Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position Y2-080

Rhodes Lane 500 kV Project

Web Version

June, 2013

Feasibility Study Report

Rhodes Lane 500 kV Generation Project

Introduction

This Feasibility Study report provides the documentation of an assessment that has been performed by FirstEnergy (FE) in response to a request made by the Interconnection Customer (IC) for the connection of a 1065 MW Natural Gas Combined Cycle Generation facility to the West Penn System at the Rhodes Lane 500 kV Switching Station. The IC has proposed a commercial operation date of June 2017 for the proposed facility. As per the PJM RTEP study process, the project assessment was accomplished by: 1. Evaluating the reliability impact of the proposed facilities and connection on the interconnected transmission system by the performance of a power flow study; 2. Ensuring compliance with the NERC, ReliabilityFirst, PJM and FE Reliability Standards by identifying the system reinforcements that will need to be installed for an interconnection of the proposed project; 3. Coordinating and cooperating with the PJM staff and Interconnection Customer by participating in project meetings and issuing this report as a part of the RTEP study process; 4. Performing a Steady State, Short-Circuit and Dynamics Study as necessary; 5. Conducting all studies in accordance with the PJM Manuals, the "FE Requirements for Transmission Connected Facilities", and the "FE Study Guide".

Connection Facilities

In compliance with the Regional Transmission Expansion Planning (RTEP) protocol, IC has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to construct a combined cycle natural gas generation facility connected to a common bus with a total capability of 1065 MW (1065 MW Capacity.) For purposes of this report, it has been designated as the “Rhodes Lane Y2-080 Project” (hereinafter, the “Project”) to reflect its proximity to the Rhodes Lane Substation (see Attachment 1) The IC has requested the study of a Primary Point of Interconnection (POI) for the Project. This report contains detailed connection requirements, direct connection costs and schedule, power flow analysis, short circuit analysis, and a cost and schedule for any associated system reinforcements for the Primary POI.

Primary Point of Interconnection: Rhodes Lane 500 kV Substation

The Primary POI for the Project will be accomplished by building a new 500 kV terminal at Rhodes Lane by adding a 4th breaker and providing a 500 kV meter package. IC will be responsible for acquiring all easements, properties and permits that may be required to construct both the new 500kV line and the associated attachment facilities. A summary of the Project direct connection facilities that will be required for the Primary POI and their estimated costs are shown on Attachment 3 and the one-line for the Primary POI is shown in Attachment 2.

PJM Interconnection Study Results

The following are the results of the analysis performed by PJM engineers with respect to the transmission system impacts.

Network Impacts

The Queue Project #Y2-080 was studied as a 1065.0MW (Capacity 1065.0MW) injection at the T-174 Tap 500 kV substation in the APS area. Project #Y2-080 was evaluated for compliance with reliability criteria for summer peak conditions in 2016. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

1. The T174_TAP-YUKON 500 kV line (from bus 292625 to bus 235116 ckt 1) loads from 81.11% to 97.56% (**DC power flow**) of its emergency rating (3734 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('01HATFLD _01BLACKO _058'). This project contributes approximately 614.51 MW to the thermal violation.

CONTINGENCY '01HATFLD _01BLACKO _058'
DISCONNECT BRANCH FROM BUS 235108 TO BUS 235103 CKT 1 /* 500/500KV, AREA 201/201.
END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. The KEYSTONE-JACKMTN1 500 kV line (from bus 200011 to bus 200071 ckt 1) loads from 93.16% to 96.8% (**DC power flow**) of its emergency rating (3723 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('CONEM-GH_JACKMTN2_2'). This project contributes approximately 135.56 MW to the thermal violation.

CONTINGENCY 'CONEM-GH_JACKMTN2_2' /* 500/500KV, AREA 225/225.
DISCONNECT BRANCH FROM BUS 200005 TO BUS 200072 CKT 1
END

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

3. The ROCKWOOD-Q34 115 kV line (from bus 200746 to bus 290079 ckt 1) loads from 95.64% to 96.53% (**DC power flow**) of its emergency rating (166 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.1 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

4. The SMITHTON 62-SHEPLER H J 138 kV line (from bus 235252 to bus 235247 ckt 1) loads from 79.88% to 101.94% (**DC power flow**) of its emergency rating (297 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 65.52 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

5. The KEYSTONE-CONEM-GH 500 kV line (from bus 200011 to bus 200005 ckt 1) loads from 91.83% to 96.77% (**DC power flow**) of its emergency rating (3723 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('KEYSTONE_JACKMTN1_1'). This project contributes approximately 205.94 MW to the thermal violation.

CONTINGENCY 'KEYSTONE_JACKMTN1_1' /* 500/500KV, AREA 225/225.
DISCONNECT BRANCH FROM BUS 200011 TO BUS 200071 CKT 1
END

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

~~6. The GARRETT-Y1-003 TAP 115 kV line (from bus 200762 to bus 913000 ckt 1) loads from 97.19% to 98.18% (**DC power flow**) of its emergency rating (152 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.34 MW to the thermal violation.~~

~~CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1~~
~~OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1~~
~~END~~

~~Please refer to Appendix 7 for a table containing the generators having contribution to this flowgate.~~

7. The JACKMTN2-JUNIATA 500 kV line (from bus 200072 to bus 200009 ckt 1) loads from 96.53% to 100.15% (**DC power flow**) of its emergency rating (3723 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('PJM20B'). This project contributes approximately 135.11 MW to the thermal violation.

CONTINGENCY 'PJM20B'
DISCONNECT BRANCH FROM BUS 200071 TO BUS 200009 CKT 1 /*
CONEMAGH JUNIATA 500 500
END

Please refer to Appendix 9 for a table containing the generators having contribution to this flowgate.

~~8. The PENN-MAR-Y1-033 TAP 115 kV line (from bus 200747 to bus 913240 ckt 1) loads from 98.59% to 99.57% (**DC power flow**) of its emergency rating (153 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.31 MW to the thermal violation.~~

~~CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1~~
~~OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1~~
~~END~~

~~Please refer to Appendix 10 for a table containing the generators having contribution to this flowgate.~~

~~9. The Y1-003 TAP-PENN-MAR 115 kV line (from bus 913000 to bus 200747 ckt 1) loads from 98.82% to 99.81% (**DC power flow**) of its emergency rating (152 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.34 MW to the thermal violation.~~

~~CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1~~
~~OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1~~
~~END~~

~~Please refer to Appendix 11 for a table containing the generators having contribution to this flowgate.~~

10. The JACKMTN1-JUNIATA 500 kV line (from bus 200071 to bus 200009 ckt 1) loads from 97.64% to 101.33% (**DC power flow**) of its emergency rating (3723 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('PJM24A'). This project contributes approximately 137.26 MW to the thermal violation.

CONTINGENCY 'PJM24A'
DISCONNECT BRANCH FROM BUS 200009 TO BUS 200072 CKT 1 /*
JUNIATA KEYSTONE 500 500
END

Please refer to Appendix 12 for a table containing the generators having contribution to this flowgate.

11. The YUKON-SMITHTON 62 138 kV line (from bus 235277 to bus 235252 ckt 1) loads from 85.18% to 107.24% (**DC power flow**) of its emergency rating (297 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 65.52 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500
235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 13 for a table containing the generators having contribution to this flowgate.

12. The YUKON 500/138 kV transformer (from bus 235116 to bus 235277 ckt 2) loads from 91.4% to 109.74% (**DC power flow**) of its emergency rating (466 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 85.47 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500
235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 15 for a table containing the generators having contribution to this flowgate.

13. The YUKON 500/138 kV transformer (from bus 235116 to bus 235277 ckt 1) loads from 91.6% to 109.98% (**DC power flow**) of its emergency rating (465 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 85.47 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500
235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 16 for a table containing the generators having contribution to this flowgate.

Light Load Analysis

Light Load Studies, if required, will be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

1. The KEYSTONE-CONEM-GH 500 kV line (from bus 200011 to bus 200005 ckt 1) loads from 93.18% to 98.24% (**DC power flow**) of its emergency rating (3723 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('PJM3B1'). This project contributes approximately 211.39 MW to the thermal violation.

```
CONTINGENCY 'PJM3B1'                                    /* KEYSTONE BUS
BREAKER 3
  DISCONNECT BRANCH FROM BUS 200071 TO BUS 200011 CKT 1          /*
JUNIATA KEYSTONE 500 500 /* BUS 200072 => 200071 (JACKMNT1)
  DISCONNECT BRANCH FROM BUS 200011 TO BUS 200810 TO BUS 200907
CKT 4/* KEYSTONE KEYSTONE 500 230 #4
  END
```

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

2. The KEYSTONE-JACKMTN1 500 kV line (from bus 200011 to bus 200071 ckt 1) loads from 95.44% to 99.49% (**DC power flow**) of its emergency rating (3723 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('PJM53'). This project contributes approximately 168.04 MW to the thermal violation.

```
CONTINGENCY 'PJM53'                                     /* CONEMAUGH BREAKER
2
  DISCONNECT BRANCH FROM BUS 200005 TO BUS 200011 CKT 1          /*
CONEMAGH C14_CLCT 500 500
  DISCONNECT BRANCH FROM BUS 200005 TO BUS 200031 CKT 1          /*
CONEMAGH CONEMAGH 500 22
  REMOVE MACHINE H FROM BUS 200031                      /* CONEMAUGH 2
  REMOVE MACHINE L FROM BUS 200031
  END
```

Please refer to Appendix 8 for a table containing the generators having contribution to this flowgate.

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

Refer to the results presented in the Interconnected Transmission Owner's Analysis Results section of this report.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. The Y1-033 TAP-ROCKWOOD 115 kV line (from bus 913240 to bus 200746 ckt 1) loads from 100.94% to 101.93% (**DC power flow**) of its emergency rating (153 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.31 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 14 for a table containing the generators having contribution to this flowgate.

2. The Q34-SOMERST 115 kV line (from bus 290079 to bus 200744 ckt 1) loads from 103.92% to 104.81% (**DC power flow**) of its emergency rating (166 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.1 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 17 for a table containing the generators having contribution to this flowgate.

~~3. The GARRETT-GARRETT 115 kV line (from bus 235470 to bus 200762 ckt 1) loads from 108.99% to 110.18% (**DC power flow**) of its emergency rating (129 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.46 MW to the thermal violation.~~

~~CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1~~
~~OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1~~
~~END~~

~~Please refer to Appendix 18 for a table containing the generators having contribution to this flowgate.~~

~~4. The GARRETT-GARRETT 115 kV line (from bus 235470 to bus 200762 ckt 1) loads from 108.99% to 110.18% (DC power flow) of its emergency rating (129 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 9.46 MW to the thermal violation.~~

~~CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500 235118 01SOBEND 500 1~~
~~OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1~~
~~END~~

~~Please refer to Appendix 19 for a table containing the generators having contribution to this flowgate.~~

5. The SOUTH BEND-KEYSTONE 500 kV line (from bus 235118 to bus 200011 ckt 1) loads from 107.06% to 122.63% (**DC power flow**) of its emergency rating (2598 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('788_B2'). This project contributes approximately 407.0 MW to the thermal violation.

CONTINGENCY '788_B2'
OPEN BRANCH FROM BUS 235103 TO BUS 235108 CKT 1 / 235103 BLACK OAK 500 235108 HATFIELD 500 1
OPEN BRANCH FROM BUS 235103 TO BUS 235446 CKT 2 / 235103 BLACK OAK 500 235446 BLACK OAK 138 3
END

Please refer to Appendix 20 for a table containing the generators having contribution to this flowgate.

6. The SOUTH BEND-KEYSTONE 500 kV line (from bus 235118 to bus 200011 ckt 1) loads from 107.06% to 122.63% (**DC power flow**) of its emergency rating (2598 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('788_B2'). This project contributes approximately 407.0 MW to the thermal violation.

