DRAFT DATA REPORT Rev 0
GEOTECHNICAL EXPLORATION AND TESTING

EXELON TEXAS COL PROJECT
VICTORIA COUNTY, TEXAS
POWER BLOCK

July 10, 2008

VOLUME 4
Appendix F – RCTS Data

Prepared By:

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

MACTEC Project No. 6468-07-1777

Prepared For:

Bechtel Power Corporation
Subcontract No. 25352-102-HC4-CY00-00001

CONTENTS

FUGRO CONSULTANTS, INC.

6100 Hillcroft (77081)
P.O. Box 740010
Houston, Texas 77274
Tel: 713-369-5400
Fax: 713-369-5518

February 18, 2008

Ms. Siesta Williams
MACTEC
3301 Atlantic Avenue
Raleigh, NC 27604

RE: One (1) Report For The EXELON COL Project

Dear Ms. Williams:

Fugro has completed one (1) RCTS test, which is B2269-UD15, for the EXELON project. Fugro has incorporated, as needed, Dr. Kenneth Stokoe's comments into the final report. The final report and the associated RCTS Test Approval by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

Cc: Kathryn White, in PDF

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#A	B2269-UD15	216	K HS (+)	

One RCTS test for the site referenced above was tested, and one report was prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

(+) minor suggested changes as noted on several figs.

APPENDIX A

Specimen EXELON B2269-UD15
(Index Properties Not Available)

Borehole B2269
Sample UD15
Depth = 216.2 ft (65.9 m)
Total Unit Weight = 122.7 lb/ft^3
Water Content = 13.9 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 77 psi

