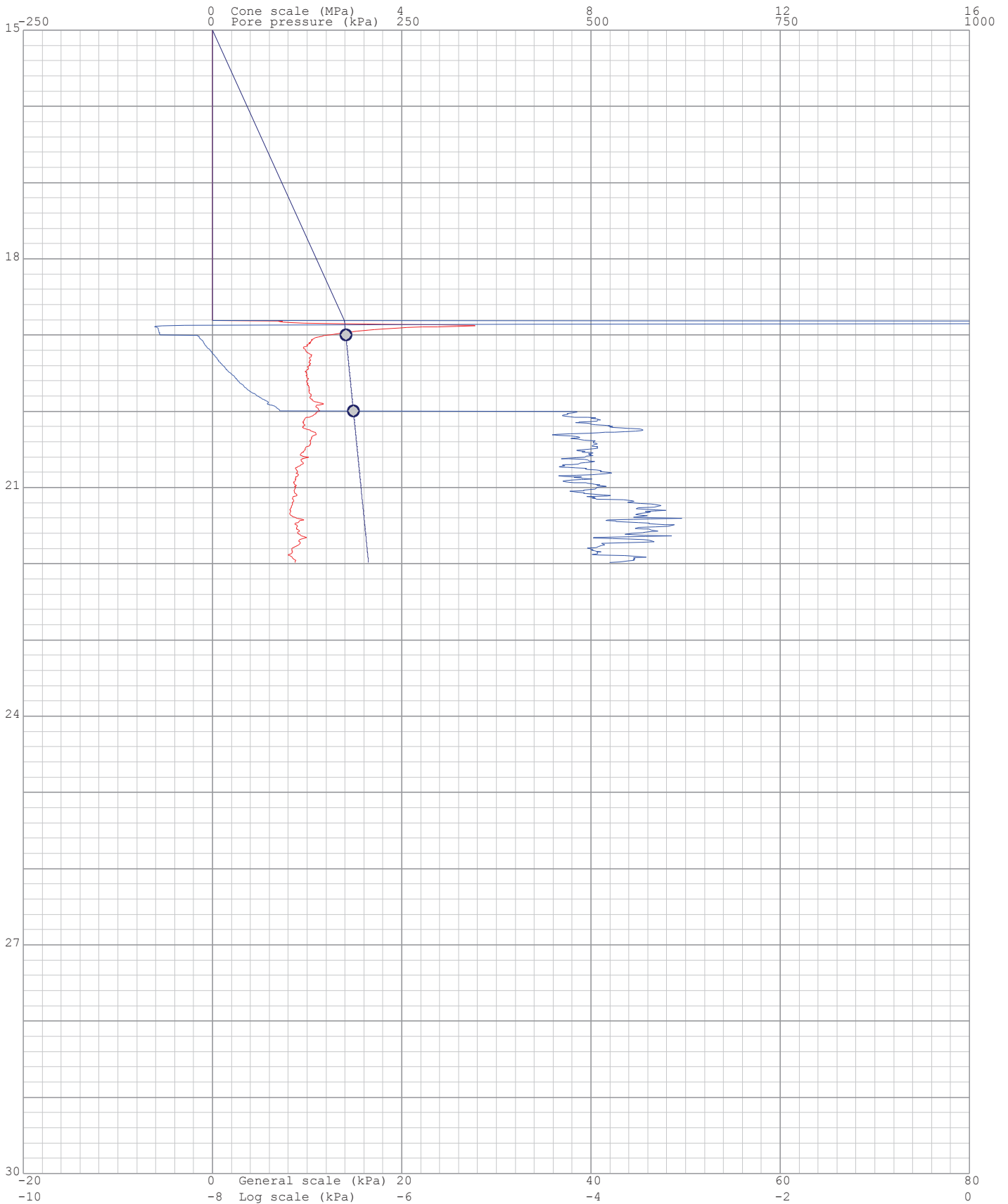
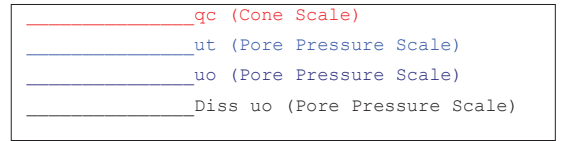
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rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: P 22  
Date: 2012/09/19

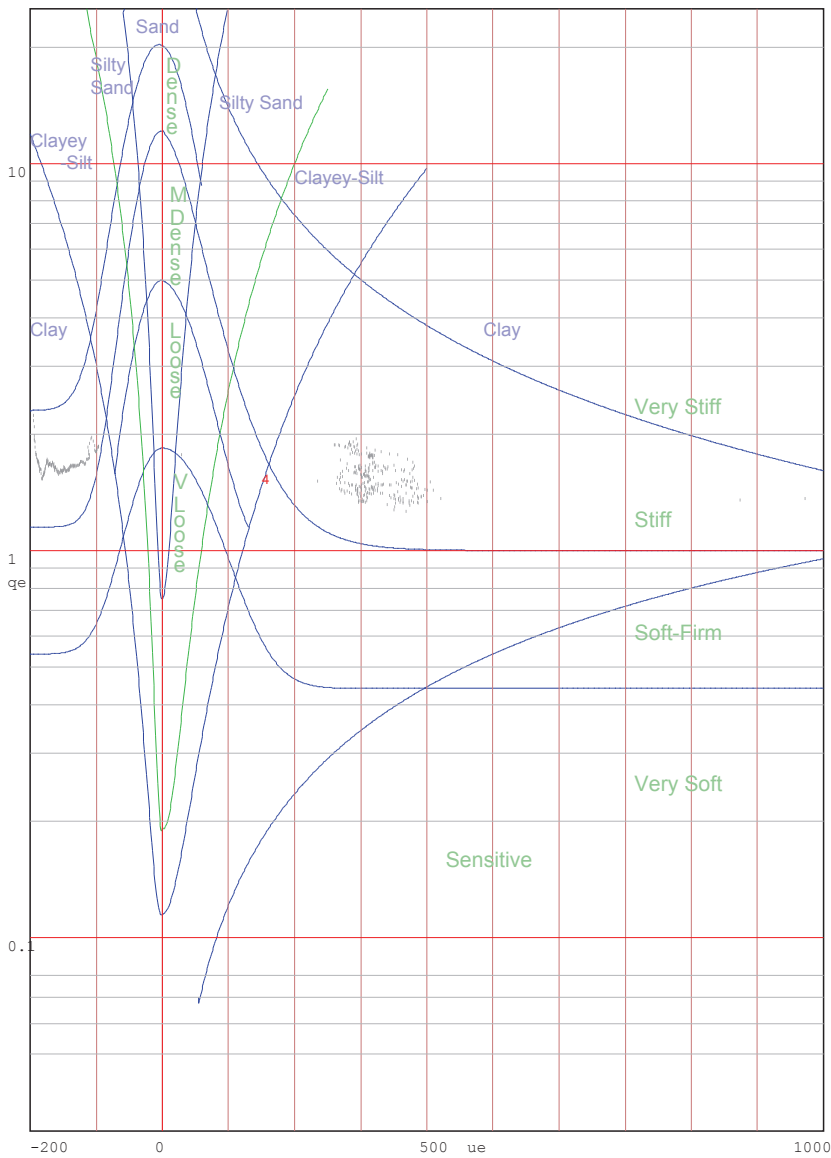
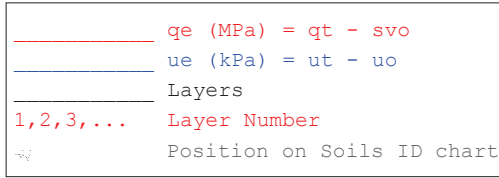


Project: Durban Harbour Piezocone Investigation for Dredging

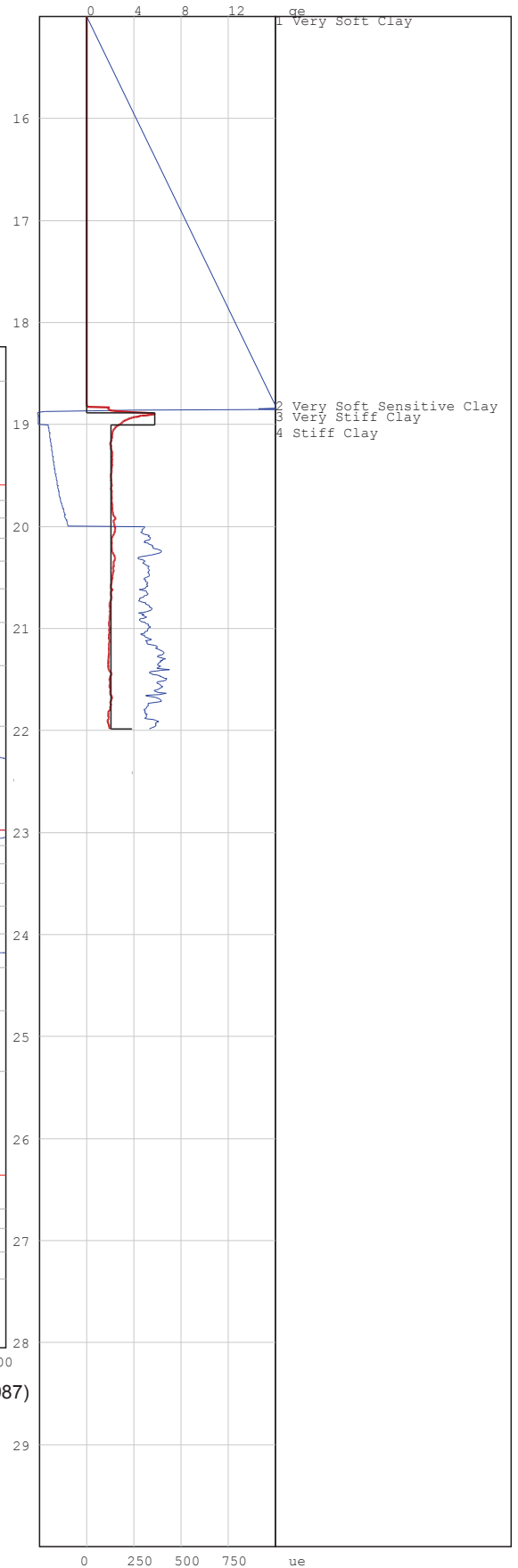
Site: Durban Harbour over water

Hole No: P 22

Date: 2012/09/19



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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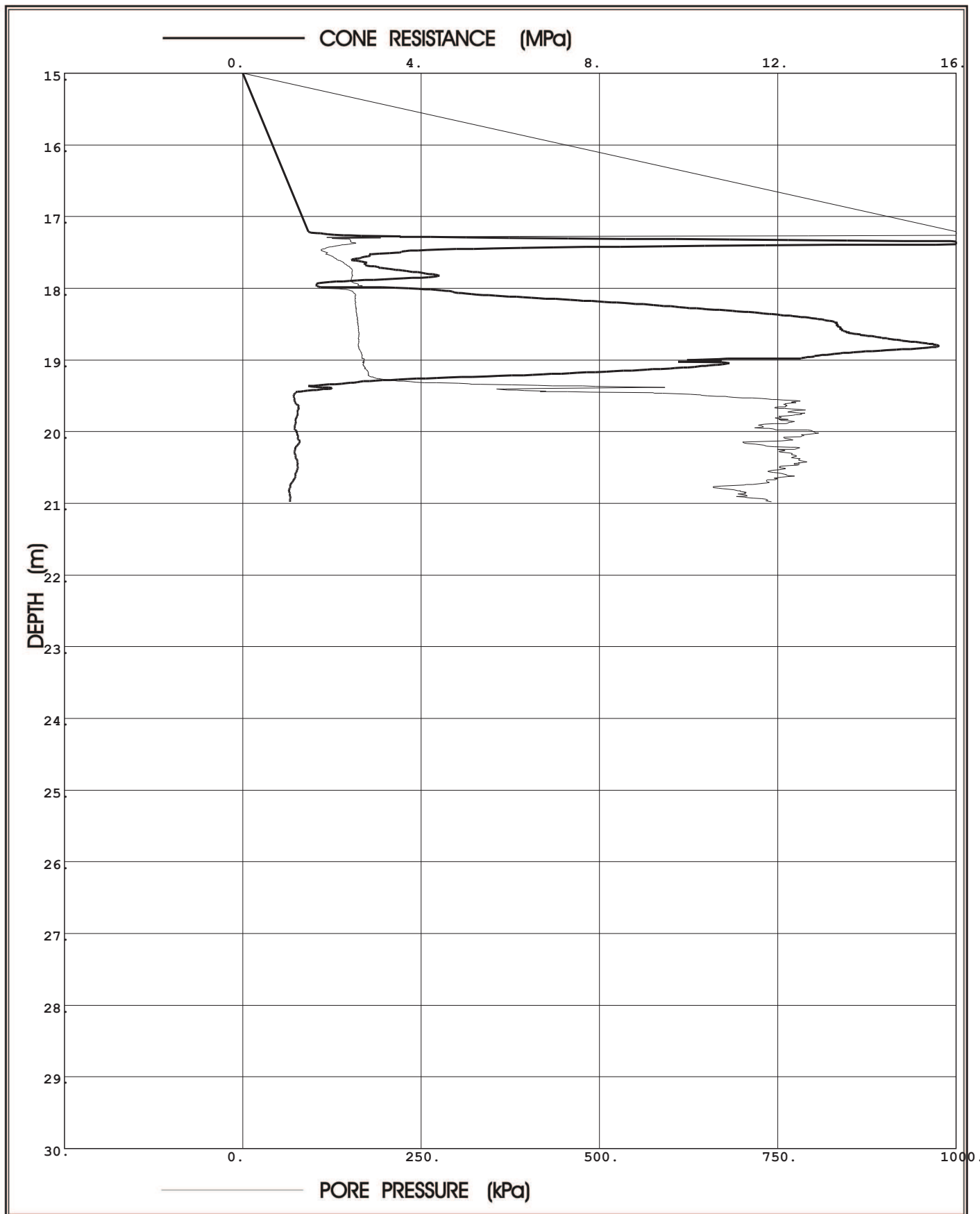
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 23

DATE: 2012/09/26

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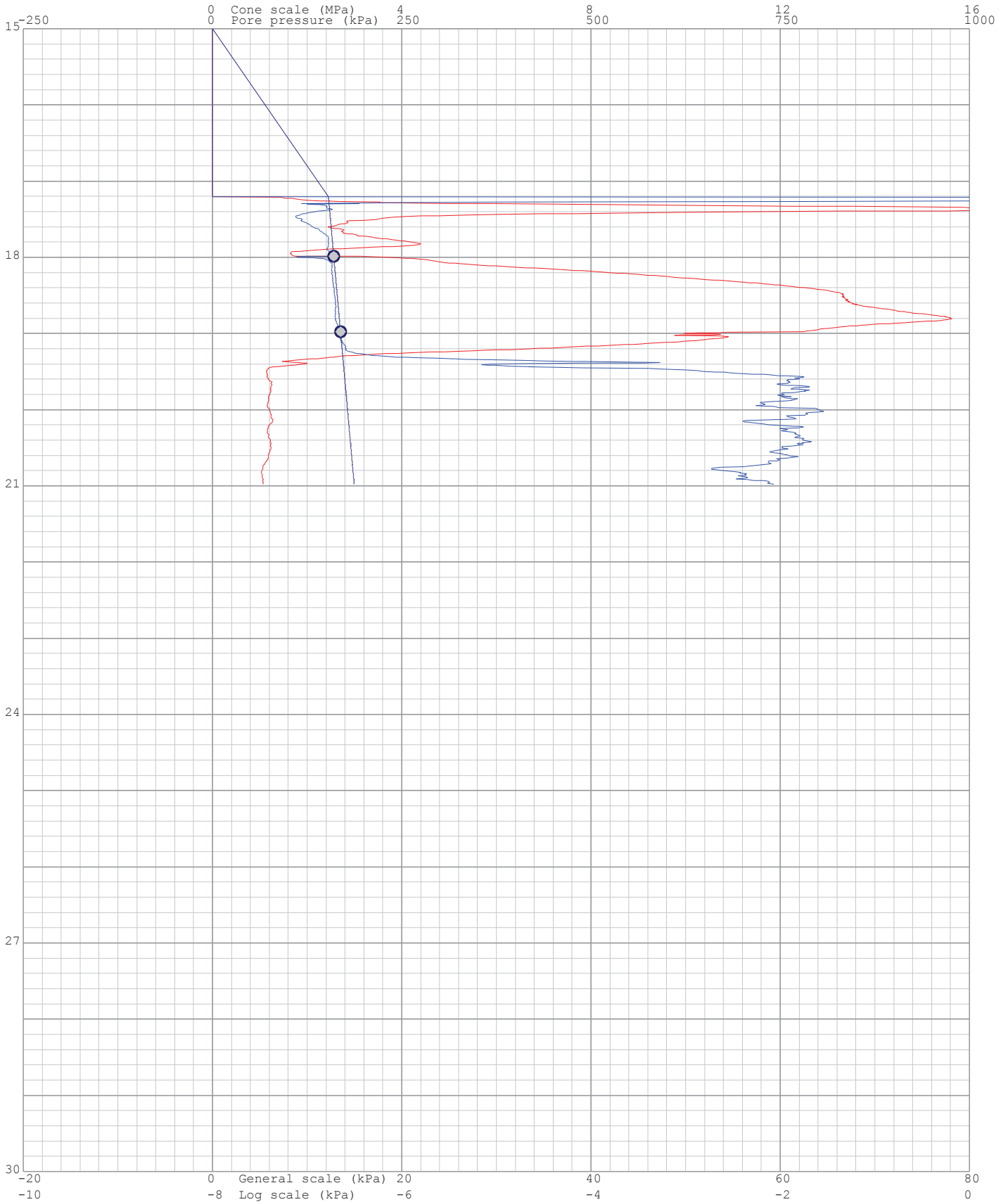
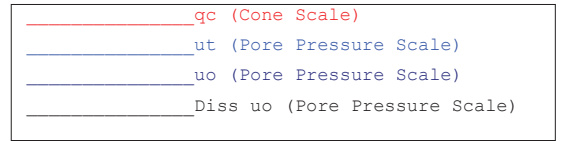
rust@global.co.za

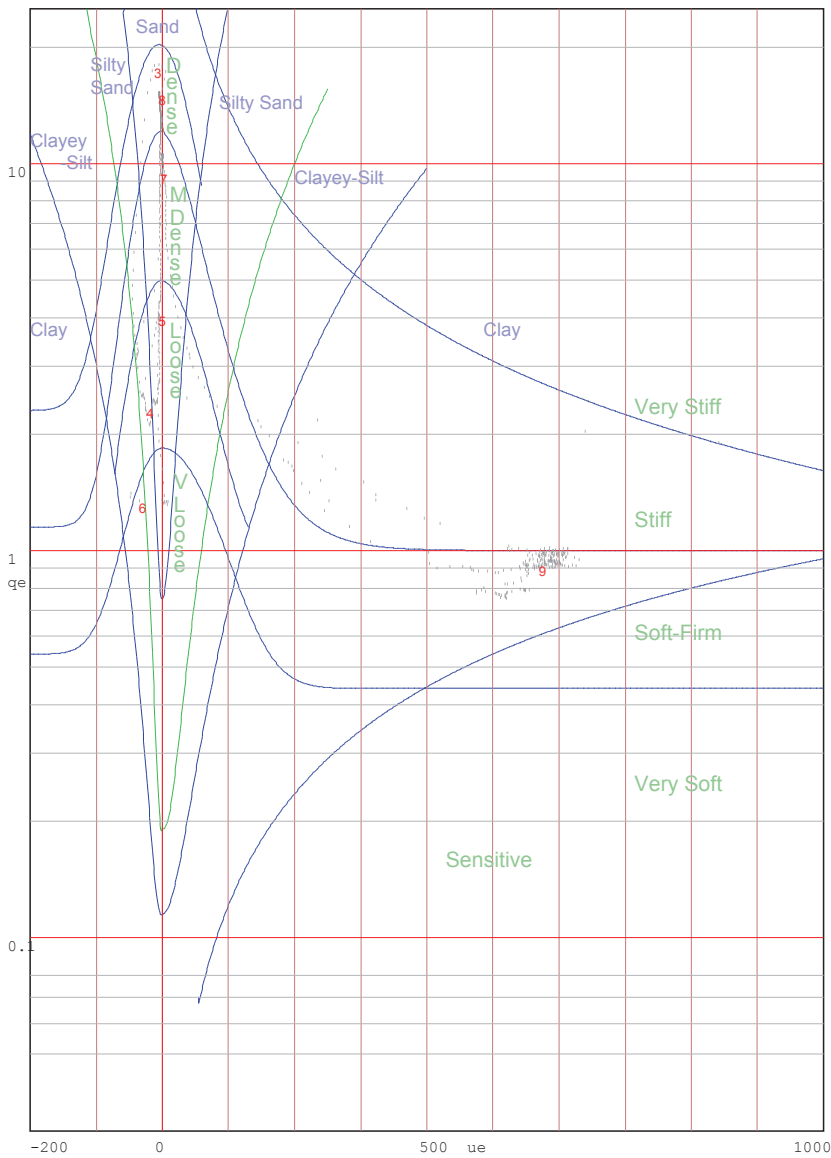
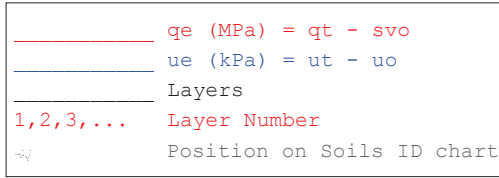
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

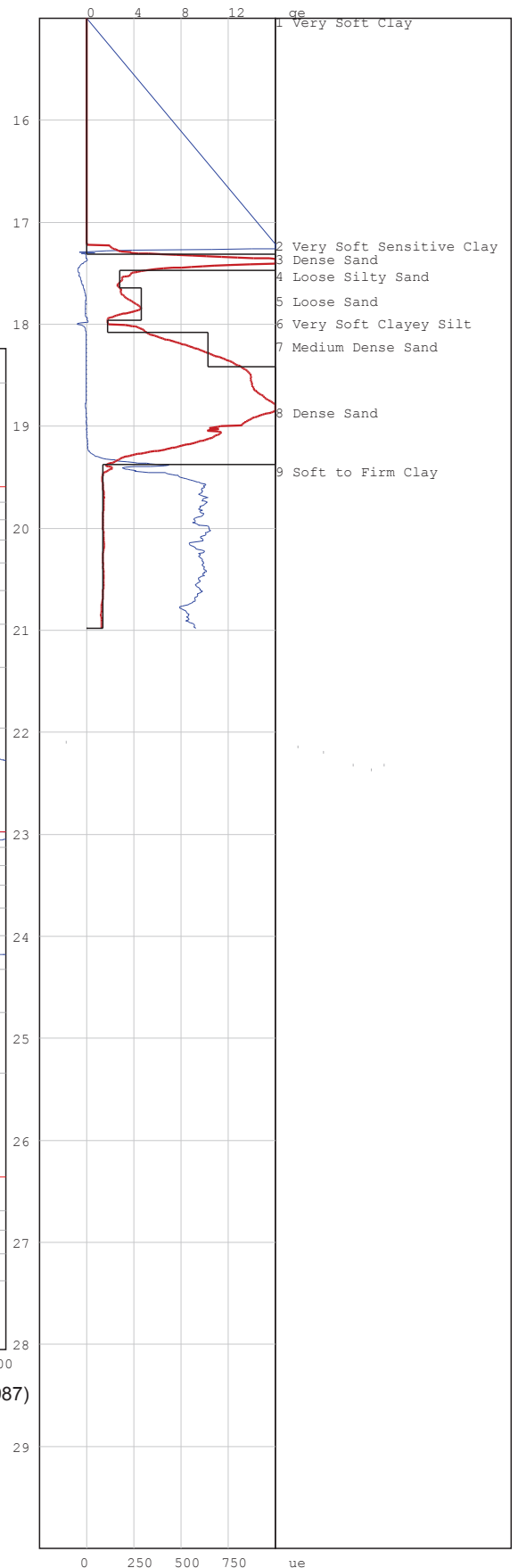
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Date: 2012/09/26





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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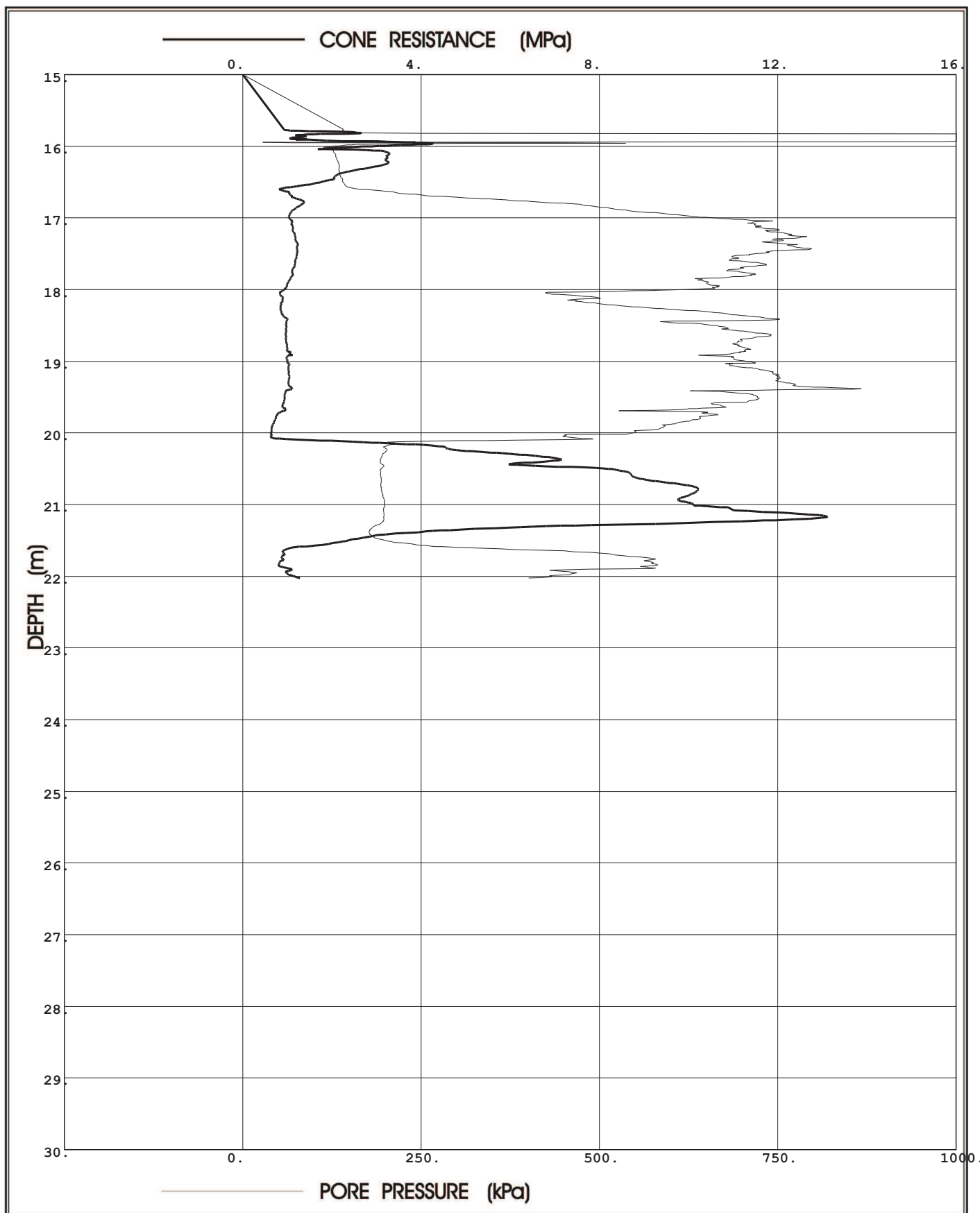
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): P 24

DATE: 2012/09/25

Page:2



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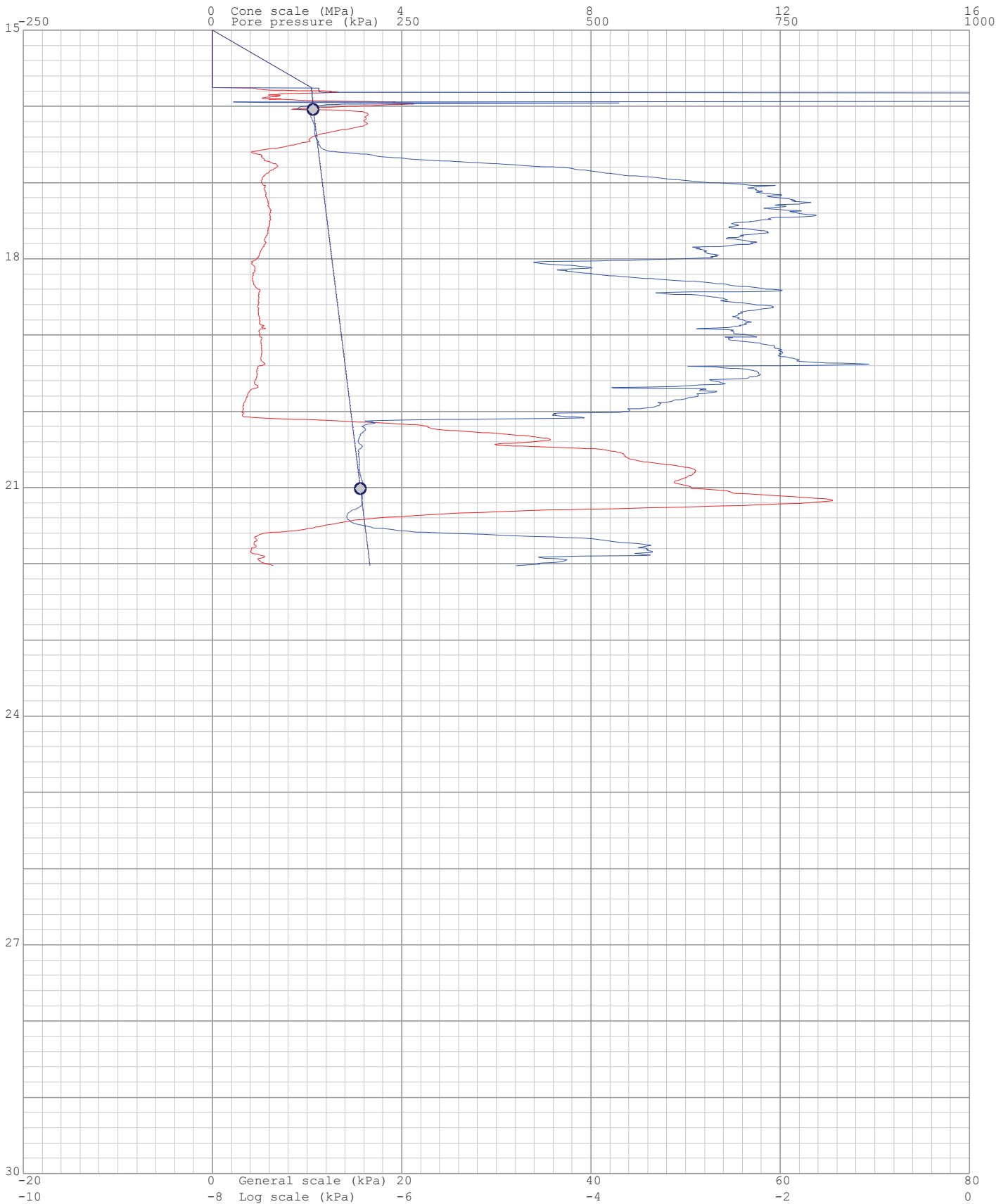
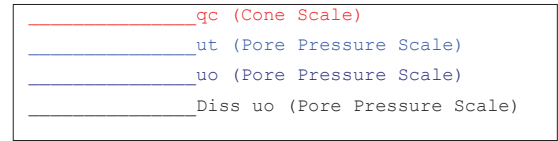
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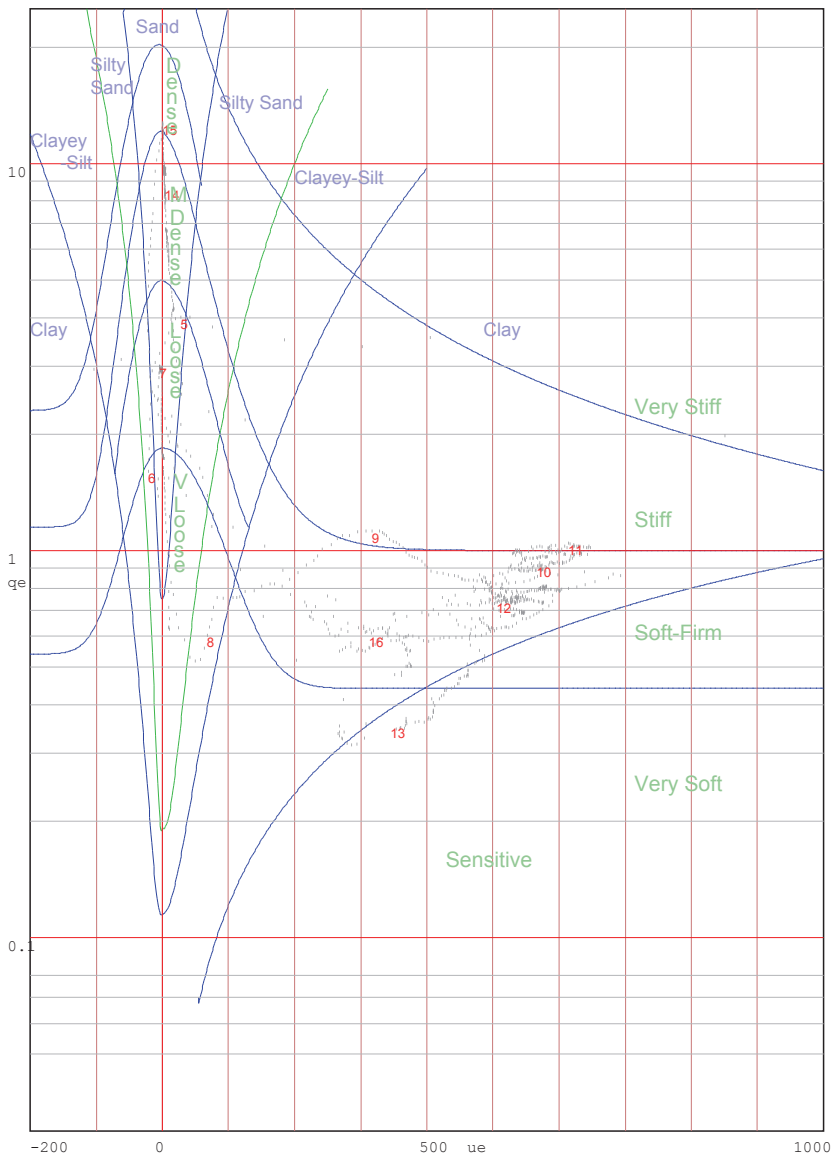
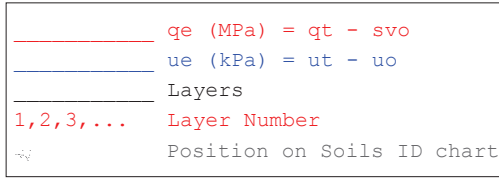
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Project: Durban Harbour Piezocone Investigation for Dredging

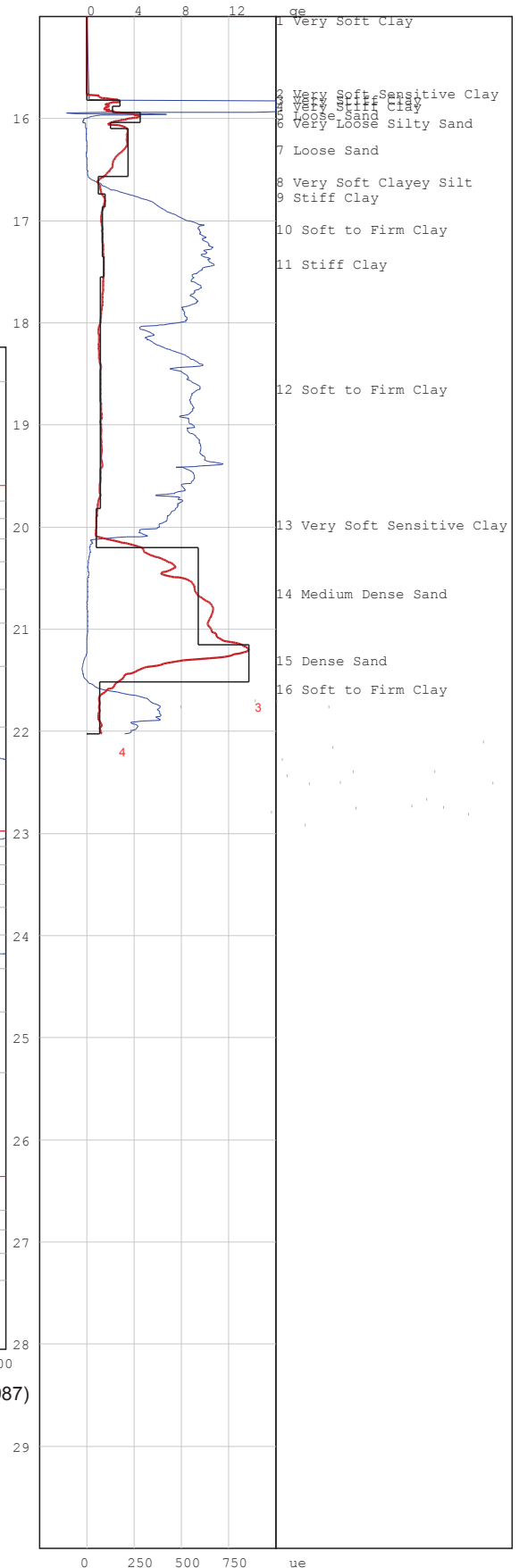
Site: Durban Harbour over water

Hole No: P 24  
Date: 2012/09/25





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# PIEZOCONE PENETRATION TEST



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0044

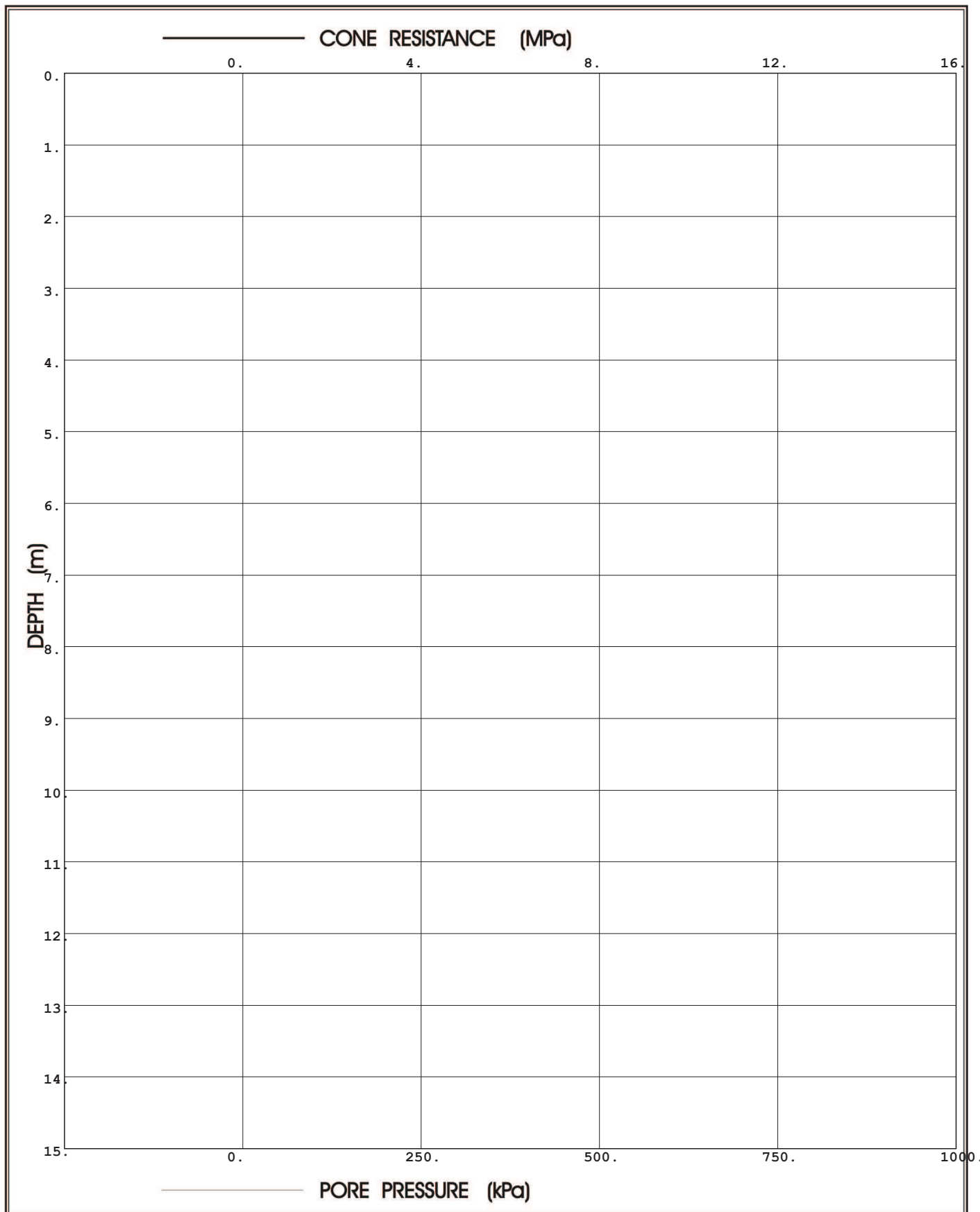
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 01

DATE: 2012-08-11

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

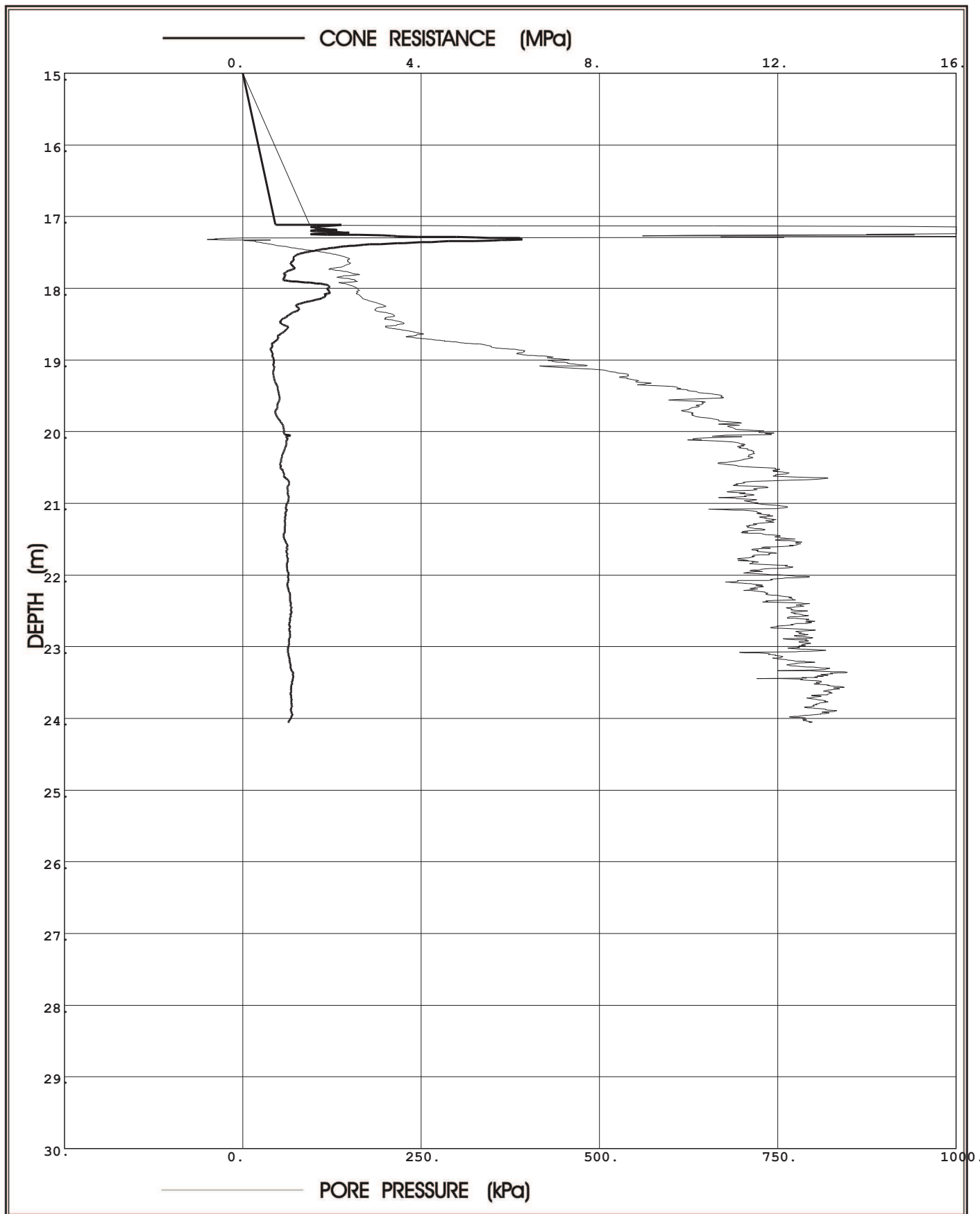
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 01

DATE: 2012-08-11

Page:2



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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 01  
Date: 2012-08-11

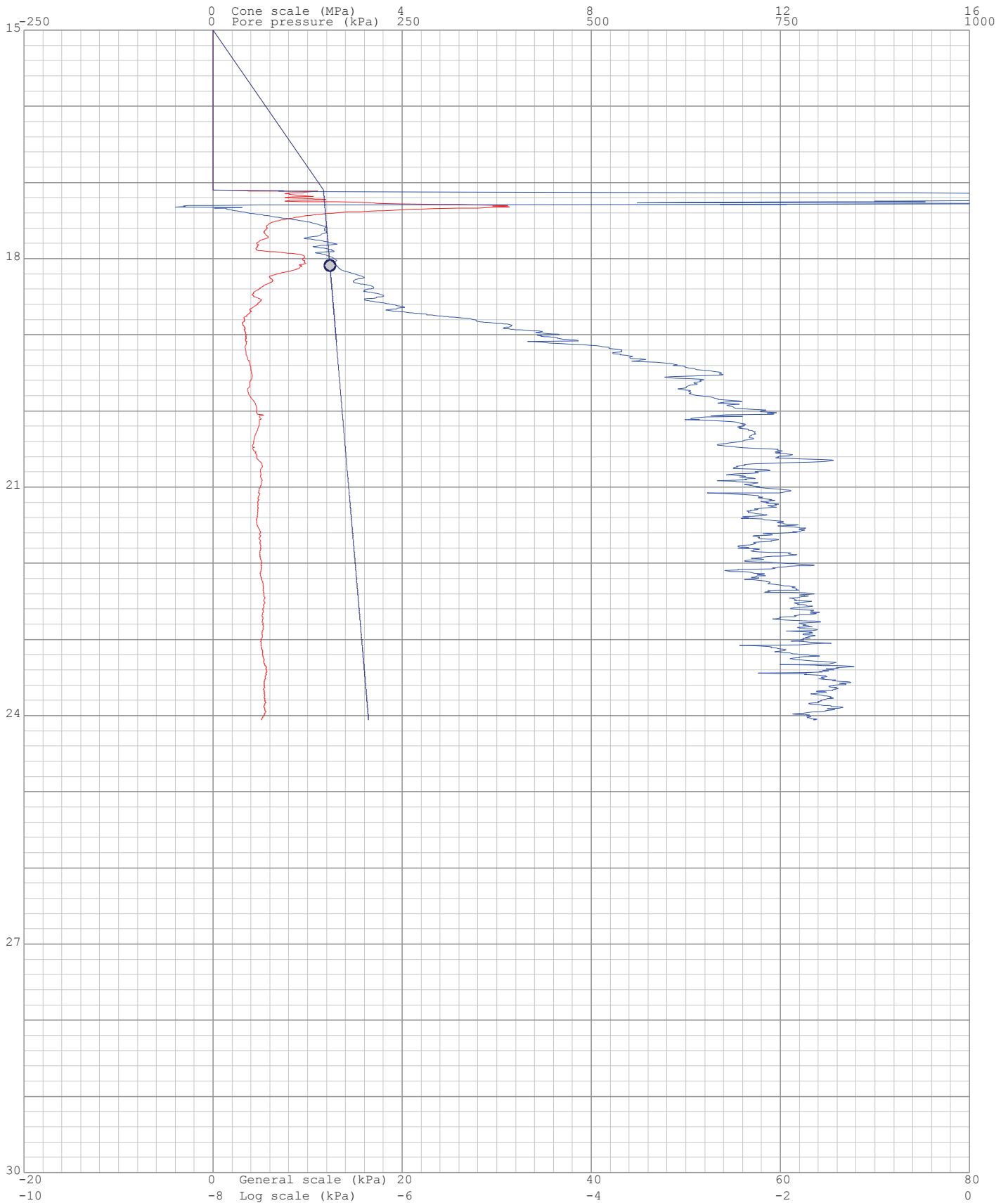
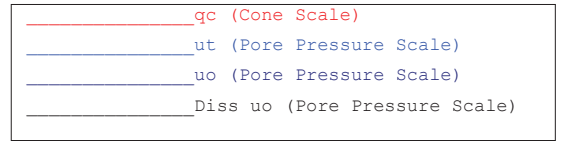
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| _____ | ut (Pore Pressure Scale)      |
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 01  
Date: 2012-08-11



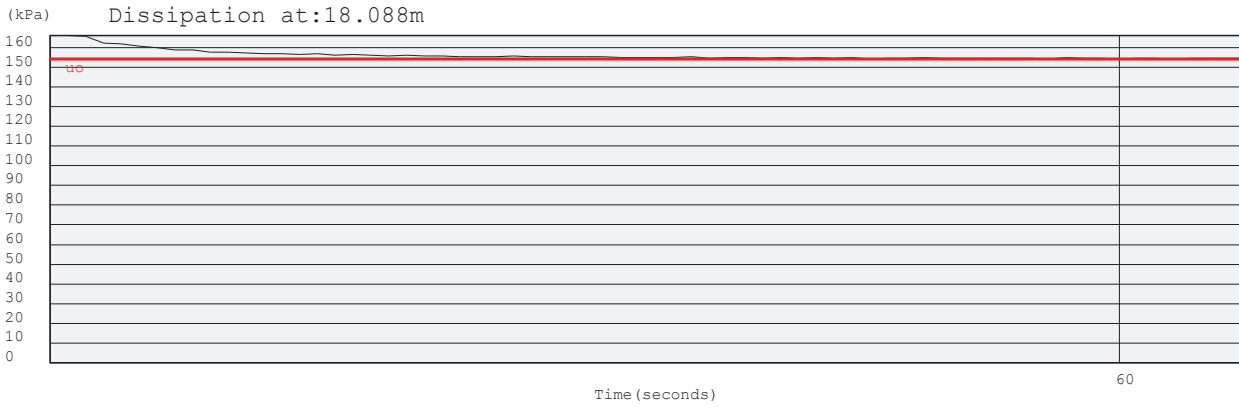
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 01

Date: 2012-08-11

Page: 1



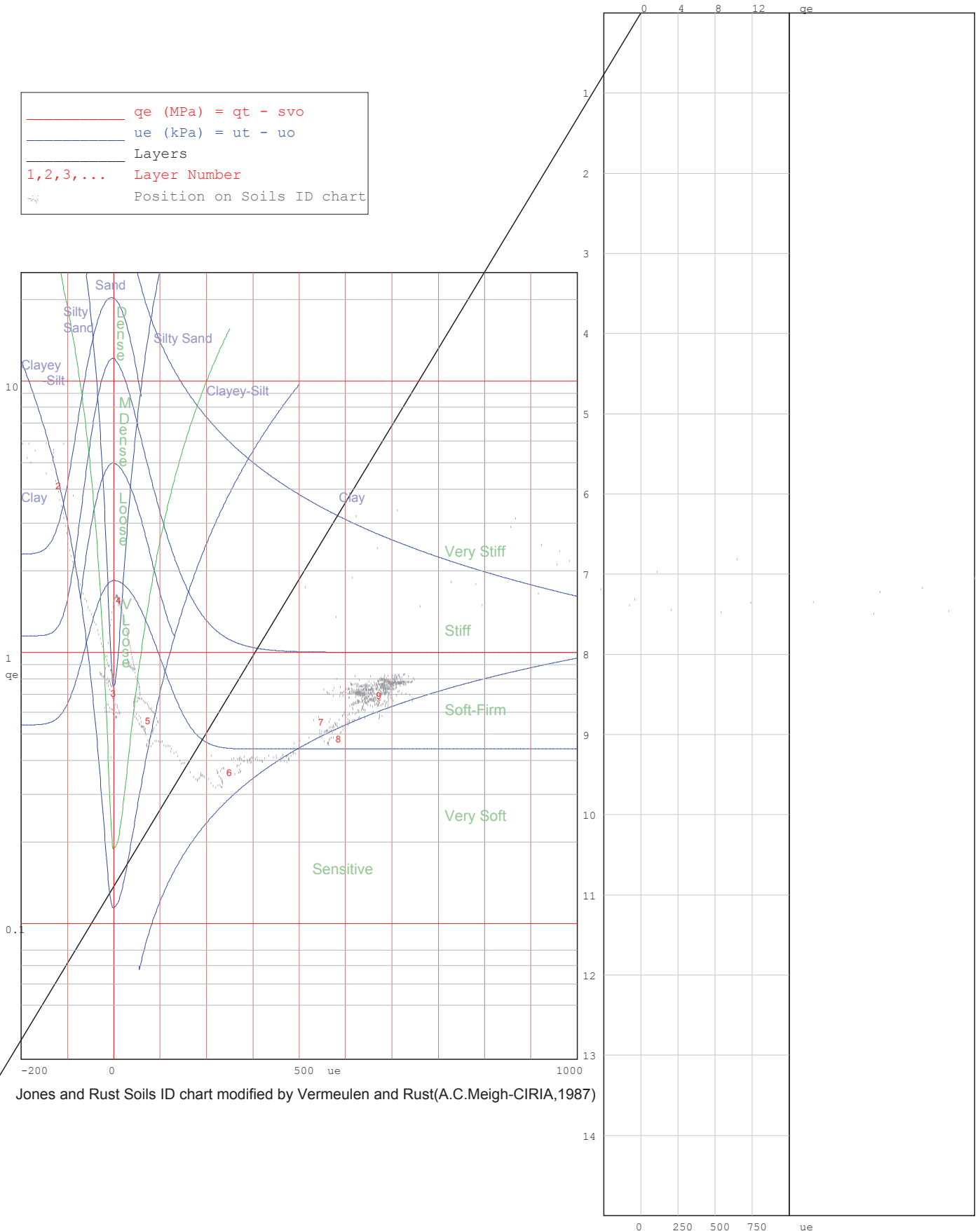
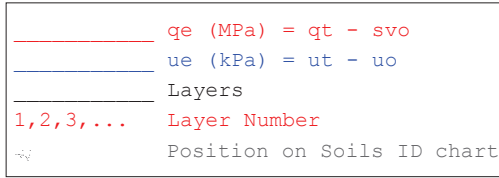


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 01

Date: 2012-08-11

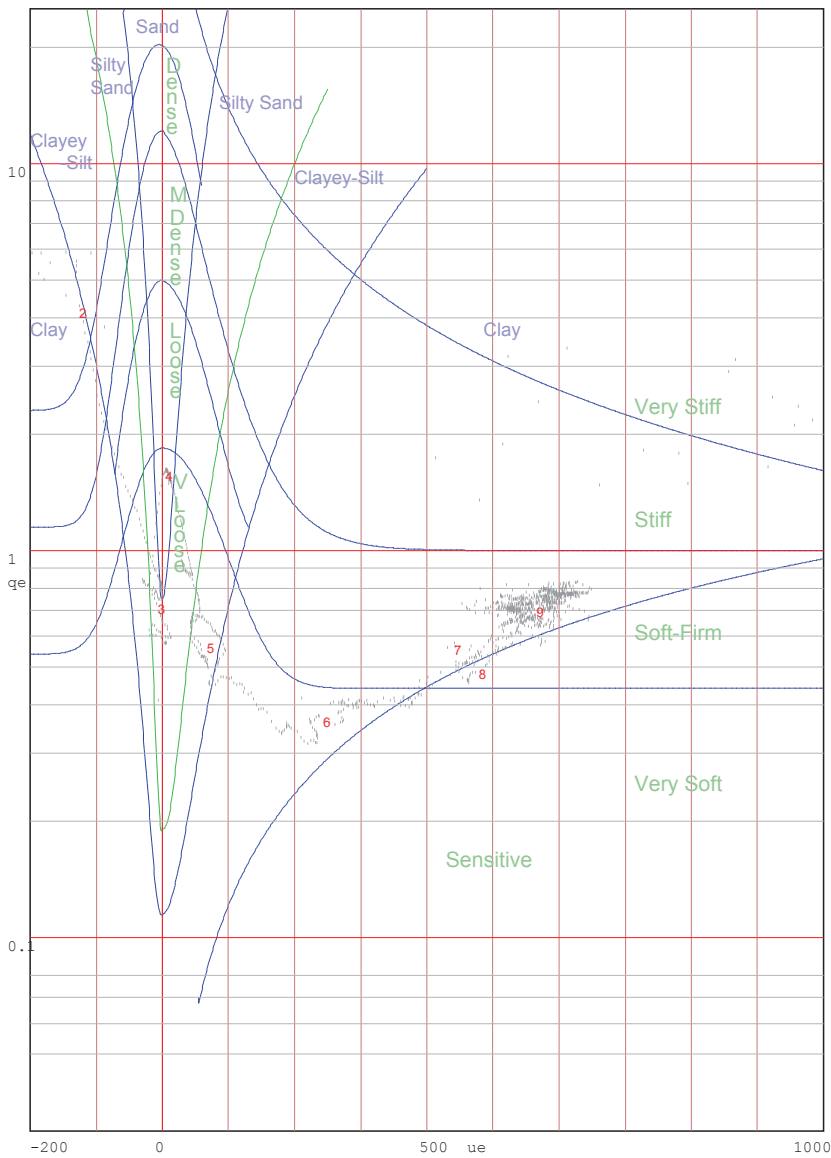


Site: Durban Harbour over water

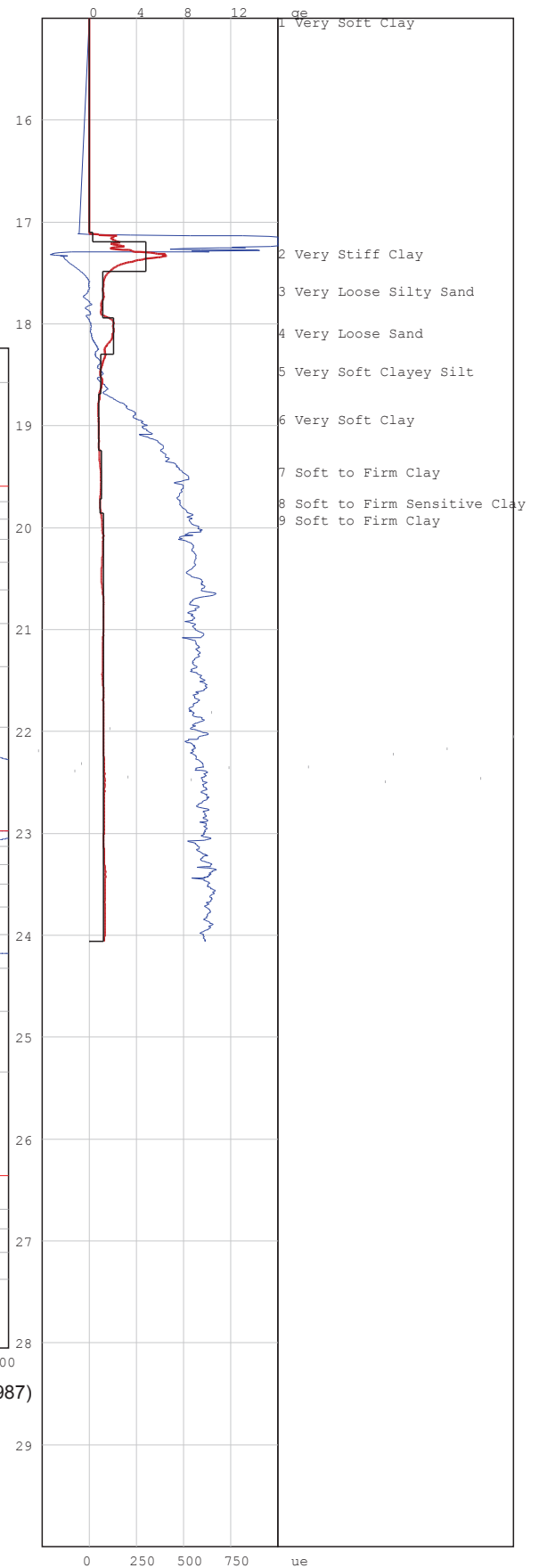
Hole No: S 01

Date: 2012-08-11

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

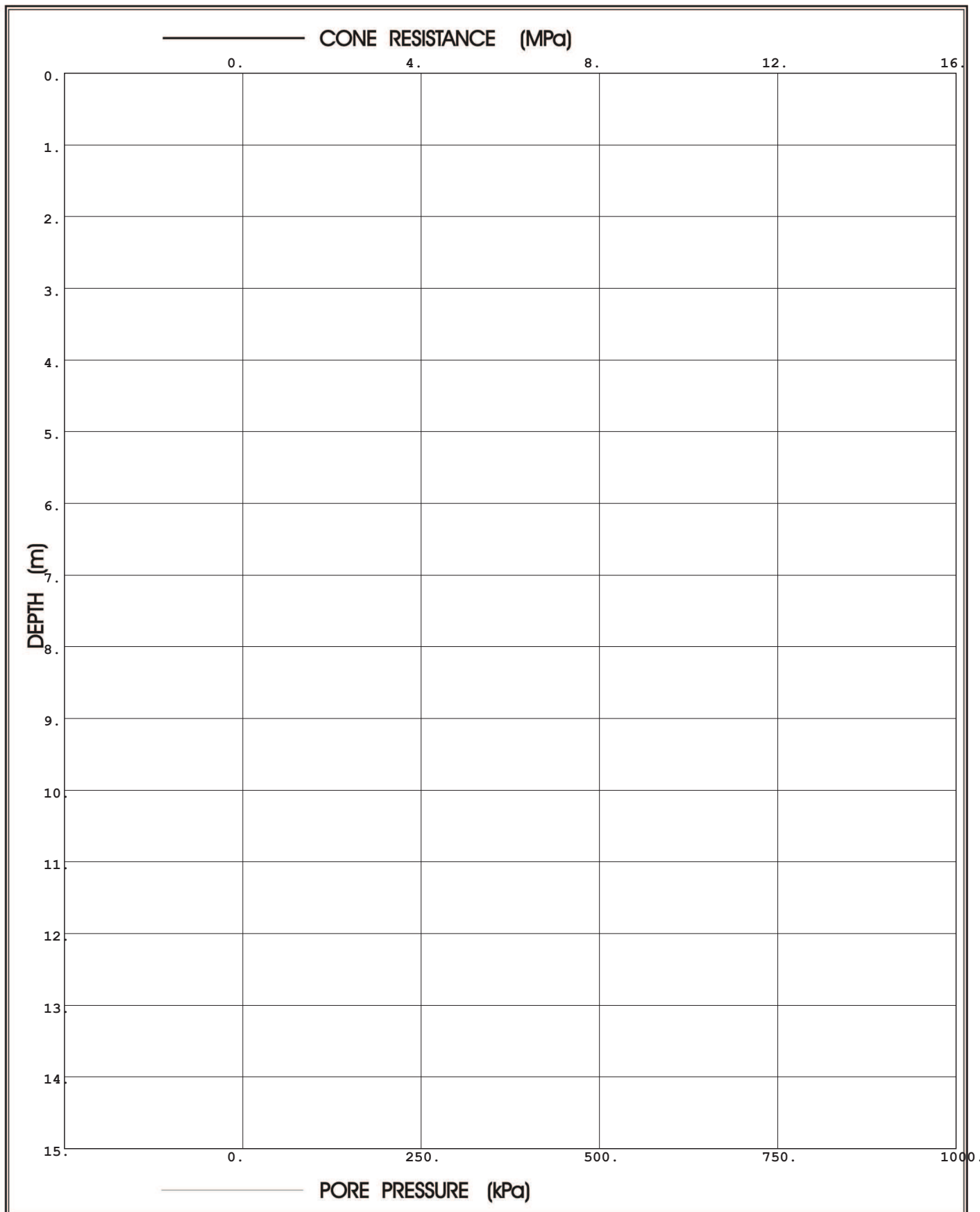
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 02

DATE: 2012/08/11

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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

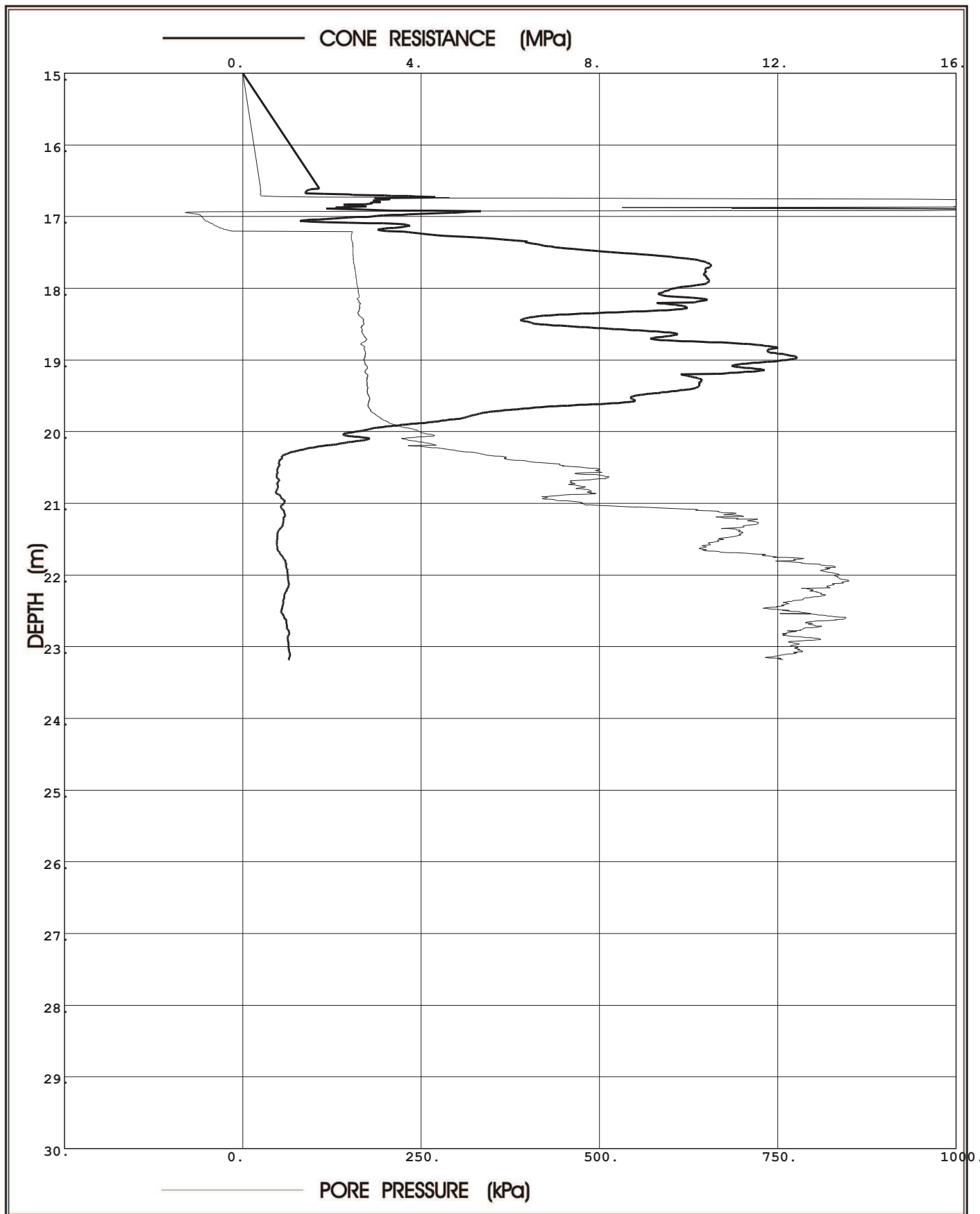
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 02

DATE: 2012/08/11

Page:2



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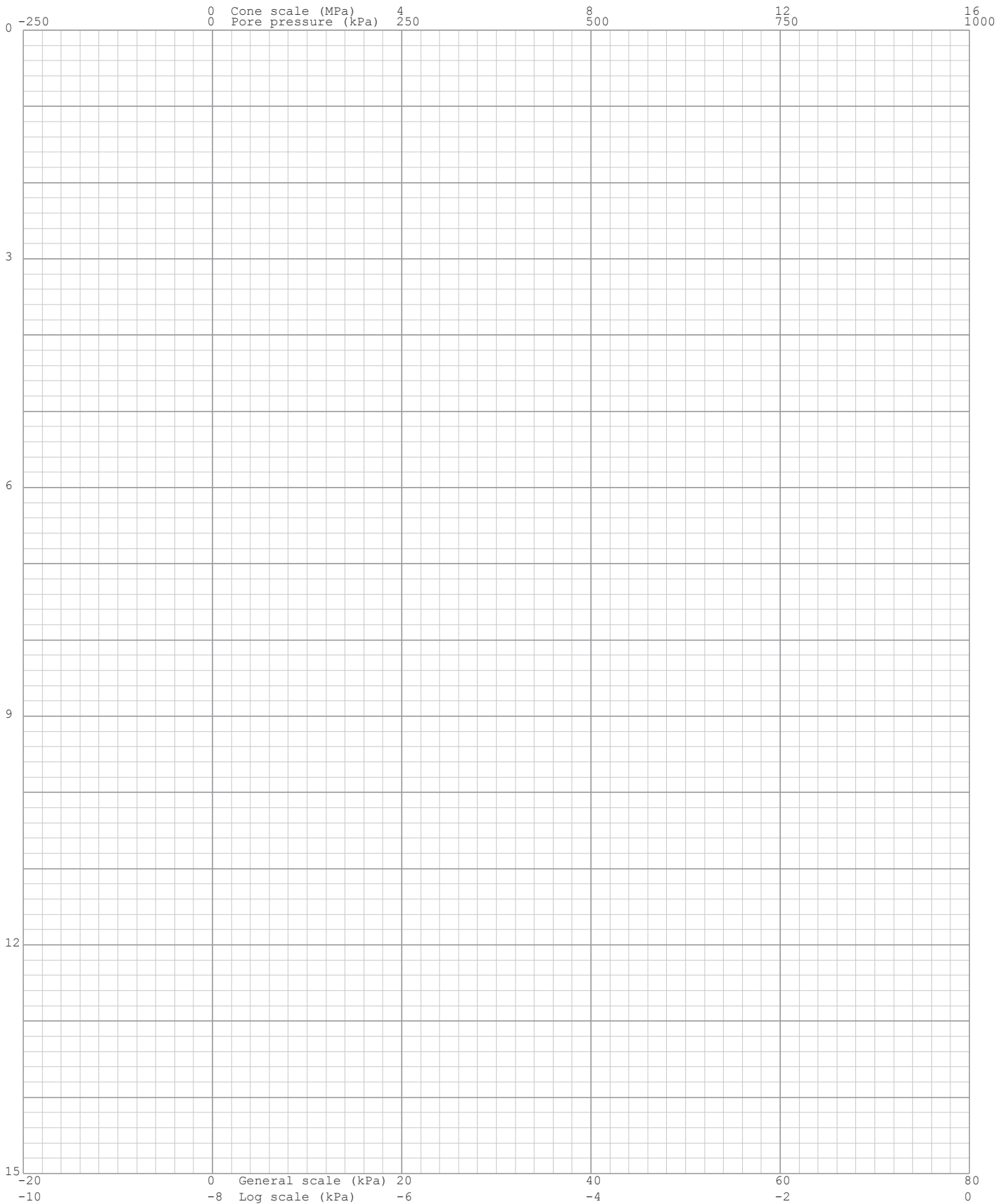
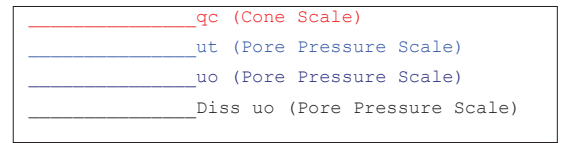
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

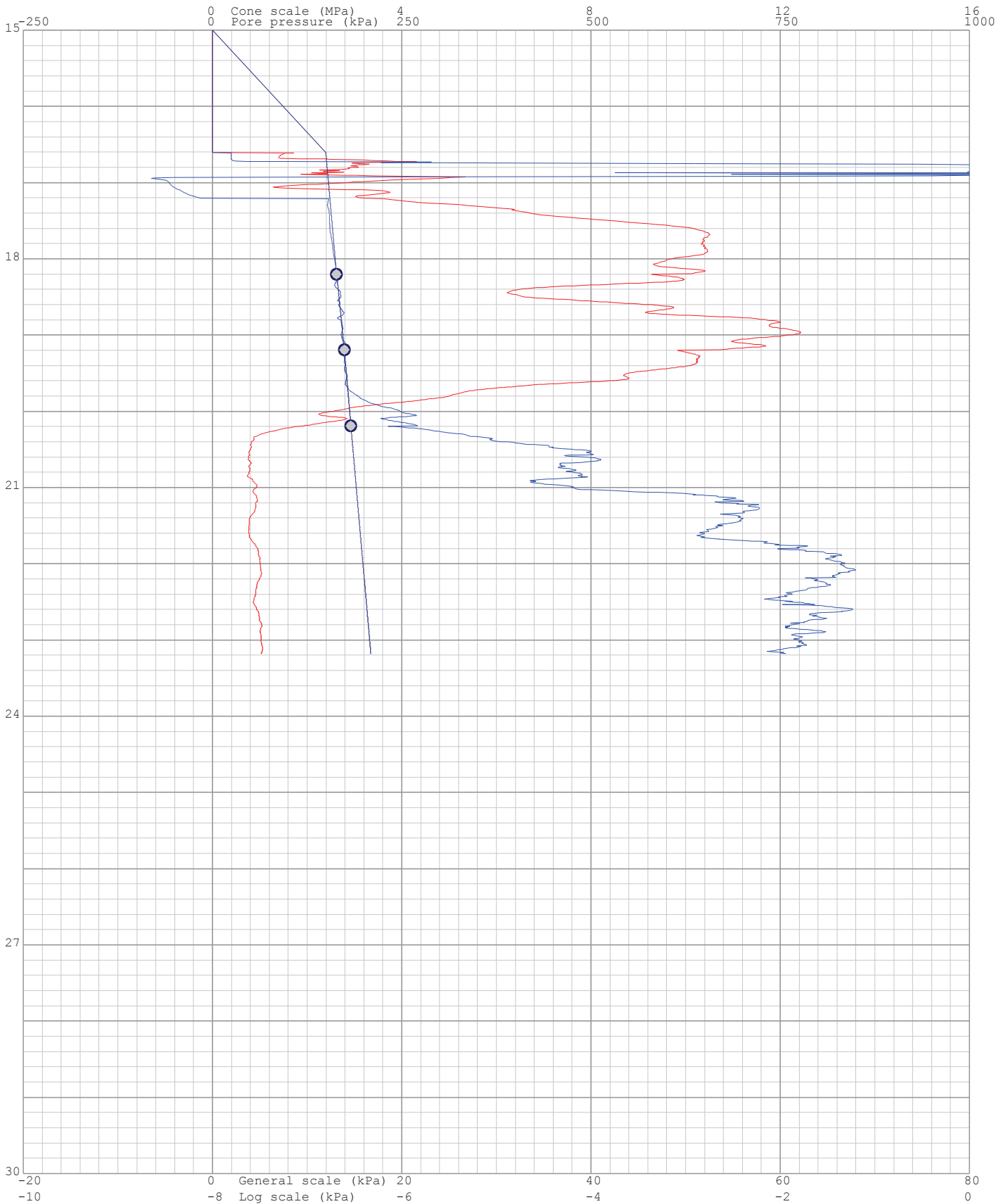
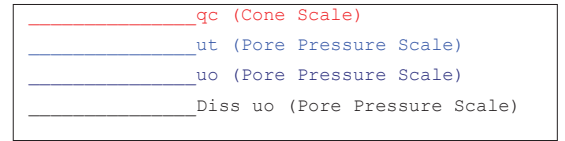
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 02  
Date: 2012/08/11



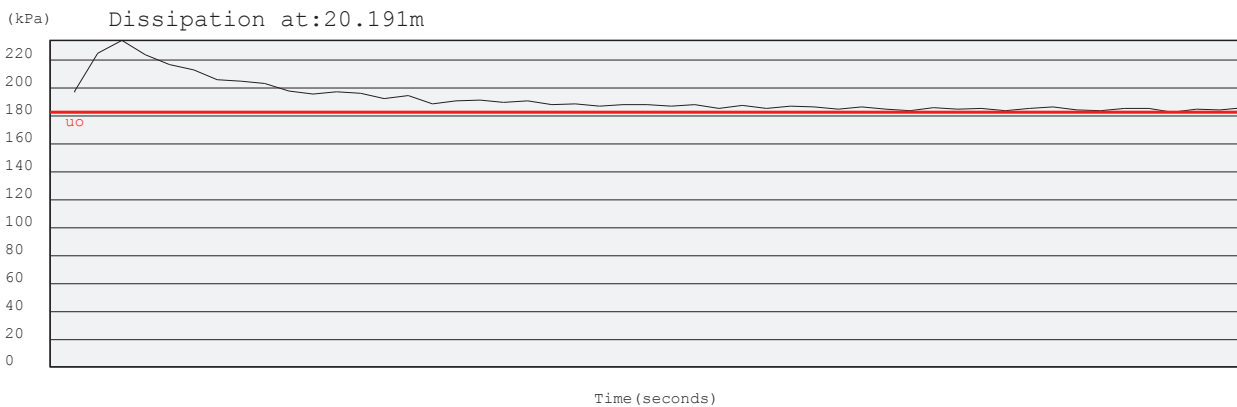
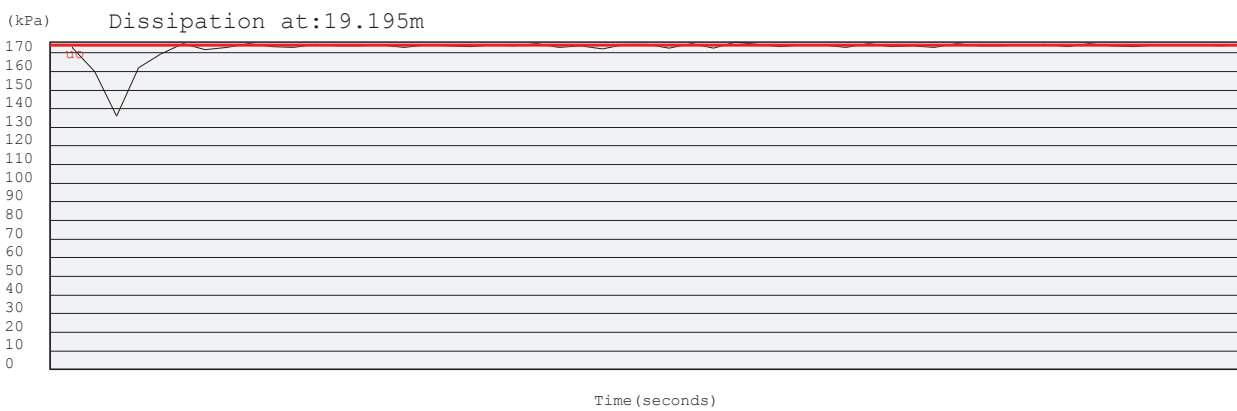
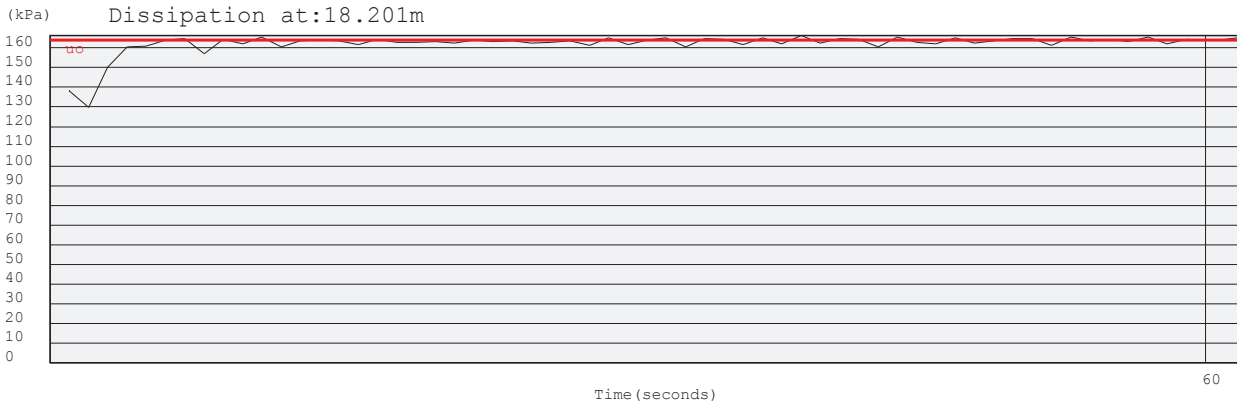
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 02

Date: 2012/08/11


Page: 1

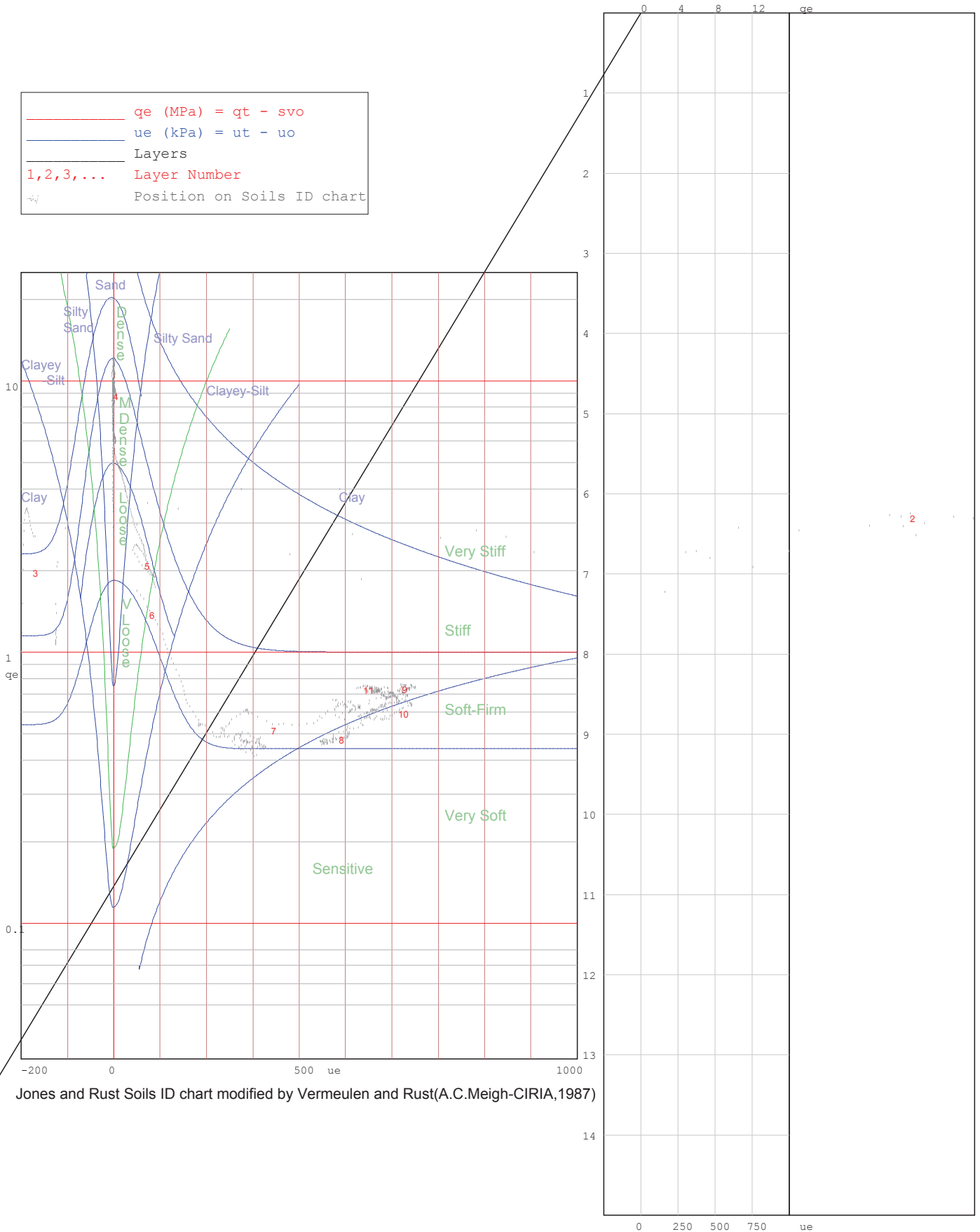


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 02  
Date: 2012/08/11

$q_e$  (MPa) =  $q_t - s_{vo}$   
 $u_e$  (kPa) =  $u_t - u_o$   
 Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

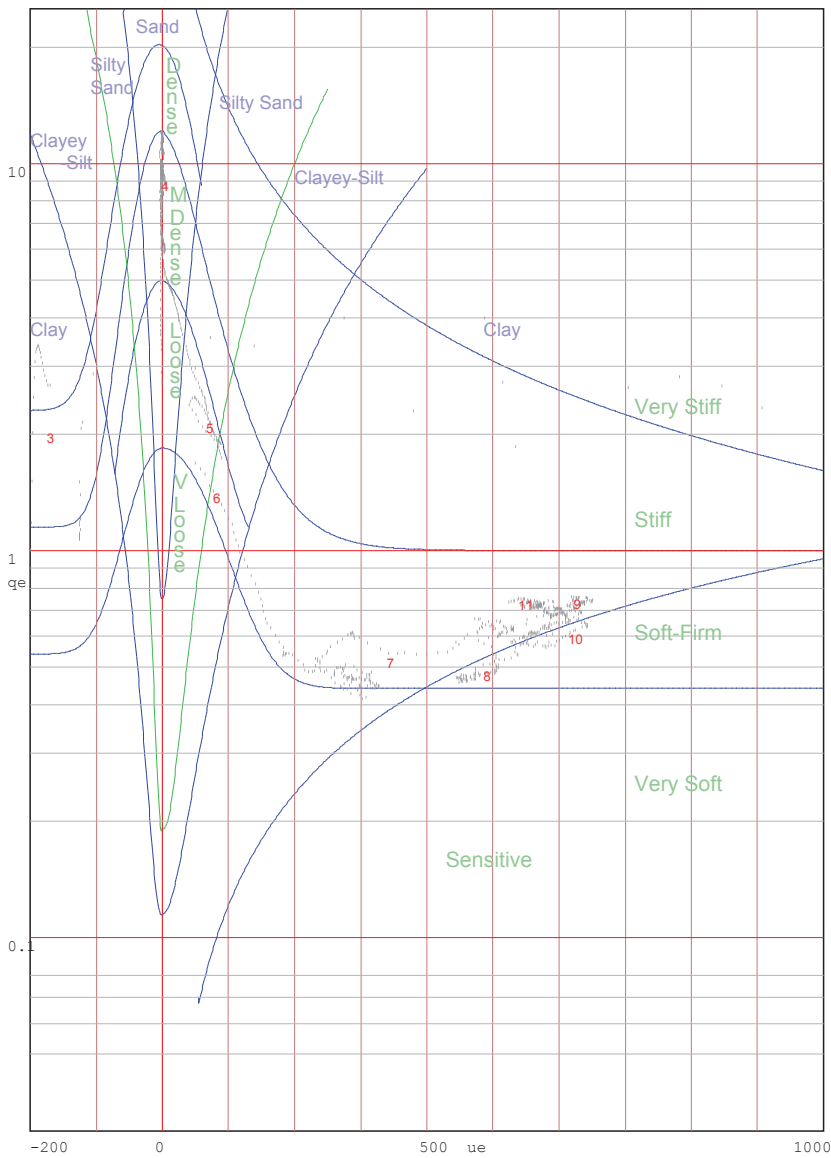
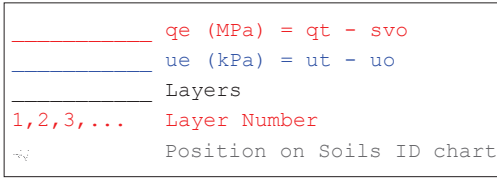


Project: Durban Harbour Piezocone Investigation for

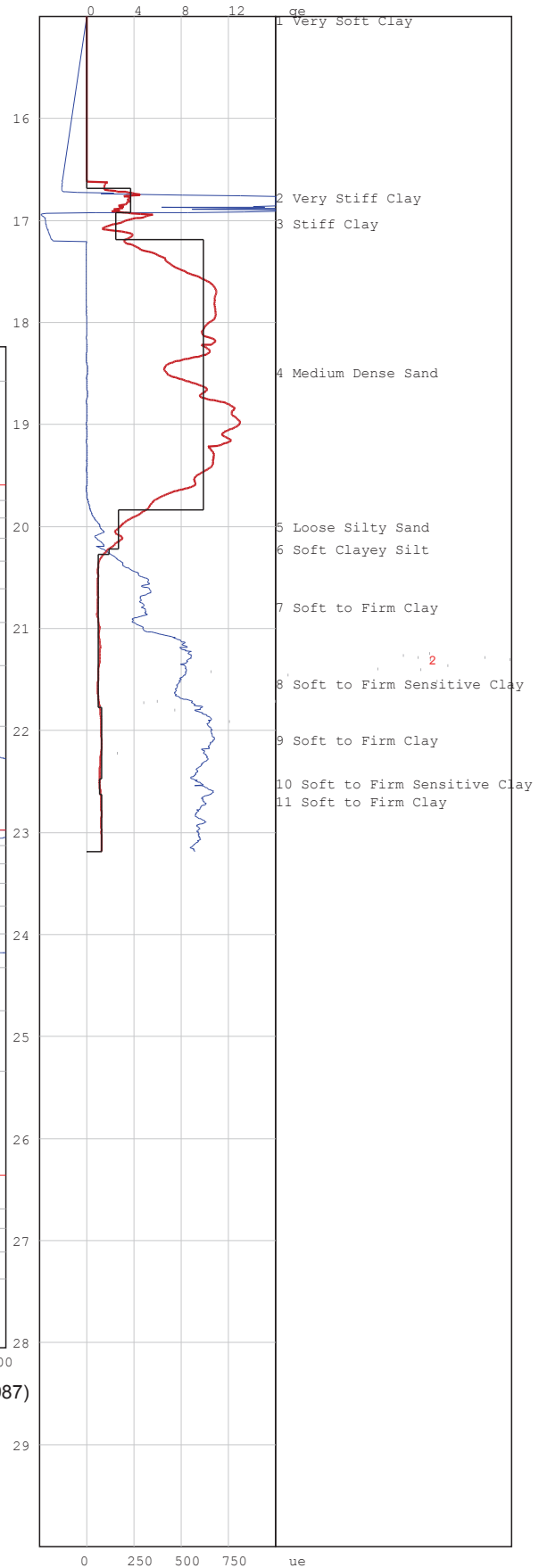
Site: Durban Harbour over water

Hole No: S 02

Date: 2012/08/11



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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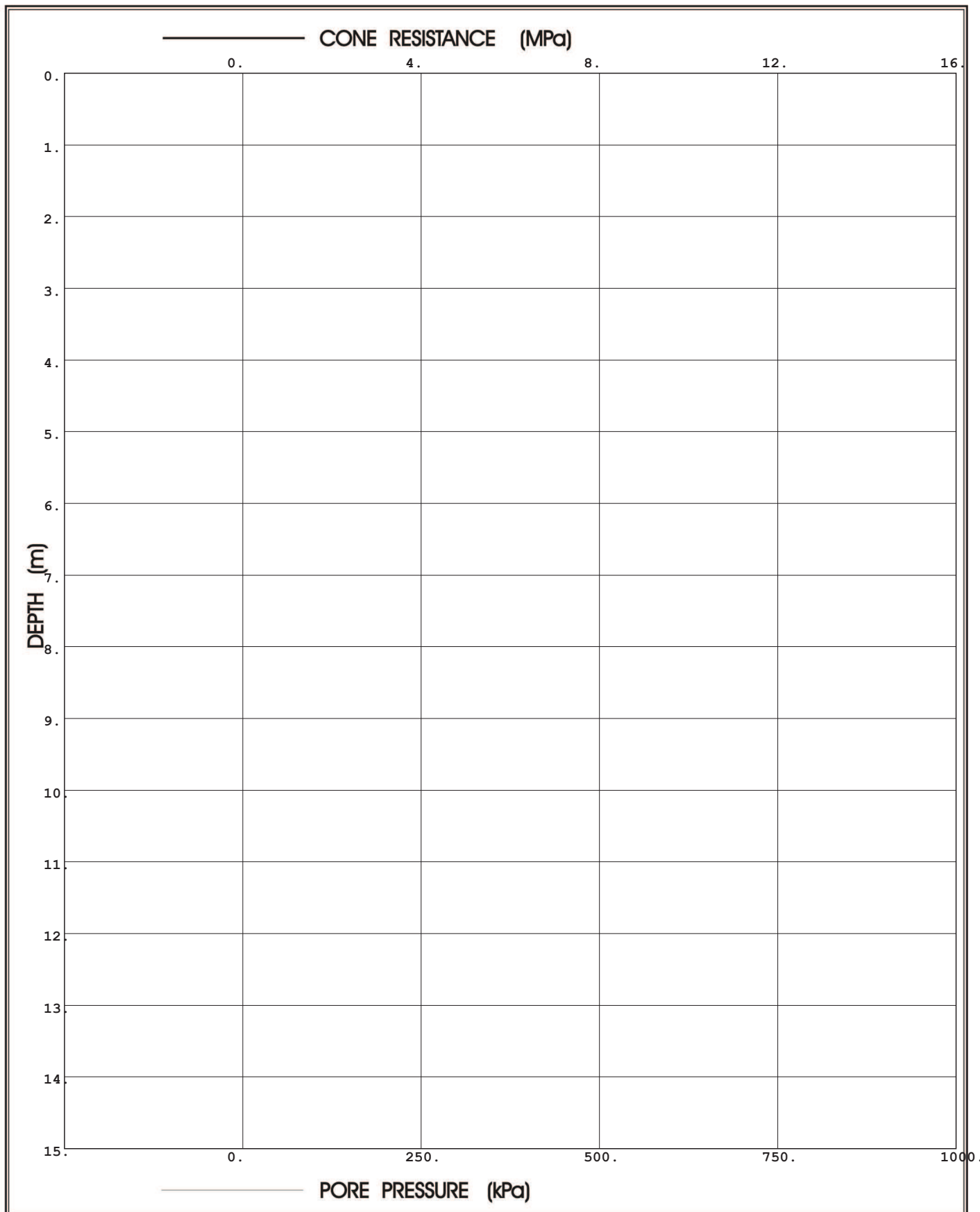
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 03

DATE: 2012/08/10

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

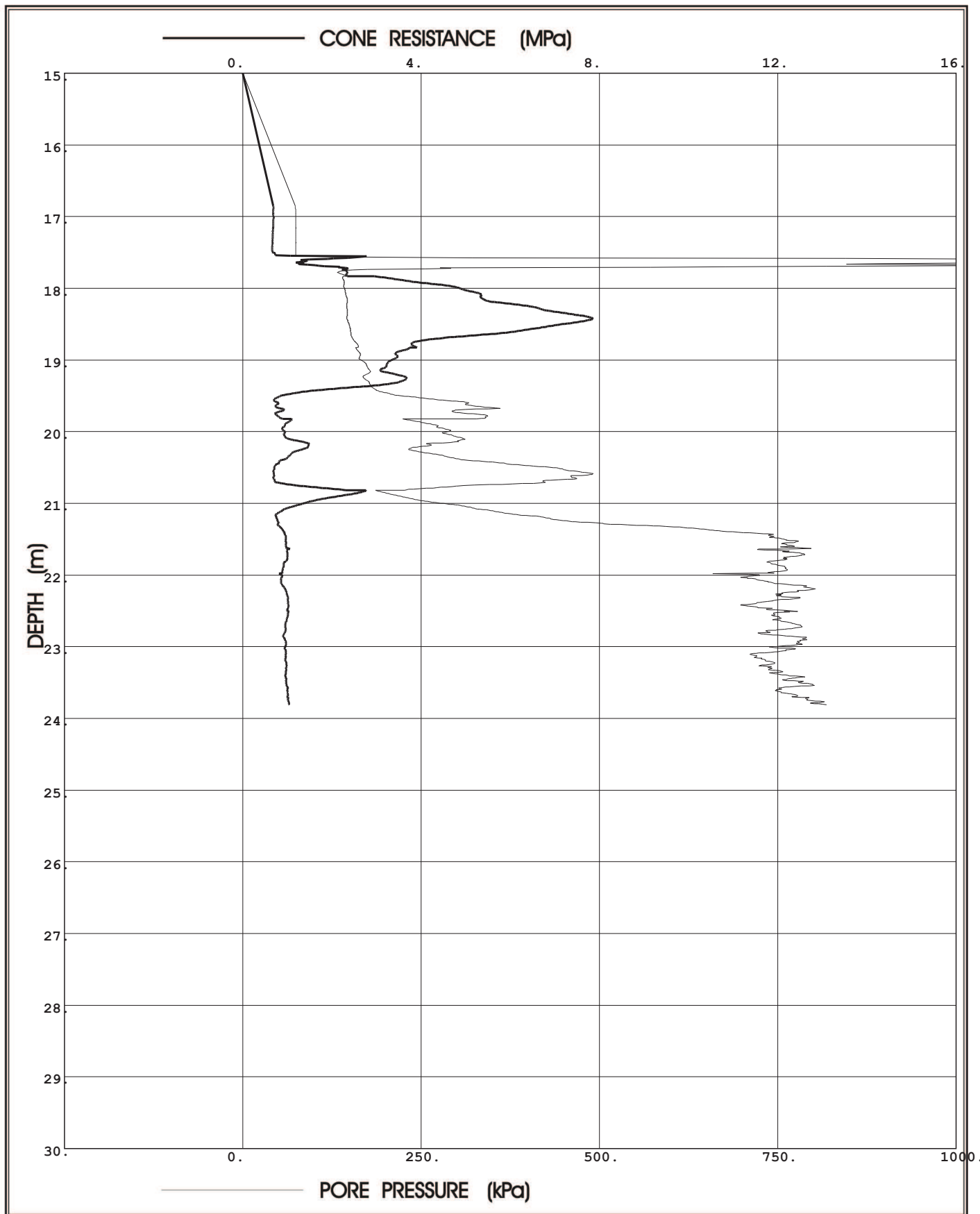
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 03

DATE: 2012/08/10

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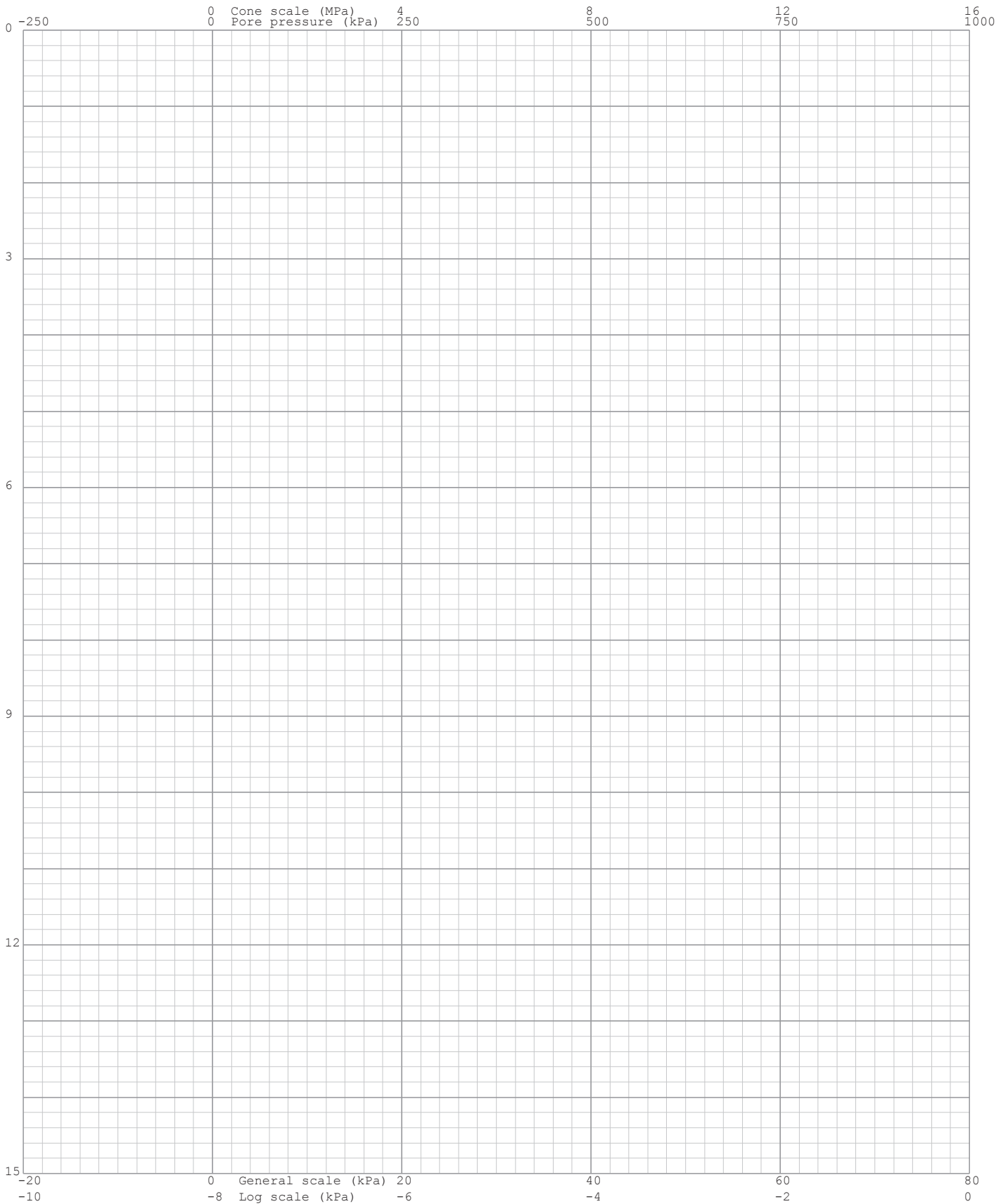
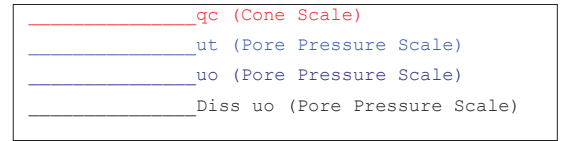
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

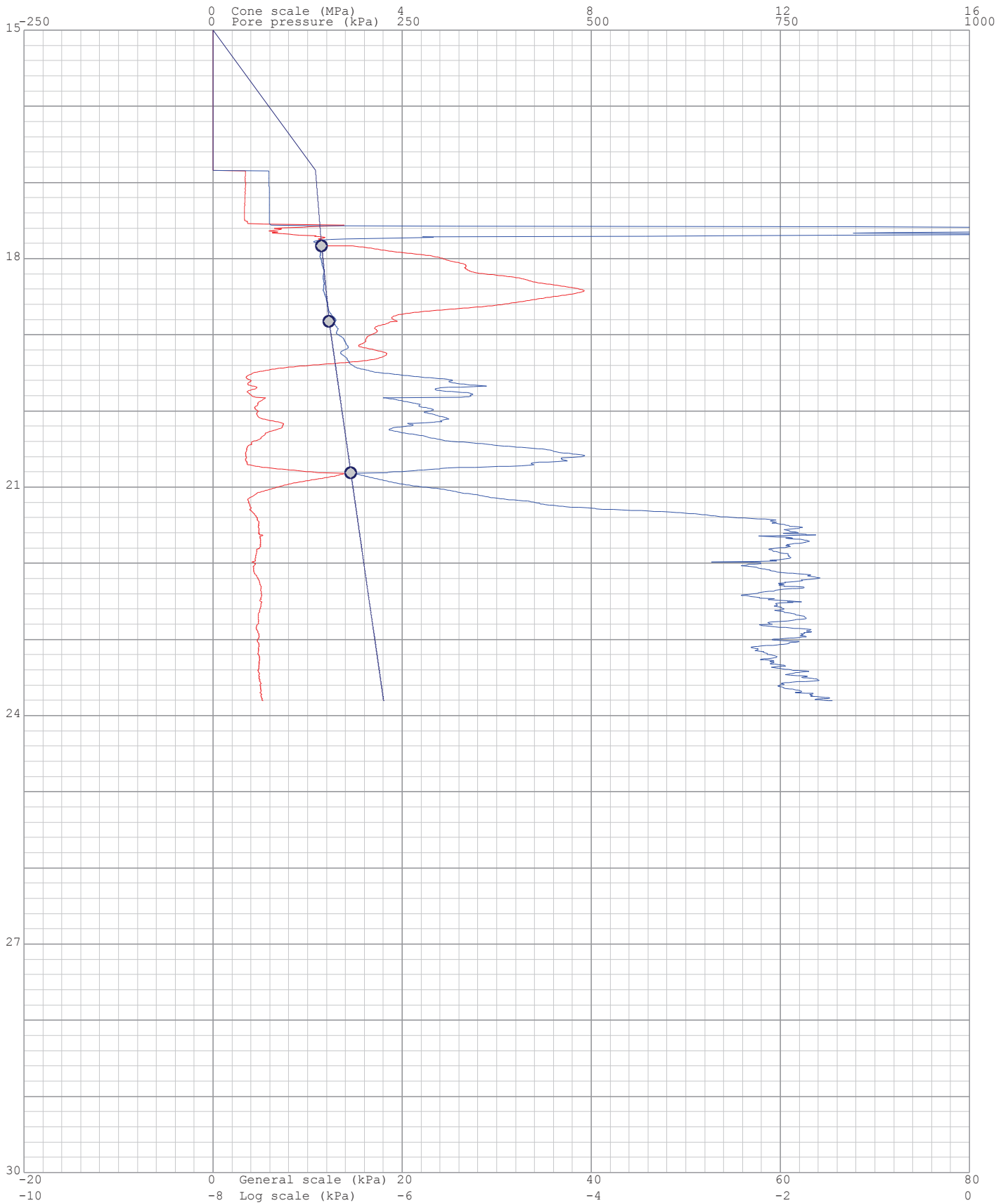
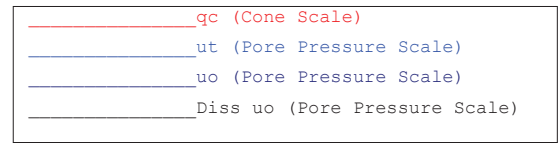
Hole No: S 03  
Date: 2012/08/10



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 03  
Date: 2012/08/10



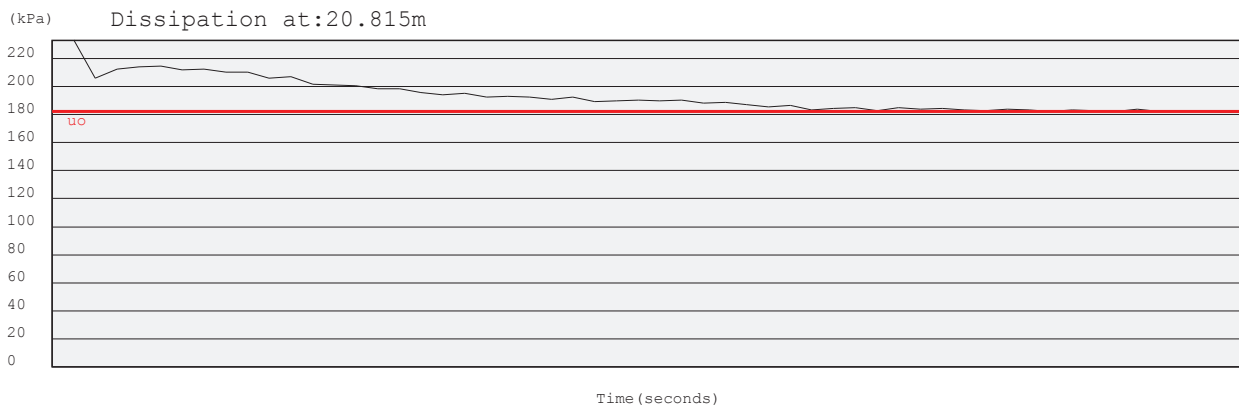
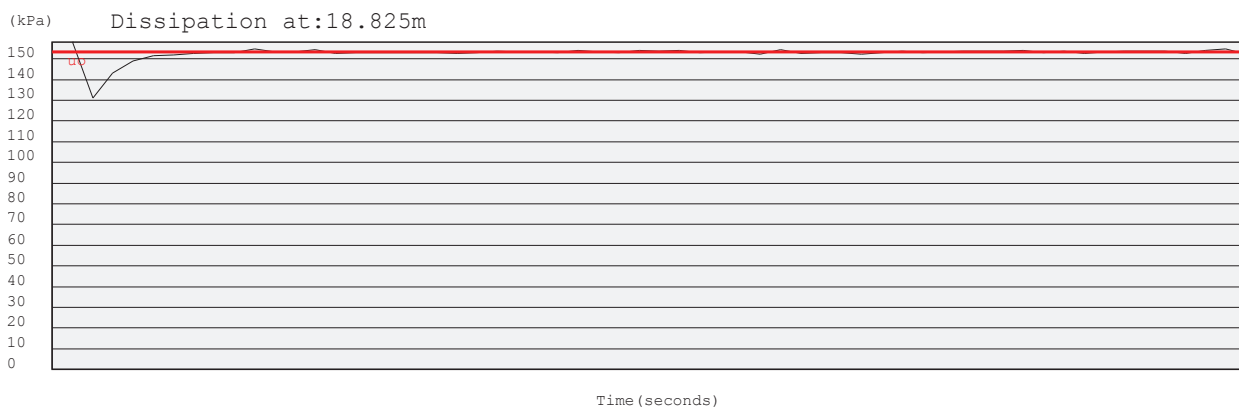
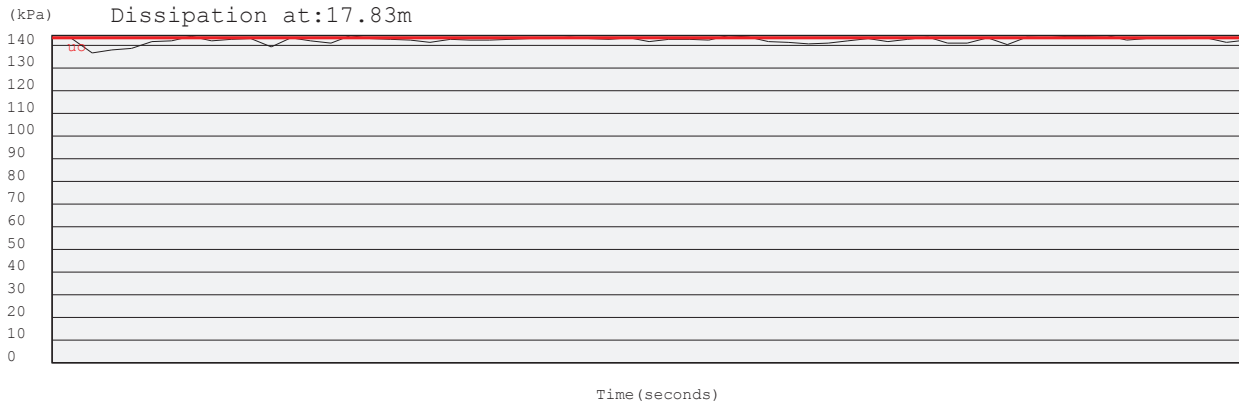
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 03

Date: 2012/08/10

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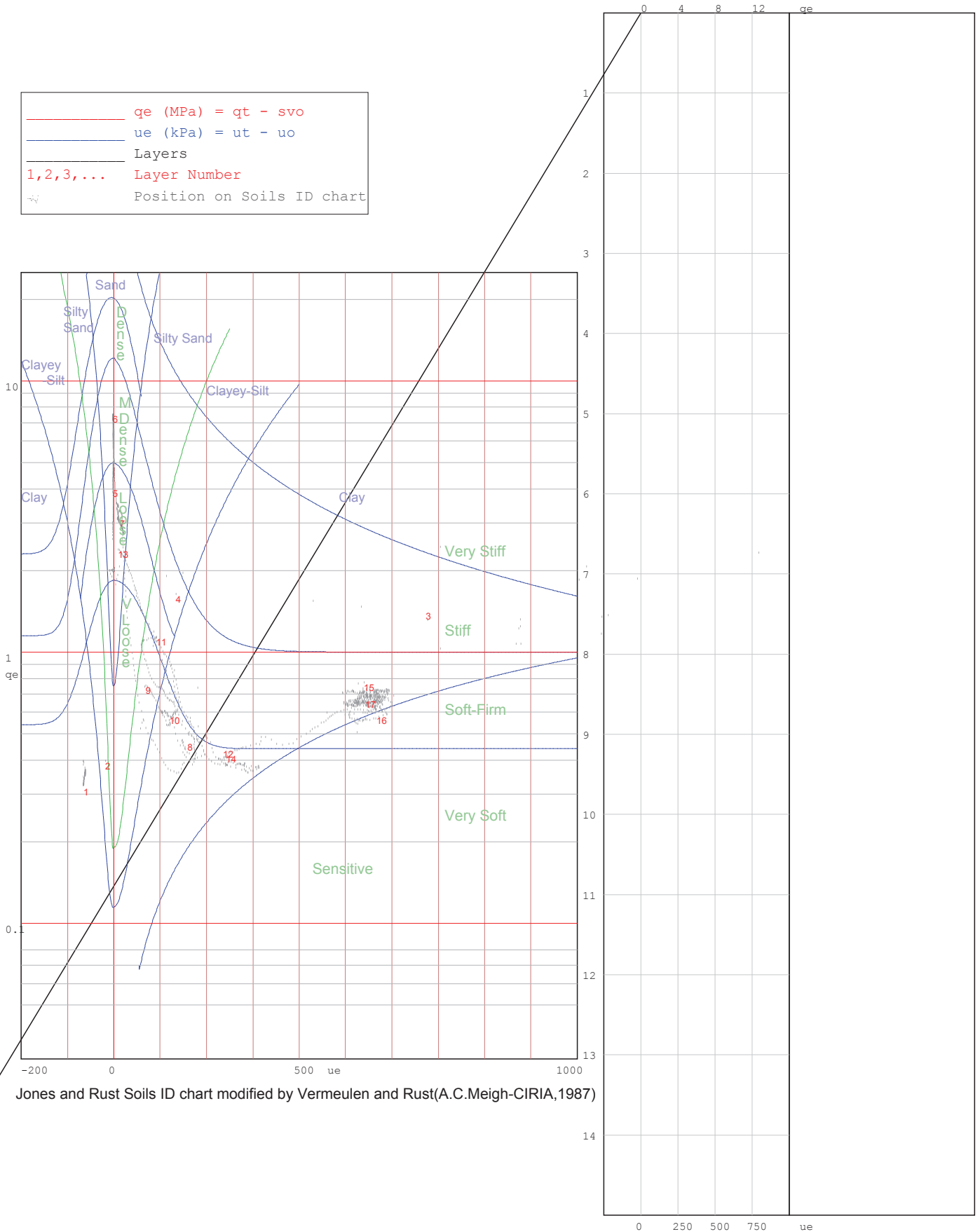


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 03  
Date: 2012/08/10

$q_e$  (MPa) =  $q_t - s_{vo}$   
 $u_e$  (kPa) =  $u_t - u_o$   
 Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



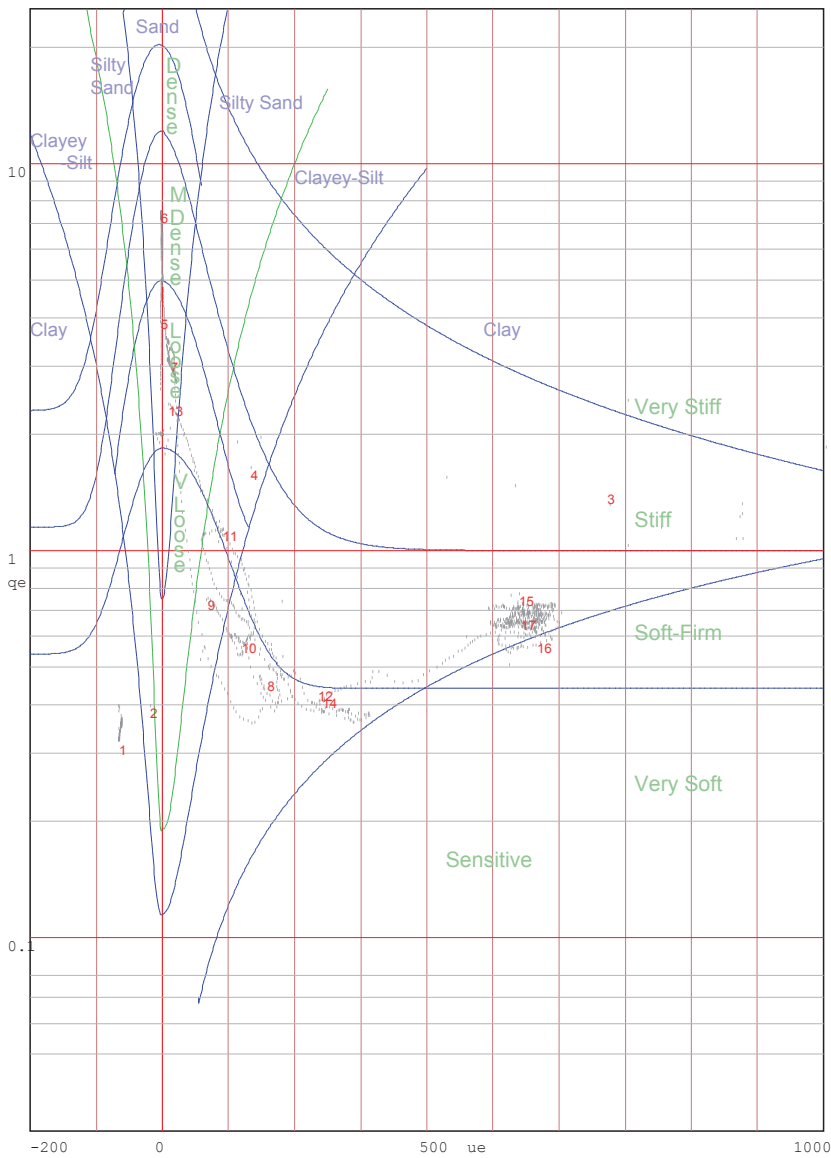
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

Site: Durban Harbour over water

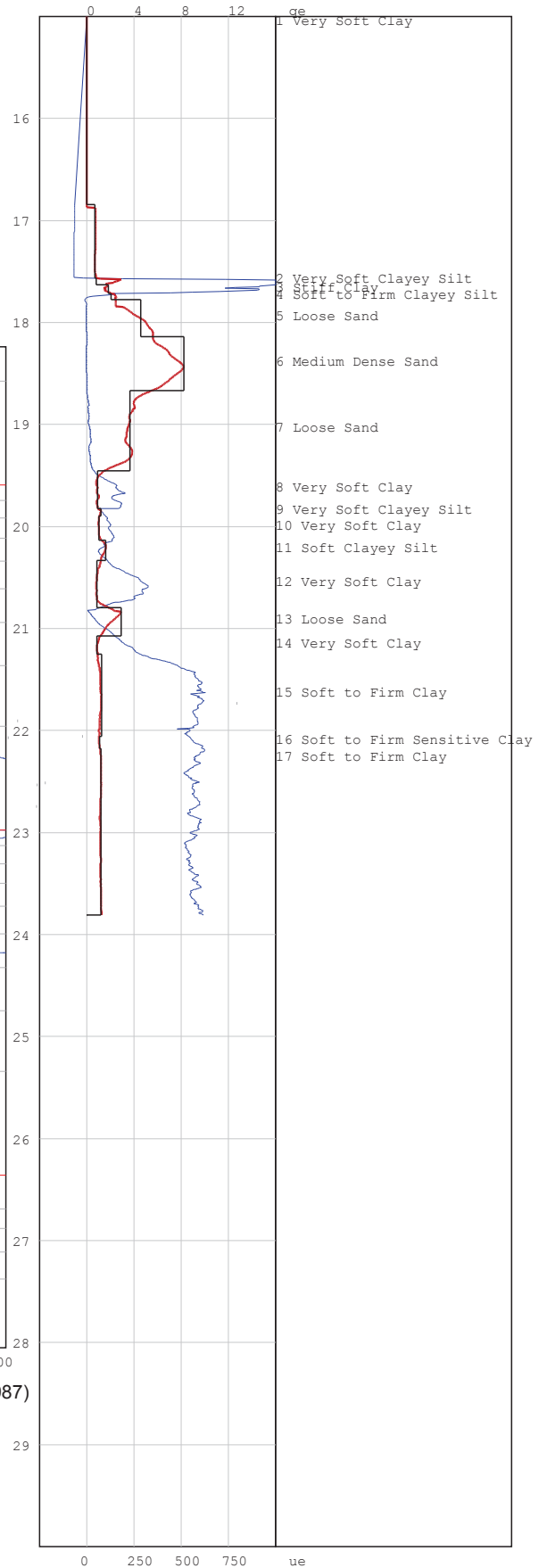
Hole No: S 03

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—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
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~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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0044

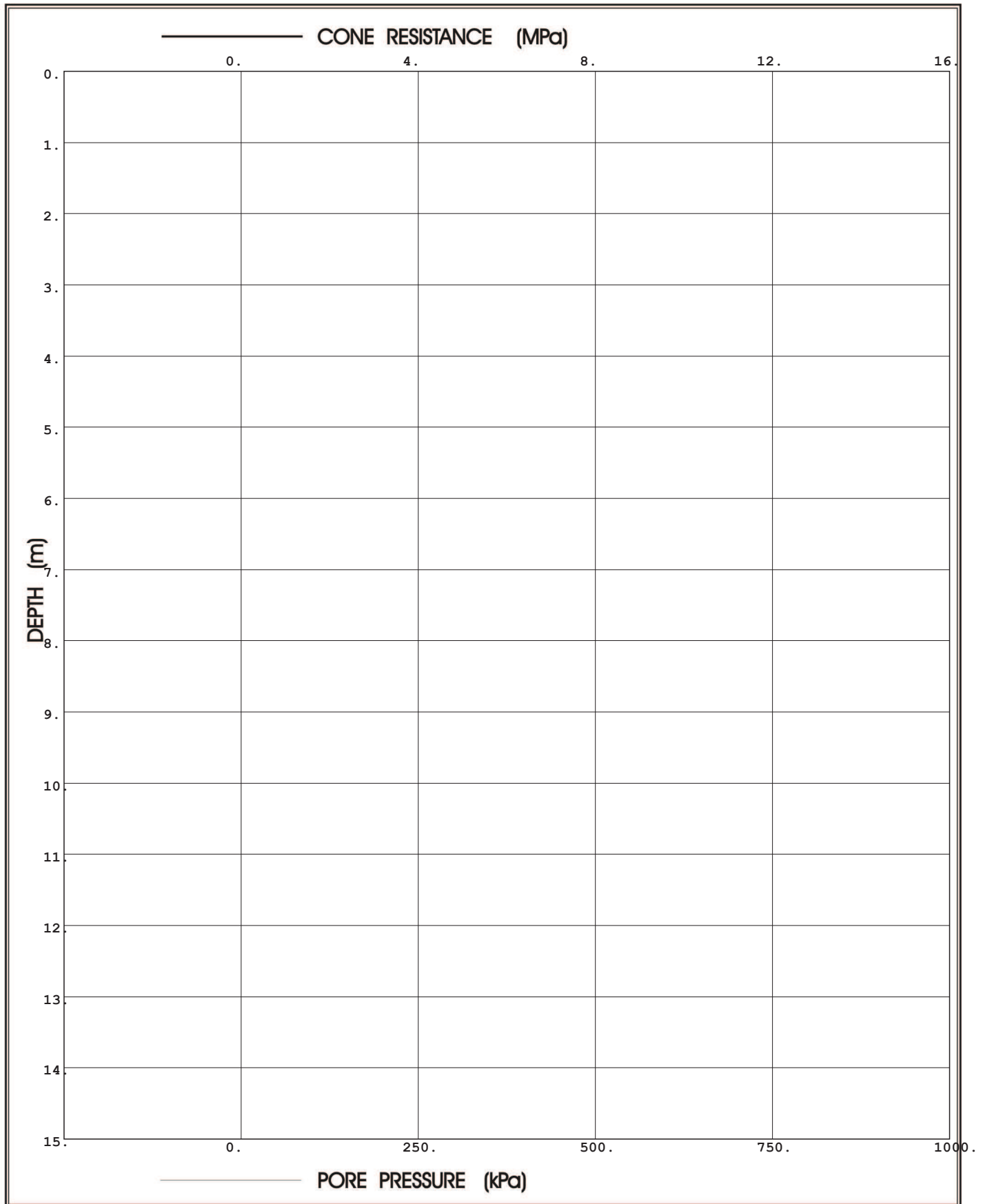
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 04

DATE: 2012/08/13

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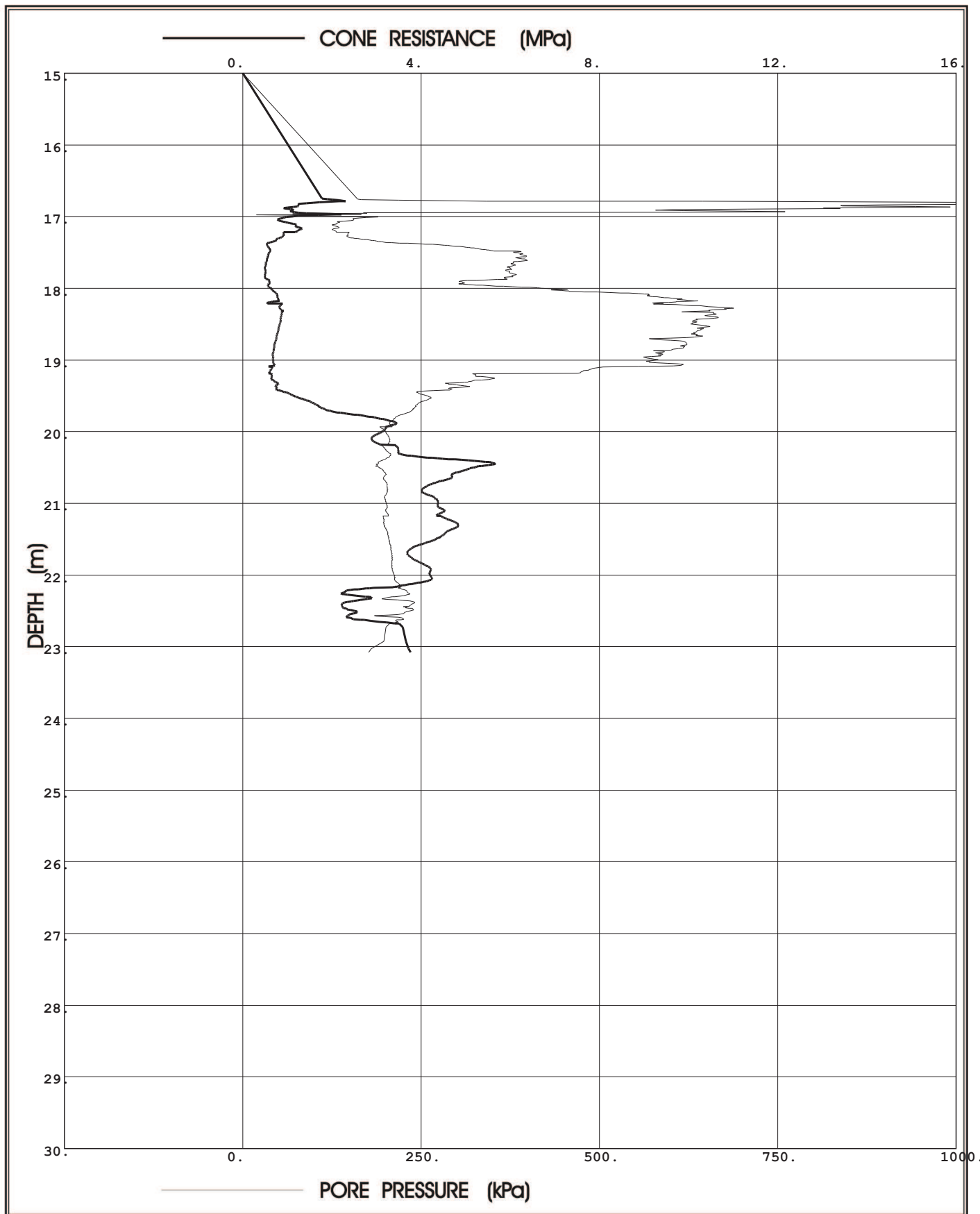
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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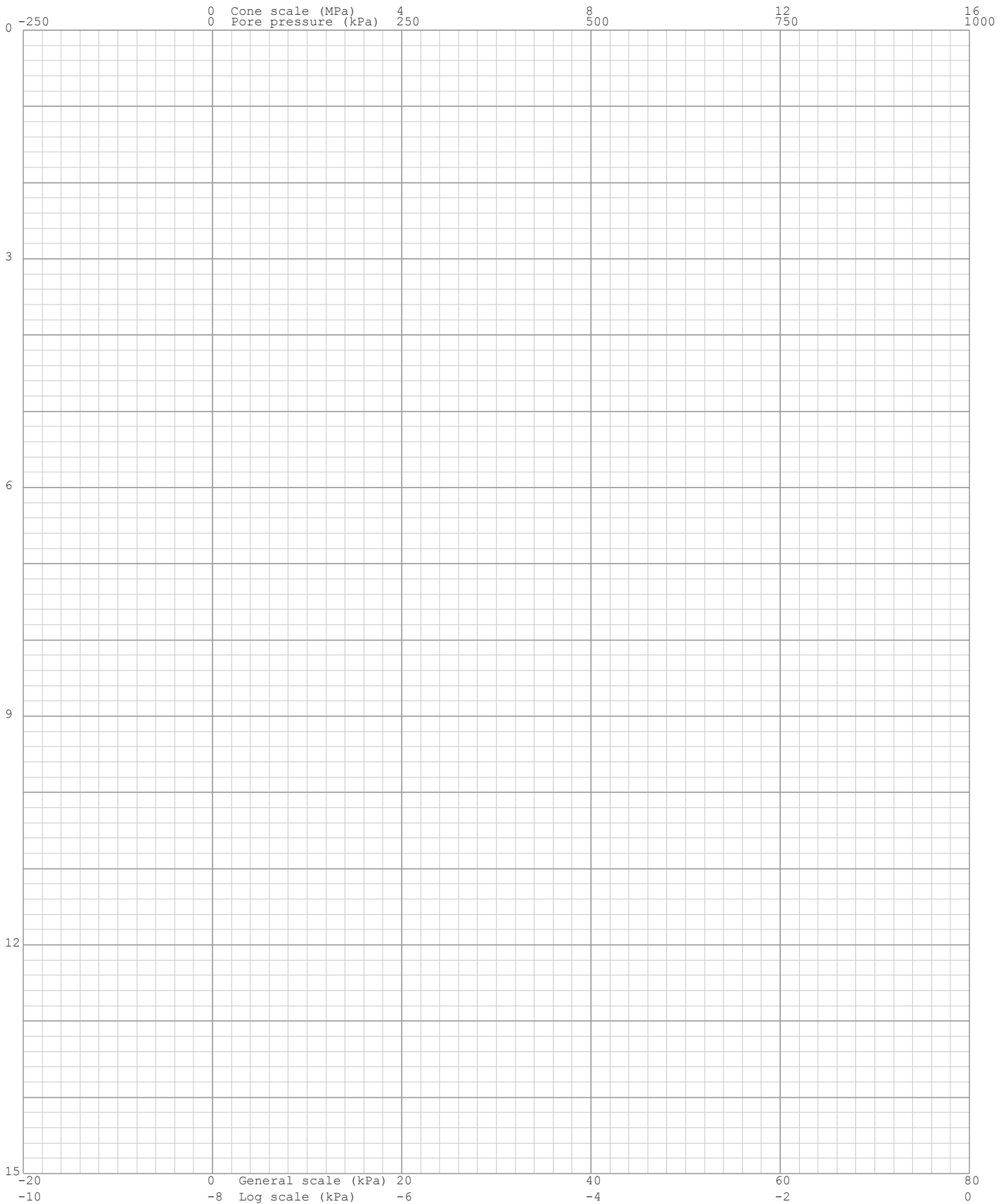
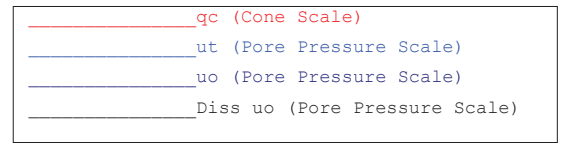
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 04

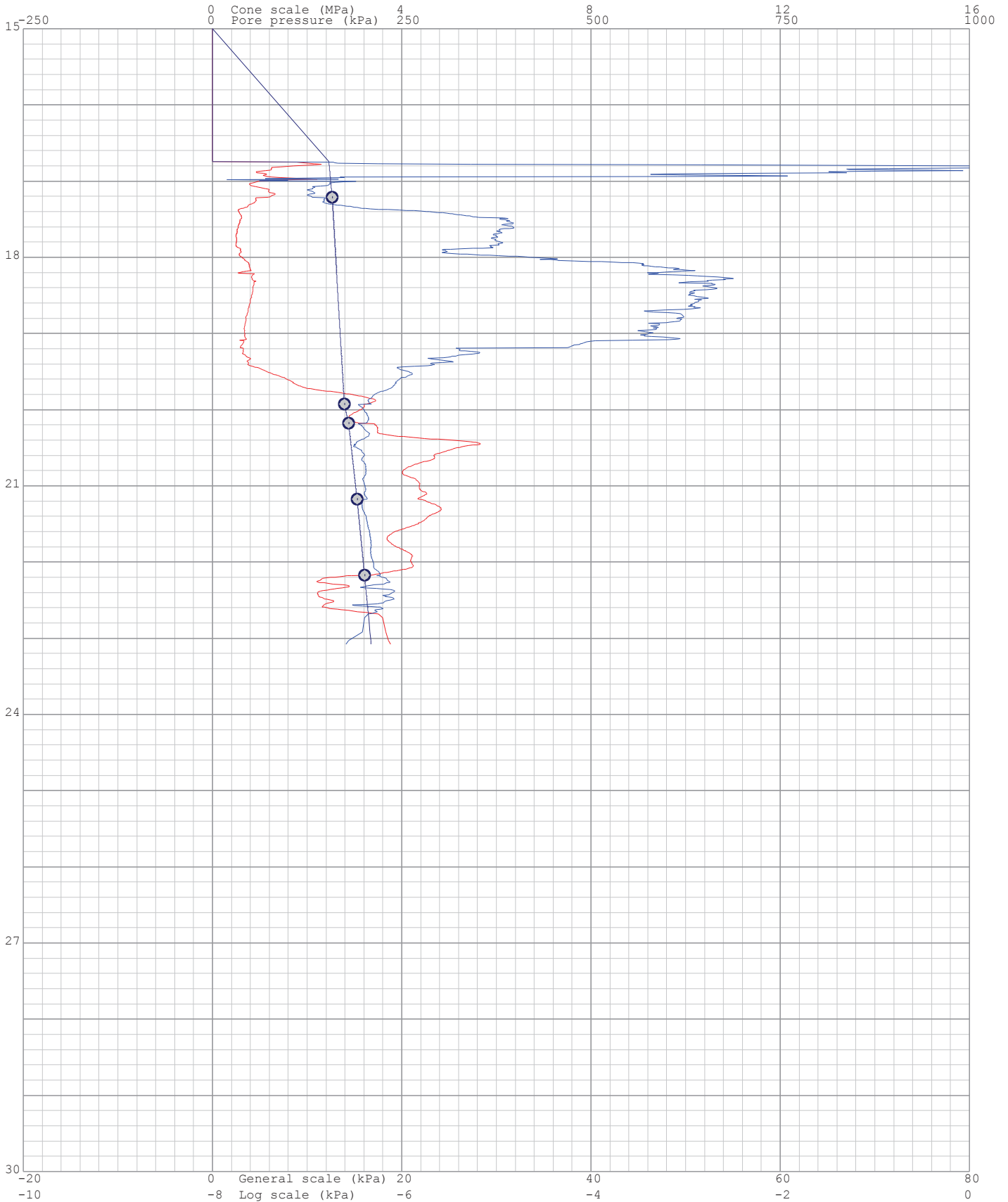
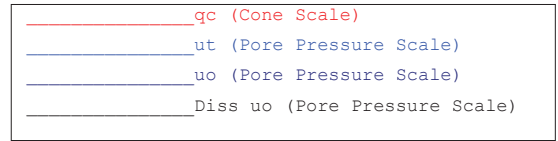
Date: 2012/08/13



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 04  
Date: 2012/08/13



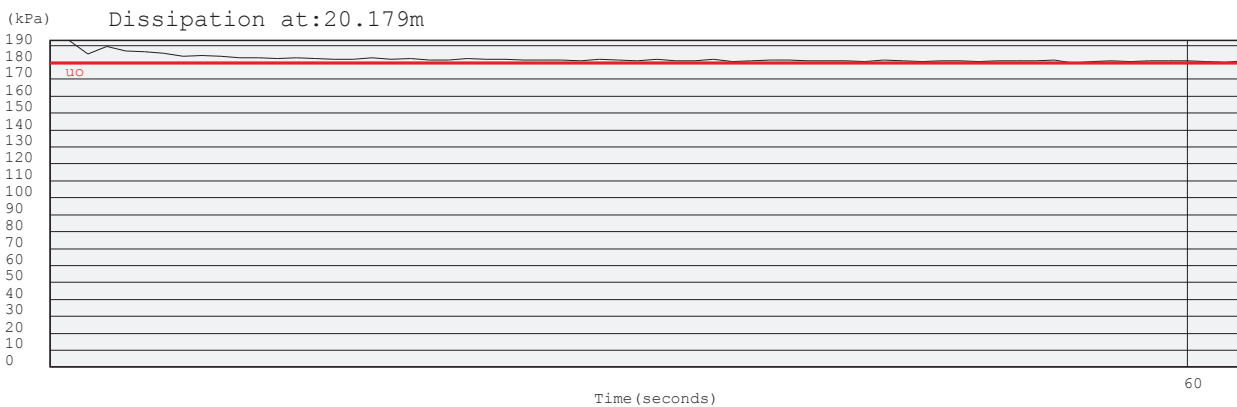
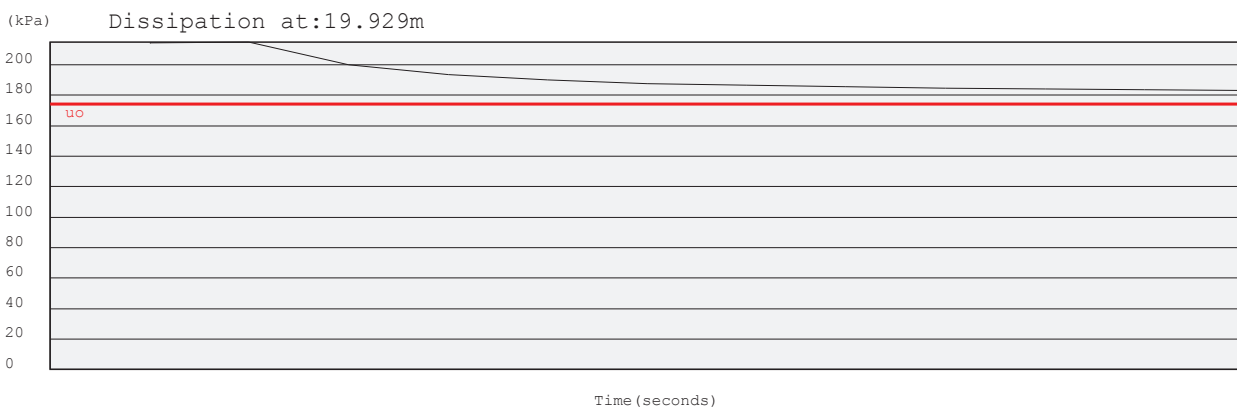
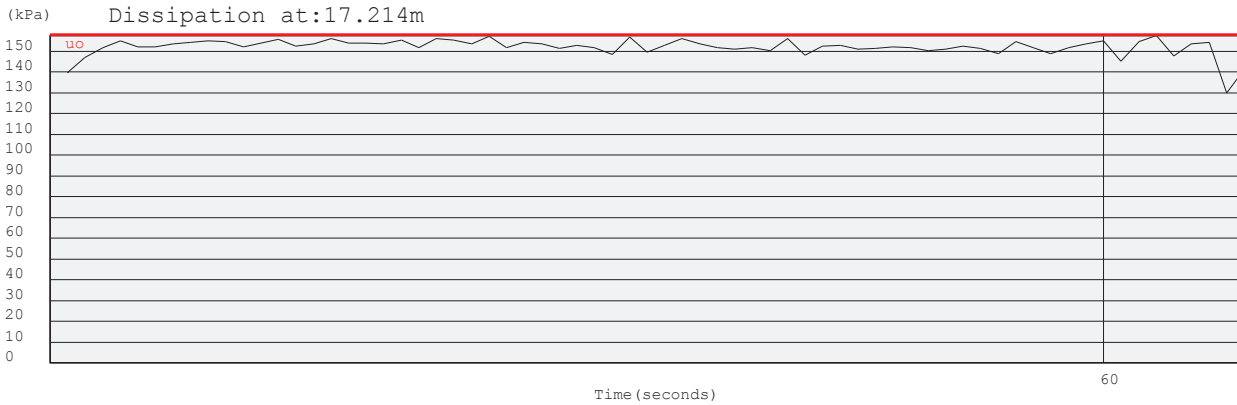
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 04

Date: 2012/08/13

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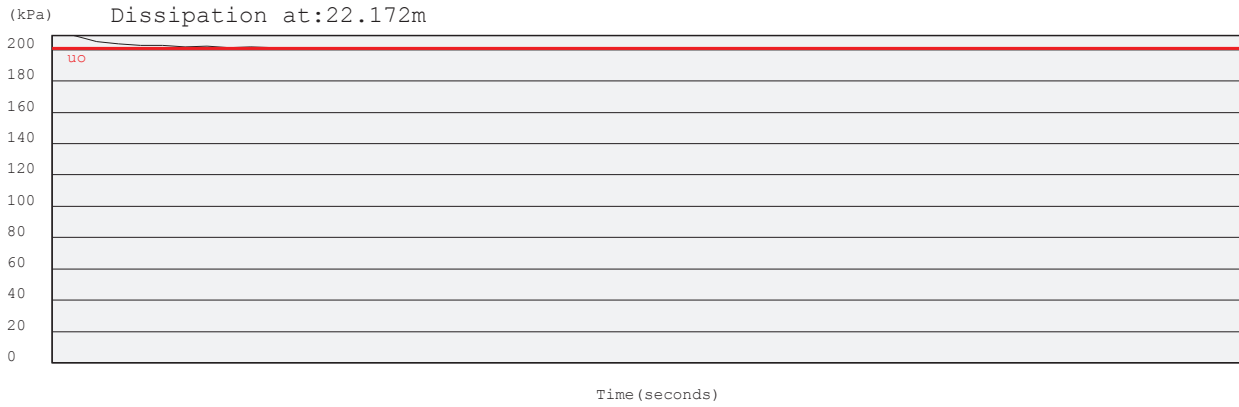
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 04

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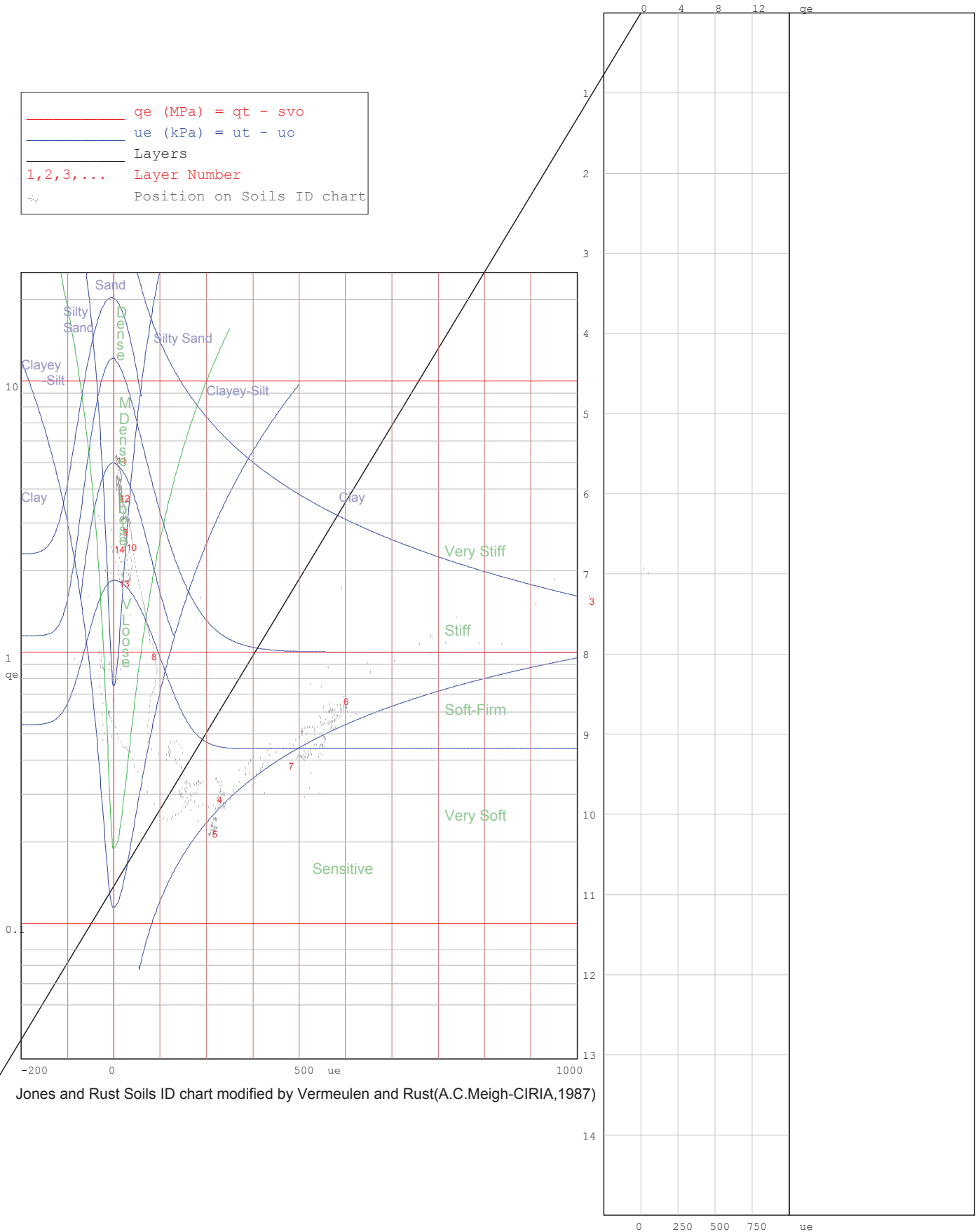
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 04

Date: 2012/08/13

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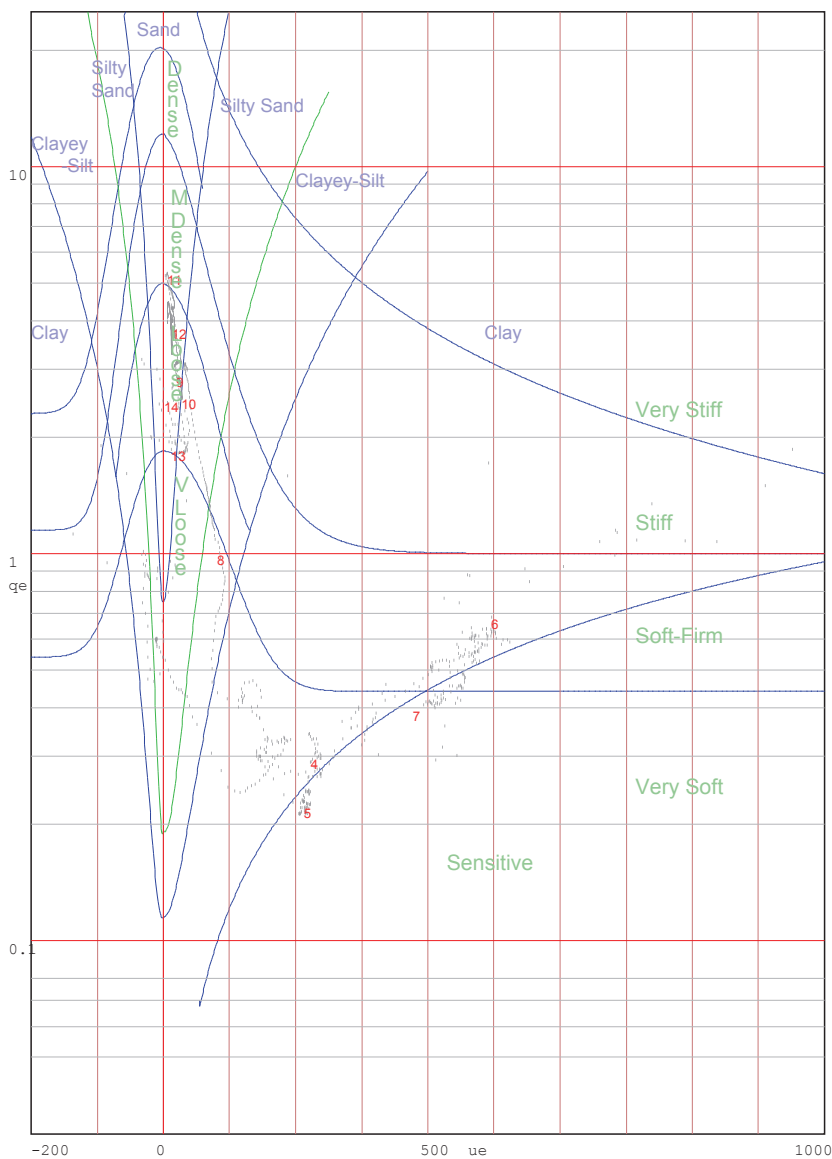
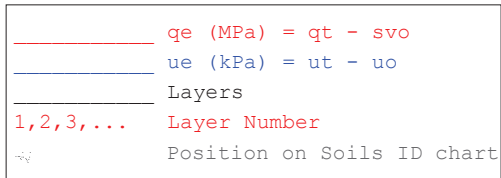


Project: Durban Harbour Piezocone Investigation for Dredging

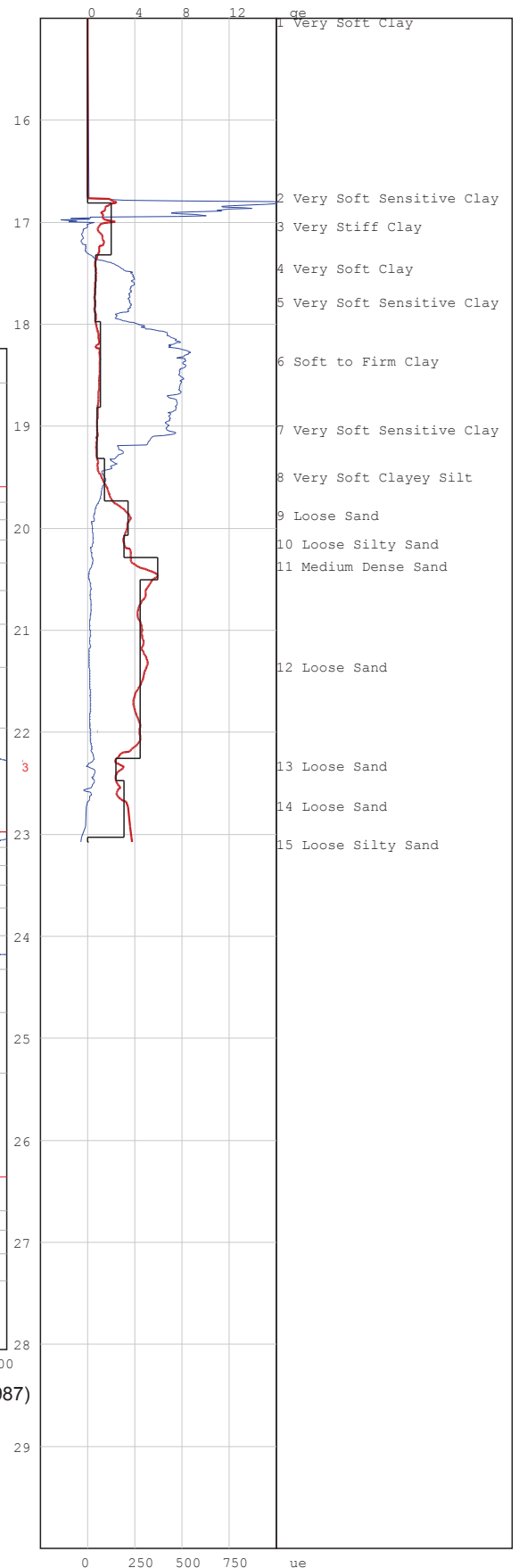
Site: Durban Harbour over water

Hole No: S 04

Date: 2012/08/13



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





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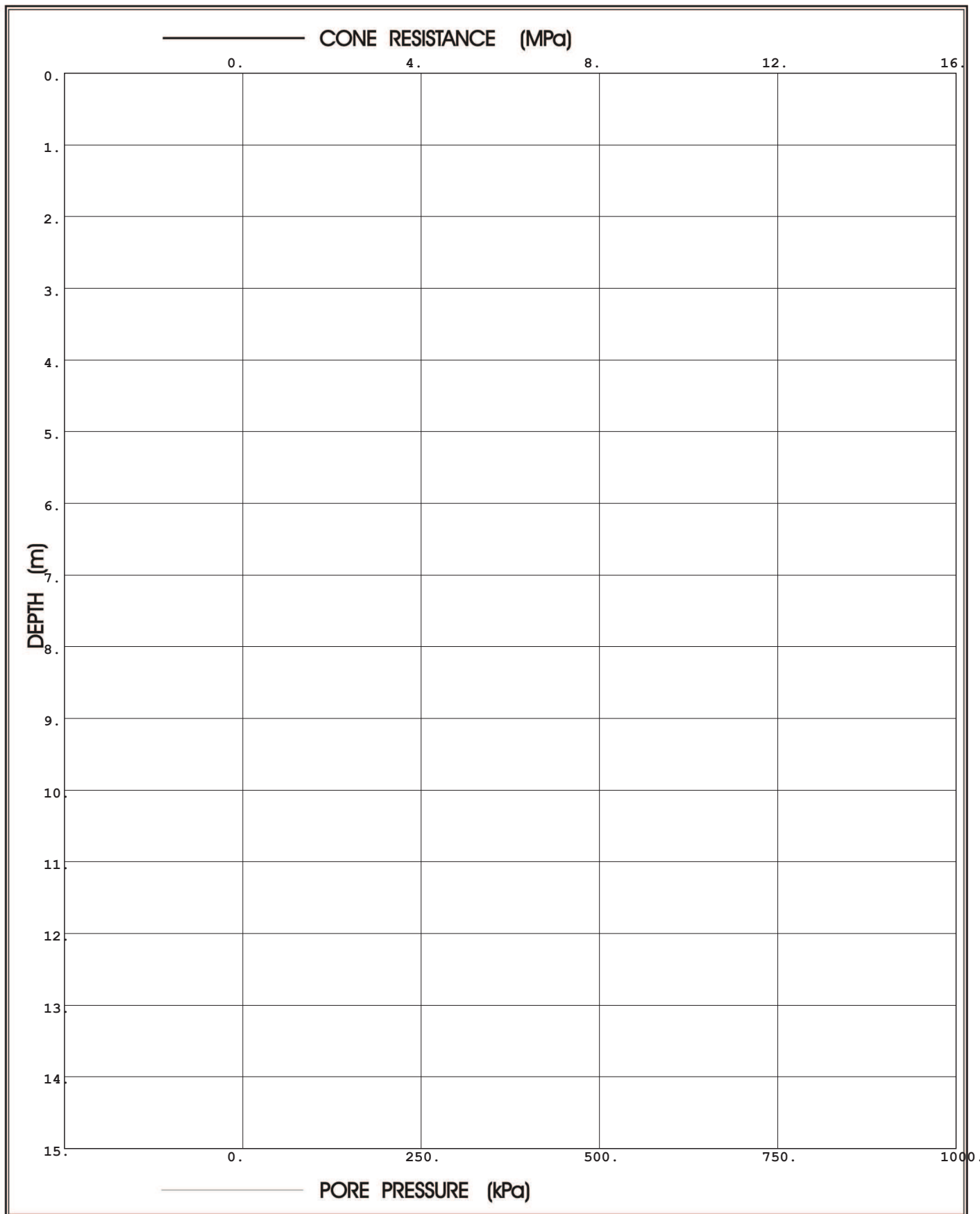
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 05

DATE: 2012/08/13

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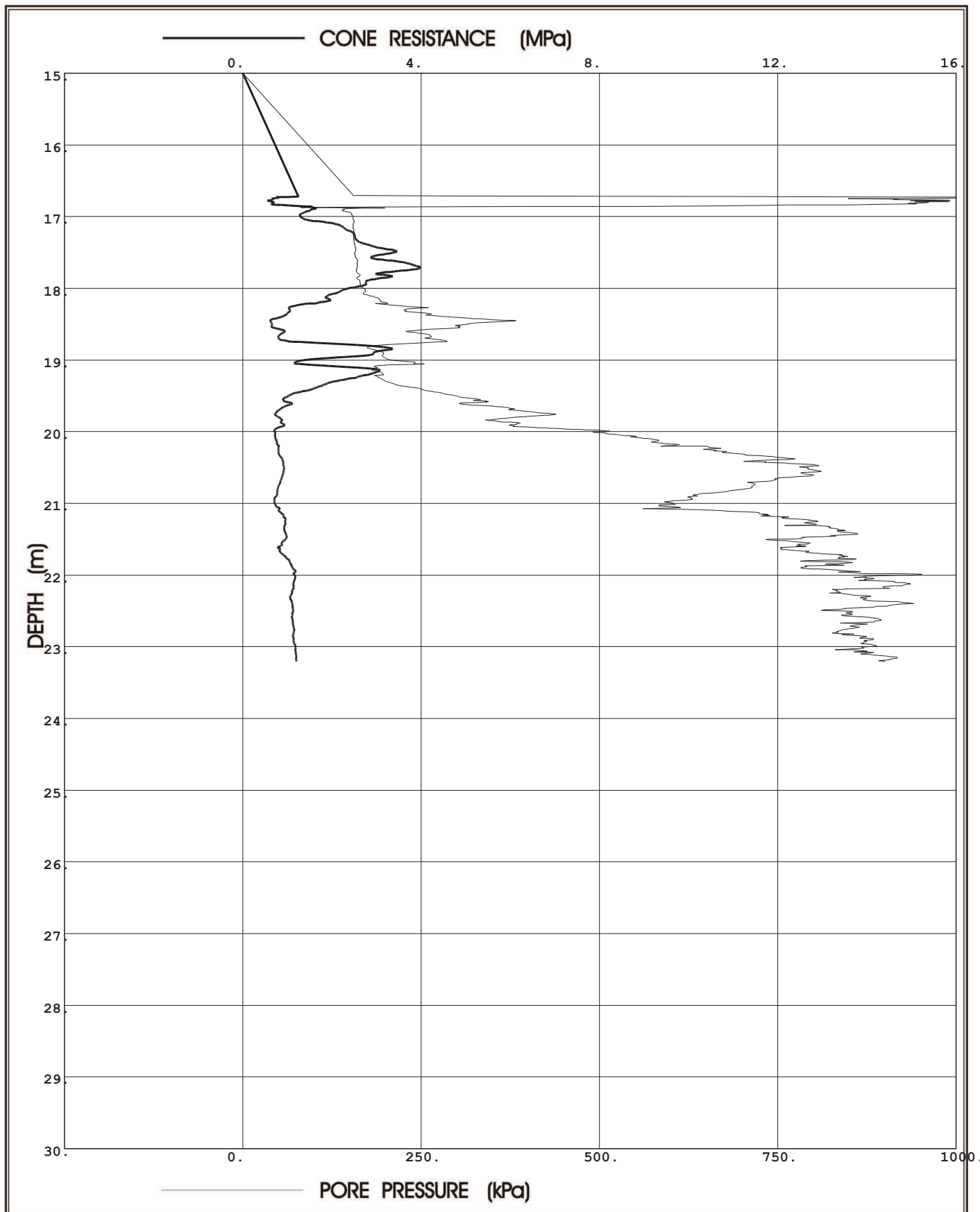
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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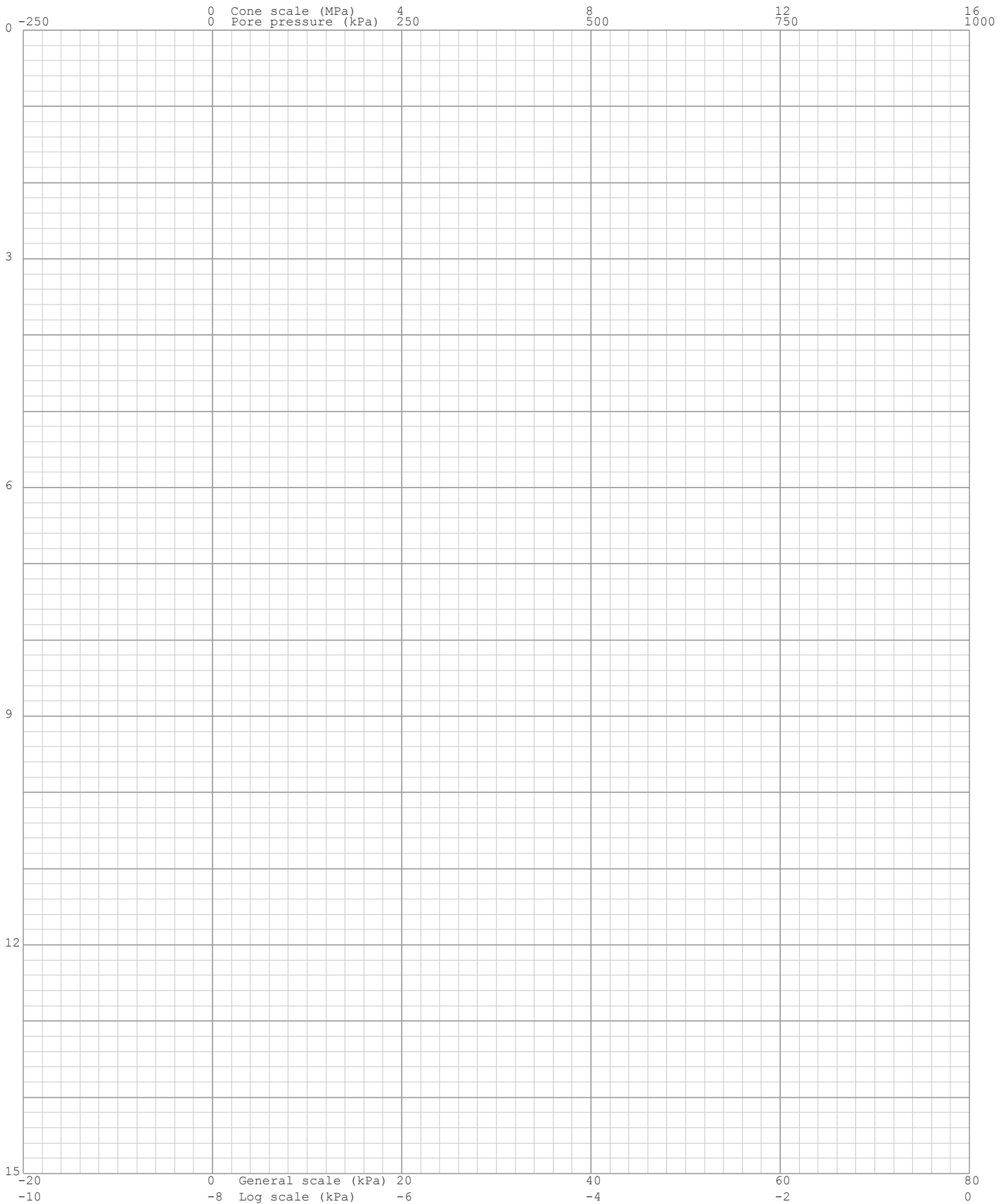
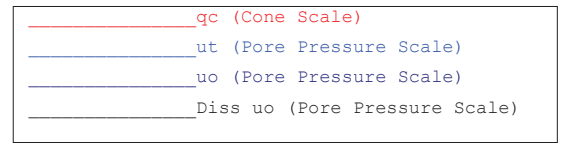
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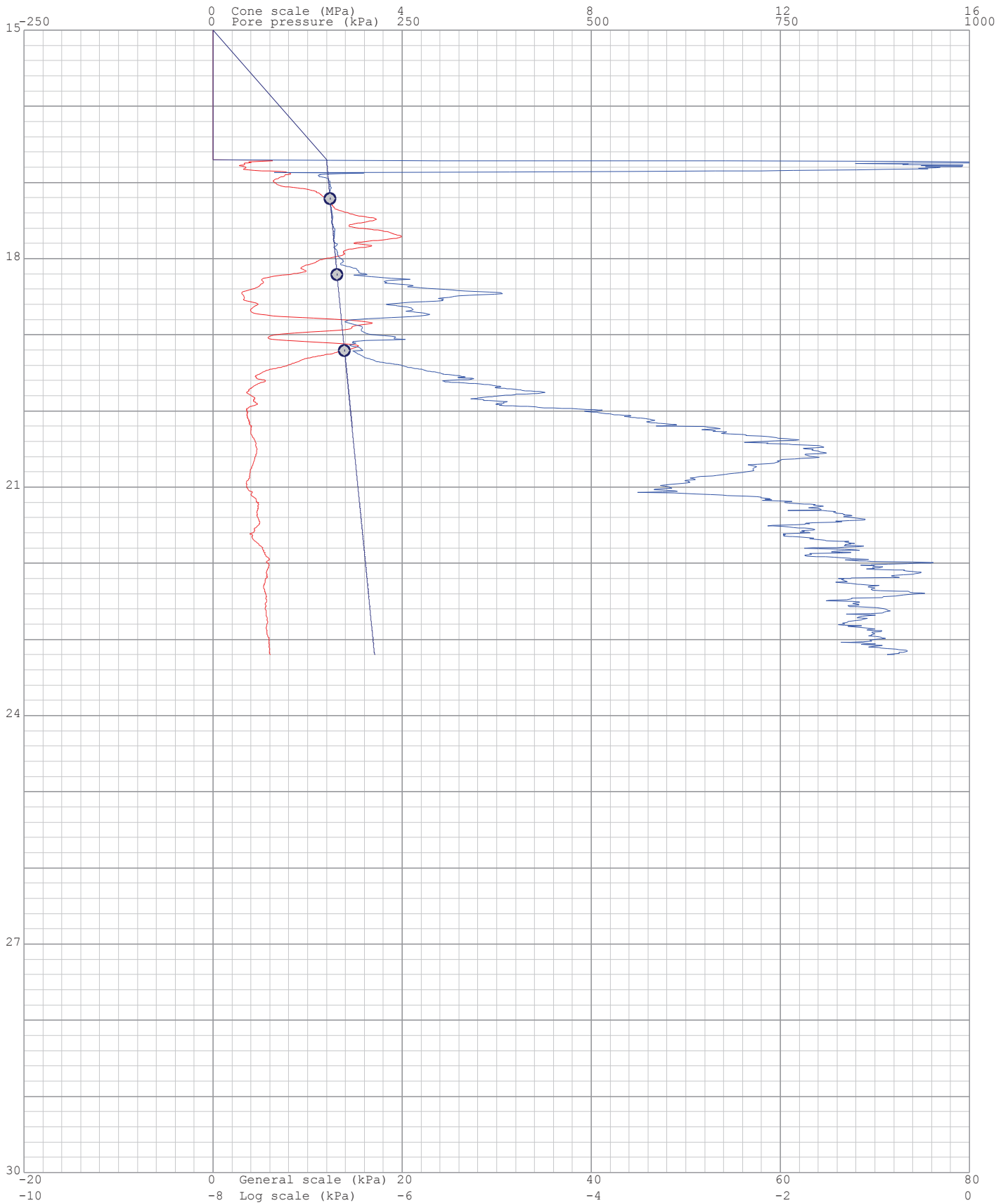
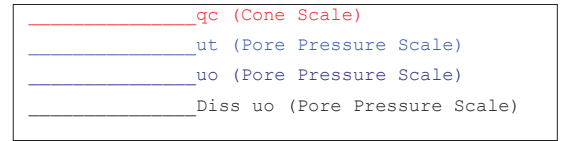
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 05

Date: 2012/08/13





Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 05

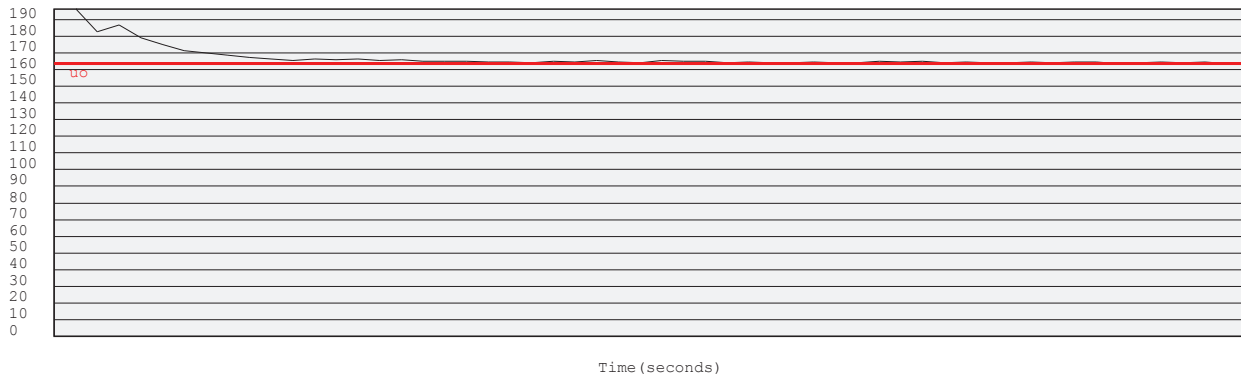
Date: 2012/08/13

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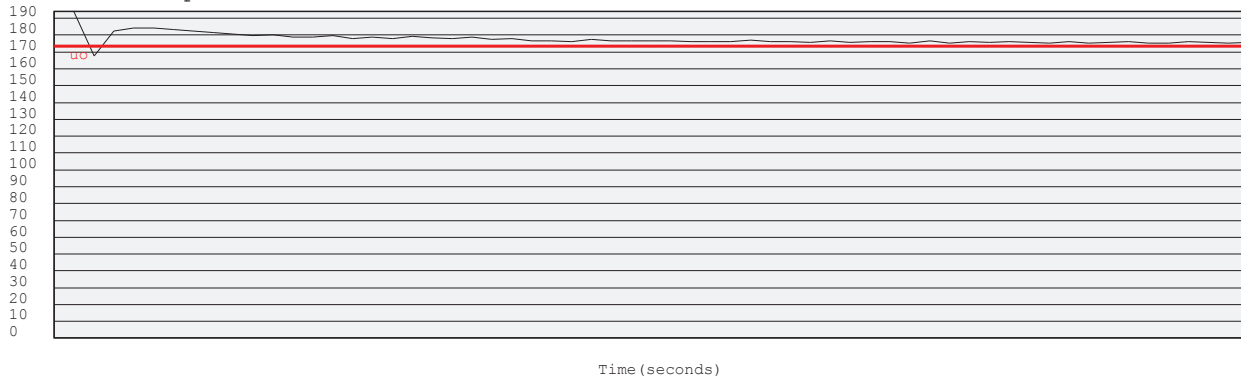
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(kPa) Dissipation at: 18.209m



(kPa) Dissipation at: 19.207m

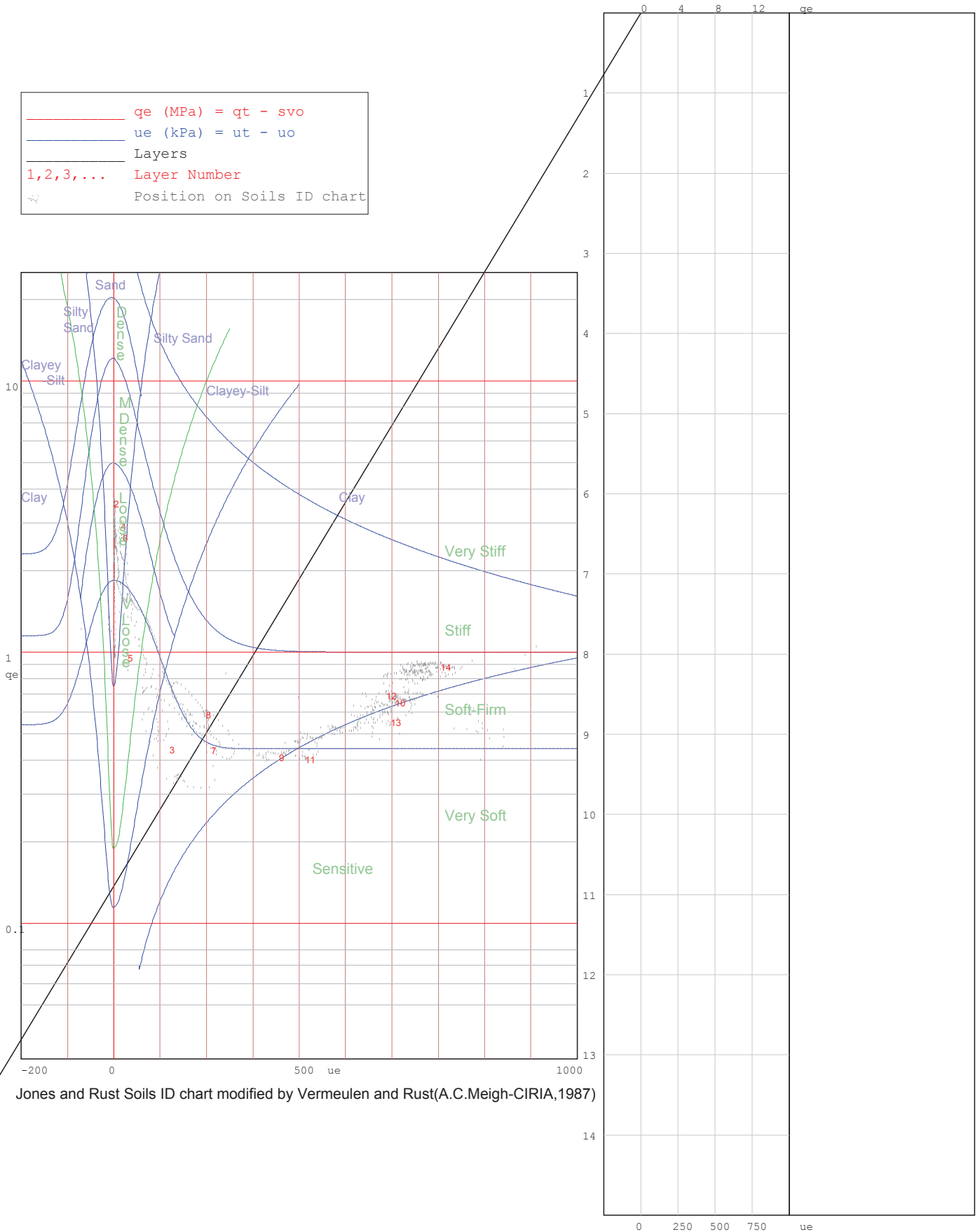
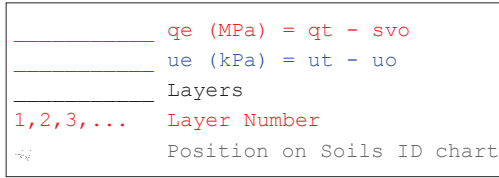


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 05

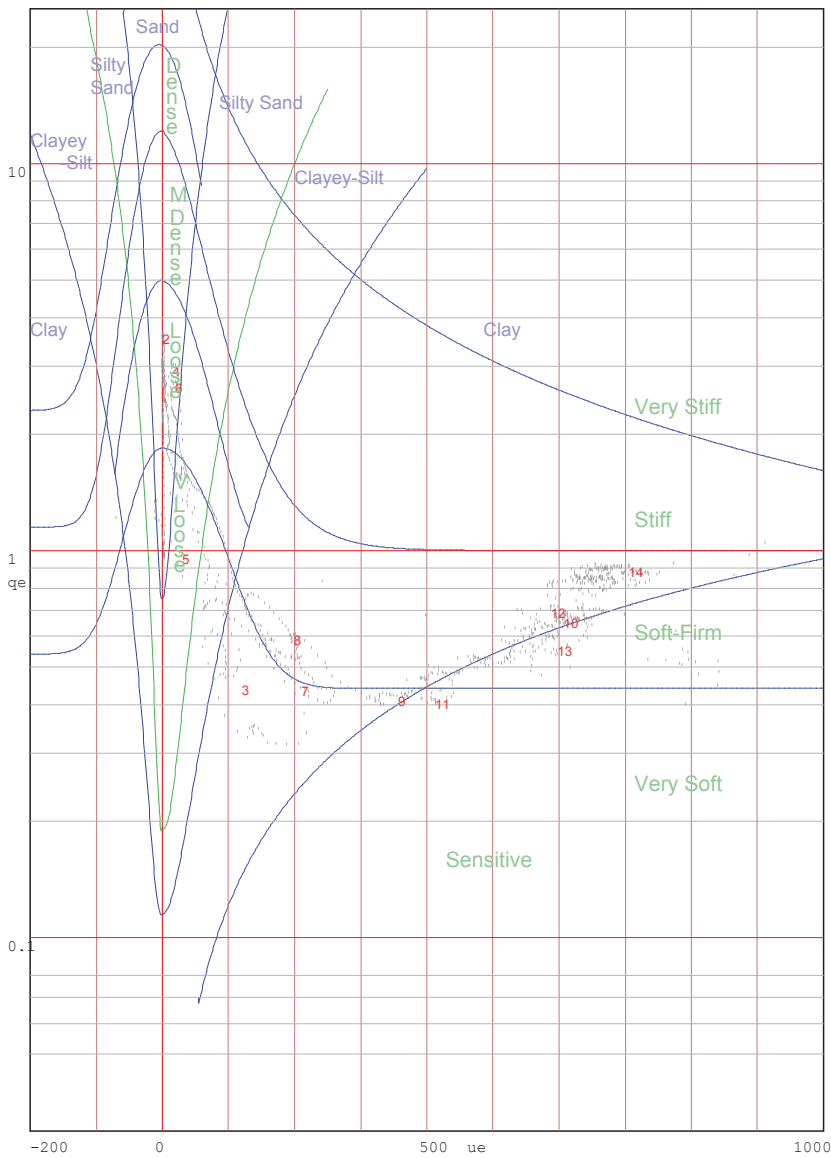
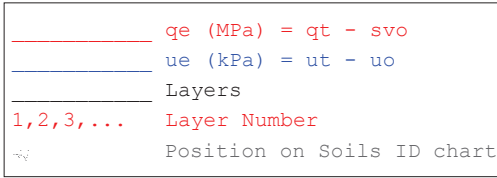
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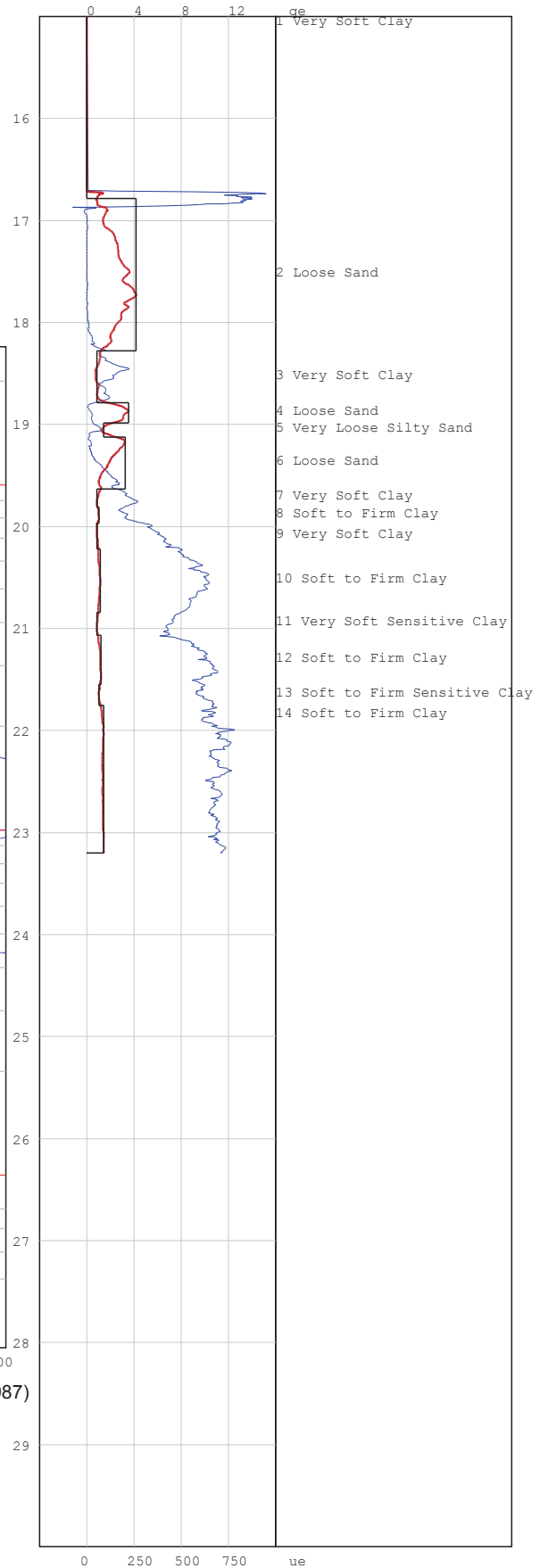
Site: Durban Harbour over water

Hole No: S 05

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



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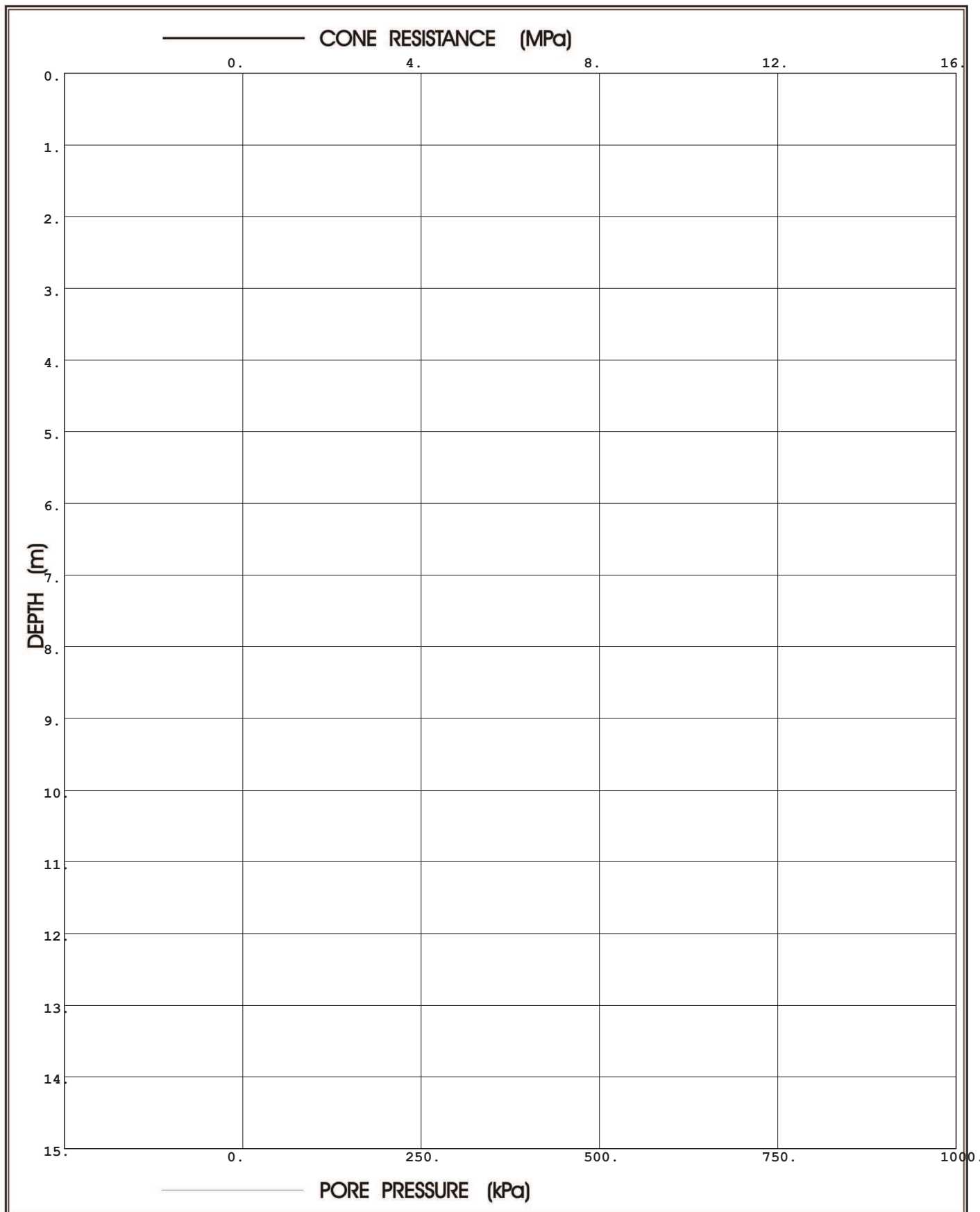
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 06

DATE: 2012/08/14

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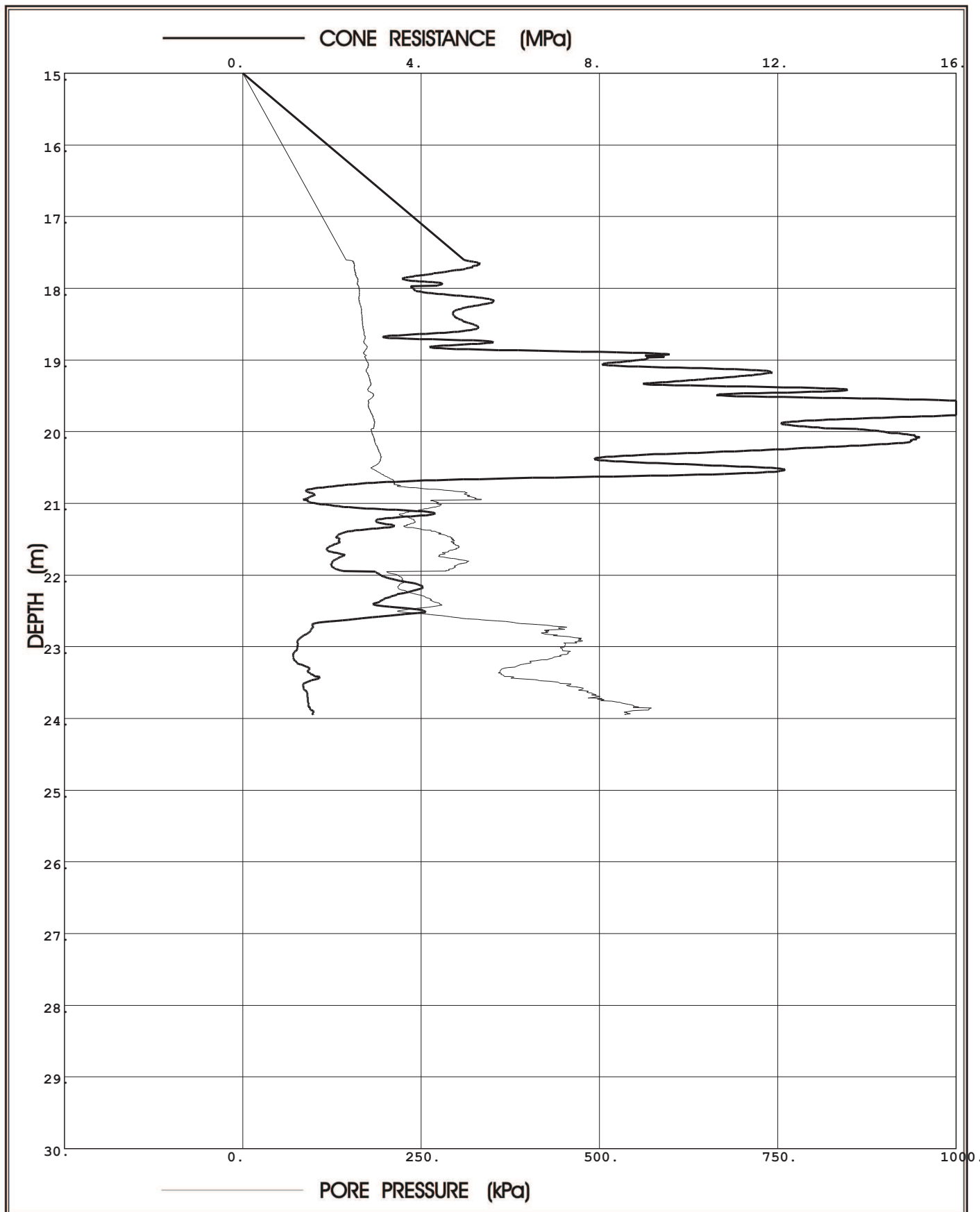
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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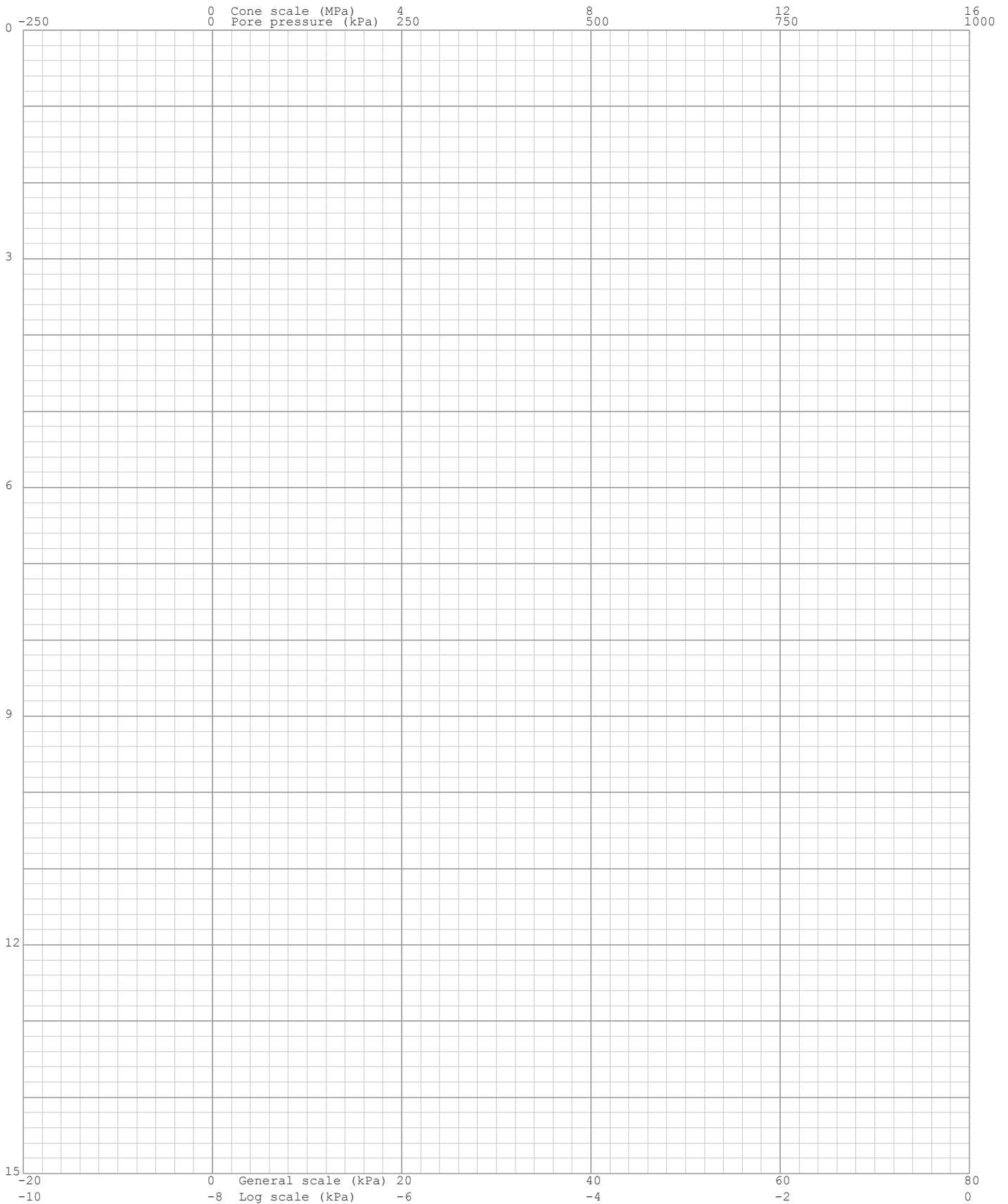
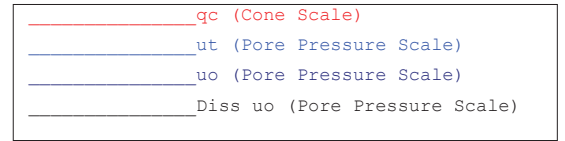
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 06

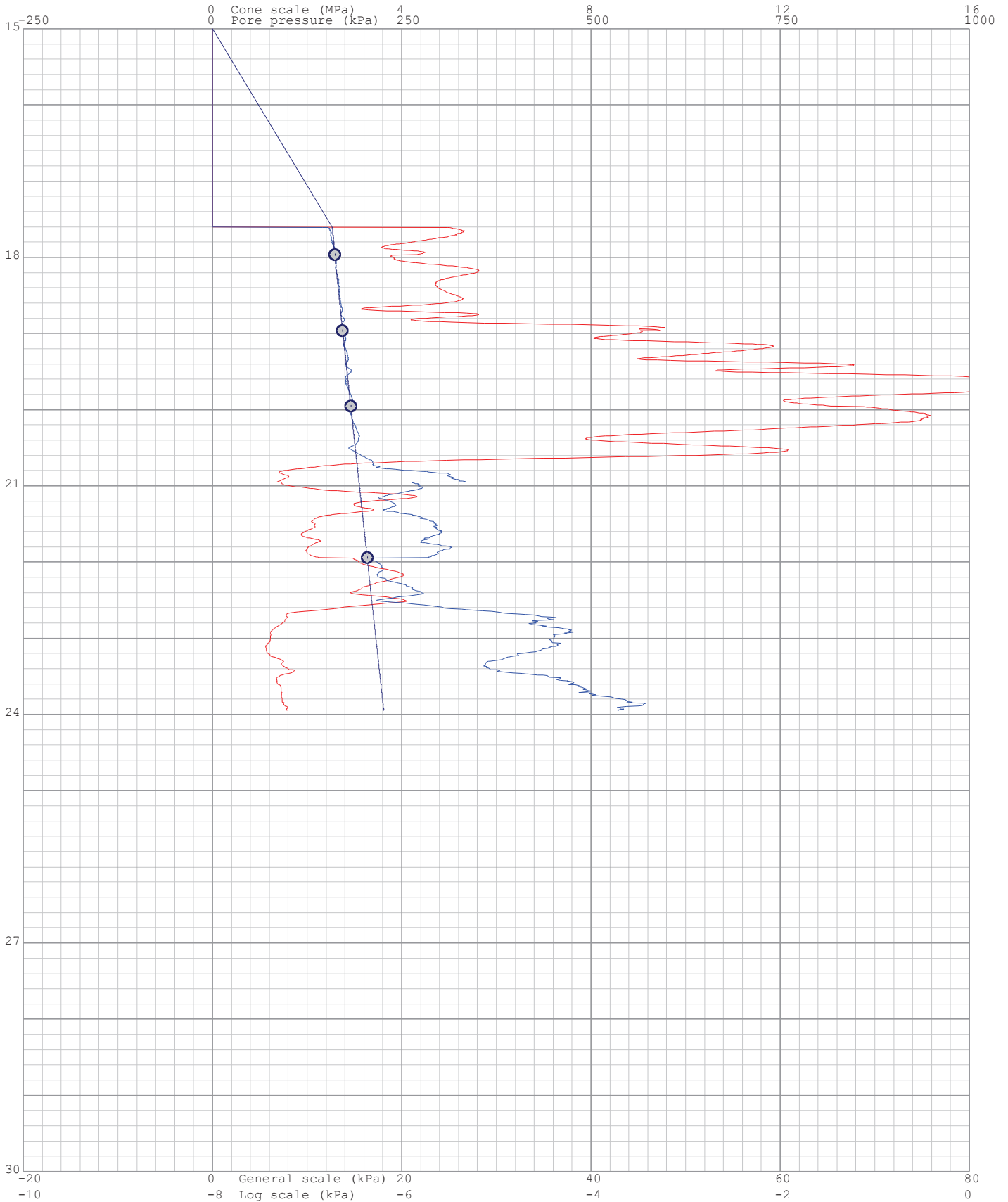
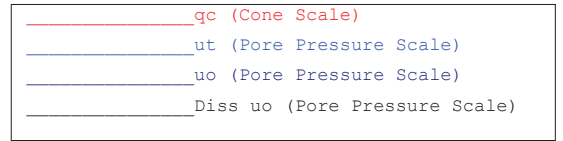
Date: 2012/08/14



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 06  
Date: 2012/08/14



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 06

Date: 2012/08/14

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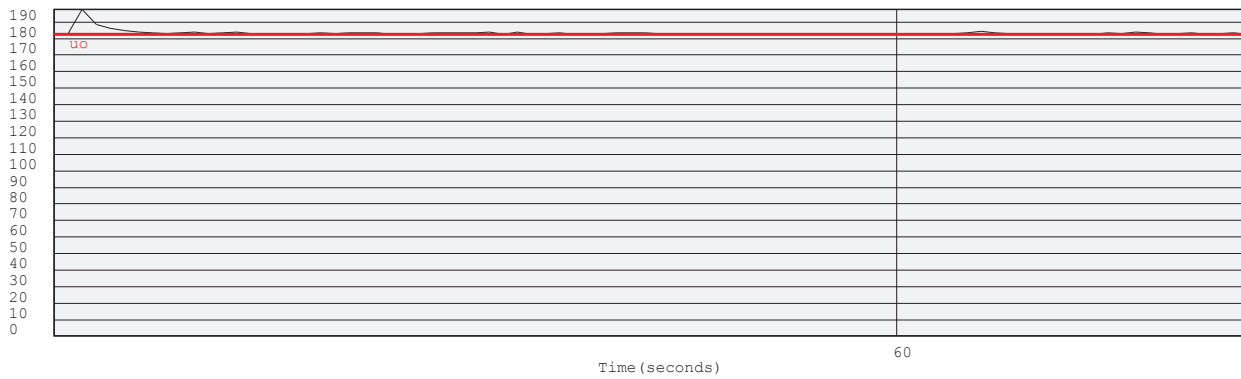
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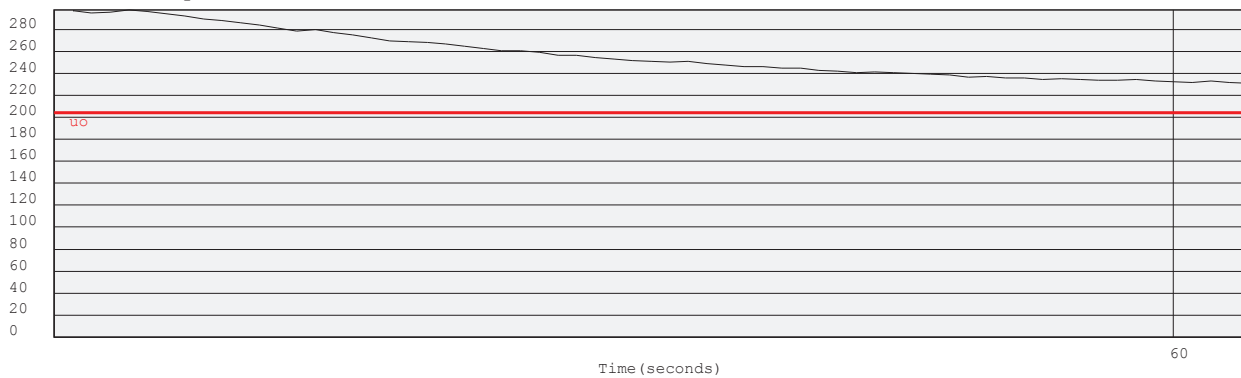
(kPa) Dissipation at:18.96m



(kPa) Dissipation at:19.956m



(kPa) Dissipation at:21.944m

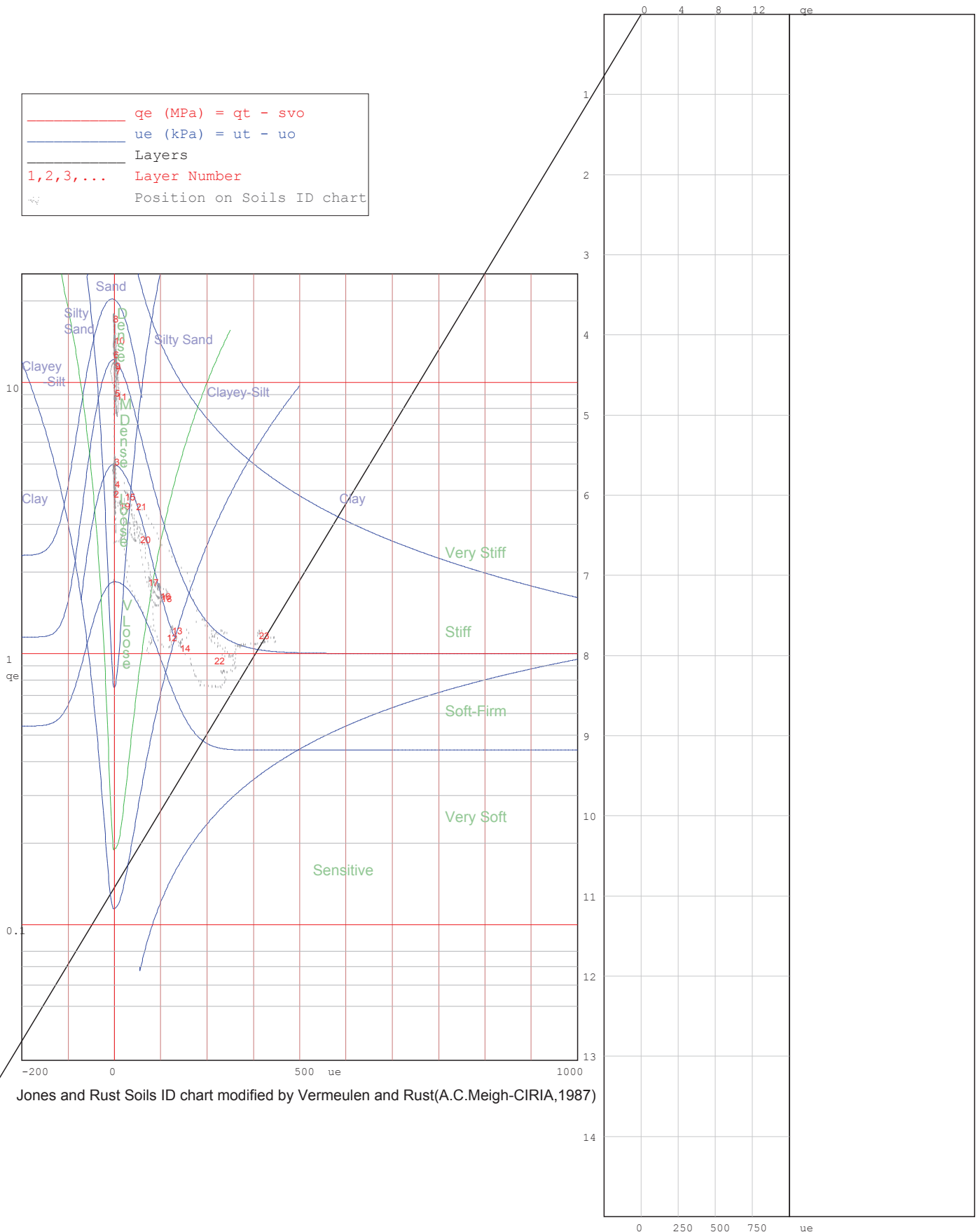
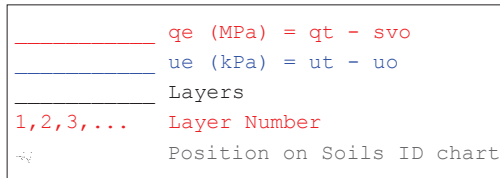


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 06

Date: 2012/08/14



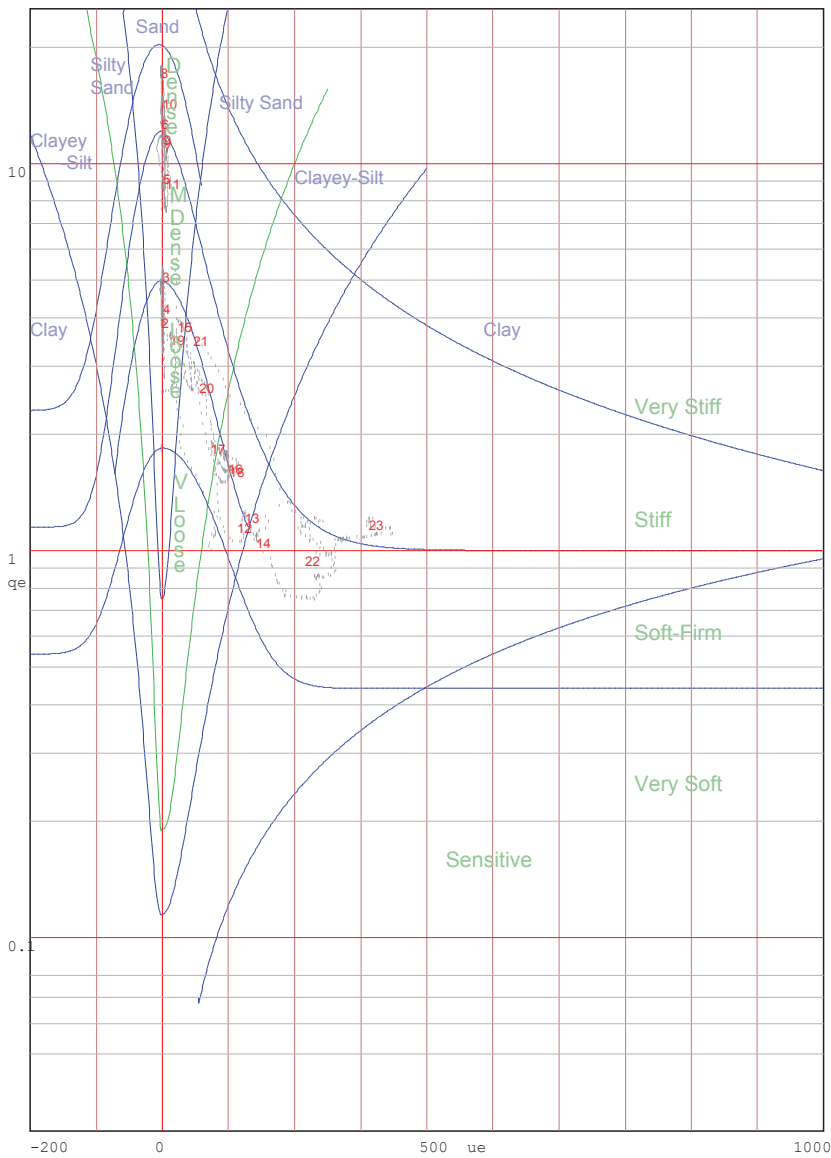
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

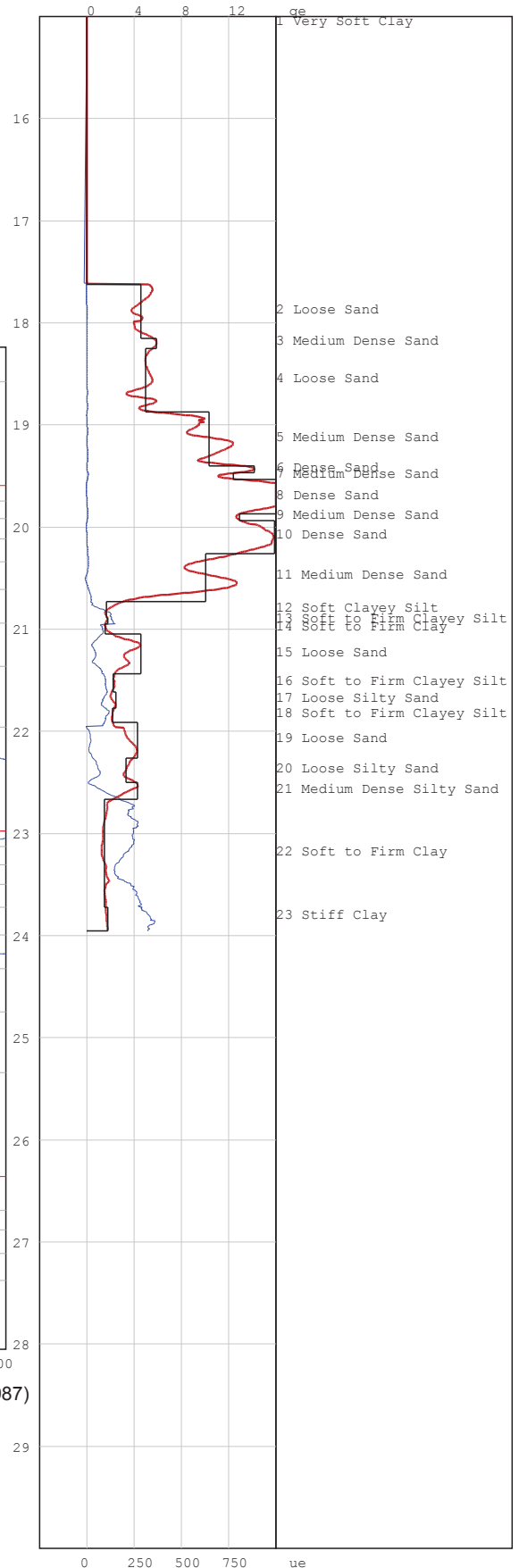
Hole No: S 06

Date: 2012/08/14

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 — Layers  
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 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



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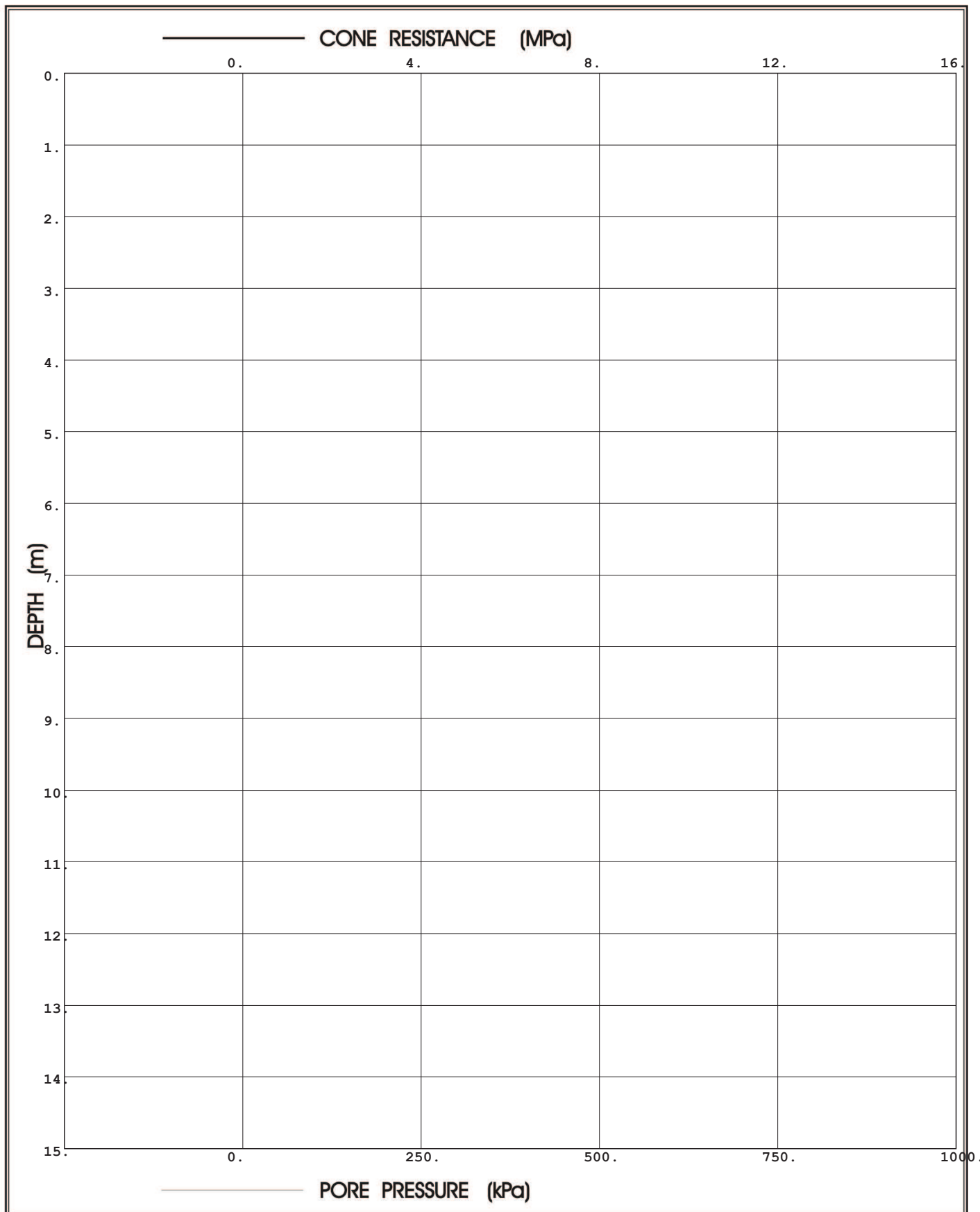
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

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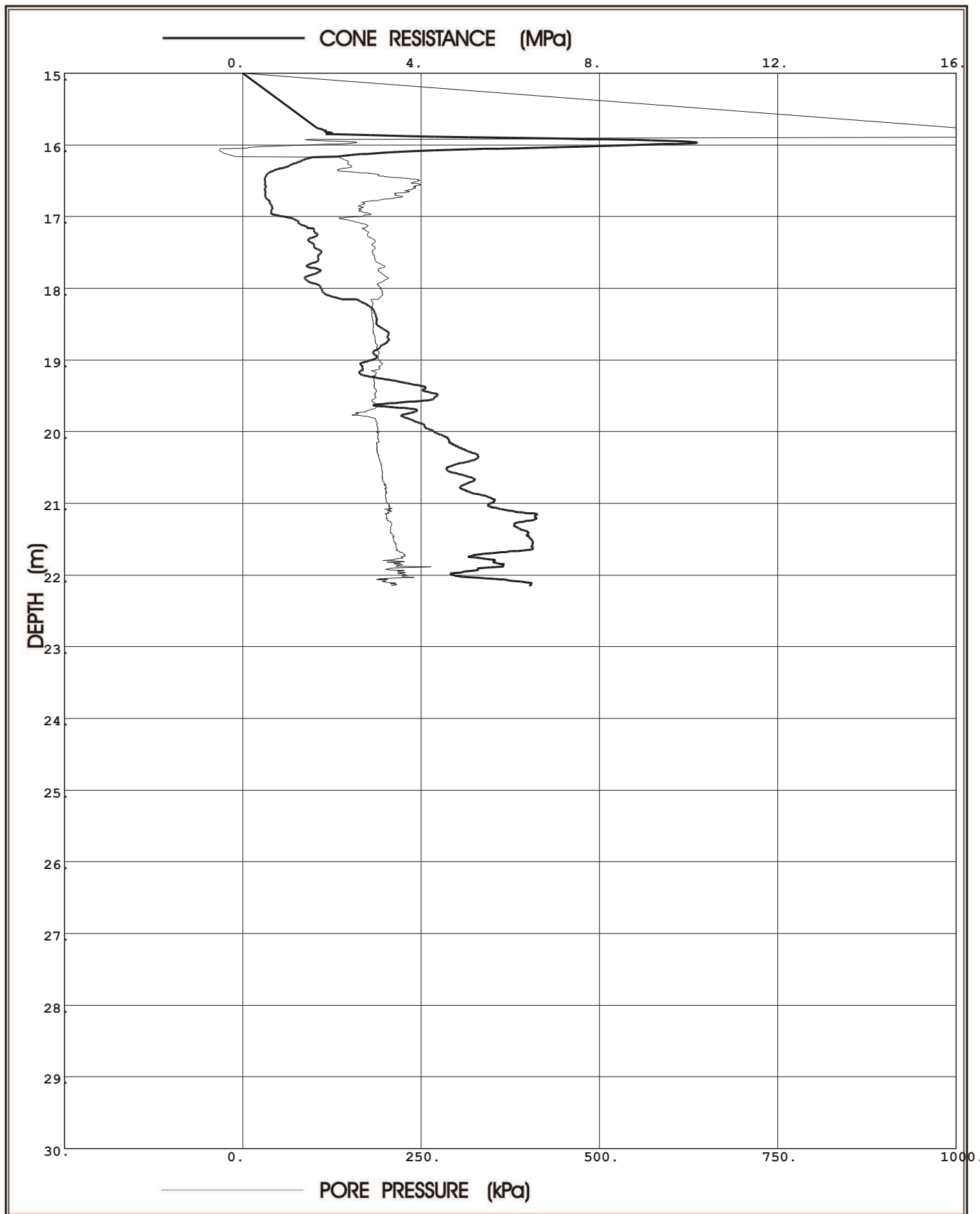
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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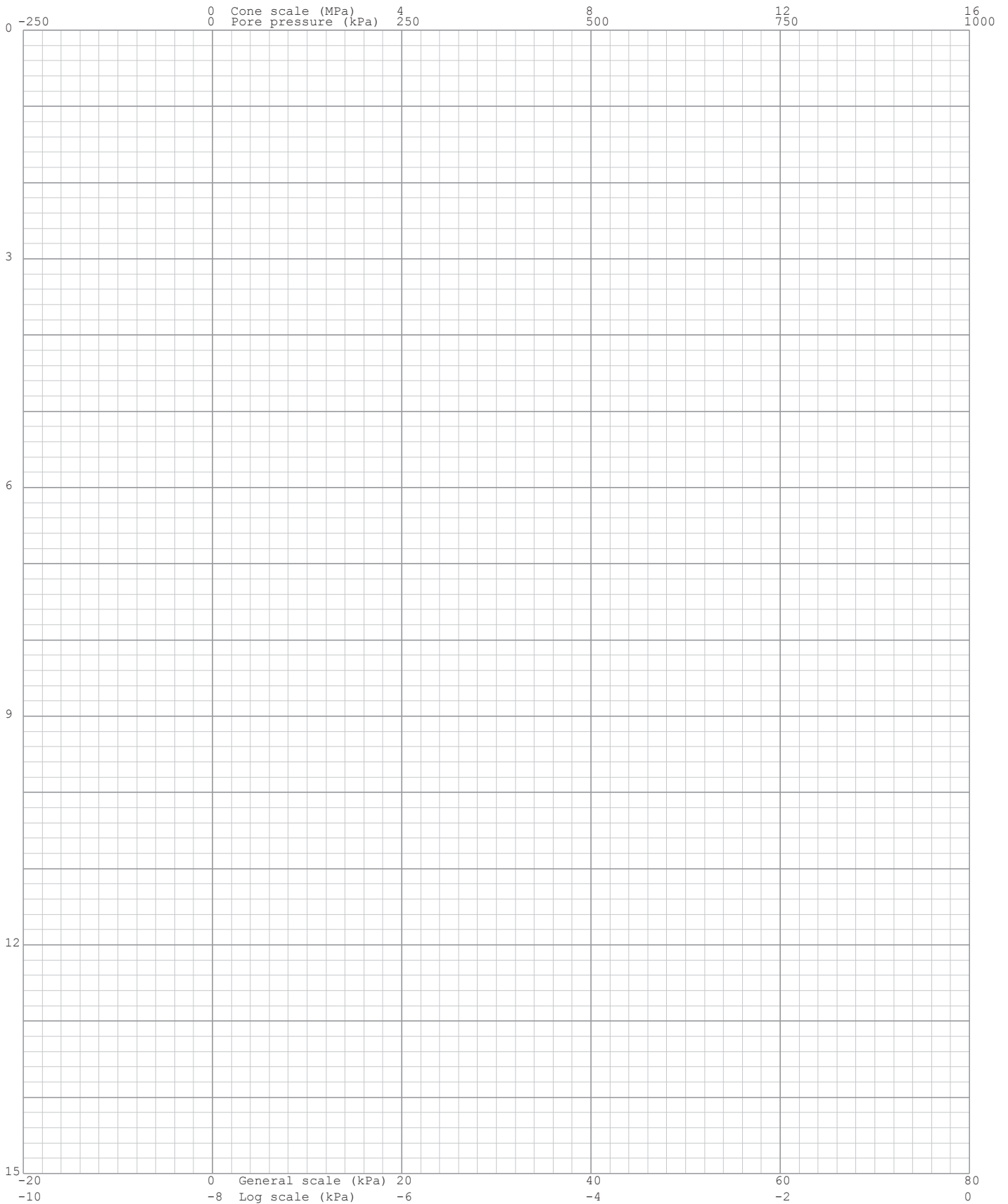
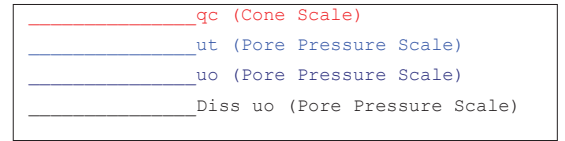


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 07

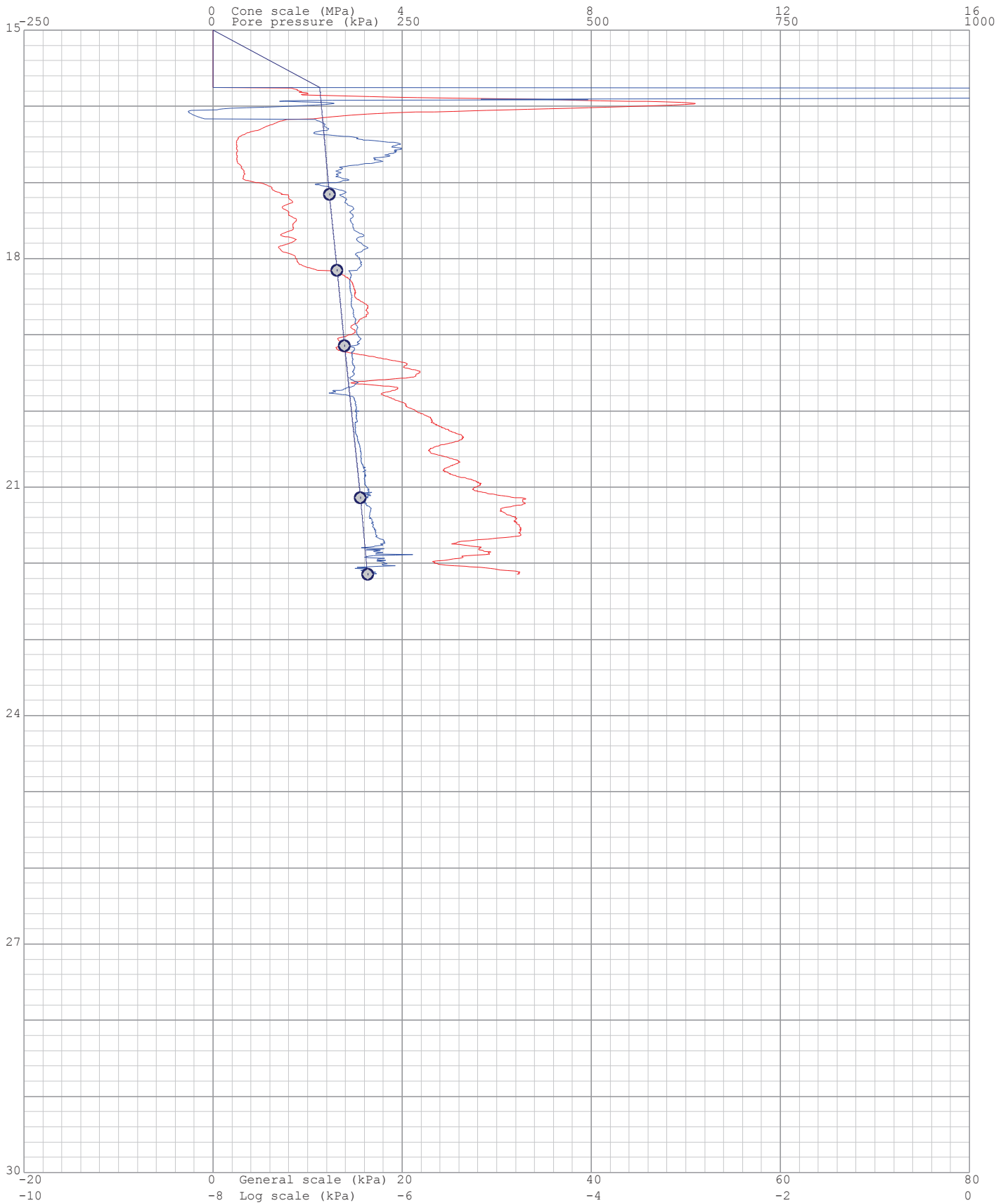
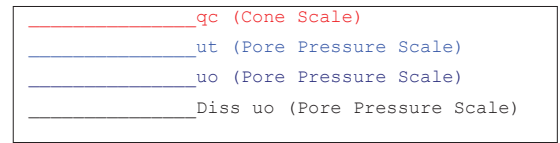
Date: 2012/08/16



