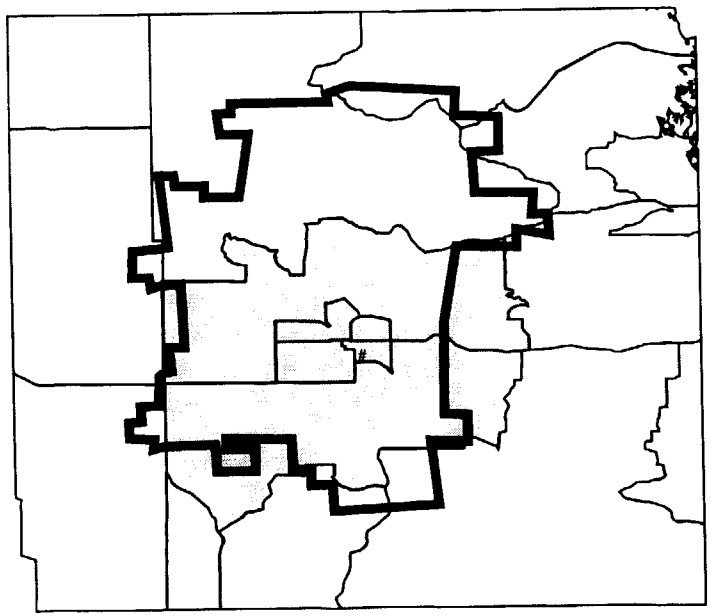
Appendix A Exhibit 4

BCPM Enhanced Customer Location

■ Improved Wire Centers

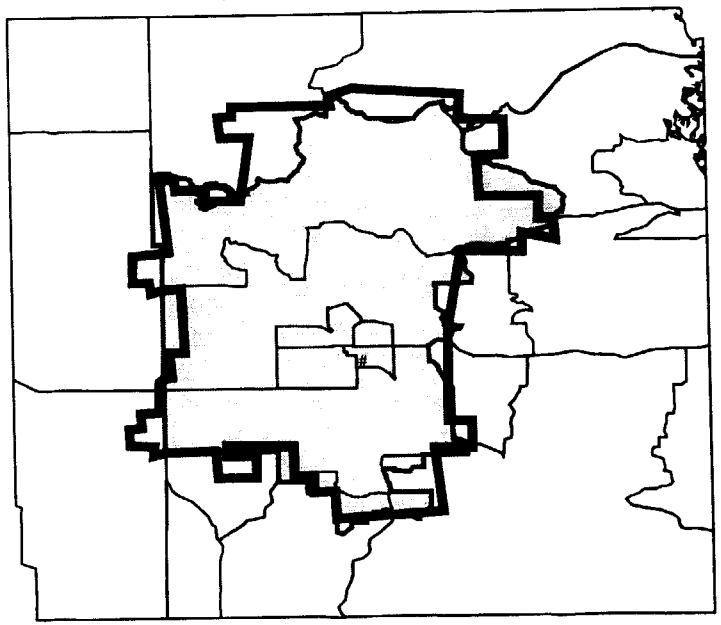
Actual Wire Center Boundary

Representative Hatfield / BCPM1.1 Boundary



Actual Wire Center Boundary

BLR Boundary used in BCPM 3.0



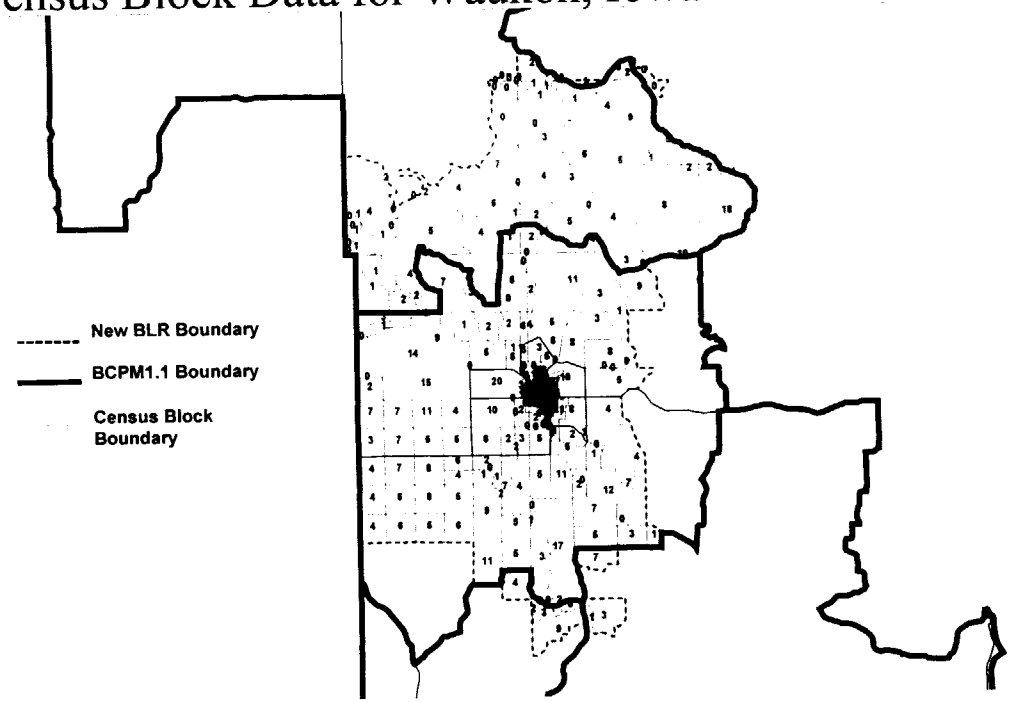
Developed by: Sprint, US WEST, BELLSOUTH, INDETEC International

Any representation of data is for illustrative purposes only.

