Universal Service and Network Modeling

...then and now

February, 2007

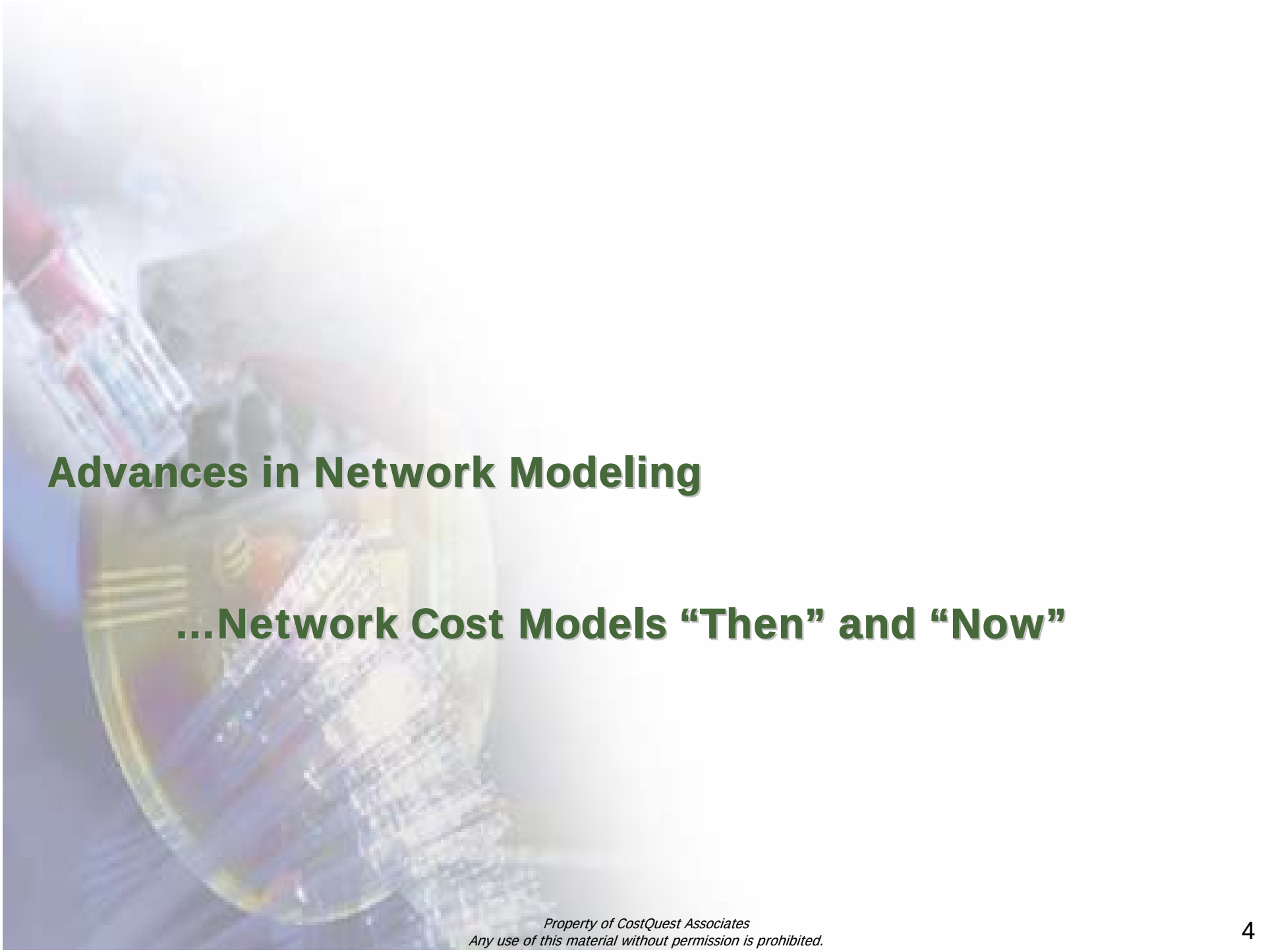
En Banc Presentation

Model Definitions

- Every current universal program relies upon both a “cost model” and a “support model.”
- Definitions:
  - “Cost Model:”: A systematized collection of mathematical procedure that takes as inputs geographic and non-geographic data and that produces an estimate of the cost of providing a telecommunications service
    - Provides a normalized measure so that carriers and geographic areas can be compared on the fair and impartial basis
  - “Support Model:” A mathematical procedure that takes cost data as an input, sets a standard for acceptable customer payment or affordability, applies a funding model (regulatory or carrier based), and finally produces a universal service support amount for the carrier or its customer
    - This is sometimes called a “support mechanism.”

Cost Model Policy Decisions…a short list

- What technologies will the model assume?
  - Will broadband be supported? At what speeds?
  - Is wireless included? Mobility? Cable VoIP?
- What percentage of customers purchase the service?
  - What is the take rate we assume?
  - Do we include COLR costs?
- What is the geographic unit of consideration?
  - Is the ILEC wire center the proper unit?
  - Or should it be Study areas? Census units?
  - Should it account for the Donut/Hole Dr. Staihr recommends?



Advances in Network Modeling

…Network Cost Models “Then” and “Now”

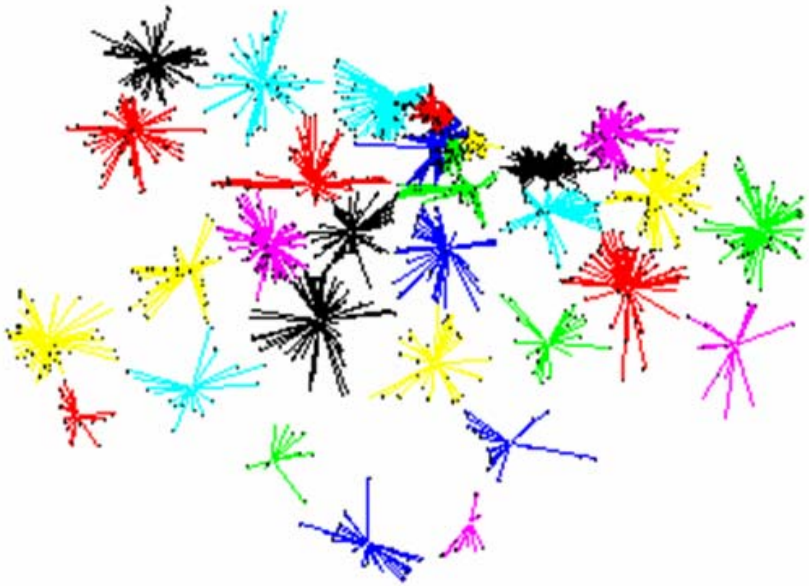
Advancements in Network Modeling

- Improved customer locations
- Improved ability to match engineering designs and constraints
- Improved network routing
- Improved ability to vary the service delivered...broadband designs
- Ability to model multiple terrestrial networks

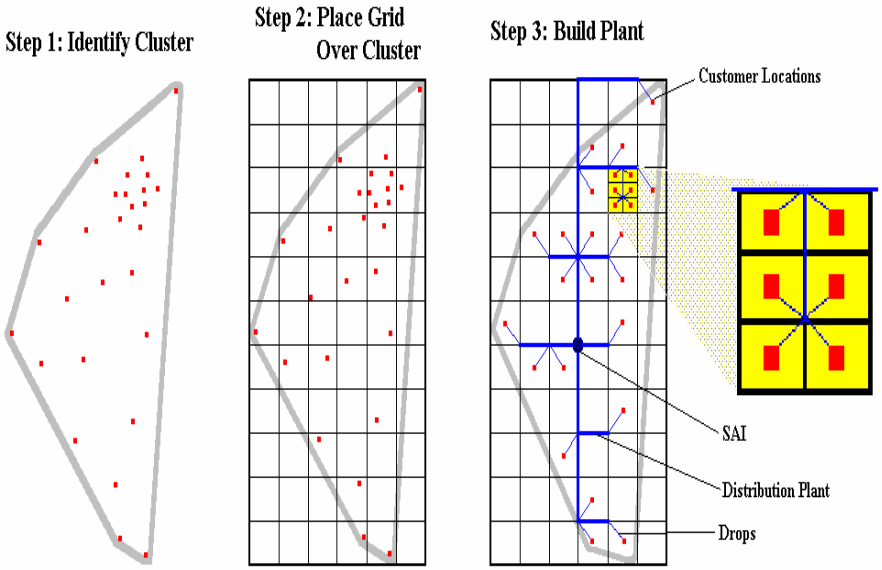
...In general, a more realistic, flexible network design resulting in more accurate cost estimates and improved information for decision makers

