COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

**In the Matter of:**

| | | |
|---|---|---|
| **THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONSTRUCT FACILITIES ACCORDING TO THE APPLICANT'S 01/01/2012 ~ 12/31/2015 CONSTRUCTION WORK PLAN** | ) ) ) ) ) ) | **CASE NO. 2011-00442** |

**REDACTED RESPONSE OF CUMBERLAND VALLEY ELECTRIC, INC. TO THE COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION TO CUMBERLAND VALLEY ELECTRIC, INC. DATED FEBRUARY 17, 2012**

**FILED: MARCH 14, 2012**

**The Witness for all Responses Contained Hereinafter is Mark Abner, Engineering Manager of Cumberland Valley Electric, Inc.**

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## VERIFICATION

**COMMONWEALTH OF KENTUCKY** )
) **SS:**
**COUNTY OF KNOX** )

The undersigned, **Mark Abner as the Engineering Manager of Cumberland Valley Electric, Inc.,** after being duly sworn states and avers that he has personal knowledge of the matters set forth in the response for which he is identified as the witness and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Mark Abner
**MARK ABNER**
**Engineering Manager of**
**Cumberland Valley Electric, Inc.**

Subscribed and sworn to before me by **Mark Abner** on this 13 TH day of March 2012.

Deborah Barry
NOTARY PUBLIC, State-at-Large

My Commission Expires: Jan 18 2014

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 1**

**Witness:** Mark Abner

Q1. Refer to paragraphs 10 and 11 of the Application and Section E of the Executive Summary in the Application. Provide a breakdown of the costs by year that reflect the exclusions contained in Section E, paragraph 11.

**A1.**

| | 2012 | 2013 | 2014 | 2015 | ALL YEARS |
|---|---|---|---|---|---|
| 740c – 615 | $200k | $200k | $0 | $0 | $400k |
| 740c – 1501 | $0 | $330k | $300k | $300k | $990k |
| Yearly Tot. | $200k | $530k | $300k | $300k | $1,330k |

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 2**

**Witness:** Mark Abner

Q2. Refer to Item C.3. of the "Basis of Study and Proposed Construction." The 2010 Operations and Maintenance Survey listed two items that required corrective action. Explain what procedures have been put in place to address those problems.

A2. **Item 1: Telephone poles left standing close to the electric pole should be removed.**

**This is in regard to CVE poles that have been replaced having one or more third party attachments still in place. The upper portion of such poles is usually removed above the highest third party attachment. The CVE Engineering Department is collecting third party pole numbers from such structures and is forwarding same to attachment owners with requests for attachment transfer to the new pole. It is usual for the last attachment owner, which is typically the telephone provider, to remove the pole stub after their attachment has been transferred. CVE is identifying such structures by way of its pole inspection program and annual facilities inspections, as well as at the beginning of any planned pole replacements project.**

**Item 2: Cable TV attachments require constant monitoring and follow-up to ensure code requirements are met.**

**This is in regard to possible NESC violations of cable TV attachments. Many such code violations result from CATV placement of attachments without adequate pole space being present, hence the need for monitoring. The CVE Engineering Department is advising cable TV companies operating in its territory and upon its poles of the requirements of CVE's established Cable Television Attachment Tariff. That tariff provides procedures for proper administration of CATV attachments within the frame work of the NESC. CVE intends to proactively engage these companies in this regard to ensure their compliance with NESC requirements.**

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 3**

**Witness:** Mark Abner

Q3. Refer to Exhibit C of the Application. Explain why three of the projects contained in the prior Construction Work Plan were cancelled.

**A3.** Item No. 308.01 was cancelled because little, if any, additional load was added to the subject conductor above the base model loading. Therefore, this project was deemed unnecessary.

Item No. 310.01 was cancelled because the exact location for the new Girdler Substation was not known at the time the work plan was completed. After the new sub was built, an alternate route for the distribution exit circuits was selected leaving the existing 1/0 ACSR line in place.

Item No. 315.01 was cancelled because actual loading of the existing 4/0 ACSR DC line did not warrant conductor replacement.

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 4**

**Witness:** Mark Abner

Q4. Refer to page 10 of the CWP document prepared by consultant Patterson & Dewar Engineers, Inc. Under Section I, the replacement of the CVE radio system is noted.

a. The above replacement is supported by a study "by a reputable engineering firm with experience in radio communications . . . ." Provide the study and the name of the engineering firm.

b. The statement, "[t]he many benefits of an accurate and modern AM/FM/GIS system are well documented in the industry . . . ." Provide that documentation or the sources of such.

A4. **a. Power Systems Engineering of Madison, Wisconsin, conducted the study. Said study is attached hereto as Appendix A.**

**b. ESRI is a company that produces software which many utilities use in mapping and GIS applications. The AM/FM/GIS system proposed by Cumberland Valley Electric is based on producing data in ESRI format and using ESRI software. The ESRI web-site provides a page that contains case studies of various utility projects. Within these case studies are statements from several utility leaders on how these projects have benefited their companies. The case study page can be found at the following link:**

http://www.esri.com/showcase/case-studies/index.html#utilities_and_communication_panel

**Many of these case studies are for electric utilities. Although Cumberland Valley Electric would not plan to implement every single aspect of GIS and mapping shown in all of these case studies, these reports and statements from utility employees help to give an overview of some of the benefits that can be achieved from implementing such technologies.**

**An "Outline of Information to Support GIS Financing" for Inclusion in 2012-2015 Construction Work Plan is included as APPENDIX B.**

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 5**

**Witness:** Mark Abner

Q5. Refer to Exhibit B, page 1. Explain the item "Transformers for voltage conversion on Jellico Creek Substation in Year 3." Give the voltages involved and the reasons for the change.

**A5. The Jellico Creek Substation and the distribution system it serves is currently operates at 7.62/13.2 kV. The proposed voltage conversion project would increase the station voltage and all distribution system voltage to 14.4/25 kV. The annual losses associated with this system typically run at approximately 7 to 8 percent of energy purchased at the sub. This project will reduce losses by about 50%.**

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 6**

**Witness:** Mark Abner

Q6. Refer to the O&M Survey completed by the Rural Utilities Service ("RUS") Field Representative where foreign structures and attachments are noted as needing attention for improvement. Explain what plans are being made to specifically address those situations.

**A6. These are the same situations addressed by Question 2 above. Please see CVE response A2.**

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 7**

**Witness:** Mark Abner

Q7. It was noted in Exhibit L that primary conductors are considered for replacement when loaded to 65 percent of the thermal rating. In Exhibit R, several accounts are indicated to be loaded to over 65 percent. Are these large power loads addressed the same as primary conductors and are they being considered for replacement? Explain.

**A7. The large power loads listed by Exhibit R are served by primary conductors, but are not primary conductors themselves. The load factor associated with each account represents the percentage of time that their measured peak load is present on the system. This load factor, when in excess of 65 percent, does not equate to primary lines being loaded in excess of 65 percent of thermal loading. There are no primary conductor upgrades planned for any of the accounts depicted by Exhibit R.**

**CUMBERLAND VALLEY ELECTRIC, INC.**

**CASE NO. 2011-00442**

**Response to Commission Staff's First Request for Information**
**Dated February 17, 2012**

**Question No. 8**

**Witness:** Mark Abner

Q8. Refer to Exhibit E, page 2, with regard to RUS Form 740c and Accounting Code 601.

a. There is a cost detail for new meters and new replacement meters. Describe the type of meters that Cumberland Valley Electric proposes to install in these two categories, giving the functions and capabilities of such meters in relation to existing meters being used.

b. Are these new meters an upgrade to more advanced AMR/AMI - capable meters?

**A8.** **a. Specifically, the term "New Meters" refers to meters that CVE expects to place on newly constructed premises as required by connecting new members. The term "New Replacement Meters" refers to meters that are intended to replace existing meters at existing member's premises. Generally speaking, the type of meter to be used for both categories is the same. CVE has been using, and expects to continue to use, Landis + Gyr's Focus AL form 2S meters for all single phase accounts. This meter will be used for both new premises and meter replacements. CVE has a significant number of legacy electro-mechanical meters fitted with Hunt Technologies TS2 endpoints. These will be gradually replaced with the Focus AL digital meters in conjunction with CVE's meter testing program. The Focus AL meter has the capability of measuring kilowatt-hours and line**

voltage and delivering same to the cooperative via Hunt Technologies TS2 system. Electro-mechanical meters can only measure kilowatt-hours.

b. The Focus AL digital meter is considered to be a more advanced AMR/AMI capable meter, namely in that it can measure line voltage.

# APPENDIX A

## Cumberland Valley Electric

***GIS Overview***

# Cumberland Valley Electric

KY57 Bell

November 8, 2011

Outline of Information to Support GIS Financing for Inclusion in 2012-2015 Construction Work Plan or CWP Amendments

1) Describe the planning process that was utilized in determining to proceed with a GIS implementation, including use of any pilot program, investigation of process used by other utilities, studies issued by CRN or others, use of consultants, etc.

   CVE has an existing GIS database that is a personal geo-database that resides on a single work station. CVE's plan is to upgrade this system to a server based GIS system. Other cooperatives have been contacted and it was found that most have implemented such systems.

2) List of GIS applications intended to be implemented, broken into the following general categories: traditional mapping, engineering, operations, planning and environmental, business and marketing, management, and shared services. This list will assist in understanding system priorities, by identifying when the individual applications will be implemented (i.e. immediate, near-term, or long-term).
   - Traditional mapping (immediate)
   - Staking (near term)
   - Engineering analysis models (near term)
   - R/W maintenance
   - Operations – future Outage Management support (long term)

3) Describe the data design standards and metadata that will ensure interoperability of GIS data with other borrower systems and systems of other parties (power supplier, transmission provider, government entities or PUC) with which the borrower may be required to share data.

   Data is expected to be formatted for ESRI version 9.3 based GIS products. Most other cooperatives use these products, therefore interoperability should be assured. CVE's power and transmission provider, East Kentucky Power Cooperative, as well as the Kentucky Public Service Commission and the US Forest Service are capable of using data produced by these software products.

4) List of both tangible and intangible benefits expected to be generated through GIS implementation.
   - Maps will be maintained daily instead of monthly to quarterly, thereby providing up-to-date maps.

- Implementation GIS system and a software staking solution based on GIS data will streamline staking and work order processes, thereby saving time and money.
- GIS data can be used by service personnel for damage assessment and regulatory inspections.
- Server based GIS system will integrate with and support CIS, ABS, EA, OMS
- GIS along with field collection of GPS and inventory data will provide for enhanced facilities management and correct plant asset records, thereby possibly saving property tax.

5) Details concerning the following GIS component elements requested for financing:
   a) Hardware: desk top or hand held computers, GPS units, etc, including the number of units to be procured which will be devoted to GIS use.
      - Three handheld GPS receivers to be used for staking and facility locating.
      - Three tablet or laptop machines for staking.

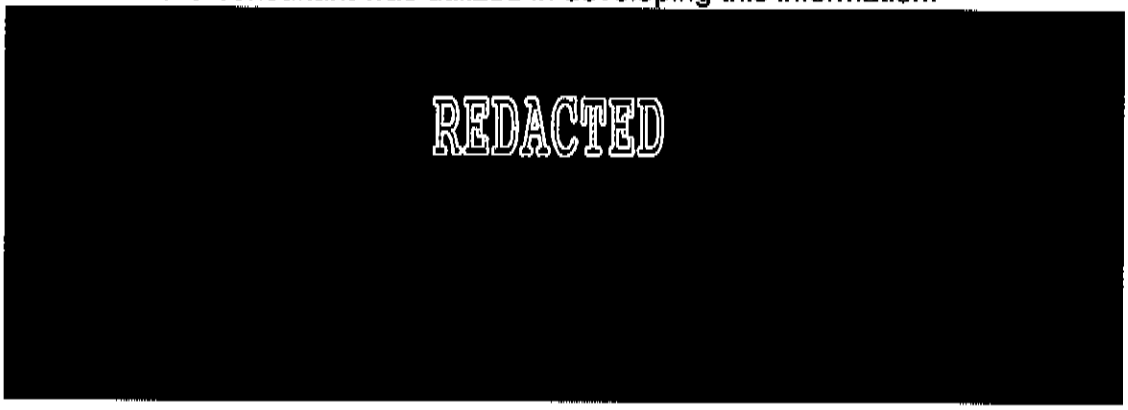
   b) Software: automated mapping/facilities management (AM/FM) software, geographic information system software (GIS), data viewer software, computer aided drafting software, business geographic software, including the specific software packages being utilized, if possible, as well as the number of software licenses being procured.
      - Server based GIS system – Futura Map
      - Staking software – Futura Stake
      - Map viewing software – Futura Viewer
      - 3 ESRI ArcView 9.3 License
      - 1 ESRI ArcEditor 9.3 License
      - 1 ESRI ArcServer 9.3 License

   c) Field Inventory: list of specific information that will be gathered and resources used to do so.
      - GPS coordinates of substations, poles, meters, pad transformers, pedestals and junction boxes
      - Pole size, class and year along with inspection dates
      - Attachments to poles and anchors of third parties
      - Primary, secondary and service wire sizes
      - Conductor phasing
      - Pole top assembly units

- Equipment types and sizes – transformers, reclosers, sectionalizers, regulators, capacitors, fuses and security lights

A contractor such as Davey Resources or Patterson-Dewar Engineers will be used to perform field inventory functions.

6) Budgeted costs for each GIS component. Due to the importance of this information, provide specific elements of cost within the categories of hardware, software, field inventory, conversion of existing data, training, etc. Indicate whether a GIS consultant was utilized in developing this information.