Appendix A Exhibit 5

BCPM Enhanced Customer Location

- Finer Level of Input Data
  - Census Block Data for Waukon, Iowa



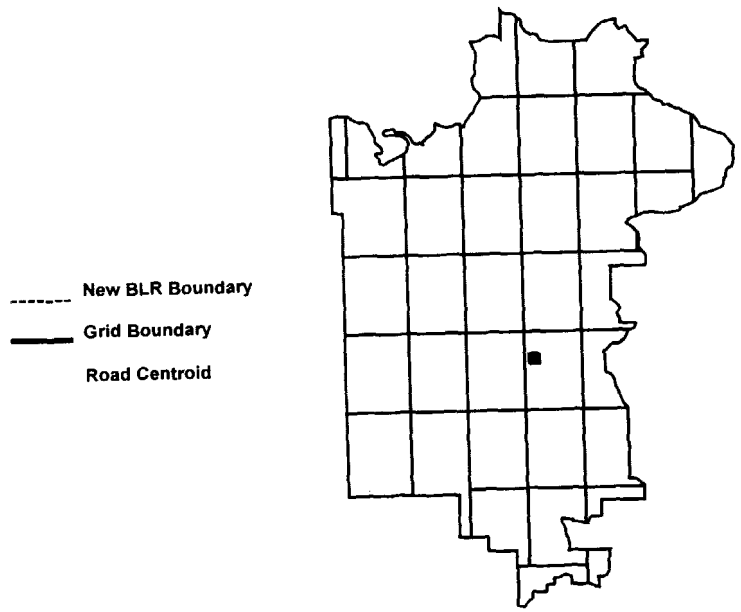
Developed by: Sprint. U S WEST BELLSOUTH INDETEC International

Any representation of data is for illustrative purposes only.

Appendix A Exhibit 6

BCPM Enhanced Customer Location

- Variable Size Grids for Waukon, Iowa



Developed by: Sprint. USWEST BELLSOUTH INDETEC International

Any representation of data is for illustrative purposes only.

APPENDIX B

BCPM 3.1 DATA SPECIFICATIONS

The following summarizes the data to be provided for the BCPM 3.1 model. This data is provided as a set of comma-separated variable ASCII text files. For each of 50 states (in Alaska, for the Anchorage area only), the District of Columbia, and Puerto Rico, the following 4 files are produced:

- Base Grid File: Fundamental file, containing attributes and measures for each grid
- Wire Center Terrain File: Auxiliary file, containing terrain attributes of the service area
- Wire Center Information File: Cross reference for wire center as a whole
- CBG-to-Grid Equivalence: Cross reference for CBGs in a service area

Also, a single Telephone Companies' File relates each operating company to its parent company.

Each comma-separated variable file presents character fields without surrounding quotation marks. Spaces freely appear in such character fields, but commas and ampersands never do. When either a comma or ampersand appears in the original data, it is be converted to a space in that field in the output file.

Each comma-separated variable file includes, as its first record, the *Field Names* for the file. Those names appear in this paper, each in parentheses after the descriptive name of the field. The *File Names* also appear, each in parentheses after the file's title line in this paper. Each *ss* is the state abbreviation.

Grids and MicroGrids

The fundamental unit of measurement is the *grid cell*, measuring $1/25^{th}$ of a degree of latitude by $1/25^{th}$ of a degree of longitude, somewhat less than 15,000 feet on each side. The fundamental unit in building these grids is a *microgrid cell*, $1/8^{th}$ of a grid cell on each side (therefore $1/200^{th}$ of a degree on each side), 64 of these forming a full grid cell.

However, locations and clusterings of subscribers sometimes cause the reporting of information for an *effective grid cell* that is some part of a standard grid cell, or even parts of a standard grid cell augmented by a small part of another. Reporting is done per effective grid cell.

Base Grid File (*ssOUT.CSV*)

Each of the 50 state files contains one record per *effective grid cell*. The records appear in the following order, from major to minor, all fields in ascending sequence:

Wire Center CLLI Code
FDI Code

Each record of a state's Base Grid file contains the following fields, in the order presented here (names in parentheses are the column names in the file):

- **Wire Center Switch CLLI (*SWCLLI*)**: The 11-character code identifying the switch serving this grid cell. The switch and its location are taken from the LERG. The wire center service area is taken from the BLR *Wire Center Premium Package* data files. If more than one switch location serves a wire center service area, each microgrid cell is assigned to the *nearest* switch.

- **Central Latitude of Effective Grid Cell (*CentLat*)**: Latitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Central Longitude of Effective Grid Cell (*CentLng*)**: Longitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Area of the Effective Grid Cell (*AreaSqMi*)**: The area, presented as square miles with up to 6 fractional digits.

- **Depth To Bedrock in Inches (*RockDepL*)**: Minimum depth to bedrock for the effective grid cell, expressed in inches with up to 2 fractional digits. Terrain information is taken directly from *STATSGO* data. If an effective grid cell spans more than one terrain area as defined by STATSGO, the attributes of the areas are proportionally weighted ... This is done for the next five measures as well.

- **Rock Hardness (*RockHard*)**: Predominant rock hardness for the effective grid cell ... HARD or SOFT, or blank to indicate neither.

- **Surface Soil Texture (*SurfTex*)**: Predominant surface soil texture in the effective grid cell, an abbreviation of up to 7 characters.

- **Water Table Depth in Feet (*WTDepL*)**: Minimum water table depth for the effective grid cell, expressed in feet with up to 2 fractional digits.

- **Minimum Soil Slope (*SlopeL*)**: Minimum soil slope for the effective grid cell, expressed with 2 fractional digits.