THEN…FCC Model Methods for Customers and Engineering Design

Cluster formation



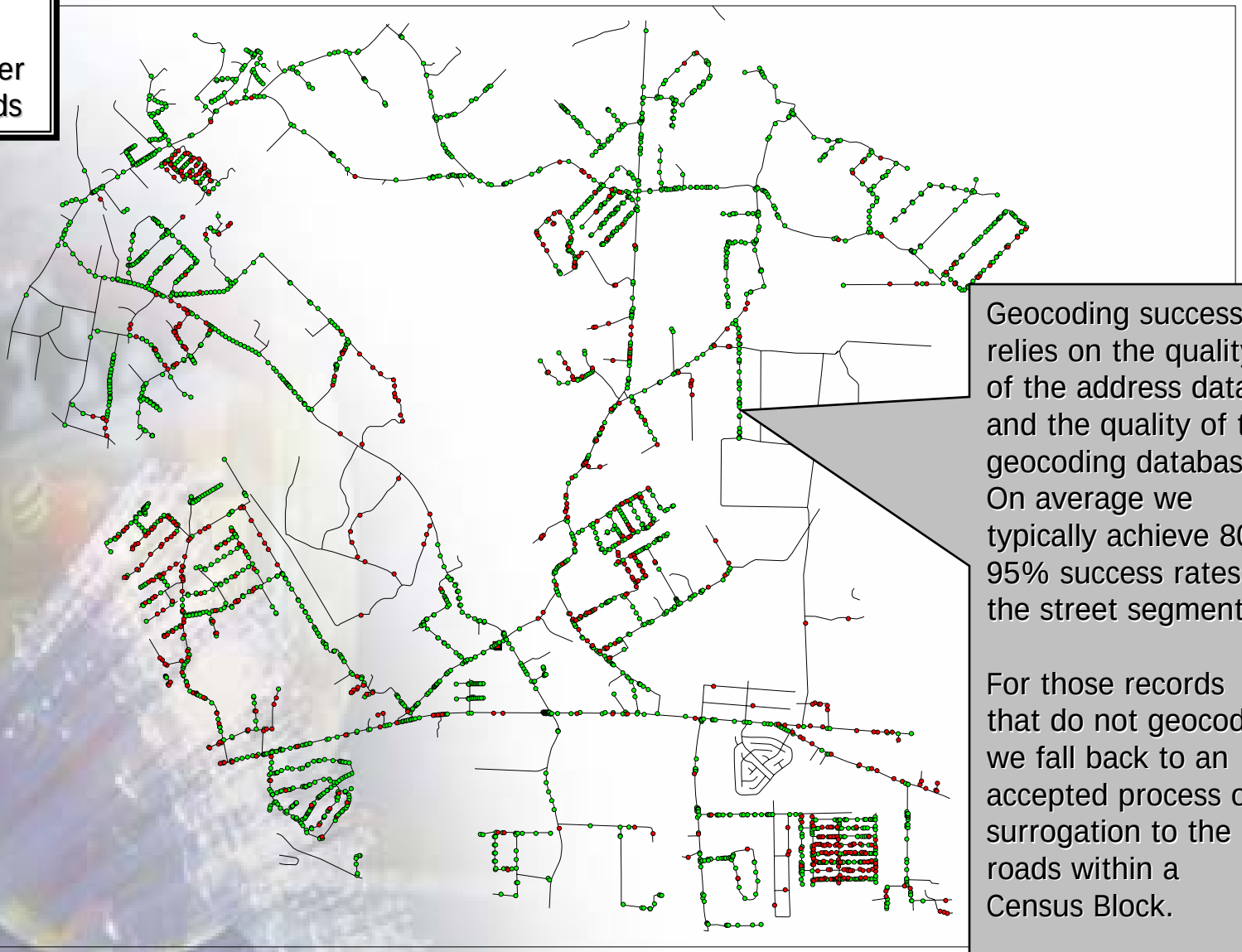
Customer locations and engineering design



Material courtesy of William Sharkey (FCC)

NOW…CostPro Customer and Road Data

ILEC Wire Center service area with geocoded customer locations and roads



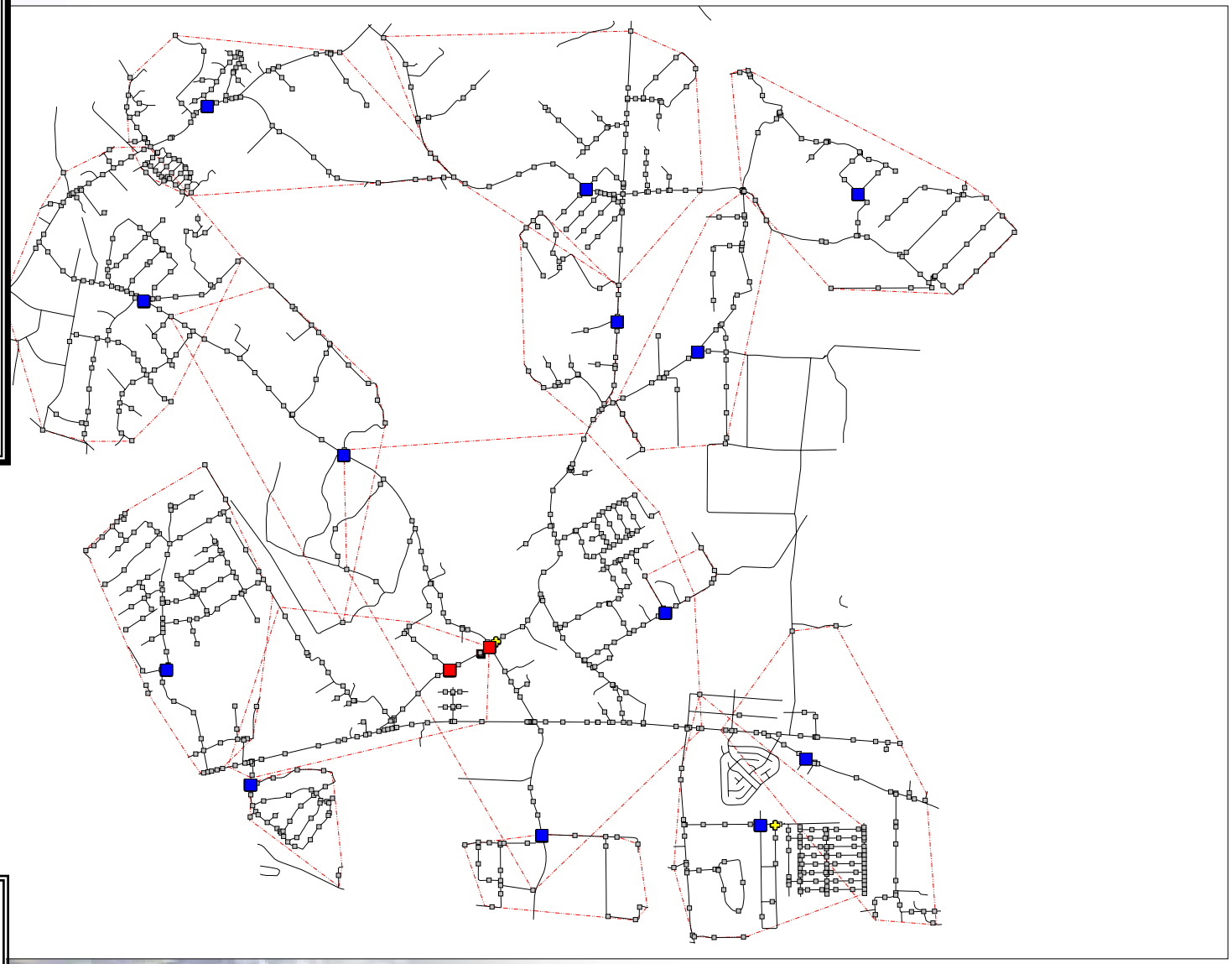
Geocoding success relies on the quality of the address data and the quality of the geocoding databases. On average we typically achieve 80-95% success rates to the street segment.

