REGION 51

PUBLIC SAFETY RADIO

REGIONAL COMMUNICATIONS

PLAN

REGION 51 PLANNING COMMITTEE

CHAIRMAN
MARK G. ZERINGUE

VICE CHAIRMAN
JOHN R. MELCHER

REGION 51 PLANNING DOCUMENT EDITOR
RONALD J. GILLORY

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PUBLIC SAFETY RADIO COMMUNICATIONS PLAN
FCC REGION 51 - SOUTHEAST TEXAS

As one of 55 Regional Areas assigned the task of creating a plan of action to efficiently utilize a six megahertz band (821-824 / 866-869) of R.F. spectrum, the Region 51 Planning Committee came into existence on October 12, 1988. The meeting was convened by Mr. Larry G. Orr, then President of the Texas Chapter of APCO.

On April 1, 1991, the general membership, of Region 51 Planning Committee, voted unanimously to accept the regional plan as proposed to the full committee, and to immediately forward this plan to the F.C.C. for acceptance. This plan represents over two years effort in development, and incorporates some elements which I believe are unique to the Region 51 plan.

The Regional Plan for Region 51 has been developed to satisfy the requirements set forth by the members of the working subcommittees, and incorporates ideas submitted by the general membership during our periodic meetings. I believe that this plan best addresses the needs of Region 51. The major issues addressed in the plan are as follows.

- Channel assignments and allocations have been generated through the use of frequency packing program developed by Ronald Gillory, a member of the Region 51 Committee, with assistance from Bob Eckert of the Federal Communication Commission Office of Engineering and Technology. Mr. Eckert supplied the kernel algorithms, in FORTRAN, upon which the entire program has been developed. This program has allowed us to model the impact of technical requirements as they effect channel reuse. The program allows for the creation of a truly dynamic plan which can access the impact of license requests in a timely and efficient manner. Finally, the economic impact of utilizing a regionally controlled sorting program cannot be overstated. This aspect of the plan is believed to be unique.

- Distribution of channels is based upon population as required by the F.C.C. report and order.
- The 20 channels requested by the State of Texas have been reserved.

- 10 channels have been reserved for the data communications needs of the Region.

- The frequency packing program has been designed to fully protect all adjacent Regions from interference based upon assignments made within the Region 51 plan. Coordination with adjacent Regions is a Plan requirement. The adjacent regions were sent a copy of the final plan and their comments/concurrence received (Appendix 16).

- Each County has a specified pool of frequencies to draw from. This pool has been selected to provide maximum separation, and maximum packing of spectrum. This pool can be adjusted dynamically as needed. The pool as currently configured will satisfy the requirements of this Region, based upon the Public Safety needs as currently expressed by the Public Safety entities participating in the Regional Planning activities.

- Additionally, the Region 51 Plan addresses all of the other common components found within the previously accepted plans. Issues regarding technical requirements, interoperability, frequency assignments, applications and evaluation criteria are all addressed in the plan, in manner consistent with previously approved plans.

Through the hard work and dedication of the members of the Region 51 Planning Committee, I am able to submit this plan for consider by the Federal Communications Commission.

Respectfully submitted,

Mark G. Zeringue, Chairman
Region 51 Planning Committee

Mailing Address:

Mark G. Zeringue
Houston Police Department
Communications Maintenance Div.
Room C413
61 Riesner Street
Houston, Texas 77002

REGION 51
PUBLIC SAFETY RADIO
REGIONAL COMMUNICATIONS PLAN

1 SCOPE

1.1 INTRODUCTION

This plan specifically addresses utilization of the 6MHz of 800 MHz spectrum allocated to Public Safety and the subsequent "give-ups" of other spectrum as agencies migrate. It is the intent of this Plan to manage spectrum resources and to establish certain interagency operational procedures as set forth by Federal Communications Commission (FCC) in General Docket 87-112 and specifically those items identified in Section IV, Subsection C, Paragraph 51, Contents of Regional Plans.

1.2 BACKGROUND

In July 1986, the Federal Communications Commissions allocated 6 MHz of the 800 MHz reserve radio frequencies to Public Safety Radio Services and Special Emergency Radio Services (SERS) nationwide. In compliance with a Congressional Mandate, the Federal Communications Commission required that a National Plan outlining the use of the Public Safety Radio frequencies be in place before any agency would receive channels from this new allocation. As part of this requirement, Regional Plans conforming to the National Plan were to be developed.

1.3 PURPOSE

This Plan ensures that the communication needs of Region 51 public safety authorities have been met. This Plan puts the spectrum to the best possible use by requiring system design with minimum coverage areas, by assigning frequencies so that maximum frequency reuse and offset

channel use may be made, by using trunking, and by requiring small entities with minimal requirements to join together on a single system where possible. Numerous entities within Region 51 will require new and/or additional communication capabilities in order to maintain a satisfactory level of public safety services for their citizens. Spectrum users within the boundaries of Region 51 recognize that spectrum is a highly valued and limited resource which necessitates an orderly and efficient development of its use. This Regional Plan has assigned frequencies in an equitable fashion to those Public Safety and Special Emergency Radio Service eligibles with the highest demonstrated need. Spectrum assignments were developed in the most efficient manner possible, by computer generation. Under the umbrella of the National Plan, the Region 51 Planning Committee identified specific users and their spectrum requirements, regional interoperability requirements, technical and frequency reuse requirements, and other requirements that may be applicable to Region 51 and adjacent Regions. A wide variety of specific communications requirements are provided for in this Plan.

1.4 SUMMARY OF THE PLAN

This 800 MHz Regional Communications Plan was developed to insure efficient use is made of available spectrum and that maximum public benefit is derived from all radio communications used by eligibles that come under FCC rules for Public Safety Radio Services and the Special Emergency Radio Services (SERS). This Regional Plan was established with the objective of insuring that unassigned frequencies would be distributed in an equitable fashion with the priority given to those public safety agencies that are primarily responsible for the protection of life and property and that assigned frequencies will be utilized in the most efficient manner.

The plan includes the following:

The methodology for assigning user priorities and frequency assignment.

Channel "give-up" and reassignment criteria.

Specific system design criteria.

Implementation parameters.

Use, control and responsibility of the 5 common national channels

Inter-regional coordination.

Unsatisfied spectrum requirements.

Frequency specific channel assignment and "give-up" plans.

Regional mobile data spectrum allocations.

Use of computer generated frequency pools.

2 REGIONAL PLANNING COMMITTEE

2.1 AUTHORITY

Authority for the Region 51 Planning Committee to carry out its assigned tasks is derived from the Federal Communications Commission Report and Order, Docket 87-112. A simple majority of those present at a scheduled meeting will prevail provided at least 10 working days notice of the meeting has been provided.

2.2 REGIONAL BOUNDARIES

The region is defined as Region 51 and consists of 28 counties in the State of Texas representing 3 Councils of Government: Deep East Texas COG, South East Texas COG, and Houston Galveston COG. A map of Region 51 is contained in Appendix 1.

2.3 GENERAL MEMBERSHIP

Membership in the Region 51 Planning Committee is open to representatives from all eligible user groups pursuant to FCC Report and Order, Docket 87-112, Section IV, Subsection B, Paragraph 46. A list of the Region 51 Planning Committee membership is contained in Appendix 2.

2.4 WORKING COMMITTEES

Working committees were established to facilitate the development of the Regional Plan. Members of these committees were selected and approved by the general membership at the first formal meeting of the Regional Planning Committee on October 12, 1988. Members of these committee and their respective tasks are listed in Appendix 3.

2.5 REGIONAL REVIEW COMMITTEE

A Regional Review Committee will be established for the review of new applications, for conducting biannual (every six months) system implementation review, for making action recommendations to the Commission, for the resolution of interregional problems, for recommending modifications and amendments to the Plan, and for exercising general oversight of the Plan. All existing subcommittees will dissolve when the Region 51 Plan receives FCC approval and a new Regional Review Committee will be established. The Region 51 Chairman shall serve as chairman of this committee. Most Committee members will be employees of an official entity responsible under Texas Statutes for the preservation of life and property as a matter of public safety. The APCO frequency advisor responsible for Region 51 will serve as an ex-officio nonvoting member of the Committee. The Regional Review Committee shall establish rules and operating procedures as it deems necessary. All active members of the dissolved Applications Procedure and Evaluation Subcommittee will serve as members of the newly established Regional Review Committee.

3 PLAN DEVELOPMENT AND IMPLEMENTATION

3.1 NOTIFICATION

All interested parties were invited to participate in the development of the Region 51 Plan. This notification was accomplished by the FCC issuing a Public Notice and by the "Convener" directly notifying organizations representing eligible entities. In addition, the print media was contacted by the "Convener" and parties made aware of the Committee's formulation. Also notified were federal, state and local government agencies concerned with emergency management.

3.2 APPROVAL OF REGIONAL PLAN

Prior to submitting the plan to the FCC for approval all members of the Region 51 Planning Committee and the appointed Conveners and/or Planning Committee Chairmen of the adjacent regions received a draft copy of the Plan for review and comment. After review, the Plan was modified as agreed upon by the majority of the Region 51 Planning Committee and sent to the FCC for final approval and adoption.

3.3 APPEAL PROCEDURES

If an applicant feels that its requests were not given the proper consideration, that applicant may appeal the Committee's decision. The appeal process has two levels: the Regional Review Committee, and the FCC. An applicant who decides to appeal a rejection should initiate that appeal immediately upon notification of rejection. The appeal must be in writing and should be addressed to the Review Committee Chairman. Letters of appeal should explain the reasons that the applicant feels that his request for spectrum was not given fair consideration and why the Regional Review Committee should reconsider the request. In addition, the applicant should include any additional supporting documentation that will assist the Review Committee when reviewing the appeal. The Review Committee will review the appeal and supporting documentation and notify the applicant in writing of its decision. If the Review Committee rejects the appeal or the applicant is not satisfied with the Committee's decision, the applicant may appeal directly to the FCC. In the event that an appeal reaches the FCC, its decision will be final and binding upon all parties.

3.4 UNSATISFIED SPECTRUM REQUIREMENTS

Applicants whose spectrum requirements could not be met within the available spectrum in the 821-824/866-869 MHz band or from the "give-ups" are placed on the unsatisfied spectrum requirements list. This list will serve as a waiting list. Should some applicants be required to relinquish channels due to their failure to implement systems, the agencies on this list will have preference to the relinquished channels over agencies that request channels at a later time.

3.5 REGIONAL PLAN REVISION

Periodically it may be necessary to revise the Regional Plan. Modification of the Regional Plan will be a function of the standing Regional Review Committee. Proposals for modification of the Plan may be initiated by the Review Committee or may result from requests submitted by the local APCO Frequency Coordination Advisor, other Committees, or eligibles within the Region. Requests for revisions to the Regional Plan should be submitted, in writing, to the Chairman of the Regional Review Committee, who will forward the request to the Regional Review Committee. Minor changes will be approved by a simple majority of the Regional Review Committee. The Chairman of the Regional Review Committee shall then submit a written request to the Commission, with a copy to APCO, requesting the modification. Major revisions to the Plan will require approval of the general membership before being submitted to the Commission. At least ten days after notification of the general membership, a meeting will be held to discuss and vote on the proposed changes. Upon approval by a simple majority of the general membership, the Chairman of the Regional Review Committee shall submit a written request to the Commission, with a copy to APCO, requesting the modification. The Regional Review Committee shall coordinate all revision, whether major or minor, with adjoining Regions.

3.6 NATIONAL PLAN COMPLIANCE

The Region 51 Plan is in conformity with the National Plan. However, should a conflict arise between the two plans, the National Plan will govern. It is expected that Regional Plans for other areas in the country may differ from the Plan for this area due to dissimilar situations. By

officially sanctioning the Plan, the FCC agrees to its conformity to the National Plan. Nothing in the plan is to interfere with the proper functions and duties of the organizations appointed by the FCC for frequency coordination in the Private Land Mobile Service but rather it provides procedures that are the consensus of the Public Safety/Special Emergency Radio Service user agencies in the Region. If there is a perceived conflict then the judgment of the FCC will prevail.

4 NATIONAL COMMON CHANNELS

4.1 MUTUAL AID AND INTEROPERABILITY

One of the primary objectives of the National Plan was to establish a mechanism providing for multi-agency, multi-discipline communications at all levels of government. On a national level, this has been accomplished by setting aside 5 channels for use on a nationwide basis. While general guidelines for implementation of the 5 National Common Channels were set by the Federal Communications Commission, specific policies and procedures are to be set by each region. This section establishes the policies and procedures for utilization of the 5 National Common Channels . Implementation of the common channels will be separated into two categories of users: primary and secondary.

4.2 ELIGIBILITY

All users eligible under the Police, Fire, Local Government, Highway Maintenance, Forestry Conservation, and Special Emergency Radio Services (the "Public Safety Category" defined in section 90.616(a) Of the FCC Rules and Regulations) and licensed to use the spectrum are eligible to operate stations on the 5 National Common Channels.

4.3 APPLICATION PROCEDURES

All licenses for Base (FB), Mobile Relay (FB2), or Fixed (FX1) Stations shall be obtained by application to the Regional Review Committee. Eligible users may operate mobile units on the 5 National Common Channels without further authorization when this Plan is approved by the FCC. The application shall certify compliance with the two user category requirements as outlined. No frequency coordination fee is required for operation on the 5 National Common Channels. Applicable frequency coordination fee shall be paid by the applicant for frequencies other than the 5 National Common Channels. Applicants may be required to submit copies of their implementation plan to demonstrate compliance.

4.4 PRIMARY USERS

A primary user is licensed on 5 or more channels. As a minimum, all primary users shall operate a receiver for continuous monitoring of the National Calling Channel and a separate mobile relay base station equipped to operate on all 5 National Common Channels. All primary users shall maintain a radio watch on the calling channel for the purpose of monitoring the channel and rendering assistance. All common channel equipment shall be equipped to provide an on-street mobile coverage capability of the same size and quality for which the station license was granted. All licensees are encouraged to operate additional base stations on any or all of the remaining common channels.

4.5 SECONDARY USERS

A secondary user is licensed on 4 or less channels. As a minimum, all secondary users shall operate a base station for continuous monitoring of the National Calling Channel. All secondary users shall maintain a radio watch for the purpose of monitoring and rendering assistance on the calling channel. A secondary user whose area is encompassed by a primary user may apply for a waiver from the Regional Review Committee for full time monitoring of the National Calling Channel. The secondary user will be required to have a station on the National Calling Channel.

4.6 CHANNEL USE

Plain English language will be used on all 5 common channels at all times. The use of unfamiliar terms, phrases or codes will be kept to a minimum, unless deemed necessary for security purposes. The use of these channels for intra-system normal dispatch and routine agency operation is strictly prohibited. The common channels are to be used only for activities requiring communications between agencies not sharing any other compatible communication system. Under emergency situations one or more tactical channels may be used by the controlling agency at the time of the incident.

4.6.1 CALLING CHANNELS

The calling channel shall be used to contact other users in the Region for the purpose of requesting incident related information and assistance. This channel shall not be used as an ongoing

working channel. Once contact is made, an agreed upon tactical channel is recommended for continued communications.

4.6.2 TACTICAL CHANNELS

These channels are reserved for use by those agencies in need of conducting interagency communications. Incidents requiring multiagency participation will be coordinated over these channels by the agency controlling the incident. Individual tactical channels may be designated for use by various services or disciplines on an incident basis by the controlling agency. In the event of multiple incidents requiring the use of these channels, channels shall be designated by mutual agreement between controlling agencies. In no case shall control of these channels remain with any single agency beyond the termination of a declared emergency.

4.7 AUTHORIZED USERS

Users of these channels include federal, state, and local disaster management agencies, police, fire, and providers of basic and advanced life support services. Other eligible, such as school buses, volunteer emergency corps, red cross, radio amateur civil emergency services, amateur radio emergency services, salvation army,etc are eligible for use of the interoperability channels in support of the preservation of life and property during emergencies. Those eligible may be called upon by a controlling agency for support when such eligible is a part of a controlling agency's documented emergency plan.

4.8 FEDERAL INTEROPERABILITY

Interoperability between federal, state, county, and local governments during day-to-day and disaster operations will take place primarily on the 5 National Common Channels. Federal agencies may access nonfederal channels through the use of S-160 or similar agreements. Additionally, in accordance with Title 47 CFR, Section 2.103 , individual nonfederal agencies may permit federal agencies to use their communications system for coordination of federal/nonfederal activities. Licensees are allowed to count as additional loading, a factor of two percent for federal interoperability agreements.

4.9 INTEROPERABILITY PLANNING

Any applicant for frequencies shall have a plan and include with their application a statement showing interoperability with the appropriate public safety agencies of the same discipline as that of the applicant within the areas adjacent to the applicants area of operation.

4.10 TEMPORARY STATIONS

Individual users may be permitted to operate 1 or more temporary mobile relay stations (FB2T) or temporary base stations (FBT) on the 4 National Common Tactical Channels . These stations may be used to provide temporary fill-in coverage or temporary coverage at a specific operation. The use of temporary stations to provide tailored coverage at an operation which is either preplanned or of an extended nature is strongly encouraged. The use of a temporary station shall be coordinated with the primary users in that designated area. Temporary stations shall not exceed 35 watts ERP. All temporary mobile relay base stations shall be equipped to operate as a mobile relay station on demand, but shall normally operate in the repeat disable mode.

4.11 UTILIZATION

The specific common frequencies covered by this plan and their uses are:

821/866.0125 Mhz - Nat'l Common Channel 1 (hi-level calling)
821/866.5125 Mhz - Nat'l Common Channel 2 (tactical)
822/867.0125 Mhz - Nat'l Common Channel 3 (tactical)
822/867.5125 Mhz - Nat'l Common Channel 4 (tactical)
823/868.0125 Mhz - Nat'l Common Channel 5 (tactical)

These channels are to be used primarily for coordination activities between different agencies in a mutual aid situation, or emergency activities of a single agency.

4.12 INTERCONNECT

Automatic interconnection of the National Common Channels to the switched telephone network is prohibited.

4.13 VOICE PRIVACY, SIGNALLING OR PAGING

The use of tone or digital signaling (other than ATIS), or paging is prohibited on these channels. Voice privacy is permitted in the simplex mode or on user provided portable mobile relays on the National Common Tactical Channels (2 through 5) only, provided that such use is coordinated through the respective area's primary users. Such use must cease in the event of a higher priority incident requiring use of the channel.

4.14 TONE SQUELCH

All equipment capable of operating on the National Common Channels must be equipped with the national common tone squelch of 156.7 Hz (EIA code '5a').

4.15 CROSS-BAND REPEATING

Linking of agency channels outside of the 800 MHz spectrum to the National Common Channels is permitted in emergency situations and as per applicable FCC rules and regulations.

4.16 USE OF LONG RANGE COMMUNICATIONS

In a major emergency, where public safety entities might need long range communications in and out of a disaster area, alternate radio communications plans are to be addressed by primary agencies within Region 51. These agencies shall include the appropriate interface to the 5 National Channels as a minimum. Such long distance radio communications might be amateur radio operations, satellite communications and/or long range emergency preparedness communications systems. Any or all of these systems should be incorporated in the communications plans of those primary agencies.

These agencies could then communicate outside the disaster area for themselves and the smaller agencies which might need assistance. Incidents addressed in the National Public Safety Planning Advisory Committees Plan such as earthquakes, hurricanes, floods, widespread forest fires or nuclear reactor problems could be cause for such long range communications needs.

4.17 UNIT IDENTIFIERS/ATIS

Units operating on the National Common Channels are to include their agency name in their unit identification. Automatic transmitter identification system (ATIS) utilization is encouraged, but is not to replace the voice identification requirements.

4.18 GRANDFATHERED EQUIPMENT

Radio equipment that is currently type accepted and in service on systems in the 806-821/851-866 MHz sub-band may operate on the National Channels. The Regional Review Committee may recommend to the FCC waivers for other frequencies covered under this plan on a case-by-case basis.

4.19 STATION REQUIREMENTS

All mobile radios, portable radios, and mobile relay base stations operating in the 821-824/866-869 MHz band shall be equipped to operate on the 5 National Common Channels and will use CTCSS tone squelch of 156.7 Hz. All mobile relay base stations shall be equipped to operate as a mobile relay station on demand with normal operation in the repeat disable mode.

4.20 ENCRYPTION REQUIREMENT

The calling channel shall not use any means of encryption. The four tactical interoperable repeaters should be pass through digital capable, that is capable of passing encrypted digital communications through the system.

5 TECHNICAL DESIGN REQUIREMENTS

5.1 SYSTEM DESIGN CRITERIA - INTERFERENCE

It will be necessary for users of the 821-824/866-869 MHz band to design their radio systems to minimize the amount of RF energy radiated into unneeded areas. Additionally, systems will have to be designed to function in the presence of interfering signals. These criteria are intended as guidelines and may be modified with the mutual consent of co-channel and next adjacent offset channel users. All users shall design their radio system to minimize the amount of RF energy radiated beyond their geo-political boundaries. Additionally, insofar as possible, users shall subdivide their geo-political area into smaller areas representing the "normal daily operating area" of the intended user. In recognition that the "operating area" is not hard-and-fast, systems may be designed to provide radio coverage within the "operating area" plus a distance of 3 miles. This larger area, hereinafter, will be referred to as the "coverage area". Users needing to occasionally travel outside of their normal "coverage area" should change to a wider area channel which is shared by a great many users. Users should design their radio systems to provide at least 40 dBu throughout the "coverage area" with the caveat that they should also minimize the signal strength outside the "coverage area". System designers should coordinate their use of CTCSS (continuous tone coded squelch systems) and CDCSS (continuous digital coded squelch systems) to enhance system discrimination between desired and undesired signals.

5.2 COVERAGE LIMITATION - ANTENNA HEIGHT AND POWER

System coverage area is limited to geographical boundaries in order to maintain maximum frequency reuse within Region 51. Agencies requesting new or additional channels will have their proposed system design evaluated by the Regional Review Committee. Any agency requesting a transmitter location not centrally located within its jurisdiction must include in the request adequate justification for such placement. If a non-centrally located transmitter may result in significant encroachment on surrounding jurisdictions, a directional antenna must be chosen which will minimize this encroachment. Agencies with operating areas outside their political boundaries may request extended system coverage areas. Such requests for extended coverage must be accompanied by written justification. Extended coverage systems will not be authorized unless

approved by the Regional Review Committee. Favorable consideration will be given to those extended coverage systems which are made available for use by eligibles other than the licensee.

5.3 DEFINITION OF COVERAGE AREA

"System coverage area" is defined as the boundary where received signal strength falls to 40 dBu. Forty (40) dbu was selected by combining factors, such as receiver sensitivity for 20 db quieting, foliage attenuation, Rayleigh fading (98 percent probability), and portable body loss. Refer to 87-112, Appendix C, 90.621 (c).

5.4 CALCULATION OF COVERAGE RADIUS

Three factors must be known to determine the coverage area radius: the strength of the received signal, i.e., "received signal strength", antenna height above average terrain (HAAT), and the effective radiated power (ERP). Received signal strength has been defined, leaving two factors that can be modified to achieve the desired coverage radius. The coverage radius will be 3 miles greater than the jurisdiction (operating) radius unless extenuating circumstances are provided to the Regional Review Committee. Tabulated data from Okumura propagation curves in Appendix 4 will be used to give the distances to the 40 dbu boundary based on HAAT and ERP. This distance is considered the radius of coverage from the transmitting site. A step-by-step procedure is provided in Appendix 5. It will be permissible for agencies requesting system authorization to determine the distance to the 40 dbu boundary on a radial-by-radial basis, with a minimum of 8 equally spaced radials at 45 degree intervals, beginning at true north, and plot the coverage radius boundary based on these points. This plot may be submitted with the request for frequencies to show that operating areas outside the agencies political jurisdictions are being kept to a minimum not to exceed 3 miles. In any case, a minimum antenna height of 100 feet above ground elevation will be necessary to provide clearance with roof lines and treetops. Any agency with its transmitter centrally located will be allowed a minimum coverage area radius of 8 miles regardless of the size of its jurisdiction radius and as long as interference protection for existing co-channel and adjacent channel systems is sufficient.

5.5 RESPONSIBILITY FOR CALCULATIONS

It will be the responsibility of the requesting agency to calculate the proposed coverage area and to validate the accuracy of the calculation. However, the Regional Review Committee may provide assistance to any agency requesting help in determining its coverage area. This assistance will be available for a period of 5 years after approval of the Regional Plan by the FCC. This assistance will be limited to the numerical calculations associated with the look-up tables. It is the requesting agencies responsibility to provide accurate system parameters and procure "height above average terrain" radials as specified in 90.309(A)(4) of the Commission's Rules.

5.6 PROPOSED SERVICE AREA EXHIBIT

An agency shall provide, along with its request for frequencies, an exhibit showing the calculated coverage area radius and the agency's jurisdictional boundaries. The boundaries should be drawn to scale on a 1:250,000 USGS map with a title block including the name of the requesting agency, height above average terrain, effective radiated power, latitude, longitude, ground elevation of the transmitting site, and the distance to the coverage area boundary in miles, as calculated. An example is included in Appendix 6 of this plan.

