GOVERNO DO ESTADO DO CEARÁ

SRH Secretaria dos Recursos Hídricos

Programa de Gerenciamento e Integração dos Recursos Hídricos do Estado do Ceará - PROGERIRH

Contrato
Nº 02/ PROGERIRH-PILOTO/CE/SRH 2001

Estudos de Alternativas, EIAS/RIMAS, Projetos Executivos, Levantamentos Cadastrais, Planos de Reassentamento e Avaliação Financeira e Econômica dos Projetos das Barragens João Guerra / Umari, Riacho da Serra, Ceará e Missi, e dos Projetos das Adutoras de Madalena, Lagoa do Mato, Alto Santo e Amontada

BARRAGEM CEARÁ

VOLUME I - ESTUDOS BÁSICOS

Tomo 3B - Estudos Cartográficos - Memória de Cálculo

MONTGOMERY WATSON

EngeSoft

Julho de 2003

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1. APRESENTAÇÃO

1. APRESENTAÇÃO

O consórcio **Montgomery-Watson / Engesoft** e a **Secretaria dos Recursos Hídricos do Estado do Ceará (SRH-CE)** celebraram o contrato nº 02/PROGERIRH-PILOTO/CE/SRH 2001, que tem como objetivo o Estudo de Alternativas, EIA/RIMAS, Levantamentos Cadastrais, Planos de Reassentamento e Avaliação Financeira e Econômica dos Projetos das Barragens João Guerra / Umari, Riacho da Serra, Ceará e Missi, e dos Projetos das Adutoras de Madalena, Lagoa do Mato, Alto Santo e Amontada.

A ordem de serviço foi emitida em 05 de março de 2001 e imediatamente as equipes do consórcio iniciaram as atividades previstas no cronograma aprovado.

O presente relatório, denominado **Tomo 3B – Estudos Cartográficos – Memória de Cálculo**, é parte integrante do **Volume 1 – Estudos Básicos** e diz respeito à **Barragem Ceará**, a qual tem por finalidade a criação de um reservatório no rio de mesmo nome.

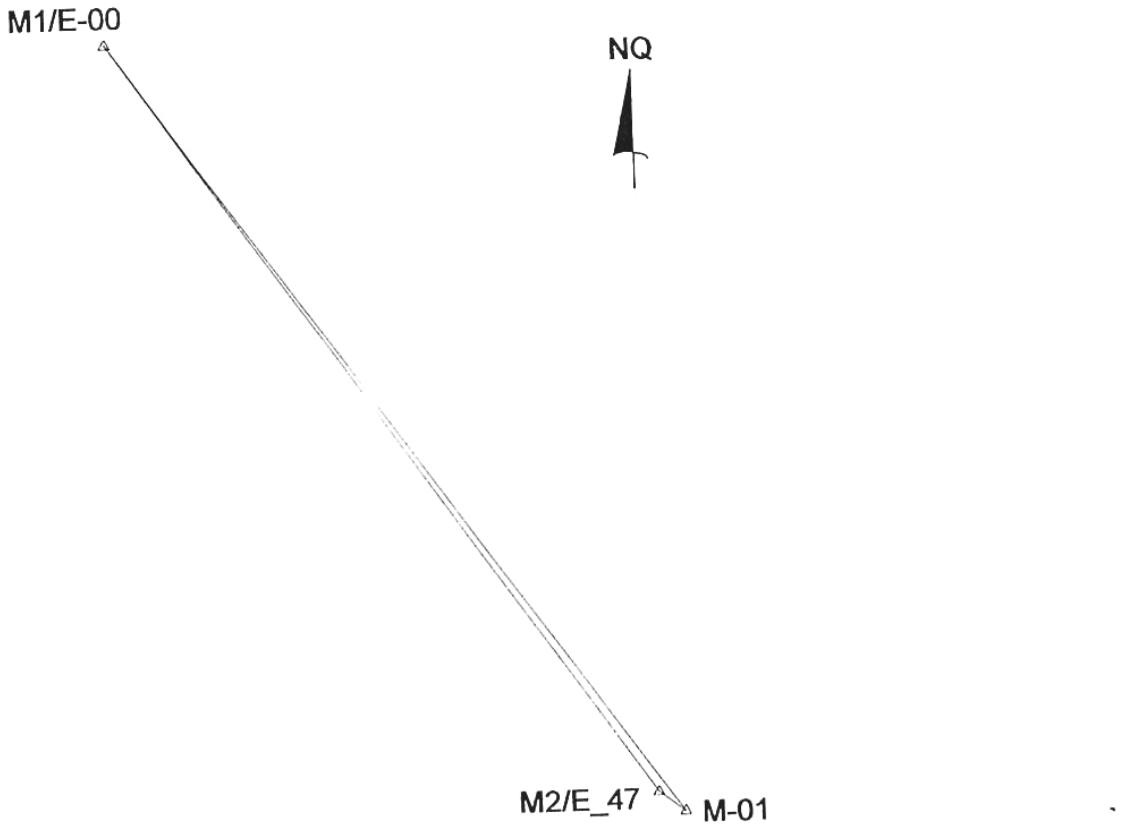
Este tomo apresenta os anexos referentes à memória de cálculo relativa à transporte de coordenadas e apoio básico e suplementar para o levantamento aerofotogramétrico da bacia hidráulica.

2. TRANSPORTE DE COORDENADAS

ENGESOFT ENGENHARIA E CONSULTORIA LTDA

Projeto: Ceará	**Município:** Caucaia	**Estado:** Ceará
Origem M-01.	**Marco Poligonal** Marco_1/E_00	**Projeção/Datum** UTM/SAD-69
Coordenada NORTE 9.574.505,231m	**Coordenada ESTE** 522.181,769m	**Altitude Ortométrica** 44,114m
Latitude Geodésica 3°50'58.16322" S		**Longitude Geodésica** 38°48'00.76126" WGr

Projeto: Ceará	**Município:** Caucaia	**Estado:** Ceará
Origem M-01	**Marco Poligonal** Marco_M2/E_47	**Projeção/Datum** UTM/SAD-69
Coordenada NORTE 9.573.732,493m	**Coordenada ESTE** 522.714,025m	**Altitude Ortométrica** 40,302m
Latitude Geodésica 3°51'23.32603" S		**Longitude Geodésica** 38°47'43.49716" WGr



ENGESOFT ENGENHARIA E CONSULTORIA LTDA

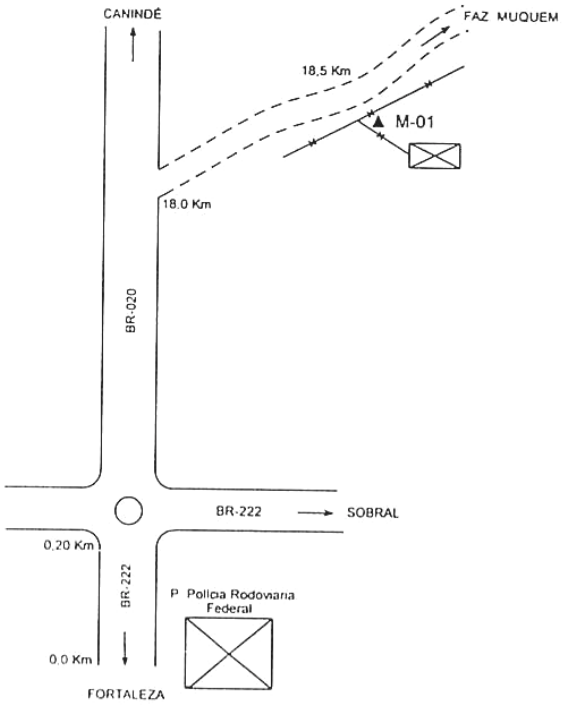
Vértice: **M-01**	**Ponto Visado:** M-02	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Lagoinha
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 51'24,02561"S	**Coordenada Geodésica Longitude:** 38° 47'42,63078"W	
Coordenada UTM Norte: 9.573.711,008m	**Coordenada UTM Este:** 522.740,731m	**Altura Geométrica:** 40,099m **Altitude Ortométrica:** 39,756m

Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: M-01 – ENGESOFT – 06/2001.

ITINERÁRIO

Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 18,0Km toma-se a direita, com 18,5Km + 3m a direita chega-se ao marco no canto da cerca do quintal da casa do Sr. Luciano Frota.