For those records that do not geocode, we fall back to an accepted process of surrogation to the roads within a Census Block.

NOW…CostPro Engineering Design

Network Node locations are based upon user inputs and general network design principles

Picture captures network nodes with red dashed line representing Road Based Clusters

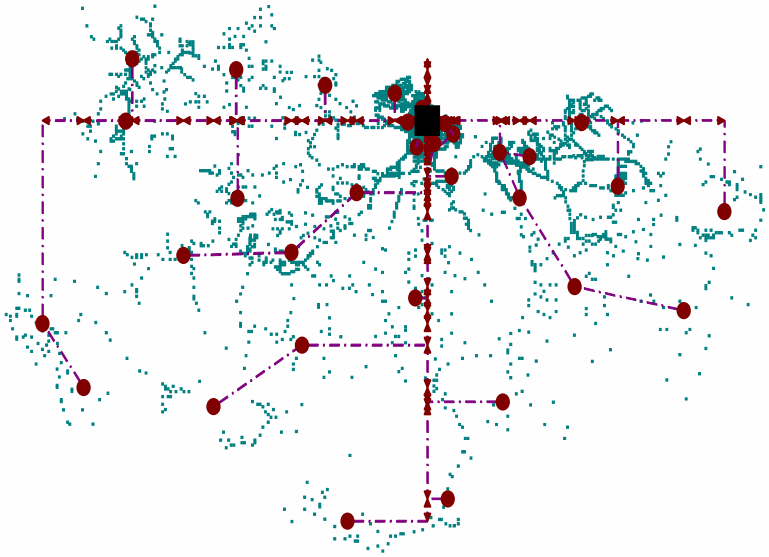


Legend:
- – Digital Loop Carrier
- – Copper fed X-Box
- – Pedestal

THEN…FCC Model Network Routing

Rectilinear Distribution Design

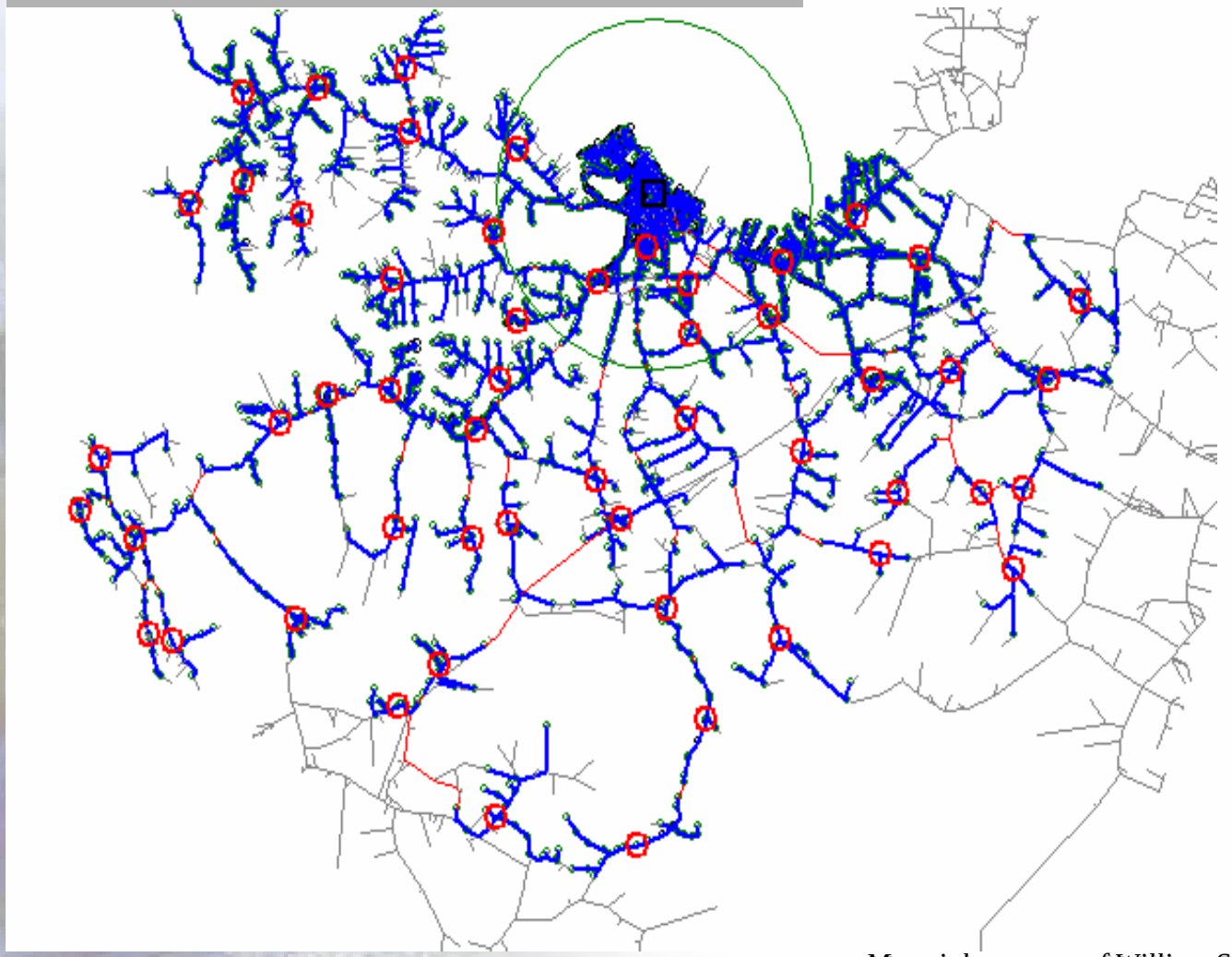
Rectilinear Feeder Design



Material courtesy of William Sharkey (FCC)

NOW…Road Based Networks

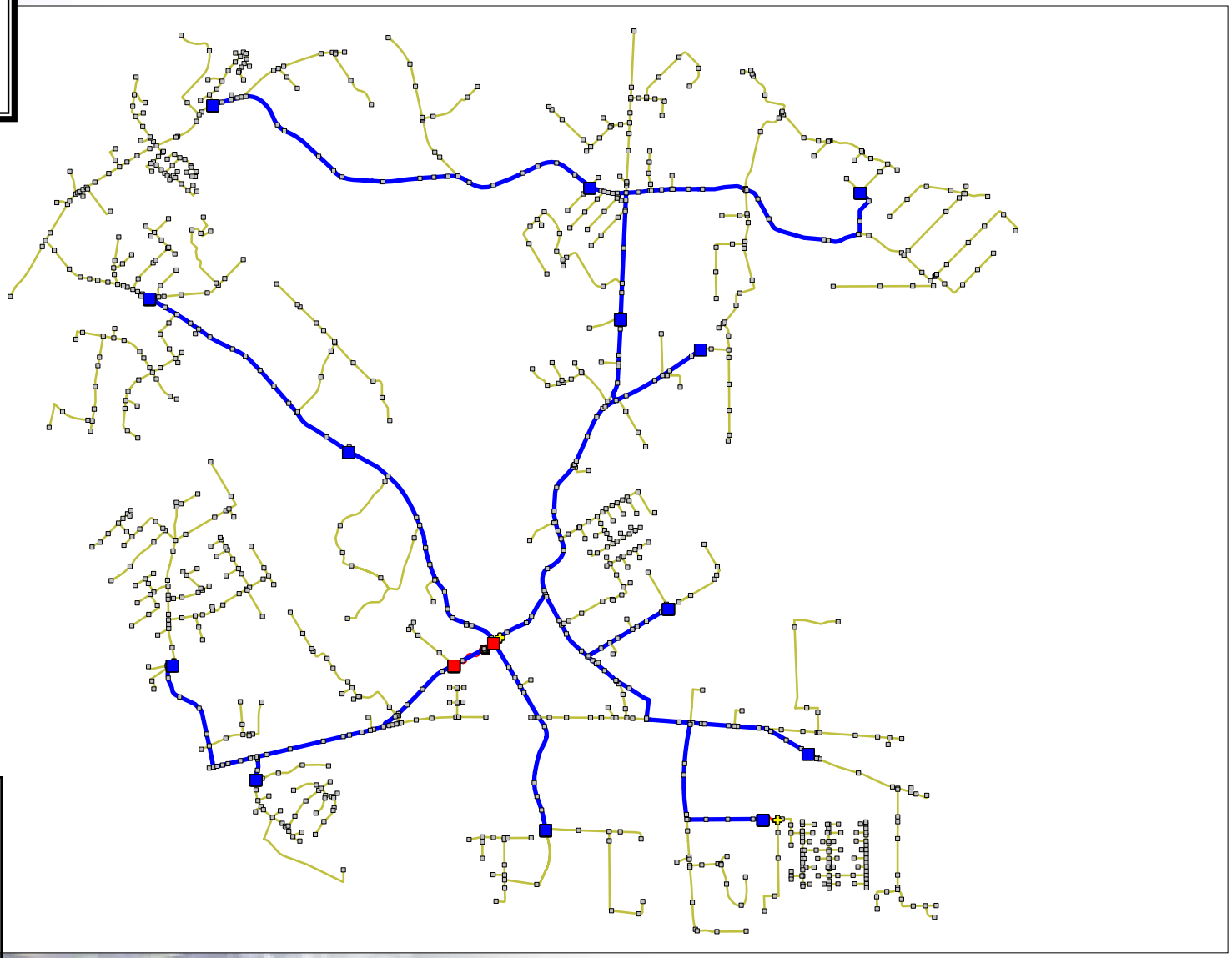
Road based design of wire center on prior chart