5.7 FREQUENCY REUSE

Careful adherence to the system technical design requirements of this plan will allow for maximum co-channel usage with this region. Because of the close proximity of adjacent channel frequencies, adjacent channel considerations must be planned similar to that of co-channel design. Agencies requesting frequencies that have been previously licensed within this Region or an adjacent Region must show that their proposed system will operate on an interference-free basis with any existing co-channel system. Requesting agencies must demonstrate that the proposed system will provide an existing proposed signal margin of at least 35 db at the coverage radius boundary of the existing system. The signal strength of the proposed system is to be calculated by the same method as outlined in "CALCULATION OF COVERAGE RADIUS", elsewhere in this plan. After the distance from the proposed transmitter site to the existing service area contour radius is determined, the received signal strength of the proposed system can be found in the look-up tables

using antenna height, effective radiated power, and distance. If it is determined that the margin of protection is insufficient, the proposed system must be modified to meet the protection criteria. A step by step procedure for performing the series of interference calculations is included in Appendix 7.

5.8 ADJACENT CHANNEL DESIGN

Proposed systems must also be designed for interference-free operation with adjacent channel licensees. The method of determination is identical to that of co-channel design as detailed in "co-channel design," elsewhere in this plan, with the exception of the existing to proposed signal margin criteria. In the case of adjacent channel systems, this margin will be reduced to 15 db. All other calculations will remain the same. It should be noted that the FCC has adopted technical standards for transmitters which will reduce adjacent channel interference and permit closer geographical adjacent channel use. However, the Commission has not adopted improved receiver technical standards. It is the position of the Commission that receivers do not cause interference, nor do they threaten effective operation of the Public Safety Network, as would substandard transmitters. Because of the demand for limited spectrum, it is the intent of this plan to provide efficient spectrum utilization within current technological capabilities. Agencies are encouraged to carefully consider the receiver selectivity specifications of any equipment to be purchased for use in the 821-824/866-869 MHz band. A step by step procedure for performing the series of interference calculations is included in Appendix 7.

5.9 ABSOLUTE MILEAGE SEPARATION

In any case where the service areas of adjacent or co-channel systems are separated by at least 70 miles, the interference studies as set forth in this plan are unnecessary because of free space and terrain losses.

5.10 TRUNKING REQUIREMENT

As referenced in the National Plan, trunking is mandated for any new system with more than four channels in the 800 MHz band. Requests for exceptions will be considered by the Regional Review Committee for usage such as mobile data use, encryption, and telemetry stations. Other

requests for waiver of the trunking requirement will be considered after presentation of evidence by the requesting agency. Approval to waive the trunking requirement will be based on the individual merits of the presentation.

5.11 TRANSMITTER COMBINING

The frequency separation between channels utilizing transmitter combining is at the least .250 MHz. This parameter will provide efficient spectrum utilization and is the default value for the frequency packing program developed by Region 51. Agencies should purchase combiners to meet the .250 MHz. frequency spacing.

5.12 SYSTEM LOADING AND IMPLEMENTATION REQUIREMENT

Agencies utilizing frequencies in the 821-824/866-869 MHz band shall comply with loading requirements as called for in Part 90.631 of the Commission's Rules and Regulations for trunked radio systems, and in Part 90.633 of the Commission's Rules and Regulations for conventional systems. As referenced in 90.631 and 90.633, Part 90.629, shall also apply.

5.13 TRAFFIC LOADING STUDY

Justification for adding frequencies, or retaining existing frequencies in the 821-824/866-869 MHz band, can be provided by a traffic loading study in lieu of loading by number of transmitters per channel. It will be the responsibility of the requesting agency to provide a verifiable study showing sufficient air time usage to merit additional frequencies. A showing of air time usage, excluding telephone interconnect air time, during the peak busy hour greater than 40 percent per channel on three consecutive days will be required to justify additional or retain existing frequencies.

5.14 SYSTEM ENGINEERING EXHIBIT

All requests to the Regional Review Committee for frequencies must include sufficient data for the committee to be able to determine proposed system operating parameters. The system engineering exhibit must show:

1. Transmit output power
2. Type of cavities (duplexers and combiners) and associated losses
3. Type of transmission line and associated loss (including jumpers)
4. Antenna model and gain
5. Ground elevation above mean sea level
6. Antenna centerline AGL
7. Height above average terrain of antenna centerline
8. Effective radiated power as determined by items 1 through 4.

A proposed format for this exhibit is in Appendix 8.

5.15 AVERAGE ELEVATION EXHIBIT

An additional exhibit showing the average elevation of the terrain of each of the eight main radials will be required. If an outside source is used for the calculation of average terrain, a copy of this report can be substituted for the average elevation exhibit.

5.16 CELLULAR TELEPHONE USE

The use of a car radio telephone via interconnect through an 800 MHz trunked radio system or other two-way radio communications system will normally require a significant amount of air time. Therefore, telephone interconnect is discouraged. The use of a defeatable interconnect for radio telephone use is allowed for systems implemented under this Regional Plan. The use of cellular telephones for automatic interconnect to the Public Switched Telephone Network is recommended.

5.17 TRANSMITTER STANDARDS

Unless specifically excepted, all transmitters utilized within Region 51, including the rural areas, on the new spectrum shall be type accepted for operation on the 821-824/866-869 MHz spectrum and meet the technical standards defined in Part 90 of the Commission's Rules and Regulations. Transmitters type accepted for operation in the 806-821/851-866 MHz

band may be utilized by eligibles in the Public Safety and Special Emergency Radio Services on the 5 National Mutual Aid Channels without special authorization. In some instances, the Regional Review Committee may authorize waivers for the use of equipment (with deviation reduced to 4KHz) that is type accepted for the 806-821/851-866 MHz band on other channels in the new spectrum. This will not be done on a routine basis and will only be allowed for existing systems where the equipment has already been procured and it can be shown that no interference will result. Modification of the existing system may be required. When authorized, use of equipment that is type accepted for the 806-821/851-866 MHz band on other than mutual aid channels in the new spectrum will only be allowed until January 1, 2000. Applicants requesting waivers for authorization to utilize equipment that has been type accepted for 806-821/851-866 MHz band, on channels in the new spectrum other than the designated mutual aid channels, should submit letters of request to the Regional Review Committee. Applicants should submit justification as to why the waiver is required and provide engineering data that shows that operation of the equipment will not cause interference to other users. Written concurrence from co-channel and adjacent-channel users will be required. Additionally, letters of request shall clearly indicate that the applicant understands that the waiver, if granted, is temporary and that the applicant agrees to phase out old equipment and change to type accepted equipment by January 1, 2000. Applicants authorized to use older equipment that is not type accepted for the new spectrum should be aware that protection of the old receivers from adjacent-channel users can be eliminated by utilizing receivers meeting NPSPAC recommendations, no additional protection will be provided. In all cases where equipment type accepted for 806-821/851-866 MHz band is utilized on channels in the new spectrum, the transmitter deviation must be reduced to plus or minus 4.0 KHz except on the Mutual Aid Channels.

5.18 RECEIVER STANDARDS

The Commission did not adopt the NPSPAC recommendation for receiver standards. The use of enhanced receivers providing at least 20 DB of protection to the 12.5 KHz removed signal when tested with the revised method described in the NPSPAC final report is recommended. Agencies utilizing substandard receivers that do not meet the minimum standards recommended by NPSPAC do so at their own risk.

5.19 CODED SQUELCH

The use of CTCSS (continuous tone-controlled squelch systems) or CDCSS (continuous digital-coded squelch systems) is recommended in the Region 51 area. Systems not incorporating some form of coded squelch will not be protected from receiving interference.

5.20 MAXIMUM EFFECTIVE RADIATED POWER

The maximum effective radiated power (ERP) of all systems operating in the Region 51 area shall be limited to the minimum amount necessary to provide coverage of the using agency(ies) geo-political boundaries. Radio equipment installed in aircraft that operate on channels in the 821-824/866-869 MHz spectrum in the Region 51 area shall be limited to a maximum ERP of 1 watt with operation prohibited above 1000 feet AGL.

5.21 ENCRYPTION STANDARDS

The use of encryption is encouraged for those agencies that as part of their operation have need to conduct covert operations that require some assurance of communications security. The use of encryption techniques that provide high levels of communications security as well as a high level of voice recognition is recommended for those agencies. Systems operating within Region 51 that utilize encryption will use a digital format . Encrypted systems will employ an analog to digital conversion technique having a bit rate not to exceed that which will fit within a 25 KHz channel.

5.22 AUTOMATIC STATION IDENTIFICATION

All equipment operating in the 821-824/866-869 MHz band, except mobiles, portables, and control stations, shall be equipped with an automatic identification device and shall meet station identification requirements, all in accordance with FCC Rules and Regulations. Such equipment will be designed to transmit the stations call sign only to the minimum extent required by the FCC Rules and Regulations and only when it detects no carrier on its receive frequency. Transmitters shall not transmit station identification during periods when the transmitter is otherwise not active.

6 FREQUENCY ASSIGNMENT PROGRAM

6.1 INTRODUCTION

The Region 51 Communications Plan is frequency specific through the entire region. Region 51 developed custom application software facilitating this goal. The task accomplished was to preassign specific radio frequencies to geographic pools for future assignments in an efficient, as well as in a compatible manner from an interference standpoint. The geographic frequency pools are drawn upon as agency specific frequency assignments are made by the Regional Review Committee. Region 51 can be subdivided efficiently for the purpose of sorting frequencies using county boundaries and population densities. Appendix 13 contains the "Channel Assignments by County" output listing which is location specific in form. Appendix 14 contains the "County Assignment by Channel" output listing which is frequency specific. Appendix 10 contains the "Reserved Spectrum" listing. Channels not reserved or assigned as indicated in the above mentioned listings are eligible for use as needed by the Regional Review Committee.

6.2 POPULATION RATIO

It has been determined that a ratio of one radio channel per 25,000 population is acceptable for public safety communication needs. As a minimum, any county would initially receive 3 channels in the sort process. A county of less than 75,000 receives 3 channels as a minimum.

6.3 FREQUENCY POOL USAGE

Frequency pools which have no agency assigned will be available to the Regional Review Committee for spectrum efficient assignment outside their original geographic location. Such action can be taken by the Regional Review Committee at the end of an application window if need arises.

6.4 PROGRAM METHODS

Region 51 developed it own frequency packing program. The program was written by Ronald Gillory, Communications Maintenance Division of the Houston Police Department. It incorporates several subroutine modules supplied by Bob Eckert, Spectrum Engineering Office of the FCC. Fortran source code for the program is found in Appendix 11. Some data files are not included as they can be reconstructed from the source code. The use of Okumura propagation curves allow terrain specific estimates for loss prediction when calculating the various interference parameters of concern to the Review Committee. The program does not accomplish a system design. Frequency assignment order is based upon the numerical constraint ratios present among the agencies and geopolitical locations. Entries with the largest interference constraint ratios are processed first. Reserved and assigned frequencies can be blocked on a global or location(s) specific basis. Reallocation of spectrum pools is possible after assignments are made.

6.5 PROTECTION RATIOS

There are two protection ratio parameters built into the computer program. One is for the co-channel test and the other is for the adjacent channel test. The global default ratio is 35 DB desired/undesired for the co-channel and 15 DB desired/undesired ratio for the adjacent channel case. These ratios should provide a probability of interference of less than 1%. It was strongly suggested that these values be used. They are adjustable on a global basis only.

6.6 TRANSMITTER COMBINING

The computer program is designed to provide a minimum frequency separation between any two channels assigned to the same eligible or pool at the same site. This separation is provided in order to enable a more efficient combining of multiple transmitters into a single antenna. The blocks of frequencies are limited in size only by the spectrum boundary limits and constraint conflicts from previous assignments. This parameter is adjustable on a global basis only. The parameter has a value of .250 MHz.

6.7 EXISTING SYSTEMS

Systems with synthesizers that can generate only 25KHz increments may receive special consideration from the Regional Review Committee. The use of radios with 12.5 KHz incremental synthesizers will be encouraged and given preference due to their use of spectrum efficient technology. The Region 51 computer program will make assignments based on 12.5 KHz incremental synthesizers.

6.8 GEOGRAPHICAL DEFINITION

For the purpose of the computer program, a geographical area is to be defined as a circle with the radius expressed in miles. To the degree practical, this circle should include the entire eligibles geopolitical boundary, but not to exceed the boundary by more than three miles. Cases requiring more than one circle to depict the coverage area will require guidance from the Regional Review Committee. Circle with a radius in excess of 24 miles will require additional justification for favorable action by the Regional Review Committee.

6.9 ADJACENT REGIONS

Adjacent Regions to Region 51 with existing frequency assignments near (within 70 miles) a common border will have those frequencies protected from interference due to assignment in neighboring areas of Region 51. The Region 51 Sorting Program contains a location specific frequency blocking database that contains the frequencies of these adjacent Region assignments. Any frequency assignments, voice or mobile data, for systems whose operating area is within 70 miles of another regional boundary will require coordination of channels with the neighboring region. This will ensure that computer databases remain updated thereby preventing cochannel or adjacent channel conflicts. Region 51 will make its database available to neighboring regions.

7 SYSTEM LICENSING

7.1 APPLICATION PROCEDURES

Any request for frequencies to be used for public safety or special emergency operations (as described in Part 90 of the FCC Rules and Regulations) must be submitted to the Regional Review Committee for approval. If adequate spectrum is available, the Regional Review Committee shall review the application to determine its compliance with the Region 51 Plan. It there is inadequate spectrum or the Regional Review Committee anticipates a shortage, the established evaluation procedure (Evaluation Criteria) shall be instituted. If approved by the Regional Review Committee, the request for frequencies will be returned to the applicant to be forwarded to the Associated Public Safety Communications Officers, Inc. (APCO) for frequency coordination. If not approved by the Regional Review Committee, the request will be returned to the applicant for revision and correction before being resubmitted to the Committee for further consideration. All applications will be considered slow growth. The request shall contain information to justify the frequencies requested and shall demonstrate compliance with the Region 51 Plan. As a minimum, this request shall consist of the following:

Appropriate Coordination and Licensing Application Forms

System Design Information

Funding Statement

Proposed Implementation Schedule

Existing Frequency Statement

Applicant General Information

7.2 EVALUATION PROCEDURES

The Regional Review Committee will review and evaluate each request based on the sufficiency of the information contained in the sections listed in APPLICATION PROCEDURES. The information required in each section includes the following:

7.2.1 SYSTEM DESIGN

A brief statement of the intended use of requested frequencies and how they will be integrated into existing emergency and non-emergency operations will be required. The efficiency of 800 MHz frequencies depends greatly upon the design and programming of the system itself. To assist all public safety users in making all systems operate in an efficient manner is the reason this area is being included for review. Specific criteria regarding system parameters are defined in the section, "Technical Design Requirements".

7.2.2 FUNDING STATEMENTS

The applicants commitment to implement the system must be ensured to maintain the efficient utilization of these 800 MHz frequencies. The funding statement, which will be a resolution from the applicants governing body, will include the method by which the system will be funded; for example, by Certificates of Obligation or local bond funds.

7.2.3 IMPLEMENTATION SCHEDULE

The applicant will be requested to furnish a schedule detailing the time period required to implement the proposed communications system, from funding through turn-on and final acceptance. It is not the intent of this plan to allow spectrum to be reserved for indefinite or long periods of time. Failure of the applicant to timely implement the proposed project will result in loss of the spectrum and its return to the general pools. The Regional Review Committee will notify the applicant when such problems arise.

7.2.4 EXISTING FREQUENCIES STATEMENT

It is anticipated that, in all but the most unusual cases, frequencies presently utilized by a licensee will be released for reassignment to other agencies within the FCC designated radio services, E.G., fire, local government, forestry, etc. The applicant is required to furnish the Regional Review Committee a list of frequencies

licensed including those to be released as "givebacks." The FCC authorized frequency coordinator will be notified of any recommended reassignments of giveback frequencies. The applicant evaluation criteria established in the Region 51 Plan are to be considered for recommendation purposes, In such cases where specific channels are required by numerous applicants, the user prioritization by service and function, as outlined, will be utilized for making the recommendation In all cases, area of coverage criteria and channel loading criteria as covered in the Region 51 Plan will be applied. All giveback frequencies are to be considered for reassignment by the Regional Review Committee. An agency will not be able to "farm down" frequencies to other services within their political structure unless it is justified to the Regional Review Committee. Agencies failing to give back channels, as agreed, will be subject to forfeiture of their 821-824/866-869 MHz channels. For example, if an agency applies for a five channel trunked system to replace existing UHF channels, the agencies expressed intent is to give back its UHF channels. Should the agency decide not to give back its UHF channels, and not be able to justify the decision to the Regional Review Committee, the Committee may recommend to the FCC that all or part of the requested new frequencies be withdrawn.

7.2.5 APPLICANT GENERAL INFORMATION

Information for this section is found in Appendix 9. Three sections are to be included. Section A is general information, Section B covers departmental/division use of existing frequencies, Section C is additional information for each department/division. Each applicant will produce a report covering the requested information. An outline form of documentation is acceptable.

7.3 EVALUATION CRITERIA

The criteria incorporates a filing concept which provides for the evaluation of all applications for available spectrum. The evaluation is a sequence of events that will be followed in the assignment of the 821-824/866-869 MHz spectrum within Region 51. In order to provide for maximum frequency reuse, the allocation has been placed in county frequency pools as a starting point. An initial closing date 120 days after approval of the plan will allow applicants to submit applications in accordance with the Region 51 Plan. In order to make frequency

assignments objectively, the Regional Review Committee will evaluate these initial applications in accordance with the criteria established by this section of the plan, awarding a score for each application. That score will be the total of the points in the listed "EVALUATION SCORING CATEGORIES". The maximum score is 100 points. Frequency assignments will be made for these applications using the appropriate county frequency pool or by line entry in the Region 51 computer program. If the valid applications exceed the available spectrum, frequencies will be awarded to those applicants with the highest descending score order. Applications received after the initial closing date will be evaluated by the Regional Review Committee in similar fashion. Frequency assignments will be made first by utilizing individual county frequency pools as the spectrum resource. As these pools are depleted, frequencies will be assigned utilizing protection criteria defined in the computer program until all frequencies offering minimum protection are depleted. The Regional Review Committee can adjust county frequency pools when population densities and applicant needs indicate that pool adjustment would provide efficient use of spectrum resources. Channels not assigned to a specific frequency pool can be assigned on a noninterference basis by the Regional Review Committee.

7.4 EVALUATION SCORING CATEGORIES

7.4.1 SERVICE (maximum score 35 points)

Each of the eligible services has a predetermined point value:

7.4.1.1 Local Government

Transit System	15 points
Utility Operation	30 points
Administration	15 points
Maintenance	15 points
Security Patrols	15 points
Other Functions	15 points

7.4.1.2 Police 35 points

7.4.1.3 Fire 35 points

7.4.1.4 Highway 30 points

7.4.1.5 Forest Fire	30 points
7.4.1.6 Conservation	25 points
7.4.1.7 Medical Services	
Hospitals	10 points
Patient Transfer	5 points
Physicians	5 points
7.4.1.8 Emergency Medical Services	35 points
7.4.1.9 Handicapped Transportation	15 points
7.4.1.10 Veterinarians	5 points
7.4.1.11 Disaster Relief Organization	15 points
7.4.1.12 School Busses	
Private Under Contract	5 points
School District Operated	5 points
Included in an approved Emergency Plan	15 points
7.4.1.13 Beach Patrols	5 points
7.4.1.14 Isolated Areas	5 points
7.4.1.15 Communication Standby Facilities	5 points
7.4.1.16 Communication Repair Facilities	5 points

An applicant for a system for multiple services will be scored on the basis of the sum of the maximum points for each service reduced by the percentage that each service represents of the total system. For example, a system application for use by 50 percent police, 25 percent local government (utility operations) and 25 percent highway (street maintenance) would be scored as follows: Police - 35 point maximum times 50 percent system use equals a score of 17.5 points, Local Government (utility operations) - 30 points maximum value times 25 percent use equals a score of 7.5 points, and Highway (street maintenance) - 30 points maximum value times 25 percent system use equals a score of 7.5 points. Total points awarded for this system is the sum of 17.5, 7.5, and 7.5 for a total of 32.5 points.

7.4.2 INTERSYSTEM COMMUNICATIONS (maximum score 10 points)

The Applicant is scored on the degree of interoperability that is demonstrated, with a range of points from 1 to 10 points. No points are awarded for use of the mandated designated interoperability channels. These points are awarded for the applicants ability to communicate with different levels of government and other services during times of emergency.

7.4.3 COOPERATIVE SYSTEMS (maximum score 25 points)

Those applicants that have demonstrated that they are part of a cooperative, multi-organization system will be scored on a range of 0 to 25 points depending upon the extent of the cooperation.

7.4.4 SYSTEM IMPLEMENTATION FACTORS (maximum score 10 points)

This category scores the applicant from 0 to 10 points on the degree of budgetary commitment. If funding has been provided by a line item budget equivalent in a sufficient amount for immediate implementation, a score of 10 points will be awarded.

7.4.5 GIVEBACK FREQUENCIES (maximum score 20 points)

This category is divided into two factors, each with a point value of 0 to 10 points.

7.4.5.1 NUMBER OF FREQUENCIES

The greater the number of giveback frequencies, the greater the number of points that will be awarded up to a maximum of 10 points.

7.4.5.2 NEED FOR FREQUENCIES

The greater the need for the giveback frequencies by other agencies, the greater the number of points that will be awarded up to a maximum of 10 points. For example, a statewide police frequency, as a giveback, would not be awarded as many points as would a needed VHF frequency usable by local police or fire department.

Points are totaled for each application and the application is prioritized by the Regional Review Committee according to the total score. As frequencies are assigned, the appropriate county frequency pool is updated to reflect the frequencies assigned. System implementation is monitored by the Regional Review Committee which determines the progress being made. If progress is found lacking, the licensee is informed of the consequences of the lack of progress. If continued monitoring indicated that sufficient progress is not taking place, licensee is notified of pending action of the Regional Review Committee to recommend to the FCC that the license be withdrawn. Should the license be withdrawn, these frequencies will be returned to the county frequency pool.

8 REGIONAL MOBILE DATA SYSTEMS

8.1 INTRODUCTION

Region 51 has reserved 10 channels (see Appendix 10) for the exclusive use of multi agency/multi user mobile data systems. By including small agencies, a combined mobile data system will promote interoperability and improve voice channel efficiency by removing certain types of voice channel loading such as routine data base inquiries. At a minimum, channel loading will equal or exceed trunked requirements in a coordinated system.

8.2 APPLICATION PROCEDURE

Any request for frequencies in the reserved mobile data system pool must be submitted to the Regional Review Committee for approval. If adequate spectrum is available, the Regional Review Committee shall review the application to determine its compliance with the Region 51 Plan. In addition to meeting all requirements under the SYSTEM LICENSING chapter of this plan, the applicant will include sufficient information showing the Regional Review Committee how the use of this reserved mobile data spectrum will allow multi agency/multi user entities outside of the applicants geopolitical structure to participate if desired.

8.3 SYSTEM INTEROPERABILITY

Mobile data systems operating in the Region 51 reserved spectrum will allow provisions in the design of their backbone system that can allow for interoperability between other data networks in the region.

8.4 LONGEVITY OF RESERVED SPECTRUM

Frequencies in the Region 51 reserved mobile data spectrum that remain unused for 5 years after plan approval can be returned to the general pool for reassignment allowing voice only operation.

8.5 FREQUENCY REUSE

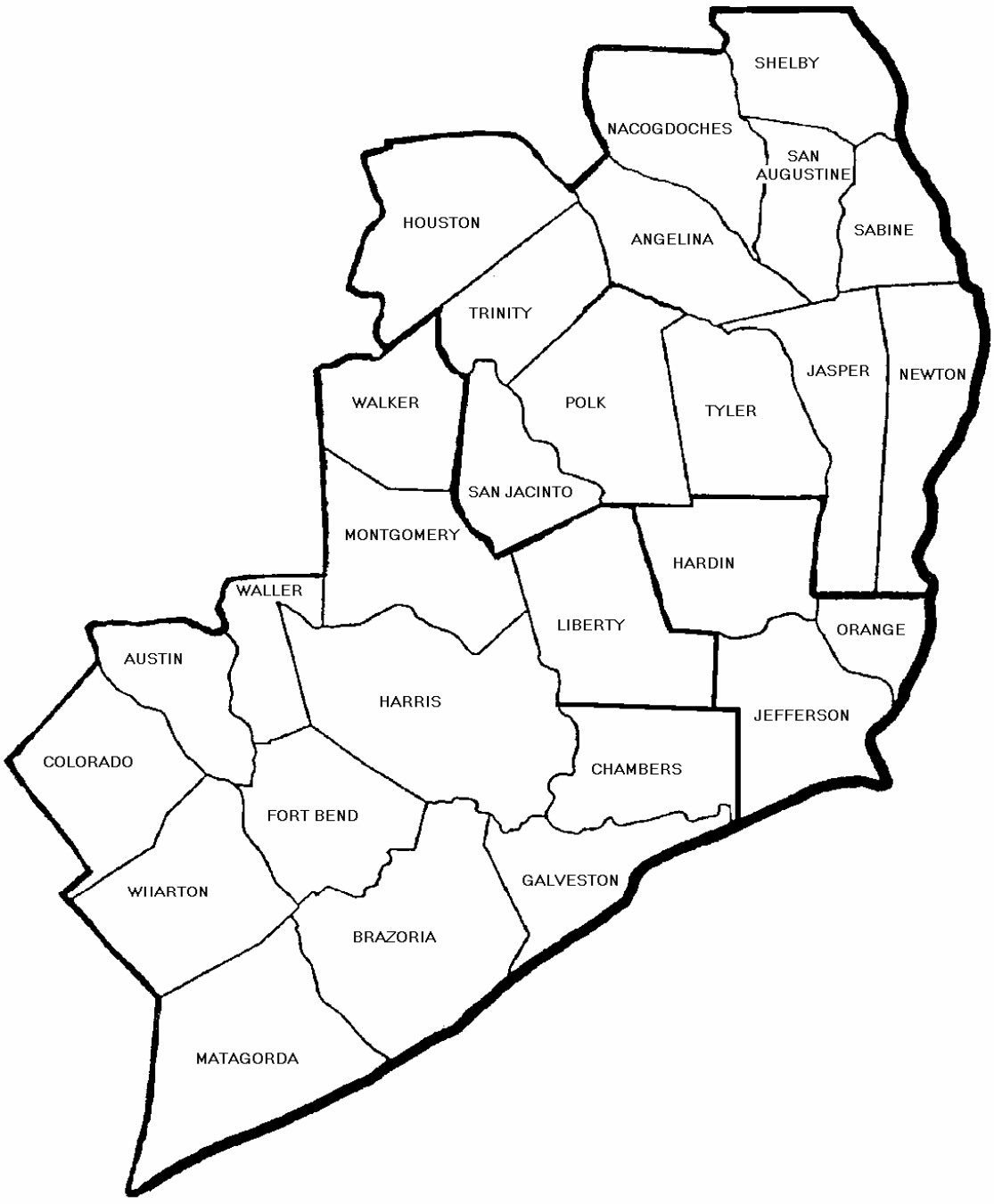
Applicants are encouraged to employ design methodology that will result in maximum frequency reuse. Designs utilizing small cells in the RF network are encouraged.