CROQUIS



Aerofotogrametria e Projetos S. L. BASE

```
Ashtech, Inc. GPPS-L          Program: LINECOMP          Version: 5.2.00
                              Wed Sep 19 20:30:54 2001
_____________________________________________________________________________
Project information
GPS Survey                |25-character project name  [ The | is in column 26.
]
2621A                     |5-character session name
Project information

Known-station parameters
00                        |Receiver identifier used in "LOGTIMES" file
000000                    |Project station number
M-01                      |4-character short name
FIXED STATION             |25-character long name
___ ___ ___ _____________ |25-character comment field
0                         |Position extraction (0=below,1=U-file,2=proj. file)
S   3 51 25.39444         |Latitude deg-min-sec  (g=good;b=bad)
E 321 12 16.12152         |E-Longitude deg-min-sec (g=good;b=bad)
W  38 47 43.87848         |W-Longitude deg-min-sec (g=good;b=bad)
    39.7560               |Ellipsoidal height  (m) (g=good;b=bad)
     0.0000               |North antenna offset(m)
     0.0000               |East antenna offset (m)
  1.9070  0.1318  0.0000  |Vert antenna offset (m): slant/radius/added_offset
    20.0                  |Temperature (degrees C)
    50.0                  |Humidity (percent)
  1010.0                  |Pressure (millibars)
UBASEA01.262              |Measurement filename (restricted to 24 characters)
Known-station parameters

Unknown-station parameters
00                        |Receiver identifier used in "LOGTIMES" file
000000                    |Project station number
Marco M1/E_00             |4-character short name
UNKNOWN STATION           |25-character long name
___ ___ ___ _____________ |25-character comment field
0                         |Position extraction (0=below,1=U-file,2=proj. file)
S   3 50 59.71562         |Latitude deg-min-sec  (g=good;b=bad)
E 321 11 58.00864         |E-Longitude deg-min-sec (g=good;b=bad)
W  38 48  1.99136         |W-Longitude deg-min-sec (g=good;b=bad)
    70.8052               |Ellipsoidal height  (m) (g=good;b=bad)
     0.0000               |North antenna offset(m)
     0.0000               |East antenna offset (m)
  1.9940  0.1318  0.0000  |Vert antenna offset (m): slant/radius/added_offset
    20.0                  |Temperature (degrees C)
    50.0                  |Humidity (percent)
  1010.0                  |Pressure (millibars)
U00M1A01.262              |Measurement filename (restricted to 24 characters)
Unknown-station parameters

Run-time parameters
    1                     |First epoch to process
   -1                     |Final epoch to process (-1 = last available)
15.0                      |Elevation cutoff angle (degrees)
1                         |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000                  |Convergence criterion (meters)
00 00 00 00 00 00 00      |Omit these satellites (up to 7)
10                        |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 00      |Forbidden reference SVs (up to 7)
yes                       |Apply tropo delay correction
Run-time parameters

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.
UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.
```

```
UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/19 13:39:40.00
Common end   of two UFILES: 2001/09/19 14:15:60.00
    Selected first epoch:  1
    Selected last  epoch:  437
For SV  5 there are   436 triple-difference measurements.
For SV  6 there are   181 triple-difference measurements.
For SV  9 there are   436 triple-difference measurements.
For SV 10 there are   436 triple-difference measurements.
For SV 17 there are   285 triple-difference measurements.
For SV 24 there are   436 triple-difference measurements.
For SV 26 there are   436 triple-difference measurements.
For SV 30 there are   109 triple-difference measurements.
Epoch interval (seconds): 5.000000


THE TRIPLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 7.025847
num_meas =  2319        num_used =  2319         rms_resid = 0.003760(m)
Post-Fit Chisq = 11492.945           NDF      =     5.368


  Sigmax (m):      5.524669
  Sigmay (m):      5.728642
  Sigmaz (m):      1.647291
  x     y     z
x 1.00
y 0.46y 1.00
z 0.37z 0.23z 1.00

del_station: 0.000066 0.000159 0.000028
     Station1: FIXED STATION              Station2: UNKNOWN STATION
               M-01                                 Marco M1/E_00
 Latitude:  -3.85705401  -3 51 25.39444        -3.84987012  -3 50 59.53244
 E-Long  : 321.20447820 321 12 16.12152       321.19944057 321 11 57.98605
 W-Long  :  38.79552180  38 47 43.87848        38.80055943  38 48  2.01395
 E-Height:  39.7560                            44.0751

 Baseline vector:      -305.6228      -472.2268       792.3082

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      324.84093         0.2503       971.6768
 E1 N1 U1   :     -559.5281       794.3943         4.3191
 Mark2_xyz  :  4959577.5761  -3987682.4793   -425385.7227
 Az2 El2 D2 :      144.84127        -0.2591       971.6768
 E2 N2 U2   :      559.5332      -794.3947        -4.3191

Double-Difference Epochs:
  Prn:   5  Start epoch:    2  End epoch:  437
  Prn:   6  Start epoch:  257  End epoch:  437
  Prn:   9  Start epoch:    2  End epoch:  437
  Prn:  10  Start epoch:    2  End epoch:  437
  Prn:  17  Start epoch:  153  End epoch:  437
  Prn:  24  Start epoch:    2  End epoch:  437
  Prn:  26  Start epoch:    2  End epoch:  437
  Prn:  30  Start epoch:  329  End epoch:  437


THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.179533     Wavelength = 0.190294 (m/cycle)
num_meas =  2322        num_used =  2321         rms_resid = 0.014324(m)
Post-Fit Chisq = 13353.016           NDF      =     5.373

Reference SV:  9
  SV     Ambiguity       FIT    Meas      SV     Ambiguity       FIT    Meas
   5       546033.935f  0.050   436       6      -5423026.714f  0.107   182
```

```
  10      -3979652.387f  0.066   436      17      -9965989.936f  0.060   286
  24     -16474738.231f  0.053   436      26     -21157277.185f  0.104   435
  30     -13534313.957f  0.103   110

  Sigmax (m):       0.139334
  Sigmay (m):       0.160094
  Sigmaz (m):       0.070878
  SigmaN (cy):      0.480077
  SigmaN (cy):      0.618776
  SigmaN (cy):      1.014069
  SigmaN (cy):      0.497307
  SigmaN (cy):      0.772662
  SigmaN (cy):      0.616150
  SigmaN (cy):      0.489898
  x     y     z     N     N     N     N     N     N     N
x 1.00
y 0.49y 1.00
z-0.22z-0.03z 1.00
N 0.38N 0.71N-0.70N 1.00
N-0.93N-0.45N-0.12N-0.12N 1.00
N 0.71N 0.95N-0.04N 0.66N-0.67N 1.00
N-0.86N-0.22N 0.62N-0.47N 0.67N-0.42N 1.00
N 0.62N 0.88N-0.47N 0.92N-0.44N 0.89N-0.54N 1.00
N 0.14N 0.82N 0.51N 0.25N-0.28N 0.73N 0.29N 0.47N 1.00
N-0.46N 0.18N-0.55N 0.60N 0.68N-0.04N 0.21N 0.32N-0.01N 1.00

del_station: -0.001042 -0.001837 0.000020
     Station1: FIXED STATION                Station2: UNKNOWN STATION
               M-01                                   Marco M1/E_00
 Latitude:  -3.85705401  -3 51 25.39444        -3.84987005  -3 50 59.53219
 E-Long   : 321.20447820 321 12 16.12152       321.19944130 321 11 57.98869
 W-Long   :  38.79552180  38 47 43.87848        38.80055870  38 48  2.01131
 E-Height:  39.7560                             44.1124

 Baseline vector:      -305.5424      -472.1870       792.3136

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      324.84513         0.2525       971.6365
 E1 N1 U1   :     -559.4467       794.4021         4.3564
 Mark2_xyz  :  4959577.6566  -3987682.4395   -425385.7173
 Az2 El2 D2 :      144.84546        -0.2613       971.6365
 E2 N2 U2   :      559.4518      -794.4026        -4.3564


AMBIGUITY RESOLUTION
                        1          2          3          4
Abs Contrast         25.908      0.001      0.000      0.000
Contrast                        99.992    100.000    100.000
Change Chi2        2294.379   25544.451  40641.292  41943.925
Bias S 9: 5          546034     546035     546033     546033
Bias S 9: 6        -5423027   -5423026   -5423026   -5423027
Bias S 9:17        -9965990   -9965990   -9965990   -9965989
Bias S 9:24       -16474738  -16474737  -16474740  -16474739
Bias S 9:26       -21157277  -21157277  -21157279  -21157276
Bias S 9:30       -13534314  -13534313  -13534314  -13534315
NDF=65.0250 Chi2=13353.0158
                        1          2          3
Abs Contrast         46.609      0.000      0.000
Contrast                       100.000    100.000
Change Chi2        321.330  329161.258 371584.290
Bias S 9:10        -3979652   -3979651   -3979653
NDF=71.0250 Chi2=15647.3948


THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.018462     Wavelength = 0.190294 (m/cycle)
num_meas =  2322        num_used =  2318         rms_resid = 0.015433(m)
```

```
Post-Fit Chisq = 15481.134           NDF      =     5.366

Reference SV:  9                    Integer Search Ratio =   99.992
  SV     Ambiguity        FIT    Meas      SV     Ambiguity        FIT    Meas
   5       546034.000X  0.053   436        6      -5423027.000X  0.125   182
  10     -3979652.000X  0.070   436       17      -9965990.000X  0.074   286
  24     -16474738.000X 0.057   436       26     -21157277.000X  0.101   432
  30     -13534314.000X 0.123   110

  Sigmax (m):       0.016515
  Sigmay (m):       0.017261
  Sigmaz (m):       0.006628
   x      y      z
x 1.00
y-0.67y 1.00
z 0.10z-0.09z 1.00

del_station: -0.000106 0.000236 0.000136
     Station1: FIXED STATION              Station2: UNKNOWN STATION
               M-01                                 Marco M1/E_00
 Latitude:  -3.85705401  -3 51 25.39444          -3.84986999  -3 50 59.53195
 E-Long  : 321.20447820 321 12 16.12152         321.19944196 321 11 57.99106
 W-Long  :  38.79552180  38 47 43.87848          38.80055804  38 48  2.00894
 E-Height:  39.7560                               44.1139

 Baseline vector:      -305.4951      -472.1314       792.3208

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      324.84889         0.2526       971.6005