FUGRO JOB #: 0401-08-1686
Testing Station: RC9

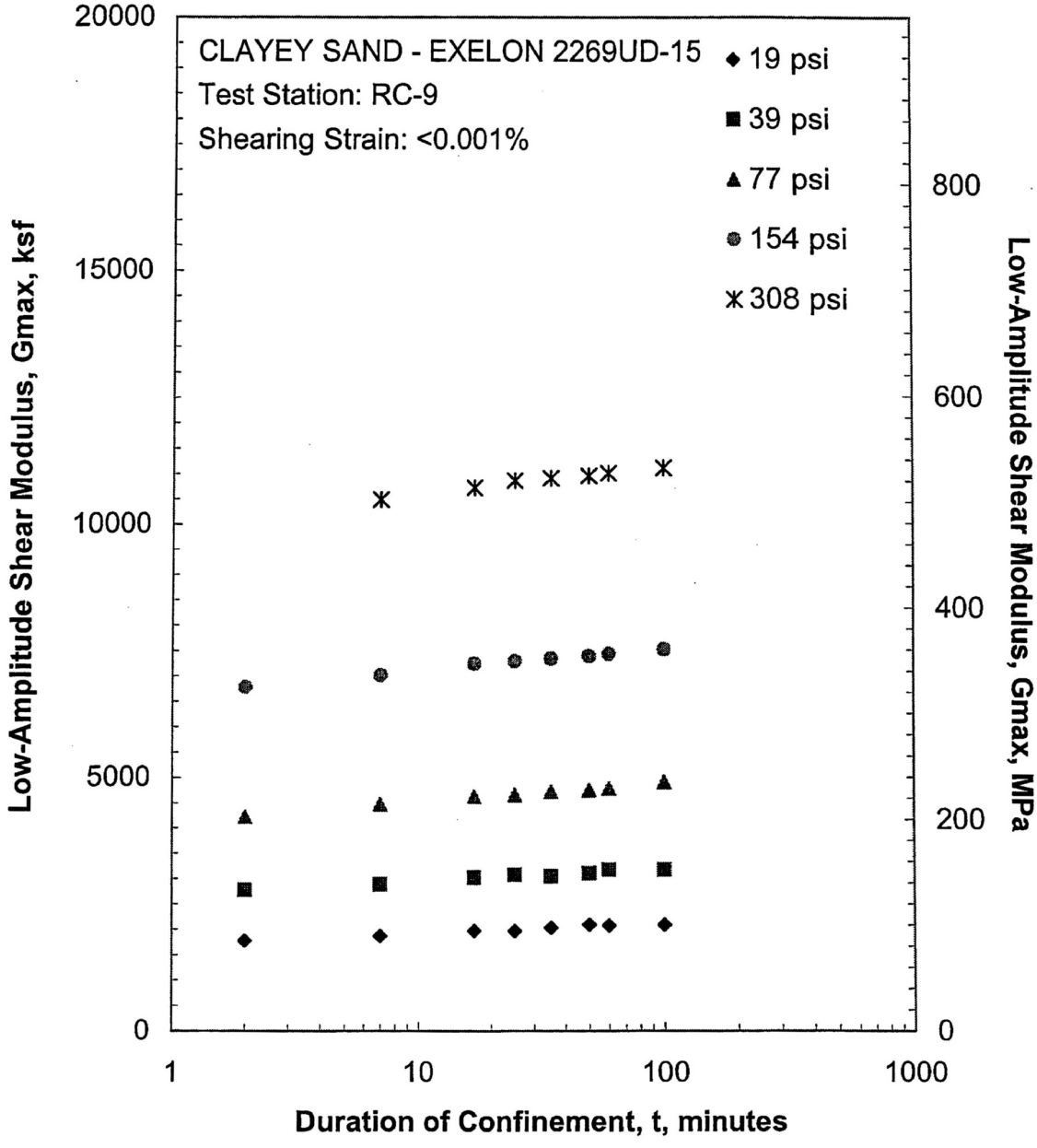

Figure A.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

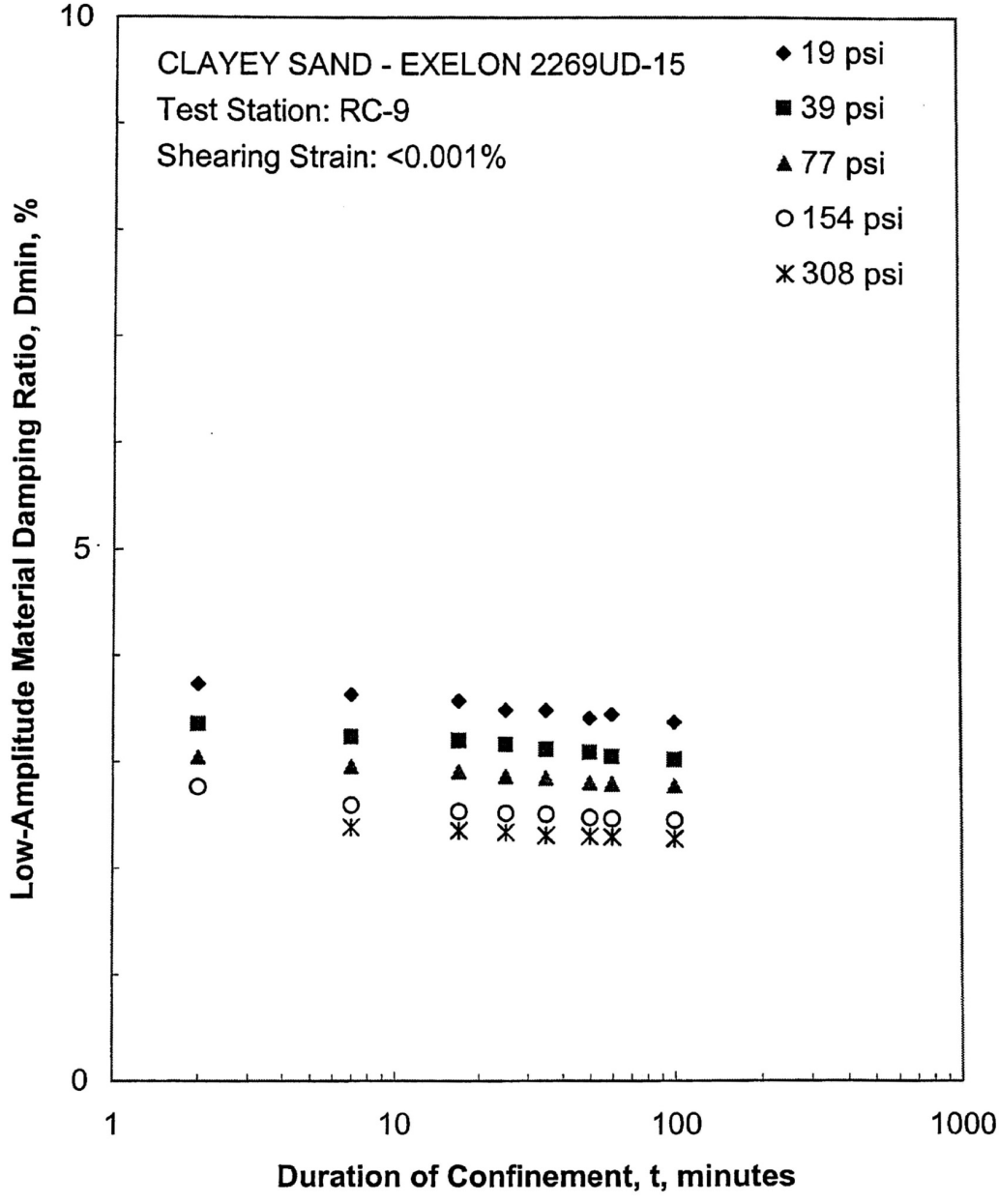

Figure A.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

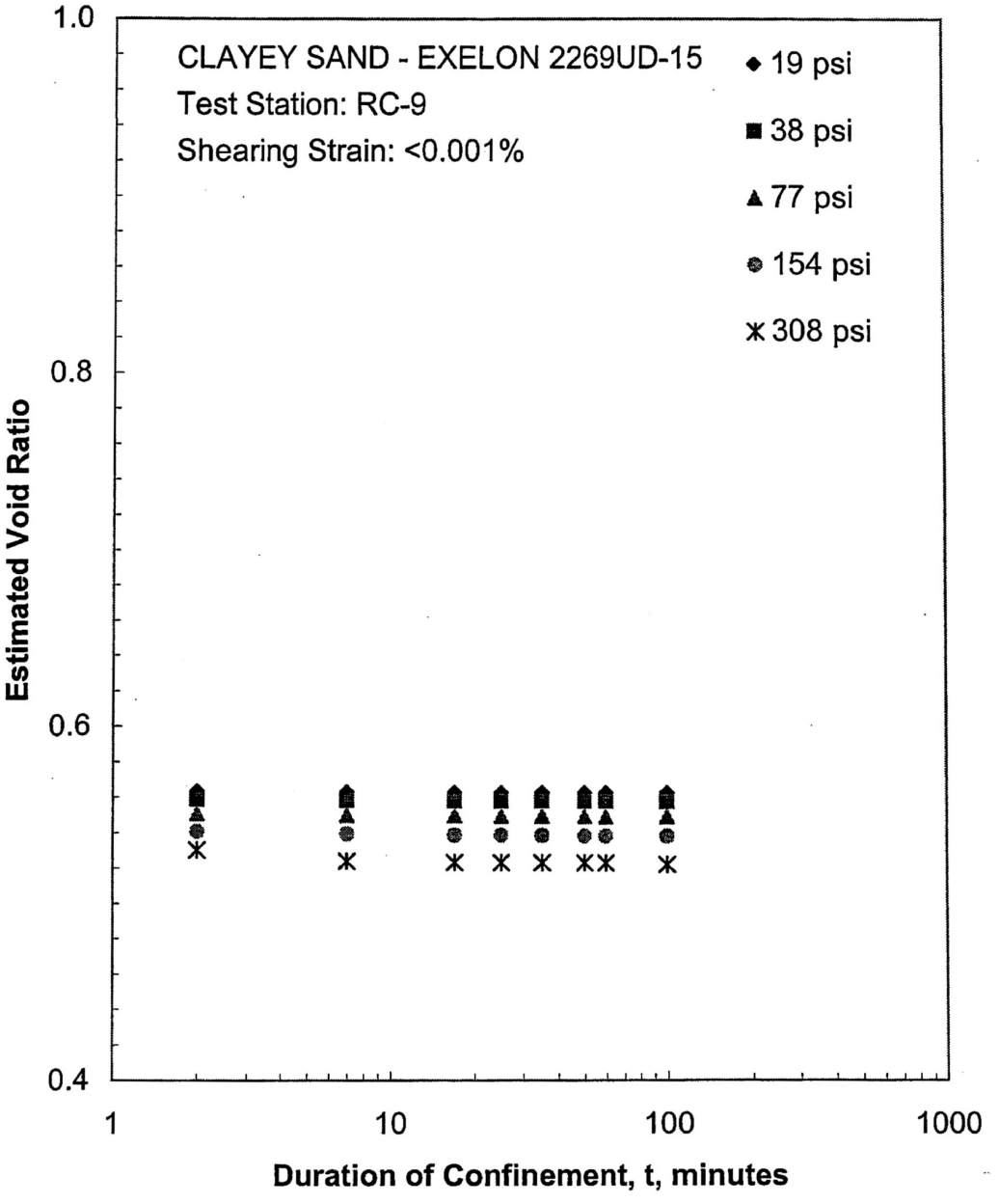

Figure A.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

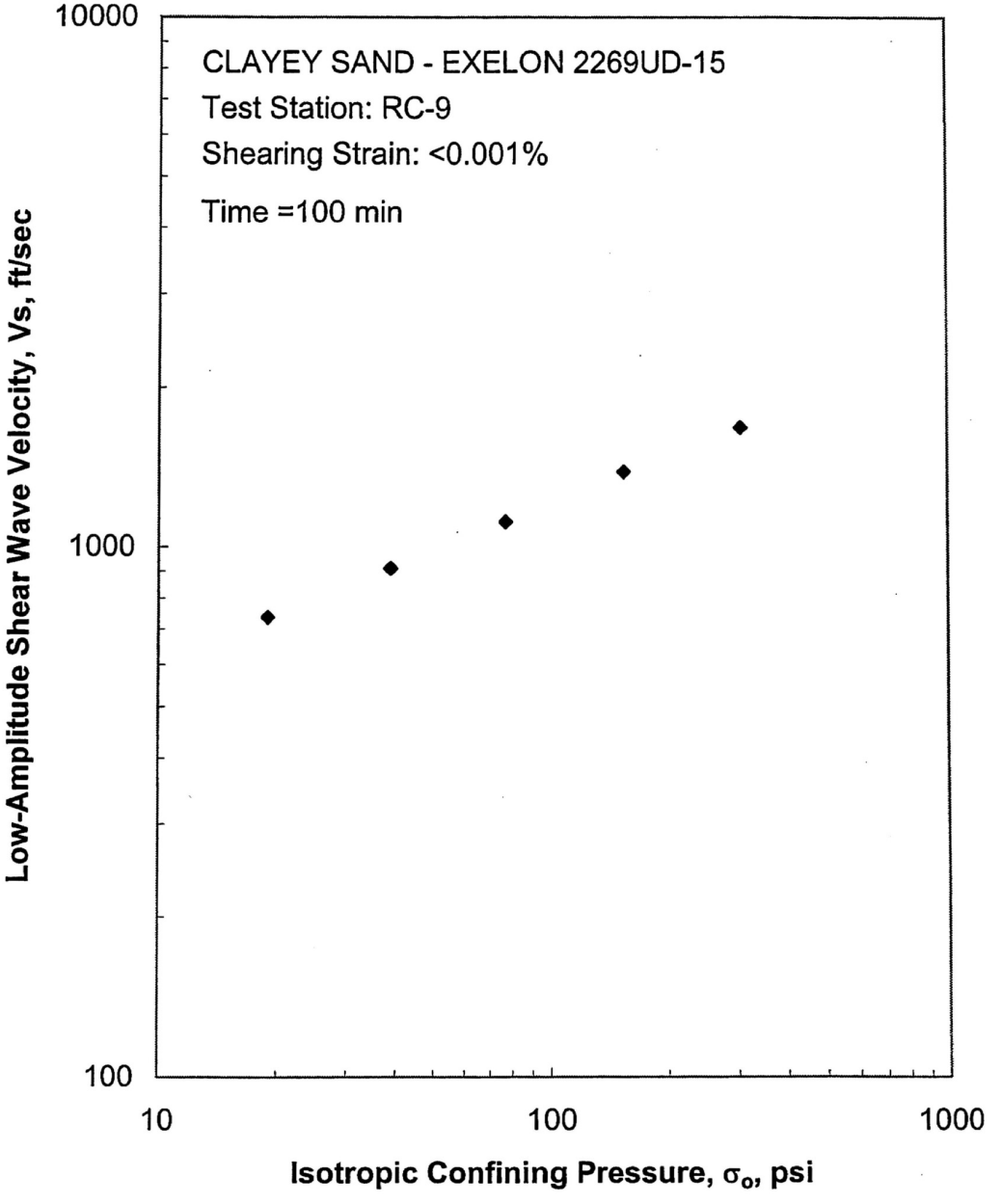

Figure A.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

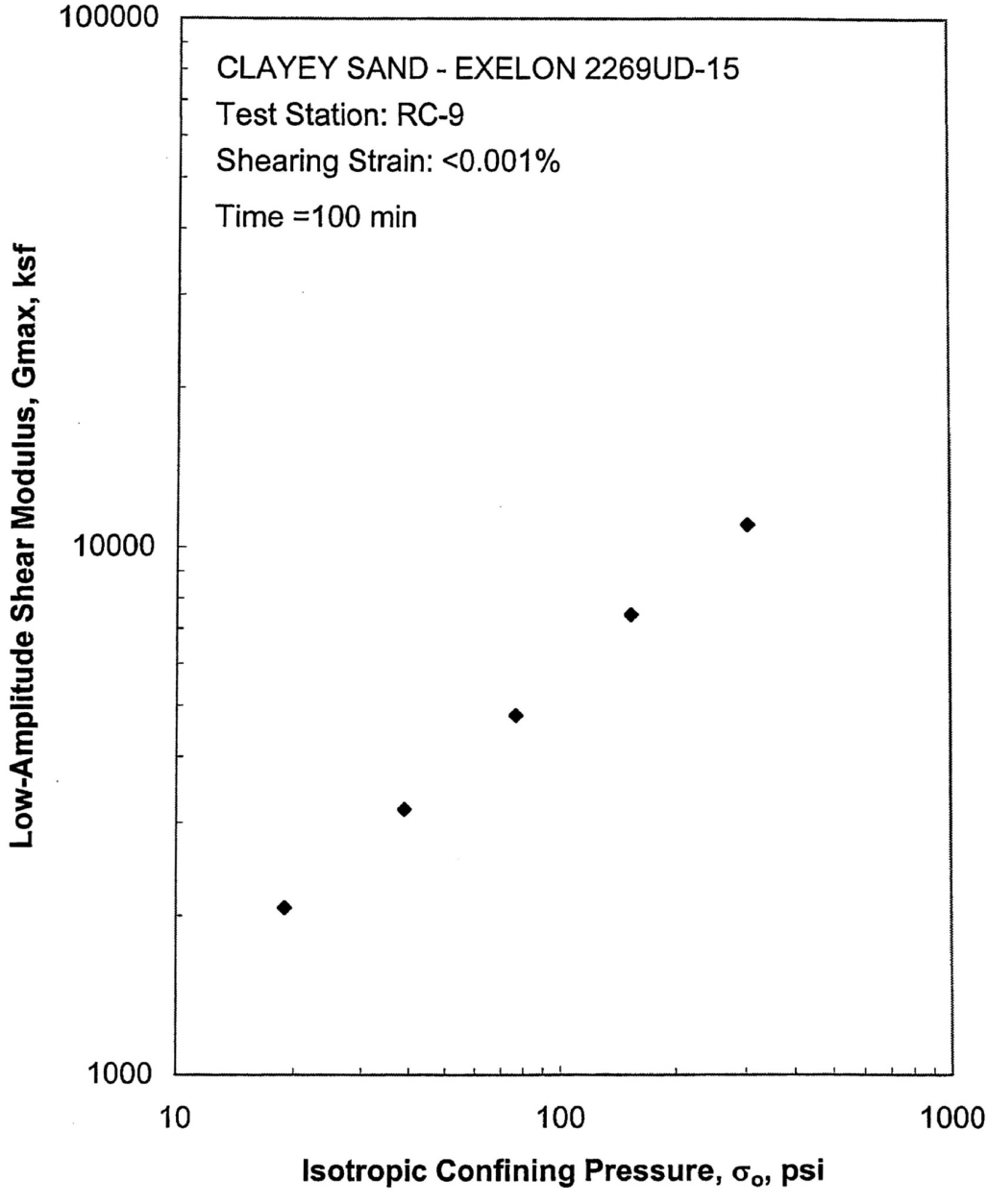

Figure A.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

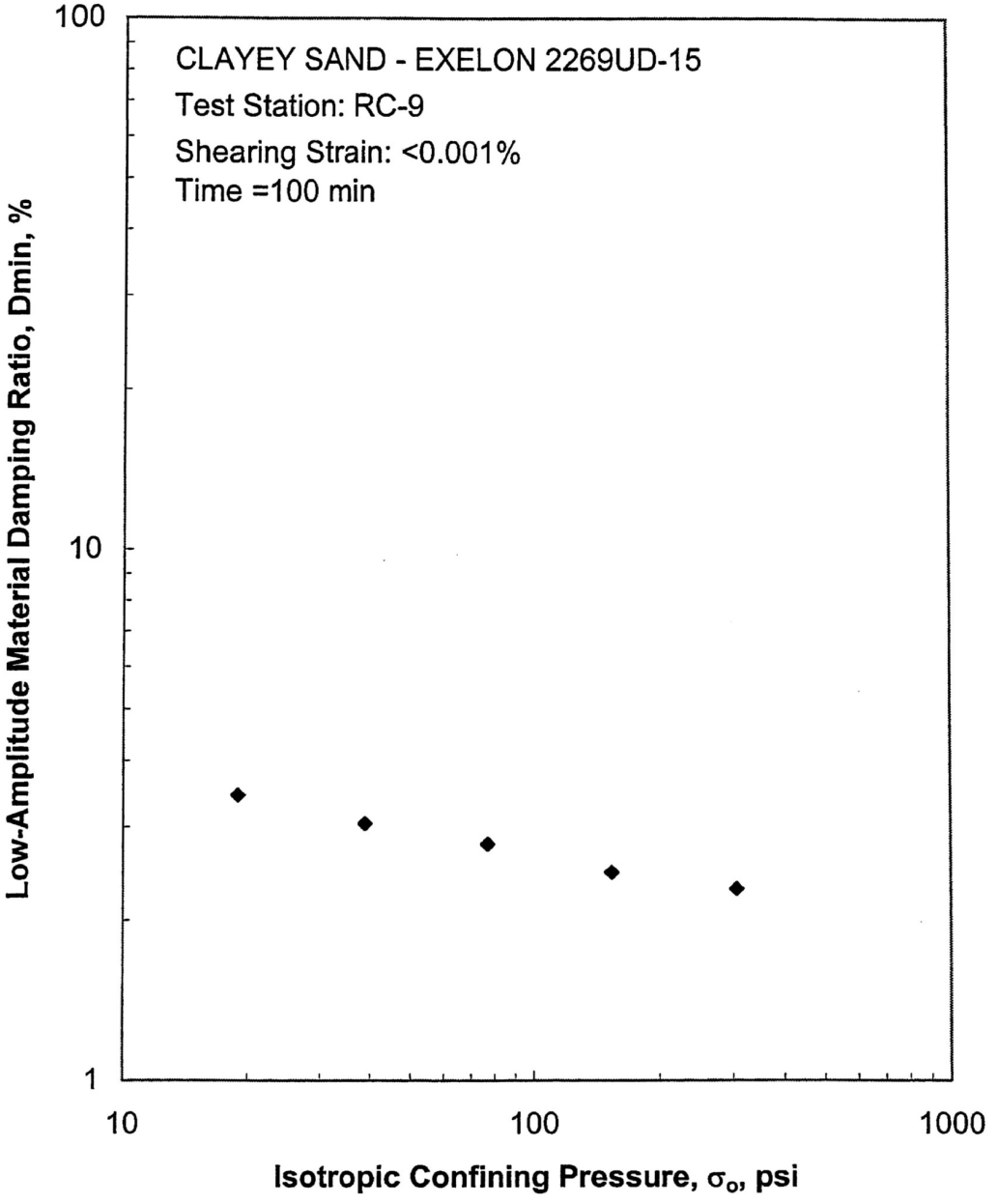

Figure A.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

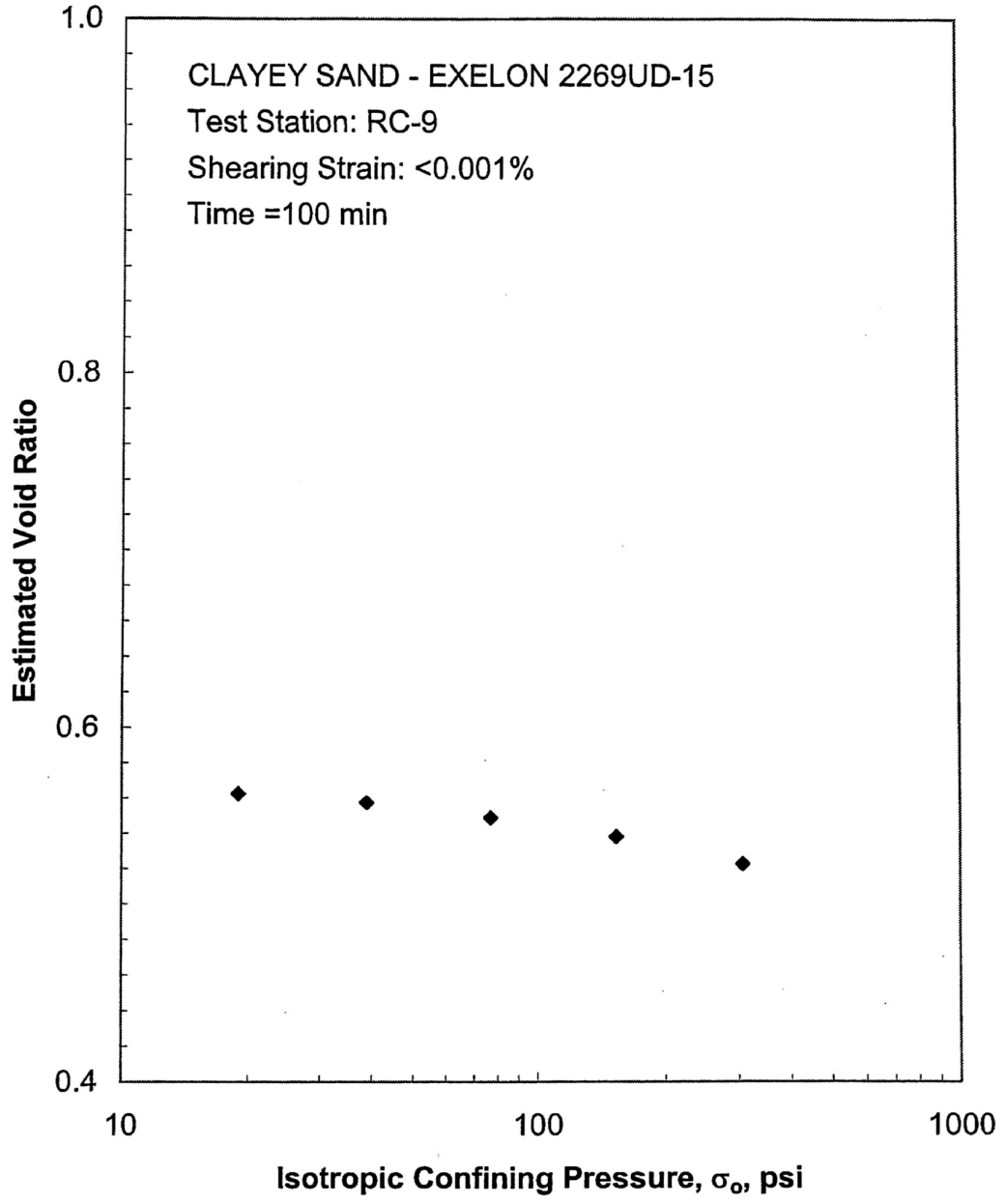

Figure A.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

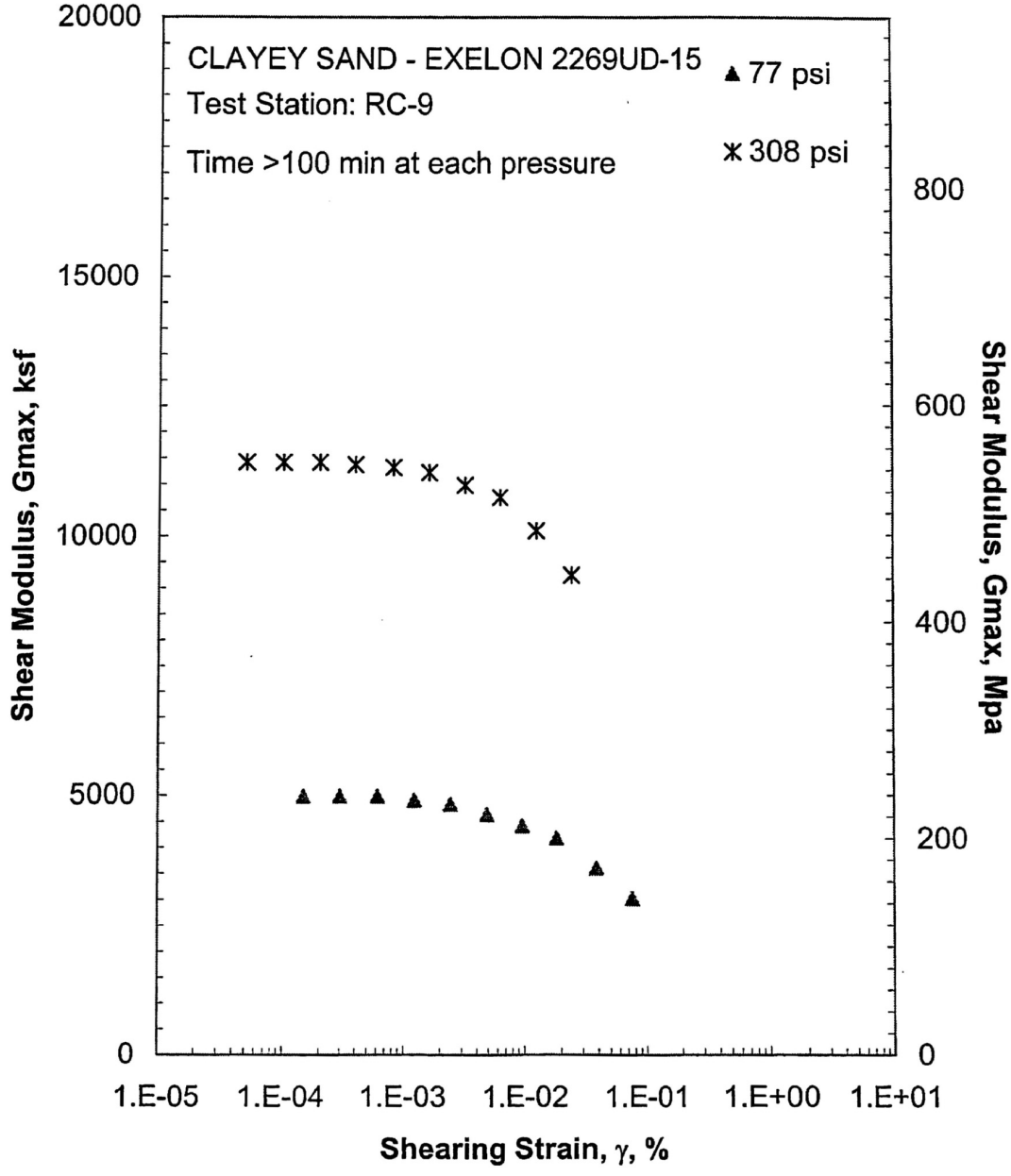

Figure A.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

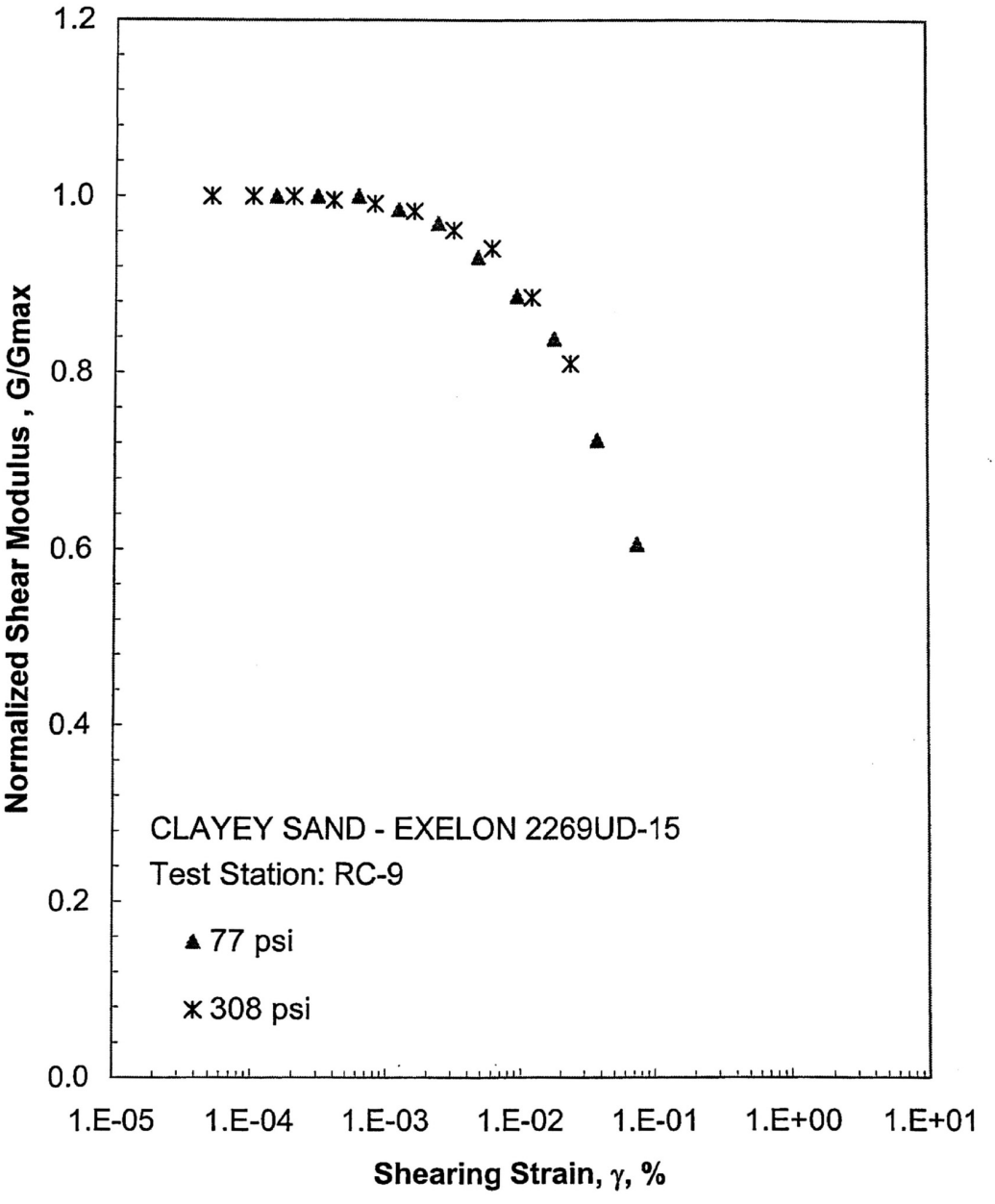

Figure A.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

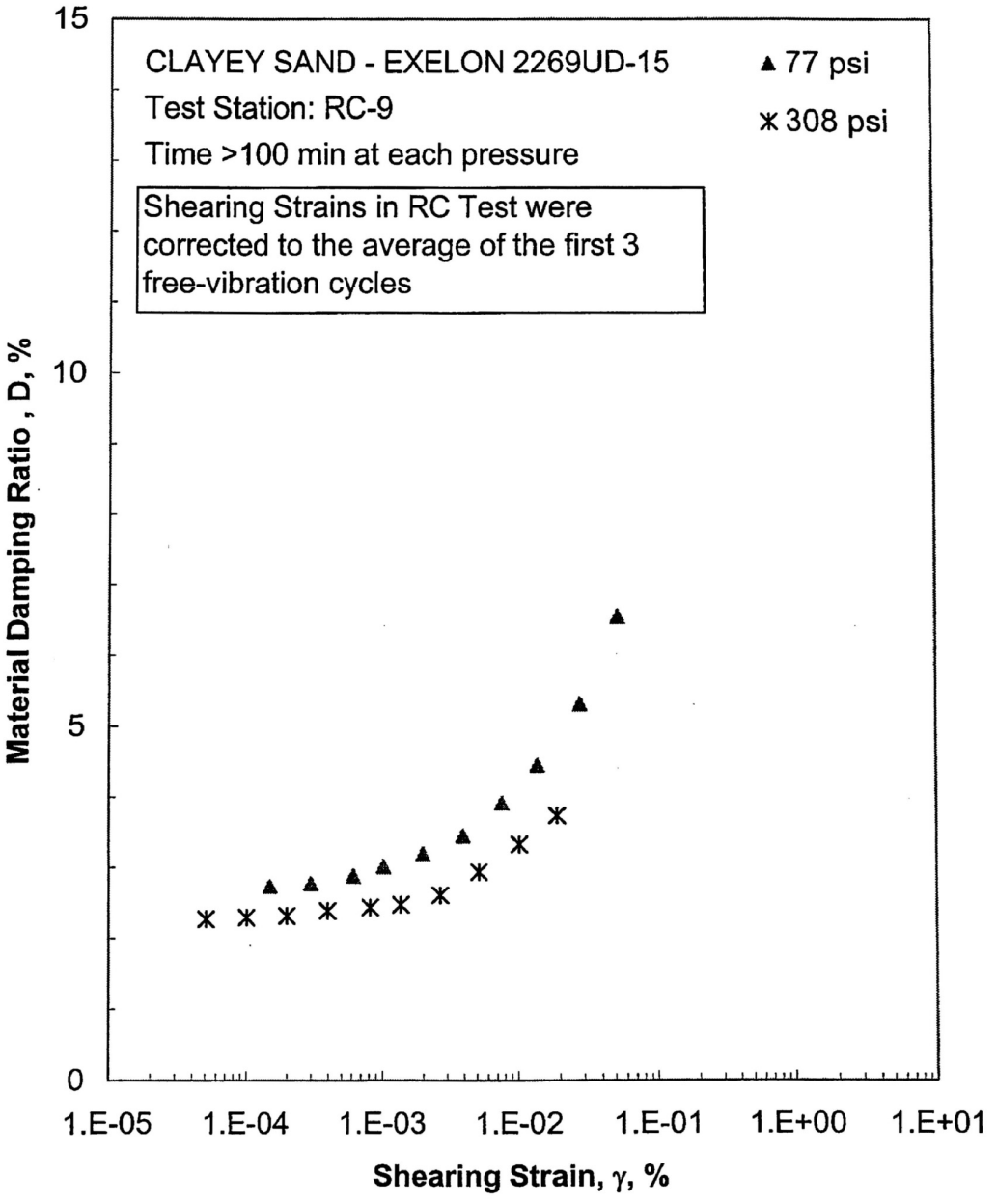

Figure A.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

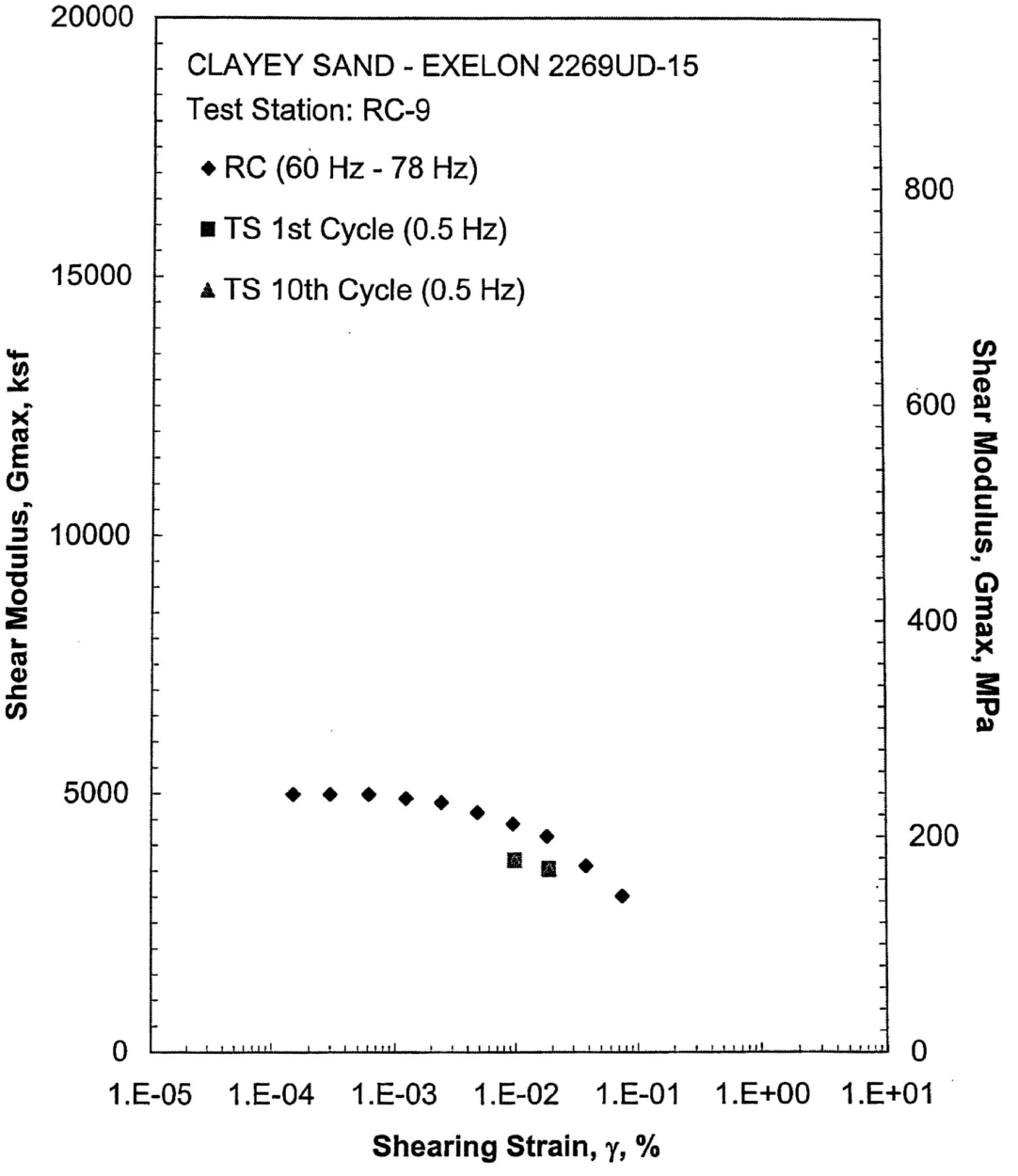

Figure A.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 77 psi from the Combined RCTS Tests

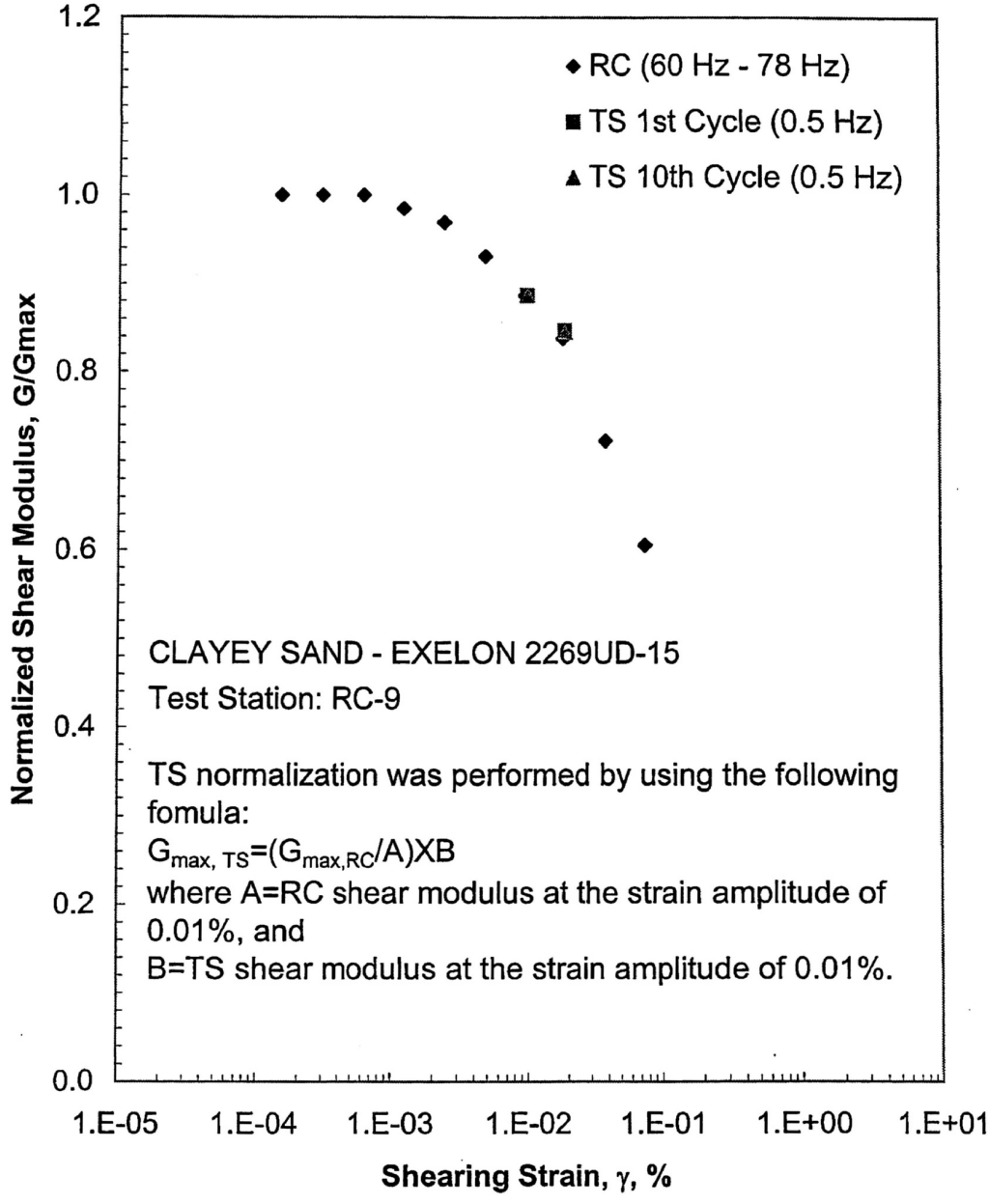

Figure A.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 77 psi from the Combined RCTS Tests

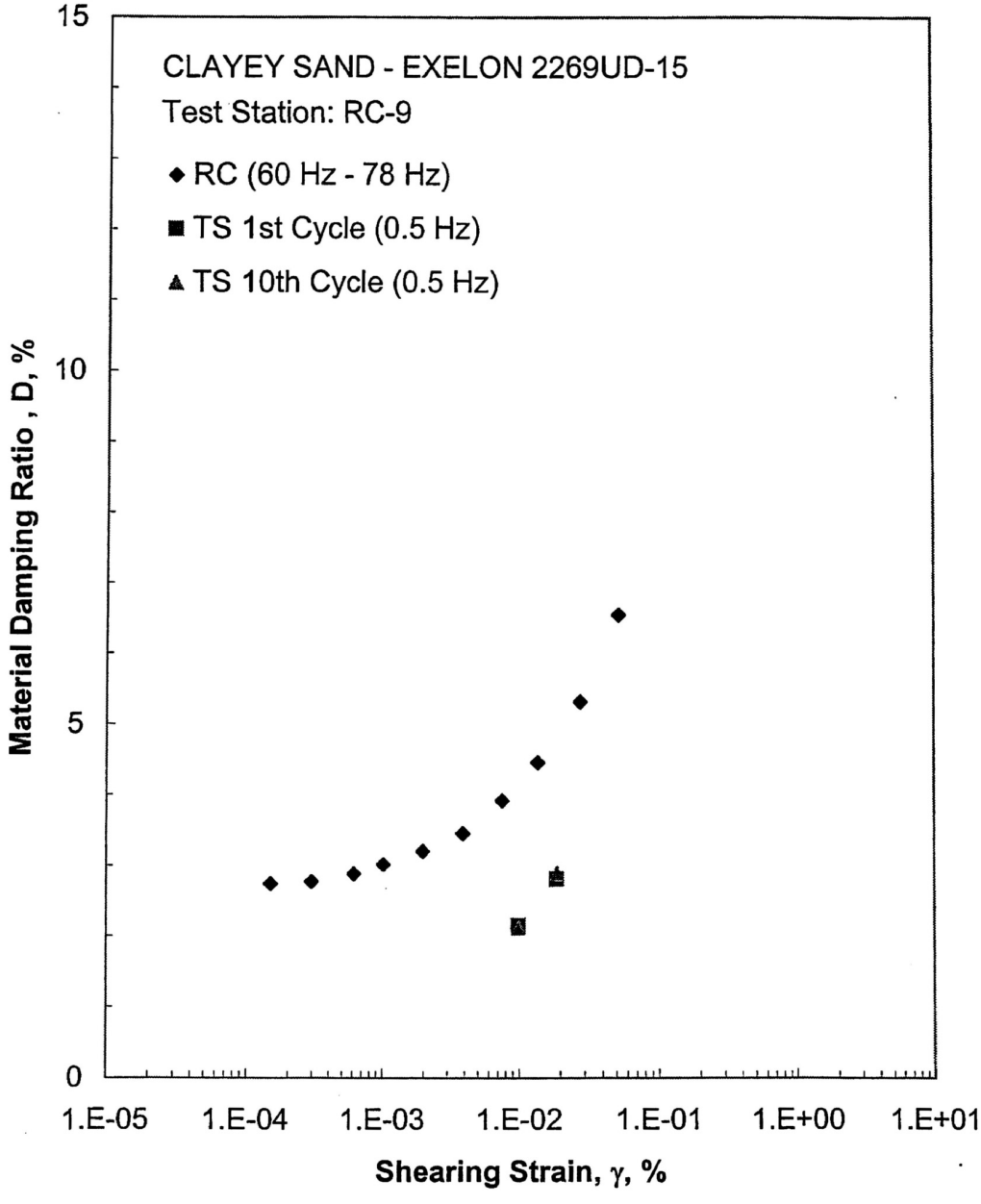

Figure A.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 77 psi from the Combined RCTS Tests

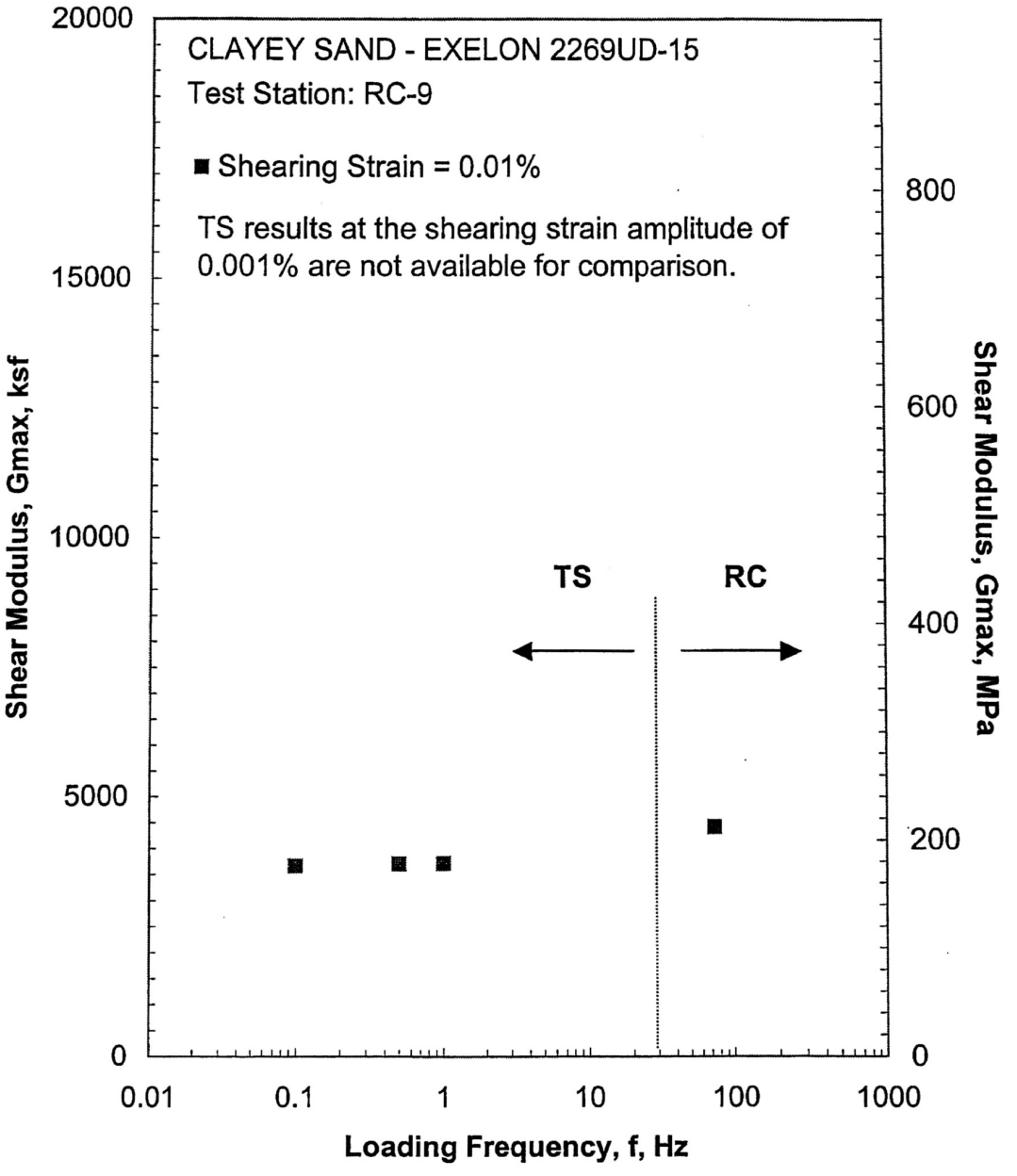

Figure A.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 77 psi from the Combined RCTS Tests

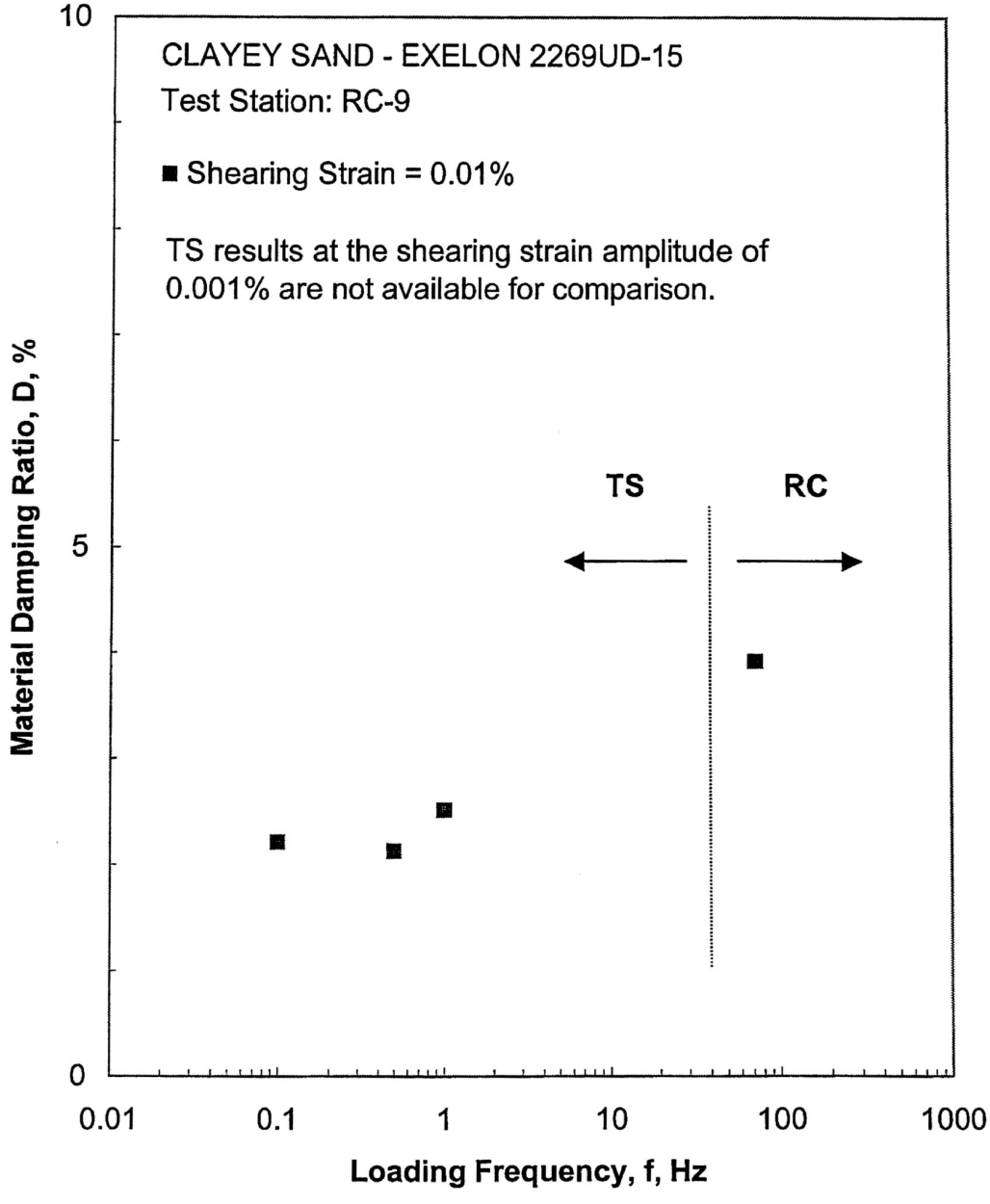

Figure A.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 77 psi from the Combined RCTS Tests

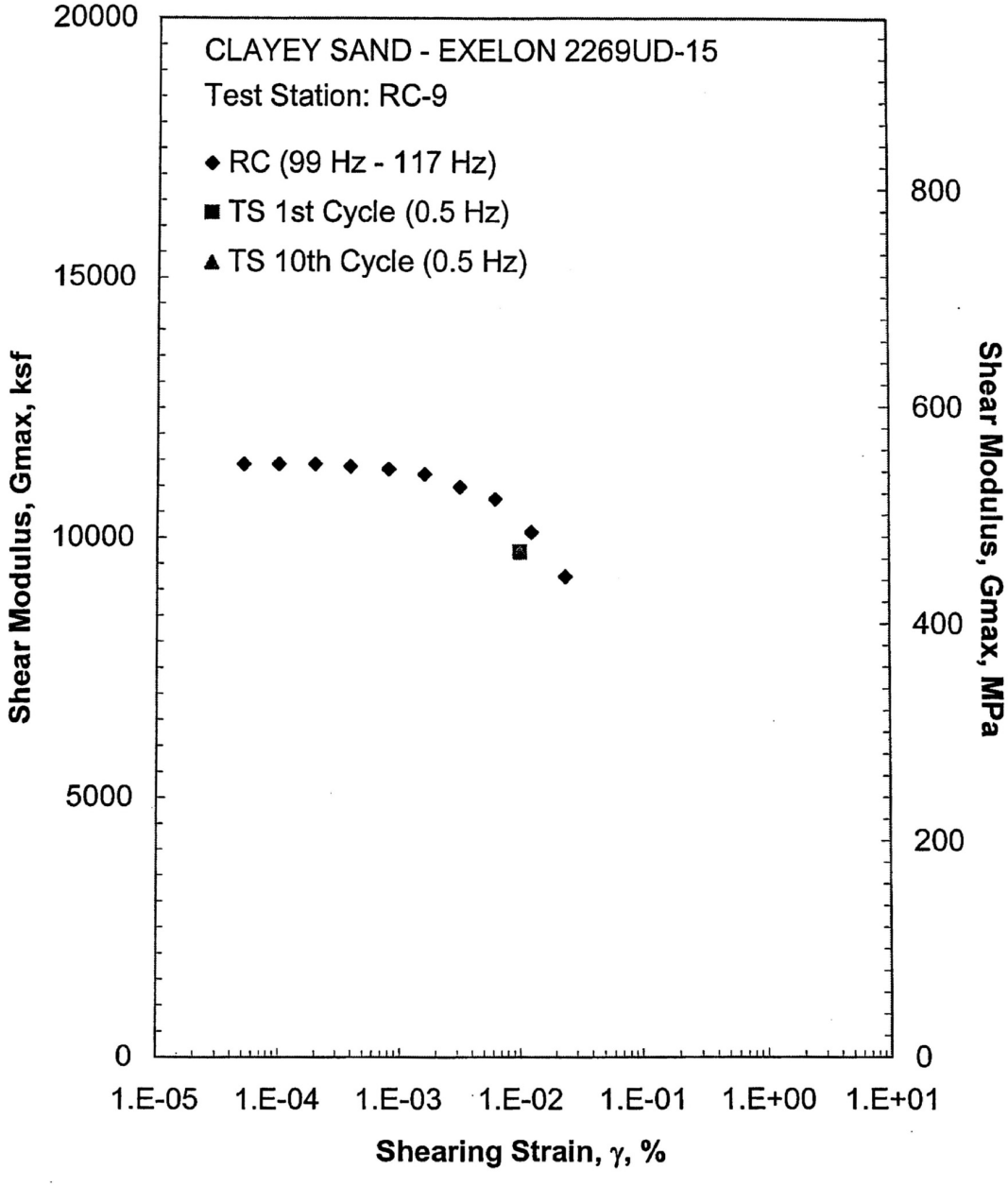

Figure A.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 308 psi from the Combined RCTS Tests

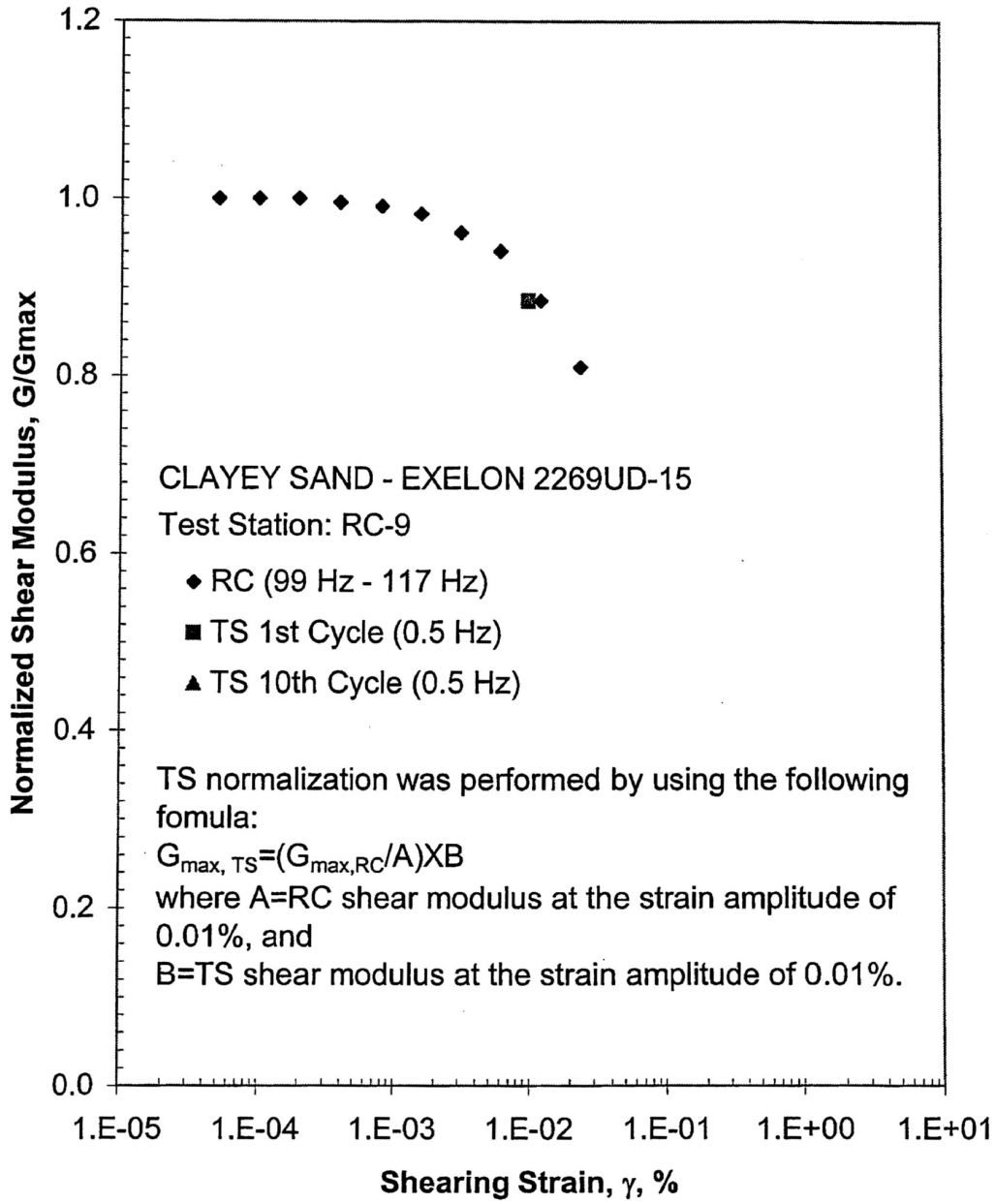

Figure A.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 308 psi from the Combined RCTS Tests

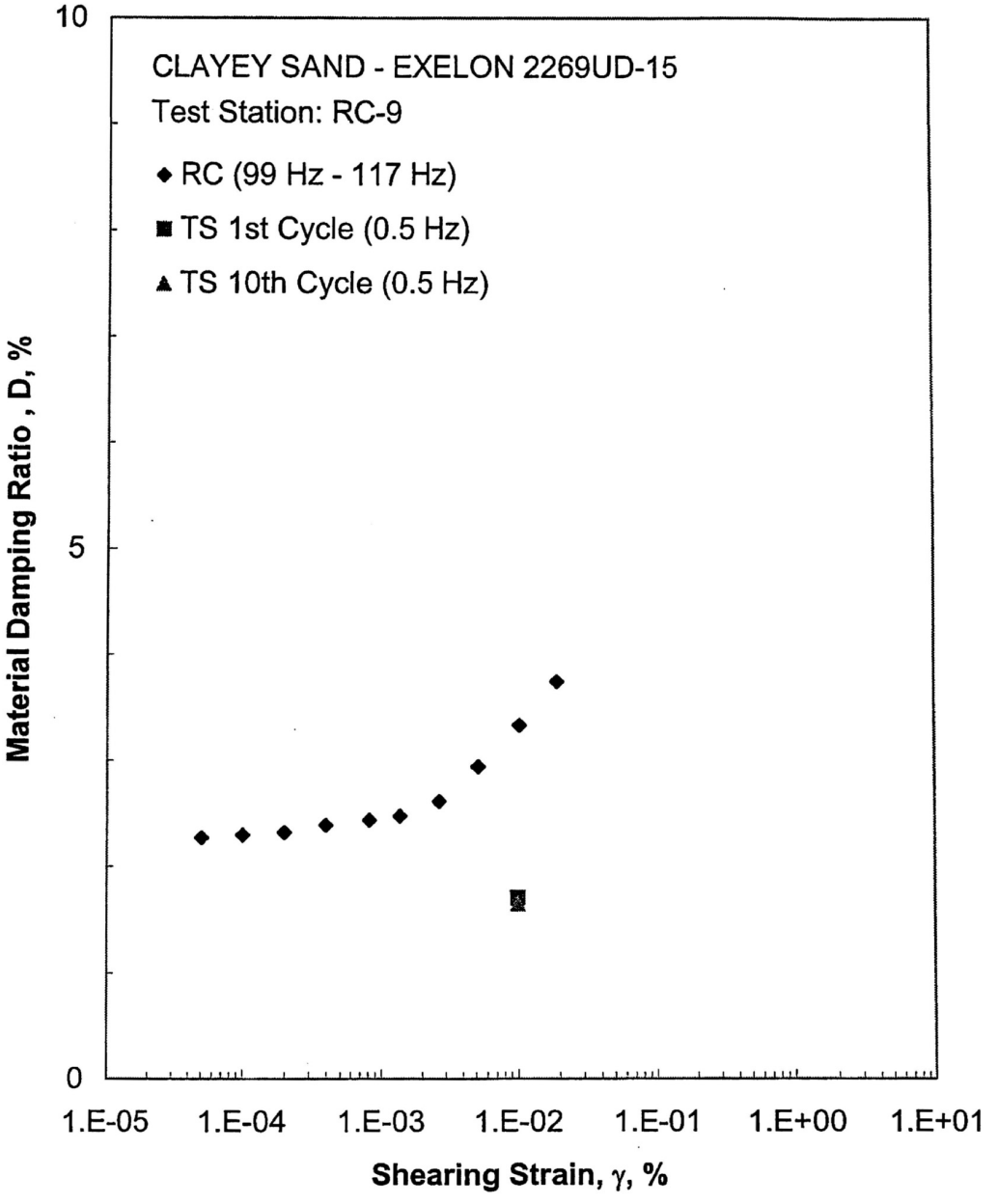

Figure A.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 308 psi from the Combined RCTS Tests

