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**DECISION RISK ANALYSIS FOR
DYNAMIC SEPARATORS**

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MAY 1976

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US ARMY ARMAMENT COMMAND

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Investigations resulting from the explosion of the TNT facilities at Radford AAP concluded that excessive amounts of explosive material were contained within the Nitration and Purification (N&P) Building and Quantity Distance (QD) requirements would be violated if the lines were reconstructed in their former configuration. One method of satisfying QD requirements is to increase the acid to nitrobody ratio in the N&P section. To maintain the present production rate, flow rates would have to be increased beyond the capability of the current static separators. It has been proposed		

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that dynamic separators be purchased and installed in place of the static separators to accommodate the required increased flow rate. Dynamic separators are expected to achieve the required increase in-process flow without major structural changes. This analysis examines the risk and the expected time and cost of installing dynamic separators at Radford with and without a prior Manufacturing, Methods, and Technology (MM&T) project. It was concluded that the MM&T would not reduce the risk and would delay the reconstruction unnecessarily.

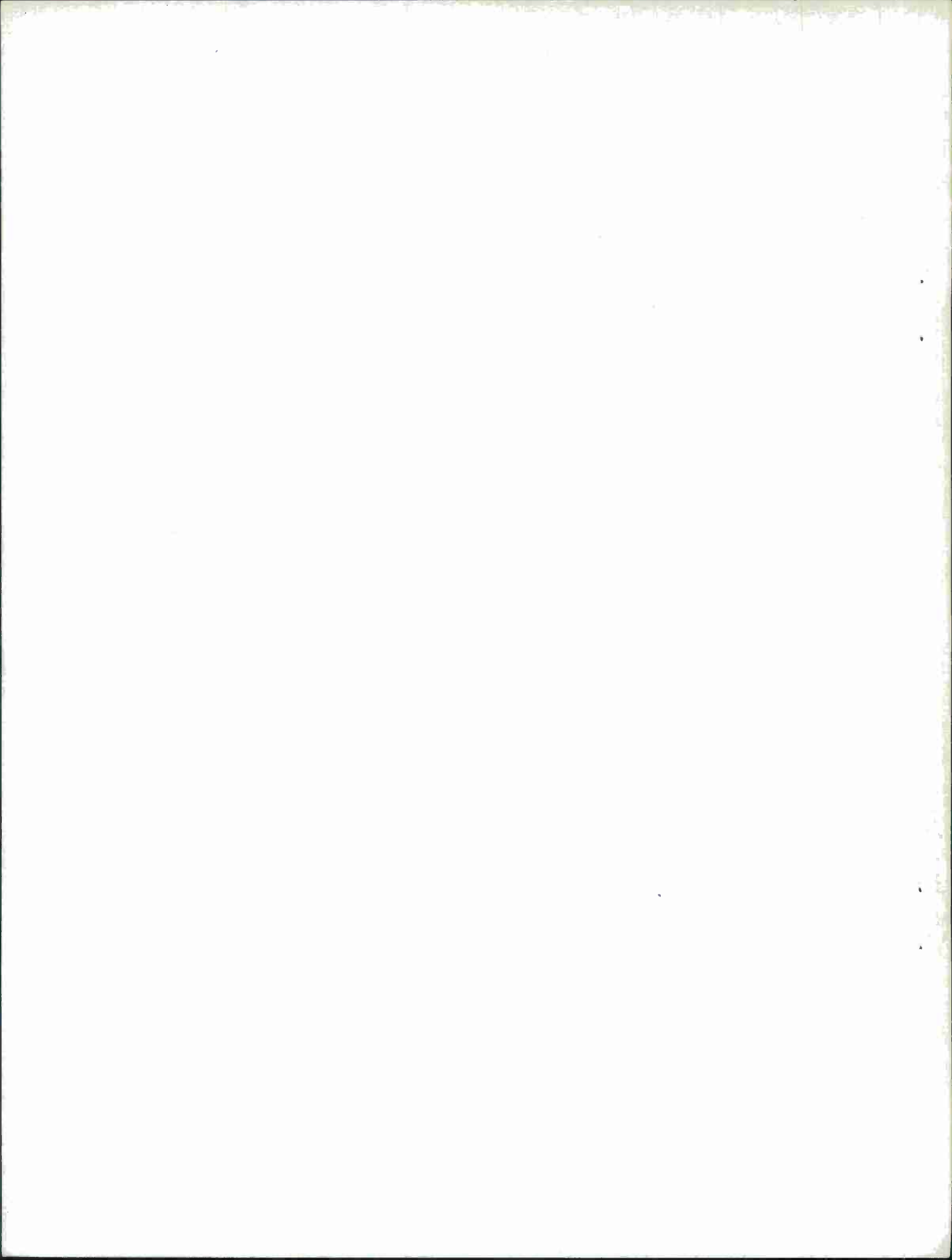
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OBJECTIVE

The objective of this analysis was to determine if any benefits could result from conducting a Manufacturing, Methods, and Technology (MM&T) project at the Volunteer Army Ammunition Plant (VAAP) or Joliet Army Ammunition Plant (JAAP) prior to installing dynamic separators during the reconstruction of B and C TNT lines at Radford Army Ammunition Plant (RAAP).

INTRODUCTION

When facilities which contain explosive material are constructed, the distance required between neighboring structures depends upon the quantity of detonable material contained within each structure. When TNT lines A, B, and C were constructed at Radford AAP, the distance between structures was calculated on 12,000 pounds of class 7 (detonable) material. On 31 May 1974, TNT line A at Radford AAP was destroyed by an explosion. Lines B and C were also damaged, which initiated an investigation to determine how much explosive material was actually contained in line A at the time of the explosion. The investigation concluded that there was 18,000-19,000 pounds of class 7 material being processed in the Nitration and Purification (N&P) building at the time of the explosion, not counting remelt TNT which is sometimes present in this building. This was sufficiently above the original design quantity to declare lines B and C unsafe in their present configuration.

A restoration project for B and C lines was submitted as a late-start 76 project. The project would repair B and C lines in their present location. To meet the new Quantity Distance (QD) requirements and maintain a production rate of 50 tons per day, either structural or process changes must be implemented.

A structural solution to this problem would be to build a retaining wall between the Nitration and Purification Section in the TNT building. However, examination of the TNT facilities and the structural requirements of a retaining wall showed this to be a high-risk alternative. Thirty foot of separation would be required between the Nitration and Purification Sections to allow time for a detonation trap to activate in the event an explosion occurred. This would require major structural and process changes. This alternative was not pursued due to the high expectations of the process changes discussed in this study.

The process change under consideration would reduce the explosive quantity to the original design specification by increasing the acid-to-nitrobody ratio in the nitration process from 3:1 to 9:1 and increase the flow rate accordingly to maintain the production rate of 50 tons per day. In order to accommodate the required increased flow rate, dynamic separators would be installed in place of the present static separators. The gravitational action of the current static separators limits the possible flow rate; however, by utilizing centrifugal force, dynamic separators are expected to achieve the required increase in the process flow without major structural modifications. The proposed flow rate requires

dynamic separators to process 30,000 liters/hour in the nitration section and 10,000 liters/hour in the purification section. AB Bofors of Sweden, a developer of dynamic separators, has considerable experience in the construction of 10,000 liters/hour separators for TNT lines and 10,000 and 20,000 liters/hour separators for nitroglycerine lines. They have also constructed three 20,000 liters/hour separators for the Canadian Industries Limited (CIL) lines. The CIL units will be installed on a 35 ton per day TNT production line in September 1975. AB Bofors has not produced any 30,000 liters/hour units. They have indicated size can be misleading and there would be some risk in scaling up to 30,000 liters/hour, since an increase in capacity will not necessarily result in a commensurate increase in output.

The risks associated with the operation of a TNT line with dynamic separators are categorized as mechanical or process flow problems. Mechanical problems may arise due to sludge build-up in the separator or uncontrolled vibrations of the rotating basket. Process flow problems may arise with the increased flow rate. If the retention time in the nitrators does not permit sufficient nitration, the flow rate would have to be reduced. This would increase the TNT equivalence in the N&P building and QD requirements would not be met.

ALTERNATIVES

After reviewing the project and outlining the necessary steps required to rebuild lines B and C, four primary alternatives were identified for evaluation. The primary difference among the four alternatives is the time when approval is given to purchase the required dynamic separators. The alternatives are as follows:

ALT 1. Immediate approval is given to purchase and install 28 dynamic separators (14 for each TNT line). After the TNT lines have been rebuilt with dynamic separators, one line would be proven-out to determine if QD requirements are met.

ALT 2. Immediate approval is given to purchase and install 14 dynamic separators on one TNT line B, while static separators are installed on TNT line C. If operation with dynamic separators is successful and QD requirements are met, then dynamic separators would be purchased and retrofitted on TNT line C.

ALT 3. Approval to purchase 28 dynamic separators is withheld until three of them are tested at VAAP or JAAP. This proposed MM&T project would replace two static separators in the Nitration Section and one in the Purification Section with dynamic separators of various sizes. The TNT line would be operated, using current operating procedures (e.g., flow rates) to correct any mechanical problems which may arise. Therefore, this would not demonstrate concept feasibility (i.e., whether a TNT line can operate at the proposed higher flow rates and if this will lower the TNT equivalence enough so QD requirements are met).

ALT 4. Approval to purchase dynamic separators is withheld until Canadian Industries Limited (CIL) installs and operates their dynamic separators. After the CIL units are evaluated, a decision would be made to purchase and install dynamic separators on Radford AAP's two TNT lines (ALT 1) or proceed with further testing (ALT 3). As in ALT 3, the CIL installation would operate at current flow rates and not demonstrate concept feasibility.

Delivery of the dynamic separators could be expected approximately six months after the order is placed, and it will take approximately two years to rebuild lines B and C. As preliminary testing could be performed at JAAP or VAAP while waiting on the construction, ALT 1 was broken into two parts:

ALT 1a. Immediate approval is given to purchase and install the dynamic separators, but no preliminary testing would be performed.

ALT 1b. Immediate approval is given to purchase and install the dynamic separators, but preliminary testing is performed at JAAP or VAAP while waiting on the construction at Radford AAP.

APPROACH

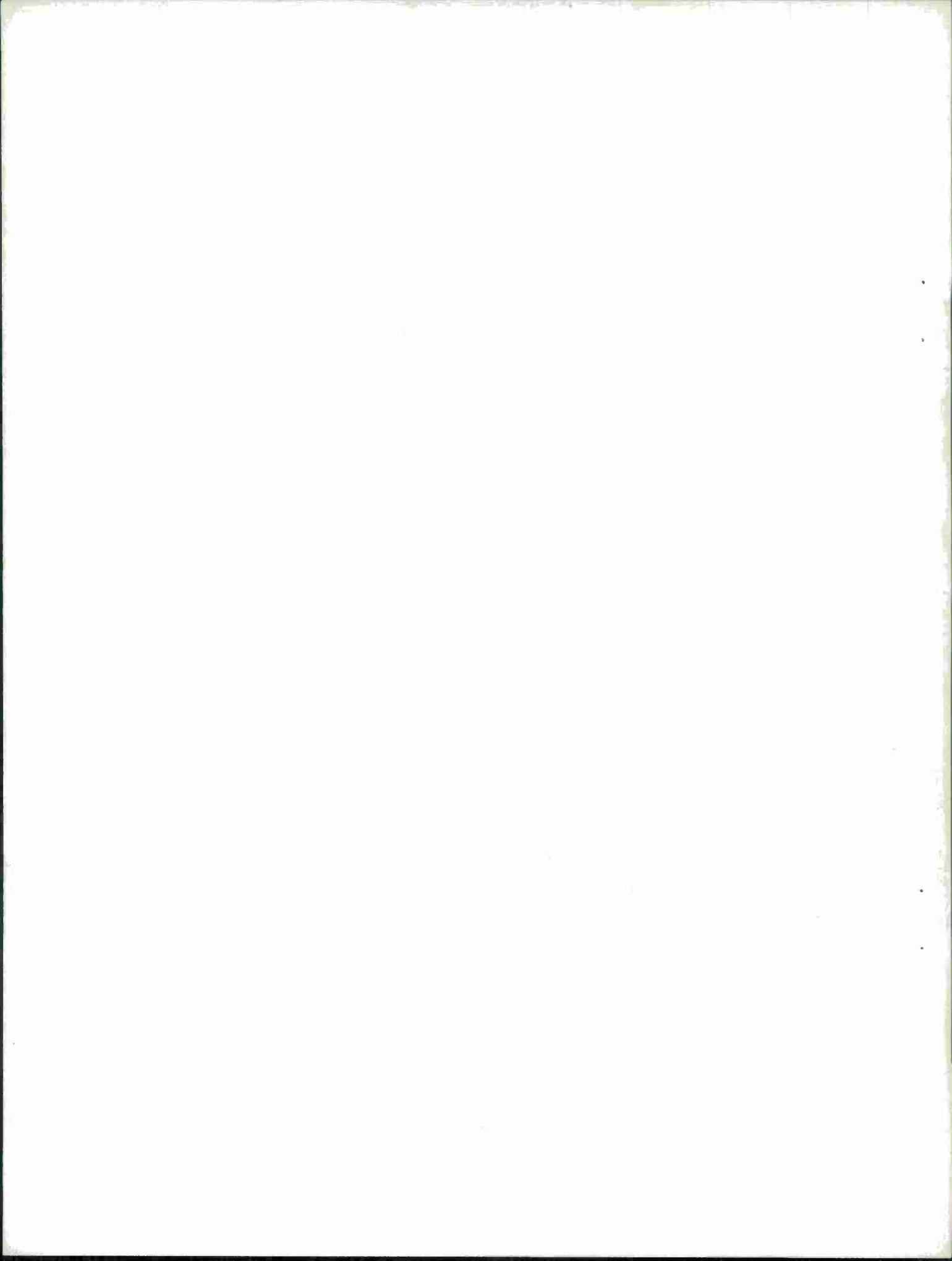
Each alternative course-of-action was represented by a network of activities from the initial decision to success or failure of that alternative. For example, the decision to adopt ALT 2 initiates activities to rebuild line C with static separators and rebuild line B with dynamic separators. These are represented as lines (arcs) A5 and A6 of the network in Figure 1. Follow-on activities are represented through final prove-out (A52) when the course-of-action will be judged a success or failure, depending on whether the QD requirements are met. The condition in which the separators function properly but QD requirements are not fully achieved has been labeled conditional success.

Minimum, maximum, and most likely time and cost estimates were obtained for each activity depicted in Figure 1; see Appendix B, Table B1. Probabilities associated with the possible outcomes of tests and likely decisions were also estimated and are presented in Figure 1 (e.g., it was estimated that the probability of failing preliminary testing at VAAP (A30) is .04 (A31).

These data were combined (using the Venture Evaluation and Review Technique (VERT)) in a computer simulation to generate time/cost estimates with uncertainty for each alternative.

RESULTS

Time and cost values for each activity were accumulated from the time a course of action was chosen to the time when the results of operating a TNT line with dynamic separators were evaluated. These values include



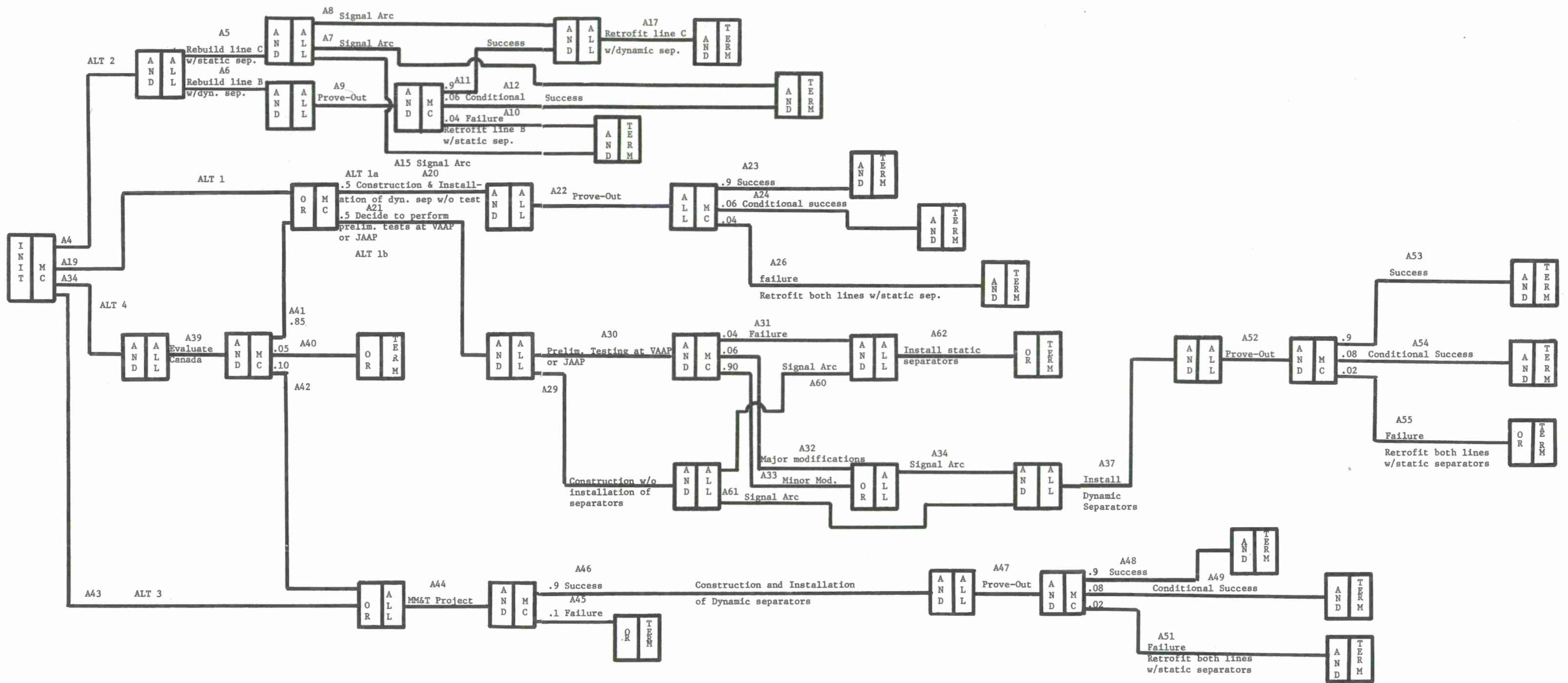
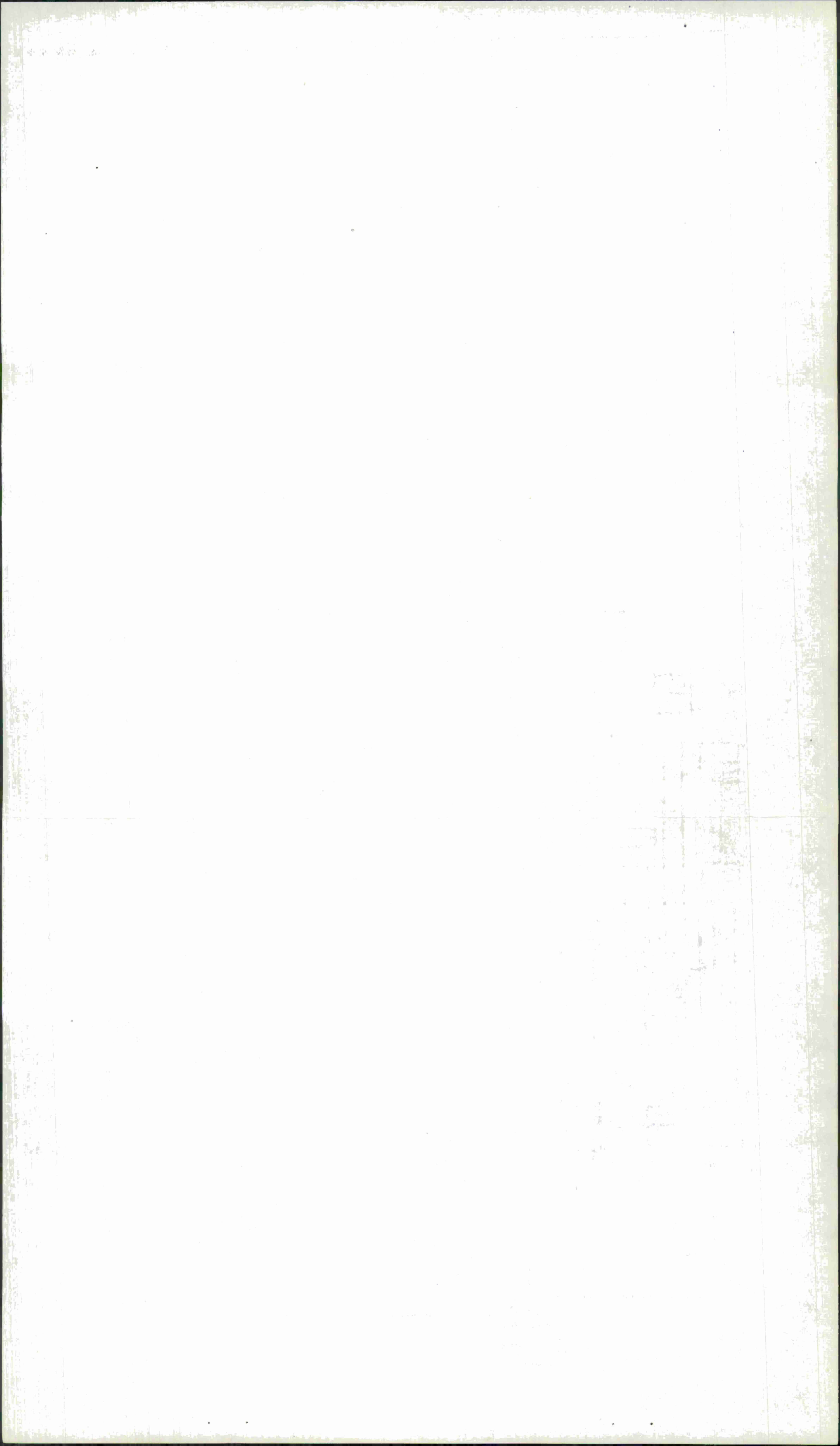


FIGURE 1. Dynamic Separator Network Analysis



the time and cost of retrofitting static separators if needed, but do not include the time and cost for further structural or process modifications which would be required if QD requirements were not met. The expected time and cost of each possible outcome for each alternative, with 90% probability intervals (ninety percent of the values were contained between the upper (95%) and lower (5%) values), are presented in Table 1. This table summarizes the terminal node histograms from the VERT computer simulations which are located in APPENDIX C.

For ALT 1a there is a 90% chance that operation with dynamic separators would meet QD requirements. The expected time to complete the project is 31 months at an expected cost of \$8.73M. The 90% probability interval (ninety percent of the values were contained between the upper (95%) and lower (5%) values) for time and cost are 29 to 32 months and \$8.10M to \$9.26M, respectively.

There is a 10% chance that operation with dynamic separators would not meet QD requirements and additional process and/or structural changes would be required. This consists of a 6% chance that the dynamic separators would remain on the TNT line and a 4% chance that static separators would be retrofitted.