 E1 N1 U1   :     -559.3738       794.4095         4.3579
 Mark2_xyz  :  4959577.7038  -3987682.3839   -425385.7101
 Az2 El2 D2 :      144.84923        -0.2614       971.6005
 E2 N2 U2   :      559.3788      -794.4099        -4.3579
Wed Sep 19 20:31:02 2001
```

```
Ashtech, Inc. GPPS-L          Program: LINECOMP          Version: 5.2.00
                              Wed Sep 19 20:31:02 2001
_____________________________________________________________________
Project information
GPS Survey                  |25-character project name  [ The | is in column 26.
]
2621A                       |5-character session name
Project information

Known-station parameters
00                          |Receiver identifier used in "LOGTIMES" file
000000                      |Project station number
M-01                        |4-character short name
FIXED STATION               |25-character long name
___ ___ ___ _____________   |25-character comment field
0                           |Position extraction (0=below,1=U-file,2=proj. file)
S    3 51 25.39444          |Latitude deg-min-sec  (g=good;b=bad)
E 321 12 16.12152           |E-Longitude deg-min-sec (g=good;b=bad)
W  38 47 43.87848           |W-Longitude deg-min-sec (g=good;b=bad)
    39.7560                 |Ellipsoidal height  (m) (g=good;b=bad)
     0.0000                 |North antenna offset(m)
     0.0000                 |East antenna offset (m)
  1.9070  0.1318  0.0000    |Vert antenna offset (m): slant/radius/added_offset
    20.0                    |Temperature (degrees C)
    50.0                    |Humidity (percent)
  1010.0                    |Pressure (millibars)
UBASEA01.262                |Measurement filename (restricted to 24 characters)
Known-station parameters

Unknown-station parameters
00                          |Receiver identifier used in "LOGTIMES" file
000000                      |Project station number
Marco M2/E_47               |4-character short name
UNKNOWN STATION             |25-character long name
___ ___ ___ _____________   |25-character comment field
0                           |Position extraction (0=below,1=U-file,2=proj. file)
S    3 51 24.84985          |Latitude deg-min-sec  (g=good;b=bad)
E 321 12 15.13245           |E-Longitude deg-min-sec (g=good;b=bad)
W  38 47 44.86755           |W-Longitude deg-min-sec (g=good;b=bad)
    63.8937                 |Ellipsoidal height  (m) (g=good;b=bad)
     0.0000                 |North antenna offset(m)
     0.0000                 |East antenna offset (m)
  1.9270  0.1318  0.0000    |Vert antenna offset (m): slant/radius/added_offset
    20.0                    |Temperature (degrees C)
    50.0                    |Humidity (percent)
  1010.0                    |Pressure (millibars)
U00M2A01.262                |Measurement filename (restricted to 24 characters)
Unknown-station parameters

Run-time parameters
    1                       |First epoch to process
   -1                       |Final epoch to process (-1 = last available)
15.0                        |Elevation cutoff angle (degrees)
1                           |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000                    |Convergence criterion (meters)
00 00 00 00 00 00 00        |Omit these satellites (up to 7)
10                          |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 00        |Forbidden reference SVs (up to 7)
yes                         |Apply tropo delay correction
Run-time parameters

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.
UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.
```

```
UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/19 12:11:40.00
Common end   of two UFILES: 2001/09/19 12:49:50.00
    Selected first epoch:  1
    Selected last  epoch:  459
For SV  2 there are   354 triple-difference measurements.
For SV  4 there are   458 triple-difference measurements.
For SV  5 there are   137 triple-difference measurements.
For SV  9 there are   458 triple-difference measurements.
For SV 10 there are   458 triple-difference measurements.
For SV 24 there are   458 triple-difference measurements.
For SV 26 there are   458 triple-difference measurements.
Epoch interval (seconds): 5.000000


THE TRIPLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 6.322744
num_meas =  2323        num_used =  2323         rms_resid = 0.002774(m)
Post-Fit Chisq =  8814.068          NDF      =     5.377


  Sigmax (m):       3.752212
  Sigmay (m):       4.997190
  Sigmaz (m):       1.379693
  x      y      z
x 1.00
y 0.28y 1.00
z-0.52z-0.19z 1.00

del_station: -0.000027 -0.000008 0.000016
     Station1: FIXED STATION                Station2: UNKNOWN STATION
               M-01                                    Marco M2/E_47
 Latitude:  -3.85705401  -3 51 25.39444      -3.85685973  -3 51 24.69503
 E-Long  : 321.20447820 321 12 16.12152     321.20423794 321 12 15.25658
 W-Long  :  38.79552180  38 47 43.87848      38.79576206  38 47 44.74342
 E-Height:  39.7560                           40.3355

 Baseline vector:        -15.1429        -22.0662         21.3961

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      308.83621         0.9688        34.2639
 E1 N1 U1   :      -26.6858        21.4837         0.5795
 Mark2_xyz  :  4959868.0560  -3987232.3187   -426156.6348
 Az2 El2 D2 :      128.83622        -0.9692        34.2639
 E2 N2 U2   :       26.6858       -21.4837        -0.5795

Double-Difference Epochs:
  Prn:   2  Start epoch:    2  End epoch:  355
  Prn:   4  Start epoch:    2  End epoch:  459
  Prn:   5  Start epoch:  323  End epoch:  459
  Prn:   9  Start epoch:    2  End epoch:  459
  Prn:  10  Start epoch:    2  End epoch:  459
  Prn:  24  Start epoch:    2  End epoch:  459
  Prn:  26  Start epoch:    2  End epoch:  459


THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.134741     Wavelength = 0.190294 (m/cycle)
num_meas =  2324        num_used =  2309         rms_resid = 0.005607(m)
Post-Fit Chisq =  2841.624          NDF      =     5.345

Reference SV: 24
  SV     Ambiguity        FIT    Meas      SV     Ambiguity        FIT    Meas
   2     -934681.066f   0.042     339       4     -1309960.964f  0.025     458
   5      441302.974f   0.037     138       9      1270930.984f  0.023     458
  10      166092.915f   0.032     458      26     -1236956.116f  0.022     458
```

```
  Sigmax (m):       0.046845
  Sigmay (m):       0.056777
  Sigmaz (m):       0.024789
  SigmaN (cy):      0.295291
  SigmaN (cy):      0.135782
  SigmaN (cy):      0.249467
  SigmaN (cy):      0.203663
  SigmaN (cy):      0.188695
  SigmaN (cy):      0.275272
   x     y     z     N     N     N     N     N     N
x 1.00
y 0.31y 1.00
z-0.35z 0.03z 1.00
N 0.24N 0.99N 0.10N 1.00
N 0.28N 0.88N-0.37N 0.86N 1.00
N-0.90N-0.44N-0.04N-0.38N-0.22N 1.00
N-0.80N-0.72N-0.07N-0.67N-0.50N 0.92N 1.00
N-0.46N 0.48N 0.80N 0.55N 0.18N 0.10N-0.12N 1.00
N-0.90N-0.53N 0.58N-0.45N-0.61N 0.74N 0.76N 0.44N 1.00

del_station: 0.002641 0.001731 -0.001855
     Station1: FIXED STATION       Station2: UNKNOWN STATION
                M-01                          Marco M2/E_47
 Latitude:  -3.85705401  -3 51 25.39444        -3.85685978  -3 51 24.69519
 E-Long   : 321.20447820 321 12 16.12152       321.20423771 321 12 15.25577
 W-Long   :  38.79552180  38 47 43.87848        38.79576229  38 47 44.74423
 E-Height:  39.7560                             40.3210

 Baseline vector:       -15.1702       -22.0764        21.3920

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      308.80328         0.9442        34.2800
 E1 N1 U1   :      -26.7109        21.4786         0.5650
 Mark2_xyz  :  4959868.0288  -3987232.3290   -426156.6389
 Az2 El2 D2 :      128.80329        -0.9445        34.2800
 E2 N2 U2   :       26.7109       -21.4786        -0.5650


AMBIGUITY RESOLUTION
                        1          2          3          4
Abs Contrast         2.490      0.000      0.000      0.000
Contrast                      100.000    100.000    100.000
Change Chi2       1785.825  35995.212  38743.983  88623.683
Bias S24: 2        -934681    -934680    -934682    -934682
Bias S24: 4       -1309961   -1309961   -1309961   -1309961
Bias S24: 5         441303     441302     441304     441303
Bias S24: 9        1270931    1270930    1270932    1270931
Bias S24:10         166093     166094     166092     166092
Bias S24:26       -1236956   -1236956   -1236956   -1236957
NDF=63.7250 Chi2=2841.6237


THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.015060     Wavelength = 0.190294 (m/cycle)
num_meas =  2324        num_used =  2316         rms_resid = 0.007173(m)
Post-Fit Chisq =  4701.268           NDF      =     5.361

Reference SV: 24                    Integer Search Ratio =  100.000
  SV     Ambiguity       FIT    Meas      SV     Ambiguity       FIT    Meas
   2       -934681.000X  0.051   346       4      -1309961.000X  0.044   458
   5        441303.000X  0.038   138       9       1270931.000X  0.026   458
  10        166093.000X  0.039   458      26      -1236956.000X  0.025   458

  Sigmax (m):       0.008563
  Sigmay (m):       0.006237
  Sigmaz (m):       0.003476
```

```
  x     y     z
x 1.00
y-0.66y 1.00
z 0.15z-0.12z 1.00

del_station: -0.000057 0.000006 0.000018
     Station1: FIXED STATION                Station2: UNKNOWN STATION
               M-01                                    Marco M2/E_47
 Latitude:  -3.85705401  -3 51 25.39444        -3.85685967  -3 51 24.69480
 E-Long   : 321.20447820 321 12 16.12152       321.20423765 321 12 15.25554
 W-Long   :  38.79552180  38 47 43.87848        38.79576235  38 47 44.74446
 E-Height:  39.7560                             40.3020

 Baseline vector:       -15.1888       -22.0706        21.4051

 Mark1_xyz  :  4959883.1990  -3987210.2525   -426178.0309
 Az1 El1 D1 :      308.81136         0.9121        34.2927
 E1 N1 U1   :      -26.7180        21.4905         0.5460
 Mark2_xyz  :  4959868.0102  -3987232.3231   -426156.6258
 Az2 El2 D2 :      128.81138        -0.9124        34.2927
 E2 N2 U2   :       26.7180       -21.4905        -0.5460
Wed Sep 19 20:31:10 2001
```