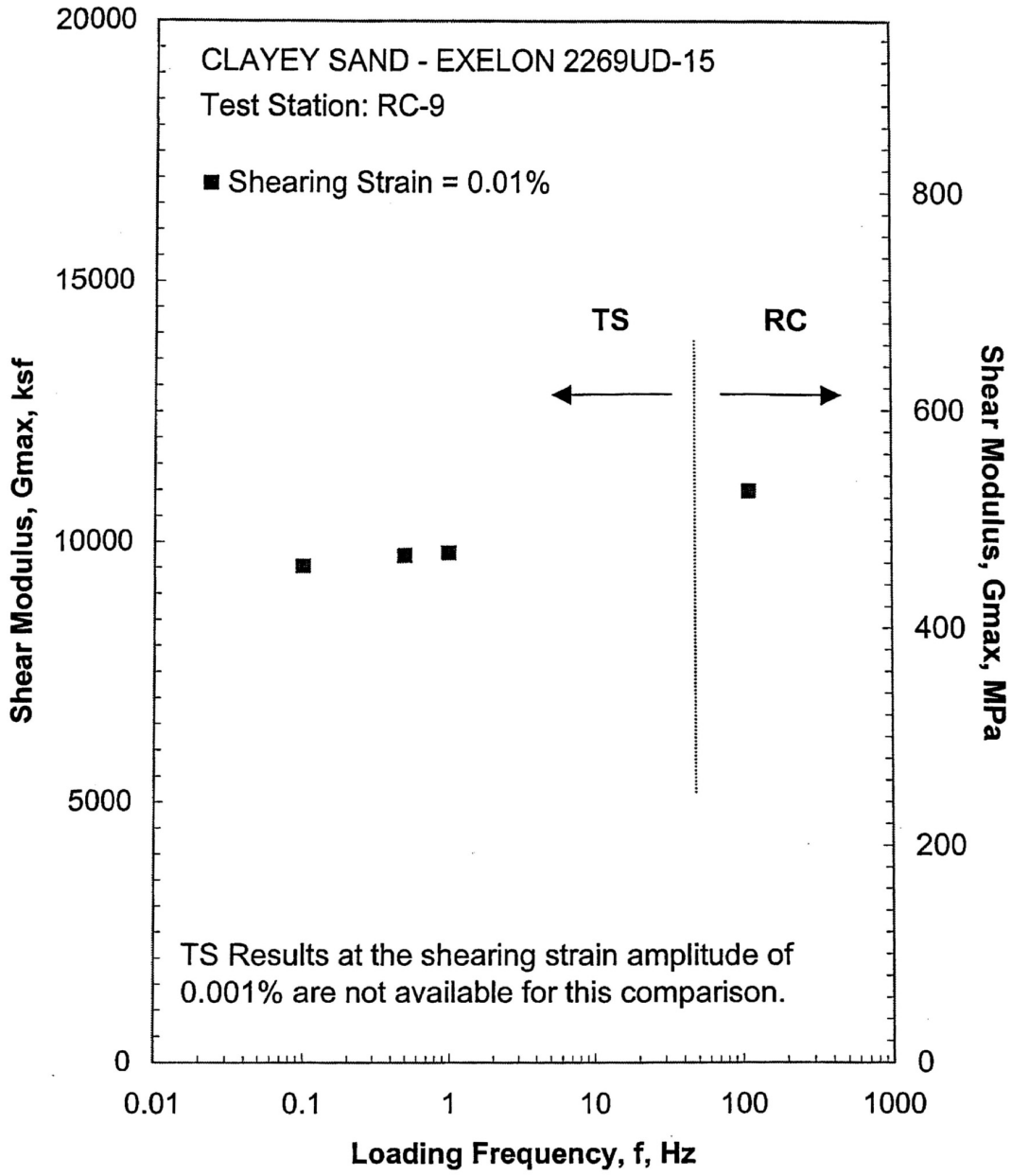

Figure A.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 308 psi from the Combined RCTS Tests

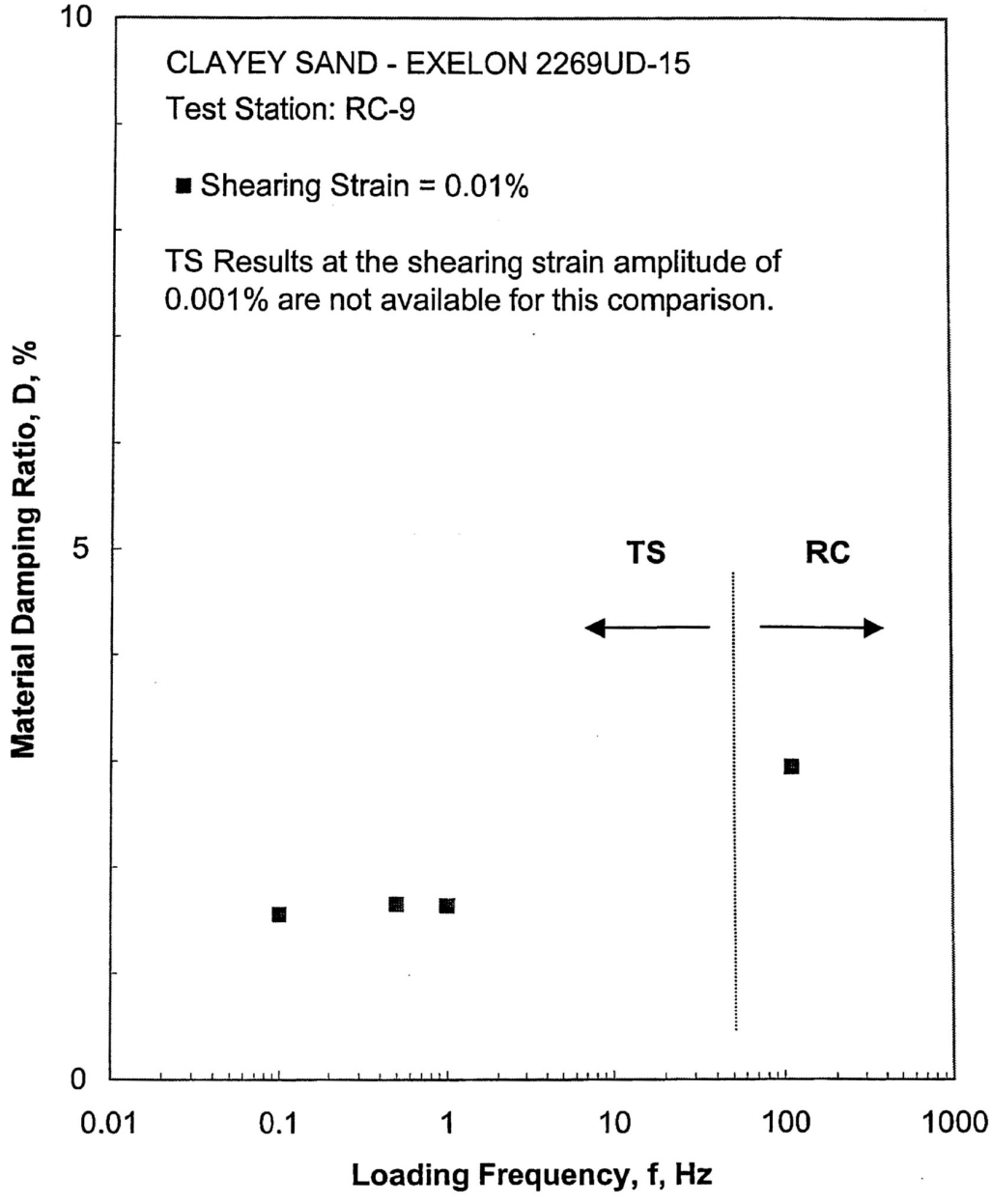

Figure A.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 308 psi from the Combined RCTS Tests

Table A.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen EXELON B2269-UD15

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
19	2736	131	2073	99	737	3.45	0.56
39	5616	269	3177	153	911	3.05	0.56
77	11088	531	4783	230	1114	2.79	0.55
154	22176	1061	7436	357	1384	2.46	0.54
308	44352	2122	11011	529	1676	2.29	0.52

Table A.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON B2269-UD15; Isoptropic Confining Pressure, σ_o=77 psi (11.1 ksf = 531 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.50E-04	4984	1.00	1.50E-04	2.74
3.00E-04	4984	1.00	3.00E-04	2.77
6.19E-04	4984	1.00	6.19E-04	2.88
1.24E-03	4907	0.98	1.03E-03	3.02
2.43E-03	4830	0.97	1.99E-03	3.20
4.85E-03	4640	0.93	3.93E-03	3.46
9.59E-03	4417	0.89	7.57E-03	3.92
1.82E-02	4176	0.84	1.38E-02	4.46
3.83E-02	3601	0.72	2.80E-02	5.32
7.52E-02	3017	0.61	5.19E-02	6.55

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table A.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen EXELON B2269-UD15; Isotropic Confining Pressure, σ_o = 77 psi (11.1 ksf =531 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
9.94E-03	3714	0.89	2.15	9.96E-03	3707	0.89	2.12
1.89E-02	3547	0.85	2.81	1.89E-02	3533	0.84	2.89

Table A.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON B2269-UD15; Isoptropic Confining Pressure, σ_o= 308 psi (44.4 ksf = 2122 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
5.10E-05	11419	1.00	5.10E-05	2.27
1.01E-04	11419	1.00	1.01E-04	2.30
2.01E-04	11419	1.00	2.01E-04	2.32
3.98E-04	11369	1.00	3.98E-04	2.39
8.20E-04	11320	0.99	8.20E-04	2.44
1.61E-03	11222	0.98	1.37E-03	2.48
3.16E-03	10978	0.96	2.69E-03	2.61
6.20E-03	10743	0.94	5.15E-03	2.94
1.24E-02	10104	0.88	1.02E-02	3.33
2.42E-02	9246	0.81	1.91E-02	3.74

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table A.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen EXELON B2269-UD15; Isotropic Confining Pressure, σ_o=308 psi (44.4 ksf = 2122 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
9.95E-03	9724	0.88	1.70	9.94E-03	9734	0.88	1.65

FUGRO CONSULTANTS, INC.

6100 Hillcroft (77081)
P.O. Box 740010
Houston, Texas 77274
Tel: 713-369-5400
Fax: 713-369-5518

March 24, 2008

Ms. Siesta Williams
MACTEC
3301 Atlantic Avenue
Raleigh, NC 27604

RE: Five (5) Reports For The EXELON COL Project

Dear Ms. Williams:

Fugro has completed five (5) RCTS tests, which are B2182-UD3, B2182-UD32, B2182-UD18, B2182-UD9, and B2274-UD14, for the EXELON project. Fugro has incorporated, as needed, Dr. Kenneth Stokoe's comments into the final reports. The final reports and the associated RCTS Test Approvals by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

Cc: Kathryn White, in PDF

Y/S

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#B	B2182-UD3	18	KHS ⊕	14 Mar '08

One RCTS test for the site referenced above was tested, and one report was prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

⊕ simply comments (not any suggested modifications) on

9/

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#C	B2182-UD32	352.7	KHS ⊕	15 Mar '08

One RCTS test for the site referenced above was tested, and one report was prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

⊕ see comments and minor suggestions in several figures.

5/

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#D	B2182-UD18	220.5	KHS ⊕	15 Mar '08

One RCTS test for the site referenced above was tested, and one report was prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

⊕ See minor comments on several figures.

1/15

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#E	B2182-UD9	85.8	KHS (+)	16 Mar. 08
RCTS#F	B2274-UD14	267.5	KHS (+)	16 Mar. 08

Two RCTS tests for the site referenced above were tested, and two reports were prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

(+) see comments and suggested modifications on one or two figures

APPENDIX B

Specimen EXELON B2182-UD3
(Index Properties Not Available)

Borehole B2182
Sample UD3
Depth = 17.7 ft (5.4 m)
Total Unit Weight = 125.3 lb/ft^3
Water Content = 21.6 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 9 psi