The outcomes for ALT 1b are similar to ALT 1a, except that the expected cost for successful completion of the project is increased by \$0.17M. This increase is due to the preliminary testing at JAAP or VAAP. Even with preliminary testing, the chance remains at 90% that operation with dynamic separators would meet QD requirements. However, because of preliminary testing, the probability is reduced from 4% to 2% that static separators would have to be retrofitted because operation with dynamic separators is infeasible.

For ALT 2 there is a 90% chance that operation with dynamic separators would meet QD requirement. If this occurs, dynamic separators would be purchased and installed on the second TNT line at Radford AAP. The expected time to complete this project is 40 months at an expected cost of \$8.73M. The 90% probability intervals for time and cost are 37 to 42 months and \$8.29M to \$9.07M. ALT 2 requires 9 months more than ALT 1 if QD requirements are met; however, there is a 10% chance that the QD requirements would not be met. In the latter case, the purchase and installation cost (\$0.75M) of dynamic separators for the second TNT line would not be incurred.

For ALT 3, if dynamic separators are installed after the completion of the tests, the expected time to complete the project is 71 months at an expected cost of \$8.92M. The 90% probability intervals for time and cost are 66 to 76 months and \$8.26M to \$9.48M. A substantial increase in time is incurred since a MM&T project would not start until 1976 and would require approximately 18 months (and \$0.2M) to complete. There is a 10% chance that upon completion of the MM&T, dynamic separators would not be purchased and static separators would be installed. If this occurred, the time to complete the project would be 68 + 5 months at an expected cost of \$7.44M + \$0.5M.

TABLE 1. COST/SCHEDULE COMPARISON WITH 90% CONFIDENCE INTERVAL

Decision	Schedule (Mo)			Cost (\$M)		
	5%	Expected	95%	5%	Expected	95%
<u>ALT 1a.</u> Rebuild lines B and C w/dynamic separators w/o MM&T or any preliminary testing.	29	31	33	8.10	8.73	9.26
<u>Possible Outcomes</u>						
1. Operation w/dynamic separators meets QD requirements.	29	31	32	8.10	8.73	9.26
2. Operation w/dynamic separators does not meet QD requirements.	30	31	32	8.10	8.66	9.16
3. Operation w/dynamic separators is not possible. Static separators are installed.	32	34	36	8.24	8.91	9.50
<u>ALT 1b.</u> Rebuild lines B and C w/dynamic separators w/o MM&T, but w/preliminary testing.	29	31	33	8.30	8.90	9.40
<u>Possible Outcomes</u>						
1. Operation w/dynamic separators meets QD requirements.	29	31	32	8.32	8.93	9.41
2. Operation w/dynamic separators does not meet QD requirements.	29	31	32	8.31	8.90	9.46
3. Operation w/dynamic separators is not possible. Static separators are installed.	28	30	34	7.81	8.49	9.34

TABLE 1 (Cont'd)

Decision	Schedule (Mo)			Cost (\$M)		
	5%	Expected	95%	5%	Expected	95%
<u>ALT 2.</u> Initially rebuild one line w/dynamic separators and the other w/static separators. No MM&T.	31	39	42	7.91	8.65	9.02
<u>Possible Outcomes</u>						
1. Dynamic separators completely successful and installed on both lines.	37	40	42	8.29	8.73	9.07
2. Operation w/dynamic separators does not meet QD requirements. Dynamic separators installed on one line only.	29	31	32	7.54	7.96	8.23
3. Operation w/dynamic separators is not possible. Static separators installed on both lines.	32	34	35	7.60	8.05	8.37
<u>ALT 3.</u> Perform MM&T project at JAAP or VAAP before rebuilding B and C lines.	65	71	76	7.40	8.77	9.41
<u>Possible Outcomes</u>						
1. Initially rebuild w/dynamic separators.						
a. Operation w/dynamic separators meets QD requirements.	66	71	76	8.26	8.92	9.48
b. Operation w/dynamic separators does not meet QD requirements.	65	71	76	8.20	8.92	9.35
c. Operation w/dynamic separators is not possible. Static separators are installed.	68	75	78	8.56	9.18	9.78
2. Initially rebuild w/static separators.	63	68	73	6.88	7.44	7.88

TABLE 1 (Cont'd)

Decision	Schedule (Mo)			Cost (\$M)		
	5%	Expected	95%	5%	Expected	95%
<u>ALT 4.</u> Defer decision until Canadian dynamic separators are evaluated.	38	45	70	7.79	8.70	9.26
<u>Possible Outcomes</u>						
1. Rebuild w/dynamic separators. No MM&T.						
a. Operation w/dynamic separators meets QD requirements.	39	42	44	8.09	8.74	9.26
b. Operation w/dynamic separators does not meet QD requirements.	40	42	44	8.10	8.82	9.35
c. Operation w/dynamic separators is not possible. Install static separators.	43	45	46	8.17	9.00	9.43
2. Rebuild w/dynamic separators after MM&T.						
a. Operation w/dynamic separators meets QD requirements.	67	72	77	8.34	8.94	9.50
b. Operation w/dynamic separators does not meet QD requirements.	67	71	75	8.18	9.05	9.30
c. Operation w/dynamic separators is not possible. Install static separators.	68	75	78	8.56	9.18	9.78
3. Rebuild w/static separators only.	37	43	68	6.75	7.27	7.66

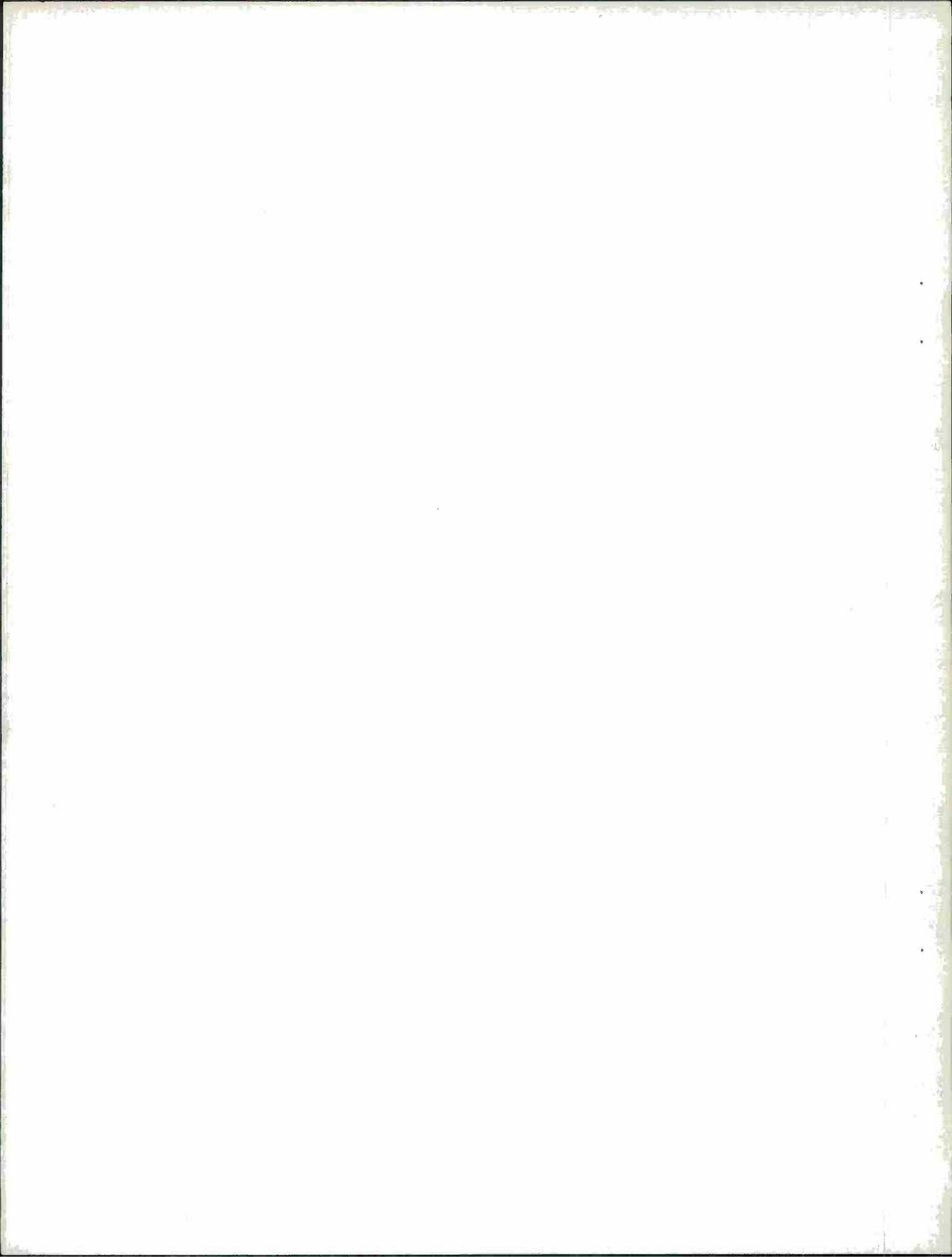
For ALT 4, if the decision were made to purchase and install dynamic separators at Radford after the Canadian units were evaluated, the expected time to complete the project is 42 months at an expected cost of \$8.74M. The 90% probability intervals for this outcome are 39 to 44 months and \$8.09M to \$9.26M. An increase of 11 months is incurred since the Canadian units would not be evaluated until late CY75 or early CY76. Then, if it were decided to perform a MM&T project before purchasing and installing dynamic separators at Radford AAP, an additional 18 to 20 months would be needed.

CONCLUSIONS

Preliminary testing of the dynamic separators would correct mechanical problems which would arise and reduce the probability from 4% to 2% that static separators would have to be retrofitted because operation with dynamic separators was infeasible. The probability that operation with dynamic separators will meet QD requirements is not increased by performing any preliminary testing, since successful operation is based on operating the TNT line at the increased flow rates. Because of this, there is little to be gained by ALT 1b, ALT 3, and ALT 4.

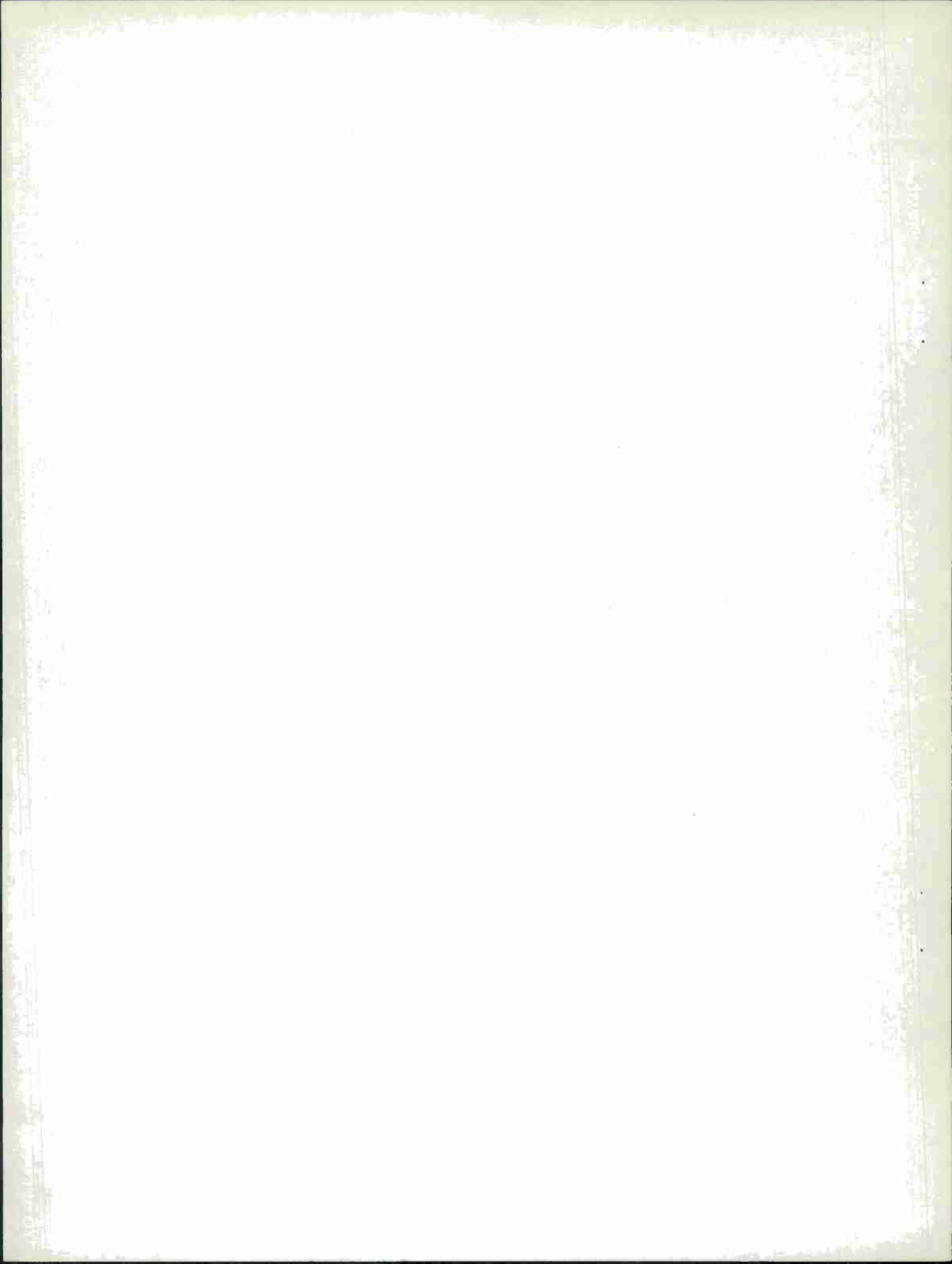
Rebuilding both lines with dynamic separators (ALT 1a) has a lower expected completion time than ALT 2 (initially proceeding with dynamic separators on only one TNT line); however, ALT 2 concludes with the same information on dynamic separators as ALT 1a, but without the additional sunk cost for dynamic separators. If operation with dynamic separators does not meet QD requirements, the expected cost of ALT 2 is \$8.0M in comparison to \$8.76M for ALT 1a. With ALT 2, time is sacrificed in converting the second line if dynamic separators are successful; however, there does not appear to be any reasons to require an earlier completion date based on current mobilization requirements as outlined in APPENDIX A.

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APPENDIX A
ADDITIONAL CONSIDERATIONS

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According to the Production Base Analysis (PBA for FY76-80), the Level II mobilization requirements for TNT production is 47.644M lbs/mo. This TNT requirement increases to 66M lbs/mo if ICMs can not be produced in the quantities stated in the PBA and HE rounds must be substituted in their place. The TNT lines which are designated to produce the required TNT are shown in Table A-1. Of the 22 lines listed in Table A-1, two of the TNT lines at Joliet are the manual batch lines; all others are continuous.

TABLE A-1. TNT MOBILIZATION REQUIREMENTS

<u>Location</u>	<u>No. of Lines</u>	<u>Capacity (M #/Mo)</u>
Newport	5	15
Volunteer	6	18
Joliet	8	24
Canadian Manufacturing	1	2
Radford ^a	2	6
Total		65M #/Mo.

^aAssuming B and C lines are rebuilt.

The number of lines that are currently capable of producing TNT are listed in Table A-2.

TABLE A-2. PRESENT TNT PRODUCTION CAPABILITY

<u>Location</u>	<u>No. of Lines</u>	<u>Type</u>		<u>Production Capability (M #/Mo)</u>
		<u>CIL</u>	<u>Batch</u>	
Newport	5	5	-	15
Volunteer	10	6	4	30
Joliet ^a	11	6	5	33
Canadian Manufacturing	1	1	-	2
Radford	0	-	-	-

^aJoliet has 5 additional batch lines which could produce TNT if supplied with enough oleum. To obtain this extra oleum, a new plant could be built at an estimated cost of \$24M.

As shown in Table A-2, without Radford's production, there is still enough TNT production capability to meet mobilization requirements. This would require the use of additional batch lines in place of the continuous lines. However, the present planning (Table A-1) includes the use of two batch lines and Joliet indicates that the batch lines can be activated with less risk in meeting the mobilization schedule. Therefore, the question concerning the actual need for B and C lines at Radford should be readdressed, based on an economic criteria.

There is still some question as to the actual TNT equivalence in the N and P building (estimates range from 12,000-20,000 pounds). It has been proposed that Picatinny Arsenal perform a test to determine the actual TNT equivalence in the N and P buildings of continuous TNT lines. Five months after Picatinny Arsenal is funded, the tests should be completed. If the results indicate that the TNT equivalence is less than 12,000 pounds, then operation of the TNT lines with static separators at Radford would meet QD requirements. If Radford is being used as a vehicle to prove out dynamic separators, then a counterargument can be made that it would be cheaper to install them at an already existing line, such as at Joliet, Volunteer, or Newport Army Ammunition Plants.

APPENDIX B
NETWORK DESCRIPTION WITH TIME AND COST INPUT DATA

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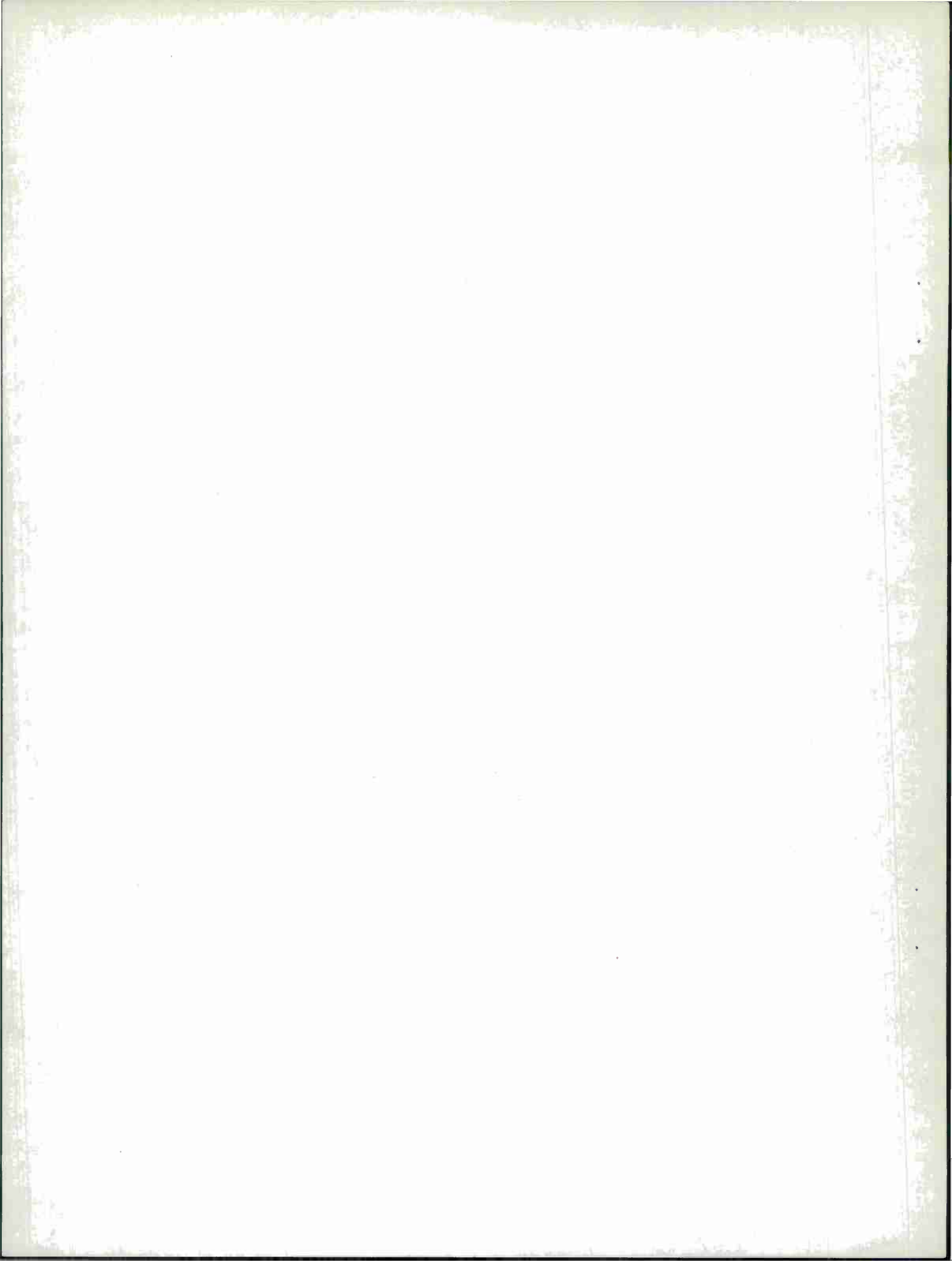


TABLE B-1. NETWORK DESCRIPTION

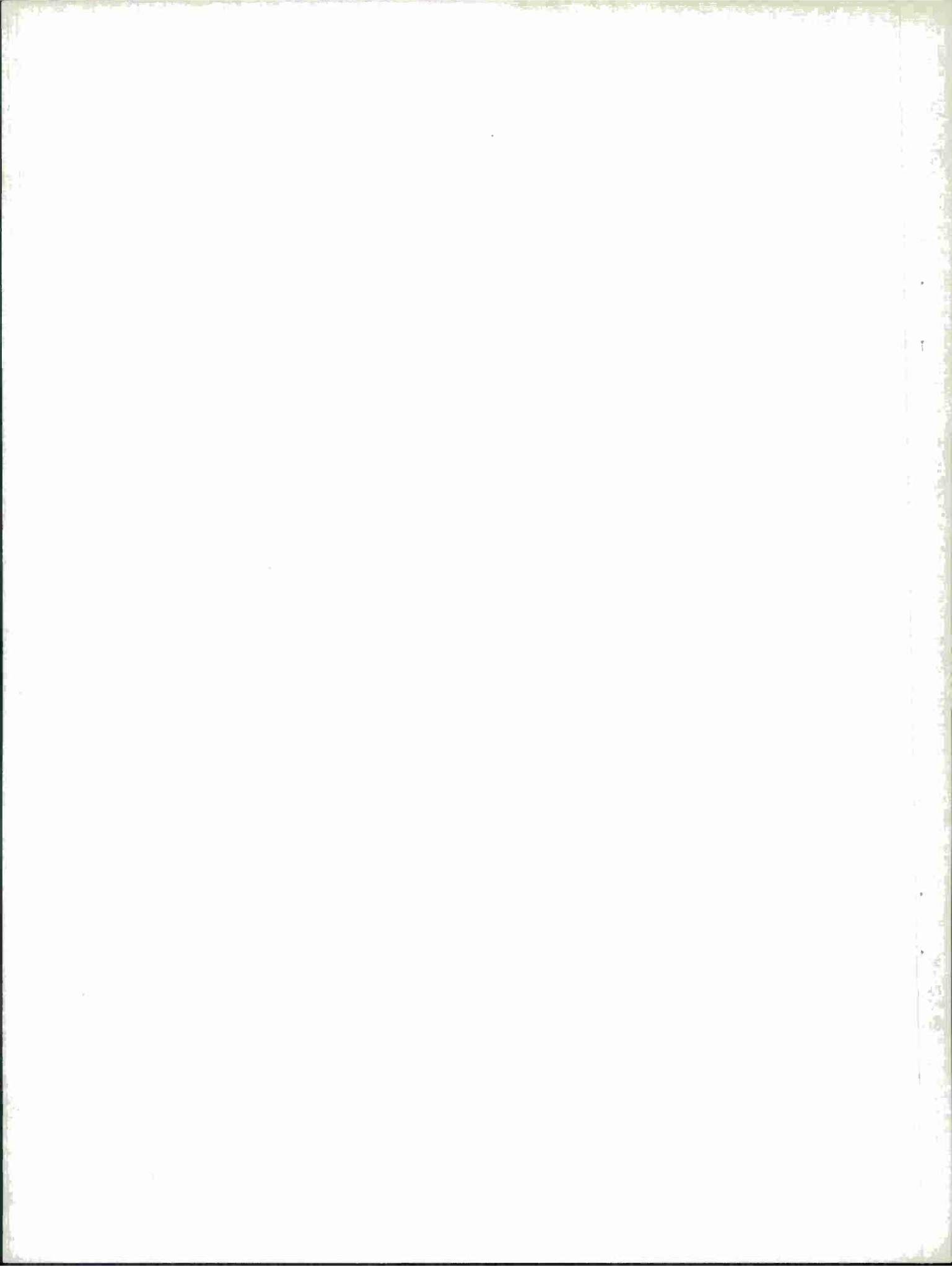
<u>Name</u>	<u>ACTIVITY</u> <u>Description</u>	<u>TIME</u> (Mo)	<u>COST</u> (\$M)
A4	Decide to restore line B with dynamic separators and line C with static separators.	-	-
A5	Restore line C with static separators.	26-28-30	3.25-3.615-3.977
A6	Restore line B with dynamic separators.	26-28-30	3.93-4.365-4.802
A7, A8 A15, A21 A34, A60 A61	Signal Arc.	-	-
A9, A22 A47, A52	Prove-out the TNT line which has the dynamic separators.	2-3-4	
23 A10	TNT line prove-out was unsuccessful. Static separators are necessary.	2-2-4	.075-.1-.125
A11, A23 A48, A53	TNT line prove-out was successful. Operation with dynamic separators meet QD requirements.	-	-
A12, A24 A49, A54	TNT prove-out determined that dynamic separators operate mechanically, but QD requirements are not met.	-	-
A17	Given that operation with dynamic separators meets QD requirements, then install dynamic separators on the other TNT line.	6-9-12	.675-.75-.825
A19	Decide to restore both B and C lines with dynamic separators.	-	-
A20, A46	Restore B and C lines with dynamic separators (Projects 5755901 and 5765901). Cost + 10% deviation.	26-28-30	7.86-8.73-9.60
A29	Same as A20 above, except that the time and cost for installation of half of the dynamic separators has been subtracted.	23-24-25	7.18-7.97-8.77