3. APOIO BÁSICO E SUPLEMENTAR PARA O LEVANTAMENTO AEROFOTOGRAMÉTRICO

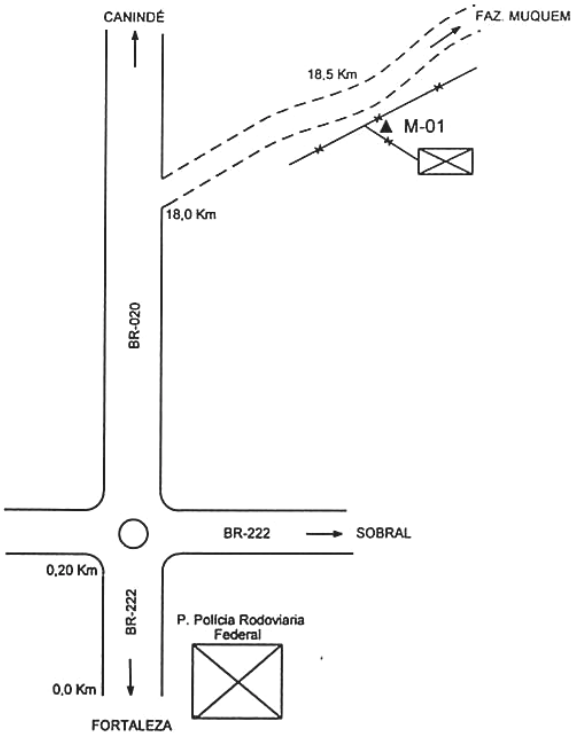
ENGESOFT ENGENHARIA E CONSULTORIA LTDA

Vértice: **M-01**	**Ponto Visado:** M-02	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Lagoinha
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 51'24,02561"S	**Coordenada Geodésica Longitude:** 38° 47'42,63078"W	
Coordenada UTM Norte: 9.573.711,008m	**Coordenada UTM Este:** 522.740,731m	**Altura Geométrica:** 40,099m **Altitude Ortométrica:** 39,756m
Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: M-01 – ENGESOFT – 06/2001.		

ITINERÁRIO

Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 18,0Km toma-se a direita, com 18,5Km + 3m a direita chega-se ao marco no canto da cerca do quintal da casa do Sr. Luciano Frota.

CROQUIS



Aerofotogrametria e Projetos S.A. BABE

ENGESOFT ENGENHARIA E CONSULTORIA LTDA

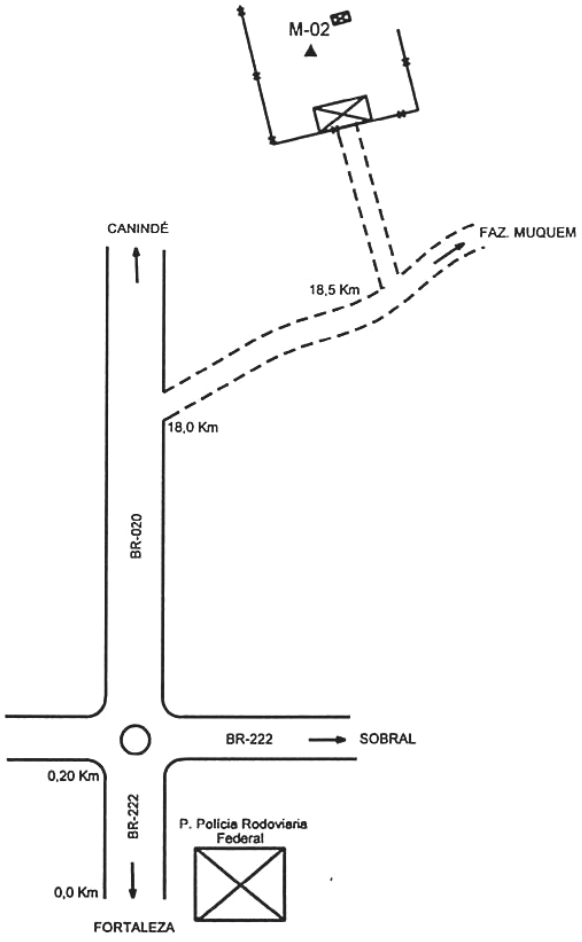
Vértice: **M-02**	**Ponto Visado:** M-01	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Lagoinha
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 51'28,05089"S	**Coordenada Geodésica Longitude:** 38° 47'42,82365"W	
Coordenada UTM Norte: 9.573.587,416m	**Coordenada UTM Este:** 522.734,753m	**Altura Geométrica:** 39,928m **Altitude Ortométrica:** 39,576m

Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: M-02 – ENGESOFT – 06/2001.

ITINERÁRIO

Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 18,0Km toma-se a direita, com 18,5Km + 100m a esquerda chega-se na casa do Sr. Raimundo de Freitas Sousa, onde o marco está localizado no fundo do quintal.