FUGRO JOB #: 0401-1686
Testing Station: RC9

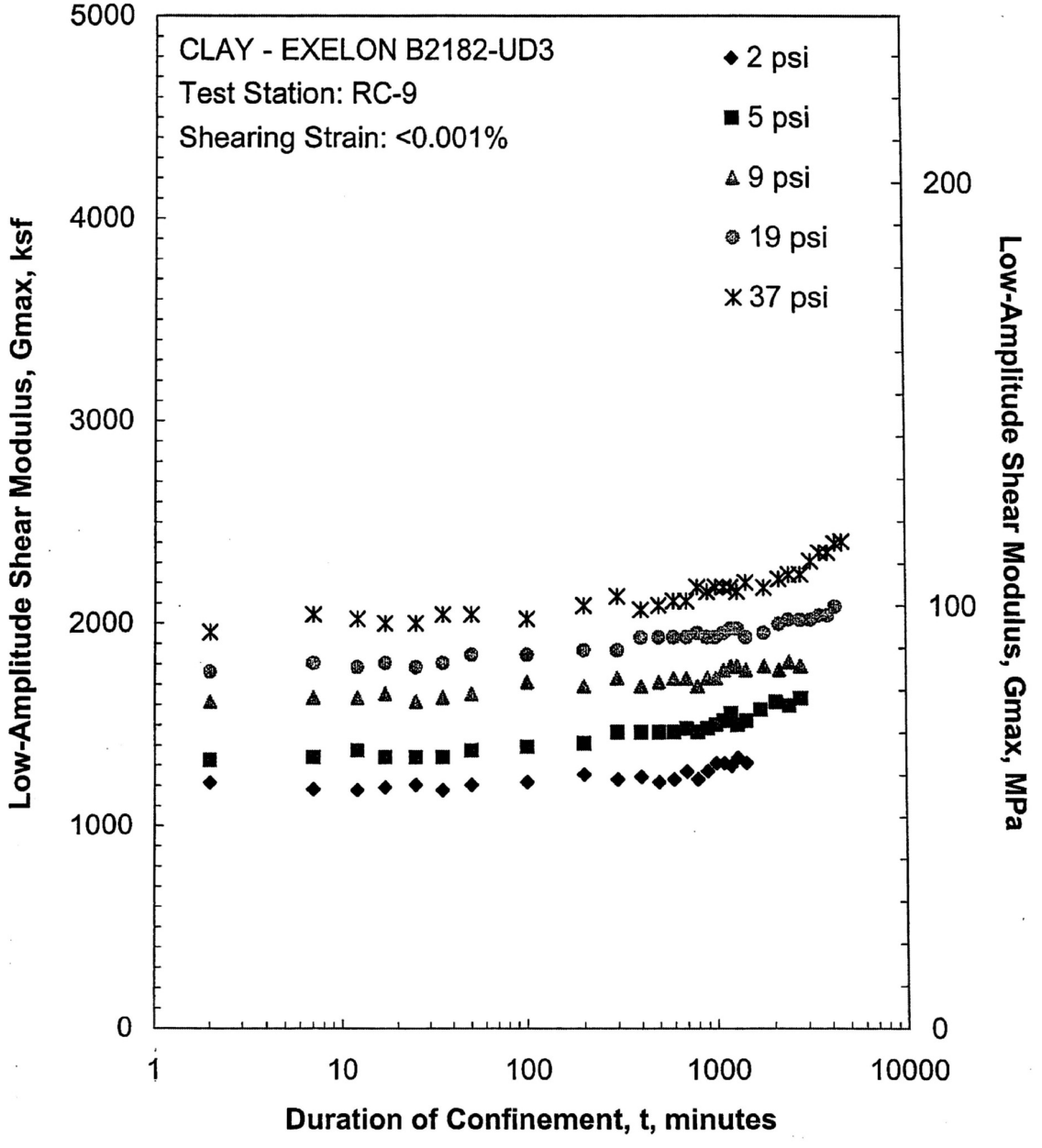

Figure B.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

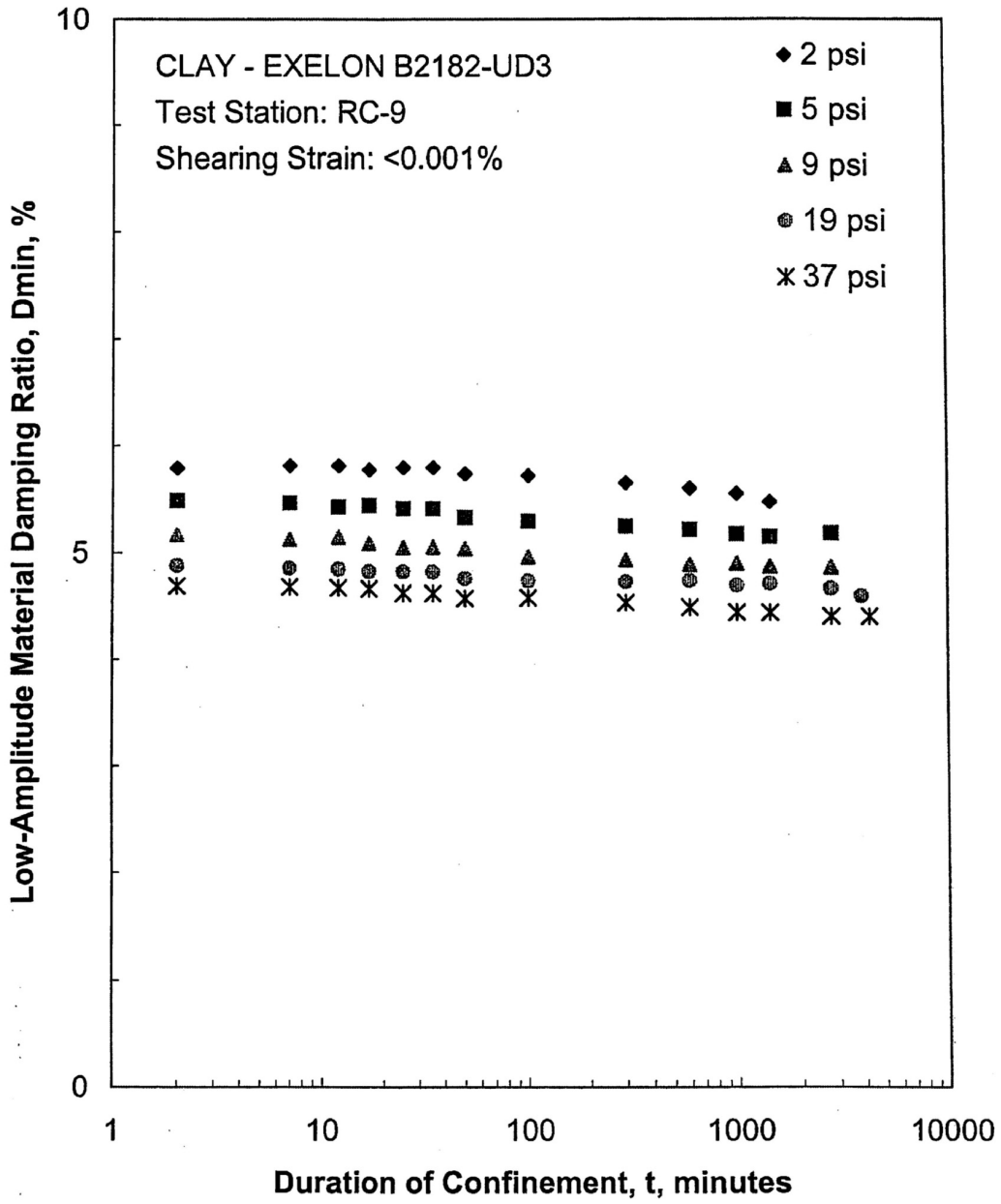

Figure B.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

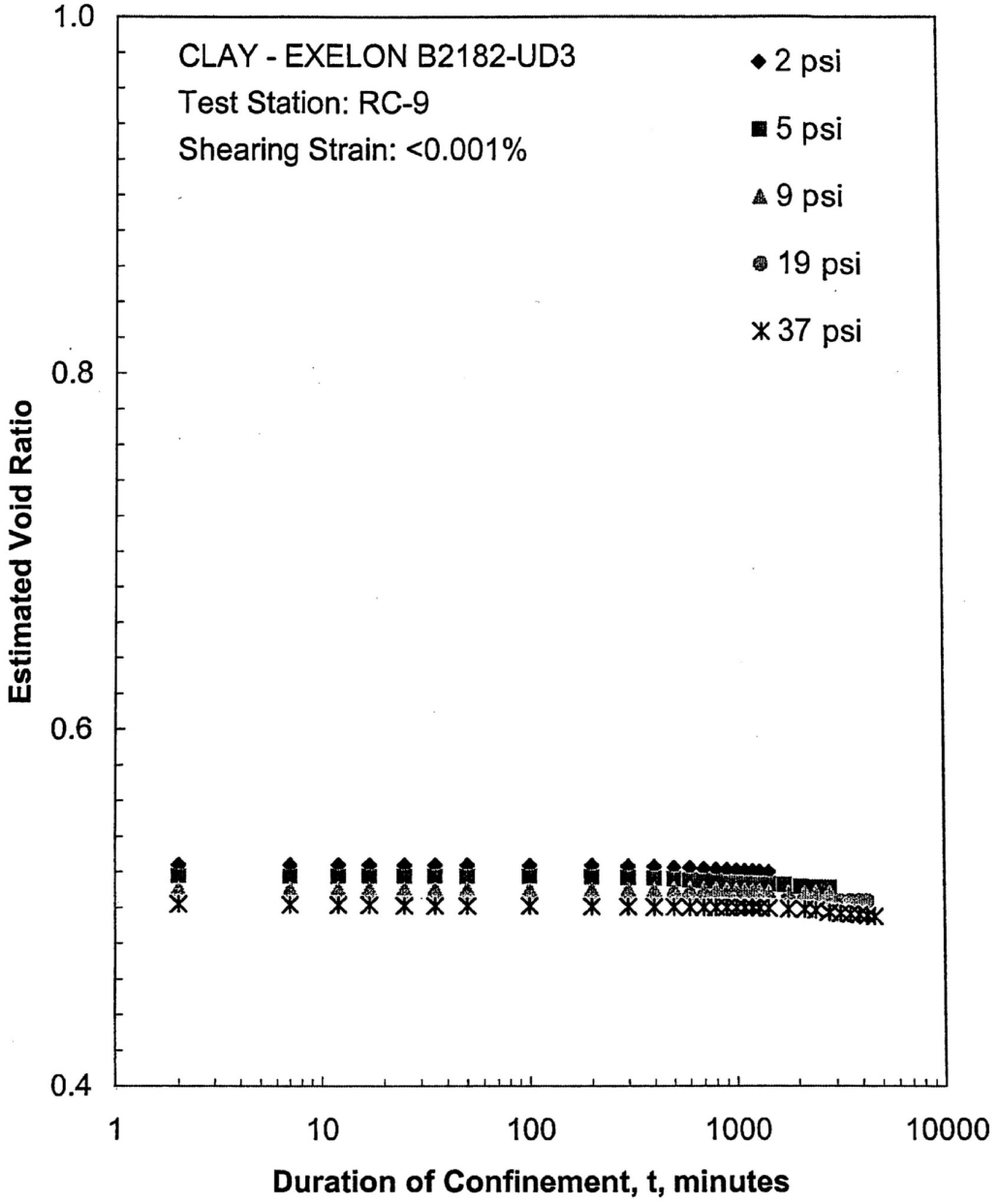

Figure B.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

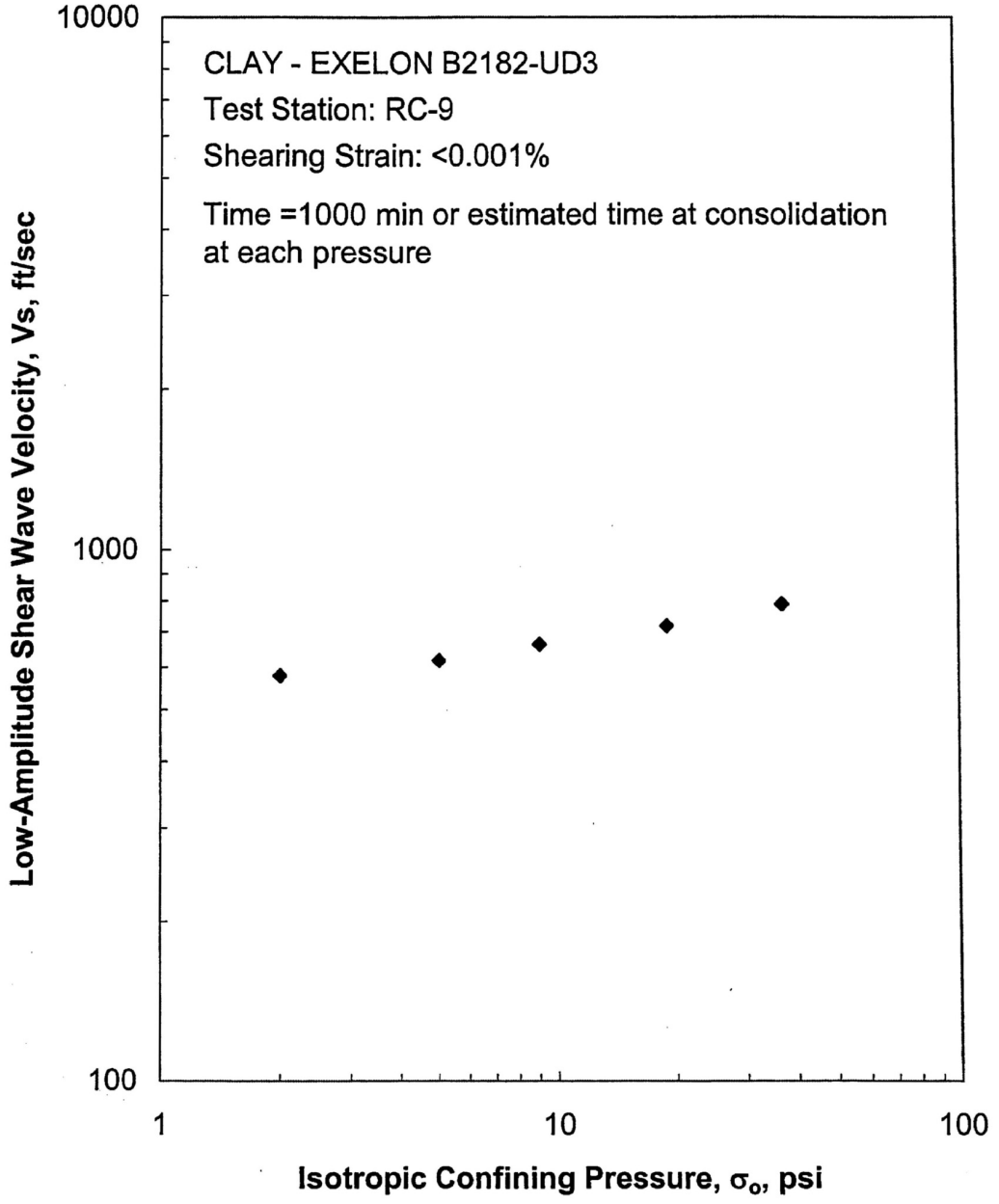

Figure B.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

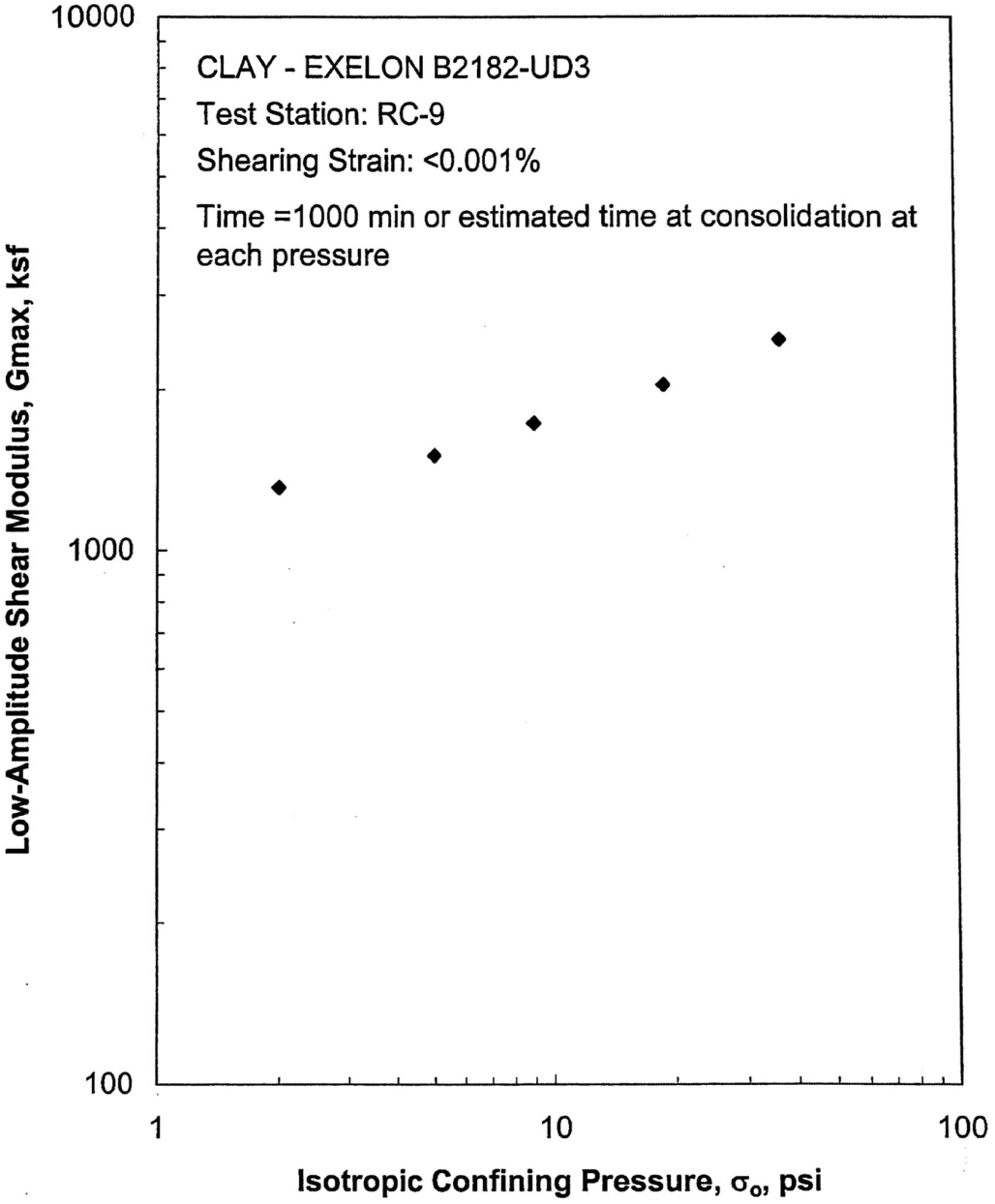

Figure B.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

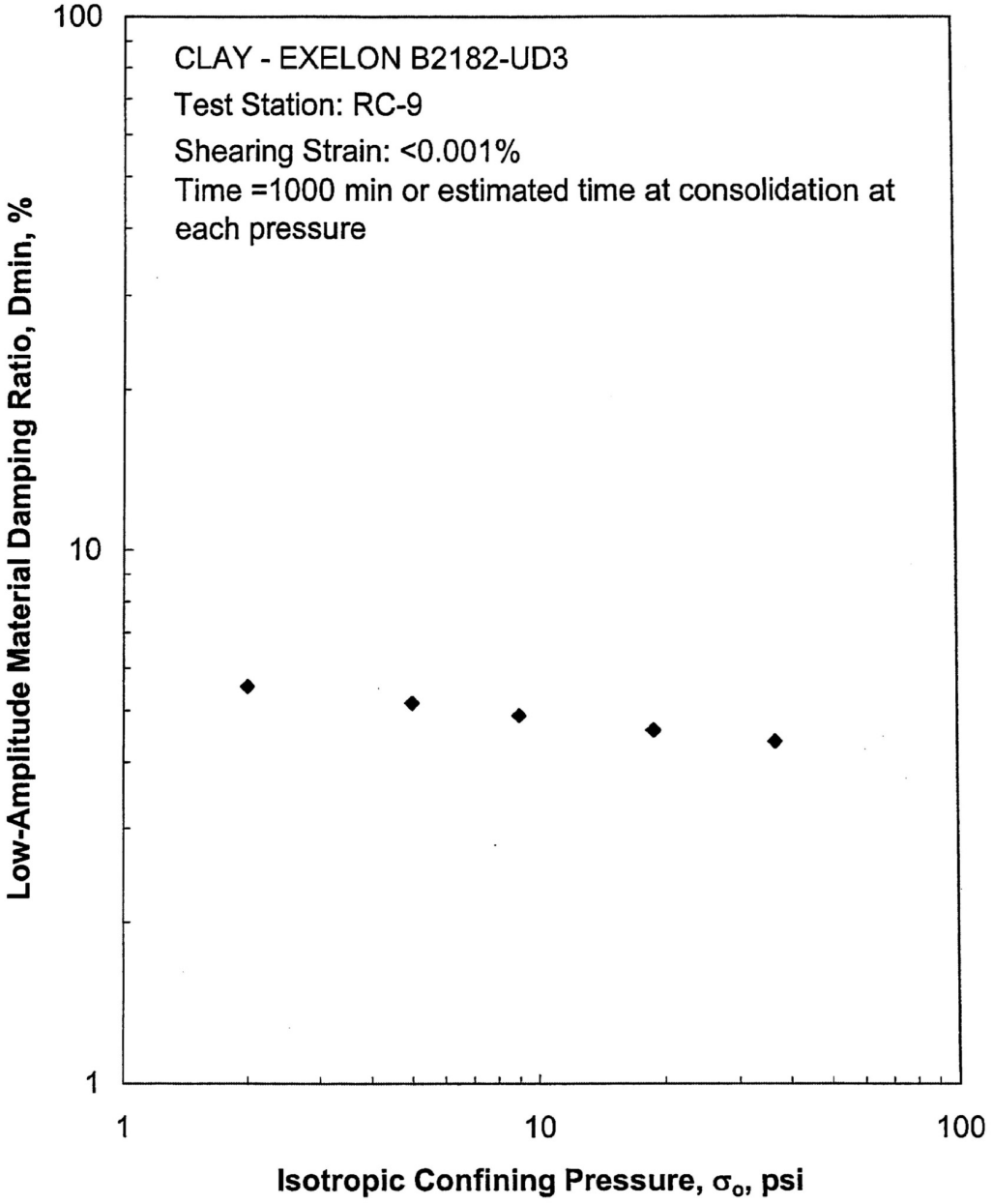

Figure B.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

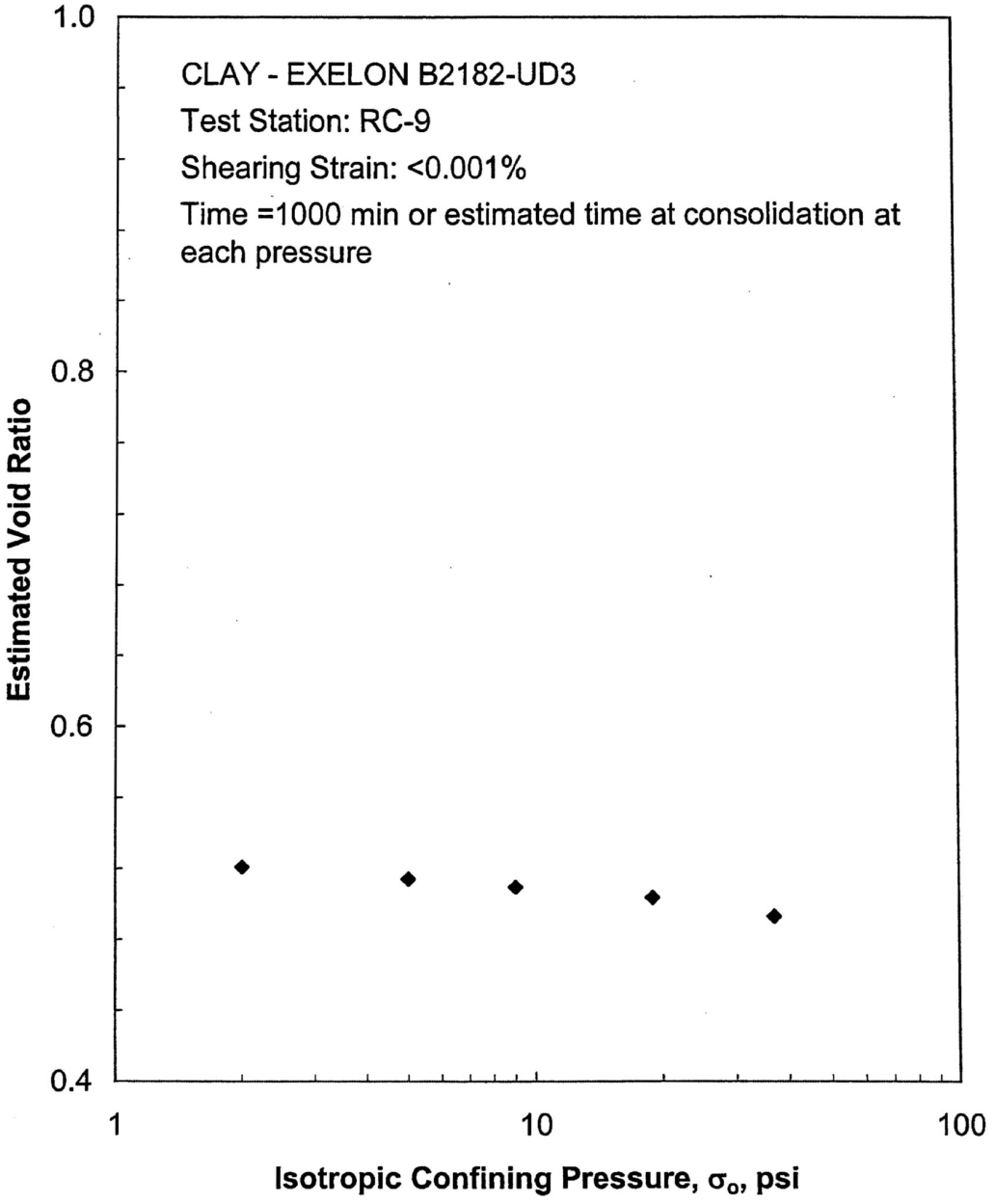

Figure B.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

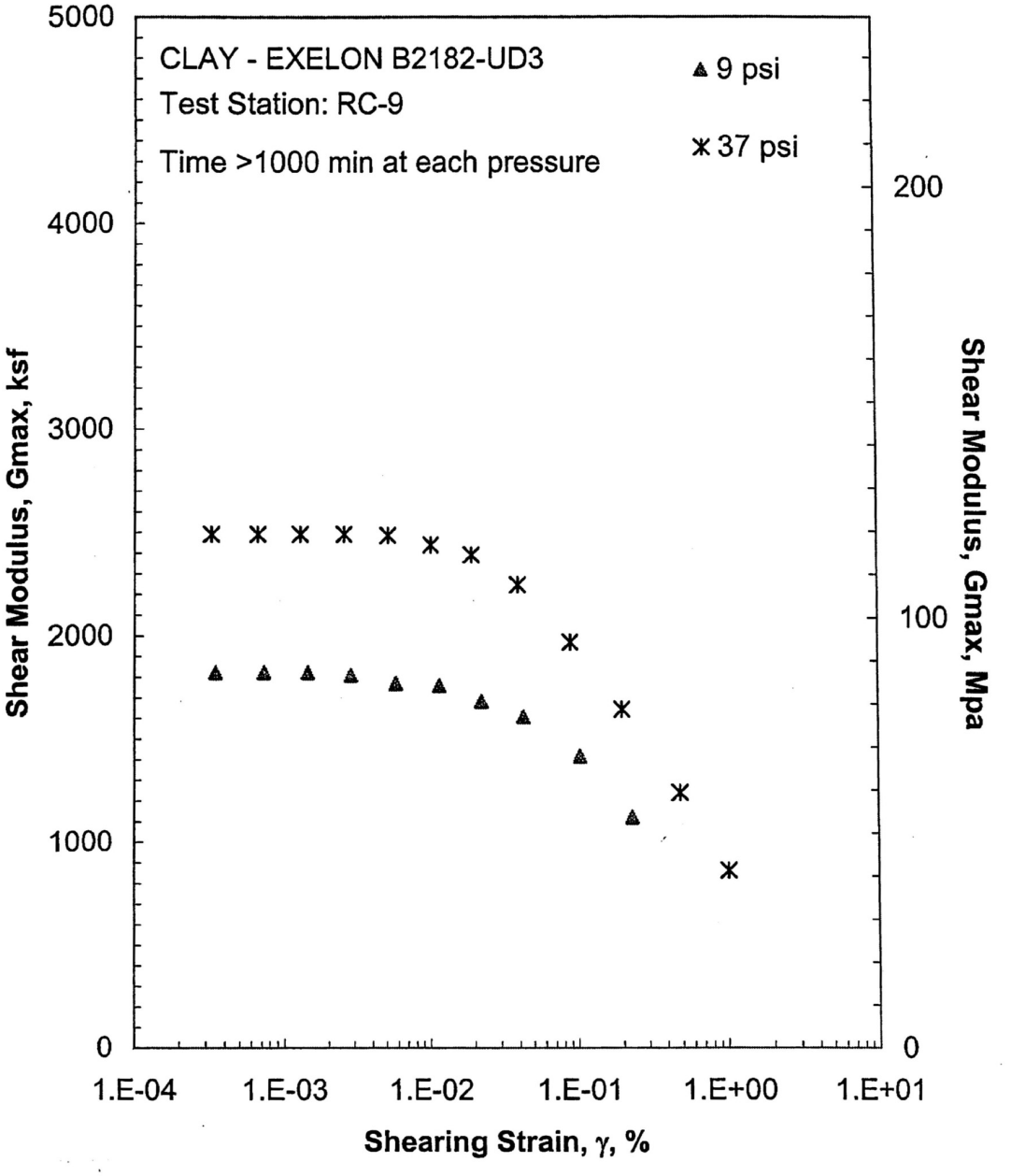

Figure B.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

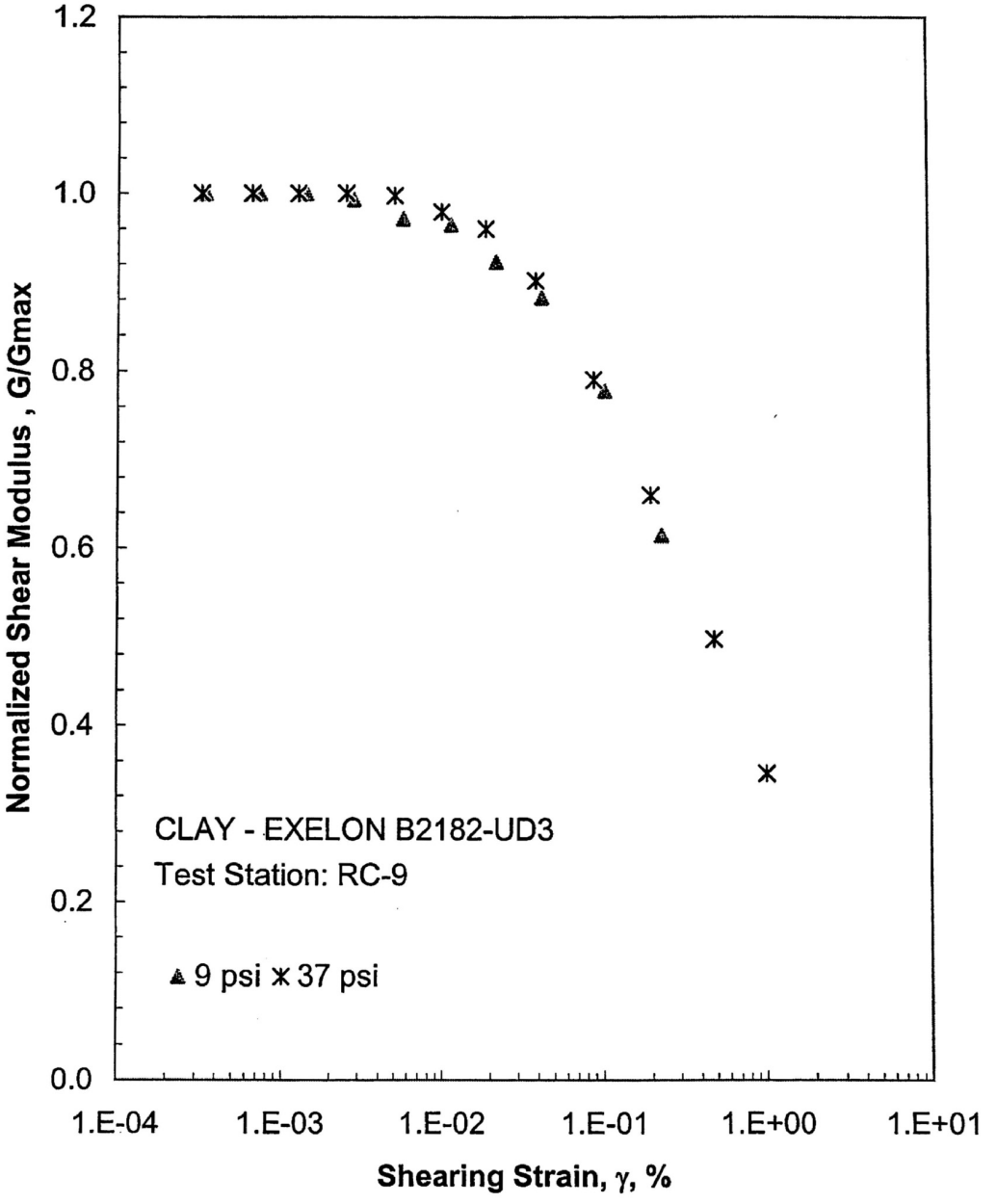

Figure B.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

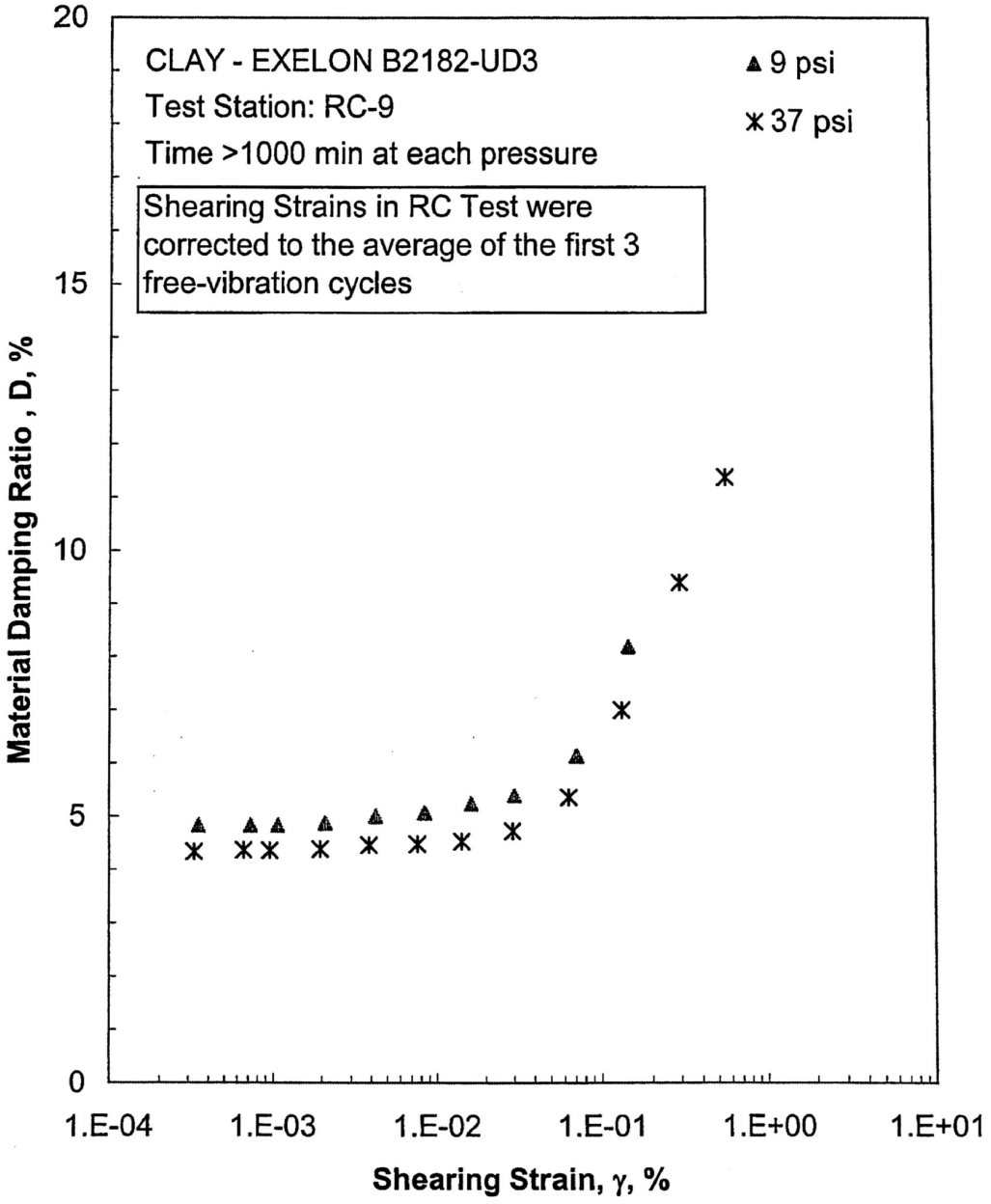

Figure B.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

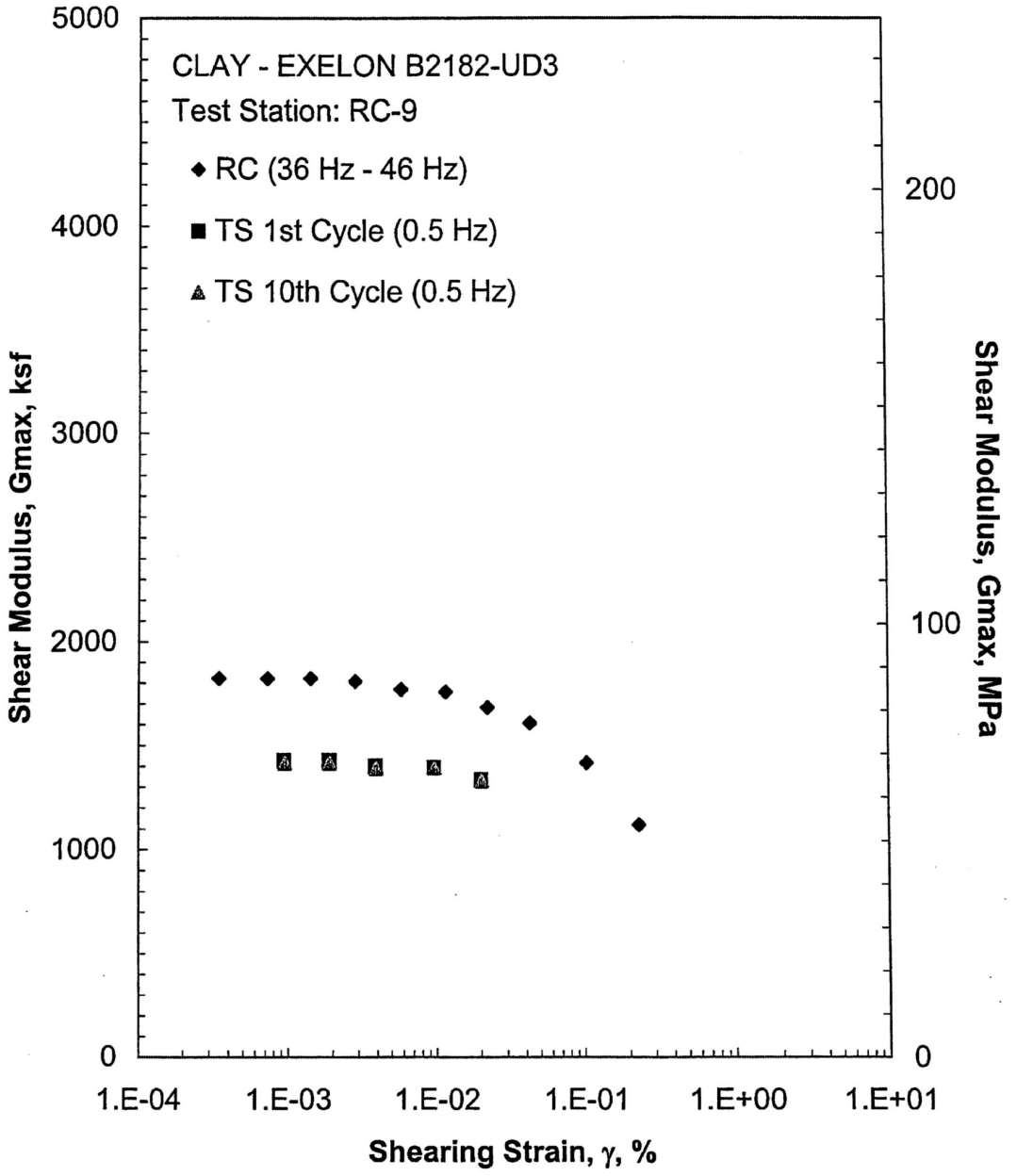

Figure B.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

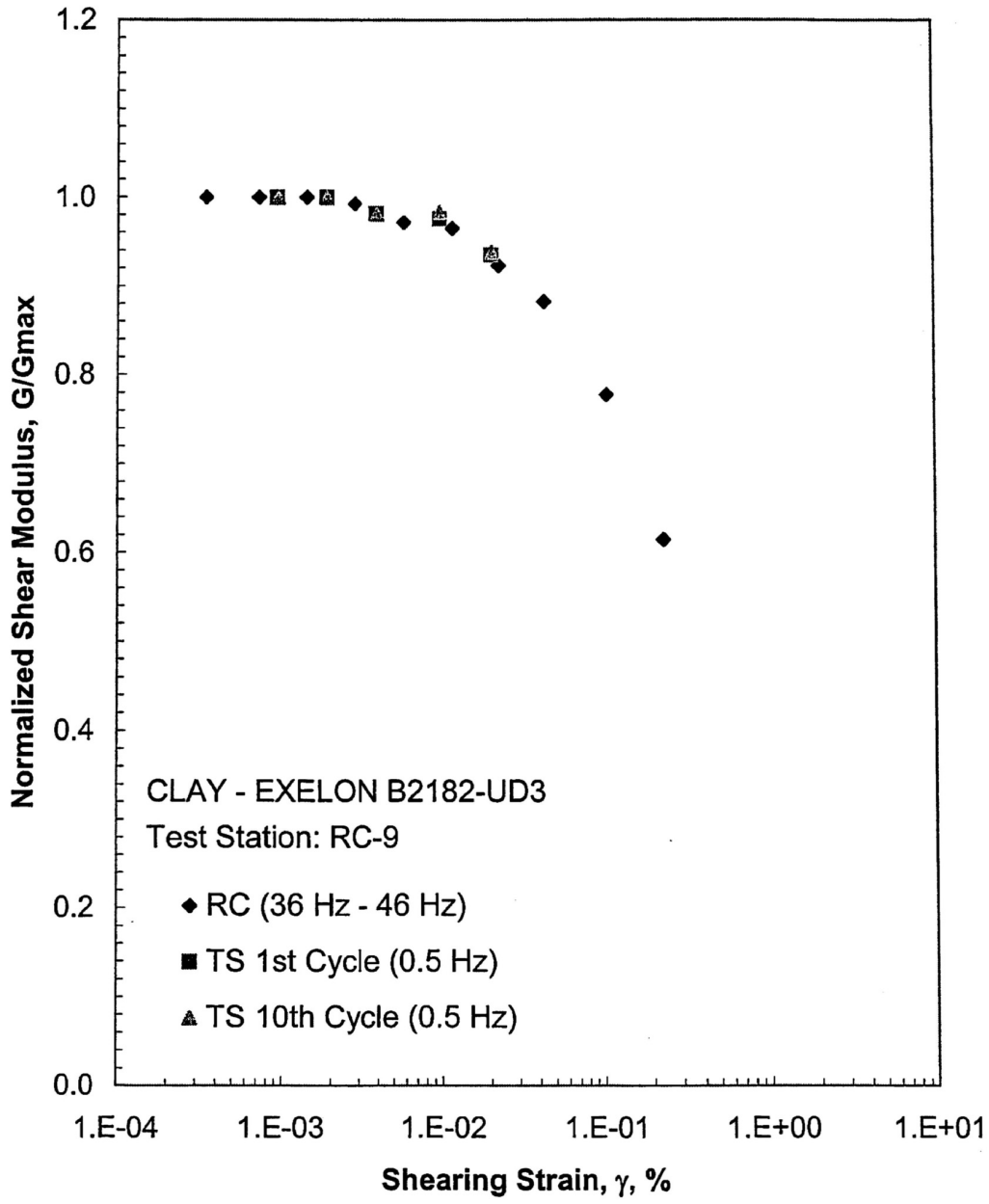

Figure B.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

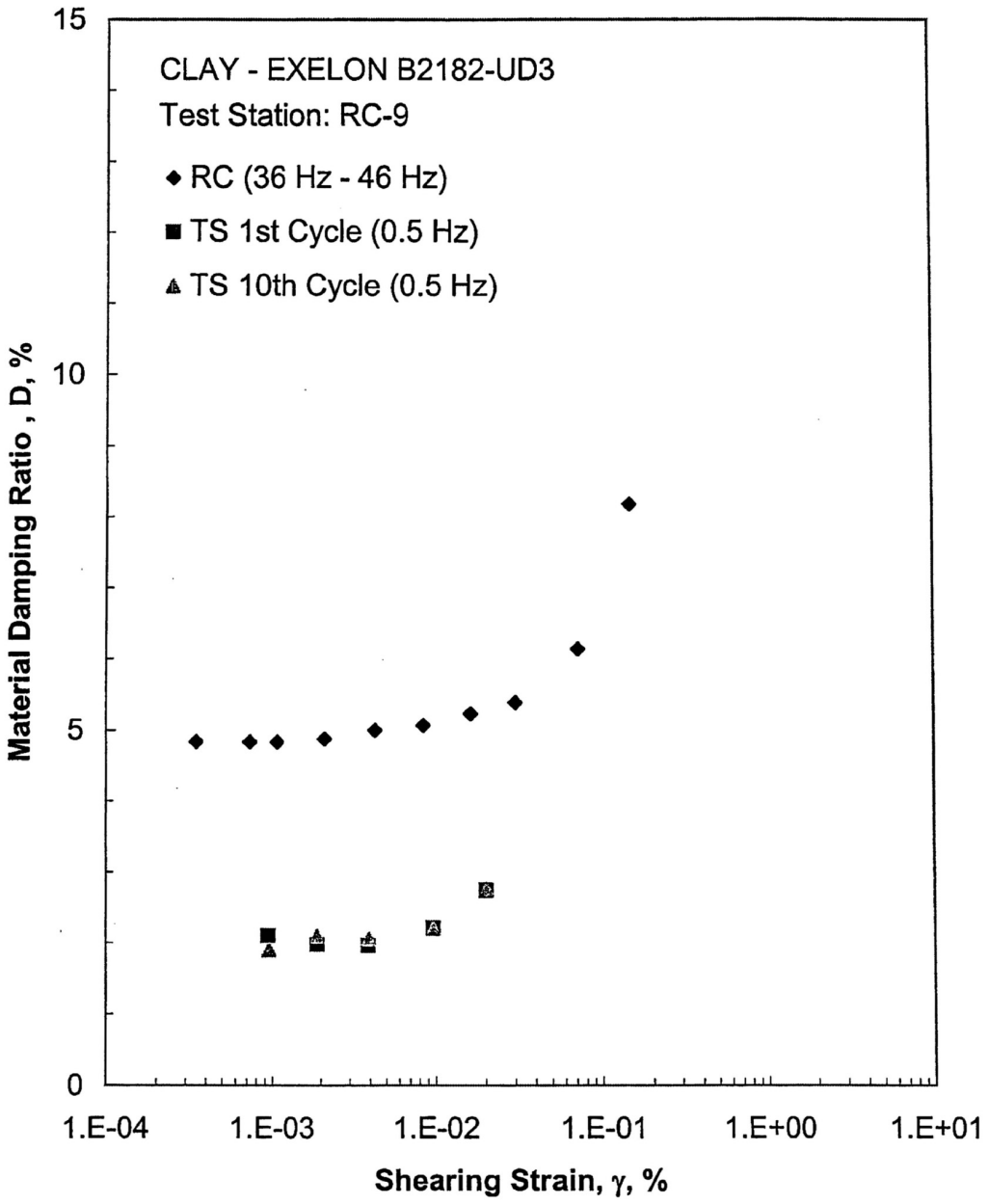

Figure B.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

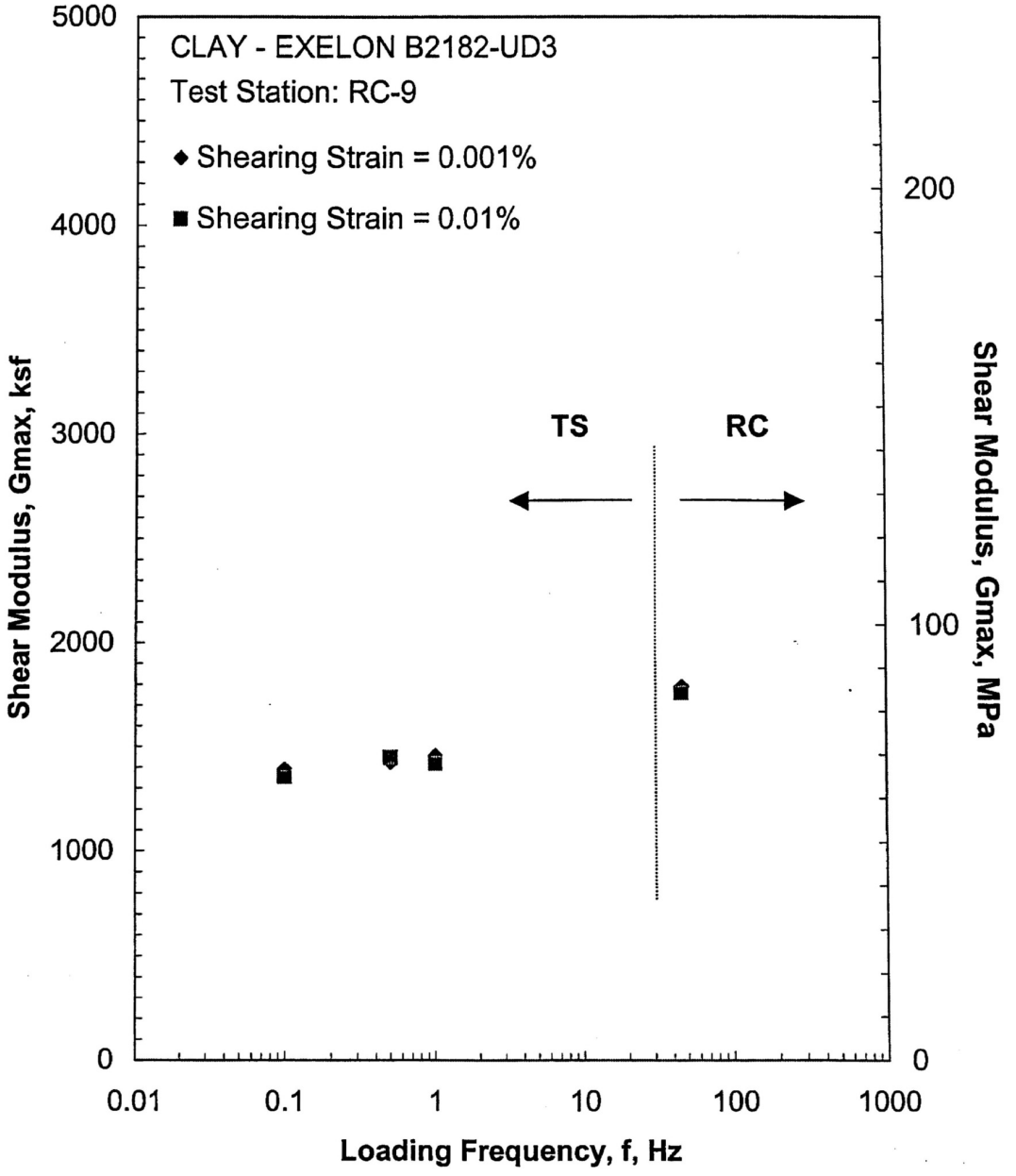

Figure B.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

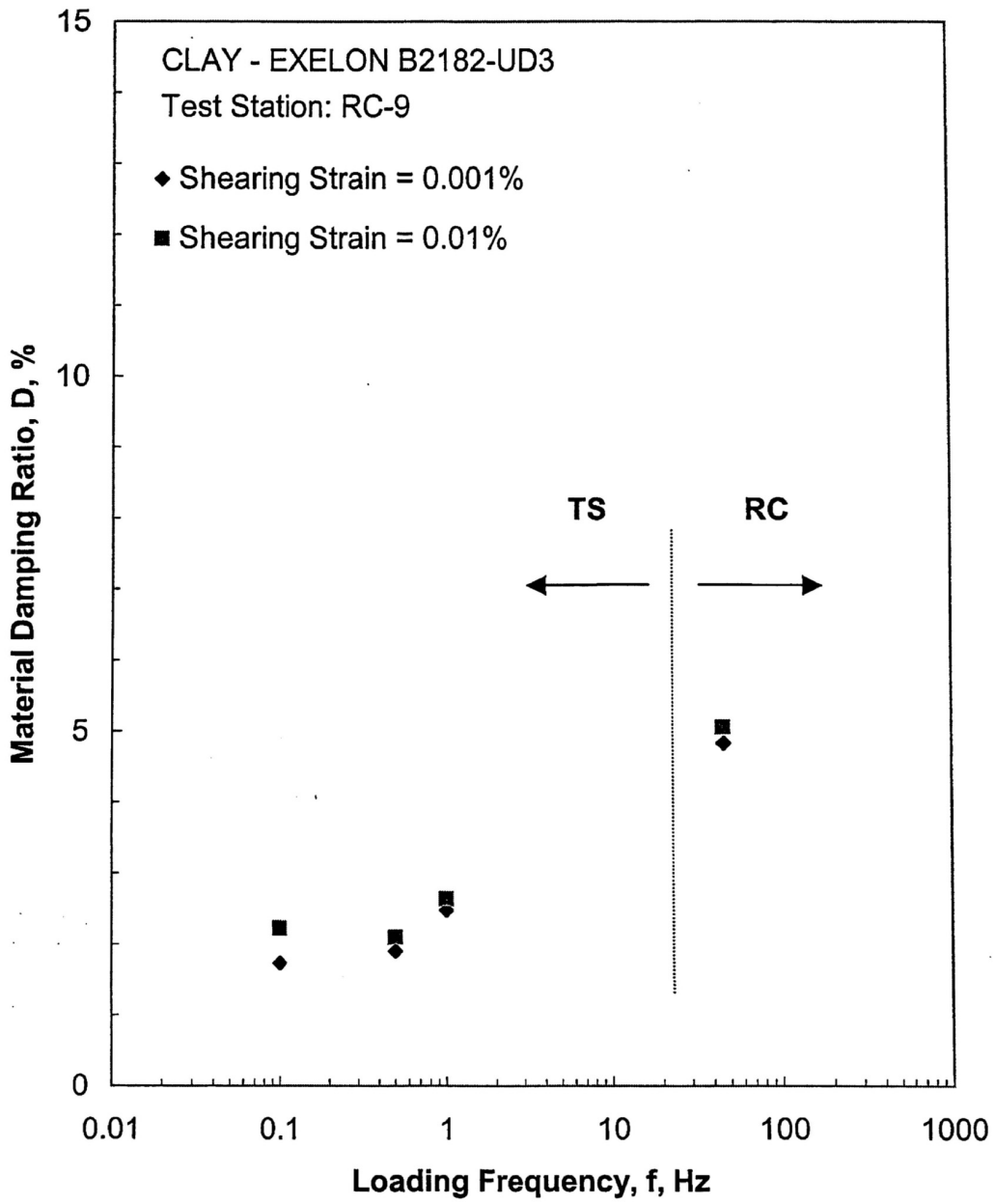

Figure B.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

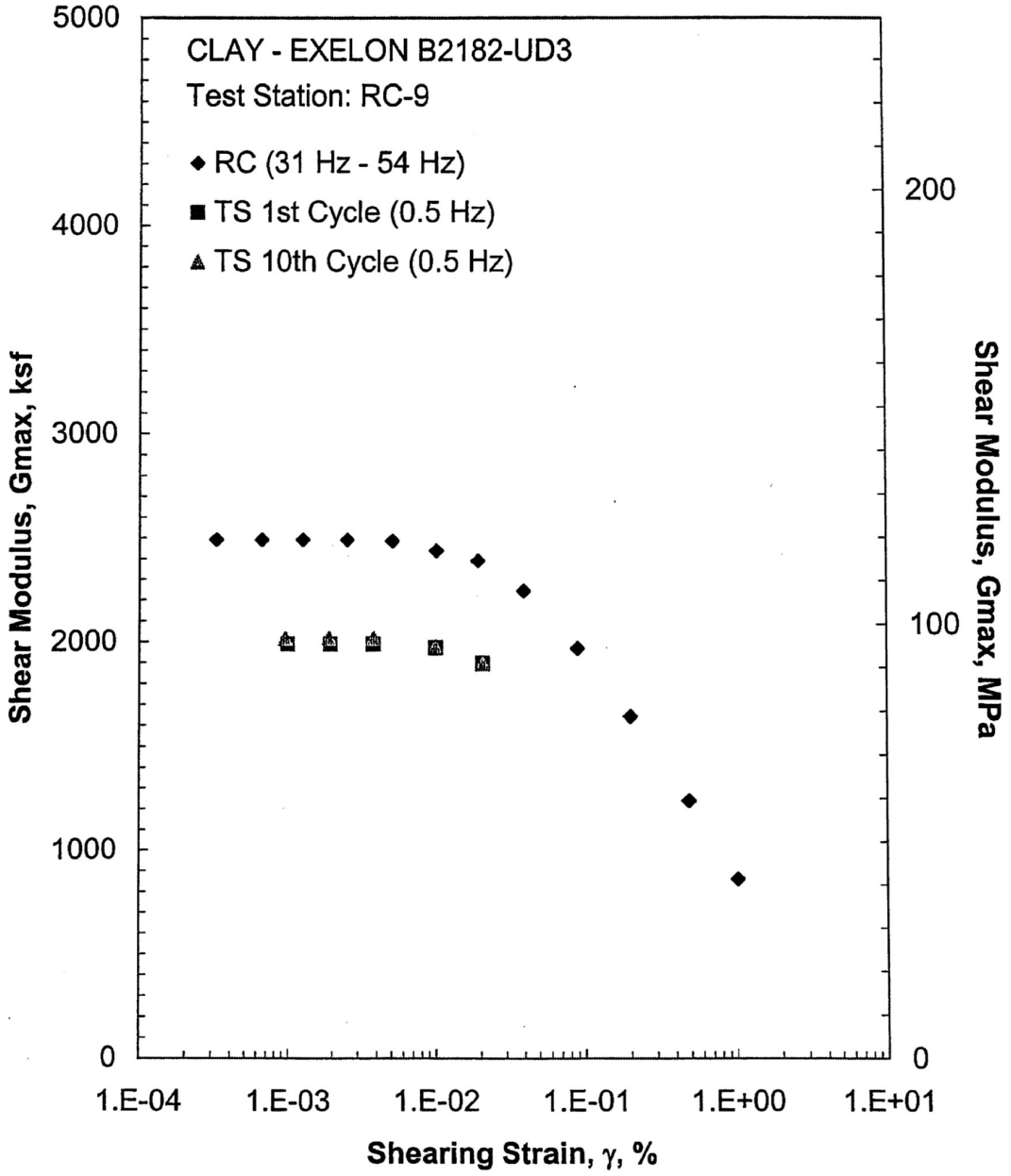

Figure B.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 37 psi from the Combined RCTS Tests