8.6 SPECTRUM COORDINATION

Any frequency assignments, voice or mobile data, for systems whose operating area is within 70 miles of another regional boundary will require coordination of channels with the neighboring region.

APPENDIX 1

REGION 51 MAP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NACOGDOCHES
SAN AUGUSTINE
HOUSTON
ANGELINA
SABINE
TRINITY
JASPER
NEWTON
WALKER
POLK
TYLER
SAN JACINTO
MONTGOMERY
HARDIN
WALLER
LIBERTY
ORANGE
AUSTIN
HARRIS
JEFFERSON
COLORADO
CHAMBERS
FORT BEND
GALVESTON
WHARTON
BRAZORIA
MATAGORDA

APPENDIX 2

GENERAL MEMBERSHIP LIST

NAME: Pat Adams
TITLE: Chief of Police
AGENCY: Katy Police Dept.
ADDRESS: 5456 Franz Road
CITY: Katy TX 77449
PHONE: (713) 391-9221 Ext.
COUNTY: COG: HGAC

NAME: Walter C. Adams
TITLE: Communications Supt.
AGENCY: State Department of Highways
ADDRESS: P.O. Box 1386
CITY: Houston TX 77251
PHONE: (713) 869-4571 Ext.
COUNTY: COG: HGAC

NAME: Doug Atkins
TITLE: Radio Technician
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-6037 Ext.
COUNTY: Harris COG: HGAC

NAME: Jerry Barker
TITLE: Lt.
AGENCY: Webster Police Dept.
ADDRESS: 217 Pennsylvania Ave.
CITY: Webster TX 77598
PHONE: (713) 332-2426 Ext.

NAME: Walter H. Bauer
TITLE: Sgt.
AGENCY: V. A. Police
ADDRESS: 2002 Holcombe BLVD
CITY: Houston TX 77030
PHONE: (713) 795-7467 Ext.
COUNTY: COG: HGAC

NAME: Mark Bisby
TITLE: Captain
AGENCY: Klein ISD Police
ADDRESS: 7200 Spring Cypress
CITY: Klein TX 77079
PHONE: 713 376 1462 Ext.
COUNTY: Harris COG: HGAC

NAME: W. J. Blair Jr.
TITLE: Region 40 Convener
AGENCY: DFW Airport
ADDRESS: P.O. DRAWER DWF
DFW Airport
CITY: Dallas TX 75261
PHONE: (214) 574-6642 Ext.

NAME: Charles O. Bowles
TITLE: Chairman Region 40
AGENCY: North Central Texas COG
ADDRESS: 3310 Matador Drive
CITY: Garland TX 75042
PHONE: (214) 276-7855 Ext.

NAME: Joe Boyle
TITLE: Captain
AGENCY: Village Police Dept.
ADDRESS: --

NAME: C. A. Brawner
TITLE: Police Officer
AGENCY: Spring Branch ISD Police
ADDRESS: 955 Campbell Rd.
CITY: Houston TX 77024
PHONE: 713 464 1511 Ext.
COUNTY: Harris COG: HGAC

NAME: Lindsay Carlton
TITLE: Lt.
AGENCY: League City Police Department
ADDRESS: 600 West Walher
CITY: League City TX 77573
PHONE: (713) 332-2566 Ext.
COUNTY: COG: HGAC

NAME: Ann Carter
TITLE: Support Supervisor
AGENCY: Webster Police Dept.
ADDRESS: ?
CITY: Webster TX
PHONE: 332-2426 Ext.

NAME: Jay Chapman
TITLE: Lt.
AGENCY: Pearland Police Dept.
ADDRESS: 2703 Veterans Drive
CITY: Pearland TX 77584
PHONE: (713) 485-4361 Ext.

NAME: Allen Dieter
TITLE: Director of Communications
AGENCY: Harris County
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-6468 Ext.
COUNTY: COG: HGAC

NAME: David P. Duhon
TITLE: Radio Technician
AGENCY: Baytown Police Dept.
ADDRESS: 3200 N. Main
CITY: Baytown TX 77522
PHONE: 713 427 4333 Ext.
COUNTY: Harris COG: HGAC

NAME: C. L. Ellis
TITLE: Deputy Chief of Police
AGENCY: Pasadena Police
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77502
PHONE: (713) 477-1221 Ext.
COUNTY: COG: HGAC

NAME: Margri Ferguson
TITLE: Sergeant Special Services
AGENCY: Fort Bend County S.O.
ADDRESS: 1410 Ransom Road
CITY: Richmond TX 77469
PHONE: (713) 341-4610 Ext.

NAME: James E. Fowler
TITLE: Captain CID/Comm. Div.
AGENCY: Galveston S.O.
ADDRESS: 2026 Sealy
CITY: Galveston TX 77550
PHONE: (409) 766-2498 Ext.
COUNTY: COG: HGAC

NAME: Fred Gallant
TITLE: Rep.
AGENCY: G.E. Mobile Communications

NAME: Linda C. Gandy
TITLE: Supervisor Communications & Records
AGENCY: Stafford Police
ADDRESS: 2602 South Main
CITY: Stafford TX 77477
PHONE: (713) 499-1695 Ext.
COUNTY: COG: HGAC

NAME: C. R. Gebbert
TITLE: Fire Fighter
AGENCY: City of West University Place
ADDRESS: 3800 University BLVD
CITY: Houston TX 77005
PHONE: (713) 662-5835 Ext.
COUNTY: Harris COG: HGAC

NAME: Ronald J. Gillory
TITLE: Police Officer, Digital Section
AGENCY: Houston Police Department
ADDRESS: Room C424 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5744 Ext.
COUNTY: Harris COG: HGAC

NAME: Stephen M. Griffith
TITLE: Chief of Police
AGENCY: City of West University Place
ADDRESS: 3814 University
CITY: Houston TX 77005
PHONE: (713) 662-4600 Ext.
COUNTY: COG: HGAC

NAME: Richard Herndon
TITLE: Asst. Engr. of Radio Operations
AGENCY: State Dept. Hwys & Public Transport.
ADDRESS: File D-18STO SRO
11th & Brazos Streets
CITY: Austin TX 78701
PHONE: (512) 465-6338 Ext.

NAME: Ron Hickman
TITLE: Captain / Dept. Analyst
AGENCY: Harris County Pct.4 Constable

NAME: Bob Hilsher
TITLE: Constable's Project Analyst
AGENCY: Prct. 1 Constable
ADDRESS: 301 San Jacinto
Suite 310
CITY: Houston TX 77002
PHONE: (713) 221-5200 Ext.
COUNTY: Harris COG: HGAC

NAME: Carl Hoagland
TITLE: Communications Officer
AGENCY: Harris County S.O.
ADDRESS: 1301 Franklin
CITY: Houston TX 77002
PHONE: (713) 221-7753 Ext.
COUNTY: Harris COG: HGAC

NAME: Jimmy M. Holland
TITLE: Captain
AGENCY: Friendswood Police Department
ADDRESS: 109 Willowick
CITY: Friendswood TX 77546
PHONE: (713) 482-8037 Ext. 3301
COUNTY: COG: HGAC

NAME: Billy C. Hutchison
TITLE: Region Supervisor Police Communication
AGENCY: Texas DPS
ADDRESS: 10110 N.W. Freeway
CITY: Houston TX 77092
PHONE: (713) 957-6190 Ext.

NAME: Joe D. Jeffrey
TITLE: Communications Supervisor
AGENCY: Sugarland Police Dept.
ADDRESS: P.O. Box 110
CITY: Sugar Land TX 77487
PHONE: (713) 242-2600 Ext.
COUNTY: COG: HGAC

NAME: Jan W. Jones
TITLE: Lieutenant
AGENCY: Stafford Police Dept.

NAME: Larry Kennedy
TITLE: Technician
AGENCY: Conroe Police Dept.
ADDRESS: 901 Old Montgomery Road
CITY: Conroe TX 77031
PHONE: (409) 756-7848 Ext.
COUNTY: Montgomery COG:

NAME: Scott Kniffen
TITLE: ?
AGENCY: Conroe Police Dept.
ADDRESS: ?
CITY: Conroe TX
PHONE: (409) 756-5588 Ext.
COUNTY: Montgomery COG:

NAME: Richard A. Kupferer
TITLE: Communication Manager
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-5910 Ext.
COUNTY: COG: HGAC

NAME: Lenert A. Kurtz
TITLE: Equipment Supt.
AGENCY: Texas SDH & PT
ADDRESS: P.O. Box 1386
CITY: Houston TX 77251
PHONE: (713) 869-4571 Ext.
COUNTY: Harris COG: HGAC

NAME: Don LaVrier
TITLE: Deputy Fire Chief
AGENCY: Conroe Fire Department
ADDRESS: P.O. Box 1331
CITY: Conroe TX 77305
COUNTY: Montgomery COG:

NAME: Ed Lewis
TITLE: Account Executive
AGENCY: Motorola
ADDRESS: P.O. Box 73115
CITY: Houston TX 77090
PHONE: (713) 537-3779 Ext.
COUNTY: COG: HGAC

NAME: Edith M. Lindstrom
TITLE: Account Executive
AGENCY: IWL Communications
ADDRESS: P.O. Box 1324
CITY: Friendswood TX 77546
PHONE: (713) 482-0289 Ext.
COUNTY: COG: HGAC

NAME: Philip M. Lipnick
TITLE: Deputy Emergency Management Coord.
AGENCY: City of Galveston
ADDRESS: P.O. Box 779
CITY: Galveston TX 77553
PHONE: (409) 766-2102 Ext.
COUNTY: COG: HGAC

NAME: Luke Loeser
TITLE: Lieutenant
AGENCY: Friendswood Police Dept.
ADDRESS: 109 Willowien
CITY: Friendswood TX 77546
PHONE: 713 482 8037 Ext.

NAME: George J. Maczali
TITLE: Communications
AGENCY: Houston Office of Emergency Mang.
ADDRESS: P.O. Box 1562
330 Rusk
CITY: Houston TX 77251
PHONE: (713) 236-7750 Ext.
COUNTY: Harris COG: HGAC

NAME: Otto Maresh
TITLE: Admin. Assistant
AGENCY: Texas Highway Dept.

NAME: Harris E. Maulden
TITLE: Computer Communication Eng.
AGENCY: City of Pearland
ADDRESS: 3519 Liberty Drive
CITY: Pearland TX 77588
PHONE: (713) 485-2411 Ext.
COUNTY: COG: HGAC

NAME: Gary S. McFarland
TITLE: Communications Coordinator
AGENCY: Missouri City Police Department
ADDRESS: 1522 Texas Parkway
CITY: Missouri City TX 77495
PHONE: (713) 261-4200 Ext.
COUNTY: COG: HGAC

NAME: John R. Melcher
TITLE: Dispatch Supervisor
AGENCY: Pasadena Police Dept.
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77501
PHONE: (713) 475-5511 Ext.
COUNTY: COG: HGAC

NAME: Thomas L. Morrow
TITLE: Territory Manager
AGENCY: G.E. Mobile Communications
ADDRESS: 7100 Regency Square BLVD
Suite 241
CITY: Houston TX 77036
PHONE: (713) 978-5105 Ext.

NAME: Brain O'hare
TITLE: Communications Officer
AGENCY: Conroe Police Dept.

NAME: Larry G. Orr
TITLE: Manager/Planner
AGENCY: Harric County Communications
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-8386
COUNTY: Harris COG: HGAC

NAME: John G. Parsons
TITLE: Captain
AGENCY: Beaumont Police Department
ADDRESS: 255 College St.
CITY: Beaumont TX 77701
PHONE: (409) 880-3810 Ext.

NAME: Glen Reid
TITLE: District Manager
AGENCY: Motorola Government Div.
ADDRESS: 1140 Cypress Station
CITY: Houston TX 77090
PHONE: (713) 537-3600 Ext.
COUNTY: COG: HGAC

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12
COUNTY: COG: HGAC

NAME: Rick Robertson
TITLE: Communications Supervisor
AGENCY: Fort Bend County EMS
ADDRESS: RT. 2 BOX 643-C
CITY: Rosenberg TX 77471
PHONE: 713 342 7233 Ext.
COUNTY: Fort Bend COG: HGAC

NAME: Angie Rodriguez
TITLE: Public Affairs Spec.
AGENCY: F.C.C.
ADDRESS: 1225 North Loop West
Suite 900
CITY: Houston TX 77008
PHONE: (713) 229-2748 Ext.

NAME: Joe Royle
TITLE: Captain
AGENCY: Village Police Department
ADDRESS: 11981 Memorial Drive
CITY: Houston TX 77024
PHONE: (713) 468-7878 Ext.
COUNTY: Harris COG: HGAC

NAME: David Sarkozi
TITLE: Communication Specialist
AGENCY: University of Houston Police
ADDRESS: Police Department
University of Houston
CITY: Houston TX 77204
PHONE: (713) 749-2292 Ext.
COUNTY: COG: HGAC

NAME: Neill M. Seeley
TITLE: Communications
AGENCY: Baytown Police Dept.
ADDRESS: P.O. Box 3220
CITY: Baytown TX 77522
PHONE: 713 427 4333 Ext.
COUNTY: Harris COG: HGAC

NAME: J. Ross Sherohman
TITLE: Communications Coordinator
AGENCY: Nacogdoches Sheriff Department
ADDRESS: P.O. Box 632911
CITY: Nacogdoches TX 75963
PHONE: 409 560 7793 Ext.
COUNTY: Nacogdoches COG: DETCAG

NAME: Robert Shiflet
TITLE: Technical Management Sgt.
AGENCY: Beaumont Police Dept.
ADDRESS: P.O. Box 3827
CITY: Beaumont TX 77704
PHONE: (409) 880-3811 Ext.

NAME: Michael K. Snow
TITLE: Assistant Fire Technician
AGENCY: Cypress Creek Fire Department
ADDRESS: P.O. Box 690465
CITY: Houston TX 77269
PHONE: (713) 894-0151 Ext.
COUNTY: COG: HGAC

NAME: Bobby Spradlin
TITLE: Lieutenant
AGENCY: Port Arthur Police Department
ADDRESS: P.O. Box 1089
CITY: Port Arthur TX 77640
PHONE: (409) 983-8600 Ext.

NAME: Terry Stevenson
TITLE: Fire Chief
AGENCY: City of West University Place
ADDRESS: 3800 University BLVD
CITY: Houston TX 77005
PHONE: (713) 662-5835 Ext.
COUNTY: Harris COG: HGAC

NAME: Richard Storemski
TITLE: Lieutenant
AGENCY: University of Houston Police
ADDRESS: University of Houston
CITY: Houston TX 77204
PHONE: (713) 749-7212 Ext.
COUNTY: COG: HGAC

NAME: David Thompson
TITLE: Data Processing Manager
AGENCY: Texas City Police Dept.
ADDRESS: 928 5th Ave N.
CITY: Texas City , Tx 77590
PHONE: (409) 948 2525

NAME: Pete Updegraff
TITLE: Area Sales Manager
AGENCY: Motorola C & E, Inc.
ADDRESS: 1140 Cypress Station Drive
CITY: Houston TX 77090
PHONE: (713) 537-3627 Ext.
COUNTY: COG: HGAC

NAME: Raymond F. Vyoul
TITLE: Director of Transportation
AGENCY: Tomball Ind. School District
ADDRESS: 221 West Main
CITY: Tomball TX 77375
PHONE: (713) 351-4589 Ext.
COUNTY: COG: HGAC

NAME: Brian Weisinger
TITLE: Supervisor
AGENCY: Friendswood I.S.D.

NAME: R. L. "RED" Williamson
TITLE: Communications Supervisor
AGENCY: Montgomery County S.O.
ADDRESS: #1 Criminal Justice Drive
CITY: Conroe TX 77301
PHONE: (409) 760-5800 Ext.
COUNTY: Montgomery COG:

NAME: T. G. Wilson
TITLE: Lieutenant Communications Div.
AGENCY: Harris County S.O.
ADDRESS: 1301 Franklin
CITY: Houston TX 77002
PHONE: (713) 221-7954 Ext.
COUNTY: COG: HGAC

NAME: Herman Wolff
TITLE: Fleet Manager
AGENCY: Texas Dept. of Public Safety
ADDRESS: P.O. Box 4087
CITY: Austin TX 78773
PHONE: (512) 465-2043 Ext.

NAME: Kenneth C. Yoder
TITLE: Frequency Advisor
AGENCY: Texas DPS
ADDRESS: P.O. Box 4087
5805 N. Larmar BLVD
CITY: Austin TX 78748
PHONE: (512) 465-2104 Ext.

NAME: Mark G. Zeringue
TITLE: Digital Section Supervisor
AGENCY: Houston Police Department
ADDRESS: Room C413 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5743 Ext.
COUNTY: Harris COG: HGAC

NAME: Rick Russek
TITLE: Sergeant
AGENCY: Fort Bend Co Sheriff Dept
ADDRESS: 1410 Ransom Rd
CITY: Richmond Tx 77469
PHONE: (713) 341-4600
COUNTY: Fort Bend COG: HGAC

NAME: Robert E Williamson
TITLE: Lieutenant
AGENCY: Port Author Police Dept
ADDRESS: P.O. Box 1089 - 645 4th St.
CITY: Port Authur, Tx 77641
PHONE: (409) 983 8668
COUNTY: Orange COG: South East Texas COG
NAME:Nick Davis

TITLE: Major
AGENCY: Orange Police Dept.
ADDRESS: P.O. Box 520
CITY: Orange, Tx 77630
PHONE: (409) 883-1073
FAX: (409) 883-1991
COUNTY: Orange COG:South East Texas COG

NAME: Steve Jones
TITLE: Sergent
AGENCY:Orange Police Dept
ADDRESS: P.O. 520
CITY: Orange Tx 77630
PHONE: (409) 883-1071
COUNTY: Orange COG: South East Texas COG

NAME:Jay Ogden
TITLE: Director EMS
AGENCY: Montgomery County EMS
ADDRESS: P.O. Box 478
CITY: Conroe Tx 77305
PHONE: (409) 539-7148
COUNTY: Montgomery COG: HGAC

NAME:Lisa Aymes Karlok
TITLE: Communications Supervisor
AGENCY: Galveston Police Dept
ADDRESS: 2517 Ball
CITY: Galveston Tx 77550
PHONE: (409) 766 2176
COUNTY: Galveston COG: HGAC

NAME: Don Shauberger
TITLE: Chief Deputy
AGENCY: Liberty County Sheriff Dept
ADDRESS: 2113 Sam Houston Street
CITY: Liberty Tx 77575
PHONE: (409) 336 8906
COUNTY: Liberty COG: HGAC

NAME: Mike Herbst

TITLE: Director of Police
AGENCY: University of Houston - Clear Lake
ADDRESS: 2700 Bay Area Blvd
CITY: Houston Tx 77058
PHONE: (713) 283-2222
COUNTY: COG:

NAME:Kyle Rhorer
TITLE: Communications Coordinator
AGENCY: Webster Fire Dept
ADDRESS:P.O. Box 57098
CITY: Webster, Tx 77598
PHONE: (713) 332 2711
COUNTY: COG:

NAME: Mark Plagens
TITLE: Systems Officer
AGENCY: Harris County Communications
ADDRESS: 406 Caroline
CITY: Houston, Tx 77002
PHONE: (713) 221-7318
COUNTY: Harris COG: HGAC

NAME: Dan Howard
TITLE:
AGENCY: Motorola
ADDRESS: 1140 Cypress Station Dr.
CITY: Houston Tx 77090
PHONE: (713) 537-3752
COUNTY: Harris COG:HGAC

NAME:Peter Jorna
TITLE: Communications Supv
AGENCY: Montgomery County EMS
ADDRESS: P.O. Box 478
CITY: Conroe Tx 77305
PHONE:(409) 539-7796
COUNTY: Montgomery COG:HGAC

NAME:Patrick Black
TITLE: Account Executive
AGENCY: Motorola Communication & Electronics
ADDRESS:1140 Cypress Station
CITY: Houston Tx 77090
PHONE: (713) 537 3685
COUNTY: Harris COG: HGAC

NAME:Mary James
TITLE: Dispatch Supv.
AGENCY: Pasadena Police Dept.
ADDRESS: 1114 Davis
CITY: Pasadena Tx 77506
PHONE: (713) 475 5511
COUNTY: Harris COG:HGAC

NAME:Ross Sherohman
TITLE: Regional Advisor
AGENCY: Deep East Tx Council of Govt.
ADDRESS: P.O. Box 632911
CITY: Nacogdoches Tx 75963-2911
PHONE: (409) 569 8911
COUNTY: COG:

NAME:Joe Boyle
TITLE: Capt.
AGENCY:Village P.D.
ADDRESS: 11981 Memorial Dr.
CITY: Houston Tx 77024
PHONE: (713) 468 7878
COUNTY: Harris COG: HGAC

NAME:Hellen Contreres
TITLE: Communication Supv.
AGENCY: Bay City P.D.
ADDRESS: 2201 Ave H
CITY: Bay City Tx 77414
PHONE: (409) 245 8500
COUNTY: COG:

NAME:Dallis W Warren
TITLE: Capt.
AGENCY: Rosenberg Police Dept.
ADDRESS: 2033 Ave H
CITY: Rosenberg Tx 77471
PHONE: (713) 342-6945
COUNTY: COG:

NAME: T.M. HonRay
TITLE: Special Services
AGENCY: Fort Bend Sheriff Dept.
ADDRESS: 1410 Ransom Rd.
CITY: Richmond tx 77469
PHONE: (713) 341-4629
COUNTY: Fort Bend COG:HGAC

NAME: Donald Little
TITLE: Chief of Police
AGENCY: Dear Park
ADDRESS: P.O. Box 700
CITY: Deer Park, Tx 77536
PHONE: (713) 479 1511
COUNTY: COG:

NAME:Gary A Finkelman
TITLE: Patrolman
AGENCY: Spring Valley Police Dept.
ADDRESS: 1025 Campbell Rd.
CITY: Houston, Tx 77055
PHONE: (713) 465-8323
COUNTY: Harris COG: HGAC

NAME:Robert Cusick
TITLE: Airport System Supv.
AGENCY: Dept of Aviation/ City of Houston
ADDRESS: 2800 N. Terminal Rd -
Houston Intercontinental Airport
CITY: Houston Tx 77205
PHONE:(713) 230 3052
COUNTY:Harris COG:HGAC

APPENDIX 3

Regional Planning Subcommittee
Members List

< Steve Jennings - CHAIRMAN >

NAME: Carl Hoagland
TITLE: Communications Officer
AGENCY: Harris County S.O.
ADDRESS: 1301 Franklin
CITY: Houston TX 77002
PHONE: (713) 221-7753

NAME: C. L. Ellis
TITLE: Deputy Chief of Police
AGENCY: Pasadena Police
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77502
PHONE: (713) 477-1221

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Billy C. Hutchison
TITLE: Region Supervisor Police Communication
AGENCY: Texas DPS
ADDRESS: 10110 N.W. Freeway
CITY: Houston TX 77092
PHONE: (713) 957-6190

NAME: R. L. "RED" Williamson
TITLE: Communications Supervisor
AGENCY: Montgomery County S.O.
ADDRESS: #1 Criminal Justice Drive
CITY: Conroe TX 77301
PHONE: (409) 760-5800

NAME: Lindsay Carlton
TITLE: Lt.
AGENCY: League City Police Department
ADDRESS: 600 West Walher
CITY: League City TX 77573
PHONE: (713) 332-2566 Ext.

NAME: Steve Jennings
TITLE: Director
AGENCY: Harris County
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-6299

Regional Interoperability Subcommittee
Members List

< Billy Hutchison - CHAIRMAN >

NAME: Doug Atkins
TITLE: Radio Technician
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-6037 Ext.

NAME: Gary S. McFarland
TITLE: Communications Coordinator
AGENCY: Missouri City Police Department
ADDRESS: 1522 Texas Parkway
CITY: Missouri City TX 77495
PHONE: (713) 261-4200 Ext.

