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September 2, 1998

Ms. Blanca S. Bayó
Director, Records and Reporting
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Determination of Cost of Local Service --
Docket No. 980696-TP

Dear Ms. Bayó:

Enclosed for filing on behalf of MCI Telecommunications Corporation and MCImetro Access Transmission Services, Inc. (collectively, "MCI") are the original and fifteen redacted copies of the rebuttal testimony and exhibits of J.W. Wells.

Also enclosed in an envelope marked "CONFIDENTIAL" is one unredacted copy of Mr. Wells' testimony and exhibits on which potentially confidential information has been highlighted in yellow.

This potentially confidential information belongs to BellSouth, GTE Florida and Sprint, respectively. MCI hereby requests that this information be accorded confidential status pending any required justification by the owners of the information and an ultimate ruling, if one is required.

By copy of this letter, the redacted version of these documents are being furnished to the parties on the attached service list.

Very truly yours,

Richard D. Melson

RDM/mee
Enclosures
cc: Parties of Record

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DOCUMENT NUMBER-DATE
09596 SEP-2 98
FPSC-RECORDS/REPORTING

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FPSC-RECORDS/REPORTING

Letter of Intent
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FPSC-RECORDS/REPORTING

ORIGINAL

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

REBUTTAL TESTIMONY OF

JAMES W. WELLS, JR.

ON BEHALF OF

MCI TELECOMMUNICATIONS CORPORATION

Docket No. 980696-TP

September 2, 1998

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is James W. Wells, Jr., and my office address is 5280 Laithbank Lane, Alpharetta, GA 30022

Q. BY WHOM AND IN WHAT CAPACITY ARE YOU EMPLOYED?

A. I am the President of J. W. Wells, Inc. In this proceeding, I am providing consulting expertise in telecommunications Outside Plant ("OSP") infrastructure planning, design and construction, including costing aspects of the local loop.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of MCI Telecommunications Corporation.

II. PURPOSE

Q. WHAT ARE THE PURPOSES OF YOUR TESTIMONY?

A. The purposes of my testimony are to:

- analyze the OSP input values of the Incumbent Local Exchange Carriers ("ILECs") in comparison to those of AT&T/MCI,
- examine the OSP modeling methodology and assumptions of the Benchmark Cost Proxy Model Release 3.1 ("BCPM 3.1") in comparison to those of the HAI Model Release 5.0a ("HM 5.0a"), formerly known as the Hatfield Model, and
- rebut specific OSP portions of the direct testimonies of the ILEC witnesses.

Q. HAVE YOU PROVIDED OTHER TESTIMONY IN THIS PROCEEDING?

A. Yes. I filed direct testimony in this proceeding.

III. QUALIFICATIONS AND EXPERIENCE

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND OSP WORK EXPERIENCE.

A. I have Bachelor of Engineering (Electrical Engineering) and Master of Business Administration degrees and certification as a Project Management Professional. I have gained OSP experience in the following assignments with:

- South Central Bell Telephone Company (now BellSouth) in Birmingham, AL: OSP Construction Foreman - 1 year, OSP Facilities Engineer - 4 years, OSP Planning Engineer - 2 years,
- Western Electric and AT&T Network Systems (now Lucent Technologies): Technical Representative for OSP Products - 5 years and District Manager - OSP Engineering and Construction - 5 years,
- AT&T Local Infrastructure and Access Management: District Manager OSP Engineering and Construction - 1 year,
- AT&T Local Services Division: District Manager Outside Plant Cost Engineering – 1 year, and
- J. W. Wells, Inc.: OSP Consultant – 2 months.

IV. SYNOPSIS

Q. HOW DOES YOUR TESTIMONY FIT INTO THE OVERALL CASE?

A. My area of expertise is the OSP portion of the local loop, which is the network infrastructure from the main distributing frame in the wire center to the network interface device at the customer's premise. My testimony is complemented by the testimonies of:

- Mr. Don Wood, which addresses the HM 5.0a methodology, design and several of the inputs, and
- Mr. Brian Pitkin, which addresses the overall BCPM 3.1.

Q. WOULD YOU PLEASE PROVIDE AN OVERVIEW OF YOUR CONCERNS REGARDING THE BCPM 3.1?

A. I have reviewed the OSP portions of the prefiled direct testimonies of the ILEC witnesses in this proceeding and the BCPM 3.1 Model Methodology (April 30, 1998 Edition). I have also participated in workshops where ILECs have presented the BCPM. In Release 3.1, the BCPM modelers have taken steps to evolve their model by incorporating several of the concepts of earlier releases of the Hatfield Model plus some additional ideas to improve the accuracy and cost efficiency of their local loop model. However, upon thorough investigation, I have found that in the actual implementation of these ideas the <u>BCPM 3.1 still falls well short of being the least-cost, most-efficient, forward-looking and reasonable local loop cost model based on currently available technology</u> in the following ten areas:

- The input values filed by BellSouth, GTE and Sprint vary widely, and in numerous instances the ILECs have utilized unreasonable OSP input values. The OSP input values filed by AT&T/MCI for the HM 5.0a in this proceeding will be shown to be reasonable by comparison.

- The ILEC witnesses make misleading claims of superior transmission quality based on adhering to the constraints of the Carrier Serving Area ("CSA") Concept. However, BCPM 3.1 very clearly does not adhere to those constraints. Both models appropriately design distribution to a maximum length of 18,000 feet from the Digital Loop Carrier Remote Terminal ("DLC RT") by employing range extension cards as required.
- BCPM 3.1 now models customer locations to the much smaller Census Block ("CB") level instead of the Census Block Group ("CBG") level. However, the HM 5.0a employs a superior customer location methodology to BCPM 3.1 in that it models most customer locations (70% for Florida) far more precisely by latitude and longitude geocoding of their addresses. The remaining customers are located by HM 5.0a at the CB level of precision, which is the maximum level of precision that BCPM 3.1 attains for any customer. More precise customer location produces a more accurate and cost efficient network design.
- BCPM 3.1 arbitrarily segments natural clusters of customers (i.e., customers located in the same neighborhood or town) based on a fixed grid overlay. However, HM 5.0a clusters customers based on their proximity to each other and transmission design rules, which is what an OSP Engineer would realistically do in designing a least-cost local loop network.
- The BCPM 3.1 overstates costs because it models an excessive number of DLC RTs in locations serving geographical areas and numbers of

customers that are far too small for a least-cost model. DLC RT locations are costly, and thus it is more cost effective to fully utilize the capacity and transmission capabilities of currently available DLC systems, which is exactly what HM 5.0a does.

- BCPM 3.1 does not perform a quality check to determine if a loop exceeds 18,000 feet in length from the DLC RT. This is important because when a loop exceeds 18,000 feet, the quality of voice grade becomes substandard. In Florida and other states, the BCPM 3.1 has indeed modeled customer locations that are more than 18,000 feet from the DLC RT. By way of comparison, HM 5.0a performs a quality test to assure that none of the loops it models exceed this limit.
- BCPM 3.1 uses a fixed copper/fiber breakpoint and also automatically deploys fiber feeder and DLC for grids where customer demand exceeds the capacity of a single copper cable. However, fiber with DLC is clearly not the economical alternative to copper feeder cables for short loops. HM 5.0a methodology is far superior in its use of dynamic selection of copper versus fiber feeder based upon comparative life cycle economics of these two alternatives.
- BCPM 3.1 still overstates distribution cable length and cost by modeling square lots even though it is clearly more economical and realistic for cities and subdivisions to be modeled based on rectangular lots. The HAI Model has always been more real world and cost efficient in its modeling of 1 wide by 2 deep rectangular lots
- The BCPM 3.1 modeling methodology oversizes distribution cables by:

1. first sizing for the <u>ultimate</u> demand by providing up to two copper cable pairs to all houses, including empty houses;
2. then <u>increasing the ultimate</u> number of pairs required by a cable sizing factor; and
3. finally rounding up this double inflated pair requirement to the next largest discrete cable size.

- The BCPM 3.1 has three significant, but <u>rather arbitrary</u>, OSP network design assumptions which cannot be readily subjected to sensitivity analysis because they are only user adjustable via the cumbersome and time consuming preprocessing application. These assumptions are:
  1. The maximum threshold of 999 lines for determining Carrier Serving Area size.
  2. The distance of 10,000 feet from the wire center in <u>every</u> feeder route in the state of Florida as being the appropriate distance where it is economical and feasible to split a feeder route. Also, this is the arbitrary distance from every wire center where the spacing of lateral subfeeder routes suddenly goes from approximately every 1,600 feet to approximately every 13,000 feet.
  3. The sizing of the road reduced area in the distribution quadrant based on a 500-foot buffer along each side of the roads within that distribution quadrant.

As will be demonstrated in much greater detail in the remainder of this rebuttal testimony, the HM 5.0a is clearly the most appropriate model for determining the cost of the local loop network in Florida based on the relevant criteria of being:

- reasonable,
- least-cost,
- most-efficient, and
- based on currently available technology.

V. <u>CONCERNS REGARDING THE OSP PORTION OF BCPM 3.1</u>

Q. WHAT CONCERNS DO YOU HAVE REGARDING THE OSP INPUT VALUES FILED BY THE ILECs?

A. My analysis of the OSP input values filed by BellSouth, GTE, Sprint and AT&T/MCI in this proceeding <u>contradicts</u> the following three representations generally promoted by the ILECs:

1. The ILECs somehow possess the only true knowledge of local loop network costs in Florida and have also figured out how to appropriately apply their cost data to a bottoms-up model.
2. Because an input value reflects the ILEC's actual experience in its service territory, it is therefore indisputably the least-cost, most-efficient input value.
3. HM 5.0a is populated with unrealistic and low input values because the HAI OSP Engineering Team developed these input values on a national basis.

ILECs have been building local loop networks for decades and do indeed have a great deal of data and experience with studies that perform top-down allocations of the embedded costs in their local loop networks which have been deployed under rate base regulation. However, BellSouth, GTE and Sprint are clearly grappling with how to utilize a bottoms-up, forward-looking, least-cost, most-efficient model for a local loop network based on currently available technology under a "scorched node" assumption.

Q. HAVE YOU COMPARED THE INPUT VALUES PROPOSED BY THE ILECs FOR BCPM 3.1 WITH THOSE OF HM 5.0a?

A. Yes. This docket has created yet another opportunity for a side-by-side comparison of input values for the same model in the same state in the same time frame from three independent ILECs. The following analysis will once again show that:

- There are a number of significant differences among the input values of the three ILECs for the same item.
- ILECs have adopted the BCPM national default input values for several items rather than determine their Florida-specific input values.
- In many areas there is a great deal of consistency between the input values of the ILECs and AT&T/MCI.
- In several instances, the input values of AT&T/MCI to HM 5.0a are significantly more costly than the same input value for the ILECs to BCPM 3.1 because they reflect real world OSP Engineering judgment.
- There are several major differences between the input values of AT&T/MCI to HM 5.0a and the input values of the ILECs to BCPM 3.1

in those areas where there are significantly differing modeling assumptions.

- There are numerous examples of ILEC incorrect and illogical input values having been derived by top-down accounting methods absent direction, or at least a reasonableness check, by OSP Engineers.
- There appears to be no consistent patterns in these differences.

Thus, there is no substantiation to representations that ILEC input values are always the correct values and HM 5.0a input values always drive unreasonably low costs. My conclusions are based on a side-by-side comparison of the national default input values for the BCPM 3.1, with the BCPM 3.1 input values filed by BellSouth, Sprint and GTE on August 3, 1998, and the AT&T/MCI input values to the HM 5.0a in this proceeding. This comparison is detailed in the attached Exhibit ___(JWW-4). The following are examples of some of the analysis of these input values by category:

Pole Costs: The input value comparison for the per unit installed cost of a pole with anchors and guys in density zone 650 - 850 is:

BCPM 3.1				
Default	BellSouth	Sprint	GTE	HM 5.0a
$775.20	xxxxxxx	xxxxxxx	xxxxxxx	$417.00

There is no explanation as to why GTE's input value is 96.9% higher than BellSouth's for Florida-specific installed pole cost. GTE used a mix of 30-foot non-shared poles and 40-foot shared poles. However, Sprint appears to have used only 45- foot poles, which are too tall and much too costly, especially for approximately half of the poles that Sprint does not share. There are obviously major inconsistencies among the ILECs on how to properly model and cost poles using BCPM 3.1.

The relevant question is "What is a <u>reasonable</u> input value in Florida for pole costs?" For a benchmark, the Federal Communications Commission ("FCC") has gathered pole cost data from the ILECs regarding material and labor costs for 40-foot class 4 poles, which is summarized in Exhibit ___ (JWW-2) of my Direct Testimony in this proceeding. Even though it adds costs, HM 5.0a utilizes only 40-foot class 4 poles in order to accommodate sharing on any pole. However, there is very little supporting documentation to ascertain the size and class of the pole(s) being modeled by the ILECs or any underlying data regarding how pole costs were derived or may have been validated.

The total pole costs submitted to the FCC for Florida were BellSouth - $xxxxxx, Sprint - $xxxxxx and GTE - $xxxxxx. Note that the input values filed by Sprint and GTE in this proceeding are considerably higher.

The unweighted arithmetical mean of the FCC pole cost data is $500.75 nationwide and $373.49 for the three Florida ILECs. The nationwide median cost is $422.14. Therefore, my conclusion is that the input value for pole costs for HM 5.0a of $417.00 (even though it is indeed a national default value) is actually quite reasonable for Florida based on the ILEC data collected by the FCC and the Florida-specific costs filed by BellSouth.

Buried Distribution Structure: The input value comparisons for normal buried distribution structure cost in density zone 0 - 5, which is the most rural and therefore most critical in this Universal Service Fund (USF) case, and the most urban density zone of 10,000 + are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
0 - 5	$ 1.47	$ xxxx	$ xxxx	$ xxxx	$ 1.77
10000+	$ 8.84	$ xxxx	$ xxxx	$ xxxx	$45.00

GTE has utilized BCPM national default values rather than its Florida-specific costs for burying cable, even though it is local contractors that typically bury cables. BellSouth's buried distribution structure cost in the lowest density zone (0 - 5), where USF funding is most applicable, is overstated by at least xx%.

BellSouth has not figured out how to, or for other reasons has chosen not to, differentiate buried cable structure costs by type for input into the BCPM 3.1 bottom-up model. Specifically, BellSouth has filed the same cost of $xxxx per foot for plow, rocky plow, trench and backfill, rocky trench, backhoe trench and hand dig for each density zone. This is simply wrong. It cost much less per foot to plow cable than it does to trench and backfill.

Sprint has also made this same erroneous simplification in Florida, though it was able to provide costs specific to each type of buried cable trench in another state. However, it should be possible to derive these differing costs by type of buried structure from the ILEC's contracts.

The consequences of this inability, or refusal, of the ILECs to differentiate their buried structure costs are profound in the most rural density zone where the USF Fund would be applied. The reason is that the predominant method of burying cable in rural areas is plowing (e.g., xx% in BellSouth's filing, Bates Stamp 000196), and plowing is by far the least costly of the BCPM 3.1 buried structure types. Thus, ILEC buried cable structure costs are substantially overstated in rural areas because the average cost for buried cable structures of all types of placing methods has been used as the input value.

Note that the HM 5.0a input value in this comparison is inside the range of the ILECs in the lowest density zone. However, in the most urban density zone, the HM 5.0a input value is far more costly than the three ILECs. This is because the HAI Model OSP Engineering Team has more reasonably determined that there are much higher costs for burying cable when the density is more than 10,000 lines per square mile. This is just one clear demonstration that the HM 5.0a input values are more realistic and have not been derived to produce unreasonably low costs for the local loop network.

Further analysis of the ILEC input values for below ground structure shows that BellSouth's buried and underground structure costs in density zone 10,000+ are illogically lower than the same costs in density zones 2,550 – 5,000 and 5,000 – 10,000. It certainly appears that BellSouth has made input value entry errors which overstate structure costs in density zones 2,550 – 5,000 and 5,000 – 10,000. Also, Sprint's underground structure costs are approximately 10% less than its buried structure costs in each density zone. This is illogical because a conduit trench is wider than a buried cable trench, and the trench depth should be comparable.

These few examples clearly demonstrate that the ILECs are using accountants to unrealistically spread ILEC top-down cost data for input into the bottom-up BCPM 3.1 without applying the judgment of OSP Engineers. Furthermore, it is apparent that even with access to the same pool of OSP Contractors in Florida that Sprint models buried cable structure at less than half the cost of BellSouth.

Underground Feeder Structure: The input value comparisons for underground feeder structure cost in density zone 0 - 5 and the two most urban density zones are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
0 - 5	$ 2.76	$ xxxx	$ xxxx	$ xxxx	$10.29
5000 -10000	$ 8.22	$xxxxx	$ xxxx	$ xxxx	$50.10
10000+	$ 8.84	$xxxxx	$ xxxx	$ xxxx	$75.00

Since the ILECs have access to the same pool of contractors in Florida who place underground structure, why would BellSouth's costs for placing underground structure in the most rural density zone be more than four times that of Sprint? In going from the 5,000 - 10,000 density zone to the 10,000+ density zone, the HM 5.0a input value increases by 49.7%, GTE's input value (i.e., the BCPM national default value) increase by 7.5%, Sprint's input value remains constant, but the BellSouth input value inexplicably drops by 9.9%. Unfortunately, there is no supporting ILEC documentation (e.g., the HM 5.0a Inputs Portfolio) that would help to explain such huge discrepancies.

The HM 5.0a input values in the urban area are far more costly compared to those of the three ILECs. This is because the HAI Model OSP Engineering Team has more reasonably determined that there are extra costs for placing conduit when the density is more than 5,000 lines per square mile. This clearly shows again that the HM 5.0a inputs have been derived from realistic OSP Engineering judgment and certainly do not produce unreasonably low costs.

Note also that GTE's input values for both buried cable and for underground conduit structure in the three highest density zones are identical to each other (Exhibit ___ (JWW-4), Pg. 1). However, the cost for underground conduit structure should definitely be higher than for buried structure because it takes a wider trench for conduit placement, plus several other cost in general.

Conduit: The input value comparison for the material cost of 4-inch conduit is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a

$0.83	$xxxx	$xxxx	$xxxx	$0.60

The HM 5.0a Inputs Portfolio shows validation data ranging from $0.52 to $0.65, which supports the HM 5.0a input value of $0.60. However, BellSouth's input value of $xxxx per foot for 4-inch conduit purchased in large quantities is at least xxx% too high. Once again, however, there is no ILEC supporting documentation to explain why Sprint can obtain 4-inch conduit at a much more reasonable cost than BellSouth or GTE in Florida.

Structure Sharing (% Paid by Telco) - Aerial: The input value comparisons for the sharing of aerial structure (after weighting for poles, anchors and guys) in the most rural and most urban density zones are:

Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a Model
0 - 5	56.45%	xxxxx%	xxxxx%	xxxxx%	50.00%
10000+	60.53%	xxxxx%	xxxxx%	xxxxx%	25.00%

There is consistency among all input values in the most rural density zone. However, HM 5.0a shows considerably more structure sharing (i.e., a lower percentage paid by the telephone company) in the urban area than in the rural area. This is because there are, and certainly will be in the future, more utilities to share with in the urban area than in the rural area. The ILECs, on the other hand, have modeled little difference in the sharing in the urban area than the rural area. There is no supporting documentation to explain the ILEC's modeling logic, which appears lacking in sound OSP Engineering judgment.

<u>Structure Sharing (% Paid by Telco) – Buried Distribution Cable and Underground Feeder Conduit</u>: The input value comparisons for the percentage paid by the telephone company for underground feeder structure in the most urban density zones are:

Type of Structure	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Buried Dist	10000+	80.0%	xxxx%	xxxx%	xxxxx%	33.00%
UG Feeder	10000+	85.0%	xxxx%	xxxx%	xxxxx%	33.00%

These input values represent a most significant difference of OSP Subject Matter Expert opinion regarding least-cost, most-efficient, forward-looking modeling of the local loop network. In the most urban areas for below ground structures, the forward-looking view of the HAI Model OSP Engineering Team is that the telephone company will be able to share underground costs with two other utilities on the average (HM 5.0a IP, App. B).

