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BEFORE THE ARIZONA CORPORATION COMMISSION

WILLIAM A. MUNDELL
Chairman
JIM IRVIN
Commissioner
MARC SPITZER
Commissioner

IN THE MATTER OF THE GENERIC INVESTIGATION INTO U S WEST COMMUNICATIONS, INC.'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS.	DOCKET NO. T-00000A-00-0194 **QWEST CORPORATION'S NOTICE OF FILING**

Qwest Corporation hereby provides notice of filing the Surrebuttal Testimony of William L. Fitzsimmons, which was submitted at the hearing on July 31, 2001.

RESPECTFULLY SUBMITTED this 1st day of August, 2001.

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By Jennifer Gadiville for
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Arizona Corporation Commission
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BEFORE THE ARIZONA CORPORATION COMMISSION

WILLIAM A. MUNDELL
Chairman
JAMES M. IRVIN
Commissioner
MARC SPITZER
Commissioner

IN THE MATTER OF INVESTIGATION INTO QWEST CORPORATION'S COMPLIANCE WITH CERTAIN WHOLESALE PRICING REQUIREMENTS FOR UNBUNDLED NETWORK ELEMENTS AND RESALE DISCOUNTS	)	**DOCKET NO. T-00000A-00-0194** **PHASE II**

SURREBUTTAL TESTIMONY OF

WILLIAM L. FITZSIMMONS

ON BEHALF OF QWEST CORPORATION

JULY 30, 2001

Q. PLEASE STATE YOUR NAME AND POSITION.

A. My name is William L. Fitzsimmons. I am a Director at LECG, LLC; my business address is 2000 Powell Street, Suite 600, Emeryville, CA 94608.

Q. ARE YOU THE SAME WILLIAM L. FITZSIMMONS WHO FILED DIRECT AND REBUTTAL TESTIMONY IN THIS DOCKET?

A. Yes.

Q. WHY ARE YOU FILING SURREBUTTAL TESTIMONY AT THIS TIME?

A. On page 62 of my rebuttal testimony, I explained that many of the input values used by Mr. Dunkel in his run of HAI 5.2a are not based on the Arizona Corporation Commission values, the FCC's Tenth Report and Order, or the HAI 5.2a default values. In Exhibit WLF-3 attached to my rebuttal testimony, I identified the distribution and feeder input values from Mr. Dunkel's run of the model that are not supported by the FCC. During the first week of the proceedings in this case, Mr. Dunkel filed surrebuttal testimony that identified the source of the input values that he portrayed as values used by the FCC when it ran its cost model for Arizona. Immediately after I testified in Phoenix on July 19, 2001, I began investigating Mr. Dunkel's claim that the source he identified includes the values for inputs used by the FCC to estimate feeder and distribution investments. This testimony presents the results of that investigation.

Q. DID YOU INVESTIGATE MR. DUNKEL'S CLAIM THAT HE USES THE FCC'S INPUT VALUES IN HIS RUN OF THE HAI 5.2A MODEL [DUNKEL SURREBUTTAL, P. 1]?

A. Yes. To investigate Mr. Dunkel's claim that he uses FCC specified input values in his run of the HAI 5.2a model, I reviewed the FCC's Tenth Report and Order[1] and the User Manual for the FCC's cost model,[2] and Debra Stump, a consultant on my staff, contacted FCC staff to confirm my findings.

Q. DID THIS REVIEW CONFIRM YOUR EARLIER CONCLUSION THAT MR. DUNKEL'S RUN OF HAI 5.2A DOES NOT REFLECT THE FCC'S SPECIFIED VALUES FOR KEY INVESTMENT INPUTS? [FITZSIMMONS REBUTTAL, P. 62]

A. Yes. My investigation confirms that Mr. Dunkel does not use the FCC's specified values for feeder or distribution investment inputs in his run of the HAI 5.2a model. Mr. Dunkel states that "[t]he FCC inputs that I used are the FCC inputs exactly as used by the FCC in the actual run that the FCC used to determine universal service fund eligibility for Qwest in Arizona."[3] This claim is inaccurate.

Mr. Dunkel apparently uses input values from the worksheet titled "User Adjustable Inputs" in the file "AZ Mountain Bell-Arizon_Default

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1 *Federal-State Joint Board on Universal Service, Forward-Looking Mechanism for High Cost Support for Non-Rural LECs,* Tenth Report and Order, CC Docket Nos. 96-45 and 97-160, FCC 99-304 (rel. October 21, 1999) ("Tenth Report and Order").

2 Le, Hung and W. W. Sharkey, "The HCPM/HAI Interface for a Cost Proxy Model Synthesis: A User Manual," Federal Communications Commission, March 26, 1999 ("User Manual").