CONTINGENCY '788_B2'
OPEN BRANCH FROM BUS 235103 TO BUS 235108 CKT 1 / 235103 BLACK OAK 500 235108 HATFIELD 500 1
OPEN BRANCH FROM BUS 235103 TO BUS 235446 CKT 2 / 235103 BLACK OAK 500 235446 BLACK OAK 138 3
END

Please refer to Appendix 21 for a table containing the generators having contribution to this flowgate.

7. The ROXBURY 138/115 kV transformer (from bus 200532 to bus 200520 ckt 1) loads from 118.86% to 120.03% (**DC power flow**) of its emergency rating (138 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('01YUKON

_01BRNRUN _084_A'). This project contributes approximately 10.35 MW to the thermal violation.

CONTINGENCY '01YUKON _01BRNRUN _084_A'
DISCONNECT BRANCH FROM BUS 235116 TO BUS 292625 CKT 1 /*
500/500KV, AREA 201/201. / BUS 235850 -> 292625. T174.
END

Please refer to Appendix 22 for a table containing the generators having contribution to this flowgate.

8. The YUKON 500/138 kV transformer (from bus 235116 to bus 235277 ckt 3) loads from 110.43% to 131.66% (**DC power flow**) of its emergency rating (416 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 88.33 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500
235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 23 for a table containing the generators having contribution to this flowgate.

9. The YUKON 500/138 kV transformer (from bus 235116 to bus 235277 ckt 4) loads from 111.24% to 132.62% (**DC power flow**) of its emergency rating (409 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('APS_B_G693'). This project contributes approximately 87.45 MW to the thermal violation.

CONTINGENCY 'APS_B_G693' / 200011 KEYSTONE 500
235118 01SOBEND 500 1
OPEN BRANCH FROM BUS 200011 TO BUS 235118 CKT 1
END

Please refer to Appendix 24 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

If required, this will be performed and results presented in a later report.

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

Stability Analysis will be performed and results presented in a later report.

New System Reinforcements

(Upgrades, costs, and schedules required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

Generator Deliverability

1. The T174_TAP-YUKON 500 kV line:
Upgrade 2-138 kV breakers to 80 kA, upgrade associated switches, structures, foundations and replace control cables at Yukon. Estimated cost w/o tax: $1,351,700; Estimated cost w tax: $1,751,900; Estimated time: 3 years from the signing of an ISA/CSA.

2. The KEYSTONE-JACKMTN1 500 kV line:
Existing baseline RTEP project b0284.3 replaces the wave trap at Keystone on the future Jacks Mountain terminal. With the trap replaced, the rating of the line is 4239 MVA. Upgrade b0284.3 is presently scheduled to be complete prior to the ISD for the Y2-050 project (Q3 - 2017) and will eliminate the violations identified below.

3. The ROCKWOOD-Q34 115 kV line:
This violation is crossed out because the actual rating of the line is 179 MVA, with this rating, there is no violation.

4. The SMITHTON 62-SHEPLER H J 138 kV line:
There is an existing baseline upgrade that will address this violation, b2170; the planned in-service date is 6/1/15.

5. The KEYSTONE-CONEM-GH 500 kV line:
Existing baseline RTEP projects b0285.1 and b0285.2 replace the wave trap at Keystone and Conemaugh respectively on the Keystone-Conemaugh 500 kV line. The ISD for b0285.1 and b0285.2 is 6-1-2018. These projects may need accelerated to address the violation however both projects are tied to the Jacks Mountain project which is presently being evaluated by PJM and may be cancelled. This project will need to be studied without Jacks Mt, in the impact study, to evaluate the need for this upgrade. The new rating will be 4239 MVA with the traps replaced.

6. The GARRETT-Y1-003 TAP 115 kV line:
This violation is crossed out because the actual rating is 167 MVA, with this rating there is no violation.

7. The JACKMTN2-JUNIATA 500 kV line:
To address the overload of the Jacks Mountain 2 – Juniata 500 kV line, PPL EU proposes to rebuild 16 miles of the Jacks Mountain 2 – Juniata 500 kV line with 3x1590 ACSR, replace three breakers and the associated switches for 4000A rated breakers and switches in Juniata Bay 4 and replace the North and South 500 kV buses with 5" Aluminum tube. The estimated cost for the transmission work is $104,000,000 and the estimated cost for the substation work is $7,215,000. The total estimated upgrade cost is $111,215,000.

This magnitude estimate was prepared without extensive research and field review. The feasibility of this solution is dependent on the ability to take an extended outage of the Jacks Mountain 2 – Juniata 500 kV line.

8. The PENN-MAR-Y1-033 TAP 115 kV line:
This violation is crossed out because the actual rating is 174 MVA, with this rating, there is no violation.

9. The Y1-003 TAP-PENN-MAR 115 kV line:
This violation is crossed out because the actual rating is 167 MVA, with this rating there is no violation.

10. The JACKMTN1-JUNIATA 500 kV line:
To address the overload of Jacks Mountain 1 – Juniata 500 kV line, PPL EU proposes to rebuild 16 miles of the Jacks Mountain 1 – Juniata 500 kV line with 3x1590 ACSR and replace three breakers and the associated switches for 4000A rated breakers and switches in Juniata Bay 2. It is assumed that the North and South buses will already be rebuilt with 5" Aluminum tube for the network impacts associated with Y2-080. The estimated cost for the transmission work is $104,000,000 and the estimate cost for the substation work is $6,240,000. The total estimated upgraded cost is $110,240,000.
This magnitude estimate was prepared without extensive research and field review. The feasibility of this solution is dependent on the ability to take an extended outage of the Jacks Mountain 1 – Juniata 500 kV line.

11. The YUKON-SMITHTON 62 138 kV line:
There is an existing baseline upgrade that will address this violation, b2169; the planned in-service date is 6/1/15.

12. The YUKON 500/138 kV transformer:
Replace the number 2 500/138 transformer at Yukon with 333/448/560 MVA unit. Estimated cost w/o tax: $4,885,525; Estimated cost w tax: $6,330,325; Estimated time: 3 years from the signing of an ISA/CSA.

13. The YUKON 500/138 kV transformer:
Replace the number 1 500/138 transformer at Yukon with 333/448/560 MVA unit. Estimated cost w/o tax: $4,885,525; Estimated cost w tax: $6,330,325; Estimated time: 3 years from the signing of an ISA/CSA.

Multiple Facility Contingency

1. The KEYSTONE-CONEM-GH 500 kV line:
Existing baseline RTEP projects b0285.1 and b0285.2 replace the wave trap at Keystone and Conemaugh respectively on the Keystone-Conemaugh 500 kV line. The ISD for b0285.1 and b0285.2 is 6-1-2018. These projects may need to be accelerated to address the violation however both projects are tied to the Jacks Mountain project which is presently being evaluated by PJM and may be cancelled. This project will need to be studied without Jacks Mt, in the impact study, to evaluate the need for this upgrade. The

new rating will be 4239 MVA with the traps replaced.

2. The KEYSTONE-JACKMTN1 500 kV line:
Existing baseline RTEP project b0284.3 replaces the wave trap at Keystone on the future Jacks Mountain terminal. With the trap replaced, the rating of the line is 4239 MVA. Upgrade b0284.3 is presently scheduled to be complete prior to the ISD for the Y2-050 project (Q3 - 2017) and will eliminate the violations identified below.

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. The Y1-033 TAP-ROCKWOOD 115 kV line:
This violation is crossed out because the actual rating on this line is 174 MVA; the final flow at the close of the Y2 queue on this line is 165.29 MW, with the actual rating, there is no violation.

2. The Q34-SOMERST 115 kV line:
Reconductor the 7.1 mile Q34 – Somerset 115 kV line with 336 kcmil ACSS, replacing the existing conductor. Estimated cost with tax: $4,933,300; Estimated cost without tax: $3,808,000; Estimated time: 3 years from the signing of an ISA/CSA.

3, 4. The GARRETT-GARRETT 115 kV line:
These violations are crossed out because the actual rating on this line is 157 MVA; the final flow at the close of the Y2 queue on this line is 152.89 MW, with the actual rating, there is no violation.

5, 6. The SOUTH BEND-KEYSTONE 500 kV line:
Upgrade 500 kV wave trap to 4000 A and replace WHM meter on South Bend (5001) line at Keystone. Estimated cost w/o tax: $145,800; Estimated cost w tax: $188,900; Estimated time: 3 years from the signing of an ISA/CSA.

7. The ROXBURY 138/115 kV transformer:
There is an operating procedure that allows for the opening of this transformer, pre-contingency, to prevent an overload. This could not be tested to verify that opening the transformer did not cause any other overloads. The reinforcement that was previously provided to PJM is to install a standard 115kV Circuit Breaker with 3000A. Total Cost: $717,300.

8. The YUKON 500/138 kV transformer:
Replace the number 3 500/138 transformer at Yukon with 333/448/560 MVA unit. Estimated cost w/o tax: $4,885,525; Estimated cost w tax: $6,330,325; Estimated time: 3 years from the signing of an ISA/CSA.

9. The YUKON 500/138 kV transformer:
Replace the number 4 500/138 transformer at Yukon with 333/448/560 MVA unit.
Estimated cost w/o tax: $4,885,525; Estimated cost w tax: $6,330,325; Estimated time: 3 years from the signing of an ISA/CSA.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

None

Summary of Project Costs and Schedule

The following table presents a collection the costs of the reinforcements for the upgrades identified earlier in this report. This summary includes those costs presented in the FirstEnergy Summary at the end of the Interconnected Transmission Owner's Analysis Results section of this report.

The total shows that this project is estimated to cost $250,303,600 before taxes.

The schedule for work to be performed by FirstEnergy (West Penn Power, MetEd, and Penelec) is 36 months from the execution of an Interconnection Service Agreement and an Interconnection Construction Service Agreement. (Note: As of the date of this report, PPL did not specify a construction period for its portion of the work.)

Category	Number in report	Network Upgrade No., Baseline, or status	Trans. Owner	Cost	Tax	Total
Attachment	Dir. Conn	-	WPP	$ 3,283,700	$ 972,000	$ 4,255,700
Gen. Deliverability	1	WP-S-135	WPP	$ 1,351,700	$ 400,200	$ 1,751,900
Gen. Deliverability	2	b0284,3				
Gen. Deliverability	3	Removed				
Gen. Deliverability	4	b2170				
Gen. Deliverability	5	b0285.1 &.2				
Gen. Deliverability	6	Removed				
Gen. Deliverability	7		PPL	$ 111,215,000	$32,889,723	$144,104,723
Gen. Deliverability	8	Removed				
Gen. Deliverability	9	Removed				
Gen. Deliverability	10		PPL	$ 110,240,000	$32,601,385	$142,841,385
Gen. Deliverability	11	b2169				
Gen. Deliverability	12	WP-S-140	Penelec	$ 4,885,525	$ 1,444,800	$ 6,330,325
Gen. Deliverability	13	WP-S-140	Penelec	$ 4,885,525	$ 1,444,800	$ 6,330,325
			Sub Total:	$ 235,861,450	$69,752,909	$305,614,359
Contributions to Previous	1	Removed				
Contributions to Previous	2	PN-T-187	Penelec	$ 3,808,000	$ 1,125,300	$ 4,933,300
Contributions to Previous	3	Removed				
Contributions to Previous	4	Removed				
Contributions to Previous	5	PN-S-650	Penelec	$ 145,800	$ 43,100	$ 188,900
Contributions to Previous	6	PN-S-650	Penelec	Incl'd. above		
Contributions to Previous	7	See Note 1	MetEd	$ 717,300	$ 212,128	$ 929,428
Contributions to Previous	8	WP-S-140	Penelec	$ 4,885,525	$ 1,444,800	$ 6,330,325
Contributions to Previous	9	WP-S-140	Penelec	$ 4,885,525	$ 1,444,800	$ 6,330,325
			Total	**$ 250,303,600**	**$74,023,036**	**$324,326,636**
Note 1: There is an operating procedure that may prevent an overload but PJM was unable to test and verify that. The reinforcement priced here is 115kV Circuit Breaker rated for 3000 Amps.						