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Billy C. Hutchison
TITLE: Region Supervisor Police Communication
AGENCY: Texas DPS
ADDRESS: 10110 N.W. Freeway
CITY: Houston TX 77092
PHONE: (713) 957-6190

NAME: Jimmy M. Holland
TITLE: Captain
AGENCY: Friendswood Police Department
ADDRESS: 109 Willowick
CITY: Friendswood TX 77546
PHONE: (713) 482-8037 Ext. 3301

NAME: Jay Chapman
TITLE: Lt.
AGENCY: Pearland Police Dept.
ADDRESS: 2703 Veterans Drive
CITY: Pearland TX 77584
PHONE: (713) 485-4361

NAME: R. L. "RED" Williamson
TITLE: Communications Supervisor
AGENCY: Montgomery County S.O.
ADDRESS: #1 Criminal Justice Drive
CITY: Conroe TX 77301
PHONE: (409) 760-5800

NAME: Walter C. Adams
TITLE: Communications Supt.
AGENCY: State Department of Highways
ADDRESS: P.O. Box 1386
CITY: Houston TX 77251
PHONE: (713) 869-4571

NAME: Joe D. Jeffrey
TITLE: Communications Supervisor
AGENCY: Sugarland Police Dept.
ADDRESS: P.O. Box 110
CITY: Sugar Land TX 77487
PHONE: (713) 242-2600

NAME: Ronald J. Gillory
TITLE: Police Officer
AGENCY: Houston Police Department
ADDRESS: Room C424 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5744

Regional Review Subcommittee
Members List

< Allan Dieter - CHAIRMAN >

NAME: C. L. Ellis
TITLE: Deputy Chief of Police
AGENCY: Pasadena Police
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77502
PHONE: (713) 477-1221

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Allen Dieter
TITLE: Director of Communications
AGENCY: Harris County
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-6468

NAME: R. L. "RED" Williamson
TITLE: Communications Supervisor
AGENCY: Montgomery County S.O.
ADDRESS: #1 Criminal Justice Drive
CITY: Conroe TX 77301
PHONE: (409) 760-5800

NAME: Walter H. Bauer
TITLE: Sgt.
AGENCY: V. A. Police
ADDRESS: 2002 Holcombe BLVD
CITY: Houston TX 77030
PHONE: (713) 795-7467

NAME: C. L. Ellis
TITLE: Deputy Chief of Police
AGENCY: Pasadena Police
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77502
PHONE: (713) 477-1221

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Allen Dieter
TITLE: Director of Communications
AGENCY: Harris County
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-6468

NAME: R. L. "RED" Williamson
TITLE: Communications Supervisor
AGENCY: Montgomery County S.O.
ADDRESS: #1 Criminal Justice Drive
CITY: Conroe TX 77301
PHONE: (409) 760-5800

NAME: Walter H. Bauer
TITLE: Sgt.
AGENCY: V. A. Police
ADDRESS: 2002 Holcombe BLVD
CITY: Houston TX 77030
PHONE: (713) 795-7467

Application Procedure and Evaluation Subcommittee
Members List

< C. L. Ellis - CHAIRMAN >

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Steve Jennings
TITLE: Director of Data Services & Communications
AGENCY: Harris County
ADDRESS: 406 Caroline
CITY: Houston TX 77002
PHONE: (713) 221-6299

NAME: Larry Orr
TITLE: Manager of Radio Communications
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-8386

NAME: Ronald J. Gillory
TITLE: Police Officer, Digital Section
AGENCY: Houston Police Department
ADDRESS: Room C424 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5744

NAME: C. L. Ellis
TITLE: Deputy Chief of Police
AGENCY: Pasadena Police
ADDRESS: P.O. Box 3209
CITY: Pasadena TX 77501
PHONE: (713) 477-1221

NAME: Rick Russek
TITLE: Sergeant
AGENCY: Fort Bend Co Sheriff Dept
ADDRESS: 1410 Ransom Rd
CITY: Richmond Tx 77469
PHONE: (713) 341-4600
COUNTY: Fort Bend COG: HGAC

NAME: Robert E Williamson
TITLE: Lieutenant
AGENCY: Port Author Police Dept
ADDRESS: P.O. Box 1089 - 645 4th St.
CITY: Port Authur, Tx 77641
PHONE: (409) 983 8668
COUNTY: Orange COG: South East Texas COG

NAME: Rick Robertson
TITLE: Communications Supv.
AGENCY: Ft Bend EMS
ADDRESS: Rt 2 Box 643-C (4336 Hy 36)
CITY: Rosenberg, Tx
PHONE: (713) 342-7233
COUNTY: Fort Bend COG: HGAC

NAME:Jay Ogden
TITLE: Director EMS
AGENCY: Montgomery County EMS
ADDRESS: P.O. Box 478
CITY: Conroe Tx 77305
PHONE: (409) 539-7148
COUNTY: Montgomery COG: HGAC

NAME:Nick Davis
TITLE: Major
AGENCY: Orange Police Dept.
ADDRESS: P.O. Box 520
CITY: Orange, Tx 77630
PHONE: (409) 883-1073
FAX: (409) 883-1991
COUNTY: Orange COG:South East Texas COG

NAME: Steve Jones
TITLE: Sergent
AGENCY:Orange Police Dept
ADDRESS: P.O. 520
CITY: Orange Tx 77630
PHONE: (409) 883-1071
COUNTY: Orange COG: South East Texas COG

NAME: David Thompson
TITLE: Data Processing Manager
AGENCY: Texas City Police Dept.
ADDRESS: 928 5th Ave N.
CITY: Texas City , Tx 77590
PHONE: (409) 948 2525

Spectrum Efficiency Subcommittee
Members List

< Gary McFarland - CHAIRMAN >

NAME: Doug Atkins
TITLE: Radio Technician
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-6037

NAME: Gary S. McFarland
TITLE: Communications Coordinator
AGENCY: Missouri City Police Department
ADDRESS: 1522 Texas Parkway
CITY: Missouri City TX 77495
PHONE: (713) 261-4200

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Jimmy M. Holland
TITLE: Captain
AGENCY: Friendswood Police Department
ADDRESS: 109 Willowick
CITY: Friendswood TX 77546
PHONE: (713) 482-8037 Ext. 3301

NAME: Joe D. Jeffrey
TITLE: Communications Supervisor
AGENCY: Sugarland Police Dept.
ADDRESS: P.O. Box 110
CITY: Sugar Land TX 77487
PHONE: (713) 242-2600

NAME: Ronald J. Gillory
TITLE: Police Officer, Digital Section
AGENCY: Houston Police Department
ADDRESS: Room C424 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5744

NAME: C. R. Gebbert
TITLE: Fire Fighter
AGENCY: City of West University Place
ADDRESS: 3800 University BLVD
CITY: Houston TX 77005
PHONE: (713) 662-5835

NAME: Lindsay Carlton
TITLE: Lt.
AGENCY: League City Police Department
ADDRESS: 600 West Walher
CITY: League City TX 77573
PHONE: (713) 332-2566

Existing Frequencies Subcommittee
Members List

< Terry Stevenson - CHAIRMAN >

NAME: Richard A. Kupferer
TITLE: Communication Manager
AGENCY: Harris County
ADDRESS: 311 Austin
CITY: Houston TX 77002
PHONE: (713) 221-5910

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Jimmy M. Holland
TITLE: Captain
AGENCY: Friendswood Police Department
ADDRESS: 109 Willowick
CITY: Friendswood TX 77546
PHONE: (713) 482-8037 Ext. 3301

NAME: Jay Chapman
TITLE: Lt.
AGENCY: Pearland Police Dept.
ADDRESS: 2703 Veterans Drive
CITY: Pearland TX 77584
PHONE: (713) 485-4361

NAME: Terry Stevenson
TITLE: Fire Chief
AGENCY: City of West University Place
ADDRESS: 3800 University BLVD
CITY: Houston TX 77005
PHONE: (713) 662-5835

Data Communications and Voice Encryption Subcommittee
Members List

< Ronald Gillory - CHAIRMAN >

NAME: Stephen M. Griffith
TITLE: Chief of Police
AGENCY: City of West University Place
ADDRESS: 3814 University
CITY: Houston TX 77005
PHONE: (713) 662-4600

NAME: Gary Rice
TITLE: Sergeant
AGENCY: La Porte Police
ADDRESS: P.O. Box 846
CITY: La Porte TX 77572
PHONE: (713) 471-3810 Ext. 12

NAME: Harris E. Maulden
TITLE: Computer Communication Eng.
AGENCY: City of Pearland
ADDRESS: 3519 Liberty Drive
CITY: Pearland TX 77588
PHONE: (713) 485-2411

NAME: Ronald J. Gillory
TITLE: Police Officer, Digital Section
AGENCY: Houston Police Department
ADDRESS: Room C424 Communications Annex
61 Riesner Street
CITY: Houston TX 77002
PHONE: (713) 247-5744

Vendor Resource Subcommittee
Members List

NAME: Brice Shelton
TITLE: Account Executive
AGENCY: Motorola
ADDRESS: 1140 Cypress Station
CITY: Houston TX 77090
PHONE: (713) 537-3739

NAME: Ed Lewis
TITLE: Account Executive
AGENCY: Motorola
ADDRESS: P.O. Box 73115
CITY: Houston TX 77090
PHONE: (713) 537-3779

NAME: Pete Updegraff
TITLE: Area Sales Manager
AGENCY: Motorola C & E, Inc.
ADDRESS: 1140 Cypress Station Drive
CITY: Houston TX 77090
PHONE: (713) 537-3627

NAME: Thomas L. Morrow
TITLE: Territory Manager
AGENCY: G.E. Mobile Communications
ADDRESS: 7100 Regency Square BLVD
Suite 241
CITY: Houston TX 77036
PHONE: (713) 978-5105

APPENDIX 4

OKUMURA OPEN 800 MHz
10*dBu/kW

MILES	100'	200'	500'	1000'
5	695	754	833	892
6	667	728	808	869
7	643	706	788	850
8	623	686	770	834
9	605	669	755	819
10	589	654	741	806
11	574	640	728	794
12	561	628	716	783
13	547	614	703	770
14	532	599	687	754
15	518	584	672	739
16	505	571	658	724
17	492	558	645	710
18	480	545	632	697
19	468	533	619	684
20	457	521	606	671
21	446	510	594	658
22	435	499	583	646
23	425	488	571	634
24	415	477	560	622
25	405	467	549	611
26	396	457	538	600
27	387	447	528	588
28	378	438	517	577
29	369	428	507	567
30	360	419	497	556
31	352	410	487	545
32	343	401	477	535
33	335	392	468	525
34	327	384	458	515
35	319	375	449	505
36	312	367	439	495
37	304	358	430	485
38	296	350	421	475
39	289	342	412	465
40	282	334	403	456
41	277	329	397	449

42	273	324	391	442
43	269	319	385	436
44	265	314	380	429
45	260	309	374	423
46	256	305	368	416
47	253	300	363	410
48	249	295	357	404
49	245	291	352	398
50	241	286	346	391
51	237	282	341	385
52	234	278	335	379
53	230	273	330	373
54	227	269	325	367
55	223	265	320	361
56	220	261	315	355
57	217	257	309	350
58	213	252	304	344
59	210	248	299	338
60	207	244	294	332
61	204	241	289	326
62	200	237	285	321
63	197	233	280	315
64	194	229	275	310
65	191	225	270	304
66	188	221	265	298
67	185	218	260	293
78	182	214	256	287
79	179	210	251	282
70	177	207	246	276
71	174	203	242	271
72	171	200	237	266
73	168	196	233	260
74	166	192	228	255
75	162	189	223	250
76	160	185	219	244
77	158	182	214	239
78	155	179	210	234
79	152	175	206	229
80	150	172	201	223

OKUMURA SUBURBAN 800 MHz
10*dBu/kW

MILES	100'	200'	500'	1000'
5	511	570	649	708
6	483	544	625	686
7	460	522	604	667
8	439	503	587	650
9	421	486	571	635
10	405	470	557	622
11	390	457	544	610
12	377	444	533	600
13	363	430	519	586
14	348	415	503	570
15	334	401	489	555
16	321	387	475	541
17	308	374	461	527
18	296	361	448	513
19	284	349	435	500
20	273	337	423	487
21	262	326	411	475
22	252	315	399	462
23	241	304	387	450
24	231	294	376	439
25	222	284	365	427
26	212	273	355	416
27	203	264	344	405
28	194	254	334	394
29	185	245	323	383
30	177	235	313	372
31	168	226	303	362
32	160	217	294	351
33	152	209	284	341
34	144	200	275	331
35	136	191	265	321
36	128	183	256	311
37	120	175	247	301
38	113	166	238	291
39	105	158	229	282
40	098	150	220	272
41	094	145	214	265
42	089	140	208	259
43	085	135	202	252

44	081	130	196	245
45	077	126	190	239
46	073	121	185	233
47	069	116	179	226
48	065	112	173	220
49	061	107	168	214
50	057	103	162	208
51	054	098	157	202
52	050	094	152	195
53	047	090	146	189
54	043	085	141	183
55	040	081	136	178
56	036	077	131	172
57	033	073	126	166
58	030	069	121	160
59	026	065	116	154
60	023	061	111	148
61	020	057	106	143
62	017	053	101	137
63	014	049	096	131
64	011	045	091	126
65	008	041	086	120
66	005	038	082	115
67	002	034	077	109
68	-01	030	072	104
69	-04	027	067	098
70	-07	023	063	093
71	-10	019	058	087
72	-13	016	053	082
73	-15	012	049	077
74	-18	009	044	071
75	-21	005	040	066
76	-24	002	035	061
77	-26	-02	031	055
78	-29	-05	026	050
79	-31	-08	022	045
80	-34	-12	017	040

OKUMURA URBAN 800 MHz
10*dBu/kW

MILES	100'	200'	500'	1000'
5	413	473	551	611
6	385	446	527	588
7	362	424	507	569
8	341	405	489	552
9	323	388	473	538
10	307	373	459	525
11	293	359	447	513
12	280	346	435	502
13	265	332	421	485
14	251	317	406	473
15	237	303	391	458
16	223	289	377	443
17	211	276	363	429
18	198	264	350	416
19	187	252	337	402
20	175	240	325	390
21	164	228	313	377
22	154	217	301	365
23	144	207	290	353
24	134	196	279	341
25	124	186	268	330
26	115	176	257	318
27	105	166	246	307
28	096	156	236	296
29	087	147	226	285
30	079	138	216	275
31	070	129	206	264
32	062	120	196	254
33	054	111	186	243
34	046	102	177	233
35	038	094	167	223
36	030	085	158	213
37	023	077	149	203
38	015	069	140	194
39	008	061	131	184
40	000	053	122	174
41	-03	048	116	168
42	-07	043	110	161
43	-12	038	104	154

44	-16	033	098	148
45	-20	028	093	141
46	-24	023	087	135
47	-28	019	081	129
48	-32	014	076	122
49	-35	009	070	116
50	-39	005	065	110
51	-43	001	059	104
52	-47	-03	054	098
53	-50	-07	049	092
54	-54	-11	044	086
55	-57	-16	038	080
56	-60	-20	033	074
57	-64	-24	028	068
58	-67	-28	023	062
59	-70	-32	018	057
60	-74	-36	013	051
61	-77	-40	008	045
62	-80	-44	003	039
63	-83	-48	-01	034
64	-86	-51	-06	028
65	-89	-55	-10	023
66	-92	-59	-15	017
67	-95	-63	-20	012
68	-98	-66	-25	006
69	-101	-70	-29	001
70	-104	-74	-34	-04
71	-107	-77	-39	-09
72	-109	-81	-43	-15
73	-112	-84	-48	-20
74	-115	-88	-52	-25
75	-118	-91	-57	-31
76	-120	-95	-61	-36
77	-123	-98	-66	-41
78	-125	-102	-70	-47
79	-128	-105	-75	-52
80	-131	-108	-79	-57

APPENDIX 5

PROCEDURE FOR CALCULATION OF COVERAGE RADIUS

1. Convert effective radiated power from Watts to dBk using the formula:

   P(dBk) = 10 * log (ERP Watts / 1000)

2. Subtract this number, P(dBk), from 40 dBu. If the calculated value of P(dBK) is negative in value, change its sign to positive and add to 40 dBu. The sign of the result will be positive for this case. If the calculated value of P(dBk) is positive in value, subtract this number from 40 dBu and the sign or the result may be positive or negative depending on the magnitude of the parameters.

3. The Okumura tables found in Appendix 4 represent 10*dBu/kW. It is necessary to convert the dimension of the result of step 2 above to the same dimension used for the lookup tables. Take the answer from step 2 and multiply by 10.

4. The Okumura tables found in Appendix 4 contain 5 columns of numbers. The left most column represents the radius in miles. At the top of the remaining 4 columns, tower heights in feet are listed ranging from 100 feet to 1000 feet. Also, There are three sets of Okumura tables that correspond to different terrain models; open, suburban, and urban. Use the table that best fits the topology of the jurisdiction service area.

5. In the appropriate lookup table, determine the two height columns that correspond most closely with your H.A.A.T. If your H.A.A.T. is 400 feet, use the 200' and 500' columns. Interpolate between the listings under the two columns to determine where the figure arrived at in Step 3 falls.

6. Read the mileage at the extreme left hand column of the row.

EXAMPLE OF COVERAGE RADIUS CALCULATION

The ERP of a base station has been calculated at 125 watts. The terrain model is Okumura Suburban and the antenna H.A.A.T. is 400 feet. To determine the jurisdiction service area the following calculations are used:

P(dBk) = 10 * log (125/1000)
P(dBk) = -9

Subtraction from 40 dBu:

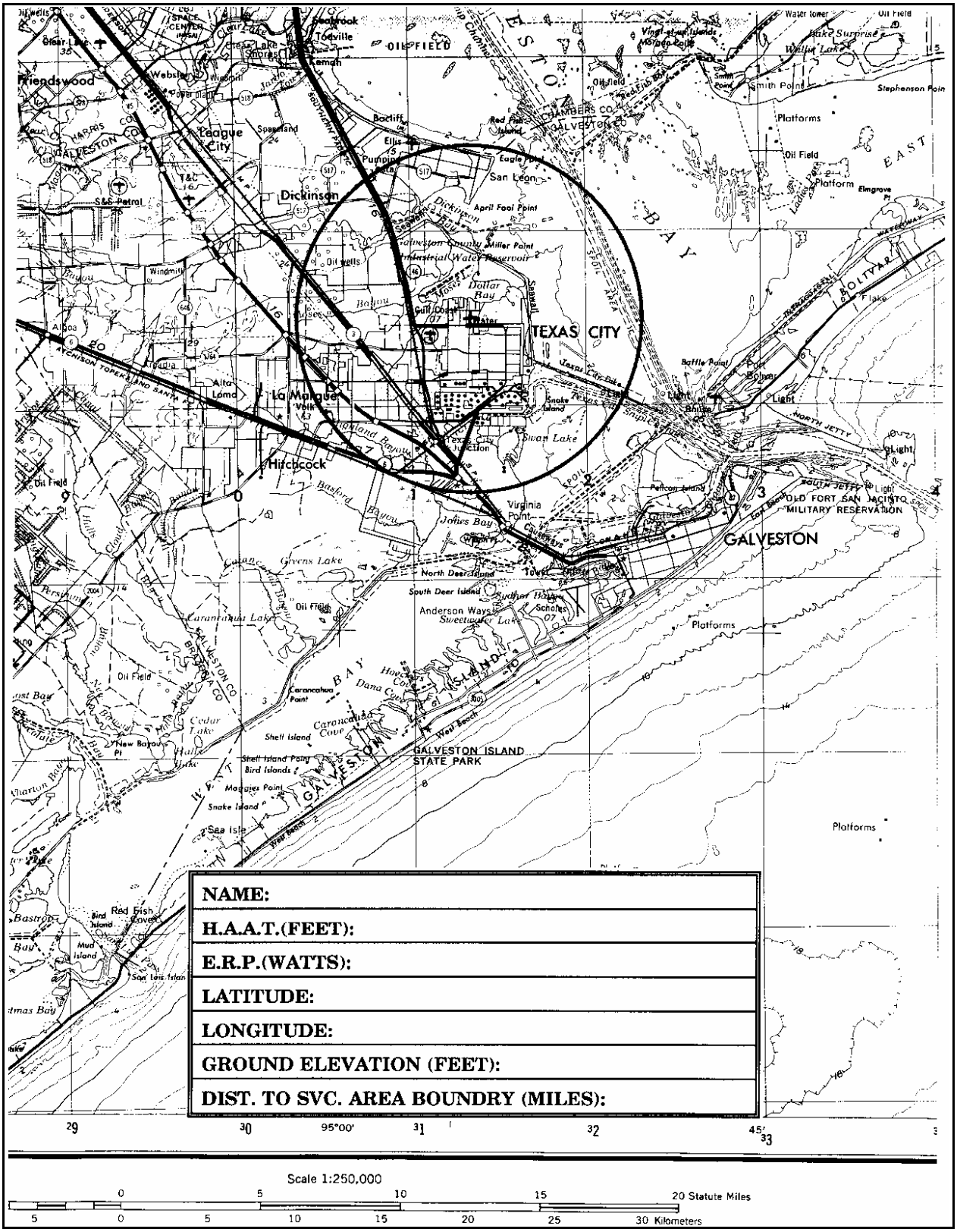
F(dBu) = 40 - (-9)
F(dBu) = 49

Convert to 10 * dBu :

10F(dBu) = 49 * 10
10F(dBu) = 490

From the Okumura Suburban lookup table, 490 falls between 430 @200' and 519 @500'. 400 feet is interpolated between 200' and 500'. Corresponding mileage is 13 miles.

APPENDIX 6


NAME:
H.A.A.T.(FEET):
E.R.P.(WATTS):
LATITUDE:
LONGITUDE:
GROUND ELEVATION (FEET):
DIST. TO SVC. AREA BOUNDRY (MILES):
Friendswood
League City
Dickinson
La Marque
Hitchcock
TEXAS CITY
GALVESTON
GALVESTON ISLAND STATE PARK
OLD FORT SAN JACINTO MILITARY RESERVATION
Scale 1:250,000
20 Statute Miles
30 Kilometers

APPENDIX 7

CO-CHANNEL INTERFERENCE PROCEDURE

1. Determine the distance from the proposed station to the existing station.

2. If not previously known, determine the jurisdiction service area boundary of the existing station. This information should be obtained from the existing station but calculation of Coverage Radius less 3 miles will provide initial working data.

3. Find the distance from the proposed station to the closest point of the jurisdiction service area boundary of the existing station. (Subtract #2 from #1)

4. Based on mileage from 3 (above), ERP and HAAT of the proposed station, consult the appropriate Okumura lookup table for the 10*dBu level at the service area boundary of the existing station. Interpolate between height columns for the dBu for tower HAAT not charted. Divide this level by 10 to obtain dBu.

5. Subtract this dBu level from 40. If the result is greater than 35, the proposed system will conform with the interference parameters. If the result is less than 35, the proposed system must be redesigned by lowering power, antenna height, of both until the 35 dB protection ratio is met.

6. If the terrain between the two systems would provide additional protection that would not be evident from using the normalized HAAT's, it will be permissible to calculate the HAAT of both existing and proposed systems along the radial line directly connecting the two stations. The resulting service area boundary of the existing station and the dBu level of the proposed station at that point would then be used to calculate the protection ratio.

CO-CHANNEL INTERFERENCE EXAMPLE

	Station A (proposed)	Station X (existing)
ERP:	100W (-10dBk)	200w (-7dBk)
HAAT:	500 feet. AMSL	200 feet, AMSL
Terrain:	Suburban	Suburban

Distance from A to X: 64 miles

Service Area:	14 miles	10 miles

64 miles - 10 miles = 54 miles, distance from proposed Station A to service area boundary of existing Station X.

From appropriate Okumura look up table, dBu level at 54 miles from a station with an ERP of 100 watts and HAAT of 500 feet is :

14.1 + (-10) = 4.1 dBu

Subtracting this amount from the defined 40 dBu level at the service area boundary of the existing station gives 35.9 dB of protection, .9 dB more that the minimum required.

ADJACENT CHANNEL INTERFERENCE PROCEDURE

1. Determine the distance from the proposed station to the existing station.

2. If not previously known, determine the jurisdiction service area boundary of the existing station. This information should be obtained from the existing station but calculation of Coverage Radius less 3 miles will provide initial working data.

3. Find the distance from the proposed station to the closest point of the jurisdiction service area boundary of the existing station. (Subtract #2 from #1)

4. Based on mileage from 3 (above), ERP and HAAT of the proposed station, consult the appropriate Okumura lookup table for the 10*dBu level at the service area boundary of the existing station. Interpolate between height columns for the dBu for tower HAAT not charted. Divide this level by 10 to obtain dBu.

5. Subtract this dBu level from 40. If the result is greater than 15, the proposed system will conform with the interference parameters. If the result is less than 15, the proposed system must be redesigned by lowering power, antenna height, of both until the 15 dB protection ratio is met.

6. If the terrain between the two systems would provide additional protection that would not be evident from using the normalized HAAT's, it will be permissible to calculate the HAAT of both existing and proposed systems along the radial line directly connecting the two stations. The resulting service area boundary of the existing station and the dBu level of the proposed station at that point would then be used to calculate the protection ratio.