7) Time-lines for GIS implementation including the extent to which GIS costs have been included in the current year's budget as well as costs to be incurred in coming years. If a portion of the GIS implementation has been completed in prior years, list what activities and their associated costs have already been performed and over what time period.

GIS system implementation and training is expected to take place during the first quarter of 2012. 2012 is the budget year for all cost items listed above except that the field inventory portion is expected to take longer than one year to complete. ESRI licensing and software support fees will recur yearly and monthly, respectively.

A field inventory pilot project started on Monday, October 31, 2011, and should be completed by the first of December, 2011. This pilot project includes all facilities and consumers served by CVE's Pine Mountain Substation. The cost is expected to be approximately $14,000.

8) Staff and outside resources to be utilized in establishing the GIS system as well as for on-going maintenance of data collection and entry. Indicate the number and position of new employees required, whether existing employees will be utilized on a part-time basis, as well as any consulting assistance or contractors to be utilized in the process.

CVE's engineering manager will oversee implementation of GIS system and training of engineering department employees in its use, operation and maintenance. The software vendor will be responsible for software implementation and training. The department's three current staking technicians will maintain the GIS database through use of the software staking solution. It is expected that editing, data collection and system maintenance will be performed by one new full time GIS administrator/technician. It is likely that outside resources may be required for system support and maintenance until the new GIS administrator/technician is employed and properly trained.

9) Training that will be provided to ensure a successful deployment, including specifics of training being provided and by what parties, number of employees to be trained, and over what time period this training will be offered.

Training will be provided for CVE's engineering manager, its three current staking technicians and new GIS administrator/technician. Training will take place immediately after software is successfully implemented and tested. The software vendor, Futura GIS Systems, estimates 15 days will be required for implementation and training. The exact date of software implementation is not yet known, but is expected to be during the first quarter of 2012.

Training specifics include:

- Map Viewing
- Map editing
- Use of staking software and field equipment
- Data collection and revision

10) Describe the processes to be used for collecting field data as well as the conversion of existing mapping data, to ensure a successful integration into the overall GIS system. What external GIS data sets are planned to be used.

Field inventory data collection will be performed by a third party provider. They typically use two person teams consisting of a driver/map operator and an equipment operator that physically visits each asset feature being inventoried. The data compiled is formatted for the particular GIS system platform with which it will be used.

CVE staking technicians will collect GPS coordinates and field data using hand held receivers during their field visits for new construction or retirement activities. Once data is collected, the technician will import collected data into staking solution for production of work orders.

External data sets that may be used include, but not necessarily limited to:

- Google Earth imagery or Department of Agriculture imagery
- County property tax office parcel records
- Kentucky Public Service Commission territorial boundary data

- G&T transmission line and switch location data
- Publicly available land base data such as county, hydrology, highway, rail line, incorporated city, school tax and fire department data
- FEMA flood map data

11) Extent to which the mapping system will be integrated with other computerized applications, including engineering analysis, customer information system, work order tracking and outage analysis.

Immediately after implementation, integration will be in place between GIS system and CVE's CIS and accounting/work order systems. The new GIS system will provide work order tracking inherently. It will also immediately support engineering analysis but may not be fully integrated with it. CVE does not currently own or operate software driven outage management system, nor does it plan to in the near future. Should CVE plan for OMS implementation, a software module can be added to the GIS package to provide this functionality, or a third party solution may be used that GIS system will integrate with and support.

12) Board action to authorize the overall plan for implementing the GIS system including recognition of the time-lines, costs, and overall resources to be utilized. Include the board resolution as well as the information that was provided to them for their review.

The Cumberland Valley Electric board of directors was presented with a proposed 2012-2015 work plan on October 13, 2011. This GIS project was included in the proposed plan. A copy of their resolution to adopt the work plan is attached hereto.

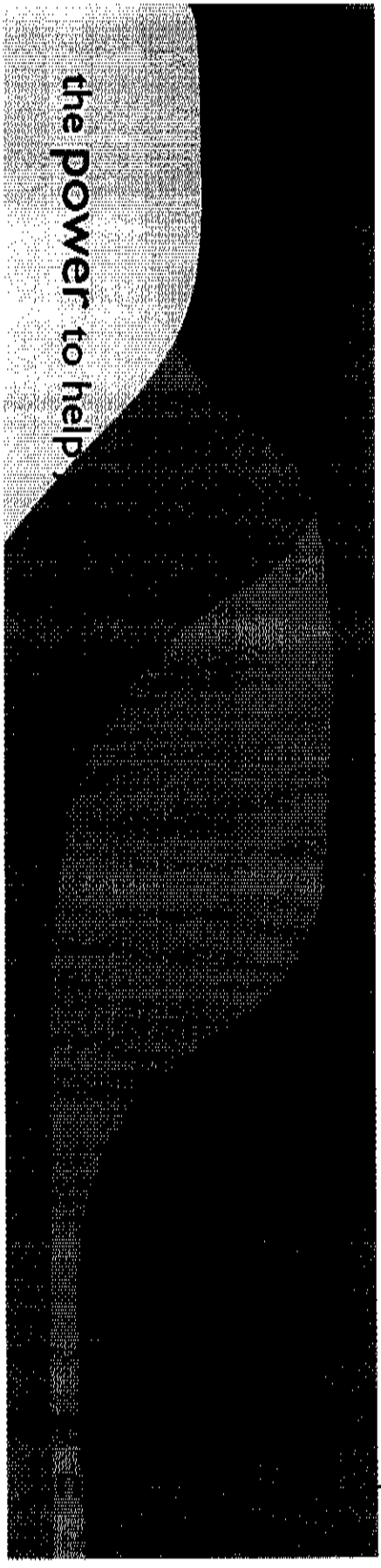
# CUMBERLAND VALLEY ELECTRIC

**GIS COST SUMMARY**

# APPENDIX B

## Cumberland Valley Electric

## *Communication Assessment Report*




Cumberland Valley Electric, Inc.

A Touchstone Energy® Cooperative

# Communications Assessment Report

November 8, 2010

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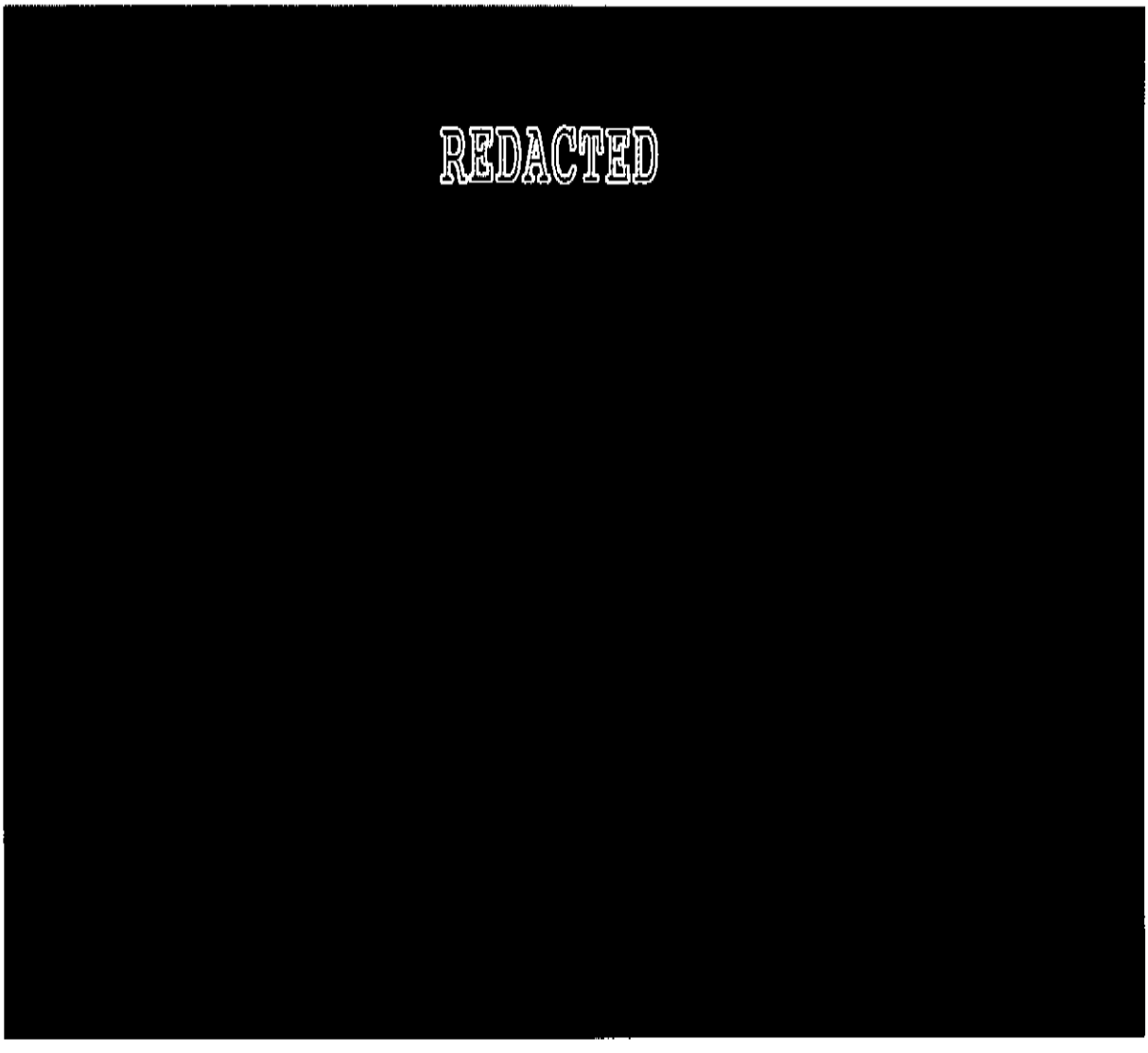
# 1 Project Overview and Goals

Cumberland Valley Electric's (CVE) present low band mobile radio system is dated, replacement parts are becoming difficult to find, and there are fairly large coverage gaps exist with cellular. A reliable, private mobile voice communication system replacement is imperative to provide high quality electric service. Also of utmost importance is interoperability with Eastern Kentucky Power Cooperative's radio system.

Cumberland Valley hired Power System Engineering, Inc. (PSE) to lead the effort and provide resources to evaluate Land Mobile Radio (LMR) technologies. Figure 1 below illustrates our approach for the project.

The goals of the project were to determine:



# 2 Cumberland Valley Electric Current State

## 2.1 CVE Overview

### 2.1.1 General Information on CVE

Cumberland Valley Electric, Inc. (CVE) is an electrical distribution cooperative located in South Eastern Kentucky. The cooperative was formed by local business and community leaders in 1942 to bring electricity to the more rural areas of eastern Kentucky. Today, CVE serves over 24,000 members in Bell, Harlan, Knox, Laurel, Leslie, Letcher, McCreary, and Whitley counties in Kentucky as well as some members in Claiborne County, Tennessee. There are over 50 employees working at CVE to provide the electrical service for the cooperative. The headquarters for CVE is in Grays, Kentucky.

CVE is one of the 16 distribution member systems (cooperatives) that own and are served by Eastern Kentucky Power Company (EKPC). The member cooperatives set up EKPC as a not-for-profit generation and transmission utility with headquarters in Winchester, Kentucky. EKPC's purpose is to generate energy and ship it to co-ops that distribute it to retail customers. Today, EKPC provides wholesale energy and services to 16 distribution cooperatives through power plants, peaking units, hydro power and more than 2,800 miles of transmission lines. Together, EKPC and member cooperatives are known as Kentucky's Touchstone Energy Cooperatives. The distribution cooperatives supply energy to 519,000 Kentucky homes, farms, businesses and industries across 87 counties.

The service territory is illustrated in Figure 1 below.