CROQUIS



Aerofotogrametria e Projetos S.A. BASE

ENGESOFT ENGENHARIA E CONSULTORIA LTDA

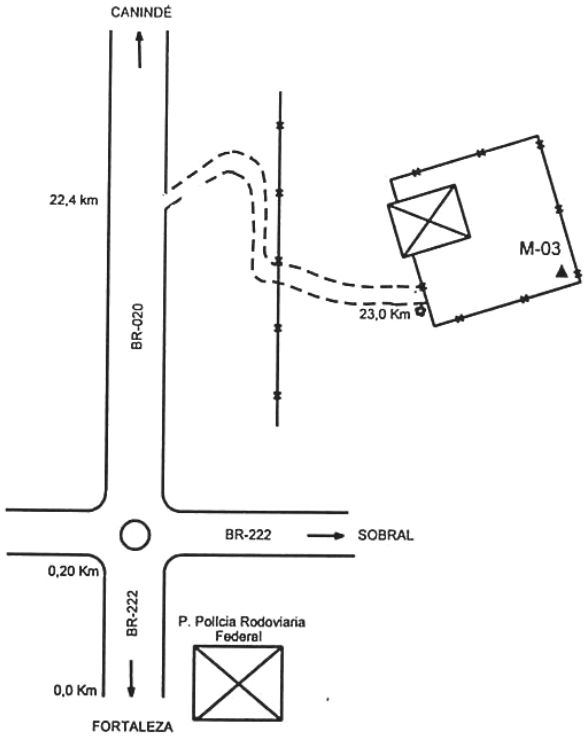
Vértice: M-03	**Ponto Visado:**	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Imburanas
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 52'39,05623"S	**Coordenada Geodésica Longitude:** 38° 49'20,96802"W	
Coordenada UTM Norte: 9.571.407,915m	**Coordenada UTM Este:** 519.707,483m	**Altura Geométrica:** 56,996m **Altitude Ortométrica:** 56,746m

Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: M-03 – ENGESOFT – 06/2001.

ITINERÁRIO

Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 22,4Km toma-se a direita, com 23,0Km chega-se na casa do Sr. João Marimbondo, local do marco que está no canto da cerca do quintal.

CROQUIS



Aerofotogrametria e Projetos S.A. BASE

ENGESOFT ENGENHARIA E CONSULTORIA LTDA

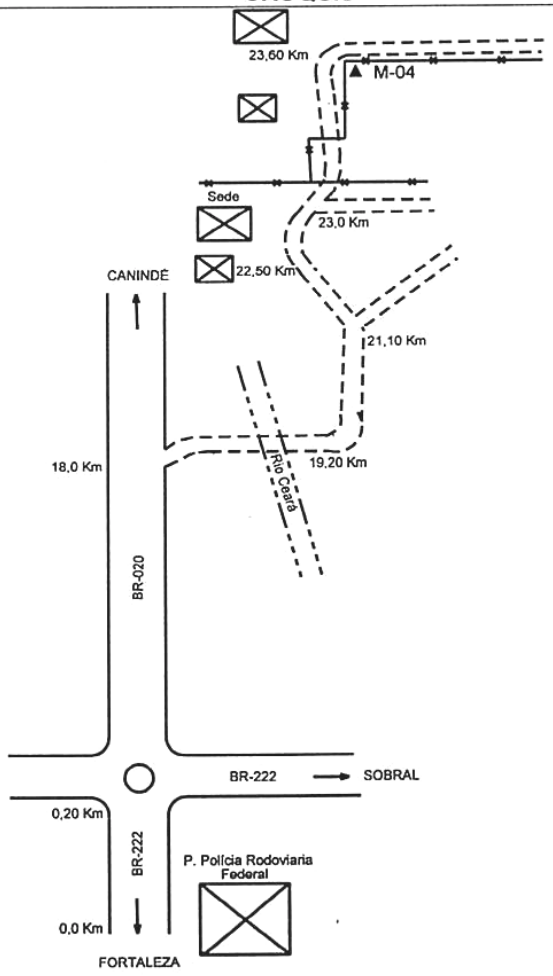
Vértice: **M-04**	**Ponto Visado:**	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Fazenda Muquém
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 52'06,12660"S	**Coordenada Geodésica Longitude:** 38° 49'37,68068"W	
Coordenada UTM Norte: 9.572.419,108m	**Coordenada UTM Este:** 519.192,277m	**Altura Geométrica:** 43,618m **Altitude Ortométrica:** 43,352m

Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: M-04 – ENGESOFT – 06/2001.

ITINERÁRIO

Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 18,0Km toma-se à direita, com 19,2Km passa-se o Rio Ceará, com 21,1Km toma-se a esquerda, com 22,5Km passa-se ao lado da sede da Fazenda Muquém, com 23,0Km toma-se a esquerda, com 23,6Km chega-se ao marco que está localizado no lado direito da estrada no canto da cerca em frente a casa do Sr. João Paulo da Silva.

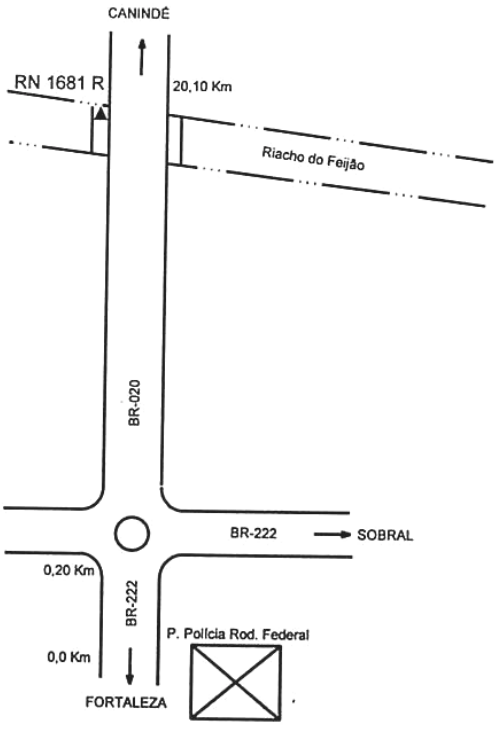
CROQUIS



Aerofotogrametria e Projetos S.A. BASE

ENGESOFT ENGENHARIA E CONSULTORIA LTDA

Vértice: RN-1681R(IBGE)	**Ponto Visado:**	**Obra/Ano:** O-739/2001
Estado: Ceará	**Município:** Caucaia	**Local:** Riacho do Feijão
Origem: V-9024 (IBGE)	**MC:** 39° W	**Datum:** SAD-69
Coordenada Geodésica Latitude: 03° 52'12,53306"S	**Coordenada Geodésica Longitude:** 38° 48'20,06624"W	
Coordenada UTM Norte: 9.572.221,883m	**Coordenada UTM Este:** 521.585,863m	**Altura Geométrica:** 40,505m **Altitude Ortométrica:** 40,167m
Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: RN 1681-R IBGE.		

ITINERÁRIO	CROQUIS
Partindo-se com 0,0Km do Posto da Polícia Rodoviária Federal no Km 11 da BR-222 no Bairro Metropoli-Caucaia em direção a cidade de Canindé, com 0,2Km rotatória, segue-se pela BR-020 com 20,1Km chega-se ao marco na margem esquerda da ponte do Riacho do Feijão.	

