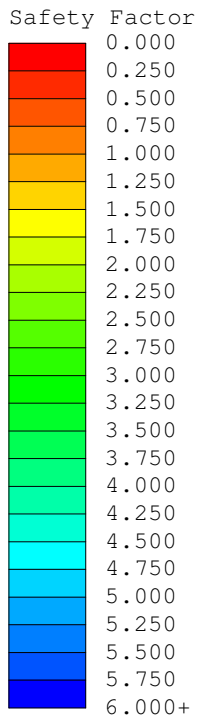


Allegato 10
Analisi di stabilità del pendio



Global Minimums

Method: janbu corrected FS: 1.591250
Center: 155.138, 324.285 Radius: 97.285

Method: spencer FS: 1.569170
Center: 155.138, 324.285 Radius: 97.285

Method: gle/morgenstern-price FS: 1.569440
Center: 155.138, 324.285 Radius: 97.285

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.594520
Factor of Safety, standard deviation: 0.068124
Probability of Failure: 0.000%
Reliability index: 8.72705 (normal distribution)
Reliability index: 10.90432 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.574344
Factor of Safety, standard deviation: 0.067310
Probability of Failure: 0.000%
Reliability index: 8.53284 (normal distribution)
Reliability index: 10.59855 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.574563
Factor of Safety, standard deviation: 0.067318
Probability of Failure: 0.000%
Reliability index: 8.53501 (normal distribution)
Reliability index: 10.60193 (lognormal distribution)

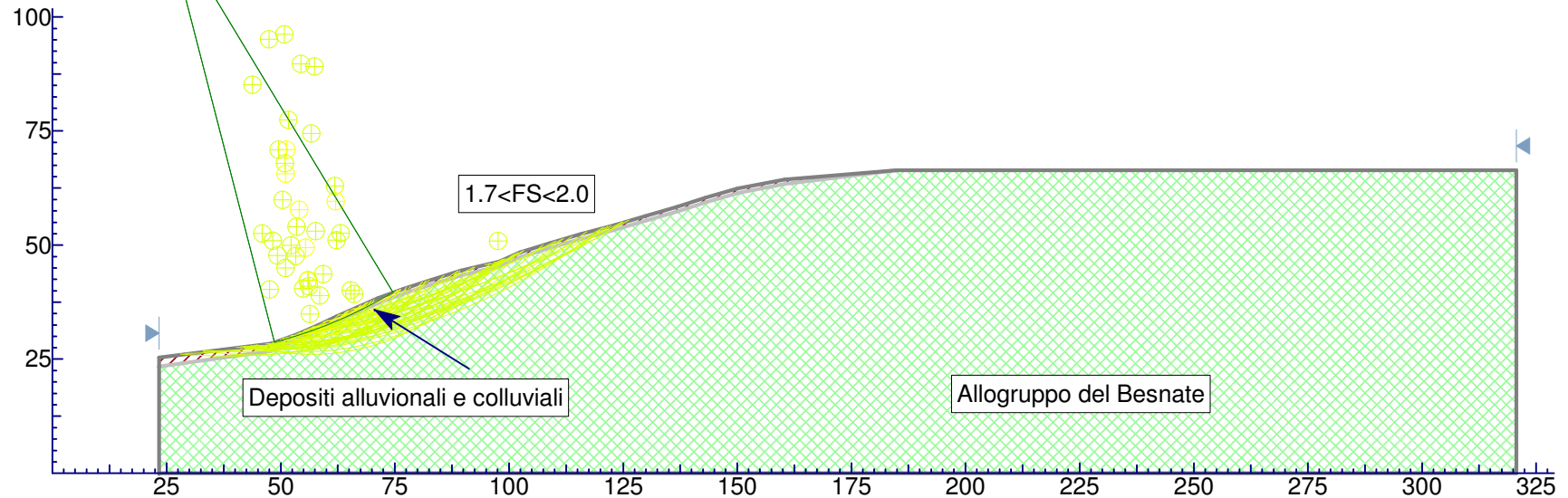
Tradate - PGT
Analisi di stabilità dei versanti
Sezione 1 - Condizioni Drenate

Material Properties

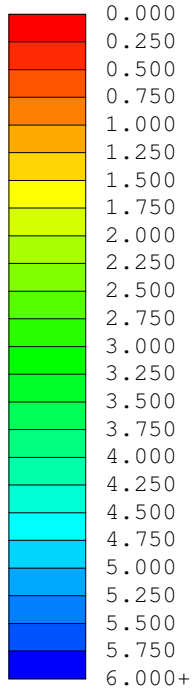
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m³
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m³
Cohesion: 1 kPa Friction Angle: 28.5 degrees

FS (deterministic) = 1.569
FS (mean) = 1.575
PF = 0.00%



Safety Factor



Tradate - PGT
Analisi di stabilità dei versanti
Sezione 1 - Condizioni Non Drenate

Global Minimums

Method: janbu corrected FS: 0.791274
Center: 184.812, 259.210 Radius: 25.356

Method: spencer FS: 0.778540
Center: 184.812, 259.210 Radius: 25.356

Method: gle/morgenstern-price FS: 0.778563
Center: 184.812, 259.210 Radius: 25.356

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 0.792530
Factor of Safety, standard deviation: 0.096117
Probability of Failure: 98.100%
Reliability index: -2.15852 (normal distribution)
Reliability index: -1.98472 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 0.781195
Factor of Safety, standard deviation: 0.094074
Probability of Failure: 98.700%
Reliability index: -2.32589 (normal distribution)
Reliability index: -2.11793 (lognormal distribution)