3 Dunkel Surrebuttal, p. 1.

Scenario_WC.xls," which he downloaded from the FCC's website.[4] He claims that these are the input values specified by the FCC. He is mistaken. A review of the FCC's model documentation shows that the FCC's input values for distribution and feeder investment are not located in this worksheet. The feeder and distribution investment input values in this worksheet are not the values specified by the FCC and are not the values used in the FCC's run of their model.

Q. WOULD YOU PLEASE ELABORATE ON WHAT THE USER MANUAL DESCRIBES RELATIVE TO THE USE OF INPUT VALUES?

A. To run the FCC's model, the user selects an HCPM input file and a HAI scenario.[5] In October 1999, the FCC adopted input values for the HCPM model and described these values in the Tenth Report and Order.[6] These FCC-specified values are located in the file "HCPM_inputs_October 1999.xls."[7] This file is downloaded automatically when a user downloads the FCC's model. A copy of this file is attached as Exhibit WLF-5. The inputs described in this file match the inputs specified by the FCC in its Tenth Report and Order, and they match the

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4 Dunkel Surrebuttal, p. 1 and Schedule WD-20. The file is available by downloading the "Results Zip File" available at http://www.fcc.gov/ccb/apd/hcpm/.

5 User Manual, p. 5.

6 "In this Report and Order, we complete the selection of a model to estimate forward-looking cost by selecting input values for the synthesis model we previously adopted." Tenth Report and Order, paragraph 2.

7 The FCC-specified values are also described in documentation provided when a user downloads the FCC model from the FCC's website. See Bush, CA, DM Kennet, J Prisbrey, and WW Sharkey, Federal Communications Commission, and Vaikunth Gupta, Panum Telecom, LLC, "Computer Modeling of the Local Telephone Network," October 1999, Appendix A, p. 22.

values listed in the "FCC" column of Exhibit WLF-3 of my rebuttal testimony.[8] They are not the values for feeder and distribution investments used by Mr. Dunkel in his run of the HAI 5.2a model.

When the FCC's model is run, the HCPM input values from the file "HCPM_inputs_October 1999.xls" are written to a file called "Hcpm_current_inputs.xls."[9] This new file contains the values for the HCPM inputs that are actually used when the model is run. When the HCPM is run with the "HCPM_inputs_October 1999.xls" file, the values for feeder and investment inputs match Exhibit WLF-3.

Q. DID YOU VERIFY YOUR FINDINGS WITH EXPERTS AT THE FCC?

A. Yes. FCC staff confirmed that the inputs listed in the "User Adjustable Inputs" worksheet of the file cited by Mr. Dunkel are the HAI 5.0a default inputs.[10] They are *not* the FCC's inputs to the HCPM portion of its model. In some cases, such as SAI and fiber feeder investments, they are no longer even supported by proponents of the HAI model. The HCPM inputs are selected by the user before running the FCC's model. These inputs are in a different format than the HAI inputs for distribution and investment and are not included as inputs in the "User Adjustable Inputs" worksheet. The only FCC-specified input values listed in this worksheet are inputs related to the FCC model's switching, interoffice, and

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8 The "Fiber Feeder Investment per foot" input values in the "FCC" column of Exhibit WLF-3 are weighted averages of the FCC's specified input values. The weighting is done to translate the FCC-specified values into Arizona-specific values that are compatible with the HAI 5.2a model.

9 User Manual, p. 6.

10 Telephone conversation with the FCC Staff, July 24, 2001.

expense modules.

Q. DID YOU REPLICATE THE FCC MODEL RUN THAT IS ON THE FCC'S WEBSITE?

A. Yes, I replicated the FCC's model run that produces the worksheet cited by Mr. Dunkel, "AZ Mountain Bell-Arizon_Default Scenario_WC.xls." The values for the feeder and distribution investment match the values from the FCC's Tenth Report and Order. They are not the values used in Mr. Dunkel's run of the HAI 5.2a model. For example, Table 1 compares the input values for SAI indoor investment from the FCC's Tenth Report and Order, the "Hcpm_current_inputs.xls" file created when I replicated the FCC model run, and Mr. Dunkel's run of HAI 5.2a. The values used by Mr. Dunkel for this input are actually the default values from HAI 5.0a, which is not supported by any party in this proceeding.

Table 1
Comparison of Input Values for SAI Indoor Investment ($)

Lines	FCC 10th Report and Order	WLF run of FCC model ("hcpm_current_inputs.xls")	Dunkel run of HAI 5.2a
50	220	220	98
100	333	333	148
200	665	665	296
400	1,331	1,331	592
600	1,996	1,996	888
900	2,770	2,770	1,232
1200	3,993	3,993	1,776
1800	5,539	5,539	2,464
2400	7,536	7,536	3,352
3600	11,079	11,079	4,928
5400	16,618	16,618	7,392
7200	21,708	21,708	9,656

Q. WHAT WERE THE RESULTS OF THESE RUNS OF THE FCC'S MODEL?

A. When I ran the "wire center" option, using the HCPM inputs file described above and attached as Exhibit WLF-5, the model produced the same output worksheet that is available on the FCC's website.