Interconnected Transmission Owner's Analysis Results

The following was generated by FirstEnergy (Pennsylvania Electric Company or "Penelec") the Interconnected Transmission Owner, based upon its analysis, as well as that of PJM, for mitigation of the project's impacts on the transmission and lower voltage system as applicable. It includes the costs and schedules for any system upgrades.
Costs for affected Transmission owners other than FirstEnergy are included and reported in the "New System Reinforcements" and "Contribution to Previously Identified System Reinforcements" sections of the "PJM Interconnection Study Results" above.

Primary Point of Interconnection: Rhodes Lane 500 kV Substation

The Primary POI for the Project will be accomplished by building a new 500 kV terminal at Rhodes Lane by adding a 4th breaker and providing a 500 kV meter package. Interconnection Customer will be responsible for acquiring all easements, properties and permits that may be required to construct both the new 500kV line and the associated attachment facilities. A summary of the Project direct connection facilities that will be required for the Primary POI and their estimated costs are shown on Attachment 3. The one-line for the Primary POI is shown in Attachment 2.

Power Flow Analysis

A Power Flow study was conducted to determine the reliability impact of the proposed Project on the FE Transmission System. This included the performance of a contingency analysis to identify any facility overload or voltage condition that violates the FE Planning Criteria. Any such violation that is either directly attributable to this project or for which it will have a shared responsibility is included in this report with a least cost plan identified to mitigate them.

The Power Flow Analysis was performed using a 2016 summer peak load base case provided by the PJM staff. This base case included a detailed representation of the West Penn system. A simulation of all Single and Common Structure contingencies within the NERC and FE Planning Standards that are impacted by the Project was conducted to test for criteria compliance. The direct connection of the Rhodes Lane 500 kV (Y2-080) Project to the West Penn transmission system was studied at the Primary POI.

Short Circuit and Dynamics Analysis

A short circuit analysis has been performed by PJM and the findings were confirmed by FE. The findings show that two Yukon 138 kV circuit breakers are newly over-dutied with the addition of the Project. The following Yukon 138 kV Breakers has been identified as over-dutied:

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With y2-080_APS	Duty Percent Without y2-080_APS	Duty Percent Difference	Note
20858	YUKON 138.kV	Y-18(CHARL2)	S	117.70%	112.60%	5.10%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-19(CHARL2)	S	115.00%	110.00%	5.00%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-13(BETHEL)	S	109.70%	104.90%	4.80%	Over 100%, > 3% contribution
20858	YUKON 138.kV	CAP	S	108.30%	103.60%	4.70%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-1(YOUNGWD)	S	107.00%	102.40%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y3(LYN-YNGD)	S	107.00%	102.40%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-6(HEMPFLD)	S	106.90%	102.30%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y7(HTDN-HMF)	S	106.90%	102.30%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-5(LAYTON)	S	106.00%	101.40%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y2(1B-BETHE)	S	105.90%	101.30%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-8(HUNTING)	S	105.70%	101.00%	4.70%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-11(CHARL1)	S	105.30%	100.70%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y10(CHRL-SP)	S	105.30%	100.70%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y-9(SPRINGD)	S	104.90%	100.30%	4.60%	Over 100%, > 3% contribution
20858	YUKON 138.kV	Y21(SHEPJ)	S	103.70%	99.10%	4.60%	New Over-duty
20858	YUKON 138.kV	Y22(SHEPHJT)	S	103.70%	99.10%	4.60%	New Over-duty

Yukon 138 kV fault Current

Three Phase: 66,377 Amps
Line to Ground: 51,057 Amps

System Protection Analysis

A System Protection Analysis will be performed during the System Impact Study.

Metering

Interconnection Customer will be required to comply with all PJM and all FE revenue metering requirements for generation interconnection customers. The FE requirements are detailed on Attachment 7 of this report.

Compliance Issues

Interconnection Customer will be responsible for meeting all FE criteria as defined in the FE Requirements for Transmission Connected Facilities document:

www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

While the voltage analysis is not performed for the feasibility study, any voltage criteria violations that would require the plant to provide reactive power, that determination of reactive power requirements will be determined in the system impact study, which will include the low voltage ride through analysis.

Interconnection Customer must also meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures required for standards compliance. For example, the

Interconnection Customer will need to properly locate and report the over and under-voltage and over and under-frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

FE Facility Upgrades and Costs

Results from the Power Flow Analysis (Attachment 9) show that there are FE Transmission Planning Criteria violations directly attributable to the capacity of the Project. Therefore in accordance with the RTEP procedures defined in the PJM Open Access Transmission Tariff and PJM Manuals, Interconnection Customer is responsible for network upgrades (see Attachments 5 and 6.)

The Project contributes and/causes overloads (loading exceeding 100%) of the following facilities:

West Penn Power:

- Yukon 500/138 kV autotransformers 1, 2, 3 and 4
- Yukon–Smithton 138 kV line **(Existing Baseline RTEP Project)**
- Shepler Hill Jct–Smithton 138 kV line **(Existing Baseline RTEP Project)**
- Replace Yukon 138 kV breakers Y21 & Y22

The existing RTEP projects noted above (b2169 and b2170) have planned in-service dates of 6/01/2015. As such, the RTEP projects will be in-service before Y2-080 and therefore Interconnection Customer will not be responsible for the cost of those upgrades.

Penelec:

- South Bend-Keystone 500 kV (Keystone terminal)
- Garrett 138/115 kV Transformer
- Reconductor 7.1 Q34 – Somerset 115 kV Line

Attachment 9 includes overloads for the Y1-033 Tap-Rockwood 115 kV, Q34-Somerset 115 kV and Roxbury 138/115 kV autotransformer. For the two 115 kV lines, the emergency ratings should be 174 MVA and 179 MVA respectively. With ratings updated, these facilities are not overloaded. For the Roxbury 138/115 kV autotransformer, there is an existing operating procedure documented in PJM Manual 3 to open the transformer pre-contingency if contingency analysis indicates the transformer is overloaded. In this case, the transformer should be opened to mitigate the violation.

External to FE:

- Jacks Mt.-Juniata 500 kV (cost provided by PJM and/or PPL)

Note that all cost estimates contained in this document were produced without a detailed engineering review and are therefore subject to revision. More accurate estimates will be determined as a part of the System Impact Study. Interconnection Customer will be responsible for the actual cost of the direct connection that is implemented. FE herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission system.

Interconnection Customer Requirements

In addition to the FE facilities, Interconnection Customer will also be responsible for meeting all criteria as specified in the applicable sections of the "FE Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of a fully rated circuit breaker on the high side of the Y2-080 step-up transformer.

2. The purchase and installation of a lockable load-break switch at the point of interconnection. This switch must be accessible by First Energy.

3. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

4. The purchase and installation of a 500kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.

5. The purchase and installation of a revenue class meter for each unit to measure the power delivered in compliance with the FE standards.

6. The purchase and installation of supervisory control and data acquisition (SCADA) equipment to provide information in a compatible format to the FE Transmission System Control Center. The RTU, the communications channel and all related equipment will be furnished and maintained by Interconnection Customer. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.

7. The establishment of dedicated communication circuits for SCADA report to the FE Transmission System Control Center.

8. A compliance with the FE and PJM generator power factor and voltage control requirements.

9. The execution of a back-up service agreement to serve the customer load supplied from the Y2-080 500kV interconnection substation when the units are out-of-

service. This assumes the intent of Interconnection Customer is to net the generation with the load.

10. The rough grade of the property for the Y2-080 500kV interconnection substation and an access road for the delivery of equipment to this site.

The above requirements are in addition to any metering required by PJM.

FirstEnergy Report Summary

The Project direct connection will require the facility upgrades defined in Attachment 3. As shown, the total estimated cost of the direct connection facilities is $4,255,700. This cost includes a CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge of $972,000. This tax may or may not be charged based on whether or not this project meets the eligibility requirements of IRS Notice 88-129. The Project does require network upgrades as defined in Attachment 5. As shown, the total estimated cost for the required FirstEnergy network upgrades is $37,917,700. This cost includes a CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge of $8,653,100. This tax may or may not be charged based on whether or not this project meets the eligibility requirements of IRS Notice 88-129.

Based on the scope of the direct connection, it is expected to take a minimum of thirty six months (36) or 3 years from the signing of an Interconnection Service Agreement/Construction Service Agreement to complete the installation required for the Project. This includes a preliminary payment that compensates FE for the first three months of the engineering design work that is related to the construction of the Y2-080 500kV interconnection substation. It also assumes that the Interconnection Customer will provide the property for the Y2-080 500kV interconnection substation and all right-of-way, permits, easements, etc. that will be needed. A further assumption is that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that PJM will allow all transmission system outages when requested.

Attachment 1
Rhodes Lane 500kV (Y2-080) Project
Project Location

Attachment 2
Rhodes Lane 500kV (Y2-080) Project
Primary POI Interconnection Substation Configuration

Attachment 3
Rhodes Lane 500kV (Y2-080) Project
Direct Connection Requirements

Estimate No.	Description	Total with Tax	Tax	Total Cost
WP-S-132	Feasibility study estimate. Install fourth 500kV breaker in existing Rhodes Lane 500kV switching station ring bus for an additional generation interconnection of 1065 MW for PJM Queue Y2-080 project. Install 1-3000A, 500kV breaker, 1-500kV DE structure, 3-3000A, 500kV motor operated switches, 3-500kV CVT's, 3-500kV arresters, grounding, control panels and cables, and associated equipment. Assume PJM Queue T174 project is in service. Developer to install fiber between Y2-080 and Rhodes Lane SS, and install 500kV metering in their generating SS. @ Rhodes Lane	4,086,300	933,300	3,153,000
EOC	Engineering oversight and commissioning	169,400	38,700	130,700
	Totals	**4,255,700**	**972,000**	**3,283,700**

Attachment 4
Contingency Analysis

Refer to the PJM Study Results

Attachment 5
Rhodes Lane 500kV (Y2-080) Project
FE Network Facility Reinforcement Conceptual Costs Estimates

Estimate No.	Description	Total with Tax	Tax	Total Cost
WP-S-140	Replace the No. 1, 2, 3 &$ 500-138kV transformer with 333/448/560 MVA units @ Yukon	25,321,300	5,779,200	19,542,100
WP-S-135	Upgrade 2-138 kV breaker to 80KA, upgrade associated switches, structures, foundations, replace control cables @Yukon	1,751,900	400,200	1,351,700
PN-S-650	Upgrade 500 kV wave trap to 4000A and replace WHM meter on South Bend (5001) line. @ Keystone	188,900	43,100	145,800
PN-S-658	Replace existing 138/115kV 130MVA No. 2 Transformer with a 138/115kV 350MVA Transformer. Replace 138kV Breaker and 2 138kV switches. @ Garrett	5,722,300	1,305,300	4,417,000
PN-T-187	Reconductor the 7.1 mile Q34-Somerset 115 kV Line with 336 kcmil ACSS	4,933,300	1,125,300	3,808,000
	Total	**$37,917,700**	**$8,653,100**	**$29,264,600**

Attachment 6
Rhodes Lane 500kV (Y2-080) Project
FE Network Facility Reinforcement Conceptual One Line Diagrams