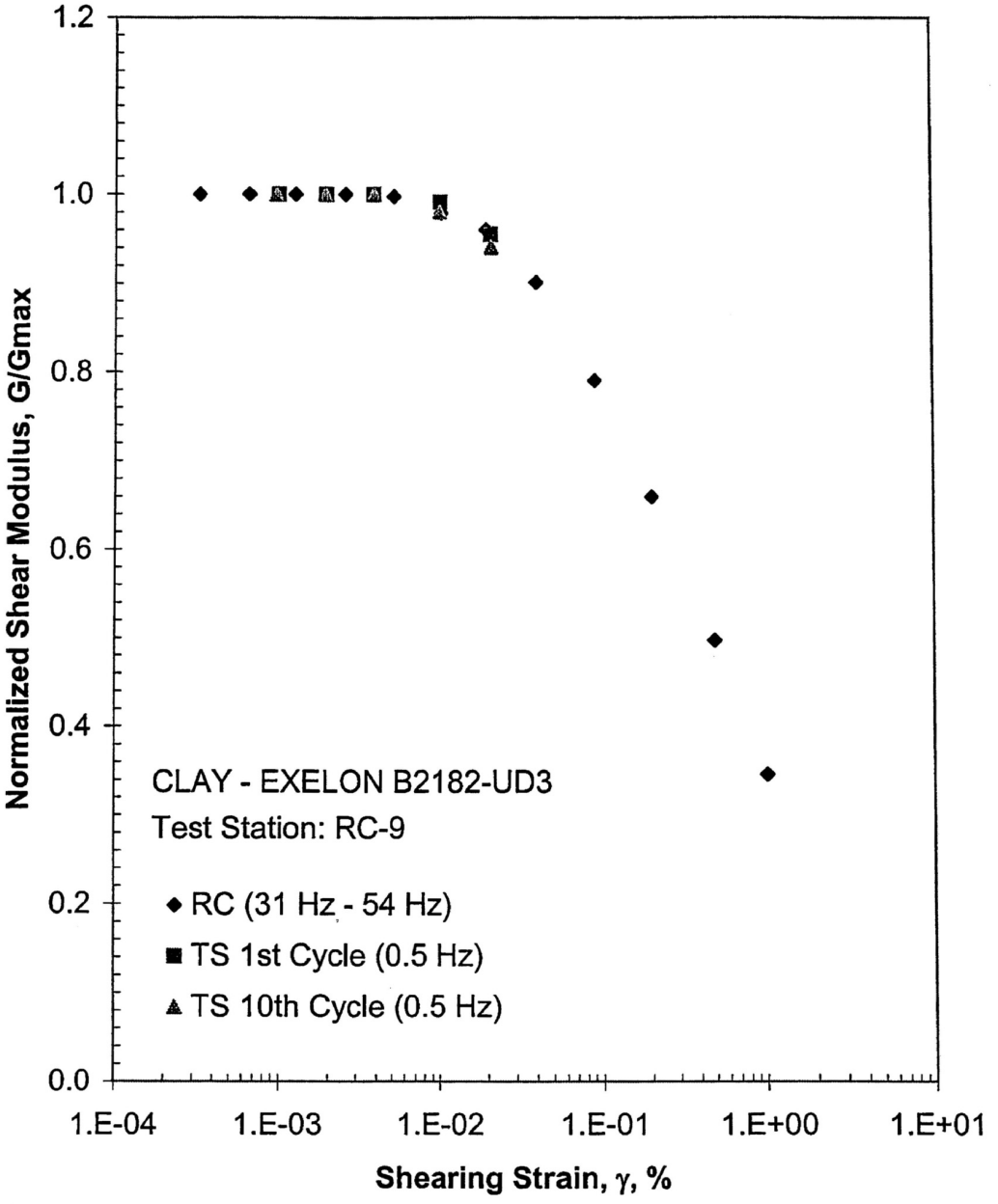

Figure B.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 37 psi from the Combined RCTS Tests

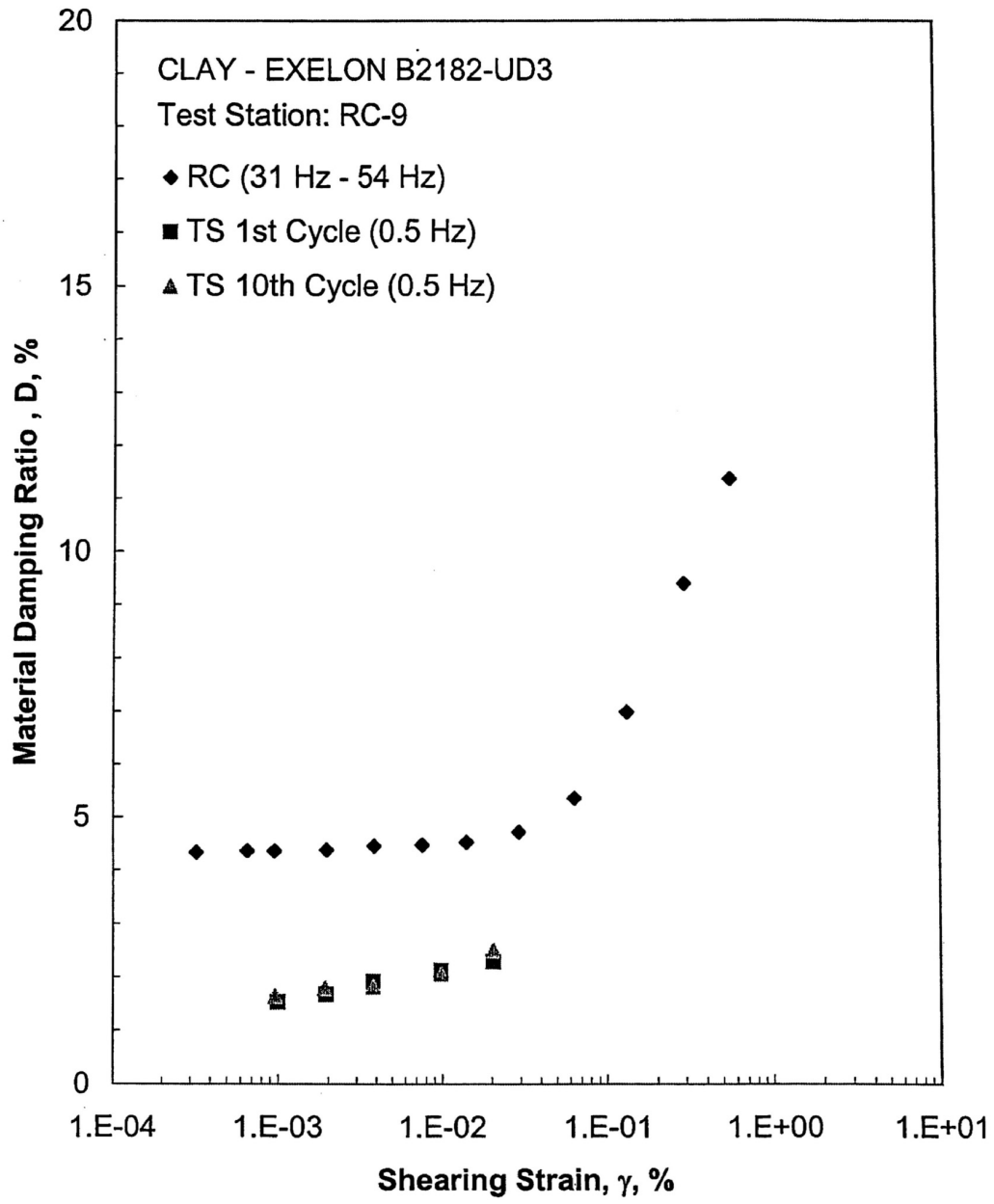

Figure B.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 37 psi from the Combined RCTS Tests

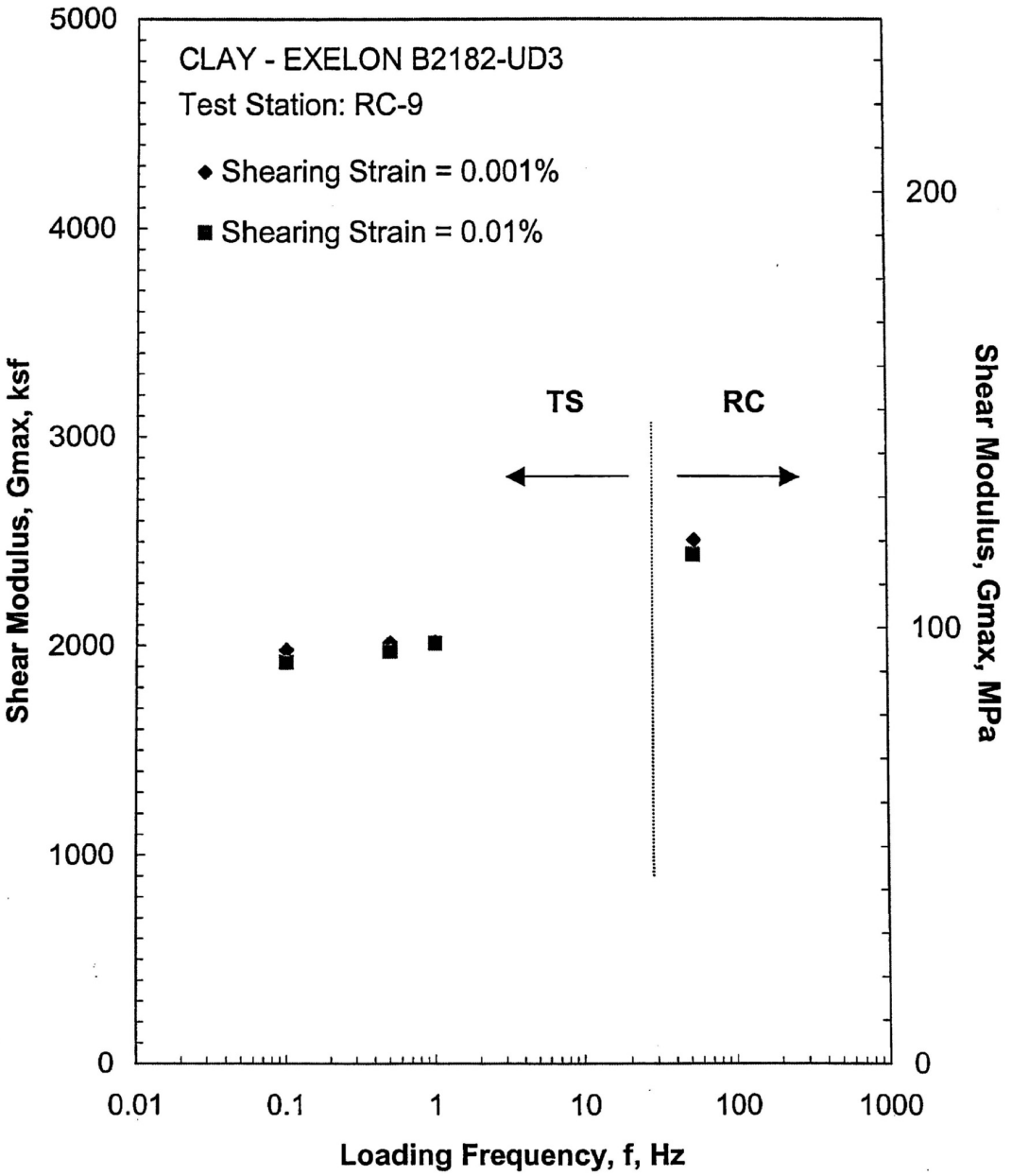

Figure B.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 37 psi from the Combined RCTS Tests

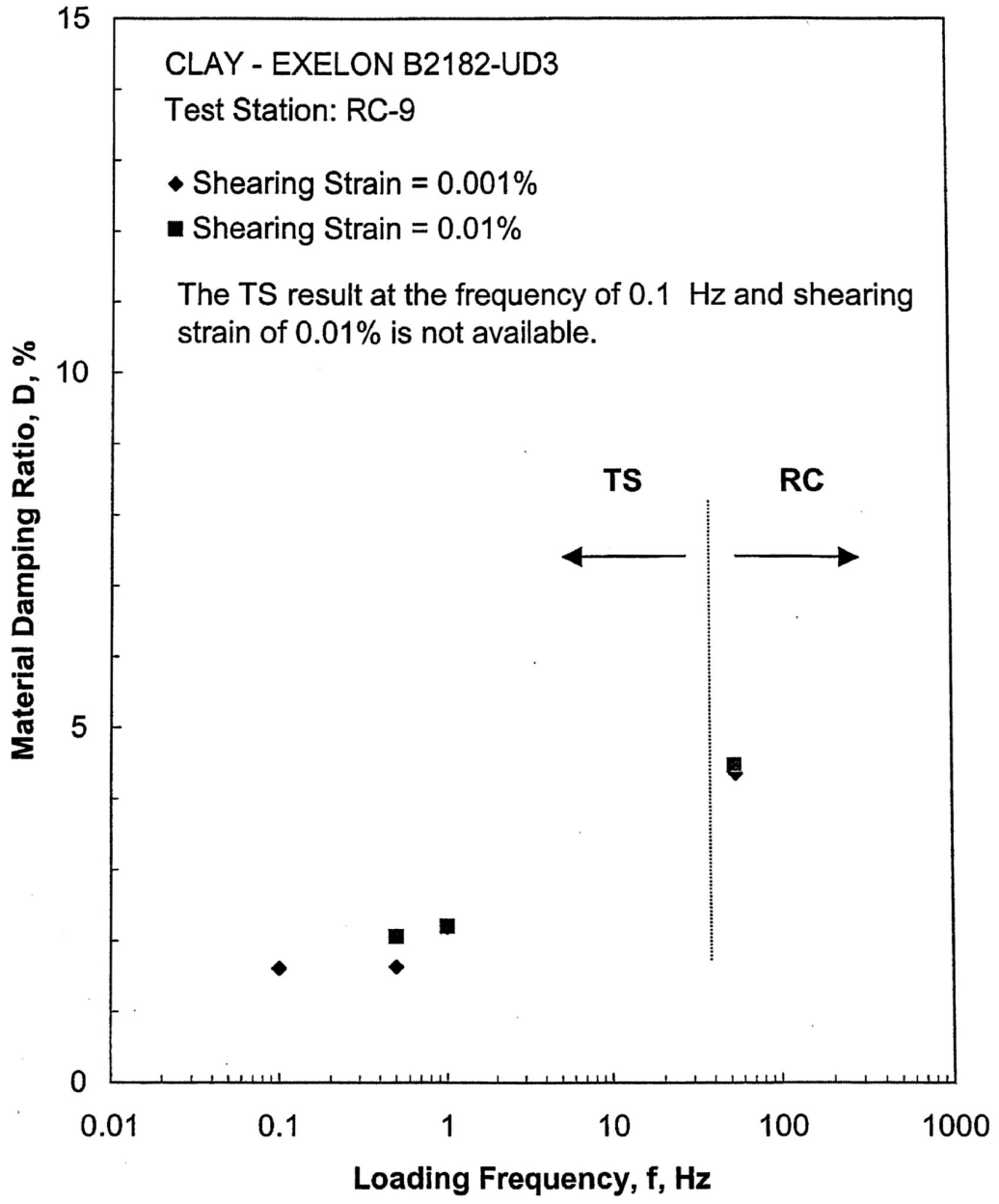

Figure B.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 37 psi from the Combined RCTS Tests

Table B.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen EXELON B2182-UD3

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
2	288	14	1311	63	579	5.55	0.52
5	720	34	1502	72	618	5.18	0.51
9	1296	62	1730	83	663	4.90	0.51
19	2736	131	2040	98	718	4.60	0.50
37	5328	255	2479	119	789	4.38	0.49

Table B.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON B2182-UD3; Isoptropic Confining Pressure, σ_o=9 psi (1.3 ksf = 62 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
3.47E-04	1823	1.00	3.47E-04	4.84
7.29E-04	1823	1.00	7.29E-04	4.83
1.43E-03	1823	1.00	1.07E-03	4.83
2.84E-03	1810	0.99	2.10E-03	4.88
5.76E-03	1771	0.97	4.26E-03	5.00
1.15E-02	1759	0.96	8.40E-03	5.07
2.22E-02	1682	0.92	1.62E-02	5.23
4.24E-02	1608	0.88	3.01E-02	5.39
1.04E-01	1418	0.78	7.14E-02	6.14
2.32E-01	1120	0.61	1.46E-01	8.18

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table B.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen EXELON B2182-UD3; Isotropic Confining Pressure, σ_o= 9 psi (1.3 ksf =62 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
9.42E-04	1429	1.00	2.10	9.56E-04	1418	1.00	1.90
1.89E-03	1429	1.00	1.98	1.90E-03	1418	1.00	2.09
3.89E-03	1403	0.98	1.96	3.92E-03	1391	0.98	2.06
9.60E-03	1395	0.98	2.21	9.61E-03	1393	0.98	2.21
2.00E-02	1336	0.93	2.74	2.01E-02	1330	0.94	2.76

Table B.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON B2182-UD3; Isoptropic Confining Pressure, σ_o= 37 psi (5.3 ksf = 255 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
3.26E-04	2492	1.00	3.26E-04	4.34
6.60E-04	2492	1.00	6.60E-04	4.37
1.27E-03	2492	1.00	9.53E-04	4.36
2.55E-03	2492	1.00	1.96E-03	4.38
5.10E-03	2486	1.00	3.87E-03	4.46
1.00E-02	2440	0.98	7.61E-03	4.48
1.91E-02	2392	0.96	1.41E-02	4.53
3.91E-02	2246	0.90	2.93E-02	4.73
8.87E-02	1969	0.79	6.39E-02	5.36
1.99E-01	1643	0.66	1.33E-01	6.99
4.90E-01	1239	0.50	2.99E-01	9.40
1.01E+00	862	0.35	5.68E-01	11.37

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table B.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen EXELON B2182-UD3; Isotropic Confining Pressure, σ_o=37 psi (5.3 ksf = 255 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.00E-03	1989	1.00	1.53	9.68E-04	2015	1.00	1.63
1.95E-03	1989	1.00	1.67	1.92E-03	2015	1.00	1.79
3.83E-03	1989	1.00	1.91	3.83E-03	2015	1.00	1.82
9.89E-03	1972	0.99	2.11	9.87E-03	1976	0.98	2.06
2.05E-02	1900	0.95	2.29	2.06E-02	1896	0.94	2.49

APPENDIX C

Specimen B2182-UD32
(Index Properties Not Available)

Borehole B2182
Sample UD32
Depth = 352.7 ft (107.5 m)
Total Unit Weight = 126.8 lb/ft^3
Water Content = 21.1 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 116 psi

