

December 18, 2003
9704-MSS-058

DOCUMENT CONTROL DESK
UNITED STATES NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

- Reference:
- a) Boeing Letter G-1151-RSO-92-365 dated August 31, 1992; R.S. Orr to the NRC Operations Center
 - b) NRC Letter Docket No. 99901227 dated August 12, 1992; L. J. Norrholm to R. S. Orr; Subject: Response to 10 CFR 21 Inquiry

Dear Sir or Madam:

In accordance with the Reference correspondence and 10 CFR 21, Boeing is sending the NRC the attached error notices received from our former software suppliers. Because of unknown current addresses, the following former customers were not notified:

Reactor Controls, Inc
Echo Energy Consultants
Nuclear Applications and Systems Analysis Company (Japan)
Nuclear Power Services
GPU Nuclear Corporation
Tenera, Inc.
Stone & Webster Engineering
Raytheon Engineers & Constructors

Error notices have been sent to our other former customers.

Very truly yours,



Mark S. Snyder
Nuclear Administrator
Mail Code 7A-XT

Enclosures: GT STRUDL Program Report Forms 2003.3 through 2003..8 and 2003.11

IE 20



GTSTRUDL Program Report Form

GPRF No.: 2003.3

DATE: 5/12/2003

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT** Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS** Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR** Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE** Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed May 12, 2003

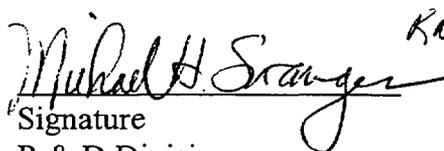
Date Notification Sent 5/15/03

Computers PC

Operating System All Windows

Version 26

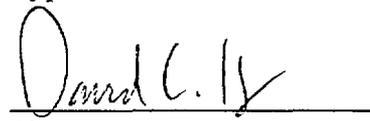
Target Release for Correction Version 27.0


Signature
R & D Division

Sr. RE
Title

Michael H. Swanger
Typed or Printed Name

5/12/03
Date of Signature


Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

5/15/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003.3

DATE: 5/15/03

DESCRIPTION:

The presence of member added inertia data from the MEMBER ADDED INERTIA command and/or the INERTIA OF JOINTS FROM LOAD command will cause any dynamic analysis to abort if the member added inertia data are applied to members having variable properties and the MEMBER ADDED INERTIA and/or INERTIA OF JOINTS FROM LOAD commands are the only inertia command(s) (INERTIA OF JOINTS LUMPED/CONSISTENT command also was not specified). The best work-around is illustrated by the following sequences of commands that illustrate the abort conditions and the added work-around commands:

1. Sequence of commands that will cause the abort

```
MEMBER PROPERTIES VARIABLE
  1
    SEGMENT 1      TABLE 'TUBES9'      'TS4x4x1/4'
    SEGMENT 2      TABLE 'TUBES9'      'TS8x8x1/4'  L 100.0
      .
      .
      .
DEAD LOAD 'DL' DIR  -Y ALL MEMBERS
      .
      .
      .
$$* **
$$* ** Create member added inertia data from the member loads
$$* ** from loading 'DL'
$$* **
INERTIA OF JOINTS FROM LOAD 'DL' ALL DOFS
DYNAMIC ANALYSIS EIGENVALUE  $$ Aborts!
```

2. Sequence of commands that illustrate the work-around

```
MEMBER PROPERTIES VARIABLE
  1
    SEGMENT 1      TABLE 'TUBES9'      'TS4x4x1/4'
    SEGMENT 2      TABLE 'TUBES9'      'TS8x8x1/4'  L 100.0
```

.
.
.
DEAD LOAD 'DL' DIR -Y ALL MEMBERS
.
.
.