South Bend-Keystone 500 kV Line – Replace Trap and Meter

Q34-Somerset Reconductor

Attachment 7
FE Revenue Metering Requirements

The FirstEnergy Revenue Metering Requirements may be found in the FirstEnergy Requirements for Transmission Connected Facilities document located at the following links:

www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

Appendices for the PJM Analysis Results

Appendix 1

Bus Number	Bus Name	Full Contribution
254009	15ELRMA3	-10.95
254010	15ELRMA4	-17.66
315251	1MT STM1	1.29
315252	1MT STM2	1.29
235567	ARMSTRONG 1	-24.96
235569	ARMSTRONG 2	-24.82
235850	BROWNS RUN	184.99
235583	FT MARTIN 1	2.77
235584	FT MARTIN 2	2.79
235585	HARRISON 1	1.95
235586	HARRISON 2	1.95
235587	HARRISON 3	1.93
235580	HATFIELD 1	4.23
235581	HATFIELD 2	4.23
235582	HATFIELD 3	4.23
209027	LOR2_Q27 E	-8.48
235851	N LONGVIEW	2.88
295731	Q-079 1	.48
235755	RONCO 1	1.25
235756	RONCO 2	1.25
235757	RONCO 3	2.27
200715	SHAWVL 1	-14.66
200722	SHAWVL 2	-15.03
200665	SHAWVL 3	-20.54
292626	T-174 1	106.75
292627	T-174 2	106.75
292628	T-174 3	106.75
292629	T-174 4	216.38
LTF	V3-012	37.5
209019	VIKI IPP	-1.78
LTF	X2-042	35.73
LTF	X3-021	22.31
LTF	X3-096	25.86
LTF	X3-097	36.68
LTF	X3-098	34.76
LTF	X4-041	34.35
LTF	Y1-002	32.43
LTF	Y1-004	45.51

LTF	Y1-007	31.6
913251	Y1-034 OP1	.64
LTF	Y2-007	34.88
LTF	Y2-008	35.09
LTF	Y2-033	23.77
LTF	Y2-034	24.57
LTF	Y2-040	22.31
LTF	Y2-056	26.91
LTF	Y2-068	184.03
914291	Y2-080	614.51

Appendix 2

Bus Number	Bus Name	Full Contribution
238995	02NCUNTD	.65
239006	02NILEG1	10.99
239007	02NILEG2	10.89
239022	02NWCAG3	10.32
239023	02NWCAG4	10.04
239024	02NWCAG5	15.49
254007	15ELRMA1	9.98
254008	15ELRMA2	10.19
254009	15ELRMA3	11.46
254010	15ELRMA4	18.47
235134	ALL L&D 6	.02
235567	ARMSTRONG 1	17.57
235569	ARMSTRONG 2	17.47
298466	B-018	.05
217006	BERGN26A	-4.1
219103	BURLNGT8	-3.74
219124	BURLNGT9	-32.79
228000	CEDR#1CT	-8.32
228001	CEDR#2CT	-4.01
202158	CON.GEN1	.01
202160	CON.GEN2	.01
200030	CONE G1	2.74
200031	CONE G2	2.78
228301	D/W 1 ST	-13.69
228302	D/W 6 ST	-14.04
231904	DC1 NUG	-4.65
231905	DC2 NUG	-4.65
217078	ESSEX 12	-35.89
298464	G-030	.4
99210	G07_NEW	20.08
231903	GEN4	-13.21
206331	GG A1&2	-7.84
206332	GG A3&4	-7.84
206333	GG B5&6	-7.84
206334	GG B7&8	-7.84
292320	K-020	.01
200032	KEYS G1	3.8
200033	KEYS G2	3.75
209027	LOR2_Q27 E	-18.04
292880	M-026	28.27
219134	MERCER 3	-20.69

227807	MO AV B	-3.55
219137	NAT PARK	-3.71
94130	O66_NONFIRM	68.86
204652	PORT1GEN	-31.57
204653	PORT2GEN	-48.65
884780	S-058 C	52.89
884781	S-058 E	174.37
213941	SCHYLABC	-.4
213945	SCHYLKL1	-28.99
218360	SEWAREN1	-20.07
218361	SEWAREN2	-22.75
218362	SEWAREN3	-20.63
218363	SEWAREN4	-23.88
218364	SEWAREN6	-21.36
235619	SOUTH BEND 1	.68
235620	SOUTH BEND 2	.68
235621	SOUTH BEND 3	.68
235622	SOUTH BEND 4	.68
235610	SPRINGDALE 1	.13
235611	SPRINGDALE 2	.13
235612	SPRINGDALE 3	.5
235613	SPRINGDALE 4	.5
235614	SPRINGDALE 5	.53
292339	T-109	.09
292344	T-110	.09
292548	T-155	.02
292552	T-156	2.08
292626	T-174 1	23.55
292627	T-174 2	23.55
292628	T-174 3	23.55
292629	T-174 4	47.73
885600	T20SOLAR E	-.39
204656	TITUS 1G	-14.11
204657	TITUS 2G	-14.11
204658	TITUS 3G	-14.11
292078	V1-034	.59
LTF	V3-012	53.94
209019	VIKI IPP	-3.84
228700	VNLD 10	-4.03
901381	W1-107 C	.
902161	W2-010	.06
902171	W2-011	.06
902211	W2-019 C	-.42

905031	W4-001A_AT9	.34
905051	W4-004A_AT10	2.04
905211	W4-025 C	-.48
905291	W4-038 OP1	-4.68
907241	X1-068	-1.91
907991	X1-078	100.03
907381	X1-094 C	-1.26
LTF	X2-042	58.85
910531	X3-004	-6.83
LTF	X3-021	62.53
900404	X3-028 C	260.58
910931	X3-085 C	-.59
LTF	X3-096	38.91
LTF	X3-097	55.18
LTF	X3-098	52.3
912091	X4-012 C OP1	-.45
912101	X4-015 C	-.35
LTF	X4-041	51.67
912241	X4-042	.3
LTF	Y1-002	53.5
LTF	Y1-004	64.11
LTF	Y1-007	44.52
913091	Y1-015 C	90.37
913191	Y1-027 C OP1	.
913461	Y1-070 OP1	85.69
LTF	Y2-004	26.22
LTF	Y2-005	26.22
LTF	Y2-006	26.79
LTF	Y2-007	52.45
LTF	Y2-008	53.44
LTF	Y2-033	30.77
LTF	Y2-034	26.01
LTF	Y2-040	62.53
LTF	Y2-049	51.35
LTF	Y2-056	42.9
LTF	Y2-068	276.87
914291	Y2-080	135.56

Appendix 3

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.4
235565	ALBRIGHT 2	4.4
235566	ALBRIGHT 3	8.26
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
200835	DSGENWIN	.24
292350	K-023	.1
292400	K-028 C1	.03
200856	L-013 C	.13
293901	O-048 C	.12
293431	R-040 C	.01
290228	S-014 C	.03
884780	S-058 C	2.63
884781	S-058 E	8.68
885641	T-016 C	.35
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.2
236001	WARRIOR RUN	.33
LTF	X2-042	3.02
LTF	X3-021	1.59
900404	X3-028 C	14.21
LTF	X3-096	2.13
LTF	X3-097	3.02
LTF	X3-098	2.87
LTF	X4-041	2.83
LTF	Y1-002	2.64
913001	Y1-003 C OP1	2.63
LTF	Y1-004	3.89
LTF	Y1-007	2.7
913101	Y1-016 C OP1	.33
913241	Y1-033 C OP1	3.79
LTF	Y2-004	1.44
LTF	Y2-005	1.44
LTF	Y2-006	1.45
LTF	Y2-007	2.87
LTF	Y2-008	2.9
LTF	Y2-033	1.99
LTF	Y2-034	2.09
LTF	Y2-035	1.12
LTF	Y2-036	1.12

LTF	Y2-040	1.59
LTF	Y2-049	1.31
LTF	Y2-056	2.2
LTF	Y2-068	15.17
914291	Y2-080	9.1
200813	YOUGH	.07

Appendix 4

Bus Number	Bus Name	Full Contribution
254007	15ELRMA1	-8.19
254008	15ELRMA2	-8.36
254009	15ELRMA3	-10.88
254010	15ELRMA4	-17.54
235850	BROWNS RUN	16.67
298464	G-030	.14
235619	SOUTH BEND 1	.24
235620	SOUTH BEND 2	.24
235621	SOUTH BEND 3	.24
235622	SOUTH BEND 4	.24
292626	T-174 1	11.38
292627	T-174 2	11.38
292628	T-174 3	11.38
292629	T-174 4	23.07
914291	Y2-080	65.52

Appendix 5

Bus Number	Bus Name	Full Contribution
238545	02ASHTG5	26.77
238554	02AVONG7	11.54
238555	02AVONG9	77.2
238565	02BAYSG2	15.16
238566	02BAYSG3	15.59
238567	02BAYSG4	23.61
238995	02NCUNTD	.93
239006	02NILEG1	15.44
239007	02NILEG2	15.3
239022	02NWCAG3	14.83
239023	02NWCAG4	14.36
239024	02NWCAG5	22.2
243654	05CVG3	18.35
243045	05MUSKNG	44.56
254007	15ELRMA1	14.2
254008	15ELRMA2	14.5
254009	15ELRMA3	16.36
254010	15ELRMA4	26.36
235564	ALBRIGHT 1	5.57
235565	ALBRIGHT 2	5.57
235566	ALBRIGHT 3	10.46
298466	B-018	.06
217006	BERGN26A	-4.42
235850	BROWNS RUN	72.82
219103	BURLNGT8	-4.32
219124	BURLNGT9	-37.87
228000	CEDR#1CT	-9.46
228001	CEDR#2CT	-4.56
228301	D/W 1 ST	-16.
228302	D/W 6 ST	-16.41
231904	DC1 NUG	-5.73
231905	DC2 NUG	-5.73
217078	ESSEX 12	-38.72
298464	G-030	.65
99210	G07_NEW	22.02
231903	GEN4	-16.29
206331	GG A1&2	-8.42
206332	GG A3&4	-8.42
206333	GG B5&6	-8.42
206334	GG B7&8	-8.42
292320	K-020	.01

200032	KEYS G1	6.11
200033	KEYS G2	6.04
209027	LOR2_Q27 E	-17.67
292880	M-026	40.5
219134	MERCER 3	-23.85
235573	MITCHELL 2	.3
235574	MITCHELL 3	1.01
227807	MO AV B	-4.11
219137	NAT PARK	-4.31
94130	O66_NONFIRM	74.27
204652	PORT1GEN	-33.4
204653	PORT2GEN	-51.37
235575	RIVESVILLE 5	4.06
235576	RIVESVILLE 6	9.96
213941	SCHYLABC	-.47
213945	SCHYLKL1	-33.93
218360	SEWAREN1	-21.85
218361	SEWAREN2	-24.78
218362	SEWAREN3	-22.47
218363	SEWAREN4	-26.04
218364	SEWAREN6	-23.29
235619	SOUTH BEND 1	1.09
235620	SOUTH BEND 2	1.09
235621	SOUTH BEND 3	1.1
235622	SOUTH BEND 4	1.09
235610	SPRINGDALE 1	.18
235611	SPRINGDALE 2	.18
235612	SPRINGDALE 3	.68
235613	SPRINGDALE 4	.67
235614	SPRINGDALE 5	.71
292339	T-109	.14
292344	T-110	.14
292552	T-156	2.98
292626	T-174 1	35.77
292627	T-174 2	35.77
292628	T-174 3	35.77
292629	T-174 4	72.51
885600	T20SOLAR E	-.45
204656	TITUS 1G	-16.16
204657	TITUS 2G	-16.16
204658	TITUS 3G	-16.16
247522	U1-059 C	.71
889031	U2-028A_AT1	14.82