In addition, I viewed the results of the same run by density zone, rather than by wire center. Like the HAI 5.2a model presented by Mr. Denney in this proceeding, the FCC's model allows the user to display results by density zone or by wire center. As Mr. Denney describes, "the [HAI 5.2a] Model calculates per-unit UNE costs, network interconnection costs, and the cost of universal service. At the user's discretion, these results can be displayed by line density range, wire center, or individual customer location 'cluster.'"[11]

The run of the FCC model is meant to estimate the cost of providing basic local service for use in determining universal service funding. I agree with Mr. Denney that the FCC model is not designed to produce UNE costs.[12] The loop cost estimate from the "density zone" run of the HCPM/HAI, consistent with the FCC's specified input values, is $17.77.

Q. WOULD YOU PLEASE SUMMARIZE YOUR COMMENTS?

A. The FCC's HCPM User Manual states: "Users should be aware that there is no linkage between HAI inputs and HCPM input files. It is the responsibility of the

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[11] Denney Direct, p. 13.

[12] Denney Direct, p. 19.

user to make appropriate selections for each of the model components."[13] Rather than heed this warning, Mr. Dunkel selected inappropriate input values for the run that he presents in this proceeding. Many of the feeder and distribution input values that he portrays as FCC values are actually default values from the HAI 5.0a model, which is not supported by any party in this proceeding. As a result, Mr. Dunkel's run of the HAI model does not provide meaningful information for consideration in this proceeding.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes.

PHX/1210163.1/67817.240

[13] User Manual, p. 6.

Interface Options		
** Values	Description	Comments
-s0.36	Clusintf Options	Determine microgrid size in kilofeet
-v -p	Feeddist Options	Determine output reporting and optimization in distribution plant
0	Plant Mix by Study Area	Requires file PlantMixByStudyArea.csv in Inputs Subdirectory
1	Save Workfiles	Saves Cluster.zip and HM Worksheets
3	HCPM Start With	
1	HAI Start With	
1	Output Reports	

Cluster Inputs		
** Values	Description	Comments
150	Raster_Size	Initial value for rasterization process
17000	Distance_Limit	
1800	Line_Limit	
80	Line_Fill	Determines cluster size before optimizaton
113	Block_Divide_Factor	Used only with Census block data
1	Cluster_Algorithm	
4	Optimization_Method	
1000	Maximum_populated_cells	Initial value for rasterization process
1	Use_hcpm.mdb	
1	True-up_line_counts	

Feeder / Distribution Inputs		
** Value	Variable Name	Comments
0.5	max_drop_length	kilofeet
0.5	user_lambda	kilofeet
12	copper_gauge_xover	kilofeet
18	max_copper_distance	kilofeet
1.25	MaxCopperPenalty	
18	copper_t1_xover	kilofeet
0	t1_fiber_xover	kilofeet; Set this value to zero to turn off T1 technology for switched services
1.25	t1_redundancy_factor	
24	copper_placement_depth	inches
36	fiber_placement_depth	inches
3	CriticalWaterDepth	feet
1.3	WaterFactor	
12	MinSlopeTrigger	
1.10	MinSlopeFactor	
30	MaxSlopeTrigger	
1.05	MaxSlopeFactor	
1.20	CombSlopeFactor	
12.7500%	pct_ds1	
91.75%	pct_lsa	
24	ChannelsPerT1System	
2	PairsPerT1System	
4	FibersPerTerminal	
2016	CapacityF2016	
1344	CapacityF1344	
672	CapacityF672	
96	CapacityF96	
24	CapacityF24	
96	CapacityT96	
24	CapacityT24	
10	lines_per_bus	
1.00	DistRoadFactor	
1.00	FiberFillFactor	
1	DistanceType	
1.00	FeederRoadFactor	
2	Max_SAIs	Maximum number of SAI's placed in a cluster