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 07  
Date: 2012/08/16



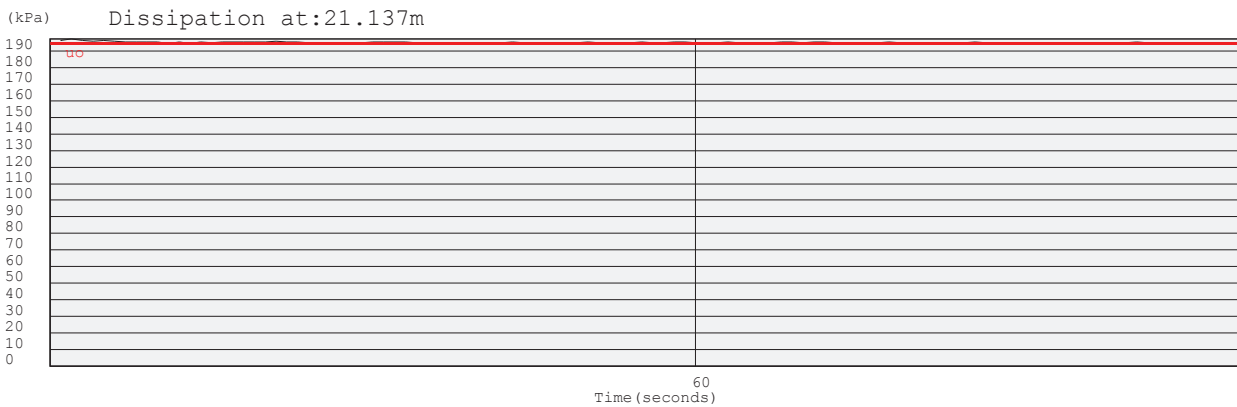
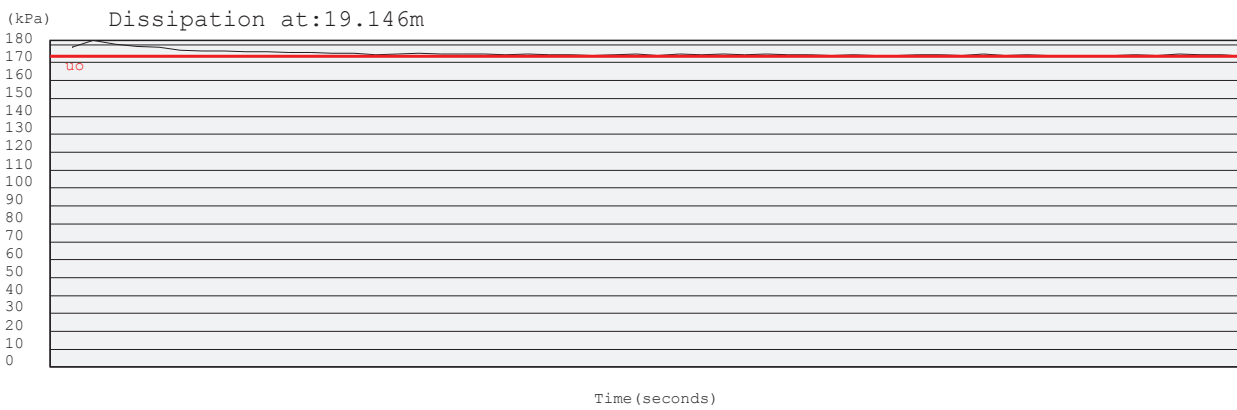
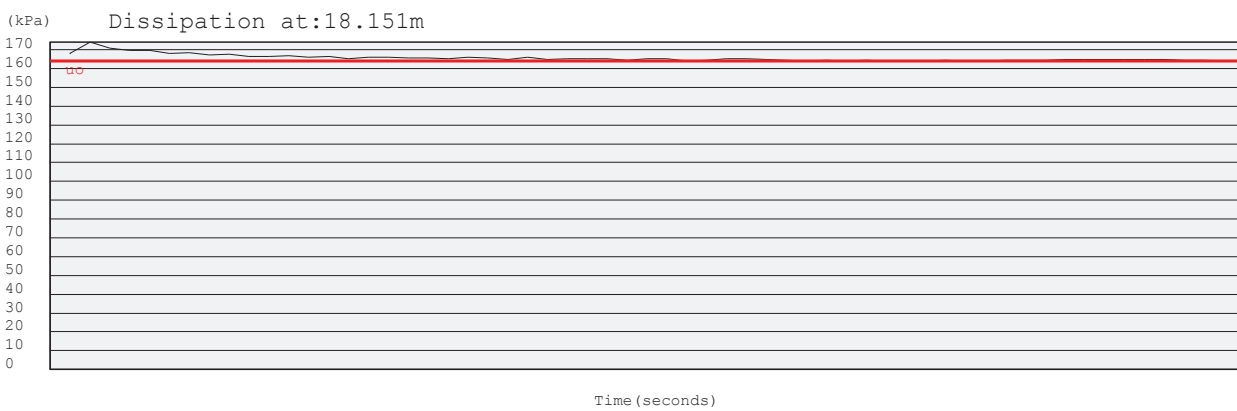
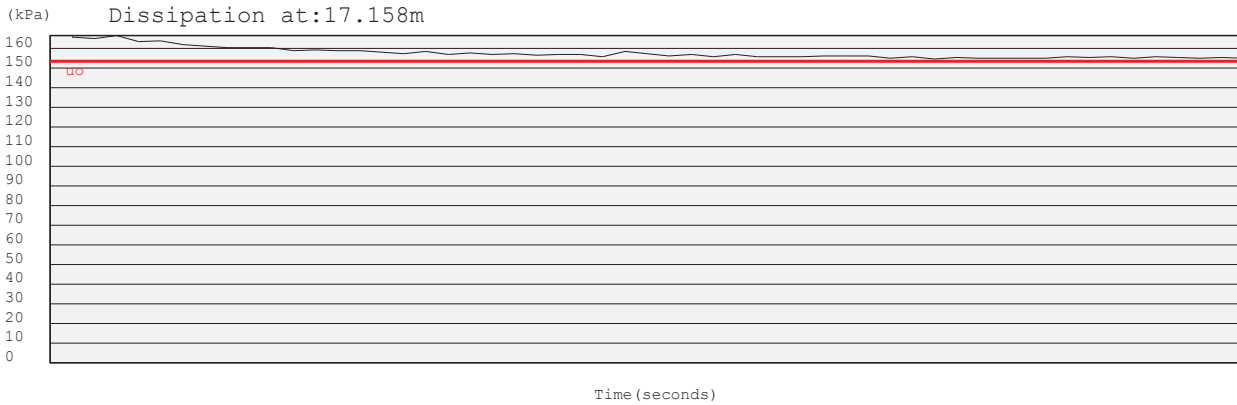
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 07

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Project: Durban Harbour Piezocone Investigation for Dredging

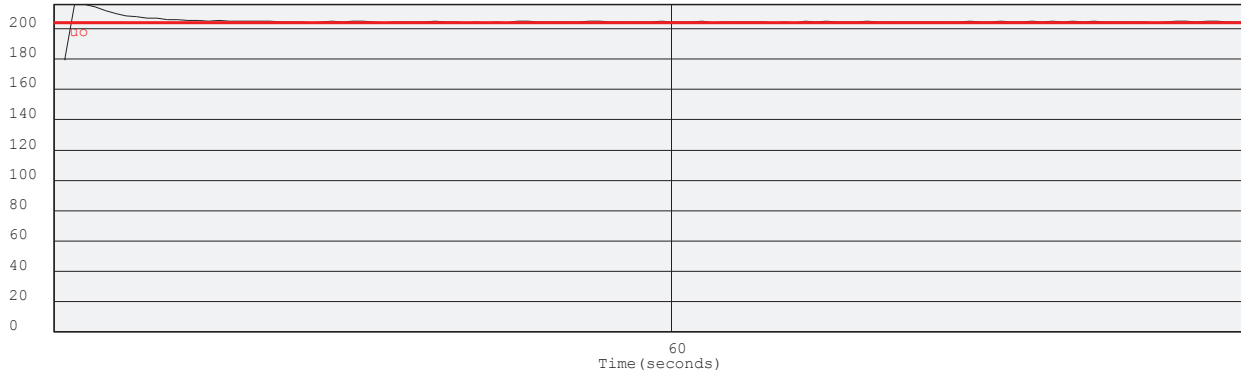
Site: Durban Harbour over water

Hole: S 07

Date: 2012/08/16

Page: 2

(kPa) Dissipation at: 22.147m

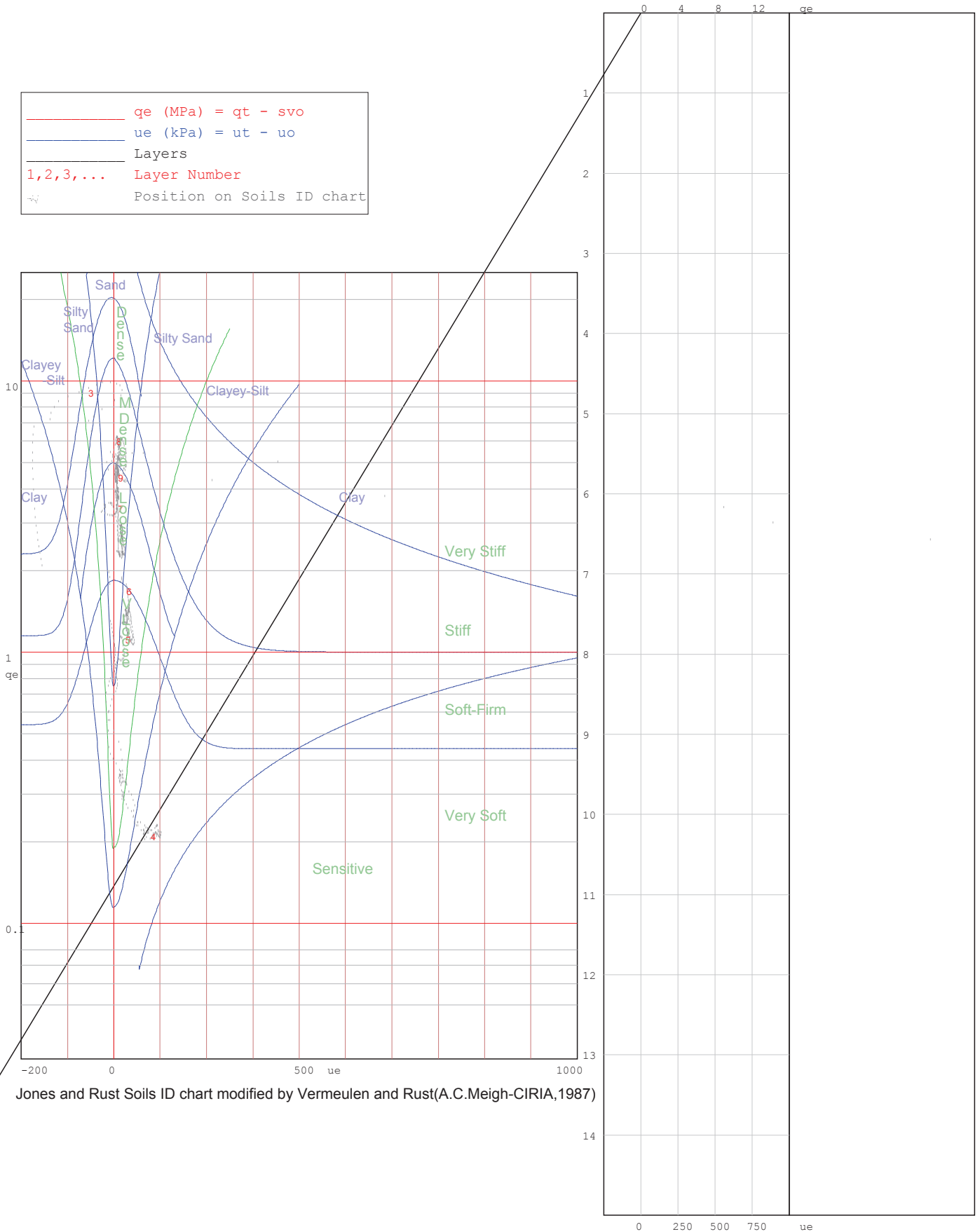
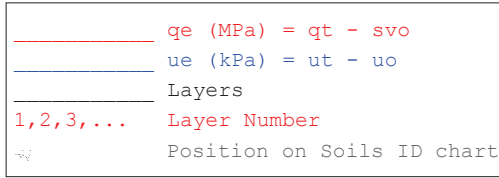


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 07

Date: 2012/08/16

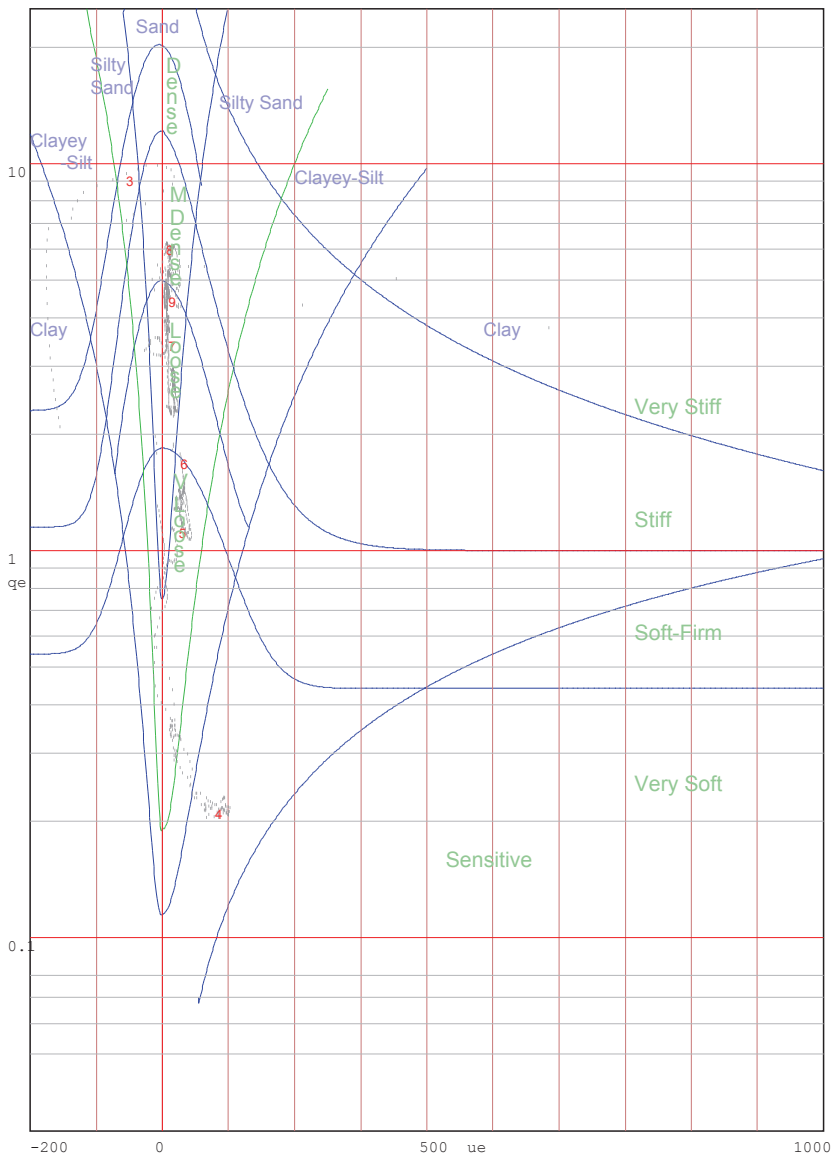
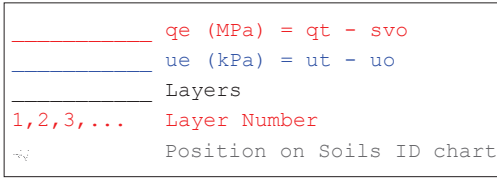


Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

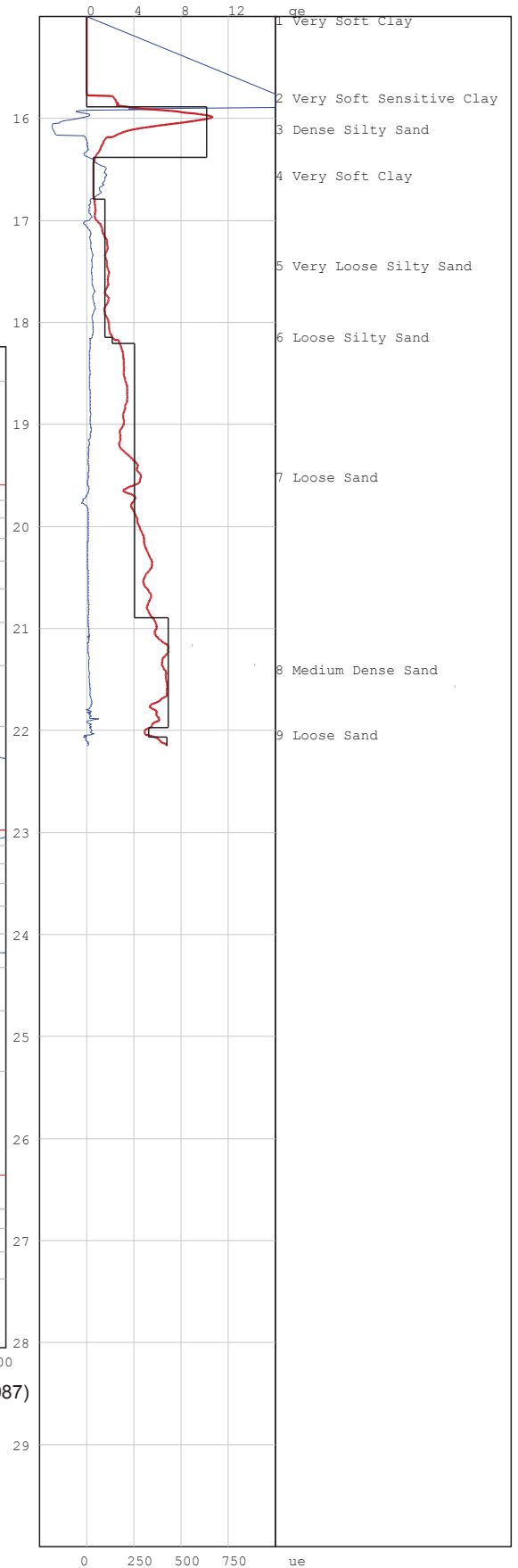
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 07  
Date: 2012/08/16



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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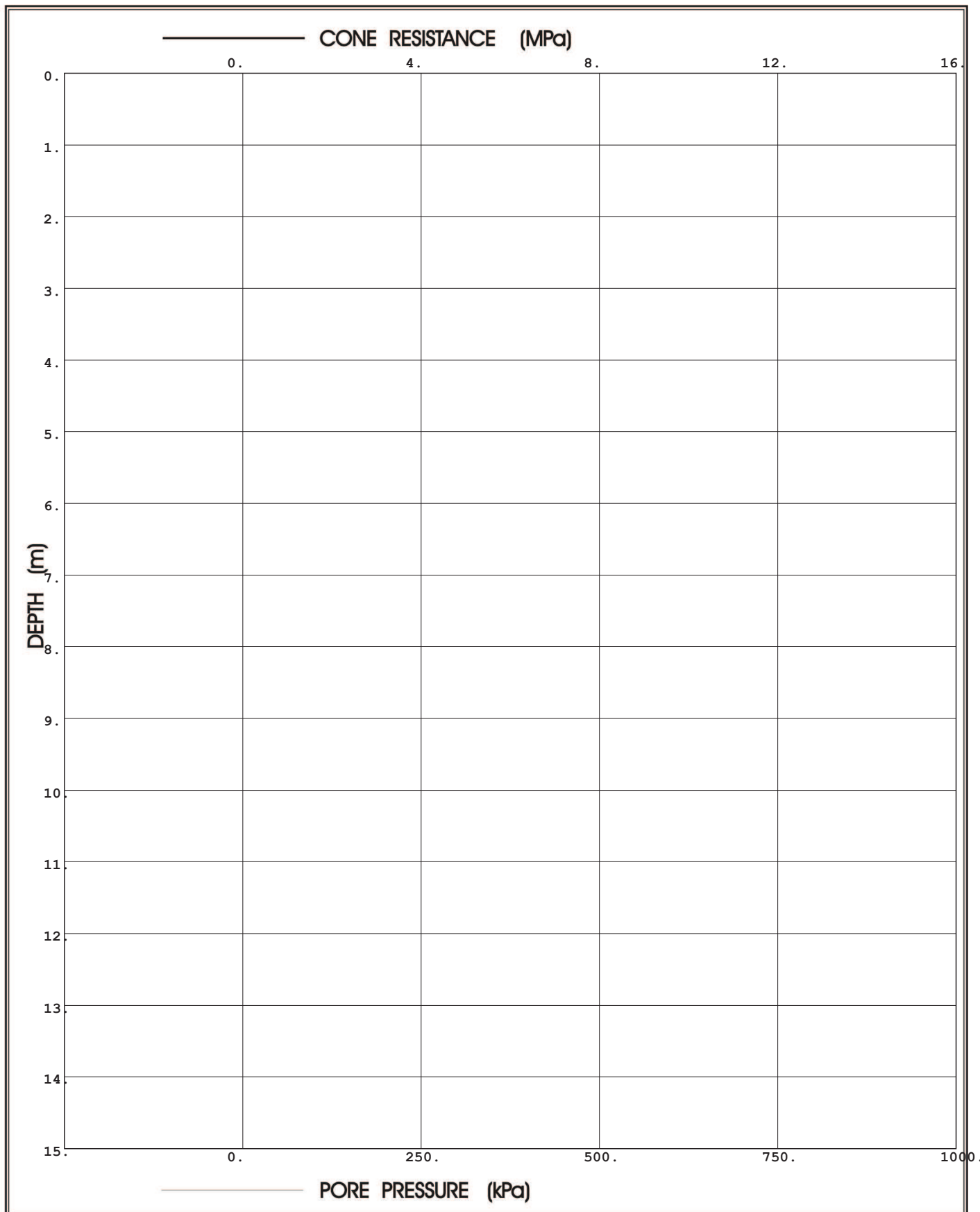
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 08

DATE: 2012/08/14

Page:1



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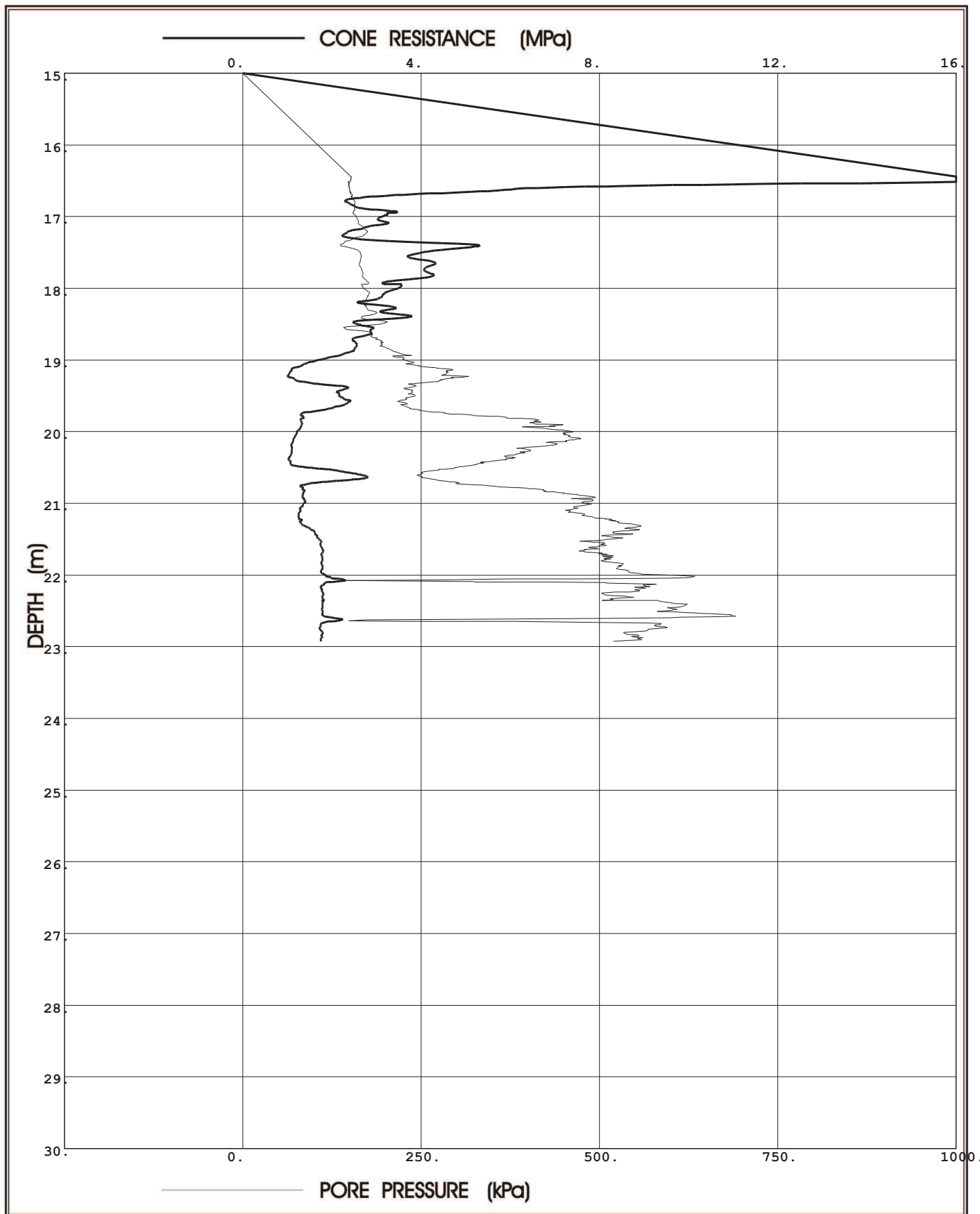
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 08

DATE: 2012/08/14

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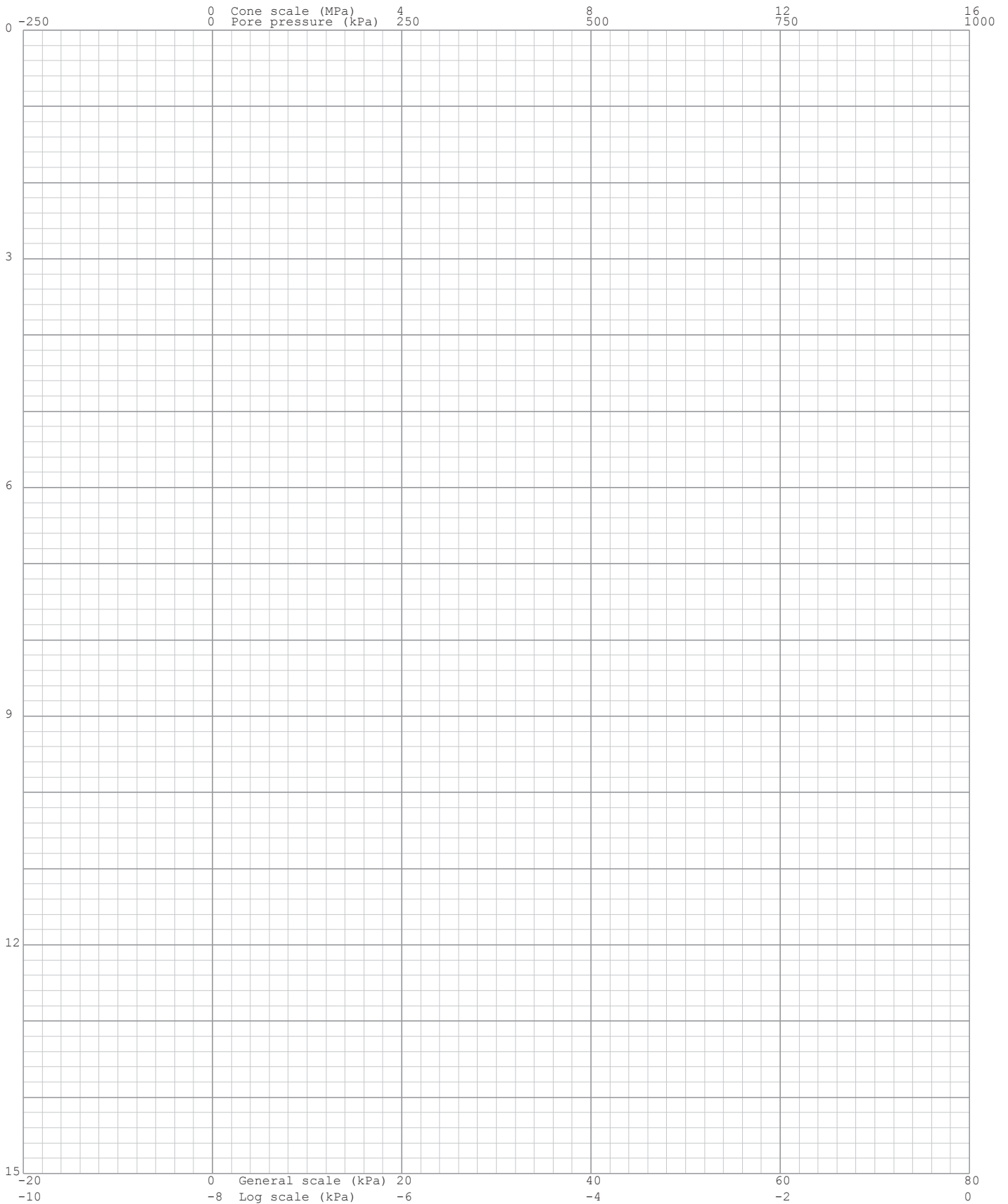
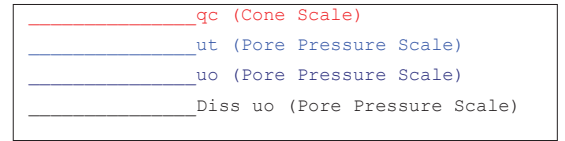


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 08

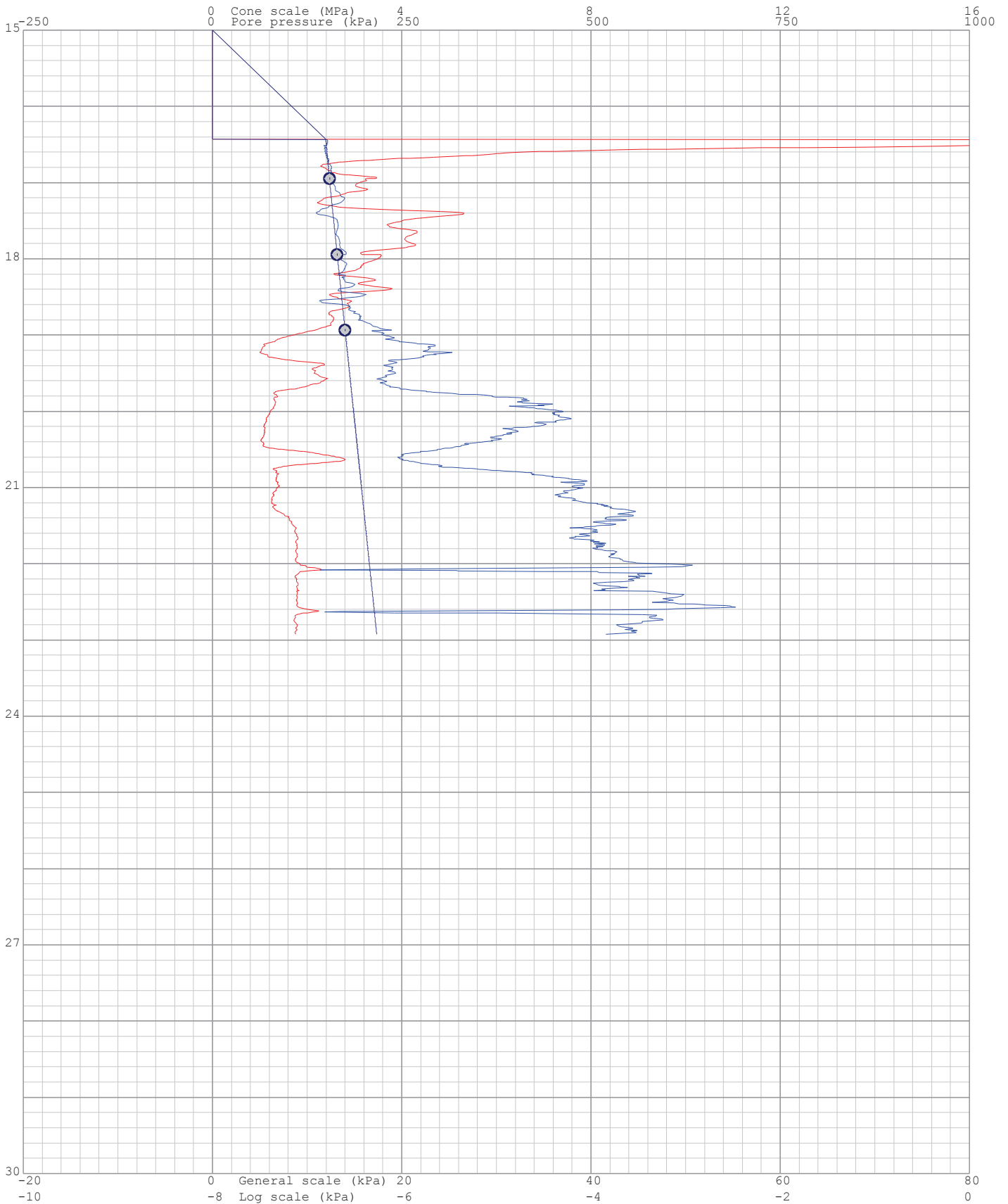
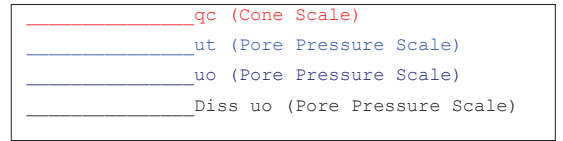
Date: 2012/08/14



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 08  
Date: 2012/08/14



Project: Durban Harbour Piezocone Investigation for Dredging

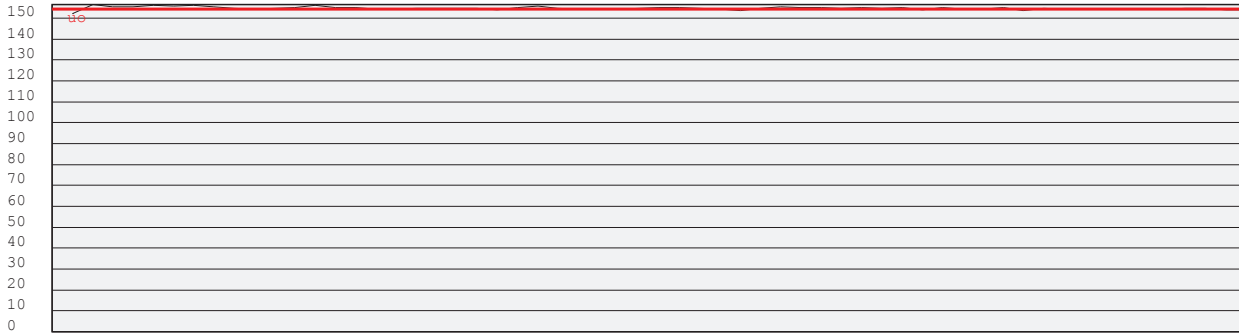
Site: Durban Harbour over water

Hole: S 08

Date: 2012/08/14

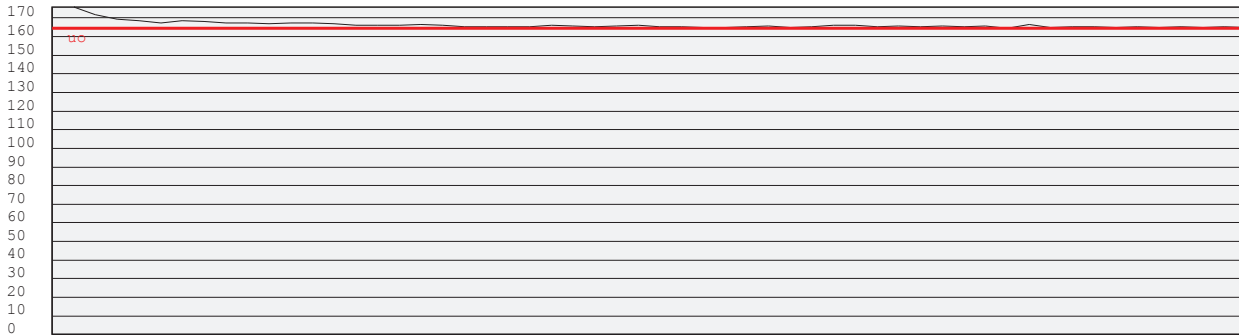
Page: 1

(kPa) Dissipation at:16.945m



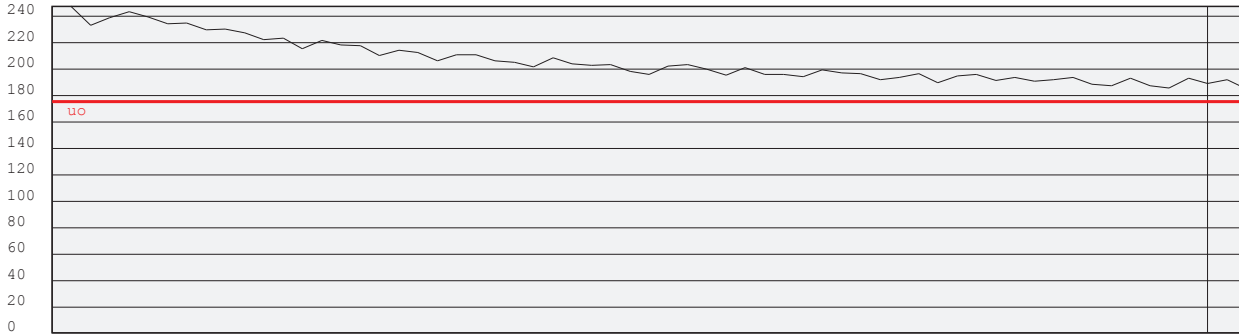
Time (seconds)

(kPa) Dissipation at:17.941m



Time (seconds)

(kPa) Dissipation at:18.938m



Time (seconds)

60

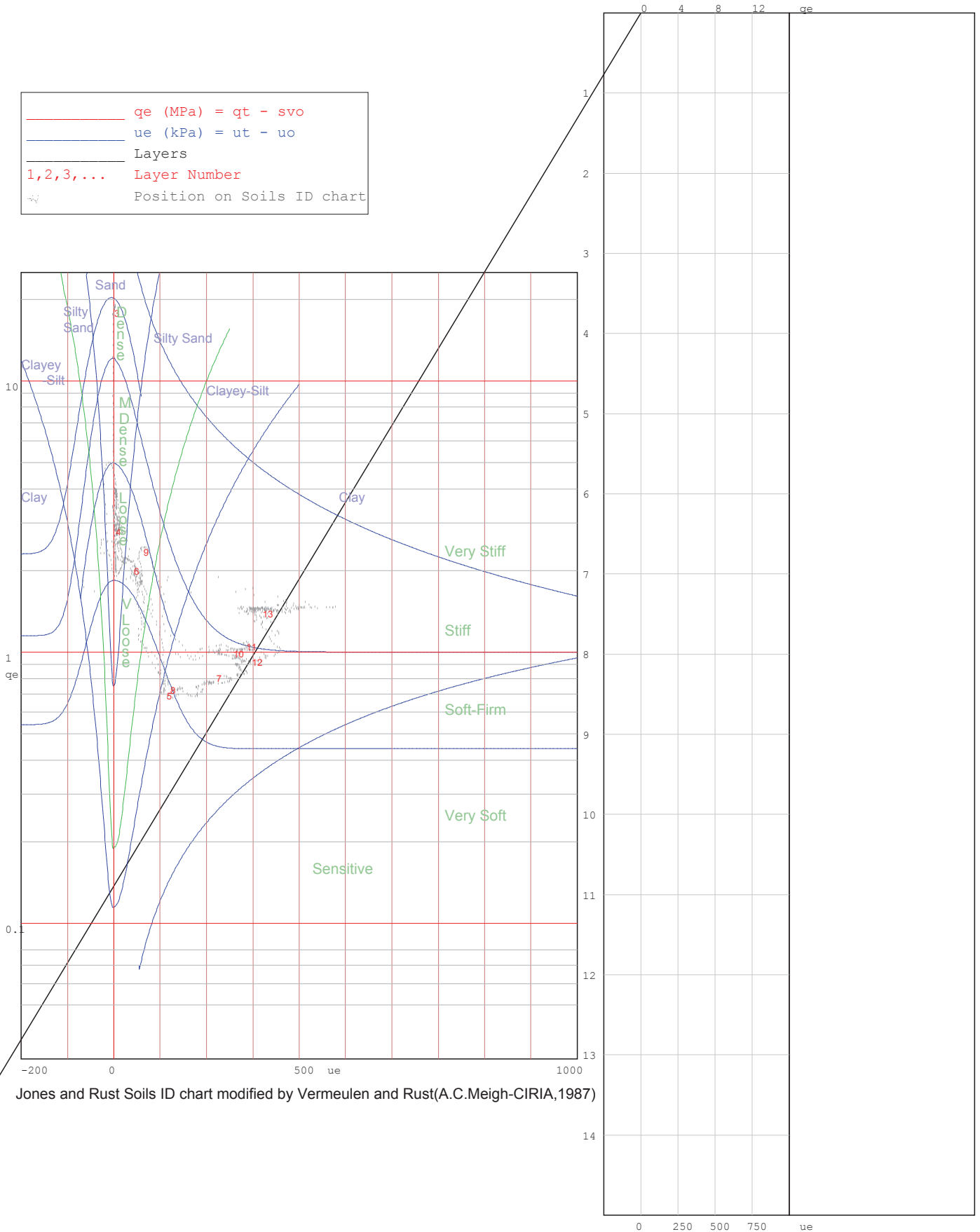
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 08

Date: 2012/08/14

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



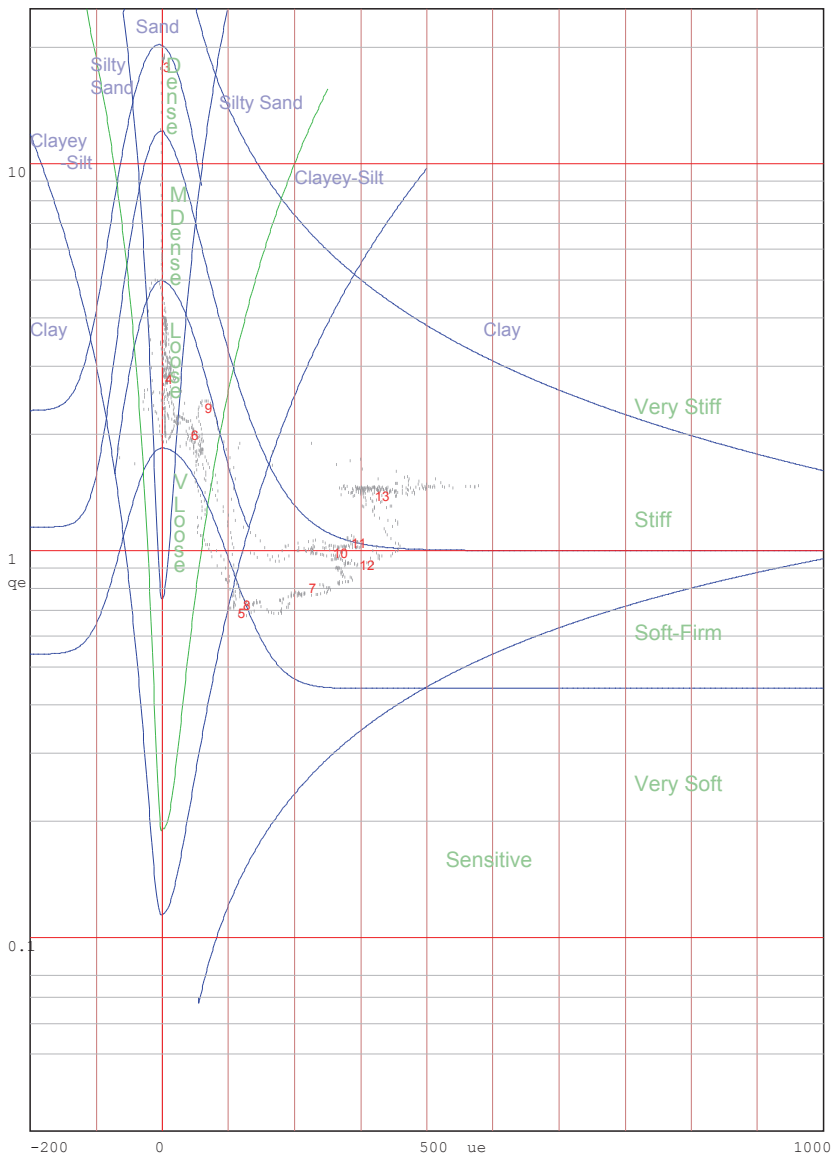
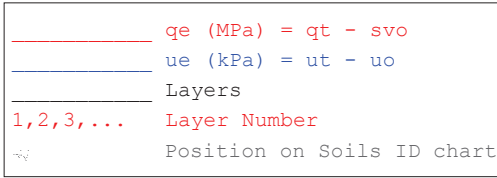
Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

Project: Durban Harbour Piezocone Investigation for Dredging

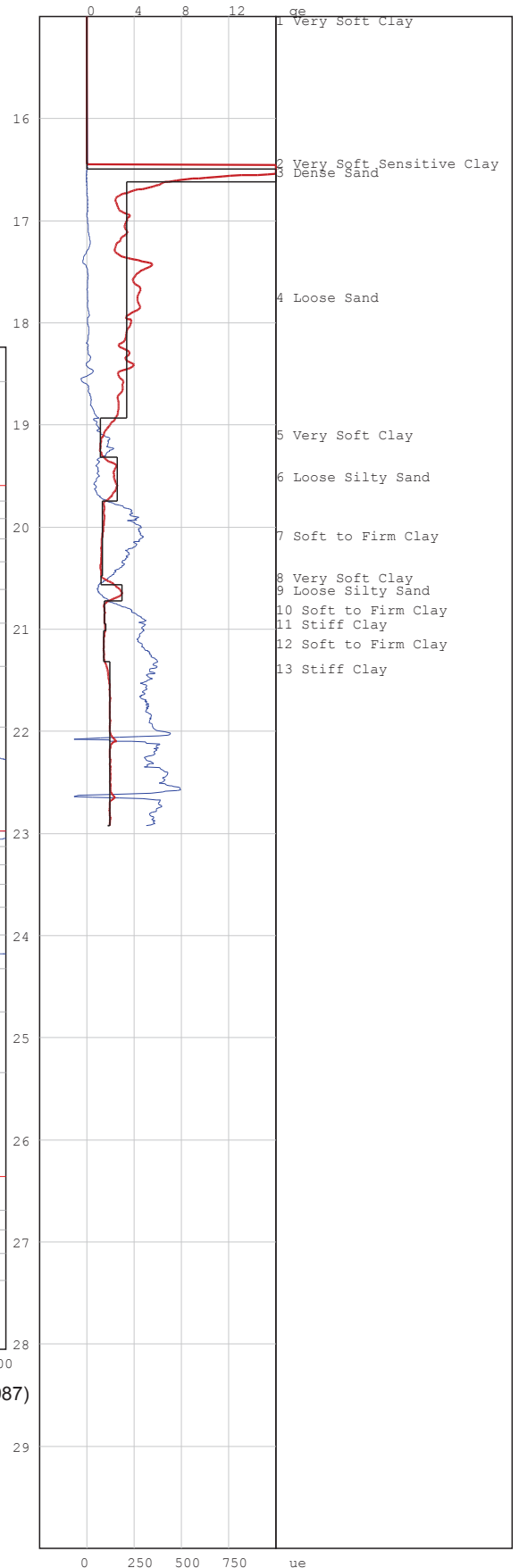
Site: Durban Harbour over water

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# PIEZOCONE PENETRATION TEST



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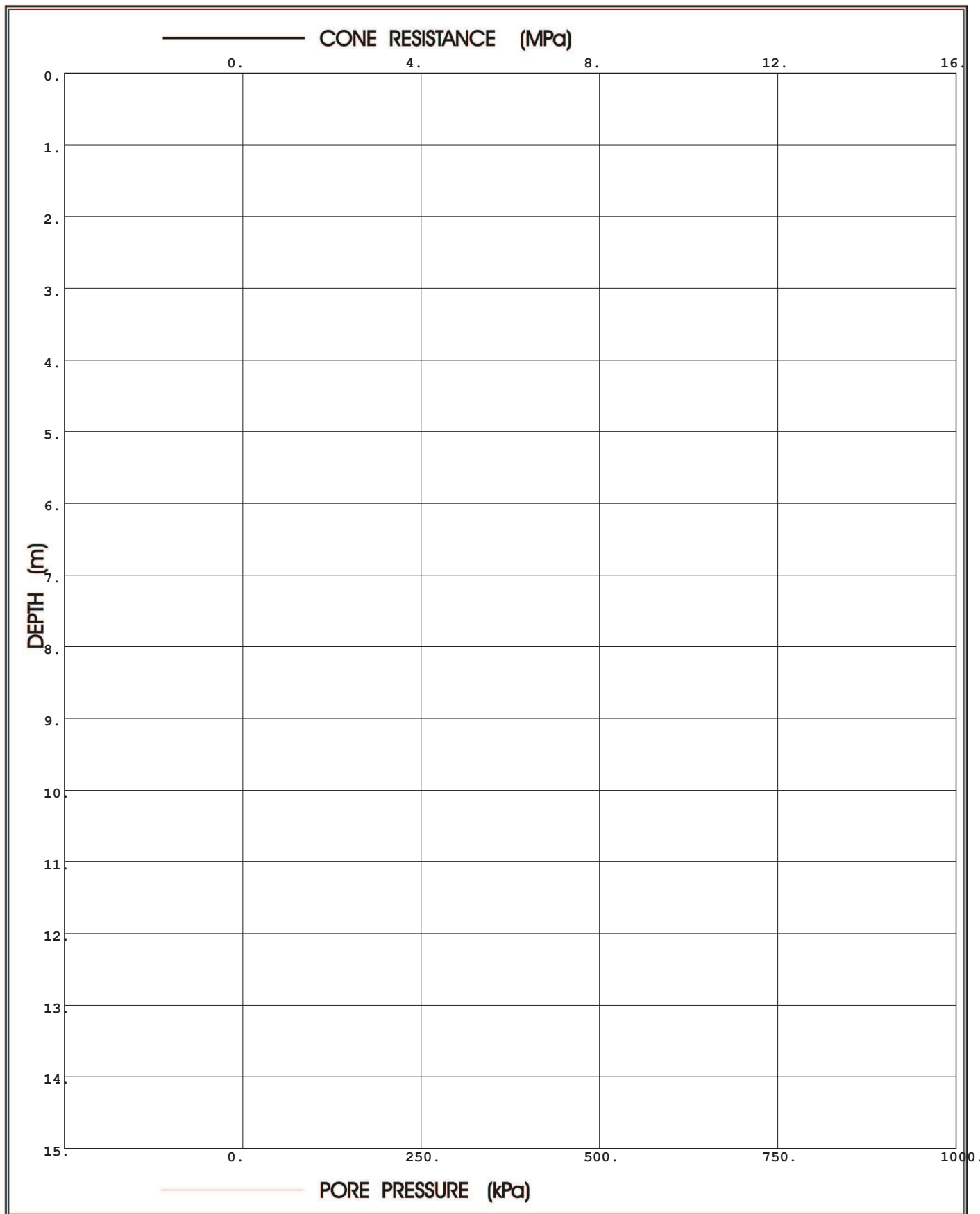
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 09

DATE: 2012/08/16

Page:1



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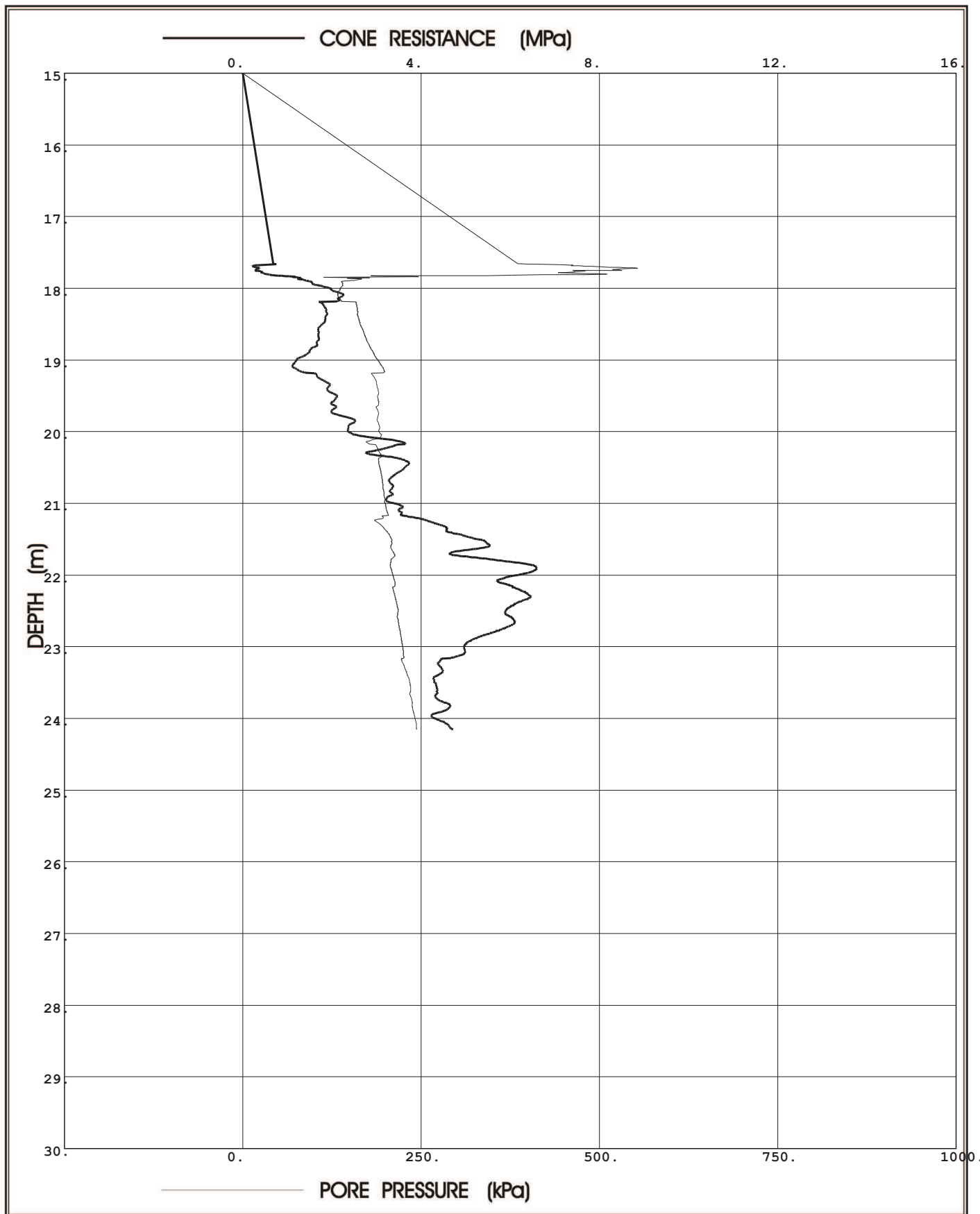
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

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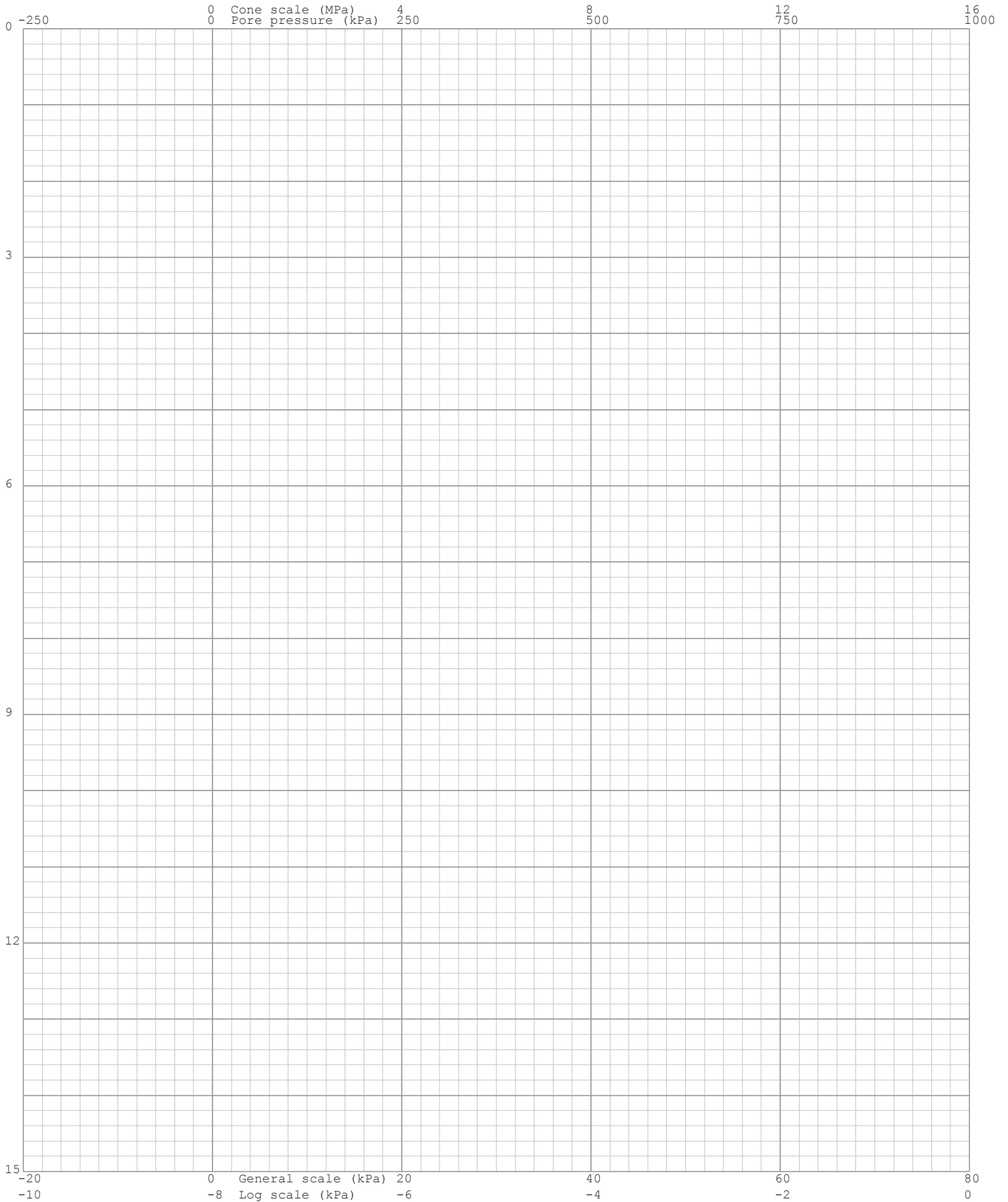
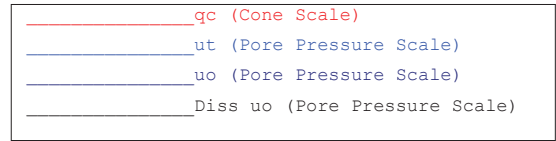
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 09  
Date: 2012/08/16

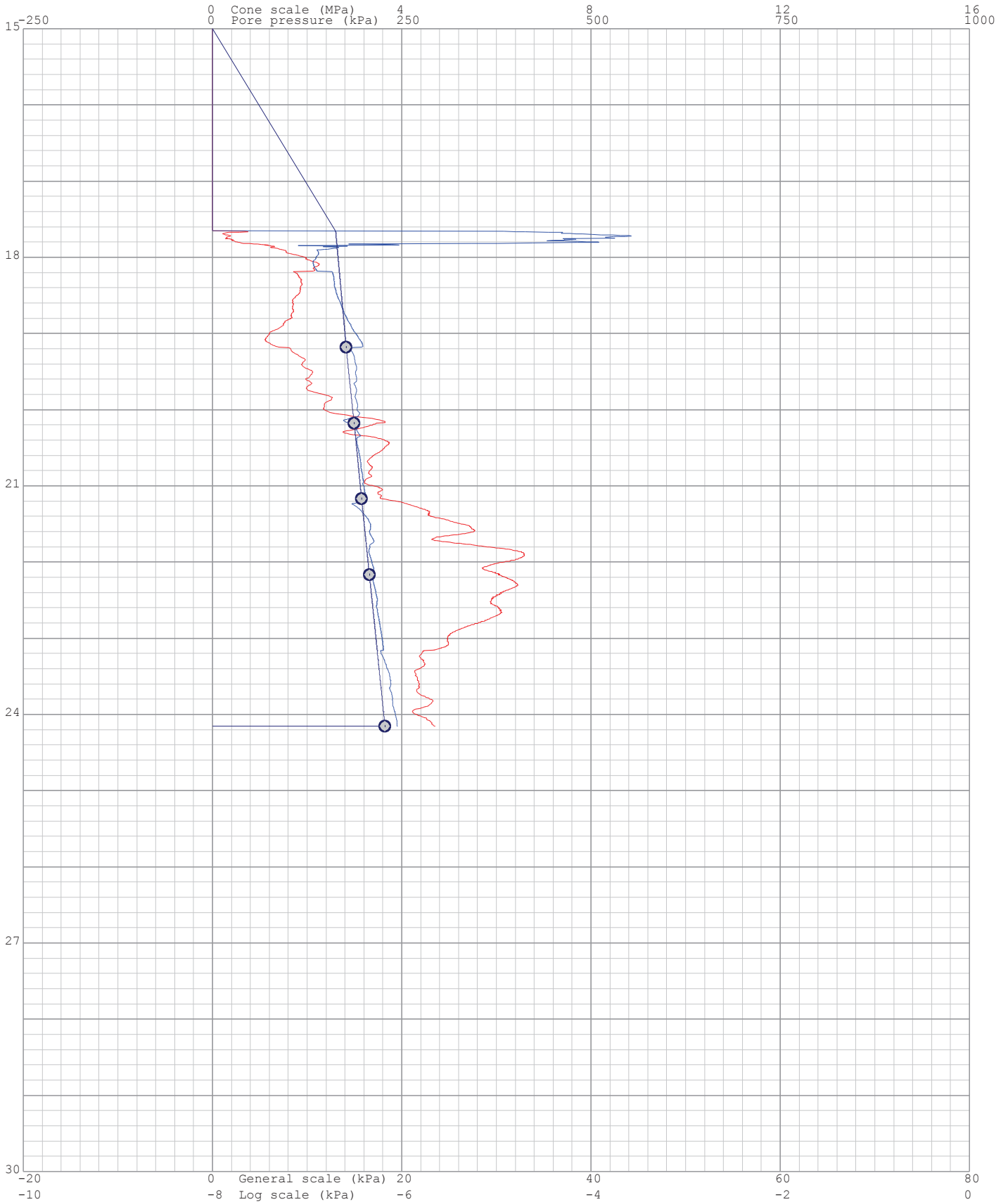
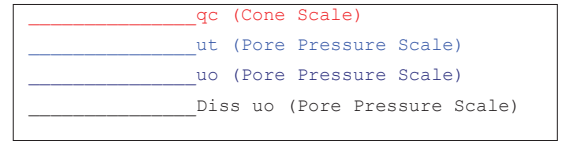




Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 09  
Date: 2012/08/16



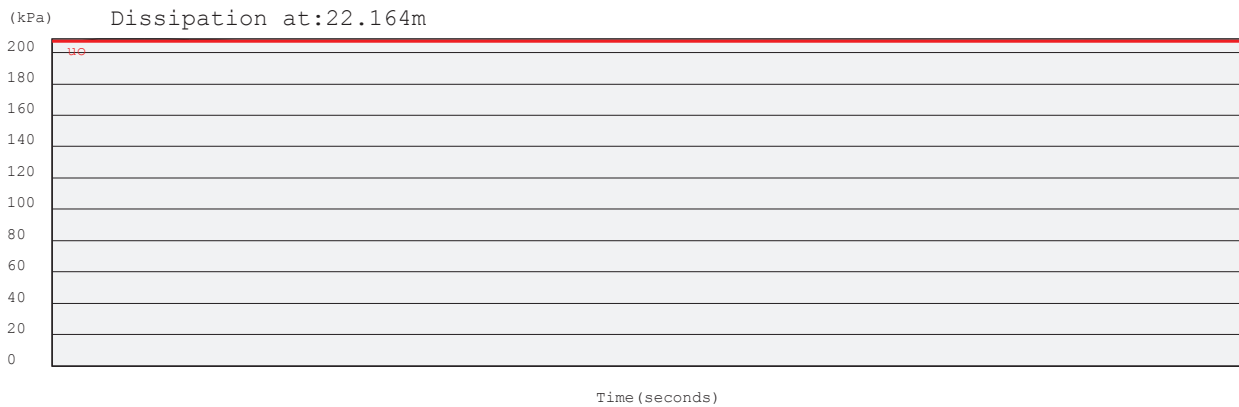
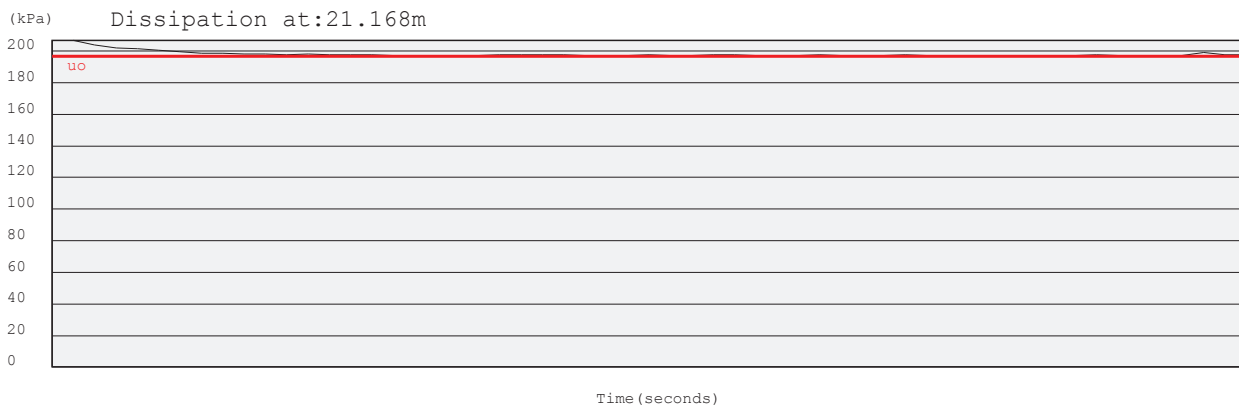
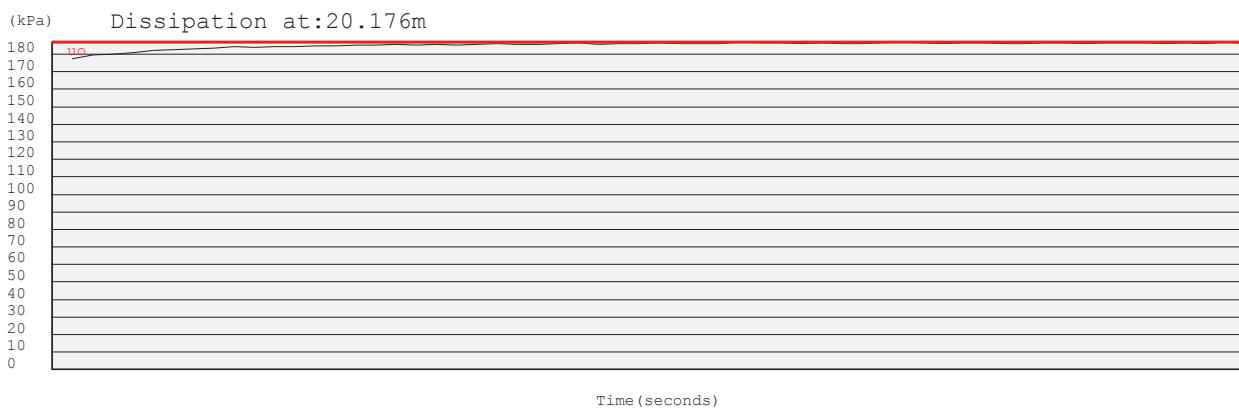
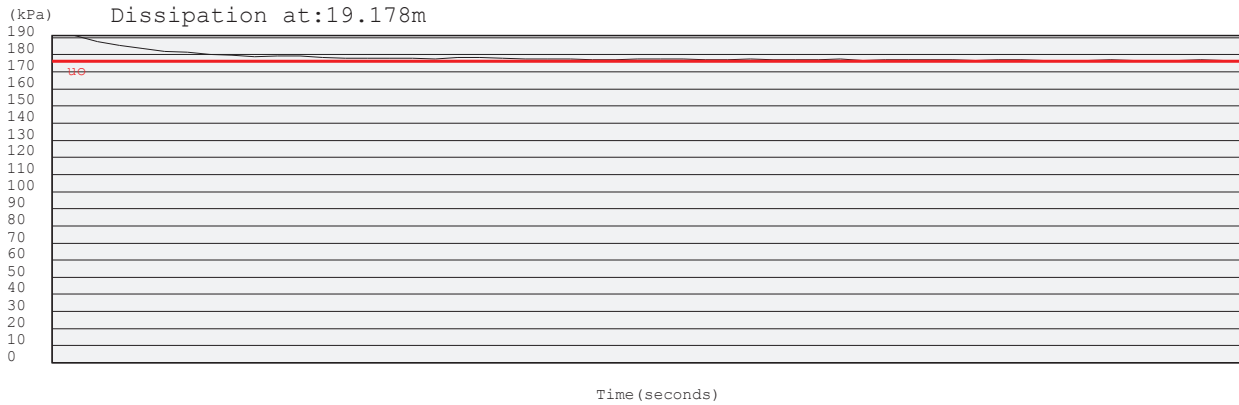
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 09

Date: 2012/08/16

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Project: Durban Harbour Piezocone Investigation for Dredging

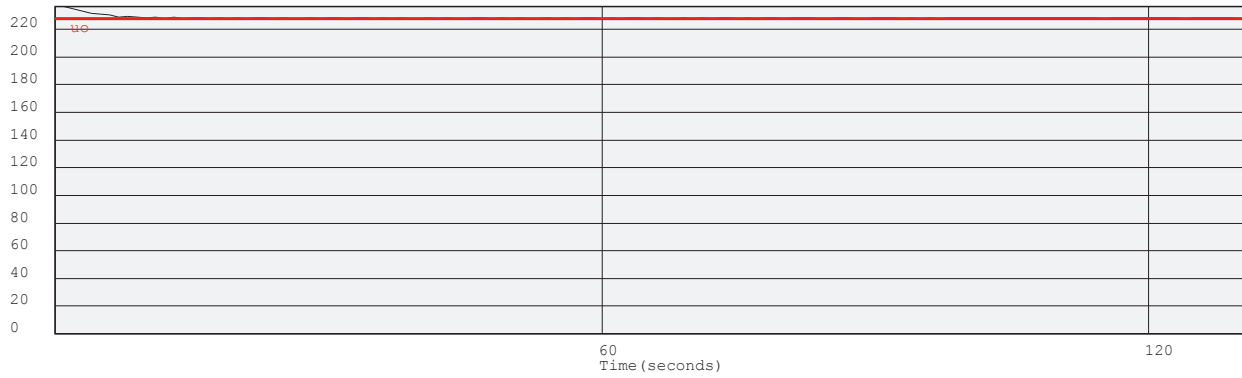
Site: Durban Harbour over water

Hole: S 09

Date: 2012/08/16

Page: 2

(kPa) Dissipation at: 24.155m



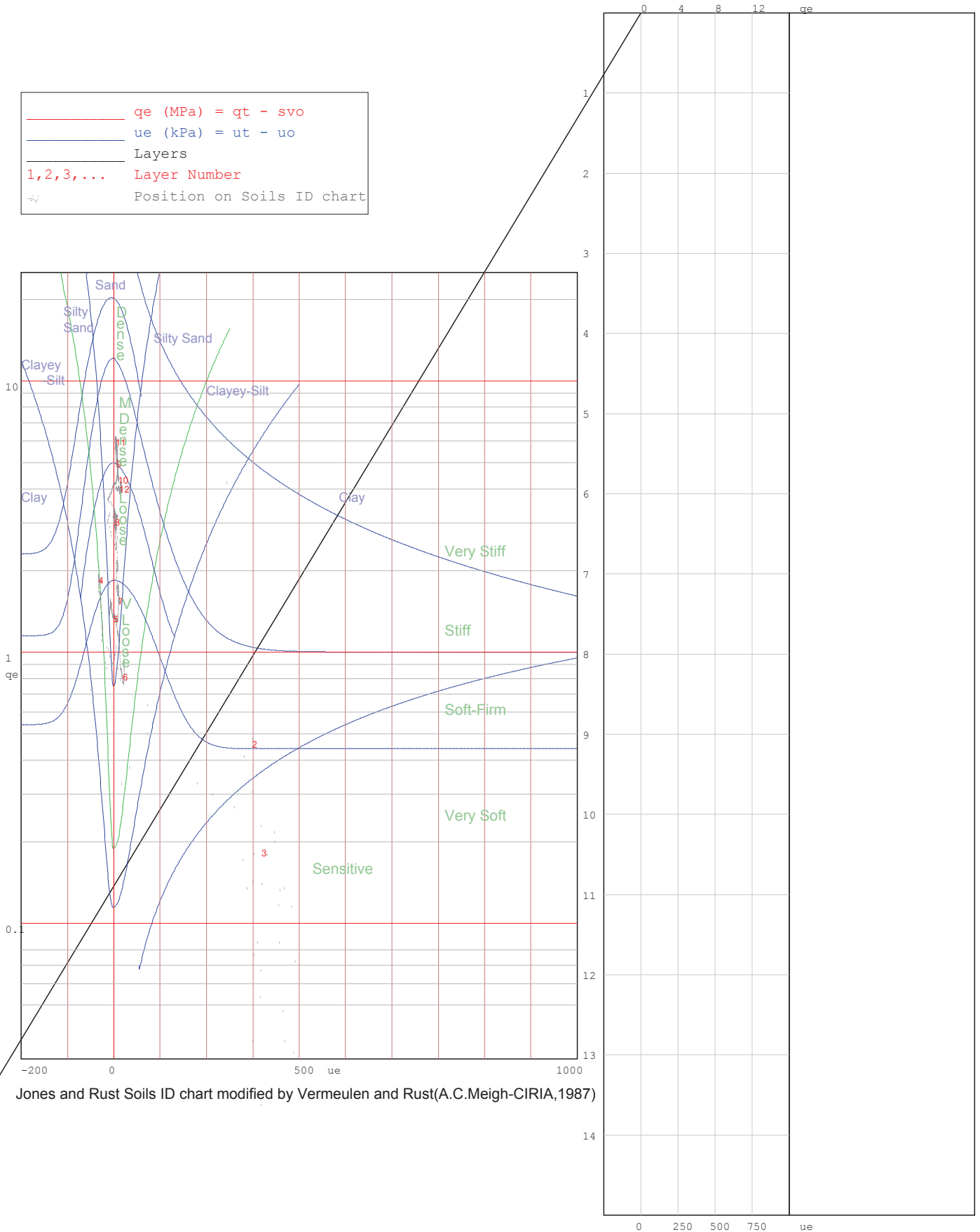
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 09

Date: 2012/08/16

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart

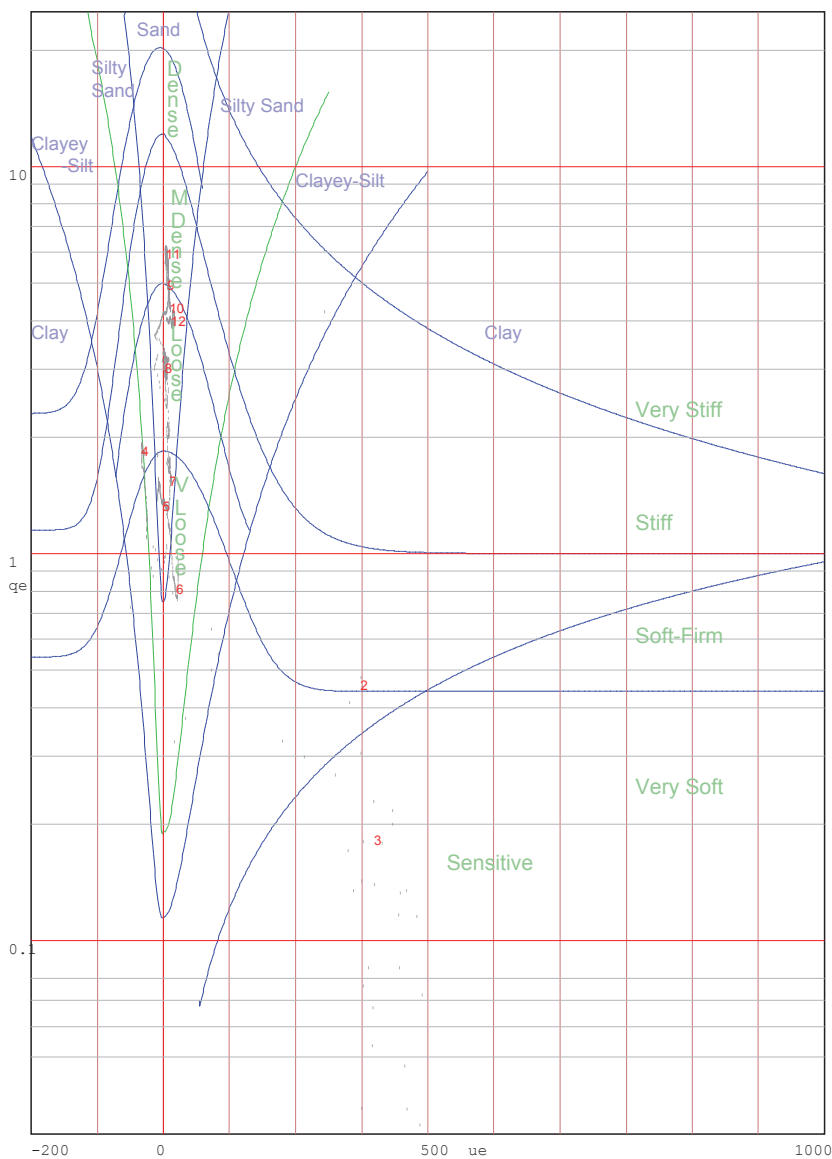


Project: Durban Harbour Piezocone Investigation for Dredging

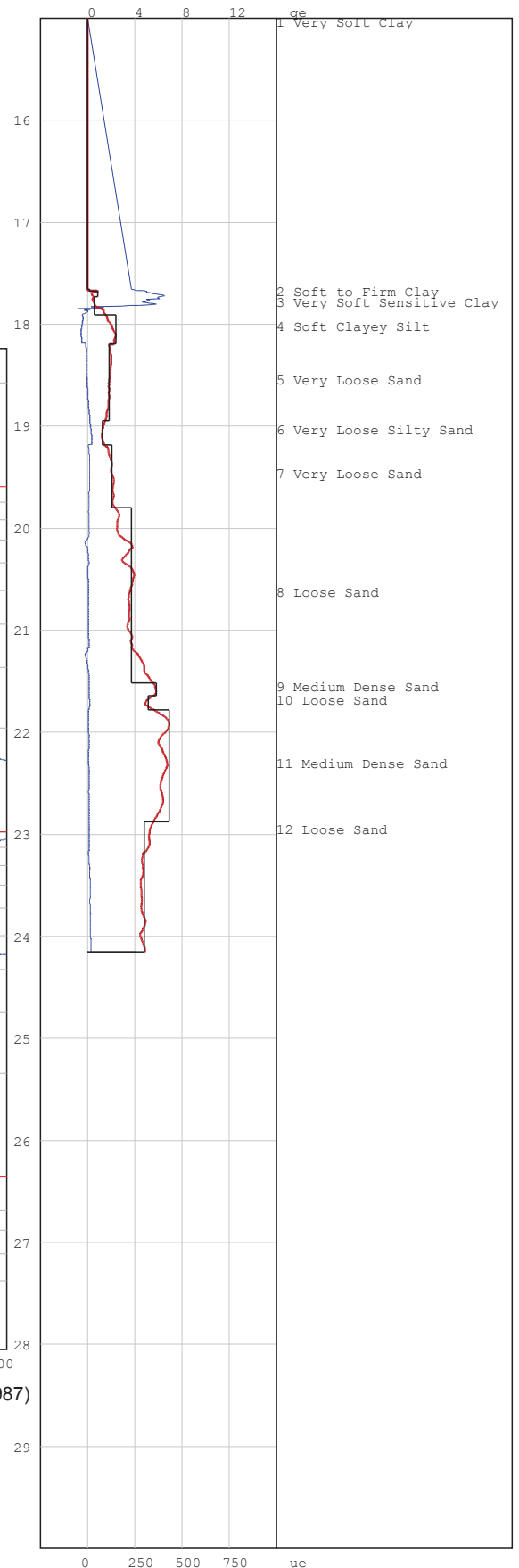
Site: Durban Harbour over water

Hole No: S 09  
Date: 2012/08/16

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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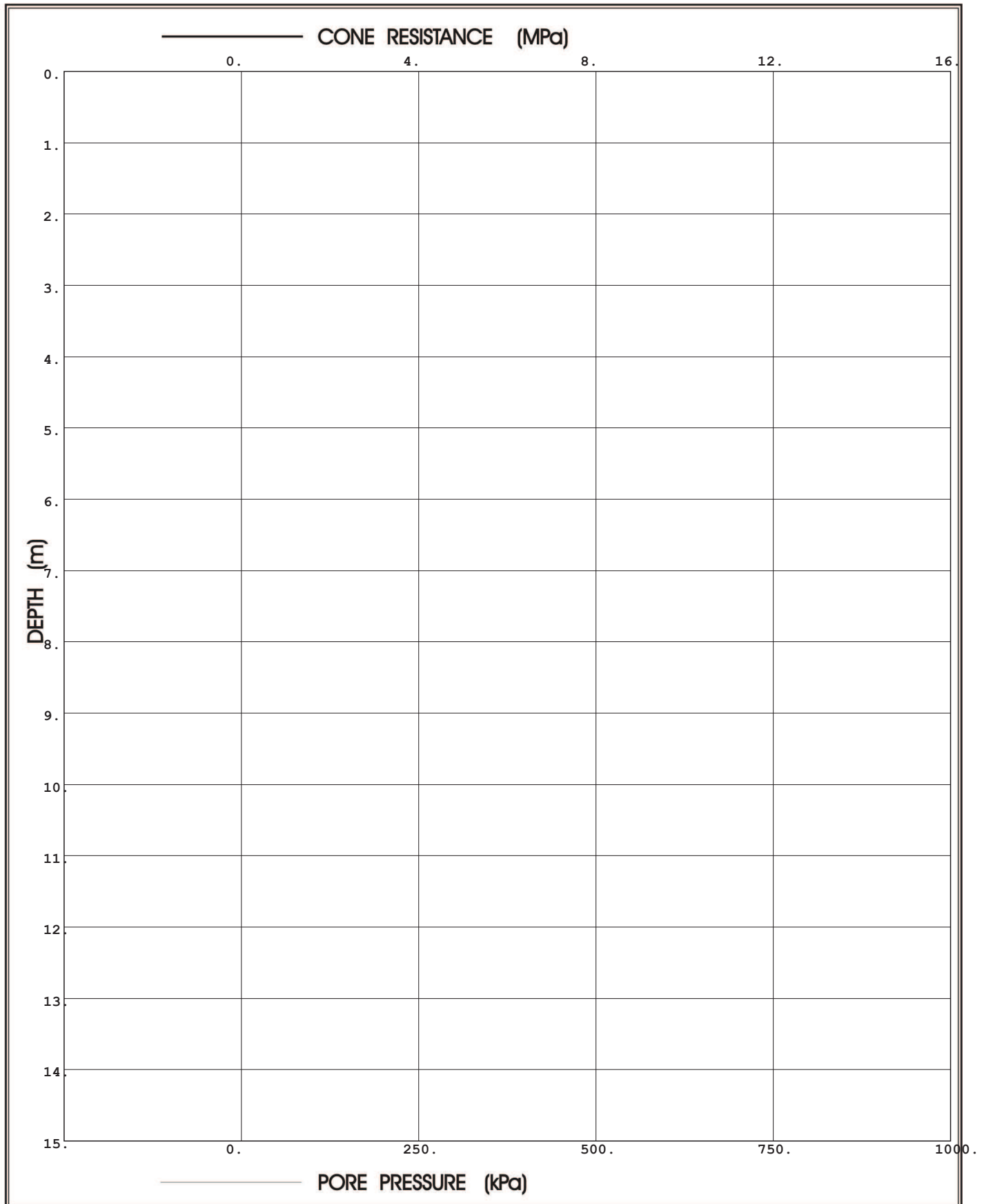
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 10

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Page:1



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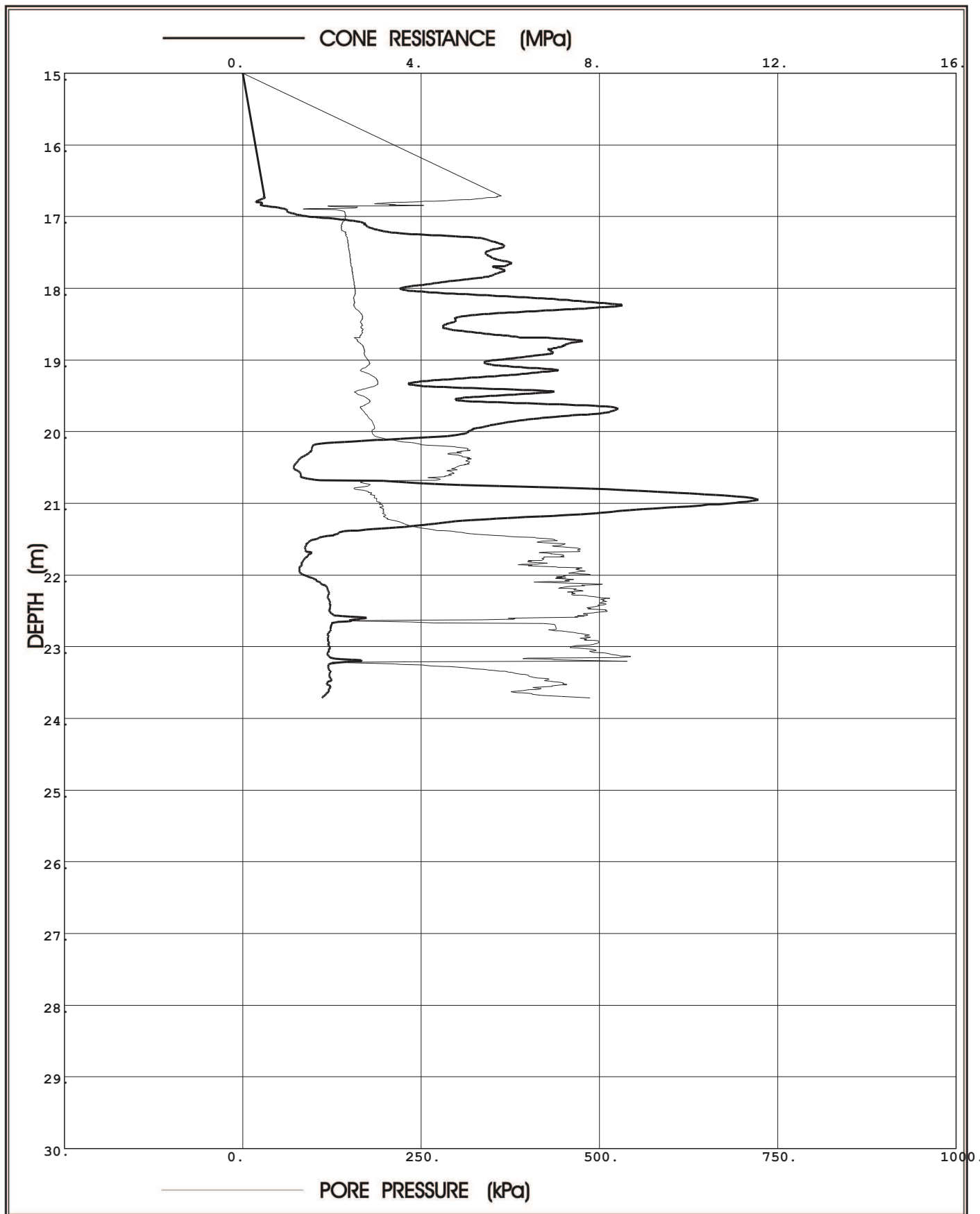
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

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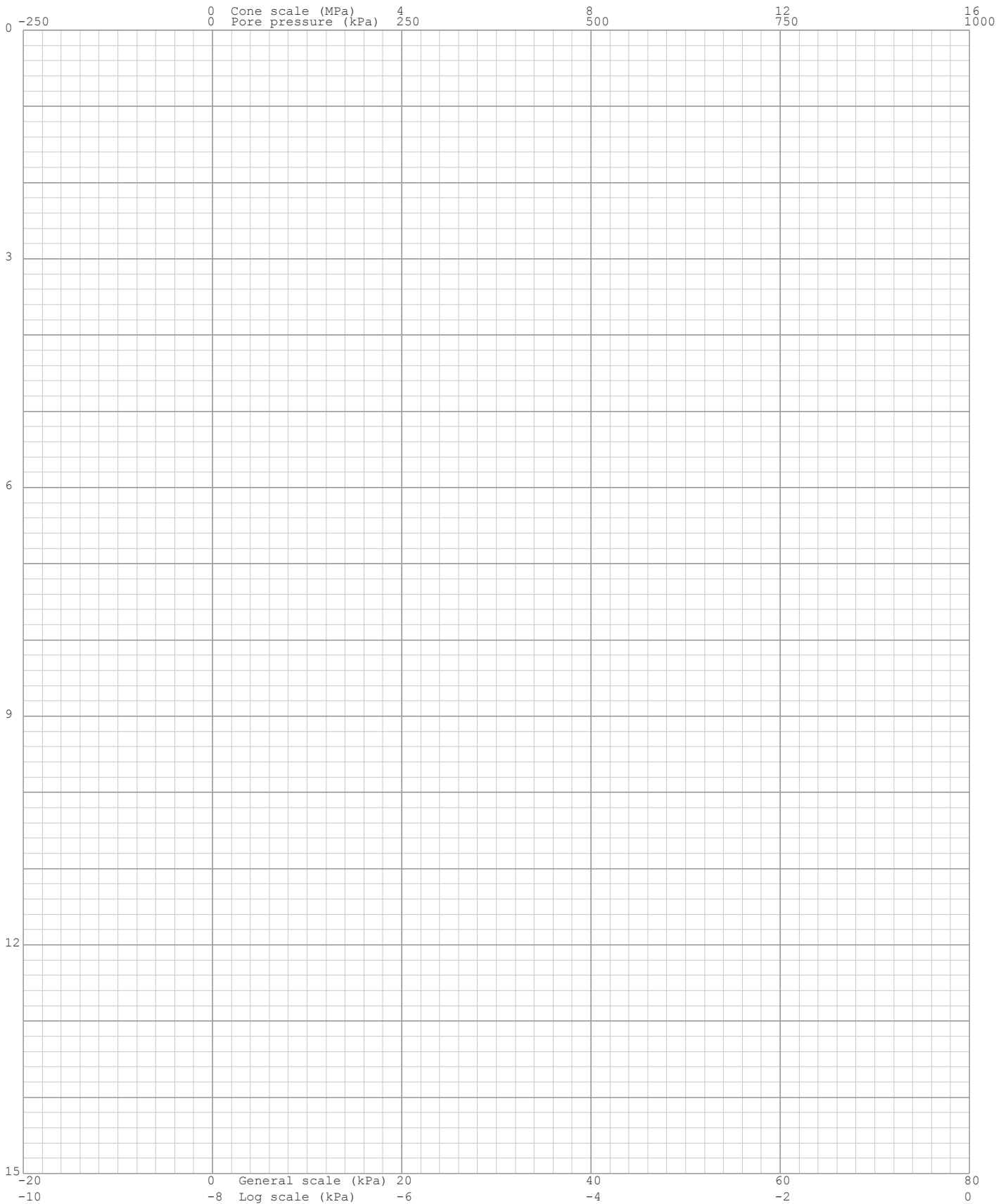
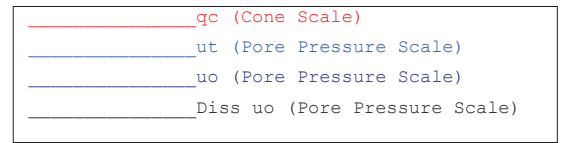
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 10  
Date: 2012/08/17

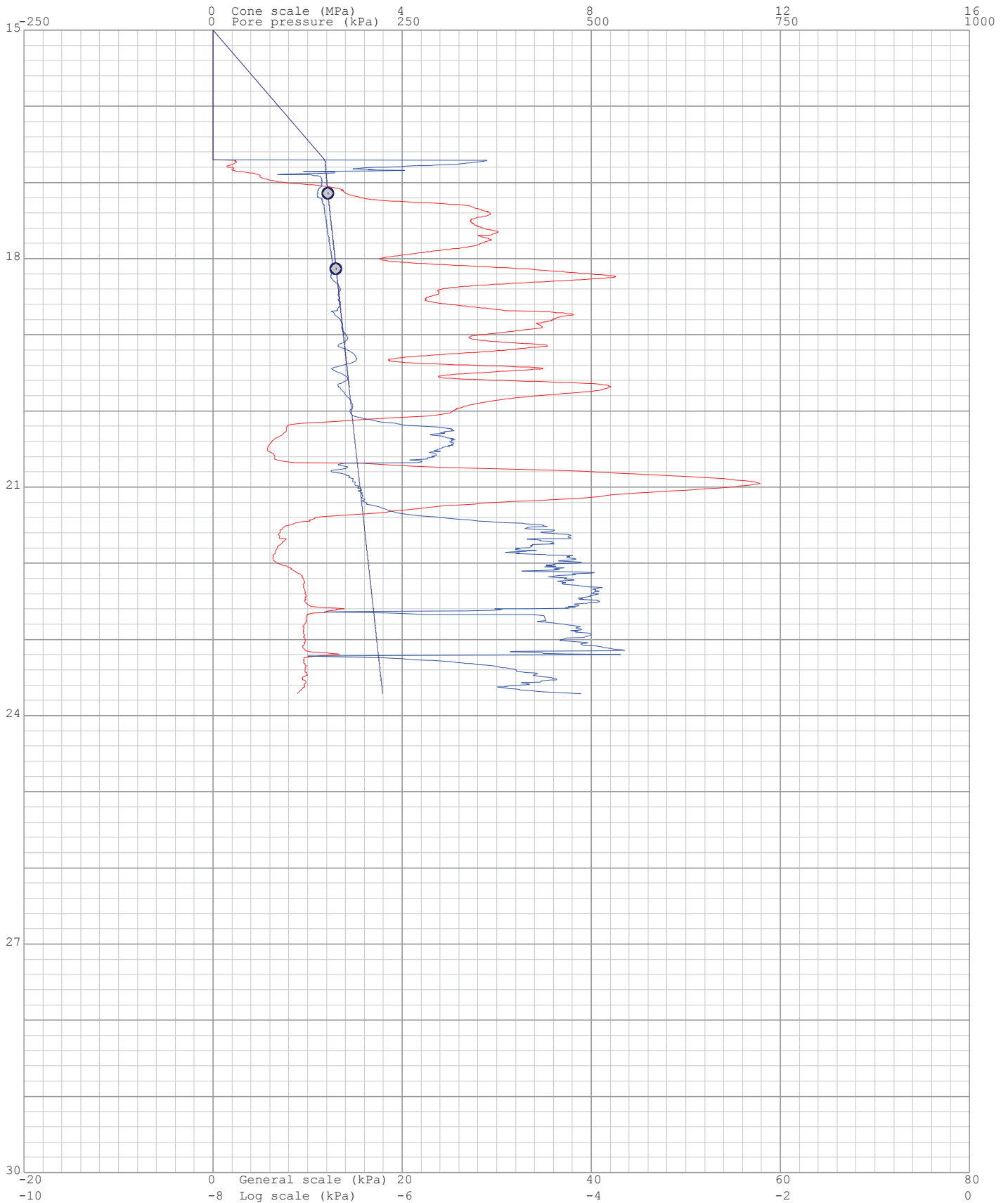
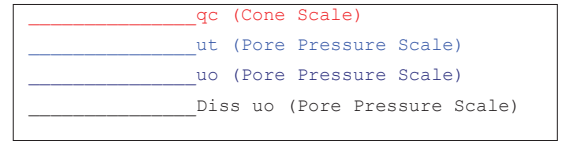




Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 10  
Date: 2012/08/17



Project: Durban Harbour Piezocone Investigation for Dredging

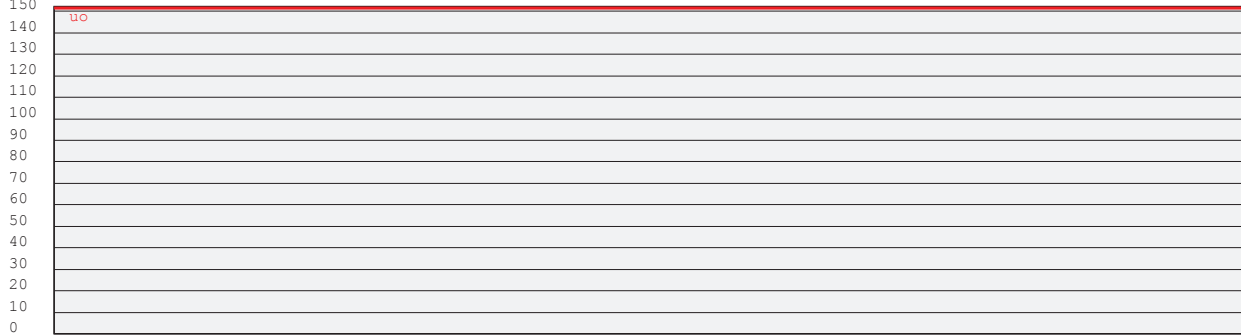
Site: Durban Harbour over water

Hole: S 10

Date: 2012/08/17

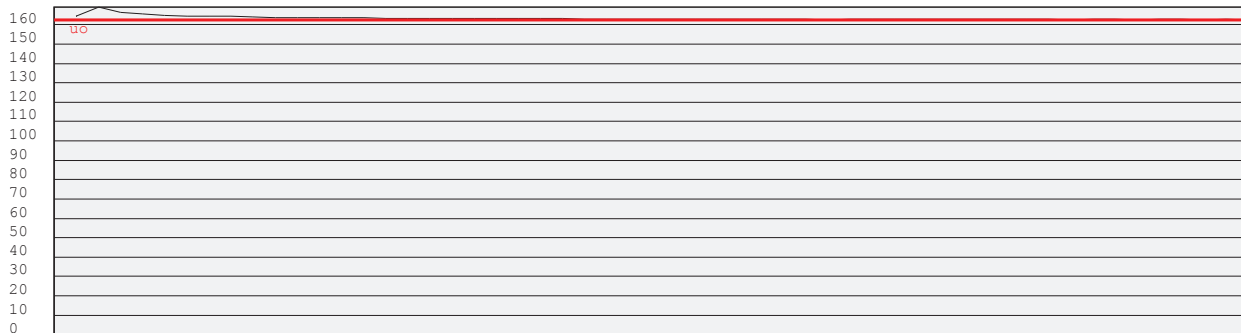
Page: 1

(kPa) Dissipation at: 17.14m



Time (seconds)

(kPa) Dissipation at: 18.135m



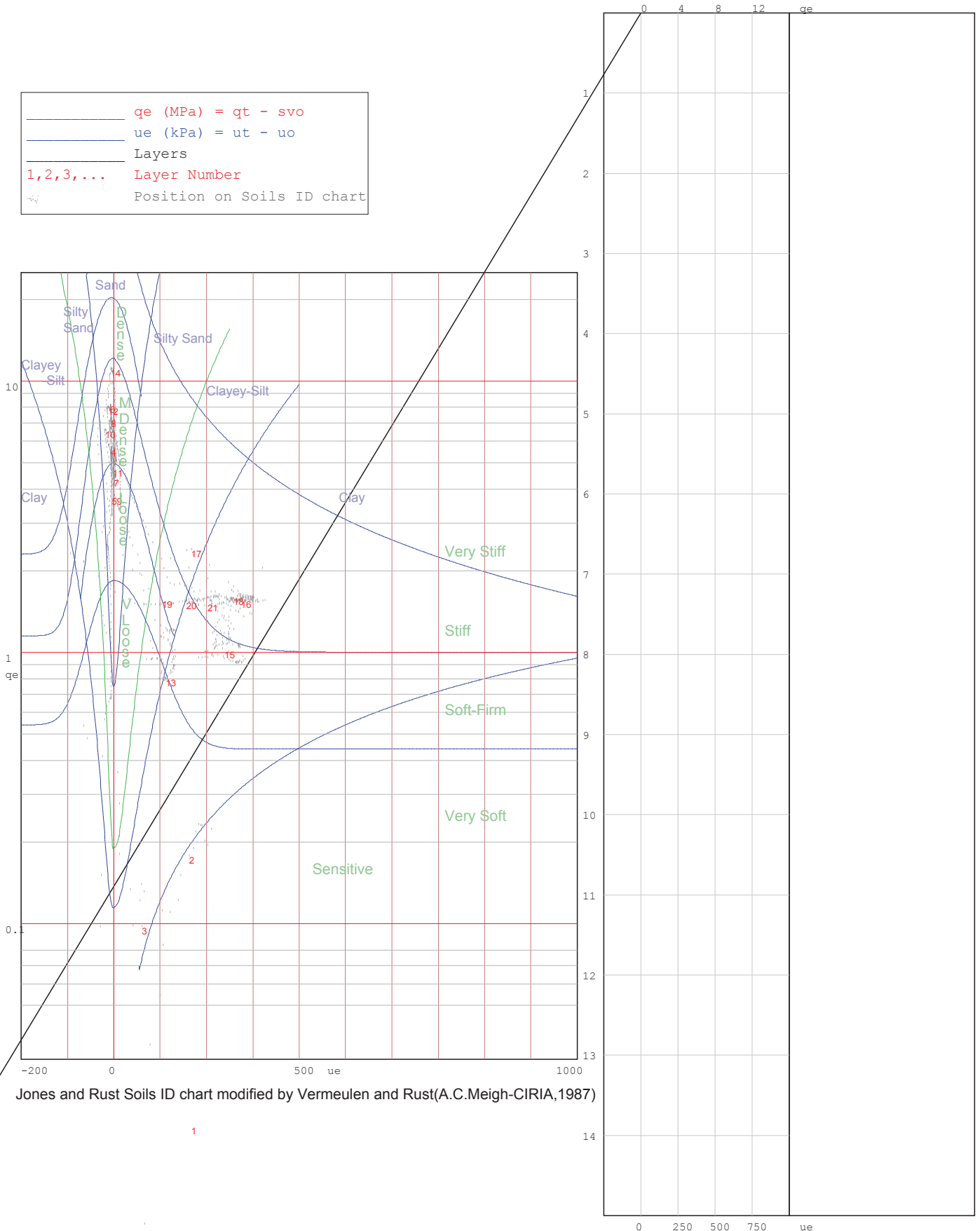
Time (seconds)

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 10  
Date: 2012/08/17

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 — Layers  
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 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

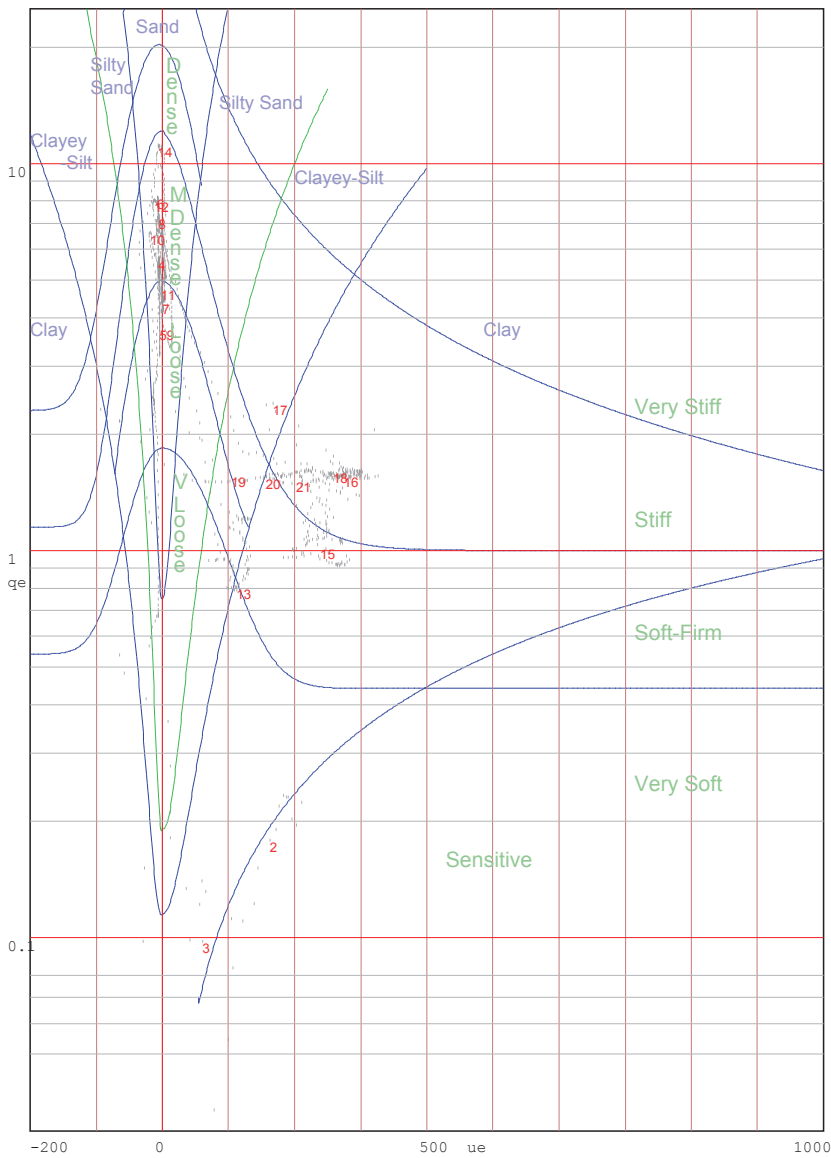
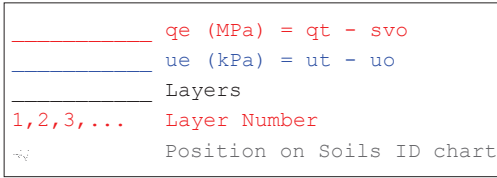
Project: Durban Harbour Piezocone Investigation for Dredging

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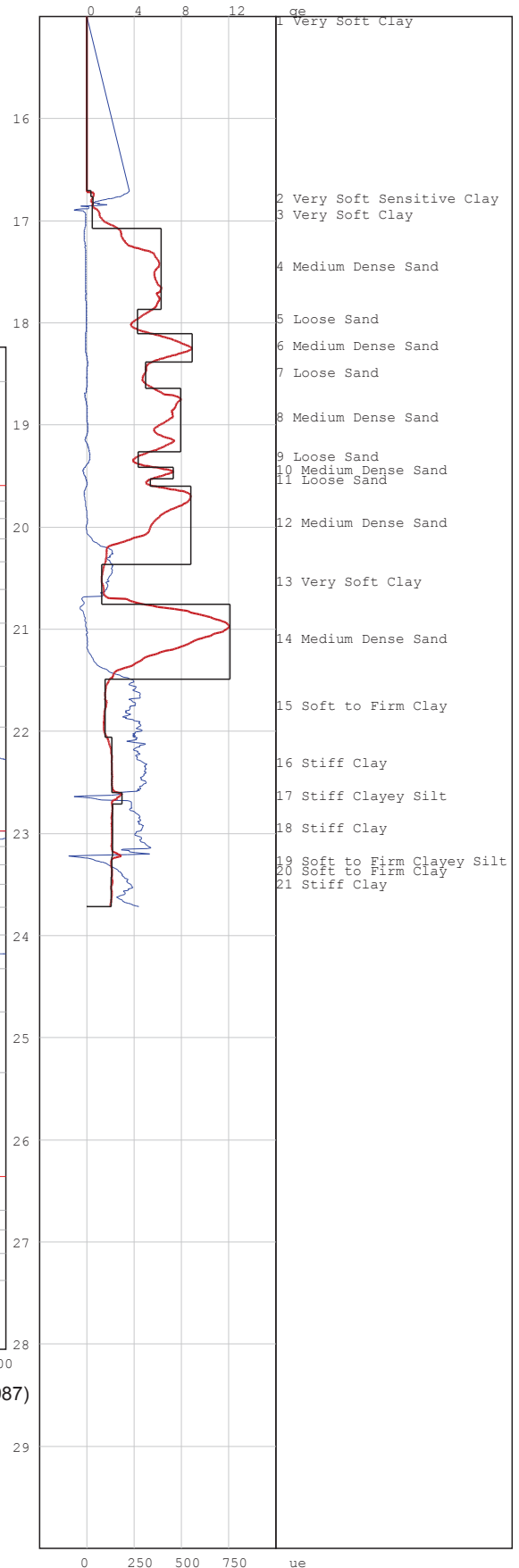
Hole No: S 10

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Page



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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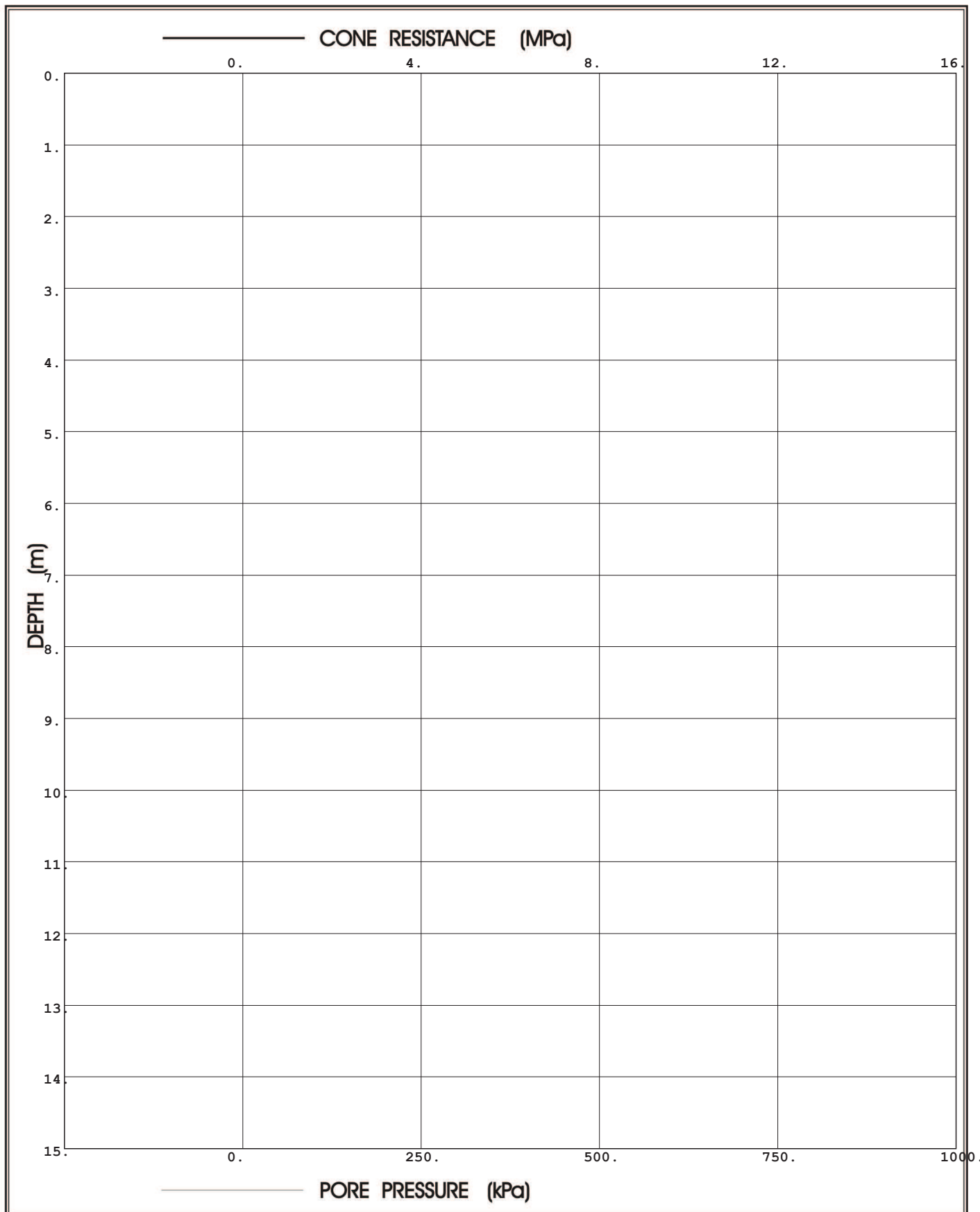
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 11

DATE: 2012/08/17

Page:1



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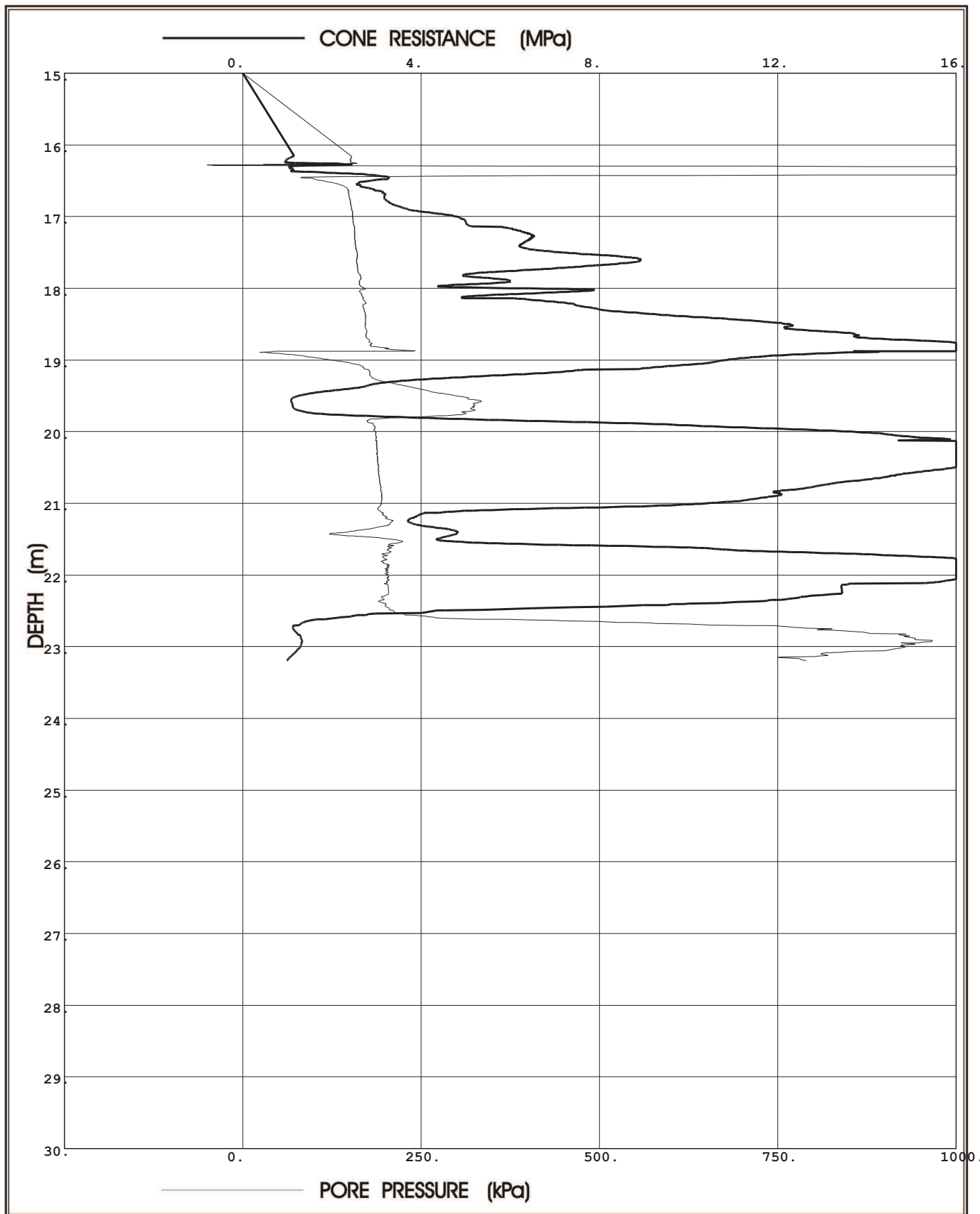
PROJECT: Durban Harbour Piezocone Investigation for Dredging

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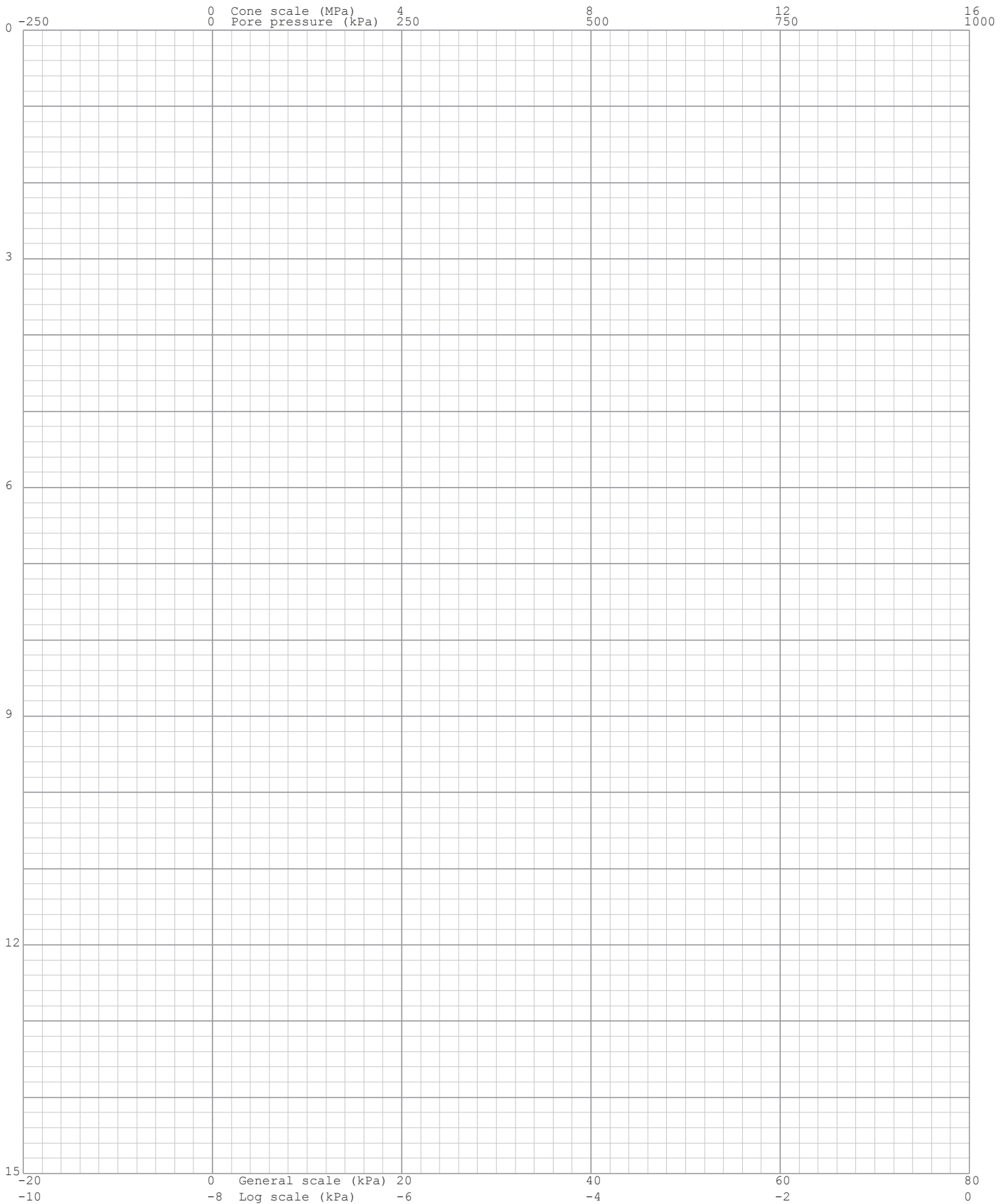
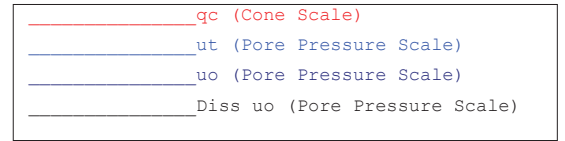
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Site: Durban Harbour over water

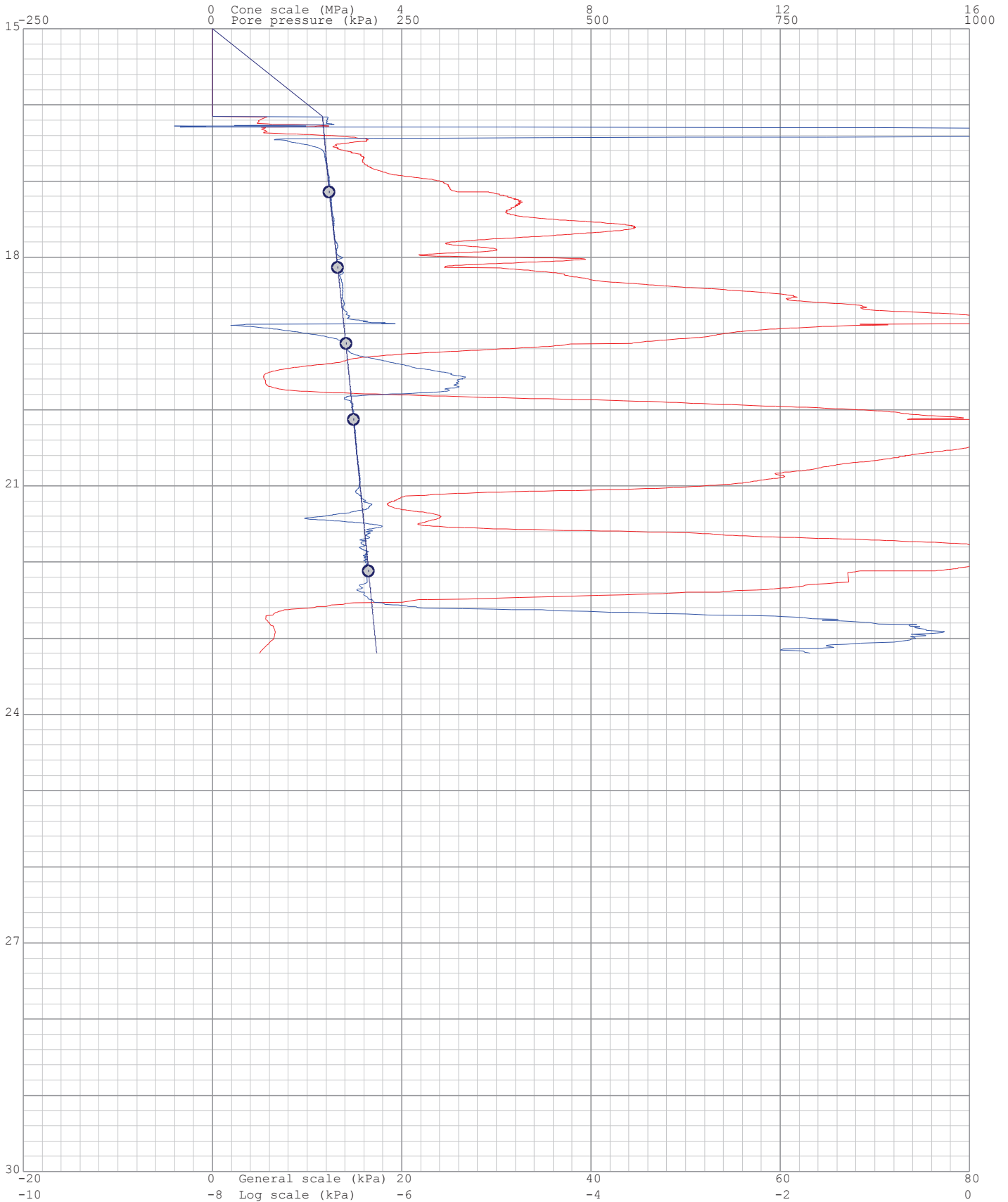
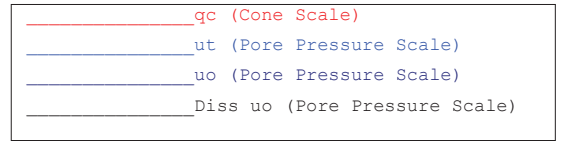
Hole No: S 11  
Date: 2012/08/17



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 11  
Date: 2012/08/17





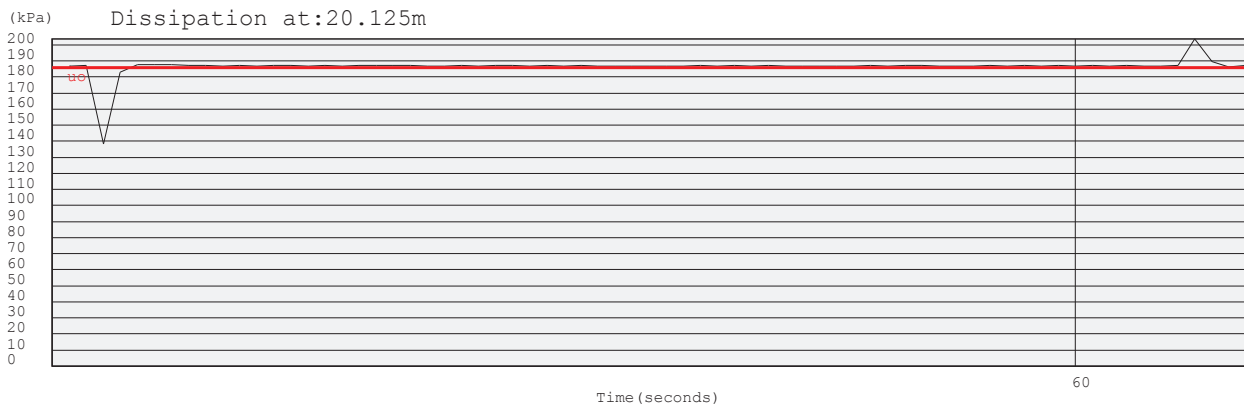
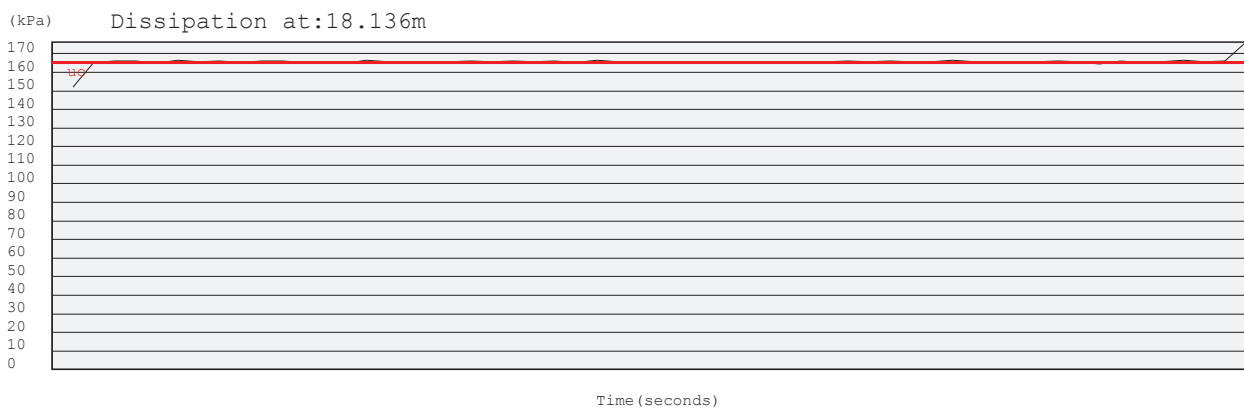
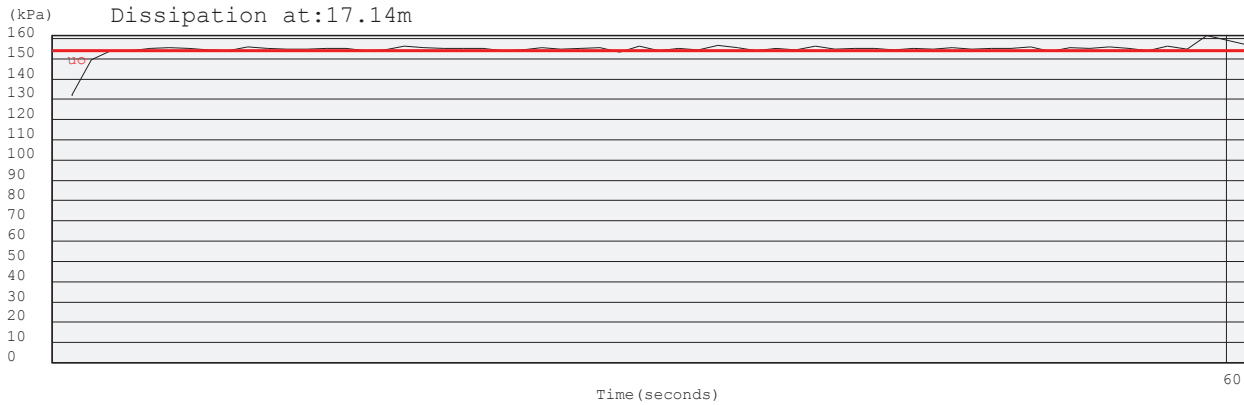
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 11

Date: 2012/08/17

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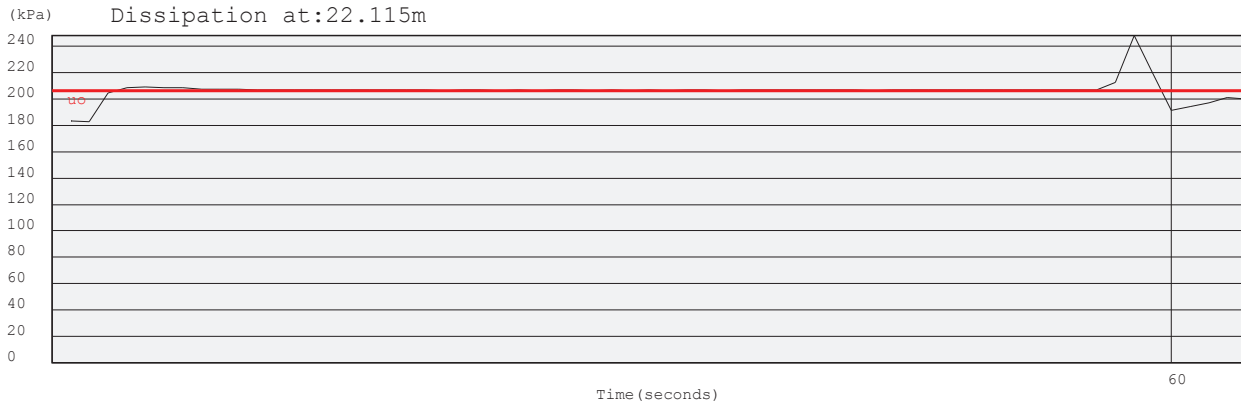
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 11

Date: 2012/08/17

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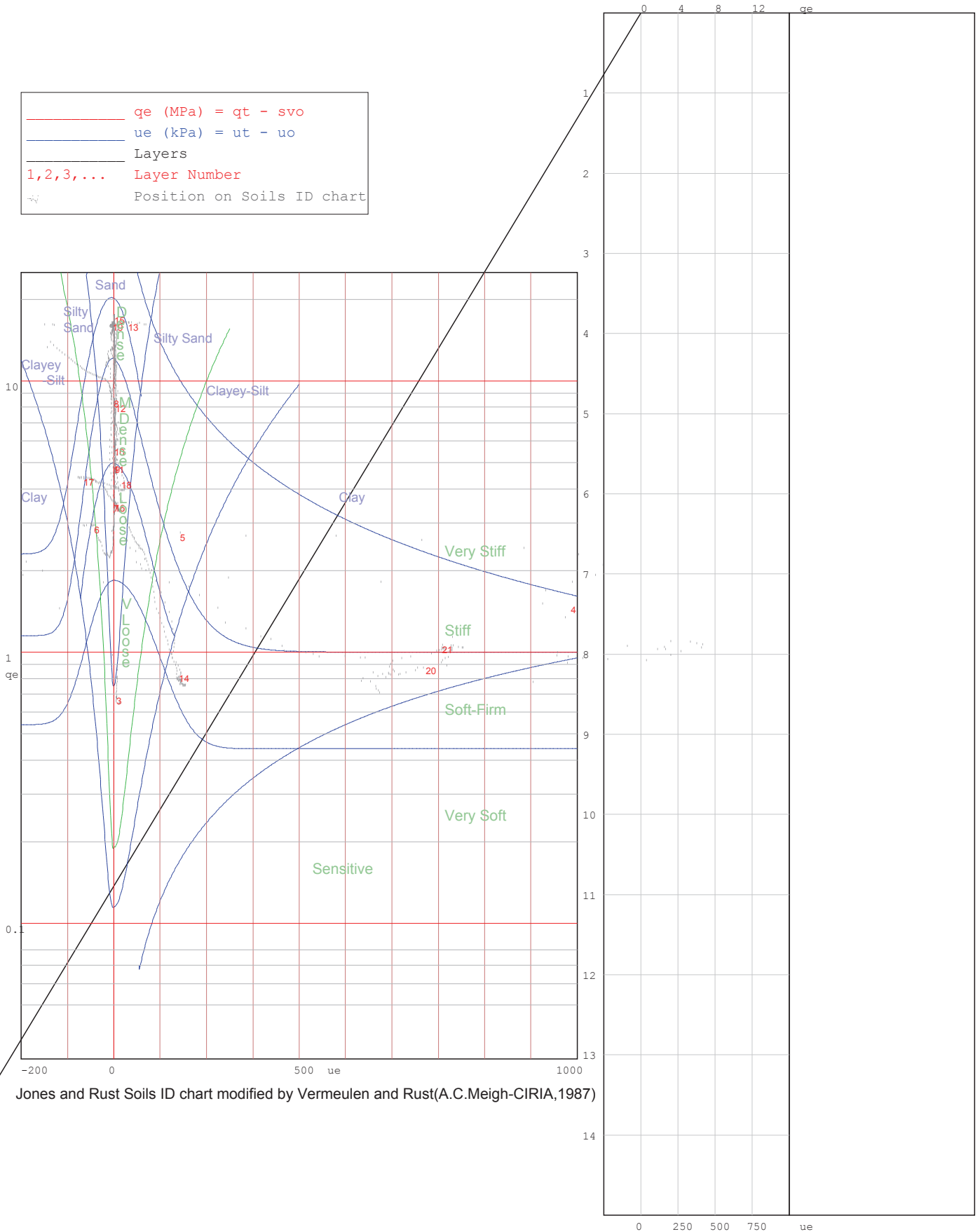
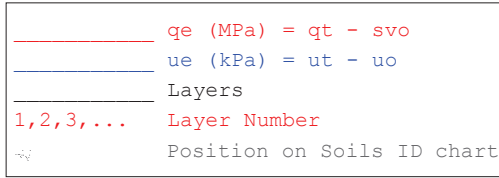


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 11

Date: 2012/08/17

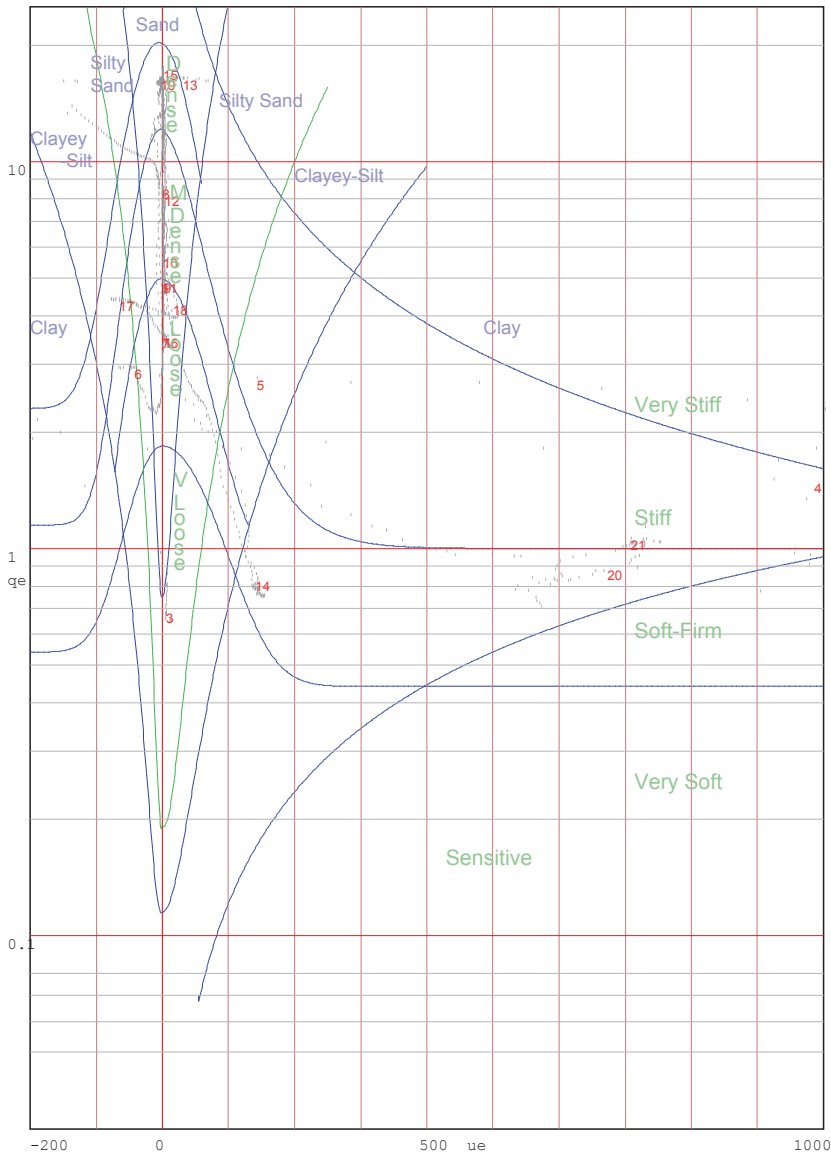


Site: Durban Harbour over water

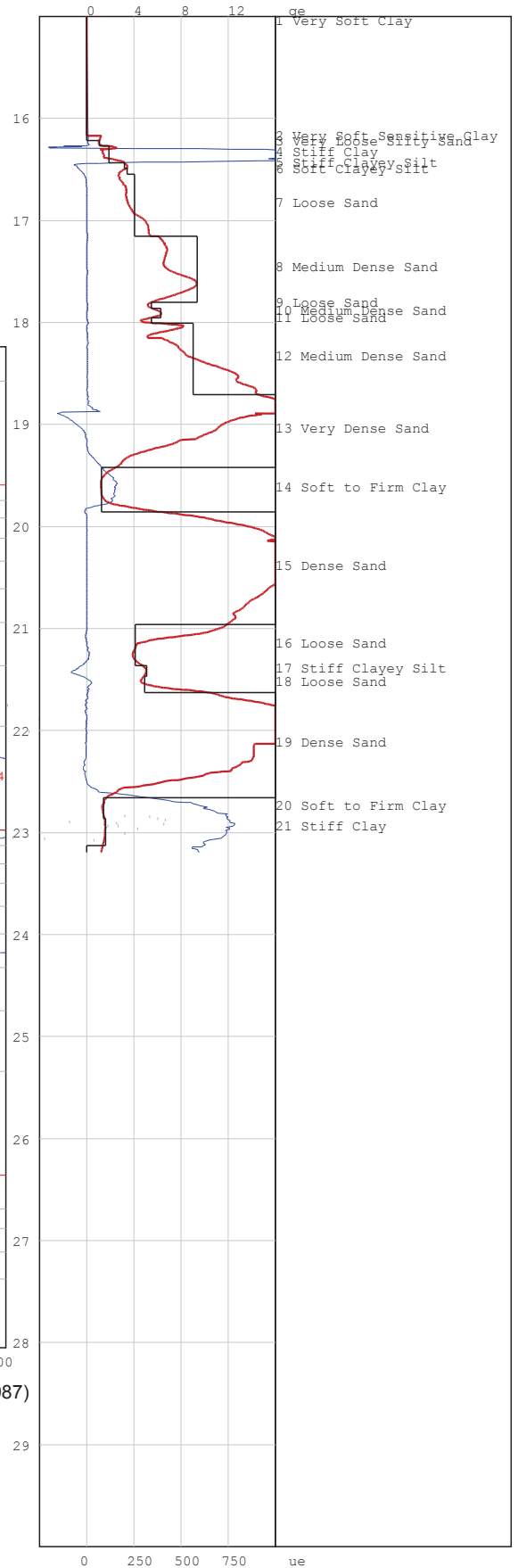
Hole No: S 11

Date: 2012/08/17

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

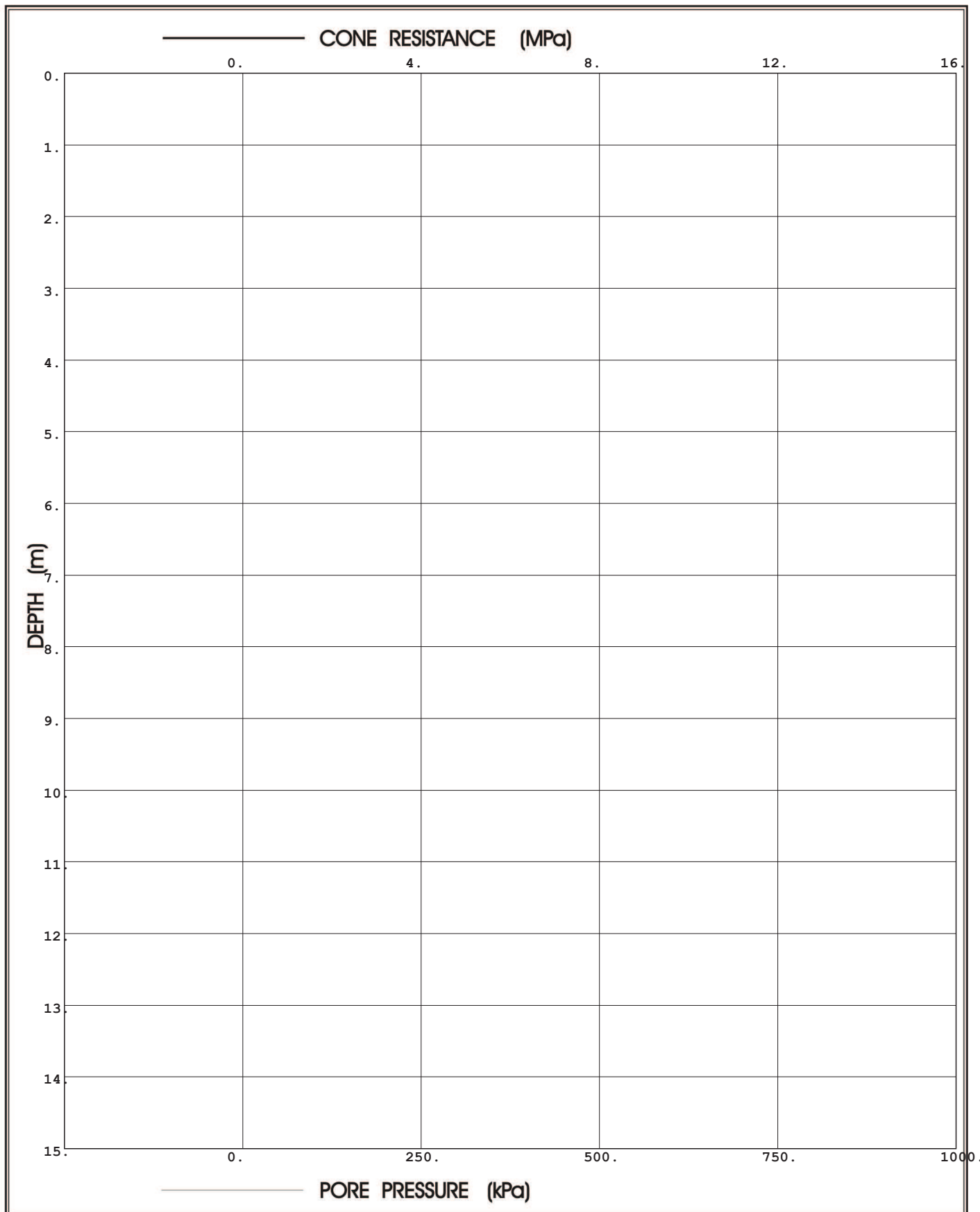
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 12

DATE: 2012/08/17

Page:1



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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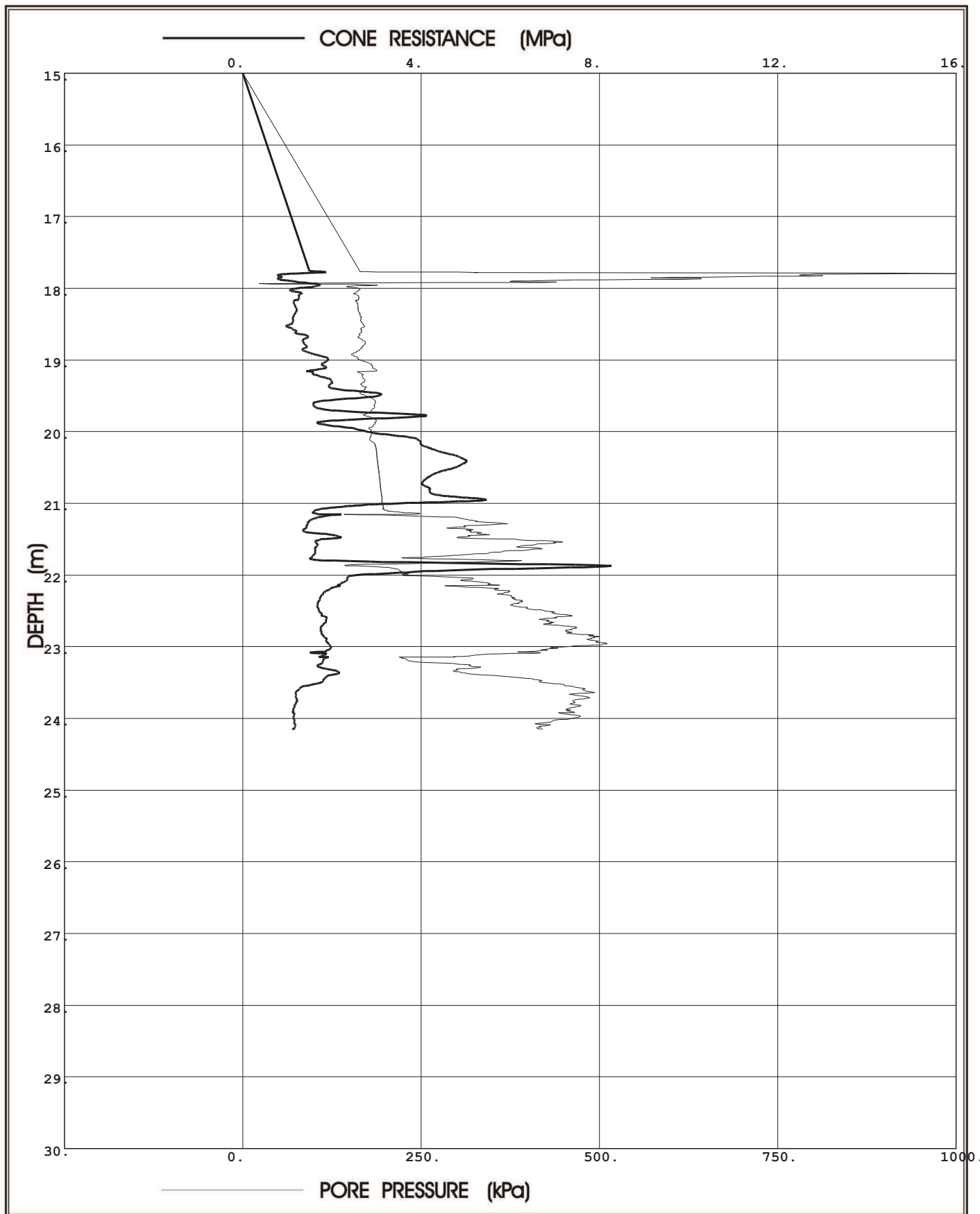
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 12

DATE: 2012/08/17

Page:2



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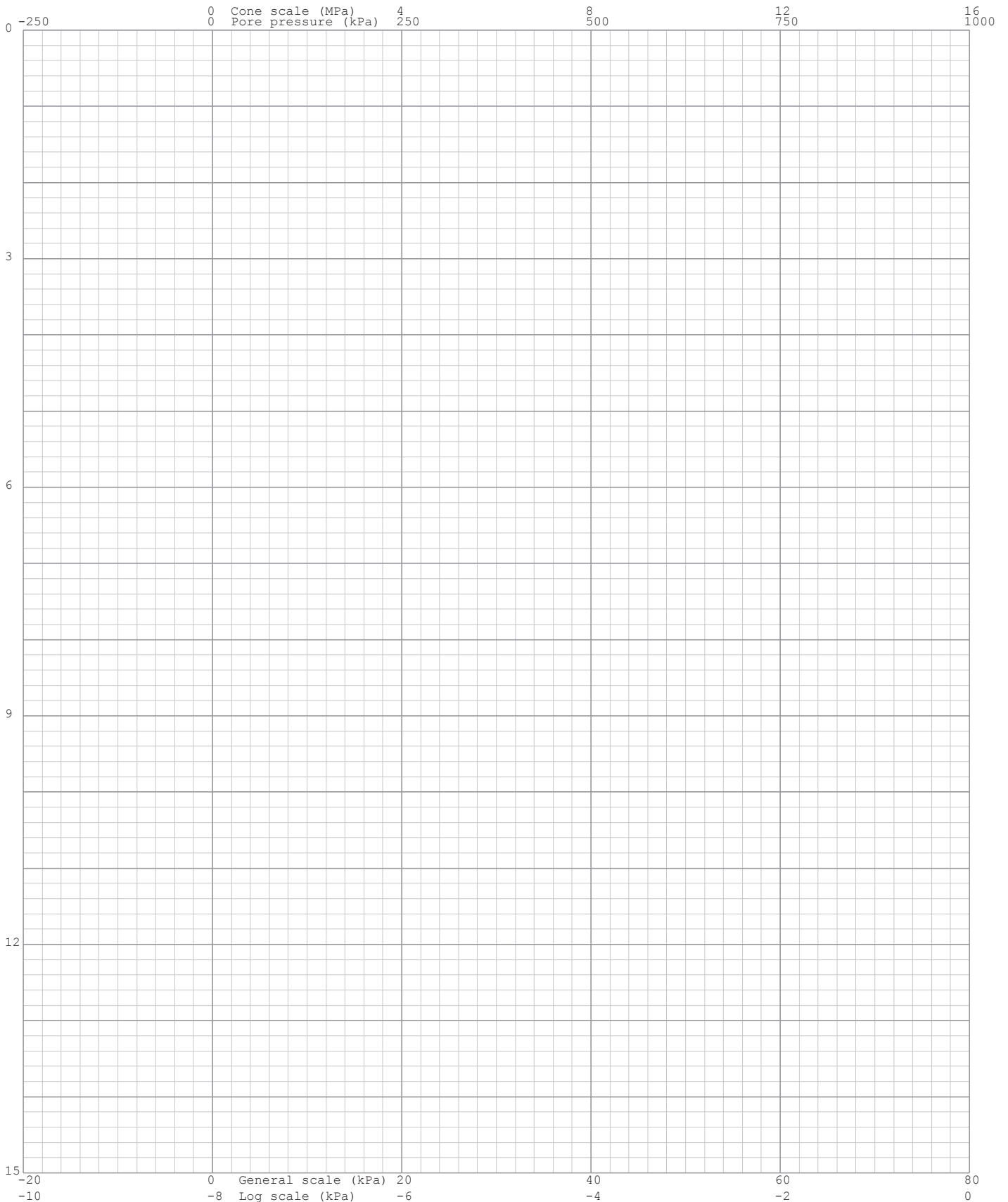
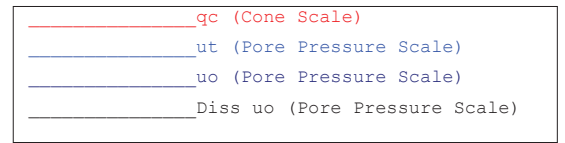
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

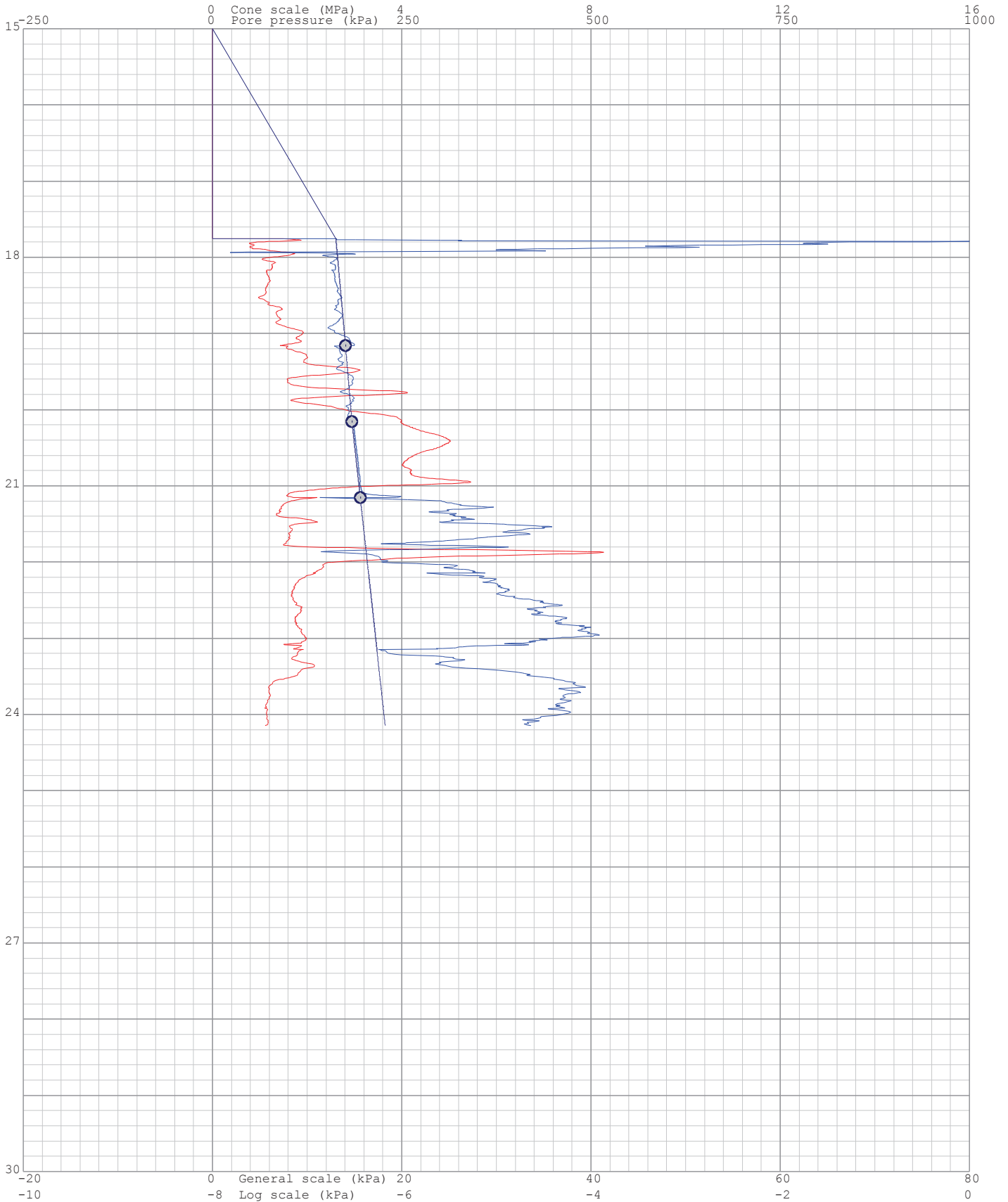
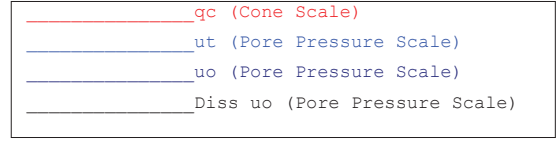
Hole No: S 12  
Date: 2012/08/17



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 12  
Date: 2012/08/17





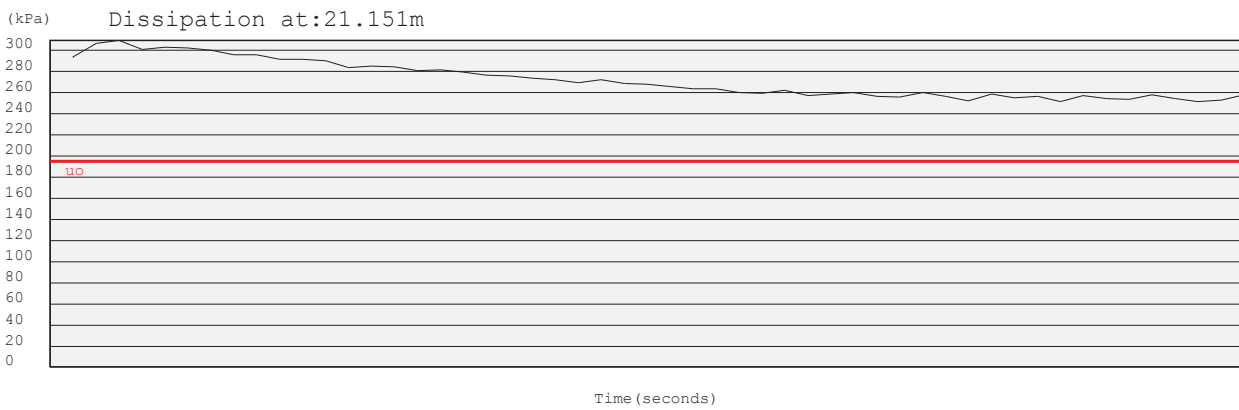
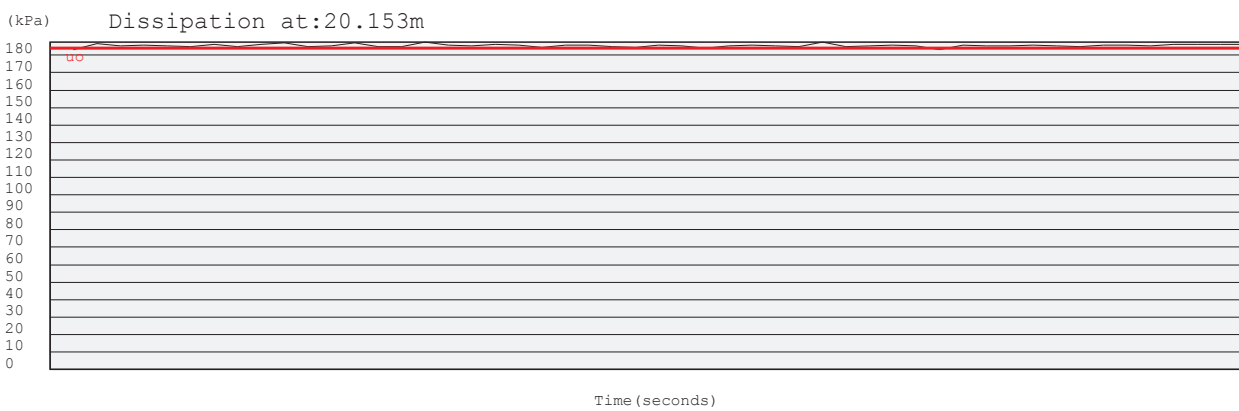
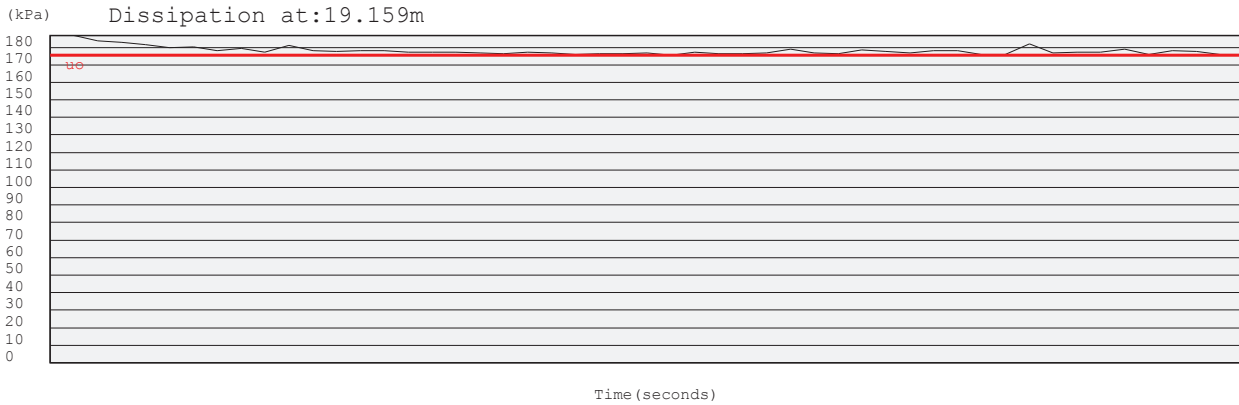
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 12

Date: 2012/08/17

Page: 1



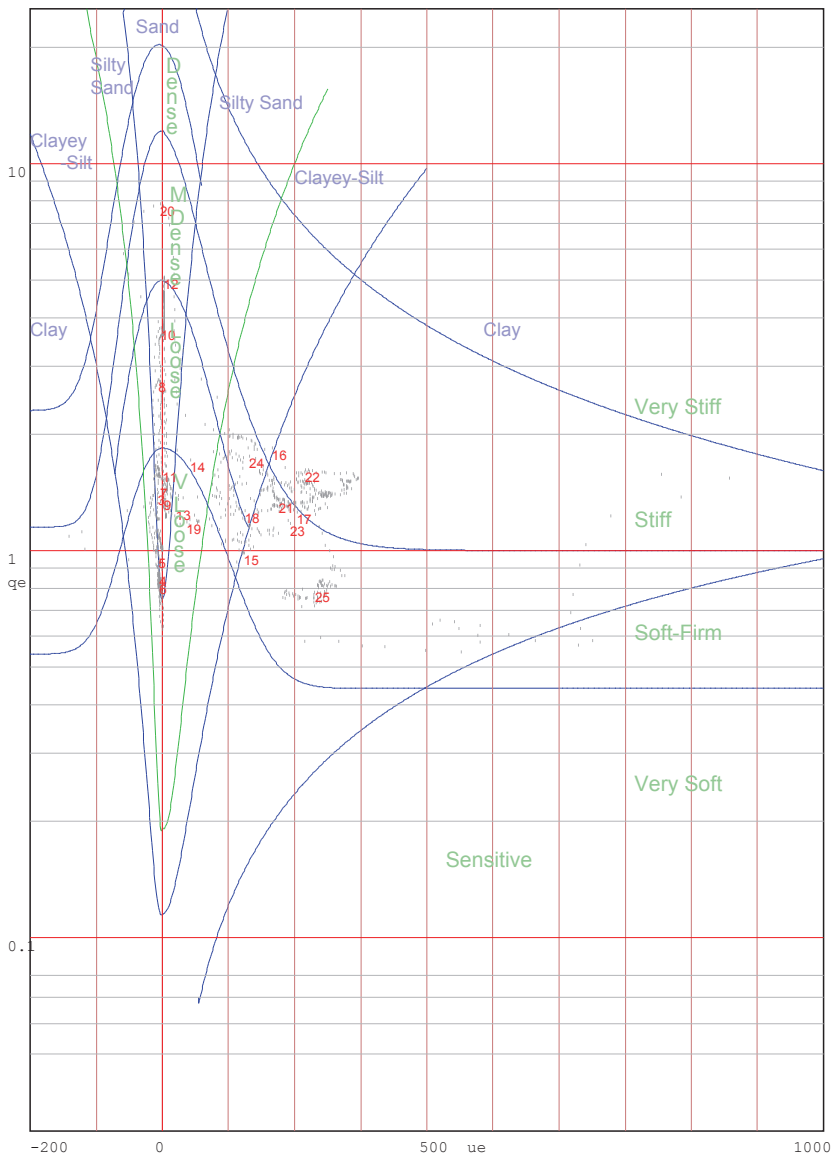
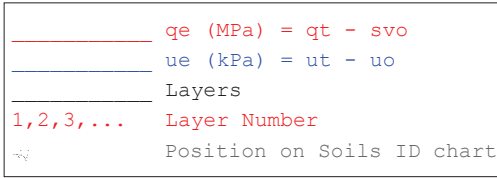


Project: Durban Harbour Piezocone Investigation for Dredging

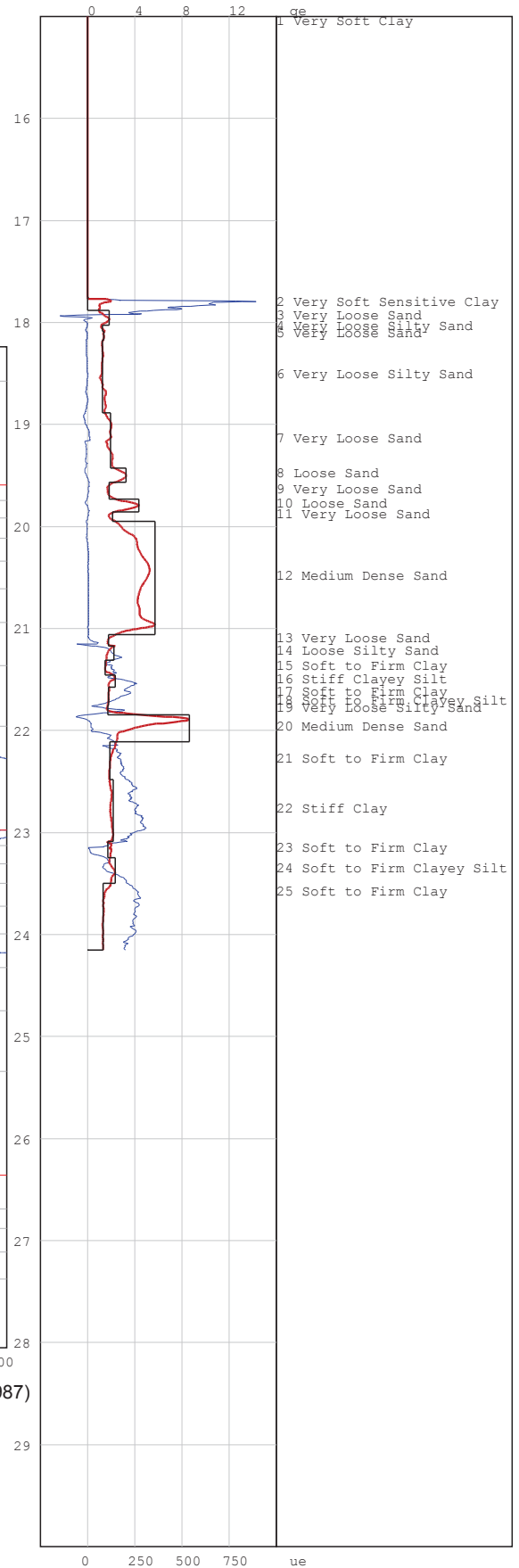
Site: Durban Harbour over water

Hole No: S 12

Date: 2012/08/17



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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0044

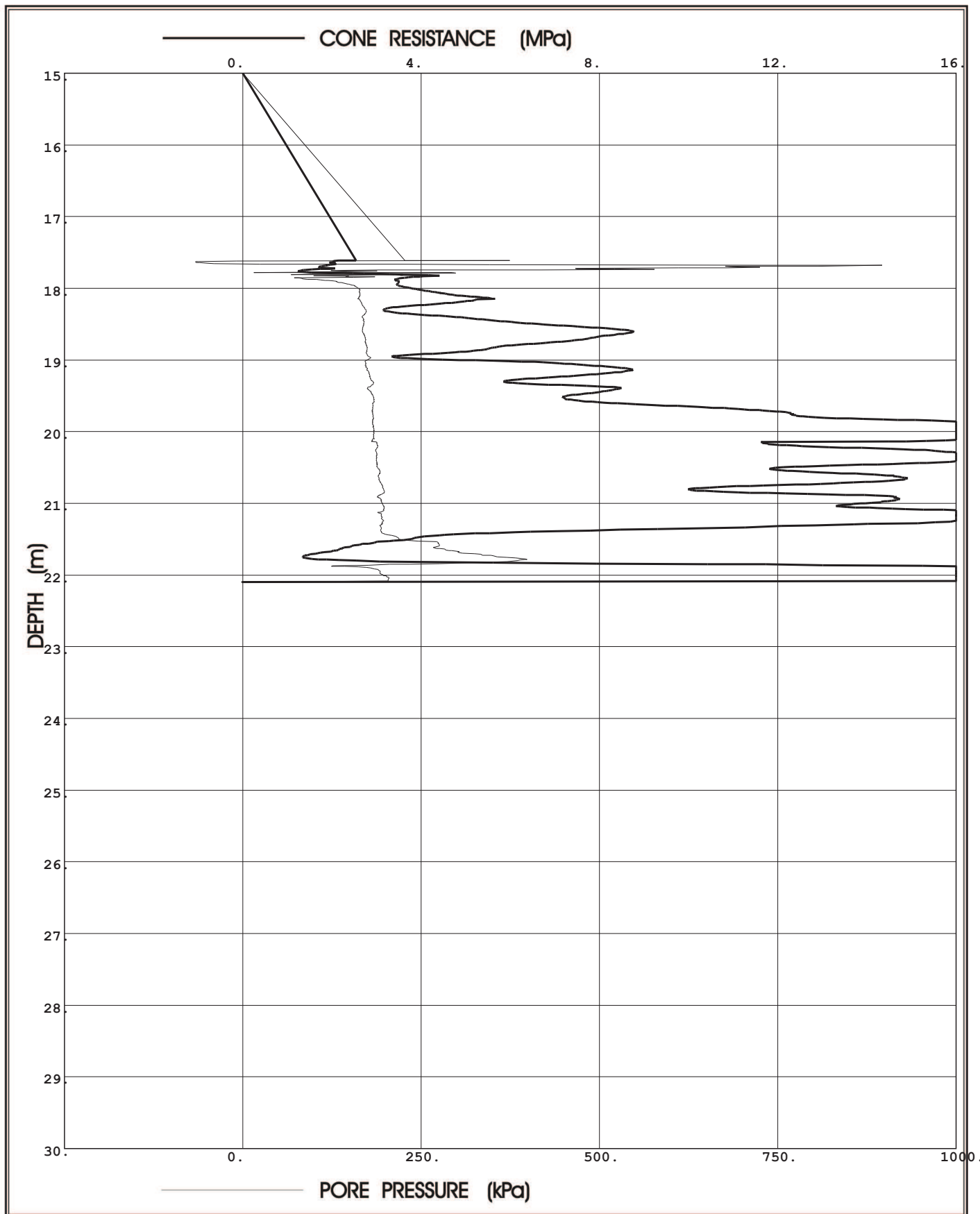
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 13

DATE: 2012/08/21

Page:2



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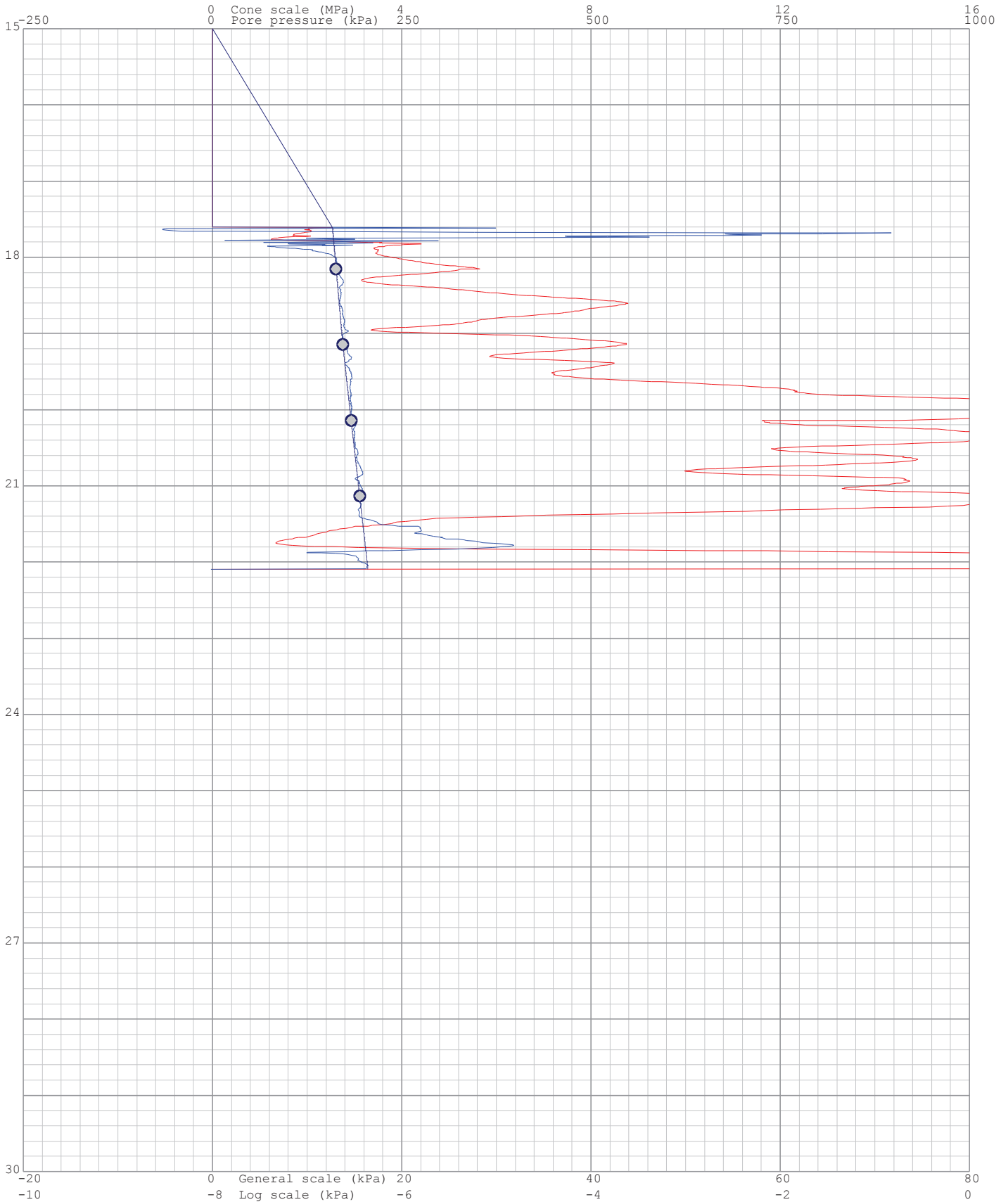
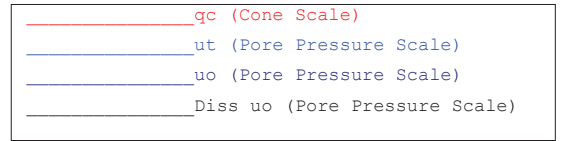
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 13  
Date: 2012/08/21



Project: Durban Harbour Piezocone Investigation for Dredging

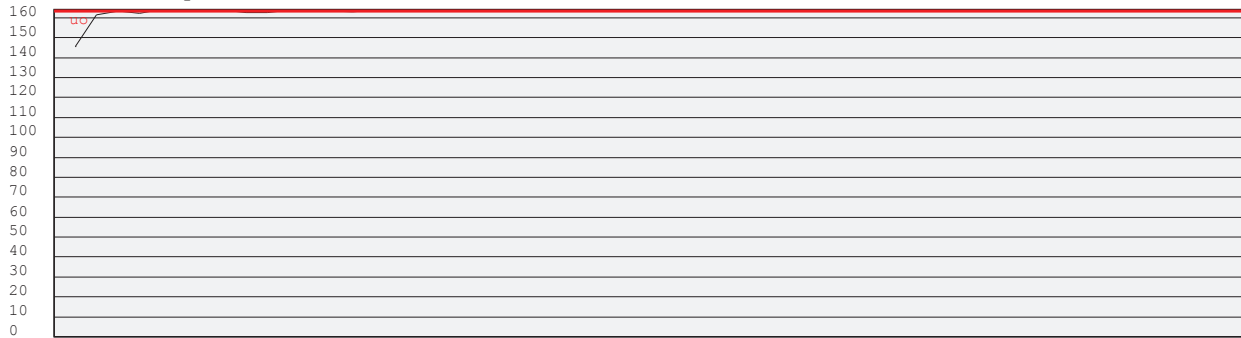
Site: Durban Harbour over water

Hole: S 13

Date: 2012/08/21

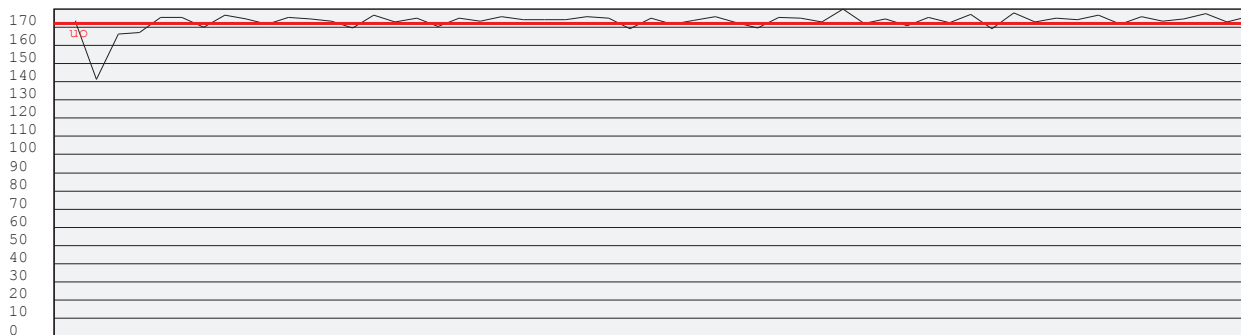
Page: 1

(kPa) Dissipation at:18.15m



Time (seconds)

(kPa) Dissipation at:19.144m



Time (seconds)

(kPa) Dissipation at:20.139m



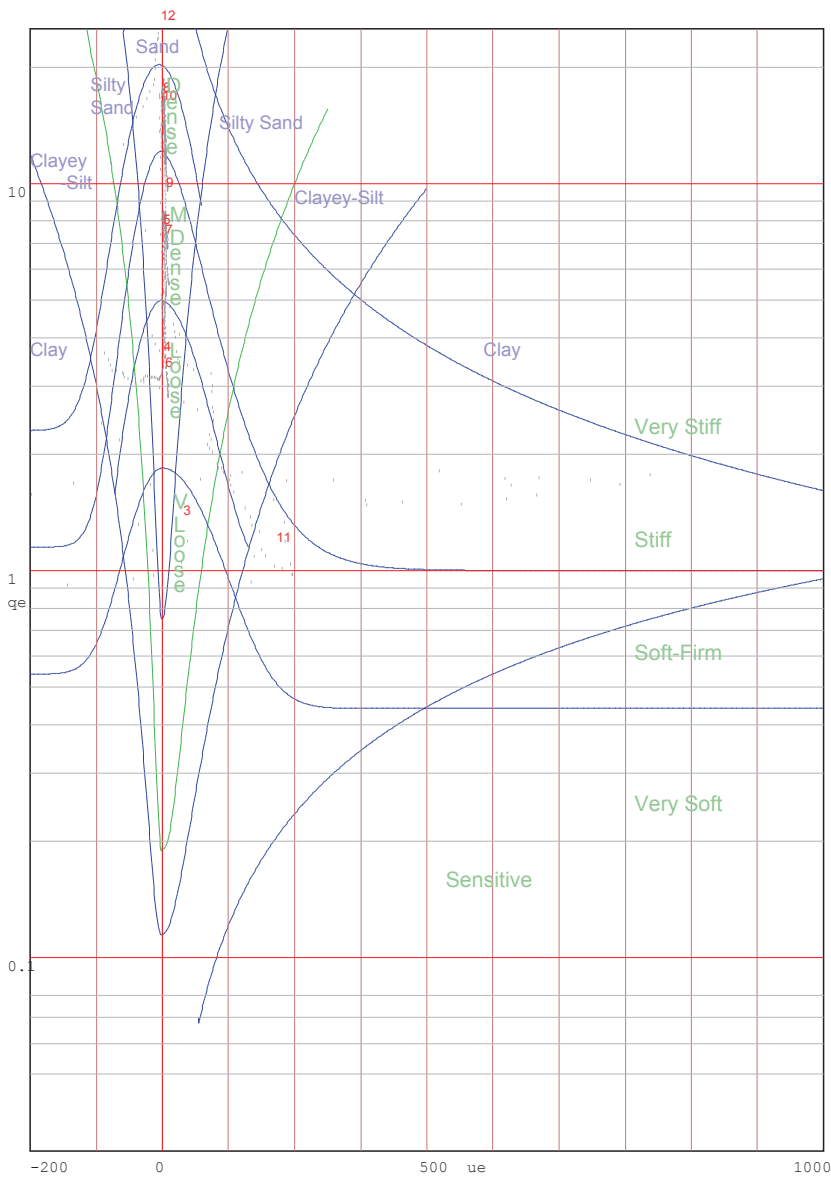
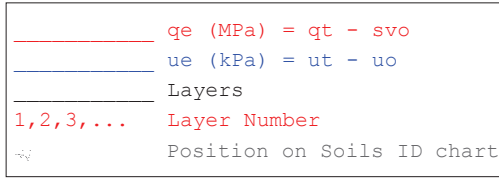
Time (seconds)

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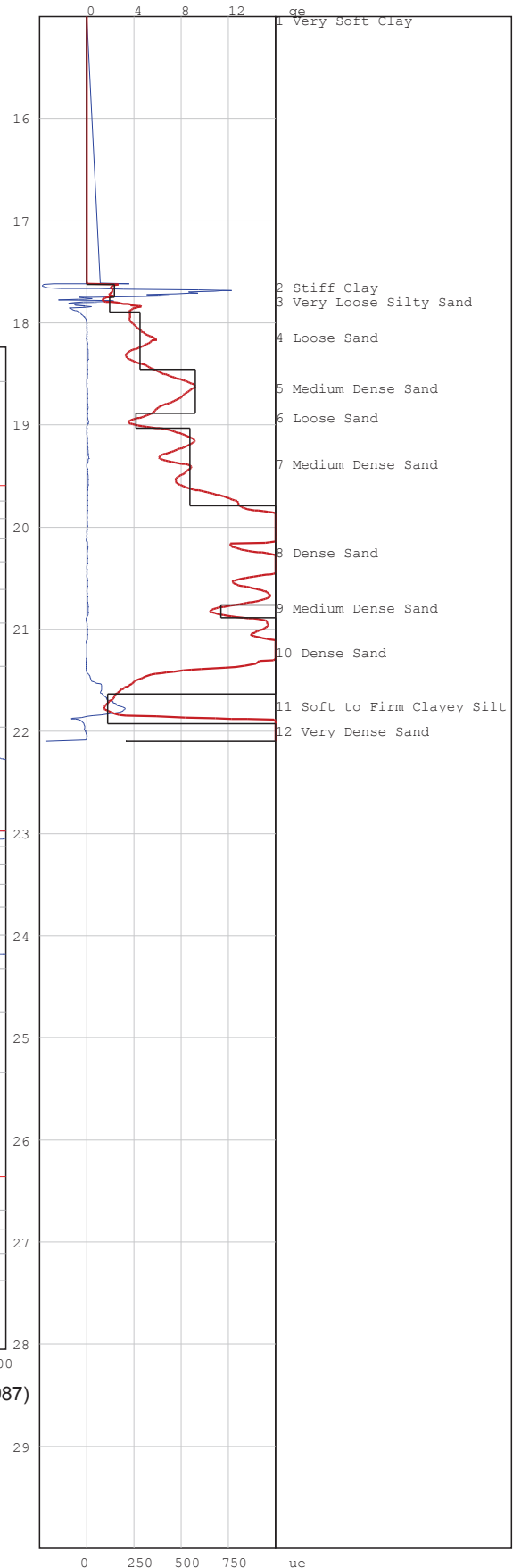
(kPa) Dissipation at:21.133m



Time (seconds)



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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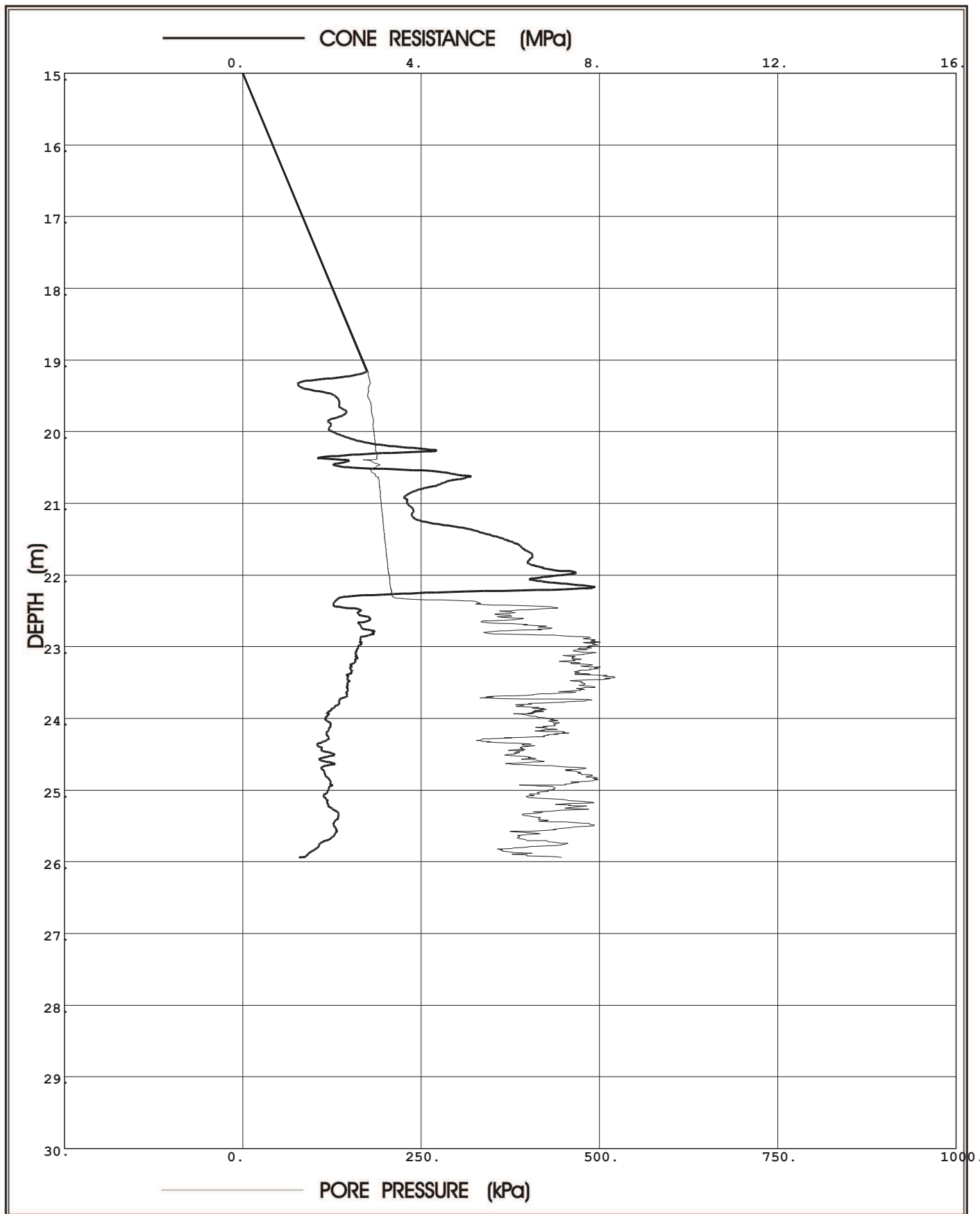
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 14

DATE: 2012/08/19

Page:2



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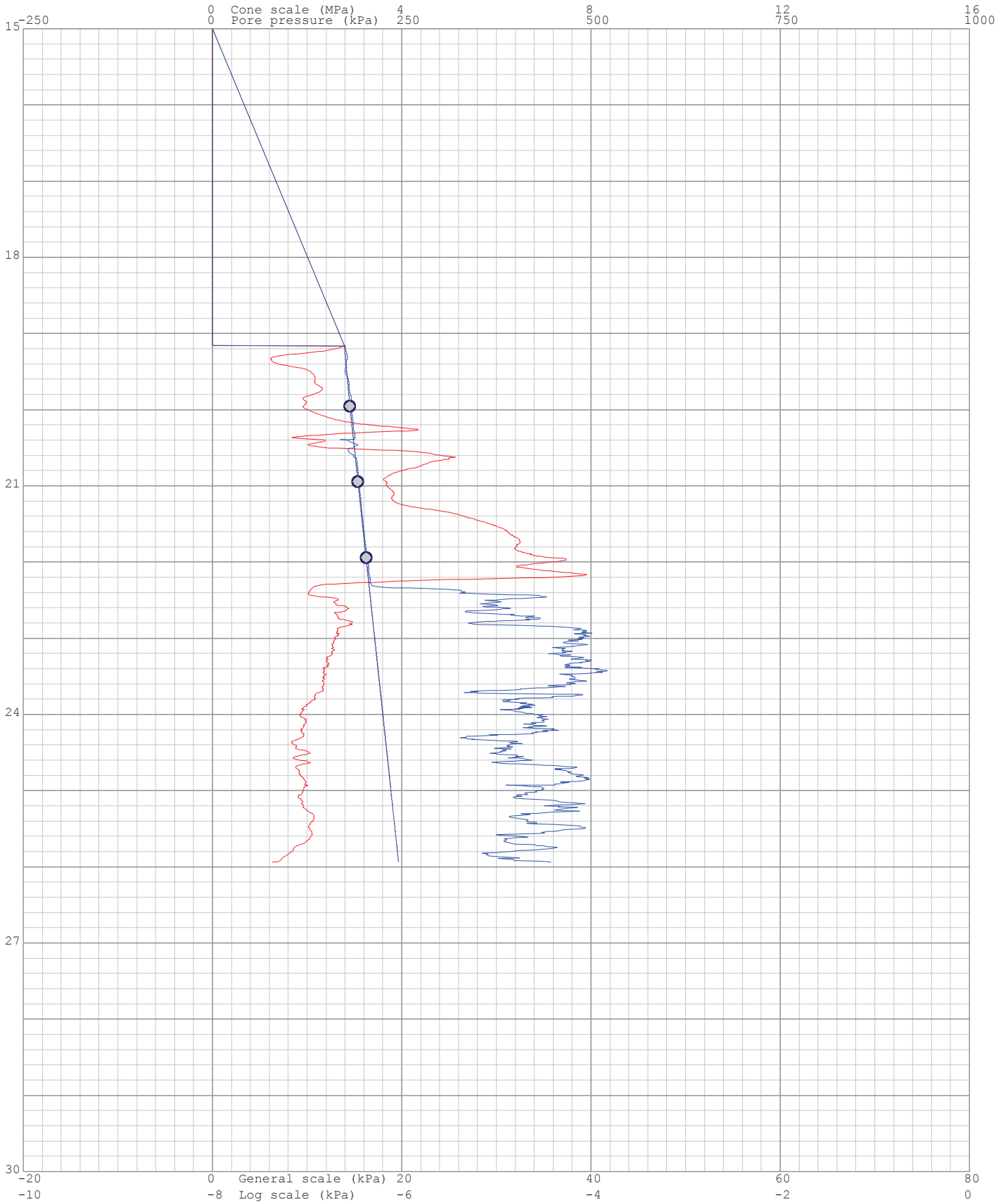
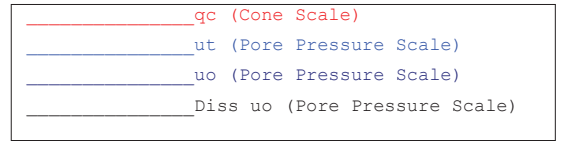
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rust@global.co.za



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 14  
Date: 2012/08/19



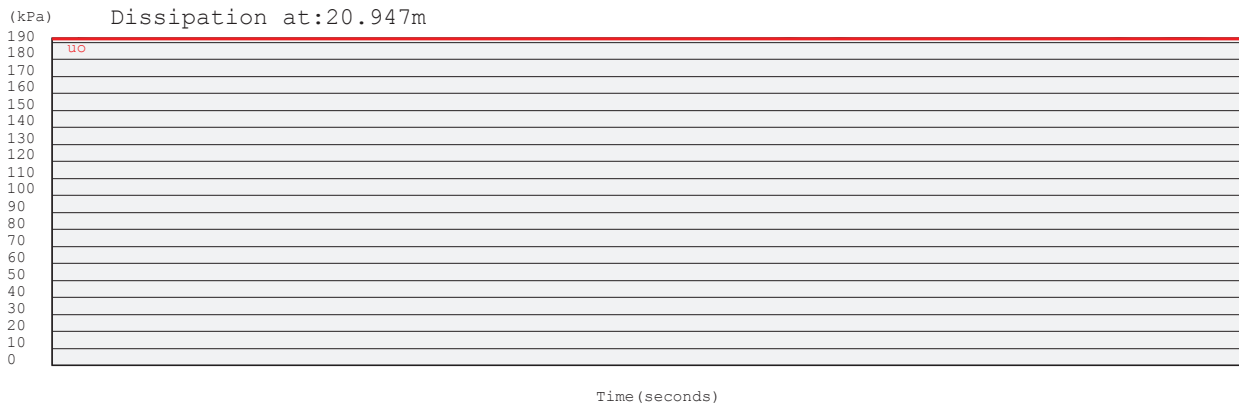
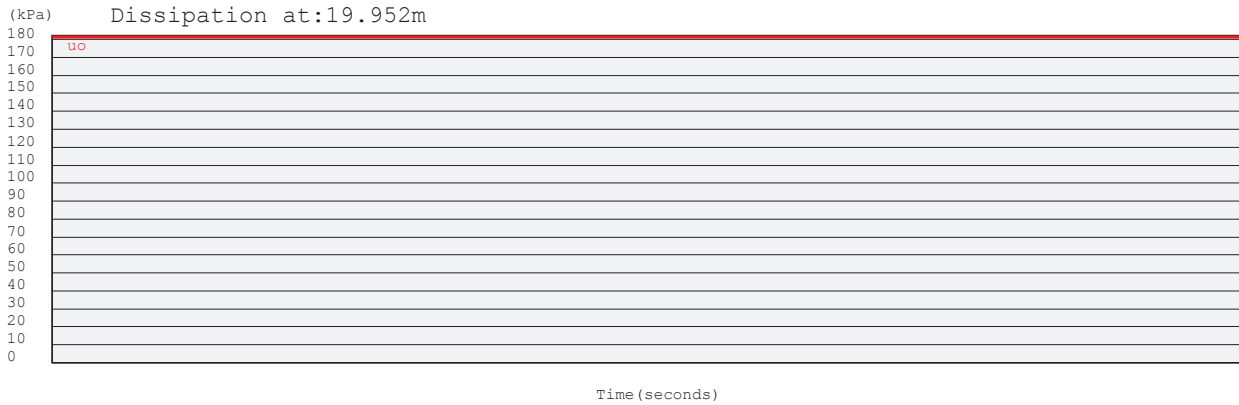
Project: Durban Harbour Piezocone Investigation for Dredging

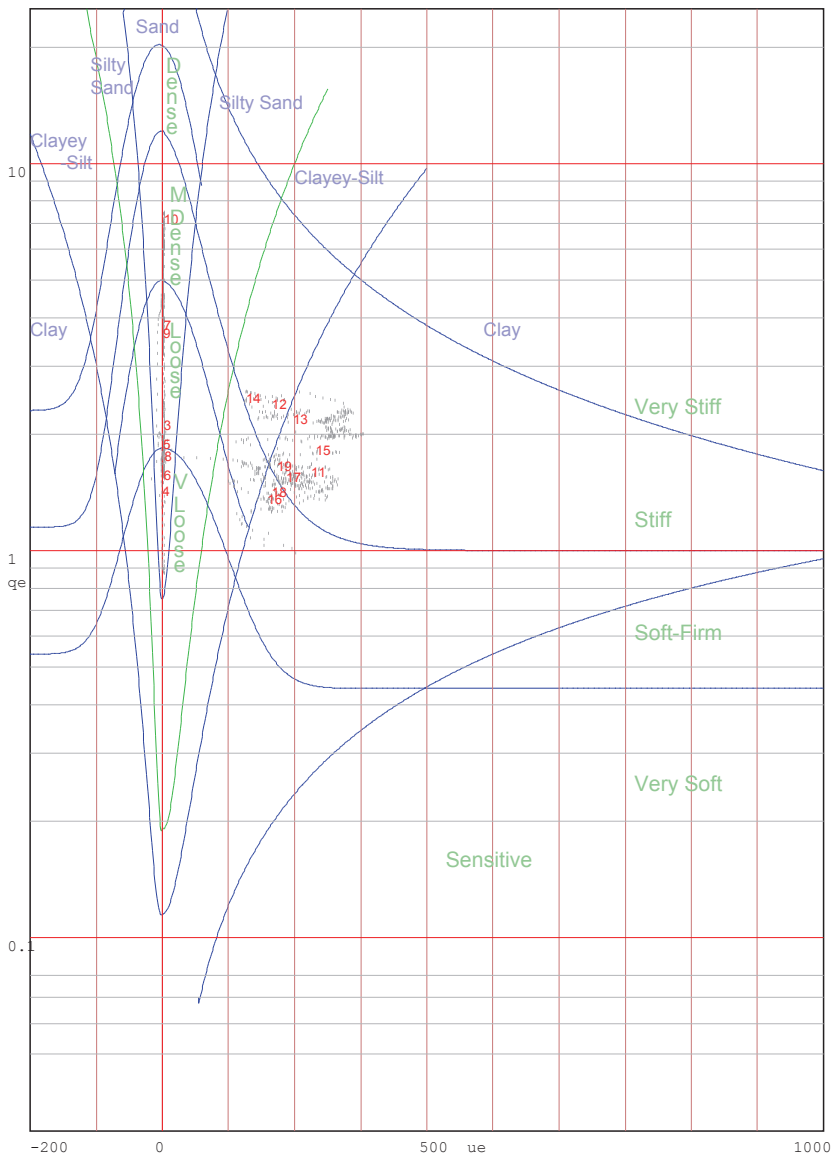
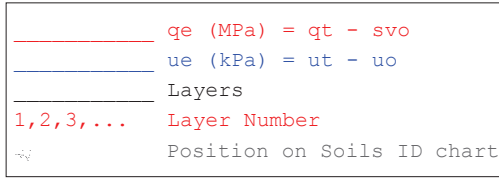
Site: Durban Harbour over water

Hole: S 14

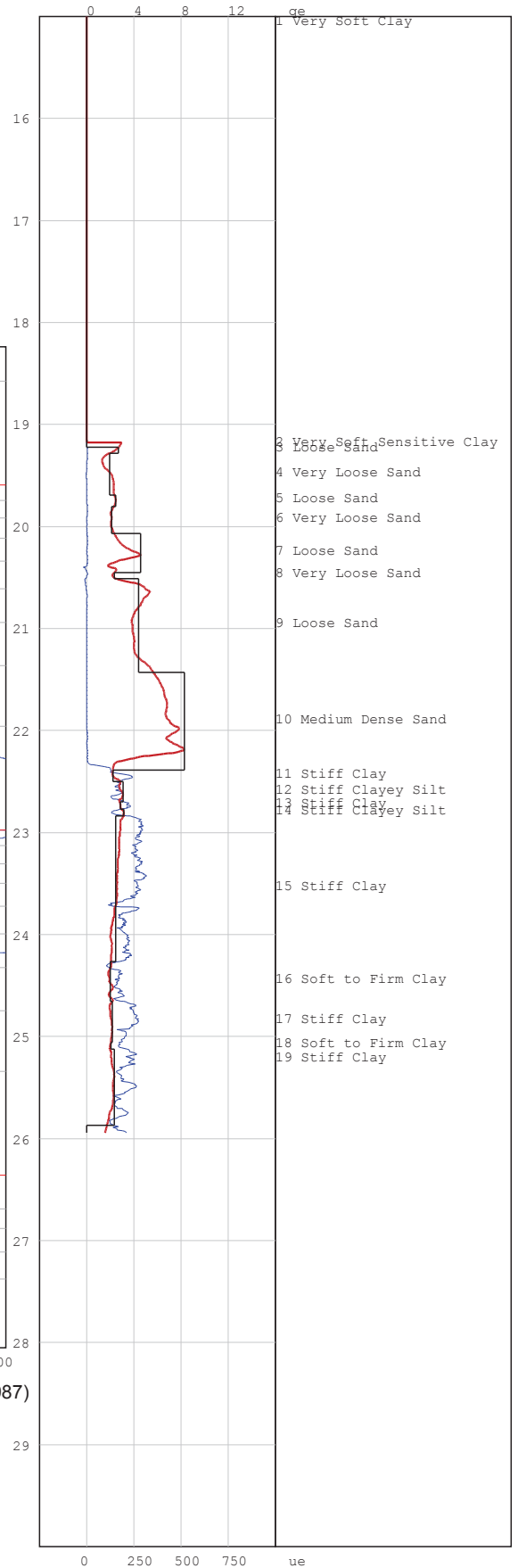
Date: 2012/08/19

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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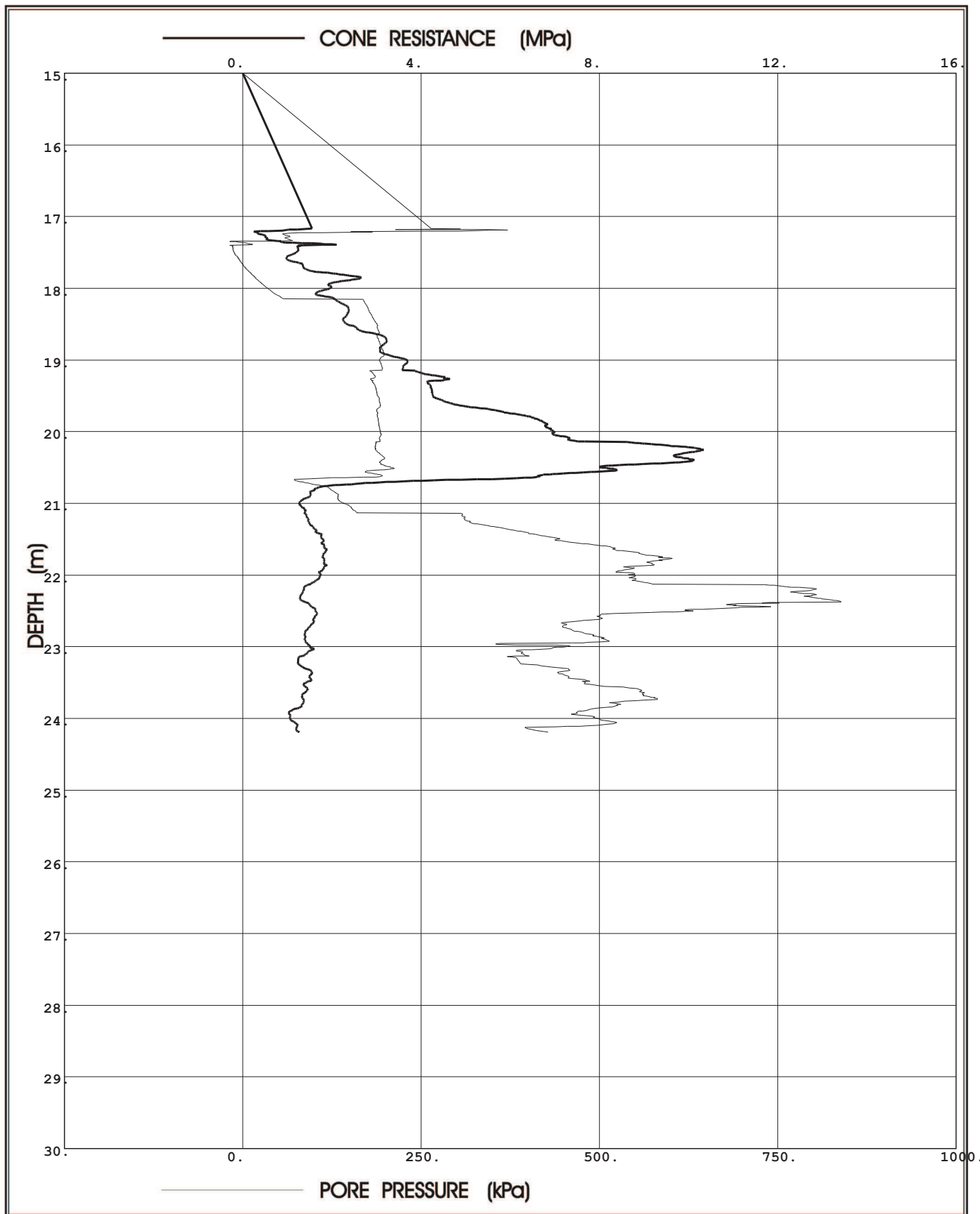
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 15

DATE: 2012/08/19

Page:2



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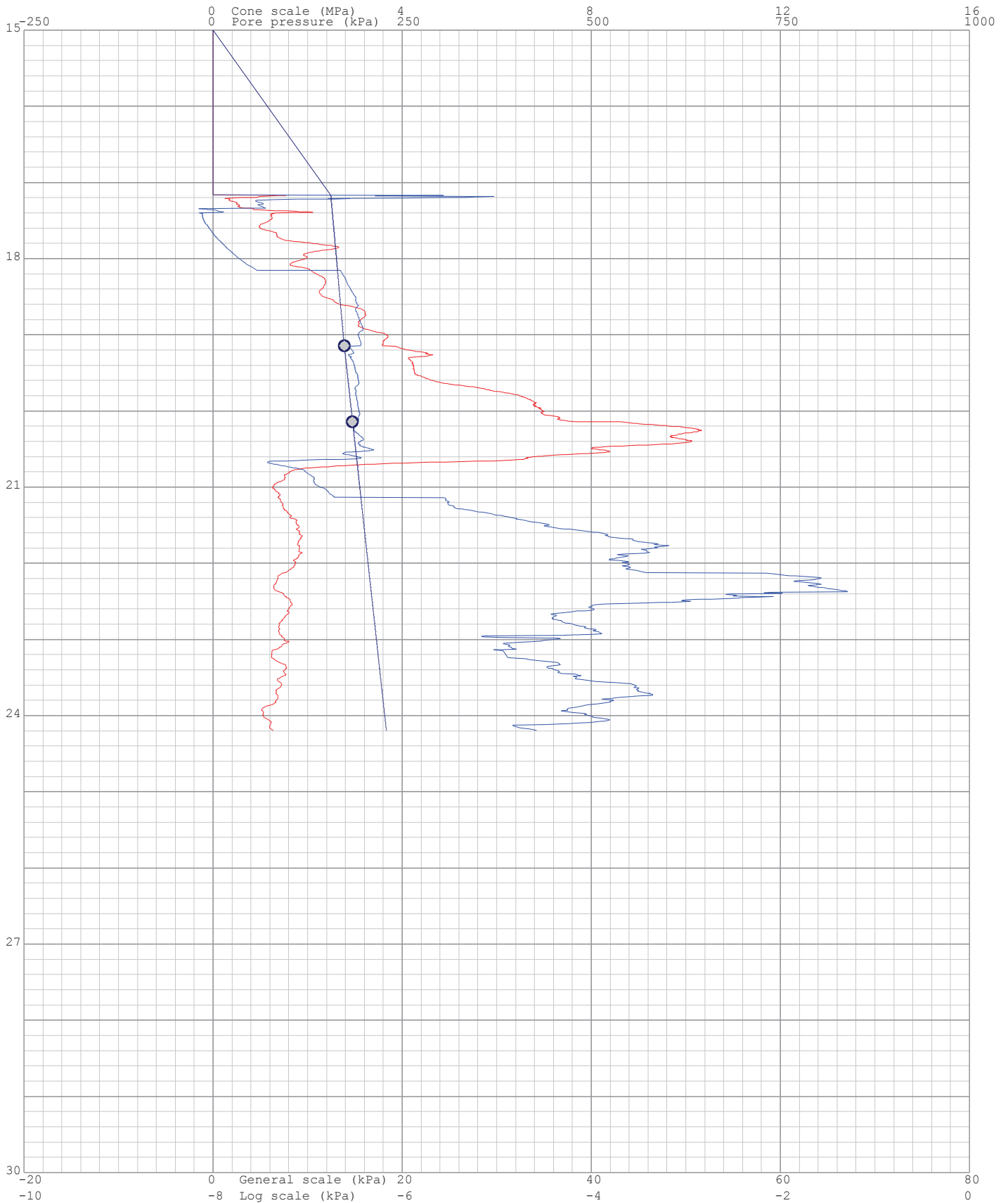
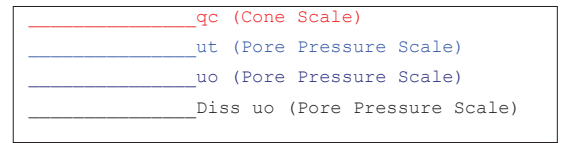
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 15  
Date: 2012/08/19



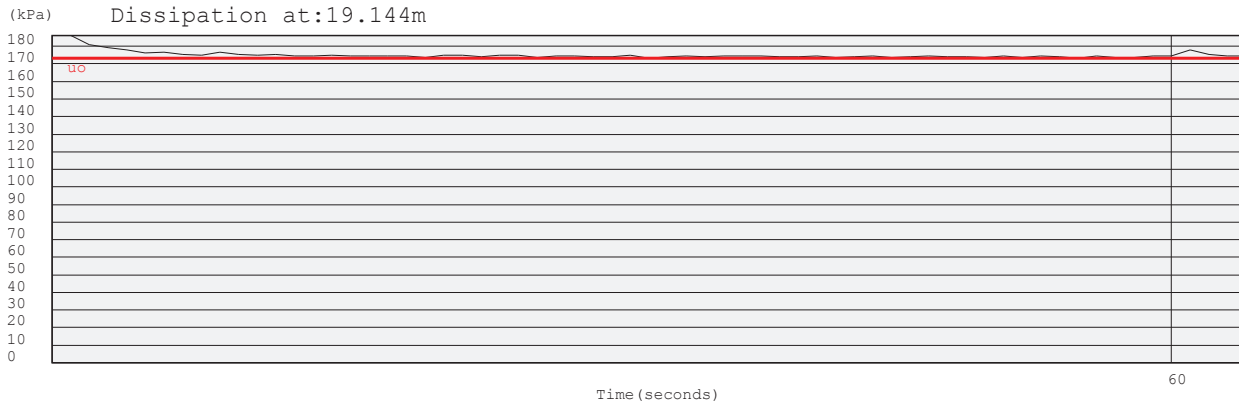
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 15

Date: 2012/08/19

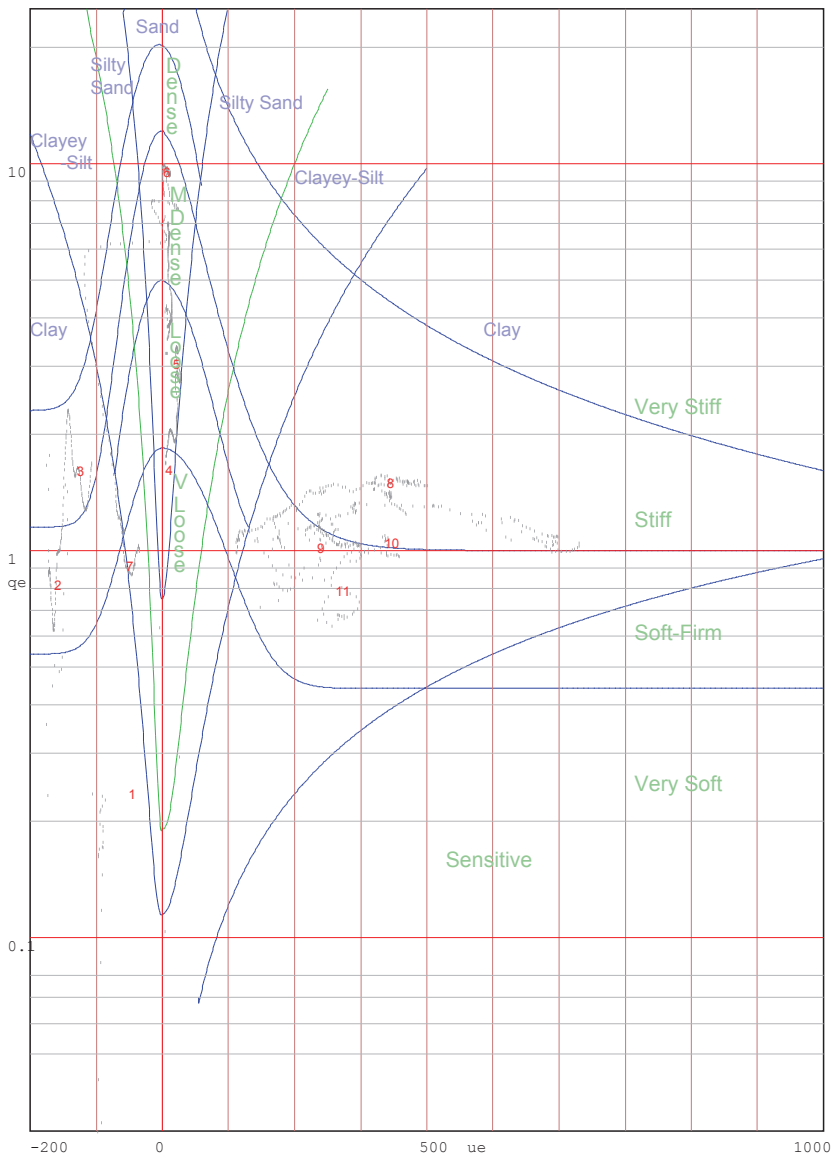
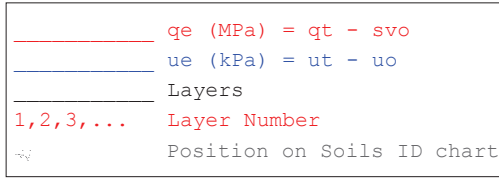
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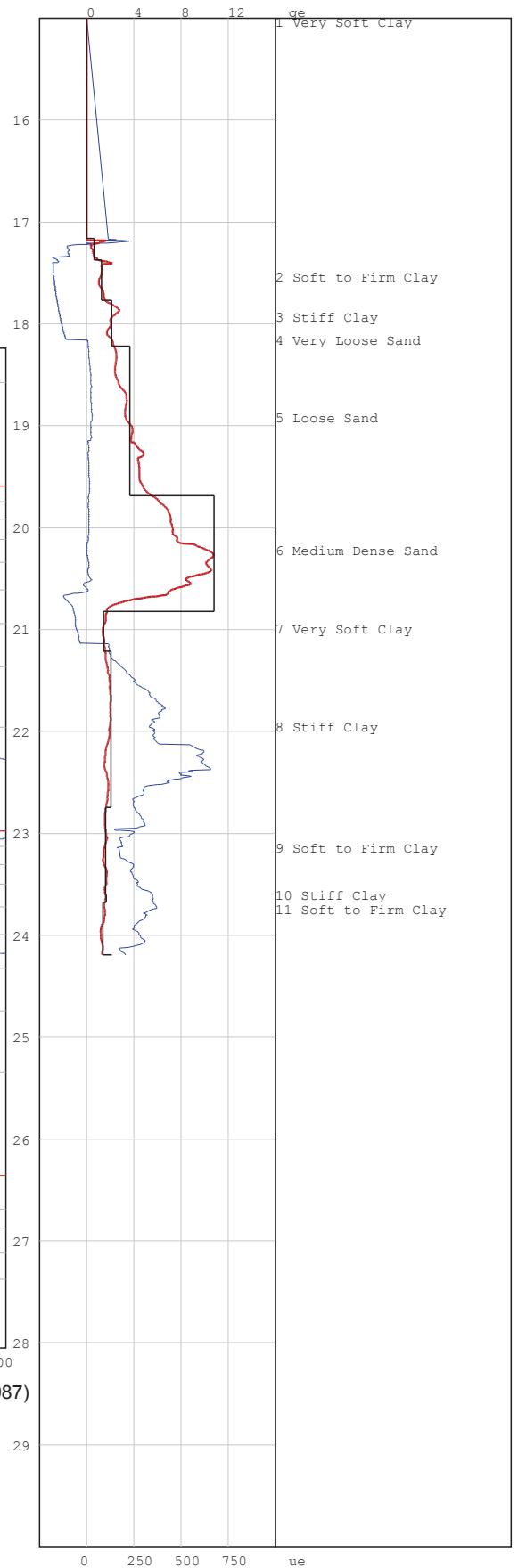
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 15  
Date: 2012/08/19



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

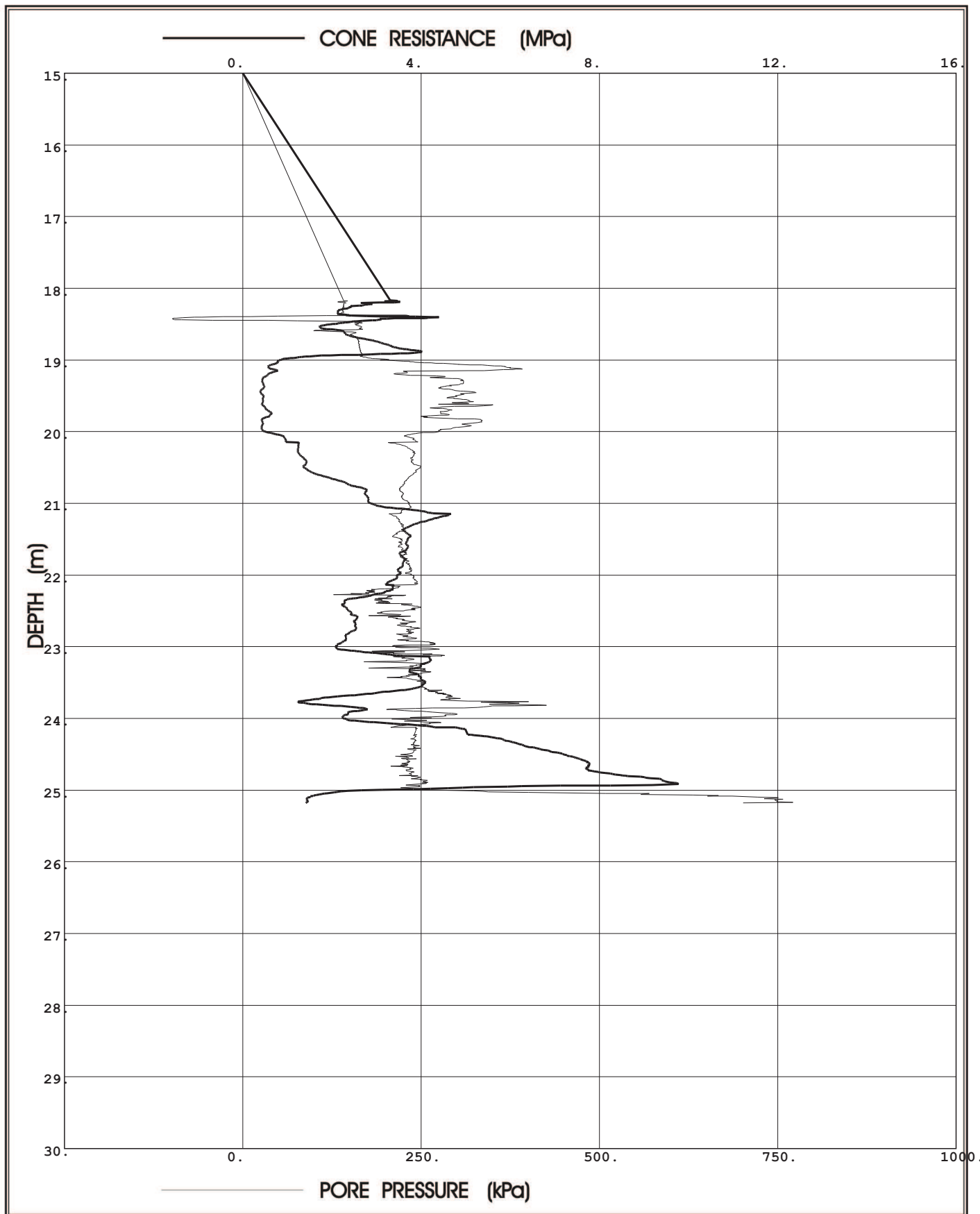
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 16

DATE: 2012/08/19

Page:2



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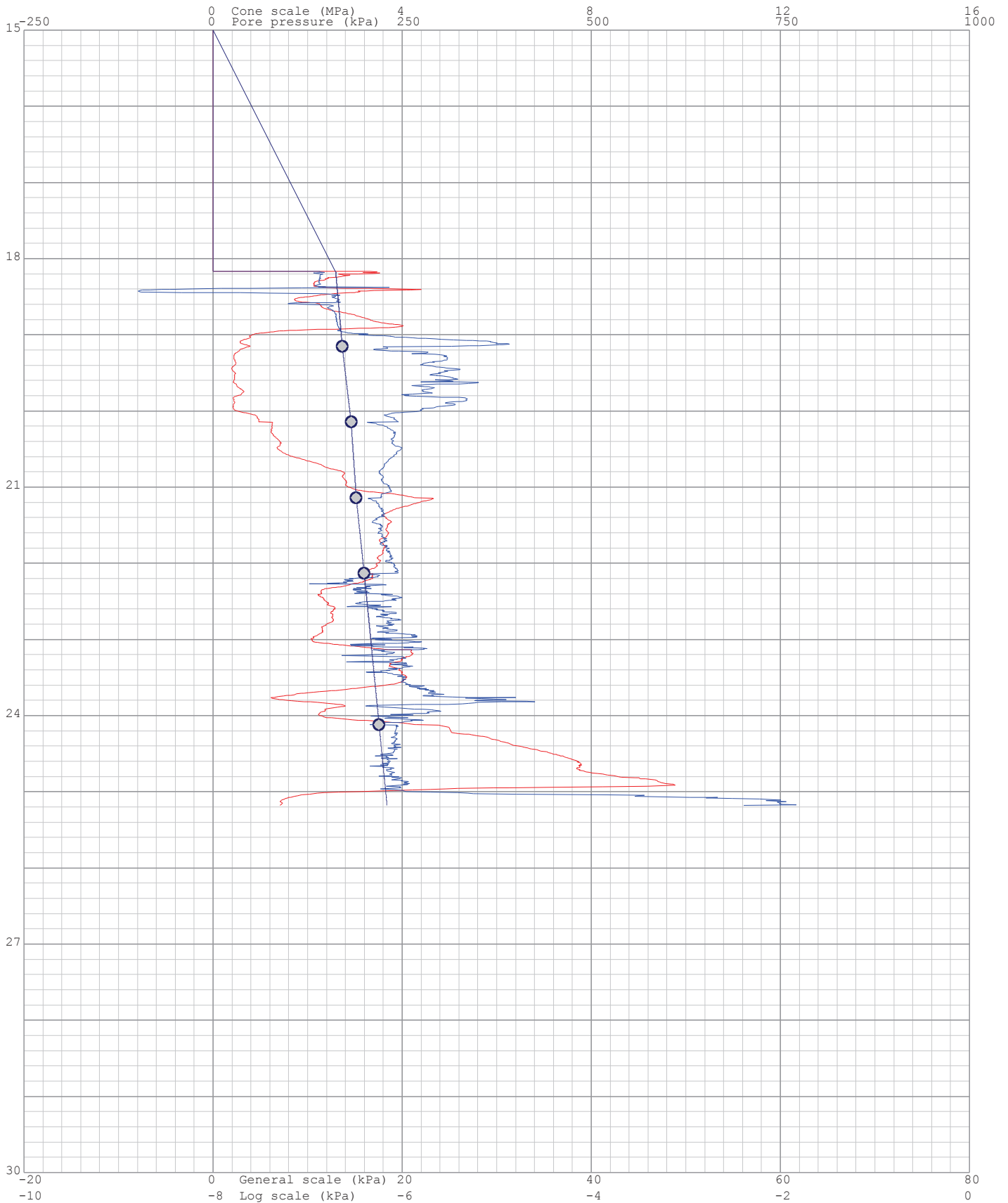
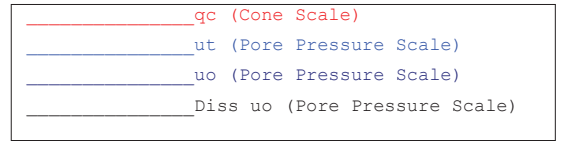
rust@global.co.za