ADJACENT CHANNEL INTERFERENCE EXAMPLE

	Station A (proposed)	Station X (existing)
ERP:	100W (-10dBk)	200w (-7dBk)
HAAT:	500 feet. AMSL	200 feet, AMSL
Terrain:	Suburban	Suburban

Distance from A to X: 48 miles

Service Area:	14 miles	10 miles

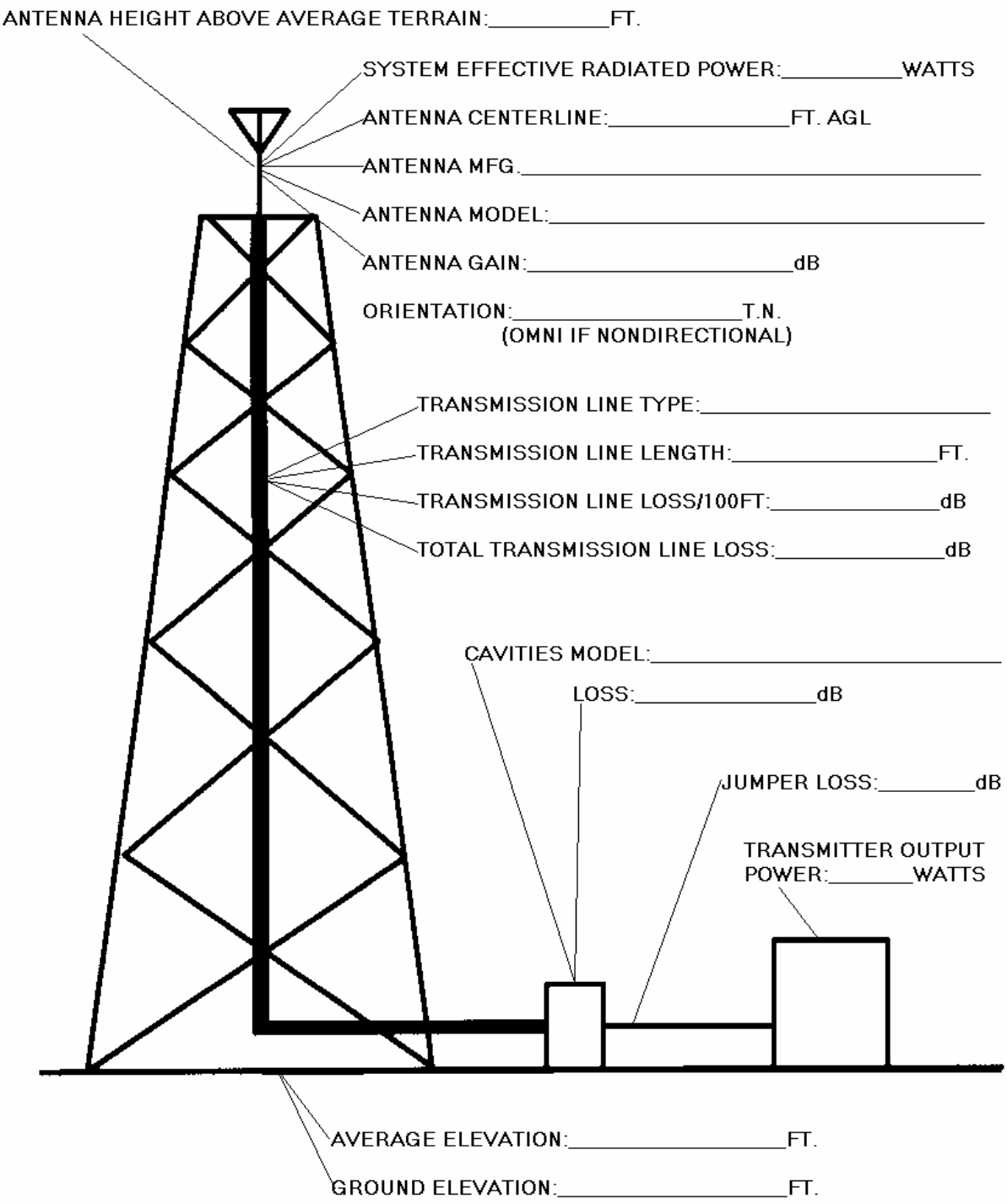
48 miles - 10 miles = 38 miles, distance from proposed Station A to service area boundary of existing Station X.

From appropriate Okumura look up table, dBu level at 38 miles from a station with an ERP of 100 watts and HAAT of 500 feet is :

23.8 + (-10) = 13.8 dBu

Subtracting this amount from the defined 40 dBu level at the service area boundary of the existing station gives 26.2 dB of protection, 1.2 dB more that the minimum required.

APPENDIX 8


ANTENNA HEIGHT ABOVE AVERAGE TERRAIN:_____FT.
SYSTEM EFFECTIVE RADIATED POWER:_____WATTS
ANTENNA CENTERLINE:_____FT. AGL
ANTENNA MFG._____
ANTENNA MODEL:_____
ANTENNA GAIN:_____dB
ORIENTATION:_____T.N.
(OMNI IF NONDIRECTIONAL)
TRANSMISSION LINE TYPE:_____
TRANSMISSION LINE LENGTH:_____FT.
TRANSMISSION LINE LOSS/100FT:_____dB
TOTAL TRANSMISSION LINE LOSS:_____dB
CAVITIES MODEL:_____
LOSS:_____dB
JUMPER LOSS:_____dB
TRANSMITTER OUTPUT POWER:_____WATTS
AVERAGE ELEVATION:_____FT.
GROUND ELEVATION:_____FT.

APPENDIX 9

APPLICANT GENERAL INFORMATION
SECTION A

THE FOLLOWING ITEMS WILL BE INCLUDED:

1. Name of Applicant:

2. Name of Preparer:

3. Title:

4. Mailing Address:

5. Telephone Number:

6. Residential Population:

7. Business/Tourist Population:

8. Square Mile Area:

9. Unique Geographic Considerations:

10. Unique Demographic Considerations:

11. List all Department/Divisions within above Applicant which have separate Communications Systems:

DEPARTMENT/DIVISION FREQUENCY USE
SECTION B

PRODUCE ONE SECTION B FOR EACH EXISTING CHANNEL:

1. Name of Applicant:

2. Name of Department/Division:

3. Number of personnel in this Department/division which regularly use radios (excluding dispatchers):

4. Carrier Frequency:

   If Mobile Relay or Duplex Channel, Indicate paired frequency:

   Is this part of a trunked system?:

   Is this part of a mutual aid system?:

5. FCC assigned call sign(s):

6. FCC Part 90 Service Category: (Local Government Radio Service, Police Radio Service, Fire Radio Service, Highway Maintenance Radio Service, Forestry-Conservation Radio Service, Special Emergency Radio Service, Other)

7. Station Classification from License (include all that apply):(Voice, Data/Telemetry, Base Station [FB], Mobile Relay [Repeater] [FB2], Mobile [MO], Control Station [FX1], other-indicate specifics)

8. Number of Mobiles in service and in operation at this time on this frequency (not including "Convertacom" units):

   Are these same units listed on another frequency?:

9. Number of Portables (handhelds) in service and in operation at this time on this frequency not including spare units:

   How many of these are used with a convertacom?:

   How many of these same units are listed on other frequencies? List quantity and frequencies:

10. How many individual radio transmissions occur during an average 24 hour period?(Indicate estimated or measured):

11. How many of these transmissions occur per hour during peak periods?(Indicate estimated of measured):

12: If this is a Voice Channel, what is the typical air time per individual transmission?: (Less than five seconds, More than five but less than ten seconds, More than ten seconds)

ADDITIONAL INFORMATION
SECTION C

PRODUCE ONE SECTION C FOR EACH DEPARTMENT/DIVISION:

1. Name of Applicant:

2. Name of Department/Division:

3. How many channels are being requested for this division?:

4. State the intended use of the requested frequencies and the proposed system structure and spectrum considerations (interoperability):

5. What frequency band is desired for the new frequency?:

6. Explain requirements for the selected band and reason why others spectrum will not suffice:

APPENDIX 10

REGIONAL RESERVED SPECTRUM

SEQUENCE	CHANNEL	FREQUENCY	ACTION
1.	000	866.0000	1 BLOCKED_NOT A CHANNEl
2.	601	866.0125	1 MUTUAL AID 1
3.	000	866.0250	1 BLOCKED_NOT A CHANNEl
4.	602	866.0375	1 STATE WIDE
5.	603	866.0500	1 BLOCKED
6.	604	866.0625	1 STATE WIDE
7.	605	866.0750	1 BLOCKED
8.	606	866.0875	1 REGIONAL MDT
9.	607	866.1000	1 BLOCKED
10.	608	866.1125	0
11.	609	866.1250	0
12.	610	866.1375	0
13.	611	866.1500	0
14.	612	866.1625	0
15.	613	866.1750	0
16.	614	866.1875	0
17.	615	866.2000	0
18.	616	866.2125	0
19.	617	866.2250	0
20.	618	866.2375	0
21.	619	866.2500	0
22.	620	866.2625	0
23.	621	866.2750	0
24.	622	866.2875	0
25.	623	866.3000	0
26.	624	866.3125	0
27.	625	866.3250	0
28.	626	866.3375	0
29.	627	866.3500	0
30.	628	866.3625	0
31.	629	866.3750	0
32.	630	866.3875	0
33.	631	866.4000	0
34.	632	866.4125	0
35.	633	866.4250	1 BLOCKED
36.	634	866.4375	1 REGIONAL MDT
37.	635	866.4500	1 BLOCKED
38.	636	866.4625	1 STATE WIDE
39.	637	866.4750	1 BLOCKED

40.	638	866.4875	1 STATE WIDE
41.	000	866.5000	1 BLOCKED NOT A CHANNEL
42.	639	866.5125	1 MUTUAL AID 2
43.	000	866.5250	1 BLOCKED NOT A CHANNEL
44.	640	866.5375	1 STATE WIDE
45.	641	866.5500	1 BLOCKED
46.	642	866.5625	1 STATE WIDE
47.	643	866.5750	1 BLOCKED
48.	644	866.5875	1 REGIONAL MDT
49.	645	866.6000	1 BLOCKED
50.	646	866.6125	0
51.	647	866.6250	0
52.	648	866.6375	0
53.	649	866.6500	0
54.	650	866.6625	0
55.	651	866.6750	0
56.	652	866.6875	0
57.	653	866.7000	0
58.	654	866.7125	0
59.	655	866.7250	0
60.	656	866.7375	0
61.	657	866.7500	0
62.	658	866.7625	0
63.	659	866.7750	0
64.	660	866.7875	0
65.	661	866.8000	0
66.	662	866.8125	0
67.	663	866.8250	0
68.	664	866.8375	0
69.	665	866.8500	0
70.	666	866.8625	0
71.	667	866.8750	0
72.	668	866.8875	0
73.	669	866.9000	0
74.	670	866.9125	0
75.	671	866.9250	1 BLOCKED
76.	672	866.9375	1 REGIONAL MDT
77.	673	866.9500	1 BLOCKED
78.	674	866.9625	1 STATE WIDE
79.	675	866.9750	1 BLOCKED
80.	676	866.9875	1 STATE WIDE
81.	000	867.0000	1 BLOCKED NOT A CHANNEL
82.	677	867.0125	1 MUTUAL AID 3
83.	000	867.0250	1 BLOCKED NOT A CHANNEL
84.	678	867.0375	1 STATE WIDE

85.	679	867.0500	1 BLOCKED
86.	680	867.0625	1 STATE WIDE
87.	681	867.0750	1 BLOCKED
88.	682	867.0875	1 REGIONAL MDT
89.	683	867.1000	1 BLOCKED
90.	684	867.1125	0
91.	685	867.1250	0
92.	686	867.1375	0
93.	687	867.1500	0
94.	688	867.1625	0
95.	689	867.1750	0
96.	690	867.1875	0
97.	691	867.2000	0
98.	692	867.2125	0
99.	693	867.2250	0
100.	694	867.2375	0
101.	695	867.2500	0
102.	696	867.2625	0
103.	697	867.2750	0
104.	698	867.2875	0
105.	699	867.3000	0
106.	700	867.3125	0
107.	701	867.3250	0
108.	702	867.3375	0
109.	703	867.3500	0
110.	704	867.3625	0
111.	705	867.3750	0
112.	706	867.3875	0
113.	707	867.4000	0
114.	708	867.4125	0
115.	709	867.4250	1 BLOCKED
116.	710	867.4375	1 REGIONAL MDT
117.	711	867.4500	1 BLOCKED
118.	712	867.4625	1 STATE WIDE
119.	713	867.4750	1 BLOCKED
120.	714	867.4875	1 STATE WIDE
121.	000	867.5000	1 BLOCKED NOT A CHANNEL
122.	715	867.5125	1 MUTUAL AID 4
123.	000	867.5250	1 BLOCKED NOT A CHANNEL
124.	716	867.5375	1 STATE WIDE
125.	717	867.5500	1 BLOCKED
126.	718	867.5625	1 STATE WIDE
127.	719	867.5750	1 BLOCKED
128.	720	867.5875	1 REGIONAL MDT
129.	721	867.6000	1 BLOCKED

130.	722	867.6125	0
131.	723	867.6250	0
132.	724	867.6375	0
133.	725	867.6500	0
134.	726	867.6625	0
135.	727	867.6750	0
136.	728	867.6875	0
137.	729	867.7000	0
138.	730	867.7125	0
139.	731	867.7250	0
140.	732	867.7375	0
141.	733	867.7500	0
142.	734	867.7625	0
143.	735	867.7750	0
144.	736	867.7875	0
145.	737	867.8000	0
146.	738	867.8125	0
147.	739	867.8250	0
148.	740	867.8375	0
149.	741	867.8500	0
150.	742	867.8625	0
151.	743	867.8750	0
152.	744	867.8875	0
153.	745	867.9000	0
154.	746	867.9125	0
155.	747	867.9250	1 BLOCKED
156.	748	867.9375	1 REGIONAL MDT
157.	749	867.9500	1 BLOCKED
158.	750	867.9625	1 STATEWIDE
159.	751	867.9750	1 BLOCKED
160.	752	867.9875	1 STATEWIDE
161.	000	868.0000	1 BLOCKED NOT A CHANNEL
162.	753	868.0125	1 MUTUAL AID 5
163.	000	868.0250	1 BLOCKED NOT A CHANNEL
164.	754	868.0375	1 STATE WIDE
165.	755	868.0500	1 BLOCKED
166.	756	868.0625	1 STATE WIDE
167.	757	868.0750	1 BLOCKED
168.	758	868.0875	1 REGIONAL MDT
169.	759	868.1000	1 BLOCKED
170.	760	868.1125	0
171.	761	868.1250	0
172.	762	868.1375	0
173.	763	868.1500	0
174.	764	868.1625	0

175.	765	868.1750	0
176.	766	868.1875	0
177.	767	868.2000	0
178.	768	868.2125	0
179.	769	868.2250	0
180.	770	868.2375	0
181.	771	868.2500	0
182.	772	868.2625	0
183.	773	868.2750	0
184.	774	868.2875	0
185.	775	868.3000	0
186.	776	868.3125	0
187.	777	868.3250	0
188.	778	868.3375	0
189.	779	868.3500	0
190.	780	868.3625	0
191.	781	868.3750	0
192.	782	868.3875	0
193.	783	868.4000	0
194.	784	868.4125	0
195.	785	868.4250	0
196.	786	868.4375	0
197.	787	868.4500	0
198.	788	868.4625	0
199.	789	868.4750	0
200.	790	868.4875	0
201.	791	868.5000	0
202.	792	868.5125	0
203.	793	868.5250	0
204.	794	868.5375	0
205.	795	868.5500	0
206.	796	868.5625	0
207.	797	868.5750	0
208.	798	868.5875	0
209.	799	868.6000	0
210.	800	868.6125	0
211.	801	868.6250	0
212.	802	868.6375	0
213.	803	868.6500	0
214.	804	868.6625	0
215.	805	868.6750	0
216.	806	868.6875	0
217.	807	868.7000	0
218.	808	868.7125	0
219.	809	868.7250	0

220.	810	868.7375	0
221.	811	868.7500	0
222.	812	868.7625	0
223.	813	868.7750	0
224.	814	868.7875	0
225.	815	868.8000	0
226.	816	868.8125	0
227.	817	868.8250	0
228.	818	868.8375	0
229.	819	868.8500	0
230.	820	868.8625	0
231.	821	868.8750	0
232.	822	868.8875	0
233.	823	868.9000	1 BLOCKED
234.	824	868.9125	1 REGIONAL MDT
235.	825	868.9250	1 BLOCKED
236.	826	868.9375	1 STATE WIDE
237.	827	868.9500	1 BLOCKED
238.	828	868.9625	1 STATE WIDE
239.	829	868.9750	1 BLOCKED
240.	830	868.9875	1 BLOCKED FOR INTERFERENCE

500 KHz

*	601	*	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638
*	639	*	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676
*	677	*	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714
*	715	*	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752
*	753	*	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830

