First Year Load Impact Study of

1998 Low Income Energy Efficiency Programs for

Pacific Gas and Electric Company

San Diego Gas and Electric Company

Southern California Edison Company

Southern California Gas Company

Project Manager
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April 2000

Summary Table: Completed Load Impact Study (April 2000)

(In fulfillment of Table 6 of the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs)

Study Title:

First Year Load Impact Study of 1998 Low Income Energy Efficiency Programs

Pacific Gas and Electric Company (PG&E)
San Diego Gas and Electric Company (SDGE)
Southern California Edison Company (SCE)
Southern California Gas Company (SCG)

Study ID: xxx

Program/Program Year:

Low Income Energy Efficiency Programs (LIEE), Program Year 1998

Program Description:

Low Income Energy Efficiency Programs throughout the state in 1998 provided subsidies for installation of energy conservation measures, maintenance of equipment, and replacement of space conditioning equipment to low income customers.

1. Table 6 –Protocols fo Reporting of Results of Impact Measurement Studies Used to Support an Earning Claim

1.A Average Participant Group and Average Comparison Group Usage (therms)

Utility		Type	Total	Space Ht	Water Ht
PG&E	A. Pre Installation	Single Family	653	349	271
		Multi Family	408	202	192
PG&E	B. Post Installation	Single Family	614	330	251
		Multi Family	389	201	174
SDGE	A. Pre Installation	Single Family	394	205	167
		Multi Family	197	108	140
SDGE	B. Post Installation	Single Family	384	198	164
		Multi Family	186	104	133
SCG	A. Pre Installation	Single Family	546	290	187
		Multi Family	358	198	154
SCG	B. Post Installation	Single Family	524	278	178
		Multi Family	337	187	144

Notes: There is no comparison group; single family and multi family end-use estimates sum to more than the total use estimates due to the end-use saturations being less than 1.0.

Average Participant Group and Average Comparison Group Usage (KWH)

Utility		Type	Total	Space Ht	Water Ht	Air Cond	Miscell
PG&E	A. Pre Installation	Single Family	5892	2544	4044	1332	5520
		Multi Family	4164	2064	2712	924	3948
PG&E	B. Post Installation	Single Family	5736	2517	4004	1283	5479
		Multi Family	4045	1986	2692	913	3938
SDGE	A. Pre Installation	Single Family	4752	1020	3180	708	4512
		Multi Family	4356	1092	3828	924	4080
SDGE	B. Post Installation	Single Family	4680	1018	3178	708	4443
		Multi Family	4289	1087	3825	925	4022
SCE	A. Pre Installation	Single Family	5888	1860	3804	1884	4704
		Multi Family	4308	1368	3372	1056	3816
SCE	B. Post Installation	Single Family	5772	1860	3803	1839	4635
		Multi Family	4202	1368	3368	1047	3724

Notes: There is no comparison group; single family and multi family end-use estimates sum to more than the total use estimates due to the end-use saturations being less than 1.0.

2. Average net and gross end use load impacts for the 1998 program year.

Therms

Utility		Type	Total	Space Ht	Water Ht
PG&E	A&B Avg Impacts	Single Family	38.6	19.2	19.4
		Multi Family	18.9	1.1	17.8
PG&E	C. Post Percentage	Single Family	5.9%	5.5%	7.2%
		Multi Family	4.6%	.5%	9.3%
SDGE	A&B Avg Impacts	Single Family	10.0	6.6	3.4
		Multi Family	11.1	4.1	7.0
SDGE	C. Post Percentage	Single Family	2.5%	3.2%	2.0%
		Multi Family	5.6%	3.8%	5.0%
SCG	A&B Avg Impacts	Single Family	22.2	12.0	10.2
		Multi Family	21.0	11.1	9.9
SCG	C. Post Percentage	Single Family	4.1%	4.1%	5.5%
		Multi Family	5.9%	5.6%	6.4%

Notes: There is no comparison group; realization rates are presented in Tables S1 and S2 below at the measure level (programs had measure specific ex-ante estimates, rather than end-use specific estimates)

Kwh

Utility		Type	Total	Space Ht	Water Ht	Air Cond	Miscell
PG&E	A&B Avg Impacts	Single Family	156.3	26.8	39.5	49.4	40.6
		Multi Family	118.9	77.6	20.4	10.9	10.0
PG&E	C. Post Percentage	Single Family	2.7%	1.1%	1.0%	3.7%	.7%
		Multi Family	2.9%	3.8%	.8%	1.2%	.3%
SDGE	A&B Avg Impacts	Single Family	72.3	1.7	2.0	-.4	69.0
		Multi Family	66.5	5.2	4.9	-1.1	57.5
SDGE	C. Post Percentage	Single Family	1.5%	.2%	.1%	-.1%	1.6%
		Multi Family	1.6%	.5%	.1%	-.1%	1.4%
SCE	A&B Avg Impacts	Single Family	115.5	.2	.8	45.2	69.3
		Multi Family	106.4	.4	4.4	9.3	92.3
SCE	C. Post Percentage	Single Family	2.0%	0%	0%	2.4%	1.5%
		Multi Family	2.5%	0%	.1%	.9%	2.4%

Notes: There is no comparison group; realization rates are presented in Tables S1 and S2 below at the measure level (programs had measure specific ex-ante estimates, rather than end-use specific estimates)

3. Net to Gross Ratio: 1.0

Impacts in Section 2 above are both net and gross impacts since it is believed that program participants would not have taken action in absence of the programs.

4. Designated Unit Intermediate Data

Mean values of intermediate data (both pre and post installation) are shown in Appendix A of the report.

5. Precision of Load Impact Estimates

The precision of the measure-specific load impact estimates at the 90 percent and 80 percent confidence levels are shown in the fifth column of Tables S1 and S2. Confidence intervals were not calculated at the end-use level since the focus of the program efforts were at the measure level.

6. Measure Count Data

Measure count data for program participants are shown in the sixth column of Tables S1 and S2.

7. Market Segment Data

Program participation and sample by weather region appear below.

Utility	Weather Region	Participants	Sample
PG&E	East Bay	18.0%	16.5%
	Golden Gate	6.4%	6.7%
	Mission Trail	11.4%	12.1%
	Redwood	2.3%	2.2%
	Sacramento Valley	17.2%	13.1%
	San Joaquin Valley	44.7%	49.4%
SDGE	Coastal	32.7%	32.3%
	Maritime	38.7%	37.7%
	Transitional	28.6%	30.0%
SCE	Mountain	.4%	.6%
	Lower Desert	5.1%	3.6%
	Coastal	11.2%	13.8%
	High Desert	11.6%	9.0%
	Inland Valleys	24.0%	24.9%
	Coastal Valleys	47.7%	48.2%
SCG	Mountain	0%	0%
	Lower Desert	3.1%	3.4%
	Coastal	6.0%	5.8%
	High Desert	6.6%	6.4%
	Inland Valleys	42.7%	41.0%
	Coastal Valleys	41.6%	43.4%

Table S1
SCG Single Family Therm Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	23.7	24.6	103.8	5.3, 4.1	1,892	46,543
Weatherstripping/Caulking	4.6	3.6	78.3	.8, .6	12,782	46,015
Building Envelope Repairs	6.9	6.1	88.4	1.4, 1.1	11,849	72,279
Low Flow Showerhead	8.0	9.5	118.7	4.5, 3.5	10,593	100,633
Water Heater Blanket	6.0	7.6	126.7	3.5, 2.8	4,068	30,917
Furnace Repair and Replacement						
Space Heating Replace	14	-3.2	-	5.6,4.4	1,536	-4,915
Space Heating Repair	-17	-14.8	-	9.8, 7.6	408	-6,038
All Measures	-	22.2			12,872	285,434

Table S1
PG&E Single Family Therm Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	-	29.0	-	6.0, 4.7	4,709	136,561
Weatherstripping/Caulking	-	4.3	-	.9, .7	11,452	49,244
Building Envelope Repairs	-	7.2	-	1.6, 1.3	13,129	94,529
Low Flow Showerhead	-	16.4	-	7.3, 5.7	13,765	225,746
Water Heater Blanket	-	13.2	-	5.9, 4.6	4,344	57,341
All Measures	16.8	38.6	229.7		14,601	563,421

Table S1
SDGE Single Family Therm Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	64.1	21.0	32.8	5.8, 4.5	211	4,431
Weatherstripping/Caulking	-	3.2	-	.9, .7	1,593	5,098
Building Envelope Repairs	17.4	5.3	30.5	1.5, 1.2	1,605	8,507
Low Flow Showerhead	10.6	7.2	67.9	5.2, 4.0	1,146	8,251
Water Heater Blanket	5.5	5.8	105.5	4.2, 3.3	207	1,201
All Measures	-	10.0			2,756	27,488

Table S1
PG&E Single Family KWH Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	271.7	-	169, 132	151	41,027
Weatherstripping/Caulking SH	-	40.8	-	27 , 21	366	14,933
Building Envelope Repairs SH	-	67.9	-	44, 34	420	28,476
Ceiling Insulation AC	-	129.9	-	41, 32	514	66,769
Weatherstripping/Caulking AC	-	19.5	-	6, 4	1,570	30,615
Building Envelope Repairs AC	-	32.5	-	9, 7	1,800	58,500
Low Flow Showerhead	-	247.2	-	189, 147	411	101,599
Water Heater Blanket	-	197.8	-	151, 118	116	22,945
Refrigerator Replacement						
Refrigerator Replacement	855.8	542	63.3	295, 229	236	127,912
All Measures	149.8	156.3			3,153	492,776

Table S1
SCE Single Family KWH Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	335.6	-	537, 408	4	1,342
Weatherstripping/Caulking SH	-	50.3	-	76 , 59	17	855
Building Envelope Repairs SH	-	83.9	-	130, 101	12	1,007
Ceiling Insulation AC	-	215.7	-	170, 132	9	1,941
Weatherstripping/Caulking AC	-	32.4	-	24, 19	34	1,102
Building Envelope Repairs AC	-	53.9	-	28, 22	23	1,240
Low Flow Showerhead	-	298.5	-	249, 194	21	6,269
Water Heater Blanket	-	238.8	-	198, 154	30	7,164
Compact Fluorescent Lights	45.7	26.5	58.0	24, 19	42,534	1,127,151
Evaporative Cooler Installation and Maintenance						
Evaporative Cooler Inst	654.4	353.6	54.0	45, 35	1,891	668,658
Evaporative Cooler Maint.	190.9	19.2	10.1	55, 43	3,236	62,131
All Measures	536.5	115.5			16,273	1,878,860

Table S1
SDGE Single Family KWH Savings
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	64.9	-	62, 49	24	1 ,558
Weatherstripping/Caulking SH	-	9.7	-	9, 7	160	1,552
Building Envelope Repairs SH	-	16.2	-	16, 12	161	2,680
Ceiling Insulation AC	-	-30.7	-	44, 31	12	-368
Weatherstripping/Caulking AC	-	-4.6	-	6, 4	77	-354
Building Envelope Repairs AC	-	-7.7	-	11, 8	78	-601
Low Flow Showerhead	-	173.5	-	170 132	35	6,073
Water Heater Blanket	-	138.5	-	136, 118	6	831
Compact Fluorescent Lights	-	23.2	-	12, 10	10,254	237,893
All Measures	-	72.3			3,448	249,264

Table S2
SCG Multifamily Therm Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	14.0	20.0	142.9	11.9, 9.3	1,168	23,360
Weatherstripping/Caulking	3.0	3.0	100.0	1.8, 1.4	6,815	20,445
Building Envelope Repairs	4.0	5.0	125.0	3.0, 2.4	6,421	32,105
Low Flow Showerhead	8.0	9.2	115.0	4.4, 3.4	5,552	51,078
Water Heater Blanket	5.0	7.4	148.0	3.7, 2.9	2,248	16,635
All Measures	-	21.0			6,853	143,623

Table S2
PG&E Multifamily Therm Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	-	2.9	-	19.5, 15.2	718	2,082
Weatherstripping/Caulking	-	.4	-	2.6, 2.0	10,951	4,380
Building Envelope Repairs	-	.7	-	4.9, 3.8	8,552	5,986
Low Flow Showerhead	-	16.4	-	7.3, 5.7	11,163	183,073
Water Heater Blanket	-	13.2	-	5.9, 4.6	1,167	15,404
All Measures	23.3	18.9	81.0		11,182	210,925

Table S2
SDGE Multifamily Therm Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	64.1	9.6	15.0	9.5, 7.4	69	662
Weatherstripping/Caulking	-	1.4	-	1.4, 1.1	5,732	8,025
Building Envelope Repairs	17.4	2.4	13.8	2.4, 1.9	5,736	13,766
Low Flow Showerhead	10.6	8.2	77.4	5.9, 4.6	4,871	39,942
Water Heater Blanket	5.5	6.5	118.2	4.7, 3.7	128	832
All Measures	-	11.1			5,767	64,227

Table S2
SCE Multifamily KWH Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	208.0	-	283, 220	1	208
Weatherstripping/Caulking SH	-	31.8	-	41 , 33	477	15,169
Building Envelope Repairs SH	-	52.5	-	73, 57	93	4,882
Ceiling Insulation AC	-	212.0	-	71, 55	17	3,604
Weatherstripping/Caulking AC	-	31.8	-	10, 8	2436	77,465
Building Envelope Repairs AC	-	53.0	-	19, 15	503	26,659
Low Flow Showerhead	-	264.8	-	232, 180	79	20,919
Water Heater Blanket	-	211.8	-	191, 149	846	179,183
Compact Fluorescent Lights	45.7	26.5	58.0	24, 19	159,765	4,233,773
Evaporative Cooler Installation and Maintenance						
Evaporative Cooler Inst	654.4	237.1	36.2	107, 83	791	187,546
Evaporative Cooler Maint	190.9	20.5	10.7	59, 46	6,368	130,544
All Measures	536.5	106.4			45,862	4,879,952

Table S2
PG&E Multifamily KWH Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	266.1	-	173, 135	141	37,520
Weatherstripping/Caulking SH	-	36.9	-	26 , 20	838	30,922
Building Envelope Repairs SH	-	66.5	-	43, 33	745	49,542
Ceiling Insulation AC	-	102.0	-	17, 14	6	612
Weatherstripping/Caulking AC	-	15.3	-	3, 2	578	8,843
Building Envelope Repairs AC	-	25.5	-	7, 5	279	7,114
Low Flow Showerhead	-	247.2	-	189, 147	124	30,653
Water Heater Blanket	-	197.8	-	151, 118	2	396
Refrigerator Replacement						
Refrigerator Replacement	713.6	542	63.3	295, 229	28	15,176
All Measures	111.5	118.9			1,521	180,778

Table S2
SDGE Multifamily KWH Savings-
Measure Impacts, Measure Counts and Program Impacts

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	71.0	-	60, 47	16	1 ,136
Weatherstripping/Caulking SH	-	10.6	-	10, 9	886	9,392
Building Envelope Repairs SH	-	17.7	-	17, 15	888	15,718
Ceiling Insulation AC	-	-39.9	-	50, 40	4	-160
Weatherstripping/Caulking AC	-	-6.0	-	8, 6	342	-2,052
Building Envelope Repairs AC	-	-10.0	-	13, 10	341	-3,410
Low Flow Showerhead	-	209.0	-	189 147	117	24,453
Water Heater Blanket	-	167.2	-	151, 118	3	502
Compact Fluorescent Lights	-	23.2	-	12, 10	12,576	291,763
All Measures	-	66.5			5,075	337,342

Table 7-Documentation Protocols for Data Quality and Processing

A. Overview Information

1. Study Title:

First Year Load Impact Study of 1998 Low Income Energy Efficiency Programs

Pacific Gas and Electric Company
San Diego Gas and Electric Company
Southern California Edison Company
Southern California Gas Company

Study ID: xxx

2. Program/Program Year:

Low Income Energy Efficiency Programs (LIEE), Program Year 1998

3. End uses/measures:

End uses: space heating, water heating, air conditioning, miscellaneous electric

Measures: ceiling insulation, weatherastripping/caulking, building envelope repairs, low flow showerheads, water heater blankets, compact fluorescent lights, furnace repair, furnace replacement, refrigerator replacement, evaporative cooler maintenance, and evaporative cooler replacement.

4. Methods and models used: Conditional demand model; specification discussed on pages 28–56 of the report.

5. Participant and comparison group definitions: Participants included qualified low income customers residing in single family and multi family dwellings who received one or more program measures. There was no comparison group since none was required by the Protocols.

6. Analysis Sample size: The analysis includes program participants listed on page 26 of the report. Up to 36 months of consumption data was available for each participant included in the sample.

B. Data Base Management

1. Flow chart illustrating the relationships between data elements:
Included on page 22 of the report.

2. Identify the specific data sources:
See pages 21 – 27 of the report.

3. Diagram and describe the data attrition process:
A diagram of the process is included on page 22 of the report. Discussion of the attrition process is included in pages 23 – 25 of the report.

4. Describe the internal/organizational data quality checks:
Survey information was not collected in this analysis. Identification of large changes in energy use is described in pages 28 – 56 of the report.

5. Provide a summary of the data collected:
For data file contact Frank Spasaro of the Southern California Gas Company

C. Sampling

1. Sampling procedures and protocols: See pages 24 and 25 of the report.

2. Survey information: Survey information was not collected in this analysis.

3. Statistical description: See Appendicies A and B.

D. Data Screening and Analysis

1. Describe procedures used for the treatment of outliers: Without survey data, outlier analysis was not conducted in this analysis.

2. Describe what was done to control for the effects of background: Large changes in household usage were incorporated as were weather effects.

3. Describe porcedures, including those identified in Table C-12: See page 22 and associated discussion that follows page 22 of the report.

4. Regression statistics: See pages 34- 38 of the report as well as the SAS output in appendix B

5. Specification:

See Section IV, Conditional Demand Model Development (pages 28 – 56) and Section V, Usage Estimates and Energy Savings Impacts (pages 57 – 63).

Since LIEE staff required end use estimates of energy from the study, an early decision was made to forego the "change" in usage model approach in favor of "level" model specifications. The initial work employing the change model specifications was not considered sufficiently developed to warrant inclusion in the formal report.

The specification and estimation of the level models was straightforward. Initial estimates employed models very similar to the modeel outlined in the report. The initial models contained fewer variables. For example, the variable added to account for the impact of senior citizens in the household was not included initially. This variable was added later to improve upon initial specification. Their includsion improved the explanatory power of subsequent models, but had little impact on the savings estiamtes. The correction for serial correlation (which is outlined in the report) had a much greater impact on savings estimates than the various alternative specification of the "level" model. The alternative specifications of the "level" model are not included in the formal report. It was believed that their inclusion would have added little value.

6. Error in measuring variables:

It was not believed that measurement error presented a significant problem for this analysis.

7. Autocorrelation:

See pages 39 – 40 of the report.

8. Heteroscedasticity:

It was not believed that heteroscedasticity presented a significant problem for this analysis.

9. Collinearity:

Collinearity was not believed to be a significant problem with the chosen model specification.

10. Influential data points:

Outliers were not believed to be a problem given the size and distribution of the variables in the analytic dataset.

11. Missing data:

Without survey data, missing data was not an issue in this analysis.

12. Precision:

Standard errors were calculated using the t-values provided in Tables 5 and 6.

E. Data Interpretation and Application

1. For all program participants and at the end-use level….: Net impacts are equivalent to participant gross impacts.

2. Describe the process, choices made, and rational for….: There was no comparison group, since it was not required by the Protocols. It is believed that participants would not have taken the actions without the program, hence the net to gross ratio is 1.0.

Table of Contents

Summary

First year energy load impacts for the 1998 residential Low Income Energy Efficiency programs (LIEE) by utility are presented below. The LIEE provided assistance to low income customer groups throughout the state. The assistance consisted of subsidies for installation of energy efficiency measures, energy education, and repair and/or replacement of space heating and evaporative cooling equipment. The participating utilities are Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric Company (SDGE), Southern California Edison Company (SCE), and Southern California Gas Company (SCG).

The energy models employed engineering estimates to capture the importance of specific measures to estimate energy savings. The model savings are compared to ex-ante savings provided by the utilities in this summary section only. The term "ex-post" means after the fact first year impacts in this study.

The energy saving impacts are provided in three tables. The savings are dependent on weather conditions and comparisons between utilities should be discounted due to different weather. The savings are averages across the utility's climate areas, therefore customers living in the colder areas of the territory will actually have greater savings than the reported numbers. Table 1 summarizes first year results for all participants combined. While program efforts are delineated by dwelling type, Table 1 provides an overview of total program results and results by each measure across all households by utility. Table 2 provides first year results for single family participants, while Table 3 provides first year results for multifamily participants. First year ex-ante measure impacts are also included in Tables 2 and 3. Ex-ante measure impacts were taken from the 1998 LIEE advice letter filings by the various utilities.

The number of households receiving LIEE services by utility and fuel are as follows:

	Electricity Homes	Gas Homes
Pacific Gas and Electric Company	4,674	25,783
San Diego Gas and Electric Company	8,523	8,523
Southern California GasCompany		19,725
Southern California Edison Company	62,135	

The ex-post savings per household by utility and fuel are as follows:

	Electricity Per Home	Gas Per Home
Pacific Gas and Electric Company	144.3	30.0
San Diego Gas and Electric Company	68.8	10.6
Southern California GasCompany		21.7
Southern California Edison Company	108.8	

These savings are considered to be net savings. A net-to-gross assessment was not conducted for the 1998 Low Income Energy Efficiency Programs. Given the income constraints on this customer group, the recorded actions likely would not have occurred without the programs' efforts.

Usage values defining the 90 percent and 80 percent confidence levels for each single family and multifamily measure are provided in Tables 2 and 3 and in the detailed unit savings tables in the section entitled Appliance Usage Estimates and Energy Savings Impacts (Tables 7, through 12).

The single family households receiving LIEE services by utility and fuel are as follows:

	Electricity Homes	Gas Homes
Pacific Gas and Electric Company	3,153	14,601
San Diego Gas and Electric Company	3,448	2,756
Southern California Gas Company		12,872
Southern California Edison Company	16,273	

The ex-post savings per household by utility and fuel are as follows:

	Electricity Per Home	Gas Per Home
Pacific Gas and Electric Company	156.3	38.6
San Diego Gas and Electric Company	72.3	10.0
Southern California Gas Company		22.2
Southern California Edison Company	115.5	

The multiple family households receiving LIEE services by utility and fuel are as follows:

	Electricity Homes	Gas Homes
Pacific Gas and Electric Company	1,521	11,182
San Diego Gas and Electric Company	5,075	5,767
Southern California Gas Company		6,853
Southern California Edison Company	45,862	

The ex-post multiple family savings per household by utility and fuel are as follows:

	Electricity Per Home	Gas Per Home
Pacific Gas and Electric Company	118.9	18.9
San Diego Gas and Electric Company	66.5	11.1
Southern California Gas Company		21.0
Southern California Edison Company	106.4	

Table 1
All Participants Therm Savings
Measure Impacts, Measure Counts and Program Impacts

PG&E Therm Savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation	25.5	5,427	138,389
Weatherstripping/Caulking	2.4	22,403	53,767
Building Envelope Repairs	4.6	21,681	99,733
Low Flow Showerhead	16.4	24,928	408,819
Water Heater Blanket	13.2	5,511	72,745
All Measures	30.0	25,783	773,453

SDGE Therm Savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation	18.2	280	5,096
Weatherstripping/Caulking	1.8	7,325	13,185
Building Envelope Repairs	3.0	7,341	22,023
Low Flow Showerhead	8.0	5,947	47,576
Water Heater Blanket	6.1	335	2,044
All Measures	10.6	8,523	89,924

SCG Therm Savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation	22.8	3,060	69,768
Weatherstripping/Caulking	3.4	19,597	66,630
Building Envelope Repairs	5.7	18,270	104,139
Low Flow Showerhead	9.4	16,145	151,763
Water Heater Blanket	7.5	6,316	47,370
Furnace Repair and Replacement			
Space Heating Replacement	-3.2	1,536	-4,915
Space Heating Repair	-14.8	408	-6,038
All Measures	21.7	19,725	428,716

All Participants KWH Savings
Measure Impacts, Measure Counts and Program Impacts
PG&E KWH Savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation SH	271.2	292	79,190
Weatherstripping/Caulking SH	38.1	1,204	45,872
Building Envelope Repairs SH	67.0	1,165	78,055
Ceiling Insulation AC	129.6	520	67,392
Weatherstripping/Caulking AC	18.4	2,148	39,523
Building Envelope Repairs AC	31.6	2,079	65,696
Low Flow Showerhead	247.2	535	132,252
Water Heater Blanket	197.8	118	23,340
Equipment Replacement			
Refrigerator Replacement	542	264	143,088
All Measures	144.3	4,674	674,408

SDGE KWH savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation SH	67.3	40	2,692
Weatherstripping/Caulking SH	10.5	1,046	10,983
Building Envelope Repairs SH	17.5	1,049	18,358
Ceiling Insulation AC	-33.0	16	-528
Weatherstripping/Caulking AC	-5.7	419	-2,388
Building Envelope Repairs AC	-9.6	419	-4,022
Low Flow Showerhead	200.8	152	30,522
Water Heater Blanket	148.0	9	1,332
Compact Fluorescent Lights	23.2	22830	529,656
All Measures	68.8	8,523	586,605

SCE KWH Savings

Measure	Ex-Post Measure Impact	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization			
Ceiling Insulation SH	310.1	5	1,551
Weatherstripping/Caulking SH	32.4	494	16,006
Building Envelope Repairs SH	56.1	105	5,891
Ceiling Insulation AC	213.3	26	5,546
Weatherstripping/Caulking AC	31.8	2470	78,546
Building Envelope Repairs AC	53.0	526	27,878
Low Flow Showerhead	271.9	100	27,190
Water Heater Blanket	212.7	876	186,325
Compact Fluorescent Lights	26.5	202,299	5,360,924
Evaporative Cooler Installation and Maintenance			
Evaporative Cooler Installation	319.2	2,682	856,094
Evaporative Cooler Maintenance	20.1	9,604	193,040
All Measures	108.8	62,135	6,758,991

Table 2
Single Family Therm Savings
Measure Impacts, Measure Counts and Program Impacts

PG&E Single Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	-	29.0	-	6.0, 4.7	4,709	136,561
Weatherstripping/Caulking	-	4.3	-	.9, .7	11,452	49,244
Building Envelope Repairs	-	7.2	-	1.6, 1.3	13,129	94,529
Low Flow Showerhead	-	16.4	-	7.3, 5.7	13,765	225,746
Water Heater Blanket	-	13.2	-	5.9, 4.6	4,344	57,341
All Measures	16.8	38.6	229.7		14,601	563,421

SDGE Single Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	64.1	21.0	32.8	5.8, 4.5	211	4,431
Weatherstripping/Caulking	-	3.2	-	.9, .7	1,593	5,098
Building Envelope Repairs	17.4	5.3	30.5	1.5, 1.2	1,605	8,507
Low Flow Showerhead	10.6	7.2	67.9	5.2, 4.0	1,146	8,251
Water Heater Blanket	5.5	5.8	105.5	4.2, 3.3	207	1,201
All Measures	-	10.0			2,756	27,488

SCG Single Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	23.7	24.6	103.8	5.3, 4.1	1,892	46,543
Weatherstripping/Caulking	4.6	3.6	78.3	.8, .6	12,782	46,015
Building Envelope Repairs	6.9	6.1	88.4	1.4, 1.1	11,849	72,279
Low Flow Showerhead	8.0	9.5	118.7	4.5, 3.5	10,593	100,633
Water Heater Blanket	6.0	7.6	126.7	3.5, 2.8	4,068	30,917
Furnace Repair and Replacement						
Space Heating Replacement	14	-3.2	-	5.6,4.4	1,536	-4,915
Space Heating Repair	-17	-14.8	-	9.8, 7.6	408	-6,038
All Measures	-	22.2			12,872	285,434

Single Family KWH Savings -
Measure Impacts, Measure Counts and Program Impacts

PG&E Single Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	271.7	-	169, 132	151	41,027
Weatherstripping/Caulking SH	-	40.8	-	27 , 21	366	14,933
Building Envelope Repairs SH	-	67.9	-	44, 34	420	28,476
Ceiling Insulation AC	-	129.9	-	41, 32	514	66,769
Weatherstripping/Caulking AC	-	19.5	-	6, 4	1,570	30,615
Building Envelope Repairs AC	-	32.5	-	9, 7	1,800	58,500
Low Flow Showerhead	-	247.2	-	189, 147	411	101,599
Water Heater Blanket	-	197.8	-	151, 118	116	22,945
Refrigerator Replacement						
Refrigerator Replacement	855.8	542	63.3	295, 229	236	127,912
All Measures	149.8	156.3			3,153	492,776

SDGE Single Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	64.9	-	62, 49	24	1 ,558
Weatherstripping/Caulking SH	-	9.7	-	9, 7	160	1,552
Building Envelope Repairs SH	-	16.2	-	16, 12	161	2,680
Ceiling Insulation AC	-	-30.7	-	44, 31	12	-368
Weatherstripping/Caulking AC	-	-4.6	-	6, 4	77	-354
Building Envelope Repairs AC	-	-7.7	-	11, 8	78	-601
Low Flow Showerhead	-	173.5	-	170 132	35	6,073
Water Heater Blanket	-	138.5	-	136, 118	6	831
Compact Fluorescent Lights	-	23.2	-	12, 10	10,254	237,893
All Measures	-	72.3			3,448	249,264

SCE Single Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	335.6	-	537, 408	4	1,342
Weatherstripping/Caulking SH	-	50.3	-	76 , 59	17	855
Building Envelope Repairs SH	-	83.9	-	130, 101	12	1,007
Ceiling Insulation AC	-	215.7	-	170, 132	9	1,941
Weatherstripping/Caulking AC	-	32.4	-	24, 19	34	1,102
Building Envelope Repairs AC	-	53.9	-	28, 22	23	1,240
Low Flow Showerhead	-	298.5	-	249, 194	21	6,269
Water Heater Blanket	-	238.8	-	198, 154	30	7,164
Compact Fluorescent Lights	45.7	26.5	58.0	24, 19	42,534	1,127,151
Evaporative Cooler Installation and Maintenance						
Evaporative Cooler Installation	654.4	353.6	54.0	45, 35	1,891	668,658
Evaporative Cooler Maintenance	190.9	19.2	10.1	55, 43	3,236	62,131
All Measures	536.5	115.5			16,273	1,878,860

Table 3
Multifamily Therm Savings-
Measure Impacts, Measure Counts and Program Impacts

PG&E Multiple Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	-	2.9	-	19.5, 15.2	718	2,082
Weatherstripping/Caulking	-	.4	-	2.6, 2.0	10,951	4,380
Building Envelope Repairs	-	.7	-	4.9, 3.8	8,552	5,986
Low Flow Showerhead	-	16.4	-	7.3, 5.7	11,163	183,073
Water Heater Blanket	-	13.2	-	5.9, 4.6	1,167	15,404
All Measures	23.3	18.9	81.0		11,182	210,925

SDGE Multiple Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	64.1	9.6	15.0	9.5, 7.4	69	662
Weatherstripping/Caulking	-	1.4	-	1.4, 1.1	5,732	8,025
Building Envelope Repairs	17.4	2.4	13.8	2.4, 1.9	5,736	13,766
Low Flow Showerhead	10.6	8.2	77.4	5.9, 4.6	4,871	39,942
Water Heater Blanket	5.5	6.5	118.2	4.7, 3.7	128	832
All Measures	-	11.1			5,767	64,227

SCG Multiple Family Therm Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation	14.0	20.0	142.9	11.9, 9.3	1,168	23,360
Weatherstripping/Caulking	3.0	3.0	100.0	1.8, 1.4	6,815	20,445
Building Envelope Repairs	4.0	5.0	125.0	3.0, 2.4	6,421	32,105
Low Flow Showerhead	8.0	9.2	115.0	4.4, 3.4	5,552	51,078
Water Heater Blanket	5.0	7.4	148.0	3.7, 2.9	2,248	16,635
All Measures	-	21.0			6,853	143,623

Multifamily KWH Savings -
Measure Impacts, Measure Counts and Program Impacts

PG&E Multiple Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	266.1	-	173, 135	141	37,520
Weatherstripping/Caulking SH	-	36.9	-	26 , 20	838	30,922
Building Envelope Repairs SH	-	66.5	-	43, 33	745	49,542
Ceiling Insulation AC	-	102.0	-	17, 14	6	612
Weatherstripping/Caulking AC	-	15.3	-	3, 2	578	8,843
Building Envelope Repairs AC	-	25.5	-	7, 5	279	7,114
Low Flow Showerhead	-	247.2	-	189, 147	124	30,653
Water Heater Blanket	-	197.8	-	151, 118	2	396
Refrigerator Replacement						
Refrigerator Replacement	713.6	542	63.3	295, 229	28	15,176
All Measures	111.5	118.9			1,521	180,778

SDGE Multiple Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	71.0	-	60, 47	16	1 ,136
Weatherstripping/Caulking SH	-	10.6	-	10, 9	886	9,392
Building Envelope Repairs SH	-	17.7	-	17, 15	888	15,718
Ceiling Insulation AC	-	-39.9	-	50, 40	4	-160
Weatherstripping/Caulking AC	-	-6.0	-	8, 6	342	-2,052
Building Envelope Repairs AC	-	-10.0	-	13, 10	341	-3,410
Low Flow Showerhead	-	209.0	-	189 147	117	24,453
Water Heater Blanket	-	167.2	-	151, 118	3	502
Compact Fluorescent Lights	-	23.2	-	12, 10	12,576	291,763
All Measures	-	66.5			5,075	337,342

SCE Multiple Family KWH Savings

Measure	Ex-Ante Measure Impact	Ex-Post Measure Impact	Ex-Post % of Ex-Ante	Confidence Intervals (90%,80%)	Ex-Post Measure Count	Ex-Post Program Impact
Weatherization						
Ceiling Insulation SH	-	208.0	-	283, 220	1	208
Weatherstripping/Caulking SH	-	31.8	-	41 , 33	477	15,169
Building Envelope Repairs SH	-	52.5	-	73, 57	93	4,882
Ceiling Insulation AC	-	212.0	-	71, 55	17	3,604
Weatherstripping/Caulking AC	-	31.8	-	10, 8	2436	77,465
Building Envelope Repairs AC	-	53.0	-	19, 15	503	26,659
Low Flow Showerhead	-	264.8	-	232, 180	79	20,919
Water Heater Blanket	-	211.8	-	191, 149	846	179,183
Compact Fluorescent Lights	45.7	26.5	58.0	24, 19	159,765	4,233,773
Evaporative Cooler Installation and Maintenance						
Evaporative Cooler Installation	654.4	237.1	36.2	107, 83	791	187,546
Evaporative Cooler Maintenance	190.9	20.5	10.7	59, 46	6,368	130,544
All Measures	536.5	106.4			45,862	4,879,952

Introduction

The 1998 Low Income Energy Efficiency Programs (LIEE) provided a wide range of assistance to low income customer groups throughout the state. The assistance consisted primarily of full subsidies for installation of energy efficiency measures and energy education, with repair and/or replacement of space heating, refrigeration, and evaporative cooling equipment, when necessary. The participating utilities in the 1998 LIEE are Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric Company (SDGE), Southern California Edison Company (SCE), and the Southern California Gas Company (SCG).