**	24 Gauge Distribution Cable Costs			
Size	UG	Buried	Aerial	Coments
4200	$ 40.36	$ 41.97	$ 39.57	Price per foot for underground, buried and aerial copper
3600	$ 35.32	$ 36.07	$ 34.10	
3000	$ 30.28	$ 30.17	$ 28.64	
2400	$ 25.24	$ 24.27	$ 23.17	
2100	$ 22.72	$ 21.32	$ 20.44	
1800	$ 20.20	$ 18.37	$ 17.70	
1200	$ 15.16	$ 12.47	$ 12.23	
900	$ 12.64	$ 9.51	$ 9.50	
600	$ 10.12	$ 6.56	$ 6.77	
400	$ 8.43	$ 4.60	$ 4.95	
300	$ 7.59	$ 3.61	$ 4.03	
200	$ 6.75	$ 2.63	$ 3.12	
100	$ 5.91	$ 1.65	$ 2.21	
50	$ 5.49	$ 1.16	$ 1.76	
25	$ 5.28	$ 0.91	$ 1.53	
18	$ 5.23	$ 0.84	$ 1.46	
12	$ 5.17	$ 0.78	$ 1.41	
6	$ 5.12	$ 0.72	$ 1.36	
1	$ 5.08	$ 0.67	$ 1.31	

26 Guage Distribution Cable Costs				
** Size	UG	Buried	Aerial	Comments
4200	$ 30.07	$ 31.81	$ 28.48	Price per foot for underground, buried and aerial copper
3600	$ 26.37	$ 27.37	$ 24.63	
3000	$ 22.67	$ 22.93	$ 20.78	
2400	$ 18.97	$ 18.49	$ 16.94	
2100	$ 17.12	$ 16.27	$ 15.01	
1800	$ 15.27	$ 14.05	$ 13.09	
1200	$ 11.60	$ 9.61	$ 9.23	
900	$ 9.78	$ 7.39	$ 7.31	
600	$ 7.98	$ 5.17	$ 5.38	
400	$ 6.82	$ 3.68	$ 4.08	
300	$ 6.27	$ 2.94	$ 3.44	
200	$ 5.75	$ 2.20	$ 2.78	
100	$ 5.32	$ 1.45	$ 2.12	
50	$ 5.18	$ 1.07	$ 1.79	
25	$ 5.15	$ 0.88	$ 1.61	
18	$ 5.15	$ 0.82	$ 1.57	
12	$ 5.15	$ 0.78	$ 1.52	
6	$ 5.16	$ 0.73	$ 1.48	
1	$ 5.16	$ 0.69	$ 1.45	

**	24 Guage Feeder Cable Costs			
Size	UG	Buried	Aerial	Comments
4200	$ 40.36	$ 41.97	$ 39.57	Price per foot for underground, buried and aerial copper
3600	$ 35.32	$ 36.07	$ 34.10	
3000	$ 30.28	$ 30.17	$ 28.64	
2400	$ 25.24	$ 24.27	$ 23.17	
2100	$ 22.72	$ 21.32	$ 20.44	
1800	$ 20.20	$ 18.37	$ 17.70	
1200	$ 15.16	$ 12.47	$ 12.23	
900	$ 12.64	$ 9.51	$ 9.50	
600	$ 10.12	$ 6.56	$ 6.77	
400	$ 8.43	$ 4.60	$ 4.95	
300	$ 7.59	$ 3.61	$ 4.03	
200	$ 6.75	$ 2.63	$ 3.12	
100	$ 5.91	$ 1.65	$ 2.21	
50	$ 5.49	$ 1.16	$ 1.76	
25	$ 5.28	$ 0.91	$ 1.53	
18	$ 5.23	$ 0.84	$ 1.46	
12	$ 5.17	$ 0.78	$ 1.41	
6	$ 5.12	$ 0.72	$ 1.36	
1	$ 5.08	$ 0.67	$ 1.31	

**	26 Gauge Feeder Costs			
Size	UG	Buried	Aerial	Comments
4200	$ 30.07	$ 31.81	$ 28.48	Price per foot for underground, buried and aerial copper
3600	$ 26.37	$ 27.37	$ 24.63	
3000	$ 22.67	$ 22.93	$ 20.78	
2400	$ 18.97	$ 18.49	$ 16.94	
2100	$ 17.12	$ 16.27	$ 15.01	
1800	$ 15.27	$ 14.05	$ 13.09	
1200	$ 11.60	$ 9.61	$ 9.23	
900	$ 9.78	$ 7.39	$ 7.31	
600	$ 7.98	$ 5.17	$ 5.38	
400	$ 6.82	$ 3.68	$ 4.08	
300	$ 6.27	$ 2.94	$ 3.44	
200	$ 5.75	$ 2.20	$ 2.78	
100	$ 5.32	$ 1.45	$ 2.12	
50	$ 5.18	$ 1.07	$ 1.79	
25	$ 5.15	$ 0.88	$ 1.61	
18	$ 5.15	$ 0.82	$ 1.57	
12	$ 5.15	$ 0.78	$ 1.52	
6	$ 5.16	$ 0.73	$ 1.48	
1	$ 5.16	$ 0.69	$ 1.45	