247542	U4-001 C	2.96
891141	U4-028 C	1.45
891151	U4-029 C	1.45
292078	V1-034	.63
893001	V2-001 C	1.28
833193	V2-042AC1OP1	2.93
LTF	V3-012	72.88
247548	V4-010 C	2.9
900041	V4-011	.35
247546	V4-015 C	.96
209019	VIKI IPP	-3.68
228700	VNLD 10	-4.71
901161	W1-056 C	.26
901211	W1-070A_AT4	.71
901221	W1-072A_AT5	4.39
901381	W1-107 C	.
902141	W2-001 C	.95
902211	W2-019 C	-.48
903231	W3-005 C	7.19
903511	W3-059A_AT6	1.5
903611	W3-085 C	2.71
903691	W3-111 C	.88
903701	W3-112 C	.88
903711	W3-113 C	.88
903761	W3-128	71.76
905031	W4-001A_AT9	.48
905051	W4-004A_AT10	2.9
905061	W4-004B_AT11	1.82
905211	W4-025 C	-.54
905291	W4-038 OP1	-5.05
235577	WILLOW I 1	6.02
235578	WILLOW I 2	18.62
907041	X1-027A C1	1.88
907044	X1-027A C2	1.88
907046	X1-027A C3	1.88
907048	X1-027A C4	1.88
907211	X1-064A_AT13	17.14
907213	X1-064A_AT13	17.14
907241	X1-068	-2.1
907991	X1-078	110.12
907381	X1-094 C	-1.35
LTF	X2-042	80.16
909201	X2-058 C	2.13

910531	X3-004	-7.36
LTF	X3-020	21.97
LTF	X3-021	83.44
910601	X3-023 C OP1	.88
910931	X3-085 C	-.63
LTF	X3-096	52.84
LTF	X3-097	74.93
LTF	X3-098	71.03
912091	X4-012 C OP1	-.48
912101	X4-015 C	-.39
LTF	X4-041	70.17
912241	X4-042	.42
LTF	Y1-002	72.75
LTF	Y1-004	86.57
LTF	Y1-007	60.12
913091	Y1-015 C	127.86
913111	Y1-018	.55
913121	Y1-019	.55
913191	Y1-027 C OP1	.01
913211	Y1-030 C OP1	1.43
913251	Y1-034 OP1	.75
913261	Y1-035	54.89
913271	Y1-036	54.4
913301	Y1-044	.77
913461	Y1-070 OP1	121.25
913491	Y1-074 C OP1	.38
LTF	Y2-004	35.61
LTF	Y2-005	35.61
LTF	Y2-006	36.49
LTF	Y2-007	71.22
LTF	Y2-008	72.76
LTF	Y2-033	41.5
LTF	Y2-034	34.37
LTF	Y2-040	83.44
LTF	Y2-049	68.52
LTF	Y2-056	58.28
LTF	Y2-068	376.01
914291	Y2-080	205.94

Appendix 6

Bus Number	Bus Name	Full Contribution
238554	02AVONG7	11.47
238555	02AVONG9	76.83
238995	02NCUNTD	.94
239006	02NILEG1	15.55
239007	02NILEG2	15.41
239022	02NWCAG3	15.
239023	02NWCAG4	14.51
239024	02NWCAG5	22.45
243654	05CVG3	18.5
243045	05MUSKNG	45.02
254007	15ELRMA1	14.37
254008	15ELRMA2	14.67
254009	15ELRMA3	16.56
254010	15ELRMA4	26.68
217006	BERGN26A	-4.44
235850	BROWNS RUN	74.57
219103	BURLNGT8	-4.34
219124	BURLNGT9	-38.01
228000	CEDR#1CT	-9.5
228001	CEDR#2CT	-4.57
228301	D/W 1 ST	-16.05
228302	D/W 6 ST	-16.46
231904	DC1 NUG	-5.75
231905	DC2 NUG	-5.75
217078	ESSEX 12	-38.92
206617	EXXON	-1.48
298464	G-030	.67
99210	G07_NEW	22.12
231903	GEN4	-16.33
206331	GG A1&2	-8.46
206332	GG A3&4	-8.46
206333	GG B5&6	-8.46
206334	GG B7&8	-8.46
208453	HONY	-.31
200032	KEYS G1	6.33
200033	KEYS G2	6.25
209027	LOR2_Q27 E	-17.79
206679	M&M S721	-2.18
292880	M-026	41.04
210888	MACRTR10	-1.07
219134	MERCER 3	-23.94

227807	MO AV B	-4.13
214194	N WALES4	-.42
293231	N-032 E	5.45
219137	NAT PARK	-4.33
94130	O66_NONFIRM	74.67
206638	PEAPACK	-.85
204652	PORT1GEN	-33.6
204653	PORT2GEN	-51.67
290092	Q-041 E	-6.35
235575	RIVESVILLE 5	4.12
235576	RIVESVILLE 6	10.12
244996	ROSEVALL	.08
213941	SCHYLABC	-.47
213945	SCHYLKL1	-34.04
218360	SEWAREN1	-21.96
218361	SEWAREN2	-24.91
218362	SEWAREN3	-22.58
218363	SEWAREN4	-26.17
218364	SEWAREN6	-23.4
208769	SISO	-.42
245417	SOMRSET8	.72
235619	SOUTH BEND 1	1.13
235620	SOUTH BEND 2	1.13
235621	SOUTH BEND 3	1.14
235622	SOUTH BEND 4	1.13
245347	STON CNT	1.18
292339	T-109	.15
292344	T-110	.15
292552	T-156	3.02
292626	T-174 1	36.72
292627	T-174 2	36.72
292628	T-174 3	36.72
292629	T-174 4	74.43
885600	T20SOLAR E	-.45
204656	TITUS 1G	-16.24
204657	TITUS 2G	-16.24
204658	TITUS 3G	-16.24
299984	U3-029 E	1.58
299989	U3-030 E	.72
247542	U4-001 C	2.97
247918	U4-001 E	19.89
891141	U4-028 C	1.45
891142	U4-028 E	9.71

891151	U4-029 C	1.45
891152	U4-029 E	9.71
292063	V1-021 E	-.06
292078	V1-034	.63
893001	V2-001 C	1.29
893002	V2-001 E	9.17
833193	V2-042AC1OP1	2.95
833194	V2-042AE1OP1	19.71
LTF	V3-012	73.57
247548	V4-010 C	2.9
247932	V4-010 E	19.4
904512	V4-052 E	-.8
209019	VIKI IPP	-3.71
228700	VNLD 10	-4.73
901382	W1-107 E	.21
901602	W1-111 E	4.35
902211	W2-019 C	-.48
903511	W3-059A_AT6	1.5
903512	W3-059A_AT6	10.01
903611	W3-085 C	2.72
903612	W3-085 E	18.23
903691	W3-111 C	.89
903692	W3-111 E	1.45
903701	W3-112 C	.89
903702	W3-112 E	1.45
903711	W3-113 C	.89
903712	W3-113 E	1.45
903761	W3-128	49.5
905031	W4-001A_AT9	.49
905051	W4-004A_AT10	2.92
905211	W4-025 C	-.54
905291	W4-038 OP1	-5.08
905482	W4-085 E	.41
235577	WILLOW I 1	6.1
235578	WILLOW I 2	18.87
907041	X1-027A C1	1.88
907044	X1-027A C2	1.88
907046	X1-027A C3	1.88
907048	X1-027A C4	1.88
907042	X1-027A E1	12.56
907045	X1-027A E2	12.56
907047	X1-027A E3	12.56
907049	X1-027A E4	12.56

907211	X1-064A_AT13	17.14
907213	X1-064A_AT13	17.14
907241	X1-068	-2.11
907991	X1-078	110.62
907381	X1-094 C	-1.36
909032	X2-013 E	.41
LTF	X2-042	80.76
909292	X2-085 E	1.11
910531	X3-004	-7.4
LTF	X3-020	22.14
LTF	X3-021	83.05
910601	X3-023 C OP1	.88
910602	X3-023 E OP1	5.91
910612	X3-029 E	-2.37
910762	X3-052 E	-.63
910902	X3-081 E	-.1
910931	X3-085 C	-.64
LTF	X3-096	53.26
LTF	X3-097	75.52
LTF	X3-098	71.59
912032	X4-004 E	-1.03
912091	X4-012 C OP1	-.48
912101	X4-015 C	-.4
LTF	X4-041	70.73
912241	X4-042	.43
912271	X4-045 E	.1
LTF	Y1-002	73.19
LTF	Y1-004	87.42
LTF	Y1-007	60.71
913091	Y1-015 C	128.96
913092	Y1-015 E	19.27
913111	Y1-018	.56
913121	Y1-019	.56
913251	Y1-034 OP1	.76
913261	Y1-035	53.87
913271	Y1-036	53.25
913301	Y1-044	.78
913362	Y1-057 E	.41
913461	Y1-070 OP1	122.29
913491	Y1-074 C OP1	.38
913492	Y1-074 E OP1	.62
LTF	Y2-004	35.89
LTF	Y2-005	35.89

LTF	Y2-006	36.78
LTF	Y2-007	71.78
LTF	Y2-008	73.34
LTF	Y2-033	41.94
LTF	Y2-034	34.87
LTF	Y2-040	83.05
LTF	Y2-049	68.2
LTF	Y2-056	58.68
LTF	Y2-068	378.97
914291	Y2-080	211.39

Appendix 7

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.42
235565	ALBRIGHT 2	4.42
235566	ALBRIGHT 3	8.29
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
292400	K-028 C1	.03
290228	S-014 C	.03
884780	S-058 C	2.79
884781	S-058 E	9.21
885641	T-016 C	.35
292626	T-174 1	1.62
292627	T-174 2	1.62
292628	T-174 3	1.62
292629	T-174 4	3.29
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.38
236001	WARRIOR RUN	.33
LTF	X2-042	3.2
LTF	X3-020	.94
LTF	X3-021	1.78
900404	X3-028 C	15.02
LTF	X3-096	2.25
LTF	X3-097	3.2
LTF	X3-098	3.03
LTF	X4-041	2.99
LTF	Y1-002	2.8
LTF	Y1-004	4.11
LTF	Y1-007	2.85
913101	Y1-016 C OP1	.34
LTF	Y2-004	1.52
LTF	Y2-005	1.52
LTF	Y2-006	1.53
LTF	Y2-007	3.04
LTF	Y2-008	3.06
LTF	Y2-033	2.1
LTF	Y2-034	2.2
LTF	Y2-035	1.18
LTF	Y2-036	1.18
LTF	Y2-040	1.78
LTF	Y2-049	1.46

LTF	Y2-056	2.33
LTF	Y2-068	16.04
914291	Y2-080	9.34

Appendix 8

Bus Number	Bus Name	Full Contribution
238554	02AVONG7	9.87
238555	02AVONG9	65.95
238995	02NCUNTD	.78
239006	02NILEG1	12.97
239007	02NILEG2	12.85
239022	02NWCAG3	12.35
239023	02NWCAG4	11.98
239024	02NWCAG5	18.51
254007	15ELRMA1	11.87
254008	15ELRMA2	12.12
254009	15ELRMA3	13.66
254010	15ELRMA4	22.01
217006	BERGN26A	-4.14
235850	BROWNS RUN	60.24
219103	BURLNGT8	-3.93
219124	BURLNGT9	-34.44
228000	CEDR#1CT	-8.66
228001	CEDR#2CT	-4.17
228301	D/W 1 ST	-14.48
228302	D/W 6 ST	-14.85
231904	DC1 NUG	-5.07
231905	DC2 NUG	-5.07
217078	ESSEX 12	-36.28
206617	EXXON	-1.38
298464	G-030	.52
99210	G07_NEW	20.48
231903	GEN4	-14.41
206331	GG A1&2	-7.9
206332	GG A3&4	-7.9
206333	GG B5&6	-7.9
206334	GG B7&8	-7.9
208453	HONY	-.28
200032	KEYS G1	4.88
200033	KEYS G2	4.83
209027	LOR2_Q27 E	-17.3
206679	M&M S721	-2.04
292880	M-026	33.77
210888	MACRTR10	-1.01
219134	MERCER 3	-21.71
227807	MO AV B	-3.73
214194	N WALES4	-.38