- **Maximum Soil Slope (*SlopeH*)**: Maximum soil slope for the effective grid cell, expressed with 2 fractional digits

- **Number of Business Lines (*BusLines*)**: Count of Business Lines in the effective grid cell. This number is allocated from PNR Business Lines/Firms data, provided principally at the Census Block Level. Where PNR's data was *not* assigned to the Census Block level (about 15% of those records), we have first *allocated* it to the Census Block level, allocating the higher-level lines and firms to Census Blocks that already have business lines, on a basis proportional to the number each constituent Census block already has. This number, for the

effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell , in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

- **Number of Business Firms (*BusFirms*)**: Count of Business *Firms* from the same source, allocated and apportioned as above.

- **Number of Households (*HHlds*)**: Count of Households in the effective grid cell. The source for this number is the Census Bureau's 1990 figures per Census Block; these numbers are then modified for each Census Block of a county by the Census Bureau's 1995 estimate of population change in that county. This number, for the effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell, in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

- **Number of Housing Units (*HUnits*)**: Count of Housing Units in the effective grid cell. The source for this number is the Census Bureau's 1990 figures per Census Block; these numbers are then modified for each Census Block of a county by the Census Bureau's 1995 estimate of population change in that county. This number, for the effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell , in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

The following ten fields are subdivision of the above Number of Housing Units, indicating the number of housing units in each of several structure sizes and types; with some tolerance for rounding, these 10 numbers – including their fractional digits – should sum to the Number of Housing Units above. The 10 fields are:

- **Number of Housing Units in Single-Unit Detached Structures (*HU1Det*)**: Units in the traditional standalone house.
- **Number of Housing Units in Single-Unit Attached Structures (*HU1Att*)**: Units that are, for example, garage apartments.
- **Number of Housing Units in Two-Unit Structures (*HU2*)**: Units in a duplex.
- **Number of Housing Units in 3- to 4-Unit Structures (*HU3to4*)**: Units in typical smallest apartment buildings or triplex or quadruplex.
- **Number of Housing Units in 5- to 9-Unit Structures (*HU5to9*)**: Units in typical modest sized apartment buildings.
- **Number of Housing Units in 10- to 19-Unit Structures (*HU10to19*)**: Units in larger apartment buildings.
- **Number of Housing Units in 20- to 49-Unit Structures (*HU20to49*)**: Units in large apartment buildings.
- **Number of Housing Units in 50-or-Greater-Unit Structures (*HU50Plus*)**: Units in very large apartment buildings, typically high-rise.
- **Number of Housing Units that are Mobile Homes (*HUMbl*)**: Mobile home units.
- **Number of Housing Units that are None of the Above (*HUOther*)**: For example, houseboats.

The record continues with the remaining fields:

- **Latitude of Road Centroid (*RdCentLat*)**: For that center point of road segments of this effective grid cell, this is the latitude (the "Y" value).

- **Longitude of Road Centroid (*RdCentLng*)**: For each effective grid cell, a center point of road segments is calculated. This is the longitude (the "X" value) of that center point.

- **Distance from Switch (*SWDist*)**: Straight-line distance, in feet, of the road centroid of this effective grid cell from the switch that serves this effective grid cell.

- **FDI Code (*FDICode*)**: This 7-character code indicates the path and sequence of the feeder, subfeeder, and any part 2 subfeeder used to reach the road centroid of this effective grid cell. The characters of this code are in the form *qbyydzz* where:

  - ***q*** indicates the quadrant: 1=East, 2=North, 3=West, 4=South
  - ***b*** indicates any main feeder splitting: 0=No split, 1=North/East leg, 2=South/West leg
  - ***yy*** indicates a relative number (01..99) of this subfeeder, in this direction, off its main feeder
  - ***d*** indicates direction of subfeeder from feeder: 1=East, 2=North, 3=West, 4=South
  - *zz* indicates a relative number (01..99) of this part 2 subfeeder, off this subfeeder ... If no part 2 subfeeder, this code is 00

  In addition, where any main feeder *splits*, a "dummy record" appears with Switch CLLI Code, with an FDI Code of ***q*099999**, with a Main Feeder Length of **10000**, with terrain values, and with all other fields zero.

- **Length Along Main Feeder (*MainFdrLen*)**: Distance, in feet, along main feeder from switch to the point at which this effective grid cell's subfeeder comes off the main feeder.

- **Length Along Subfeeder (*SubFdrLen*)**: Distance, in feet, along subfeeder from point at which this effective grid cell's subfeeder leaves main feeder to:

  - If a part 2 subfeeder is used, to the point at which the part 2 subfeeder departs from this subfeeder
  - If *no* part 2 subfeeder is used (e.g., inside 10,000 feet), to the road centroid of the effective grid cell itself

- **Length Along Part 2 Subfeeder (*Pt2FdrLen*)**: If a part 2 subfeeder is used, distance in feet from point at which part 2 subfeeder departs subfeeder to the road centroid of this effective grid cell ... If no part 2 subfeeder is used, this number is 0.