In sharp contrast, BellSouth, GTE and Sprint foresee virtually zero amounts of sharing. However, the Lucent (formerly AT&T) OSP Engineering Handbook that "reflects standard engineering guidelines" supposedly modeled by BCPM 3.1 (Bowman Direct, Pg. 7) states that "[i]n areas where both power and telephone

This demonstrates an appalling lack of OSP Engineering oversight. This also results in GTE's cost for aerial plant in rural areas to be overstated because too many poles are modeled per aerial cable route distance.

<u>Copper Cable</u>: BellSouth, GTE and Sprint all have input values for 3000, 3600 and 4200 pair 24 gauge cables. However, 24 gauge cables are simply not manufactured in sizes larger than 2400 pairs. Therefore, it is rather obvious that the ILECs are not using the actual existing prices that they pay for specific size cables, since they could not possibly have purchased these particular cables for which they have provided input values. Again, it is obvious that accountants are determining the BCPM 3.1 input values for the ILECs without the input or oversight of competent OSP Engineers.

The comparisons of the total cost input values for the smaller sizes of 24 gauge buried cables, which would be used extensively in rural areas, are:

Cable Size	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
200 pair	$4.45	$xxxx	$xxxx	$xxxx	$4.42
50 pair	$2.50	$xxxx	$xxxx	$xxxx	$1.70
25 pair	$2.08	$xxxx	$xxxx	$xxxx	$1.24
12 pair	$2.05	$xxxx	$xxxx	$xxxx	$0.79
6 pair	$1.97	$xxxx	$xxxx	$xxxx	$0.66

HM 5.0a models 6 and 12 pair 24 gauge cables when they satisfy cable size requirements because they represent currently available technology alternatives that have lower installed cost and are more efficient in terms of cable utilization than 25 pair cables. BellSouth has defaulted to the 25 pair cable costs for 6 and 12 pair cable sizes. The rationale is that current (i.e., BellSouth's embedded) operating practices do not allow these small cables in their inventories.

The relevant criteria for determining USF support are least-cost and most-efficient based on currently available technology. The latest input values filed by BellSouth in the BCPM 3.1 for 6 and 12 pair 24 gauge cable does not satisfy these relevant criteria. Furthermore, the greatest manifestation of this excessive cable costing will be in the most rural areas where the smallest cables are more prevalent and where the USF support will be most required. BellSouth should provide appropriate input values for 6 and 12 pair 24 gauge copper cables in BCPM 3.1 for the purpose of determining appropriate local loop costs for USF support, which is what Sprint and GTE have done.

BellSouth utilizes the same copper cable prices for feeder and distribution cable applications. However, BellSouth's cable prices include cable terminals via a loading factor (BellSouth's Model Inputs and Assumptions, Bates Stamp 000157). Feeder cables simply do not have cable terminals, yet BellSouth's feeder cable costs obviously include a loading factor for terminals. This is a prime example of misapplying top-down costing principles in a bottom-up costing model without OSP Engineering judgment direction or oversight.

Another seemingly illogical phenomenon of BellSouth's cable costing is that its 26 gauge aerial cable costs are higher than its 24 gauge buried cable cost for each pair size. Also, BellSouth's cost for 25 pair 26 gauge aerial and buried cables are higher than for the same cables in 24 gauge. Because 26 gauge copper conductors are smaller than 24 gauge, 26 gauge cables are less costly than 24 gauge cables in the same pair size for the same application.

For some unexplained reason, Sprint's underground cable costs (i.e., without structure) are significantly higher than its aerial and buried cable cost for the same pair size and gauge of cables. This contradicts the appropriate relationship demonstrated by the comparable input values for HM 5.0a and the other ILECs.

Fiber Cable: The input value comparisons for aerial fiber cable total costs are:

Fiber Strands	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
144	$9.85	$xxxx	$xxxx	$xxxx	$9.50
48	$5.27	$xxxx	$xxxx	$xxxx	$4.70
12	$3.04	$xxxx	$xxxx	$xxxx	$2.90

Thus, the HM 5.0a fiber cable costs are shown to be very reasonable. Also, HM 5.0a has a maximum size fiber cable of 216 strands versus 288 strands for the BCPM 3.1 and the three ILECs. Thus, HM 5.0a will incur even higher fiber cable costs than BCPM 3.1 when the fiber strand requirements exceed 216 because HM 5.0a will place an additional fiber cable with supporting structure at multiples of 216 required strands instead of at multiples of 288 required strands

Serving Area Interface ("SAI", also known as Feeder Distribution Interface): The input value comparison for the installed (i.e., material and installation) cost of a 3600 pair indoor SAI is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
$19,605	$xxxxxx	$xxxxxx	$xxxxxx	$4,928

There are obviously incredible differences. The HM 5.0a input value is described in Section 2.9 of the HM 5.0a Inputs Portfolio. There is no similar documentation to explain the ILEC's costs. The material components consist of a plywood backboard, modular protector units, connecting blocks and jumper wire. BellSouth's cost level could cover several weeks of engineering and labor plus $xxxxx in supply costs, all of which are exorbitant. Note that GTE has defaulted to the BCPM national input value rather than ascertain its Florida-specific costs.

Only BellSouth furnished detailed SAI costs (Exhibit ___ (JWW-4), Pg. 15 – 18). Note how the "engineering" costs have been applied linearly based on the pair count of the SAI. For example, BellSouth has costed $xxxxxx to engineer a 100 pair indoor SAI and $xxxxxxxxx to engineer a 4200 pair indoor SAI (i.e., 42 times more). However, real world engineering costs for an indoor SAI vary little by pair size. This is an example of the top-down accounting application of ILEC cost data without OSP Engineering judgment.

Drop Wire Placement – Aerial and Buried: The comparisons of ILEC input values for the aerial and buried total drop wire costs are:

Drop Type	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Aerial	0 – 5	$ 0.77	$ xxxx	$ xxxx	$xxxx	$0.26
Aerial	10000+	$ 0.77	$ xxxx	$ xxxx	$xxxx	$0.33
Buried	0 – 5	$ 0.77	$ xxxx	$ xxxx	$xxxx	$0.74
Buried	10000+	$ 0.77	$ xxxx	$ xxxx	$xxxx	$5.14

HM 5.0a appropriately reflects the real world by modeling higher drop costs for the urban versus rural areas, 27% higher for aerial drops and 595% higher for buried drops. The ILECs model the same cost per foot in all density areas by drop type. This shows a lack of OSP Engineering judgment and also results in higher drop costs in rural areas because the average drop cost is being applied.

Drop costs have a major impact on total loop costs because they represent a significant amount of investment that occurs at virtually each customer location. The impact of inappropriate drop costing on a per foot basis is even more profound in rural areas because of generally longer drops lengths.

Buried drops simply cost more than aerial drops. Note that BellSouth more than doubles its installed cost for buried drops versus aerial drops, while HM 5.0a increases range from 184% to 1458%. In contrast, Sprint's costing of aerial drops higher than buried drops is astonishingly illogical.

Note that GTE's buried and aerial drop input values (i.e., the BCPM 3.1 national default values) are the same, and they are at the much higher buried drop cost level. This is because GTE is modeling 100% buried drop costs, which cost more than aerial drops. This is a clear violation of the FCC Criteria No. 1 that the model be "reasonable" and "least-cost" based on currently available technology.

The drop wire input values of the HM 5.0a are clearly realistic and reasonable compared to those of the ILECs. Furthermore, in urban density zones, the HM 5.0a drops costs are significantly higher. This reflects sound OSP Engineering judgment of real world higher costs that has been consistently incorporated into the HM 5.0a input values as appropriate.

<u>Network Interface Device ("NID"), Protector and Interface</u>: The input value comparison for the total costs of NID, Protector and Interfaces is:

NID Type	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Residential	$30.73	$xxxxx	$xxxxx	$xxxxx	$29.00
Business	$30.73	$xxxxx	$xxxxx	$xxxxx	$44.00

BellSouth and GTE utilize the same cost for residential and business NIDs, whereas Sprint and HM 5.0a appropriately reflect lower cost for residential NIDs. Why are Sprint's business NID costs so much higher? HM 5.0a costs are within the range of the ILEC costs.

Digital Loop Carrier: The comparisons of ILEC input values for digital loop carrier costs are:

Cost Type	Line Size	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Fixed	25	$19,204	$ xxxxxx	$ xxxxx	$ xxxxxx	$18,300
Fixed	673	$96,859	$ xxxxxx	$xxxxxxx	$ xxxxxx	$88,500
Per Line	0 – 192	$94.00	$xxxxx	$xxxxx	$xxxxx	$100.00
Per Line	192 – 2016	$89.11	$xxxxx	$xxxxx	$xxxxx	$ 77.50

Why does GTE input the same cost for low density and high density line cards? The ILEC's fixed costs for DLC RT locations are extremely high considering that these locations would be generally much smaller than 999 lines, the BCPM 3.1 threshold. In other words, the smaller size DLC RTs modeled by BCPM 3.1 should be housed predominantly in cabinets and not require more expensive huts or controlled environment vaults ("CEVs"). It appears that ILEC accountants have loaded DLC RT site input values reflecting the embedded network investment including huts and CEVs. There is no supporting documentation that would reflect appropriate OSP Engineering judgment.

Why are high density DLC system costs per line significantly less for Sprint and GTE than for BellSouth? The conclusion of the Staff of the Louisiana Public Service Commission was that the BCPM inappropriately modeled the expensive REUVG range extension line card for high density DLC systems (Louisiana Staff's Final Recommendation, Docket No. U-20833, March 27, 1998, Pg. 14). BellSouth has adopted the BCPM national default value that still includes the exorbitant REUVG range extension line cards; whereas, Sprint and GTE appear to have made the appropriate adjustment to the lower cost RUVG2 range extension line card.

HM 5.0a models sufficient costs for range extension line cards as required. For the CSAs requiring low density DLC Systems, HM 5.0a models the Advanced Fiber Systems UMC 1000. HM 5.0a has costed these systems with 100% utilization of UMC Remote Terminal Range Extension RST POTS Channel Units (R-EPOTS or simply EPOTS), even though the less expensive standard RPOTS card is sufficient for loops up to 12,000 feet from the DLC RT. Note that this is reflected in the HM 5.0a low density per line costs, which are higher than those of the ILECs.

For high density CSAs, HM 5.0a models the DSC Litespan 2000 DLC System. HM 5.0a incorporates costs for the DSC Litespan 2000 RPOTS channel unit for customers served by large DLC RT units to a distance of 17,600 feet. DSC recommends the use of the RUVG2 card for those customers exceeding 17,600 feet in distribution length. Since the maximum distribution length in limited to

18,000 feet in HM 5.0a, the number of customers requiring this card from a high density DLC system is de minimis.

To add some further perspective to the debate over range extension requirements and appropriate costs, BCPM 3.1 recommends range extension only for loops exceeding 13,600 feet from the DLC RT (BCPM 3.1 Description, Pg. 55). According to Mr. Brian Pitkin, an AT&T/MCI Witness in this proceeding, the HM 5.0a network designed for Florida has less than 0.05% of its loops exceeding 13,600 feet in distribution length from the DLC RT. Furthermore, most of these loops will be served by low density DLC systems, which have 100% range extension line cards in HM 5.0a. My conclusion is that HM 5.0a models more than sufficient costs for the required range extension line cards.

Fiber/Copper Breakpoint: The input value comparison for the fiber/copper breakpoint is:

BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
12,000	12,000	12,000	12,000	9,000

The explanation for the 3,000 foot difference between BCPM 3.1 modeled by the ILECs and HM 5.0a is that BCPM 3.1 is measuring the longest total loop length in a CSA whereas HM 5.0a is measuring the feeder distance from the wire center to the Feeder Distribution Interface ("FDI"). The overall impact of this difference in modeling methodologies is not that significant. However, the latest dynamic copper versus fiber feeder selection methodology employed by the HM

5.0a (HM 5.0a Methodology, Sec. 4.5) is the one that replicates the process utilized by a real world OSP Engineer.

Plant Mix - Distribution: The input value comparisons for the percentage of distribution plant are:

Type of Plant	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Underground	10000+	90.00%	xxxxx%	xxxxx%	xxxx%	10.00%
Buried	0 – 5	60.00%	xxxxx%	xxxxx%	xxxx%	75.00%
Aerial	10000+	0.00%	xxxxx%	xxxxx%	xxxx%	5.00%

BellSouth has adopted the BCPM 3.1 national default input values for all of its plant mix inputs because it cannot ascertain from its own Florida-specific data the appropriate mix of plant in Florida. There are huge differences among the ILEC input values.

The BCPM 3.1 national default input, which BellSouth has adopted, is 90% underground distribution plant in the 10000+ density zone. However, in this most urban, high density zone, most feeder cables go into buildings, and most of the distribution cables are either inside of or attached to buildings or placed in ducts provided by property owners. Thus, when BellSouth models 90% of the distribution plant as underground, it is adding substantial costs for underground conduit and manholes that are simply not required.

In sharp contrast, HM 5.0a has a more reasoned input value of 10% as described in the HAI Model Release 5.0a Inputs Portfolio Section 2.5. Also, note that Sprint and GTE have even smaller input values of less than xxxx% for underground distribution plant in urban areas.

Another example of flawed modeling logic is the fact that BellSouth, again using the BCPM national default input value, shows 0.00% for aerial plant in the most urban density zone. Moreover, Sprint has modeled xxxx% of its distribution cables in the highest density zone as buried plant, which would be cost prohibitive, if not impossible, to place in a congested urban area. Neither of these ILEC input values reflects sound OSP Engineering judgment.

Plant Mix – Fiber Feeder: The input value comparisons for the percentage of fiber feeder plant are:

Type of Plant	Density Zone	BCPM 3.1 Default	BellSouth	Sprint	GTE	HM 5.0a
Underground	0 - 5	10.00%	xxx %	xxxx%	xxxxx%	5.00%

GTE's high input value of xxxxx% for underground fiber feeder percentage in the rural areas is simply ridiculous. Feeder routes in rural areas consist of only one fiber cable that will never need to be reinforced. Such situations clearly call for less costly buried or aerial plant. No cost-efficient telephone company would incur the exorbitant cost of building a conduit and manhole system for xxxxx% of its fiber feeder in rural areas. This is an even more profound issue given that the

BCPM 3.1 also models excessive fiber feeder to far too many DLC RT locations (detailed elsewhere in this testimony). The impact of this egregious error in plant mix is to greatly inflate GTE's rural costs, which results in an artificially high Universal Service Fund.

Investment Loop Cap: BCPM 3.1 employs an investment loop cap to allow for a maximum individual loop investment based on either potential regulatory policy or a wireless technology alternative (BCPM Methodology, Pg. 56). The default value is $10,000, which has been commonly accepted in numerous proceedings by all parties. In this proceeding, however, BellSouth has filed an Investment Loop Cap of only $xxxxx, without any explanation or supporting documentation.

BellSouth's In-Plant Loading Factors: BellSouth's engineering and labor costs are derived from BellSouth's in-plant loading factors that convert the material prices to an installed investment. Having analyzed BellSouth's in-plant loading factors in UNE Cost Dockets in eight states, including Florida, I believe that BellSouth's OSP loadings are not forward-looking and, instead, are utilized to recover the costs of BellSouth's embedded methods of operation. I have several concerns with BellSouth's cost modeling methodology base on its use of top-down loading factors.

BellSouth applies a material loading factor to the inflated (Caldwell Direct, Pg. 9) direct material cost for copper and fiber cables in its OSP Field Reporting Codes. These material loading factors are modeled primarily to recover telecommunications engineering and labor, vendor engineering and installation, exempt (i.e., minor) material, and sales tax (Caldwell Direct, Pg. 11). BellSouth's methodology is to calculate a ratio of these associated expenses to its non-exempt (i.e., major) material investments for the year 1995, and then multiply this ratio by the inflated direct cable material cost.

I do not believe that BellSouth's ratio of material loading expenses to cable investment in 1995 should be considered least-cost, most-efficient, or forward-looking based on currently available technology. Mr. William Zarakas, BellSouth's Cost Modeling Witness in the UNE Cost Dockets, stated in his deposition in Louisiana that, "our assumption there would be that *the cost of installing a pole in the future would basically be the same as it was in the past*, because we see no change in the technology. *And we did that for each individual factor or loading*" (Zarakas Deposition, LA Docket U-22022/U-22093, 8/19/97, Pg. 110, with italics added for emphasis). However, the BCPM proponents contradict this statement by saying that "the Model does not rely upon embedded costs for facilities, functions or elements" (BCPM Methodology, Pg. 12).

Going beyond the fundamental methodology question and looking into the data provided on the material loading factors raises additional questions. These material loading factors for cable are huge contributors to the total loop investment. The following examples of these in-plant loadings will demonstrate how they are used to drive enormous underlying costs that make up BellSouth's input values to the BCPM 3.1:

- A prime example of the impact of these loadings can be found in the BellSouth's application of in-plant loading factors to SAIs. In BellSouth's costing of a 4200 pair indoor SAI, $xxxxxx worth of material becomes $xxxxxx in installed costs. Thus, the in-plant loading factors account for 84% of the total costs.
- ILEC Engineering and placing costs have been allocated based on cable size or material costs. For example, BellSouth's placing input values for 24 gauge underground cable are $xxxx for 100 pair and $xxxxx for 2400 pair. Likewise, BellSouth's engineering input values for these same cables are $xxxx and $xxxx. It simply does not cost 22 times as much to engineer or place a 2400 pair underground cable than a 100 pair underground cable. In reality, there is very little difference in the costs to engineer and place an underground copper cable based on its pair size.
- BellSouth has double counted placing costs for buried copper and fiber cables because it zeroed out the splicing column instead of the placing column in its buried cable tables. Buried cable placement costs are appropriately included in the buried structure costs and should not be included in the cost of the buried cables themselves. Furthermore, based on a comparison of these additional buried placement costs to the splicing cost for aerial and underground cables, this double-counting does not seem to have been a simple matter of BellSouth putting its splicing costs in the placing costs column. Thus, BellSouth's installed buried cable costs are overstated.

- There are a significantly higher supply costs for aerial versus buried and underground copper cables of the same gauge and pair count as shown in the following table:

<u>BellSouth's Copper Cable Supply Costs</u>

Size/ Type	24 Gauge Cables			26 Gauge Cables		
Pairs	4200	900	25	4200	900	25
Aerial	$xxxxx	$xxxx	$xxxx	$xxxxx	$xxxxx	$xxxx
Buried	$xxxxx	$xxxx	$xxxx	$xxxxx	$xxxxx	$xxxx
UG	$xxxxx	$xxxx	$xxxx	$xxxxx	$xxxxx	$xxxx

The explanation cannot be that BellSouth includes terminal costs as a cable loading factor because there are no comparable supply costs for buried cables that also have terminals. Furthermore, comparable supply costs have been applied to the larger size cables, which rarely have terminals. Also, the explanation cannot be due to strand and pole line hardware costs because there are no comparable supply costs for aerial fiber cables?

- BellSouth's costs for splicing aerial cables are unrealistically higher than splicing costs for underground cables of the same pair size and gauge.
- BellSouth's filing also shows that it is more costly to place 26 gauge underground cables than larger and heavier 24 gauge cables of the same pair size.
- BellSouth's engineering costs vary considerably between 24 and 26 gauge cables of the same pair size and type of plant.

- Furthermore, since fiber cable sheaths are the virtually the same regardless of fiber count, there is no rationale for BellSouth to model a much higher cost to place a fiber cable of higher fiber count. This discrepancy causes BellSouth's fiber cable placement costs for larger fiber cables to be overstated.

These are but a few examples where BellSouth has taken an illogical, top-down accounting approach to deriving input values that simply contradict real world OSP Engineering. BellSouth's filing shows a lack of OSP Engineering judgment in the determination or review its cable input values. Noteworthy is the observation that GTE and Sprint simply did not file the underlying costing details for their cable input values for analysis.

Drop Wires: Responses to Data Requests in this proceeding show that ILECs serve fewer than xxxx lines per residence. Yet, BCPM 3.1 assumes five-pair buried drops for both residences and businesses. While ILECs can certainly choose to invest in five-pair buried drops to every residence to preclude ever having to reinforce any of them, it does not seem reasonable that the Universal Service Fund should fully support the excessive spare capacity. Furthermore, the availability of two-channel DSL Systems provides a viable alternative for up to four subscriber lines on a two-pair buried drop for those residential customers who may someday require more than two lines. My recommendation, for the purpose of USF costing, is that all residence buried drops should be two pair.