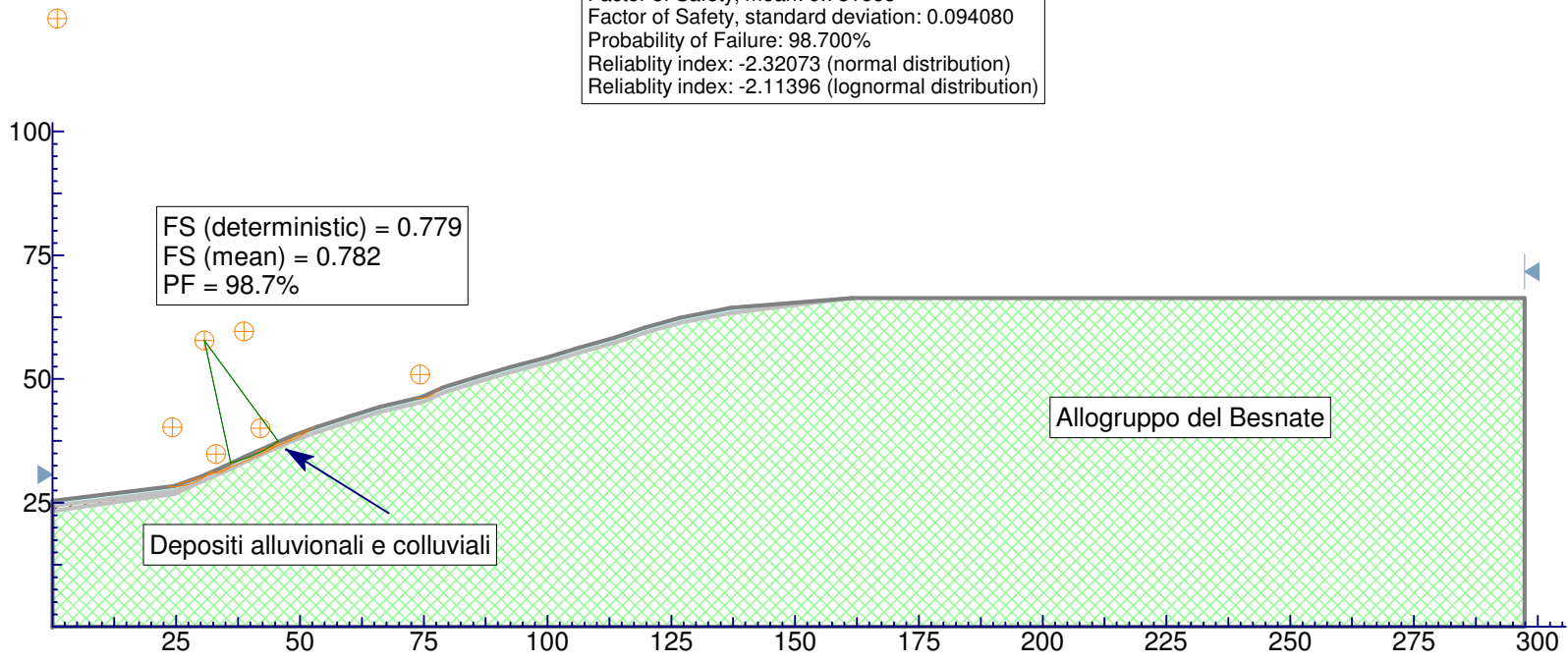
Method: gle/morgenstern-price
Factor of Safety, mean: 0.781665
Factor of Safety, standard deviation: 0.094080
Probability of Failure: 98.700%
Reliability index: -2.32073 (normal distribution)
Reliability index: -2.11396 (lognormal distribution)

Material Properties

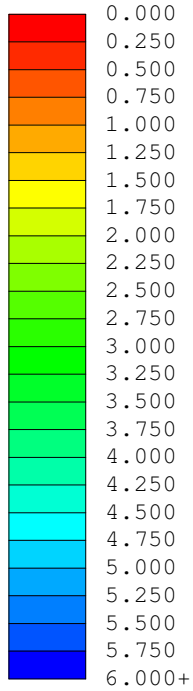
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Depositi alluvionali e colluviali saturi
Strength Type: Mohr-Coulomb Unit Weight: 21 kN/m3
Cohesion: 1 kPa Friction Angle: 26 degrees
Ru Value: 0.47



Safety Factor



Global Minimums

Method: janbu corrected FS: 1.497330
Center: 155.138, 324.285 Radius: 97.285

Method: spencer FS: 1.476870
Center: 155.138, 324.28 Radius: 97.285

Method: gle/morgenstern-price FS: 1.477170
Center: 155.138, 324.285 Radius: 97.285

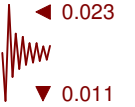
Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.500409
Factor of Safety, standard deviation: 0.064066
Probability of Failure: 0.000%
Reliability index: 7.81078 (normal distribution)
Reliability index: 9.48519 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.481725
Factor of Safety, standard deviation: 0.063317
Probability of Failure: 0.000%
Reliability index: 7.60816 (normal distribution)
Reliability index: 9.18456 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.481866
Factor of Safety, standard deviation: 0.063319
Probability of Failure: 0.000%
Reliability index: 7.61016 (normal distribution)
Reliability index: 9.18740 (lognormal distribution)

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 1 - Condizioni Sismiche

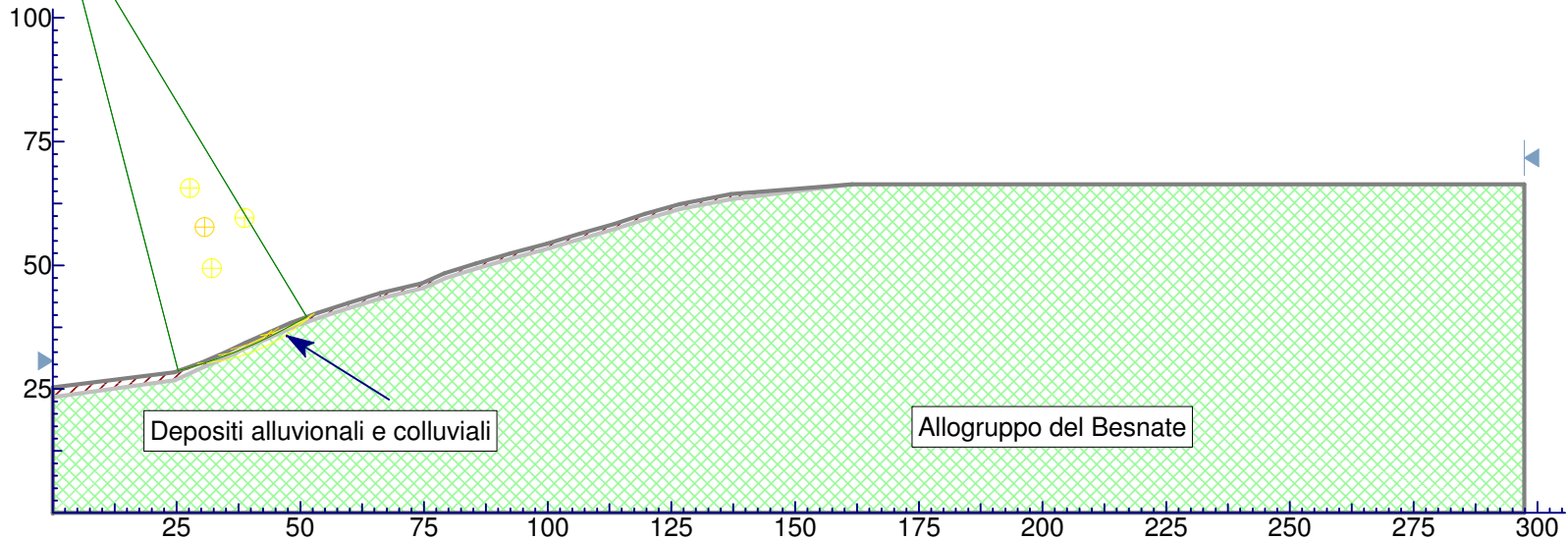


Material Properties

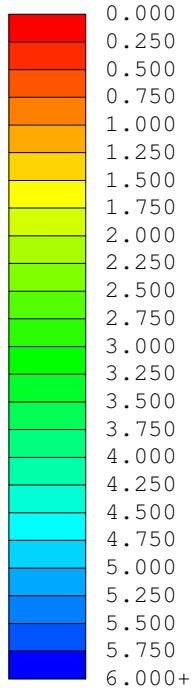
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

