GTS NX

New eXperience of Geo-Technical analysis System

Slope Stability Check

Basic Course Session 1

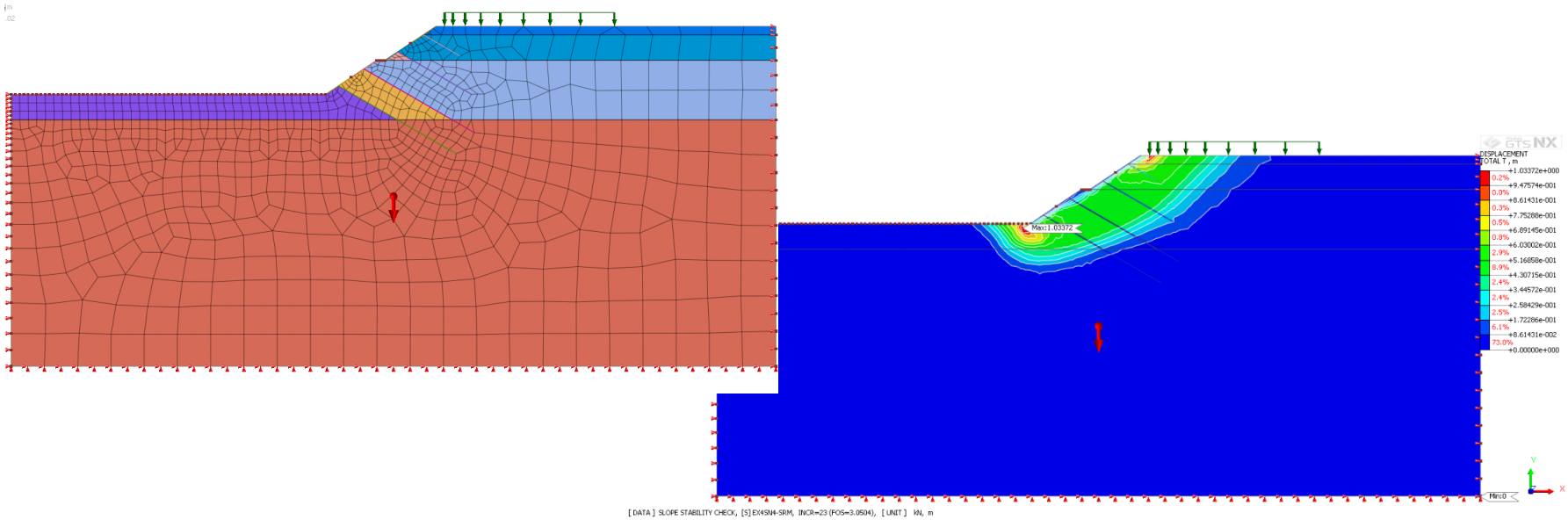
MIDAS

Modeling and Analysis Summary

The model represents 4 stage for slope excavation work which is supported by reinforcement such as lean concrete on the slope face and 4 layers of soilnail.

This tutorial is aiming on performing the analysis to check F.O.S of excavated slope and verify water drawdown.

This tutorial will be carried out with “Semi-Coupled Analysis” which is supported by GTS NX to check water behavior as well.



GTS NX

Ground

[unit : kN, m]

Name	Fill	SVI	SV	SIV
Material	Isotropic	Isotropic	Isotropic	Isotropic
Model Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
General				
Elastic Modulus (E) [kN/m^2]	10,000	16,666	83,333	250,000
Poisson's Ratio (v)	0.3	0.3	0.3	0.3
Unit Weight (γ) [kN/m^3]	17	20	21	22
Ko	0.5	0.7	0.7	0.7
Porous				
Unit Weight (Saturated) [kN/m^3]	18	21	22	23
Drainage Parameters	Drained	Drained	Drained	Drained
Non-Linear				
Cohesion (c) [kN/m^2]	1	1	5	15
Frictional Angle (Φ) [deg]	30	30	32	34

02 Material & Property

GTS NX

Structure

[unit : kN, m]

Name	Conc'	Steel
Material	Isotropic	Isotropic
Model Type	Elastic	Elastic
Elastic Modulus (E) [kN/m^2]	28,000,000	205,000,000
Poisson's Ratio (v)	0.15	0.15
Unit Weight (γ) [kN/m^3]	24	74

Property (Structure)

[unit : kN, m]

Name	Material	Type
Lean Concrete (0.1 m)	Conc'	Beam
Soil Nail (Dia. 0.2m @ 2.4m c/c)	Steel	Embedded Truss

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Geometry Modeling

MIDAS

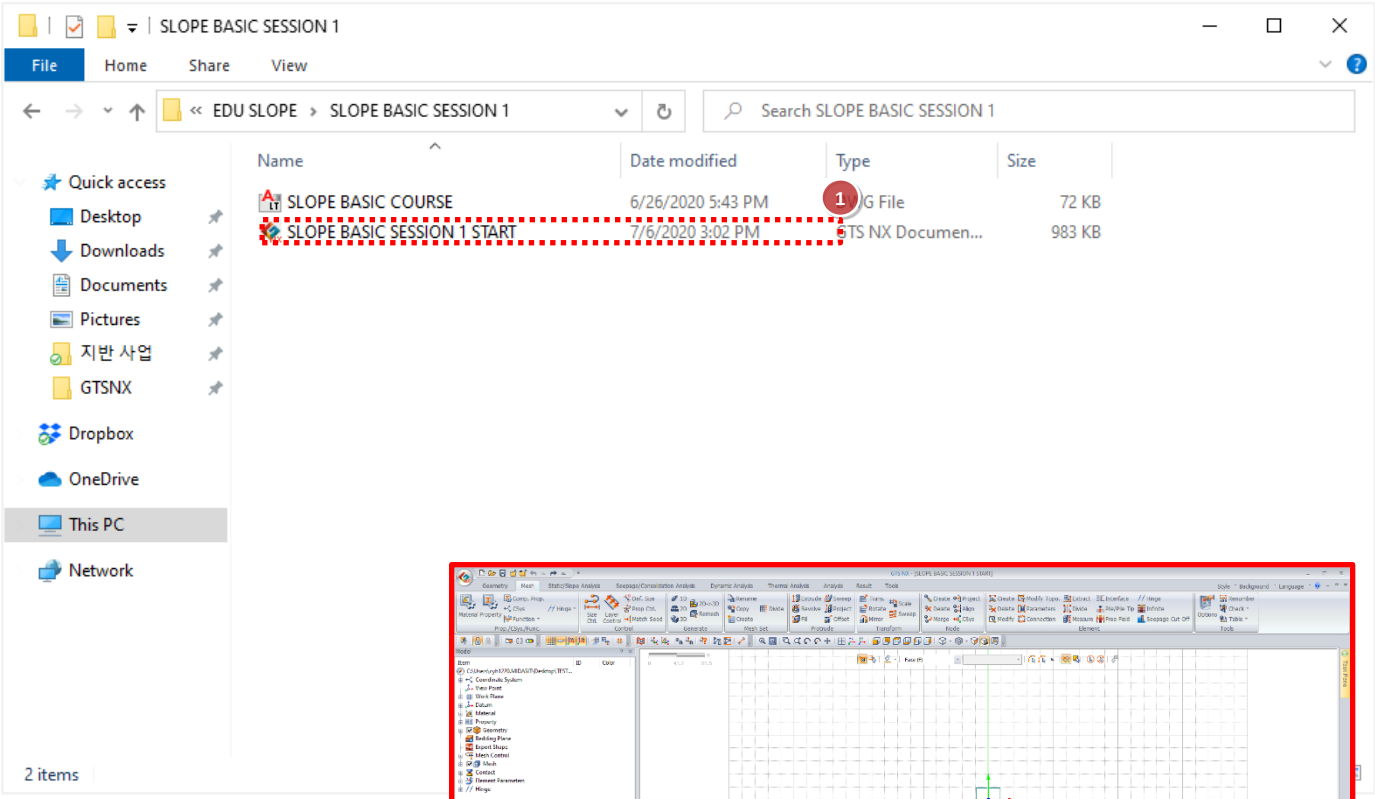
GTS NX

Starting

Procedure

1. Open the start file

   "SLOPE BASIC SESSION 1 START"

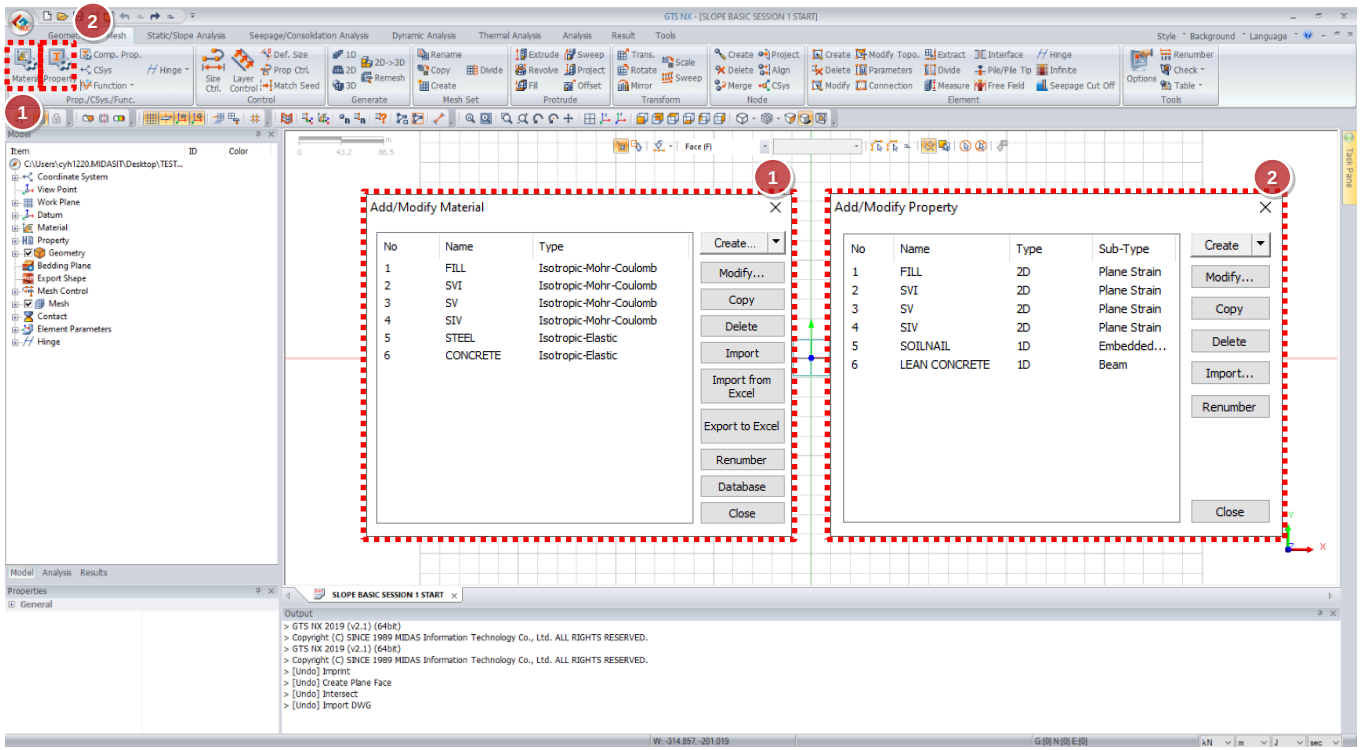


GTS NX

Check the properties

Procedure

1. Check existing materials (Mesh > Prop./CSys./Func. > Material)
2. Check existing properties (Mesh > Prop./CSys./Func. > Property)

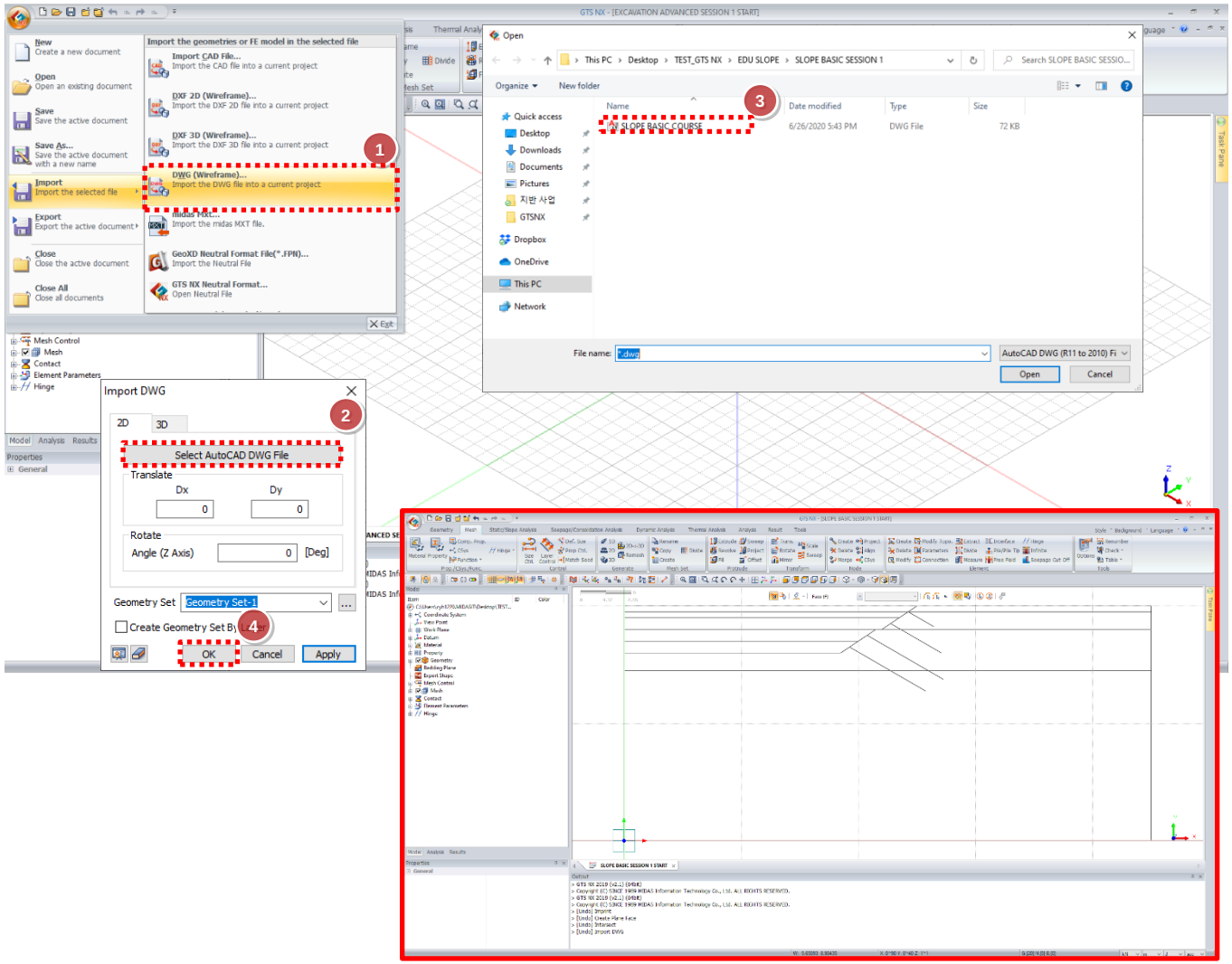


GTS NX

Import CAD file

Procedure

1. Click “DWG(Wireframe)…”
2. Click “Select AutoCAD DWG File”
3. Double click “SLOPE BASIC COURSE”
4. Click “OK”



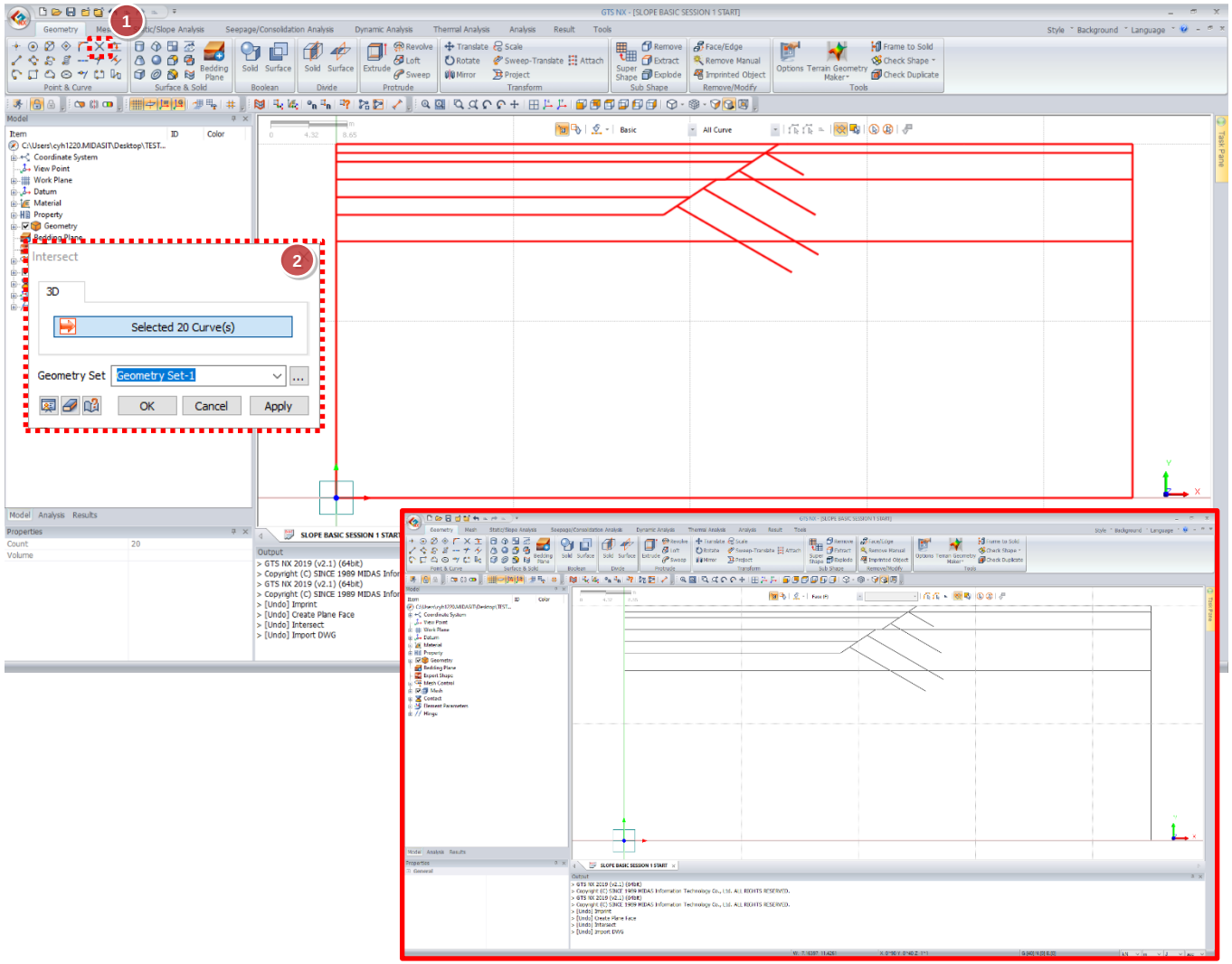
GTS NX

Intersect the lines

Procedure

1. Click “Intersect”
2. Select curve (20 curves)
   Click “OK”

   [Information]
   Curves will be divided by points.