TABLE B-1. (Cont'd)

<u>Name</u>	<u>ACTIVITY</u> <u>Description</u>	<u>TIME</u> (Mo)	<u>COST</u> (\$M)
A30	While restoration of B and C lines is taking place, install a dynamic separator at JAAP or VAAP to test its mechanical ability. Leadtime, installation, testing, removal, and return shipment to Radford are considered.	10-12-14	.11-.125-.15
A31	Failure of larger size dynamic separators to function properly. Static separators are necessary.	-	-
A32	Dynamic separators will work mechanically, but major modifications are needed which would delay completion of project. Renegotiation of contracts, changes to equipment, and leadtime are considered.	12-15.5-19	.342-.38-.418
24 A33	Dynamic separators work properly with minor modifications. No slip in program.	0-1-2	.01-.05-.1
A62	If dynamic separators are rejected as a result of the preliminary testing at VAAP or JAAP, then B and C lines will be completed with static separators.	3-4-5	.15-.2-.25
A37	If dynamic separators are excepted as a result of the preliminary testing at VAAP or JAAP, then install them on B and C lines at RAAP.	3-4-5	.684-.760-.836
A38	Defer the decision to rebuild B and C lines until the Canadian dynamic separators are evaluated.	9-9-12	-
A39	Evaluate the Canadian dynamic separators.	1	.005
A40	Rebuild B and C lines w/static separators only.	26-28-30	6.5-7.23-7.95
A41	Based on favorable Canadian results, rebuild B and C lines with dynamic separators.	-	-
A42	Based on questionable Canadian results (their 20,000 liters/hr units work, but it's possible that the proposed 30,000 liters/hr units will not work) do a MM&T at VAAP or JAAP.	6-6-15	-

TABLE B-1. (Cont'd)

<u>Name</u>	<u>ACTIVITY</u> <u>Description</u>	<u>TIME</u> <u>(Mo)</u>	<u>COST</u> <u>(\$M)</u>
A43	Decide to do a MM&T project at VAAP or JAAP before B and C lines are restored. Money could be funded as a late-start FY76 or a FY77 project.	15-15-27	-
A44	MM&T project; includes negotiation, leadtime, installation and testing.	18-21-24	.175-.175-.225
A45	Based on unfavorable results from the MM&T, rebuild B and C lines with static separators.	26-28-30	6.5-7.23-7.95
A51, A26, A55	TNT Prove-out was unsuccessful. Static separators are necessary.	2-3-4	.15-.2-.25

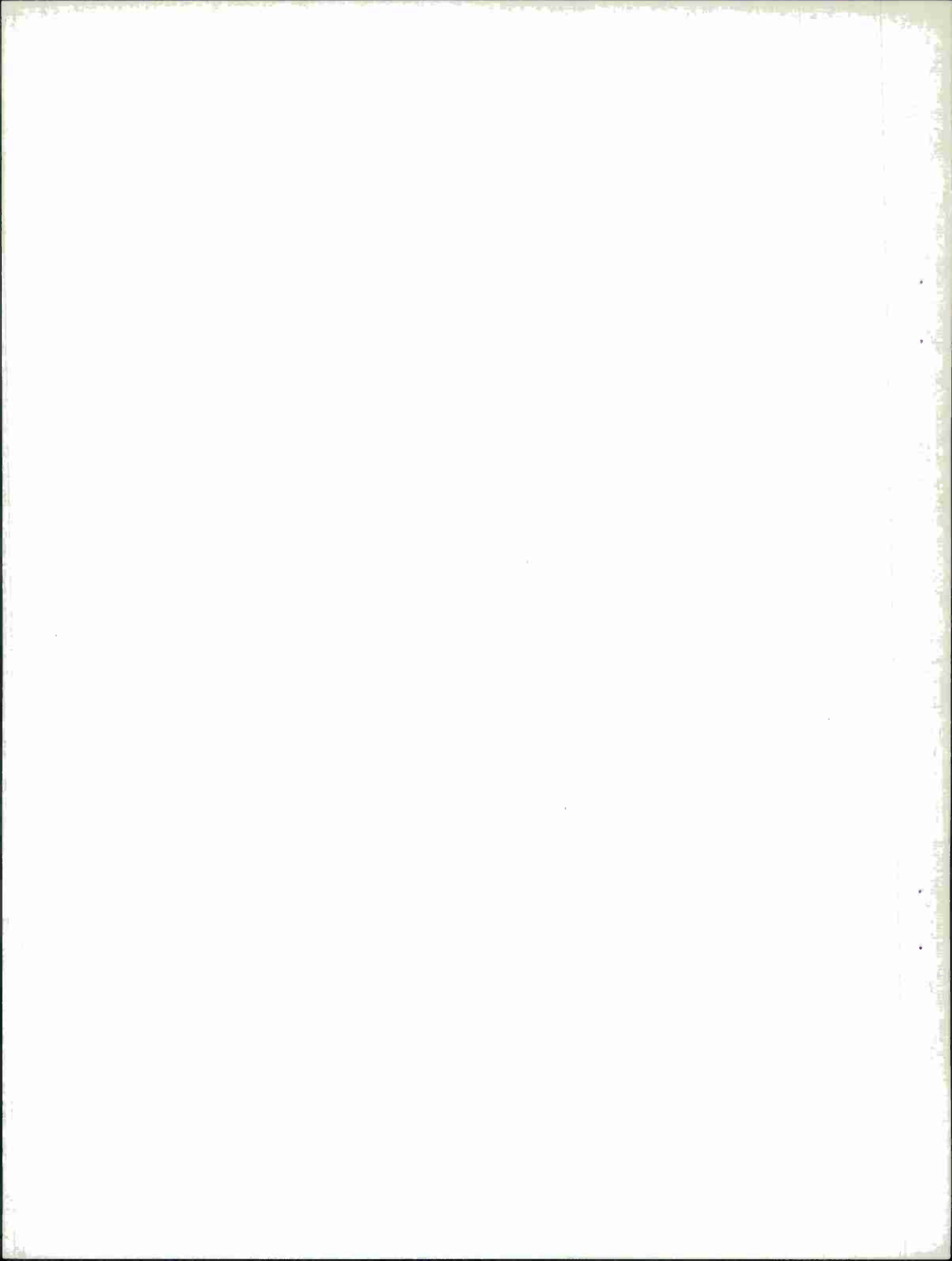


APPENDIX C

TERMINAL NODE HISTOGRAMS FOR EACH ALTERNATIVE

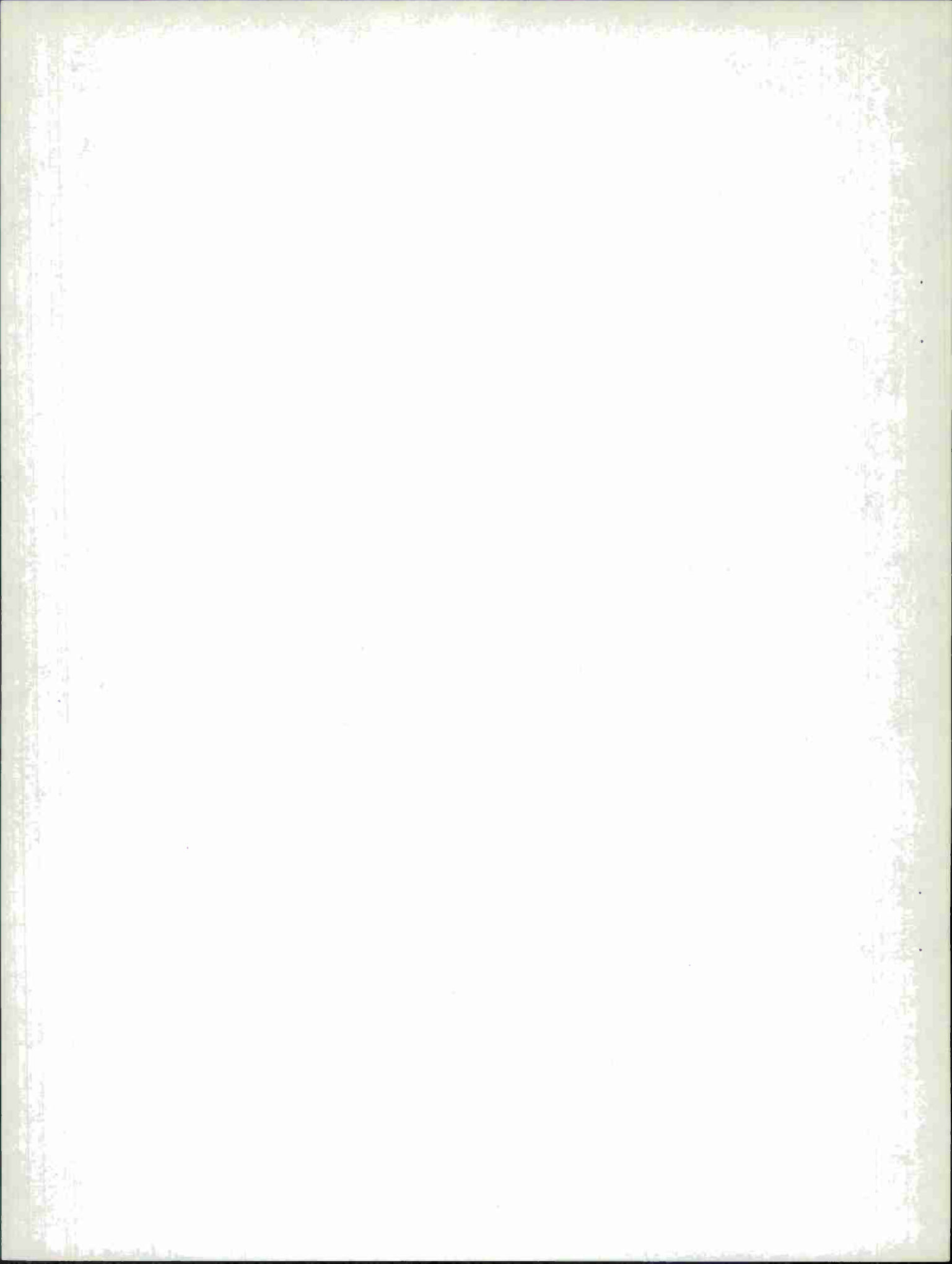
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PART 1. TIME AND COST DISTRIBUTIONS FOR ALT 1a

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PART 1. TIME AND COST DISTRIBUTIONS FOR ALT 1A

ALT 1A: Composite Time Distribution
 WFD 0.05 0.10 0.15 0.20 0.25

Time	MIN
28.8567	0.0
28.8567	0.013
29.1660	0.026
29.4754	0.051
29.7848	0.085
30.0942	0.095
30.4036	0.130
30.7130	0.120
31.0224	0.107
31.3318	0.113
31.6411	0.073
31.9505	0.068
32.2599	0.039
32.5693	0.033
32.8787	0.017
33.1881	0.005
33.4975	0.001
33.8069	0.002
34.1162	0.006
34.4256	0.003
34.7350	0.005
35.0444	0.003
35.3538	0.002
35.6632	0.001
35.9726	0.001
36.2820	0.0
36.5913	0.001
36.9010	0.0
36.9010	MAX

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
28.8567	I	I	I	I	I	I	I	I	I	I	0.0
28.8567	I	I	I	I	I	I	I	I	I	I	0.013
29.1660	I	I	I	I	I	I	I	I	I	I	0.039
29.4754	I	I	I	I	I	I	I	I	I	I	0.090
29.7848	I	I	I	I	I	I	I	I	I	I	0.175
30.0942	I	I	I	I	I	I	I	I	I	I	0.270
30.4036	I	I	I	I	I	I	I	I	I	I	0.400
30.7130	I	I	I	I	I	I	I	I	I	I	0.520
31.0224	I	I	I	I	I	I	I	I	I	I	0.627
31.3318	I	I	I	I	I	I	I	I	I	I	0.740
31.6411	I	I	I	I	I	I	I	I	I	I	0.813
31.9505	I	I	I	I	I	I	I	I	I	I	0.881
32.2599	I	I	I	I	I	I	I	I	I	I	0.920
32.5693	I	I	I	I	I	I	I	I	I	I	0.953
32.8787	I	I	I	I	I	I	I	I	I	I	0.970
33.1881	I	I	I	I	I	I	I	I	I	I	0.975
33.4975	I	I	I	I	I	I	I	I	I	I	0.976
33.8069	I	I	I	I	I	I	I	I	I	I	0.978
34.1162	I	I	I	I	I	I	I	I	I	I	0.984
34.4256	I	I	I	I	I	I	I	I	I	I	0.987
34.7350	I	I	I	I	I	I	I	I	I	I	0.992
35.0444	I	I	I	I	I	I	I	I	I	I	0.995
35.3538	I	I	I	I	I	I	I	I	I	I	0.997
35.6632	I	I	I	I	I	I	I	I	I	I	0.998
35.9726	I	I	I	I	I	I	I	I	I	I	0.999
36.2820	I	I	I	I	I	I	I	I	I	I	0.999
36.5913	I	I	I	I	I	I	I	I	I	I	1.000
36.9010	I	I	I	I	I	I	I	I	I	I	0.0
36.9010	I	I	I	I	I	I	I	I	I	I	MAX

NO. OBS. = 100 MEAN = 31.0900 STD ERROR = 1.0939 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 5.47
 MODE = 30.6442 PEARSONIAN SKEW = 0.41

PATH AND OVERALL COST ARE THE SAME FOR THE COMPOSITE TERMINAL NODE

ALT. 1A: Composite Cost Distribution

RFD	0.05	0.10	0.15	0.20	0.25	MIN
7.9112	I	I	I	I	I	0.0
7.9112	I					0.004
7.9112	I					0.006
7.9756	I					0.014
7.9756	I					0.029
8.0400	I					0.031
8.0400	I*					0.032
8.1044	I					0.041
8.1044	I**					0.037
8.1687	I					0.059
8.1687	I**					0.058
8.2331	I					0.062
8.2331	I***					0.075
8.2975	I					0.074
8.2975	I****					0.089
8.3619	I					0.060
8.3619	I****					0.046
8.4263	I					0.053
8.4263	I****					0.053
8.4906	I					0.034
8.4906	I****					0.035
8.5550	I					0.031
8.5550	I****					0.031
8.6194	I					0.019
8.6194	I****					0.019
8.6838	I					0.007
8.6838	I****					0.016
8.7482	I					0.004
8.7482	I****					0.004
8.8125	I					0.0
8.8125	I****					0.0
8.8769	I					0.0
8.8769	I****					0.0
8.9413	I					0.0
8.9413	I****					0.0
9.0057	I					0.0
9.0057	I****					0.0
9.0701	I					0.0
9.0701	I****					0.0
9.1344	I					0.0
9.1344	I****					0.0
9.1988	I					0.0
9.1988	I****					0.0
9.2632	I					0.0
9.2632	I****					0.0
9.3276	I					0.0
9.3276	I****					0.0
9.3920	I					0.0
9.3920	I****					0.0
9.4563	I					0.0
9.4563	I****					0.0
9.5207	I					0.0
9.5207	I****					0.0
9.5851	I					0.0
9.5851	I****					0.0
9.5851	I					0.0
9.5851	I					0.0

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
7.9112	I	I	I	I	I	I	I	I	I	I	0.0
7.9112	I										0.004
7.9112	I										0.010
7.9756	I										0.024
7.9756	I										0.053
8.0400	I										0.084
8.0400	I*										0.116
8.1044	I										0.157
8.1044	I**										0.194
8.1687	I										0.253
8.1687	I***										0.311
8.2331	I										0.373
8.2331	I****										0.448
8.2975	I										0.522
8.2975	I*****										0.611
8.3619	I										0.671
8.3619	I*****										0.717
8.4263	I										0.770
8.4263	I*****										0.823
8.4906	I										0.857
8.4906	I*****										0.892
8.5550	I										0.923
8.5550	I*****										0.954
8.6194	I										0.973
8.6194	I*****										0.980
8.6838	I										0.996
8.6838	I*****										1.000
8.7482	I										0.0
8.7482	I*****										0.0
8.8125	I										0.0
8.8125	I*****										0.0
8.8769	I										0.0
8.8769	I*****										0.0
8.9413	I										0.0
8.9413	I*****										0.0
9.0057	I										0.0
9.0057	I*****										0.0
9.0701	I										0.0
9.0701	I*****										0.0
9.1344	I										0.0
9.1344	I*****										0.0
9.1988	I										0.0
9.1988	I*****										0.0
9.2632	I										0.0
9.2632	I*****										0.0
9.3276	I										0.0
9.3276	I*****										0.0
9.3920	I										0.0
9.3920	I*****										0.0
9.4563	I										0.0
9.4563	I*****										0.0
9.5207	I										0.0
9.5207	I*****										0.0
9.5851	I										0.0
9.5851	I*****										0.0
9.5851	I										0.0
9.5851	I										0.0

NO. OBS. = 1000
MEAN =
MODE =

8.7330 STD ERROR =
8.7701 PEARSONIAN SKEW = 0.11

0.3453 COEF OF VARIATION = 0.04
KURTOSIS (BETA 2) = 2.45

NETWORK TIME FOR NODE N42
 ALT.1A: Operation Is Successful and QD Requirements Are Met.

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
28.8567	I	I	I	I	I	28.8567	I	I	I	I	I	I	I	I	I	I
	I				MIN											MIN
					0.0											0.0
28.8567	I					28.8567	I									
	I				0.008		I									0.008
29.0204	I					29.0204	I									
	I				0.008		I*									0.015
29.1841	I					29.1841	I									
	I*				0.016		I**									0.032
29.3477	I					29.3477	I									
	I*				0.015		I**									0.047
29.5114	I					29.5114	I									
	I**				0.021		I***									0.068
29.6751	I					29.6751	I									
	I***				0.041		I****									0.108
29.8388	I					29.8388	I									
	I****				0.042		I*****									0.150
30.0025	I					30.0025	I									
	I****				0.047		I*****									0.197
30.1662	I					30.1662	I									
	I*****				0.055		I*****									0.252
30.3299	I					30.3299	I									
	I*****				0.060		I*****									0.312
30.4936	I					30.4936	I									
	I*****				0.079		I*****									0.391
30.6573	I					30.6573	I									
	I*****				0.069		I*****									0.460
30.8210	I					30.8210	I									
	I*****				0.067		I*****									0.527
30.9847	I					30.9847	I									
	I*****				0.056		I*****									0.583
31.1484	I					31.1484	I									
	I*****				0.064		I*****									0.646
31.3121	I					31.3121	I									
	I*****				0.058		I*****									0.704
31.4758	I					31.4758	I									
	I*****				0.069		I*****									0.773
31.6395	I					31.6395	I									
	I**				0.039		I*****									0.813
31.8032	I					31.8032	I									
	I***				0.041		I*****									0.853
31.9669	I					31.9669	I									
	I****				0.044		I*****									0.897
32.1306	I					32.1306	I									
	I**				0.024		I*****									0.921
32.2943	I					32.2943	I									
	I**				0.024		I*****									0.945
32.4580	I					32.4580	I									
	I*				0.015		I*****									0.961
32.6217	I					32.6217	I									
	I**				0.024		I*****									0.985
32.7854	I					32.7854	I									
	I				0.009		I*****									0.993
32.9491	I					32.9491	I									
	I				0.007		I*****									1.000
33.1131	I					33.1131	I									
	I				0.0		I									0.0
33.1131	I					33.1131	I									MAX

33

NO. OBS. = 913 MEAN = 30.9603 STD ERROR = 0.8889 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.46
 MODE = 30.6006 PEARSONIAN SKEW = 0.40

PATH AND OVERALL COST ARE THE SAME FOR NODE N42

ALT. 1A: Operation is Successful and QD Requirements Are Met.