293231	N-032 E	4.59
219137	NAT PARK	-3.91
94130	O66_NONFIRM	69.59
206638	PEAPACK	-.79
204652	PORT1GEN	-31.57
204653	PORT2GEN	-48.59
290092	Q-041 E	-5.93
244996	ROSEVALL	.07
884780	S-058 C	61.17
884781	S-058 E	201.7
213941	SCHYLABC	-.43
213945	SCHYLKL1	-30.68
218360	SEWAREN1	-20.39
218361	SEWAREN2	-23.12
218362	SEWAREN3	-20.96
218363	SEWAREN4	-24.28
218364	SEWAREN6	-21.72
208769	SISO	-.35
235619	SOUTH BEND 1	.87
235620	SOUTH BEND 2	.87
235621	SOUTH BEND 3	.88
235622	SOUTH BEND 4	.87
292339	T-109	.11
292344	T-110	.11
292552	T-156	2.48
292626	T-174 1	29.19
292627	T-174 2	29.19
292628	T-174 3	29.19
292629	T-174 4	59.17
885600	T20SOLAR E	-.41
204656	TITUS 1G	-14.75
204657	TITUS 2G	-14.75
204658	TITUS 3G	-14.75
299984	U3-029 E	1.31
299989	U3-030 E	.6
292063	V1-021 E	-.06
292078	V1-034	.59
LTF	V3-012	62.15
904512	V4-052 E	-.73
209019	VIKI IPP	-3.64
228700	VNLD 10	-4.26
901382	W1-107 E	.18
901602	W1-111 E	4.19

902211	W2-019 C	-.44
905031	W4-001A_AT9	.4
905051	W4-004A_AT10	2.42
905211	W4-025 C	-.49
905291	W4-038 OP1	-4.73
905482	W4-085 E	.37
907211	X1-064A_AT13	14.54
907213	X1-064A_AT13	14.54
907241	X1-068	-1.95
907991	X1-078	102.25
907381	X1-094 C	-1.27
909032	X2-013 E	.37
LTF	X2-042	68.14
909292	X2-085 E	.94
910531	X3-004	-6.9
LTF	X3-021	71.51
910612	X3-029 E	-2.22
910762	X3-052 E	-.59
910902	X3-081 E	-.09
910931	X3-085 C	-.59
LTF	X3-096	44.98
LTF	X3-097	63.78
LTF	X3-098	60.45
912032	X4-004 E	-.93
912091	X4-012 C OP1	-.45
912101	X4-015 C	-.36
LTF	X4-041	59.72
912241	X4-042	.36
912271	X4-045 E	.09
LTF	Y1-002	61.89
LTF	Y1-004	73.85
LTF	Y1-007	51.28
913091	Y1-015 C	107.12
913092	Y1-015 E	16.01
913261	Y1-035	47.58
913271	Y1-036	47.29
913362	Y1-057 E	.37
913461	Y1-070 OP1	101.58
913491	Y1-074 C OP1	.32
913492	Y1-074 E OP1	.53
LTF	Y2-004	30.31
LTF	Y2-005	30.31
LTF	Y2-006	31.02

LTF	Y2-007	60.62
LTF	Y2-008	61.87
LTF	Y2-033	35.41
LTF	Y2-034	29.57
LTF	Y2-040	71.51
LTF	Y2-049	58.72
LTF	Y2-056	49.6
LTF	Y2-068	320.02
914291	Y2-080	168.04

Appendix 9

Bus Number	Bus Name	Full Contribution
238995	02NCUNTD	.66
239006	02NILEG1	11.06
239007	02NILEG2	10.96
239022	02NWCAG3	10.36
239023	02NWCAG4	10.08
239024	02NWCAG5	15.55
254007	15ELRMA1	10.02
254008	15ELRMA2	10.23
254009	15ELRMA3	11.51
254010	15ELRMA4	18.55
235134	ALL L&D 6	.02
235567	ARMSTRONG 1	18.29
235569	ARMSTRONG 2	18.19
298466	B-018	.05
217006	BERGN26A	-4.23
219103	BURLNGT8	-3.84
219124	BURLNGT9	-33.66
228000	CEDR#1CT	-8.55
228001	CEDR#2CT	-4.12
202158	CON.GEN1	.01
202160	CON.GEN2	.01
200030	CONE G1	3.91
200031	CONE G2	3.96
228301	D/W 1 ST	-14.04
228302	D/W 6 ST	-14.4
231904	DC1 NUG	-4.74
231905	DC2 NUG	-4.74
217078	ESSEX 12	-37.07
298464	G-030	.4
99210	G07_NEW	20.71
231903	GEN4	-13.48
206331	GG A1&2	-8.1
206332	GG A3&4	-8.1
206333	GG B5&6	-8.1
206334	GG B7&8	-8.1
200837	HOMER C1	1.75
200636	IUP CO-G	.04
200864	K-013	.02
292320	K-020	.01
200032	KEYS G1	3.75
200033	KEYS G2	3.71

209027	LOR2_Q27 E	-18.78
292880	M-026	28.37
219134	MERCER 3	-21.24
227807	MO AV B	-3.64
219137	NAT PARK	-3.81
94130	O66_NONFIRM	71.12
204652	PORT1GEN	-32.66
204653	PORT2GEN	-50.34
290081	Q-034 C	2.06
200846	RINGGOLD	1.51
884780	S-058 C	53.4
884781	S-058 E	176.05
213941	SCHYLABC	-.41
213945	SCHYLKL1	-29.73
218360	SEWAREN1	-20.71
218361	SEWAREN2	-23.47
218362	SEWAREN3	-21.29
218363	SEWAREN4	-24.65
218364	SEWAREN6	-22.04
200833	SEWRDB34	1.65
200809	SITHE	.1
235619	SOUTH BEND 1	.67
235620	SOUTH BEND 2	.67
235621	SOUTH BEND 3	.68
235622	SOUTH BEND 4	.67
235610	SPRINGDALE 1	.13
235611	SPRINGDALE 2	.13
235612	SPRINGDALE 3	.51
235613	SPRINGDALE 4	.5
235614	SPRINGDALE 5	.53
292339	T-109	.09
292344	T-110	.09
292548	T-155	.02
292552	T-156	2.09
292626	T-174 1	23.47
292627	T-174 2	23.47
292628	T-174 3	23.47
292629	T-174 4	47.57
885600	T20SOLAR E	-.4
204656	TITUS 1G	-14.49
204657	TITUS 2G	-14.49
204658	TITUS 3G	-14.49
292078	V1-034	.6

LTF	V3-012	54.5
209019	VIKI IPP	-4.
228700	VNLD 10	-4.13
901381	W1-107 C	.
902161	W2-010	.09
902171	W2-011	.09
902211	W2-019 C	-.43
905031	W4-001A_AT9	.34
905051	W4-004A_AT10	2.04
905211	W4-025 C	-.49
905291	W4-038 OP1	-4.84
907241	X1-068	-1.97
907991	X1-078	103.13
907381	X1-094 C	-1.3
909111	X2-031 C	.67
LTF	X2-042	59.41
910531	X3-004	-7.05
LTF	X3-021	63.27
900404	X3-028 C	263.1
910931	X3-085 C	-.61
LTF	X3-096	39.3
LTF	X3-097	55.72
LTF	X3-098	52.82
912091	X4-012 C OP1	-.47
912101	X4-015 C	-.36
LTF	X4-041	52.18
912241	X4-042	.3
LTF	Y1-002	54.03
LTF	Y1-004	64.79
LTF	Y1-007	44.99
913091	Y1-015 C	90.85
913191	Y1-027 C OP1	.
913461	Y1-070 OP1	86.15
913471	Y1-071	.67
LTF	Y2-004	26.48
LTF	Y2-005	26.48
LTF	Y2-006	27.05
LTF	Y2-007	52.97
LTF	Y2-008	53.96
LTF	Y2-033	31.1
LTF	Y2-034	26.34
LTF	Y2-040	63.27
LTF	Y2-049	51.96

LTF	Y2-056	43.33
LTF	Y2-068	279.61
914291	Y2-080	135.11

Appendix 10

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.41
235565	ALBRIGHT 2	4.41
235566	ALBRIGHT 3	8.28
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
292400	K-028 C1	.03
290228	S-014 C	.03
884780	S-058 C	2.77
884781	S-058 E	9.14
885641	T-016 C	.35
292626	T-174 1	1.62
292627	T-174 2	1.62
292628	T-174 3	1.62
292629	T-174 4	3.28
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.35
236001	WARRIOR RUN	.33
LTF	X2-042	3.17
LTF	X3-020	.93
LTF	X3-021	1.75
900404	X3-028 C	14.88
LTF	X3-096	2.24
LTF	X3-097	3.17
LTF	X3-098	3.01
LTF	X4-041	2.97
LTF	Y1-002	2.78
913001	Y1-003 C OP1	2.63
LTF	Y1-004	4.08
LTF	Y1-007	2.83
913101	Y1-016 C OP1	.34
LTF	Y2-004	1.51
LTF	Y2-005	1.51
LTF	Y2-006	1.52
LTF	Y2-007	3.02
LTF	Y2-008	3.04
LTF	Y2-033	2.08
LTF	Y2-034	2.18
LTF	Y2-035	1.17
LTF	Y2-036	1.17
LTF	Y2-040	1.75

LTF	Y2-049	1.44
LTF	Y2-056	2.31
LTF	Y2-068	15.92
914291	Y2-080	9.31
200813	YOUGH	.07

Appendix 11

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.42
235565	ALBRIGHT 2	4.42
235566	ALBRIGHT 3	8.29
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
292400	K-028 C1	.03
290228	S-014 C	.03
884780	S-058 C	2.79
884781	S-058 E	9.21
885641	T-016 C	.35
292626	T-174 1	1.62
292627	T-174 2	1.62
292628	T-174 3	1.62
292629	T-174 4	3.29
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.38
236001	WARRIOR RUN	.33
LTF	X2-042	3.2
LTF	X3-020	.94
LTF	X3-021	1.78
900404	X3-028 C	15.02
LTF	X3-096	2.25
LTF	X3-097	3.2
LTF	X3-098	3.03
LTF	X4-041	2.99
LTF	Y1-002	2.8
913001	Y1-003 C OP1	2.63
LTF	Y1-004	4.11
LTF	Y1-007	2.85
913101	Y1-016 C OP1	.34
LTF	Y2-004	1.52
LTF	Y2-005	1.52
LTF	Y2-006	1.53
LTF	Y2-007	3.04
LTF	Y2-008	3.06
LTF	Y2-033	2.1
LTF	Y2-034	2.2
LTF	Y2-035	1.18
LTF	Y2-036	1.18
LTF	Y2-040	1.78

LTF	Y2-049	1.46
LTF	Y2-056	2.33
LTF	Y2-068	16.04
914291	Y2-080	9.34

Appendix 12

Bus Number	Bus Name	Full Contribution
238995	02NCUNTD	.67
239006	02NILEG1	11.23
239007	02NILEG2	11.12
239022	02NWCAG3	10.52
239023	02NWCAG4	10.23
239024	02NWCAG5	15.78
254007	15ELRMA1	10.17
254008	15ELRMA2	10.39
254009	15ELRMA3	11.69
254010	15ELRMA4	18.83
235134	ALL L&D 6	.02
235567	ARMSTRONG 1	18.51
235569	ARMSTRONG 2	18.4
298466	B-018	.05
217006	BERGN26A	-4.28
219103	BURLNGT8	-3.89
219124	BURLNGT9	-34.1
228000	CEDR#1CT	-8.66
228001	CEDR#2CT	-4.17
202158	CON.GEN1	.01
202160	CON.GEN2	.01
200030	CONE G1	3.86
200031	CONE G2	3.9
228301	D/W 1 ST	-14.22
228302	D/W 6 ST	-14.59
231904	DC1 NUG	-4.81
231905	DC2 NUG	-4.81
217078	ESSEX 12	-37.53
298464	G-030	.4
99210	G07_NEW	20.97
231903	GEN4	-13.66
206331	GG A1&2	-8.2
206332	GG A3&4	-8.2
206333	GG B5&6	-8.2
206334	GG B7&8	-8.2
200837	HOMER C1	1.76
200636	IUP CO-G	.04
292320	K-020	.01
200032	KEYS G1	3.82
200033	KEYS G2	3.77
209027	LOR2_Q27 E	-18.99