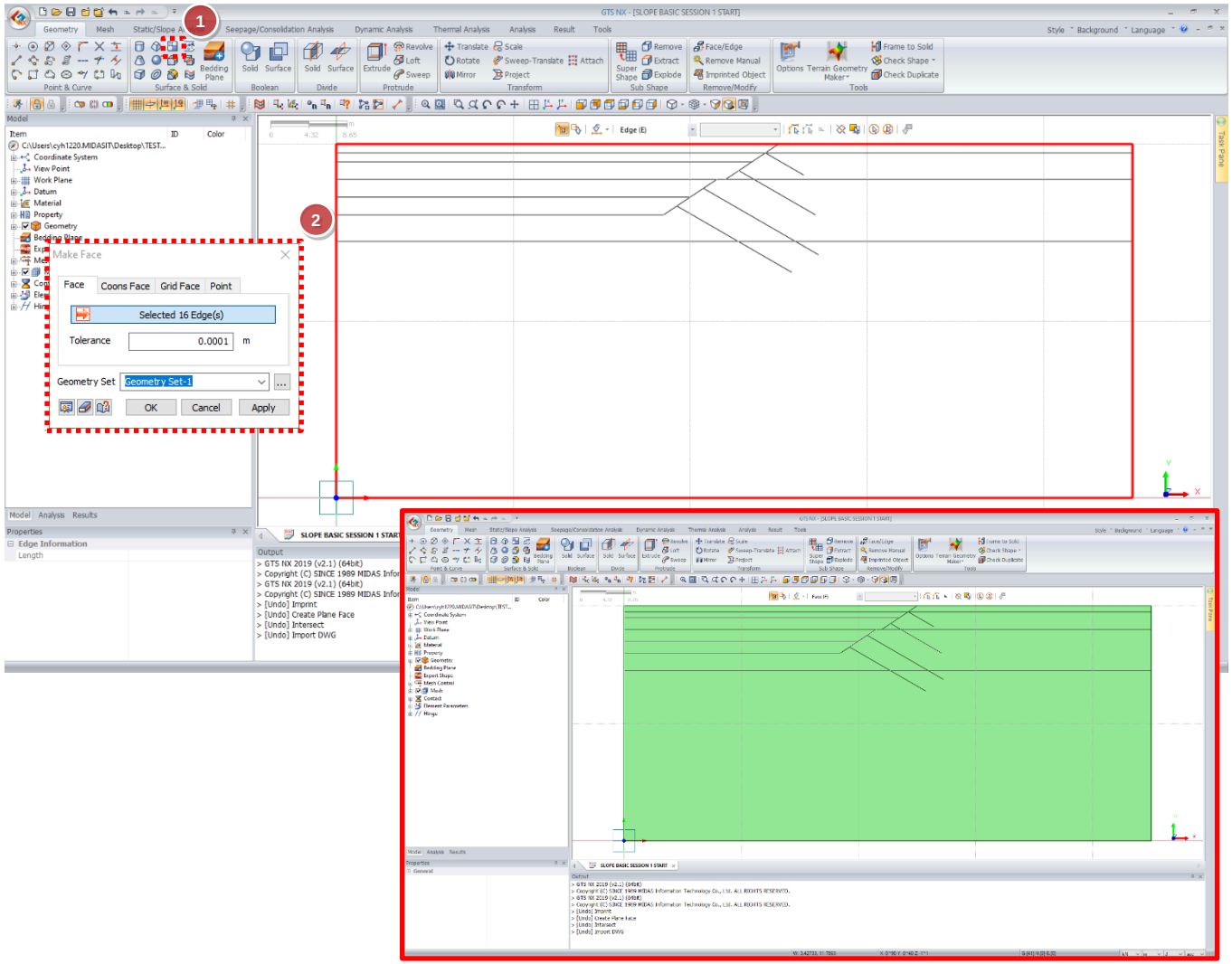


GTS NX

Create Surface

Procedure

1. Click “Make Face”
2. Select curve (16 curves)
   Click “OK”



GTS NX

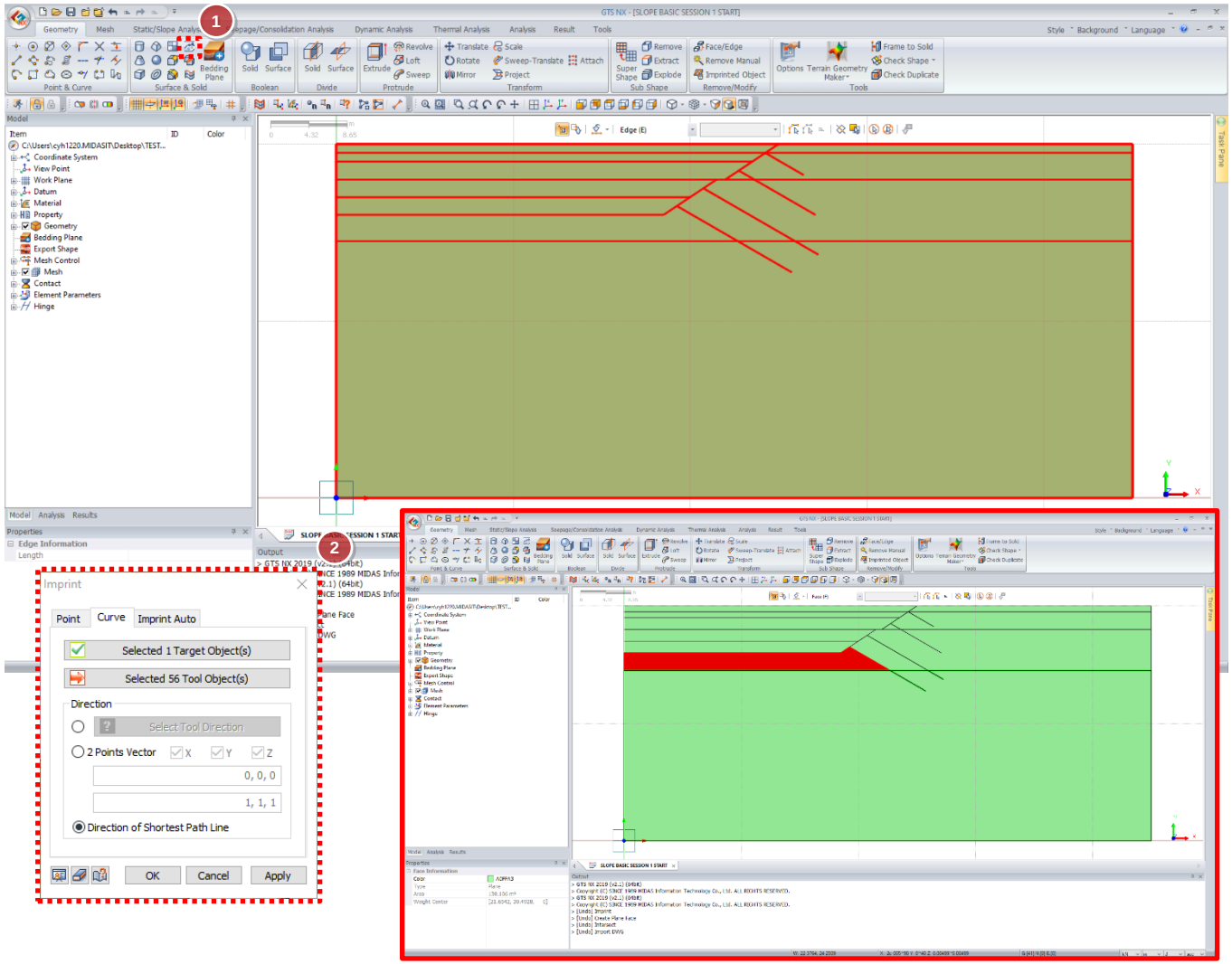
Imprint lines on face

Procedure

1. Click “Imprint”

2. Go to “Curve” tab
   Select 1 face (ctrl + a)
   Select 56 curves (ctrl + a)
   Check on “Direction of Shortest Path Line”
   Click “OK”

   [Information]
   When you imprint the lines on the specific face, you can see that faces are divided by lines.



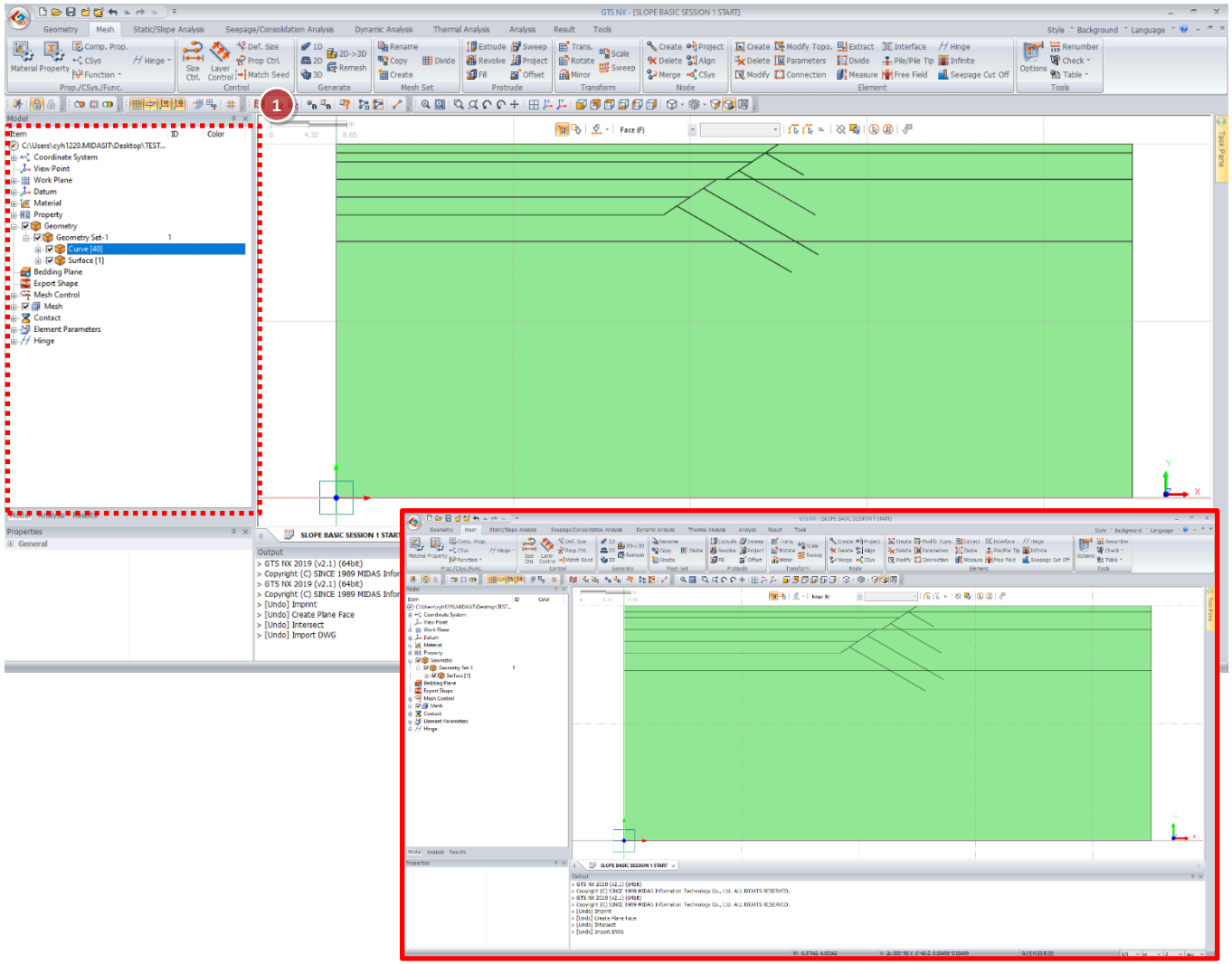
GTS NX

Imprint lines on face

Procedure

1. <Geometry tree>
   Delete every curves

   [Information]
   Curves are already imprinted to face so that those curves will not use anymore.