Each effective grid cell is further partitioned into four *reporting quadrants*, unless the effective grid cell is only the size of a microgrid cell:

- Upper Left Quadrant (UL)
- Upper Right Quadrant (UR)
- Lower Left Quadrant (LL)
- Lower Right Quadrant (LR)

Each effective grid cell record includes information of all four of these quadrants, in the order specified above. For each of the quadrants, the following information appears, unless the effective grid cell is a *microgrid* cell (1/200th by 1/200th), in which case the full set of numbers is presented as the first (UL) quadrant's data, and the numbers for the remaining quadrants are all zero:

- **Quadrant Number of Housing Units (*UL/UR/LL/LRHUnits*)**
- **Quadrant Number of Households (*UL/UR/LL/LRHHlds*)**
- **Quadrant Number of Business Lines (*UL/UR/LL/LRBusLines*)**
- **Quadrant Road Segment Length (*UL/UR/LL/LRRdSegLen*):** In feet
- **Quadrant Road Reduced Area (*UL/UR/LL/LRRdArea*)**
- **Quadrant Road Centroid Horizontal (X) Distance (*UL/UR/LL/LRRdCHDist*)**: From grid cell road centroid, in feet
- **Quadrant Road Centroid Vertical (Y) Distance (*UL/UR/LL/LRRdCVDist*)**: From grid cell road centroid, in feet

Wire Center Terrain File (*ssWCTRN.CSV*)

There is one record per wire center, in ascending order by wire center switch 11-character CLLI code. The data fields are these:

- **Wire Center Switch CLLI *(SWCIli)***: The 11-character code identifying the switch that serves the wire center area.

- **Area of the Service Area *(Area_WC)***: The area, in square miles with fractional digits, of the wire center service area.

- **Depth To Bedrock (Inches) *(Bedrock_Depth_WC)***: Minimum depth to bedrock for the wire center service area, expressed in inches with up to 2 fractional digits.

- **Fraction of Area with HARD Rock *(Rock_Hard_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is HARD.

- **Fraction of Area with Normal Rock *(Rock_Norm_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is normal.

- **Fraction of Area with SOFT Rock *(Rock_Soft_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is SOFT.

- **Surface Soil Texture** ***(Soil_Type_WC)***: Predominant surface soil texture in the wire center service area, an abbreviation of up to 7 characters.

- **Water Table Depth (Feet)** ***(Water_Depth_WC)***: Minimum water table depth for the wire center service area, expressed in feet with up to 2 fractional digits.

- **Minimum Soil Slope** ***(Slope_Min_WC)***: Minimum soil slope for the wire center service area, expressed as degrees with 2 fractional digits.

- **Maximum Soil Slope** ***(Slope_Max_WC)***: Maximum soil slope for the wire center service area, expressed as degrees with 2 fractional digits.

Wire Center Information File *(ssWCINFO.CSV)*

There is one record per wire center, in ascending order by wire center switch 11-character CLLI code. The data fields are these:

- **Wire Center Switch CLLI** ***(SWClli)***: The 11-character code identifying the wire center and its service area.

- **Operating Company Number** ***(OCN)***: Number of the operating company

- **Operating Company Name** ***(Oper_Company)***: Name of the operating company

- **Central Office Type** ***(Switch_Type)***: Type of the central office (H=Host, R=Remote)

CBG-to-Grid Equivalence File *(ssAGGBG.CSV)*

There is one record per combination of Census Block Group and effective grid cell that overlays any part of it. These records are in the following order, major to minor, all ascending:

Switch CLLI Code
FDI Code
Census Block Group FIPS Code

Each record contains the following data fields:

- **Switch CLLI Code** ***(SWCLLI)***: 11-character CLLI code identifying the wire center to which this record belongs.

- **Central Latitude of Effective Grid Cell** ***(CentLat)***: Latitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Central Longitude of Effective Grid Cell *(CentLong)***: Longitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **FDI Code *(FDICode)***: FDI Code for the effective grid cell.

- **Census Block Group FIPS Code *(CBG_FIPS)***: Standard code identifying a CBG.

- **Number of Business Lines (*BusLines*)**: Count of Business Lines in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Business Firms (*BusFirms*)**: Count of Business *Firms* in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Households (*HHlds*)**: Count of Households in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Housing Units (*HUnits*)**: Count of Housing Units in the effective grid cell that were allocated from the specified Census Block Group.

Telephone Companies' File (*TELCOS.CSV*)

This file is a single file for the entire country. It is in order by Operating Company Name, ascending. The data fields are:

- **Operating Company Number *(OCN)***: "OCN"

- **Operating Company Name *(Oper_Company)***: Name as it appears in Wire Center Information file.

- **Parent Company Name *(Parent_Company)***: Name of its parent company.

- **Company Size *(Parent_Size)***: (S=Small, M=Medium, L=Large)

APPENDIX B

BCPM 3.1 PROCESSING STEPS

This paper describes the steps in processing BCPM 3.1 data. Processing occurs state-by-state.

Step 1: Create Appropriate Wire Center Service Areas Table

Program: MapBasic **B2WCSA**
Tables/Files Used: ***CDDrive:\\aa\aa*WCSA**, BLR wire center boundaries
Tables/Files Produced: ***basepath\aa\aa*WCSA,** Effective BLR wire center boundaries

This program selects wire center boundaries for which the central office is *within* the state. It sorts them into CLLI-8 ascending order and writes the resulting table to the base directory.

Step 2: Determine Counties Covered by Wire Centers of a State

Program: MapBasic **B2WCCNTY**
Tables/Files Used: ***basepath\aa\aa*WCSA**, wire center boundaries
***basepath*\USCNTYHR**, high resolution county boundaries
Tables/Files Produced: ***basepath\aa\aa*WCCOS.TXT**, ASCII text list of counties required

This program determines the counties covered by a state's wire centers. These will typically be all counties of the subject state, but can also be several counties from one or more adjacent states.

The program considers a county should to be included if at least 2% of that county's area is intersected by the set of wire center boundaries for the state.

The resulting ASCII text file is produced in ascending state/county FIPS code sequence.

Step 3: Determine the Switches for the Wire Center Service Areas

Program: MapBasic **B2WCSWS**
Tables/Files Used: ***basepath\aa\aa*WCSA,** wire center service area boundaries
***basepath*\LERG7U**, all unique switches defined in LERG
Tables/Files Produced: ***basepath\aa\aa*WCSWS**, switches for state wire centers

This program determines the switches that qualify. There may be more than one per wire center boundary. But there *must* be at least one per wire center boundary ... if there is not, the program issues an error message.