* Protection For Mutual Aid Channels

APPENDIX 11

```
C       FILE NAME:  REGION_MAIN_LF_V3.FOR  By Ronald J Gillory  713-247-5744

C       THIS IS THE MAIN LINE OF A PROGRAM DESIGNED FOR MAXIMUM SPECTRUM
C       UTILIZATION BY GEOGRAPHIC LOCATION, POPULATION, AND COVERAGE AREA.


C       ITS FIRST JOB IS TO COUNT THE NUMBER OF NODES IN THE INPUT FILE
C       REGION_51.DAT.


        INCLUDE
   $            '($FORIOSDEF)'

        CHARACTER *40
   &            CITY_COUNTY,
   &            NAME_LIST

        INTEGER
   &            POPULATION,
   &            NAME,    !ARGUMENT REPRESENTS RANK,VALUE IS NAME_LIST INDEX
   &            EXPANDED_NAME,
   &            LINK,
   &            ALINK,
   &            NUMNODES,
   &            NUMCOLORS,
   &            COLOR,
   &            LPOINT,
   &            APOINT,
   &            TEMP,
   &            INFEAS,
   &            RANK,
   &            JURISDICTION,
   &            PROPAGATION,
   &            ANTENNA,
   &            SQUARE_MILES,
   &            LATD,LATM,LATS,
   &            LOND,LONM,LONS,
   &            RECORD_COUNT,
   &            PROPAGATE_TYPE,
   &            POPULATE_FACTOR,
   &            MAXNODES,MAXLINKS,
   &            RADIUS,
   &            HEIGHT,
   &            CO_LIST,
   &            CO_ORDER,
   &            ADJ_LIST,
   &            ADJ_ORDER,
   &            CONSTRAIN


        LOGICAL
   &            ADJACENT, !TRUE IF ADJACENT CHANNEL CONSTRAINTS ARE PRESENT
   &            PACK, ! TRUE FOR END PACKING FREQUENCY ASSIGNMENTS
   &            TEST, ! TRUE TO OUTPUT THE CONSTRAINT LIST LINK AND ALINK
   &            FLAG1,
   &            FLAG2,
   &            FLAG3,
   &            FLAG4

        REAL*8
   &            DISTANCE,  !NODE TO NODE DISTANCES, ARGUMENTS REF NAME_LIST
   &            IN_LIST,   !DISTANCE_CAL ROUTINE ARRAY
   &            OUT_LIST   !DISTANCE_CAL ROUTINE ARRAY

        REAL*4
```

```
&               OKUMURA_OPEN,
&               OKUMURA_SUBURBAN,
&               OKUMURA_URBAN,
&               PROPAGATE_TEMP,
&               INTERPOLATED,
&               TEMP_1

      INCLUDE
&               'GRAPH_PARAMS.FOR'

      DIMENSION
&               NAME_LIST( MAXNODES ),     !ARRAY CONTAINING THE RECORD NAMES
&               EXPANDED_NAME(MAXNODES),
&               NAME(MAXNODES), !ARGUMENT IS RANK, VALUE IS NAME_LIST INDEX
&               LINK(MAXLINKS), !CO CHANNEL LIST BY DESCENDING RANK SUBLISTS
&               ALINK(MAXLINKS),!ADJ CHANNEL LIST BY DESCENDING RANK SUBLISTS
&               COLOR(MAXLINKS), !RESULTING FREQUENCY ASSIGNMENTS
&               LPOINT(MAXNODES),!INDEXING ARRAY
&               APOINT(MAXNODES),!INDEXING ARRAY
&               TEMP(MAXLINKS),
&               INFEAS(MAXCOLORS,MAXNODES),
&               RANK(MAXNODES),
&               DISTANCE( MAXNODES,MAXNODES ), !ARRAY OF THE NODE DISTANCES
&               PROPAGATE_TYPE(MAXNODES), !ARRAY OF PROPAGATION OKUMURA TYPE
&               OKUMURA_OPEN( 5:80,4 ),    !PROPAGATION DATA ARRAY
&               OKUMURA_SUBURBAN( 5:80,4 ), !PROPAGATION DATA ARRAY
&               OKUMURA_URBAN( 5:80,4 ),   !PROPAGATION DATA ARRAY
&               PROPAGATE_TEMP(5:80,4),   !TEMP PROPAGATION ARRAY
&               INTERPOLATED(5:80),!HEIGHT INTERPOLATED PROPAGATION TABLE
&               POPULATE_FACTOR(MAXNODES,2),!ENTRY POPULATION &POPULATION FACTOR
&               RADIUS (MAXNODES,4),!ARRAY CONTAINING PROPAGATION RADIUS DATA
&               HEIGHT (MAXNODES),!ANTENNA HEIGHT ARRAY
&               CO_LIST (MAXNODES,MAXNODES),!CO CHANNEL CONSTRAINT LIST
&               CO_ORDER(MAXNODES),!NUMBER OF ELEMENTS/ROW IN CO_LIST
&               ADJ_LIST (MAXNODES,MAXNODES),!ADJ CHANNEL CONSTRAINT LIST
&               ADJ_ORDER (MAXNODES),!NUMBER OF ELEMENTS/ROW IN ADJ_LIST
&               IN_LIST (MAXNODES,10),!DISTANCE_CAL ARRAY
&               OUT_LIST (MAXNODES,6) !DISTANCE_CAL ARRAY


      COMMON
&               /ARRAY1/NAME_LIST,
&               /ARRAY2/DISTANCE,
&               /ARRAY3/OKUMURA_OPEN,
&               /ARRAY4/OKUMURA_SUBURBAN,
&               /ARRAY5/OKUMURA_URBAN,
&               /ARRAY6/RADIUS,
&               /ARRAY7/PROPAGATE_TYPE,
&               /ARRAY8/POPULATE_FACTOR,
&               /ARRAY9/HEIGHT,
&               /ARRAY10/PROPAGATE_TEMP,
&               /ARRAY11/INTERPOLATED,
&               /ARRAY12/NAME,
&               /ARRAY13/LINK,
&               /ARRAY14/ALINK,
&               /ARRAY15/COLOR,
&               /ARRAY16/LPOINT,
&               /ARRAY17/APOINT,
&               /ARRAY18/INFEAS,
&               /ARRAY19/RANK,
&               /ARRAY20/CO_LIST,
&               /ARRAY21/ADJ_LIST,
&               /ARRAY22/CO_ORDER,
&               /ARRAY23/ADJ_ORDER,
&               /ARRAY24/EXPANDED_NAME,
&               /ARRAY25/IN_LIST,
&               /ARRAY26/OUT_LIST,
&               /WORKING_AREA/TEMP
```

```
      DATA
     &          (HEIGHT (I),I=1,MAXNODES)/MAXNODES*0/,
     &          (PROPAGATE_TYPE (I),I=1,MAXNODES)/MAXNODES*0/



      RECORD_COUNT = 0
      TEST = .FALSE.


      OPEN    (
     &          UNIT=1,
     &          STATUS= 'OLD',
     &          FILE= 'REGION_51.DAT',
     &          ACCESS= 'SEQUENTIAL',
     &          FORM= 'FORMATTED',
     &          ERR = 10,
     &          IOSTAT= IERR
     &          )

      GO TO 11
10    STOP 'ERROR OPENING REGION_51.DAT'
11    WRITE
     &          (6,*) 'REGION_51.DAT OPENED'




30    CONTINUE

      READ (1,40,IOSTAT=IERR,END=100)
     &          CITY_COUNTY,
     &          JURISDICTION,
     &          PROPAGATION,
     &          ANTENNA,
     &          POPULATION,
     &          SQUARE_MILES,
     &          LATD,LATM,LATS,
     &          LOND,LONM,LONS
40    FORMAT (1X,A40,I2,1X,I1,1X,I4,1X,I7,1X,I6,1X,3I2,1X,3I2)


      RECORD_COUNT = RECORD_COUNT + 1

      GO TO 30

100   CONTINUE

      WRITE
     &          (6,*) 'THE NUMBER OF RECORDS IS',RECORD_COUNT

      REWIND
     &          (UNIT=1)

      CALL DISTANCE_CAL
     &          ( RECORD_COUNT )

      CLOSE
     &          (UNIT=1)

      CALL WRITE_DISTANCE
     &          ( RECORD_COUNT ) !ARRAY TO NAME_DISTANCE.DAT

      CALL OKUMURA              !BUILD PROPAGATION CHARACTERISTIC ARRAYS

      CALL COVERAGE
     &          ( RECORD_COUNT )          !CONSTRUCT PROPAGATION RADIUS ARRAY
```

```
      CALL POPULATE
     &          (RECORD_COUNT)          !CALCULATE POPULATION FREQUENCY FACTOR

      CALL PREPROCESSOR
     &          (
     &          RECORD_COUNT,
     &          TEST,
     &          NUMNODES
     &          )

      CALL GLOBAL
     &          (
     &          NUMNODES
     &          )


      CALL BLOCK
     &          (
     &          RECORD_COUNT,
     &          NUMNODES
     &          )


      CALL LF  (
     &          NUMNODES,
     &          NUMCOLORS
     &          )

      CALL OUTPUT_MAIN_LF
     &          (
     &          RECORD_COUNT,
     &          NUMNODES,
     &          NUMCOLORS
     &          )

10000 STOP

      END
```

```
C       FILE NAME: DISTANCE_CAL.FOR by Ronald J Gillory

        SUBROUTINE DISTANCE_CAL ( RECORD_COUNT )


C       THE INPUT FILE HAS BEEN REWOUND AND IS PRESENTLY OPEN.

        INTEGER
     &          RECORD_COUNT,           ! PASSED ARGUMENT OF SUBROUTINE
     &          EXPANDED_NAME,
     &          POPULATION,
     &          JURISDICTION,
     &          POPULATE_FACTOR,
     &          DEF_POPULATE,
     &          PROPAGATION,
     &          ANTENNA,
     &          HEIGHT,
     &          PROPAGATE_TYPE,
     &          SQUARE_MILES,
     &          LATD, LATM, LATS,
     &          LOND, LONM, LONS,
     &          MAXNODES, MAXLINKS,     ! PARAMETER IN GRAPH_PARAMS.FOR
     &          RADIUS                  ! COVERAGE RADIUS ARRAY NAME

        REAL*8
     &          LAT, LON,
     &          COVERAGE_RADIUS,
     &          EARTH_RADIUS,   ! PARAMETER IN GRAPH_PARAMS.FOR
     &          PI,             ! PARAMETER 3.14... IN GRAPH_PARAMS.FOR
     &          OUT_LIST,       ! ARRAY OF RADIUS, DECIMAL DEGREES & ETC.
     &          DISTANCE,       ! ARRAY OF NODE DISTANCE RELATIONSHIP
     &          X,Y,Z,          ! SPHERICAL COORDINATES
     &          CHORD,          ! DISTANCE BETWEEN TWO POINTS THUR A SPHERE
     &          ARC,            ! DISTANCE BETWEEN TWO POINTS ON SURFACE
     &          RADIAN,         ! PARAMETER FOR CONVERSION DEGREES TO RADIANS
     &          ANGLE,          ! SUBTENDED CENTRAL ANGLE FROM TWO POINTS
     &          IN_LIST,  ! INPUT STORAGE ARRAY
     &          X1, Y1, Z1,
     &          X2, Y2, Z2


        CHARACTER *40
     &          CITY_COUNTY,
     &          NAME_LIST       ! THIS ARRAY IDENTIFIES THE AGENCIES


        INCLUDE
     &          'GRAPH_PARAMS.FOR'


C       THIS NEXT ARRAY WILL CONTAIN THE LIST OF NAME FROM THE INPUT FILE
C       WITH THE ORDER BY ROWS MATCHING THE ORDER OF THE RECORD IN THE INPUT
C       FILE SEQUENCE

        DIMENSION
     &          NAME_LIST (MAXNODES)

        DIMENSION
     &          EXPANDED_NAME(MAXNODES)


C       THIS NEXT ARRAY IS ORGANIZED BY THE ROWS MATCHING THE ORDER OF THE
C       RECORD IN THE INPUT FILE.  THE FIRST ROW  OF IN_LIST IS FROM THE NAME
C       IN THE FIRST ROW OF NAME_LIST.
C       THE COLUMNS ARE:
C       COL 1   POPULATION
C       COL 2   SQUARE_MILES
```

```
C       COL 3    LATD
C       COL 4    LATM
C       COL 5    LATS
C       COL 6    LOND
C       COL 7    LONM
C       COL 8    LONS
C       COL 9    JURISDICTION RADIUS
C       COL 10   ANTENNA HEIGHT
C       FOR EXAMPLE: IN_LIST(1,4) IS LATITUDE MINUTES OF RECORD 1

        DIMENSION
     &          IN_LIST (MAXNODES,10)



C       THIS NEXT ARRAY HAS THE ROWS CORRESPONDING TO MATCH THE NAME_LIST ARRAY.
C       THE COLUMNS ARE:
C       COL1    RADIUS  THIS IS THE CALCULATED RADIUS  FOR JURISDICTION
C       COL2    LAT     LATITUDE IN DECIMAL DEGREES
C       COL3    LON     LONGITUDE IN DECIMAL DEGREES
C       COL4    X       EARTH_RADIUS*COS(LAT)*COS(LON)
C       COL5    Y       EARTH_RADIUS*COS(LAT)*SIN(LON)
C       COL6    Z       EARTH_RADIUS*SIN(LAT)

        DIMENSION
     &          OUT_LIST (MAXNODES,6)



C       THIS NEXT ARRAY HAS THE DISTANCE FROM EACH NODE TO EACH NODE CALCULATED.
C       EACH DISTANCE FROM NODE 1 TO NODE 2 AND FROM NODE 2 TO NODE 1 IS
C       REPRESENTED TWICE.
C       THE ROWS WILL REPRESENT THE RECORD POSITION.
C       THE COLUMNS WILL REPRESENT THE OTHER NODES RELATIONSHIP TO THE ROW.
C       WHEN ROW AND COLUMN MATCH THE DISTANCE IS 0  ie DISTANCE(1,1)=0

        DIMENSION
     &          DISTANCE(MAXNODES,MAXNODES)

C       THIS ARRAY WILL BE THE COVERAGE RADIUS TABLE
C               COL1    JURISDICTION RADIUS
C               COL2    COVERAGE RADIUS
C               COL3    CO_CHANNEL RADIUS
C               COL4    ADJ_CHANNEL RADIUS
C
        DIMENSION
     &          RADIUS (MAXNODES,4)




        DIMENSION
     &          PROPAGATE_TYPE (MAXNODES)
C       THIS ARRAY INDICATES WHICH OF THE OKUMURA TABLES WILL BE USED FOR
C       THE PROPAGATION BOUNDARIES CALCULATION
C               1 = OKUMURA OPEN
C               2 = OKUMURA SUBURBAN
C               3 = OKUMURA URBAN



        DIMENSION
     &          POPULATE_FACTOR (MAXNODES,2)
C       THIS ARRAY CONTAINS THE POPULATION AND TABLE ENTRY FACTOR
C               COL 1 = POPULATION
C               COL 2 = CALCULATED FACTOR
```

```
C       THE POPULATION WILL BE ENTERED IN THIS SUBROUTINE.
C       THE ROW RANK MATCHES THE NAME ARRAY.




        DIMENSION
     &          HEIGHT(MAXNODES)
C       THIS ARRAY CONTAINS THE COMMON STORAGE FOR THE ANTENNA HEIGHT FIELD



        COMMON
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY2/DISTANCE,
     &          /ARRAY6/RADIUS,
     &          /ARRAY7/PROPAGATE_TYPE,
     &          /ARRAY8/POPULATE_FACTOR,
     &          /ARRAY9/HEIGHT,
     &          /ARRAY24/EXPANDED_NAME,
     &          /ARRAY25/IN_LIST,
     &          /ARRAY26/OUT_LIST



        OPEN    (
     &          UNIT = 10,
     &          STATUS = 'NEW',
     &          FILE = 'DISTANCE_CAL.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 25,
     &          IOSTAT = IERR
     &          )
        GO TO 26
25      STOP 'ERROR OPENING DISTANCE_CAL.DAT'
26      WRITE (6,*) 'DISTANCE_CAL.DAT OPENED'

C       NOW THE NAME_LIST ARRAY AND THE IN_LIST ARRAY WILL BE LOADED WITH
C       THE DATA FROM THE INPUT FILE

        DO 100 I=1,RECORD_COUNT

        READ (1,10,IOSTAT=IERR,END=9999)
     &          CITY_COUNTY,
     &          JURISDICTION,
     &          PROPAGATION,
     &          ANTENNA,
     &          POPULATION,
     &          SQUARE_MILES,
     &          LATD,LATM,LATS,
     &          LOND,LONM,LONS

10      FORMAT (1X,A40,I2,1X,I1,1X,I4,1X,I7,1X,I6,1X,3I2,1X,3I2)

        PROPAGATE_TYPE ( I ) = PROPAGATION

        POPULATE_FACTOR ( I,1 ) = POPULATION
        POPULATE_FACTOR ( I,2 ) = DEF_POPULATE

        HEIGHT ( I ) = ANTENNA

        NAME_LIST ( I ) = CITY_COUNTY

        RADIUS ( I,1 ) = JURISDICTION !THIS IS AN INTEGER VALUE I2 FORMAT
```

```
      IN_LIST ( I,1 ) = DFLOAT ( POPULATION )
      IN_LIST ( I,2 ) = DFLOAT ( SQUARE_MILES )
      IN_LIST ( I,3 ) = DFLOAT ( LATD )
      IN_LIST ( I,4 ) = DFLOAT ( LATM )
      IN_LIST ( I,5 ) = DFLOAT ( LATS )
      IN_LIST ( I,6 ) = DFLOAT ( LOND )
      IN_LIST ( I,7 ) = DFLOAT ( LONM )
      IN_LIST ( I,8 ) = DFLOAT ( LONS )
      IN_LIST ( I,9 ) = DFLOAT ( JURISDICTION )
      IN_LIST ( I,10) = DFLOAT ( ANTENNA )

C     THE CONVERSION FROM AREA TO RADIUS IS NEXT:


C     THIS NEXT EQUATION CALCULATED THE JURISDICTION RADIUS BY ASSUMING
C     THAT THE AREA OF THE NAMED ENTITY WAS CIRCULAR.
C     AFTER DOING SOME TESTS, A BETTER GUESS OF AVERAGE GEOMETRIC DESIGN
C     IS MADE BY USING A SQUARE AND FINDING THE DISTANCE FROM THE
C     CENTER OF THE SQUARE TO A CORNER.
C     !COMMENTED OUT ON PURPOSE! OUT_LIST(I,1)=(DSQRT(IN_LIST(I,2)/PI))
C     NOW IS NESTED THE NEW APPROXIMATION.

      OUT_LIST(I,1) = ((DSQRT(IN_LIST(I,2)*2))/2)


C     THIS NEXT CODE CHECKS TO SEE IF THE INPUT FILE CONTAINED A SPECIFIED
C     RADIUS FOR THE RECORD LISTED. IF NOT IT USED THE CALCULATED RADIUS

      IF (JURISDICTION .EQ. 0 ) THEN

      RADIUS(I,1)= NINT(OUT_LIST(I,1)) !NEAREST INTEGER CONVERSION

      END IF


C     THE CONVERSION TO DECIMAL DEGREES IS NEXT:

C     LATITUDE
      OUT_LIST(I,2)=(IN_LIST(I,3)+(IN_LIST(I,4)/60)+(IN_LIST(I,5)/3600))

C     LONGITUDE
      OUT_LIST(I,3)=(IN_LIST(I,6)+(IN_LIST(I,7)/60)+(IN_LIST(I,8)/3600))


C     THE COMPUTATION OF THE SPHERICAL COORDINATES IS NEXT:

C     X COORDINATE
      OUT_LIST(I,4)=(EARTH_RADIUS*DCOSD(OUT_LIST(I,2))*DCOSD(OUT_LIST(I,3)))

C     Y COORDINATE
      OUT_LIST(I,5)=(EARTH_RADIUS*DCOSD(OUT_LIST(I,2))*DSIND(OUT_LIST(I,3)))

C     Z COORDINATE
      OUT_LIST(I,6)=(EARTH_RADIUS*DSIND(OUT_LIST(I,2)))

C     THE ANGLE COMPUTATIONS ARE IN DECIMAL DEGREES

100   CONTINUE


C     NEXT THE CALCULATIONS FOR CHORD LENGTH BETWEEN TWO POINTS ON A
C     SPHERE ARE DONE.
C
C     CHORD=SQRT(((X1-X2)**2) + ((Y1-Y2)**2) + ((Z1-Z2)**2))
```

```
C
C       THE DISTANCE ARRAY WILL STORE THE RESULTS BASED ON ROW ORDER OF RECORDS

        DO 300 I=1,RECORD_COUNT

                DO 200 J=1,RECORD_COUNT

                CHORD = DSQRT (
     &                          ((OUT_LIST(I,4) - OUT_LIST(J,4))**2) +
     &                          ((OUT_LIST(I,5) - OUT_LIST(J,5))**2) +
     &                          ((OUT_LIST(I,6) - OUT_LIST(J,6))**2)
     &                    )

                ANGLE =  2 *  (
     &                          DASIN( CHORD / (2 * EARTH_RADIUS))
     &                  )

                ARC = EARTH_RADIUS * ANGLE

C               ANGLE IS IN RADIANS AND DISTANCES ARE IN STANDARD MILES

                DISTANCE (I,J) = ARC

200             CONTINUE

300     CONTINUE

        REWIND (UNIT = 1)

        DO 500 I=1,RECORD_COUNT
                WRITE(10,400)
     &                  I,NAME_LIST(I),
     &                  'PROPAGATE TYPE= ',PROPAGATE_TYPE(I),
     &                  'JURISDICTION RADIUS= ',RADIUS(I,1),
     &                  'ANTENNA HEIGHT= ',HEIGHT(I)
400     FORMAT (1X,I4,'.',1X,A40,1X,A16,I1/48X,A21,I2/48X,A16,I4/)
500     CONTINUE

        CLOSE (UNIT = 10)

        RETURN
9999    STOP 'INPUT FILE ERROR'
        END
```

```
C       FILE NAME:  PREPROCESSOR_V2.FOR by Ronald J Gillory

        SUBROUTINE PREPROCESSOR (RECORD_COUNT,TEST, NUMNODES)

        CHARACTER * 40
     &          NAME_LIST

        INTEGER
     &          NAME,
     &          OPTION,
     &          RANK,
     &          EXPANDED_NAME,
     &          RECORD_COUNT,
     &          POPULATE_FACTOR,
     &          LINK,
     &          ALINK,
     &          NUMNODES,
     &          POINT,
     &          APOINT,
     &          MAX_DEGREE,
     &          RADIUS,
     &          CO_LIST,
     &          ADJ_LIST,
     &          CO_ORDER,
     &          ADJ_ORDER,
     &          MAXNODES,
     &          MAXLINKS,
     &          INDEX,
     &          I_VAL,
     &          J_VAL,
     &          POSITION,
     &          LOCATION

        REAL * 8
     &          DISTANCE

        LOGICAL
     &          ADJACENT,
     &          TEST

        INCLUDE
     &          'GRAPH_PARAMS.FOR'


        DIMENSION
     &          NAME_LIST(MAXNODES),!CONTAINS THE RECORD NAMES
     &          EXPANDED_NAME(MAXNODES),
     &          POPULATE_FACTOR(MAXNODES,2),!COL2 HAS NUMBER OF FREQ/NAME
     &          NAME(MAXNODES),!ARGUMENT IS RANK,VALUE IS NAME_LIST INDEX
     &          LINK(MAXLINKS),!CO CHANNEL LIST BY RANK IN NAME ARRAY
     &          ALINK(MAXLINKS),!ADJ CHANNEL LIST BY RANK IN NAME ARRAY
     &          RADIUS (MAXNODES,4),!ARRAY CONTAINING PROPAGATION RADIUS DATA
     &          CO_LIST(MAXNODES,MAXNODES),! CO CHANNEL VIOLATORS
     &          CO_ORDER(MAXNODES),!NUMBER OF ELEMENTS/ROW IN CO_LIST
     &          ADJ_LIST(MAXNODES,MAXNODES),! ADJ CHANNEL VIOLATORS
     &          ADJ_ORDER(MAXNODES),!NUMBER OF ELEMENTS/ROW IN ADJ_LIST
     &          DISTANCE(MAXNODES,MAXNODES), !ARRAY OF THE NODE TO NODE DISTANCE
     &          POINT(MAXLINKS),
     &          APOINT(MAXLINKS),
     &          RANK(MAXNODES)

        COMMON
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY2/DISTANCE,
     &          /ARRAY8/POPULATE_FACTOR,
```

```
     &                /ARRAY12/NAME,
     &                /ARRAY13/LINK,
     &                /ARRAY14/ALINK,
     &                /ARRAY19/RADIUS,
     &                /ARRAY20/CO_LIST,
     &                /ARRAY21/ADJ_LIST,
     &                /ARRAY22/CO_ORDER,
     &                /ARRAY23/ADJ_ORDER,
     &                /ARRAY24/EXPANDED_NAME

           OPEN      (
     &                UNIT=60,
     &                STATUS='NEW',
     &                FILE='PREPROCESSOR_V2.DAT',
     &                ACCESS='SEQUENTIAL',
     &                FORM='FORMATTED',
     &                ERR=100,
     &                IOSTAT=IERR
     &                )
           GO TO 101
100        STOP 'ERROR OPENING PREPROCESSOR_V21.DAT'
101        WRITE (6,*) 'PREPROCESSOR_V2.DAT OPENED'

           OPEN      (
     &                UNIT=61,
     &                STATUS='NEW',
     &                FILE='CONSTRAINT_ARRAY_V2.DAT',
     &                ACCESS='SEQUENTIAL',
     &                FORM='FORMATTED',
     &                ERR=200,
     &                IOSTAT=IERR
     &                )
           GO TO 201
200        STOP 'ERROR OPENING CONSTRAINT_ARRAY_V2.DAT'
201        WRITE (6,*) 'CONSTRAINT_ARRAY_V2.DAT OPENED'

C          THESE ROUTINES FIRST SET UP AN INTEGER ARRAY 'NAME'. THE ARGUMENT
C          OF NAME IS THE INTEGER REPRESENTING THE CURRENT RANK OF A TRANSMITTER
C          AND THE VALUE OF NAME IS THE INTEGER WHICH SERVES AS THE IDENTIFICATION
C          OF THAT TRANSMITTER REFERRING TO THE ARGUMENT OF THE NAME_LIST CHARACTER
C          ARRAY. THE VALUE STORED IN AN ELEMENT OF THE NAME ARRAY WILL BE THE
C          POINTER(ARGUMENT) FOR REFERENCING A CHARACTER STRING IN THE NAME_LIST
C          ARRAY.

           NUMNODES = 0

           DO 5000  I = 1, RECORD_COUNT

            INDEX = I !THIS LINE FOR UNIQUE REFERENCE

            CALL CONSTRAINTS ( RECORD_COUNT , INDEX )


           WRITE (60,1000)
     &                I,
     &                NAME_LIST (I)
1000       FORMAT (1X,I4,'.',1X,A40/)

           WRITE (60,1010)
     &                'CO CHANNEL LIST-----------------------------------------------'
1010       FORMAT (1X,6X,A65)


           WRITE (60,1020)
     &                ( NAME_LIST(CO_LIST(I,L)),L=1,CO_ORDER(I))
1020       FORMAT (1X,6X,A40)

           WRITE (60,*) ' '
```

```
      WRITE (60,1030)
     &          'ADJ CHANNEL LIST----------------------------------------------'
1030  FORMAT (1X,6X,A65)

      WRITE (60,1040)
     &          (NAME_LIST( ADJ_LIST(I,M)),M=1,ADJ_ORDER(I))
1040  FORMAT (1X,6X,A40)

      WRITE (60,1050)
1050  FORMAT (1X,//)

        DO 4000 J = 1, ( POPULATE_FACTOR(I,2) )

          NUMNODES = NUMNODES + 1

          EXPANDED_NAME ( NUMNODES ) = I
          NAME(NUMNODES)=NUMNODES

4000    CONTINUE
5000  CONTINUE

      WRITE(61,*)
     &          'I,EXPANDED_NAME(I),NAME(I),NAME_LIST(EXPANDED_NAME(NAME(I)))'
      DO 5100 I=1,NUMNODES
          WRITE(61,5050)
     &                    I,
     &                    EXPANDED_NAME(I),
     &                    NAME(I),
     &                    NAME_LIST(EXPANDED_NAME(NAME(I)))
5050      FORMAT(1X,I4,4X,I4,4X,I4,4X,A40)
5100  CONTINUE



      WRITE (60,*) 'NUMNODES=', NUMNODES

      WRITE (6,*)  'NUMNODES=', NUMNODES

      POSITION = 0
      LOCATION = 0

      DO 30000 I = 1, NUMNODES

        INDEX = EXPANDED_NAME (I) !FOR UNIQUE REFERENCE

          DO 15000 J = 1,CO_ORDER(INDEX)

            I_VAL = CO_LIST ( INDEX, J )

              DO 10000 K =  NUMNODES,1,-1 !TO START WITH HIGH INDEX #

                IF ((I_VAL.EQ.EXPANDED_NAME(K)).AND.(I.NE.K)) THEN

                  POSITION = POSITION+1

                  LINK (POSITION) = K

                END IF
10000 CONTINUE

                IF ( J .EQ. CO_ORDER(INDEX) ) THEN

                  POSITION = POSITION+1

                  LINK (POSITION) = 0

                END IF
```

```
15000   CONTINUE
                DO 25000 J = 1,ADJ_ORDER(INDEX)
                  J_VAL = ADJ_LIST ( INDEX, J )
                        DO 20000 K =  NUMNODES, 1,-1 !TO START WITH HIGH INDEX #
                          IF ((J_VAL .EQ. EXPANDED_NAME(K)).AND.(I.NE.K)) THEN
                                LOCATION = LOCATION+1
                                ALINK (LOCATION) = K
                          END IF
20000   CONTINUE
                          IF ( J .EQ. ADJ_ORDER(INDEX) ) THEN
                                LOCATION = LOCATION+1
                                ALINK (LOCATION) = 0
                          END IF

25000   CONTINUE

30000   CONTINUE


C       TEST THE REORDER ROUTINE
C
        OPTION=1
        CALL REORDER
   &            (
   &            OPTION,
   &            NUMNODES,
   &            NAME,
   &            RANK,
   &            LINK,
   &            ALINK
   &            )


C       CONSTRUCT THE INDEX ARRAY FOR TESTING
        CALL GET_POINTERS
   &            (
   &            NUMNODES,
   &            LINK,
   &            ALINK,
   &            POINT,
   &            APOINT,
   &            MAX_DEGREE,
   &            ADJACENT
   &            )


        IF ( TEST  )  THEN


        DO 60000 I=1,NUMNODES
        WRITE(61,*)'I,POINT(I),APOINT(I),NAME_LIST(EXPANDED_NAME(NAME(I)))'
```

```
      WRITE (61,40000) I,POINT(I),APOINT(I),NAME_LIST(EXPANDED_NAME(NAME(I)))
40000 FORMAT(1X,I4,4X,I4,4X,I4,4X,A40)
            J=POINT(I)
            WRITE(61,*) 'LINK ARRAY -J,LINK(J)'
            DO WHILE (LINK(J).NE.0)
            WRITE(61,40011) J,LINK(J),
     &                  NAME_LIST(EXPANDED_NAME(NAME(LINK(J))))

            J=J+1
            END DO
            WRITE(61,40010) J,LINK(J) !TO GET THE ZERO

            K=APOINT(I)
            WRITE(61,*) 'ALINK ARRAY -K,ALINK(K)'
            DO WHILE (ALINK(K).NE.0)
            WRITE(61,40011) K,ALINK(K),
     &                  NAME_LIST(EXPANDED_NAME(NAME(ALINK(K))))
            K=K+1
            END DO
            WRITE (61,40010) K,ALINK(K)

40010       FORMAT (1X,I4,4X,I4)
40011       FORMAT (1X,I4,4X,I4,4X,A40)

60000 CONTINUE

      END IF

      CLOSE(60)
      CLOSE(61)


      RETURN

      END
```

```
C       FILE NAME GLOBAL_BLOCKING_V2.FOR by Ronald J Gillory



        SUBROUTINE GLOBAL
     &          (
     &          NUMNODES
     &          )


        INTEGER
     &          COLOR,
     &          CHANNEL,
     &          BLOCK,
     &          INFEAS,
     &          MAXNODES,
     &          MAXCOLORS,
     &          NUMNODES,
     &          NUMBER_OF_CHANNELS,
     &          C,
     &          M,
     &          ITEMP_1

        CHARACTER *35
     &          COMMENT

        REAL*8
     &          FREQUENCY,
     &          RTEMP_1

        INCLUDE
     &          'GRAPH_PARAMS.FOR'

        DIMENSION
     &  INFEAS (MAXCOLORS,MAXNODES)

        COMMON
     &  /ARRAY18/INFEAS

        OPEN
     &          (
     &          UNIT = 80,
     &          STATUS = 'OLD',
     &          FILE = 'FREQUENCY_POOL.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 100,
     &          IOSTAT = IERR
     &          )

        GO TO 101
100     STOP 'ERROR OPENING FREQUENCY_POOL.DAT'
101     WRITE (6,*) 'FREQUENCY_POOL.DAT OPENED'

C       FOR PARADOX TEXT IMPORT
        OPEN
     &          (
     &          UNIT = 81,
     &          STATUS = 'NEW',
     &          FILE = 'POOL.TXT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 110,
     &          IOSTAT = IERR
     &          )
```

```
      GO TO 111
110   STOP 'ERROR CREATING POOL.DAT'
111   WRITE (6,*) 'POOL.TXT CREATED'

      DO WHILE (.TRUE.)

      READ ( 80,200,END=2000 )
     &            COLOR,
     &            CHANNEL,
     &            FREQUENCY,
     &            BLOCK,
     &            COMMENT

200   FORMAT
     &            (
     &            1X,
     &            I3,
     &            9X,
     &            I3,
     &            8X,
     &            F8.4,
     &            8X,
     &            I1,
     &            A35
     &            )

      IF ( BLOCK .EQ. 1 ) THEN

        DO M = 1, NUMNODES

            INFEAS(COLOR,M) = BLOCK

        END DO

      END IF

      WRITE (81,300)
     &            COLOR,
     &            CHANNEL,
     &            FREQUENCY,
     &            BLOCK,
     &            COMMENT

300   FORMAT
     &            (
     &            1X,
     &            I3,
     &            ',',
     &            I3,
     &            ',',
     &            F8.4,
     &            ',',
     &            I1,
     &            ',',
     &            A35
     &            )


      END DO

2000  CONTINUE

      CLOSE (UNIT = 80)
      CLOSE (UNIT = 81)

      RETURN
```