It is very important to note that the program also served an equity objective in assisting customers who were highly unlikely or unable to participate in other residential conservation programs because of income constraints. This program allowed income eligible customers to receive the benefits of energy conservation without the hardship of making cash investments.

The utilities used a variety of community-based organizations (CBO) and local contractors for locating and recruiting households who qualified for program participation, i.e., households whose annual income is less than the Low Income Weatherization Income Limits established by the California Public Utilities Commission. Staff from these entities received training by each utility or utility representative in the installation of ceiling insulation and other conservation measures.

There were two major LIEE programs provided in 1998: 1) the Weatherization Program, and 2) the Equipment Repair and Replacement Program. The Weatherization Program focused on the installation of conservation measures in single family, multifamily, and mobile homes and providing energy education to customers. Conservation measures were aimed at reducing space heating, space cooling, lighting, and water heating energy use. The space heating/cooling-related measure impacts evaluated in this study included:

ceiling insulation, weatherstripping, caulking, and building envelope repair (the repair of windows, walls, and doors to reduce air infiltration). Savings from other weatherization measures such as outlet gaskets and attic venting were not measured in this study. The lighting measure was compact fluorescent bulbs, although not all utilities offered this measure. The water heating-related measures are: low-flow showerheads and water heater blankets. Savings from othe conservation measures such as faucet aerators were not measured in this study.

The Equipment Repair and Replacement Program repaired or replaced inoperative or potentially hazardous furnaces or evaporative coolers and replaced refrigerators, for income-eligible customers in owner-occupied homes. This program has been particularly helpful for senior citizens and disabled customers.

This report summarizes the results of a statistical analysis aimed at estimating the first year load impacts of the aforementioned elements of the 1998 Low Income Energy Efficiency Program by utility and fuel type. The focus of this effort is on the energy use impacts of the LIEE, rather than job creation, skill enhancement, resident comfort, hardship reduction, public safety, and public health benefits generated through LIEE efforts. These aspects are extremely important, but the impacts are not energy related.

The objective of this study was to: 1) estimate the impact of weatherization and other LIEE conservation measures on space heating, space cooling, lighting, and water heating energy usage; and 2) estimate load impacts from equipment repair and replacement efforts. These objectives were accomplished using conditional demand analysis (CDA), a statistical technique that disaggregates monthly energy consumption data into appliance-specific average usage. The technique uses individual customer recorded monthly gas and electricity usage both before and after installation of conservation measures (and/or repair or replacement of a furnace or evaporative cooler) to estimate changes in energy usage. Customer-specific demographic information and regional weather data are also directly

employed in the estimation process. Weather differences explain a great amount of variation the monthly usage by customers within a utility service territory

The data employed in the analysis, and its development, are outlined herein in the section entitled Analytic Data Set Development. The estimation of the CDA model is described in the section entitled Conditional Demand Model Development and load impacts are included in the section entitled Usage Estimates and Energy Savings Impacts. Appendices include the summary statistics for variables included in the CDA models, and the Statistical Analysis System (SAS) output for the CDA models.

Analytic Data Set Development

This section describes the development of the data used in the analyses of the 1998 DAP usage impacts. The required analytic data sets were created from integrating three separate data sets for each utility: the 1998 program participant file, utility monthly customer billing files, and the daily weather files The relationship of these datasets with respect to the development of the analytic data sets is shown in Figure 1. A brief description of each data set follows.

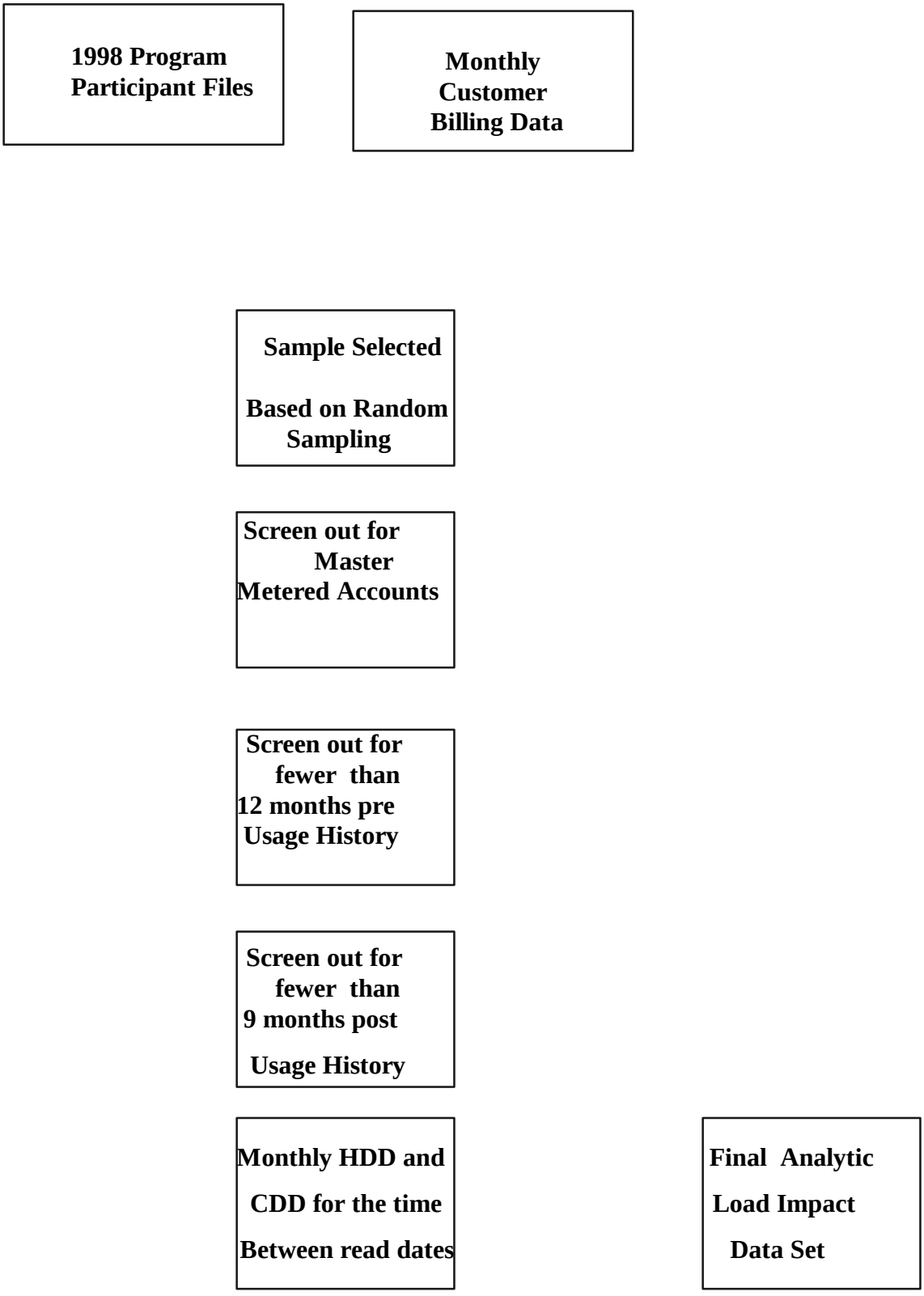
Program Participation Records

Each utility maintains a LIEE participant transaction databases. The databases are used to track program transaction activities from eligible customer identification, through verification of eligibility, measure and equipment installation, inspection and verification, contractor request for reimbursement, and check issuance to the contractor. The files contain information pertaining to each stage of LIEE delivery. The systems are routinely internally audited and have been reviewed by the California Public Utilities Commission (CPUC).

The Program participation files contain data vital to the estimation of load impacts, specifically:

- Number of people in the home
- Age of the head of the household
- Type of dwelling receiving LIEE services
- Conservation measures undertaken
- Date each repair, replacement, and measure was implemented
- Premise and customer identification number (used to match billing records to the customer)
- Address (used to assign weather data)

Figure 1
Analytic Data Set Development



The customer name, address, and account number from the customer bill are used to identify the premise and customer identification numbers and the premise and customer identification numbers are appended to the participation files. The participation process does not continue if an accurate identification of the customer on the utility customer information system cannot be made. Customer eligibility and dwelling type information is employed in the load impact modeling process.

Billing Data

Energy consumption data was obtained from the customer billing files maintained by the utilities. The customer billing file contains monthly energy usage for each customer. The correct billing data for each program participant were obtained by matching the account numbers on the LIEE participation files with those on the customer billing files.

Key participant-specific information obtained from the customer billing files included:

- monthly energy consumption for each 1998 LIEE participant from January, 1997 through December, 1999
- meter read dates
- baseline codes
- monthly billing days

Weather Data

Weather variables were created to account for the effect of weather on space heating energy use and on air conditioning energy use. For space heating a set of climate area and billing cycle-specific "heating degree days" variables with a 65 degree Fahrenheit base was created. A heating degree day equals the positive difference between 65 degrees and the average daily temperature. For air conditioning a set of climate area and billing cycle-specific "cooling degree days" variables with a 70 degree Fahrenheit base was created. A

cooling degree day equals the positive difference between the average daily temperature and 70 degrees. Daily temperatures were employed to create daily degree variables over the billing data time frame. These daily values were aggregated into monthly values for each combination of weather zones and each possible billing cycle. For PG&E, twenty-five weather zones areas were used. SDGE had three weather zones. SCE and SCG territories were split into six zone areas. An identical process was undertaken using normalized weather (a file of 16 year average weather data computed for each service territory and climatic subregions) to compute the program load impacts. This process allowed household-specific weather to be employed in the estimation process.

The heating degree day and cooling degree day variables (both actual and 16 year normalized) were merged with the LIEE participant and billing data using address and billing cycle information. The "actual" variables were used for estimation of savings, while the "normalized" variables were used for simulation of the model and calculation of program impacts.

Program Participant Sample

The first step in the participant sample-process was to determine an appropriate sample frame. The individually metered LIEE participants from each utility/fuel type combination comprised the analysis population. That is, customers who are not billed directly for the energy consumed by the household (e.g. master metered customers) were removed from the analysis population. Annual average 1998 usage and standard deviations were computed. Target sample sizes were estimated for each stratum to achieve a minimum 10 percent precision at the 95 percent confidence level using simple sample size statistical techniques. The target minimum sample sizes by utility and fuel are as follows.

Pacific Gas and Electric Company Electric Customers	215
Pacific Gas and Electric Company Gas Customers	162
San Diego Gas and Electric Company Electric Customers	172
San Diego Gas and Electric Company Gas Customers	261
Southern California Edison Evaporative Cooler Installation	132
Southern California Edison Evaporative Cooler Maintenance	184
Southern California Edison Relamping	173
Southern California Edison Weatherization	157
Southern California Gas Company Weatherization	112
Southern California Gas Company Furnace Repair/Replace	82

Larger samples were drawn from each group listed above to insure enough households would pass the pre and post period usage requirements specified in the Protocols. The pre period usage minimum month requirement is twelve while the post period usage minimum month requirement is nine. Without survey information, the only screen was meeting the pre and post installation consumption requirements. Table 4 provides the distribution of individually metered participants, initial sample, and participants passing the usage history screen by utility.

The major end-use ownership indicators were assigned to the sample using the average monthly usage profiles. Appliance ownership indicators were assigned to households that passed various usage criteria. For gas samples, space and water heating ownership indicators were developed. For the electric samples, space heating, water heating and air conditioning indicators were created. Baseline codes were used to create the space and water heating indicators for SCG. PG&E had information on central air conditioning. Analysis of average monthly usage was undertaken to determine appliance ownership for the remaining utilities.

In the case of gas space heating, customers using more than 30 therms in the winter (December and January) months or customers whose winter use was more than 50 percent greater than summer (July and August) use were assigned as gas space heating customers. Analysis of summer use was employed to determine gas water heating. Customers whose monthly summer usage was 10 or more therms were assigned as gas water heating.

Electric space heating and water heating ownership were determined by looking at winter period use relative to spring season (April and May). Customers whose winter and spring electric use exceeded 800 kWh per month were assigned to have both electric space heating and water heating. Customers whose winter monthly kWh was over 700 kWh and more than 25 percent higher than spring monthly kWh were assigned electric space heating. Customers whose spring monthly usage was greater than 650 kWh were assigned electric water heating. In the case of air conditioning, customers whose summer monthly use exceeded 800 kWh were assigned electric air conditioning.

Table 4
1998 Program Participation by Utility

Utility	Ind. Metered Participants	Initial Sample	Screened Sample
PG&E Electric	24851	1281	1027
PG&E Gas	21779	900	738
SDGE Electric	10859	3122	1179
SDGE Gas	5095	1698	766
SCE EC Install	2474	769	436
SCE EC Maint.	8036	1071	616
SCE Relamping	48360	1149	523
SCE Weather	2469	834	350
SCG Weather	15337	1501	1056
SCG Furnace	1944	348	313

The final step in the creation of the analytic data set was to create household demographic variables. These variables included number of people in the home, whether a senior citizen was the head of the household, and a multiple family dwelling indicator all extracted from program eligibility information. Along with the appliance ownership indicators and program measure data, the household demographic variables were used to specify the conditional demand model discussed in the next section.

Conditional Demand Model Development

The objectives of the monthly energy use models developed from the merged participant and billing record database (i.e., the analytic data set) were to:

1. Measure the impact that weatherization measures have on space heating consumption,
2. Measure the impact of conservation measures on water heating consumption,
3. Measure the usage impacts attributed to the repair and replacement of space heating appliances/equipment,
4. Measure the usage impacts attributed to the installation and maintenance of evaporative coolers,
5. Measure the usage impacts attributed to the replacement of refrigerators, and
6. Measure the usage impacts attributed to compact fluorescent light lamps.

Equipment usage impacts and conservation savings are provided in Tables 1, 2 and 3 within the Summary section of this report. They are also included in Tables 7 through 13 within Usage Estimates and Savings Impacts, following this section. Space heating and space cooling equipment usage and related weatherization savings are estimated under normal weather conditions as required by the Protocols.

A detailed presentation of the LIEE monthly energy use and load impact equations are provided in this section. An overview of the estimation technique and data sources employed are described first, then the overall energy demand equations are presented. Finally, an interpretation of the coefficients is presented.

Estimation Technique

The estimation technique used in this study is conditional demand analysis. The conditional demand technique provides a method of distributing total household energy consumption among the major energy using appliances present in the home. In addition,

the technique allows estimation of changes in major appliance use due to the installation of conservation measures and/or the repair or replacement of major appliances.
Conditional demand analysis was used in lieu of other approaches for two reasons. First, the approach had been successfully employed to assess energy savings in previous LIEE studies. Second, other approaches either did not provide the detailed results CDA would afford (i.e., result at an end-use basis for various types of program participants) or would have demanded information that was unavailable (e.g., reasonably accurate energy use priors for individual end-uses across many types of customers).

A change in consumption model, where the change in usage is modeled as a function of the change in weather, as well as changes in conservation from the previous year, was also considered in the early stages of this study. Robust, end-use specific usage estimates could not be derived, so the approach was discarded. Although several versions of the CDA were estimated, only the final versions (based on goodness of fit and reasonable annual usage estimate values) are presented in the report.

The conditional demand technique is based on the proposition that the energy use of each household is the sum of the energy used by each of the appliances in the household. In mathematical terms, natural gas use is expressed as:

Guse = gsh * GSH + gwh * GWH + goth
where:

Guse	is household gas consumption
gsh	is gas space heating use
GSH	is a gas space heat indicator variable
gwh	is gas water heating use
GWH	is a gas water heating indicator variable
goth	is other gas use

In mathematical terms, electricity use is expressed as:

Euse = esh * ESH + ewh * EWH + eac * EAC + eoth

where:

Euse	is household electricity consumption
esh	is electric space heating use
ESH	is an electric space heat indicator variable
ewh	is electric water heating use
EWH	is an electric water heating indicator variable
eac	is electric air conditioning use
EAC	is an electric air conditioning indicator variable
eoth	is other electricity use

The indicator variables take the value of 1 if the appliance is present in the household and 0 if the household does not own or operate the appliance. Most LIEE participant households had gas space heating and water heating - The indicator variable for these appliances was 1 for most households. Few of the LIEE participant households had air conditioning, electric space and water heating --The indicator variable was most often 0, but when a major electric appliance is present it has a large impact on household electric consumption.

For each of the above mentioned appliances, a usage equation is created. The usage equation relates the energy use of a particular appliance to key factors that will influence its monthly use. For example, the number and age composition of residents will affect water heater use, type of residence and weather conditions will affect space heating use, and conservation measures, as well as the presence of replaced or repaired equipment, will affect the monthly consumption of specific appliances.

Information for every factor is required for each LIEE participant household. The data elements integrated to estimate the appliance equations include:

1) program participant household demographic information,
2) program participant information regarding the date conservation measures were installed, and the measures installed,
3) monthly consumption, meter read date and billing days from billing records, and
4) weather data (in heating degree days) in the temperature zone in which each household is located and for the time period covered by each energy bill.

The sources for these data elements were outlined in the Analytical Data Set section. The discussion that follows details the process of using that data to estimate conditional demand models of appliance energy use.

Estimation Process and Regression Results

A two-stage estimation process was employed to obtain a regression model from which reasonable appliance usage estimates and savings impacts could be determined. In addition to employing a sound, established theoretical framework, devlopment of reasonable estimated regression coefficients that are unbiased and consistent.

Traditional econometric theory clearly defines how the properties of estimated regression coefficients (e.g., unbiasedness and consistency) and the estimated standard errors depend on the error structure of the model employed. If the regression error terms are serially correlated (i.e., the value of residuals follow a pattern determined by the value of preceding residuals), the estimated coefficients can be unbiased and consistent, but the standard errors of the coefficients are inconsistent. If the standard errors are inconsistent, hypothesis tests conducted with them may be inaccurate. Of more direct importance to this study, the 90 percent and 80 percent confidence intervals developed around the usage and savings estimates would be inaccurate.

The error structure of a model based on a pooled cross-section and time-series data set is likely to be time-wise autoregressive. A CDA model requires a pooled cross-section and time-series data set. Consequently, a CDA model should be tested for serial correlation. Corrections for the presence of serial correlation in the error structure should be undertaken, when evidence of the problem is discovered.

Serial correlation was discovered during the estimation of the conditional demand model for the 1998 LIEE programs. This prompted the use of a two-stage process to develop acceptable estimates of appliance usage of conservation savings. The first stage involved the development of the basic model, its estimation using ordinary least squares, and testing for serial correlation. The second stage involved correcting the first stage results for the presence of serial correlation. The summary appliance usage and conservation impacts provided in this report employ the second stage model results.

First Stage - Ordinary Least Squares

This stage involved the estimation of a regression equation using ordinary least squares. The initial assumption was that the error terms were not serially correlated.

The LIEE equations were estimated using January, 1997 through December, 1999 billing year data. All households had at least one year of consumption history prior to the installation of conservation measure and at least nine months of post conservation installation consumption history. The regression equation was weighted to adjust for varying lengths of consumption history present. The weight equaled the inverse of the ratio of monthly observations for all households.

Appendix A contains definitions of the model variables as well as summary statistics (mean, standard deviation, minimum and maximum) for the untransformed variables of the first stage. Appendix B contains the SAS System regression results for both stages.

The first stage equations yielded an adjusted R-squared values of .30 to .50, which are typical for pooled datasets. The model coefficients and their t values for the various models are displayed in Tables 5 and 6. Estimated coefficients from both stages are included in these tables. The results are what were generally anticipated during the formulation of the original specification. Interpretation of individual coefficients is discussed below in Appliance-Equipment Specific Use Estimation.

TABLE 5
Gas Usage Conditional Demand Model Parameter Estimates

PG&E Gas LIEE Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	6.373332	8.81	6.610694	6.54
GSH*HDD	.141204	71.29	.132608	64.07
GSH*HDD*MF	-.067654	-23.56	-.064272	-22.14
GSH*HDD*OLD	.016299	12.17	.023240	15.19
GSH*HDD*WTHR*SF	-.079706	-10.17	-.063286	-7.78
GSH*HDD*WTHR*MF	-.034928	-1.46	-.006332	-.27
GWH	21.038479	26.28	22.558130	19.74
GWH*MF	-6.570143	-11.55	-6.596080	-8.31
GWH*WTHR	-14.969935	-4.20	-18.269765	-3.70
BCHANGE*DPOST	12.585050	12.93	20.133556	14.14
NCHANGE*DPOST	-13.987216	-4.53	-26.802090	-5.80

SDGE Gas LIEE Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	10.312300	33.98	10.762443	25.60
MF	-7.659500	-6.15	-7.716638	-20.39
GSH*HDD	.131634	38.89	.105029	33.77
GSH*HDD*MF	-.048302	-7.87	-.053166	-9.64
GSH*HDD*OLD	.036154	21.29	.046615	27.76
GSH*HDD*WTHR*SF	-.141773	-11.17	-.076066	-6.52
GSH*HDD*WTHR*MF	-.111873	-5.15	-.034540	-1.83
GWH*LNUM	6.339481	20.12	7.833979	18.59
GWH*LNUM*WTHR	-4.355478	-1.89	-6.369541	-2.42
BCHANGE*DPOST	1.057238	1.85	2.803529	3.22
NCHANGE*DPOST	-7.659500	-6.15	-6.535405	-3.13

SCG Gas LIEE Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	22.035349	57.52	14.514831	31.32
MF	-6.512065	-14.74	-6.777672	-10.65
GSH*HDD	.129886	42.74	.126305	42.80
GSH*HDD*MF	-.054799	-7.19	-.055257	-7.65
GSH*HDD*OLD	.053926	33.47	.061106	38.78
GSH*HDD*NEW	-.029631	-11.43	-.023256	-9.19
GSH*HDD*WTHR*SF	-.089865	-7.46	-.096540	-8.32
GSH*HDD*WTHR*MF	-.083335	-2.94	-.085640	-3.21
GSH*HDD*FSH*POST	.011888	2.71	.009404	1.87
GSH*HDD*RSH*POST	-.003593	-1.27	.002452	.99
GWH*LNUM	5.616324	21.57	7.566556	17.86
GWH*LNUM*WTHR	-11.097932	-6.29	-7.524597	-3.44
BCHANGE*DPOST	8.494446	11.65	11.153210	9.92
NCHANGE*DPOST	-12.743050	-3.38	-14.759904	-3.50

TABLE 6
Electricity Usage Conditional Demand Model Parameter Estimates

PG&E Electric LIEE Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	449.393433	44.80	460.094648	30.98
MF	-126.067000	-58.07	-131.306599	-32.35
REF*DPOST	-43.778666	-4.34	-45.167848	-3.03
ESH*HDD	.731718	12.08	.954138	16.14
ESH*HDD*MF	.175109	3.29	-.169095	-3.17
ESH*HDD*WTHR	-.143648	-.61	-.544751	-2.51
EAC*CDD	.968969	31.25	1.043861	40.66
EAC*CDD*MF	-.043449	-1.31	-.122249	-4.48
EAC*CDD*WTHR	-.471145	-3.49	-.509773	-4.58
EWH	383.138976	30.53	337.103516	26.35
EWH*MF	-41.504507	-2.09	-111.302318	-1.67
EWH*WTHR	-636.846291	-5.02	-274.694605	-2.16
BCHANGE*DPOST	55.121375	12.87	54.594745	8.39
NCHANGE*DPOST	-228.757012	-15.07	-235.358165	-32.35

SDGE Electric LIEE Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	186.672329	109.14	282.447327	53.04
MF	-35.498850	-22.87	-42.218594	-13.74
LNUM	51.211795	29.66	71.051482	21.60
ESH*HDD	1.114008	70.98	.732592	41.90
ESH*HDD*WTHR	.564909	4.27	-.264990	-2.04
EAC*CDD	3.522204	54.12	2.158966	44.92
EAC*CDD*WTHR	1.693184	3.39	.466358	1.29
EWH*LNUM	172.295573	26.92	186.699318	26.18
EWH*LNUM*WTHR	-254.845509	-3.58	-135.866971	-1.76
LT*DPOST	-2.831587	-6.56	-1.931758	-3.09
BCHANGE*DPOST	61.180041	23.54	67.650112	16.92
NCHANGE*DPOST	-216.555428	-11.79	-218.572164	-8.64

SCE Electric LIEE Weatherization Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	313.478860	45.12	310.342862	14.78
MF	-71.172171	-11.88	-71.138234	-3.95
LNUM	56.682606	17.40	58.102835	5.73
ESH*HDD	.877810	7.82	1.008331	7.24
ESH*HDD*WTHR	.021439	.05	-.606547	-1.14
EAC*CDD	1.724004	23.48	1.440400	19.71
EAC*CDD*WTHR	-.058548	-.18	-.569127	-1.86
EWH*LNUM	152.981501	34.25	178.863721	14.88
EWH*LNUM *WTHR	70.484395	1.38	-187.146486	-1.96
BCHANGE*DPOST	37.515907	8.33	49.023931	5.02
NCHANGE*DPOST	-123.903370	-6.72	-78.635308	-2.06

SCE LIEE Relamping Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	287.801553	52.79	290.980040	18.85
MF	-66.944147	-24.48	-73.124282	-9.35
LNUM	42.031928	13.85	47.743382	5.48
ESH*HDD	.822987	37.425	.494788	16.91
EAC*CDD	1.729619	90.87	1.366195	64.93
EWH*LNUM	221.910900	52.49	257.443982	22.89
LT*DPOST	-2.826789	-3.74	-2.207844	-1.81
BCHANGE*DPOST	77.108439	18.72	66.556915	8.29
NCHANGE*DPOST	-130.387353	-5.70	-126.487075	-2.90

SCE LIEE Evaporative Cooler Maintenance Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	360.626749	115.76	363.392498	54.07
MF	-41.3555534	-8.78	-45.673099	-4.49
ESH*HDD	.734611	32.83	.562598	18.39
EVAP*CDD	1.182184	85.23	1.179157	75.83
EVAP*CDD*MF	-.207432	-10.78	-.162543	-7.53
EVAP*CDD*DPOST	.011747	.68	-.011847	-.54
EWH*LNUM	261.047355	54.30	263.155682	22.83
BCHANGE*DPOST	122.134608	16.38	112.475324	8.21
NCHANGE*DPOST	-229.972819	-4.91	-104.270435	-1.21

SCE Direct Assistance Evaporative Cooler Replacement Program

Model Variables	Ordinary Least Squares		Correction for Serial Correlation	
	Coefficient	t-value	Coefficient	t-value
INT	380.828067	134.37	390.657769	82.10
MF	-44.496153	-7.29	-70.170409	-7.04
ESH*HDD	.582057	26.37	.465019	18.15
EVAP*CDD	1.268889	61.23	1.291518	62.74
EVAP*CDD*MF	-.193931	-5.09	-.068670	-1.68
EVAP*CDD*DPOST*SF	-.184860	-7.07	-305212	-12.04
EVAP*CDD*DPOST*MF	-.191290	-4.76	-.154825	-3.59
EWH*LNUM	249.946777	51.67	269.133731	35.18
BCHANGE*DPOST	155.972367	11.60	214.232446	9.41
NCHANGE*DPOST	-292.305910	-7.87	-233.870814	-3.85

where:

Variable	Definition
GSH	gas space heating indicator
GWH	gas water heating indicator
POST	post space heater installation
NEW	post 1978 building indicator
FSH	repair space heater indicator
RSH	replace space heater indicator
ESH	electric space heating indicator
EWH	electric water heating indicator
HDD	number of heating degree days (base 65)
EAC	air conditioning indicator
EVAP	evaporative cooler indicator
CDD	number of cooling degree days (base 70)
MF	multiple family residence indicator
LNUM	log of number of people in the home
OLD	persons over 65 in the home indicator
DPOST	post weatherization installation period indicator
WTHR	sum of weatherization measures saving impact
BCHANGE	large post period increase in usage indicator
NCHANGE	large post period decrease in usage indicator
LT	number of compact fluorescent lightbulbs installed
REF	replace refrigerator indicator

A Durbin Watson statistic was calculated to assess whether serial correlation was present in each model. The Durbin Watson statistics were all below 1 indicating the presence of

serial correlation. Respondent-specific rho values were also calculated. These are shown on page 7 of Appendix B.

Second Stage — Correction for Serial Correlation

The second stage was actually begun with the estimation of the respondent-specific rho values discussed above. The predicted values from the initial conditional energy demand equation were used to estimate the level of correlation in the error term over time for each respondent (i.e., household). This was done by fitting an autoregressive model of order one, an AR(1) model, for each respondent.

The AR(1) model can be described as follows:

$$e_{i,t} = rho_i * e_{i,t-1} + N_{i,t}$$

where:

$e_{i,t}$ is the regression error term from the first stage for the i^{th} respondent in month t

$N_{i,t}$ is a "white noise" error term for the i^{th} respondent in month t

Estimates of rho_i, P_i, are obtained by regressing residuals from the first stage OLS model on the residuals values lagged one period. This is done separately for each respondent.

The estimated P_i values are used to transform the dependent variable and all the regressors. It is important to remember that each regressor in Tables 8 and 9 has a time (t) and a household (i) subscript attached to it. These subscripts were left out of the table for presentation purposes. For example, the last variable in Table 8, GSH*HDD, should be interpreted as $(GSH*HDD)_{i,t}$. The transformation involves replacing the value of $(GSH*HDD)_{i,t}$ with the value of $(GSH*HDD)_{i,t}$ - Pi* $(GSH*HDD*)_{i,t-1}$.

Next the energy demand equation was re-estimated using the transformed variables to correct for the correlation in the error term. This correction generates more consistent

regression parameter estimates. The parameter estimates from this second stage are also summarized in Tables 5 and 6. The detailed results are contained in Appendix B.

Gas Appliance/Equipment Specific Use Estimation

SCG

The space heating (gsh) water heating (gwh), and other (goth) demand equations for the SCG model are explained below.

Gas Space Heating

The actual space heating load is based on customer behavior and the principles of thermodynamics. Therm usage depends upon the efficiency of the heating system, the thermal integrity of the home, the area to be heated, and the desired household indoor temperature.

The presence of weatherization measures (attic insulation, caulking/weatherstripping, and building envelope repairs) improves the thermal integrity of the home. The program measure file provided information concerning weatherization measures. The dates of measure installation provided a tool to develop pre and post weatherization indicators. It was assumed that if customers had no program measure installation information for a particular item, they already had the weatherization item present in the home. A term equaling the sum of expected savings (20 percent for attic insulation, 3 percent for caulking/weatherstripping, and 5 percent for building envelope repairs) from the weatherization items was entered into the equation. These estimates were developed as a result of a detailed engineering analysis.

The desired indoor temperature in the home is thought to be dependent on the age characteristics of the people in the home and the building. Specifically, it was assumed that households with at least one member over 65 years have higher indoor temperature requirements than other household age formations and homes built after 1978 will have

lower indoor requirements due to the improved thermal integrity. Note that differences between single family and multiple family dwellings are taken into account with a multiple family interaction.

The space heating usage model takes the form described below (the coefficient and t-values are provided in Table 5).

gsh = .126305 * GSH* HDD
(t2) - -.055257 * GSH* HDD *MF
(t3) + .061106 * GSH* HDD * OLD
(t4) - .023256 * GSH* HDD * NEW
(t5) - .096540 * GSH*HDD*WTHR*SF
(t6) - .085640 * GSH*HDD*WTHR*MF
(t7) + .011888 * GSH*HDD*FSH*POST
(t8) + .002452 * GSH*HDD*RSH*POST

where the variables are defined following Table 6.

Term t1 captures the use per degree-day. Multiple family household use per degree-day (term t2) is more than 40 percent less than single family households. The term t3 indicates households with senior citizens use almost 50 percent more than younger household formations. Term t4 represents the impact new construction dwellings have on space heating use. Terms t5 and t6 measures the weatherization savings that were achieved by single and multiple family households. Term t6 measures the space heating use after the space heater was repaired and t7 captures the load impact for those participants who received a new space heater.

Gas Water Heating

Gas water heating use depends on the number of people in the home. The log of the number of people plus 1 was used to model the impact household size has on water heating use. The low flow showerhead impacts the volume of water used while the blanket impacts the implied efficiency of the heater tank. A term equaling the sum of expected savings taken from the engineering analysis and equal to 7.5 percent for the low flow showerhead and 6 percent for heater blanket was entered into the water heating equation. The water heating usage model takes the form (t-values reported in Table 5):

gwh = 7.566556 * GWH*LNUM
(t2) - 7.524597 * GWH*LNUM*WTHR

where the variables are defined following Table 6.