Invariably, some exceptions, indicated by one or more messages in the message box, must be dealt with manually. This *could* require a further reordering of the ***aa*WCSWS** table, which must be in WCCLLI/SWCLLI name order.

Step 4: Generate 1/200th Degree Grid Cells for Each Wire Center Service Area

Program: MapBasic **B2WCGRID**
Tables/Files Used: ***basepath**aa**aa*WCSA**, wire center boundaries
***basepath**aa**aa*WCSWS**, wire center switches
Tables/Files Produced: ***basepath**aa**aa*WCGR**, grid cells for all wire centers of the state
***basepath**aa*\B2LOG**, ASCII text log file of errors encountered

The ***aa*WCGR** table consists of 1/200th degree grid cells as MapInfo regions, each of which is (if necessary) cut to precisely fit within wire center boundaries … thus not all of these regions are true "square" grids.

Each record of this table contains the CLLI code of its wire center, and the latitude and longitude of the numerical centerpoint of the grid cell that is represented by the record.

Mutually distinct parts of the same 1/200th degree grid may appear in different (adjacent) wire centers.

The resultant records are in order by wire center CLLI / switch CLLI (whatever the order of the input ***aa*WCSWS** table), and within a wire center / switch area, by ascending latitude (major) and ascending longitude (minor).

If MapInfo has an error when cutting the grid cells, a log – **B2aaLOG** – is produced indicating the errors, and the program corrects / fixes those errors.

Step 5: Assign the Minimum Bounding Rectangle for Each Switch's Area

Program: MapBasic **B2SWMBR**
Tables/Files Used: ***basepath**aa**aa*WCGR,** wire center grid cells
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers

This program determines, from the assigned grid cells, the minimum bounding rectangle (MBR) for the area covered by each of the switches, and updates the switches file with those 4 values.

Step 6: Fully Format the Grid Cell Records

Program: MapBasic **B2FMWCGR**
Tables/Files Used/Affected: ***basepath**aa**aa*WCGR**, grid cells for wire centers

This program just adds all additional columns in the ***aa*WCGR** table required for succeeding processes.

Step 7: Set the Record Number in the *aa*WCGR Records

Program: DOS C-Program **B2RCDNBR**
Tables/Files Used/Affected: ***basepath**aa**aa*WCGR**, wirecenter grids

The two parameters to this program are *StateAbbr* and *BasePath*. The program updates the records in place.

Step 8: Collect the Terrain Data for All States Served by This State's Wire Centers

Program: MapBasic **B2BGTRN**
Tables/Files Used: ***CDdrive:*\CBGSOILS*aa*BGSOILS**, Terrain Data by Block Group
Tables/Files Produced: ***basepath**aa**aa*WCSOIL**, terrain data for all block groups served

This program uses the Stopwatch Maps *State Terrain Data by Census Block Group* product as its source. It copies to a table on hard disk the terrain data for all block groups of all states served by this state's wire centers. That table is used in the next step.

Step 9: Determine Area Overlap of Terrain Data

Program: MapBasic **B2GRTRN**
Tables/Files Used: ***basepath**aa**aa*WCSOIL**, terrain data for all block groups served
Tables/Files Used/Affected: **C:\TEMP\GRBGX**, a temporary table

This program joins information in these two tables, writing it to a temporary table on the local drive **C:\TEMP\GRBGX**. It then ends, often with an *Error Overlaying Objects*.

Step 10: Assign Terrain Data to Each Grid Cell

Program: DOS C-Program **B2GRBG2**
Tables/Files Used: **C:\TEMP\GRBGX**, a temporary table

Tables/Files Used/Affected: ***basepath**aa**aa*WCGR**, wire center grid cells

This program actually performs the assignment to the grid cells. Run it from the base directory, with two arguments: *StateAbbr* and *BasePath*.

Step 11: Collect the Census Block Boundaries for the State's Wire Centers

Program: MapBasic **B2ALLCBS**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of counties required
CDdrive:**CBBY**aa**CBssccc, Census Block Boundary tables on CD
***basepath**aa**aa*WCSA**, wire center service areas
Tables/Files Produced: ***basepath**aa**aa*WCCBS**, Census Block Boundaries for all these WCs

This program uses the list of counties required to direct the operator to mount the one or more CD-ROMs containing the Census Block boundaries for the required counties (some of which may be outside the subject state). It produces a table of all Census Block boundaries within the purview of the subject state's wire centers.

Step 12: Collect the Census Block-Level Housing Data

Program: DOS Batch File **B2CBDEMS.BAT**
DOS C-Program **C:\UTIL\CSVTOTAB.EXE**, plus other utilities
Tables/Files Used: ***basepath*\BXDEMS.DEF**, ASCII text file definition
CDdrive:*\XBLK\BX*ssccc, STF1B extract files
Tables/Files Produced: ***basepath**aa**aa*CBDEMS**, Census Block housing demographics

This batch file, file conversion utility program, and assorted other utility programs generate a table containing, for each occupied Census Block in any county (of any state) touched by one of this state's wire centers, the base housing demographics, including a 3-way distribution of housing units by structure size. At this point, this is unadjusted 1990 Census data.

Step 13: Collect the Block Group-Level Units-in-Structure Distribution Data

Program: MapBasic **B2BGHUS**
Tables/Files Used: ***CDdrive:*\BLOCK\REP*aa*G01**, Claritas BG Units in Structure by State
Tables/Files Produced: ***basepath**aa**aa*BGHUS**, resulting table for all BGs touched by WCs

This program copies the BG-level units-in-structure data, for Block Groups in all states touched by this state's wire centers, to a table, in FIPS order.