END

```
C       FILE NAME : BLOCK.FOR by Ronald J Gillory

C       THIS IS A ROUTINE FOR COLOR BLOCKING BASED ON GEOGRAPHIC LOCATION


        SUBROUTINE BLOCK
     &                  (
     &                  RECORD_COUNT,
     &                  NUMNODES
     &                  )


        INTEGER
     &          COLOR,
     &          NAME,
     &          EXPANDED_NAME,
     &          RADIUS,
     &          POINTER,
     &          COLOR_COUNTER,
     &          I_ARC,
     &          CHANNEL,
     &          INFEAS,
     &          TEMP,
     &          MAXNODES,
     &          MAXCOLORS,
     &          NUMBER_OF_CHANNELS,
     &          LATD, LATM, LATS,
     &          LOND, LONM, LONS,
     &          MAXLINKS


        REAL*8
     &          LAT, LON,
     &          BLOCK_LAT, BLOCK_LON,
     &          PI,
     &          COVERAGE_RADIUS,
     &          EARTH_RADIUS,
     &          OUT_LIST,
     &          IN_LIST,
     &          DISTANCE,
     &          CO_DISTANCE,
     &          ADJ_DISTANCE,
     &          CO_FROM,
     &          ADJ_FROM,
     &          CO_TEST,
     &          ADJ_TEST,
     &          JURISDICTION,
     &          X1, Y1, Z1,
     &          X2, Y2, Z2,
     &          CHORD,
     &          ANGLE,
     &          ARC


        CHARACTER *40
     &          CITY_COUNTY,
     &          NAME_LIST,
     &          DESCRIPTOR


        INCLUDE
     &          'GRAPH_PARAMS.FOR'


        DIMENSION
     &          NAME_LIST (MAXNODES),
     &          EXPANDED_NAME (MAXNODES),
```

```
     &          NAME (MAXNODES),
     &          IN_LIST (MAXNODES,10),
     &          OUT_LIST (MAXNODES,6),
     &          RADIUS (MAXNODES,4),
     &          INFEAS (MAXCOLORS,MAXNODES),
     &          DISTANCE(MAXNODES,MAXNODES),
     &          TEMP(MAXLINKS)

          COMMON
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY2/DISTANCE,
     &          /ARRAY6/RADIUS,
     &          /ARRAY12/NAME,
     &          /ARRAY18/INFEAS,
     &          /ARRAY24/EXPANDED_NAME,        !THIS IS THE SITE ARRAY
     &          /ARRAY25/IN_LIST,
     &          /ARRAY26/OUT_LIST,
     &          /WORKING_AREA/TEMP


          OPEN
     &          (
     &          UNIT = 1,
     &          STATUS = 'OLD',
     &          FILE = 'BLOCK.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 100,
     &          IOSTAT = IERR
     &          )

          GO TO 101
100       STOP 'ERROR OPENING BLOCK.DAT'
101       WRITE (6,*)        'BLOCK.DAT IS OPENED'


          OPEN
     &          (
     &          UNIT = 2,
     &          STATUS = 'NEW',
     &          FILE = 'BLOCK_DONE.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 110,
     &          IOSTAT = IERR
     &          )

          GO TO 111
110       STOP 'ERROR CREATING BLOCK_DONE.DAT'
111       WRITE (6,*)        'BLOCK_DONE.DAT CREATED'


          DO WHILE (.TRUE.)

130       CONTINUE

          COLOR_COUNTER = 0

          READ (1,200,END=2000)
     &          LATD, LATM, LATS,
     &          LOND, LONM, LONS,
     &          CO_DISTANCE,
     &          ADJ_DISTANCE,
     &          JURISDICTION,
     &          DESCRIPTOR


200       FORMAT
```

```
     &                (
     &                3I2,
     &                1X,
     &                3I2,
     &                1X,
     &                F3.0,
     &                1X,
     &                F3.0,
     &                1X,
     &                F3.0,
     &                1X,
     &                A40
     &                )

              WRITE (2,*) ' '
              WRITE (2,*) ' '
              WRITE (2,300)
     &                LATD, LATM, LATS,
     &                LOND, LONM, LONS,
     &                CO_DISTANCE,
     &                ADJ_DISTANCE,
     &                JURISDICTION,
     &                DESCRIPTOR

300           FORMAT
     &                (
     &                1X,
     &                3I2,
     &                2X,
     &                3I2,
     &                2X,
     &                F3.0,
     &                5X,
     &                F3.0,
     &                5X,
     &                F3.0,
     &                5X,
     &                A40
     &                )

400           CONTINUE

              READ(1,*,END= 500) COLOR


              DO WHILE (COLOR .NE. 0 )

              IF (COLOR_COUNTER .GT. MAXCOLORS) THEN
500           STOP 'ERROR IN BLOCK.DAT , NO ENDING ZERO'
              END IF
              COLOR_COUNTER = COLOR_COUNTER+1

              TEMP(COLOR_COUNTER) = COLOR

              READ(1,*,END=500) COLOR

              END DO


C             THE CONVERSION TO DECIMAL DEGREES IS NEXT

              BLOCK_LAT =
     &                (
     &                (DFLOAT (LATD))
     &                +
     &                ((DFLOAT (LATM))/60)
     &                +
```

```
     &                ((DFLOAT (LATS))/3600)
     &                )

              BLOCK_LON =
     &                (
     &                (DFLOAT (LOND))
     &                +
     &                ((DFLOAT (LONM))/60)
     &                +
     &                ((DFLOAT (LONS))/3600)
     &                )

C             THE COMPUTATION OF SPHERICAL COORDINATES IS NEXT

              X1 =
     &                (
     &                (EARTH_RADIUS*DCOSD(BLOCK_LAT))
     &                *
     &                (DCOSD(BLOCK_LON))
     &                )

              Y1 =
     &                (
     &                (EARTH_RADIUS*DCOSD(BLOCK_LAT))
     &                *
     &                (DSIND(BLOCK_LON))
     &                )

              Z1 =
     &                (
     &                (EARTH_RADIUS*DSIND(BLOCK_LAT))
     &                )

              DO I = 1, NUMNODES

              POINTER = (EXPANDED_NAME ( NAME (I))) !FOR NON EXPANDED ARRAYS

              X2 =  OUT_LIST(POINTER,4)

              Y2 =  OUT_LIST(POINTER,5)

              Z2 =  OUT_LIST(POINTER,6)


              CHORD =
     &                (
     &                DSQRT
     &                (
     &                ((X1-X2)**2)
     &                +
     &                ((Y1-Y2)**2)
     &                +
     &                ((Z1-Z2)**2)
     &                )
     &                )

              ANGLE =
     &                (
     &                2
     &                *
     &                (
     &        DASIN
     &                (CHORD/(2*EARTH_RADIUS))
     &                )
     &                )

              ARC =
     &                (
```

```
     &                EARTH_RADIUS
     &                *
     &                ANGLE
     &                )

          I_ARC = NINT(ARC)

C                              INBOUND TESTS
          CO_TEST =
     &                (FLOAT
     &                (RADIUS(POINTER,1)) !PROTECTION TO JURISDICTION RADIUS
     &                +
     &                CO_DISTANCE
     &                +
     &                JURISDICTION
     &                )

          ADJ_TEST =
     &                (FLOAT
     &                (RADIUS(POINTER,1)) !PROTECTION TO JURISDICTION RADIUS
     &                +
     &                ADJ_DISTANCE
     &                +
     &                JURISDICTION
     &                )

C                              OUTBOUND TESTS
          CO_FROM =
     &                (FLOAT
     &                (RADIUS(POINTER,3)) !PROTECTION FROM COVERAGE RADIUS
     &                +
     &                JURISDICTION
     &                )

          ADJ_FROM =
     &                (FLOAT
     &                (RADIUS(POINTER,4)) !PROTECTION FROM COVERAGE RADIUS
     &                +
     &                JURISDICTION
     &                )


          IF ((ARC.LE.CO_TEST).OR.(ARC.LE.CO_FROM)) THEN
             WRITE (2,*) ' '
             WRITE (2,900)
     &                        I,
     &                        POINTER,
     &                        I_ARC,
     &                        NAME_LIST(POINTER)
             WRITE (2,*) 'CO_CHANNEL COLOR BLOCKED'
             DO J=1,COLOR_COUNTER

                  INFEAS((TEMP(J)),I)=1
               WRITE (2,*) TEMP(J)! ,INFEAS((TEMP(J)),I)

             END DO
          END IF



          IF ((ARC.LE.ADJ_TEST).OR.(ARC.LE.ADJ_FROM)) THEN
             WRITE (2,*) ' '
             WRITE (2,900)
     &                        I,
     &                        POINTER,
     &                        I_ARC,
     &                        NAME_LIST(POINTER)
```

```
900     FORMAT
   &              (
   &              1x,
   &              I5,
   &              '= I'
   &              I5,
   &              '= RECORD'
   &              I7,
   &              ' MILES:  '
   &              A40
   &              )

          WRITE (2,*) 'ADJ_CHANNEL COLOR BLOCKED'
          DO J=1,COLOR_COUNTER

                INFEAS((TEMP(J)+1),I)=1
                INFEAS((TEMP(J)-1),I)=1
             WRITE (2,*)
   &     (TEMP(J)+1), !INFEAS((TEMP(J)+1),I),
   &     (TEMP(J)-1) !,INFEAS((TEMP(J)-1),I)

          END DO
        CONTINUE

        END IF



        END DO



        END DO

2000    CONTINUE


        CLOSE ( UNIT = 1 )

        CLOSE ( UNIT = 2 )

        RETURN

        END
```

```
C            FILE NAME :  LARGEST_FIRST_V3.FOR supplied by Bob Eckert,Engr.,FCC
C                                          modified by Ronald J Gillory
             SUBROUTINE LF
     &                  (
     &       NUMNODES,
     &       NUMCOLORS
     &                  )
C
C  Color graphs with the nodes arranged in node-degree
C  (largest-first) order.  At the time each node is addressed,
C  it is assigned the lowest-numbered color allowable in
C  consideration of the assignments already made and the modifications
C  made to the original routines.
C
      IMPLICIT INTEGER ( A - Z )

      LOGICAL
     &                  ADJACENT, ! TRUE IF ADJACENT CHANNEL CONSTRAINTS ARE USED
     &                  PACK,     ! ALTERNATE FREQUENCY SPECTRUM ON OPPOSING ENDS
     &                  PACK_PARM,
     &                  HIGH_END,
     &                  HIGH_END_PARM,
     &                  LOW_END,
     &                  LOW_END_PARM


      INCLUDE 'GRAPH_PARAMS.FOR'
C-------------------------------------------------------
C            THIS PARAMETER IS INCLUDED IN GRAPH_PARAMS.FOR
C      PARAMETER ( MAXCOLORS = MAXNODES )
C-------------------------------------------------------
C
C
C  Input and output arrays
C
      DIMENSION
     &   NAME( MAXNODES ),      !Node-number as function of order
     &   LINK( MAXLINKS ),      !Graph is specified by its links
     &   ALINK( MAXLINKS ),     !and adjacent-color constraints
     &   COLOR( MAXNODES )      !Output color assignments
C
C  Index arrays for LINK and ALINK
C
      DIMENSION LPOINT( MAXNODES ), APOINT( MAXNODES )
C
C  Array used to flag assignments no longer permitted
C
      DIMENSION INFEAS( MAXCOLORS, MAXNODES )


            COMMON
     &                  /WORKING_AREA/ TEMP( MAXLINKS ),
     &                  /ARRAY12/NAME,
     &                  /ARRAY13/LINK,
     &                  /ARRAY14/ALINK,
     &                  /ARRAY15/COLOR,
     &                  /ARRAY16/LPOINT,
     &                  /ARRAY17/APOINT,
     &                  /ARRAY18/INFEAS
C
C
C
C  Array used in call to REORDER
C
      DIMENSION RANK( MAXNODES )
C
C  Reorder the nodes
```

```
C
      OPTION = 1        !Largest-first reordering option
      CALL REORDER(
     &   OPTION, NUMNODES, NAME, RANK, LINK, ALINK )
C
C  Construct index arrays
C
      CALL GET_POINTERS( NUMNODES, LINK, ALINK,
     &   LPOINT, APOINT, MAX_DEGREE, ADJACENT )
C-------------------------------------------------------------
C            THIS SECTION THE VARIABLE IS CHANGED TO NUMBER_OF_CHANNELS
C            A PARAMETER IS INCLUDED IN GRAPH_PARAMS.FOR
C  Reset table of available colors
C
C      COLOR_LIMIT = NUMNODES
C      IF ( ADJACENT )
C     &   COLOR_LIMIT = MIN( MAXCOLORS, 2 * NUMNODES - 1 )
C-------------------------------------------------------------
C
C      DO 130 C=1, NUMBER_OF_CHANNELS
C         DO 120 M=1, NUMNODES
C            INFEAS( C, M ) = 0
C  120    CONTINUE
C  130 CONTINUE
C
C  ARRAY IS ZEROED OUT BY VMS - ARRAY WILL BE PRELOADED WITH SOME CONSTRAINTS
C-------------------------------------------------------------
C
C
C  Color the graph
C
            PACK = PACK_PARM   ! TO ALLOW CHANGING A PARAMETER
C

            HIGH_END = HIGH_END_PARM   ! TO ALLOW CHANGING A PARAMETER


            IF ( HIGH_END_PARM ) THEN   !  LOW_END IS THE .NOT. OF HIGH END
            LOW_END = .FALSE.
            ELSE
            LOW_END = .TRUE.
            END IF

            NEXT = 1
      NUMCOLORS = 1                 !Minimum number required
      DO 230 M = 1, NUMNODES              !Examine nodes in rank order


            IF (NEXT.GT.NUMBER_OF_CHANNELS) THEN  !CHECK THE NEW VALUE FOR LIMITS.
               NEXT = 1            !START AT THE BEGINNING WHEN NECESSARY
            END IF

            IF ( .NOT. PACK ) THEN

C   In the following do block NEXT is COMBINER_INCREMENT larger each pass
C   thus allowing a minimum spacing when possible.
         DO  C= NEXT, NUMBER_OF_CHANNELS       !Find first available color

           IF ( INFEAS( C, M ) .EQ. 0 ) THEN
             COLOR( NAME( M ) ) = C
             GOTO 220         !Go update INFEAS array
           END IF

              END DO

C   Start search at color 1 if unable to find a slot in infeas array.

         DO  C= 1, NUMBER_OF_CHANNELS       !Find first available color
```

```
          IF ( INFEAS( C, M ) .EQ. 0 ) THEN
            COLOR( NAME( M ) ) = C
            GOTO 220        !Go update INFEAS array
          END IF

             END DO

       WRITE (6,*) 'Too many colors required in subroutine LF'
             GO TO 230
C            RETURN

             ELSE IF ( PACK .AND. LOW_END ) THEN


          DO  C=1, NUMBER_OF_CHANNELS       !Find first available color

          IF ( INFEAS( C, M ) .EQ. 0 ) THEN
            COLOR( NAME( M ) ) = C
                        LOW_END = .FALSE.
                        HIGH_END = .TRUE.
            GOTO 220        !Go update INFEAS array
          END IF

             END DO


       WRITE(6,*) 'Too many colors required in subroutine LF'
             GO TO 230
C            RETURN

             ELSE IF ( PACK .AND. HIGH_END ) THEN

          DO  C= NUMBER_OF_CHANNELS,1,-1    !Find first available color

          IF ( INFEAS( C, M ) .EQ. 0 ) THEN
            COLOR( NAME( M ) ) = C
                        LOW_END = .TRUE.
                        HIGH_END = .FALSE.
            GOTO 220        !Go update INFEAS array
          END IF

             END DO

       WRITE(6,*) 'Too many colors required in subroutine LF'
             GO TO 230
C            RETURN

             ELSE

                        STOP 'ERROR IN THE COLOR SELECTION PROCESS'

             END IF


  220    CONTINUE
         IF ( C .GT. NUMCOLORS ) NUMCOLORS = C
         P = LPOINT( M )
         LNK = LINK( P )
         DO WHILE ( LNK .GT. 0 )
           INFEAS( C, LNK ) = 1
           P = P + 1
           LNK = LINK( P )
         END DO
         IF ( .NOT. ADJACENT ) GOTO 230
         C1 = C - 1
         C2 = C + 1
         P = APOINT( M )
```

```
      LNK = ALINK( P )
      DO WHILE ( LNK .GT. 0 )
        IF ( C1 .GT. 0 ) INFEAS( C1, LNK ) = 1
        IF ( C2 .LE. NUMBER_OF_CHANNELS) INFEAS( C2, LNK ) = 1
        P = P + 1
        LNK = ALINK( P )
      END DO

          NEXT = C + COMBINER_INCREMENT  ! TX COMBINER INCREMENT

230 CONTINUE

    RETURN
    END
```

```
C            FILE NAME : REORDER_V1.FOR

      SUBROUTINE REORDER(
     &   OPTION, NUMNODES, NAME, RANK, LINK, ALINK )
C
C  Reorder the nodes of a graph by revising the arrays NAME,
C  LINK and ALINK.
C
C  In option 0, the desired new order is specified by the RANK
C  array.  In other options, the new order is determined within
C  the subroutine by analysis of the structure of the graph.
C
      IMPLICIT INTEGER ( A - Z )
c     LOGICAL ADJACENT
      INCLUDE 'GRAPH_PARAMS.FOR'
C
C     COMMON /INOUT/ IN, IO, IPSW
C
C  Input and output arrays
C
      DIMENSION NAME( MAXNODES ), RANK( MAXNODES )
      DIMENSION LINK( MAXLINKS ), ALINK( MAXLINKS )
C
C  Arrays used in reordering procedures
C
      DIMENSION
     &   SORT( 4, MAXNODES ),
     &   PTR( MAXNODES ), KEY( 4 ), BUF( 4 ),
     &   DUMMY( MAXNODES ),     !Dummy PTR array
     &   LPOINT( MAXNODES ),    !Index for LINK array
     &   APOINT( MAXNODES )     !ALINK index
C
C  Share working area containing large array with temporary
C  storage of other subroutines
C
      COMMON /WORKING_AREA/
     &   TEMP( MAXLINKS )       !Used in revising link arrays
C
C  Construct index arrays for LINK and ALINK
C
      CALL GET_POINTERS( NUMNODES, LINK, ALINK,
     &   LPOINT, APOINT, MAX_DEGREE, ADJACENT )
C
C  If the nodes have not been named, fill NAME array with
C  node-numbers in natural order
C
      IF ( NAME( 1 ) .GT. 0 ) GOTO 20
      DO 10 N=1, NUMNODES
        NAME( N ) = N
   10 CONTINUE
   20 CONTINUE
C
C  Construct SORT array
C


      DO 30 M=1, NUMNODES               !Nodes in original rank order
        P = LPOINT( M )
        LL = 0                      !Reset number of links
        LNK = LINK( P )
        DO WHILE ( LNK .NE. 0 )
          LL = LL + 1               !Count links
          P = P + 1                 !Advance pointer
          LNK = LINK ( P )
        END DO
        P = APOINT( M )
        AL = 0          !Reset number of adjacent-color links
```

```
        LNK = ALINK( P )
        DO WHILE ( LNK .NE. 0 )
          AL = AL + 1        !Count adjacent-color links
          P = P + 1
          LNK = ALINK ( P )
        END DO
        SORT( 1, M ) = M
        SORT( 2, M ) = NAME( M )
        SORT( 3, M ) = LL + AL        !Total links
        SORT( 4, M ) = AL             !Adjacent-color links
  30 CONTINUE
C
C  Option 0:  Transform the link arrays and NAME according to
C  the order prescribed by the array RANK
C
     IF ( OPTION .EQ. 0 ) THEN
        DO 40 M=1, NUMNODES
          PTR( RANK( M ) ) = M       !Inverse of RANK
          NAME( RANK( M ) ) = SORT( 2, M )
  40    CONTINUE
        GOTO 900
     END IF
C
C  Other types of reordering are determined by how the nodes
C  are linked.
C
     GOTO ( 100, 200, 300 ), OPTION
     IF ( OPTION .GT. 3 ) STOP
    &   'Invalid option in subroutine REORDER'
C
C  Option 1:  Largest-first, giving priority to adjacent-color
C  links
C
  100 CONTINUE
     KEY( 1 ) = -4     !Sort by number of adj-color links
     KEY( 2 ) = -3     !Secondarily by total links
     KEY( 3 ) =  1     !Third key is original order
     NKEY = 3
     CALL HEAPSI( SORT, 4, NUMNODES, KEY, NKEY, BUF, PTR )
C
     DO 110 J=1, NUMNODES              !J signifies new rank


        NAME( J ) = SORT( 2, J )
        RANK( PTR( J ) ) = J          !Inverse of PTR
  110 CONTINUE
     GOTO 900
C
C  Option 2:  Reorder the nodes so that the first has the most
C  links and subsequently node K is connected to more of the
C  nodes 1, 2, ..., K-1 than any of the nodes that will follow
C  node K.  Node with the greatest number of adjacent-color links
C  is selected in case of tie.
C
  200 CONTINUE
     KEY( 1 ) = -3     !Sort by total links in descending order
     KEY( 2 ) = -4     !Secondarily by number of ALINKS
     KEY( 3 ) =  1     !Original order is final tie-breaker
     NKEY = 3
     CALL HEAPSI( SORT, 4, NUMNODES, KEY, NKEY, BUF, PTR )
C
C  Reset 4th column of SORT array, and form inverse of the PTR
C  function produced in sorting
C
     DO 210 J=1, NUMNODES
        SORT( 4, J ) = 0
        RANK( PTR( J ) ) = J
  210 CONTINUE
```

```
C
C  Find the node with largest number of links to previously
C  selected nodes.  Modify the node-degree function accordingly
C  and repeat until all nodes have been processed in this way.
C
      NAME( 1 ) = SORT( 2, 1 )          !Highest degree node
      SORT( 4, 1 ) = -1
      KK = 1
      DO 230 J=2, NUMNODES
        M = SORT( 1, KK )               !Previously selected node
        P = LPOINT( M )
        LNK = LINK( P )
        DO WHILE ( LNK .GT. 0 )
          NEWPLACE = RANK( LNK )      !Position after heap sort
          ACCUM = SORT( 4, NEWPLACE )
          IF ( ACCUM .GE. 0 ) SORT( 4, NEWPLACE ) = ACCUM + 1
          P = P + 1
          LNK = LINK( P )
        END DO
C
        P = APOINT( M )
        LNK = ALINK( P )
        DO WHILE ( LNK .GT. 0 )
          NEWPLACE = RANK( LNK )      !Position after last sort
          ACCUM = SORT( 4, NEWPLACE )
          IF ( ACCUM .GE. 0 ) SORT( 4, NEWPLACE ) = ACCUM + 1
          P = P + 1


          LNK = ALINK( P )
        END DO
C
        MOST = -1
        DO 220 K=2, NUMNODES
          IF ( SORT( 4, K ) .GT. MOST ) THEN
            KK = K
            MOST = SORT( 4, K )
          END IF
  220   CONTINUE
        SORT( 4, KK ) = -1              !Mark nodes already selected
        PTR( J ) = SORT( 1, KK )        !Revise PTR array
        NAME( J ) = SORT( 2, KK )
  230 CONTINUE
C
C  Redefine RANK
C
      DO 240 J=1, NUMNODES
        RANK( PTR( J ) ) = J
  240 CONTINUE
      GOTO 900
C
C  Option 3:  Smallest last
C
  300 CONTINUE