FUGRO JOB #: 0401-1686
Testing Station: RC7

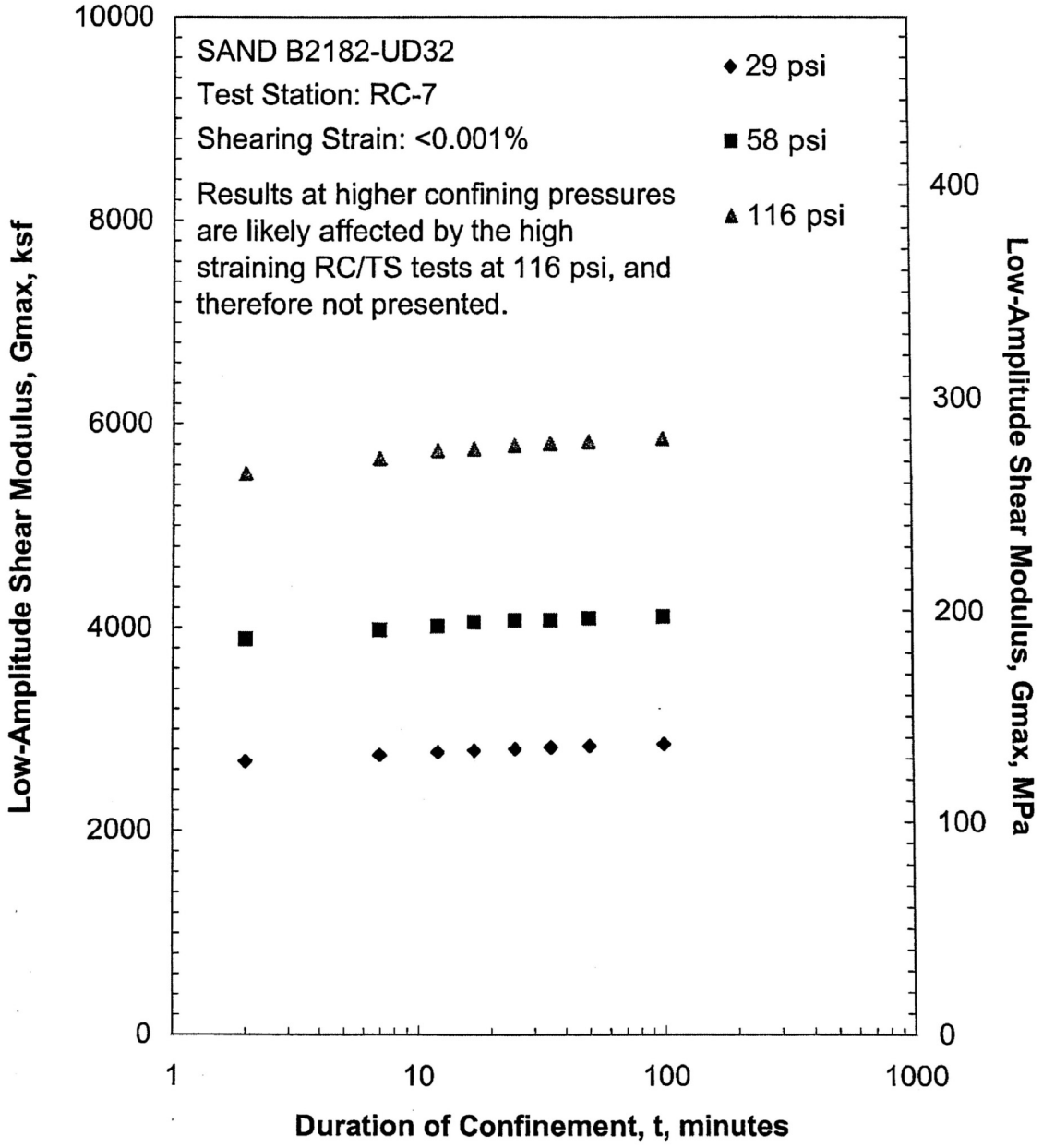

Figure C.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

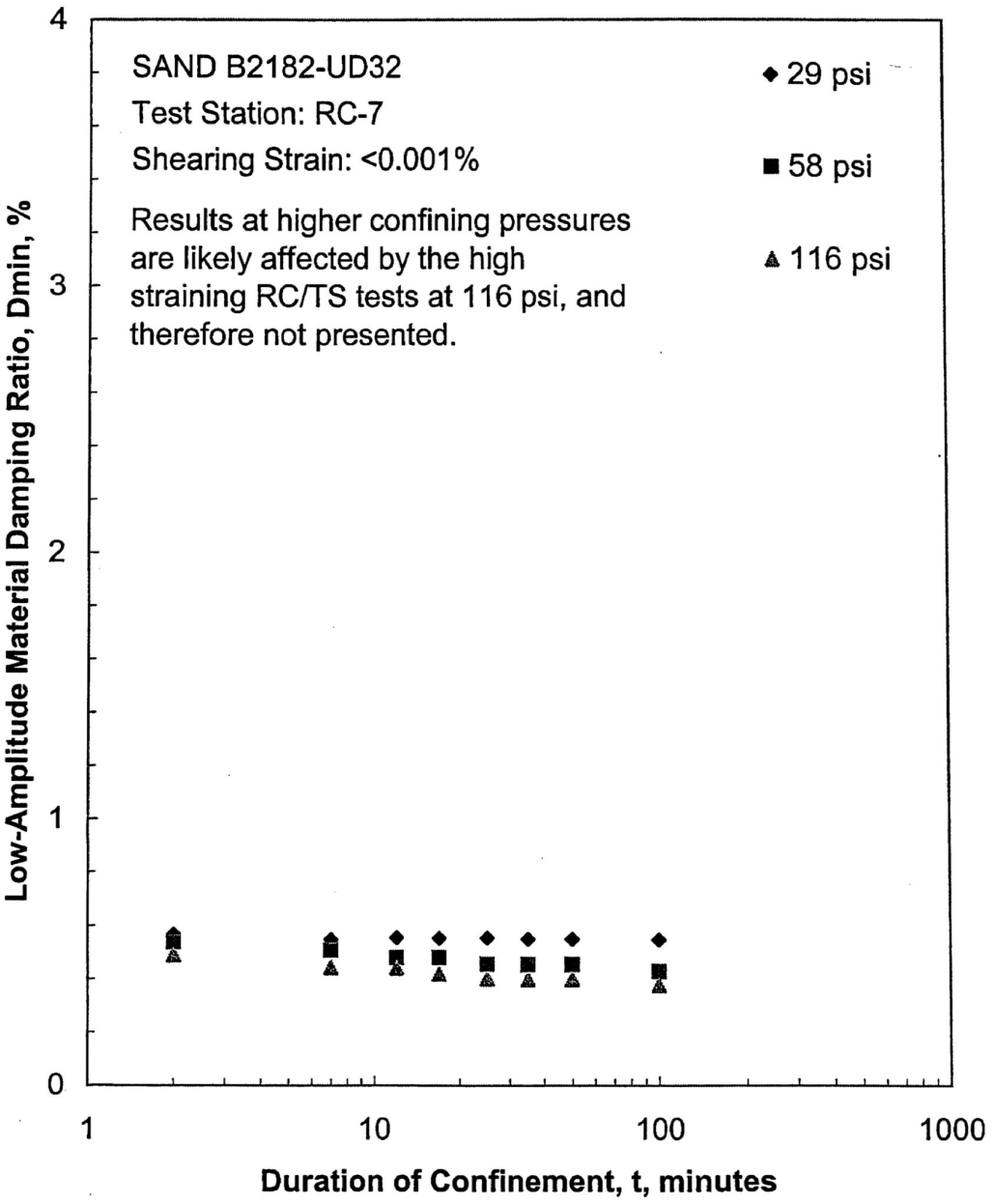

Figure C.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

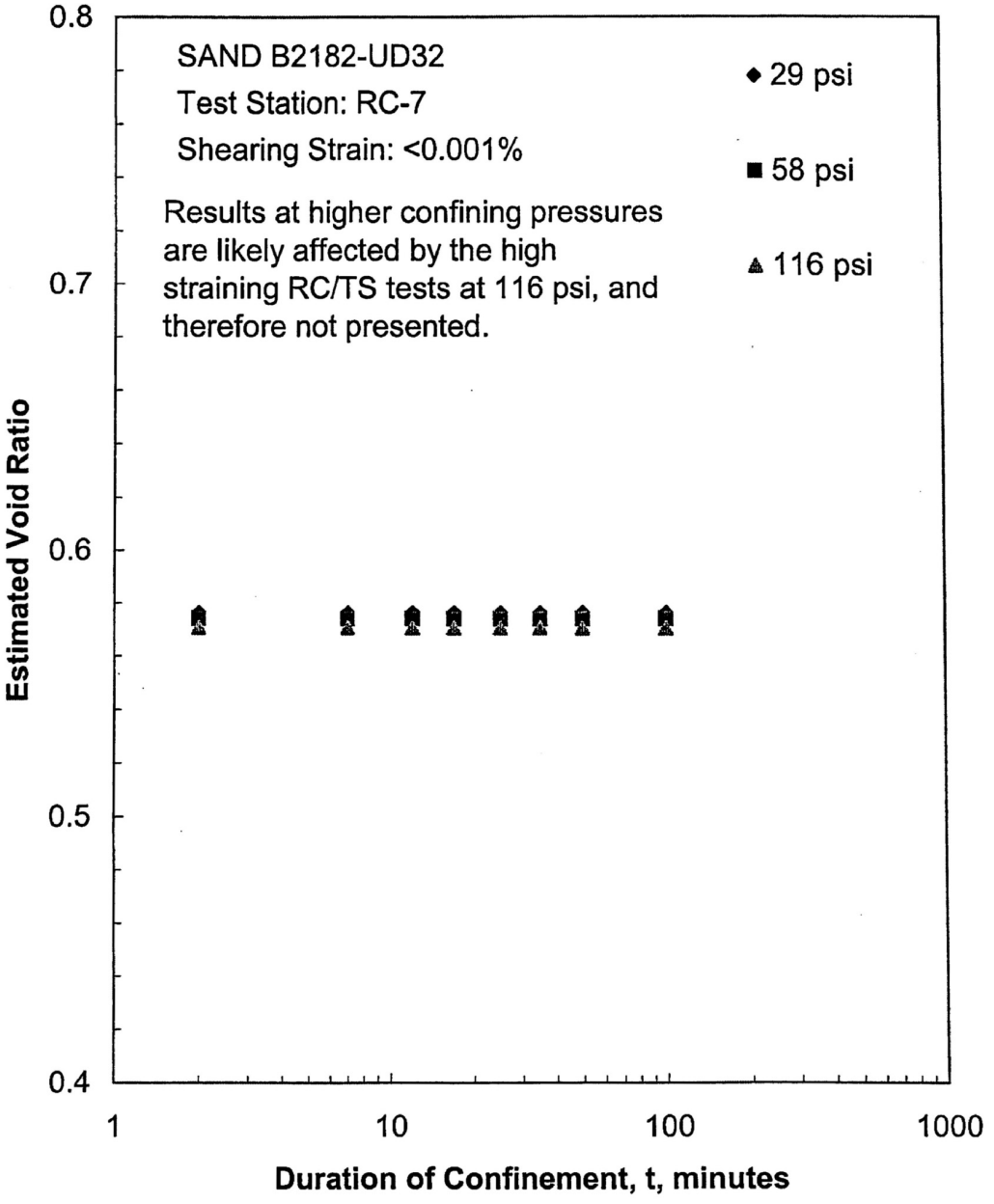

Figure C.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

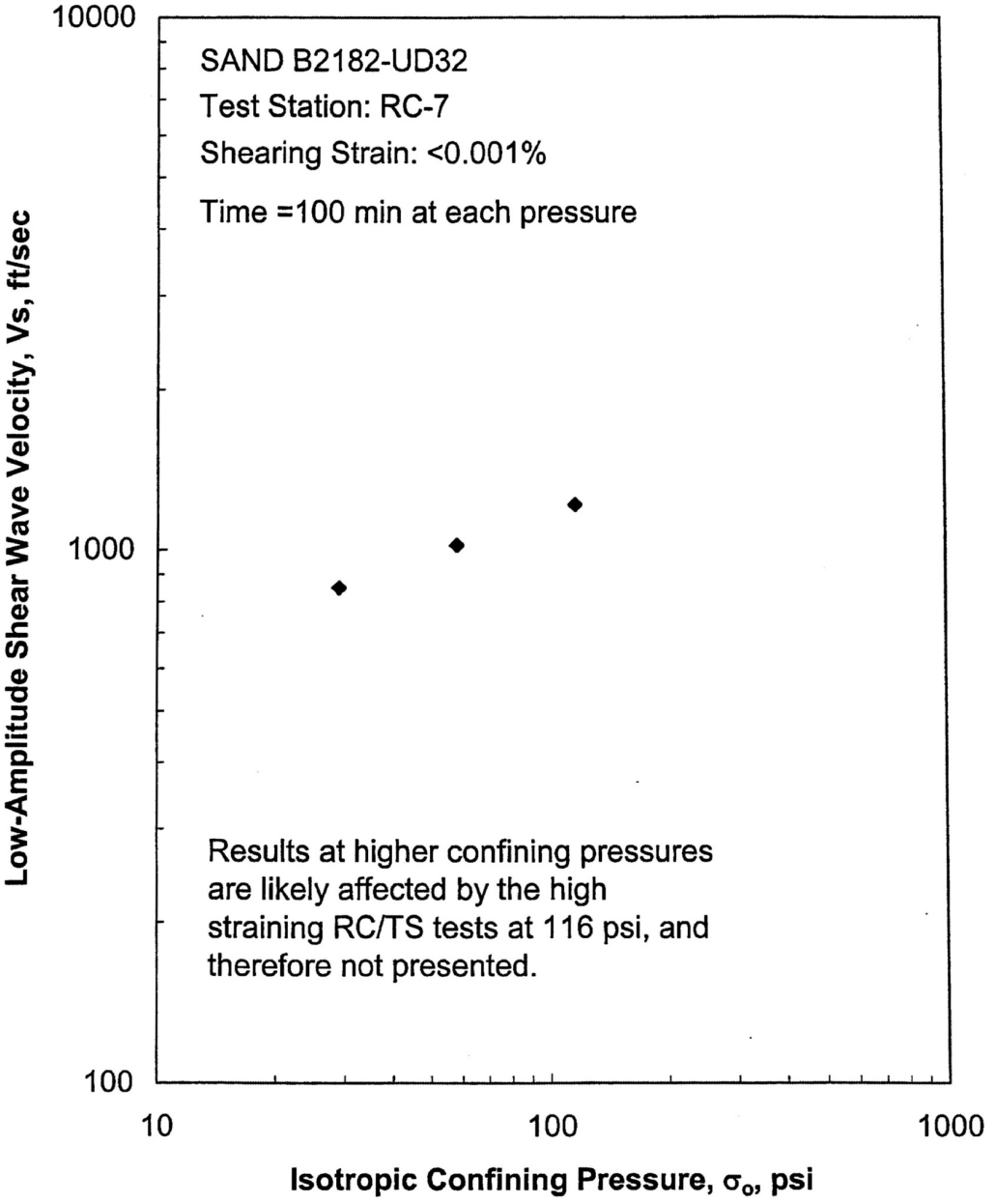

Figure C.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

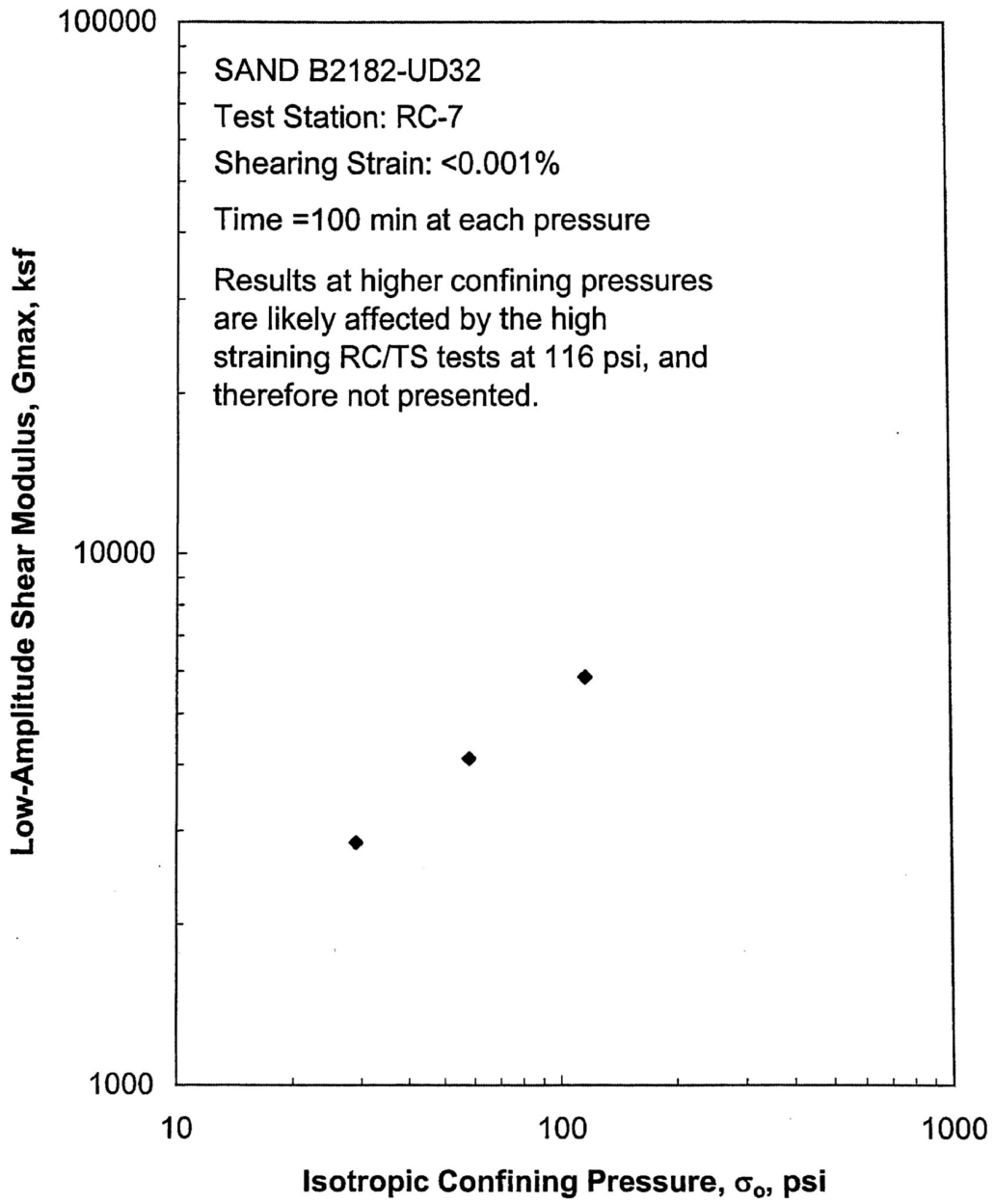

Figure C.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

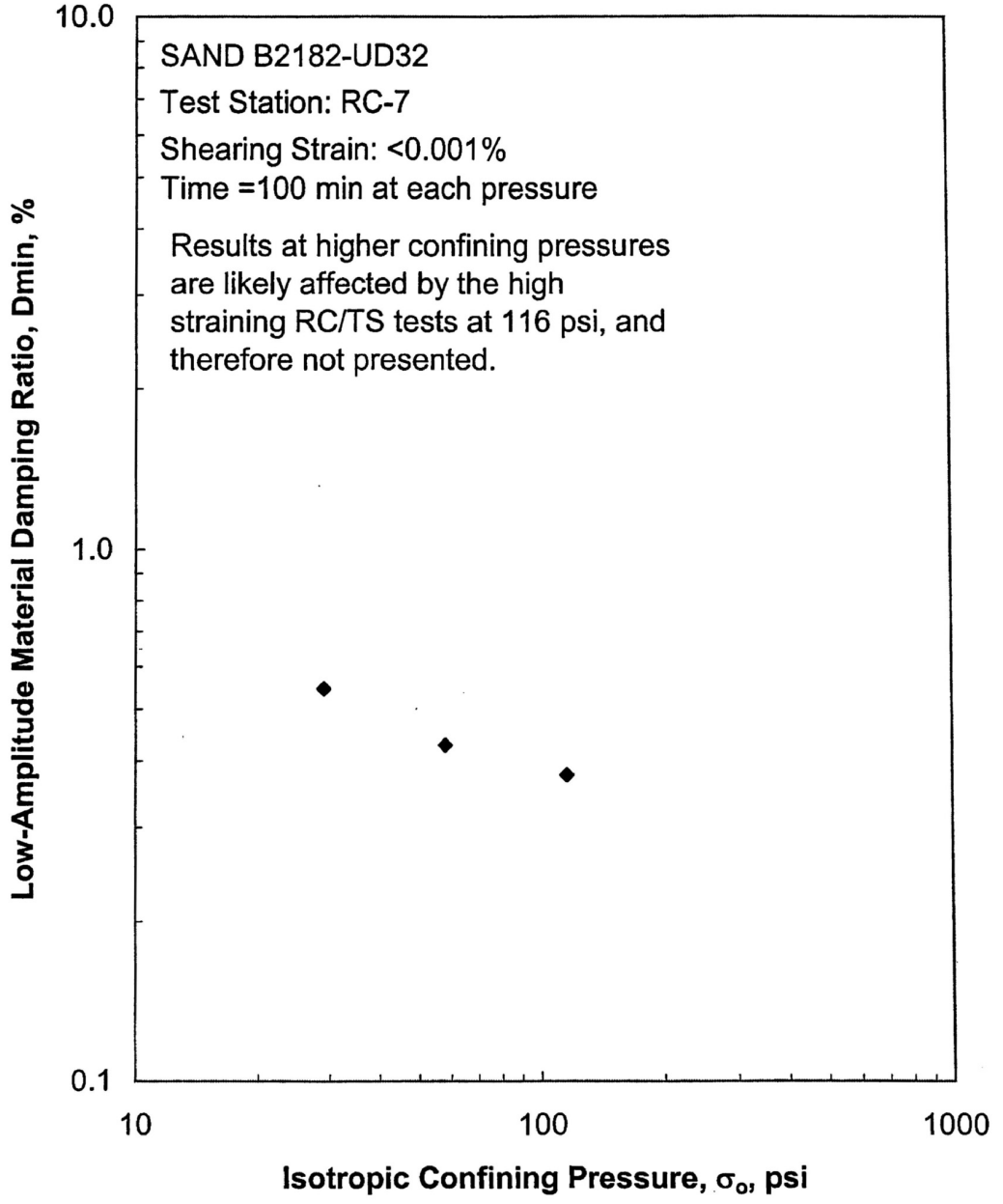

Figure C.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

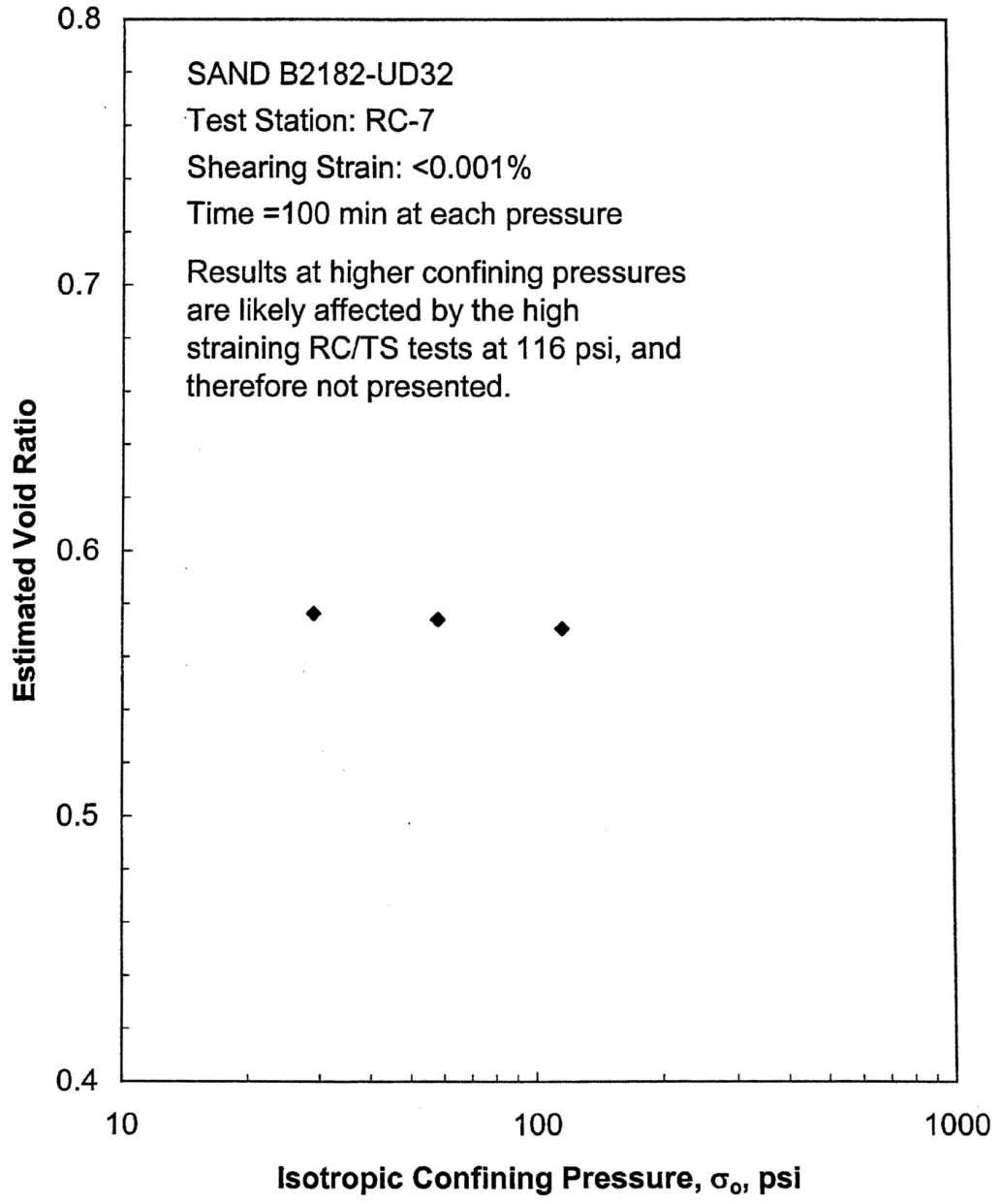

Figure C.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

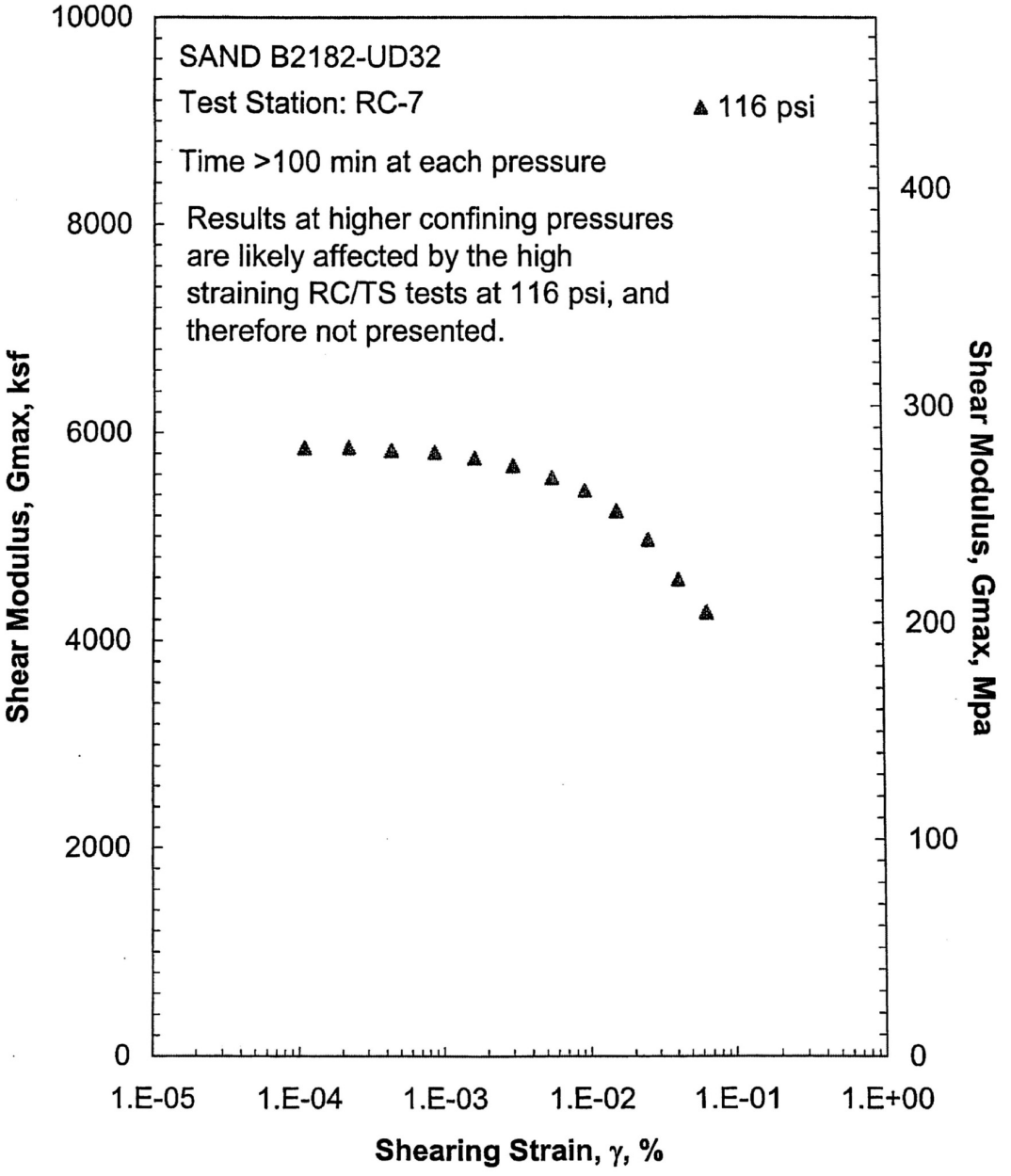

Figure C.8 Variation in Shear Modulus with Shearing Strain at An Isotropic Confining Pressure of 116 psi from the Resonant Column Tests

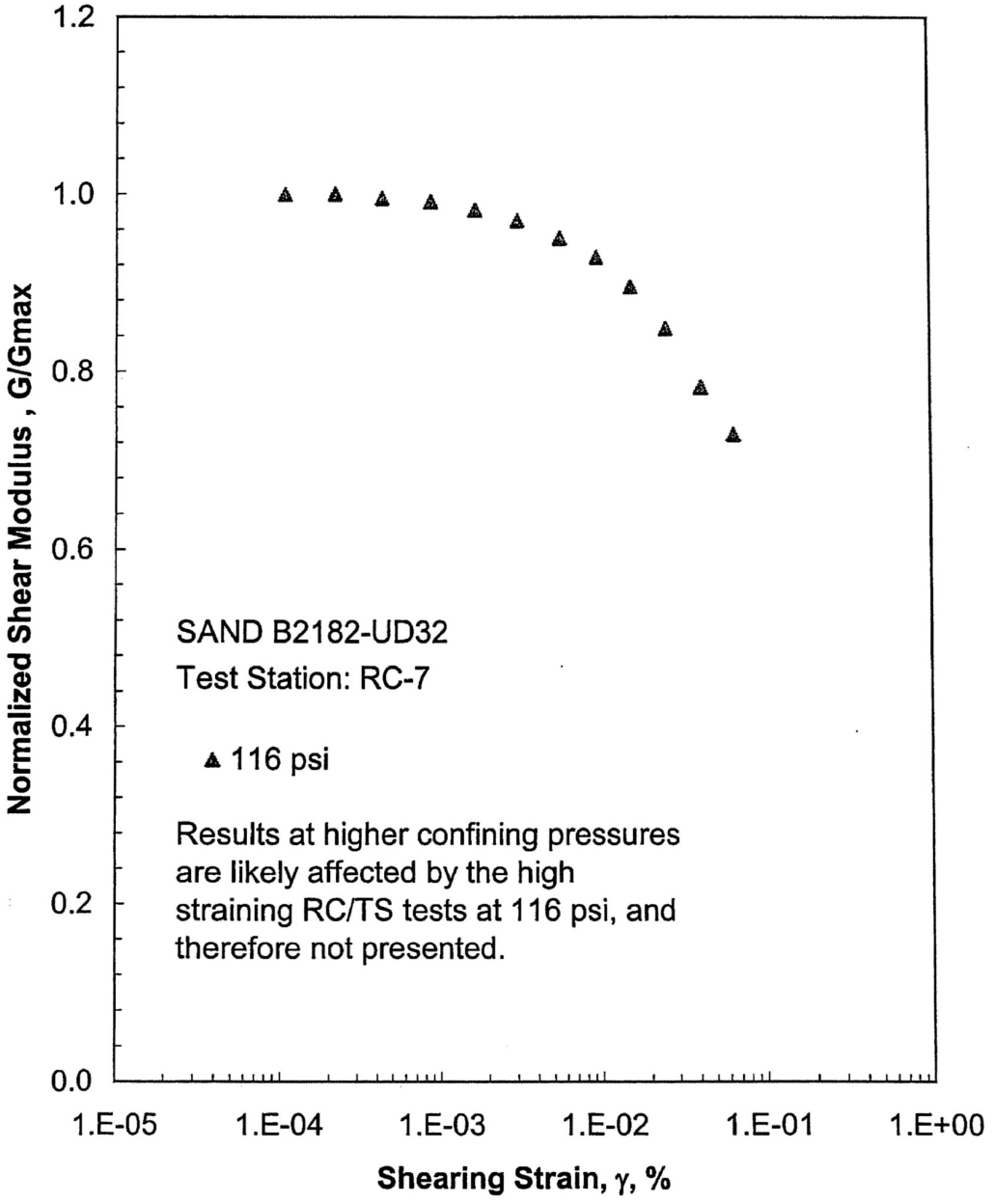

Figure C.9 Variation in Normalized Shear Modulus with Shearing Strain at An Isotropic Confining Pressure of 116 psi from the Resonant Column Tests

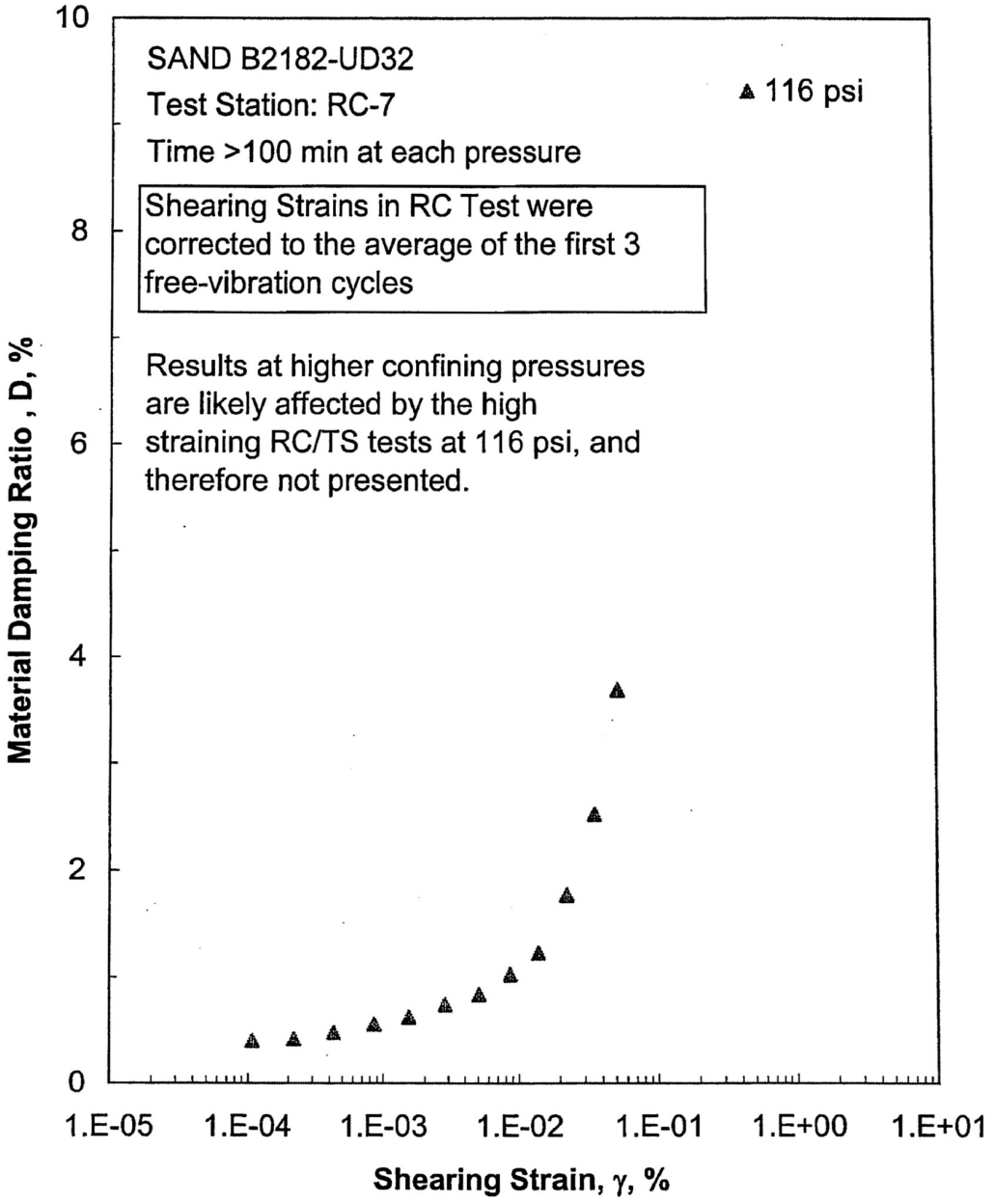

Figure C.10 Variation in Material Damping Ratio with Shearing Strain at An Isotropic Confining Pressure of 116 psi from the Resonant Column Tests

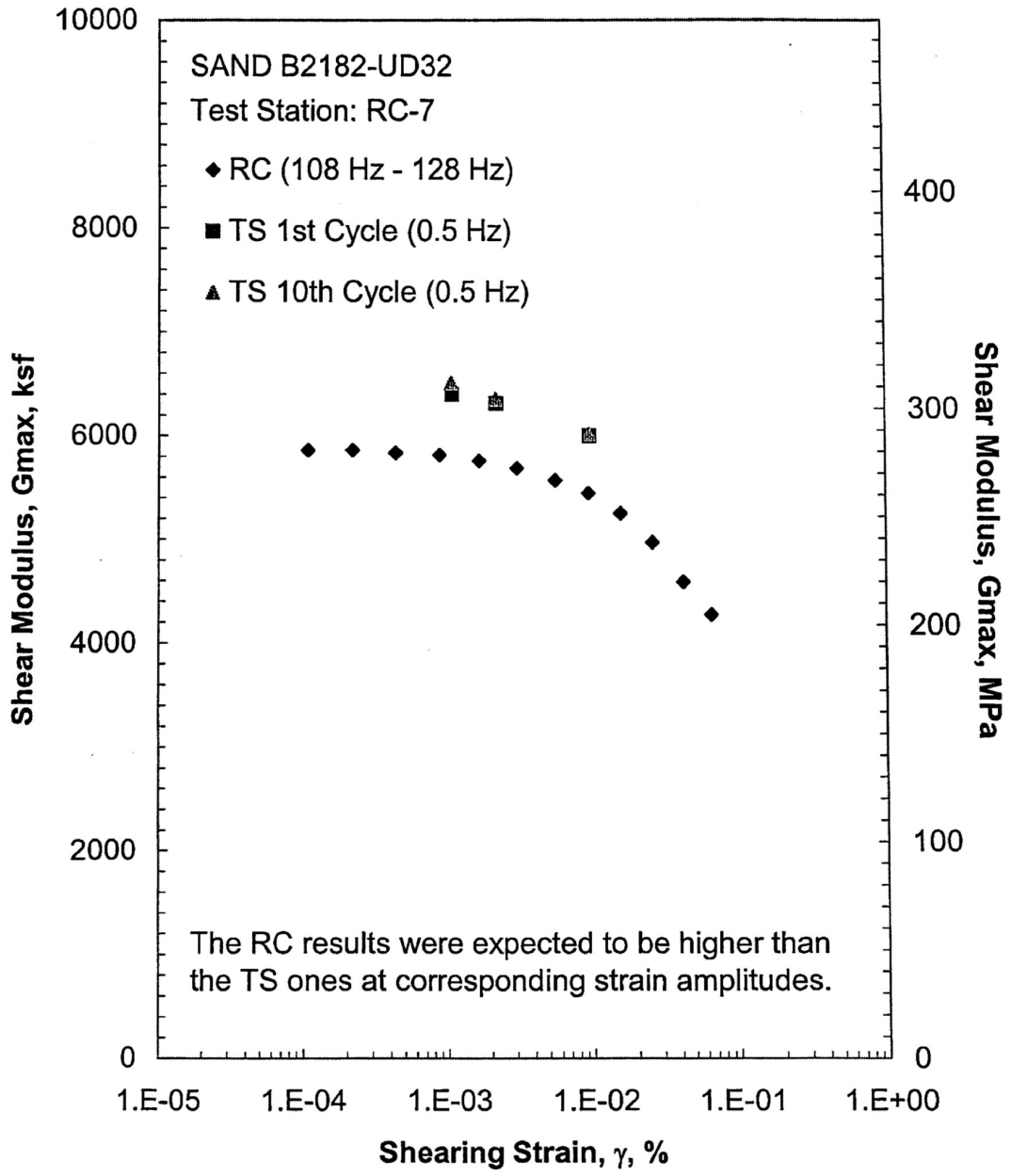

Figure C.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 116 psi from the Combined RCTS Tests

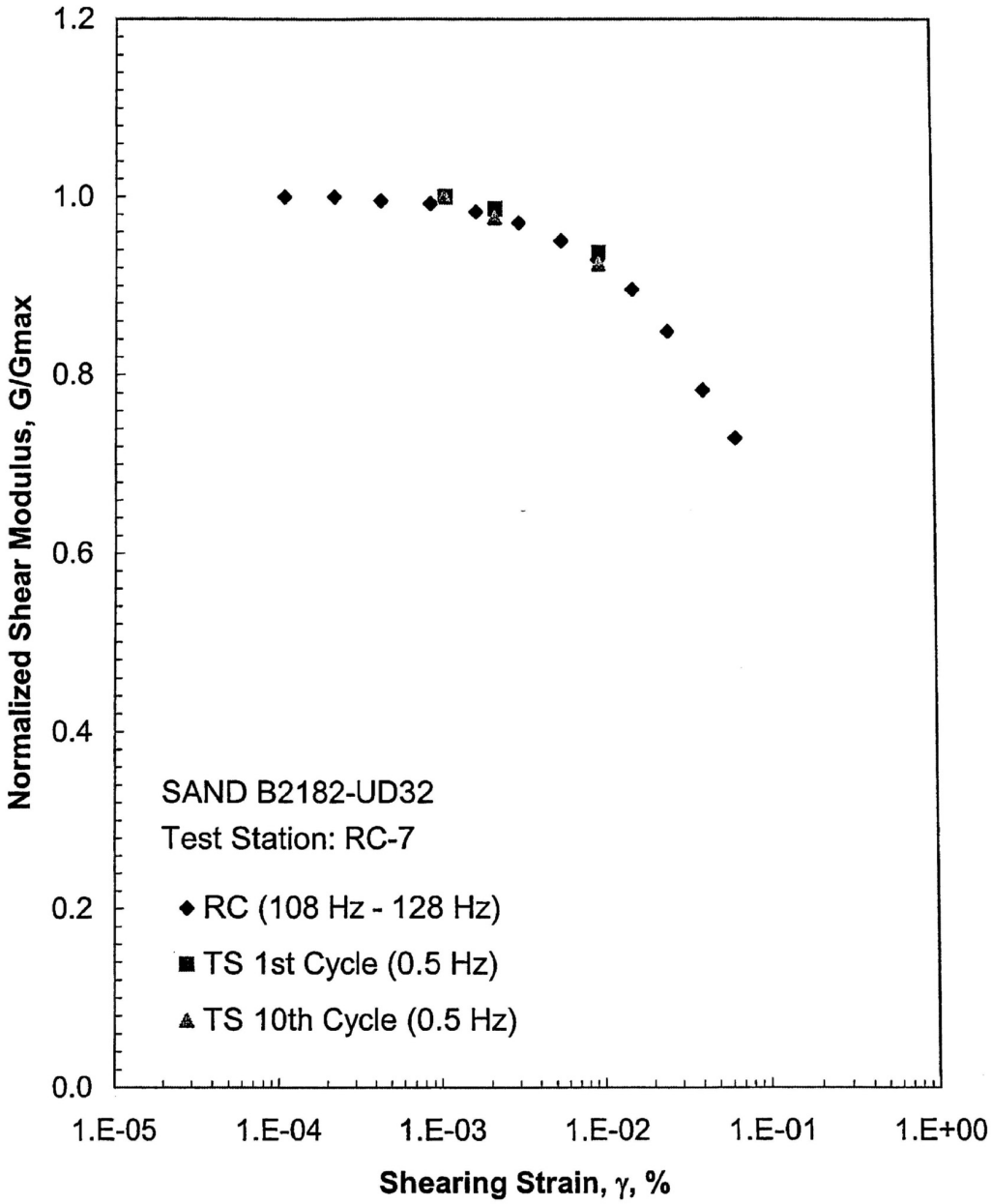

Figure C.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 116 psi from the Combined RCTS Tests