292880	M-026	28.8
219134	MERCER 3	-21.52
227807	MO AV B	-3.69
219137	NAT PARK	-3.86
94130	O66_NONFIRM	71.99
204652	PORT1GEN	-33.06
204653	PORT2GEN	-50.95
290081	Q-034 C	2.07
200846	RINGGOLD	1.52
884780	S-058 C	54.17
884781	S-058 E	178.62
213941	SCHYLABC	-.42
213945	SCHYLKL1	-30.12
218360	SEWAREN1	-20.97
218361	SEWAREN2	-23.77
218362	SEWAREN3	-21.55
218363	SEWAREN4	-24.95
218364	SEWAREN6	-22.32
200833	SEWRDB34	1.65
200809	SITHE	.1
235619	SOUTH BEND 1	.68
235620	SOUTH BEND 2	.68
235621	SOUTH BEND 3	.69
235622	SOUTH BEND 4	.68
235610	SPRINGDALE 1	.14
235611	SPRINGDALE 2	.14
235612	SPRINGDALE 3	.52
235613	SPRINGDALE 4	.51
235614	SPRINGDALE 5	.54
292339	T-109	.09
292344	T-110	.09
292548	T-155	.02
292552	T-156	2.12
292626	T-174 1	23.84
292627	T-174 2	23.84
292628	T-174 3	23.84
292629	T-174 4	48.33
885600	T20SOLAR E	-.41
204656	TITUS 1G	-14.68
204657	TITUS 2G	-14.68
204658	TITUS 3G	-14.68
292078	V1-034	.61
LTF	V3-012	55.29

209019	VIKI IPP	-4.05
228700	VNLD 10	-4.18
901381	W1-107 C	.
902161	W2-010	.09
902171	W2-011	.09
902211	W2-019 C	-.44
905031	W4-001A_AT9	.35
905051	W4-004A_AT10	2.08
905211	W4-025 C	-.5
905291	W4-038 OP1	-4.89
907241	X1-068	-1.99
907991	X1-078	104.42
907381	X1-094 C	-1.32
909111	X2-031 C	.67
LTF	X2-042	60.28
910531	X3-004	-7.14
LTF	X3-021	64.18
900404	X3-028 C	266.91
910931	X3-085 C	-.62
LTF	X3-096	39.87
LTF	X3-097	56.53
LTF	X3-098	53.59
912091	X4-012 C OP1	-.47
912101	X4-015 C	-.36
LTF	X4-041	52.94
912241	X4-042	.31
LTF	Y1-002	54.81
LTF	Y1-004	65.73
LTF	Y1-007	45.64
913091	Y1-015 C	92.21
913191	Y1-027 C OP1	.
913461	Y1-070 OP1	87.44
913471	Y1-071	.67
LTF	Y2-004	26.87
LTF	Y2-005	26.87
LTF	Y2-006	27.44
LTF	Y2-007	53.74
LTF	Y2-008	54.74
LTF	Y2-033	31.55
LTF	Y2-034	26.72
LTF	Y2-040	64.18
LTF	Y2-049	52.71
LTF	Y2-056	43.96

LTF	Y2-068	283.68
914291	Y2-080	137.26

Appendix 13

Bus Number	Bus Name	Full Contribution
254007	15ELRMA1	-8.19
254008	15ELRMA2	-8.36
254009	15ELRMA3	-10.88
254010	15ELRMA4	-17.54
235850	BROWNS RUN	16.67
298464	G-030	.14
235619	SOUTH BEND 1	.24
235620	SOUTH BEND 2	.24
235621	SOUTH BEND 3	.24
235622	SOUTH BEND 4	.24
292626	T-174 1	11.38
292627	T-174 2	11.38
292628	T-174 3	11.38
292629	T-174 4	23.07
914291	Y2-080	65.52

Appendix 14

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.41
235565	ALBRIGHT 2	4.41
235566	ALBRIGHT 3	8.28
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
292400	K-028 C1	.03
290228	S-014 C	.03
884780	S-058 C	2.77
884781	S-058 E	9.14
885641	T-016 C	.35
292626	T-174 1	1.62
292627	T-174 2	1.62
292628	T-174 3	1.62
292629	T-174 4	3.28
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.35
236001	WARRIOR RUN	.33
LTF	X2-042	3.17
LTF	X3-020	.93
LTF	X3-021	1.75
900404	X3-028 C	14.88
LTF	X3-096	2.24
LTF	X3-097	3.17
LTF	X3-098	3.01
LTF	X4-041	2.97
LTF	Y1-002	2.78
913001	Y1-003 C OP1	2.63
LTF	Y1-004	4.08
LTF	Y1-007	2.83
913101	Y1-016 C OP1	.34
913241	Y1-033 C OP1	3.79
LTF	Y2-004	1.51
LTF	Y2-005	1.51
LTF	Y2-006	1.52
LTF	Y2-007	3.02
LTF	Y2-008	3.04
LTF	Y2-033	2.08
LTF	Y2-034	2.18
LTF	Y2-035	1.17
LTF	Y2-036	1.17

LTF	Y2-040	1.75
LTF	Y2-049	1.44
LTF	Y2-056	2.31
LTF	Y2-068	15.92
914291	Y2-080	9.31
200813	YOUGH	.07

Appendix 15

Bus Number	Bus Name	Full Contribution
298464	G-030	.18
235619	SOUTH BEND 1	.31
235620	SOUTH BEND 2	.31
235621	SOUTH BEND 3	.31
235622	SOUTH BEND 4	.31
292626	T-174 1	14.85
292627	T-174 2	14.85
292628	T-174 3	14.85
292629	T-174 4	30.09
LTF	Y2-068	3.08
914291	Y2-080	85.47

Appendix 16

Bus Number	Bus Name	Full Contribution
298464	G-030	.18
235619	SOUTH BEND 1	.31
235620	SOUTH BEND 2	.31
235621	SOUTH BEND 3	.31
235622	SOUTH BEND 4	.31
292626	T-174 1	14.85
292627	T-174 2	14.85
292628	T-174 3	14.85
292629	T-174 4	30.09
LTF	Y2-068	3.08
914291	Y2-080	85.47

Appendix 17

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.4
235565	ALBRIGHT 2	4.4
235566	ALBRIGHT 3	8.26
200840	DEEPCRK1	.06
200841	DEEPCRK2	.06
200835	DSGENWIN	.24
292350	K-023	.1
292400	K-028 C1	.03
200856	L-013 C	.13
293901	O-048 C	.12
290081	Q-034 C	14.02
293431	R-040 C	.01
290228	S-014 C	.03
884780	S-058 C	2.63
884781	S-058 E	8.68
885641	T-016 C	.35
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.2
236001	WARRIOR RUN	.33
LTF	X2-042	3.02
LTF	X3-021	1.59
900404	X3-028 C	14.21
LTF	X3-096	2.13
LTF	X3-097	3.02
LTF	X3-098	2.87
LTF	X4-041	2.83
LTF	Y1-002	2.64
913001	Y1-003 C OP1	2.63
LTF	Y1-004	3.89
LTF	Y1-007	2.7
913101	Y1-016 C OP1	.33
913241	Y1-033 C OP1	3.79
LTF	Y2-004	1.44
LTF	Y2-005	1.44
LTF	Y2-006	1.45
LTF	Y2-007	2.87
LTF	Y2-008	2.9
LTF	Y2-033	1.99
LTF	Y2-034	2.09
LTF	Y2-035	1.12

LTF	Y2-036	1.12
LTF	Y2-040	1.59
LTF	Y2-049	1.31
LTF	Y2-056	2.2
LTF	Y2-068	15.17
914291	Y2-080	9.1
200813	YOUGH	.07

Appendix 18

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.42
235565	ALBRIGHT 2	4.42
235566	ALBRIGHT 3	8.3
292400	K-028 C1	.03
315446	Q-065	7.46
290228	S-014 C	.03
884780	S-058 C	2.87
884781	S-058 E	9.46
885641	T-016 C	.35
292626	T-174 1	1.64
292627	T-174 2	1.64
292628	T-174 3	1.64
292629	T-174 4	3.33
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.46
236001	WARRIOR RUN	.33
LTF	X2-042	3.28
LTF	X3-020	.96
LTF	X3-021	1.87
900404	X3-028 C	15.36
LTF	X3-096	2.31
LTF	X3-097	3.28
LTF	X3-098	3.11
LTF	X4-029D	.8
LTF	X4-041	3.07
LTF	Y1-002	2.88
LTF	Y1-004	4.21
LTF	Y1-007	2.92
913101	Y1-016 C OP1	.34
LTF	Y1-041	.8
LTF	Y2-004	1.56
LTF	Y2-005	1.56
LTF	Y2-006	1.57
LTF	Y2-007	3.12
LTF	Y2-008	3.14
LTF	Y2-030	.9
LTF	Y2-031	.9
LTF	Y2-032	.9
LTF	Y2-033	2.15
LTF	Y2-034	2.25

LTF	Y2-035	1.2
LTF	Y2-036	1.2
LTF	Y2-040	1.87
LTF	Y2-049	1.53
LTF	Y2-056	2.39
LTF	Y2-068	16.45
914291	Y2-080	9.46

Appendix 19

Bus Number	Bus Name	Full Contribution
235564	ALBRIGHT 1	4.42
235565	ALBRIGHT 2	4.42
235566	ALBRIGHT 3	8.3
292400	K-028 C1	.03
315446	Q-065	7.46
290228	S-014 C	.03
884780	S-058 C	2.87
884781	S-058 E	9.46
885641	T-016 C	.35
292626	T-174 1	1.64
292627	T-174 2	1.64
292628	T-174 3	1.64
292629	T-174 4	3.33
929512	U2-030 C	.01
889151	U2-073 C	.04
LTF	V3-012	3.46
236001	WARRIOR RUN	.33
LTF	X2-042	3.28
LTF	X3-020	.96
LTF	X3-021	1.87
900404	X3-028 C	15.36
LTF	X3-096	2.31
LTF	X3-097	3.28
LTF	X3-098	3.11
LTF	X4-029D	.8
LTF	X4-041	3.07
LTF	Y1-002	2.88
LTF	Y1-004	4.21
LTF	Y1-007	2.92
913101	Y1-016 C OP1	.34
LTF	Y1-041	.8
LTF	Y2-004	1.56
LTF	Y2-005	1.56
LTF	Y2-006	1.57
LTF	Y2-007	3.12
LTF	Y2-008	3.14
LTF	Y2-030	.9
LTF	Y2-031	.9
LTF	Y2-032	.9
LTF	Y2-033	2.15
LTF	Y2-034	2.25