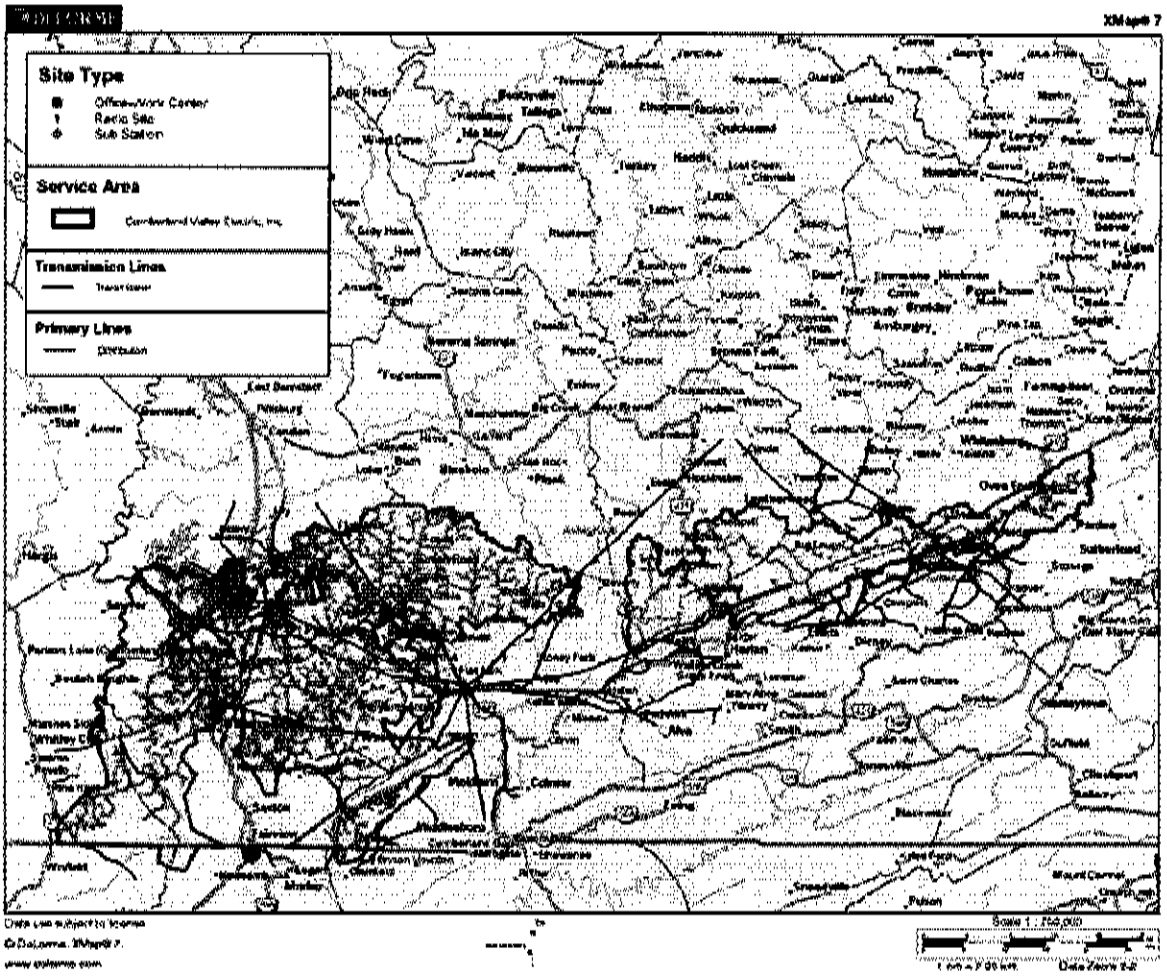



**Figure 2 CVE Service Territory**

### 2.1.2 CVE Corporate Culture

CVE tends to have a "wait and see" approach to adopting new technologies and concepts; a safe, conservative approach. With CVE's type of corporate culture, there is not an emphasis on programs often seen with early adopters (those quick to implement cutting edge or bleeding edge technologies):

- Targeted reliability improvements
- Broadband Internet for members
- Partnering with other entities (other than EKPC) for backbone build outs
- Major push for mobile data private infrastructure

Therefore, the solution options for the new mobile voice system that PSE focused on were not for the latest in cutting edge technologies. Instead, the technology choices presented for the mobile voice system were with well-established products and proven technologies. The

backbone suggestions were limited to only encompass the requirements for the new radio system, and not for future programs in progress at CVE.

# 2.2 Current CVE Communications Assets

### 2.2.1 Current Mobile Voice System

CVE currently is using an antiquated, simplex, conventional low-band mobile voice system that is owned and operated by EKPC. There are two tower remote base sites that CVE communicates to:

1. Johnson Hollow (Gilliam Knob), near Gray, KY HQ office
2. Joe Knob, near Cumberland, KY district office

Both tower sites are licensed by CVE on call sign KIA297 for one frequency, 37.54 MHz. The license is up for renewal on January 30, 2011. Some of the characteristics of the system are as follows:

- EKPC and CVE have their own receivers to hear mobiles calling.
- When either EKPC or CVE is transmitting, the other cannot receive calls.
- EKPC dispatch has access to CVE channel.
- Links from the CVE and EKPC dispatch offices to remote base sites is via a DS0 over microwave.
- The shared transmitters provide some degree of interoperability between CVE and EKPC since EKPC can select CVE's transmitter and vice versa via the dispatch centers.
- CVE has approximately 60 mobiles and 10 portables in use today.
- Current mobile voice system has some coverage gaps per the onsite PSE meeting in July 2010. Also, the mobile voice coverage gaps tend to be in the same place that cellular coverage is poor.

During a conversation with Terry Estes at EKPC, the following should be noted about the Johnson Hollow and Joe Knob tower sites:

1. The SCADA master radio and the current EKPC low band VHF two-way equipment are housed inside the respective EKPC shelters at each site.
2. Both shelters are undersized for the equipment they currently hold.
3. EKPC is installing a Motorola 150 MHz PassPort mobile voice radio system at both sites. The new EKPC radio equipment (two 24"x24" cabinets) just about fills the floor space in the shelters. Motorola installed the cabinets, leaving no room for another radio system. Therefore, if CVE would put in their own independent system, they would need to provide a

shelter or outdoor environmentally controlled cabinet at the site or locate the new system at towers other than Joe Knob and Johnson Hollow.

4. Microwave transceivers at the sites are:
   - Manufacturer: Western Multiplex Lynx HD4xT1
   - Model: 31350-10A1 (4 T1 capacity)
   - Frequency: 2.4 GHz Unlicensed to make use of the existing dishes

EKPC maintains the site remote base station equipment and Cornett Electronics maintains the radios in the CVE trucks. The service provided by Cornett Electronics is described as satisfactory. There is not currently a service level agreement (SLA) contract in place between Cornett Electronics and CVE.

Figure 2 below is a prediction model of the low band coverage across the CVE territory. The white areas within the territory map are uncovered areas based on propagation characteristics. There may be further open areas based on noise issues, which are common in low-band systems and difficult to model.

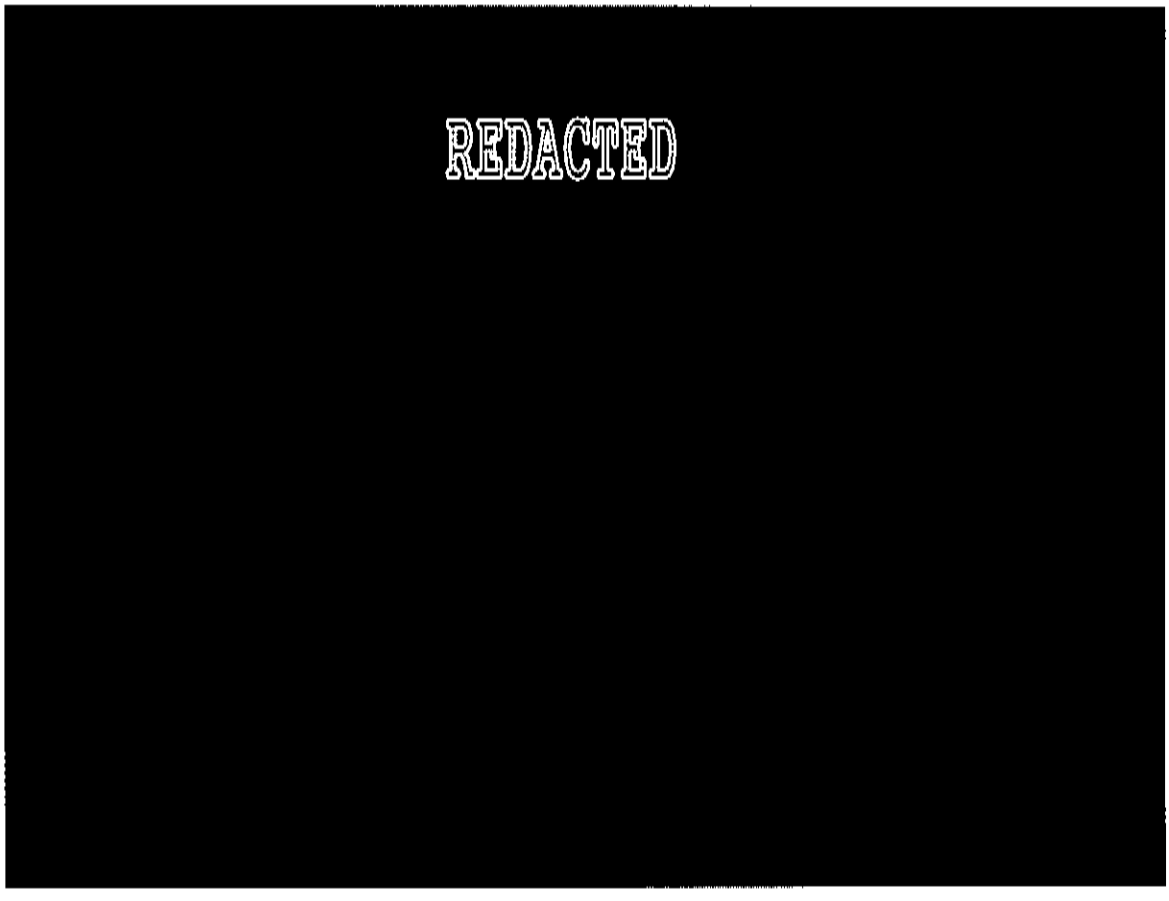



**Figure 3 CVE Prediction Model of Low Band Coverage**

### 2.2.2 Current Microwave Backbone System

There is a microwave system that interconnects the two CVE offices and mobile voice remote base stations on Johnson Hollow and Joe Knob via three links (See Figure 3 below). The microwave system is capable of four T-1s. The end links between the towers and the offices are 2.4 GHz unlicensed links owned by CVE. The licensed microwave link between tower sites is a four T-1 space diversity Alcatel MDR8000 system that is owned and operated by EKPC. Two of the four T-1s are currently in use by CVE:

- One T-1 channel bank is used for CVE telephones and mobile voice radio system. This channelized T-1 from the CVE channel banks is routed through an EKPC-owned RFL Mini-DACS, located at Johnson Hollow, for DS0 grooming and routing.
- One T-1 is used for WAN IP connectivity between the CVE offices that is routed directly across the EKPC link.

The microwave is terminated at both offices into Telect TeleMix 4000 modular DSX jack fields. If CVE were to need an increase in bandwidth, a full bandwidth versus path reliability study would be required to verify that reliability would not be compromised.

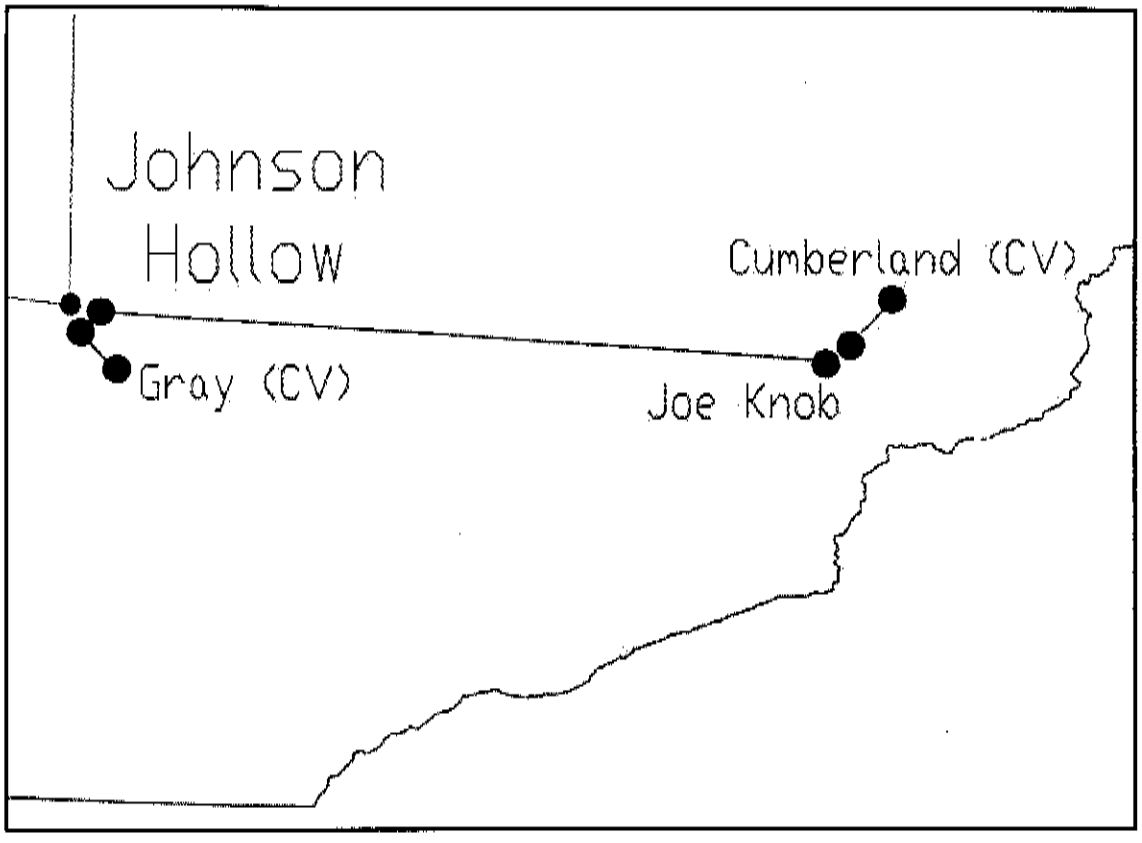



**Figure 4 CVE Microwave System**

### 2.2.3 Current CVE Operational Data Systems

CVE has eighteen substations throughout the territory. Below is a list of the current substations and the communications medium in place.

| Substations | | Latitude | Longitude | Media in Place |
|---|---|---|---|---|
| 1 | Emanual | 36° 55' 33.68" N | 83° 53' 57.37 W | POTS/DSL/4W DATA |
| 2 | Hinkle | 36° 52' 55.84" N | 83° 49' 47.38" W | POTS/DSL/4W DATA |
| 3 | Alex Creek | 36° 54' 34.80" N | 83° 36' 08.55" W | POTS/CATV MOD./4W DATA |
| 4 | Girdler | 36° 56' 24.26" N | 83° 50' 49.70" W | POTS/DSL/4W DATA |
| 5 | North Corbin | 36° 57' 50.79 N | 84° 03' 01.42 W | POTS/DSL/4W DATA |
| 6 | Liberty Church | 36° 54' 00.83" N | 84° 03' 16.06" W | CATV MOD./EKP SCADA RADIO |
| 7 | Bacon Creek | 36° 55' 04.26" N | 84° 07' 04.29" W | POTS(CATV MOD & DSL AVAIL.) |
| 8 | South Corbin | 36° 54' 29.14" N | 84° 06' 57.29 W | POTS/DSL |
| 9 | Cumberland Falls | 36° 52' 13.33" N | 84° 13' 01.27" W | POTS/4W DATA |
| 10 | Goldbug | 36° 47' 06.07" N | 84° 09' 55.12" W | POTS/CATV MODEM |
| 11 | Rockhold | 36° 49' 42.91" N | 84° 06' 24.93 W | POTS/4W DATA |
| 12 | Jellico Creek | 36° 40' 55.17" N | 84° 16' 18.11" W | POTS |
| 13 | Carpenter | 36° 43' 35.02" N | 84° 28' 34.11" W | POTS/4W DATA |
| 14 | Bledsoe | 36° 53' 29.18 N | 83° 22' 07.25" W | POTS/DSL/4W DATA |
| 15 | Pine Mountain | 36° 56'07.12" N | 83° 13' 17.19" W | POTS/4W DATA |
| 16 | Chad | 36° 55' 16.58" N | 83° 01' 23.02" W | POTS/DSL/4W DATA |
| 17 | Oven Fork | 37° 02' 32.08" N | 82° 50' 10.21" W | POTS/4W DATA |
| 18 | Ark Land | 37° 00' 16.32 N | 82° 52' 23.05" W | POTS |

CVE uses Futura GIS Systems and ESRI ArcMap mapping tools for their GIS needs. CVE personnel have laptops with GIS map viewer software. Many of the substations have Wi-Fi mobile hotspots that allow them to download data.