Material courtesy of William Sharkey (FCC) and Jeff Prisbrey

NOW…CostPro Road Based Network

Designed Network with overlaid cabling, no roads



Legend:

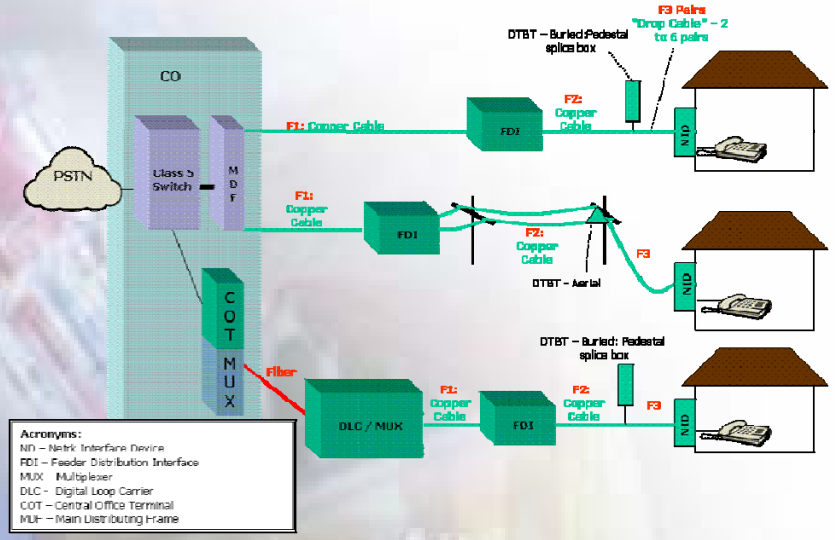
- ■ – Digital loop carrier
- ■ – Copper Fed X-Box
- ■ – Pedestal
- -- – Fiber Feeder
- -- – Copper Feeder
- -- – Distribution

THEN…Broadband Network Design

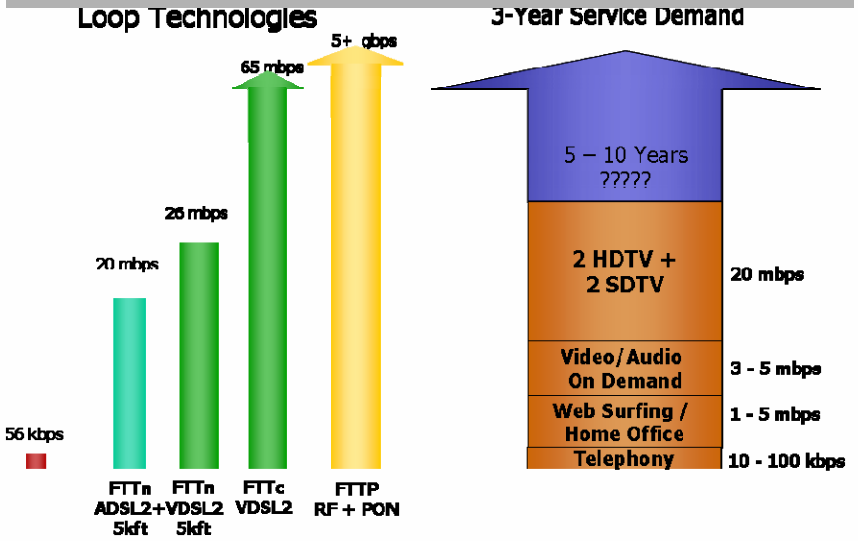
…Advanced services at time of development - 28.8kbs modem service

Wireline Architecture

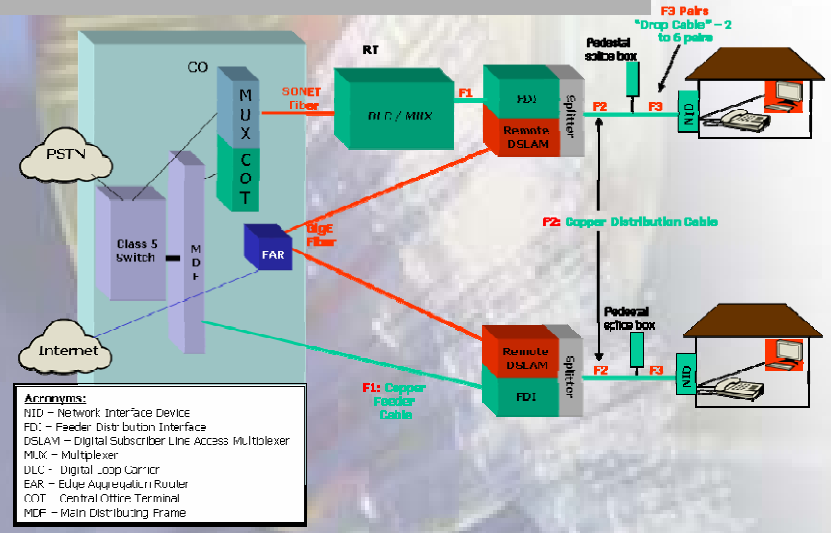
THEN…Voice Network – Current USF model design



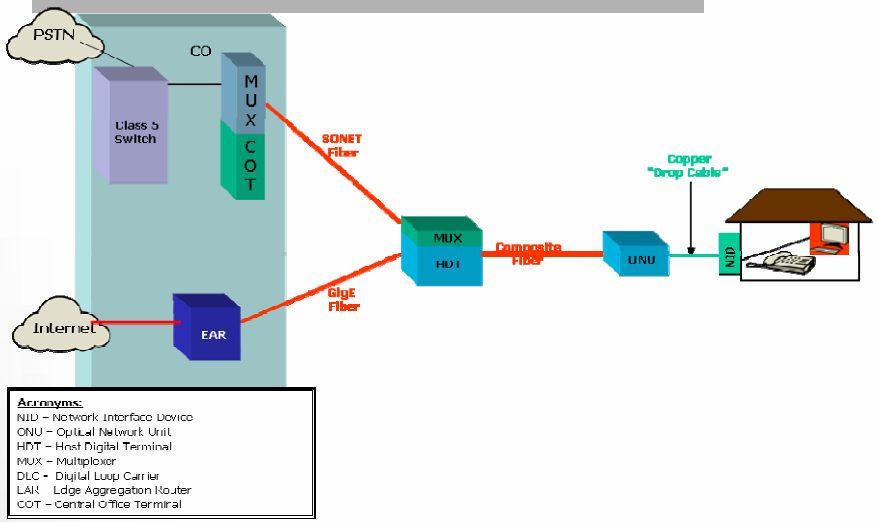
The need for a fatter "pipe" to the customer