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 16  
Date: 2012/08/19



Project: Durban Harbour Piezocone Investigation for Dredging

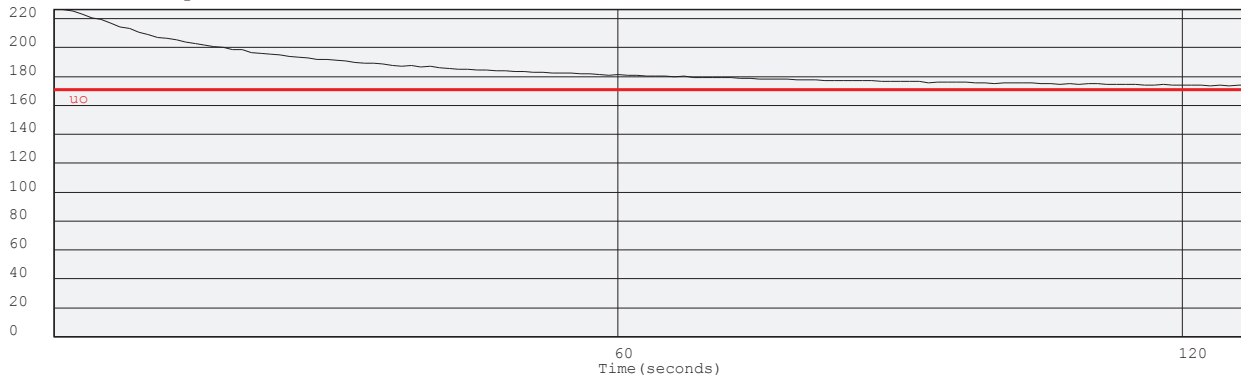
Site: Durban Harbour over water

Hole: S 16

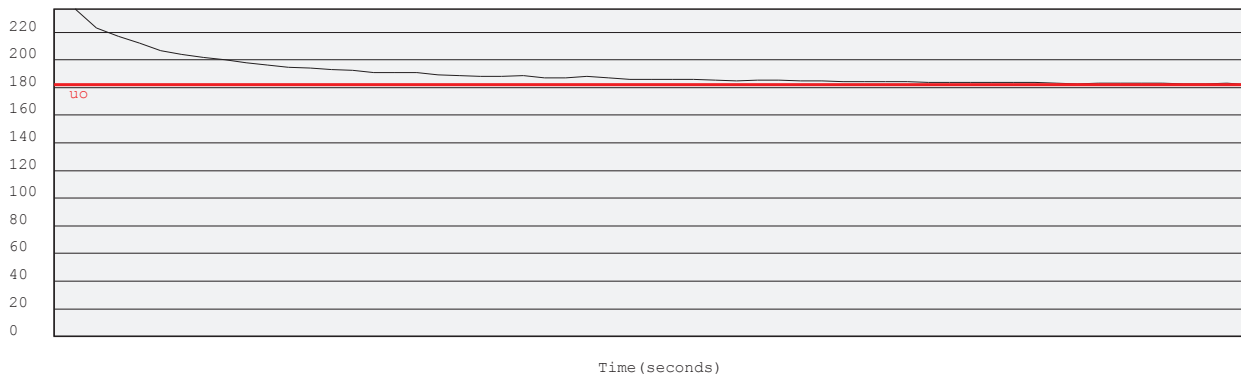
Date: 2012/08/19

Page: 1

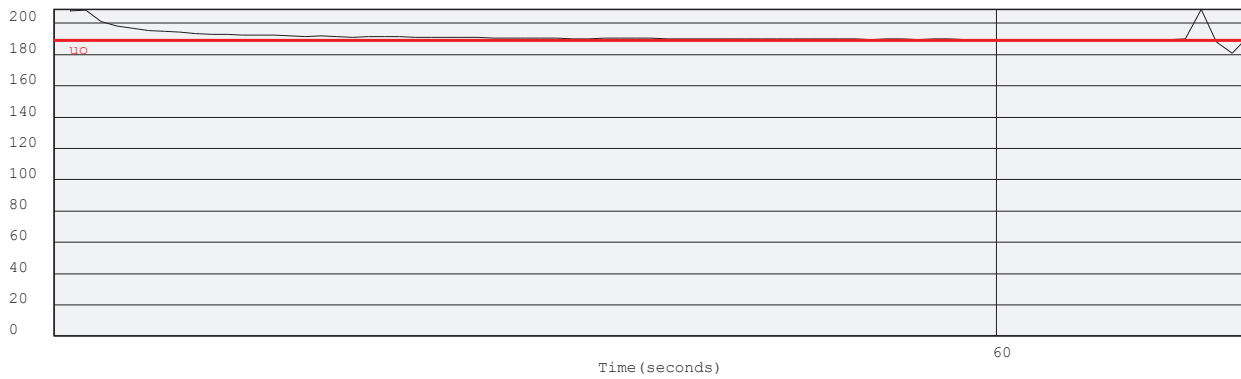
(kPa) Dissipation at:19.15m



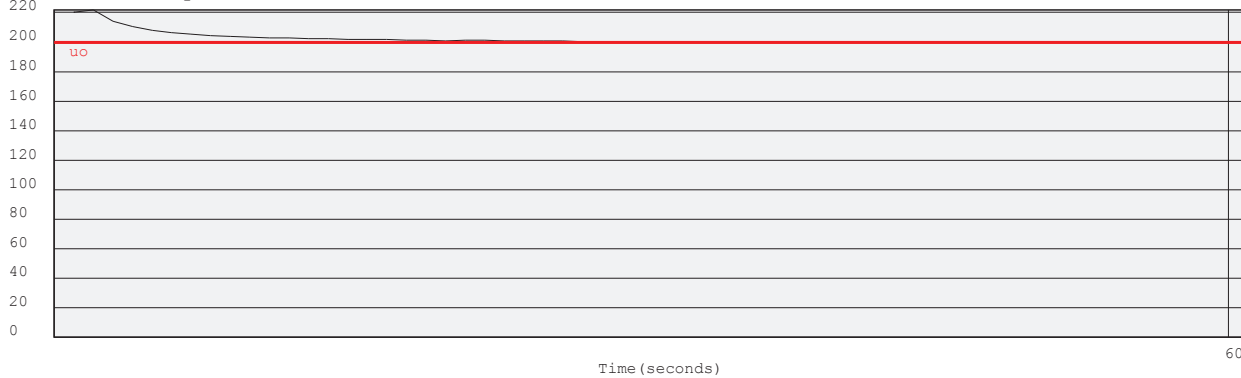
(kPa) Dissipation at:20.144m



(kPa) Dissipation at:21.139m



(kPa) Dissipation at:22.133m



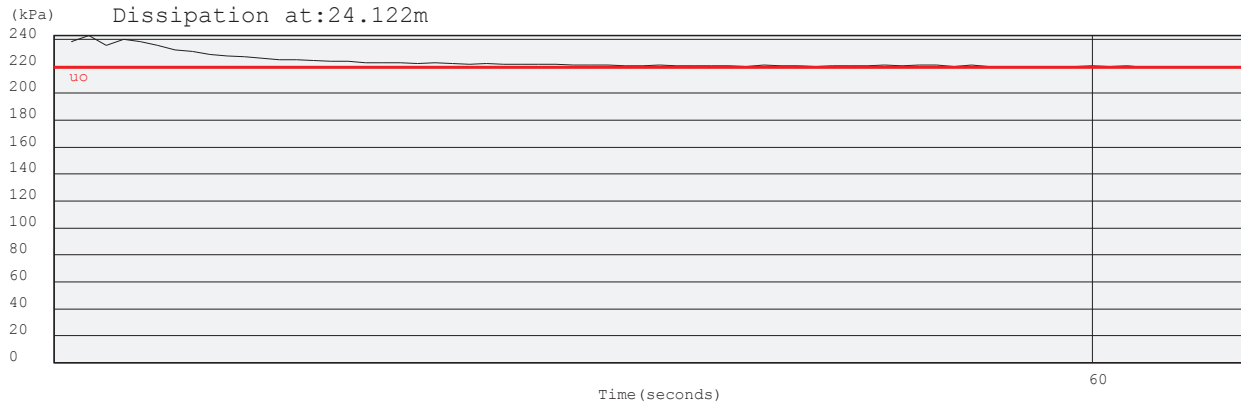
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 16

Date: 2012/08/19

Page: 2

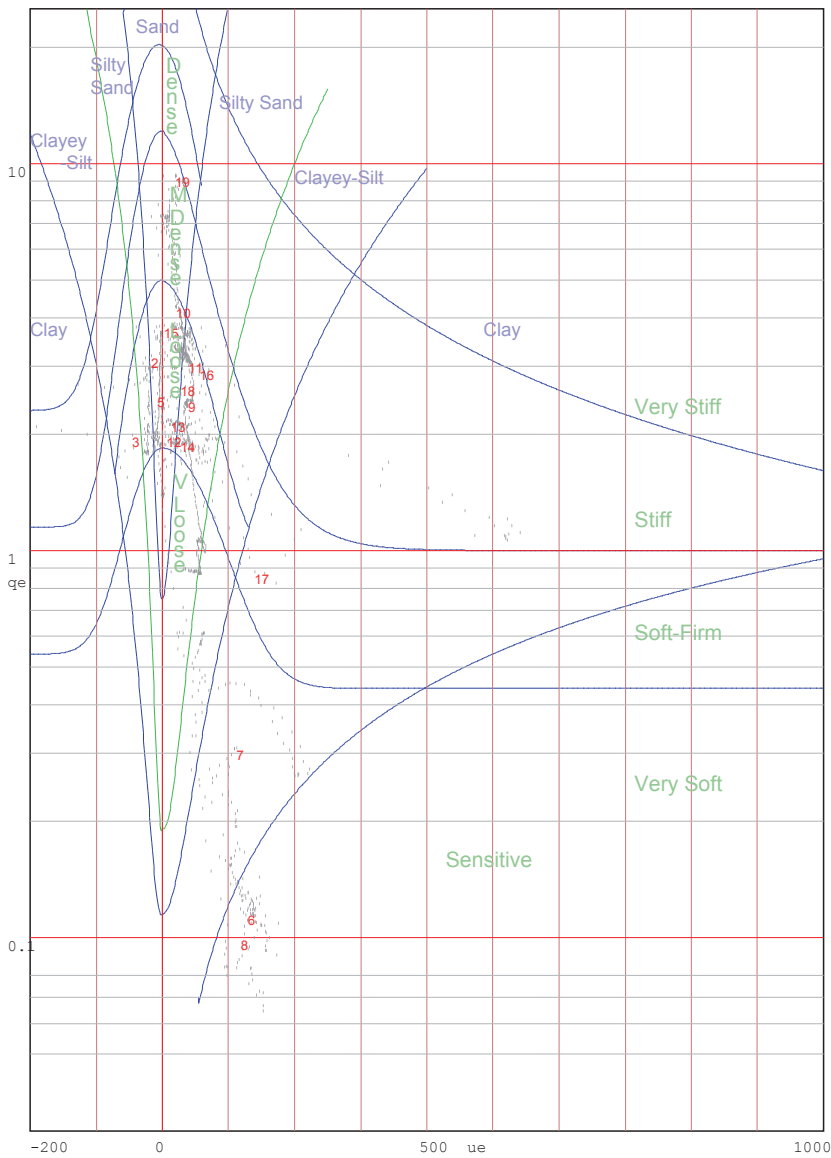


Project: Durban Harbour Piezocone Investigation for Dredging

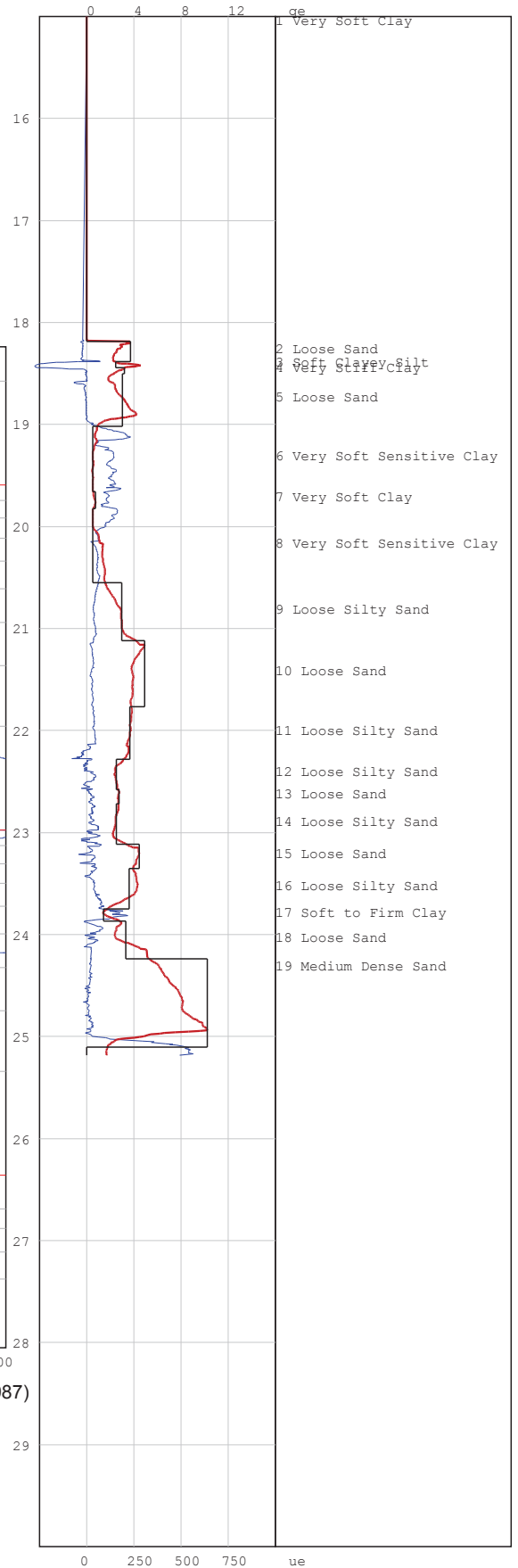
Site: Durban Harbour over water

Hole No: S 16  
Date: 2012/08/19

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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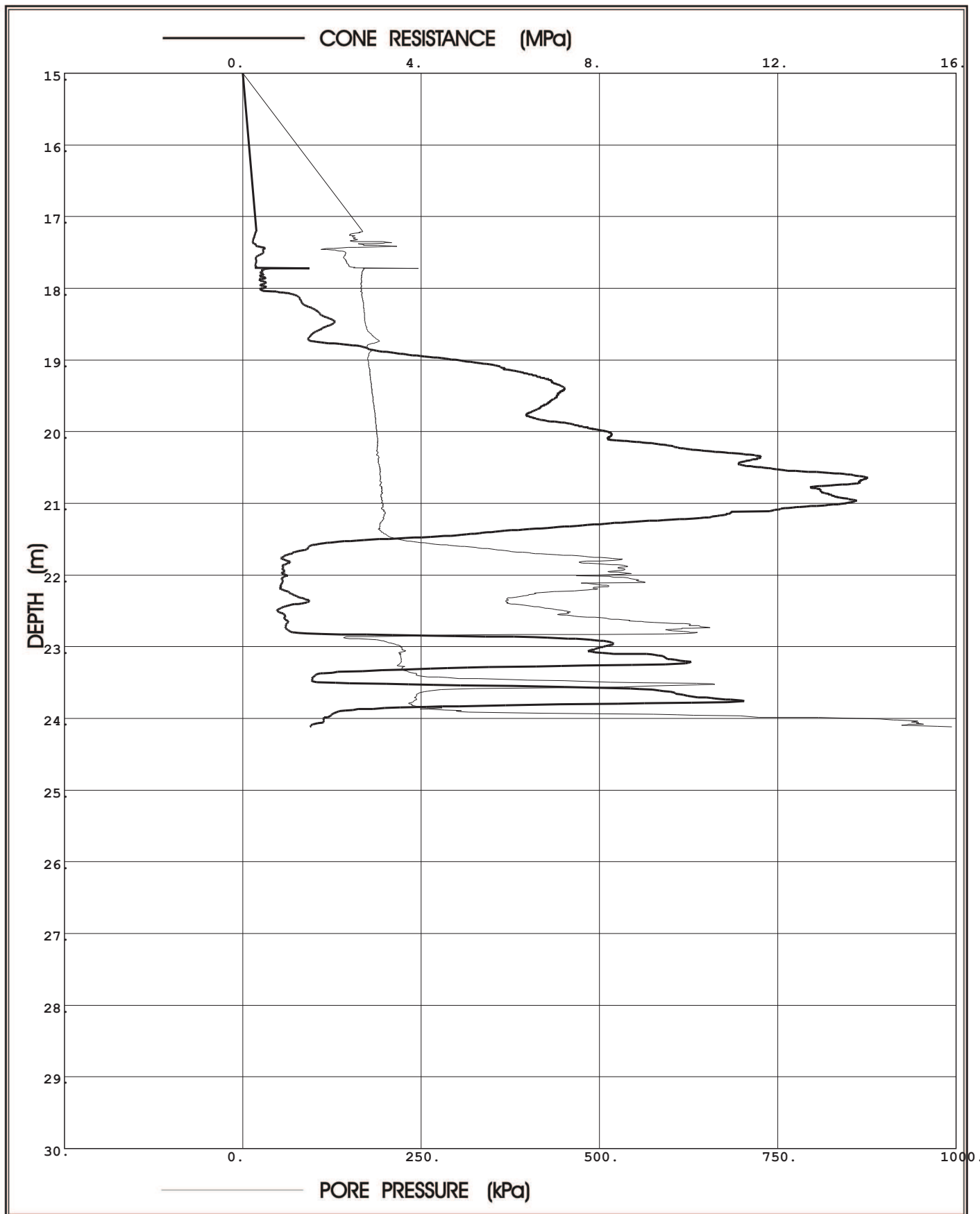
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 17

DATE: 2012/08/23

Page:2



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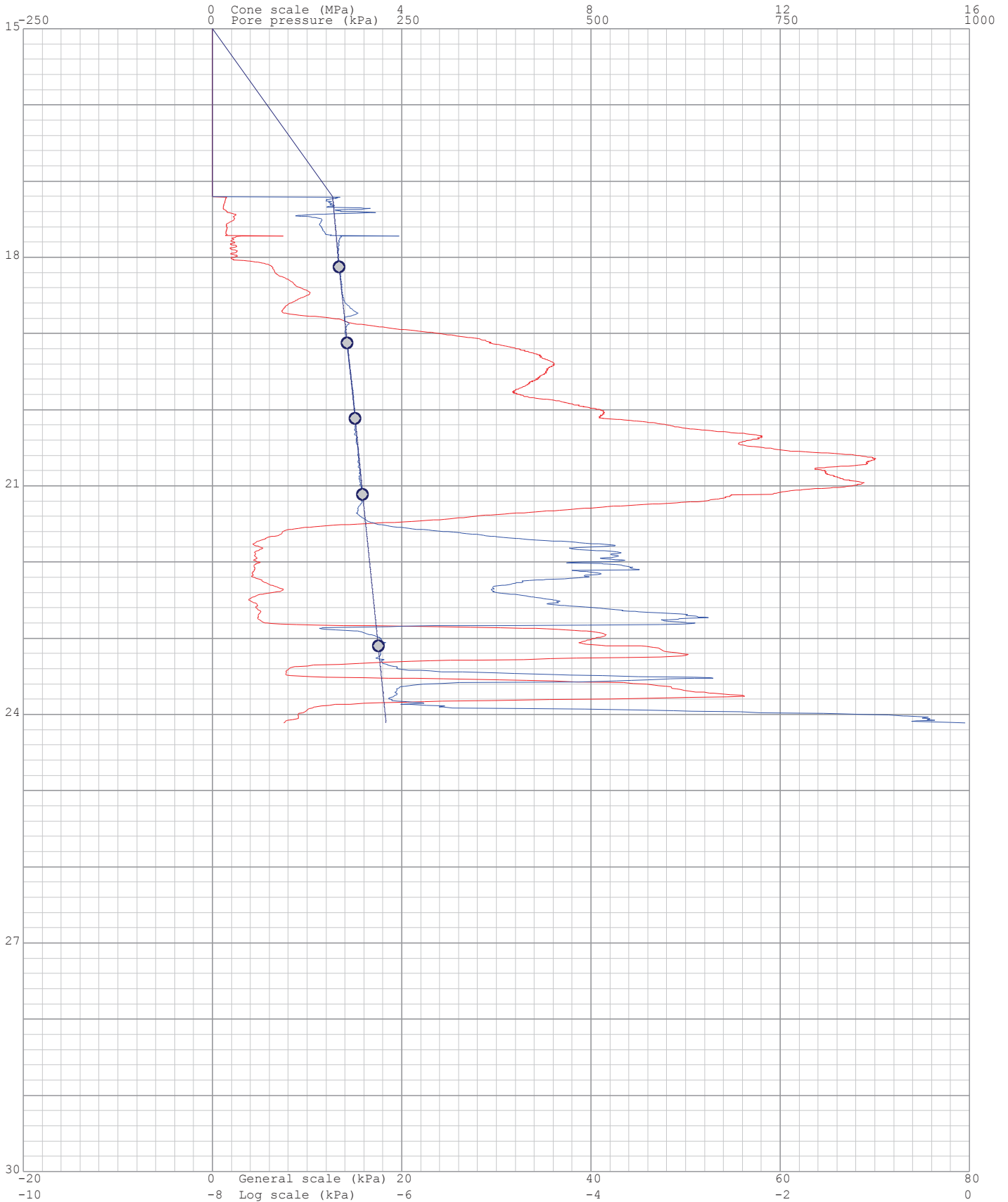
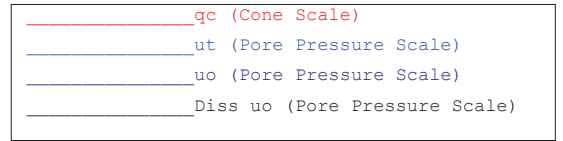
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 17  
Date: 2012/08/23



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 17

Date: 2012/08/23

Page: 1

(kPa) Dissipation at: 18.126m



(kPa) Dissipation at: 19.12m



(kPa) Dissipation at: 20.116m



(kPa) Dissipation at: 21.111m



Project: Durban Harbour Piezocone Investigation for Dredging

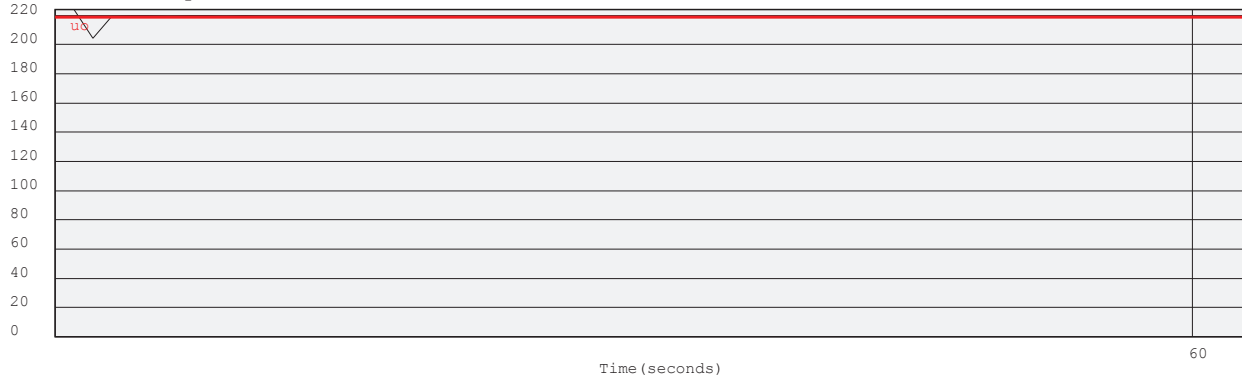
Site: Durban Harbour over water

Hole: S 17

Date: 2012/08/23

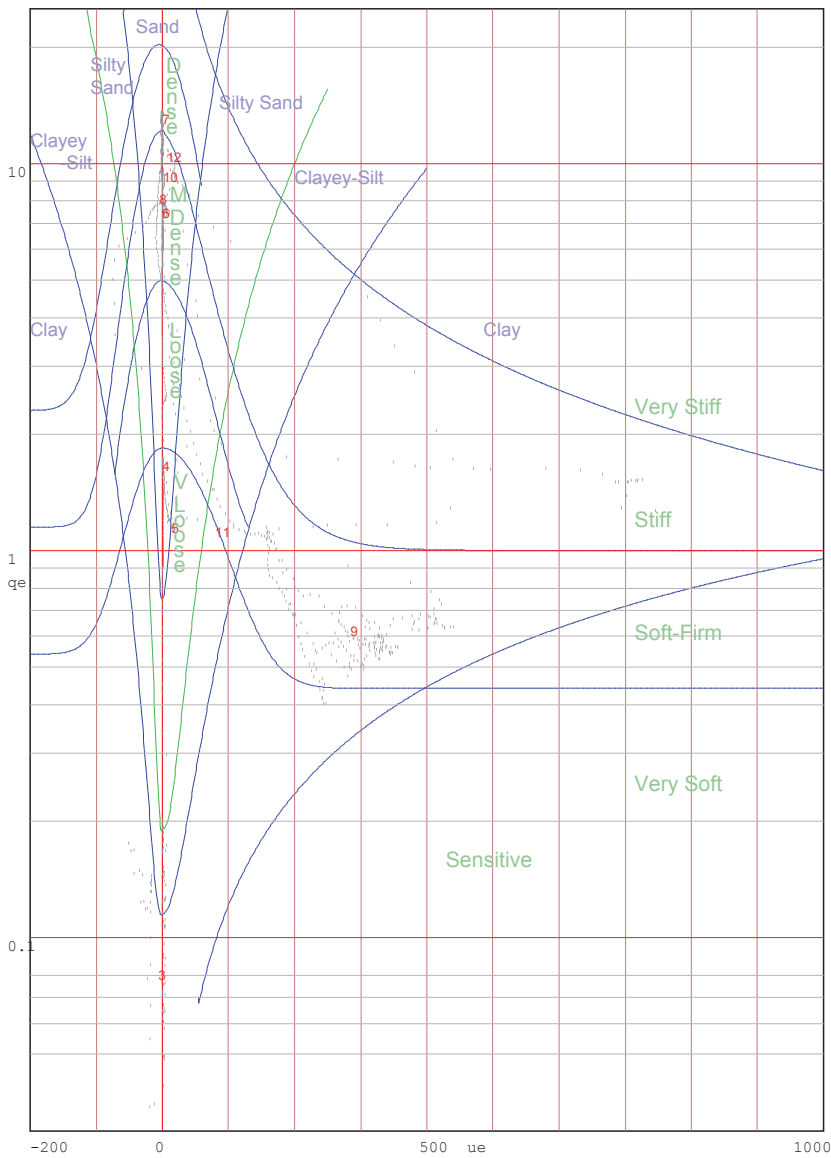
Page: 2

(kPa) Dissipation at: 23.097m

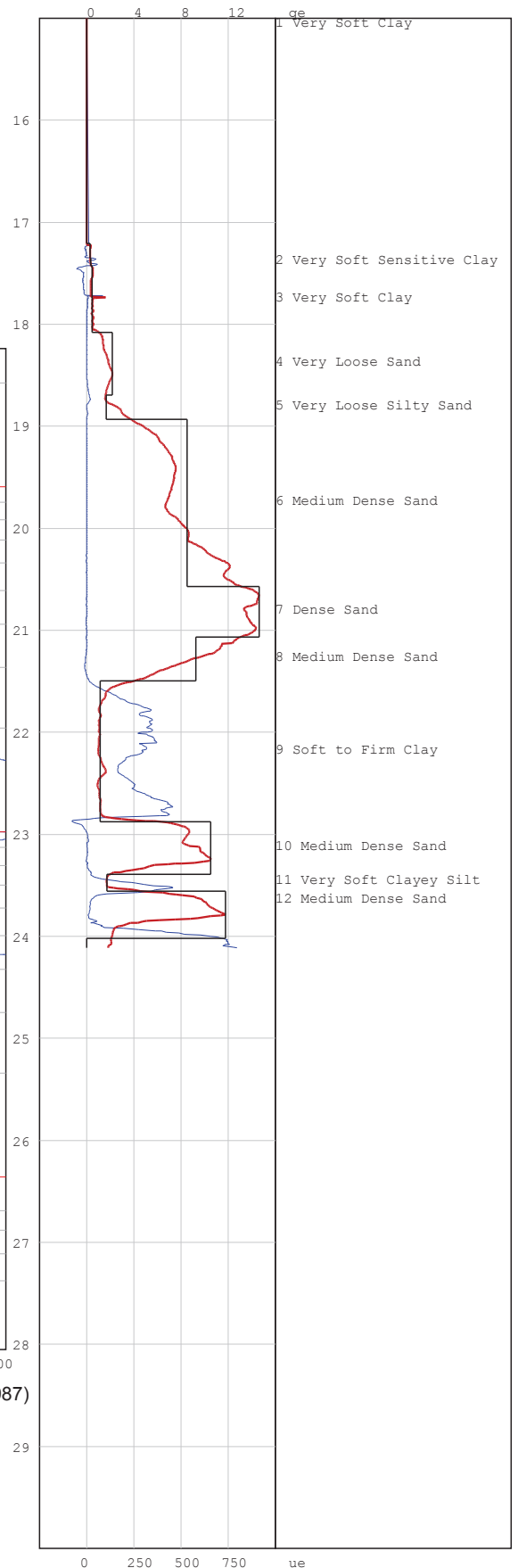




—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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0044

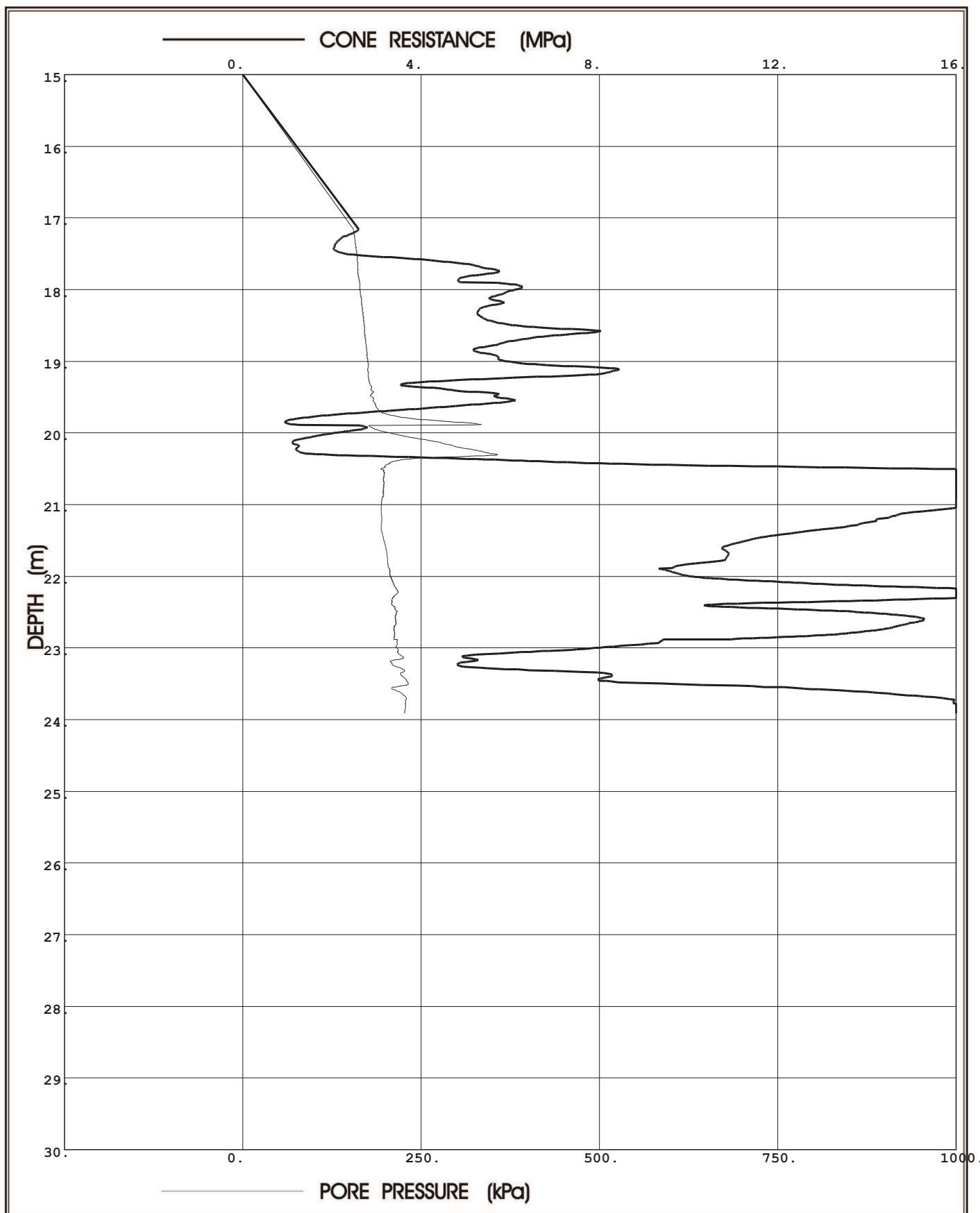
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 18

DATE: 2012/08/21

Page:2



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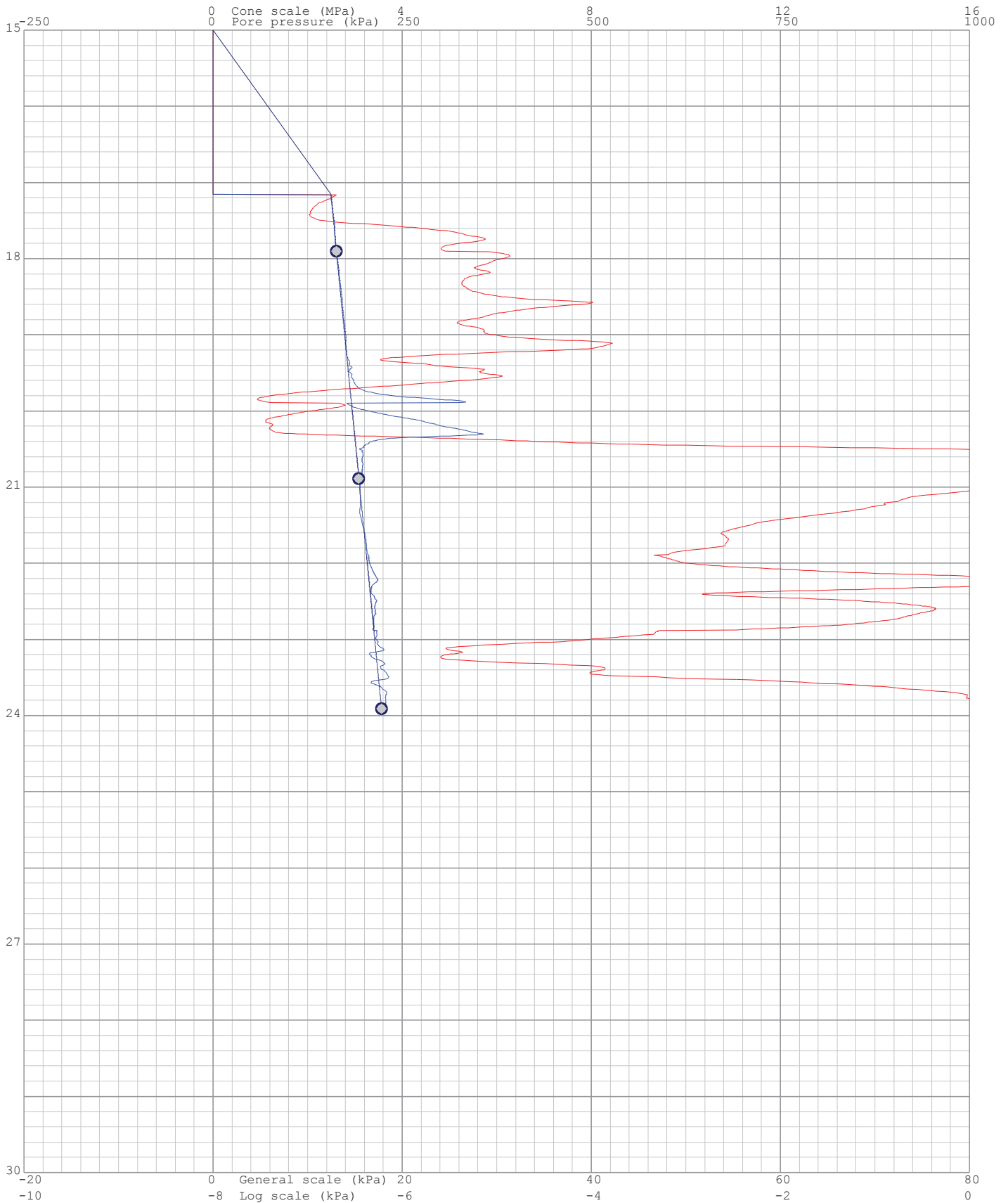
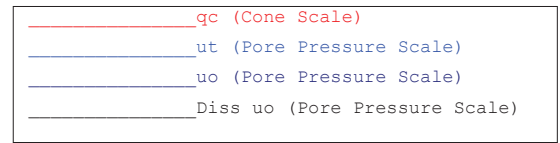
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 18  
Date: 2012/08/21



Project: Durban Harbour Piezocone Investigation for Dredging

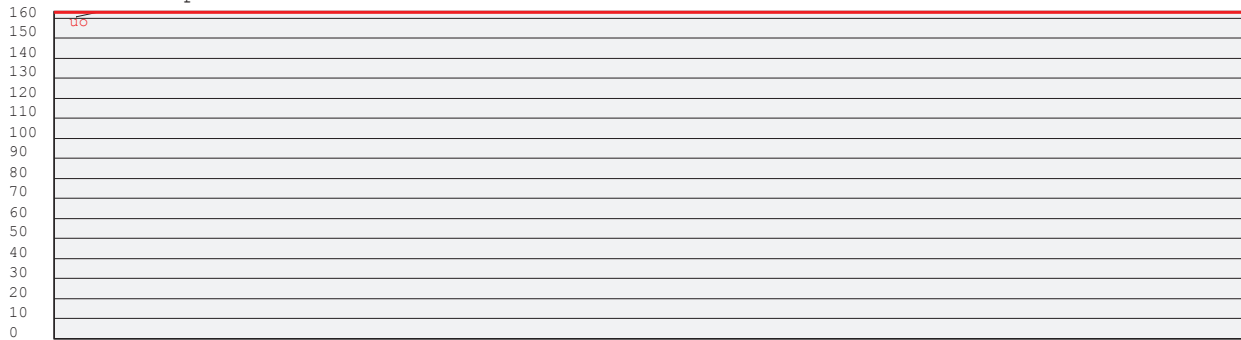
Site: Durban Harbour over water

Hole: S 18

Date: 2012/08/21

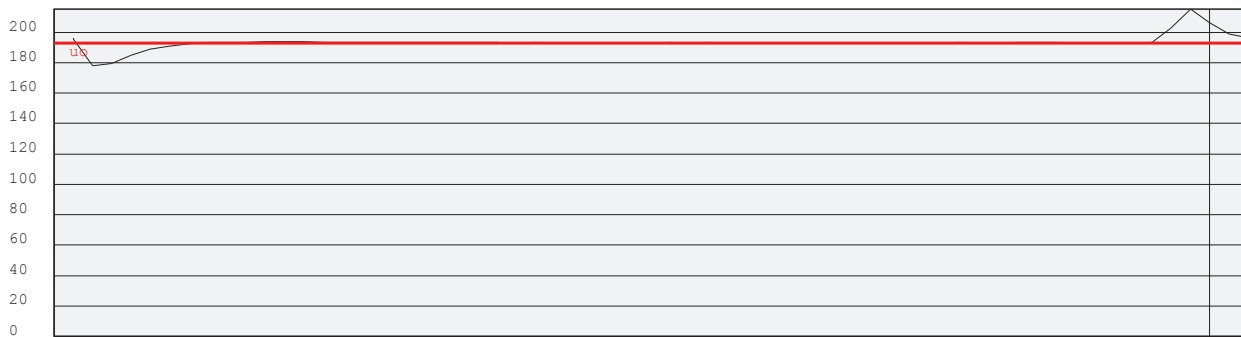
Page: 1

(kPa) Dissipation at: 17.901m



Time (seconds)

(kPa) Dissipation at: 20.887m



Time (seconds)

60

(kPa) Dissipation at: 23.911m



Time (seconds)

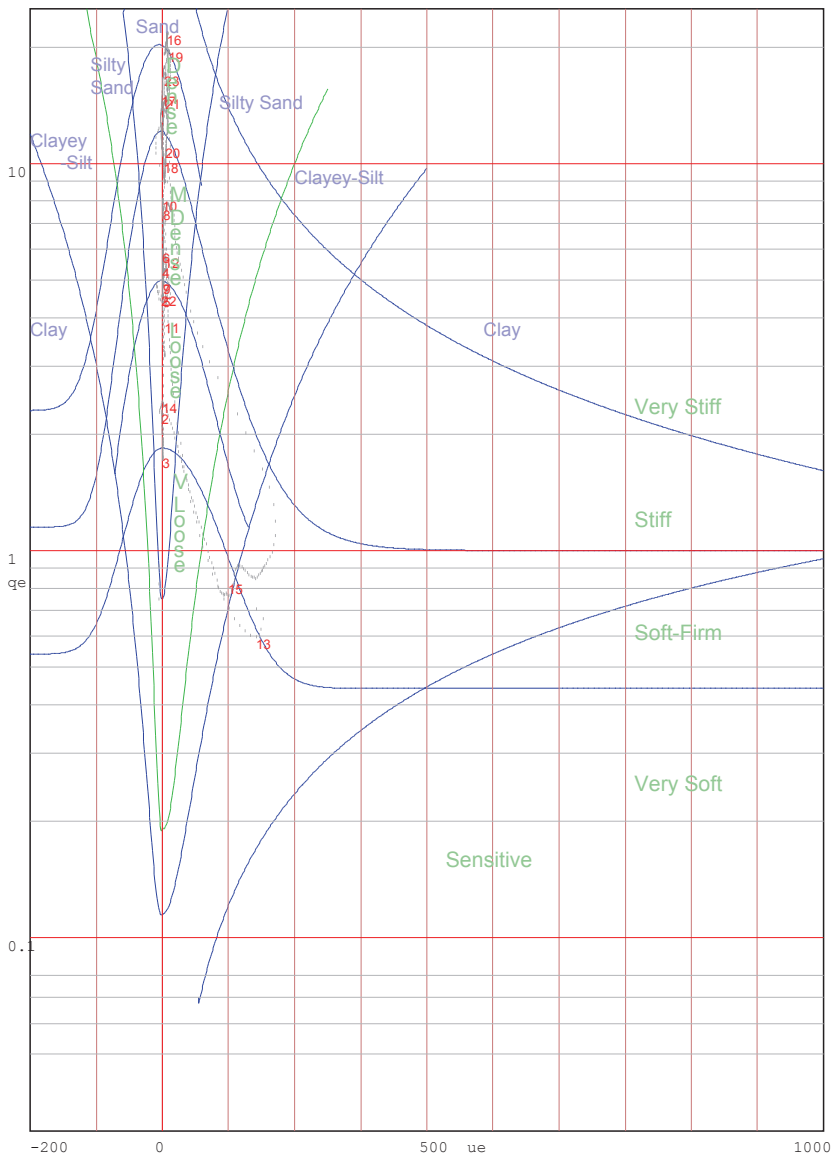
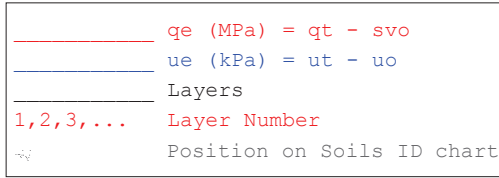
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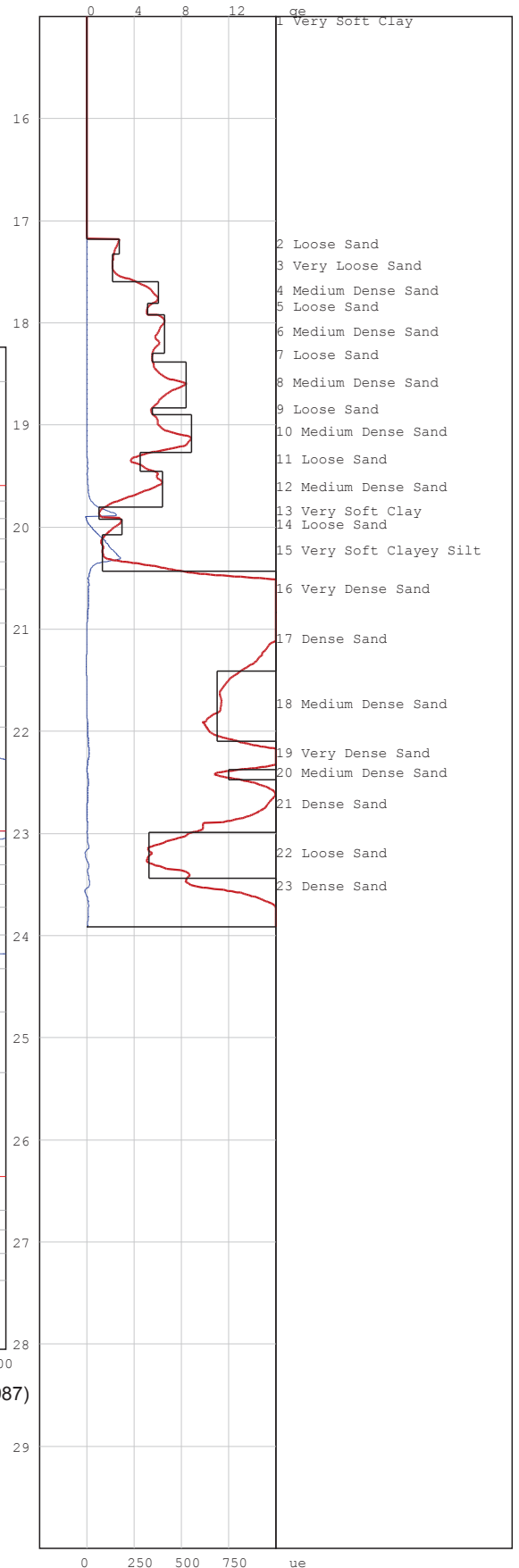
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 18  
 Date: 2012/08/21



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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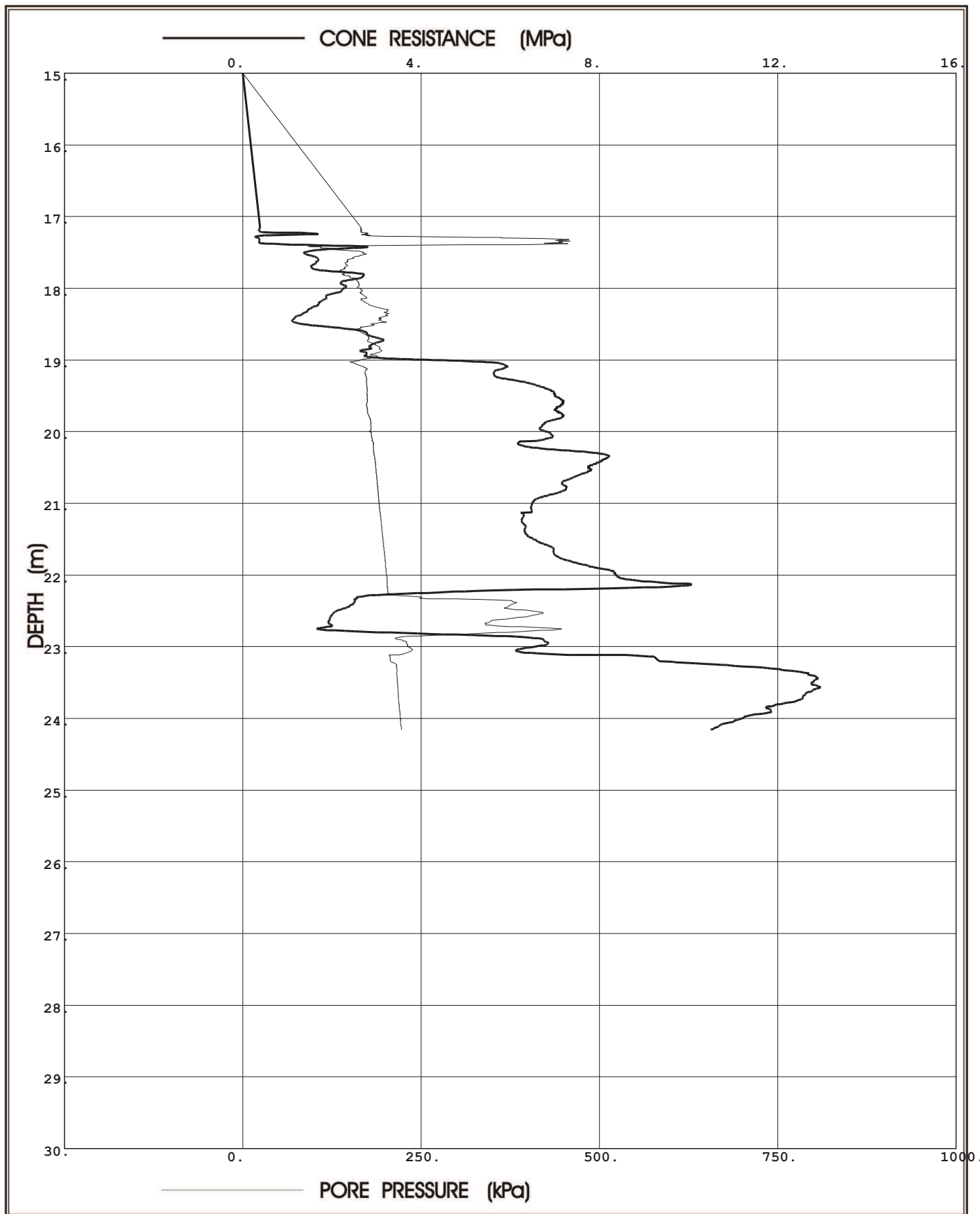
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 19

DATE: 2012/08/23

Page:2



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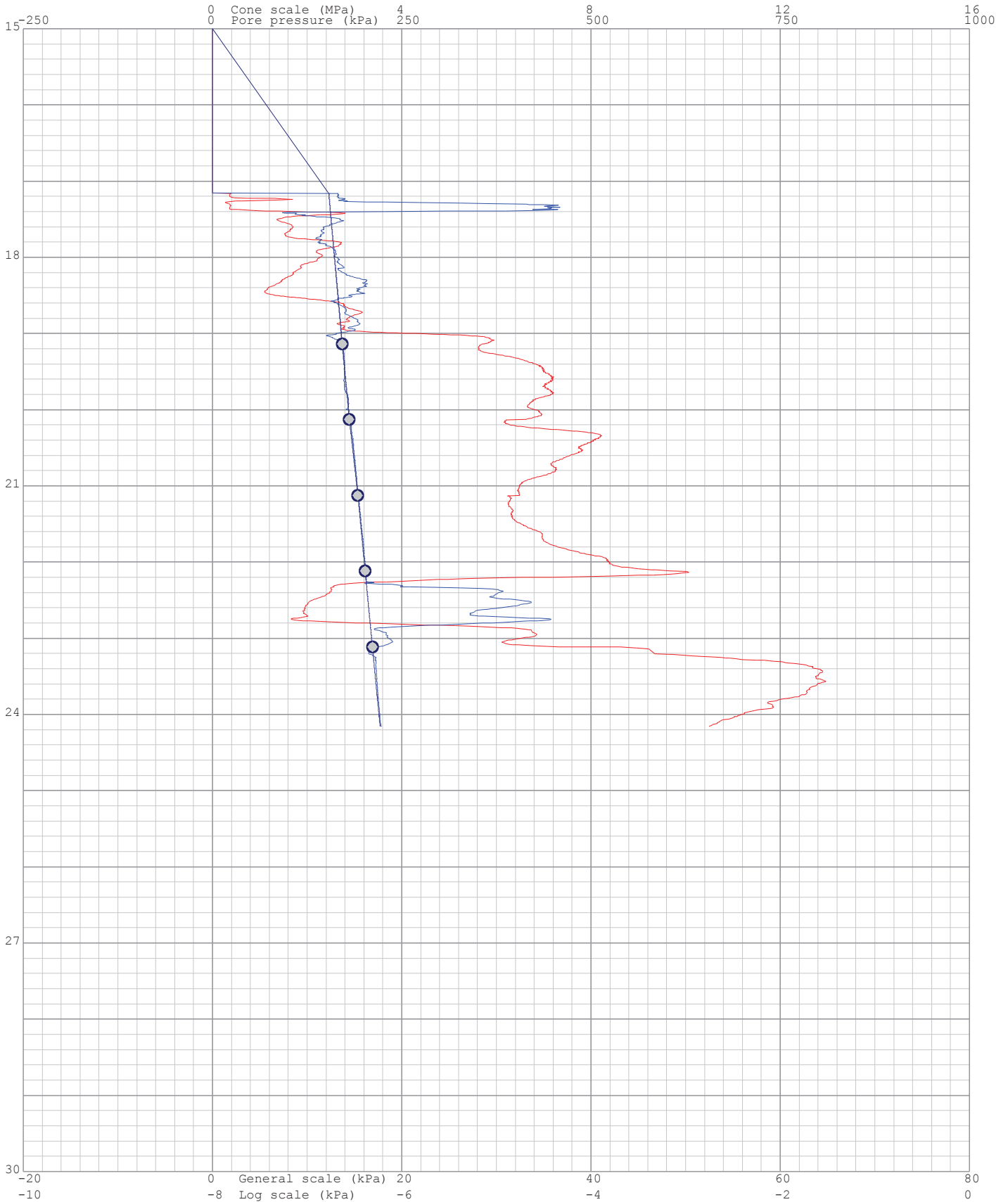
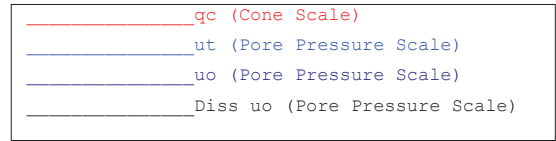
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 19  
Date: 2012/08/23



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 19

Date: 2012/08/23

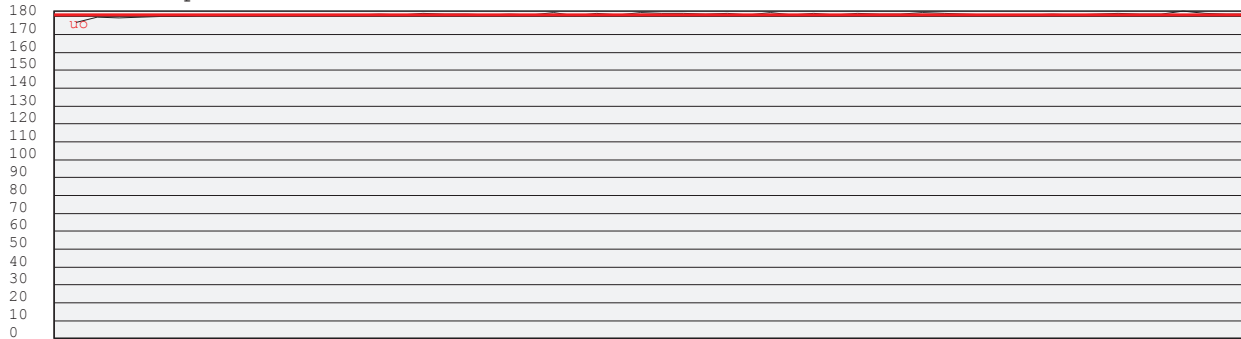
Page: 1

(kPa) Dissipation at:19.136m



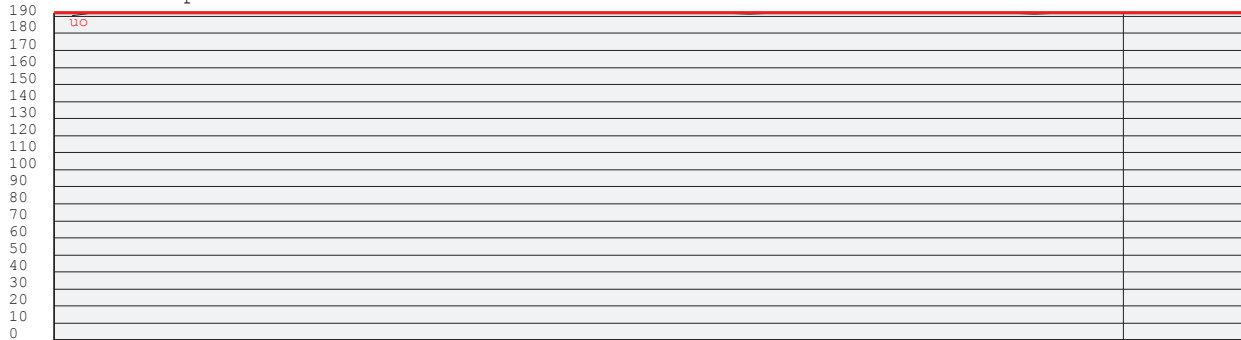
Time (seconds)

(kPa) Dissipation at:20.13m



Time (seconds)

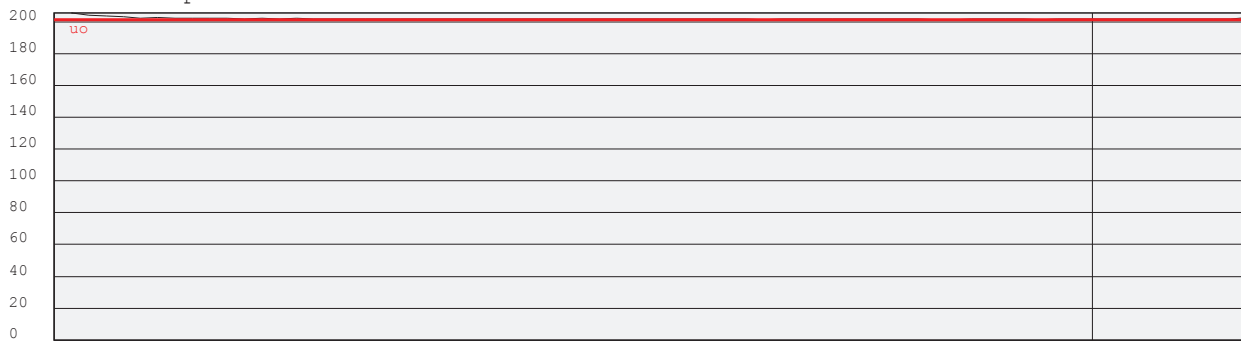
(kPa) Dissipation at:21.125m



Time (seconds)

60

(kPa) Dissipation at:22.117m



Time (seconds)

60



Project: Durban Harbour Piezocone Investigation for Dredging

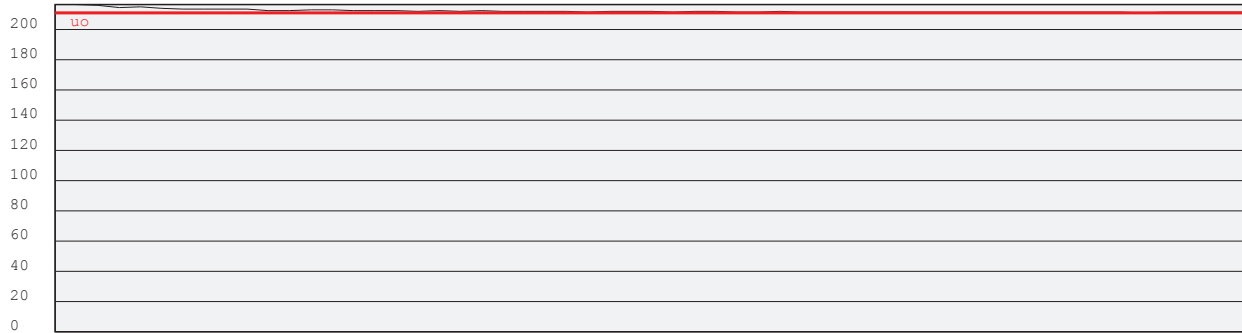
Site: Durban Harbour over water

Hole: S 19

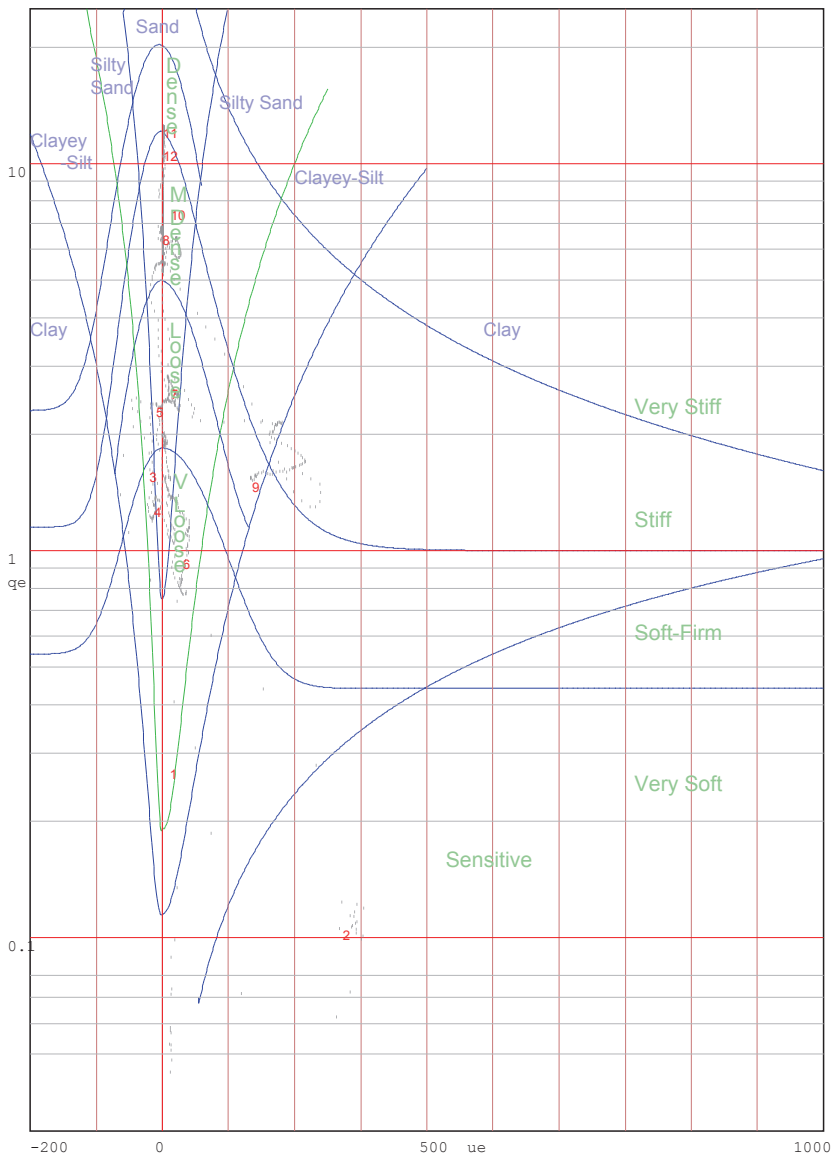
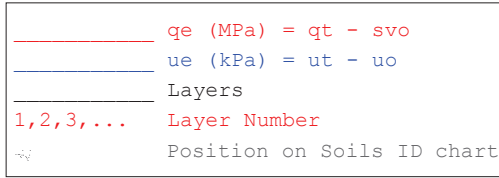
Date: 2012/08/23

Page: 2

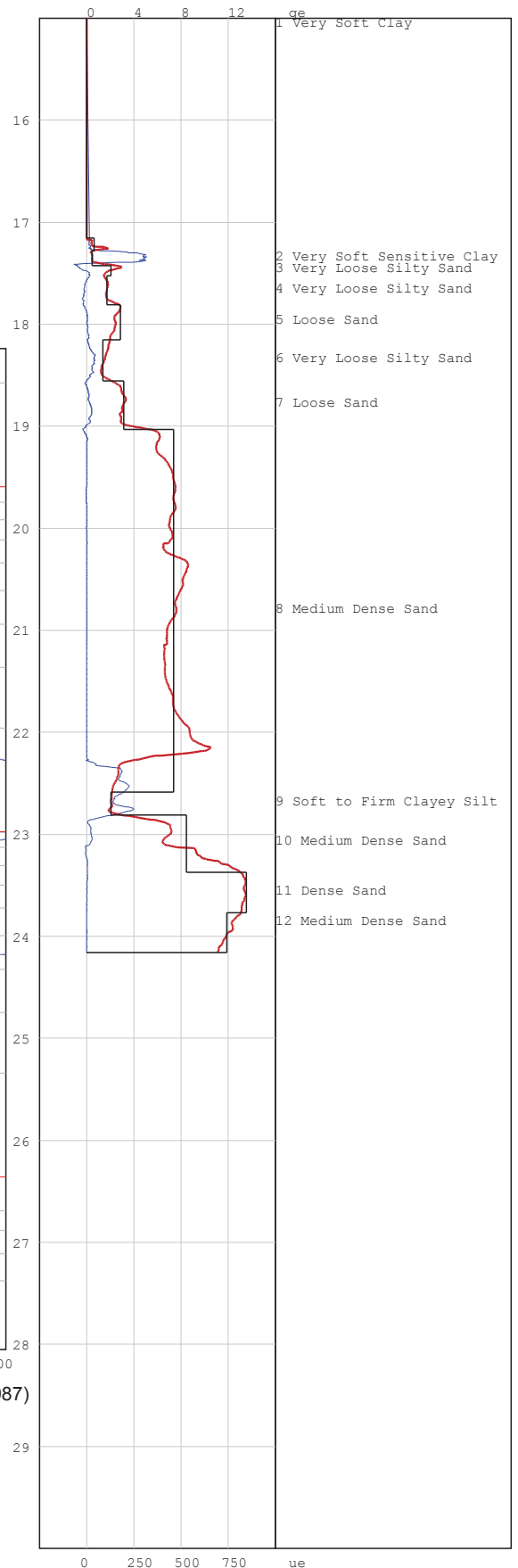
(kPa) Dissipation at: 23.111m



Time (seconds)



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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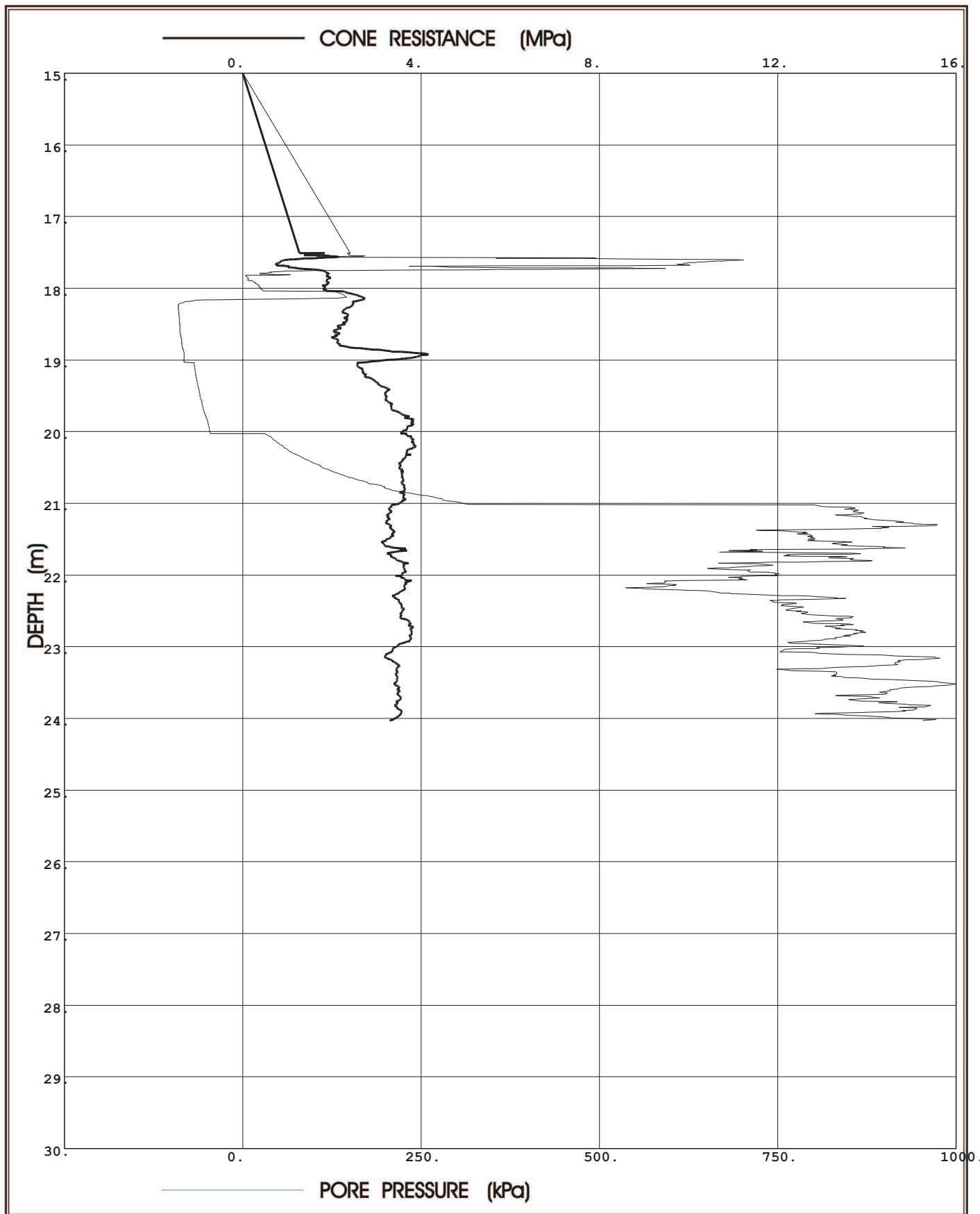
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 20

DATE: 2012/08/25

Page:2



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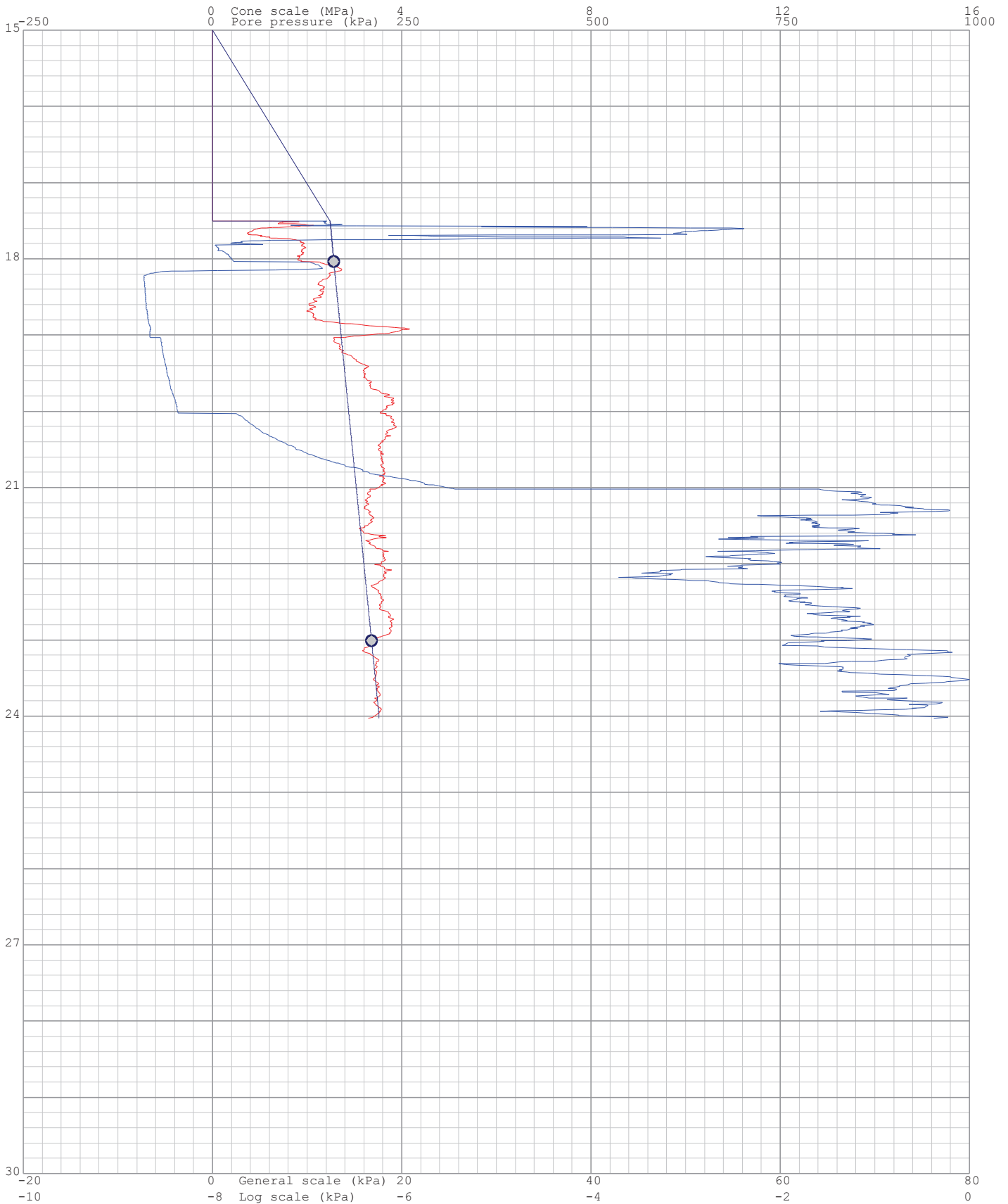
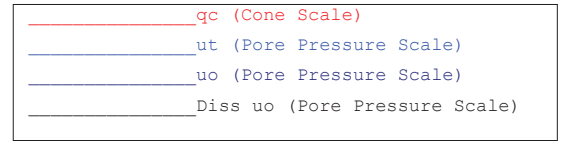
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Fax: 012 420 4940  
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 20

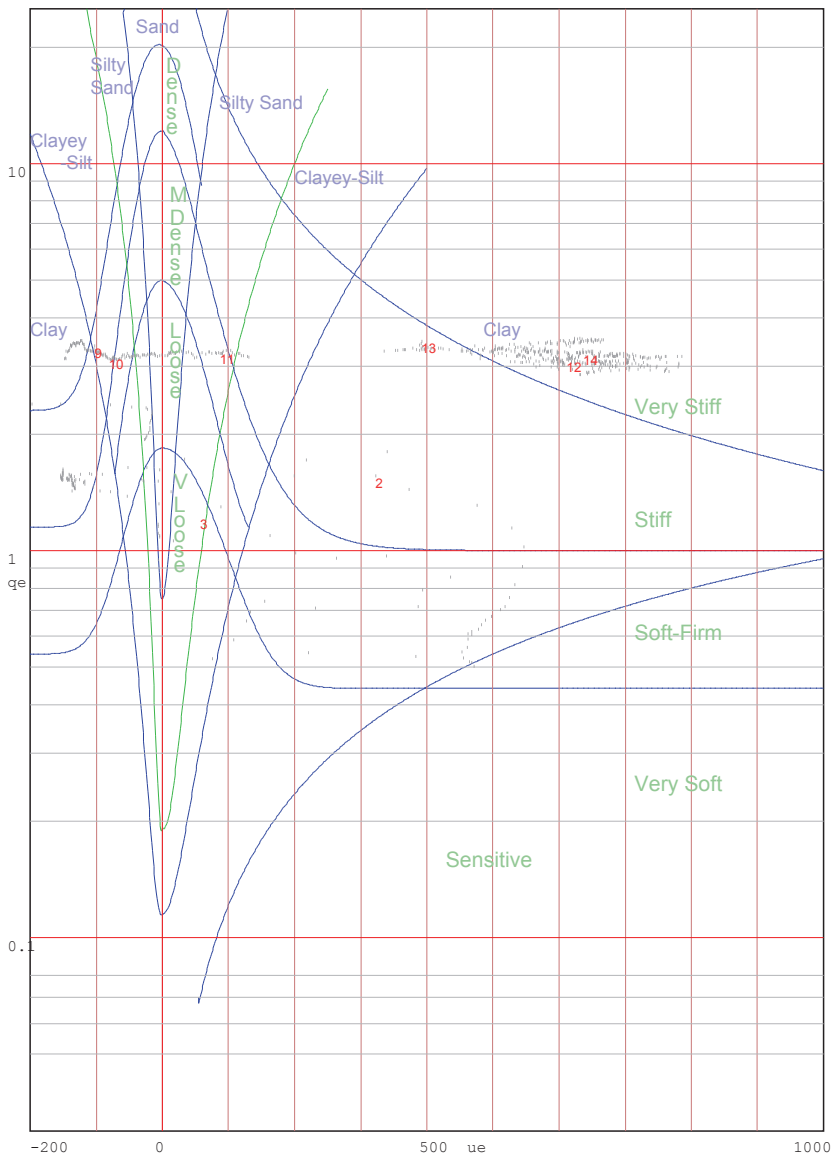
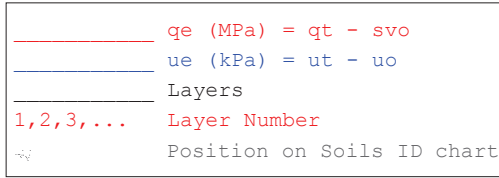
Date: 2012/08/25



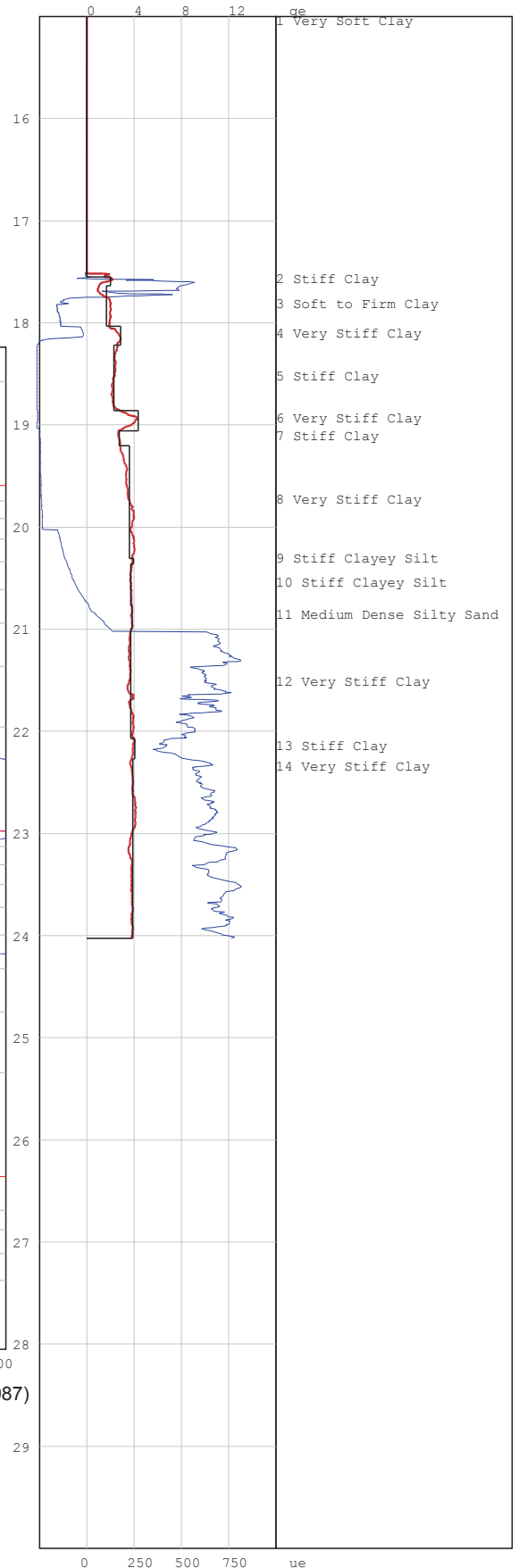
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 20  
Date: 2012/08/25



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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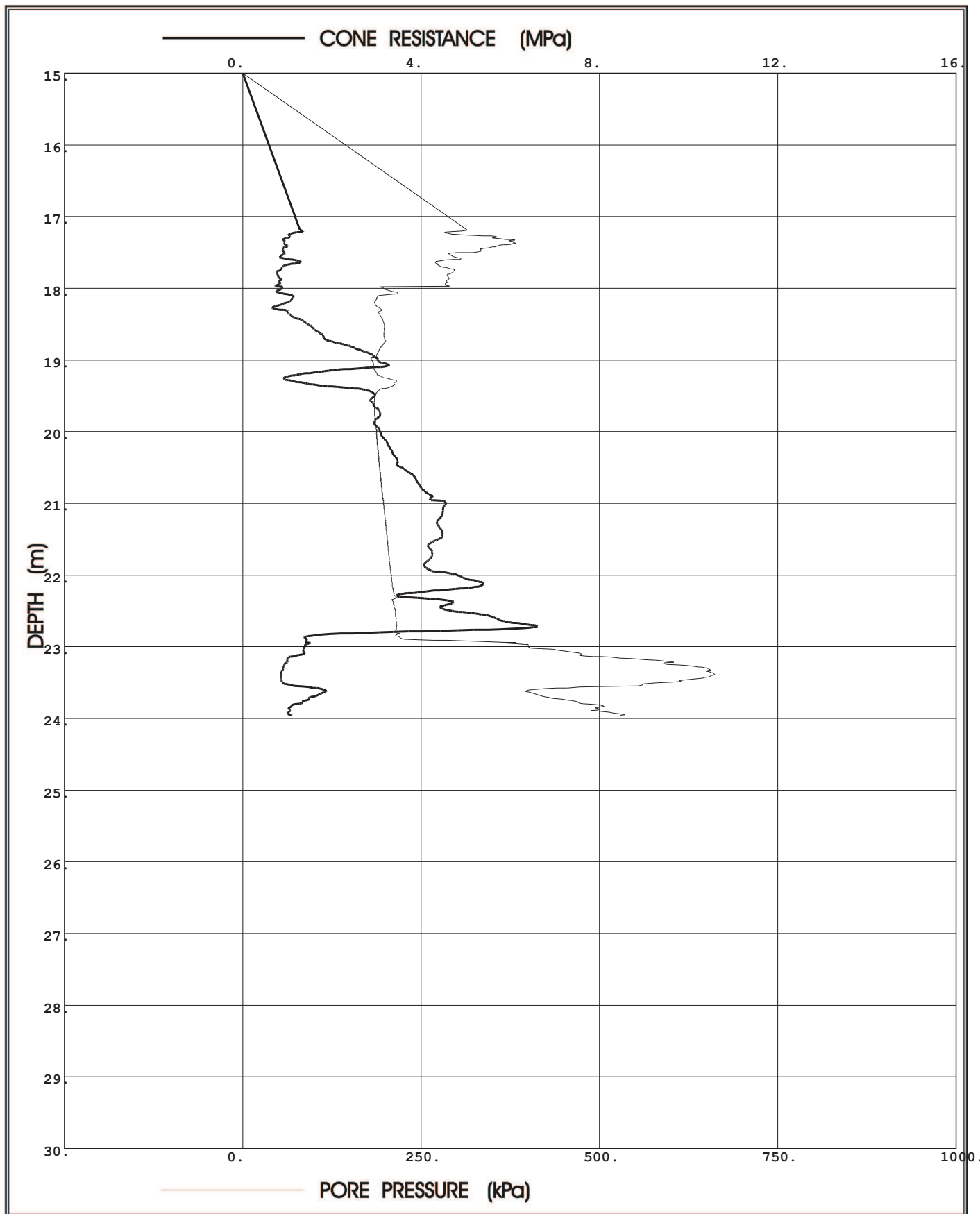
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 21

DATE: 2012/08/23

Page: 2



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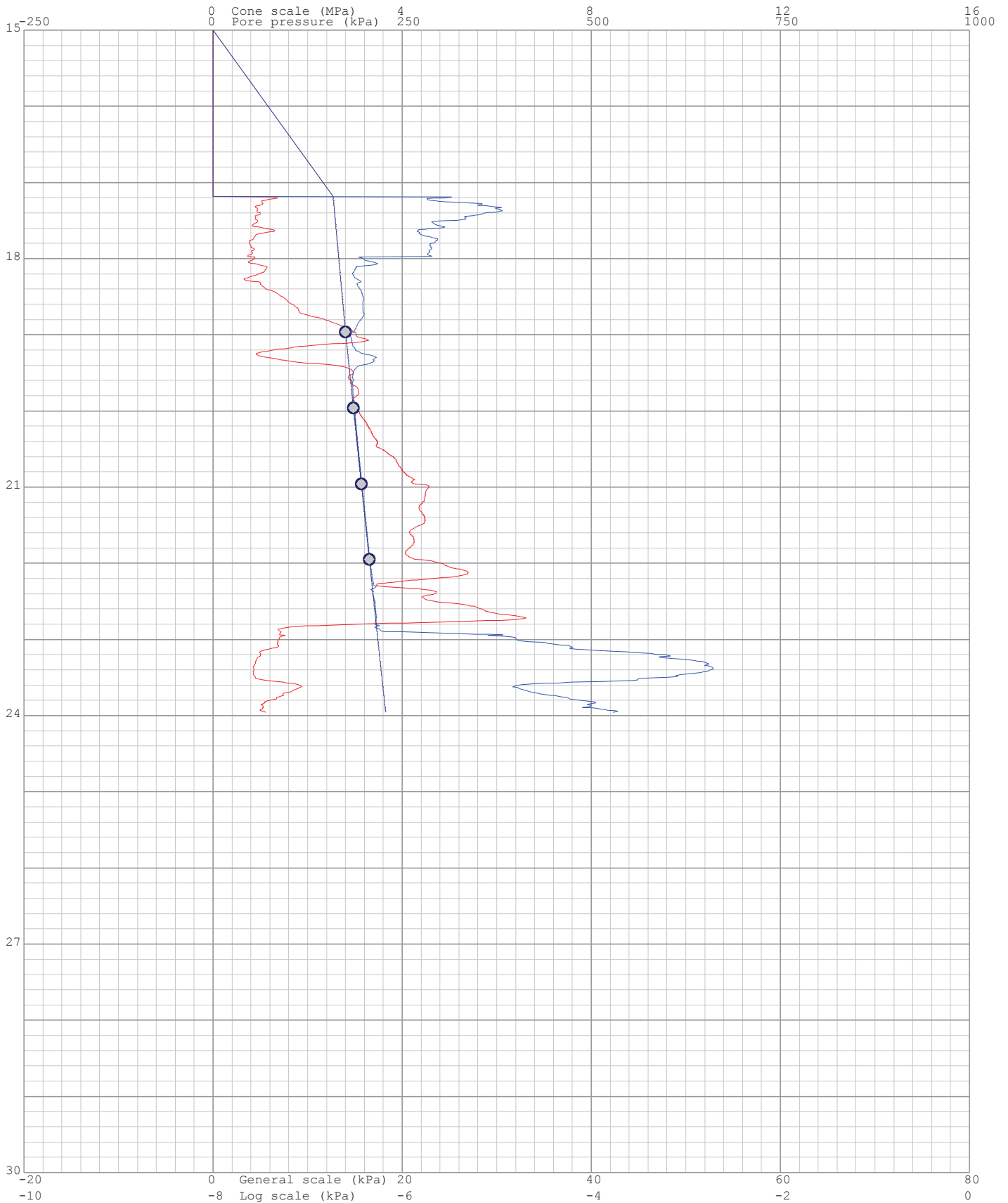
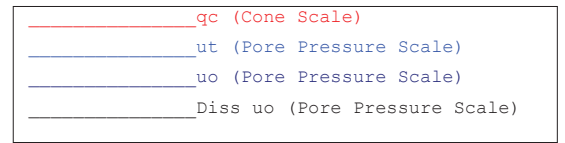
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 21  
Date: 2012/08/23



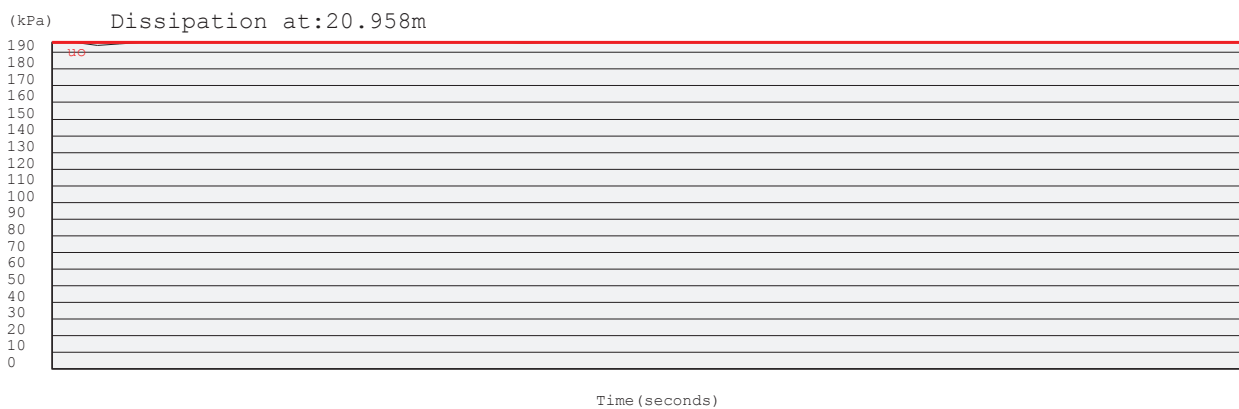
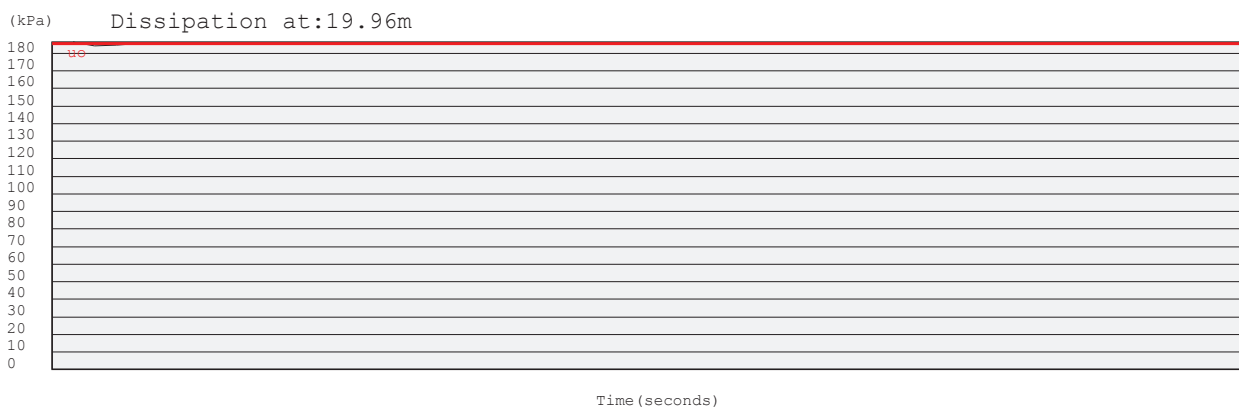
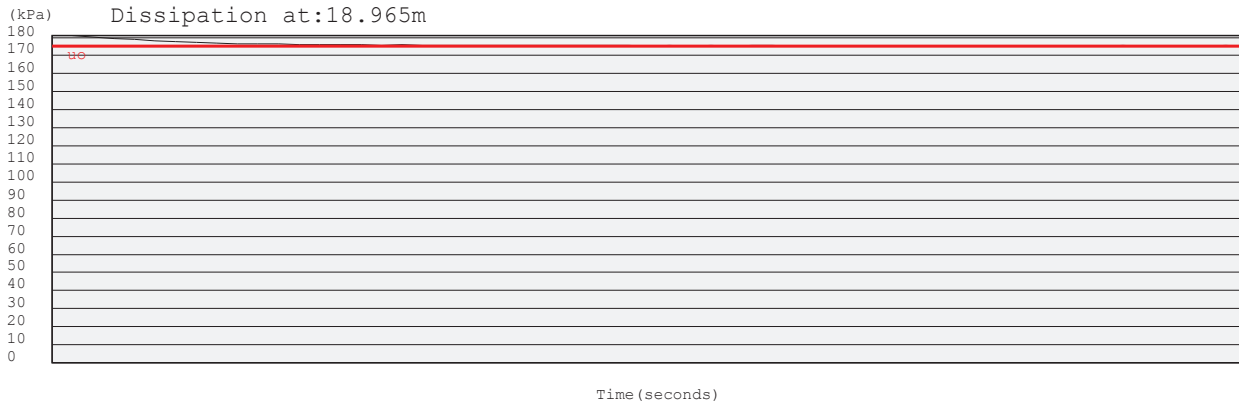
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 21

Date: 2012/08/23

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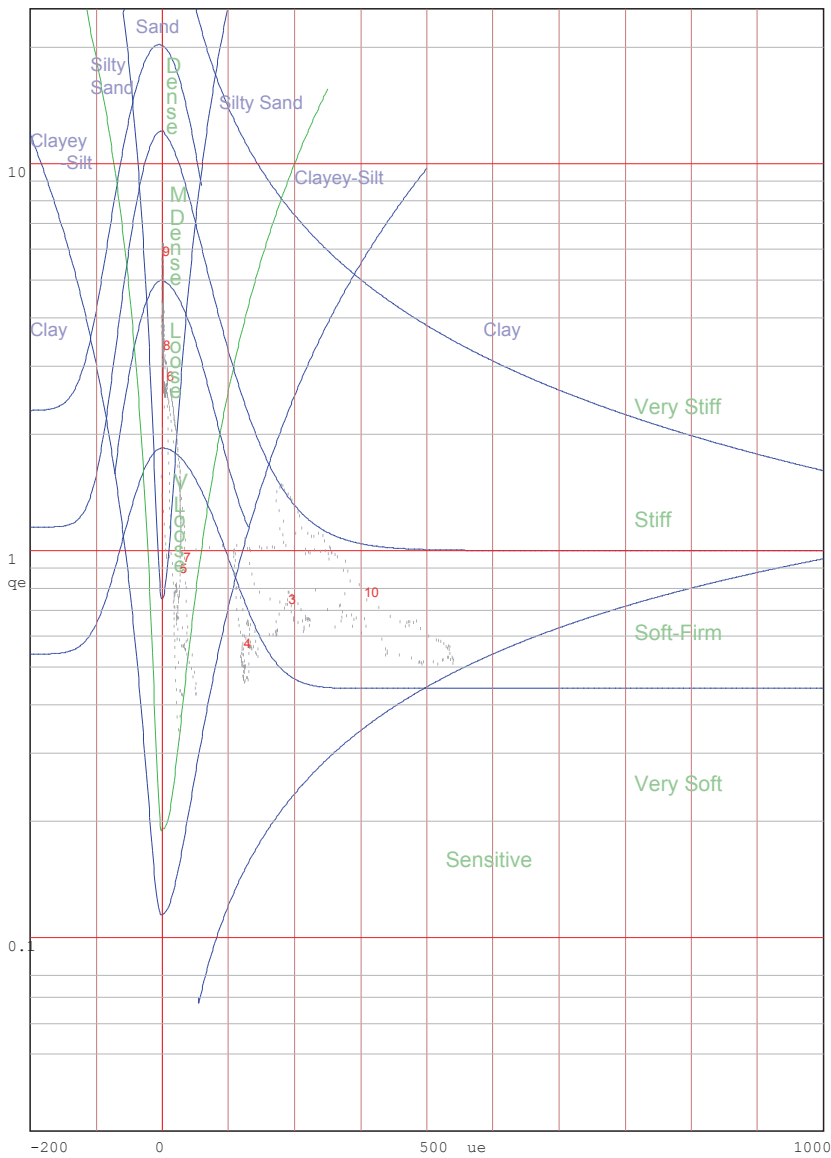
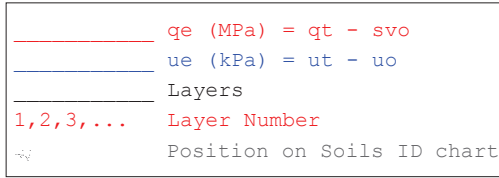


Project: Durban Harbour Piezocone Investigation for Dredging

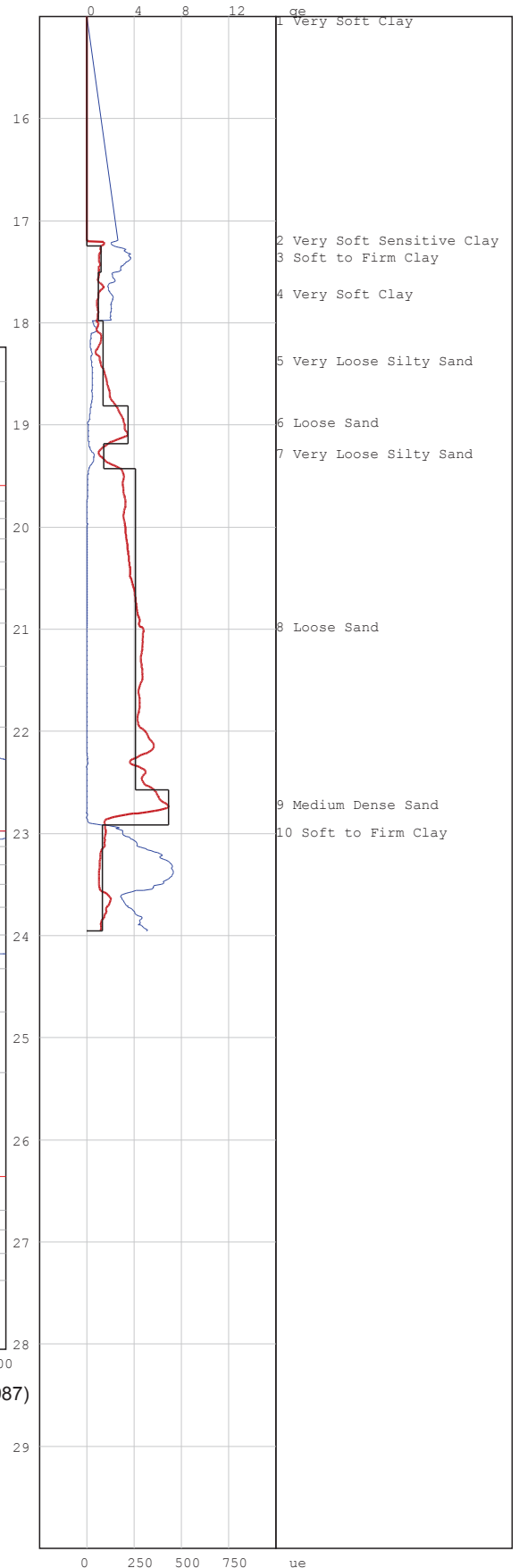
Site: Durban Harbour over water

Hole No: S 21

Date: 2012/08/23



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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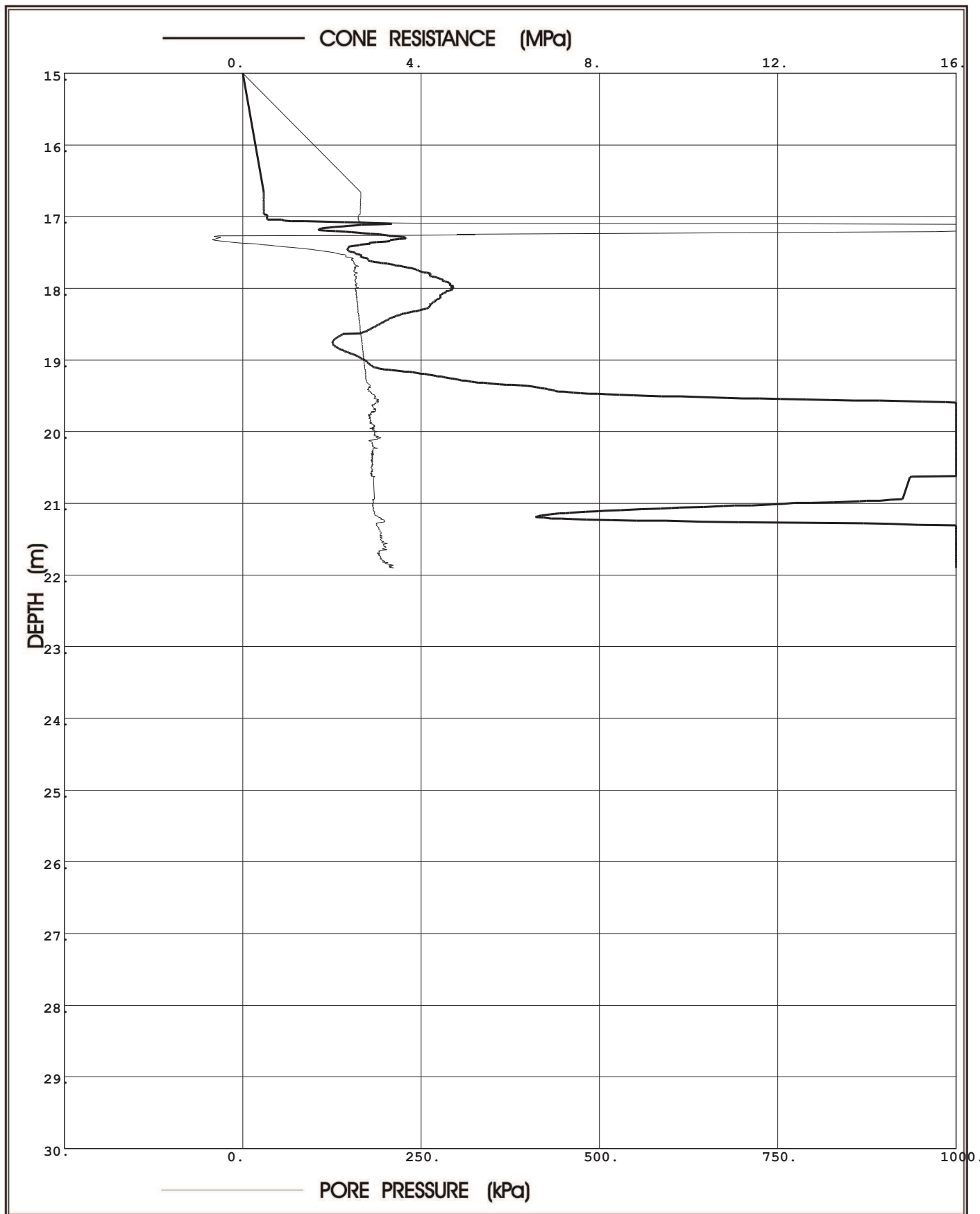
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 22

DATE: 2012/08/22

Page:2



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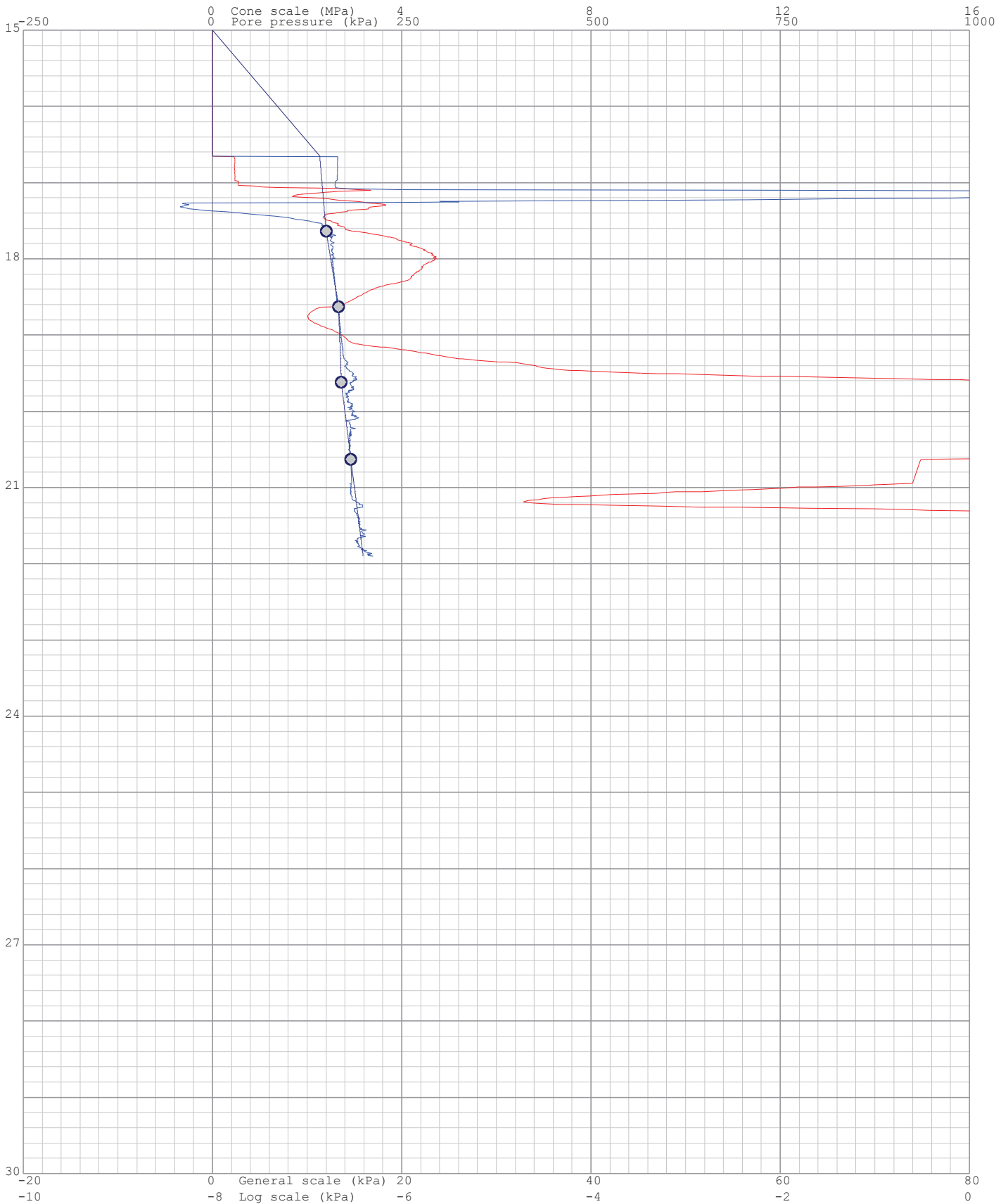
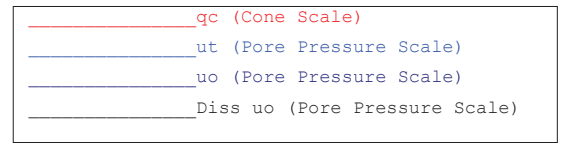
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 22

Date: 2012/08/22



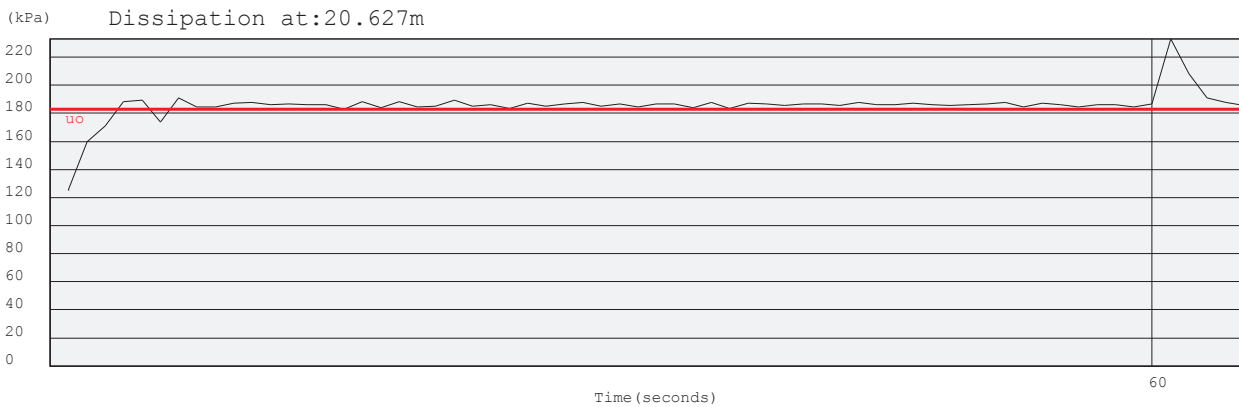
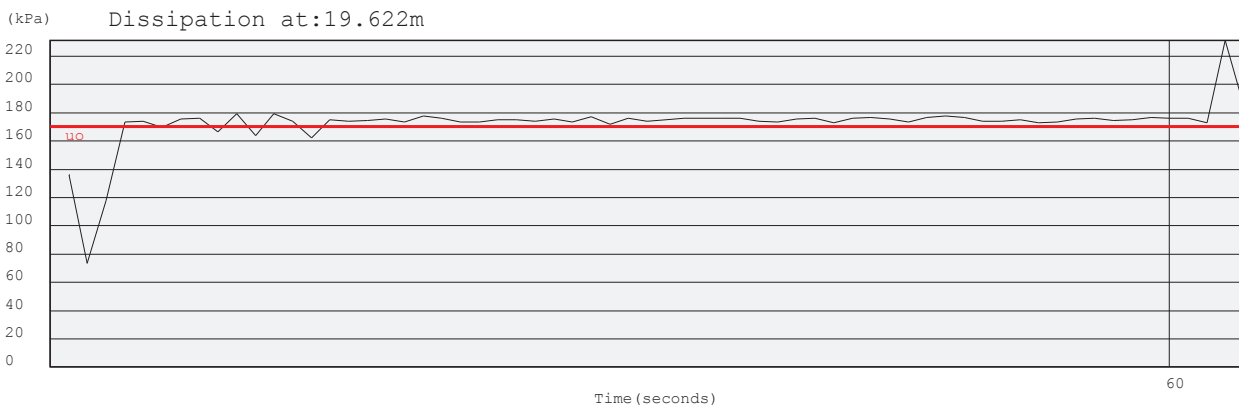
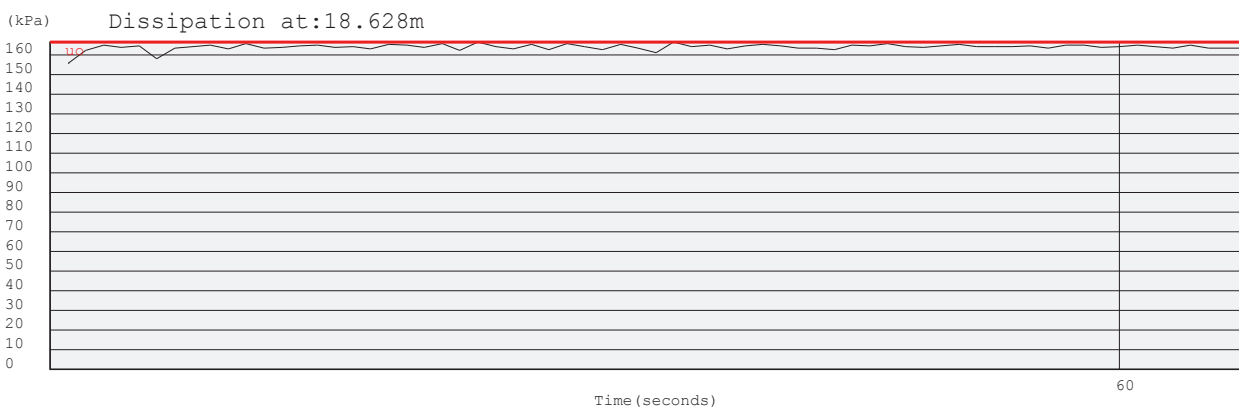
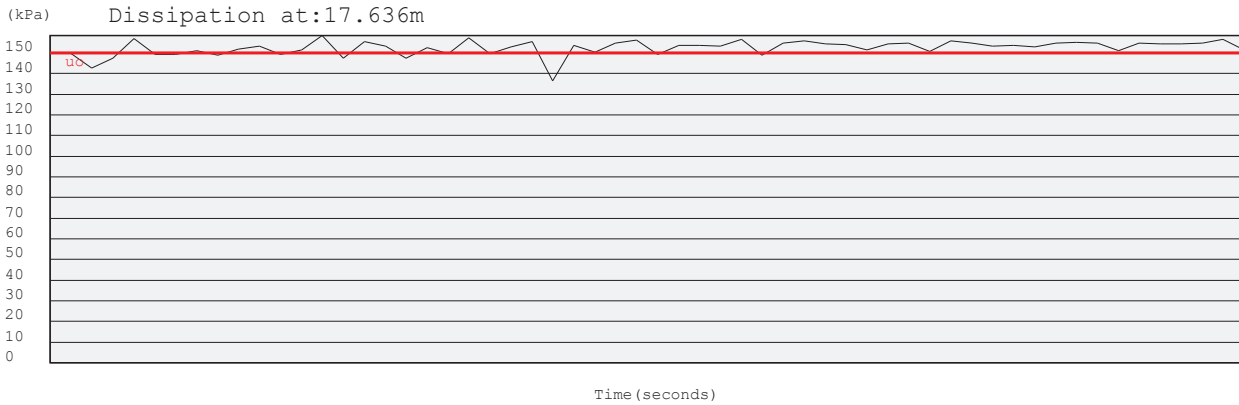
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 22

Date: 2012/08/22

Page: 1

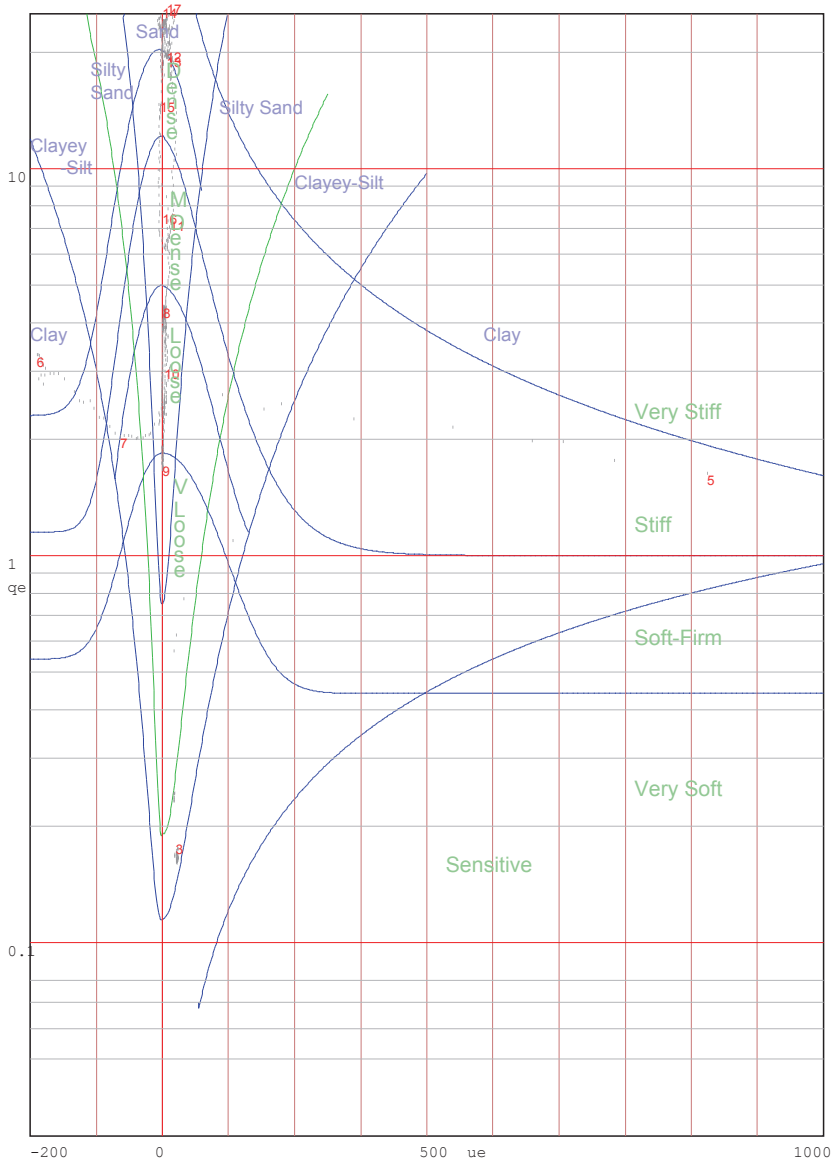
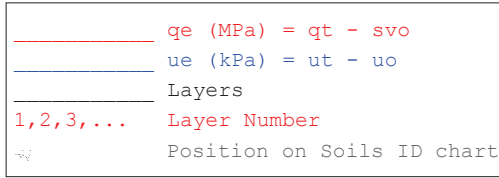


Project: Durban Harbour Piezocone Investigation for Dredging

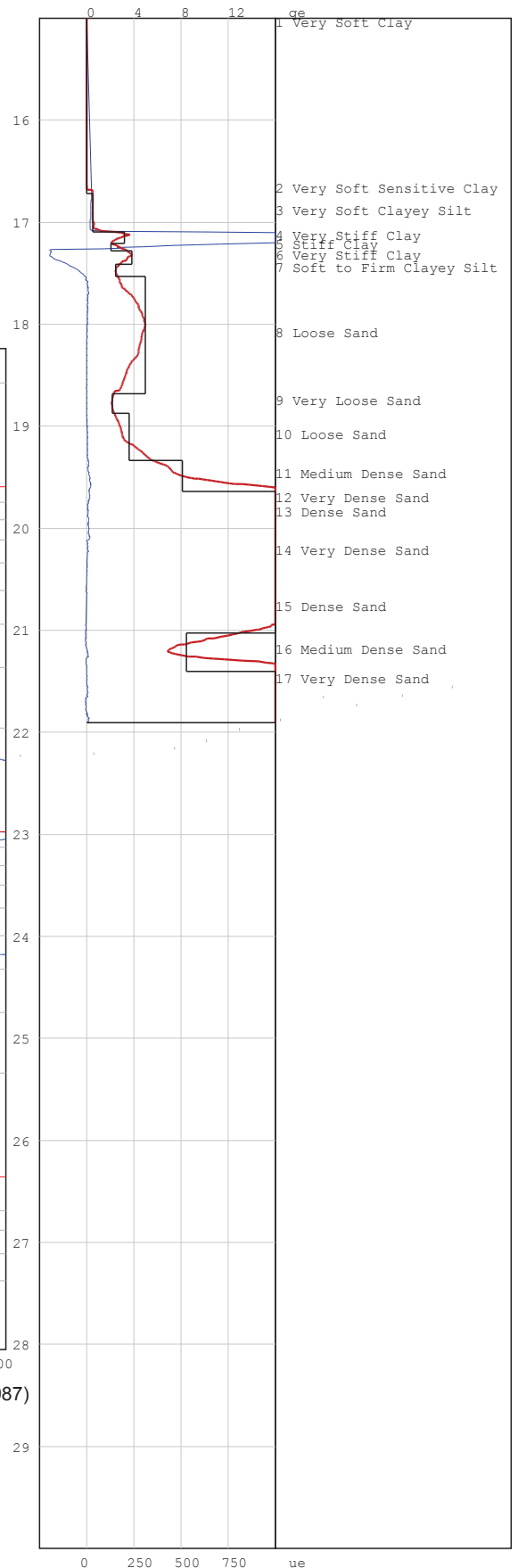
Site: Durban Harbour over water

Hole No: S 22

Date: 2012/08/22



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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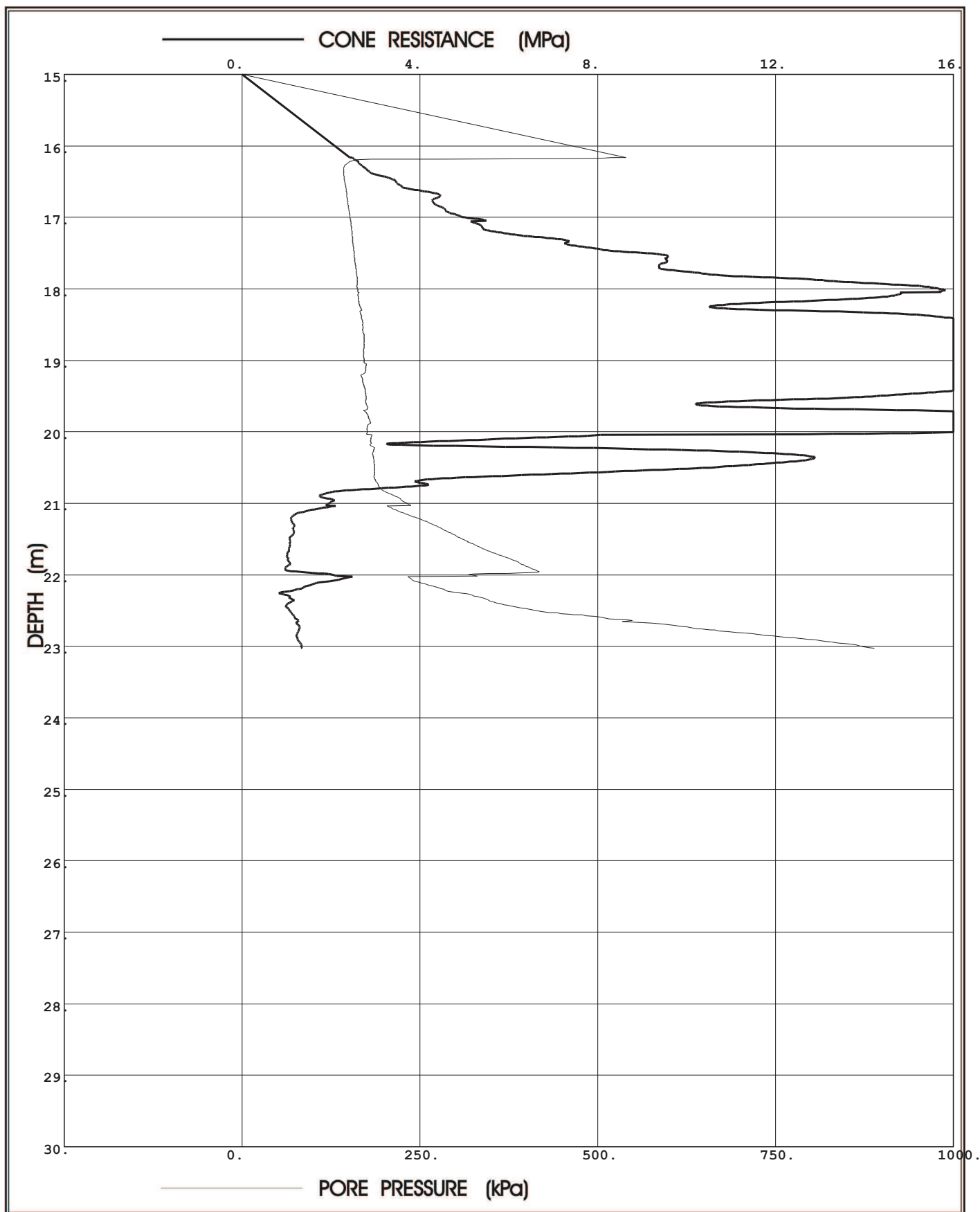
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 23

DATE: 2012/08/22

Page: 2



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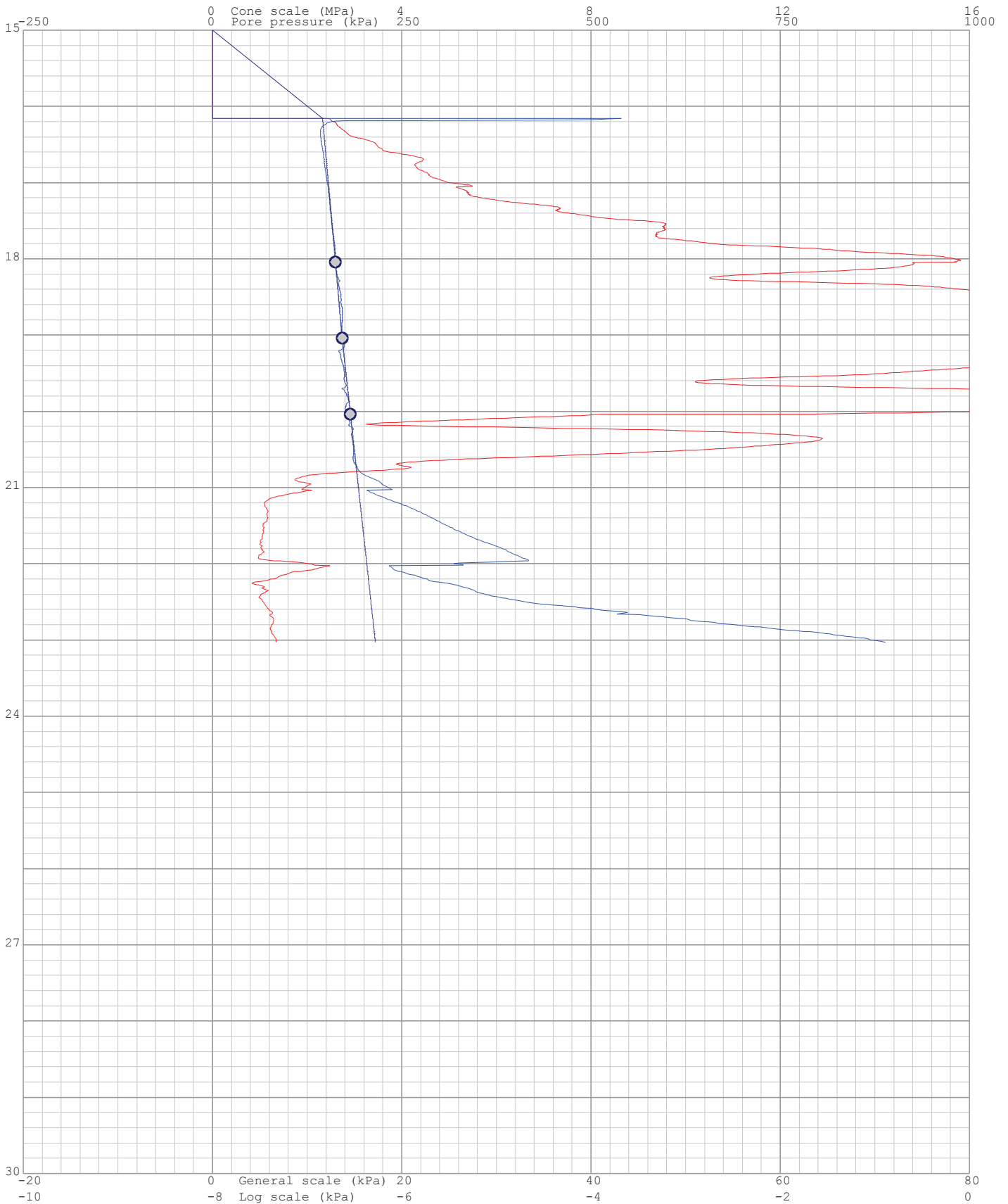
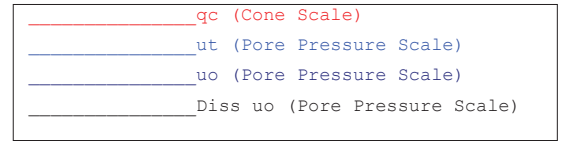
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 23

Date: 2012/08/22



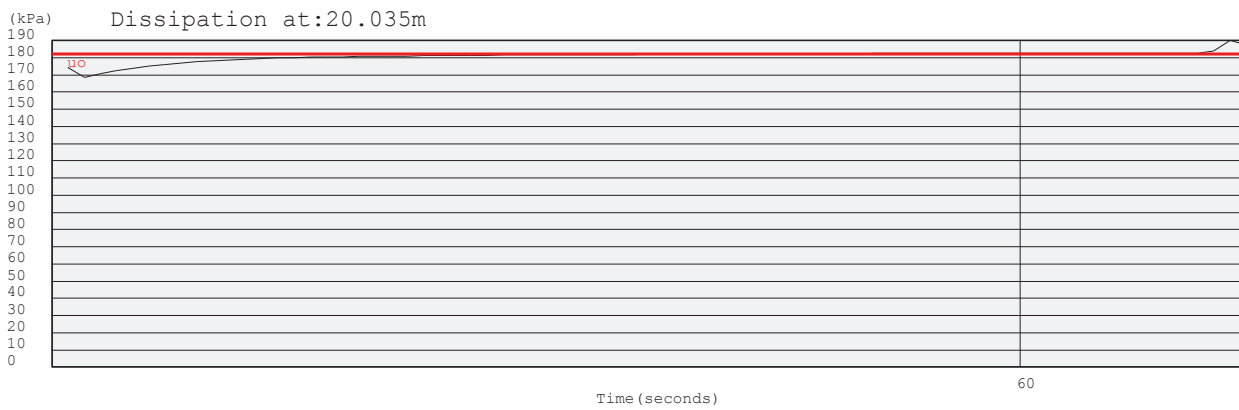
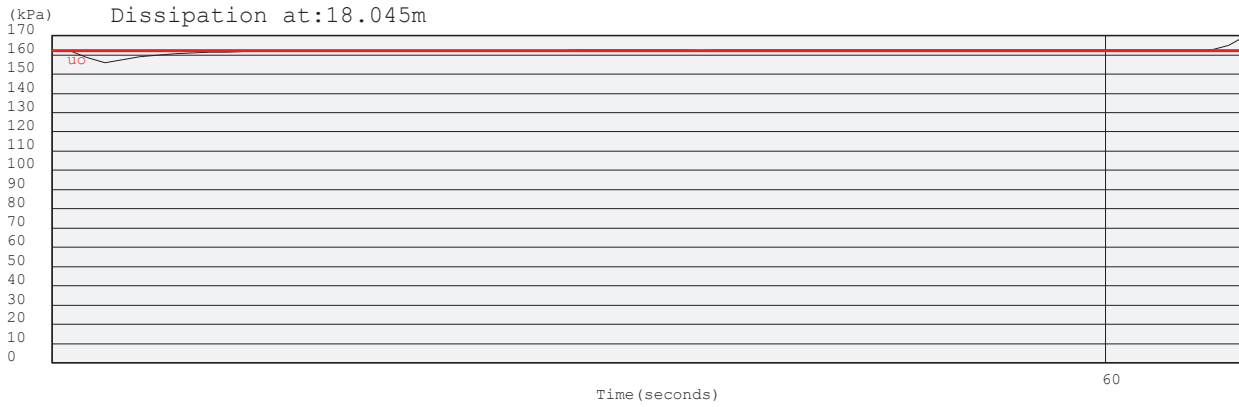
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

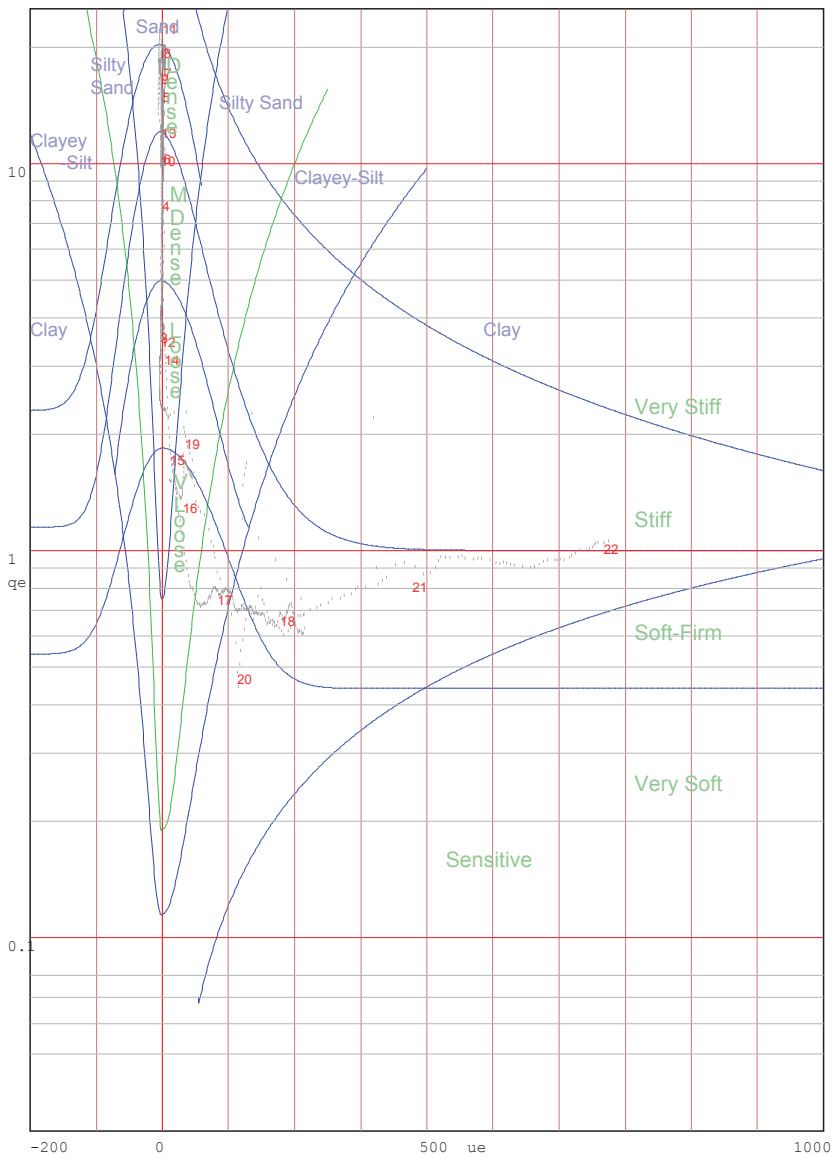
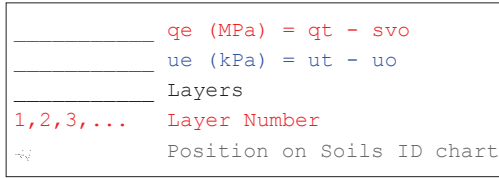
Hole: S 23

Date: 2012/08/22

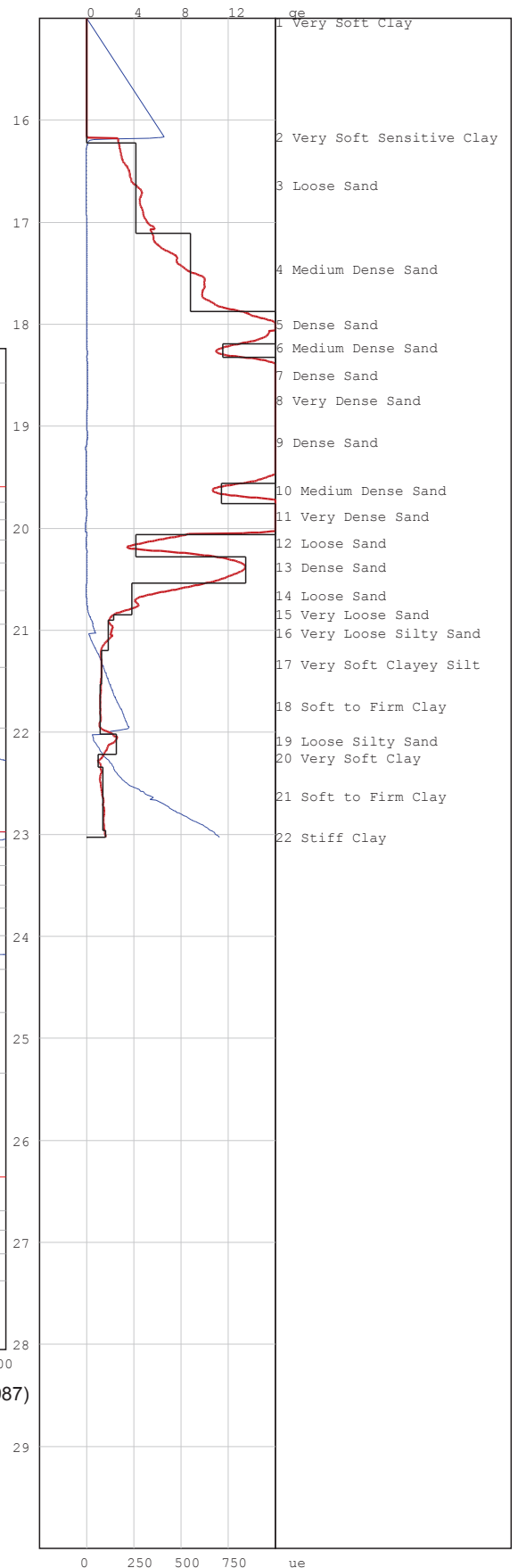
Page: 1







Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

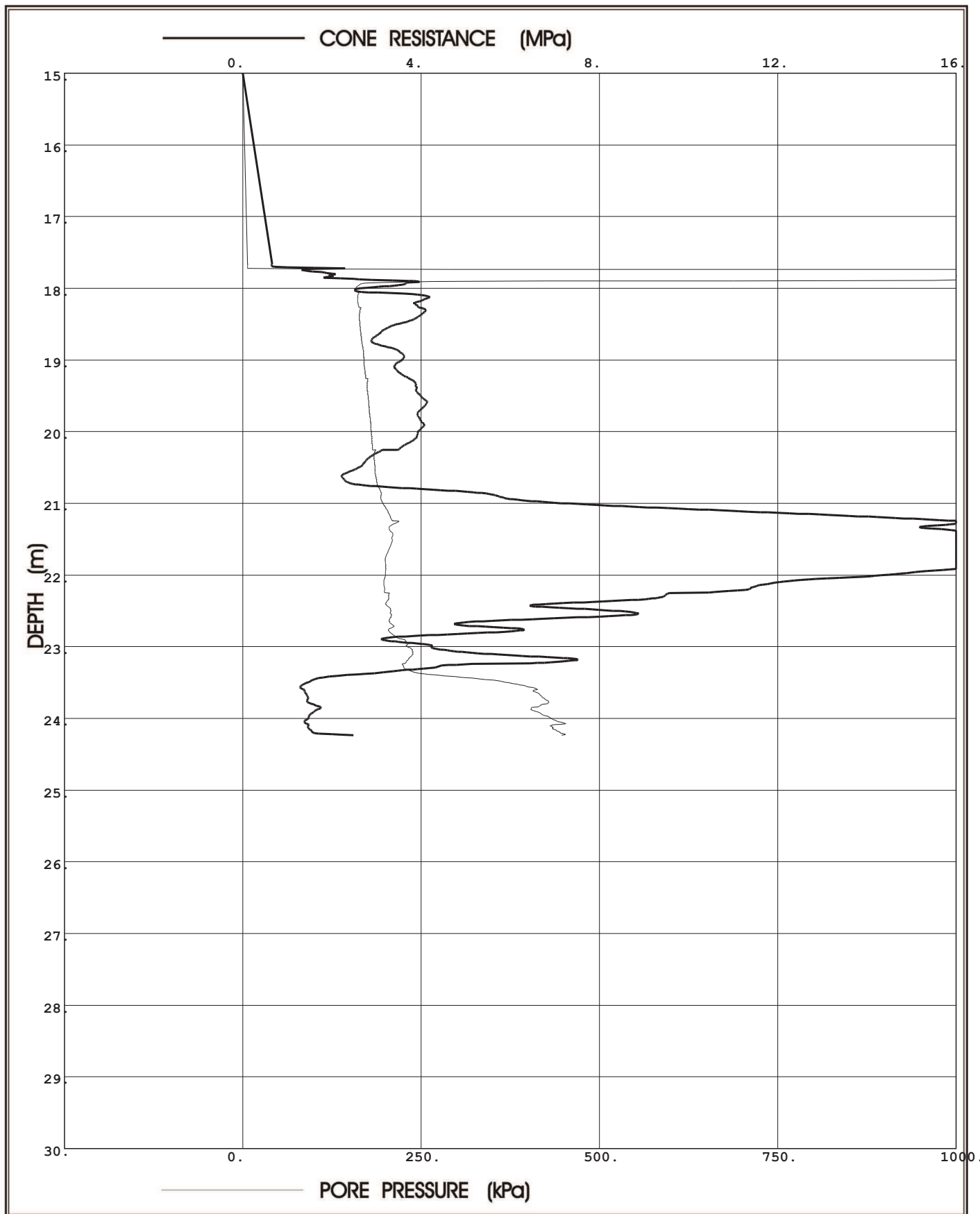
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 24

DATE: 2012/08/24

Page:2



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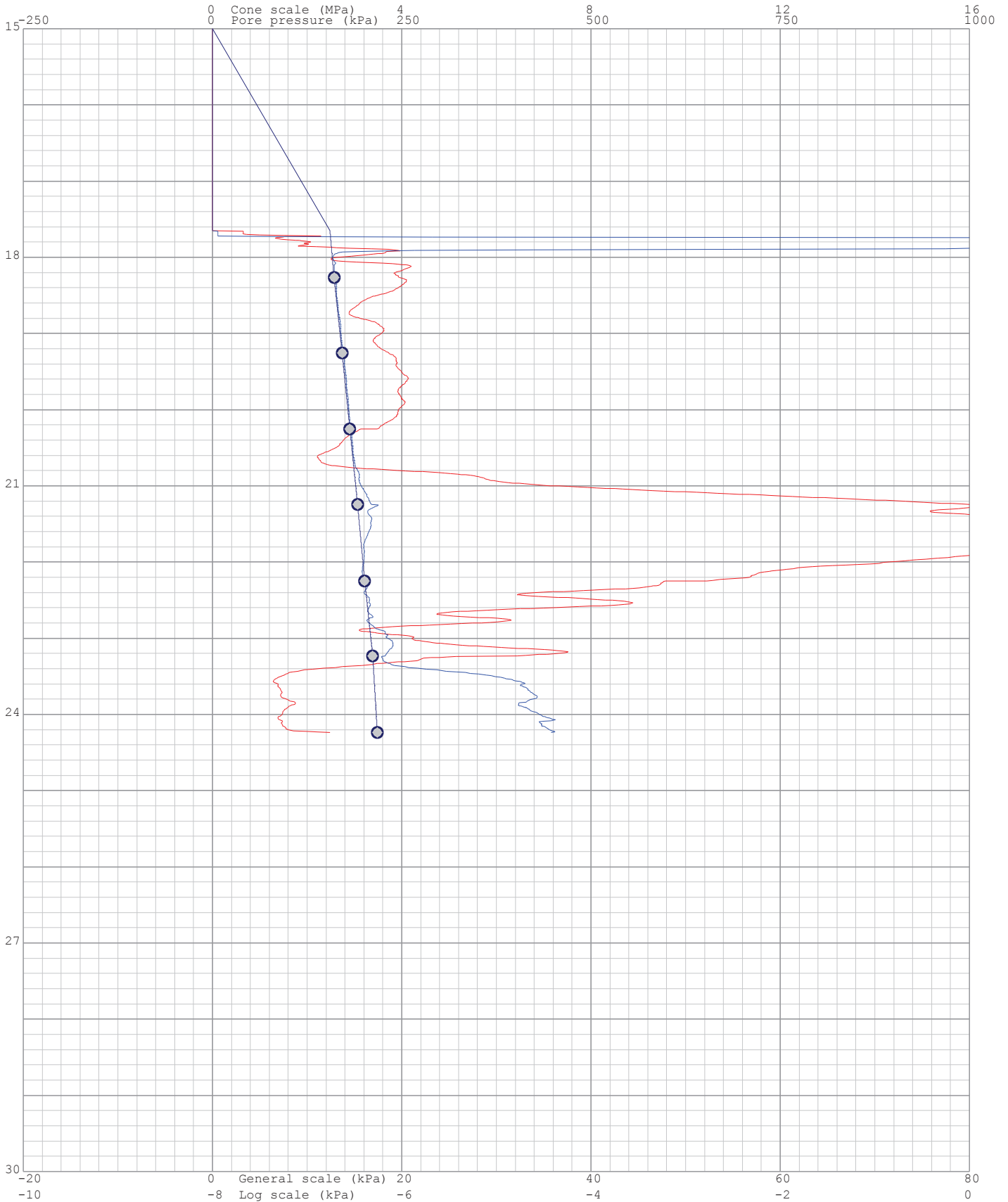
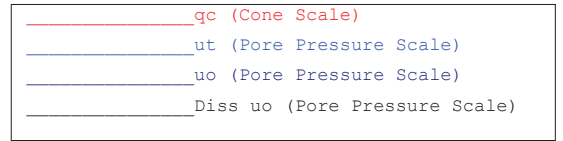
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 24  
Date: 2012/08/24



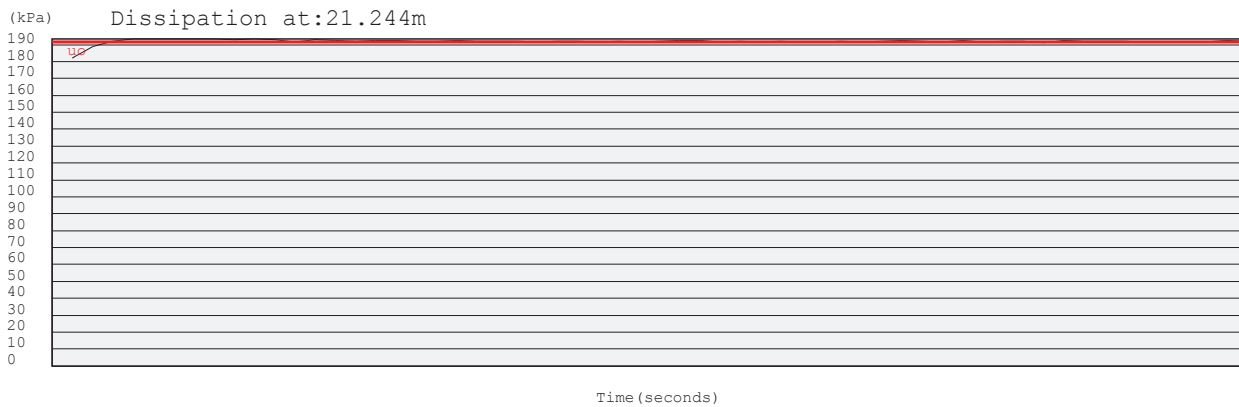
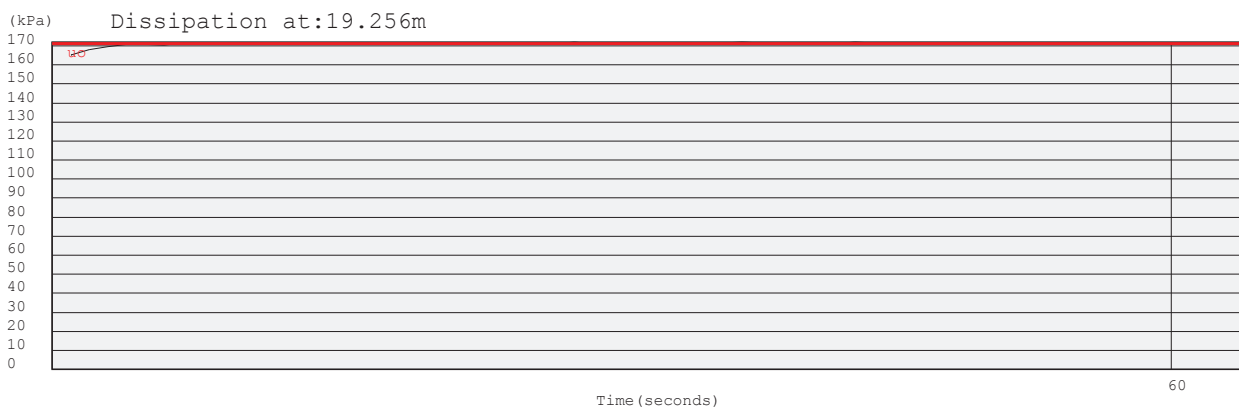
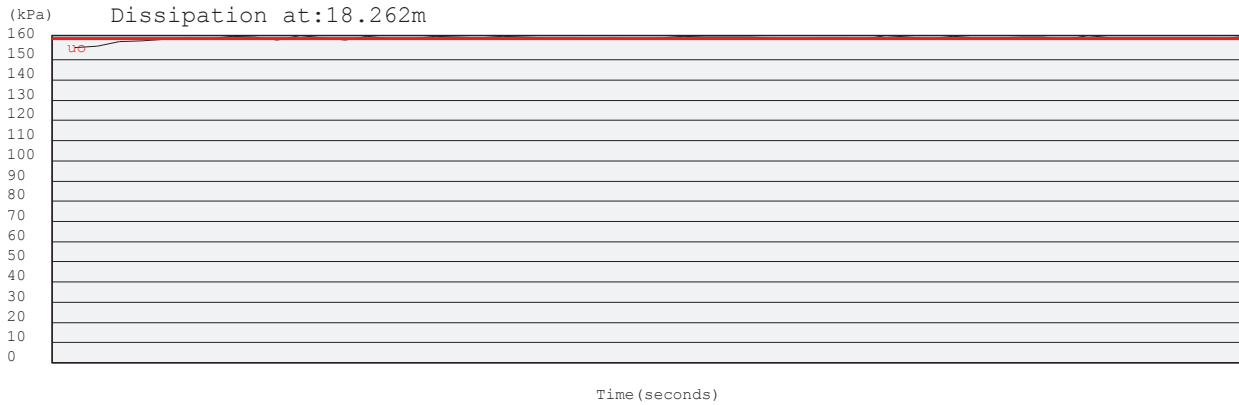
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 24

Date: 2012/08/24

Page: 1



Project: Durban Harbour Piezocone Investigation for Dredging

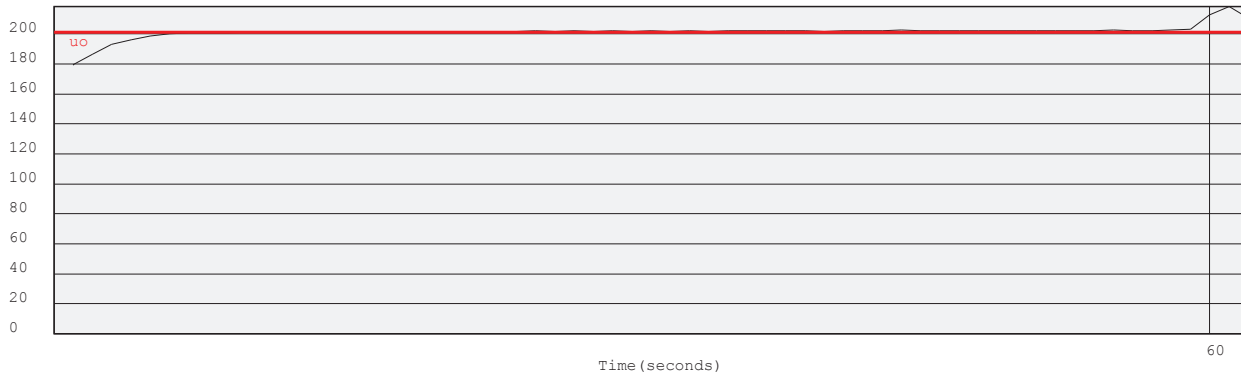
Site: Durban Harbour over water

Hole: S 24

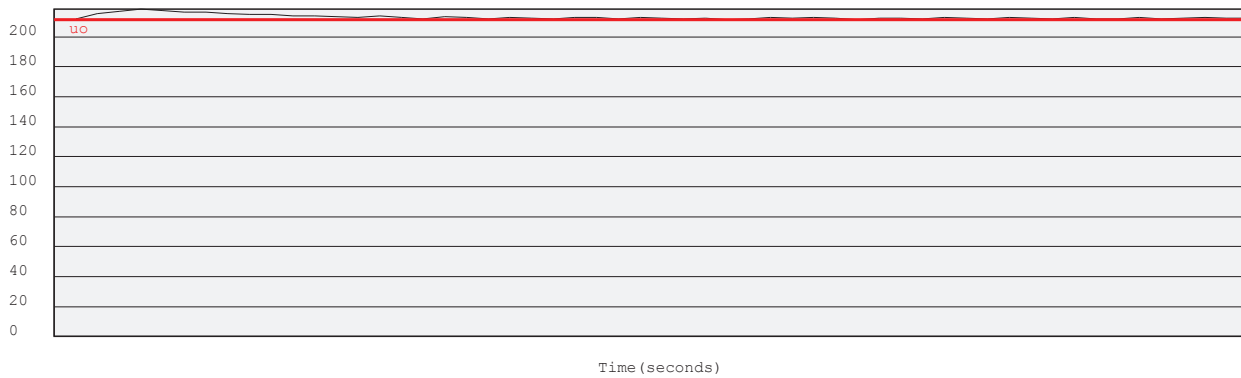
Date: 2012/08/24

Page: 2

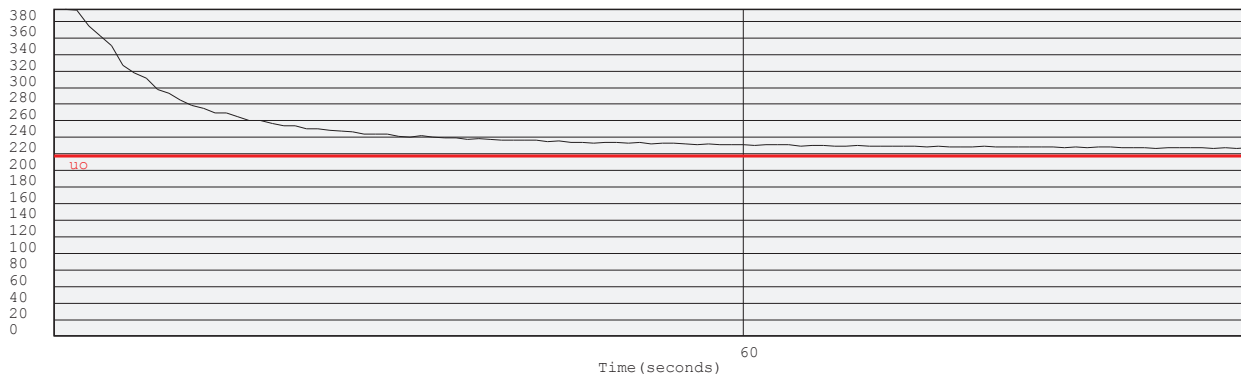
(kPa) Dissipation at: 22.247m



(kPa) Dissipation at: 23.233m



(kPa) Dissipation at: 24.235m

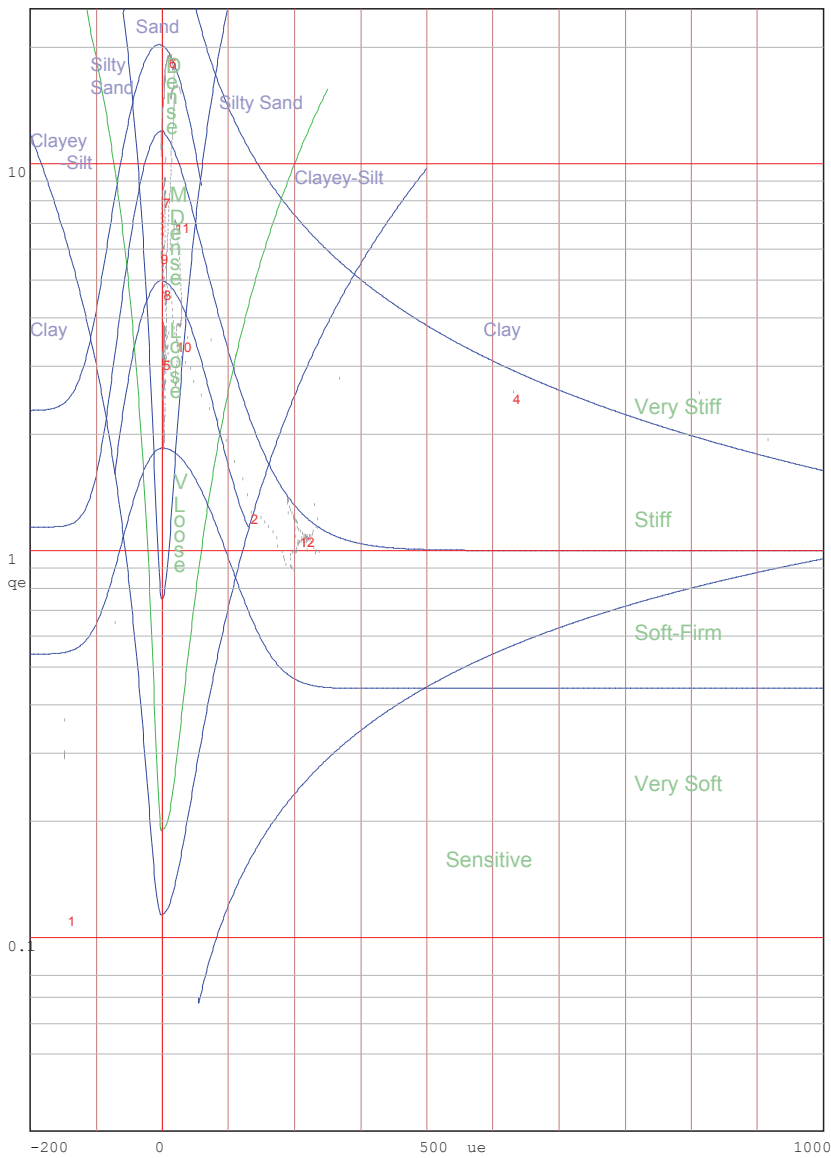
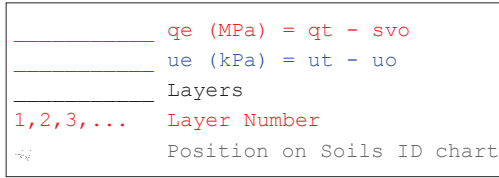


Project: Durban Harbour Piezocone Investigation for Dredging

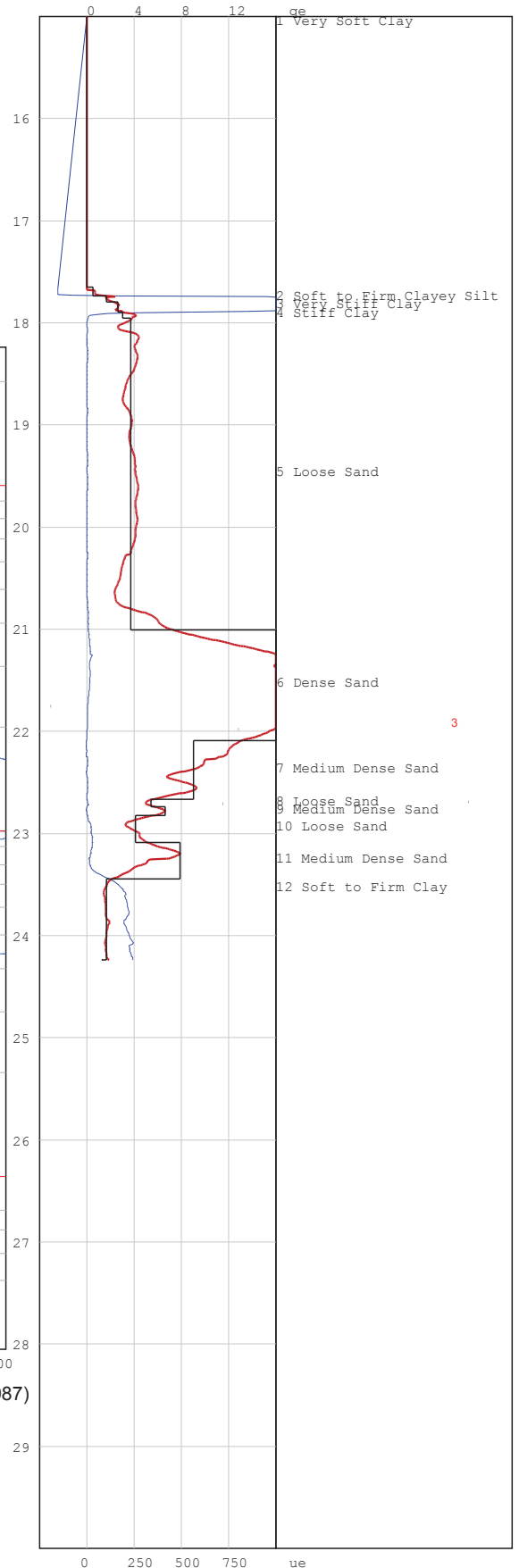
Site: Durban Harbour over water

Hole No: S 24

Date: 2012/08/24



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

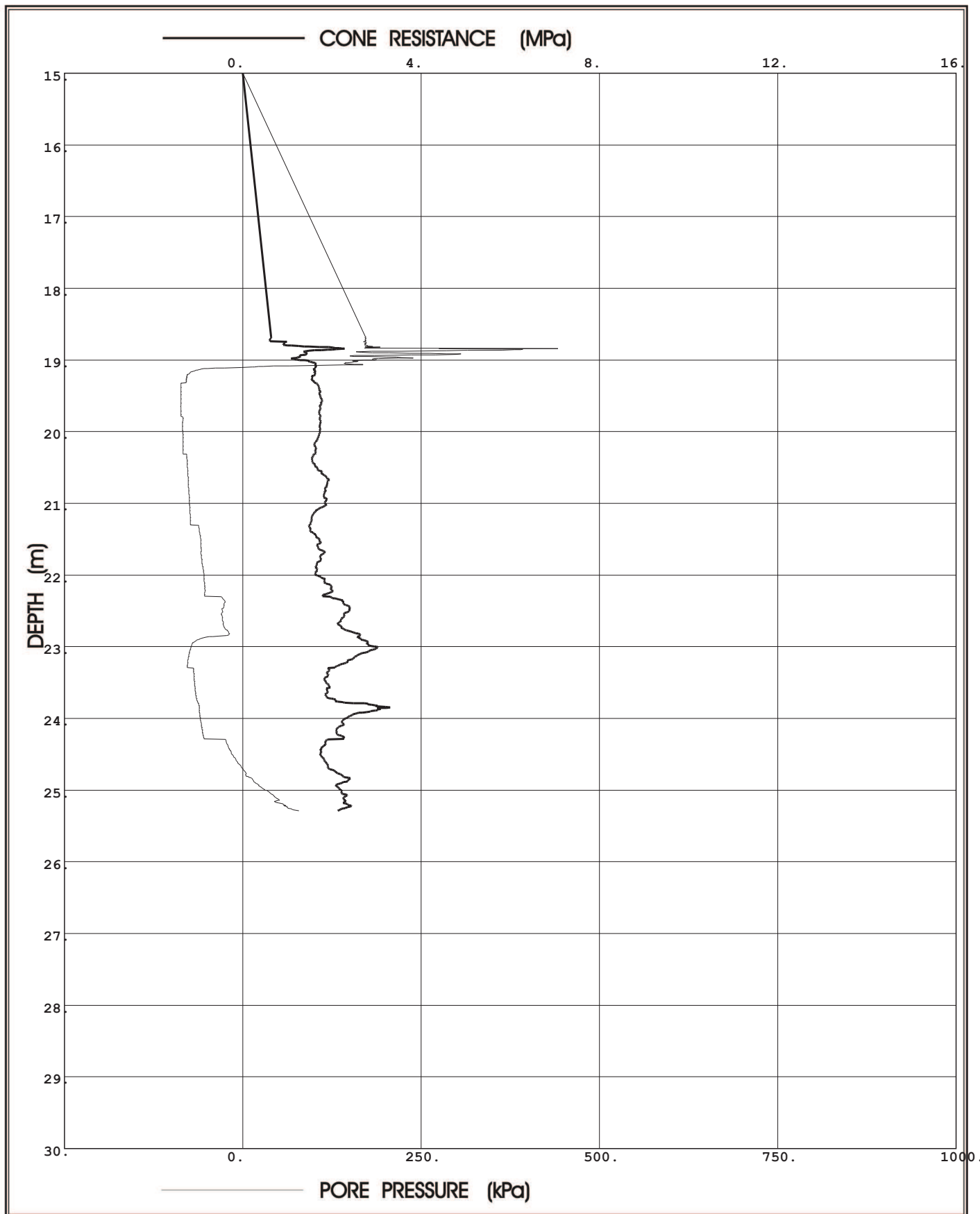
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 25

DATE: 2012/08/25

Page:2



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082 570 6446

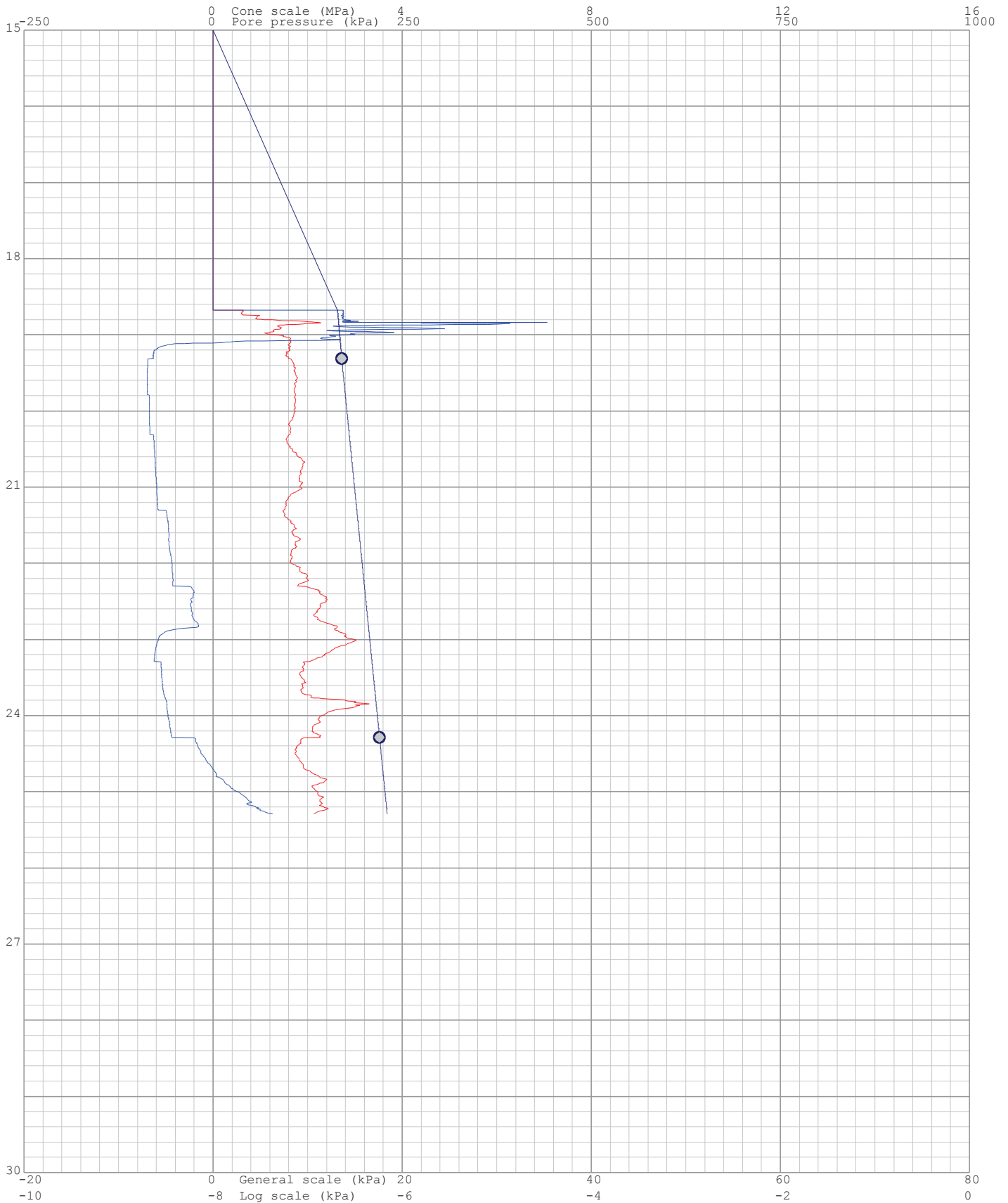
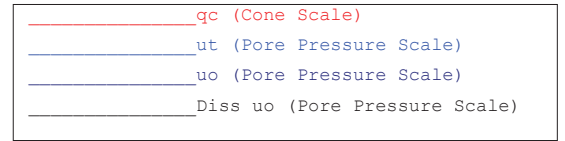
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 25  
Date: 2012/08/25



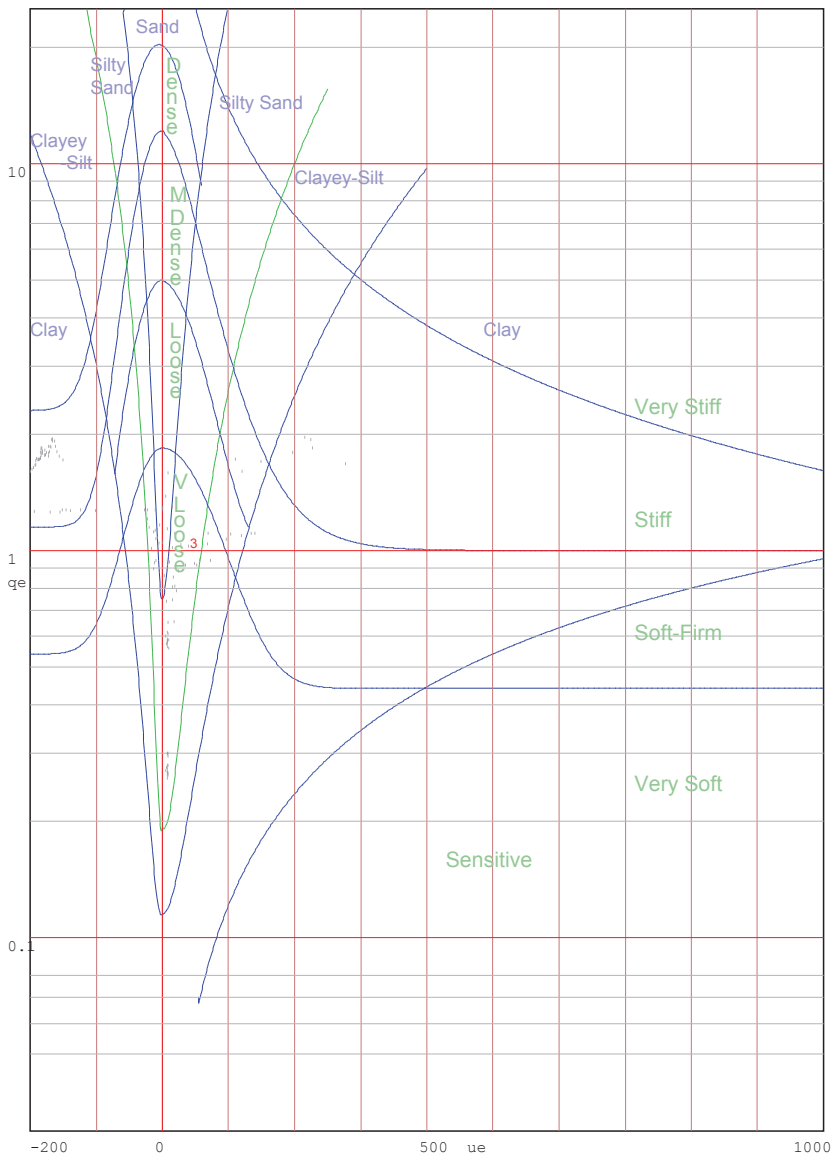


Project: Durban Harbour Piezocone Investigation for Dredging

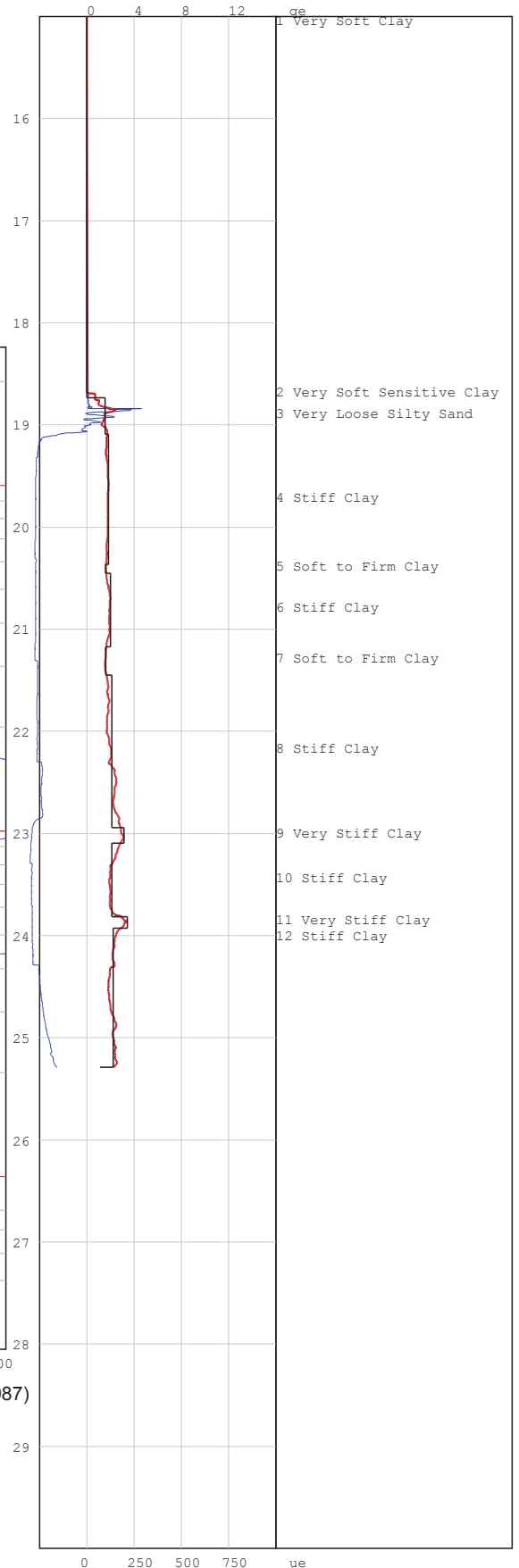
Site: Durban Harbour over water

Hole No: S 25  
Date: 2012/08/25

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

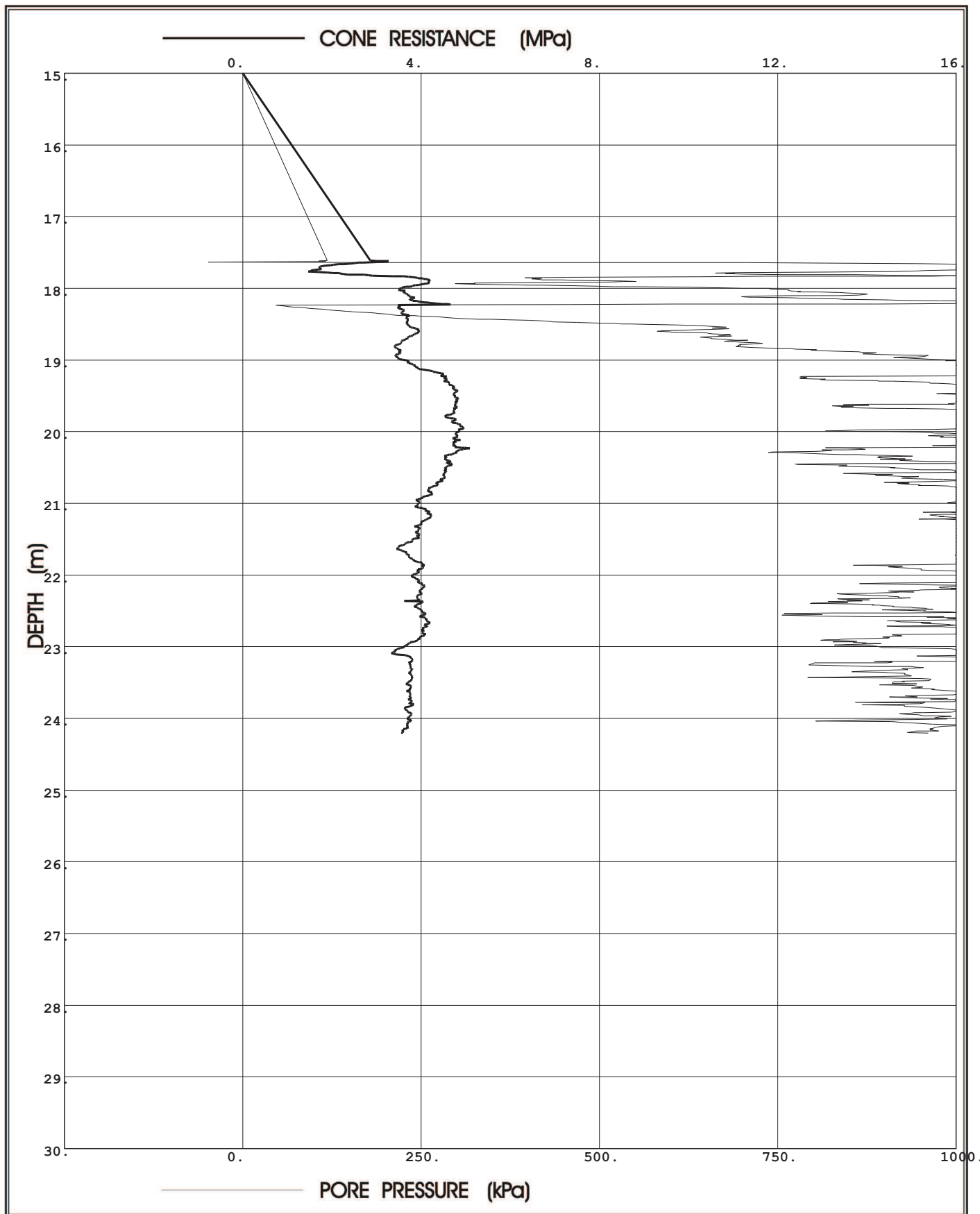
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 26

DATE: 2012/08/29

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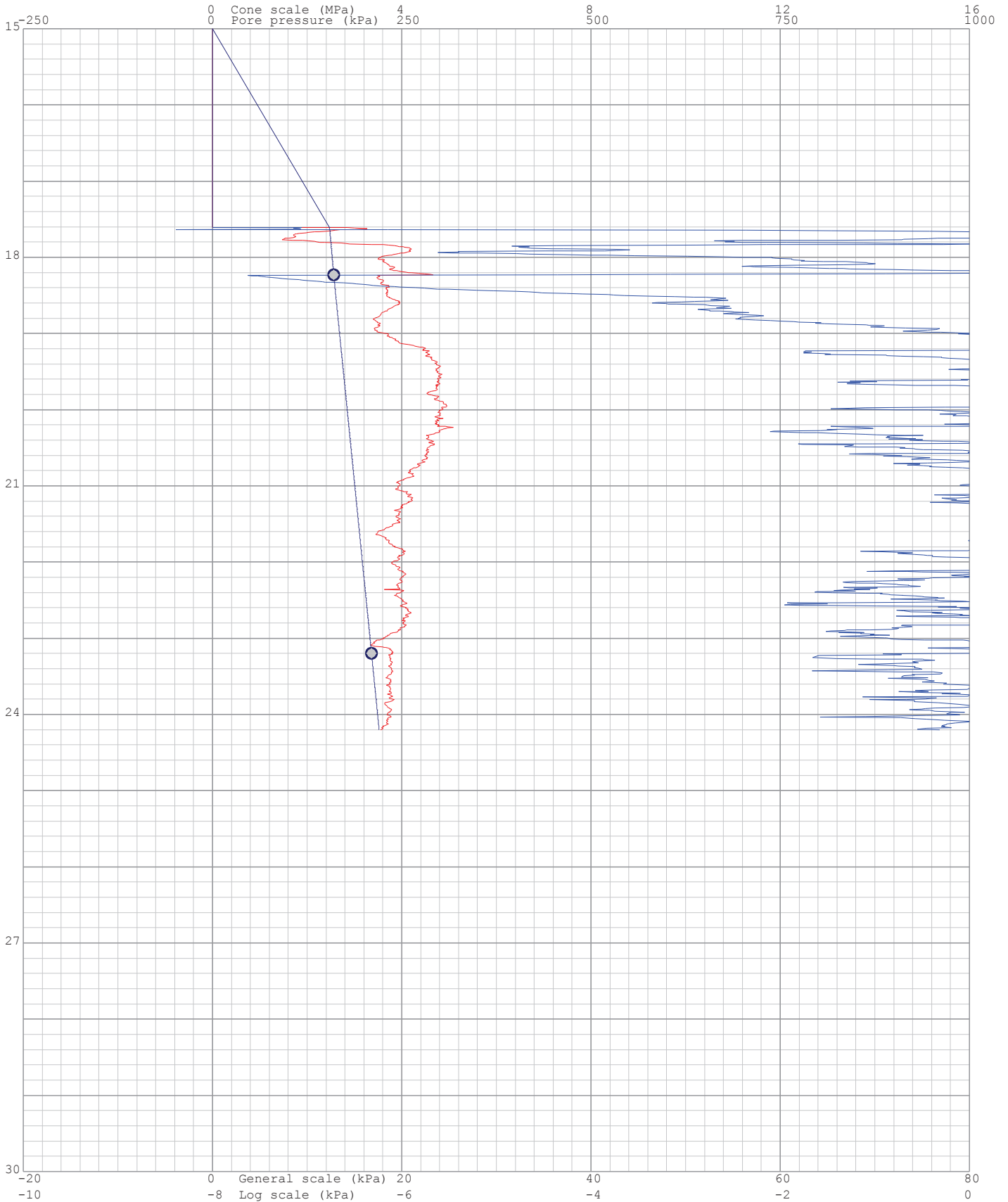
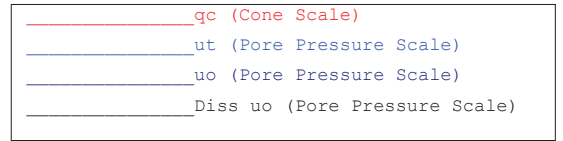
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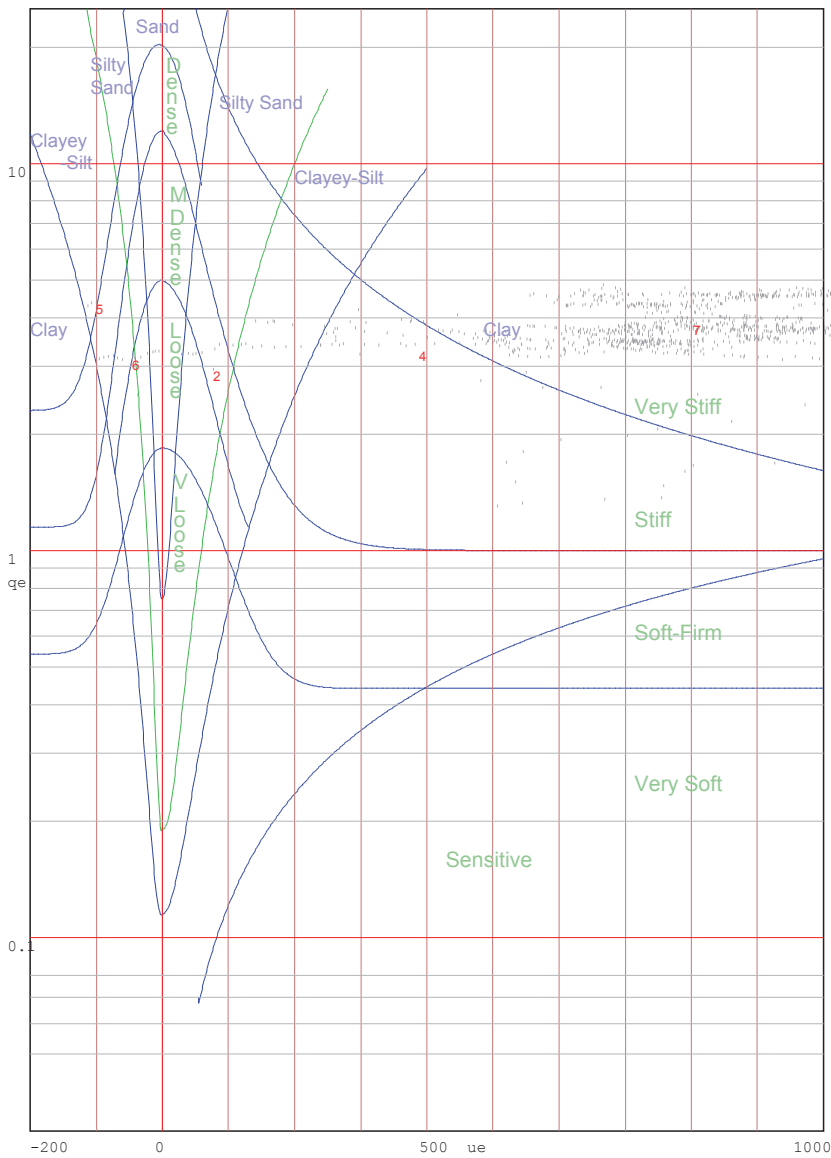
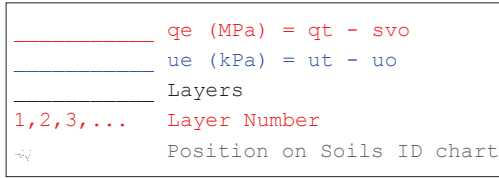
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

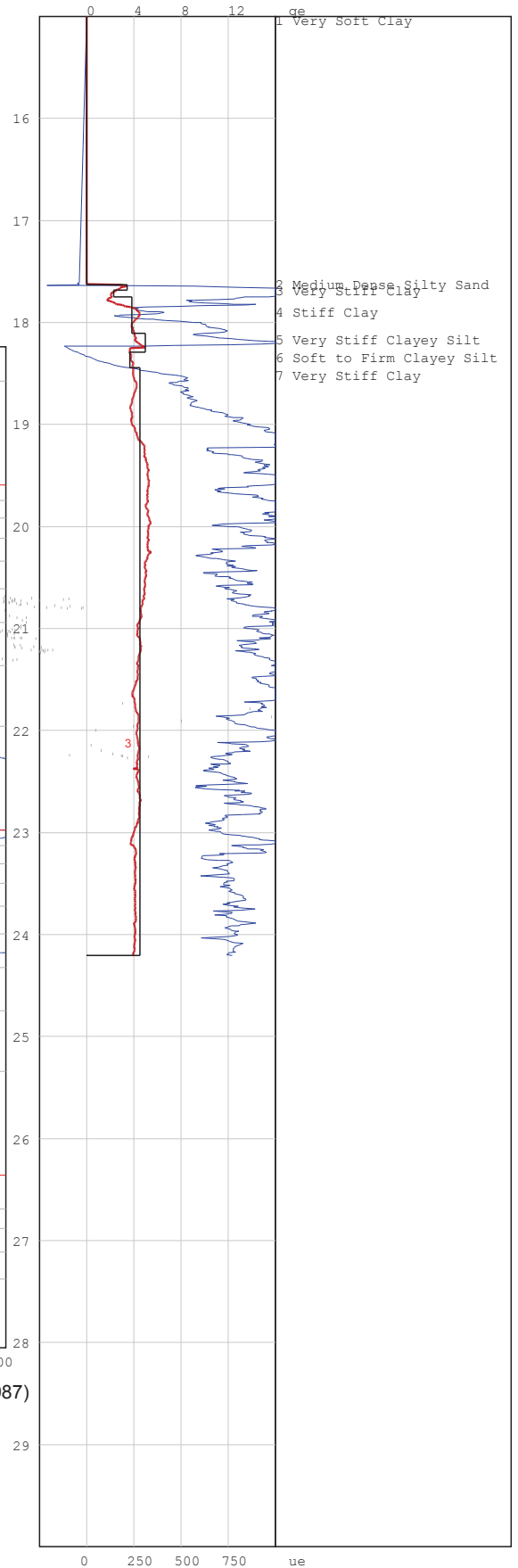
Site: Durban Harbour over water

Hole No: S 26  
Date: 2012/08/29





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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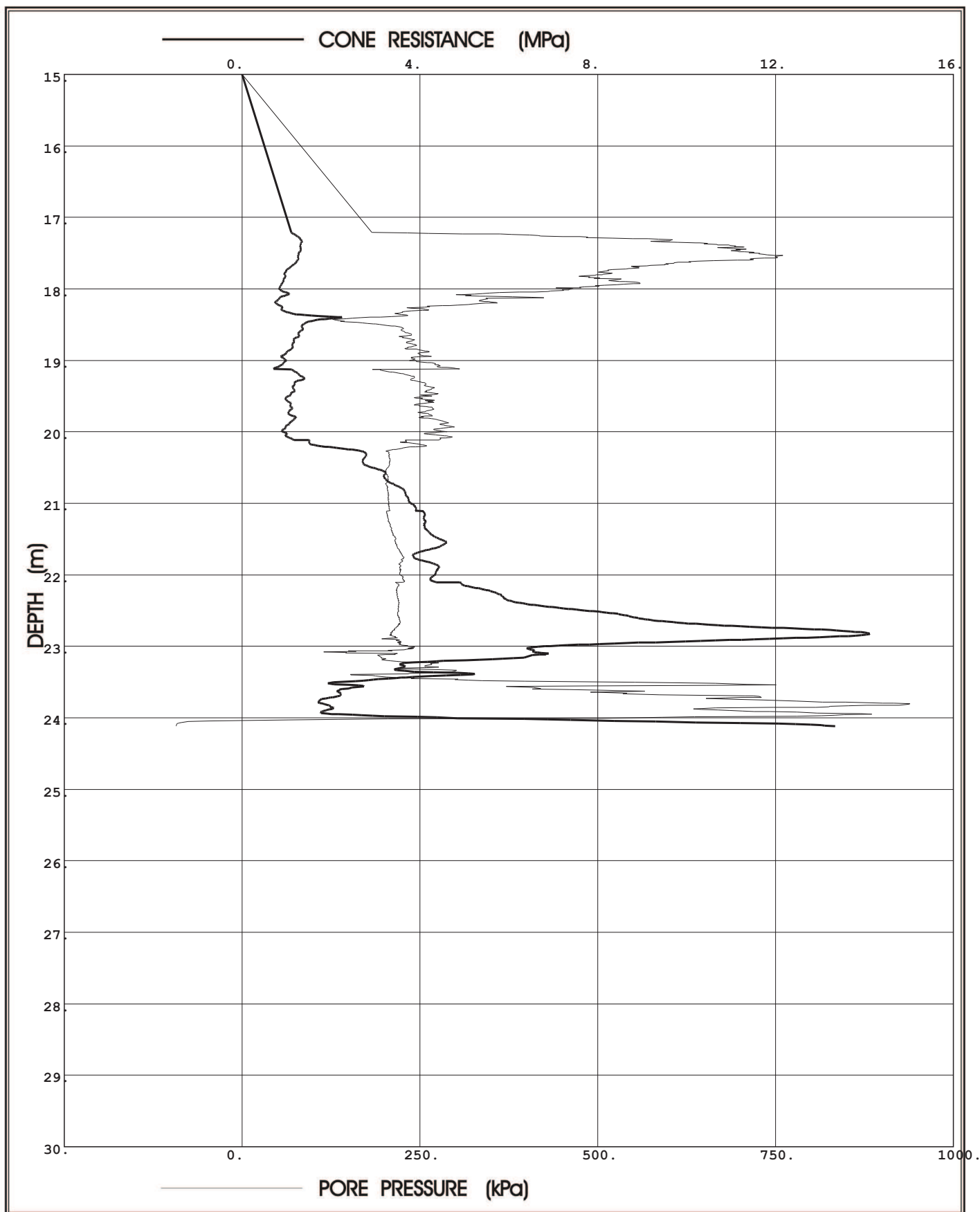
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 27

DATE: 2012/08/29

Page: 2



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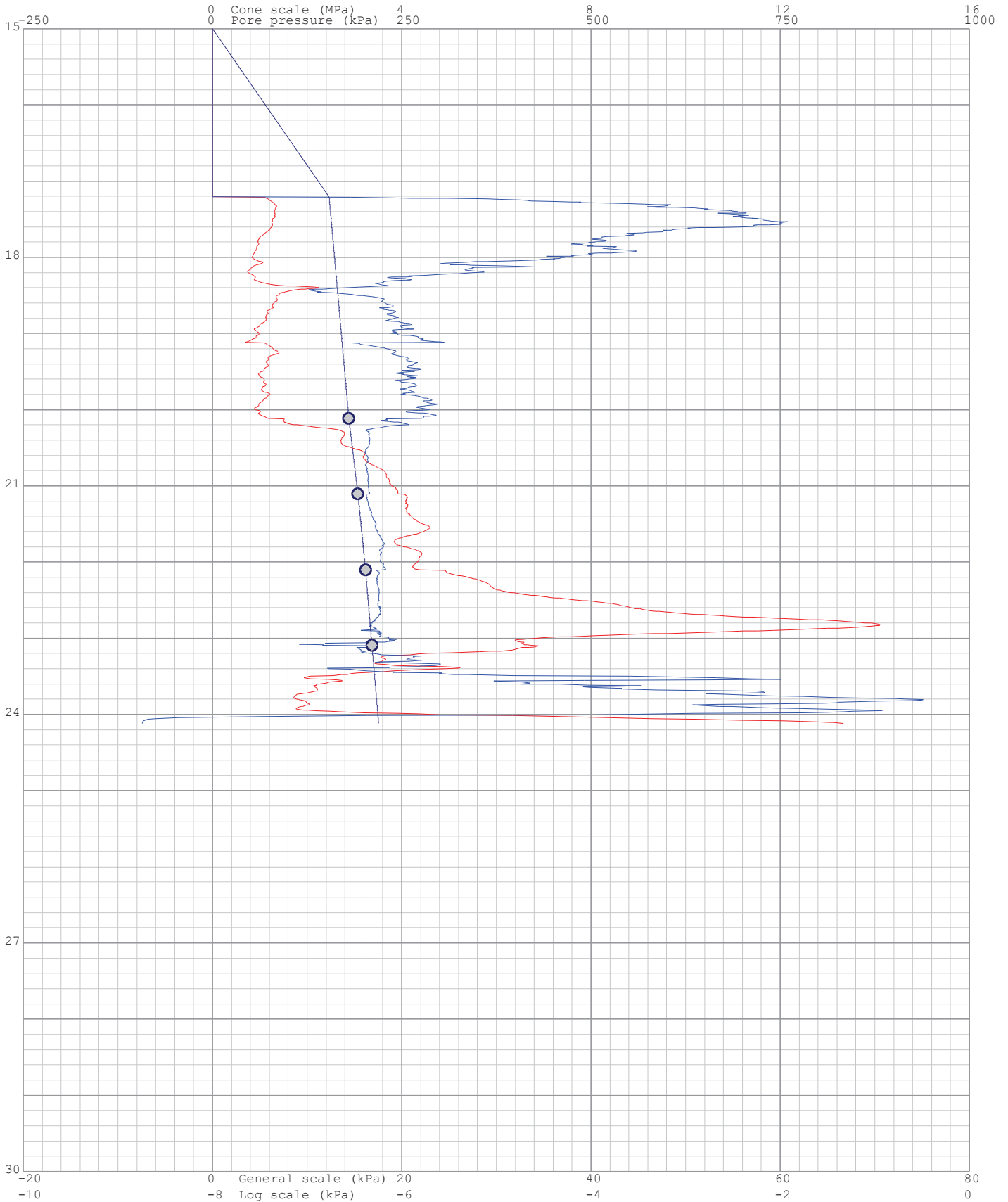
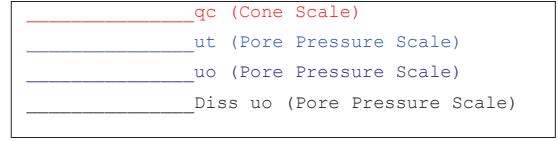
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 27  
Date: 2012/08/29



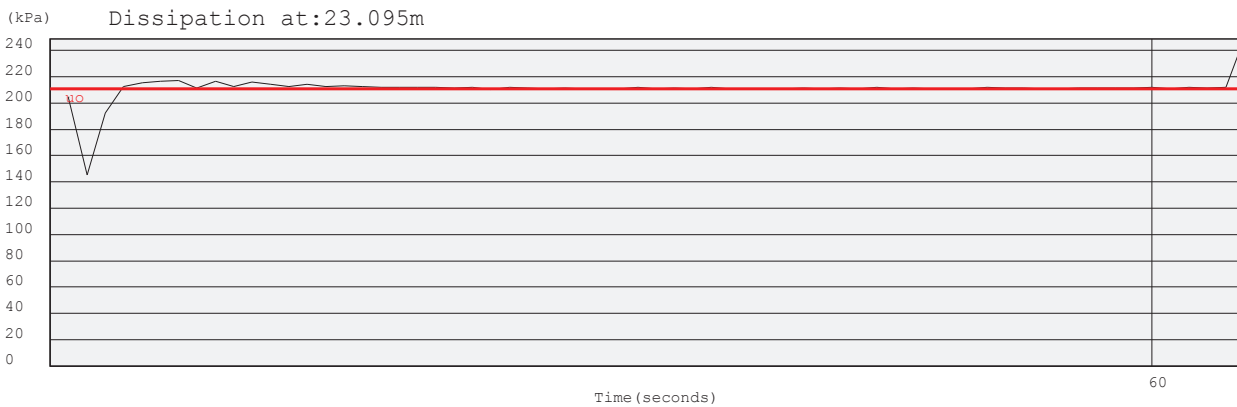
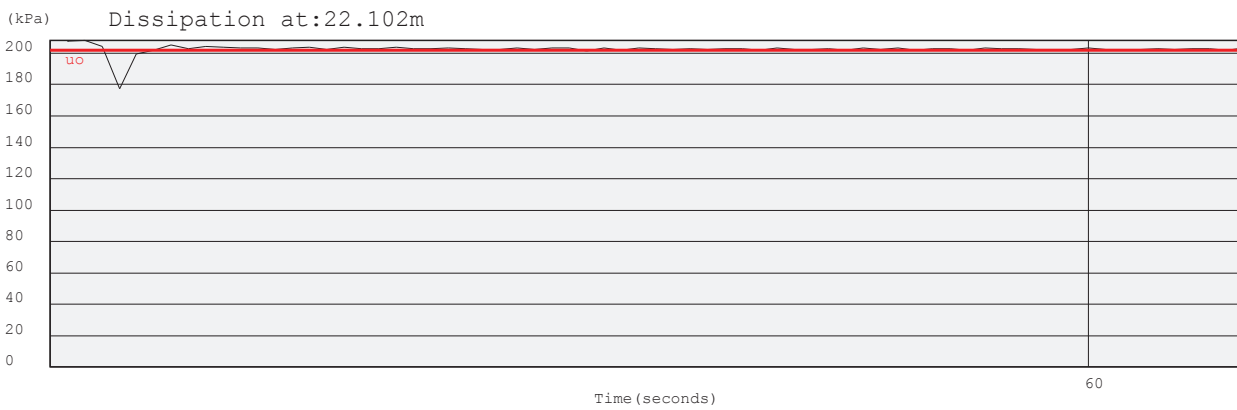
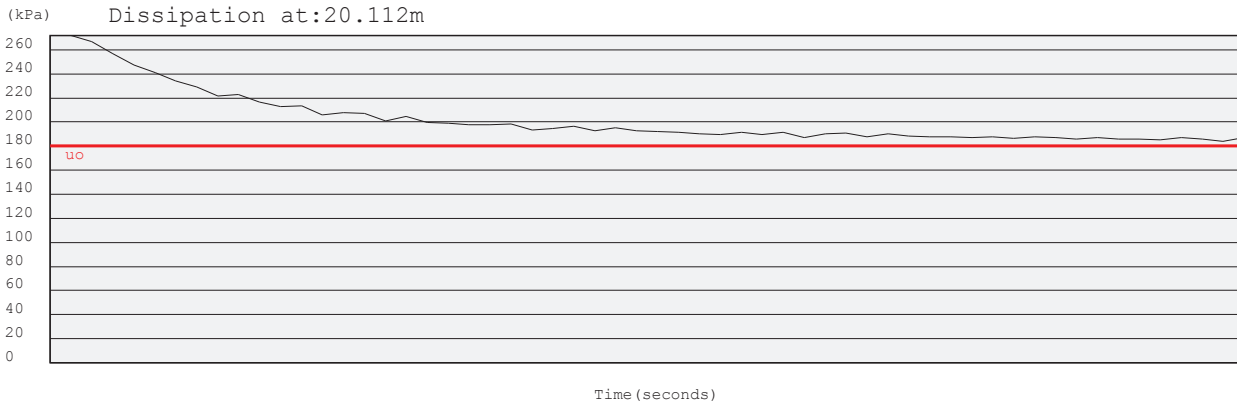
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

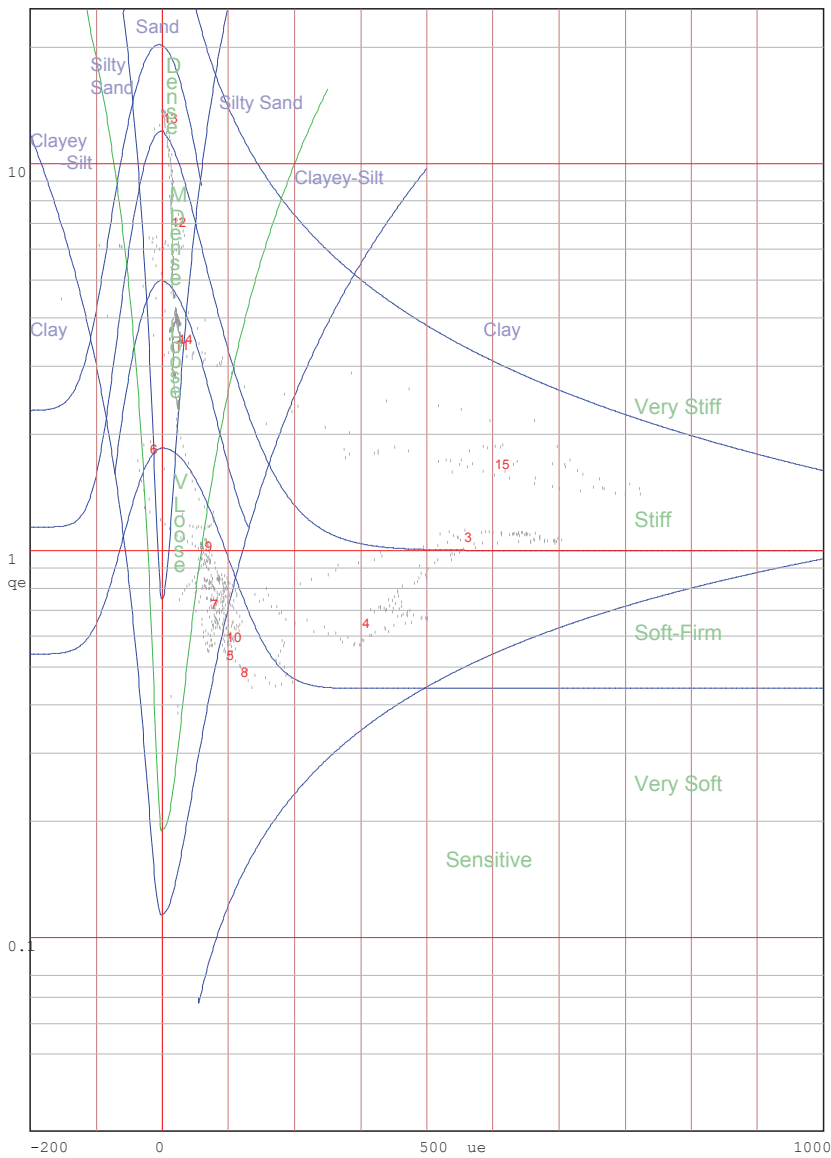
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Date: 2012/08/29

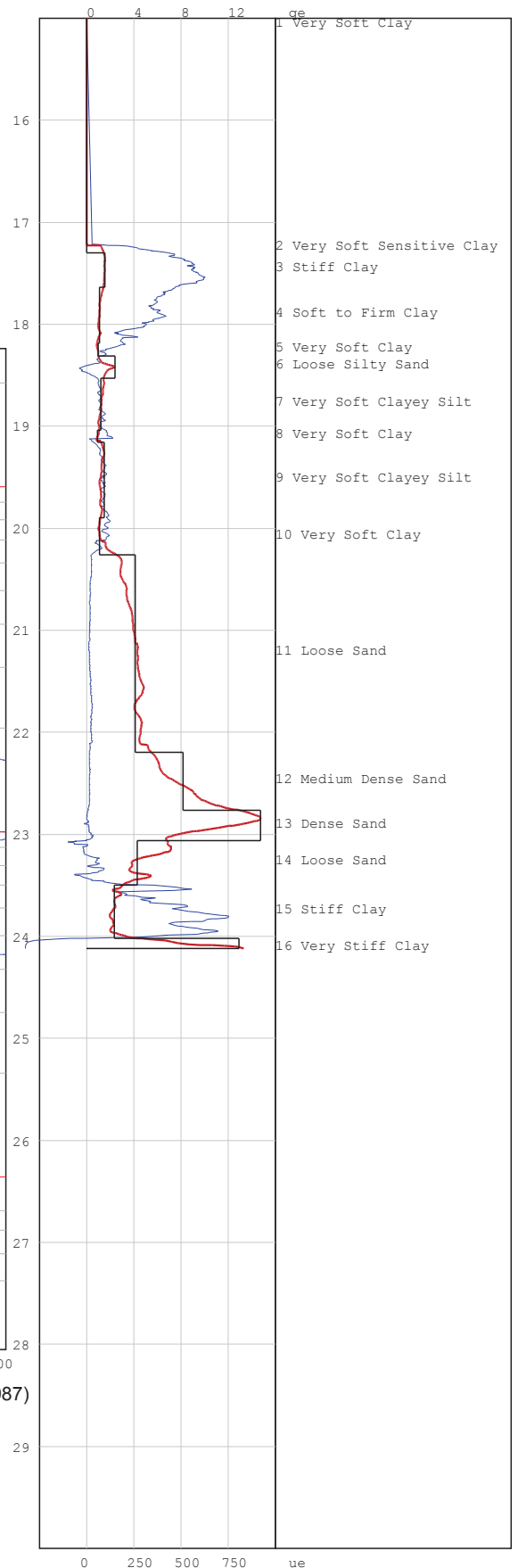
Page: 1



—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





# PIEZOCONE PENETRATION TEST



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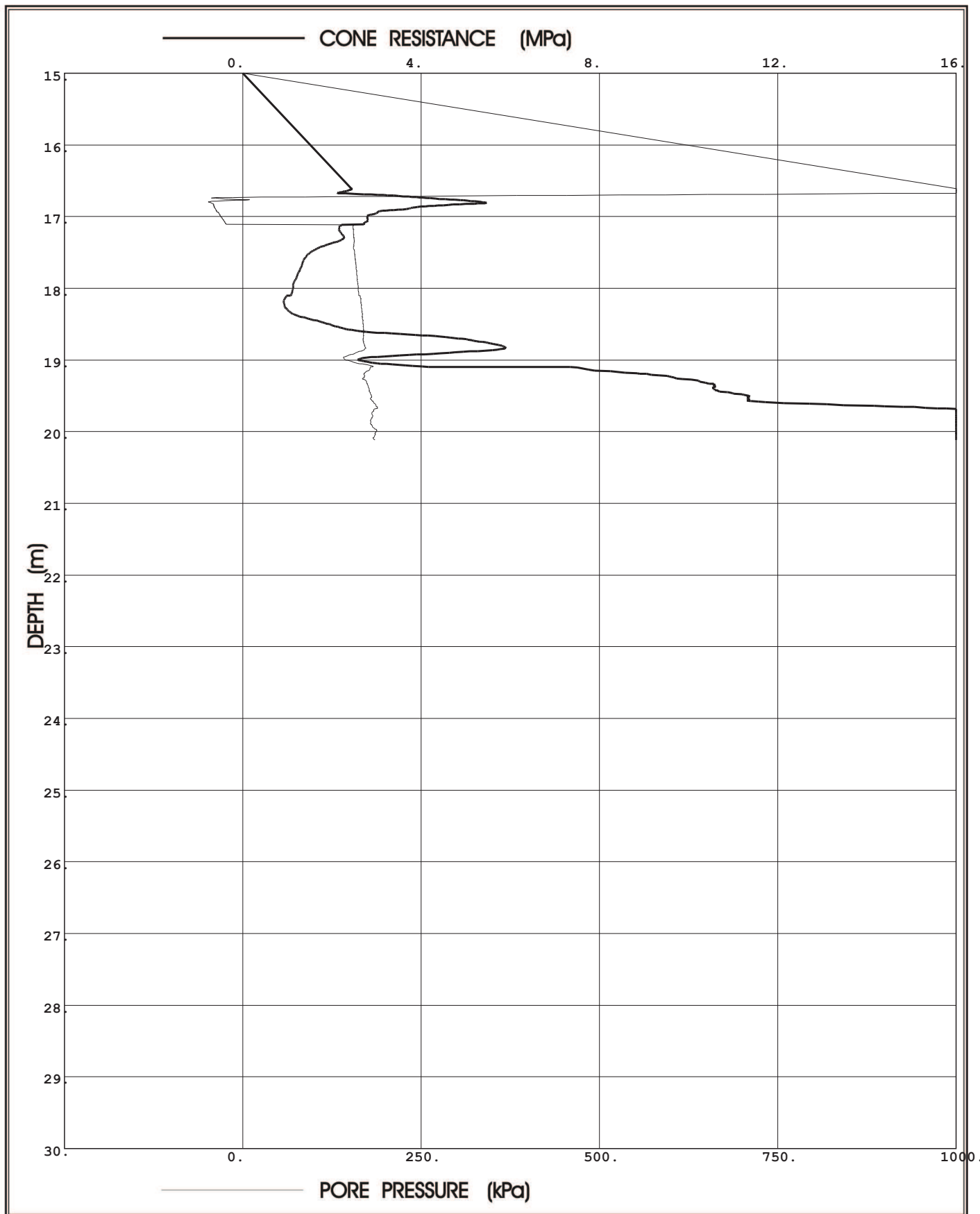
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 28

DATE: 2012/08/29

Page: 2



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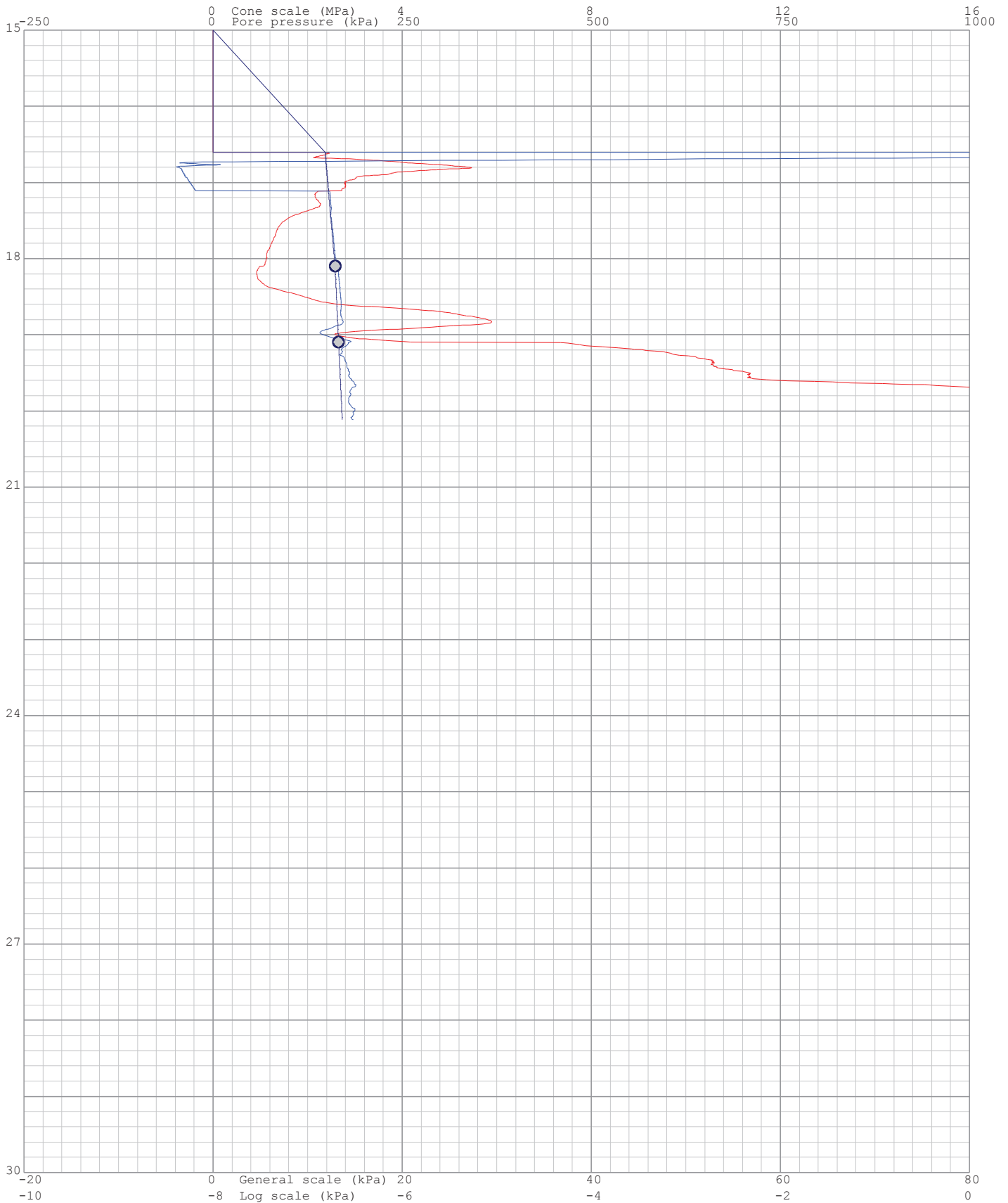
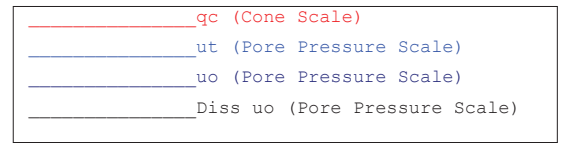
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 28

Date: 2012/08/29



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 28

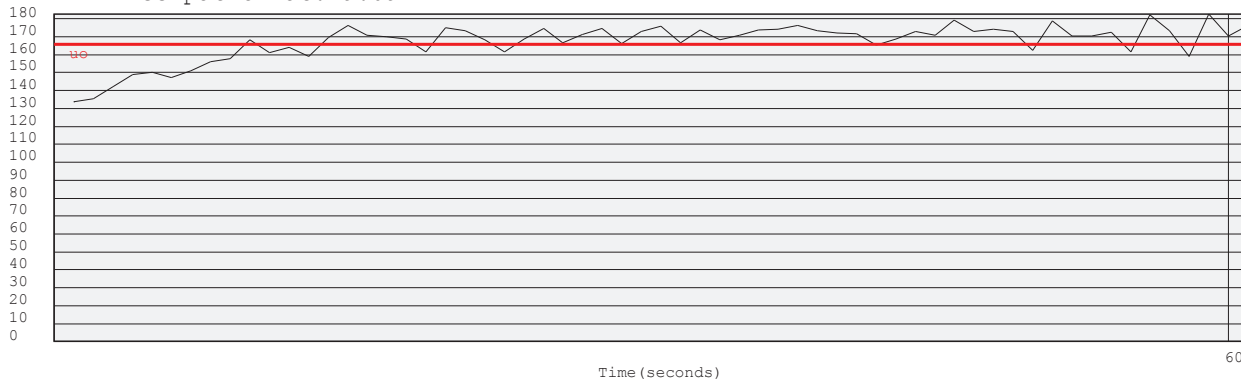
Date: 2012/08/29

Page: 1

(kPa) Dissipation at:18.1m



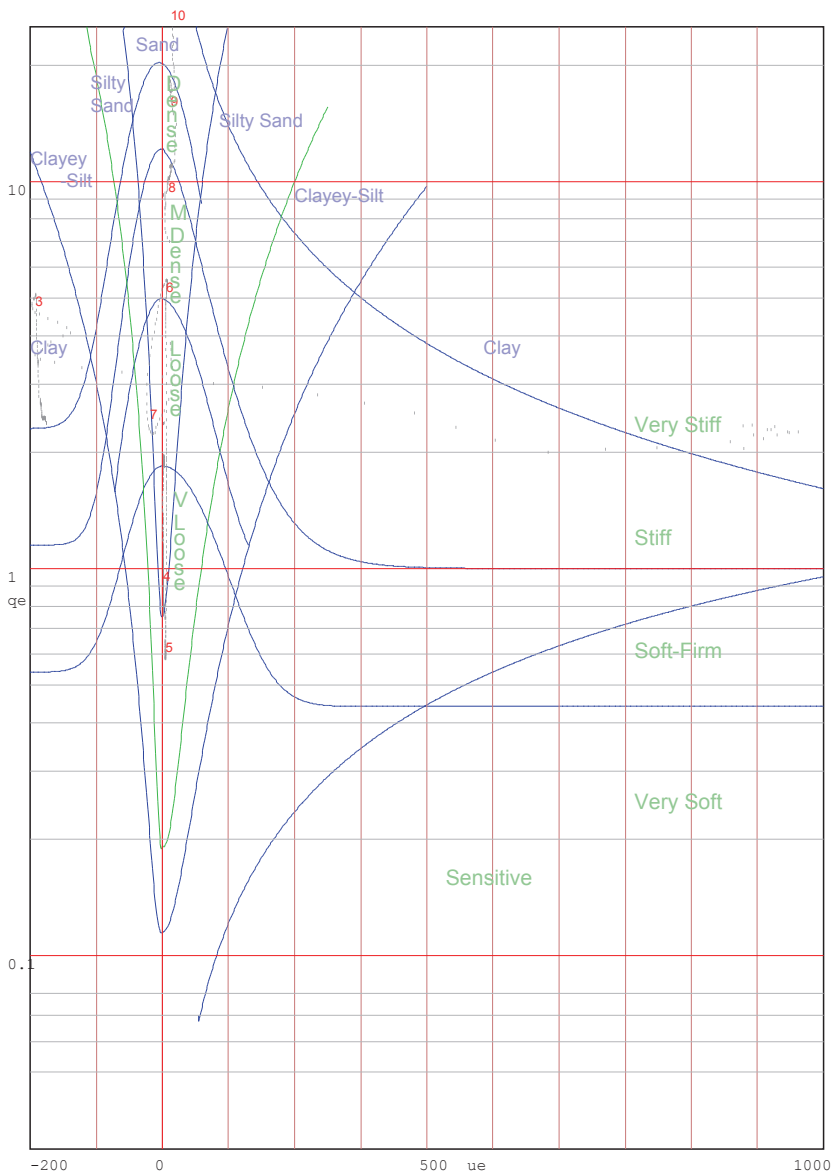
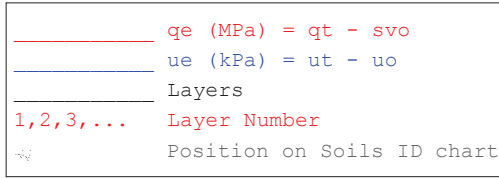
(kPa) Dissipation at:19.094m



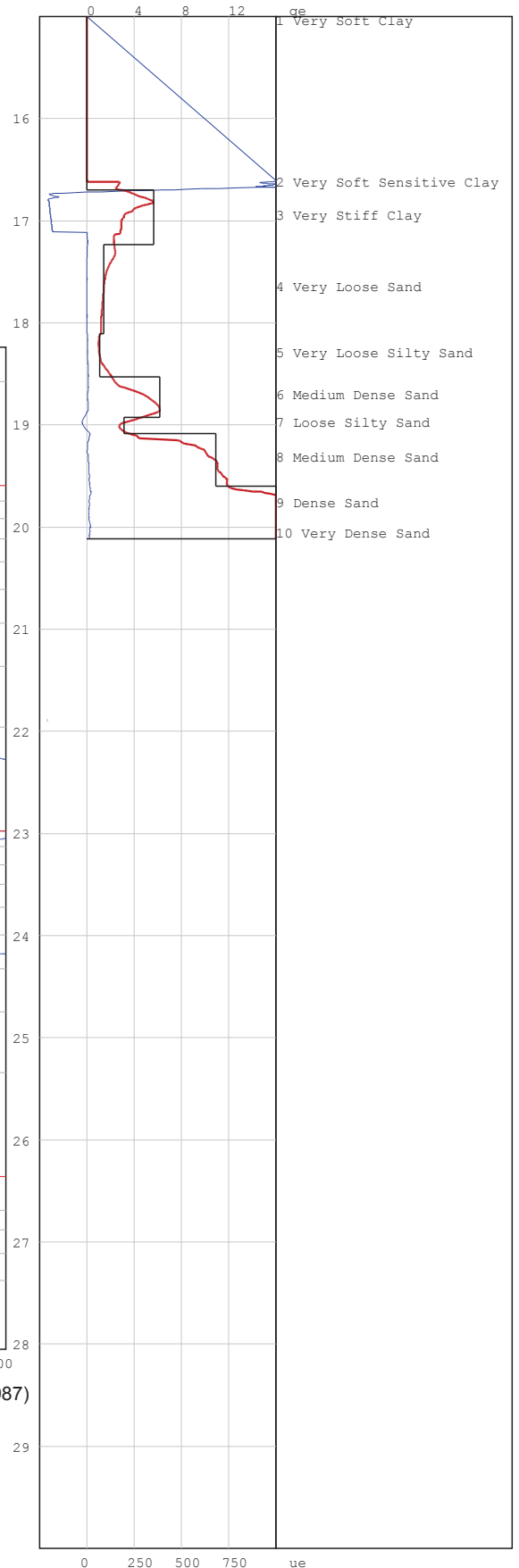
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 28  
Date: 2012/08/29



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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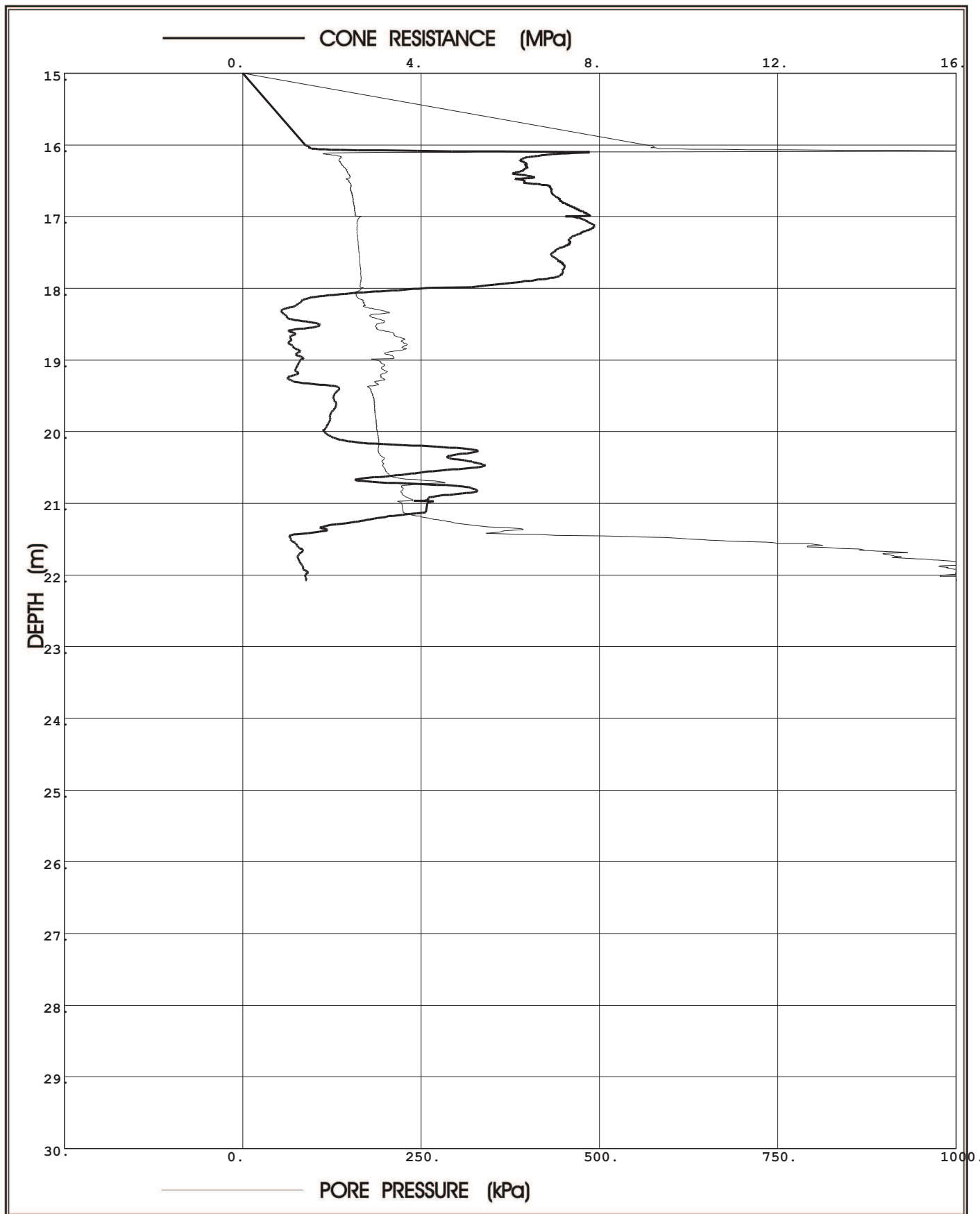
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 29

DATE: 2012/08/27

Page:2



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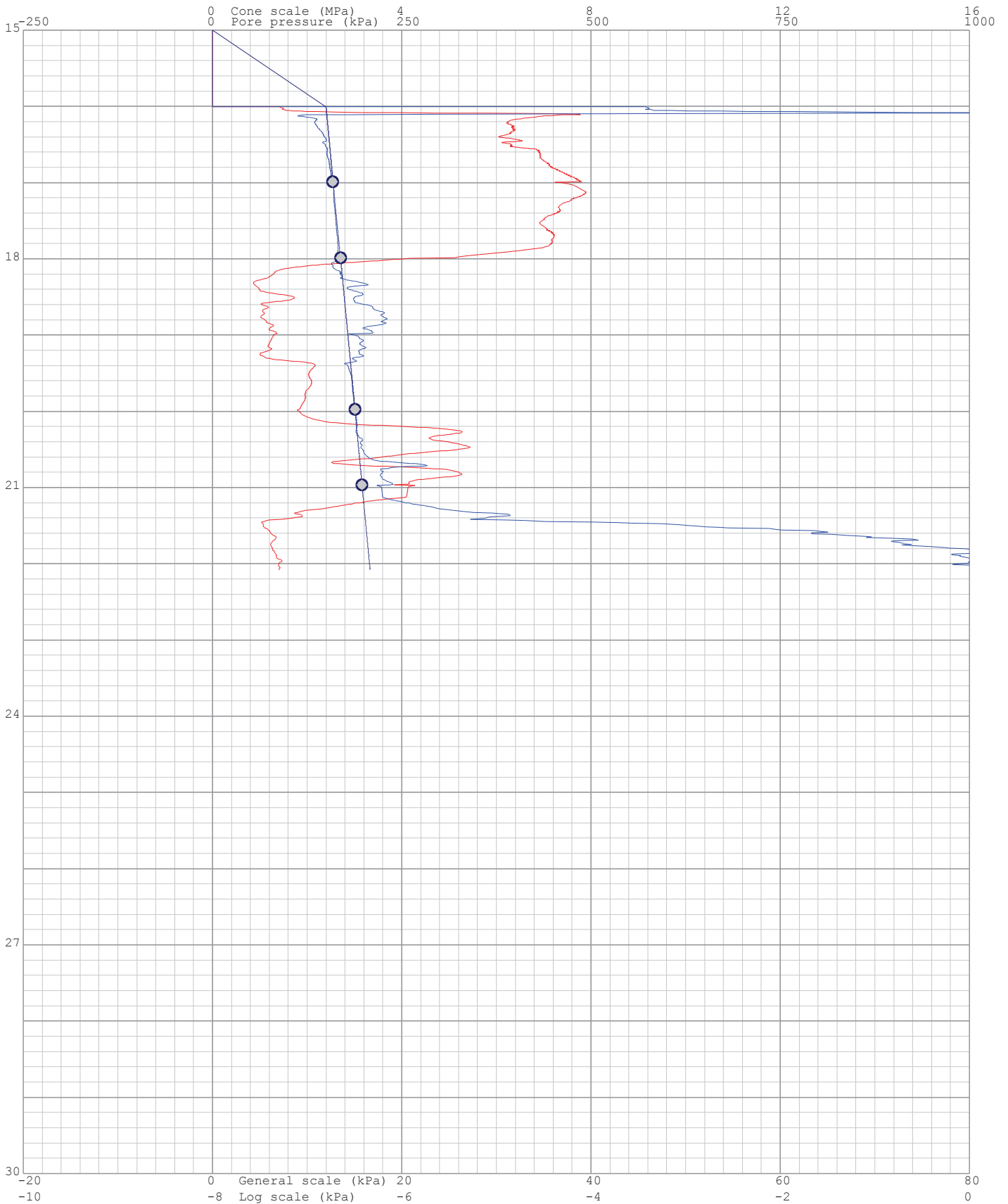
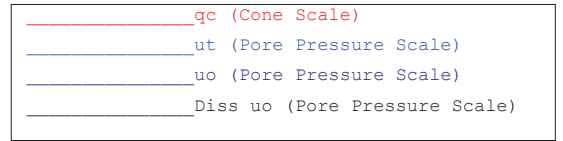
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 29  
Date: 2012/08/27



Project: Durban Harbour Piezocone Investigation for Dredging

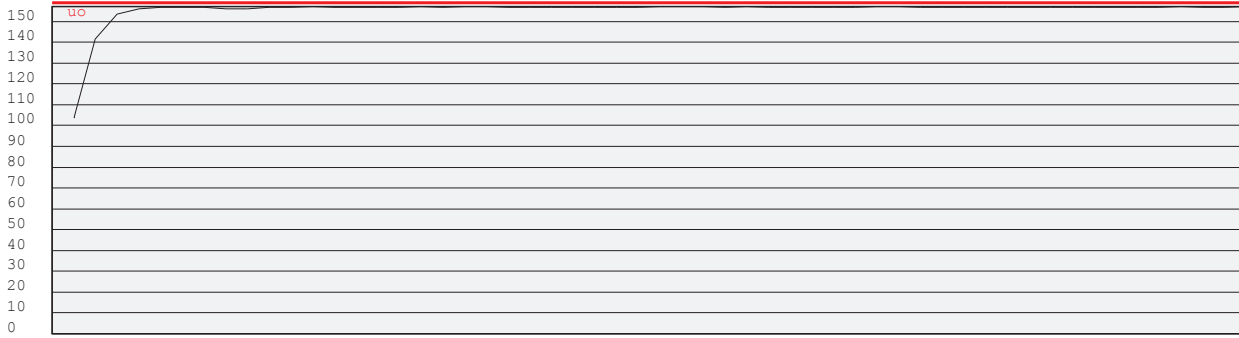
Site: Durban Harbour over water

Hole: S 29

Date: 2012/08/27

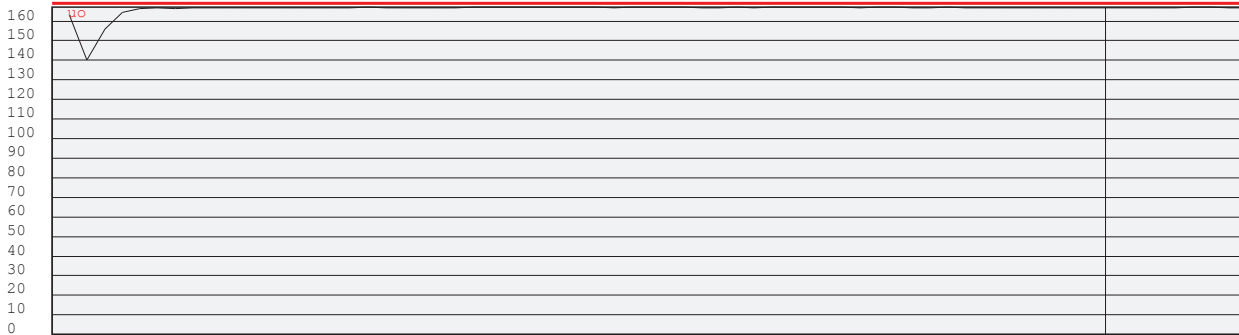
Page: 1

(kPa) Dissipation at:16.99m



Time (seconds)