Term t1 measures water heating use per person. Water heating conservation impacts are captured in term t2. The value of t2 suggests that nearly 100 percent of the expected water heating savings were achieved after the conservation measures is installed.

Other Gas

Other gas usage as well as space and water heating pilot loads are captured in the intercept. Multiple family households are assumed to have fewer other gas appliances and smaller pilot loads than single family households. Also, participants whose average monthly post weatherization use were either 50 percent higher or 50 percent lower as pre weatherization monthly use were accounted for in the regression model. The variables are included to capture any changes in appliance ownership or household characteristics that would help explain such large differences in use. Households whose usage increased drastically during the post period are expected to have a positive influence on post

installation use while customers whose usage dropped dramatically are expected to have negative impact on post period consumption.

The other gas usage model takes the form (t-values reported in Table 5):

Goth = 19.354463
(t2) - 6.777672 * MF
(t3) + 11.153210 * BCHANGE * POST
(t4) - 14.759904 * NCHANGE * POST

where the variables are defined following Table 6.

The intercept (t1) has the expected positive sign. The magnitude of term t2 suggests multiple family households have smaller other gas loads than single family households. The customers whose usage changed dramatically in the post period have the expected impact on gas usage as was mentioned above.

SDGE
The space heating (gsh) water heating (gwh), and other (goth) demand equations for the SDGE model are explained below.

Gas Space Heating

The space heating usage model takes the form described below (the coefficient and t-values are provided in Table 5).

gsh = .105029 * GSH* HDD
(t2) - -.053166 * GSH* HDD *MF
(t3) + .046615 * GSH* HDD * OLD
(t4) - .076066 * GSH*HDD*WTHR*SF
(t5) - .034540 * GSH*HDD*WTHR*MF

(where the variables are defined following Table 6).

Term t1 captures the use per degree-day. Multiple family household use per degree-day (term t2) is 50 percent less than single family households. The term t3 indicates households with senior citizens use 45 percent more than younger household formations. Terms t4 and t5 measures the weatherization savings that were achieved by single and multiple family households. The single family savings are twice as much as multiple family savings.

Gas Water Heating

The water heating usage model takes the form (t-values reported in Table 5):

gwh = 7.833979 * GWH*LNUM
(t2) - 6.369541 * GWH*LNUM*WTHR

where the variables are defined following Table 6.

Term t1 measures water heating use per person. Water heating conservation impacts are captured in term t2. The value of t2 suggests that over 80 percent of the expected water heating savings were achieved after the conservation measure is installed.

Other Gas

The other gas usage model takes the form (t-values reported in Table 5):

Goth = 10.762443
(t2) - 6.535405 * MF
(t3) + 2.803529 * BCHANGE * POST
(t4) - 6.535405 * NCHANGE * POST

where the variables are defined following Table 6.

The intercept (t1) has the expected positive sign. The magnitude of term t2 suggests multiple family households have smaller other gas loads as single family households.

PG&E

The space heating (gsh) water heating (gwh), and other (goth) demand equations for the PG&E model are explained below.

Gas Space Heating

The space heating usage model takes the form described below (the coefficient and t-values are provided in Table 5).

gsh = .132608 * GSH* HDD
(t2) - -.064272 * GSH* HDD *MF
(t3) + .023240 * GSH* HDD * OLD
(t4) - .063286 * GSH*HDD*WTHR*SF
(t5) - .006332 * GSH*HDD*WTHR*MF
(where the variables are defined following Table 6).

Term t1 captures the use per degree-day. Multiple family household use per degree-day (term t2) is more than 50 percent less than single family households. The term t3 indicates households with senior citizens use 15 percent more than younger household formations. Terms t4 and t5 measures the weatherization savings that were achieved by single and multiple family households. The multiple family savings are very small and statistically insignificant.

Gas Water Heating

The water heating usage model takes the form (t-values reported in Table 5):

gwh = 22.558130 * GWH
(t2) - 6.596080 * GWH*MF
(t3) - 18.269765 * GWH*WTHR

where the variables are defined following Table 6.

Term t1 measures water heating use for single family households. Term t2 shows the reduction in water heating use in multiple family homes. Water heating conservation impacts are captured in term t3. The value of t3 suggests that over 80 percent of the expected water heating savings were achieved after the conservation measured is installed.

Other Gas

The other gas usage model takes the form (t-values reported in Table 5):

goth = 6.610694
(t2) + 20.133556 * BCHANGE * POST
(t3) - 26.802090 * NCHANGE * POST

where the variables are defined following Table 6.

Electric Appliance/Equipment Specific Use Estimation

SCE

The space heating (esh), water heating (ewh), air conditioning (eac), and other (eoth) demand equations for the SCE models are explained below.

Electric Space Heating

The actual space heating load is based on customer behavior and the principles of thermodynamics. Electric heating use depends upon the thermal integrity of the home, the area to be heated and the desired household indoor temperature. The presence of weatherization measures (attic insulation, caulking/weatherstripping, and building envelope repairs) improves the thermal integrity of the home. The program measure file provided information concerning weatherization measures. The dates of measure installation provided a tool to develop pre and post weatherization indicators. It was assumed that customers who had no program measure installation information for a particular item, already had the weatherization item present in the home. A term equaling the sum of expected savings (20 percent for attic insulation, 3 percent for caulking/weatherstripping, and 5 percent for building envelope repairs) from the weatherization items was entered into the equation. These estimates were developed as a result of a detailed engineering analysis.

The space heating usage models for the four SCE programs takes the form described below (the coefficient and t-values are provided in Table 6).

		Weatherization	Evaporative Replace	Evaporative Maintenance	Relamping
esh	= ESH*HDD*	1.008331	.465019	.562598	.494788
(t2)	- ESH* HDD* WTHR*	.606547			

where the variables are defined following Table 6.

Term t1 captures the use per degree-day. Due to the low saturation of electric space heating, multiple family impacts and senior citizen impacts were not measured. The weatherization impact on use per degree-day (term t2) suggests that 60 percent of the expected savings were achieved, although the estimate was not statistically significant.

Electric Water Heating

Electric water heating use depends on the number of people in the home. The log of the people in the home plus 1 was used to model the impact household size has on water heating use. The low flow showerhead impacts the volume of water used while the blanket impacts the implied efficiency of the heater tank. A term equaling the sum of expected savings taken from the engineering analysis and equal to 7.5 percent for the low flow showerhead and 6 percent for heater blanket was entered into the water heating equation.

The water heating usage models takes the form (t-values reported in Table 5):

		Weatherization	Evaporative Replace	Evaporative Maintenance	Relamping
ewh	= EWH*LNUM*	178.863721	269.133731	263.155682	257.443982
(t2)	- EWH* LNUM* WTHR*	187.146486			

where the variables are defined following Table 6.

Term t1 measures water heating use per person. Water heating conservation impacts are captured in term t2. The value of t2 suggests that nearly 110 percent of the expected water heating savings were achieved after the conservation measure is installed.

Air Conditioning

The actual air conditioning load is based on customer behavior and the principles of thermodynamics. Electric cooling use depends upon the thermal integrity of the home, the efficiency of the equipment, and the area to be heated and the desired household indoor temperature. Replacement and maintenance of evaporative coolers improves the efficiency of the cooling system. The presence of weatherization measures (attic insulation, caulking/weatherstripping, and building envelope repairs) improves the thermal integrity of the home. The program measure file provided information concerning weatherization measures. The dates of measure installation provided a tool to develop pre and post weatherization indicators. It was assumed that customers who had no program measure installation information for a particular item, already had the weatherization item present in the home. A term equaling the sum of expected savings (20 percent for attic insulation, 3 percent for caulking/weatherstripping, and 5 percent for building envelope repairs) from the weatherization items was entered into the equation. These estimates were developed as a result of a detailed engineering analysis.

The air conditioning models for the four SCE programs takes the form described below (the coefficient and t-values are provided in Table 6).

		Weatherization	Evaporative Replace	Evaporative Maintenance	Relamping
eac	= EAC*CDD*	1.440400			1.366195
(t2)	- EAC* CDD* WTHR*	.569127			
(t3)	+ EVAP*CDD		1.291518	1.179157	
(t4)	- EVAP*CDD*MF		.068670	.162543	
(t5)	- EVAP*CDD*DPOST		.011847		
(t6)	- EVAP*CDD*DPOST*SF		.305212		
(t7)	- EVAP*CDD*DPOST*MF		.154825		

where the variables are defined following Table 6.

Terms t1 and t3 captures the use per cooling degree-day. The multiple family impact on evaporative cooling use is measured by term t4. The weatherization impact on use per cooling degree-day (term t2) suggests that 40 percent of the expected savings is achieved. Evaporative cooler replacement cooling degree-day savings by dwelling are expressed in term t6 and t7. Savings per cooling degree-day for evaporative cooler maintenance are shown in term t5.

Other Electric

Other electric usage is assumed to depend on the number of people in the home. The log of the people plus 1 was used to model the impact household size. Multiple family households are assumed to have fewer other electric appliances as single family households have. Relamping impacts are taken into account with a post implementation indicator. Also, participants whose average monthly post installation use was either 15 percent higher or 50 percent lower than pre installation monthly use was accounted for in the regression model. The variables are included to capture any changes in appliance ownership or household characteristics that would help explain such large differences in use. Households whose usage increased drastically during the post period are expected to have a positive influence on post installation use while customers whose usage dropped dramatically are expected to have negative impact on post period consumption.

The other electric usage models takes the form (t-values reported in Table 6):

	Weatherization	Evaporative Replace	Evaporative Maintenance	Relamping
Eoth = INT	310.34	390.66	363.39	290.98
(t2) + LNUM	58.10			47.74
(t3) - MF	71.14	70.17	45.67	73.12
(t4) - LT * DPOST				2.207
(t5) + BCHANGE* DPOST	49.02	214.23	112.48	66.56
(t6) - NCHANGE* DPOST	78.64	233.87	104.27	126.49

where the variables are defined following Table 6.

The intercept (t1) has the expected positive sign. The number of people in the home impact is captured in term t2. The magnitude of term t3 suggests multiple family households have smaller other electric loads than single family households. Term t4 suggest that customers save a little more than 2 kwh per month for each compact fluorescent lamp that was installed. The customers whose usage changed dramatically in the post installation period have the expected impact on other electric use as was mentioned above.

PG&E

The space heating (esh), water heating (ewh), air conditioning (eac) and other (eoth) demand equations for the PG&E model are explained below.

Electric Space Heating

The space heating usage model takes the form described below (the coefficient and t-values are provided in Table 6).

esh = .954138 * ESH* HDD
(t2) - .169095 * ESH* HDD *MF
(t3) + .170236 * ESH* HDD * OLD
(t4) - .544751 * ESH*HDD*WTHR

(where the variables are defined following Table 6).

Term t1 captures the use per degree-day. Multiple family household use per degree-day (term t2) is more than 17 percent less than single family households. The term t3 indicates households with senior citizens use 19 percent more than younger household formations. Term t4 measures the weatherization savings that were achieved by households with electric space heat.

Electric Water Heating

The electric water heating usage model takes the form (t-values reported in Table 6):

Ewh = 337.103516 * EWH
(t2) - 111.302318 * EWH*MF
(t3) - 274.694605 * EWH*WTHR

where the variables are defined following Table 6.

Term t1 measures water heating use for single family households. Term t2 shows the reduction in water heating use in multiple family homes. Water heating conservation impacts are captured in term t3. The value of t3 suggests that over 80 percent of the expected water heating savings were achieved after the conservation measure is installed.

Air Conditioning

The air conditioning usage model takes the form described below (the coefficient and t-values are provided in Table 6).

eac = 1.043861 * EAC* CDD
(t2) - .122249 * EAC* CDD *MF
(t3) - .5009773* EAC*CDD*WTHR

(where the variables are defined following Table 6).

Term t1 captures the use per cooling degree-day. Multiple family household use per degree-day (term t2) is 12 percent less than single family households. Term t4 measures the weatherization savings that were achieved by households with air conditioning.

Other Electric

The other electric usage model takes the form (t-values reported in Table 6):

eoth = 460.094648
(t2) - 131.306599 * MF
(t3) - 45.167848 * REF*DPOST
(t4) + 54.594745 * BCHANGE * POST
(t5) - 235.358165 * NCHANGE * POST

where the variables are defined following Table 6.

The intercept (t1) has the expected positive sign. Term t2 measures the impact multiple family homes have on other electric use. Monthly energy savings for customers who had refrigerators replaced are captured in term t3.

SDGE

The space heating (esh), water heating (ewh), air conditioning (eac) and other (eoth) demand equations for the SDGE model are explained below.

Electric Space Heating

The space heating usage model takes the form described below (the coefficient and t-values are provided in Table 6).

esh = .732592 * ESH* HDD
(t2) - .264990 * ESH*HDD*WTHR

(where the variables are defined following Table 6).

Term t1 captures the use per degree-day. Term t4 measures the weatherization savings that were achieved by households with electric space heat. The value indicates slightly over 30 percent of the expected savings were achieved.

Electric Water Heating

The electric water heating usage model takes the form (t-values reported in Table 6):

ewh = 186.699318 * EWH*LNUM
(t2) - 135.866971 * EWH*LNUM*WTHR

where the variables are defined following Table 6.

Term t1 measures water heating use per household . Water heating conservation impacts are captured in term t2. The value of t2 suggests that over 70 percent of the expected water heating savings were achieved after the conservation measure is installed.

Air Conditioning

The air conditioning usage model takes the form described below (the coefficient and t-values are provided in Table 6).

eac = 2.158966 * EAC* CDD
(t2) + .4663583* EAC*CDD*WTHR

(where the variables are defined following Table 6).

Term t1 captures the use per cooling degree-day. Term t2 measures the negative weatherization savings that were achieved by households with air conditioning, but the coefficient is significant at the 80% level of confidence only.

Other Electric

The other electric usage model takes the form (t-values reported in Table 6):

eoth = 282.447327
(t2) – 42.218594 * MF
(t3) + 71.051482 * LNUM
(t4) – 1.931758 * LT*DPOST
(t4) + 67.650112 * BCHANGE * POST
(t5) – 218.572164 * NCHANGE * POST

where the variables are defined following Table 6.

The intercept (t1) has the expected positive sign. Term t2 measures the impact multiple family homes have on other electric use. The people in the home impact is captured in term t3. Monthly energy savings for customers who had compact fluorescent lights installed are captured in term t4.

Usage Estimates and Energy Savings Impacts

This section of the report presents the annual saving impacts from weatherization measures, other conservation measures, and repaired and replaced appliances. The space heating and air conditioning usage estimates are based on average monthly weather conditions over the past 16 years in the weather zones throughout the state weighted for program participation.

The remainder of the section is organized as follows. First, the method used to estimate savings is discussed. Second, the weatherization and conservation savings estimates are presented for each utility.

Method of Calculating Savings

The energy use model regression coefficients displayed in Tables 5 through 13 are employed to predict monthly consumption under normal weather condition values. Households participating in the programs had annual end-use energy use values calculated for the following scenarios:

a) no weatherization/conservation measures were installed
b) all weatherization/conservation measures were installed

Monthly weather conditions as well as other household characteristics are held constant throughout all the scenarios for all sample households. This approach permits the differences in end-use usage among the scenarios to truly reflect the energy savings attributed to the measure or new equipment. The coefficients from the model correcting for serial correlation are employed to compute the end-use energy and savings estimates. Simulation results are presented in the next section.

Gas Weatherization Measure Savings and Equipment Estimates

SCG

Table 7 displays the annual space heating savings estimates for weatherization measures, water heating conservation measures, replaced furnaces, and repaired furnaces along with the 90 percent and 80 percent confidence intervals respectively. The replacement numbers indicate that the space heating post-installation period usage values are higher than pre-installation period values. Space heating use increased slightly after the furnace was replaced. The furnace repair numbers show significant usage increases after the furnace is repaired. All the space heating weatherization saving values and water heating conservation measures are statistically significantly different than zero. Ceiling insulation had the greatest weatherization therm savings and the low flow showerhead the greatest conservation measure therm savings. The single family therm savings are greater than the multiple family values.

Table 7
SCG Weatherization and Conservation Measures Therm Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Showerhead	Water Heater Blanket	Furnace Replace	Furnace Repair
Weatherization Single Family	24.6 (5.3, 4.1)	3.6 (.8, .6)	6.1 (1.4, 1.1)	9.5 (4.5,3.5)	7.6 (3.5, 2.8)	-3.2 (5.6, 4.4)	-14.8 (9.8,7.6)
Weatherization Multifamily	20.0 (11.9, 9.3)	3.0 (1.8, 1.4)	5.0 (3.0, 2.4)	9.2 (4.4, 3.4)	7.4 (3.7, 2.9)	-	-

SDGE

Table 8 lists the gas weatherization and conservation results with the 90 percent and 80 percent confidence band in parenthesis for San Diego Gas and Electric Company. All the space heating weatherization saving values and water heating conservation measures are statistically significantly different than zero. Ceiling insulation had the greatest weatherization therm savings amount and the low flow showerhead the greatest conservation measure therm savings. The single family weatgherization savings are greater than the multiple family values, but the multiple family water heating savings are greater than single family.

Table8
SDGE Gas Weatherization and Conservation Measures Therm Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Showerhead	Water Heater Blanket
Weatherization Single Family	21.0 (5.8, 4.5)	3.2 (.9, .7)	5.3 (1.5, 1.2)	7.2 (5.2,4.0)	5.8 (4.2, 3.3)
Weatherization Multifamily	9.6 (9.5, 7.4)	1.4 (1.4, 1.1)	2.4 (2.4, 1.9)	8.2 (5.9, 4.6)	6.5 (4.7, 3.7)

PG&E

Table 9 displays the annual space heating savings estimates for weatherization measures and water heating conservation measures along with the 90 percent and 80 percent confidence intervals respectively for the Pacific Gas and Electric Company. The single family space heating weatherization saving values and the water heating conservation measures for all dwellings are statistically significantly different than zero, but the multiple family weatherization estimates are not statistically significant. Ceiling insulation had the greatest weatherization therm savings amount and the low flow showerhead the greatest conservation measure therm savings.

Table 9
PG&E Weatherization and Conservation Measures Therm Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Showerhead	Water Heater Blanket
Weatherization Single Family	29.0 (6.0, 4.7)	4.3 (.9, .7)	7.2 (1.6, 1.3)	16.4 (7.3,5.7)	13.2 (5.9, 4.6)
Weatherization Multifamily	2.9 (19.5, 15.2)	.4 (2.6, 2.0)	.7 (4.9, 3.8)	16.4 (7.3, 5.7)	13.2 (5.9, 4.6)

Electric Weatherization Measure Savings and Equipment Estimates

SCE

Table 10 displays the annual space conditioning savings estimates for weatherization measures, water heating conservation measures, lighting and equipment savings along with the 90 percent and 80 percent confidence intervals respectively. The evaporative cooler and lighting replacement numbers indicate significant savings. All the air conditioning weatherization saving values along with the water heating conservation measures are significantly different than zero. The space heating savings are not significantly different than zero. Ceiling insulation had the largest weatherization electricity savings and the low flow showerhead the greatest conservation measure electricity savings. The single family savings are greater than the multiple family values.

Table 10
SCE Weatherization and Conservation Measures KWH Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Shower	Water Heater Blanket	Evapor - Cooler Replace	Evapor-Cooler Maintenance	Lighting
Weatherization Single Family Space Heating Water Heating	335.6 (537, 408)	50.3 (76, 59)	83.9 (130, 101)	298.5 (249,194)	238.8 (198, 154)	-	-	26.5 (24.2,18.8)
Weatherization Single Family Cooling	215.7 (170, 132)	32.4 (24, 19)	53.9 (28, 22)	- -	- -	353.6 (45, 35)	19.2 (55,43)	-
Weatherization Multifamily Space Heating Water Heating	208.0 (283, 220)	31.8 (41,33)	52.5 (73, 57)	264.8 (232,180)	211.8 (191, 149)	-	-	26.5 (24.2,18.8)
Weatherization Multifamily Cooling	212.0 (71, 55)	31.8 (10, 8)	53.0 (19, 15)	-	-	237.1 (107, 83)	20.5 (59, 46)	-

PG&E

Table 11 displays the annual space conditioning savings estimates for weatherization measures, water heating conservation measures, and refrigeration replacement savings along with the 90 percent and 80 percent confidence intervals respectively. The refrigerator replacement saves more than 540 kwh annually. All the space heating and air conditioning weatherization saving values along with the water heating conservation savings are significantly different than zero. Ceiling insulation had the greatest weatherization electricity savings and the low flow showerhead the greatest conservation measure electricity savings.

Table 11
PG&E Weatherization and Conservation Measures KWH Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Shower	Water Heater Blanket	Refrigerator Replace
Weatherization Single Family Space Heating Water Heating	271.7 (169, 132)	40.8 (27, 21)	67.9 (44, 34)	247.2 (189,147)	197.8 (151, 118)	542.0 (295, 229)
Weatherization Single Family Cooling	129.9 (41, 32)	19.5 (6, 4)	32.5 (9, 7)	-	-	-
Weatherization Multifamily Space Heating Water Heating	266.1 (173, 135)	39.9 (26,20)	66.5 (43, 33)	247.2 (189,147)	197.8 (151, 118)	542.0 (295, 229)
Weatherization Multifamily Cooling	102.0 (17, 14)	15.3 (3, 2)	25.5 (7, 5)	-	-	-

SDGE

Table 12 displays the annual space conditioning savings estimates for weatherization measures, water heating conservation measures, and lighting replacement along with the 90 percent and 80 percent confidence intervals respectively. The lighting replacement saves slightly less than 24 kwh annually per lightbulb. All the space heating weatherization saving values along with the water heating conservation measures are significantly different than zero. The air conditioning savings are negative but not significant at the 90 percent confidence level. Ceiling insulation had the greatest space heating weatherization electrictiy savings and the low flow showerhead the largest conservation measure electricity savings.

Table 12
SDGE Weatherization and Conservation Measures KWH Savings

Class	Ceiling Insulation	Weather-stripping/ Caulking	Building Envelope Repairs	Low Flow Shower	Water Heater Blanket	Lighting Replace
Weatherization Single Family Space Heating Water Heating	64.9 (62 , 49)	9.7 (9, 7)	16.2 (16 12)	173.5 (170,132)	138.8 (136, 118)	23.2 (12, 10)
Weatherization Single Family Cooling	-30.7 (44, 31)	-4.6 (6, 4)	-7.7 (11, 8)	-	-	-
Weatherization Multifamily Space Heating Water Heating	71.0 (60, 47)	10.6 (10, 9)	17.7 (17, 15)	209.0 (189,147)	167.2 (151, 118)	23.2 (12, 10)
Weatherization Multifamily Cooling	-39.9 (50, 40)	-6.0 (8, 6)	-10.0 (13, 10)	-	-	-

Appendix A
Summary Statistics of Model Variables SCG Gas Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.028	.163	0	1
BLANK	water heater blanket dummy	.288	.453	0	1
CAULK	Caulking/weatherstripping dummy	.928	.258	0	1
CONSH	Aggregate weatherization measure space heater term* _HEAT*HDD*single family	22.988	31.648	0	205.062
CONSHM	Aggregate weatherization measure space heater term*multiple family dummy*G_HEAT*HDD	3.550	14.396	0	205.062
CONWH	Aggregate conservation measure water heater term*G_WAT*log(numinhh+1)	.063	.075	0	.324
DD	Gas space heat * heating degree days	113.131	126.607	0	732.364
DDMF	Gas space heat * heating degree days*multiple family dummy	15.412	59.044	0	732.364
DDNEW	Dwelling built after 1978 dummy*G_HEAT*heating degree days	7.432	47.120	0	732.364
ENV	Building envelope repair dummy	.863	.344	0	1
FIX	Space heater repaired dummy	.040	.196	0	1
G_HEAT	gas space heating dummy	.999	.020	0	1
G_WAT	gas water heating dummy	.981	.136	0	1
GWAT	water heater*log(numinhh+1)	1.345	.518	0	2.398
INSUL	ceiling insulation dummy	.123	.328	0	1
LOWFL	Low flow showerhead dummy	.772	.419	0	1
MF	Multifamily dummy	.149	.356	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.001	.030	0	1
NEW	Dwelling built after 1978 dummy	.058	.234	0	1
NUMINHH	number in household	3.443	2.102	1	10
OLD	Senior citizen in the home dummy*G_HEAT*heating degree days	40.209	89.131	0	731.442
PFIX	Space heater repaired dummy*POST*HDD	2.308	23.860	0	706.800
PREP	Space heater replaced dummy*POST*HDD	7.740	44.438	0	731.442
REP	Space heater replaced dummy	.130	.336	0	1
SENIOR	Senior citizen in the home dummy	.361	.480	0	1
USE	Monthly therm usage	41.571	30.196	0	426.494

Summary Statistics of Model Variables SDGE Gas Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.035	.183	0	1
BLANK	water heater blanket dummy	.073	.259	0	1
CAULK	Caulking/weatherstripping dummy	.739	.439	0	1
CONSH	Aggregate weatherization measure space heater term* _HEAT*HDD*single family	16.362	28.292	0	111.290
CONSHM	Aggregate weatherization measure space heater term*multiple family dummy*G_HEAT*HDD	8.426	21.334	0	111.290
CONWH	Aggregate conservation measure water heater term*G_WAT*log(numinhh+1)	.135	.078	0	.324
DD	Gas space heat * heating degree days	102.049	120.923	0	397.463
DDMF	Gas space heat * heating degree days*multiple family dummy	35.346	86.520	0	397.463
ENV	Building envelope repair dummy	.743	.437	0	1
G_HEAT	gas space heating dummy	.805	.397	0	1
G_WAT	gas water heating dummy	.904	.295	0	1
GWAT	water heater*log(numinhh+1)	1.120	.554	0	2.398
INSUL	ceiling insulation dummy	.080	.272	0	1
LOWFL	Low flow showerhead dummy	.511	.500	0	1
MF	Multifamily dummy	.428	.495	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.007	.083	0	1
NUMINHH	number in household	3.080	1.694	1	10
OLD	Senior citizen in the home dummy*G_HEAT*heating degree days	22.393	70.143	0	395.617
SENIOR	Senior citizen in the home dummy	.192	.394	0	1
USE	Monthly therm usage	23.578	21.985	0	363.752

Summary Statistics of Model Variables PG&E Gas Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.028	.163	0	1
BLANK	water heater blanket dummy	.263	.440	0	1
CAULK	Caulking/weatherstripping dummy	.704	.457	0	1
CONSH	Aggregate weatherization measure space heater term* _HEAT*HDD*single family	32.600	48.492	0	206.738
CONSHM	Aggregate weatherization measure space heater term*multiple family dummy*G_HEAT*HDD	1.114	7.724	0	184.943
CONWH	Aggregate conservation measure water heater term*G_WAT	.083	.052	0	.135
DD	Gas space heat * heating degree days	182.011	196.019	0	738.352
DDMF	Gas space heat * heating degree days*multiple family dummy	32.512	105.413	0	719.973
ENV	Building envelope repair dummy	.797	.403	0	1
G_HEAT	gas space heating dummy	.989	.104	0	1
G_WAT	gas water heating dummy	.950	.218	0	1
INSUL	ceiling insulation dummy	.251	.434	0	1
LOWFL	Low flow showerhead dummy	.870	.337	0	1
MF	Multifamily dummy	.180	.385	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.002	.049	0	1
OLD	Senior citizen in the home dummy*G_HEAT*heating degree days	47.961	129.850	0	738.352
SENIOR	Senior citizen in the home dummy	.257	.438	0	1
USE	Monthly therm usage	46.013	35.513	0	392.055

Summary Statistics of Model Variables PG&E Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.056	.228	0	1
BLANK	water heater blanket dummy	.196	.397	0	1
CAULK	Caulking/weatherstripping dummy	.760	.427	0	1
CD	Air conditioning * cooling degree days	5.472	18.465	0	579.120
CDMF	Air conditioning * cooling degree days*multi family dummy	4.597	32.516	0	562.400
CONAC	Aggregate weatherization measure space heater term*E_AC*CDD	5.472	18.465	0	159.742
CONSH	Aggregate weatherization measure space heater term*E_HEAT*HDD	.970	9.021	0	196.627
CONWH	Aggregate conservation measure water heater term*E_WAT	.001	.013	0	.135
DD	Electric space heat * heating degree days	9.531	58.777	0	741.000
DDMF	Electric space heat * heating degree days*multiple family dummy	5.960	46.088	0	741.000
E_AC	Air conditioning dummy	.307	.461	0	1
E_HEAT	electric space heating dummy	.051	.219	0	1
E_WAT	Electric water heating dummy	.021	.145	0	1
ENV	Building envelope repair dummy	.741	.438	0	1
INSUL	Ceiling insulation dummy	.200	.400	0	1
LOWFL	Low flow showerhead dummy	.848	.359	0	1
MF	Multifamily dummy	.362	.481	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.004	.065	0	1
OLD	Senior citizen in the home dummy*E_HEAT*heating degree days	3.505	36.348	0	656.745
REF	Refrigerator replacement dummy*POST	.990	.097	0	1
RF	Refrigerator replacement dummy	.016	.124	0	1
SENIOR	Senior citizen in the home dummy	.332	.471	0	1
USE	Monthly kwh usage	396.212	216.738	.921	2737.050

Summary Statistics of Model Variables SDGE Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.094	.290	0	1
BLANK	Water heater blanket dummy	.042	.200	0	1
CAULK	Caulking/weatherstripping dummy	.715	.451	0	1
CD	Air conditioning * cooling degree days	1.523	14.760	0	300.881
CONAC	Aggregate weatherization measure space heater term*E_AC*CDD	.135	1.916	0	81.862
CONSH	Aggregate weatherization measure space heater term*E_HEAT*HDD	1.475	8.432	0	110.773
CONWH	Aggregate conservation measure water heater term*E_WAT*log(numinhh+1)	.003	.022	0	.281
DD	Electric space heat * heating degree days	11.382	53.806	0	416.480
DDMF	Electric space heat * heating degree days*multiple family dummy	11.382	53.806	0	416.480
E_AC	Air conditioning dummy	.045	.208	0	1
E_HEAT	electric space heating dummy	.045	.208	0	1
E_WAT	Electric water heating dummy	.025	.156	0	1
ENV	Building envelope repair dummy	.715	.451	0	1
EWAT	water heater*log(numinhh+1)	.039	.252	0	2.079
INSUL	ceiling insulation dummy	.038	.191	0	1
LITE	Compact fluorescent lighting indicator	.892	.310	0	1
LNUM	Log(numinhh+1)	1.367	.431	.693	2.303
LOWFL	Low flow showerhead dummy	.521	.500	0	1
LT	LITE*POST*bulbs	1.565	1.768	0	12
MF	Multifamily dummy	.611	.488	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.002	.039	0	1
NUMINHH	number in household	3.304	1.775	1	9
USE	Monthly kwh usage	367.417	187.378	0	2220.25

Summary Statistics of Model Variables SCERelamping Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.139	.343	0	1
BULBS	Compact fluorescent bulbs	3.613	.694	1	8
CD	Air conditioning * cooling degree days	12.764	67.843	0	778.240
DD	Electric space heat * heating degree days	12.058	64.091	0	1005.3
E_AC	Air conditioning dummy	.139	.346	0	1
E_HEAT	electric space heating dummy	.096	.294	0	1
E_WAT	Electric water heating dummy	.038	.192	0	1
EWAT	water heater*log(numinhh+1)	.039	.252	0	2.079
LNUM	Log(numinhh+1)	1.553	.431	.693	2.485
LT	POST*bulbs	1.757	1.874	0	8
MF	Multifamily dummy	.649	.477	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.003	.057	0	1
NUMINHH	number in household	4.148	1.999	1	11
USE	Monthly kwh usage	361.669	247.206	0	3460.17

Summary Statistics of Model Variables SCE Evaporative Cooler Replacement Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.024	.151	0	1
CD	Air conditioning * cooling degree days	97.304	162.438	0	779.393
CDMF	Air conditioning * cooling degree days*multiple family indicator	24.151	99.521	0	779.393
DD	Electric space heat * heating degree days	29.049	101.441	0	996.291
E_AC	Air conditioning dummy	1	0	1	1
E_HEAT	electric space heating dummy	.186	.389	0	1
E_WAT	Electric water heating dummy	.089	.285	0	1
EVAP	Air conditioning * cooling degree days*POST*single family	36.873	109.251	0	779.393
EVAPMF	Air conditioning * cooling degree days*POST*multiple family indicator	12.570	73.722	0	771.943
EWAT	water heater*log(numinhh+1)	.137	.457	0	2.303
MF	Multifamily dummy	.196	.397	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.003	.053	0	1
NUMINHH	number in household	4.037	2.122	1	13
USE	Monthly kwh usage	536.362	339.832	0	3409.550

Summary Statistics of Model Variables SCE Evaporative Cooler Maintenance Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.076	.263	0	1
CD	Air conditioning * cooling degree days	130.400	201.712	0	779.760
CDMF	Air conditioning * cooling degree days*multiple family indicator	52.675	145.219	0	779.760
DD	Electric space heat * heating degree days	24.817	90.660	0	990.533
E_AC	Air conditioning dummy	1	0	1	1
E_HEAT	electric space heating dummy	.191	.393	0	1
E_WAT	Electric water heating dummy	.084	.278	0	1
EVAP	Air conditioning * cooling degree days*POST*single family	42.176	131.298	0	779.760
EWAT	water heater*log(numinhh+1)	.118	.415	0	2.485
MF	Multifamily dummy	.390	.488	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.002	.041	0	1
NUMINHH	number in household	3.678	2.277	1	25
USE	Monthly kwh usage	546.284	382.650	0	4531.630

Summary Statistics of Model Variables SCEWeatherization Electric Model

Variable	Definition	Mean	Std Dev	Minimum	Maximum
BCHANGE	Large post installation usage increase indicator*POST	.142	.347	0	1
BLANK	water heater blanket dummy	.107	.309	0	1
CAULK	Caulking/weatherstripping dummy	1	0	1	1
CD	Air conditioning * cooling degree days	11.858	56.229	0	775.200
CONAC	Aggregate weatherization measure space heater term*E_AC*CDD	2.385	13.001	0	217.056
CONSH	Aggregate weatherization measure space heater term*E_HEAT*HDD	7.071	24.022	0	190.101
CONWH	Aggregate conservation measure water heater term*E_WAT*log(numinhh+1)	.009	.043	0	.297
DD	Electric space heat * heating degree days	28.056	93.239	0	686.942
E_AC	Air conditioning dummy	.159	.366	0	1
E_HEAT	electric space heating dummy	.201	.401	0	1
E_WAT	Electric water heating dummy	.110	.313	0	1
ENV	Building envelope repair dummy	.246	.431	0	1
EWAT	water heater*log(numinhh+1)	.185	.538	0	2.303

Summary Statistics of Model Variables SCEWeatherization Electric Model cont.