<u>Lack of Real World Variation in Input Values</u>: The ILECs have filed in BCPM 3.1 input values in a manner that totally disregards clearly understood differences by density zone. There is no appropriate variation in many of the ILEC input values by density zone for such input values as pole structure sharing, aerial and buried drop costs, or distribution fill factors. The following examples will further illustrate the lack of OSP Engineering judgment in deriving ILEC input values:

- BellSouth utilizes the same costs per foot for conduit installation and cost per foot for buried cable installation for each trenching method: Trench and Backfill, Rocky Trench, Backhoe Trench and Hand Dig Trench. Sprint does likewise. Furthermore, BellSouth does not vary its buried cable trenching costs for differing terrain conditions of normal, soft rock and hard rock.
- Sprint even uses the same base cost per foot installed for both conduit and cable placement for all methods, all soil types, and all density zones. Sprint's explanation is that "the contract does not differentiate among these activities" (Sprint's Response to AT&T's First Set of Interrogatories, Att. 24). As an OSP Engineer, I find that statement rather amazing. As an example of the impact of these simplified input values, For Hard Rock – Feeder Conduit Trench and Backfill, BellSouth has filed a base cost per foot installed of $xxxxx compared to Sprint's filing of $xxxx, a difference of 3,209%. This contradicts real world OSP costing, because trench costs vary considerably by method, density zone and type of soil condition.

BCPM 3.1 contains extensive input value tables that have been developed to appropriately differentiate pole, buried cable and underground conduit placement costs by type of method, by density zone, and by soil conditions. The ILECs may rationalize that by populating these input tables with average values that "it all averages out." However, the abject failure of the ILECs to populate the cells of these input value tables with realistic costs raises considerable doubt regarding the validity of BCPM 3.1 output in any particular density zone.

Contract Prices: Ms. Caldwell states that "BellSouth's structure placement costs (contractor costs) for placing conduit, trenching/plowing buried cable, and placing poles are based on an average of the ten existing BellSouth contracts with outside plant contractors in Florida" (Caldwell Direct, Pg. 9). ILECs use such "Master Contracts" to award day-to-day small-scale routine work and smaller-scale projects. However, in accordance with the "least-cost, most-efficient" assumptions of FCC Criterion 1, the appropriate contractor costs for these models should be lower than these averages to reflect only large-scale projects that are put out for competitive bids. This would produce more appropriate contractor costs consistent with the underlying "scorched node" assumption of these models.

The supposedly proper application of the "scorched node" assumption by BCPM 3.1 has been testified to by Dr. Staihr when he stated that, "the BCPM 3.1 model assumes *that the entire network is built at a single point in time*. This allows the service provider to *realize certain 'efficiencies' and 'economies of scale' that could not have been realized historically*" (Staihr Direct, Pg. 7 with italics added for emphasis). The averaging of Master Contract costs by the ILECs to determine input values to BCPM 3.1 does not conform with this very key assumption.

Summary Regarding Input Value Comparisons: These input value comparisons are rather clear examples of the ILECs having the data but not seeming to know how to identify and/or correctly apply their data as input values into a bottom-up, least-cost model. It is also apparent that the ILEC OSP input values for many items have been derived via accounting methods that have not been subjected to a reasonableness check by OSP Engineers.

Some BCPM witnesses have frankly admitted this. One stated that, "GTE does not necessarily maintain data that can be easily translated into all of the input values for the BCPM or HAI models" (Robinson Direct, NC Docket P-100, SUB 133b, 12/10/97, Pg. 5). Another ILEC witness has testified that "it is difficult and time consuming to make all model default inputs company-specific. Therefore, in producing costs using a cost proxy model, GTE must rely on many default inputs" (Collins Direct, TX Docket 18515, 2/17/98, Pg. 4).

It is indeed difficult for the ILECs to properly define and properly apply OSP input values, even though they have volumes of state-specific cost data. On the other hand, HM 5.0a employs national default input values developed by the HAI OSP Engineering Team that work within the HM 5.0a to produce Florida-specific outputs because:

- The labor content of OSP costs are reduced from national levels by a Florida-specific factor of 68% (HM 5.0a IP, Sec 7.)
- Placing costs are increased appropriately for difficult terrain, surface texture, rock depth, rock hardness and water depth statistics that are Florida-specific at the CBG level.
- Customer and wire center locations are Florida-specific at the individual location level.
- Material costs for a least-cost model representing large ILECs should not vary significantly from nationwide material costs.

Q. HAS THE BCPM 3.1 ACHIEVED THE MOST REALISTICALLY ATTAINABLE LEVEL OF ACCURACY FOR IDENTIFYING CUSTOMER LOCATIONS?

A. No. One of the primary goals of a superior local loop model is precise customer location because this is the basis for accurate and cost-efficient network design. The BCPM 1.0 and the Hatfield Model up through Release 4.0 located or assigned customers at the CBG level. The BCPM 2.0 and now BCPM 3.1 use housing and business line data at the CB level to better locate customers. On average, there are about 30 CBs per CBG (BCPM 3.1 Description, Pg. 6). However, the HM 5.0a is much more precise in locating customers through latitude and longitude geocoding to six decimal places of the customer's addresses (HM 5.0a Description, Sec. 5.4.3).

The overall geocoding success rate for HM 5.0a, as calculated by Mr. Pitkin, was 70% of the Florida customers in this proceeding. It is higher in the urban areas because customer locations have more geographically definite addresses and lower in rural areas for the opposite reason.

BCPM 3.1 does not actually locate any customers. In essence, it locates roads and then assumes that customers in the CB are uniformly distributed along those roads (Duffy-Deno Direct, Pg. 3). The testimonies of Messrs. Pitkin and Wood critique the BCPM 3.1 grid based customer location methodology in detail.

Q. HOW WELL DOES THE BCPM 3.1 GROUP CUSTOMERS AS AN OSP ENGINEER WOULD IN DESIGNING A LOCAL LOOP NETWORK?

A. Not nearly as well as HM 5.0a. The BCPM 3.1 translates the CB level customer information into a microgrid that has its boundaries based on <u>fixed</u> latitude and longitude lines. As these microgrids are subsequently combined into ultimate grids, or CSAs, for the purpose of modeling the OSP network, their boundaries are still arbitrarily fixed. The BCPM 3.1 CSAs are then divided into four Distribution Area ("DA") quadrants.

One unintended consequence of this BCPM 3.1 modeling methodology is that some natural clusters of customers (e.g., a small town or subdivision) will be arbitrarily segmented into different DAs, CSAs or feeder routes in contradiction to the way that they would in reality be engineered. As an OSP Engineer, I thus take exception to the assertion that "BCPM designs a network the way actual telephone companies design networks" (Bowman Direct, Pg. 6). Furthermore, the current FCC Public Notice states that, "we consider a model platform that groups customers using a clustering approach because it appears to have advantages over gridding approaches" (FCC Public Notice DA 98-1587, 8/7/98, Pg. 4).

The BCPM 3.1 road-reduced DA (BCPM 3.1 Methodology, Pg. 49) is based on two questionable assumptions:

1. That simply designating "a 500 foot buffer along each side of the roads within the distribution quadrant" in all density zones will model the correct size DA for distribution cable design. Because the arbitrariness of this assumption can result in oversizing the DA, the BCPM 3.1 has had to add a check to constrain the area of the DA so that it does not exceed the actual area of the microgrid itself (BCPM 3.1 Methodology, Pg. 49, Footnote 36).
2. The center of each quadrant's DA should be placed at the road centroid of the quadrant because customers are uniformly distributed along the roads. While this is an improvement over locating them at the centroid of a CBG, in reality the road centroid could be in the middle of a lake, on top of a mountain, or in any number of inaccessible places.

On the other hand, HM 5.0a clusters its more precisely located customers like an OSP Engineer would do in designing a local loop network (HM 5.0a Description, Sec. 5.5) based on:

- assuring a reasonable proximity of the customer locations to each other (i.e., two miles),

- maximizing the copper distribution length up to 18,000 feet from the DLC RT based on fully utilizing the capabilities of currently available technology,
- maximizing the customer line size of the DLC RT up to 1,800 lines based on 90% utilization of a 2,016 line DLC system,
- designing the shortest distance between customer clusters (however, based on right angle routing to assure sufficient cable length), and
- efficiently linking "outlier clusters" to main clusters.

"One of the major challenges of building a proxy model is clustering customers in a fashion that integrates engineering practices based on this CSA approach" (BCPM 3.1 Methodology, Pg. 24). I certainly agree, and conclude that the HM 5.0a methodology of grouping customer locations into clusters based on OSP Engineering principles is clearly superior to the BCPM 3.1 methodology of assembling and dividing grids with fixed boundaries at various latitude and longitude lines.

Q. DOES EITHER BCPM 3.1 OR HM 5.0a ACTUALLY DESIGN DISTRIBUTION CABLES TO EACH AND EVERY CUSTOMER LOCATION?

A. No. Each model sizes and centers its DAs using different methodologies. Each model then effectively lays out a grid of backbone and branch distribution cables to serve the defined DAs areas from the defined DA centers. However, "[t]he [BCPM 3.1] road-reduced area is *not used to locate customers*, but as a *modeling tool* to determine *likely cable distances required to serve customers* in the distribution quadrant" (BCPM 3.1 Methodology, Pg. 20, with italics added for emphasis). Dr. Duffy-Deno helps to further clarify the BCPM 3.1 distribution cable modeling methodology by stating:

> It is important to make clear that *BCPM does not locate customers within the road-reduced areas. Estimated customer locations* reside in the microgrids and *are not "moved"* to the road-reduced areas. Rather, the road-reduced area is used as a *tool to estimate the amount of cable needed to serve the estimated customer locations* that reside within the microgrids in populated distribution quads (Duffy-Deno Direct, Pg. 20, with italics added for emphasis).

Claims that either model "moves customers" or "comes up short" of reaching a particular customer location must be evaluated with the above understanding of what these two models do, and do not do, in regards to distribution cable modeling. For example, the BCPM 3.1 Model Methodology makes the following false and very misleading statement when it states that, "*BCPM places cable to the actual customer locations, rather than moving the customers to some hypothetical distribution cable network*" (BCPM 3.1 Methodology, Pg. 34, with italics added for emphasis). The truth is that neither model designs a distribution cable to each and every precise customer location, and neither model physically "moves customers."

The relevant issue then is to determine which model has the most accurate, most reasonable, least-cost, most-efficient methodology based on currently available technology for modeling sufficient distribution cable and structure investment to serve all of the customers located in the CSA/DA. The relevant evaluation criteria are:

- precisely locating customers,

- clustering customers into CSA/DAs in a manner consistent with that of an OPS Engineer,
- cost-effectively sizing the CSA/DAs,
- realistically shaping the CSA/DAs,
- determining the center of the CSA/DAs relative to the customer locations,
- determining the number of FDIs needed,
- laying out the distribution cable grid in realistic and cost-efficient configuration (e.g., rectangular lots),
- sufficiently sizing the distribution cables to serve existing customers only with appropriate administrative and maintenance spare capacity, and
- conforming to transmission requirements for loop resistance and loss.

The CSA/DA modeling methodology, assumptions and input values of HM 5.0a are superior to those of BCPM 3.1 in regards to each of the above criterion.

Q. DOES THE BCPM 3.1 METHODOLOGY FOR MODELING CSAs PRODUCE THE LEAST-COST, MOST-EFFICIENT, FORWARD-LOOKING AND REASONABLE LOCAL LOOP MODEL BASED ON CURRENTLY AVAILABLE TECHNOLOGY?

A. Absolutely not. There are two major shortcomings in the BCPM 3.1 methodology for modeling CSAs that result in an overestimate of network costs with an excessive number of DLC RT locations. The BCPM 3.1 CSAs are:

- too small geographically because they are designed far beneath the maximum distribution cable distance reachable with currently available technology, and
- too small in terms of the number of customers served because the maximum line threshold for an ultimate grid CSA is well below the capacity of the DLC RT to serve customers in a CSA.

There is a major difference between HM 5.0a and BCPM 3.1 regarding the design of distribution cable lengths from the DLC RT. The ILEC proponents incorrectly emphasize that BCPM 3.1 designs an outside plant network that maximizes loop lengths for copper at 12,000 feet. For example, the BCPM 3.1 proponents make the following partially true statements (with italics added for emphasis):

> The engineering protocols most central to the design of this model include a *maximum* loop length for each CSA that is *less than 12,000 feet*. To *ensure attainment of this standard*, the maximum ultimate grid size is typically constrained to 1/25th of a degree of latitude and longitude... (BCPM 3.1 Description, Pg. 42).

> BCPM 3.1 *constrains* the size of the ultimate grids to be no larger than approximately 12,000 feet by 14,000 feet. The *rationale for this constraint* on the ultimate grid size is to *limit copper loop lengths from the DLC to the farthest customer to approximately 12,000 feet* (Bowman Direct, Pg. 4).

> By utilizing the DSC architecture and the *maximum 12 Kft copper loop*, BCPM3 *assures* that the requirements for advanced telecommunications service access for remote rural customers is reasonably comparable to the enjoyed by urban customers, as mandated by the 1996 Act (Bowman Direct, Exhibit RMB 3, Pg. 9).

The whole truth in regards to this matter is that BCPM 3.1 routinely designs copper loops in excess of 12,000 feet in length from the DLC RT because it adds partial grids to the 12,000 x 14,000 foot ultimate grids. This is quite evident from the following statements from the BCPM 3.1 Model Methodology itself (with italics added for emphasis):

> BCPM 3.1 – *Tends to limit* average copper loop lengths from the DLC to the customer by *generally limiting* the maximum ultimate grid size to 12,000 feet by 14,000 feet, latitude and longitude. *If copper cable lengths from the DLC to the customer exceed 12,000 feet*, the cable gauge is reduced to 24 gauge cable and extended range plug-ins are installed on *loops extending beyond 13,600 feet*. The ultimate grids are designed such that *copper loop lengths from the DLC to the customer are unlikely to exceed 18,000 feet.* (BCPM Description, Pg. 125).
>
> The design of the ultimate grids *ensures that the maximum copper loop length from the DLC site to the customer for any individual customer should not exceed 18,000 feet.* (BCPM 3.1 Description, Pg. 42)

Thus, BCPM 3.1 clearly allows for copper loops of up to 18,000 feet, and occasionally even further, from the DLC RT in its distribution network. It is an indisputable fact that currently available DLC technology will support distribution cable lengths up to 18,000 feet from the DLC RT. And, both HM 5.0a and BCPM 3.1 design loops to this limit.

The telling difference is that HM 5.0a designs up to 18,000 foot copper loops purposefully because it conforms to network transmission design standards and produces a least-cost network design. On the other hand, BCPM 3.1 designs up to 18,000 foot copper loops on an exception basis due to the arbitrarily fixed dimensions of its grid structure.

Q. DOES BCPM 3.1 "ENSURE" SUPERIOR TRANSMISSION QUALITY AND "ASSURE...ADVANCED TELECOMMUNICATIONS SERVICES" BY "CONSTRAINING" COPPER LOOPS TO 12,000 FEET?

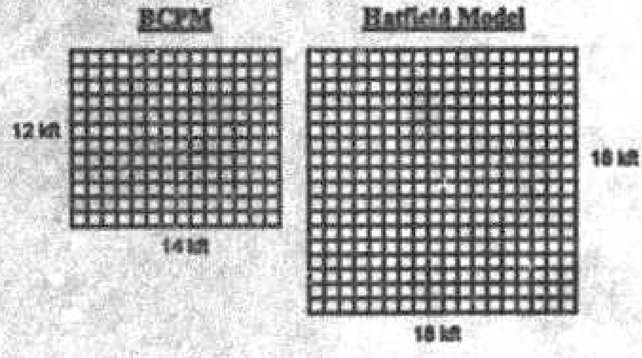
A. No. Not only has this been incorrectly stated by the ILEC proponents, but it begs a question regarding the quality of service the proponents of BCPM 3.1 believe they would be providing to those customers who are actually modeled by BCPM 3.1 to be more than 12,000 feet from the DLC RT.

BCPM 3.1 states as an objective the minimization of the distribution portion of the plant (BCPM 3.1 Methodology, Pg. 24), which is contrary to a least-cost, most-efficient network design. On the other hand, HM 5.0a seeks to maximize the distribution portion of the plant in order to minimize the number of costly DLC RT locations and the additional subfeeder cable and structure required to reach them. Sensitivity runs of HM 5.0a with the maximum distribution cable length constrained to 12,000 feet have actually produced higher loop costs. This is because the expected reductions in distribution cable investment are more than offset by increased investments in feeder cable and structure and additional DLC RT sites.

It is commonly understood in the local loop telecommunications industry that the ultimate minimization of distribution cable length is achieved by putting fiber feeder further into the network and closer to the customer in what is known as Fiber-to-the Curb ("FTTC") architecture. However, ILECs have not deployed FTTC on a wide scale basis for the simple reason that it is a very costly network architecture. This is even more true for the basic types of narrowband services to be supported by these networks, especially in rural areas.

OSP Engineering design guidelines typically state limits that assure quality transmission performance of the network. Both BCPM 3.1 and HM 5.0a agree that the maximum limit for copper distribution cable is 18,000 feet from the DLC RT. HM 5.0a very purposefully designs non-loaded copper distribution loops out to 18,000 feet from the DLC RT and models subsidiary remote terminals on T1 extensions to "outlier clusters" on copper cable far beyond 18,000 feet (HM 5.0a Description, Sec. 6.2 and HM 5.0a, IP, Sec. 2.8) because this is the least-cost, most-efficient network design utilizing currently available technology.

The following diagrams compare the geographical coverage of just the copper distribution cables for these two differing modeling assumptions:



Furthermore, the effective geographical area covered from a single DLC RT by the HM 5.0a is actually even more than 93% greater than the 12 Kft x 14 Kft CSA of the BCPM 3.1 (as illustrated above) when the road cables on the T1 extensions to "outlier clusters" are taken into consideration.

The conclusion from these diagrams is that the BCPM 3.1 must model many more CSAs to cover the same geographical area. The consequences of this aspect of the BCPM 3.1 modeling methodology are excessive fixed investments and recurring operations and maintenance cost for many more DLC RTs. These costly consequences are even more profound in the extensive rural geographical areas, which are the primary areas for support from the Universal Service Fund.

Q. HOW DOES THE BCPM 3.1 ASSUMPTION LIMITING THE MAXIMUM NUMBER OF LINES SERVED IN EACH CSA TO 999 RESULT IN EXCESSIVE COSTS?

A. The second costly flaw in the CSA modeling methodology of BCPM 3.1 is that the maximum number of lines modeled for each CSA is simply too few based on the most economic application of currently available technology. The BCPM 3.1 preprocessing program limits ultimate grids (i.e., CSAs) to a maximum of 999 lines (BCPM 3.1 Description, Pg. 119).

A BCPM 3.1 witness states that "a Carrier Serving Area *typically* contains no more than 1,000 living units, while a Distribution Area *typically* contains 200 to 600 living units" (Bowman Direct, Pg. 6 with italics added for emphasis). This statement clearly shows that the BCPM 3.1 modeling methodology for sizing CSAs and DAs is based on the backward-looking inefficiencies of the embedded network in violation of the long-run, least-cost principles in the FCC guidelines for these models. This preprocessing assumption drives excessive costs into the BCPM 3.1 network because it models many more CSAs and with excessive fixed investments and recurring operations and maintenance cost for many more DLC RTs than does HM 5.0a.

A "least-cost, most-efficient" network design based on "currently available technology" would seek to maximize the utilization of the 1,800 line capability (i.e., 90% of 2,016 line capacity) of the DLC RT serving a CSA without exceeding the limitation of 18,000 feet of copper distribution cable. The BCPM 3.1 modelers do support a DLC RT site capable of 2,016 lines and do agree that 2,016 line DLC systems optimize the utilization of fiber feeder cables (BCPM 3.1 Description, Pg. 49). However, BCPM 3.1 has a <u>maximum</u> threshold of 999 lines per CSA, which is far below the "most-efficient" 2,016-line capacity of a DLC RT site. Thus, the BCPM 3.1 modeling assumption of a 999 line maximum CSA results in a network design that is certainly not "least-cost, most-efficient."

All of the unnecessary additional DLC RT sites modeled by the BCPM 3.1 drive excessive costs, because each one has incremental investment associated with:

- site acquisition and preparation,
- cabinetry (or perhaps huts and CEVs),
- common equipment,
- standard and emergency power source,
- additional strands in the main fiber feeder cables,
- subfeeder fiber cables with associated structure
- and optical patch panel.