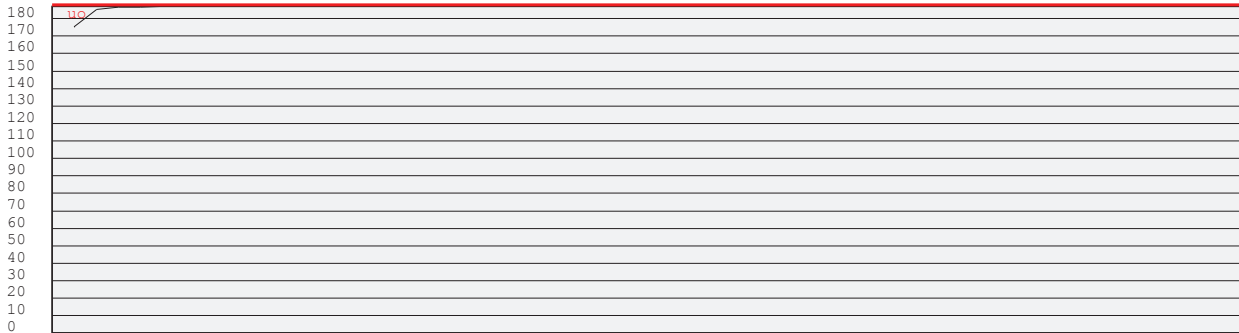
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Time (seconds)

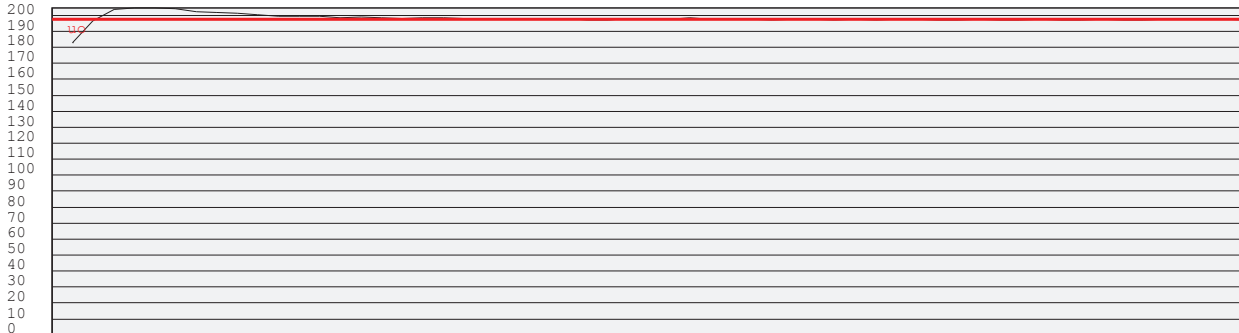
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(kPa) Dissipation at:19.975m



Time (seconds)

(kPa) Dissipation at:20.967m



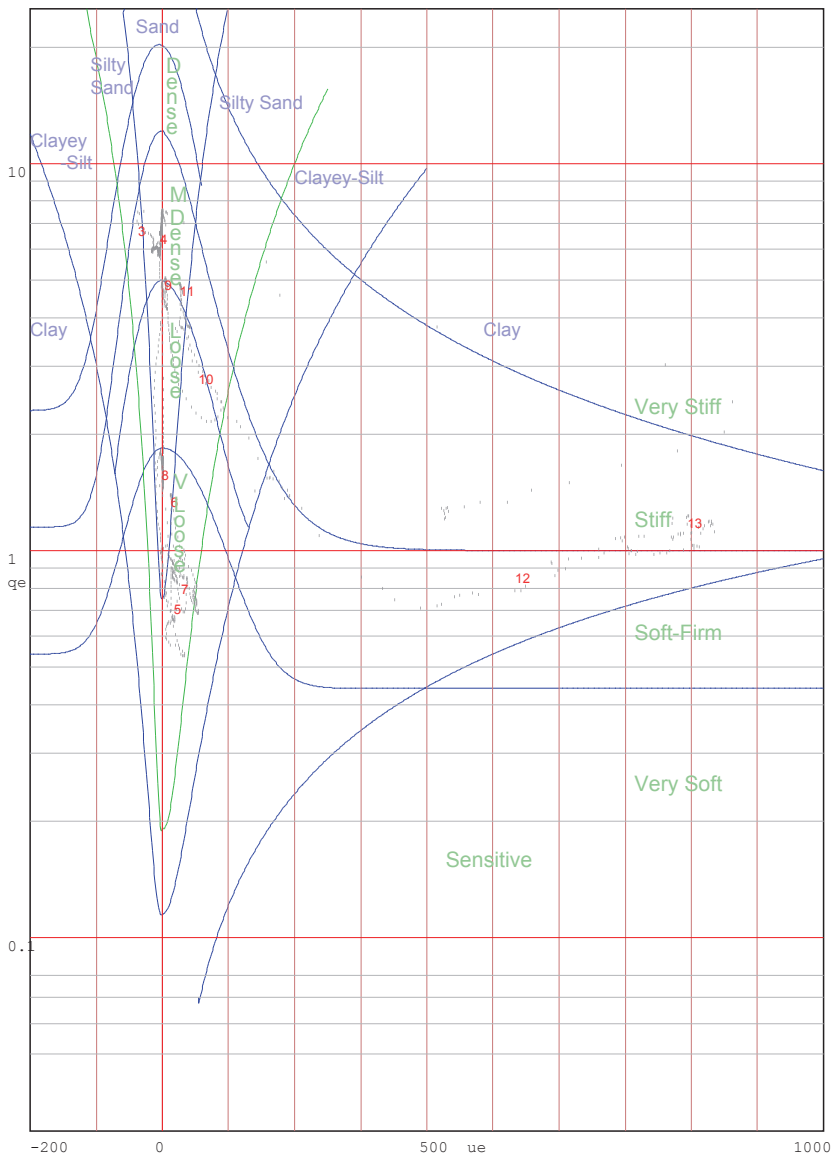
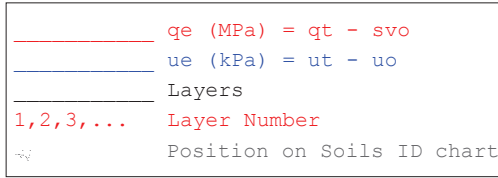
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Project: Durban Harbour Piezocone Investigation for Dredging

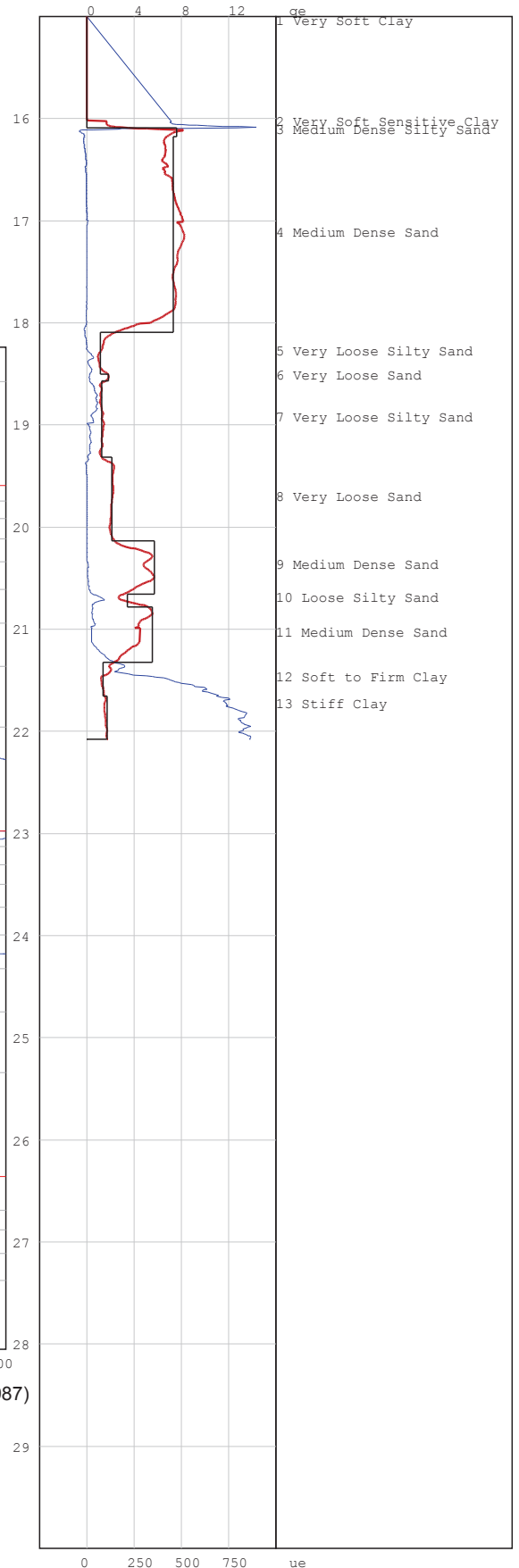
Site: Durban Harbour over water

Hole No: S 29

Date: 2012/08/27



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





# PIEZOCONE PENETRATION TEST



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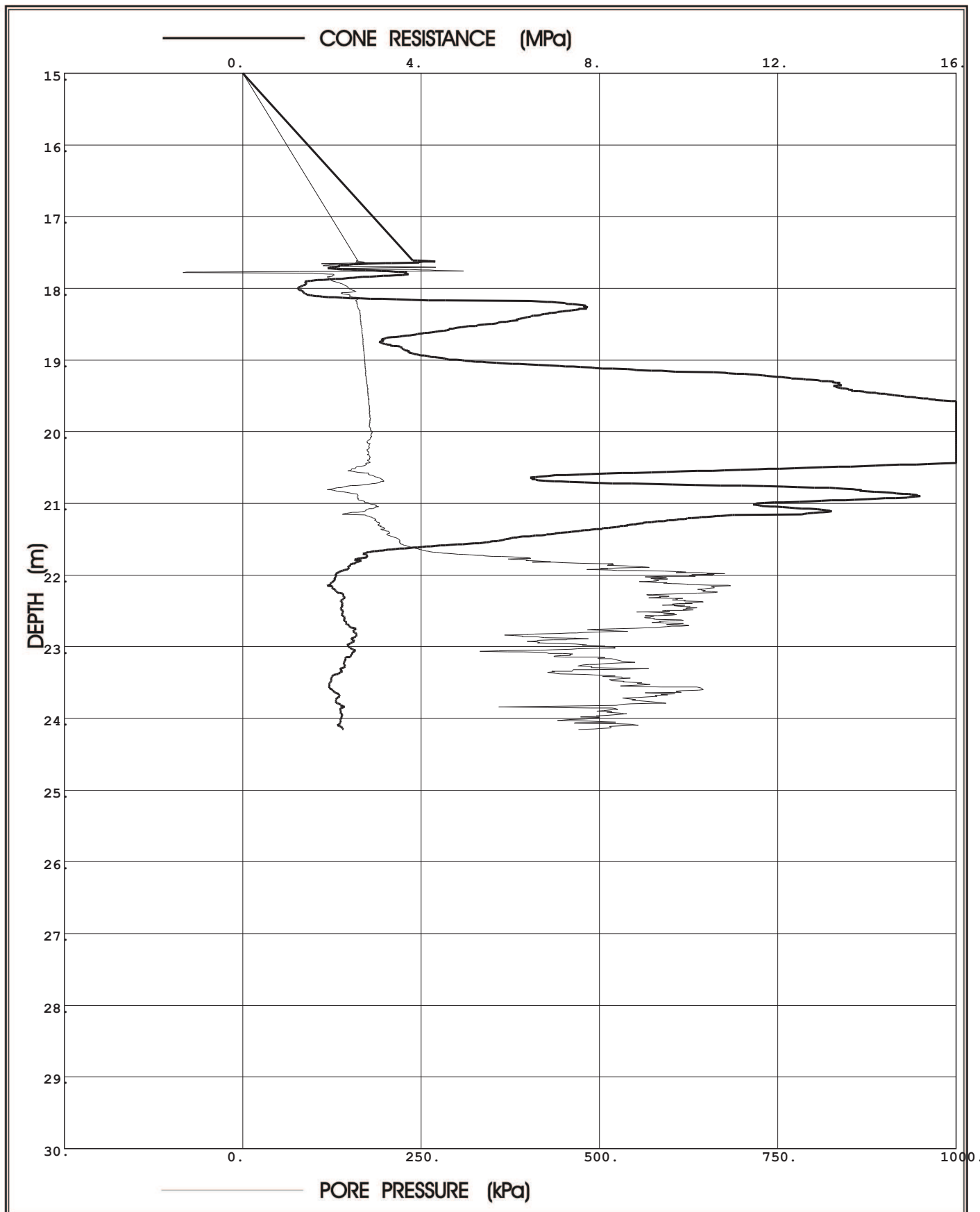
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 30

DATE: 2012/08/27

Page:2



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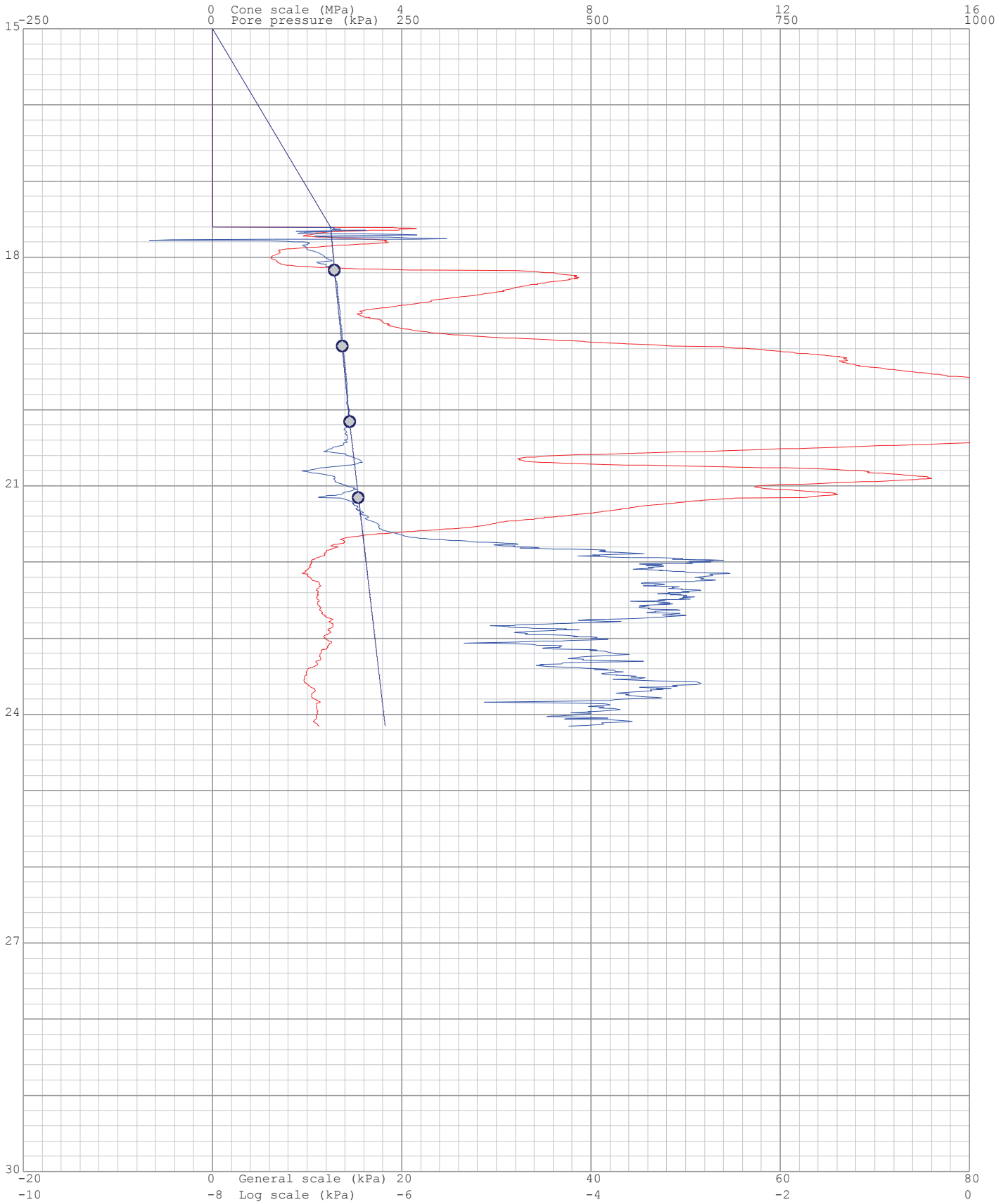
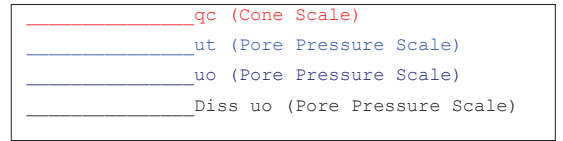
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 30  
Date: 2012/08/27



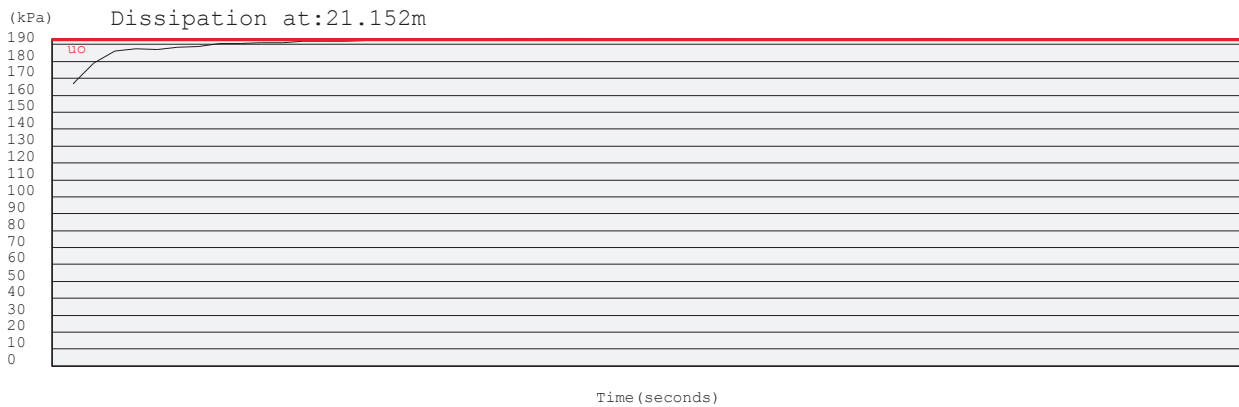
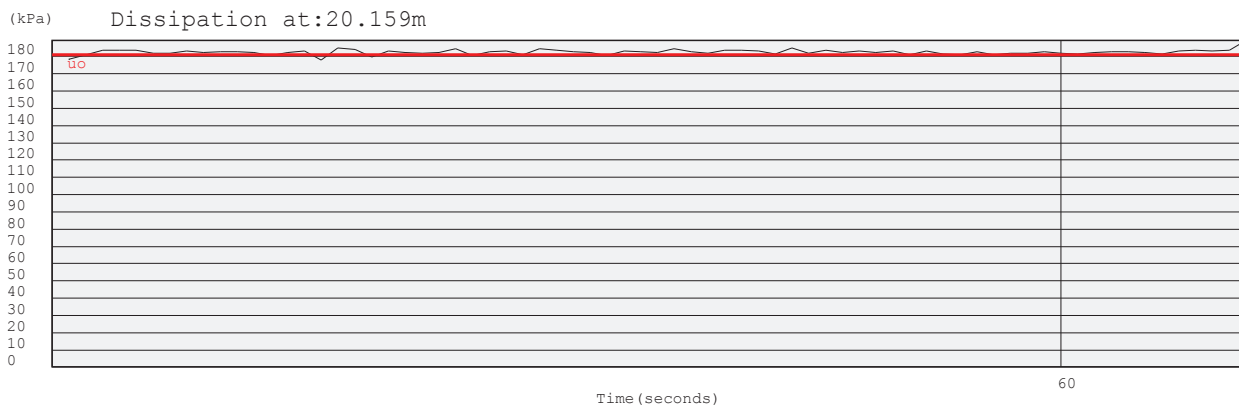
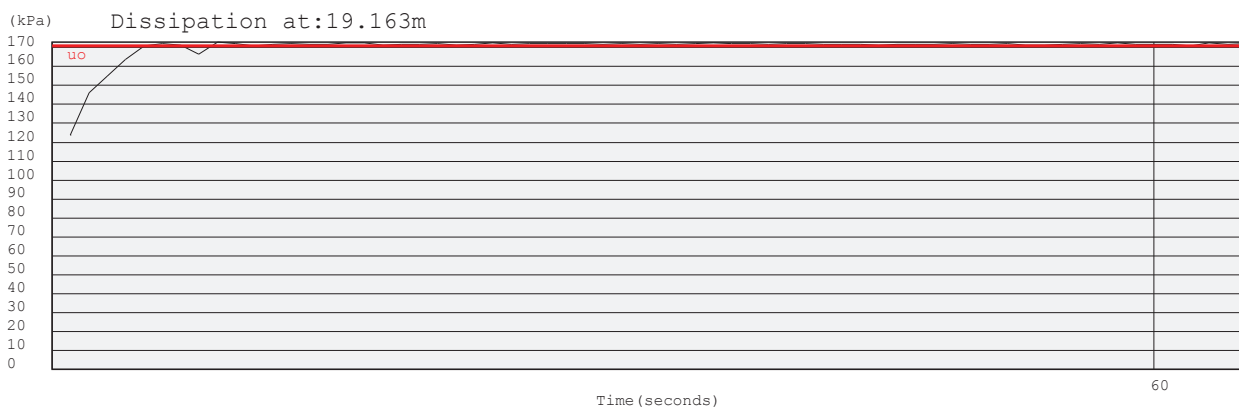
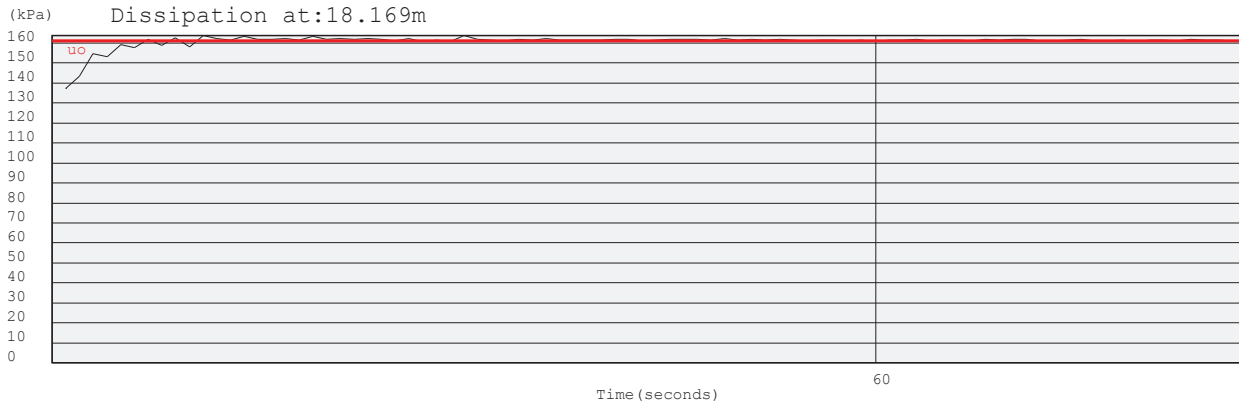
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

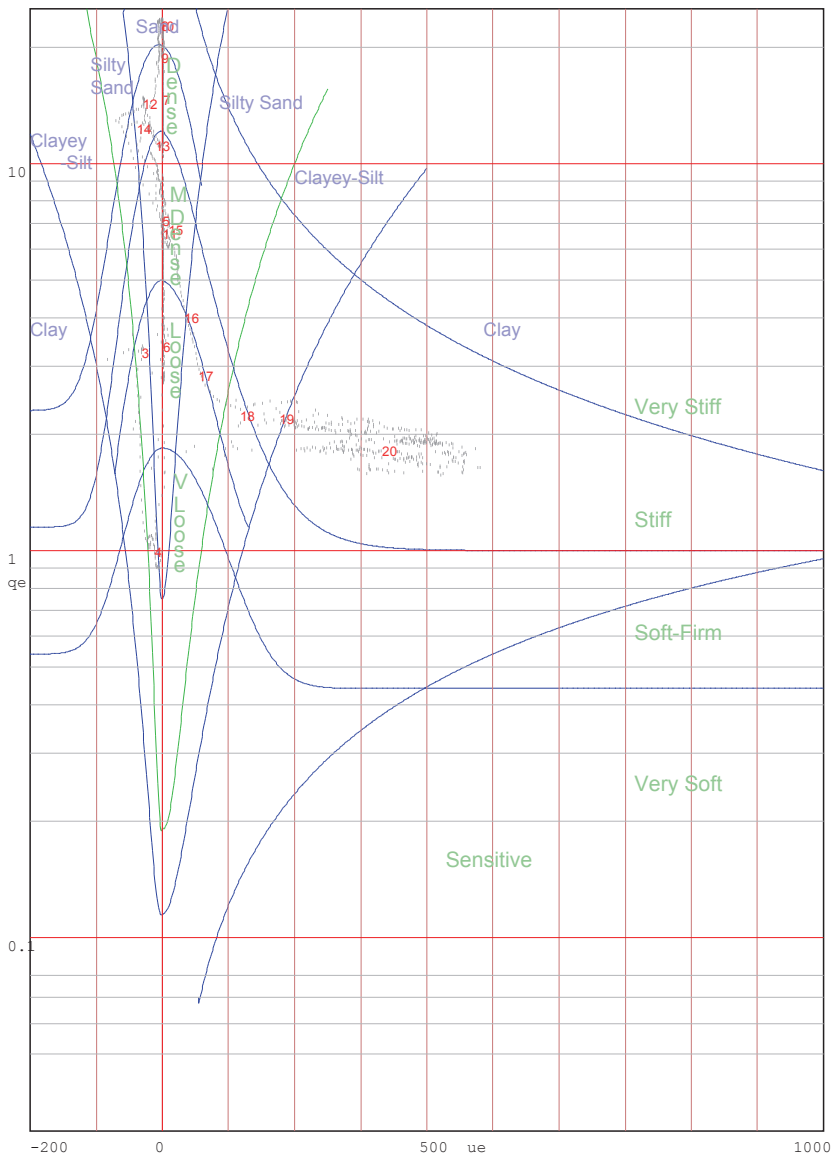
Hole: S 30

Date: 2012/08/27

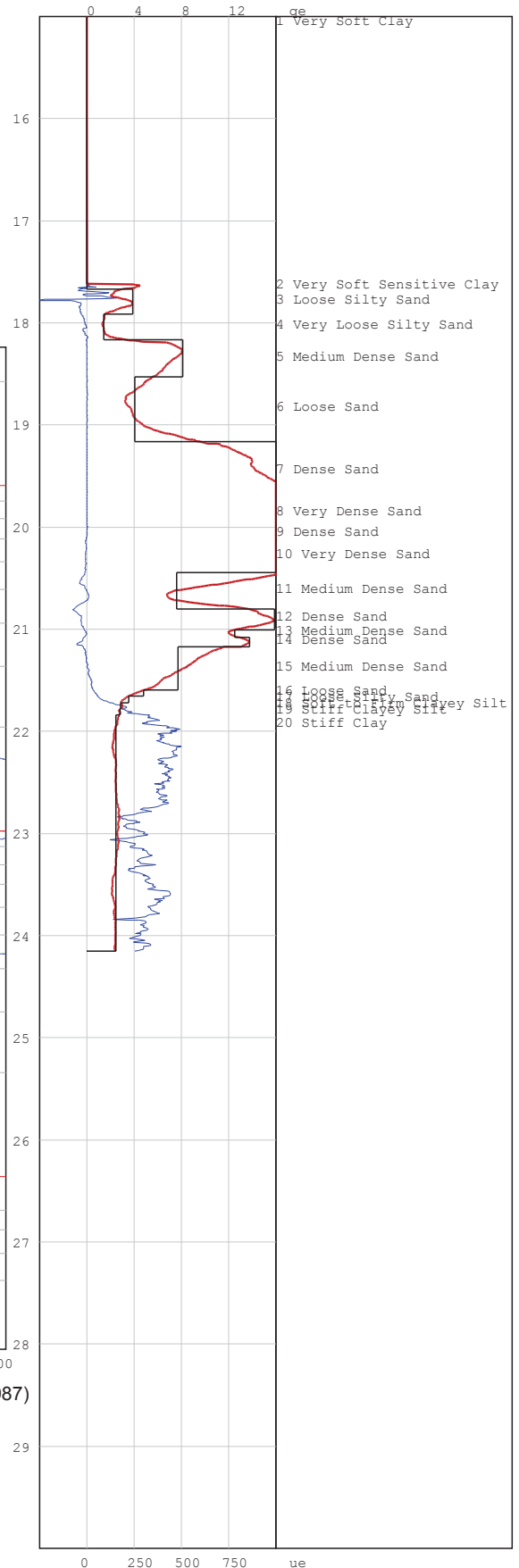
Page: 1



—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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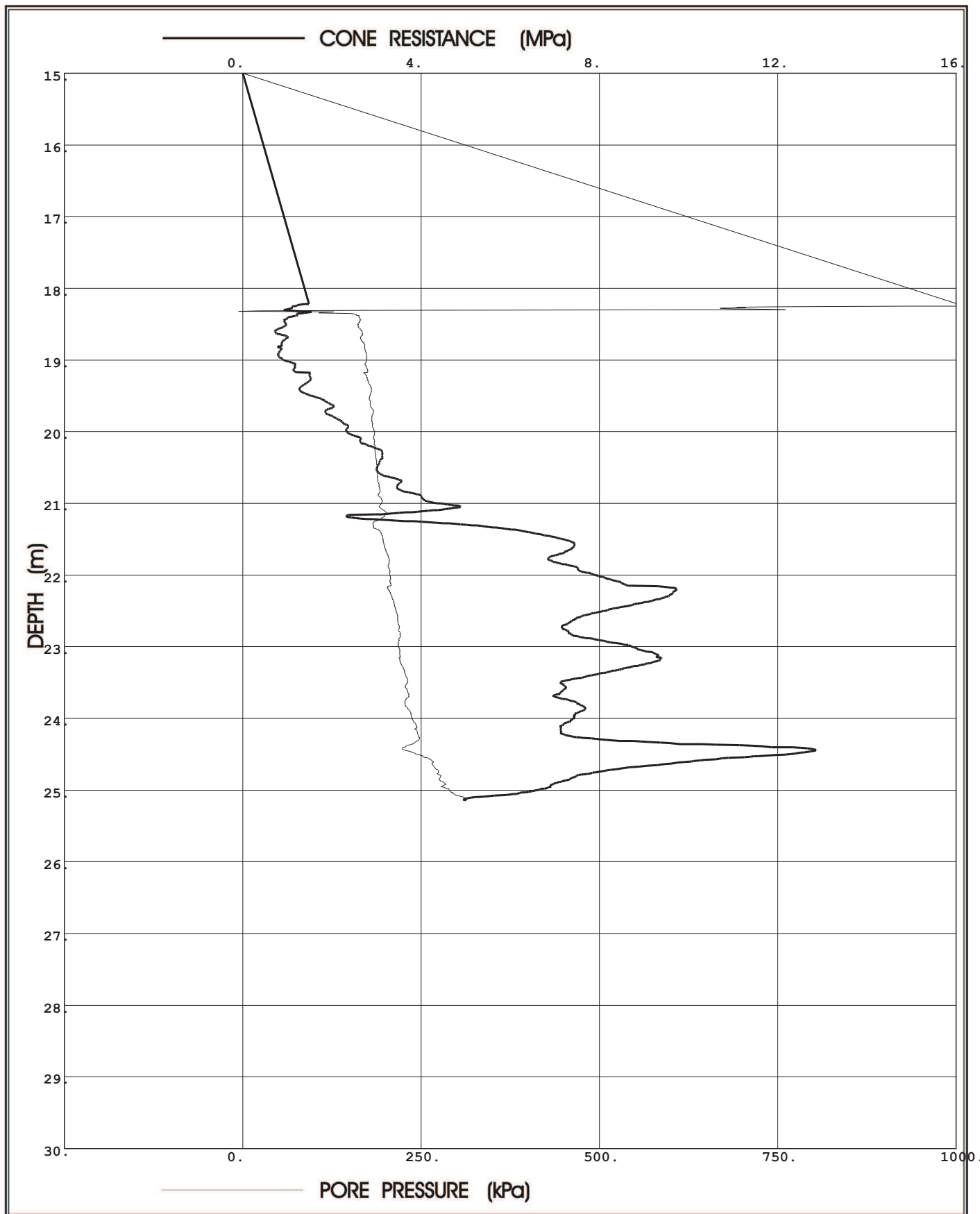
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 31

DATE: 2012/08/31

Page:2



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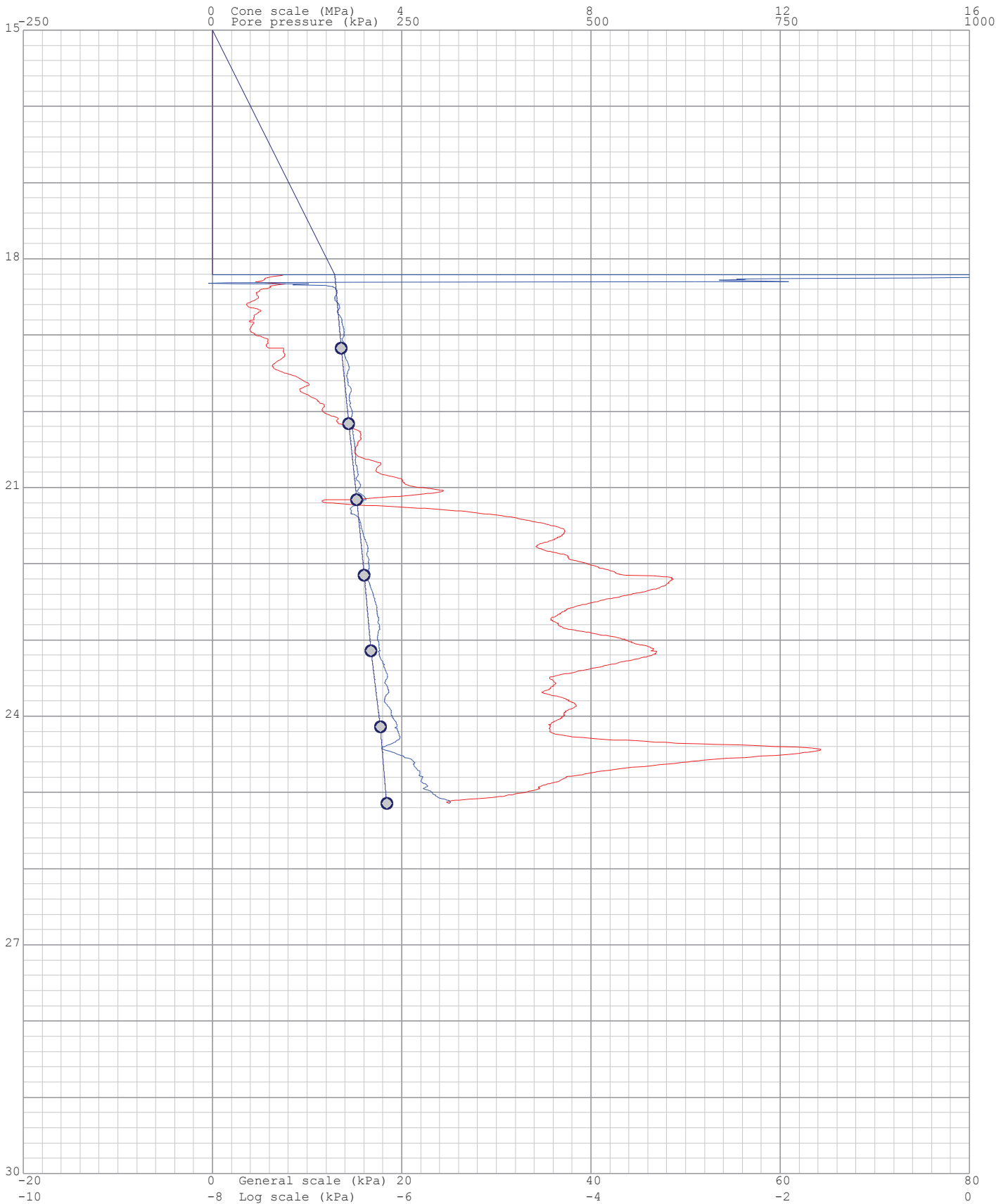
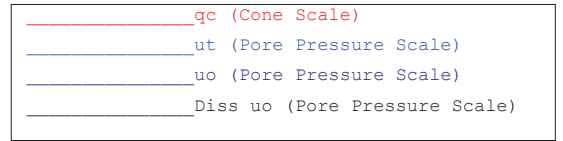
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 31  
Date: 2012/08/31



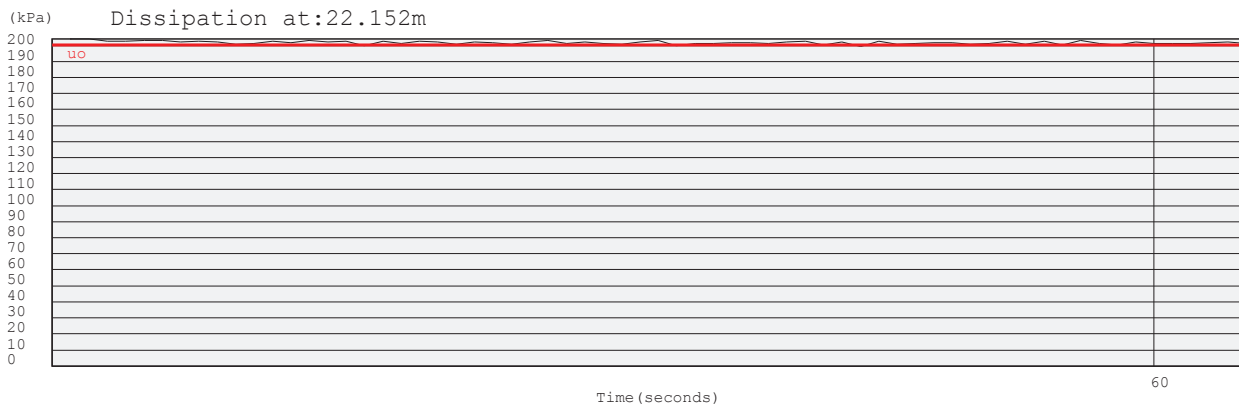
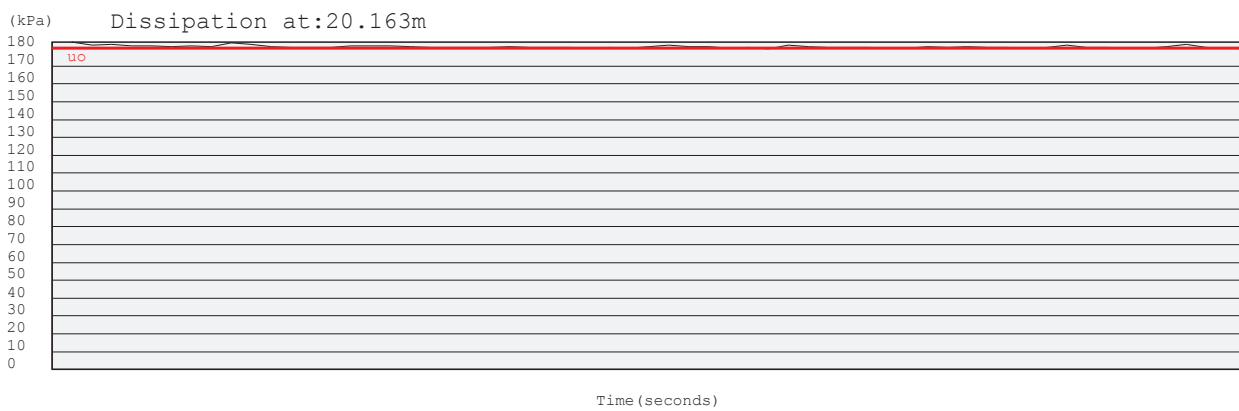
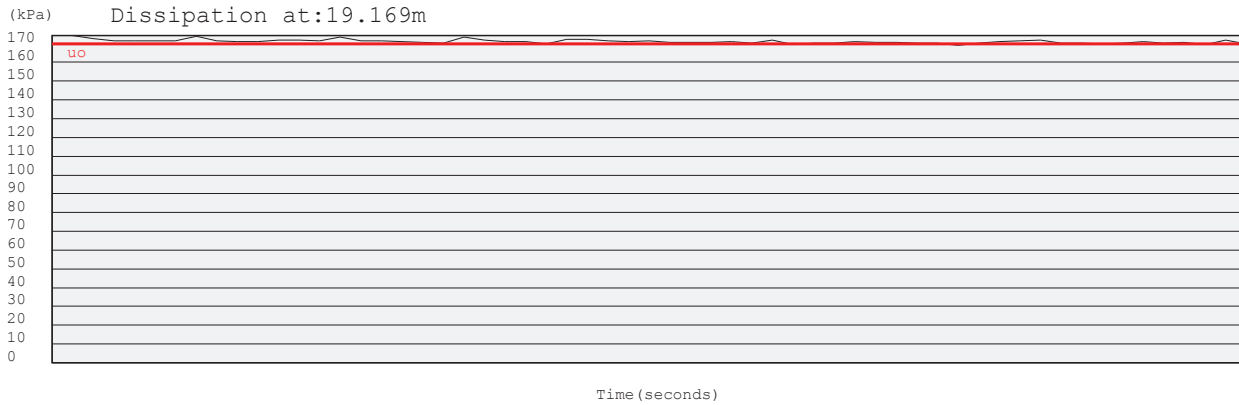
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 31

Date: 2012/08/31

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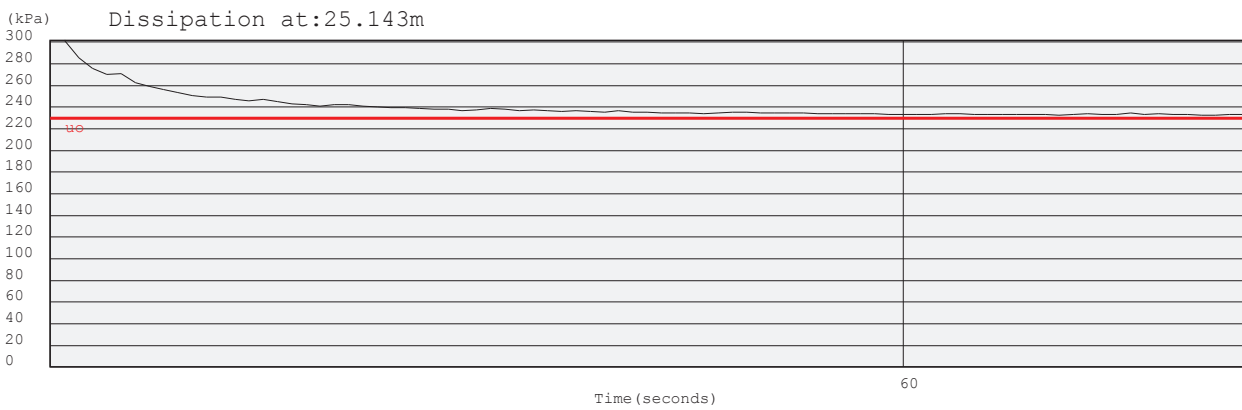
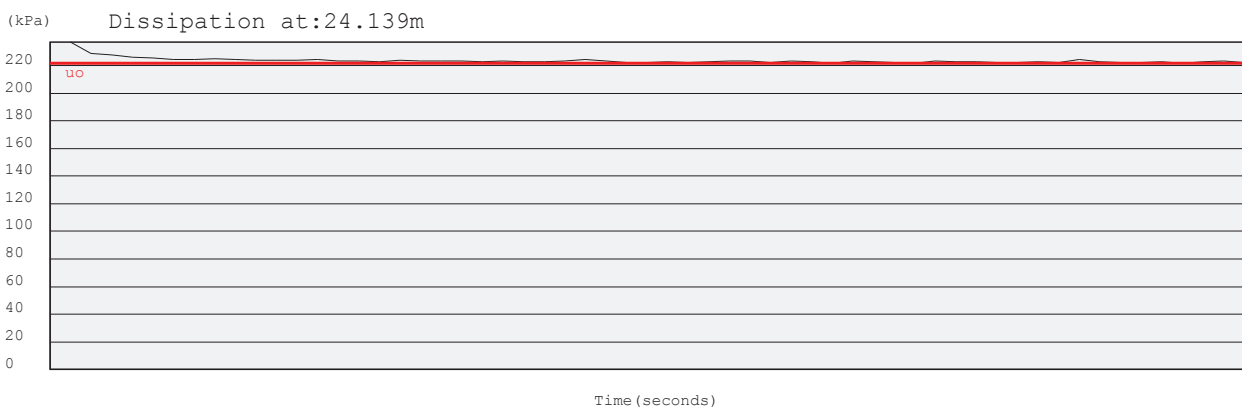
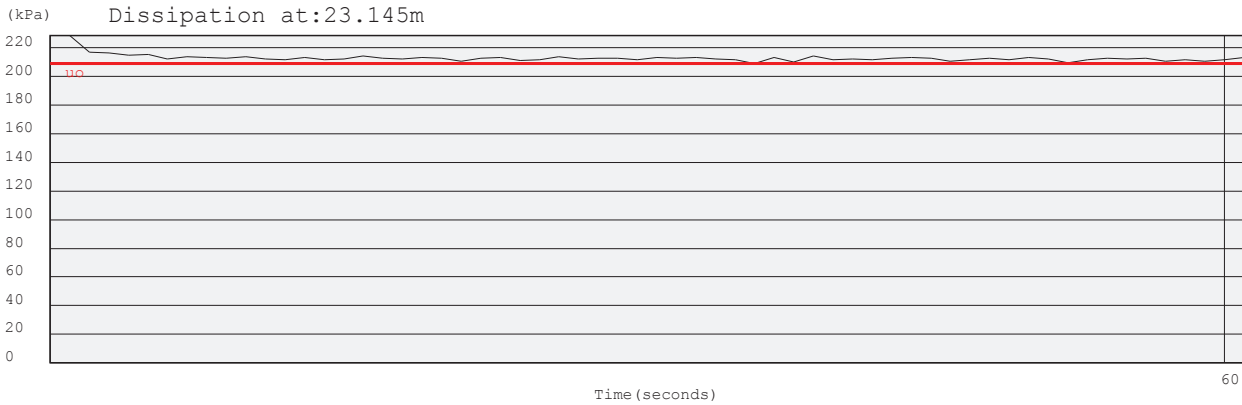
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

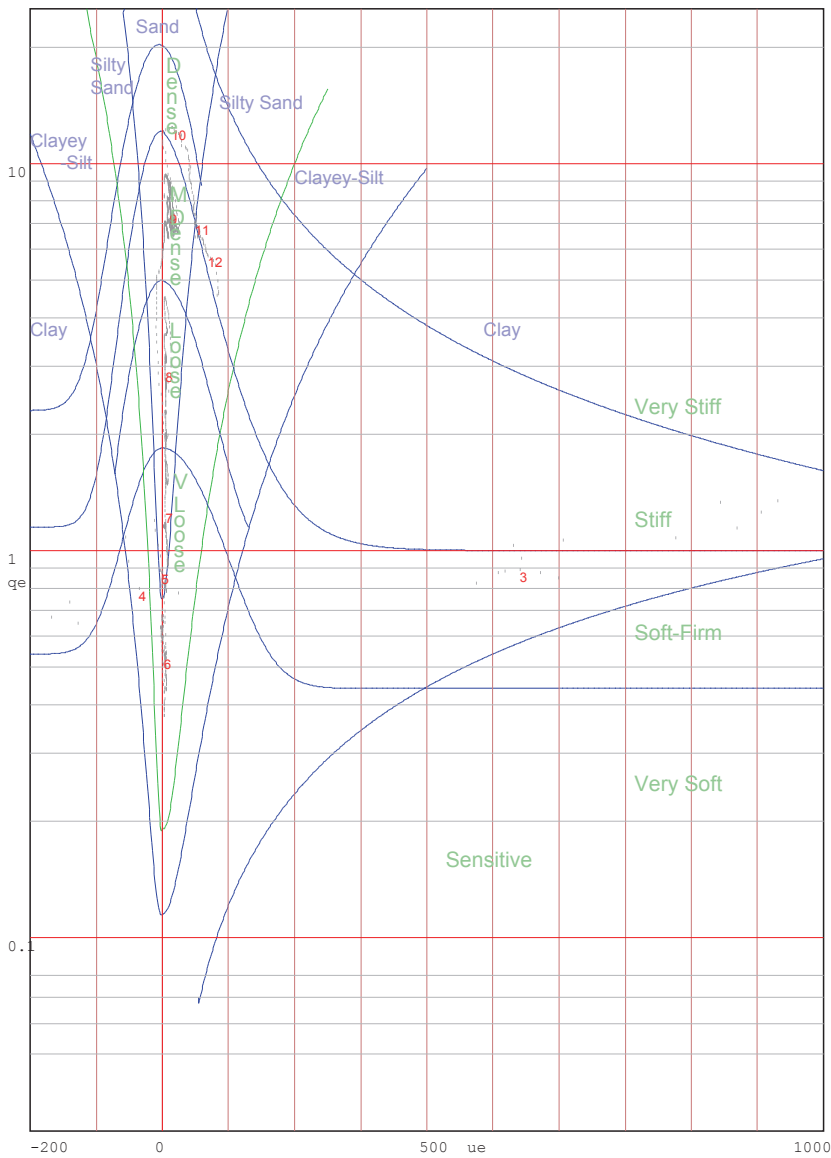
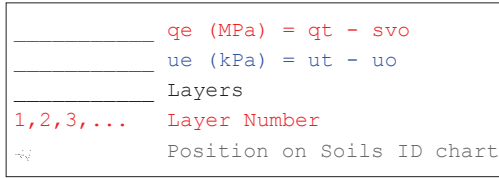
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Date: 2012/08/31

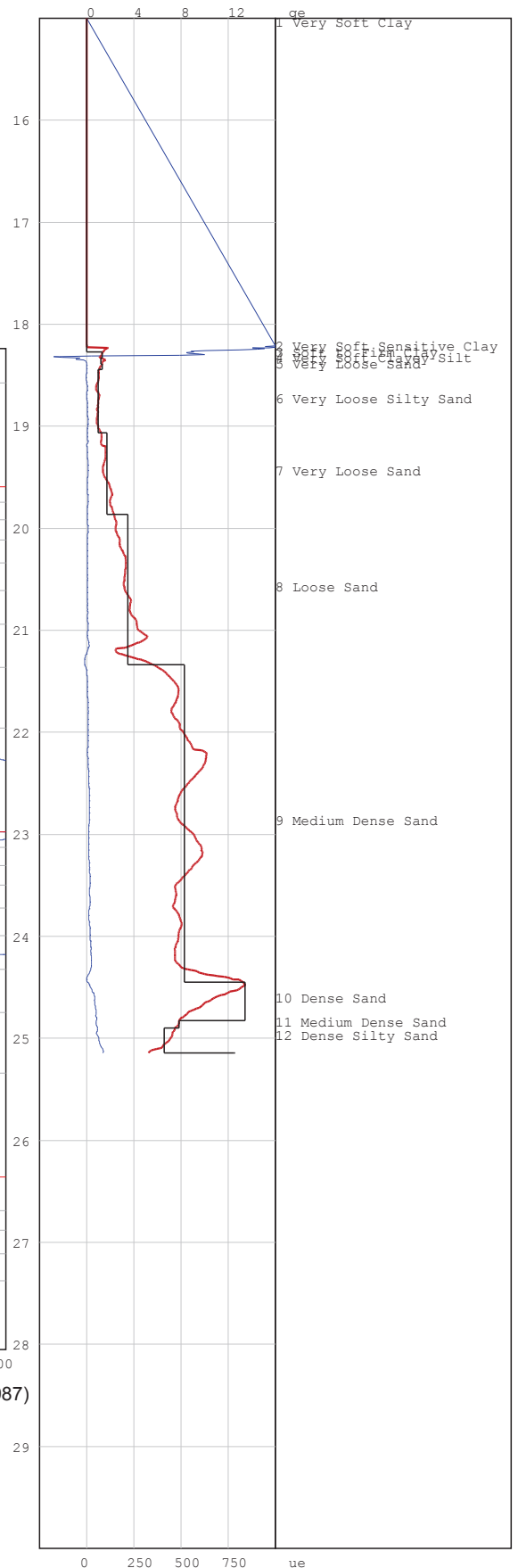
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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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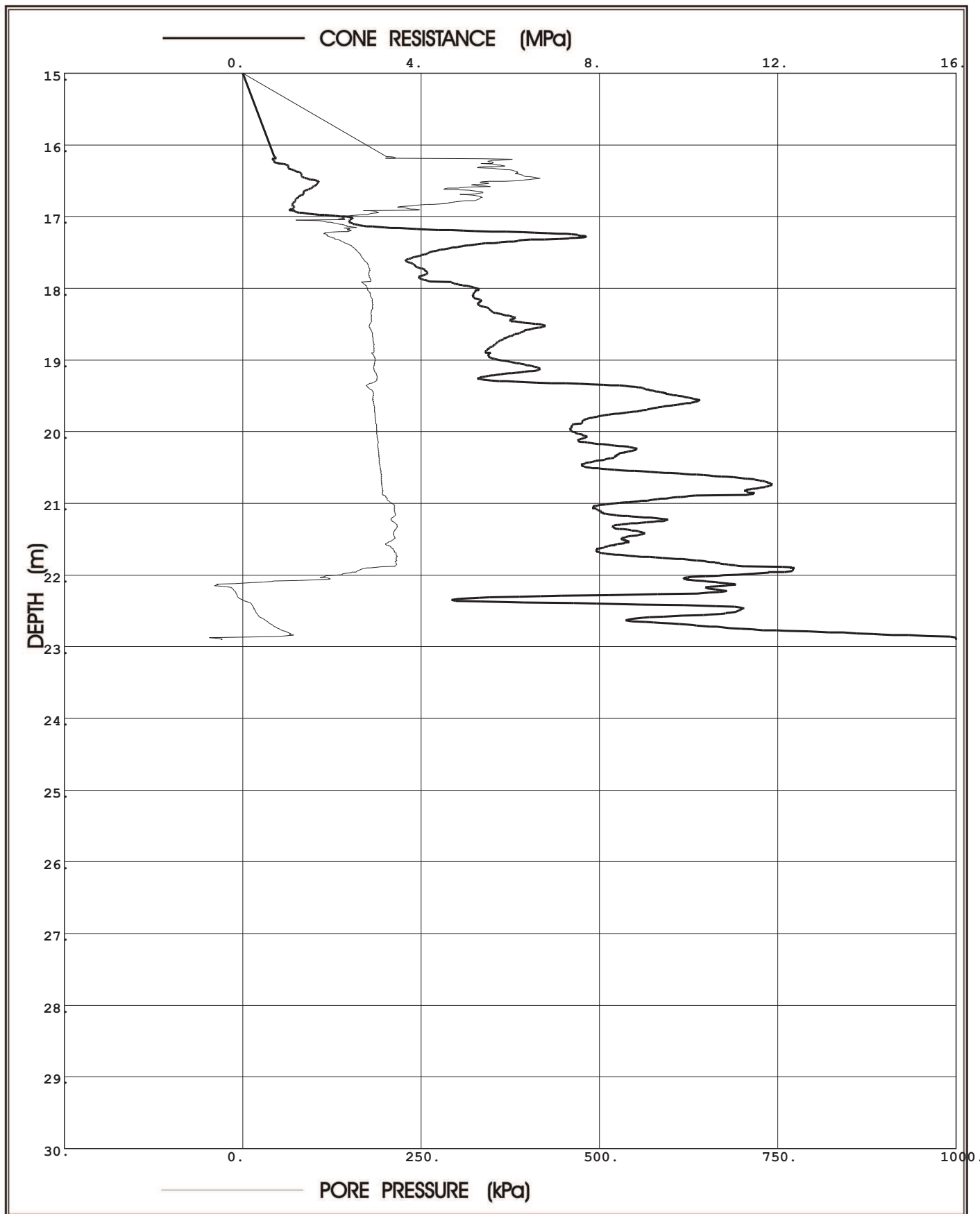
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 32

DATE: 2012/09/02

Page:2



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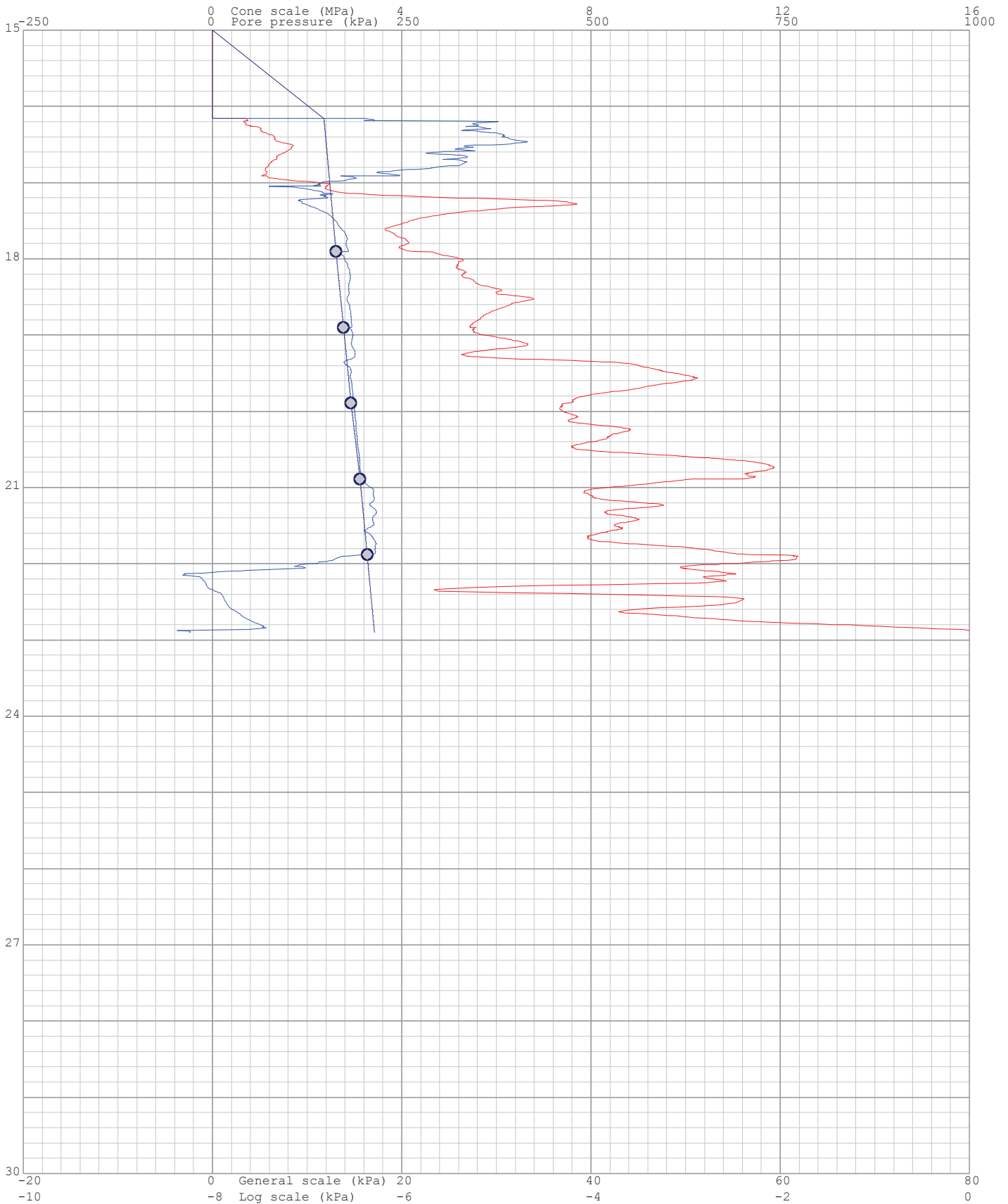
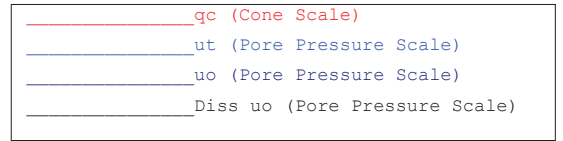
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 32  
Date: 2012/09/02



Project: Durban Harbour Piezocone Investigation for Dredging

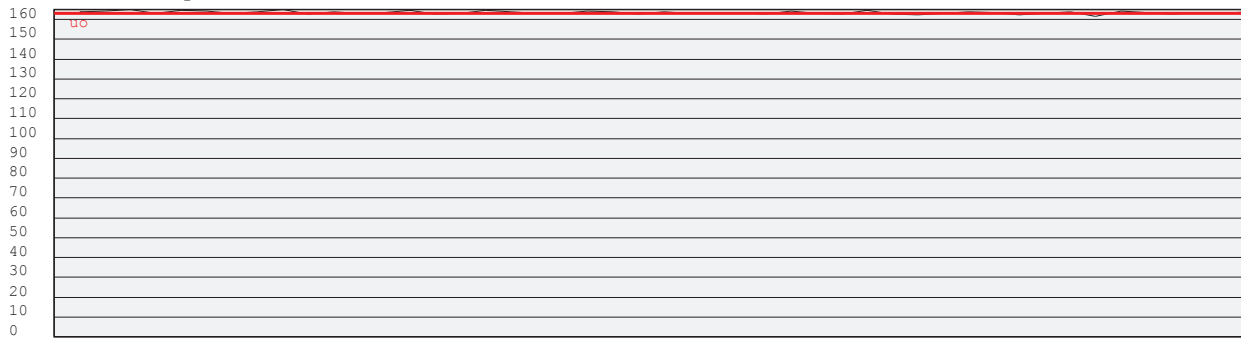
Site: Durban Harbour over water

Hole: S 32

Date: 2012/09/02

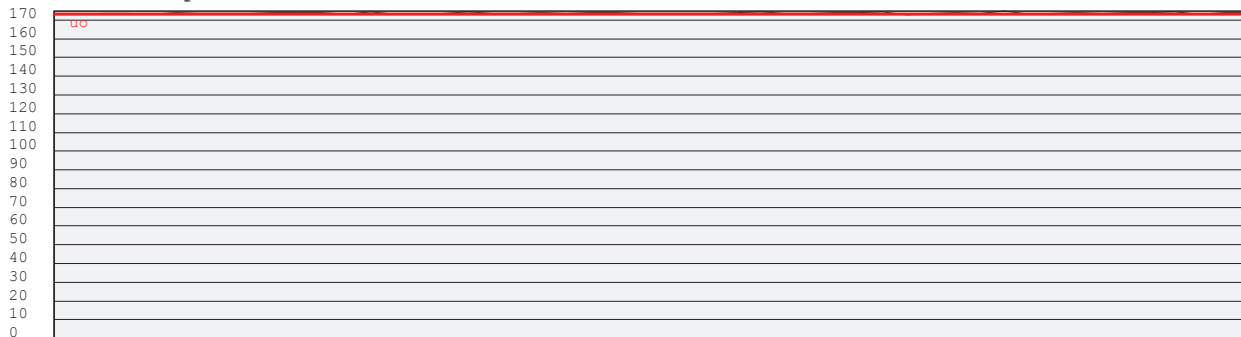
Page: 1

(kPa) Dissipation at: 17.903m



Time (seconds)

(kPa) Dissipation at: 18.897m



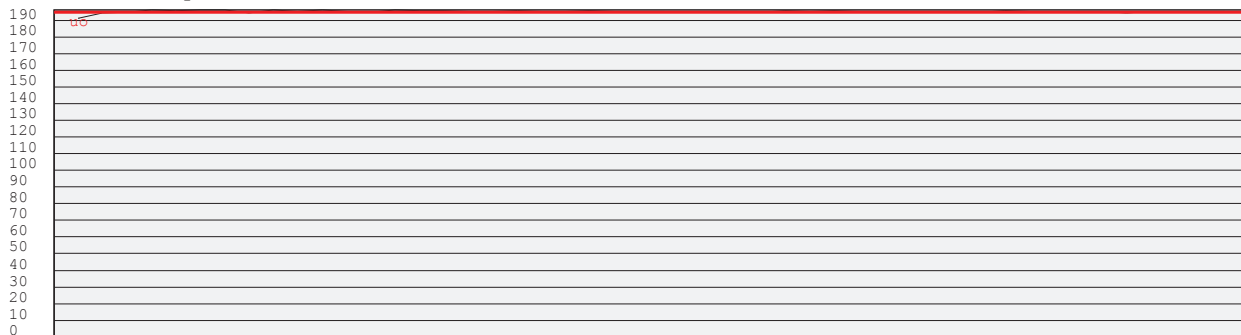
Time (seconds)

(kPa) Dissipation at: 19.891m



Time (seconds)

(kPa) Dissipation at: 20.886m



Time (seconds)

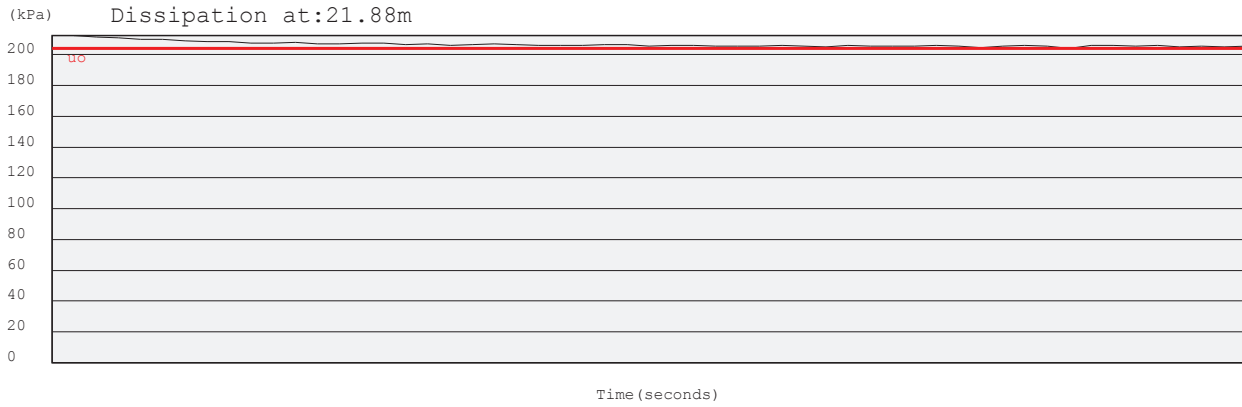
Project: Durban Harbour Piezocone Investigation for Dredging

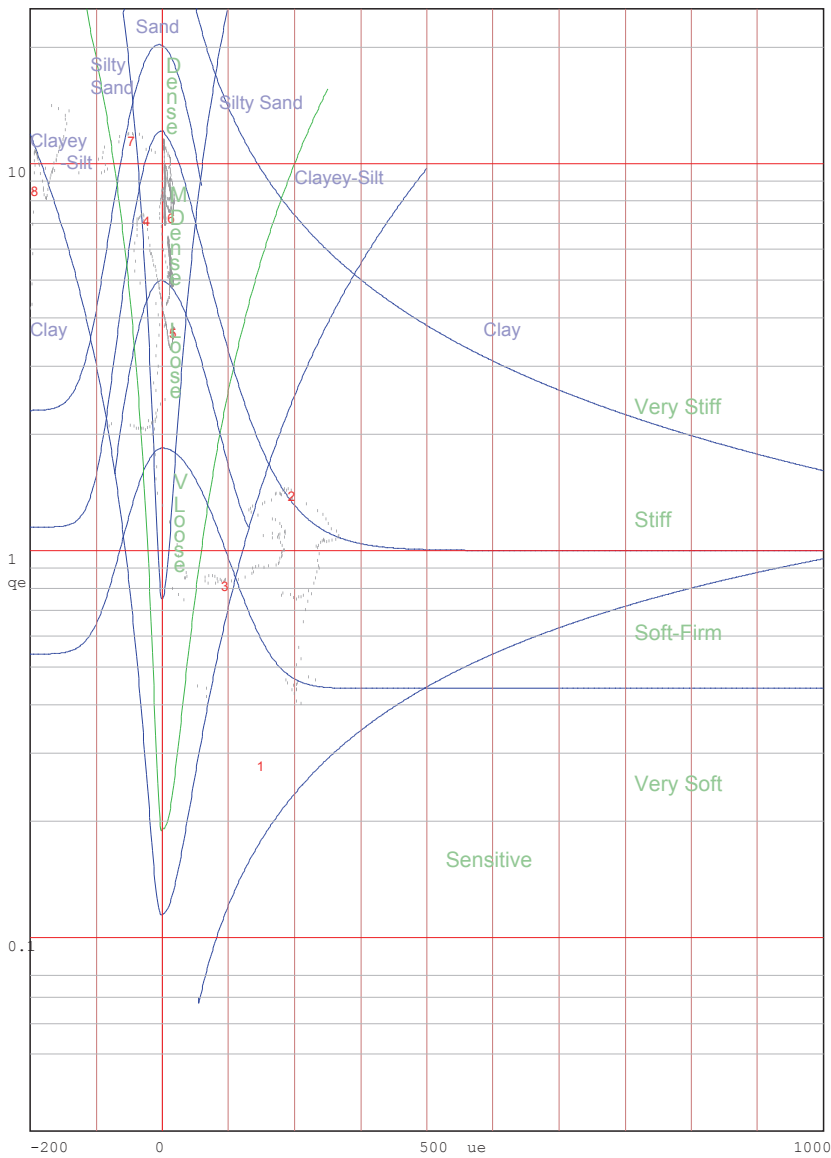
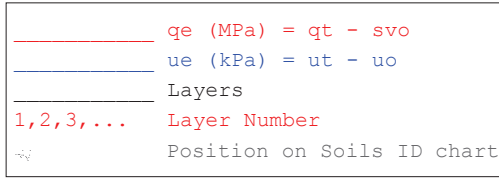
Site: Durban Harbour over water

Hole: S 32

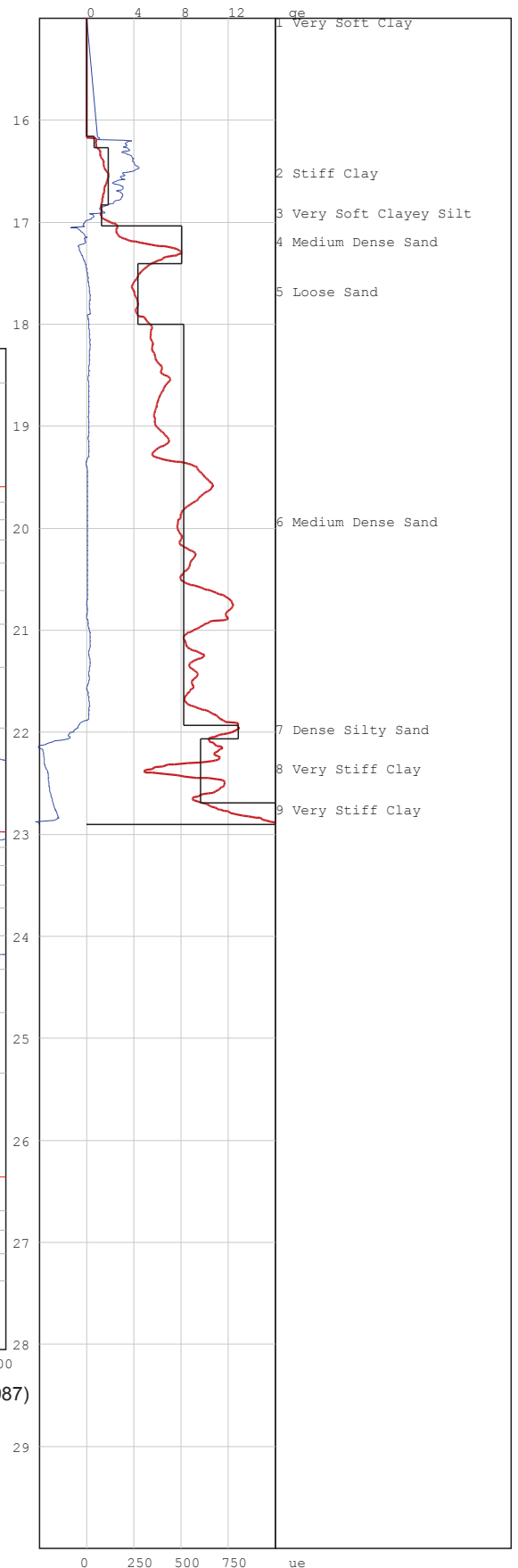
Date: 2012/09/02

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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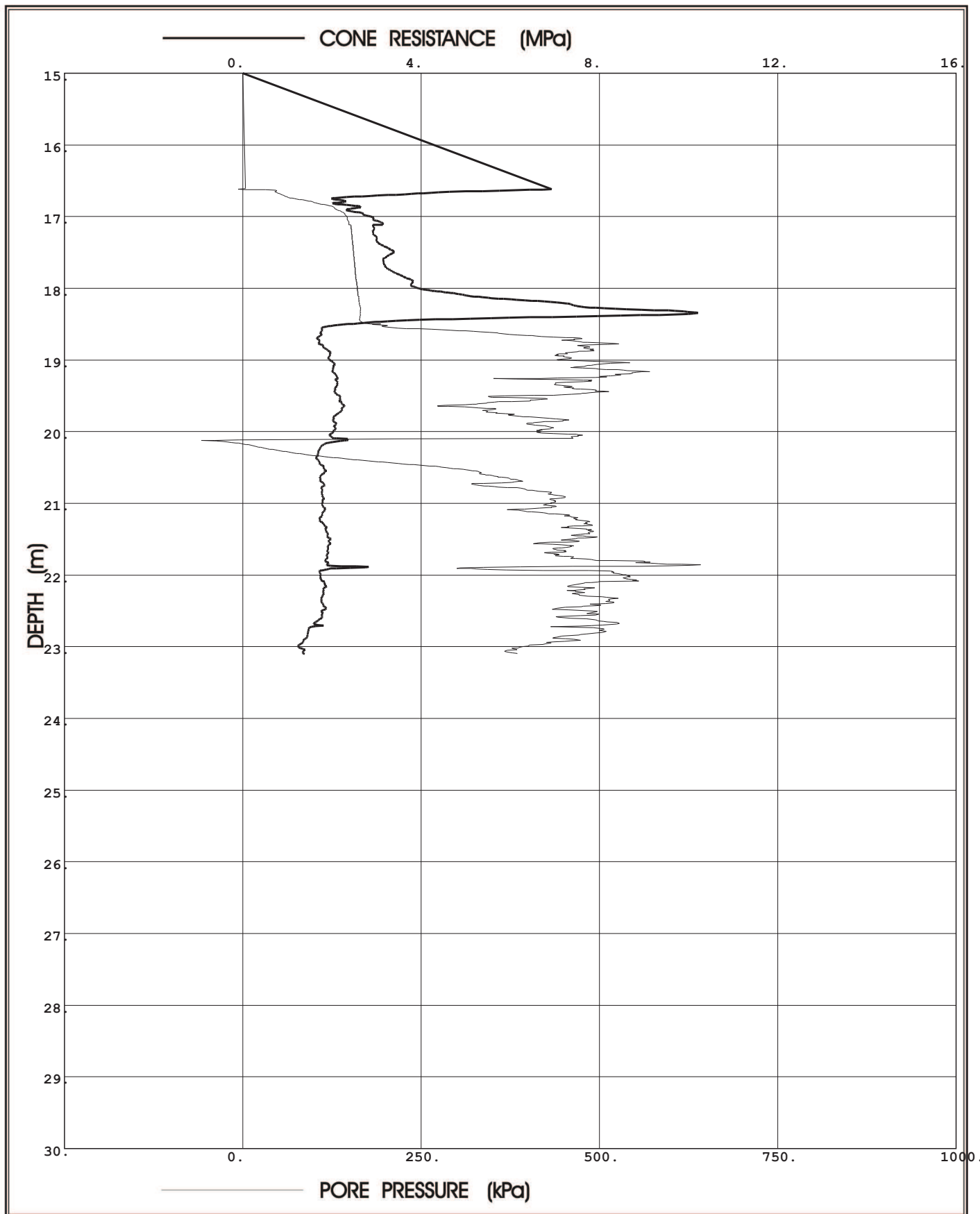
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 33

DATE: 2012/08/31

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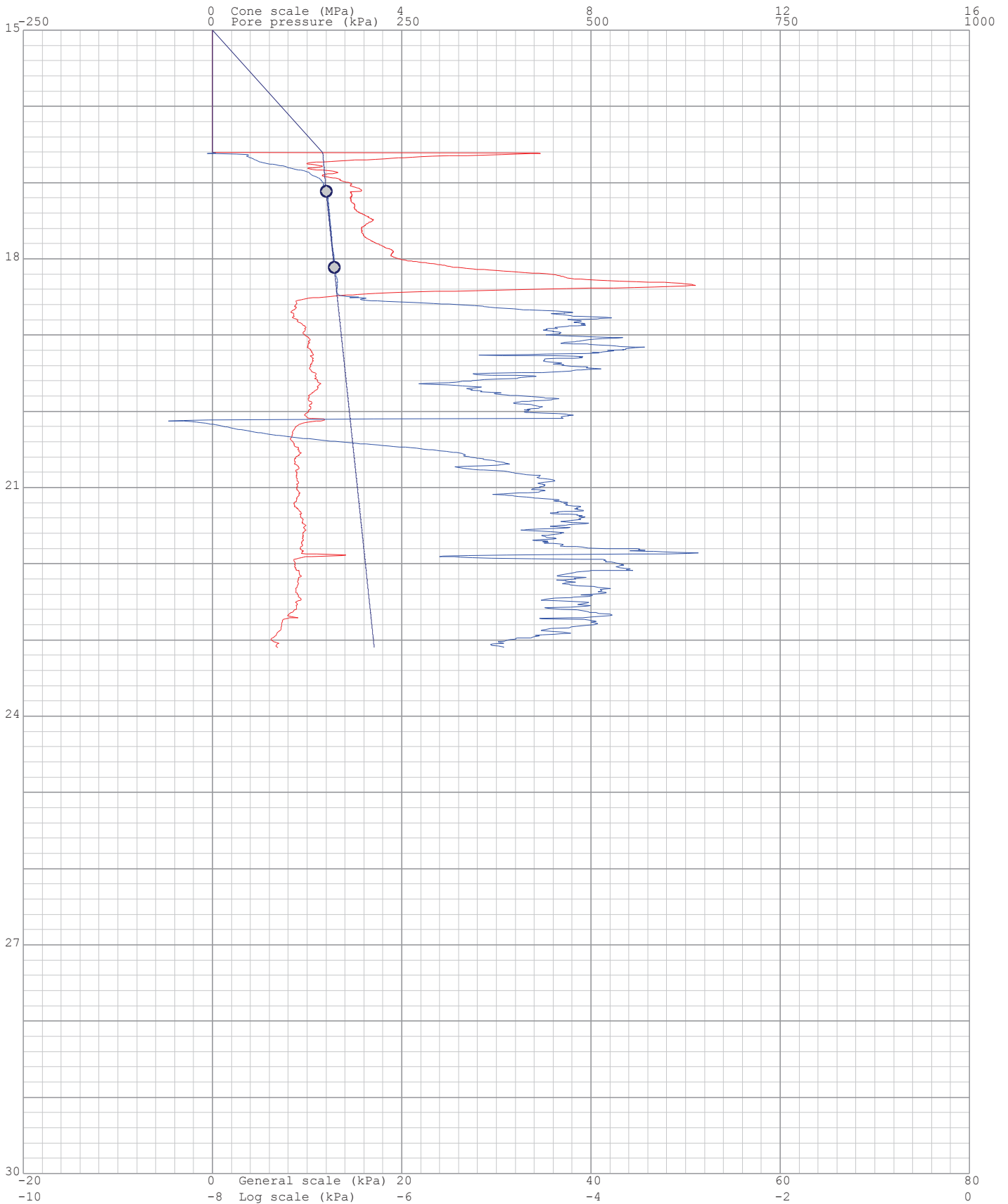
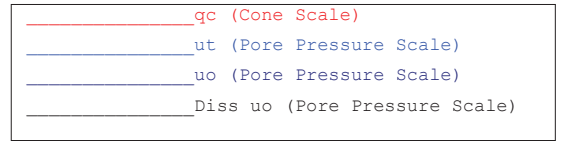
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 33  
Date: 2012/08/31





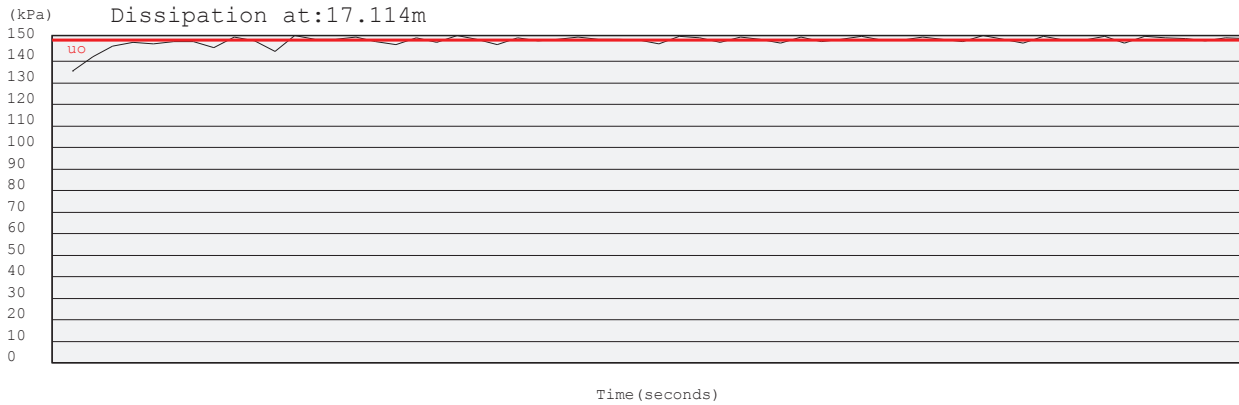
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 33

Date: 2012/08/31

Page: 1

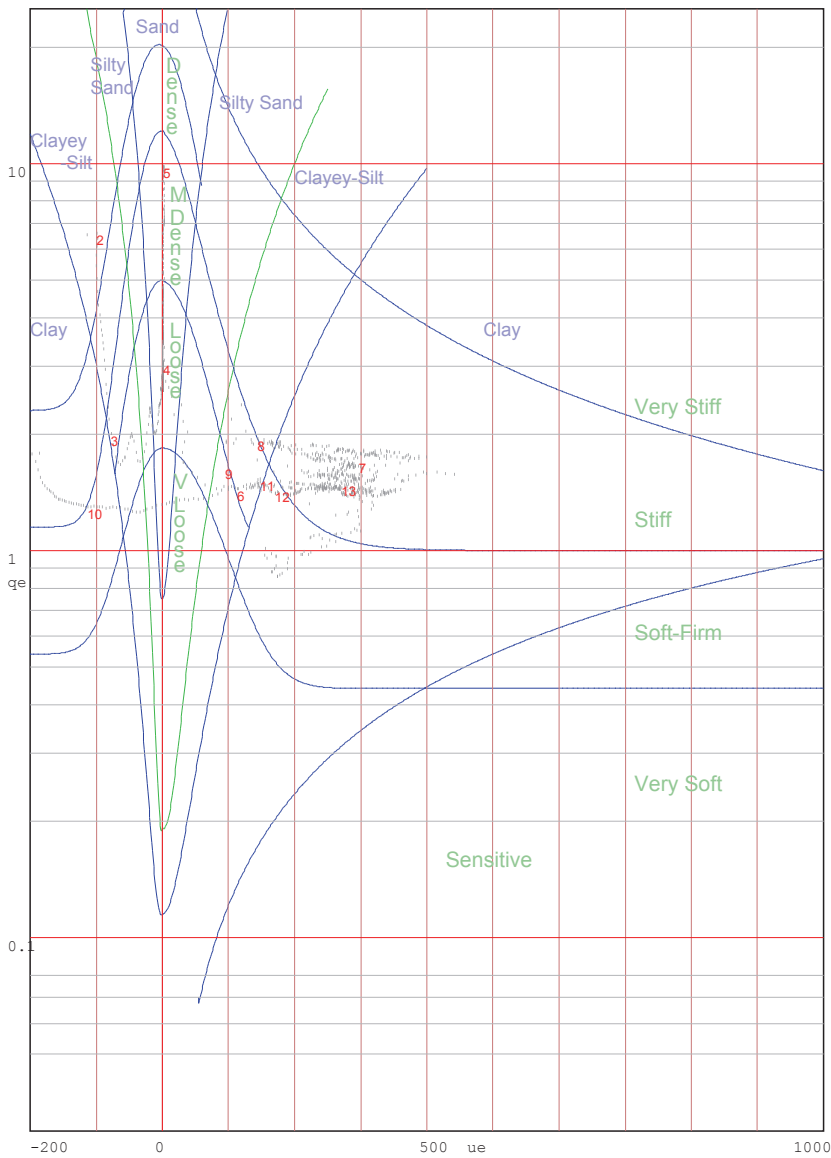


Project: Durban Harbour Piezocone Investigation for Dredging

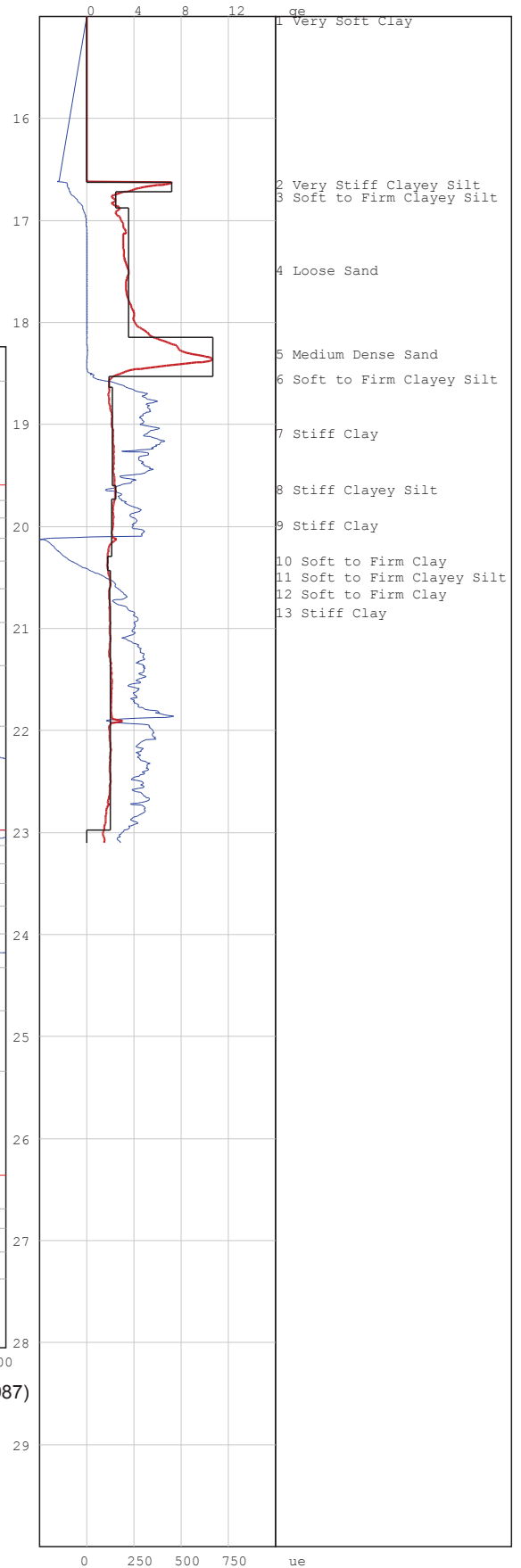
Site: Durban Harbour over water

Hole No: S 33  
Date: 2012/08/31

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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0044

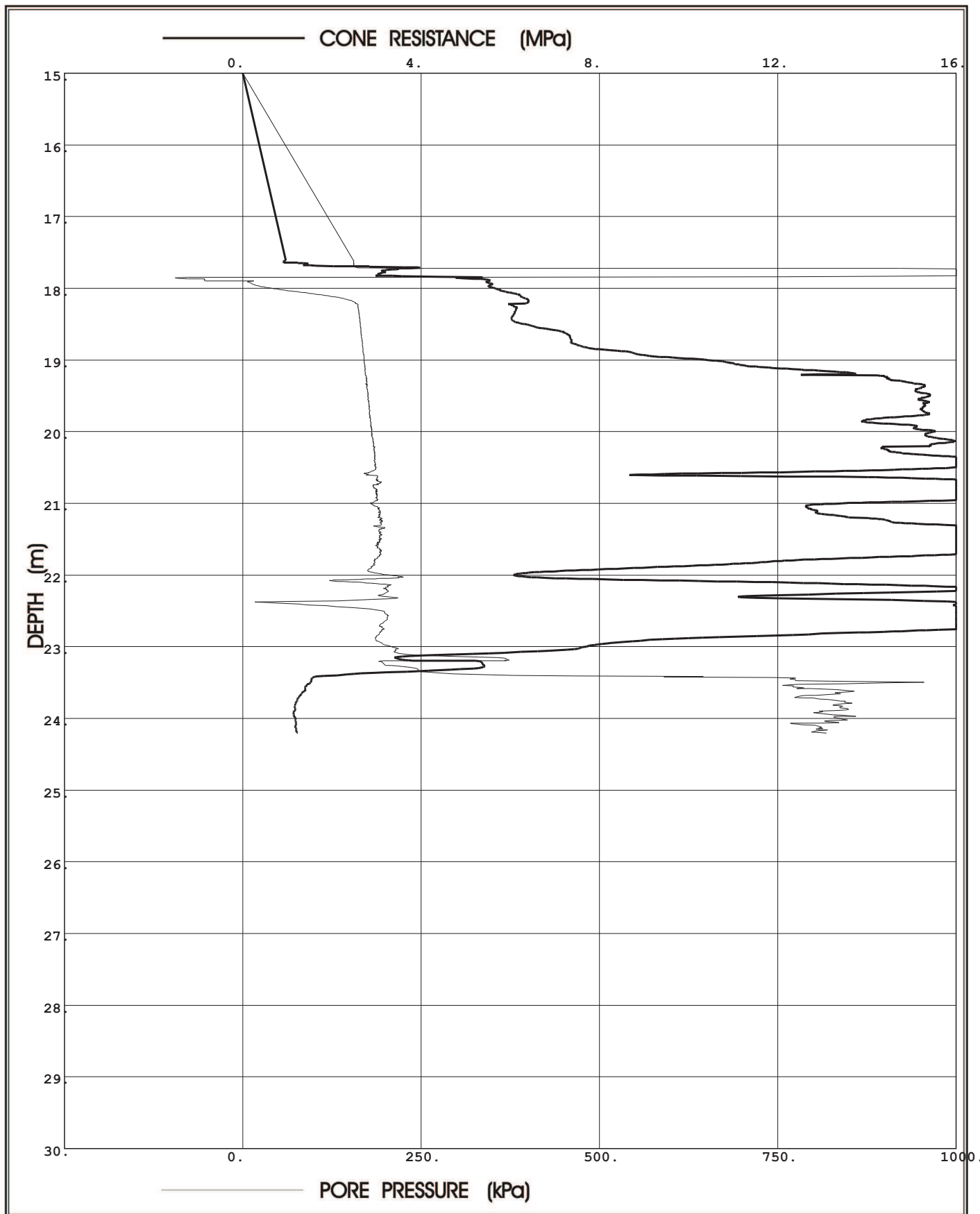
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 34

DATE: 2012/08/30

Page:2



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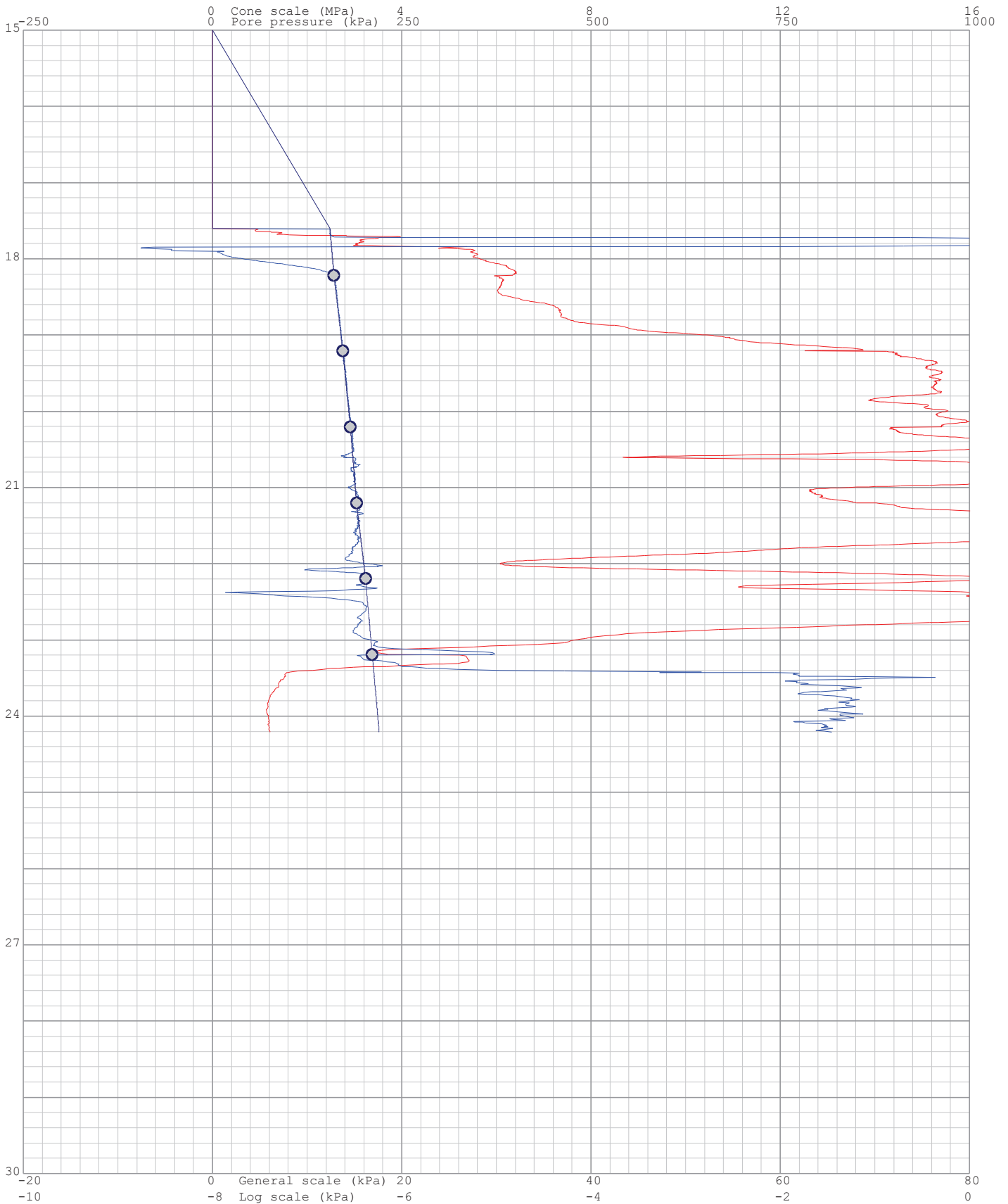
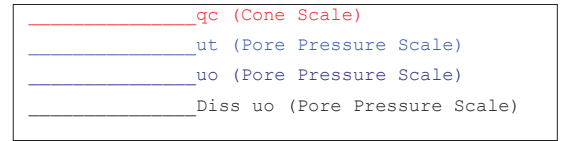
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 34  
Date: 2012/08/30



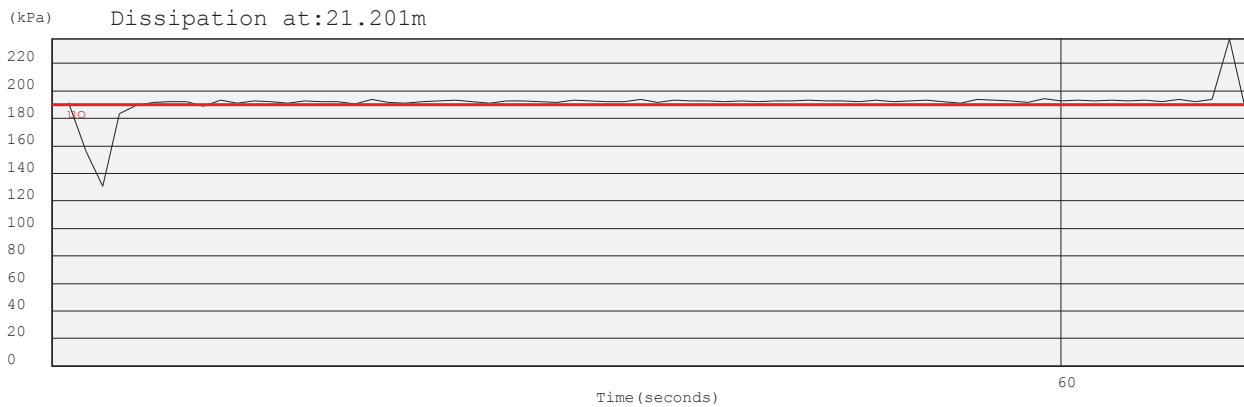
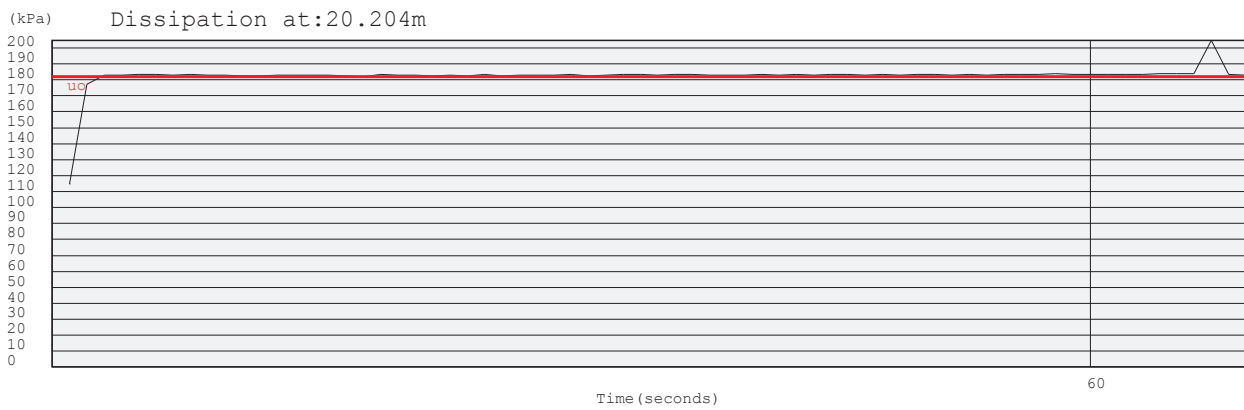
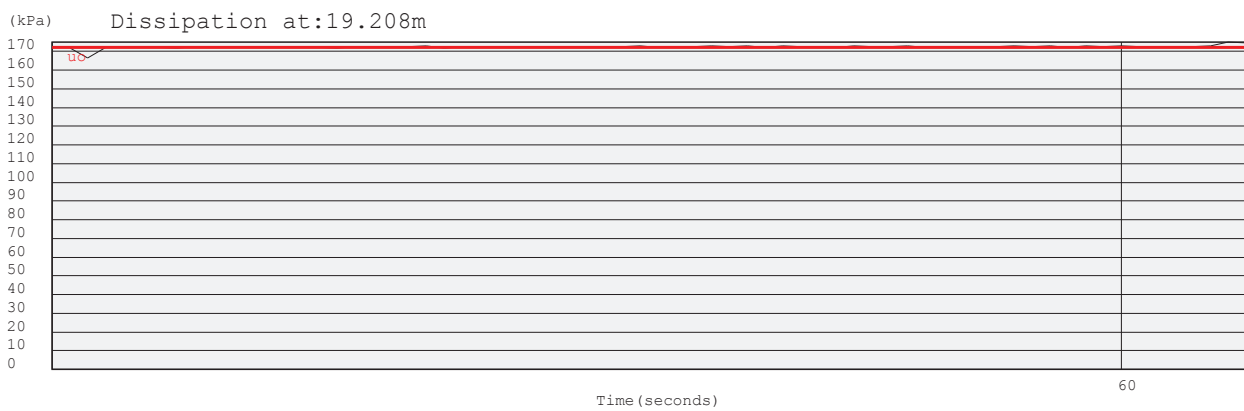
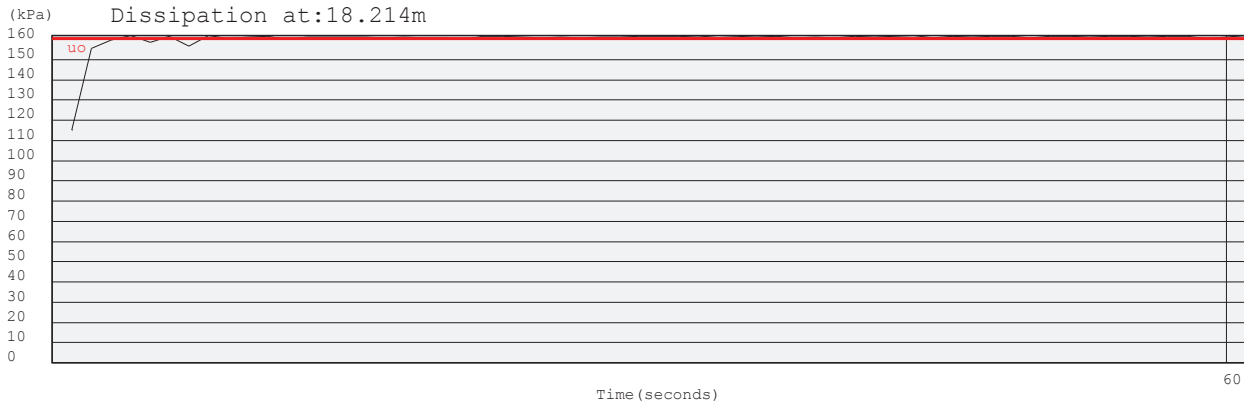
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 34

Date: 2012/08/30

Page: 1



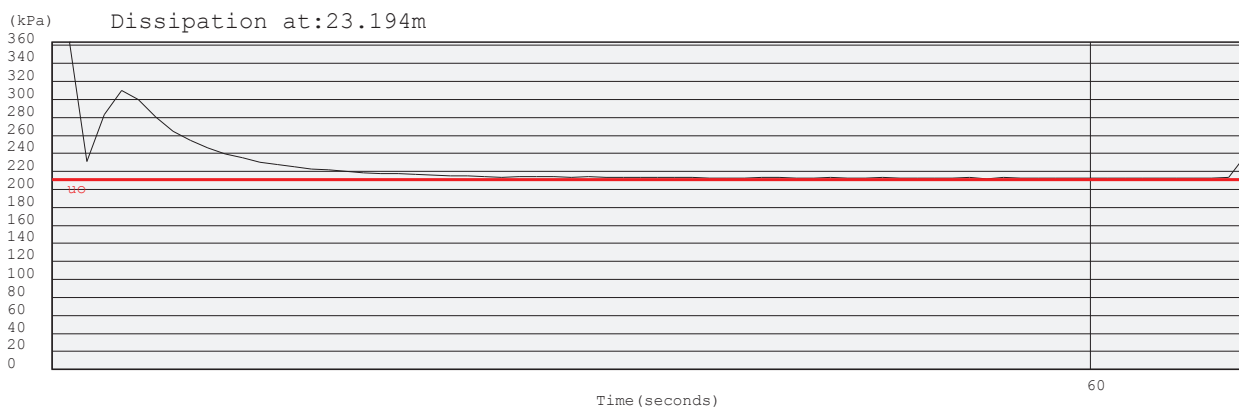
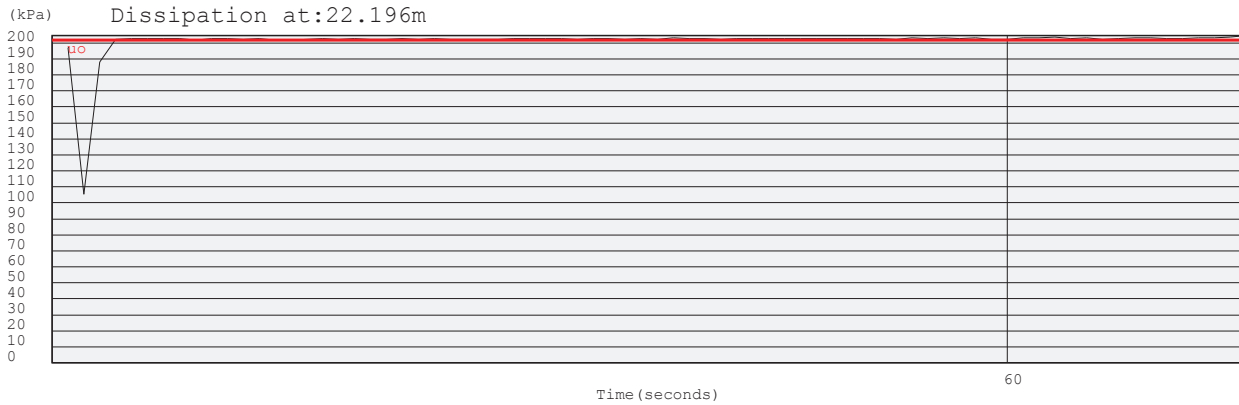
Project: Durban Harbour Piezocone Investigation for Dredging

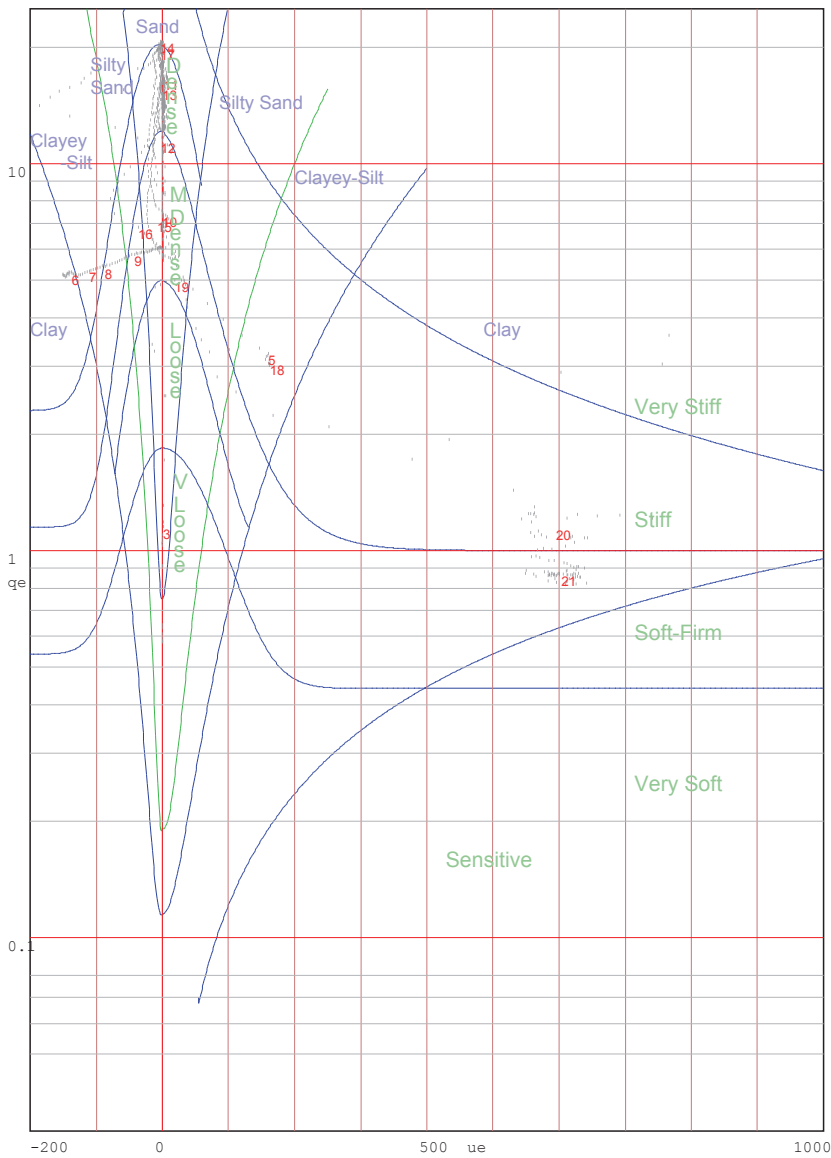
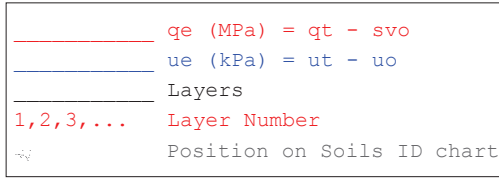
Site: Durban Harbour over water

Hole: S 34

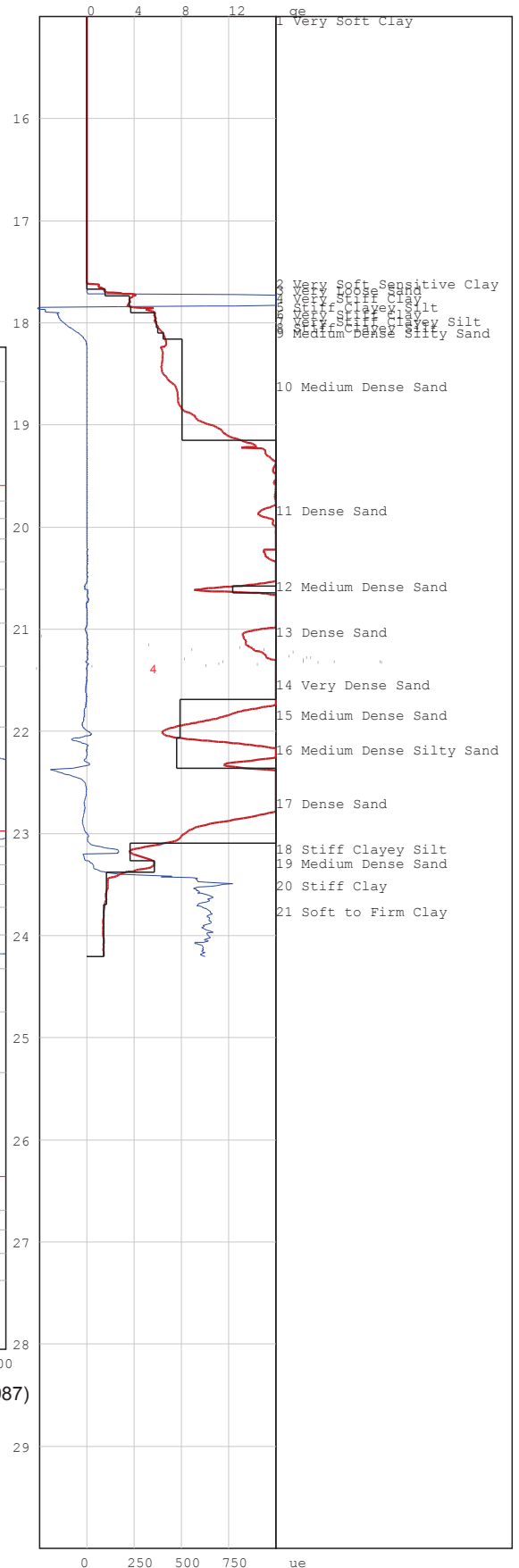
Date: 2012/08/30

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Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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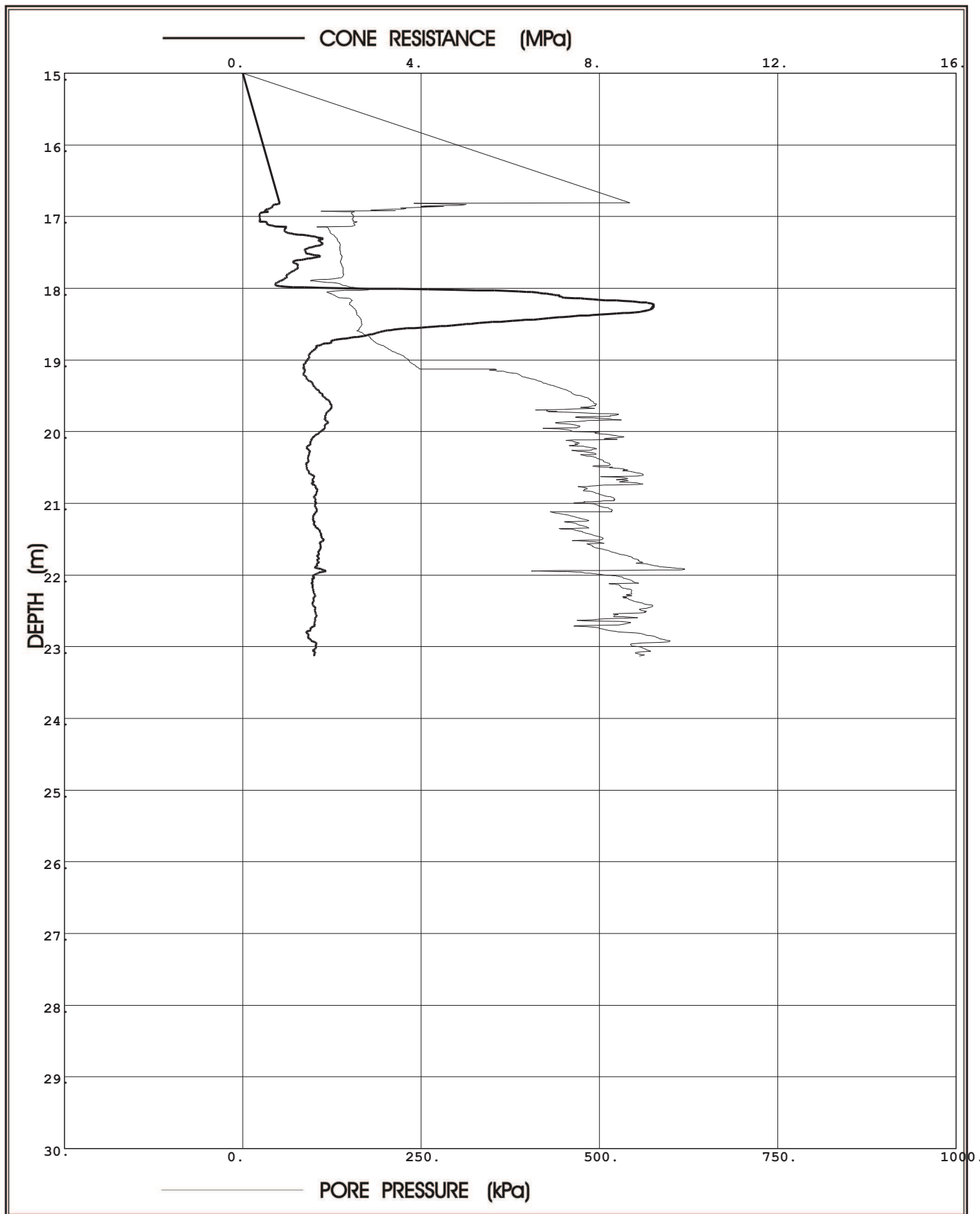
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 35

DATE: 2012/08/30

Page:2



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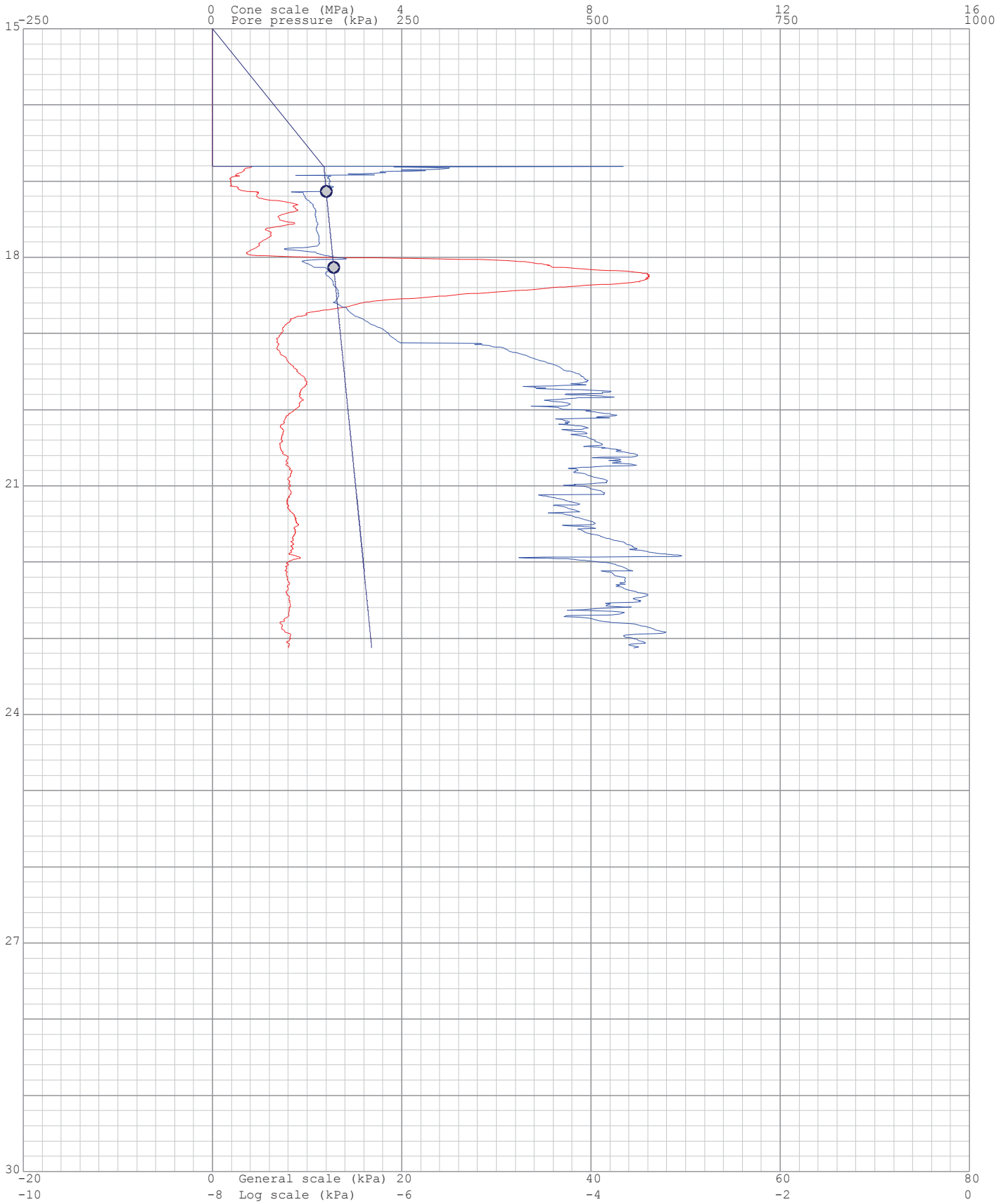
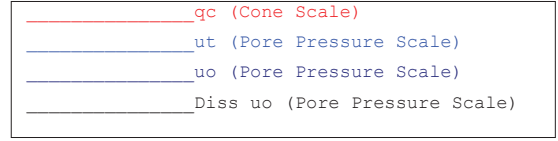
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 35  
Date: 2012/08/30



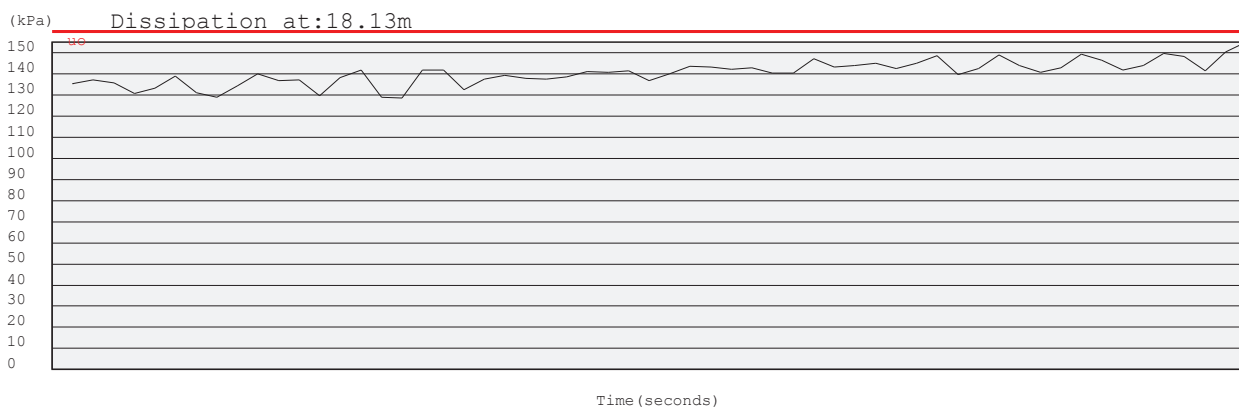
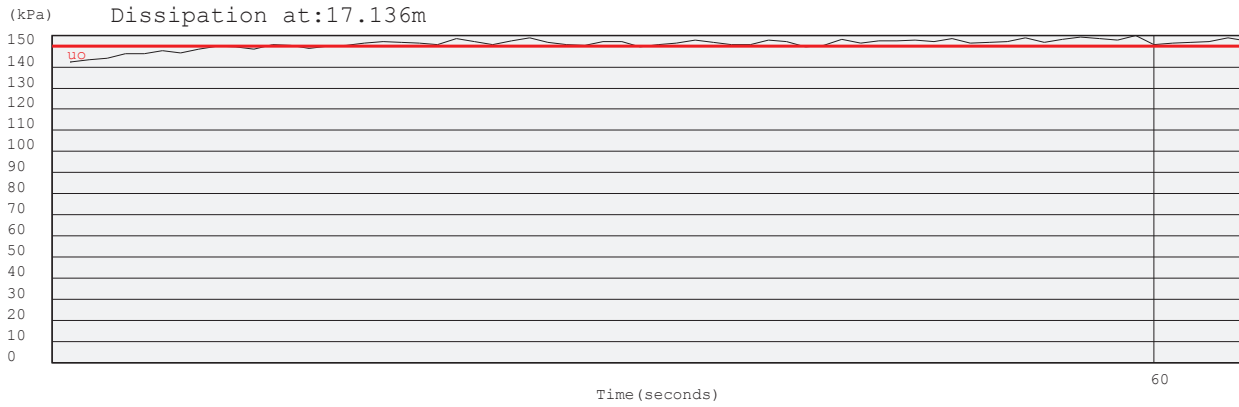
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 35

Date: 2012/08/30

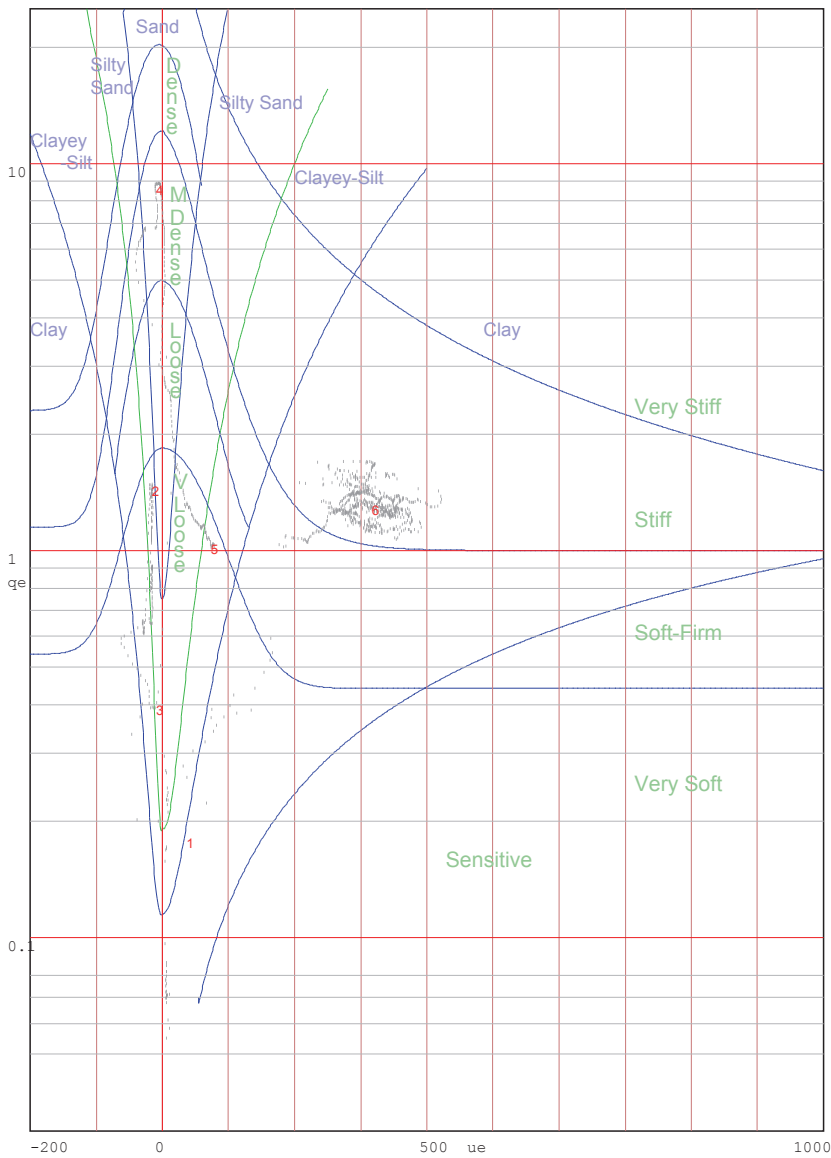
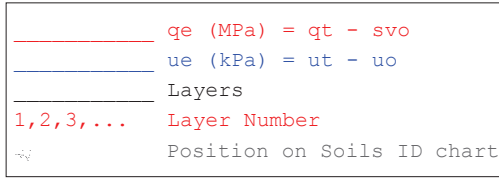
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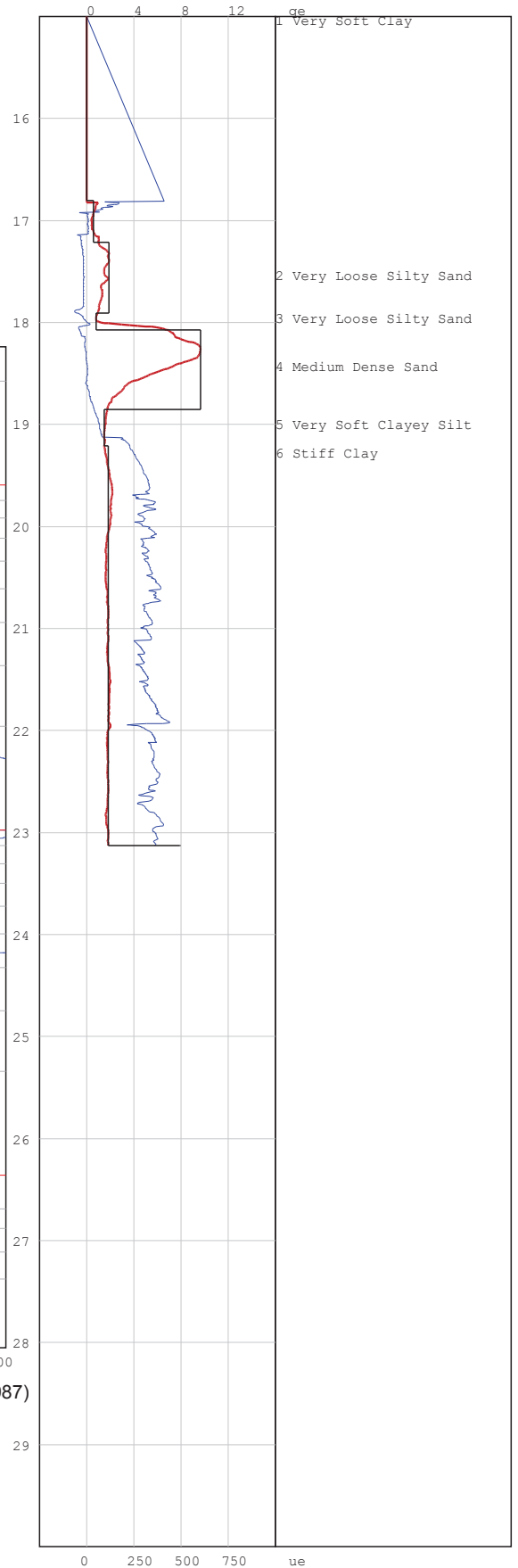
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 35  
Date: 2012/08/30



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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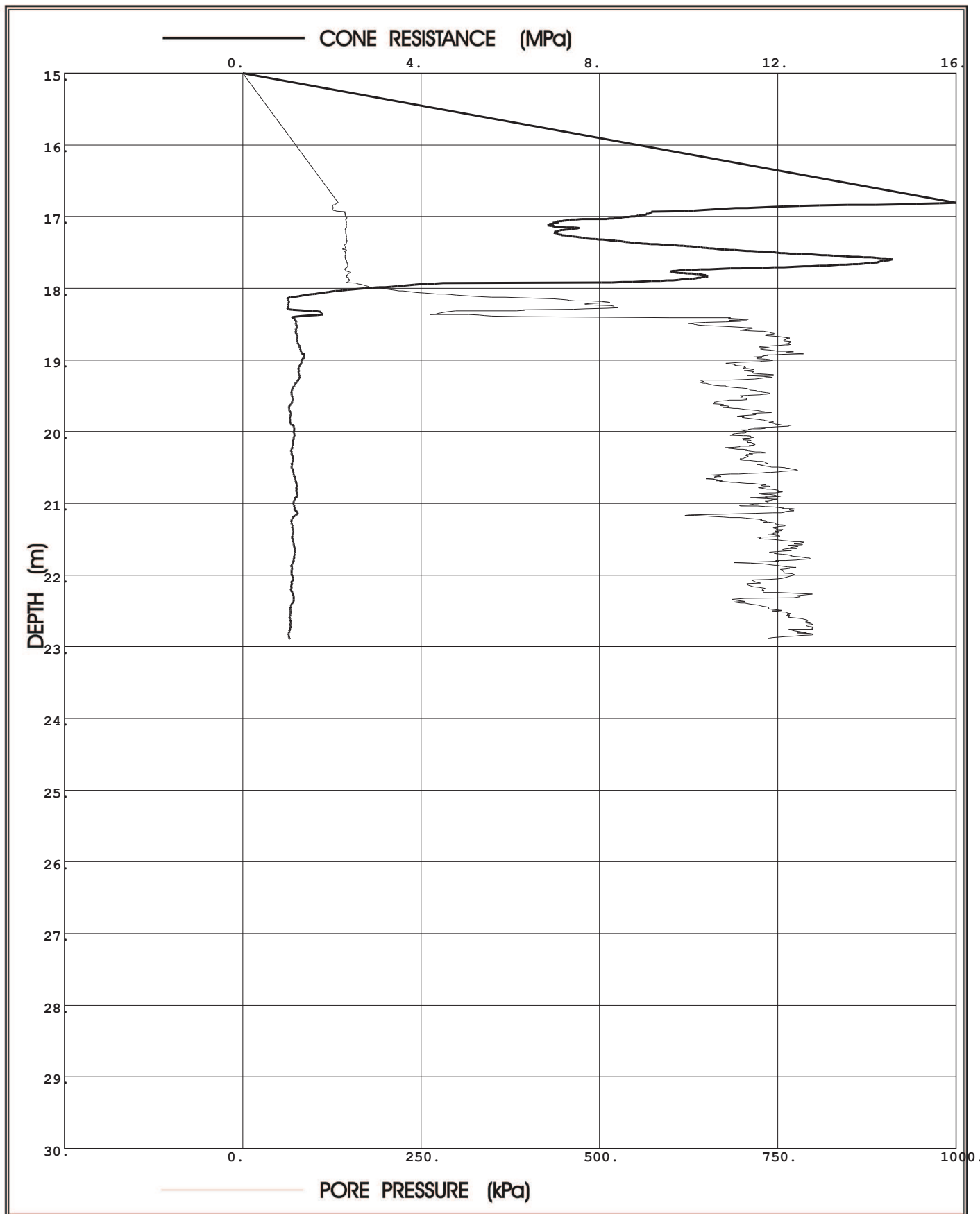
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 36

DATE: 2012/09/20

Page:2



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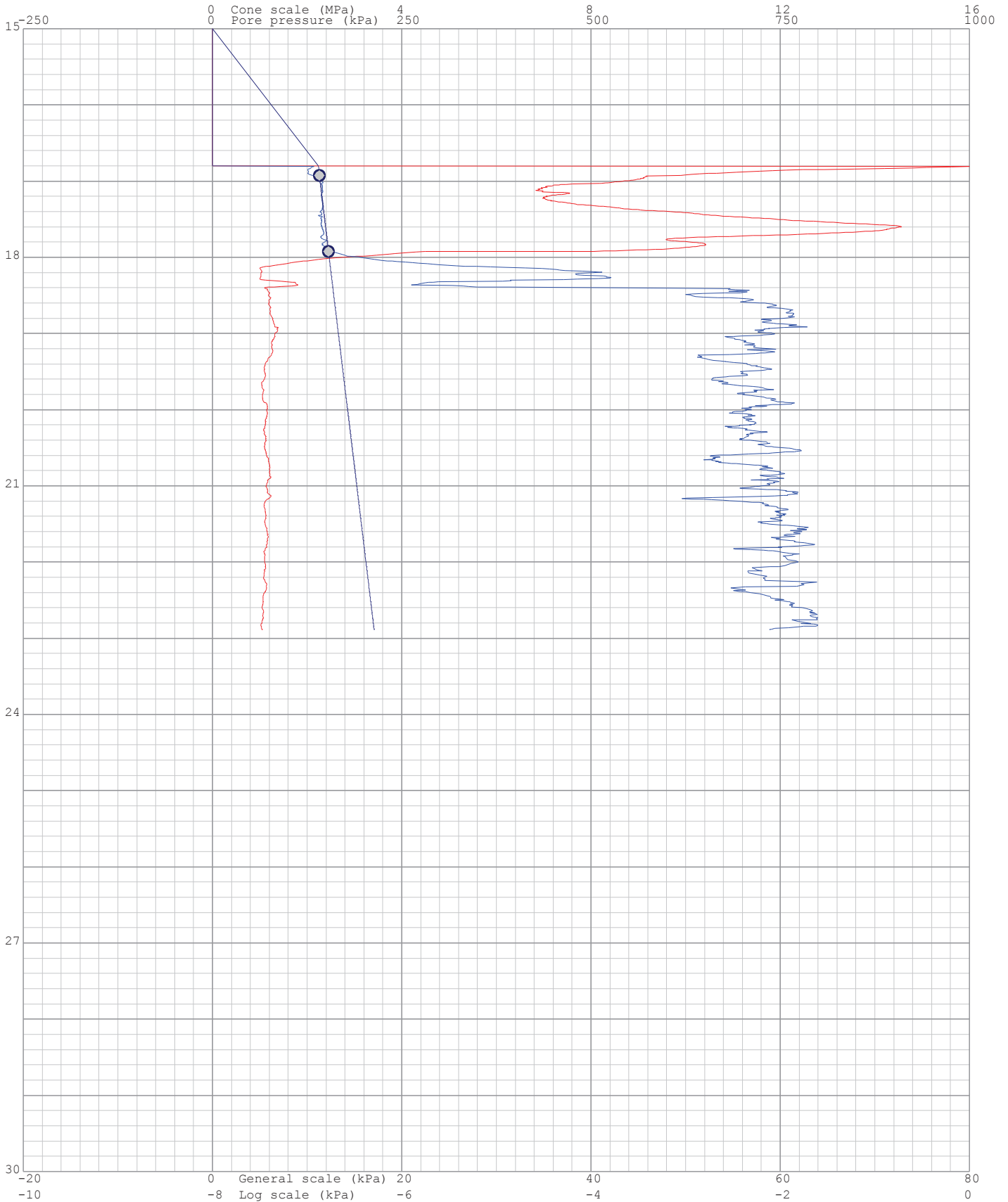
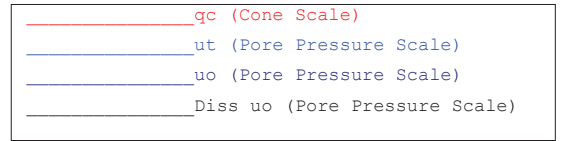
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

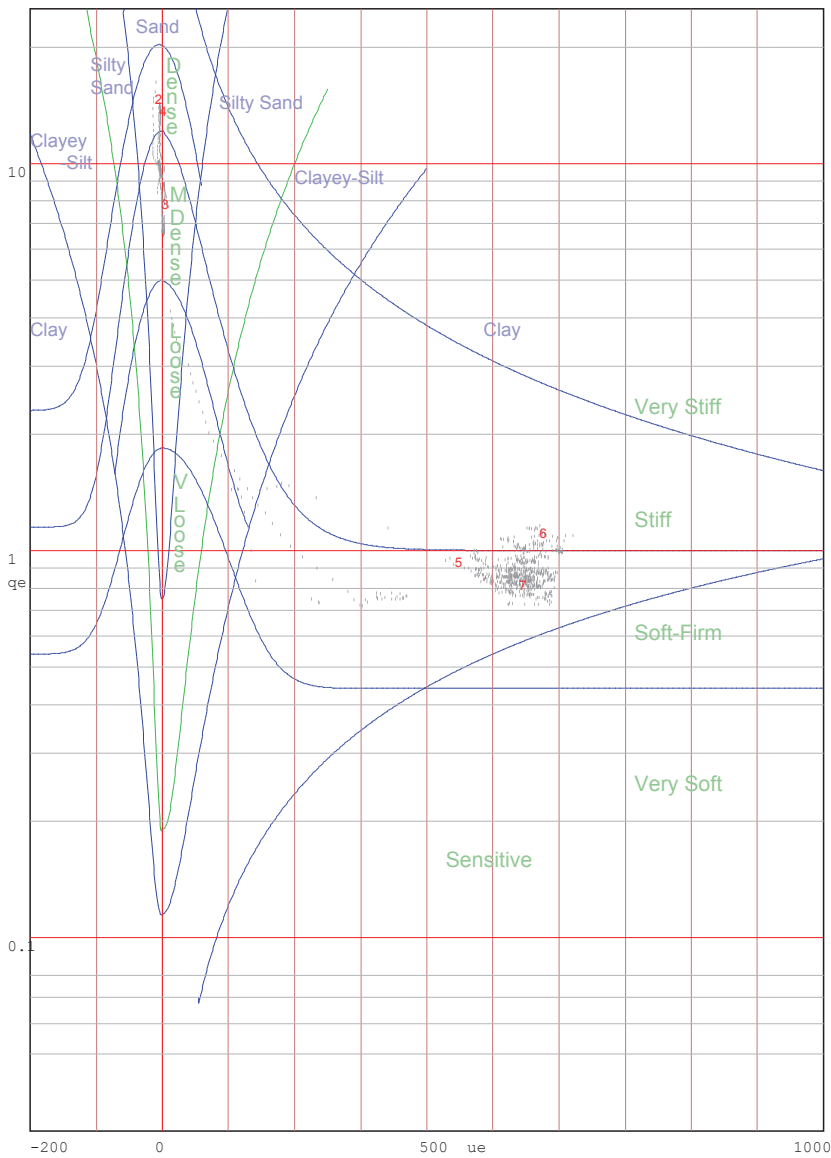
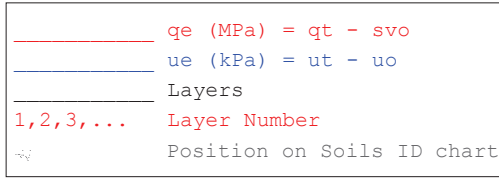
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Date: 2012/09/20



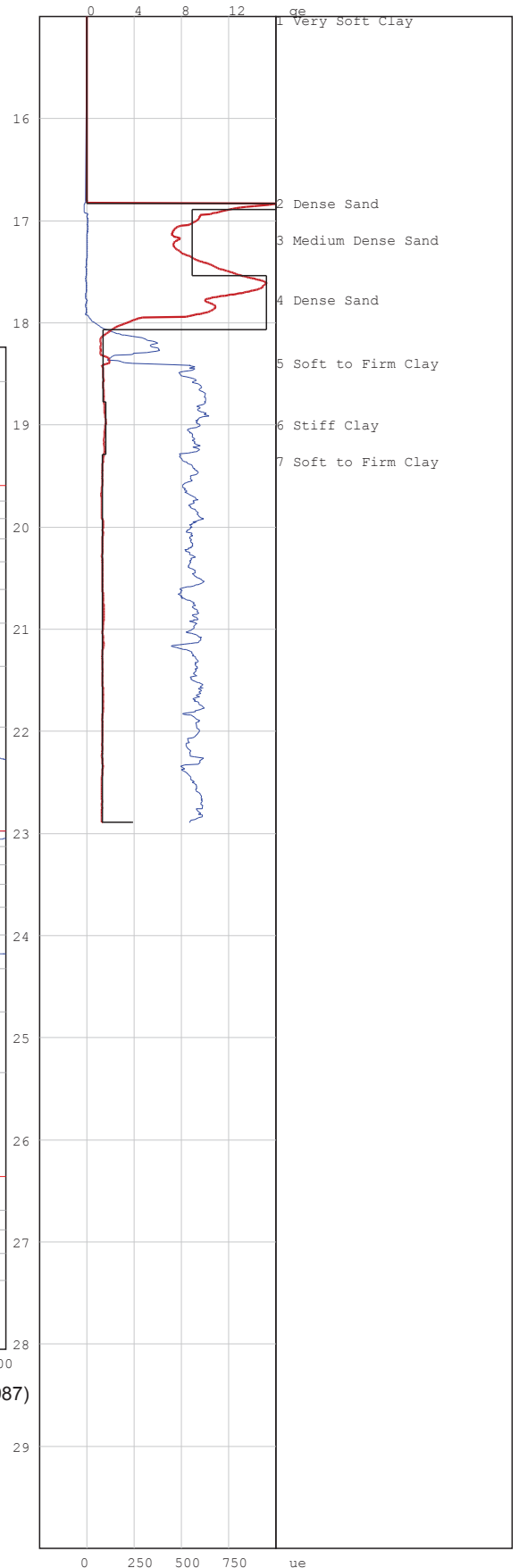
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 36  
Date: 2012/09/20



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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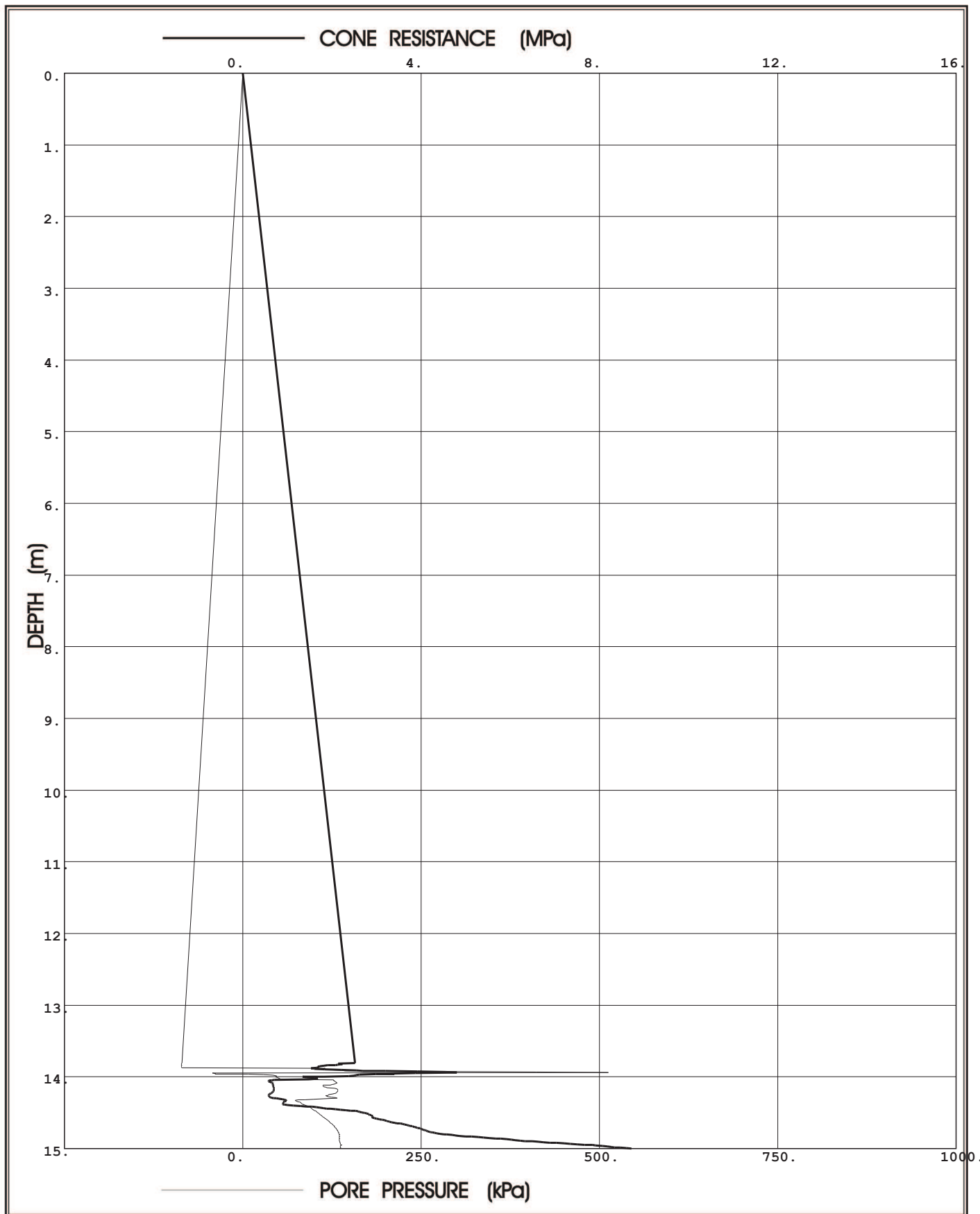
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 37

DATE: 2012/09/20

Page:1



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# PIEZOCONE PENETRATION TEST



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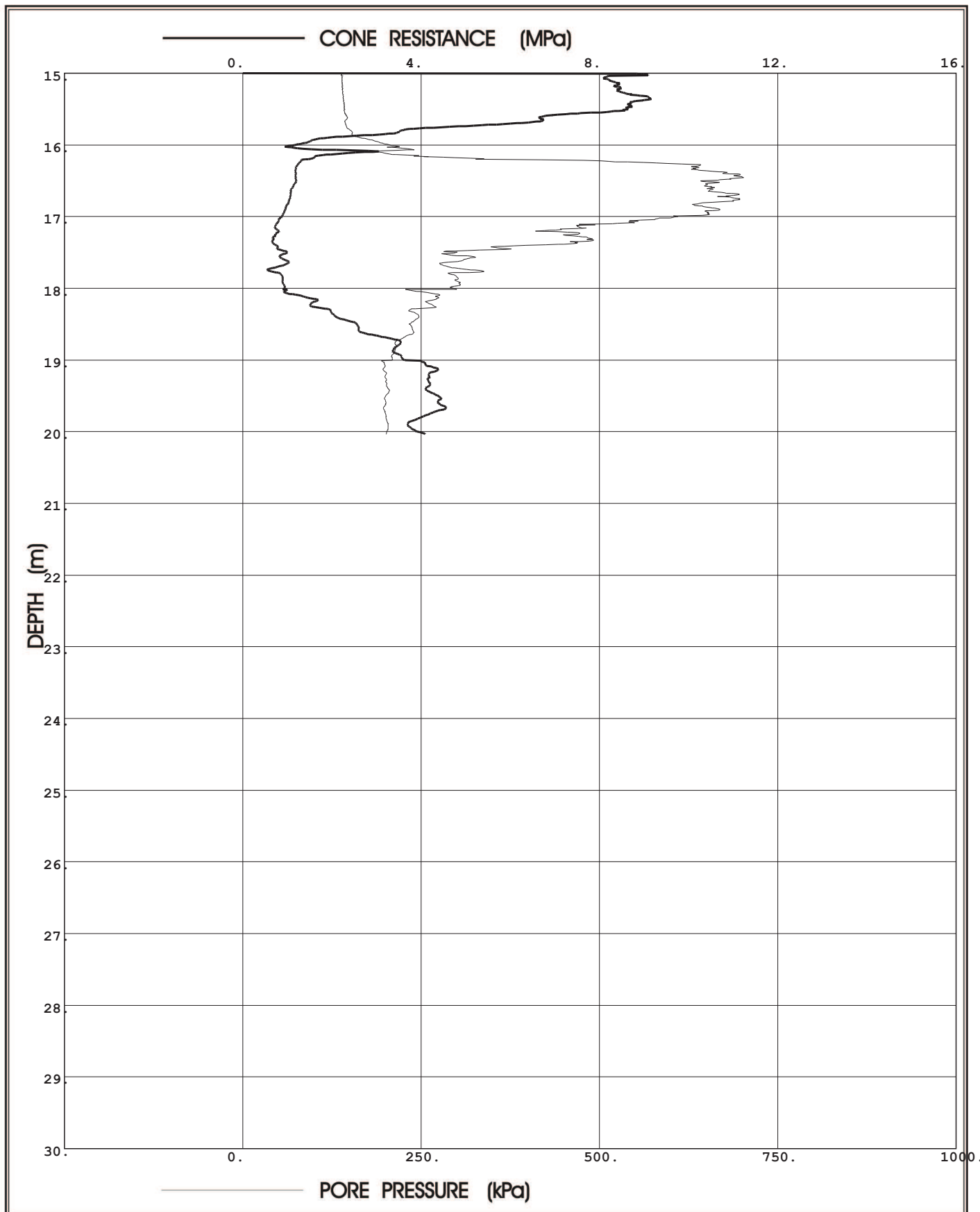
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 37

DATE: 2012/09/20

Page:2



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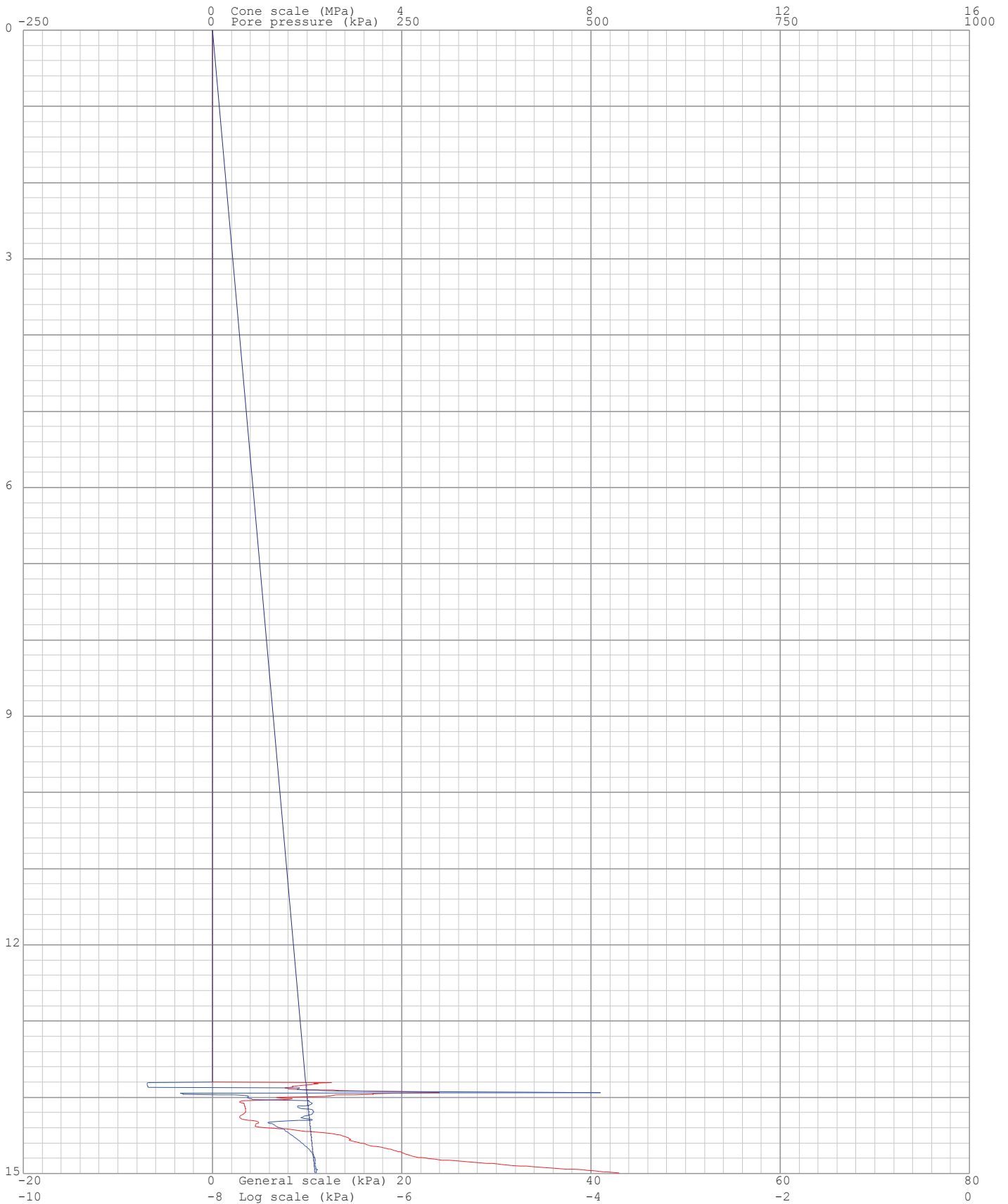
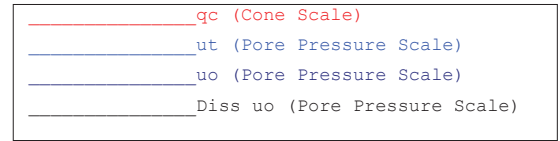
rust@global.co.za



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

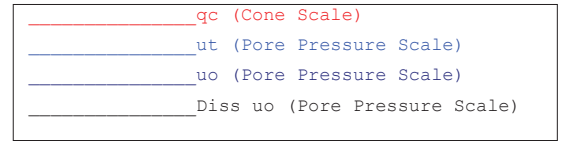
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Date: 2012/09/20



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

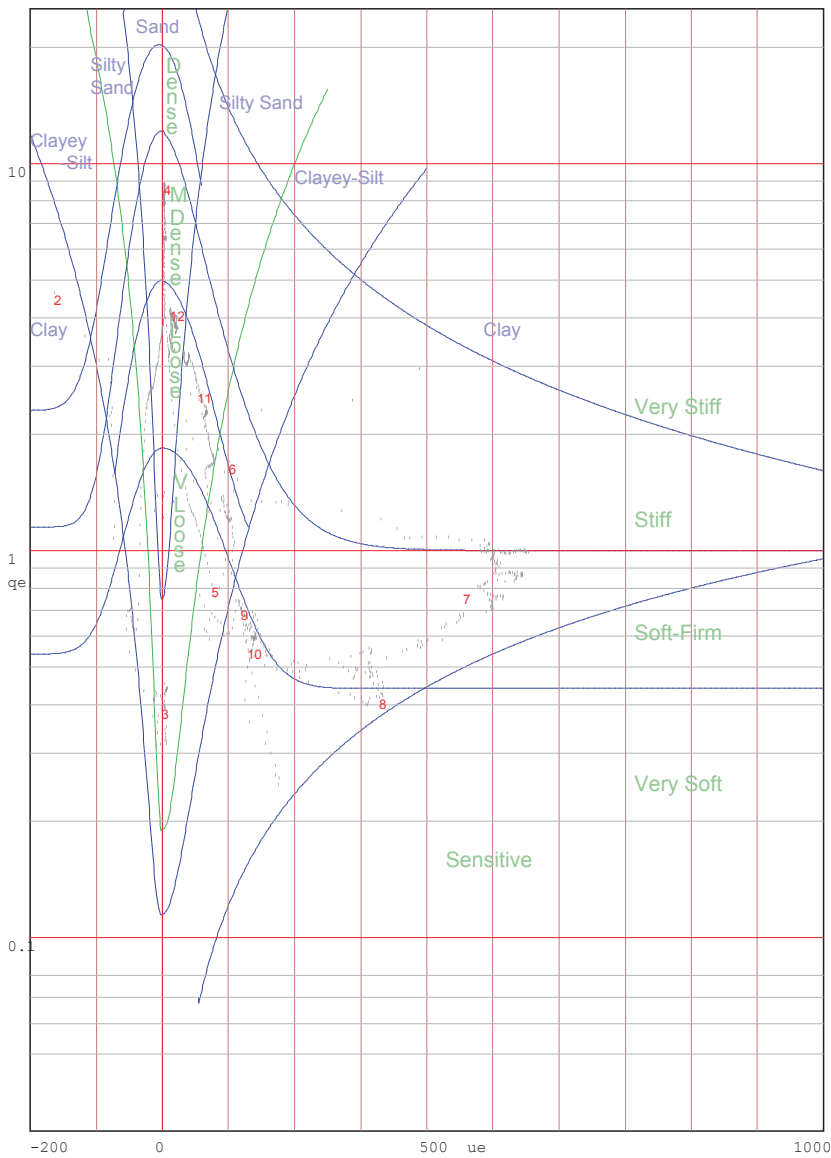
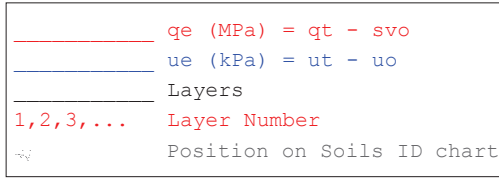
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Date: 2012/09/20



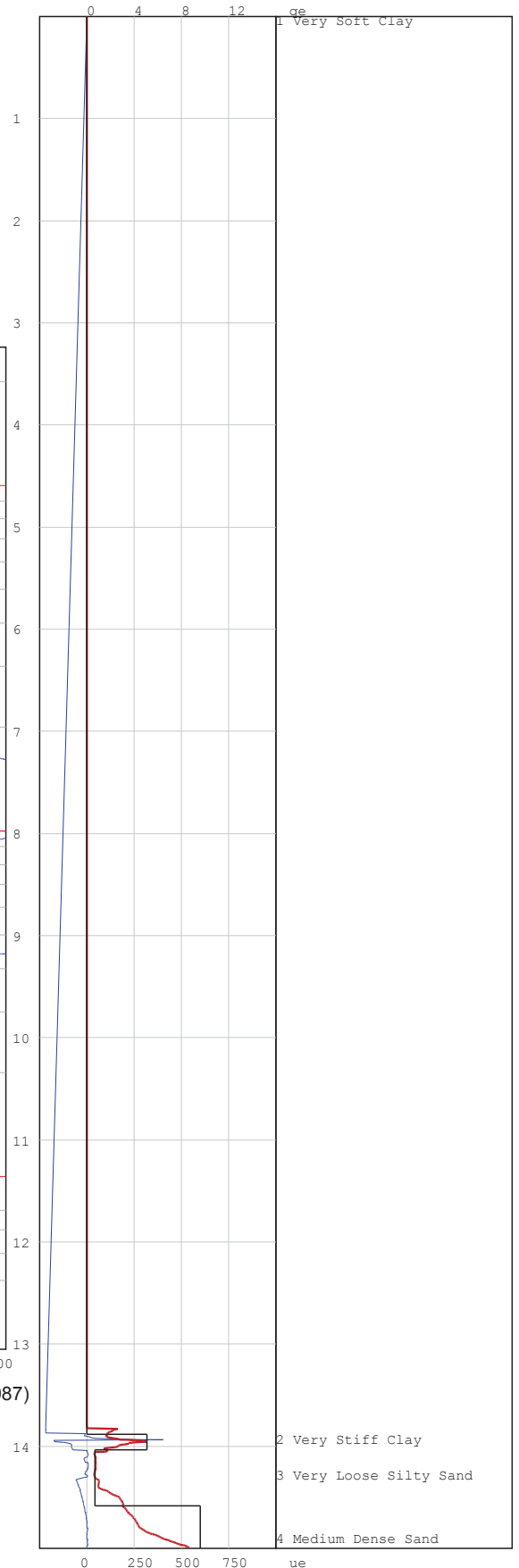
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 37  
Date: 2012/09/20



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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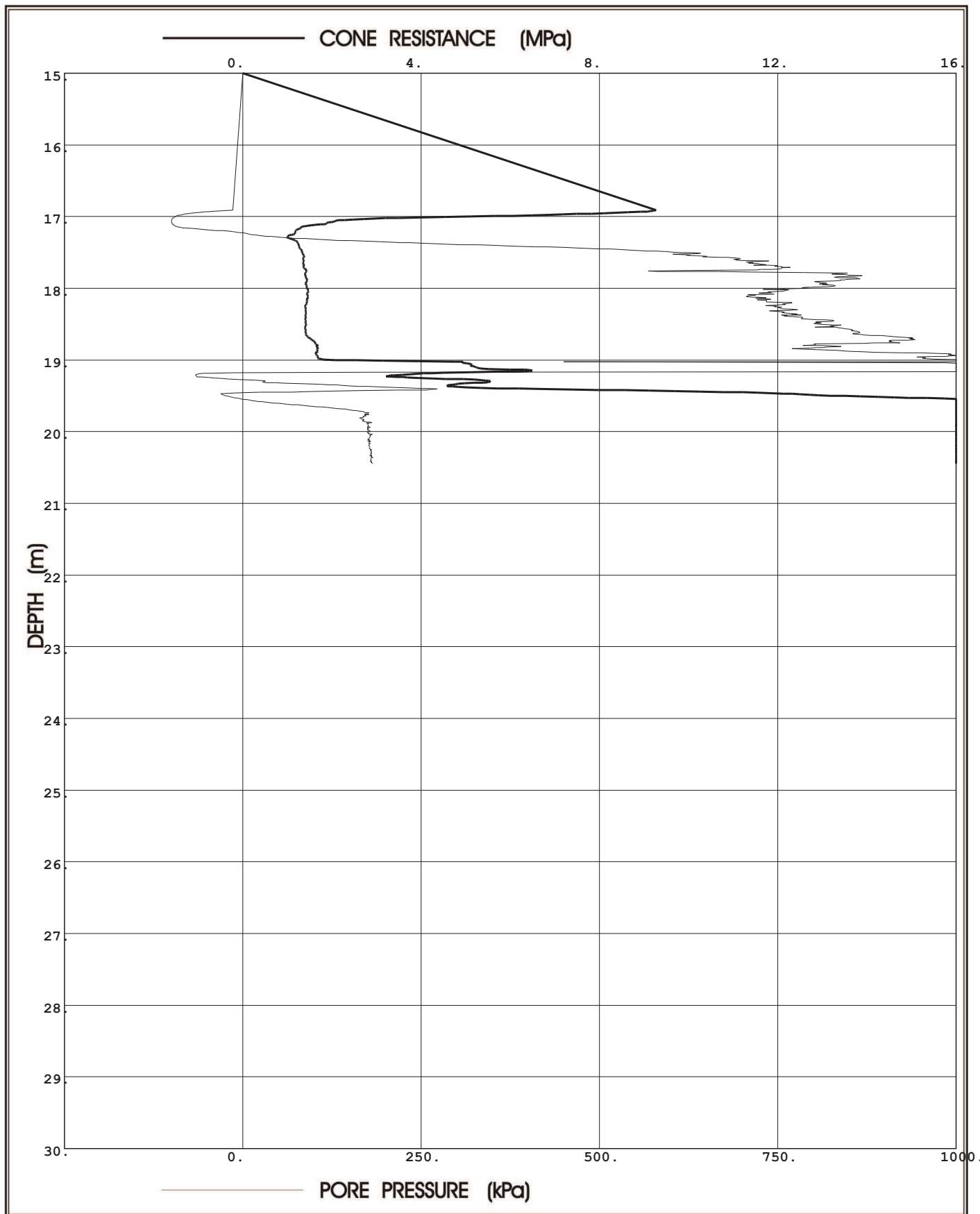
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 38

DATE: 2012/09/20

Page:2



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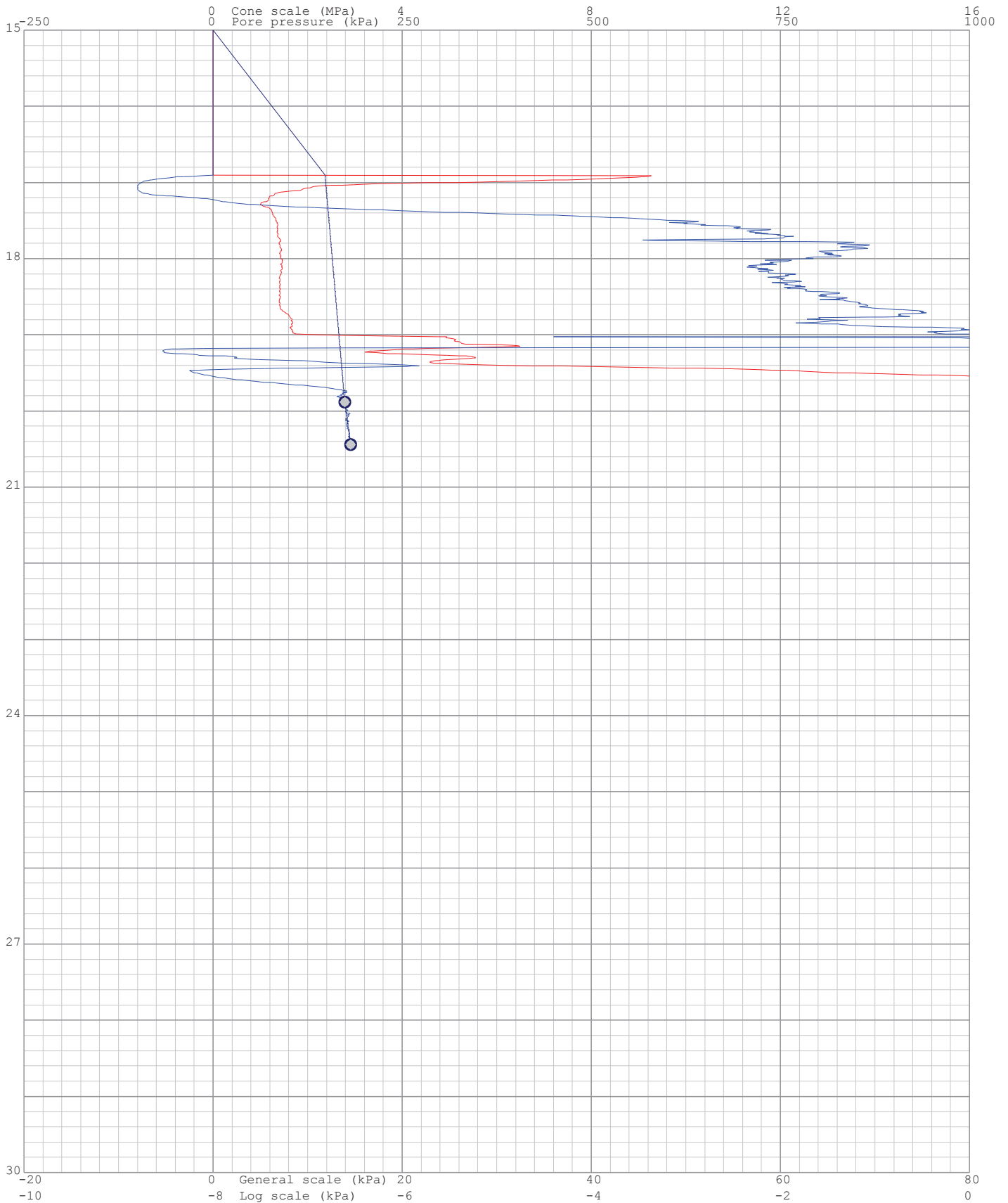
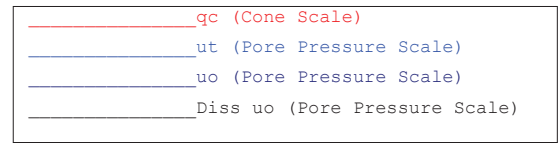
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

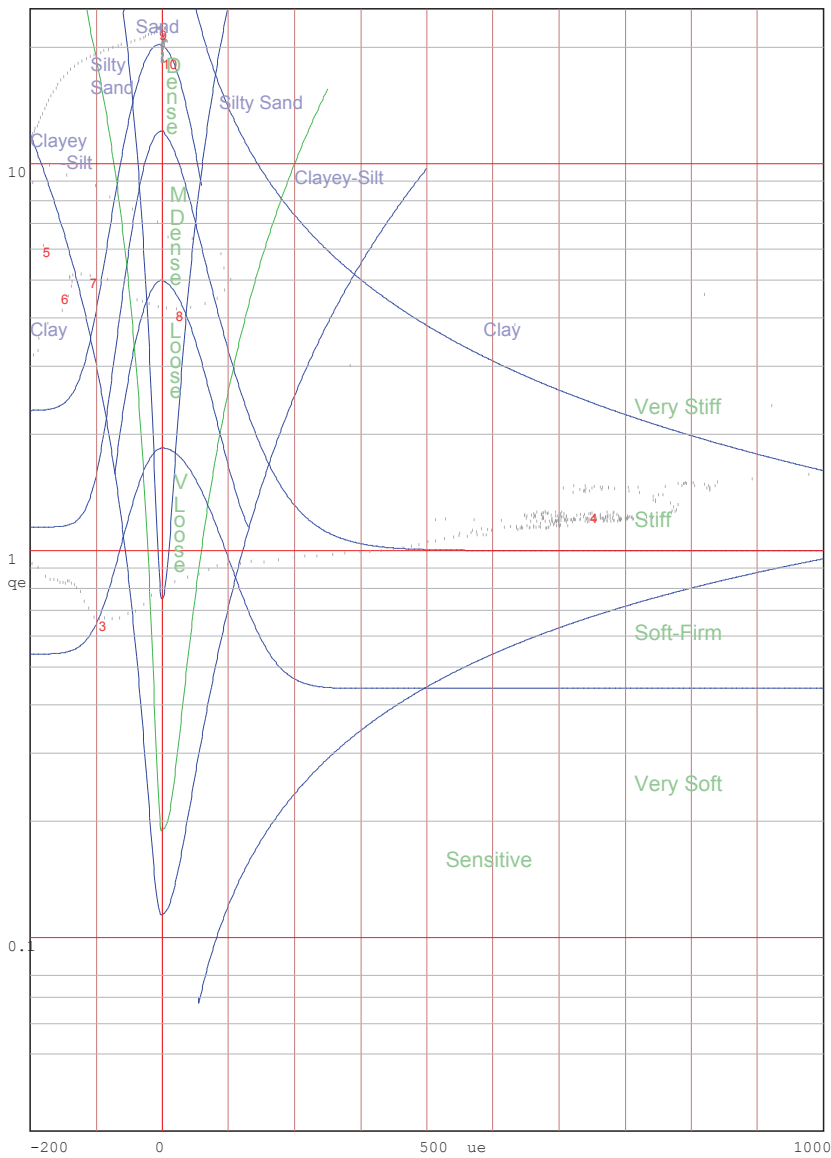
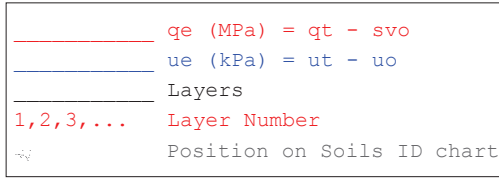
Hole No: S 38  
Date: 2012/09/20



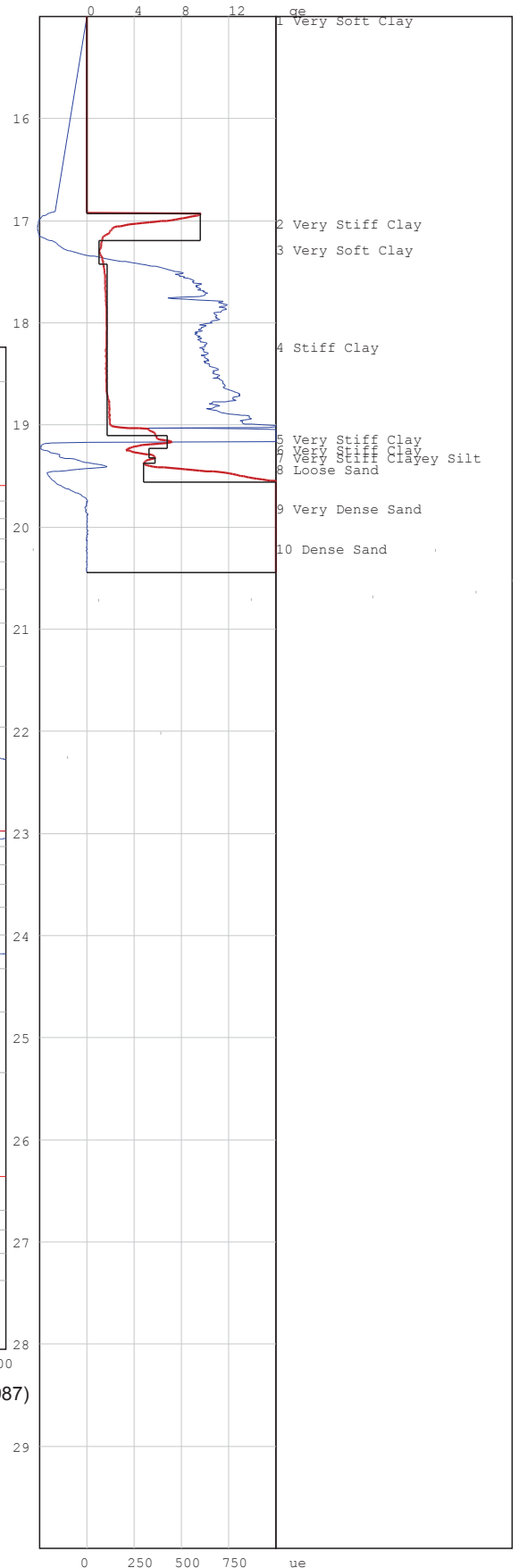
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 38  
 Date: 2012/09/20



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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0044

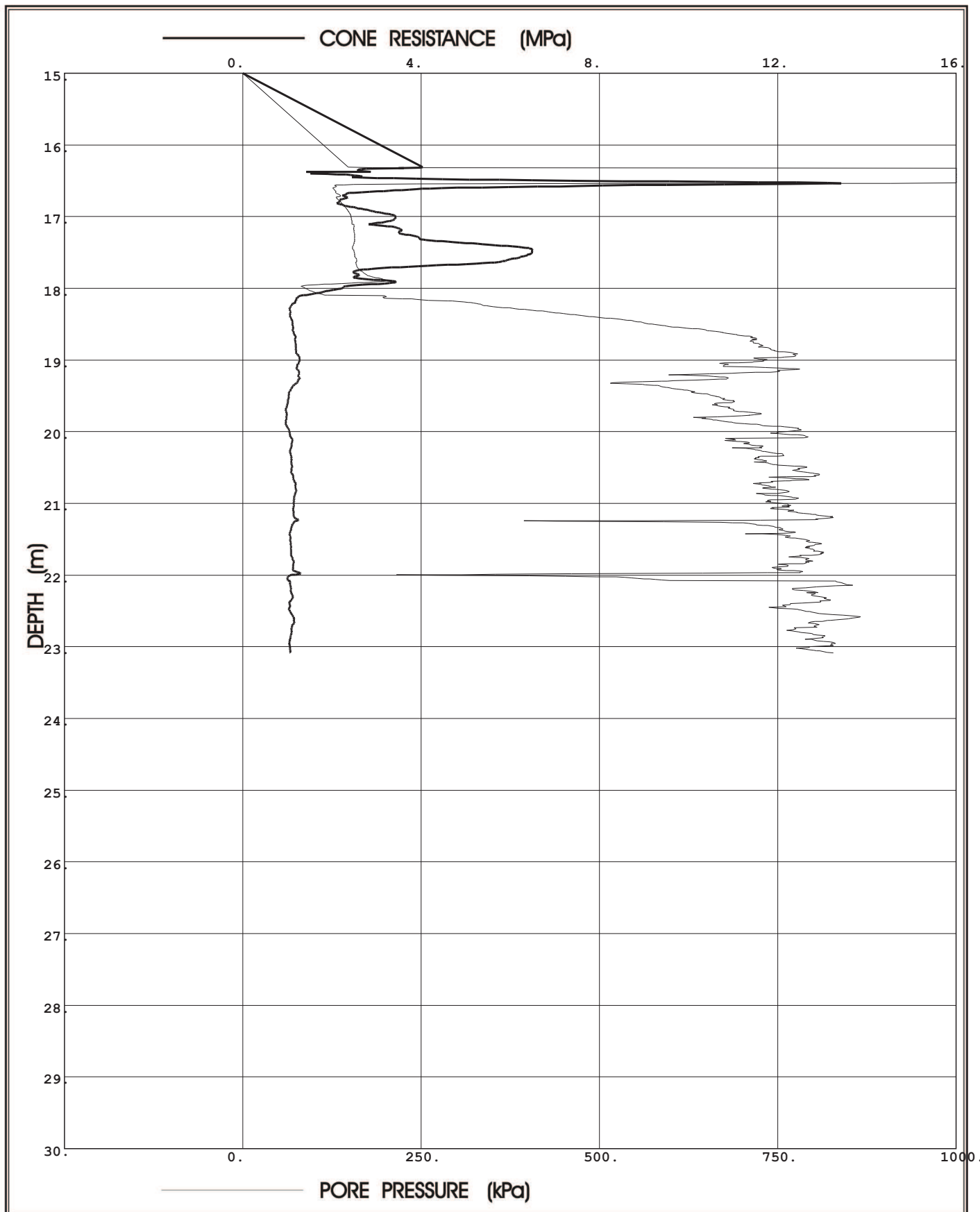
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 39

DATE: 2012/09/21

Page:2



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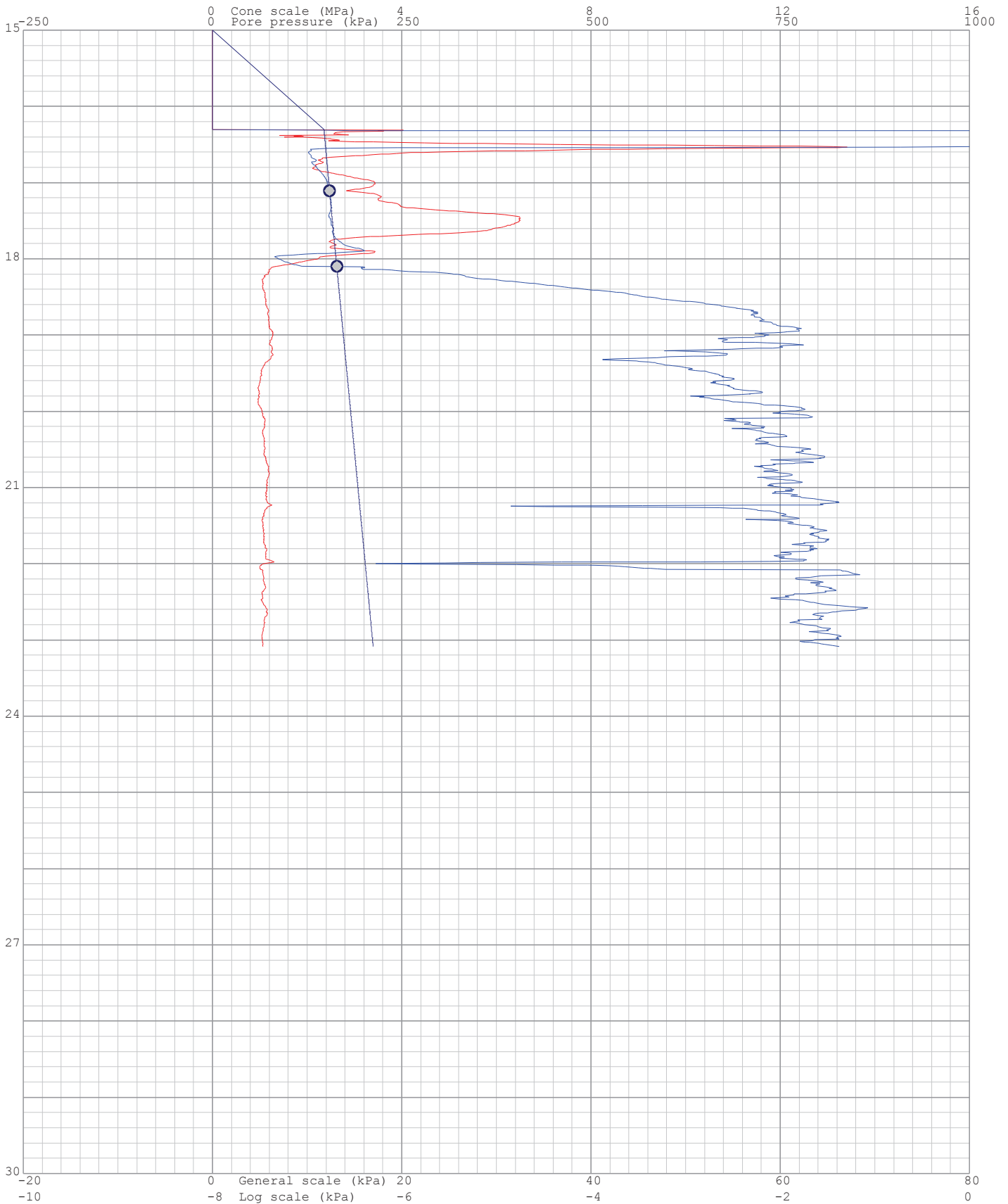
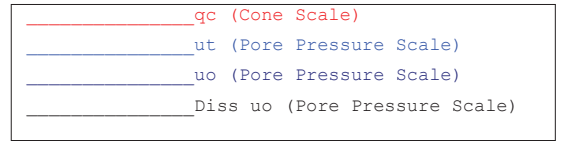
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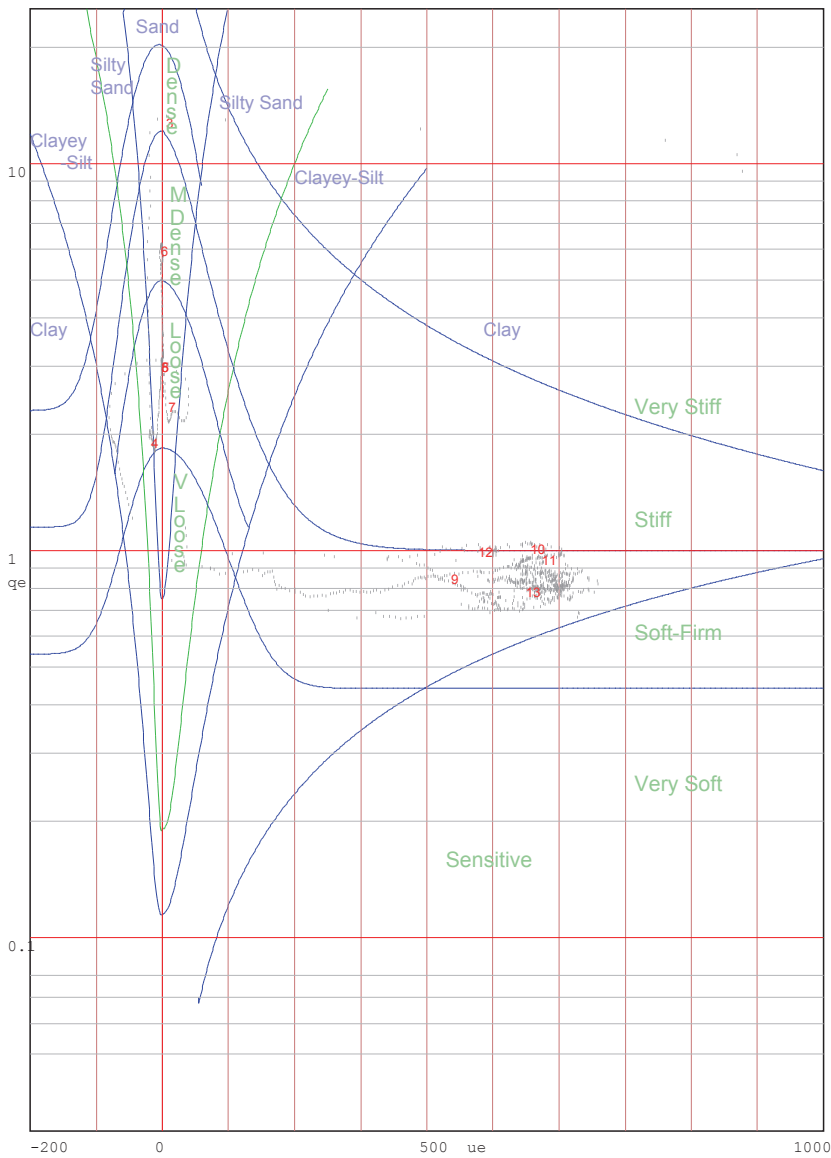
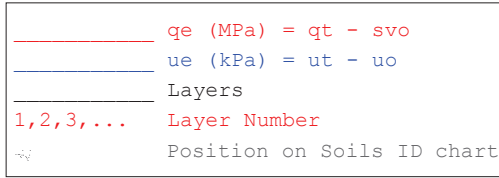


Project: Durban Harbour Piezocone Investigation for Dredging

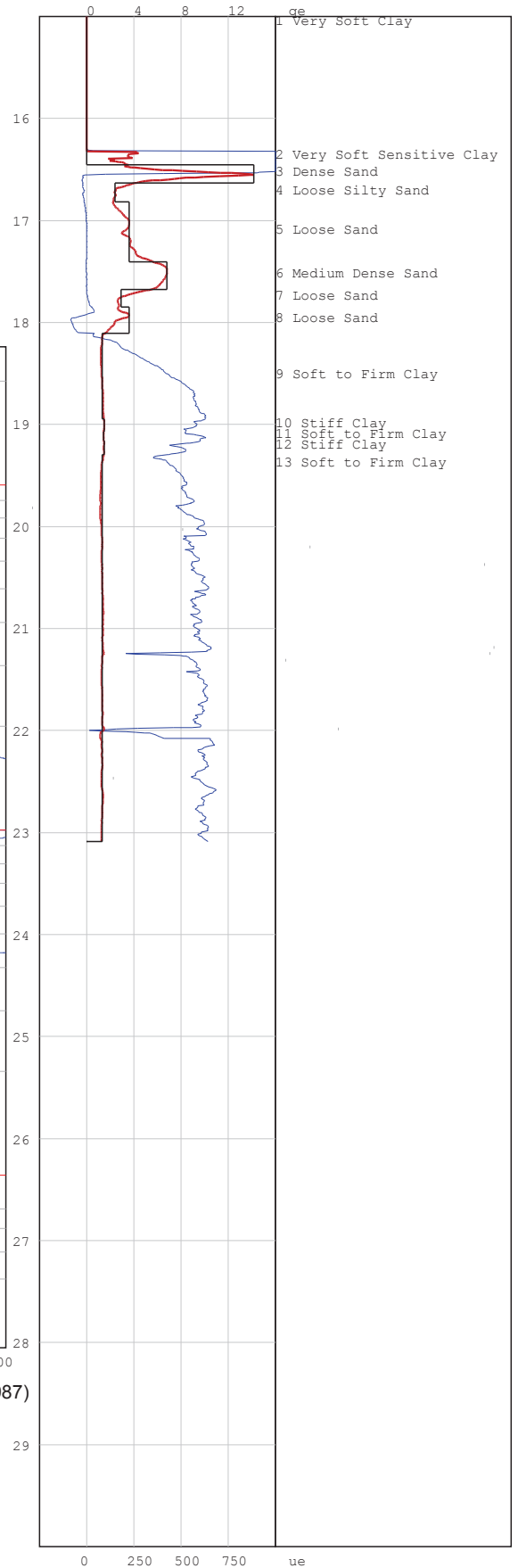
Site: Durban Harbour over water

Hole No: S 39  
Date: 2012/09/21





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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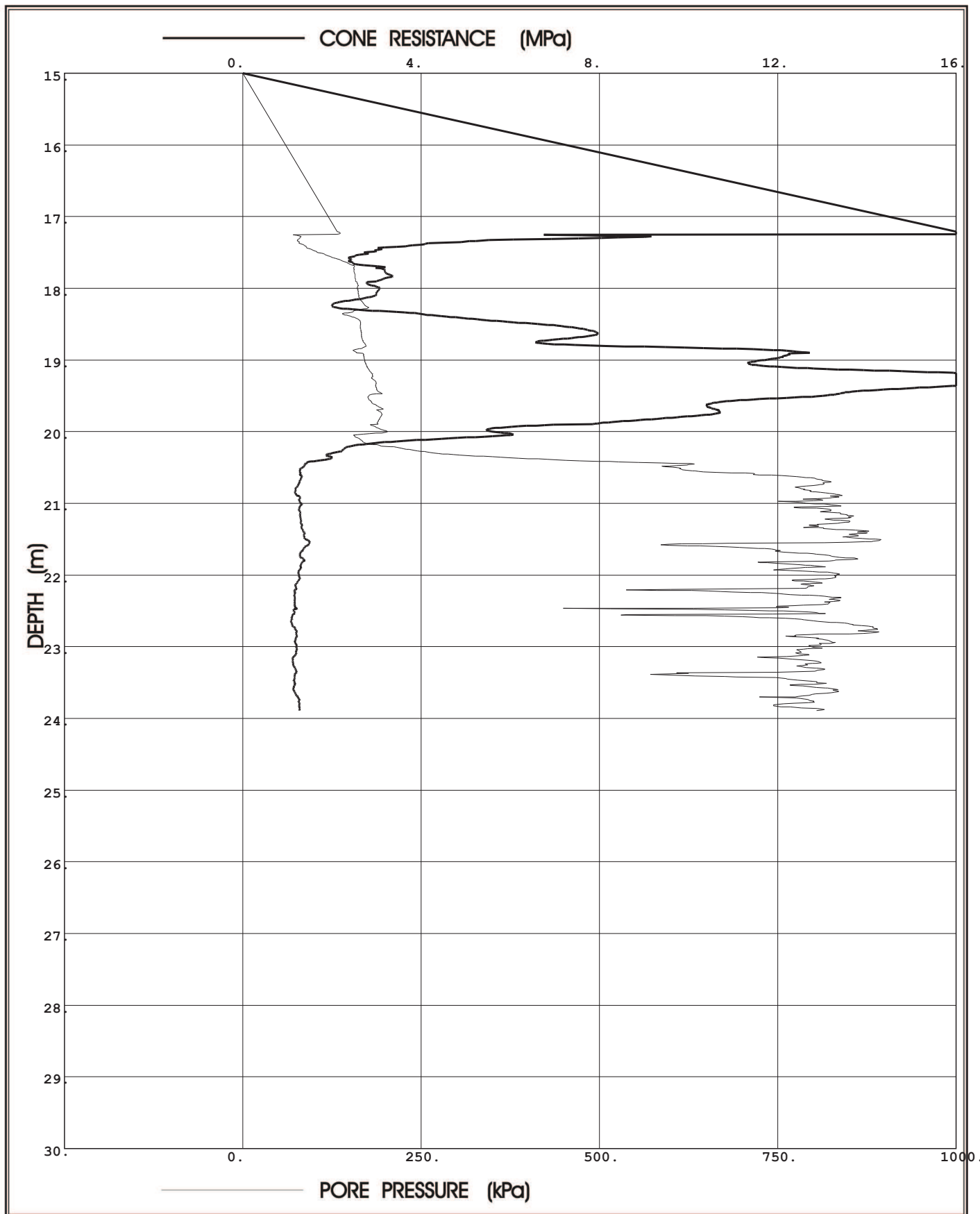
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 40

DATE: 2012/09/08

Page:2



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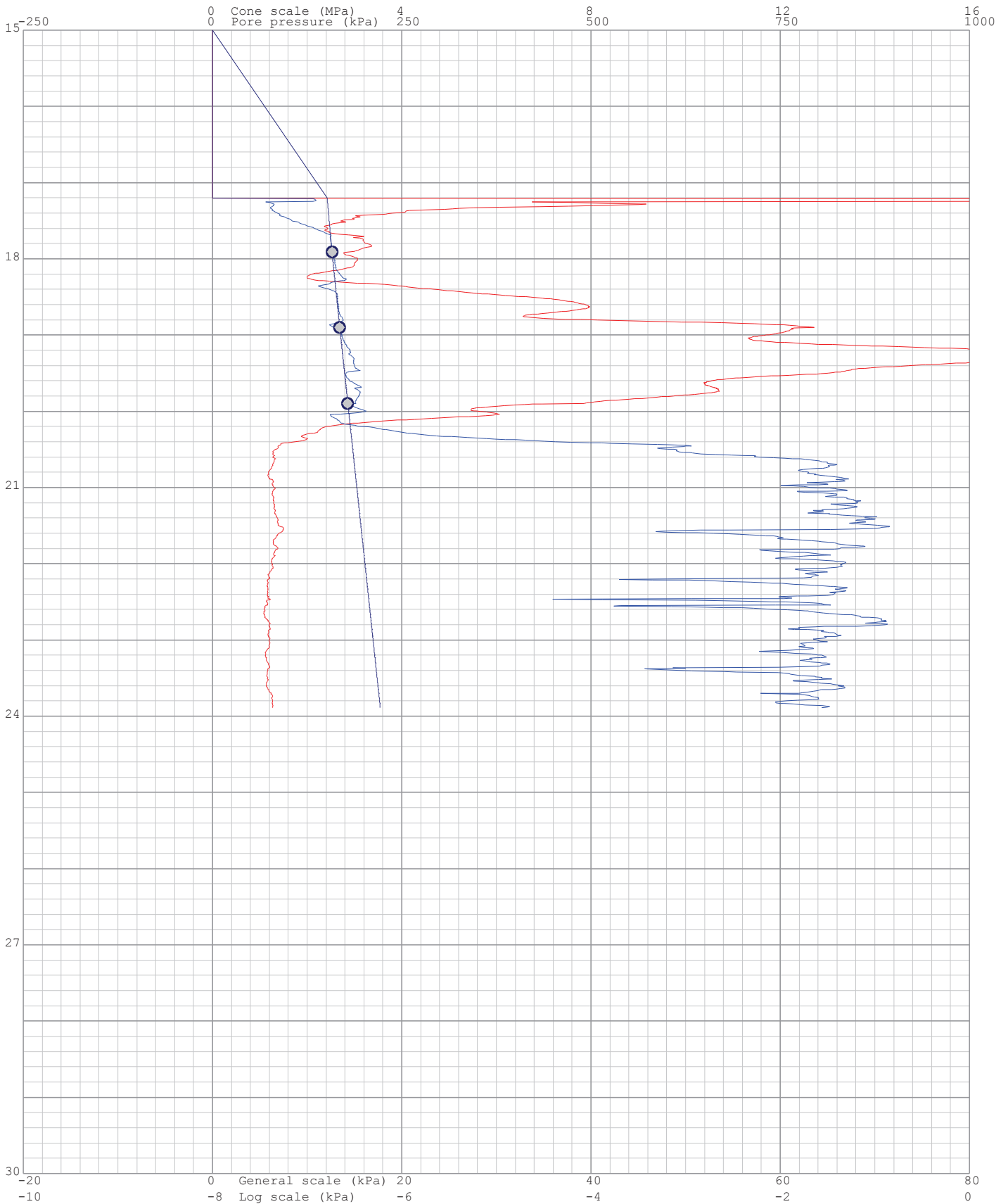
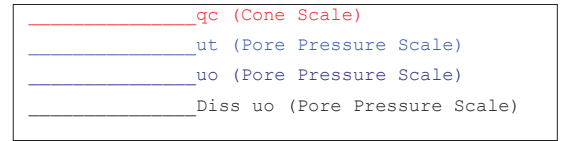
**Jeanne Rust** Information Technology

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 40  
Date: 2012/09/08



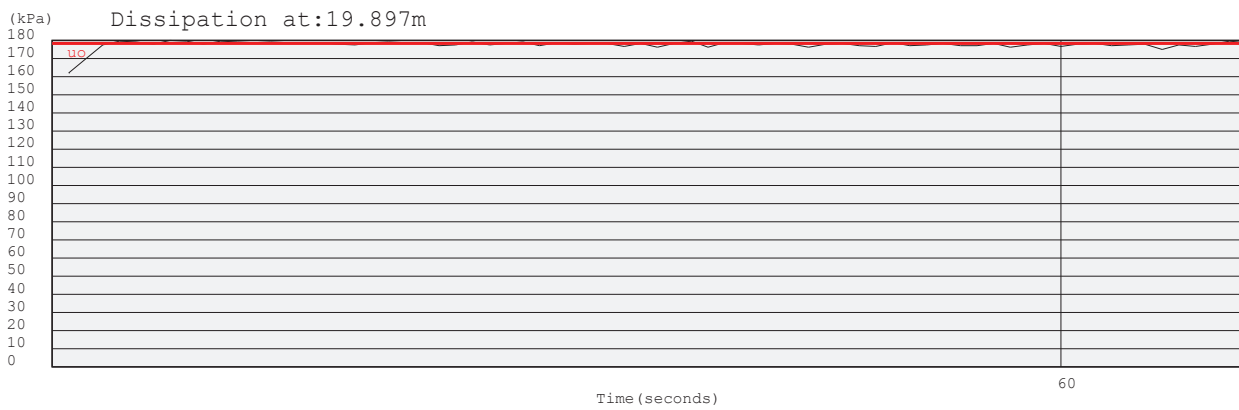
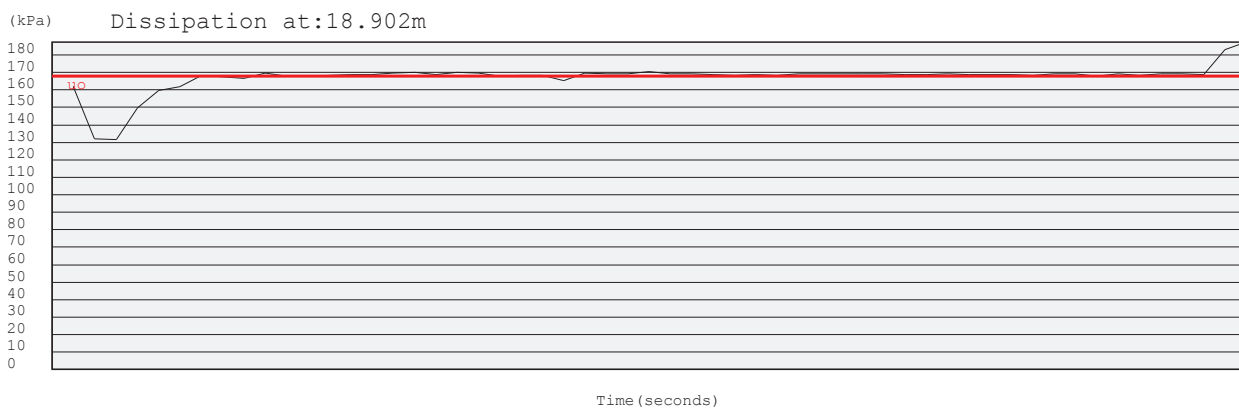
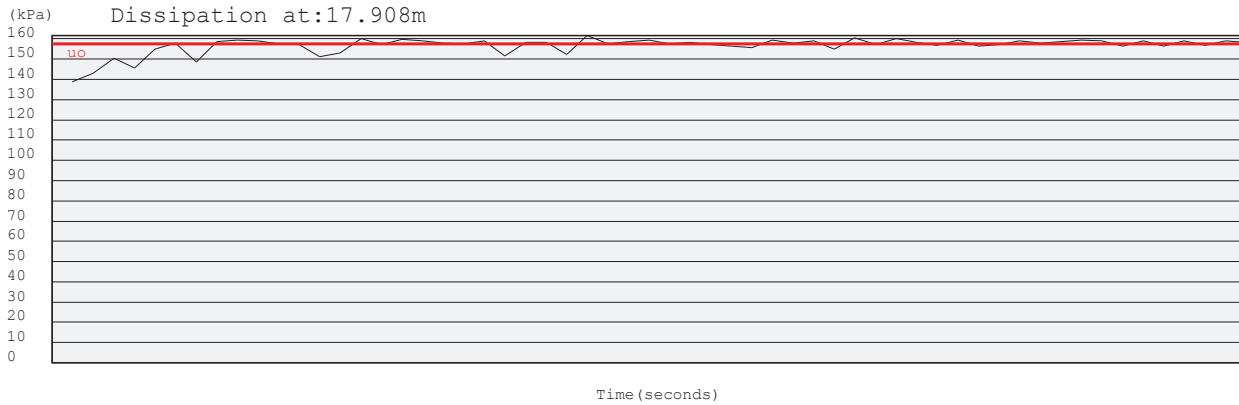
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 40

Date: 2012/09/08

Page: 1

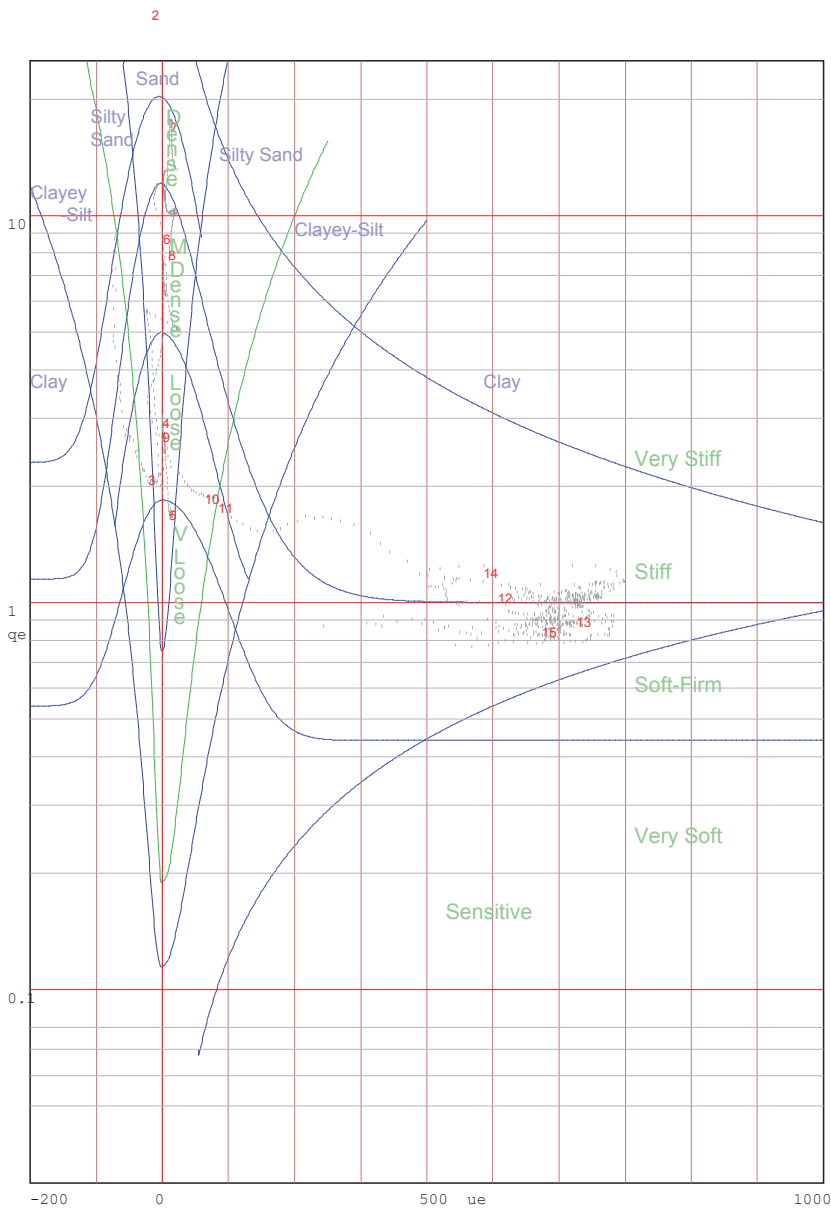


Project: Durban Harbour Piezocone Investigation for Dredging

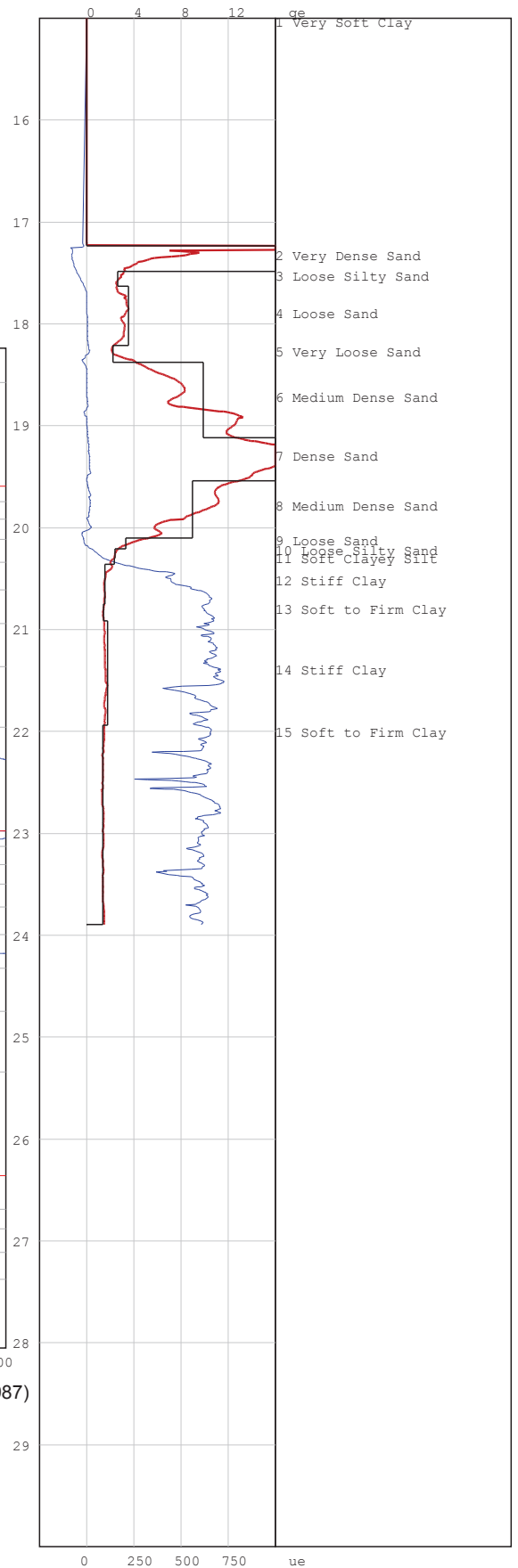
Site: Durban Harbour over water

Hole No: S 40  
Date: 2012/09/08

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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0044

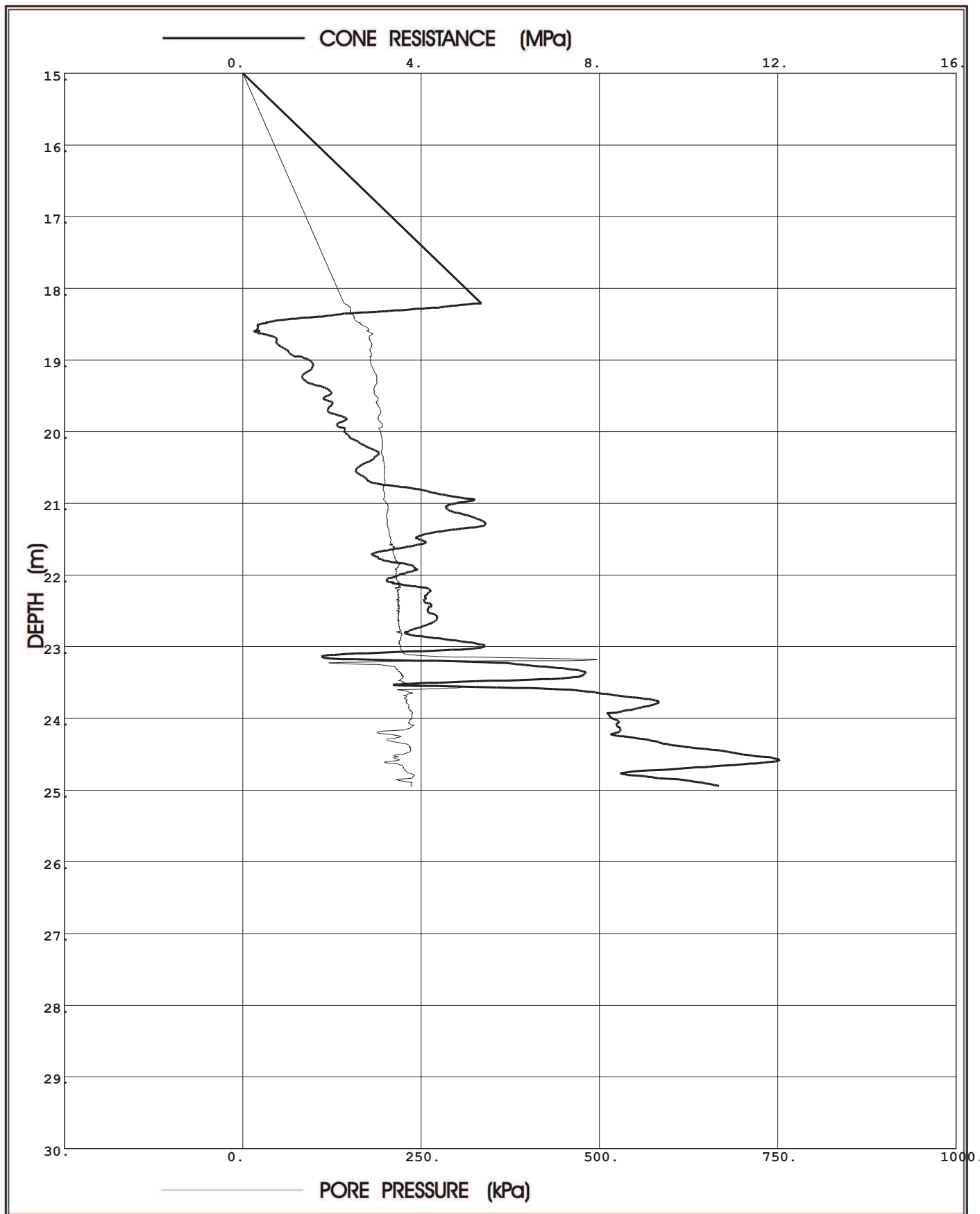
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 41

DATE: 2012/09/10

Page:2



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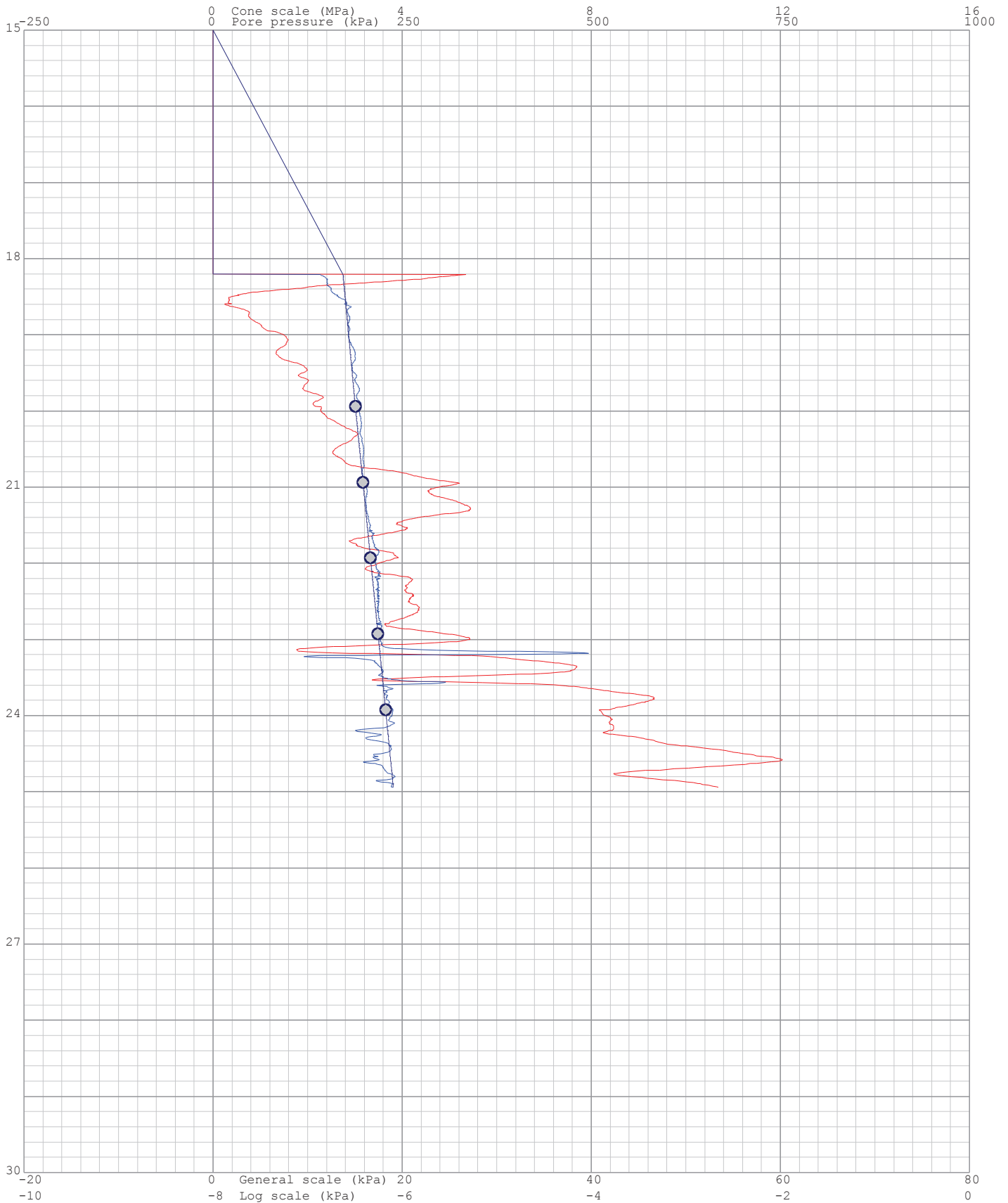
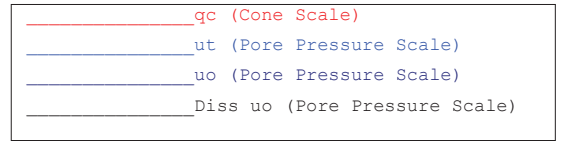
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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 41  
Date: 2012/09/10





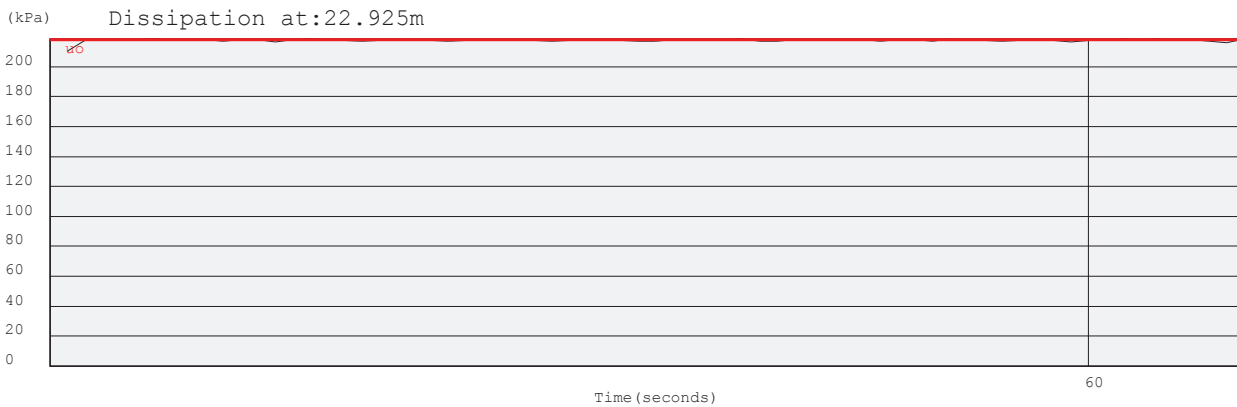
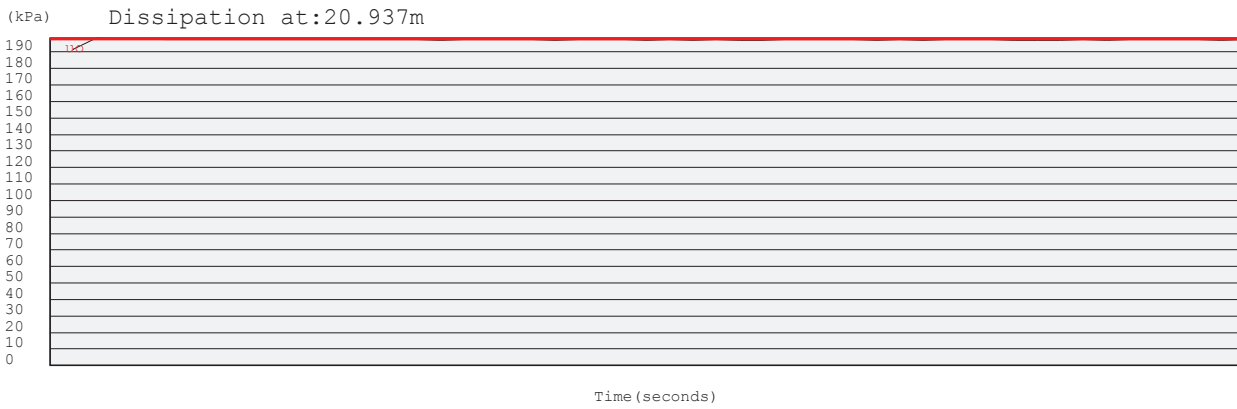
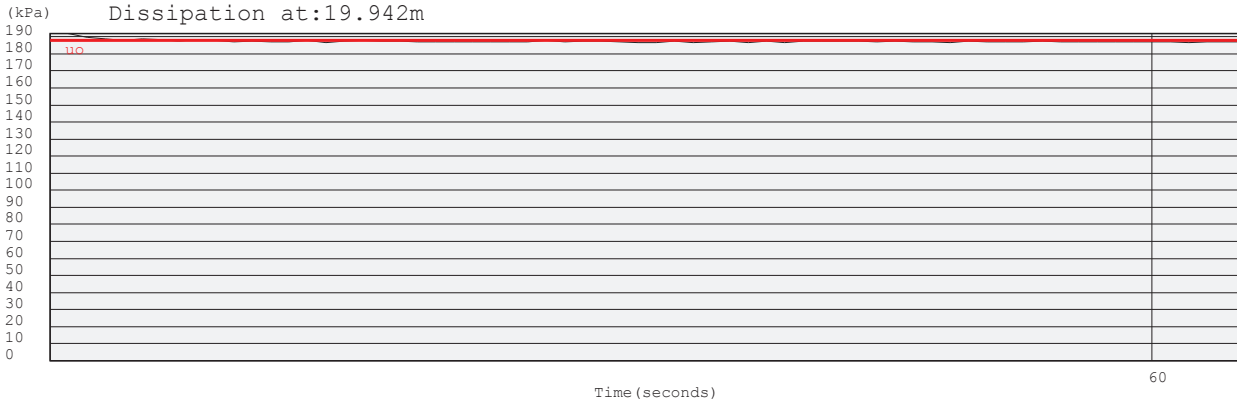
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 41

Date: 2012/09/10

Page: 1



Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 41

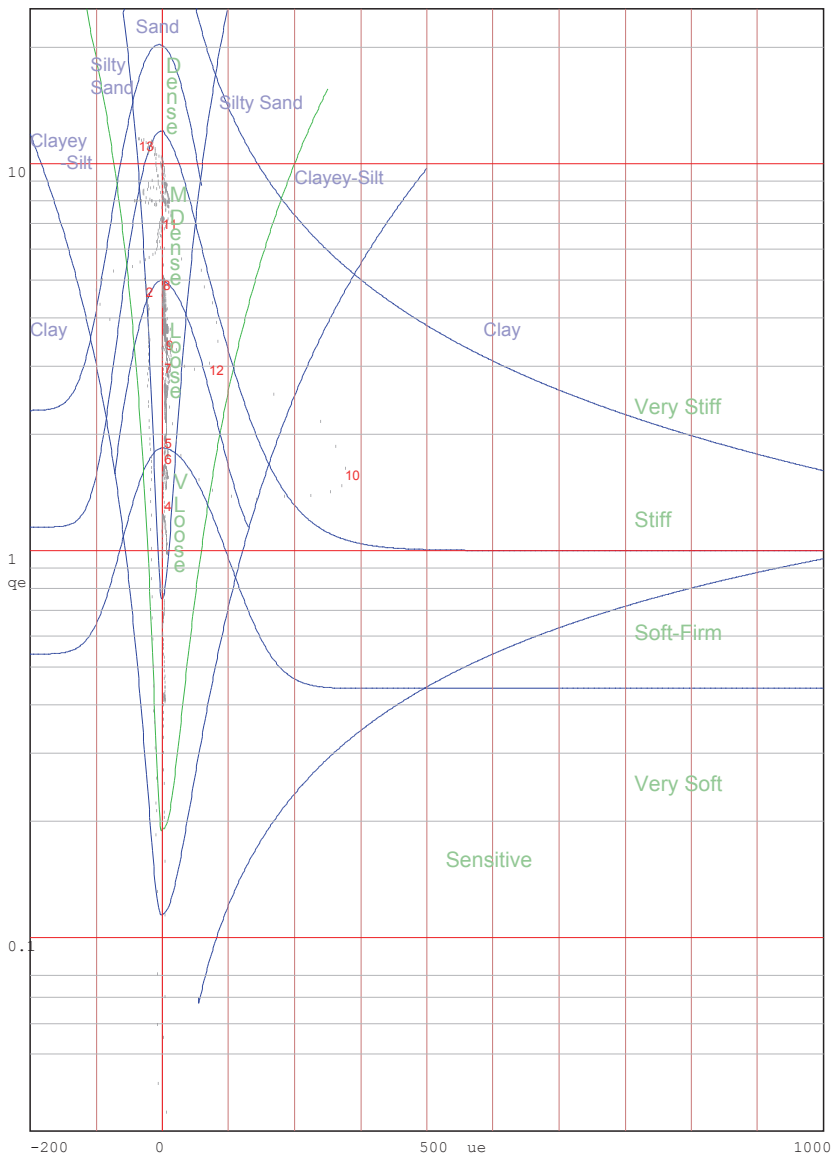
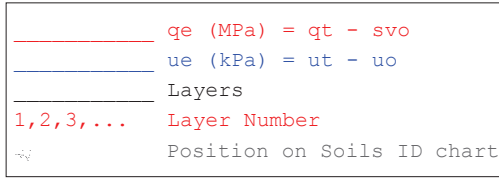
Date: 2012/09/10

Page: 2

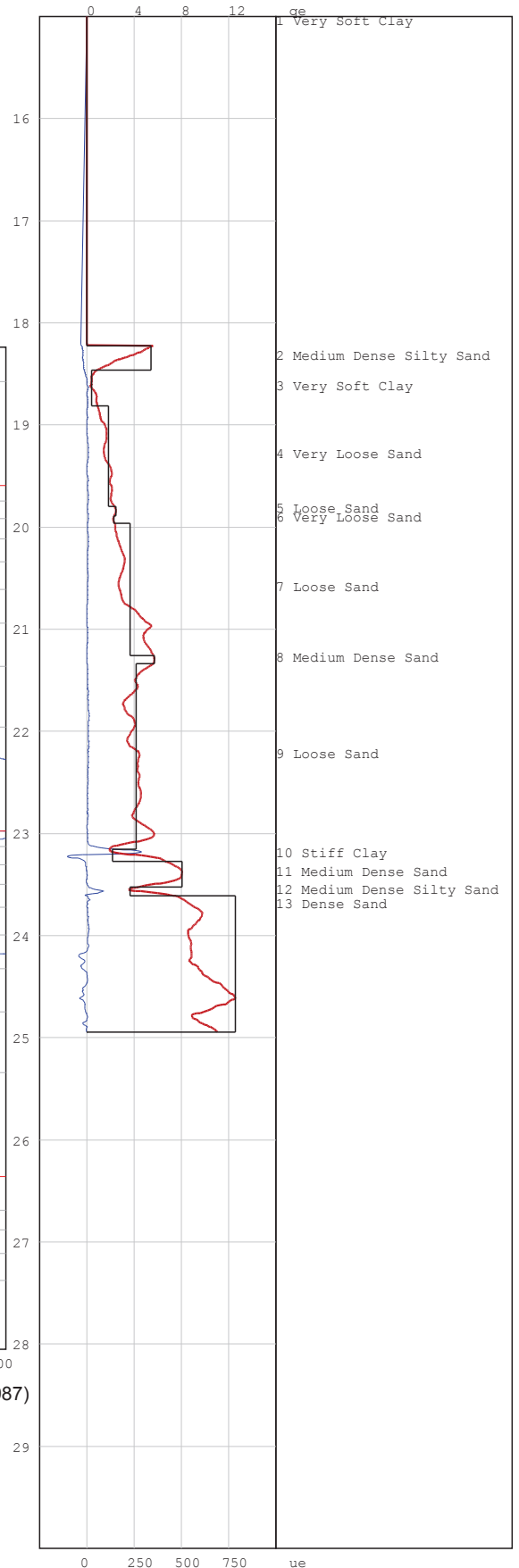
(kPa) Dissipation at: 23.92m



Time (seconds)



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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0044

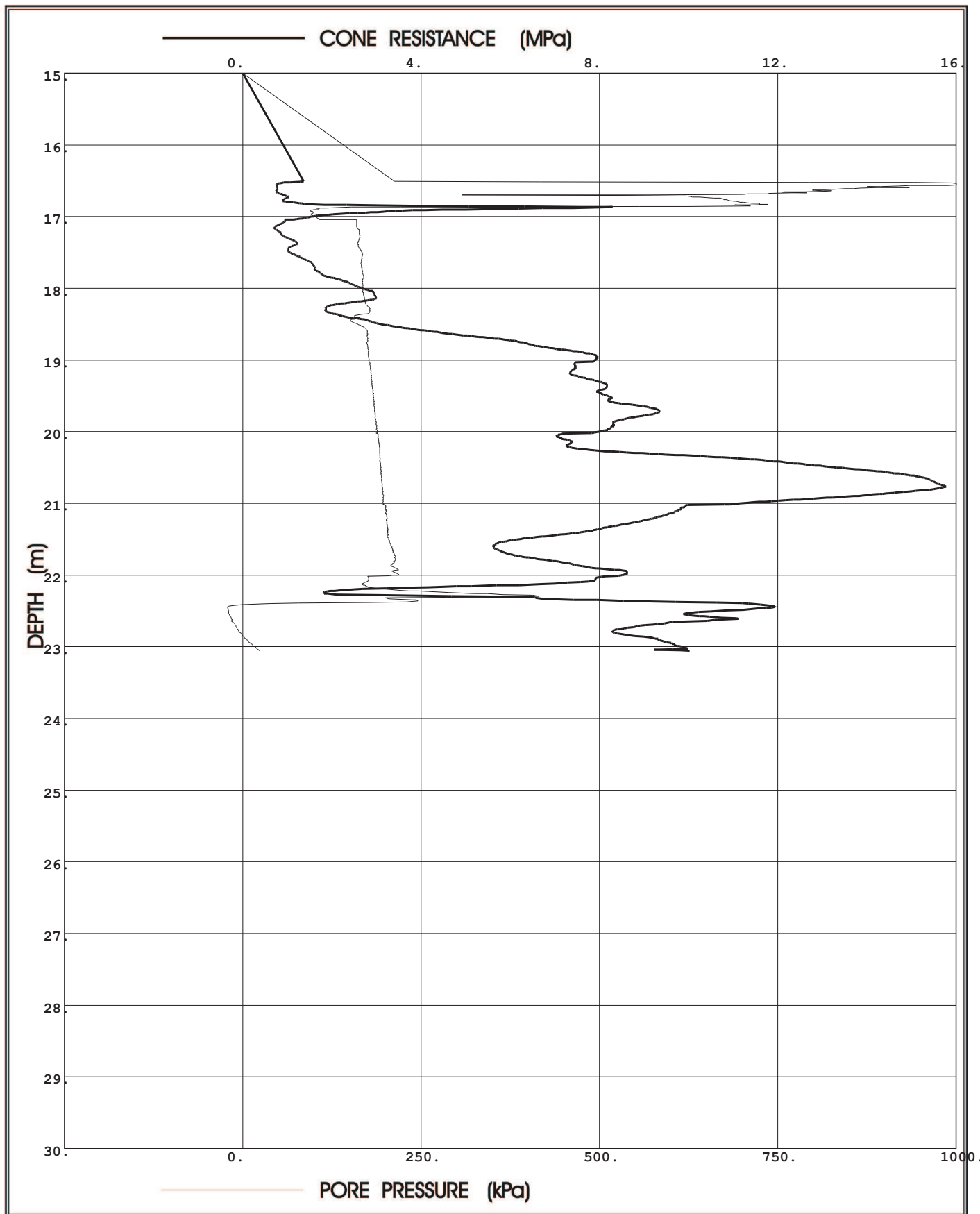
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 42