WFD					CFD										
					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
7.9112	I	----	I	MIN	7.9112	I	----	I	----	I	----	I	----	I	MIN
	I			0.0		I									0.0
7.9112	I			0.004	7.9112	I									0.004
	I			0.007		I									0.011
7.9756	I			0.013	7.9756	I									0.024
	I*			0.028		I*									0.053
8.0400	I			0.032	8.0400	I									0.084
	I**			0.032		I**									0.116
8.1044	I			0.039	8.1044	I									0.156
	I***			0.039		I***									0.195
8.1687	I			0.061	8.1687	I									0.256
	I****			0.057		I****									0.313
8.2331	I			0.064	8.2331	I									0.377
	I****			0.079		I****									0.456
8.2975	I			0.069	8.2975	I									0.525
	I****			0.088		I****									0.612
8.3619	I			0.061	8.3619	I									0.674
	I****			0.049		I****									0.723
8.4263	I			0.055	8.4263	I									0.778
	I*****			0.053		I*****									0.830
8.4906	I			0.032	8.4906	I									0.862
	I*****			0.035		I*****									0.897
8.5550	I			0.030	8.5550	I									0.927
	I*****			0.033		I*****									0.959
8.6194	I			0.018	8.6194	I									0.977
	I*****			0.005		I*****									0.982
8.6838	I			0.014	8.6838	I									0.997
	I*****			0.003		I*****									1.000
8.7482	I			0.0	8.7482	I									0.0
	I*****			MAX		I									MAX
8.8125	I			8.7286	8.8125	I									8.7749
	I*****			STD ERROR =		I									PEARSONIAN SKEW =
8.8769	I			0.3421	8.8769	I									0.14
	I*****			COEF OF VARIATION =		I									
8.9413	I			0.04	8.9413	I									KURTOSIS (BETA 2) =
	I*****			2.45		I									

NO. OPS. = 913 MEAN = 8.7286 STD ERROR = 0.3421 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.45
 MODE = 8.7749 PEARSONIAN SKEW = 0.14

NETWORK TIME FOR NODE N43

ALT.1A: Operation Is Successful, But QD Requirements Are Not Met

RFD		CFD	
0.05 0.10 0.15 0.20 0.25		0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0	
	MIN		MIN
29.6774	I-----I-----I-----I-----I	29.6774	I-----I-----I-----I-----I
I	0.0	I	0.0
29.6774	I	29.6774	I**
I****	0.045	I	0.045
29.7931	I	29.7931	I
I*****	0.068	I*****	0.114
29.9088	I	29.9088	I
I*****	0.068	I*****	0.182
30.0244	I	30.0244	I
I****	0.045	I*****	0.227
30.1401	I	30.1401	I
I*****	0.114	I*****	0.341
30.2558	I	30.2558	I
I	0.0	I*****	0.341
30.3715	I	30.3715	I
I****	0.045	I*****	0.386
30.4872	I	30.4872	I
I****	0.045	I*****	0.432
30.6029	I	30.6029	I
I*****	0.068	I*****	0.500
30.7186	I	30.7186	I
I****	0.045	I*****	0.545
30.8343	I	30.8343	I
I*****	0.068	I*****	0.614
30.9500	I	30.9500	I
I	0.0	I*****	0.614
31.0657	I	31.0657	I
I	0.0	I*****	0.614
31.1814	I	31.1814	I
I**	0.023	I*****	0.636
31.2971	I	31.2971	I
I****	0.045	I*****	0.682
31.4128	I	31.4128	I
I**	0.023	I*****	0.705
31.5284	I	31.5284	I
I*****	0.068	I*****	0.773
31.6441	I	31.6441	I
I****	0.045	I*****	0.818
31.7598	I	31.7598	I
I	0.0	I*****	0.818
31.8755	I	31.8755	I
I**	0.023	I*****	0.841
31.9912	I	31.9912	I
I**	0.023	I*****	0.864
32.1069	I	32.1069	I
I****	0.045	I*****	0.909
32.2226	I	32.2226	I
I	0.0	I*****	0.909
32.3383	I	32.3383	I
I**	0.023	I*****	0.932
32.4540	I	32.4540	I
I**	0.023	I*****	0.955
32.5697	I	32.5697	I
I****	0.045	I*****	1.000
32.6857	I	32.6857	I
I	0.0	I	0.0
32.6857	I	32.6857	I
I	MAX	I	MAX

35

NO. OBS. = 44 MEAN = 30.9170 STD ERROR = 0.8910 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 1.96
 MODE = 30.1835 PEARSONIAN SKEW = 0.82

PATH AND OVERALL COST ARE THE SAME FOR NODE N43

ALT. 1A: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0		
8.0519	I-----I-----I-----I-----I-----I	MIN	8.0519	I-----I-----I-----I-----I-----I	MIN	0.0											0.0	
8.0519	I	0.045	8.0519	I	0.045													
8.1021	I****	0.023	8.1021	I**	0.023													0.068
8.1523	I**	0.023	8.1523	I	0.023													0.091
8.2025	I**	0.023	8.2025	I*****	0.023													0.114
8.2528	I****	0.045	8.2528	I*****	0.045													0.159
8.3030	I****	0.045	8.3030	I*****	0.045													0.205
8.3532	I**	0.023	8.3532	I*****	0.023													0.227
8.4034	I	0.0	8.4034	I*****	0.0													0.227
8.4536	I*****	0.068	8.4536	I*****	0.068													0.295
8.5038	I*****	0.091	8.5038	I*****	0.091													0.386
8.5540	I*****	0.091	8.5540	I*****	0.091													0.477
8.6043	I**	0.023	8.6043	I*****	0.023													0.500
8.6545	I**	0.023	8.6545	I*****	0.023													0.523
8.7047	I*****	0.136	8.7047	I*****	0.136													0.659
8.7549	I*****	0.091	8.7549	I*****	0.091													0.750
8.8051	I****	0.045	8.8051	I*****	0.045													0.795
8.8553	I	0.0	8.8553	I*****	0.0													0.795
8.9055	I**	0.023	8.9055	I*****	0.023													0.818
8.9557	I**	0.023	8.9557	I*****	0.023													0.841
9.0060	I	0.0	9.0060	I*****	0.0													0.841
9.0562	I**	0.023	9.0562	I*****	0.023													0.864
9.1064	I	0.0	9.1064	I*****	0.0													0.864
9.1566	I*****	0.091	9.1566	I*****	0.091													0.955
9.2068	I	0.0	9.2068	I*****	0.0													0.955
9.2570	I	0.0	9.2570	I*****	0.0													0.955
9.3072	I****	0.045	9.3072	I*****	0.045													1.000
9.3575	I	0.0	9.3575	I	0.0													0.0
9.3575	I	MAX	9.3575	I	MAX													0.0

36

NO. OBS. = 44 MEAN = 8.6598 STD ERRGR = 0.3328 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.47
 MODE = 8.7405 PEARSONIAN SKEW = 0.24

NETWORK TIME FOR NODE N44

ALT.1A: Static Separators Are Installed And QD Requirements Are Not Met

RFD						CFD														
0.05 0.10 0.15 0.20 0.25						0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0														
MIN						MIN														
32.0007	I				0.0	32.0007	I													0.0
32.0007	I				0.023	32.0007	I													0.023
32.1891	I				0.023	32.1891	I													0.047
32.3776	I				0.047	32.3776	I													0.093
32.5661	I				0.070	32.5661	I													0.163
32.7545	I				0.023	32.7545	I													0.186
32.9430	I				0.093	32.9430	I													0.279
33.1314	I				0.070	33.1314	I													0.349
33.3199	I				0.070	33.3199	I													0.419
33.5084	I				0.023	33.5084	I													0.442
33.6968	I				0.023	33.6968	I													0.465
33.8853	I				0.0	33.8853	I													0.465
34.0737	I				0.093	34.0737	I													0.558
34.2622	I				0.093	34.2622	I													0.651
34.4507	I				0.0	34.4507	I													0.651
34.6391	I				0.047	34.6391	I													0.698
34.8276	I				0.093	34.8276	I													0.791
35.0161	I				0.070	35.0161	I													0.860
35.2045	I				0.023	35.2045	I													0.884
35.3930	I				0.047	35.3930	I													0.930
35.5814	I				0.023	35.5814	I													0.953
35.7699	I				0.0	35.7699	I													0.953
35.9584	I				0.023	35.9584	I													0.977
36.1468	I				0.0	36.1468	I													0.977
36.3353	I				0.0	36.3353	I													0.977
36.5237	I				0.0	36.5237	I													0.977
36.7122	I				0.023	36.7122	I													1.000
36.9010	I				0.0	36.9010	I													0.0
36.9010	I				MAX	36.9010	I													MAX

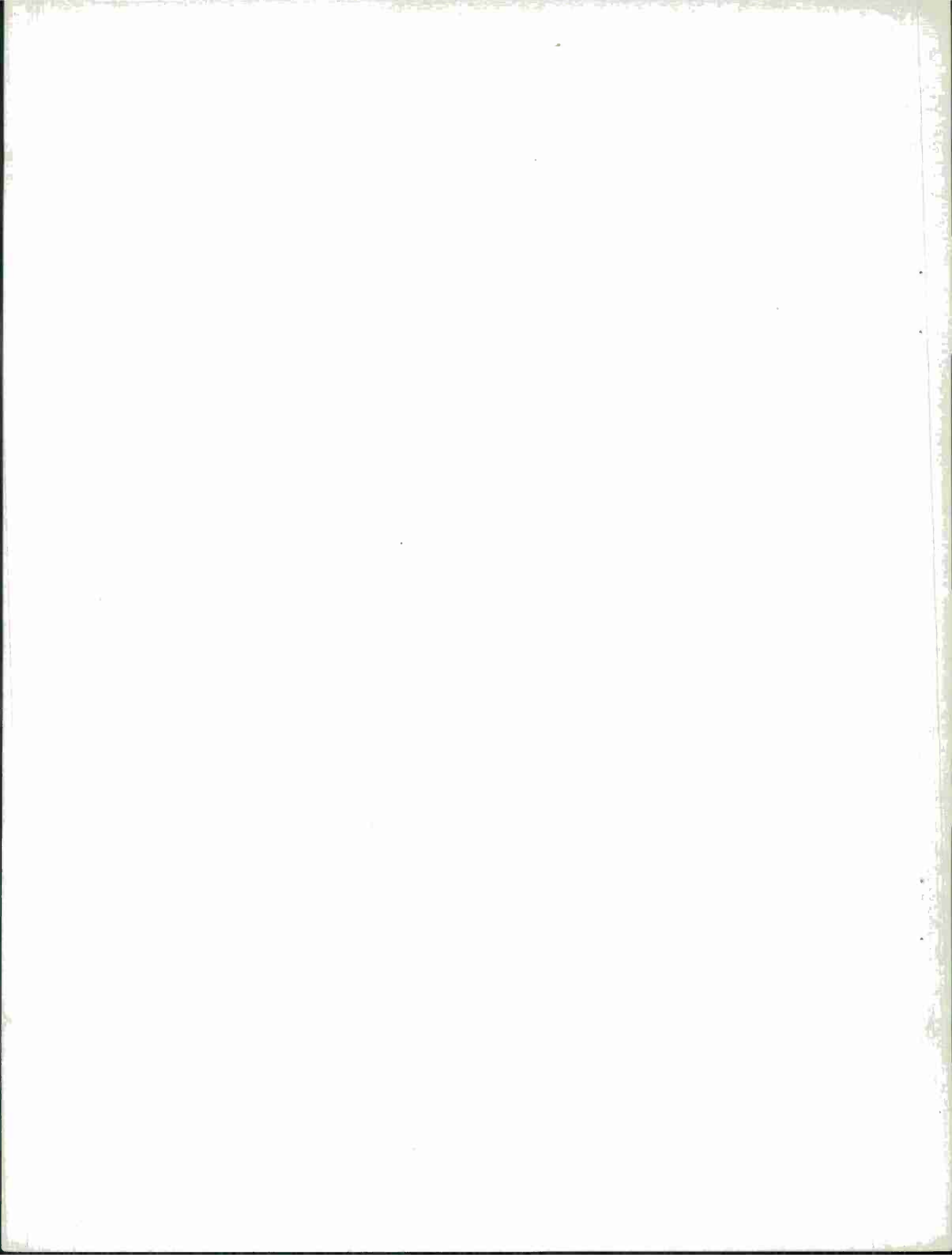
NO. OBS. = 43 MEAN =
A MULTIMODAL DISTRIBUTION

34.0230 STD ERROR =

1.1383 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.33

PART 2. TIME AND COST DISTRIBUTIONS FOR ALT 1b

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PART 2. TIME AND COST DISTRIBUTIONS FOR ALT 1B

ALT 1B: Composite Time Distribution
 RFD 0.05 0.10 0.15 0.20 0.25

TIME	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
27.1002	I										MIN
	I										0.0
27.1002	I										0.003
	I										
27.4872	I										0.016
	I*										
27.8742	I										0.007
	I										
28.2612	I										0.016
	I*										
28.6482	I										0.006
	I										
29.0352	I										0.007
	I										
29.4222	I										0.038
	I***										
29.8092	I										0.084
	I*****										
30.1962	I										0.120
	I*****										
30.5833	I										0.162
	I*****										
30.9703	I										0.198
	I*****										
31.3573	I										0.145
	I*****										
31.7443	I										0.089
	I*****										
32.1313	I										0.038
	I***										
32.5183	I										0.015
	I*										
32.9053	I										0.007
	I										
33.2923	I										0.001
	I										
33.6793	I										0.010
	I*										
34.0663	I										0.009
	I										
34.4533	I										0.009
	I										
34.8403	I										0.003
	I										
35.2274	I										0.002
	I										
35.6144	I										0.003
	I										
36.0014	I										0.002
	I										
36.3884	I										0.006
	I										
36.7754	I										0.004
	I										
37.1625	I										0.0
	I										
37.1625	I										0.0
	I										MAX

TIME	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
27.1002	I										MIN
	I										0.0
27.1002	I										0.003
	I										
27.4872	I										0.019
	I*										
27.8742	I										0.026
	I*										
28.2612	I										0.042
	I**										
28.6482	I										0.048
	I**										
29.0352	I										0.055
	I***										
29.4222	I										0.093
	I***										
29.8092	I										0.177
	I*****										
30.1962	I										0.297
	I*****										
30.5833	I										0.459
	I*****										
30.9703	I										0.657
	I*****										
31.3573	I										0.802
	I*****										
31.7443	I										0.891
	I*****										
32.1313	I										0.929
	I*****										
32.5183	I										0.944
	I*****										
32.9053	I										0.951
	I*****										
33.2923	I										0.952
	I*****										
33.6793	I										0.962
	I*****										
34.0663	I										0.971
	I*****										
34.4533	I										0.980
	I*****										
34.8403	I										0.983
	I*****										
35.2274	I										0.985
	I*****										
35.6144	I										0.988
	I*****										
36.0014	I										0.990
	I*****										
36.3884	I										0.996
	I*****										
36.7754	I										1.000
	I*****										
37.1625	I										0.0
	I										
37.1625	I										0.0
	I										MAX

NO. OBS. = 1000 MEAN =
MODE =

31.0834 STD ERROR =
31.1268 PEARSONIAN SKEW = 0.03

1.3135 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 7.51

PATH AND OVERALL COST ARE THE SAME FOR THE COMPOSITE TERMINAL NODE

ALT. 1B: Composite Cost Distribution

RFD 0.05 0.10 0.15 0.20 0.25

	0.05	0.10	0.15	0.20	0.25	MIN
7.7340	I	I	I	I	I	0.0
7.7340	I					0.002
7.8157	I					0.004
7.8975	I					0.002
7.9793	I					0.004
8.0610	I					0.006
8.1428	I					0.010
8.2246	I*					0.021
8.3063	I**					0.032
8.3881	I***					0.036
8.4699	I****					0.061
8.5516	I*****					0.062
8.6334	I*****					0.070
8.7152	I*****					0.083
8.7969	I*****					0.077
8.8787	I*****					0.083
8.9605	I*****					0.090
9.0422	I*****					0.089
9.1240	I*****					0.075
9.2058	I*****					0.051
9.2876	I****					0.043
9.3693	I***					0.035
9.4511	I**					0.028
9.5329	I*					0.019
9.6146	I					0.010
9.6964	I					0.005
9.7782	I					0.002
9.8599	I					0.0
9.8599	I					MAX

42

CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
7.7340	I	I	I	I	I	I	I	I	I	I	0.0
7.7340	I										0.002
7.8157	I										0.006
7.8975	I										0.008
7.9793	I										0.012
8.0610	I*										0.018
8.1428	I*										0.028
8.2246	I**										0.049
8.3063	I***										0.081
8.3881	I****										0.117
8.4699	I*****										0.178
8.5516	I*****										0.240
8.6334	I*****										0.310
8.7152	I*****										0.393
8.7969	I*****										0.470
8.8787	I*****										0.553
8.9605	I*****										0.643
9.0422	I*****										0.732
9.1240	I*****										0.807
9.2058	I*****										0.858
9.2876	I*****										0.901
9.3693	I*****										0.936
9.4511	I*****										0.964
9.5329	I*****										0.983
9.6146	I*****										0.993
9.6964	I*****										0.998
9.7782	I*****										1.000
9.8599	I*****										0.0
9.8599	I*****										MAX

NO. OFS. = 1000 MEAN =
MODE =

8.8954 STD ERROR =
9.0320 PEARSONIAN SKEW =

0.3602 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.79

NETWORK TIME FOR NODE N45

ALT.10: Operation Is Successful and QD Requirements Are Met.

RFD		0.05	0.10	0.15	0.20	0.25	CFD												
							0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0			
28.8994	I	----	----	----	----	----	I	----	----	----	----	----	----	----	----	----	----	MIN	MIN
	I					0.0												0.0	0.0
28.8994	I					0.004												0.004	0.004
29.2172	I*					0.015												0.015	0.019
29.5350	I					0.037												0.037	0.056
29.8528	I					0.075												0.075	0.131
30.1707	I					0.105												0.105	0.236
30.4885	I					0.123												0.123	0.359
30.8063	I					0.175												0.175	0.534
31.1241	I					0.153												0.153	0.687
31.4419	I					0.123												0.123	0.810
31.7597	I					0.081												0.081	0.890
32.0775	I					0.043												0.043	0.933
32.3953	I*					0.020												0.020	0.953
32.7131	I					0.007												0.007	0.960
33.0309	I					0.004												0.004	0.964
33.3488	I					0.0												0.0	0.964
33.6666	I					0.007												0.007	0.971
33.9844	I					0.004												0.004	0.974
34.3022	I					0.002												0.002	0.977
34.6200	I					0.005												0.005	0.981
34.9378	I					0.001												0.001	0.982
35.2556	I					0.001												0.001	0.984
35.5734	I					0.002												0.002	0.986
35.8912	I					0.002												0.002	0.988
36.2090	I					0.002												0.002	0.991
36.5269	I					0.007												0.007	0.998
36.8447	I					0.002												0.002	1.000
37.1625	I					0.0												0.0	0.0
37.1625	I					MAX												MAX	MAX

43

NO. OBS. = 850 MEAN = 31.1738 STD ERROR = 1.1003 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 11.32
 MODE = 31.0297 PEARSONIAN SKEW = 0.13

PATH AND OVERALL COST ARE THE SAME FOR NODE N45
 ALT.18: Operation Is Successful and QD Requirements Are Met.
 RFD 0.05 0.10 0.15 0.20 0.25

	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
8.1196 I	I	I	I	I	I	I	I	I	I	I	I	0.0
8.1196 I	I											0.007
8.1865 I	I											0.007
8.2535 I	I*											0.019
8.3204 I	I**											0.022
8.3873 I	I**											0.025
8.4543 I	I****											0.051
8.5212 I	I****											0.042
8.5881 I	I****											0.056
8.6551 I	I****											0.057
8.7220 I	I*****											0.068
8.7890 I	I*****											0.065
8.8559 I	I*****											0.064
8.9228 I	I*****											0.078
8.9898 I	I*****											0.072
9.0567 I	I*****											0.083
9.1236 I	I*****											0.067
9.1906 I	I****											0.049
9.2575 I	I***											0.039
9.3244 I	I**											0.040
9.3914 I	I*											0.028
9.4583 I	I											0.020
9.5253 I	I											0.020
9.5922 I	I											0.012
9.6591 I	I											0.005
9.7261 I	I											0.002
9.7930 I	I											0.002
9.8599 I	I											0.0
9.8599 I	I											0.0

44

NO. OBS. = 856 MEAN = 8.9265 STD ERROR = 0.3345 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.50
 MODE = 9.0829 PEARSONIAN SKEW = 0.47

NETWORK TIME FOR NODE N46

ALT.JR: Operation Is Successful, But QD Requirements Are Not Met
 RFD 0.05 0.10 0.15 0.20 0.25

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
29.5413	I	I	I	I	I	I	I	I	I	I	0.0
29.5413	I	I	I	I	I	I	I	I	I	I	0.026
29.7316	I**	I	I	I	I	I	I	I	I	I	0.039
29.9219	I***	I	I	I	I	I	I	I	I	I	0.078
30.1122	I****	I	I	I	I	I	I	I	I	I	0.039
30.3026	I*****	I	I	I	I	I	I	I	I	I	0.026
30.4929	I*****	I	I	I	I	I	I	I	I	I	0.104
30.6832	I*****	I	I	I	I	I	I	I	I	I	0.039
30.8735	I*****	I	I	I	I	I	I	I	I	I	0.104
31.0639	I*****	I	I	I	I	I	I	I	I	I	0.156
31.2542	I*****	I	I	I	I	I	I	I	I	I	0.143
31.4445	I*****	I	I	I	I	I	I	I	I	I	0.104
31.6348	I*****	I	I	I	I	I	I	I	I	I	0.039
31.8251	I*****	I	I	I	I	I	I	I	I	I	0.026
32.0155	I*****	I	I	I	I	I	I	I	I	I	0.013
32.2058	I*****	I	I	I	I	I	I	I	I	I	0.0
32.3961	I*****	I	I	I	I	I	I	I	I	I	0.013
32.5864	I*****	I	I	I	I	I	I	I	I	I	0.026
32.7768	I*****	I	I	I	I	I	I	I	I	I	0.0
32.9671	I*****	I	I	I	I	I	I	I	I	I	0.0
33.1574	I*****	I	I	I	I	I	I	I	I	I	0.0
33.3477	I*****	I	I	I	I	I	I	I	I	I	0.0
33.5381	I*****	I	I	I	I	I	I	I	I	I	0.0
33.7284	I*****	I	I	I	I	I	I	I	I	I	0.0
33.9187	I*****	I	I	I	I	I	I	I	I	I	0.013
34.1090	I*****	I	I	I	I	I	I	I	I	I	0.0
34.2993	I*****	I	I	I	I	I	I	I	I	I	0.013
34.4898	I*****	I	I	I	I	I	I	I	I	I	0.0
34.4898	I*****	I	I	I	I	I	I	I	I	I	0.0

45

NO. OBS. = 77
 MEAN =
 MODE =

31.0919 STD ERROR =
 31.2161 PEARSONIAN SKEW = 0.14

0.8591 COEF OF VARIATION = 0.03
 KURTOSIS (BETA 2) = 6.35

PATH AND OVERALL COST ARE THE SAME FOR NODE N46

ALT. 1R: Operation Is Successful, But QD Requirements Are Not Met

RFD 0.05 0.10 0.15 0.20 0.25

CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

Node	Path	MIN
8.1899	I	0.0
4.1899	I	
	I*	0.013
8.2487	I	
	I**	0.026
8.3075	I	
	I*	0.013
8.3663	I	
	I*	0.013
8.4250	I	
	I***	0.039
8.4838	I	
	I**	0.026
8.5426	I	
	I*****	0.078
8.6014	I	
	I***	0.039
8.6601	I	
	I*****	0.065
8.7189	I	
	I**	0.026
8.7777	I	
	I*****	0.117
8.8365	I	
	I*****	0.091
8.8952	I	
	I*****	0.052
8.9540	I	
	I*****	0.052
9.0128	I	
	I*****	0.052
9.0716	I	
	I***	0.039
9.1303	I	
	I***	0.039
9.1891	I	
	I*****	0.065
9.2479	I	
	I**	0.026
9.3067	I	
	I**	0.026
9.3654	I	
	I*	0.013
9.4242	I	
	I*	0.013
9.4830	I	
	I***	0.039
9.5418	I	
	I**	0.026
9.6005	I	
	I	0.0
9.6593	I	
	I*	0.013
9.7181	I	
	I	0.0
9.7181	I	MAX