According to Mr. Pitkin, the BCPM 3.1 networks modeled by the ILECs for Florida in this proceeding include 223 CSAs that have only one customer location. Thus, BCPM 3.1 models each of these customer locations with the exorbitant costs of its own dedicated feeder fibers and its own dedicated DLC RT. The cost-effective HM 5.0a alternative for narrowband services is to model isolated individual and tiny groups of customers as "outlier clusters" on T1 road cables from a "main cluster" CSA. BCPM 3.1 is definitely not the "least-cost, most-efficient" network model for isolated customer locations based on "currently available technology," and thus it inflates the loop cost basis for the Universal Service Fund.

Furthermore, there are greater operational expenses resulting from having a larger number of DLC RT sites (e.g., maintaining service during a power failure). Thus, the BCPM 3.1 does not use the forward-looking, least-cost, most-efficient engineering design for determining the number of CSAs and DAs, particularly when compared to HM 5.0a.

CSAs and DAs in a forward-looking model should be modeled based on:

- clustering customer locations that are within reasonable proximity to one another,
- keeping natural clusters of customers together,
- utilizing the transmission design capabilities of currently available technology, and
- allowing the cost-efficient utilization of the maximum size of IDLC system (2,016 lines) and FDI (7,200 pairs).

The CSA/DA modeling methodology, assumptions and input values of HM 5.0a are superior to those of BCPM 3.1 in regards to the above criteria.

Q. WHAT IS THE CARRIER SERVING AREA CONCEPT?

A. The CSA Concept is an OSP Engineering guideline that was formulated around 1980 and has been documented as a part of the record for this proceeding (Bowman Direct, Exhibit RMB 3, Pg. 6). The source document for the CSA design criteria used by the BCPM modelers is the Lucent Technologies (formerly AT&T) Outside Plant Engineering Handbook (BCPM 3.1 Description, Pg. 18). Incidentally, I was a member of the AT&T OSP organization that did the 1994 update of the handbook. The relevant parts of the CSA Concept for this proceeding are (with italics added for emphasis):

- No loop can exceed 900 ohms of resistance, which generally equates to:
  - *9,000 feet of 26 gauge copper cable* or
  - 12,000 feet of 24 gauge copper cable. [Note: cables with 26 gauge copper conductors are smaller, less costly and have greater resistance and loss than 24 gauge cables.]
- *Extended range line cards* are available *which extend the range of the DLC remote terminal beyond 12,000 feet.*

Q. DOES BCPM 3.1 CONFORM TO THE CSA CONCEPT?

A. No. The ILEC proponents have incorrectly implied that BCPM 3.1 is designed around and conforms to the CSA Concept as evidenced by the following statements (with italics added for emphasis):

> *CSA engineering guidelines* do not recommend *copper loop lengths greater than 12,000 feet*...The 26/24 gauging used in the distribution takes into account the *industry standard 900 ohm Carrier Serving Area (CSA) design criteria of no more than 12,000 feet of copper regardless of gauge*. (BCPM Description, Pg. 18)
>
> These *engineering constraints conform to the specifications* of a forward-looking, efficient network design. That efficient network is *based on the designation of a Carrier Serving Area*. A Carrier Serving Area is a *standard telephone design concept* that consists of a geographic area that can be served by a single digital loop carrier (DLC) site. (Bowman Direct, Pg. 4)
>
> The *Carrier Serving Area (CSA) concept* was specifically designed to allow for *access to advance telecommunications services* within the context of an efficient local exchange distribution network. (Bowman Direct, Exhibit RMB 3, Pg. 7)

Yet, the truth is that the BCPM 3.1 does not conform to the "constraints" of the CSA Concept as evidenced by the following enlightening statements from the ILEC testimonies (with italics added for emphasis):

> BCPM 3.1 uses *24 gauge cable only when the copper loop from the DLC to the furthest customer exceeds 11,100 feet*. This distance is based on *complying with engineering standards* for the maximum dB loss permissible to maintain adequate service quality. An *extended range line card is included for loops that extend beyond 13,600 feet* from the DLC to the customer. This *also is an engineering standard*, but is a user adjustable input in the model. (Bowman Direct, Pg. 5)
>
> BCPM 3.1 uses 26/24 gauge cable in distribution. 12,000 ft of 26 gauge copper has resistance value of *999.6 ohms* (83.3.ohms per thousand feet @ 68deg.), well within the 1500 ohm supervisory limit of today's digital switches. The 26/24 gauging used in the distribution takes into account the industry standard *900 ohm* Carrier Serving Area (CSA) design criteria of no more than 12,000 feet of copper regardless of gauge. In the *few cases where BCPM 3.1 finds grid Quadrants with copper loops greater than 12,000 and up to 18,000 feet in the distribution network*, it uses the *Extended CSA (ECSA) design* with 24 gauge cable throughout that quadrant. *Extended range line cards* are used to serve all customers in the distribution area (Grid quadrant) for *distribution distances over 13,600 feet*. (BCPM 3.1 Methodology, Pg. 18 - 19)
>
> Within a grid, if the length of copper from the DLC to the last lot in a quadrant is *less than 11,100 feet, 26 gauge cable is used* to serve all customers. In those circumstances where the distance from the DLC to the last lot is *greater than 11,100 feet, 24 gauge wire is used in all cables*

> to and within the quadrant. Where distances exceed 13,600 feet, *extended range plug-ins are installed on lines that exceed 13,600 feet.* (BCPM 3.1 Methodology, Pg. 54 - 55)

Thus, BCPM 3.1 clearly violates the CSA Concept in the following four ways:

- BCPM 3.1 models 26 gauge cable out to 11,100 feet from the DLC RT, which <u>clearly exceeds the 9,000 foot limit on 26 gauge cable of the CSA Concept</u>. The 9,000 foot CSA Concept limit on 26 gauge cable is based on cable loss, not 900 ohms of resistance. Therefore, BCPM 3.1 would appear to be modeling customers that are located 9,000 to 11,100 feet from the DLC RT with excessive loss and thus poor quality service. There is no BCPM 3.1 supporting documentation (like the HAI 5.0a Inputs Portfolio) that explains how or why the BCPM developers changed the CSA Concept maximum loop distance for 26 gauge distribution cable from the DLC RT from 9,000 feet to 11,100 feet.
- BCPM 3.1 models loops between 12,000 and 13,600 feet from the DLC RT <u>without range extension line cards in violation of the CSA Concept</u> requirement that all loops in excess of 12,000 feet should have range extension line cards. Do these particular BCPM 3.1 customers have substandard quality service and/or impeded access to advanced services on a reasonably comparable basis? Again, there is no BCPM 3.1 supporting documentation for this deviation from the CSA Concept.
- BCPM 3.1 actually models the <u>Extended</u> (or Expanded) CSA Concept, which supports the <u>design of loops out to 18,000 feet from the DLC RT</u>.
- BCPM 3.1 allows the distance at which the extended range line cards are applied to be a user adjustable input, instead of conforming to the CSA

Concept requirement of 12,000 feet or any particular standard. The statement is made that the 13,600 foot distance to begin employing range extension cards "also is an engineering standard," but there is no supporting documentation for this deviation from the CSA Concept.

Q. DOES BCPM 3.1 MODEL DISTRIBUTION CABLE REALISTICALLY AND COST-EFFECTIVELY?

A. No. When a single lot in a DA exceeds 11,100 feet distance from the DLC RT, BCPM 3.1 then designs all of the distribution cables to and within the DA from 26 gauge to more costly 24 gauge conductor cables. This is a grossly oversimplified and needlessly costly modeling assumption. In the real world, OSP Engineers do not simply increase the gauge of every single cable in a DA to satisfy the transmission requirements of the longest loop when only a few customers exceed the limit for 26 gauge cables. In the real world of OSP Engineering, the larger distribution cables closer to the DLC RT would remain 26 gauge, and the smaller cables closer to the customer would be 24 gauge such that the combined 26/24 gauge loop resistance and loss would be within transmission limits.

In comparison, HM 5.0a models 24 gauge copper conductors for cables less than 400 pairs and 26 gauge conductors for cables 400 pairs and larger (HM 5.0a IP, 2.3.2). Since distribution cable loops more than 9,000 feet from a DLC RT of no greater than 1,800 line capacity will invariably be less than 400 pairs, HM 5.0a does satisfy the CSA Concept constraint on 26 gauge cable distance.

Furthermore, HM 5.0a does this in a "least-cost" manner that is consistent with real world OSP Engineering practice.

Q. WHAT CSA DESIGN STANDARD DOES HM 5.0a EMPLOY?

A. The more cost-efficient design employed by HM 5.0a conforms to OSP transmission requirements for acceptable loop loss of 8.5 dB from the DLC RT based on currently available technology. OSP Engineering guidelines are always subject to "engineering judgment", and currently available technology continually drives the evolution of such guidelines. For example, when the CSA design concept was originally formulated around 1980, ISDN was then limited to less than 12,000 feet on copper. Such service is now routinely guaranteed to any subscriber served on copper cable within 18,000 feet of their serving wire center.

The realistic and cost-effective gauging of the copper distribution cables by HM 5.0a has been described above. For its Integrated DLC systems, HM 5.0a uses two types:

- Low density DLC system applications are based on the Advanced Fiber Communications UMC 1000A.
- High density DLC systum applications are based on the DSC Communications Litespan-2000.

The line cards costed for each of these DLC systems allows for the utilization of extended range line cards as required to support distribution cable lengths out to 18,000 feet from the DLC RT. The low density DLC system, which is more likely to be deployed in rural areas, actually uses the cost for UMC Remote

Terminal Extended Range RST POTS Channel Units (R-EPOTS) for all channel units. The high density DLC system uses its "regular" R-POTS channel unit to meet transmission requirements for loops up to 17,600 feet from the DLC RT (Exhibit ___ (JWW-5)). Should there be any instances of customers between 17,600 to 18,000 feet from a high density DLC system, the Litespan 2000 RUVG2 card is utilized.

In the USF Hearings in Louisiana (Docket U-20883), the Staff's Final Recommendation dated April 3, 1998, reported on page 15 (with italics added for emphasis) that, "Dr. Bowman did concede that Hatfield's [i.e., *HAI 5.0a's] use of 18,000 feet for copper cable beyond the DLC remote terminal would provide quality telecommunications services, as long as the proper electronics were installed in those instances.*" HM 5.0a does indeed use the proper electronics, which are the range extension line cards described above.

Moreover, the Louisiana Staff also found (pages 17 – 18) that "the BCPM overstates cost because the input for extended line range cards are for the more expensive REUVG card." For comparison, the RUVG2 card, used by HM 5.0a for any customers located between 17,600 and 18,000 feet from a high density DLC RT, is approximately 25% more than the standard RPOTS card. However, the REUVG card used by BCPM 3.1 for customers between 13,600 and 18,000 feet is twice as expensive as the standard RPOTS card.

Q. WHAT IS THE COST COMPARISON BETWEEN MODEL RUNS BASED ON 12,000-FOOT GRIDS VERSUS 18,000-FOOT GRIDS?

A. The ILEC proponents claim that "the 12,000-foot grids result in lower per-line loop cost than the 18,000-foot grids." (Bowman Direct, Pg. 5) This claim is not surprising, nor particularly persuasive, given that:

- BCPM 3.1 defaults to <u>all 24 gauge</u> cable when any customer in a DA is beyond 11,100 feet from the DLC RT.
- BCPM 3.1 greatly exaggerates the cost of range extension line cards by utilizing the very expensive REUVG card beyond 13,600 feet when the RPOTS card, at half the cost, is good out to 17,600 feet. At the very least, BCPM 3.1 should be costing the RUVG2 card, which is only 25% more expensive than the standard RPOTS card.

Sensitivity runs of HM 5.0a with the maximum distribution cable length constrained to 12,000 feet have actually produced higher loop costs. This is because the expected reductions in distribution cable investment are more than offset by increased investments in feeder cable and structure and additional DLC RT sites.

Q. **DO YOU HAVE OTHER TRANSMISSION CONCERNS REGARDING THE BCPM 3.1?**

A. Yes. There is no explicit test in BCPM 3.1 to ensure that customers do not exceed 18,000 feet in loop length from the DLC RT. The BCPM 3.1 Model Methodology states that "ultimate grids are designed such that loop lengths from the DLC to the customer are *unlikely* to exceed 18,000 feet" (BCPM 3.1 Description, Pg. 125, with italics added for emphasis). However, BCPM 3.1 does indeed model customers more than 18,000 feet from the DLC RT, and Mr.

Pitkin has determined that BellSouth, GTE and Sprint have all modeled loops exceeding 18,000 feet from the DLC RT in this proceeding. By comparison, the HM 5.0a explicitly tests to ensure that no copper loops exceed the 18,000 feet limit from the DLC RT.

The reason that this is important is that copper loops in excess of 18,000 feet require load coils to meet transmission requirements for quality voice grade service. However, load coils are unacceptable in these models because they would inhibit the provisioning of advanced services per FCC Criterion No. 1. On the other hand, non-loaded copper loops longer than 18,000 feet from the DLC RT would violate network design standards and result in poor quality service to those customers.

Q. DO YOU HAVE A CONCERN WITH THE BCPM 3.1 MODELING METHODOLOGY THAT PLACES FIBER FEEDER CABLE TO LARGE CAPACITY GRIDS BY DEFAULT?

A. Yes. The BCPM 3.1 deploys DLC systems for voice grade services rather than analog copper facilities when demand within a particular grid "exceeds the user designated capacity of the largest copper distribution cable" (BCPM 3.1 Methodology, Pg. 19). I have serious engineering and economic concerns regarding this modeling assumption because no consideration is given to the distance of the particular grid from the wire center. Consequently, BCPM 3.1 will uneconomically deploy fiber and DLC to a large apartment/office building directly across the street from the wire center.

This is not an acceptable assumption for a "least-cost" local loop network. The reason is that there are insufficient savings realized in the substitution of fiber feeder cable for copper feeder cable to offset the additional cost of the DLC electronics for loops generally less than 12,000 feet in total length from the wire center, which is the BCPM 3.1 copper to fiber breakpoint. So, this particular BCPM 3.1 modeling assumption is an unreasonable cost adder to the network and thus unreasonably increases the cost of an average loop.

The justification offered by the BCPM proponents is that this modeling assumption "avoids the typical duct congestion in urban rights of way where utilities and urban services vie for below ground space" (BCPM 3.1 Methodology, Pg. 19). That is a backward-looking justification based on the ILEC's embedded network and is inconsistent with the "long-run, forward-looking cost" economic assumptions applicable to these models per FCC Criterion 3. In other words, in accordance with the "scorched node" assumption, a conduit system would need to be installed anyway with sufficient 4-inch ducts to handle whatever copper and fiber feeder cables might be required. So, BCPM3.1's uneconomic substitution of one fiber cable with substantial DLC system costs instead of placing two, more economical copper cables, saves only the minimal cost of one duct and certainly avoids no congestion.

HM 5.0a, on the other hand, performs a life cycle cost analysis of fiber versus copper feeder on the route to determine if fiber with DLC is the more economical alternative (HM 5.0a Description, Sec. 6.3.5). Thus, the HM 5.0a model methodology again more realistically represents the decision process of an OSP Engineer in designing a feeder route.

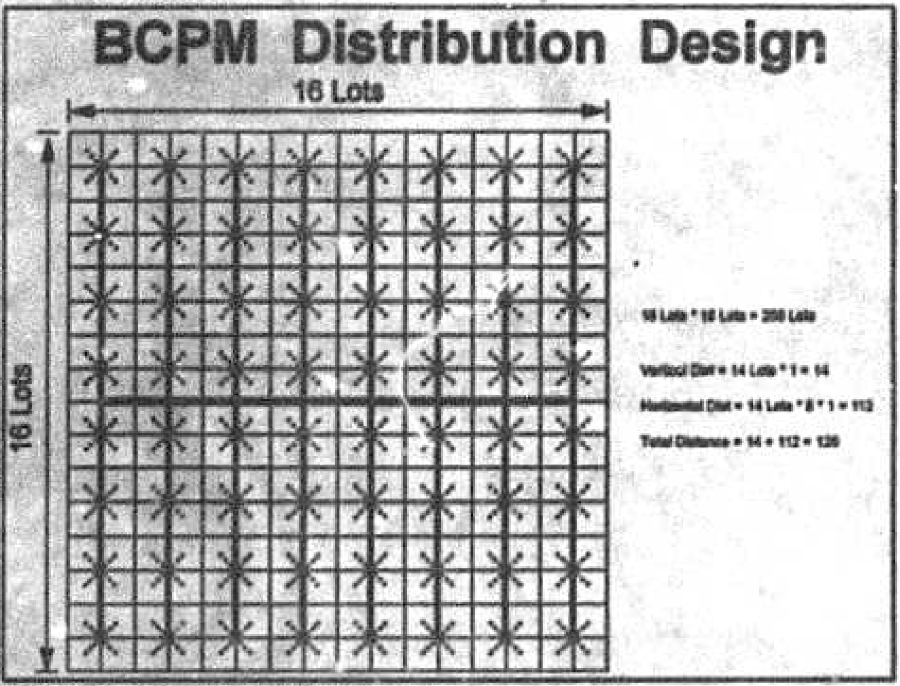
Q. DOES BCPM 3.1 SYSTEMATICALLY OVERSTATE THE AMOUNT OF DISTRIBUTION CABLE REQUIRED BECAUSE IT MODELS SQUARE LOTS?

A. Yes. The BCPM 3.1 developers continue to assert the assumption that customer locations should be modeled as square lots. This is not only unrealistic; it results in the modeling of excessive distribution cable and associated structure investment. HM 5.0a makes a much more realistic assumption that lots are rectangular based on observations of a number of zoning maps and field experience.

Furthermore, as will be detailed below, city and subdivision planners know that any given geographical area can be served with fewer streets, sidewalks, sewers, streetlights, etc. if the lots are rectangular rather than square. Since utilities typically follow the streets or rear lot lines, it follows that rectangular lot layouts are also more efficient and less costly for the power, water, cable and telecommunications utilities to serve their customers as illustrated by the diagrams in Exhibit ___ (JWW-6).

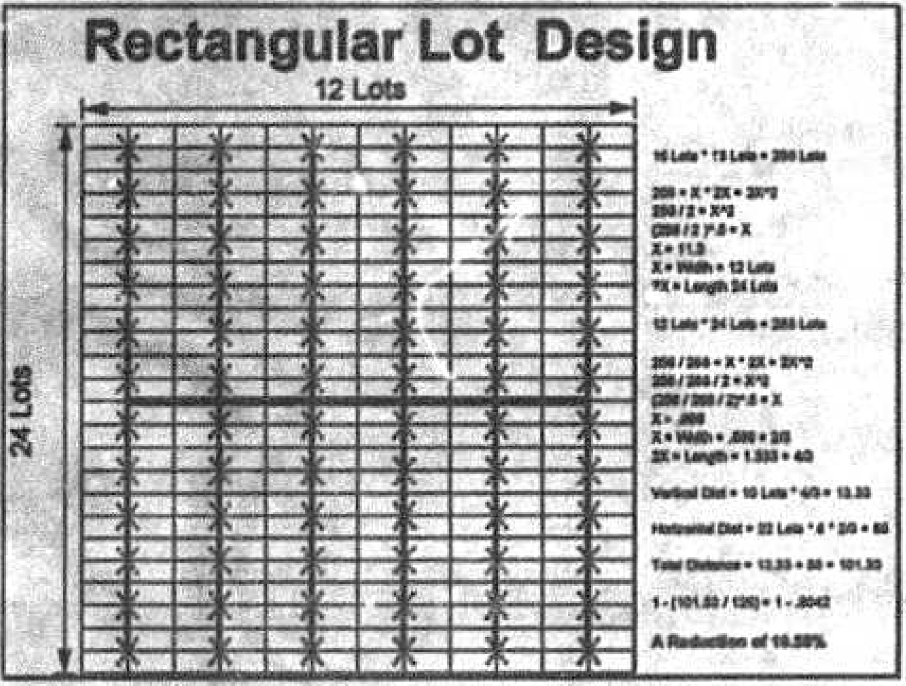
The square lot assumption that has been perpetuated in BCPM 3.1 results in more distribution cable than would be necessary with rectangular lots. Let's consider two generic examples. Assume there are 256 households within a DA.