LTF	Y2-035	1.2
LTF	Y2-036	1.2
LTF	Y2-040	1.87
LTF	Y2-049	1.53
LTF	Y2-056	2.39
LTF	Y2-068	16.45
914291	Y2-080	9.46

Appendix 20

Bus Number	Bus Name	Full Contribution
254007	15ELRMA1	10.32
254008	15ELRMA2	10.53
254009	15ELRMA3	13.49
254010	15ELRMA4	21.74
235564	ALBRIGHT 1	9.49
235565	ALBRIGHT 2	9.49
235566	ALBRIGHT 3	17.81
217006	BERGN26A	-2.75
235850	BROWNS RUN	130.71
219103	BURLNGT8	-2.62
219124	BURLNGT9	-22.98
228000	CEDR#1CT	-5.77
228001	CEDR#2CT	-2.78
228301	D/W 1 ST	-9.68
228302	D/W 6 ST	-9.92
231904	DC1 NUG	-3.41
231905	DC2 NUG	-3.41
217078	ESSEX 12	-24.11
235583	FT MARTIN 1	2.16
235584	FT MARTIN 2	2.18
298464	G-030	1.55
99210	G07_NEW	13.61
235615	GANS 8	.17
235616	GANS 9	.17
231903	GEN4	-9.7
206331	GG A1&2	-5.25
206332	GG A3&4	-5.25
206333	GG B5&6	-5.25
206334	GG B7&8	-5.25
235580	HATFIELD 1	3.01
235581	HATFIELD 2	3.01
235582	HATFIELD 3	3.01
292320	K-020	.01
235570	LAKE LYNN 1	.1
235571	LAKE LYNN 2	.1
209027	LOR2_Q27 E	-11.32
292850	M-023 C	3.74
219134	MERCER 3	-14.48
235573	MITCHELL 2	.3
235574	MITCHELL 3	1.01
227807	MO AV B	-2.49

236000	MORGANTOWN E	.17
235851	N LONGVIEW	2.28
292980	N-007 C	.86
293230	N-032 C	.04
219137	NAT PARK	-2.61
94130	O66_NONFIRM	46.25
204652	PORT1GEN	-20.97
204653	PORT2GEN	-32.3
295731	Q-079 1	.38
235575	RIVESVILLE 5	4.59
235576	RIVESVILLE 6	11.28
235755	RONCO 1	.9
235756	RONCO 2	.9
235757	RONCO 3	1.63
884780	S-058 C	43.26
884781	S-058 E	142.63
213941	SCHYLABC	-.28
213945	SCHYLKL1	-20.49
218360	SEWAREN1	-13.54
218361	SEWAREN2	-15.36
218362	SEWAREN3	-13.93
218363	SEWAREN4	-16.13
218364	SEWAREN6	-14.43
200715	SHAWVL 1	-13.38
200722	SHAWVL 2	-13.71
200665	SHAWVL 3	-18.95
235619	SOUTH BEND 1	2.61
235620	SOUTH BEND 2	2.61
235621	SOUTH BEND 3	2.64
235622	SOUTH BEND 4	2.61
885641	T-016 C	.77
292626	T-174 1	70.7
292627	T-174 2	70.7
292628	T-174 3	70.7
292629	T-174 4	143.31
885600	T20SOLAR E	-.28
204656	TITUS 1G	-9.89
204657	TITUS 2G	-9.89
204658	TITUS 3G	-9.89
891011	U4-002 C	1.42
891041	U4-007 C	1.67
292078	V1-034	.39
LTF	V3-012	46.58

209019	VIKI IPP	-2.37
228700	VNLD 10	-2.85
902211	W2-019 C	-.29
905211	W4-025 C	-.33
905291	W4-038 OP1	-3.14
907241	X1-068	-1.29
907991	X1-078	67.89
907381	X1-094 C	-.84
LTF	X2-042	48.15
910531	X3-004	-4.59
LTF	X3-021	39.52
900404	X3-028 C	221.72
910931	X3-085 C	-.39
LTF	X3-096	33.06
LTF	X3-097	46.88
LTF	X3-098	44.44
912091	X4-012 C OP1	-.3
912101	X4-015 C	-.24
LTF	X4-041	43.91
912241	X4-042	.5
LTF	Y1-002	43.55
LTF	Y1-004	55.91
LTF	Y1-007	38.83
913101	Y1-016 C OP1	.8
913191	Y1-027 C OP1	.01
913251	Y1-034 OP1	.84
LTF	Y2-004	22.28
LTF	Y2-005	22.28
LTF	Y2-006	22.71
LTF	Y2-007	44.57
LTF	Y2-008	45.32
LTF	Y2-033	27.98
LTF	Y2-034	25.81
LTF	Y2-040	39.52
LTF	Y2-049	32.45
LTF	Y2-056	35.45
LTF	Y2-068	235.26
914291	Y2-080	407.

Appendix 21

Bus Number	Bus Name	Full Contribution
254007	15ELRMA1	10.32
254008	15ELRMA2	10.53
254009	15ELRMA3	13.49
254010	15ELRMA4	21.74
235564	ALBRIGHT 1	9.49
235565	ALBRIGHT 2	9.49
235566	ALBRIGHT 3	17.81
217006	BERGN26A	-2.75
235850	BROWNS RUN	130.71
219103	BURLNGT8	-2.62
219124	BURLNGT9	-22.98
228000	CEDR#1CT	-5.77
228001	CEDR#2CT	-2.78
228301	D/W 1 ST	-9.68
228302	D/W 6 ST	-9.92
231904	DC1 NUG	-3.41
231905	DC2 NUG	-3.41
217078	ESSEX 12	-24.11
235583	FT MARTIN 1	2.16
235584	FT MARTIN 2	2.18
298464	G-030	1.55
99210	G07_NEW	13.61
235615	GANS 8	.17
235616	GANS 9	.17
231903	GEN4	-9.7
206331	GG A1&2	-5.25
206332	GG A3&4	-5.25
206333	GG B5&6	-5.25
206334	GG B7&8	-5.25
235580	HATFIELD 1	3.01
235581	HATFIELD 2	3.01
235582	HATFIELD 3	3.01
292320	K-020	.01
235570	LAKE LYNN 1	.1
235571	LAKE LYNN 2	.1
209027	LOR2_Q27 E	-11.32
292850	M-023 C	3.74
219134	MERCER 3	-14.48
235573	MITCHELL 2	.3
235574	MITCHELL 3	1.01
227807	MO AV B	-2.49

236000	MORGANTOWN E	.17
235851	N LONGVIEW	2.28
292980	N-007 C	.86
293230	N-032 C	.04
219137	NAT PARK	-2.61
94130	O66_NONFIRM	46.25
204652	PORT1GEN	-20.97
204653	PORT2GEN	-32.3
295731	Q-079 1	.38
235575	RIVESVILLE 5	4.59
235576	RIVESVILLE 6	11.28
235755	RONCO 1	.9
235756	RONCO 2	.9
235757	RONCO 3	1.63
884780	S-058 C	43.26
884781	S-058 E	142.63
213941	SCHYLABC	-.28
213945	SCHYLKL1	-20.49
218360	SEWAREN1	-13.54
218361	SEWAREN2	-15.36
218362	SEWAREN3	-13.93
218363	SEWAREN4	-16.13
218364	SEWAREN6	-14.43
200715	SHAWVL 1	-13.38
200722	SHAWVL 2	-13.71
200665	SHAWVL 3	-18.95
235619	SOUTH BEND 1	2.61
235620	SOUTH BEND 2	2.61
235621	SOUTH BEND 3	2.64
235622	SOUTH BEND 4	2.61
885641	T-016 C	.77
292626	T-174 1	70.7
292627	T-174 2	70.7
292628	T-174 3	70.7
292629	T-174 4	143.31
885600	T20SOLAR E	-.28
204656	TITUS 1G	-9.89
204657	TITUS 2G	-9.89
204658	TITUS 3G	-9.89
891011	U4-002 C	1.42
891041	U4-007 C	1.67
292078	V1-034	.39
LTF	V3-012	46.58

209019	VIKI IPP	-2.37
228700	VNLD 10	-2.85
902211	W2-019 C	-.29
905211	W4-025 C	-.33
905291	W4-038 OP1	-3.14
907241	X1-068	-1.29
907991	X1-078	67.89
907381	X1-094 C	-.84
LTF	X2-042	48.15
910531	X3-004	-4.59
LTF	X3-021	39.52
900404	X3-028 C	221.72
910931	X3-085 C	-.39
LTF	X3-096	33.06
LTF	X3-097	46.88
LTF	X3-098	44.44
912091	X4-012 C OP1	-.3
912101	X4-015 C	-.24
LTF	X4-041	43.91
912241	X4-042	.5
LTF	Y1-002	43.55
LTF	Y1-004	55.91
LTF	Y1-007	38.83
913101	Y1-016 C OP1	.8
913191	Y1-027 C OP1	.01
913251	Y1-034 OP1	.84
LTF	Y2-004	22.28
LTF	Y2-005	22.28
LTF	Y2-006	22.71
LTF	Y2-007	44.57
LTF	Y2-008	45.32
LTF	Y2-033	27.98
LTF	Y2-034	25.81
LTF	Y2-040	39.52
LTF	Y2-049	32.45
LTF	Y2-056	35.45
LTF	Y2-068	235.26
914291	Y2-080	407.

Appendix 22

Bus Number	Bus Name	Full Contribution
237577	01ROUTE 16	.
220900	G-051	.03
235723	GUILFORD 1	.17
235724	GUILFORD 2	.17
290890	I-012	.16
315446	Q-065	19.46
884780	S-058 C	3.12
884781	S-058 E	10.27
218360	SEWAREN1	-1.45
218361	SEWAREN2	-1.64
218362	SEWAREN3	-1.49
218363	SEWAREN4	-1.73
218364	SEWAREN6	-1.54
200715	SHAWVL 1	-3.76
200722	SHAWVL 2	-3.86
292626	T-174 1	1.8
292627	T-174 2	1.8
292628	T-174 3	1.8
292629	T-174 4	3.65
LTF	V3-012	4.39
292630	V3-017	7.01
901181	W1-064	.01
905321	W4-044	7.01
907991	X1-078	7.2
LTF	X2-042	3.6
LTF	X3-020	1.1
LTF	X3-021	2.07
900404	X3-028 C	16.98
910941	X3-087 C OP1	7.6
LTF	X3-096	2.65
LTF	X3-097	3.76
LTF	X3-098	3.56
LTF	X4-029D	.89
912211	X4-035 OP1	7.53
912221	X4-039	11.31
LTF	X4-041	3.52
LTF	Y1-002	3.12
LTF	Y1-004	5.38
LTF	Y1-007	3.74
LTF	Y1-041	.89
LTF	Y2-004	1.79

LTF	Y2-005	1.79
LTF	Y2-006	1.73
LTF	Y2-007	3.58
LTF	Y2-008	3.48
LTF	Y2-030	1.
LTF	Y2-031	1.
LTF	Y2-032	1.
LTF	Y2-033	2.77
LTF	Y2-034	3.47
LTF	Y2-035	1.86
LTF	Y2-036	1.86
LTF	Y2-040	2.07
LTF	Y2-049	1.7
LTF	Y2-056	2.66
LTF	Y2-068	18.86
914291	Y2-080	10.35

Appendix 23

Bus Number	Bus Name	Full Contribution
235850	BROWNS RUN	23.06
298464	G-030	.19
235619	SOUTH BEND 1	.32
235620	SOUTH BEND 2	.32
235621	SOUTH BEND 3	.32
235622	SOUTH BEND 4	.32
292626	T-174 1	15.34
292627	T-174 2	15.34
292628	T-174 3	15.34
292629	T-174 4	31.1
LTF	Y2-068	3.18
914291	Y2-080	88.33

Appendix 24

Bus Number	Bus Name	Full Contribution
235850	BROWNS RUN	22.83
298464	G-030	.19
235619	SOUTH BEND 1	.32
235620	SOUTH BEND 2	.32
235621	SOUTH BEND 3	.32
235622	SOUTH BEND 4	.32
292626	T-174 1	15.19
292627	T-174 2	15.19
292628	T-174 3	15.19
292629	T-174 4	30.79
LTF	Y2-068	3.15
914291	Y2-080	87.45