Node	Path	MIN
8.1899	I	0.0
	I	
8.1899	I	
	I*	0.013
8.2487	I	
	I**	0.039
8.3075	I	
	I***	0.052
8.3663	I	
	I***	0.065
8.4250	I	
	I*****	0.104
8.4838	I	
	I*****	0.130
8.5426	I	
	I*****	0.208
8.6014	I	
	I*****	0.247
8.6601	I	
	I*****	0.312
8.7189	I	
	I*****	0.338
8.7777	I	
	I*****	0.455
8.8365	I	
	I*****	0.545
8.8952	I	
	I*****	0.597
8.9540	I	
	I*****	0.649
9.0128	I	
	I*****	0.701
9.0716	I	
	I*****	0.740
9.1303	I	
	I*****	0.779
9.1891	I	
	I*****	0.844
9.2479	I	
	I*****	0.870
9.3067	I	
	I*****	0.896
9.3654	I	
	I*****	0.909
9.4242	I	
	I*****	0.922
9.4830	I	
	I*****	0.961
9.5418	I	
	I*****	0.987
9.6005	I	
	I*****	0.987
9.6593	I	
	I*****	1.000
9.7181	I	
	I	0.0
9.7181	I	MAX

NO. OBS. = 77 MEAN =
MODE =

8.9043 STD ERROR =
8.8234 PEARSONIAN SKEW =

0.3424 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.56

NETWORK TIME FOR NODE N47

ALTIM: Static Separators Are Installed And QD Requirements Are Not Met

RFD		CFD									
0.05 0.10 0.15 0.20 0.25		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
27.1002	I-----I-----I-----I-----I MIN	27.1002	I-----I-----I-----I-----I-----I-----I-----I-----I-----I	MIN							
	I		I	0.0							0.0
27.1002	I	27.1002	I								
	I****		I**	0.045							0.045
27.4581	I	27.4581	I								
	I*****		I*****	0.209							0.254
27.8161	I	27.8161	I								
	I*****		I*****	0.119							0.373
28.1740	I	28.1740	I								
	I*****		I*****	0.134							0.507
28.5320	I	28.5320	I								
	I*****		I*****	0.164							0.672
28.8900	I	28.8900	I								
	I**		I*****	0.030							0.701
29.2479	I	29.2479	I								
	I		I*****	0.0							0.701
29.6059	I	29.6059	I								
	I		I*****	0.0							0.701
29.9638	I	29.9638	I								
	I		I*****	0.0							0.701
30.3218	I	30.3218	I								
	I		I*****	0.0							0.701
30.6797	I	30.6797	I								
	I		I*****	0.0							0.701
31.0377	I	31.0377	I								
	I		I*****	0.0							0.701
31.3956	I	31.3956	I								
	I		I*****	0.0							0.701
31.7536	I	31.7536	I								
	I		I*****	0.0							0.701
32.1116	I	32.1116	I								
	I		I*****	0.0							0.701
32.4695	I	32.4695	I								
	I*		I*****	0.015							0.716
32.8275	I	32.8275	I								
	I**		I*****	0.030							0.746
33.1854	I	33.1854	I								
	I**		I*****	0.030							0.776
33.5434	I	33.5434	I								
	I****		I*****	0.045							0.821
33.9013	I	33.9013	I								
	I**		I*****	0.030							0.851
34.2593	I	34.2593	I								
	I*****		I*****	0.075							0.925
34.6172	I	34.6172	I								
	I****		I*****	0.045							0.970
34.9752	I	34.9752	I								
	I*		I*****	0.015							0.985
35.3332	I	35.3332	I								
	I		I*****	0.0							0.985
35.6911	I	35.6911	I								
	I		I*****	0.0							0.985
36.0491	I	36.0491	I								
	I*		I*****	0.015							1.000
36.4072	I	36.4072	I								
	I		I	0.0							0.0
36.4072	I	36.4072	I								MAX

NO. OBS. = 67 MEAN = 29.9215 STD ERROR = 2.8465 COEF OF VARIATION = 0.10 KURTOSIS (BETA 2) = 2.04
 MODE = 27.6877 PEARSONIAN SKEW = 0.78

PATH AND OVERALL COST ARE THE SAME FOR NODE N47

ALT. 18: Static Separators Are Installed And QD Requirements Are Not Met

RFD						CFD														
0.05 0.10 0.15 0.20 0.25						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0					
7.7340	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	MIN
	I																			0.0
7.7340	I																			0.030
	I**																			
7.8107	I																			0.030
	I**																			
7.8874	I																			0.060
	I*****																			
7.9641	I																			0.045
	I****																			
8.0408	I																			0.060
	I*****																			
8.1175	I																			0.045
	I****																			
8.1942	I																			0.060
	I*****																			
8.2709	I																			0.090
	I*****																			
8.3476	I																			0.045
	I****																			
8.4243	I																			0.090
	I*****																			
8.5011	I																			0.090
	I*****																			
8.5778	I																			0.075
	I*****																			
8.6545	I																			0.045
	I****																			
8.7312	I																			0.015
	I*																			
8.8079	I																			0.030
	I**																			
8.8846	I																			0.015
	I*																			
8.9613	I																			0.060
	I*****																			
9.0380	I																			0.015
	I*																			
9.1147	I																			0.030
	I**																			
9.1914	I																			0.015
	I*																			
9.2682	I																			0.0
	I																			
9.3449	I																			0.015
	I*																			
9.4216	I																			0.015
	I*																			
9.4983	I																			0.0
	I																			
9.5750	I																			0.015
	I*																			
9.6517	I																			0.015
	I*																			
9.7284	I																			0.0
	I																			
9.7284	I																			0.0
	I																			
																				MAX

48

NO. OBS. = 67 MEAN =
A MULTIMODAL DISTRIBUTION

8.4915 STD ERROR =

0.4476 COEF OF VARIATION = 0.05 KURTOSIS (BETA 2) = 3.06

PATH AND OVERALL COST ARE THE SAME FOR NODE N39
 ALT.2: Operation Is Successful and QD Requirements Are Met.

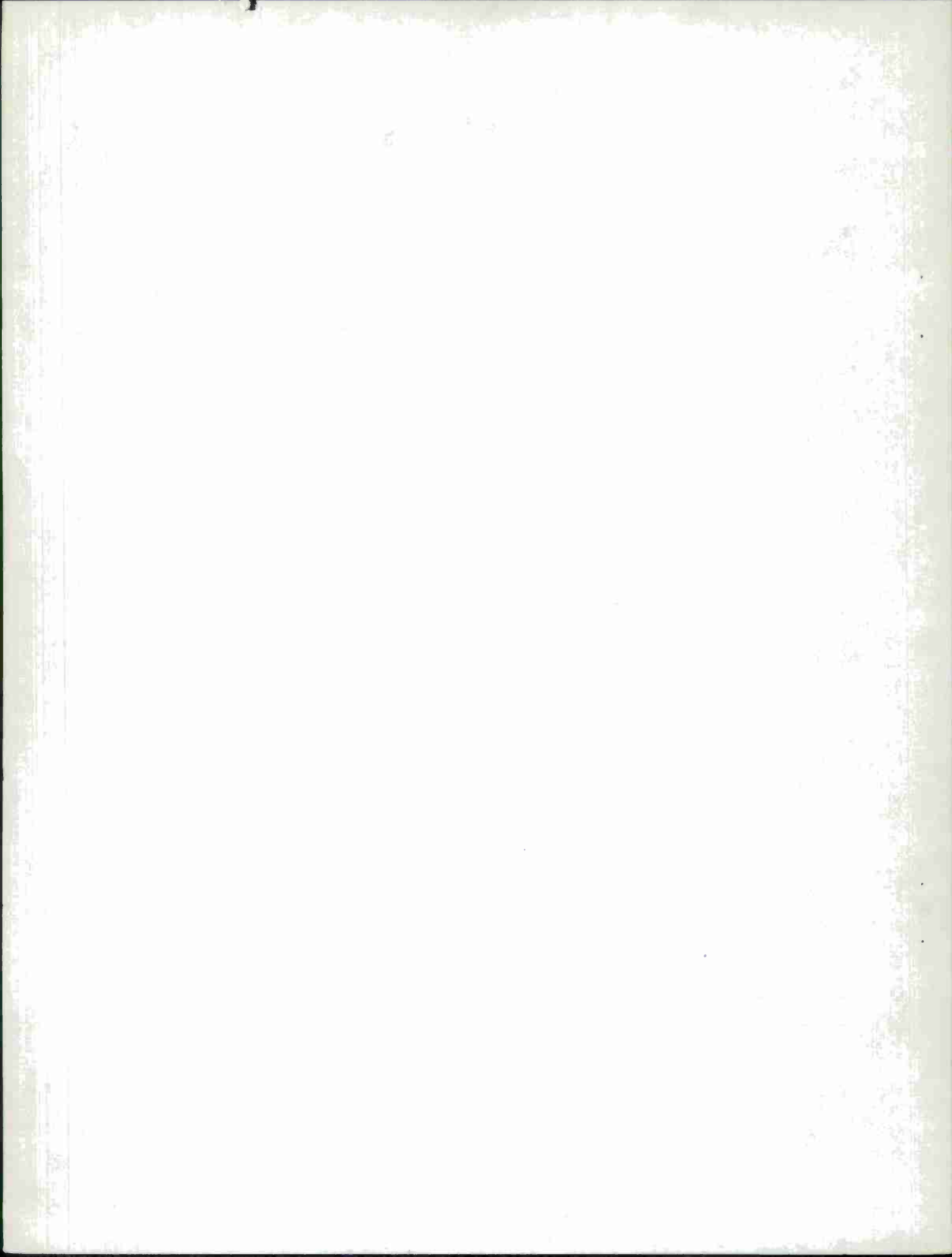
RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
8.0958	I	I	I	I	I	8.0958	I	I	I	I	I	I	I	I	I	I
	I				0.0		I									0.0
8.0958	I				0.002	8.0958	I									0.002
8.1447	I				0.006	8.1447	I									0.008
8.1937	I				0.007	8.1937	I									0.015
8.2426	I				0.016	8.2426	I*									0.030
8.2916	I				0.021	8.2916	I**									0.051
8.3405	I				0.029	8.3405	I***									0.080
8.3895	I				0.031	8.3895	I****									0.112
8.4384	I				0.030	8.4384	I*****									0.142
8.4874	I				0.059	8.4874	I*****									0.201
8.5363	I				0.063	8.5363	I*****									0.263
8.5853	I				0.087	8.5853	I*****									0.350
8.6342	I				0.077	8.6342	I*****									0.427
8.6832	I				0.088	8.6832	I*****									0.516
8.7321	I				0.077	8.7321	I*****									0.593
8.7811	I				0.073	8.7811	I*****									0.665
8.8300	I				0.075	8.8300	I*****									0.740
8.8789	I				0.050	8.8789	I*****									0.790
8.9279	I				0.057	8.9279	I*****									0.847
8.9768	I				0.046	8.9768	I*****									0.893
9.0258	I				0.036	9.0258	I*****									0.929
9.0747	I				0.025	9.0747	I*****									0.953
9.1237	I				0.018	9.1237	I*****									0.971
9.1726	I				0.016	9.1726	I*****									0.987
9.2216	I				0.009	9.2216	I*****									0.996
9.2705	I				0.003	9.2705	I*****									0.999
9.3195	I				0.001	9.3195	I*****									1.000
9.3684	I				0.0	9.3684	I									0.0
	I				MAX		I									MAX

50

NO. OBS. = 896 MEAN = 8.7277 STD ERROR = 0.2309 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.65
 MODE = 8.7076 PEARSONIAN SKEW = 0.09

PART 3. TIME AND COST DISTRIBUTIONS FOR ALT 2

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PART 3. TIME AND COST DISTRIBUTIONS FOR ALT 2

ALT 2: Composite Time Distribution

RFD 0.05 0.10 0.15 0.20 0.25					CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0																
				MIN																MIN	
28.7396	I				0.0	28.7396	I													0.0	
28.7396	I					28.7396	I														0.005
29.3582	I				0.005	29.3582	I														0.011
29.9769	I				0.006	29.9769	I*														0.021
30.5955	I				0.010	30.5955	I*														0.042
31.2142	I				0.021	31.2142	I**														0.054
31.8328	I				0.012	31.8328	I***														0.061
32.4515	I				0.007	32.4515	I***														0.070
33.0701	I				0.009	33.0701	I****														0.075
33.6888	I				0.005	33.6888	I****														0.094
34.3074	I*				0.019	34.3074	I*****														0.100
34.9261	I				0.006	34.9261	I*****														0.103
35.5447	I				0.003	35.5447	I*****														0.104
36.1634	I				0.001	36.1634	I*****														0.114
36.7820	I*				0.010	36.7820	I*****														0.146
37.4007	I**				0.032	37.4007	I*****														0.204
38.0193	I***				0.058	38.0193	I*****														0.283
38.6380	I****				0.079	38.6380	I*****														0.379
39.2567	I*****				0.096	39.2567	I*****														0.513
39.8753	I*****				0.134	39.8753	I*****														0.640
40.4940	I*****				0.127	40.4940	I*****														0.778
41.1126	I*****				0.138	41.1126	I*****														0.876
41.7313	I*****				0.098	41.7313	I*****														0.946
42.3499	I*****				0.070	42.3499	I*****														0.973
42.9686	I**				0.027	42.9686	I*****														0.995
43.5872	I**				0.022	43.5872	I*****														0.998
44.2059	I				0.003	44.2059	I*****														1.000
44.8249	I				0.002	44.8249	I*****														0.0
44.8249	I				0.0	44.8249	I														0.0
					MAX																MAX

NO. OPS. = 1000
MEAN =
MODE =

39.2144
40.6274
STD ERROR =
PEARSONIAN SKEW = 0.49

2.8830
COEF OF VARIATION = 0.07
KURTOSIS (BETA 2) = 5.57

53

PAIN AND OVERALL COST ARE THE SAME FOR THE COMPOSITE TERMINAL NODE

ALT.2: Composite Cost Distribution
 RFD 0.05 0.10 0.15 0.20 0.25

	0.05	0.10	0.15	0.20	0.25
7.4772	I	I	I	I	I
I					MIN
I					0.0
7.4772	I				
I					0.002
7.5500	I				
I					0.006
7.6227	I				
I					0.005
7.6954	I				
I					0.003
7.7682	I				
I*					0.013
7.8409	I				
I*					0.010
7.9137	I				
I*					0.010
7.9864	I				
I*					0.011
8.0591	I				
I*					0.011
8.1319	I				
I*					0.017
8.2046	I				
I***					0.033
8.2774	I				
I**					0.029
8.3501	I				
I****					0.045
8.4228	I				
I****					0.041
8.4956	I				
I*****					0.083
8.5683	I				
I*****					0.109
8.6410	I				
I*****					0.113
8.7138	I				
I*****					0.100
8.7865	I				
I*****					0.096
8.8593	I				
I*****					0.081
8.9320	I				
I*****					0.070
9.0047	I				
I****					0.049
9.0775	I				
I***					0.033
9.1502	I				
I*					0.019
9.2230	I				
I					0.008
9.2957	I				
I					0.003
9.3684	I				
I					0.0
9.3684	I				MAX

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
7.4772	I	I	I	I	I	I	I	I	I	I
I										MIN
I										0.0
7.4772	I									
I										0.002
7.5500	I									
I										0.008
7.6227	I									
I*										0.013
7.6954	I									
I*										0.016
7.7682	I									
I*										0.029
7.8409	I									
I**										0.039
7.9137	I									
I**										0.049
7.9864	I									
I***										0.060
8.0591	I									
I***										0.071
8.1319	I									
I****										0.088
8.2046	I									
I*****										0.121
8.2774	I									
I*****										0.150
8.3501	I									
I*****										0.195
8.4228	I									
I*****										0.236
8.4956	I									
I*****										0.319
8.5683	I									
I*****										0.428
8.6410	I									
I*****										0.541
8.7138	I									
I*****										0.641
8.7865	I									
I*****										0.737
8.8593	I									
I*****										0.818
8.9320	I									
I*****										0.888
9.0047	I									
I*****										0.937
9.0775	I									
I*****										0.970
9.1502	I									
I*****										0.989
9.2230	I									
I*****										0.997
9.2957	I									
I*****										1.000
9.3684	I									
I										0.0
9.3684	I									MAX

54

NO. OBS. = 1000 MEAN = 8.6514 STD ERROR = 0.3215 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 4.04
 MODE = 8.6582 PEARSONIAN SKEW = 0.02

NETWORK TIME FOR NODE N40

ALT. 2: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
28.7396	I	I	I	I	I	28.7396	I	I	I	I	I	I	I	I	I	I
	I				0.0		I									0.0
28.7396	I					28.7396	I									
	I***				0.033		I**									0.033
28.8882	I					28.8882	I									
	I*				0.016		I**									0.049
29.0367	I					29.0367	I									
	I*				0.016		I***									0.066
29.1853	I					29.1853	I									
	I*				0.016		I****									0.082
29.3339	I					29.3339	I									
	I*				0.016		I*****									0.098
29.4825	I					29.4825	I									
	I***				0.033		I*****									0.131
29.6311	I					29.6311	I									
	I****				0.049		I*****									0.180
29.7797	I					29.7797	I									
	I				0.0		I*****									0.180
29.9283	I					29.9283	I									
	I*				0.016		I*****									0.197
30.0769	I					30.0769	I									
	I***				0.033		I*****									0.230
30.2255	I					30.2255	I									
	I****				0.049		I*****									0.279
30.3741	I					30.3741	I									
	I***				0.033		I*****									0.311
30.5226	I					30.5226	I									
	I****				0.049		I*****									0.361
30.6712	I					30.6712	I									
	I*				0.016		I*****									0.377
30.8198	I					30.8198	I									
	I****				0.049		I*****									0.426
30.9684	I					30.9684	I									
	I*****				0.180		I*****									0.607
31.1170	I					31.1170	I									
	I*****				0.098		I*****									0.705
31.2656	I					31.2656	I									
	I***				0.049		I*****									0.754
31.4142	I					31.4142	I									
	I****				0.049		I*****									0.803
31.5628	I					31.5628	I									
	I***				0.049		I*****									0.852
31.7114	I					31.7114	I									
	I**				0.033		I*****									0.885
31.8600	I					31.8600	I									
	I				0.0		I*****									0.885
32.0085	I					32.0085	I									
	I*****				0.066		I*****									0.951
32.1571	I					32.1571	I									
	I				0.0		I*****									0.951
32.3057	I					32.3057	I									
	I*				0.016		I*****									0.967
32.4543	I					32.4543	I									
	I***				0.033		I*****									1.000
32.6029	I					32.6029	I									
	I				0.0		I									0.0
32.6029	I					32.6029	I									MAX

55

NO. OBS. = 61 MEAN = 30.8404 STD ERROR = 0.9292 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.68
 MODE = 31.0598 PEARSONIAN SKEW = 0.24

PATH AND OVERALL COST ARE THE SAME FOR NODE N40
 ALT. 7: Operation Is Successful, But QD Requirements Are Not Met
 RFD 0.05 0.10 0.15 0.20 0.25

	I	I	I	I	I	MIN
7.4772	I	I	I	I	I	0.0
7.4772	I					0.016
7.5131	I					0.0
7.5490	I	I****				0.049
7.5848	I	I***				0.033
7.6207	I	I****				0.049
7.6566	I	I*				0.016
7.6924	I	I***				0.033
7.7283	I	I				0.0
7.7642	I	I****				0.049
7.8000	I	I*****				0.066
7.8359	I	I*****				0.066
7.8719	I	I****				0.049
7.9076	I	I*****				0.098
7.9435	I	I				0.0
7.9794	I	I				0.0
8.0152	I	I*****				0.082
8.0511	I	I***				0.049
8.0870	I	I*****				0.066
8.1228	I	I***				0.049
8.1587	I	I*****				0.066
8.1946	I	I*****				0.066
8.2304	I	I***				0.049
8.2663	I	I***				0.033
8.3022	I	I				0.0
8.3381	I	I				0.0
8.3739	I	I*				0.016
8.4098	I	I				0.0
8.4098	I	I				0.0

	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
7.4772	I	I	I	I	I	I	I	I	I	I	I	0.0
7.4772	I											0.016
7.5131	I											0.016
7.5490	I	I***										0.066
7.5848	I	I*****										0.098
7.6207	I	I*****										0.148
7.6566	I	I*****										0.164
7.6924	I	I*****										0.197
7.7283	I	I*****										0.197
7.7642	I	I*****										0.246
7.8000	I	I*****										0.311
7.8359	I	I*****										0.377
7.8719	I	I*****										0.426
7.9076	I	I*****										0.525
7.9435	I	I*****										0.525
7.9794	I	I*****										0.525
8.0152	I	I*****										0.607
8.0511	I	I*****										0.656
8.0870	I	I*****										0.721
8.1228	I	I*****										0.770
8.1587	I	I*****										0.836
8.1946	I	I*****										0.902
8.2304	I	I*****										0.951
8.2663	I	I*****										0.984
8.3022	I	I*****										0.984
8.3381	I	I*****										0.984
8.3739	I	I*****										1.000
8.4098	I	I										0.0
8.4098	I	I										0.0

NO. OBS. = 61 MEAN = 7.9550 STD ERROR = 0.2244 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.06
 MODE = 7.9196 PEARSONIAN SKEW = 0.16

56

NETWORK TIME FOR NODE N41

ALT.2: Static Separators Are Installed And QD Requirements Are Not Met

RFD					CFD																
0.05 0.10 0.15 0.20 0.25					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0							
31.8381	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	MIN	0.0
31.8381	I		I**																		0.023
32.0278	I		I																		0.0
32.2175	I		I**																		0.023
32.4073	I		I**																		0.023
32.5970	I		I**																		0.023
32.7867	I		I****																		0.047
32.9765	I		I*****																		0.093
33.1662	I		I**																		0.023
33.3559	I		I																		0.0
33.5456	I		I*****																		0.116
33.7354	I		I*****																		0.116
33.9251	I		I*****																		0.116
34.1148	I		I*****																		0.163
34.3046	I		I****																		0.047
34.4943	I		I																		0.0
34.6840	I		I*****																		0.093
34.8737	I		I**																		0.023
35.0635	I		I																		0.0
35.2532	I		I****																		0.047
35.4429	I		I																		0.0
35.6326	I		I																		0.0
35.8224	I		I																		0.0
36.0121	I		I																		0.0
36.2018	I		I																		0.0
36.3916	I		I																		0.0
36.5813	I		I**																		0.023
36.7714	I		I																		0.0
36.7714	I																				MAX

57

NO. OBS. = 43 MEAN = 33.9081 STD ERROR = 0.8985 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 4.22
 MODE = 34.1690 PEARSONIAN SKEW = 0.29

PATH AND OVERALL COST ARE THE SAME FOR NODE N41
 ALT. 2: Static Separators Are Installed And QD Requirements Are Not Met