The square DA in the BCPM 3.1 will have 256 square lots, or 16 by 16 as can be seen below.



Each square lot represents a customer location with a drop going to it (dotted line). The thicker lines represent the distribution cable needed to reach each customer location. For simplicity sake let's assume the area of each lot is one. This means each side of a lot has a length and a width of one. Thus, from the diagram one can see that the amount of distribution cable needed by the BCPM 3.1 in this example is enough to run past 126 lots.

Now consider the next diagram, which roughly represents the way rectangular customer locations could be distributed within the same DA. The total DA remains the same; however, in order to fit this into a square serving area that is somewhat similar, I have taken the liberty of using 288 lots to avoid rounding problems. Again, to be conservative, we will assume that the HAI Model will design the distribution cable to reach <u>all</u> 288 lots in this DA, and that none are empty. Refer to the following figure to see how the HAI Model designs the distribution plant.



Pecall the BCPM 3.1 DA was 256 lots. The area of each lot in BCPM 3.1 was 1. The area of each lot in the HAI Model is the distribution area divided by the number of lots, 256/288 = 8/9. Since the length of a lot is twice its width in HM 5.0a, the width must be 2/3. You can see that this is correct by multiplying the width times twice the width, 2/3*(2*2/3) = 8/9. Now all we need to do is to add up the cable used by the HAI Model, which equals 101.33 to serve 288 rectangular lots. Now, compare this number to the BCPM 3.1 design, which needed cable for a distance of 126 to serve only 256 square lots.

The amount of distribution cable needed for the same distribution area as modeled by the HM 5.0a is 19.58% less than that modeled by the BCPM 3.1 — a significant difference that also reflects the reality of city and subdivision planning. BCPM 3.1 consistently models excessive distribution cable length to serve a modeled area of customers occupying lots of identical area.

Q. DOES BCPM 3.1 HAVE TO LIMIT THE AMOUNT OF CABLE THAT CAN BE MODELED WITHIN A DISTRIBUTION QUADRANT?

A. Yes. As an indication of just how seriously BCPM 3.1 overstates total distribution cable length, there is a check that had to be built into the BCPM 3.1 that "constrains the total length of cables (including the backbone, branch, vertical and horizontal connecting cables) within a distribution quadrant to not exceed the length of the road network in that distribution quadrant (BCPM 3.1 Methodology, Pg. 54). According to Mr. Pitkin, over half of the distribution quadrants have to invoke this constraint in order to limit the amount of excessive distribution cable otherwise modeled by BCPM 3.1 based on the square lot assumption.

This difference in modeling assumptions between the HAI Model and the BCPM is further accentuated when the distance from the center of the street to the front of the lot is taken into consideration. The 1 x 2 rectangular lots of the HAI Model and the 1 x 1 square lots of the BCPM include the entire area being modeled and thus go to the center of the street or road. When the distance from the center of the road to the actual front of the lot, which is typically 25 - 30 feet, is subtracted, the HAI Model still has a rectangular lot where the depth is greater than its width. However, the BCPM is now left with a rectangular lot where the width is greater than the depth with the distribution cables having to traverse the longer width. This further elucidates just how unrealistic it is for BCPM 3.1 to model square lots.

Q. DOES BCPM 3.1 OVERSIZE DISTRIBUTION CABLES?

A. Yes. In regards to distribution cable sizing, the BCPM 3.1 Model Methodology states the following:

- "Branch cables are sized to the number of pairs for housing units and business locations. This calculation takes the number of housing units times pairs per housing unit and the greater of actual business pairs per location or business locations times pairs per location." (BCPM 3.1 Methodology, Pg. 55)
- "The Model default inputs assume two pairs for a resident unit and six pairs for a business unit." (BCPM 3.1 Methodology, Pg. 56)

These "default minimums" in BCPM 3.1 are based on a guideline from the outdated practice on Detailed Distribution Area Planning (DDAP) for a minimum of two pairs per ultimate living unit and five pairs per small business, which may be modified based on the judgment of the engineer (BSP 901-350-250, Pg. 20-21). However, technological advances have superseded these "minimum" values. For example, two-channel DSL Systems have become a viable means of rapidly providing additional lines for loops up to 18,000 feet. A primary advantage of incorporating these systems into local loop distribution planning for additional lines is that the investment in two-channel DSL Systems is only needed if, when, and for as long as the additional customer demand is there.

There is excessive cost in oversizing copper distribution cables based on historically low utilization rates that can no longer be justified. The ILECs like to raise a big scare over the time, expense and disruption of digging up streets and yards to place a second distribution cable or drop to serve additional customer demand. With the widespread use of two-channel DSL Systems, the addition of a second cable is no longer the primary alternative. Thus, the ILECs can no longer justify exorbitant levels of spare cable pairs by using their historically low average distribution cables utilization, typically in the 40% range (Dickerson Direct, Pg. 11). Indeed, GTE's deployment practice prescribes distribution cable fills in excess of xxxx% based on the planned selective utilization of two-channel DSL Systems. ILEC cable utilization rates should be rising from their historical levels.

In regards to these historically embedded distribution cable fills, BellSouth testifies that, "These *[distribution cable sizing] factors* are designed to produce a *fill representative of* BellSouth's projection of *actual fill, based on experience over time, for Florida*" (Caldwell Direct, Pg. 12 with italics added for emphasis). However, in response to AT&T's First Set of Interrogatories, Item No. 26, which tried to ascertain the historical utilization of distribution cables, BellSouth responded that, "No record is kept of distribution cable status on statewide basis." Thus, BellSouth could not produce any distribution cable "actual fill, based on experience over time, for Florida", and BellSouth's interrogatory response appears to contradict Ms. Caldwell's testimony.

Similarly, Sprint testifies it "calculated *actual feeder fill* based on working pairs (cable pairs in service) divided by total pairs available *as tracked in the Customer Loop Assignment System, Sprint's internal system for maintaining cable pair inventory*" (Dickerson Direct, Pg. 10 with italics added for emphasis). However, in response to AT&T's First Set of Interrogatories, Item No. 26, which tried to ascertain the historical utilization of feeder cables, Sprint responded that, "Without waiving its objection, Sprint states that the information requested does not exist." Thus, Sprint's interrogatory response appears to contradict Mr. Dickerson's testimony.

From other proceedings that I have participated in, I know that BellSouth has reduced its distribution cable sizing guidelines for pairs per house, or living unit. BellSouth, GTE and Sprint have filed xxx pairs per housing unit in this proceeding. However, I recommend that the BCPM 3.1 input value for distribution pairs per residential housing unit for the ILECs should be reduced to 1.5.

BCPM 3.1 takes the greater of actual business pairs per location or business locations times the input value for business pairs per location. Based on data from several other dockets, I know that the number of business lines per small business location is definitely less than 3.0. However, BellSouth, GTE and Sprint all have filed input values of xxx pairs per business location. This is much too high given that the actual number of lines are modeled for large businesses. Therefore, I recommend that the input value for the minimum number of pairs per business location should be reduced from x to 3.

BCPM 3.1 utilizes distribution cable sizing factors to increase the demand numbers that are already based on the <u>ultimate</u> pair requirements. In addition, there is one more step of rounding up to the next discrete cable size, which is necessary, but in the case of the BCPM 3.1 is based on already overinflated pair requirements as detailed above. Interestingly, the ILECs have begun to realize the excess that has been built into the BCPM 3.1 distribution cable sizing methodology and have more appropriately filed distribution cable sizing factors ranging from 98.0% to 100.0% in this proceeding. Nevertheless, the resulting distribution cable fills are still aimed at maintaining historical embedded utilization levels rather than "least-cost, most-efficient, forward-looking" cable fills based on "currently available technology."

Q. IS THERE ANY EMPIRICAL EVIDENCE THAT ILEC COPPER CABLE UTILIZATION RATES BEING MODELED ARE TOO LOW?

A. Yes. I believe that ILEC historical copper utilization rates, the basis upon which ILEC copper cable fills for BCPM 3.1 have been developed, can be shown to be low based on empirical evidence. This is because an excessive defective pair rate can be attributed in large part to excessive spare capacity, which reduces the incentive to clear defective copper cable pairs.

The cost of a loop is being estimated by the ILECs in this proceeding to be approximately $xxxxx per loop. The ILEC cost to clear a defective pair is $xx - $xxx per pair (ILEC Responses to AT&T's First Set of Interrogatories, Item No. 33). Thus, there should be ample economic incentive to clear defective cable pairs and keep the cable pair inventory in high working order, unless there was an excessive surplus of spare cable pairs.

An acceptable defective copper pair rate in the industry is 2% - 3%. AT&T's First Set of Interrogatories, Item No. 25 requested data on defective pair rates. GTE's defective pair rate was reported to be within industry standards. Furthermore, there were practices and data produced that indicate that GTE makes clearing defective pairs and effectively managing the defective pair rate a priority.

However, BellSouth's defective pair rate is more than four times the industry standard, and growing. Furthermore, in response to AT&T's First Set of Interrogatories, Item No. 33, BellSouth responded that, "No data is kept on the quantity and percentage of copper pairs and fiber stands cleared."

Also interesting is Sprint's response that, "Without waiving its objection, Sprint states that the information does not exist." However, in response to AT&T's First Request for Production of Document, Item No. 12, Sprint furnished an extensive practice on its "Defective Cable Identification and Prioritization Process" that appeared to include a statistical reporting system.

It is difficult for me to believe that an ILEC would not keep track of and try to effectively manage its defective pair rate. Unless, however, that ILEC had such a large surplus of spare cable pairs that it was actually uneconomical to expend resources to reclaim even excessive numbers of defective pairs.

Q. DOES THE EMPLOYMENT OF THE TIGER ROAD NETWORK BY THE BCPM 3.1 MAKE THE MODEL MORE REALISTIC?

A. Not really. This is another modeling idea that sounds good at first, but when its implementation in BCPM 3.1 is investigated reveals a number of concerns and uncovers just how shallow the perceived benefits really are.

BCPM 3.1 relies on a straightforward premise that households and business typically reside near roads (Duffy-Deno Direct, Pg. 16). However, it is the converse of this premise upon which the BCPM 3.1 really operates. The actual modeling premise being that the presence of a road ensures the uniform distribution of households and businesses along that road. As stated in the BCPM Model Methodology, "[c]ustomers, assigned to microgrids within distribution quadrants, are subsequently placed *uniformly* in Road Reduced Areas" (BCPM 3.1 Methodology, Pg. 122 with italics added for emphasis). This is simply not the best premise for modeling customer locations.

Indeed, there are many roads that have no households or businesses, and many roads along which customers are not uniformly distributed. In rural areas, customers tend to be more concentrated at the end of their road, which may traverse several grids without any customer locations, before it gets to them. These models are supposed to design a network to serve all of the customer locations, not all of the roads.

However, if a model accurately locates the customers, then it can be reasonably assumed that roads exist to reach those customers without having to identify particular roads from a separate database. This is the modeling premise of HM 5.0a.

The BCPM 3.1 Model Methodology states another simple fact that "rights of way for provisioning telecom cables are most frequently found along roadways" (BCPM 3.1 Methodology, Pg. 6). Once again, if a model such as HM 5.0a locates customers, then it can be reasonably assumed that roads exist with rights of way for cables to reach those customer locations. BCPM 3.1 thus has no claim to any superiority in the matter of rights of way. Furthermore, BCPM 3.1 makes absolutely no use of the road network information to determine pathways that engineers would use to place facilities.

On the contrary, the need for road right of way actually indicts another assumption in the BCPM 3.1 in that it is necessary to model sufficient route distance to allow for the meandering of the road network. Typically, this is done in HM 5.0a and the BCPM 3.1 via right angle, or rectilinear, routing of the cables. However, in BCPM 3.1 the split, or angled, feeder route appears to take a direct route towards "the population centroid of the entire feeder quadrant" (BCPM Methodology, Pg. 43). If no allowance is made for conversion of "airline" route to "road" route distances, as is done in HM 5.0a, then the BCPM 3.1 will not model sufficient investment for the split feeder route to reach its destination.

Any perceived added value of applying the road network to locate customers below the CB level is suspect. As an example of how the road network is used to allocate customers from CBs to microgrids, the BCPM 3.1 Model Methodology (Pg. 30) uses an illustration of 20 miles of roads traversing a microgrid. However, a microgrid is only 1,500 feet by 1,700 feet and could not realistically contain a even minuscule fraction of 20 miles of roads.

Q. DO YOU HAVE CONCERNS WITH THE OSP SENSITIVITY ANALYSIS CAPABILITY OF THE *BCPM* 3.1?

A. Yes. The BCPM 3.1 has two major, rather arbitrary, OSP network design assumptions which cannot be readily subjected to sensitivity analysis because they are only user adjustable via the cumbersome and time consuming one day preprocessing application. These two assumptions are:

1. The preprocessor has a maximum threshold of 999 lines (or households plus business lines) for determining if *microgrids* are re-aggregating to form CSAs. As detailed earlier in my testimony, I believe that the BCPM 3.1 models far too many DLC RT sites because the number of lines modeled in its CSAs and DAs is well below capacity. It is very difficult to run a sensitivity analysis in the BCPM 3.1 to verify this and develop a more cost-efficient alternative threshold because it is only changeable in the one day preprocessing cycle.
2. The preprocessing routine has a fixed distance of 10,000 feet from every wire center as the appropriate distance where it is economical and feasible to split a feeder route. This is also the fixed distance where the spacing of lateral subfeeder routes suddenly goes from roughly every 1,600 feet to roughly

every 13,000 feet (BCPM 3.1 Methodology, Pg. 46). The BCPM Model Methodology rationale is "that within 10,000 feet [of the wire center], customers are generally located within the perimeter of a town and that the town has some sort of gridded street complex" (BCPM 3.1 Methodology, Pg. 43).

BCPM 3.1 then applies this questionable fixed assumption to <u>every feeder route</u> in <u>every wire center</u> in <u>every geographical area in Florida</u>. Furthermore, there is no economic justification offered by the BCPM modelers that 10,000 feet is the realistic or least-cost, most-efficient distance for any feeder route, much less for every feeder route in every wire center. This number needs to be more easily adjustable for sensitivity testing. Furthermore, this assumption should be variable (perhaps in a look-up table) that is based on the size of the wire center and/or the density of customers along the feeder route.

VI. <u>OTHER CRITICISMS REGARDING THE HAI MODEL</u>

Q. WOULD YOU PLEASE RESPOND TO ANY OTHER BCPM 3.1 CLAIMS OR HM 5.0a CRITICISMS REGARDING OSP?

A. Yes. There are six.

1. The BCPM 3.1 alleges superiority in sizing distribution cables based on ultimate pairs per house instead of current households. There is no shortcoming of HM 5.0A in this regard. The distribution cable fill factors in HM 5.0a are more than adequate to serve the number of empty houses that may exceed the number of households in an area, even though this is not a

requirement of the model. Furthermore, the BCPM 3.1's modeling of distribution cables sized specifically to serve empty houses has been rejected (Staff's Final Recommendation, LA Docket U-20833, 3/27/98, Pg. 16).

2. The BCPM 3.1 Model Methodology still continues show the Hatfield Model Release 4.0 ("HM 4.0") methodology for distribution road cables in rural areas. This methodology has been totally superseded by the clustering algorithms of HM 5.0a. Furthermore, BCPM 3.1 continues to misrepresent the road cables of HM 4.0 as two cables running in a straight line from the center to opposite corners of the quadrant (BCPM 3.1 Methodology, App. A, Ex. 2). What HM 4.0 did with road cables was model road cable investment based on twice the rectilinear distance from the centroid to the corner of the occupied area of the quadrant. The relevant points being that there could be more than two cables within the modeled total length and the total distance modeled is significantly understated in the BCPM 3.1 illustration.

3. The BCPM proponents are also still making outdated and totally irrelevant assertions in regards to 85% of the rural customers modeled as being in towns and served via a distribution cable grid on maximum three acre lots in HM 4.0 (BCPM 3.1 Methodology, Pg. 24). For many months, HM 5.0a has modeled main and outlier clusters in a way that is more precise and representative of the way that local loop networks are designed. (A description of the OSP enhancements of HM 5.0a is covered in the direct testimony that I filed in this proceeding.)

4. The BCPM proponents cite a study of five states performed for the FCC that concludes that 12,000-foot grids result in lower per-line loop costs than 18,000-foot grids (Bowman Direct, Pg. 5). I have little doubt regarding the reported results given the longer loop cost inefficiencies inherent in the BCPM 3.1. Specifically, the previously documented excessive costs of the REUVG range extension card for all loops in excess of 13,600 feet in length and the use of 24 gauge cable only for the entire CSA when the copper loop to any customer in the CSA exceeds 11,100 feet. If this study had been conducted using the HM 5.0a assumptions of less costly RUVG2 range extension card and 24 gauge for cables less than 400 pairs, the results would no doubt have been markedly different.

5. In regards to the sharing of buried cable trenching , it has been written that, "Such proposals [for sharing buried cable trenches in the future] conveniently overlook the fact that GTE's network is in place today....With respect to buried cable, these parties [i.e., AT&T and MCI] apparently believe that GTE will dig up its existing cable in order to immediately rebury in a shared trench" (Tucek Direct, Pg. 8). These statements reflect a serious lack of understanding of the "scorched node" assumption that is to be applied to these models. As stated very clearly by another ILEC witness, "the BCPM 3.1 model assumes that the entire network is built at a single point in time" (Staihr Direct, Pg. 7).

6. The BCPM sponsors have unilaterally declared that "data transmission over a 28.8 Kbps modem" constitutes "access to advanced services" for the purpose

of implementing FCC Criterion 1 (Bowman Direct, Exhibit RMB 3, Pg. 2). The FCC Criterion actually states that, "[t]he loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. For example, loading coils should not be used because they impede the provision of advanced services." (FCC Report and Order, May 8, 1997, Paragraph 250, Criterion 1). While the FCC does not specifically define "advanced services," its use of the words "not impede" and the example of "load coils," which would actually <u>preclude</u> the transmission of digital signals, does provide ample guidance in this matter.

My understanding of "impeding advanced services" in regards to the issue raised in Exhibit RMB 3 would be to deny modem access to rural customers, which the existing ILEC networks certainly do today. The attempt by the BCPM sponsors to declare 28.8 Kbps modem access as the standard for advanced services (as opposed to say 14.4 Kbps or 56 Kbps) is blatantly self-serving and misleading.

Proponents of BCPM have noted a Bellcore Technical Memorandum TM-25704 as support for why the Hatfield Model will not support modem speeds of 28.8 Kbps (Bowman Direct, Exhibit RMB 3, Pg. 10). This TM is not a transmission standard and was specifically developed as a worst-case scenario. Mr. John Donovan, the leader of the HAI OSP Engineering Team has reviewed this TM, talked with its author and makes the following observations, which I support:

> A close reading of the TM indicates exactly what I have been saying regarding the inexactness of analog modem performance. Worthy of note is page 12 of that TM, which tabulates the actual experiments performed. The purpose of the tests was not to validate the transmission characteristics of either the BCPM or Hatfield Models, but to examine worst-case scenarios. In fact the worst case is so bad, that none of the loops used in experiment meet tariff requirements, since all loops exceed the 8.5 dB maximum for POTS loops. Since other empirical data is not readily available on short notice, however, we can make certain observations about the data. First of all, I personally spoke with Rick Perez, the Bellcore author. He told me that the worst-case test loops had many gauge changes and many splices. This would cause high reflection losses in each splice, and is the most likely cause of the abnormal dB losses at the standard test frequency of 1004 Hz.
>
> Test loop number 1 was 18,000 feet with no bridge tap. It supported 24.0 kbps on a 28.8 modem, but had a horrendous loss of 14.3 dB, 5.8 dB above the maximum allowed by tariff. Since each 3dB attenuation halves the signal strength, this means that the signal on this loop was at about ¼ or 25% of the strength it should be at 8.5 dB. The next longest loop was test loop number 6 which was 17,500 feet with 1,000 feet of bridge tap. Yet this loop still had 12.8 dB of loss, or about 3/8ths of the signal strength the Hatfield Model would provide at 8.5 dB. Still, this loop readily supported 26.4 kbps with a 28.8 kbps modem.