INSUL	ceiling insulation dummy	.058	.234	0	1
LNUM	Log(numinhh+1)	1.352	.493	.693	2.773
LOWFL	Low flow showerhead dummy	.381	.486	0	1
MF	Multifamily dummy	.885	.319	0	1
NCHANGE	Large post installation usage decrease indicator*POST	.008	.089	0	1
NUMINHH	number in household	3.469	3.704	1	15
USE	Monthly kwh usage	405.480	259.343	0	3177.32

Model: MODEL1
Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	13	167686378.36	12898952.181	1523.594	0.0001
Error	46592	394454149.44	8466.1347322		
C Total	46605	562140527.8			

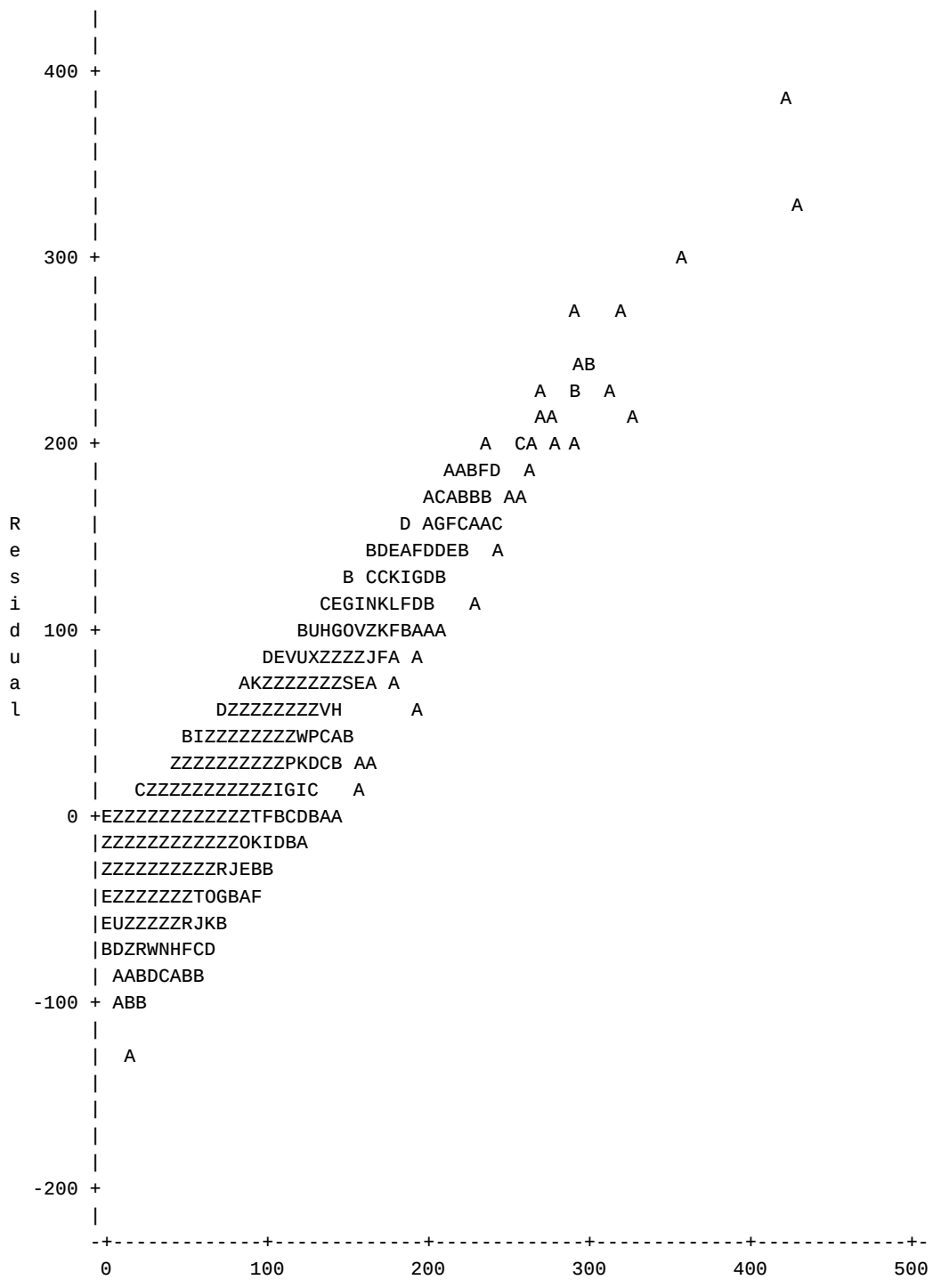
Root MSE	92.01160	R-square	0.2983
Dep Mean	41.56623	Adj R-sq	0.2981
C.V.	221.36143		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	22.035349	0.38308438	57.521	0.0001
PFIX	1	0.009404	0.00503798	1.867	0.0620
PREP	1	-0.003593	0.00281986	-1.274	0.2027
BCHANGE	1	8.494446	0.72886673	11.654	0.0001
NCHANGE	1	-12.743050	3.76521405	-3.384	0.0007
MF	1	-6.512065	0.44178145	-14.740	0.0001
DD	1	0.129886	0.00303929	42.735	0.0001
DDMF	1	-0.054799	0.00762396	-7.188	0.0001
DDNEW	1	-0.029631	0.00259280	-11.428	0.0001
OLD	1	0.053926	0.00161130	33.468	0.0001
CONSH	1	-0.089865	0.01205117	-7.457	0.0001
CONSHM	1	-0.083335	0.02837710	-2.937	0.0033
GWAT	1	5.616324	0.26042597	21.566	0.0001
CONWH	1	-11.097932	1.76388028	-6.292	0.0001

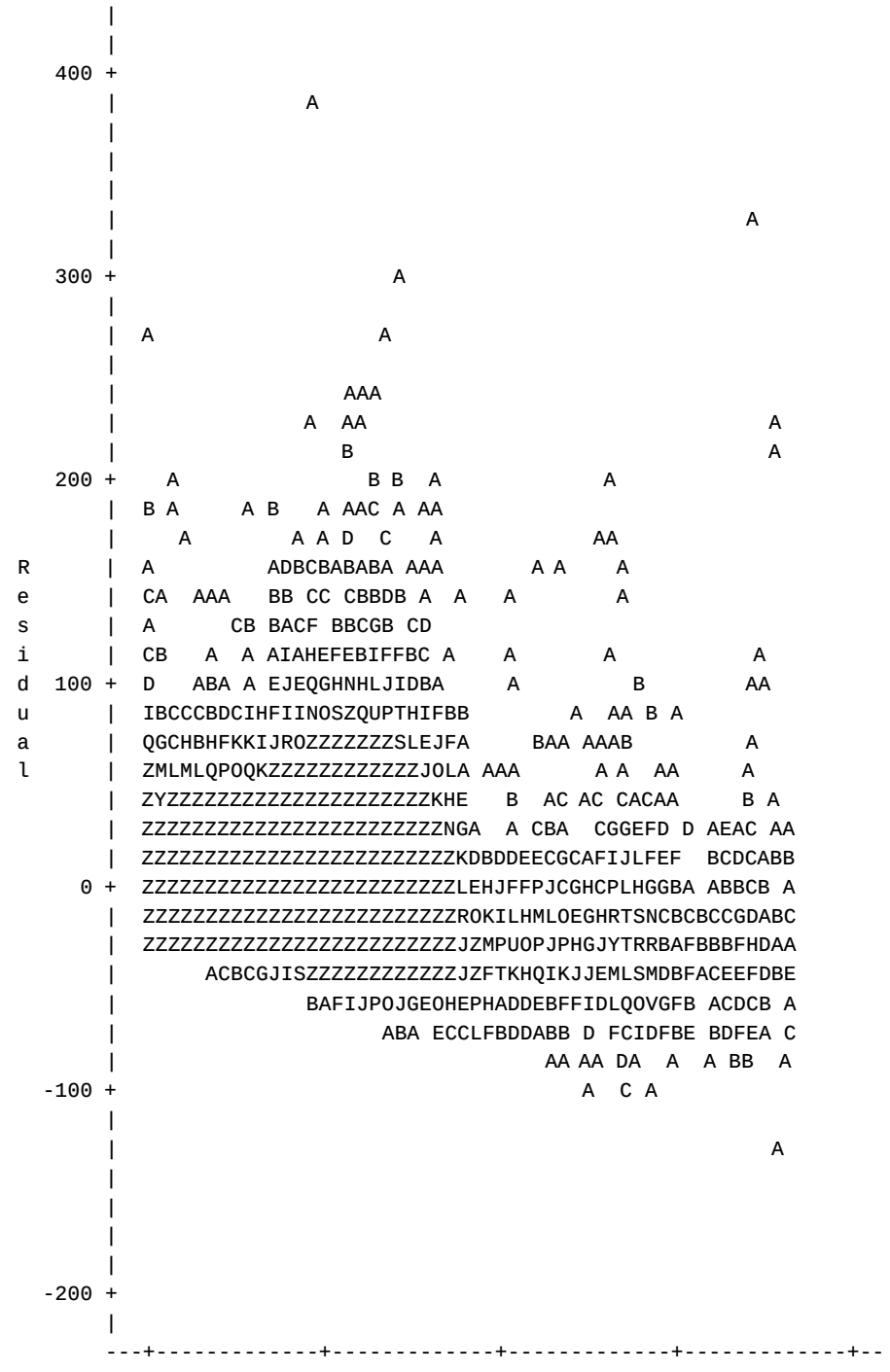
Durbin-Watson D	0.419
(For Number of Obs.)	46606
1st Order Autocorrelation	0.790

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 43136 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 39364 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	15	1.1	15	1.1
0.1	8	0.6	23	1.7
0.2	9	0.7	32	2.3
0.3	26	1.9	58	4.2
0.4	39	2.8	97	7.1
0.5	67	4.9	164	12.0
0.6	115	8.4	279	20.4
0.7	230	16.8	509	37.2
0.8	319	23.3	828	60.5
0.9	410	29.9	1238	90.4
1	131	9.6	1369	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
1369	0.7620811	0.1888618	0.000558378	0.9990086

Model: MODEL1
NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	14	154427410.44	11030529.317	4769.611	0.0001
Error	45223	104585812.99	2312.6686198		
U Total	45237	259013223.43			

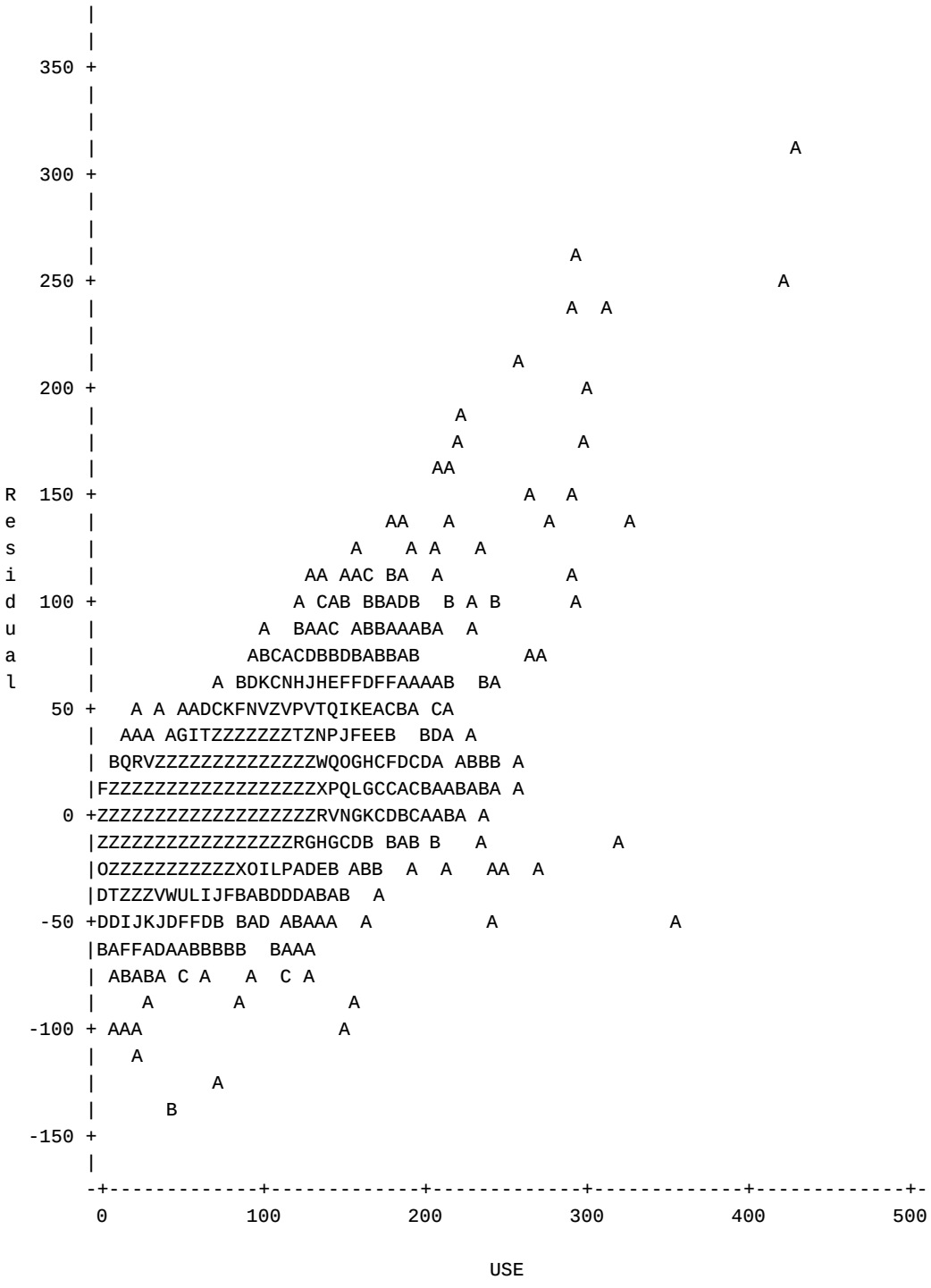
Root MSE	48.09021	R-square	0.5962
Dep Mean	10.01166	Adj R-sq	0.5961
C.V.	480.34204		

Parameter Estimates

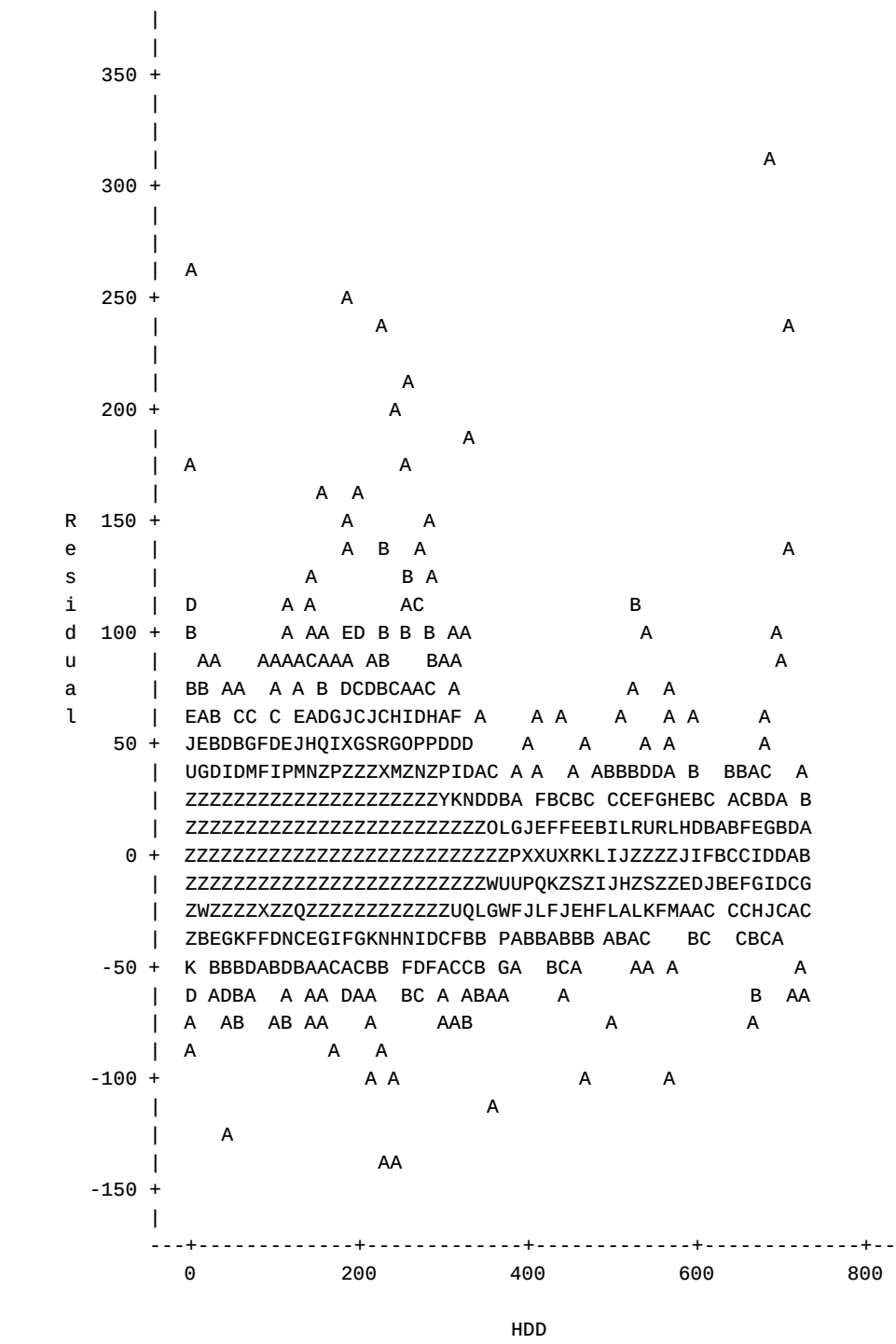
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	6.071532E-17	0.00000000	.	.
INT	1	19.354463	0.61800774	31.318	0.0001
DPFIX	1	0.011888	0.00438635	2.710	0.0067
DPREP	1	0.002452	0.00248591	0.987	0.3239
DBCHANGE	1	11.153210	1.12409930	9.922	0.0001
DNCHANGE	1	-14.759904	4.21892515	-3.498	0.0005
DMF	1	-6.777672	0.63656028	-10.647	0.0001
DDD	1	0.126305	0.00295086	42.803	0.0001
DDDMF	1	-0.055257	0.00722157	-7.652	0.0001
DDDNEW	1	-0.023256	0.00252940	-9.194	0.0001
DOLD	1	0.061106	0.00157582	38.777	0.0001
DCONSH	1	-0.096540	0.01161084	-8.315	0.0001
DCONSHM	1	-0.085640	0.02667734	-3.210	0.0013
DGWAT	1	7.566556	0.42369787	17.858	0.0001
DCONWH	1	-7.524597	2.18571444	-3.443	0.0006
RESTRICT	-1	2218.410864	22346.541650	0.099	0.9209

Durbin-Watson D	1.907
(For Number of Obs.)	45237
1st Order Autocorrelation	0.047

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 1369 obs had missing values. 41500 obs hidden.



NOTE: 1369 obs had missing values. 39623 obs hidden.

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	10	34044323.51	3404432.351	1819.107	0.0001
Error	25959	48581903.821	1871.4859517		
C Total	25969	82626227.331			

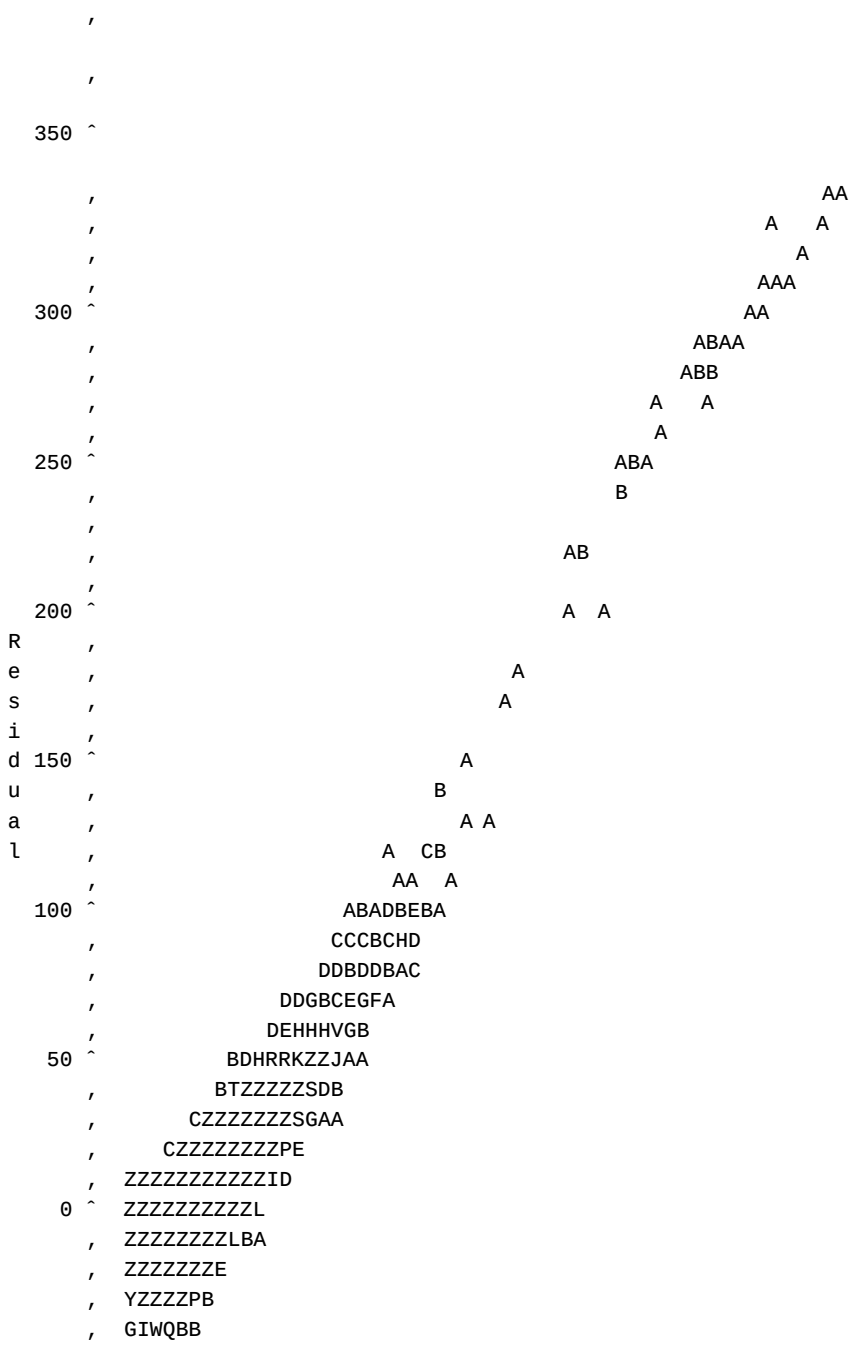
Root MSE	43.26067	R-square	0.4120
Dep Mean	23.38261	Adj R-sq	0.4118
C.V.	185.01215		

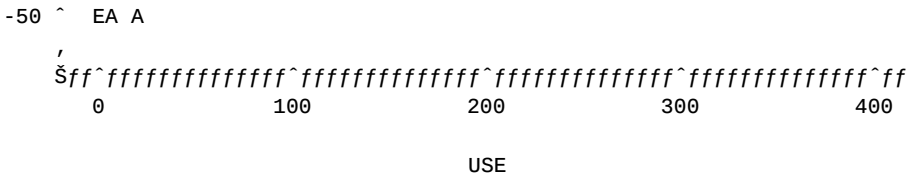
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	10.312300	0.30345284	33.983	0.0001
BCHANGE	1	1.057238	0.57079371	1.852	0.0640
NCHANGE	1	-7.659500	1.24466126	-6.154	0.0001
MF	1	-7.241185	0.27603469	-26.233	0.0001
DD	1	0.131634	0.00338474	38.890	0.0001
DDMF	1	-0.048302	0.00614021	-7.866	0.0001
OLD	1	0.036154	0.00169823	21.289	0.0001
CONSH	1	-0.141773	0.01269253	-11.170	0.0001
CONSHM	1	-0.111873	0.02171503	-5.152	0.0001
GWAT	1	6.339481	0.31505101	20.122	0.0001
CONWH	1	-4.355478	2.30573485	-1.889	0.0589

Durbin-Watson D	0.385
(For Number of Obs.)	25970
1st Order Autocorrelation	0.807

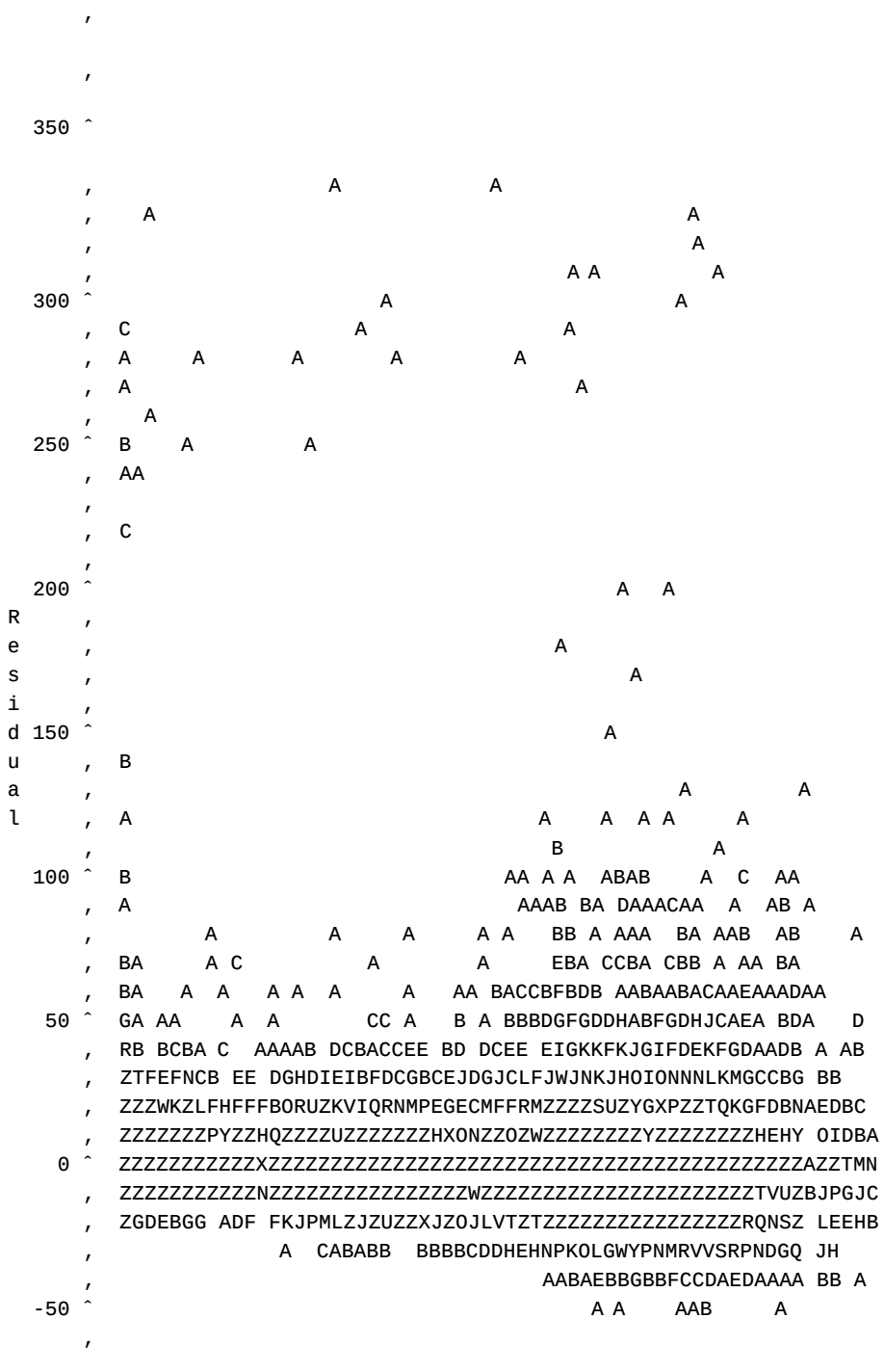
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.

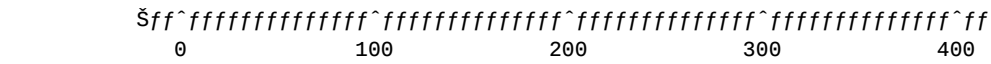




NOTE: 23807 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.