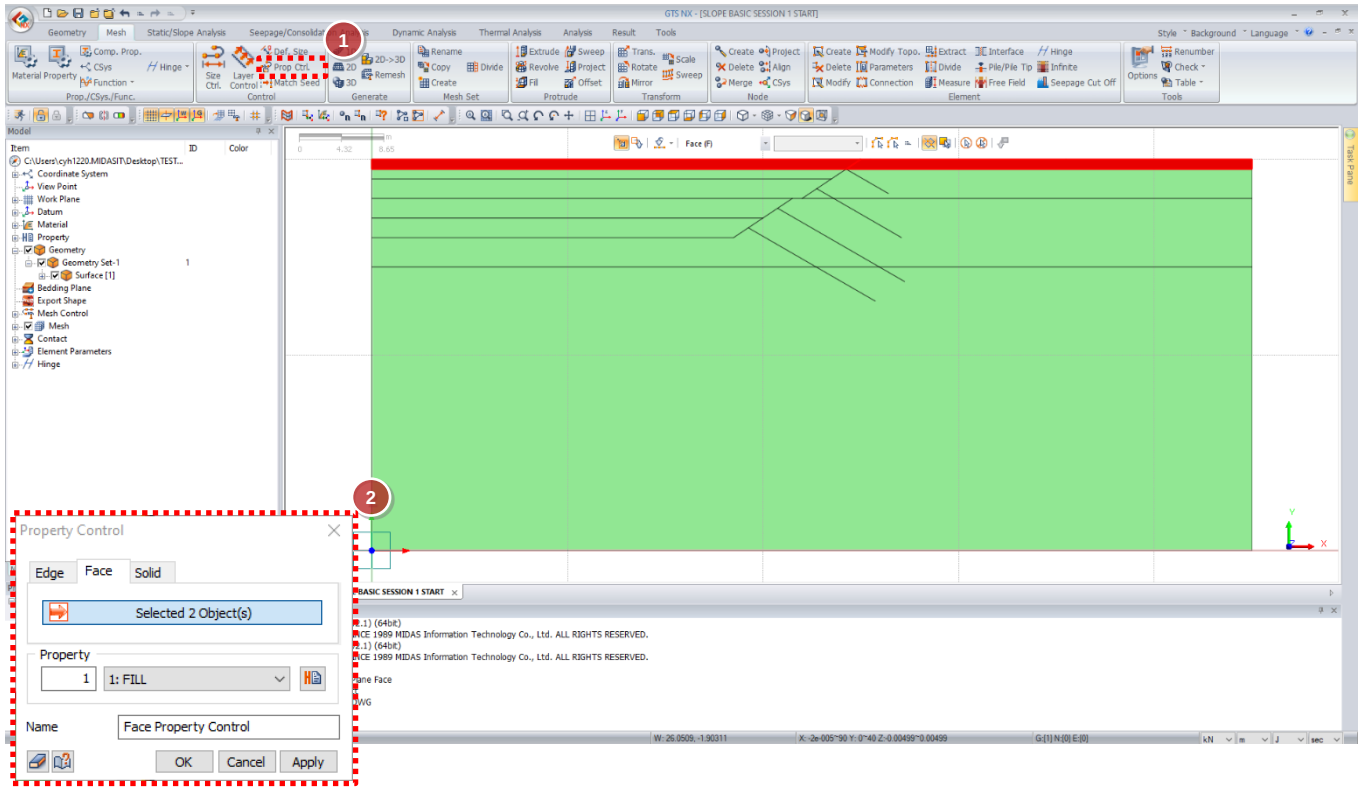


GTS NX

Property control

Procedure

1. Click “Prop Ctrl.”
2. Go to “Face” tab
   Select 1st layer of face
   Property change to “Fill”
   Click “Apply”

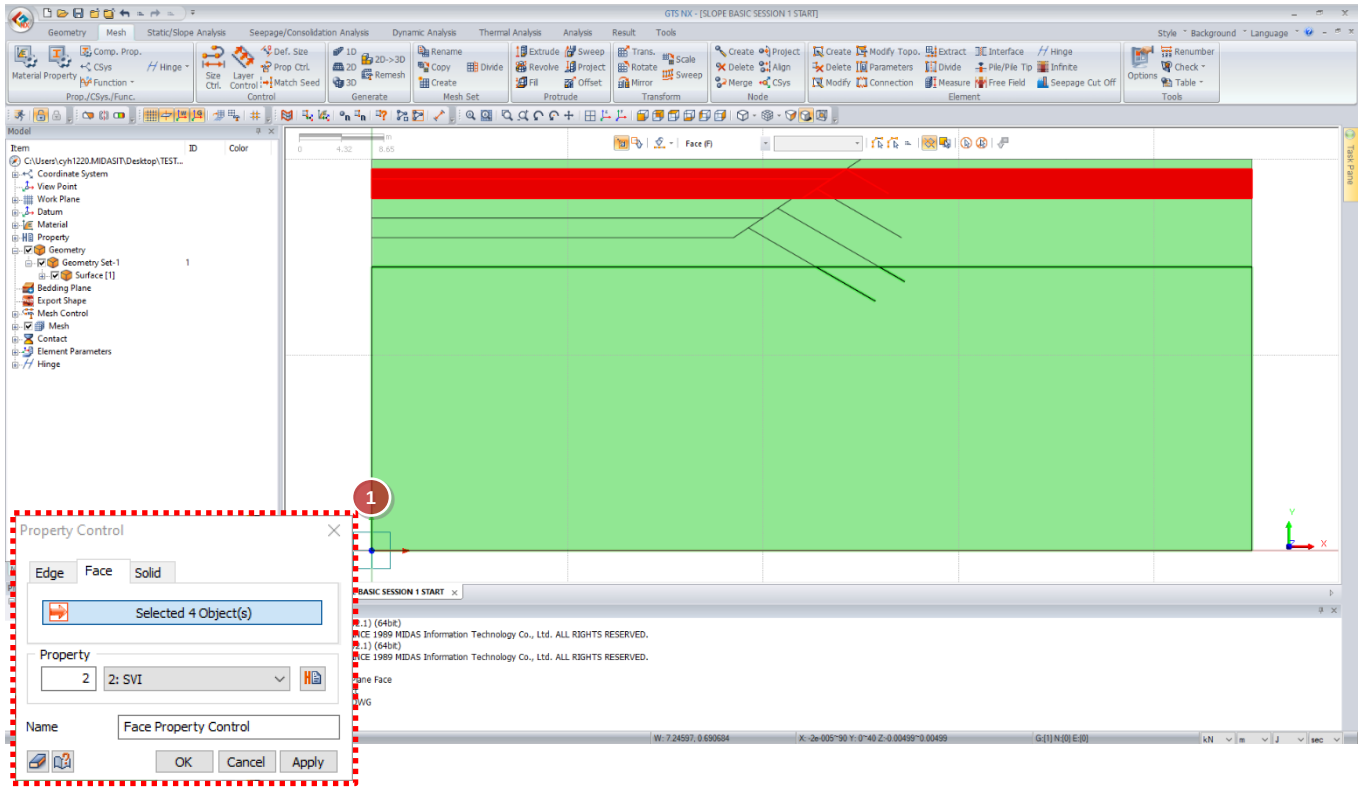


GTS NX

Property control

Procedure

1. Select 2nd layer of face
   Property change to “SVI”
   Click “Apply”

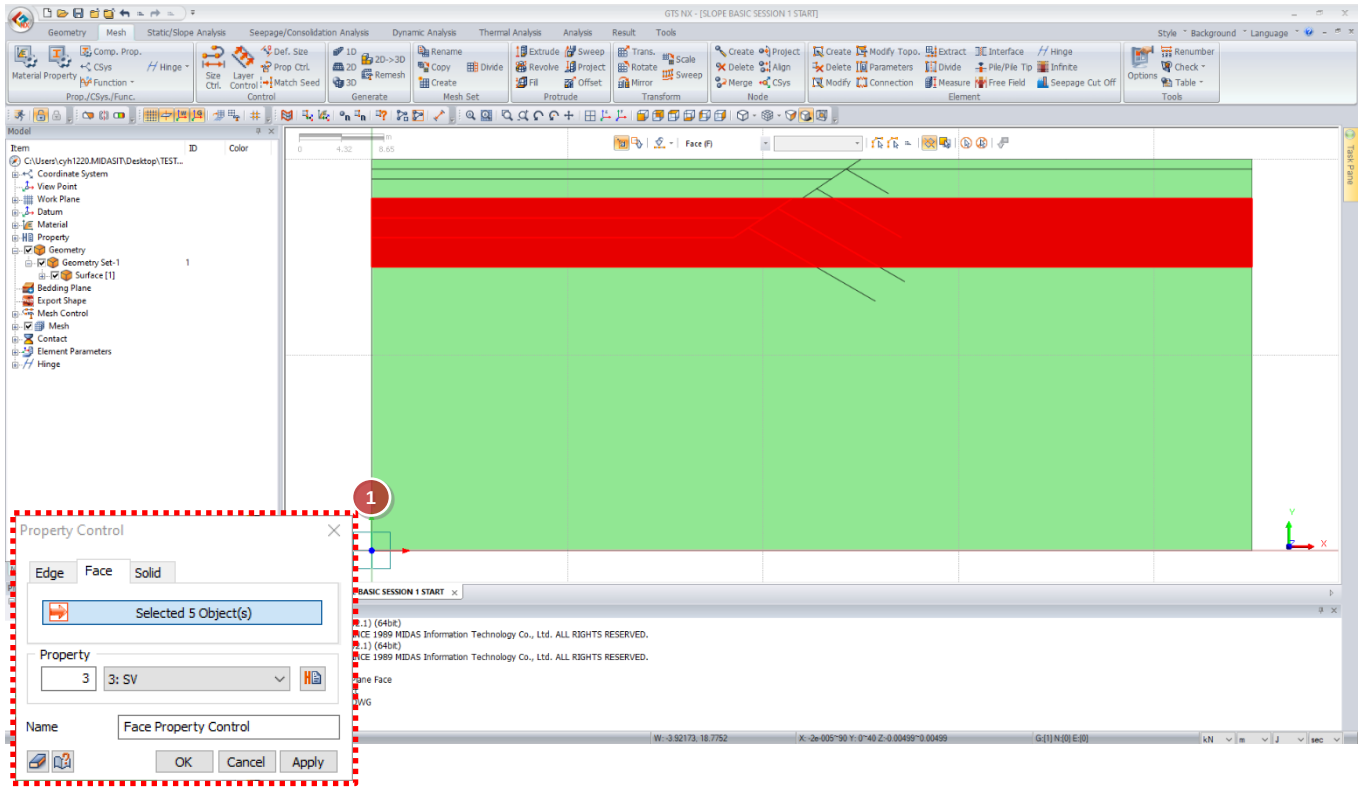


GTS NX

Property control

Procedure

1. Select 3rd layer of face
   Property change to “SV”
   Click “Apply”

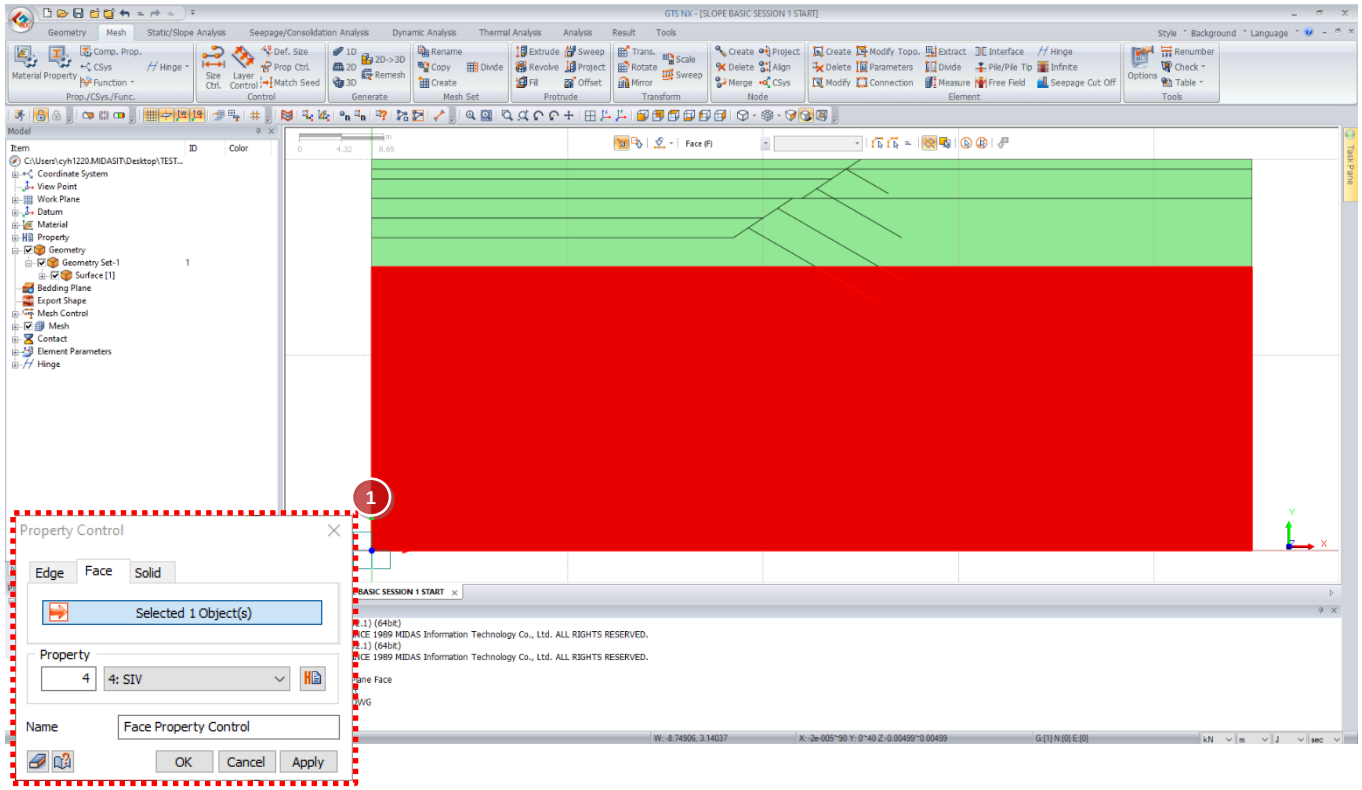


GTS NX

Property control

Procedure

1. Select 4th layer of face
   Property change to “SIV”
   Click “OK”



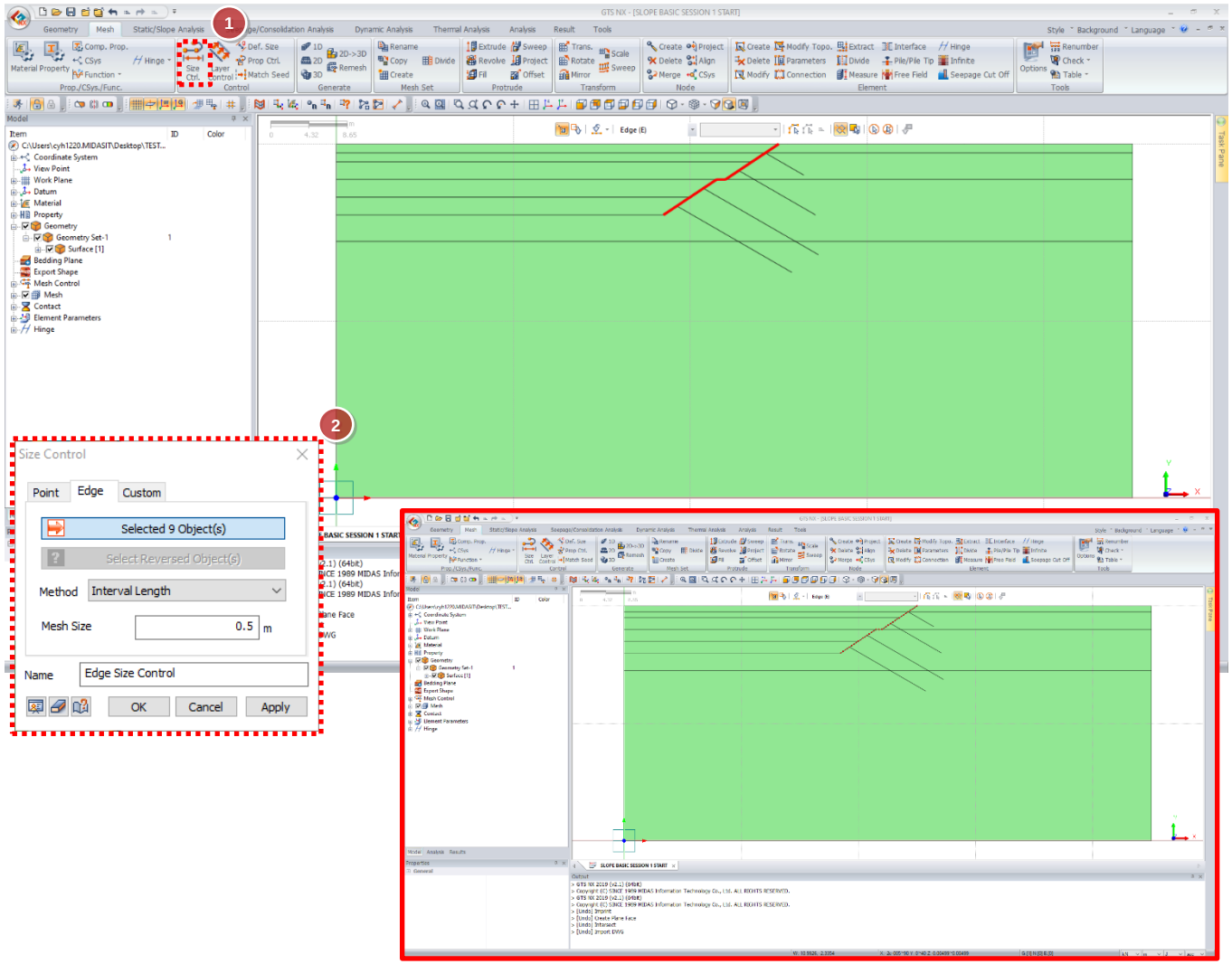
GTS NX

Control mesh size

Procedure

1. Click “Size Ctrl.”

   Go to “Edge” tab
   Select curves on face of slope
   Mesh Size: 0.5 m
   Click “Apply”