FS (deterministic) = 1.477
FS (mean) = 1.482
PF = 0.00%



Safety Factor



Global Minimums

Method: janbu corrected FS: 1.226500
Center: 106.249, 231.089 Radius: 162.065

Method: spencer FS: 1.216200
Center: 106.249, 231.089 Radius: 162.065

Method: gle/morgenstern-price FS: 1.216200
Center: 106.249, 231.089 Radius: 162.065

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.229015
Factor of Safety, standard deviation: 0.061873
Probability of Failure: 0.000%
Reliability index: 3.70139 (normal distribution)
Reliability index: 4.07358 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.218694
Factor of Safety, standard deviation: 0.061327
Probability of Failure: 0.000%
Reliability index: 3.56602 (normal distribution)
Reliability index: 3.90762 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.218696
Factor of Safety, standard deviation: 0.061327
Probability of Failure: 0.000%
Reliability index: 3.56604 (normal distribution)
Reliability index: 3.90764 (lognormal distribution)

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 2 - Condizioni Drenate

Material Properties

Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Conglomerato con grado di cementazione variabile
Strength Type: Infinite strength Unit Weight: 20 kN/m3

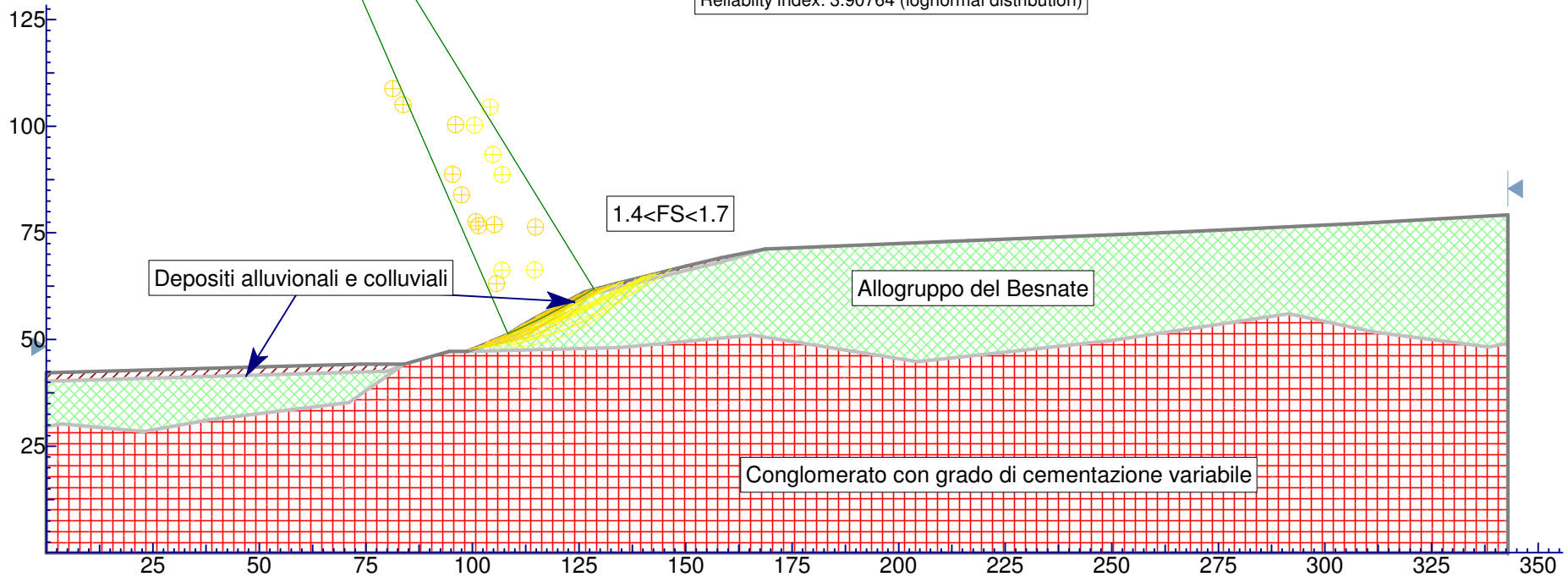
FS (deterministic) = 1.216
FS (mean) = 1.219
PF = 0.00%

1.4 < FS < 1.7

Depositi alluvionali e colluviali

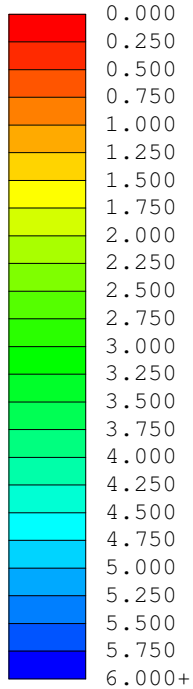
Allogruppo del Besnate

Conglomerato con grado di cementazione variabile



Scale 1:1500.0

Safety Factor



Tradate - PGT
Analisi di stabilità dei versanti
Sezione 2 - Condizioni Non Drenate

Global Minimums

Method: janbu corrected FS: 0.580471
Center: 106.249, 231.089 Radius: 162.065

Method: spencer FS: 0.575240
Center: 106.249, 231.089 Radius: 162.065

Method: gle/morgenstern-price FS: 0.575240
Center: 106.249, 231.089 Radius: 162.065

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 0.579114
Factor of Safety, standard deviation: 0.056109
Probability of Failure: 100.000%
Reliability index: -7.50128 (normal distribution)
Reliability index: -5.69960 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 0.573907
Factor of Safety, standard deviation: 0.055756
Probability of Failure: 100.000%
Reliability index: -7.64215 (normal distribution)
Reliability index: -5.77763 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 0.573908
Factor of Safety, standard deviation: 0.055756
Probability of Failure: 100.000%
Reliability index: -7.64215 (normal distribution)
Reliability index: -5.77764 (lognormal distribution)