NOTE: 18357 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9	1.2	9	1.2
0.1	5	0.7	14	1.8
0.2	10	1.3	24	3.1
0.3	20	2.6	44	5.7
0.4	26	3.4	70	9.1
0.5	38	5.0	108	14.1
0.6	65	8.5	173	22.6
0.7	107	14.0	280	36.6
0.8	165	21.5	445	58.1
0.9	234	30.5	679	88.6
1	87	11.4	766	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
766	0.7599556	0.2027803	0.0078845	0.9998540

Model: MODEL1
NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	11	19110240.399	1737294.5817	3752.465	0.0001
Error	25193	11663709.879	462.97423406		
U Total	25204	30773950.277			

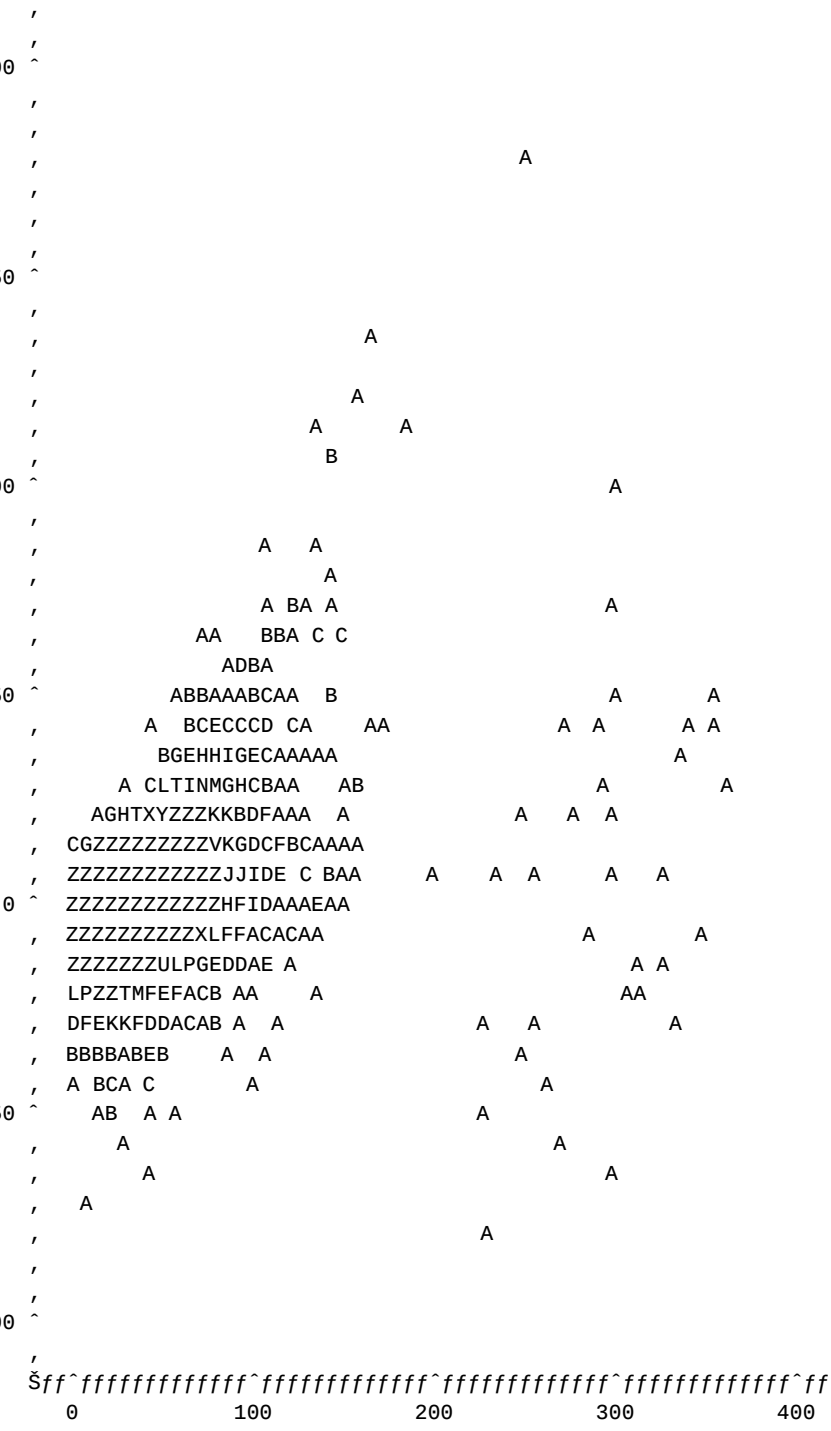
Root MSE	21.51684	R-square	0.6210
Dep Mean	6.14852	Adj R-sq	0.6208
C.V.	349.95160		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	10.762443	0.42044635	25.598	0.0001
DBCHANGE	1	2.803529	0.86960108	3.224	0.0013
DNCHANGE	1	-6.535405	2.08520173	-3.134	0.0017
DMF	1	-7.716638	0.37848559	-20.388	0.0001
DDD	1	0.105029	0.00310982	33.773	0.0001
DDDMF	1	-0.053166	0.00551821	-9.635	0.0001
DOLD	1	0.046615	0.00167935	27.758	0.0001
DCONSH	1	-0.076066	0.01166760	-6.519	0.0001
DCONSHM	1	-0.034540	0.01885219	-1.832	0.0669
DGWAT	1	7.833979	0.42136122	18.592	0.0001
DCONWH	1	-6.369541	2.80582823	-2.270	0.0232
RESTRICT	-1	-13242	5480.7938233	-2.416	0.0157

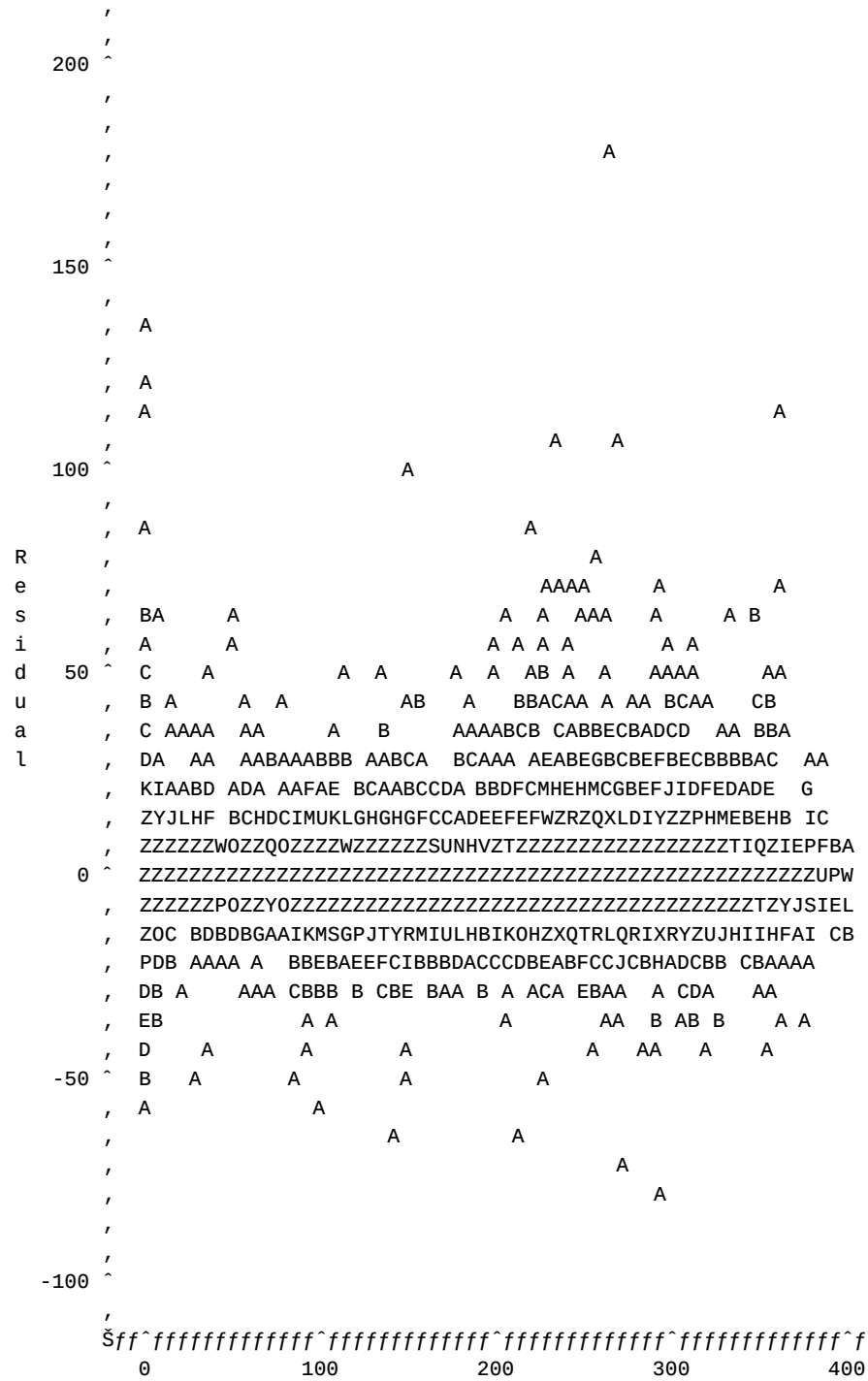
Durbin-Watson D	1.963
(For Number of Obs.)	25204
1st Order Autocorrelation	0.018

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 766 obs had missing values. 22904 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



HDD

NOTE: 766 obs had missing values. 19180 obs hidden.

Model: MODEL1
Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	10	16175209.531	1617520.9531	2548.523	0.0001
Error	25888	16430846.517	634.68968315		
C Total	25898	32606056.049			

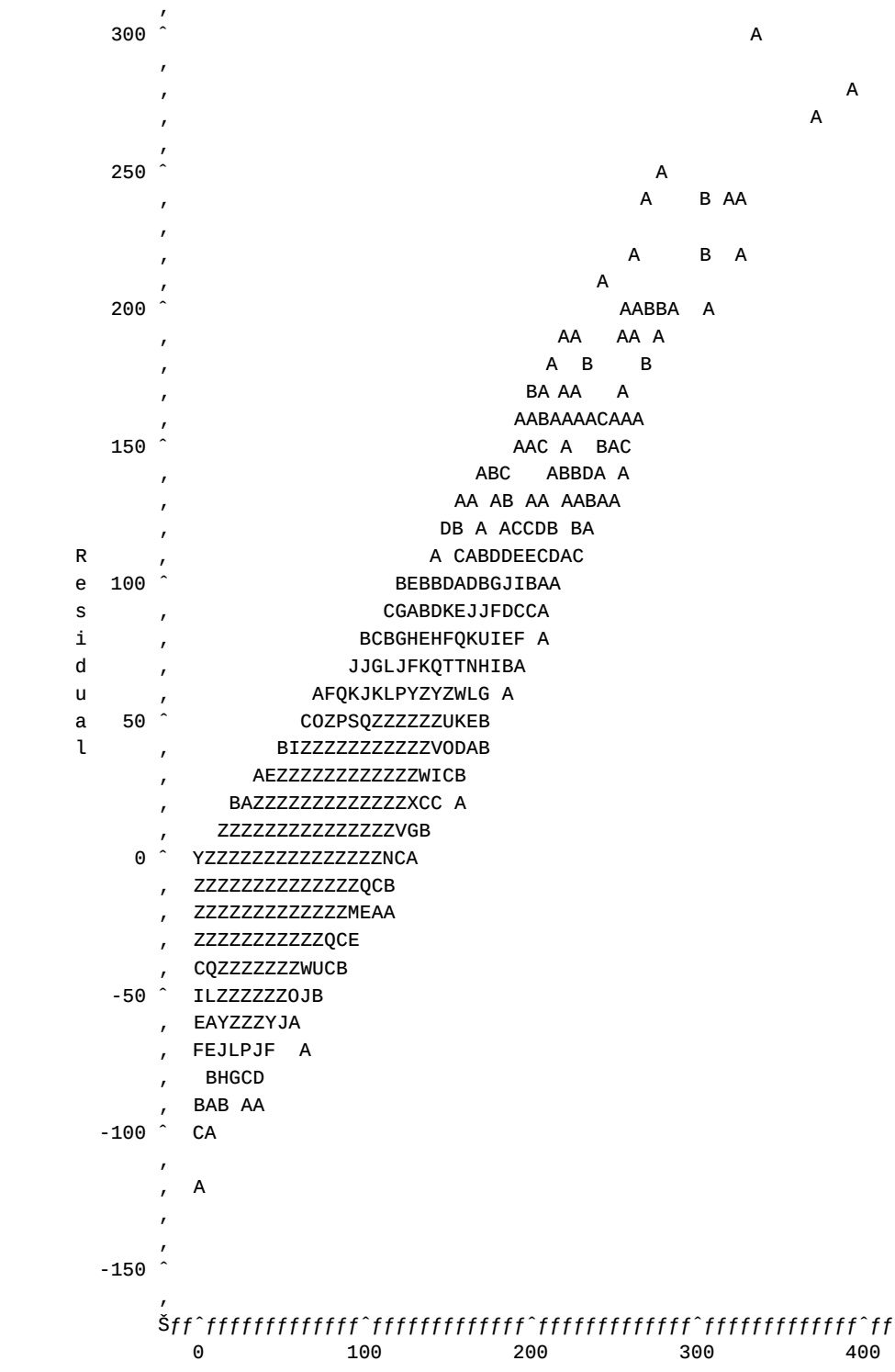
Root MSE	25.19305	R-square	0.4961
Dep Mean	45.98050	Adj R-sq	0.4959
C.V.	54.79072		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	6.373332	0.72343076	8.810	0.0001
BCHANGE	1	12.585050	0.97327981	12.931	0.0001
NCHANGE	1	-13.987216	3.08549562	-4.533	0.0001
OLD	1	0.016299	0.00133972	12.166	0.0001
DD	1	0.141204	0.00198080	71.286	0.0001
DDMF	1	-0.067654	0.00287124	-23.563	0.0001
CONSH	1	-0.079706	0.00783824	-10.169	0.0001
CONSHM	1	-0.034928	0.02390586	-1.461	0.1440
G_WAT	1	21.038479	0.80039683	26.285	0.0001
G_WATMF	1	-6.570143	0.56875266	-11.552	0.0001
CONWH	1	-14.969935	3.56553418	-4.199	0.0001

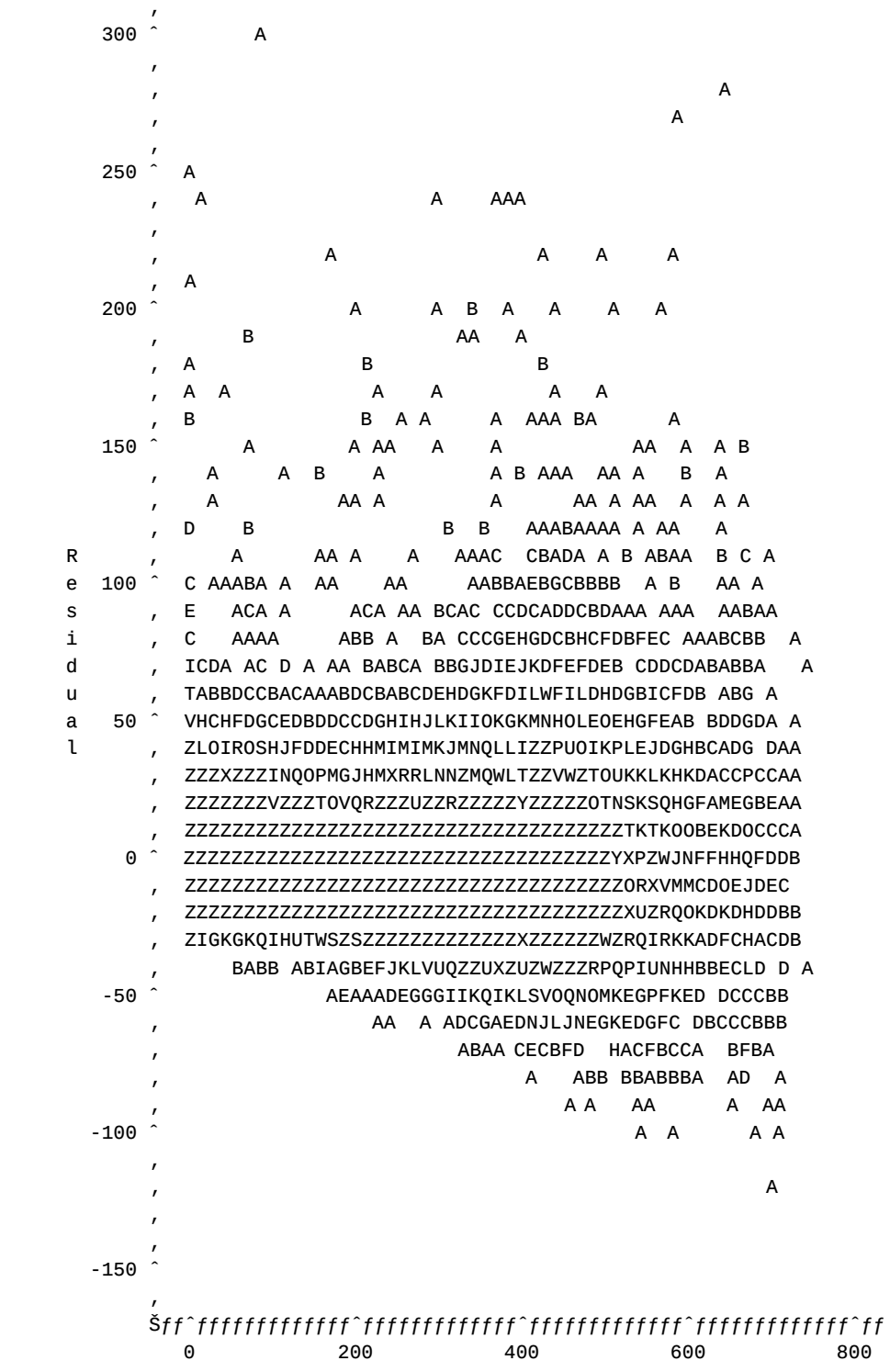
Durbin-Watson D	0.549
(For Number of Obs.)	25899
1st Order Autocorrelation	0.725

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 21157 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 15897 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9	1.2	9	1.2
0.1	10	1.4	19	2.6
0.2	12	1.6	31	4.2
0.3	17	2.3	48	6.5
0.4	30	4.1	78	10.6
0.5	57	7.7	135	18.3
0.6	88	11.9	223	30.2
0.7	132	17.9	355	48.1
0.8	152	20.6	507	68.7
0.9	204	27.6	711	96.3
1	27	3.7	738	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
738	0.7132195	0.2040328	0.0100000	0.9905514

Model: MODEL1

NOTE: Restrictions have been applied to parameter estimates.

NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	11	12258252.642	1114386.6038	5038.416	0.0001
Error	25150	5562625.4637	221.17795084		
U Total	25161	17820878.106			

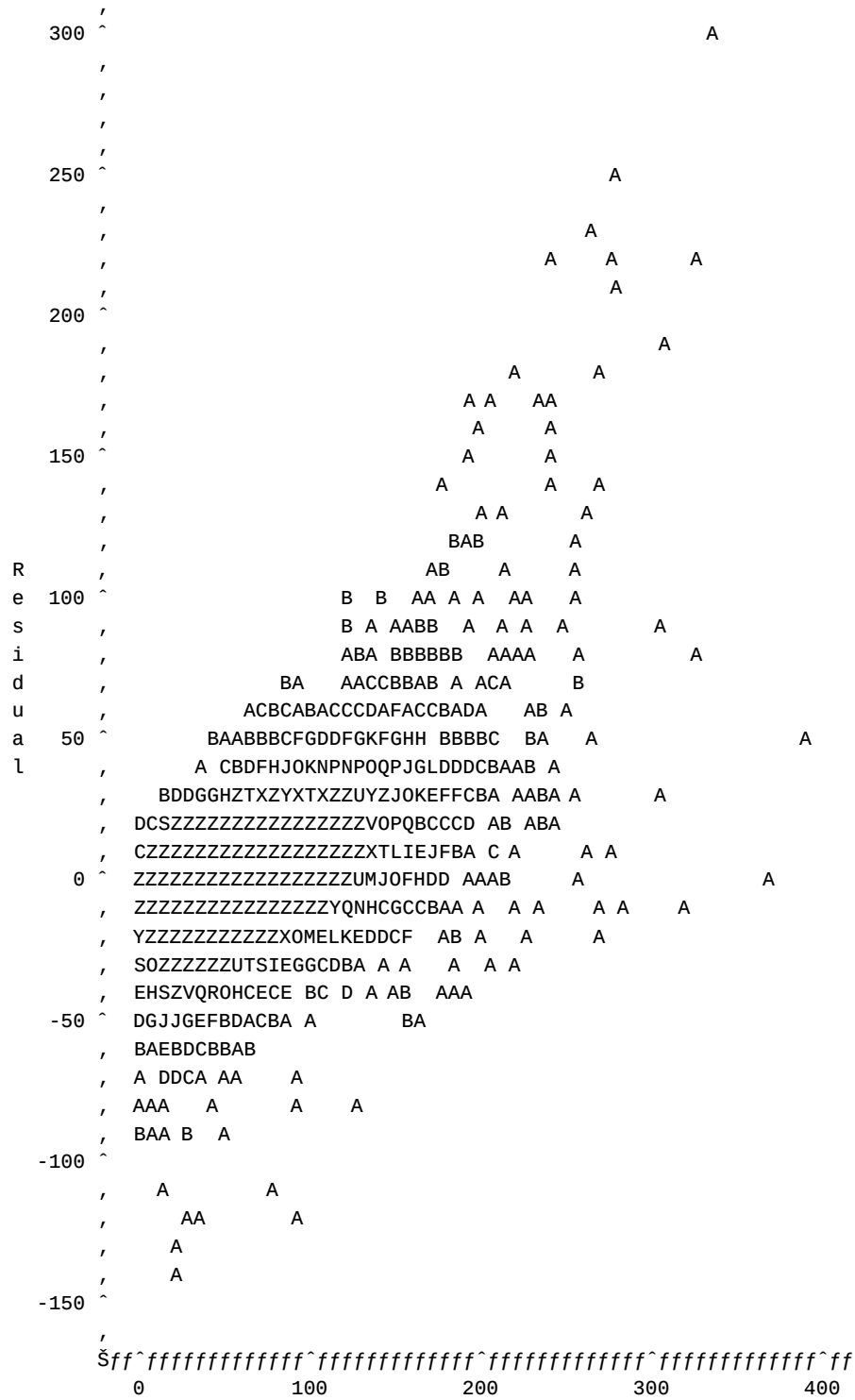
Root MSE	14.87205	R-square	0.6879
Dep Mean	12.71949	Adj R-sq	0.6877
C.V.	116.92333		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	6.610694	1.01007530	6.545	0.0001
DBCHANGE	1	20.133556	1.42340762	14.145	0.0001
DNCHANGE	1	-26.802090	4.62162391	-5.799	0.0001
DOLD	1	0.023240	0.00153037	15.186	0.0001
DDD	1	0.132608	0.00206969	64.071	0.0001
DDDMF	1	-0.064272	0.00290274	-22.142	0.0001
DCONSH	1	-0.063286	0.00813693	-7.778	0.0001
DCONSHM	1	-0.006332	0.02309582	-0.274	0.7840
DG_WAT	1	22.558130	1.14262531	19.742	0.0001
DG_WATMF	1	-6.596080	0.79351659	-8.312	0.0001
DCONWH	1	-18.269765	4.93540218	-3.702	0.0002
RESTRICT	-1	-3118.118403	1359.2546992	-2.294	0.0218

Durbin-Watson D	1.873
(For Number of Obs.)	25161
1st Order Autocorrelation	0.063

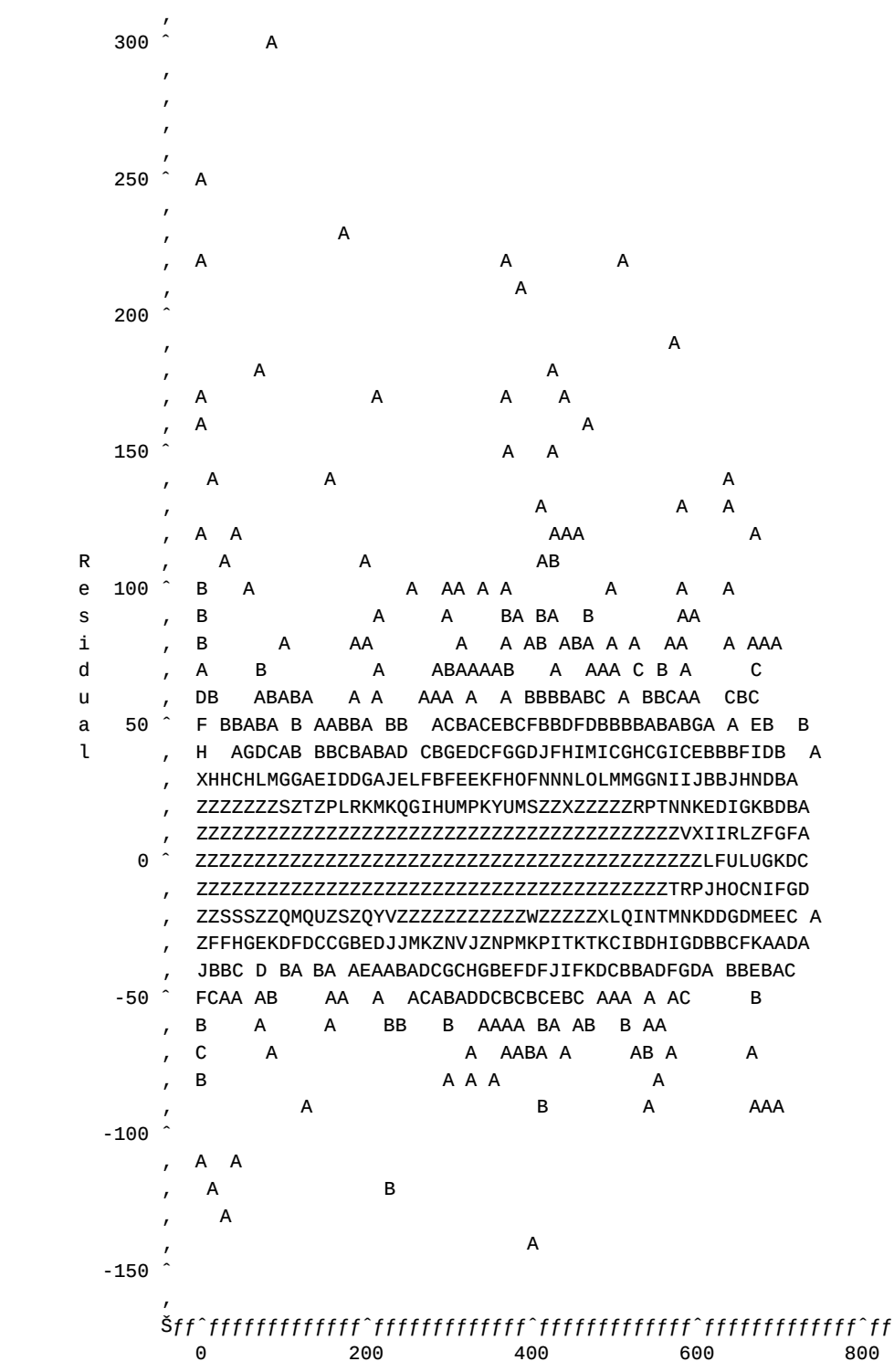
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



USE

NOTE: 738 obs had missing values. 21098 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 738 obs had missing values. 18032 obs hidden.

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	14	532498902.32	38035635.88	1122.876	0.0001
Error	35473	1201591764.2	33873.418211		
C Total	35487	1734090666.5			

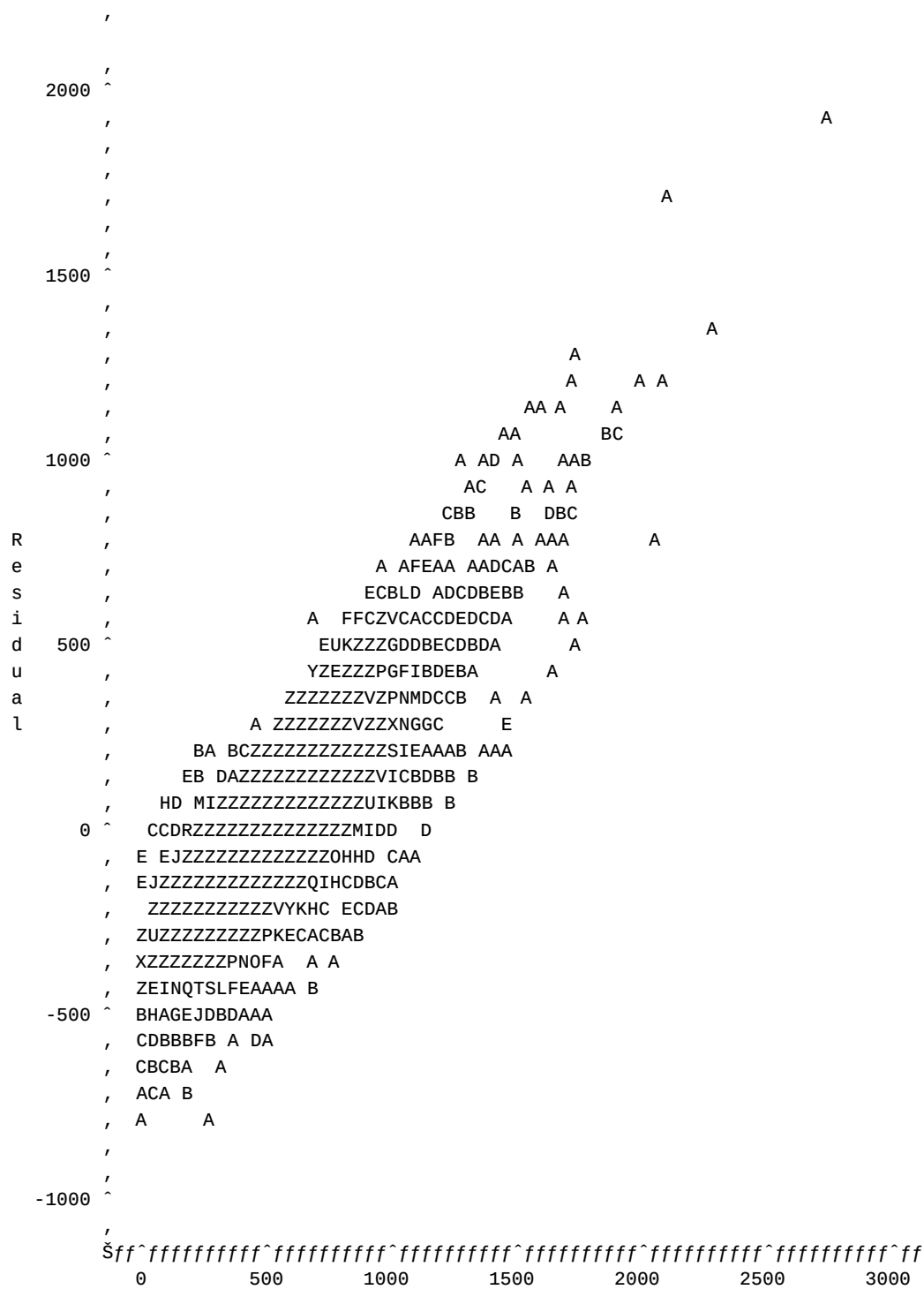
Root MSE	184.04733	R-square	0.3071
Dep Mean	400.03279	Adj R-sq	0.3068
C.V.	46.00806		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	449.393433	10.03154461	44.798	0.0001
BCHANGE	1	55.121375	4.28119527	12.875	0.0001
NCHANGE	1	-228.757012	15.18169176	-15.068	0.0001
REF	1	-43.778666	10.08882481	-4.339	0.0001
MF	1	-126.067000	2.17106832	-58.067	0.0001
DD	1	0.731718	0.06055721	12.083	0.0001
DDMF	1	0.175109	0.05316590	3.294	0.0010
OD	1	-0.040042	0.03445354	-1.162	0.2452
CONSH	1	-0.143648	0.23707427	-0.606	0.5446
E_WAT	1	383.138976	12.54822100	30.533	0.0001
CONWH	1	-636.846291	126.77958669	-5.023	0.0001
E_WATMF	1	-41.504507	19.83120072	-2.093	0.0364
CDMF	1	-0.043449	0.03327078	-1.306	0.1916
CLD	1	0.968969	0.03100276	31.254	0.0001
CONAC	1	-0.471145	0.13490432	-3.492	0.0005

Durbin-Watson D	0.406
(For Number of Obs.)	35488
1st Order Autocorrelation	0.797

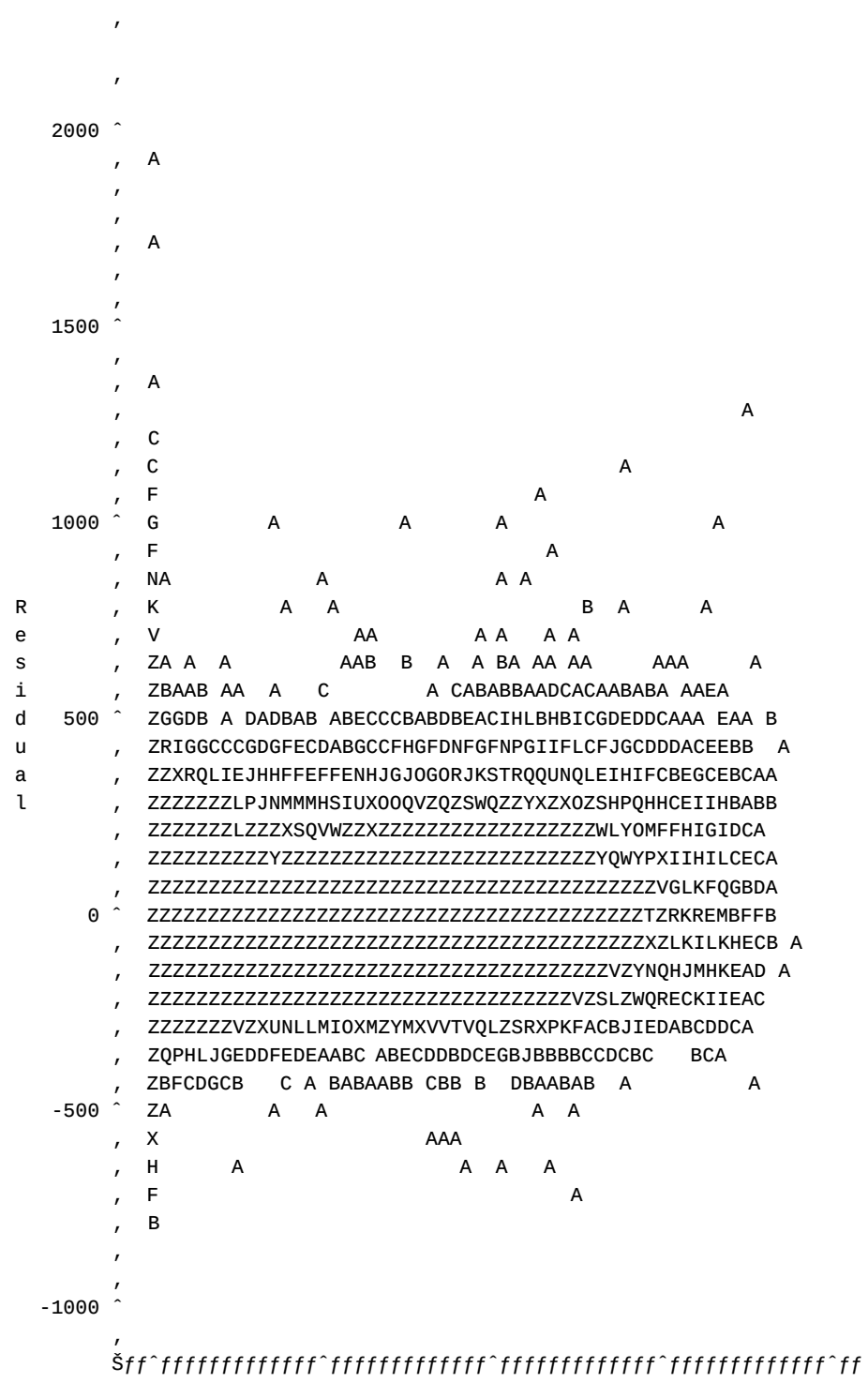
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



```
                                        USE

NOTE: 30735 obs hidden.
```

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 24140 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4	0.4	4	0.4
0.1	2	0.2	6	0.6
0.2	7	0.7	13	1.3
0.3	14	1.4	27	2.6
0.4	30	2.9	57	5.6
0.5	61	5.9	118	11.5
0.6	120	11.7	238	23.2
0.7	143	13.9	381	37.1
0.8	203	19.8	584	56.9
0.9	296	28.8	880	85.7
1	147	14.3	1027	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
1027	0.7741802	0.1794395	0	0.9997890

Model: MODEL1

NOTE: Restrictions have been applied to parameter estimates.

NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	666086084.61	44405738.974	4378.310	0.0001
Error	34446	349358540.39	10142.209266		
U Total	34461	1015444625			

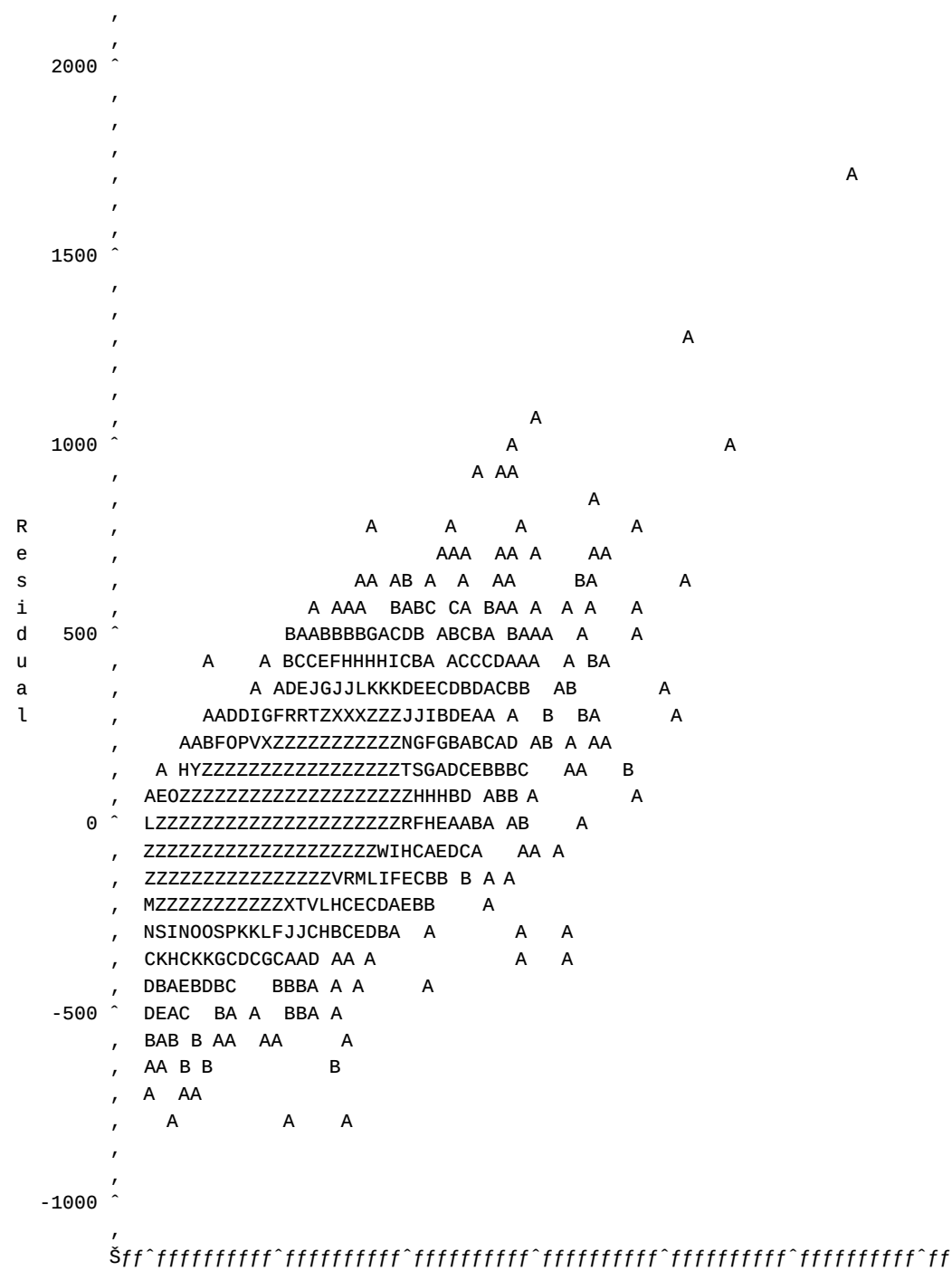
Root MSE	100.70854	R-square	0.6560
Dep Mean	94.75094	Adj R-sq	0.6558
C.V.	106.28763		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	460.094648	14.85133482	30.980	0.0001
DREF	1	-45.167848	14.88796430	-3.034	0.0024
DBCHANGE	1	54.594745	6.50703793	8.390	0.0001
DNCHANGE	1	-235.358165	22.81640657	-10.315	0.0001
DMF	1	-131.306599	4.05847103	-32.354	0.0001
DDD	1	0.954138	0.05909779	16.145	0.0001
DDDMF	1	-0.169095	0.05334946	-3.170	0.0015
DOLD	1	0.170236	0.03735418	4.557	0.0001
DCONSH	1	-0.544751	0.21687019	-2.512	0.0120
DE_WAT	1	337.103516	12.79447840	26.348	0.0001
DE_WATMF	1	-111.302318	66.52586650	-1.673	0.0943
DCONWH	1	-274.694605	127.12508219	-2.161	0.0307
DCDMF	1	-0.122249	0.02728405	-4.481	0.0001
DCD	1	1.043861	0.02567300	40.660	0.0001
DCONAC	1	-0.509773	0.11126765	-4.581	0.0001
RESTRICT	-1	21592	11531.022170	1.873	0.0611

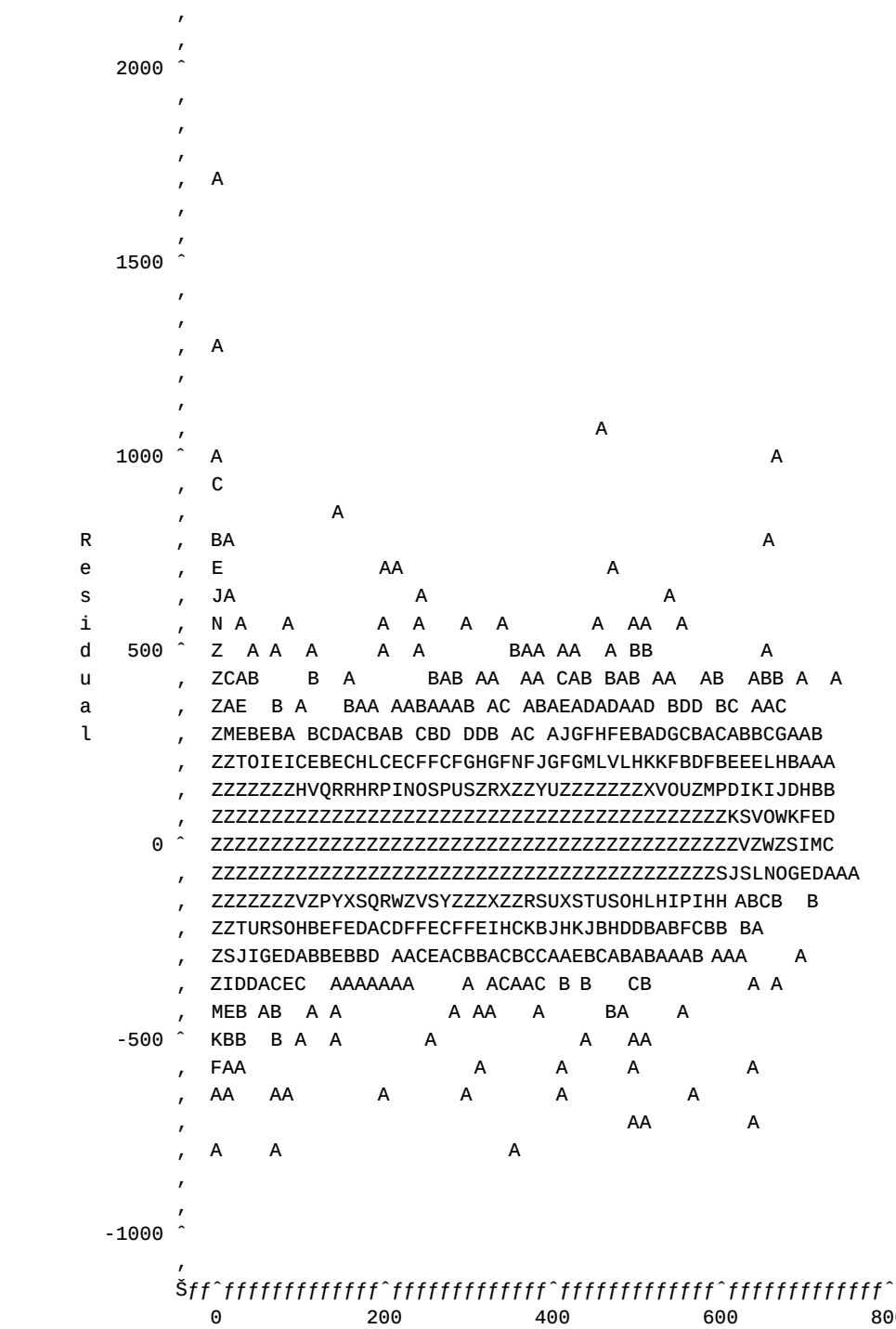
Durbin-Watson D	1.871
(For Number of Obs.)	34461
1st Order Autocorrelation	0.064

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 1027 obs had missing values. 29786 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



HDD

NOTE: 1027 obs had missing values. 27393 obs hidden.

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	12	4652891482.8	387740956.9	2148.295	0.0001
Error	40197	7255065818.4	180487.74333		
C Total	40209	11907957301			

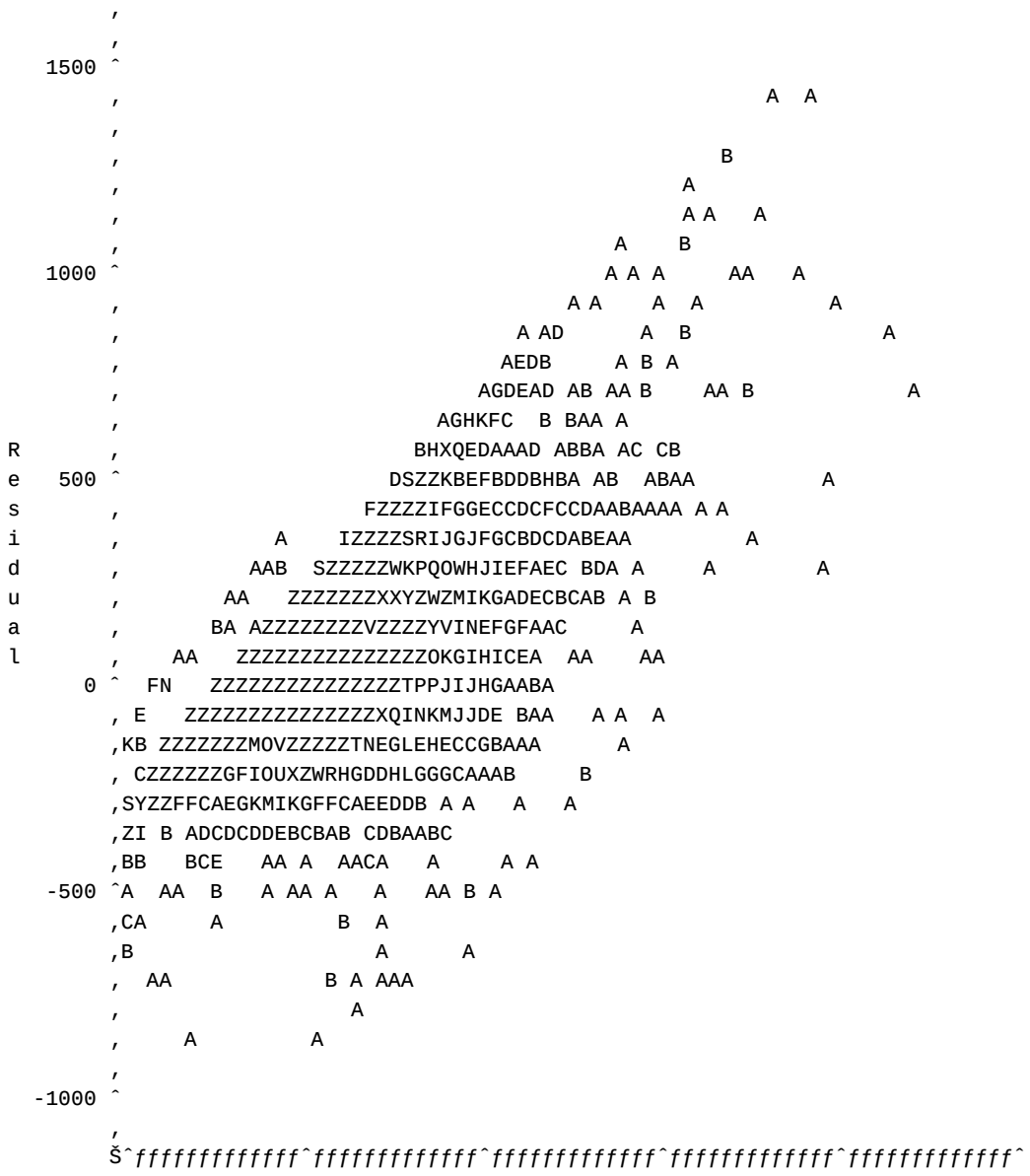
Root MSE	424.83849	R-square	0.3907
Dep Mean	367.43733	Adj R-sq	0.3906
C.V.	115.62203		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	285.771444	2.63076950	108.627	0.0001
LT	1	-2.594667	0.43334244	-5.988	0.0001
BCHANGE	1	61.663245	2.59912933	23.725	0.0001
NCHANGE	1	-216.405603	18.36087581	-11.786	0.0001
LNUM	1	51.086675	1.72606795	29.597	0.0001
MF	1	-34.487252	1.56268243	-22.069	0.0001
DD	1	1.421843	0.05818327	24.437	0.0001
DDMF	1	-0.286862	0.05221061	-5.494	0.0001
CONSH	1	-0.619141	0.24642428	-2.512	0.0120
CD	1	3.526459	0.06506629	54.198	0.0001
CONAC	1	1.713345	0.49858938	3.436	0.0006
EWAT	1	166.496805	6.48351415	25.680	0.0001
CONWH	1	-189.119176	72.05559498	-2.625	0.0087

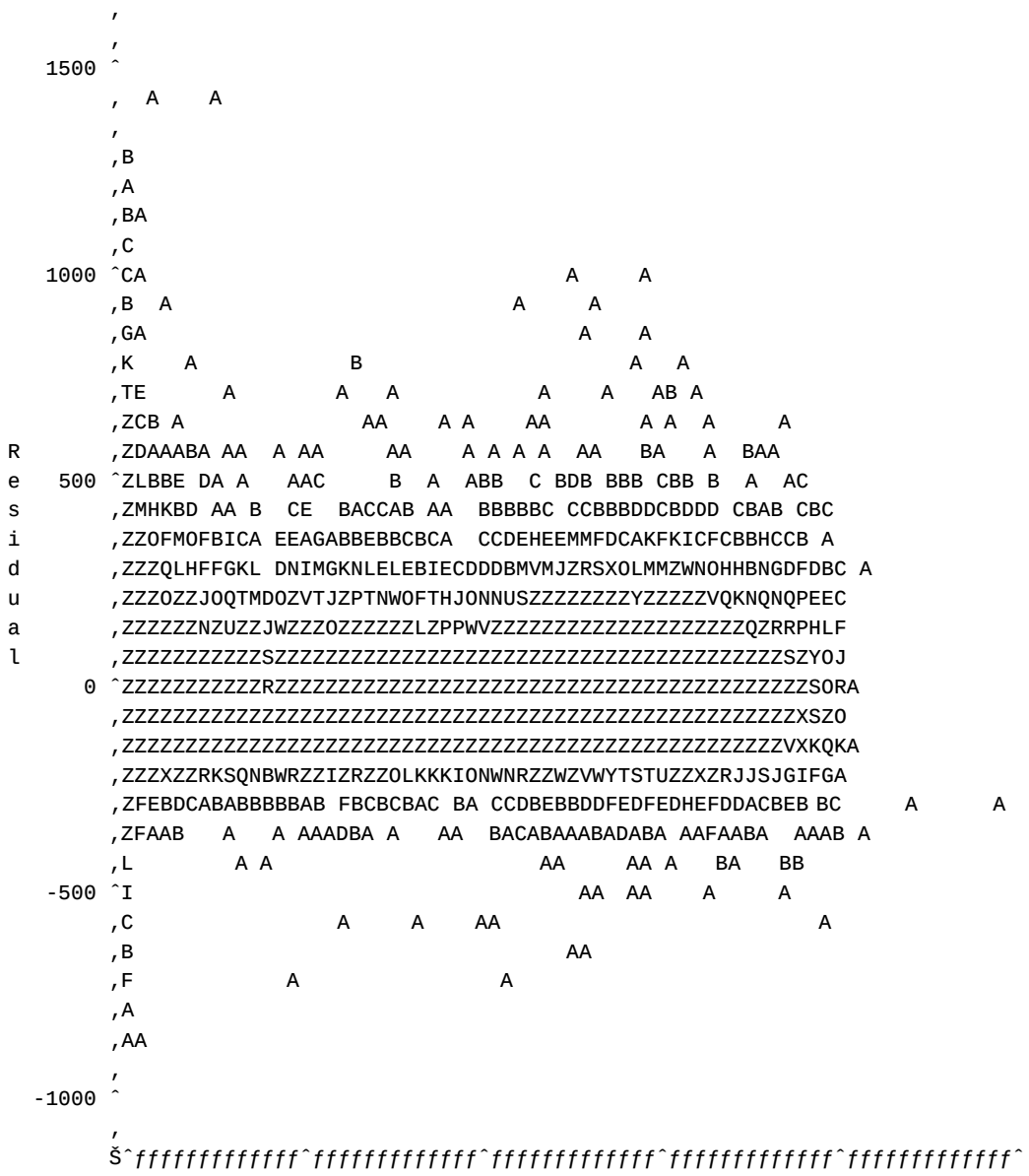
Durbin-Watson D	0.454
(For Number of Obs.)	40210
1st Order Autocorrelation	0.773

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 35597 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 29294 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4	0.3	4	0.3
0.1	6	0.5	10	0.8
0.2	7	0.6	17	1.4
0.3	23	2.0	40	3.4
0.4	31	2.6	71	6.0
0.5	65	5.5	136	11.5
0.6	144	12.2	280	23.7
0.7	166	14.1	446	37.8
0.8	256	21.7	702	59.5
0.9	294	24.9	996	84.5
1	183	15.5	1179	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
1179	0.7696490	0.1824837	0.0100000	0.9996693

Model: MODEL1
NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	12	4937387268.2	411448939.01	7514.140	0.0001
Error	39019	2136548586.6	54756.620791		
U Total	39031	7073935854.8			

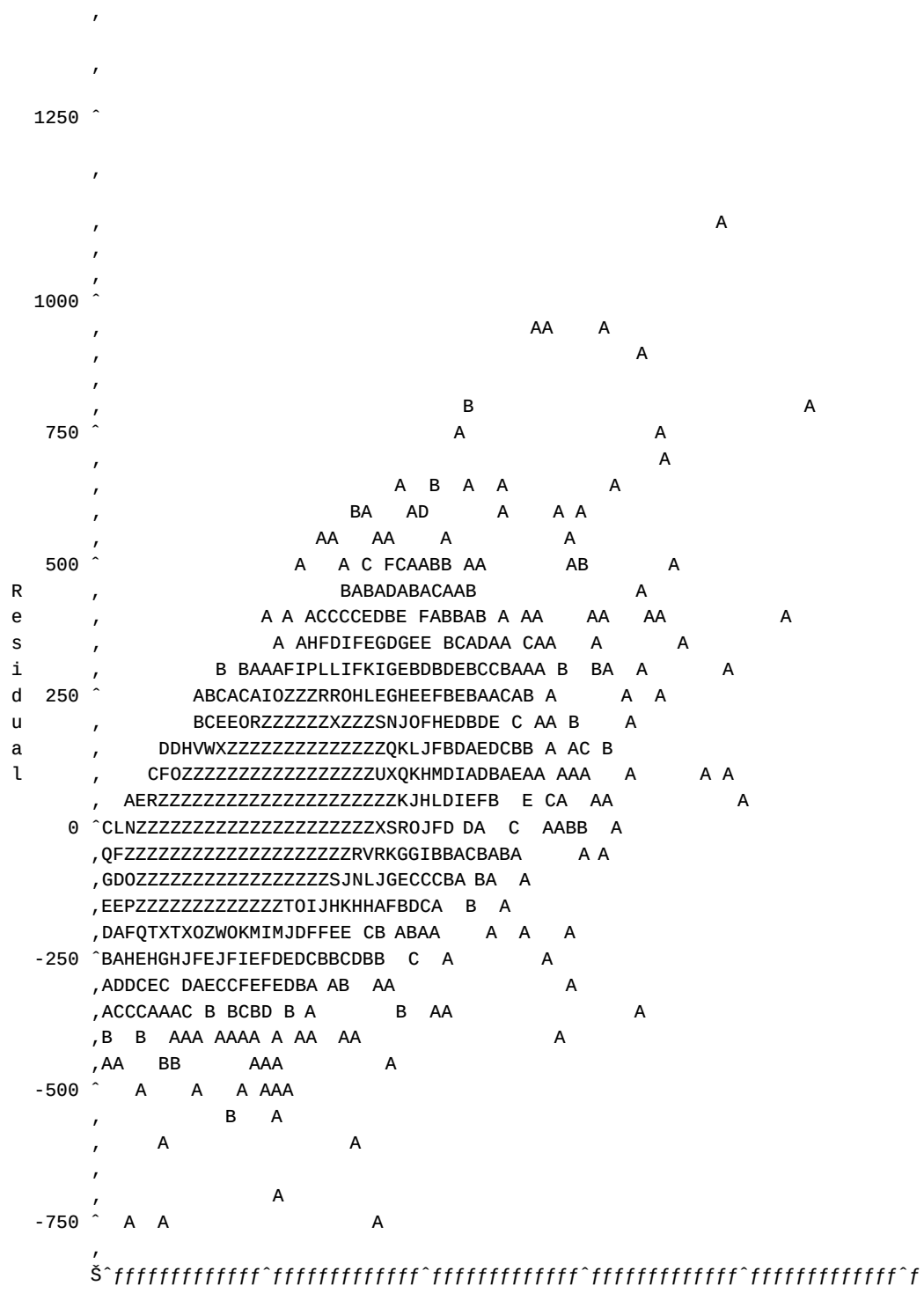
Root MSE	234.00133	R-square	0.6980
Dep Mean	88.22330	Adj R-sq	0.6979
C.V.	265.23756		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	282.830826	5.31407276	53.223	0.0001
DLT	1	-1.938969	0.62500578	-3.102	0.0019
DBCHANGE	1	67.735243	3.99477677	16.956	0.0001
DNCHANGE	1	-218.513142	25.33107449	-8.626	0.0001
DLNUM	1	70.809753	3.30639385	21.416	0.0001
DMF	1	-42.215918	3.06699075	-13.765	0.0001
DDD	1	0.729227	0.01745337	41.781	0.0001
DCONSH	1	-0.230690	0.12968317	-1.779	0.0753
DCONAC	1	0.488615	0.36179724	1.351	0.1769
DCD	1	2.158365	0.04807817	44.893	0.0001
DEWAT	1	185.974415	7.18124062	25.897	0.0001
DCONWH	1	-133.897832	77.57706908	-1.726	0.0844
RESTRICT	-1	110948	83521.818967	1.328	0.1841

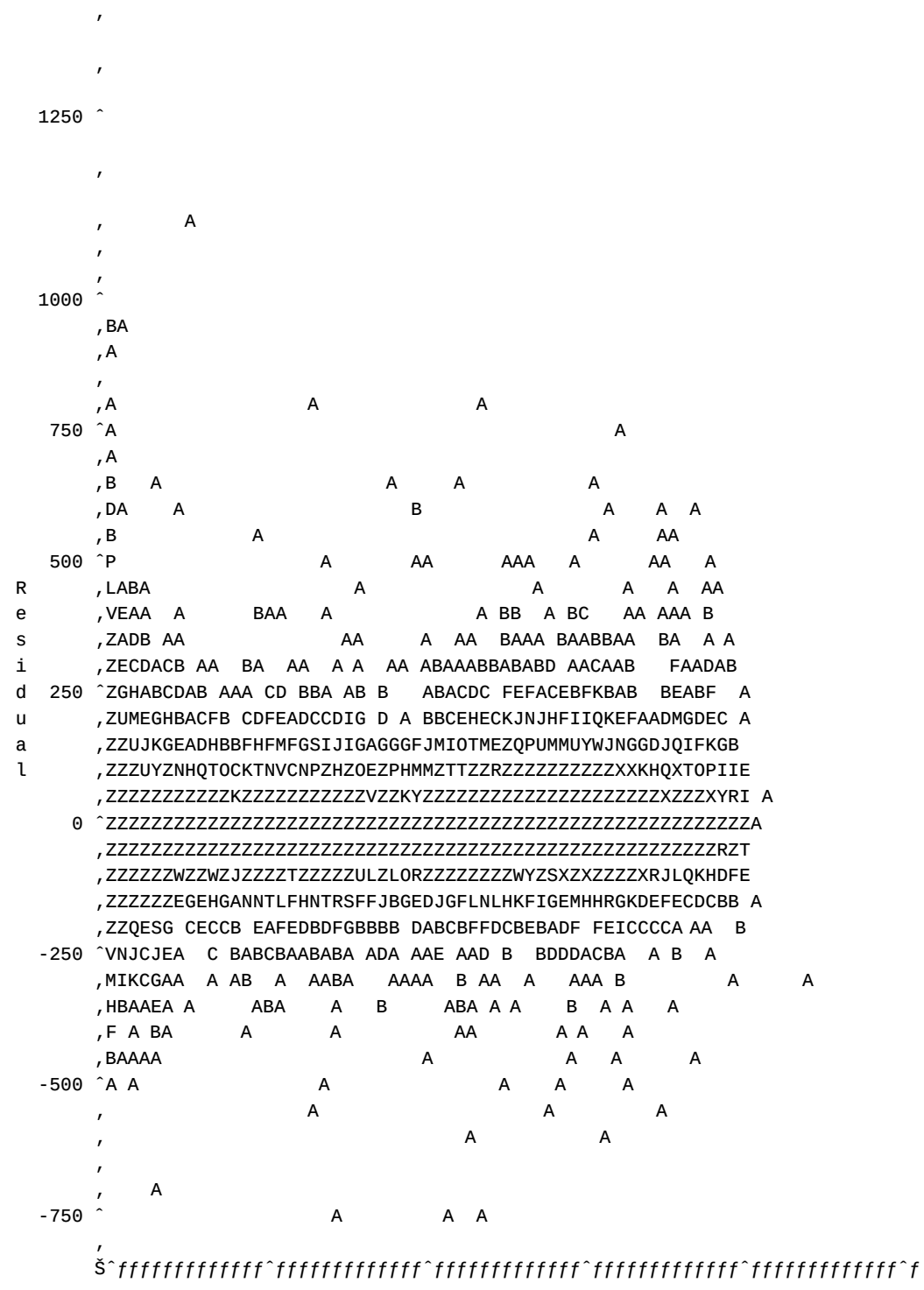
Durbin-Watson D	1.842
(For Number of Obs.)	39031
1st Order Autocorrelation	0.079

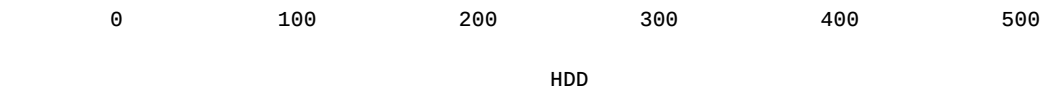
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 1179 obs had missing values. 33296 obs hidden.

Plot of RESID*HDD. Legend: A = 1 obs, B = 2 obs, etc.





NOTE: 1179 obs had missing values. 29849 obs hidden.

Model: MODEL1
Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	51355774920	6419471865.1	2351.122	0.0001
Error	17966	49054122384	2730386.4179		
C Total	17974	100409897305			

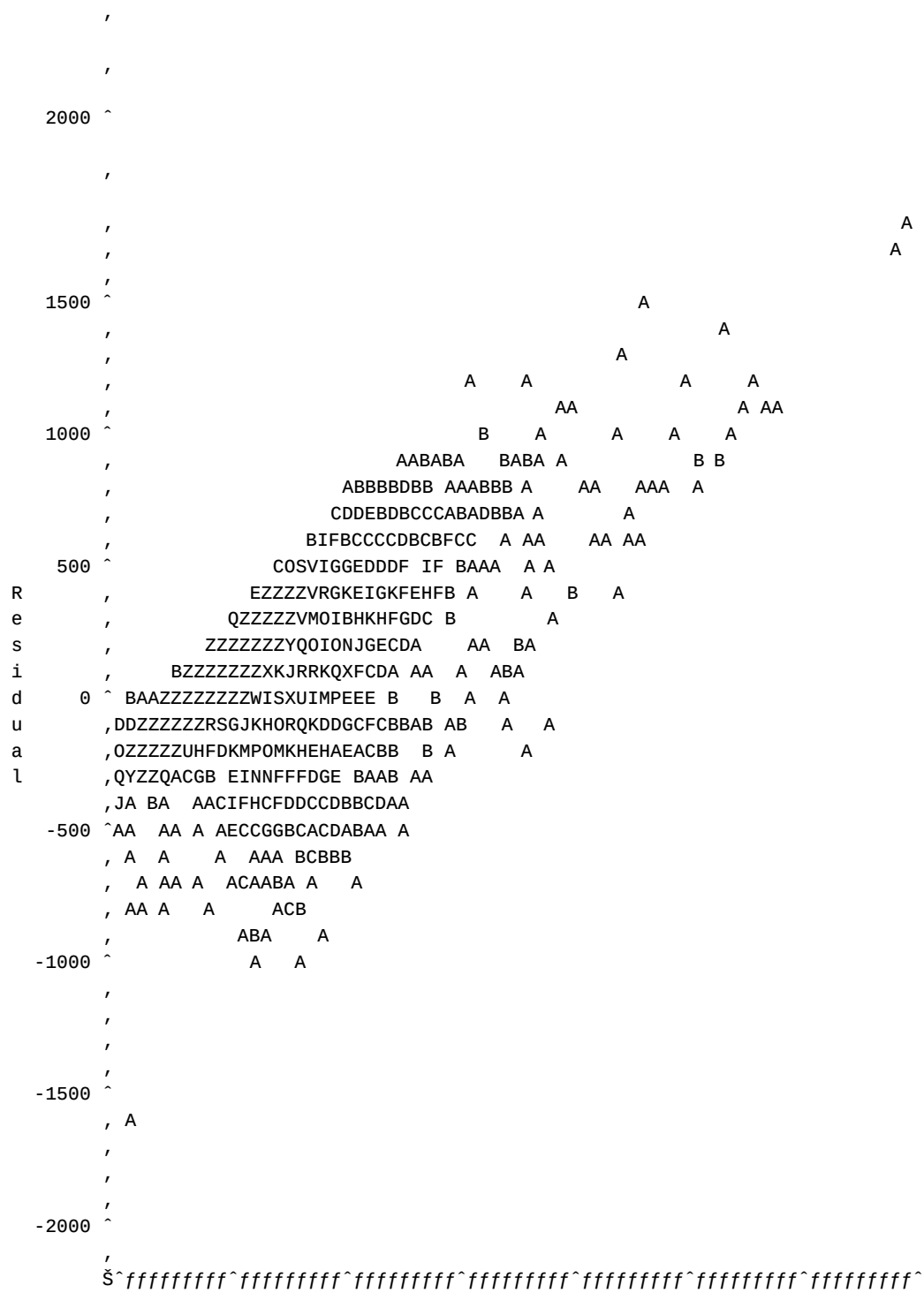
Root MSE	1652.38810	R-square	0.5115
Dep Mean	362.40472	Adj R-sq	0.5112
C.V.	455.95104		

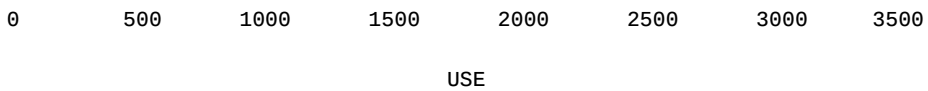
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	287.801553	5.45158755	52.792	0.0001
LT	1	-2.826789	0.75562415	-3.741	0.0002
BCHANGE	1	77.108439	4.11854464	18.722	0.0001
NCHANGE	1	-130.387353	22.87076925	-5.701	0.0001
LNUM	1	42.031928	3.03451883	13.851	0.0001
MF	1	-66.944147	2.73512145	-24.476	0.0001
DD	1	0.822987	0.02199043	37.425	0.0001
CD	1	1.729619	0.01903322	90.874	0.0001
E_WAT	1	221.910900	4.22724985	52.495	0.0001

Durbin-Watson D	0.472
(For Number of Obs.)	17975
1st Order Autocorrelation	0.764

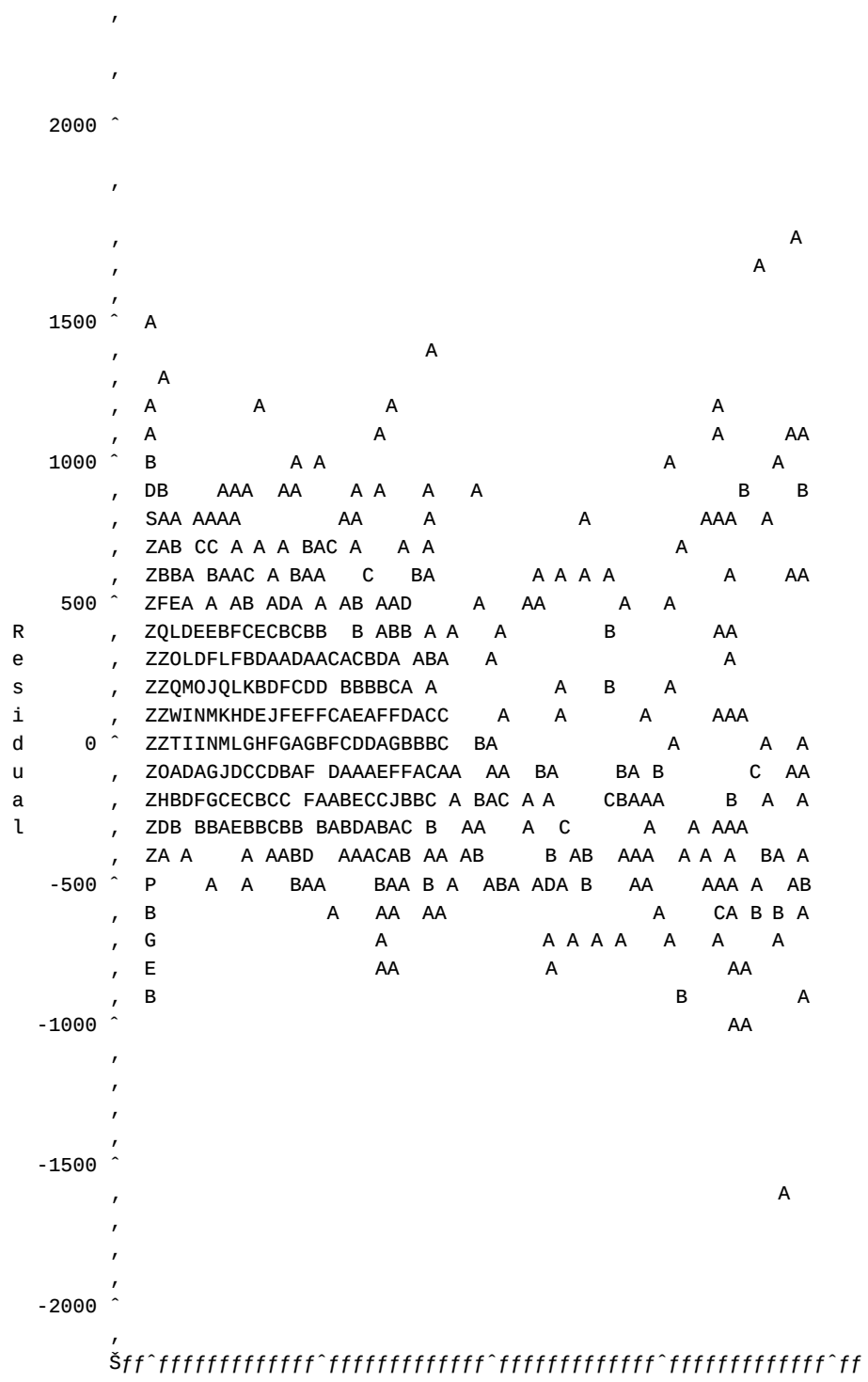
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.