Garmin NUVI GPS navigation units are also in the trucks loaded with the CVE maps. However, during the visit in July, it was determined that most of the line personnel do not use the Garmin GPS data since they have local knowledge of the CVE electrical system and geography.

# 3 Future Mobile Voice System Needs

### 3.1.1 Mobile Voice State of the Industry Presentation

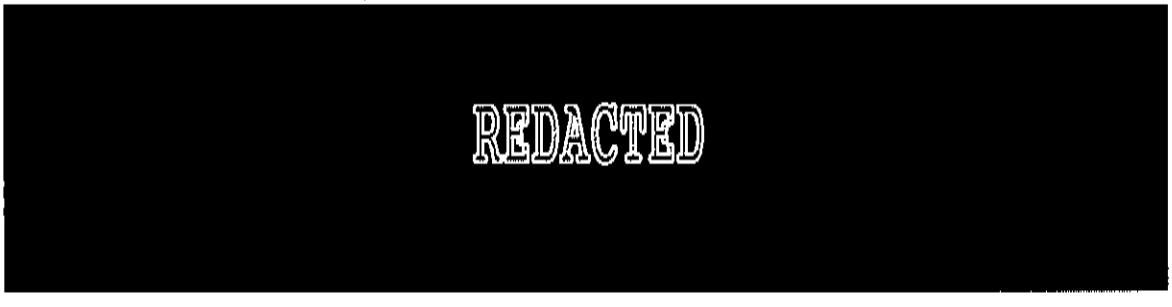
PSE provided a mobile voice state of the industry presentation to CVE personnel in July 2010. During that visit we discussed several types of mobile voice systems, including:

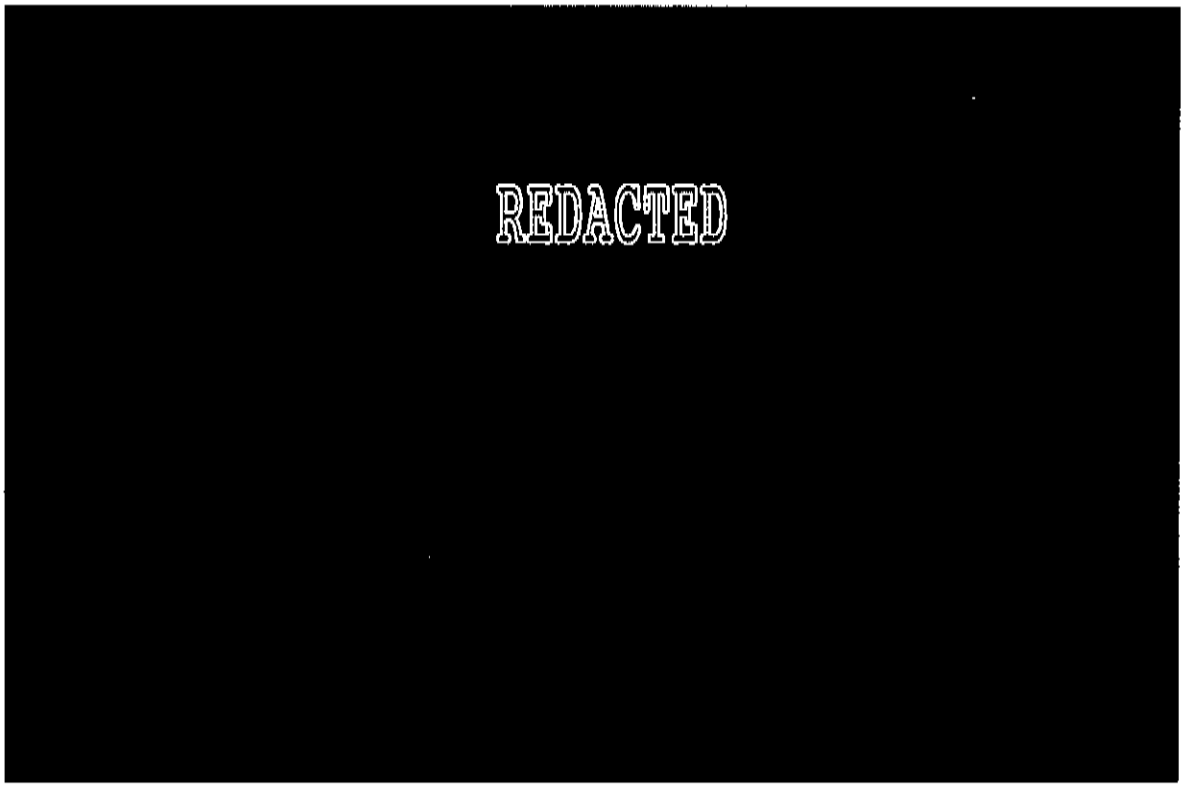
- Conventional simplex radio systems - like CVE's present system.
- Conventional single channel repeater radio systems.
- Conventional multiple channel repeater radio systems.
- Voted and simulcast multiple site conventional radio systems.
- Analog trunked radio systems.
- Digital trunked radio systems.


During the presentation, we discussed propagation characteristics of radio frequency waves and other RF concepts. Additionally, we went through several mobile data concepts to better understand the mobile data needs at CVE.

### 3.1.2 CVE Future Mobile Voice Needs

During the visit in July, we determined the following critical mobile voice needs based on the presentation feedback and interviews from key personnel who use the system:






### 3.1.3 CVE Future Mobile Data Needs

During the visit in July we went through many possible mobile data requirements with CVE. They are summarized in the following table:

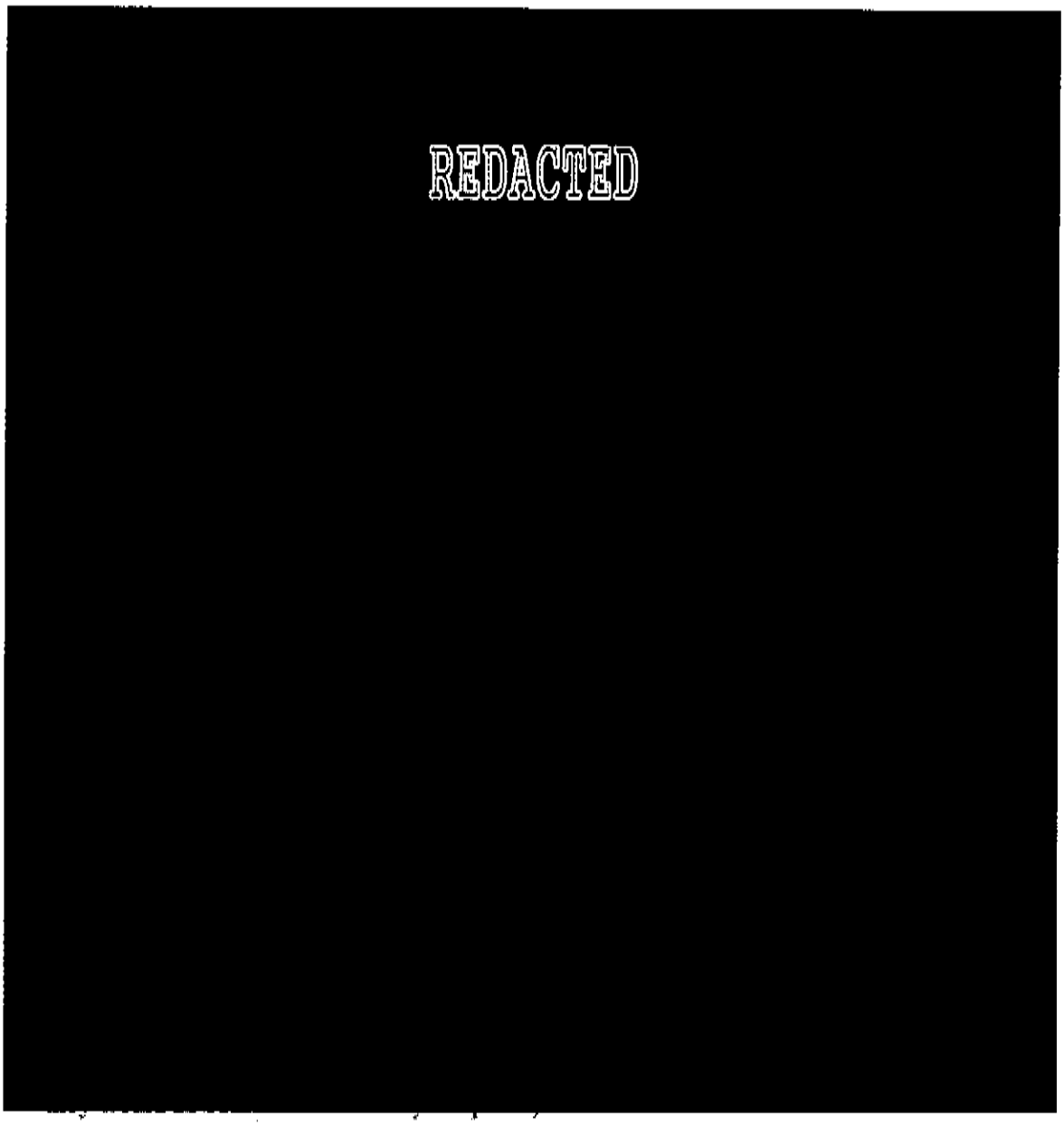
| Service | CVE Opinion | Communications Medium |
|---|---|---|
| Text Messaging | *Little Interest* | **Typically offered in all trunked mobile voice technologies** |
| **Automatic Vehicle Location** | ***Very Interested*** | **Mobile Voice** |
| Mobile GIS Viewing | *Already Using* | Garmin GPS Loaded with CVE Maps |
| **Service/Outage Orders** | ***Interested*** | **Mobile Voice (if field data only, not downloading forms)** |
| Work Scheduling | *Not Interested* | Not Applicable |
| **Time Sheets** | ***Not Interested*** | **Not Applicable** |
| Field Inspections | *Interested* | Via Laptops – Downloaded at Hotspot or office |
| **Staking** | ***Interested*** | **Via Laptops – Downloaded at Hotspot or office** |
| Tree Trimming Data | *Not Interested* | Not Applicable |

Automatic Vehicle Location (AVL) and service/outage orders could be transmitted to the vehicles via the mobile voice system. Conventional technologies have limited data capabilities and can affect the voice capacity. However, trunked radio technologies can provide controlled data at rates of approximately 2400 bps. Trunked technologies that incorporate a control channel can send the AVL data (and text messaging, either free form or canned messages) on the control channel without affecting the radio voice capacity.

Service and outage orders would use a voice channel operating at 2400 bps. Care is needed in choosing the mobile service/outage order software suite to limit the size of the transmissions.