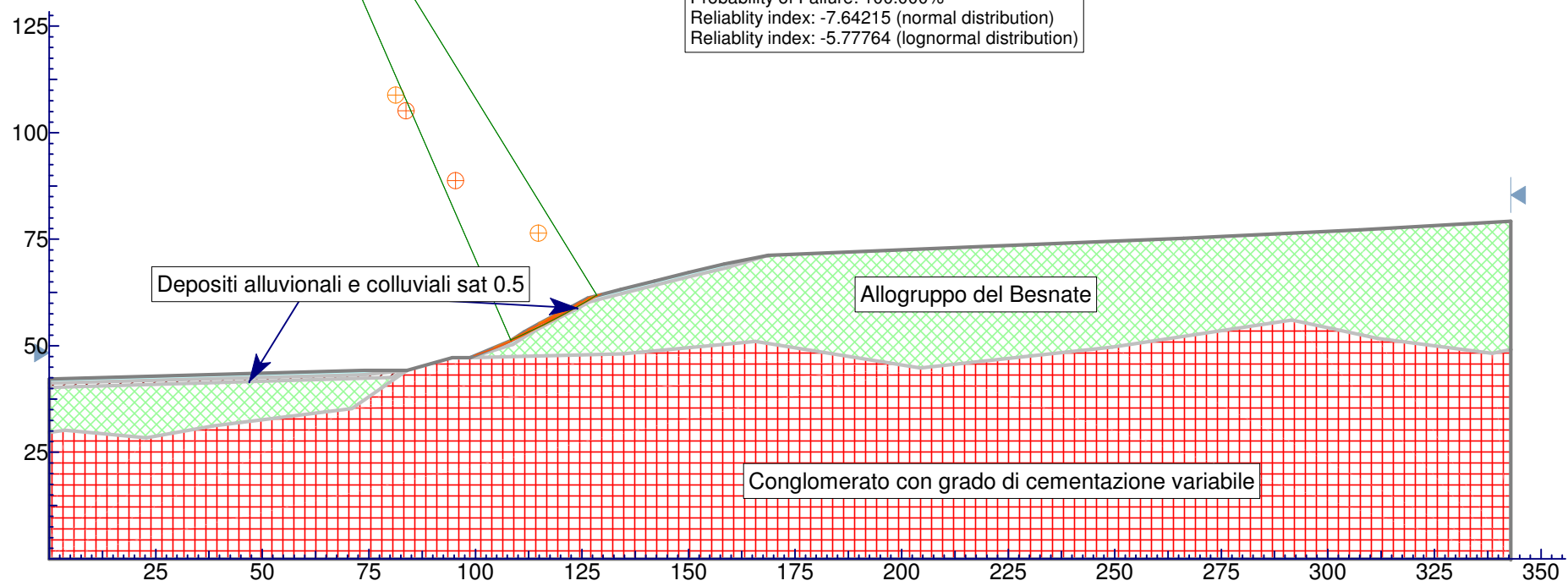
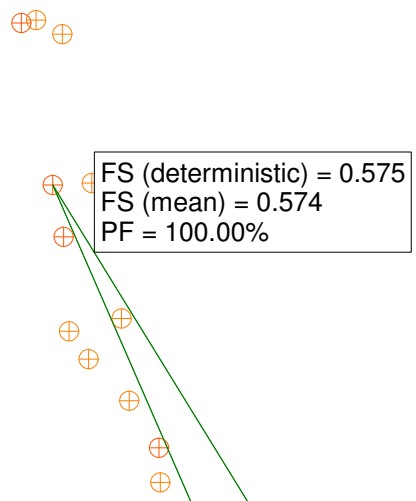
Material Properties

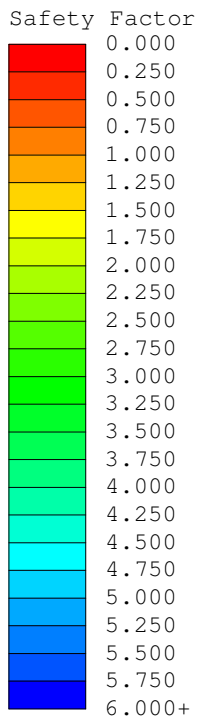
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 21 kN/m3
Cohesion: 1 kPa Friction Angle: 26 degrees
Ru Value: 0.5 - 0.43

Material: Conglomerato con grado di cementazione variabile
Strength Type: Infinite strength Unit Weight: 20 kN/m3





Global Minimums

Method: janbu corrected FS: 1.161650
Center: 106.249, 231.089 Radius: 162.065

Method: spencer FS: 1.152070
Center: 106.249, 231.089 Radius: 162.065

Method: gle/morgenstern-price FS: 1.152070
Center: 106.249, 231.089 Radius: 162.065

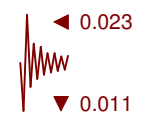
Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.164115
Factor of Safety, standard deviation: 0.058645
Probability of Failure: 0.000%
Reliability index: 2.79842 (normal distribution)
Reliability index: 2.99317 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.154429
Factor of Safety, standard deviation: 0.058148
Probability of Failure: 0.200%
Reliability index: 2.65579 (normal distribution)
Reliability index: 2.82768 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.154432
Factor of Safety, standard deviation: 0.058148
Probability of Failure: 0.200%
Reliability index: 2.65584 (normal distribution)
Reliability index: 2.82774 (lognormal distribution)