Aerofotogrametria e Projetos S.A. BASE

ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: CEARÁ/CE
Obra: O-739 Operador: WIVEAR Data: 14-Jul-2001

Transformação de Sistemas Geodésicos
Elipsóide de origem: WGS_84 a=6378137.000 b=6356752.314
Elipsóide de destino: SAD_69 a=6378160.000 b=6356774.719
Parâmetros para transformação: dX = 66.870 dY = -4.370 dZ = 38.520

Coordenadas referidas ao Sistema WGS_84

Ponto	Latitude	Longitude	h
M01	3°51'25.39435"S	38°47'43.87835"W	010.956
M02	3°51'29.41966"S	38°47'44.07122"W	010.785
M03	3°52'40.42553"S	38°49'22.21647"W	027.886
M04	3°52'07.49562"S	38°49'38.92925"W	014.505
RN1681N	3°54'21.17677"S	38°50'39.88163"W	018.289
RN1681R	3°52'13.90217"S	38°48'21.31416"W	011.379
V9024	3°50'47.83230"S	38°53'11.93201"W	379.580

ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: CEARÁ/CE
Obra: O-739 Operador: WIVEAR Data: 14-Jul-2001

Transformação de Sistemas Geodésicos
Elipsóide de origem: WGS_84 a=6378137.000 b=6356752.314
Elipsóide de destino: SAD_69 a=6378160.000 b=6356774.719
Parâmetros para transformação: dX = 66.870 dY = -4.370 dZ = 38.520

Coordenadas referidas ao Sistema SAD_69

Ponto	Latitude	Longitude	h
M01	3°51'24.02561"S	38°47'42.63078"W	040.099
M02	3°51'28.05089"S	38°47'42.82365"W	039.928
M03	3°52'39.05623"S	38°49'20.96802"W	056.996
M04	3°52'06.12660"S	38°49'37.68068"W	043.618
RN1681N	3°54'19.80670"S	38°50'38.63248"W	047.364
RN1681R	3°52'12.53306"S	38°48'20.06624"W	040.505
V9024	3°50'46.46408"S	38°53'10.68171"W	408.670

ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: CEARÁ/CE
Obra: O-739 Operador: WIVEAR Data: 14-Jul-2001

Transformação de Coordenadas Geodésicas em Planoretangulares TM
Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul
Coordenadas UTM

Ponto	N(m)	E(m)	h(m)	Convergência	kapa
M01	9573711.008	522740.731	40.099	0°00'49.60"	0.99960640
M02	9573587.416	522734.753	39.928	0°00'49.60"	0.99960640
M03	9571407.915	519707.483	56.996	0°00'43.21"	0.99960481
M04	9572419.108	519192.277	43.618	0°00'41.98"	0.99960456
RN1681N	9568314.901	517311.766	47.364	0°00'38.24"	0.99960371
RN1681R	9572221.883	521585.863	40.505	0°00'47.24"	0.99960577
V9024	9574866.202	512623.658	408.670	0°00'27.46"	0.99960197

OBS.: Alturas Geométricas, referidas ao elipsóide.

ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: CEARÁ/CE
Obra: O-739 Operador: WIVEAR Data: 14-Jul-2001

Coordenadas Geodésicas Planoretangulares - UTM
Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul

Ponto	N(m)	E(m)	H(m)
M01	9573711.008	522740.731	39.756
M02	9573587.416	522734.753	39.576
M03	9571407.915	519707.483	56.746
M04	9572419.108	519192.277	43.352
RN1681N	9568314.901	517311.766	47.156
RN1681R	9572221.883	521585.863	40.167
V9024	9574866.202	512623.658	408.67

OBS.: Altitudes Ortométricas, com milímetros, obtidas por nivelamento geométrico e com centímetros, obtidas por diferença geoidal.

ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO SUPLEMENTAR

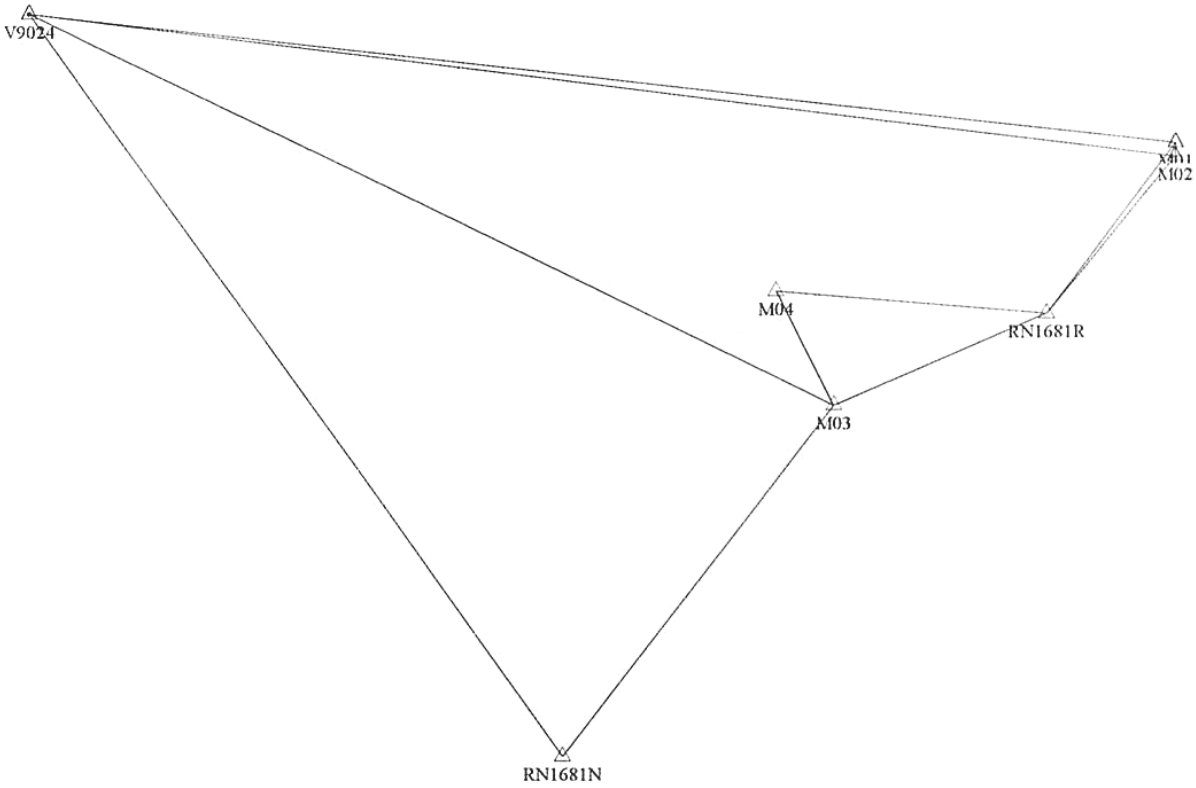
Cliente: ENGESOFT Local: CEARÁ/CE
Obra: O-739 Operador: WIVEAR Data: 14-Jul-2001

Coordenadas Geodésicas Planoretangulares - UTM
Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul

Ponto	N(m)	E(m)	H(m)
HV01	9572004.091	516598.585	56.76
HV02	9574303.485	519785.018	53.22
HV03	9576856.818	523226.039	39.89
HV04	9570178.201	518444.567	50.01
HV05	9572534.369	521009.265	36.78
HV06	9575565.050	524273.288	29.72
HV07	9568077.204	518926.719	58.88
HV08	9571498.993	522365.378	46.09
HV09	9573616.596	526317.076	39.29
M01	9573711.008	522740.731	39.83

OBS.: Altitudes Ortométricas, com milímetros, obtidas
Por nivelamento geométrico e com centímetros,
obtidas por diferença geoidal.

Network Map: CEM



COORDINATE ADJUSTMENT SUMMARY
NETWORK = CEM
TIME = Fri Jul 13 17:12:03 2001

Datum = WGS-84
Coordinate System = Geographic
Zone = Global

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in H

POINT	NAME	OLD COORDS	ADJUST	NEW COORDS	1.00σ
1	M01				
	LAT=	3° 51' 25.394350"	+0.000000"	3° 51' 25.394350"	0.002921m
	LON=	38° 47' 43.878344"	+0.000000"	38° 47' 43.878345"	0.002930m
	ELL HT=	10.9563m	+0.0000m	10.9563m	0.002000m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
	M02				
	LAT=	3° 51' 29.419658"	+0.000000"	3° 51' 29.419658"	0.002934m
	LON=	38° 47' 44.071224"	+0.000000"	38° 47' 44.071224"	0.002942m
	ELL HT=	10.7854m	+0.0000m	10.7854m	0.002000m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
3	M03				
	LAT=	3° 52' 40.425519"	-0.000007"	3° 52' 40.425526"	0.005213m
	LON=	38° 49' 22.216469"	+0.000002"	38° 49' 22.216467"	0.005338m
	ELL HT=	27.8860m	+0.0004m	27.8863m	0.006095m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
4	M04				
	LAT=	3° 52' 07.495616"	-0.000007"	3° 52' 07.495624"	0.005140m
	LON=	38° 49' 38.929255"	+0.000002"	38° 49' 38.929252"	0.005225m
	ELL HT=	14.5041m	+0.0005m	14.5047m	0.005533m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
	RN1681N				
	LAT=	3° 54' 21.176773"	+0.000004"	3° 54' 21.176769"	0.008400m
	LON=	38° 50' 39.881648"	+0.000016"	38° 50' 39.881632"	0.008940m
	ELL HT=	18.2889m	+0.0005m	18.2894m	0.067257m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
6	RN1681R				
	LAT=	3° 52' 13.902158"	-0.000008"	3° 52' 13.902166"	0.004184m
	LON=	38° 48' 21.314158"	+0.000003"	38° 48' 21.314155"	0.004266m
	ELL HT=	11.3783m	+0.0008m	11.3791m	0.004813m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
7	V9024				
	LAT=	3° 50' 47.832302"	+0.000000"	3° 50' 47.832302"	FIXED
	LON=	38° 53' 11.932014"	+0.000000"	38° 53' 11.932014"	FIXED
	ELL HT=	379.5800m	+0.0000m	379.5800m	FIXED
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN

SUMMARY OF COVARIANCES
NETWORK = CEM
TIME = Fri Jul 13 17:12:04 2001

Definition of precision (E x S)² = C² + P²:
Horizontal:
Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted horizontal distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
3-Dimensional:
Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted slope distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
Using orthometric height errors

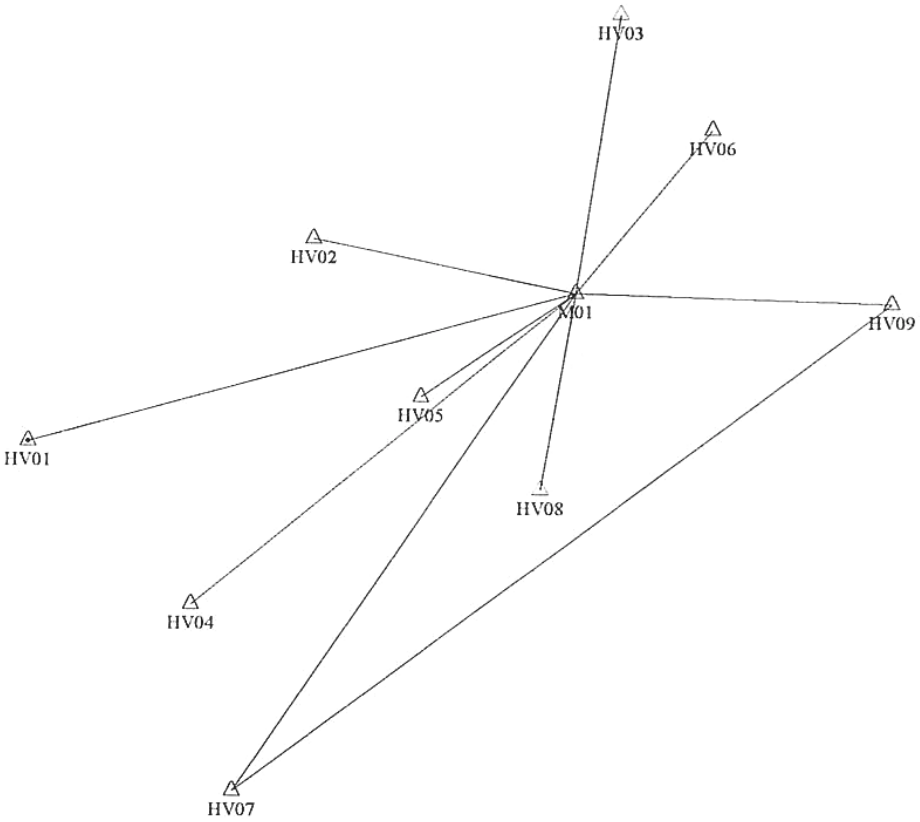
FROM/ TO	AZIMUTH/ DELTA H	1.00σ 1.00σ	DISTANCE/ DELTA h	1.00σ	HOR PREC/ 3-D PREC
M0.	182°45'20"	4.68"	123.786m	0.0028m	1: 44333
M02	-0.1709m	0.0020m	-**-	-**-	1: 44333
M01	232°46'39"	0.25"	3810.041m	0.0047m	1: 803009
M03	+16.9301m	0.0058m	-**-	-**-	1: 803009
M01	249°58'52"	0.25"	3777.820m	0.0046m	1: 817063
M04	+3.5484m	0.0052m	-**-	-**-	1: 817063
M01	225°09'36"	0.23"	7657.577m	0.0085m	1: 900789
RN1681N	+7.3332m	0.0672m	-**-	-**-	1: 900789
M01	217°46'52"	0.37"	1885.218m	0.0034m	1: 547552
RN1681R	+0.4229m	0.0044m	-**-	-**-	1: 547552
M01	276°30'01"	0.06"	10186.890m	0.0029m	1: 3477966
V9024	+368.6237m	0.0020m	-**-	-**-	1: 3477966
M0^	234°14'02"	0.28"	3731.714m	0.0051m	1: 727867
M0.	+17.1010m	0.0061m	-**-	-**-	1: 727867
M02	251°44'01"	0.27"	3731.648m	0.0050m	1: 742916
M04	+3.7193m	0.0055m	-**-	-**-	1: 742916
M02	225°47'32"	0.24"	7566.634m	0.0087m	1: 872250
RN1681N	+7.5040m	0.0673m	-**-	-**-	1: 872250
M02	220°03'42"	0.45"	1785.264m	0.0040m	1: 450917
RN1681R	+0.5937m	0.0048m	-**-	-**-	1: 450917
M02	277°11'40"	0.06"	10195.723m	0.0029m	1: 3466792
V9024	+368.7946m	0.0020m	-**-	-**-	1: 3466792
M03	332°59'20"	0.56"	1135.332m	0.0031m	1: 366699
M04	-13.3817m	0.0026m	-**-	-**-	1: 366699
M03	217°44'52"	0.42"	3913.881m	0.0076m	1: 512595

RN1681N	-9.5969m	0.0671m	-**-	-**- 1: 512595
M03	66°33'33"	0.34"	2047.975m	0.0034m 1: 607080
RN1681R	-16.5072m	0.0037m	-**-	-**- 1: 607080
M03	296°00'34"	0.14"	7886.077m	0.0053m 1: 1487092
V9024	+351.6937m	0.0061m	-**-	-**- 1: 1487092
M04	204°36'18"	0.39"	4516.322m	0.0080m 1: 564420
RN1681N	+3.7848m	0.0671m	-**-	-**- 1: 564420
M04	94°41'55"	0.27"	2402.658m	0.0031m 1: 771111
RN1681R	-3.1255m	0.0027m	-**-	-**- 1: 771111
M04	290°25'15"	0.15"	7012.451m	0.0052m 1: 1347498
V9024	+365.0753m	0.0055m	-**-	-**- 1: 1347498
RN1681N	47°33'32"	0.29"	5793.034m	0.0081m 1: 712399
RN1681R	-6.9103m	0.0672m	-**-	-**- 1: 712399
RN1681N	324°24'07"	0.22"	8059.162m	0.0086m 1: 934962
V9024	+361.2906m	0.0673m	-**-	-**- 1: 934962
RN1 ,1R	286°25'33"	0.09"	9347.917m	0.0042m 1: 2200715
V9024	+368.2009m	0.0048m	-**-	-**- 1: 2200715

From Station Short Name	To Station Short Name	Solution Type	Slope	Ratio	Reference Variance	Entered Ant. Ht. (From)	Entered Ant. Ht. (To)
M01	M02	L1 fixed	123.785	75.5	3.899	1.410	1.410
M01	RN1681R	L1 fixed	1885.229	5.2	12.382	1.380	1.410
M02	RN1681R	L1 fixed	1785.267	3.0	20.447	1.410	1.410
M03	M04	L1 fixed	1135.418	3.8	23.195	1.340	1.410
RN1681N	M03	L1 fixed	3913.914	23.0	10.019	1.410	1.410
RN1681R	M03	L1 fixed	2048.054	12.1	31.339	1.410	1.340
RN1681R	M04	L1 fixed	2402.674	2.3	37.255	1.410	1.410
V9024	M01	L1 fixed	10193.908	39.7	12.603	1.090	1.410
V9024	M02	L1 fixed	10202.741	4.8	15.291	1.090	1.410
V9024	M03	L1 fixed	7894.586	1.8	4.869	1.090	1.410
V9024	RN1681N	L1 fixed	8067.539	23.6	19.867	1.090	1.410