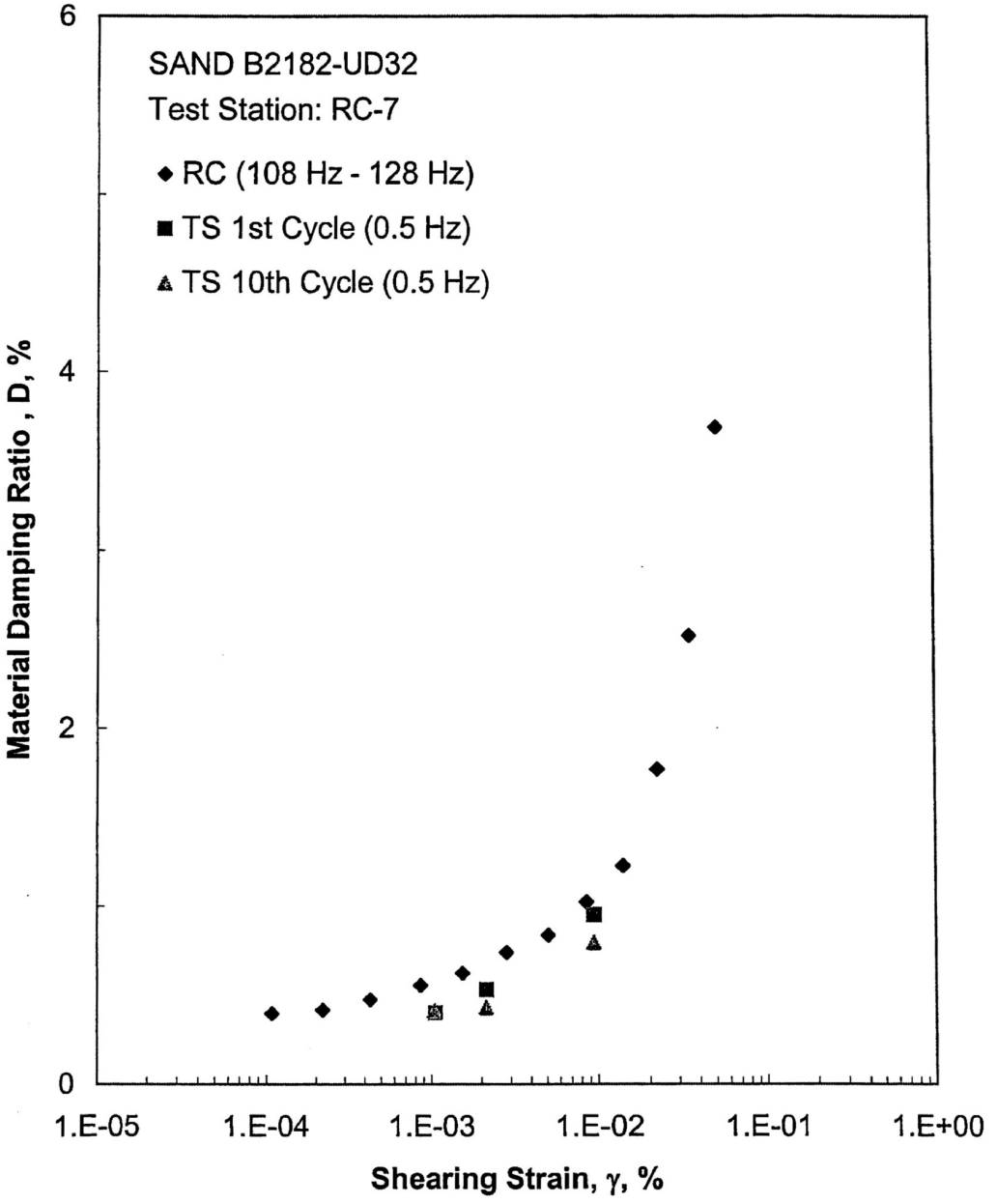

Figure C.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 116 psi from the Combined RCTS Tests

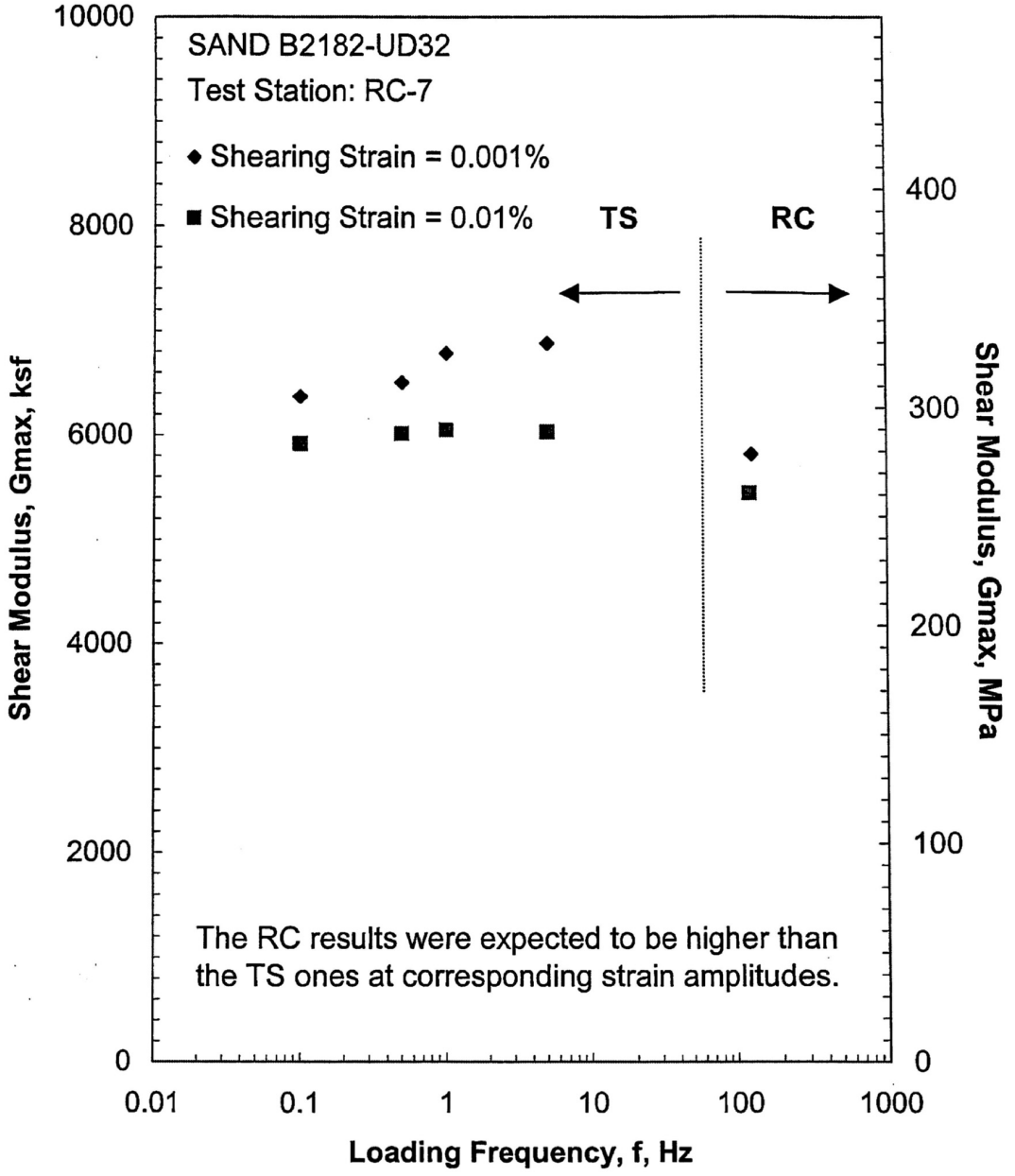

Figure C.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 116 psi from the Combined RCTS Tests

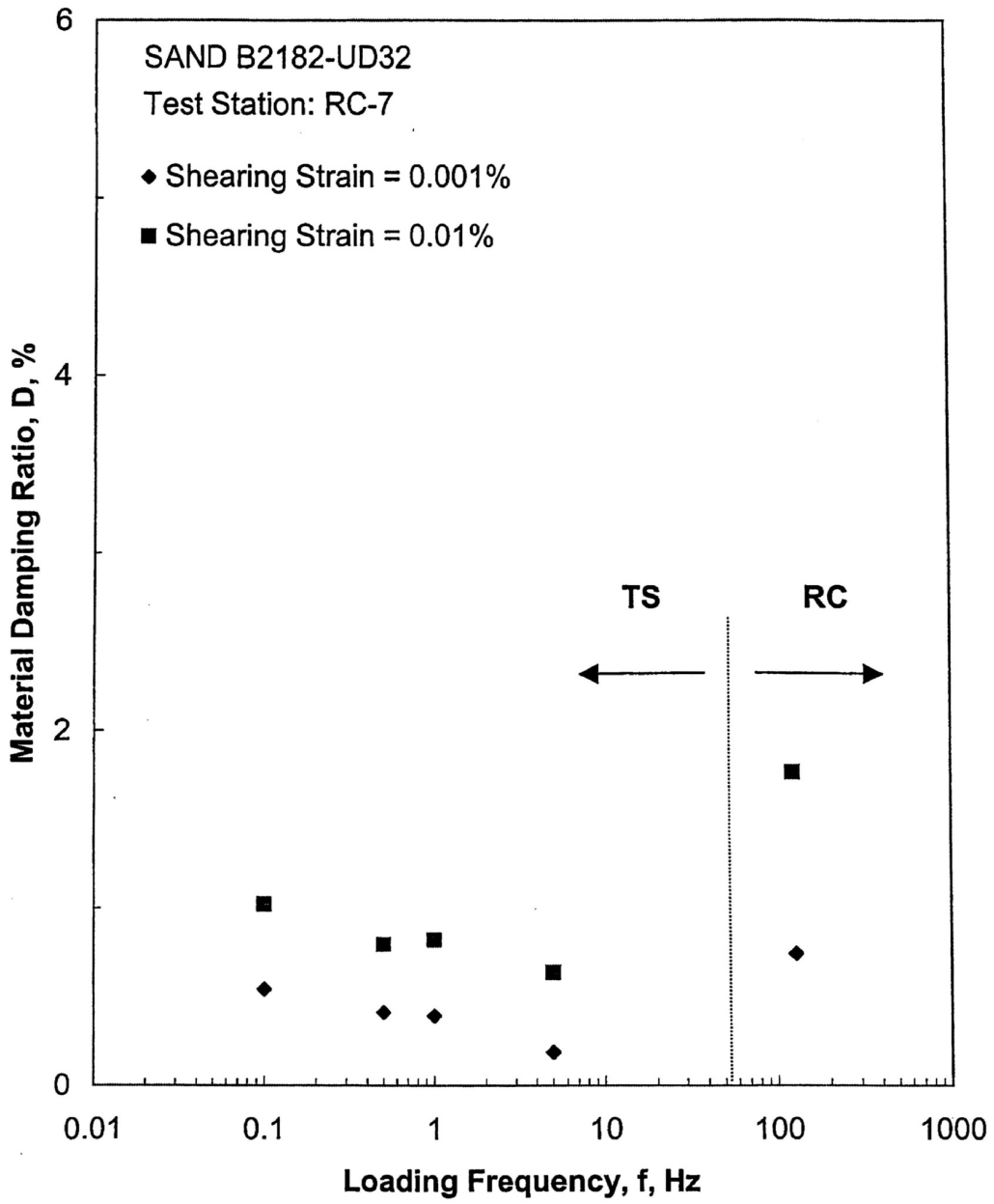

Figure C.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 116 psi from the Combined RCTS Tests

NOTE: Figures C.16 through C.20 are NOT presented due to the influence of strain hardening during testing. See relevant note on figures (Figures C.1 through C.10).

Table C.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen B2182-UD32

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
29	4176	200	2853	137	850	0.55	0.58
58	8352	400	4112	197	1020	0.43	0.57
116	16704	799	5856	281	1215	0.38	0.57

Note: Results at higher confining pressures are likely affected by the high straining RC/TS tests at 116 psi, and therefore not presented.

Table C.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON B2182-UD3; Isoptropic Confining Pressure, σ_o=116 psi (16.7 ksf = 799 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.08E-04	5858	1.00	1.08E-04	0.40
2.19E-04	5858	1.00	2.19E-04	0.42
4.31E-04	5830	1.00	4.31E-04	0.48
8.63E-04	5812	0.99	8.63E-04	0.56
1.64E-03	5757	0.98	1.54E-03	0.62
3.02E-03	5684	0.97	2.84E-03	0.74
5.52E-03	5566	0.95	5.08E-03	0.84
9.32E-03	5440	0.93	8.58E-03	1.02
1.54E-02	5245	0.90	1.40E-02	1.23
2.54E-02	4969	0.85	2.24E-02	1.77
4.20E-02	4584	0.78	3.53E-02	2.52
6.55E-02	4270	0.73	5.18E-02	3.69

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table C.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2182-UD32; Isotropic Confining Pressure, σ_o= 116 psi (16.7 ksf =799 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.06E-03	6398	1.00	0.40	1.04E-03	6506	1.00	0.41
2.15E-03	6309	0.99	0.53	2.13E-03	6351	0.98	0.43
9.50E-03	5993	0.94	0.95	9.47E-03	6012	0.92	0.80

Table C.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2182-UD32; Isoptropic Confining Pressure, σ_o= 455 psi (65.5 ksf = 3135 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
---*	---	---	---	---

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

* Results at higher confining pressures are likely affected by the high straining RC/TS tests at 116 psi, and therefore not presented.

Table C.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2182-UD32; Isotropic Confining Pressure, σ_o=455 psi (65.5 ksf = 3135 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
---*	---*	---*	---*	---*	---*	---*	---*

* Results at higher confining pressures are likely affected by the high straining RC/TS tests at 116 psi, and therefore not presented.

APPENDIX D

Specimen EXELON B2182-UD18
(Index Properties Not Available)

Borehole B2182
Sample UD18
Depth = 220.5 ft (67.2 m)
Total Unit Weight = 115.1 lb/ft^3
Water Content = 35.2 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 78 psi