Step 14: Apply All Housing Unit Demographics to Census Block Table

Program: MapBasic **B2UPCBHU**

Tables/Files Used: ***basepath**aa**aa*CBDEMS**, Census Block housing demographics
***basepath**aa**aa*BGHUS**, BG units-in-structure
***basepath*\POPADJ.TXT**, 1995 census adjustment factors by county
Tables/Files Affected: ***basepath**aa**aa*CBS**, Census Blocks table

This program applies the housing unit information from the above tables and file to the Census Blocks.

Step 15: Apply Business Lines/Firms Data to Census Block Table

Program: MapBasic **B2UPCBBU**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
***basepath**ss**ss*PNRCB**, CB-level businesses for all states touched
***basepath**ss**ss*PNRBG**, BG-level businesses for all states touched
***basepath**ss**ss*PNRTR**, TR-level businesses for all states touched
Tables/Files Used/Affected: ***basepath**aa**aa*CBS**, Census Blocks table

This program first collects PNR data for all counties touched into work files **C:\TEMP\PNRCB, C:\TEMP\PNRBG,** and **C:\TEMP\PNRTR**, sorted to FIPS order. It then applies that data to the Census Blocks file.

Step 16: Collect the Roads for a State's Wire Centers as MID/MIF Files

Program: DOS Batch File **B2TGRMIF**
DOS C-Program **B2TGRRDS.EXE**, plus other utilities
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
CDdrive:*\TIGER94*x**ss*\CB*ssccc.xxx, TIGER94 files
Tables/Files Produced: ***basepath**aa**aa*STS*ssccc*.MID/MIF**, importable files per county

This process creates, from TIGER94 CDs, the roads for all counties (in all states) touched by this state's wire centers.

Step 17: Import Roads MID/MIF Files to a MapInfo Table

Program: MapBasic **B2ALLRDS**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
***basepath**aa**aa*STS*ssccc*.MID/MIF**, importable files per county
Tables/Files Produced: ***basepath**aa**aa*RDS**, Census Blocks table

This program imports and collects all the above files into a single MapInfo table. When you are satisfied that the process is successful, you may erase the MID/MIF files, and the temporary ***aa*RD0** table.

Step 18: Relate Roads and Census Blocks

Program: DOS C-Program **B2CBRDS**
Tables/Files Used/Affected: ***basepath\aa\aa*RDS**, roads for the entire state
***basepath\aa\aa*CBS**, Census Blocks table

This DOS program (whose two parameters are *StateAbbr* and *BasePath*) determines and posts the total road segment lengths for each Census Block, and tags the Roads records with the WCCLLI code of the Census Block and the indication as to whether the CB is large, small, or empty.

Step 19: Create the Valid Roads Table and the Roads-In-Large-Census-Blocks Table

Program: MapBasic **B2SPLRDS**
Tables/Files Used: ***basepath\aa\aa*RDS**, roads for the entire state
***basepath\aa\aa*CBS**, Census Blocks table
Tables/Files Produced: ***basepath\aa\aa*VLDRDS**, valid roads for state
***basepath\aa\aa*LCBRDS**, roads for state in large Census Blocks

This program creates the two working Roads tables from the original.

Step 20: Determine Area Overlap of Smaller Census Blocks with Grid Cells

Program: MapBasic **B2SCBXGR**
Tables/Files Used: ***basepath\aa\aa*CBS**, Census Blocks table
***basepath\aa\aa*WCGR**, wire center grid cells
Tables/File Produced: ***basepath\aa\aa*SCBxGR**, small Census Block/microgrid join

This program determines the area overlap between microgrid cells and Census Blocks less than 0.25 square miles in size. This relationship will be used in the next step to allocate demographics from those Census Blocks to the overlaid grid cells.

If MapInfo stops this program with an *Error overlaying the objects*, you should save the SCBXGR temporary table as ***basepath\aa\aa*SCBxGR** and end the program.

Step 21: Allocate Demographic Data from Small Census Blocks to Microgrids

Program: DOS C-Program **B2ALLOSM.EXE**
Tables/Files Used: ***basepath\aa\aa*SCBxGR**, small Census Block/microgrid join
***basepath\aa\aa*CBS**, Census Blocks
Tables/Files Affected: ***basepath\aa\aa*WCGR**, wire center grid cells

This program uses the relationships determined above to add area-proportional Census Blocks demographics to the overlaid grid cells.

Step 22: Determine Road Segment Overlap of Larger Census Blocks with Grid Cells

Program: MapBasic **B2LCBXGR**
Tables/Files Used: ***basepath\aa\aa*LCBRDS**, large Census Block road segments
***basepath\aa\aa*WCGR**, wire center grid cells
Tables/File Produced: ***basepath\aa\aa*LCBxGR**, large Census Block road/microgrid join

This program determines the area overlap between microgrid cells and road segments of Census Blocks larger than 0.25 square miles in size. This relationship will be used in the next step to allocate demographics from those Census Blocks to the overlaid grid cells.

If MapInfo stops this program with an *Error overlaying the objects*, you should save the LCBXGR temporary table as ***basepath\aa\aa*LCBxGR** and end the program.

Step 23: Allocate Demographic Data from Large Census Blocks to Microgrids

Program: DOS C-Program **B2ALLOLG.EXE**
Tables/Files Used: ***basepath\aa\aa*LCBxGR**, small Census Block/microgrid join
***basepath\aa\aa*CBS**, Census Blocks
Tables/Files Affected: ***basepath\aa\aa*WCGR**, wire center grid cells

This program uses the relationships determined above to add road-length-proportional Census Blocks demographics to the overlaid grid cells.