T1 Feeder Costs				
** Size	UG	Buried	Aerial	Comments
4200	$ 30.07	$ 31.81	$ 28.48	Price per foot for underground, buried and aerial copper
3600	$ 26.37	$ 27.37	$ 24.63	
3000	$ 22.67	$ 22.93	$ 20.78	
2400	$ 18.97	$ 18.49	$ 16.94	
2100	$ 17.12	$ 16.27	$ 15.01	
1800	$ 15.27	$ 14.05	$ 13.09	
1200	$ 11.60	$ 9.61	$ 9.23	
900	$ 9.78	$ 7.39	$ 7.31	
600	$ 7.98	$ 5.17	$ 5.38	
400	$ 6.82	$ 3.68	$ 4.08	
300	$ 6.27	$ 2.94	$ 3.44	
200	$ 5.75	$ 2.20	$ 2.78	
100	$ 5.32	$ 1.45	$ 2.12	
50	$ 5.18	$ 1.07	$ 1.79	
25	$ 5.15	$ 0.88	$ 1.61	
18	$ 5.15	$ 0.82	$ 1.57	
12	$ 5.15	$ 0.78	$ 1.52	
6	$ 5.16	$ 0.73	$ 1.48	
1	$ 5.16	$ 0.69	$ 1.45	

Fiber Cable Costs				
** Size	UG	Buried	Aerial	Comments
288	$ 9.43	$ 8.89	$ 8.17	{Costs of underground,
144	$ 6.14	$ 4.76	$ 4.69	buried and aerial fiber
96	$ 5.04	$ 3.39	$ 3.53	cable}
72	$ 4.49	$ 2.70	$ 2.95	
60	$ 4.22	$ 2.35	$ 2.66	
48	$ 3.94	$ 2.01	$ 2.37	
36	$ 3.67	$ 1.67	$ 2.08	
24	$ 3.40	$ 1.32	$ 1.79	
18	$ 3.26	$ 1.15	$ 1.65	
12	$ 3.12	$ 0.98	$ 1.50	
1	$ 2.87	$ 0.66	$ 1.24	

Distribution Plant Mix				
** Density	UG	Buried	Aerial	Comments
0	0.00%	60.00%	40.00%	{These entries represent
5	1.00%	62.00%	37.00%	minimum placement percentages
100	2.00%	68.00%	30.00%	for underground, buried
200	4.00%	66.00%	30.00%	and aerial respectively.
650	8.00%	62.00%	30.00%	When they sum to less than 1,
850	20.00%	50.00%	30.00%	the model selects the residual
2550	40.00%	30.00%	30.00%	placement to minimize cost
5000	60.00%	10.00%	30.00%	for the particular terrain and
10000	90.00%	0.00%	10.00%	density.}

Copper Feeder Plant Mix				
** Density	UG	Buried	Aerial	Comments
0	5.00%	50.00%	45.00%	{Minimum placement percetages.
5	5.00%	50.00%	45.00%	See comment in distrmix
100	5.00%	50.00%	45.00%	for further explanation.}
200	20.00%	40.00%	40.00%	
650	40.00%	30.00%	30.00%	
850	60.00%	25.00%	15.00%	
2550	75.00%	15.00%	10.00%	
5000	90.00%	5.00%	5.00%	
10000	95.00%	0.00%	5.00%	

Fiber Feeder Plant Mix				
** Density	UG	Buried	Aerial	Comments
0	5.00%	50.00%	45.00%	Minimum placement percetages.
5	5.00%	50.00%	45.00%	See comment in distrmix
100	5.00%	50.00%	45.00%	for further explanation.
200	20.00%	40.00%	40.00%	
650	40.00%	30.00%	30.00%	
850	60.00%	25.00%	15.00%	
2550	75.00%	15.00%	10.00%	
5000	90.00%	5.00%	5.00%	
10000	95.00%	0.00%	5.00%	

Drop Terminal Costs				
** Size	Buried	Aerial	UG	Comments
1	$ 133.46	$ 70.44	$ 133.46	Drop terminal costs
6	$ 157.05	$ 95.98	$ 157.05	
12	$ 440.87	$ 131.81	$ 440.87	
25	$ 451.00	$ 216.00	$ 451.00	
50	$ 220.00	$ 220.00	$ 220.00	For terminal sizes larger than 25
100	$ 333.00	$ 333.00	$ 333.00	the values in this table reflect the
200	$ 665.00	$ 665.00	$ 665.00	cost of an indoor SAI.
400	$ 1,331.00	$ 1,331.00	$ 1,331.00	
600	$ 1,996.00	$ 1,996.00	$ 1,996.00	
900	$ 2,770.00	$ 2,770.00	$ 2,770.00	
1200	$ 3,993.00	$ 3,993.00	$ 3,993.00	
1800	$ 5,539.00	$ 5,539.00	$ 5,539.00	
2400	$ 7,536.00	$ 7,536.00	$ 7,536.00	
3600	$ 11,079.00	$ 11,079.00	$ 11,079.00	
5400	$ 16,618.00	$ 16,618.00	$ 16,618.00	
7200	$ 21,708.00	$ 21,708.00	$ 21,708.00	