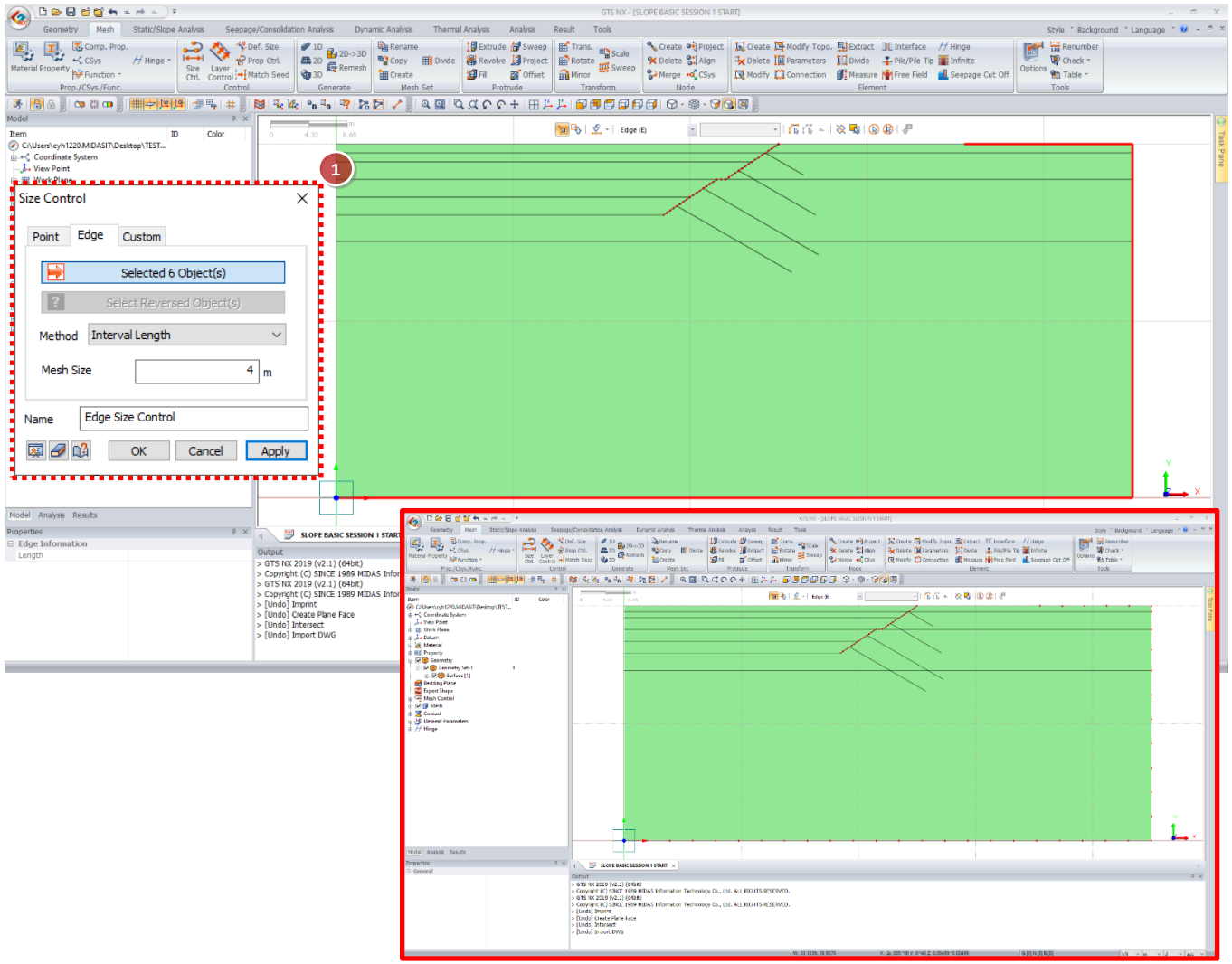


GTS NX

Control mesh size

Procedure

1. Select 6 curves
   Mesh Size: 4 m
   Click “Apply”

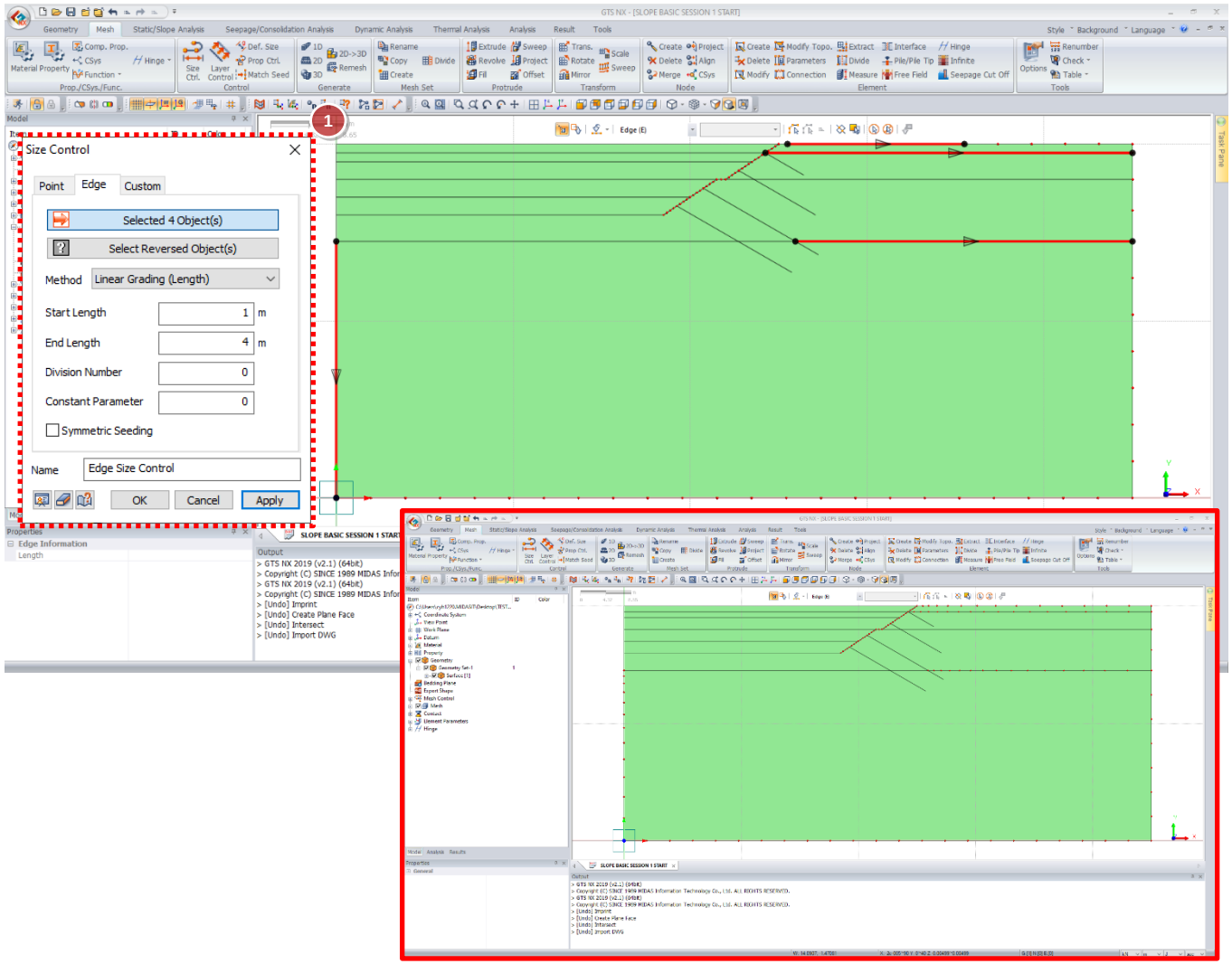


GTS NX

Control mesh size

Procedure

1. Select 4 curves
   Method “Linear Grading(Length)”
   Start Length: 1 m
   End Length: 4 m
   Click “Apply”

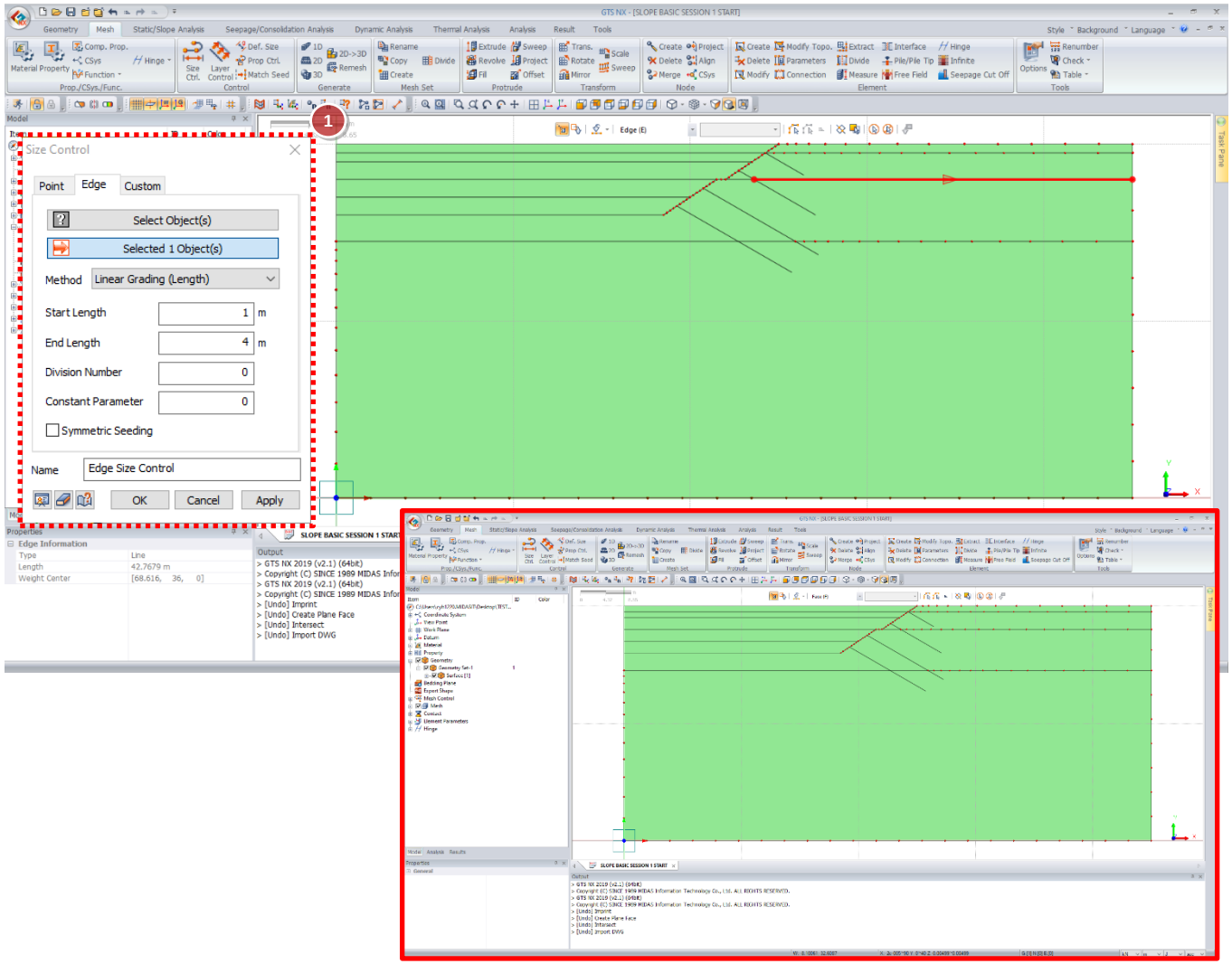


GTS NX

Control mesh size

Procedure

1. Select 1 curve
   (Select Reversed Object)
   Method “Linear Grading(Length)”
   Start Length: 1 m
   End Length: 4 m
   Click “OK”



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Mesh Generation

MIDAS

GTS NX

Generate the mesh for ground

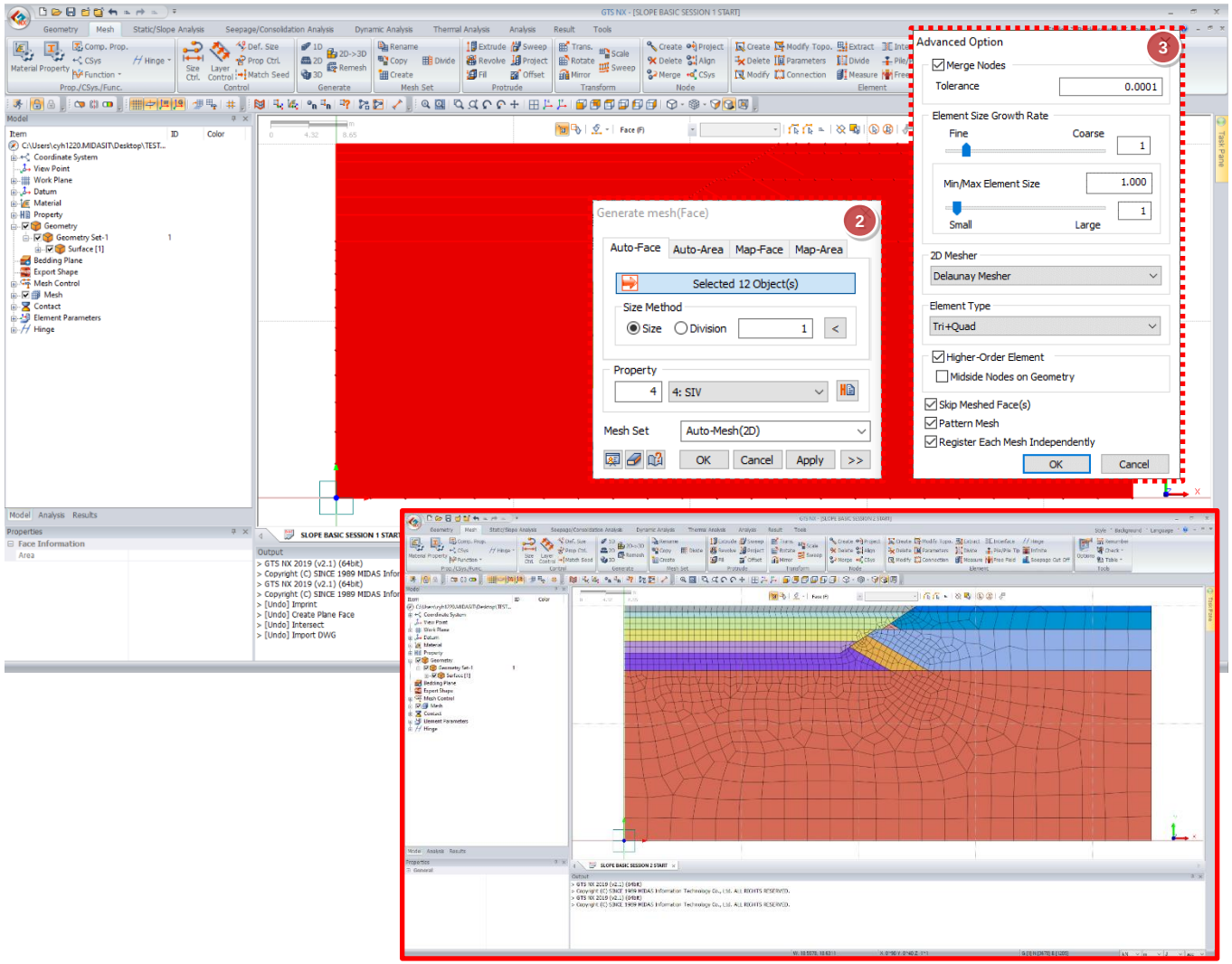
Procedure

1. Select every face
   Right click from mouse
   Click “Generate Mesh”

2. Size Method: 1 m
   Click “>>”

3. Element Type: Tri+Quad
   Check “Higher-Order Element”
   Check “Register Each Mesh..”
   Click “OK”

   Click “OK”