DATE: 2012/09/16

Page:2



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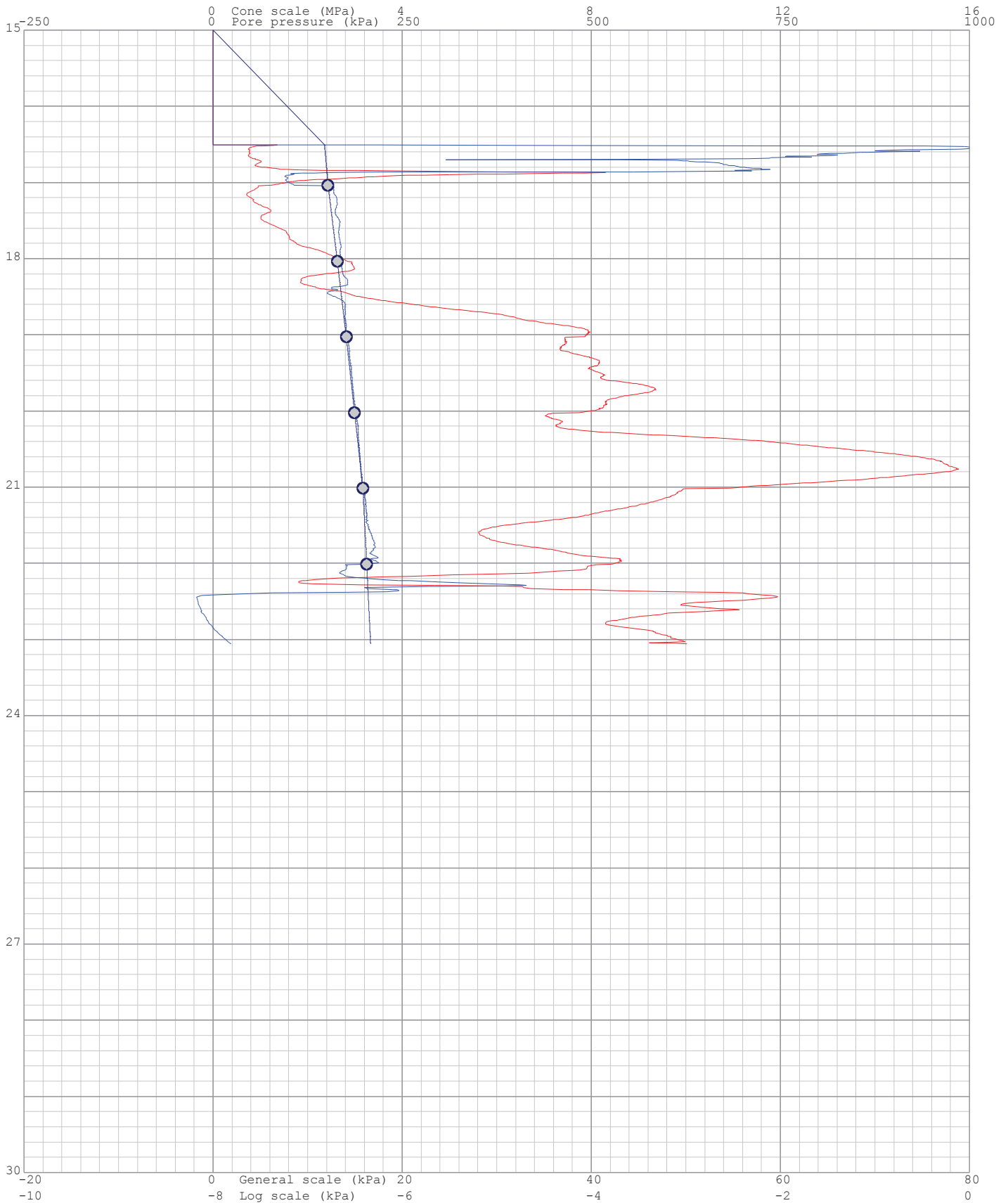
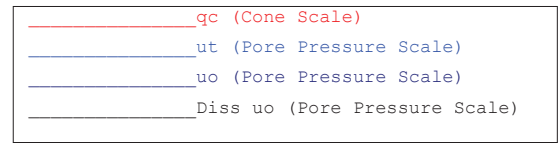
Fax: 012 420 4940

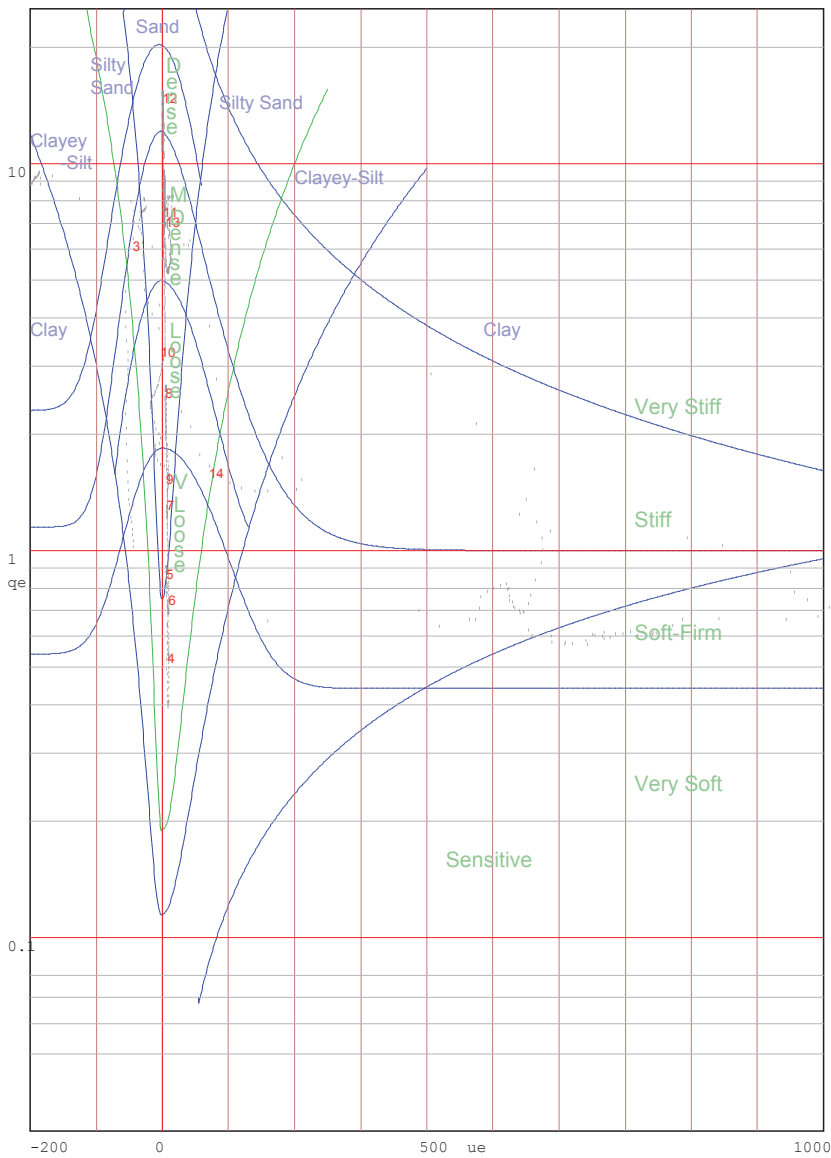
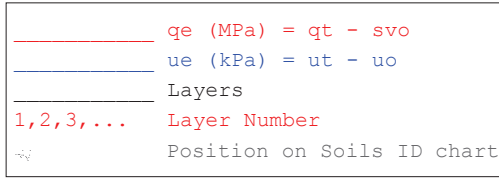
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

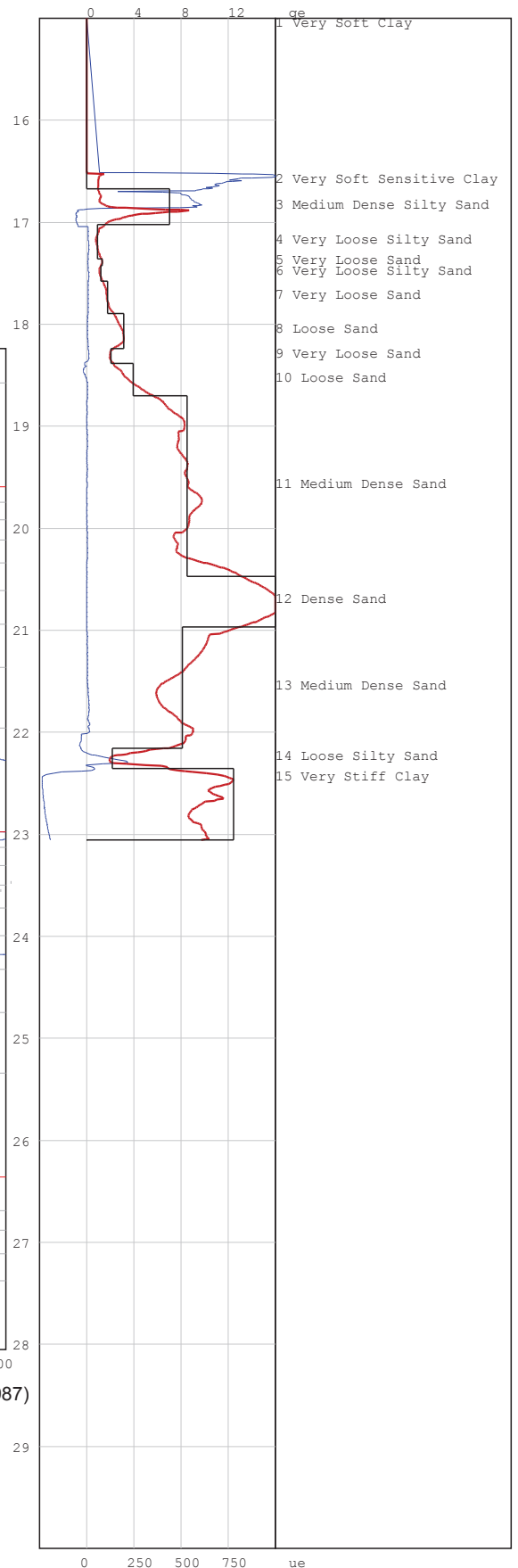
Site: Durban Harbour over water

Hole No: S 42  
Date: 2012/09/16





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

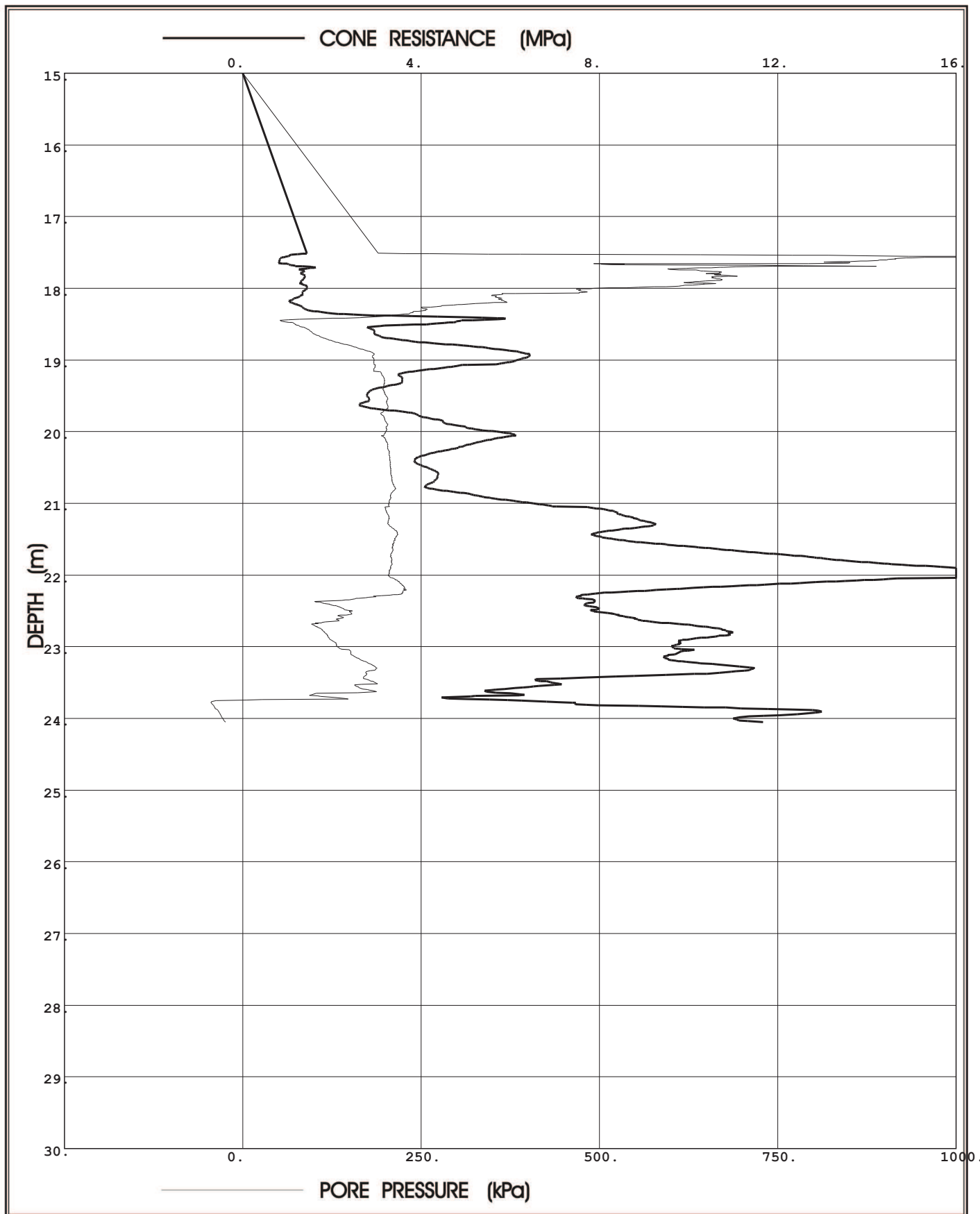
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 43

DATE: 2012/09/11

Page:2



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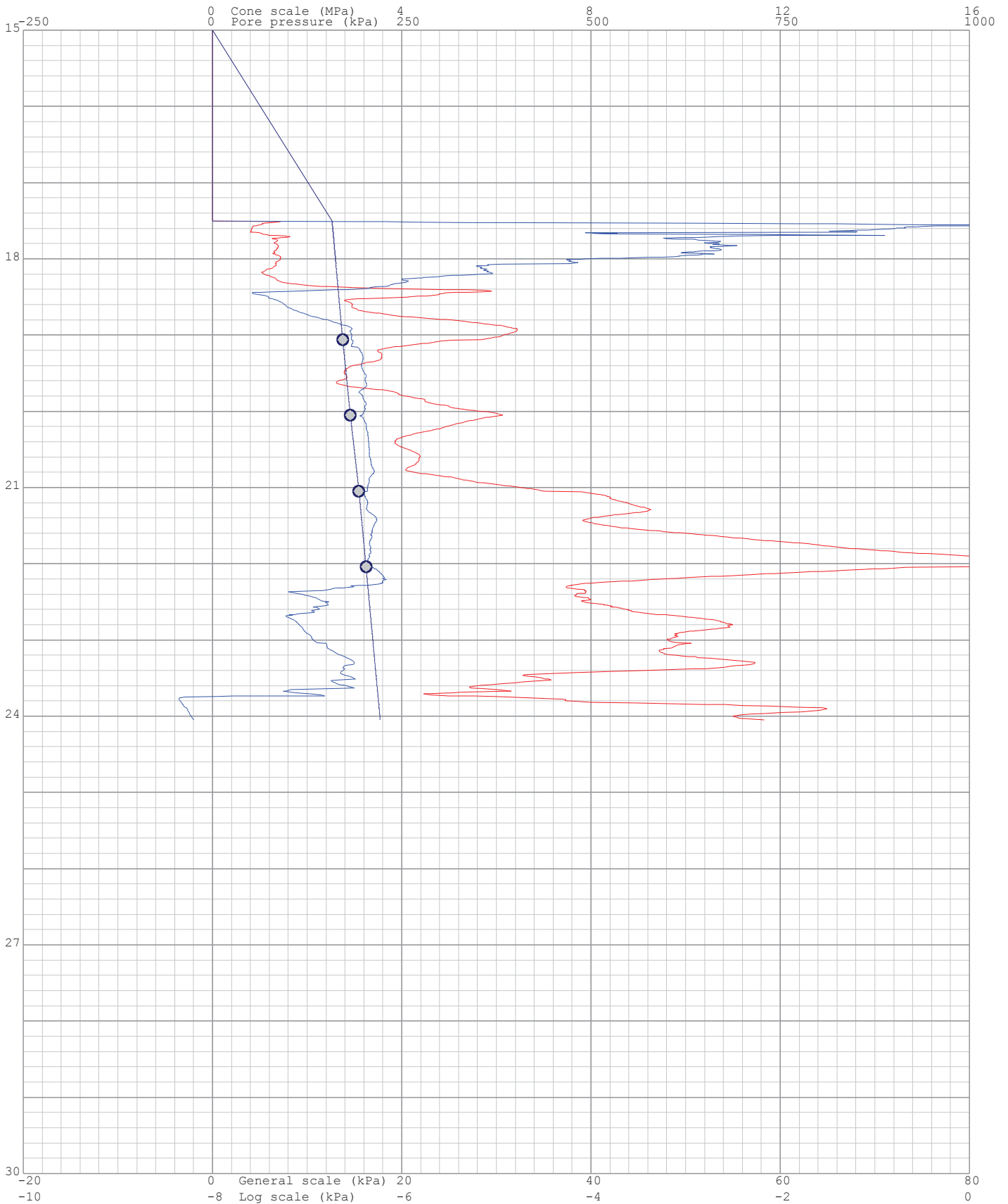
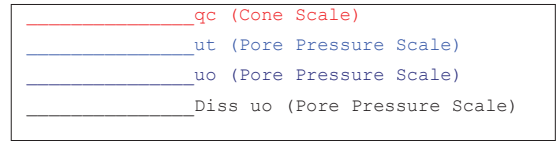
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 43  
Date: 2012/09/11





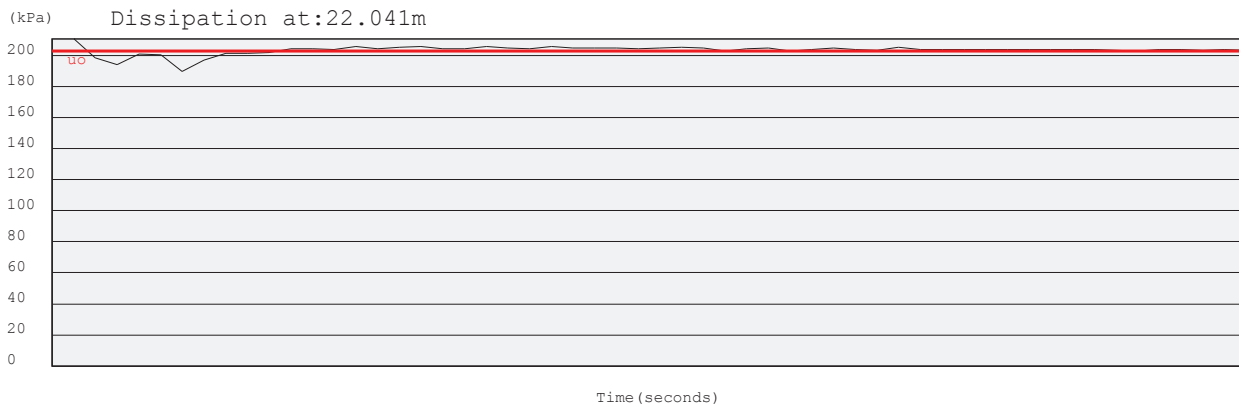
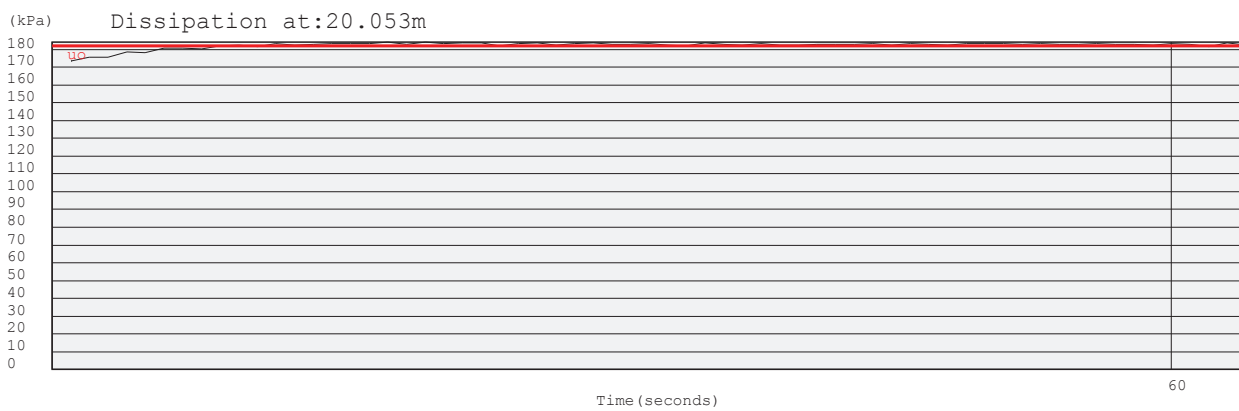
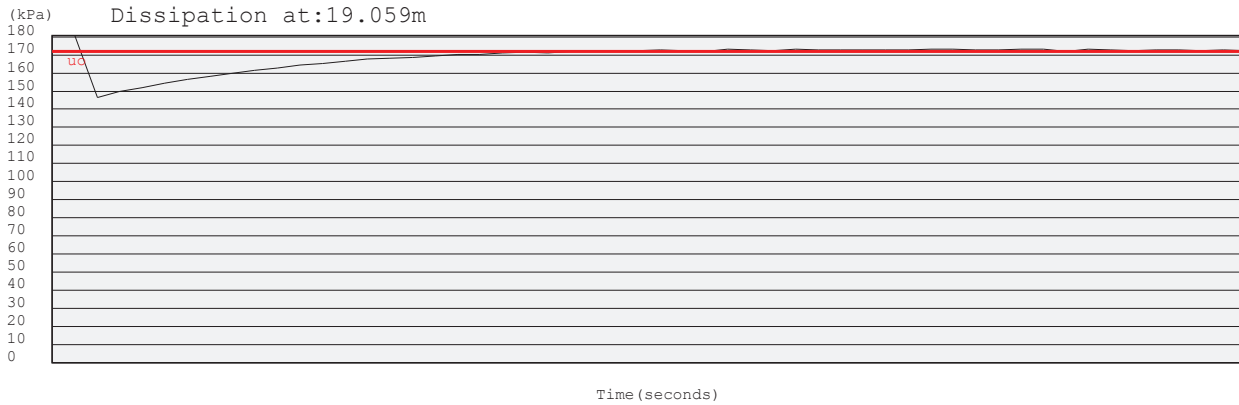
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 43

Date: 2012/09/11

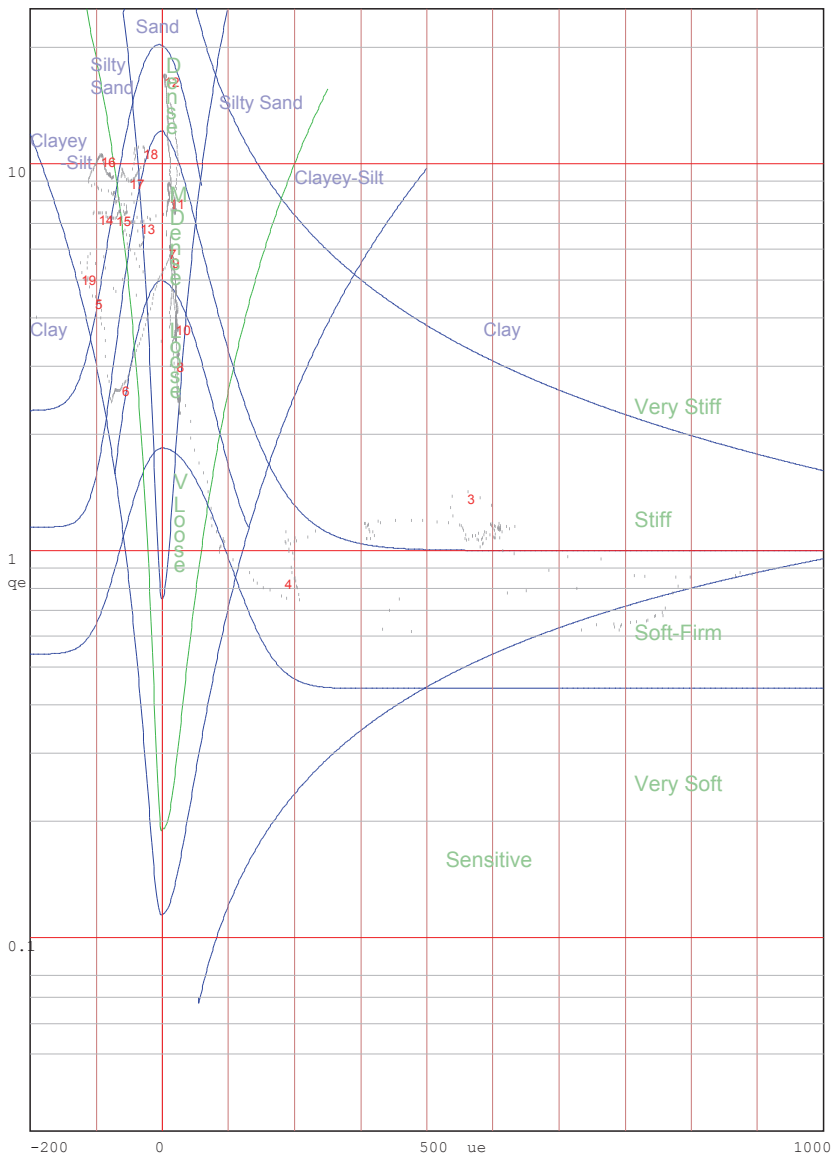
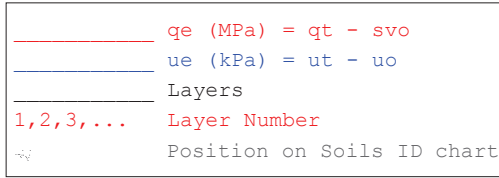
Page: 1



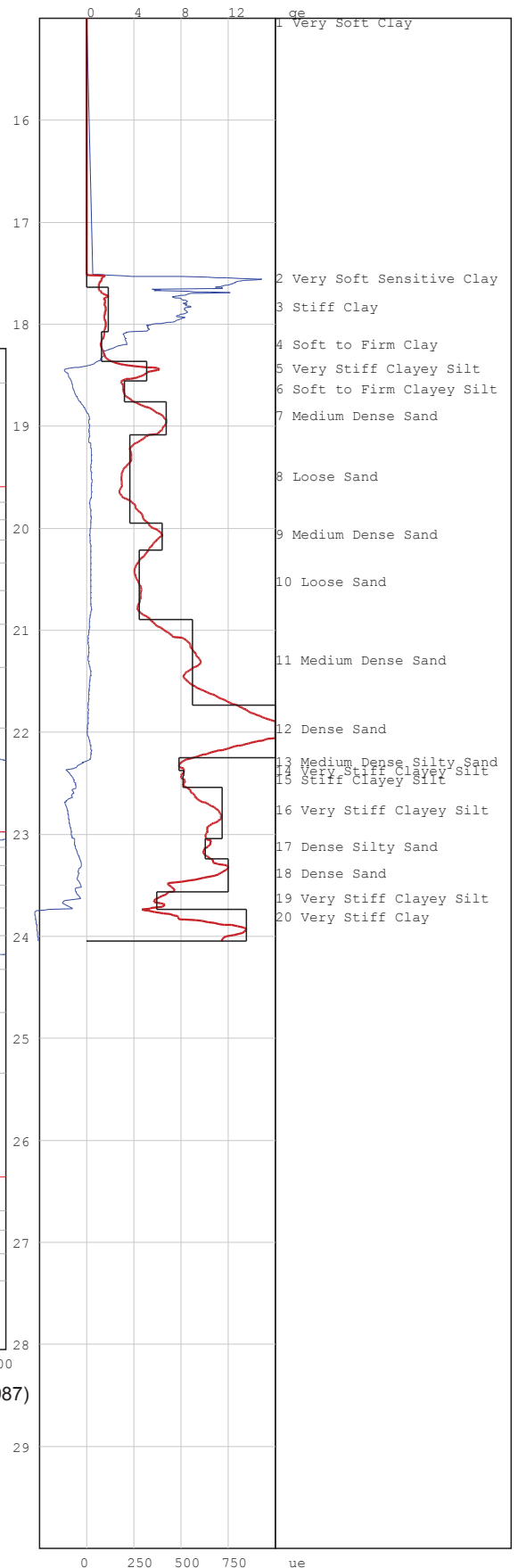
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 43  
Date: 2012/09/11



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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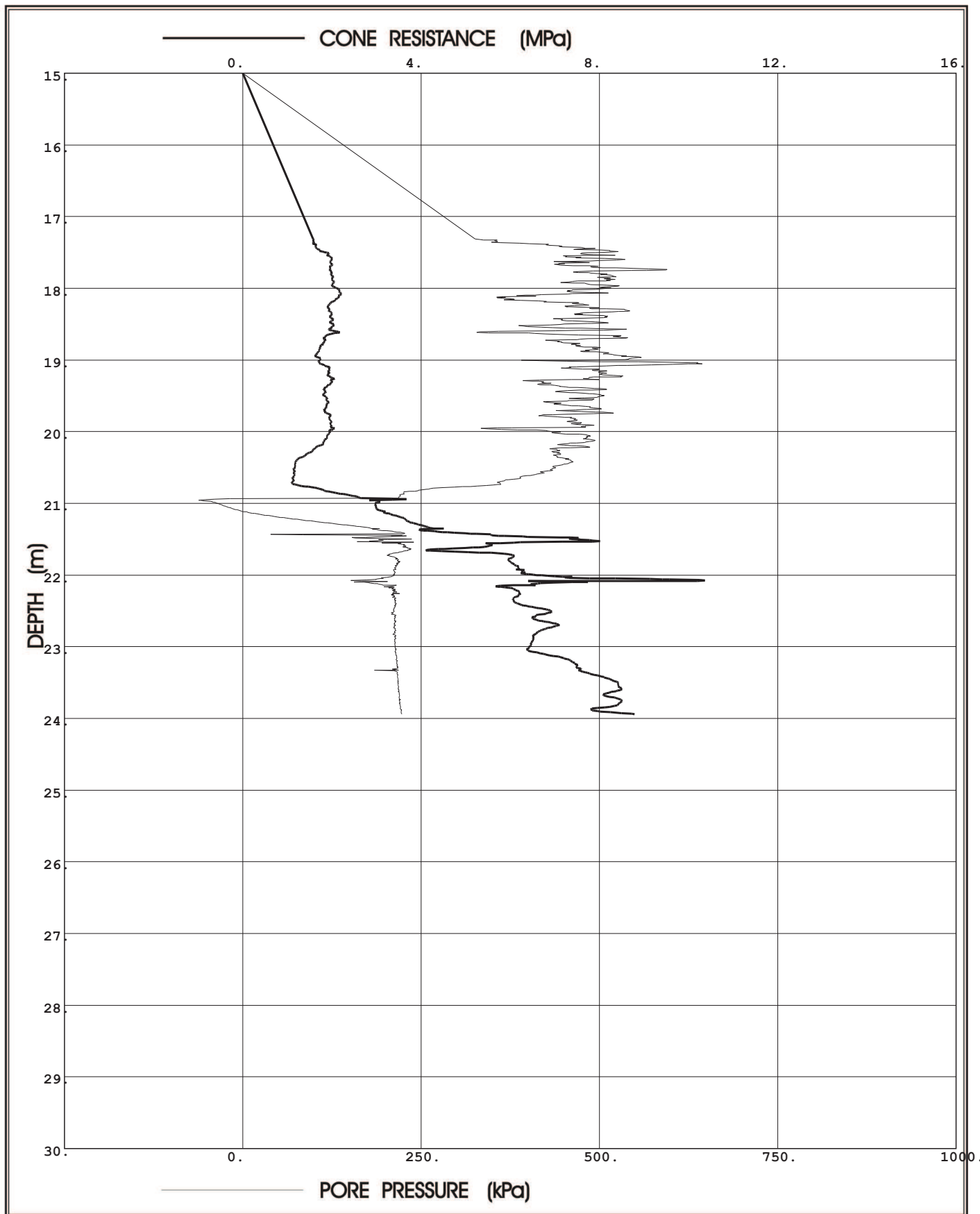
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 44

DATE: 2012/09/09

Page:2



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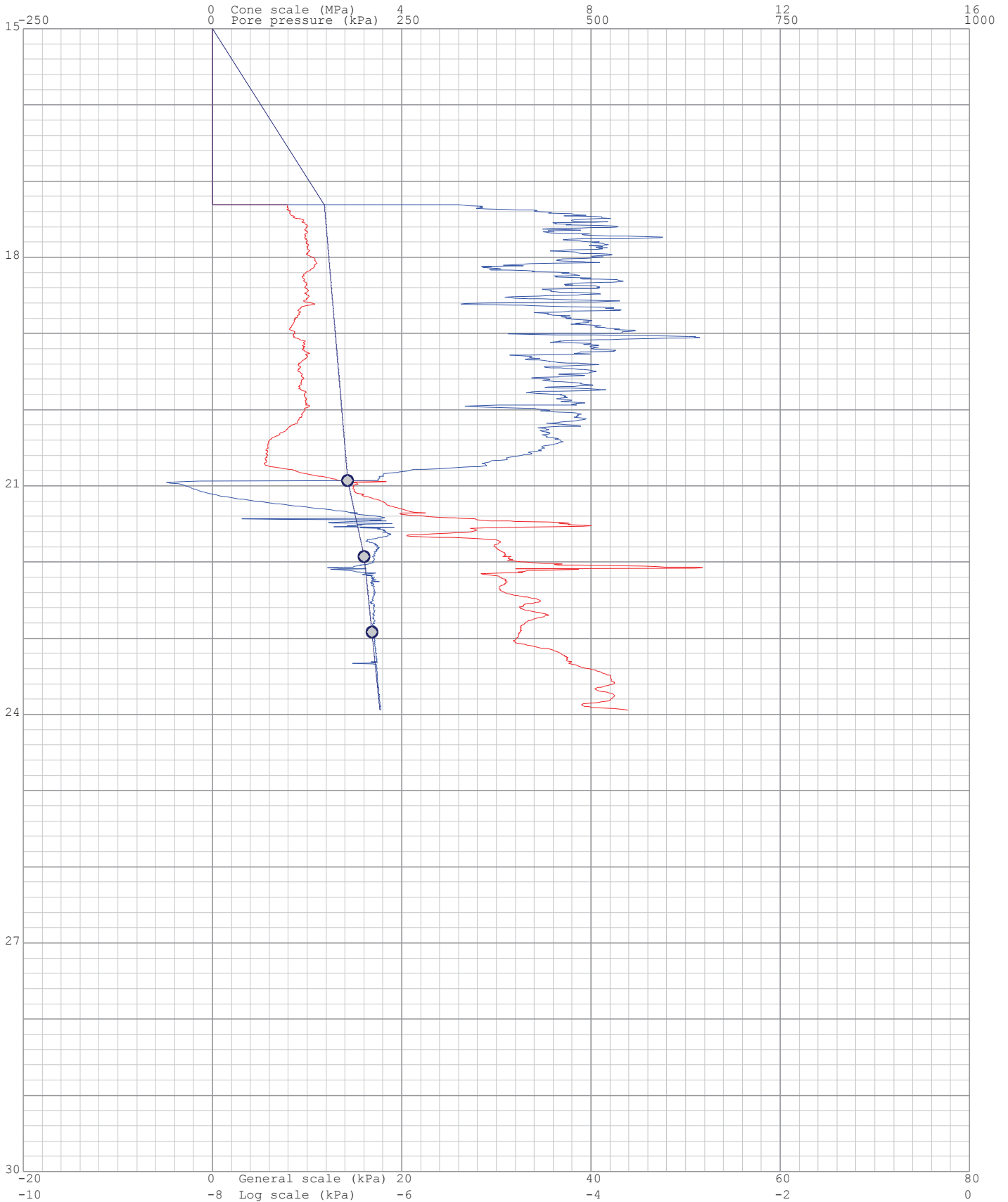
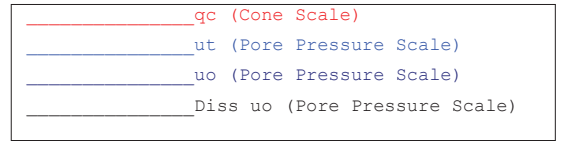
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 44

Date: 2012/09/09



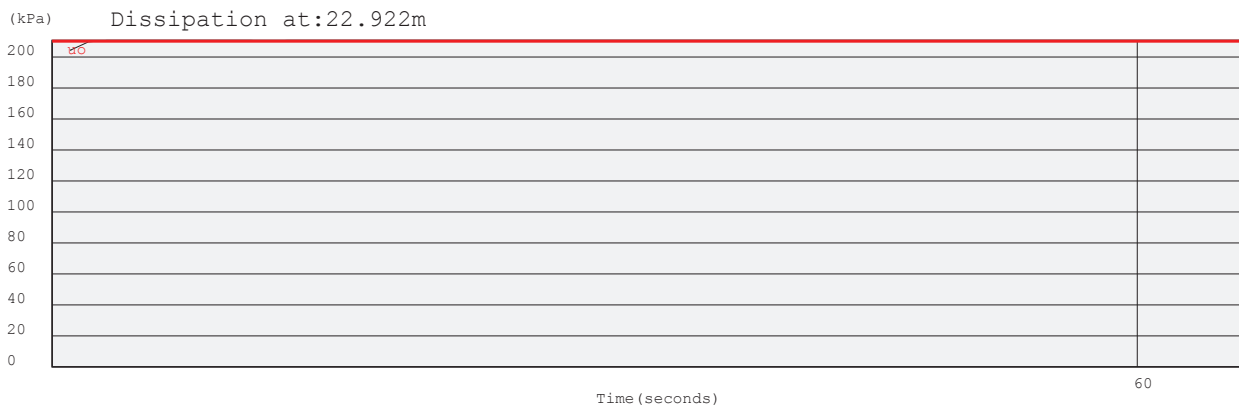
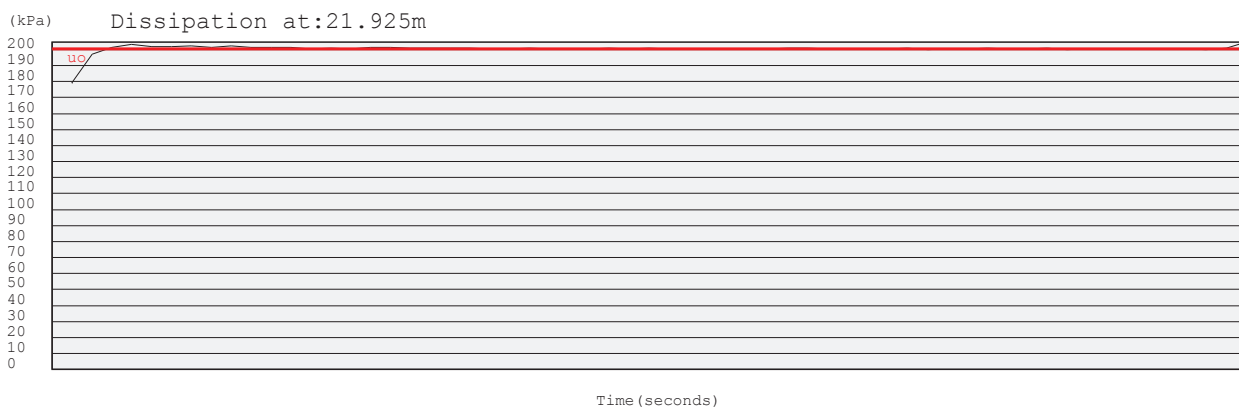
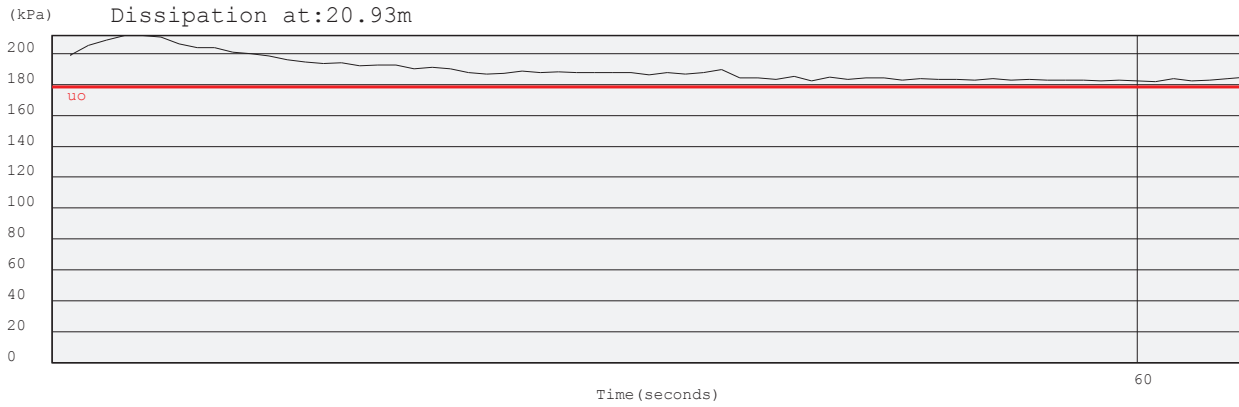
Project: Durban Harbour Piezocone Investigation for Dredging

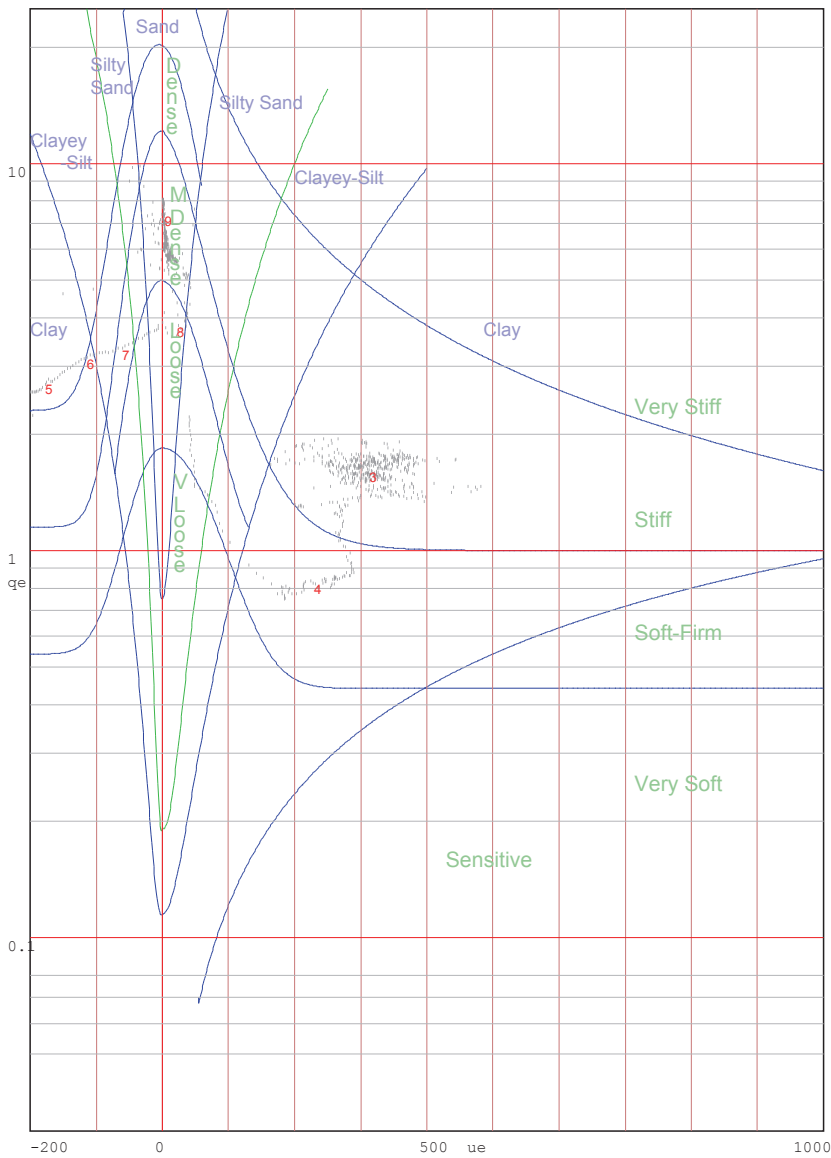
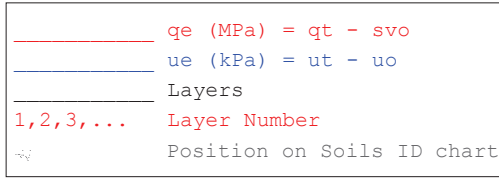
Site: Durban Harbour over water

Hole: S 44

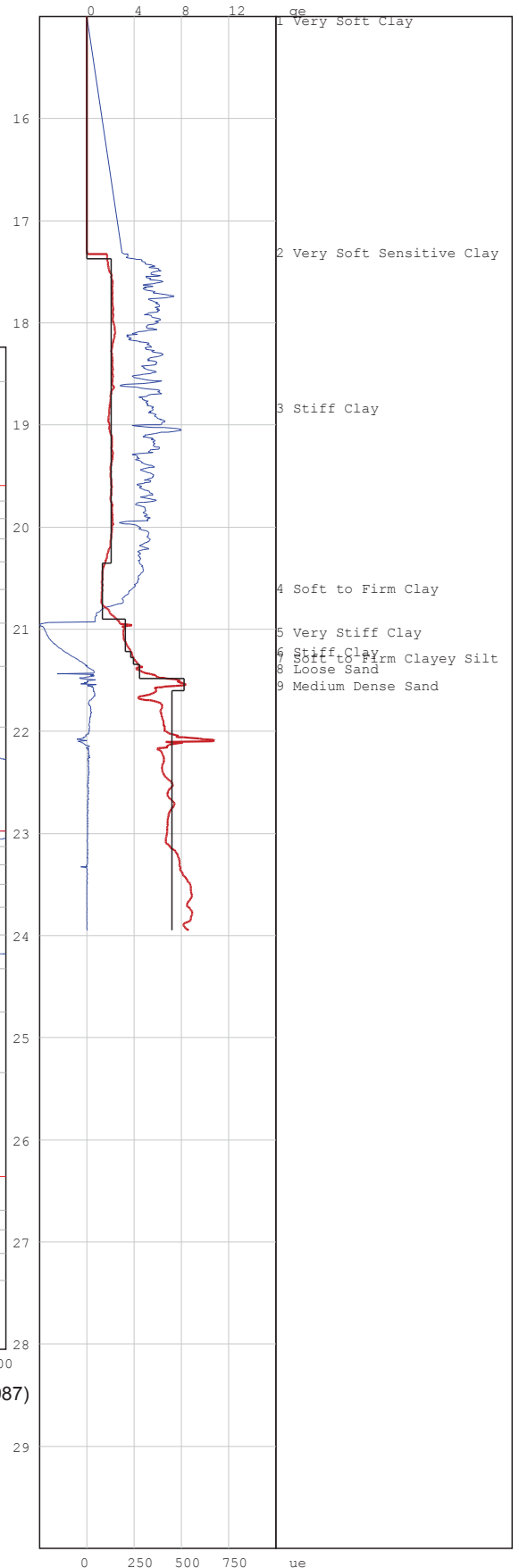
Date: 2012/09/09

Page: 1





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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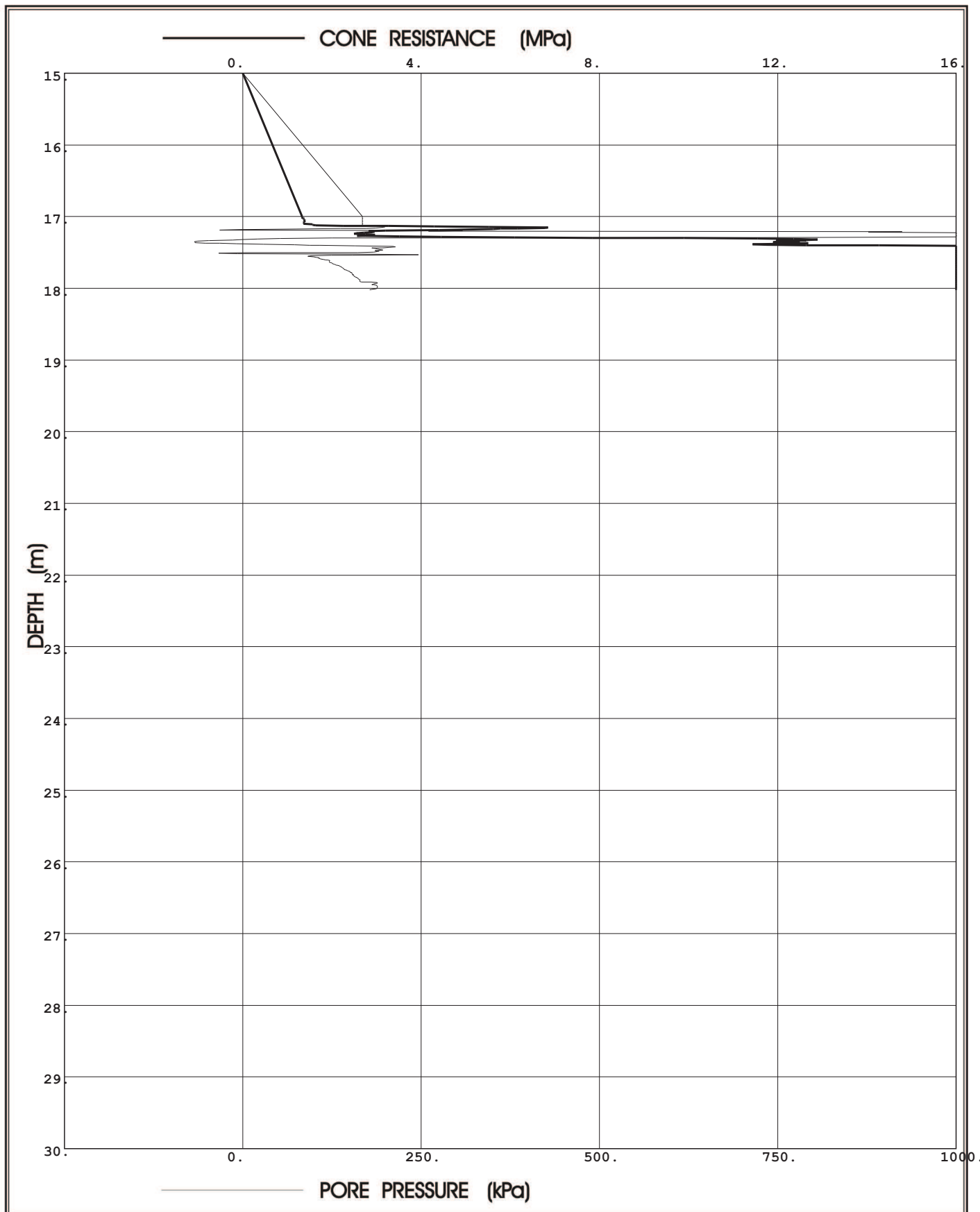
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 45

DATE: 2012/09/09

Page:2



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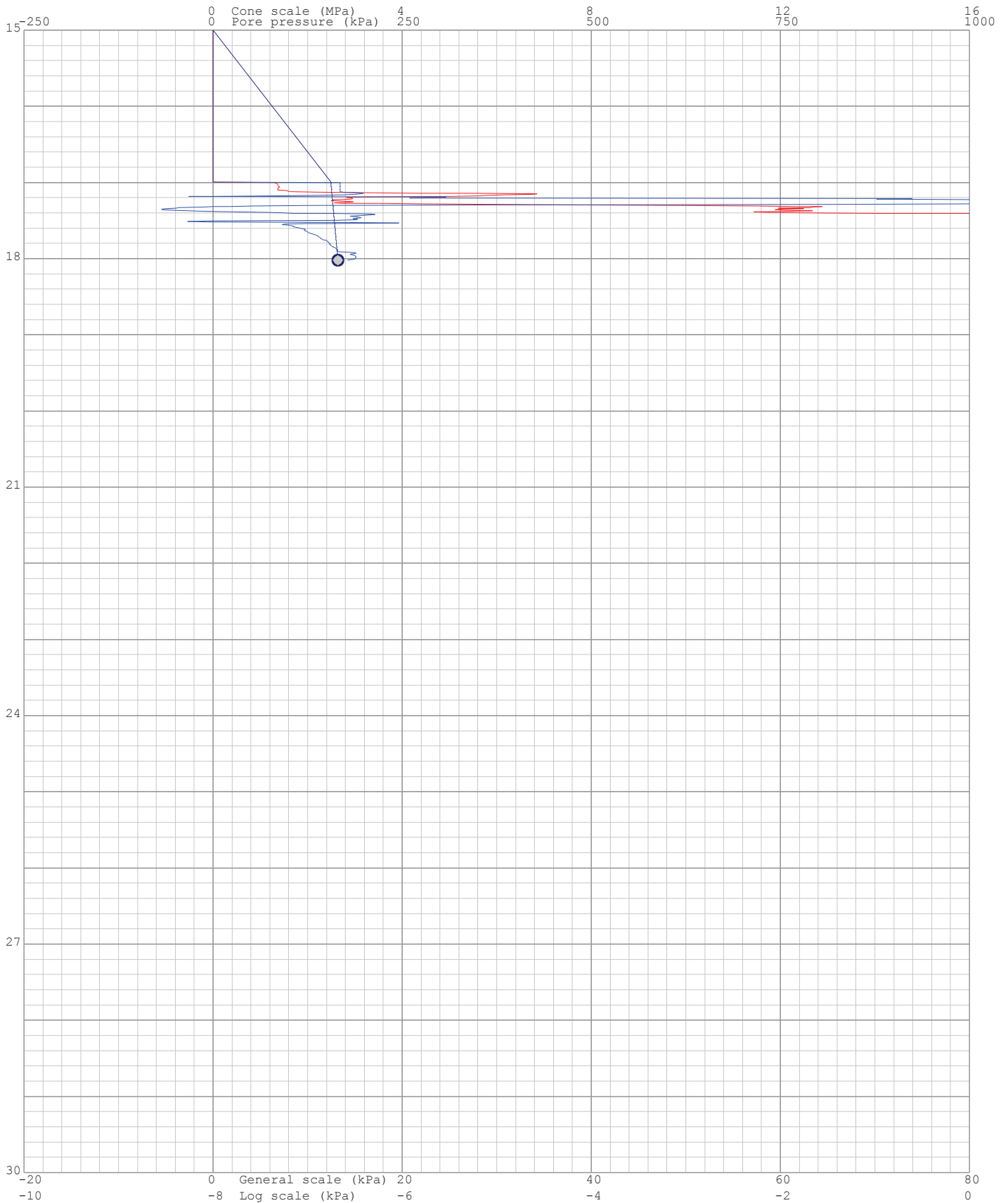
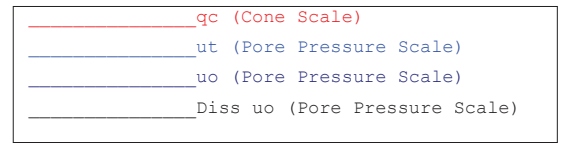
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 45

Date: 2012/09/09





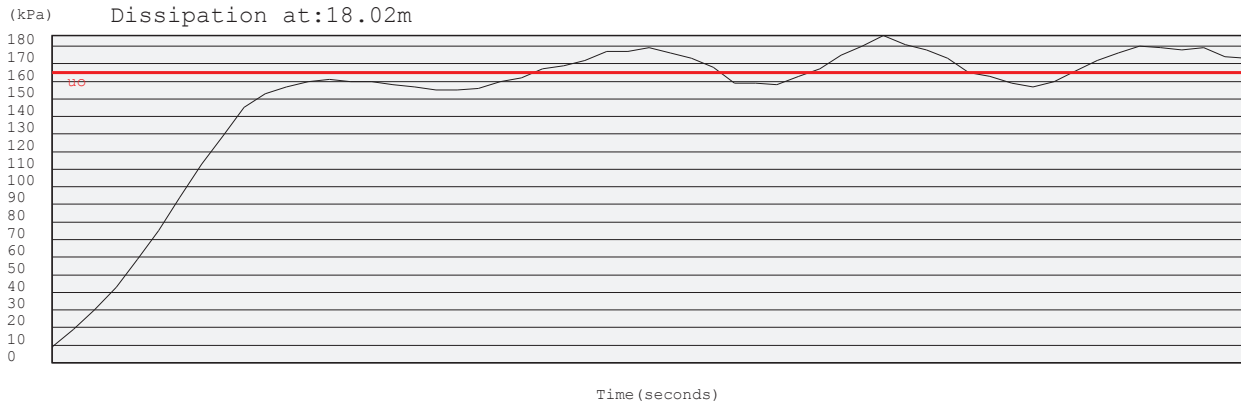
Project: Durban Harbour Piezocone Investigation for Dredging

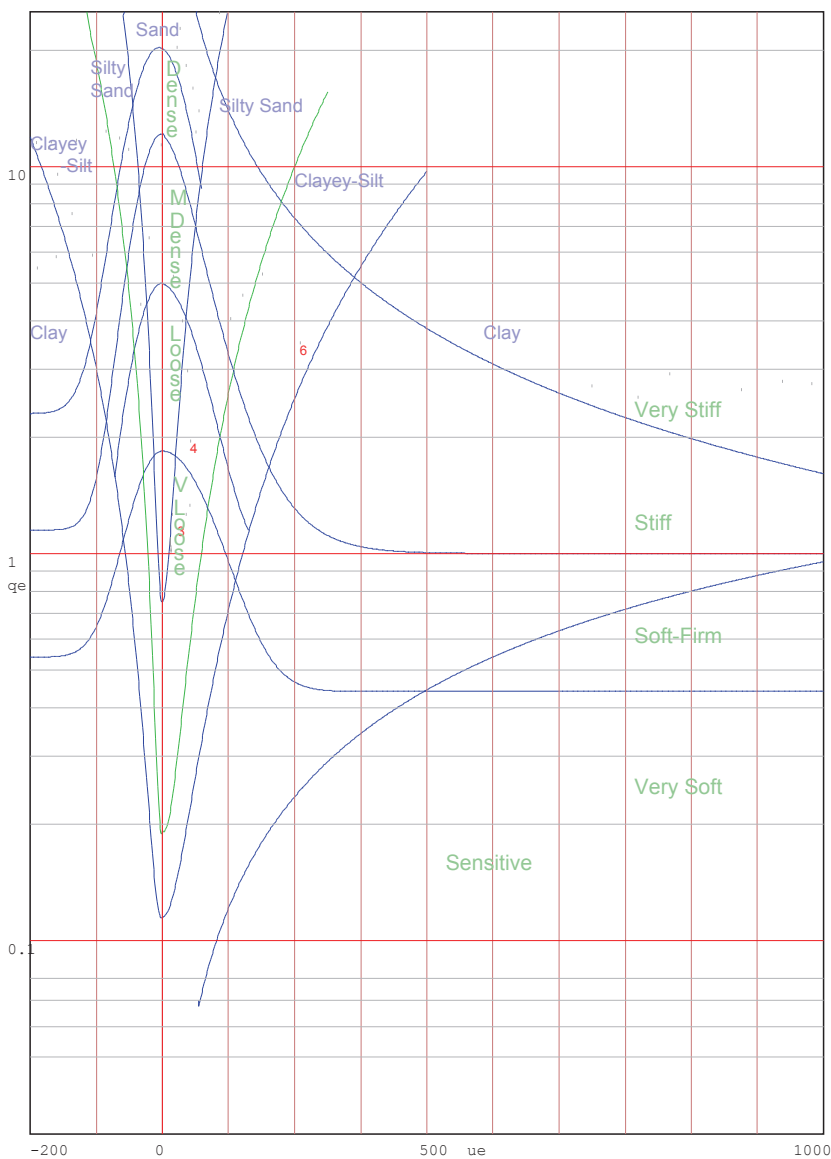
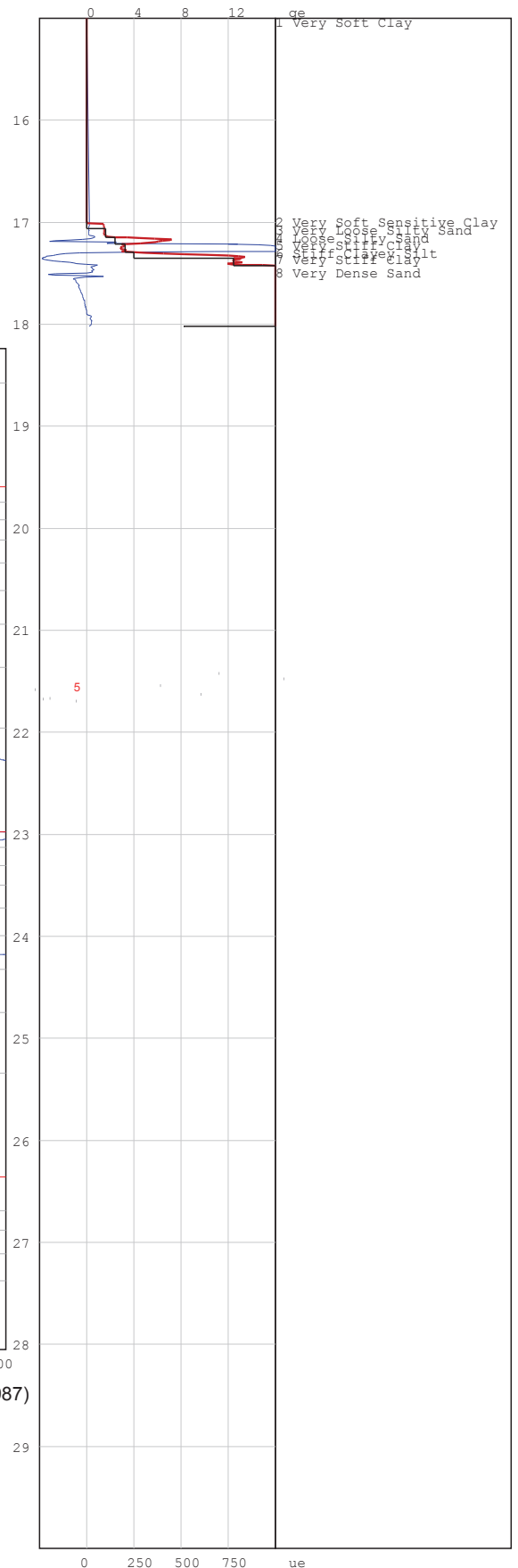
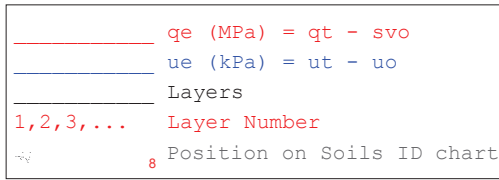
Site: Durban Harbour over water

Hole: S 45

Date: 2012/09/09

Page: 1





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)

# PIEZOCONE PENETRATION TEST



P O Box 39108  
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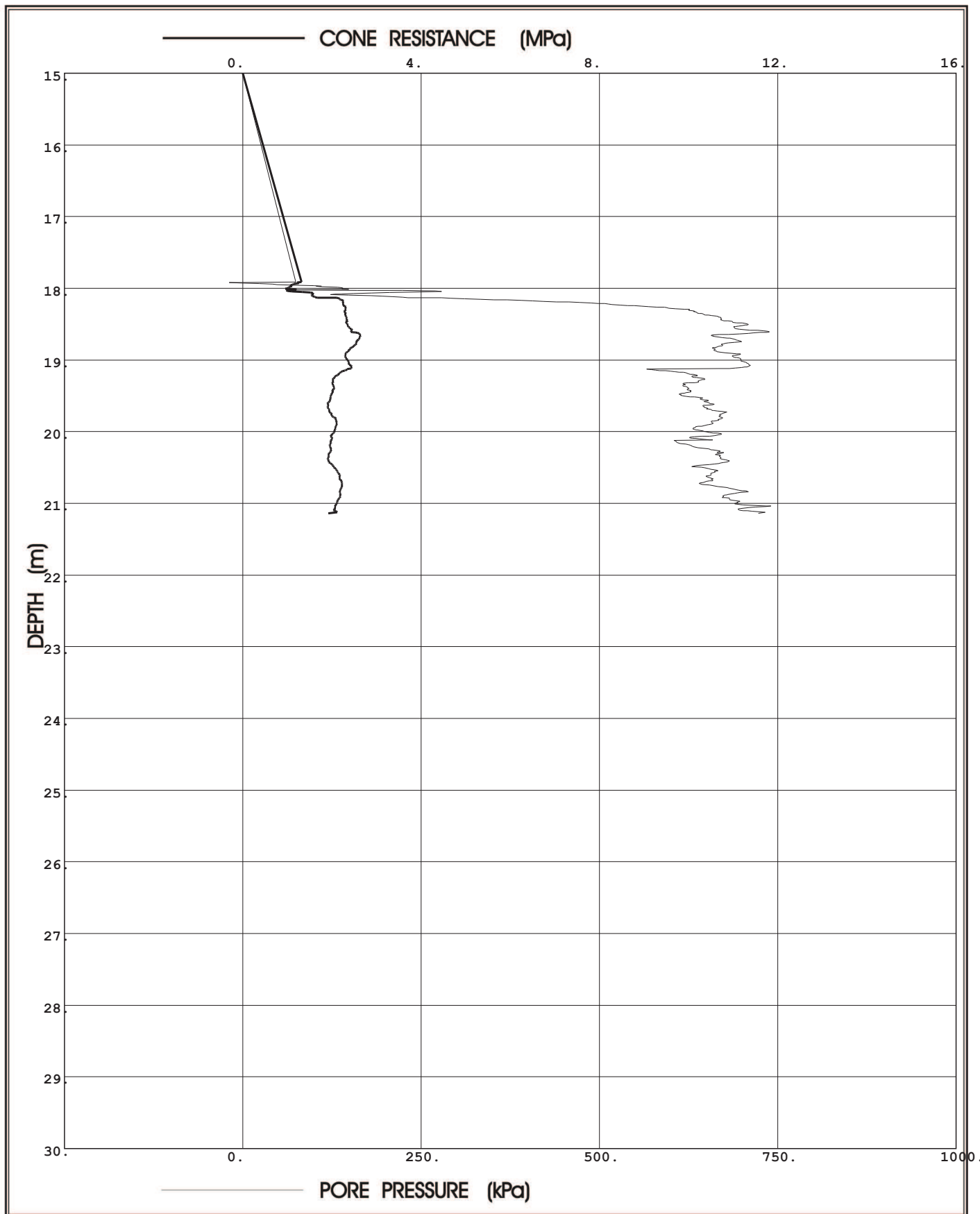
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 46

DATE: 2012/09/21

Page: 2



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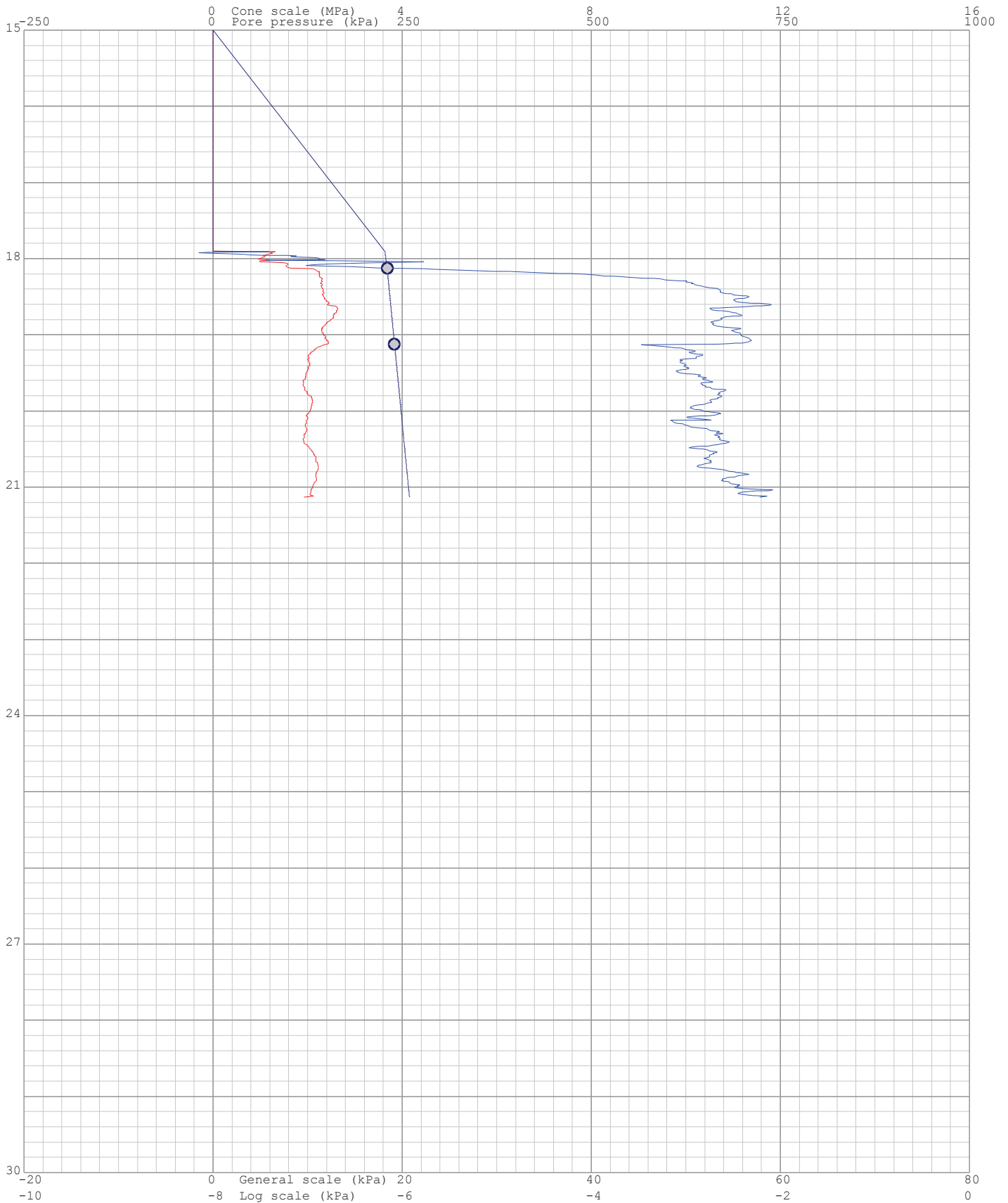
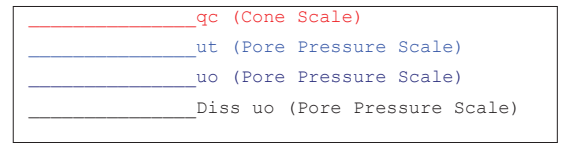
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

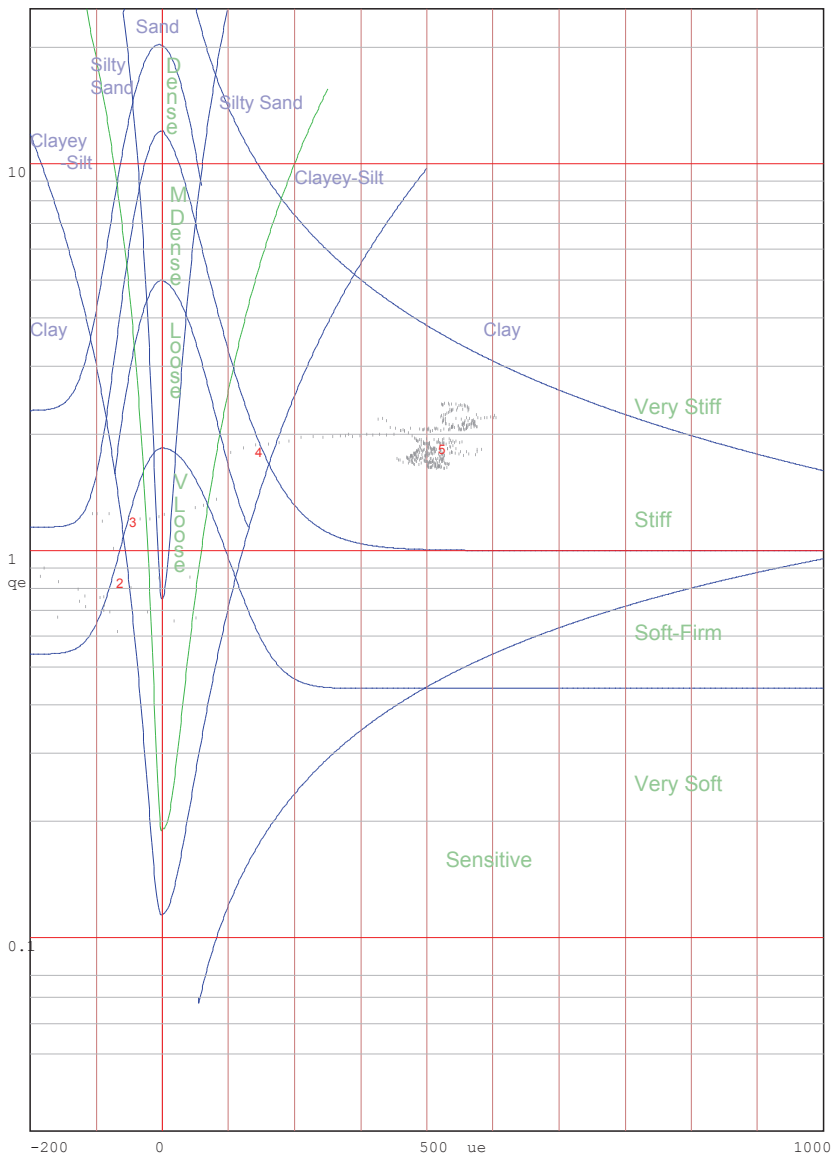
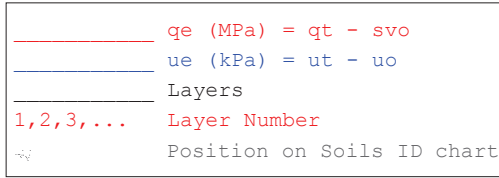
Hole No: S 46  
Date: 2012/09/21



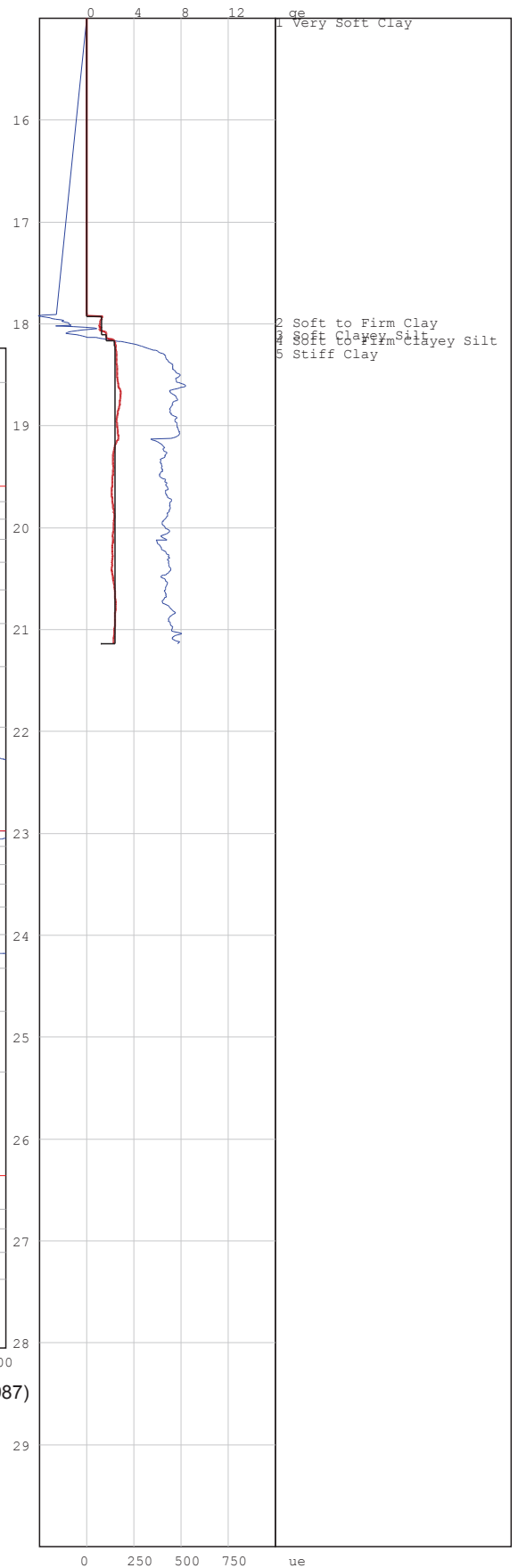
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 46  
Date: 2012/09/21



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

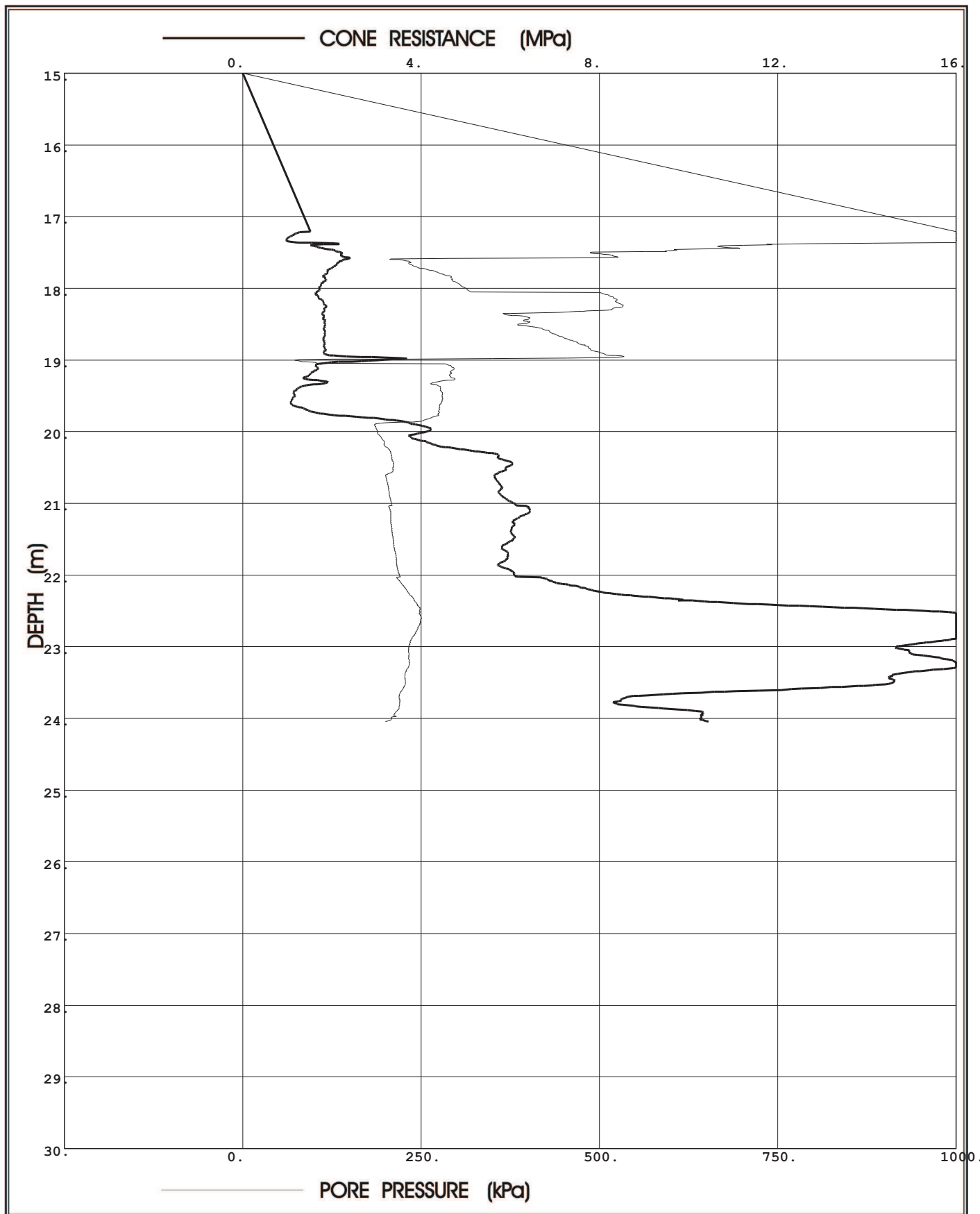
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 47

DATE: 2012/09/25

Page:2



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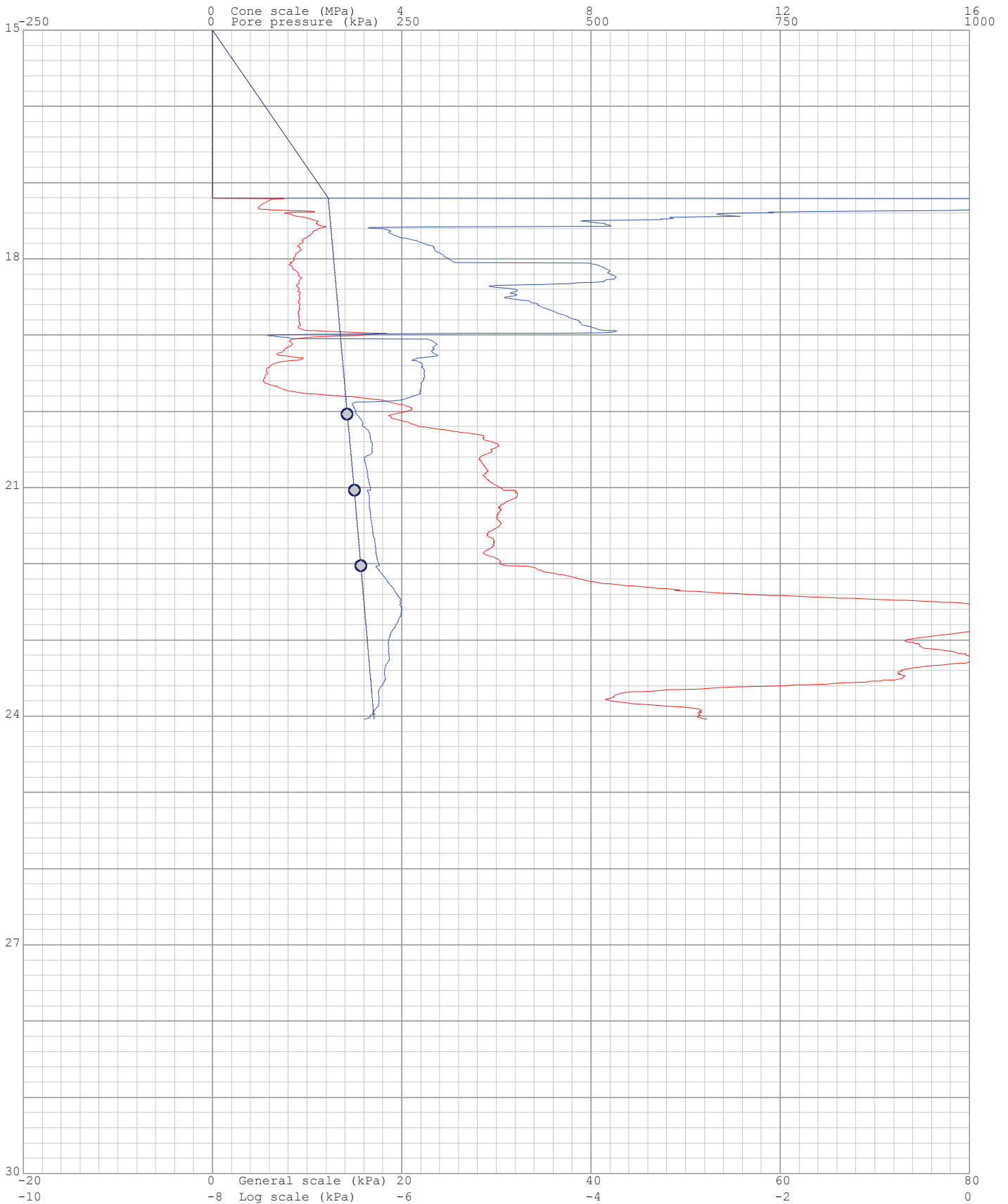
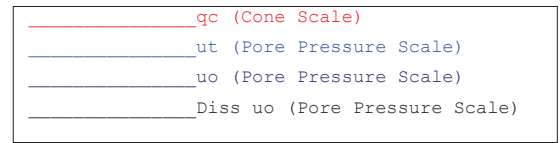
**Jeanne Rust** Information Technology

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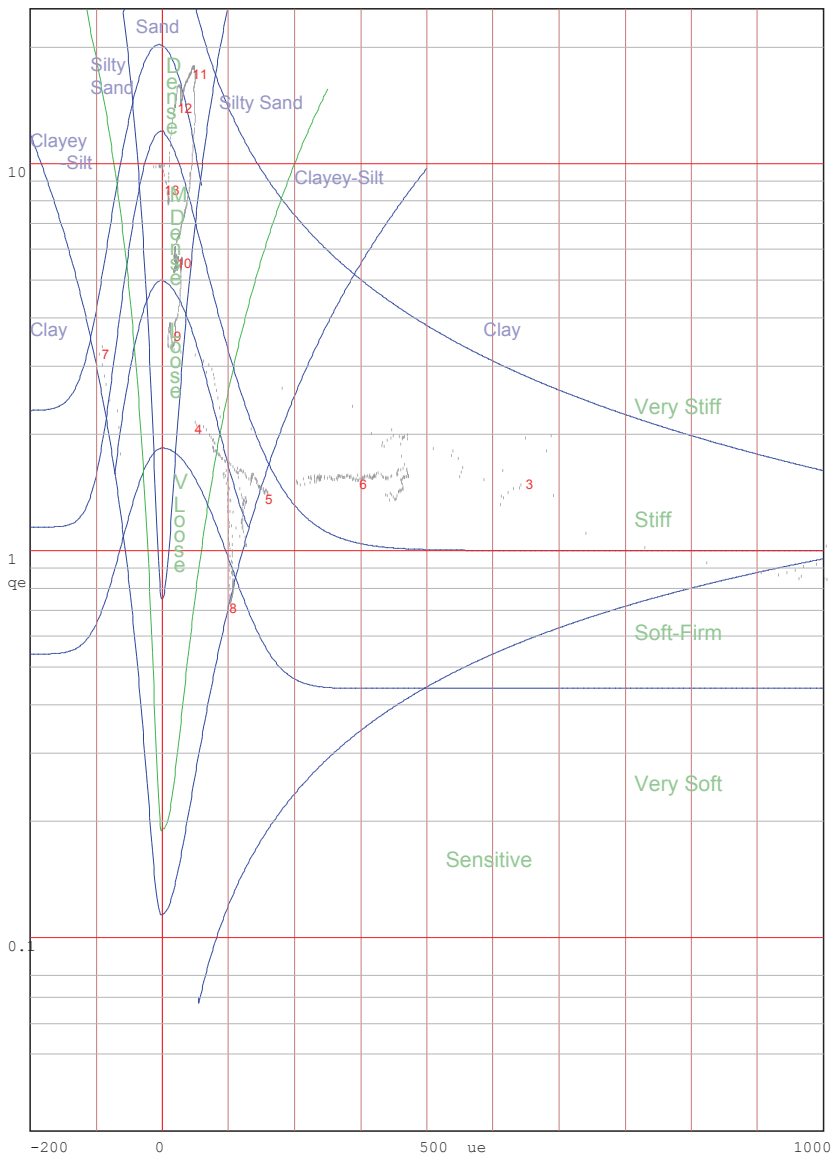
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

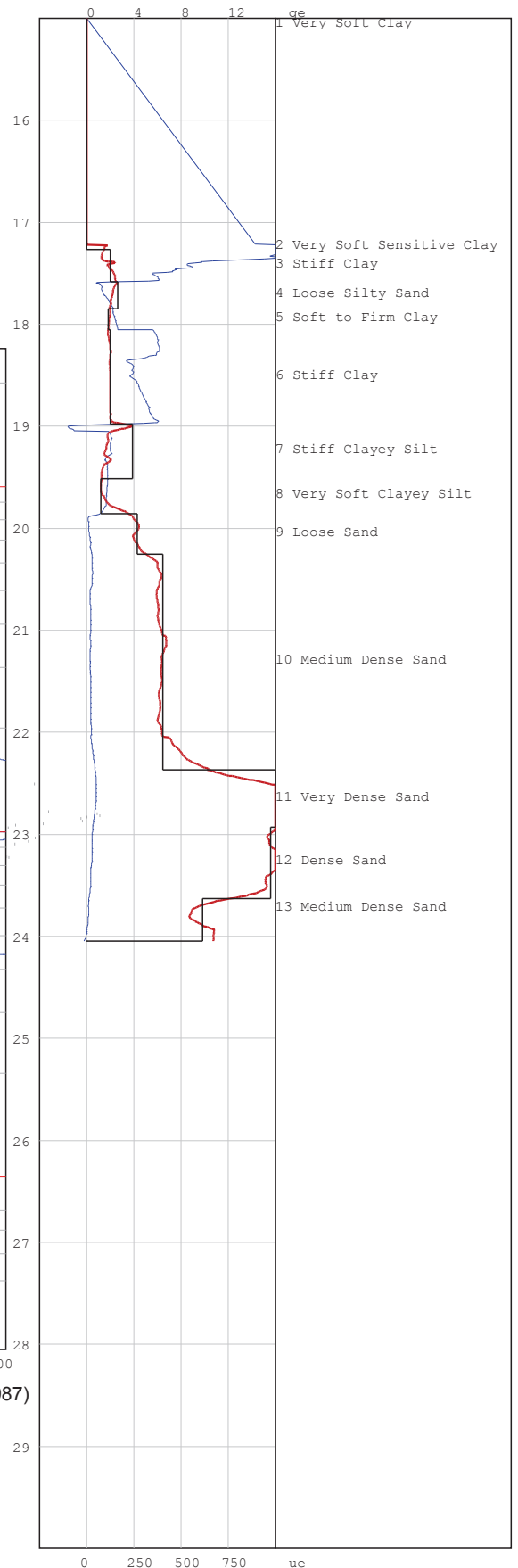
Hole No: S 47  
Date: 2012/09/25



—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 — Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

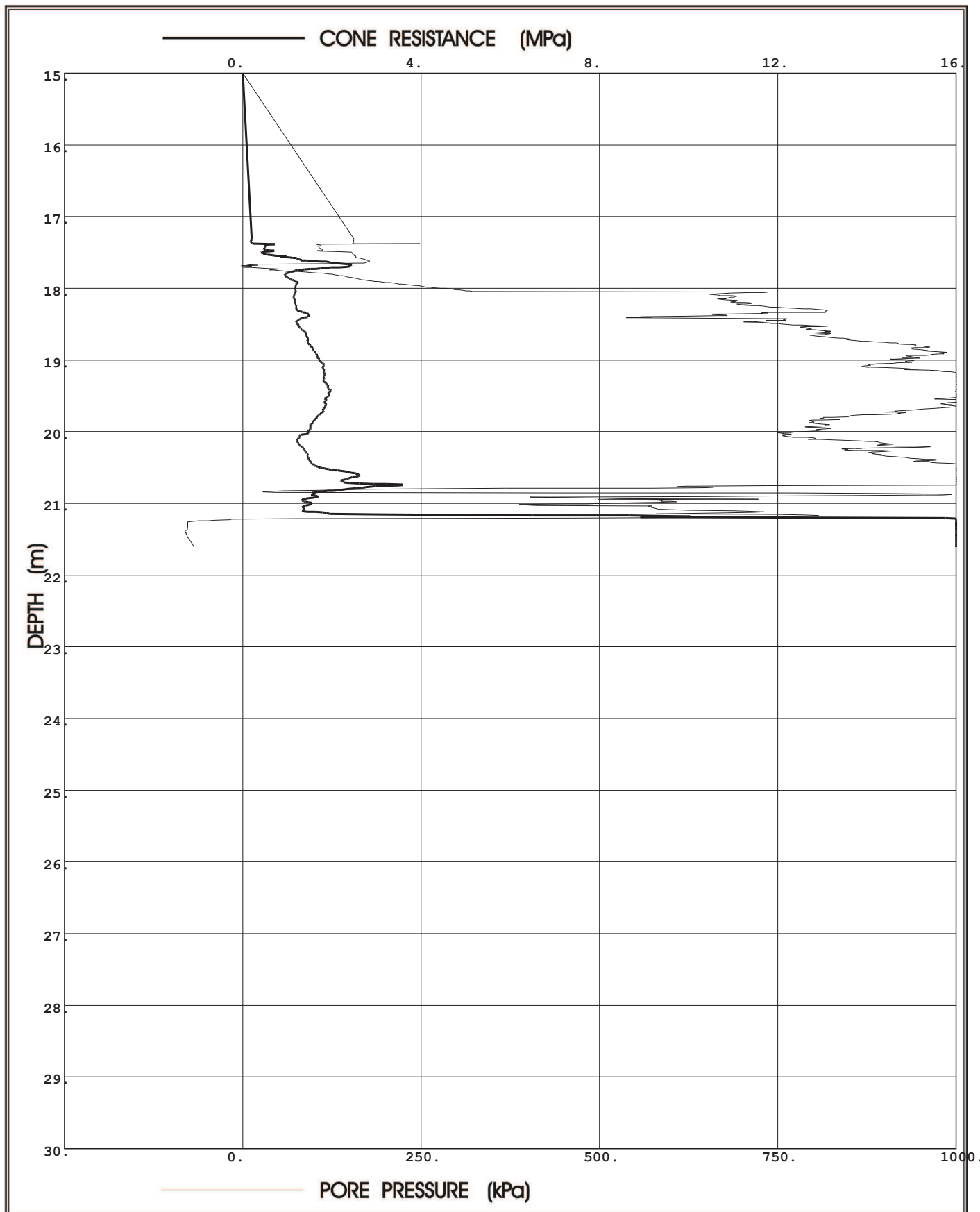
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 48

DATE: 2012/09/22

Page:2



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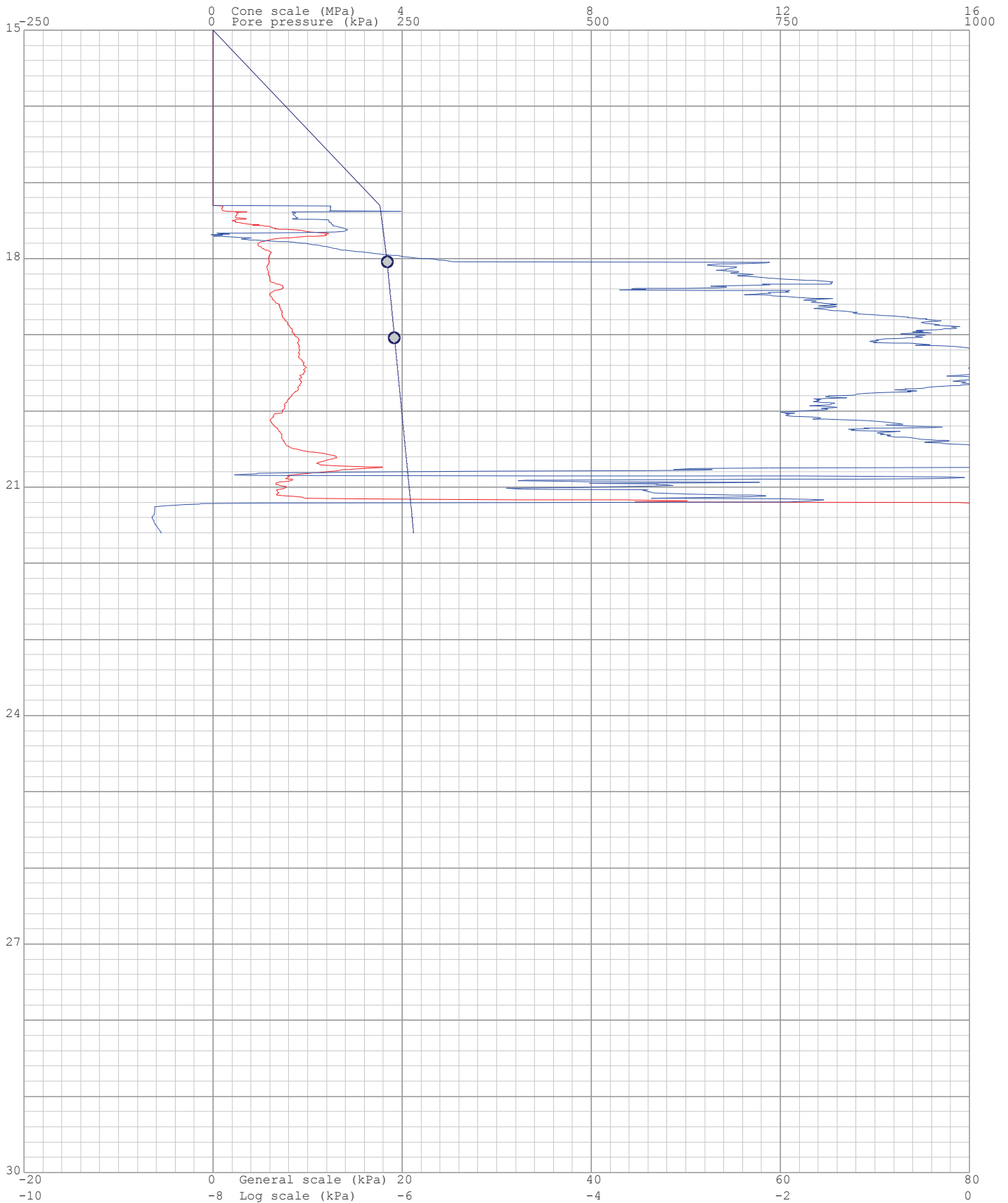
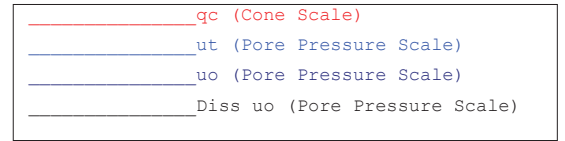
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 48

Date: 2012/09/22

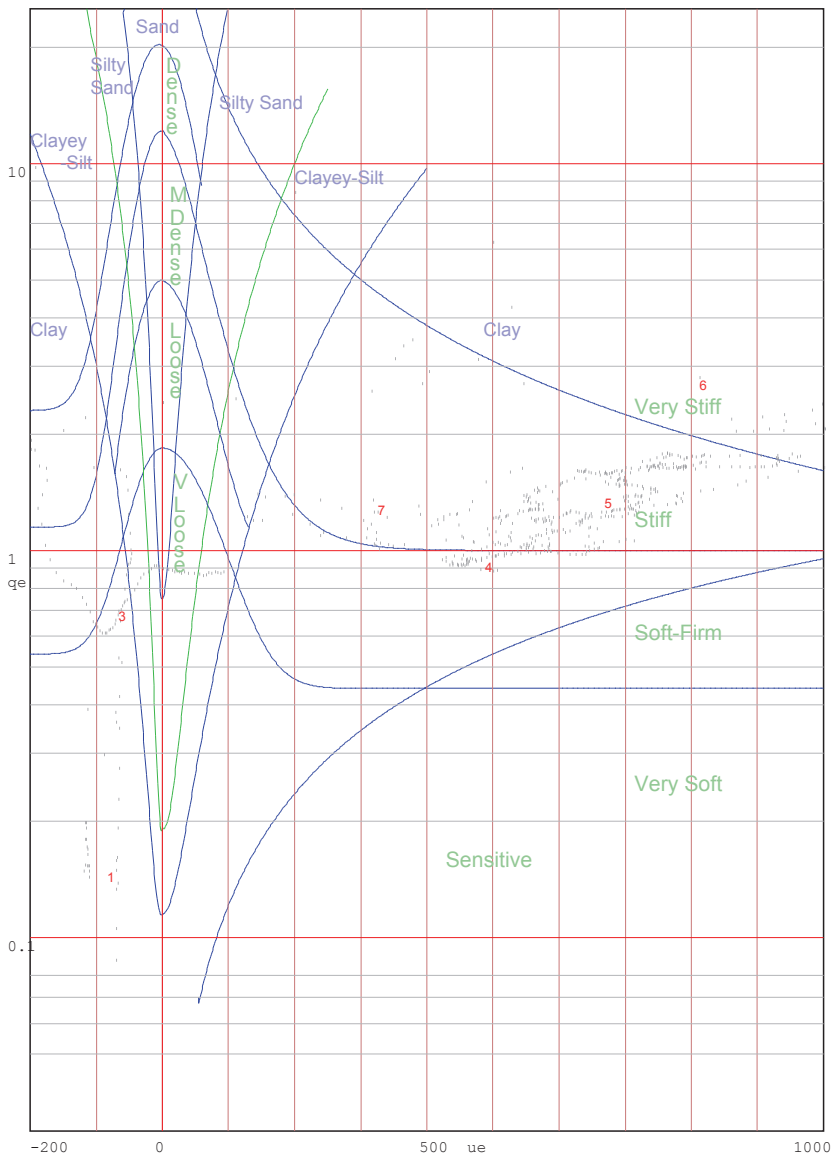
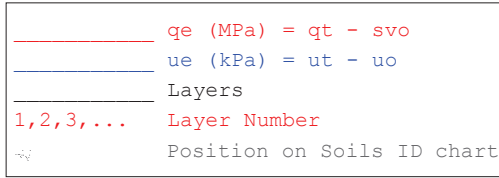


Project: Durban Harbour Piezocone Investigation for Dredging

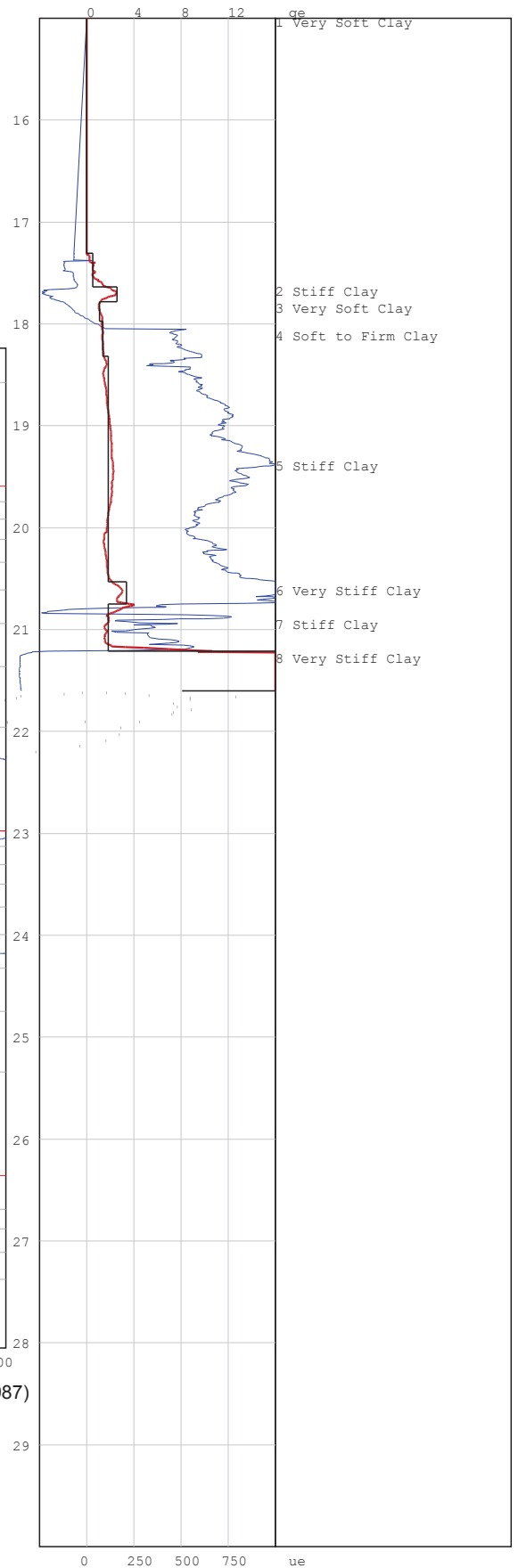
Site: Durban Harbour over water

Hole No: S 48

Date: 2012/09/22



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

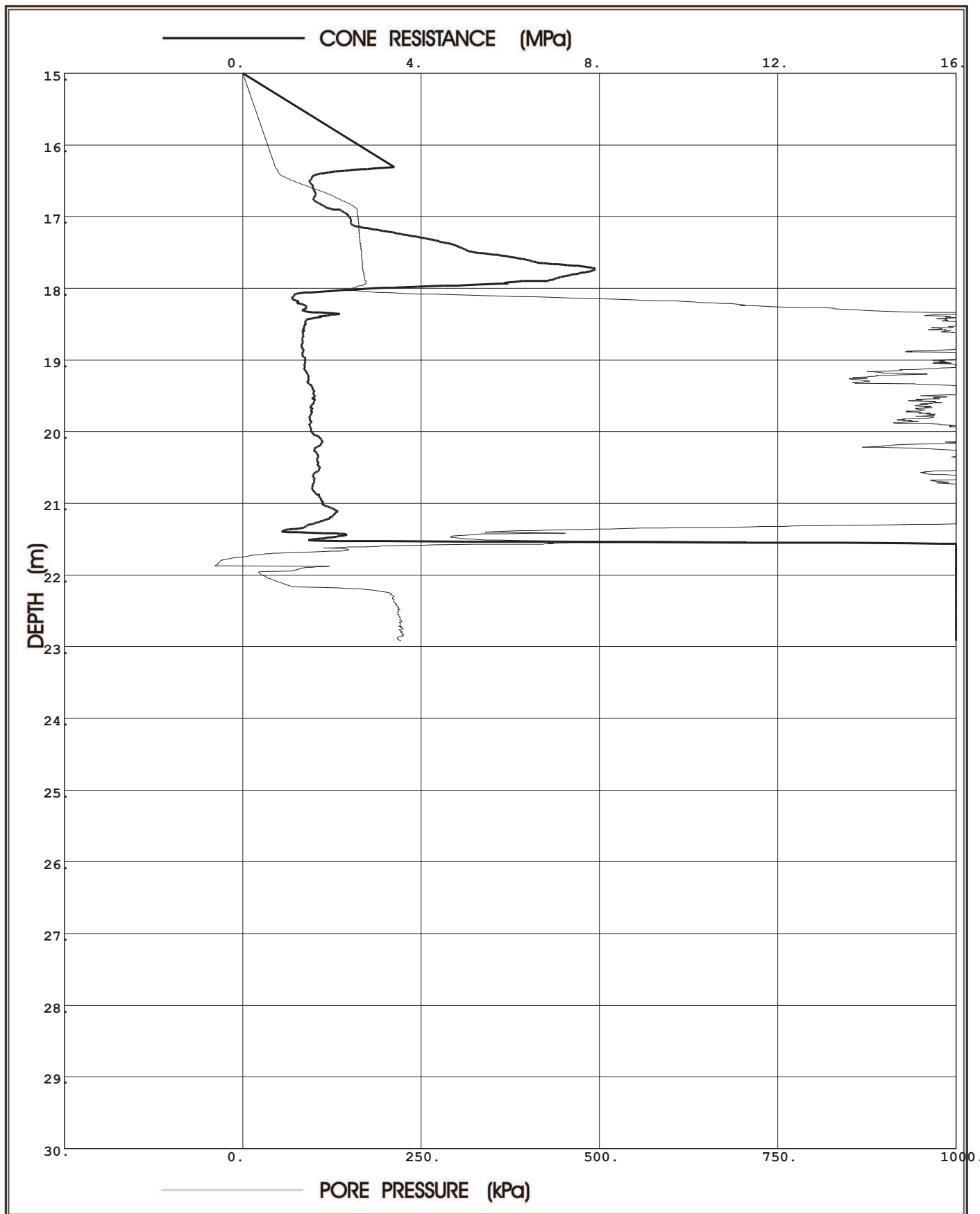
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): S 49

DATE: 2012/09/23

Page: 2



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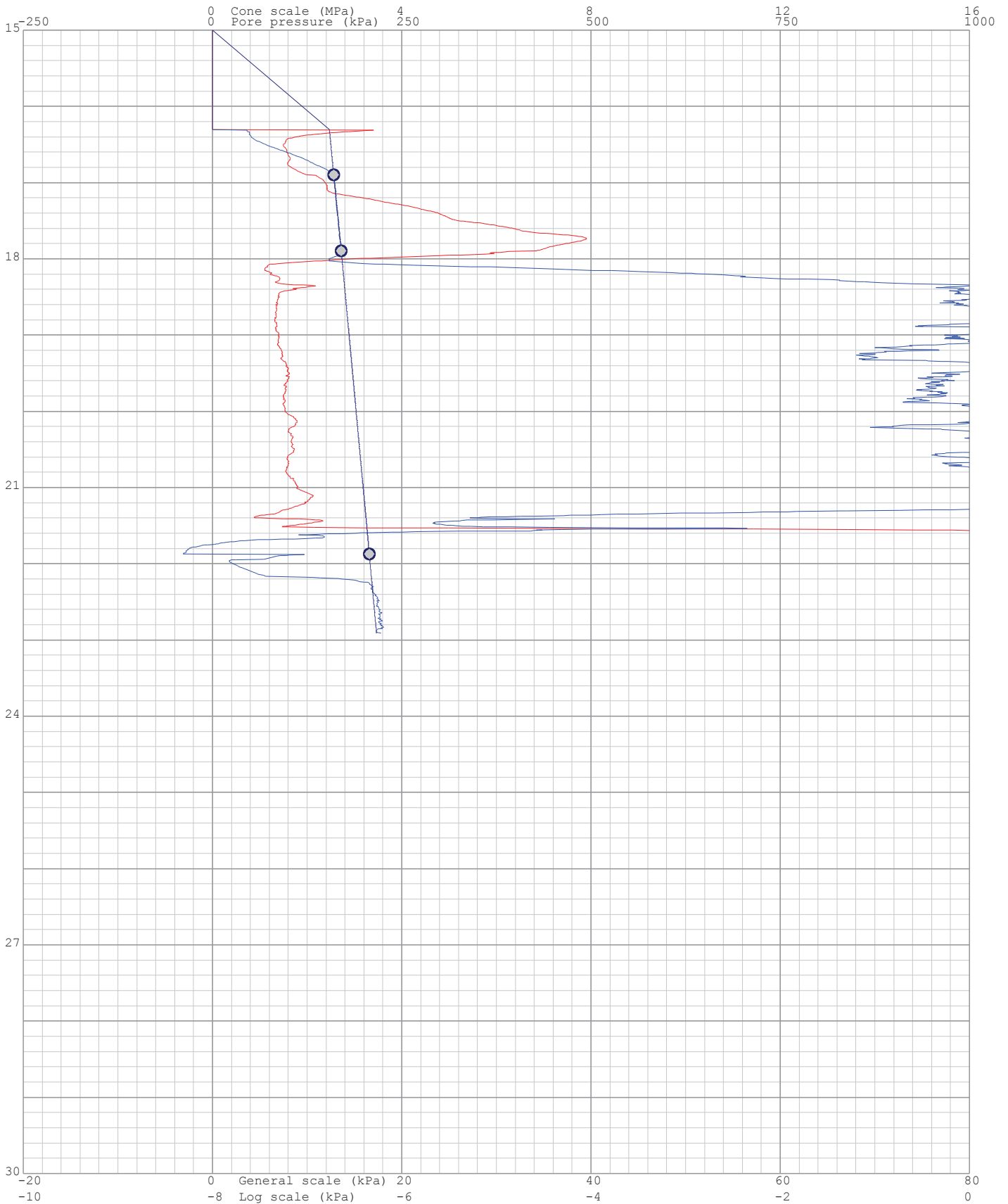
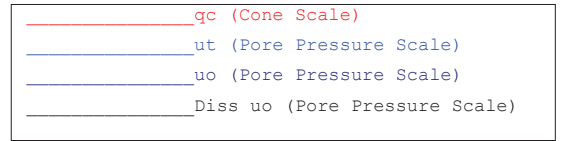
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 49  
Date: 2012/09/23

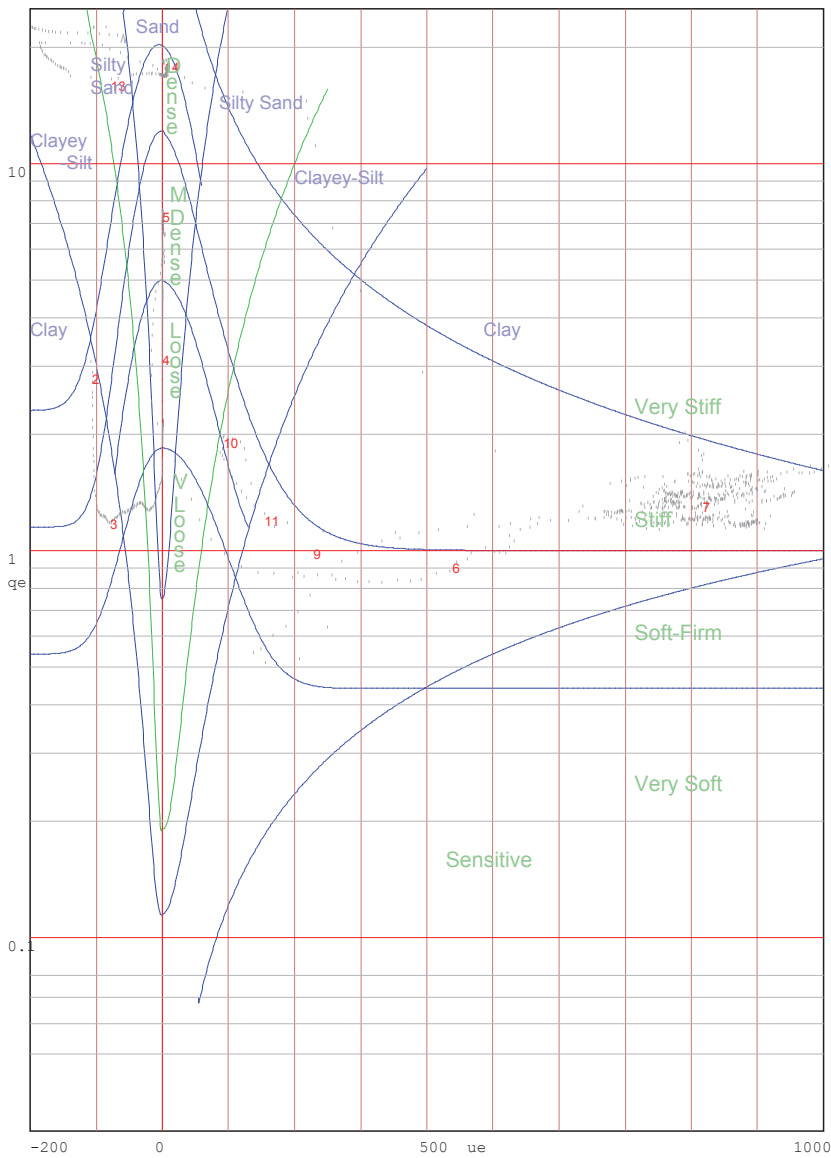
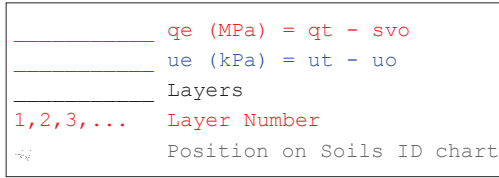


Project: Durban Harbour Piezocone Investigation for Dredging

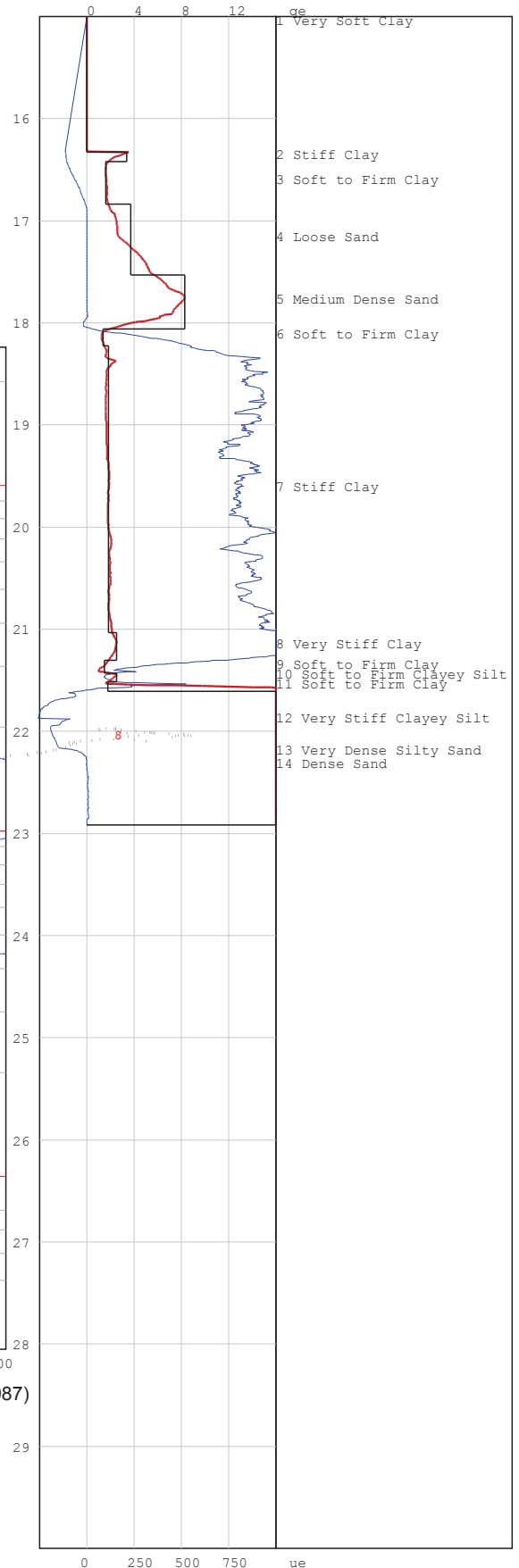
Site: Durban Harbour over water

Hole No: S 49

Date: 2012/09/23



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# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

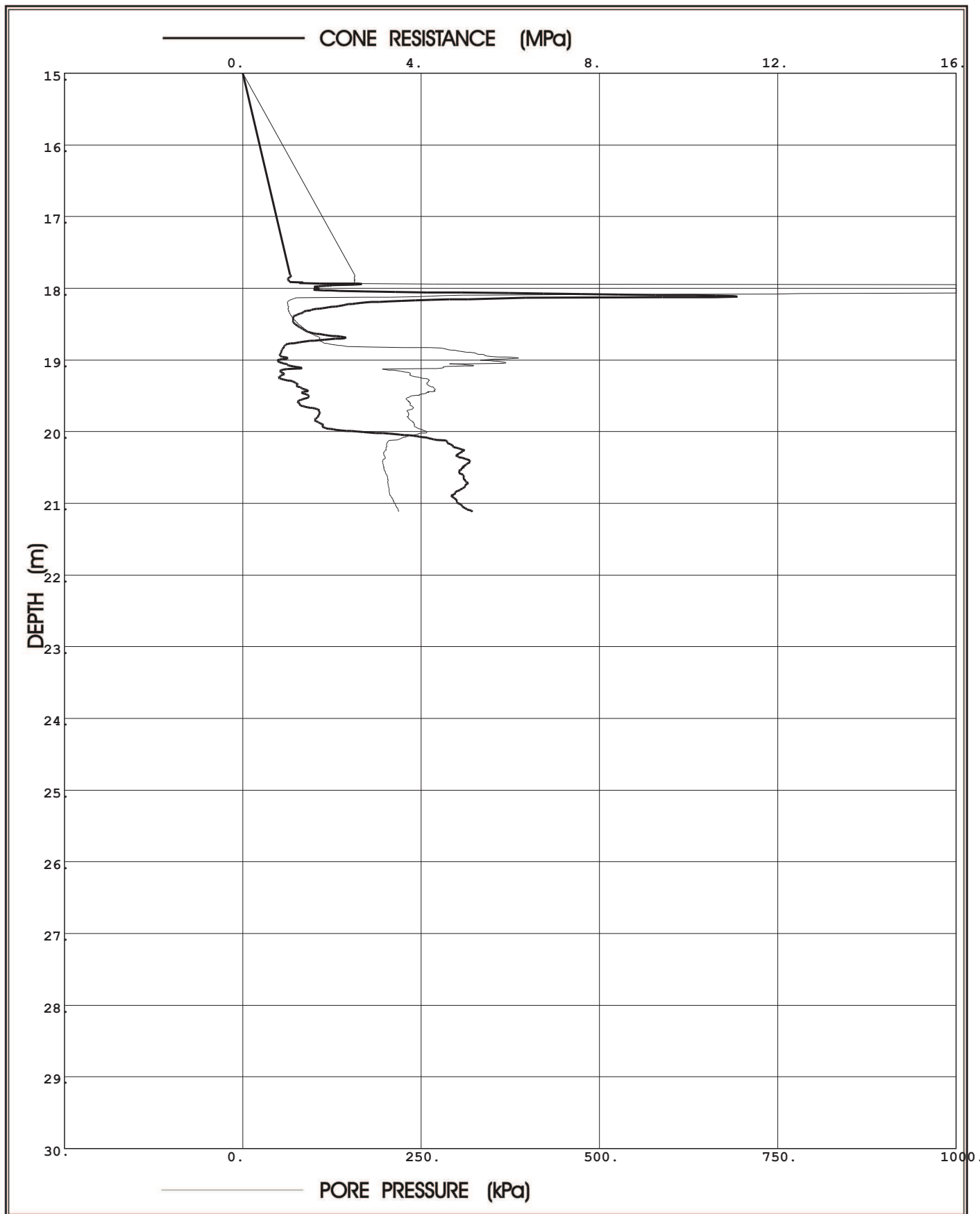
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 50

DATE: 2012/09/25

Page:2



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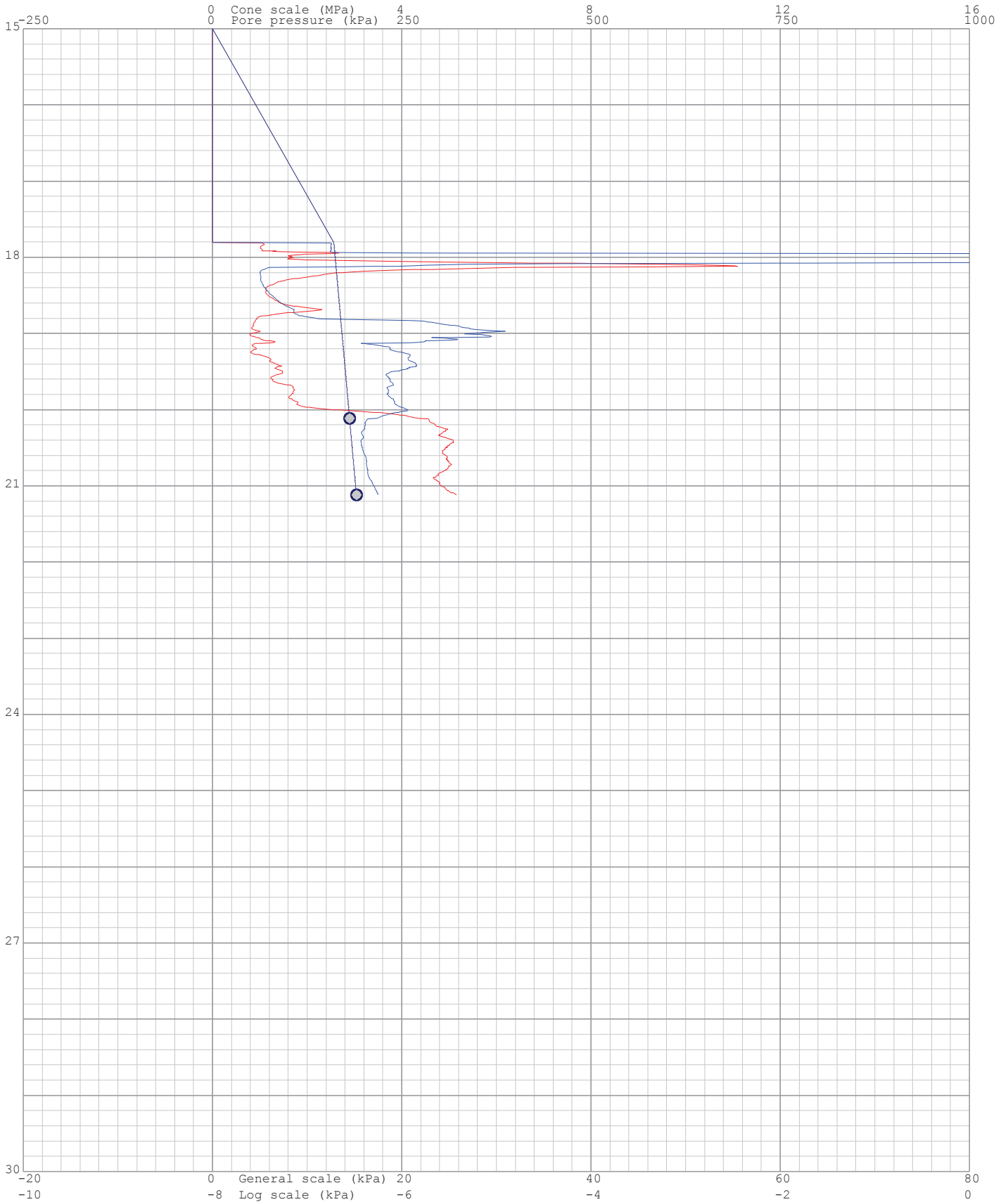
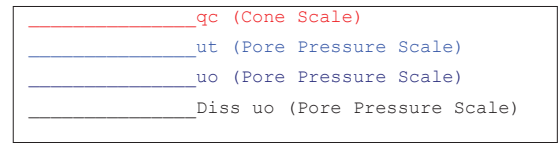
Fax: 012 420 4940

rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

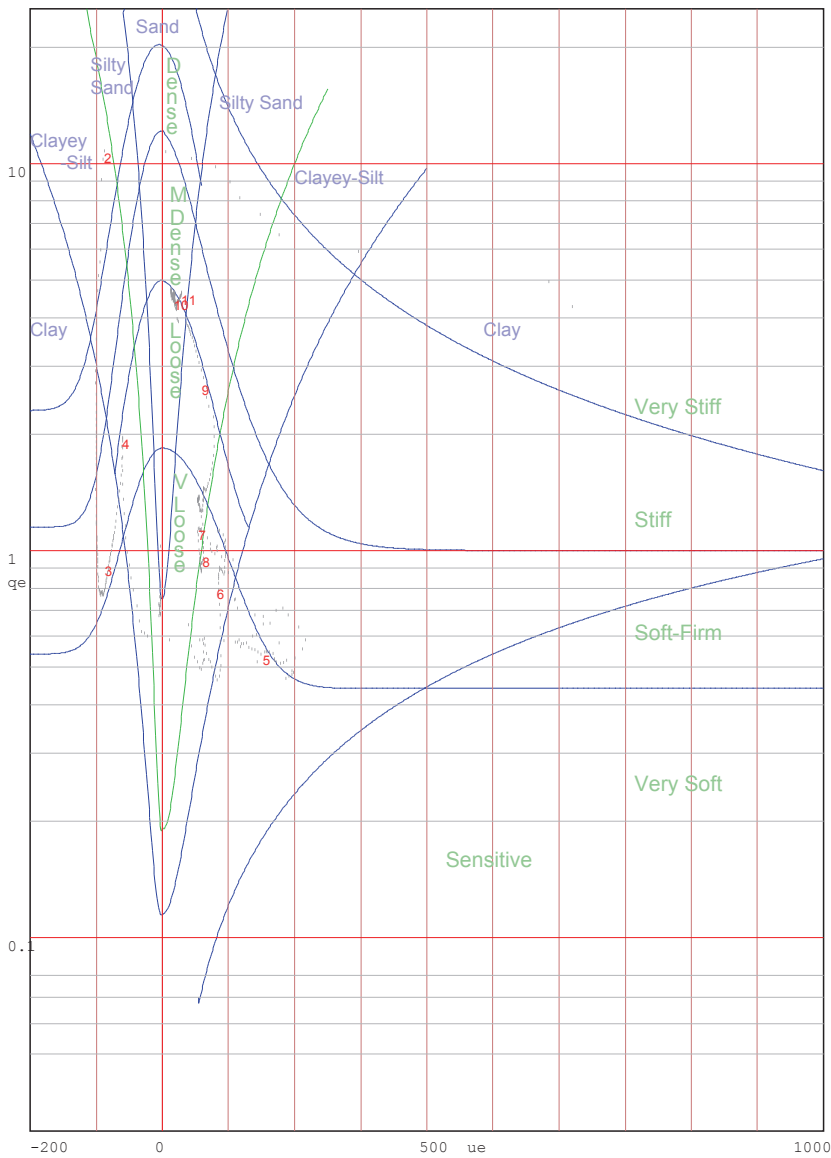
Site: Durban Harbour over water

Hole No: S 50  
Date: 2012/09/25

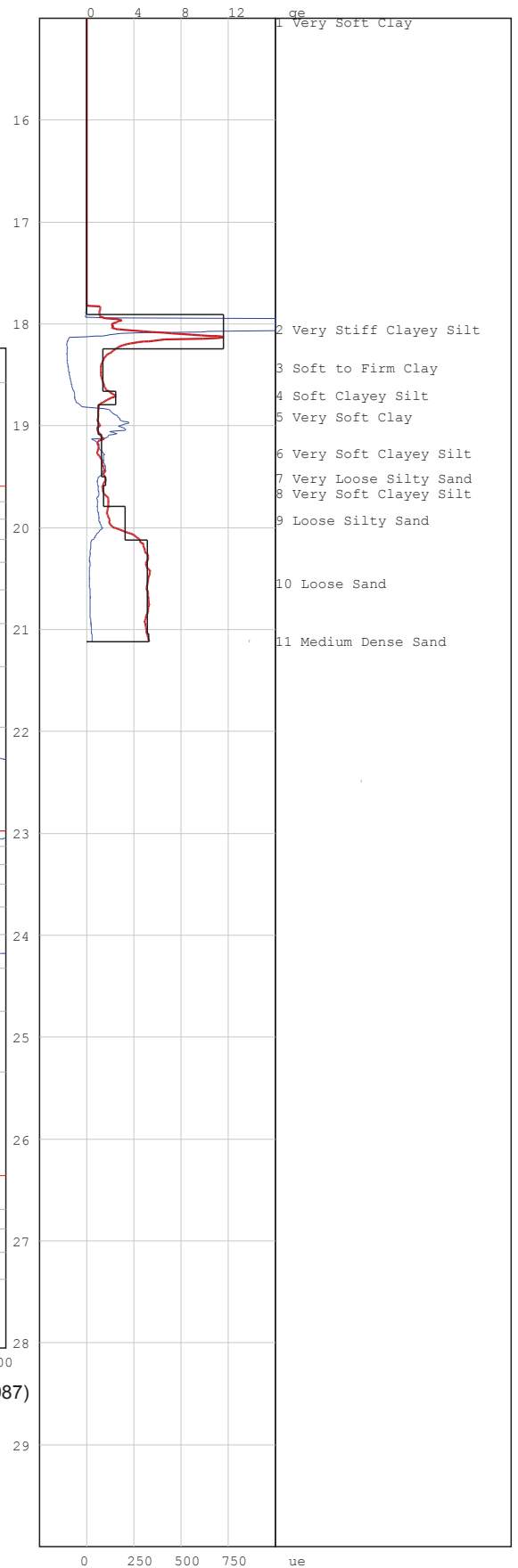




—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)



# PIEZOCONE PENETRATION TEST



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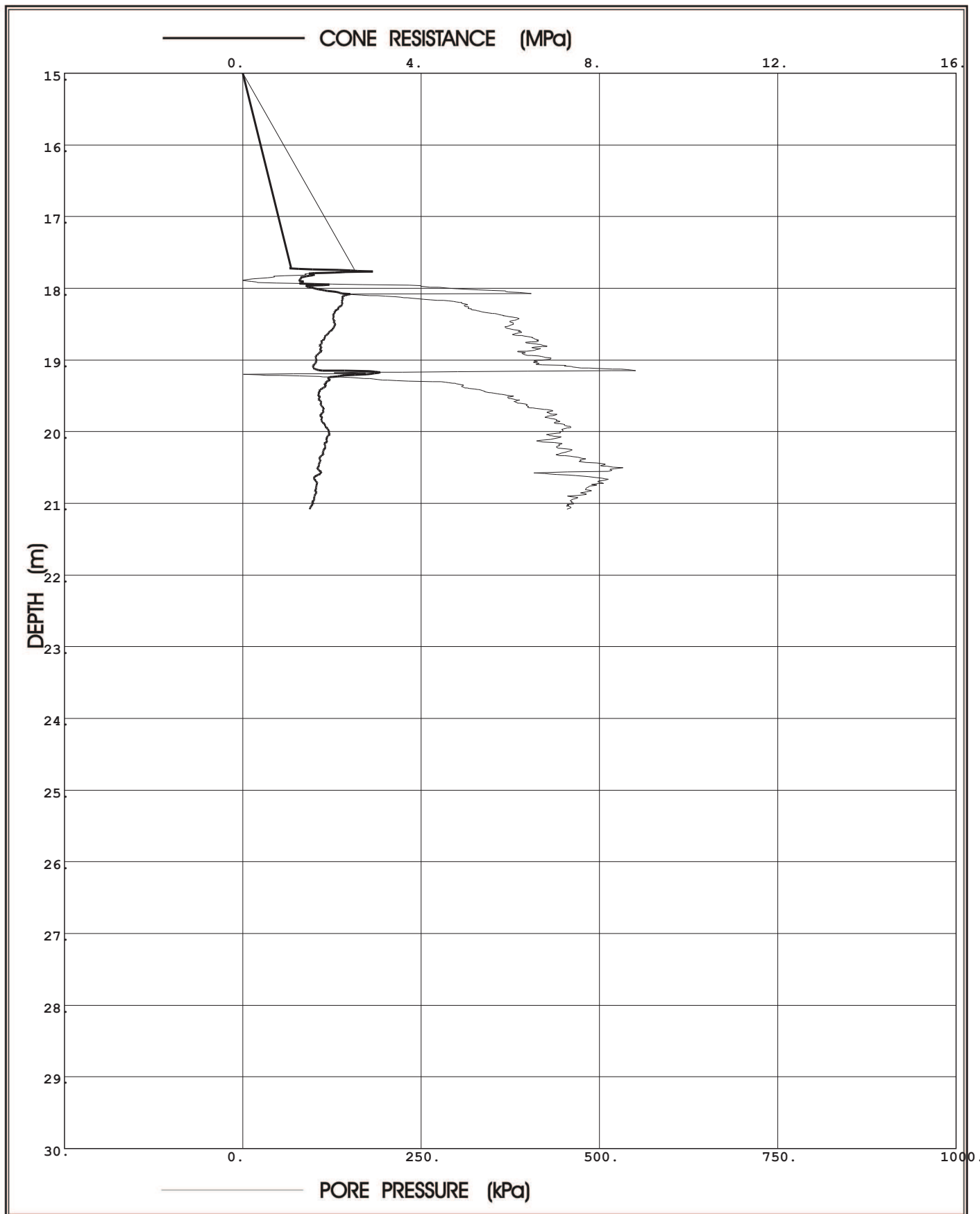
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 51

DATE: 2012/09/26

Page:2



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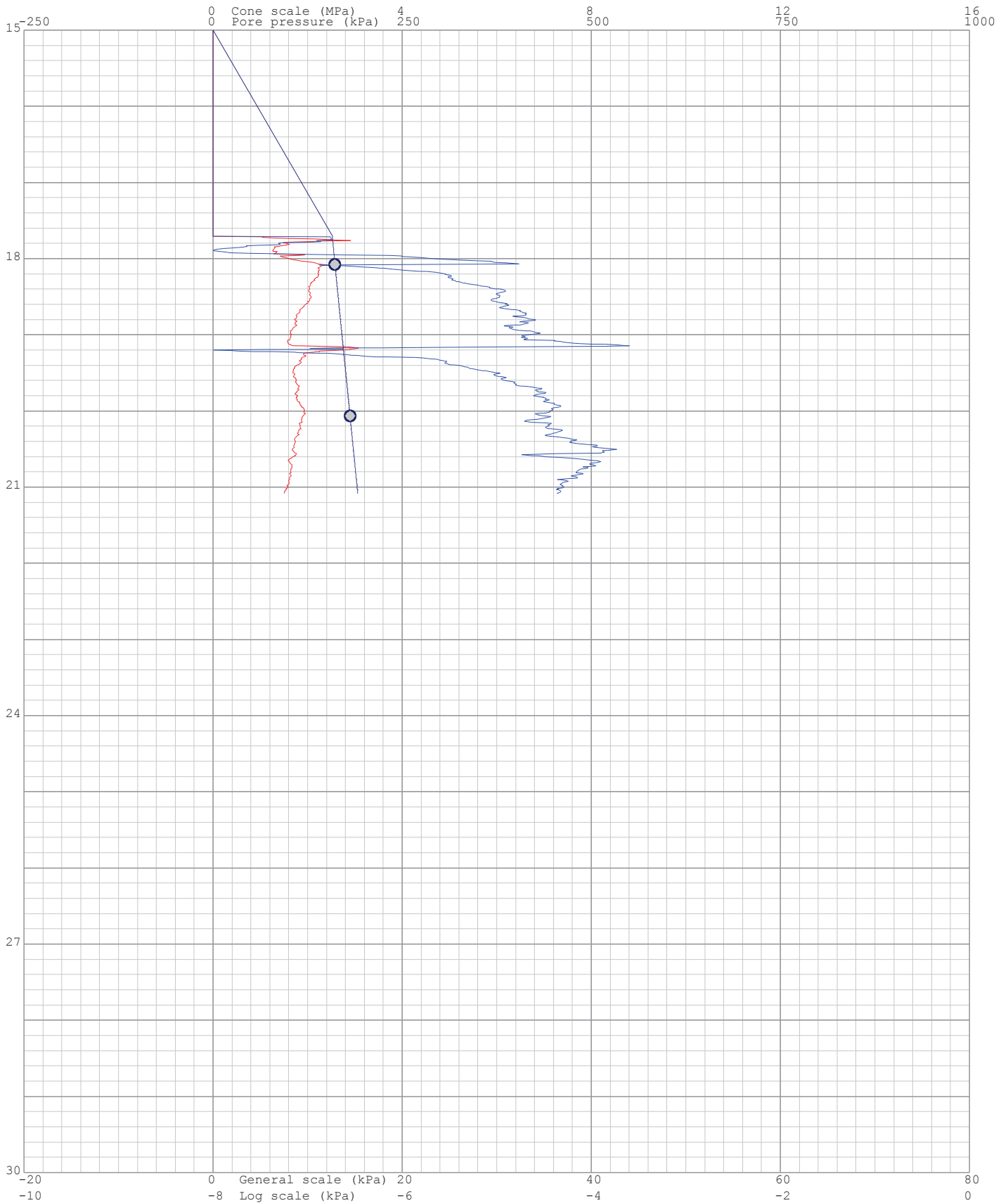
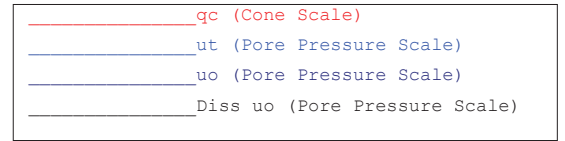
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 51

Date: 2012/09/26



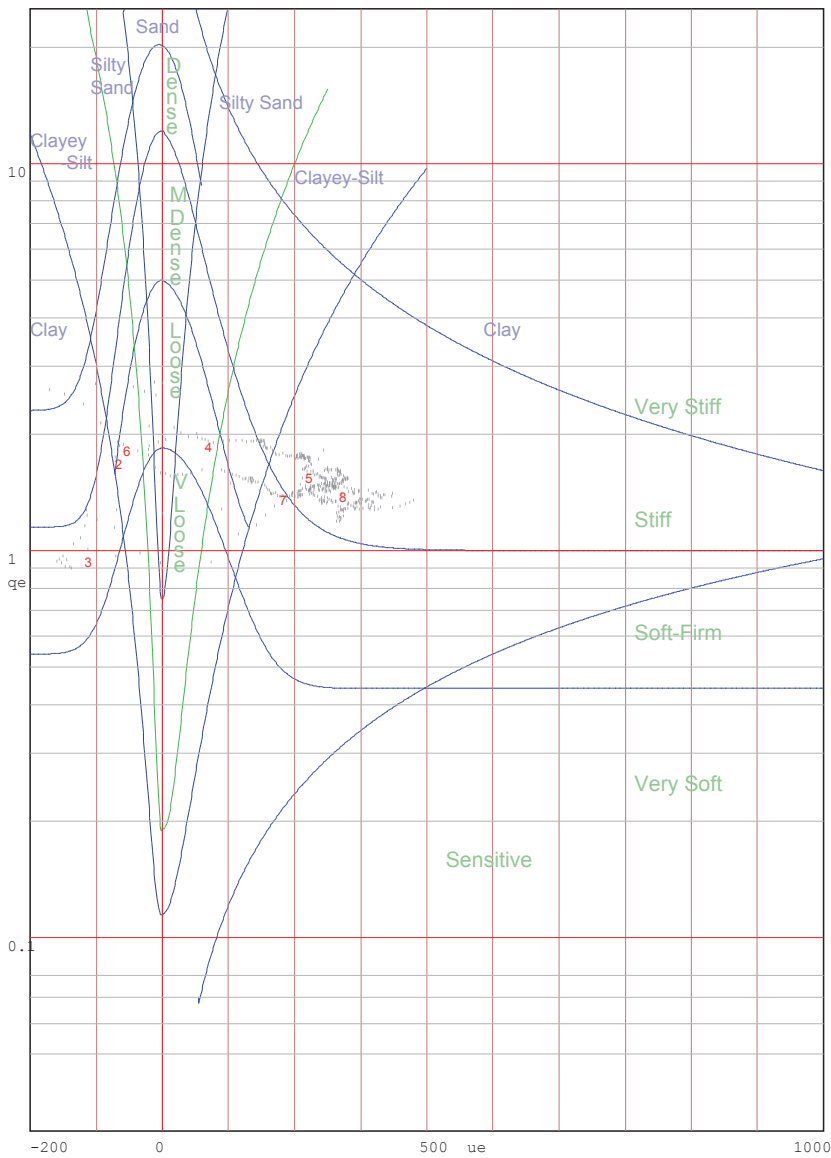
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

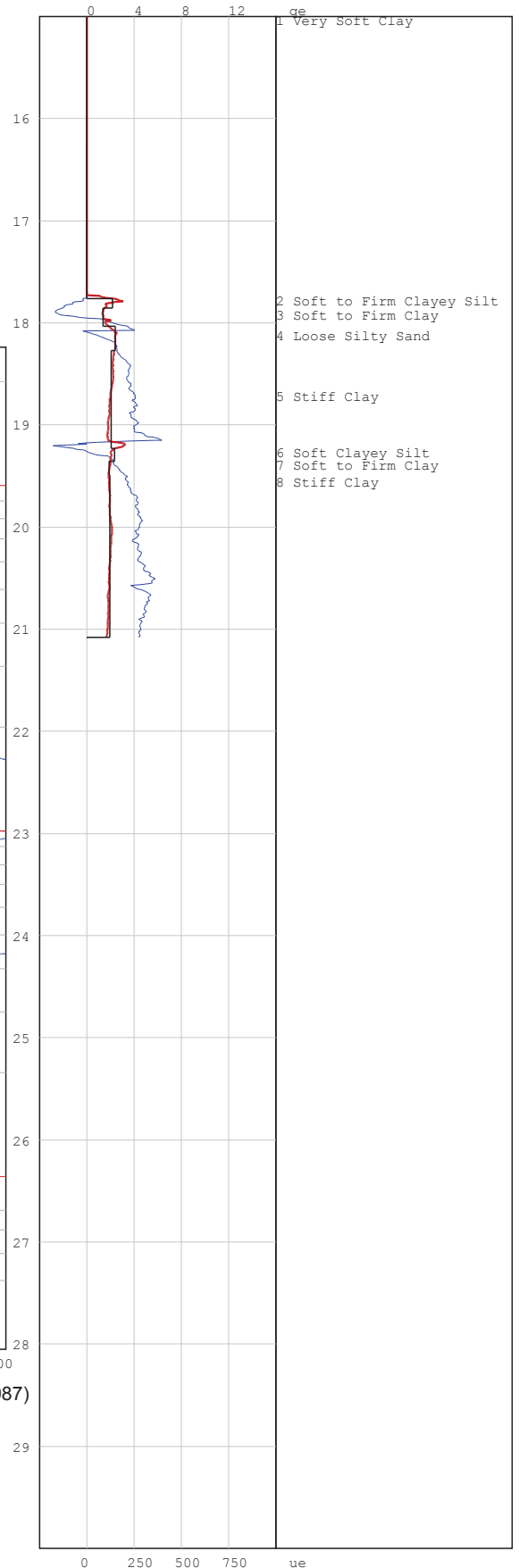
Hole No: S 51

Date: 2012/09/26

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

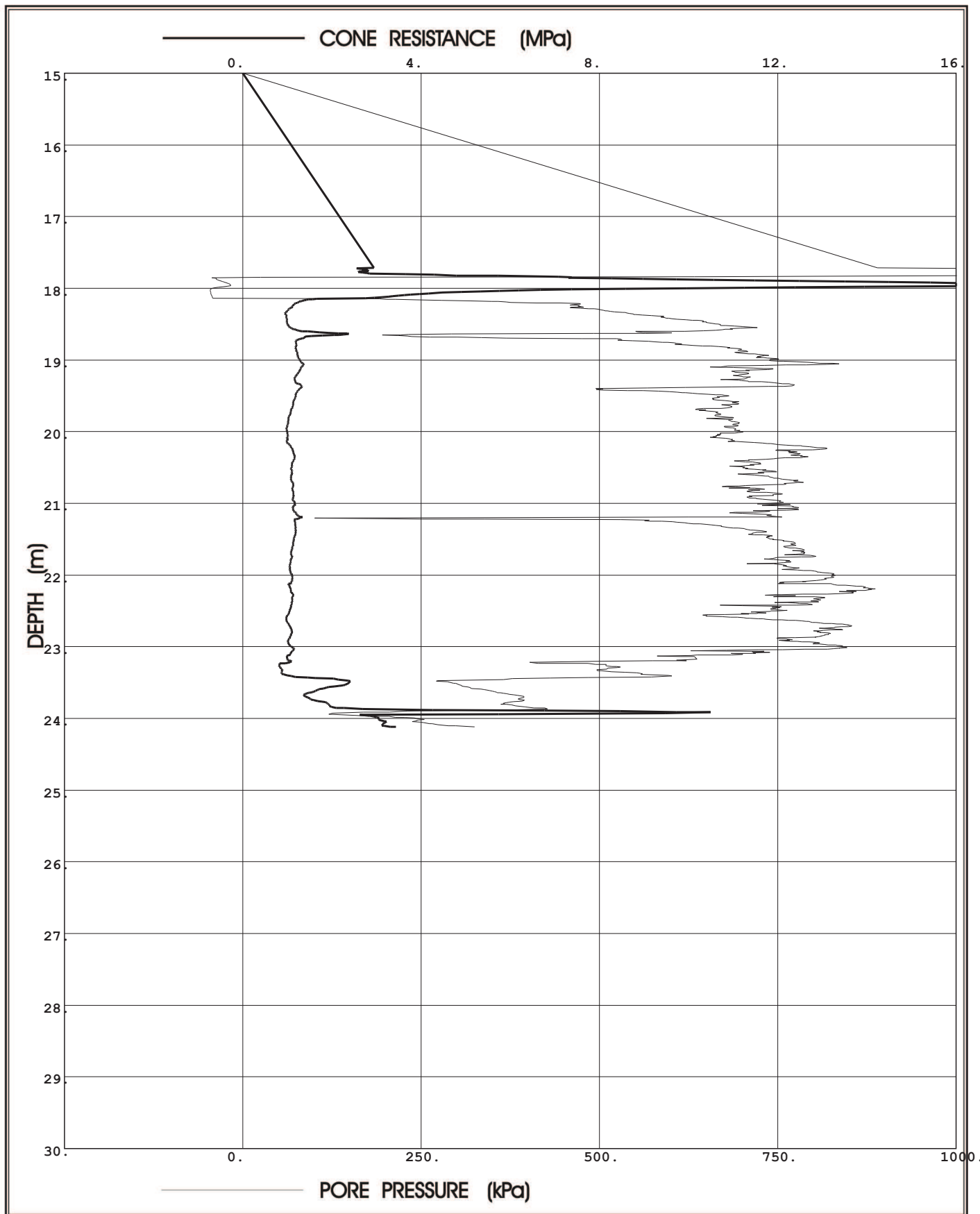
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 52

DATE: 2012/09/11

Page:2



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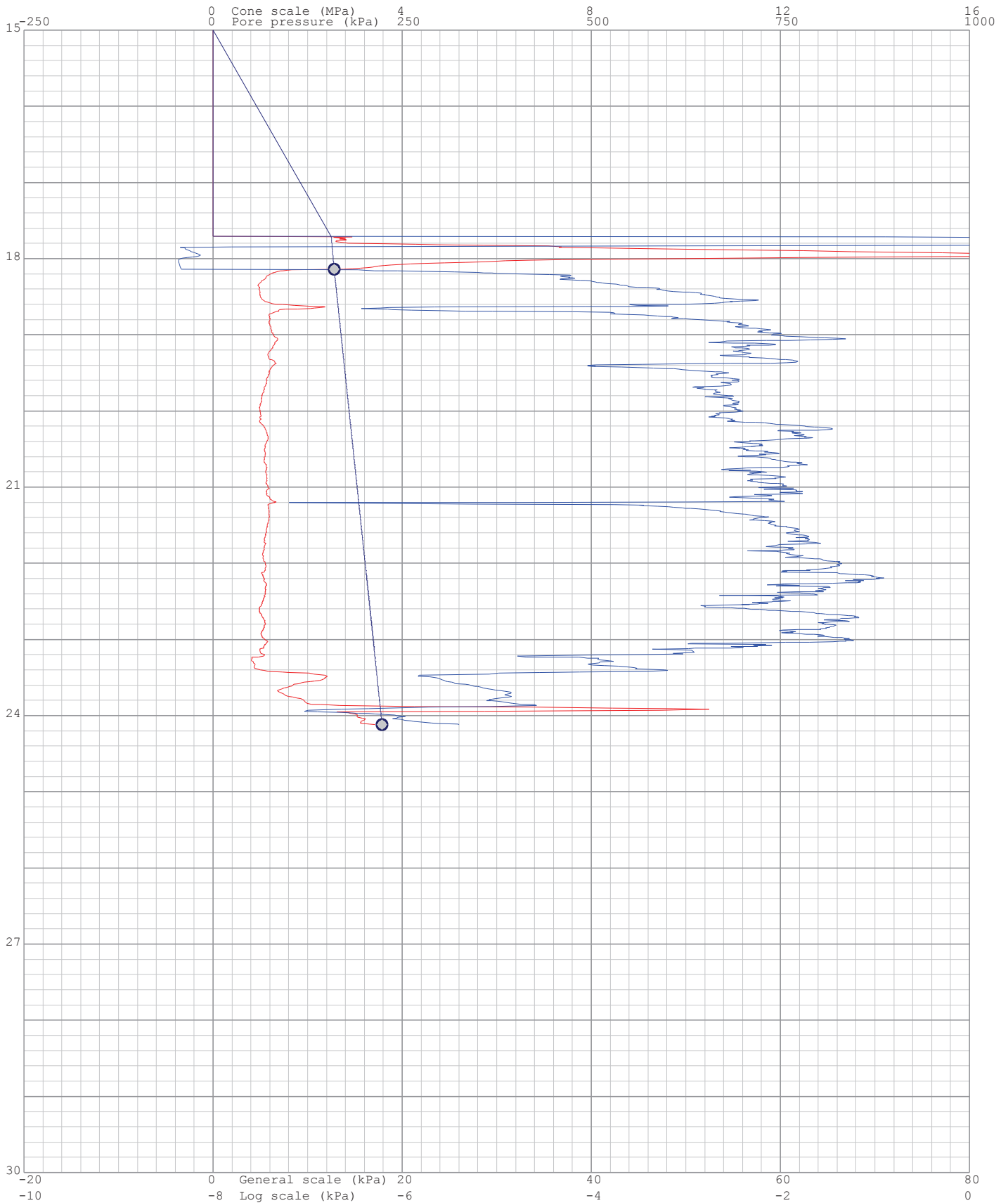
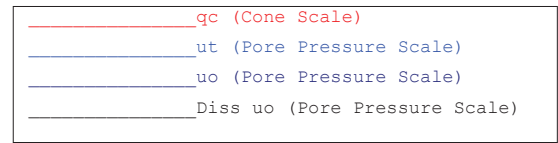
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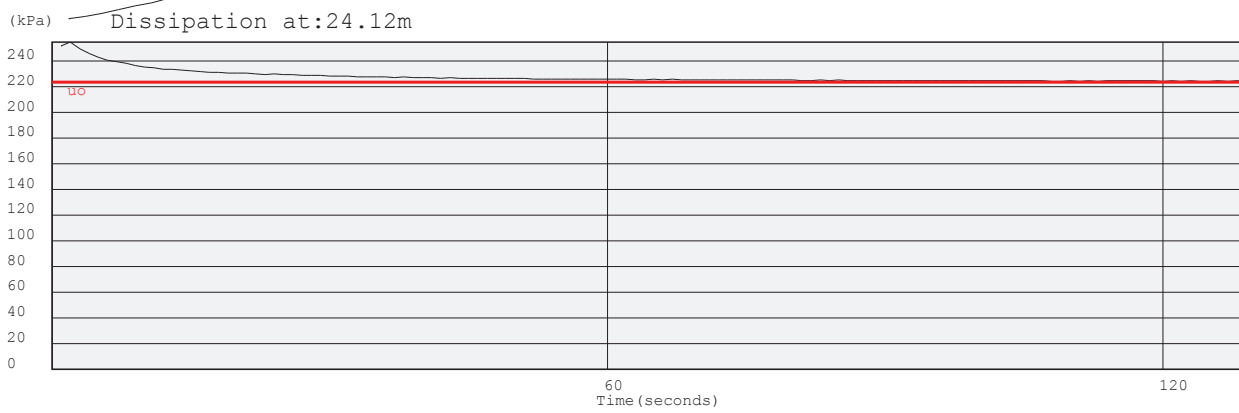
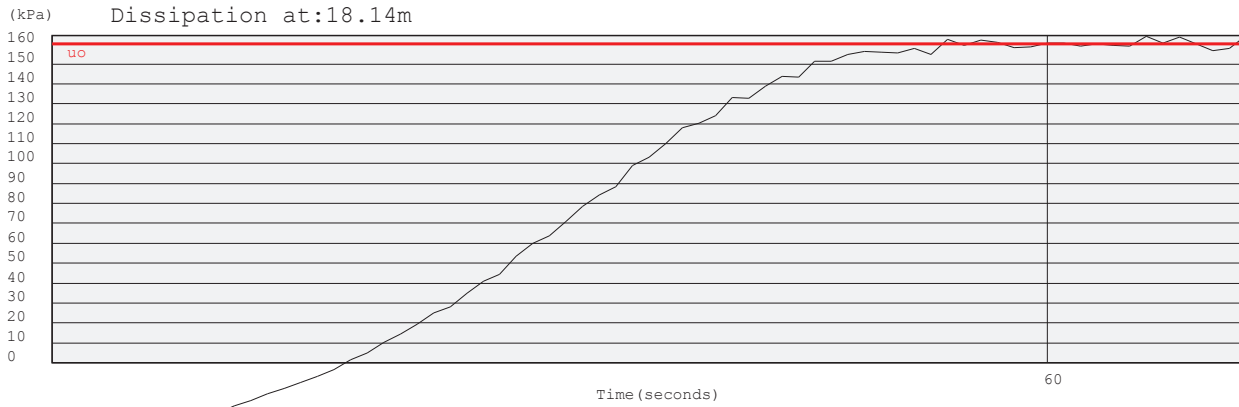
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole: S 52

Date: 2012/09/11

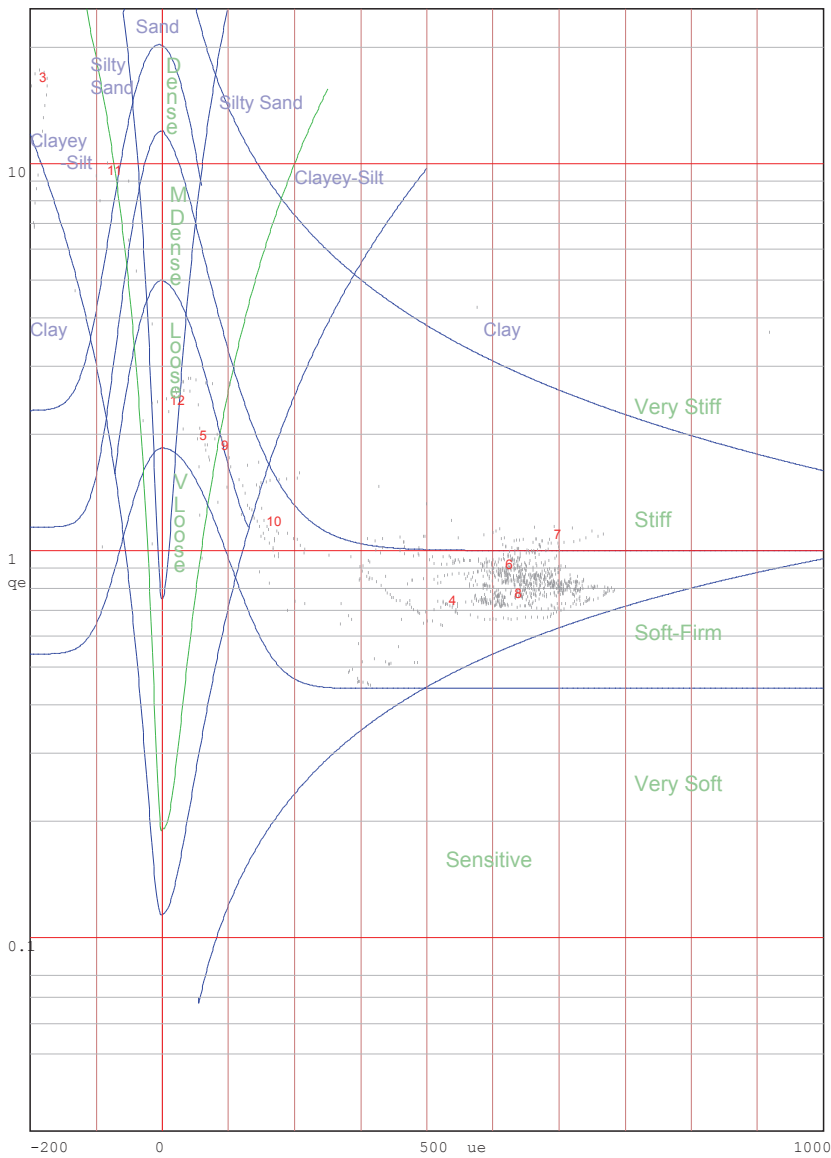
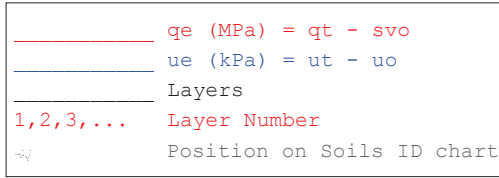
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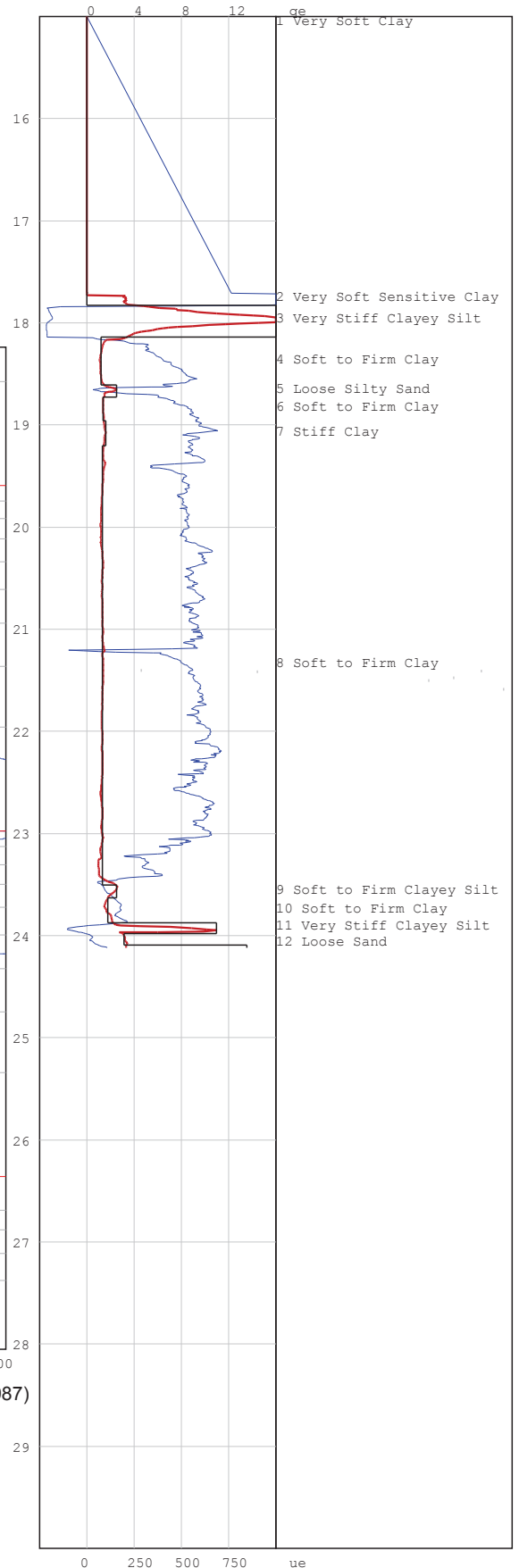
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 52  
Date: 2012/09/11



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# PIEZOCONE PENETRATION TEST



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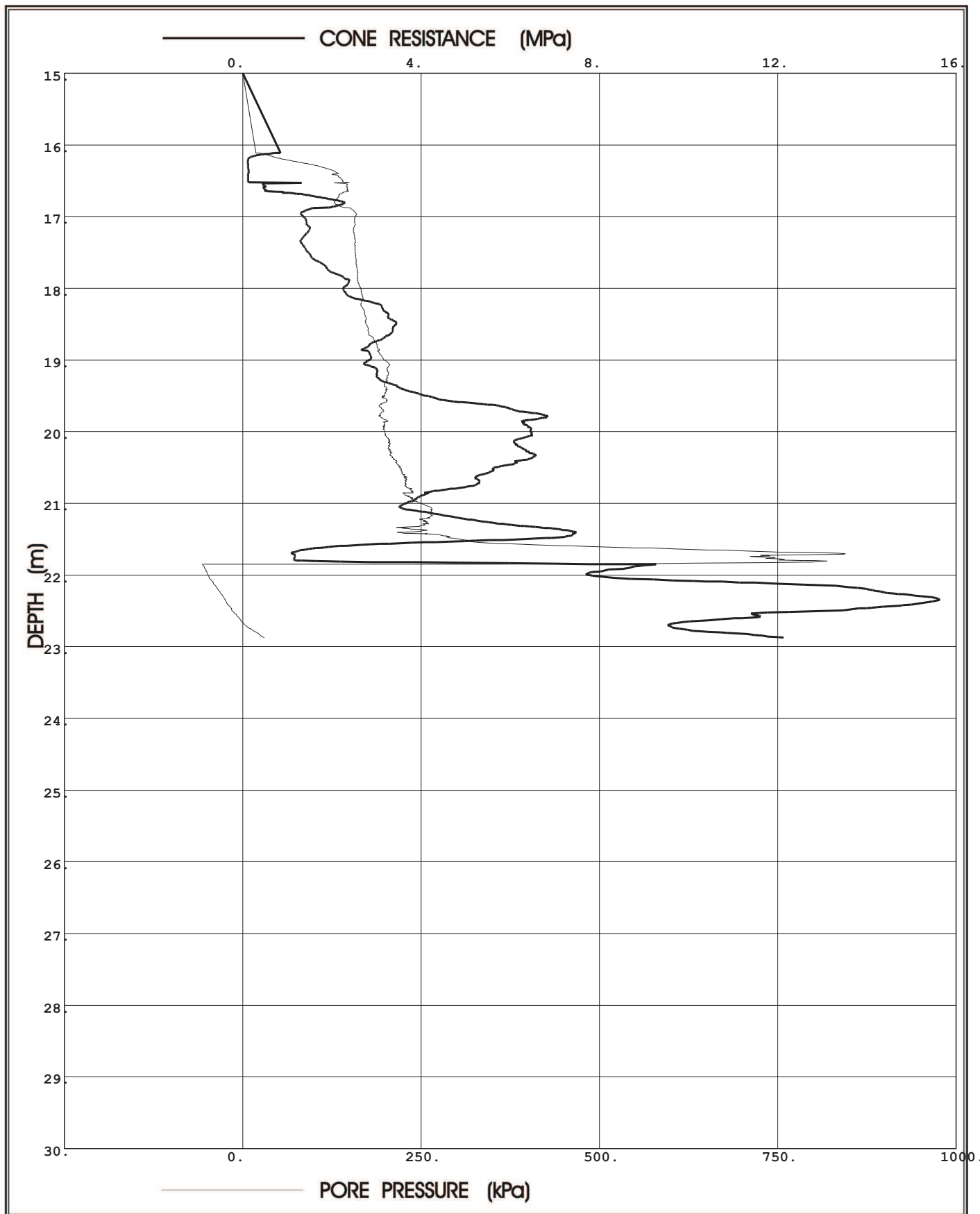
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 53

DATE: 2012/09/18

Page:2



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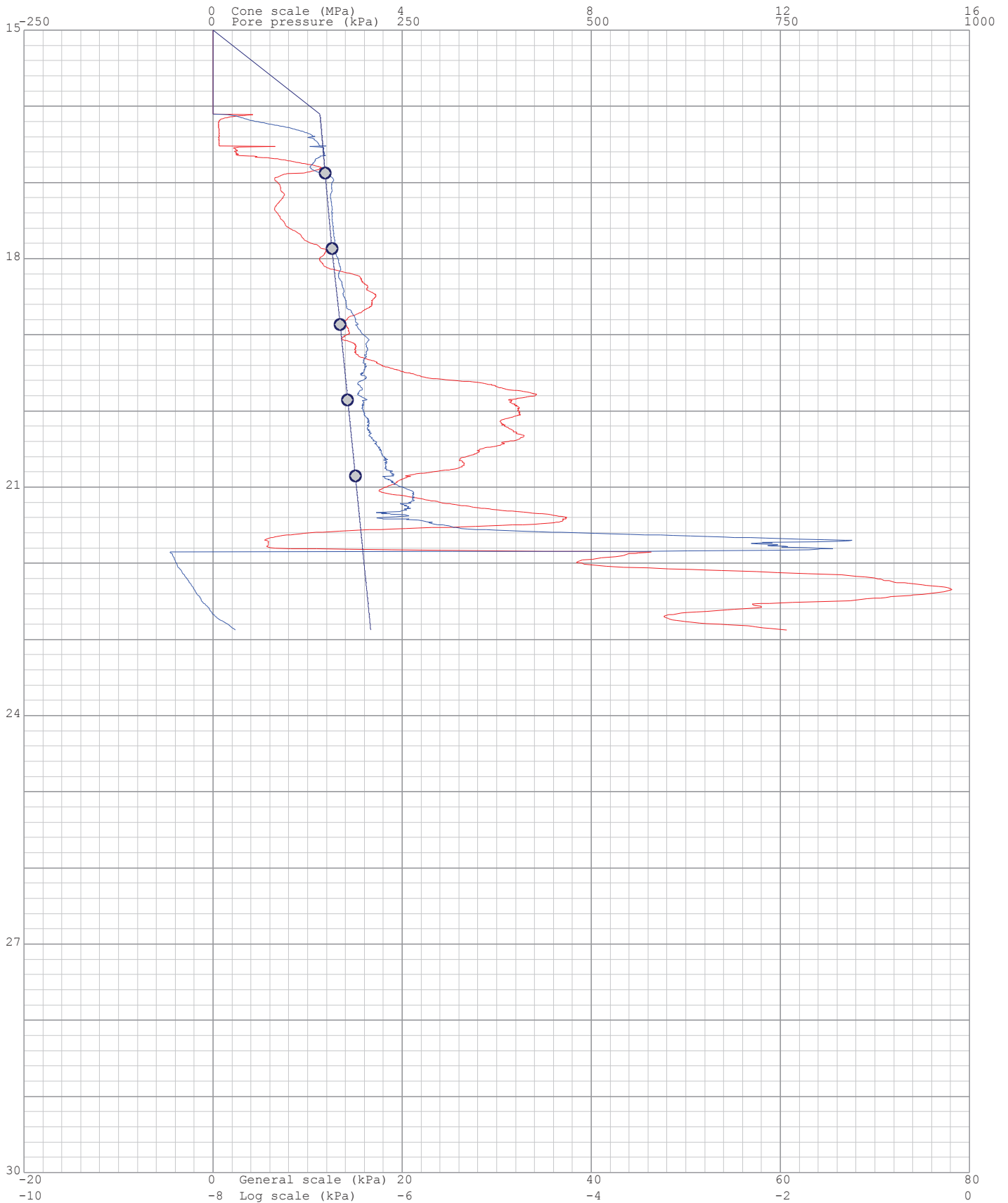
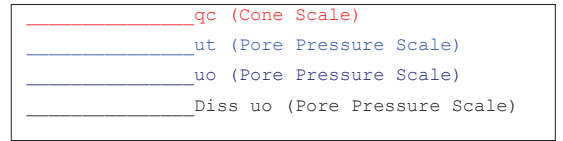
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 53  
Date: 2012/09/18

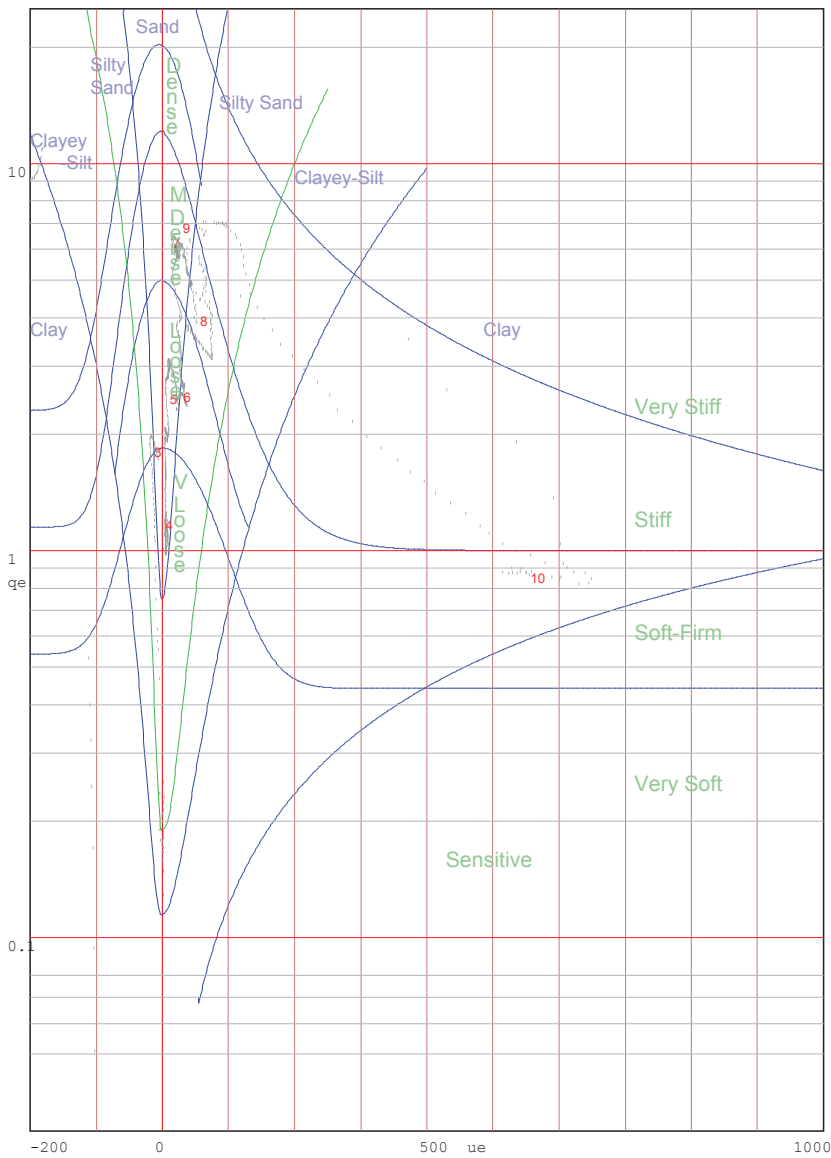
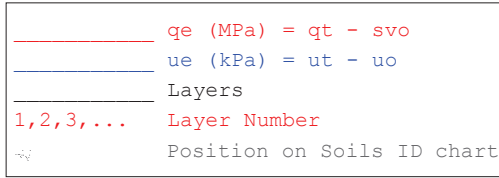


Project: Durban Harbour Piezocone Investigation for Dredging

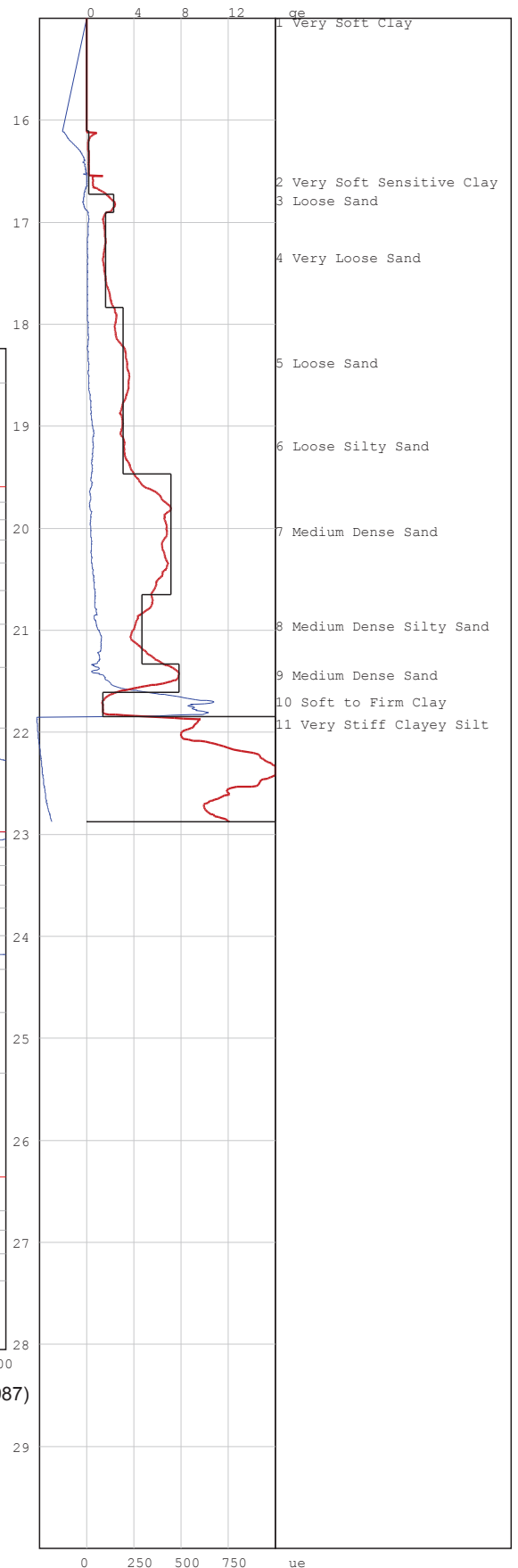
Site: Durban Harbour over water

Hole No: S 53

Date: 2012/09/18



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



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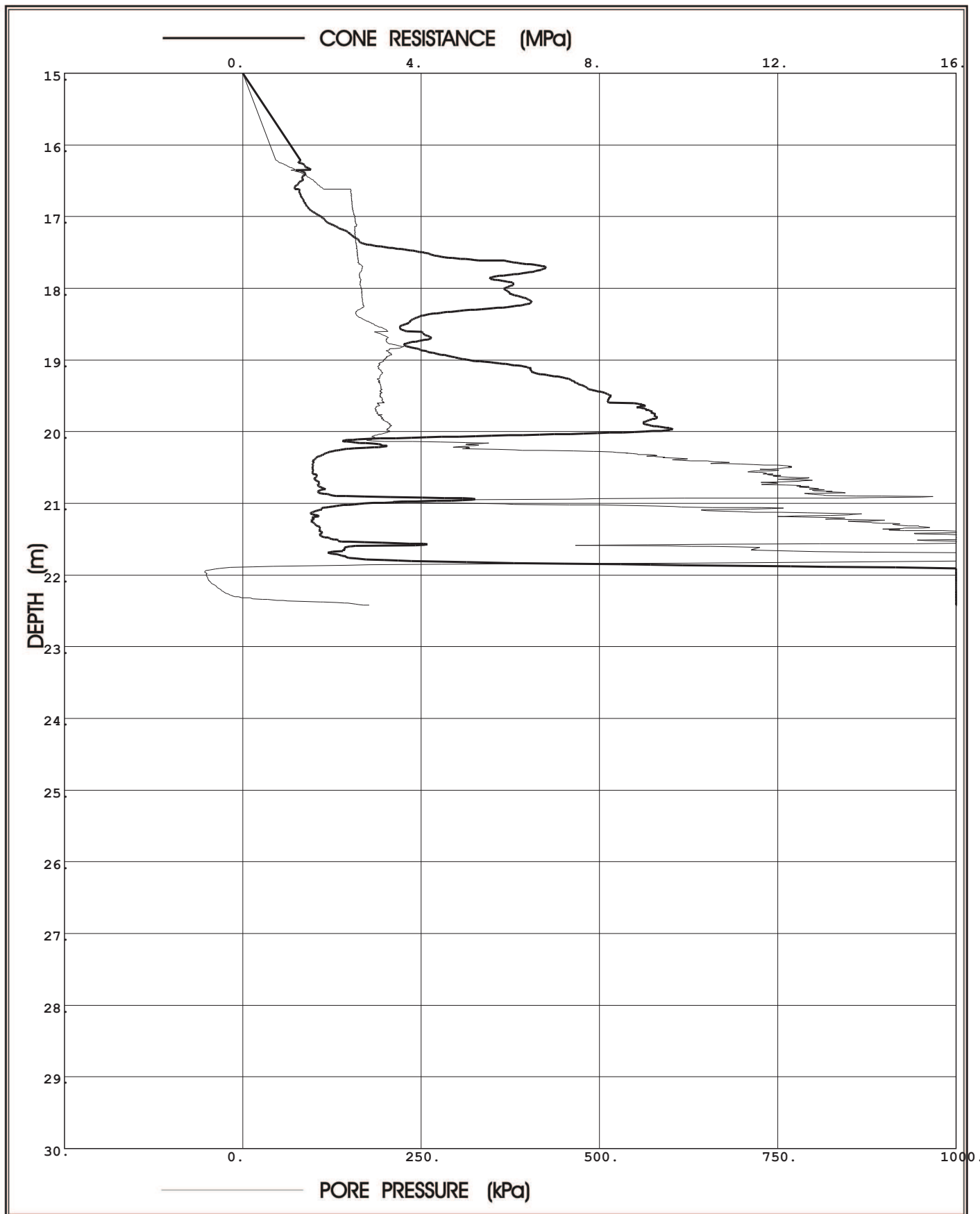
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 54

DATE: 2012/09/18

Page:2



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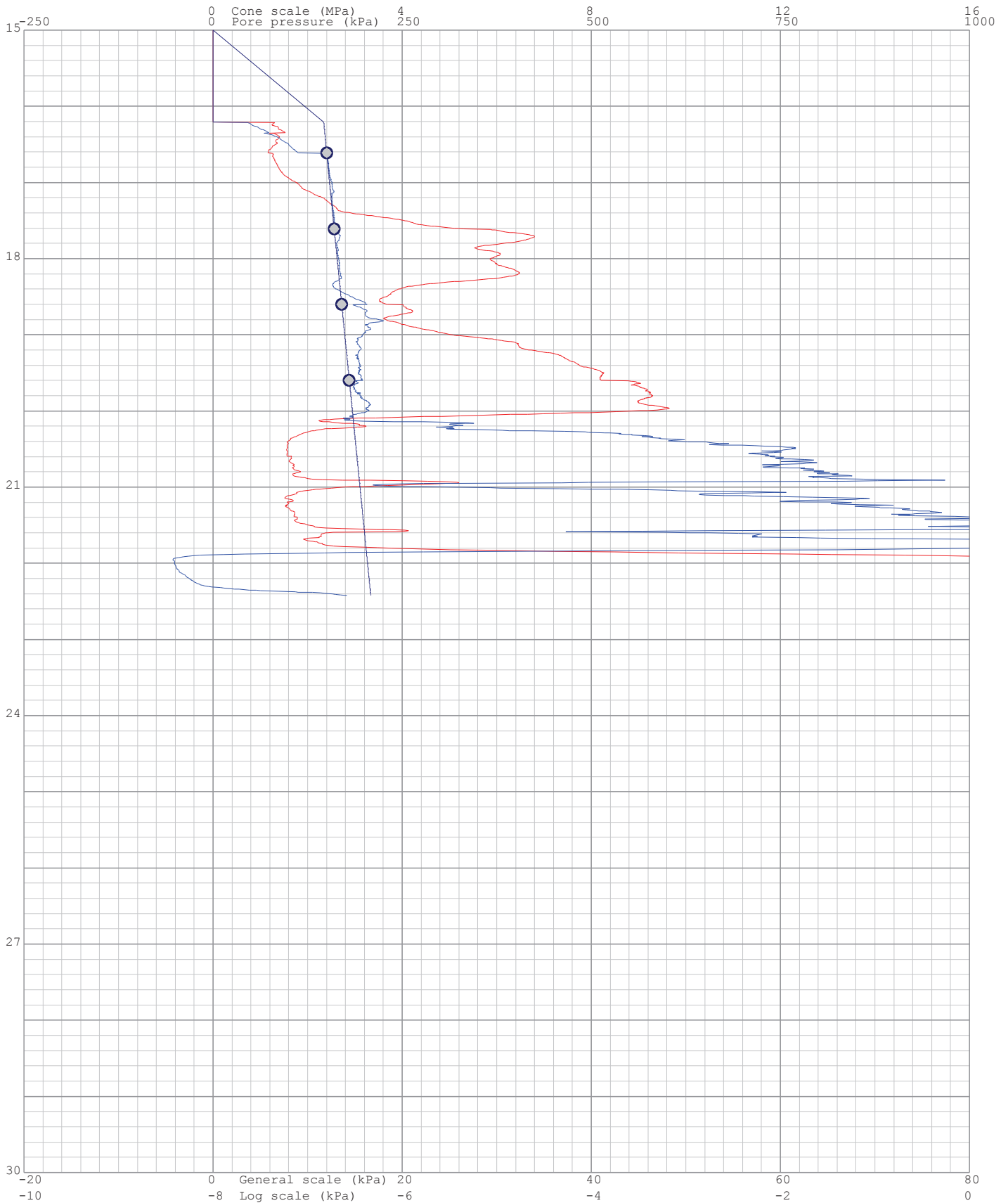
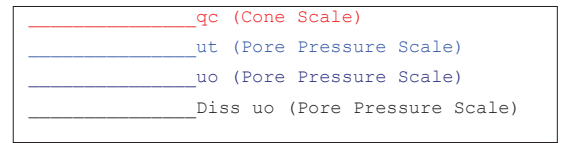
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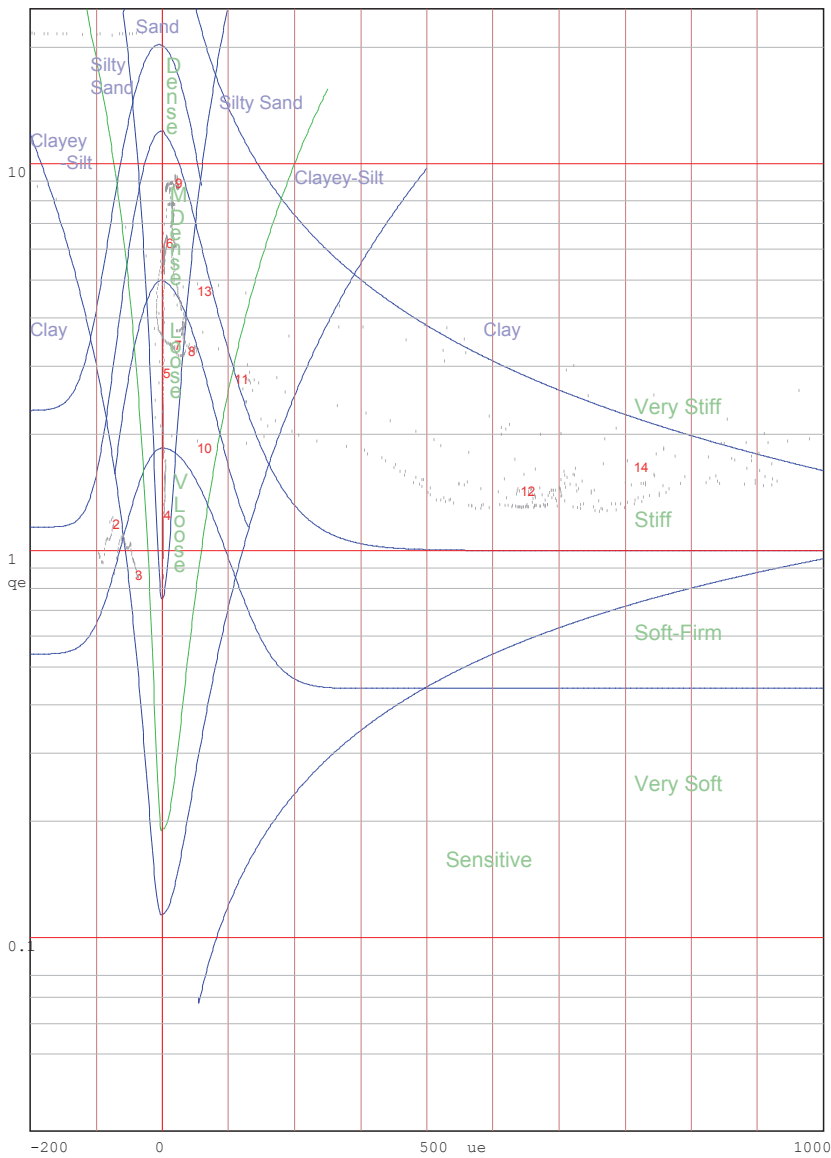
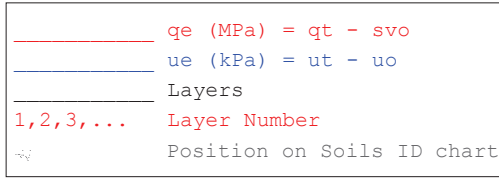
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

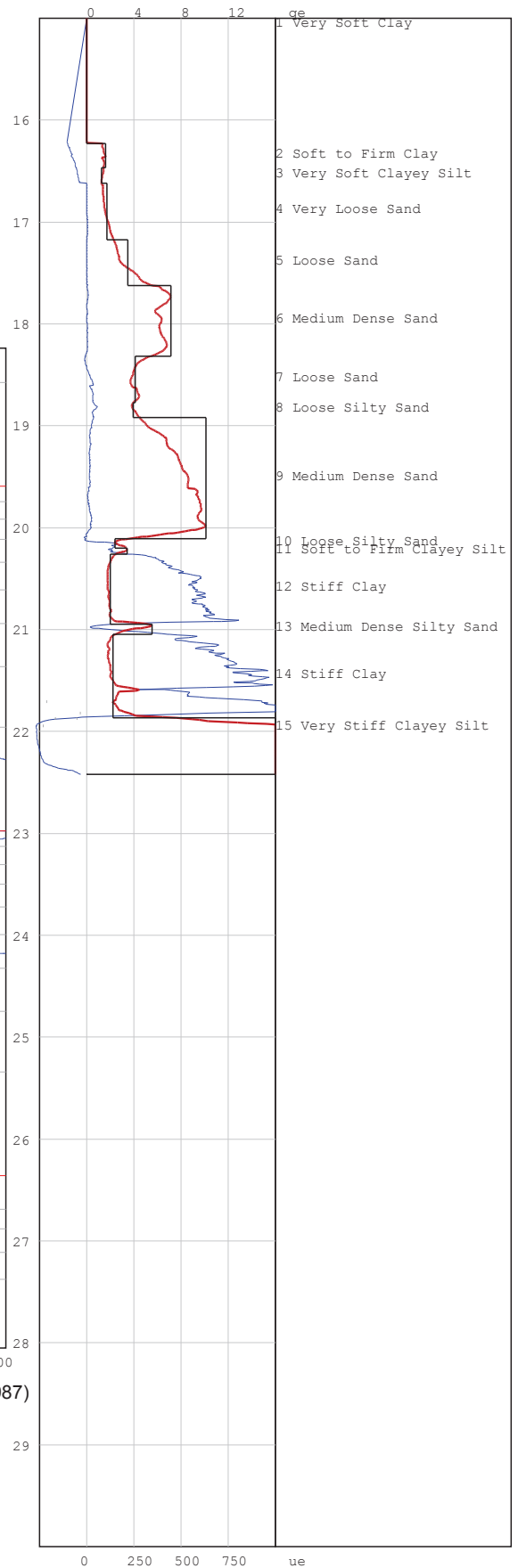
Site: Durban Harbour over water

Hole No: S 54  
Date: 2012/09/18





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# PIEZOCONE PENETRATION TEST



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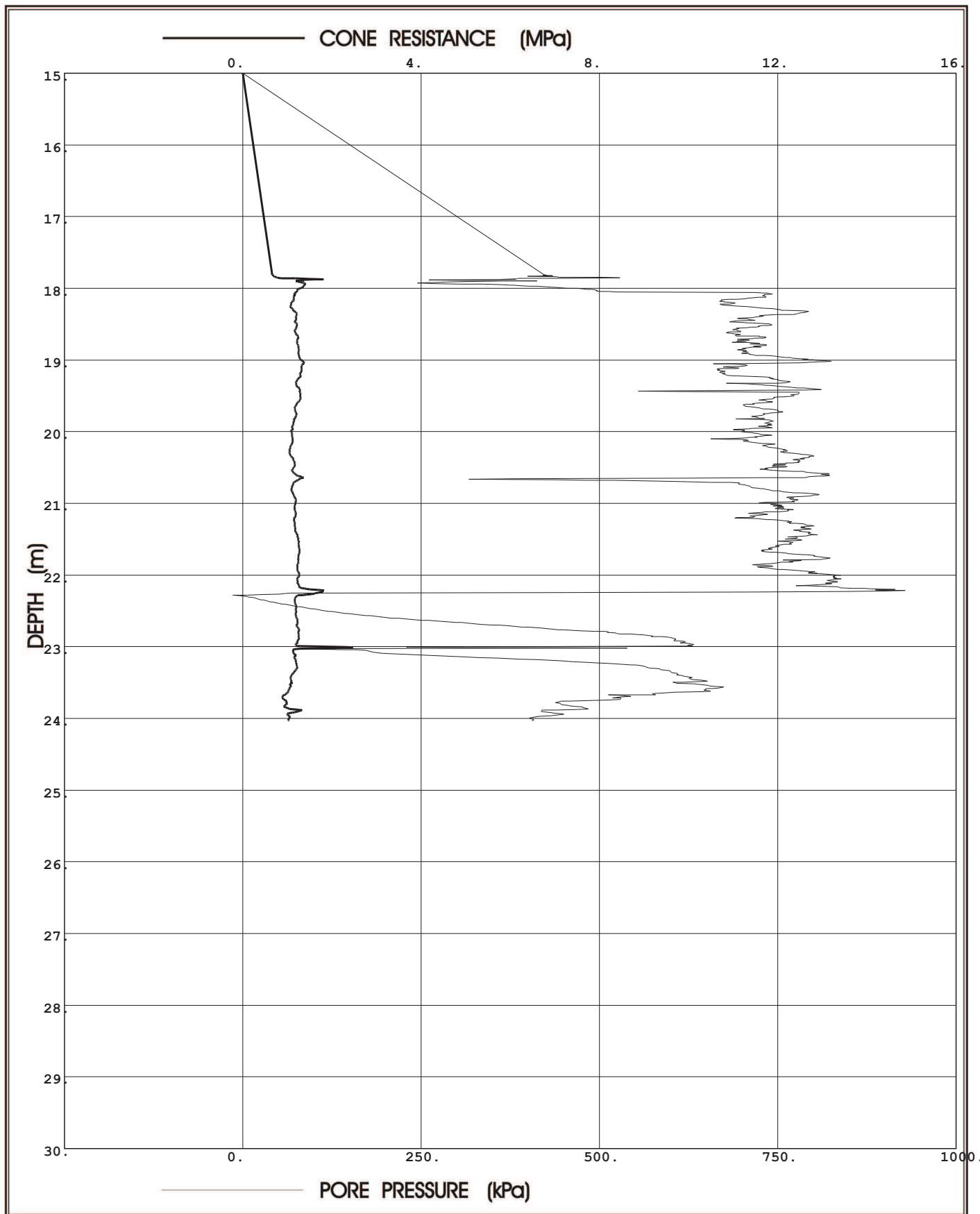
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 55

DATE: 2012/09/19

Page:2



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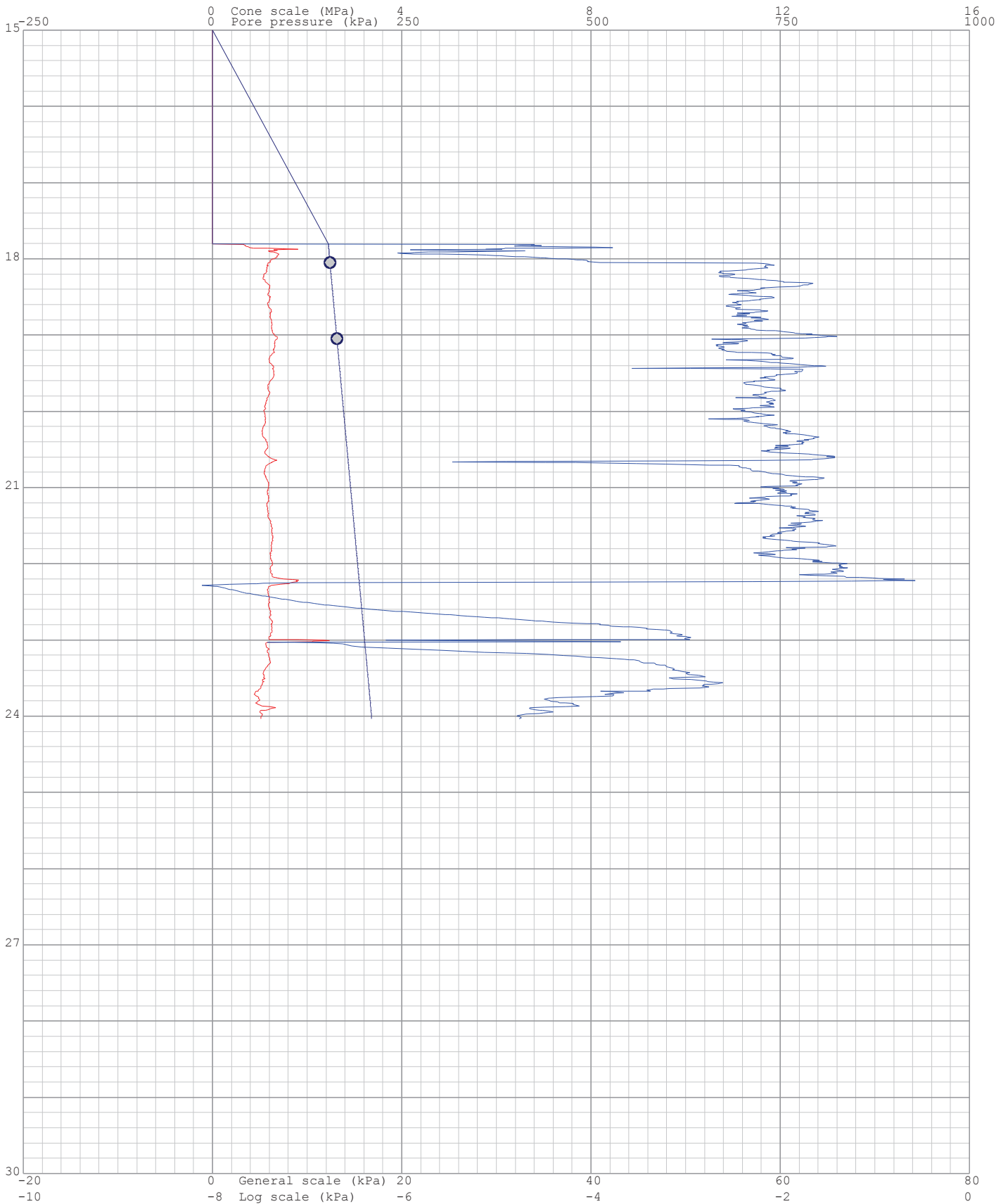
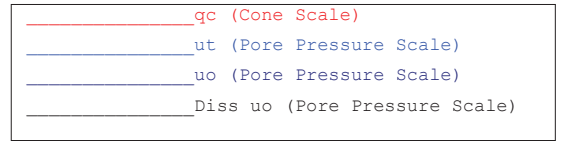
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 55  
Date: 2012/09/19

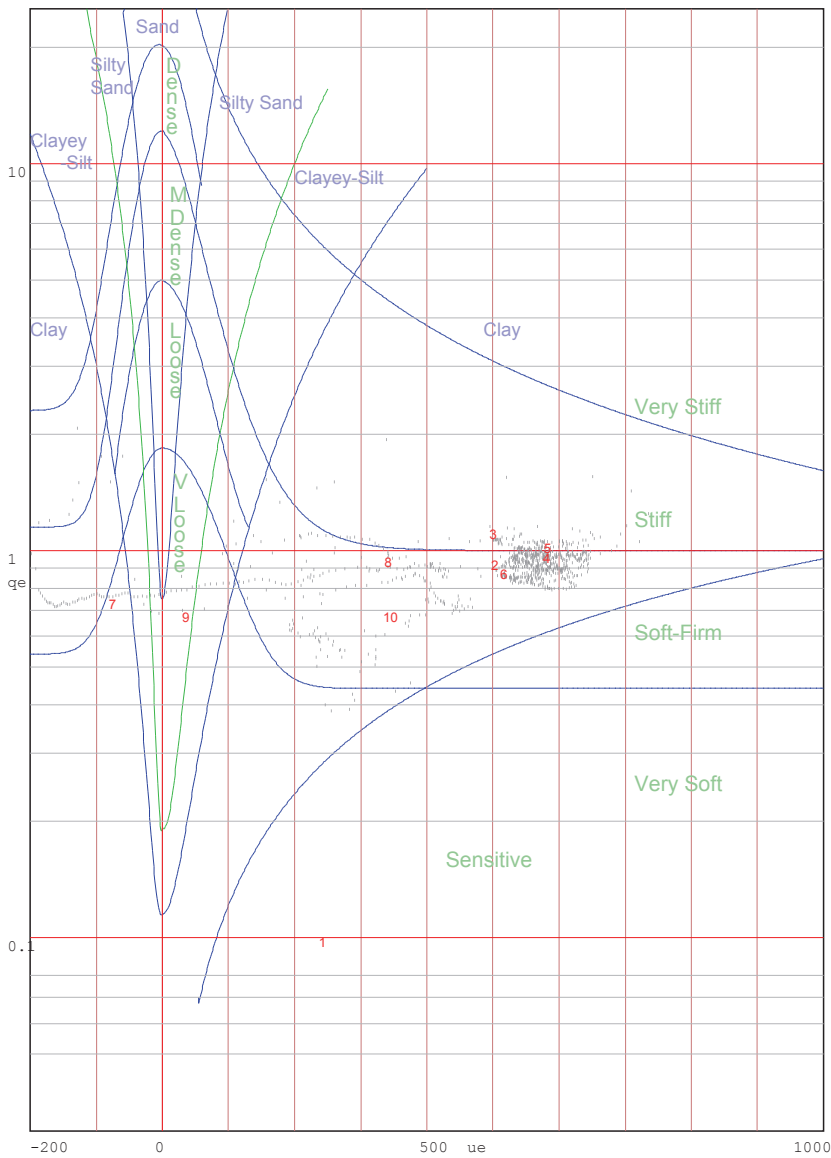
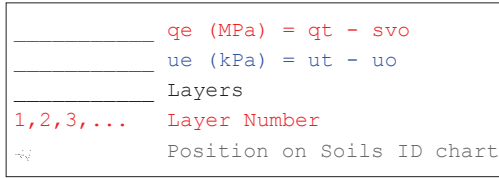




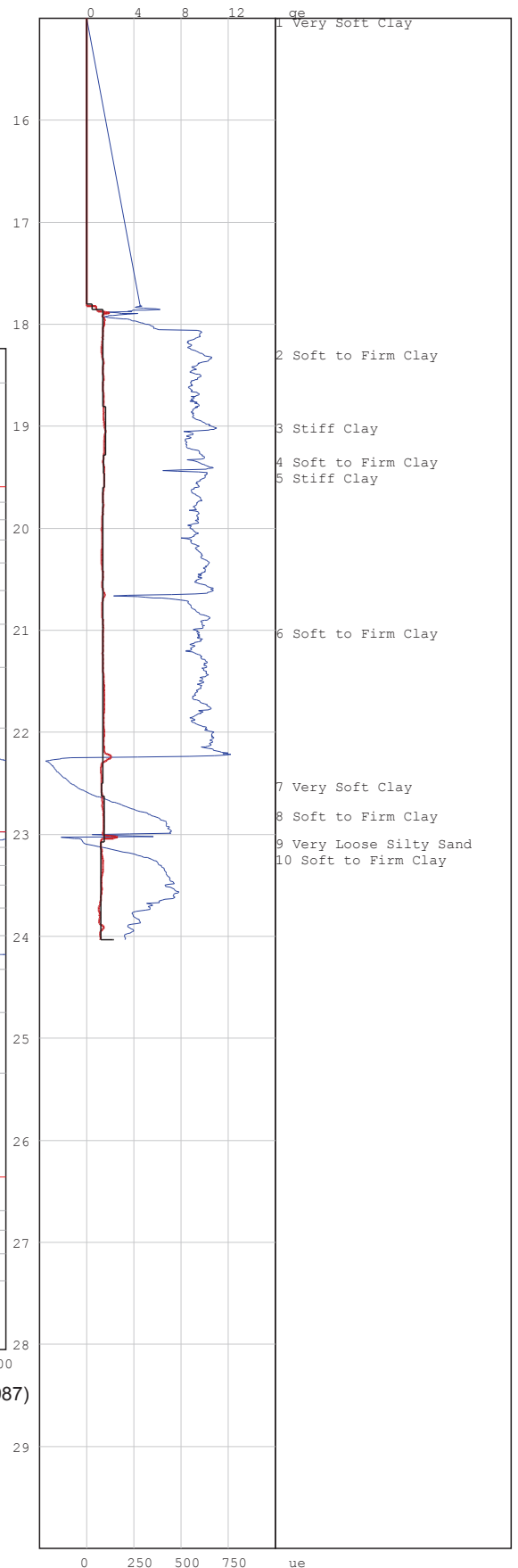
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 55  
Date: 2012/09/19



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# PIEZOCONE PENETRATION TEST



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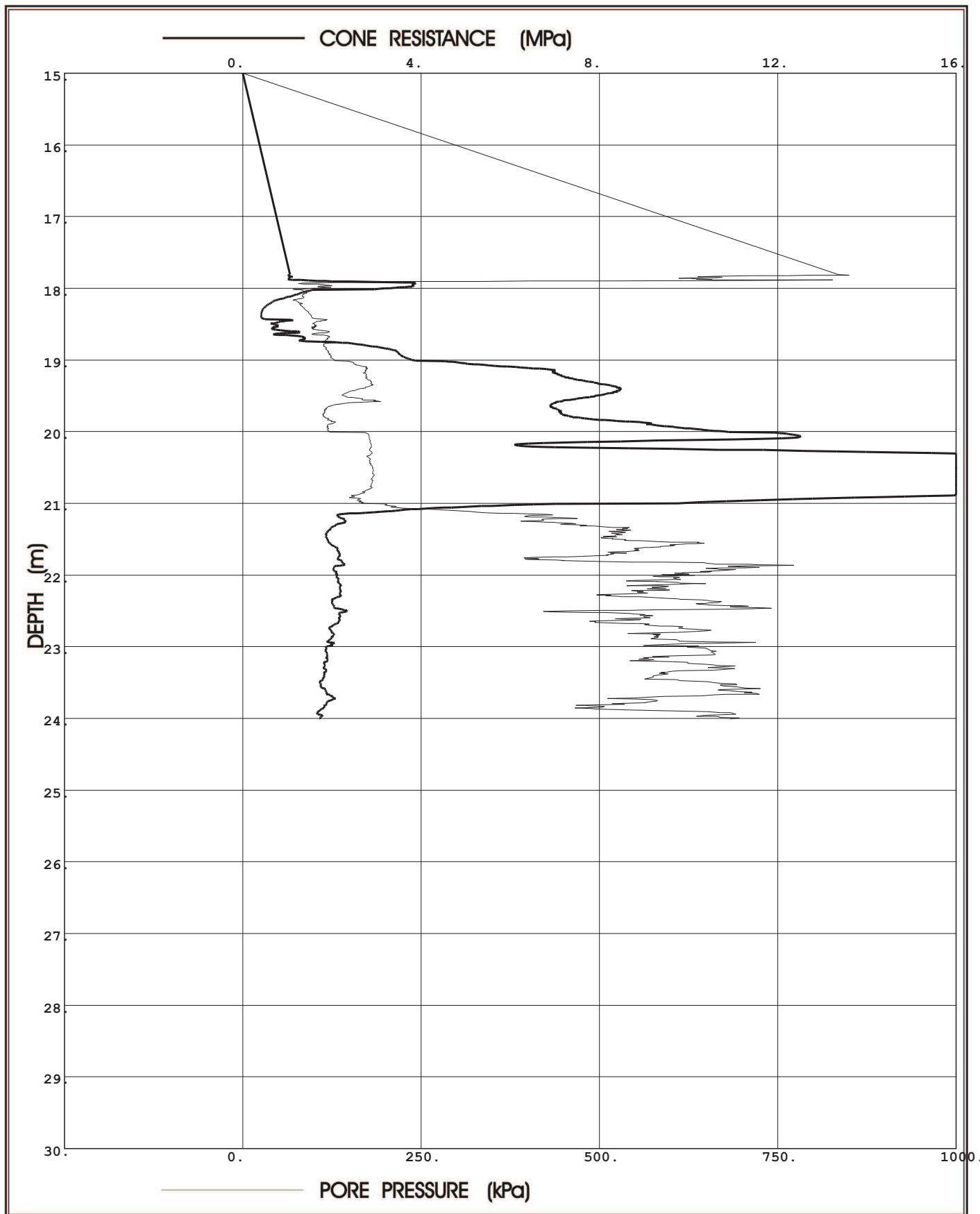
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 56

DATE: 2012/09/19

Page:2



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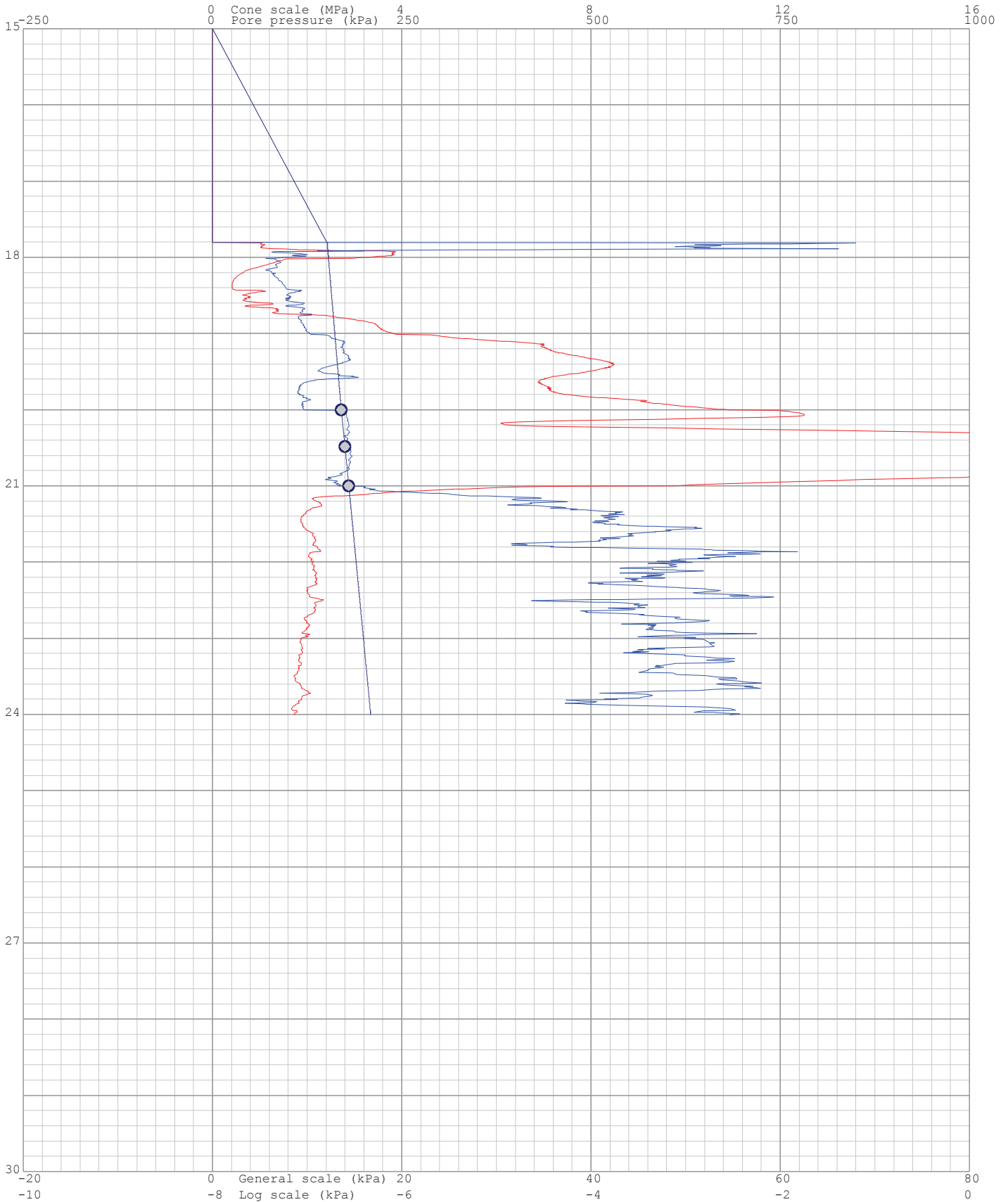
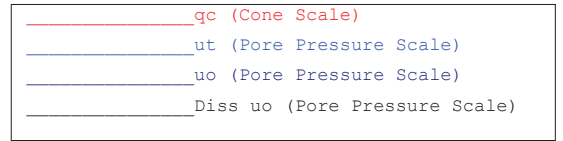
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

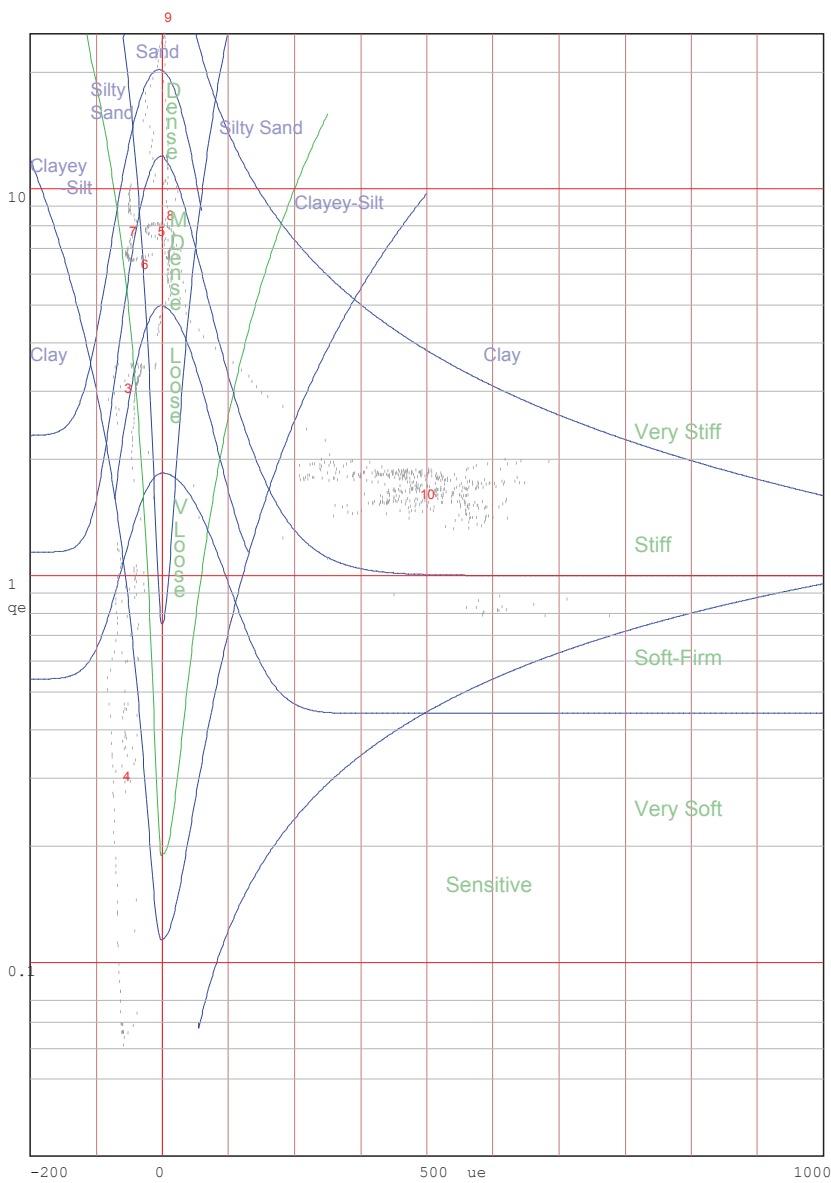
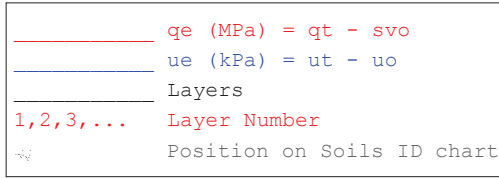
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Date: 2012/09/19



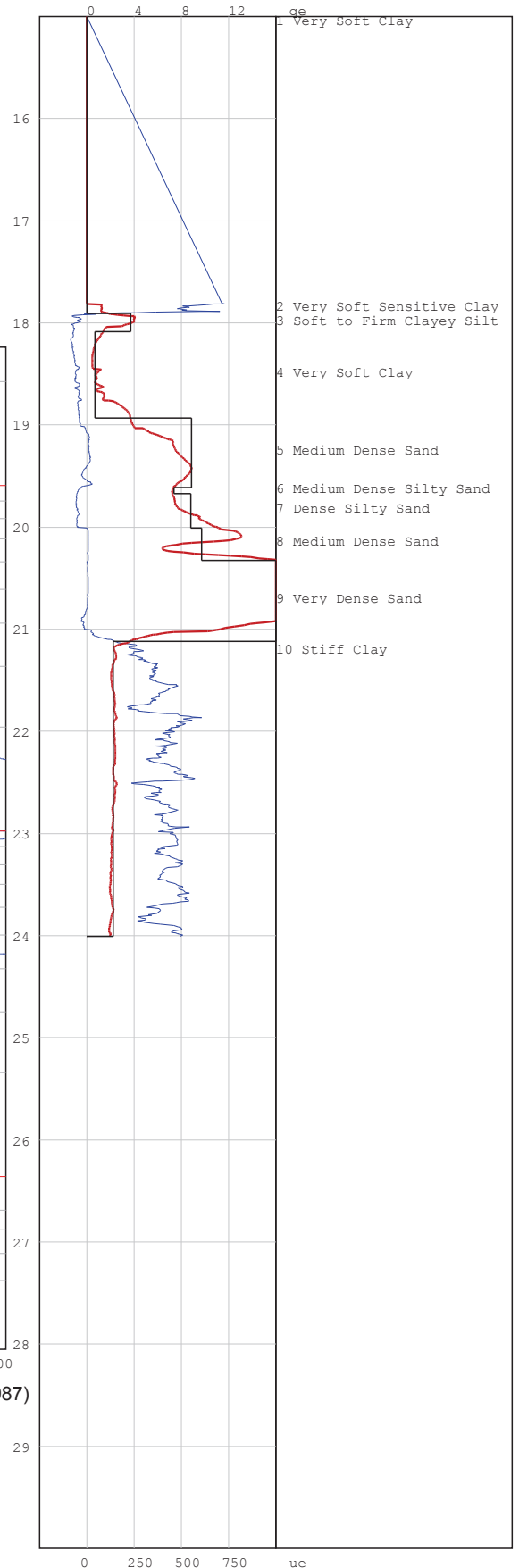
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 56  
Date: 2012/09/19



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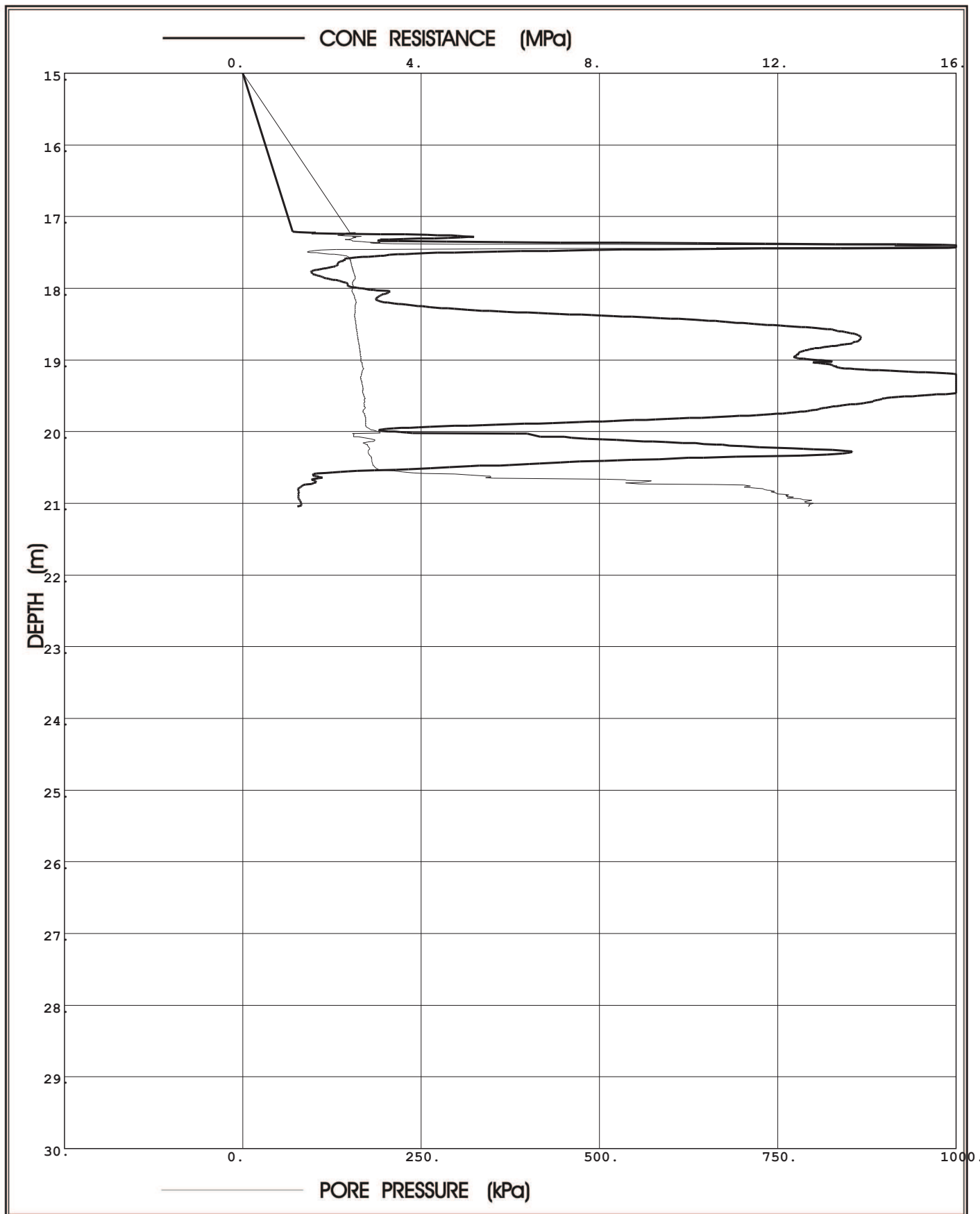
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 57

DATE: 2012/09/27

Page:2



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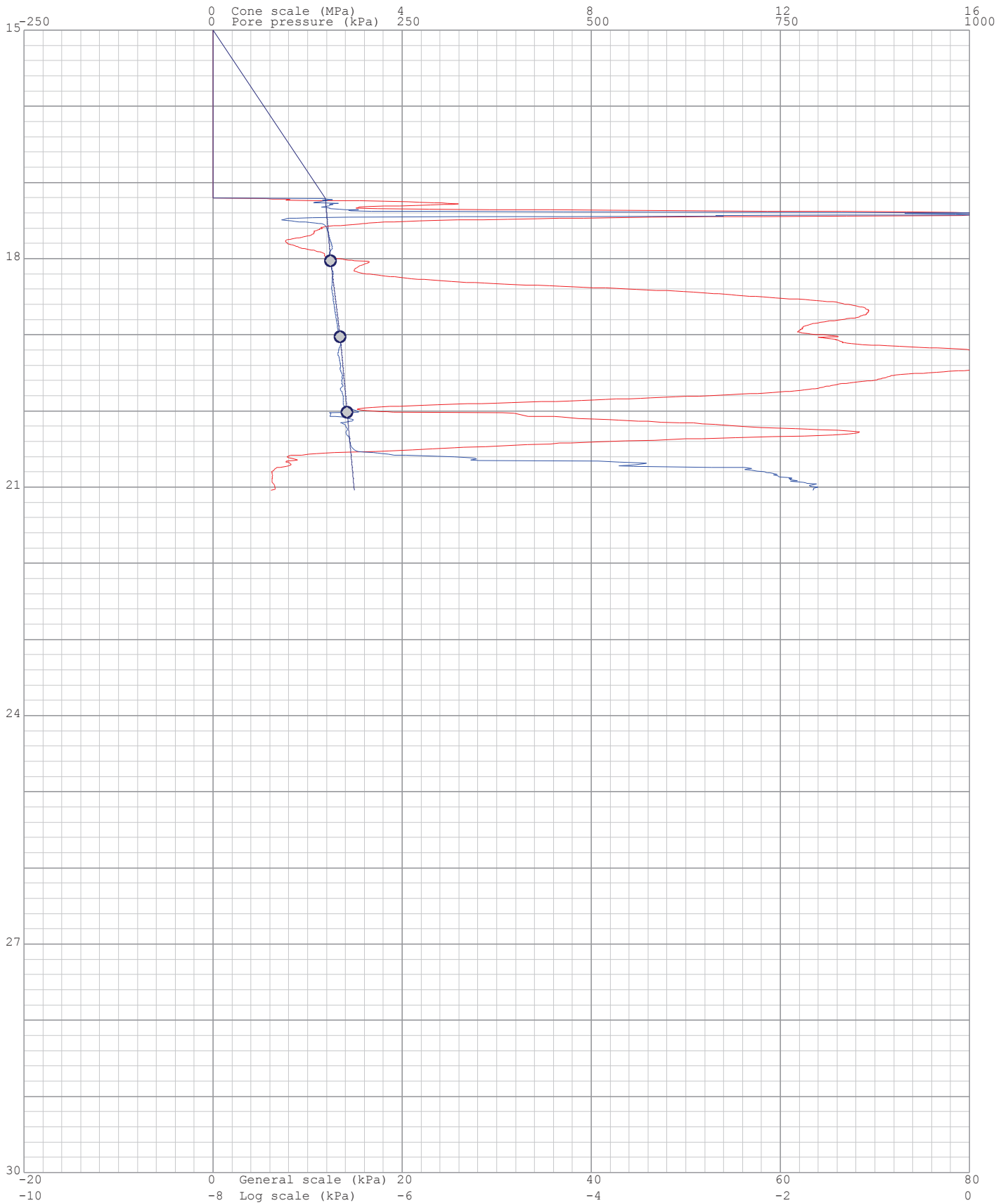
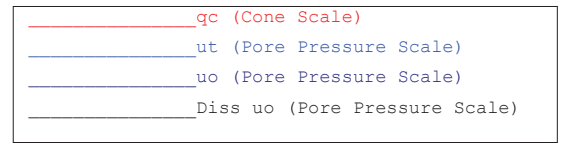
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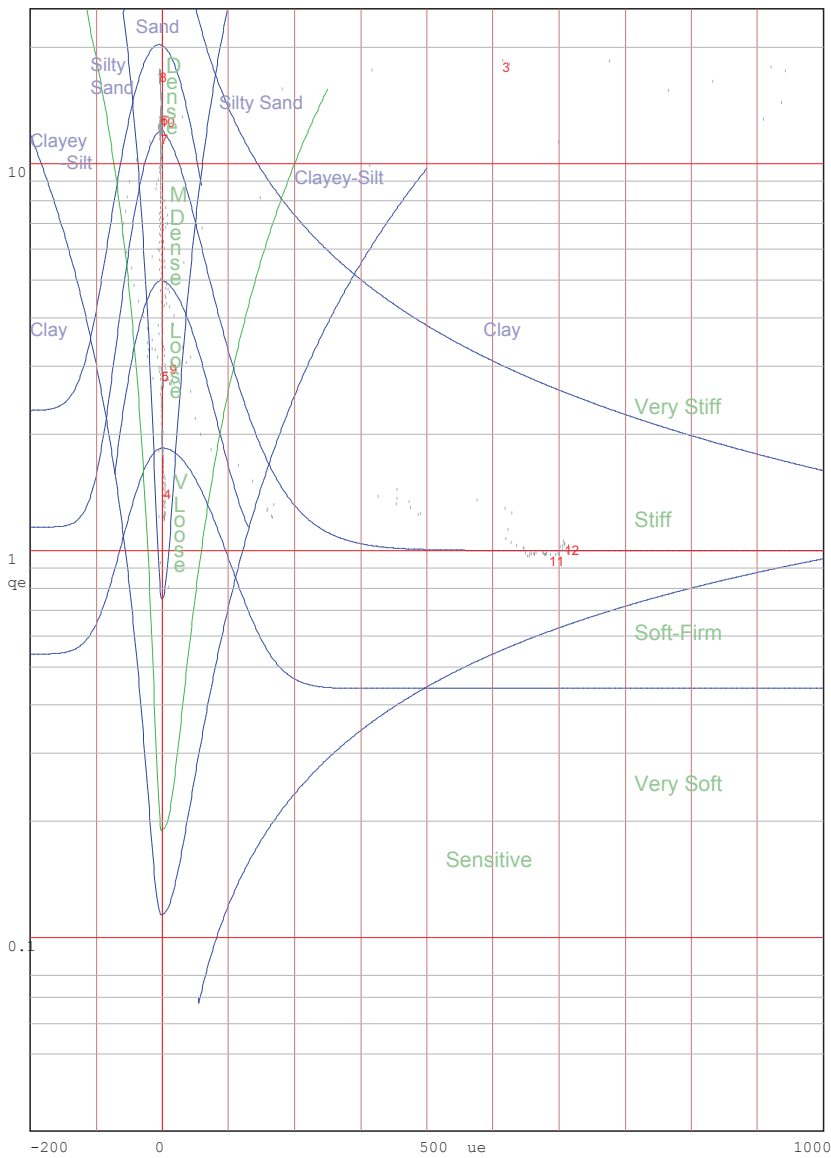
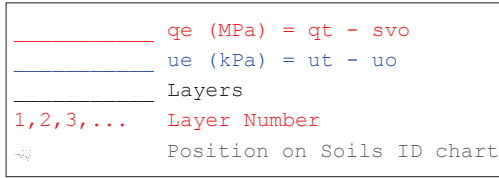
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