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 2 - Condizioni Sismiche



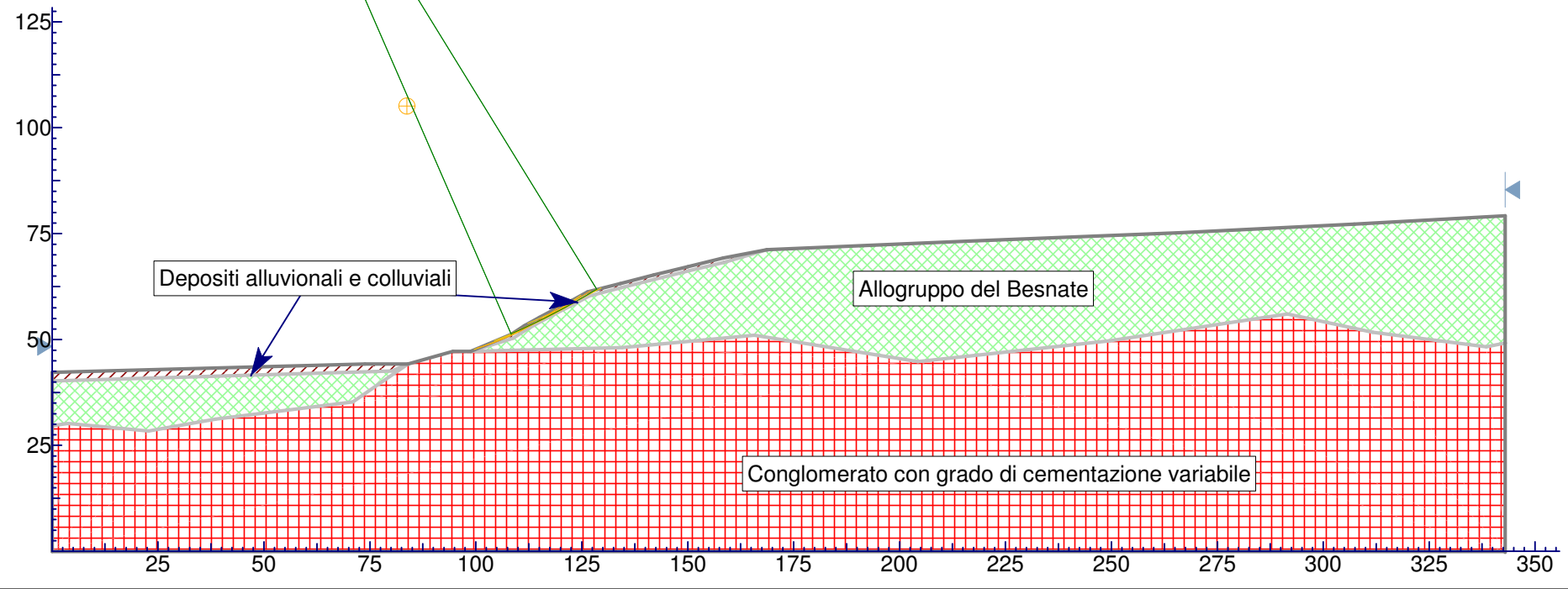
Material Properties

Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

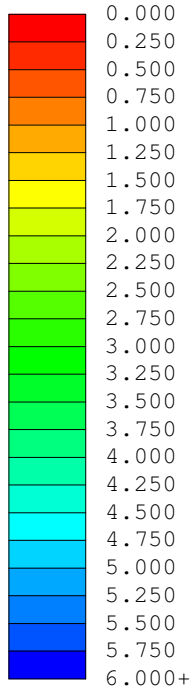
Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Conglomerato con grado di cementazione variabile
Strength Type: Infinite strength Unit Weight: 20 kN/m3

FS (deterministic) = 1.152
FS (mean) = 1.154
PF = 0.20%



Safety Factor



Global Minimums

Method: janbu corrected FS: 1.160640
Center: 248.461, 106.188 Radius: 63.067

Method: spencer FS: 1.146510
Center: 248.461, 106.188 Radius: 63.067

Method: gle/morgenstern-price FS: 1.146610
Center: 248.461, 106.188 Radius: 63.067

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.163784
Factor of Safety, standard deviation: 0.083740
Probability of Failure: 2.900%
Reliability index: 1.95585 (normal distribution)
Reliability index: 2.07472 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.150001
Factor of Safety, standard deviation: 0.082631
Probability of Failure: 3.700%
Reliability index: 1.81531 (normal distribution)
Reliability index: 1.91175 (lognormal distribution)

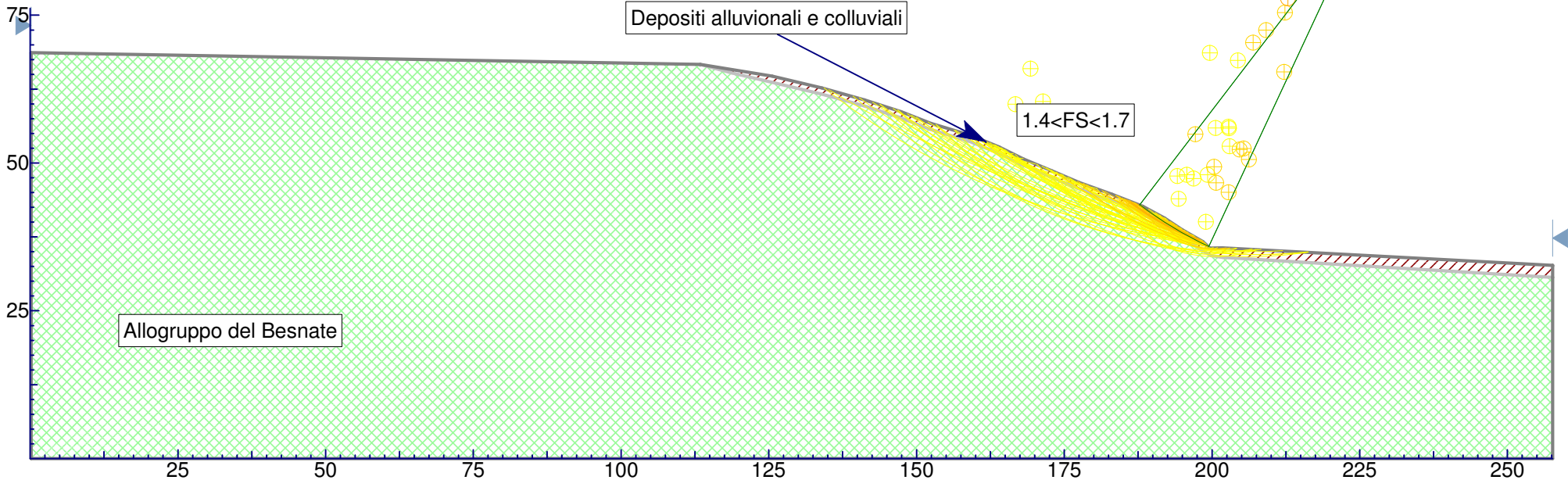
Method: gle/morgenstern-price
Factor of Safety, mean: 1.150054
Factor of Safety, standard deviation: 0.082647
Probability of Failure: 3.700%
Reliability index: 1.81561 (normal distribution)
Reliability index: 1.91211 (lognormal distribution)

Material Properties

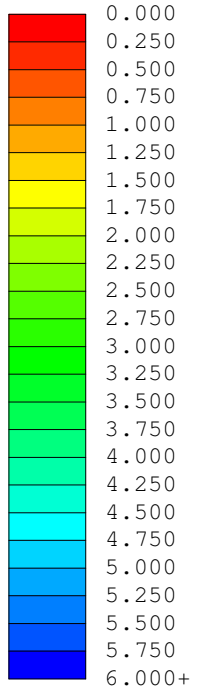
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 3 - Condizioni Drenate



Safety Factor



Global Minimums

Method: janbu corrected FS: 0.540535
Center: 248.461, 106.188 Radius: 63.067

Method: spencer FS: 0.533667
Center: 248.461, 106.188 Radius: 63.067

Method: gle/morgenstern-price FS: 0.533722
Center: 248.461, 106.188 Radius: 63.067

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 0.539213
Factor of Safety, standard deviation: 0.070814
Probability of Failure: 100.000%
Reliability index: -6.50704 (normal distribution)
Reliability index: -4.78864 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 0.533677
Factor of Safety, standard deviation: 0.070117
Probability of Failure: 100.000%
Reliability index: -6.65066 (normal distribution)
Reliability index: -4.86553 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 0.533784
Factor of Safety, standard deviation: 0.070142
Probability of Failure: 100.000%
Reliability index: -6.64670 (normal distribution)
Reliability index: -4.86323 (lognormal distribution)