GTS NX

Generate the mesh for lean concrete

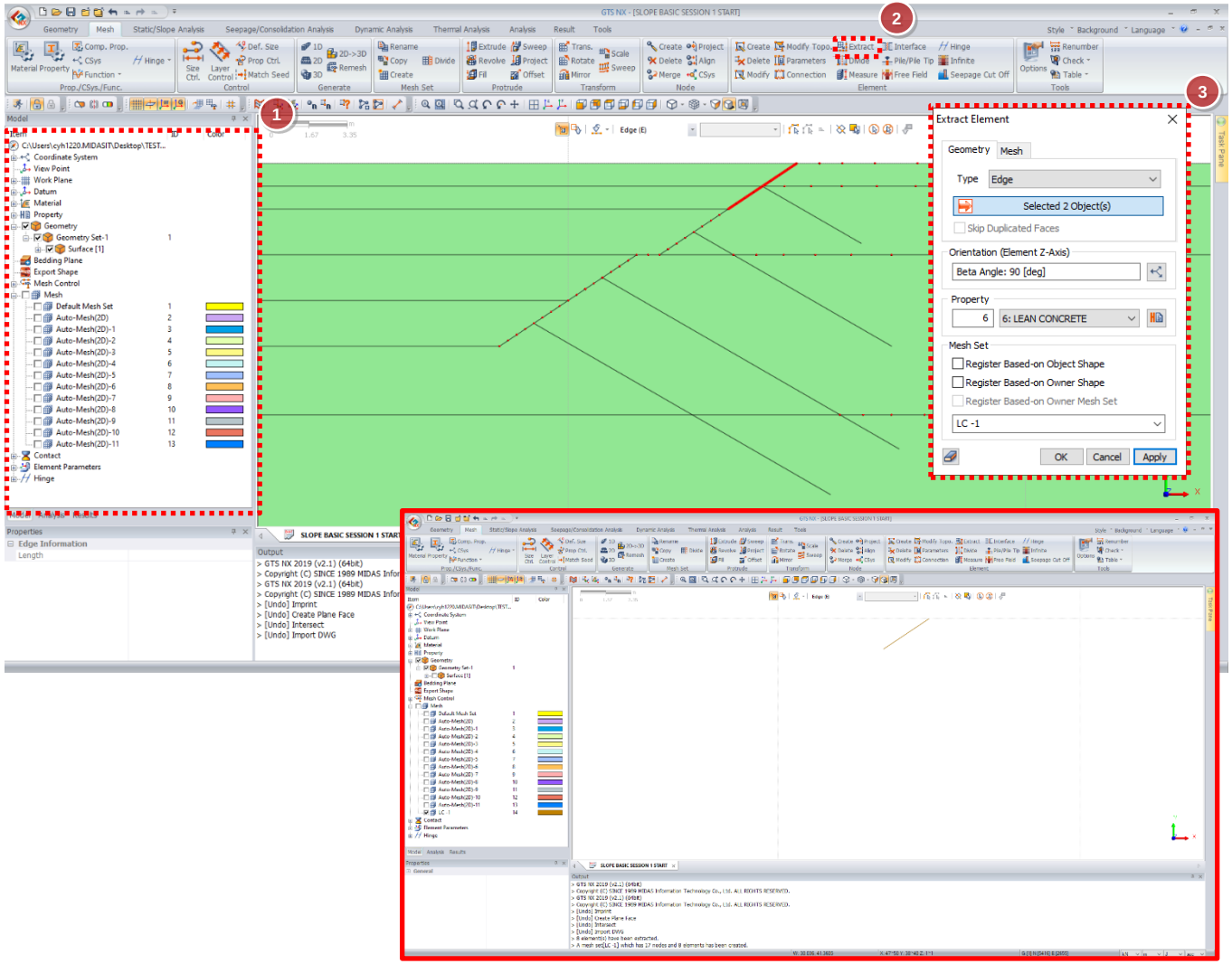
Procedure

1. <Geometry tree>
   Show all

   <Mesh tree>
   Hide all

2. Click “Extract”

3. Select 2 curves
   Property: LEAN CONCRETE
   Mesh Set: LC -1
   Click “Apply”

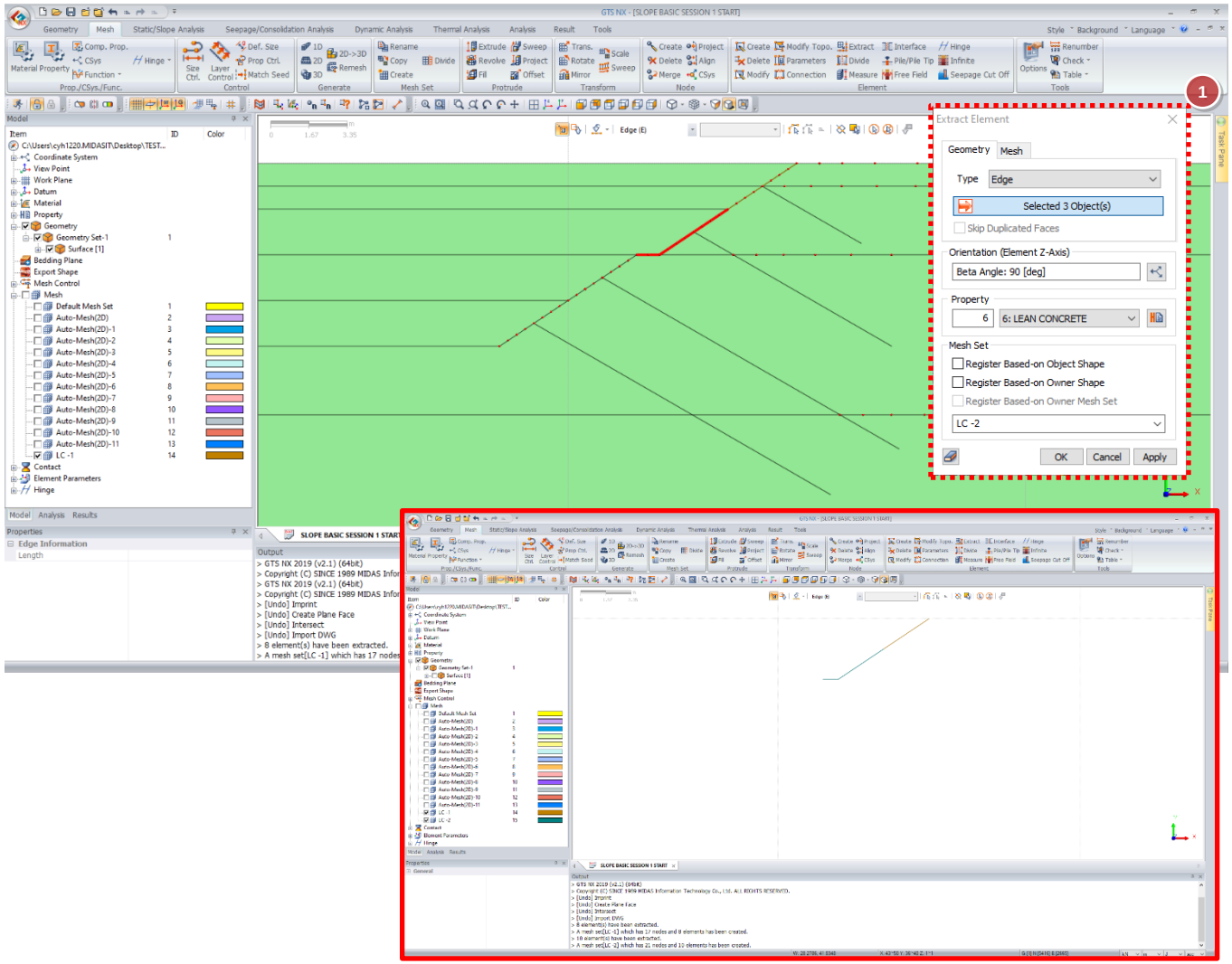


GTS NX

Generate the mesh for lean concrete

Procedure

1. Select 3 curves
   Property: LEAN CONCRETE
   Mesh Set: LC -2
   Click “Apply”

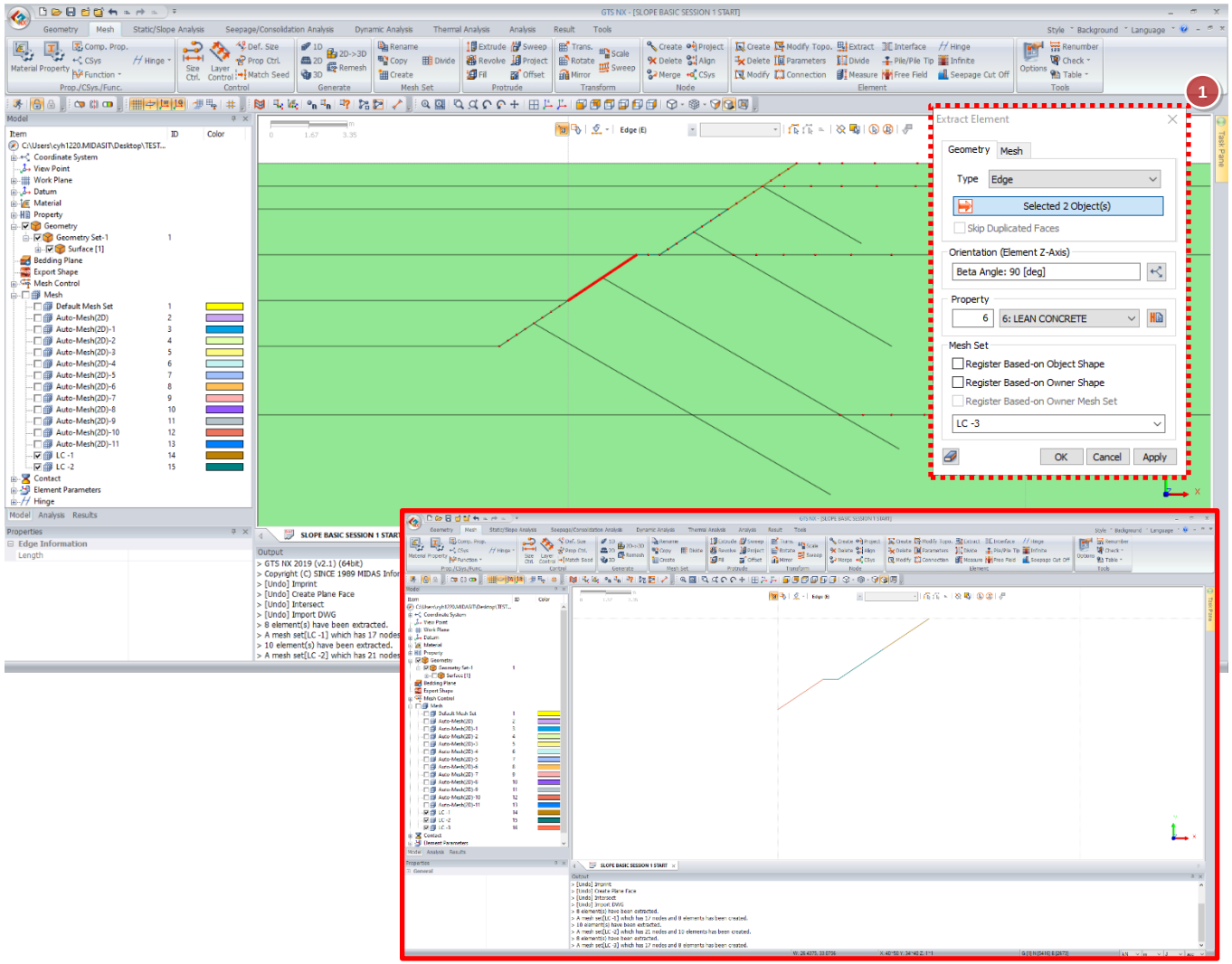


GTS NX

Generate the mesh for lean concrete

Procedure

1. Select 2 curves
   Property: LEAN CONCRETE
   Mesh Set: LC -3
   Click “Apply”

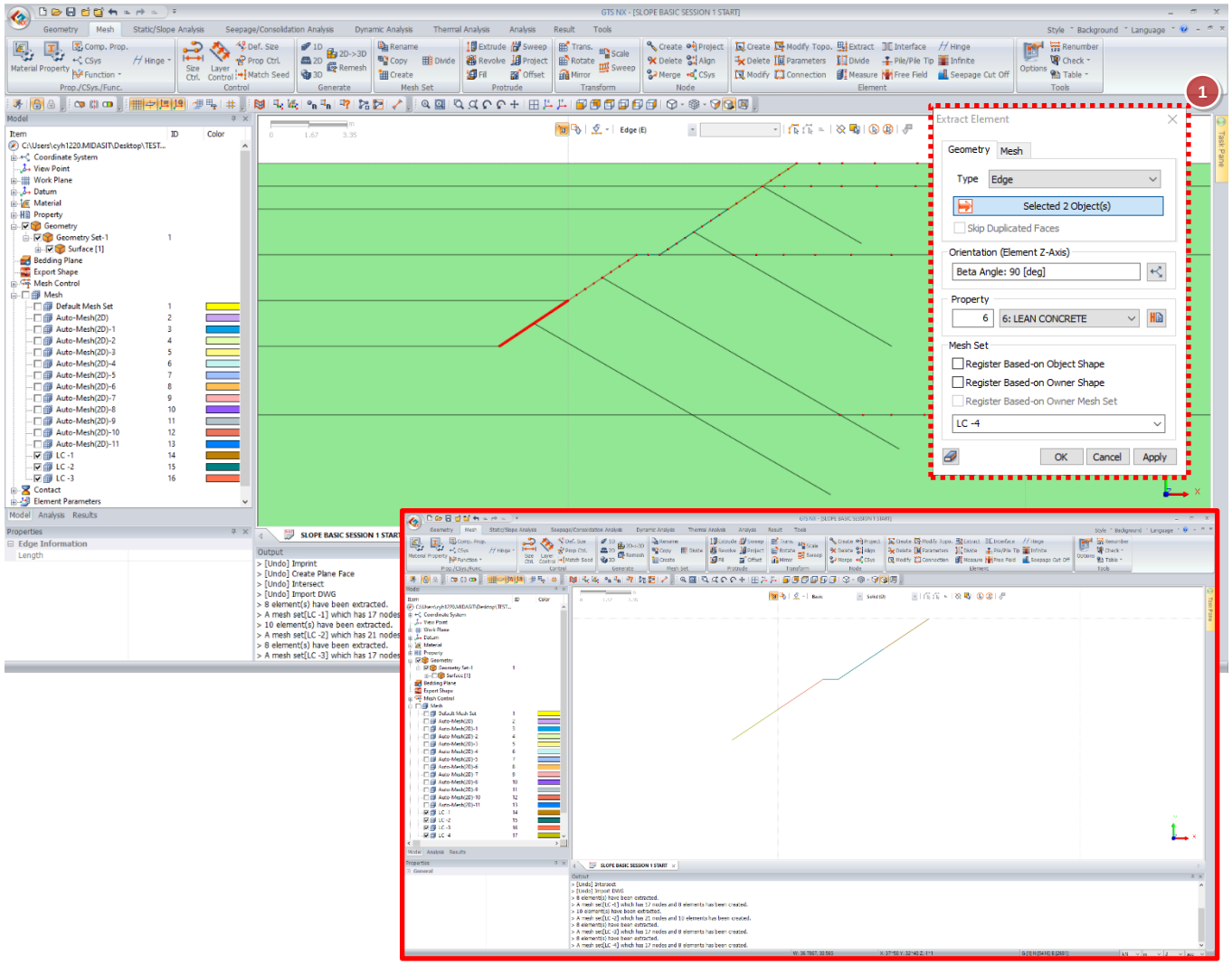


GTS NX

Generate the mesh for lean concrete

Procedure

1. Select 2 curves
   Property: LEAN CONCRETE
   Mesh Set: LC -4
   Click “OK”



GTS NX

Generate the mesh for soil nail

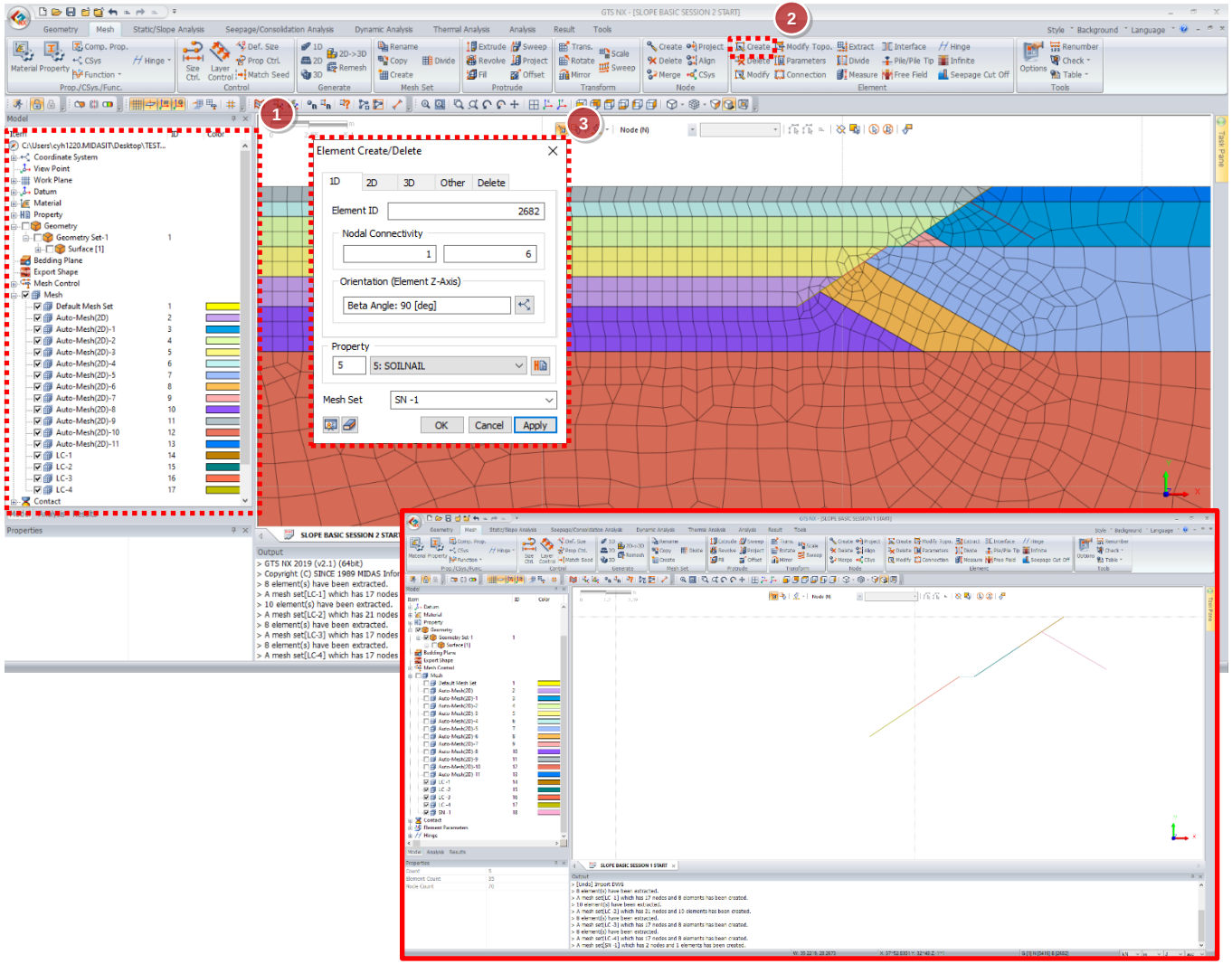
Procedure

1. <Geometry tree>
   Hide all

   <Mesh tree>
   Show all

2. Click “Create”

3. Click start point & end point
   Property: SOILNAIL
   Mesh Set: SN -1
   Click “Apply”

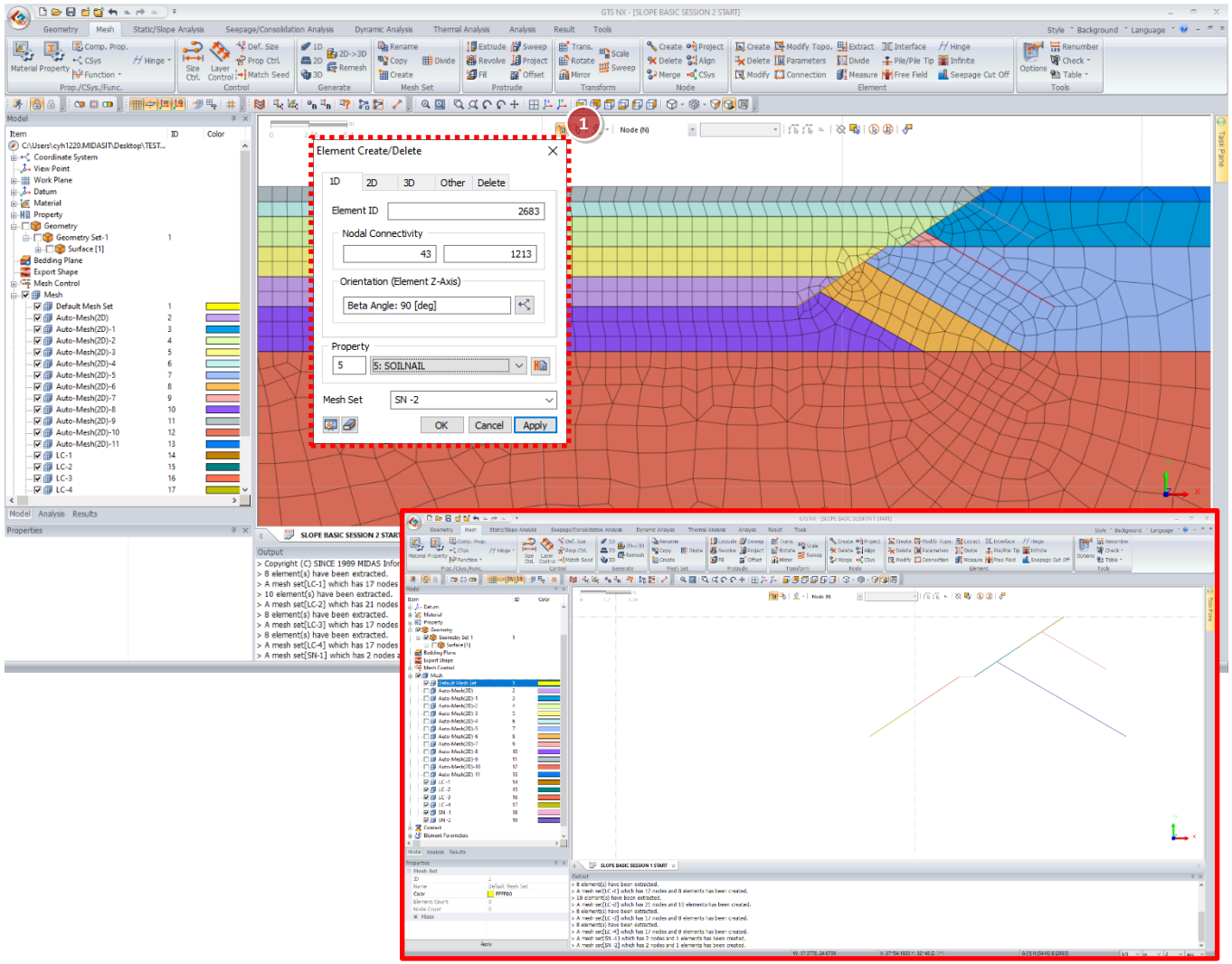


GTS NX

Generate the mesh for soil nail

Procedure

1. Click start point & end point
   Property: SOILNAIL
   Mesh Set: SN -2
   Click “Apply”

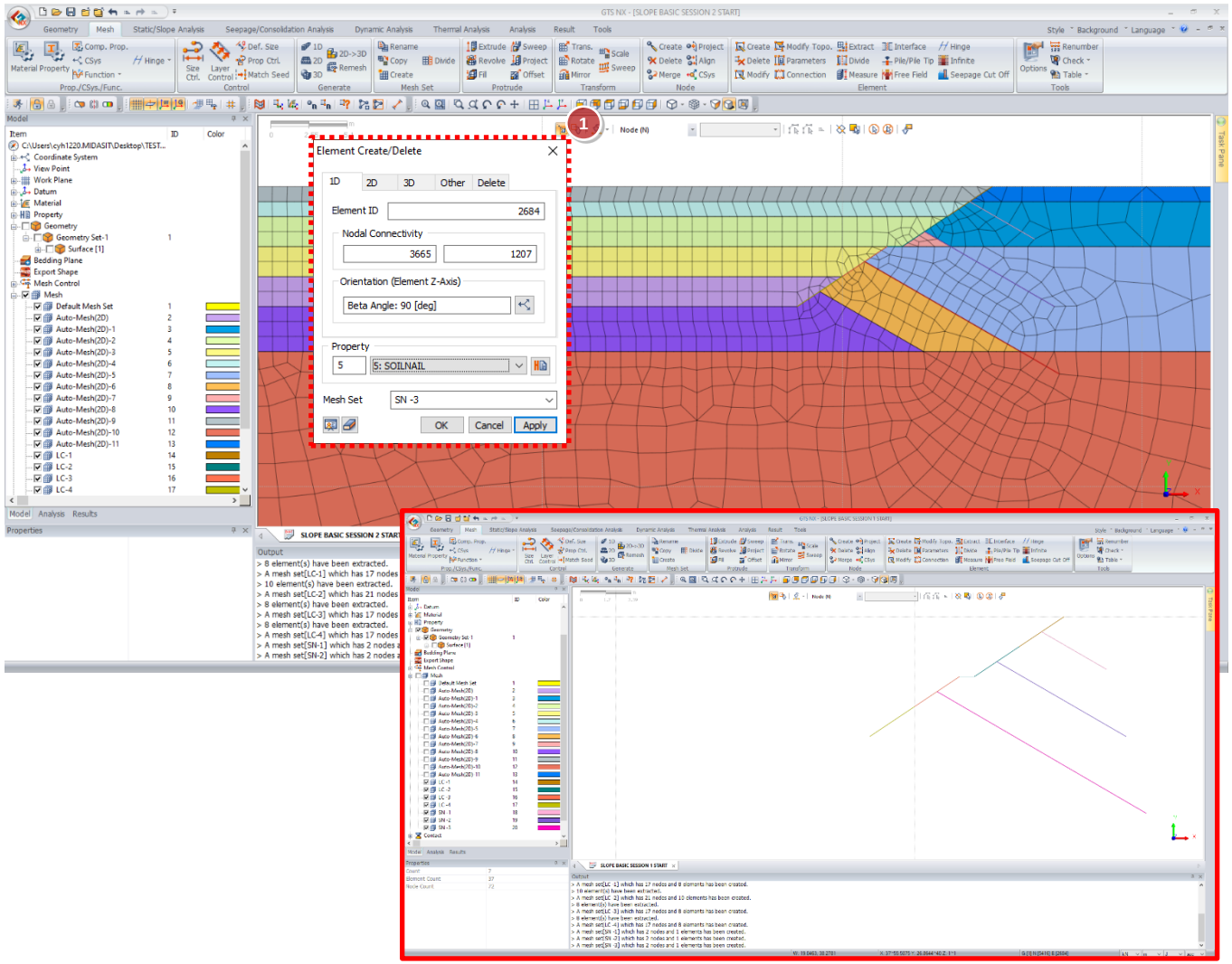


GTS NX

Generate the mesh for soil nail