***** End of Report *****

Network Map: CEH



COORDINATE ADJUSTMENT SUMMARY
NETWORK = CEH
TIME = Fri Jul 13 17:40:19 2001

Datum = WGS-84
Coordinate System = Geographic
Zone = Global

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in H

POINT	NAME		OLD COORDS	ADJUST	NEW COORDS	1.00σ
1	HV01					
		LAT=	3° 52' 21.028257"	+0.000000"	3° 52' 21.028257"	0.004012m
		LON=	38° 51' 03.029153"	+0.000000"	38° 51' 03.029153"	0.004011m
		ELL HT=	27.9371m	+0.0000m	27.9371m	0.002684m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
2	HV02					
		LAT=	3° 51' 06.119672"	+0.000000"	3° 51' 06.119672"	0.004261m
		LON=	38° 49' 19.721973"	+0.000000"	38° 49' 19.721973"	0.004291m
		ELL HT=	24.3609m	+0.0000m	24.3609m	0.005820m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
3	HV03					
		LAT=	3° 49' 42.935285"	+0.000000"	3° 49' 42.935285"	0.004011m
		LON=	38° 47' 28.167055"	+0.000000"	38° 47' 28.167055"	0.004011m
		ELL HT=	10.9970m	+0.0000m	10.9970m	0.002674m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
4	HV04					
		LAT=	3° 53' 20.484226"	+0.000000"	3° 53' 20.484226"	0.004189m
		LON=	38° 50' 03.160036"	+0.000000"	38° 50' 03.160036"	0.004320m
		ELL HT=	21.1875m	+0.0000m	21.1875m	0.005237m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
5	HV05					
		LAT=	3° 52' 03.729114"	+0.000000"	3° 52' 03.729114"	0.004011m
		LON=	38° 48' 40.013015"	+0.000000"	38° 48' 40.013015"	0.004011m
		ELL HT=	7.9288m	+0.0000m	7.9288m	0.002674m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
6	HV06					
		LAT=	3° 50' 24.998123"	+0.000000"	3° 50' 24.998123"	0.004011m
		LON=	38° 46' 54.200299"	+0.000000"	38° 46' 54.200299"	0.004011m
		ELL HT=	0.8247m	+0.0000m	0.8247m	0.002675m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
7	HV07					
		LAT=	3° 54' 28.908078"	+0.000000"	3° 54' 28.908078"	0.003663m
		LON=	38° 49' 47.511790"	+0.000000"	38° 49' 47.511791"	0.003731m
		ELL HT=	30.0707m	+0.0000m	30.0707m	0.006660m
		ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
8	HV08					

```
        LAT=   3° 52' 37.439902" +0.000000"   3° 52' 37.439902"     0.004142m
        LON=  38° 47' 56.032270" +0.000000"  38° 47' 56.032270"     0.004163m
    ELL HT=             17.2397m   +0.0000m            17.2397m     0.004174m
  ORTHO HT=              0.0000m   +0.0000m             0.0000m     NOT KNOWN

 9 HV09
        LAT=   3° 51' 28.439064" +0.000000"   3° 51' 28.439064"     0.003635m
        LON=  38° 45' 47.913978" +0.000000"  38° 45' 47.913977"     0.003735m
    ELL HT=             10.3962m   -0.0001m            10.3961m     0.006350m
  ORTHO HT=              0.0000m   +0.0000m             0.0000m     NOT KNOWN

10 M01
        LAT=   3° 51' 25.394350" +0.000000"   3° 51' 25.394350"         FIXED
        LON=  38° 47' 43.878345" +0.000000"  38° 47' 43.878345"         FIXED
    ELL HT=             10.9563m   +0.0000m            10.9563m         FIXED
  ORTHO HT=              0.0000m   +0.0000m             0.0000m     NOT KNOWN
```

From Station Short Name	To Station Short Name	Solution Type	Slope	Ratio	Reference Variance	Entered Ant. Ht. (From)	Entered Ant. Ht. (To)
HV09	HV07	L1 fixed	9239.683	3.2	11.058	2.460	2.460
M01	HV01	L1 fixed	6377.526	1.5	19.618	1.380	1.410
M01	HV02	L1 fixed	3015.761	2.4	20.844	1.380	2.460
M01	HV03	L1 fixed	3184.308	2.6	22.409	1.380	2.460
M01	HV04	L1 fixed	5564.436	1.5	16.041	1.380	2.460
M01	HV05	L1 fixed	2094.279	1.7	14.505	1.380	1.410
M01	HV06	L1 fixed	2406.441	4.5	15.418	1.380	3.560
M01	HV07	L1 fixed	6806.199	1.7	16.303	1.380	2.460
M01	HV08	L1 fixed	2244.551	4.3	14.611	1.380	2.460
M01	HV09	L1 fixed	3579.027	1.7	15.266	1.380	2.460

***** End of Report *****

COORDINATE ADJUSTMENT SUMMARY
NETWORK = RS177
TIME = Thu Jul 12 15:32:24 2001

um = WGS-84
rdinate System = Geographic
e = Global

SUB-NETWORK 1
vork Adjustment Constraints:
fixed coordinates in y
fixed coordinates in x
fixed coordinates in H

NT NAME		OLD COORDS	ADJUST	NEW COORDS	1.00σ
L HV01					
	LAT=	5° 38' 09.186664"	-0.000162"	5° 38' 09.186826"	0.004313m
	LON=	38° 21' 23.324414"	+0.000073"	38° 21' 23.324341"	0.004381m
	ELL HT=	85.6189m	-0.0002m	85.6187m	0.003897m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
? HV02					
	LAT=	5° 36' 37.530283"	+0.000239"	5° 36' 37.530044"	0.004320m
	LON=	38° 19' 51.799124"	+0.000165"	38° 19' 51.798960"	0.004358m
	ELL HT=	82.8827m	-0.0002m	82.8825m	0.004436m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
: HV05					
	LAT=	5° 38' 26.515549"	-0.000262"	5° 38' 26.515810"	0.004325m
	LON=	38° 21' 54.791990"	+0.000018"	38° 21' 54.791972"	0.004364m
	ELL HT=	92.0197m	-0.0002m	92.0195m	0.004008m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
HV06					
	LAT=	5° 38' 08.300458"	-0.000256"	5° 38' 08.300714"	0.004438m
	LON=	38° 22' 20.461914"	-0.000082"	38° 22' 20.461995"	0.004607m
	ELL HT=	89.0949m	-0.0002m	89.0947m	0.004612m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
H 7					
	LAT=	5° 36' 39.475517"	+0.000072"	5° 36' 39.475445"	0.004421m
	LON=	38° 21' 27.332730"	-0.000089"	38° 21' 27.332819"	0.004440m
	ELL HT=	62.7006m	-0.0002m	62.7005m	0.004219m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
HV10					
	LAT=	5° 35' 57.119868"	+0.000086"	5° 35' 57.119782"	0.004385m
	LON=	38° 22' 26.415112"	-0.000319"	38° 22' 26.415431"	0.004572m
	ELL HT=	94.6983m	-0.0003m	94.6980m	0.004141m
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN
M03					
	LAT=	5° 37' 13.607761"	+0.000000"	5° 37' 13.607761"	FIXED
	LON=	38° 21' 15.739726"	+0.000000"	38° 21' 15.739726"	FIXED
	ELL HT=	84.8014m	+0.0000m	84.8014m	FIXED
	ORTHO HT=	0.0000m	+0.0000m	0.0000m	NOT KNOWN

Geométrico ✓
Trigonométrico
Taqueométrico

Cliente: ENGESOFT ENGENHARIA & PROJETOS S/A Folha: 01
Local: CEARÁ/CE Obra: 0-739

Estacas	Desnível Ida	Desnível Volta	Desnível Médio	Comp.	Desnível Compens.	Atitudes	Estacas
RN1681R (IBGE)						40,1667	
PSØ1	+ 6,575			+ 0,0004	+ 6,5754	46,7421	1.027,77
MØ1	− 6,987			+ 0,0006	− 6,9864	39,7557	1.577,31
MØ2	− 0,180			+ 0,0001	− 0,1799	39,5758	125,82
PSØ2	− 5,850			+ 0,0009	− 5,8491	33,7267	2.143,38
PSØ3	+ 7,315			+ 0,0003	+ 7,3153	41,0420	794,11
MØ4	+ 2,309			+ 0,0008	+ 2,3098	43,3518	2.059,56
MØ3	+ 13,394			+ 0,0006	+ 13,3946	56,7464	1.625,11
PSØ4	− 10,751			+ 0,0004	− 10,7506	45,9958	852,29
PSØ5	− 0,707			+ 0,0007	− 0,7063	45,2895	1.814,44
RN1681N	+ 1,866			+ 0,0006	+ 1,8666	47,1561	1.613,52
(IBGE) Σh = +6.984		f = −0,0054m	P = 1mm			Σh = +6,9894	D = 13.633,31m

Calculado por: ZM. Verificado por: ZM. Data: 05 / 09 / 2001