As one would surmise from the Bellcore Technical Memorandum, determining predicted modem speeds is not an exact science. The HAI OSP Engineering Team has estimated that the HM 5.0a will support minimum modem speeds of 21 - 24 Kbps for any loop, and 28.8 Kbps, or better, for most loops. I believe that this level of performance more than complies with a reasonable interpretation of the FCC requirement to provide access to "advanced telecommunications and information services that are reasonably comparable to those services provided in urban areas."

The conclusion of this exhibit stated that, "[b]y utilizing the DSC architecture and the *maximum 12 Kft copper loop*, BCPM3 *assures that the requirements for advanced telecommunications service access* for remote rural customers is reasonably comparable to that enjoyed by urban customers, as mandated by the 1996 Act" (Bowman Direct, Exhibit RMB 3, Pg. 9, with italics added for emphasis). In this testimony it has been shown that the BCPM 3.1 clearly designs copper loops out to 18 Kft and even beyond. Not only is the conclusion statement above rather questionable, but any undue concern raised by Exhibit RMB 3 regarding modem speed is applicable to BCPM 3.1.

VII. SUMMARY

Q. WOULD YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A. I recommend that the Commission adopt the HM 5.0a as the most appropriate model for determining the local loop cost of basic local exchange service in Florida. In Release 3.1, the BCPM modelers have taken steps to evolve their model by incorporating several of the concepts of the Hatfield Model plus some additional ideas to improve the accuracy and cost efficiency of the local loop model. Most of the evolutionary changes in this particular release of the BCPM have the initial conceptual appearance of being cost improvements. However, upon investigation, I have found that in the implementation of these ideas the BCPM 3.1 still falls well short of being the least-cost, most-efficient, forward-looking and reasonable local loop cost model based on currently available technology, particularly in comparison to the HAI Model Release 5.0a.

Second, I recommend that many of the OSP input values proposed by BellSouth, GTE and Sprint be rejected, since these inputs contain numerous fallacies and are not the least-cost, most-efficient and forward-looking set of input values that are required in this proceeding. The HAI Model 5.0a and the input values proposed by AT&T and MCI for OSP are more appropriate to use in this proceeding for determining the cost of the local loop network in Florida in order to size the Universal Service Fund.

Q. **DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/15/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	00000 - 00005	$ 780.58				$ 417.00
(Before Structure Sharing)	00005 - 00100	$ 780.58				$ 417.00
	00100 - 00200	$ 780.58				$ 417.00
	00200 - 00650	$ 780.58				$ 417.00
	00650 - 00850	$ 775.20				$ 417.00
	00850 - 02550	$ 823.65				$ 417.00
	02550 - 05000	$ 823.65				$ 417.00
	05000 - 10000	$ 823.65				$ 417.00
	10000 +	$ 823.65				$ 417.00
Structure Cost - Aerial - Feeder	00000 - 00005	$ 780.58				$ 417.00
(Before Structure Sharing)	00005 - 00100	$ 780.58				$ 417.00
	00100 - 00200	$ 780.58				$ 417.00
	00200 - 00650	$ 780.58				$ 417.00
	00650 - 00850	$ 775.20				$ 417.00
	00850 - 02550	$ 823.65				$ 417.00
	02550 - 05000	$ 823.65				$ 417.00
	05000 - 10000	$ 823.65				$ 417.00
	10000 +	$ 823.65				$ 417.00
Structure Cost - Buried - Distribution	00000 - 00005	$ 1.47				$ 1.77
(Before Structure Sharing)	00005 - 00100	$ 1.73				$ 1.77
	00100 - 00200	$ 2.40				$ 1.77
	00200 - 00650	$ 4.13				$ 1.93
	00650 - 00850	$ 5.22				$ 2.17
	00850 - 02550	$ [illegible]				$ 2.54
	02550 - 05000	$ 8.23				$ 4.27
	05000 - 10000	$ 8.23				$ 13.00
	10000 +	$ 8.84				$ 45.00
Structure Cost - Buried - Feeder	00000 - 00005	$ [illegible]				$ 1.77
(Before Structure Sharing)	00005 - 00100	$ 1.79				$ 1.77
	00100 - 00200	$ [illegible]				$ 1.77
	00200 - 00650	$ 4.13				$ 1.93
	00650 - 00850	$ 5.18				$ 2.17
	00850 - 02550	$ 5.18				$ 2.54
	02550 - 05000	$ 8.22				$ 4.27
	05000 - 10000	$ 8.22				$ 13.00
	10000 +	$ 8.84				$ 45.00
Structure Cost - Underground - Distribu	00000 - 00005	$ 2.70				$ 10.29
(Before Structure Sharing)	00005 - 00100	$ 3.04				$ 10.29
	00100 - 00200	$ 3.88				$ 10.29
	00200 - 00650	$ 4.47				$ 11.35
	00650 - 00850	$ 5.28				$ 11.88
	00850 - 02550	$ [illegible]				$ 16.40
	02550 - 05000	$ 8.23				$ 21.80
	05000 - 10000	$ 8.23				$ 60.10
	10000 +	$ 8.84				$ 75.00
Structure Cost - Underground - Feeder	00000 - 00005	$ 2.70				$ 10.29
(Before Structure Sharing)	00005 - 00100	$ 3.04				$ 10.29
	00100 - 00200	$ 3.88				$ 10.29
	00200 - 00650	$ 4.43				$ [illegible]
	00650 - 00850	$ 5.27				$ 11.88
	00850 - 02550	$ 5.27				$ 16.40
	02550 - 05000	$ 8.22				$ 21.80
	05000 - 10000	$ 8.22				$ 60.10
	10000 +	$ 8.84				$ 75.00
Structure Cost - Conduit (Before Struct	4 Inch	$ 0.83				$ 0.80
Structure Cost - Manholes - Material	nd Hole: 3'*5' or	$ [illegible]				$ 290.00
(Before Sharing)	anhole: 4'*6'*6'/	$ 2,138.36				$ 2,340.00
	Manhole 6'*12'*7'/	$ [illegible]				$ 2,340.00
	Adder 6'*12'*2'	$ 2,300.00				N/A
Structure Cost - Manholes - Installation	nd Hole: 3'*5' or	$ 400.00				$ [illegible]
(Before Sharing)	anhole: 4'*6'*6'/	$ 1,848.00				$ 2,600.00
	Manhole 6'*12'*7'/	$ 2,431.00				$ 5,000.00
	Adder 6'*12'*7'	$ 600.00				N/A
% Paid by Telco - Aerial - Distribution	00000 - 00005	50.00%				
(Poles)	00005 - 00100	50.00%				
	00100 - 00200	50.00%				
	00200 - 00650	50.00%				
	00650 - 00850	50.00%				
	00850 - 02550	50.00%				
	02550 - 05000	50.00%				
	05000 - 10000	50.00%				
	10000 +	50.00%				
% Paid by Telco - Aerial - Distribution	00000 - 00005	100.00%				
(Anchors & Guys)	00005 - 00100	100.00%				
	00100 - 00200	100.00%				
	00200 - 00650	100.00%				
	00650 - 00850	100.00%				
	00850 - 02550	100.00%				
	02550 - 05000	100.00%				

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
[illegible] Aerial (Poles) - Distribu	00005 - 00100	$ 387.[illegible]				$ 437.69
	00100 - 00200	$ 417.21				$ 104.25
	00200 - 00650	$ 417.21				$ 104.25
	00650 - 00850	$ 411.83				$ 104.25
	00850 - 02550	$ 460.38				$ 104.25
	02550 - 05000	$ 460.38				$ 104.25
	05000 - 10000	$ 460.38				$ 104.25
	10000 +	$ 460.38				$ 104.25
Pole Sharing Cost - Aerial - Feeder (Poles, Anchors & guys)	00000 - 00005	$ 417.21				$ 209.80
	00005 - 00100	$ 417.21				$ 137.61
	00100 - 00200	$ 417.21				$ 104.25
	00200 - 00650	$ 417.21				$ 104.25
	00650 - 00850	$ 411.83				$ 104.25
	00850 - 02550	$ 460.38				$ 104.25
	02550 - 05000	$ 460.38				$ 104.25
	05000 - 10000	$ 460.38				$ 104.25
	10000 +	$ 460.38				$ 104.25
Pole Sharing Cost - Buried - Distribution	00000 - 00005	$ 1.47				$ 0.88
	00005 - 00100	$ 1.69				$ 0.88
	00100 - 00200	$ 2.11				$ 0.88
	00200 - 00650	$ 3.84				$ 0.64
	00650 - 00850	$ 4.13				$ 0.72
	00850 - 02550	$ 4.73				$ 1.17
	02550 - 05000	$ 6.66				$ 1.41
	05000 - 10000	$ 6.89				$ 4.39
	10000 +	$ 7.47				$ 14.88
Pole Sharing Cost - Buried - Feeder	00000 - 00005	$ 1.35				$ 0.71
	00005 - 00100	$ 1.77				$ 0.71
	00100 - 00200	$ 2.69				$ 0.71
	00200 - 00650	$ 3.80				$ 0.77
	00650 - 00850	$ 4.08				$ 0.87
	00850 - 02550	$ 4.68				$ 1.42
	02550 - 05000	$ 6.69				$ 1.71
	05000 - 10000	$ 6.89				$ 5.20
	10000 +	$ 7.81				$ 18.00
Pole Sharing Cost - Underground - Distr	00000 - 00005	$ 2.70				$ 10.39
	00005 - 00100	$ 2.89				$ 5.14
	00100 - 00200	$ 3.39				$ 5.14
	00200 - 00650	$ 3.87				$ 5.68
	00650 - 00850	$ 4.23				$ 4.76
	00850 - 02550	$ 4.73				$ 6.41
	02550 - 05000	$ 6.66				$ 7.13
	05000 - 10000	$ 6.98				$ 18.83
	10000 +	$ 7.07				$ 24.75
Pole Sharing Cost - Underground - Feed	00000 - 00005	$ 2.76				$ 5.14
	00005 - 00100	$ 2.89				$ 5.14
	00100 - 00200	$ 3.73				$ 4.11
	00200 - 00650	$ 4.18				$ 3.79
	00650 - 00850	$ 4.74				$ 3.87
	00850 - 02550	$ 4.74				$ 6.41
	02550 - 05000	$ 6.99				$ 7.13
	05000 - 10000	$ 6.99				$ 18.83
	10000 +	$ 7.81				$ 24.75
Pole Sharing Cost - Conduit	4 Inch	$ 0.81				$ 0.60
Pole Sharing Cost - Manholes - Mat. & Inst	Hand Hole 3'x5'	$ 1,708.[illegible]				$ 188.00
	Manhole 4'x6'x7'	$ 3,404.60				$ 2,870.00
	Manhole 6'x12'x7'	$ 4,217.00				$ 3,422.20
	Adder 6'x12'x7'	$ 2,840.00				N/A
Pole Spacing	00000 - 00005	250				250
	00005 - 00100	250				250
	00100 - 00200	[illegible]				200
	00200 - 00650	200				200
	00650 - 00850	150				175
	00850 - 02550	150				175
	02550 - 05000	150				150
	05000 - 10000	150				150
	10000 +	150				150
Cable - Copper - Aerial - 24 Gauge (Material Cost)	4200	$ 82.79				N/A
	3600	$ 47.83				N/A
	3000	$ 46.46				N/A
	2400	$ 35.39				N/A
	2100	$ 29.30				N/A
	1800	$ 25.57				N/A
	1200	$ 18.83				N/A
	900	$ 17.85				N/A
	600	$ 9.39				N/A
	400	$ 6.52				N/A
	200	$ 5.89				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ [illegible]				$ [illegible]
	100	$ 3.37				$ 2.90
	50	$ 3.77				$ 1.45
	25	$ 7.82				$ 1.19
	18	$ 2.79				$ 0.79
	12	$ 2.54				$ 0.63
Cable - Copper - Aerial - 24 Gauge (Supply Cost)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 24 Gauge (Tax)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 24 Gauge (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 24 Gauge (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 24 Gauge (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/5/98)
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ [illegible]				$ [illegible]
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 24 Gauge (TOTAL)	4200	$ 52.78				$ 29.00
	3600	$ 47.59				$ 26.00
	3000	$ 46.45				$ 23.00
	2400	$ 35.69				$ 20.00
	2100	$ 28.30				$ 18.00
	1800	$ 28.54				$ 16.00
	1200	$ [illegible]				$ 13.00
	900	$ 12.85				$ 10.00
	600	$ 8.60				$ 7.75
	400	$ 6.83				$ 6.00
	300	$ 5.85				$ 5.13
	200	$ 4.89				$ 4.25
	100	$ 3.37				$ 2.80
	50	$ 2.77				$ 1.63
	25	$ 2.62				$ 1.19
	18	$ 2.56				$ 0.78
	12	$ 2.54				$ 0.63
Cable - Copper - Aerial - 26 Gauge (Material)	4200	$ 37.18				N/A
	3600	$ 34.51				N/A
	3000	$ 33.18				N/A
	2400	$ 25.35				N/A
	2100	$ 20.48				N/A
	1800	$ 15.29				N/A
	1200	$ 12.73				N/A
	900	$ 8.89				N/A
	600	$ 7.21				N/A
	400	$ 5.71				N/A
	300	$ 4.45				N/A
	200	$ 3.84				N/A
	100	$ 2.89				N/A
	50	$ 2.59				N/A
	25	$ 2.50				N/A
	18	$ 2.50				N/A
	12	$ 2.50				N/A
Cable - Copper - Aerial - 26 Gauge (Supply Cost)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 26 Gauge (Tax)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	00000-200000	$ 780.35				$ 41[illegible]
Cable - Copper - Aerial - 26 Gauge (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 26 Gauge (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 26 Gauge (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Aerial - 26 Gauge (TOTAL)	4200	$ 37.18				$ 29.00
	3600	$ 34.01				$ 26.00
	3000	$ 33.56				$ 23.00
	2400	$ 28.26				$ 20.00
	2100	$ 20.86				$ 18.00
	1800	$ 18.38				$ 16.00
	1200	$ 12.76				$ 12.00
	900	$ 9.88				$ 10.00
	600	$ 7.21				$ 7.75
	400	$ 5.56				$ 6.00
	300	$ 4.88				$ 5.13
	200	$ 3.64				$ 4.25
	100	$ 2.89				$ 2.50
	50	$ 2.69				$ 1.63
	25	$ 2.60				$ 1.19
	18	$ 2.60				$ 0.79
	12	$ 2.60				$ 0.63
Cable - Copper - Buried - 24 Gauge (Material Cost)	4200	$ 38.37				N/A
	3600	$ 36.56				N/A
	3000	$ 34.79				N/A
	2400	$ 32.36				N/A
	2100	$ 27.82				N/A
	1800	$ 25.67				N/A
	1200	$ 17.21				N/A
	900	$ 13.68				N/A
	600	$ 9.08				N/A
	400	$ 7.30				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default [1/14/98]	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida [8/3/98]
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ 795.59				$ 417[illegible]
	200	$ 4.45				N/A
	100	$ 3.04				N/A
	50	$ 2.50				N/A
	25	$ 2.06				N/A
	18	$ 2.06				N/A
	12	$ 1.97				N/A
Cable - Copper - Buried - 24 Gauge (Supply Cost)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 24 Gauge (Tax)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 24 Gauge (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 24 Gauge (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 24 Gauge (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default [1/16/98]	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida [8/3/98]
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ 780.29				$ 41.08
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 24 Gauge	4200	$ 39.37				$ 30.18
(TOTAL)	3600	$ 36.56				$ 27.04
	3000	$ 34.78				$ 23.92
	2400	$ 32.38				$ 20.80
	2100	$ 27.50				$ 18.72
	1800	$ 25.57				$ 16.64
	1200	$ 17.21				$ 12.48
	900	$ 13.80				$ 10.40
	600	$ 9.08				$ 8.09
	400	$ 7.29				$ 6.24
	300	$ 5.29				$ 5.34
	200	$ 4.40				$ 4.42
	100	$ 3.64				$ 2.60
	50	$ 2.80				$ 1.70
	25	$ 2.08				$ 1.24
	12	$ 2.05				$ 0.78
	6	$ 1.67				$ 0.66
Cable - Copper - Buried - 28 Gauge	4200	$ 33.18				N/A
(Material)	3600	$ 30.30				N/A
	3000	$ 28.18				N/A
	2400	$ 26.78				N/A
	2100	$ 22.60				N/A
	1800	$ 20.46				N/A
	1200	$ 13.20				N/A
	900	$ 10.70				N/A
	600	$ 7.27				N/A
	400	$ 5.87				N/A
	300	$ 4.39				N/A
	200	$ 3.48				N/A
	100	$ 2.62				N/A
	50	$ 2.18				N/A
	25	$ 1.85				N/A
	18	$ 1.93				N/A
	12	$ 1.93				N/A
Cable - Copper - Buried - 28 Gauge	4200	$ -				N/A
(Supply Cost)	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 28 Gauge	4200	$ -				N/A
(Tap)	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (6/2/98)	BCPM 3.1 Sprint-FL (6/2/98)	BCPM 3.1 GTE-FL (6/2/98)	HM 5.0a Florida (6/2/98)
Structure Cost - Aerial (Poles) - Distribu	000001000005	$ 760.68				$ 41[illegible]
	12	$ -				N/A
Cable - Copper - Buried - 26 Gauge (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 26 Gauge (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 26 Gauge (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Buried - 26 Gauge (TOTAL)	4200	$ 33.16				$ 30.16
	3600	$ 30.20				$ 27.04
	3000	$ 28.19				$ 23.92
	2400	$ 25.75				$ 20.80
	2100	$ 23.60				$ 18.72
	1800	$ 20.48				$ 16.64
	1200	$ 17.20				$ 12.48
	900	$ 10.70				$ 10.40
	600	$ 7.27				$ 8.06
	400	$ 5.67				$ 6.24
	300	$ 4.35				$ 5.34
	200	$ 3.49				$ 4.42
	100	$ 2.62				$ 2.60
	50	$ 2.16				$ 1.70
	25	$ 1.85				$ 1.34
	18	$ 1.85				$ 0.78
	12	$ 1.85				$ 0.68
Cable - Copper - Underground - 24 Gau (Material)	4200	$ 46.48				N/A
	3600	$ 42.51				N/A
	3000	$ 38.33				N/A
	2400	$ 30.27				N/A
	2100	$ 27.49				N/A
	1800	$ 24.27				N/A
	1200	$ 16.73				N/A
	900	$ 13.82				N/A
	600	$ 8.84				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/15/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ 792.55				$ 41[illegible]
	300	$ 5.38				N/A
	200	$ 4.22				N/A
	100	$ 2.82				N/A
	50	$ 2.16				N/A
	25	$ 1.59				N/A
	18	$ 1.59				N/A
	12	$ 1.59				N/A
Cable - Copper - Underground - 24 Gau (Supply Cost)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 24 Gau (Tax)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 24 Gau (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 24 Gau (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 24 Gau (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default [1/16/98]	BCPM 3.1 BellSouth-FL [illegible]	BCPM 3.1 Sprint-FL [illegible]	BCPM 3.1 GTE-FL [illegible]	HM 5.0a Florida [illegible]
Structure Cost - Aerial (Poles) - Distribu	0000000000005	$ 750.00				$ 417.00
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 24 Gau (TOTAL)	4200	$ 48.48				$ 29.00
	3600	$ 42.81				$ 26.00
	3000	$ 39.23				$ 23.00
	2400	$ 29.97				$ 20.00
	2100	$ 27.08				$ 18.00
	1800	$ 24.47				$ 16.00
	1200	$ 18.72				$ 12.00
	900	$ 13.82				$ 10.00
	600	$ 9.04				$ 7.75
	400	$ 7.89				$ 6.00
	300	$ 5.25				$ 5.13
	200	$ 4.47				$ 4.25
	100	$ 2.41				$ 2.50
	50	$ 2.16				$ 1.63
	25	$ 1.89				$ 1.19
	18	$ 1.89				$ 0.75
	12	$ 1.38				$ 0.63
Cable - Copper - Underground - 28 Gau (Material)	4200	$ 28.50				N/A
	3600	$ 33.30				N/A
	3000	$ 28.31				N/A
	2400	$ 21.50				N/A
	2100	$ 19.48				N/A
	1800	$ 17.38				N/A
	1200	$ 11.85				N/A
	900	$ 9.58				N/A
	600	$ 7.53				N/A
	400	$ 6.53				N/A
	300	$ 4.42				N/A
	200	$ 3.50				N/A
	100	$ 2.61				N/A
	50	$ 1.19				N/A
	25	$ 1.00				N/A
	12	$ 1.00				N/A
	6	$ 1.00				N/A
Cable - Copper - Underground - 28 Gau (Supply Cost)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 28 Gau (Tax)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (5/3/98)
Structure Cost - Aerial (Poles) - Distribu	[illegible]	$ 780.38				$ 417.09
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 26 Gau (Placing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 26 Gau (Splicing)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 26 Gau (Engineering)	4200	$ -				N/A
	3600	$ -				N/A
	3000	$ -				N/A
	2400	$ -				N/A
	2100	$ -				N/A
	1800	$ -				N/A
	1200	$ -				N/A
	900	$ -				N/A
	600	$ -				N/A
	400	$ -				N/A
	300	$ -				N/A
	200	$ -				N/A
	100	$ -				N/A
	50	$ -				N/A
	25	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Copper - Underground - 26 Gau (TOTAL)	4200	$ 35.60				$ 29.00
	3600	$ 33.50				$ 28.00
	3000	$ 28.21				$ 23.00
	2400	$ 21.80				$ 20.00
	2100	$ 19.48				$ 18.00
	1800	$ 17.36				$ 16.00
	1200	$ 11.76				$ 12.00
	900	$ 9.66				$ 10.00
	600	$ 7.57				$ 7.75
	400	$ 6.55				$ 6.00
	300	$ 4.42				$ 5.13
	200	$ 3.60				$ 4.38
	100	$ 2.66				$ 2.60
	50	$ 1.19				$ 1.63
	25	$ 1.00				$ 1.19
	18	$ 1.00				$ 0.79
	12	$ 1.00				$ 0.63
Cable - Fiber - Aerial (Material)	288	$ 12.02				N/A
	216	N/A				N/A
	144	$ 8.85				N/A
	96	$ 7.19				N/A
	72	$ 6.75				N/A
	60	$ 6.02				N/A
	48	$ 5.27				N/A
	36	$ 4.67				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Defaults (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/99)	BCPM 3.1 Sprint-FL (8/3/99)	BCPM 3.1 GTE-FL (8/3/99)	HM 5.0a Florida (8/3/99)
Structure Cost - Aerial (Poles) - Distribu	00000-00005	$ 783.55				$ 417.00
	18	$ 3.38				N/A
	12	$ 3.04				N/A
Cable - Fiber - Aerial	288	$ -				N/A
(Supply Cost)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Aerial	288	$ -				N/A
(Tax)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Aerial	288	$ -				N/A
(Placing)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Aerial	288	$ -				N/A
(Splicing)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Aerial	288	$ -				N/A
(Engineering)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Aerial	288	$ 12.02				N/A
(TOTAL)	216	N/A				$ 13.10
	144	$ 8.85				$ 9.50
	96	$ 7.19				$ 7.10
	72	$ 6.75				$ 5.90
	60	$ 6.03				$ 5.30
	48	$ 5.27				$ 4.70
	36	$ 4.67				$ 4.10
	24	$ 3.46				$ 3.50
	18	$ 3.38				$ 3.30
	12	$ 3.04				$ 2.90
Cable - Fiber - Buried	288	$ 12.79				N/A
(Material)	216	N/A				$ 13.30
	144	$ 8.58				$ 9.70
	96	$ 7.43				$ 7.30
	72	$ 6.00				$ 6.10
	60	$ 5.17				$ 5.80
	48	$ 4.80				$ 4.90
	36	$ 4.01				$ 4.30
	24	$ 3.63				$ 3.70
	18	$ 3.25				$ 3.40