NOW…FTTn Network

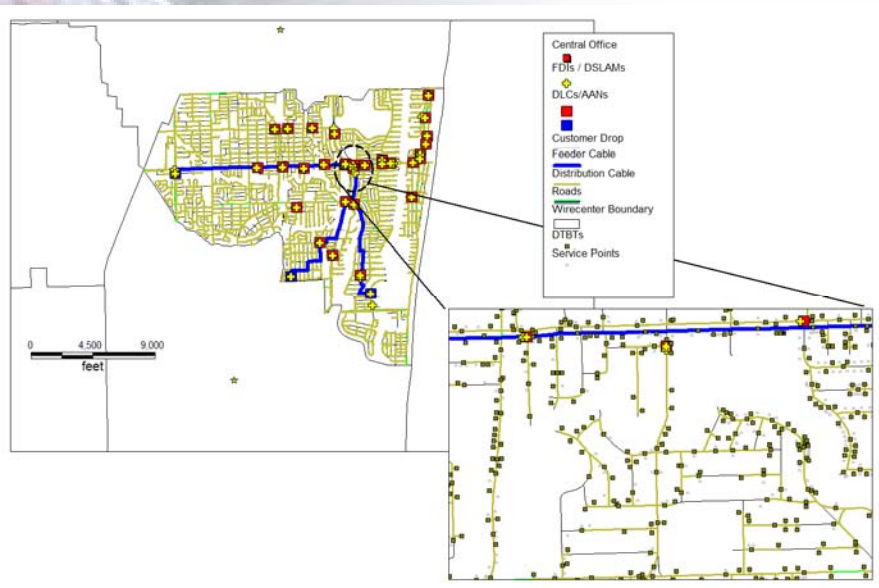


NOW…FTTc Network

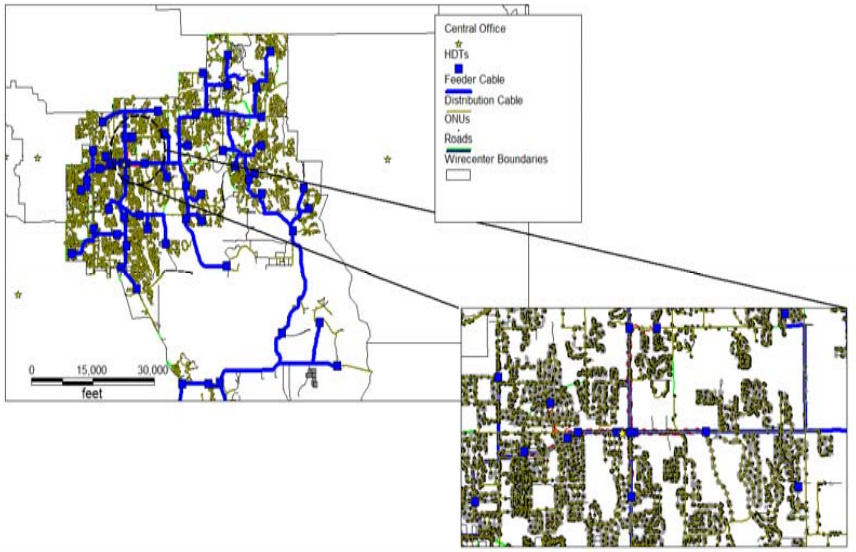


NOW…CostPro Broadband Network Designs

FTTn Network



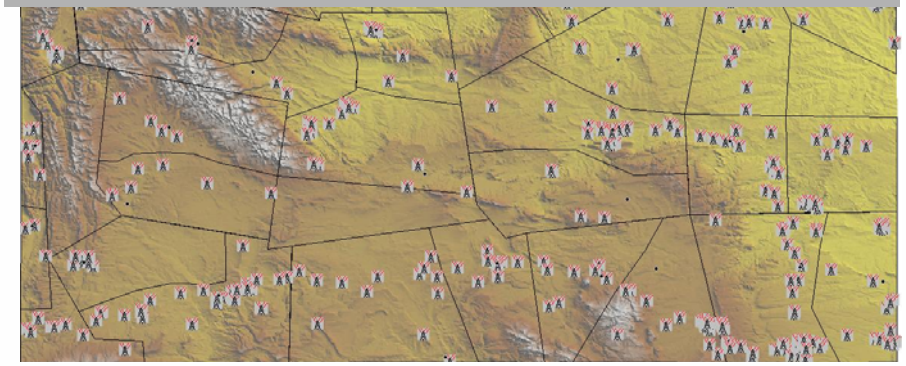
FTTc Network



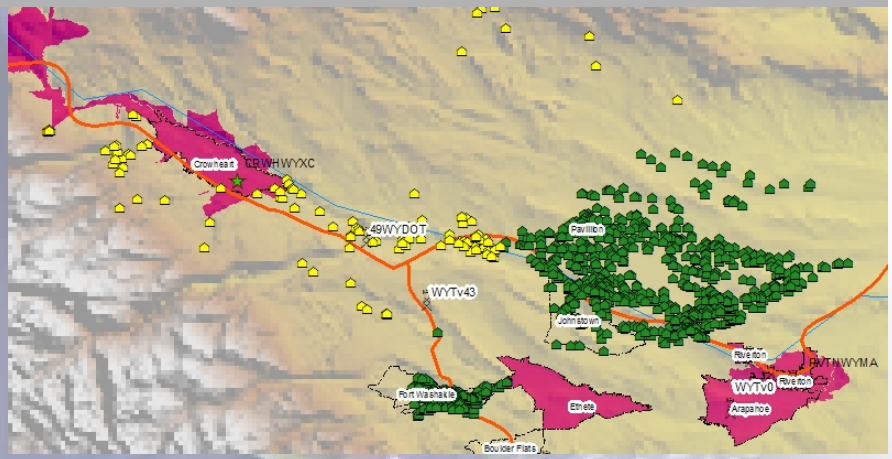
NOW…CostPro Wireless Architecture

- Wireless network design
  - Step 1: Develop tower database
  - Step 2: Select most appropriate towers
  - Step 3: Group towers into serving areas fed by a common interconnection point
  - Step 4: Accumulate customers to towers and size tower equipment
    - Typical design of up to 10 miles for fixed wireless
    - Line of Site limited to 4 miles
  - Step 5: Create backhaul network
    - Typical radio link design of 20 miles (70 mile max)

- Towers are available from a number of national databases
- Wireless serving areas define the backhaul network
  - Each WSA backhauls to a single interconnection point such as a switch or point of interconnection



- Customers are accumulated onto towers so as to efficiently use antenna placements