NOTE: 15132 obs hidden.

Plot of RESID*CDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 16368 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	3	0.6	3	0.6
0.1	6	1.1	9	1.7
0.2	4	0.8	13	2.5
0.3	3	0.6	16	3.1
0.4	13	2.5	29	5.5
0.5	28	5.4	57	10.9
0.6	42	8.0	99	18.9
0.7	73	14.0	172	32.9
0.8	106	20.3	278	53.2
0.9	158	30.2	436	83.4
1	87	16.6	523	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
523	0.7864275	0.1885155	0.0100000	0.9998203

Model: MODEL1

NOTE: Restrictions have been applied to parameter estimates.

NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	9	15240795694	1693421743.8	1692.108	0.0001
Error	17443	17456544629	1000776.508		
U Total	17452	32697340322			

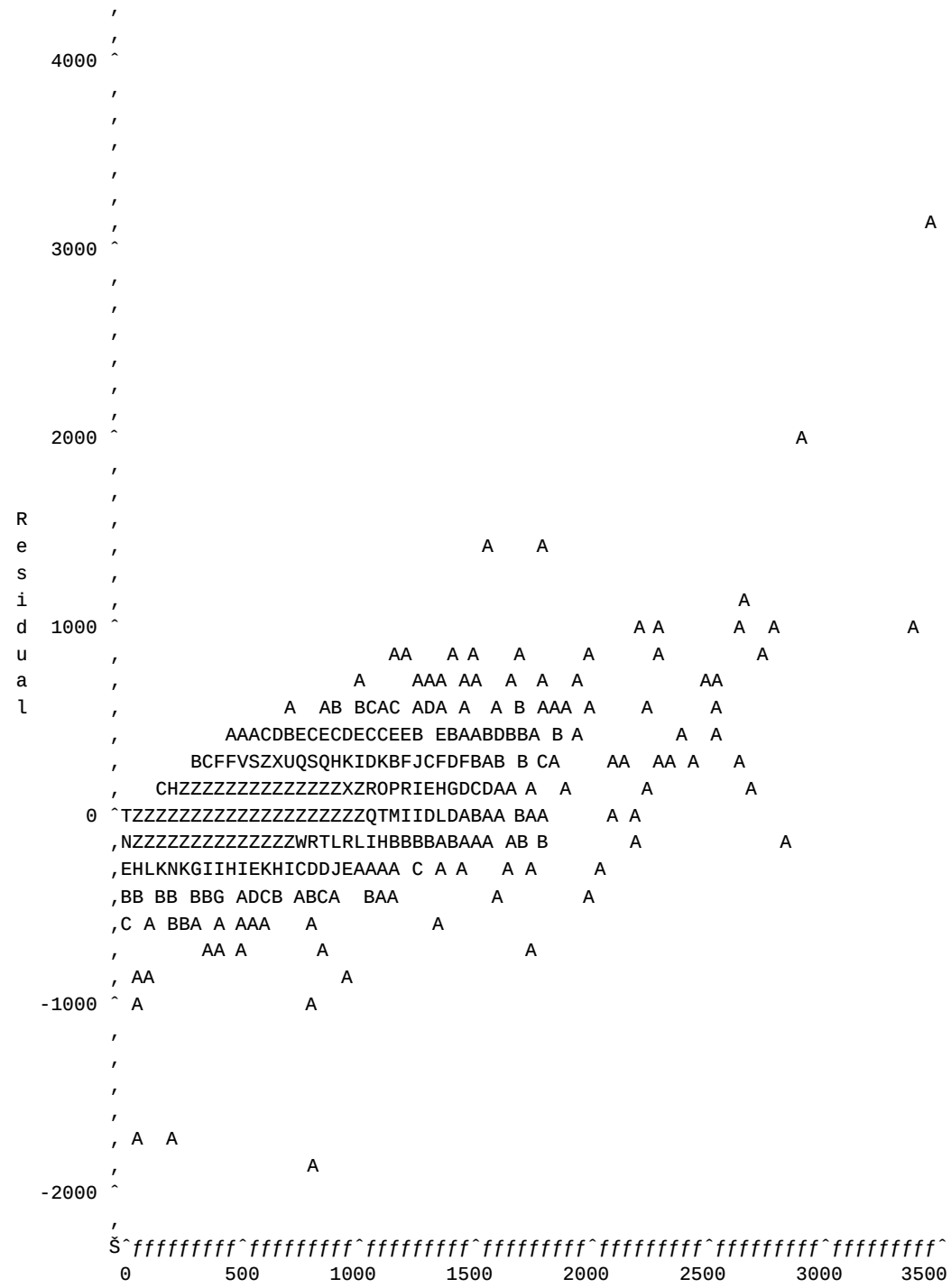
Root MSE	1000.38818	R-square	0.4661
Dep Mean	77.95139	Adj R-sq	0.4658
C.V.	1283.34870		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	3.469447E-18	0.00000000	.	.
INT	1	290.980040	15.43320569	18.854	0.0001
DLT	1	-2.207844	1.22167728	-1.807	0.0707
DBCHANGE	1	66.556915	8.02958152	8.289	0.0001
DNCHANGE	1	-126.487075	43.61752832	-2.900	0.0037
DLNUM	1	47.743382	8.70970595	5.482	0.0001
DMF	1	-73.124282	7.82023067	-9.351	0.0001
DDD	1	0.494788	0.02926546	16.907	0.0001
DCD	1	1.366195	0.02104265	64.925	0.0001
DEWAT	1	257.443982	11.24459561	22.895	0.0001
RESTRICT	-1	-7.63976E-10	0.15559693	-0.000	1.0000

Durbin-Watson D	2.126
(For Number of Obs.)	17452
1st Order Autocorrelation	-0.063