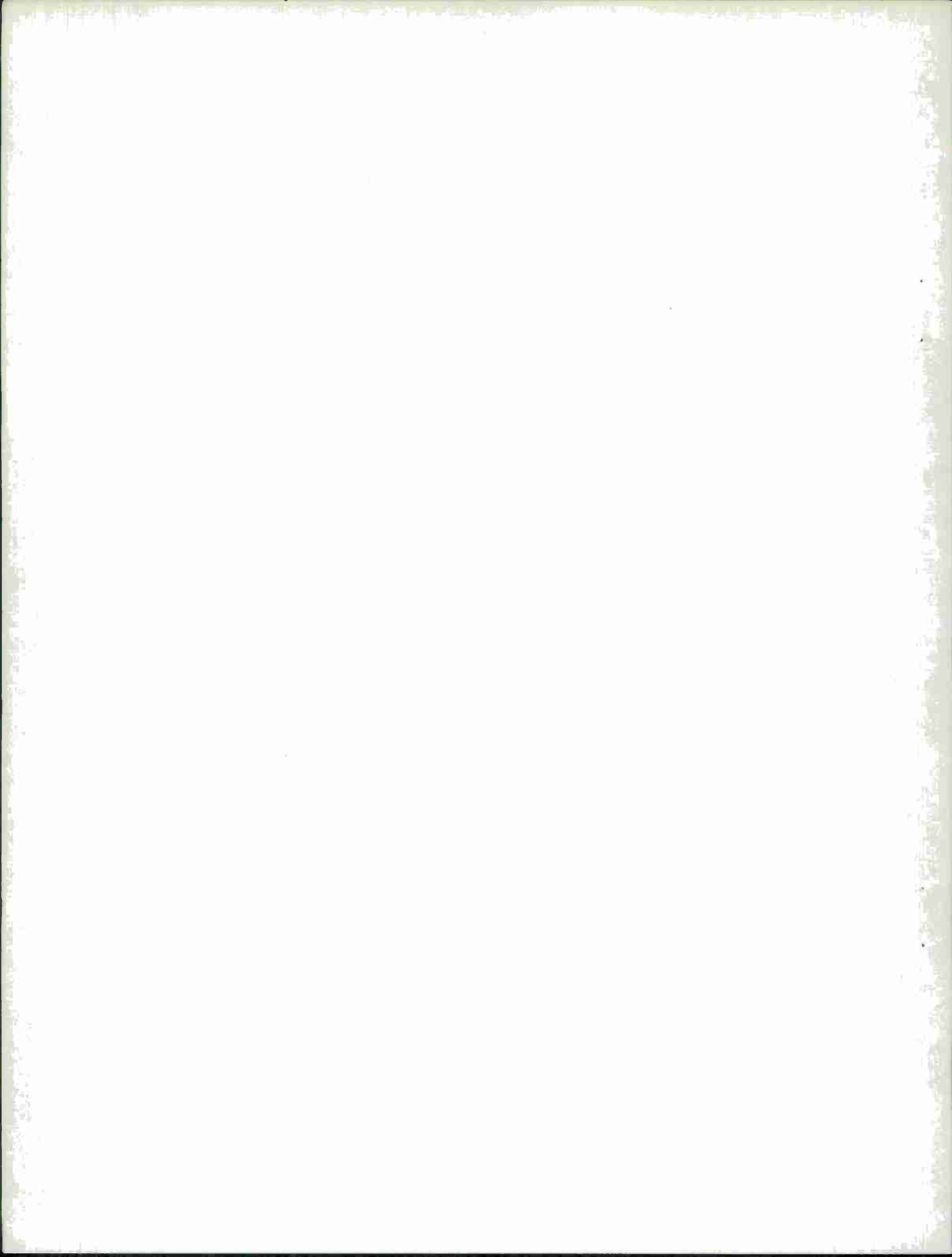
RFD					CFD										
	0.05	0.10	0.15	0.20	0.25	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
7.5254	I	I	I	I	I	7.5254	I	I	I	I	I	I	I	I	I
					MIN										MIN
					0.0										0.0
7.5254	I					7.5254	I								
	I**				0.023		I*								0.023
7.5638	I					7.5638	I								
	I**				0.023		I**								0.047
7.6021	I					7.6021	I								
	I				0.0		I**								0.047
7.6405	I					7.6405	I								
	I**				0.023		I***								0.070
7.6788	I					7.6788	I								
	I				0.0		I***								0.070
7.7171	I					7.7171	I								
	I**				0.023		I*****								0.093
7.7555	I					7.7555	I								
	I****				0.047		I*****								0.140
7.7938	I					7.7938	I								
	I****				0.047		I*****								0.186
7.8322	I					7.8322	I								
	I**				0.023		I*****								0.209
7.8705	I					7.8705	I								
	I*****				0.070		I*****								0.279
7.9089	I					7.9089	I								
	I*****				0.070		I*****								0.349
7.9472	I					7.9472	I								
	I****				0.047		I*****								0.395
7.9855	I					7.9855	I								
	I*****				0.070		I*****								0.465
8.0239	I					8.0239	I								
	I****				0.047		I*****								0.512
8.0622	I					8.0622	I								
	I**				0.023		I*****								0.535
8.1006	I					8.1006	I								
	I****				0.047		I*****								0.581
8.1389	I					8.1389	I								
	I*****				0.070		I*****								0.651
8.1773	I					8.1773	I								
	I****				0.047		I*****								0.698
8.2156	I					8.2156	I								
	I*****				0.116		I*****								0.814
8.2539	I					8.2539	I								
	I*****				0.070		I*****								0.884
8.2923	I					8.2923	I								
	I				0.0		I*****								0.884
8.3306	I					8.3306	I								
	I****				0.047		I*****								0.930
8.3690	I					8.3690	I								
	I**				0.023		I*****								0.953
8.4073	I					8.4073	I								
	I				0.0		I*****								0.953
8.4456	I					8.4456	I								
	I				0.0		I*****								0.953
8.4840	I					8.4840	I								
	I****				0.047		I*****								1.000
8.5223	I					8.5223	I								
	I				0.0		I								0.0
8.5223	I				MAX	8.5223	I								MAX

NO. OBS. = 43 MEAN = 8.0544 STD ERROR = 0.2335 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.50
 MODE = 8.2386 PEARSONIAN SKEW = 0.79

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Part 4. TIME AND COST DISTRIBUTIONS FOR ALT 3

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PART 4. TIME AND COST DISTRIBUTIONS FOR ALT 3

ALT 3: Composite Time Distribution					CFD													
RFD					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0				
61.8349	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	----	I	MIN
	I																	0.0
61.8349	I																	0.001
62.5785	I																	0.001
63.3220	I																	0.009
64.0656	I																	0.013
64.8091	I																	0.035
65.5527	I																	0.035
66.2962	I																	0.051
67.0397	I																	0.054
67.7833	I																	0.077
68.5268	I																	0.085
69.2704	I																	0.077
70.0139	I																	0.098
70.7575	I																	0.080
71.5010	I																	0.056
72.2446	I																	0.061
72.9881	I																	0.064
73.7317	I																	0.041
74.4752	I																	0.047
75.2188	I																	0.027
75.9623	I																	0.034
75.7058	I																	0.019
77.4494	I																	0.011
78.1929	I																	0.011
78.9365	I																	0.006
79.6800	I																	0.003
80.4236	I																	0.004
81.1675	I																	0.0
81.1675	I																	0.0
																		MAX
0. OPS. = 1000	MEAN =	70.7949	STD ERROR =	3.4828	COEF OF VARIATION =	0.05	KURTOSIS (BETA 2) =	2.69										MAX
	MODE =	70.4143	PEARSONIAN SKEW =	0.11														

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PATH AND OVERALL COST ARE THE SAME FOR THE COMPOSITE TERMINAL NODE

ALT.3: Composite Cost Distribution

RFD	0.05	0.10	0.15	0.20	0.25
6.8124	I	I	I	I	I
6.8124	I				
6.8124	I				
6.9305	I				
6.9305	I				
7.0486	I				
7.0486	I*				
7.1666	I				
7.1666	I				
7.2847	I				
7.2847	I*				
7.4028	I				
7.4028	I*				
7.5209	I				
7.5209	I*				
7.6389	I				
7.6389	I*				
7.7570	I				
7.7570	I				
7.8751	I				
7.8751	I				
7.9932	I				
7.9932	I				
8.1112	I				
8.1112	I*				
8.2293	I				
8.2293	I**				
8.3474	I				
8.3474	I***				
8.4655	I				
8.4655	I****				
8.5835	I				
8.5835	I*****				
8.7016	I				
8.7016	I*****				
8.8197	I				
8.8197	I*****				
8.9378	I				
8.9378	I*****				
9.0558	I				
9.0558	I*****				
9.1739	I				
9.1739	I*****				
9.2920	I				
9.2920	I****				
9.4101	I				
9.4101	I****				
9.5281	I				
9.5281	I***				
9.6462	I				
9.6462	I				
9.7643	I				
9.7643	I				
9.8824	I				
9.8824	I				
9.8824	I				
9.8824	I				

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
6.8124	I	I	I	I	I	I	I	I	I	I
6.8124	I									
6.8124	I									
6.9305	I									
6.9305	I									
7.0486	I									
7.0486	I*									
7.1666	I									
7.1666	I*									
7.2847	I									
7.2847	I**									
7.4028	I									
7.4028	I***									
7.5209	I									
7.5209	I****									
7.6389	I									
7.6389	I****									
7.7570	I									
7.7570	I*****									
7.8751	I									
7.8751	I*****									
7.9932	I									
7.9932	I*****									
8.1112	I									
8.1112	I*****									
8.2293	I									
8.2293	I*****									
8.3474	I									
8.3474	I*****									
8.4655	I									
8.4655	I*****									
8.5835	I									
8.5835	I*****									
8.7016	I									
8.7016	I*****									
8.8197	I									
8.8197	I*****									
8.9378	I									
8.9378	I*****									
9.0558	I									
9.0558	I*****									
9.1739	I									
9.1739	I*****									
9.2920	I									
9.2920	I*****									
9.4101	I									
9.4101	I*****									
9.5281	I									
9.5281	I*****									
9.6462	I									
9.6462	I*****									
9.7643	I									
9.7643	I*****									
9.8824	I									
9.8824	I*****									
9.8824	I									
9.8824	I									

62

NO. OBS. = 1000 MEAN =
MODE =

8.7703 STD ERROR =
8.8770 PEARSONIAN SKEW =

0.5636 COEF OF VARIATION = 0.06 KURTOSIS (BETA 2) = 4.64

PATH AND OVERALL COST ARE THE SAME FOR NODE N48
 ALT.3: Operation Is Successful and QD Requirements Are Met.

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
8.0676	I	I	I	I	I	8.0676	I	I	I	I	I	I	I	I	I	I	
	I				MIN		I									MIN	
					0.0												0.0
8.0076	I					8.0676	I										0.005
	I				0.005		I										
8.1317	I					8.1317	I										0.020
	I*				0.015		I*										
8.1957	I					8.1957	I										0.034
	I*				0.015		I**										
8.2597	I					8.2597	I										0.047
	I*				0.012		I**										
8.3238	I					8.3238	I										0.071
	I**				0.024		I****										
8.3878	I					8.3878	I										0.092
	I**				0.021		I*****										
8.4518	I					8.4518	I										0.127
	I***				0.035		I*****										
8.5159	I					8.5159	I										0.169
	I****				0.042		I*****										
8.5799	I					8.5799	I										0.219
	I*****				0.050		I*****										
8.6440	I					8.6440	I										0.277
	I*****				0.058		I*****										
8.7080	I					8.7080	I										0.332
	I*****				0.055		I*****										
8.7720	I					8.7720	I										0.416
	I*****				0.084		I*****										
8.8361	I					8.8361	I										0.496
	I*****				0.080		I*****										
8.9001	I					8.9001	I										0.562
	I*****				0.066		I*****										
8.9641	I					8.9641	I										0.624
	I*****				0.062		I*****										
9.0282	I					9.0282	I										0.693
	I*****				0.069		I*****										
9.0922	I					9.0922	I										0.750
	I*****				0.058		I*****										
9.1562	I					9.1562	I										0.798
	I****				0.048		I*****										
9.2203	I					9.2203	I										0.849
	I*****				0.051		I*****										
9.2843	I					9.2843	I										0.881
	I**				0.032		I*****										
9.3483	I					9.3483	I										0.903
	I**				0.022		I*****										
9.4124	I					9.4124	I										0.927
	I**				0.023		I*****										
9.4764	I					9.4764	I										0.953
	I**				0.027		I*****										
9.5404	I					9.5404	I										0.982
	I**				0.028		I*****										
9.6045	I					9.6045	I										0.994
	I*				0.012		I*****										
9.6685	I					9.6685	I										1.000
	I				0.006		I*****										
9.7326	I					9.7326	I										0.0
	I				0.0		I										
9.7326	I					9.7326	I										MAX
					MAX												

64

NO. OBS. = 817 MEAN = 8.9171 STD ERROR = 0.3479 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.53
 MODE = 8.8269 PEARSONIAN SKEW = 0.26

NETWORK TIME FOR NODE N49

ALT. 3: Operation Is Successful, But QD Requirements Are Not Met

HFD 0.05 0.10 0.15 0.20 0.25					CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0												
	I	I*	I**	I***	MIN		I	I*	I**	I***	MIN		I	I*	I**	I***	MIN
64.9874	I				0.0	64.9874	I				0.0		I				0.0
64.9874	I*				0.015	64.9874	I*				0.015		I*				0.015
65.4611	I				0.0	65.4611	I				0.0		I				0.0
65.9349	I				0.060	65.9349	I				0.060		I				0.060
66.4086	I				0.045	66.4086	I				0.045		I				0.045
66.8824	I				0.015	66.8824	I				0.015		I				0.015
67.3562	I				0.075	67.3562	I				0.075		I				0.075
67.8299	I				0.030	67.8299	I				0.030		I				0.030
68.3037	I				0.015	68.3037	I				0.015		I				0.015
68.7774	I				0.030	68.7774	I				0.030		I				0.030
69.2512	I				0.030	69.2512	I				0.030		I				0.030
69.7249	I				0.030	69.7249	I				0.030		I				0.030
70.1987	I				0.075	70.1987	I				0.075		I				0.075
70.6724	I				0.030	70.6724	I				0.030		I				0.030
71.1462	I				0.090	71.1462	I				0.090		I				0.090
71.6199	I				0.015	71.6199	I				0.015		I				0.015
72.0937	I				0.060	72.0937	I				0.060		I				0.060
72.5675	I				0.060	72.5675	I				0.060		I				0.060
73.0412	I				0.030	73.0412	I				0.030		I				0.030
73.5150	I				0.060	73.5150	I				0.060		I				0.060
73.9887	I				0.015	73.9887	I				0.015		I				0.015
74.4625	I				0.030	74.4625	I				0.030		I				0.030
74.9362	I				0.030	74.9362	I				0.030		I				0.030
75.4100	I				0.045	75.4100	I				0.045		I				0.045
75.8837	I				0.015	75.8837	I				0.015		I				0.015
76.3575	I				0.060	76.3575	I				0.060		I				0.060
76.8313	I				0.045	76.8313	I				0.045		I				0.045
77.3051	I				0.0	77.3051	I				0.0		I				0.0
77.3051	I				MAX	77.3051	I				MAX		I				MAX

NO. OBS. = 67 MEAN = 71.4366 STD ERROR = 3.3348 COEF OF VARIATION = 0.05 KURTOSIS (BETA 2) = 1.94
 MODE = 71.3568 PEARSONIAN SKEW = 0.02

65

PATH AND OVERALL COST ARE THE SAME FOR NODE N49

ALT. 3: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
8.1558	I	I	I	I	I	8.1558	I	I	I	I	I	I	I	I	I	I	
	I				I MIN												I MIN
					0.0												0.0
8.1558	I					8.1558	I										
	I*				0.015		I*										0.015
8.2057	I					8.2057	I										
	I****				0.045		I***										0.060
8.2556	I					8.2556	I										
	I				0.0		I***										0.060
8.3055	I					8.3055	I										
	I				0.0		I***										0.060
8.3554	I					8.3554	I										
	I				0.0		I***										0.060
8.4053	I					8.4053	I										
	I				0.0		I***										0.060
8.4552	I					8.4552	I										
	I**				0.030		I****										0.090
8.5051	I					8.5051	I										
	I****				0.045		I*****										0.134
8.5550	I					8.5550	I										
	I				0.0		I*****										0.134
8.6049	I					8.6049	I										
	I*				0.015		I*****										0.149
8.6548	I					8.6548	I										
	I*****				0.090		I*****										0.239
8.7047	I					8.7047	I										
	I*****				0.075		I*****										0.313
8.7546	I					8.7546	I										
	I*****				0.060		I*****										0.373
8.8045	I					8.8045	I										
	I**				0.030		I*****										0.403
8.8544	I					8.8544	I										
	I*				0.015		I*****										0.418
8.9043	I					8.9043	I										
	I*****				0.119		I*****										0.537
8.9542	I					8.9542	I										
	I*****				0.090		I*****										0.627
9.0041	I					9.0041	I										
	I*****				0.060		I*****										0.687
9.0540	I					9.0540	I										
	I**				0.030		I*****										0.716
9.1039	I					9.1039	I										
	I*				0.015		I*****										0.731
9.1538	I					9.1538	I										
	I****				0.045		I*****										0.776
9.2037	I					9.2037	I										
	I*****				0.075		I*****										0.851
9.2536	I					9.2536	I										
	I**				0.030		I*****										0.881
9.3035	I					9.3035	I										
	I*				0.015		I*****										0.896
9.3534	I					9.3534	I										
	I****				0.045		I*****										0.940
9.4033	I					9.4033	I										
	I*****				0.060		I*****										1.000
9.4532	I					9.4532	I										
	I				0.0		I										0.0
9.4532	I					9.4532	I										
					MAX												MAX

99

NO. OBS. = 67 MEAN = 8.9187 STD ERROR = 0.3111 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.70
 MODE = 8.9431 PEARSONIAN SKEW = 0.08

NETWORK TIME FOR NODE N50

ALT.3: Static Separators Are Installed And QD Requirements Are Not Met

WFD 0.05 0.10 0.15 0.20 0.25					CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0																
				MIN																MIN	
68.0193	I																				0.0
68.0193	I																				0.0
68.4384	I	I*****																			0.071
68.4384	I																				0.0
68.8575	I																				0.0
68.8575	I																				0.0
69.2766	I																				0.0
69.2766	I																				0.0
69.6957	I																				0.0
69.6957	I																				0.0
70.1148	I																				0.0
70.1148	I																				0.0
70.5340	I																				0.0
70.5340	I																				0.0
70.9531	I																				0.0
70.9531	I																				0.0
71.3722	I																				0.0
71.3722	I																				0.0
71.7913	I																				0.0
71.7913	I																				0.0
72.2104	I																				0.0
72.2104	I																				0.0
72.6295	I	I*****																			0.143
72.6295	I																				0.0
73.0486	I	I*****																			0.143
73.0486	I																				0.0
73.4677	I	I*****																			0.214
73.4677	I																				0.0
73.8869	I	I*****																			0.214
73.8869	I																				0.0
74.3060	I	I*****																			0.071
74.3060	I																				0.0
74.7251	I	I*****																			0.071
74.7251	I																				0.0
75.1442	I	I*****																			0.071
75.1442	I																				0.0
75.5633	I	I*****																			0.071
75.5633	I																				0.0
75.9824	I	I*****																			0.071
75.9824	I																				0.0
76.4015	I	I*****																			0.0
76.4015	I																				0.0
76.8206	I	I*****																			0.071
76.8206	I																				0.0
77.2398	I	I*****																			0.071
77.2398	I																				0.0
77.6589	I	I*****																			0.071
77.6589	I																				0.0
78.0780	I	I*****																			0.071
78.0780	I																				0.0
78.4971	I	I*****																			0.143
78.4971	I																				0.0
78.9162	I	I*****																			0.143
78.9162	I																				0.0
78.9162	I																				0.0

67

NO. OBS. = 14 MEAN = 74.8286 STD ERROR = 2.8528 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 3.26
 MODE = 73.7192 PEARSONIAN SKEW = 0.39

PATH AND OVERALL COST ARE THE SAME FOR NODE N50
 ALT.3: Static Separators Are Installed And QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
8.5678	I	I	I	I	I	8.5678	I	I	I	I	I	I	I	I	I	I
					MIN											MIN
					0.0											0.0
8.5678	I	I	I	I	I	8.5678	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I***									0.071
8.6184	I	I	I	I	I	8.6184	I	I	I	I	I	I	I	I	I	I
	I				0.0		I***									0.071
8.6690	I	I	I	I	I	8.6690	I	I	I	I	I	I	I	I	I	I
	I				0.0		I***									0.071
8.7195	I	I	I	I	I	8.7195	I	I	I	I	I	I	I	I	I	I
	I				0.0		I***									0.071
8.7701	I	I	I	I	I	8.7701	I	I	I	I	I	I	I	I	I	I
	I*****				0.143		I*****									0.214
8.8206	I	I	I	I	I	8.8206	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.286
8.8712	I	I	I	I	I	8.8712	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.286
8.9218	I	I	I	I	I	8.9218	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.357
8.9723	I	I	I	I	I	8.9723	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.357
9.0229	I	I	I	I	I	9.0229	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.429
9.0734	I	I	I	I	I	9.0734	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.429
9.1240	I	I	I	I	I	9.1240	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.429
9.1745	I	I	I	I	I	9.1745	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.500
9.2251	I	I	I	I	I	9.2251	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.571
9.2757	I	I	I	I	I	9.2757	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.643
9.3262	I	I	I	I	I	9.3262	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.714
9.3768	I	I	I	I	I	9.3768	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.714
9.4273	I	I	I	I	I	9.4273	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.714
9.4779	I	I	I	I	I	9.4779	I	I	I	I	I	I	I	I	I	I
	I*****				0.143		I*****									0.857
9.5284	I	I	I	I	I	9.5284	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									0.929
9.5790	I	I	I	I	I	9.5790	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.929
9.6296	I	I	I	I	I	9.6296	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.929
9.6801	I	I	I	I	I	9.6801	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.929
9.7307	I	I	I	I	I	9.7307	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.929
9.7812	I	I	I	I	I	9.7812	I	I	I	I	I	I	I	I	I	I
	I				0.0		I*****									0.929
9.8318	I	I	I	I	I	9.8318	I	I	I	I	I	I	I	I	I	I
	I*****				0.071		I*****									1.000
9.8824	I	I	I	I	I	9.8824	I	I	I	I	I	I	I	I	I	I
	I				0.0		I									0.0
9.8824	I	I	I	I	I	9.8824	I	I	I	I	I	I	I	I	I	I
					MAX											MAX

89

NO. OBS. = 14 MEAN = 9.1805 STD ERROR = 0.3644 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.13
 A MULTIMODAL DISTRIBUTION