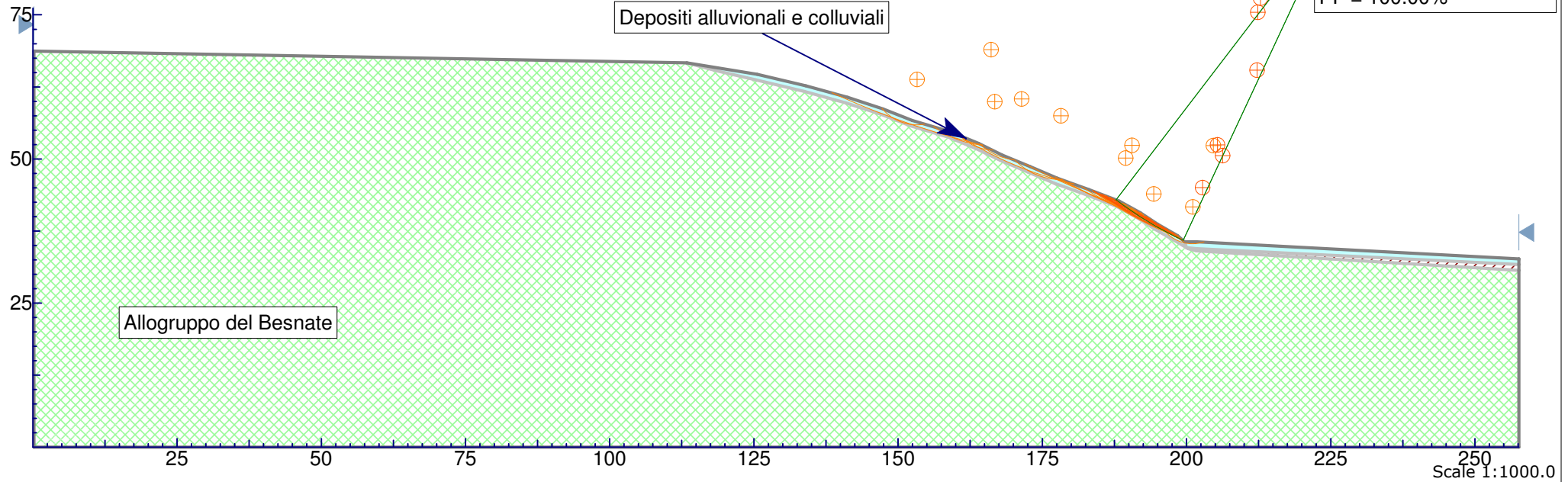
Tradate - PGT Analisi di stabilità dei versanti Sezione 3 - Condizioni Non Drenate

Material Properties

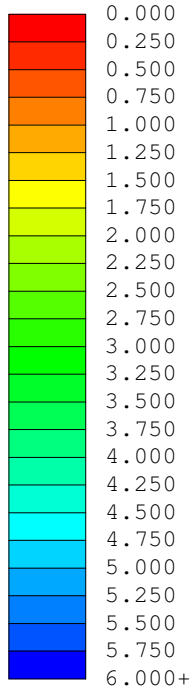
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Depositi alluvionali e colluviali saturi
Strength Type: Mohr-Coulomb Unit Weight: 21 kN/m3
Cohesion: 1 kPa Friction Angle: 26 degrees
Ru Value: 0.44 - 0.5



Safety Factor



Global Minimums

Method: janbu corrected FS: 1.103860
Center: 248.461, 106.188 Radius: 63.067

Method: spencer FS: 1.090550
Center: 248.461, 106.188 Radius: 63.067

Method: gle/morgenstern-price FS: 1.090660
Center: 248.461, 106.188 Radius: 63.067

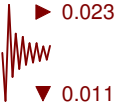
Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.106831
Factor of Safety, standard deviation: 0.079791
Probability of Failure: 9.200%
Reliability index: 1.33888 (normal distribution)
Reliability index: 1.37381 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.093876
Factor of Safety, standard deviation: 0.078763
Factor of Safety, minimum: 0.871437
Factor of Safety, maximum: 1.321790
Probability of Failure: 11.700%
Reliability index: 1.19189 (normal distribution)
Reliability index: 1.21182 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.093930
Factor of Safety, standard deviation: 0.078779
Probability of Failure: 11.700%
Reliability index: 1.19233 (normal distribution)
Reliability index: 1.21230 (lognormal distribution)

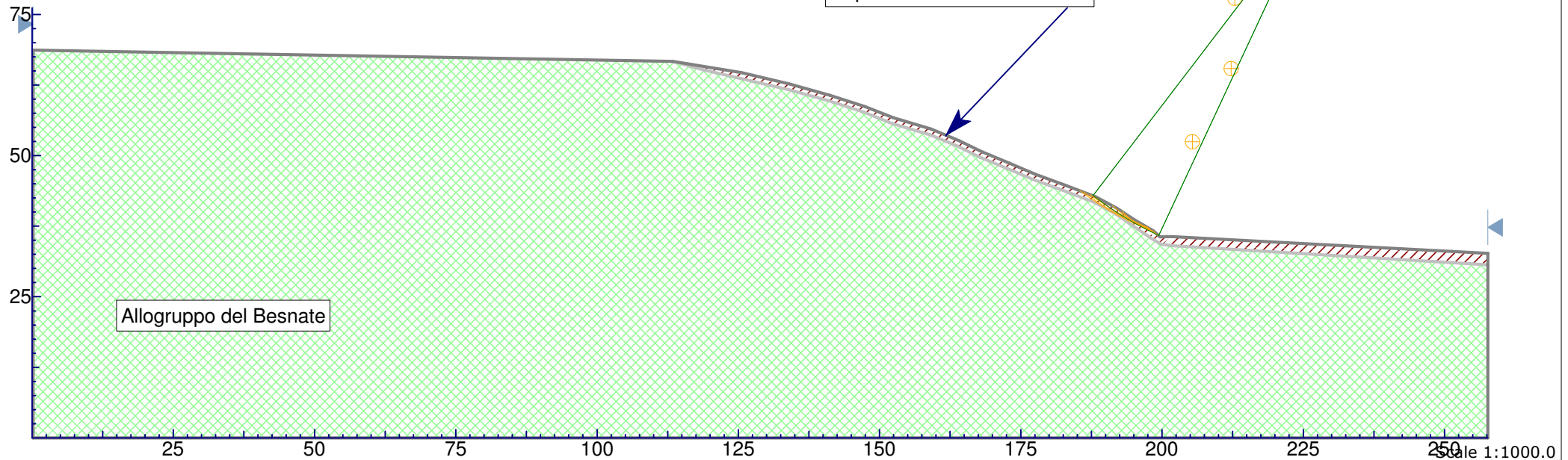
Tradate - PGT
Analisi di stabilità dei versanti
Sezione 3 - Condizioni Sismiche

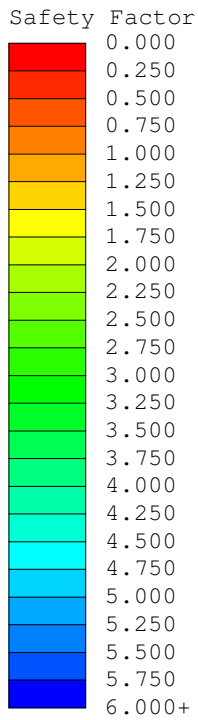


Material Properties

Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees





Global Minimums

Method: janbu corrected FS: 1.683510
Center: 169.491, 357.093 Radius: 66.701

Method: spencer FS: 1.655830
Center: 169.491, 357.093 Radius: 66.701

Method: gle/morgenstern-price FS: 1.656520
Center: 169.491, 357.093 Radius: 66.701