# 4 Possible Solutions Development

## 4.1 Solution Criteria Overview

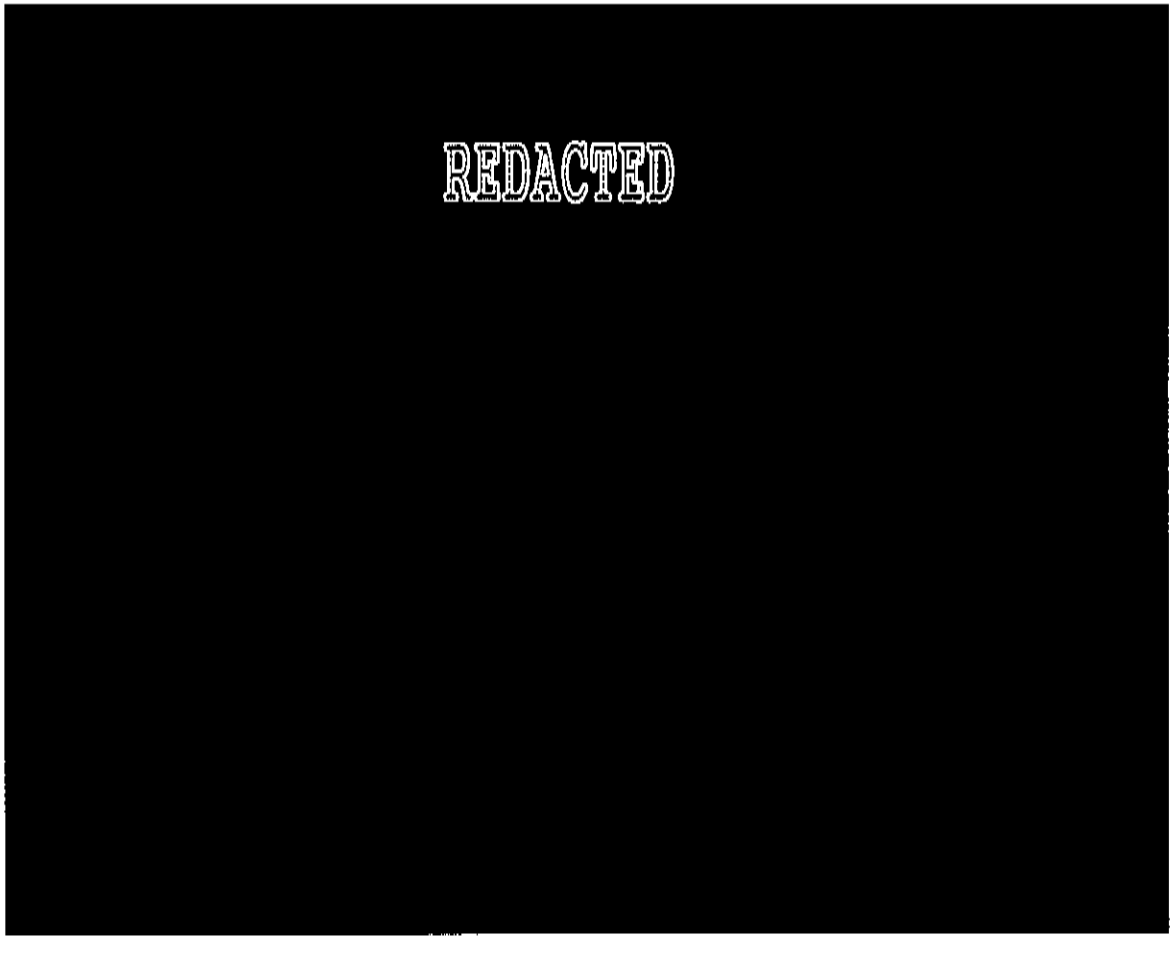


## 4.2 Technology Solution Focus

PSE did in-depth coverage predictions, features solutions, and budgetary numbers for the following three mobile voice solution alternatives:


## 4.3 Coverage and Towers

### 4.3.1 Coverage Prediction Model Assumptions



### 4.3.2 Review of Joining the EKPC 150 MHz Planned PassPort System

EKPC is in the process of installing a statewide 150 MHz trunked system to manage their day-to-day operations. This system has been contracted to Motorola and will be a PassPort system. There are three planned towers in this system that will provide coverage within the CVE territory:

1. Johnson Hollow
2. Joe Knob
3. McCreary County Switch Yard

Terry Estes, from EKPC, provided the following coverage map generated by Motorola using their proprietary propagation modeling tool. A careful look at the green coverage plot reveals that there will be significantly less than 95% coverage within the CVE territory.

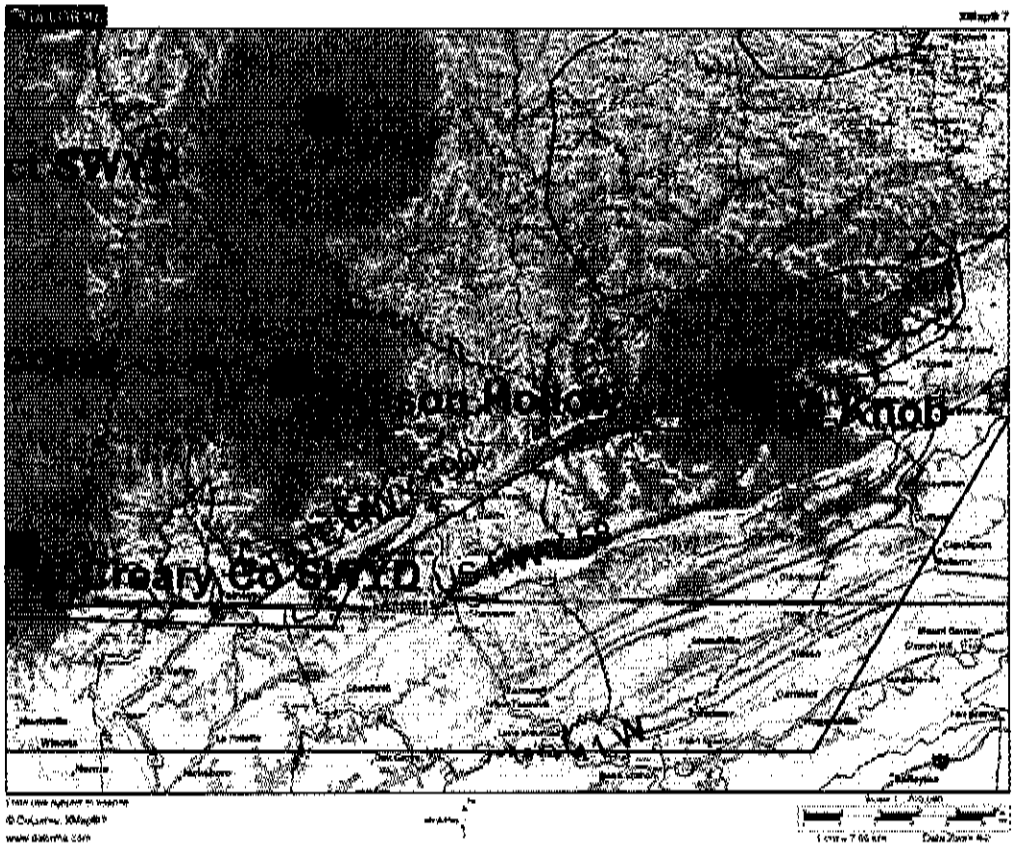
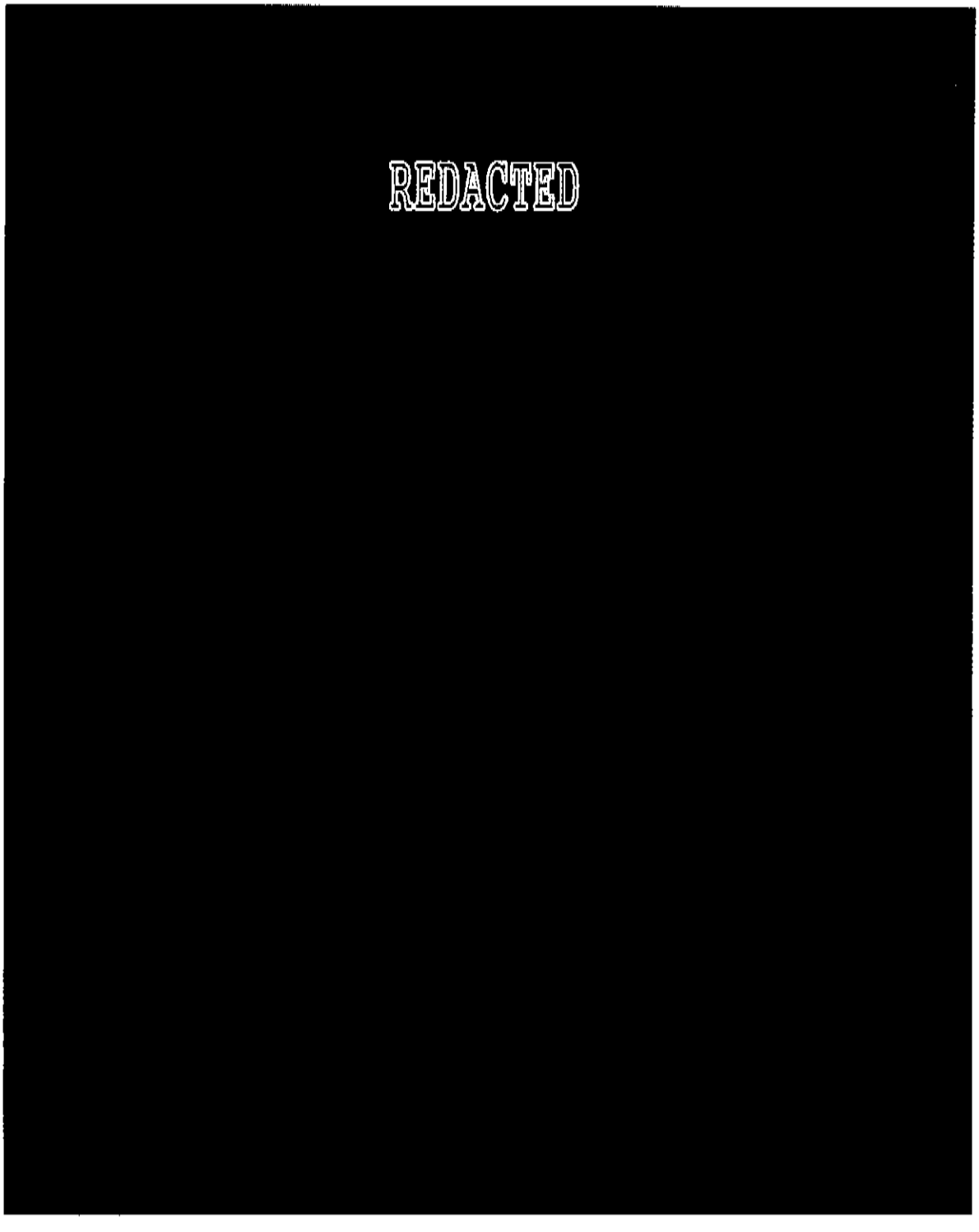


**Figure 5 EKPC Motorola Coverage Map**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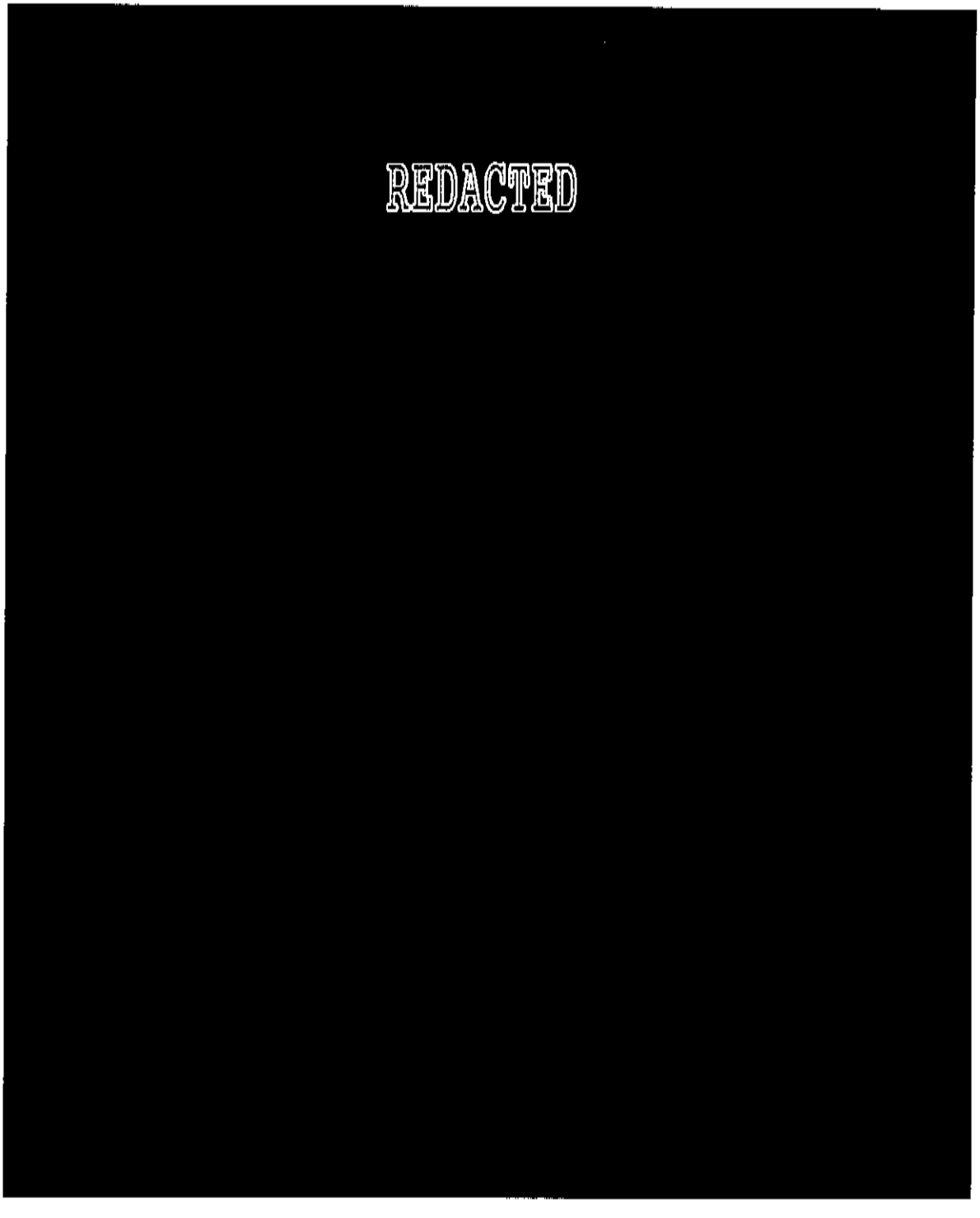
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### 4.3.3 Review of a 220 MHz (AMTS Spectrum) System