PAIth AND OVERALL COST ARE THE SAME FOR NODE N51

ALT. 3: Static Separators Are Installed and QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0		
6.8124	I	I	I	I	I	6.8124	I	I	I	I	I	I	I	I	I	I		
	I				0.0		I										0.0	
6.8124	I				0.020	6.8124	I										0.020	
	I*						I*											
6.8601	I				0.020	6.8601	I											0.039
	I*						I**											
6.9078	I				0.029	6.9078	I											0.069
	I**						I***											
6.9555	I				0.020	6.9555	I											0.088
	I*						I****											
7.0032	I				0.039	7.0032	I											0.127
	I***						I*****											
7.0509	I				0.069	7.0509	I											0.196
	I*****						I*****											
7.0986	I				0.020	7.0986	I											0.216
	I*						I*****											
7.1463	I				0.010	7.1463	I											0.225
	I						I*****											
7.1940	I				0.029	7.1940	I											0.255
	I**						I*****											
7.2417	I				0.039	7.2417	I											0.294
	I***						I*****											
7.2894	I				0.059	7.2894	I											0.353
	I*****						I*****											
7.3371	I				0.059	7.3371	I											0.412
	I*****						I*****											
7.3848	I				0.049	7.3848	I											0.461
	I****						I*****											
7.4325	I				0.039	7.4325	I											0.500
	I***						I*****											
7.4802	I				0.059	7.4802	I											0.559
	I*****						I*****											
7.5279	I				0.098	7.5279	I											0.657
	I*****						I*****											
7.5757	I				0.059	7.5757	I											0.716
	I*****						I*****											
7.6234	I				0.049	7.6234	I											0.765
	I****						I*****											
7.6711	I				0.059	7.6711	I											0.824
	I*****						I*****											
7.7188	I				0.020	7.7188	I											0.843
	I*						I*****											
7.7665	I				0.020	7.7665	I											0.863
	I*						I*****											
7.8142	I				0.039	7.8142	I											0.902
	I***						I*****											
7.8619	I				0.020	7.8619	I											0.922
	I*						I*****											
7.9096	I				0.049	7.9096	I											0.971
	I****						I*****											
7.9573	I				0.010	7.9573	I											0.980
	I						I*****											
8.0050	I				0.020	8.0050	I											1.000
	I*						I*****											
8.0527	I				0.0	8.0527	I											0.0
	I						I											
8.0527	I				MAX	8.0527	I											MAX

NO. OBS. = 102 MEAN =
MODE =

7.4439 STD ERROR =
7.5518 PEARSONIAN SKEW =

0.3056 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.23

NETWORK TIME FOR NODE NS1

ALT.3: Static Separators Are Installed And QD Requirements Are Not Met

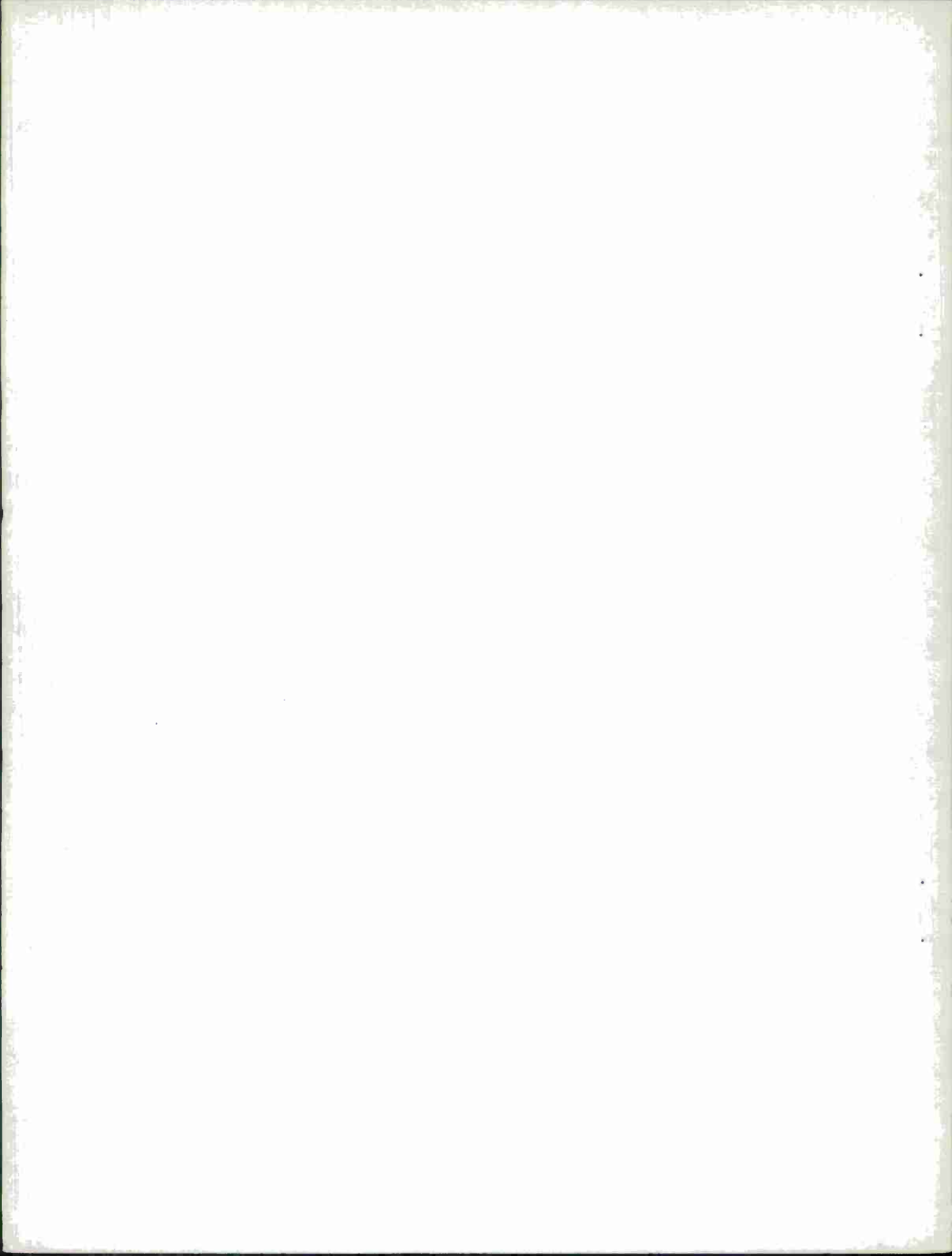
RFID	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
61.8349	I	I	I	I	I	61.8349	I	I	I	I	I	I	I	I	I	I	
					MIN											MIN	
					0.0											0.0	
61.8349	I					61.8349	I										0.010
					0.010												0.020
62.4451	I					62.4451	I										0.039
					0.010												0.108
63.0553	I					63.0553	I										0.167
					0.020												0.265
63.6654	I*					63.6654	I										0.324
	I*****				0.069		I*****										0.392
64.2756	I					64.2756	I										0.422
	I*****				0.059		I*****										0.549
64.8858	I					64.8858	I										0.618
	I*****				0.098		I*****										0.637
65.4959	I					65.4959	I										0.676
	I*****				0.059		I*****										0.745
66.1061	I					66.1061	I										0.775
	I*****				0.069		I*****										0.833
66.7163	I					66.7163	I										0.863
	I**				0.029		I**										0.882
67.3264	I					67.3264	I										0.922
	I*****				0.127		I*****										0.951
67.9366	I					67.9366	I										0.971
	I*****				0.069		I*****										0.990
68.5468	I					68.5468	I										0.990
	I*				0.020		I*										0.990
69.1570	I					69.1570	I										0.990
	I***				0.039		I***										1.000
69.7071	I					69.7071	I										0.0
	I*****				0.069		I*****										MAX
70.3773	I					70.3773	I										MAX
	I**				0.029		I**										3.3488
70.9875	I					70.9875	I										0.05
	I*****				0.059		I*****										0.05
71.5976	I					71.5976	I										0.05
	I**				0.029		I**										0.05
72.2078	I					72.2078	I										0.05
	I*				0.020		I*										0.05
72.8180	I					72.8180	I										0.05
	I***				0.039		I***										0.05
73.4281	I					73.4281	I										0.05
	I**				0.029		I**										0.05
74.0383	I					74.0383	I										0.05
	I*				0.020		I*										0.05
74.6485	I					74.6485	I										0.05
	I*				0.020		I*										0.05
75.2586	I					75.2586	I										0.05
	I				0.0		I										0.05
75.8688	I					75.8688	I										0.05
	I				0.0		I										0.05
76.4790	I					76.4790	I										0.05
	I				0.0		I										0.05
77.0891	I					77.0891	I										0.05
	I				0.010		I										0.05
77.6994	I					77.6994	I										0.05
	I				0.0		I										0.05
77.6994	I					77.6994	I										0.05
	I				0.0		I										0.05
					MAX												0.05

70

NO. OBS. = 102 MEAN = 68.1618 STD ERROR = 3.3488 COEF OF VARIATION = 0.05 KURTOSIS (BETA 2) = 2.47
 MODE = 67.7078 PEARSONIAN SKEW = 0.14

PART 5. TIME AND COST DISTRIBUTIONS FOR ALT 4

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PART 5. TIME AND COST DISTRIBUTIONS FOR ALT 4

ALT 4: Composite Time Distribution

RFD	0.05	0.10	0.15	0.20	0.25	MIN
37.1212	I	I	I	I	I	0.0
37.1212	I	I	I	I	I	0.017
38.7623	I	I	I	I	I	0.102
40.4035	I	I	I	I	I	0.360
42.0447	I	I	I	I	I	0.336
43.6859	I	I	I	I	I	0.065
45.3271	I	I	I	I	I	0.011
46.9683	I	I	I	I	I	0.001
48.6095	I	I	I	I	I	0.0
50.2507	I	I	I	I	I	0.0
51.8919	I	I	I	I	I	0.0
53.5331	I	I	I	I	I	0.0
55.1742	I	I	I	I	I	0.0
56.8154	I	I	I	I	I	0.0
58.4566	I	I	I	I	I	0.0
60.0978	I	I	I	I	I	0.0
61.7390	I	I	I	I	I	0.0
63.3802	I	I	I	I	I	0.0
65.0214	I	I	I	I	I	0.001
66.6626	I	I	I	I	I	0.007
68.3038	I	I	I	I	I	0.019
69.9449	I	I	I	I	I	0.029
71.5861	I	I	I	I	I	0.021
73.2273	I	I	I	I	I	0.018
74.8685	I	I	I	I	I	0.006
76.5097	I	I	I	I	I	0.005
78.1509	I	I	I	I	I	0.002
79.7922	I	I	I	I	I	0.0
79.7922	I	I	I	I	I	MAX

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
37.1212	I	I	I	I	I	I	I	I	I	I	0.0
37.1212	I	I	I	I	I	I	I	I	I	I	0.017
38.7623	I	I	I	I	I	I	I	I	I	I	0.119
40.4035	I	I	I	I	I	I	I	I	I	I	0.479
42.0447	I	I	I	I	I	I	I	I	I	I	0.815
43.6859	I	I	I	I	I	I	I	I	I	I	0.880
45.3271	I	I	I	I	I	I	I	I	I	I	0.891
46.9683	I	I	I	I	I	I	I	I	I	I	0.892
48.6095	I	I	I	I	I	I	I	I	I	I	0.892
50.2507	I	I	I	I	I	I	I	I	I	I	0.892
51.8919	I	I	I	I	I	I	I	I	I	I	0.892
53.5331	I	I	I	I	I	I	I	I	I	I	0.892
55.1742	I	I	I	I	I	I	I	I	I	I	0.892
56.8154	I	I	I	I	I	I	I	I	I	I	0.892
58.4566	I	I	I	I	I	I	I	I	I	I	0.892
60.0978	I	I	I	I	I	I	I	I	I	I	0.892
61.7390	I	I	I	I	I	I	I	I	I	I	0.892
63.3802	I	I	I	I	I	I	I	I	I	I	0.892
65.0214	I	I	I	I	I	I	I	I	I	I	0.893
66.6626	I	I	I	I	I	I	I	I	I	I	0.900
68.3038	I	I	I	I	I	I	I	I	I	I	0.919
69.9449	I	I	I	I	I	I	I	I	I	I	0.948
71.5861	I	I	I	I	I	I	I	I	I	I	0.969
73.2273	I	I	I	I	I	I	I	I	I	I	0.987
74.8685	I	I	I	I	I	I	I	I	I	I	0.993
76.5097	I	I	I	I	I	I	I	I	I	I	0.998
78.1509	I	I	I	I	I	I	I	I	I	I	1.000
79.7922	I	I	I	I	I	I	I	I	I	I	0.0
79.7922	I	I	I	I	I	I	I	I	I	I	MAX

73

NO. OBS. = 1000
MEAN =
MODE =

45.1469 STD ERROR =
41.9050 PEARSONIAN SKEW = 0.34

9.4183 COEF OF VARIATION = 0.21 KURTOSIS (BETA 2) = 7.41

PATH AND OVERALL COST ARE THE SAME FOR THE COMPOSITE TERMINAL NODE

ALT. 4: Composite Cost Distribution

RFD	0.05	0.10	0.15	0.20	0.25	MIN
6.6076	I	I	I	I	I	0.0
6.6076	I					0.002
6.7259	I					0.002
6.8442	I					0.003
6.9625	I					0.004
7.0808	I					0.006
7.1991	I*					0.010
7.3174	I					0.008
7.4357	I					0.008
7.5540	I					0.004
7.6723	I					0.002
7.7905	I					0.001
7.9088	I*					0.012
8.0271	I***					0.033
8.1454	I***					0.035
8.2637	I*****					0.065
8.3820	I*****					0.078
8.5003	I*****					0.095
8.6186	I*****					0.117
8.7369	I*****					0.136
8.8552	I*****					0.103
8.9735	I*****					0.084
9.0918	I*****					0.069
9.2100	I*****					0.052
9.3283	I****					0.040
9.4466	I**					0.024
9.5649	I					0.007
9.6832	I					0.0
9.6832	I					MAX

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
6.6076	I	I	I	I	I	I	I	I	I	I	0.0
6.6076	I										0.002
6.7259	I										0.004
6.8442	I										0.007
6.9625	I*										0.011
7.0808	I*										0.017
7.1991	I*										0.027
7.3174	I**										0.035
7.4357	I**										0.043
7.5540	I**										0.047
7.6723	I**										0.049
7.7905	I**										0.050
7.9088	I***										0.062
8.0271	I****										0.095
8.1454	I*****										0.130
8.2637	I*****										0.195
8.3820	I*****										0.273
8.5003	I*****										0.368
8.6186	I*****										0.485
8.7369	I*****										0.621
8.8552	I*****										0.724
8.9735	I*****										0.808
9.0918	I*****										0.877
9.2100	I*****										0.929
9.3283	I*****										0.969
9.4466	I*****										0.993
9.5649	I*****										1.000
9.6832	I										0.0
9.6832	I										MAX

74

NO. OBS. = 1000 MEAN =
MODE =

8.6981 STO ERROR =
8.7801 PEARSONIAN SKEW = 0.17

0.4853 COEF OF VARIATION = 0.06 KURTOSIS (BETA 2) = 5.39

PATH AND OVERALL COST ARE THE SAME FOR NODE N42
 ALT.4: Operation Is Successful and QD Requirements Are Met.
 RFD 0.05 0.10 0.15 0.20 0.25

	MIN	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
7.8950	I	7.8950	I	I	I	I	I	I	I	I	I	I	0.0
7.8950	I	7.8950	I										0.007
7.9602	I	7.9602	I										0.016
8.0254	I*	8.0254	I*										0.035
8.0906	I*	8.0906	I*										0.055
8.1558	I*	8.1558	I*										0.069
8.2210	I*	8.2210	I*										0.109
8.2862	I***	8.2862	I***										0.148
8.3514	I****	8.3514	I****										0.198
8.4166	I*****	8.4166	I*****										0.249
8.4818	I*****	8.4818	I*****										0.299
8.5470	I*****	8.5470	I*****										0.359
8.6122	I*****	8.6122	I*****										0.422
8.6774	I*****	8.6774	I*****										0.491
8.7425	I*****	8.7425	I*****										0.573
8.8077	I*****	8.8077	I*****										0.654
8.8729	I*****	8.8729	I*****										0.710
8.9381	I*****	8.9381	I*****										0.775
9.0033	I*****	9.0033	I*****										0.818
9.0685	I*****	9.0685	I*****										0.868
9.1337	I***	9.1337	I***										0.898
9.1989	I***	9.1989	I***										0.928
9.2641	I*	9.2641	I*										0.946
9.3293	I**	9.3293	I**										0.969
9.3945	I*	9.3945	I*										0.980
9.4597	I*	9.4597	I*										0.992
9.5249	I	9.5249	I										1.000
9.5901	I	9.5901	I										0.0
9.5901	I	9.5901	I										MAX

76

NO. OBS. = 763 MEAN =
 A MULTIMODAL DISTRIBUTION

8.7361 STD ERROR =

0.3504 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.54

NETWORK TIME FOR NODE N43

ALT. 4: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	MIN
39.7027	I					0.0
39.7027	I					0.020
39.9081	I					0.020
40.1134	I					0.059
40.3188	I					0.020
40.5241	I					0.0
40.7295	I					0.059
40.9348	I					0.059
41.1402	I					0.059
41.3456	I					0.118
41.5509	I					0.078
41.7563	I					0.118
41.9616	I					0.059
42.1670	I					0.039
42.3723	I					0.039
42.5777	I					0.059
42.7830	I					0.039
42.9884	I					0.039
43.1937	I					0.0
43.3991	I					0.020
43.6044	I					0.039
43.8098	I					0.020
44.0151	I					0.020
44.2205	I					0.0
44.4258	I					0.0
44.6312	I					0.0
44.8365	I					0.020
45.0419	I					0.0
45.0419	I					MAX

CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
39.7027	I										0.0
39.7027	I										0.020
39.9081	I										0.039
40.1134	I										0.098
40.3188	I										0.118
40.5241	I										0.118
40.7295	I										0.176
40.9348	I										0.235
41.1402	I										0.294
41.3456	I										0.412
41.5509	I										0.490
41.7563	I										0.608
41.9616	I										0.667
42.1670	I										0.706
42.3723	I										0.745
42.5777	I										0.804
42.7830	I										0.843
42.9884	I										0.882
43.1937	I										0.882
43.3991	I										0.902
43.6044	I										0.941
43.8098	I										0.961
44.0151	I										0.980
44.2205	I										0.980
44.4258	I										0.980
44.6312	I										0.980
44.8365	I										1.000
45.0419	I										0.0
45.0419	I										MAX

NO. OPS. = 51 MEAN =
A MULTIMODAL DISTRIBUTION

41.8928 STD ERROR =

1.1201 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 3.13

PATH AND OVERALL COST ARE THE SAME FOR NODE N43
 ALT.4: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
8.0454	I	I	I	I	I	8.0454	I	I	I	I	I	I	I	I	I	I	
	I				0.0		I									0.0	
8.0454	I				I***	8.0454	I									I**	0.039
8.1022	I				I*	8.1022	I									I***	0.059
8.1590	I				I	8.1590	I									I***	0.059
	I				0.0		I									I***	0.059
8.2159	I				I	8.2159	I									I***	0.059
	I				0.0		I									I***	0.059
8.2727	I				I***	8.2727	I									I*****	0.098
	I				I		I									I*****	0.137
8.3295	I				I***	8.3295	I									I*****	0.137
	I				I		I									I*****	0.196
8.3863	I				I	8.3863	I									I*****	0.235
	I				0.0		I									I*****	0.294
8.4431	I				I*****	8.4431	I									I*****	0.353
	I				I		I									I*****	0.431
8.5000	I				I***	8.5000	I									I*****	0.529
	I				I		I									I*****	0.569
8.5568	I				I***	8.5568	I									I*****	0.569
	I				I		I									I*****	0.627
8.6136	I				I*****	8.6136	I									I*****	0.686
	I				I		I									I*****	0.745
8.6704	I				I	8.6704	I									I*****	0.765
	I				I*****		I									I*****	0.863
8.7272	I				I	8.7272	I									I*****	0.902
	I				I*****		I									I*****	0.941
8.7840	I				I***	8.7840	I									I*****	0.941
	I				I		I									I*****	0.980
8.8409	I				I	8.8409	I									I*****	1.000
	I				0.0		I									I*****	1.000
8.8977	I				I***	8.8977	I									I*****	1.000
	I				I		I									I*****	1.000
8.9545	I				I*****	8.9545	I									I*****	1.000
	I				I		I									I*****	1.000
9.0113	I				I	9.0113	I									I*****	1.000
	I				0.0		I									I*****	1.000
9.0681	I				I	9.0681	I									I*****	1.000
	I				I*****		I									I*****	1.000
9.1250	I				I*	9.1250	I									I*****	1.000
	I				I		I									I*****	1.000
9.1818	I				I	9.1818	I									I*****	1.000
	I				I*****		I									I*****	1.000
9.2386	I				I	9.2386	I									I*****	1.000
	I				I***		I									I*****	1.000
9.2954	I				I	9.2954	I									I*****	1.000
	I				I***		I									I*****	1.000
9.3522	I				I	9.3522	I									I*****	1.000
	I				0.0		I									I*****	1.000
9.4091	I				I	9.4091	I									I*****	1.000
	I				I***		I									I*****	1.000
9.4659	I				I	9.4659	I									I*****	1.000
	I				I*		I									I*****	1.000
9.5227	I				I	9.5227	I									I*****	1.000
	I				0.0		I									I*****	1.000
9.5227	I				MAX	9.5227	I									MAX	1.000

NO. OPS. = 51 MEAN =
 A MULTIMODAL DISTRIBUTION

8.8153 STD ERROR =

0.3694 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.24

NETWORK TIME FOR NODE N44

ALT.4: Static Separators Are Installed And QD Requirements Are Not Met

RFD 0.05 0.10 0.15 0.20 0.25					CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0						
ALT.	QD	MIN	MAX	CFD	QD	MIN	MAX	CFD	QD	MIN	MAX
42.7488	I	0.0	0.0	42.7488	I	0.0	0.0	42.7488	I	0.0	0.0
42.7488	I	0.059	0.059	42.7488	I	0.059	0.059	42.7488	I	0.059	0.059
42.9194	I	0.0	0.0	42.9194	I	0.0	0.0	42.9194	I	0.0	0.0
43.0900	I	0.029	0.029	43.0900	I	0.029	0.029	43.0900	I	0.029	0.029
43.2606	I	0.088	0.088	43.2606	I	0.088	0.088	43.2606	I	0.088	0.088
43.4313	I	0.029	0.029	43.4313	I	0.029	0.029	43.4313	I	0.029	0.029
43.6019	I	0.029	0.029	43.6019	I	0.029	0.029	43.6019	I	0.029	0.029
43.7725	I	0.059	0.059	43.7725	I	0.059	0.059	43.7725	I	0.059	0.059
43.9431	I	0.088	0.088	43.9431	I	0.088	0.088	43.9431	I	0.088	0.088
44.1138	I	0.0	0.0	44.1138	I	0.0	0.0	44.1138	I	0.0	0.0
44.2844	I	0.029	0.029	44.2844	I	0.029	0.029	44.2844	I	0.029	0.029
44.4550	I	0.029	0.029	44.4550	I	0.029	0.029	44.4550	I	0.029	0.029
44.6256	I	0.029	0.029	44.6256	I	0.029	0.029	44.6256	I	0.029	0.029
44.7962	I	0.029	0.029	44.7962	I	0.029	0.029	44.7962	I	0.029	0.029
44.9669	I	0.059	0.059	44.9669	I	0.059	0.059	44.9669	I	0.059	0.059
45.1375	I	0.147	0.147	45.1375	I	0.147	0.147	45.1375	I	0.147	0.147
45.3081	I	0.029	0.029	45.3081	I	0.029	0.029	45.3081	I	0.029	0.029
45.4787	I	0.029	0.029	45.4787	I	0.029	0.029	45.4787	I	0.029	0.029
45.6494	I	0.029	0.029	45.6494	I	0.029	0.029	45.6494	I	0.029	0.029
45.8200	I	0.029	0.029	45.8200	I	0.029	0.029	45.8200	I	0.029	0.029
45.9906	I	0.0	0.0	45.9906	I	0.0	0.0	45.9906	I	0.0	0.0
46.1612	I	0.029	0.029	46.1612	I	0.029	0.029	46.1612	I	0.029	0.029
46.3319	I	0.088	0.088	46.3319	I	0.088	0.088	46.3319	I	0.088	0.088
46.5025	I	0.029	0.029	46.5025	I	0.029	0.029	46.5025	I	0.029	0.029
46.6731	I	0.0	0.0	46.6731	I	0.0	0.0	46.6731	I	0.0	0.0
46.8437	I	0.0	0.0	46.8437	I	0.0	0.0	46.8437	I	0.0	0.0
47.0144	I	0.029	0.029	47.0144	I	0.029	0.029	47.0144	I	0.029	0.029
47.1852	I	0.0	0.0	47.1852	I	0.0	0.0	47.1852	I	0.0	0.0
47.1852	I	MAX	MAX	47.1852	I	MAX	MAX	47.1852	I	MAX	MAX