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	000001-000005	$ 792.98				$ 413.60
Cable - Fiber - Buried	288	$ -				N/A
(Supply Cost)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Buried	288	$ -				N/A
(Tax)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Buried	288	$ -				N/A
(Placing)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Buried	288	$ -				N/A
(Splicing)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Buried	288	$ -				N/A
(Engineering)	216	N/A				N/A
	144	$ -				N/A
	96	$ -				N/A
	72	$ -				N/A
	60	$ -				N/A
	48	$ -				N/A
	36	$ -				N/A
	24	$ -				N/A
	18	$ -				N/A
	12	$ -				N/A
Cable - Fiber - Buried	288	$ 12.79				N/A
(TOTAL)	216	N/A				$ 13.30
	144	$ 8.96				$ 9.70
	96	$ 7.43				$ 7.30
	72	$ 6.00				$ 6.10
	60	$ 5.17				$ 5.60
	48	$ 4.86				$ 4.80
	36	$ 4.01				$ 4.30
	24	$ 3.83				$ 3.70
	18	$ 3.28				$ 3.40
	12	$ 2.75				$ 3.10
Cable - Fiber - Underground	288	$ 11.80				N/A
	216	N/A				$ 13.10
	144	$ 10.30				$ 9.80
	96	$ 7.20				$ 7.10
	72	$ 6.35				$ 5.80
	60	$ 5.60				$ 5.50
	48	$ 4.75				$ 4.70
	36	$ 4.15				$ 4.10
	24	$ 3.75				$ 3.60
	18	$ 3.45				$ 3.30
	12	$ 3.10				$ 2.80
Service Area Interface (SAI) - Outdoor	[illegible]	$ 407.80				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/18/00)	BCPM 3.1 BellSouth-FL (8/3/00)	BCPM 3.1 Sprint-FL (8/3/00)	BCPM 3.1 GTE-FL (8/3/00)	HM 5.0a Florida (5/2/00)
[illegible] Cost - Aerial (Poles) - Distribu	0.00000-0.00005	$ [illegible]07.00				$ 41[illegible]
	100	$ 1,265.00				N/A
	200	$ 2,130.00				N/A
	300	$ 2,366.00				N/A
	400	$ 2,506.00				N/A
	600	$ 6,509.00				N/A
	800	$ 6,848.00				N/A
	1200	$ 7,556.00				N/A
	1800	$ 8,717.00				N/A
	2100	$ 11,460.00				N/A
	2400	$ 11,460.00				N/A
	3000	$ 11,713.00				N/A
	3600	$ 14,055.60				N/A
	4200	$ 16,366.20				N/A
	5400	N/A				N/A
	7200	N/A				N/A
Service Area Interface (SAI) - Outdoor (Supply Cost)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Outdoor (Tax)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Outdoor (Placing)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Outdoor (Splicing)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default [1/18/00]	BCPM 3.1 BellSouth-FL [8/2/00]	BCPM 3.1 Sprint-FL [8/2/00]	BCPM 3.1 GTE-FL [8/2/00]	HM 5.2a Florida [8/2/00]
Structure Cost - Aerial (Poles) - Distrib.	[illegible]	$ 760.88				$ 41[illegible]
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Outdoor (Engineering)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Outdoor (TOTAL)	25					N/A
	50					$ 250.00
	100	$ 1,465.00				$ 350.00
	200	$ 2,120.00				$ 600.00
	300	$ 2,305.00				N/A
	400	$ 2,580.00				$ 1,000.00
	600	$ 5,509.00				$ 1,400.00
	800	$ 5,848.00				$ 1,800.00
	1200	$ 7,566.00				$ 2,400.00
	1800	$ 8,717.00				$ 3,400.00
	2100	$ 11,490.00				N/A
	2400	$ 11,490.00				$ 4,300.00
	3000	$ 11,713.00				N/A
	3600	$ 14,058.80				$ 6,000.00
	4200	$ 16,386.30				N/A
	5400					$ 8,200.00
	7200					$ 10,000.00
Service Area Interface (SAI) - Indoor (Material) (Includes cost of protection)	25	$ 340.00				N/A
	50	$ 509.43				N/A
	100	$ 611.80				N/A
	200	$ 1,283.06				N/A
	300	$ 1,[illegible].71				N/A
	400	$ 2,354.80				N/A
	600	$ 2,757.00				N/A
	800	$ 4,901.38				N/A
	1200	$ 6,687.08				N/A
	1800	$ 8,898.30				N/A
	2100	$ 11,692.80				N/A
	2400	$ 13,665.71				N/A
	3000	$ 15,988.77				N/A
	3600	$ 19,625.42				N/A
	4200	$ 23,367.42				N/A
	5400	$ -				N/A
	7200	$ -				N/A
Service Area Interface (SAI) - Indoor (Supply Cost)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	800	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Indoor (Tax)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/15/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HAI 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Density	[illegible]	$ 780.88				$ 417.00
	600	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Indoor (Placing)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	900	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Indoor (Splicing)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	900	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Indoor (Engineering)	25					N/A
	50					N/A
	100	$ -				N/A
	200	$ -				N/A
	300	$ -				N/A
	400	$ -				N/A
	600	$ -				N/A
	900	$ -				N/A
	1200	$ -				N/A
	1800	$ -				N/A
	2100	$ -				N/A
	2400	$ -				N/A
	3000	$ -				N/A
	3600	$ -				N/A
	4200	$ -				N/A
	5400					N/A
	7200					N/A
Service Area Interface (SAI) - Indoor (TOTAL)	25					N/A
	50					$ 88.00
	100	$ 811.80				$ 148.00
	200	$ 1,283.58				$ 296.00
	300	$ 1,606.71				N/A
	400	$ 2,224.73				$ 592.00
	600	$ 3,707.00				$ 888.00
	900	$ 4,801.56				$ 1,332.00
	1200	$ 6,447.46				$ 1,776.00
	1800	$ 8,493.56				$ 2,664.00
	2100	$ 11,096.80				N/A
	2400	$ 13,850.71				$ 3,552.00
	3000	$ 16,889.77				N/A
	3600	$ 19,605.42				$ 4,928.00
	4200	$ 22,382.42				N/A
	5400					$ 7,392.00
	7200					$ 9,856.00

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/10/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
[illegible]	[illegible]	$ [illegible]				$ 32.00
(Material)	6	$ 68.50				N/A
	12	$ 131.61				N/A
	25	$ 216.00				$ 128.00
Drop Terminal Cost - Aerial	per Line					N/A
(Supply Cost)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Aerial	per Line					N/A
(Tax)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Aerial	per Line					N/A
(Placing)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Aerial	per Line					N/A
(Splicing)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Aerial	per Line					N/A
(Engineering)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Aerial	per Line					$ 32.00
(TOTAL)	6	$ 68.50				N/A
	12	$ 131.61				N/A
		$ 216.00				$ 128.00
Drop Terminal Cost - Buried	per Line					N/A
(Material)	6	$ 157.05				N/A
	12	$ 440.87				N/A
	25	$ 451.00				N/A
Drop Terminal Cost - Buried	per Line					N/A
(Supply Cost)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Buried	per Line					N/A
(Tax)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Buried	per Line					N/A
(Placing)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Buried	per Line					N/A
(Splicing)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Buried	per Line					N/A
(Engineering)	6	$ -				N/A
	12	$ -				N/A
	25	$ -				N/A
Drop Terminal Cost - Buried	per Line					$ 47.50
(TOTAL)	6	$ 157.05				N/A
	12	$ 440.87				N/A
	25	$ 451.00				$ 170.00
Drop Cost - Aerial per Foot (2 Pair)	00000 - 00005	$ 0.77				$ 0.10
(Material)	00005 - 00100	$ 0.77				$ 0.10
	00100 - 00200	$ 0.77				$ 0.10
	00200 - 00650	$ 0.77				$ 0.10
	00650 - 00850	$ 0.77				$ 0.10
	00850 - 02550	$ 0.77				$ 0.10
	02550 - 05000	$ 0.77				$ 0.10
	05000 - 10000	$ 0.77				$ 0.10
	10000 +	$ 0.77				$ 0.10
Drop Cost - Aerial per Foot (2 Pair)	00000 - 00005	$ -				N/A
(Supply Cost)	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Aerial per Foot (2 Pair)	00000 - 00005	$ -				N/A
(Tax)	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Density	00000 - 00650	$ 790.88				$ 41[illegible]
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Aerial per Foot (2 Pair) (Placing)	00000 - 00005	$ -				$ 0.16
	00005 - 00100	$ -				$ 0.16
	00100 - 00200	$ -				$ 0.16
	00200 - 00650	$ -				$ 0.16
	00650 - 00850	$ -				$ 0.33
	00850 - 02550	$ -				$ 0.33
	02550 - 05000	$ -				$ 0.33
	05000 - 10000	$ -				$ 0.33
	10000 +	$ -				$ 0.33
Drop Cost - Aerial per Foot (2 Pair) (Splicing)	00000 - 00005	$ -				N/A
	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Aerial per Foot (2 Pair) (Engineering)	00000 - 00005	$ -				N/A
	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Aerial per Foot (2 Pair) (TOTAL)	00000 - 00005	$ 0.77				$ 0.28
	00005 - 00100	$ 0.77				$ 0.28
	00100 - 00200	$ 0.77				$ 0.28
	00200 - 00650	$ 0.77				$ 0.28
	00650 - 00850	$ 0.77				$ 0.33
	00850 - 02550	$ 0.77				$ 0.33
	02550 - 05000	$ 0.77				$ 0.33
	05000 - 10000	$ 0.77				$ 0.33
	10000 +	$ 0.77				$ 0.33
Drop Cost - Buried per Foot (3 / 6 Pair) (Material)	00000 - 00005	$ 0.77				$ 0.14
	00005 - 00100	$ 0.77				$ 0.14
	00100 - 00200	$ 0.77				$ 0.14
	00200 - 00650	$ 0.77				$ 0.14
	00650 - 00850	$ 0.77				$ 0.14
	00850 - 02550	$ 0.77				$ 0.14
	02550 - 05000	$ 0.77				$ 0.14
	05000 - 10000	$ 0.77				$ 0.14
	10000 +	$ 0.77				$ 0.14
Drop Cost - Buried per Foot (3 / 6 Pair) (Supply Cost)	00000 - 00005	$ -				N/A
	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Buried per Foot (3 / 6 Pair) (Tax)	00000 - 00005	$ -				N/A
	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Buried per Foot (3 / 6 Pair) (Placing)	00000 - 00005	$ -				$ 0.60
	00005 - 00100	$ -				$ 0.60
	00100 - 00200	$ -				$ 0.60
	00200 - 00650	$ -				$ 0.60
	00650 - 00850	$ -				$ 0.60
	00850 - 02550	$ -				$ 0.60
	02550 - 05000	$ -				$ 0.75
	05000 - 10000	$ -				$ 1.50
	10000 +	$ -				$ 5.00
Drop Cost - Buried per Foot (3 / 6 Pair)	00000 - 00005	$ -				N/A

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/16/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Stabilizing Cost - Aerial (Poles) - Distribu	00005 - 00100	$ 760.28				$ 41.66
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Buried per Foot (3 / 6 Pair)	00000 - 00005	$ -				N/A
(Engineering)	00005 - 00100	$ -				N/A
	00100 - 00200	$ -				N/A
	00200 - 00650	$ -				N/A
	00650 - 00850	$ -				N/A
	00850 - 02550	$ -				N/A
	02550 - 05000	$ -				N/A
	05000 - 10000	$ -				N/A
	10000 +	$ -				N/A
Drop Cost - Buried per Foot (3 / 6 Pair)	00000 - 00005	$ 0.77				$ 0.74
(TOTAL)	00005 - 00100	$ 0.77				$ 0.74
	00100 - 00200	$ 0.77				$ 0.74
	00200 - 00650	$ 0.77				$ 0.74
	00650 - 00850	$ 0.77				$ 0.74
	00850 - 02550	$ 0.77				$ 0.74
	02550 - 05000	$ 0.77				$ 0.88
	05000 - 10000	$ 0.77				$ 1.64
	10000 +	$ 0.77				$ 5.14
Network Interface Device (NID)	Residential	$ 30.73				$ 10.00
(Material	Business	$ 30.73				$ 25.00
Protector	Residential	$ -				$ 4.00
(Material	Business	$ -				$ 4.00
Interface	Residential	$ -				N/A
(Material	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				N/A
(Supply Cost)	Business	$ -				N/A
Protector	Residential	$ -				N/A
(Supply Cost)	Business	$ -				N/A
Interface	Residential	$ -				N/A
(Supply Cost)	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				N/A
(Tax	Business	$ -				N/A
Protector	Residential	$ -				N/A
(Tax	Business	$ -				N/A
Interface	Residential	$ -				N/A
(Tax	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				$ 15.00
(Placing)	Business	$ -				$ 15.00
Protector	Residential	$ -				N/A
(Placing)	Business	$ -				N/A
Interface	Residential	$ -				N/A
(Placing)	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				N/A
(Splicing)	Business	$ -				N/A
Protector	Residential	$ -				N/A
(Splicing)	Business	$ -				N/A
Interface	Residential	$ -				N/A
(Splicing)	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				N/A
(Engineering)	Business	$ -				N/A
Protector	Residential	$ -				N/A
(Engineering)	Business	$ -				N/A
Interface	Residential	$ -				N/A
(Engineering)	Business	$ -				N/A
Network Interface Device (NID)	Residential	$ -				$ 25.00
(Total)	Business	$ -				$ 40.00
Protector	Residential	$ -				$ 4.00
(Total)	Business	$ -				$ 4.00
Interface	Residential	$ -				$ 15.00
(Total)	Business	$ -				$ 15.00
NID, Protector & Interface	Residential	$ -				$ 29.00
(Grand Total) - Installed	Business	$ -				$ 44.00
Digital Loop Carrier (DLC) Fixed Cost	0	$ 16,120.17				$ 18,300.00
	25	$ [illegible]				$ 18,300.00
	49	$ 23,798.79				$ 18,300.00
	97	$ [illegible]				$ 27,700.00
	121	$ 37,681.13				$ 27,700.00
	193	$ 37,873.72				$ 27,100.00

INPUT VALUE DESCRIPTION	Density Zone	BCPM 3.1 BellSouth - Default (1/14/98)	BCPM 3.1 BellSouth-FL (8/3/98)	BCPM 3.1 Sprint-FL (8/3/98)	BCPM 3.1 GTE-FL (8/3/98)	HM 5.0a Florida (8/3/98)
Structure Cost - Aerial (Poles) - Distribu	00000 - 00005	$ 64,[illegible]				$ 37,4[illegible].00
	385	$ 68,377.00				$ 70,000.00
	673	$ 80,8[illegible].00				$ 85,500.00
	1848	$ 165,236.00				########
Digital Loop Carrier (DLC) per Line Cost	VG: 0 - 192	$ 84.00				$ 100.00
	VG: 192 - 2016	$ 66.11				$ 77.80
	ISDN	$ -				N/A
	DS1	$ -				N/A
	DDS	$ -				N/A
	4W	$ -				N/A
	EBS	$ -				N/A
	COIN High Dens.	$ -				$ 125.00
	ADSL	$ -				N/A
	HDSL	$ -				N/A
Fill Factors - Electronics		65.00%				80.00%
Maximum Copper Distribution Cable Length		17,000				18,000
Fiber / Copper Breakpoint		12,000				9,000
Pairs per Housing Unit						N/A
Maximum Fiber Feeder		288				216
Maximum Copper Distribution Size		[illegible]				2,400
Plant Mix - Distribution - % Aerial	00000 - 00005	40.00%				20.00%
	00005 - 00100	37.00%				25.00%
	00100 - 00200	[illegible]				25.00%
	00200 - 00650	[illegible]				30.00%
	00650 - 00850	20.00%				30.00%
	00850 - 02550	10.00%				30.00%
	02550 - 05000	5.00%				30.00%
	05000 - 10000	5.00%				60.00%
	10000 +	0.00%				85.00%
Plant Mix - Distribution - % Buried	00000 - 00005	55.00%				75.00%
	00005 - 00100	61.00%				75.00%
	00100 - 00200	57.00%				75.00%
	00200 - 00650	52.00%				70.00%
	00650 - 00850	65.00%				70.00%
	00850 - 02550	65.00%				70.00%
	02550 - 05000	55.00%				65.00%
	05000 - 10000	35.00%				35.00%
	10000 +	10.00%				5.00%
Plant Mix - Distribution - % Underground	00000 - 00005	5.00%				0.00%
	00005 - 00100	2.00%				0.00%
	00100 - 00200	5.00%				0.00%
	00200 - 00650	6.00%				0.00%
	00650 - 00850	15.00%				0.00%
	00850 - 02550	25.00%				0.00%
	02550 - 05000	40.00%				5.00%
	05000 - 10000	60.00%				5.00%
	10000 +	90.00%				10.00%
Plant Mix - Copper Feeder - % Aerial	00000 - 00005	40.00%				50.00%
	00005 - 00100	40.00%				50.00%
	00100 - 00200	40.00%				50.00%
	00200 - 00650	40.00%				40.00%
	00650 - 00850	25.00%				30.00%
	00850 - 02550	10.00%				20.00%
	02550 - 05000	0.00%				15.00%
	05000 - 10000	0.00%				10.00%
	10000 +	0.00%				5.00%
Plant Mix - Copper Feeder - % Buried	00000 - 00005	50.00%				45.00%
	00005 - 00100	45.00%				45.00%
	00100 - 00200	40.00%				45.00%
	00200 - 00650	35.00%				40.00%
	00650 - 00850	30.00%				30.00%
	00850 - 02550	25.00%				30.00%
	02550 - 05000	20.00%				10.00%
	05000 - 10000	10.00%				5.00%
	10000 +	5.00%				0.00%
Plant Mix - Copper Feeder - % Undergro	00000 - 00005	10.00%				5.00%
	00005 - 00100	15.00%				5.00%
	00100 - 00200	20.00%				5.00%
	00200 - 00650	25.00%				20.00%
	00650 - 00850	45.00%				40.00%
	00850 - 02550	65.00%				60.00%
	02550 - 05000	80.00%				75.00%
	05000 - 10000	90.00%				85.00%
	10000 +	95.00%				90.00%
Plant Mix - Fiber Feeder - % Aerial	00000 - 00005	40.00%				35.00%
	00005 - 00100	40.00%				35.00%
	00100 - 00200	40.00%				35.00%
	00200 - 00650	40.00%				30.00%