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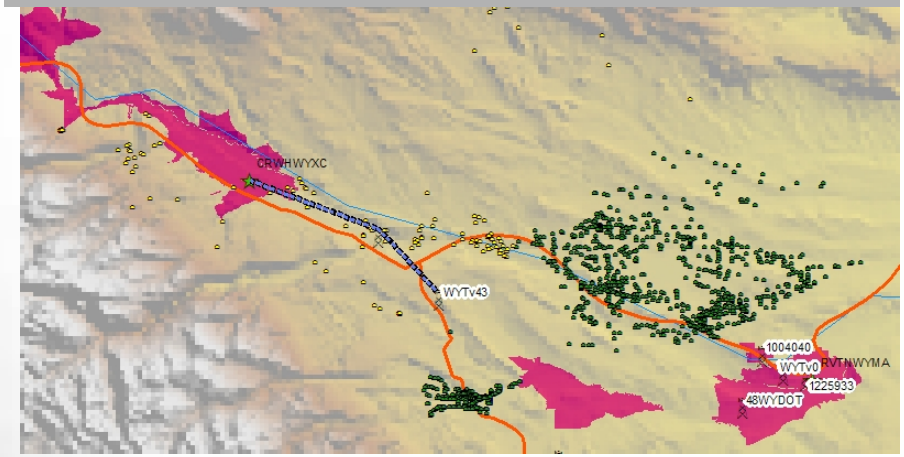
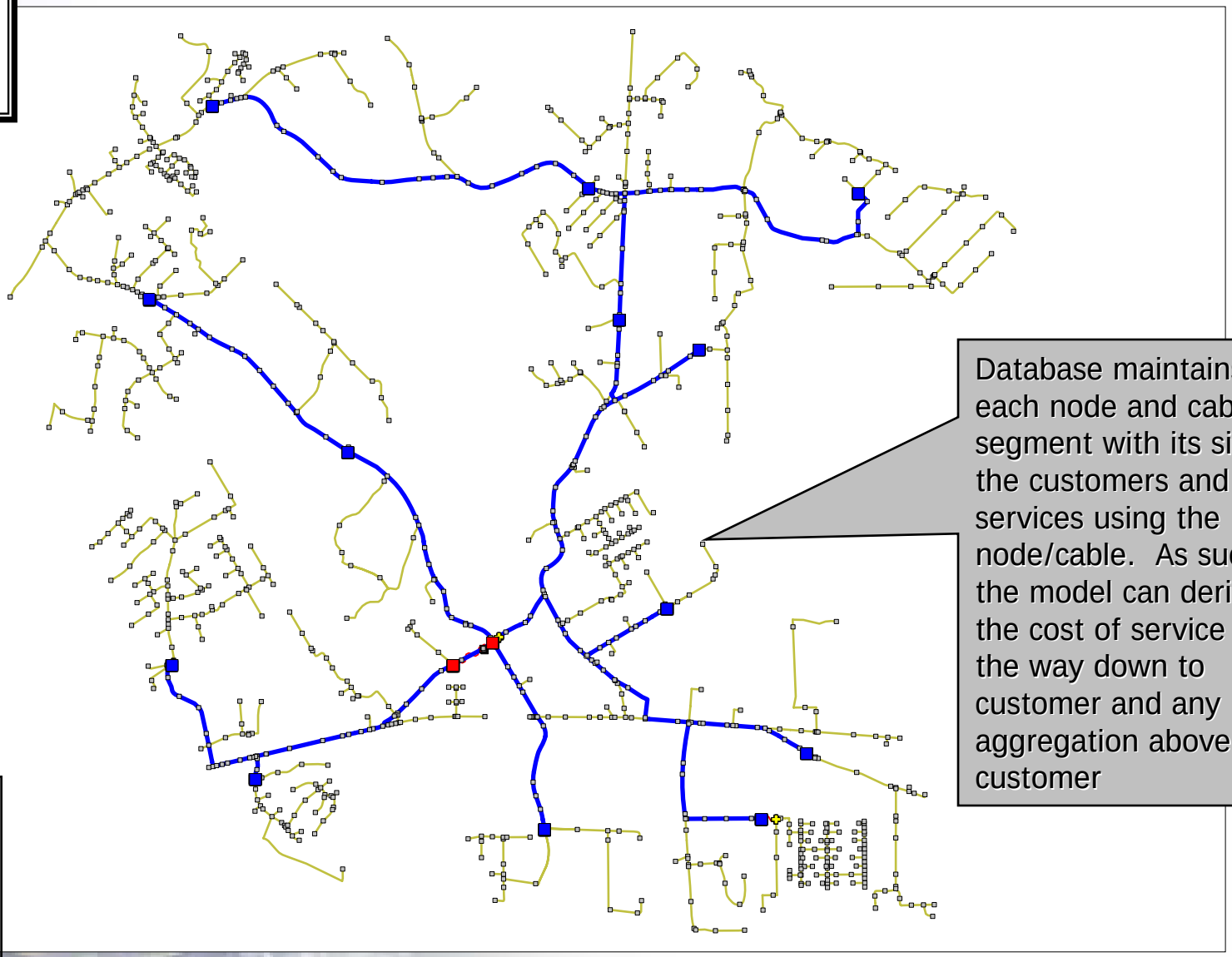


Granularity of Data and Results

CostPro Visualization – Sub Wire Center Detail

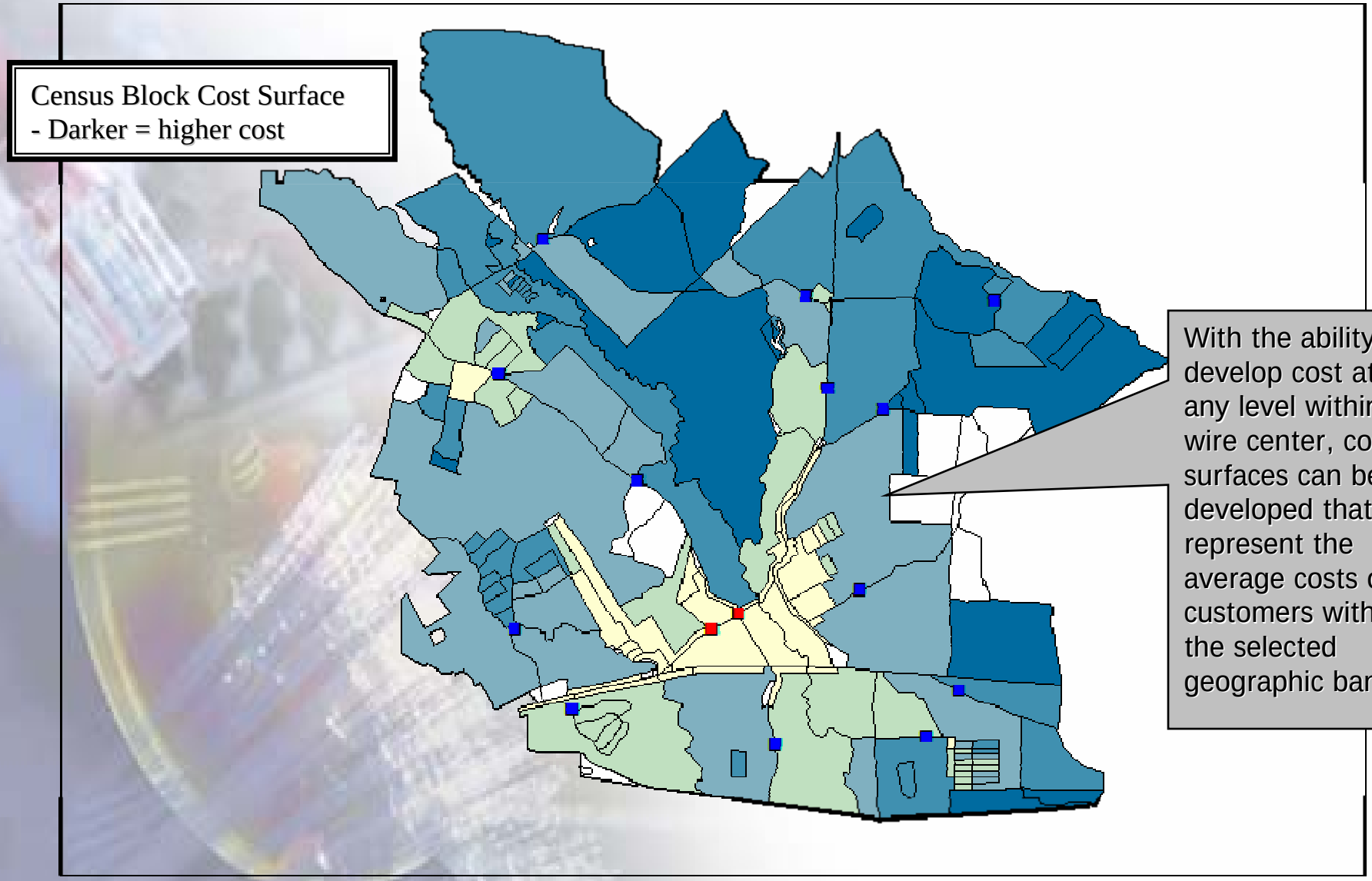
Designed Network with overlaid cabling, no roads



Database maintains each node and cable segment with its size, the customers and services using the node/cable. As such, the model can derive the cost of service all the way down to customer and any aggregation above customer