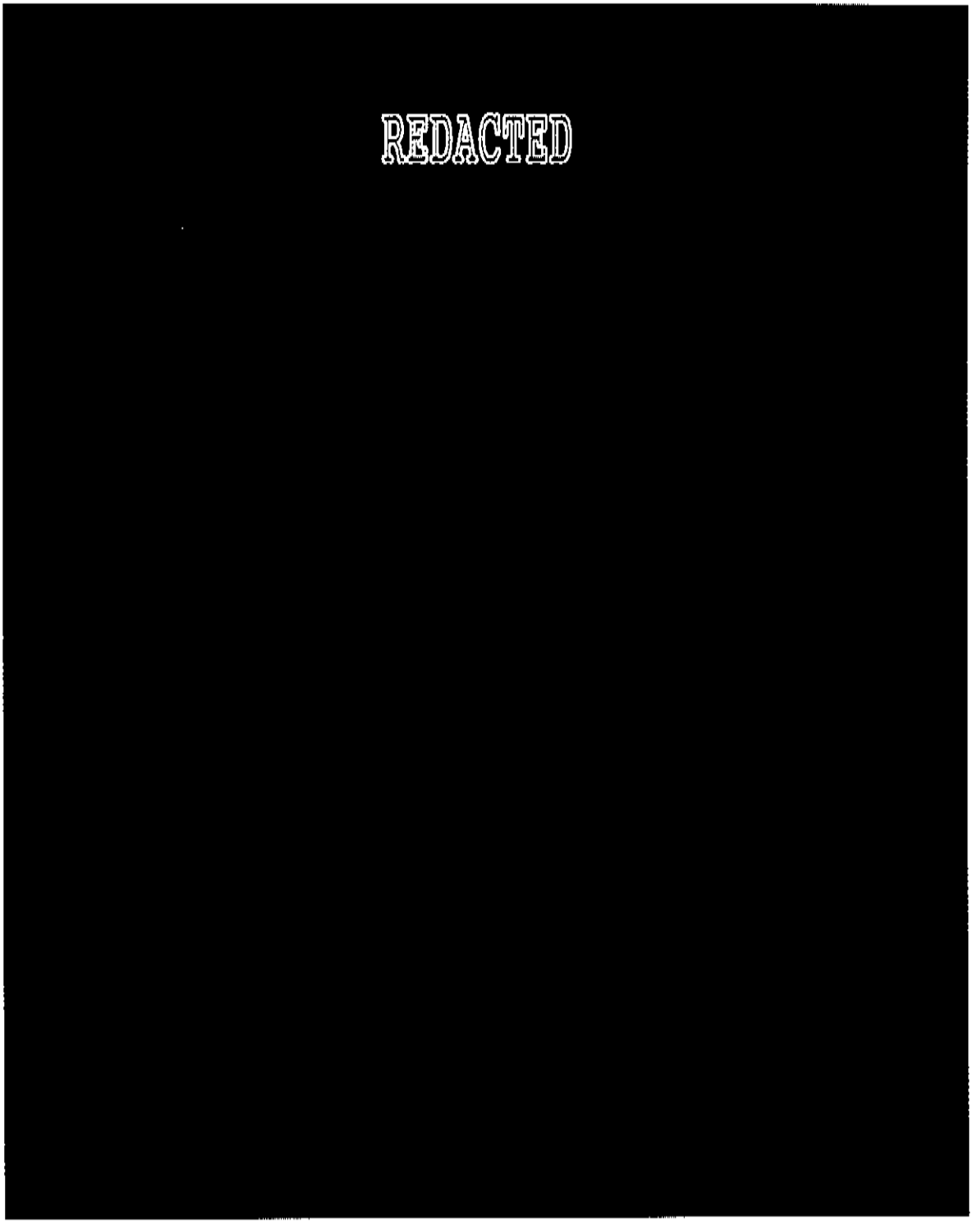
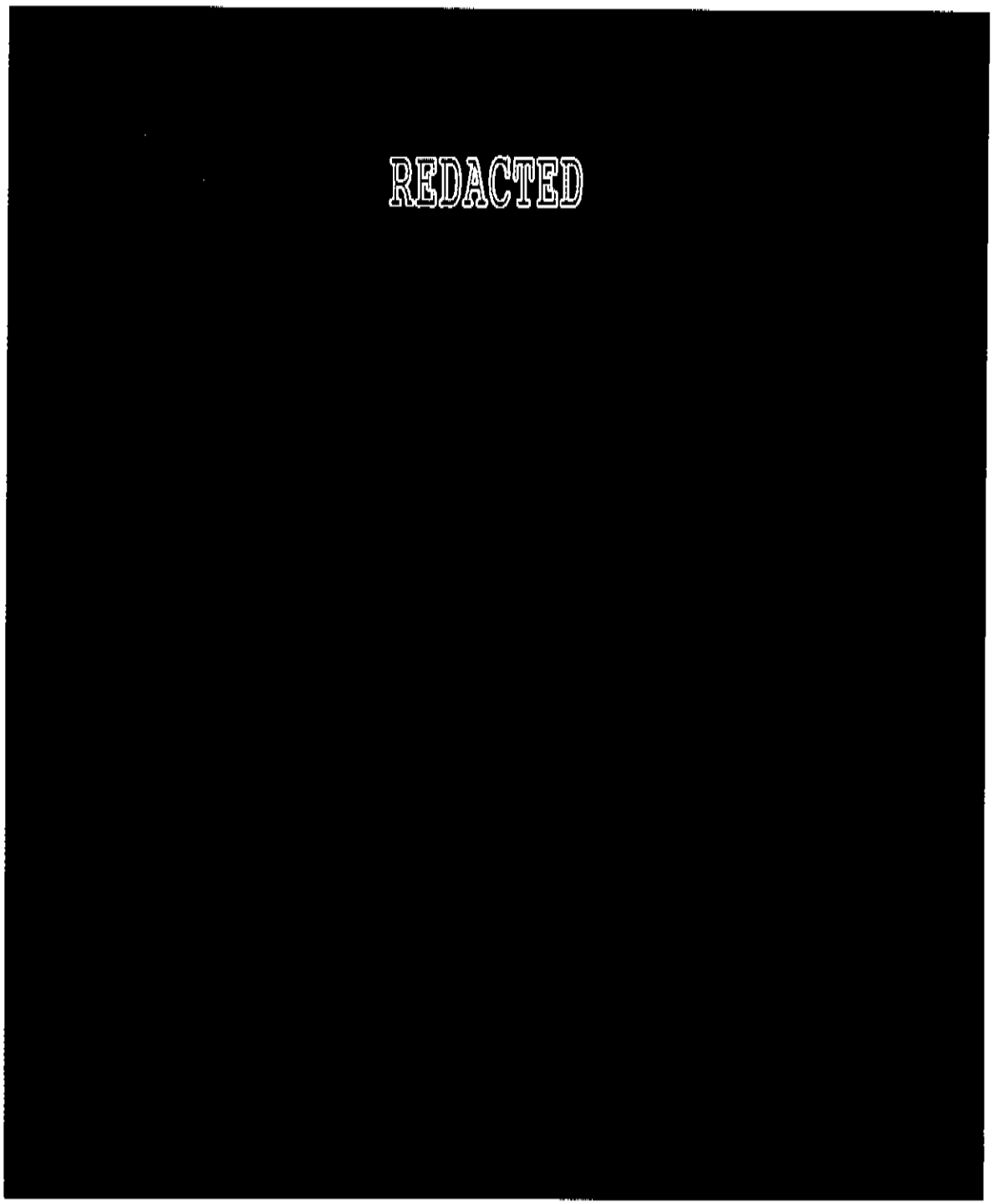
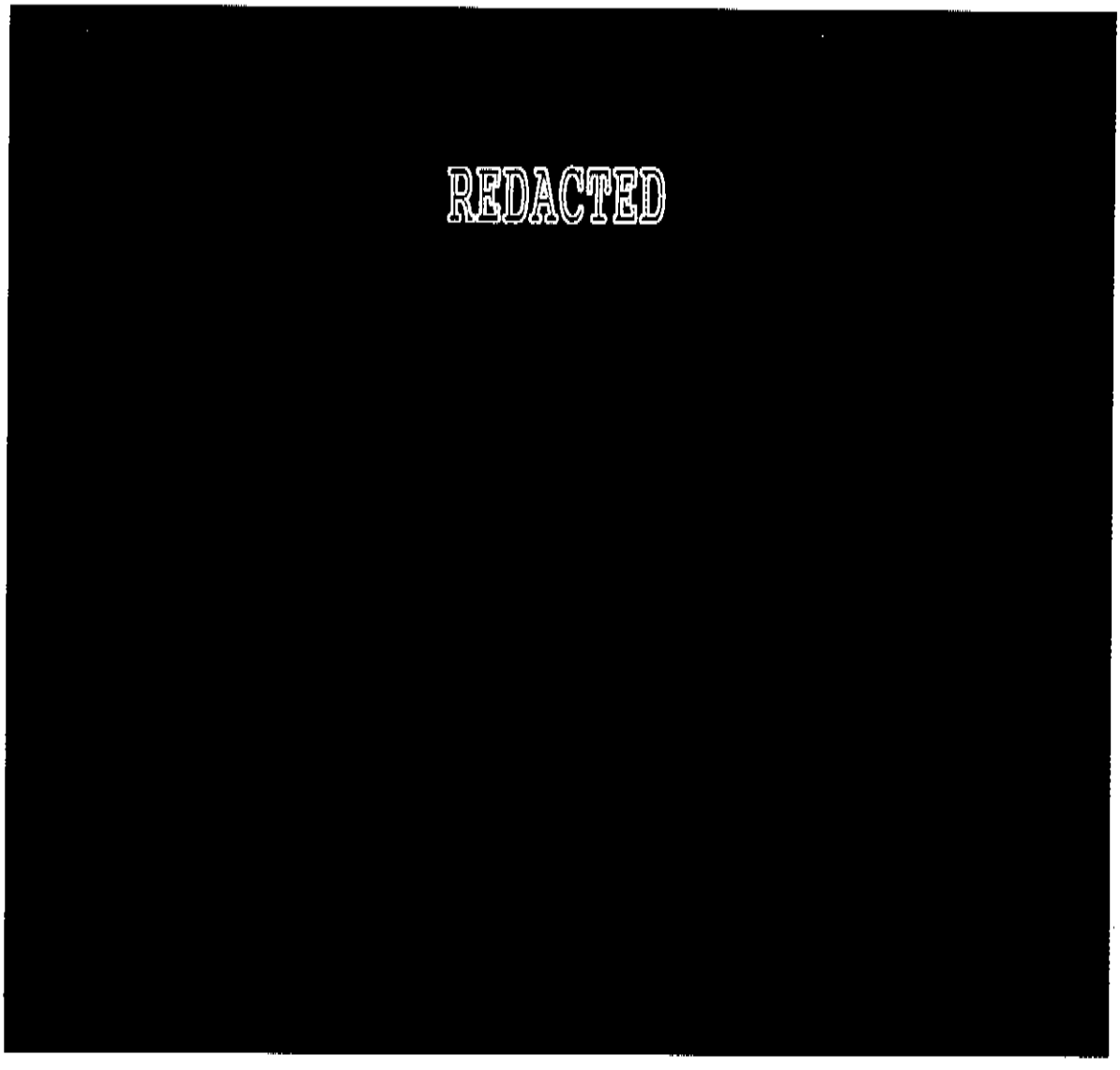