INPUT VALUE DESCRIPTION	Density Zone	SCPM 5.1 BellSouth - Default (1/16/98)	SCPM 5.1 BellSouth-FL (6/3/98)	SCPM 5.1 Sprint-FL (6/3/98)	SCPM 5.1 GTE-FL (6/3/98)	HM 5.0a Florida (6/3/98)
Structure Cost - Aerial (Poles) - Distribu	00000 - 00850	$ [illegible]				$ 60.00%
	00850 - 02550	10.00%				20.00%
	02550 - 05000	0.00%				15.00%
	05000 - 10000	0.00%				10.00%
	10000 +	0.00%				5.00%
Plant Mix - Fiber Feeder - % Buried	00000 - 00005	50.00%				60.00%
	00005 - 00100	45.00%				60.00%
	00100 - 00200	40.00%				60.00%
	00200 - 00650	35.00%				60.00%
	00650 - 00850	30.00%				30.00%
	00850 - 02550	25.00%				20.00%
	02550 - 05000	20.00%				10.00%
	05000 - 10000	10.00%				5.00%
	10000 +	5.00%				5.00%
Plant Mix - Fiber Feeder - % Undergroun	00000 - 00005	10.00%				5.00%
	00005 - 00100	[illegible]				5.00%
	00100 - 00200	[illegible]				5.00%
	00200 - 00650	25.00%				10.00%
	00650 - 00850	45.00%				40.00%
	00850 - 02550	55.00%				60.00%
	02550 - 05000	90.00%				75.00%
	05000 - 10000	90.00%				85.00%
	10000 +	95.00%				90.00%
Fill Factors - Distribution	00000 - 00005	100.00%				50.00%
	00005 - 00100	100.00%				55.00%
	00100 - 00200	100.00%				55.00%
	00200 - 00650	[illegible]				60.00%
	00650 - 00850	100.00%				65.00%
	00850 - 02550	100.00%				70.00%
	02550 - 05000	100.00%				75.00%
	05000 - 10000	100.00%				75.00%
	10000 +	100.00%				75.00%
Fill Factors - Feeder	00000 - 00005	75.00%				65.00%
	00005 - 00100	80.00%				75.00%
	00100 - 00200	80.00%				80.00%
	00200 - 00650	85.00%				80.00%
	00650 - 00850	85.00%				80.00%
	00850 - 02550	85.00%				80.00%
	02550 - 05000	85.00%				80.00%
	05000 - 10000	85.00%				80.00%
	10000 +	85.00%				80.00%

DOCKET # 980696-TP
J.W. WELLS Exhibit # ______(JWW-5)

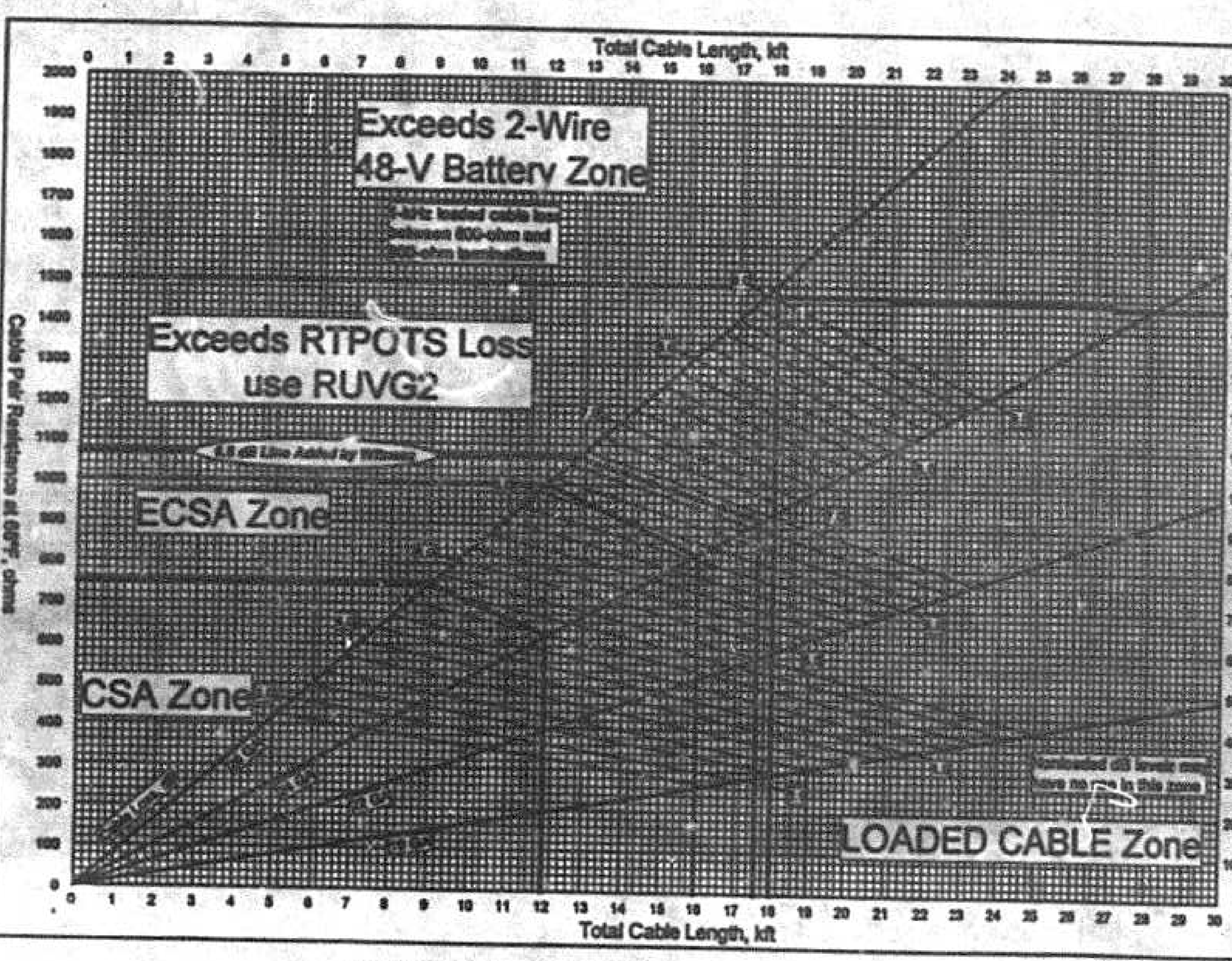
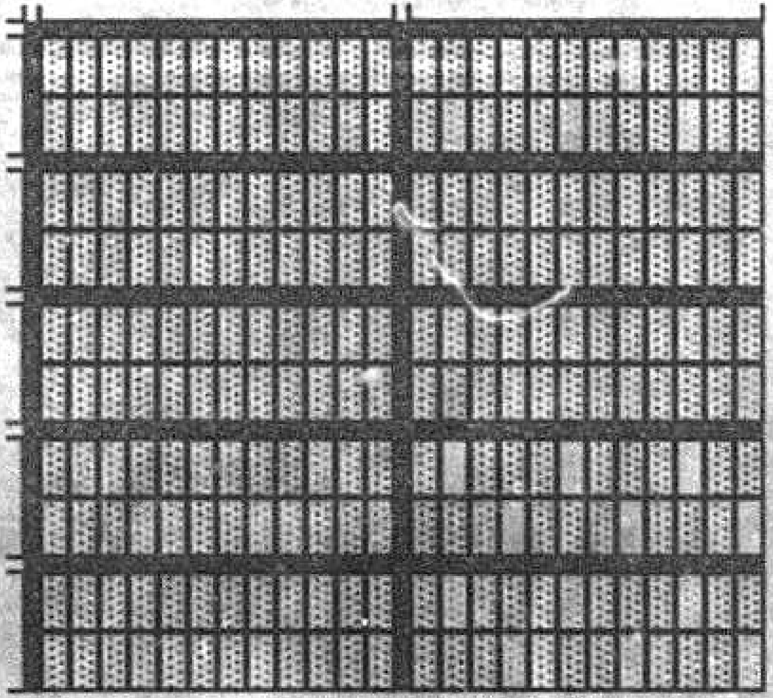


Chart III. OSP Cable Pair Resistance vs. Length, in kilofeet, for CSA & ECSA Zones, with 1-kHz Nonloaded Cable Loss between 600-ohm Terminations

Transcribed from DSC Communications Practices & shading enhanced for clarity

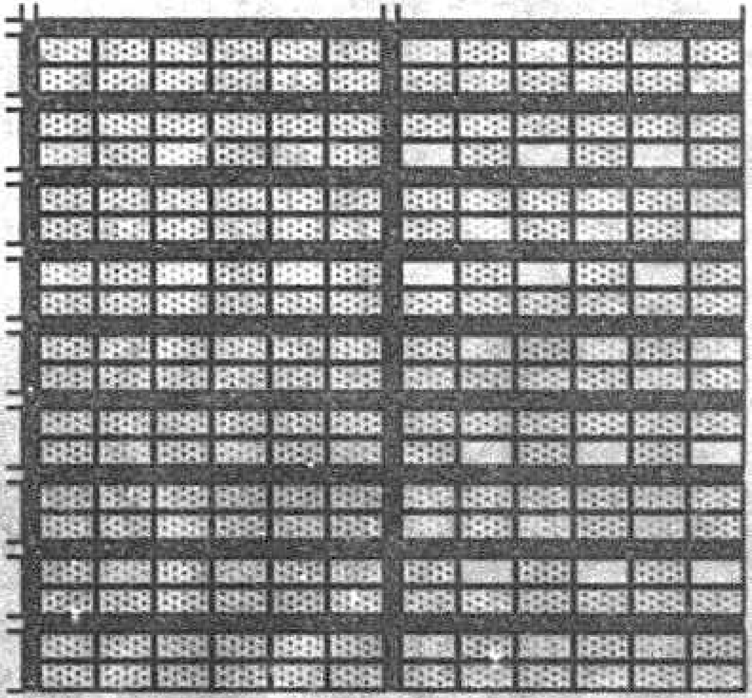
Docket No. 980696-TP
J. W. Wells Exhibit No. ___ (JWW-6)
Efficiency of Rectangular Lots
Page 1 of 3

RECTANGULAR LOTS



7ROADS
14 LENGTHS OF GRASS STRIP
14 LENGTHS OF SIDEWALK

INEFFICIENT RECTANGULAR LOTS

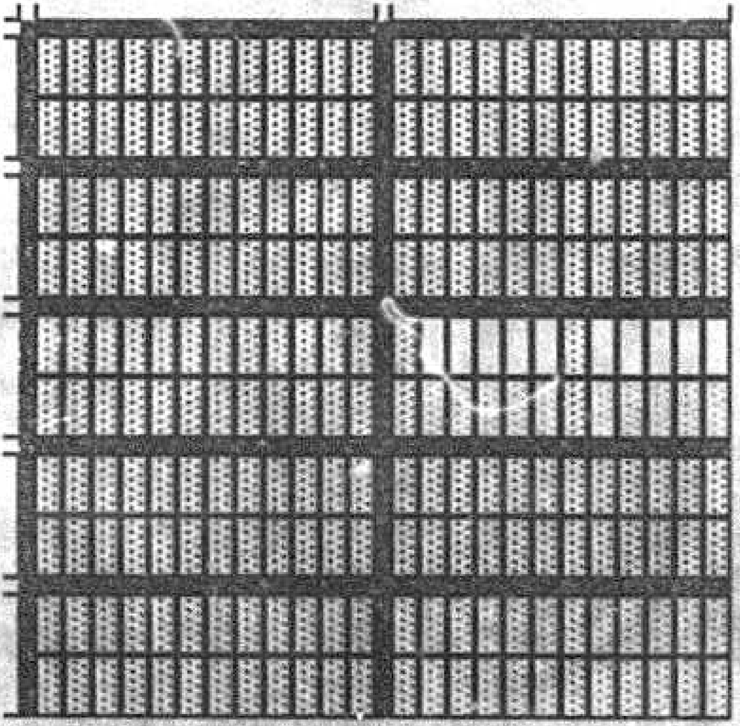


11 ROADS
22 LENGTHS OF GRASS STRIP
22 LENGTHS OF SIDEWALK

NOTE: ALL ROAD PAVING AT EXPENSE OF DEVELOPER
ALL GRASS STRIPS AT EXPENSE OF DEVELOPER
ALL SIDEWALKS AT EXPENSE OF DEVELOPER
USEABLE LOT SIZE IS REDUCED BY AMOUNT OF ROAD, GRASS STRIP & SIDEWALK AREA

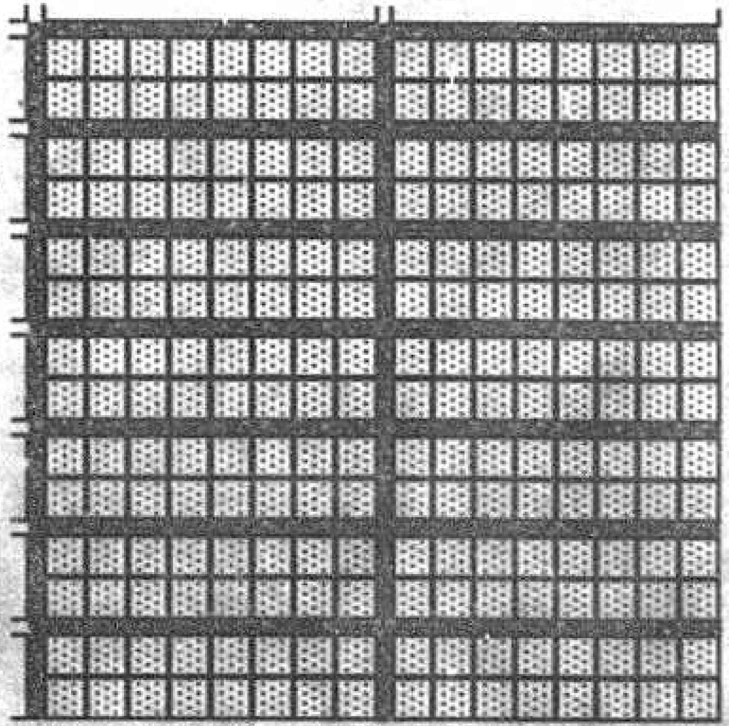
Docket No. 980696-TP
J. W. Wells Exhibit No. ___ (JWW-6)
Efficiency of Rectangular Lots
Page 2 of 3

RECTANGULAR LOTS



7 ROADS
12 LENGTHS OF GRASS STRIP
12 LENGTHS OF SIDEWALK

SQUARE LOTS



9 ROADS
18 LENGTHS OF GRASS STRIP
18 LENGTHS OF SIDEWALK

NOTE: ALL ROAD PAVING AT EXPENSE OF DEVELOPER
ALL GRASS STRIPS AT EXPENSE OF DEVELOPER
ALL SIDEWALKS AT EXPENSE OF DEVELOPER
USEABLE LOT SIZE IS REDUCED BY AMOUNT OF ROAD, GRASS STRIP & SIDEWALK AREA

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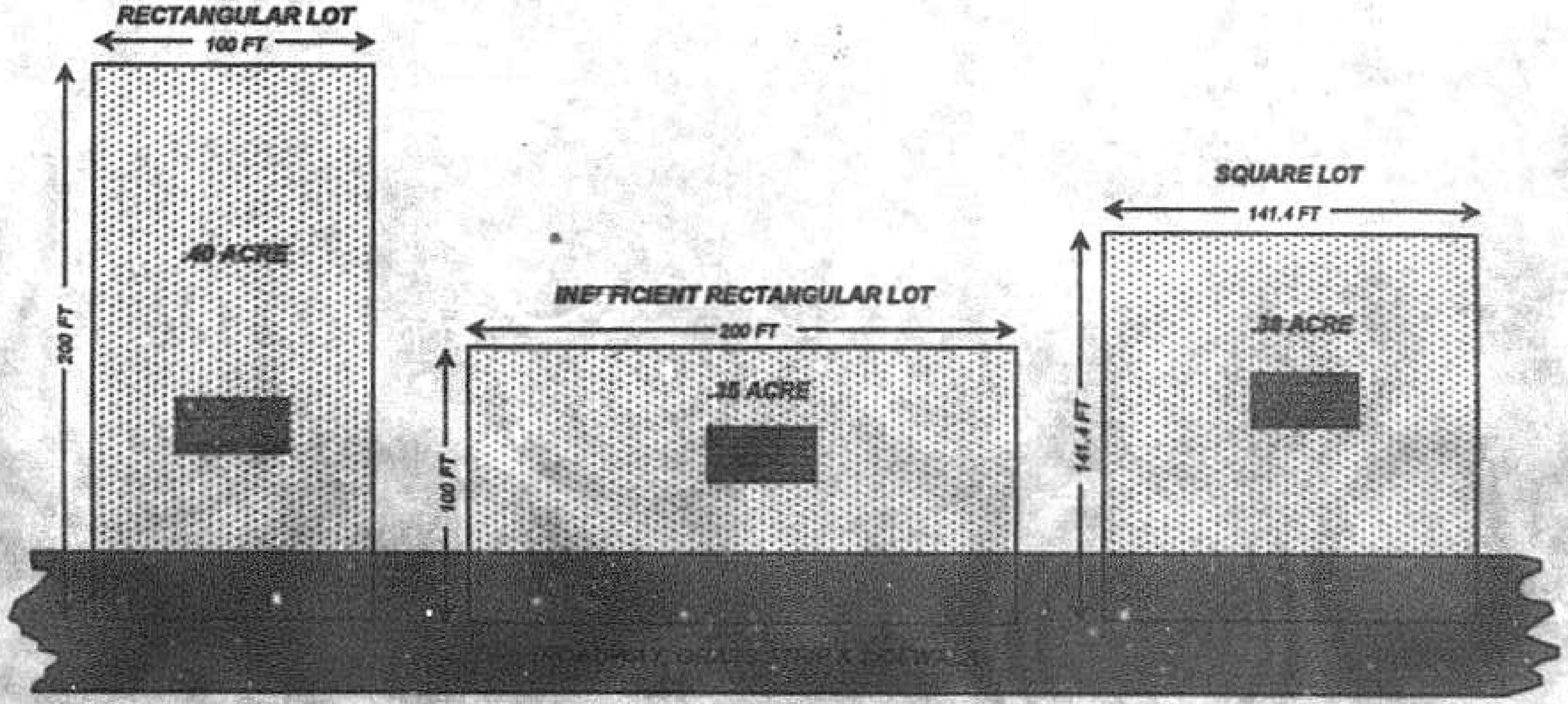
J. W. Wells Exhibit No. ___ (JWW-6)
Efficiency of Rectangular Lots
Page 3 of 3

EXAMPLE

20,000 SQ. FT. LAND



CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the foregoing was furnished to the following parties by U.S. mail or Hand Delivery (*) this 2nd day of September, 1998.

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