Step 24: Calculate Road Information for Micro-grids

Program: MapBasic **B2RDNFO**
Tables/Files Used/Affected: ***basepath\aa\aa*VLDRDS**, Valid Roads table
***basepath\aa\aa*WCGR**, wire center grid cells
Tables Produced: ***basepath\aa\aa*GRxRD**, grid/road table

This program calculates the road centroid, total length of intersecting roads, and the road area for each Micro-grid.

Step 25: Aggregate Micro-grids

Program: DOS C-Program **B2WCAGG**
Tables/Files Used/Affected: ***basepath\aa\aa*WCSWS**, switches for state wire centers
***basepath\aa\aa*WCGR**, wire center grid cells
Tables/Files Produced: ***basepath\aa\aa*AGG**, aggregate grids

This program aggregates the Micro-grids based on the algorithm described in the BCPM2 Model documentation. For each group of aggregated Micro-grids, a record with a Wire-Center-unique aggregate grid ID and the aggregated values are output to the *aa*AGG table. Additionally, each Micro-grid is tagged with the aggregate grid ID.

Step 26: Calculate Feeder Information for Aggregate Grids

Program: DOS C-Program **B2WCFDR**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers
***basepath**aa**aa*AGG**, aggregate grids
Tables/Files Produced: ***basepath**aa**aa*FNFO**, feeder information

This program calculates the feeder lengths and FDI code for each aggregate grid. The table *aa*FNFO contains main feeder-angle information for each wire center that is necessary for creating MapInfo maps for the feeders.

Step 27: Calculate (and Replace With where Appropriate) Alternate Feeder Routes

Program: DOS C-Program **B2WCFD2**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers
***basepath**aa**aa*AGG**, aggregate grids
***basepath**aa**aa*FNFO**, feeder information

This program calculates the feeder lengths on an unsplit cardinal direction basis and, if this alternate feeder routing is shorter than the previous, substitutes it in the ***aa*FNFO** table.

Step 28: Generate the Primary Output CSV File

Program: MapBasic **B2OUTCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*AGG**, aggregate grids
Tables/Files Produced: ***basepath**aa**aa*OUT.CSV**, primary comma-separated variables file
***basepath**aa**aa*OUTZ.CSV**, empty records of the above file

This program sorts the AGG table into FDI Code within Switch CLLI. It generates the CSV file, creating where necessary a special record to reflect the split of a main feeder at 10,000 feet.

Step 29: Generate the Wire Center Terrain Information

Program: DOS C-Program **B2WCTRN**
Tables/Files Used/Affected: ***basepath**aa**aa*WCGR**, micro-grids
Tables/Files Produced: ***basepath**aa**aa*WCTRN**, summarized terrain table

This program summarizes the terrain data from the microgrids of a WC service area. Its two command-line arguments are *StateAbbr* and *BasePath*.

Step 30: Generate the Wire Center Terrain Output CSV

Program: MapBasic **B2TRNCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*WCTRN**, summarized terrain table
Tables/Files Produced: ***basepath**aa**aa*WCTRN.CSV**, comma-separated variables file

This program generates the record for each switch, in switch CLLI order, summarizing the terrain characteristics of the service area.

Step 31: Generate the Wire Center Info CSV File

Program: MapBasic **B2INFCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches in wire centers
***basepath*\\TELCOS**, all telephone companies' file
Tables/Files Produced: ***basepath**aa**aa*WCINF.CSV**, comma-separated variables file

This program generates the record for each switch, in switch CLLI order, summarizing the ownership characteristics of the service area.

Postlude:

We ZIP the two files ***aa*OUT.CSV** and ***aa*OUTZ.CSV** into ***aa*OUT.ZIP**. We ZIP the two files ***aa*WCTRN.CSV** and ***aa*WCINF.CSV** into ***aa*WC.ZIP**. We then FTP these to the INDETEC FTP site.

APPENDIX B

BCPM 3.1 GRID AGGREGATION: GENERAL RULES

Terminology:

The following terms are used in the grid aggregation rules:

Grid	=	1/25 degree Latitude/Longitude Grid
1/4Grid	=	1/50 degree Latitude/Longitude Grid
1/16Grid	=	1/100 degree Latitude/Longitude Grid
1/64Grid	=	1/200 degree Latitude/Longitude Grid

General Rules

If any grid has <1000 Household Units (HU) then output;

Of remaining data,
If any 1/64 grid > 400 HU then do:
- If Grid - 1/64 grid < 400 HU then Output Grid;
- Else If 1/4Grid - 1/64 grid < 400 HU then Output 1/4Grid;
- Else If 1/16 Grid - 1/64 grid < 400 HU then Output 1/16Grid;
- Else Output 1/64Grids (all 4);

Of remaining data
If any 1/16 grid > 400 HU then do:
- If Grid - 1/16 grid < 400 HU then Output Grid;
- Else If 1/4Grid - 1/16 grid < 400 HU then Output 1/4Grid;
- Else Output 1/16Grids (remaining 4);

Of remaining data
If any 1/4 grid > 400 HU then do:
- If Grid - 1/4 grid < 400 HU then Output Grid;
- Else Output 1/4Grids (Remaining 4);

Clean up

If any record has < 100 then Merge with horizontal or vertical similar Grid of equal or larger size to which the road centroid leans.
Partial grids less than 1/5 of a large grid will be aggregated back in (as long as line count is less than 100) to the grid along the longest edge.

APPENDIX C

SUMMARY OF MAJOR CHANGES FROM BCPM 1.1 TO BCPM 3.1

I. CUSTOMER LOCATION

Customer Line Data: Housing Units Per Structure

BCPM 1.1--Used a national average based on Census data for number of housing units per structure per Census Block Group (CBG).