Feeder Distribution Interface Costs			
** Lines	Outdoor	Indoor	Comments
1	$ 150.78	$ 150.78	Costs of Outdoor and Indoor feeder/distribution
50	$ 562.00	$ 220.00	interface devices
100	$ 787.00	$ 333.00	
200	$ 1,349.00	$ 665.00	
400	$ 2,248.00	$ 1,331.00	
600	$ 3,147.00	$ 1,996.00	
900	$ 4,271.00	$ 2,770.00	
1200	$ 5,395.00	$ 3,993.00	
1800	$ 7,644.00	$ 5,539.00	
2400	$ 9,667.00	$ 7,536.00	
3600	$ 13,489.00	$ 11,079.00	Costs for SAIs with greater than 7200 lines
5400	$ 18,434.00	$ 16,618.00	are determined by summing the input values
7200	$ 22,481.00	$ 21,708.00	for two or more SAIs with less than 7200 lines
9000	$ 30,125.00	$ 27,247.00	
10800	$ 35,970.00	$ 32,787.00	
12600	$ 40,915.00	$ 38,326.00	
14400	$ 44,962.00	$ 43,416.00	
16200	$ 52,606.00	$ 48,955.00	
18000	$ 58,451.00	$ 54,495.00	
19800	$ 63,396.00	$ 60,034.00	
21600	$ 67,443.00	$ 65,124.00	
23400	$ 75,087.00	$ 70,663.00	
25200	$ 80,932.00	$ 76,203.00	
27000	$ 85,877.00	$ 81,742.00	
28800	$ 89,924.00	$ 86,832.00	

	Fill Factors			
**	Density	Feeder	Distr	Comments
	0	70.0%	50.0%	Utilization factors for feeder and distribution plant
	5	77.5%	55.0%	
	100	80.0%	55.0%	
	200	82.5%	60.0%	
	650	82.5%	70.0%	
	850	82.5%	75.0%	
	2550	82.5%	75.0%	
	5000	82.5%	75.0%	
	10000	82.5%	75.0%	

Soil Texture Table		
** Soil Type	Impact	Comments
BY	1	Soil texture types and cost multipliers
BY-COS	1	
BY-FSL	1	
BY-L	1	
BY-LS	1	
BY-SICL	1	
BY-SL	1	
BYV	1	
BYV-FSL	1	
BYV-L	1	
BYV-LS	1	
BYV-SIL	1	
BYV-SL	1	
BYX	1	
BYX-FSL	1	
BYX-L	1	
BYX-SIL	1	
BYX-SL	1	
C	0	
CB	0	
CBA	1	
CBA-FSL	1	
CB-C	0	
CB-CL	0	
CB-COSL	0	
CB-FS	0	
CB-FSL	0	
CB-L	0	
CB-LCOS	0	
CB-LS	0	
CB-S	0	
CB-SCL	0	
CB-SICL	0	
CB-SIL	0	
CB-SL	1	
CBV	1	
CBV-C	1	
CBV-CL	1	
CBV-FSL	1	
CBV-L	1	
CBV-LFS	1	
CBV-LS	1	
CBV-MUCK	1	
CBV-SCL	1	
CBV-SIL	1	
CBV-SL	1	
CBV-VFS	1	

CBX	1
CBX-L	1
CBX-CL	1
CBX-SIL	1
CBX-SL	1
CBX-VFSL	1
CE	0
CIND	0
CL	0
CM	1
CN	0
CN-CL	0
CN-FSL	0
CN-L	0
CN-SICL	0
CN-SIL	0
CN-SL	0
CNV	0
CNV-CL	0
CNV-L	0
CNV-SCL	0
CNV-SIL	0
CNV-SL	0
CNX	0
CNX-SL	0
COS	0
COSL	0
CR	0
CRC	1
CR-L	1
CR-SICL	1
CR-SIL	1
CR-SL	1
CRV	1
CRV-L	1
CRV-SIL	1
CRX	1
CRX-SIL	1
DE	0
FB	0
FINE	0
FL	0
FL-FSL	0
FL-L	0
FL-SIC	0
FL-SICL	0
FL-SIL	0
FL-SL	0
FLV	1
FLV-COSL	1