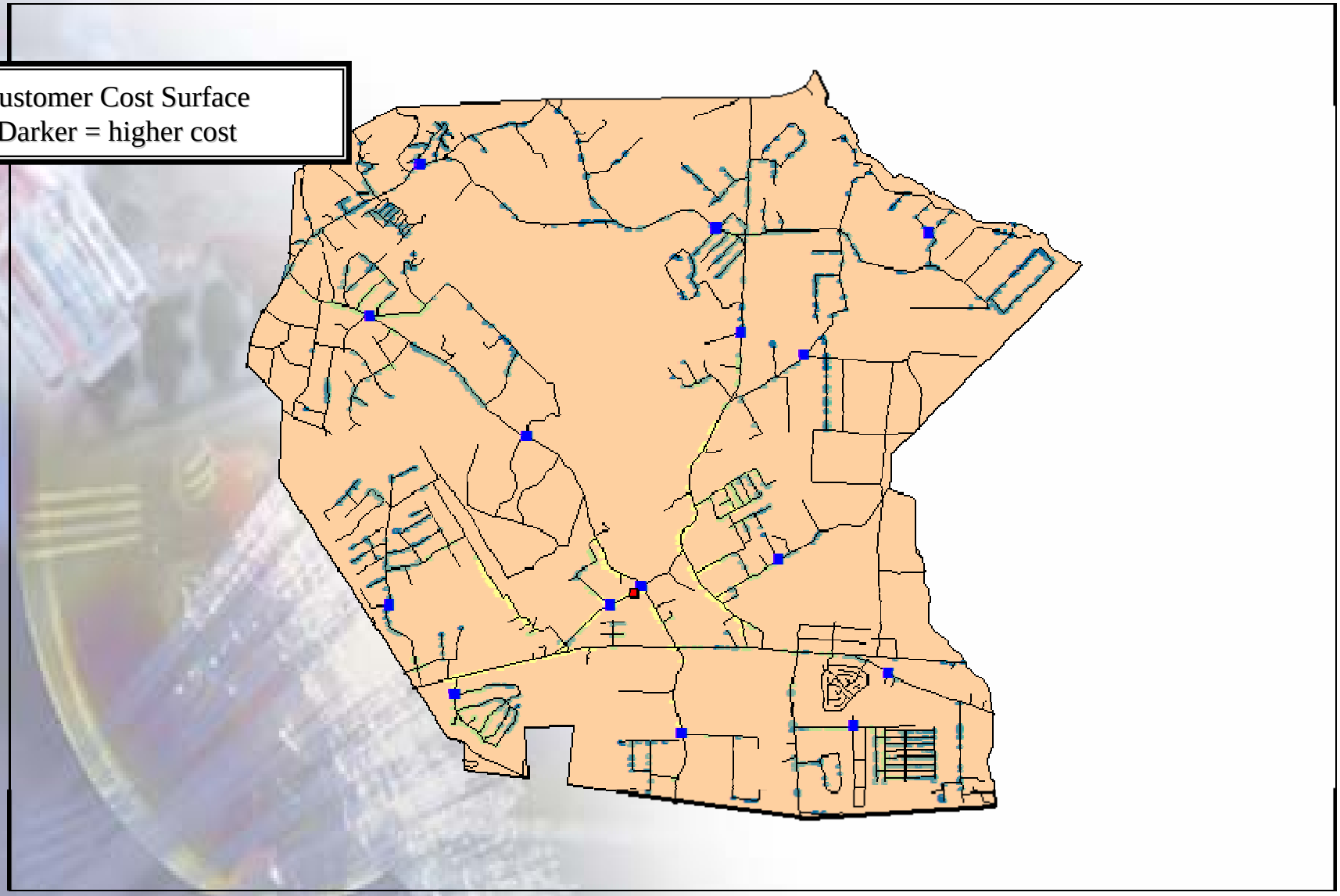
Legend:
- – Digital loop carrier
- – Copper Fed X-Box
- – Pedestal
- – Fiber Feeder
- – Copper Feeder
- – Distribution

CostPro Visualization – Sub Wire Center Detail



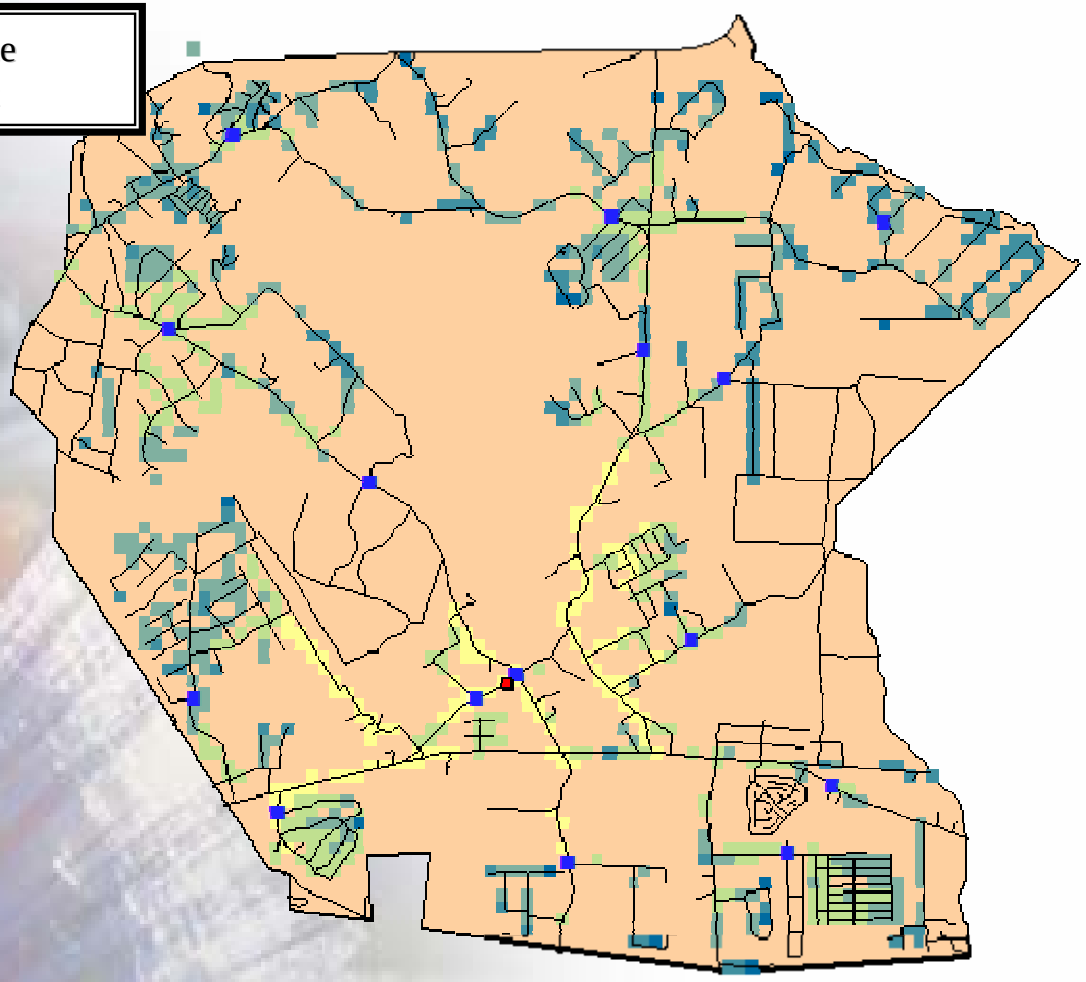
With the ability to develop cost at any level within a wire center, cost surfaces can be developed that represent the average costs of customers within the selected geographic bands