Procedure

1. Click start point & end point
   Property: SOILNAIL
   Mesh Set: SN -3
   Click “Apply”

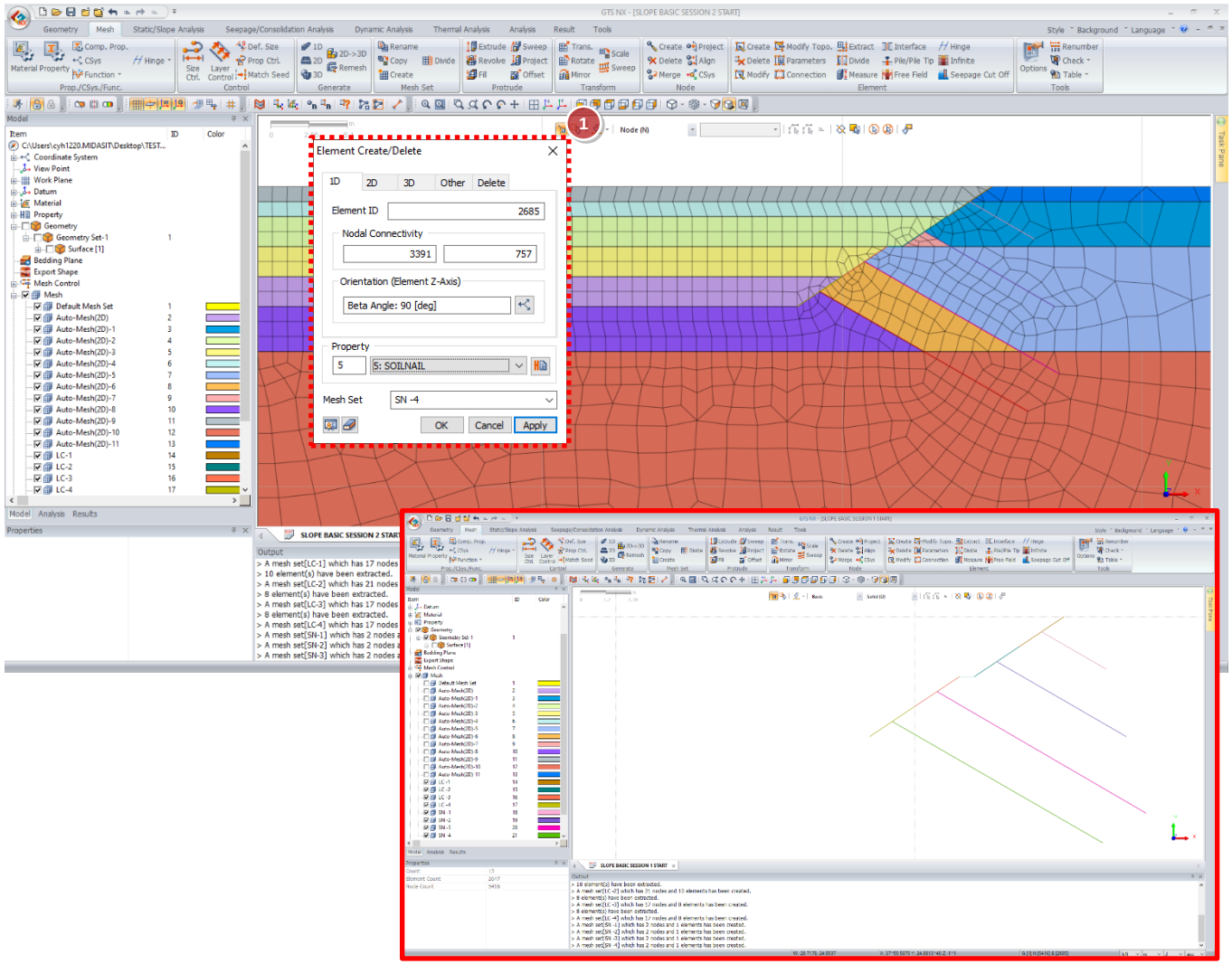


GTS NX

Generate the mesh for soil nail

Procedure

1. Click start point & end point
   Property: SOILNAIL
   Mesh Set: SN -4
   Click “OK”



GTS NX

Change mesh set name

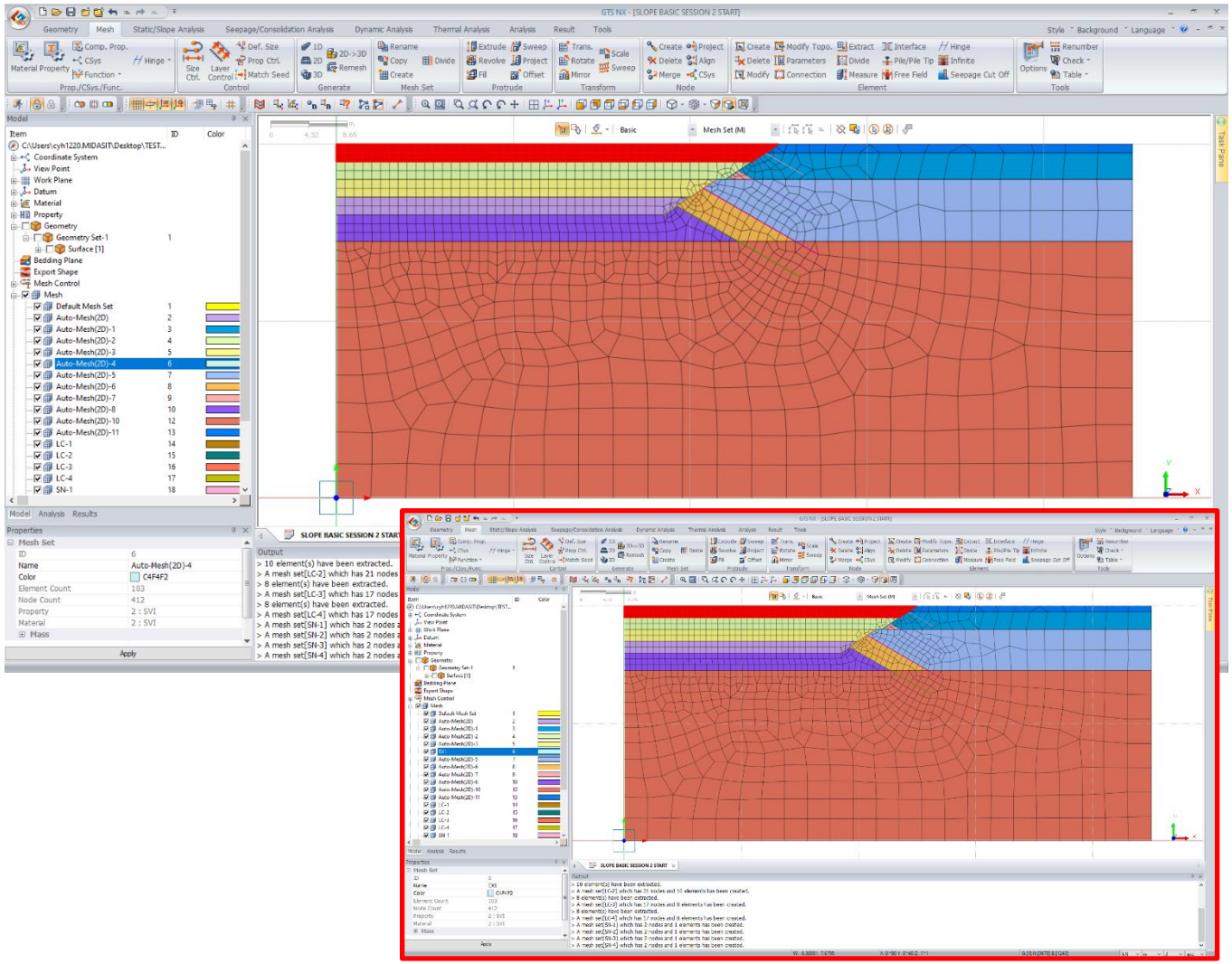
Procedure

1. Select mesh set for 1st excavation

   Right click from mouse
   Click “Merge”

   Change merged mesh set name to “EX1”

   [Information]
   You can find highlight with blue color from mesh tree when you select mesh set on working window



GTS NX

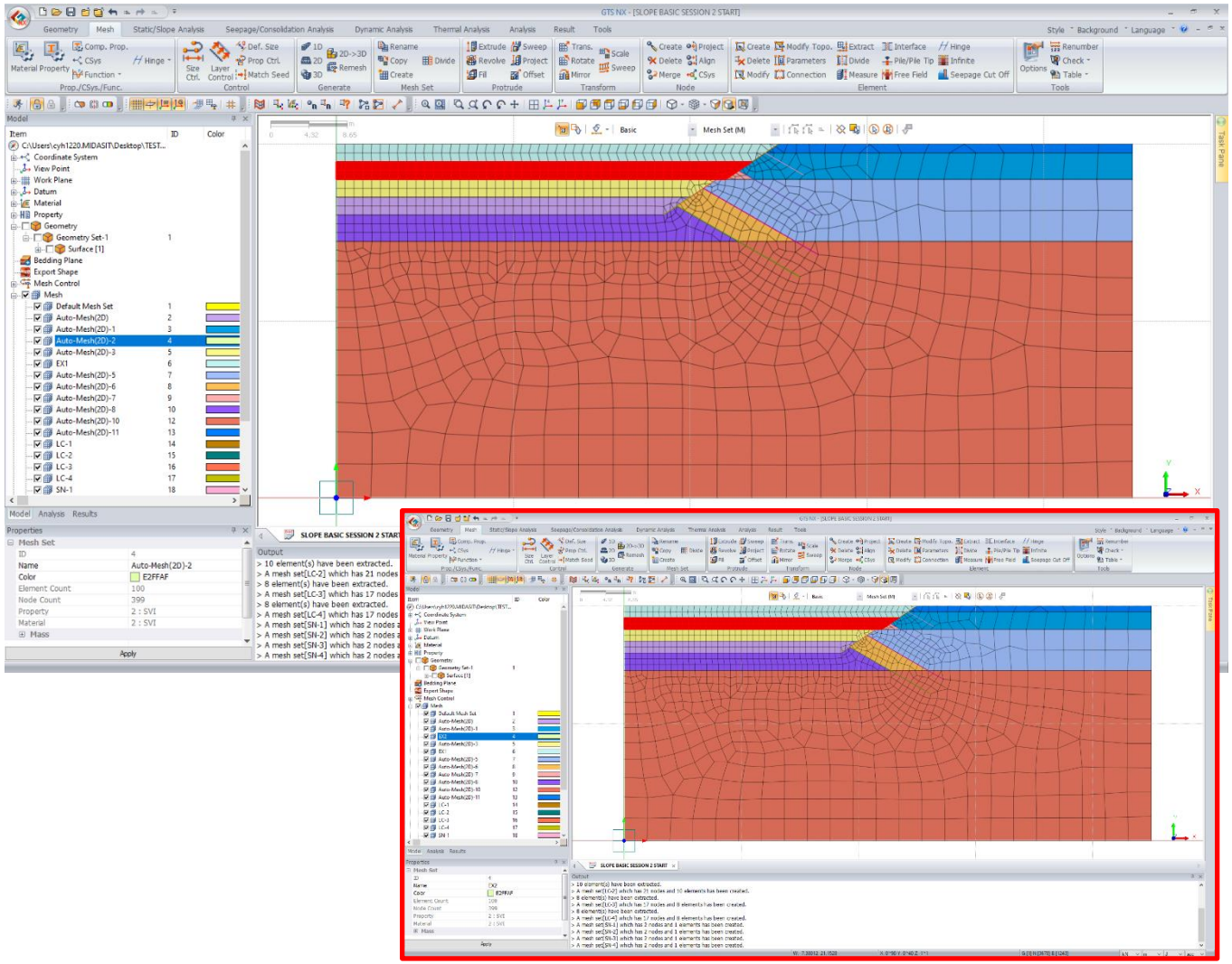
Change mesh set name

Procedure

1. Select mesh set for 2nd excavation

   Change mesh set name to “EX2”

   [Information]
   You can find highlight with blue color from mesh tree when you select mesh set on working window



GTS NX

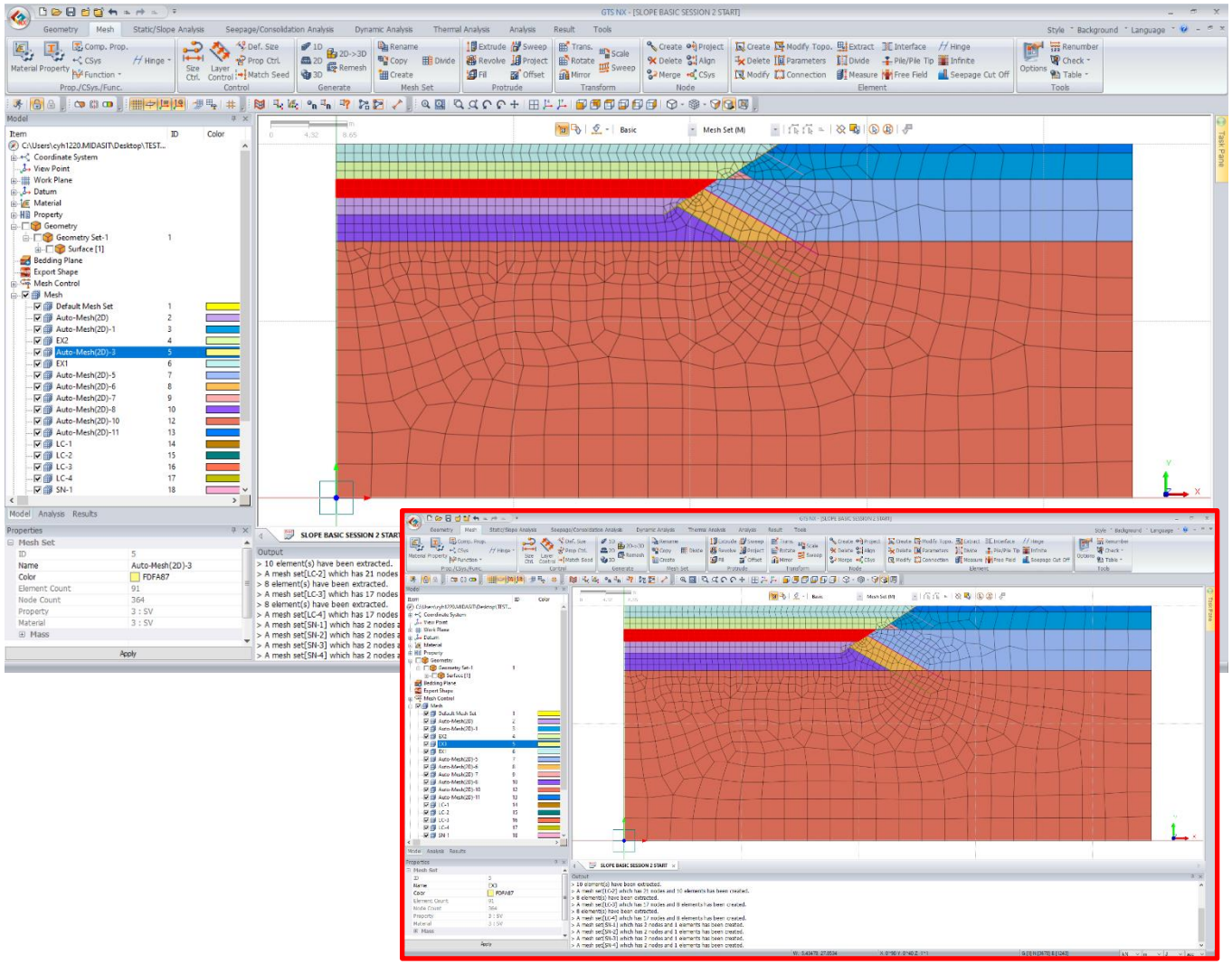
Change mesh set name

Procedure

1. Select mesh set for 3rd excavation

   Change mesh set name to “EX3”

   [Information]
   You can find highlight with blue color from mesh tree when you select mesh set on working window



GTS NX

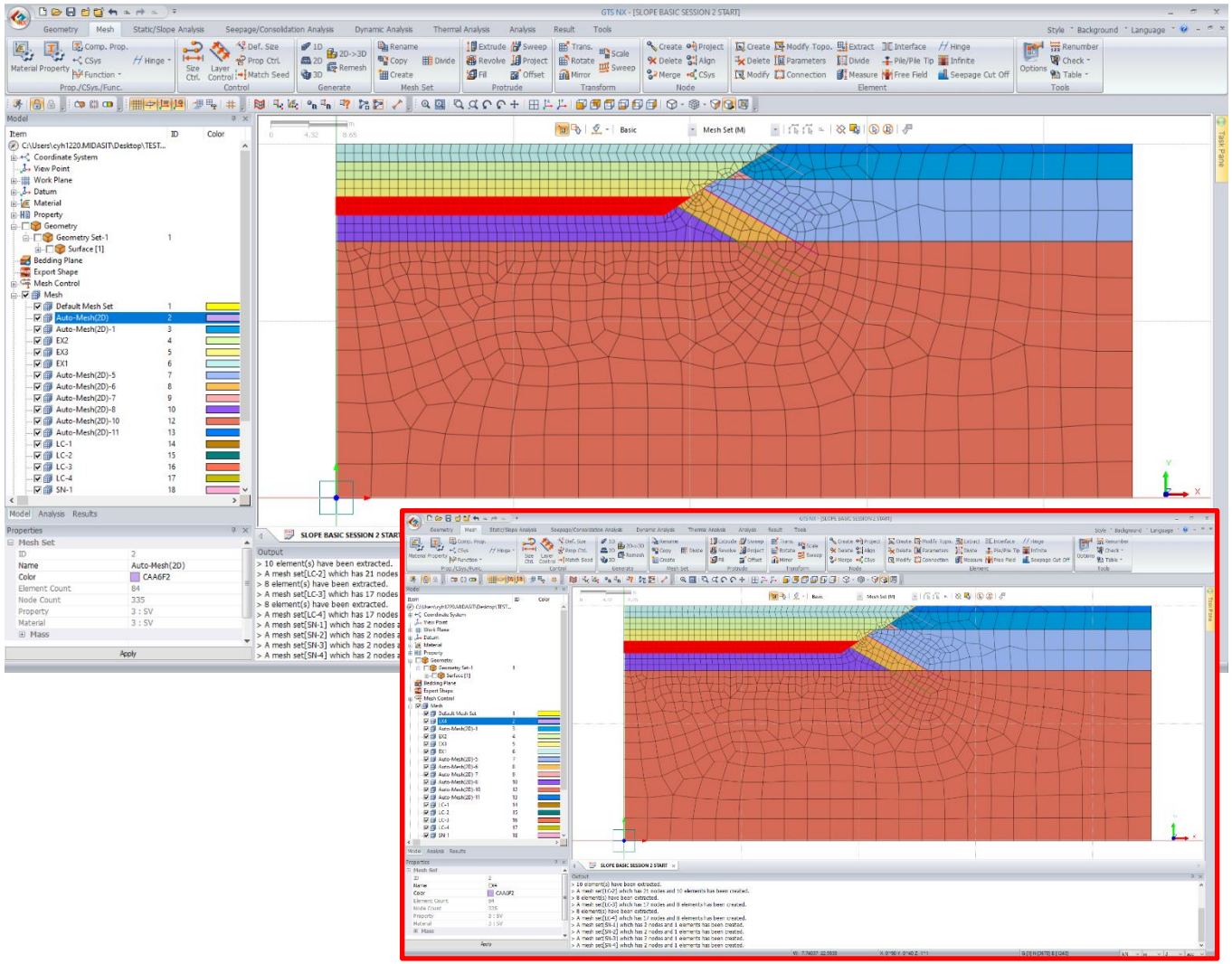
Change mesh set name

Procedure

1. Select mesh set for 4th excavation

   Change mesh set name to “EX4”