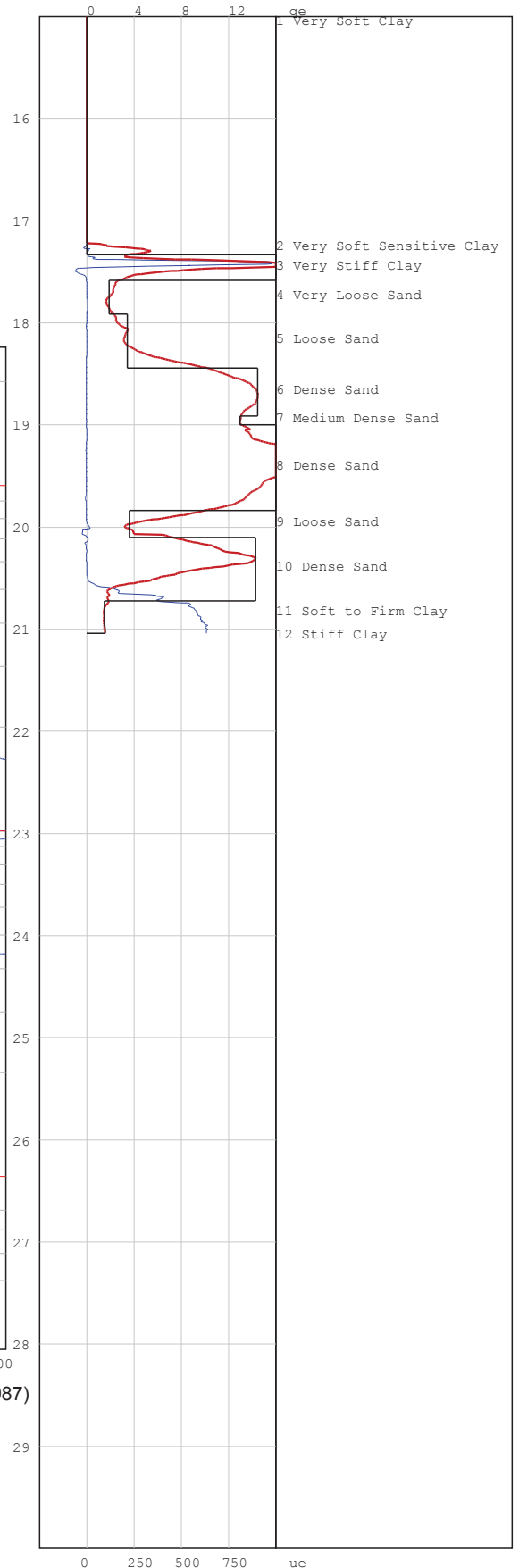
Site: Durban Harbour over water

Hole No: S 57  
Date: 2012/09/27





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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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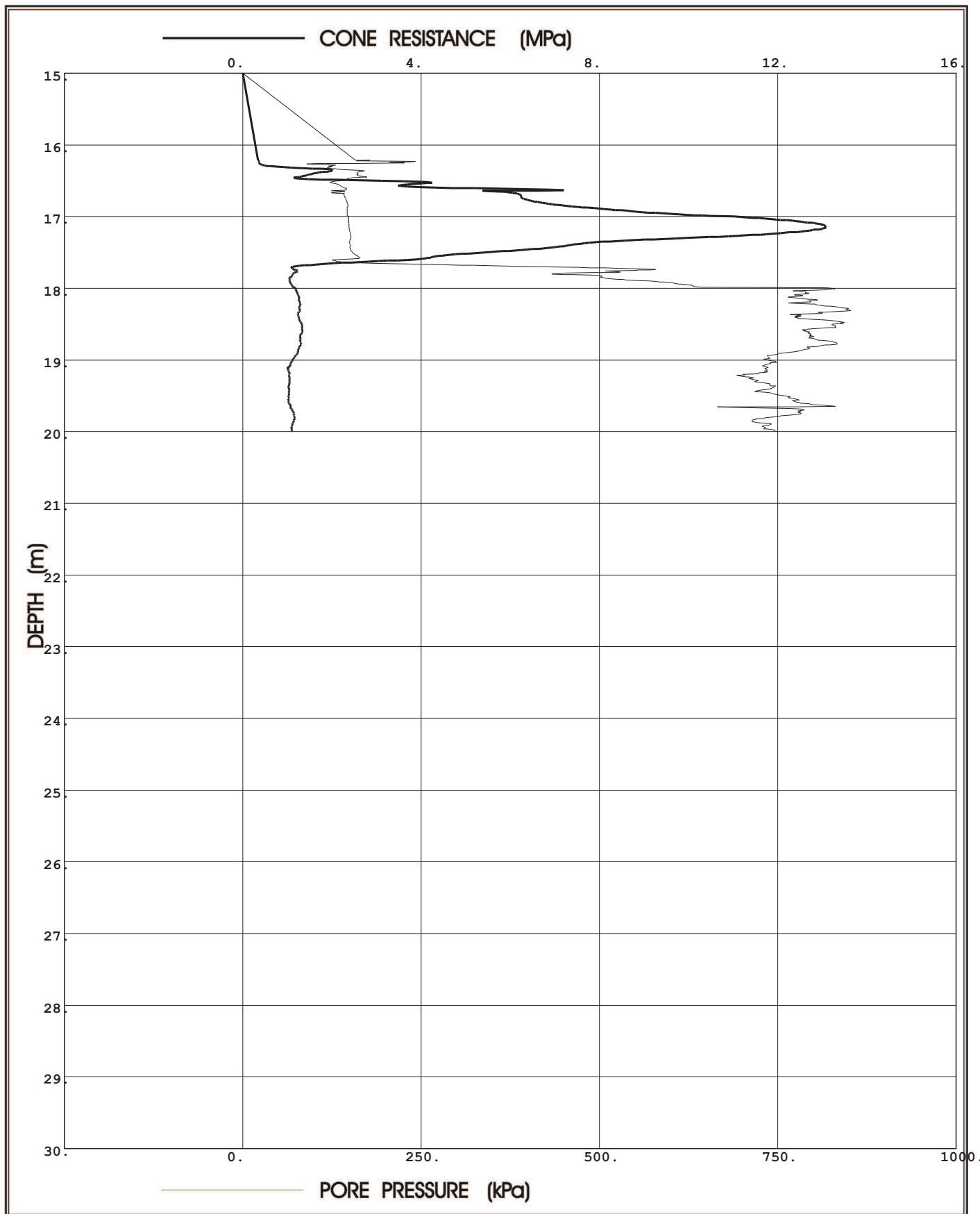
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 58

DATE: 2012/09/27

Page:2



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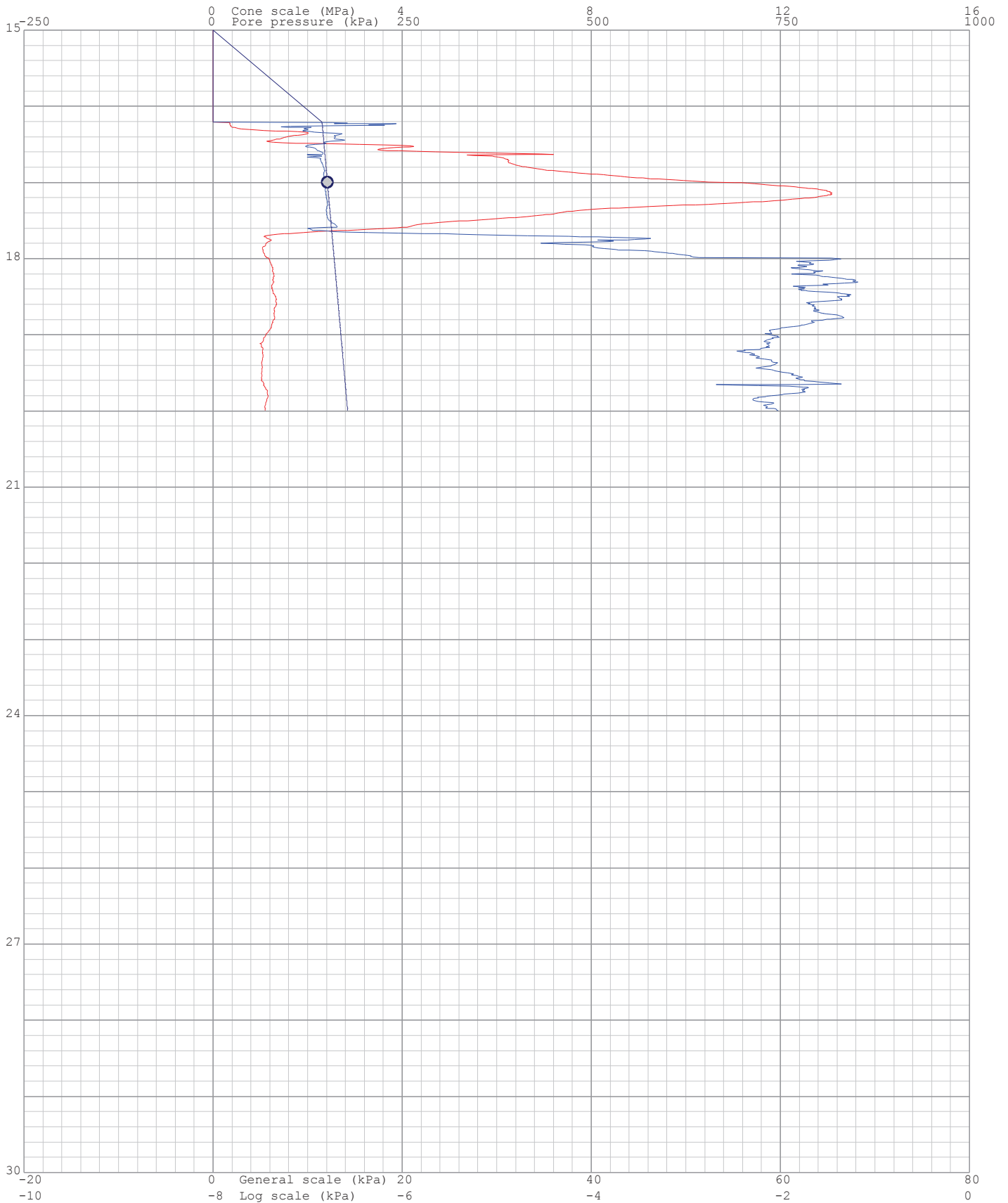
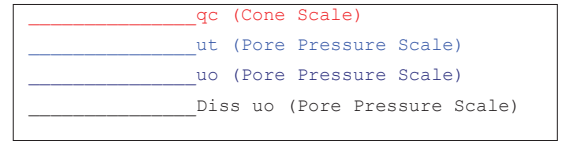
Tel: 012 997 2250  
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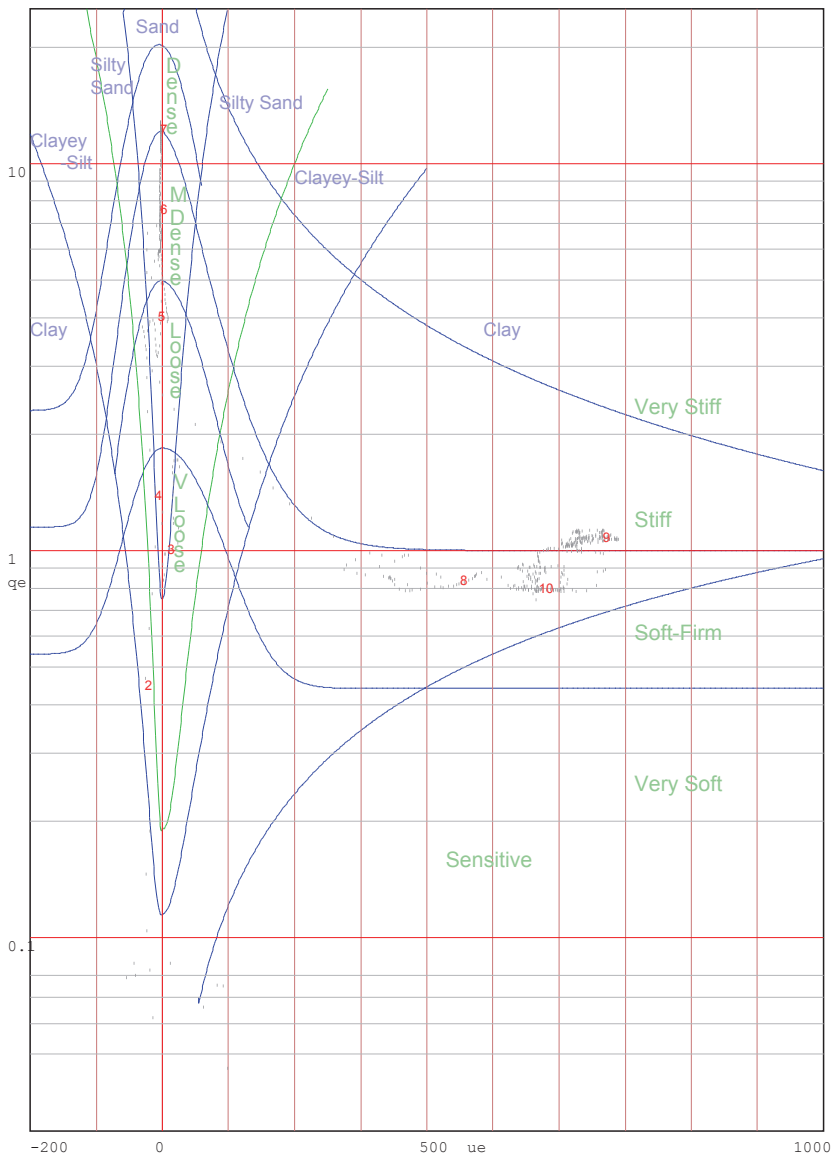
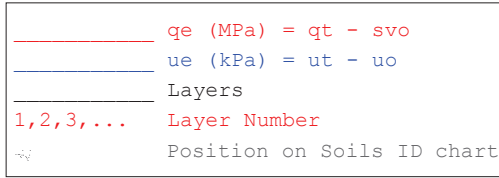


Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

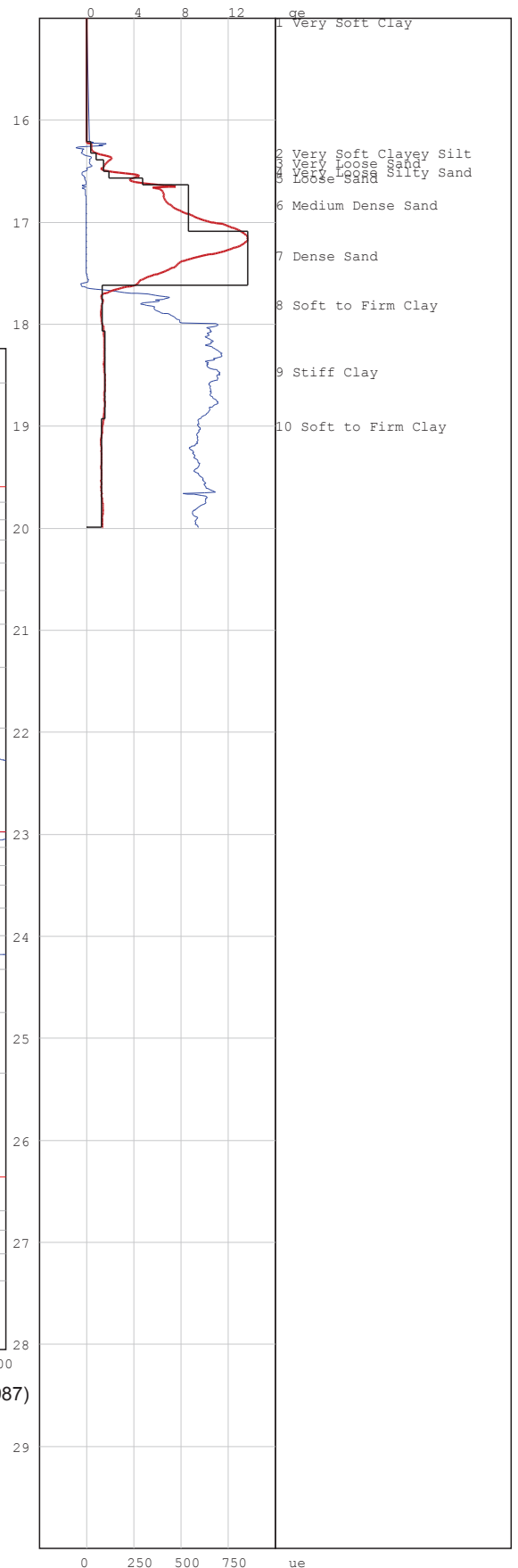
Hole No: S 58  
Date: 2012/09/27





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)

1



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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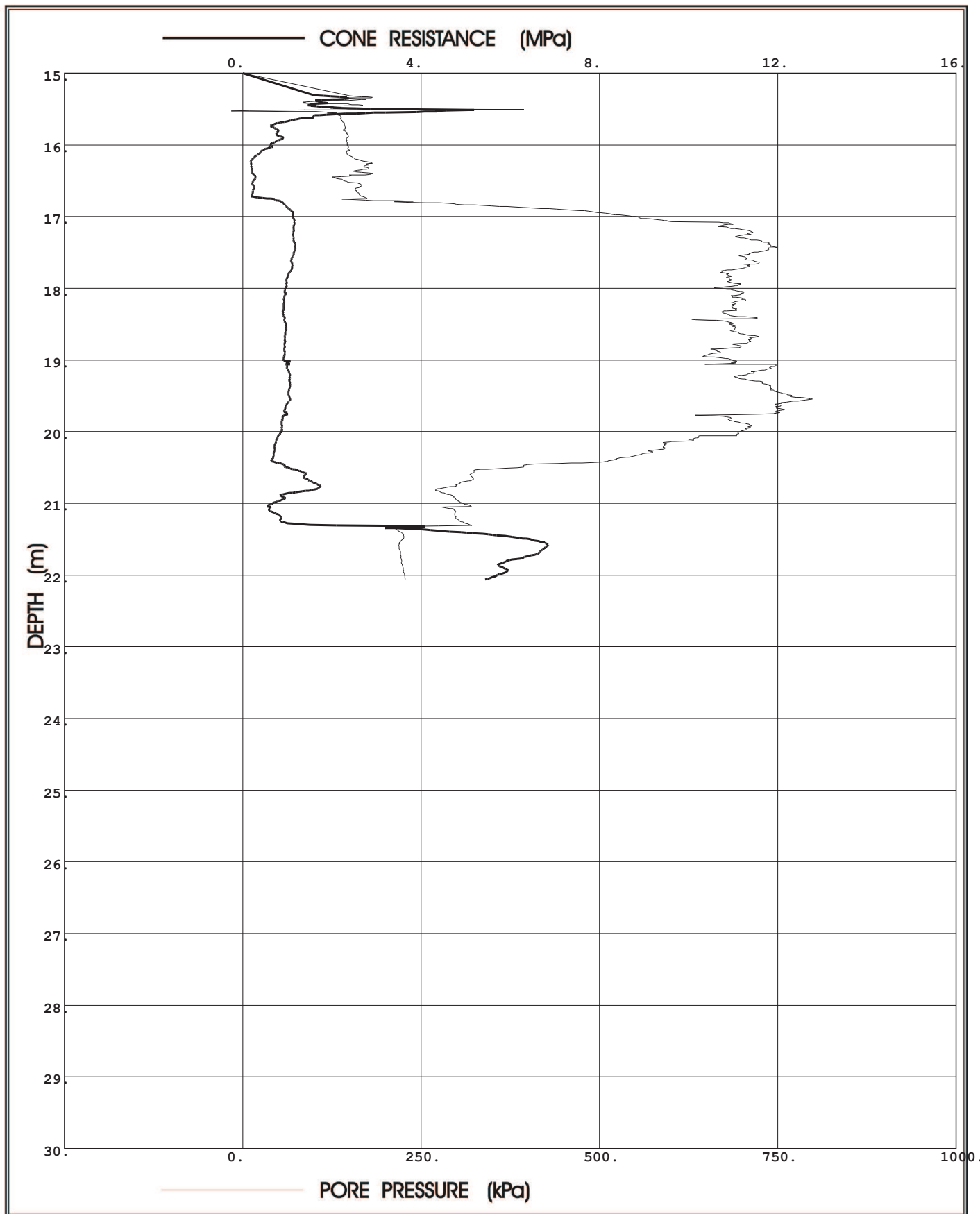
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 59

DATE: 2012/09/26

Page:2



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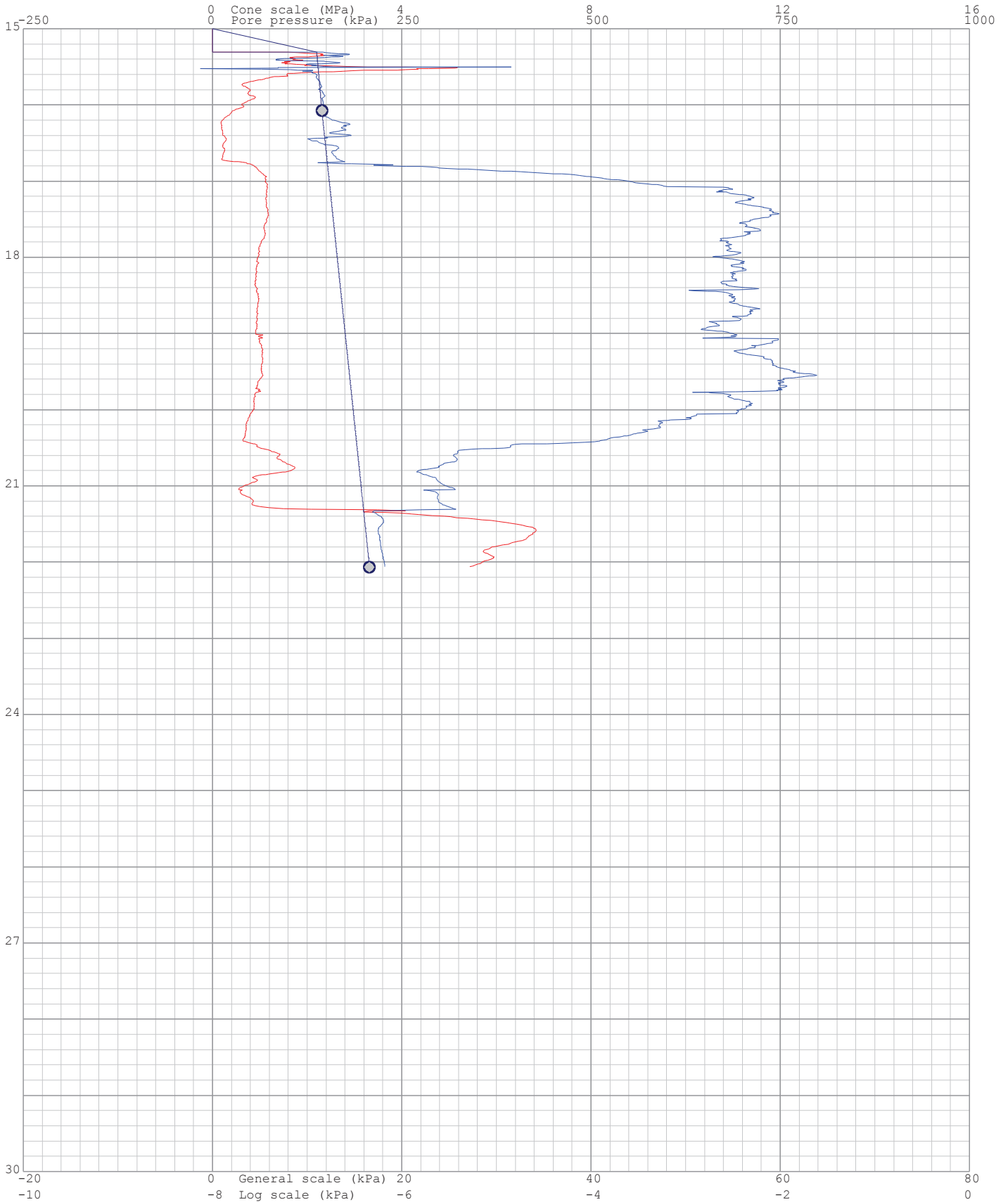
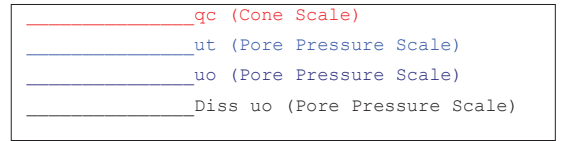
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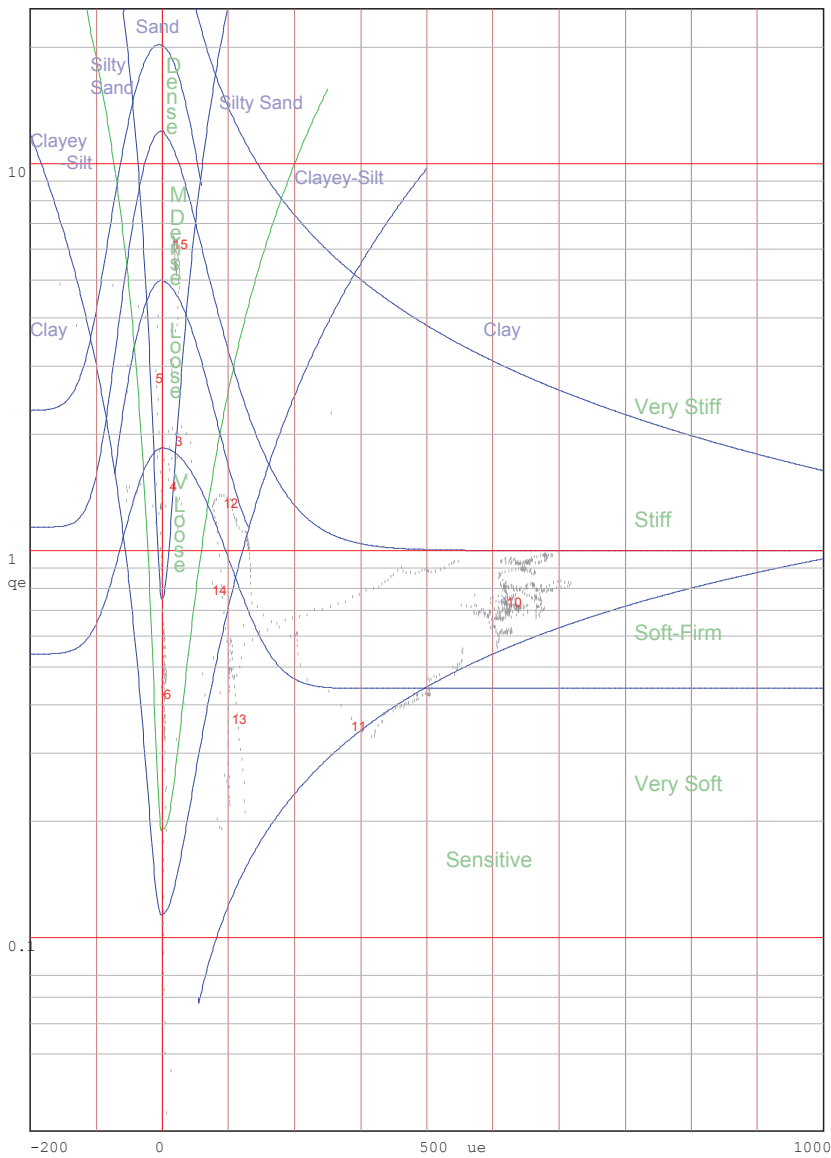
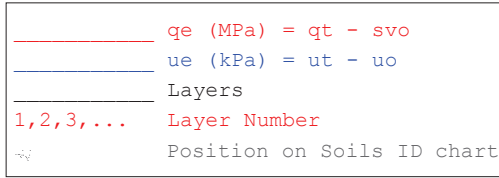
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

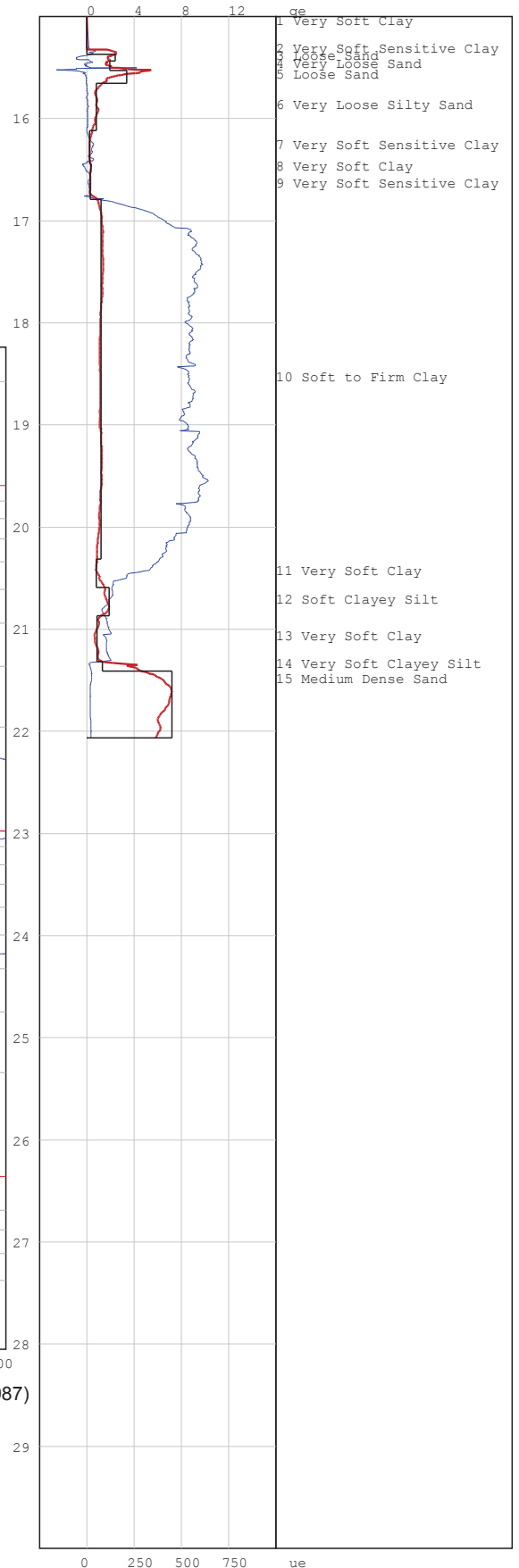
Site: Durban Harbour over water

Hole No: S 59  
Date: 2012/09/26





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# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

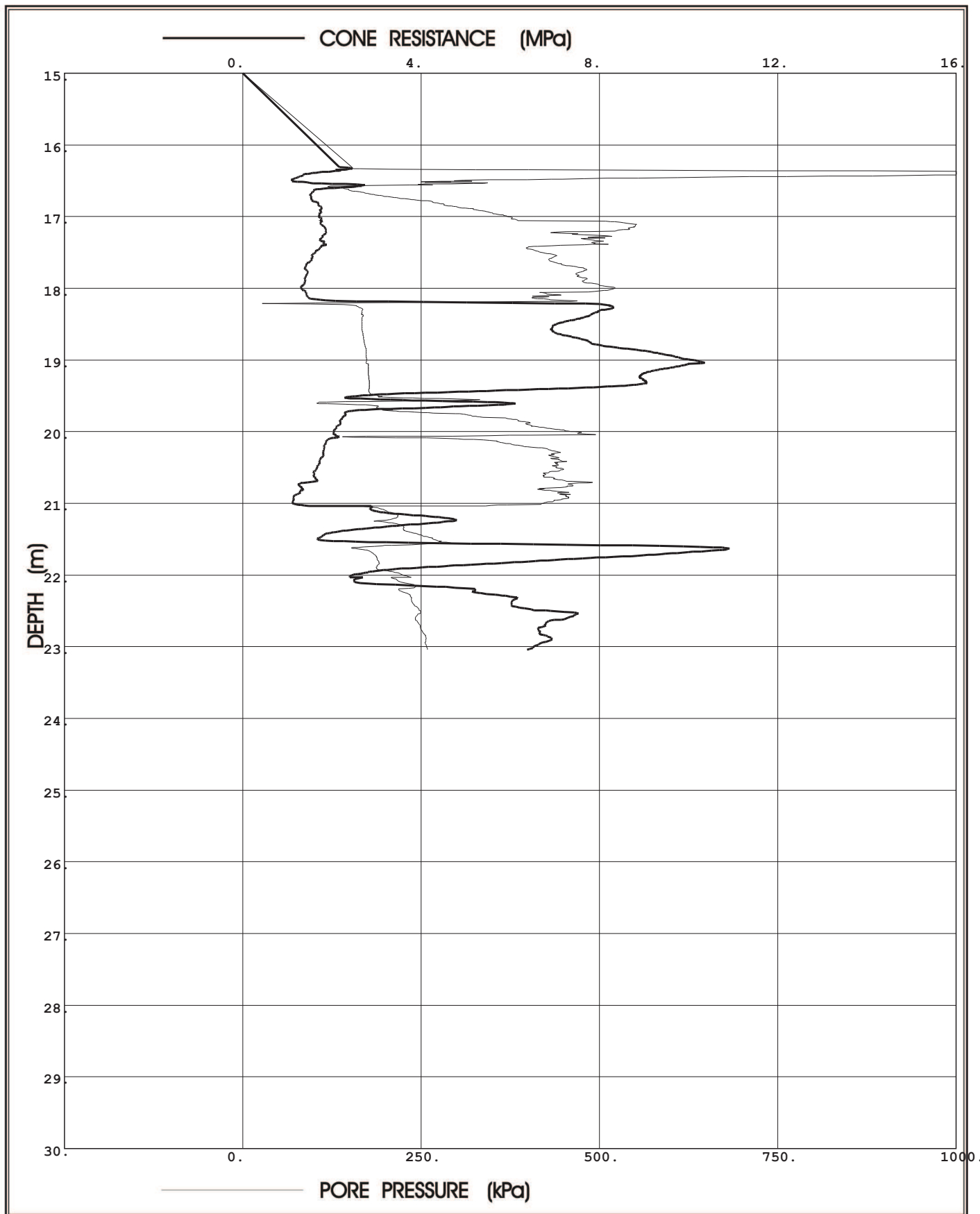
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 60

DATE: 2012/09/24

Page:2



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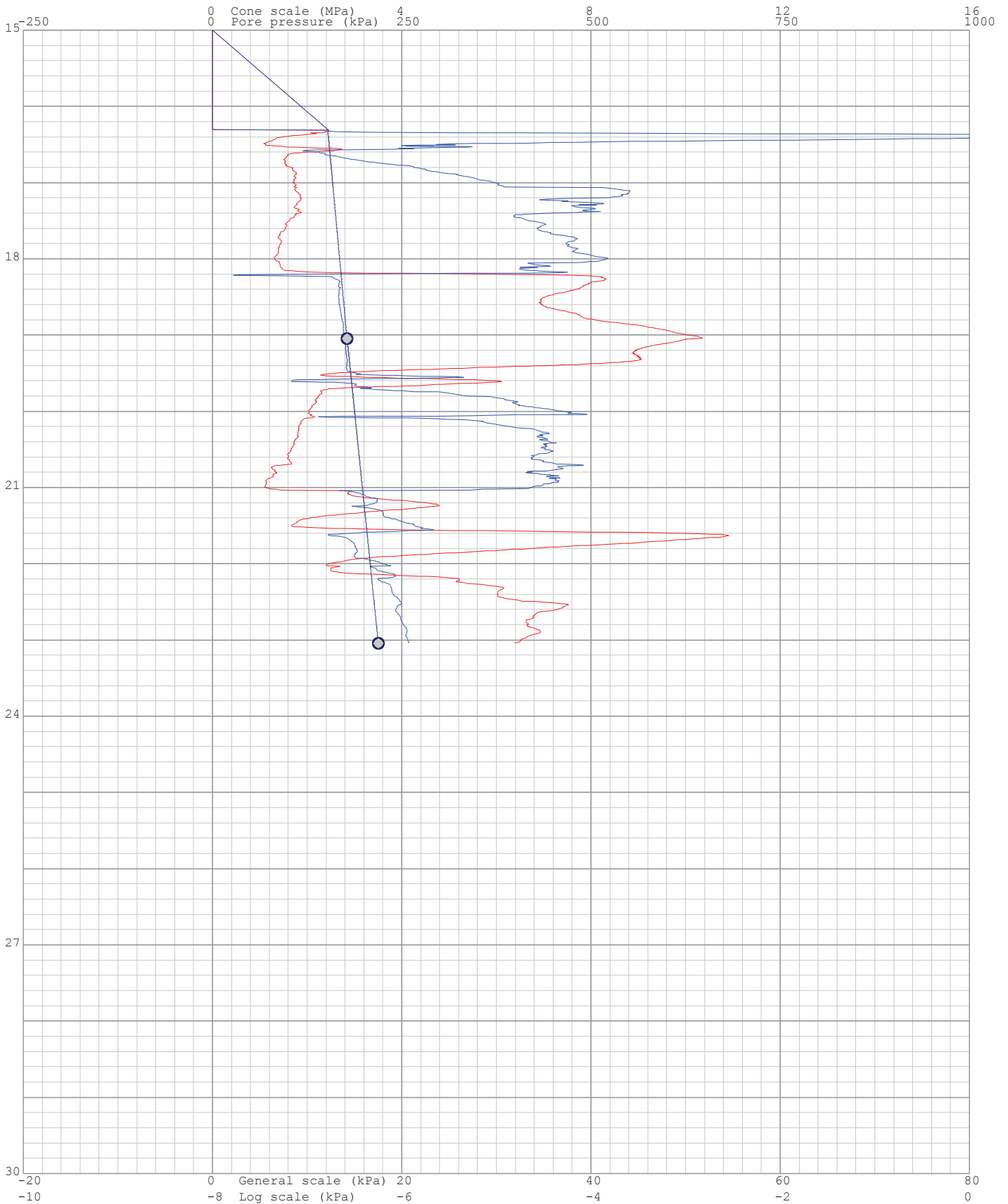
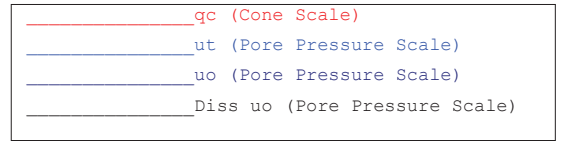
Fax: 012 420 4940

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Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 60  
Date: 2012/09/24

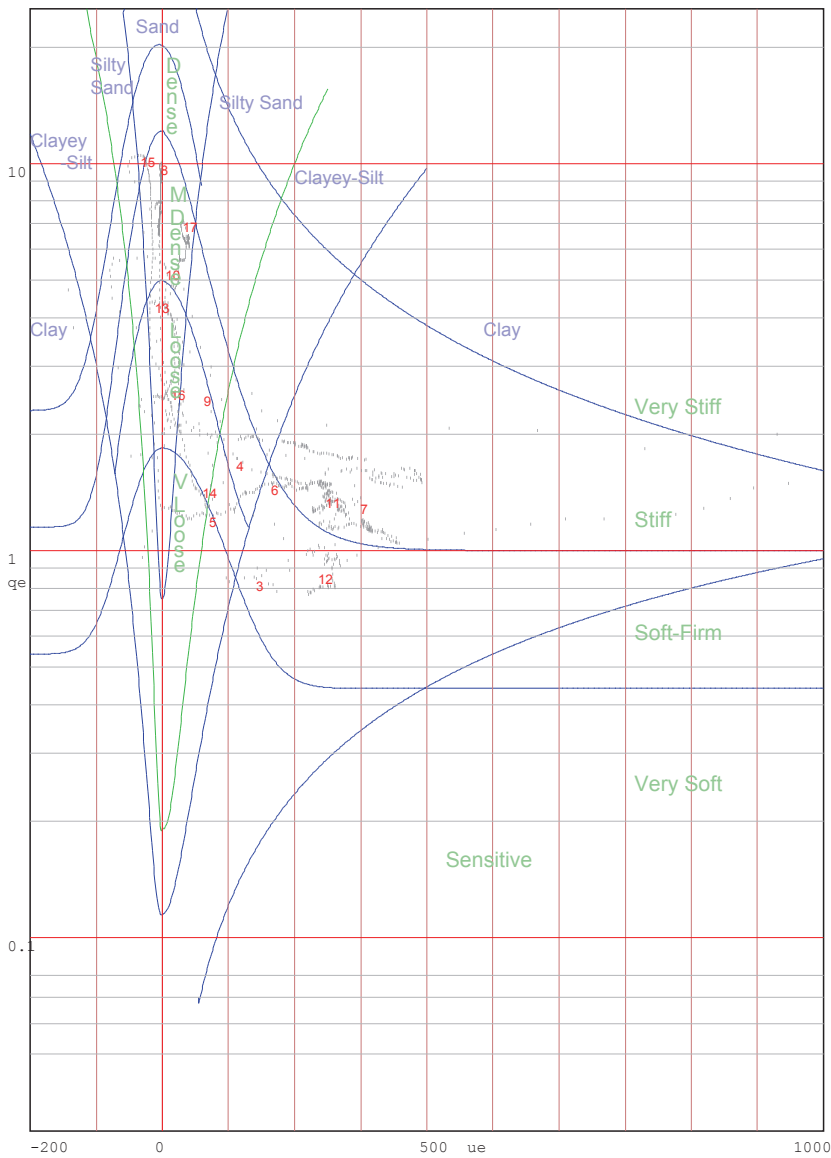


Project: Durban Harbour Piezocone Investigation for Dredging

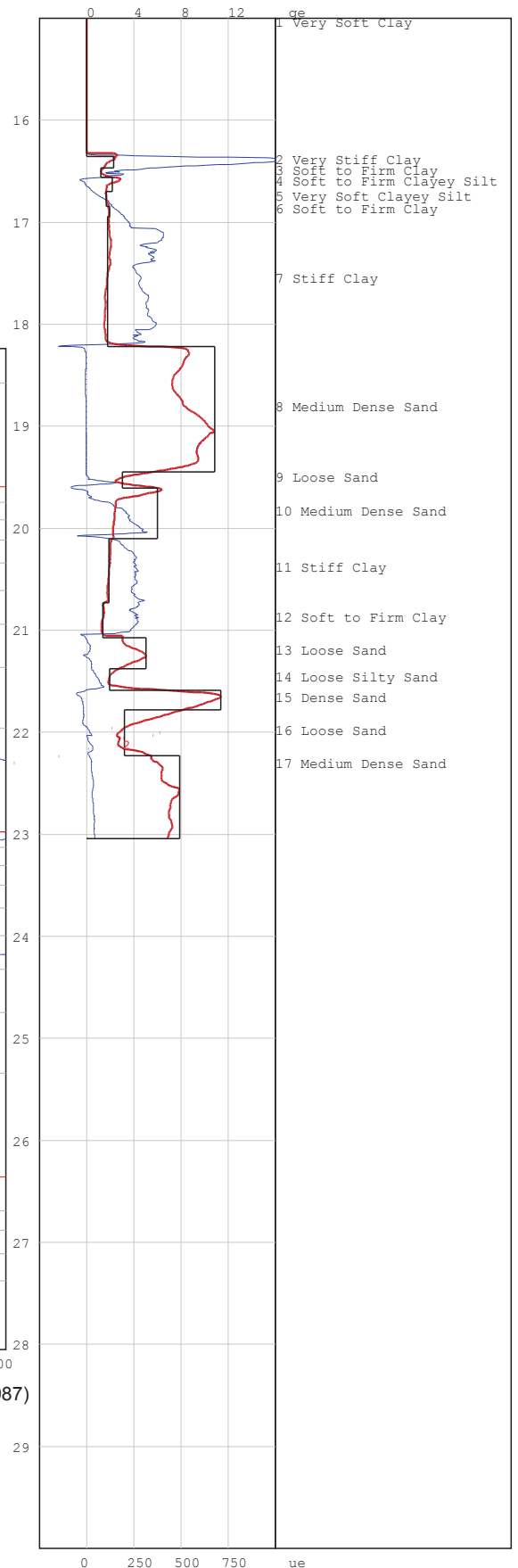
Site: Durban Harbour over water

Hole No: S 60  
Date: 2012/09/24

$q_e$  (MPa) =  $q_t - s_{vo}$   
 $u_e$  (kPa) =  $u_t - u_o$   
 Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



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0044

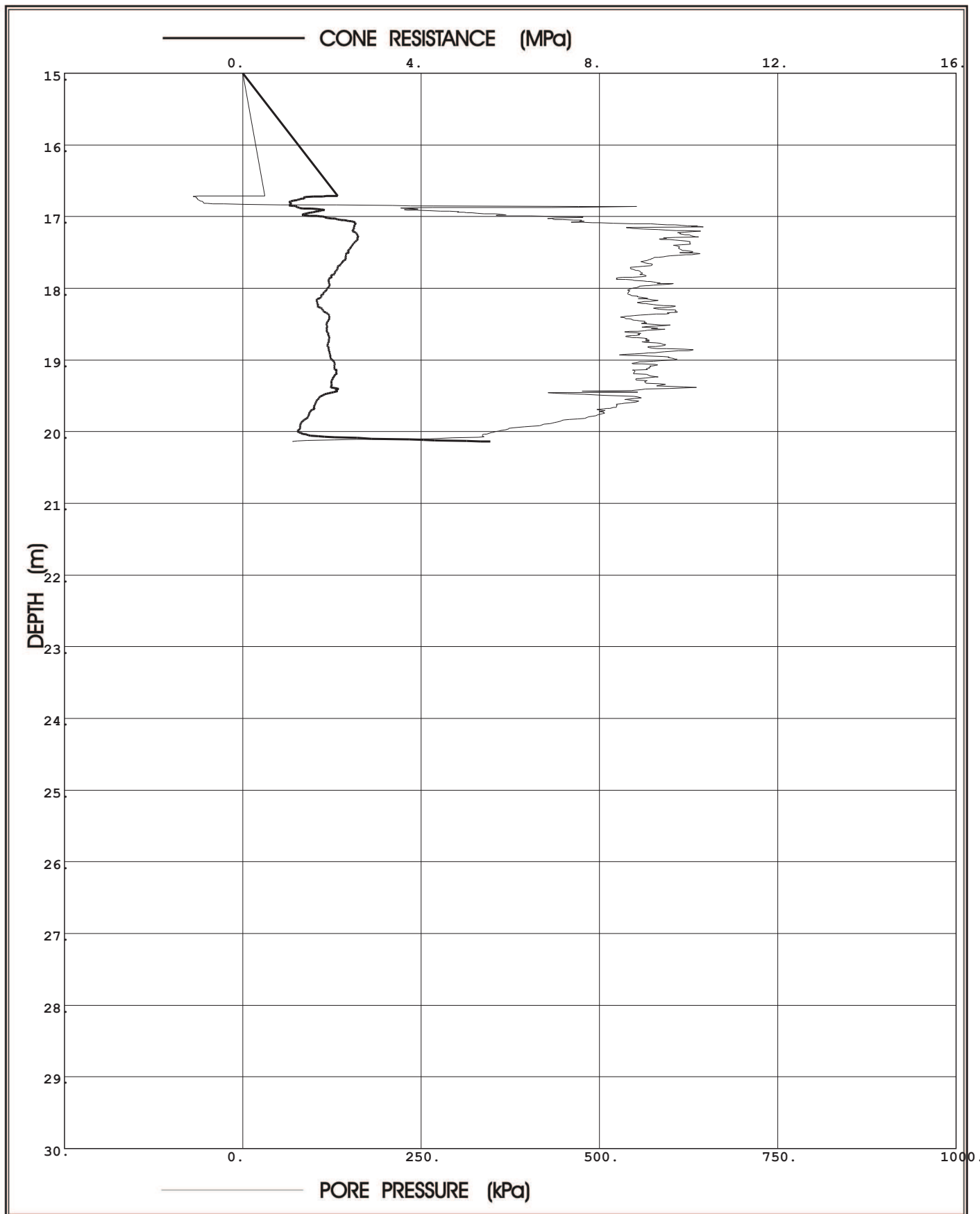
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 61

DATE: 2012/09/26

Page:2



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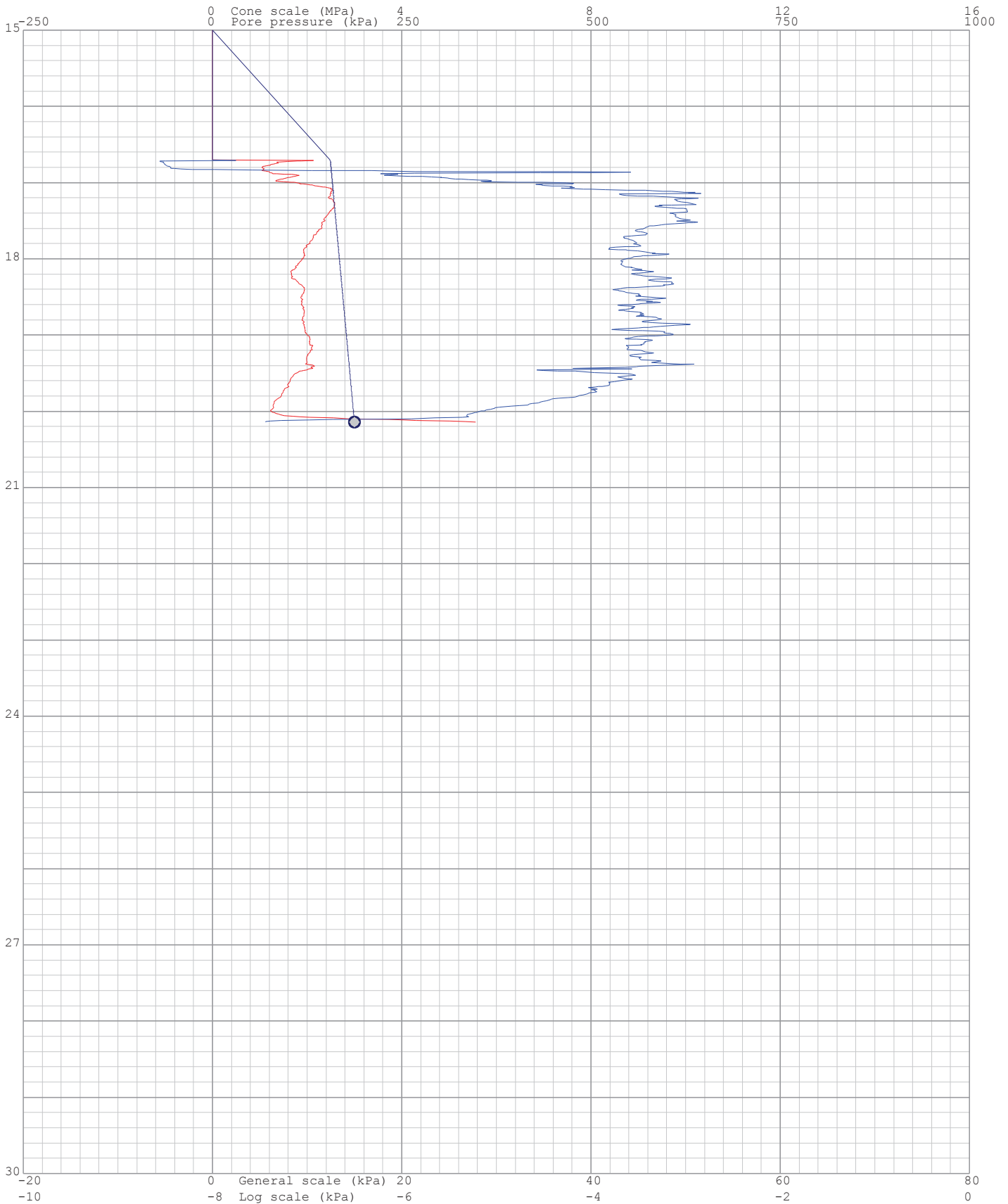
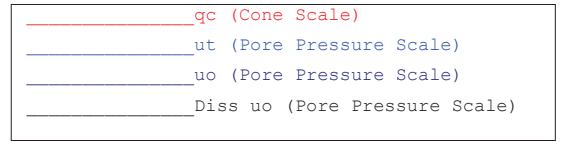
rust@global.co.za

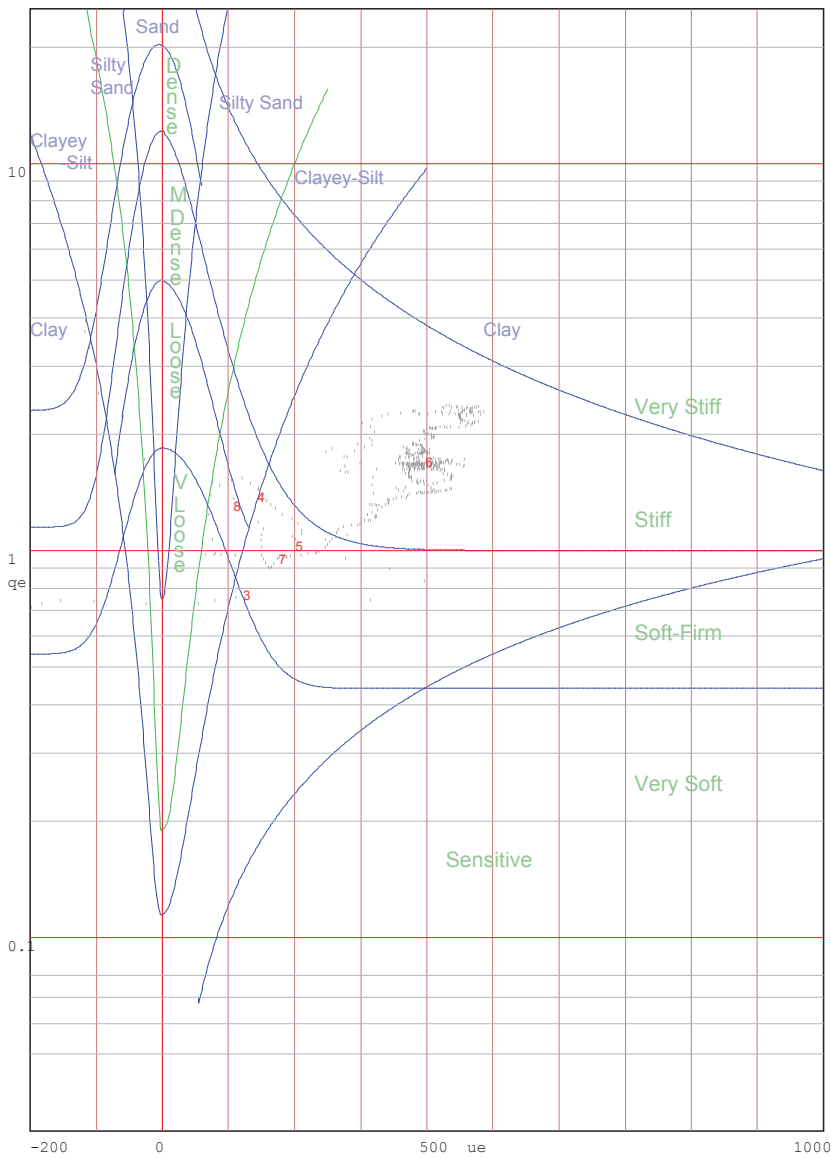
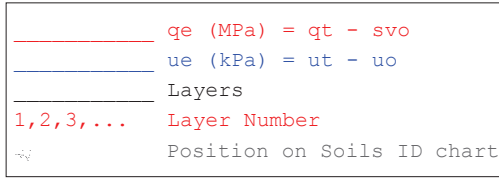
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

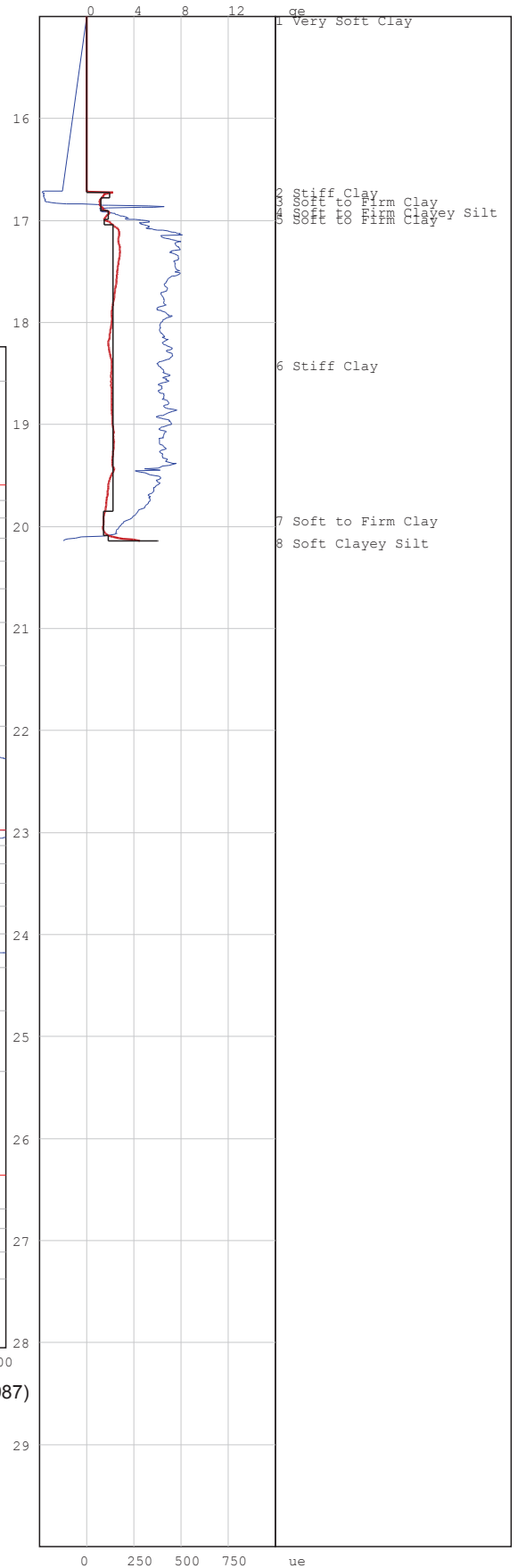
Hole No: S 61

Date: 2012/09/26





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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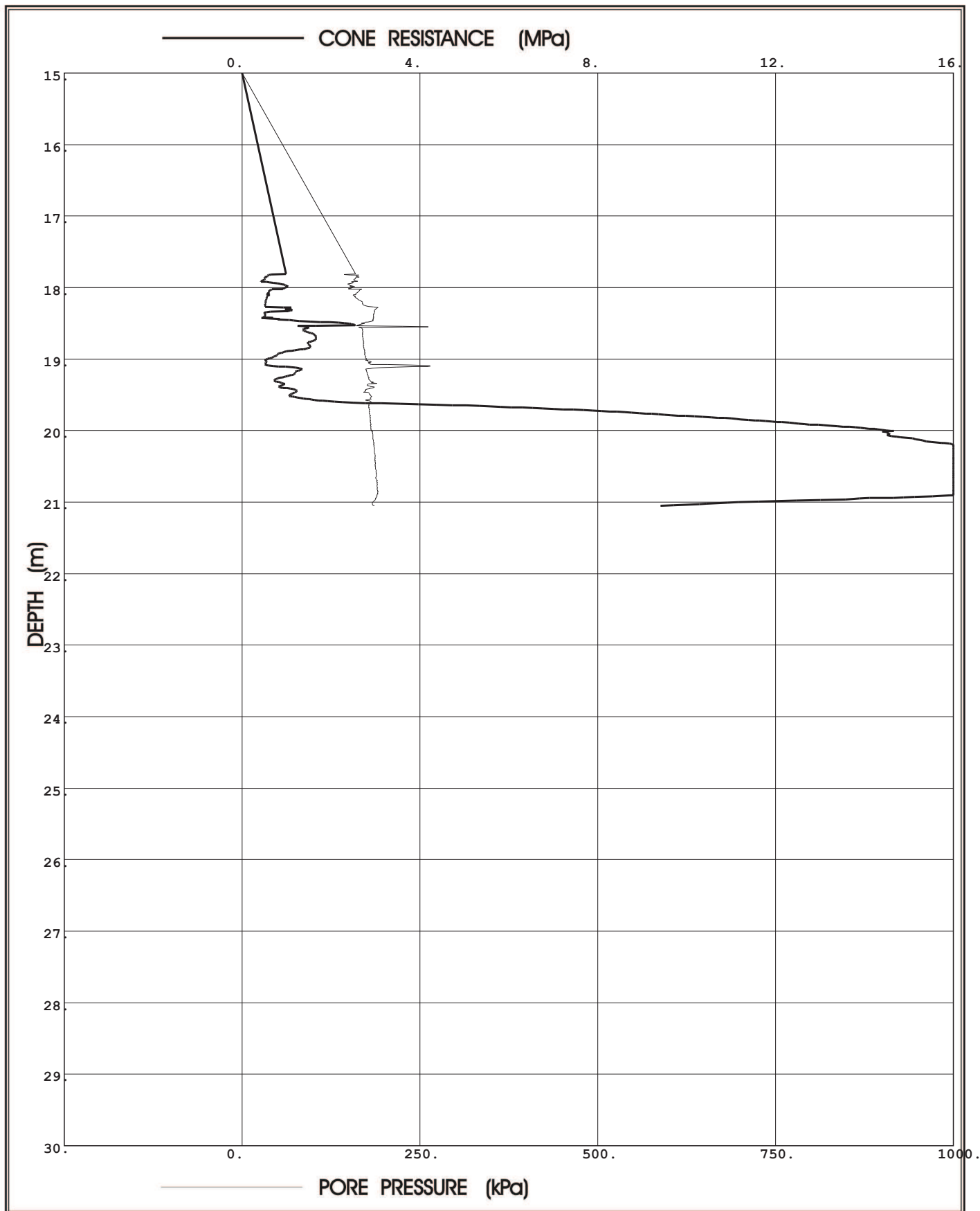
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 62

DATE: 2012/09/27

Page:2



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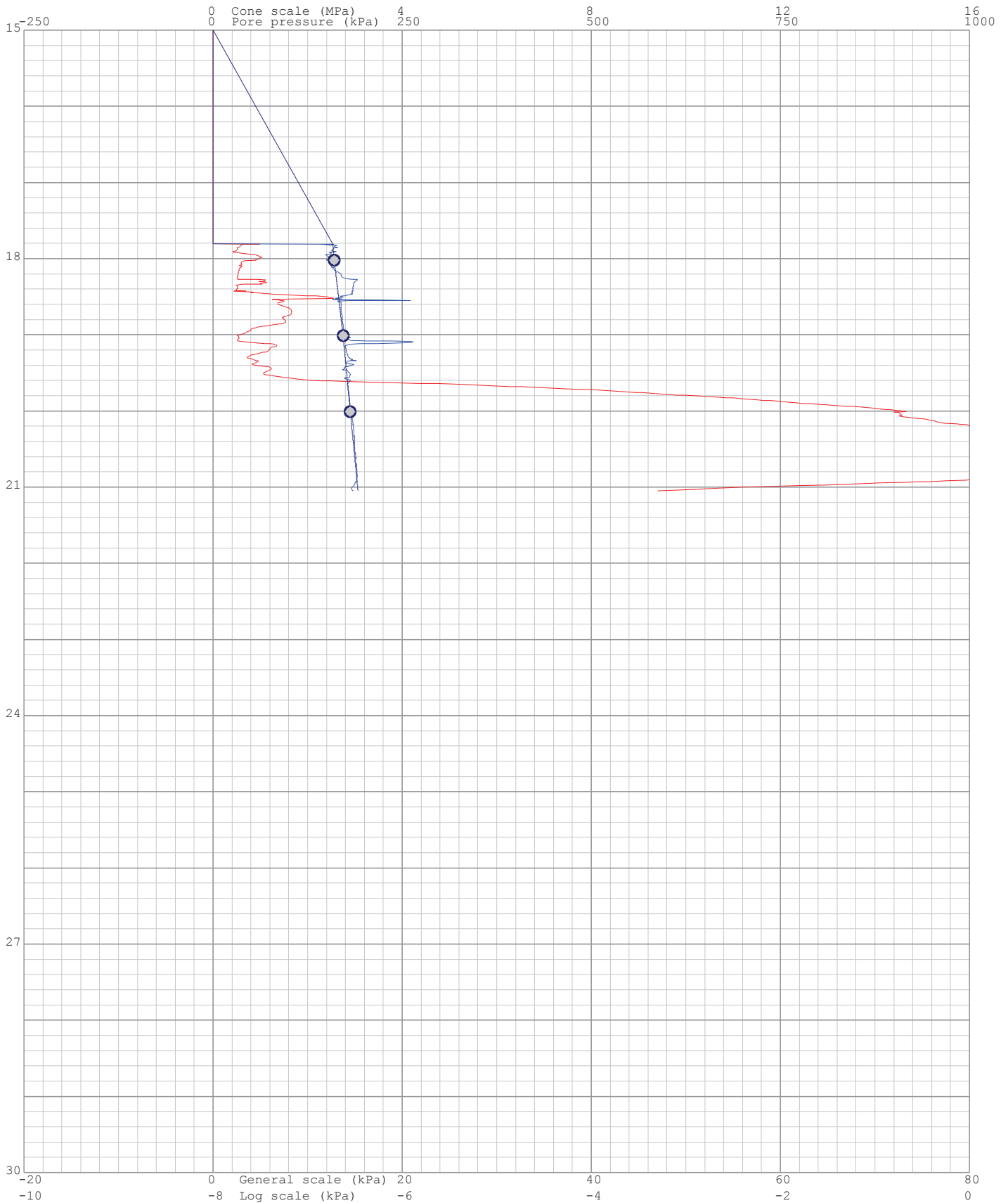
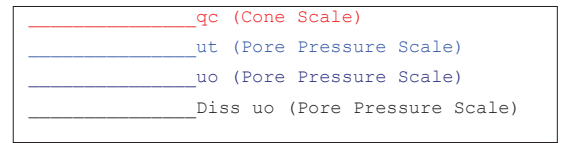
Fax: 012 420 4940

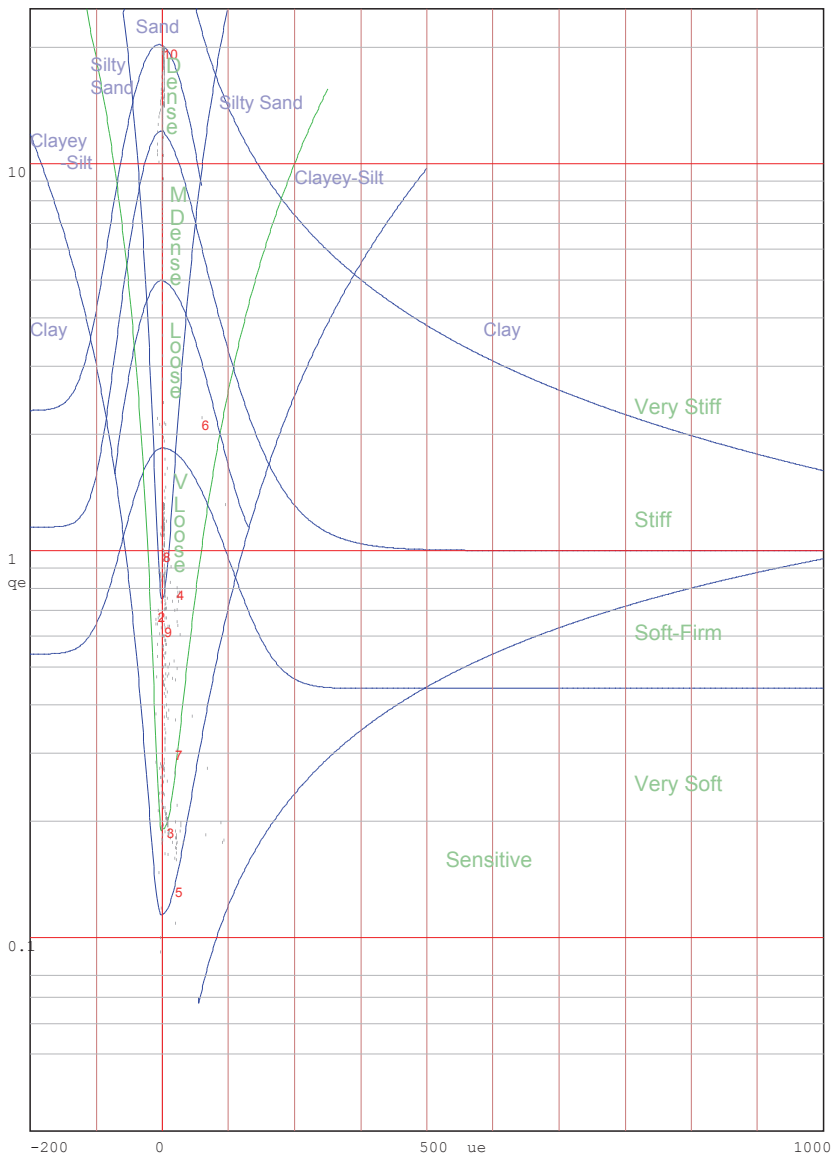
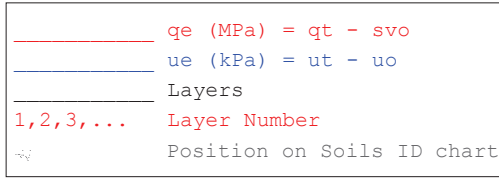
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

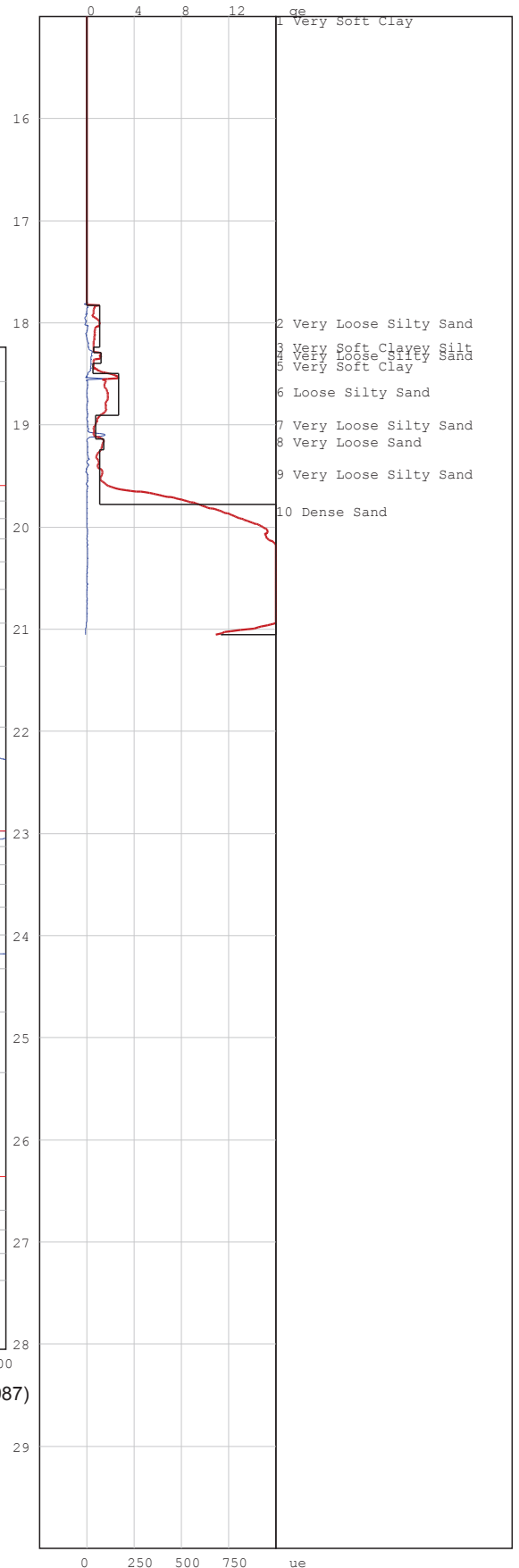
Site: Durban Harbour over water

Hole No: S 62  
Date: 2012/09/27





Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

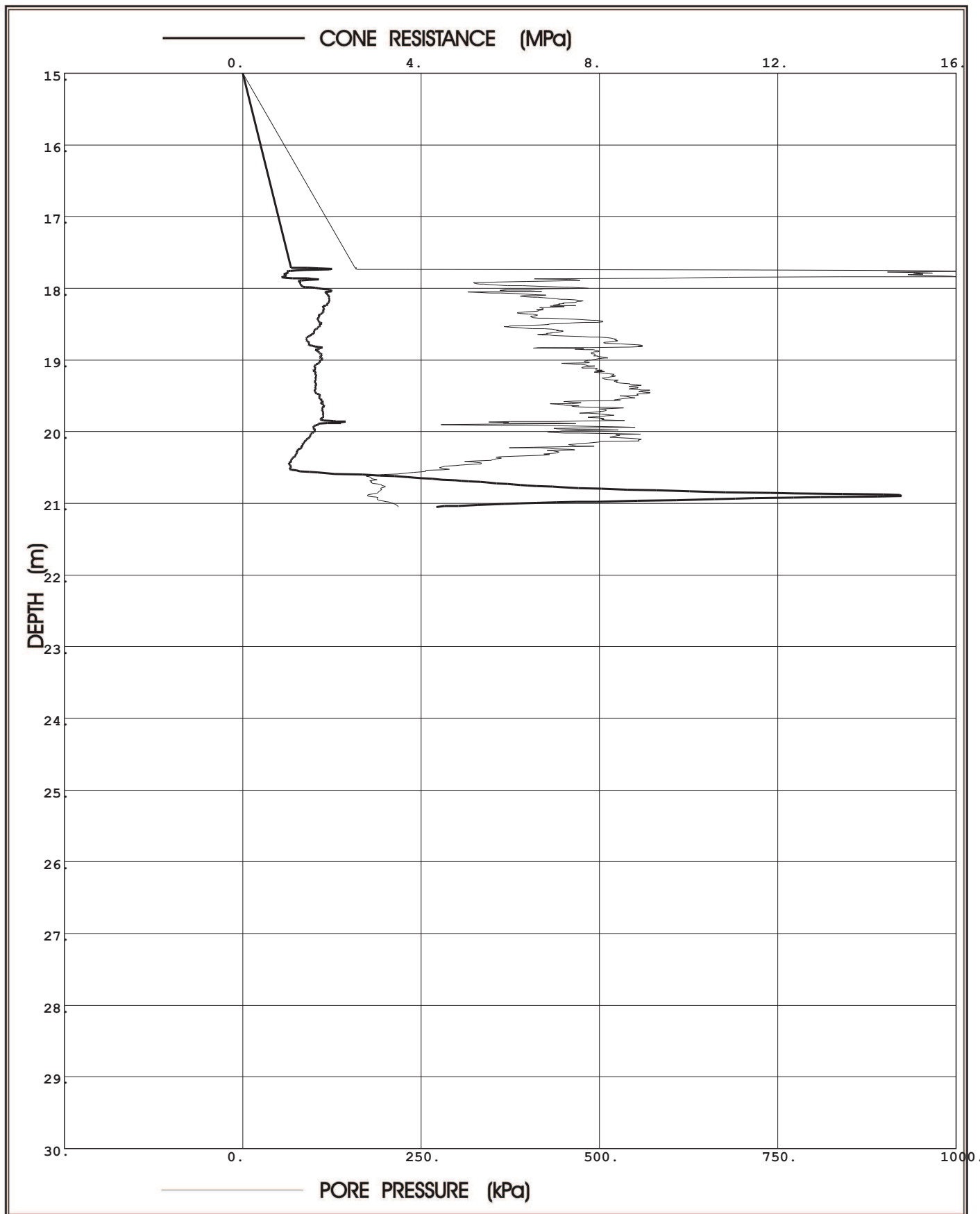
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 63

DATE: 2012/09/26

Page:2



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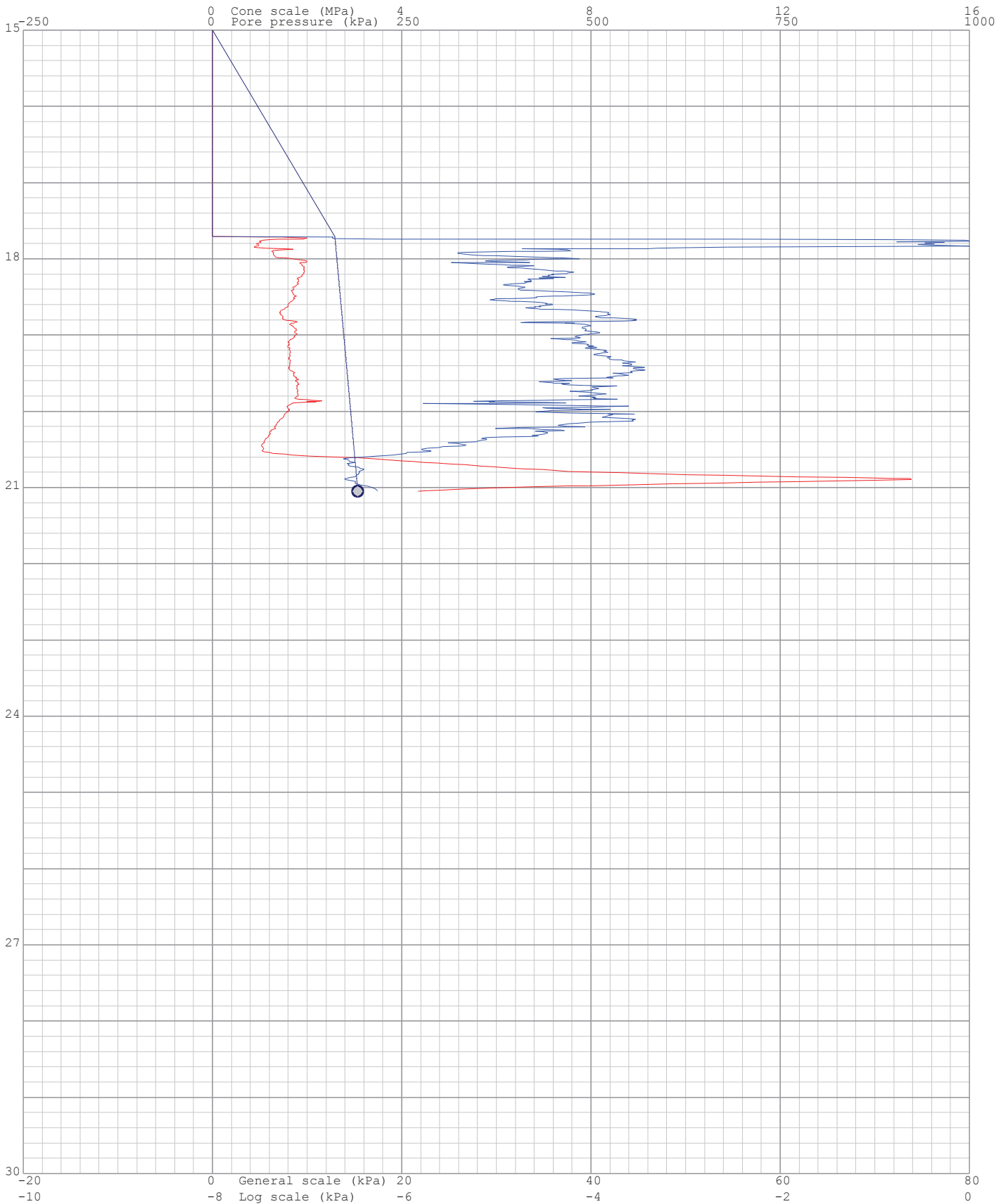
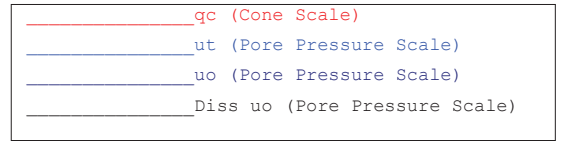
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rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 63  
Date: 2012/09/26

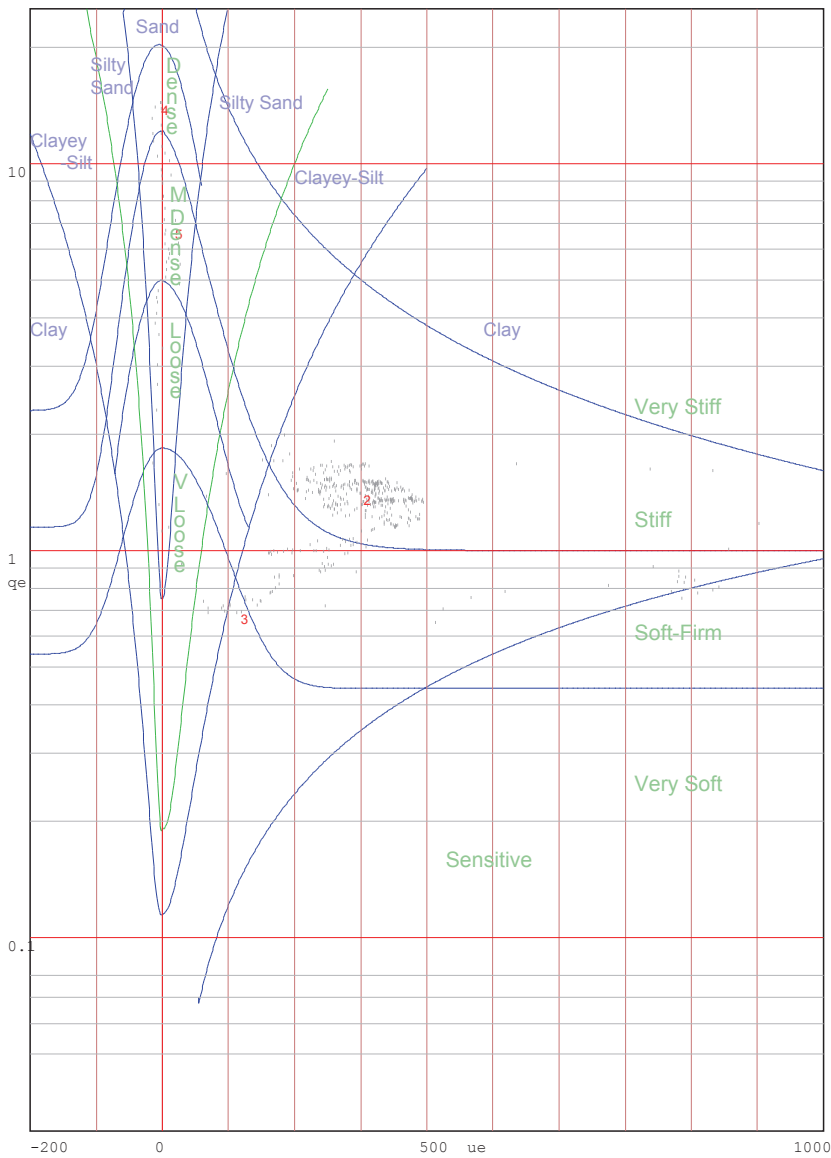
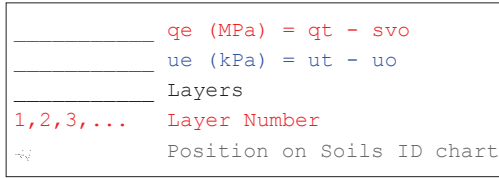




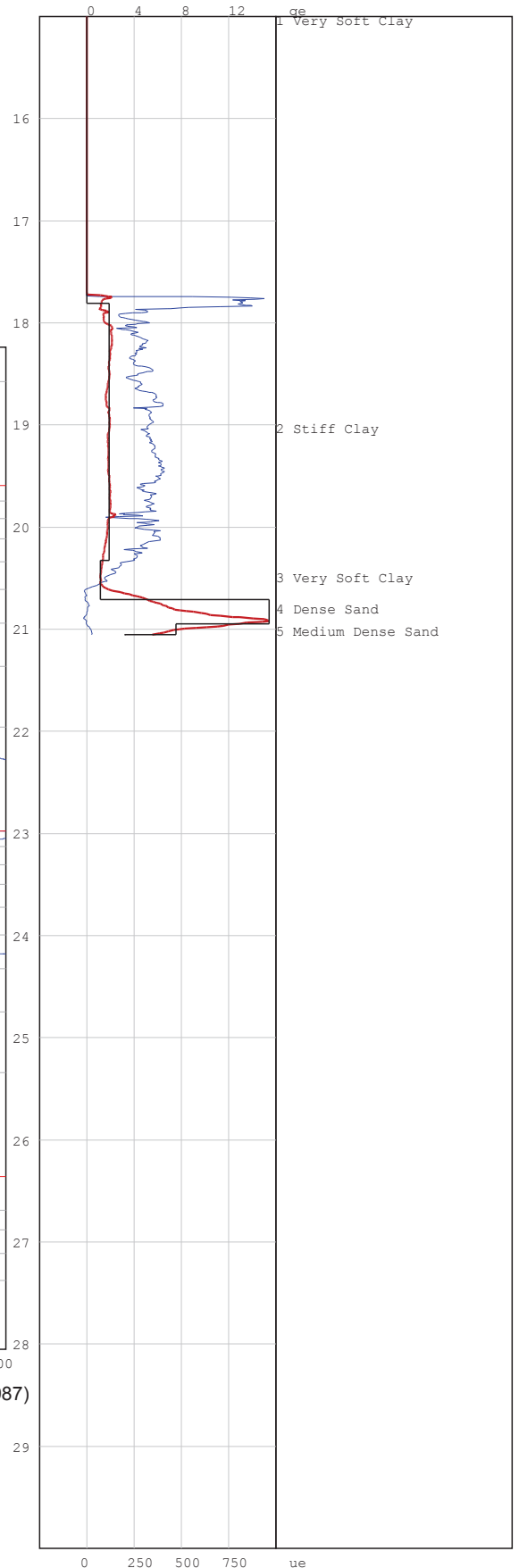
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 63  
Date: 2012/09/26



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
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0044

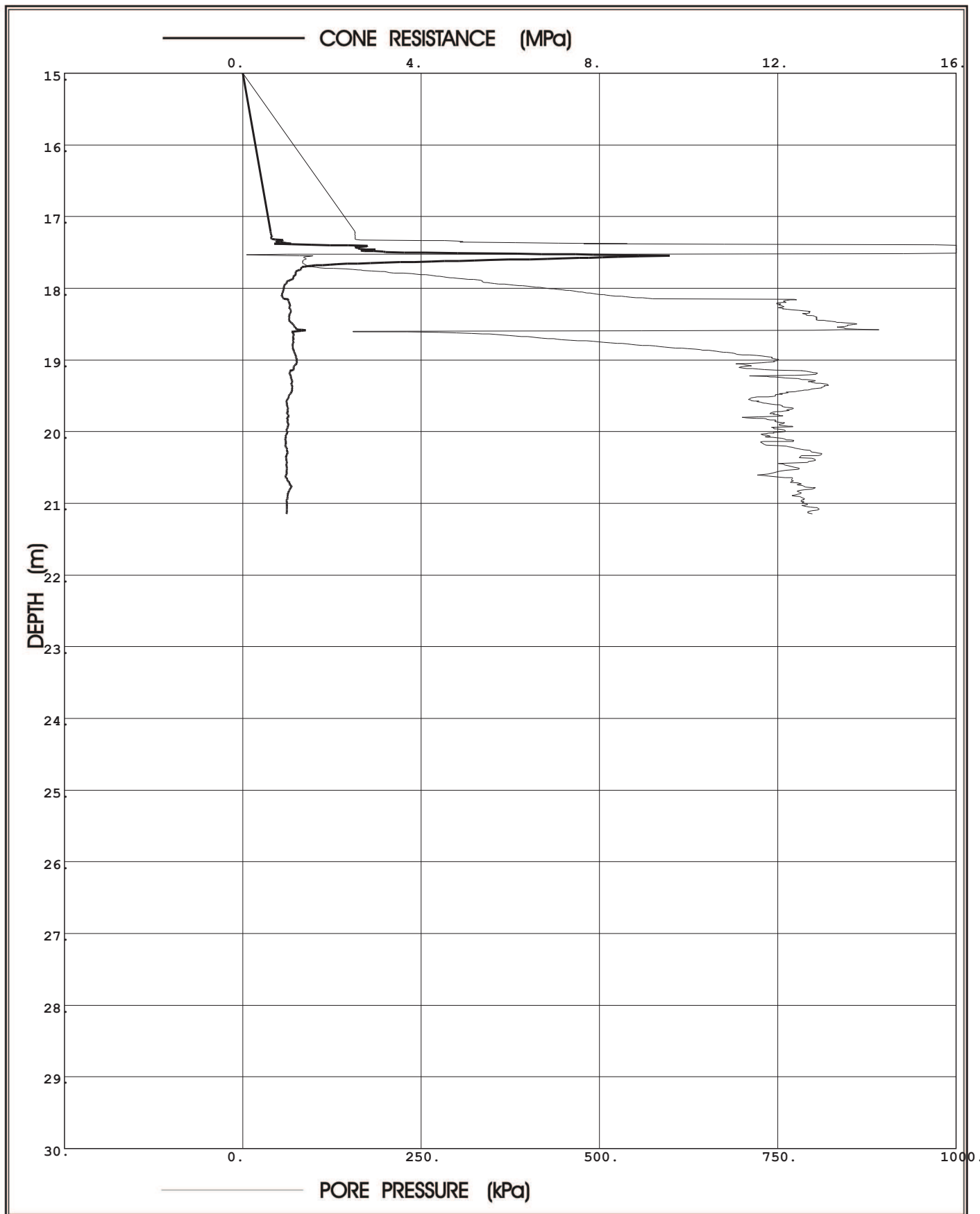
PROJECT: Durban Harbour Piezocone Investigation for Dredging

SITE: Durban Harbour over water

CPTU (RE): s 64

DATE: 2012/09/27

Page:2



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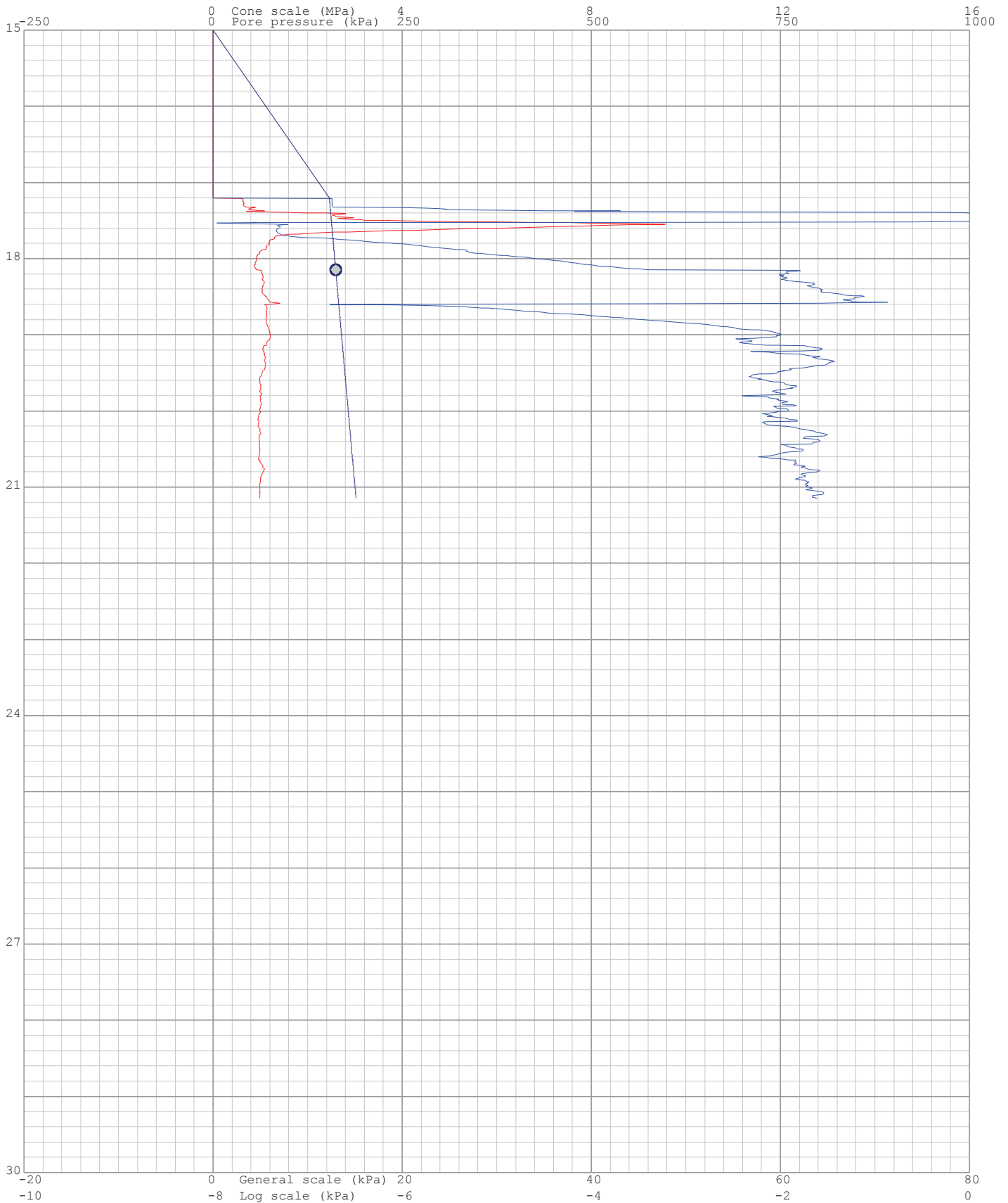
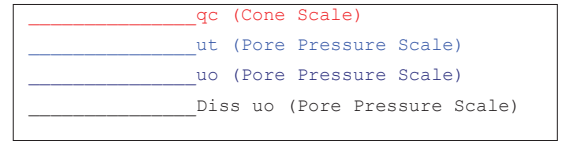
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082 570 6446  
Fax: 012 420 4940  
rust@global.co.za

Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

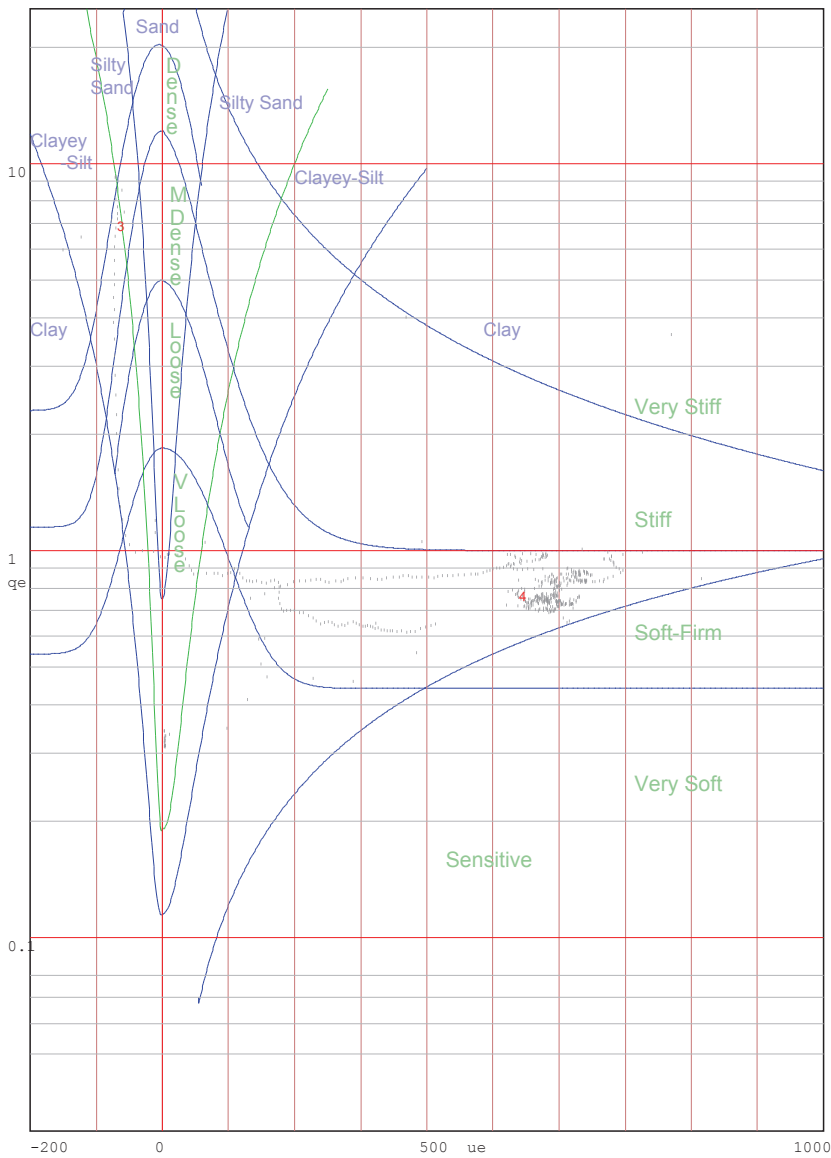
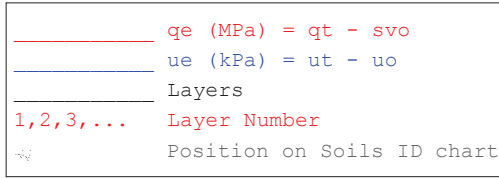
Hole No: S 64  
Date: 2012/09/27



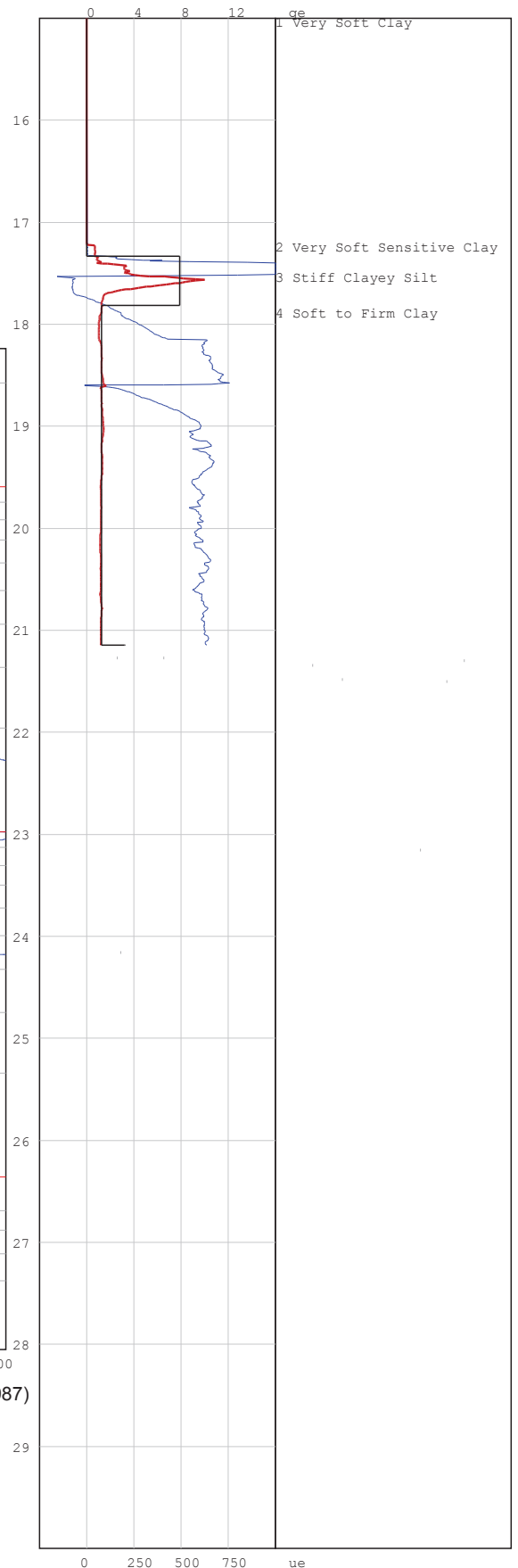
Project: Durban Harbour Piezocone Investigation for Dredging

Site: Durban Harbour over water

Hole No: S 64  
Date: 2012/09/27



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





### 3.5: CPTu LOGS – LOT 10 CASTING YARD



**EXPLORATORY BOREHOLE LOGS – BASIN DREDGE AREA**

| CPTU | Location | Date       | Start depth | End depth | y       | x          |
|------|----------|------------|-------------|-----------|---------|------------|
| -    | -        | -          | CDP         | CDP       | -       | -          |
| 1    | Land     | 2012/03/05 | 3.00 (est)  | -19.500   | -411.25 | 3307790.11 |
| 2    | Land     | 2012/03/06 | 3.00 (est)  | -17.800   | -418.71 | 3307748.31 |
| 3    | Land     | 2012/03/07 | 3.00 (est)  | -14.000   | -363.46 | 3307727.74 |
| 4    | Land     | 2012/03/06 | 3.00 (est)  | -16.800   | -442.83 | 3307704.06 |
| 5    | Land     | 2012/08/03 | 3.00 (est)  | -9.500    | -389.10 | 3307687.96 |

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

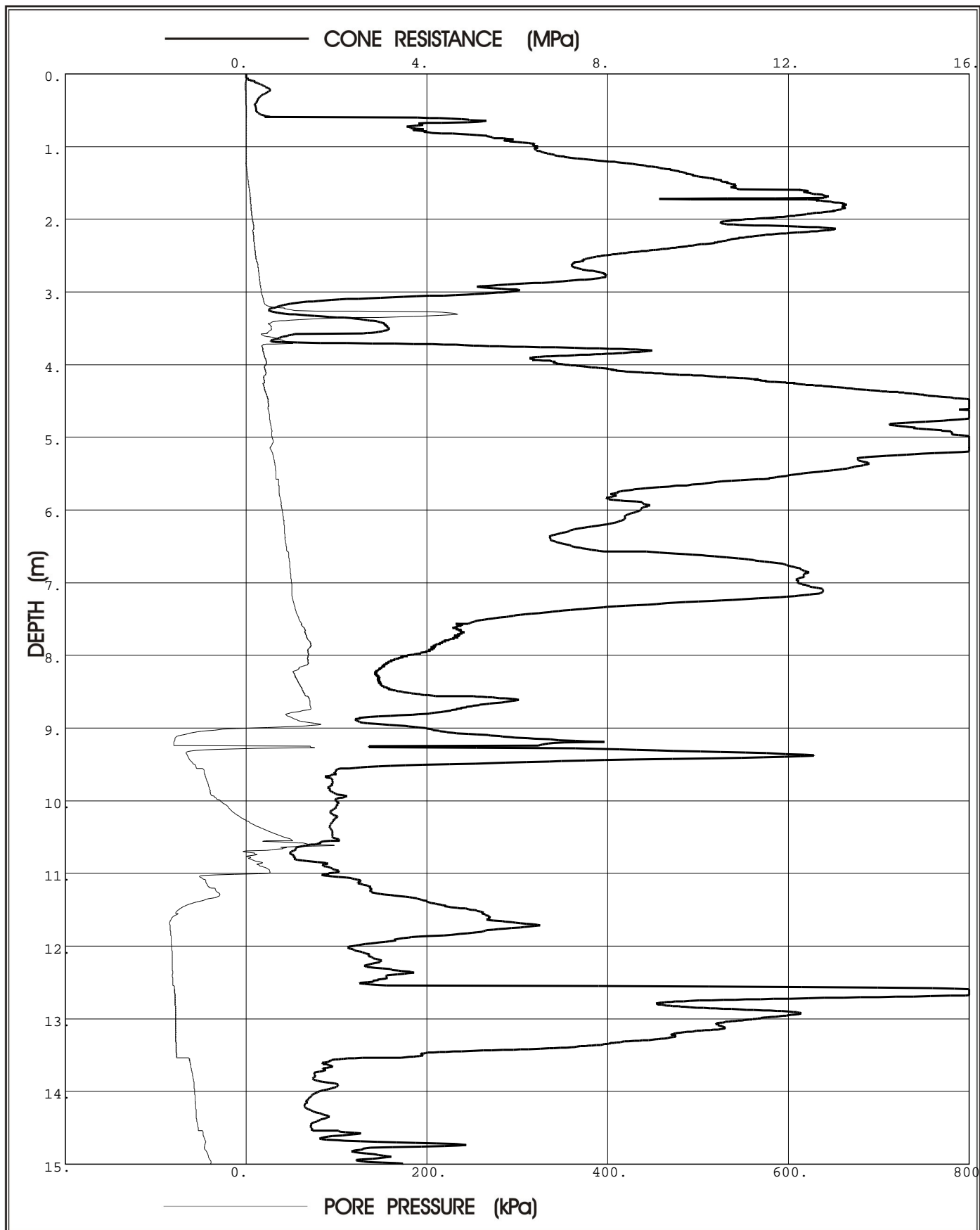
SITE: Lot 10 Long: 29°53.332' Lat: 031°00.255'

CPTU (RE): CPTU1

DATE: 2012-03-05

Probe: GHANA

Page: 1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

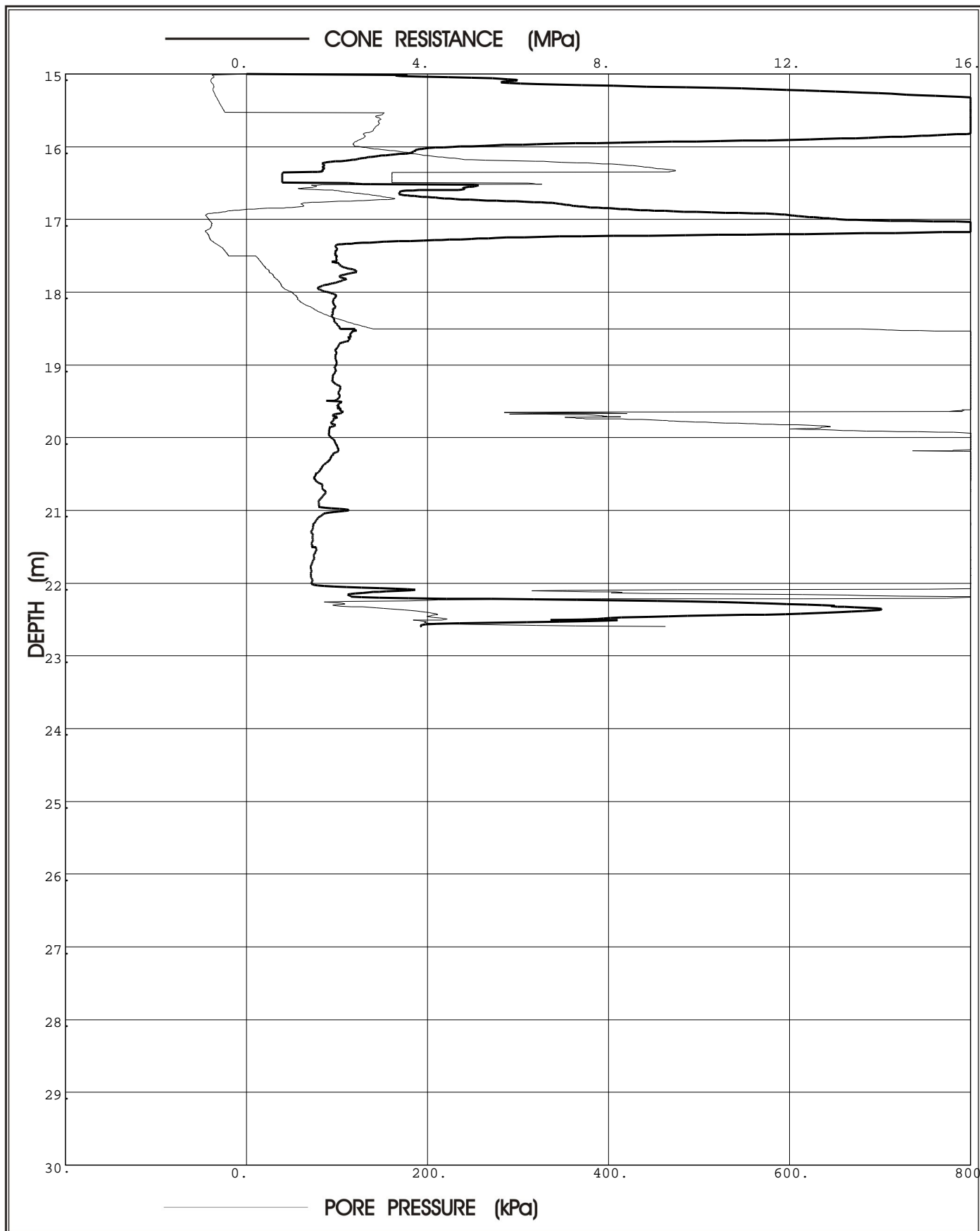
SITE: Lot 10 Long:29°53.332' Lat:031°00.255'

CPTU (RE): CPTU1

DATE: 2012-03-05

Probe: GHANA

Page: 2



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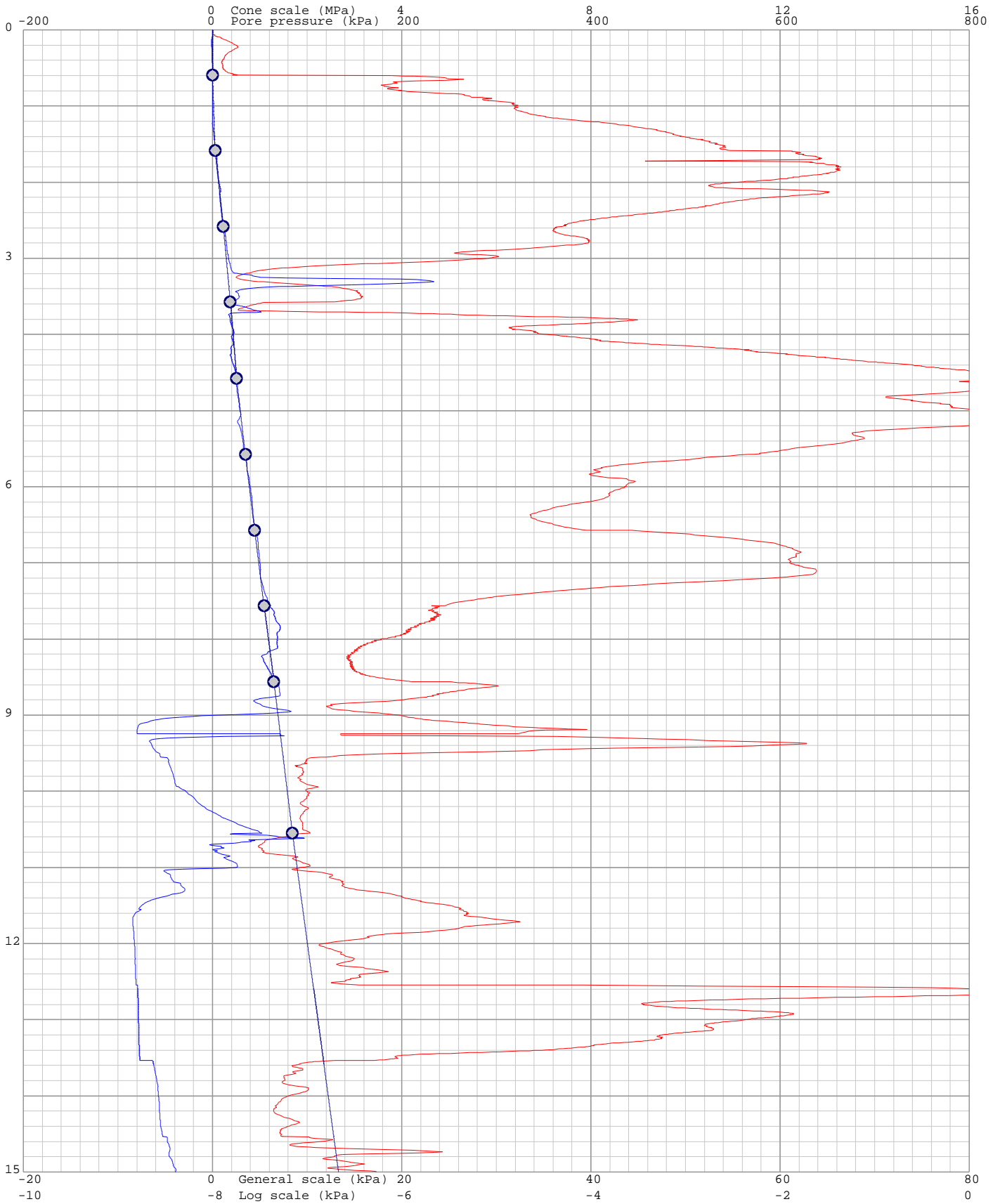
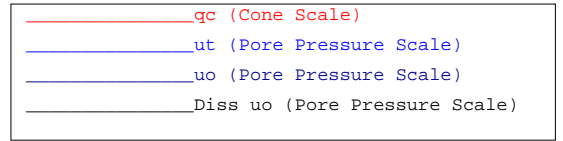
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.332' Lat:031°00.255'

Hole No: CPTU1

Date: 2012-03-05

Probe: GHANA



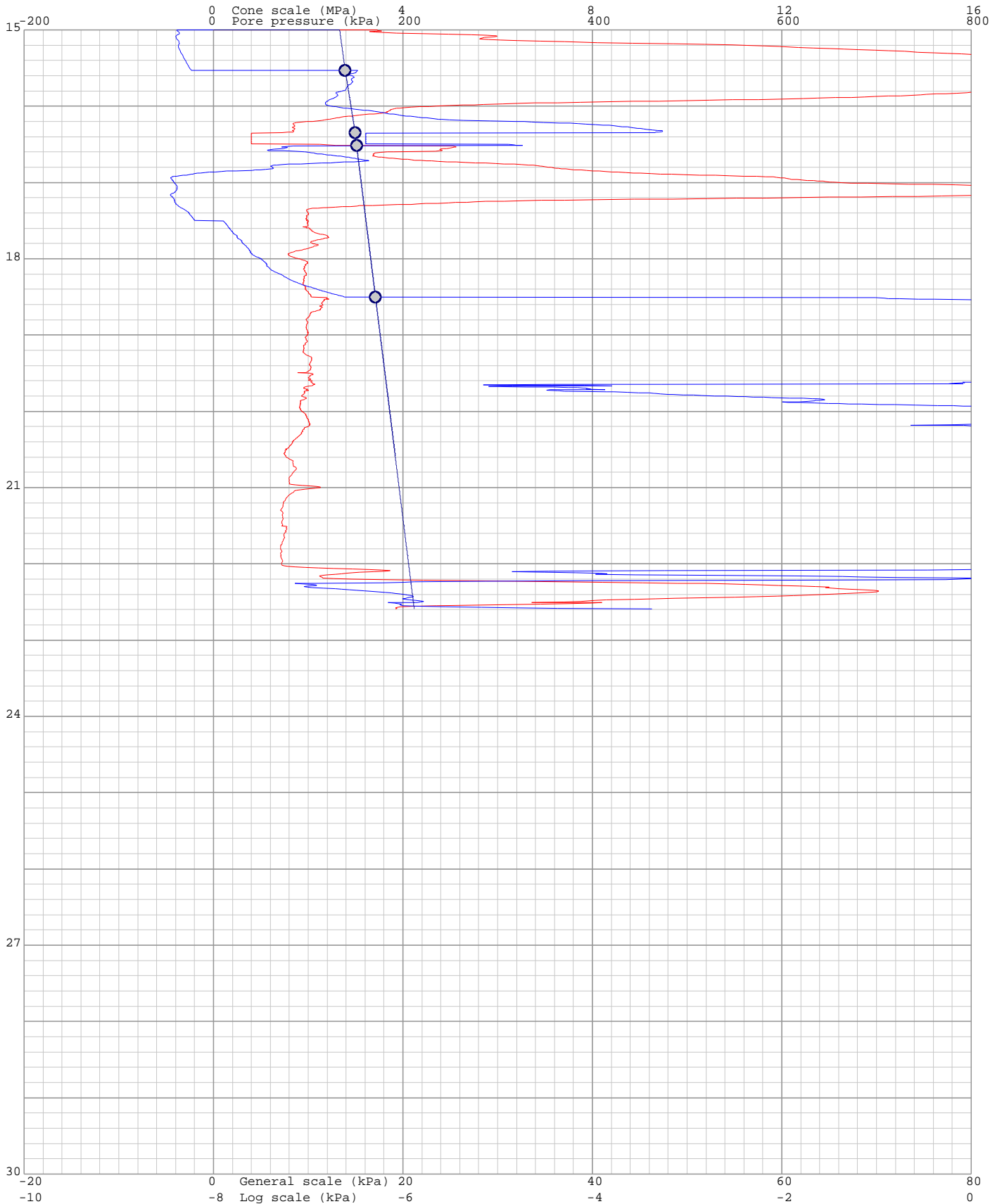
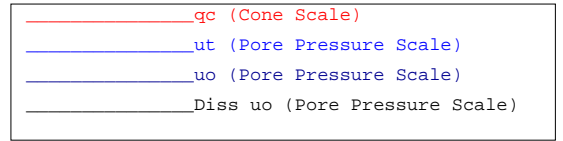
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.332' Lat:031°00.255'

Hole No: CPTU1

Date: 2012-03-05

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.332' Lat: 031°00.255'

Hole: CPTU1

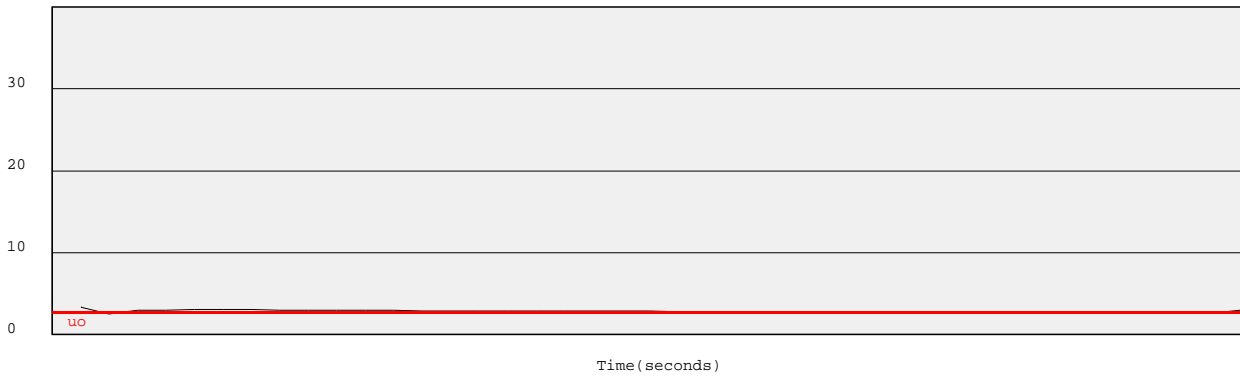
Date: 2012-03-05

Probe: GHANA  
Page: 1

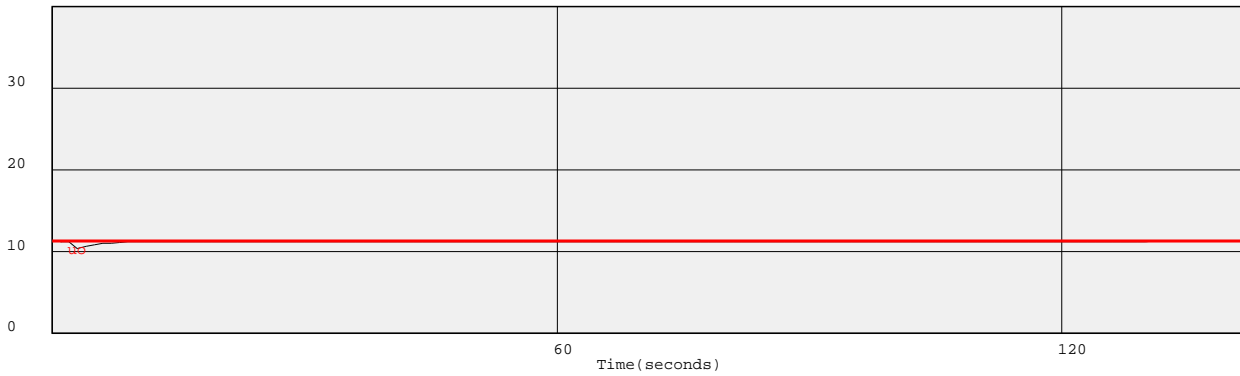
(kPa) Dissipation at: 0.592m



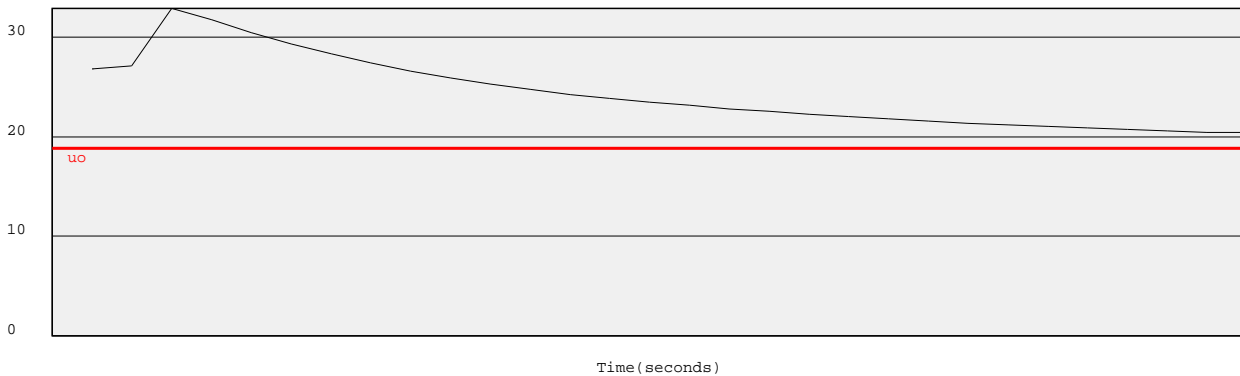
(kPa) Dissipation at: 1.586m



(kPa) Dissipation at: 2.582m



(kPa) Dissipation at: 3.573m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.332' Lat: 031°00.255'

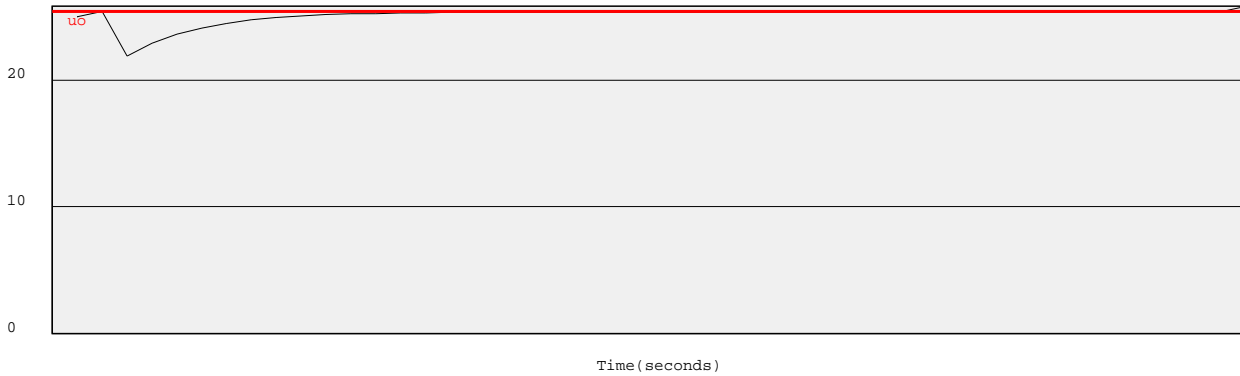
Hole: CPTU1

Date: 2012-03-05

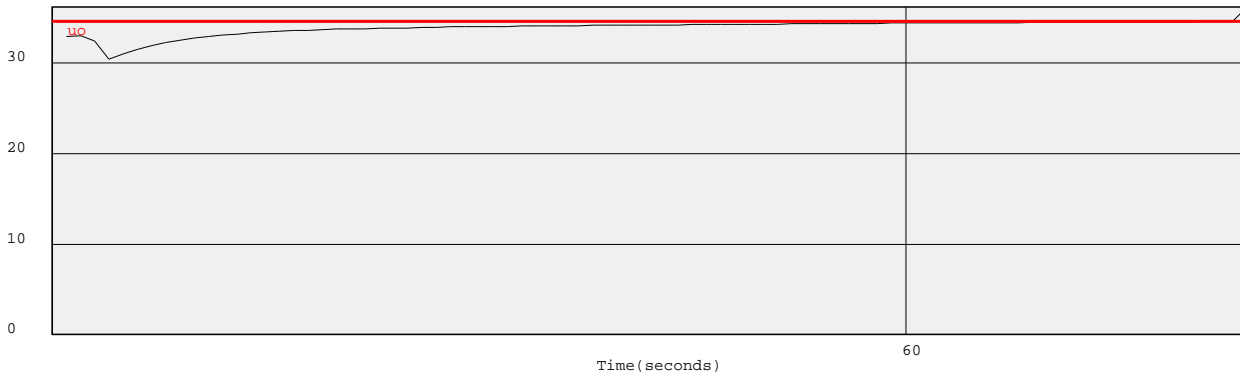
Probe: GHANA

Page: 2

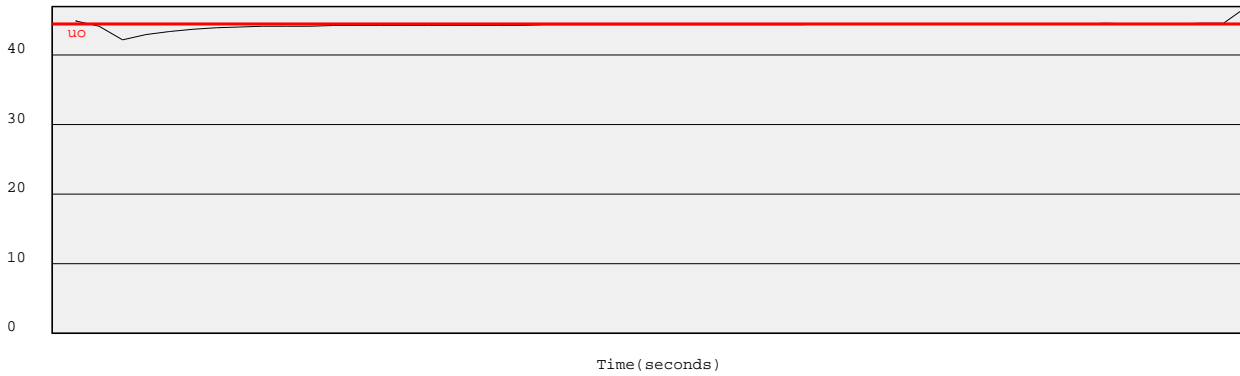
(kPa) Dissipation at: 4.575m



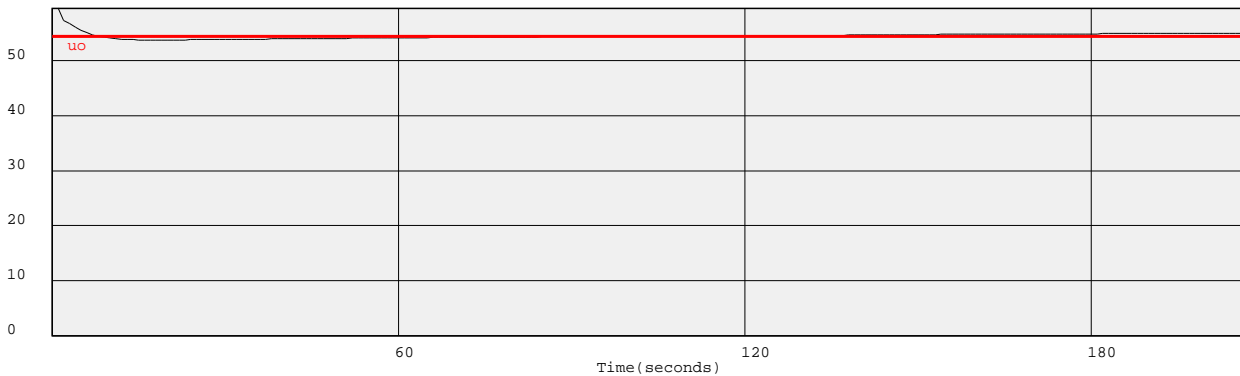
(kPa) Dissipation at: 5.574m



(kPa) Dissipation at: 6.569m



(kPa) Dissipation at: 7.566m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.332' Lat: 031°00.255'

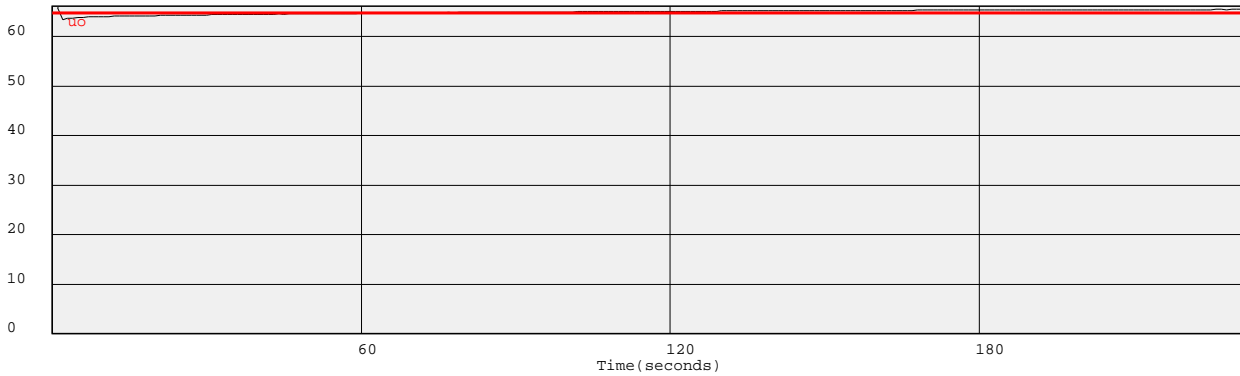
Hole: CPTU1

Date: 2012-03-05

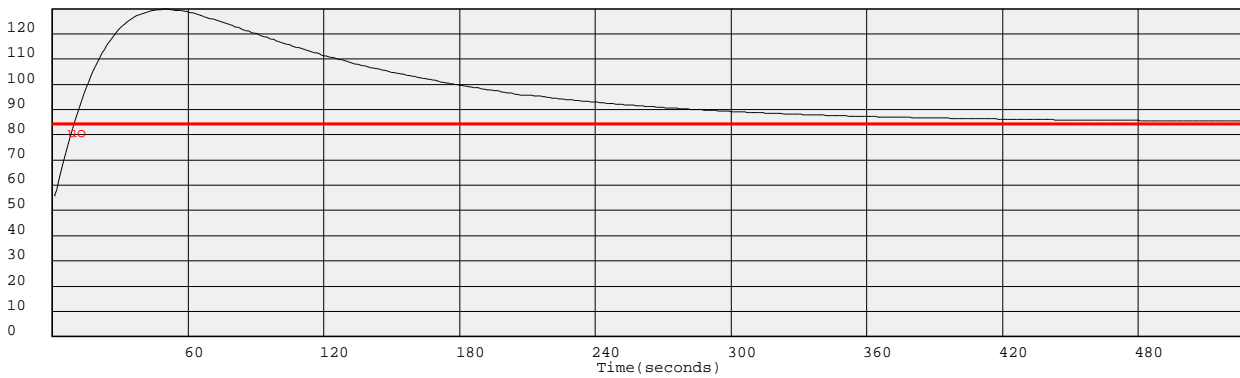
Probe: GHANA

Page: 3

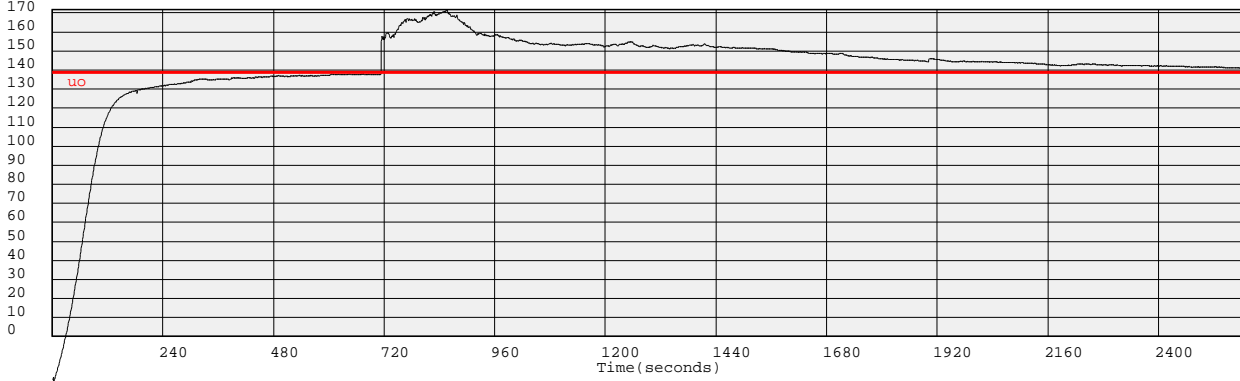
(kPa) Dissipation at: 8.559m



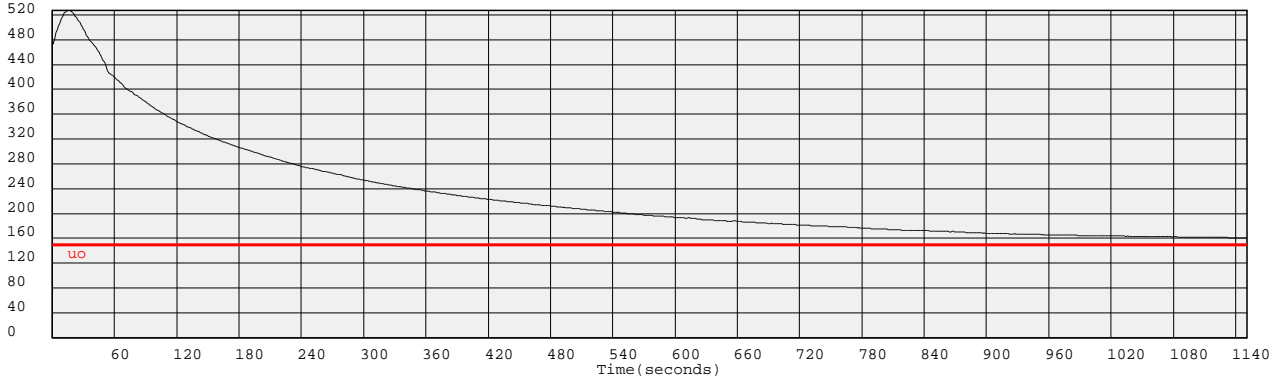
(kPa) Dissipation at: 10.55m



(kPa) Dissipation at: 15.529m



(kPa) Dissipation at: 16.348m



Project: Durban Harbour Land Based CPTu

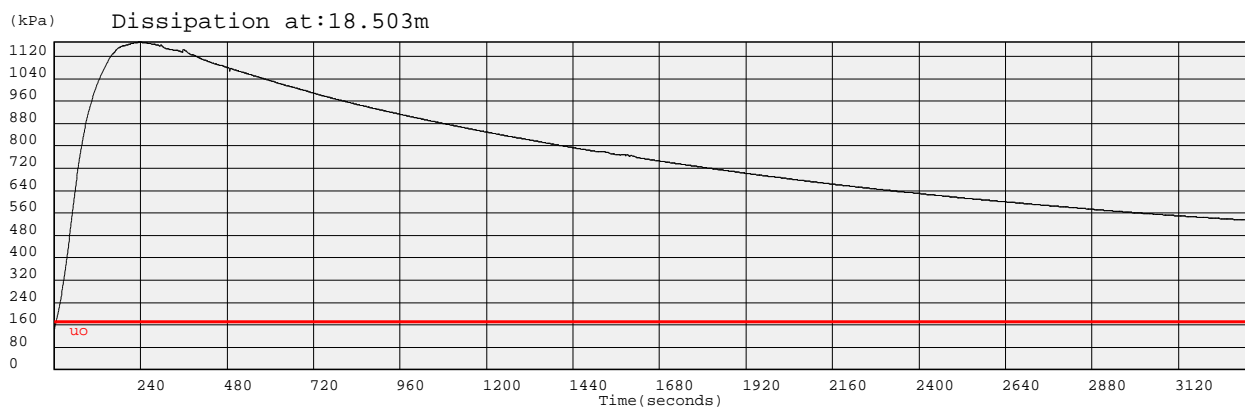
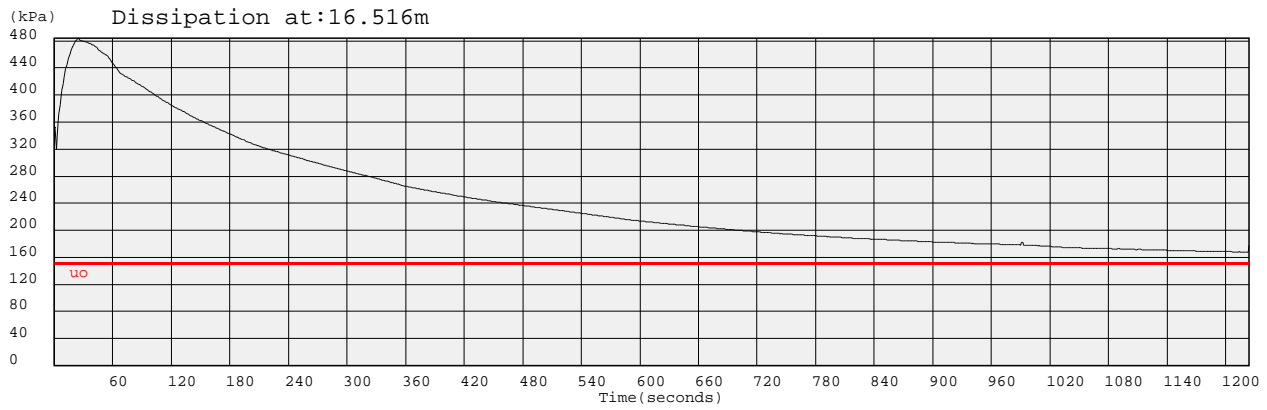
Site: Lot 10 Long: 29°53.332' Lat: 031°00.255'

Hole: CPTU1

Date: 2012-03-05

Probe: GHANA

Page: 4



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.332' Lat:031°00.255'

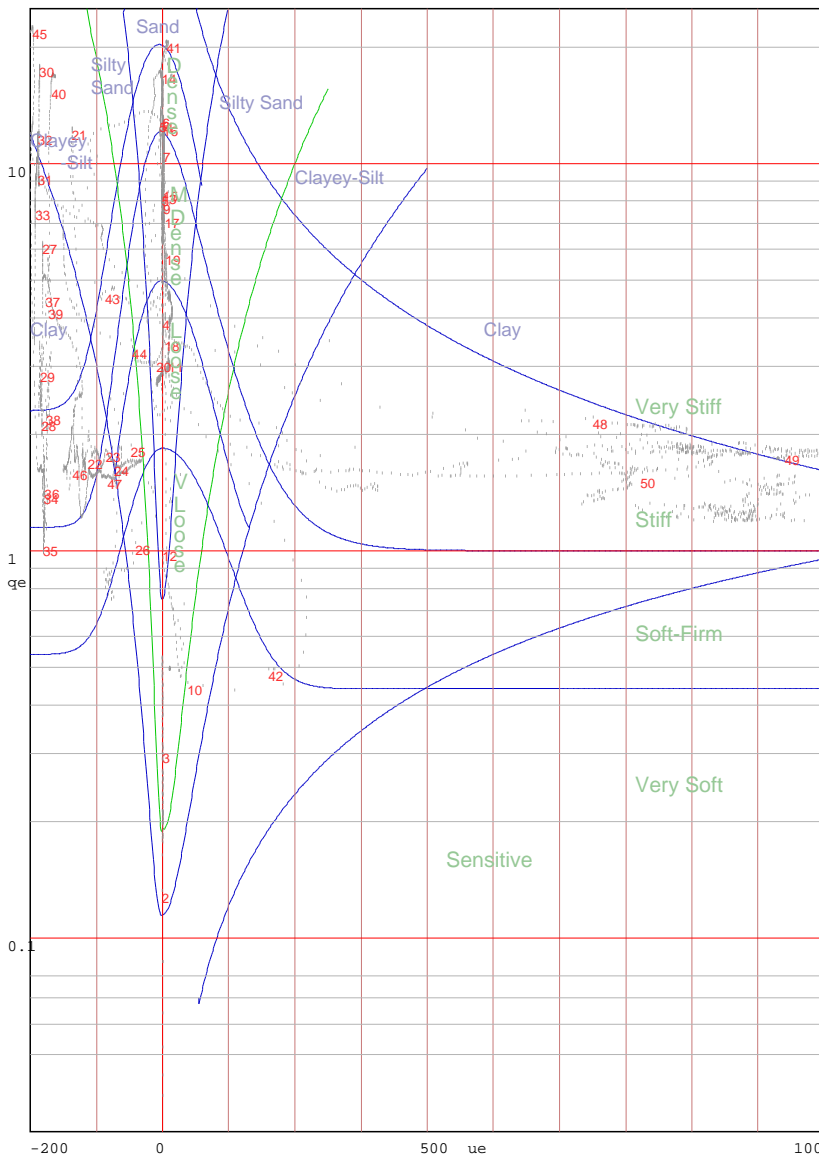
Hole No: CPTU1

Page:1

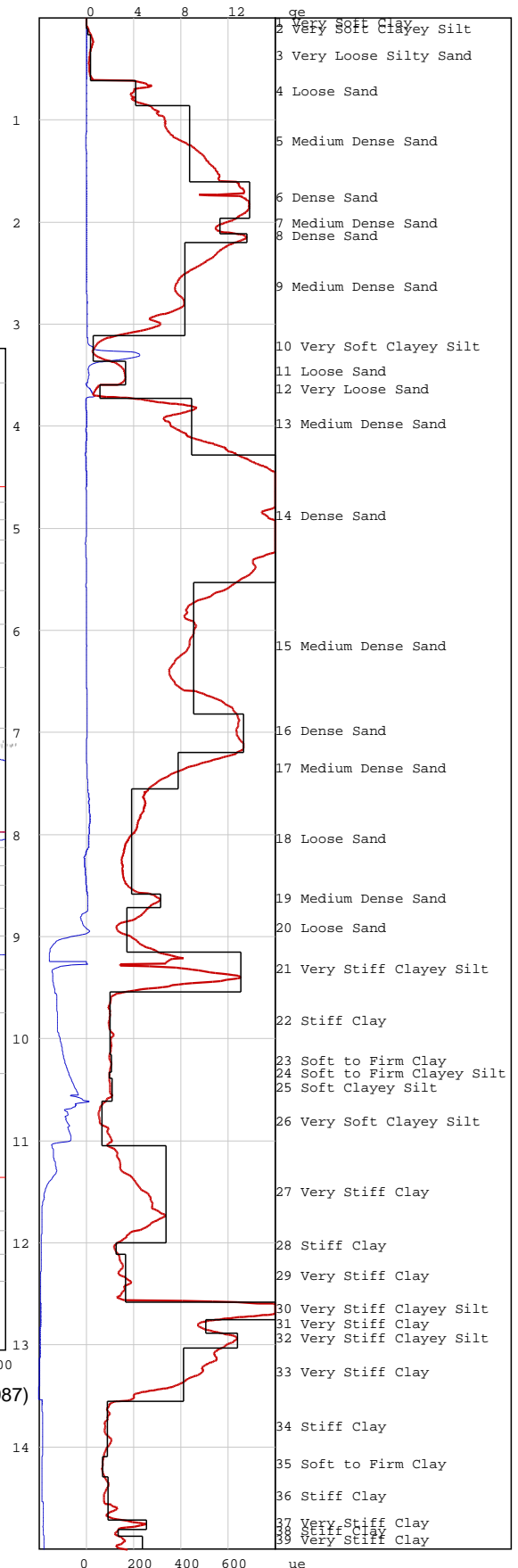
Date: 2012-03-05

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
— Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

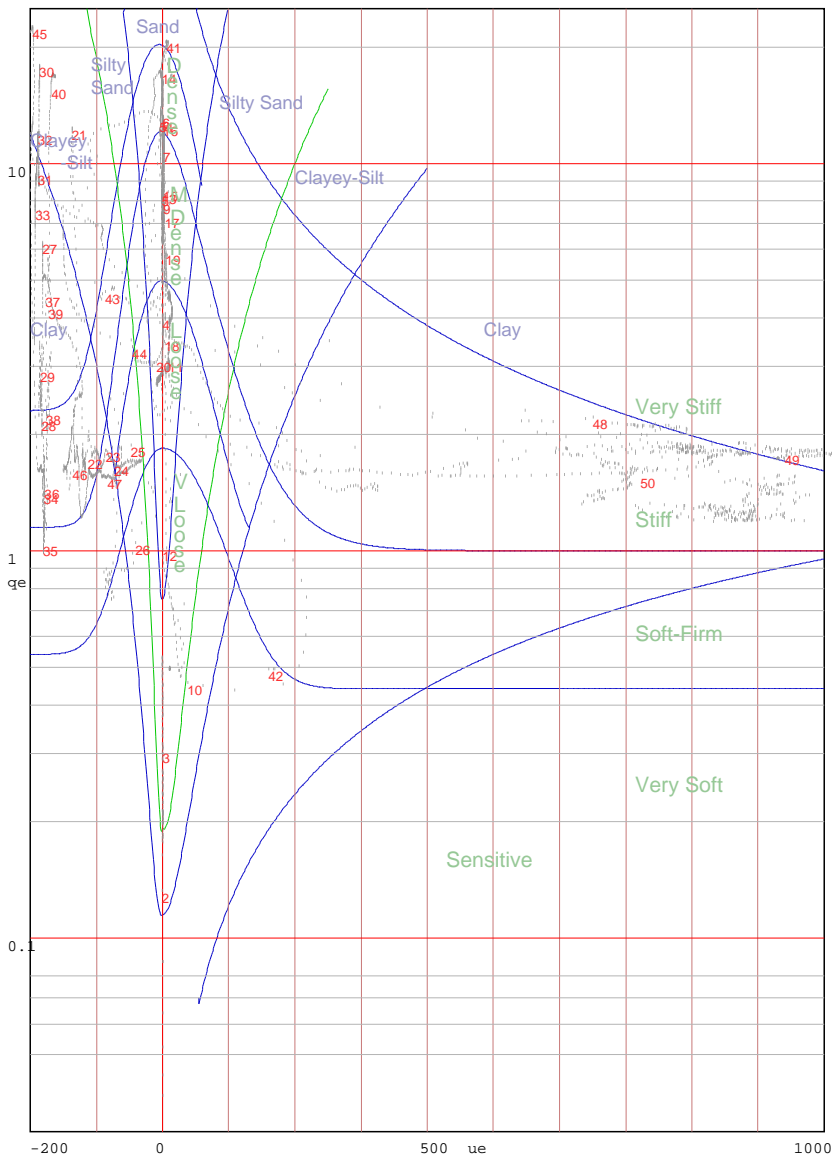
Site: Lot 10 Long:29°53.332' Lat:031°00.255'

Hole No: CPTU1

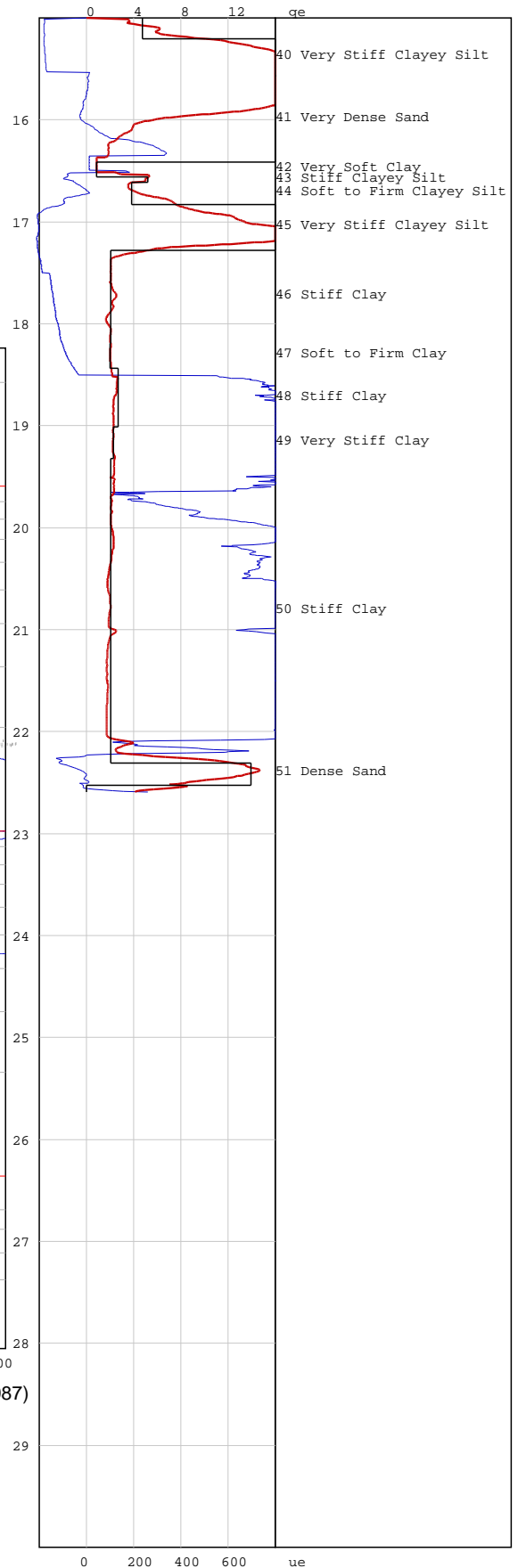
Date: 2012-03-05

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1, 2, 3, ... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

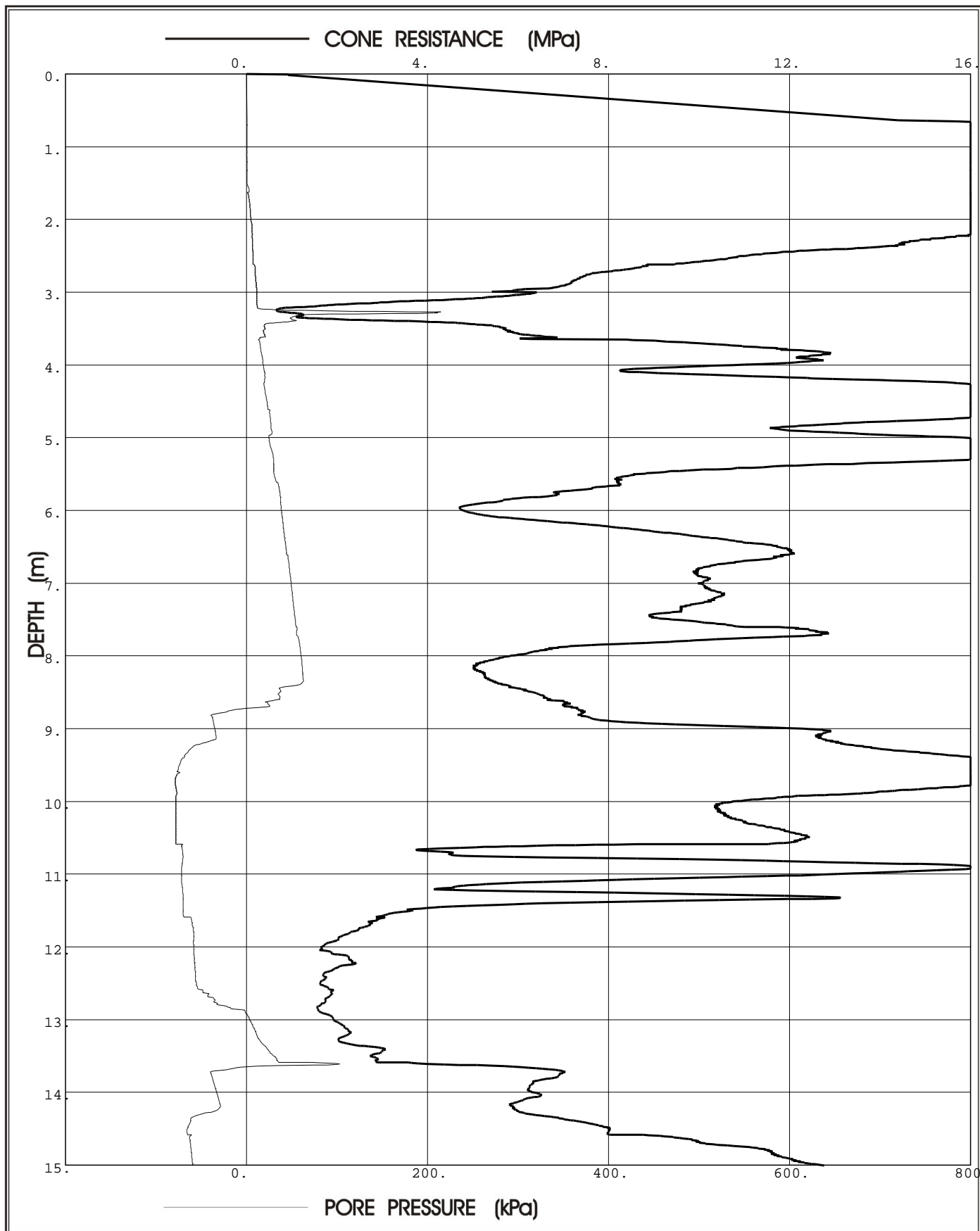
SITE: Lot 10 Long: 29°53.306' Lat: 031°00.262'

CPTU (RE): CPTU2

DATE: 2012-03-06

Probe: H1110

Page: 1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

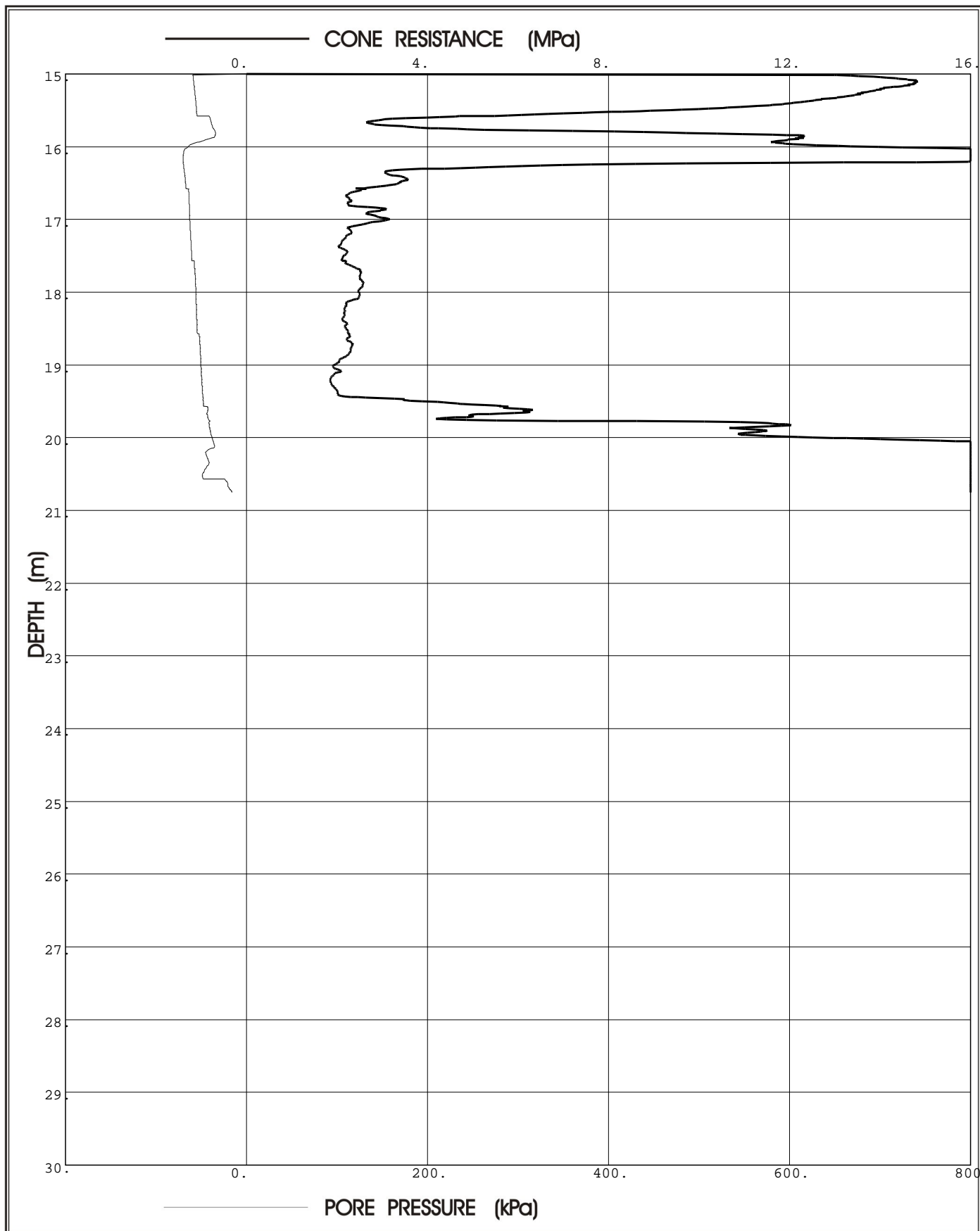
SITE: Lot 10 Long: 29°53.306' Lat: 031°00.262'

CPTU (RE): CPTU2

DATE: 2012-03-06

Probe: H1110

Page: 2



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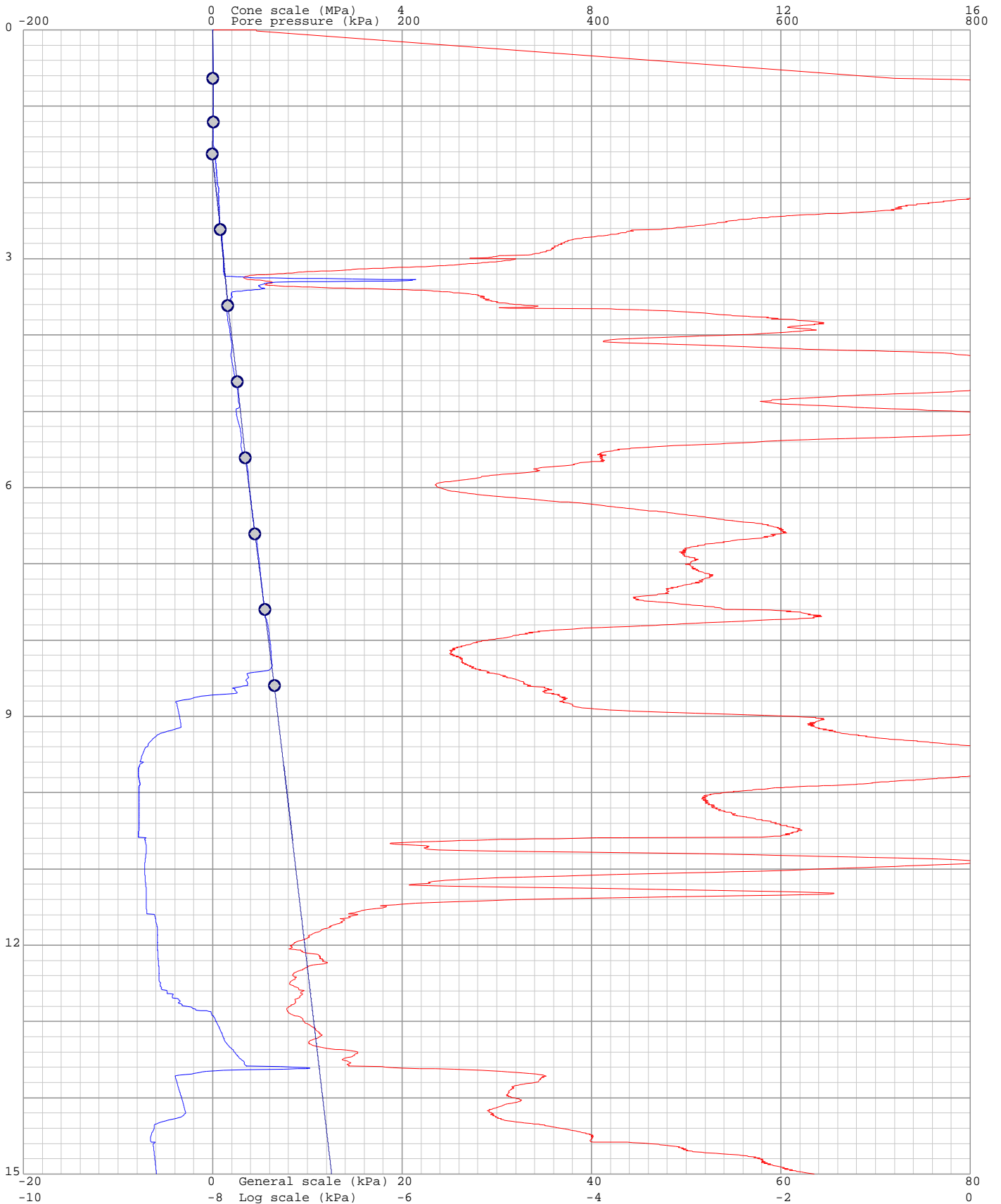
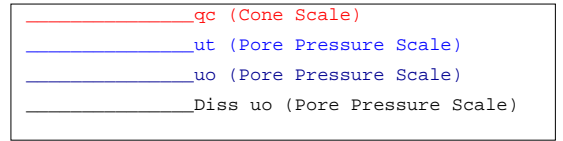
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.306' Lat:031°00.262'

Hole No: CPTU2

Date: 2012-03-06

Probe: H1110



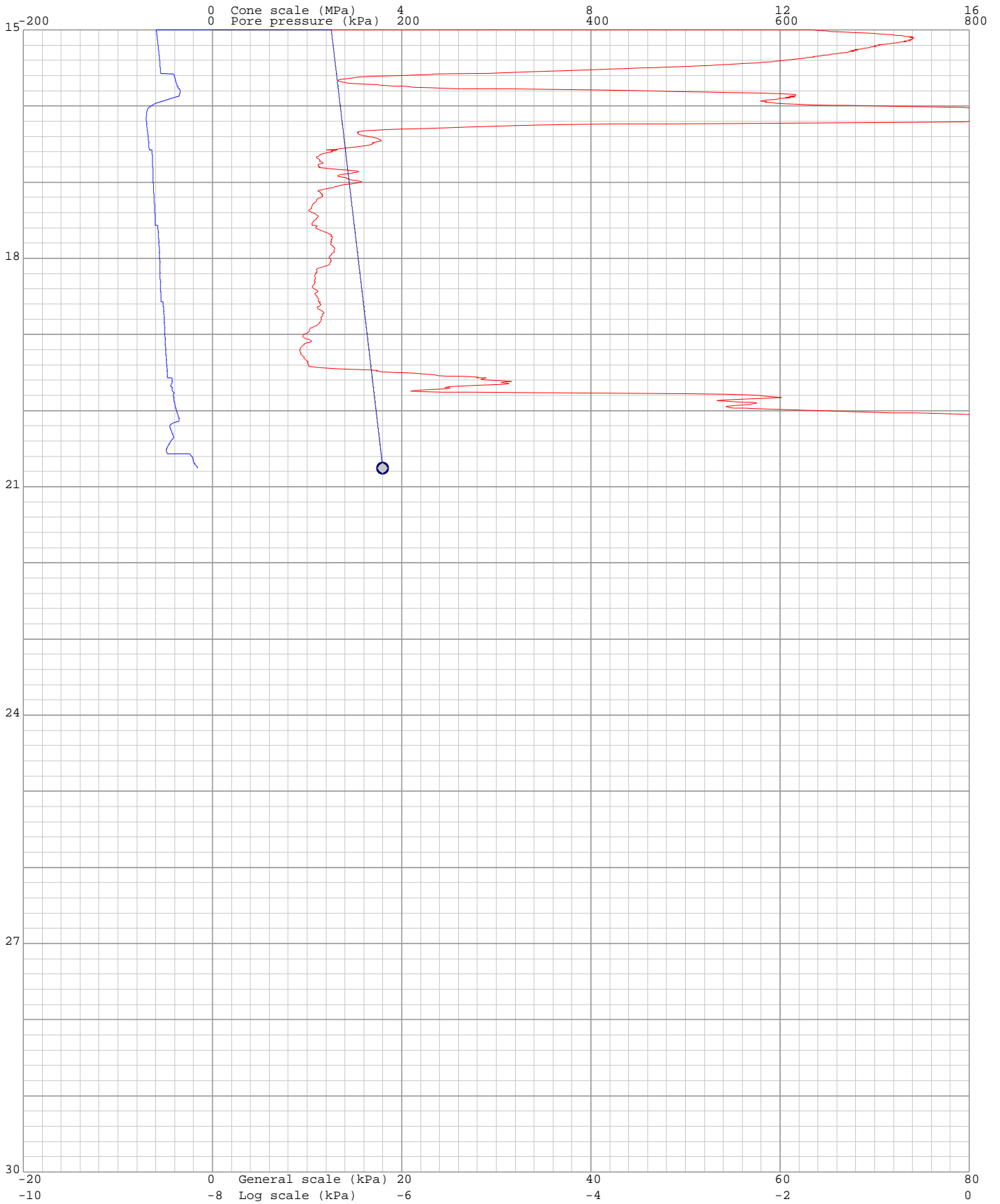
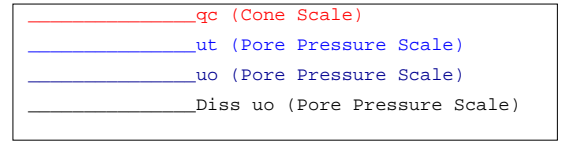
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.306' Lat:031°00.262'

Hole No: CPTU2

Date: 2012-03-06

Probe: H1110



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.306' Lat: 031°00.262'

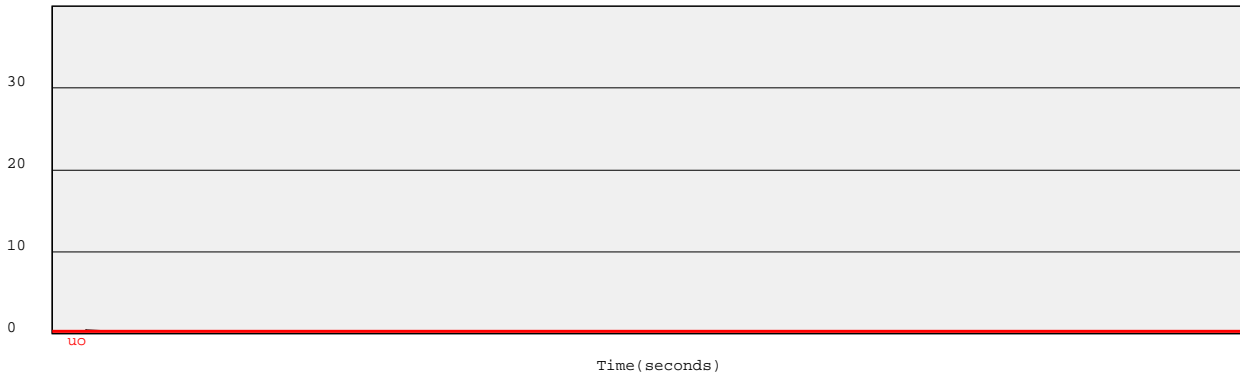
Hole: CPTU2

Date: 2012-03-06

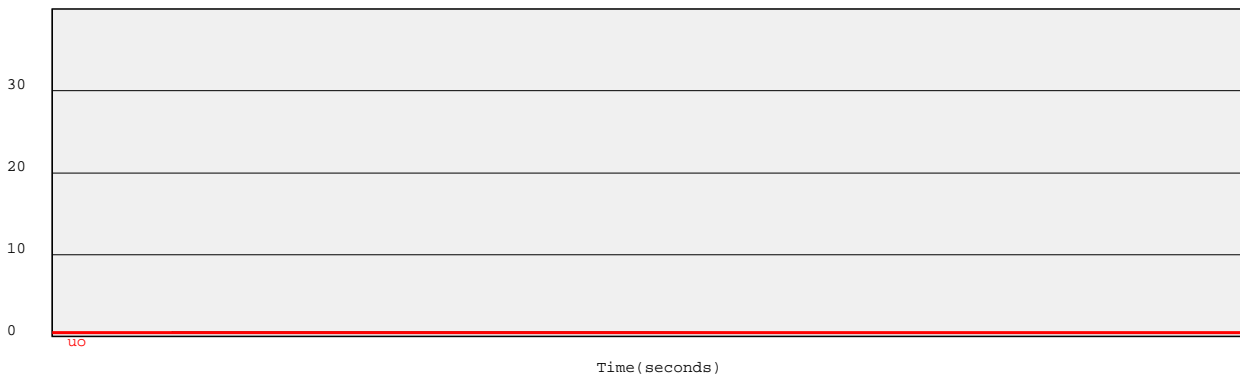
Probe: H1110

Page: 1

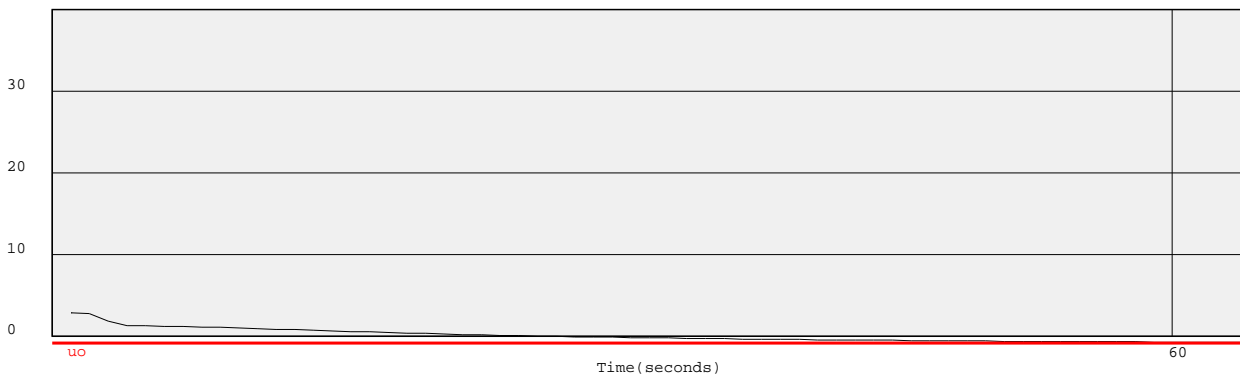
(kPa) Dissipation at: 0.632m



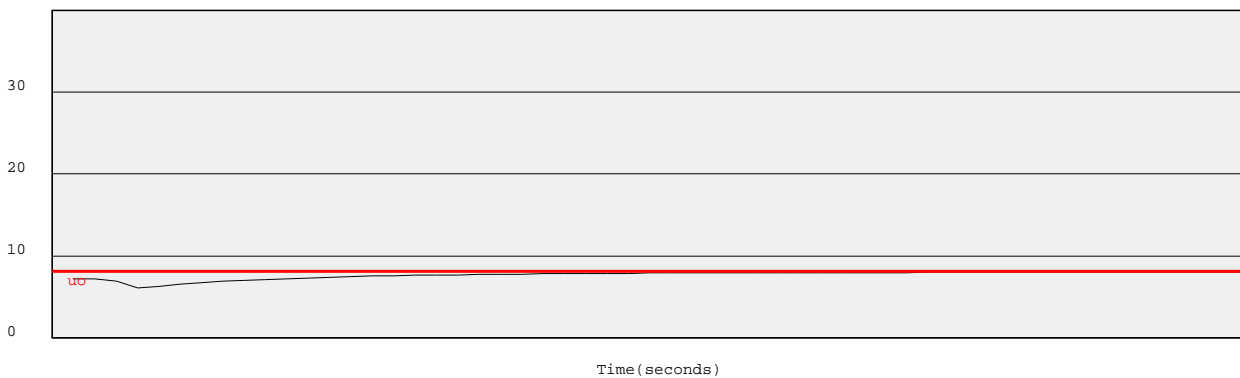
(kPa) Dissipation at: 1.206m



(kPa) Dissipation at: 1.624m



(kPa) Dissipation at: 2.618m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.306' Lat: 031°00.262'

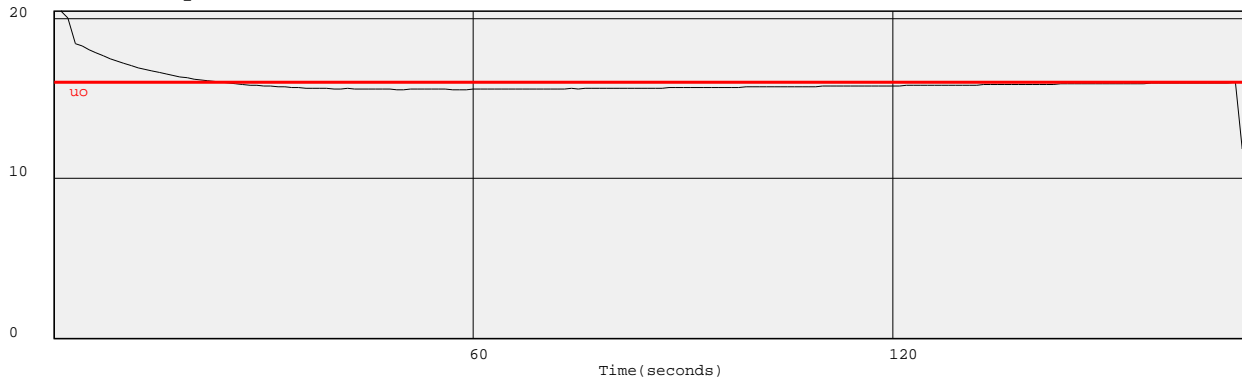
Hole: CPTU2

Date: 2012-03-06

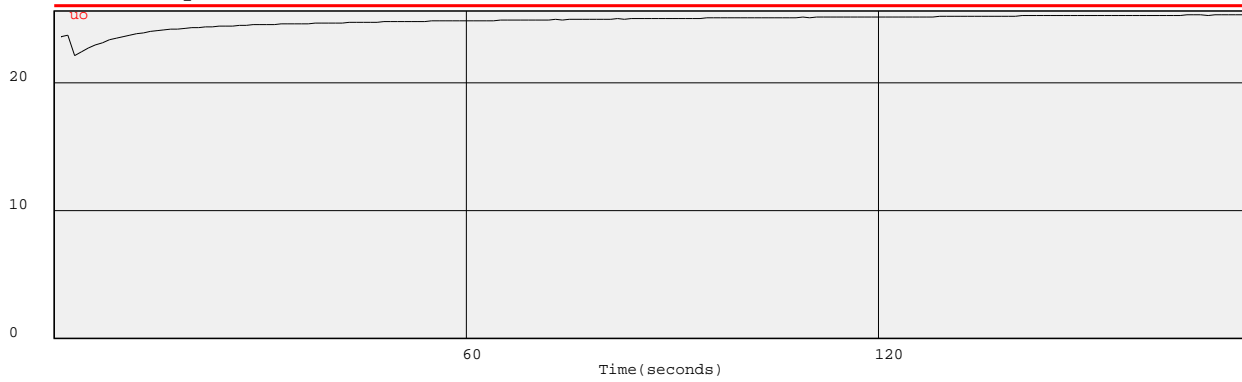
Probe: H1110

Page: 2

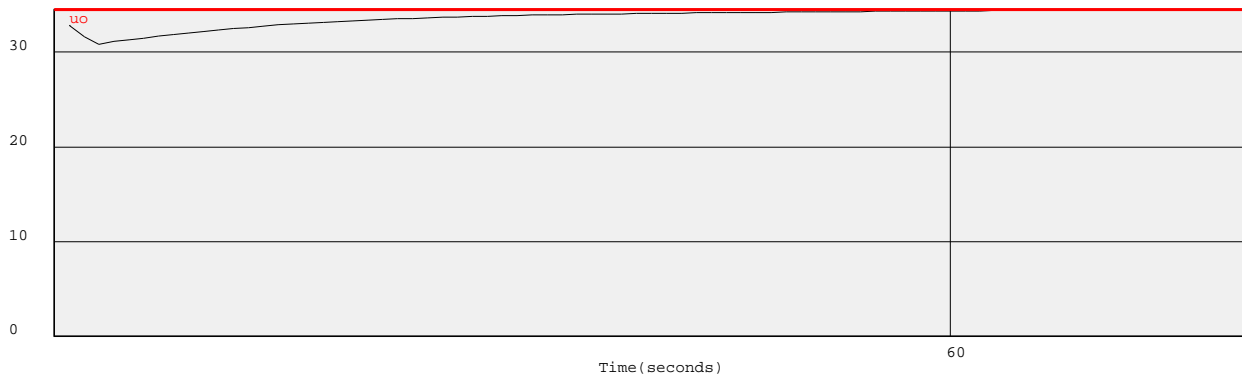
(kPa) Dissipation at: 3.615m



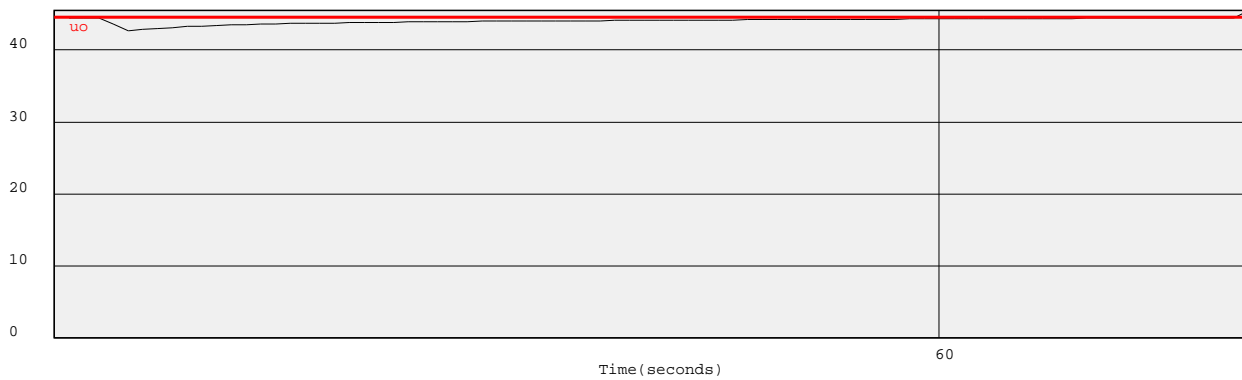
(kPa) Dissipation at: 4.613m



(kPa) Dissipation at: 5.61m



(kPa) Dissipation at: 6.608m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.306' Lat: 031°00.262'

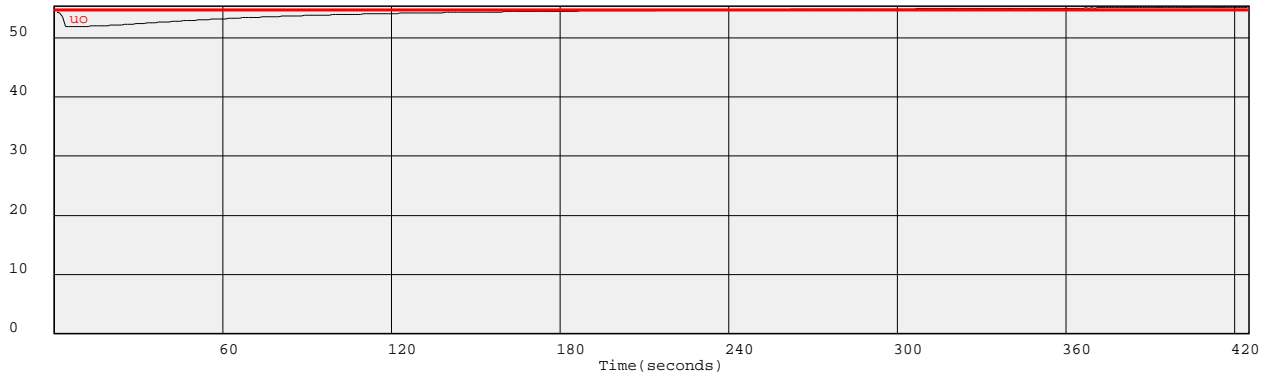
Hole: CPTU2

Date: 2012-03-06

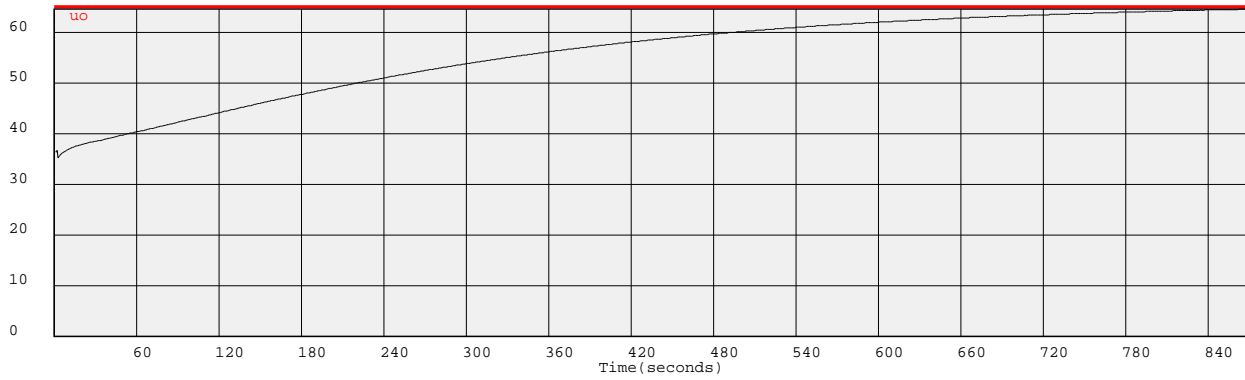
Probe: H1110

Page: 3

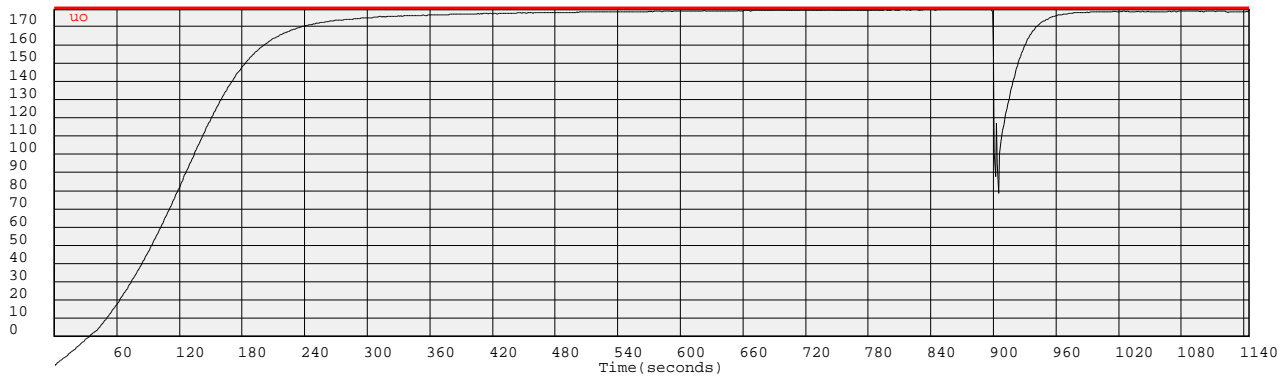
(kPa) Dissipation at: 7.6m



(kPa) Dissipation at: 8.598m



(kPa) Dissipation at: 20.753m



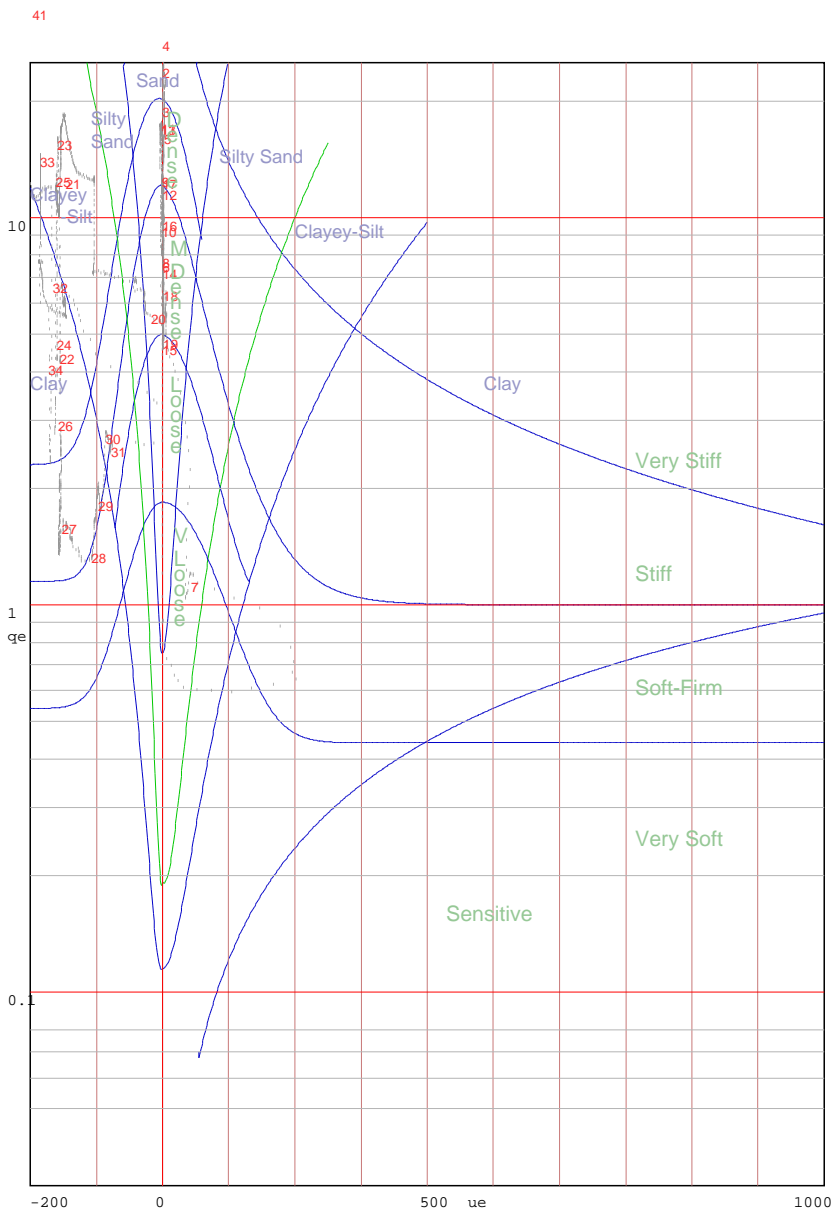
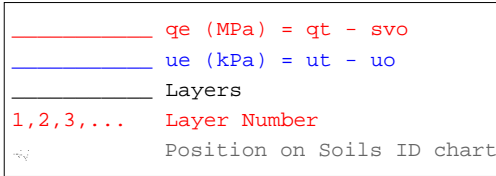
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.306' Lat:031°00.262'

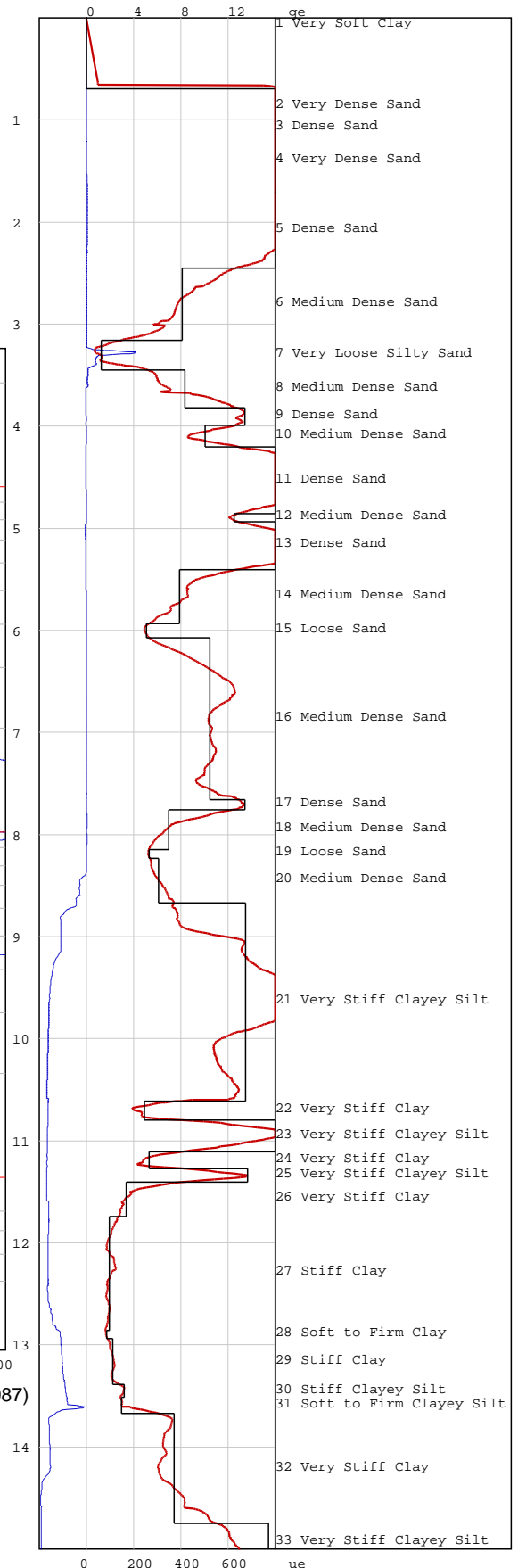
Hole No: CPTU2

Date: 2012-03-06

Probe: H1110



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





Project: Durban Harbour Land Based CPTu

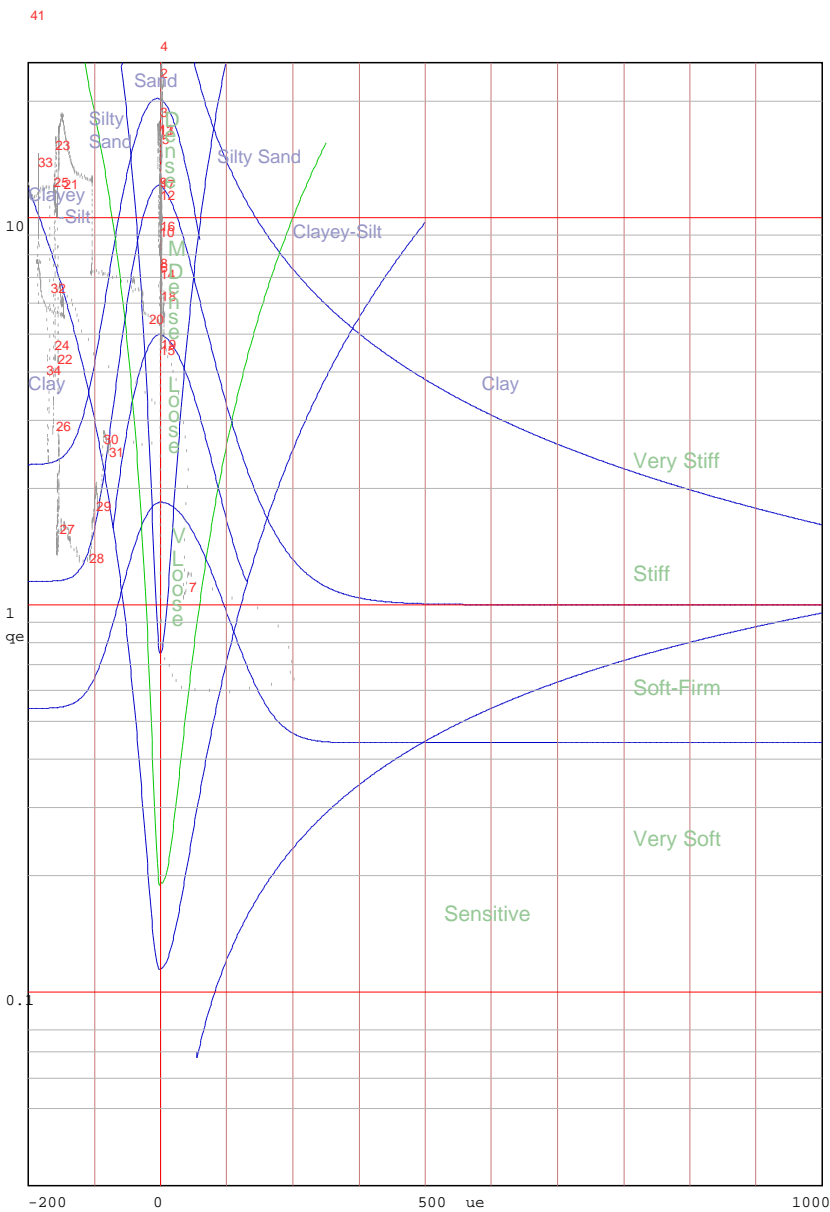
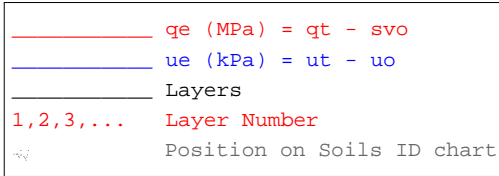
Site: Lot 10 Long:29°53.306' Lat:031°00.262'

Hole No: CPTU2

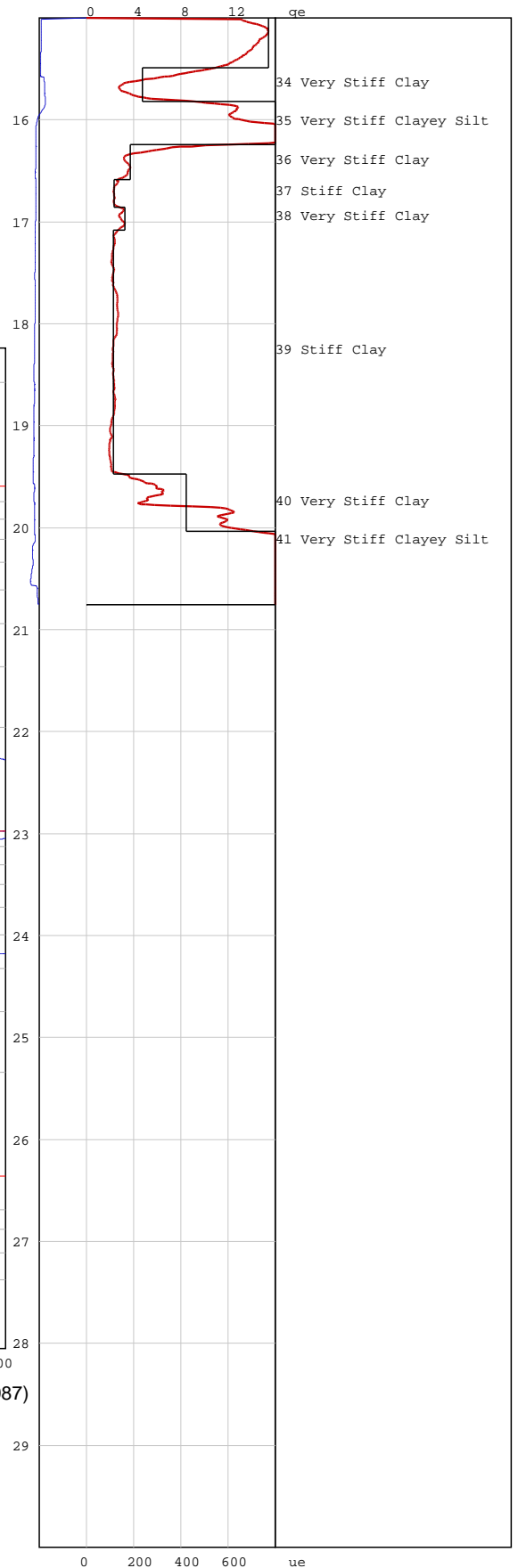
Page:2

Date: 2012-03-06

Probe: H1110



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

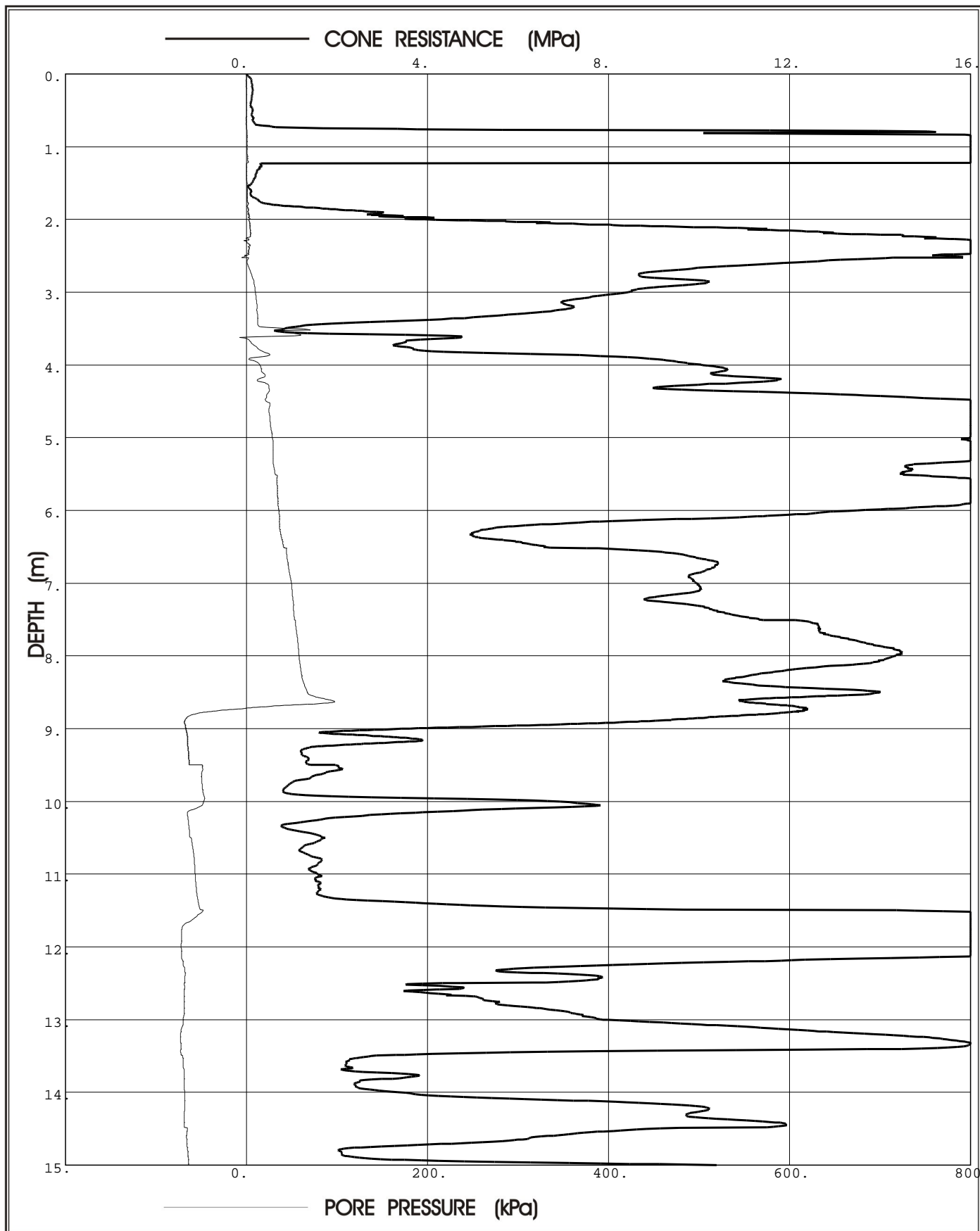
SITE: Lot 10 Long:29°53.296' Lat:031°00.228'

CPTU (RE): CPTU3

DATE: 2012-03-07

Probe: GHANA

Page:1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

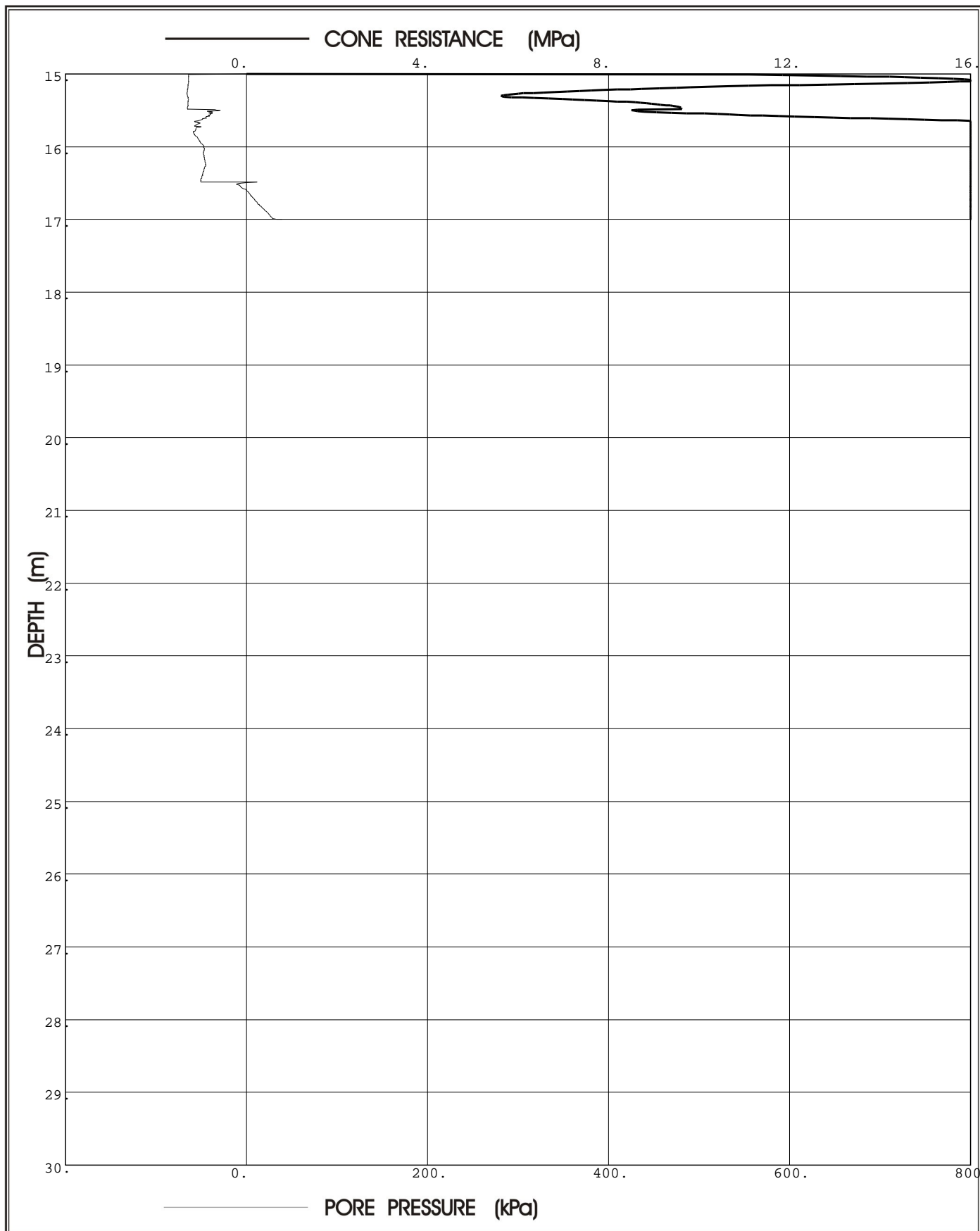
SITE: Lot 10 Long: 29°53.296' Lat: 031°00.228'

CPTU (RE): CPTU3

DATE: 2012-03-07

Probe: GHANA

Page: 2



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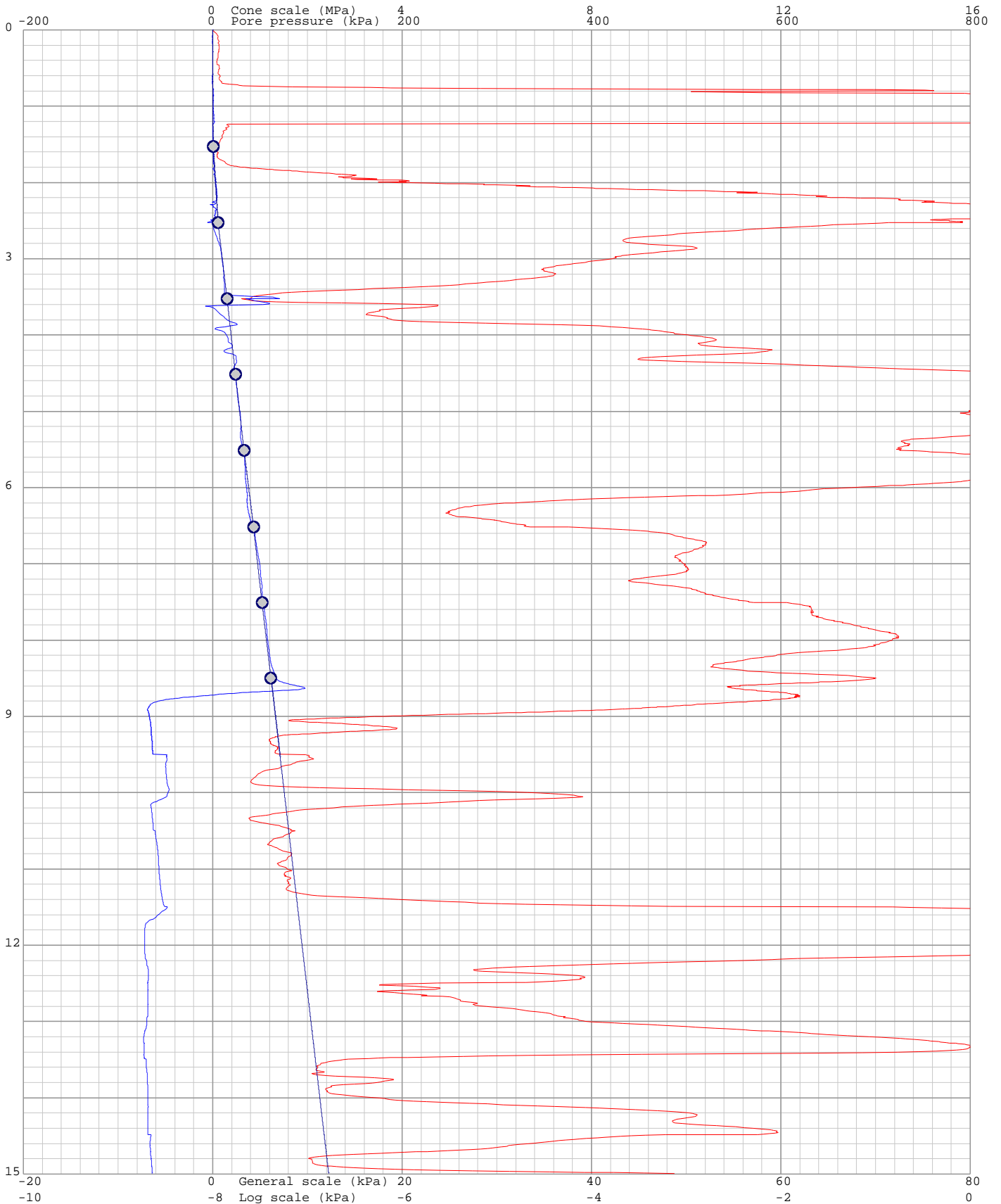
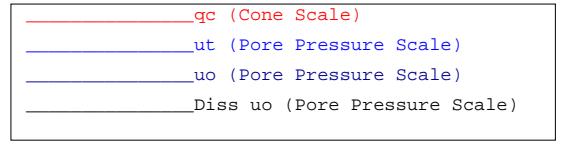
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.296' Lat:031°00.228'

Hole No: CPTU3

Date: 2012-03-07

Probe: GHANA



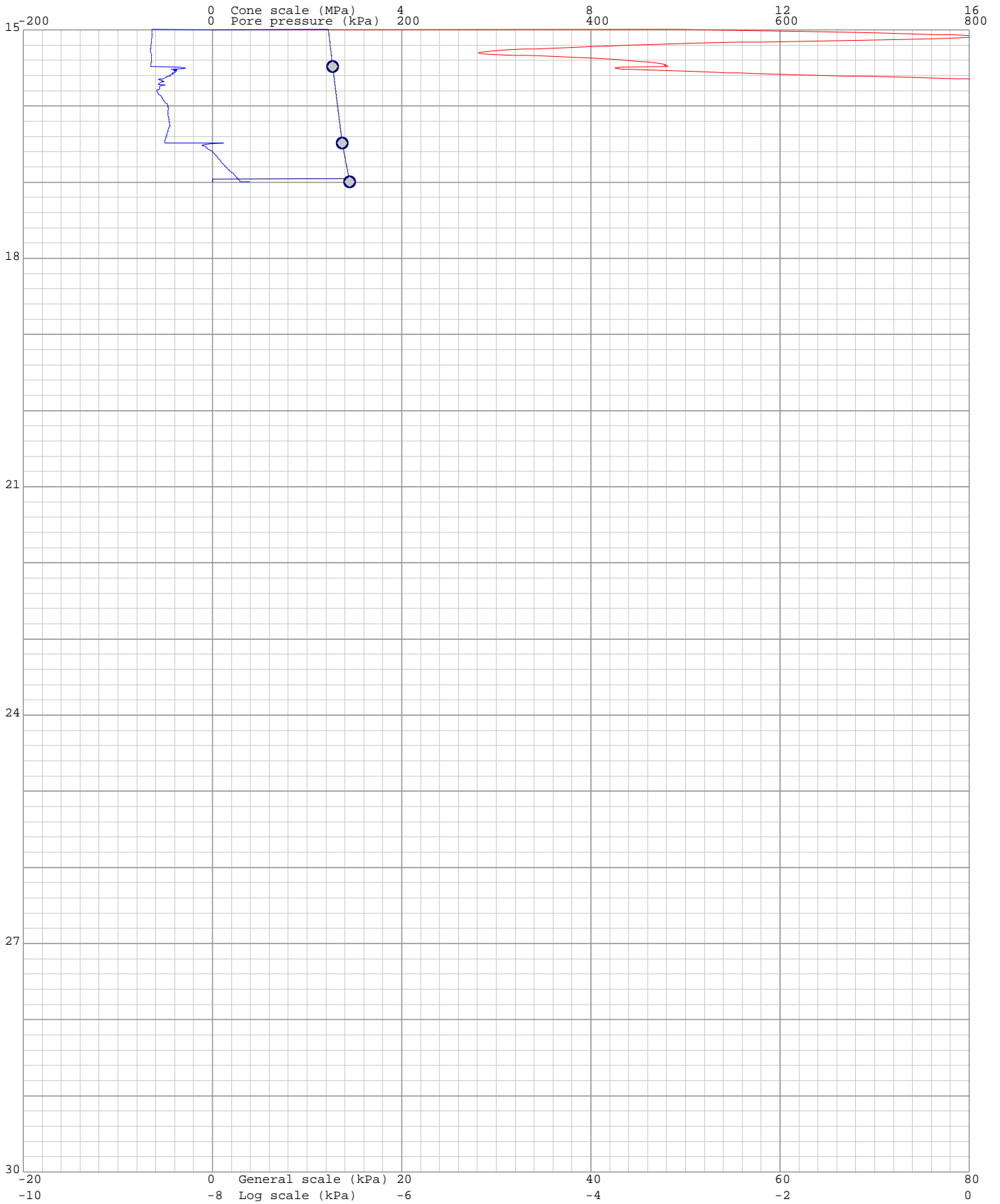
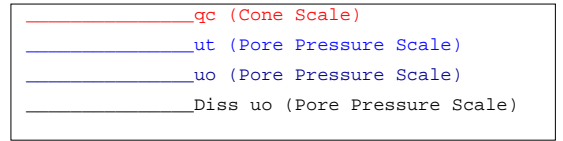
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.296' Lat:031°00.228'

Hole No: CPTU3

Date: 2012-03-07

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.296' Lat: 031°00.228'

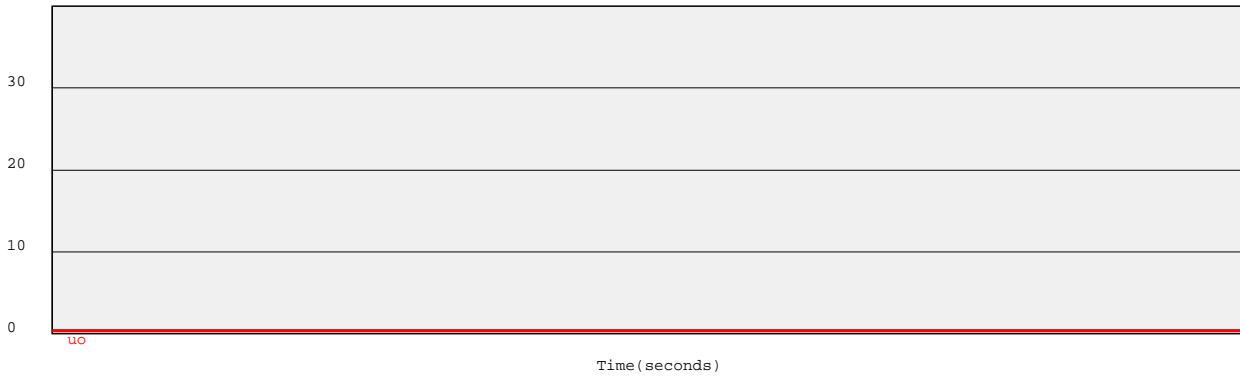
Hole: CPTU3

Date: 2012-03-07

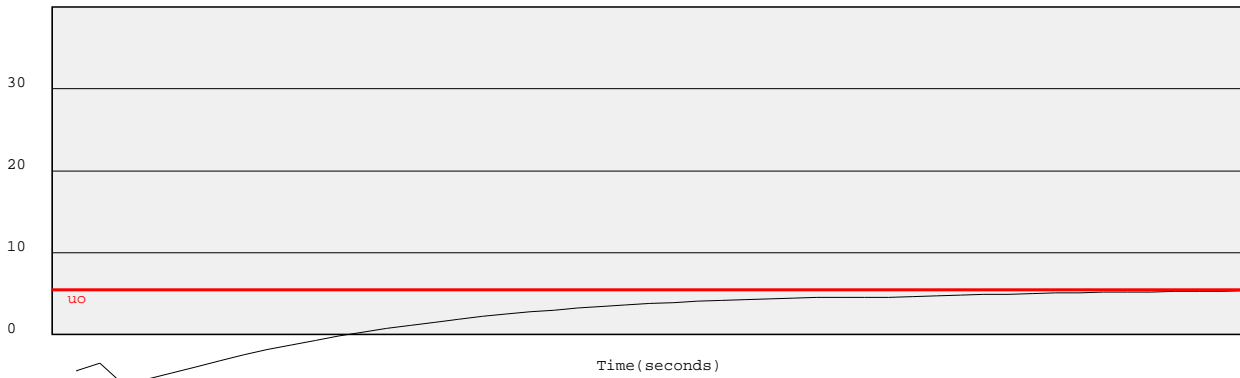
Probe: GHANA

Page: 1

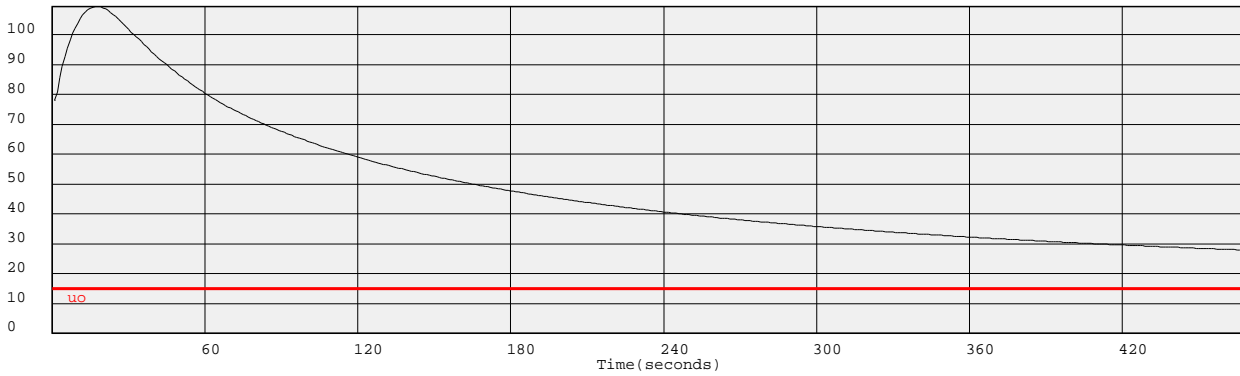
(kPa) Dissipation at: 1.529m



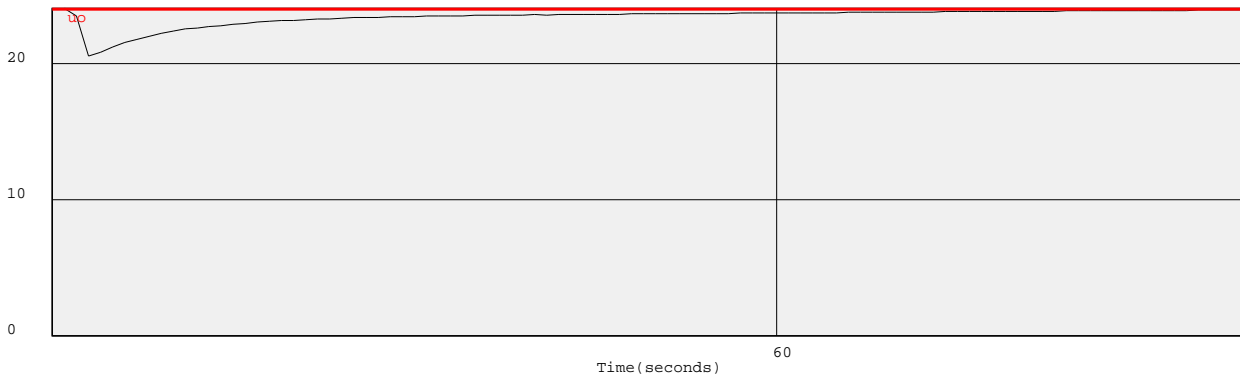
(kPa) Dissipation at: 2.523m



(kPa) Dissipation at: 3.521m



(kPa) Dissipation at: 4.517m



Project: Durban Harbour Land Based CPTu

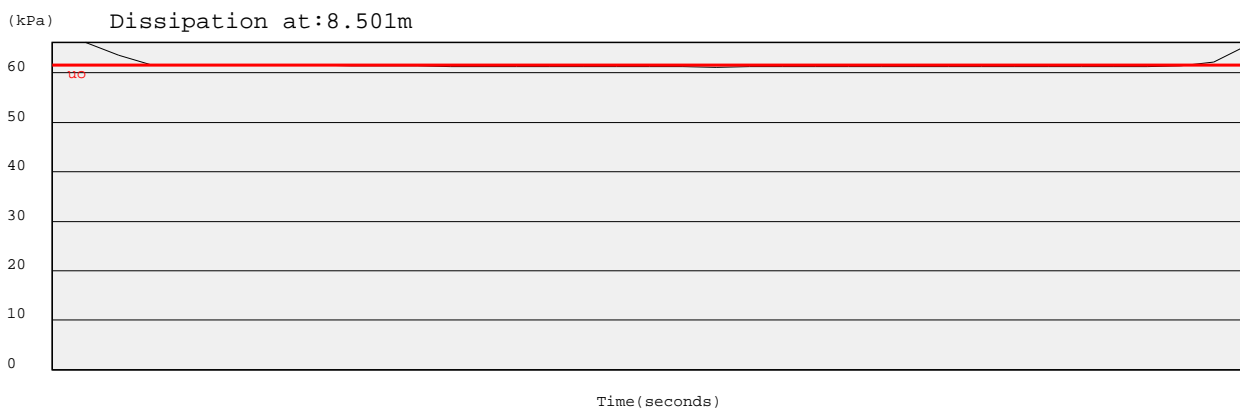
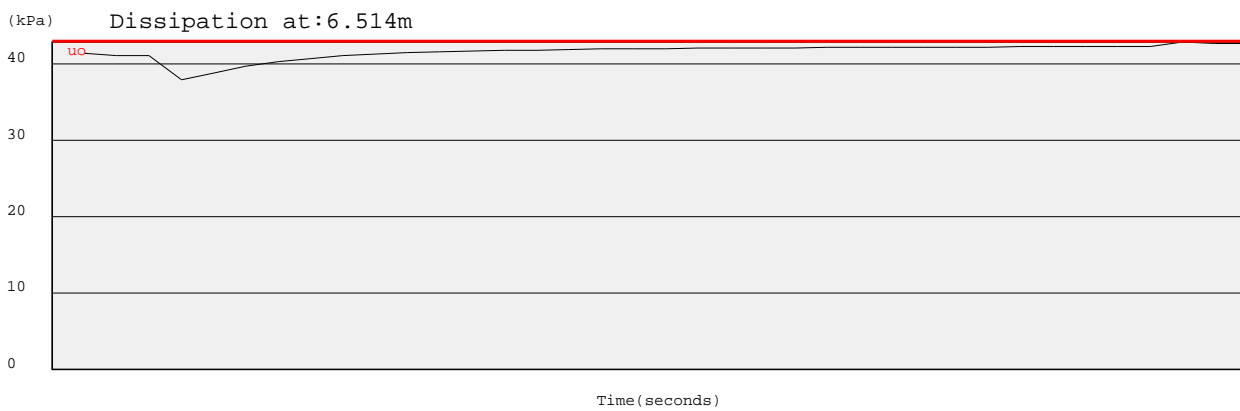
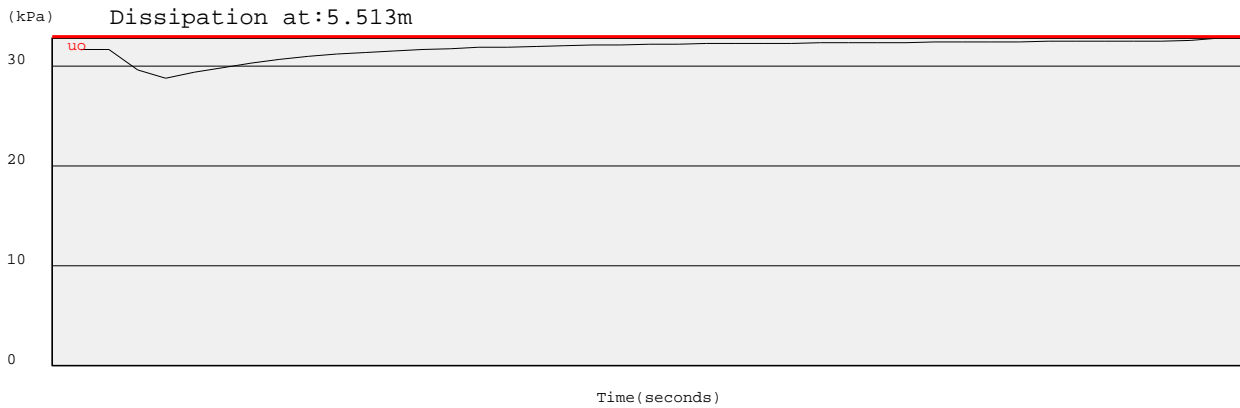
Site: Lot 10 Long: 29°53.296' Lat: 031°00.228'

Hole: CPTU3

Date: 2012-03-07

Probe: GHANA

Page: 2



Project: Durban Harbour Land Based CPTu

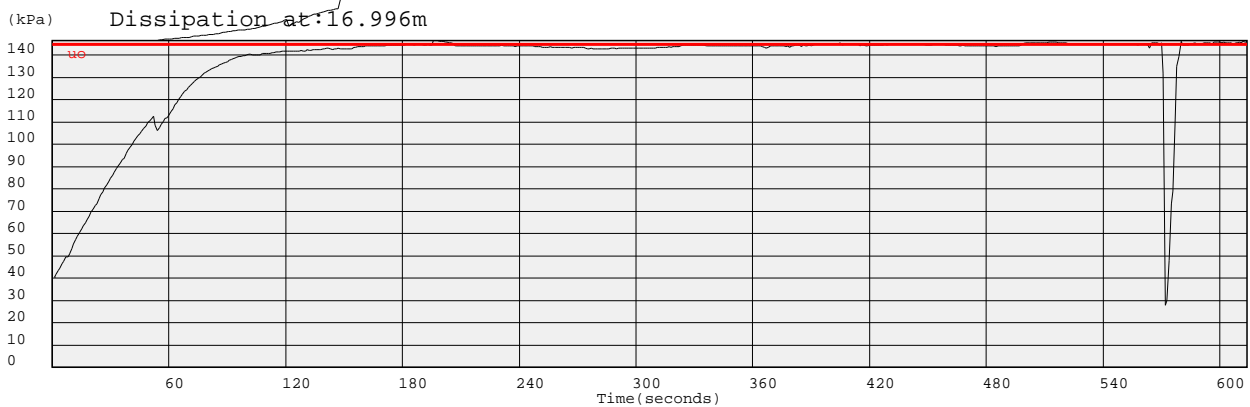
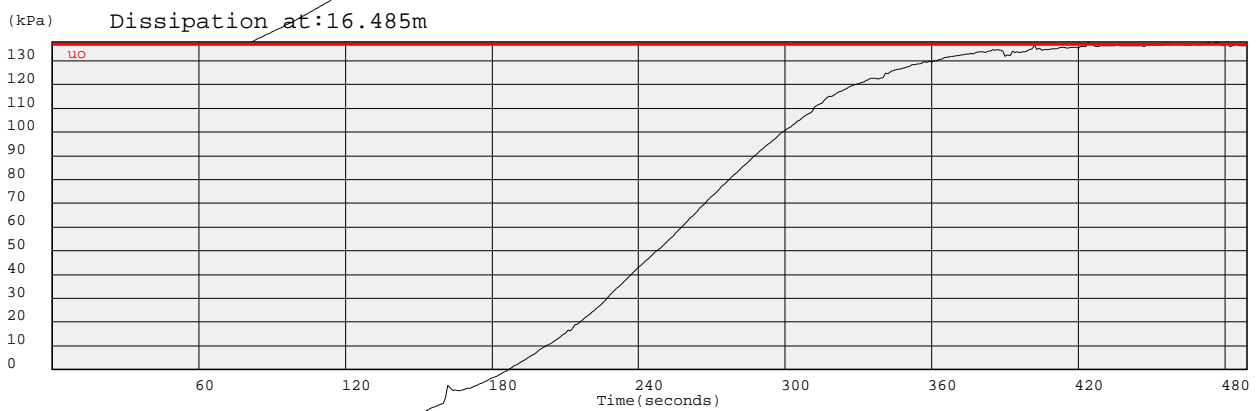
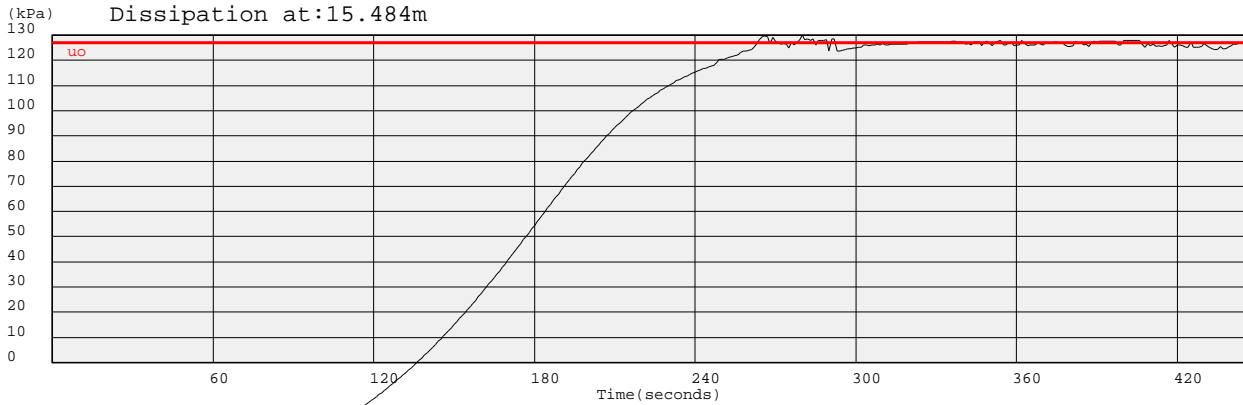
Site: Lot 10 Long: 29°53.296' Lat: 031°00.228'