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.686105
Factor of Safety, standard deviation: 0.055700
Probability of Failure: 0.000%
Reliability index: 12.31792 (normal distribution)
Reliability index: 15.80218 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.659937
Factor of Safety, standard deviation: 0.054789
Probability of Failure: 0.000%
Reliability index: 12.04512 (normal distribution)
Reliability index: 15.34161 (lognormal distribution)

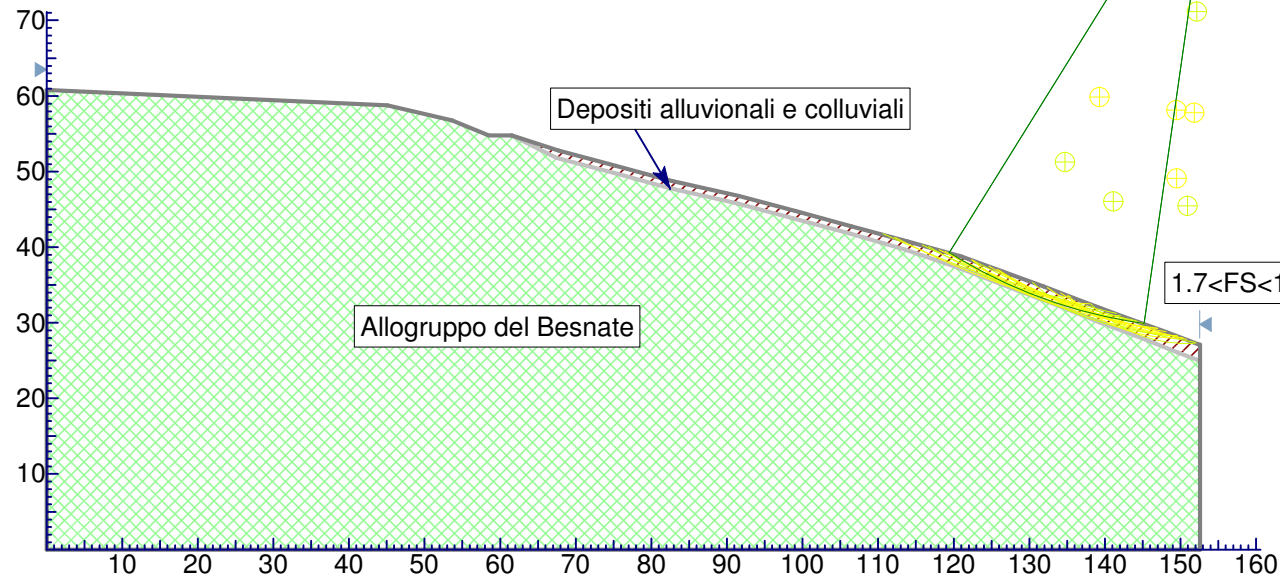
Method: gle/morgenstern-price
Factor of Safety, mean: 1.660733
Factor of Safety, standard deviation: 0.054808
Probability of Failure: 0.000%
Reliability index: 12.05545 (normal distribution)
Reliability index: 15.35816 (lognormal distribution)

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 4 - Condizioni Drenate

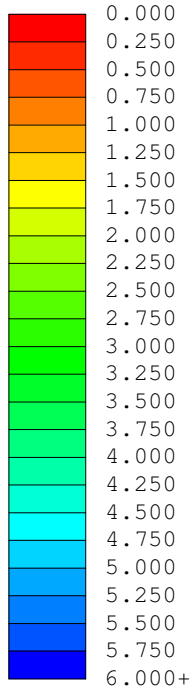
Material Properties

Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m³
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m³
Cohesion: 1 kPa Friction Angle: 28.5 degrees



Safety Factor



Global Minimums

Method: janbu corrected FS: 0.899135
Center: 176.682, 371.995 Radius: 82.485

Method: spencer FS: 0.886779
Center: 176.682, 371.995 Radius: 82.485

Method: gle/morgenstern-price FS: 0.887026
Center: 176.682, 371.995 Radius: 82.485

Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 0.900254
Factor of Safety, standard deviation: 0.083654
Probability of Failure: 87.900%
Reliability index: -1.19236 (normal distribution)
Reliability index: -1.17961 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 0.889116
Factor of Safety, standard deviation: 0.082569
Probability of Failure: 90.000%
Reliability index: -1.34292 (normal distribution)
Reliability index: -1.31461 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 0.889279
Factor of Safety, standard deviation: 0.082589
Probability of Failure: 89.900%
Reliability index: -1.34063 (normal distribution)
Reliability index: -1.31256 (lognormal distribution)

Tradate - PGT
Analisi di stabilità dei versanti
Sezione 4 - Condizioni Non Drenate

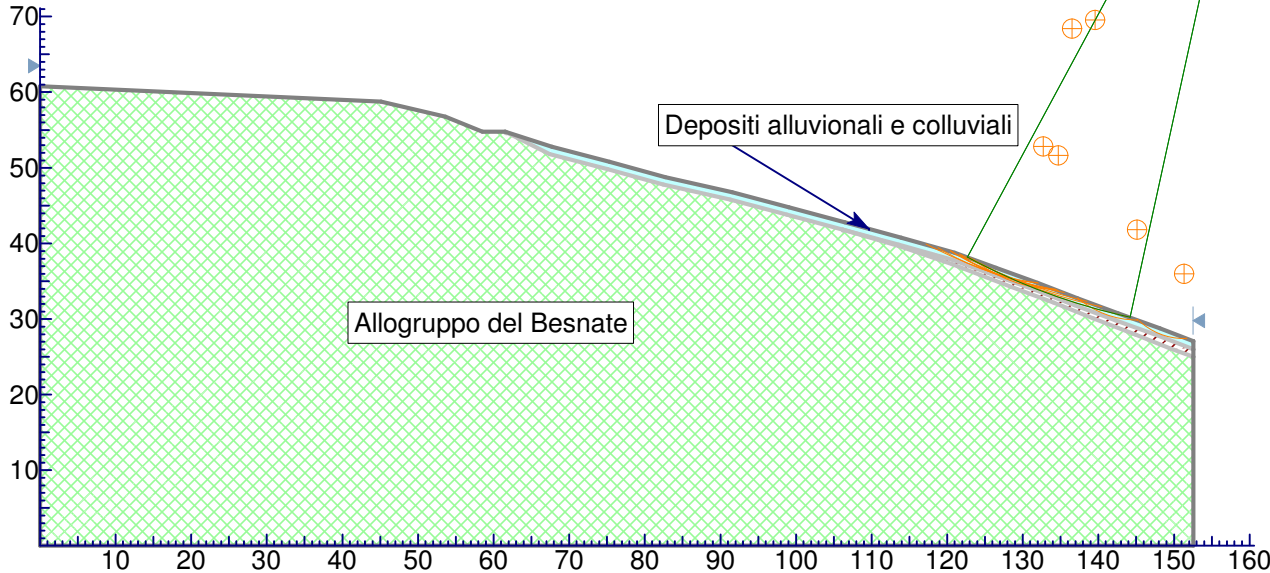
Material Properties

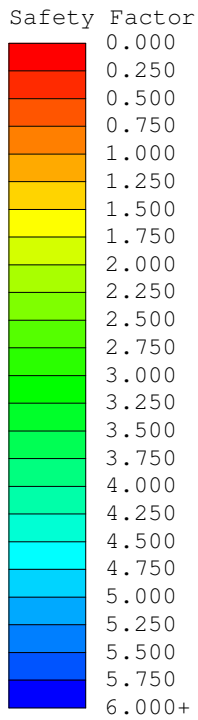
Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m3
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m3
Cohesion: 1 kPa Friction Angle: 28.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 21 kN/m3
Cohesion: 1 kPa Friction Angle: 26 degrees
Ru Value: 0.457