   [Information]
   You can find highlight with blue color from mesh tree when you select mesh set on working window



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New eXperience of Geo-Technical analysis System

Load & Boundary Condition

MIDAS

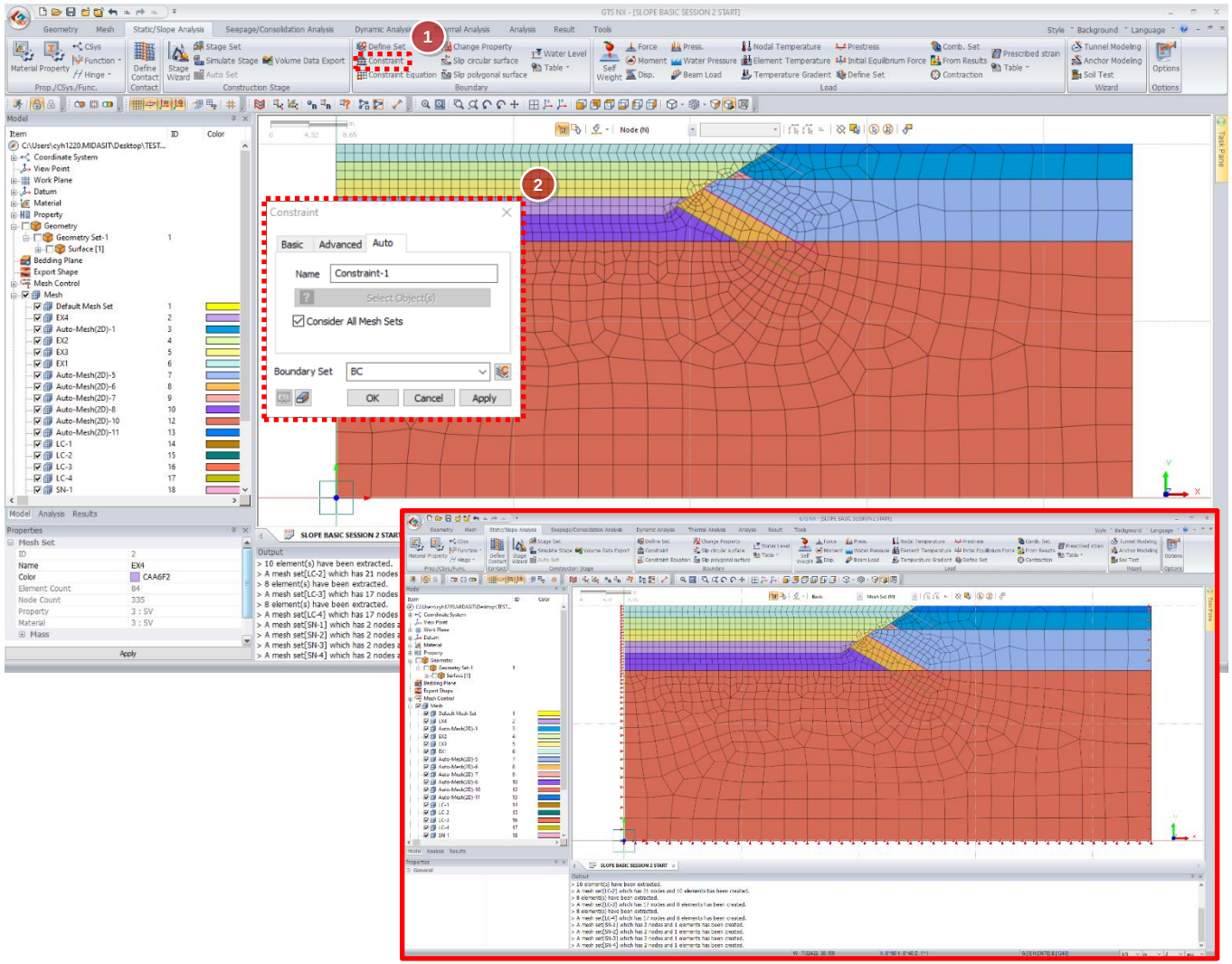
05 Load & Boundary Condition

GTS NX

Make boundary condition to ground

Procedure

1. Click “Constraint”
2. Go to “Auto” tab
   Boundary Set name “BC”
   Click “OK”

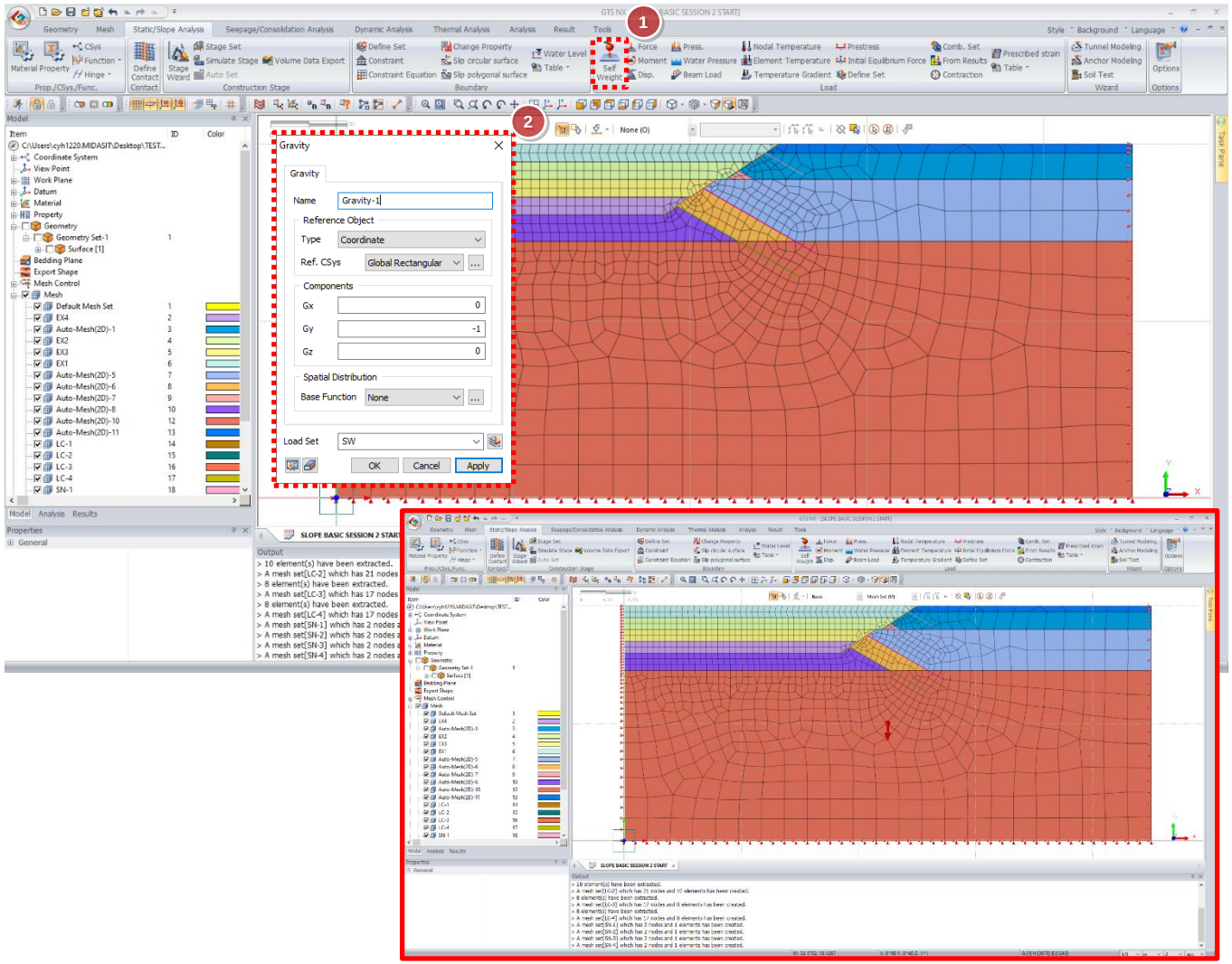


GTS NX

Make self weight

Procedure

1. Click “Self Weight”
2. Load Set name “SW”
   Click “OK”



GTS NX

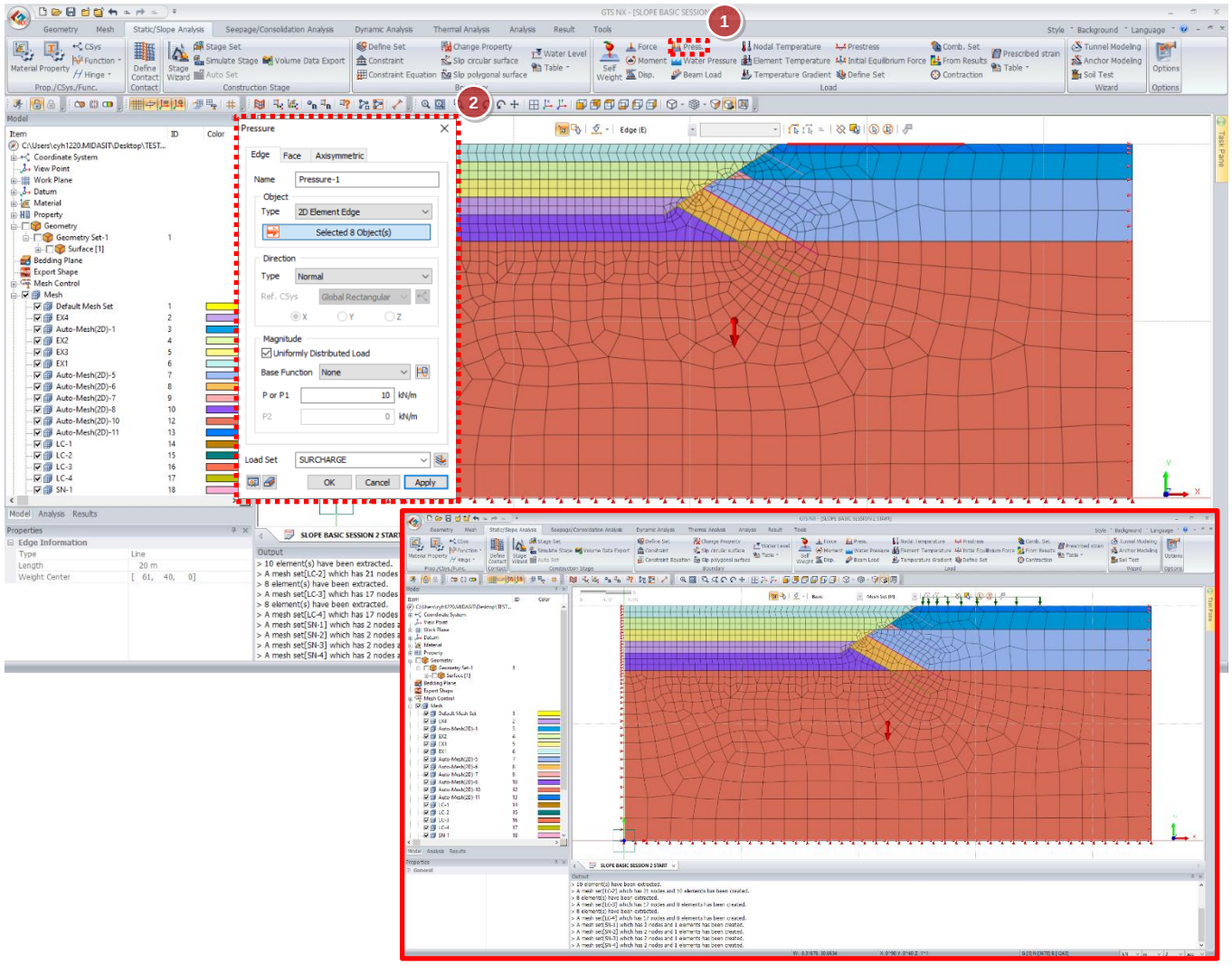
Make surcharge

Procedure

1. Click “Press.”
2. Go to “Edge” tab
   Object type “2D Element Edge”

   Select 8 objects

   P or P1 “10”
   Load Set name “SURCHARGE”
   Click “OK”



GTS NX

New eXperience of Geo-Technical analysis System

Water Level

MIDAS

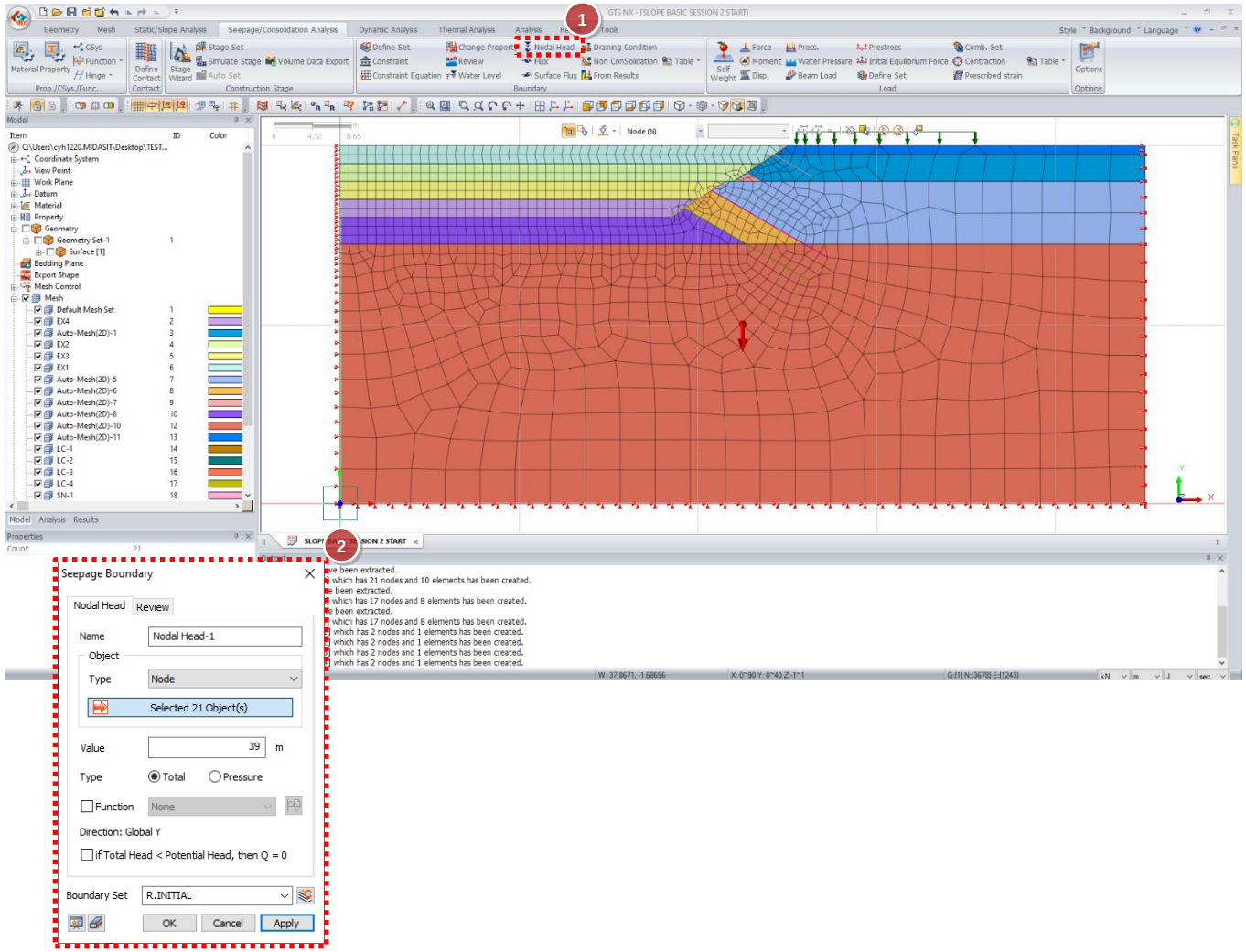
06 Water Level

GTS NX

Define water levels for each excavation stage

Procedure

1. Click “Nodal Head”
2. Select nodes on the right-hand side (below 1st layer of soil)
   Value: 39 m
   Type: Total
   Boundary Set: R.INITIAL
   Click “Apply”



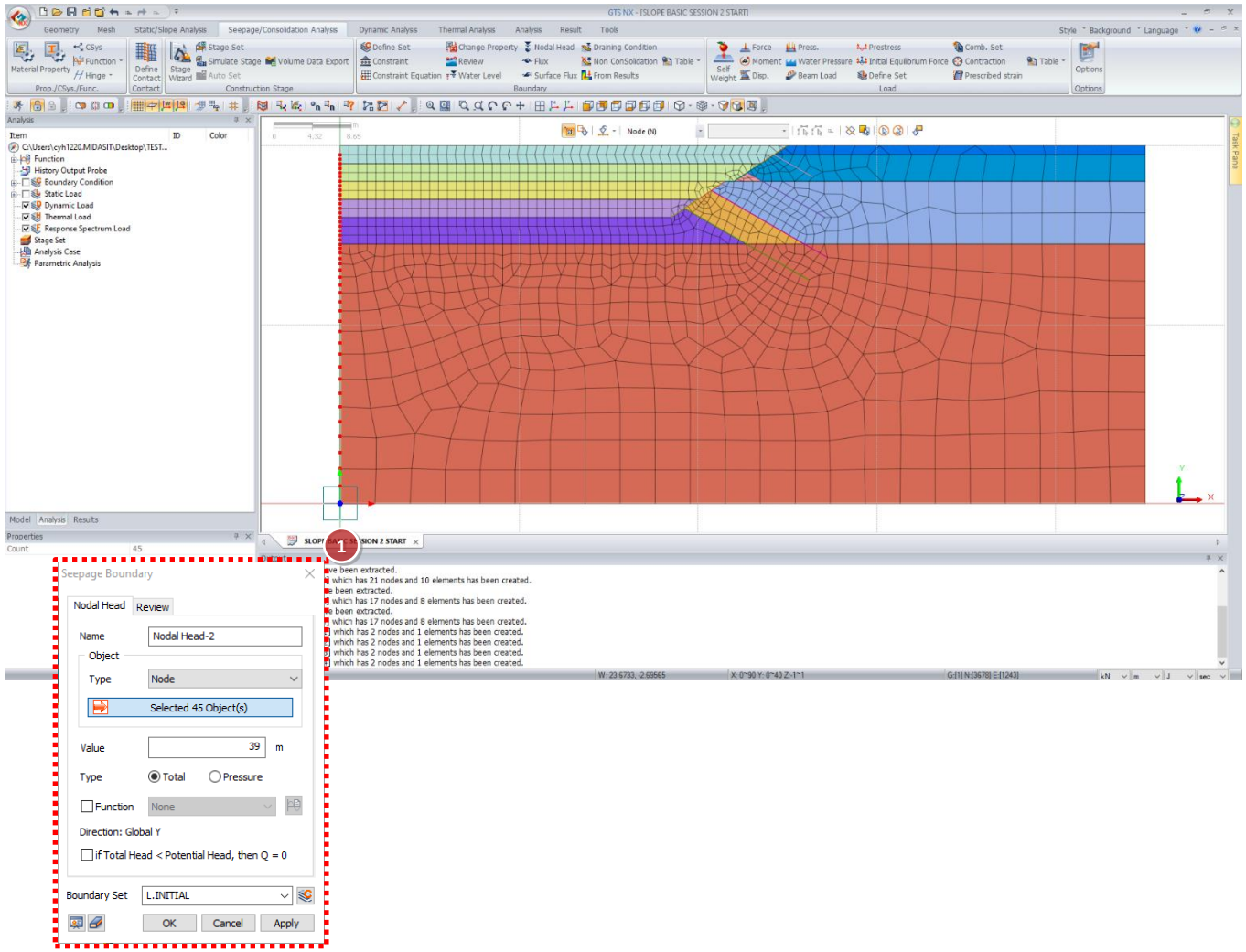
GTS NX

Define water levels for each excavation stage

Procedure

1. Select nodes on the left-hand side (below 1st layer of soil)
   Value: 39 m
   Type: Total
   Boundary Set: L.INITIAL
   Click “Apply”

   [Information]
   Be careful when you select node.
   You do not need to select inside nodes.