Hole: CPTU3

Date: 2012-03-07

Probe: GHANA

Page: 3





Project: Durban Harbour Land Based CPTu

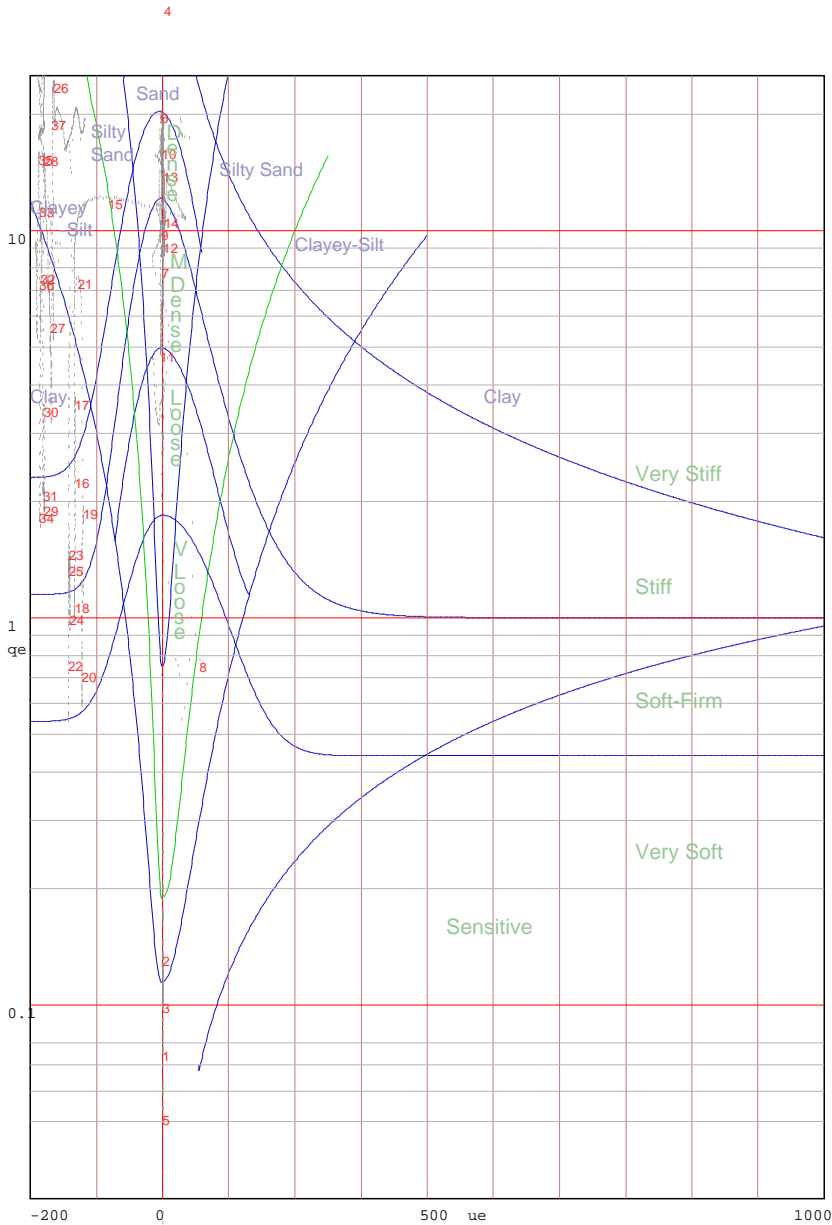
Site: Lot 10 Long:29°53.296' Lat:031°00.228'

Hole No: CPTU3

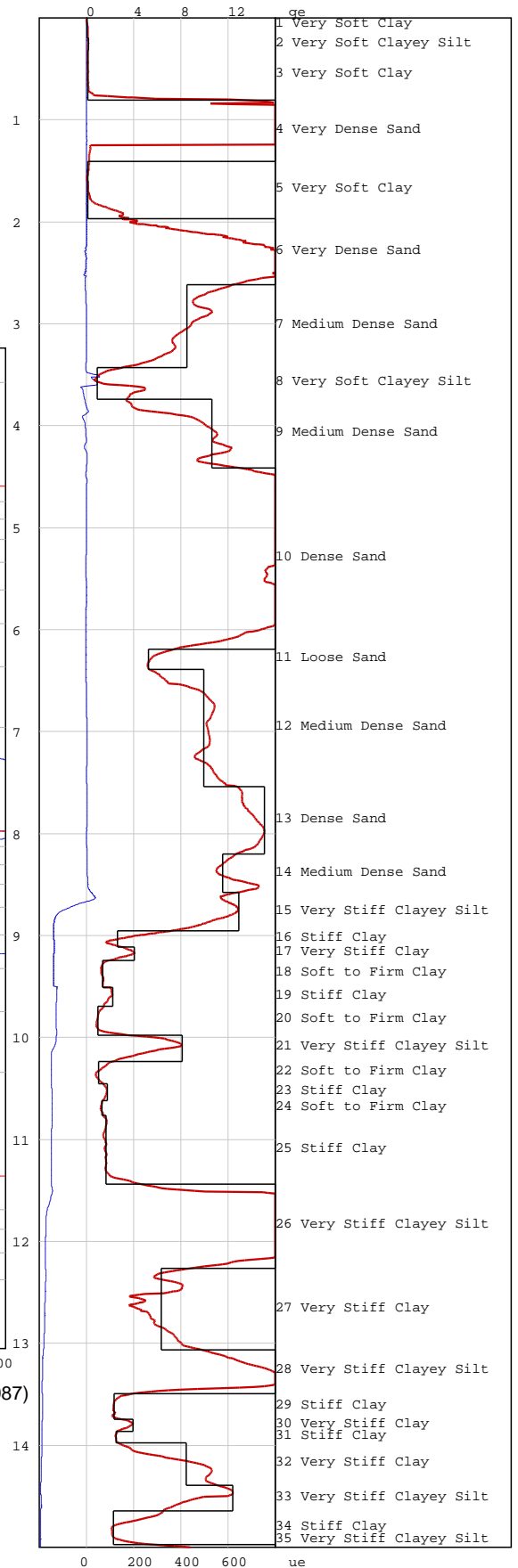
Date: 2012-03-07

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
— Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)





# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

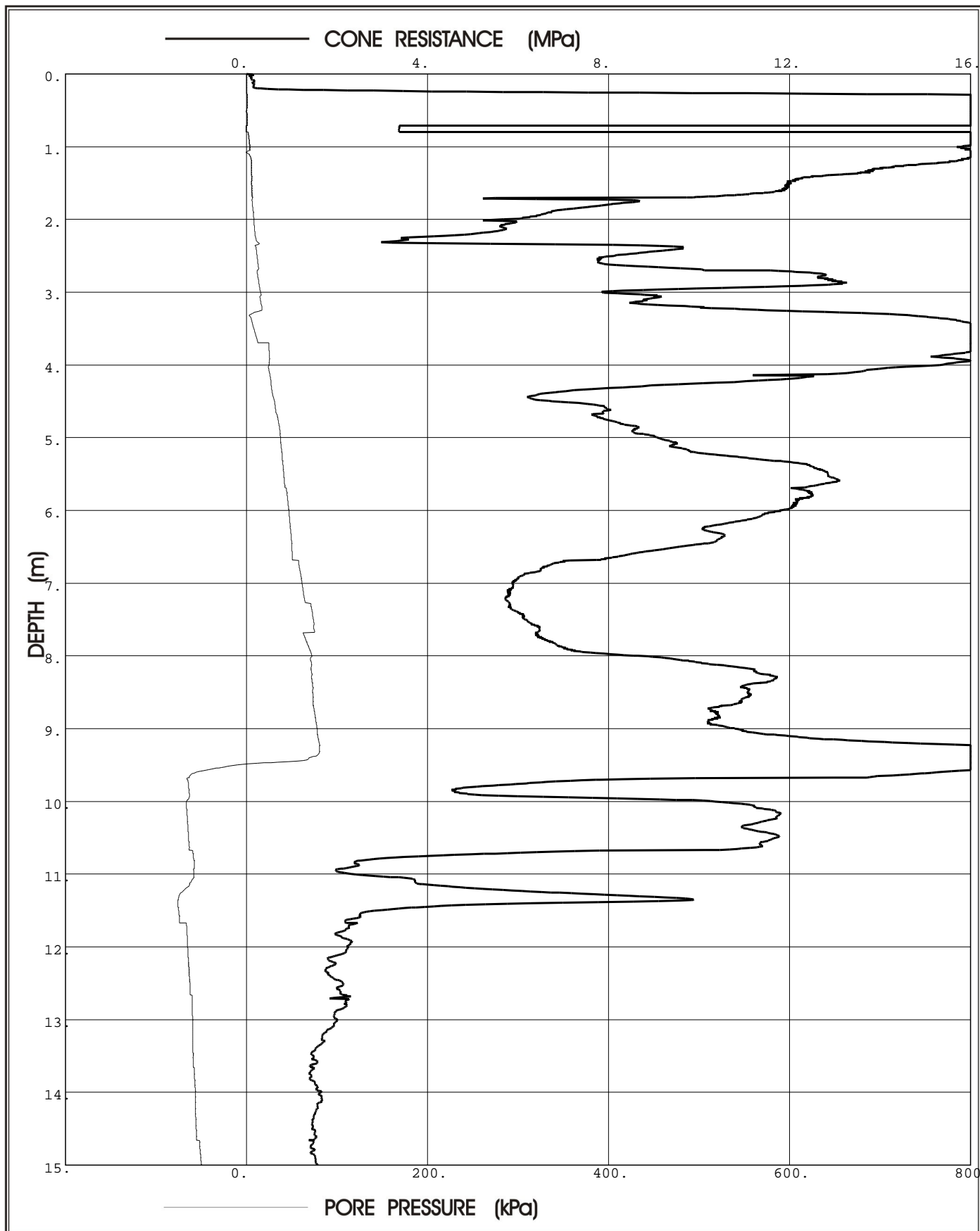
SITE: Lot 10 Long:29°53.282' Lat:031°00.274'

CPTU (RE): CPTU4

DATE: 2012-03-06

Probe: GHANA

Page:1



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rust@global.co.za

# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

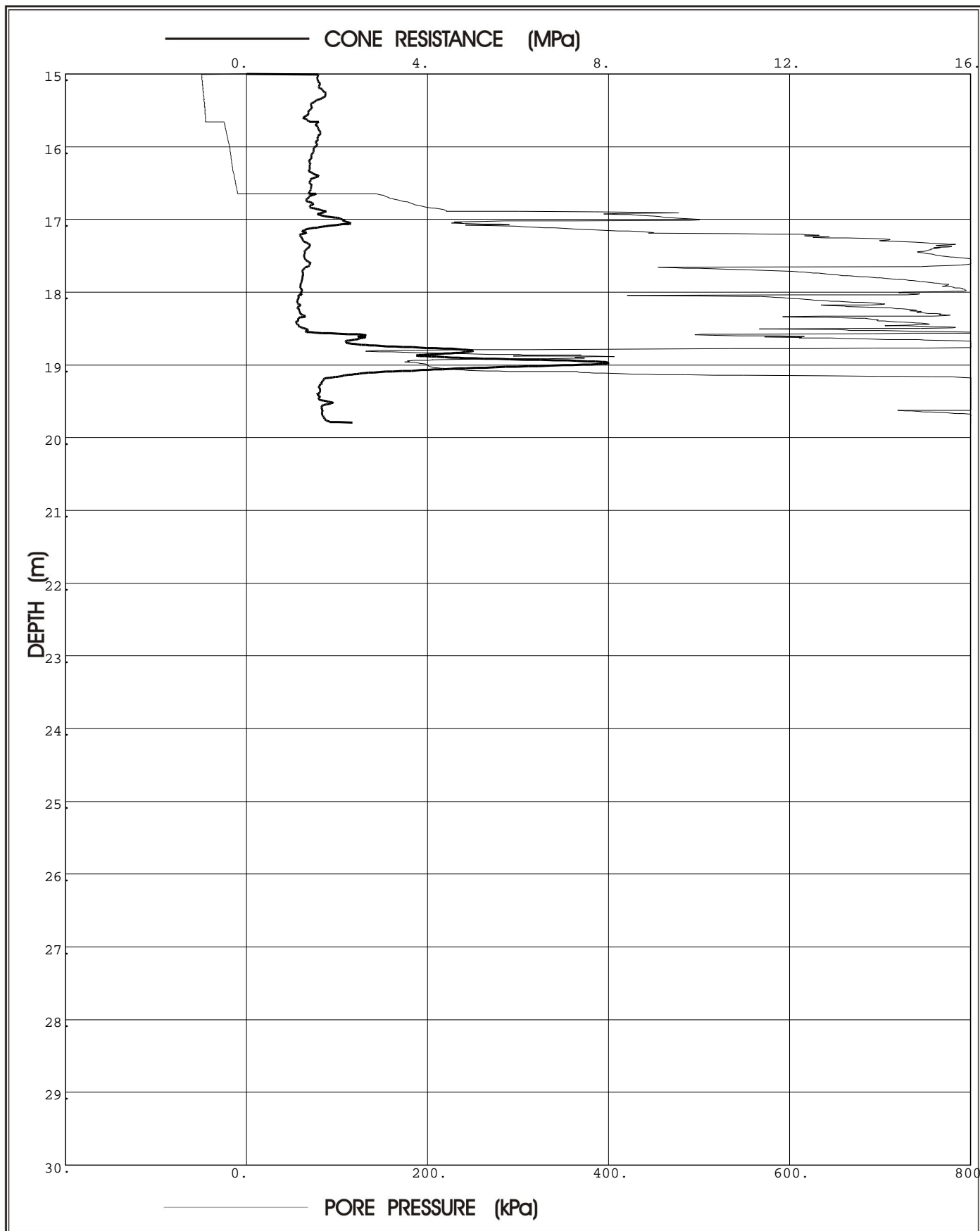
SITE: Lot 10 Long: 29°53.282' Lat: 031°00.274'

CPTU (RE): CPTU4

DATE: 2012-03-06

Probe: GHANA

Page: 2



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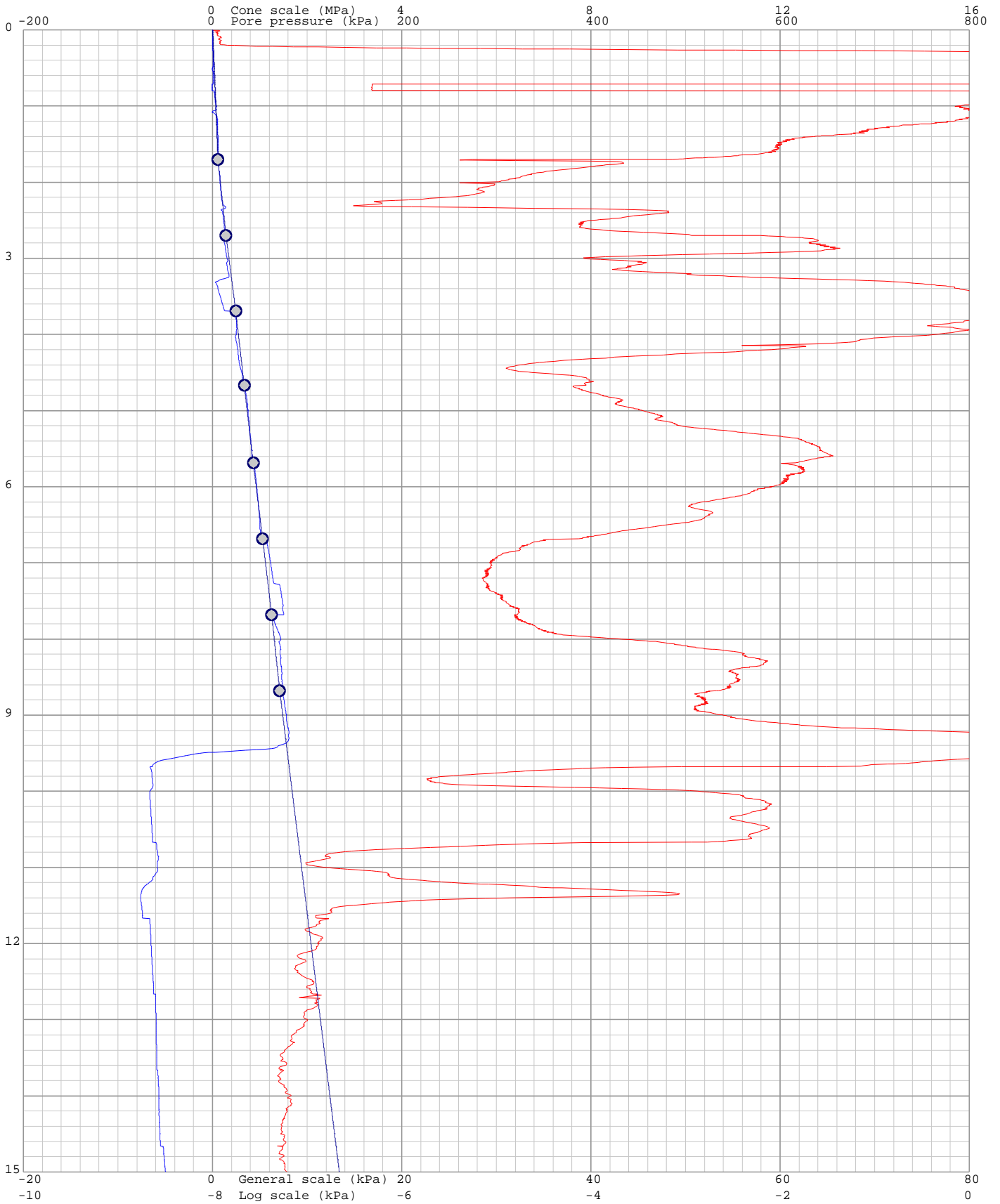
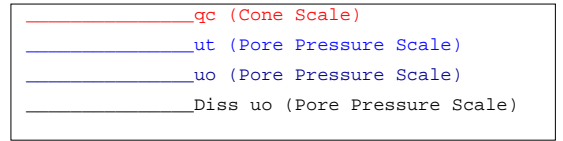
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.282' Lat:031°00.274'

Hole No: CPTU4

Date: 2012-03-06

Probe: GHANA



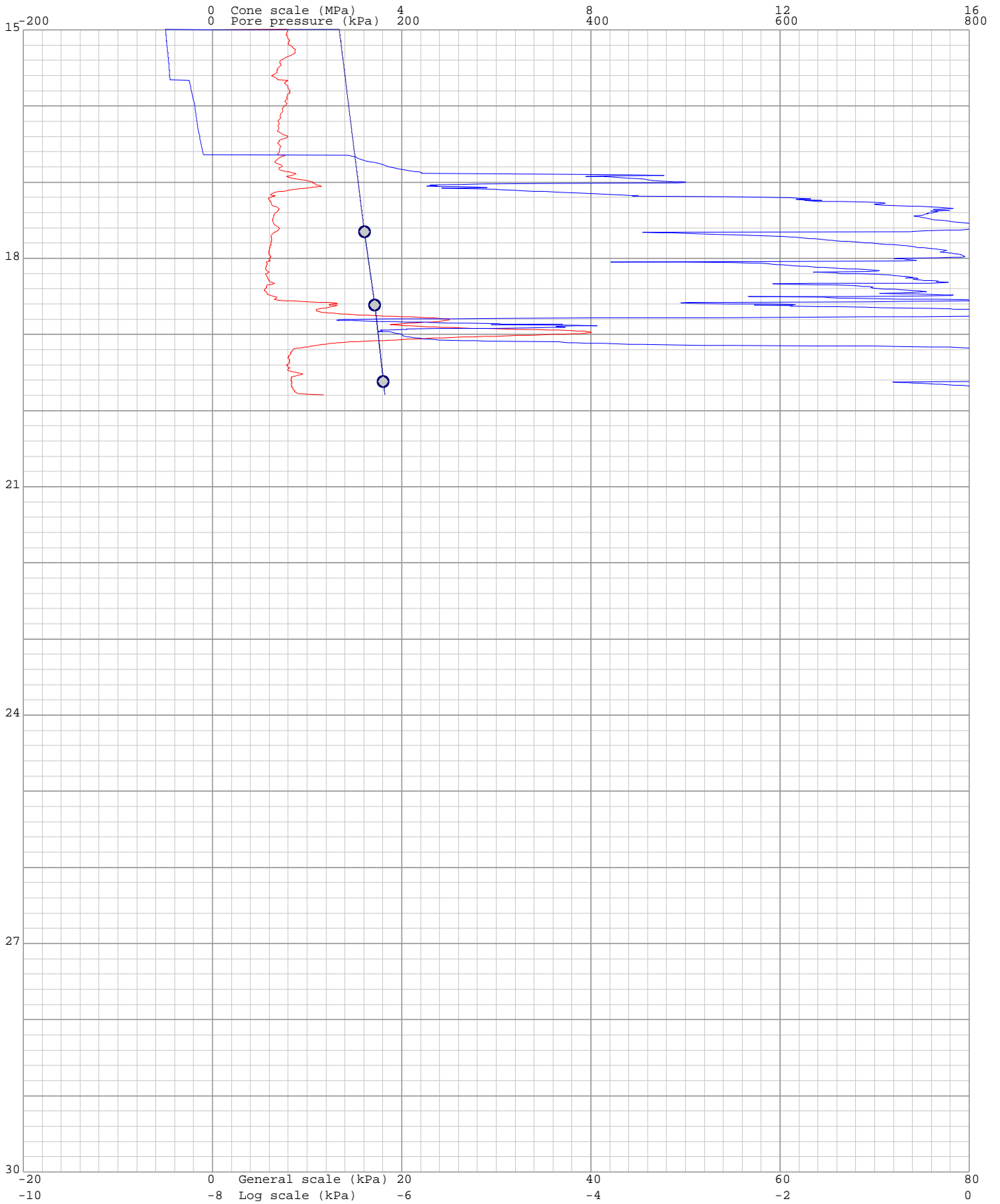
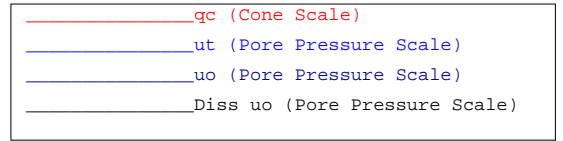
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.282' Lat:031°00.274'

Hole No: CPTU4

Date: 2012-03-06

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

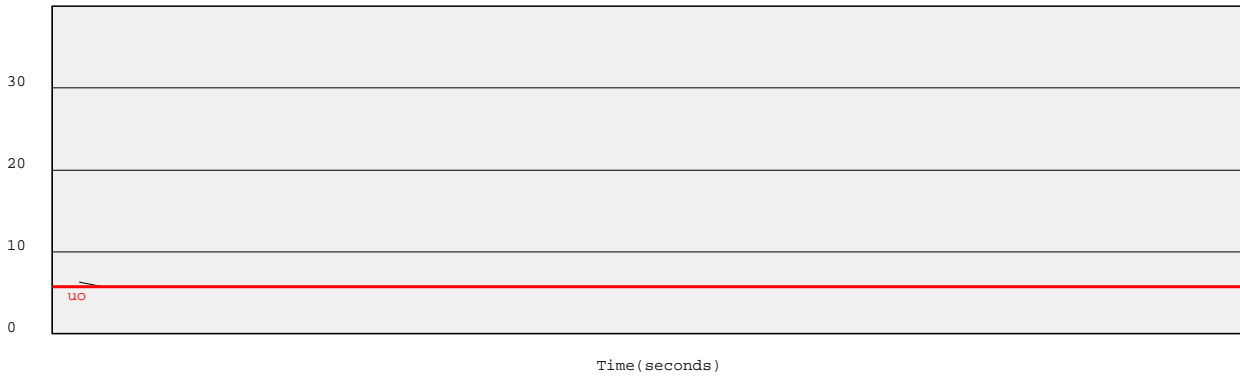
Hole: CPTU4

Date: 2012-03-06

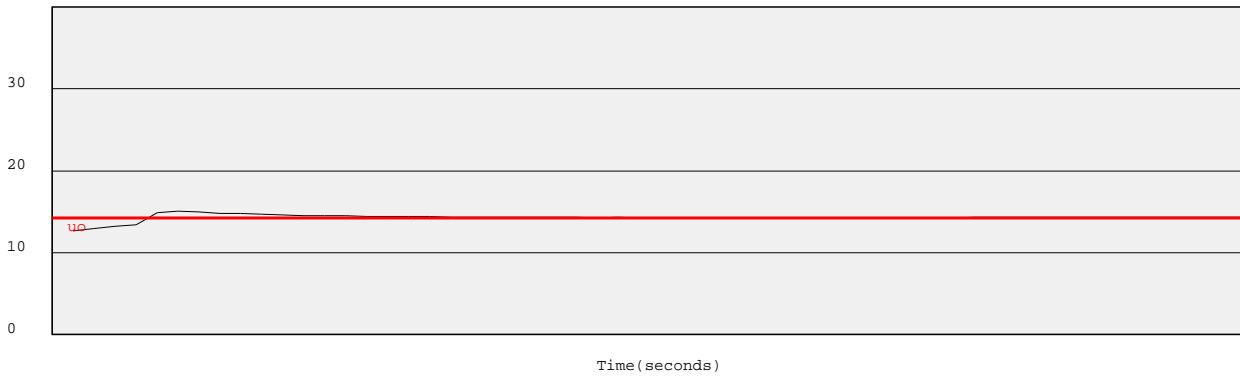
Probe: GHANA

Page: 1

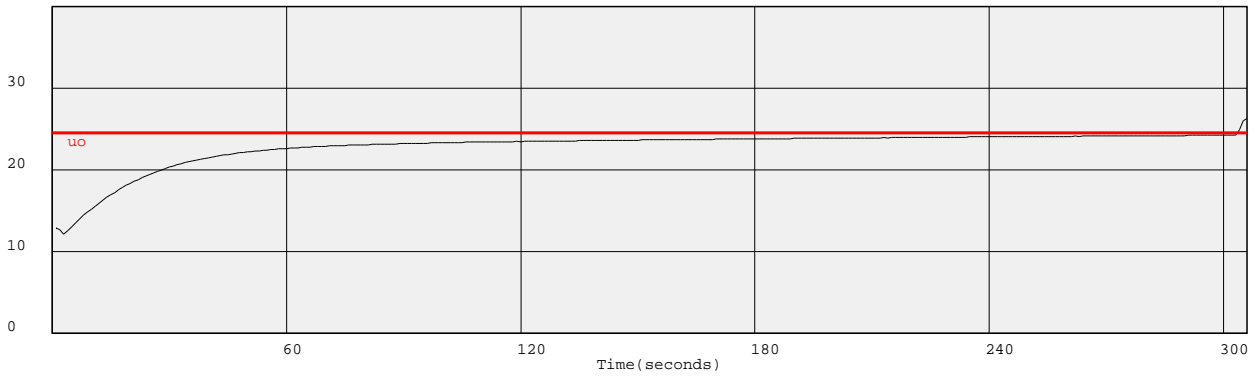
(kPa) Dissipation at: 1.701m



(kPa) Dissipation at: 2.697m



(kPa) Dissipation at: 3.694m



(kPa) Dissipation at: 4.667m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

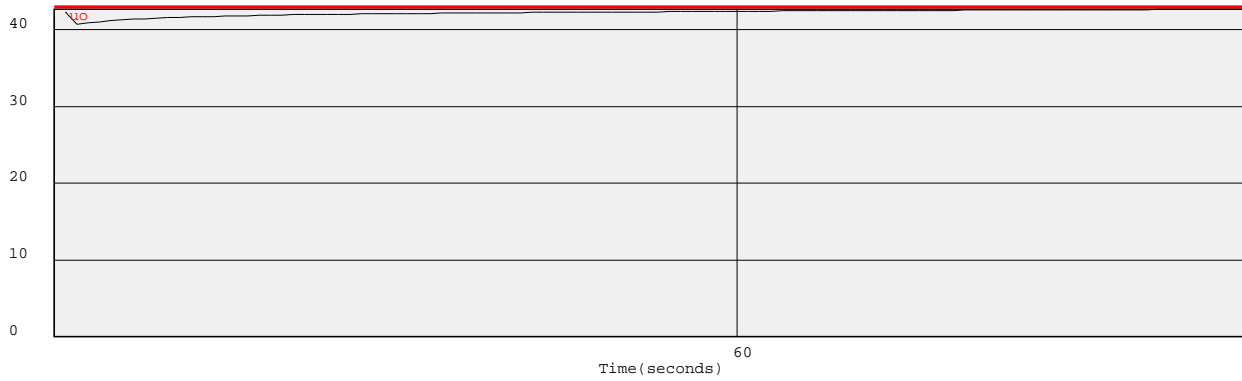
Hole: CPTU4

Date: 2012-03-06

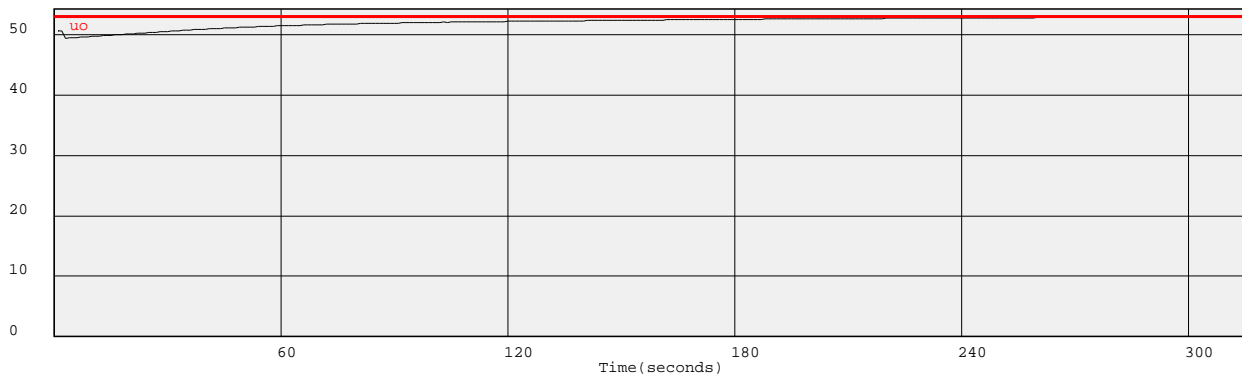
Probe: GHANA

Page: 2

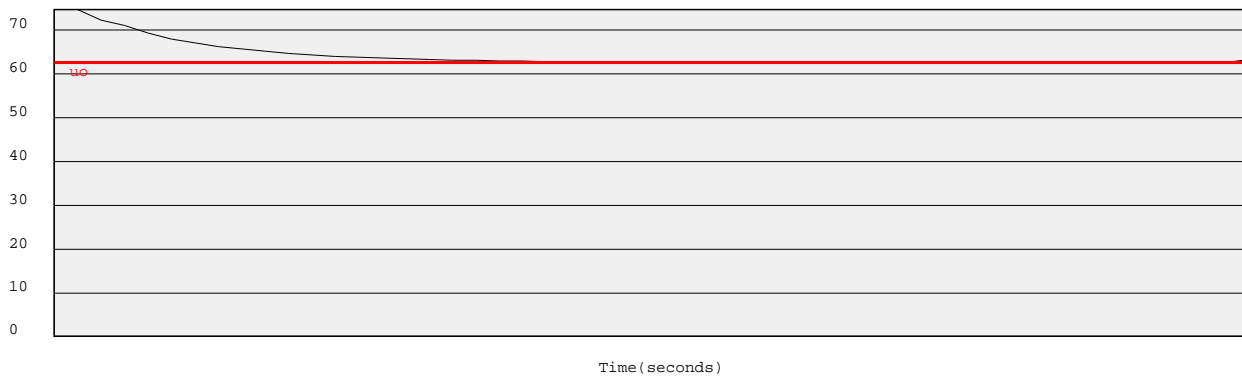
(kPa) Dissipation at: 5.688m



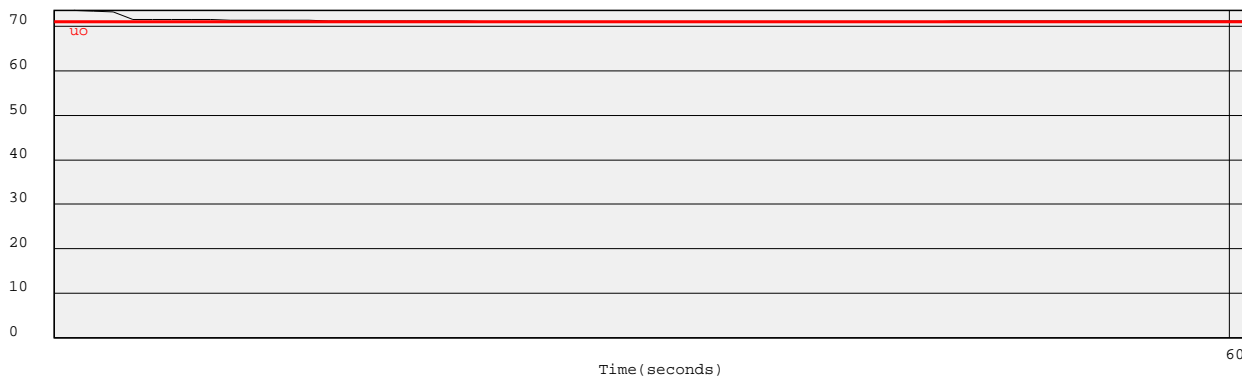
(kPa) Dissipation at: 6.684m



(kPa) Dissipation at: 7.679m



(kPa) Dissipation at: 8.679m





Project: Durban Harbour Land Based CPTu

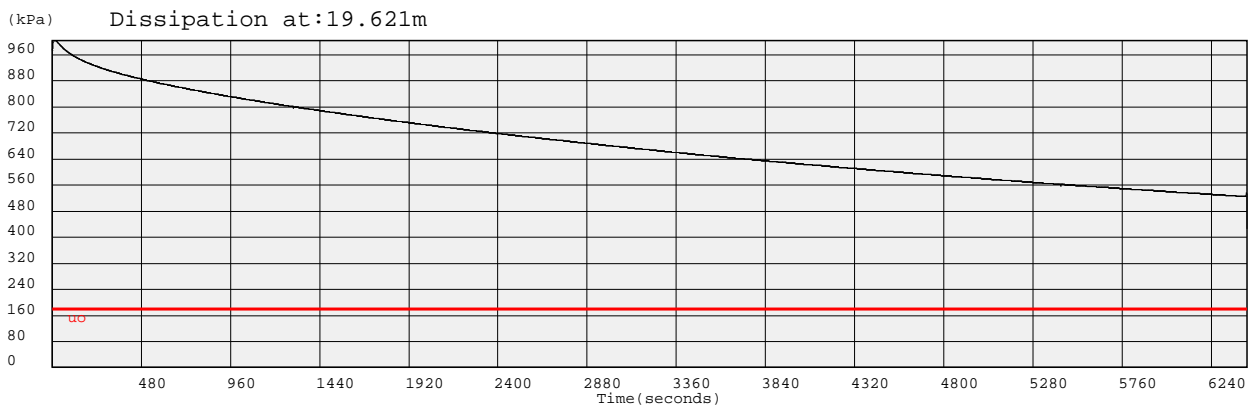
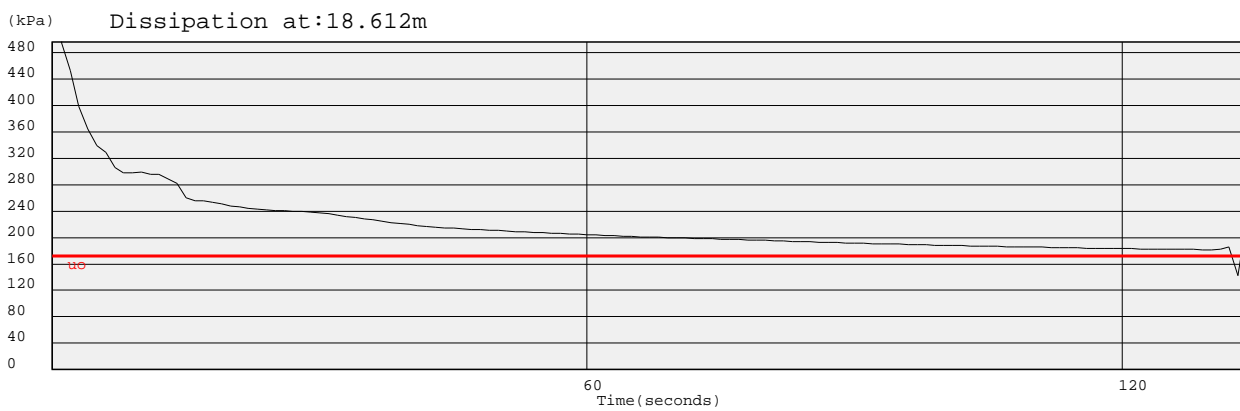
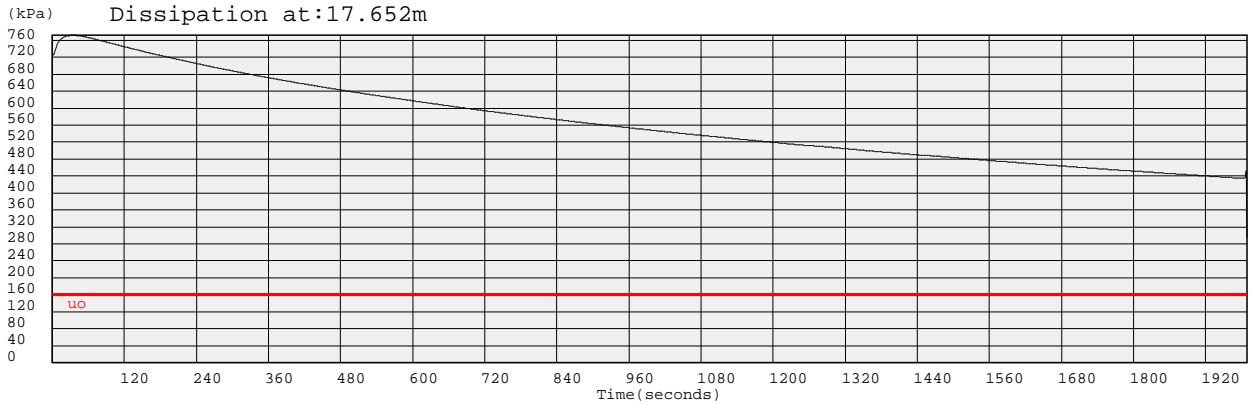
Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

Hole: CPTU4

Date: 2012-03-06

Probe: GHANA

Page: 3



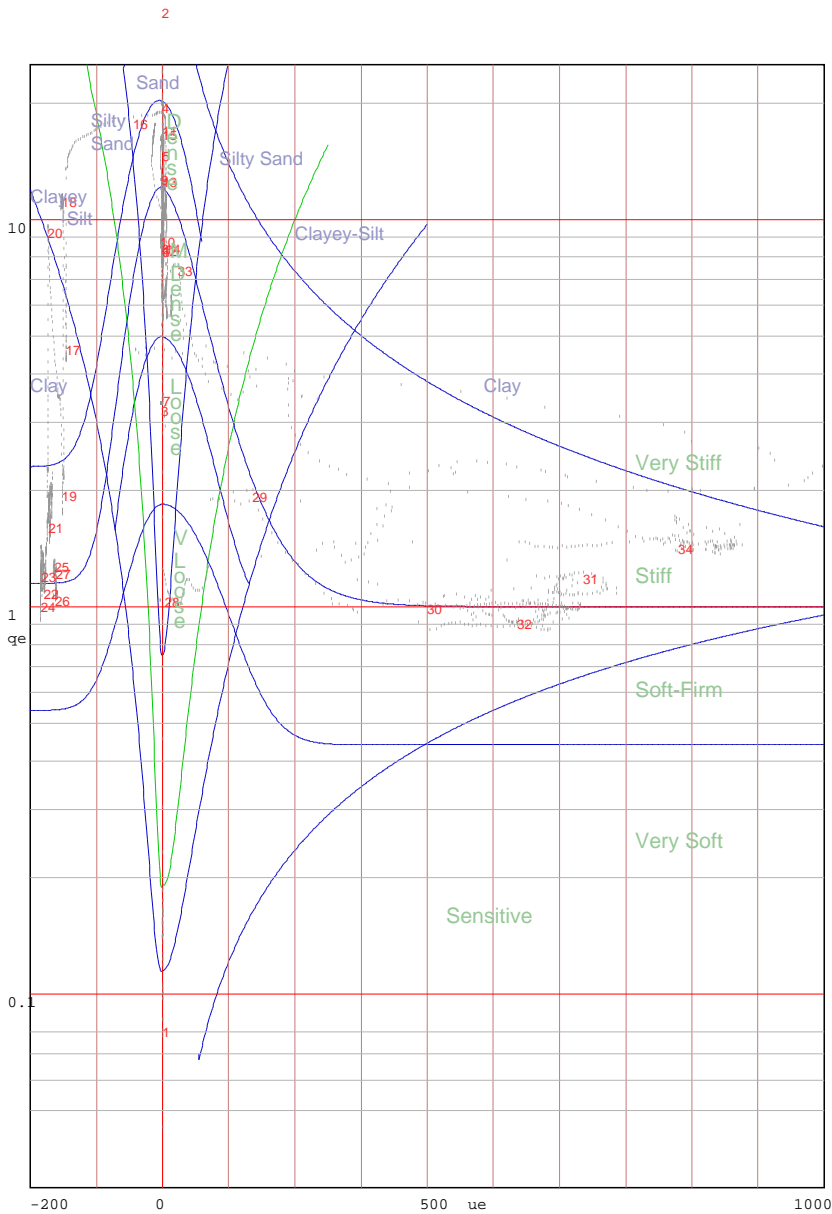
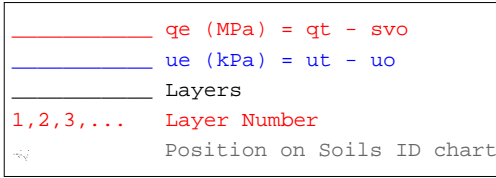
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.282' Lat:031°00.274'

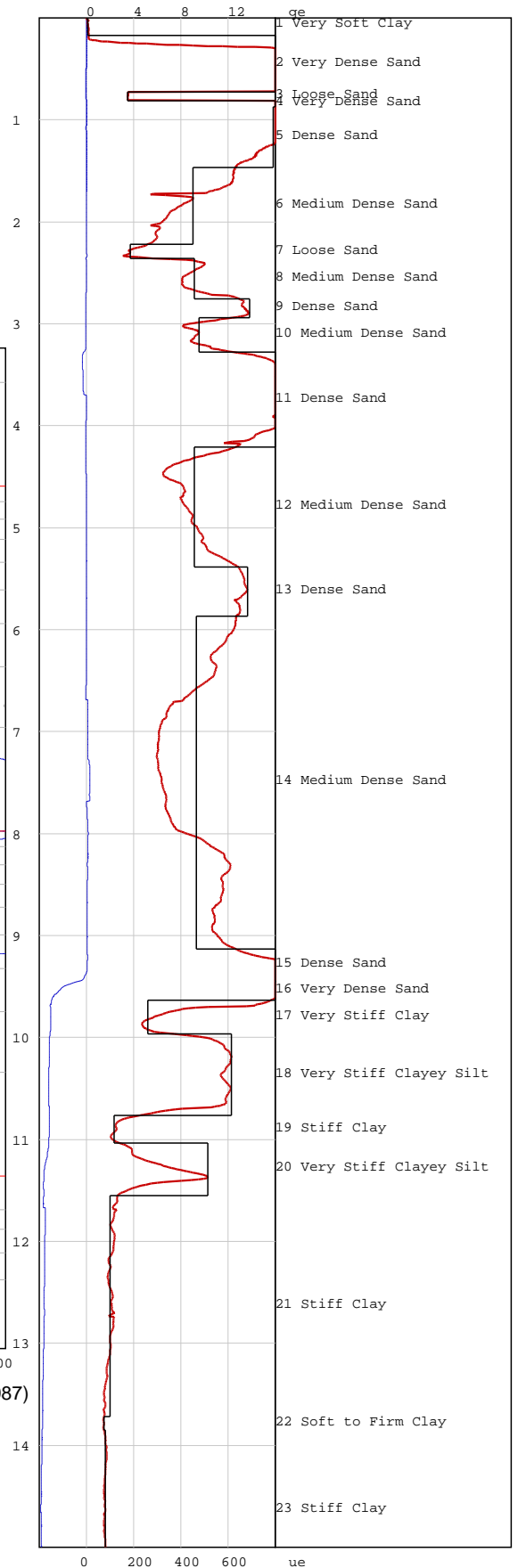
Hole No: CPTU4

Date: 2012-03-06

Probe: GHANA



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



Project: Durban Harbour Land Based CPTu

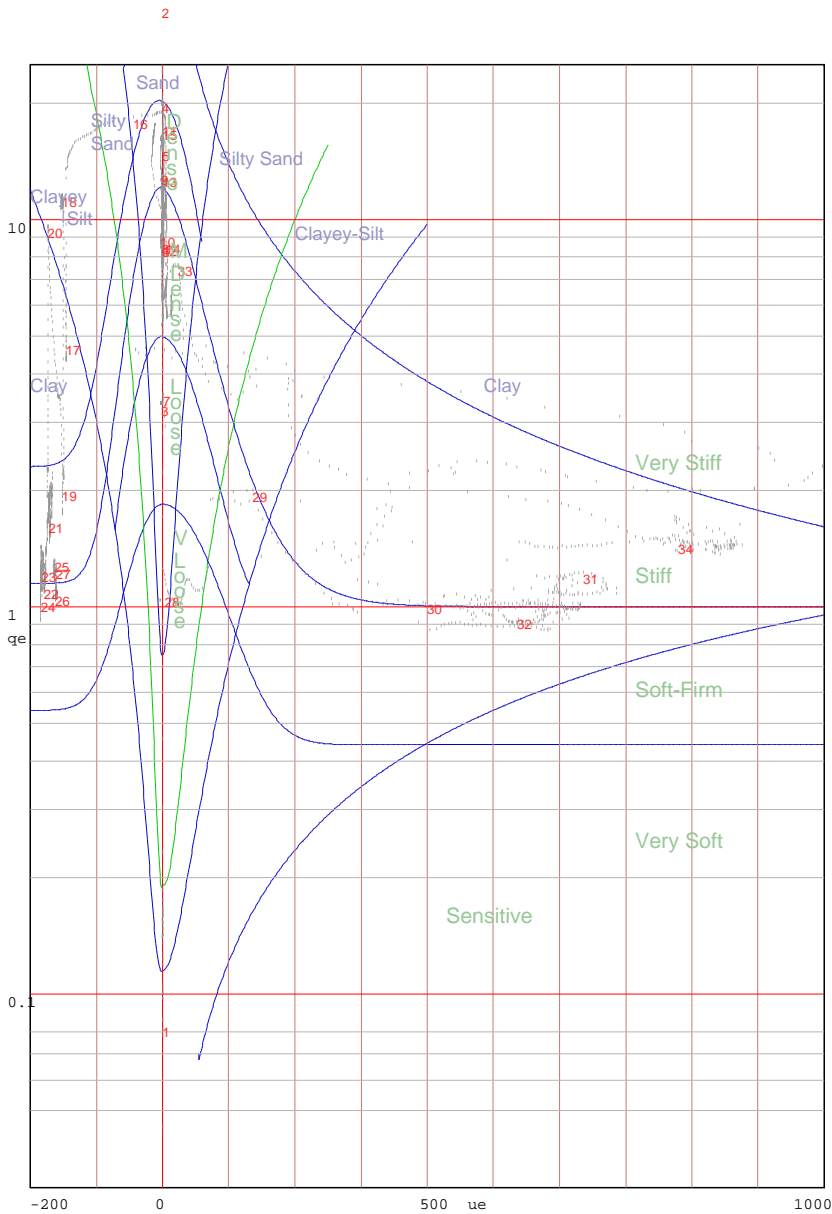
Site: Lot 10 Long:29°53.282' Lat:031°00.274'

Hole No: CPTU4

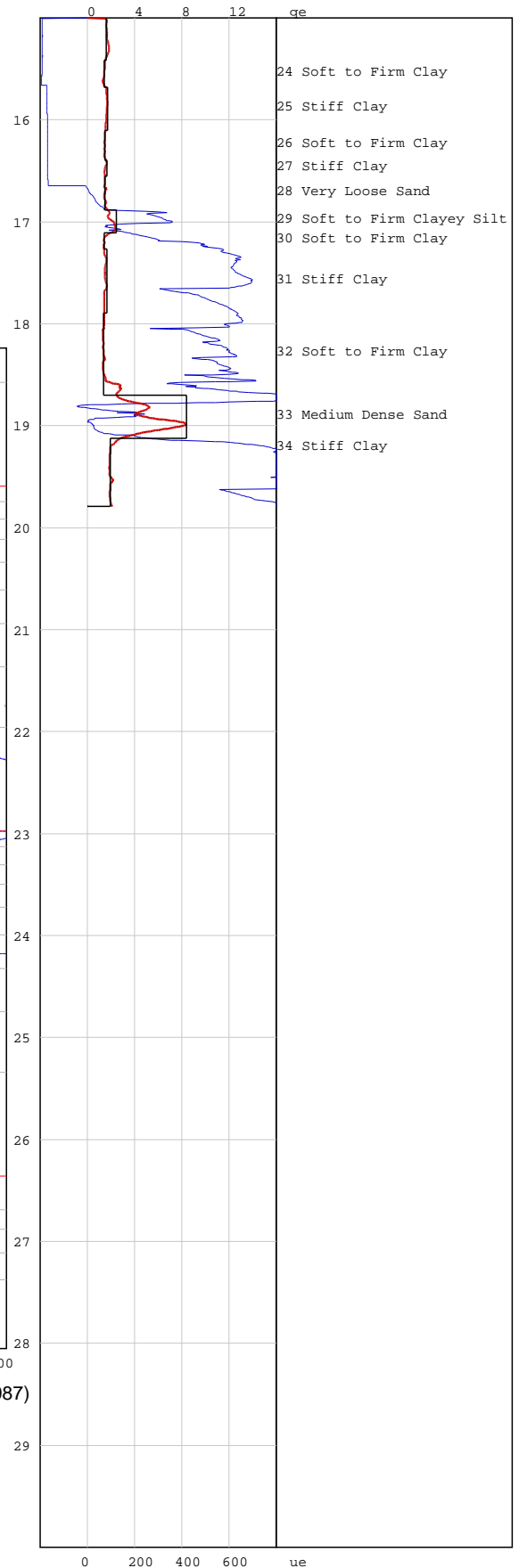
Date: 2012-03-06

Probe: GHANA

—————  $q_e$  (MPa) =  $q_t - s_{vo}$   
 —————  $u_e$  (kPa) =  $u_t - u_o$   
 ————— Layers  
 1,2,3,... Layer Number  
 Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA,1987)



# PIEZOCONE PENETRATION TEST



P O Box 39108  
Moreleta Park  
0044

PROJECT: Durban Harbour Land Based CPTu

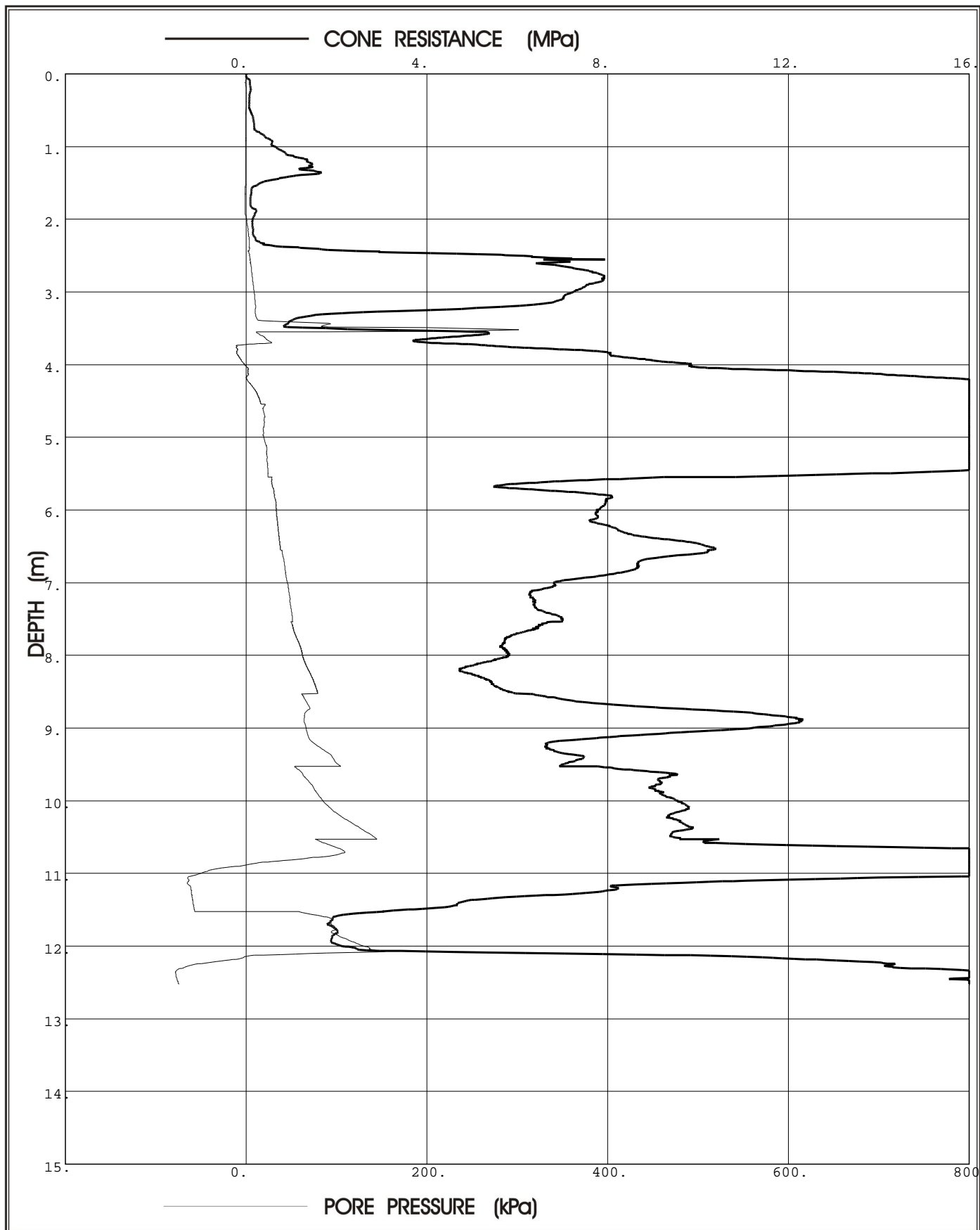
SITE: Lot 10 Long: 29°53.282' Lat: 031°00.274'

CPTU (RE): CPTU5

DATE: 2012-03-08

Probe: GHANA

Page: 1



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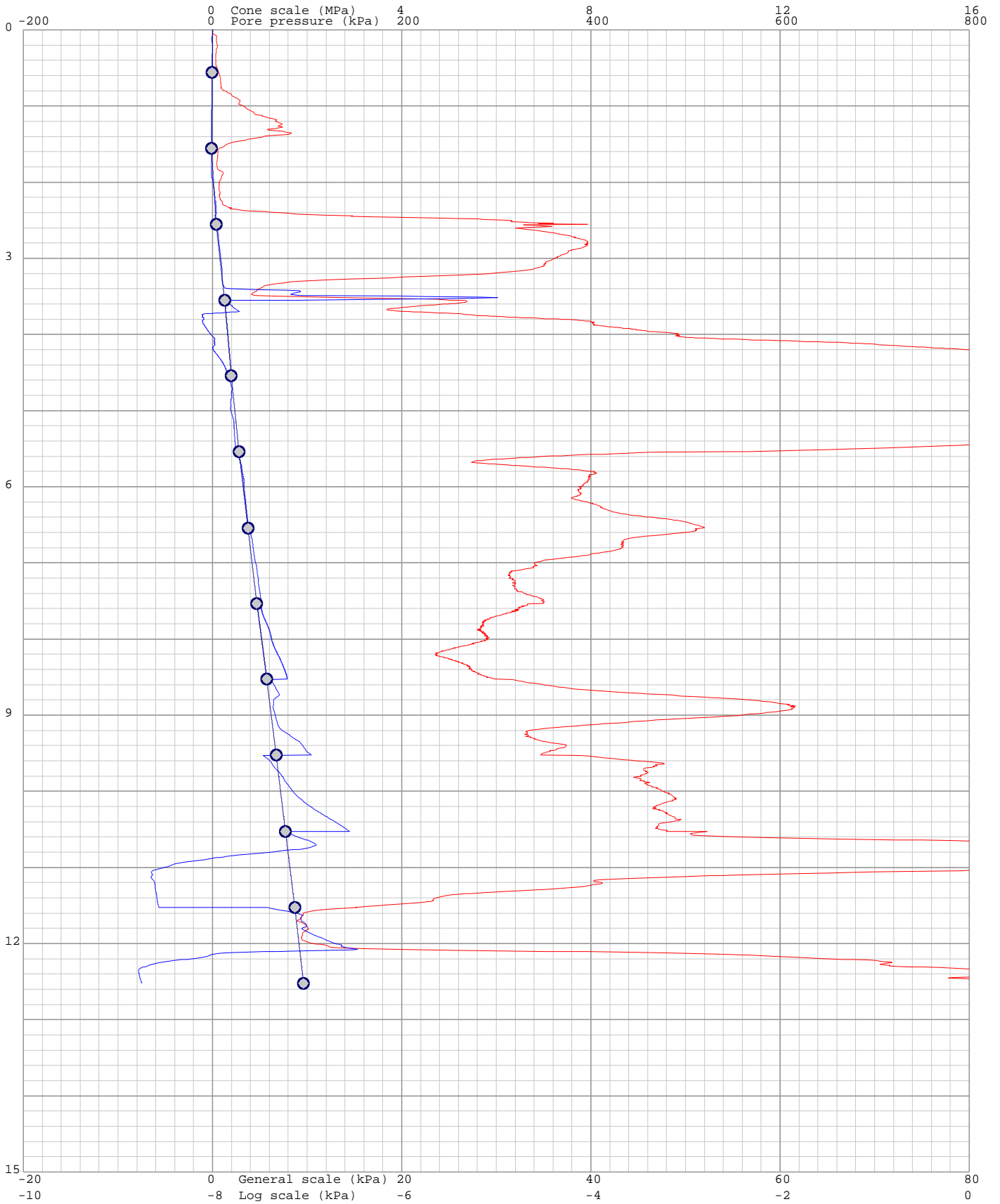
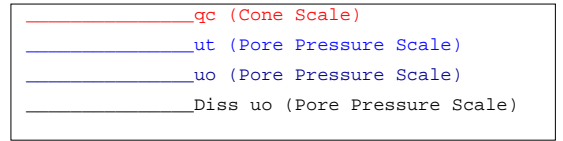
Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long:29°53.282' Lat:031°00.274'

Hole No: CPTU5

Date: 2012-03-08

Probe: GHANA



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

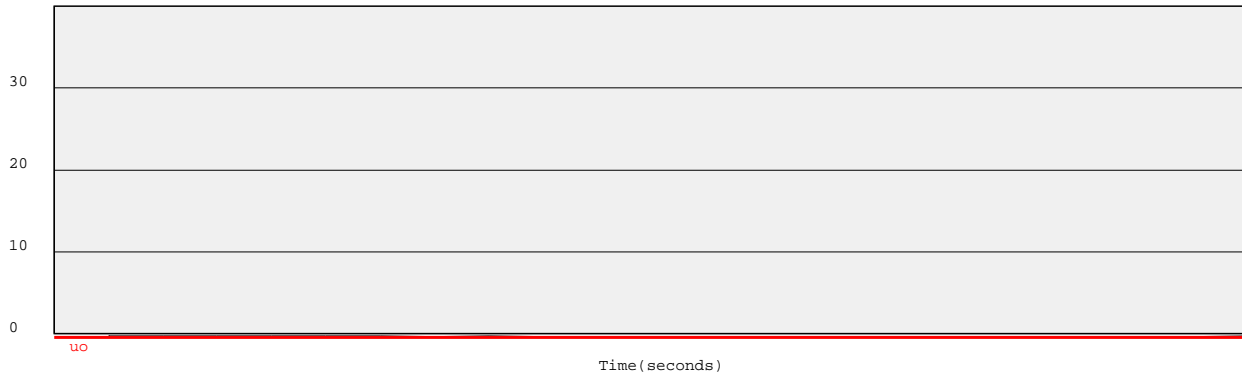
Hole: CPTU5

Date: 2012-03-08

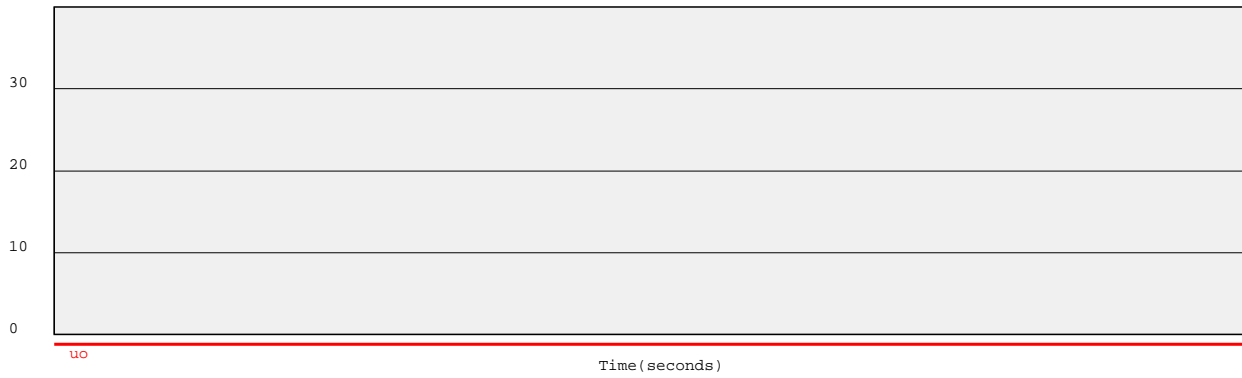
Probe: GHANA

Page: 1

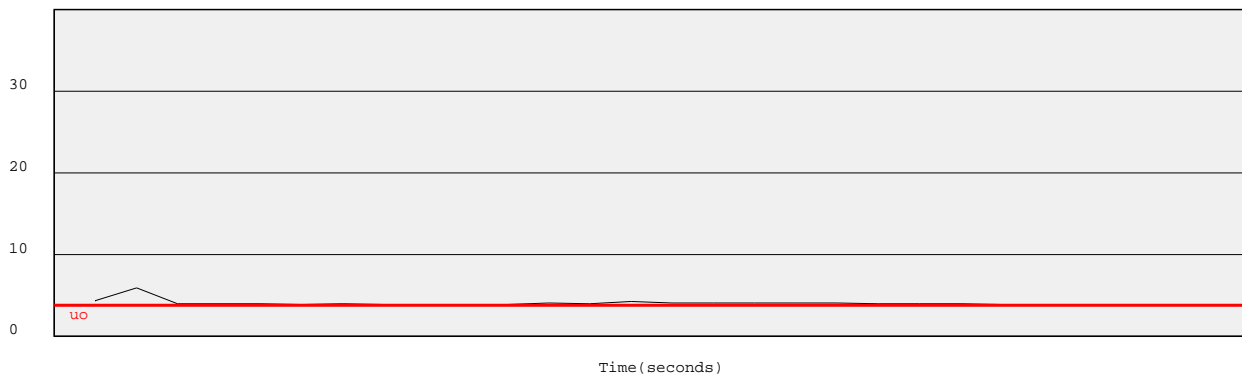
(kPa) Dissipation at: 0.561m



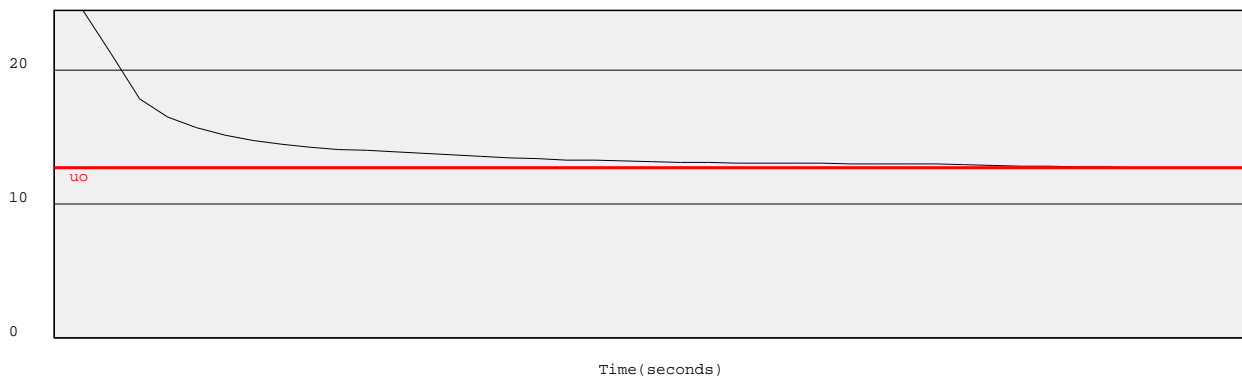
(kPa) Dissipation at: 1.557m



(kPa) Dissipation at: 2.553m



(kPa) Dissipation at: 3.548m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

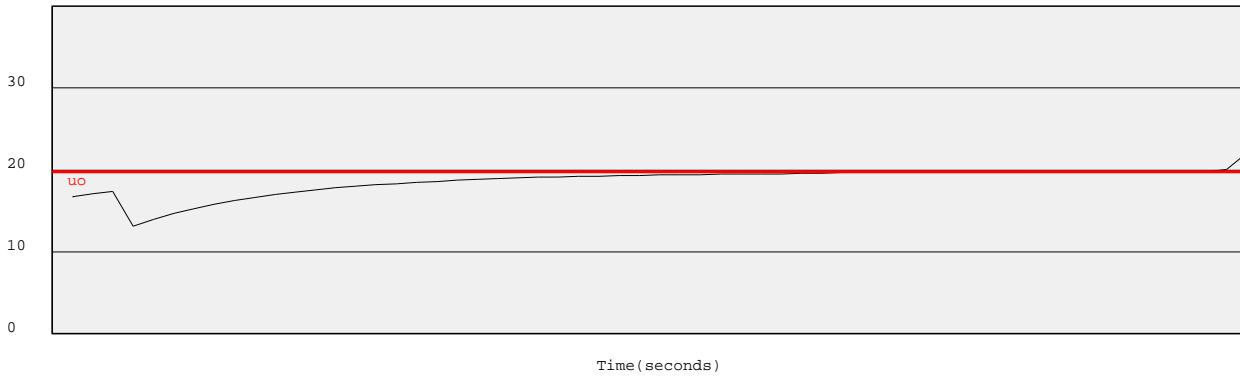
Hole: CPTU5

Date: 2012-03-08

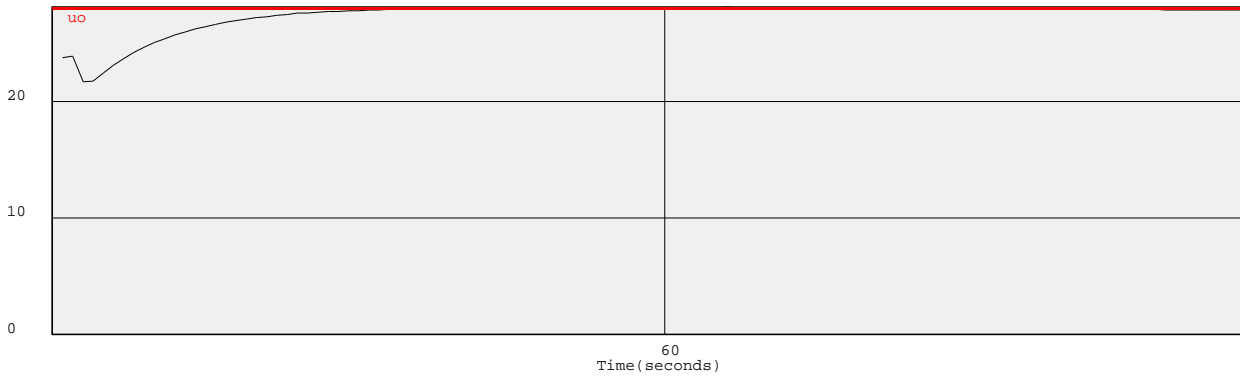
Probe: GHANA

Page: 2

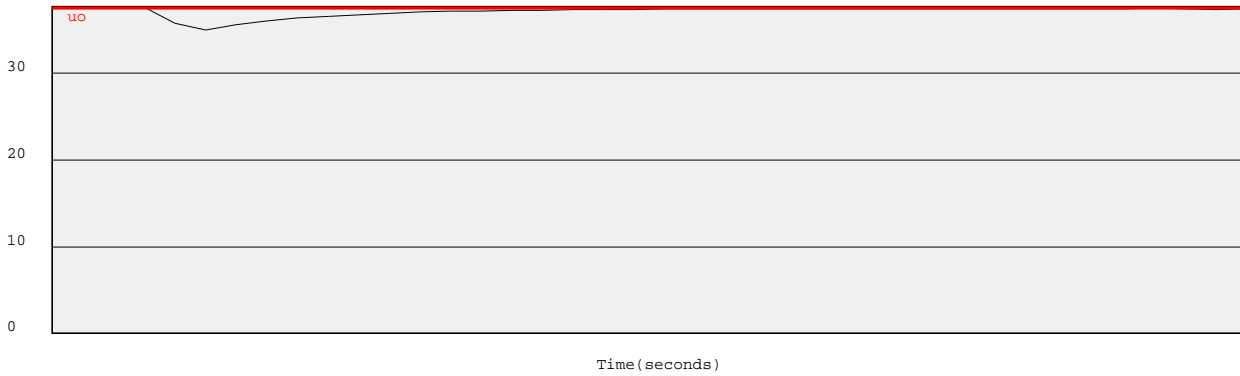
(kPa) Dissipation at: 4.543m



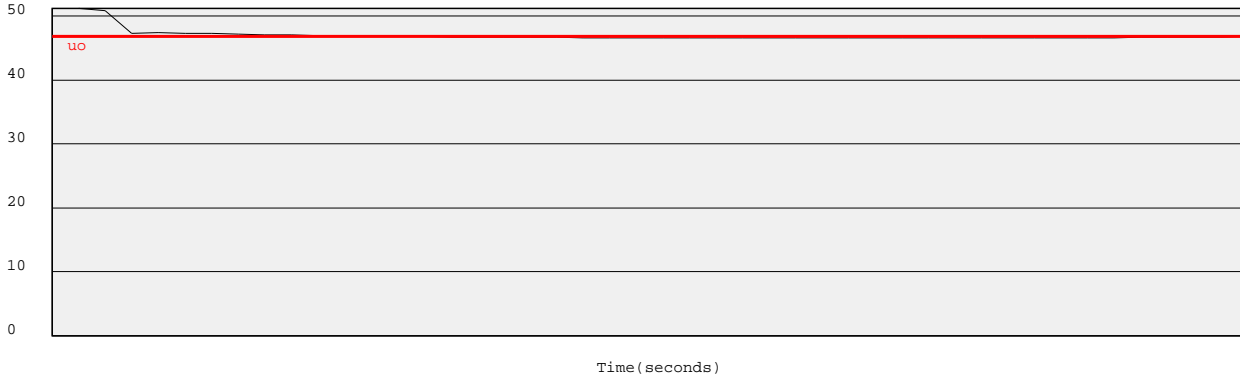
(kPa) Dissipation at: 5.543m



(kPa) Dissipation at: 6.546m



(kPa) Dissipation at: 7.534m



Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

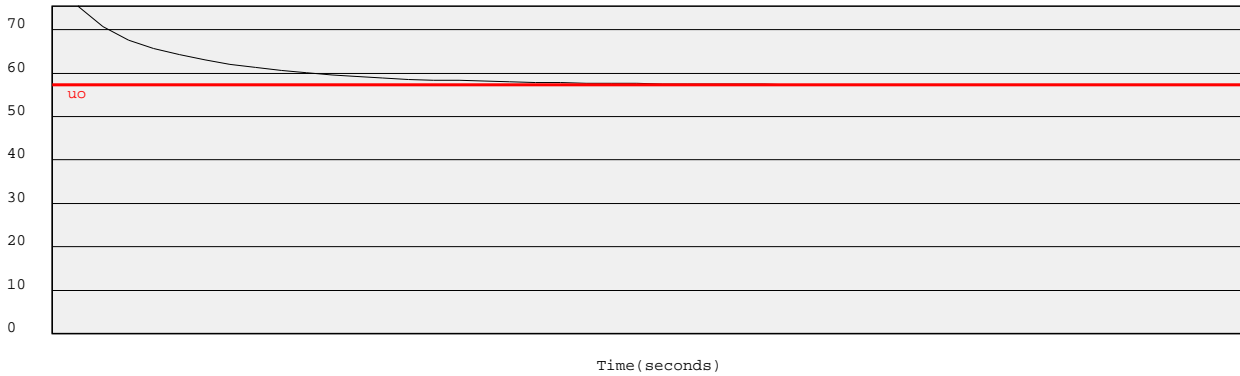
Hole: CPTU5

Date: 2012-03-08

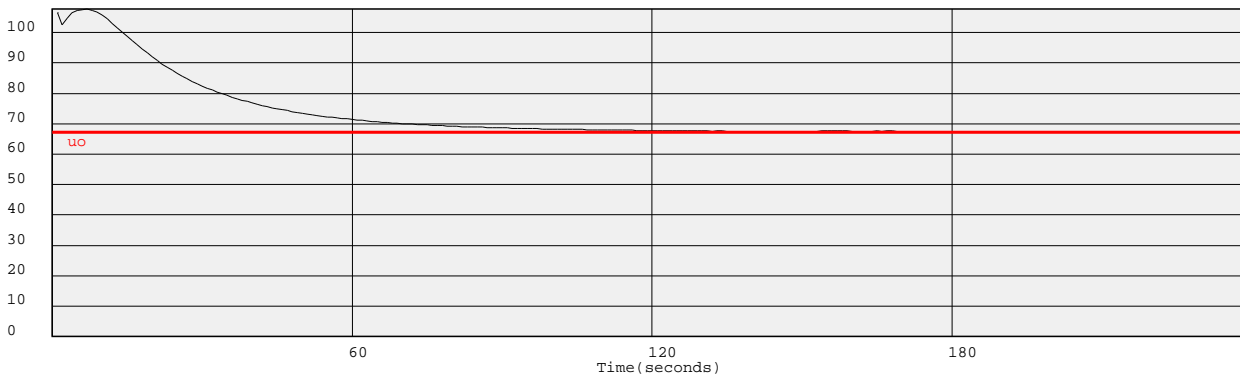
Probe: GHANA

Page: 3

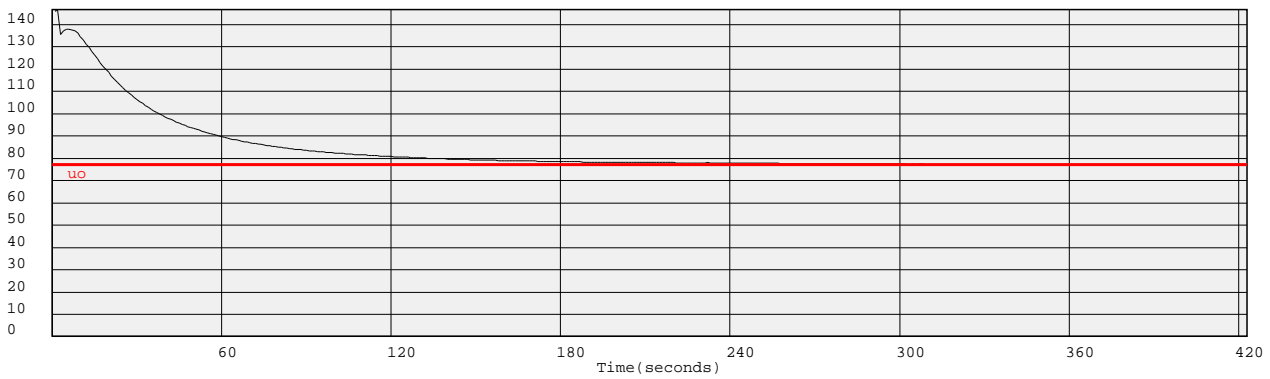
(kPa) Dissipation at: 8.527m



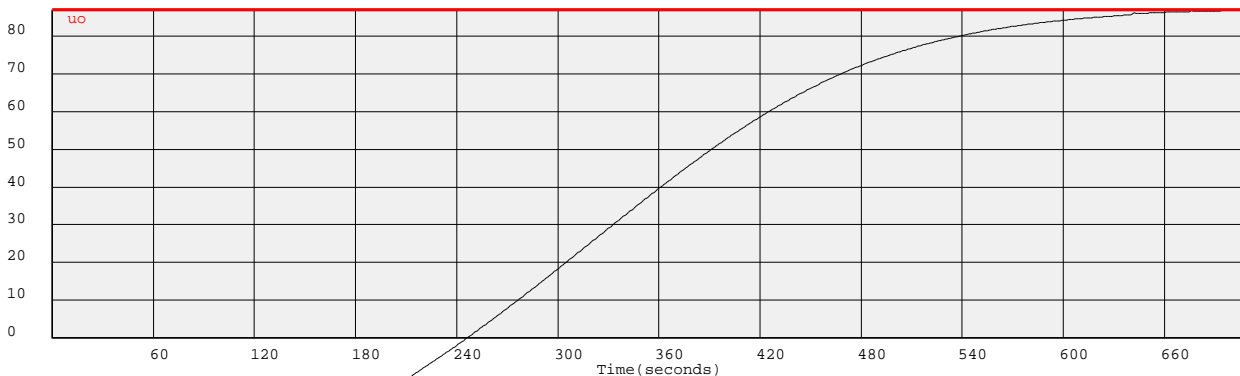
(kPa) Dissipation at: 9.526m



(kPa) Dissipation at: 10.527m



(kPa) Dissipation at: 11.525m





Project: Durban Harbour Land Based CPTu

Site: Lot 10 Long: 29°53.282' Lat: 031°00.274'

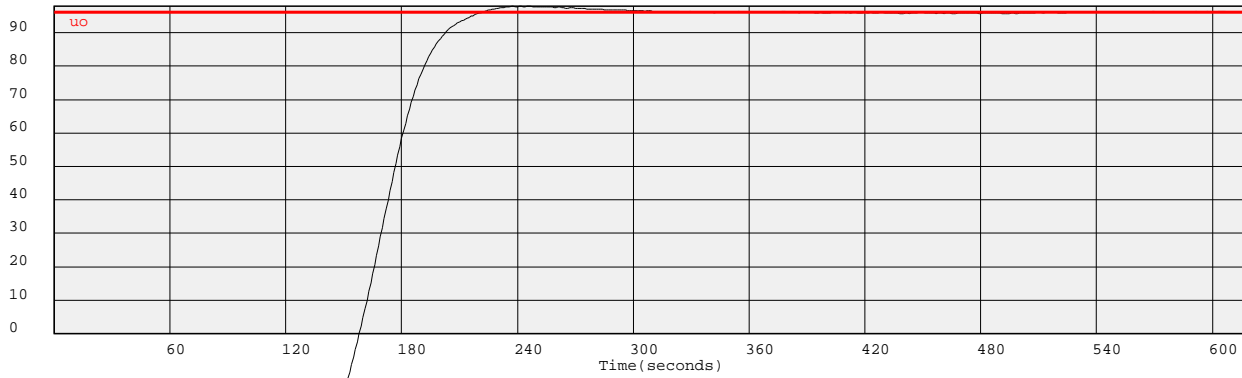
Hole: CPTU5

Date: 2012-03-08

Probe: GHANA

Page: 4

(kPa) Dissipation at: 12.522m



Project: Durban Harbour Land Based CPTu

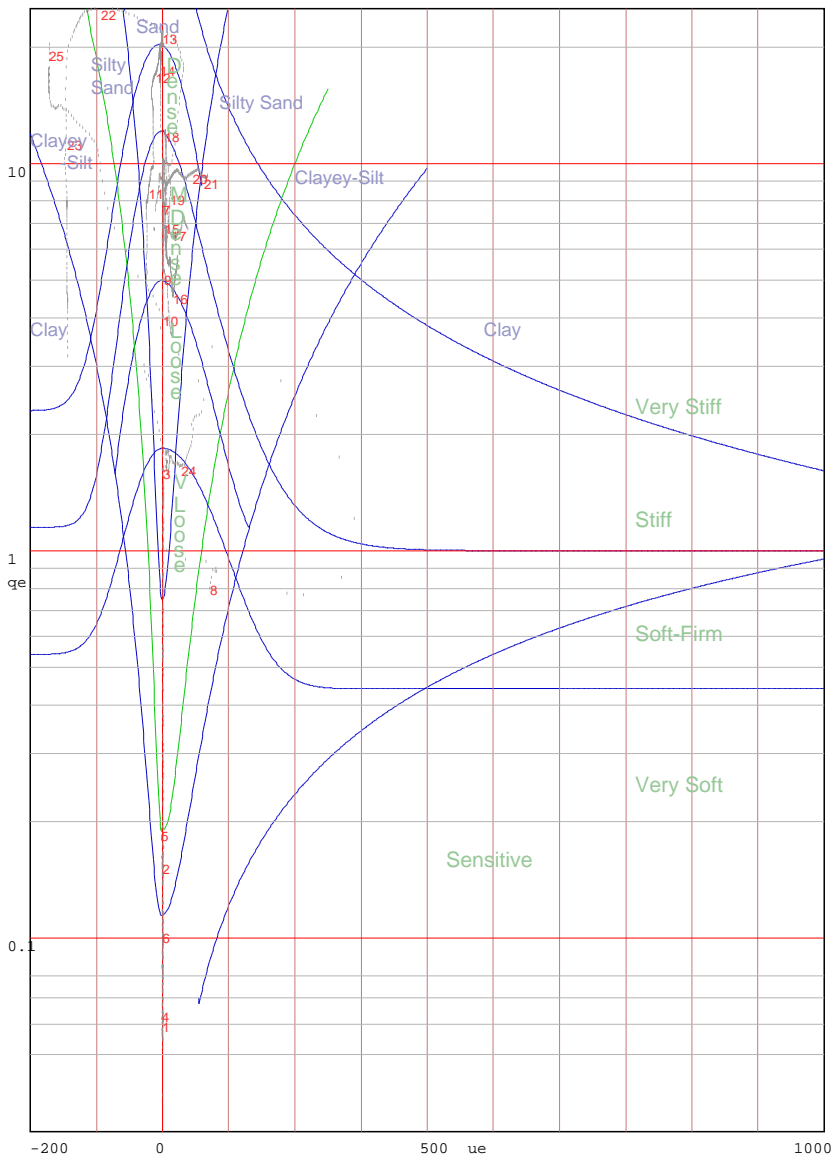
Site: Lot 10 Long:29°53.282' Lat:031°00.274'

Hole No: CPTU5

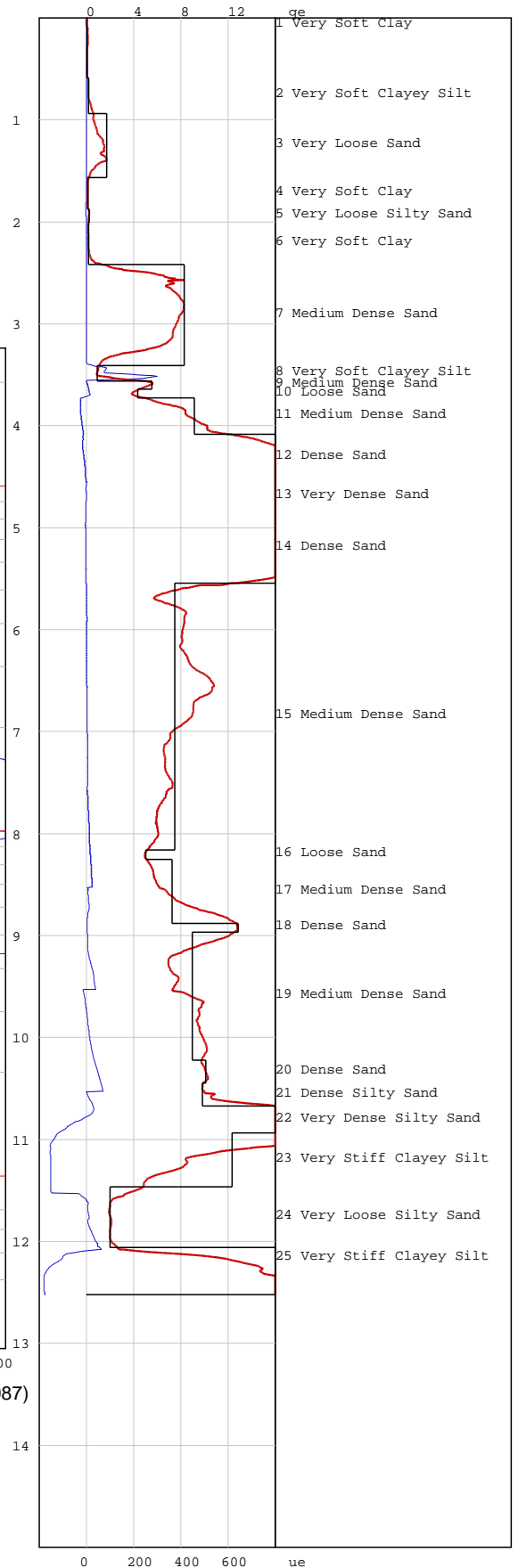
Date: 2012-03-08

Probe: GHANA

—  $q_e$  (MPa) =  $q_t - s_{vo}$   
—  $u_e$  (kPa) =  $u_t - u_o$   
 Layers  
1, 2, 3, ... Layer Number  
~ Position on Soils ID chart



Jones and Rust Soils ID chart modified by Vermeulen and Rust(A.C.Meigh-CIRIA, 1987)





## **ANNEXURE 4: LABORATORY TEST RESULTS**

### **4.1 LABORATORY TEST RESULTS – QUAY WALL**

### **4.2 LABORATORY TEST RESULTS – BASIN DREDGE AREA**



## 4.1: LABORATORY TEST RESULTS – QUAY WALL





|  |  |  |
|--|--|--|
| <b>Sample No.:</b> 1370-BHS03-S01-24.00  |  | <b>sheet:</b> 1/1                      |
| <b>Laboratory:</b> Thekwini Soil Lab. cc |  | <b>X - coordinate:</b> 3306549.66      |
| <b>Analysis:</b> Indicator tests         |  | <b>Y - coordinate:</b> -2230.81        |
| <b>Sample Location:</b> BHS03            |  | <b>Z - sample depth:</b> top bottom    |
| <b>Sample Type:</b> Shelby tube          |  | <b>mCD:</b> -20.940 -21.505            |
| <b>Material:</b> silty CLAY              |  | <b>m below platform:</b> 24.000 24.565 |

# MATERIALS ANALYSIS



**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590219901.  
 88 Ridge Road, Tollgate, DURBAN P.O. Box 30464, MAYVILLE, 4058  
 Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** Durban Harbour, Berth Deepening

**Ref no.:** 6630      **Lab no.:** 08141      **Borehole/Pit no.:** BHS 03      **Fig no.:** -

**Depth:** 24.565

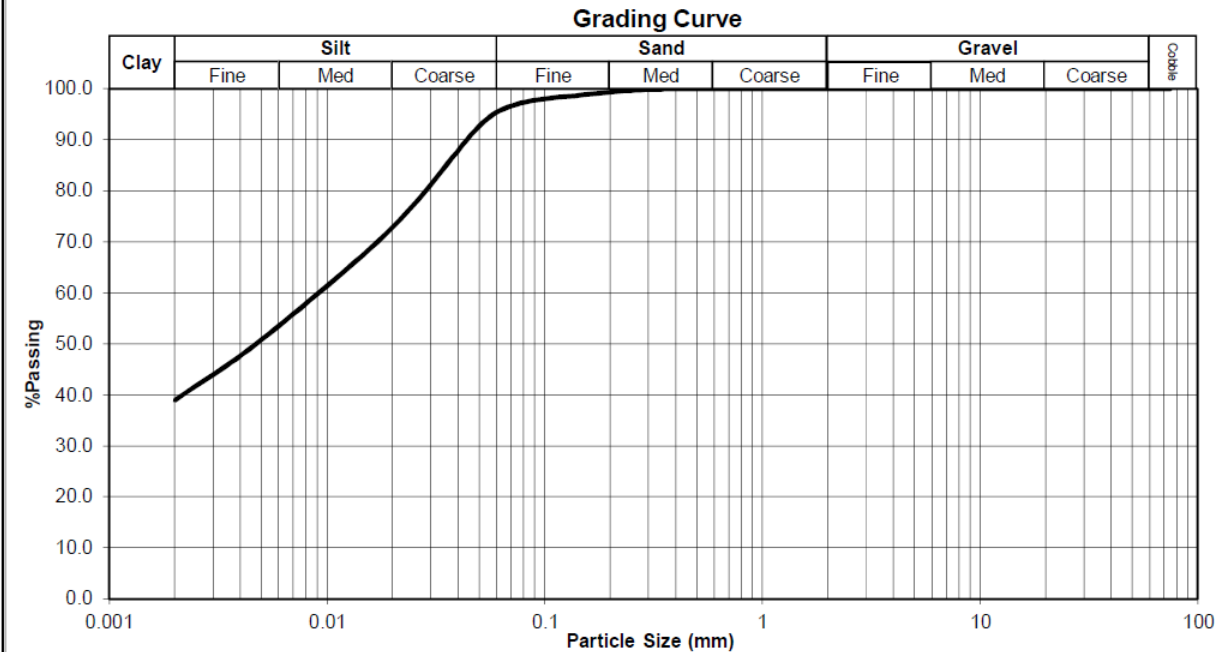
| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 100.0    |
| 0.425            | 100.0    |
| 0.25             | 99.7     |
| 0.15             | 98.8     |
| 0.075            | 97.0     |
| 0.05             | 92.7     |
| 0.02             | 72.8     |
| 0.005            | 50.8     |
| 0.002            | 39.0     |

| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.0  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.0  |
| Sand%                     | 5.6  |
| Coarse                    | 0.0  |
| Medium                    | 0.7  |
| Fine                      | 4.9  |
| Silt%                     | 55.5 |
| Coarse                    | 21.6 |
| Medium                    | 20.5 |
| Fine                      | 13.3 |
| Clay%                     | 39.0 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 35.1 |
| Plasticity Index | 21.1 |
| Linear Shrinkage | 10.7 |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.03   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Medium   |
| Group Index                | 20       |
| AASHTO Soil Classification | A - 6    |
| Unified Classification     | CL or OL |



**Ref no.:** 6630

**Fig no.:** -



Sample No.: 1370-BHS03-S02-26.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS03  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306549.66  
 Y - coordinate: -2230.81  
 Z - sample depth: top bottom  
 mCD: -22.940 -23.505  
 m below platform: 26.000 26.565

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
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 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour, Berth Deepening

Ref no.: 6630 Lab no.: 08142 Borehole/Pit no.: BHS 03 Fig no.: -

Depth: 26.565

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 100.0    |
| 0.425            | 100.0    |
| 0.25             | 99.5     |
| 0.15             | 98.4     |
| 0.075            | 96.2     |
| 0.05             | 92.8     |
| 0.02             | 79.4     |
| 0.005            | 64.9     |
| 0.002            | 53.2     |

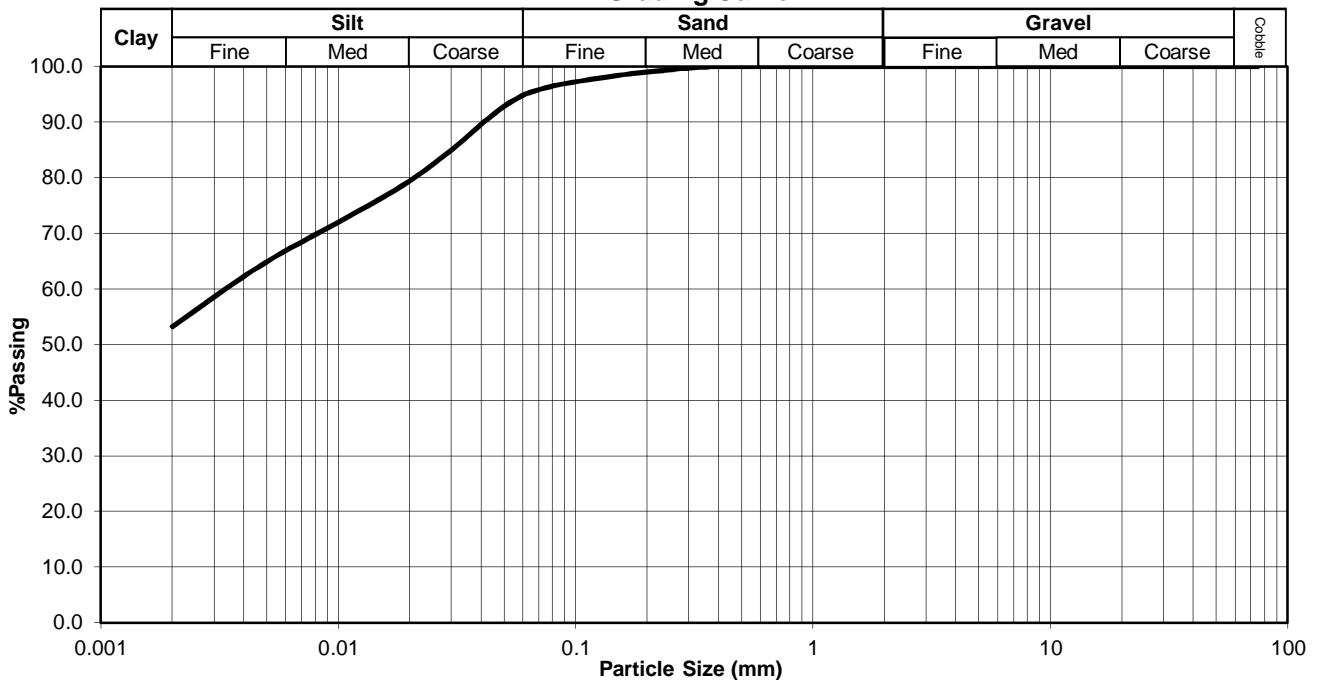
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.0  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.0  |
| Sand%                     | 5.8  |
| Coarse                    | 0.0  |
| Medium                    | 1.1  |
| Fine                      | 4.7  |
| Silt%                     | 40.9 |
| Coarse                    | 14.8 |
| Medium                    | 13.6 |
| Fine                      | 12.6 |
| Clay%                     | 53.2 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 62   |
| Plasticity Index | 26.2 |
| Linear Shrinkage | 13.3 |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.04   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Low       |
| Group Index                | 32        |
| AASHTO Soil Classification | A - 7 - 5 |
| Unified Classification     | MH or OH  |

Grading Curve



Ref no.: 6630

Fig no.: -







Sample No.: 1370-BHS03-S03-28.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS03  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306549.66  
 Y - coordinate: -2230.81  
 Z - sample depth: top bottom  
 mCD: -24.940 -25.505  
 m below platform: 28.000 28.565

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
 Tollgate, DURBAN  
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P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour-Berth Deepening J1370

Ref no.: 6630 Lab no.: 08024 Borehole/Pit no.: BH.5-03 Fig no.: -

Depth: 25m CD

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.8      |
| 0.25             | 98.6      |
| 0.15             | 95.6      |
| 0.075            | 90.7      |
| 0.05             | 88.4      |
| 0.02             | 67.5      |
| 0.005            | 40.8      |
| 0.002            | 29.7      |

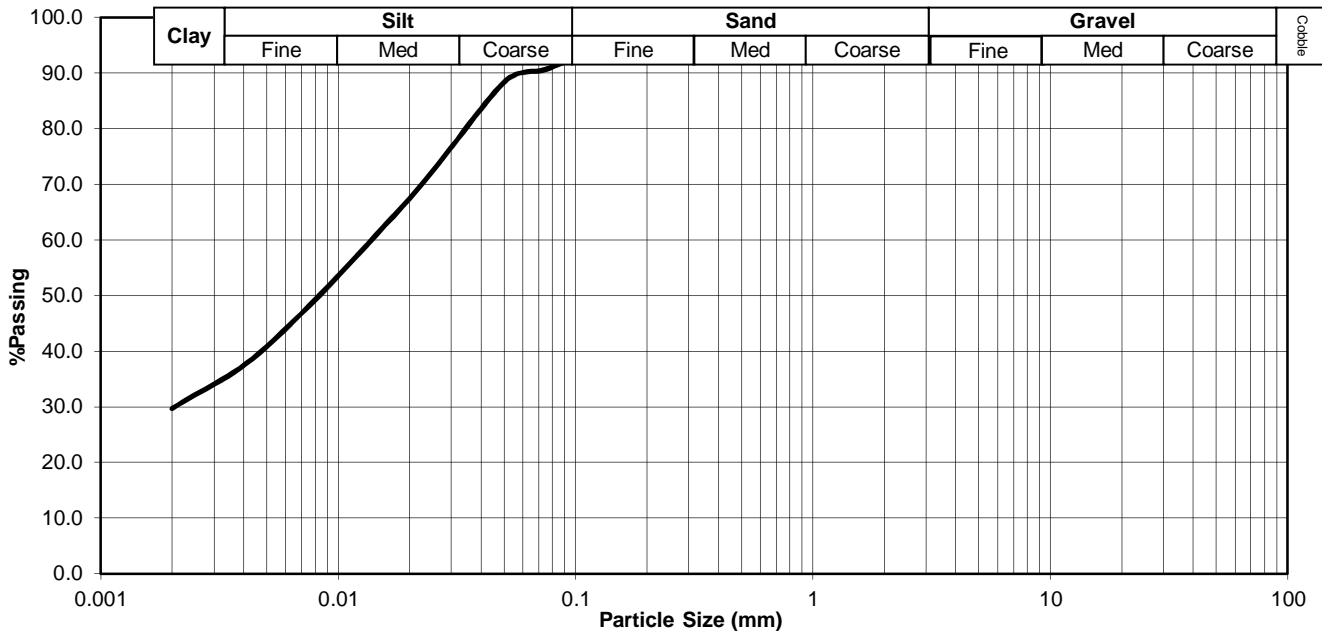
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.0  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.0  |
| Sand%                     | 10.7 |
| Coarse                    | 0.2  |
| Medium                    | 2.7  |
| Fine                      | 7.8  |
| Silt%                     | 59.6 |
| Coarse                    | 21.8 |
| Medium                    | 24.9 |
| Fine                      | 12.9 |
| Clay%                     | 29.7 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 44.7 |
| Plasticity Index | 18.2 |
| Linear Shrinkage | 9.3  |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.10   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Medium    |
| Group Index                | 19        |
| AASHTO Soil Classification | A - 7 - 6 |
| Unified Classification     | CL or OL  |

Grading Curve



Ref no.: 6630

Fig no.: -



Sample No.: 1370-BHS03-S04-30.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS04  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306549.66  
 Y - coordinate: -2230.81  
 Z - sample depth: top bottom  
 mCD: -26.940 -27.505  
 m below platform: 30.000 30.565

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
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 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour-Berth Deepening J1370

Ref no.: 6630 Lab no.: 08025 Borehole/Pit no.: BH.5-03 Fig no.: -

Depth: 27m CD

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.7      |
| 0.25             | 97.5      |
| 0.15             | 89.9      |
| 0.075            | 77.9      |
| 0.05             | 73.1      |
| 0.02             | 52.5      |
| 0.005            | 29.9      |
| 0.002            | 21.7      |

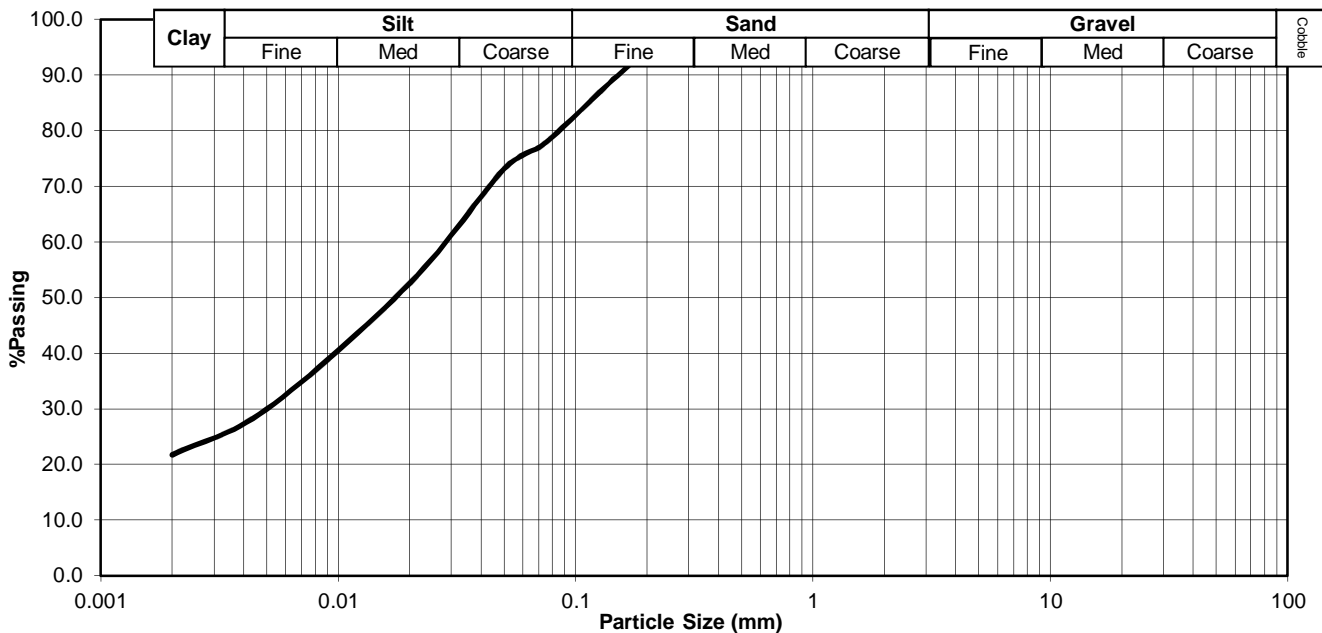
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.0  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.0  |
| Sand%                     | 25.0 |
| Coarse                    | 0.3  |
| Medium                    | 6.0  |
| Fine                      | 18.6 |
| Silt%                     | 53.3 |
| Coarse                    | 22.5 |
| Medium                    | 21.1 |
| Fine                      | 9.7  |
| Clay%                     | 21.7 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 41.2 |
| Plasticity Index | 15.9 |
| Linear Shrinkage | 8    |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.22   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Medium    |
| Group Index                | 13        |
| AASHTO Soil Classification | A - 7 - 6 |
| Unified Classification     | CL or OL  |

Grading Curve



Ref no.: 6630

Fig no.: -



|  |                      |                 |  |
|--|----------------------|-----------------|--|
| <b>Laboratory Test Summary</b>           |                      | sheet: 1/1      |  |
| <b>Laboratory:</b> Thekwini Soil Lab. cc | <b>Sample No.:</b>   | <b>Lab No.:</b> |  |
| <b>Analysis:</b> Indicator tests         | 1370-BHS04-S01-23.00 | 11138           |  |
|  | 1370-BHS05-S01-22.50 | 11139           |  |
|  | 1370-BHS06-S02-25.00 | 11140           |  |
|  | 1370-BHS06-S03-29.50 | 11141           |  |

## Laboratory Test Summary



Job Description: Durban Harbour - O/d ZAA F38  
 Job no.: 6630  
 Date: 14-01-2013

|                               |                               | BHS04-S01      | BHS05-S01      | BHS06-S02      | BHS06-S03     |  |  |  |  |
|-------------------------------|-------------------------------|----------------|----------------|----------------|---------------|--|--|--|--|
| Lab no.                       |                               | 11138          | 11139          | 11140          | 11141         |  |  |  |  |
| Location                      |                               | BH S04 - S01   | BH S05 - S01   | BH S06 - S02   | BH S06 - S03  |  |  |  |  |
| Depth                         |                               | 23.0 - 23.60   | 22.50 - 23.10  | 25.0 - 25.60   | 29.50 - 30.10 |  |  |  |  |
| Description                   |                               | -              | -              | -              | -             |  |  |  |  |
| Binder Material               |                               | -              | -              | -              | -             |  |  |  |  |
| Particle Size (mm)            | 75                            |                |                |                |               |  |  |  |  |
|                               | 53                            |                |                |                |               |  |  |  |  |
|                               | 37.5                          |                |                |                |               |  |  |  |  |
|                               | 26.5                          |                |                |                |               |  |  |  |  |
|                               | 19                            |                |                |                |               |  |  |  |  |
|                               | 13.2                          |                |                |                |               |  |  |  |  |
|                               | 9.5                           | 100            |                |                |               |  |  |  |  |
|                               | 4.75                          | 100            | 100            | 100            |               |  |  |  |  |
|                               | 2                             | 100            | 100            | 99             | 100           |  |  |  |  |
|                               | 0.425                         | 99             | 99             | 95             | 99            |  |  |  |  |
|                               | 0.25                          | 99             | 96             | 93             | 97            |  |  |  |  |
|                               | 0.15                          | 98             | 88             | 90             | 85            |  |  |  |  |
|                               | 0.075                         | 95             | 81             | 87             | 70            |  |  |  |  |
|                               | 0.05                          | 91             | 79             | 85             | 65            |  |  |  |  |
| 0.02                          | 73                            | 67             | 72             | 45             |               |  |  |  |  |
| 0.005                         | 57                            | 56             | 56             | 31             |               |  |  |  |  |
| 0.002                         | 50                            | 51             | 47             | 25             |               |  |  |  |  |
| Soil Mortar                   | Coarse Sand <2.0 >0.425mm     | 0.4            | 0.8            | 4.3            | 0.5           |  |  |  |  |
|                               | Fine Sand <0.425>0.05mm       | 9.0            | 21.3           | 14.1           | 35.1          |  |  |  |  |
|                               | Silt <0.05 >0.005             | 33.3           | 22.6           | 27.9           | 33.9          |  |  |  |  |
|                               | Clay <0.005                   | 57.3           | 55.3           | 53.7           | 30.5          |  |  |  |  |
| Atterberg Limits              | Liquid Limit                  | 55.4           | 49.5           | 48.8           | 34.7          |  |  |  |  |
|                               | Plasticity Index              | 23.8           | 20.5           | 20.2           | 12            |  |  |  |  |
|                               | Linear Shrinkage              | 13.3           | 12             | 10.7           | 4.7           |  |  |  |  |
|                               | Natural MC                    | -              | -              | -              | -             |  |  |  |  |
| Mod AASHTO Density            | Dry Density kg/m <sup>3</sup> |                |                |                |               |  |  |  |  |
|                               | OMC                           |                |                |                |               |  |  |  |  |
| CBR                           | 100%                          |                |                |                |               |  |  |  |  |
|                               | 98%                           |                |                |                |               |  |  |  |  |
|                               | 95%                           |                |                |                |               |  |  |  |  |
|                               | 93% (Inferred)                |                |                |                |               |  |  |  |  |
|                               | 90%                           |                |                |                |               |  |  |  |  |
|                               | CBR Swell                     |                |                |                |               |  |  |  |  |
| AASHTO Soil Classification    |                               | A - 7 - 5 (28) | A - 7 - 6 (18) | A - 7 - 6 (20) | A - 6 (7)     |  |  |  |  |
| Grading Modulus TRH 14 (1985) |                               | 0.06           | 0.21           | 0.19           | 0.31          |  |  |  |  |



Sample No.: 1370-BHS04-S01-23.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS04  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306720.00  
 Y - coordinate: -1466.00  
 Z - sample depth: top bottom  
 mCD: -20.334 -20.984  
 m below platform: 23.000 23.650

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
 Tollgate, DURBAN  
 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour - O/d ZAA F38

Ref no.: 6630 Lab no.: 11138 Borehole/Pit no.: BH S04 - S Fig no.: -

Depth: 23.0 - 23.60

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 99.6      |
| 2                | 99.6      |
| 0.425            | 99.2      |
| 0.25             | 98.8      |
| 0.15             | 98.0      |
| 0.075            | 95.2      |
| 0.05             | 90.9      |
| 0.02             | 72.9      |
| 0.005            | 57.5      |
| 0.002            | 49.9      |

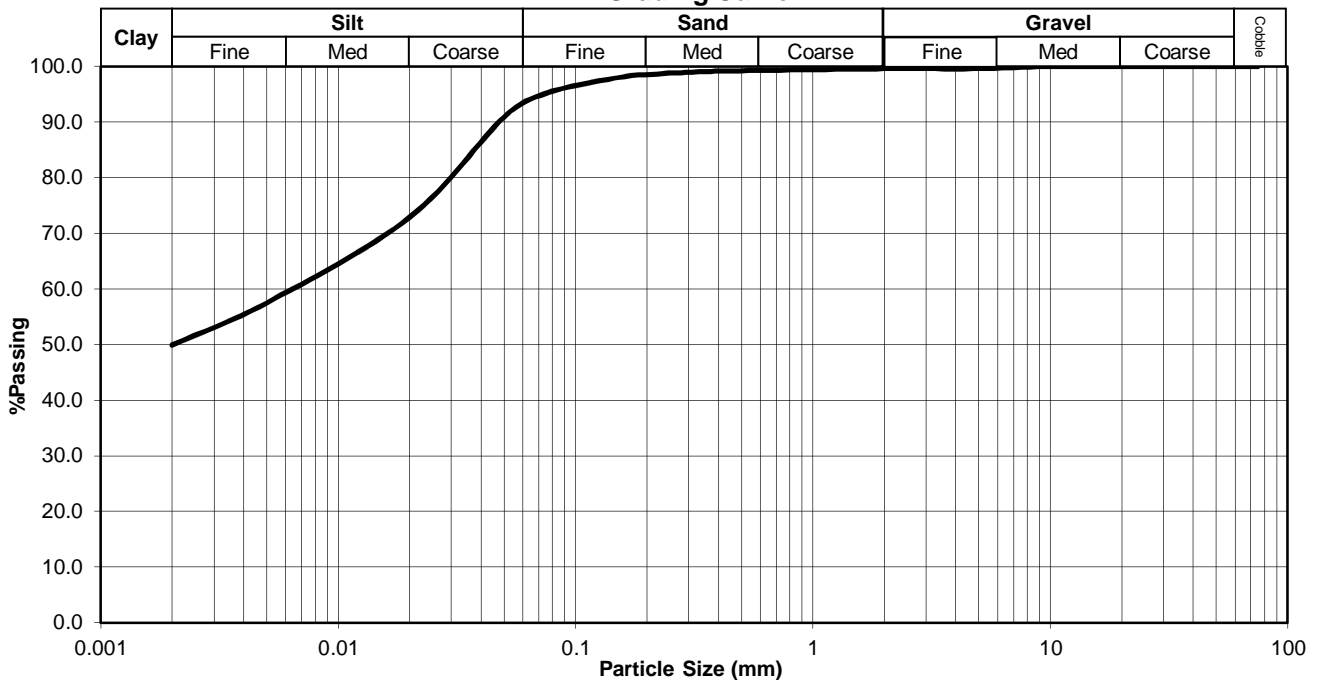
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.4  |
| Coarse                    | 0.0  |
| Medium                    | 0.3  |
| Fine                      | 0.1  |
| Sand%                     | 7.0  |
| Coarse                    | 0.4  |
| Medium                    | 0.9  |
| Fine                      | 5.8  |
| Silt%                     | 42.7 |
| Coarse                    | 19.7 |
| Medium                    | 14.4 |
| Fine                      | 8.6  |
| Clay%                     | 49.9 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 55.4 |
| Plasticity Index | 23.8 |
| Linear Shrinkage | 13.3 |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.06   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Low       |
| Group Index                | 28        |
| AASHTO Soil Classification | A - 7 - 5 |
| Unified Classification     | MH or OH  |

Grading Curve



Ref no.: 6630

Fig no.: -



Sample No.: 1370-BHS05-S01-22.50

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS05  
 Sample Type: Shelby tube  
 Material: medium SAND

X - coordinate: 3306680.00  
 Y - coordinate: -1634.00  
 Z - sample depth: top bottom  
 mCD: -20.000 -20.600  
 m below platform: 22.500 23.100

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
 Tollgate, DURBAN  
 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour - O/d ZAA F38

Ref no.: 6630 Lab no.: 11139 Borehole/Pit no.: BH S05 - S Fig no.: -

Depth: 22.50 - 23.10

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 99.7     |
| 0.425            | 98.9     |
| 0.25             | 96.2     |
| 0.15             | 87.6     |
| 0.075            | 80.8     |
| 0.05             | 78.5     |
| 0.02             | 67.2     |
| 0.005            | 55.7     |
| 0.002            | 50.5     |

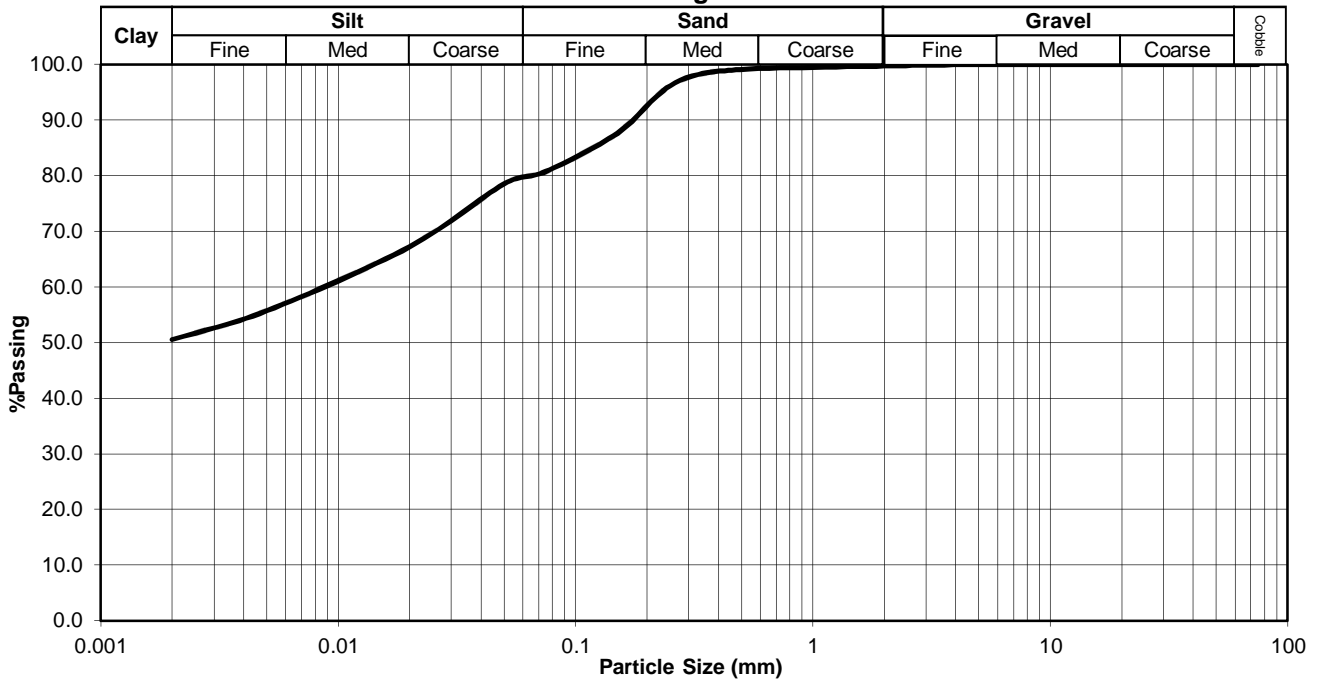
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.3  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.3  |
| Sand%          | 20.3 |
| Coarse         | 0.7  |
| Medium         | 7.1  |
| Fine           | 12.5 |
| Silt%          | 28.9 |
| Coarse         | 12.2 |
| Medium         | 10.7 |
| Fine           | 6.0  |
| Clay%          | 50.5 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 49.5 |
| Plasticity Index | 20.5 |
| Linear Shrinkage | 12   |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.21   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Low       |
| Group Index                | 18        |
| AASHTO Soil Classification | A - 7 - 6 |
| Unified Classification     | ML or OL  |

Grading Curve



Ref no.: 6630

Fig no.: -



Sample No.: 1370-BHS06-S02-25.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS06  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306645.11  
 Y - coordinate: -1778.59  
 Z - sample depth: top bottom  
 mCD: -22.300 -22.900  
 m below platform: 25.000 25.600

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
 Tollgate, DURBAN  
 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour - O/d ZAA F38

Ref no.: 6630 Lab no.: 11140 Borehole/Pit no.: BH S06 - S Fig no.: -

Depth: 25.0 - 25.60

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 99.5      |
| 0.425            | 95.2      |
| 0.25             | 92.6      |
| 0.15             | 89.7      |
| 0.075            | 86.5      |
| 0.05             | 85.3      |
| 0.02             | 71.8      |
| 0.005            | 56.1      |
| 0.002            | 47.1      |

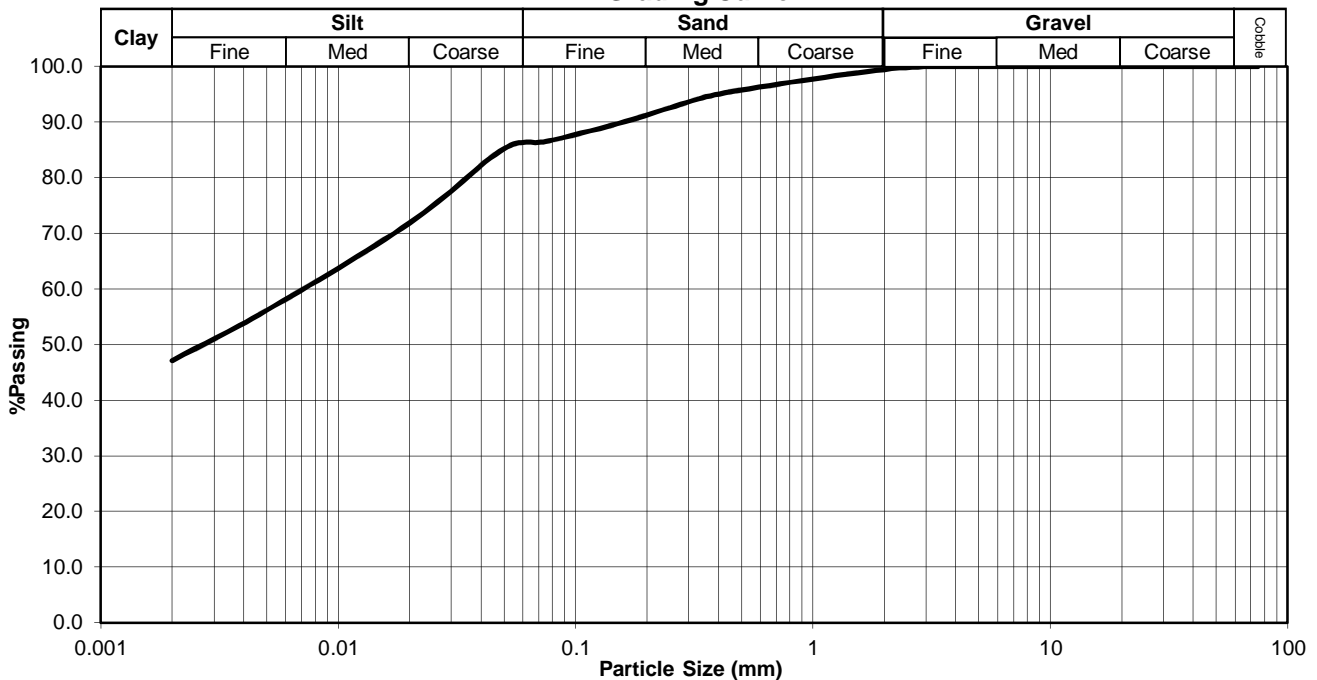
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.5  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.5  |
| Sand%                     | 13.7 |
| Coarse                    | 3.8  |
| Medium                    | 4.6  |
| Fine                      | 5.4  |
| Silt%                     | 38.6 |
| Coarse                    | 13.9 |
| Medium                    | 14.7 |
| Fine                      | 10.1 |
| Clay%                     | 47.1 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 48.8 |
| Plasticity Index | 20.2 |
| Linear Shrinkage | 10.7 |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.19   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Low       |
| Group Index                | 20        |
| AASHTO Soil Classification | A - 7 - 6 |
| Unified Classification     | ML or OL  |

Grading Curve



Ref no.: 6630

Fig no.: -



Sample No.: 1370-BHS06-S03-29.50

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc  
 Analysis: Indicator tests  
 Sample Location: BDS06  
 Sample Type: Shelby tube  
 Material: silty sandy CLAY

X - coordinate: 3306645.11  
 Y - coordinate: -1778.59  
 Z - sample depth: top bottom  
 mCD: -26.800 -27.400  
 m below platform: 29.500 30.100

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
 Tollgate, DURBAN  
 Tel : (031) 201-8992

P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

Project: Durban Harbour - O/d ZAA F38

Ref no.: 6630 Lab no.: 11141 Borehole/Pit no.: BH S06 - S Fig no.: -

Depth: 29.50 - 30.10

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.5      |
| 0.25             | 96.7      |
| 0.15             | 84.5      |
| 0.075            | 69.6      |
| 0.05             | 64.7      |
| 0.02             | 45.4      |
| 0.005            | 30.7      |
| 0.002            | 25.4      |

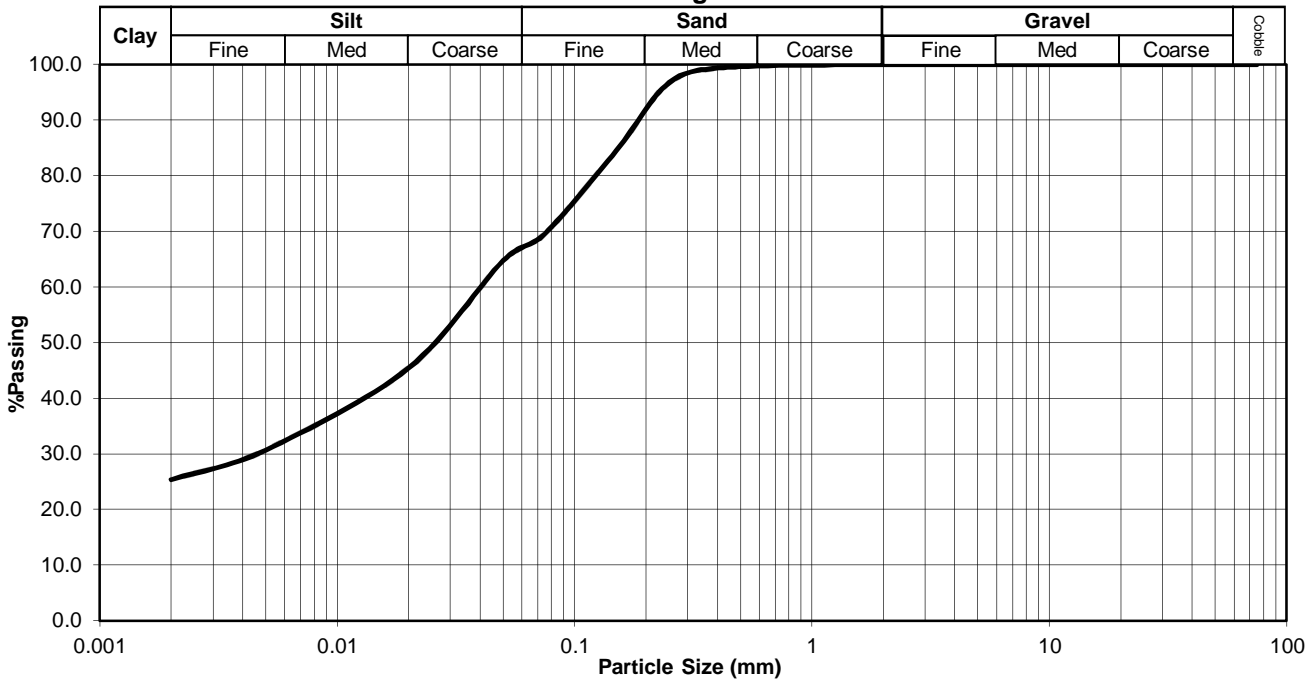
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.0  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.0  |
| Sand%                     | 33.3 |
| Coarse                    | 0.5  |
| Medium                    | 8.9  |
| Fine                      | 24.0 |
| Silt%                     | 41.3 |
| Coarse                    | 21.3 |
| Medium                    | 13.8 |
| Fine                      | 6.3  |
| Clay%                     | 25.4 |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 34.7 |
| Plasticity Index | 12   |
| Linear Shrinkage | 4.7  |

| GRADING                |        |
|------------------------|--------|
| D10 Size (mm)          | <0.002 |
| Uniformity Coefficient | NA     |
| Grading Modulus        | 0.31   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Low      |
| Group Index                | 7        |
| AASHTO Soil Classification | A - 6    |
| Unified Classification     | CL or OL |

Grading Curve



Ref no.: 6630

Fig no.: -



GEOTECHNIESE LABORATORIUM SOMERSET-WES


ATTERBERGGRENSE/LIMITS

DURBAN HARBOUR

| ZAA Engineering Sample No.: | MONSTER/NR<br>SAMPLE/NO | % VLOEIGRENS<br>% LIQUID LIMIT | % Plastisiteitsindeks<br>% Plasticity Index | % Liniere Krimping<br>% Linear Shrinkage | SPECIFIC GRAVITY | MOISTURE CONTENT |
|-----------------------------|-------------------------|--------------------------------|---|--|------------------|------------------|
| BHL01-S01                   | 20,60 m                 | 51,0                           | 19,0  | 12,5                                     | 2,49             | 59,90            |
| BHL01-S02                   | 22,10 m                 | 69,0                           | 28,0  | 15,0                                     | 2,42             | 90,50 ✓          |
| BHL01-S03                   | 26,10 m                 | 66,0                           | 29,0  | 16,0                                     | 2,46             | 72,2 ✓           |
| BHL01-S06                   | 29,70 m                 | 57,0                           | 24,0  | 13,5                                     | 2,75             | 56,7             |
| BHL01-S07                   | 30,80 m                 | 46,0                           | 15,0  | 12,0                                     | 2,55             | 52,6             |
|                             |                         |                                |   |  |                  |                  |
|                             |                         |                                |   |  |                  |                  |
|                             |                         |                                |   |  |                  |                  |
|                             |                         |                                |   |  |                  |                  |
|                             |                         |                                |   |  |                  |                  |

*N.S. This report is submitted subject to the condition that every care is taken to ensure the accuracy of all tests, neither the Geo-technical Laboratory, Somerset West, nor its employees shall be liable in any way whatever for errors made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.*

*N.S. Hierdie verslag word voorgelê met dien verstande dat alhoewel alles moontlik gedoen is om die akkuraatheid van die resultate te verseker, die Geotegniese laboratorium, Somerset-wes, of sy personeel nie aanspreeklik gehou kan word vir enige skade voortspruitend uit die gebruik of interpretasie daarvan nie.*

|   |   |          |                              |
|---|---|----------|------------------------------|
|  | <b>Laboratory Test Summary</b>          |          | sheet: 1/1                   |
|   | Laboratory: Geo-Tech. Lab. / Ben Marais |          | Sample No.: Lab No.:         |
|   | Analysis: Atterberg limits              |          | 1370-BHL01-S03-25.50 26.10 m |
|   | Sample No.:                             | Lab No.: | 1370-BHL01-S06-29.10 29.70 m |
|   | 1370-BHL01-S01-20.00                    | 20.60 m  | 1370-BHL01-S07-30.20 30.80 m |
| 1370-BHL01-S02-21.50  | 22.10 m                                 |          |                              |



**GEO-TEGNIESE LABORATORIUM SOMERSET-WES / GEO-TECHNICAL LABORATORIES, SOMERSET WEST**

SIFGRADERING/SIEVE GRADING

ASTM METODE/METHOD

KORRELGROOTTE VERSPREIDING/GRAIN SIZE DISTRIBUTION


*DURBAN HARBOUR*

| ZAA Engineering Sample No.: | MONSTER/NR<br>SAMPLE/NO | KLEI/<br>CLAY<br>< 0,002 | Sliik/<br>Silt<br>0,002 - 0,05 | Fyn sand/<br>Fine Sand<br>0,05 - 0,15 | Med sand/<br>Med sand<br>0,15 - 0,425 | Groewe sand/<br>Coarse sand<br>0,425 - 4,75 | Gruis/<br>Gravel<br>> 4,75 |
|-----------------------------|-------------------------|--------------------------|--------------------------------|---------------------------------------|---------------------------------------|---|----------------------------|
| BHL01-S01                   | 20,60 m                 | 20                       | 46                             | 30                                    | 4                                     | 0   | 0                          |
| BHL01-S02                   | 22,10 m                 | 20                       | 47                             | 33                                    | 0                                     | 0   | 0                          |
| BHL01-S03                   | 26,10 m                 | 31                       | 48                             | 21                                    | 0                                     | 0   | 0                          |
| BHL01-S06                   | 29,70 m                 | 45                       | 43                             | 12                                    | 0                                     | 0   | 0                          |
| BHL01-S07                   | 30,80 m                 | 31                       | 48                             | 16                                    | 4                                     | 1   | 0                          |
|                             |                         |                          |                                |                                       |                                       |   |                            |
|                             |                         |                          |                                |                                       |                                       |   |                            |
|                             |                         |                          |                                |                                       |                                       |   |                            |
|                             |                         |                          |                                |                                       |                                       |   |                            |

*Hippo Mud.  
all SPT's = 0*

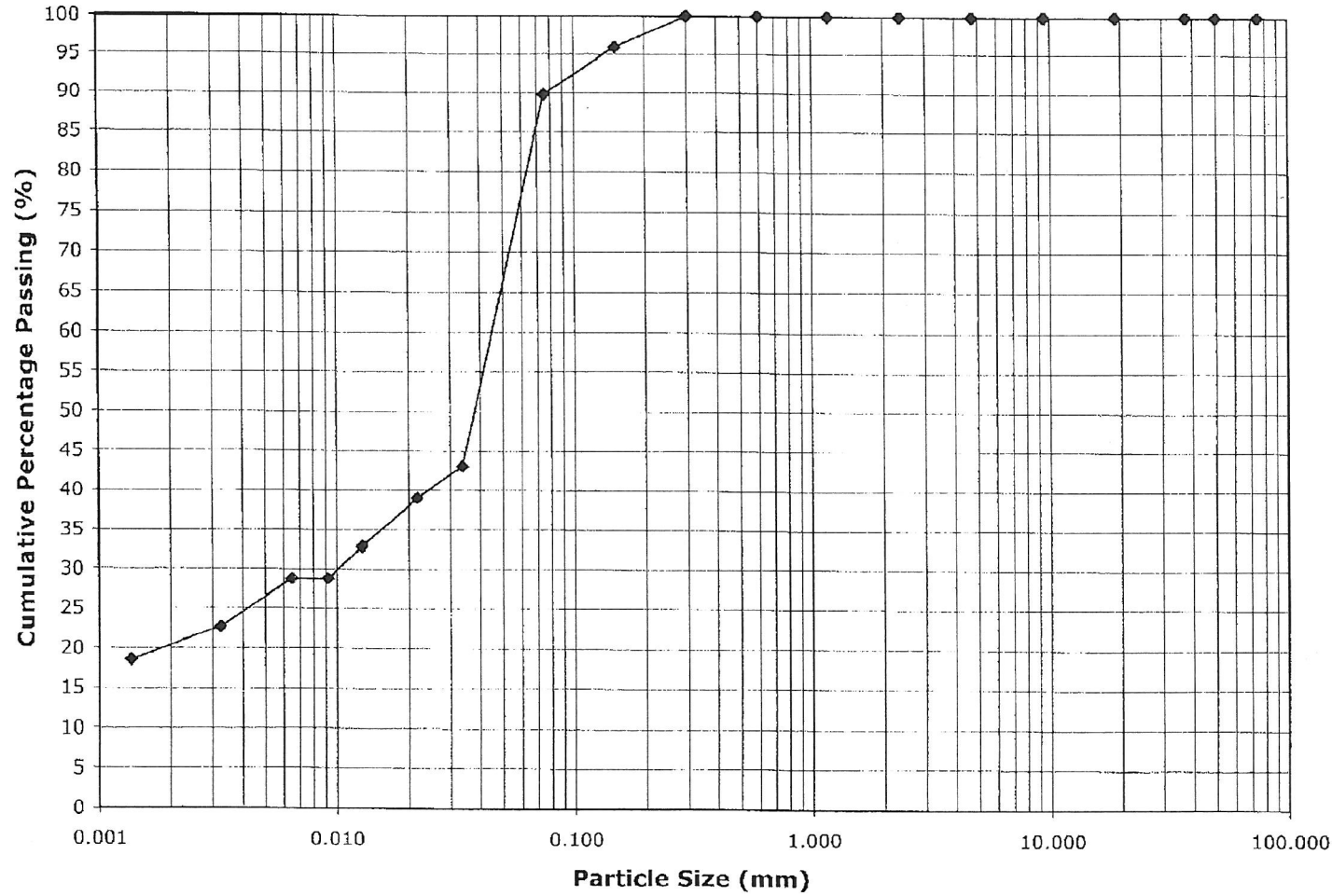
*N.S. Hierdie verslag word voorgelê met dien verstande dat alhoewel alles moontlik gedoen is om die akkuraatheid van die resultate te verseker, die Geotegniese Laboratorium, Somerset-wes, of sy personeel nie aanspreeklik gehou kan word vir enige skade voortspruitend uit die gebruik of interpretasie daarvan nie.*

*N.S. This report is submitted subject to the condition that every care is taken to ensure the accuracy of all tests, neither the Geo-technical Laboratory, Somerset West, nor its employees shall be liable in any way whatever for errors made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.*

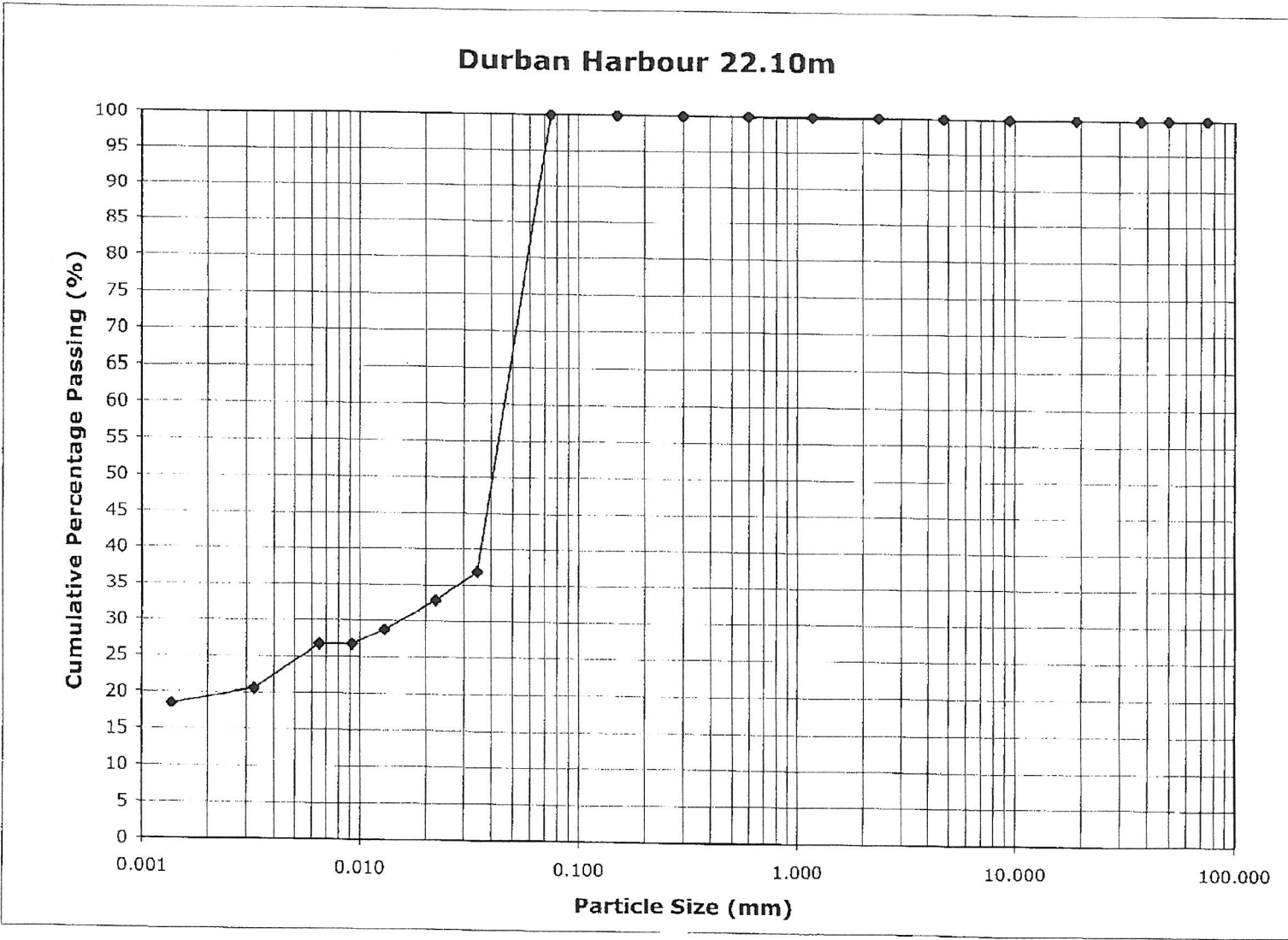
|   |   |          |                      |          |
|---|---|----------|----------------------|----------|
|  | <b>Laboratory Test Summary</b>          |          | sheet: 1/1           |          |
|   | Laboratory: Geo-Tech. Lab. / Ben Marais |          | Sample No.:          | Lab No.: |
|   | Analysis: Sieve grading                 |          | 1370-BHL01-S03-25.50 | 26.10 m  |
|   | Sample No.:                             | Lab No.: | 1370-BHL01-S06-29.10 | 29.70 m  |
|   | 1370-BHL01-S01-20.00                    | 20.60 m  | 1370-BHL01-S07-30.20 | 30.80 m  |
| 1370-BHL01-S02-21.50  | 22.10 m                                 |          |                      |          |

*7*

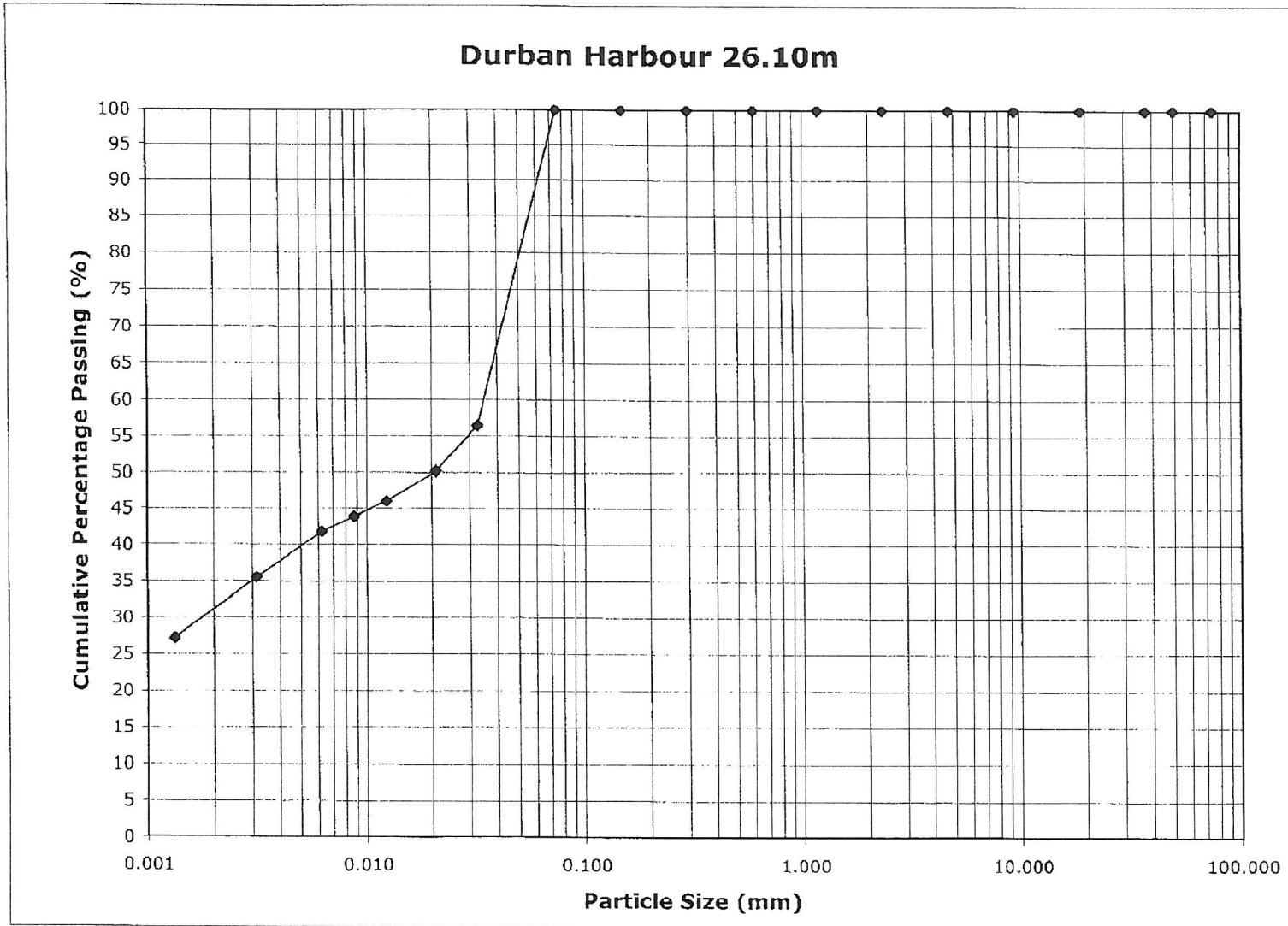
Durban Harbour 20.60m




|   |                                      |
|---|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S01-20.00       | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Geo-Tech Lab. / Ben Marais | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Grading graph                | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01                 | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube               | <b>mCD:</b> -16.280 -16.880          |
| <b>Material:</b> silty CLAY                   | <b>m below ground:</b> 20.000 20.600 |

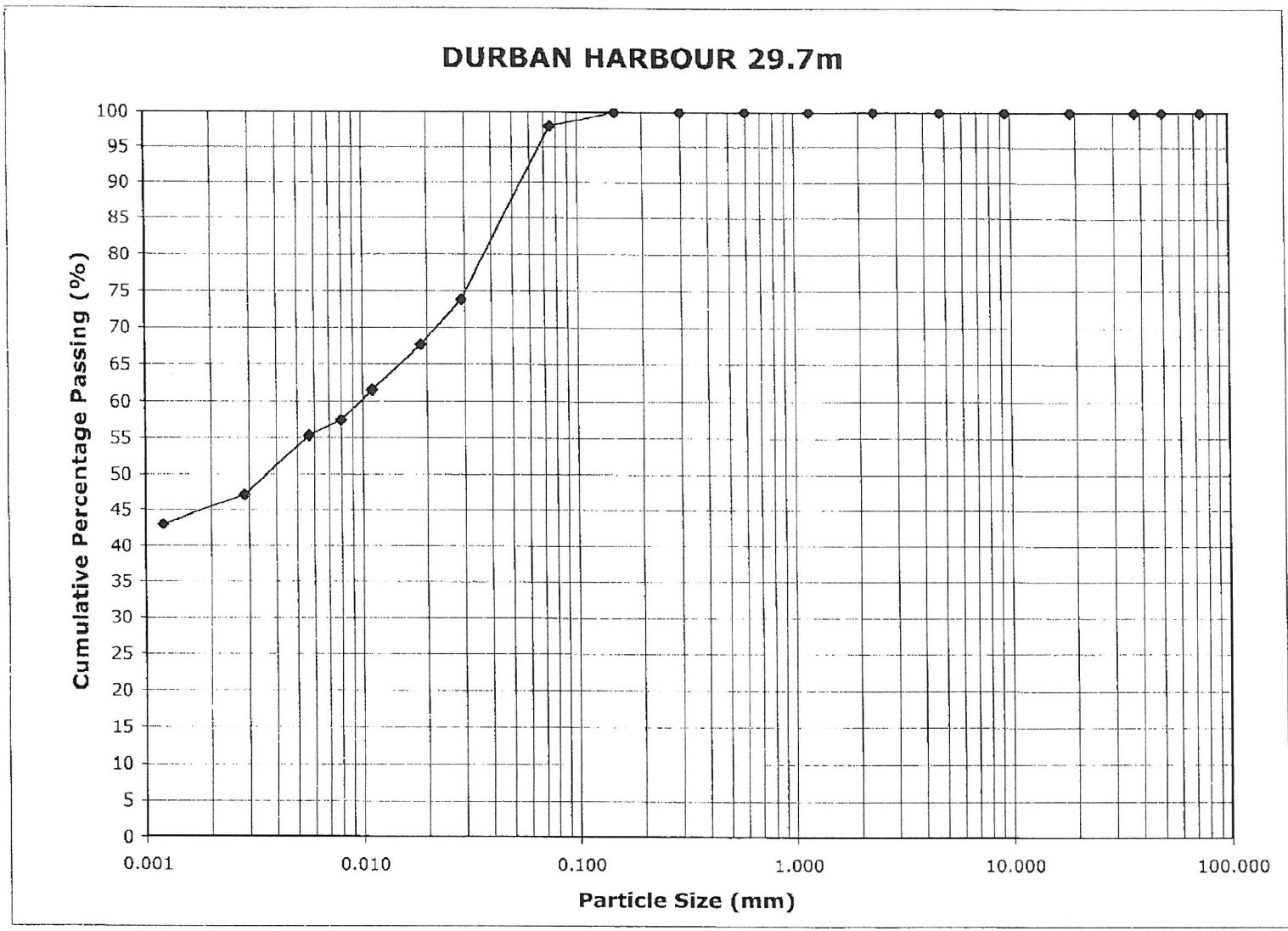


|   |  |   |
|---|--|---|
| <b>Sample No.:</b> 1370-BHL01-S02-21.50       |  | <b>sheet:</b> 1/1                                 |
| <b>Laboratory:</b> Geo-Tech Lab. / Ben Marais |  | <b>X - coordinate:</b> 3306779.02                 |
| <b>Analysis:</b> Grading graph                |  | <b>Y - coordinate:</b> -1177.11                   |
| <b>Sample Location:</b> BHL01                 |  | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
| <b>Sample Type:</b> Shelby tube               |  | <b>mCD:</b> -17.780 -18.380                       |
| <b>Material:</b> silty CLAY                   |  | <b>m below ground:</b> 21.500 22.100              |

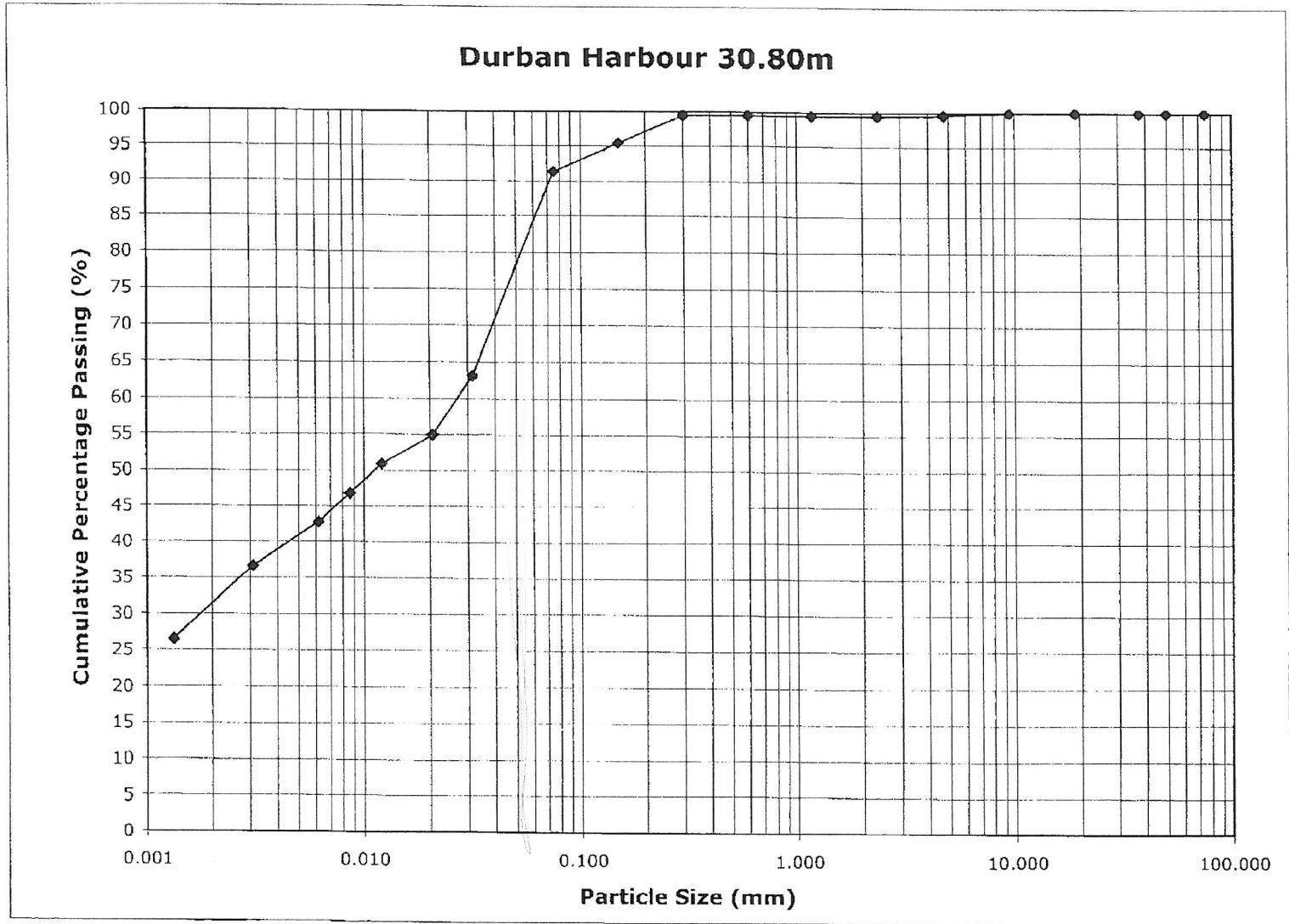


|   |   |   |
|---|---|---|
|  | <b>Sample No.:</b> 1370-BHL01-S03-25.50       | <b>sheet:</b> 1/1                                 |
|   | <b>Laboratory:</b> Geo-Tech Lab. / Ben Marais | <b>X - coordinate:</b> 3306779.02                 |
|   | <b>Analysis:</b> Grading graph                | <b>Y - coordinate:</b> -1177.11                   |
|   | <b>Sample Location:</b> BHL01                 | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
|   | <b>Sample Type:</b> Shelby tube               | <b>mCD:</b> -21.780 -22.380                       |
| <b>Material:</b> silty CLAY   | <b>m below ground:</b> 25.500 26.100          |   |





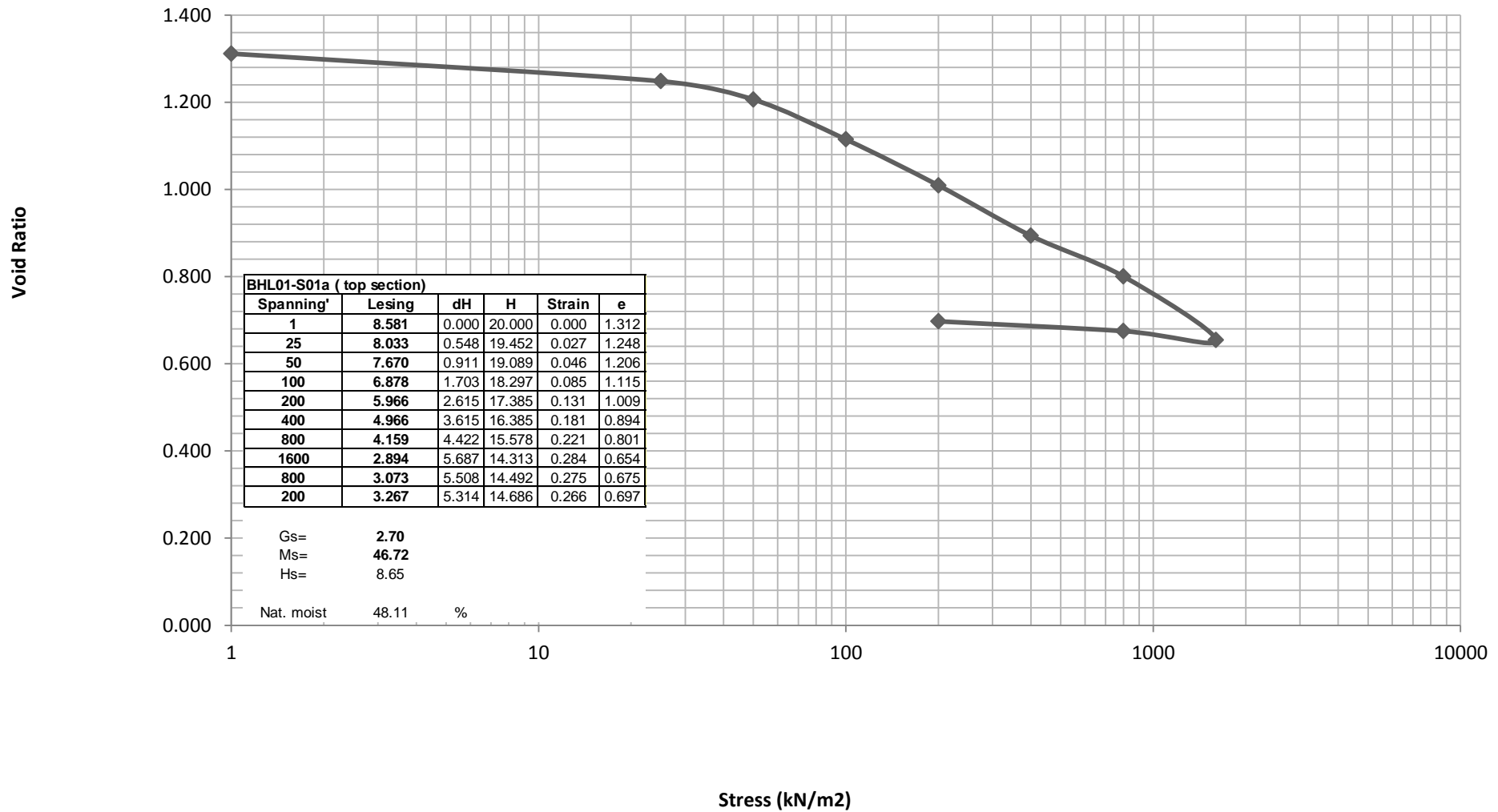
|   |  |                                      |
|---|--|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S06-29.10       |  | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Geo-Tech Lab. / Ben Marais |  | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Grading graph                |  | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01                 |  | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube               |  | <b>mCD:</b> -25.380 -25.980          |
| <b>Material:</b> silty CLAY                   |  | <b>m below ground:</b> 29.100 29.700 |



|                                   |   |   |
|-----------------------------------|---|---|
|                                   | <b>Sample No.:</b> 1370-BHL01-S07-30.20       | <b>sheet:</b> 1/1                                 |
|                                   | <b>Laboratory:</b> Geo-Tech Lab. / Ben Marais | <b>X - coordinate:</b> 3306779.02                 |
|                                   | <b>Analysis:</b> Grading graph                | <b>Y - coordinate:</b> -1177.11                   |
|                                   | <b>Sample Location:</b> BHL01                 | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
|                                   | <b>Sample Type:</b> Shelby tube               | <b>mCD:</b> -26.480 -27.080                       |
| <b>Material:</b> sandy silty CLAY | <b>m below ground:</b> 30.200 30.800          |   |



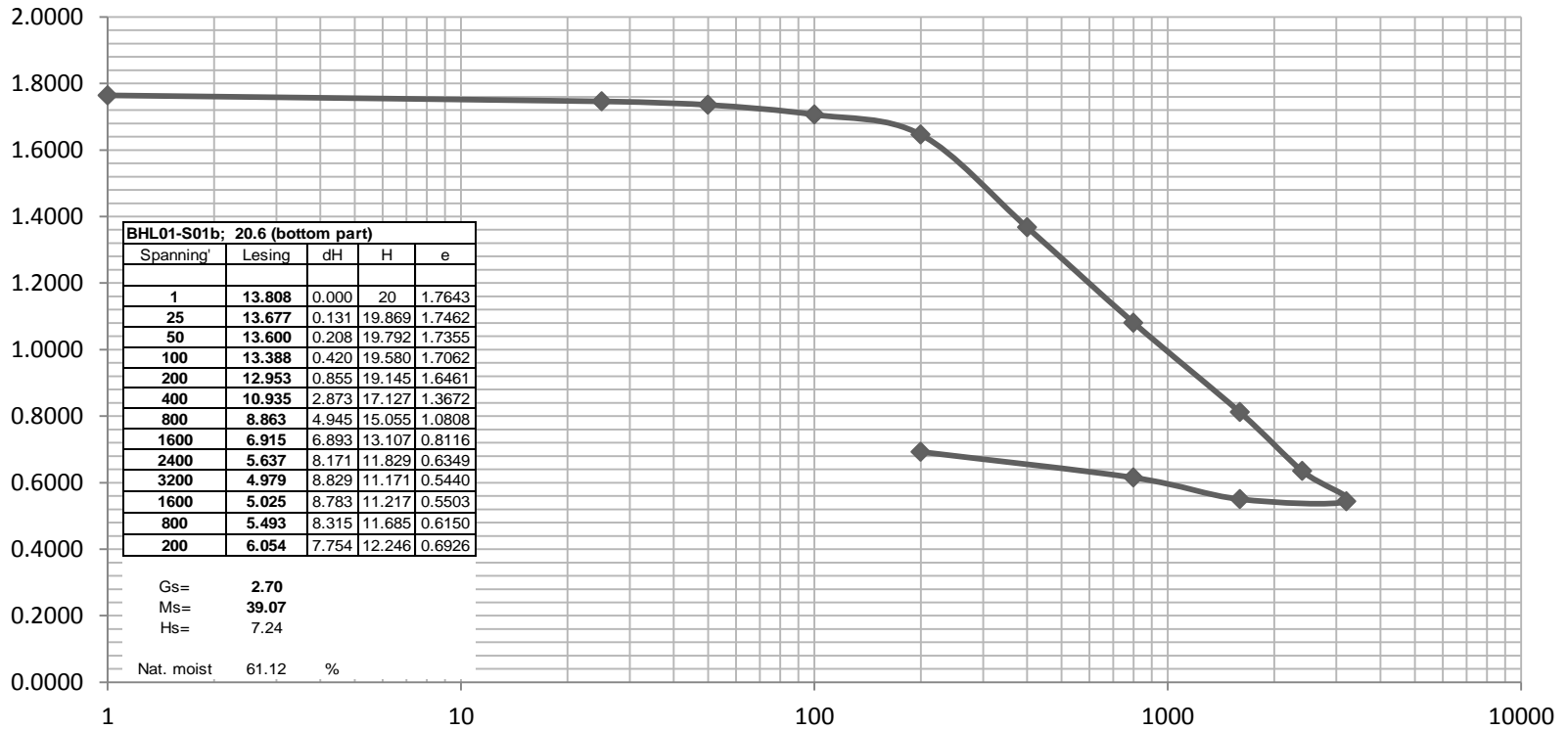
|  |                                      |
|--|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S01-20.00a   | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Stellenbosch University | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Oedometer test            | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01              | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube            | <b>mCD:</b> -16.280 -16.880          |
| <b>Material:</b> silty CLAY                | <b>m below ground:</b> 20.000 20.600 |





|  |                                      |                   |
|--|--------------------------------------|-------------------|
| <b>Sample No.:</b> 1370-BHL01-S01-20.00b   |                                      | <b>sheet:</b> 1/1 |
| <b>Laboratory:</b> Stellenbosch University | <b>X - coordinate:</b> 3306779.02    |                   |
| <b>Analysis:</b> Oedometer test            | <b>Y - coordinate:</b> -1177.11      |                   |
| <b>Sample Location:</b> BHL01              | <b>Z - sample depth:</b> top bottom  |                   |
| <b>Sample Type:</b> Shelby tube            | <b>mCD:</b> -16.280 -16.880          |                   |
| <b>Material:</b> silty CLAY                | <b>m below ground:</b> 20.000 20.600 |                   |

Void Ratio

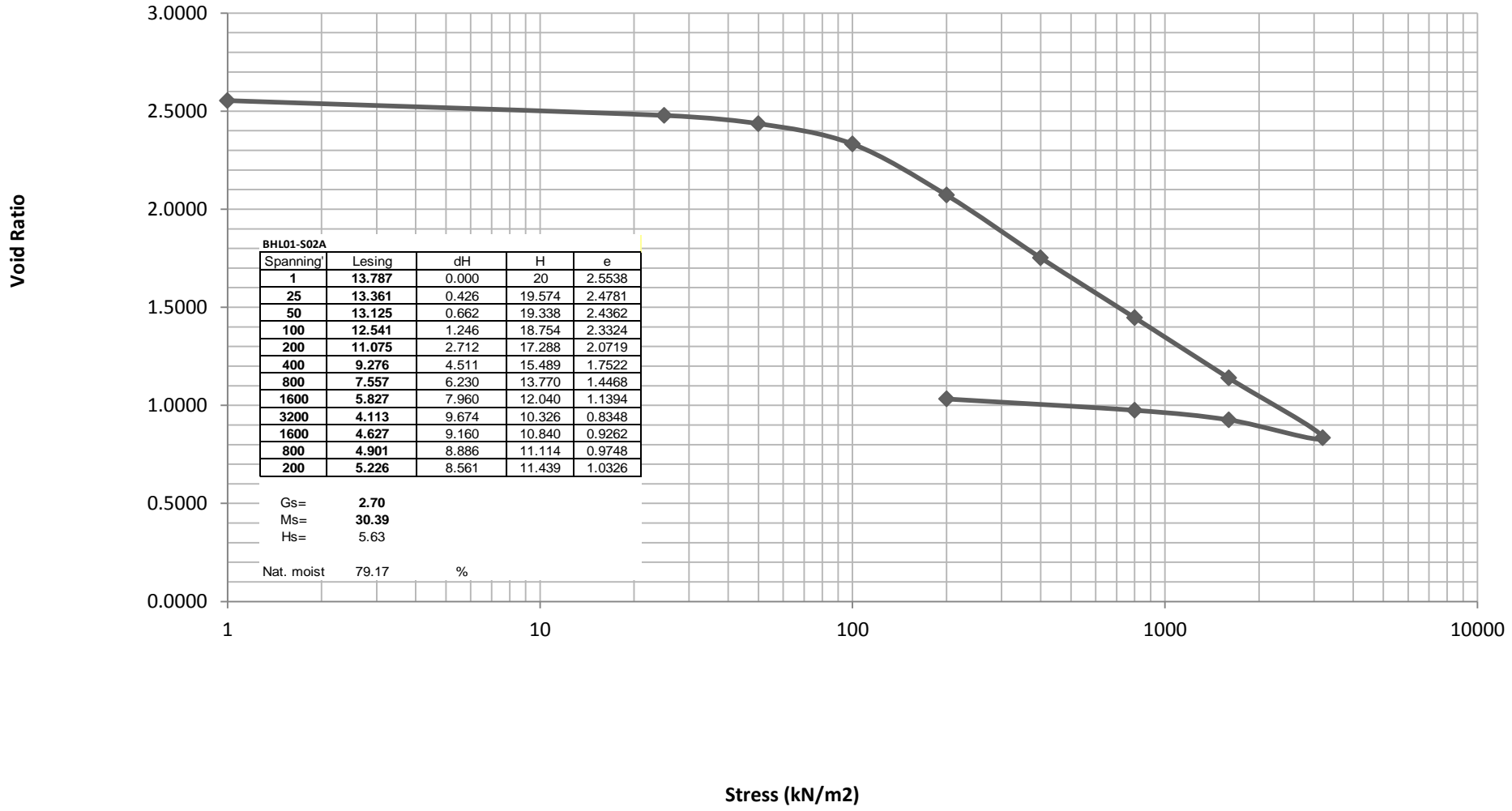


Stress (kN/m<sup>2</sup>)





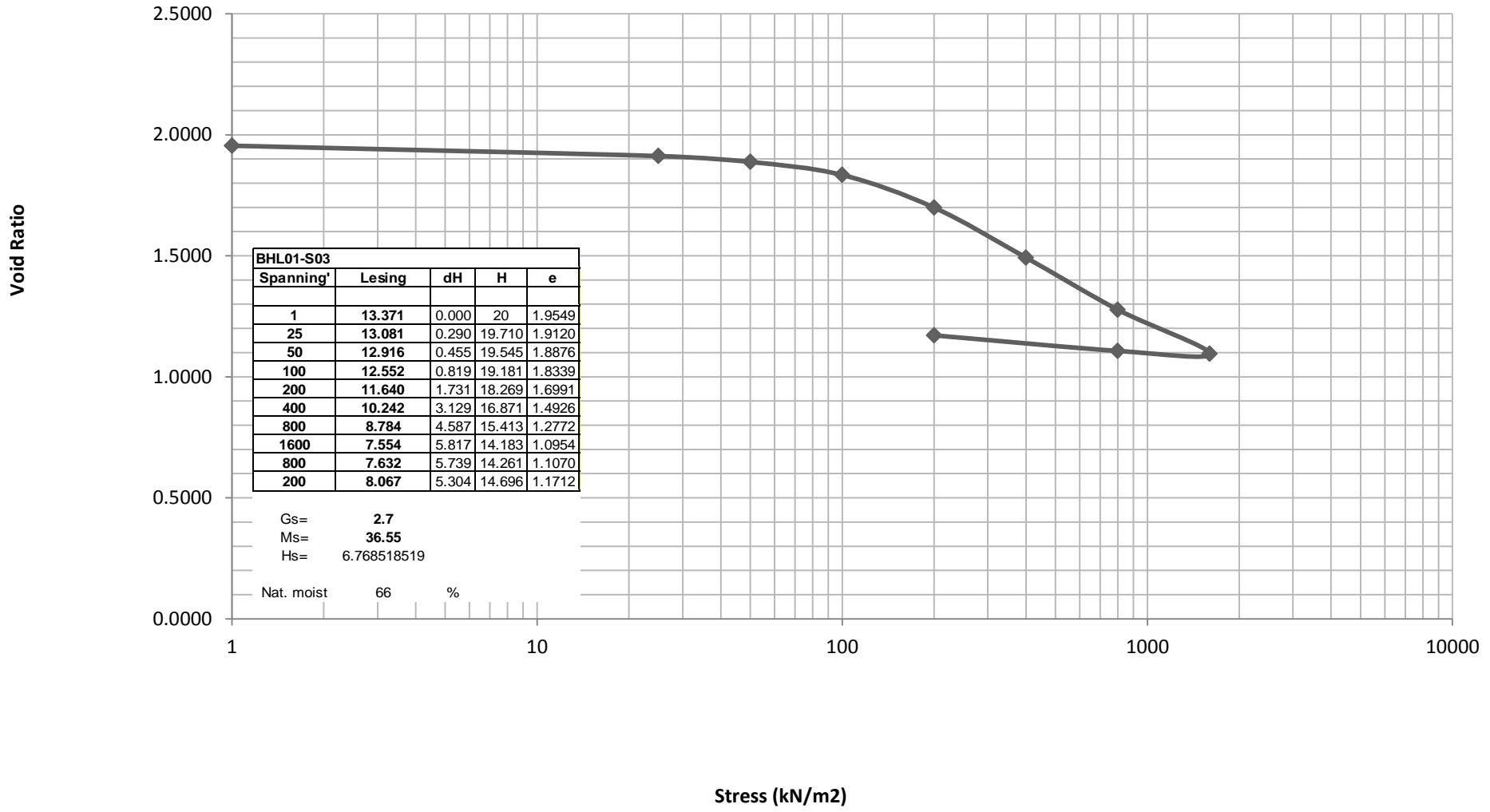
|  |  |                                      |
|--|--|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S02-21.50a   |  | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Stellenbosch University |  | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Oedometer test            |  | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01              |  | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube            |  | <b>mCD:</b> -17.780 -18.380          |
| <b>Material:</b> silty CLAY                |  | <b>m below ground:</b> 21.500 22.100 |





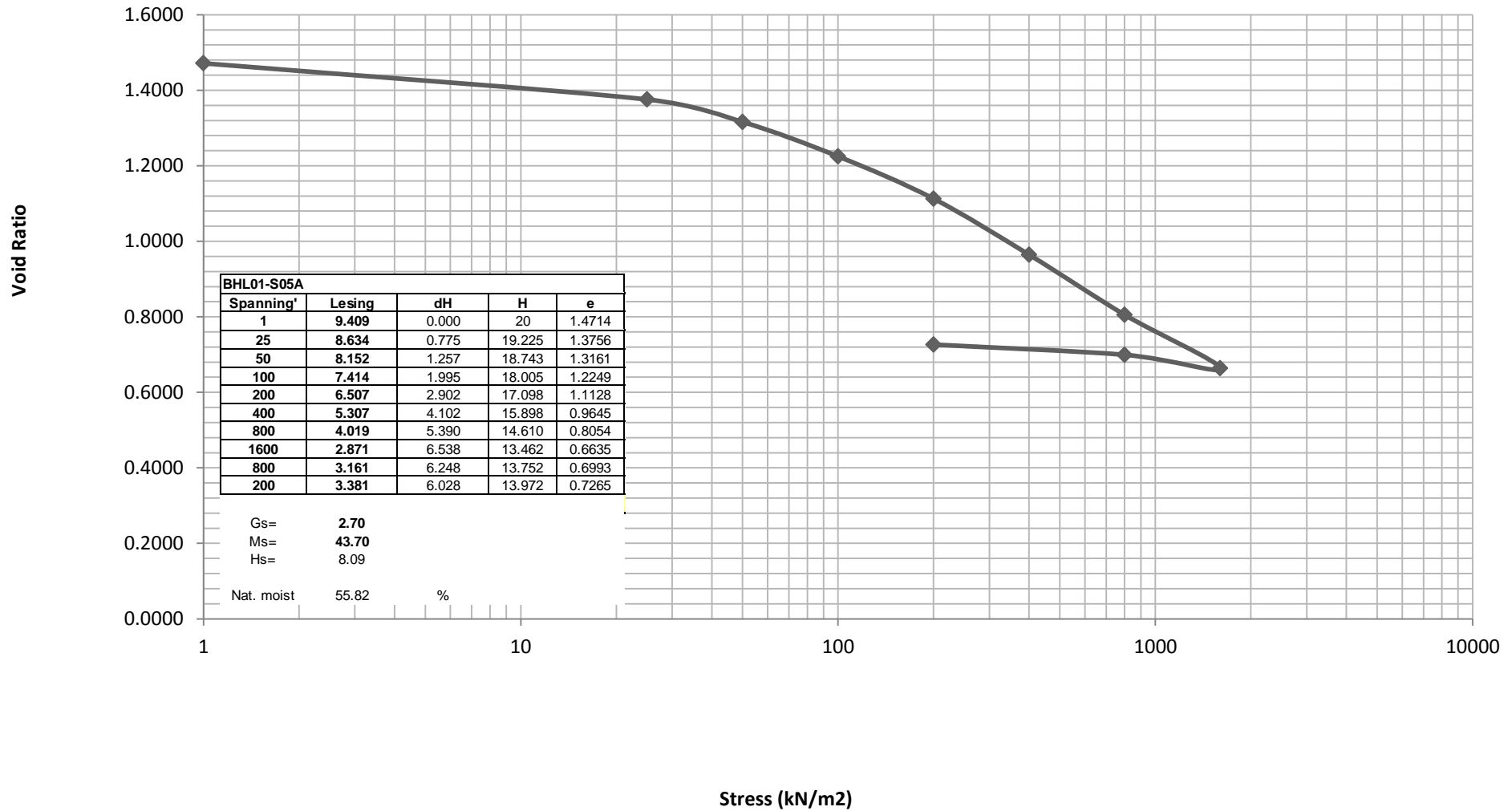


|  |  |                                      |
|--|--|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S03-25.50a   |  | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Stellenbosch University |  | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Oedometer test            |  | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01              |  | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube            |  | <b>mCD:</b> -21.780 -22.380          |
| <b>Material:</b> silty CLAY                |  | <b>m below ground:</b> 25.500 26.100 |



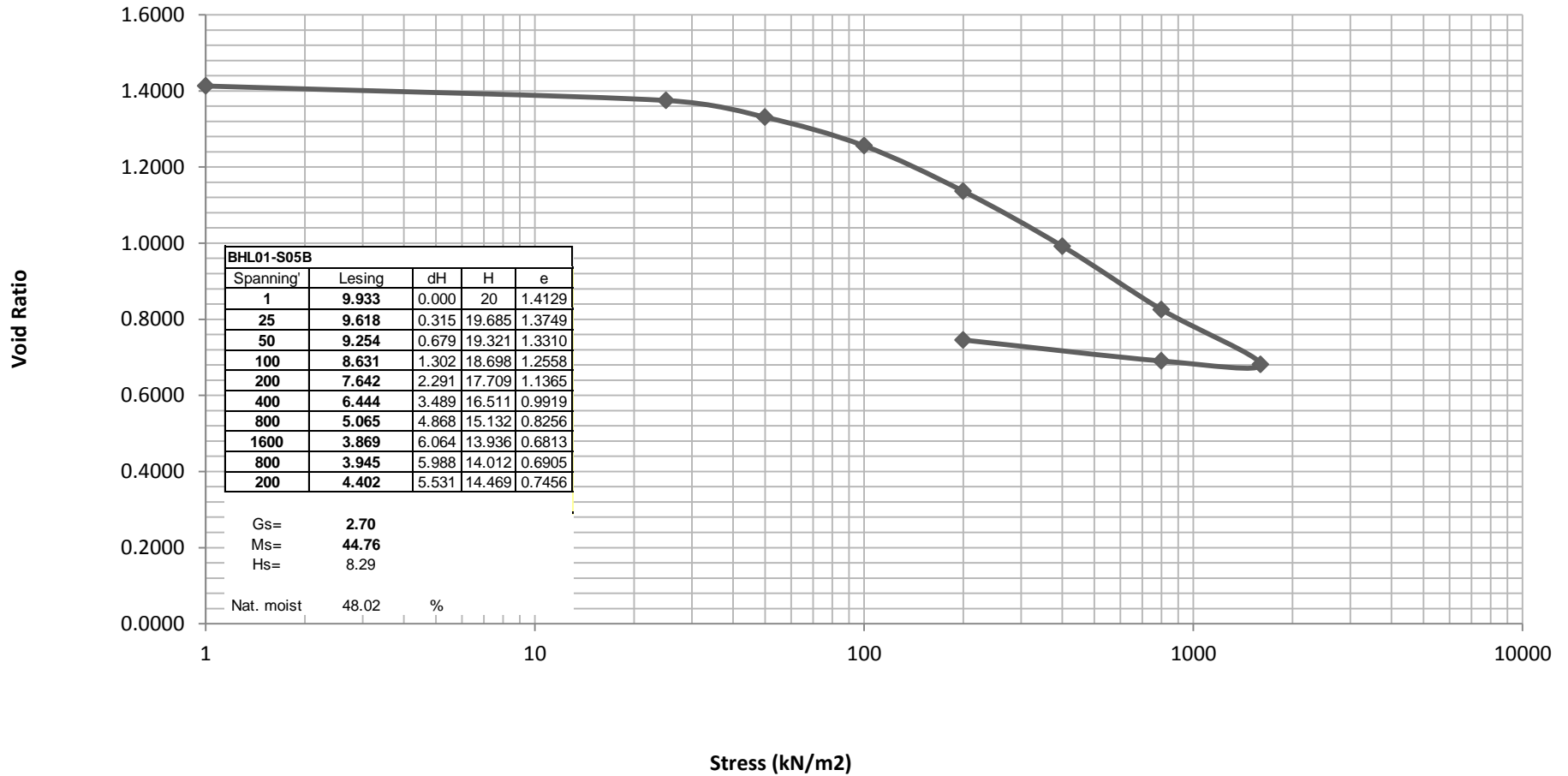


|  |   |
|--|---|
| <b>Sample No.:</b> 1370-BHL01-S05-28.00a   | <b>sheet:</b> 1/1                                       |
| <b>Laboratory:</b> Stellenbosch University | <b>X - coordinate:</b> 3306779.02                       |
| <b>Analysis:</b> Oedometer test            | <b>Y - coordinate:</b> -1177.11                         |
| <b>Sample Location:</b> BHL01              | <b>Z - sample depth:</b> <u>  </u> top <u>  </u> bottom |
| <b>Sample Type:</b> Shelby tube            | <b>mCD:</b> -24.280 -24.880                             |
| <b>Material:</b> silty CLAY                | <b>m below ground:</b> 28.000 28.600                    |



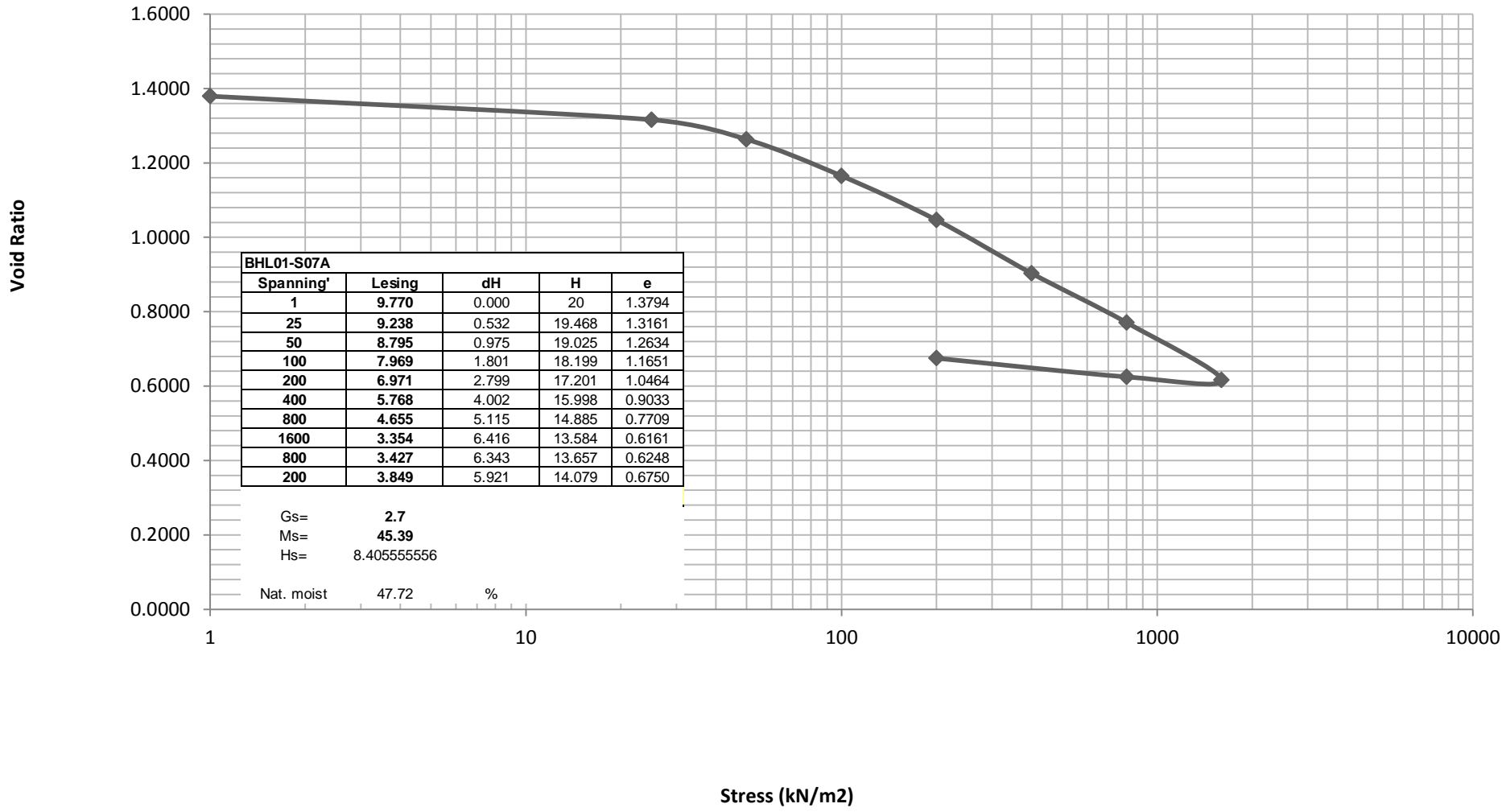


|  |  |                                      |
|--|--|--------------------------------------|
| <b>Sample No.:</b> 1370-BHL01-S05-28.00b   |  | <b>sheet:</b> 1/1                    |
| <b>Laboratory:</b> Stellenbosch University |  | <b>X - coordinate:</b> 3306779.02    |
| <b>Analysis:</b> Oedometer test            |  | <b>Y - coordinate:</b> -1177.11      |
| <b>Sample Location:</b> BHL01              |  | <b>Z - sample depth:</b> top bottom  |
| <b>Sample Type:</b> Shelby tube            |  | <b>mCD:</b> -24.280 -24.880          |
| <b>Material:</b> silty CLAY                |  | <b>m below ground:</b> 28.000 28.600 |





|                                     |  |  |
|-------------------------------------|--|--|
| Sample No.: 1370-BHL01-S07-30.20b   |  | sheet: 1/1                                 |
| Laboratory: Stellenbosch University |  | X - coordinate: 3306779.02                 |
| Analysis: Oedometer test            |  | Y - coordinate: -1177.11                   |
| Sample Location: BHL01              |  | Z - sample depth: <u>top</u> <u>bottom</u> |
| Sample Type: Shelby tube            |  | mCD: -26.480 -27.080                       |
| Material: silty CLAY                |  | m below ground: 30.200 30.800              |





Sample No.: 1370-BHL01-S07-30.20b

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306779.02

Analysis: Oedometer test

Y - coordinate: -1177.11

Sample Location: BHL01

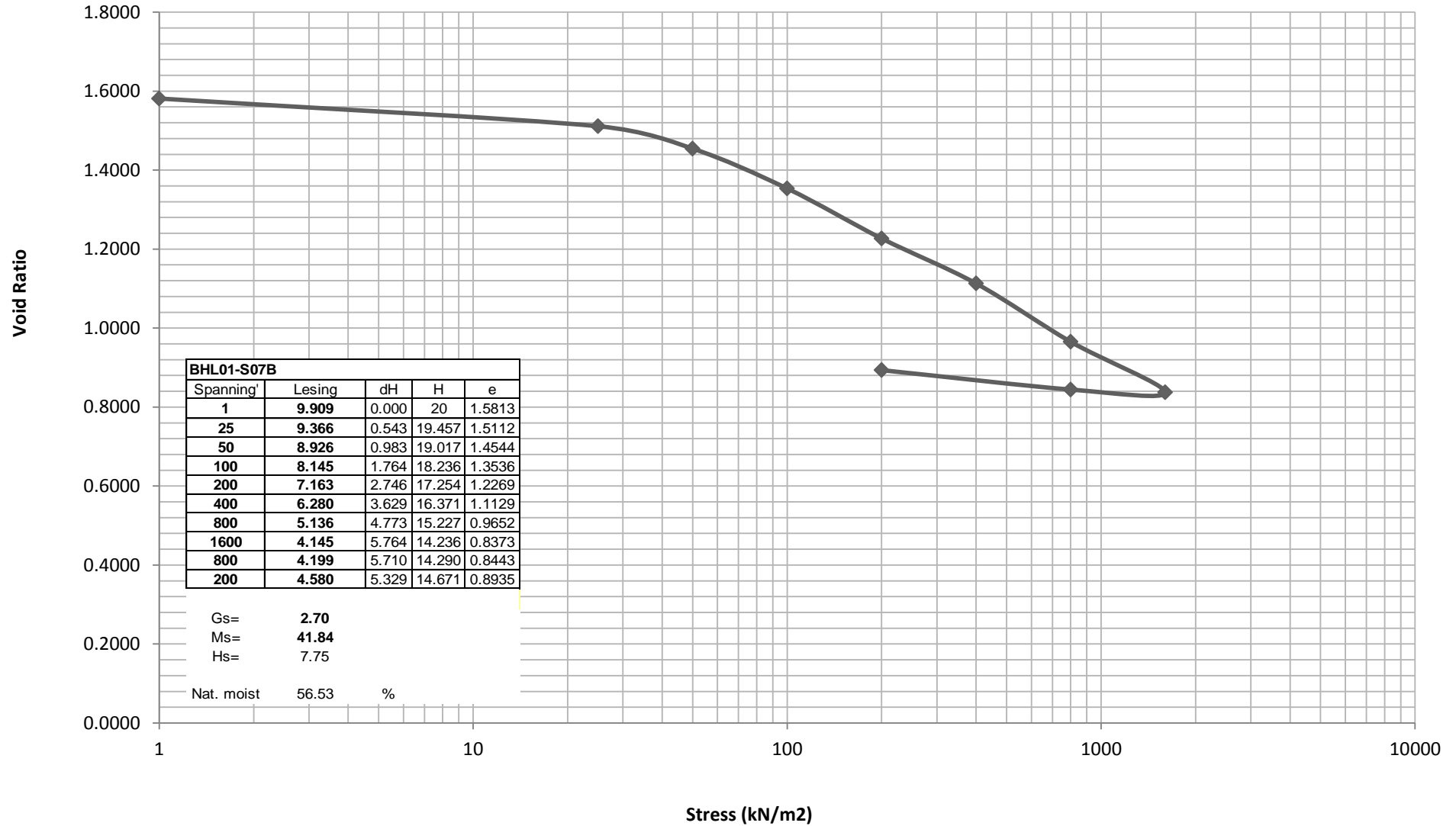
Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -26.480 -27.080

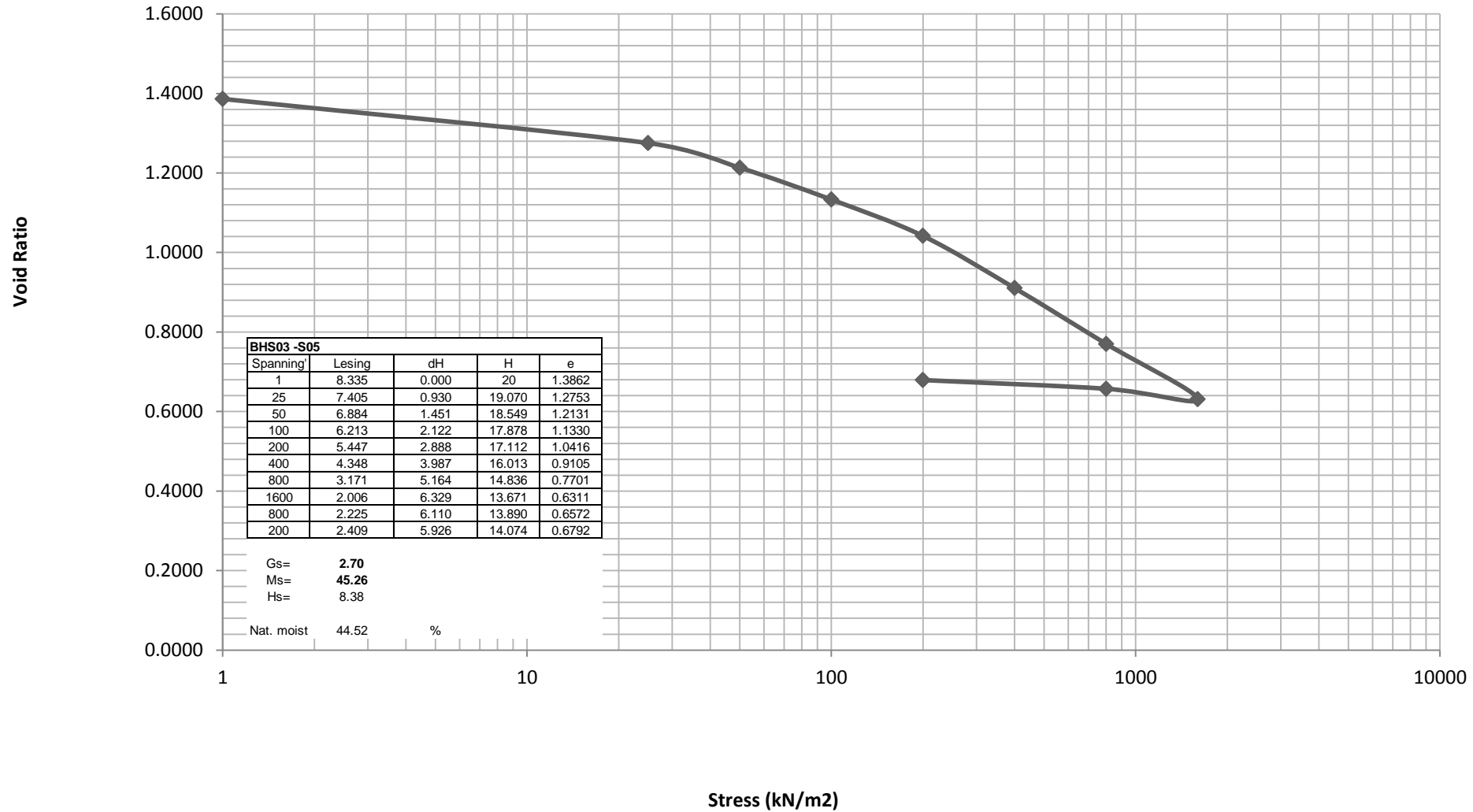
Material: silty CLAY

m below ground: 30.200 30.800





|  |   |                   |
|--|---|-------------------|
| <b>Sample No.:</b> 1370-BHS03-S05-32.00a   |   | <b>sheet:</b> 1/1 |
| <b>Laboratory:</b> Stellenbosch University | <b>X - coordinate:</b> 3306549.66                 |                   |
| <b>Analysis:</b> Oedometer test            | <b>Y - coordinate:</b> -2230.81                   |                   |
| <b>Sample Location:</b> BHS03              | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |                   |
| <b>Sample Type:</b> Shelby tube            | <b>mCD:</b> -28.940                               | -29.505           |
| <b>Material:</b> silty CLAY                | <b>m below platform:</b> 32.000                   | 32.565            |



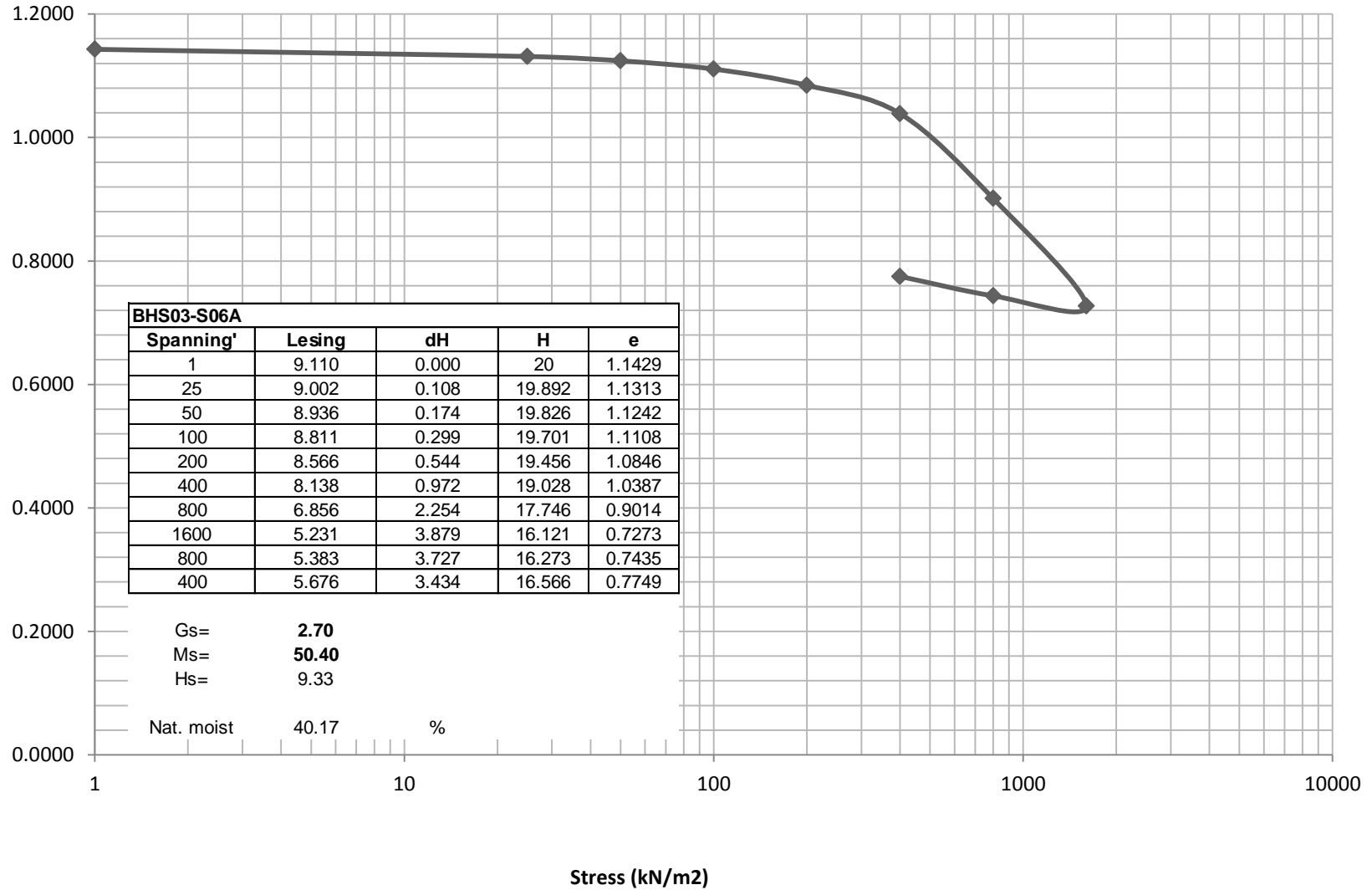




Sample No.: 1370-BHS03-S06-34.00a sheet: 1/1

|  |  |
|--|--|
| <b>Laboratory:</b> Stellenbosch University | <b>X - coordinate:</b> 3306549.66      |
| <b>Analysis:</b> Oedometer test            | <b>Y - coordinate:</b> -2230.81        |
| <b>Sample Location:</b> BHS03              | <b>Z - sample depth:</b> top bottom    |
| <b>Sample Type:</b> Shelby tube            | <b>mCD:</b> -30.940 -31.140            |
| <b>Material:</b> medium SAND               | <b>m below platform:</b> 34.000 34.200 |

Void Ratio

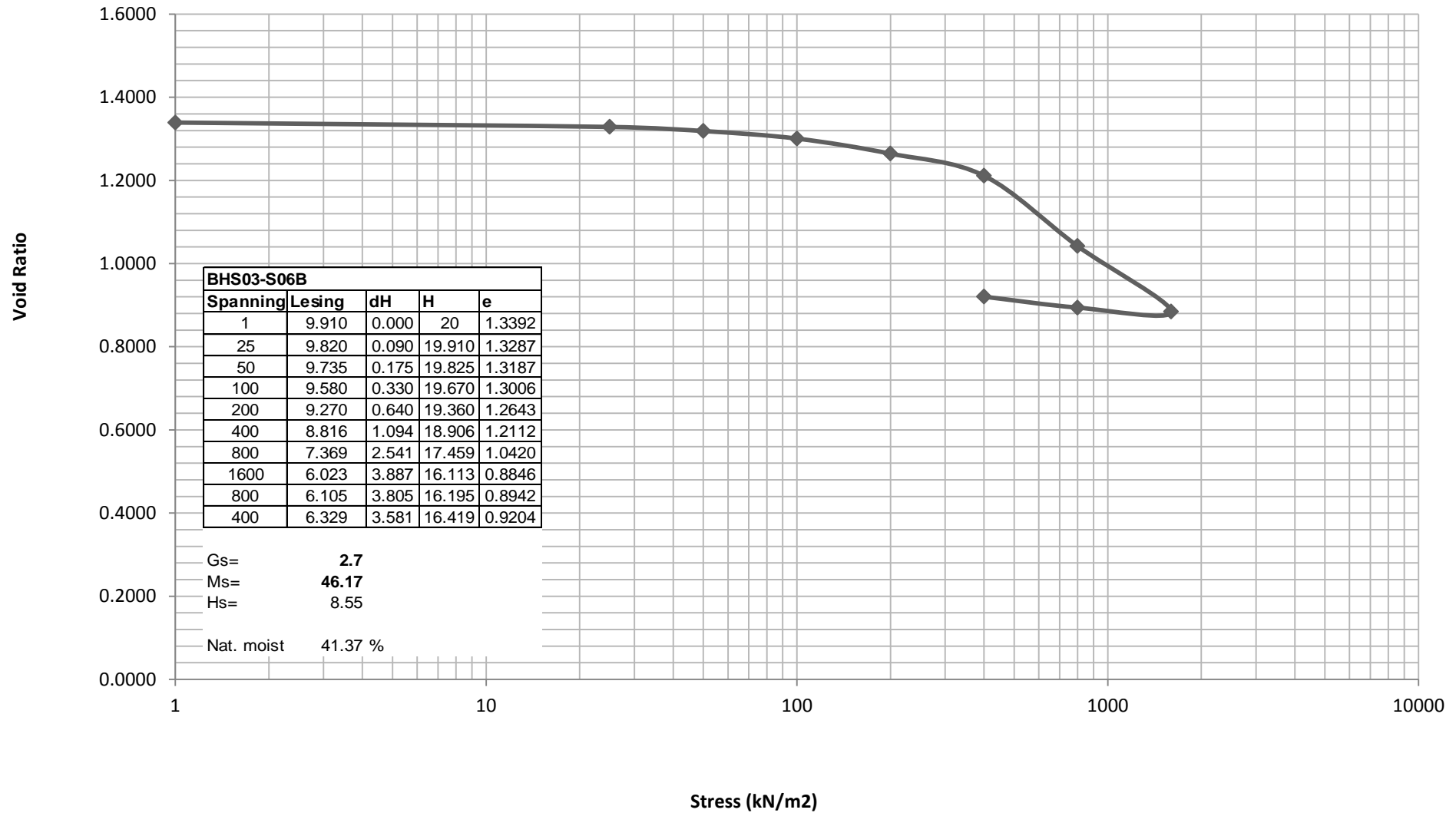


| BHS03-S06A |        |       |        |        |
|------------|--------|-------|--------|--------|
| Spanning'  | Lesing | dH    | H      | e      |
| 1          | 9.110  | 0.000 | 20     | 1.1429 |
| 25         | 9.002  | 0.108 | 19.892 | 1.1313 |
| 50         | 8.936  | 0.174 | 19.826 | 1.1242 |
| 100        | 8.811  | 0.299 | 19.701 | 1.1108 |
| 200        | 8.566  | 0.544 | 19.456 | 1.0846 |
| 400        | 8.138  | 0.972 | 19.028 | 1.0387 |
| 800        | 6.856  | 2.254 | 17.746 | 0.9014 |
| 1600       | 5.231  | 3.879 | 16.121 | 0.7273 |
| 800        | 5.383  | 3.727 | 16.273 | 0.7435 |
| 400        | 5.676  | 3.434 | 16.566 | 0.7749 |

G<sub>s</sub>= **2.70**  
 M<sub>s</sub>= **50.40**  
 H<sub>s</sub>= 9.33  
 Nat. moist 40.17 %



|  |  |  |  |
|--|--|--|--|
| <b>Sample No.:</b> 1370-BHS03-S06-34.00b   |  | <b>sheet:</b> 1/1                      |  |
| <b>Laboratory:</b> Stellenbosch University |  | <b>X - coordinate:</b> 3306549.66      |  |
| <b>Analysis:</b> Oedometer test            |  | <b>Y - coordinate:</b> -2230.81        |  |
| <b>Sample Location:</b> BHS03              |  | <b>Z - sample depth:</b> top bottom    |  |
| <b>Sample Type:</b> Shelby tube            |  | <b>mCD:</b> -30.940 -31.140            |  |
| <b>Material:</b> medium SAND               |  | <b>m below platform:</b> 34.000 34.200 |  |





Sample No.: 1370-BHS03-S01-24.00

sheet: 1/2

Laboratory: Thekwini Soil Lab. cc  
 Analysis: UU Triaxial test  
 Sample Location: BHS03  
 Sample Type: Shelby tube  
 Material: silty CLAY

X - coordinate: 3306549.66  
 Y - coordinate: -2230.81  
 Z - sample depth: top bottom  
 mCD: -20.940 -21.505  
 m below platform: 24.000 24.565

Project: Durban Harbour, Berth Deepening  
 Ref no.: 6630  
 Lab no.: 08141  
 Depth: 24.565  
 Position: BHS 03  
 Description: -



**THEKWINI SOILS LAB. CC**

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 MAYVILLE, 4058  
 Fax : (031) 201-7920

**Test 1**

**Test 2**

**Test 3**

| Test 1                            |         |                       | Test 2                            |         |                       | Test 3                            |         |                       |
|-----------------------------------|---------|-----------------------|-----------------------------------|---------|-----------------------|-----------------------------------|---------|-----------------------|
| Inputs                            |         |                       | Inputs                            |         |                       | Inputs                            |         |                       |
| L (cm)                            | 8.13    |                       | L (cm)                            |         |                       | L (cm)                            |         |                       |
| A (cm <sup>2</sup> )              | 11.11   |                       | A (cm <sup>2</sup> )              |         |                       | A (cm <sup>2</sup> )              |         |                       |
| V (cc)                            | 90.35   |                       | V (cc)                            |         |                       | V (cc)                            |         |                       |
| Prooving Ring                     | 33.70   |                       | Prooving Ring                     |         |                       | Prooving Ring                     |         |                       |
| Sigma3                            | 200     |                       | Sigma3                            |         |                       | Sigma3                            |         |                       |
| MC Before (%)                     | 62.1    |                       | MC Before (%)                     |         |                       | MC Before (%)                     |         |                       |
| MC After (%)                      | 61.6    |                       | MC After (%)                      |         |                       | MC After (%)                      |         |                       |
| Bulk Density (kg/m <sup>3</sup> ) | 1589    |                       | Bulk Density (kg/m <sup>3</sup> ) |         |                       | Bulk Density (kg/m <sup>3</sup> ) |         |                       |
| Dry Density (kg/m <sup>3</sup> )  | 981     |                       | Dry Density (kg/m <sup>3</sup> )  |         |                       | Dry Density (kg/m <sup>3</sup> )  |         |                       |
| Area at Test                      | %Strain | Deviator Stress (kPa) | Area at Test                      | %Strain | Deviator Stress (kPa) | Area at Test                      | %Strain | Deviator Stress (kPa) |
| 11.11                             | 0       | 0                     |                                   |         |                       |                                   |         |                       |
| 11.14                             | 0.25    | 124.0                 |                                   |         |                       |                                   |         |                       |
| 11.17                             | 0.49    | 193.1                 |                                   |         |                       |                                   |         |                       |
| 11.20                             | 0.74    | 234.8                 |                                   |         |                       |                                   |         |                       |
| 11.22                             | 0.98    | 264.2                 |                                   |         |                       |                                   |         |                       |
| 11.25                             | 1.23    | 284.5                 |                                   |         |                       |                                   |         |                       |
| 11.32                             | 1.85    | 312.5                 |                                   |         |                       |                                   |         |                       |
| 11.39                             | 2.46    | 327.7                 |                                   |         |                       |                                   |         |                       |
| 11.47                             | 3.08    | 336.5                 |                                   |         |                       |                                   |         |                       |
| 11.54                             | 3.69    | 343.2                 |                                   |         |                       |                                   |         |                       |
| 11.61                             | 4.31    | 345.9                 |                                   |         |                       |                                   |         |                       |
| 11.69                             | 4.92    | 351.7                 |                                   |         |                       |                                   |         |                       |
| 11.76                             | 5.54    | 355.2                 |                                   |         |                       |                                   |         |                       |
| 11.84                             | 6.15    | 358.6                 |                                   |         |                       |                                   |         |                       |
| 11.92                             | 6.77    | 358.5                 |                                   |         |                       |                                   |         |                       |
| 12.00                             | 7.38    | 359.5                 |                                   |         |                       |                                   |         |                       |
| 12.08                             | 8.00    | 362.7                 |                                   |         |                       |                                   |         |                       |
| 12.16                             | 8.61    | 364.4                 |                                   |         |                       |                                   |         |                       |
| 12.24                             | 9.23    | 366.6                 |                                   |         |                       |                                   |         |                       |
| 12.33                             | 9.84    | 369.1                 |                                   |         |                       |                                   |         |                       |
| 12.41                             | 10.46   | 368.7                 |                                   |         |                       |                                   |         |                       |
| 12.50                             | 11.07   | 368.1                 |                                   |         |                       |                                   |         |                       |
| 12.58                             | 11.69   | 367.4                 |                                   |         |                       |                                   |         |                       |
| 12.67                             | 12.30   | 368.3                 |                                   |         |                       |                                   |         |                       |
| 12.76                             | 12.92   | 369.2                 |                                   |         |                       |                                   |         |                       |
| 12.85                             | 13.53   | 369.7                 |                                   |         |                       |                                   |         |                       |
| 12.94                             | 14.15   | 367.1                 |                                   |         |                       |                                   |         |                       |
| 13.04                             | 14.76   | 364.5                 |                                   |         |                       |                                   |         |                       |
| 13.13                             | 15.38   | 362.3                 |                                   |         |                       |                                   |         |                       |
| 13.23                             | 15.99   | 359.7                 |                                   |         |                       |                                   |         |                       |
| 13.33                             | 16.61   | 357.1                 |                                   |         |                       |                                   |         |                       |
| 13.43                             | 17.22   | 356.4                 |                                   |         |                       |                                   |         |                       |
| 13.53                             | 17.84   | 354.3                 |                                   |         |                       |                                   |         |                       |
| 13.63                             | 18.45   | 353.6                 |                                   |         |                       |                                   |         |                       |
| 13.73                             | 19.07   | 353.4                 |                                   |         |                       |                                   |         |                       |
| 13.84                             | 19.68   | 353.2                 |                                   |         |                       |                                   |         |                       |
| 13.94                             | 20.30   | 352.9                 |                                   |         |                       |                                   |         |                       |
| 14.05                             | 20.91   | 352.5                 |                                   |         |                       |                                   |         |                       |
| 14.16                             | 21.53   | 349.8                 |                                   |         |                       |                                   |         |                       |
| 14.27                             | 22.14   | 348.2                 |                                   |         |                       |                                   |         |                       |
| 14.39                             | 22.76   | 346.7                 |                                   |         |                       |                                   |         |                       |
| 14.50                             | 23.37   | 346.2                 |                                   |         |                       |                                   |         |                       |
| 14.62                             | 23.99   | 345.8                 |                                   |         |                       |                                   |         |                       |
| 14.74                             | 24.60   | 344.1                 |                                   |         |                       |                                   |         |                       |
| 14.86                             | 25.22   | 342.4                 |                                   |         |                       |                                   |         |                       |
| 14.98                             | 25.83   | 341.9                 |                                   |         |                       |                                   |         |                       |
| 15.11                             | 26.45   | 341.3                 |                                   |         |                       |                                   |         |                       |
| 15.24                             | 27.06   | 340.6                 |                                   |         |                       |                                   |         |                       |
| 15.37                             | 27.68   | 339.5                 |                                   |         |                       |                                   |         |                       |
| 15.50                             | 28.29   | 338.1                 |                                   |         |                       |                                   |         |                       |
| 15.63                             | 28.91   | 338.5                 |                                   |         |                       |                                   |         |                       |
| 15.77                             | 29.52   | 335.5                 |                                   |         |                       |                                   |         |                       |
| 15.91                             | 30.14   | 332.6                 |                                   |         |                       |                                   |         |                       |
| 16.05                             | 30.75   | 329.7                 |                                   |         |                       |                                   |         |                       |



Sample No.: 1370-BHS03-S01-24.00

sheet: 2/2

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306549.66

Analysis: UU Triaxial test

Y - coordinate: -2230.81

Sample Location: BHS03

Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -20.940 -21.505

Material: silty CLAY

m below platform: 24.000 24.565

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project: Durban Harbour, Berth Deepening  
 Ref no.: 6630  
 Lab no.: 08141  
 Depth (m): 24.565  
 Position: BHS 03  
 Description: -

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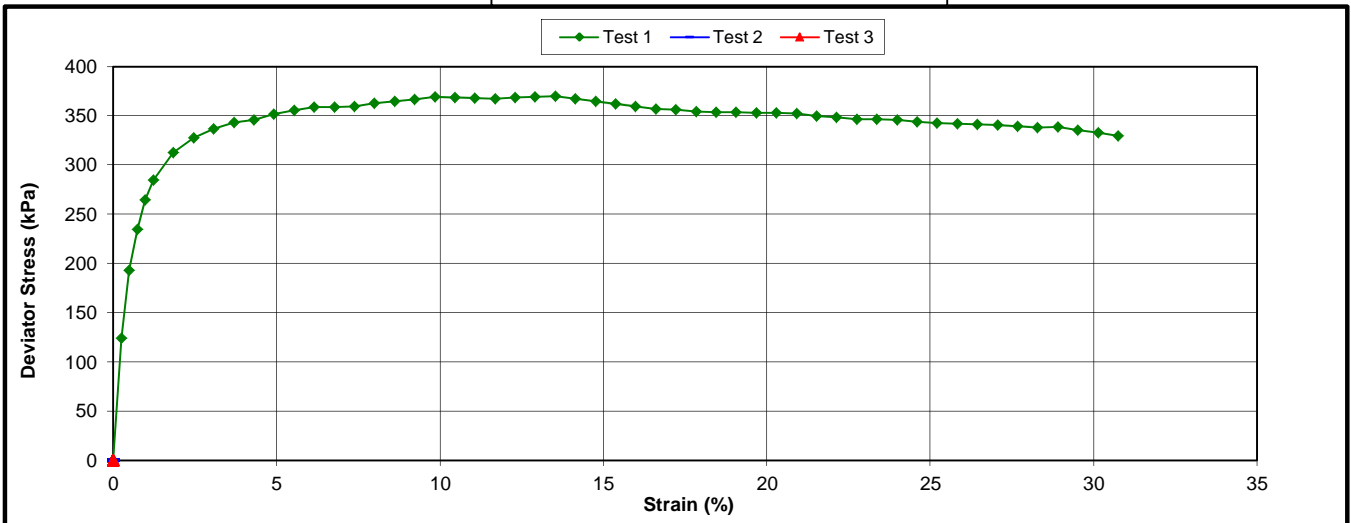


|                                    | Test 1 | Test 2 | Test 3 |
|------------------------------------|--------|--------|--------|
| Normal Stress (kN/m <sup>2</sup> ) | 200    |        |        |
| Dry Density (kg/m <sup>3</sup> )   | 981    |        |        |
| NMC(%)                             | 62.1   |        |        |
| Axial Strain (%)                   | 13.53  |        |        |
| Shear Stress at Failure (kPa)      | 185    |        |        |

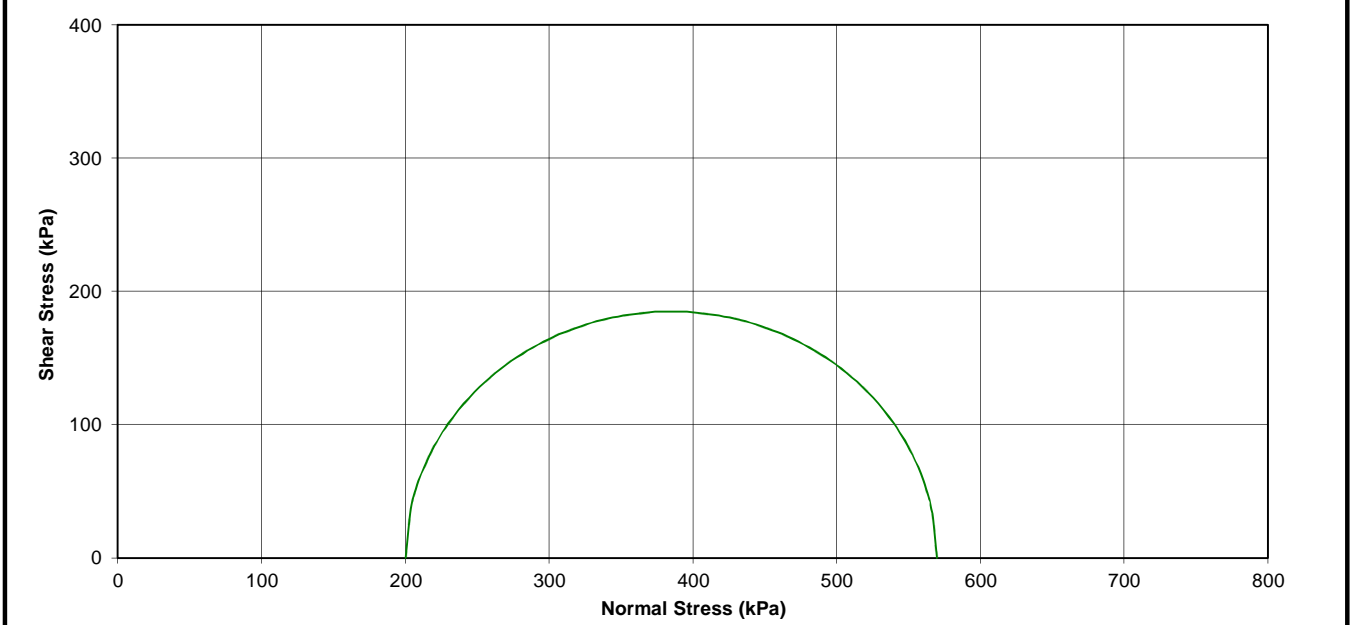
Average Cohesion

C (kPa)

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**







Sample No.: 1370-BHS03-S02-26.00

sheet: 2/2

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306549.66

Analysis: UU Triaxial test

Y - coordinate: -2230.81

Sample Location: BHS03

Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -22.940 -23.505

Material: silty CLAY

m below platform: 26.000 26.565

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project: Durban Harbour, Berth Deepening  
 Ref no.: 6630  
 Lab no.: 08142  
 Depth (m): 26.565  
 Position: BHS 03  
 Description: -

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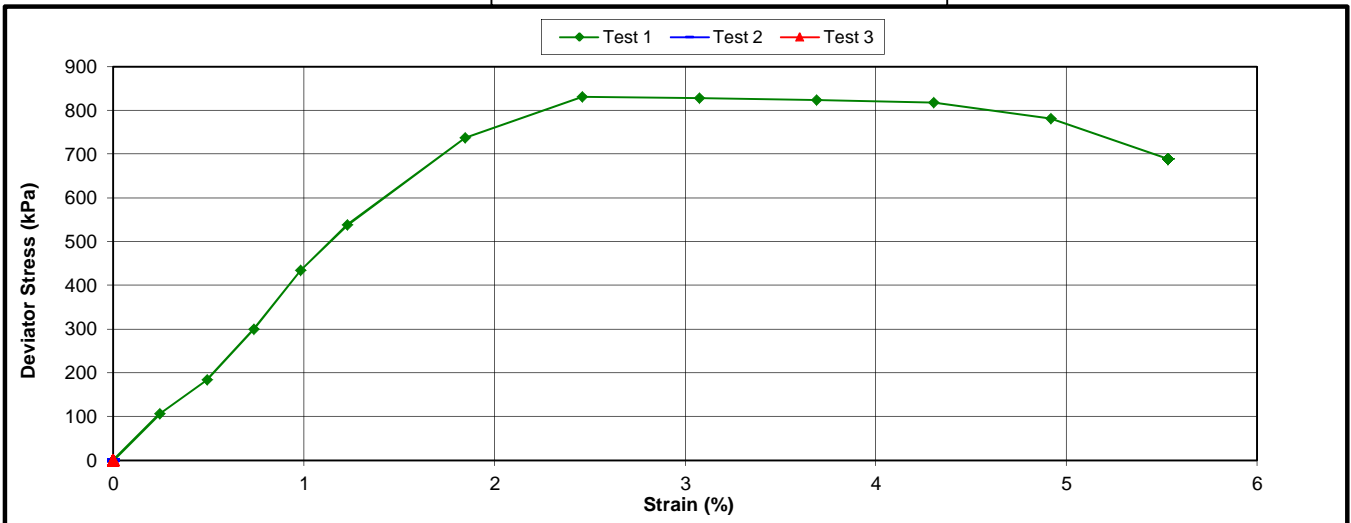


|                                    | Test 1 | Test 2 | Test 3 |
|------------------------------------|--------|--------|--------|
| Normal Stress (kN/m <sup>2</sup> ) | 200    |        |        |
| Dry Density (kg/m <sup>3</sup> )   | 1096   |        |        |
| NMC(%)                             | 53.6   |        |        |
| Axial Strain (%)                   | 2.46   |        |        |
| Shear Stress at Failure (kPa)      | 415    |        |        |

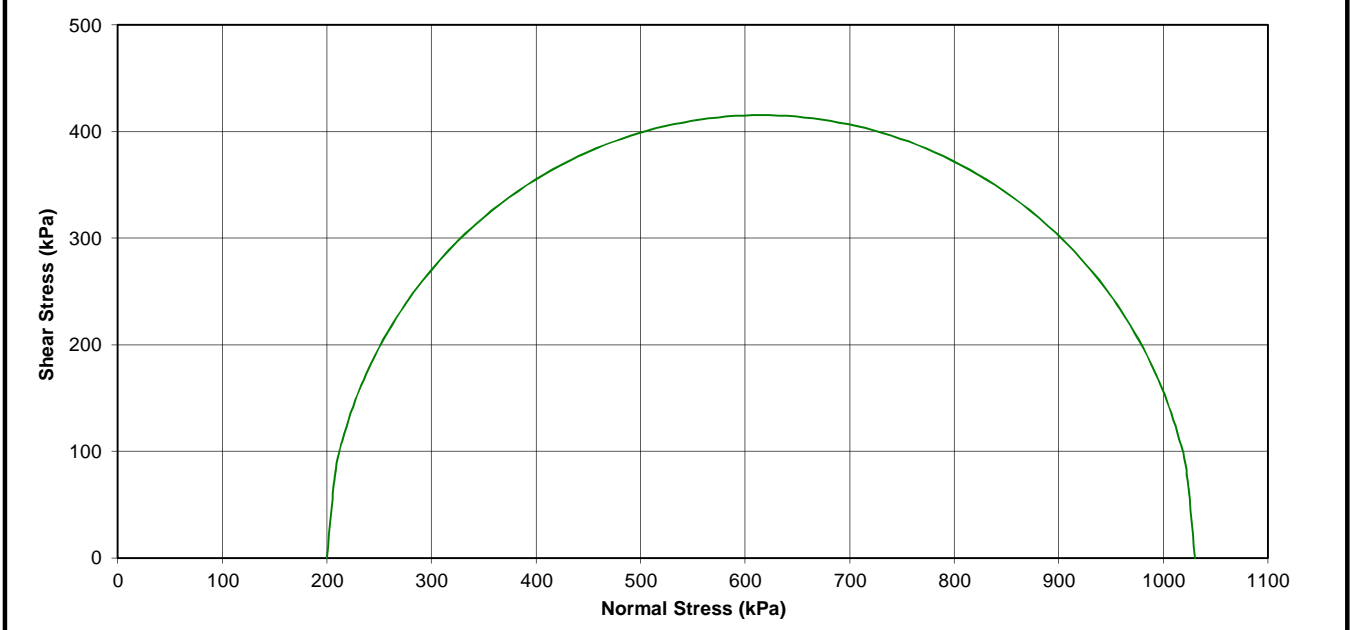
Average Cohesion

C (kPa)

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**





|  |  |   |
|--|--|---|
| <b>Sample No.:</b> 1370-BHS03-S03-28.00  |  | <b>sheet:</b> 1/2                                 |
| <b>Laboratory:</b> Thekwini Soil Lab. cc |  | <b>X - coordinate:</b> 3306549.66                 |
| <b>Analysis:</b> UU Triaxial test        |  | <b>Y - coordinate:</b> -2230.81                   |
| <b>Sample Location:</b> BHS03            |  | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
| <b>Sample Type:</b> Shelby tube          |  | <b>mCD:</b> -24.940 -25.505                       |
| <b>Material:</b> silty CLAY              |  | <b>m below platform:</b> 28.000 28.565            |

**Project:** Durban Harbour - Berth Deepening J 1370  
**Ref no.:** 6630  
**Lab no.:** 08024  
**Depth:** 25.0  
**Position:** BH 503  
**Description:** Dk. ol. dk. gr. si. cl.



### THEKWINI SOILS LAB. CC

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| Test 1       |         |                       | Test 2       |         |                       | Test 3       |         |                       |
|--------------|---------|-----------------------|--------------|---------|-----------------------|--------------|---------|-----------------------|
| Area at Test | %Strain | Deviator Stress (kPa) | Area at Test | %Strain | Deviator Stress (kPa) | Area at Test | %Strain | Deviator Stress (kPa) |
| 11.22        | 0       | 0                     | 11.21        | 0       | 0                     | 11.10        | 0       | 0                     |
| 11.25        | 0.25    | 78.2                  | 11.24        | 0.25    | 63.0                  | 11.13        | 0.25    | 60.6                  |
| 11.28        | 0.49    | 106.4                 | 11.27        | 0.49    | 101.7                 | 11.16        | 0.49    | 93.6                  |
| 11.31        | 0.74    | 130.9                 | 11.30        | 0.74    | 122.3                 | 11.19        | 0.74    | 113.0                 |
| 11.33        | 0.98    | 144.7                 | 11.32        | 0.98    | 139.9                 | 11.21        | 0.98    | 123.2                 |
| 11.36        | 1.23    | 163.4                 | 11.35        | 1.23    | 154.4                 | 11.24        | 1.23    | 129.5                 |
| 11.43        | 1.84    | 188.9                 | 11.42        | 1.84    | 181.4                 | 11.31        | 1.85    | 149.0                 |
| 11.50        | 2.46    | 194.7                 | 11.49        | 2.46    | 202.3                 | 11.38        | 2.46    | 165.8                 |
| 11.58        | 3.07    | 207.3                 | 11.57        | 3.07    | 215.6                 | 11.46        | 3.08    | 179.4                 |
| 11.65        | 3.69    | 219.7                 | 11.64        | 3.69    | 225.8                 | 11.53        | 3.69    | 190.0                 |
| 11.73        | 4.30    | 232.0                 | 11.72        | 4.30    | 233.6                 | 11.60        | 4.31    | 197.5                 |
| 11.80        | 4.92    | 237.2                 | 11.79        | 4.91    | 242.9                 | 11.68        | 4.92    | 207.8                 |
| 11.88        | 5.53    | 242.4                 | 11.87        | 5.53    | 249.9                 | 11.75        | 5.54    | 217.9                 |
| 11.96        | 6.15    | 248.9                 | 11.95        | 6.14    | 256.7                 | 11.83        | 6.15    | 226.4                 |
| 12.04        | 6.76    | 253.9                 | 12.02        | 6.76    | 263.4                 | 11.91        | 6.77    | 229.2                 |
| 12.12        | 7.38    | 256.2                 | 12.10        | 7.37    | 270.1                 | 11.99        | 7.38    | 236.1                 |
| 12.20        | 7.99    | 255.8                 | 12.19        | 7.99    | 275.2                 | 12.07        | 8.00    | 240.1                 |
| 12.28        | 8.60    | 254.1                 | 12.27        | 8.60    | 280.2                 | 12.15        | 8.61    | 246.9                 |
| 12.36        | 9.22    | 252.4                 | 12.35        | 9.21    | 283.8                 | 12.23        | 9.23    | 250.7                 |
| 12.45        | 9.83    | 252.0                 | 12.43        | 9.83    | 285.9                 | 12.32        | 9.84    | 260.0                 |
| 12.53        | 10.45   | 252.2                 | 12.52        | 10.44   | 288.0                 | 12.40        | 10.46   | 262.3                 |
| 12.62        | 11.06   | 250.4                 | 12.61        | 11.06   | 291.4                 | 12.49        | 11.07   | 264.5                 |
| 12.71        | 11.68   | 250.6                 | 12.69        | 11.67   | 292.0                 | 12.57        | 11.69   | 268.0                 |
| 12.79        | 12.29   | 251.4                 | 12.78        | 12.29   | 291.3                 | 12.66        | 12.30   | 271.5                 |
| 12.89        | 12.91   | 249.6                 | 12.87        | 12.90   | 290.6                 | 12.75        | 12.92   | 273.6                 |
| 12.98        | 13.52   | 249.7                 | 12.96        | 13.51   | 288.5                 | 12.84        | 13.53   | 275.6                 |
| 13.07        | 14.14   | 247.9                 | 13.06        | 14.13   | 286.5                 | 12.93        | 14.15   | 276.2                 |
| 13.16        | 14.75   | 249.2                 | 13.15        | 14.74   | 284.4                 | 13.03        | 14.76   | 278.9                 |
| 13.26        | 15.37   | 250.4                 | 13.25        | 15.36   | 282.4                 | 13.12        | 15.38   | 281.2                 |
| 13.36        | 15.98   | 250.4                 | 13.34        | 15.97   | 280.3                 | 13.22        | 15.99   | 283.0                 |
| 13.45        | 16.59   | 249.7                 | 13.44        | 16.58   | 278.3                 | 13.31        | 16.61   | 286.0                 |
| 13.55        | 17.21   | 250.8                 | 13.54        | 17.20   | 276.2                 | 13.41        | 17.22   | 288.9                 |
| 13.66        | 17.82   | 250.7                 | 13.64        | 17.81   | 274.2                 | 13.51        | 17.84   | 290.5                 |
| 13.76        | 18.44   | 250.0                 | 13.75        | 18.43   | 272.1                 | 13.62        | 18.45   | 292.1                 |
| 13.86        | 19.05   | 249.3                 | 13.85        | 19.04   | 270.1                 | 13.72        | 19.07   | 292.3                 |
| 13.97        | 19.67   | 250.8                 | 13.96        | 19.66   | 268.0                 | 13.82        | 19.68   | 292.5                 |
| 14.08        | 20.28   | 250.0                 | 14.06        | 20.27   | 266.0                 | 13.93        | 20.30   | 292.7                 |
| 14.19        | 20.90   | 249.2                 | 14.17        | 20.88   | 264.0                 | 14.04        | 20.91   | 292.8                 |
| 14.30        | 21.51   | 249.0                 | 14.28        | 21.50   | 261.9                 | 14.15        | 21.53   | 293.4                 |
| 14.41        | 22.13   | 249.8                 | 14.40        | 22.11   | 259.9                 | 14.26        | 22.14   | 293.0                 |
| 14.53        | 22.74   | 251.1                 | 14.51        | 22.73   | 257.8                 | 14.37        | 22.76   | 295.4                 |
| 14.64        | 23.36   | 252.4                 | 14.63        | 23.34   | 255.8                 | 14.49        | 23.37   | 295.4                 |
| 14.76        | 23.97   | 252.0                 |              |         |                       | 14.61        | 23.99   | 295.3                 |
| 14.88        | 24.59   | 252.7                 |              |         |                       | 14.73        | 24.60   | 297.0                 |
| 15.00        | 25.20   | 253.3                 |              |         |                       | 14.85        | 25.22   | 297.3                 |
| 15.13        | 25.81   | 253.9                 |              |         |                       | 14.97        | 25.83   | 299.4                 |
| 15.25        | 26.43   | 257.0                 |              |         |                       | 15.10        | 26.45   | 299.6                 |
| 15.38        | 27.04   | 257.4                 |              |         |                       | 15.22        | 27.06   | 300.0                 |
| 15.51        | 27.66   | 257.9                 |              |         |                       | 15.35        | 27.68   | 299.6                 |
| 15.65        | 28.27   | 256.7                 |              |         |                       | 15.48        | 28.29   | 300.3                 |
| 15.78        | 28.89   | 256.0                 |              |         |                       | 15.62        | 28.91   | 301.7                 |
| 15.92        | 29.50   | 256.3                 |              |         |                       | 15.75        | 29.52   | 301.6                 |
| 16.06        | 30.12   | 256.6                 |              |         |                       | 15.89        | 30.14   | 301.1                 |
| 16.20        | 30.73   | 256.8                 |              |         |                       | 16.03        | 30.75   | 300.6                 |



|  |  |  |
|--|--|--|
| <b>Sample No.:</b> 1370-BHS03-S03-28.00  |  | <b>sheet:</b> 2/2                      |
| <b>Laboratory:</b> Thekwini Soil Lab. cc |  | <b>X - coordinate:</b> 3306549.66      |
| <b>Analysis:</b> UU Triaxial test        |  | <b>Y - coordinate:</b> -2230.81        |
| <b>Sample Location:</b> BHS03            |  | <b>Z - sample depth:</b> top bottom    |
| <b>Sample Type:</b> Shelby tube          |  | <b>mCD:</b> -24.940 -25.505            |
| <b>Material:</b> silty CLAY              |  | <b>m below platform:</b> 28.000 28.565 |

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

**Project** Durban Harbour - Berth Deepening J 1370  
**Ref no.** 6630  
**Lab no.** 08024  
**Depth (m):** 25.0  
**Position:** BH 503  
**Description:** Dk. ol. dk. gr. si. cl.