79

NO. OBS. = 34 MEAN = 44.7673 STD ERROR = 1.1829 COEF OF VARIATION = 0.03 KURTOSIS (BETA 2) = 2.02
 MODE = 45.2106 PEARSONIAN SKEW = 0.37

PATH AND OVERALL COST ARE THE SAME FOR NODE N44

ALT.4: Static Separators Are Installed and QD Requirements Are Not Met

RFD 0.05 0.10 0.15 0.20 0.25						CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0					
					MIN						MIN
8.1200	I				0.0	8.1200	I				0.0
	I						I				
8.1200	I					8.1200	I				
	I**				0.029		I*				0.029
8.1795	I					8.1795	I				
	I**				0.029		I***				0.059
8.2391	I					8.2391	I				
	I				0.0		I***				0.059
8.2986	I					8.2986	I				
	I**				0.029		I****				0.088
8.3582	I					8.3582	I				
	I				0.0		I****				0.088
8.4178	I					8.4178	I				
	I				0.0		I****				0.088
8.4773	I					8.4773	I				
	I				0.0		I****				0.088
8.5369	I					8.5369	I				
	I*****				0.059		I*****				0.147
8.5964	I					8.5964	I				
	I*****				0.059		I*****				0.206
8.6560	I					8.6560	I				
	I**				0.029		I*****				0.235
8.7155	I					8.7155	I				
	I**				0.029		I*****				0.265
8.7751	I					8.7751	I				
	I**				0.029		I*****				0.294
8.8346	I					8.8346	I				
	I**				0.029		I*****				0.324
8.8942	I					8.8942	I				
	I*****				0.088		I*****				0.412
8.9538	I					8.9538	I				
	I*****				0.088		I*****				0.500
9.0133	I					9.0133	I				
	I				0.0		I*****				0.500
9.0729	I					9.0729	I				
	I*****				0.059		I*****				0.559
9.1324	I					9.1324	I				
	I*****				0.118		I*****				0.676
9.1920	I					9.1920	I				
	I**				0.029		I*****				0.706
9.2515	I					9.2515	I				
	I*****				0.088		I*****				0.794
9.3111	I					9.3111	I				
	I*****				0.059		I*****				0.853
9.3706	I					9.3706	I				
	I*****				0.059		I*****				0.912
9.4302	I					9.4302	I				
	I**				0.029		I*****				0.941
9.4897	I					9.4897	I				
	I**				0.029		I*****				0.971
9.5493	I					9.5493	I				
	I				0.0		I*****				0.971
9.6089	I					9.6089	I				
	I**				0.029		I*****				1.000
9.6684	I					9.6684	I				
	I				0.0		I				0.0
9.6684	I				MAX	9.6684	I				MAX

08

NO. OBS. = 34
 MEAN =
 MODE =

8.9981 STD ERROR =
 9.1562 PEARSONIAN SKEW =

0.3730 COEF OF VARIATION = 0.04
 KURTOSIS (BETA 2) = 2.72

NETWORK TIME FOR NODE N48

ALT.4: Operation Is Successful and QD Requirements Are Met.

MFD 0.05 0.10 0.15 0.20 0.25					CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0															
	I	I	I	I	MIN	I	I	I	I	I	I	I	I	I	I	I	I	I	I	MIN
67.0360	I				0.0	67.0860	I													0.0
67.0860	I				0.033	67.0860	I													0.033
67.5747	I				0.022	67.5747	I													0.055
68.0634	I				0.022	68.0634	I													0.077
68.5521	I				0.011	68.5521	I													0.088
69.0408	I				0.055	69.0408	I													0.143
69.5294	I				0.077	69.5294	I													0.220
70.0181	I				0.055	70.0181	I													0.275
70.5068	I				0.132	70.5068	I													0.407
70.9955	I				0.077	70.9955	I													0.484
71.4842	I				0.055	71.4842	I													0.538
71.9729	I				0.066	71.9729	I													0.604
72.4616	I				0.055	72.4616	I													0.659
72.9503	I				0.066	72.9503	I													0.725
73.4390	I				0.044	73.4390	I													0.769
73.9277	I				0.022	73.9277	I													0.791
74.4164	I				0.099	74.4164	I													0.890
74.9051	I				0.011	74.9051	I													0.901
75.3938	I				0.011	75.3938	I													0.912
75.8825	I				0.011	75.8825	I													0.923
76.3712	I				0.011	76.3712	I													0.934
76.8598	I				0.011	76.8598	I													0.945
77.3485	I				0.022	77.3485	I													0.967
77.8372	I				0.022	77.8372	I													0.989
78.3259	I				0.0	78.3259	I													0.989
78.8146	I				0.0	78.8146	I													0.989
79.3033	I				0.011	79.3033	I													1.000
79.7922	I				0.0	79.7922	I													0.0
79.7922	I				MAX	79.7922	I													MAX

81

NO. OBS. = 91 MEAN = 72.0495 STD ERROR = 2.6699 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 3.00
 MODE = 70.7919 PEARSONIAN SKEW = 0.47

PATH AND OVERALL COST ARE THE SAME FOR NODE N48
 ALT.4: Operation Is Successful and QD Requirements Are Met.

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
8.1072	I	I	I	I	I	8.1072	I	I	I	I	I	I	I	I	I	I	
	I	I	I	I	I		I	I	I	I	I	I	I	I	I	I	
	I*				0.011		I*										0.011
8.1678	I				0.0	8.1678	I										0.011
	I				0.0		I*										0.011
8.2284	I				0.011	8.2284	I										0.022
	I*				0.011		I*										0.022
8.2891	I				0.022	8.2891	I										0.044
	I**				0.022		I**										0.044
8.3497	I				0.011	8.3497	I										0.055
	I*				0.011		I***										0.055
8.4103	I				0.033	8.4103	I										0.088
	I***				0.033		I***										0.088
8.4709	I				0.033	8.4709	I										0.121
	I***				0.033		I*****										0.121
8.5315	I				0.033	8.5315	I										0.154
	I***				0.033		I*****										0.154
8.5921	I				0.066	8.5921	I										0.220
	I*****				0.066		I*****										0.220
8.6527	I				0.088	8.6527	I										0.308
	I*****				0.088		I*****										0.308
8.7134	I				0.088	8.7134	I										0.396
	I*****				0.088		I*****										0.396
8.7740	I				0.011	8.7740	I										0.407
	I*				0.011		I*****										0.407
8.8346	I				0.066	8.8346	I										0.473
	I*****				0.066		I*****										0.473
8.8952	I				0.066	8.8952	I										0.538
	I*****				0.066		I*****										0.538
8.9558	I				0.055	8.9558	I										0.593
	I*****				0.055		I*****										0.593
9.0164	I				0.055	9.0164	I										0.648
	I*****				0.055		I*****										0.648
9.0771	I				0.055	9.0771	I										0.703
	I*****				0.055		I*****										0.703
9.1377	I				0.022	9.1377	I										0.725
	I**				0.022		I*****										0.725
9.1983	I				0.033	9.1983	I										0.758
	I**				0.033		I*****										0.758
9.2589	I				0.055	9.2589	I										0.813
	I*****				0.055		I*****										0.813
9.3195	I				0.044	9.3195	I										0.857
	I****				0.044		I*****										0.857
9.3801	I				0.022	9.3801	I										0.879
	I**				0.022		I*****										0.879
9.4407	I				0.033	9.4407	I										0.912
	I**				0.033		I*****										0.912
9.5014	I				0.044	9.5014	I										0.956
	I****				0.044		I*****										0.956
9.5620	I				0.033	9.5620	I										0.989
	I**				0.033		I*****										0.989
9.6226	I				0.011	9.6226	I										1.000
	I*				0.011		I*****										1.000
9.6832	I				0.0	9.6832	I										0.0
	I				0.0		I										0.0
9.6832	I				MAX	9.6832	I										MAX

NO. OBS. = 91 MEAN =
 A MULTIMODAL DISTRIBUTION

8.9449 STD ERROR =

0.3635 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.19

NETWORK TIME FOR NODE N49

ALT.4 : Operation Is Successful, But QD Requirements Are Not Met

HFD	0.05	0.10	0.15	0.20	0.25	MIN	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	MIN
67.0352	I	I	I	I	I	0.0	67.0352	I	I	I	I	I	I	I	I	I	I	0.0
67.0352	I	I	I	I	I	0.0	67.0352	I	I	I	I	I	I	I	I	I	I	0.0
67.0352	I	I	I	I	I	0.100	67.0352	I	I	I	I	I	I	I	I	I	I	0.100
67.3505	I	I	I	I	I	0.0	67.3505	I	I	I	I	I	I	I	I	I	I	0.100
67.3505	I	I	I	I	I	0.0	67.3505	I	I	I	I	I	I	I	I	I	I	0.100
67.6658	I	I	I	I	I	0.0	67.6658	I	I	I	I	I	I	I	I	I	I	0.100
67.6658	I	I	I	I	I	0.0	67.6658	I	I	I	I	I	I	I	I	I	I	0.100
67.9810	I	I	I	I	I	0.0	67.9810	I	I	I	I	I	I	I	I	I	I	0.100
67.9810	I	I	I	I	I	0.0	67.9810	I	I	I	I	I	I	I	I	I	I	0.100
68.2963	I	I	I	I	I	0.0	68.2963	I	I	I	I	I	I	I	I	I	I	0.100
68.2963	I	I	I	I	I	0.0	68.2963	I	I	I	I	I	I	I	I	I	I	0.100
68.6116	I	I	I	I	I	0.0	68.6116	I	I	I	I	I	I	I	I	I	I	0.100
68.6116	I	I	I	I	I	0.0	68.6116	I	I	I	I	I	I	I	I	I	I	0.100
68.9269	I	I	I	I	I	0.100	68.9269	I	I	I	I	I	I	I	I	I	I	0.100
68.9269	I	I	I	I	I	0.100	68.9269	I	I	I	I	I	I	I	I	I	I	0.100
69.2422	I	I	I	I	I	0.0	69.2422	I	I	I	I	I	I	I	I	I	I	0.200
69.2422	I	I	I	I	I	0.0	69.2422	I	I	I	I	I	I	I	I	I	I	0.200
69.5575	I	I	I	I	I	0.100	69.5575	I	I	I	I	I	I	I	I	I	I	0.200
69.5575	I	I	I	I	I	0.100	69.5575	I	I	I	I	I	I	I	I	I	I	0.200
69.8728	I	I	I	I	I	0.200	69.8728	I	I	I	I	I	I	I	I	I	I	0.300
69.8728	I	I	I	I	I	0.200	69.8728	I	I	I	I	I	I	I	I	I	I	0.300
70.1881	I	I	I	I	I	0.0	70.1881	I	I	I	I	I	I	I	I	I	I	0.500
70.1881	I	I	I	I	I	0.0	70.1881	I	I	I	I	I	I	I	I	I	I	0.500
70.5034	I	I	I	I	I	0.0	70.5034	I	I	I	I	I	I	I	I	I	I	0.500
70.5034	I	I	I	I	I	0.0	70.5034	I	I	I	I	I	I	I	I	I	I	0.500
70.8187	I	I	I	I	I	0.0	70.8187	I	I	I	I	I	I	I	I	I	I	0.500
70.8187	I	I	I	I	I	0.0	70.8187	I	I	I	I	I	I	I	I	I	I	0.500
71.1340	I	I	I	I	I	0.0	71.1340	I	I	I	I	I	I	I	I	I	I	0.500
71.1340	I	I	I	I	I	0.0	71.1340	I	I	I	I	I	I	I	I	I	I	0.500
71.4493	I	I	I	I	I	0.0	71.4493	I	I	I	I	I	I	I	I	I	I	0.500
71.4493	I	I	I	I	I	0.0	71.4493	I	I	I	I	I	I	I	I	I	I	0.500
71.7646	I	I	I	I	I	0.100	71.7646	I	I	I	I	I	I	I	I	I	I	0.600
71.7646	I	I	I	I	I	0.100	71.7646	I	I	I	I	I	I	I	I	I	I	0.600
72.0798	I	I	I	I	I	0.0	72.0798	I	I	I	I	I	I	I	I	I	I	0.600
72.0798	I	I	I	I	I	0.0	72.0798	I	I	I	I	I	I	I	I	I	I	0.600
72.3951	I	I	I	I	I	0.0	72.3951	I	I	I	I	I	I	I	I	I	I	0.600
72.3951	I	I	I	I	I	0.0	72.3951	I	I	I	I	I	I	I	I	I	I	0.600
72.7104	I	I	I	I	I	0.100	72.7104	I	I	I	I	I	I	I	I	I	I	0.700
72.7104	I	I	I	I	I	0.100	72.7104	I	I	I	I	I	I	I	I	I	I	0.700
73.0257	I	I	I	I	I	0.0	73.0257	I	I	I	I	I	I	I	I	I	I	0.700
73.0257	I	I	I	I	I	0.0	73.0257	I	I	I	I	I	I	I	I	I	I	0.700
73.3410	I	I	I	I	I	0.100	73.3410	I	I	I	I	I	I	I	I	I	I	0.800
73.3410	I	I	I	I	I	0.100	73.3410	I	I	I	I	I	I	I	I	I	I	0.800
73.6563	I	I	I	I	I	0.100	73.6563	I	I	I	I	I	I	I	I	I	I	0.900
73.6563	I	I	I	I	I	0.100	73.6563	I	I	I	I	I	I	I	I	I	I	0.900
73.9716	I	I	I	I	I	0.0	73.9716	I	I	I	I	I	I	I	I	I	I	0.900
73.9716	I	I	I	I	I	0.0	73.9716	I	I	I	I	I	I	I	I	I	I	0.900
74.2869	I	I	I	I	I	0.0	74.2869	I	I	I	I	I	I	I	I	I	I	0.900
74.2869	I	I	I	I	I	0.0	74.2869	I	I	I	I	I	I	I	I	I	I	0.900
74.6022	I	I	I	I	I	0.0	74.6022	I	I	I	I	I	I	I	I	I	I	0.900
74.6022	I	I	I	I	I	0.0	74.6022	I	I	I	I	I	I	I	I	I	I	0.900
74.9175	I	I	I	I	I	0.100	74.9175	I	I	I	I	I	I	I	I	I	I	1.000
74.9175	I	I	I	I	I	0.100	74.9175	I	I	I	I	I	I	I	I	I	I	1.000
75.2330	I	I	I	I	I	0.0	75.2330	I	I	I	I	I	I	I	I	I	I	0.0
75.2330	I	I	I	I	I	0.0	75.2330	I	I	I	I	I	I	I	I	I	I	0.0

83

NO. OBS. = 10 MEAN = 71.3872 STD ERROR = 2.5399 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 1.81
 MODE = 69.9779 PEARSONIAN SKEW = 0.55

PATH AND OVERALL COST ARE THE SAME FOR NODE N49

ALT.4: Operation Is Successful, But QD Requirements Are Not Met

RFD	0.05	0.10	0.15	0.20	0.25	CFD	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
8.1809	I-----I-----I-----I-----I	MIN				8.1809	I-----I-----I-----I-----I									MIN
	I	0.0					I									0.0
8.1809	I					8.1809	I									
	I*****	0.100					I*****									0.100
8.2264	I					8.2264	I									
	I	0.0					I*****									0.100
8.2718	I					8.2718	I									
	I	0.0					I*****									0.100
8.3172	I					8.3172	I									
	I	0.0					I*****									0.100
8.3626	I					8.3626	I									
	I	0.0					I*****									0.100
8.4080	I					8.4080	I									
	I	0.0					I*****									0.100
8.4534	I					8.4534	I									
	I	0.0					I*****									0.100
8.4988	I					8.4988	I									
	I	0.0					I*****									0.100
8.5442	I					8.5442	I									
	I	0.0					I*****									0.100
8.5896	I					8.5896	I									
	I	0.0					I*****									0.100
8.6350	I					8.6350	I									
	I	0.0					I*****									0.100
8.6804	I					8.6804	I									
	I	0.0					I*****									0.100
8.7258	I					8.7258	I									
	I*****	0.100					I*****									0.200
8.7712	I					8.7712	I									
	I	0.0					I*****									0.200
8.8166	I					8.8166	I									
	I*****	0.100					I*****									0.300
8.8621	I					8.8621	I									
	I	0.0					I*****									0.300
8.9075	I					8.9075	I									
	I	0.0					I*****									0.300
8.9529	I					8.9529	I									
	I	0.0					I*****									0.300
8.9983	I					8.9983	I									
	I	0.0					I*****									0.300
9.0437	I					9.0437	I									
	I*****	0.100					I*****									0.400
9.0891	I					9.0891	I									
	I	0.0					I*****									0.400
9.1345	I					9.1345	I									
	I	0.0					I*****									0.400
9.1799	I					9.1799	I									
	I*****	0.200					I*****									0.600
9.2253	I					9.2253	I									
	I*****	0.100					I*****									0.700
9.2707	I					9.2707	I									
	I	0.0					I*****									0.700
9.3161	I					9.3161	I									
	I*****	0.300					I*****									1.000
9.3615	I					9.3615	I									
	I	0.0					I									0.0
9.3615	I					9.3615	I									
	I						I									MAX

84

NO. OBS. = 10 MEAN = 9.0493 STD ERROR = 0.3730 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 3.49
MODE = 9.3388 PEARSONIAN SKEW = 0.78

NETWORK TIME FOR NODE N51

ALT.4: Static Separators Are Installed and QD Requirements Are Not Met

RFD		0.05	0.10	0.15	0.20	0.25	CFD										MIN	
							0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0		
37.1212	I	-----I-----I-----I-----I																0.0
37.1212	I																	0.220
38.4099	I	I*****																0.360
39.6987	I	I*****																0.300
40.9875	I																	0.0
42.2762	I																	0.0
43.5650	I																	0.0
44.8538	I																	0.0
46.1426	I																	0.0
47.4313	I																	0.0
48.7201	I																	0.0
50.0089	I																	0.0
51.2977	I																	0.0
52.5864	I																	0.0
53.8752	I																	0.0
55.1640	I																	0.0
56.4527	I																	0.0
57.7415	I																	0.0
59.0303	I																	0.0
60.3191	I																	0.0
61.6078	I																	0.0
62.8966	I																	0.0
64.1854	I																	0.0
65.4742	I**																	0.020
66.7629	I																	0.0
68.0517	I																	0.060
69.3405	I	I*****																0.040
70.6295	I	I****																0.0
70.6295	I																	MAX

85

NO. OBS. = 50 MEAN = 42.7079 STD ERROR = 9.7934 COEF OF VARIATION = 0.23 KURTOSIS (BETA 2) = 6.30
 MODE = 39.3141 PEARSONIAN SKEW = 0.35

PATH AND OVERALL COST ARE THE SAME FOR NODE N51
 ALT.: Static Separators Are Installed And QD Requirements Are Not Met

RFD 0.05 0.10 0.15 0.20 0.25						CFD 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0											
	I	I**	I***	I****	I*****		I	I**	I***	I****	I*****		I	I**	I***	I****	I*****
6.6076	I					6.6076	I					6.6076	I				
					0.0												0.0
6.6076	I					6.6076	I					6.6076	I				
		I**			0.020									I**			0.020
6.6583	I					6.6583	I					6.6583	I				
		I**			0.020									I**			0.040
6.7090	I					6.7090	I					6.7090	I				
		I**			0.0									I**			0.040
6.7597	I					6.7597	I					6.7597	I				
		I**			0.020									I***			0.060
6.8104	I					6.8104	I					6.8104	I				
		I**			0.020									I****			0.080
6.8611	I					6.8611	I					6.8611	I				
		I**			0.020									I*****			0.100
6.9118	I					6.9118	I					6.9118	I				
		I***			0.040									I*****			0.140
6.9625	I					6.9625	I					6.9625	I				
		I**			0.020									I*****			0.160
7.0133	I					7.0133	I					7.0133	I				
		I****			0.040									I*****			0.200
7.0640	I					7.0640	I					7.0640	I				
		I*****			0.080									I*****			0.280
7.1147	I					7.1147	I					7.1147	I				
		I****			0.040									I*****			0.320
7.1654	I					7.1654	I					7.1654	I				
		I****			0.040									I*****			0.360
7.2161	I					7.2161	I					7.2161	I				
		I*****			0.160									I*****			0.520
7.2668	I					7.2668	I					7.2668	I				
		I**			0.020									I*****			0.540
7.3175	I					7.3175	I					7.3175	I				
		I**			0.020									I*****			0.560
7.3682	I					7.3682	I					7.3682	I				
		I*****			0.120									I*****			0.680
7.4189	I					7.4189	I					7.4189	I				
		I*****			0.100									I*****			0.780
7.4696	I					7.4696	I					7.4696	I				
		I*****			0.080									I*****			0.860
7.5203	I					7.5203	I					7.5203	I				
		I			0.0									I*****			0.860
7.5710	I					7.5710	I					7.5710	I				
		I****			0.040									I*****			0.900
7.6217	I					7.6217	I					7.6217	I				
		I****			0.040									I*****			0.940
7.6724	I					7.6724	I					7.6724	I				
		I**			0.020									I*****			0.960
7.7231	I					7.7231	I					7.7231	I				
		I**			0.020									I*****			0.980
7.7738	I					7.7738	I					7.7738	I				
		I			0.0									I*****			0.980
7.8245	I					7.8245	I					7.8245	I				
		I			0.0									I*****			0.980
7.8752	I					7.8752	I					7.8752	I				
		I**			0.020									I*****			1.000
7.9259	I					7.9259	I					7.9259	I				
		I			0.0									I			0.0
7.9259	I					7.9259	I					7.9259	I				
					MAX												MAX

NO. OBS. = 50 MEAN = 7.2736 STD ERROR = 0.2749 COEF OF VARIATION = 0.04 KURTOSIS (BETA 2) = 2.88
 MODE = 7.2395 PEARSONIAN SKEW = 0.12

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