\$\$* **

\$\$* ** Create member added inertia data from the member loads
\$\$* ** from loading 'DL'

\$\$* **

INERTIA OF JOINTS FROM LOAD 'DL' ALL DOFS

\$\$* **

\$\$* ** Added work-around commands

\$\$* **

INERTIA OF JOINTS LUMPED

CONSTANTS

DENSITY 1.E-9 ALL

\$\$* **

DYNAMIC ANALYSIS EIGENVALUE \$\$ Will not abort

GTSTRUDL User Reference Manual Sections:

Inertia Specification Section 2.4.3.1, Volume 3, Rev. Q, GTSTRUDL
Reference Manual

Member Added Inertia Command Section 2.4.3.2, Volume 3, Rev. Q, GTSTRUDL
Reference Manual

GTSTRUDL Program Report Form

GPRF No.: 2003.4

DATE: 5/22/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed May 20, 2003

Date Notification Sent 5/22/03

Computers All

Operating System All

Version All

~~Target Release for Correction~~ ^{new} Version 27.0

Michael H. Swanger
Signature
R & D Division

Sr. RE
Title

Michael H. Swanger
Typed or Printed Name

5/20/03
Date of Signature

David C. Key
Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

5/22/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003.4

DATE: 5/22/03

DESCRIPTION:

Large dynamic analysis problems – eigenvalue analysis, direct integration physical analysis – may abort if the out-of-core solver is used. The out-of-core solver is automatically invoked if the number of terms in the skyline of the upper-triangular portion of the assembled global stiffness matrix exceeds 131,072. The out-of-core solver divides the upper-triangular skyline portion of the stiffness matrix into blocks that are stored into and managed from temporary disk files on your hard drive. The default block size is 131,072 terms. The abort can occur only if the required number of blocks – number of terms in the skyline divided by the block size – exceeds 1000. Below is an example of GTStrudl output from the DYNAMIC ANALYSIS EIGENVALUE command, where the portion of the output labeled "GT/LANCZOS SOLUTION DATA" indicates that the out-of-core solver was invoked using 183 blocks (the default block size = 131,072 terms). This output is produced because the PRINT MAX option is given in the EIGENVALUE PARAMETERS command block.

```
{26707} >
{26708} > EIGENVALUE PARAMETERS
{26709} > SOLVE USING GTL
{26710} > NUMBER OF MODES 10
{26711} > PRINT MAX
{26712} > END
{26713} > INERTIA OF JOINTS LUMPED
{26714} > DYNAMIC ANALYSIS EIGENVALUE
```

BANDWIDTH INFORMATION BEFORE RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 121 AND OCCURS AT JOINT 243
THE AVERAGE BANDWIDTH IS 118.782
THE STANDARD DEVIATION OF THE BANDWIDTH IS 15.508
-----
134.290
=====
```

BANDWIDTH INFORMATION AFTER RENUMBERING.

. (some output removed)

```
TIME TO ASSEMBLE THE STIFFNESS MATRIX 3.00 SECONDS
TIME TO PROCESS 6171 JOINTS 1.64 SECONDS
TIME TO GENERATE REDUCED STIFFNESS MATRIX 41.12 SECONDS
TIME TO ASSEMBLE LUMPED MASS MATRIX 0.14 SECONDS
```

```

*****
* GT/LANCZOS SOLUTION DATA *
*****

NUMBER OF DYNAMIC DEGREES-OF-FREEDOM = 36300
NUMBER OF MODES REQUESTED             =    10
EIGENVALUE TOLERANCE                  = 1.00000E-06
NUMBER OF TERMS IN SKYLINE            = 23871016
AVERAGE COLUMN HEIGHT OF SKYLINE     =    658
RANK OF MASS MATRIX = 36300
OUT-OF-CORE EQUATION SOLVER USED ( 183 BLOCKS)
NUMBER OF LANCZOS VECTORS COMPUTED =    23

*****
* END OF GT/LANCZOS SOLUTION DATA *
*****

```

The work-around for this problem is to directly specify the block size such that the out-of-core solver uses less than 1000 blocks. This is accomplished in the EIGENVALUE PARAMETERS command by issuing the BLOCKSIZE option as follows:

```

EIGENVALUE PARAMETERS
      BLOCKSIZE 200000
END

```

GTSTRUDL User Reference Manual Sections:

Specification of Miscellaneous Dynamic Parameters
 Section 2..4.5.3, Volume 3, Rev. J, GTSTRUDL
 Reference Manual

GTSTRUDL Program Report Form

GPRF No.: 2003.5

DATE: 10/1/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT** Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS** Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR** Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE** Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed September 29, 2003

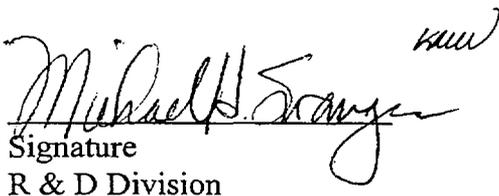
Date Notification Sent 10/1/03

Computers All

Operating System All

Version All

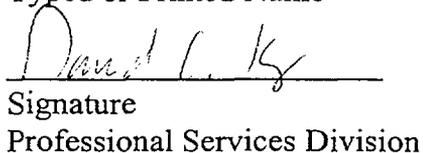
Target Release for Correction Version 27.1


Signature
R & D Division

Sr. RE
Title

Michael H. Swanger
Typed or Printed Name

9/29/03
Date of Signature


Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

10/1/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003.5

DATE: 10/1/03

DESCRIPTION:

The NONLINEAR ANALYSIS command may abort when the structure contains elastic member end connections and more than one independent loading condition is active for the analysis. A work-around is to perform a separate nonlinear analysis for each loading condition. For example, the following NONLINEAR ANALYSIS command may abort under the conditions described above:

```
LOAD LIST 1 2 3
NONLINEAR ANALYSIS
```

The following equivalent sequence of commands will avoid the abort:

```
LOAD LIST 1
NONLINEAR ANALYSIS
LOAD LIST 2
NONLINEAR ANALYSIS
LOAD LIST 3
NONLINEAR ANALYSIS
```

If the abort does not occur (which is unlikely) the analysis results are correct.

GTSTRUDL User Reference Manual Sections:

MEMBER RELEASES Command	Section 2.1.8.2, Volume 1, Rev. R, GTSTRUDL Reference Manual
Nonlinear Static Analysis	Section 2.5, Volume 3, Rev. R, GTSTRUDL Reference Manual

GTSTRUDL Program Report Form

GPRF No.: 2003.6

DATE: 10/1/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT** Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS** Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR** Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE** Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed 10/01/03

Date Notification Sent 10/1/03

Computers All

Operating System All

Version 27.1

Robert Abernathy
Signature
R & D Division

Research Engineer II
Title

Robert Abernathy
Typed or Printed Name

10/01/03
Date of Signature

David C. Key
Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

10/1/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003 06

DATE: 10/1/03

DESCRIPTION:

The PRINT REINFORCEMENT command for columns with a circular longitudinal steel arrangement designed with BSI codes (CP110 and BS8110) reports the diameter of the circular steel cage as too large, usually larger than the diameter of the concrete. The design of the column is not affected by this problem, and the output from the PROPORTION command is correct. Only the diameter reported by output commands, such as PRINT REINFORCEMENT, issued after the design is incorrect.

Columns with rectangular or square longitudinal steel arrangements are not affected.

Workaround: None

Documentation reference:

Volume 4, GTSTRUDL Reference Manual, Section 4.3 The PROPORTION MEMBERS command

Volume 4, GTSTRUDL Reference Manual, Section 5.4 The PRINT REINFORCEMENT command

GTSTRU DL Program Report Form

GPRF No.: 2003.7

DATE: 10/1/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed 10/01/03

Date Notification Sent 10/1/03

Computers All

Operating System All

Version 27.1

Robert Abernathy ^{KAW}
Signature
R & D Division

Research Engineer II
Title

Robert Abernathy
Typed or Printed Name

10/1/03
Date of Signature

David C. Key
Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

10/1/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003.7

DATE: 10/1/03

DESCRIPTION:

An abort in PROPORTIONING reinforced concrete columns designed with the ACI codes can occur during the capacity check phase. No design output is produced and GTSTRUDL stops executing. Incorrect results will NOT be reported.

Workaround: None

Since the capacity check is an iterative, heuristic algorithm, an *a priori* description of the type of column (size, loadings, etc.) cannot be provided for those columns that will experience this abort, but this abort is extremely rare and will be apparent.

Documentation reference:

Volume 4, GTSTRUDL Reference Manual, Section 4.3 The PROPORTION MEMBERS command