**THEKWINI SOILS LAB. CC**



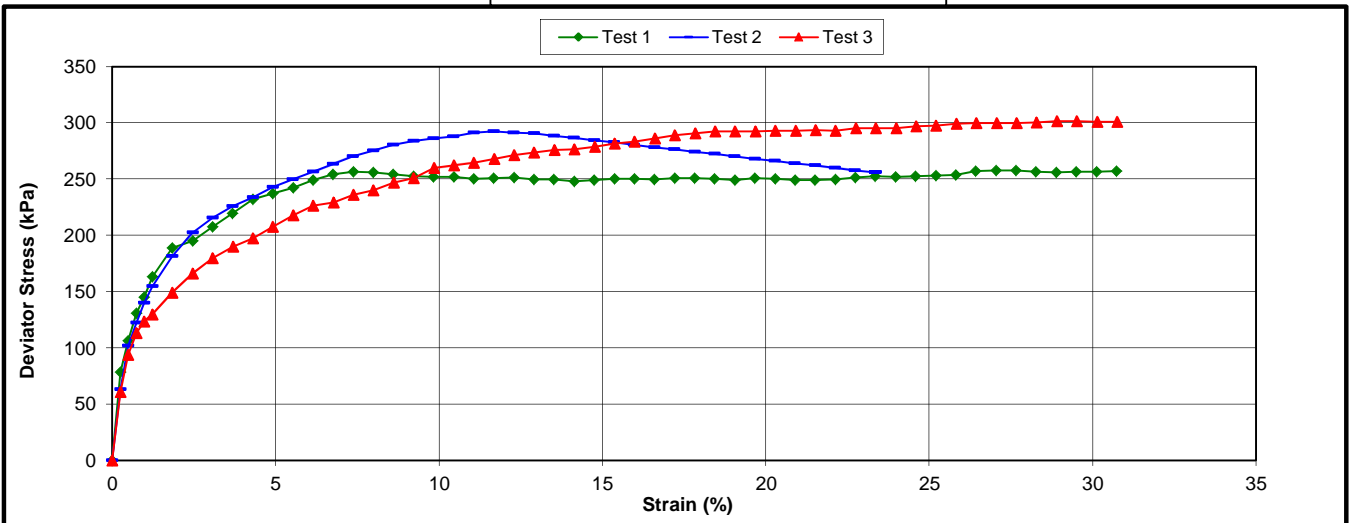
V.A.T. REGISTRATION NO. 4590210961.  
**68 Ridge Road,**  
**Tollgate, DURBAN**  
**Tel : (031) 201-8992**  
**P.O. Box 30464,**  
**MAYVILLE, 4058**  
**Fax : (031) 201-7920**

|   | Test 1 | Test 2 | Test 3 |
|---|--------|--------|--------|
| <b>Normal Stress (kN/m<sup>2</sup>)</b> | 100    | 200    | 400    |
| <b>Dry Density (kg/m<sup>3</sup>)</b>   | 1294   | 1280   | 1334   |
| <b>NMC(%)</b>                           | 38.4   | 39.5   | 38.1   |
| <b>Axial Strain (%)</b>                 | 27.66  | 11.67  | 28.91  |
| <b>Shear Stress at Failure (kPa)</b>    | 129    | 146    | 151    |

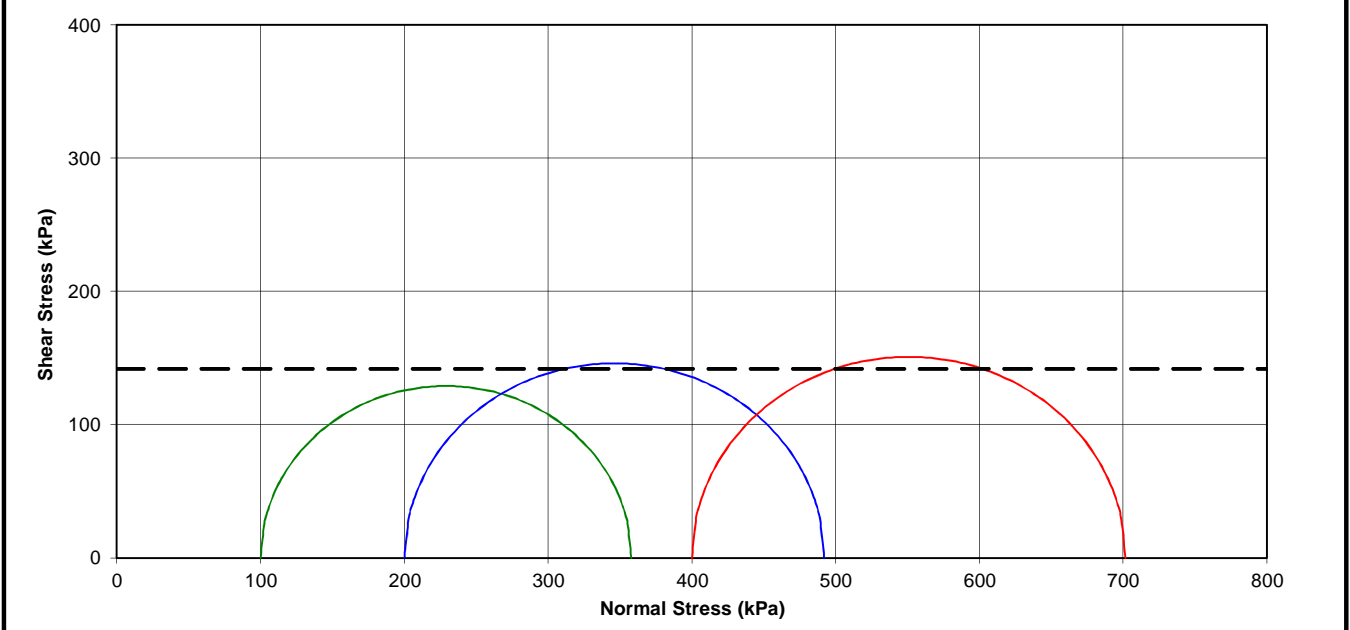
**Average Cohesion**

**C (kPa)** 142

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**









Sample No.: 1370-BHS04-S01-23.00

sheet: 2/2

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306720.00

Analysis: UU Triaxial test

Y - coordinate: -1466.00

Sample Location: BHS04

Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -20.334 -20.984

Material: silty CLAY

m below platform: 23.000 23.650

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project: Durban Harbour  
 Ref no.: 6630  
 Lab no.: 11138  
 Depth (m): 23.00 - 23.60  
 Position: BH 504 - 501  
 Description: -

**THEKWINI SOILS LAB. CC**

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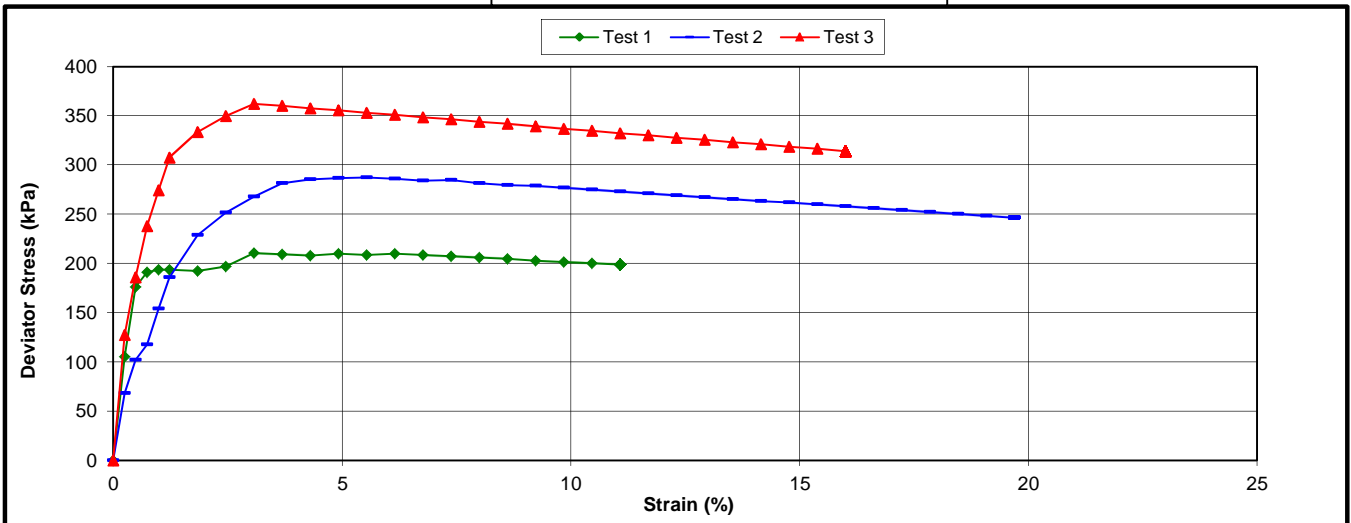


|                                    | Test 1 | Test 2 | Test 3 |
|------------------------------------|--------|--------|--------|
| Normal Stress (kN/m <sup>2</sup> ) | 100    | 200    | 400    |
| Dry Density (kg/m <sup>3</sup> )   | 1100   | 1108   | 1126   |
| NMC(%)                             | 51.1   | 52.9   | 54.0   |
| Axial Strain (%)                   | 3.08   | 5.54   | 3.08   |
| Shear Stress at Failure (kPa)      | 105    | 144    | 181    |

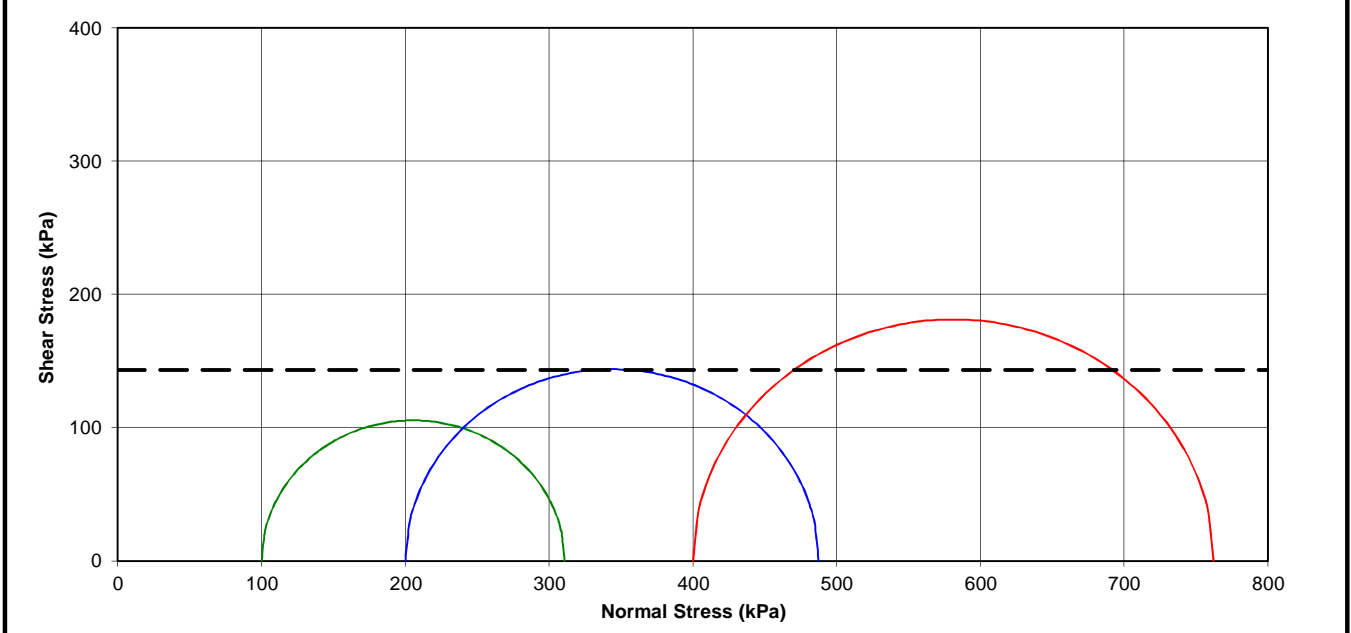
Average Cohesion

C (kPa) 143

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**





|  |   |
|--|---|
| <b>Sample No.:</b> 1370-BHS05-S01-22.50  | <b>sheet:</b> 1/2                                 |
| <b>Laboratory:</b> Thekwini Soil Lab. cc | <b>X - coordinate:</b> 3306680.00                 |
| <b>Analysis:</b> UU Triaxial test        | <b>Y - coordinate:</b> -1634.00                   |
| <b>Sample Location:</b> BHS05            | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
| <b>Sample Type:</b> Shelby tube          | <b>mCD:</b> -20.000 -20.600                       |
| <b>Material:</b> medium SAND             | <b>m below platform:</b> 22.500 23.100            |

**Project:** Durban Harbour  
**Ref no.:** 6630  
**Lab no.:** 11139  
**Depth:** 22.50 - 23.10  
**Position:** BH 505-501  
**Description:** -



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 68 Ridge Road, Tollgate, DURBAN  
 P.O. Box 30464, MAYVILLE, 4058  
 Tel : (031) 201-8992 Fax : (031) 201-7920

| Test 1       |         |                       | Test 2       |         |                       | Test 3       |         |                       |
|--------------|---------|-----------------------|--------------|---------|-----------------------|--------------|---------|-----------------------|
| Area at Test | %Strain | Deviator Stress (kPa) | Area at Test | %Strain | Deviator Stress (kPa) | Area at Test | %Strain | Deviator Stress (kPa) |
| 11.01        | 0       | 0                     | 10.95        | 0       | 0                     | 11.01        | 0       | 0                     |
| 11.03        | 0.25    | 18.3                  | 10.97        | 0.25    | 26.1                  | 11.03        | 0.25    | 32.1                  |
| 11.06        | 0.49    | 21.3                  | 11.00        | 0.49    | 35.2                  | 11.06        | 0.49    | 44.2                  |
| 11.09        | 0.74    | 24.3                  | 11.03        | 0.74    | 43.4                  | 11.09        | 0.74    | 60.8                  |
| 11.12        | 0.99    | 25.8                  | 11.06        | 0.99    | 51.8                  | 11.11        | 0.99    | 69.7                  |
| 11.14        | 1.23    | 27.2                  | 11.08        | 1.23    | 60.8                  | 11.14        | 1.23    | 78.6                  |
| 11.21        | 1.85    | 30.7                  | 11.15        | 1.85    | 75.5                  | 11.21        | 1.85    | 105.2                 |
| 11.28        | 2.47    | 32.9                  | 11.22        | 2.47    | 94.6                  | 11.28        | 2.46    | 122.5                 |
| 11.36        | 3.09    | 35.6                  | 11.30        | 3.09    | 110.4                 | 11.36        | 3.08    | 139.5                 |
| 11.43        | 3.70    | 38.3                  | 11.37        | 3.70    | 123.0                 | 11.43        | 3.69    | 150.4                 |
| 11.50        | 4.32    | 39.6                  | 11.44        | 4.32    | 132.5                 | 11.50        | 4.31    | 161.2                 |
| 11.58        | 4.94    | 41.3                  | 11.52        | 4.94    | 143.4                 | 11.58        | 4.93    | 174.7                 |
| 11.65        | 5.56    | 43.4                  | 11.59        | 5.56    | 151.2                 | 11.65        | 5.54    | 185.1                 |
| 11.73        | 6.17    | 46.0                  | 11.67        | 6.17    | 161.8                 | 11.73        | 6.16    | 195.4                 |
| 11.81        | 6.79    | 48.5                  | 11.74        | 6.79    | 169.3                 | 11.81        | 6.77    | 205.5                 |
| 11.89        | 7.41    | 51.0                  | 11.82        | 7.41    | 173.9                 | 11.88        | 7.39    | 209.9                 |
| 11.97        | 8.02    | 59.1                  | 11.90        | 8.02    | 184.0                 | 11.96        | 8.00    | 214.1                 |
| 12.05        | 8.64    | 58.7                  | 11.98        | 8.64    | 185.6                 | 12.04        | 8.62    | 221.1                 |
| 12.13        | 9.26    | 58.4                  | 12.06        | 9.26    | 191.4                 | 12.13        | 9.24    | 227.9                 |
| 12.21        | 9.88    | 58.0                  | 12.15        | 9.88    | 194.2                 | 12.21        | 9.85    | 229.1                 |
| 12.30        | 10.49   | 60.3                  | 12.23        | 10.49   | 195.6                 | 12.29        | 10.47   | 230.3                 |
| 12.38        | 11.11   | 62.6                  | 12.32        | 11.11   | 199.8                 | 12.38        | 11.08   | 231.4                 |
| 12.47        | 11.73   | 64.9                  | 12.40        | 11.73   | 201.6                 | 12.46        | 11.70   | 232.5                 |
| 12.56        | 12.35   | 67.1                  | 12.49        | 12.35   | 202.4                 | 12.55        | 12.32   | 233.6                 |
| 12.64        | 12.96   | 69.8                  | 12.58        | 12.96   | 203.6                 | 12.64        | 12.93   | 234.6                 |
| 12.73        | 13.58   | 74.1                  | 12.67        | 13.58   | 204.9                 | 12.73        | 13.55   | 235.6                 |
| 12.83        | 14.20   | 77.5                  | 12.76        | 14.20   | 203.9                 | 12.82        | 14.16   | 236.6                 |
| 12.92        | 14.81   | 80.3                  | 12.85        | 14.81   | 204.6                 | 12.91        | 14.78   | 234.9                 |
| 13.01        | 15.43   | 86.8                  | 12.94        | 15.43   | 203.1                 | 13.01        | 15.39   | 235.8                 |
| 13.11        | 16.05   | 90.0                  | 13.04        | 16.05   | 204.2                 | 13.10        | 16.01   | 235.3                 |
| 13.21        | 16.67   | 94.9                  | 13.14        | 16.67   | 204.0                 | 13.20        | 16.63   | 234.9                 |
| 13.31        | 17.28   | 96.2                  | 13.23        | 17.28   | 203.7                 | 13.30        | 17.24   | 235.7                 |
| 13.41        | 17.90   | 98.5                  | 13.33        | 17.90   | 203.5                 | 13.40        | 17.86   | 236.4                 |
| 13.51        | 18.52   | 102.3                 | 13.43        | 18.52   | 201.9                 | 13.50        | 18.47   | 235.9                 |
| 13.61        | 19.14   | 106.5                 | 13.54        | 19.14   | 201.1                 | 13.60        | 19.09   | 235.4                 |
| 13.71        | 19.75   | 113.0                 | 13.64        | 19.75   | 200.1                 | 13.71        | 19.70   | 236.0                 |
| 13.82        | 20.37   | 113.4                 | 13.75        | 20.37   | 198.6                 | 13.81        | 20.32   | 236.7                 |
| 13.93        | 20.99   | 118.6                 | 13.85        | 20.99   | 199.0                 | 13.92        | 20.94   | 237.3                 |
| 14.04        | 21.60   | 121.2                 | 13.96        | 21.60   | 199.8                 | 14.03        | 21.55   | 235.4                 |
| 14.15        | 22.22   | 126.2                 | 14.07        | 22.22   | 198.7                 | 14.14        | 22.17   | 235.9                 |
| 14.26        | 22.84   | 127.6                 | 14.19        | 22.84   | 197.2                 | 14.25        | 22.78   | 234.1                 |
| 14.38        | 23.46   | 128.9                 | 14.30        | 23.46   | 195.6                 | 14.37        | 23.40   | 232.2                 |
| 14.49        | 24.07   | 130.2                 | 14.42        | 24.07   | 194.0                 | 14.48        | 24.01   | 230.3                 |
| 14.61        | 24.69   | 131.0                 | 14.54        | 24.69   | 192.4                 | 14.60        | 24.63   | 228.5                 |
| 14.73        | 25.31   | 130.4                 | 14.66        | 25.31   | 190.9                 | 14.72        | 25.25   | 226.6                 |
| 14.86        | 25.93   | 129.7                 | 14.78        | 25.93   | 189.3                 | 14.84        | 25.86   | 224.7                 |
| 14.98        | 26.54   | 128.7                 | 14.90        | 26.54   | 187.7                 | 14.97        | 26.48   | 222.9                 |
| 15.11        | 27.16   | 128.3                 | 15.03        | 27.16   | 186.1                 | 15.10        | 27.09   | 221.0                 |
| 15.24        | 27.78   | 127.2                 | 15.16        | 27.78   | 184.5                 | 15.22        | 27.71   | 219.1                 |
| 15.37        | 28.40   | 126.1                 | 15.29        | 28.40   | 183.0                 | 15.35        | 28.33   | 217.3                 |
| 15.50        | 29.01   | 125.0                 | 15.42        | 29.01   | 181.4                 | 15.49        | 28.94   | 215.4                 |
| 15.64        | 29.63   | 123.9                 | 15.56        | 29.63   | 179.8                 | 15.62        | 29.56   | 213.5                 |
| 15.78        | 30.25   | 122.8                 |              |         |                       | 15.76        | 30.17   | 211.7                 |



|  |   |
|--|---|
| <b>Sample No.:</b> 1370-BHS05-S01-22.50  | <b>sheet:</b> 2/2                                 |
| <b>Laboratory:</b> Thekwini Soil Lab. cc | <b>X - coordinate:</b> 3306680.00                 |
| <b>Analysis:</b> UU Triaxial test        | <b>Y - coordinate:</b> -1634.00                   |
| <b>Sample Location:</b> BHS05            | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
| <b>Sample Type:</b> Shelby tube          | <b>mCD:</b> -20.000 -20.600                       |
| <b>Material:</b> medium SAND             | <b>m below platform:</b> 22.500 23.100            |

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project: Durban Harbour  
 Ref no.: 6630  
 Lab no.: 11139  
 Depth (m): 22.50 - 23.10  
 Position: BH 505-501  
 Description: -

**THEKWINI SOILS LAB. CC**



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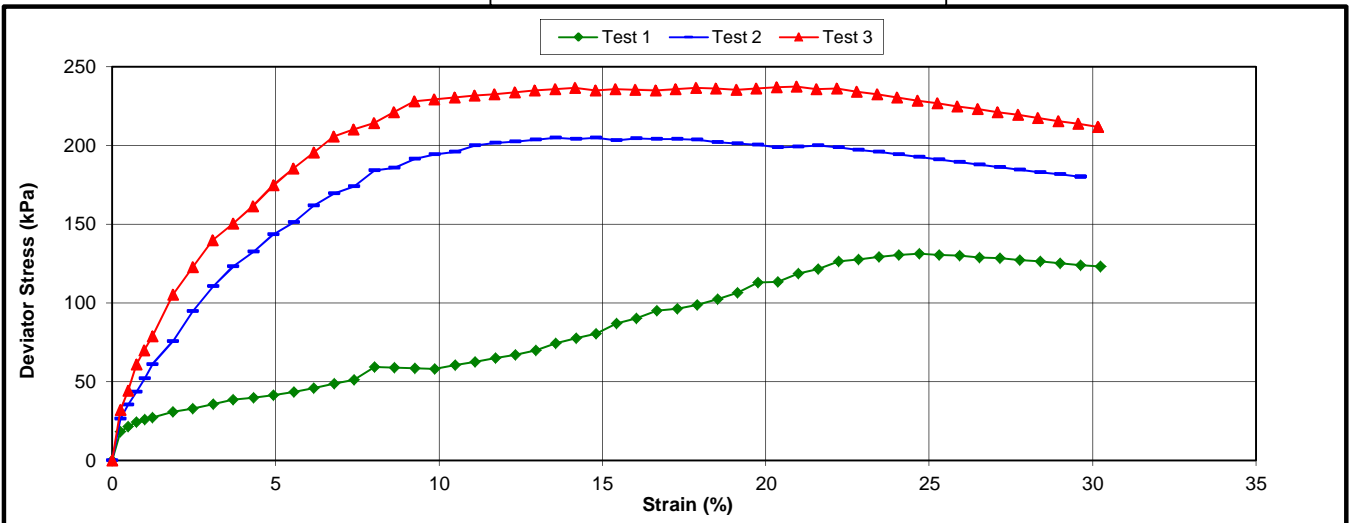
P.O. Box 30464,  
 MAYVILLE, 4058  
 Fax : (031) 201-7920

|   | Test 1 | Test 2 | Test 3 |
|---|--------|--------|--------|
| <b>Normal Stress (kN/m<sup>2</sup>)</b> | 100    | 200    | 400    |
| <b>Dry Density (kg/m<sup>3</sup>)</b>   | 1075   | 1088   | 1074   |
| <b>NMC(%)</b>                           | 56.0   | 56.2   | 57.1   |
| <b>Axial Strain (%)</b>                 | 24.69  | 13.58  | 20.94  |
| <b>Shear Stress at Failure (kPa)</b>    | 65     | 102    | 119    |

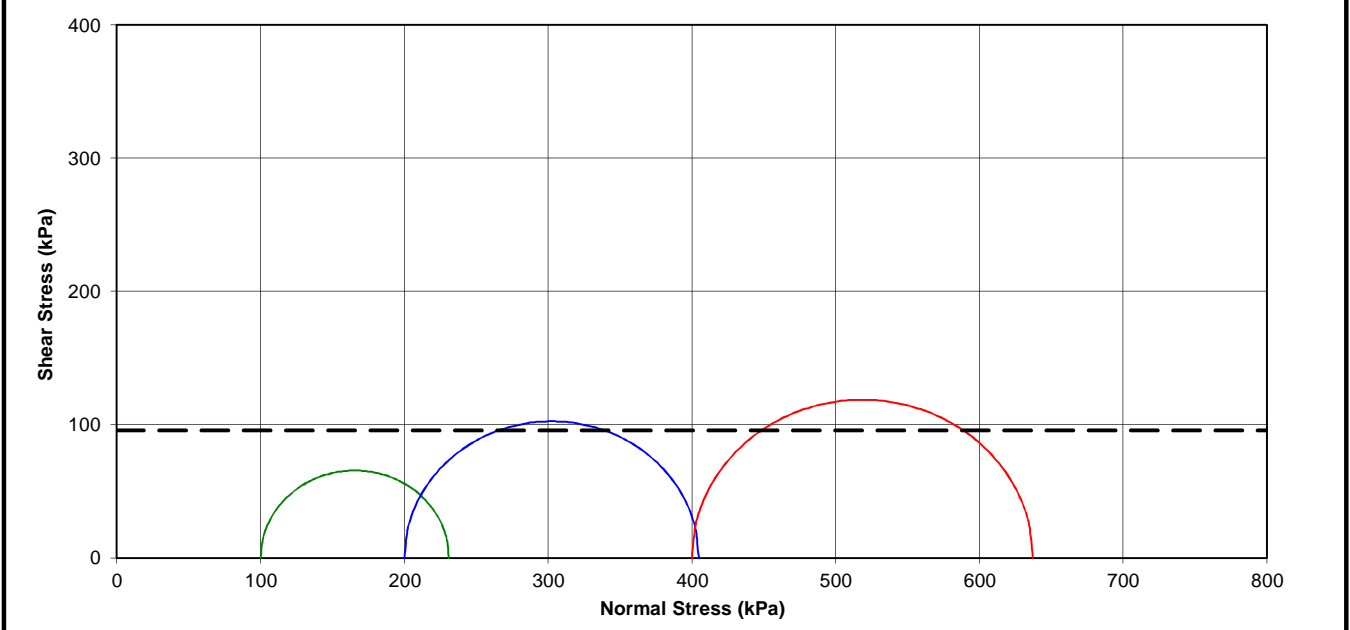
**Average Cohesion**

C (kPa) 96

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**







Sample No.: 1370-BHS06-S02-25.00

sheet: 2/2

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306645.11

Analysis: UU Triaxial test

Y - coordinate: -1778.59

Sample Location: BHS06

Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -22.300 -22.900

Material: silty CLAY

m below platform: 25.000 25.600

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project: Durban Harbour  
 Ref no.: 6630  
 Lab no.: 11140  
 Depth (m): 25.00 - 25.60  
 Position: BH 506 - 502  
 Description: -

**THEKWINI SOILS LAB. CC**

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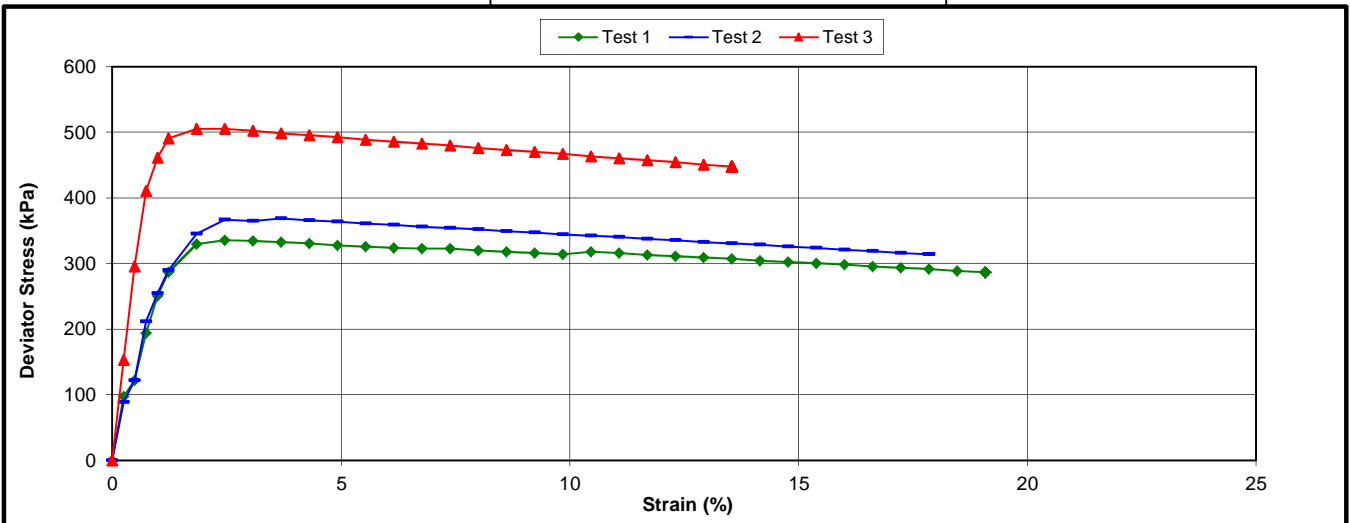


|                                    | Test 1 | Test 2 | Test 3 |
|------------------------------------|--------|--------|--------|
| Normal Stress (kN/m <sup>2</sup> ) | 100    | 200    | 400    |
| Dry Density (kg/m <sup>3</sup> )   | 1101   | 1091   | 1099   |
| NMC(%)                             | 52.0   | 52.2   | 53.6   |
| Axial Strain (%)                   | 2.46   | 3.69   | 1.85   |
| Shear Stress at Failure (kPa)      | 167    | 184    | 252    |

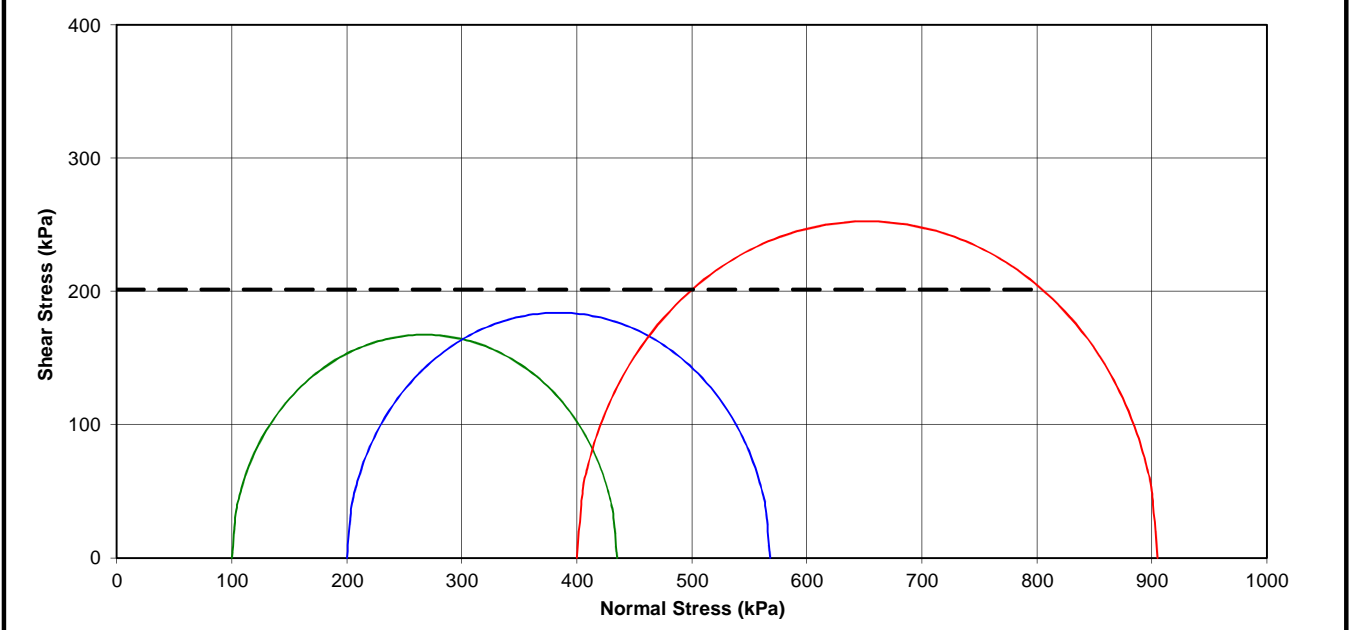
Average Cohesion

C (kPa) 201

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**







Sample No.: 1370-BHS06-S03-29.50

sheet: 1/2

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306645.11

Analysis: UU Triaxial test

Y - coordinate: -1778.59

Sample Location: BHS06

Z - sample depth: top bottom

Sample Type: Shelby tube

mCD: -26.800 -27.400

Material: silty sandy CLAY

m below platform: 29.500 30.100

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST**

Project Durban Harbour  
 Ref no. 6630  
 Lab no. 11141  
 Depth (m): 29.50 - 30.10  
 Position: BH 506 - 503  
 Description: -

**THEKWINI SOILS LAB. CC**

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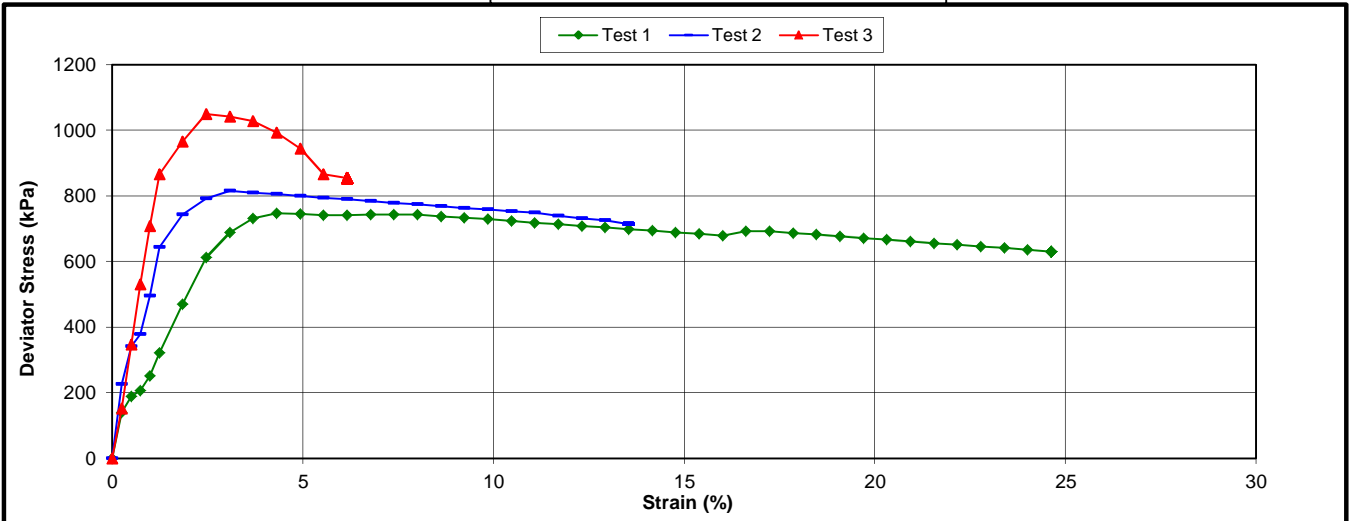


|                                    | Test 1 | Test 2 | Test 3 |
|------------------------------------|--------|--------|--------|
| Normal Stress (kN/m <sup>2</sup> ) | 100    | 200    | 400    |
| Dry Density (kg/m <sup>3</sup> )   | 1472   | 1470   | 1472   |
| NMC(%)                             | 33.1   | 32.0   | 32.7   |
| Axial Strain (%)                   | 4.31   | 3.08   | 2.46   |
| Shear Stress at Failure (kPa)      | 374    | 407    | 524    |

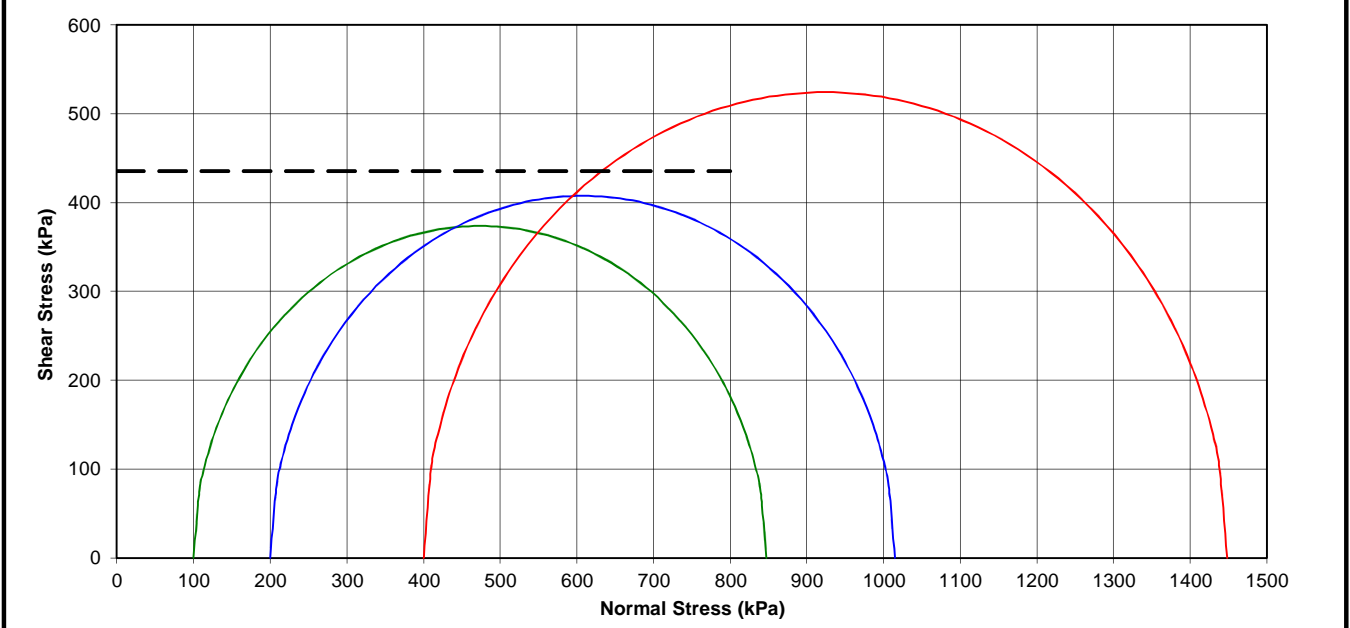
Average Cohesion

C (kPa) 435

**Deviator Stress vs Axial Strain**



**Shear Stress vs Normal Stress**







| Laboratory Test Summary                    |                 | sheet: 1/1           |                 |
|--|-----------------|----------------------|-----------------|
| <b>Laboratory:</b> Stellenbosch University |                 | <b>Sample No.:</b>   | <b>Lab No.:</b> |
| <b>Analysis:</b> Triaxial tests            |                 | 1370-BHL01-S03-25.50 | 26.10 m         |
| <b>Sample No.:</b>                         | <b>Lab No.:</b> | 1370-BHL01-S05-28.00 | 28.60 m         |
| 1370-BHL01-S01-20.00                       | 20.60 m         | 1370-BHL01-S07-30.20 | 30.80 m         |
| 1370-BHL01-S02-21.50                       | 22.10 m         | 1370-BHS03-S05-32.00 | 32.545 m        |

| Sample No.: | BOREHOLE | DEPTH    | WATER CONTENT   | VANE SHEAR                       | TRIAxIAL                   | CONSISTENCY   |
|-------------|----------|----------|-----------------|----------------------------------|----------------------------|---|
| BHL01-S01   | BH01     | 20,60 m  | 48 – 61%        | 28 – 34 kPa (bottom)             | $c_u = 27 - 42$ kPa        | Softer at top to stiffer at bottom                        |
| BHL01-S02   | BH01     | 22,10 m  | 79 – 93%??????? | 32 – 36 kPa (150 mm from bottom) | $c_u = 34 - 46$ kPa        | Softer in middle, stiffer top and bottom                  |
| BHL01-S03   | BH01     | 26,10 m  | 66%             | 36 – 39 kPa (150 mm from bottom) | $c_u = 42$ kPa             | Medium stiff over whole length                            |
| BHL01-S05   | BH01     | 28,60 m  | 48 – 55%        | Not done due to lumps            | $c' = 0; \phi' = 28^\circ$ | Stiff but with hard, brittle lumps                        |
| BHL01-S07   | BH01     | 30,80 m  | 47 – 56%        | 8 – 12 kPa (at bottom)           | $c_u = 9$ and 13 kPa       | Very soft over whole length                               |
| BHS03-S05   | BH03     | 32,545 m | 36 – 44%        | Not done, insufficient material  | $c_u = 47$ and 57 kPa      | Very stiff parts but soggy sections with water oozing out |



|                                     |                      |             |
|-------------------------------------|----------------------|-------------|
| <b>Laboratory Summary Sketch</b>    |                      | sheet: 1/1  |
| Laboratory: Stellenbosch University |                      | Sample No.: |
| Analysis: Triaxial tests            |                      | Lab No.:    |
|                                     | 1370-BHL01-S01-20.00 | 20.60 m     |
|                                     | 1370-BHL01-S02-21.50 | 22.10 m     |
|                                     | 1370-BHL01-S03-25.50 | 26.10 m     |

**BHL01-S01**

|         |     |   |   |                       |                       |        |                       |      |    |        |
|---------|-----|---|---|-----------------------|-----------------------|--------|-----------------------|------|----|--------|
| BH01    | Top | 0 | 3 | Triaxial 3<br>300 kPa | Triaxial 1<br>100 kPa | oedom. | Triaxial 2<br>200 kPa | Vane | 16 | Bottom |
| 20,60 m |     |   |   |                       |                       |        |                       |      | 3  |        |

Vane shear: 28, 32, 32, 34 kPa

Consistency: { Triaxial 1 soft  $w = 61,11\%$   $C_u = 30$  kPa

Water content: { Triaxial 2 medium stiff  $w = 61,11\%$   $C_u = 42$  kPa

$C_u$ : { Triaxial 3 soft  $w = 48,11\%$   $C_u = 27$  kPa

**BHL01-S02**

|         |     |   |   |        |                       |        |                       |      |                       |    |        |
|---------|-----|---|---|--------|-----------------------|--------|-----------------------|------|-----------------------|----|--------|
| BH01    | Top | 0 | 3 | oedom. | Triaxial 3<br>300 kPa | oedom. | Triaxial 1<br>100 kPa | Vane | Triaxial 2<br>200 kPa | 16 | Bottom |
| 22,10 m |     |   |   |        |                       |        |                       |      |                       | 3  |        |

Vane shear: 32, 36, 34, 36 kPa

Consistency: { Triaxial 1 medium stiff  $w = 93\%?$   $C_u = 42$  kPa

Water content: { Triaxial 2 soft  $w = 93\%?$   $C_u = 34$  kPa

$C_u$ : { Triaxial 3 medium stiff  $w = 79,17\%?$   $C_u = 46$  kPa

**BHL01-S03**

|         |     |   |   |        |                       |        |                       |      |                       |    |        |
|---------|-----|---|---|--------|-----------------------|--------|-----------------------|------|-----------------------|----|--------|
| BH01    | Top | 0 | 3 | oedom. | Triaxial 3<br>300 kPa | oedom. | Triaxial 2<br>200 kPa | Vane | Triaxial 1<br>100 kPa | 16 | Bottom |
| 26,10 m |     |   |   |        |                       |        |                       |      |                       | 3  |        |

Vane shear: 36, 38, 38, 39 kPa

Consistency: { Triaxial 1 medium stiff  $w =$   $C_u = 43$  kPa

Water content: { Triaxial 2 medium stiff  $w =$   $C_u = 42$  kPa

$C_u$ : { Triaxial 3 medium stiff  $w =$  No result\*\*

\*\* Specimen failed prematurely @ 21 kPa, probably because of membrane leakage or damage during preparation.



**Laboratory Summary Sheet** sheet: 1/1

**Laboratory:** Stellenbosch University  
**Analysis:** Moisture content

| Sample No.:           | Sample           | Moisture (%) |
|-----------------------|------------------|--------------|
| 1370-BHL01-S01-20.00a | 20.6 top part    | 48.11        |
| 1370-BHL01-S01-20.00b | 20.6 bottom part | 61.12        |
| 1370-BHL01-S02-22.50a | 22.10 top        | 79.17        |
| 1370-BHL01-S02-22.50b | 22.10 bottom     | 93 ??        |
| 1370-BHL01-S03-25.50a | 26,10            | 66           |
| 1370-BHL01-S05-28.00a | 28.6 top         | 55.82        |
| 1370-BHL01-S05-28.00b | 28.6 bottom      | 48.02        |
| 1370-BHL01-S07-30.20a | 30.8 top         | 47.72        |
| 1370-BHL01-S07-30.20b | 30.8 bottom      | 56.53        |
| 1370-BHS03-S05-32.00a | 32.56 bottom     | 44.52        |



**Laboratory Summary Sketch**

sheet: 1/1

Laboratory: Stellenbosch University  
Analysis: Triaxial tests

Sample No.: 1370-BHL01-S05-28.00 28.60 m  
1370-BHL01-S07-30.20 30.80 m  
1370-BHS03-S05-32.00 32.545 m

**BHL01-S05**

BH01  
28,60 m

|     |   |   |                       |   |                       |      |   |                       |        |
|-----|---|---|-----------------------|---|-----------------------|------|---|-----------------------|--------|
| Top | 0 | 3 | Triaxial 3<br>300 kPa | 0 | Triaxial 2<br>200 kPa | Vane | 0 | Triaxial 1<br>100 kPa | Bottom |
|-----|---|---|-----------------------|---|-----------------------|------|---|-----------------------|--------|

Vane shear: 38, 38, 39, 41, 40 kPa  
 Consistency: { Triaxial 1 medium stiff  $w = 48,02\%$   
 Water content: { Triaxial 2 medium stiff  $w = 55,82\%$   
 $c', \phi'$ : { Triaxial 3 contained lumps no results \*\*  
 $c' = 0 \text{ kPa}$   
 $\phi' = 28^\circ$

\*\* Triaxial specimen 3 could not be trimmed because of presence of hard, brittle lumps.

**BHL01-S07**

BH01  
30,80 m

|     |   |   |                       |   |      |                       |   |                       |        |
|-----|---|---|-----------------------|---|------|-----------------------|---|-----------------------|--------|
| Top | 0 | 3 | Triaxial 3<br>300 kPa | 0 | Vane | Triaxial 1<br>200 kPa | 0 | Triaxial 2<br>100 kPa | Bottom |
|-----|---|---|-----------------------|---|------|-----------------------|---|-----------------------|--------|

Vane shear: 7, 9, 6, 9 kPa  
 Consistency: { Triaxial 1 very soft  $w = 56,53\%$   $C_u = 13 \text{ kPa}$   
 Water content: { Triaxial 2 very soft  $w = 56,53\%$   $C_u = 9 \text{ kPa}$   
 $C_u$ : { Triaxial 3 very soft  $w = 47,72\%$   $C_u = 13 \text{ kPa}$

**BHS03-S05**

BH03  
32,545 m

|     |   |   |     |                       |     |   |                       |        |
|-----|---|---|-----|-----------------------|-----|---|-----------------------|--------|
| Top | 0 | 3 | B** | Triaxial 2<br>250 kPa | A** | 0 | Triaxial 1<br>100 kPa | Bottom |
|-----|---|---|-----|-----------------------|-----|---|-----------------------|--------|

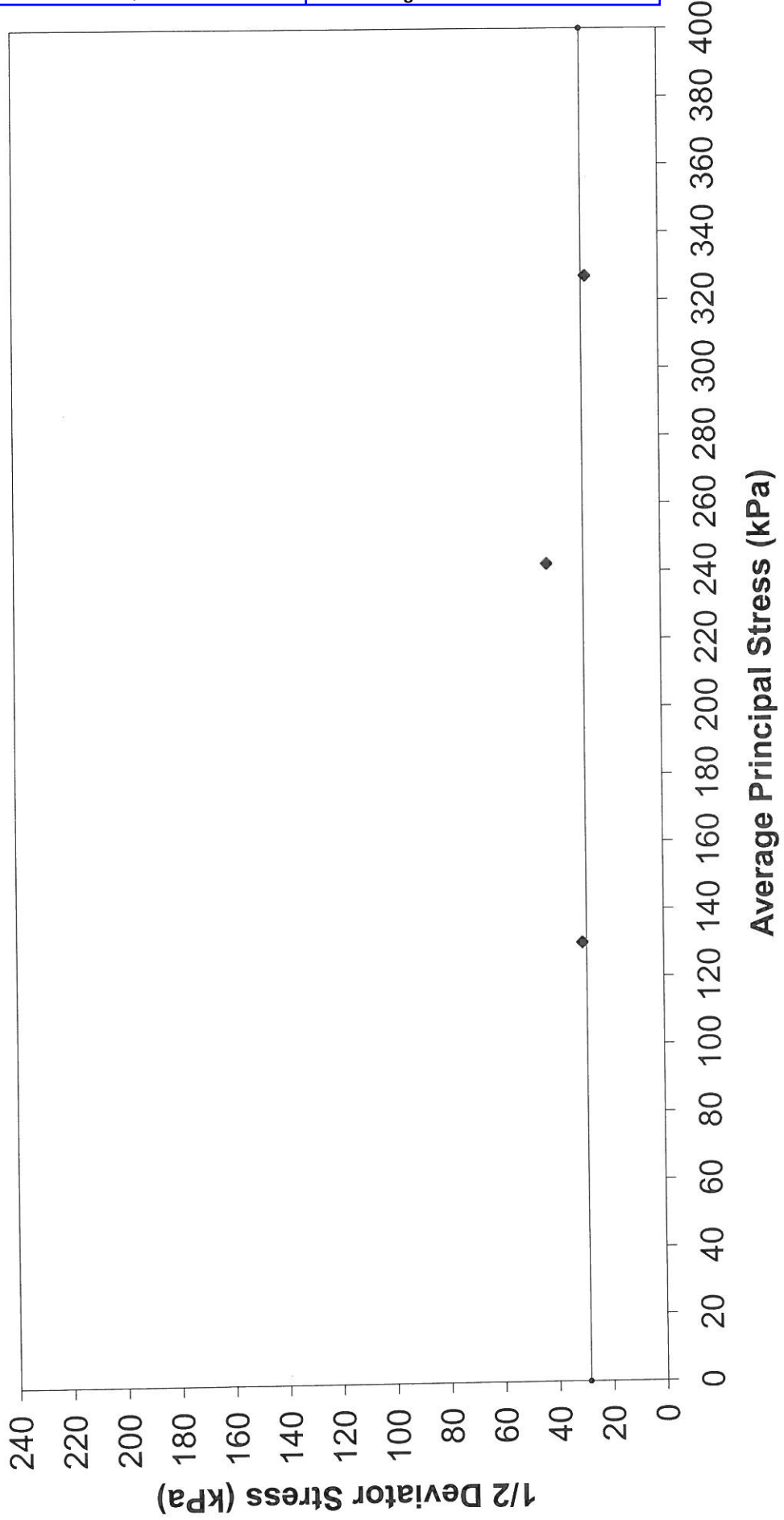
Vane shear: Not done due to soggy parts A and B  
 Consistency: { Triaxial 1 medium stiff to stiff  $w = 36,07\%$   $C_u = 47 \text{ kPa}$   
 Water content: { Triaxial 2 medium stiff to stiff  $w = 36,04\%$   $C_u = 57 \text{ kPa}$   
 $C_u$ :

\*\* Parts A and B were very soggy, almost like liquid, with slippery water oozing out. Oedometer specimen was part of stiffer material, yet may be softer than Triaxial 1 specimen.



|                                     |                              |            |
|-------------------------------------|------------------------------|------------|
| Sample No.: 1370-BHL01-S01-20.00    |                              | sheet: 1/1 |
| Laboratory: Stellenbosch University | X - coordinate: 3306779.02   |            |
| Analysis: UU Triaxial test          | Y - coordinate: -1177.11     |            |
| Sample Location: BHL01              | Z - sample depth: top bottom |            |
| Sample Type: Shelby tube            | mCD: -16.280                 | -16.880    |
| Material: silty CLAY                | m below ground: 20.000       | 20.600     |

Durban Harbour Triaxial U-U Tests: BH01 20,60 m  
 $\phi_u = 0^\circ$ ,  $c_u$  from 27 to 42 kPa, conservative value = 28,5 kPa





Sample No.: 1370-BHL01-S02-21.50

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306779.02

Analysis: UU Triaxial test

Y - coordinate: -1177.11

Sample Location: BHL01

Z - sample depth: top bottom

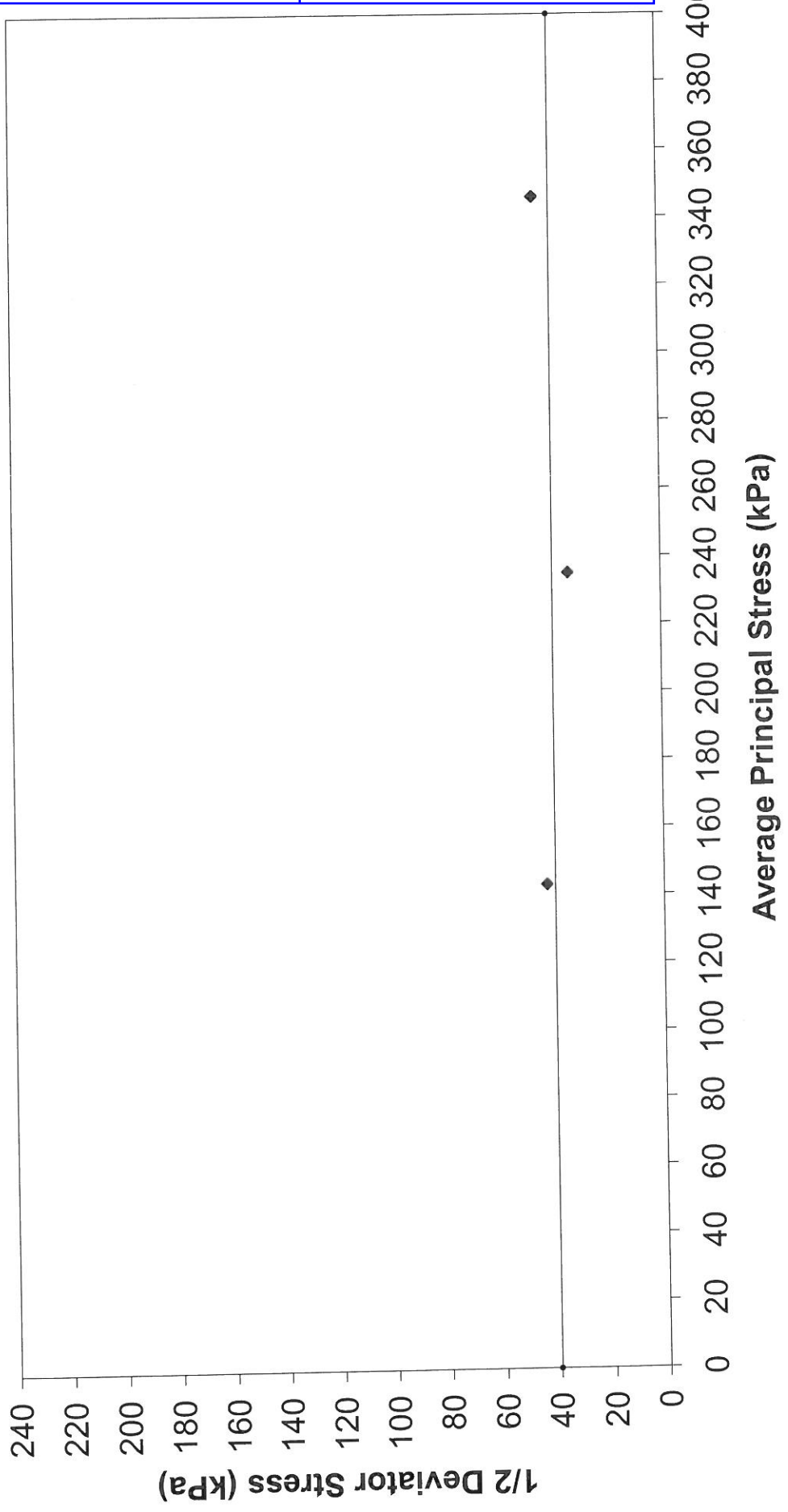
Sample Type: Shelby tube

mCD: -17.780 -18.380

Material: silty CLAY

m below ground: 21.500 22.100

Durban Harbour Triaxial U-U Tests: BH01 22,10 m  
 $\phi_u = 0^\circ$ ,  $c_u$  from 34 to 46 kPa, conservative value = 40 kPa





Sample No.: 1370-BHL01-S03-25.50

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306779.02

Analysis: UU Triaxial test

Y - coordinate: -1177.11

Sample Location: BHL01

Z - sample depth: top bottom

Sample Type: Shelby tube

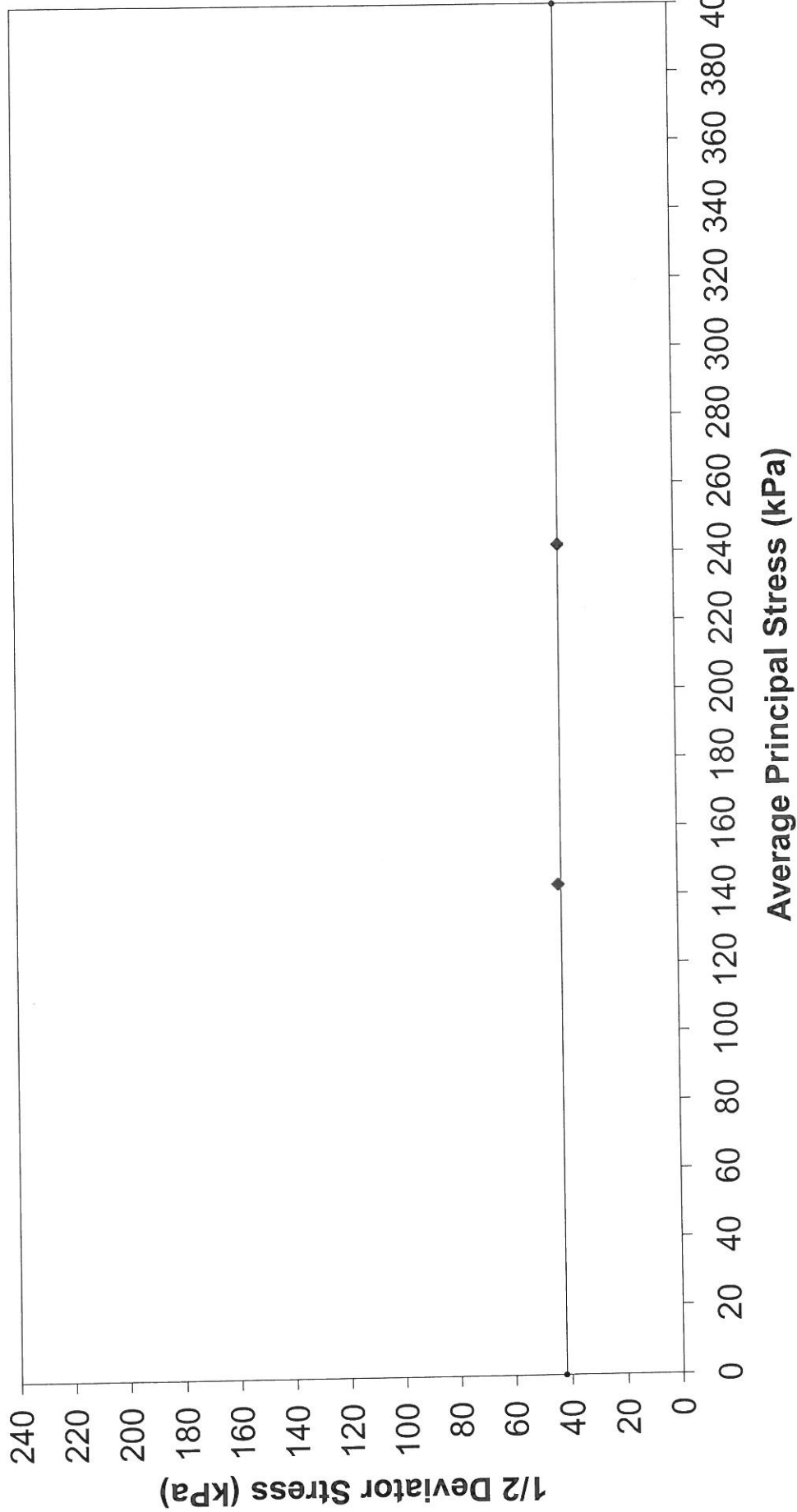
mCD: -21.780 -22.380

Material: silty CLAY

m below ground: 25.500 26100

# Durban Harbour Triaxial U-U Tests: BH01 26,10 m

$$\phi_u = 0^\circ, c_u = 42 \text{ kPa}$$







Sample No.: 1370-BHL01-S05-28.00

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306779.02

Analysis: CU Triaxial test

Y - coordinate: -1177.11

Sample Location: BHL01

Z - sample depth: top bottom

Sample Type: Shelby tube

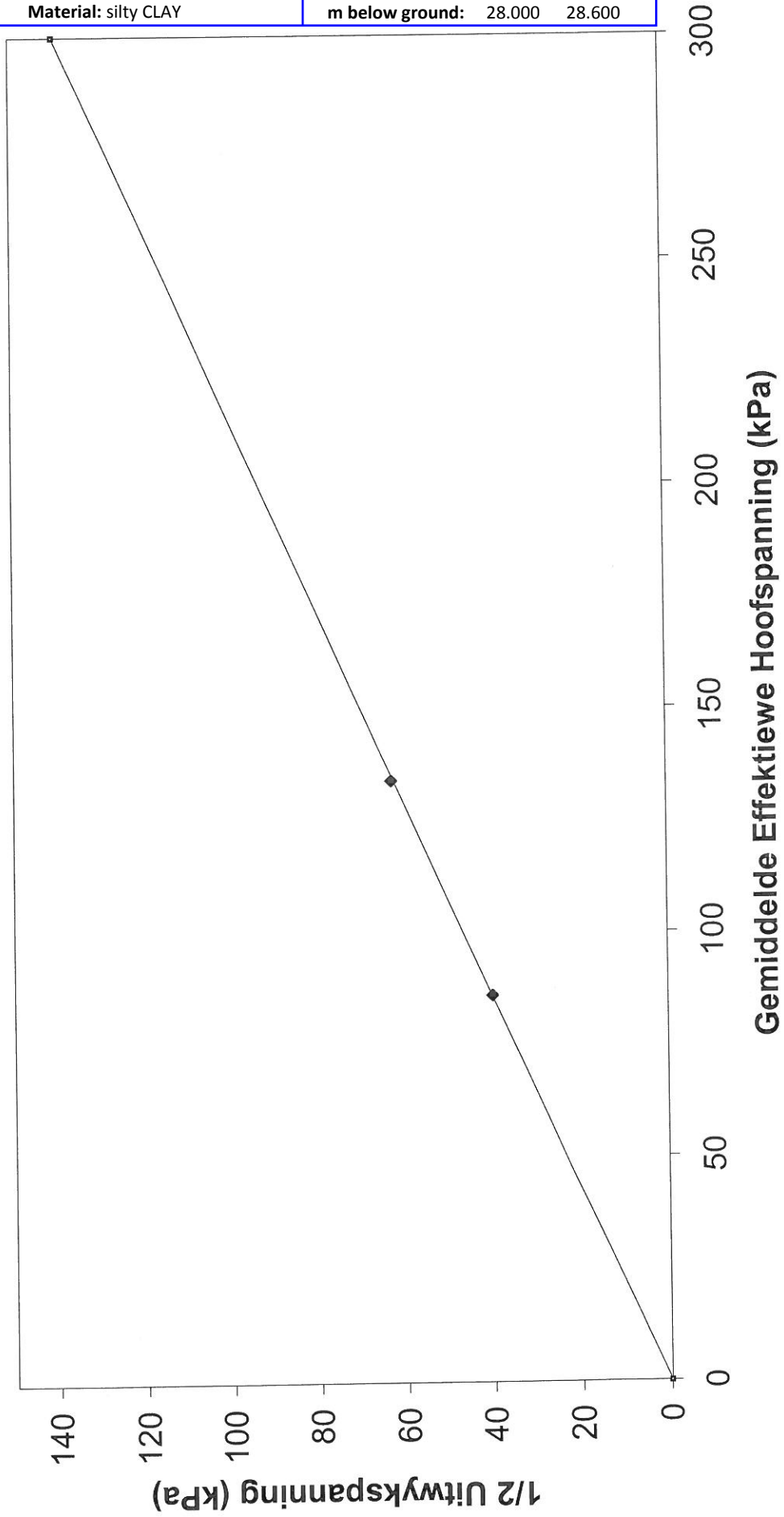
mCD: -24.280 -24.880

Material: silty CLAY

m below ground: 28.000 28.600

# TRIAXIAL C-U TESTS: BH01 28,60 m

$\phi' = 28^{\circ}$  ;  $c' = 0$  kPa







Sample No.: 1370-BHL01-S07-30.20

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306779.02

Analysis: UU Triaxial test

Y - coordinate: -1177.11

Sample Location: BHL01

Z - sample depth: top bottom

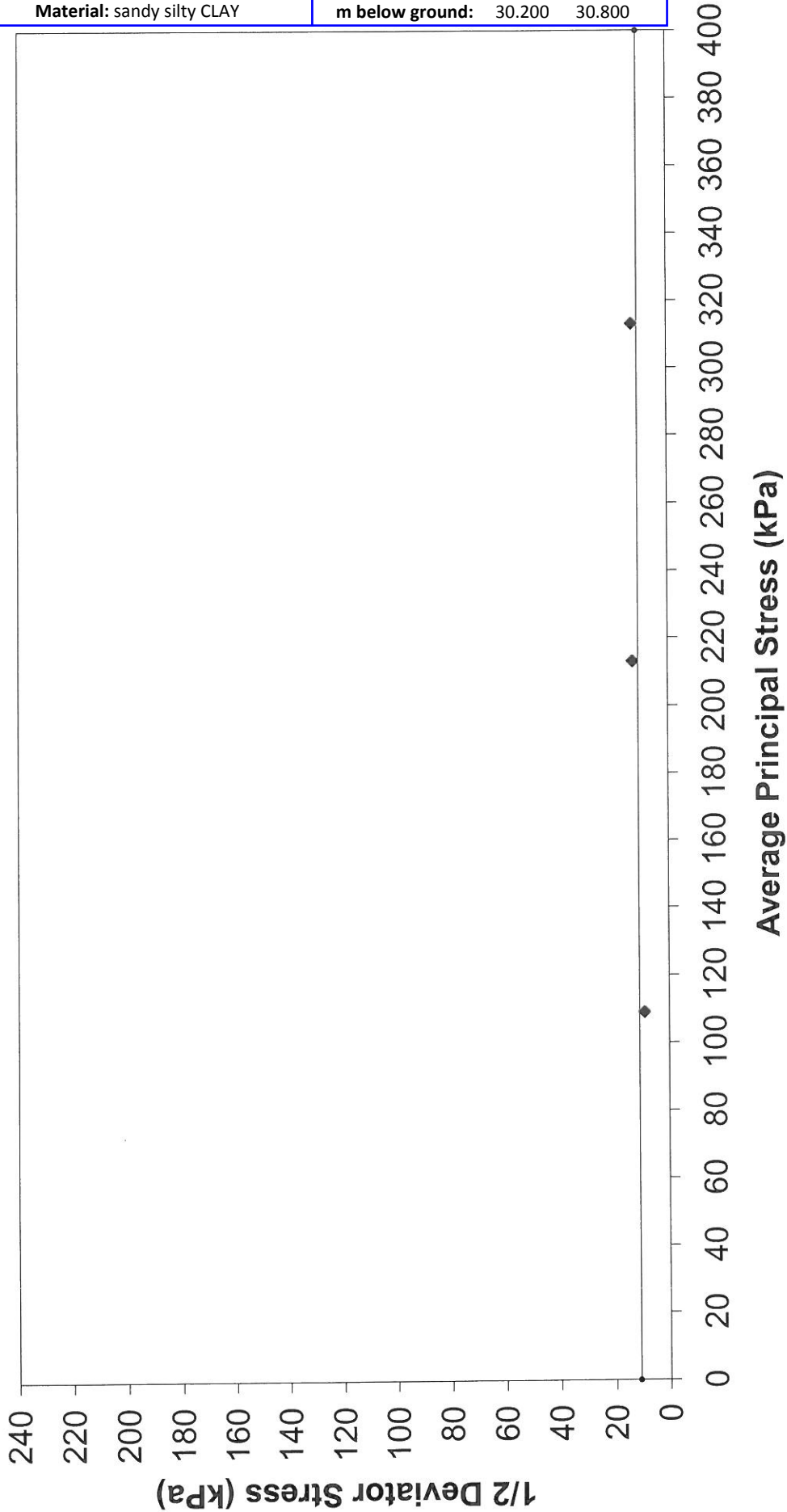
Sample Type: Shelby tube

mCD: -26.480 -27.080

Material: sandy silty CLAY

m below ground: 30.200 30.800

Durban Harbour Triaxial U-U Tests: BH01 30,80 m  
 $\phi_u = 0^\circ$ ,  $c_u$  between 9 and 13 kPa, conservative value = 11 kPa





Sample No.: 1370-BHS03-S05-32.00

sheet: 1/1

Laboratory: Stellenbosch University

X - coordinate: 3306549.66

Analysis: UU Triaxial test

Y - coordinate: -2230.81

Sample Location: BHL01

Z - sample depth: top bottom

Sample Type: Shelby tube

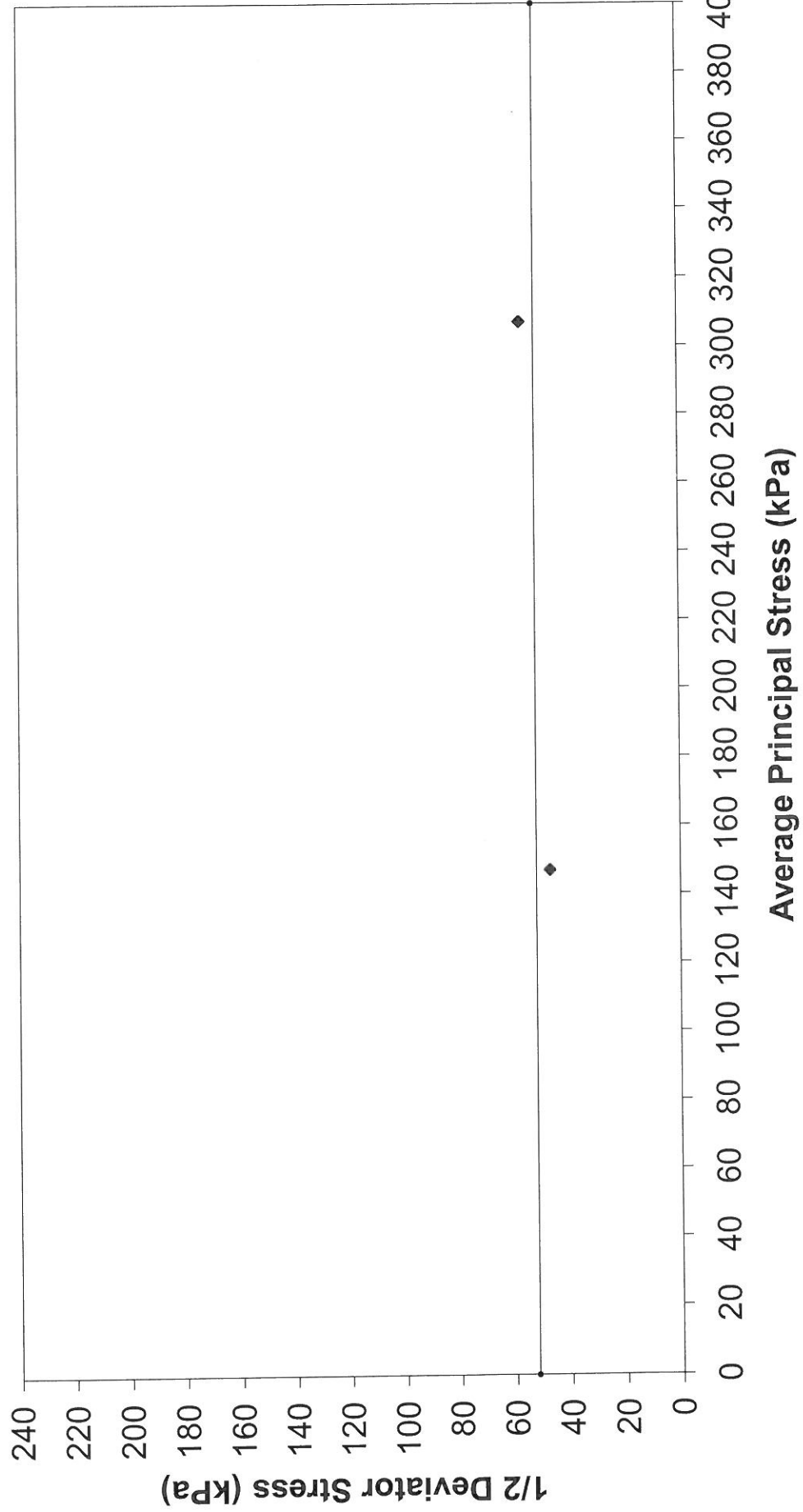
mCD: -28.940 -29.505

Material: silty CLAY

m below platform: 32.000 32.565

## Durban Harbour Triaxial U-U Tests: BH03 32,545 m

$\phi_u = 0^\circ$ ,  $c_u$  between 47 and 57 kPa but soggy in between





## 4.2: LABORATORY TEST RESULTS – BASIN DREDGE AREA



Sample No.: 1370-BDS01-S04-21.00

sheet: 1/1

Laboratory: Thekwini Soils Lab. cc

X - coordinate: 3306450.00

Analysis: Indicator tests

Y - coordinate: -1796.00

Sample Location: BDS01

Z - sample depth: top bottom

Sample Type: single SPT

mCD: -18.570 -19.570

Material: medium fine SAND

m below platform: 21.000 22.000

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
Tollgate, DURBAN

P.O. Box 30464,  
MAYVILLE, 4058

Tel : (031) 201-8992

Fax : (031) 201-7920

**Project:** 1370 Gredge Area Durban Harbour

**Date :** 01-11-2012

**Ref no.:** 6630

**Lab no.:** 10148

**Borehole/Pit no.:** BDS01\_S04

**Tester :** Patrick

**Depth:** -19m cd

**Standard Grading:** TMH Method A1(a)

**Standard Hydrometer:** TMH Method A6

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 100.0    |
| 0.425            | 100.0    |
| 0.25             | 98.9     |
| 0.15             | 41.4     |
| 0.075            | 11.3     |
| 0.05             | 10.1     |
| 0.02             | 7.7      |
| 0.005            | 6.4      |
| 0.002            | 5.5      |

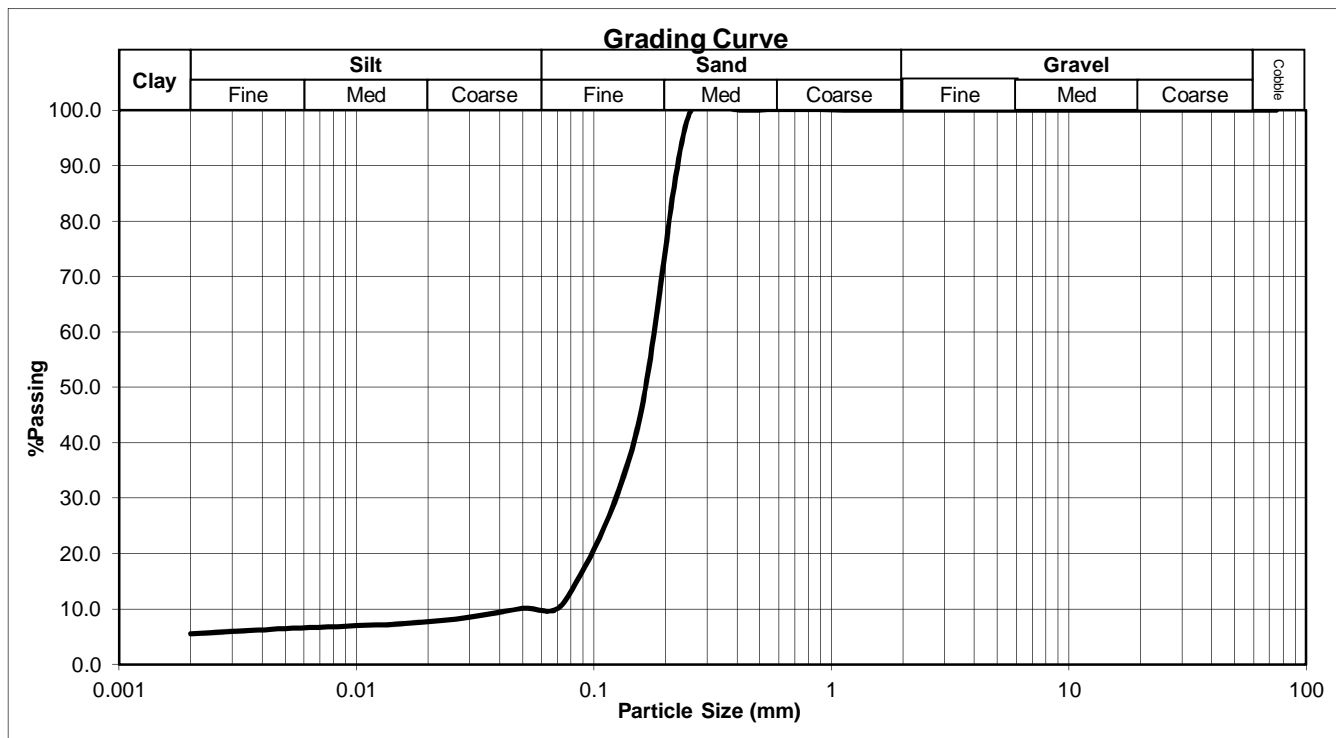
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 89.4 |
| Coarse         | 0.0  |
| Medium         | 29.8 |
| Fine           | 59.6 |
| Silt%          | 5.1  |
| Coarse         | 2.9  |
| Medium         | 1.1  |
| Fine           | 1.1  |
| Clay%          | 5.5  |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0484 |
| Uniformity Coefficient | 3.65   |
| Grading Modulus        | 0.89   |

| CLASSIFICATION             |         |
|----------------------------|---------|
| Potential Expansiveness    | Low     |
| Group Index                | 0       |
| AASHTO Soil Classification | A - 2   |
| Unified Classification     | SP - SM |

|                 |      |
|-----------------|------|
| Organic Content | 1.83 |
|-----------------|------|



Ref no.: 6630

Fig no.: Patrick



Sample No.: 1370-BDS02-S06-22.00

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306250.00

Analysis: Indicator tests

Y - coordinate: -2207.00

Sample Location: BDS02

Z - sample depth: top bottom

Sample Type: single SPT

mCD: -19.507 -20.207

Material: silty fine SAND

m below platform: 22.000 22.700

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
Tollgate, DURBAN

P.O. Box 30464,  
MAYVILLE, 4058

Tel : (031) 201-8992

Fax : (031) 201-7920

Project: 1370 Gredge Area Durban Harbour

Date: 01-11-2012

Ref no.: 6630

Lab no.: 10150

Borehole/Pit no.: BDS02\_S06

Tester: Patrick

Depth: -20m cd

Standard Grading: TMH Method A1(a)

Standard Hydrometer: TMH Method A6

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.7      |
| 0.25             | 94.2      |
| 0.15             | 29.4      |
| 0.075            | 9.6       |
| 0.05             | 9.6       |
| 0.02             | 6.6       |
| 0.005            | 6.6       |
| 0.002            | 5.8       |

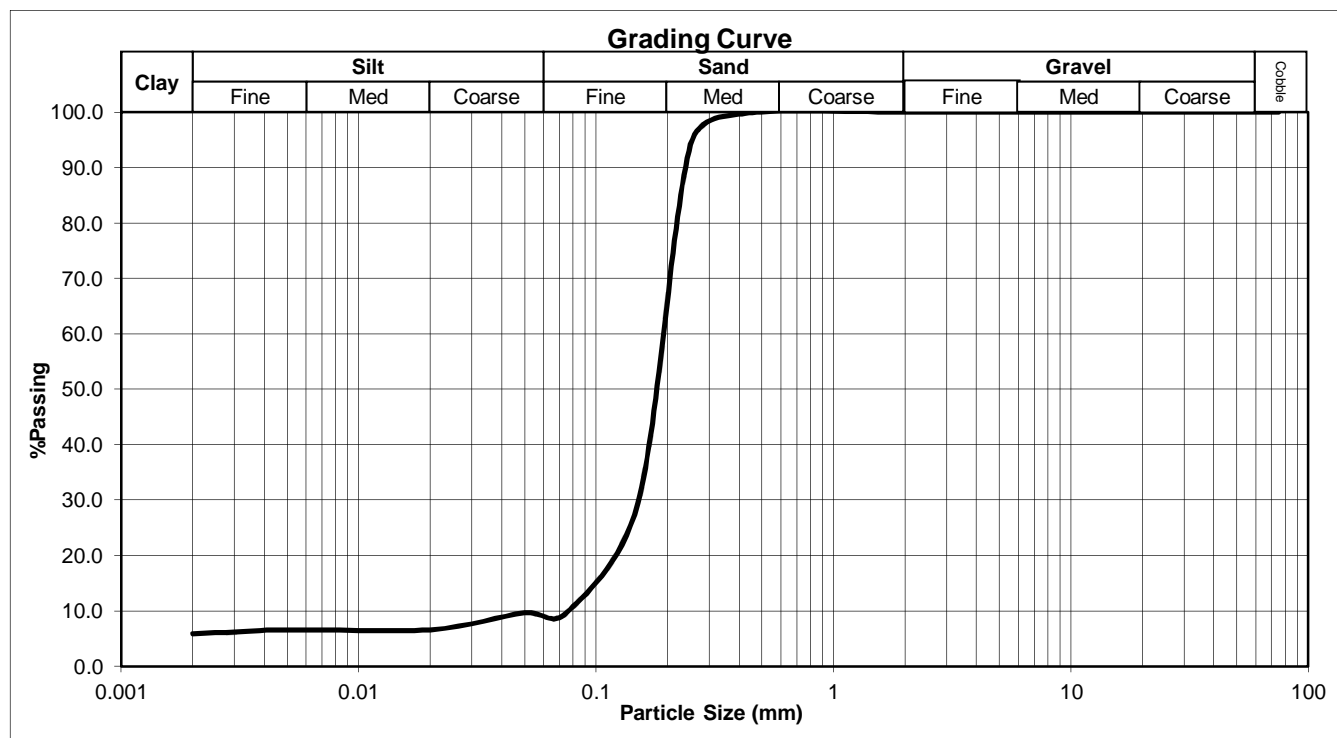
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 90.4 |
| Coarse         | 0.2  |
| Medium         | 38.0 |
| Fine           | 52.2 |
| Silt%          | 3.8  |
| Coarse         | 3.1  |
| Medium         | 0.0  |
| Fine           | 0.8  |
| Clay%          | 5.8  |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0759 |
| Uniformity Coefficient | 2.51   |
| Grading Modulus        | 0.91   |

| CLASSIFICATION             |         |
|----------------------------|---------|
| Potential Expansiveness    | Low     |
| Group Index                | 1       |
| AASHTO Soil Classification | A - 2   |
| Unified Classification     | SP - SM |

|                 |      |
|-----------------|------|
| Organic Content | 1.81 |
|-----------------|------|



Ref no.: 6630

Fig no.: Patrick



Sample No.: 1370-BDS03-S05-18.50

sheet: 1/1

Laboratory: Thekwini Soil Lab. cc

X - coordinate: 3306153.00

Analysis: Indicator tests

Y - coordinate: -2498.00

Sample Location: BDS03

Z - sample depth: top bottom

Sample Type: NXM core barrel

mCD: -16.150 -17.250

Material: clayey silty fine SAND

m below platform: 18.500 19.600

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,  
Tollgate, DURBAN

P.O. Box 30464,  
MAYVILLE, 4058

Tel : (031) 201-8992

Fax : (031) 201-7920

Project: 1370 Gredge Area Durban Harbour

Date : 01-11-2012

Ref no.: 6630

Lab no.: 10149

Borehole/Pit no.: BDS03\_S05

Tester : Patrick

Depth: -16.5m cd Standard Grading: TMH Method A1(a)

Standard Hydrometer: TMH Method A6

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.6      |
| 0.25             | 93.5      |
| 0.15             | 26.7      |
| 0.075            | 8.6       |
| 0.05             | 8.6       |
| 0.02             | 6.6       |
| 0.005            | 5.9       |
| 0.002            | 5.7       |

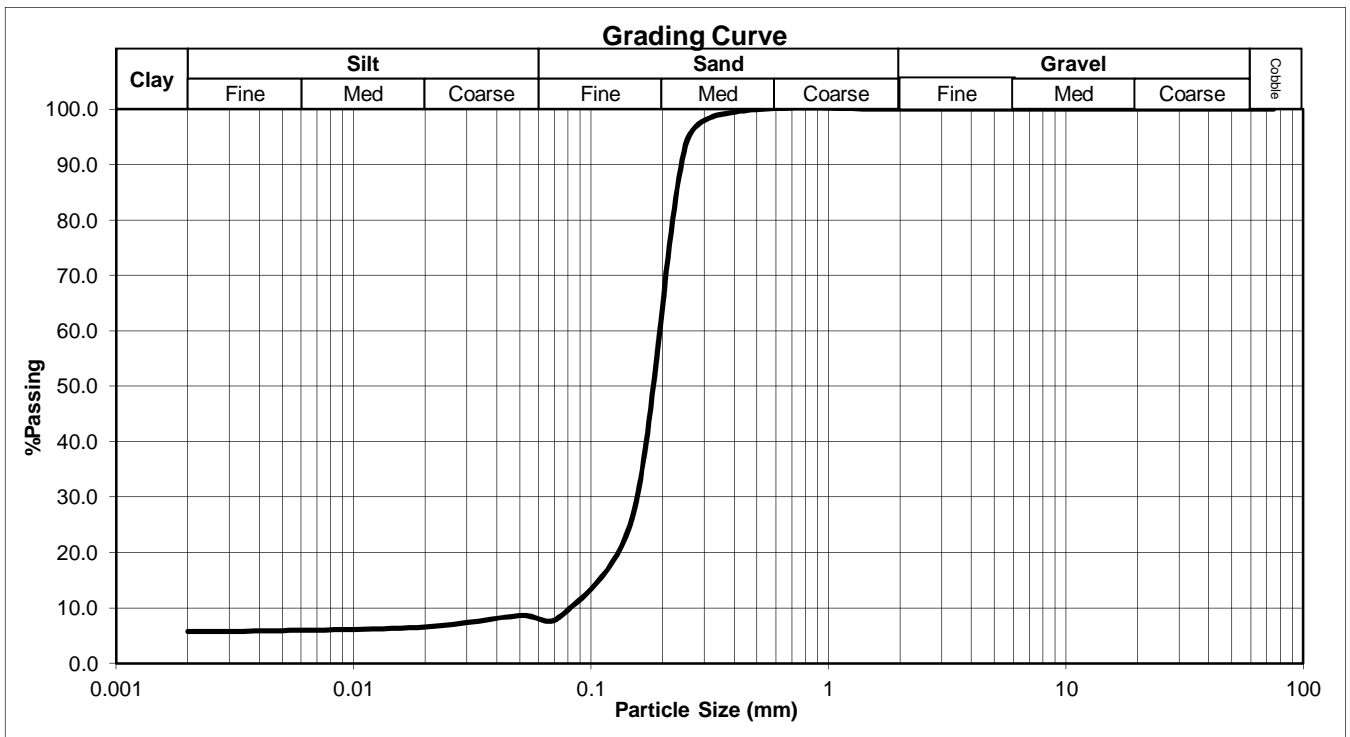
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 91.4 |
| Coarse         | 0.4  |
| Medium         | 39.6 |
| Fine           | 51.5 |
| Silt%          | 2.9  |
| Coarse         | 2.1  |
| Medium         | 0.6  |
| Fine           | 0.2  |
| Clay%          | 5.7  |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0791 |
| Uniformity Coefficient | 2.45   |
| Grading Modulus        | 0.92   |

| CLASSIFICATION             |         |
|----------------------------|---------|
| Potential Expansiveness    | Low     |
| Group Index                | 1       |
| AASHTO Soil Classification | A - 2   |
| Unified Classification     | SP - SM |

|                 |      |
|-----------------|------|
| Organic Content | 1.65 |
|-----------------|------|



Ref no.: 6630

Fig no.: Patrick



|                                   |                                     |                            |
|-----------------------------------|-------------------------------------|----------------------------|
| Sample No.: 1370-BDS03-S07-20.00  |                                     | sheet: 1/1                 |
| Laboratory: Thekwini Soil Lab. cc |                                     | X - coordinate: 3306153.00 |
| Analysis: Indicator tests         |                                     | Y - coordinate: -2498.00   |
| Sample Location: BDS03            | Z - sample depth: <u>top</u> bottom |                            |
| Sample Type: single SPT           | mCD: -17.650 -18.450                |                            |
| Material: silty CLAY              | m below platform: 20.000 20.800     |                            |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.  
68 Ridge Road,  
Tollgate, DURBAN P.O. Box 30464,  
MAYVILLE, 4058  
Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Gredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10151      **Borehole/Pit no.:** BDS03\_S07      **Tester :** Patrick

**Depth:** -18.2m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.6      |
| 0.25             | 99.1      |
| 0.15             | 85.9      |
| 0.075            | 73.1      |
| 0.05             | 71.9      |
| 0.02             | 58.2      |
| 0.005            | 51.9      |
| 0.002            | 41.2      |

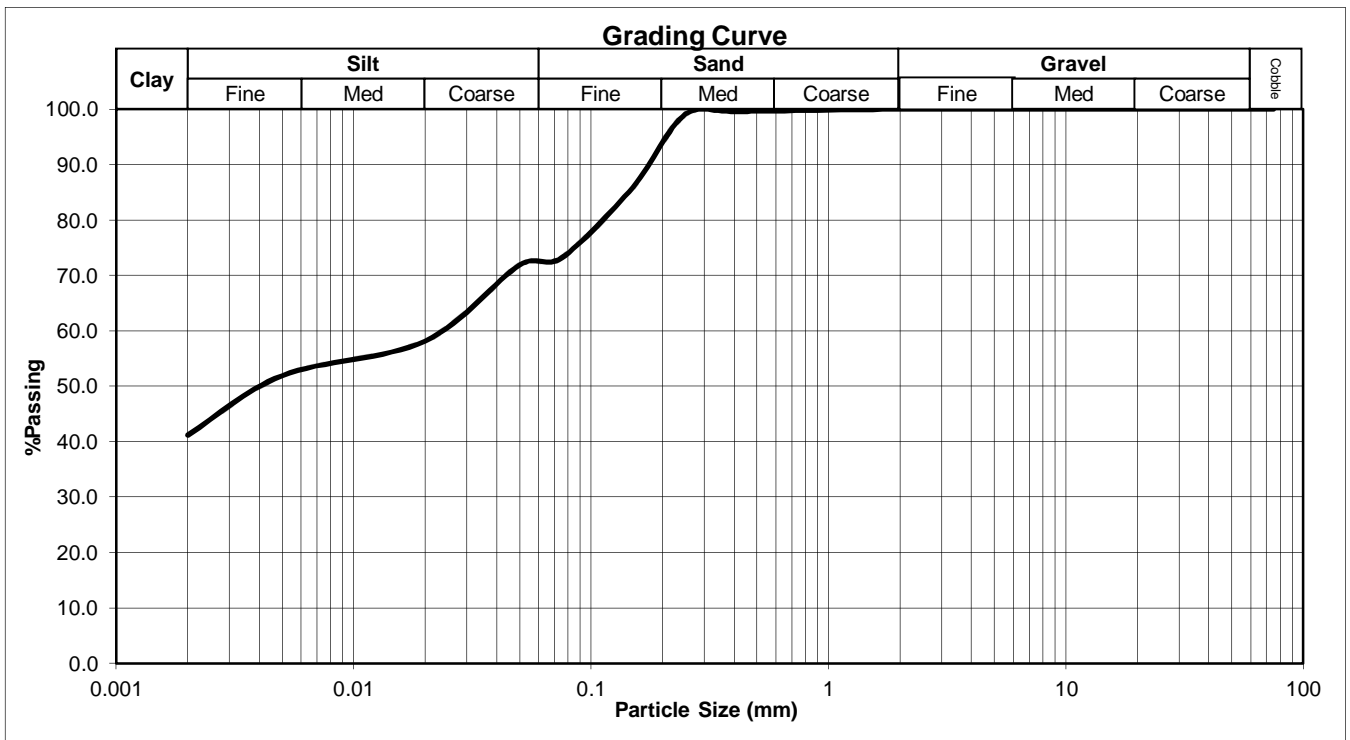
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 27.6 |
| Coarse         | 0.4  |
| Medium         | 7.1  |
| Fine           | 20.1 |
| Silt%          | 31.2 |
| Coarse         | 14.2 |
| Medium         | 5.8  |
| Fine           | 11.1 |
| Clay%          | 41.2 |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | <0.002 |
| Uniformity Coefficient | 19.12  |
| Grading Modulus        | 0.27   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Low      |
| Group Index                | 0        |
| AASHTO Soil Classification | A - 4    |
| Unified Classification     | ML or OL |

|                 |       |
|-----------------|-------|
| Organic Content | 11.64 |
|-----------------|-------|



Ref no.: 6630

Fig no.: Patrick



|                                   |  |            |
|-----------------------------------|--|------------|
| Sample No.: 1370-BDS04-S02-17.00  |  | sheet: 1/1 |
| Laboratory: Thekwini Soil Lab. cc | X - coordinate: 3306055.00                 |            |
| Analysis: Indicator tests         | Y - coordinate: -2600.00                   |            |
| Sample Location: BDS04            | Z - sample depth: <u>top</u> <u>bottom</u> |            |
| Sample Type: single SPT           | mCD: -14.655 -15.155                       |            |
| Material: fine SAND               | m below platform: 17.000 17.500            |            |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.  
68 Ridge Road,  
Tollgate, DURBAN P.O. Box 30464,  
MAYVILLE, 4058  
Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Dredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10146      **Borehole/Pit no.:** BDS04\_S02      **Tester :** Patrick

**Depth:** -15m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.8      |
| 0.25             | 92.1      |
| 0.15             | 85.5      |
| 0.075            | 66.1      |
| 0.05             | 66.1      |
| 0.02             | 52.9      |
| 0.005            | 30.1      |
| 0.002            | 30.1      |

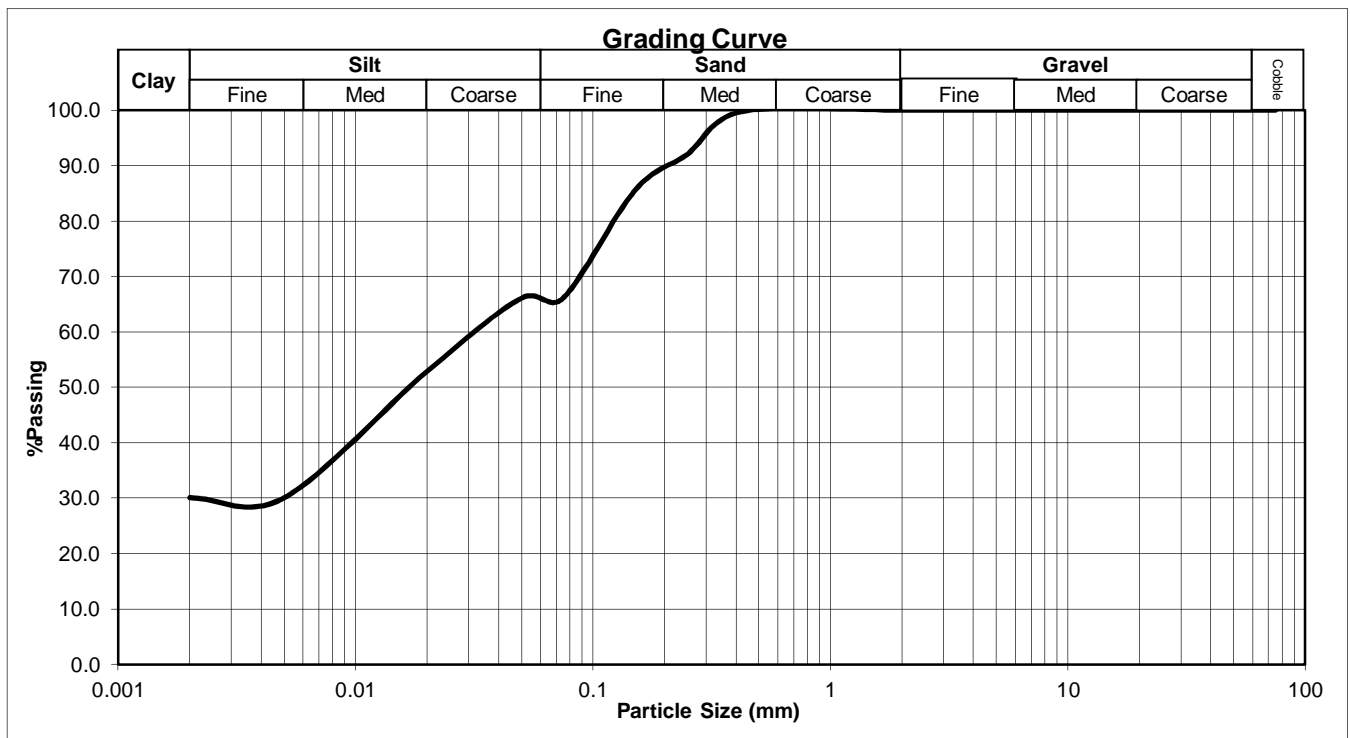
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 33.9 |
| Coarse         | 0.2  |
| Medium         | 11.0 |
| Fine           | 22.7 |
| Silt%          | 36.1 |
| Coarse         | 13.2 |
| Medium         | 21.3 |
| Fine           | 1.5  |
| Clay%          | 30.1 |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | <0.002 |
| Uniformity Coefficient | 25.98  |
| Grading Modulus        | 0.34   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Low      |
| Group Index                | 0        |
| AASHTO Soil Classification | A - 4    |
| Unified Classification     | ML or OL |

|                 |      |
|-----------------|------|
| Organic Content | 1.83 |
|-----------------|------|



Ref no.: 6630 Fig no.: Patrick





|  |  |   |
|--|--|---|
| <b>Sample No.:</b> 1370-BDS04-S03-23.00  |  | <b>sheet:</b> 1/1                                 |
| <b>Laboratory:</b> Thekwini Soil Lab. cc |  | <b>X - coordinate:</b> 3306055.00                 |
| <b>Analysis:</b> Indicator tests         |  | <b>Y - coordinate:</b> -2600.00                   |
| <b>Sample Location:</b> BDS04            |  | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |
| <b>Sample Type:</b> single SPT           |  | <b>mCD:</b> -20.655 -20.105                       |
| <b>Material:</b> fine SAND               |  | <b>m below platform:</b> 23.000 23.450            |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.  
68 Ridge Road,  
Tollgate, DURBAN P.O. Box 30464,  
MAYVILLE, 4058  
Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Dredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10147      **Borehole/Pit no.:** BDS04\_S03      **Tester :** Patrick

**Depth:** -21m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 100.0    |
| 0.425            | 92.3     |
| 0.25             | 61.0     |
| 0.15             | 23.9     |
| 0.075            | 12.6     |
| 0.05             | 12.4     |
| 0.02             | 9.7      |
| 0.005            | 6.8      |
| 0.002            | 5.8      |

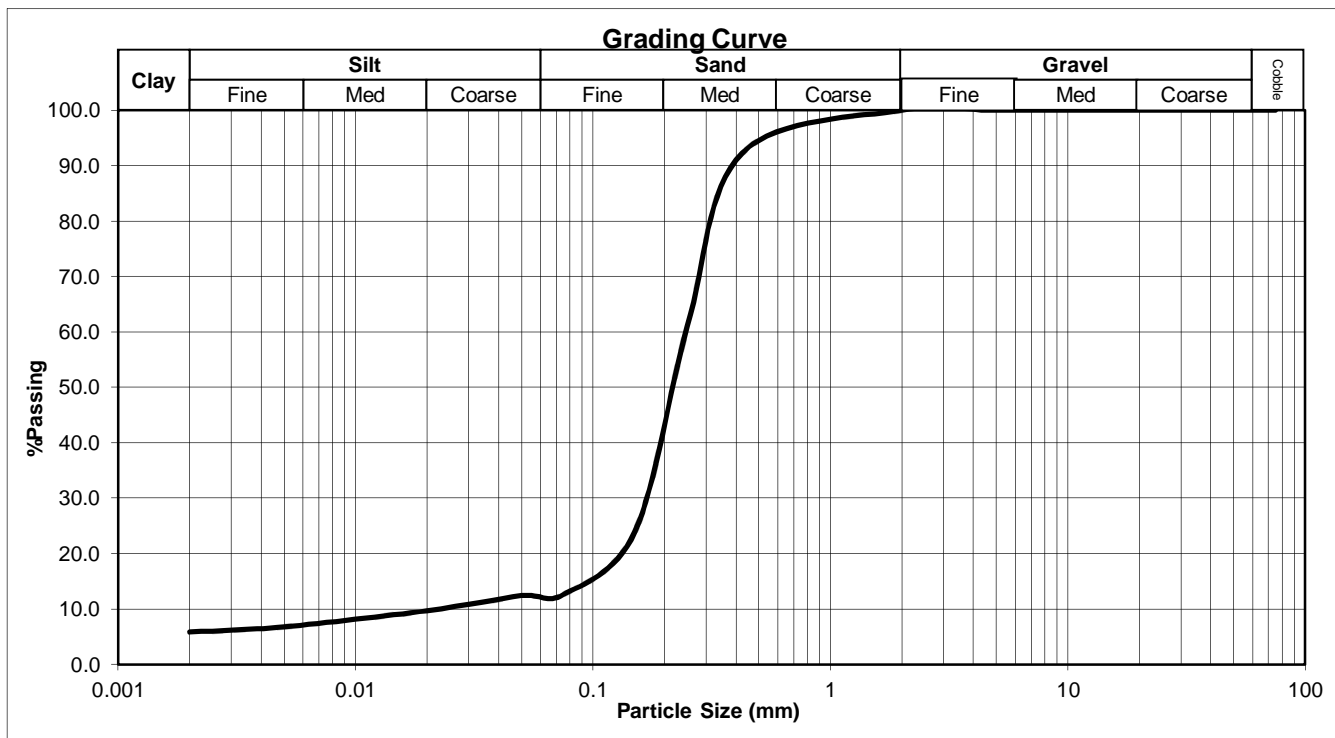
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 87.5 |
| Coarse         | 6.9  |
| Medium         | 50.7 |
| Fine           | 30.0 |
| Silt%          | 6.7  |
| Coarse         | 2.8  |
| Medium         | 2.7  |
| Fine           | 1.2  |
| Clay%          | 5.8  |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0223 |
| Uniformity Coefficient | 11.04  |
| Grading Modulus        | 0.95   |

| CLASSIFICATION             |       |
|----------------------------|-------|
| Potential Expansiveness    | Low   |
| Group Index                | 0     |
| AASHTO Soil Classification | A - 2 |
| Unified Classification     | SM    |

|                 |      |
|-----------------|------|
| Organic Content | 1.83 |
|-----------------|------|



Ref no.: 6630

Fig no.: Patrick



|  |   |                   |
|--|---|-------------------|
| <b>Sample No.:</b> 1370-BDS04-S08-19.00  |   | <b>sheet:</b> 1/1 |
| <b>Laboratory:</b> Thekwini Soil Lab. cc | <b>X - coordinate:</b> 3306055.00                 |                   |
| <b>Analysis:</b> Indicator tests         | <b>Y - coordinate:</b> -2600.00                   |                   |
| <b>Sample Location:</b> BDS04            | <b>Z - sample depth:</b> <u>top</u> <u>bottom</u> |                   |
| <b>Sample Type:</b> single SPT           | <b>mCD:</b> -16.655 -17.155                       |                   |
| <b>Material:</b> silty CLAY              | <b>m below platform:</b> 19.000 19.500            |                   |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**  
V.A.T. REGISTRATION NO. 4590210961.  
 68 Ridge Road, Tollgate, DURBAN P.O. Box 30464, MAYVILLE, 4058  
 Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Gredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10152      **Borehole/Pit no.:** BDS04\_S08      **Tester :** Patrick

**Depth:** -19.8m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 99.5     |
| 2                | 99.1     |
| 0.425            | 99.1     |
| 0.25             | 98.9     |
| 0.15             | 98.2     |
| 0.075            | 96.6     |
| 0.05             | 91.7     |
| 0.02             | 69.6     |
| 0.005            | 58.5     |
| 0.002            | 41.8     |

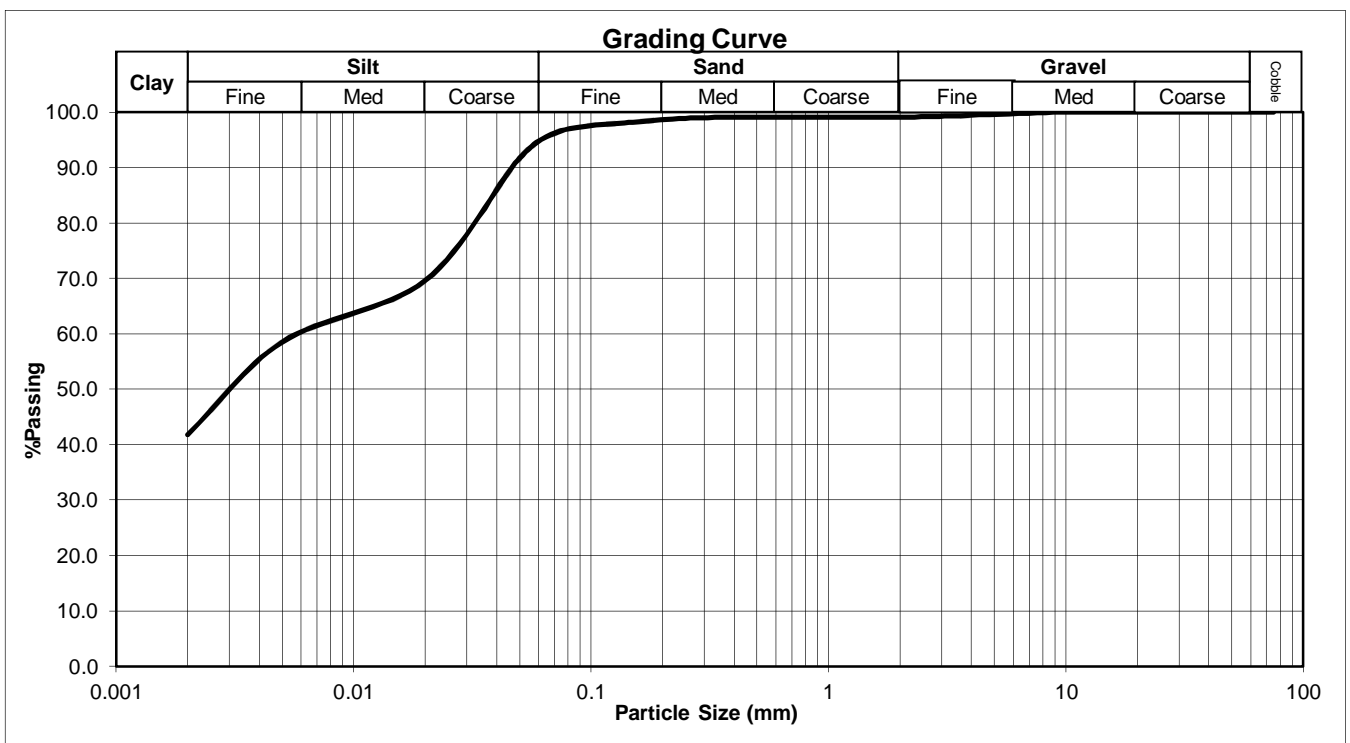
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.9  |
| Coarse         | 0.0  |
| Medium         | 0.3  |
| Fine           | 0.6  |
| Sand%          | 5.4  |
| Coarse         | 0.0  |
| Medium         | 0.6  |
| Fine           | 4.9  |
| Silt%          | 51.9 |
| Coarse         | 24.1 |
| Medium         | 10.3 |
| Fine           | 17.5 |
| Clay%          | 41.8 |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | <0.002 |
| Uniformity Coefficient | 5.10   |
| Grading Modulus        | 0.05   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Low      |
| Group Index                | 0        |
| AASHTO Soil Classification | A - 4    |
| Unified Classification     | ML or OL |

|                 |       |
|-----------------|-------|
| Organic Content | 14.09 |
|-----------------|-------|



**Ref no.:** 6630      **Fig no.:** Patrick



|                                   |  |  |
|-----------------------------------|--|--|
| Sample No.: 1370-BDS04-S09-20.00  |  | sheet: 1/1                                 |
| Laboratory: Thekwini Soil Lab. cc |  | X - coordinate: 3306055.00                 |
| Analysis: Indicator tests         |  | Y - coordinate: -2600.00                   |
| Sample Location: BDS04            |  | Z - sample depth: <u>top</u> <u>bottom</u> |
| Sample Type: NXM core barrel      |  | mCD: -17.655 -19.155                       |
| Material: silty CLAY              |  | m below platform: 20.000 21.500            |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.  
68 Ridge Road,  
Tollgate, DURBAN P.O. Box 30464,  
MAYVILLE, 4058  
Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Gredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10153      **Borehole/Pit no.:** BDS04\_S09      **Tester :** Patrick

**Depth:** -18.5m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 100.0     |
| 0.425            | 99.8      |
| 0.25             | 99.5      |
| 0.15             | 98.7      |
| 0.075            | 96.3      |
| 0.05             | 91.3      |
| 0.02             | 70.9      |
| 0.005            | 55.8      |
| 0.002            | 46.5      |

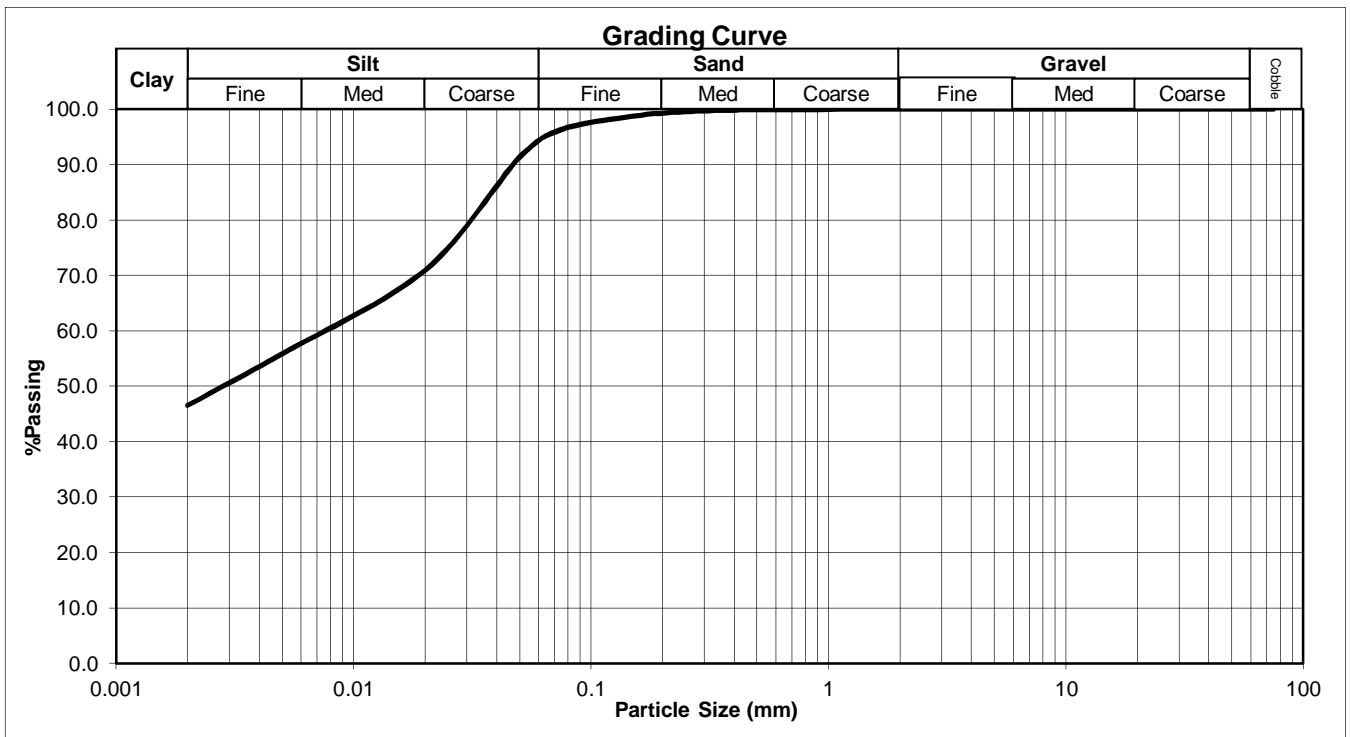
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 6.7  |
| Coarse         | 0.1  |
| Medium         | 0.7  |
| Fine           | 5.8  |
| Silt%          | 46.8 |
| Coarse         | 22.4 |
| Medium         | 14.1 |
| Fine           | 10.3 |
| Clay%          | 46.5 |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | <0.002 |
| Uniformity Coefficient | 6.31   |
| Grading Modulus        | 0.04   |

| CLASSIFICATION             |          |
|----------------------------|----------|
| Potential Expansiveness    | Low      |
| Group Index                | 0        |
| AASHTO Soil Classification | A - 4    |
| Unified Classification     | ML or OL |

|                 |       |
|-----------------|-------|
| Organic Content | 13.54 |
|-----------------|-------|



Ref no.: 6630

Fig no.: Patrick



|                                   |                                 |            |
|-----------------------------------|---------------------------------|------------|
| Sample No.: 1370-BDS05-S01-21.00  |                                 | sheet: 1/1 |
| Laboratory: Thekwini Soil Lab. cc | X - coordinate: 3306466.63      |            |
| Analysis: Indicator tests         | Y - coordinate: -1990.73        |            |
| Sample Location: BDS05            | Z - sample depth: top bottom    |            |
| Sample Type: single SPT           | mCD: -18.610 -19.060            |            |
| Material: fine SAND               | m below platform: 21.000 21.450 |            |

# MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

V.A.T. REGISTRATION NO. 4590210961.  
68 Ridge Road, Tollgate, DURBAN P.O. Box 30464, MAYVILLE, 4058  
Tel : (031) 201-8992 Fax : (031) 201-7920

**Project:** 1370 Dredge Area Durban Harbour      **Date :** 01-11-2012

**Ref no.:** 6630      **Lab no.:** 10145      **Borehole/Pit no.:** BDS05\_S01      **Tester :** Patrick

**Depth:** -18.5m cd      **Standard Grading:** TMH Method A1(a)      **Standard Hydrometer:** TMH Method A6

| Grading Analysis |          |
|------------------|----------|
| Grain Size (mm)  | %Passing |
| 75               | 100.0    |
| 53               | 100.0    |
| 37.5             | 100.0    |
| 26.5             | 100.0    |
| 19               | 100.0    |
| 13.2             | 100.0    |
| 9.5              | 100.0    |
| 4.75             | 100.0    |
| 2                | 100.0    |
| 0.425            | 99.9     |
| 0.25             | 98.0     |
| 0.15             | 37.4     |
| 0.075            | 13.2     |
| 0.05             | 13.2     |
| 0.02             | 10.0     |
| 0.005            | 7.3      |
| 0.002            | 6.7      |

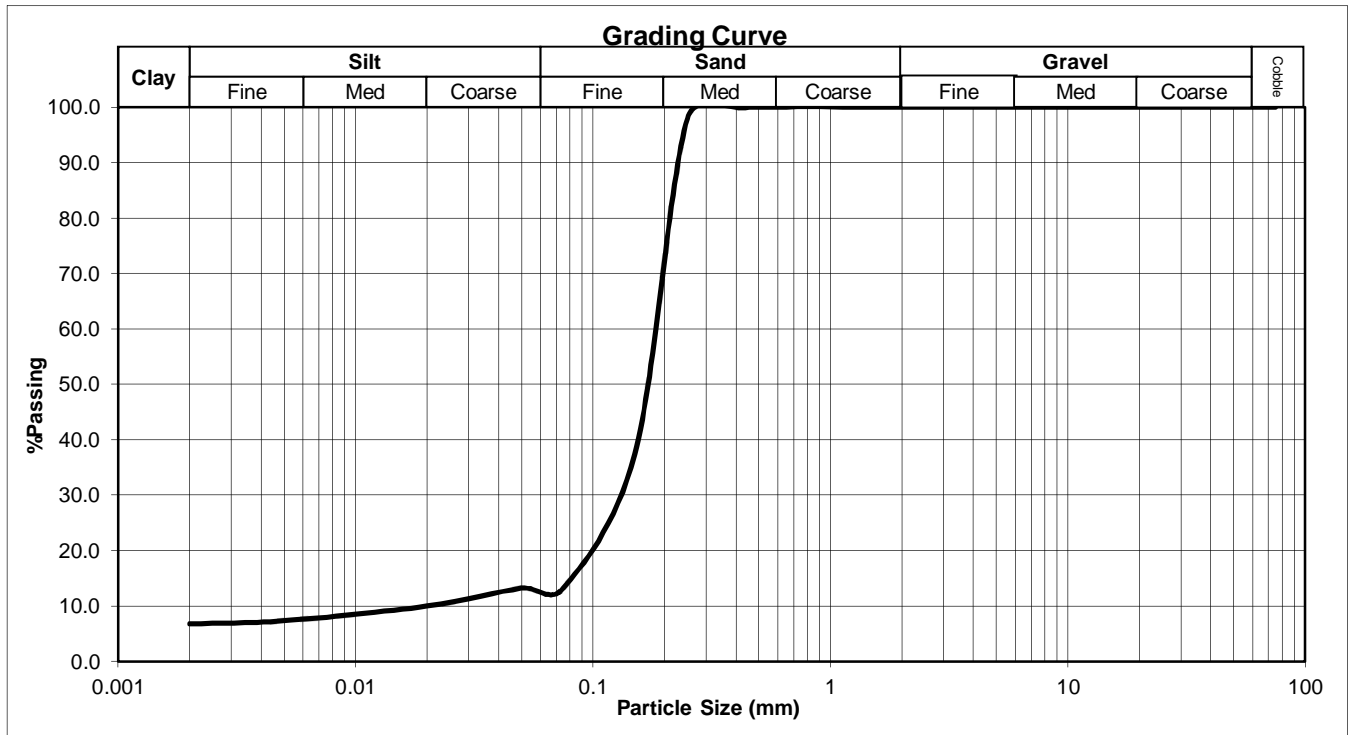
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.0  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.0  |
| Sand%          | 86.8 |
| Coarse         | 0.1  |
| Medium         | 32.2 |
| Fine           | 54.5 |
| Silt%          | 6.5  |
| Coarse         | 3.2  |
| Medium         | 2.5  |
| Fine           | 0.8  |
| Clay%          | 6.7  |

| PLASTICITY       |   |
|------------------|---|
| Liquid Limit     | 0 |
| Plasticity Index | 0 |
| Linear Shrinkage | 0 |


| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0202 |
| Uniformity Coefficient | 9.01   |
| Grading Modulus        | 0.87   |

| CLASSIFICATION             |       |
|----------------------------|-------|
| Potential Expansiveness    | Low   |
| Group Index                | 0     |
| AASHTO Soil Classification | A - 2 |
| Unified Classification     | SM    |

|                 |      |
|-----------------|------|
| Organic Content | 1.83 |
|-----------------|------|



Ref no.: 6630 Fig no.: Patrick

|  |                                   |  |
|--|-----------------------------------|--|
|  | Sample No.: 1370-BDS08-S01-17.00  | sheet: 1/1                                 |
|  | Laboratory: Thekwini Soil Lab. cc | X - coordinate: 3306198.00                 |
|  | Analysis: Indicator tests         | Y - coordinate: -2344.00                   |
|  | Sample Location: BDS08            | Z - sample depth: <u>top</u> <u>bottom</u> |
| Sample Type: multiple SPT  | mCD: -15.057 -18.507              |  |
| Material: fine SAND  | m below platform: 17.000 20.450   |  |

## MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**

S.A.T. REGISTRATION NO. 000222001  
 49 Ridge Road, Tolpene, DURBAN  
 Tel : (031) 201-0992 Fax : (031) 201-7029  
 P.O. Box 10284, MAYVILLE, 4050

Project: Durban Harbour - Stockpiles

Ref no.: 6630    Lab no.: 11059    Borehole/Pit no.: BDS08\_S01    Fig no.: -

Depth: -

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 100.0     |
| 2                | 99.6      |
| 0.425            | 92.2      |
| 0.25             | 65.7      |
| 0.15             | 18.6      |
| 0.075            | 9.5       |
| 0.05             | 9.5       |
| 0.02             | 7.1       |
| 0.005            | 7.0       |
| 0.002            | 6.9       |

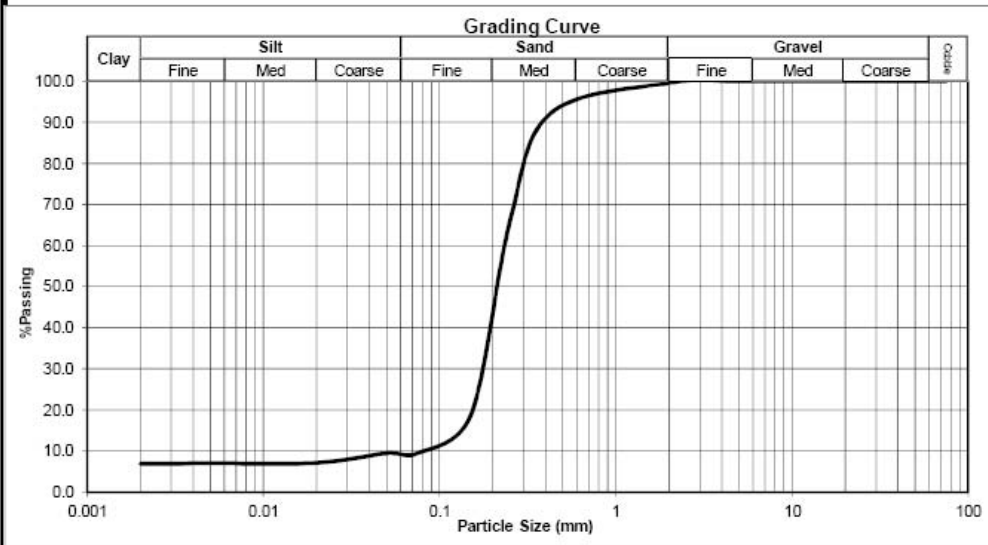
| M.I.T SIZE     |      |
|----------------|------|
| CLASSIFICATION |      |
| Cobble%        | 0.0  |
| Gravel%        | 0.4  |
| Coarse         | 0.0  |
| Medium         | 0.0  |
| Fine           | 0.4  |
| Sand%          | 90.1 |
| Coarse         | 6.6  |
| Medium         | 50.9 |
| Fine           | 32.7 |
| Silt%          | 2.6  |
| Coarse         | 2.4  |
| Medium         | 0.1  |
| Fine           | 0.1  |
| Clay%          | 6.9  |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 17.9 |
| Plasticity Index | 0    |
| Linear Shrinkage | 0    |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0781 |
| Uniformity Coefficient | 3.01   |
| Grading Modulus        | 0.99   |


| CLASSIFICATION             |         |
|----------------------------|---------|
| Potential Expansiveness    | Low     |
| Group Index                | 0       |
| AASHTO Soil Classification | A - 3   |
| Unified Classification     | SP - SM |

|                   |      |
|-------------------|------|
| Organic Content % | 1.12 |
|-------------------|------|



Ref no.: 6630

Fig no.: -

|   |  |                                     |
|---|--|-------------------------------------|
|  | <b>Sample No.:</b> 1370-BDS10-S01-15.50  | <b>sheet:</b> 1/1                   |
|   | <b>Laboratory:</b> Thekwini Soil Lab. cc | <b>X - coordinate:</b> 3306294.00   |
|   | <b>Analysis:</b> Indicator tests         | <b>Y - coordinate:</b> -2172.00     |
|   | <b>Sample Location:</b> BDS10            | <b>Z - sample depth:</b> top bottom |
| <b>Sample Type:</b> multiple SPT  | <b>mCD:</b> -13.570 -19.020              |                                     |
| <b>Material:</b> fine SAND  | <b>m below platform:</b> 15.500 20.950   |                                     |

## MATERIALS ANALYSIS

**THEKWINI SOILS LAB. CC**  
V.A.T. REGISTRATION NO. 400227081  
 48 Ridge Road, P.O. Box 20084, Durban, 4000, KZN, SOUTH AFRICA  
 Tel: (031) 201-0882 Fax: (031) 201-7028

**Project:** Durban Harbour - Stockpiles

**Ref no.:** 6630    **Lab no.:** 11060    **Borehole/Pit no.:** BDSS10\_S01 Fig no.: -

**Depth:** -

| Grading Analysis |           |
|------------------|-----------|
| Grain Size (mm)  | % Passing |
| 75               | 100.0     |
| 53               | 100.0     |
| 37.5             | 100.0     |
| 26.5             | 100.0     |
| 19               | 100.0     |
| 13.2             | 100.0     |
| 9.5              | 100.0     |
| 4.75             | 99.9      |
| 2                | 99.8      |
| 0.425            | 99.5      |
| 0.25             | 94.9      |
| 0.15             | 33.8      |
| 0.075            | 13.2      |
| 0.05             | 12.4      |
| 0.02             | 9.3       |
| 0.005            | 7.8       |
| 0.002            | 7.3       |

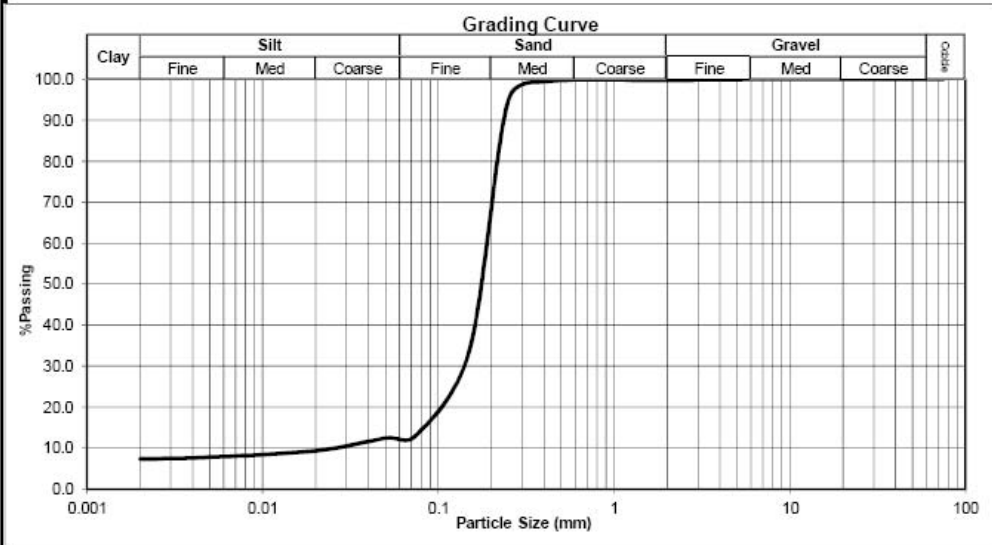
| M.I.T SIZE CLASSIFICATION |      |
|---------------------------|------|
| Cobble%                   | 0.0  |
| Gravel%                   | 0.2  |
| Coarse                    | 0.0  |
| Medium                    | 0.0  |
| Fine                      | 0.2  |
| Sand%                     | 87.0 |
| Coarse                    | 0.2  |
| Medium                    | 35.2 |
| Fine                      | 51.6 |
| Silt%                     | 5.4  |
| Coarse                    | 3.4  |
| Medium                    | 1.5  |
| Fine                      | 0.6  |
| Clay%                     | 7.3  |

| PLASTICITY       |      |
|------------------|------|
| Liquid Limit     | 18.5 |
| Plasticity Index | 0    |
| Linear Shrinkage | 0    |

| GRADING                |        |
|------------------------|--------|
| D10 Size               | 0.0244 |
| Uniformity Coefficient | 7.65   |
| Grading Modulus        | 0.88   |

| CLASSIFICATION             |           |
|----------------------------|-----------|
| Potential Expansiveness    | Low       |
| Group Index                | 0         |
| AASHTO Soil Classification | A - 2 - 4 |
| Unified Classification     | SM        |

|                   |      |
|-------------------|------|
| Organic Content % | 1.02 |
|-------------------|------|



Ref no.: 6630

Fig no.: -



## **ANNEXURE 5: PREVIOUS GEOTECHNICAL INVESTIGATION REPORTS**

- 5.1 FACTUAL GEOTECHNICAL REPORT FOR PHASE 2: PIER 2, BERTHS 203 TO 205**
- 5.2 LABORATORY REPORT FOR PHASES 1, 2 & 3: VOLUME 1 & 2**
- 5.3 FACTUAL REPORT ON MARINE CONE PENETRATION TESTS**
- 5.4 DESK STUDY APPRAISAL FOR THE DURBAN BERTH DEEPENING FEASIBILITY STUDY**
- 5.5 A GEOPHYSICAL AND SEDIMENT SAMPLING SURVEY OF TWO PROPOSED SAND WINNING AREAS IN THE DURBAN BIGHT**
- 5.6 A GEOPHYSICAL AND SEDIMENTOLOGICAL INVESTIGATION OF THE OFFSHORE DREDGE DISPOSAL SITE, DURBAN**



## **5.1: Factual Geotechnical Report for Phase 2: Pier 2: Berths 203 to 205**

(MSJ RPT No. 07-395R07Rev0; May 2009)



# ***Transnet Projects***

## ***Port of Durban Berth Deepening Feasibility Study***

### ***Factual Geotechnical Report for Phase 2 (Pier 2: Berths 203 to 205)***

***Reference : 07-395R07Rev0***

***Dated : 6 May 2009***





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| <b>Approved By</b> | M Richter   | Director           |  | 6 May 2009  |

| <b>Factual Geotechnical Report : Phase 2 (Pier 2 : Berths 203 to 205)</b> |             |                 |   |               |   |
|---|-------------|-----------------|---|---------------|---|
| <b>Revision</b>   | <b>Date</b> | <b>Author</b>   | <b>Checked</b>  | <b>Status</b> | <b>Approved</b>   |
| <b>Rev 0</b>  | 6 May 2009  | Sue-Anya Pillay |  | Ok            |  |

# Transnet Projects

## Port of Durban Berth Deepening Feasibility Study

### Factual Geotechnical Report for Phase 2 (Pier 2: Berths 203 to 205)

Reference : 07-395R07Rev0

Dated : 6 May 2009

#### VOLUME 1 of 2

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# ***Transnet Projects***

## ***Port of Durban Berth Deepening Feasibility Study***

### ***Factual Geotechnical Report for Phase 2 (Pier 2: Berths 203 to 205)***

Reference : 07- 395R07Rev0

Dated : 6 May 2009

#### **1. INTRODUCTION AND TERMS OF REFERENCE**

Transnet are presently deepening and widening the entrance channel to the port of Durban in order to accommodate post-panamax container vessels in the vessel class of 9 200 TEU. In order to accommodate this class of ship, selected berths of the existing container terminal quay wall, located at Pier 1 and Pier 2 will need to be deepened. In addition, the stability of the existing quays is to be confirmed. As a result a geotechnical investigation was commissioned by Transnet in April 2008 to evaluate the existing geological conditions beneath the affected piers.

Three separate phases have been designated for the proposed development of the harbour deepening project as shown in Figure 1. These are as follows:

- Phase 1 : Pier 1 (Berths 100 to 104),
- Phase 2 : Pier 2 (Berths 203 to 205), and
- Phase 3 : Cross-berth area between Pier 1 and 2 (Berths 108 to 109) and Pier 2 (Berths 200 to 202).

This report provides the factual information generated by the geotechnical investigation for Phase 2 and contains the following:

- i) Borehole Logs,
- ii) Core Photographs,
- iii) References to Subcontractor works for piezocone testing,
- iv) Standpipe piezometer monitoring and permeability test results, and
- v) Site Plan showing the positions of the boreholes, piezocone tests and other insitu tests carried out for the investigation.

#### **2. SCOPE OF CONSULTANT'S INVOLVEMENT**

In March 2008, Moore Spence Jones were employed by HMG Joint Venture to provide specialist geotechnical consultancy services to the Berth Deepening Feasibility Study under Contract No. H500272-CPS003. HMG JV were employed by Transnet to provide project management and technical services for the Feasibility Study.

The geotechnical Contractors (Geopractica, Franki and Subtech) were employed directly by Transnet. As part of Moore Spence Jones' scope of work, the geotechnical investigation was supervised from a technical perspective by Moore Spence Jones. Moore Spence Jones were also employed to undertake interpretative reporting for the project and a stability assessment of the quay wall. These are reported separately.

#### **3. DESCRIPTION OF THE SITE**

The area included in Phase 2 is located on the north facing side of Pier 2, extending from the existing Ro-Ro ramp located on the eastern corner up to the undeveloped sand bank area on the west known as Proposed New Berth 206 which is also punctuated on the west where a finger jetty juts into the harbour. Access to Phase 2 is via the main harbour entrance off Bayhead Road. The extent of Phase 2 is shown in Figure 2.

All berths on Phase 2 are currently in use for container loading and numerous ship to shore (STS) cranes operate along this part of Pier 2.

A double storey concrete framed building was being constructed at the corner junction between Berth 203 and Berth 202. The quays consist of concrete blockwork which is some 3.66 metres above chart datum (CD). Apart from a concrete deck or apron extending inwards some 10 metres from the cope edge, the pier is asphalt paved. Two sets of crane rails run parallel to the pier edge for the container cranes.

The marine boreholes were carried out nominally 30m in front of the quay wall copeline and the marine CPTs were carried out between 15m and 25m in front of the quay wall. At the time of the marine investigation, Berth 203 was closed to shipping due to the re-engineering works being undertaken on the land side of the berth. The marine works, therefore, did not interfere with the operation of the port. One borehole (BD-BHM205) was carried out in the operational Berth 204 between ship moves. Drilling on the marine boreholes was carried out on a 24 hour basis to ensure work was completed prior to berth re-opening. The sea floor level is maintained by dredging at nominally -12.8 CD but recent bathymetric surveys have identified that in some areas the sea floor level is deeper than this.

#### **4. GEOLOGY OF THE SITE**

The investigation was carried out to determine the geotechnical conditions associated with the existing quay wall and a proposal to deepen the sea floor in front of this quay wall. The quay wall is a concrete block work wall and was constructed during the 1960s. The wall is founded on rock fill which was placed in a dredged trench excavated to varying levels during construction dependent on the geological material found in the trench. Part of the investigation was to verify the as built levels of the trench as recorded on as built quay wall drawings. Hydraulically placed sand fill is present behind the quay wall and above the rock fill. The land boreholes were carried out approximately 10-15m behind the quay wall copeline and at this location the boreholes were expected to miss the concrete blockwork but encounter the rockfill.

Below the quay wall and the rockfill foundation layer, the Harbour Beds are present. The Harbour Beds beneath this part of Durban Harbour comprise a significantly thick succession of variable horizons of sand, silt and clay which are known to vary over short horizontal distances. The Harbour Beds are underlain by the residual soils and rocks of the St Lucia formation of Cretaceous age. The rock is predominantly siltstone but with some sandstone layers and thin calcareous siltstone layers. Previous investigations have identified the presence of buried palaeo channels incised into the older harbour Beds and the Cretaceous rock which gives rise to variable soil conditions and rock levels below the site. One of the aims of the investigations was to confirm the locations of these channels and, hence, depth to bedrock.

#### **5. FIELDWORK**

The fieldwork for Phase 2 was carried out over the period May 2008 to February 2009 and comprised the following.

1. Drilling of Land and Marine based boreholes,
2. Execution of Land and Marine based Piezocone testing, and
3. Tidal Lag Monitoring and Permeability tests.

All of the above geotechnical investigation work was supervised by Moore Spence Jones on a full time basis.

##### **5.1 Boreholes**

###### **5.1.1 Land-based Boreholes**

Eighteen land based boreholes were drilled by Geopractica for Phase 2. These boreholes were positioned between 10 and 15 metres from the edge of the cope of the quay wall. The boreholes were initially advanced using washbore drilling with Standard Penetration Tests (SPT) generally carried out at between 1.0 and 1.5 metre intervals. Where materials were encountered that were suitable for the

extraction of undisturbed samples, namely cohesive materials, Shelby tube samples or undisturbed cores (NDW4 core drilling) were taken where possible. Once bedrock was encountered a predetermined depth, usually 10m, was proved by coring with either an NDW4 or TNW core barrel. These positions, along with their surveyed coordinates, are shown in Figure 1.

A summary of the land based boreholes drilled is given in Table 1 below.

**Table 1**  
**Schedule of Boreholes –Phase 2**

| Land        | Final Depth (m) | Marine      | Final Depth (m) |
|-------------|-----------------|-------------|-----------------|
| BD BHL201   | 40.60           | -           | -               |
| BD BHL201 A | 35.92           | -           | -               |
| BD BHL202   | 43.60           | -           | -               |
| BD BHL202 A | 17.70           | -           | -               |
| BD BHL202 B | 35.00           | -           | -               |
| BD BHL203   | 51.10           | -           | -               |
| BD BHL203 A | -               | -           | -               |
| BD BHL203 B | 41.95           | -           | -               |
| BD BHL203.5 | 42.05           | -           | -               |
| BD BHL204   | 42.60           | -           | -               |
| BD BHL204 A | 36.00           | -           | -               |
| BD BHL205   | 40.75           | -           | -               |
| BD BHL206   | 41.05           | BD BHM206   | 53.81           |
| BD BHL207   | 54.55           | BD BHM207   | 52.29           |
| BD BHL208   | 68.00           | BD BHM208   | 21.45           |
| BD BHL209   | 56.00           | BD BHM209   | 62.00           |
| BD BHL210   | 59.50           | BD BHM210   | 20.00           |
| BD BHL210A  | 35.70           | BD BHM210A  | 68.40           |
| -           | -               | BD BHM211   | 62.44           |
| -           | -               | BD BHMCP208 | 14.30           |

The borehole cores were logged according to Standard South Africa Geoterminology Guidelines and photographed by an engineering geologist<sup>1</sup>. Both the borehole logs and core photographs are given in Appendix A.

### 5.1.2 Rockfill Drilling

As expected, the land boreholes encountered variable thicknesses of rock fill at the base of the hydraulic sand fill. This rock fill proved to be very time consuming and difficult to drill. In the early boreholes, the Contractor did not fully install casing through the rock fill and consequently, the lower parts of the boreholes in the Harbour Beds were subject to collapse, running sands and 'contamination' with rock fill falling down the borehole.

As a consequence, the rock fill appears to be much thicker than expected from the as-built drawings in the early boreholes and in certain holes, soil material has been encountered apparently within the rock fill. It is believed that this is due to rock fill collapsing into the borehole and was most commonly noted in the Phase 1 boreholes. In the later boreholes for Phases 2 and 3 the Contractor exercised greater care with casing installation when drilling through the rock fill, obtaining better success.

The fragments of rock fill collapsing in the boreholes also resulted in sampling and SPTs not being carried out at the instructed intervals. In the most serious of cases the Contractor was instructed to re-drill the borehole.

<sup>1</sup> Geoterminology Workshop (1990) – Guidelines for Soil and Rock Logging – SAIEG-AEG-SAICE (Geotech Div) pp47

### 5.1.3 **Marine-based Boreholes**

While the land based boreholes were in progress, eight marine based boreholes (Table 1) were drilled by Geopractica from both a jack-up barge (supplied by Subtech Pty Ltd) and a floating barge (supplied by Geopractica). Drilling off the floating barge encountered several problems such as instability of the barge during the passage of harbour traffic and windy weather as well as difficulty in staying stationary over the designated borehole position. As a result the barge had to be abandoned and the remainder of the drilling was carried out off the jack-up barge.

The marine boreholes were generally positioned a distance of 30m off the edge of the quay wall. The primary objective of these boreholes was to determine the geotechnical conditions for the piles supporting the deck structures of the deck-on-pile solution and also provide geological continuity with the land based boreholes and CPT tests being carried out on the quay wall area and near the cope edge.

The remainder of the marine boreholes originally scheduled for the investigation could not be drilled along Berths 204 and 205 due to the almost permanent occupation of these berths by container ships. Towards the end of the feasibility study, it was identified that Berths 203 to 205 in Phase 2 were unlikely to be considered for berth deepening in the near future. Therefore, the marine boreholes at berths 204 and 205 (BD-BHM201 to 205 and BD-CPTM201 to 206) were cancelled to prevent major disruptions to the Durban Container Terminal (DCT) operation.

All boreholes were drilled in core sizes ranging from NDW4 size (67mm diameter) through to TNW (76mm diameter).

### 5.1.4 **Re-drilled Boreholes**

Several of the above boreholes were re-drilled for a number of reasons, being:

- Unsuccessful sample recovery in clay horizons
- Collapse of rockfill material into lower portion of borehole,
- Defective SPT results.

During the course of the investigation, it was realised that the SPTs carried out by one specific driller on site were significantly higher than those carried out by the other drillers, even in the relatively consistent hydraulic sand backfill. The SPT values were also significantly higher than inferred from the adjacent CPT.

The Contractor was instructed to redrill these boreholes to 35m BGL using a different driller. These replacement boreholes are labelled with a suffix "A" (e.g. BD-BHL201). The affected SPT results have been highlighted on the logs for the original boreholes with an asterisk and reference should be made to the redrilled boreholes for what are considered reliable SPT values.

The boreholes which had to be re-drilled, and the reasons therefore, are given in Table 2 below.

**Table 2**  
**Schedule of Re-drilled Boreholes – Phase 2**

| <b>Original Borehole</b> | <b>Re-drilled Borehole</b> | <b>Reason for Re-drill</b>  |
|--------------------------|----------------------------|---|
| BD BHL201                | BD BHL210A                 | Defective SPT results: N values considered too high to be representative of sands           |
| BD BHL202                | BD BHL202A                 |   |
| BD BHL202A               | BD BHL202B                 | Collapse of rockfill material into lower part of borehole; casing shoe damaged continuously |
| BD BHL203                | BD BHL203A                 | Defective SPT results: N values considered too high to be representative of sands.          |
| BD BHL203A               | BD BHL203B                 | BD BHL203A was advanced into concrete deck and later cancelled. Re-drilled as BD BHL203B    |
| BD BHL204                | BD BHL204A                 | Defective SPT results: N values considered too high to be representative of sands           |
| BD BHL210                | BD BHL210A                 | Poor or no clay sample recovery   |
| BD BHM210                | BD BHM210A                 | Collapse of rockfill material into lower part of borehole; casing shoe damaged continuously |

## 6. SAMPLE PRESERVATION AND LABORATORY TESTING

Samples from the investigation were sent to different laboratories in Durban and Ireland for laboratory testing.

The Shelby samples were sealed with wax on site and dispatched to the laboratory without being extruded.

The double tube samples were extruded on site. During extrusion, sub-samples of the clay were taken and immediately covered in cling film and waxed twice before being dispatched to the laboratory.

The results of the laboratory testing are contained in report reference 07-395R09.

## 7. PIEZOCONE TESTING

Electronic Piezocone (CPTU or CPT) testing was carried out to supplement and complement the borehole information. Thirteen land based and one marine based CPT tests were carried out for Phase 2 and located at the positions shown in Figure 2. While most of the CPT tests were carried out by Osimo cc, on subcontract to Geopractica cc, a limited number of tests were carried out by Soiltech, a division of Franki Africa, also subcontracted to Geopractica for this work.

The land based CPTs were carried out at positions located within the vehicle road way adjacent to the quayside while the marine based CPTs were generally located at a distance of 30m off the edge of the quay wall.

### 7.1.1 Land-based CPT's

All land based CPT tests were carried out by Osimo cc. Although the rig used by Osimo does not have a friction sensor or sleeve near the tip, pore pressure measurements using a porous filter or sensor located behind the apex of the cone are recorded during penetration of the soils. This method provides continuous information of the soil composition and strength of the material, calculated from the porewater pressure and cone resistance values. The rig used by Osimo has a 20 tonne penetration capacity. The outputs of this method comprise plots of cone resistance, pore pressure and inferred soil geology and consistency with depth.

The results produced by Osimo are provided in the Geopractica Factual Report, "Piezometric Cone Penetrometer Testing Durban Berth Deepening Project", October 2008, and is available separately.

A summary of the land based CPT's carried out for Phase 2 is given in Table 3.



**Table 3  
Schedule of Land based CPT Tests: Phase 2**

| <b>CPT</b>       | <b>Final Depth (m)</b> |
|------------------|------------------------|
| CPT L201         | 26.962                 |
| CPT L202         | 14.379                 |
| CPT L203         | 16.948                 |
| CPT L204         | 16.97                  |
| CPT L205         | 19.408                 |
| CPT L206         | 21.41                  |
| CPT L207         | 30.324                 |
| CPT L208         | 23.59                  |
| CPT L208 Shallow | 2.357                  |
| CPT L209 Shallow | 0.842                  |
| CPT L210         | 22.495                 |
| CPT L210         | 28.367                 |
| CPT L211         | 15.975                 |

### 7.1.2 Marine-based CPT's

For the investigations of Phases 1 and 2, marine based CPT's were carried out by Soiltech, a division of Franki Africa (Pty) Ltd, using a rig with a 10 tonne penetration capacity from the offshore jack-up barge supplied by Subtech (Pty) Ltd. The marine CPT's were generally located at a distance of 30m off the edge of the quay wall. Soiltech's rig used for this work comprised a conventional electronic piezocone system with a friction sleeve and pressure sensitive cone.

A problem identified with this rig at an early stage was the limited cone penetration with depth. The rig tended to refuse at relatively shallow depths in dense sands.

Due to the shipping congestion and the limited opportunities for berth closure along Berths 203 to 205, and the generally unsatisfactory results obtained from the Soiltech rig, only two marine CPT tests were carried out for Phase 2 (Table 4). A third test, designated BD CPTM208, is not a CPT test but in effect a replacement borehole drilled in which no samples were taken but only SPT N results recorded.

**Table 4  
Schedule of Marine based CPT Tests : Phase 2**

| <b>CPT</b> | <b>Final Depth</b> |
|------------|--------------------|
| BD CPTM207 | 6.20               |
| BD CPTM209 | 11.24              |

Outputs from Soiltech comprise plots of the Cone Resistance, Friction Ratio, Pore Pressure and SBTn Index, and inferred soil type or composition against depth. The results are contained in the Soiltech report which is available separately.

## 8. SURVEYING

The Contractor surveyed the as-built positions and levels of all the land boreholes and CPTs after they had been completed. This survey was carried out by a registered surveyor using a Global Positioning System instrument of survey standard. The as built co-ordinates and the levels are given on the relevant borehole logs and in Figure 2. The co-ordinates are given in the WGS84/WG31 co-ordinate system and the levels are given in metres above Mean Sea Level.

The Contractor also surveyed the locations of the marine boreholes. However, it is believed that the positions of these boreholes were only located by hand held GPS with an accuracy of around 5m. The distance from the quay wall was also measured by the Contractor using a tape measure. The depth of the sea bed at each marine location was also recorded by the Contractor but in some cases this was done some time after the jack up had been removed from the borehole location. The Contractor converted the

depths in the boreholes from the depth below the jack up level to the depth below sea bed level based on the amount of casing installed to sea bed. The surveying of the marine boreholes and the recording of the levels was not in accordance with the Employer's specifications.

## 9. STANDPIPE PIEZOMETERS

In order to monitor the groundwater levels below the pier, standpipe piezometers were installed in the following land boreholes drilled for Phase 2 (Table 5):

**Table 5**  
**Schedule of Land Boreholes with Standpipe Piezometers: Phase 2**

| Borehole No | Depth of Piezometer (BGL*) |
|-------------|----------------------------|
| BD BHL201   | 14m                        |
| BD BHL204   | 14m                        |
| BD BHL210   | 14m                        |

\* Below Existing Ground Level

The borehole was grouted from the base of the borehole with cement bentonite grout up to 14m BGL (below existing ground level) or 7m BGL. A slotted standpipe wrapped with a geofabric sock and surrounded by sand was installed from ground level to this depth. The standpipe piezometers were constructed along the guidelines shown in Appendix B.

Multilevel piezometers were installed at position P2 (Figure 2) and comprise unslotted pipes tipped with porous elements positioned above the base of the boreholes within a 2m sand filled response zone with 1m bentonite seal above. The remainder of the borehole is sealed up to ground level with cement bentonite grout. The Multilevel piezometer comprises three standpipes installed in individual boreholes designated P2 (A, B, C), which have individually installed standpipes to 12m, 9m and 6m BGL, respectively. The three standpipes were installed in a straight line not exceeding 2m from each other. The multilevel piezometers were constructed along the guidelines shown in Appendix B.

### 9.1 Tidal Lag Monitoring and Falling Head Permeability Tests

#### 9.1.1 Tidal Lag Monitoring (Manual)

On the 15<sup>th</sup> October 2008 tidal monitoring was manually undertaken using electric borehole dip meters to monitor the standpipe levels and the harbour water level at 20 to 30 minute intervals over an 11 hour period from 6am to 5pm covering the duration of the peak Spring Tide cycle. The tidal high at 03:45 Hours and the tidal low at 09:45 Hours (actual) was obtained from the South African Navy Hydrographer

Two boreholes were monitored in Phase 2, ie. BD BHL201 and BD BHL204, each of which had piezometers installed at a depth of 14m BGL.

Further tidal monitoring was manually undertaken 12<sup>th</sup> & 13<sup>th</sup> January 2009 over a 12 hour period from 1pm to 1am to cover the January Spring tide. The published tidal high is at 16:53 Hours and the tidal low at 23:02 Hours. One borehole was monitored in Phase 2, ie. BD BHL201.

In addition, monitoring was also carried out during this January Spring Tide cycle on the multi-level piezometers installed in Phase 2, ie. P2 (A, B & C). P2 is located close to Bollard 75 on Berth 205.

The information above is summarised in the following table:

**Table 4**  
**Tidal Lag Monitoring of Spring Tides**

| <b>Monitoring Dates</b>      | <b>15 October 2008</b> | <b>12 – 13 January 2009</b> |
|------------------------------|------------------------|-----------------------------|
| Monitoring period            | 6am to 5pm             | 1pm to 1am                  |
| Tidal High                   | 03:45 Hours            | 16:53 Hours                 |
| Tidal Low                    | 09:45 Hours            | 23:02 Hours                 |
| Boreholes manually monitored | BD BHL201, BD BHL204   | BD BHL201, P2 (A,B & C)     |

The results of the standpipe monitoring, comprising plots of groundwater (and harbour water) levels against time are given in Appendix C. High and low tide events are also shown on these plots.

All data has been converted to Chart Datum.

### 9.1.2 Tidal Lag Monitoring (Divers)

Solinst Levelloggers, or divers, as they are more commonly known, are instruments suspended in boreholes for the measurement of groundwater levels and temperature. The divers are installed in a vertical orientation and are held in position within the borehole by a suspension wire tied-off at the top of the borehole. For the purposes of this investigation the Levellogger Gold was used which has a high quality piezo-resistive silicon pressure transducer in a 316L stainless steel housing. Levelloggers measure total or absolute pressure and when submerged record the combination of barometric pressure and water pressure. Actual water level is obtained by correcting for barometric pressure.

Also installed at a location on Pier 1 was a Barologger, an instrument for the automatic collection of accurate barometric data which is normally downloaded along with the diver data in order to provide a correction for atmospheric pressure.

Following the theft of the Barologger from the site in June/July 2008 no further automatic pressure data collection was possible. As the diver measures total pressure which includes atmospheric pressure this latter value had to be determined manually from outside atmospheric or weather data in order to correct the diver data and bring it into line with the manual readings.

The correction was carried out in accordance with the Solinst Levellogger User Guide Section 10 Manual Barometric Compensation. The Durban Weather station was contacted for the atmospheric pressure on the date in question. For the date of 4<sup>th</sup> February an atmospheric pressure value of 1012 hectoPascals was then converted to kiloPascals and then to Water Column Equivalent using Table 10-1 in the Manual.

The diver's pressure zero point offset value was then subtracted from the converted barometric data to correct for altitude. This value was then subtracted from the Water Column Equivalent to give the Net Barometric Pressure which was in turn subtracted from the original diver reading.

A further correction was then applied for salinity (or water density). The default setting on the divers for fresh water (density = 1kg/m<sup>3</sup>) was originally programmed. Fresh water is less dense than saline water (assumed density = 1.025 kg/m<sup>3</sup>) and the water column as measured by the diver in the Harbour boreholes was therefore overestimated. A salinity adjustment in accordance with the manual was then applied (See Section 5.1 Levellogger Information Settings – Density Adjustment).

One borehole with a diver was monitored during both monitoring cycles in Phase 2; ie BD BHL 201 with a piezometer positioned at 14m. Although the Manual data and diver data appear to correspond reasonably well the manual data plots below the diver results. The difference in values, ranging from approximately 230mm to 50mm, appear to diminish with time but this trend is by no means consistent and cannot therefore be related to corrections applied to the diver data.

The results of the tidal lag monitoring obtained from the diver information retrieved from the boreholes are given in the plots in Appendix C.

### 9.1.3 Falling Head Permeability Tests

On the 4 February 2009 falling head permeability tests were carried out in the multi-level piezometer standpipe P2 discussed above. Pre-programmed divers were installed in each of the piezometers A, B and C, and the standpipe tubes filled with water at the start of each test. A designated diver was used for all the 'A' standpipes, another for the 'B' standpipes and a third for the 'C' standpipes. The three divers were then retrieved from the multilevel standpipes and inserted in the next set of multilevel standpipes. The test was repeated at each location (ie water was added twice to each standpipe). Finally the three divers were retrieved from the last set of multilevel standpipes and the data downloaded and processed.

The diver data was then corrected for the length of the diver cable to give the depth of water in the borehole and then plotted against time. The addition of water can be clearly discerned on the plots of diver data and the steepest part of the curve representing the falling water level was used to calculate the permeability. Two points were selected from the downward part of this curve and the manual atmospheric correction applied to these values based on the barometric pressure provided by the Durban Weather station for 8am on Wednesday 4<sup>th</sup> February. (It should be noted that the readings for the early part of the plots represent the diver records before insertion into the standpipes and as such can be disregarded).

The water level measured in the borehole at the start of the test was then deducted from these two corrected values to give H1 and H2, the measurement of water head above the water table at times T1 and T2 respectively, T1 being the time at the start of the test and T2 the time at the end of the test.

The method used to calculate the permeability is as laid out in clause 25.4.6.1 Method 1 (after Hvorslev) in BS 5930 Code of Practice for Site Investigations using the following formula:

Permeability  $k = A/F(T_2 - T_1) \times \log_e H_1/H_2$ , where A is the cross sectional area of the standpipe and F is the Intake Factor as calculated according to Al-Dahir and Morgenstern.

These results are summarised in Table 6 below and the data calculations and plots are contained in Appendix D.

**Table 6**  
**Summary of Permeability Tests conducted in Standpipe P2**

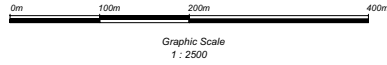
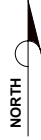
| Standpipe | Depth of Piezometer | Water level at start of test (m) | Time of Test | Coefficient of Permeability, $k$ (m/s) |
|-----------|---------------------|----------------------------------|--------------|--|
| P2A       | 12m                 | 2.19                             | 12.26        | $3.3 \times 10^{-7}$                   |
| P2B       | 9m                  | 2.40                             | 12.27        | $3.26 \times 10^{-5}$                  |
| P2C       | 6m                  | 2.34                             | 12.29        | $2.15 \times 10^{-5}$                  |

The results fall within the range  $10^{-5}$  to  $10^{-7}$  metres per second and are typical of the range for very fine sands and silts (BS 8004:1986). The site notes for P2A recorded during the Falling Head Tests note that the water levels in this standpipe moved very little.

#### MOORE SPENCE JONES (PTY) LTD

Consulting Geotechnical, Environmental & Civil Engineers  
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Fax : +027 031 2665322

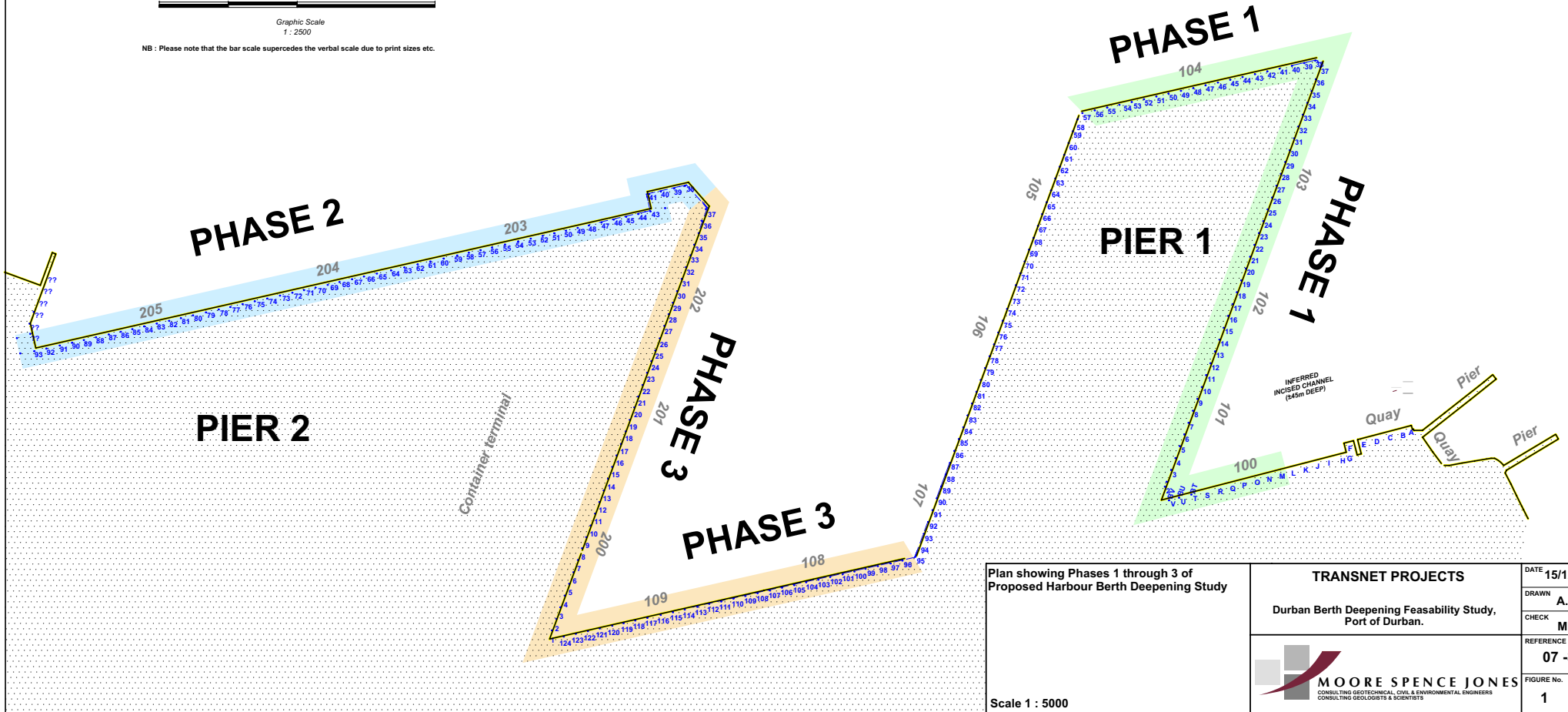
## FIGURES



NB : Please note that the bar scale supercedes the verbal scale due to print sizes etc.

**KEY:**

- 33 Position and Number of Bollard
- 205 Berth Number



Plan showing Phases 1 through 3 of Proposed Harbour Berth Deepening Study

**TRANSNET PROJECTS**

Durban Berth Deepening Feasibility Study, Port of Durban.



DATE 15/12/2009

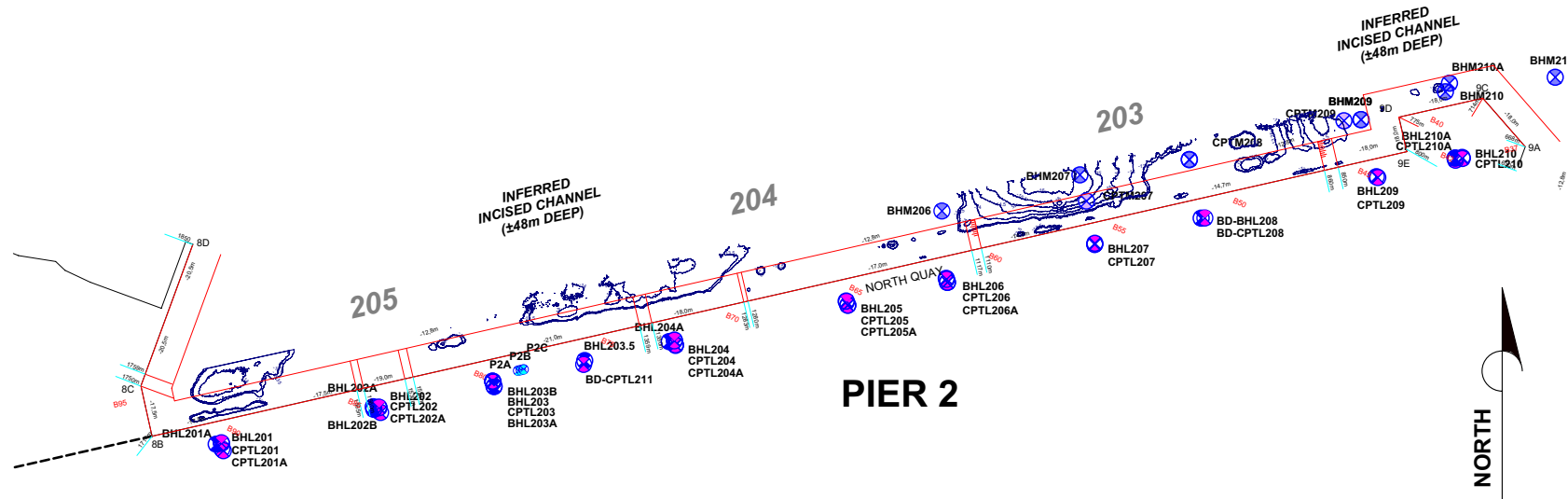
DRAWN A.S.

CHECK M.R.

REFERENCE No. 07 -395

FIGURE No. REV. 1

Scale 1 : 5000



**LAND BASED BOREHOLE AS BUILT CO-ORDINATES**

System : WGS 84

| BH NAME   | Y         | X           | Z (m) MSL | Z (m) CD (PORT) | BH DEPTH (m) BGL |
|-----------|-----------|-------------|-----------|-----------------|------------------|
| BHL 201   | -1408.281 | 3306806.698 | 2.730     | 3.630           | 40.60            |
| BHL 201A  | -1404.599 | 3306807.642 | 2.745     | 3.645           | 35.92            |
| BHL 202   | -1520.079 | 3306781.345 | 2.730     | 3.630           | 43.60            |
| BHL 202A  | -1515.961 | 3306781.271 | 2.715     | 3.615           | 17.70            |
| BHL 202B  | -1516.402 | 3306783.217 | 2.710     | 3.610           | 35.00            |
| BHL 203   | -1601.059 | 3306762.856 | 2.790     | 3.690           | 51.10            |
| BHL 203B  | -1604.917 | 3306762.234 | 2.825     | 3.725           | 43.00            |
| BHL 203.5 | -1656.456 | 3306745.284 | 2.820     | 3.720           | 42.05            |
| BHL 204   | -1730.169 | 3306733.700 | 2.752     | 3.652           | 42.60            |
| BHL 204A  | -1726.299 | 3306734.719 | 2.745     | 3.645           | 36.00            |
| BHL 205   | -1852.269 | 3306706.010 | 2.730     | 3.630           | 40.75            |
| BHL 206   | -1923.350 | 3306689.890 | 2.858     | 3.758           | 41.05            |
| BHL 207   | -2028.976 | 3306664.953 | 2.790     | 3.690           | 54.55            |
| BHL 208   | -2104.493 | 3306647.125 | 2.830     | 3.730           | 68.00            |
| BHL 209   | -2229.048 | 3306617.719 | 2.830     | 3.730           | 56.00            |
| BHL 210   | -2289.982 | 3306604.021 | 3.070     | 3.970           | 59.50            |
| BHL 210A  | -2284.988 | 3306604.512 | 3.053     | 3.953           | 35.70            |

**LAND BASED CPT AS BUILT CO-ORDINATES**

System : WGS 84

| BH NAME   | Y         | X           | Z (m) MSL | Z (m) CD (PORT) | BH DEPTH (m) BGL |
|-----------|-----------|-------------|-----------|-----------------|------------------|
| CPTL 201  | -1408.362 | 3306807.047 | 2.740     | 3.640           | MARKED           |
| CPTL 201A | -1408.607 | 3306811.044 | 2.760     | 3.660           | 26.69            |
| CPTL 202  | -1521.374 | 3306781.721 | 2.740     | 3.640           | MARKED           |
| CPTL 202A | -1521.419 | 3306785.159 | 2.750     | 3.650           | 14.38            |
| CPTL 203  | -1601.334 | 3306763.417 | 2.810     | 3.710           | 16.95            |
| CPTL 204  | -1730.210 | 3306734.278 | 2.748     | 3.648           | MARKED           |
| CPTL 204A | -1730.909 | 3306737.091 | 2.768     | 3.668           | 16.97            |
| CPTL 205  | -1852.455 | 3306706.639 | 2.730     | 3.630           | MARKED           |
| CPTL 205A | -1853.285 | 3306709.012 | 2.760     | 3.660           | 19.41            |
| CPTL 206  | -1923.604 | 3306690.552 | 2.873     | 3.773           | MARKED           |
| CPTL 206A | -1924.078 | 3306692.768 | 2.896     | 3.796           | 21.41            |
| CPTL 207  | -2028.800 | 3306665.802 | 2.810     | 3.710           | 32.32            |
| CPTL 208  | -2104.890 | 3306647.853 | 2.840     | 3.740           | 23.59            |
| CPTL 209  | -2230.078 | 3306618.298 | 2.870     | 3.770           | MARKED           |
| CPTL210   | -2290.107 | 3306604.791 | 3.049     | 3.949           | MARKED           |
| CPTL 210A | -2285.263 | 3306605.988 | 3.073     | 3.973           | 28.37            |
| CPTL 211  | -1666.456 | 3306748.284 | 2.820     | 3.720           | 15.97            |

**MARINE BASED BOREHOLE AS BUILT CO-ORDINATES**

System : WGS 84

| BH NAME   | Y         | X           | Z (m) MSL Sea Floor | Z (m) CD (PORT) Sea Floor | BH DEPTH (m) MSL Below Sea Floor |
|-----------|-----------|-------------|---------------------|---------------------------|----------------------------------|
| BHM 201   | NO DATA   | NO DATA     | NO DATA             | NO DATA                   | NO DATA                          |
| BHM 202   | NO DATA   | NO DATA     | NO DATA             | NO DATA                   | NO DATA                          |
| BHM 203   | NO DATA   | NO DATA     | NO DATA             | NO DATA                   | NO DATA                          |
| BHM 204   | NO DATA   | NO DATA     | NO DATA             | NO DATA                   | NO DATA                          |
| BHM 205   | NO DATA   | NO DATA     | NO DATA             | NO DATA                   | NO DATA                          |
| BHM 206   | -1919.433 | 3306642.005 | -13.800             | -12.900                   | 53.81                            |
| BHM 207   | -2018.854 | 3306617.188 | -16.910             | -16.010                   | 52.29                            |
| BHM 208   | -2096.114 | 3306605.555 | -14.018             | -13.118                   | 21.45                            |
| BHM 209   | -2218.109 | 3306577.189 | -13.910             | -13.010                   | 62.00                            |
| BHM 210   | -2278.051 | 3306557.380 | -13.720             | -12.820                   | 20.00                            |
| BHM 210A  | -2280.970 | 3306551.300 | -14.105             | -13.205                   | 68.40                            |
| BHM 211   | -2356.105 | 3306547.080 | -13.087             | -12.187                   | 62.44                            |
| BHCPM 208 | -2097.020 | 3306624.410 | -15.47              | -14.57                    | 14.30                            |

**MARINE BASED CPT AS BUILT CO-ORDINATES**

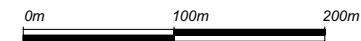
System : WGS 84

| BH NAME  | Y     | X       | Z (m) MSL | Z (m) CD (PORT) | BH DEPTH (m) MSL Below Sea Floor |
|----------|-------|---------|-----------|-----------------|----------------------------------|
| CPTM 207 | -2023 | 3306635 | -15.30    | -14.40          | 6.20                             |
| CPTM 209 | -2101 | 3306603 | -13.10    | -12.20          | 11.24                            |

**MULTI LEVEL STAND PIPE PIEZOMETER AS BUILT CO-ORDINATES**

System : WGS 84

| BH NAME | Y         | X           | Z (m) MSL | Z (m) CD (PORT) | BH DEPTH (m) BGL |
|---------|-----------|-------------|-----------|-----------------|------------------|
| P2A     | -1619.162 | 3306755.416 | 2.830     | 3.730           | 12.00            |
| P2B     | -1621.113 | 3306754.974 | 2.828     | 3.728           | 9.00             |
| P2C     | -1623.063 | 3306754.532 | 2.820     | 3.720           | 6.00             |



Graphic Scale  
1 : 2500

NB : Please note that the bar scale supercedes the verbal scale due to print sizes etc.

**KEY:**

- Profile of Sea Floor as Provided by Prestedge Reteif Dresner Wijnberg (Pty) Ltd (Dg. No. 29-09-2008.dwg)
- Position of CPT
- Position of Borehole
- Positions of Multilevel Standpipe Piezometer

Key Plan showing approximate positions of :

- a.) Positions of Boreholes
- b.) Locations of Geological Cross-Sections

**PHASE 2**

Scale 1 : 2500 (On A2 Original)

|   |  |               |            |
|---|--|---------------|------------|
| <b>TRANSNET PROJECTS</b>  |  | DATE          | 10/02/2009 |
| Durban Berth Deepening Feasibility Study,<br>Port of Durban.  |  | DRAWN         | A.S.       |
|   |  | CHECK         | M.R.       |
|   |  | REFERENCE No. | 07 -395    |
|   |  | FIGURE No.    | 2          |
| MOORE SPENCE JONES<br>CONSULTING GEOTECHNICAL, CIVIL & ENVIRONMENTAL ENGINEERS<br>CONSULTING GEOLOGISTS & SURVEYORS |  | REV.          |            |

# ***Transnet Projects***

## ***Port of Durban Berth Deepening Feasibility Study***

### ***Factual Geotechnical Report for Phase 2 (Pier 2: Berths 203 to 205)***

***Reference : 07-395R07Rev0***

***Dated : 6 May 2009***

**MOORE SPENCE JONES (PTY) LTD**

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# Transnet Projects

## Port of Durban Berth Deepening Feasibility Study

### Factual Geotechnical Report for Phase 2 (Pier 2: Berths 203 to 205)

Reference : 07-395R07Rev0

Dated : 6 May 2009

#### VOLUME 1 of 2

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## APPENDIX A



MOORE SPENCE JONES

Durban Berth Deepening Feasibility Study  
Factual Geotechnical Report : Phase 2 (Pier 2 : Berths 203 to 205)

Path : C:\Documents and Settings\Anyap\Desktop\07-395R07 Phase 2 - Factual Report Rev0 MVR.doc

HOLE No: **BD-BHL201**

Sheet 1 of 4

JOB NUMBER: **07-395**

**ROCK FABRIC**  
 MF -massive  
 BF -bedded  
 FF -foliated  
 CF -cleaved  
 SF -schistose  
 GF -gneissose  
 LF -laminated

**GRAIN SIZE**  
 FG -fine grained  
 MG -medium grain  
 CG -coarse grain

**JOINT SPACING**  
 VCJ-very close spacg  
 CJ -close spacing  
 MJ -medium spacing  
 WJ -wide spacing  
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**JOINT ROUGHNESS**  
 SLJ-slickensided  
 SJ -smooth  
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 CUR-curvilinear  
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 EHR-extremely hard rock  
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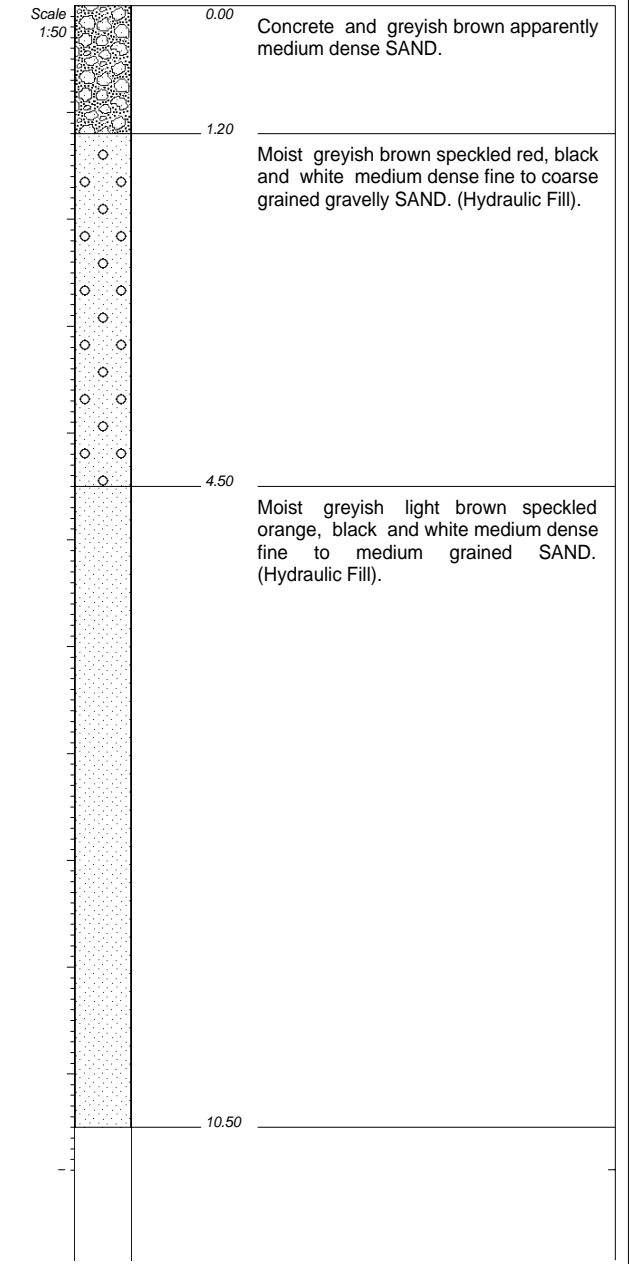
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL201**

Sheet 1 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 1.50      | 31                    | -                 | -       | N=11         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 1.95      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 3.00      | 0                     | -                 | -       | N=13         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 3.45      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Shelby                | 4.50      | 0                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 5.05      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 6.00      | 33                    | -                 | -       | N=14         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 6.45      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 7.50      | 31                    | -                 | -       | N=15         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 7.95      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 9.00      | 31                    | -                 | -       | N=17         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 9.45      | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Shelby                | 10.50     | 0                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |



HOLE No: **BD-BHL201**

Sheet 2 of 4

JOB NUMBER: **07-395**

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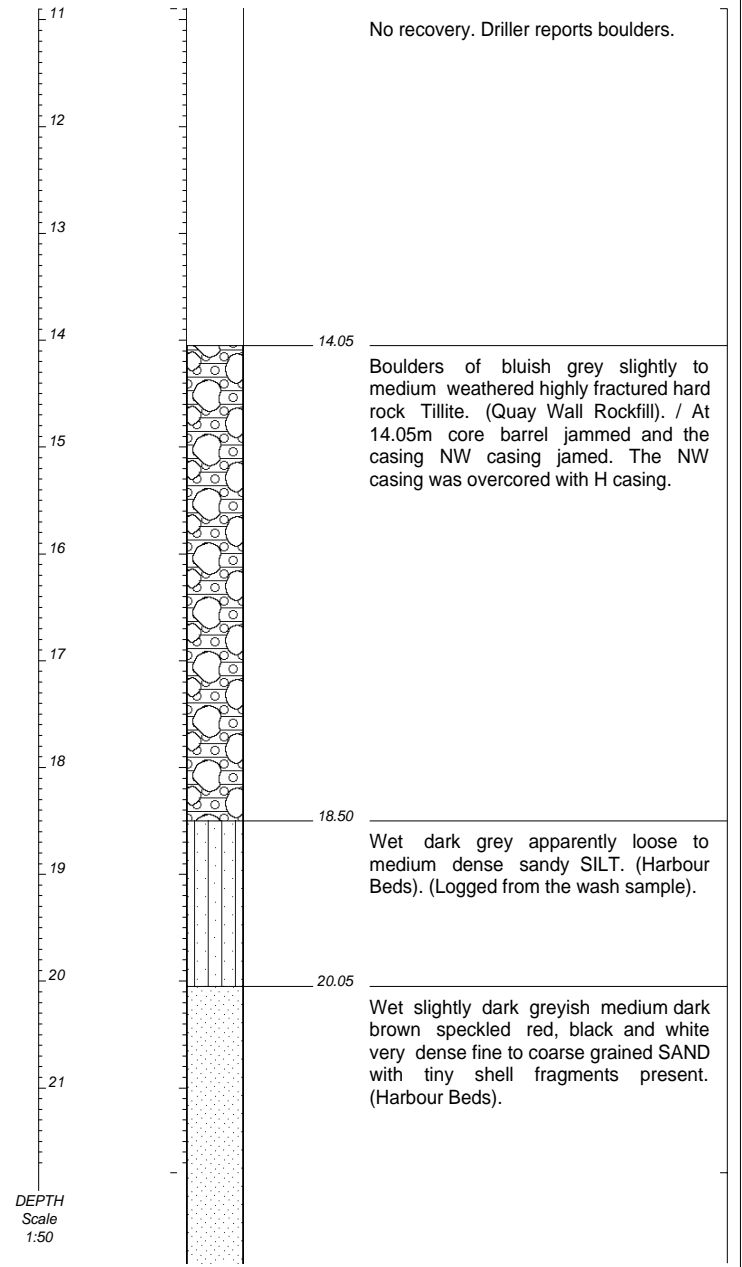
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL201**

Sheet 2 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| NWD4                  | 11.05     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 12.55     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 14.05     | 78                    | 78                |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 14.50     | 64                    | 64                |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 15.00     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 16.00     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 17.50     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 18.50     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Shelby                | 19.00     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 19.50     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 20.50     | 92                    |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 21.00     |                       |                   |         | N=63*        |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 21.45     | 86                    |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |



HOLE No: **BD-BHL201**

Sheet 3 of 4

JOB NUMBER: **07-395**

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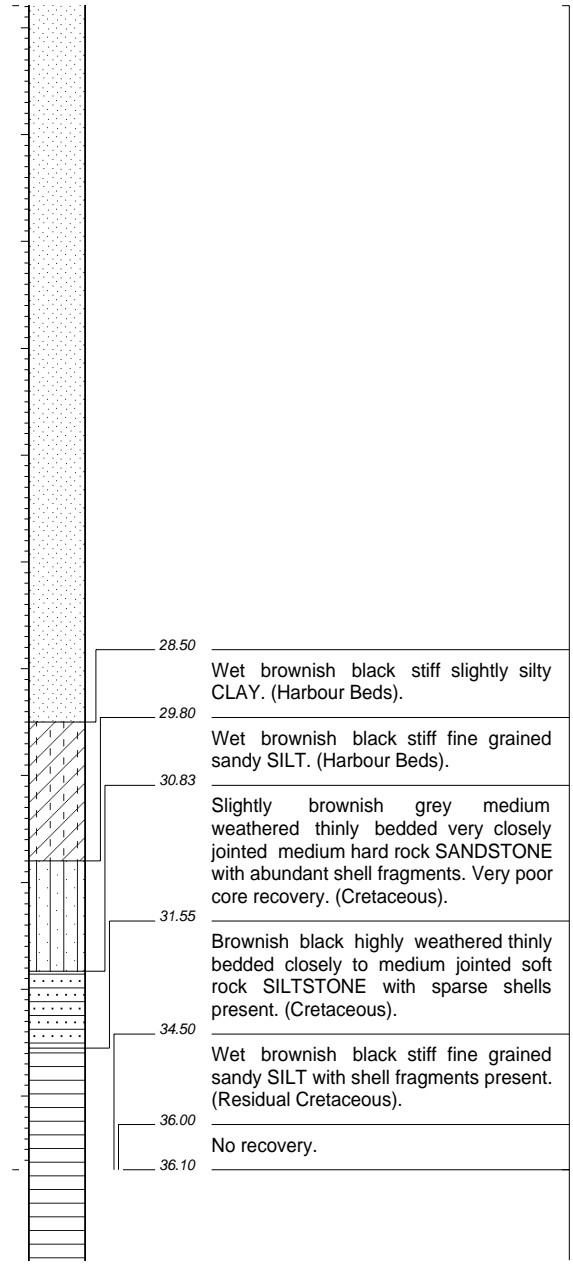
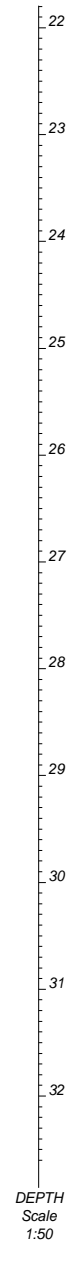
Client: **TRANSNET PROJECTS**  
 Project name: **Durban Harbour**  
**Berth Deepening**

HOLE No: **BD-BHL201**

Sheet 3 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|----------------------|
| Wash Bore             | 21.95     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 22.45     | 78                    | -                 | -       | N=Ref 72*    | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| Wash Bore             | 22.90     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 23.90     | 67                    | -                 | -       | N=Ref 21,25* | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| NWD4                  | 24.30     | 73                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 25.05     | 44                    | -                 | -       | N=Ref 21*    | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| NWD4                  | 25.30     | 95                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 26.30     | 100                   | -                 | -       | N=Ref*       | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| NWD4                  | 26.45     | 62                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| Wash Bore             | 27.50     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 29.00     | 82                    | -                 | -       | N=49*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| NWD4                  | 29.45     | 91                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| SPT                   | 30.00     | 80                    | -                 | -       | N=66*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                    |
| NWD4                  | 30.45     | 58                    | 23                | -       | -            | 1       | 0-5             | VC      | PLA         | SJ-SRJ    | slt       | <1                  | 4                  | -               | -                    |
| NWD4                  | 31.50     | 50                    | 50                | -       | -            | 1       | 0-5             | VC-C    | PLA         | SJ-SRJ    | slt       | <1                  | 12                 | -               | -                    |



HOLE No: **BD-BHL201**

Sheet 4 of 4

JOB NUMBER: **07-395**

**ROCK FABRIC**  
 MF -massive  
 BF -bedded  
 FF -foliated  
 CF -cleaved  
 SF -schistose  
 GF -gneissose  
 LF -laminated

**GRAIN SIZE**  
 FG -fine grained  
 MG -medium grain  
 CG -coarse grain

**JOINT SPACING**  
 VCJ-very close spacg  
 CJ -close spacing  
 MJ -medium spacing  
 WJ -wide spacing  
 VWJ-very wide spacng

**JOINT ROUGHNESS**  
 SLJ-slickensided  
 SJ -smooth  
 RJ -rough

**JOINT SHAPE**  
 CUR-curvilinear  
 PLA-planar  
 UND-undulating  
 STE-stepped  
 IRR-irregular

**ROCK HARDNESS**  
 EHR-extremely hard rock  
 VHR-very hard rock  
 HR-hard rock  
 MHR-medium hard rock  
 SR-soft rock  
 VSR-very soft rock



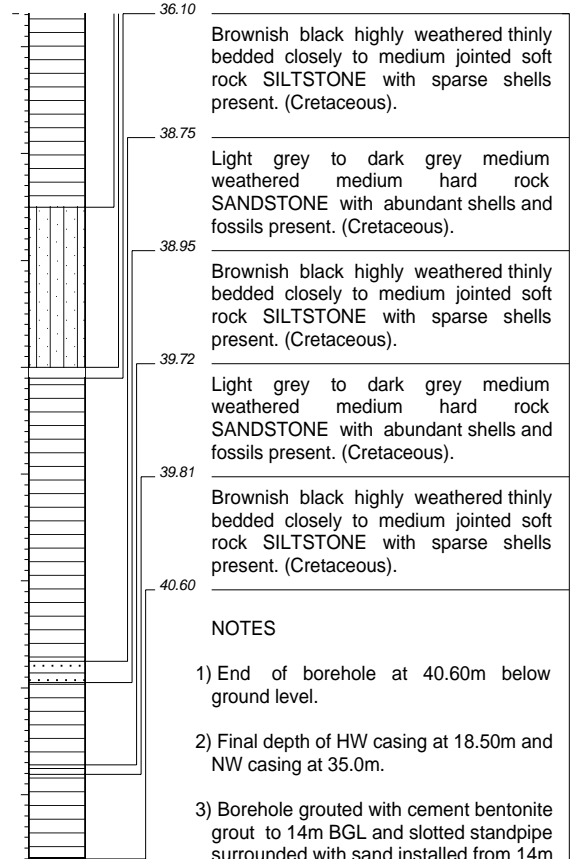
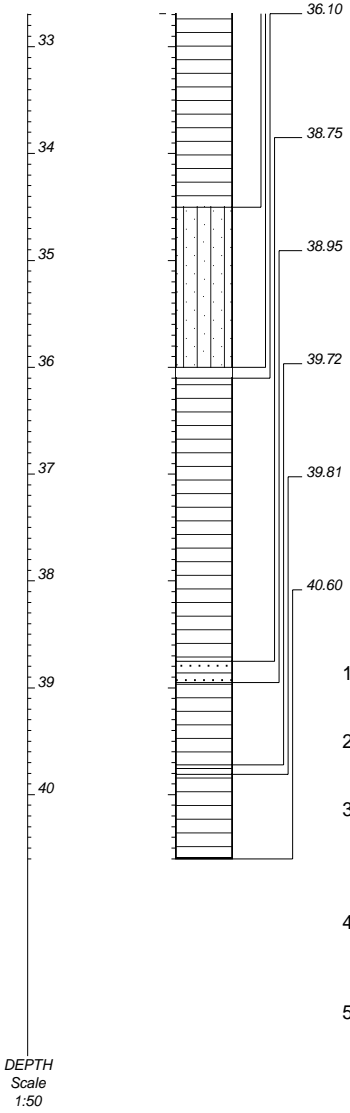
Client: **TRANSNET PROJECTS**  
 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL201**

Sheet 4 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness        | Fill type  | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|------------------|------------|---------------------|--------------------|-----------------|------------------------|
| NWD4                  | 33.00     | 82                    | 82                | 11      | -            | 1       | 0-5             | VC-C    | PLA         | SJ-SRJ           | sit        | <1                  | 13                 |                 |                        |
| NWD4                  | 34.50     | 43                    | -                 | -       | -            | -       | -               | -       | -           | -                | -          | -                   | -                  | -               |                        |
| SPT                   | 36.00     | 0                     | -                 | -       | N=Ref*       | -       | -               | -       | -           | -                | -          | -                   | -                  | -               |                        |
| NWD4                  | 36.10     | 85                    | 85                | 31      | -            | 1<br>2  | 5-10<br>45      | M<br>M  | PLA<br>PLA  | SJ-SRJ<br>SJ-SRJ | sit<br>sit | <1<br><1            | 4                  |                 |                        |
| NWD4                  | 37.60     | 60                    | 60                | 35      | -            | 1       | 5-10            | M       | PLA         | SJ-SRJ           | sit        | <1                  | 6                  |                 |                        |
| NWD4                  | 39.10     | 93                    | 93                | 29      | -            | 1       | 0-5             | VC-M    | PLA-UNDSJ   | SJ-SRJ           | sit        | <1                  | 15                 |                 |                        |
|                       | 40.60     |                       |                   |         |              |         |                 |         |             |                  |            |                     |                    |                 |                        |



- NOTES**
- 1) End of borehole at 40.60m below ground level.
  - 2) Final depth of HW casing at 18.50m and NW casing at 35.0m.
  - 3) Borehole grouted with cement bentonite grout to 14m BGL and slotted standpipe surrounded with sand installed from 14m BGL to ground level.
  - 4) Defective SPT's shown as N=60\* are considered unrepresentative of the insitu material.
  - 5) Therefore BD-BHL201 is to be redrilled as BD-BHL201A.

CONTRACTOR : **Geopractica**  
 MACHINE :  
 DRILLED BY : **Simon/ Daniel M**  
 PROFILED BY : **SAP**  
 TYPE SET BY : **Rev 0**  
 SETUP FILE : **MSJA3.SET**

INCLINATION : **90°**  
 DIAM : **N**  
 DATE : **21/06/2008**  
 DATE : **08/08/2008**  
 DATE : **04/03/09 14:03**  
 TEXT : **..\\BHOLES\\BD-BHL-1.TXT**

ELEVATION : **3.630 (m) CD**  
 X-COORD : **3306806.698**  
 Y-COORD : **-1408.281**

HOLE No: **BD-BHL201**





BD-BHL201

0.0 to 19.5m

BOX 1 of 4





BD-BHL201

19.5 to 29.0m

BOX 2 of 4





BD-BHL201

29.0 to 39.1m

BOX 3 of 4





BD-BHL201

39.1 to 40.6m

BOX 4 of 4

HOLE No: **BD-BHL201A**  
Sheet 1 of 4

JOB NUMBER: **07-395**

|   |   |   |   |
|---|---|---|---|
| <b>ROCK FABRIC</b><br>MF -massive<br>BF -bedded<br>FF -foliated<br>CF -cleaved<br>SF -schistose<br>GF -gneissose<br>LF -laminated | <b>GRAIN SIZE</b><br>FG -fine grained<br>MG -medium grain<br>CG -coarse grain   | <b>JOINT ROUGHNESS</b><br>SLJ-slickensided<br>SJ -smooth<br>RJ -rough                                 | <b>ROCK HARDNESS</b><br>EHR-extremely hard rock<br>VHR-very hard rock<br>HR -hard rock<br>MHR-medium hard rock<br>SR -soft rock<br>VSR-very soft rock |
|   | <b>JOINT SPACING</b><br>VCJ-very close spacg<br>CJ -close spacing<br>MJ -medium spacing<br>WJ -wide spacing<br>VWJ-very wide spacng | <b>JOINT SHAPE</b><br>CUR-curvilinear<br>PLA-planar<br>UND-undulating<br>STE-stepped<br>IRR-irregular |   |



Client: TRANSNET PROJECTS  
Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL201A**  
Sheet 1 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) | DEPTH Scale 1:50 |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|------------------|
| Wash Bore (N)         |           | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      | 10               |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 9                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 8                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 7                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 6                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 5                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 4                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 3                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 2                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 1                |
|                       |           |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        | 0                |

Scale 1:50  
Wash bore - no sample recovery.

HOLE No: **BD-BHL201A**  
Sheet 2 of 4

JOB NUMBER: **07-395**

**ROCK FABRIC**  
MF -massive  
BF -bedded  
FF -foliated  
CF -cleaved  
SF -schistose  
GF -gneissose  
LF -laminated

**GRAIN SIZE**  
FG -fine grained  
MG -medium grain  
CG -coarse grain

**JOINT SPACING**  
VCJ-very close spacg  
CJ -close spacing  
MJ -medium spacing  
WJ -wide spacing  
VWJ-very wide spacng

**JOINT ROUGHNESS**  
SLJ-slickensided  
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**JOINT SHAPE**  
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EHR-extremely hard rock  
VHR-very hard rock  
HR -hard rock  
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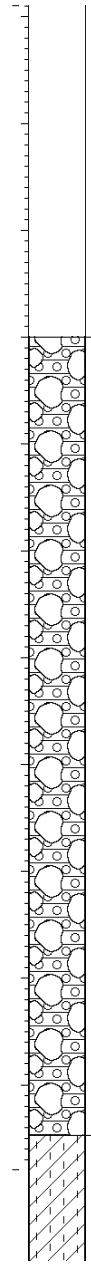
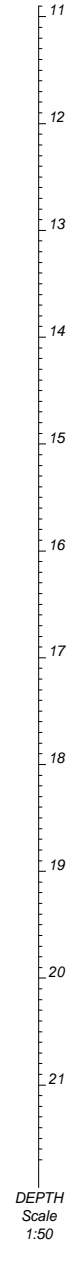


Client: TRANSNET PROJECTS  
Project name: **Durban Harbour**  
**Berth Deepening**

HOLE No: **BD-BHL201A**  
Sheet 2 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| NWD4                  | 14.00     | 60                    | 60                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 15.50     | 22                    | 22                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 17.00     | 43                    | 43                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 17.35     | 7                     | 7                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 18.72     | 7                     | 7                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 20.22     | 10                    | 10                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 21.47     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |



0.00  
14.00  
21.47

Boulders of bluish grey slightly to medium weathered hard to very hard rock TILLITE. (Quay Wall Rockfill).

HOLE No: **BD-BHL201A**  
Sheet 3 of 4

JOB NUMBER: **07-395**

ROCK FABRIC  
MF -massive  
BF -bedded  
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SF -schistose  
GF -gneissose  
LF -laminated

GRAIN SIZE  
FG -fine grained  
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JOINT ROUGHNESS  
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ROCK HARDNESS  
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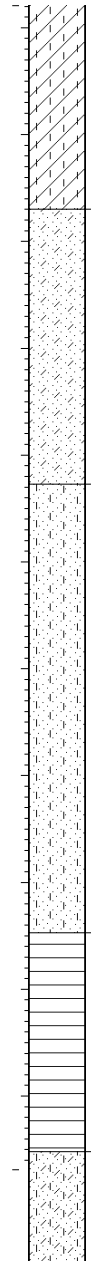
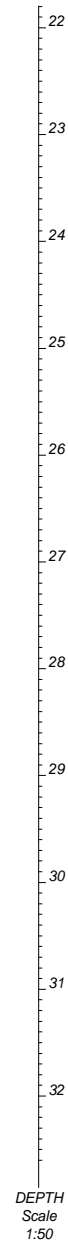


Client: TRANSNET PROJECTS  
Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL201A**  
Sheet 3 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Shelby                | 100       | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 22.02     | 51                    | -                 | -       | N=15         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 22.47     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Shelby                | 100       | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 23.02     | 64                    | -                 | -       | N=23         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 23.47     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 24.02     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 24.47     | 82                    | -                 | -       | N=23         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 25.02     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 25.47     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 25.92     | 62                    | -                 | -       | N=17         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 26.47     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 26.92     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 27.37     | 55                    | -                 | -       | N=14         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 27.92     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 28.37     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 28.82     | 41                    | -                 | -       | N=21         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 29.37     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 29.82     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 30.27     | 53                    | -                 | -       | N=23         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 30.82     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 31.27     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 31.72     | 44                    | -                 | -       | N=24         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 32.27     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore (N)         | 32.72     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 33.17     | 44                    | -                 | -       | N=27         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 33.72     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 34.17     | 96                    | 96                | -       | -            | 1       | 5-10            | C-M     | PLA         | SRJ       | sit       | <1mm                | 6                  | -               | -                      |
|                       | 34.72     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 35.17     | 80                    | 80                | -       | -            | 1       | 5-10            | C-M     | PLA         | SRJ       | sit       | <1mm                | 10                 | -               | -                      |
|                       | 35.72     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 36.17     | -                     | -                 | -       | N=Ref        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |



Wet dark greyish brown firm to stiff slightly silty CLAY. (Harbour Beds).

Wet dark grey brown speckled white medium dense slightly clayey fine to medium grained SAND with sparse shell fragments. (Harbour Beds).

Wet dark brown speckled white medium dense silty medium grained SAND with some shell fragments. (Harbour Beds).

Olive dark brown highly weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE. (Cretaceous).



HOLE No: **BD-BHL201A**  
Sheet 4 of 4

JOB NUMBER: **07-395**

**ROCK FABRIC**  
MF -massive  
BF -bedded  
FF -foliated  
CF -cleaved  
SF -schistose  
GF -gneissose  
LF -laminated

**GRAIN SIZE**  
FG -fine grained  
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**JOINT ROUGHNESS**  
SLJ-slickensided  
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**ROCK HARDNESS**  
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**JOINT SHAPE**  
CUR-curvilinear  
PLA-planar  
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STE-stepped  
IRR-irregular

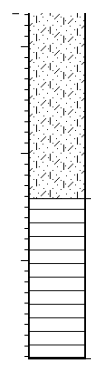


Client: **TRANSNET PROJECTS**  
Project name: **Durban Harbour**  
**Berth Deepening**

HOLE No: **BD-BHL201A**  
Sheet 4 of 4

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Wash Bore (N)         | 32.77     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore (N)         | 33.32     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore (N)         | 33.87     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore (N)         | 34.42     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 35.92     | 82                    | 82                | -       | -            | 1       | 5-10            | C-M     | PLA         | SRJ       | slt       | <1mm                | >20                |                 |                        |



Wet dark grey to black very dense slightly clayey silty fine grained SAND. (Residual Cretaceous). (Logged from the wash sample).

Olive dark brown highly weathered thinky to medium bedded closely to medium jointed soft rock SILTSTONE. (Cretaceous).

**NOTES**

- 1) End of borehole at 35.92m below ground level.
- 2) Final depth of NW casing at 34.00m.
- 3) Borehole backfilled with cement bentonite grout to ground level.
- 4) No SPT's above rock fill due to SPT's being reliable from BD-BHL201.

CONTRACTOR : Geopractica  
MACHINE : Toehoe  
DRILLED BY : Lawrence  
PROFILED BY : LD  
TYPE SET BY : Rev 0  
SETUP FILE : MSJA3.SET

INCLINATION : 90°  
DIAM : N  
DATE : 25/11/2008  
DATE : 29/11/2008  
DATE : 26/02/09 10:11  
TEXT : ..\BHOLES\BD-BHL-2.TXT

ELEVATION : 3.645 (m) CD  
X-COORD : 3306807.642  
Y-COORD : -1404.599

HOLE No: **BD-BHL201A**







BD-BHL201A

23.2 to 32.77m

BOX 2 of 3





BD-BHL201A

32.77 to 35.92m

BOX 3 of 3

HOLE No: **BD-BHL202**

Sheet 1 of 5

JOB NUMBER: **07-395**

**ROCK FABRIC**  
 MF -massive  
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 SF -schistose  
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 LF -laminated

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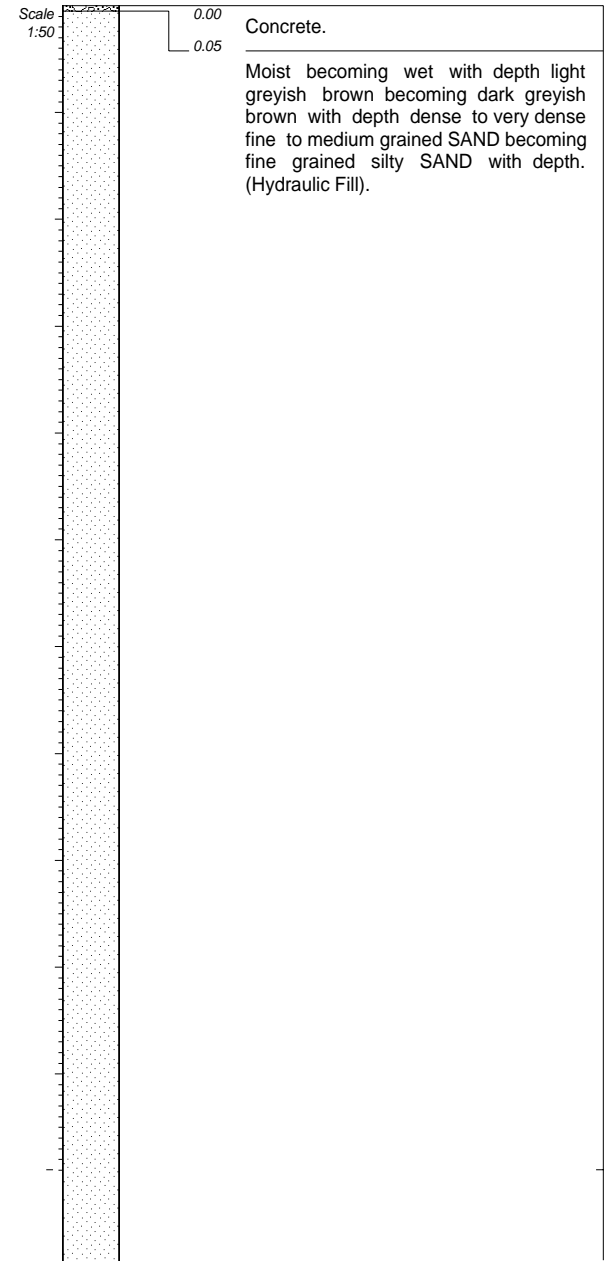
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL202**

Sheet 1 of 5

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Wash Bore             | 100       | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 1.50      | 100                   | -                 | -       | N=32*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 1.95      | 77                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 3.00      | 100                   | -                 | -       | N=35*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 3.45      | 83                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 4.50      | 84                    | -                 | -       | N=38*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 4.95      | 84                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 6.00      | 82                    | -                 | -       | N=Ref*       | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 6.45      | 76                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 7.50      | 0                     | -                 | -       | N=37*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 7.95      | 79                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 9.00      | 100                   | -                 | -       | N=60*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 9.45      | 79                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 10.50     | 84                    | -                 | -       | N=58*        | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |



HOLE No: **BD-BHL202**

Sheet 2 of 5

JOB NUMBER: **07-395**

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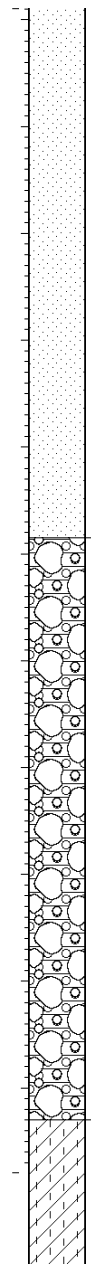
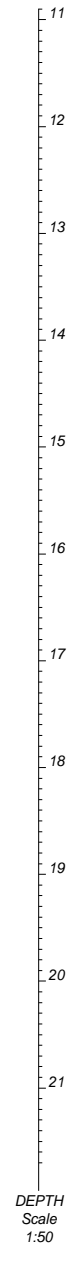
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL202**

Sheet 2 of 5

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|--------------------|-----------------|------------------------|
| Wash Bore             | 10.95     | 72                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| SPT                   | 12.00     | 0                     | -                 | -       | N=Ref*       | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| Wash Bore             | 12.45     | 48                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| SPT                   | 13.50     | 0                     | -                 | -       | N=Ref<br>27* | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| Wash Bore             | 13.80     | 67                    | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| SPT                   | 14.85     | 91                    | -                 | -       | N=55*        | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| NWD4                  | 15.30     | 89                    | 50                | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| NWD4                  | 16.80     | 26                    | 26                | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| NWD4                  | 18.30     | 25                    | 25                | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| NWD4                  | 19.80     | 33                    | 33                | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |
| NWD4                  | 21.30     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                  | -               | -                      |



15.85  
 Boulders and gravel comprising greyish blue slightly weathered medium hard rock Tillite, (Quay Wall Rockfill).  
 21.30

HOLE No: **BD-BHL202**

Sheet 3 of 5

JOB NUMBER: **07-395**

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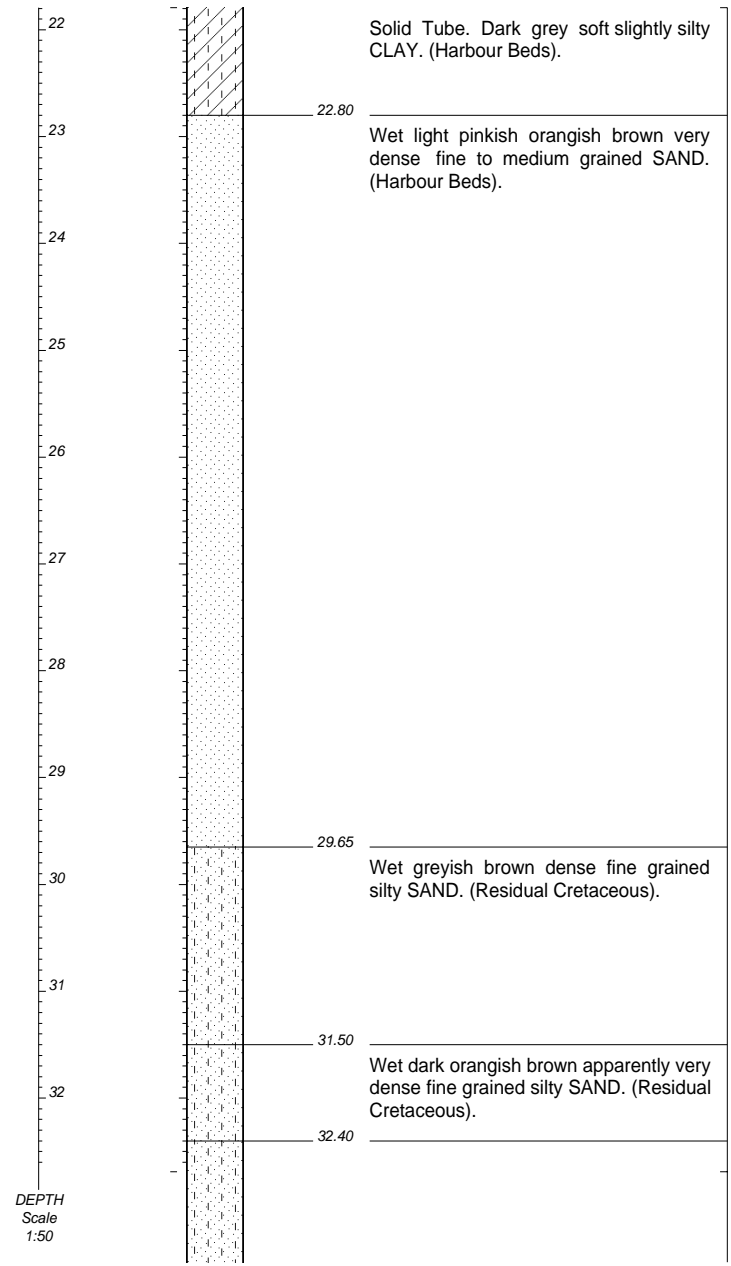
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour**  
**Berth Deepening**

HOLE No: **BD-BHL202**

Sheet 3 of 5

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results       | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Solid Tube            | 90        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 22.80     | 84                    |                   |         | N=Ref*             |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 23.25     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 0         |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 24.30     | 58                    |                   |         | N=Ref*             |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 24.75     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 0         |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 25.80     | 60                    |                   |         | N=Ref<br>19,28*    |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 26.10     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 45        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 27.15     | 0                     |                   |         | N=Ref              |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 27.30     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 35        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 28.35     | 0                     |                   |         | N=Ref<br>27*       |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 28.60     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 30        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 29.65     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 62        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 30.70     | 100                   |                   |         | N=41*              |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 31.15     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| Wash Bore             | 68        |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 31.90     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |
| SPT                   | 31.90     | 73                    |                   |         | N=Ref<br>16,15,20* |         |                 |         |             |           |           |                     |                    |                 |                        |
|                       | 32.30     |                       |                   |         |                    |         |                 |         |             |           |           |                     |                    |                 |                        |





HOLE No: **BD-BHL202**

Sheet 4 of 5

JOB NUMBER: **07-395**

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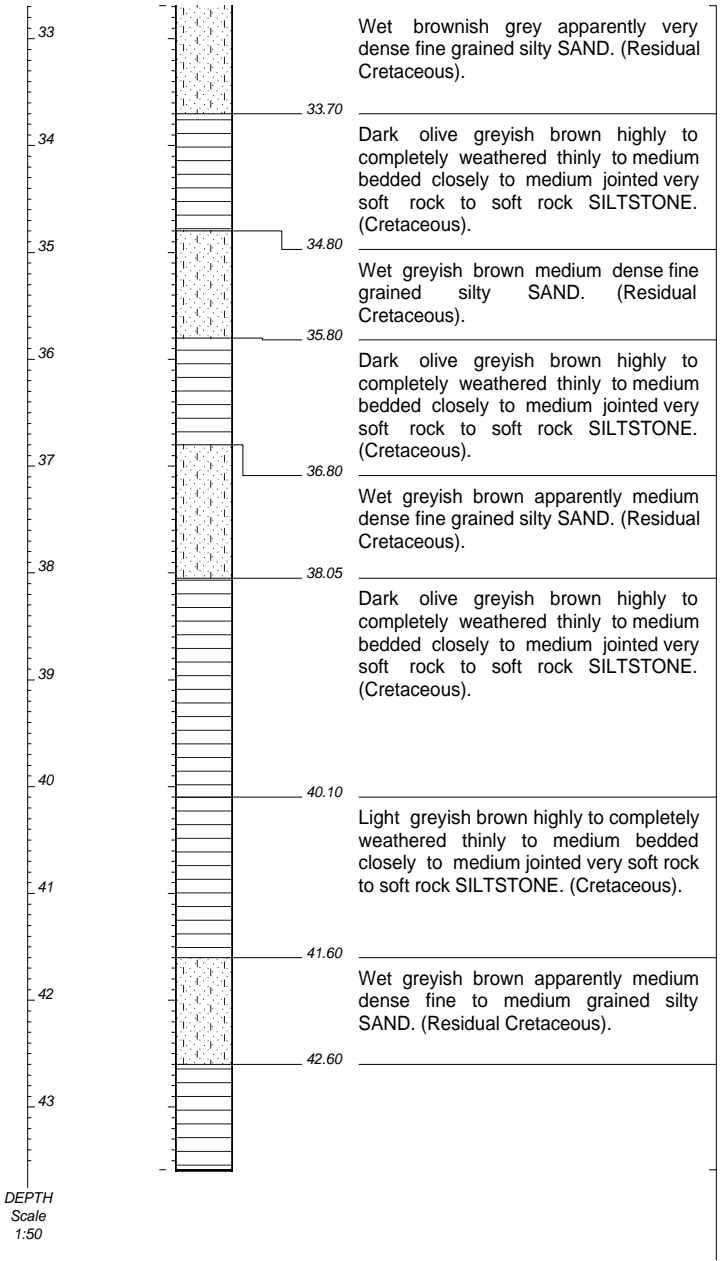
Client: TRANSNET PROJECTS  
 Project name: **Durban Harbour**  
**Berth Deepening**

HOLE No: **BD-BHL202**

Sheet 4 of 5

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| NWD4                  | 33        | 7                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
|                       | 33.80     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 33        | 33                    | -                 | -       | 1            | 0-5     | C-M             | PLA     | SRJ         | slt       | <3        | 2                   |                    |                 |                        |
|                       | 34.80     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 39        | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   |                    |                 |                        |
|                       | 35.80     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 52        | 52                    | 15                | -       | 1            | 0-20    | C-M             | PLA     | SRJ         | slt       | <3        | 7                   |                    |                 |                        |
|                       | 36.80     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 47        | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   |                    |                 |                        |
|                       | 38.05     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 74        | 74                    | 39                | -       | 1            | 0-5     | C-M             | PLA     | SRJ         | slt       | <1        | 8                   |                    |                 |                        |
|                       | 39.05     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 64        | 64                    | 46                | -       | 1            | 0-5     | C-M             | PLA     | SRJ         | slt       | <1        | 6                   |                    |                 |                        |
|                       | 40.10     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 40        | 40                    | 39                | -       | 1            | 0-5     | C-M             | PLA     | SRJ         | slt       | <1        | 4                   |                    |                 |                        |
|                       | 41.60     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 50        | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   |                    |                 |                        |
|                       | 42.60     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |
| NWD4                  | 80        | 80                    | 63                | -       | 1            | 0-5     | C-M             | PLA     | SRJ         | slt       | <1        | 4                   |                    |                 |                        |



HOLE No: **BD-BHL202**

Sheet 5 of 5

JOB NUMBER: **07-395**

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**Berth Deepening**

HOLE No: **BD-BHL202**

Sheet 5 of 5

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) | DEPTH Scale 1:50 |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|------------------|
|                       | 43.60     |                       |                   |         |              |         |                 |         |             |           |           |                     |                    |                 |                        |                  |

Dark olive greyish brown highly to completely weathered thinly to medium bedded closely to medium jointed soft rock SILTSTONE. (Cretaceous).

**NOTES**

- 1) End of borehole at 43.60m below ground level.
- 2) Final depth of NW casing at 31.0m.
- 3) Borehole backfilled with cement bentonite grout to ground level.
- 4) Defective SPT's shown as N=60\* are considered unrepresentative of the insitu material.
- 5) Therefore BD-BHL202 is to be redrilled at BD-BHL202A.

CONTRACTOR : **Geopractica**  
 MACHINE :  
 DRILLED BY : **Daniel M**  
 PROFILED BY : **GA/MM**  
 TYPE SET BY : **Rev 0**  
 SETUP FILE : **MSJA3.SET**

INCLINATION : **90°**  
 DIAM : **N**  
 DATE : **27/08/2008**  
 DATE : **28/08/2008**  
 DATE : **04/03/09 14:04**  
 TEXT : **..\\BHOLES\\BD-BHL-3.TXT**

ELEVATION : **3.630 (m) CD**  
 X-COORD : **3306781.345**  
 Y-COORD : **-1520.079**

HOLE No: **BD-BHL202**



BD-BHL202

0.0 to 7.95m

BOX 1 of 4





BD-BHL202

7.95 to 16.8m

BOX 2 of 4





BD-BHL202

16.8 to 33.8m

BOX 3 of 4





BD-BHL202

33.8 to 43.6m

BOX 4 of 4

HOLE No: **BD-BHL202A**  
Sheet 1 of 2

JOB NUMBER: **07-395**

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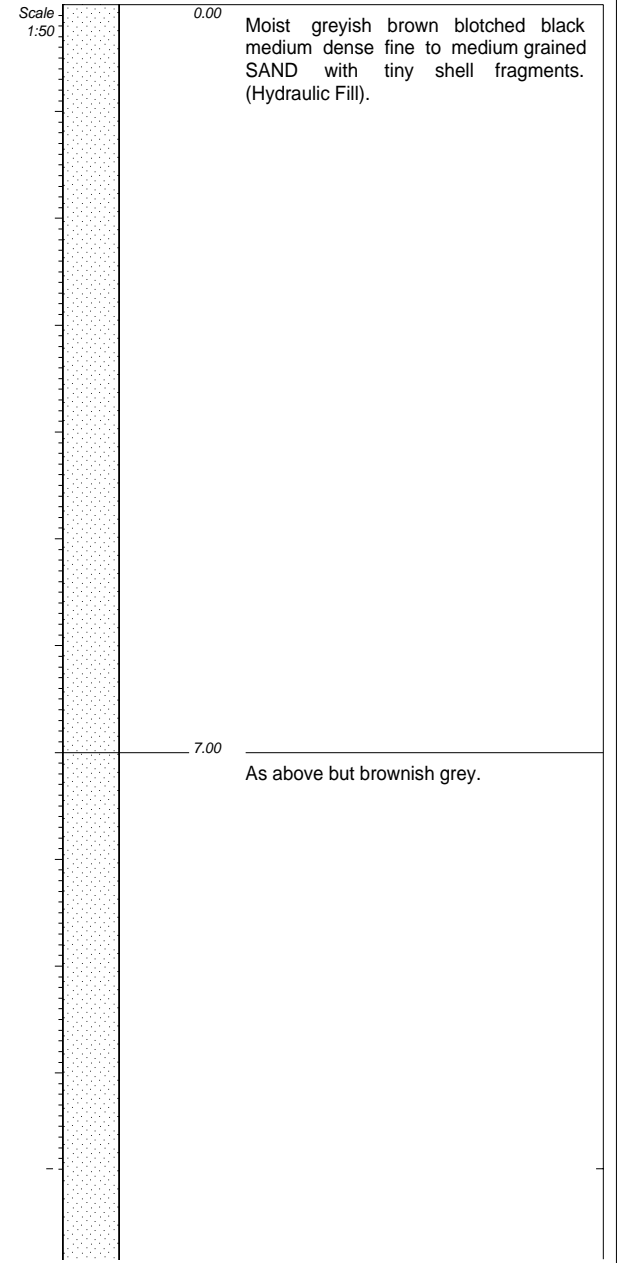


Client: TRANSNET PROJECTS  
Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL202A**  
Sheet 1 of 2

JOB NUMBER: **07-395**

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|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 1.50      | 67                    | -                 | -       | N=15         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 1.95                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 3.00      | 58                    | -                 | -       | N=17         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 3.45                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 4.50      | 58                    | -                 | -       | N=18         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 4.95                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 6.00      | 62                    | -                 | -       | N=21         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 6.45                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 7.50      | 78                    | -                 | -       | N=17         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 7.95                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 9.00      | 49                    | -                 | -       | N=25         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| 9.45                  | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | -         | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 10.50     | 89                    | -                 | -       | N=9          | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |



HOLE No: **BD-BHL202A**  
Sheet 2 of 2

JOB NUMBER: **07-395**

**ROCK FABRIC**  
MF -massive  
BF -bedded  
FF -foliated  
CF -cleaved  
SF -schistose  
GF -gneissose  
LF -laminated

**GRAIN SIZE**  
FG -fine grained  
MG -medium grain  
CG -coarse grain

**JOINT SPACING**  
VCJ-very close spacg  
CJ -close spacing  
MJ -medium spacing  
WJ -wide spacing  
VWJ-very wide spacng

**JOINT ROUGHNESS**  
SLJ-slickensided  
SJ -smooth  
RJ -rough

**JOINT SHAPE**  
CUR-curvilinear  
PLA-planar  
UND-undulating  
STE-stepped  
IRR-irregular

**ROCK HARDNESS**  
EHR-extremely hard rock  
VHR-very hard rock  
HR -hard rock  
MHR-medium hard rock  
SR -soft rock  
VSR-very soft rock

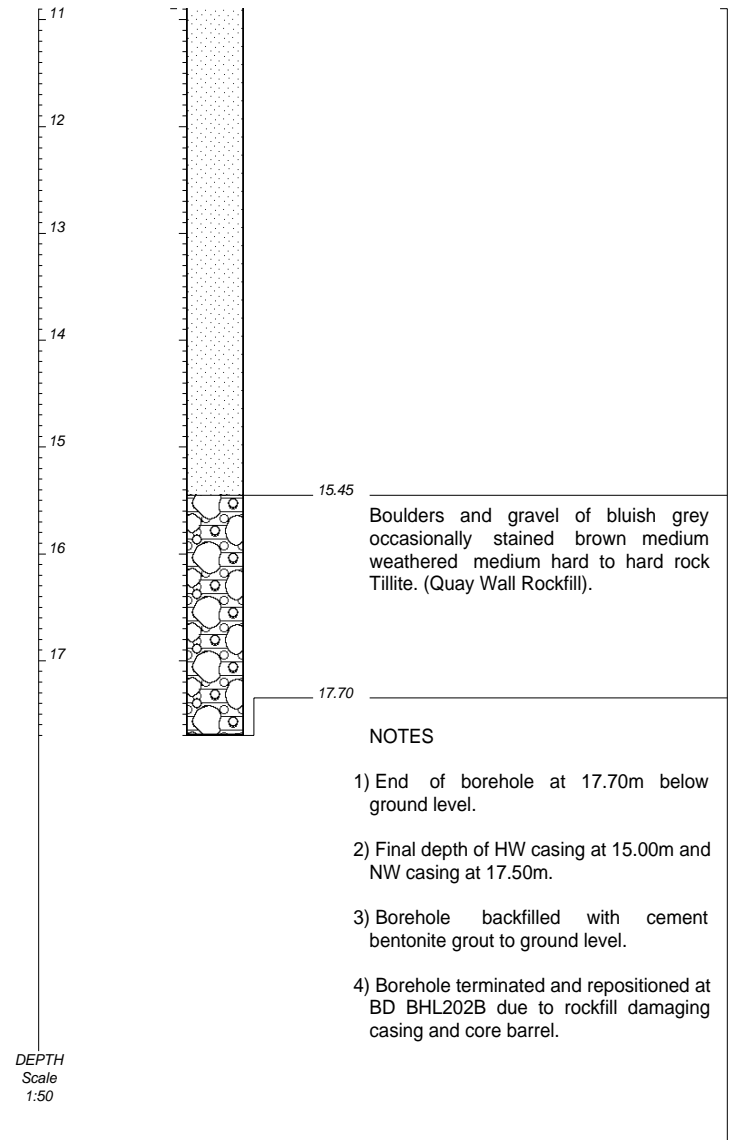


Client: TRANSNET PROJECTS  
Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL202A**  
Sheet 2 of 2

JOB NUMBER: **07-395**

| Drill Method and Size | Depth (m) | Material Recovery (%) | Core Recovery (%) | RQD (%) | Test Results | Set No. | Inclination (°) | Spacing | Joint shape | Roughness | Fill type | Fill thickness (mm) | Fracture Frequency | Weathering code | Elevation (m.a.m.s.l.) |
|-----------------------|-----------|-----------------------|-------------------|---------|--------------|---------|-----------------|---------|-------------|-----------|-----------|---------------------|--------------------|-----------------|------------------------|
| Wash Bore             | 10.95     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 12.00     | 62                    | -                 | -       | N=16         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 12.45     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 13.50     | 58                    | -                 | -       | N=18         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| Wash Bore             | 13.95     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| SPT                   | 15.00     | 67                    | -                 | -       | N=20         | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 15.45     | 19                    | 19                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 16.95     | 66                    | 66                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 17.50     | 90                    | 90                | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |
| NWD4                  | 17.70     | -                     | -                 | -       | -            | -       | -               | -       | -           | -         | -         | -                   | -                  | -               | -                      |



CONTRACTOR : Geopractica  
MACHINE : GXY-2B  
DRILLED BY : Joseph  
PROFILED BY : SAP  
TYPE SET BY : Rev 0  
SETUP FILE : MSJA3.SET

INCLINATION : 90°  
DIAM : N  
DATE : 04/11/2008  
DATE : 12/11/2008  
DATE : 11/02/09 15:14  
TEXT : ..\BHOLES\BD-BHL-4.TXT

ELEVATION : 3.615 (m) CD  
X-COORD : 3306781.271  
Y-COORD : -1515.961

HOLE No: **BD-BHL202A**





BD-BHL202A

0.0 to 15.0m

BOX 1 of 2





BD-BHL202A

15.0 to 17.70m

BOX 2 of 2



HOLE No: **BD-BHL202B**

Sheet 2 of 4

JOB NUMBER: **07-395**

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 Project name: **Durban Harbour Berth Deepening**

HOLE No: **BD-BHL202B**

Sheet 2 of 4

JOB NUMBER: **07-395**