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



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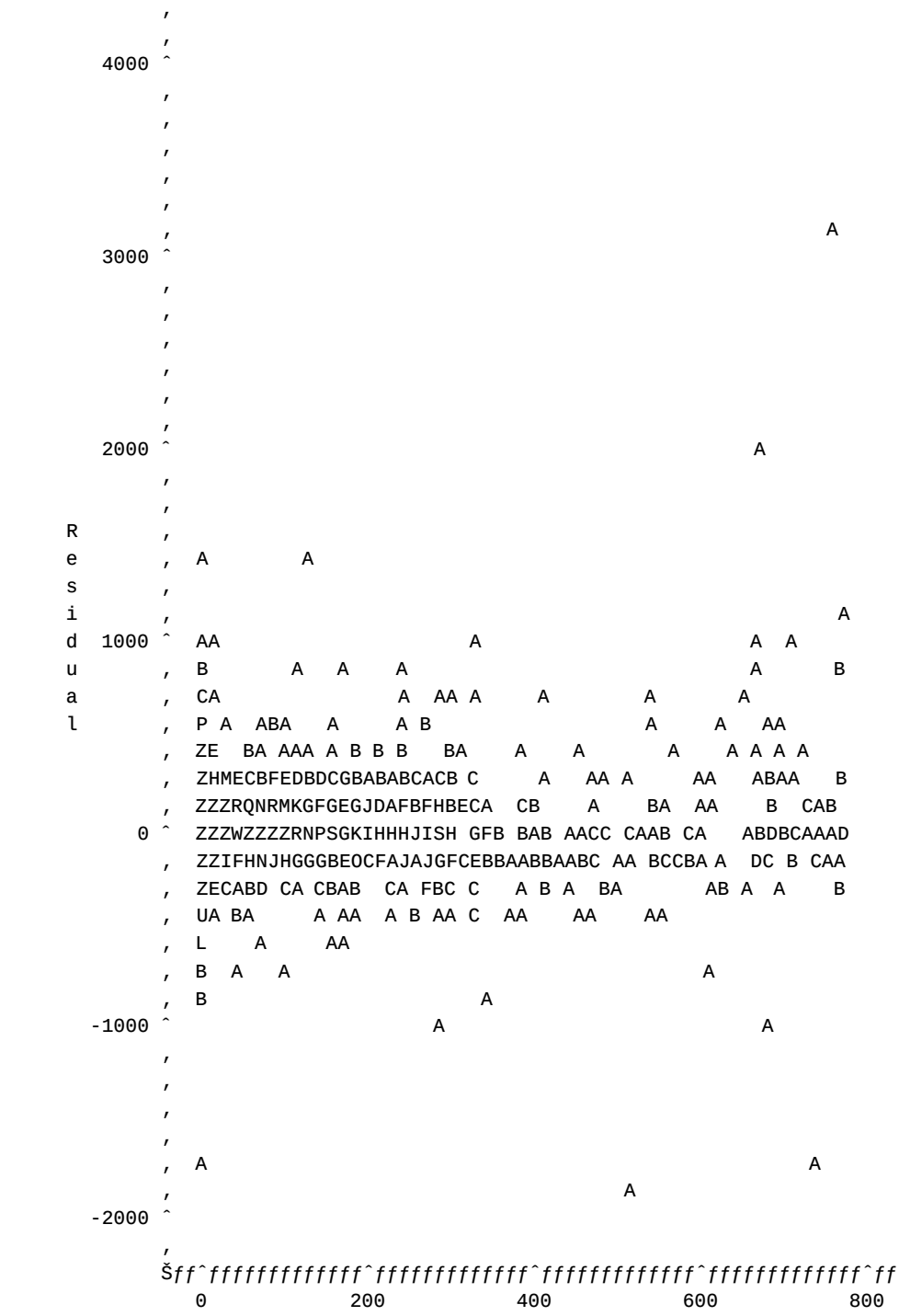
NOTE: 523 obs had missing values.  15095 obs hidden.
```

Plot of RESID*CDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 523 obs had missing values. 16122 obs hidden.

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	9	72533082291	8059231365.7	1410.802	0.0001
Error	15201	86835977570	5712517.4377		
C Total	15210	159369059861			

Root MSE	2390.08733	R-square	0.4551
Dep Mean	535.96611	Adj R-sq	0.4548
C.V.	445.94001		

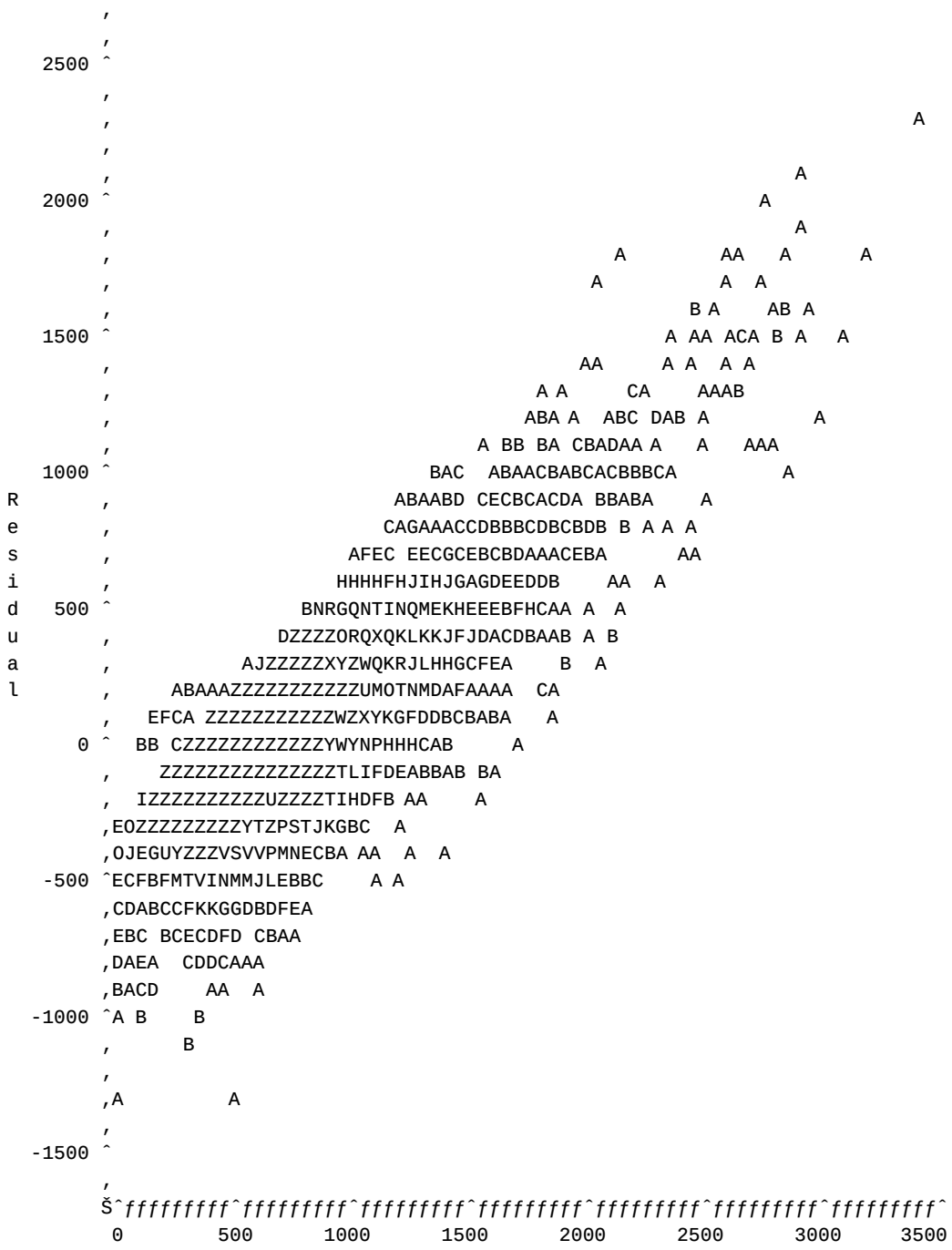
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	380.828067	2.83420158	134.369	0.0001
BCHANGE	1	155.972367	13.44381329	11.602	0.0001
NCHANGE	1	-292.305910	37.15915004	-7.866	0.0001
CD	1	1.268889	0.02072347	61.230	0.0001
CDMF	1	-0.193931	0.03806171	-5.095	0.0001
EVAPMF	1	-0.191290	0.04019213	-4.759	0.0001
EVAP	1	-0.184860	0.02615588	-7.068	0.0001
MF	1	-44.496153	6.10436974	-7.289	0.0001
DD	1	0.582057	0.02207110	26.372	0.0001
EWAT	1	249.946777	4.83777324	51.666	0.0001

Durbin-Watson D	0.582
(For Number of Obs.)	15211
1st Order Autocorrelation	0.709

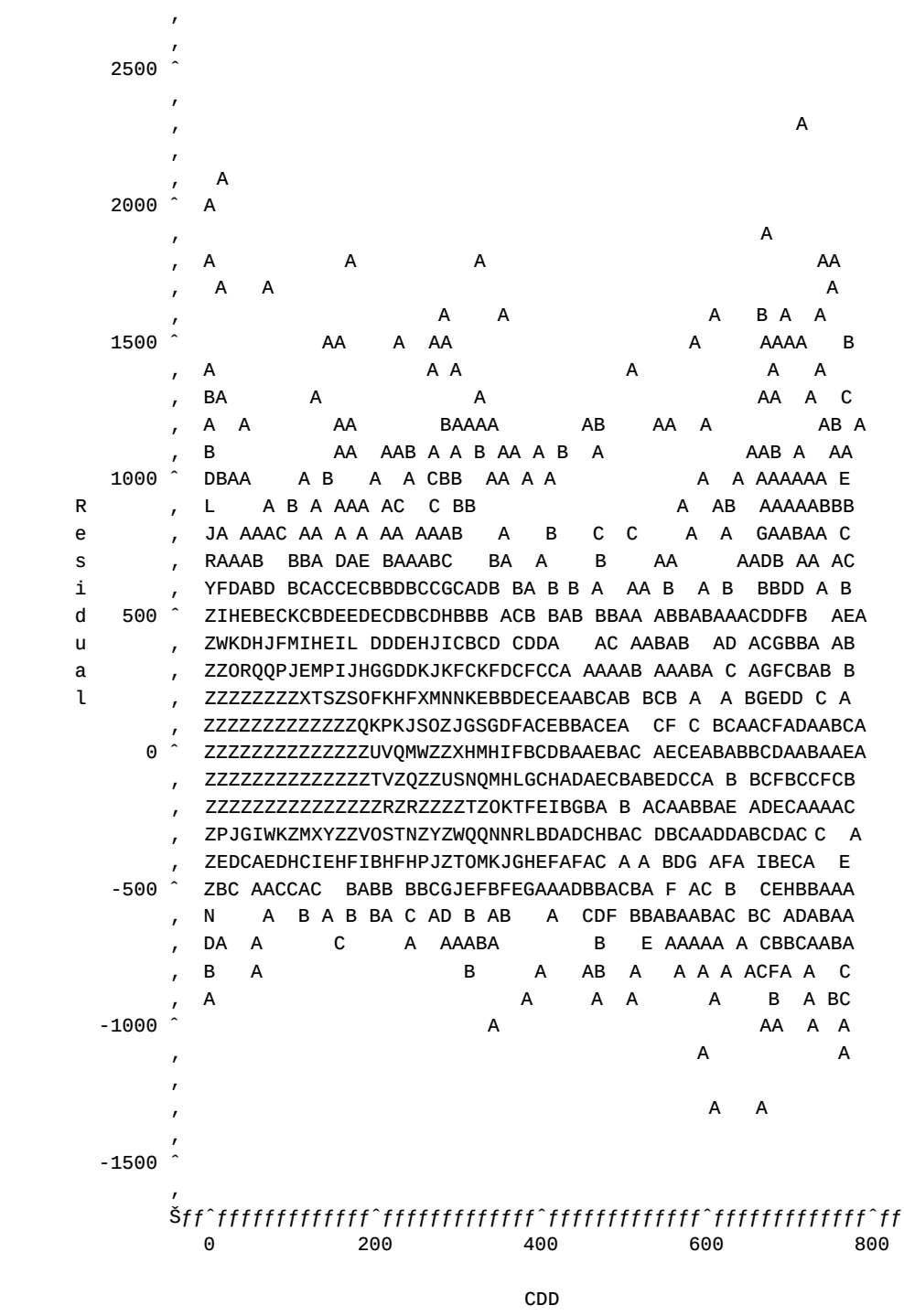
SCE Evaporative Cooler Replacement LIEE Program Model Results 2

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 10680 obs hidden.

SCE Evaporative Cooler Replacement LIEE Program Model Results 3



NOTE: 9624 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6	1.4	6	1.4
0.1	4	0.9	10	2.3
0.2	8	1.8	18	4.1
0.3	15	3.4	33	7.6
0.4	21	4.8	54	12.4
0.5	35	8.0	89	20.4
0.6	53	12.2	142	32.6
0.7	81	18.6	223	51.1
0.8	112	25.7	335	76.8
0.9	93	21.3	428	98.2
1	8	1.8	436	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
436	0.6958394	0.2016950	0.0100000	0.9900000

Model: MODEL1
NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	10	82522351112	8252235111.2	3385.791	0.0001
Error	14765	35986938013	2437313.7835		
U Total	14775	118509289125			

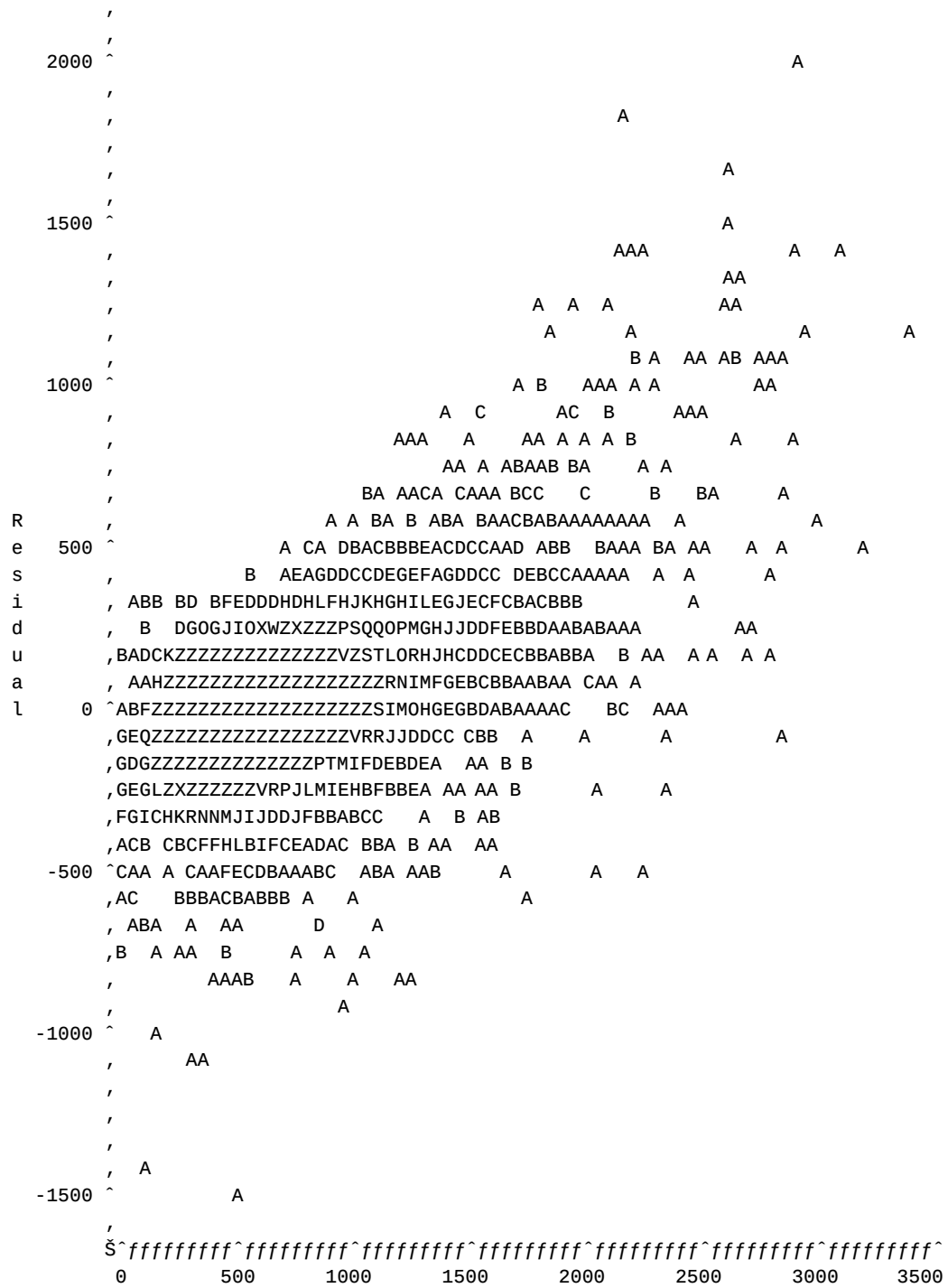
Root MSE	1561.18986	R-square	0.6963
Dep Mean	169.02882	Adj R-sq	0.6961
C.V.	923.62345		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	390.657769	4.75831057	82.100	0.0001
DCDMF	1	-0.068670	0.04080421	-1.683	0.0924
DCD	1	1.291518	0.02058617	62.737	0.0001
DEVAPMF	1	-0.154825	0.04317941	-3.586	0.0003
DEVAP	1	-0.305212	0.02534196	-12.044	0.0001
DMF	1	-70.170409	9.97239585	-7.036	0.0001
DDD	1	0.465019	0.02561682	18.153	0.0001
DEWAT	1	269.133731	7.64959943	35.183	0.0001
DBCHANGE	1	214.232446	22.77137113	9.408	0.0001
DNCHANGE	1	-233.870814	60.74307612	-3.850	0.0001
RESTRICT	-1	499111	991625.79897	0.503	0.6147

Durbin-Watson D	1.831
(For Number of Obs.)	14775
1st Order Autocorrelation	0.084

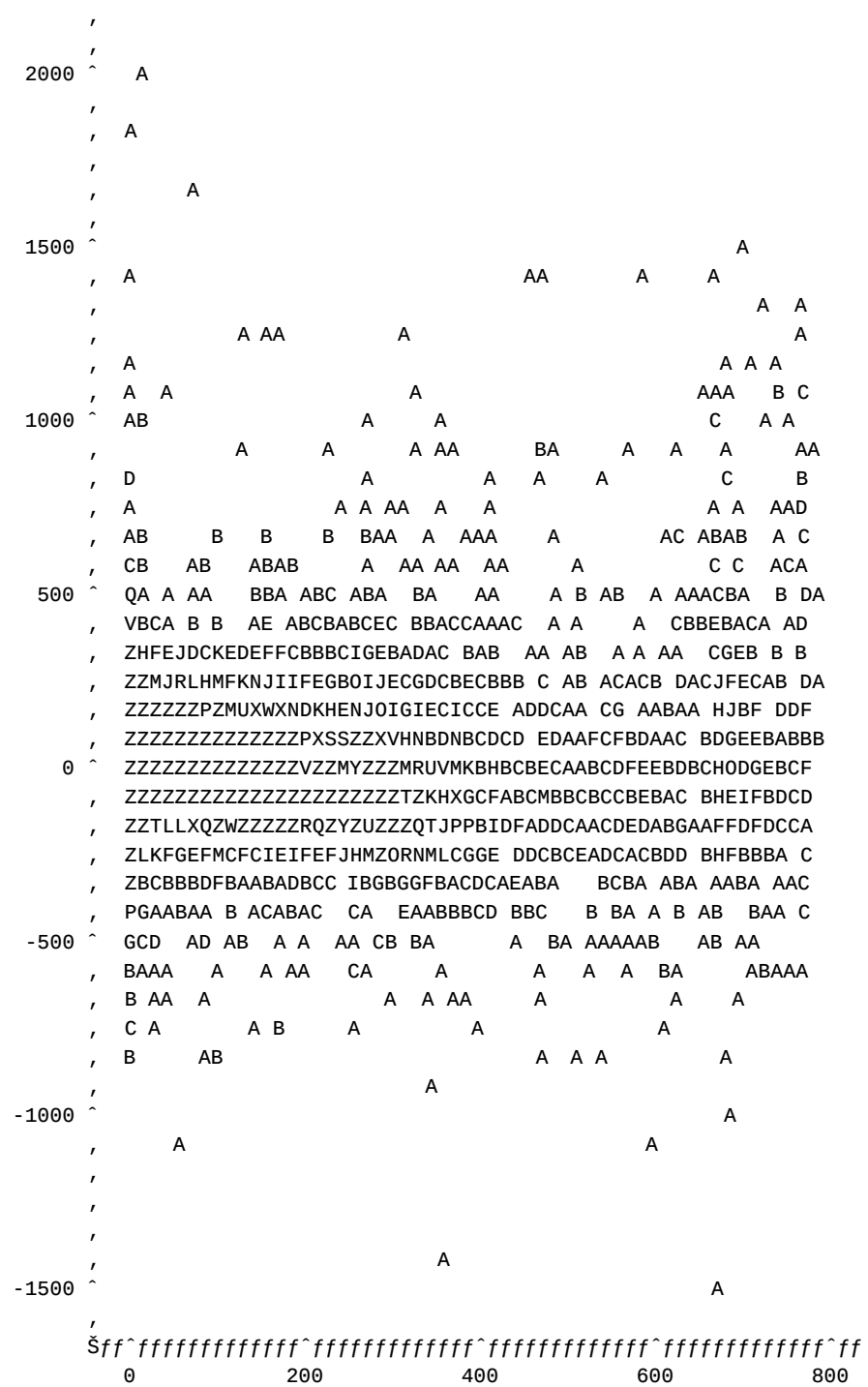
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



USE

NOTE: 436 obs had missing values. 10238 obs hidden.
SCE Evaporative Cooler Replacement LIEE Program Model Results 8

Plot of RESID*CDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 436 obs had missing values. 9828 obs hidden.

SCE Evaporative Cooler Maintenance LIEE Program Model Results 1

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	133907616581	16738452073	2357.949	0.0001
Error	21406	151955489129	7098733.4919		
C Total	21414	285863105710			

Root MSE	2664.34485	R-square	0.4684
Dep Mean	547.06960	Adj R-sq	0.4682
C.V.	487.02118		

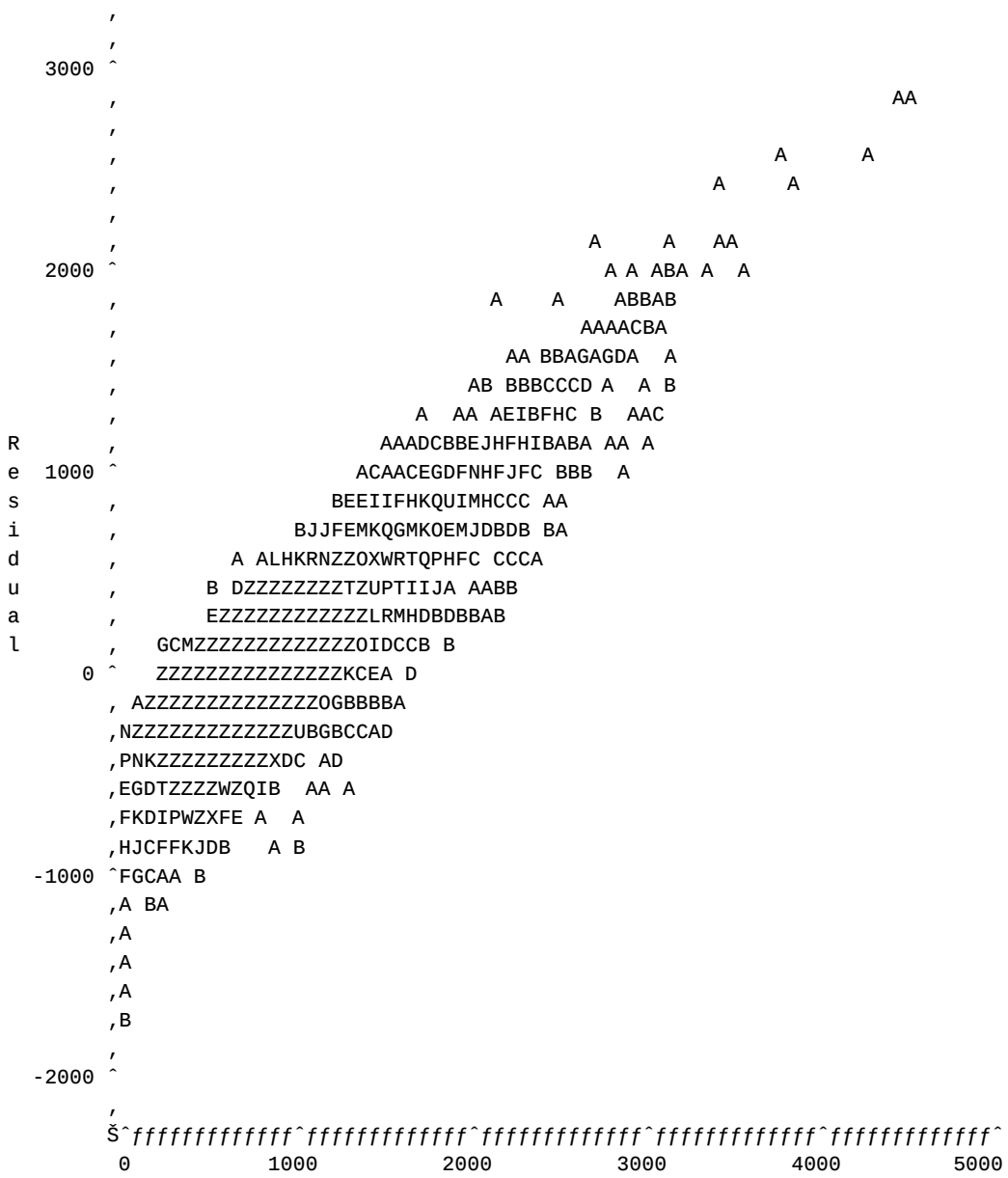
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	360.626749	3.11533726	115.758	0.0001
BCHANGE	1	122.134608	7.45631447	16.380	0.0001
NCHANGE	1	-229.972819	46.85056001	-4.909	0.0001
CD	1	1.182184	0.01387018	85.232	0.0001
CDMF	1	-0.207432	0.01924386	-10.779	0.0001
EVAP	1	0.011747	0.01730084	0.679	0.4971
MF	1	-41.355534	4.70838730	-8.783	0.0001
DD	1	0.734611	0.02237723	32.829	0.0001
EWAT	1	261.047355	4.80727641	54.303	0.0001

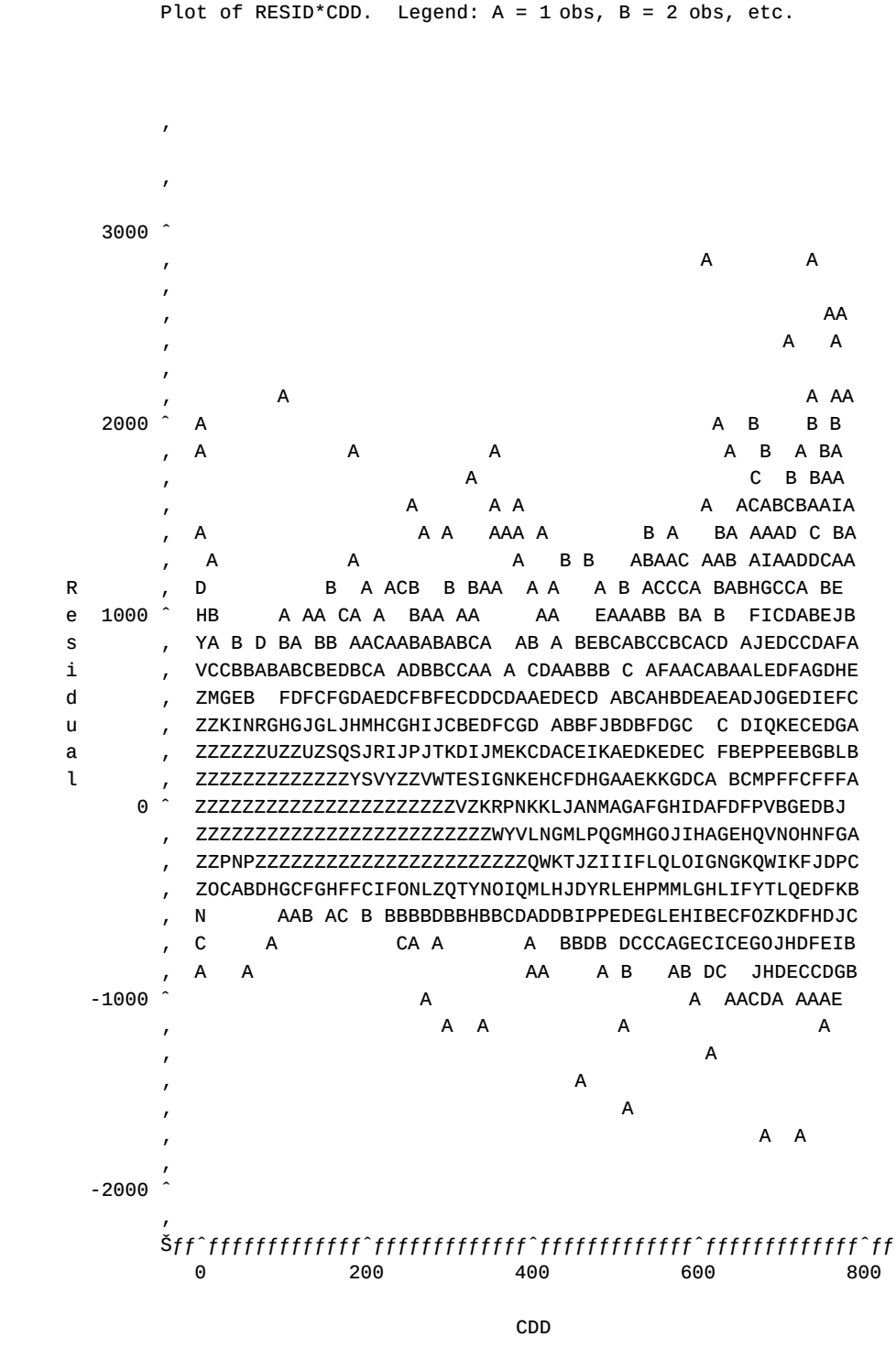
Durbin-Watson D	0.553
(For Number of Obs.)	21415
1st Order Autocorrelation	0.723

SCE Evaporative Cooler Maintenance LIEE Program Model Results 2

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 17455 obs hidden.



NOTE: 14736 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	0.3	2	0.3
0.1	5	0.8	7	1.1
0.2	16	2.6	23	3.8
0.3	25	4.1	48	7.8
0.4	25	4.1	73	11.9
0.5	52	8.5	125	20.4
0.6	77	12.6	202	33.0
0.7	112	18.3	314	51.3
0.8	159	26.0	473	77.3
0.9	131	21.4	604	98.7
1	12	1.3	616	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
616	0.6937374	0.1930988	0.0067593	0.9910251

Model: MODEL1

NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	9	82964852131	9218316903.5	2809.181	0.0001
Error	20790	68222306077	3281496.2038		
U Total	20799	151187158208			

Root MSE	1811.49005	R-square	0.5488
Dep Mean	153.40735	Adj R-sq	0.5486
C.V.	1180.83658		

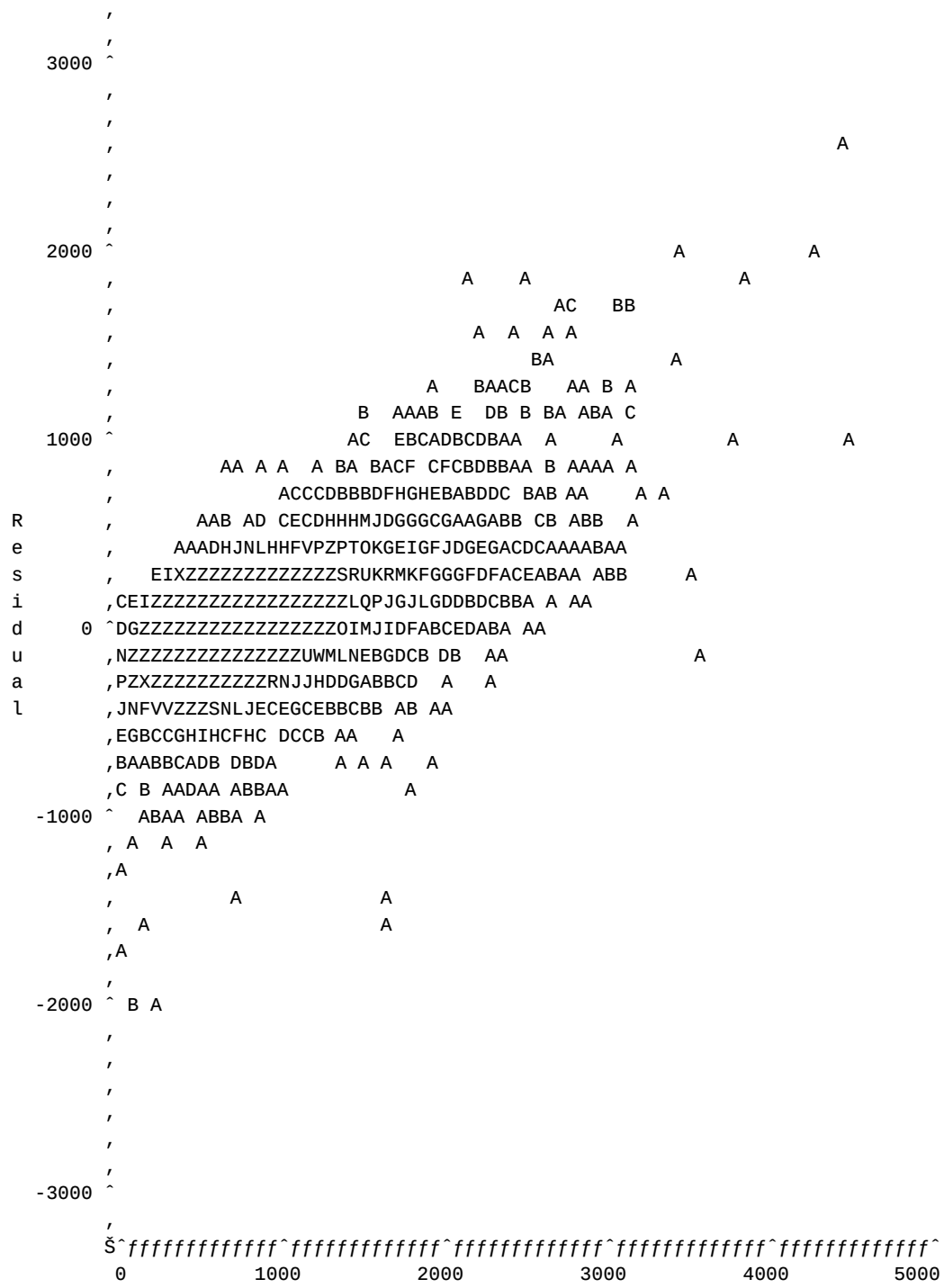
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	6.938894E-18	0.00000000	.	.
INT	1	363.392498	6.72015344	54.075	0.0001
DCD	1	1.179157	0.01554990	75.831	0.0001
DCDMF	1	-0.162543	0.02157974	-7.532	0.0001
DEVAP	1	-0.011847	0.02194008	-0.540	0.5892
DMF	1	-45.673099	10.18188617	-4.486	0.0001
DDD	1	0.562598	0.03058939	18.392	0.0001
DEWAT	1	263.155682	11.52637805	22.831	0.0001
DBCHANGE	1	112.475324	13.70184595	8.209	0.0001
DNCHANGE	1	-104.270435	85.78596313	-1.215	0.2242
RESTRICT	-1	6.548362E-10	1.10696665	0.000	1.0000

Durbin-Watson D	1.883
(For Number of Obs.)	20799
1st Order Autocorrelation	0.058

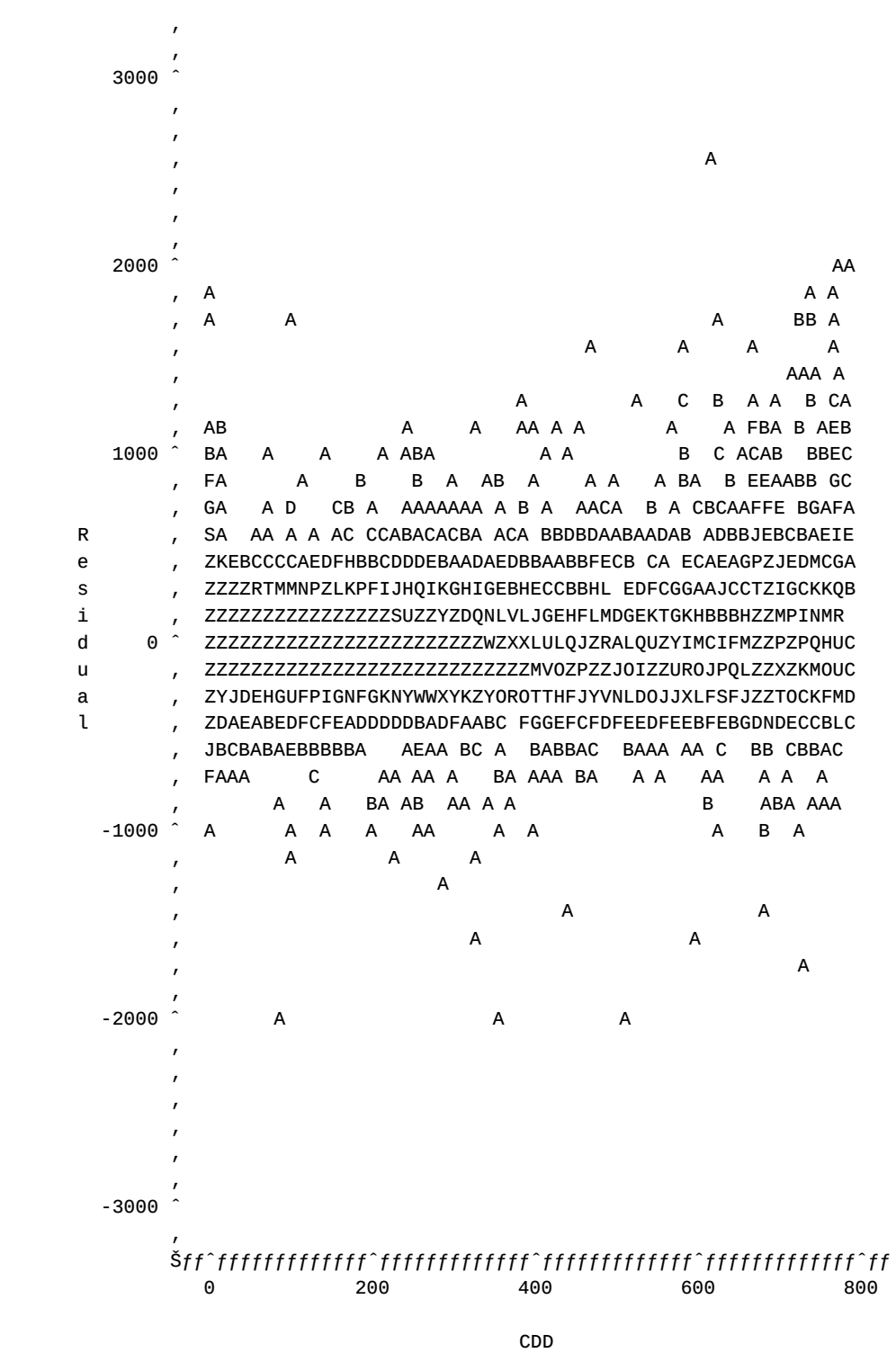
SCE Evaporative Cooler Maintenance LIEE Program Model Results 7

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 616 obs had missing values. 17131 obs hidden.

SCE Evaporative Cooler Maintenance LIEE Program Model Results 8



NOTE: 616 obs had missing values. 15067 obs hidden.

Model: MODEL1

Dependent Variable: USE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	10	3247744148	324774414.8	1694.934	0.0001
Error	11822	2265270555	191614.83294		
C Total	11832	5513014703.1			

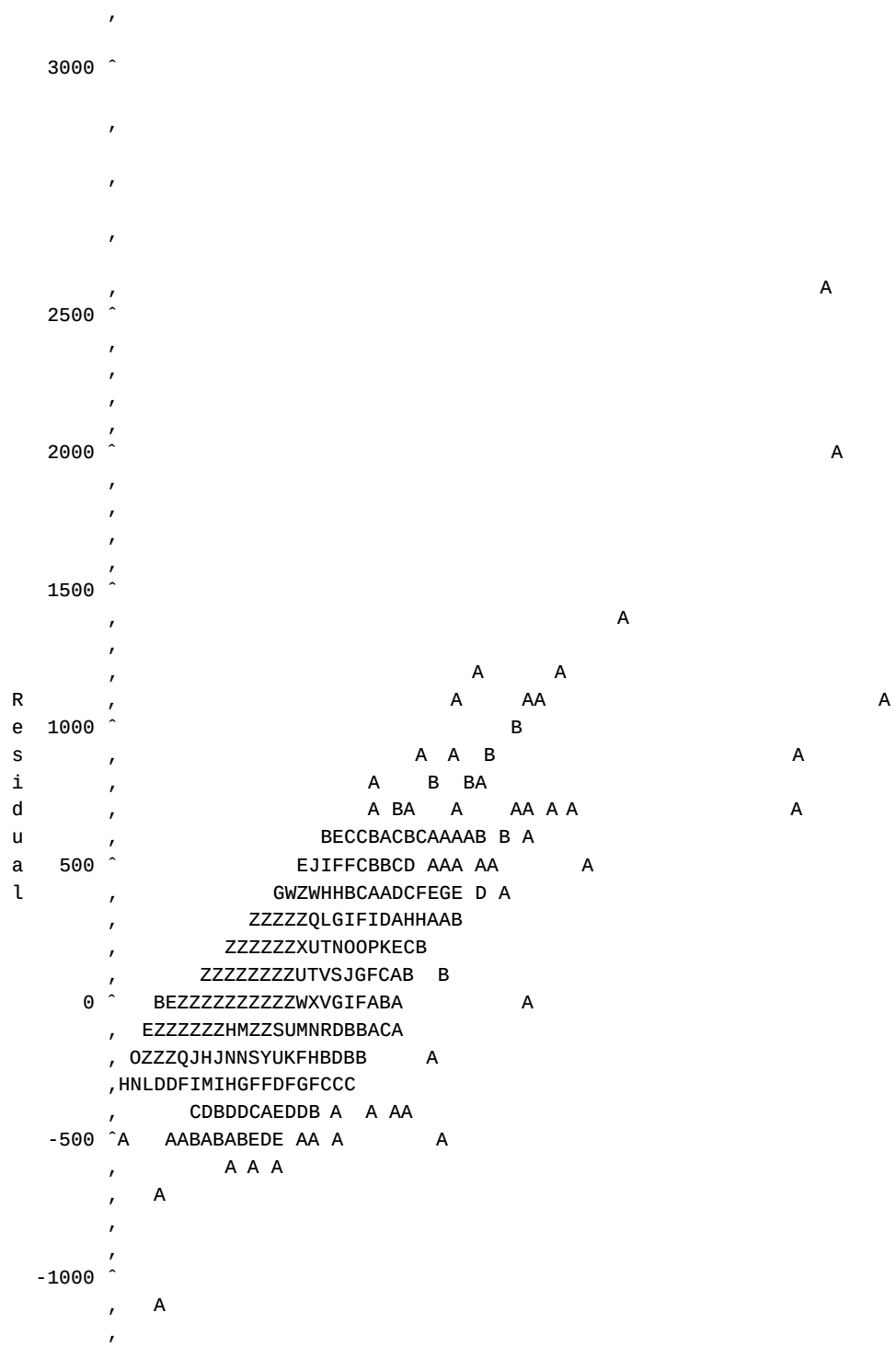
Root MSE	437.73832	R-square	0.5891
Dep Mean	405.53875	Adj R-sq	0.5888
C.V.	107.93995		

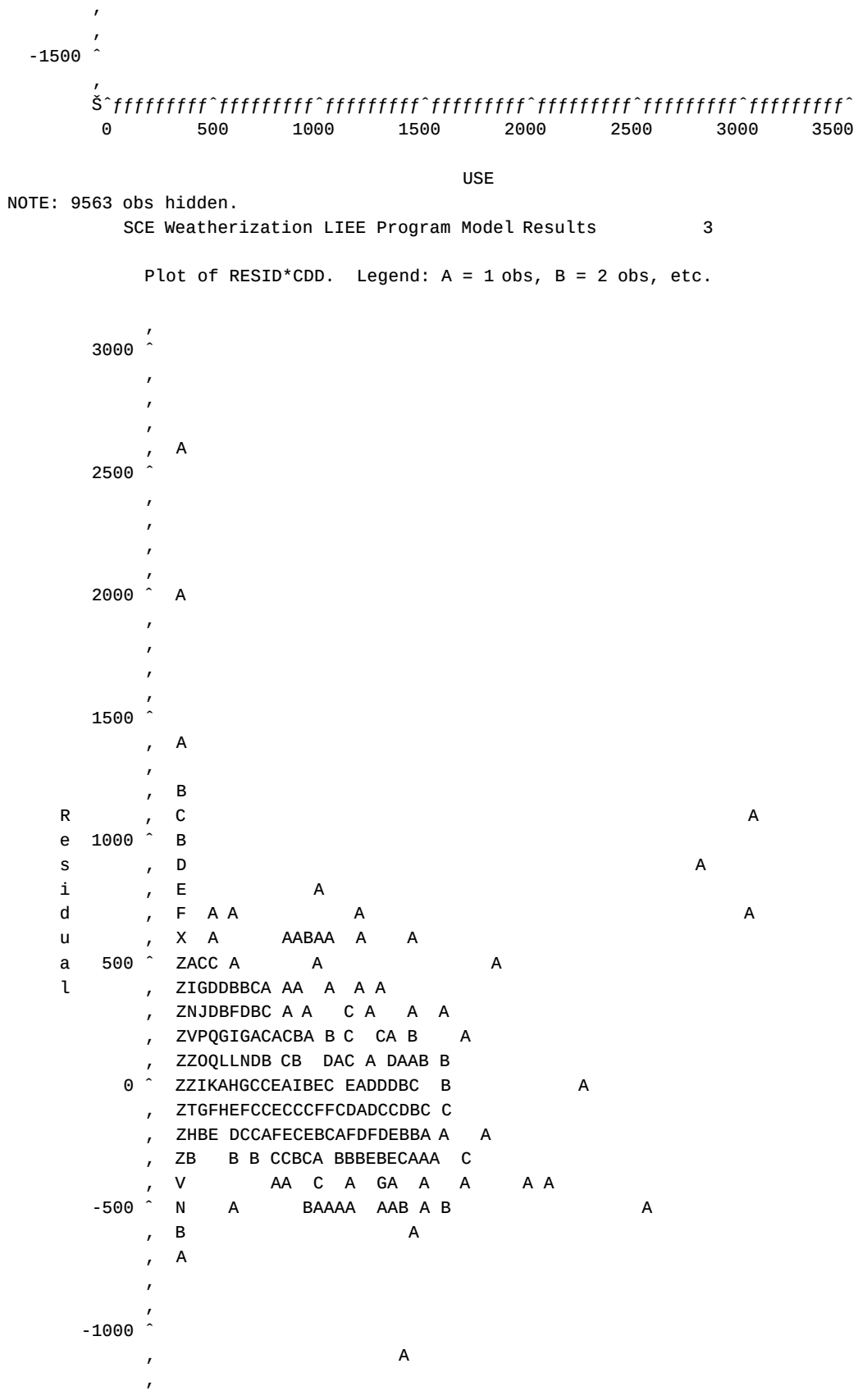
Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	313.478860	6.94629569	45.129	0.0001
LNUM	1	56.683606	3.25765311	17.400	0.0001
BCHANGE	1	37.515907	4.50079380	8.335	0.0001
NCHANGE	1	-123.903370	18.44137541	-6.719	0.0001
MF	1	-71.172171	5.99249942	-11.877	0.0001
DD	1	0.877810	0.11232702	7.815	0.0001
CONSH	1	0.021439	0.42994308	0.050	0.9602
CD	1	1.734004	0.07384581	23.481	0.0001
CONAC	1	-0.058548	0.31865738	-0.184	0.8542
EWAT	1	152.981501	4.46707835	34.246	0.0001
CONWH	1	70.484395	51.21594808	1.376	0.1688

Durbin-Watson D	0.599
(For Number of Obs.)	11833
1st Order Autocorrelation	0.700

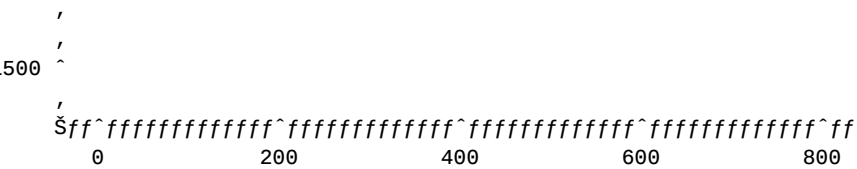
Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.





NOTE: 9563 obs hidden.

Plot of RESID*CDD. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 10772 obs hidden.

RHO1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.3	1	0.3
0.2	1	0.3	2	0.6
0.3	5	1.4	7	2.0
0.4	18	5.1	25	7.1
0.5	26	7.4	51	14.6
0.6	30	8.6	81	23.1
0.7	47	13.4	128	36.6
0.8	70	20.0	198	56.6
0.9	99	28.3	297	84.9
1	53	15.1	350	100.0

Analysis Variable : RHO

N	Mean	Std Dev	Minimum	Maximum
350	0.7715932	0.1806475	0	0.9981070

Model: MODEL1
NOTE: Restrictions have been applied to parameter estimates.
NOTE: Restrictions on intercept. R-square is redefined.
Dependent Variable: DUSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	11	928910382.16	84446398.378	1004.159	0.0001
Error	11472	964757099.78	84096.678851		
U Total	11483	1893667481.9			

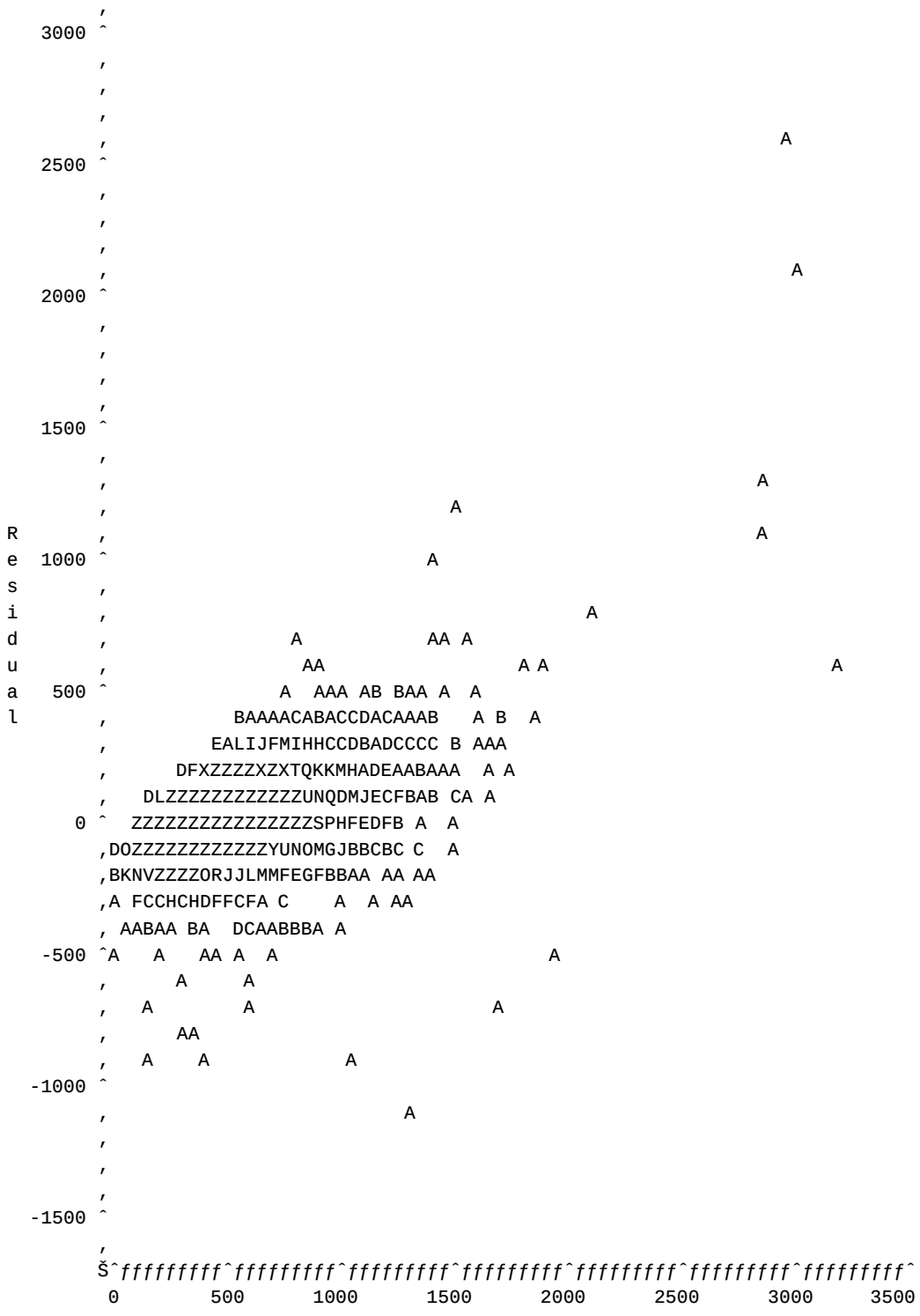
Root MSE	289.99427	R-square	0.4905
Dep Mean	86.88998	Adj R-sq	0.4900
C.V.	333.74881		

Parameter Estimates

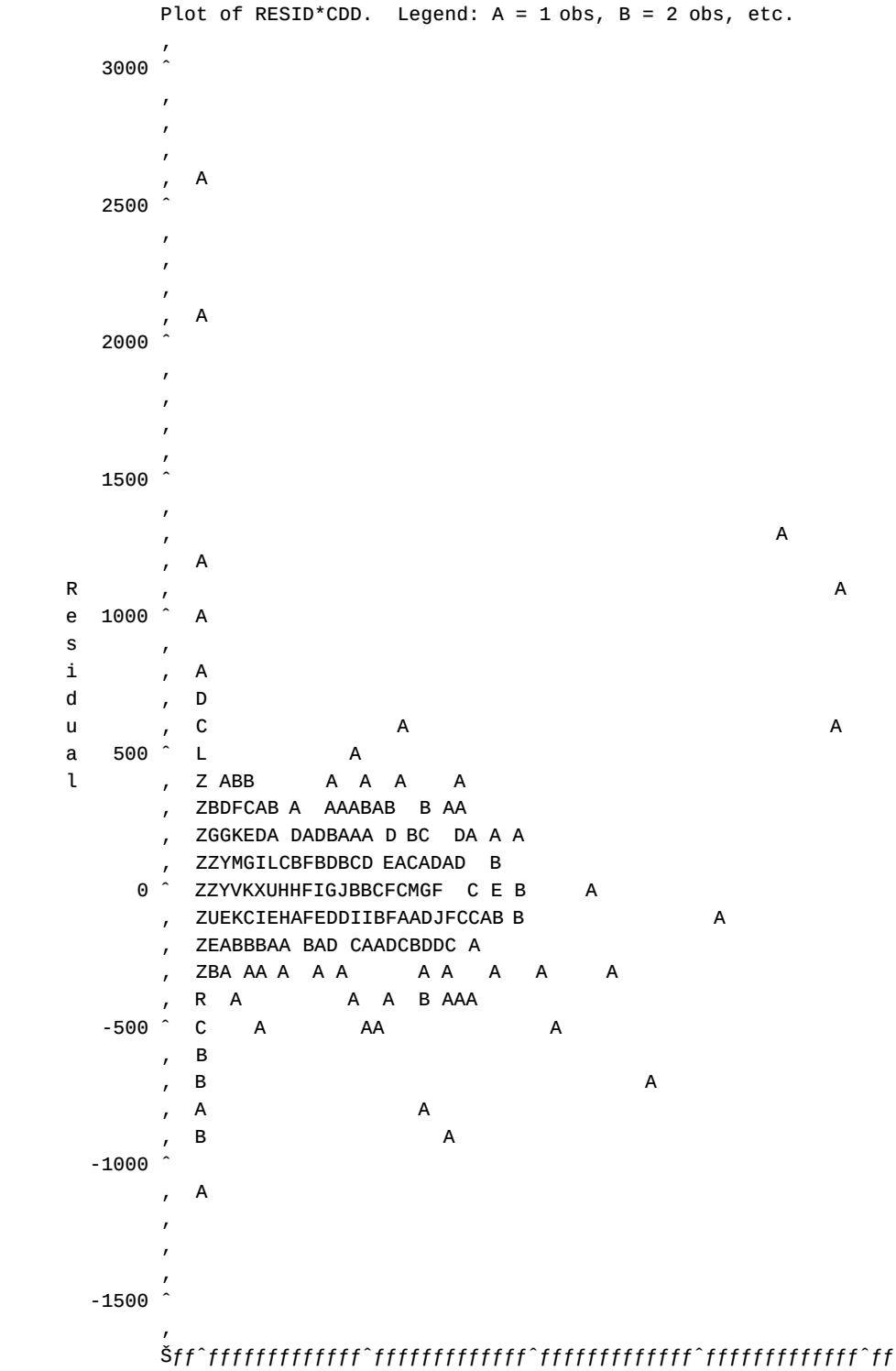
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0	0.00000000	.	.
INT	1	310.342862	20.99975541	14.778	0.0001
DLNUM	1	58.102835	10.14735561	5.726	0.0001
DBCHANGE	1	49.023931	9.76421912	5.021	0.0001
DNCHANGE	1	-78.635308	38.15637869	-2.061	0.0393
DMF	1	-71.138234	17.99428579	-3.953	0.0001
DDD	1	1.008331	0.13931224	7.238	0.0001
DCONSH	1	-0.606547	0.53058438	-1.143	0.2530
DCONAC	1	-0.569127	0.30617571	-1.859	0.0631
DCD	1	1.440400	0.07308640	19.708	0.0001
DEWAT	1	178.863721	12.01879299	14.882	0.0001
DCONWH	1	-187.146486	95.34657403	-1.963	0.0497
RESTRICT	-1	-2.10463E-10	0.01064417	-0.000	1.0000

Durbin-Watson D	2.102
(For Number of Obs.)	11483
1st Order Autocorrelation	-0.051

Plot of RESID*USE. Legend: A = 1 obs, B = 2 obs, etc.



NOTE: 350 obs had missing values. 9238 obs hidden.



NOTE: 350 obs had missing values. 10526 obs hidden.