FS (deterministic) = 0.887
FS (mean) = 0.889
PF = 89.90%





Global Minimums

Method: janbu corrected FS: 1.572230
Center: 169.491, 357.093 Radius: 66.701

Method: spencer FS: 1.546830
Center: 169.491, 357.093 Radius: 66.701

Method: gle/morgenstern-price FS: 1.547500
Center: 169.491, 357.093 Radius: 66.701

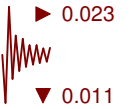
Probabilistic Analysis Results (Global Minimum)

Method: janbu corrected
Factor of Safety, mean: 1.574655
Factor of Safety, standard deviation: 0.051898
Probability of Failure: 0.000%
Reliability index: 11.07283 (normal distribution)
Reliability index: 13.76340 (lognormal distribution)

Method: spencer
Factor of Safety, mean: 1.550558
Factor of Safety, standard deviation: 0.051051
Probability of Failure: 0.000%
Reliability index: 10.78437 (normal distribution)
Reliability index: 13.30896 (lognormal distribution)

Method: gle/morgenstern-price
Factor of Safety, mean: 1.551329
Factor of Safety, standard deviation: 0.051068
Probability of Failure: 0.000%
Reliability index: 10.79602 (normal distribution)
Reliability index: 13.32643 (lognormal distribution)

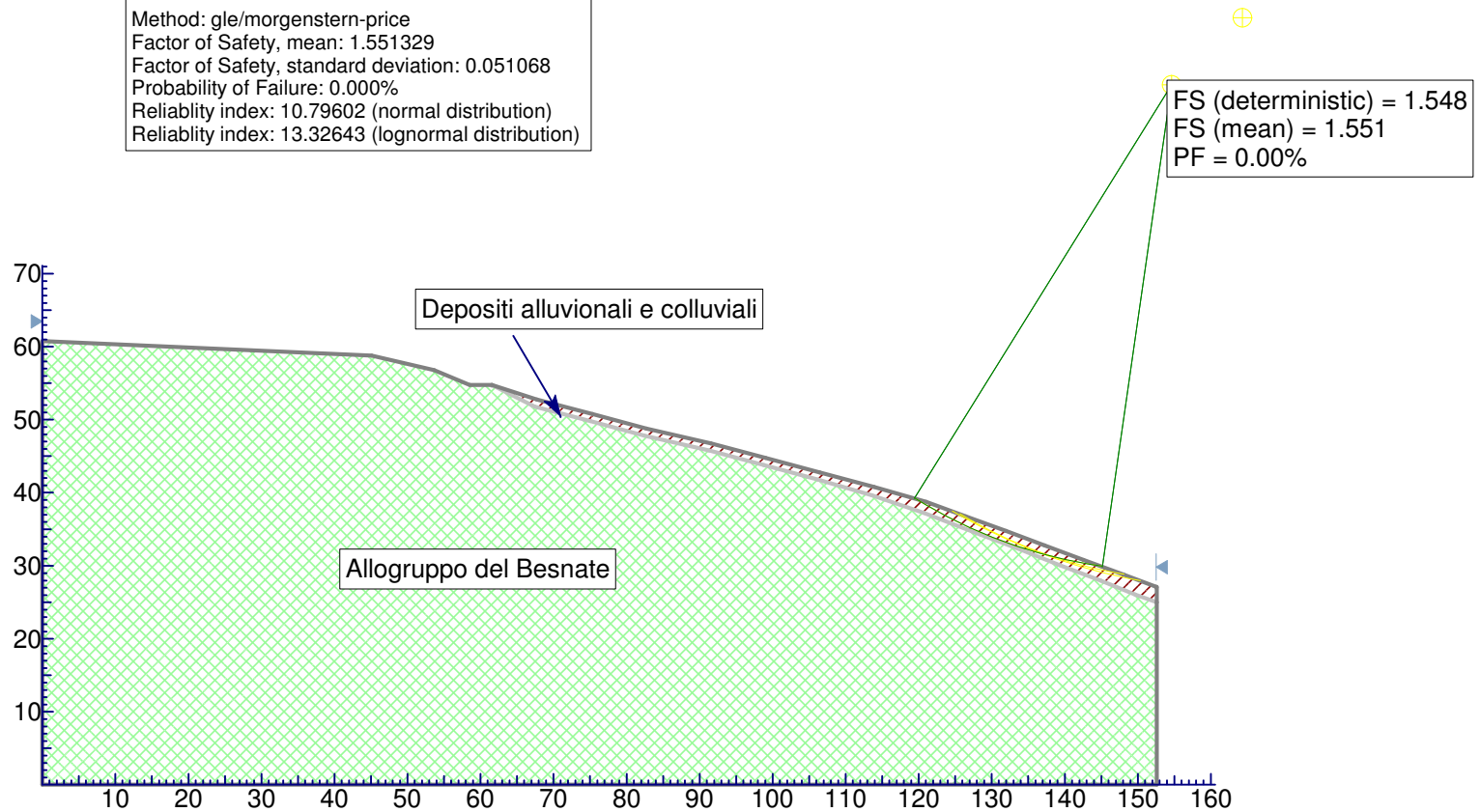
Tradate - PGT
Analisi di stabilità dei versanti
Sezione 4 - Condizioni Sismiche



Material Properties

Material: Allogruppo del Besnate
Strength Type: Mohr-Coulomb Unit Weight: 19 kN/m³
Cohesion: 3 kPa Friction Angle: 31.5 degrees

Material: Depositi alluvionali e colluviali
Strength Type: Mohr-Coulomb Unit Weight: 18 kN/m³
Cohesion: 1 kPa Friction Angle: 28.5 degrees



Slide Analysis Information

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: SI Units
Pore Fluid Unit Weight: 9.81 kN/m³
Groundwater Method: Ru Coefficient
Data Output: Standard
Calculate Excess Pore Pressure: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu corrected
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: Not Defined
Lower Angle: Not Defined
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.023
Seismic Load Coefficient (Vertical): 0.011