**Figure 7 CVE Four Site 220 MHz System Coverage**




The predicted coverage of the CVE territory using a 450 MHz system is plotted below.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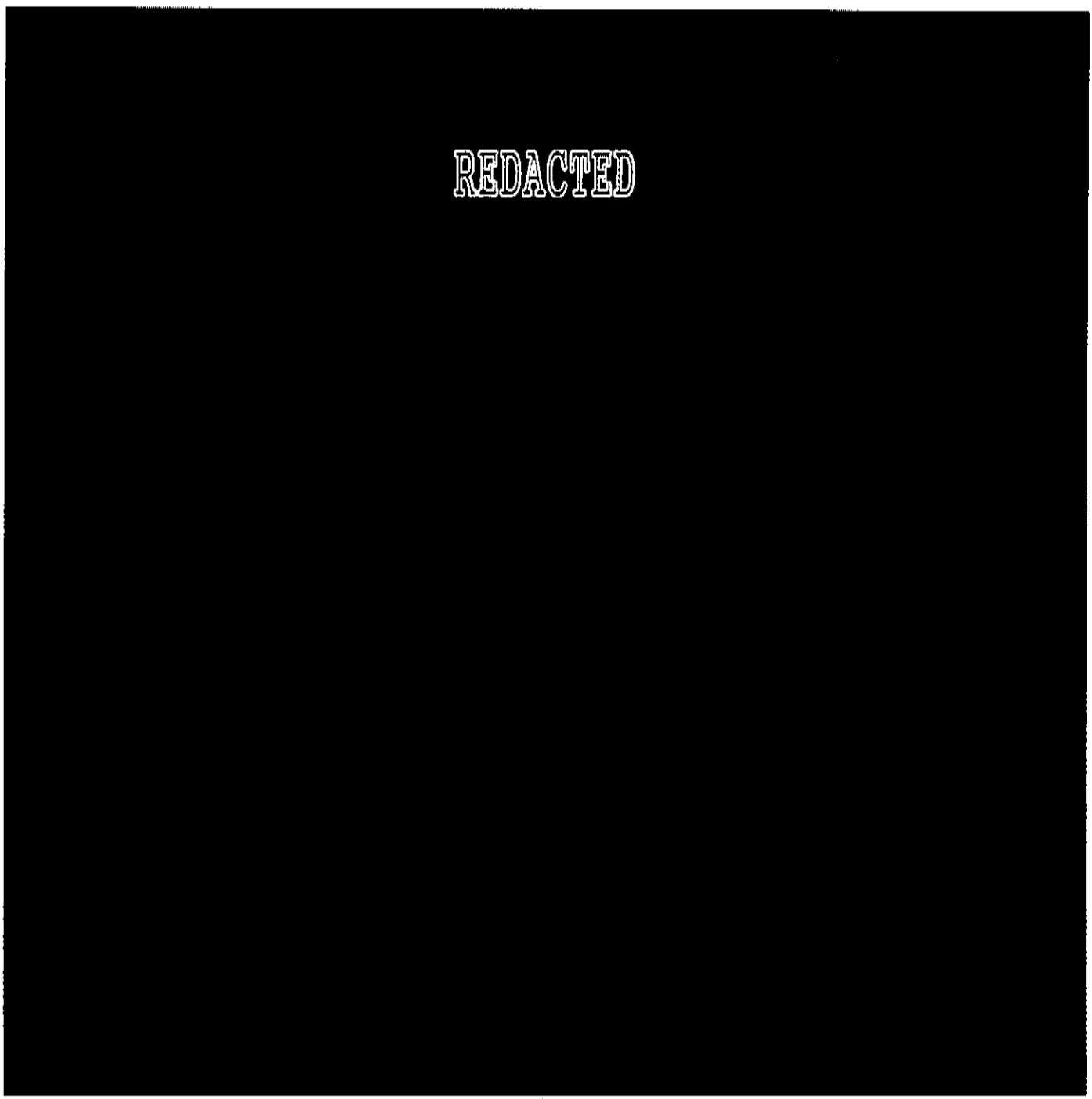
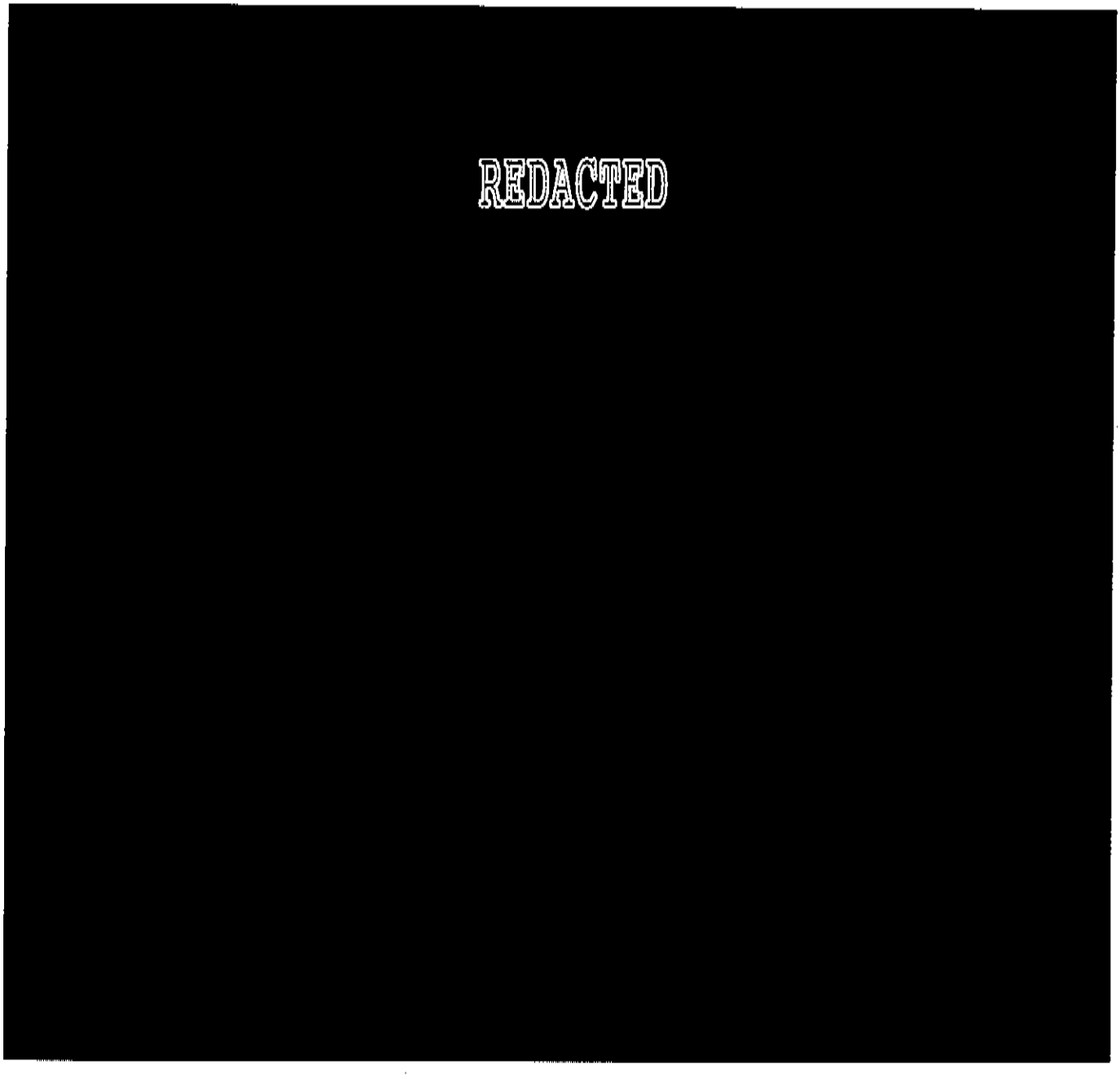
# 5 Budgetary Pricing

### 5.1.1 Budgetary Numbers for 150 MHz PassPort (EKPC)

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### 6.1.2 Budgetary Numbers for 220 MHz MPT System

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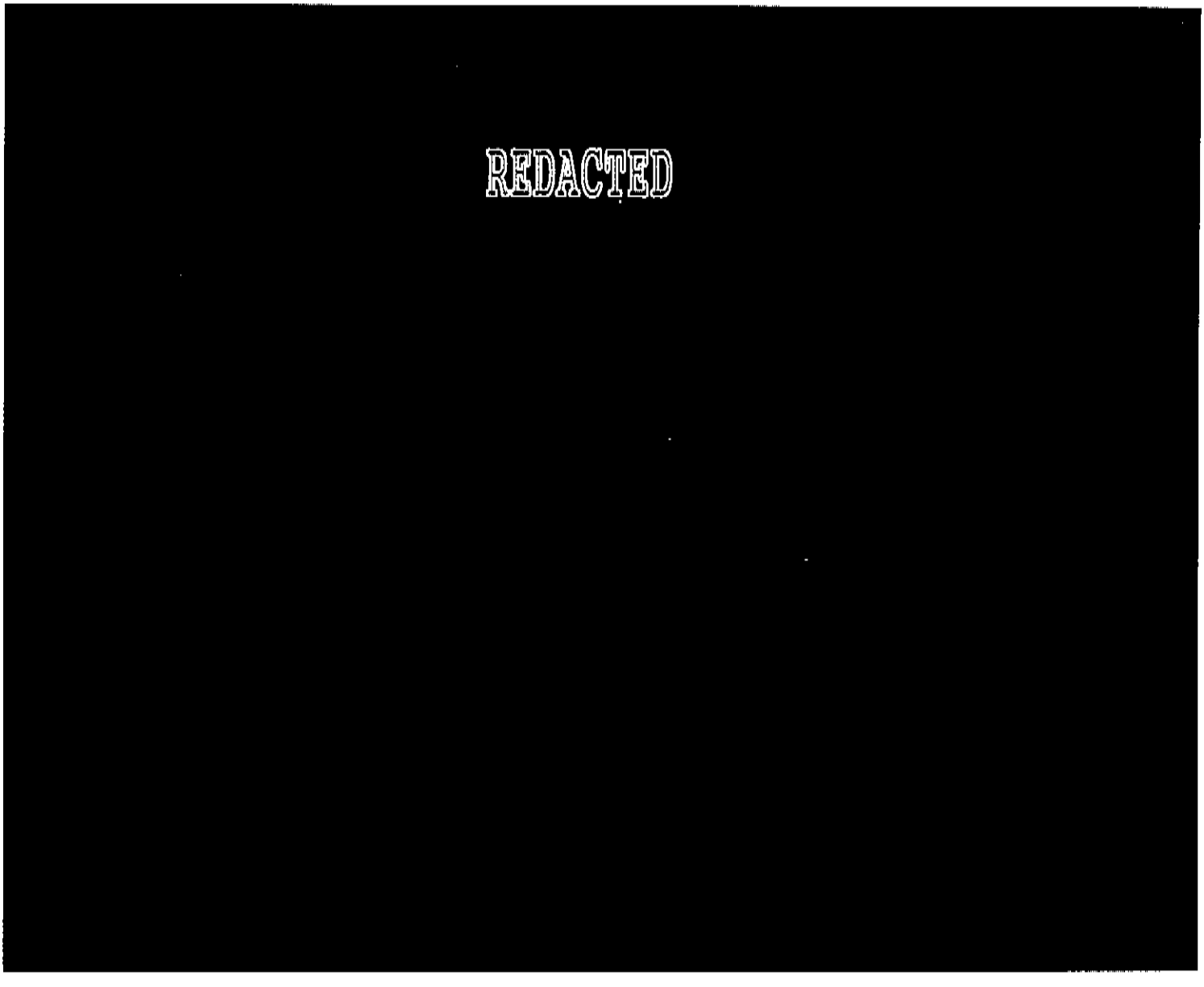
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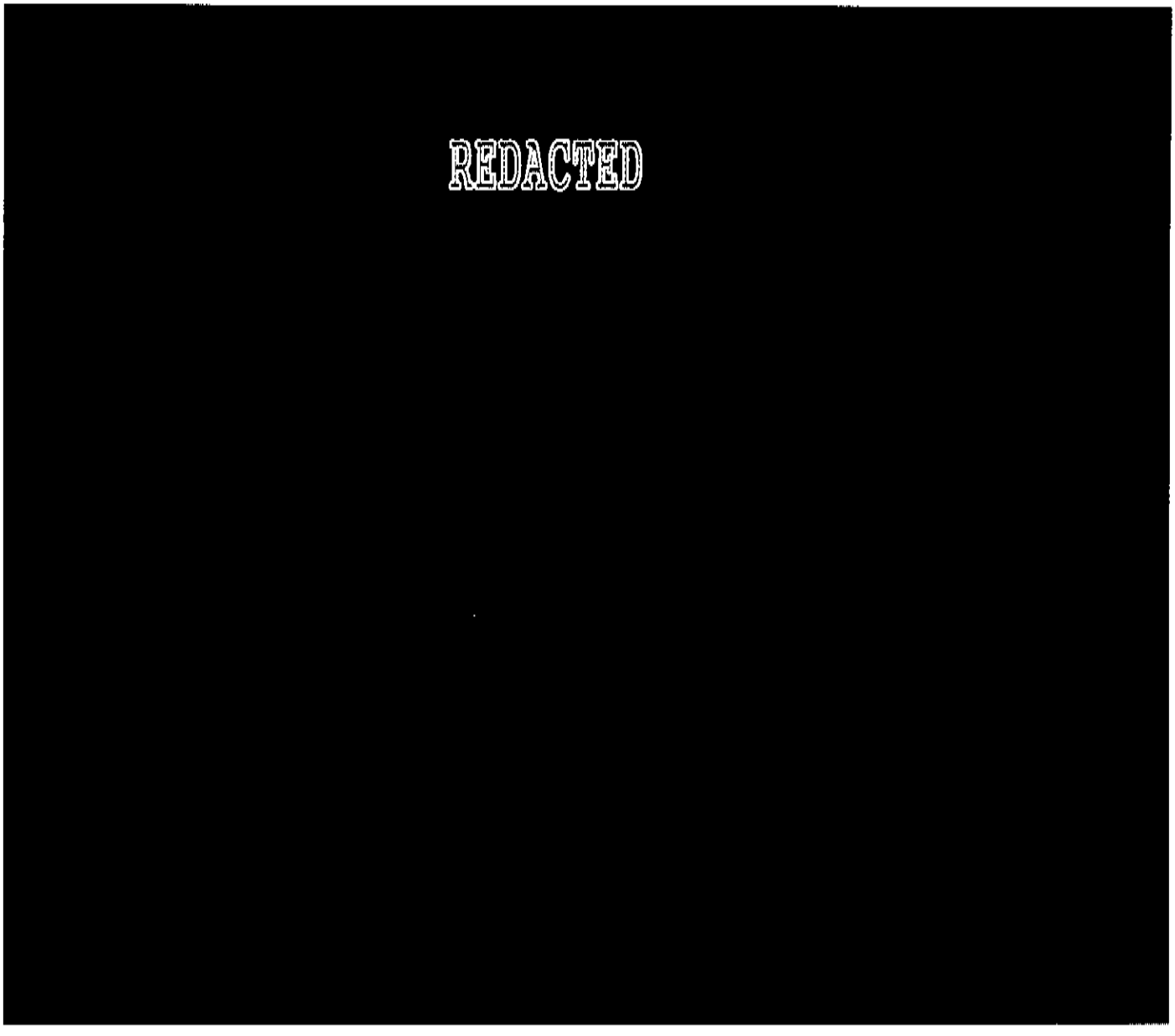
### 5.1.3 Budgetary Numbers for 450 MHz MPT System



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# 6 Recommendations and Next Steps

### 6.1.1 Comparison of CVE Future Needs for the Three Possible Solutions

The table below summarizes how well the three possible radio solutions meet the determined requirements for the new radio system.


during service outages.