FLV-L	1		
FLV-SICL	1		
FLV-SL	1		
FLX	1		
FLX-L	1		
FRAG	0		
FS	0		
FSL	0		
G	0		
GR	0		
GRC	0		
GR-C	0		
GR-CL	0		
GR-COS	0		
GR-COSL	0		
GRF	0		
GRF-SIL	0		
GR-FS	0		
GR-FSL	0		
GR-L	0		
GR-LCOS	0		
GR-LFS	0		
GR-LS	0		
GR-MUCK	0		
GR-S	0		
GR-SCL	0		
GR-SIC	0		
GR-SICL	0		
GR-SIL	0		
GR-SL	0		
GR-VFSL	0		
GRV	1		
GRV-CL	1		
GRV-COS	1		
GRV-COSL	1		
GRV-FSL	1		
GRV-L	1		
GRV-LCOS	1		
GRV-LS	1		
GRV-S	1		
GRV-SCL	1		
GRV-SICL	1		
GRV-SIL	1		
GRV-SL	1		
GRV-VFS	1		
GRV-VFSL	1		
GRX	1		
GRX-CL	1		
GRX-COS	1		
GRX-COSL	1		

GRX-FSL	1		
GRX-L	1		
GRX-LCOS	1		
GRX-LS	1		
GRX-S	1		
GRX-SIL	1		
GRX-SL	1		
GYP	1		
HM	0		
ICE	1		
IND	1		
L	0		
LCOS	0		
LFS	0		
LS	0		
LVFS	0		
MARL	0		
MK	0		
MK-C	0		
MK-CL	0		
MK-FS	0		
MK-FSL	0		
MK-L	0		
MK-LFS	0		
MK-LS	0		
MK-S	0		
MK-SI	0		
MK-SICL	0		
MK-SIL	0		
MK-SL	0		
MK-VFSL	0		
MPT	0		
MUCK	0		
PEAT	0		
PT	0		
RB	1		
RB-FSL	1		
S	0		
SC	0		
SCL	0		
SG	0		
SH	0		
SH-CL	0		
SH-L	0		
SH-SICL	0		
SH-SIL	0		
SHV	1		
SHV-CL	1		
SHX	1		
SI	0		

SIC	0		
SICL	0		
SIL	0		
SL	0		
SP	0		
SR	0		
ST	0		
ST-C	0		
ST-CL	0		
ST-COSL	0		
ST-FSL	0		
ST-L	0		
ST-LCOS	0		
ST-LFS	0		
ST-LS	0		
ST-SIC	0		
ST-SICL	0		
ST-SIL	0		
ST-SL	0		
ST-VFSL	0		
STV	1		
STV-C	1		
STV-CL	1		
STV-VFSL	1		
STV-FSL	1		
STV-L	1		
STV-LFS	1		
STV-LS	1		
STV-MPT	1		
STV-MUCK	1		
STV-SICL	1		
STV-SIL	1		
STV-SL	1		
STV-VFSL	1		
STX	1		
STX-C	1		
STX-CL	1		
STX-COS	1		
STX-COSL	1		
STX-FSL	1		
STX-L	1		
STX-LCOS	1		
STX-LS	1		
STX-MUCK	1		
STX-SIC	1		
STX-SICL	1		
STX-SIL	1		
STX-SL	1		
STX-VFSL	1		
SY	1		

SY-L	1	
SY-SIL	1	
SYV	1	
SYX	1	
UNK	0	
UWB	1	
VAR	0	
VFS	0	
VFSL	0	
WB	1	

	Normal Terrain Costs						
	Underground		Buried		Aerial		
** Density	Feeder	Distr.	Feeder	Distr.	Feeder	Distr.	Comments
0	$ 1.86	$ 1.86	$ 0.77	$ 0.77	$ 1.51	$ 1.51	Placement costs for normal terrain
5	$ 1.86	$ 1.86	$ 1.54	$ 1.54	$ 1.51	$ 1.51	
100	$ 7.63	$ 7.59	$ 3.24	$ 3.14	$ 1.98	$ 1.98	
200	$ 8.16	$ 8.38	$ 4.26	$ 4.45	$ 1.98	$ 1.98	
650	$ 8.90	$ 9.25	$ 5.20	$ 5.52	$ 2.27	$ 2.27	
850	$ 10.23	$ 10.53	$ 5.51	$ 5.82	$ 2.27	$ 2.27	
2550	$ 14.15	$ 14.23	$ 7.34	$ 7.42	$ 2.64	$ 2.64	
5000	$ 27.79	$ 27.78	$ 9.02	$ 9.00	$ 2.72	$ 2.72	
10000	$ 42.59	$ 42.57	$ 11.93	$ 11.91	$ 2.72	$ 2.72	