BCPM 3.1--Uses census data for housing units per structure at the Census Block (CB) level for each CB.

Customer Line Data: Business

BCPM 1.1--Estimated the number of business lines at the CBG level by using Dunn and Bradstreet data on the number of employees by CBG and industry reports of business lines by state.

BCPM 3.1--Uses PNR and Associates (PNR) data of actual business lines. Approximately 85% of business customers can be assigned to the CB level.

Method For Assigning Customers To Wire Centers

BCPM 1.1 --Assigned customers within a CBG to a wire center if the centroid (geographic center) of the CBG fell within the wire center boundaries provided by On Target's "Exchange Info Plus" data product. Wire Center boundaries were subsequently established by aggregating the area encompassed by CBGs whose centroids were assigned to the respective wire center.

BCPM 3.1—Uses Business Location Research (BLR) data to establish wire center boundaries. These are typically defined at the CB level.

Unit of Engineering

BCPM 1.1--Used the CBG as the unit of engineering. The size of a CBG is based on population and geography.

BCPM 3.1--Simulates basic telephone plant engineering units by using dynamic grids that vary in size within a wire center. The "ultimate grid" is sized to comport with Carrier Serving Area (CSA) and Distribution Area engineering guidelines. Ultimate grids are constructed by first establishing microgrids (approximately 1,500 feet by 1,700 feet, longitude and latitude) and then reaggregating the microgrids into larger grids as appropriate. In general, the maximum grid size allowed is 12,000 feet by 14,000 feet.[51]

Locating Customers Within the Wire Center

BCPM 1.1—Squared the area of the CBG about the geographic center of the CBG. For CBGs with less than 20 households per square mile, the area of this square was reduced to a square whose area is equal to a 500-foot buffer along each side of the roads within a CBG. For all CBGs, customers were uniformly distributed throughout the squared CBG.

BCPM 3.1—Uses road network data to place customers within a CB into the appropriate microgrids for those CBs that span multiple microgrids. Data regarding housing and business lines is retained at the microgrid level subsequent to determining the ultimate grid size. The ultimate grid is quaded about the road centroid of the ultimate grid, which also corresponds to the Digital Loop Carrier (DLC) site. Customers, assigned to microgrids within particular distribution quadrants, are subsequently placed uniformly in Road Reduced Areas. These Road Reduced Areas are centered about the road centroid of the distribution quadrant and sized as a square whose area is equal to the area encompassed by a 500-foot road buffer along each side of the roads contained within the distribution quadrant.

[51] The size of the macrogrid may be expanded when partial grids along the wire center boundaries are combined with adjacent macrogrids.

Number of Households Used as Base Line For Calculation of Subsidy

BCPM 1.1—Based the calculation of the subsidy on the number of households. If the user chose to input line counts for each switch and the line count was less than the number of households, the model still calculated the subsidy based on the number of households. This resulted in a subsidy that was greater than the cost to install plant to serve the requisite number of lines.

BCPM 3.1—The model selects the fewer of either Households or total Residential lines as the basis of the calculation of the subsidy.

II. OUTSIDE PLANT

Design of the Main Feeders

BCPM 1.1—Placed main feeder directly north, south, east and west from the wire center until no longer needed to support a CBG.

BCPM 3.1—Places main feeder directly north, south, east and west from the wire center for 10,000 feet. Beyond this point, the model tests two designs.

The first design directs main feeder to the main population concentration in the feeder quadrant that it serves, using the following rules:

- If the line count in the center 1/3 of the feeder quadrant is greater than 30% of the total feeder quadrant lines, the feeder remains a single feeder and points at the population centroid of the total section.
- If the line count in the center 1/3 of a feeder quadrant is less than 30% of the feeder quadrant lines, the feeder splits into two main feeders each pointed at the population centroid in one half of the feeder quadrant.

The second design continues to extend the feeder directly in the original cardinal direction, i.e. due north, south, east or west. The design that uses the least feeder cable (including feeder, subfeeder, and subfeeder part two) is selected.

Sharing of Subfeeder

BCPM 1.1—Placed subfeeder to each CBG. BCPM 1.1 did not permit sharing of subfeeder among CBGs assigned to the same wire center.

BCPM 3.1—Shares subfeeder among ultimate grids within a wire center when it is cost effective to do so.

Establishing the DLC Site

BCPM 1.1—Established the DLC site at the geographic center of the CBG for those CBGs that needed only one DLC site. Multiple DLC sites were established in CBGs that exceeded the 12,000-foot (default) constraint on copper loop length from the DLC to the customer. In such cases, DLC sites were established in locations that ensured that the 12,000-foot constraint on copper loop length from the respective DLC to the customer was not exceeded. (The 12,000-foot constraint was a user adjustable input.)

BCPM 3.1—Establishes the DLC site at the road centroid of the ultimate grid. More than one DLC may be placed at this site if necessary, due to line requirements.

Placement of the Feeder Distribution Interface (FDI)

BCPM 1.1—Always co-located the FDI with the DLC. BCPM 1.1 allowed for placement of more than one FDI, if necessary, due to line requirements, at the DLC site.

BCPM 3.1—Provides for the following three options for placement of the FDI(s) based on line counts: 1) co-locate the FDI with the DLC; 2) share an FDI between Distribution Areas located to the right of the DLC and share an FDI between Distribution Areas located to the left of the DLC; and 3) place an FDI at the center of the Distribution Area, which corresponds to the road centroid of the distribution quadrant, for each non-empty quadrant.

Cable Design from the DLC to the Customer

BCPM 1.1—Placed horizontal distribution cable and from that placed "legs" to remote terminals from which drop cable was placed to the customer.