FUGRO JOB #: 0401-1686
Testing Station: RC6

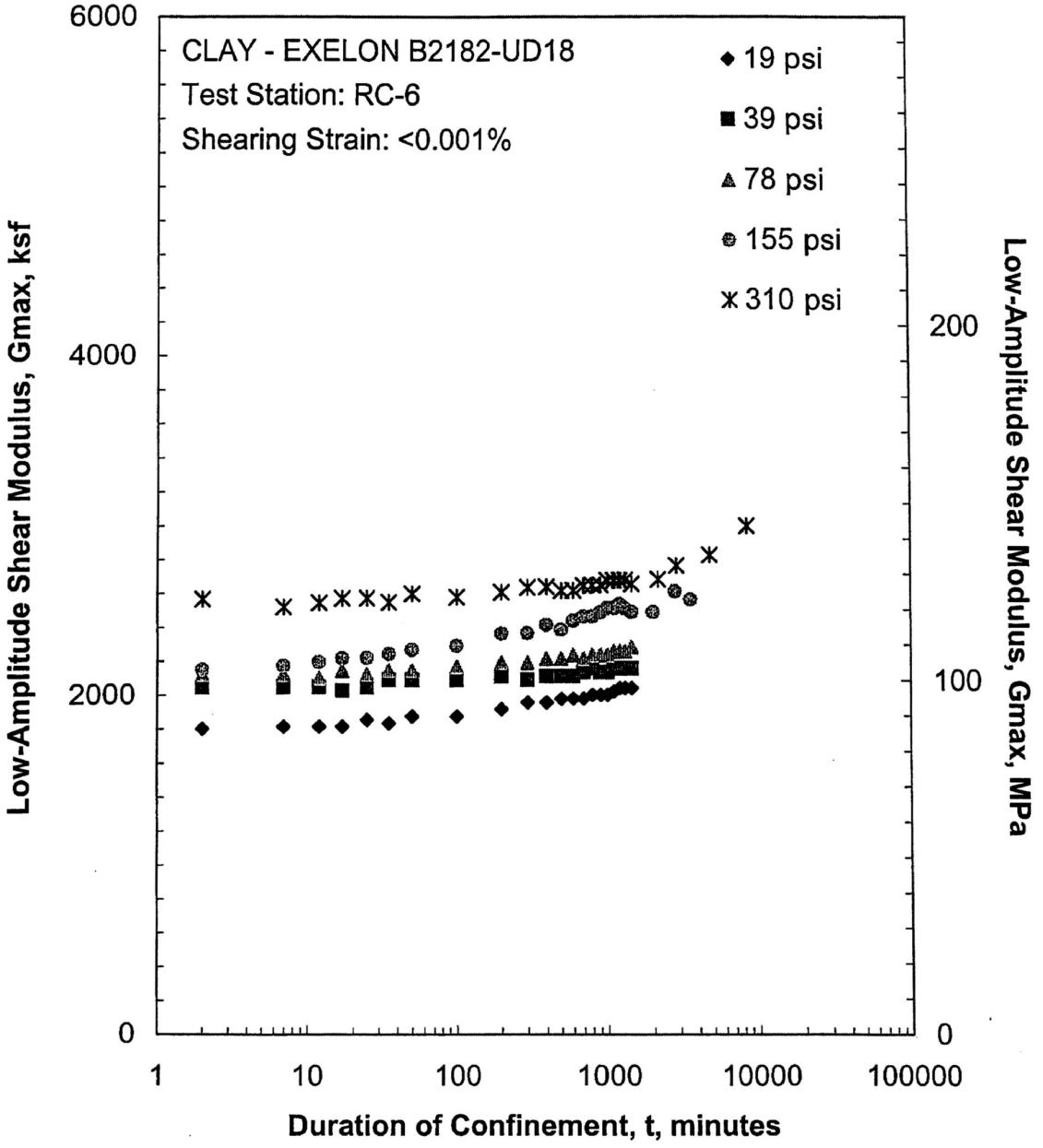

Figure D.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

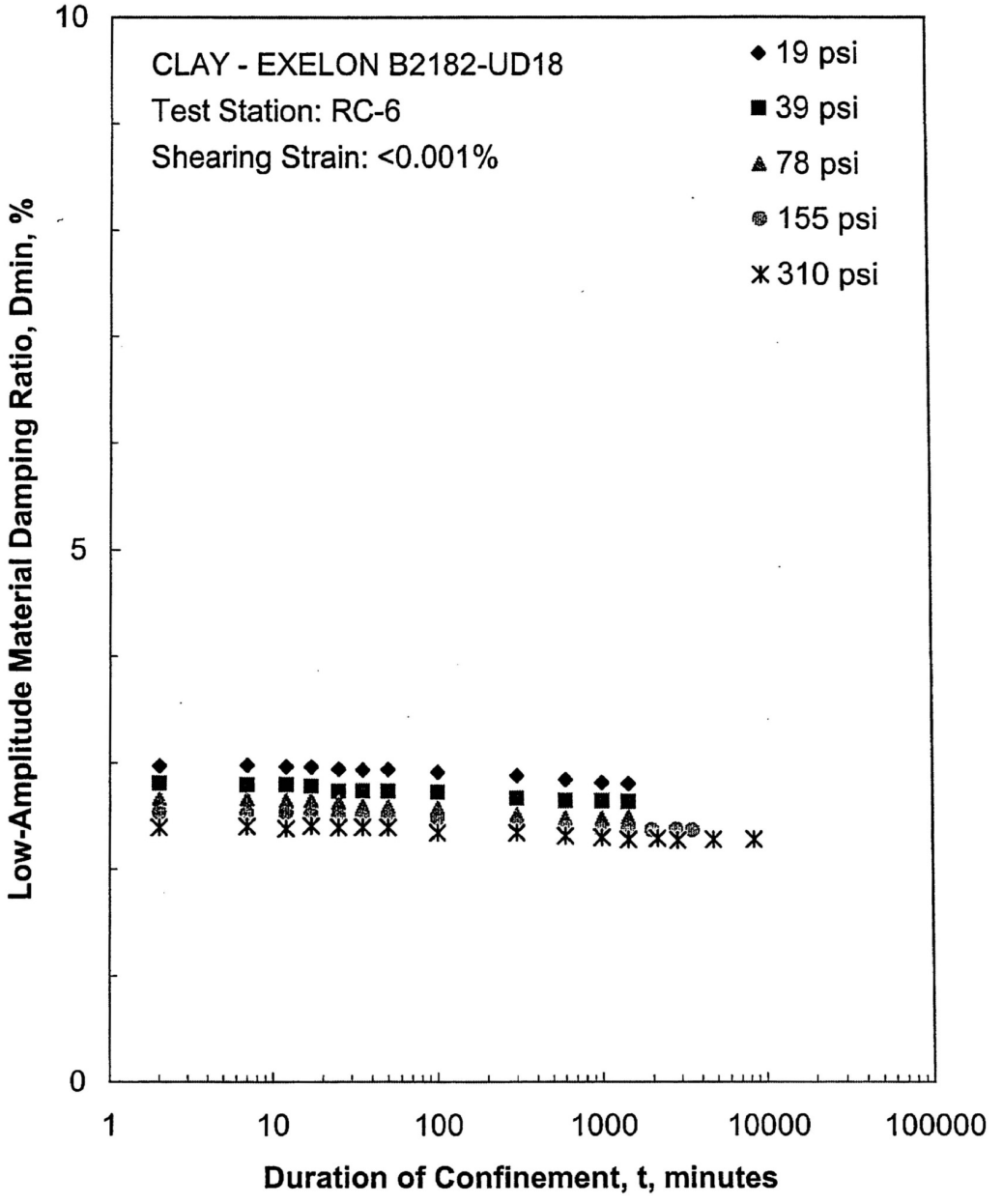

Figure D.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

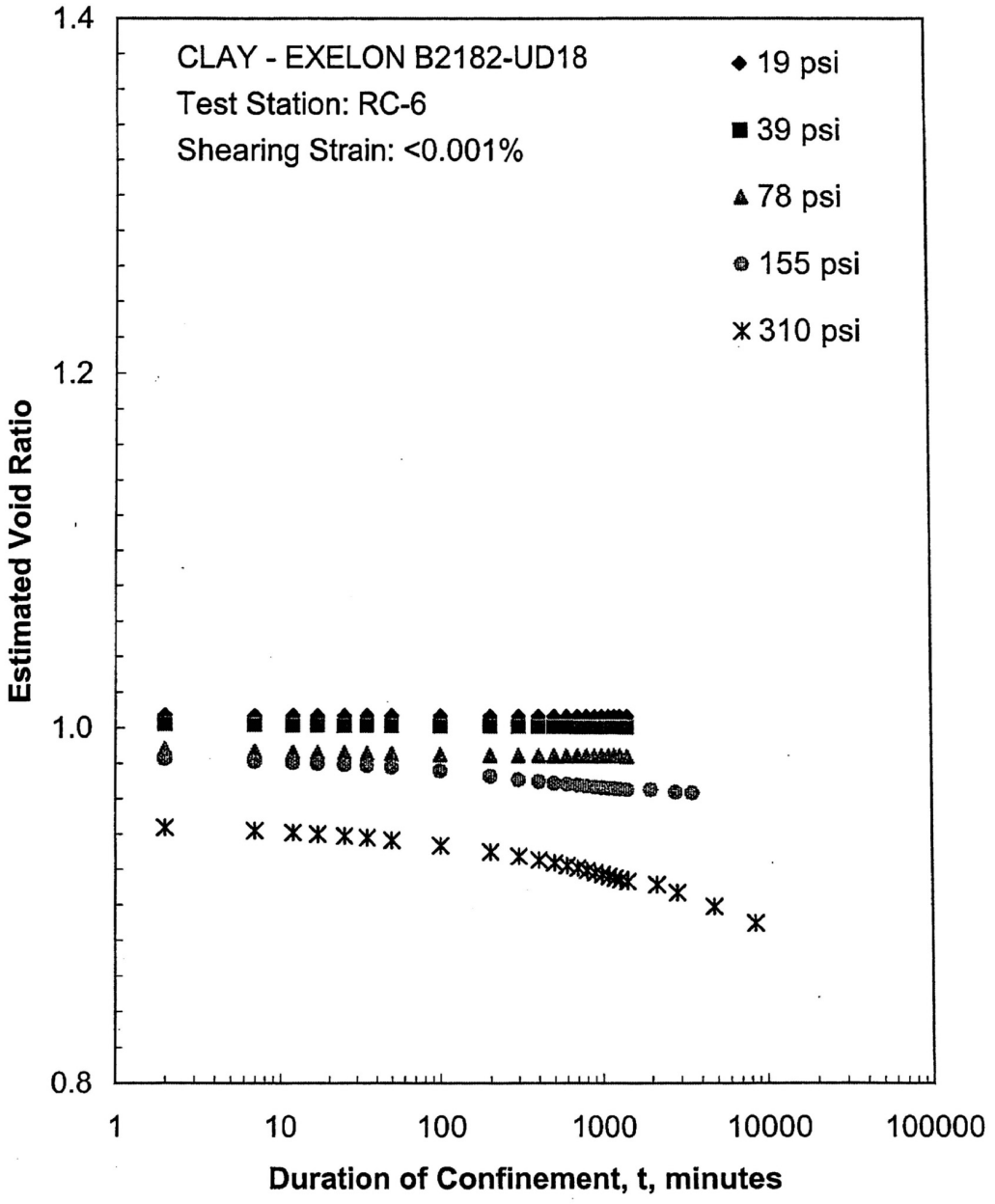

Figure D.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

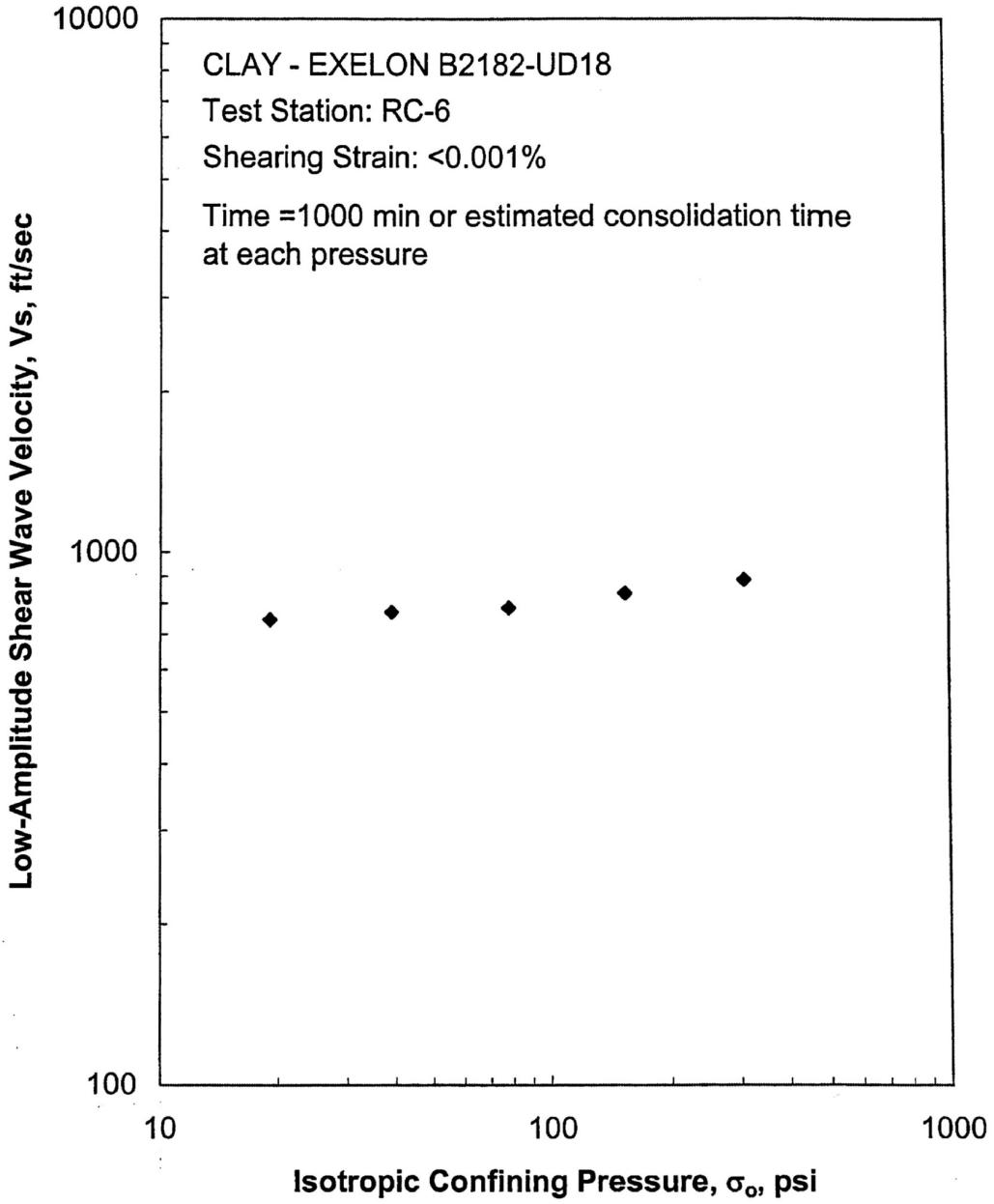

Figure D.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

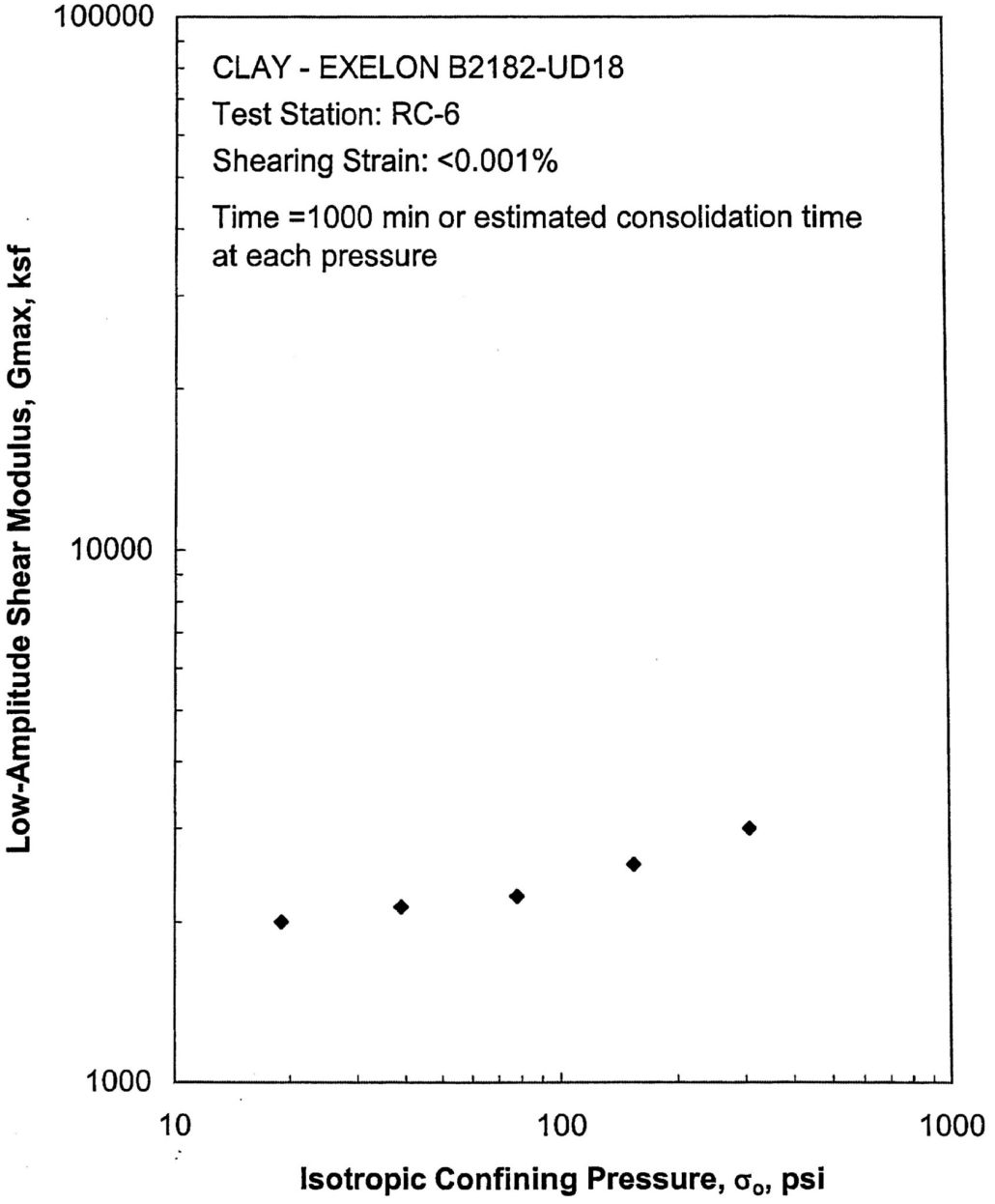

Figure D.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

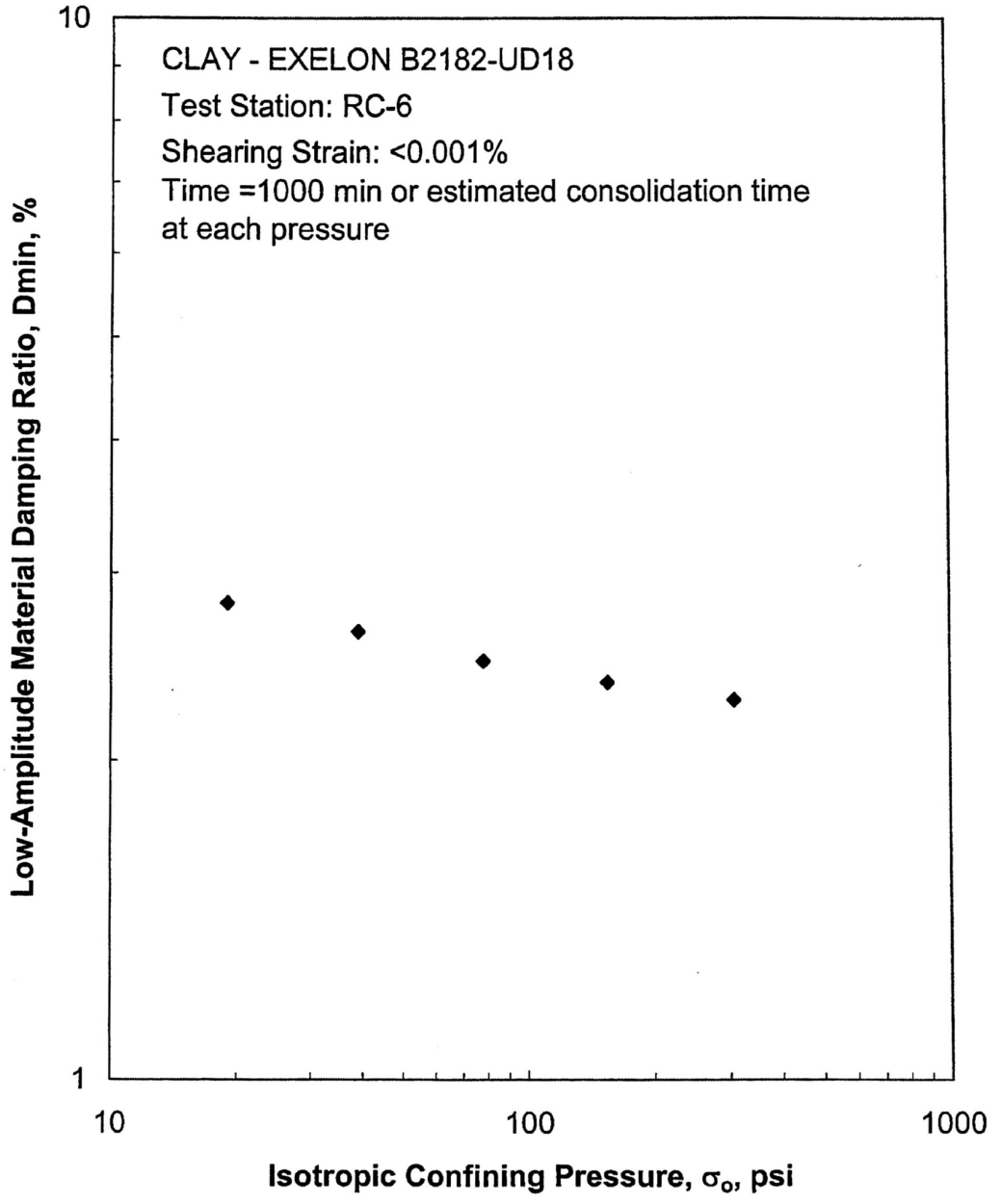

Figure D.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

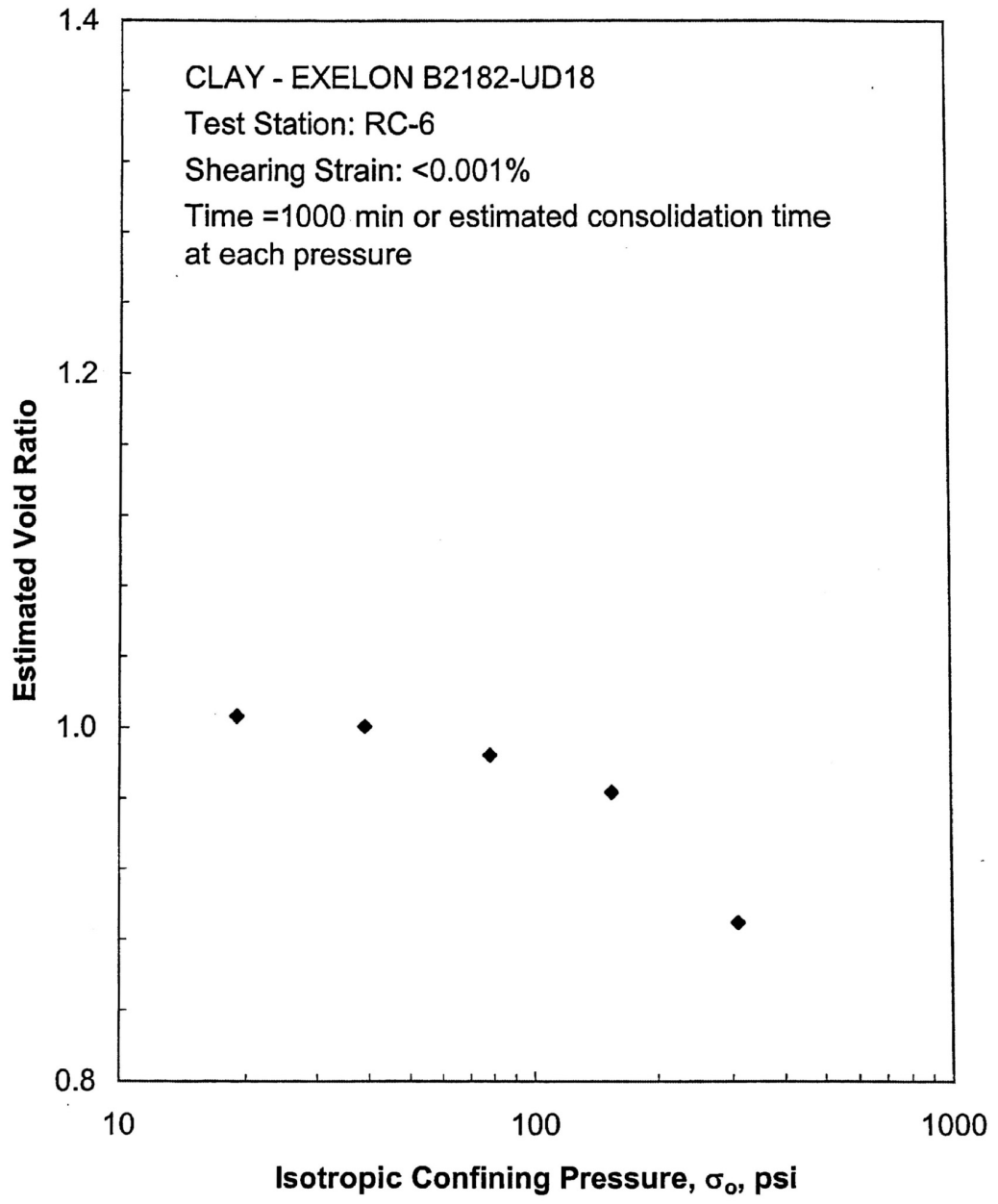

Figure D.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

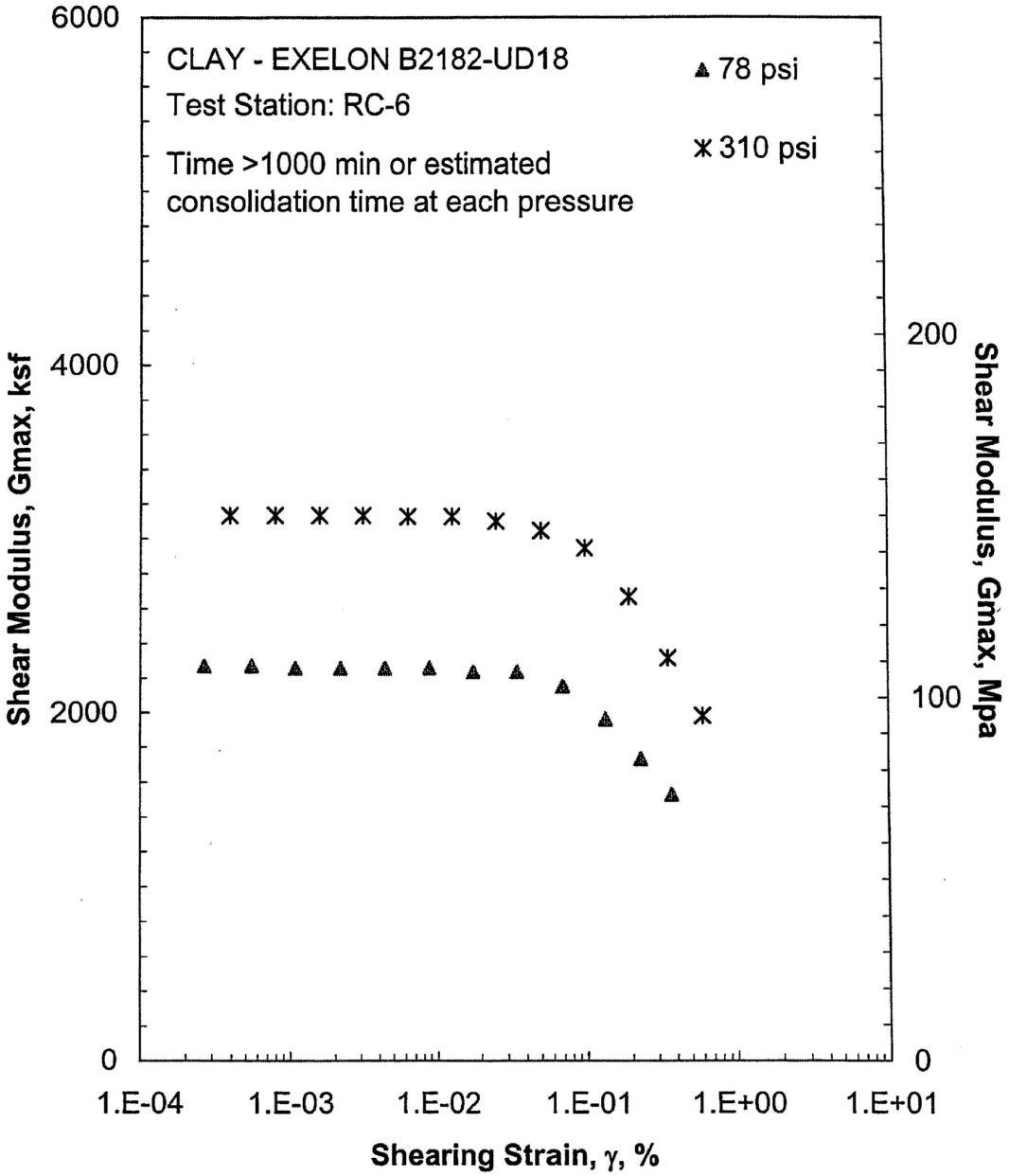

Figure D.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

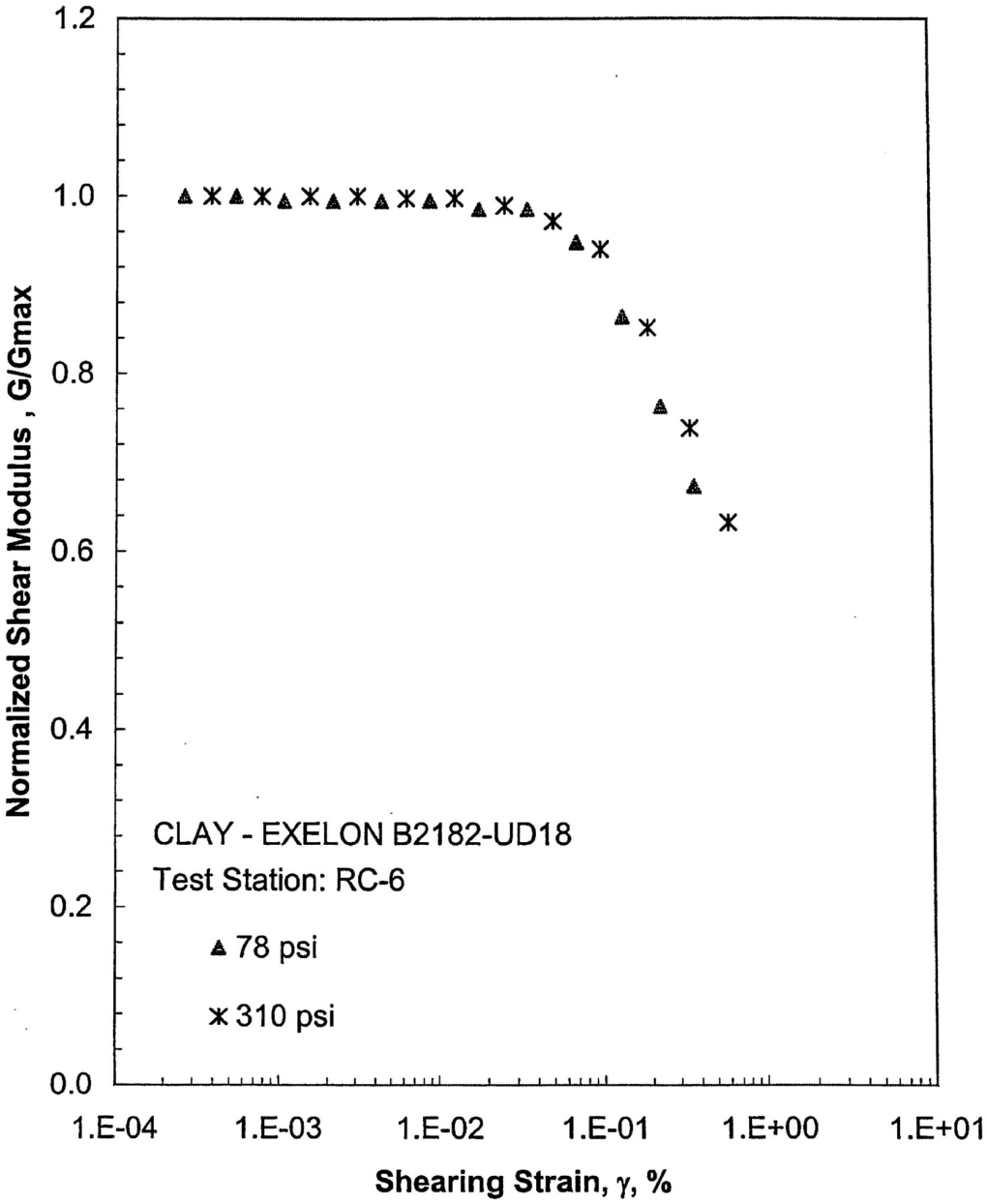

Figure D.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

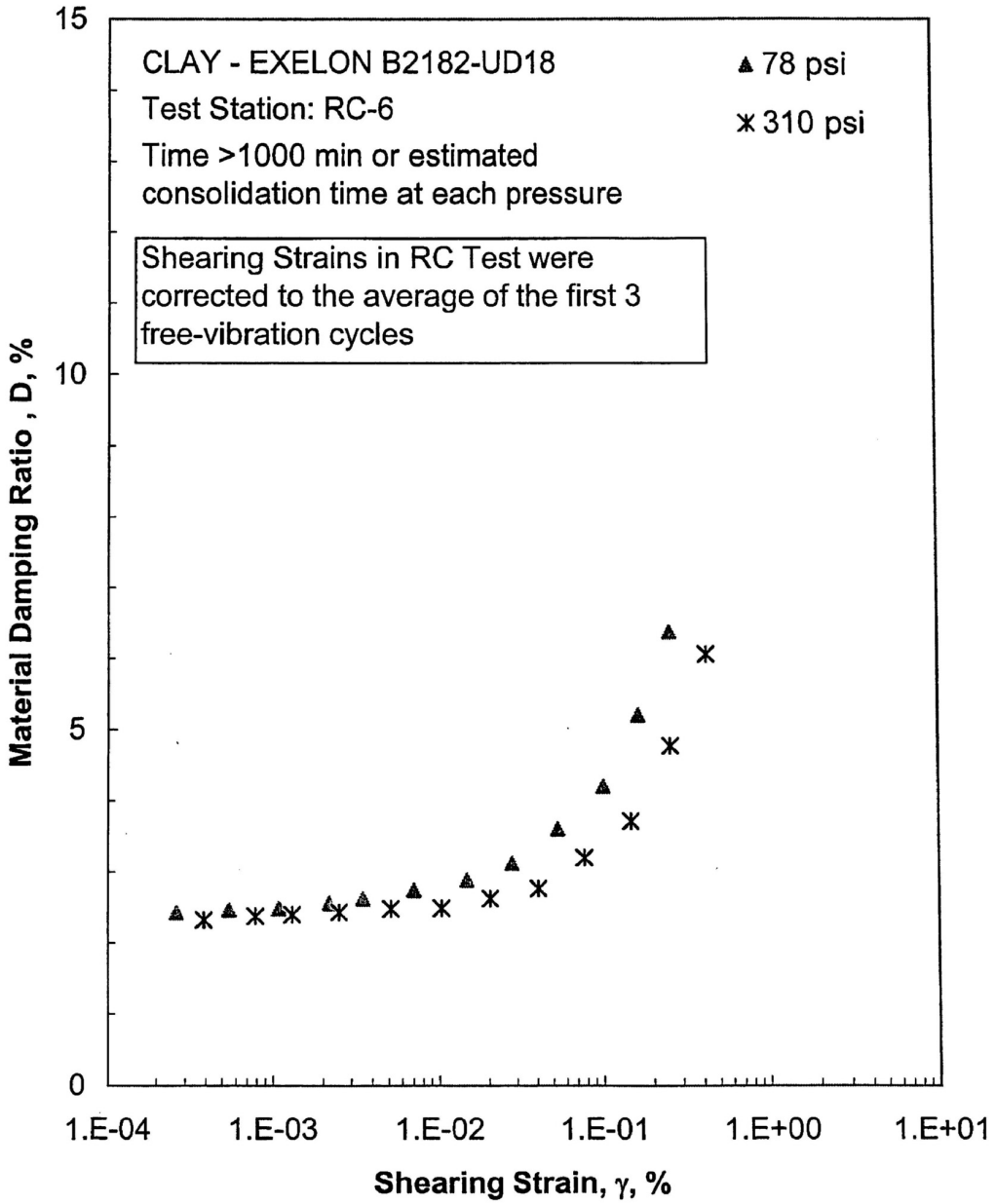

Figure D.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

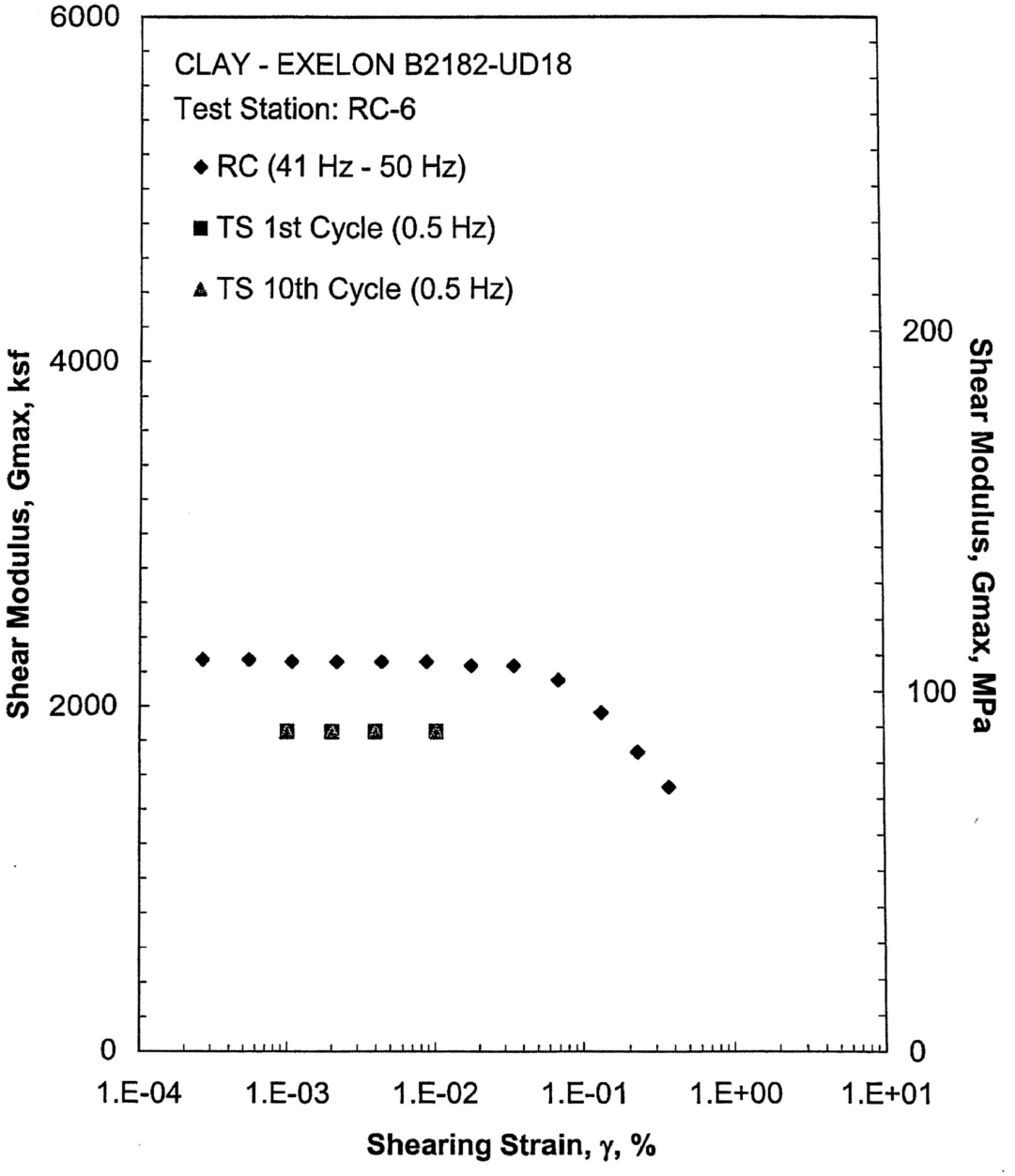

Figure D.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 78 psi from the Combined RCTS Tests

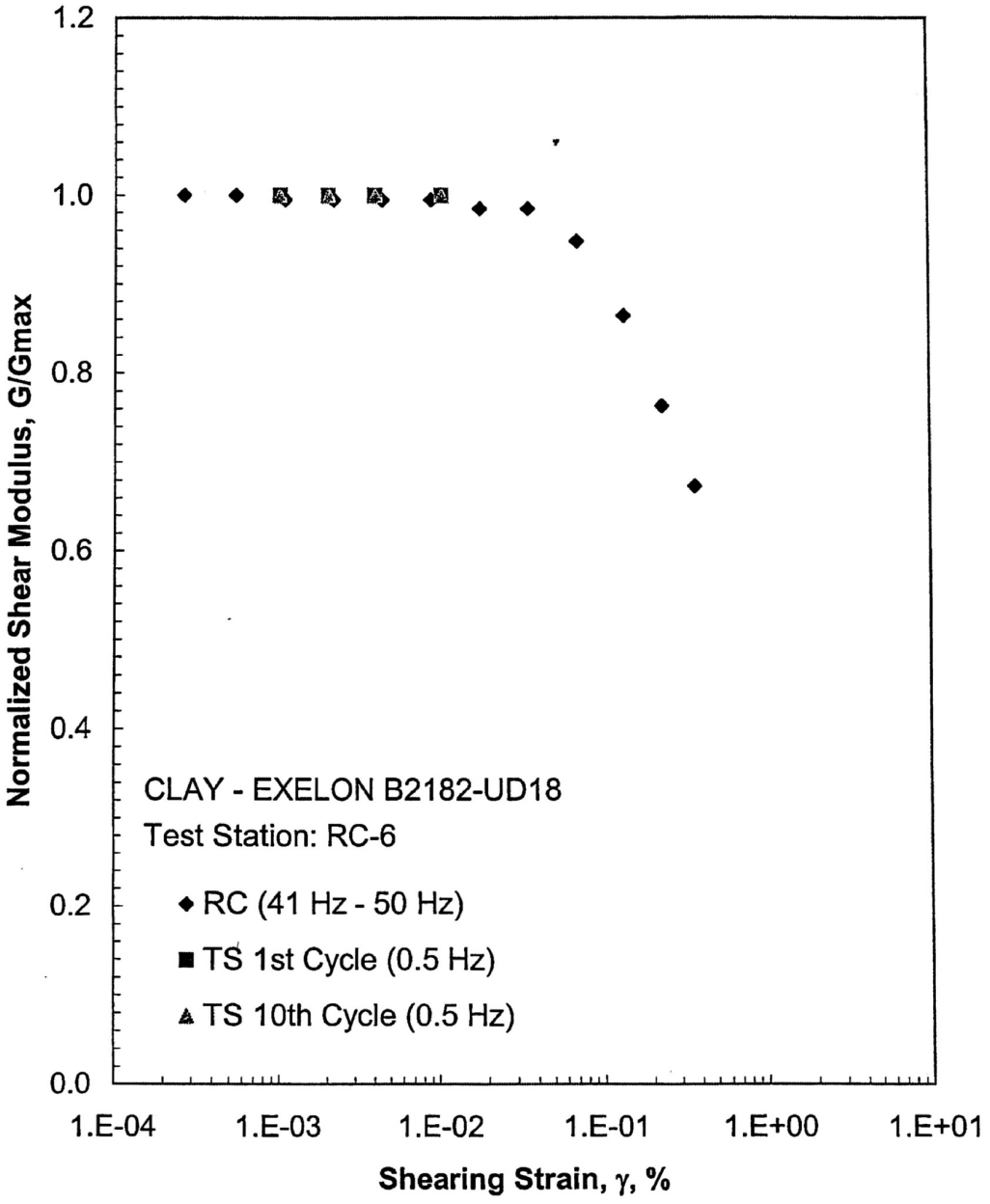

Figure D.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 78 psi from the Combined RCTS Tests

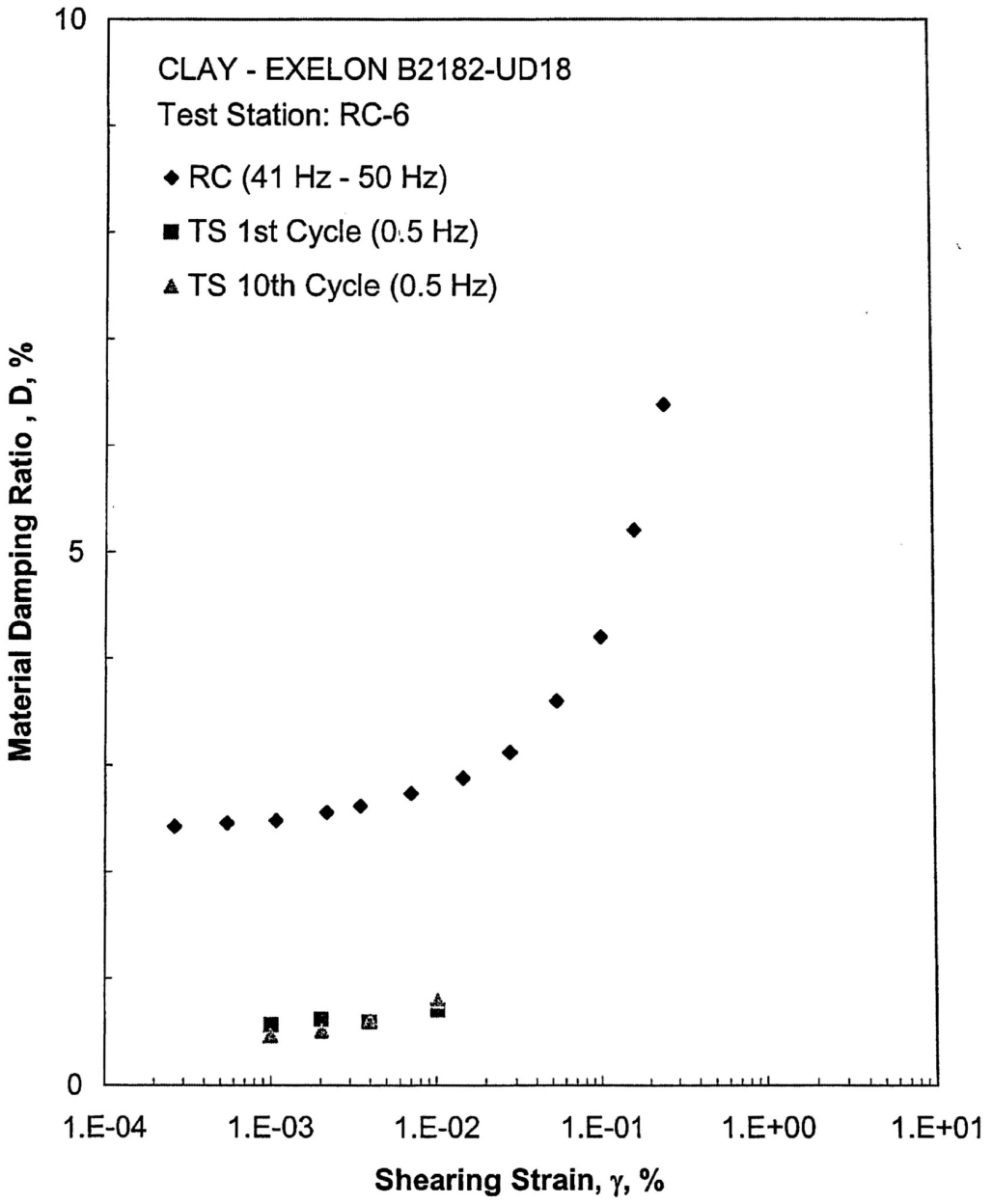

Figure D.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 78 psi from the Combined RCTS Tests

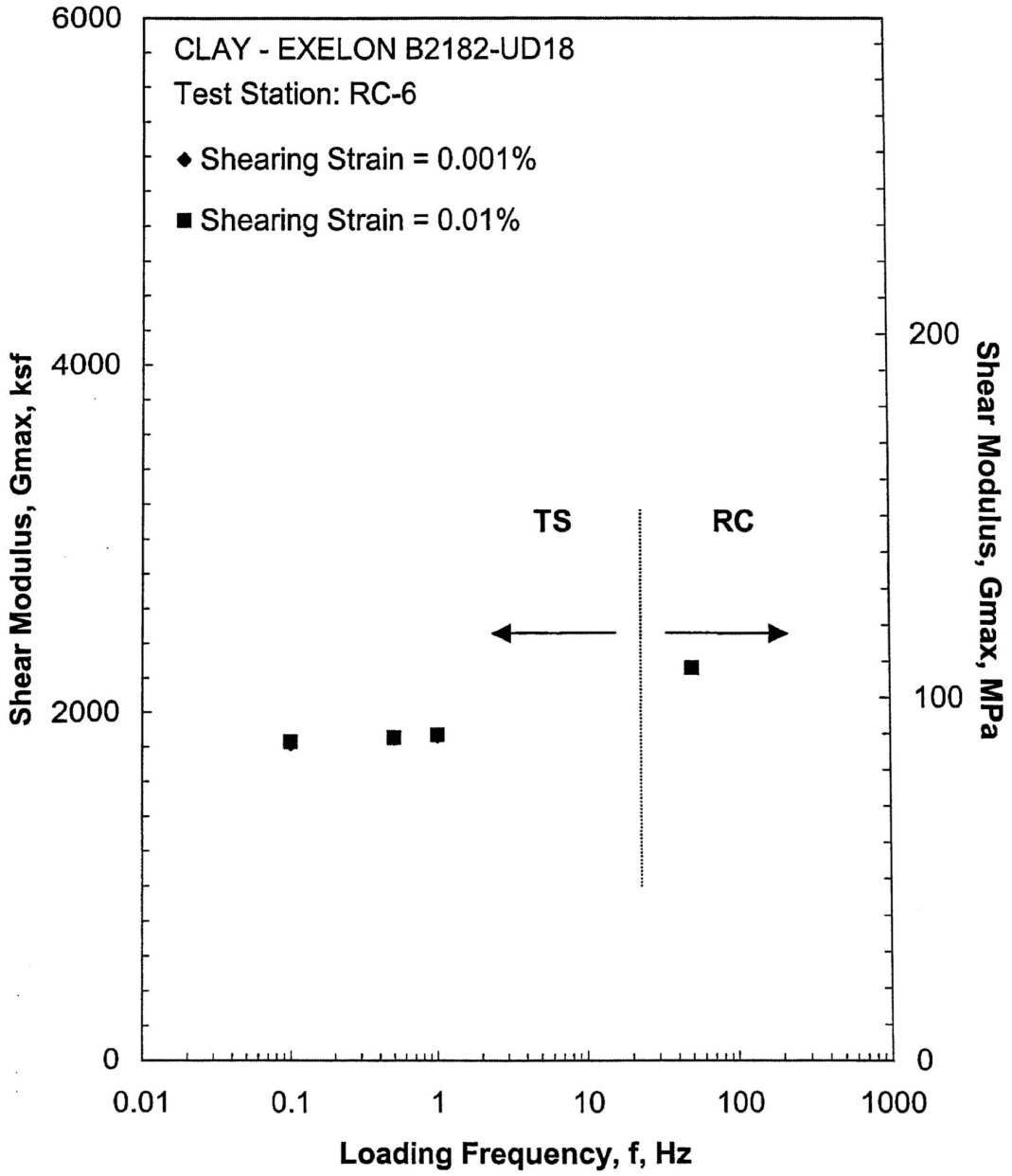

Figure D.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 78 psi from the Combined RCTS Tests

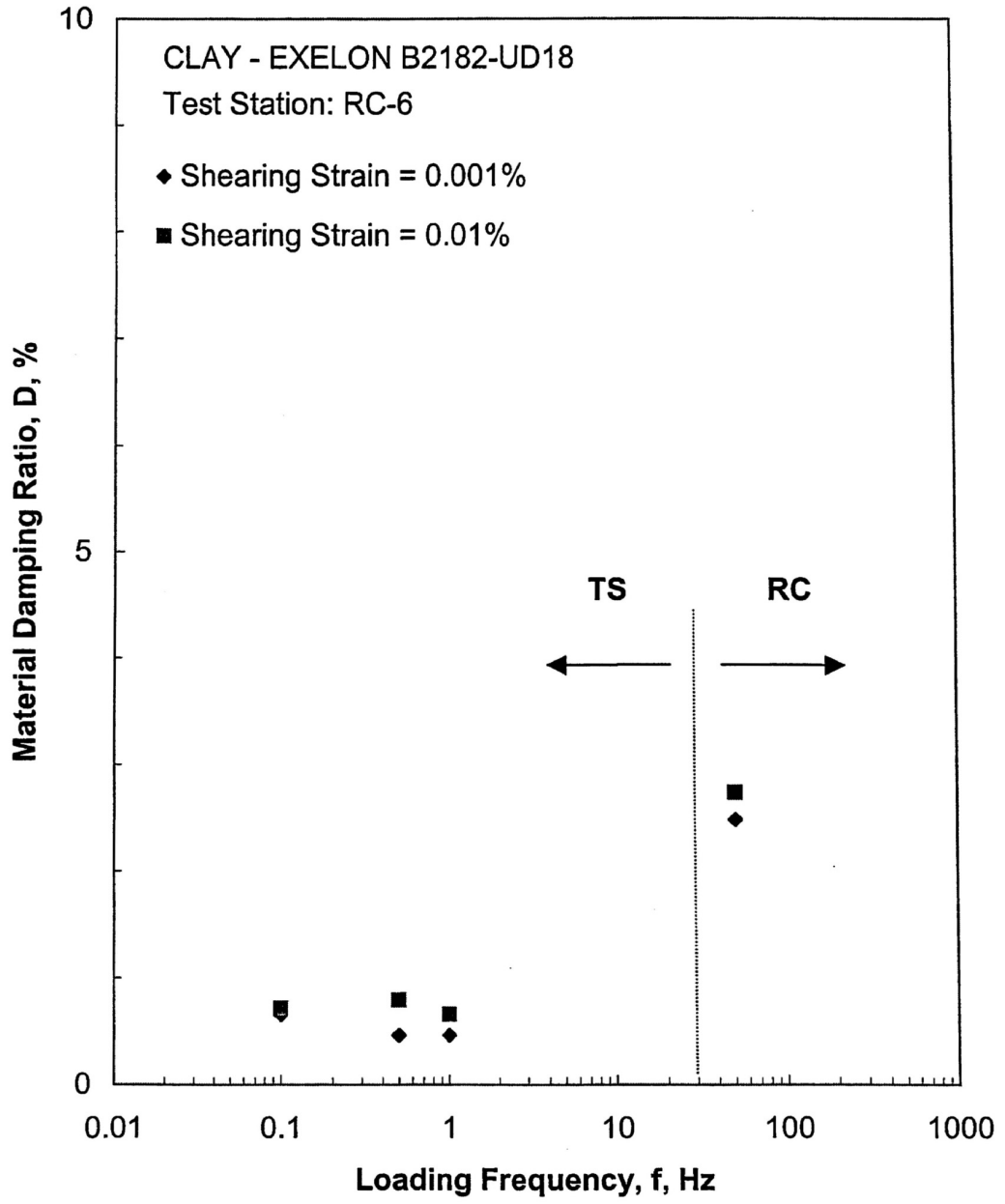

Figure D.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 78 psi from the Combined RCTS Tests