	SoftRock Costs						
	Underground		Buried		Aerial		
** Density	Feeder	Distr.	Feeder	Distr.	Feeder	Distr.	Comments
0	$ 5.78	$ 5.78	$ 1.40	$ 1.40	$ 1.80	$ 1.80	Placement costs for soft rock terrain
5	$ 5.78	$ 5.78	$ 2.17	$ 2.17	$ 1.80	$ 1.80	
100	$ 9.04	$ 9.10	$ 3.81	$ 3.93	$ 2.35	$ 2.35	
200	$ 9.99	$ 10.25	$ 5.04	$ 5.32	$ 2.35	$ 2.35	
650	$ 11.02	$ 11.31	$ 6.42	$ 6.70	$ 2.68	$ 2.68	
850	$ 13.24	$ 13.52	$ 7.03	$ 7.29	$ 2.68	$ 2.68	
2550	$ 18.66	$ 18.74	$ 9.18	$ 9.27	$ 3.13	$ 3.13	
5000	$ 38.86	$ 38.85	$ 11.70	$ 11.68	$ 3.21	$ 3.21	
10000	$ 61.20	$ 61.19	$ 16.15	$ 16.13	$ 3.21	$ 3.21	

	HardRock Costs						
	Underground		Buried		Aerial		
** Density	Feeder	Distr.	Feeder	Distr.	Feeder	Distr.	Comments
0	$ 9.69	$ 9.69	$ 2.04	$ 2.04	$ 2.09	$ 2.09	Placement costs for hard rock terrain
5	$ 9.69	$ 9.69	$ 2.80	$ 2.80	$ 2.09	$ 2.09	
100	$ 16.93	$ 16.84	$ 4.89	$ 4.89	$ 2.71	$ 2.71	
200	$ 17.57	$ 17.57	$ 6.45	$ 6.37	$ 2.71	$ 2.71	
650	$ 18.63	$ 18.69	$ 7.67	$ 7.73	$ 3.10	$ 3.10	
850	$ 21.40	$ 21.45	$ 8.65	$ 8.69	$ 3.10	$ 3.10	
2550	$ 27.62	$ 27.63	$ 11.87	$ 11.87	$ 3.61	$ 3.61	
5000	$ 58.18	$ 58.19	$ 15.71	$ 15.72	$ 3.69	$ 3.69	
10000	$ 92.02	$ 92.02	$ 22.46	$ 22.46	$ 3.69	$ 3.69	

Manhole Costs				
** Duct Capacity	Normal	SoftRock	HardRock	Comments
2	$ 1,436.50	$ 1,511.50	$ 1,586.50	Installed Cost for Manholes
4	$ 4,472.47	$ 4,652.47	$ 4,832.47	
9	$ 5,176.00	$ 5,336.00	$ 5,496.00	
99	$ 3,070.00	$ 3,150.00	$ 3,230.00	

Manhole Spacing		
** Density	Spacing(ft)	Comments
0	725	
5	725	
100	725	
200	725	
650	575	
850	575	
2550	575	
5000	400	
10000	400	

	Sharing			
** Density	UG	Buried	Aerial	Comments
0	100.00%	100.00%	50.00%	Percentage of underground, buried and aerial structure used by telco
5	100.00%	100.00%	50.00%	
100	85.00%	85.00%	50.00%	
200	65.00%	65.00%	50.00%	
650	65.00%	65.00%	50.00%	
850	65.00%	65.00%	50.00%	
2550	55.00%	55.00%	35.00%	
5000	55.00%	55.00%	35.00%	
10000	55.00%	55.00%	35.00%	

Annual Charge Factors		
** Annual Factors	Variable	Comments
0.166762	ac_ugd_cop	
0.192854	ac_bur_cop	
0.224354	ac_aer_cop	
0.150832	ac_ugd_fib	
0.146548	ac_bur_fib	
0.150824	ac_aer_fib	
0.133737	ac_ugd_struc	
0.169701	ac_bur_struc	
0.182915	ac_aer_struc	
0.133737	ac_manhole	
0.191178	ac_t1_term	
0.191178	ac_fib_term	
0.189371	ac_fdi	
0.142135	ac_fib_splice	

** Value	Variable	Comments
$ 560.00	cost_per_drop_kf	Units are in kilofeet
$ 39.50	nid_cost	
$ 720.00	duct_cost_per_kf	Units are in kilofeet
$ 152,617.43	a2016	Fixed cost of size 2016 fiber terminal
$ 74.98	b2016	Variable cost of size 2016 fiber terminal
$ 107,224.92	a1344	
$ 74.98	b1344	
$ 97,443.38	a672	
$ 74.98	b672	
$ 23,848.20	a96	
$ 87.30	b96	
$ 19,881.39	a24	
$ 87.30	b24	
$ 23,848.20	ac96	Fixed cost of size 96 T1 (or HDSL) terminal
$ 87.30	bc96	Variable cost of size 96 T1 (or HDSL) terminal
$ 19,881.39	ac24	
$ 87.30	bc24	
$ 11,000.00	site_prep_cost	
$ -	fiber_splice_cost	