GTSTRUDL Program Report Form

GPRF No.: 2003.8

DATE: 10/2/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed 10/1/03

Date Notification Sent 10/2/03

Computers All PC ^{KNW}

Operating System All

Version 27

Kenneth Will
Signature
R & D Division

Director, ASD
Title

Kenneth Will
Typed or Printed Name

10/2/03
Date of Signature

Leroy Z. Emkin
Signature
Professional Services Division

Co-Director
Title

Leroy Z. Emkin
Typed or Printed Name

10/2/03
Date of Signature

GTSTRUDL Program Report Form
(Continued)

GPRF No.: 2003.8

DATE: 10/2/03

DESCRIPTION:

The following errors exist in the GTSTRUDL Release Guide Version 27, Volume 1:

1. Section 3.3, number 1, should be attributed to GPRF 2002.3 instead of GPRF 2001.3.
2. Section 3.3, number 3, is the same correction reported by number 1, and should be deleted.
3. Section 4.3, number 5, should be attributed to GPRF 2000.16, instead of not having an associated GPRF.

GTSTRUDL Program Report Form

GPRF No.: 2003.11

DATE: 12/1/03

FROM: Computer-Aided Structural Engineering Center
Georgia Institute of Technology
Atlanta, Georgia 30332-0355

SEVERITY LEVEL:

- URGENT Problem results in incorrect answers which may not be apparent or job aborts and cannot be recovered within the session or job.
- SERIOUS Problem results in incorrect answers which are obvious or problem prevents completion of a particular user's task.
- MINOR Problem can be worked around or problem poses high frustration factor.
- INFORMATIVE Documentation error, program usage tip, user inconveniences.

Date Problem Confirmed November 24, 2003

Date Notification Sent 12/1/03

Computers PC

Operating System All

Version 26 only

Target Release for Correction ^{Kluu} Version 27.0

Michael H. Swanger
Signature
R & D Division

Sr. Research Engineer
Title

Michael H. Swanger
Typed or Printed Name

11/24/03
Date of Signature

David C. Key
Signature
Professional Services Division

Configuration Control Manager
Title

David C. Key
Typed or Printed Name

12/1/03
Date of Signature

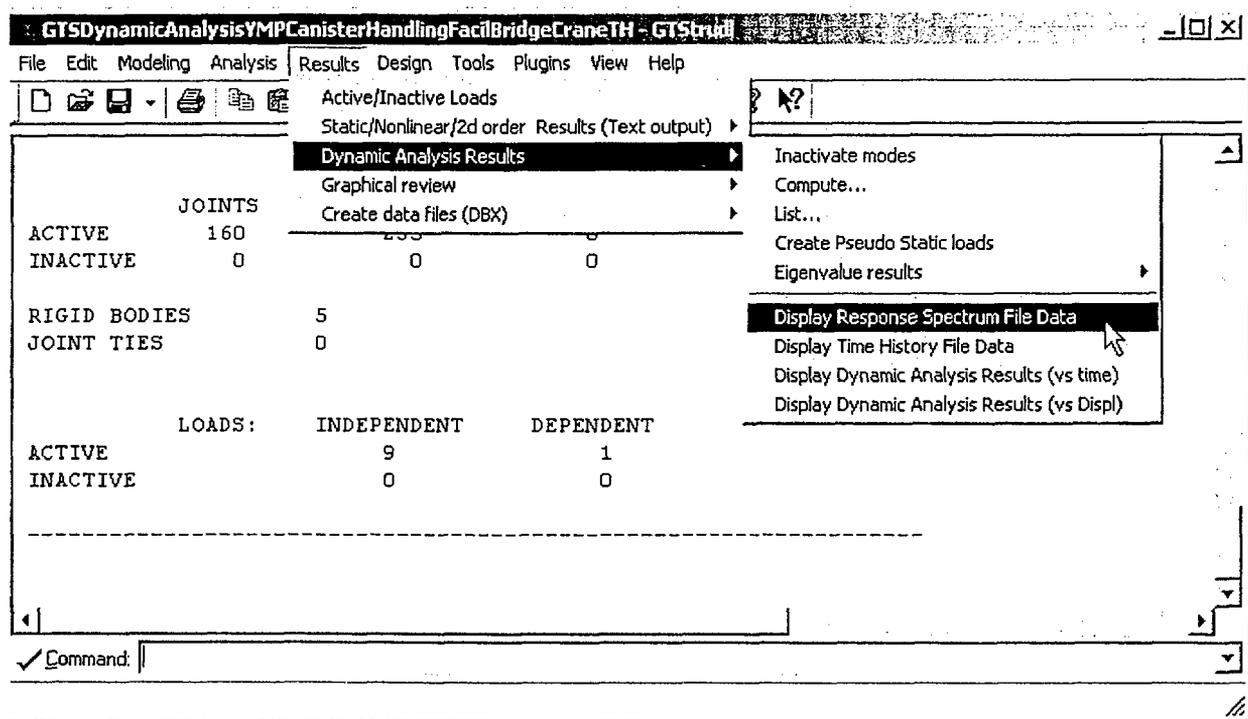
GTSTRUDL Program Report Form (Continued)

GPRF No.: 2003.11

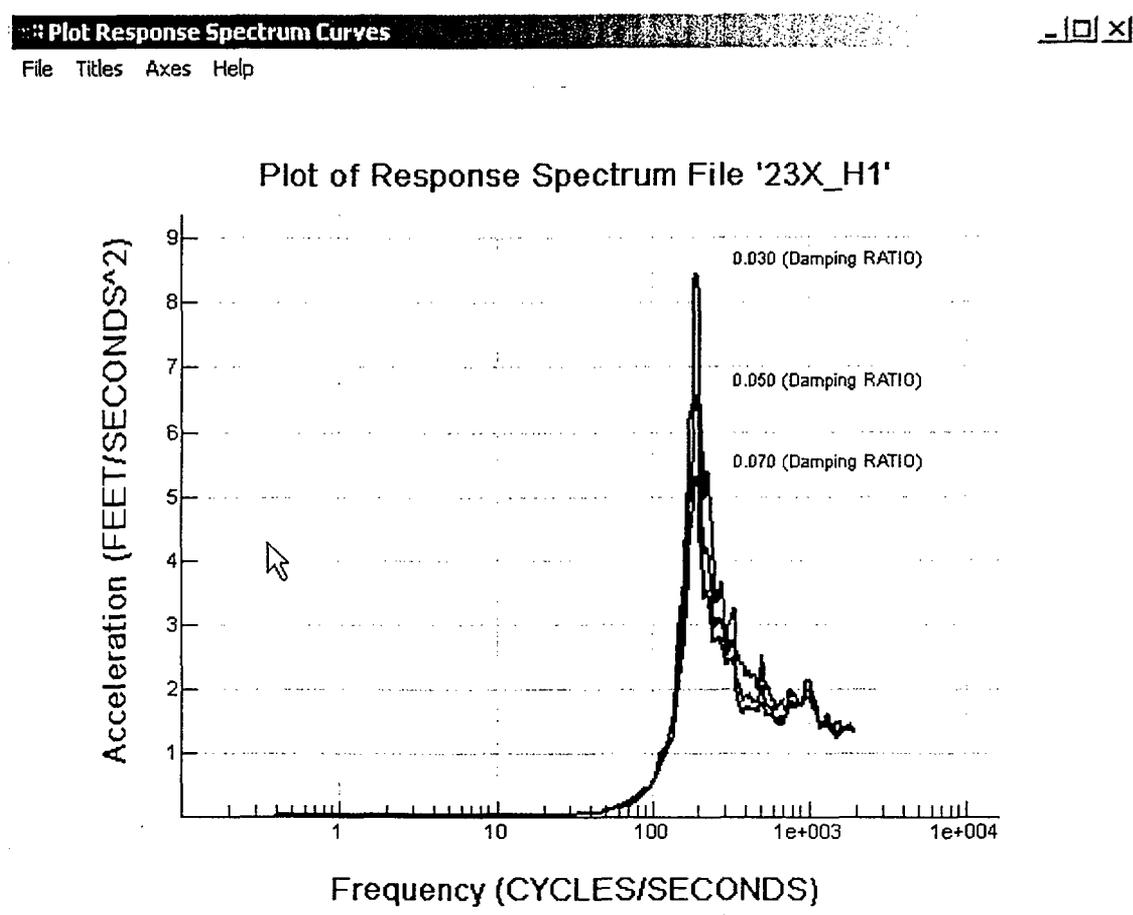
DATE: 12/1/03

DESCRIPTION:

The horizontal frequency/period axis of response spectrum x-y plots created from the graphical user interface is incorrect when the active angular unit is CYCLES. The menu selection to create these plots is illustrated below:



The figure below illustrates an erroneous response spectrum plot:



The largest frequency value in the data used to create this plot was 49 Hz. The frequency scale is in error by a factor of $4\pi^2$, which is very noticeable.

The work-around to produce correct plots is to set the active angular unit to RADIANS or DEGREES prior to creating the plot.

Note that Georgia Tech CASE Center policy governing GPRF notification does not generally include the graphical user interface; however, this particular error was deemed sufficiently important to warrant this notification.