CostPro Visualization – Sub Wire Center Detail



CostPro Visualization – Sub Wire Center Detail

500’ Grid Cost Surface
- Darker = higher cost



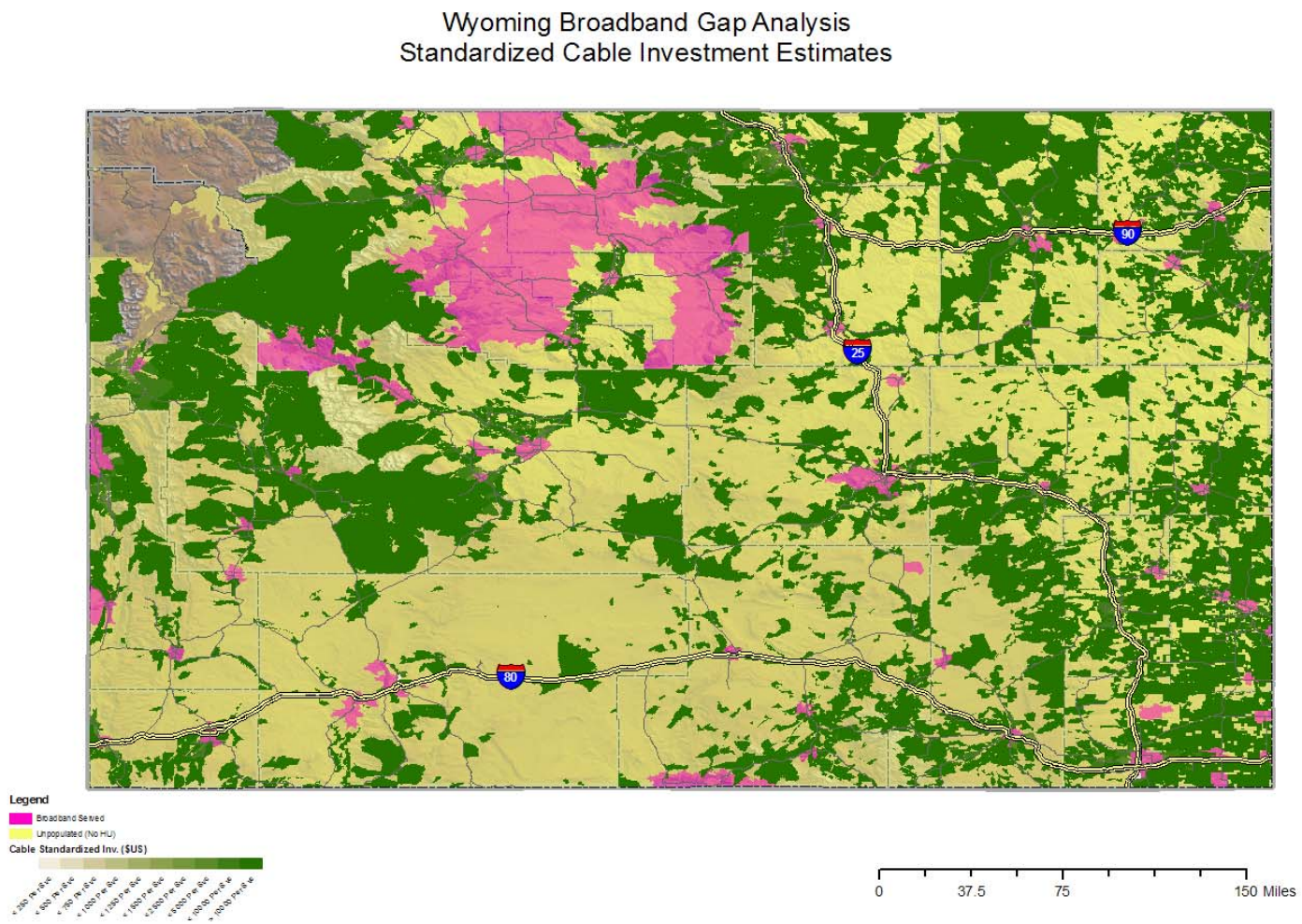
GIS Analysis and Multi-Modal Network Comparison

Wyoming Broadband Study

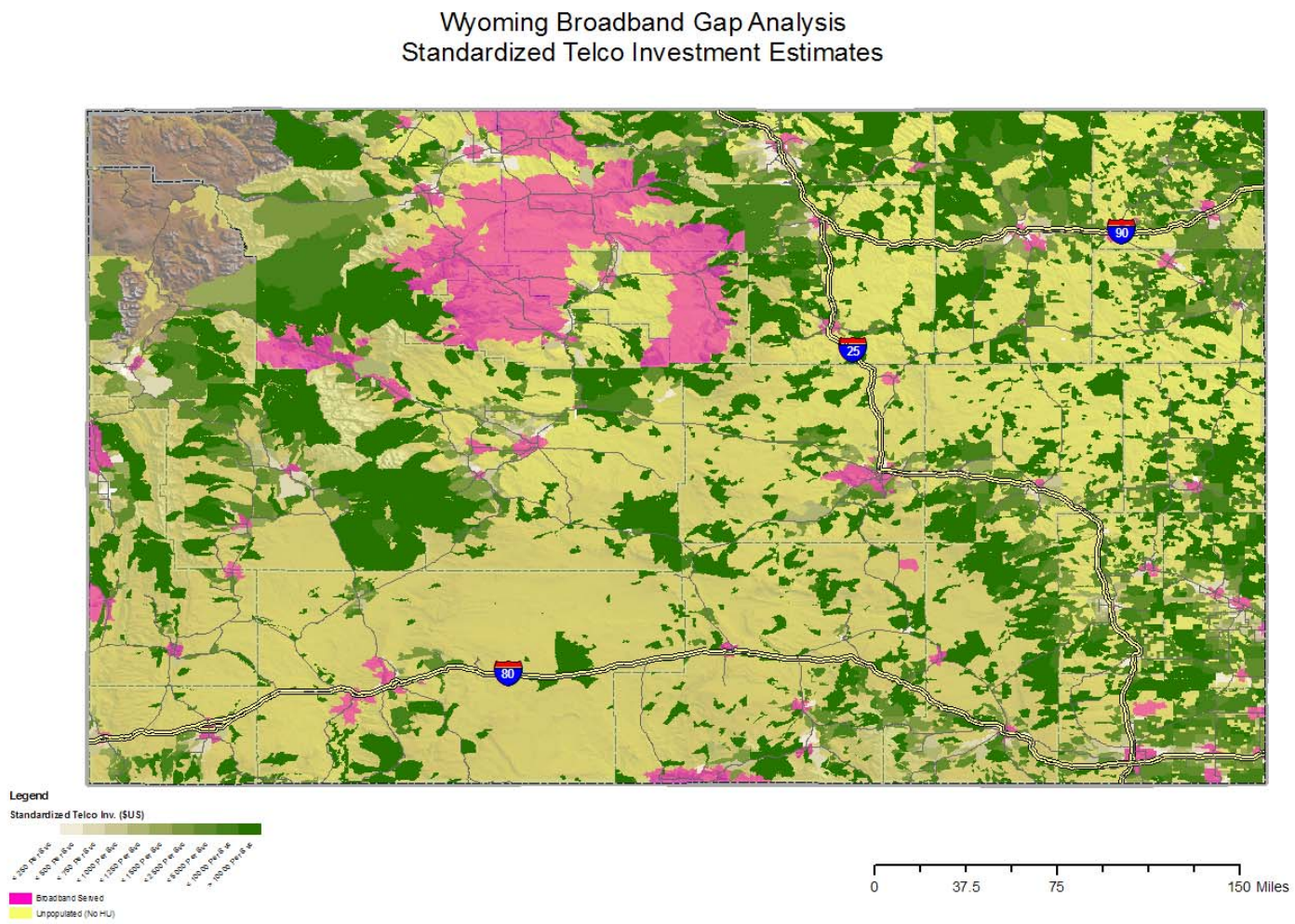
Definition of Study

- Goals of study was
  - Identify Broadband Gap Areas
  - Determine the cost to deploy in a Broadband Gap Areas
    - Technologies being compared
      - Hybrid Fiber/Coax—Cable
      - Fiber/Copper DSLAM—Telco
      - Fixed Wireless—Wireless
      - Satellite
- Broadband capacity was defined as at least 1 Mb/Sec downstream and 256 Kb/Sec upstream

CostProWY
Cable Broadband Augmentation Investment



CostProWY
Telco Broadband Augmentation Investment



CostProWY
Wireless Broadband Augmentation Investment

Wyoming Broadband Gap Analysis
Standardized WISP Investment Estimates