GTS NX

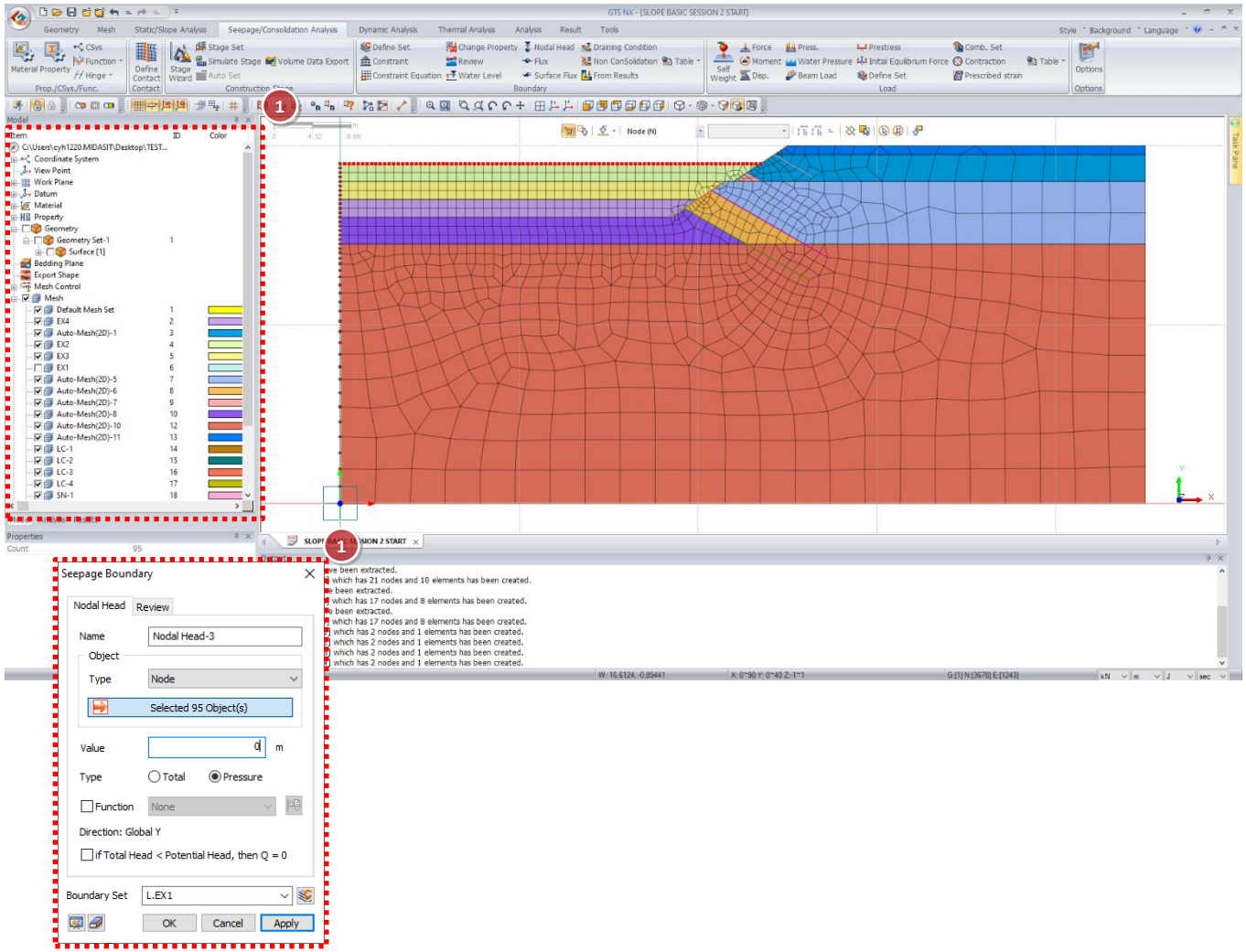
Define water levels for each excavation stage

Procedure

1. <Mesh tree>
   Hide “EX1” mesh set

   Select nodes from floor of ex1
   Value: 0
   Type: Pressure
   Boundary Set: L.EX1
   Click “Apply”

   [Information]
   The meaning of Value “0” and Type “Pressure” is 0 pressure on the selected nodes



06 Water Level

GTS NX

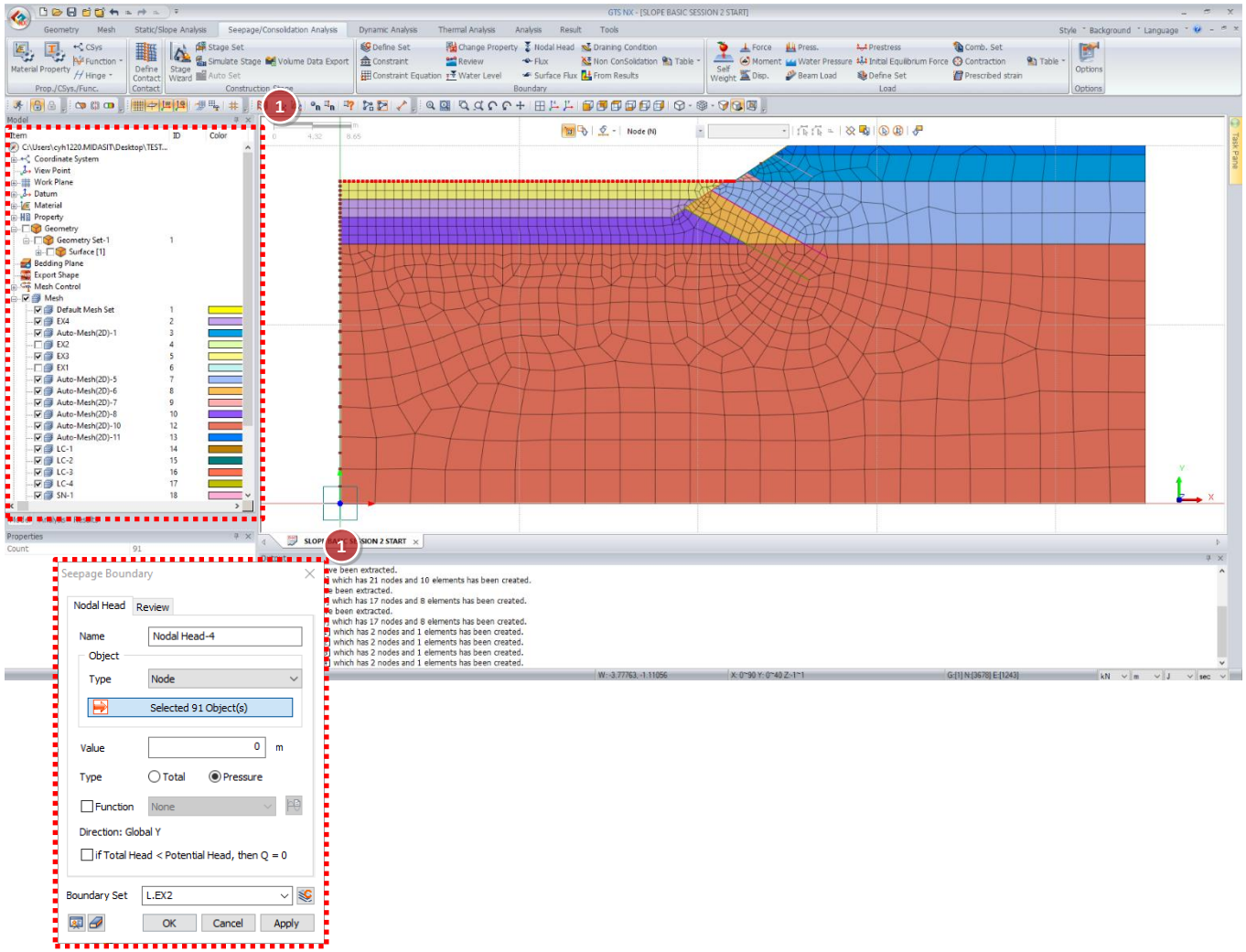
Define water levels for each excavation stage

Procedure

1. <Mesh tree>
   Hide “EX2” mesh set

   Select nodes from floor of ex2
   Value: 0
   Type: Pressure
   Boundary Set: L.EX2
   Click “Apply”

   [Information]
   The meaning of Value “0” and Type “Pressure” is 0 pressure on the selected nodes



GTS NX

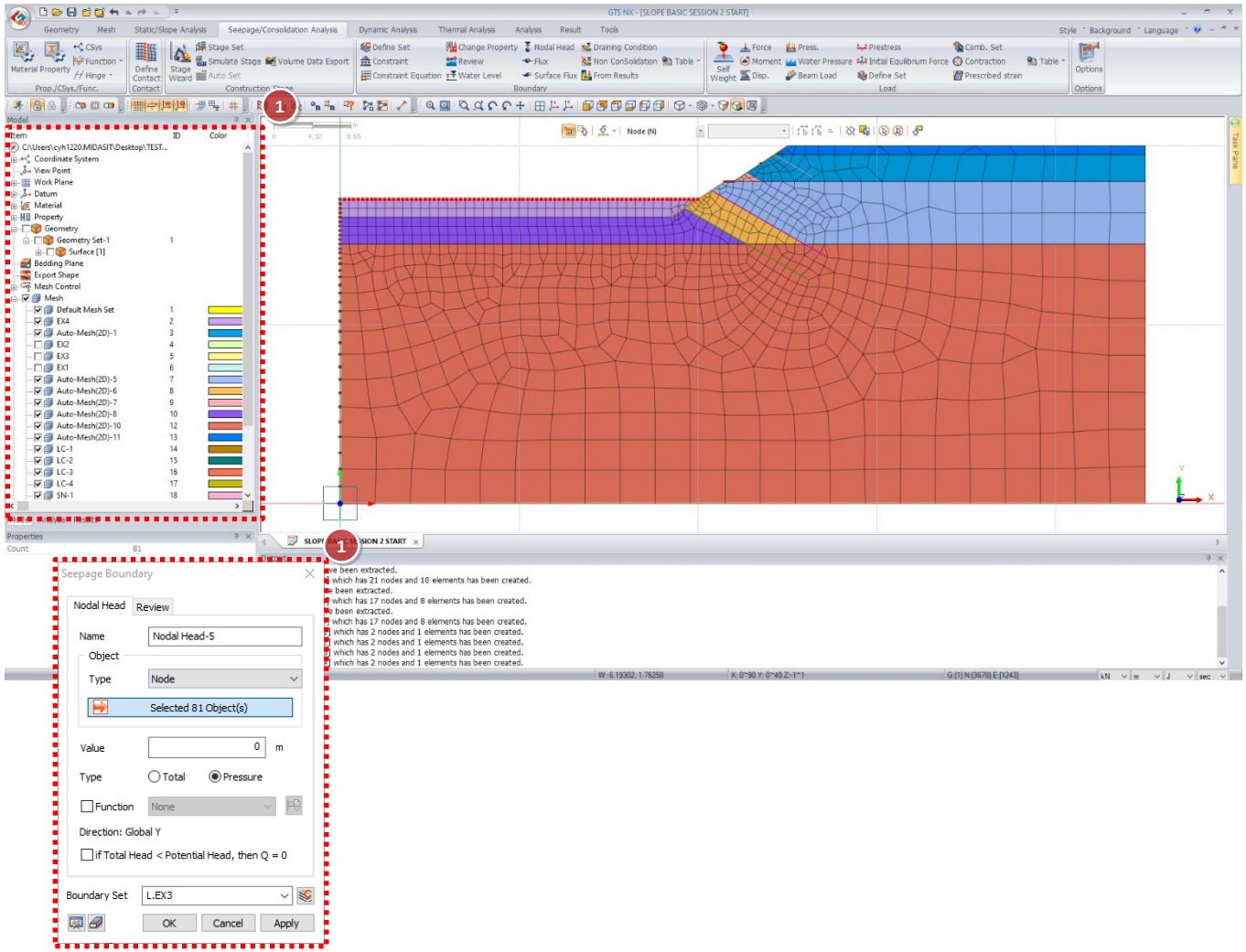
Define water levels for each excavation stage

Procedure

1. <Mesh tree>
   Hide “EX3” mesh set

   Select nodes from floor of ex3
   Value: 0
   Type: Pressure
   Boundary Set: L.EX3
   Click “Apply”

   [Information]
   The meaning of Value “0” and Type “Pressure” is 0 pressure on the selected nodes



GTS NX

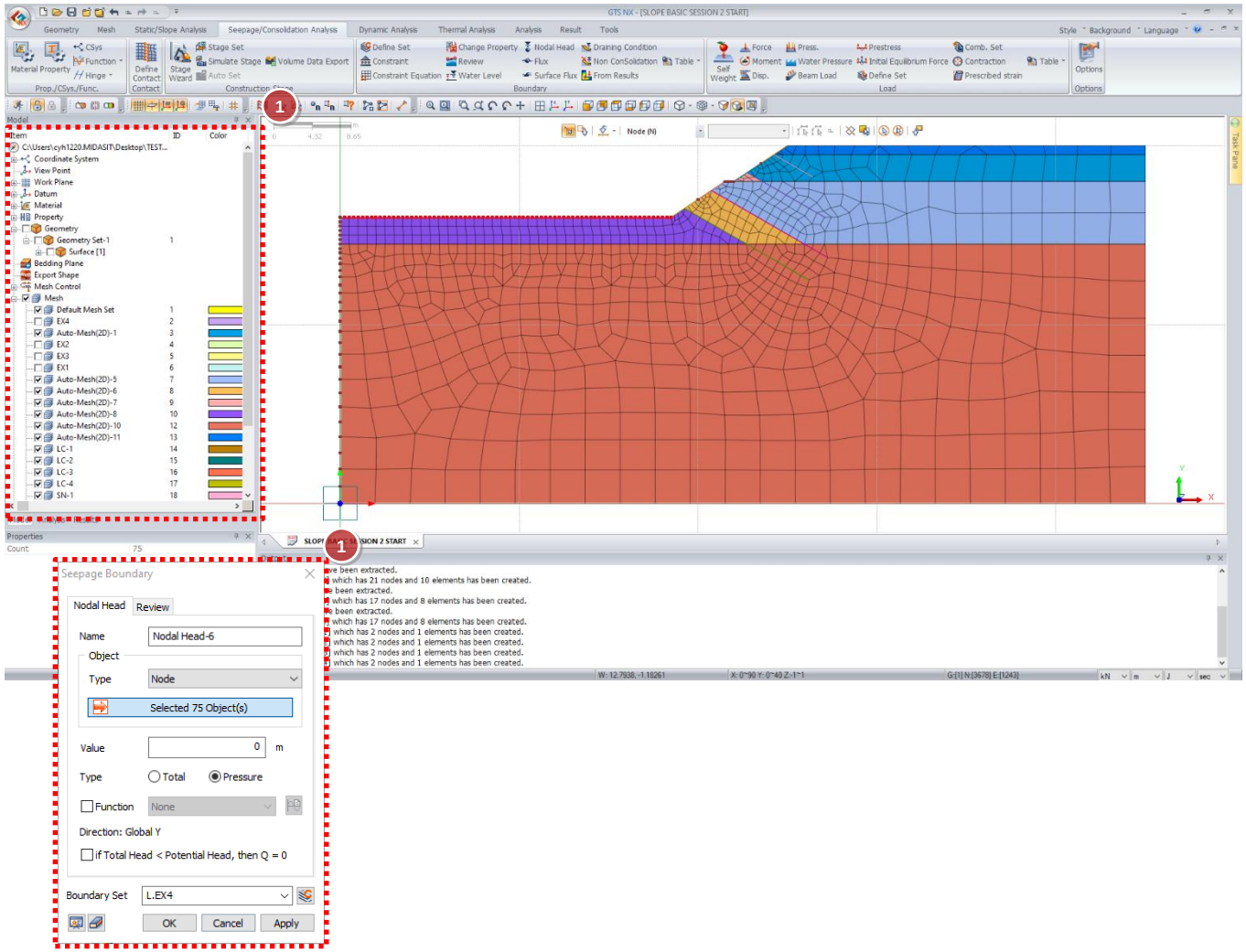
Define water levels for each excavation stage

Procedure

1. <Mesh tree>
   Hide “EX4” mesh set

   Select nodes from floor of ex4
   Value: 0
   Type: Pressure
   Boundary Set: L.EX4
   Click “OK”

   [Information]
   The meaning of Value “0” and Type “Pressure” is 0 pressure on the selected nodes



GTS NX

New eXperience of Geo-Technical analysis System

Thank you!

MIDAS