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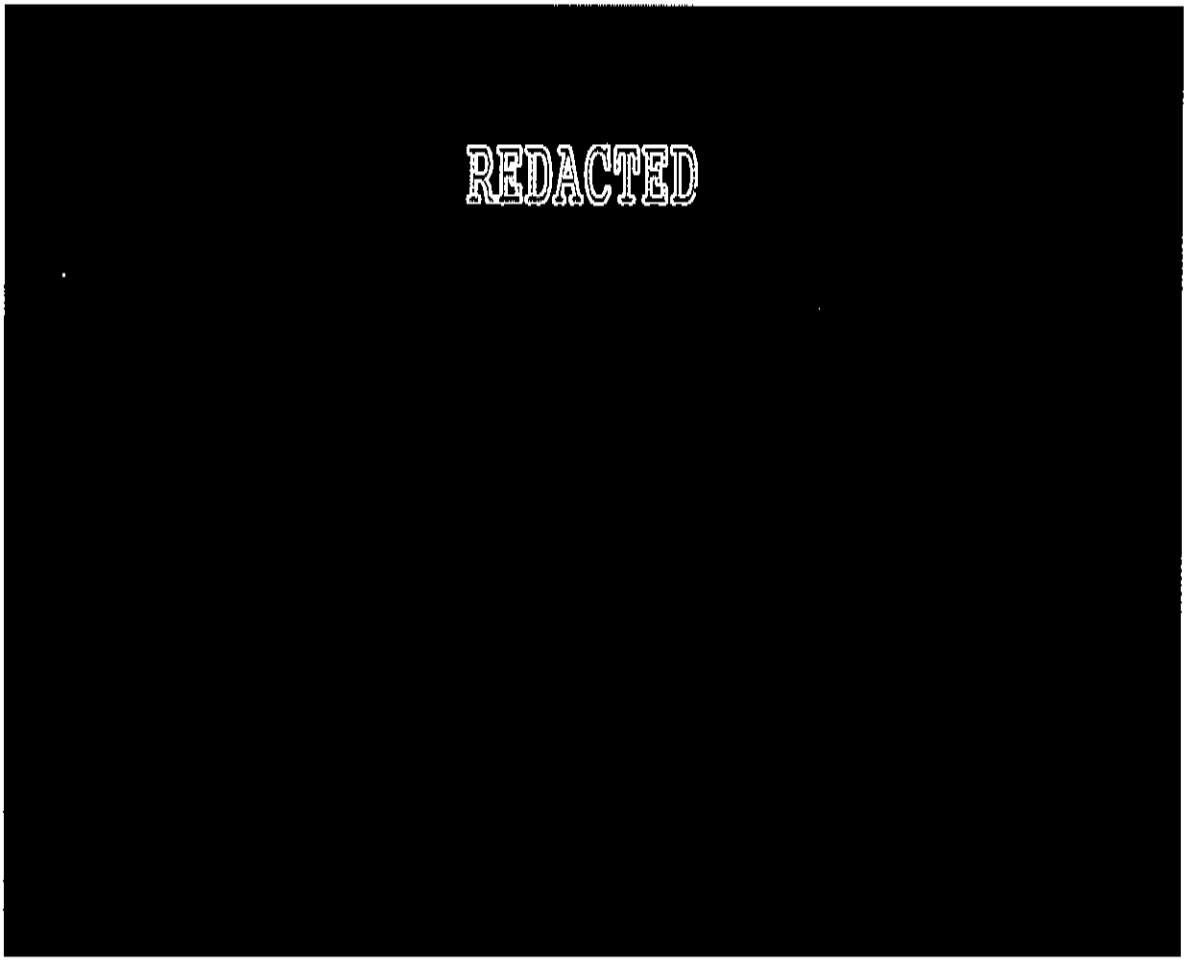
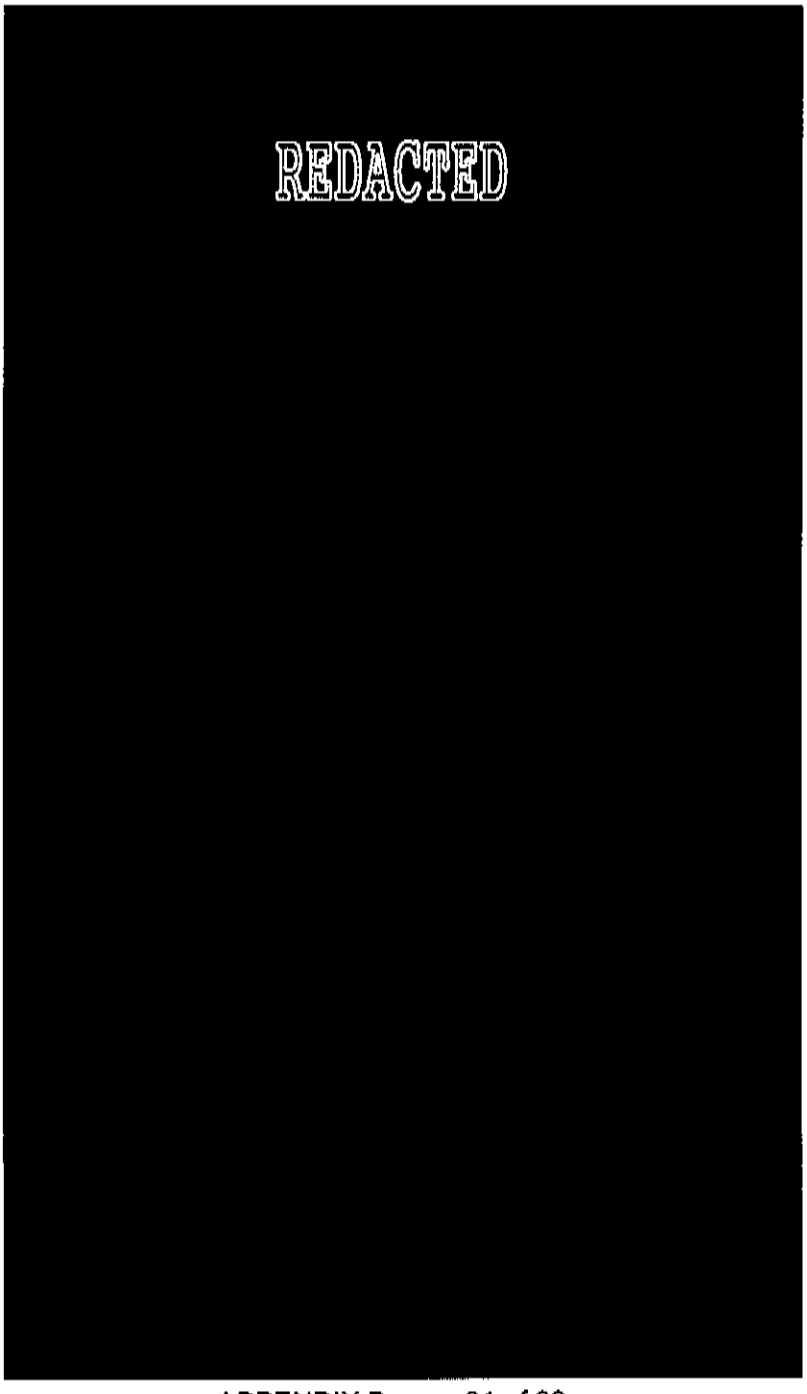
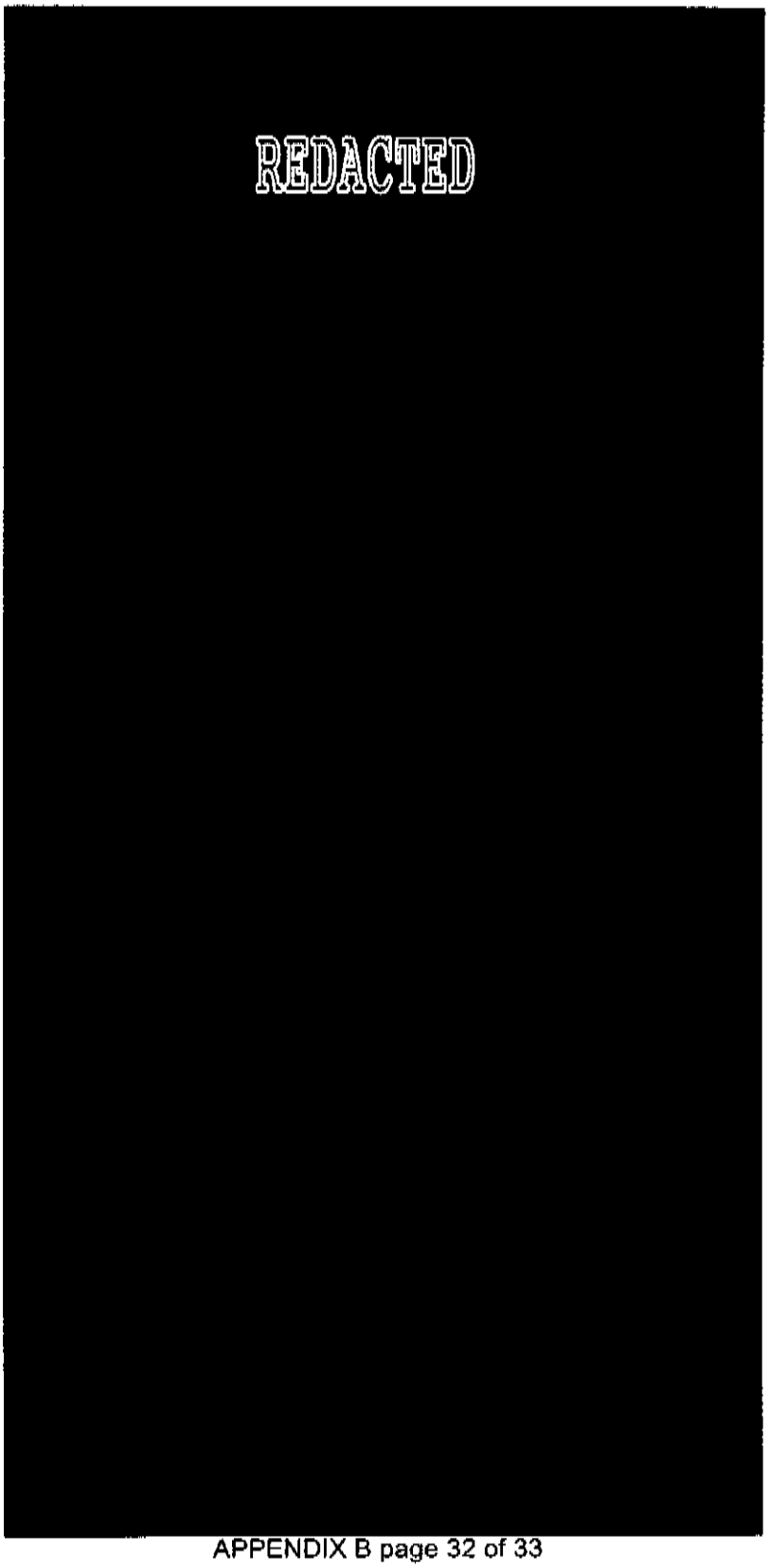
### 6.1.3 Next Steps for CVE



# 7 Appendix – Tower Sites Reviewed

243 sites were obtained from the FCC ASR database. Sites with less than 100' Height Above Average Terrain (HAAT) were filtered out and excluded from further analysis

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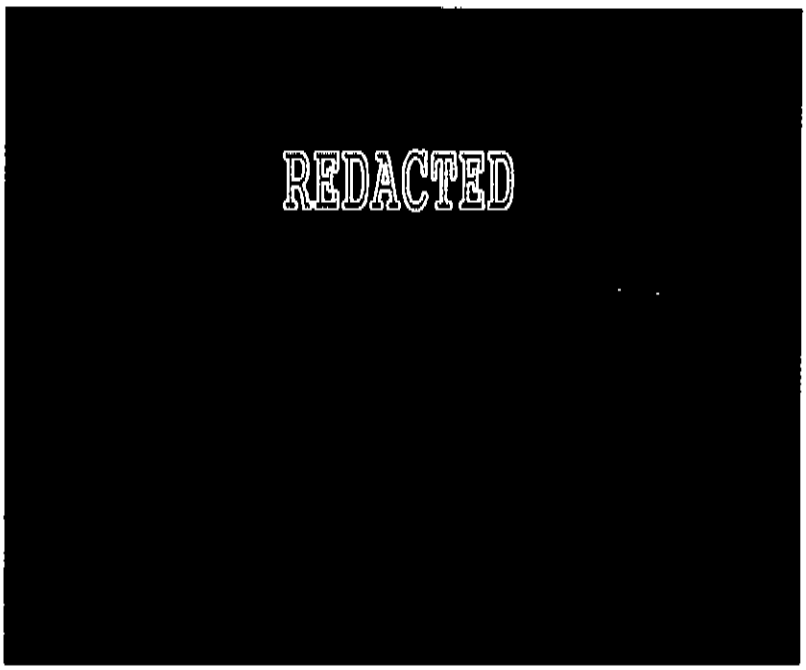
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