      KEY( 1 ) = -4     !Descending order of number of ALINKS
      KEY( 2 ) = -3     !2nd sort key is total number of links
      KEY( 3 ) = -1     !Original order breaks ties
      NKEY = 3
      DO 330 J=NUMNODES, 2, -1
        CALL HEAPSI( SORT, 4, J, KEY, NKEY, BUF, PTR )
        M = SORT( 1, J )        !Original rank of node just selected
        P = LPOINT( M )
        LNK = LINK( P )
        DO WHILE ( LNK .GT. 0 )
          DO 310 K=1, J-1
            IF( SORT( 1, K ) .NE. LNK ) GOTO 310
            SORT( 3, K ) = SORT( 3, K ) - 1
  310       CONTINUE
```

```
          P = P + 1
          LNK = LINK( P )
        END DO
        P = APOINT( M )
        LNK = ALINK( P )
        DO WHILE ( LNK .GT. 0 )
          DO 320 K=1, J-1
            IF ( SORT( 1, K ) .NE. LNK ) GOTO 320
            SORT( 3, K ) = SORT( 3, K ) - 1
            SORT( 4, K ) = SORT( 4, K ) - 1
 320        CONTINUE
          P = P + 1
          LNK = ALINK( P )

        END DO
        PTR( J ) = M
        NAME( J ) = SORT( 2, J )
 330  CONTINUE
      PTR( 1 ) = SORT( 1, 1 )
      NAME( 1 ) = SORT( 2, 1 )
C
C  Find new ranking
C
      DO 340 J=1, NUMNODES
        RANK( PTR( J ) ) = J   !Inverse of PTR
 340  CONTINUE
C
C  Show node names in new order
C
 900  CONTINUE
      IF ( OPTION .NE. 0 .AND. IPSW .GT. 0 .AND.
     &   NUMNODES .LE. 20 ) THEN
        WRITE(IO, '( 1X,A,20(1X,I2) )' ) 'Rank:',
     &      ( J, J=1, NUMNODES )
        WRITE(IO, '( 1X,A,20(1X,I2) )' ) 'Node:',
     &      ( NAME( J ), J=1, NUMNODES )
      END IF
C
C  Transform LINK
C
      IF ( MAX_DEGREE .EQ. 0 ) RETURN   !No changes needed
      KEY( 1 ) = -1     !For sorting LINK and ALINK sublists
      NKEY = 1          !Single key
      PP = 0
      DO 910 J=1, NUMNODES
        PP = PP + 1
        M = PTR( J )                !Original rank
        P = LPOINT( M )
        LNK = LINK( P )
        K = 0
        DO WHILE ( LNK .GT. 0 )
          K = K + 1
          TEMP( PP ) = RANK( LNK )
          PP = PP + 1
          P = P + 1
          LNK = LINK( P )
        END DO
        IF ( K .GT. 0 ) THEN
          FIRST = PP - K
          CALL HEAPSI(              !Sort sublist
     &        TEMP( FIRST ), 1, K, KEY, NKEY, BUF, DUMMY )
        END IF
        TEMP( PP ) = 0
 910  CONTINUE
      CALL XMIT( PP, TEMP, LINK )
      IF ( .NOT. ADJACENT ) RETURN
```

```
C
C  Transform ALINK
C
      PP = 0
      DO 920 J=1, NUMNODES
        PP = PP + 1
        M = PTR( J )
        P = APOINT( M )
        LNK = ALINK( P )
        K = 0
        DO WHILE ( LNK .GT. 0 )
          K = K + 1
          TEMP( PP ) = RANK( LNK )
          PP = PP + 1
          P = P + 1
          LNK = ALINK( P )
        END DO
        IF ( K .GT. 0 ) THEN
          FIRST = PP - K
          CALL HEAPSI(              !Sort sublist
     &       TEMP( FIRST ), 1, K, KEY, NKEY, BUF, DUMMY )
        END IF
        TEMP( PP ) = 0
  920 CONTINUE
      CALL XMIT( PP, TEMP, ALINK )
      RETURN
      END
```

```
C            FILE NAME: GET_POINTERS_V1.FOR supplied by Bob Eckert,Engr.,FCC
C                                       modified by Ronald J Gillory
C
C
      SUBROUTINE GET_POINTERS(
     &   NUMNODES, LINK, ALINK,              !Given
     &   POINT, APOINT,         !Construct pointer arrays
     &   MAX_DEGREE,    !Find degree of node with most links
     &   ADJACENT )     !Whether graph has adjacent-color links
C
      IMPLICIT INTEGER ( A - Z )
      LOGICAL ADJACENT
      INCLUDE 'GRAPH_PARAMS.FOR'
C
C  The link arrays consist of sublists, one for each node.
C  The Nth sublist contains the nodes linked to the Nth node.
C
C  The array POINT will locate specific sublists in LINK.  If
C  P3 = POINT(3), the nodes that may not share the same color
C  with the 3rd node are LINK(P3), LINK(P3 + 1),..., up to the
C  final entry of 0.  ALINK is similarly indexed by APOINT.
C
      DIMENSION
     &   LINK( MAXLINKS ),      !Graph is specified by its links
     &   ALINK( MAXLINKS ),     !and adjacent-color links
     &   POINT( MAXNODES ), APOINT( MAXNODES )  !Pointer arrays
C
C  Trap invalid arguments
C
      IF ( NUMNODES .GT. MAXNODES ) STOP
     &  'Number of nodes exceeds limit set by GRAPH_PARAMS.FOR'
C
C  Construct index arrays
C
      MAX_DEGREE = 0            !Initial value
      ADJACENT = .TRUE.         !Tentative assumption
      LIMIT = NUMNODES ** 2     !Maximum pointer array size
      P = 1
      PP = 1
      DO 100 M=1, NUMNODES
        IF ( P .GT. LIMIT ) GOTO 300
        POINT( M ) = P
        L = 0               !Reset number of links
        LNK = LINK( P )
        DO WHILE ( LNK .NE. 0 )
          L = L + 1
          P = P + 1
          IF ( P .GT. LIMIT ) GOTO 300
          LNK = LINK( P )
        END DO
        P = P + 1      !Skip terminating 0 of LINK sublist
C
        IF ( PP .GT. LIMIT ) GOTO 310
        APOINT( M ) = PP
        LNK = ALINK( PP )
        DO WHILE ( LNK .NE. 0 )
          L = L + 1
          PP = PP + 1
          IF ( PP .GT. LIMIT ) GOTO 310
          LNK = ALINK( PP )
        END DO
        PP = PP + 1    !Skip terminating 0 in ALINK
        IF ( L .GT. MAX_DEGREE ) MAX_DEGREE = L
  100 CONTINUE
      IF ( PP .EQ. NUMNODES + 1 ) ADJACENT = .FALSE.
      IF ( .NOT. ADJACENT ) RETURN
C
```

```
C  Adjacent-color links may only exist between nodes also
C  forbidden to share the same color
C
      DO 200 M=1, NUMNODES
        PP = APOINT( M )
        ALNK = ALINK( PP )
        DO WHILE ( ALNK .GT. 0 )
          P = POINT( M )              !Reset
          LNK = LINK( P )
          DO WHILE ( LNK .NE. ALNK )
            P = P + 1
            LNK = LINK( P )  !Search LINK sublist
            IF ( LNK .EQ. 0 ) GOTO 320
          END DO      !Next LINK of node M until match
          PP = PP + 1
          ALNK = ALINK( PP )
        END DO         !Next ALINK of node M
  200 CONTINUE          !Next M
      RETURN
C
  300 STOP 'Invalid LINK array'
  310 STOP 'Invalid ALINK array'
  320 STOP 'ALINK array inconsistent with LINK'
      END
```

```
C            FILE NAME : HEAP_SORT_V1.FOR supplied by Bob Eckert,Engr.,FCC
C                                    modified by Ronald J Gillory
C
      SUBROUTINE HEAPSI(
     &   ARR, M, N,     !Target array and dimensions
     &   KEY, NKEY,     !KEY( NKEY ) specifies how to sort
     &   BUF,   !Auxiliary array, size M (a slot for each column)
     &   PTR )  !Auxiliary array, size N (typically large)
C
      INTEGER KEY( NKEY ), PTR( N )
      INTEGER ARR( M, N ), BUF( M )
C
C  The array is visualized as an M-column list with N lines.
C  It is to be sorted so that the N items of column KEY(1) will
C  be in ascending or descending order depending upon the
C  algebraic sign of KEY(1).  KEY(2), KEY(3), and so on up to
C  KEY( NKEY ) specify the order of sorting at successively
C  lower levels.
C
C  The PTR array is returned with the order in which the
C  array has been changed so that another array may be
C  correspondingly rearranged.  If, for example, column 1 of
C  the array (list) initially contains the row (line) number
C  then the array PTR will match the first column of ARR as
C  sorted.  That is, PTR( IROW ) = ARR( 1, IROW ).
C
      IF( N .LE. 2 )  GO TO 900
      DO 5  I = 1, N
        PTR( I ) = I
    5 CONTINUE
      N2 = N / 2
      DO 100  I = 1, N2
        NEW = N2 - I + 1
   10   CONTINUE
        INDEX = NEW
        I1 = 2 * INDEX
        IF( I1 .GT. N )  GO TO 100
        I2 = I1 + 1
        IF( I2 .GT. N )  GO TO 50
        J1 = PTR( I2 )
        J2 = PTR( I1 )
        DO 40  IKEY = 1, NKEY
          JKEY = IABS( KEY( IKEY ) )
          IF( JKEY .EQ. 0 )  GO TO 40
          IF( ARR( JKEY, J1 ) .EQ. ARR( JKEY, J2 ) ) GO TO 40
          IF( KEY( IKEY ) .LT. 0 )  THEN
            IF( ARR( JKEY, J1 ) .LT. ARR( JKEY, J2 ) )
     &         I1 = I2
          ELSE
            IF( ARR( JKEY, J1 ) .GT. ARR( JKEY, J2 ) )
     &         I1 = I2
          END IF
          GO TO 50
   40   CONTINUE
   50   CONTINUE
        J1 = PTR( I1 )
        J2 = PTR( INDEX )
        DO 80  IKEY = 1, NKEY
          JKEY = IABS( KEY( IKEY ) )
          IF( JKEY .EQ. 0 )  GO TO 80
          IF( ARR( JKEY, J1 ) .EQ. ARR( JKEY, J2 ) )  GO TO 80
          IF( KEY( IKEY ) .LT. 0 )  THEN
            IF( ARR( JKEY, J1 ) .LT. ARR( JKEY, J2 ) )
     &         GO TO 85
          ELSE
            IF( ARR( JKEY, J1 ) .GT. ARR( JKEY, J2 ) )
     &         GO TO 85
```

```
        END IF
        GO TO 100
 80    CONTINUE
 85    CONTINUE
       NEW = I1
       K = PTR( INDEX )
       PTR( INDEX ) = PTR( I1 )
       PTR( I1 ) = K
       GO TO 10
100 CONTINUE
    DO 500  I = 2, N
       J = N - I + 2
       K = PTR( 1 )
       PTR( 1 ) = PTR( J )
       PTR( J ) = K
       NEW = 1
130    CONTINUE
       INDEX = NEW
       I1 = 2 * INDEX
       IF( I1 .GT. J - 1 )  GO TO 500
       I2 = I1 + 1
       IF( I2 .GT. J - 1 )  GO TO 200
       J1 = PTR( I2 )
       J2 = PTR( I1 )
       DO 180  IKEY = 1, NKEY
         JKEY = IABS( KEY( IKEY ) )
         IF( JKEY .EQ. 0 )  GO TO 180
         IF( ARR( JKEY, J1 ) .EQ. ARR( JKEY, J2 ) )  GO TO 180
         IF( KEY( IKEY ) .LT. 0 )  THEN
           IF( ARR( JKEY, J1 ) .LT. ARR( JKEY, J2 ) )
     &       I1 = I2
         ELSE
           IF( ARR( JKEY, J1 ) .GT. ARR( JKEY, J2 ) )
     &       I1 = I2
         END IF
         GO TO 200
180    CONTINUE
200    CONTINUE
       J1 = PTR( I1 )
       J2 = PTR( INDEX )
       DO 300  IKEY = 1, NKEY
         JKEY = IABS( KEY( IKEY ) )
         IF( JKEY .EQ. 0 )  GO TO 300
         IF( ARR( JKEY, J1 ) .EQ. ARR( JKEY, J2 ) )  GO TO 300
         IF( KEY( IKEY ) .LT. 0 )  THEN
           IF( ARR( JKEY, J1 ) .LT. ARR( JKEY, J2 ) )
     &       GO TO 310
         ELSE
           IF( ARR( JKEY, J1 ) .GT. ARR( JKEY, J2 ) )
     &       GO TO 310
         END IF
         GO TO 500
300    CONTINUE
310    CONTINUE
       NEW = I1
       K = PTR( INDEX )
       PTR( INDEX ) = PTR( I1 )
       PTR( I1 ) = K
       GO TO 130
500 CONTINUE
    IBUF = 1
    NEXT = 1
    IBEG = 2
510 CONTINUE
    DO 530 I = 1, M
       BUF( I ) = ARR( I, IBUF )
530 CONTINUE
550 CONTINUE
```

```
      MOVE = PTR( NEXT )
      IF( MOVE .EQ. IBUF )  GO TO 600
      IF( MOVE .EQ. NEXT )  GO TO 570
      DO 560 I = 1, M
        ARR( I, NEXT ) = ARR( I, MOVE )
  560 CONTINUE
  570 CONTINUE
      PTR( NEXT ) =  -PTR( NEXT )
      NEXT = MOVE
      GO TO 550
  600 CONTINUE
      IF( IBUF .EQ. NEXT )  GO TO 620
      DO 610 I = 1, M
        ARR( I, NEXT ) = BUF( I )
  610 CONTINUE
  620 CONTINUE
      PTR( NEXT ) = -PTR( NEXT )
      IF( IBEG .GT. N )  GO TO 650
      DO 640  I = IBEG, N
        IF( PTR( I ) .LT. 0 )  GO TO 640
        IBUF = I
        NEXT = I
        IBEG = I + 1
        GO TO 510
  640 CONTINUE
  650 CONTINUE
      DO 700  I = 1, N
        PTR( I ) = IABS( PTR( I ) )
  700 CONTINUE
      RETURN
C
  900 CONTINUE
      PTR( 1 ) = 1
      IF( N .LE. 1 )  RETURN
      PTR( 2 ) = 2
      DO 940  IKEY = 1, NKEY
        JKEY = IABS( KEY( IKEY ) )
        IF( JKEY .EQ. 0 )  GO TO 940
        IF( ARR( JKEY, 1 ) .EQ. ARR( JKEY, 2 ) )  GO TO 940
        IF( KEY( IKEY ) .LT. 0 )  THEN
          IF( ARR( JKEY, 1 ) .LT. ARR( JKEY, 2 ) ) GO TO 945
        ELSE
          IF( ARR( JKEY, 1 ) .GT. ARR( JKEY, 2 ) ) GO TO 945
        END IF
        RETURN
  940 CONTINUE
  945 CONTINUE
      PTR( 1 ) = 2
      PTR( 2 ) = 1
      DO 975 I = 1, M
        BUF( I ) = ARR( I, 1 )
        ARR( I, 1 ) = ARR( I, 2 )
        ARR( I, 2 ) = BUF( I )
  975 CONTINUE
C
      RETURN
      END
```

```
C       File name XMIT.FOR          supplied by Bob Eckert,Engr.,FCC

        SUBROUTINE XMIT (N, A, B )

C
C       FILLS AN ARRAY  (B) WITH EITHER A CONSTANT  ( N .LT. 0 )
C       OR ANOTHER ARRAY  ( N .GT. 0 )
C

        DIMENSION A( 1 ) , B( 1 )

C
C       DETERMINE KIND OF TRANSFERRAL
C

        IF ( N .LT. 0 ) THEN
C               PUT CONSTANT [A(1)] INTO ARRAY B
                IMAX = -N
                DO 20 I = 1, IMAX
                        B( I ) = A( 1 )
20              CONTINUE
        ELSE IF ( N .GT. 0 ) THEN
C               PUT ARRAY A INTO ARRAY B
                DO 30 I = 1, N
                        B( I ) = A ( I )
30              CONTINUE
        END IF
        RETURN
        END
```

```
C       FILE NAME:      WRITE_DISTANCE.FOR by Ronald J Gillory

        SUBROUTINE WRITE_DISTANCE ( RECORD_COUNT )


        INTEGER
     &          RECORD_COUNT,
     &          MAXNODES,       !PARAMETER FROM GRAPH_PARAMS.FOR
     &          MAXLINKS        !PARAMETER FROM GRAPH_PARAMS.FOR

        REAL*8
     &          LINK_ARC,       ! LENGTH OF LINE CONNECTION NODES
     &          DISTANCE        ! ARRAY  OF NODE TO NODE DISTANCES

        CHARACTER *40
     &          CITY_COUNTY,    ! THE NAME VARIABLE
     &          NAME_LIST       ! ARRAY OF NODE NAMES

        INCLUDE
     &          ' GRAPH_PARAMS.FOR '

        DIMENSION
     &          DISTANCE ( MAXNODES, MAXNODES ),
     &          NAME_LIST (MAXNODES )

        COMMON
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY2/DISTANCE

        OPEN    (
     &          UNIT = 20,
     &          STATUS = 'NEW',
     &          FILE = 'NAME_DISTANCE.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 25,
     &          IOSTAT = IERR
     &          )

        GO TO 26
25      STOP 'ERROR OPENING NAME_DISTANCE.DAT'
26      WRITE(6,*) 'NAME_DISTANCE.DAT OPENED'

        DO 200 I = 1,RECORD_COUNT

                DO 100 J = 1, RECORD_COUNT

                        WRITE (20,50)
     &                          I,NAME_LIST(I),
     &                          J,NAME_LIST(J),
     &                          DISTANCE(I,J)
50                      FORMAT (1X,I4,'.',1X,A40/1X,I4,'.',1X,A40,1X,F11.4//)

100             CONTINUE

200     CONTINUE

        CLOSE (UNIT = 20)

        RETURN
        END
```

```
C       FILE NAME : OKUMURA.FOR by Ronald J Gillory

        SUBROUTINE OKUMURA

        REAL*4
     &          OKUMURA_OPEN,
     &          OKUMURA_SUBURBAN,
     &          OKUMURA_URBAN

        DIMENSION
     &          OKUMURA_OPEN(5:80,4),
     &          OKUMURA_SUBURBAN(5:80,4),
     &          OKUMURA_URBAN(5:80,4)

C       ROWS OF THE OKUMURA ARRAYS CORRESPOND TO MILES 5 TO 80.
C       COLUMNS OF THE ARRAYS CORRESPOND TO ANTENNA HEIGHT;
C               COL1     100 FEET
C               COL2     200 FEET
C               COL3     500 FEET
C               COL4    1000 FEET

        COMMON
     &          /ARRAY3/OKUMURA_OPEN,
     &          /ARRAY4/OKUMURA_SUBURBAN,
     &          /ARRAY5/OKUMURA_URBAN




        OPEN    (
     &          UNIT=30,
     &          STATUS= 'OLD',
     &          FILE= 'OKUMURA_OPEN.DAT',
     &          ACCESS= 'SEQUENTIAL',
     &          FORM= 'FORMATTED',
     &          ERR = 20,
     &          IOSTAT= IERR
     &          )

        GO TO 21
20      STOP 'ERROR OPENING OKUMURA_OPEN.DAT'
21      WRITE (6,*) 'OKUMURA_OPEN.DAT OPENED'


        OPEN    (
     &          UNIT=31,
     &          STATUS= 'OLD',
     &          FILE= 'OKUMURA_SUBURBAN.DAT',
     &          ACCESS= 'SEQUENTIAL',
     &          FORM= 'FORMATTED',
     &          ERR = 40,
     &          IOSTAT= IERR
     &          )

        GO TO 41
40      STOP  'ERROR OPENING OKUMURA_SUBURBAN.DAT'
41      WRITE (6,*) 'OKUMURA_SUBURBAN.DAT OPENED'


        OPEN    (
     &          UNIT=32,
     &          STATUS= 'OLD',
     &          FILE= 'OKUMURA_URBAN.DAT',
     &          ACCESS= 'SEQUENTIAL',
     &          FORM= 'FORMATTED',
     &          ERR = 60,
     &          IOSTAT= IERR
```

```
     &                    )

           GO TO 61
60         STOP 'ERROR OPENING OKUMURA_URBAN.DAT'
61         WRITE (6,*) 'OKUMURA_URBAN.DAT OPENED'


100        CONTINUE

           DO 200 I= 5, 80                    !DISTANCE IS 5 TO 80 MILES

           READ ( 30, *, END= 200) ( OKUMURA_OPEN (I,J), J= 1, 4 )

200        CONTINUE

           DO 300 I = 5, 80      !DISTANCE IS 5 TO 80 MILES

           READ ( 31, *, END= 300) ( OKUMURA_SUBURBAN (I,J), J= 1, 4 )

300        CONTINUE

           DO 400 I = 5, 80      !DISTANCE IS 5 TO 80 MILES

           READ ( 32, *, END= 400) ( OKUMURA_URBAN (I,J), J= 1, 4 )

400        CONTINUE




           CLOSE ( UNIT = 30 )
           CLOSE ( UNIT = 31 )
           CLOSE ( UNIT = 32 )
           RETURN

           END
```

```
C       FILE NAME: COVERAGE.FOR
C       THIS ROUTINE WILL CONSTRUCT THE COVERAGE ARRAY USING THE
C       OKUMURA PROPAGATION CURVE ARRAYS.

        SUBROUTINE COVERAGE (RECORD_COUNT)

        CHARACTER *40
     &          NAME_LIST

        CHARACTER *20
     &          TABLE

        REAL*4
     &          OKUMURA_OPEN,
     &          OKUMURA_SUBURBAN,
     &          OKUMURA_URBAN,
     &          DBU_VALUE,
     &          ERP_WATTS,
     &          PROPAGATE_TEMP,
     &          INTERPOLATED,
     &          TEMP_1,
     &          TEMP_2,
     &          TEMP_3

        INTEGER
     &          RADIUS,
     &          JURISDICTION,
     &          LIMIT1,    !100 FOOT TOWER HEIGHT LIMIT
     &          LIMIT2,    !200 FOOT TOWER HEIGHT LIMIT
     &          LIMIT3,    !500 FOOT TOWER HEIGHT LIMIT
     &          EXTRA,
     &          CO_CHANNEL,
     &          ADJ_CHANNEL,
     &          MAXNODES,
     &          MAXLINKS,
     &          RECORD_COUNT,
     &          ANTENNA,
     &          HEIGHT_FACTOR,
     &          PROPAGATE_TYPE,
     &          HEIGHT,
     &          MIN_RADIUS,
     &          MAX_RADIUS

        INCLUDE
     &          'GRAPH_PARAMS.FOR'


        DIMENSION
     &          RADIUS (MAXNODES,4),
     &          OKUMURA_OPEN(5:80,4),
     &          OKUMURA_SUBURBAN(5:80,4),
     &          OKUMURA_URBAN(5:80,4),
     &          PROPAGATE_TEMP(5:80,4),
     &          INTERPOLATED(5:80),
     &          NAME_LIST(MAXNODES),
     &          HEIGHT(MAXNODES),
     &          PROPAGATE_TYPE (MAXNODES)


        COMMON
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY6/RADIUS,
     &          /ARRAY3/OKUMURA_OPEN,
     &          /ARRAY4/OKUMURA_SUBURBAN,
     &          /ARRAY5/OKUMURA_URBAN,
     &          /ARRAY7/PROPAGATE_TYPE,
     &          /ARRAY9/HEIGHT,
```

```
     &              /ARRAY10/PROPAGATE_TEMP,
     &              /ARRAY11/INTERPOLATED


            OPEN    (
     &              UNIT = 40,
     &              STATUS = 'NEW',
     &              FILE = 'COVERAGE.DAT',
     &              ACCESS = 'SEQUENTIAL',
     &              FORM = 'FORMATTED',
     &              ERR= 30,
     &              IOSTAT = IERR
     &              )

            GO TO 31
30          STOP 'ERROR OPENING COVERAGE.DAT'
31          WRITE (6,*) 'COVERAGE.DAT OPENED'




C           THE RADIUS ARRAY HAS THE ROWS ORGANIZED BY RANK OF THE NAME ARRAY.
C           THE COLUMNS OF THE RADIUS ARRAY ARE:
C                   COL1    JURISDICTION RADIUS
C                   COL2    COVERAGE RADIUS
C                   COL3    CO_CHANNEL RADIUS
C                   COL4    ADJ_CHANNEL RADIUS


C           THE OKUMURA ARRAYS ARE ORGANIZED BY ROWS CORRESPONDING TO MILEAGE
C           BASED ON THE ARRAY DECLARATION 5:80 ie 5 TO 80 MILES.
C           THE COLUMNS CORRESPOND TO THE ANTENNA HEIGHTS OF:
C                   COL1    100  FEET
C                   COL2    200  FEET
C                   COL3    500  FEET
C                   COL4    1000 FEET



C           THIS NEXT SECTION WILL CALCULATE THE COVERAGE RADIUS




            DO 1000 I=1,RECORD_COUNT

                    RADIUS (I,2) = RADIUS (I,1) + EXTRA

C           TEST THE MIN AND MAX  VALUES OF THE COVERAGE AREA
                    IF (RADIUS(I,2) .LT. MIN_RADIUS) THEN
                            RADIUS(I,2) = MIN_RADIUS
                    ELSE IF (RADIUS(I,2) .GE. MAX_RADIUS) THEN
                            WRITE (40,*)
     &                      '****COVERAGE RADIUS TOO LARGE***',
     &                      'DEFAULTS SET TO MAX_RADIUS PARAMETER'
                            RADIUS (I,2)= MAX_RADIUS
                            RADIUS (I,3)= MAX_RADIUS
                            RADIUS (I,4)= MAX_RADIUS
                    END IF
```

```
                TEMP_1=0.0
                HEIGHT_FACTOR=0


C       THIS NEXT ROUTINE WILL COPY THE DESIGNATED ARRAY INTO THE
C       WORKING ARRAY 'PROPAGATE_TEMP' BASED ON SELECTED INPUT FIELD.
          IF (PROPAGATE_TYPE(I) .EQ. 1)     THEN
                CONTINUE            !USE OKUMURA_OPEN ARRAY
                CALL TRANSFER (OKUMURA_OPEN)

          ELSE IF (PROPAGATE_TYPE(I) .EQ. 2 )   THEN
                CONTINUE            !USE OKUMURA_SUBURBAN ARRAY
                CALL TRANSFER (OKUMURA_SUBURBAN)

          ELSE IF (PROPAGATE_TYPE(I) .EQ. 3 )    THEN
                CONTINUE            !USE OKUMURA_URBAN ARRAY
                CALL TRANSFER (OKUMURA_URBAN)

          ELSE
                STOP 'ERROR IN OKUMURA PROPAGATION TYPE VARIABLE'

          END IF



C       THIS SECTION WILL SELECT A HEIGHT IF NONE WAS GIVEN IN THE INPUT.

        IF (HEIGHT(I) .EQ. 0)  THEN !WHEN NO HEIGHT IS GIVEN
          IF (RADIUS(I,2) .LT. LIMIT1 ) THEN
                HEIGHT_FACTOR = 1 !100 FOOT
          ELSE IF ((RADIUS(I,2).GE.LIMIT1).AND.(RADIUS(I,2).LT.LIMIT2))THEN
                HEIGHT_FACTOR = 2 !200 FOOT
          ELSE IF ((RADIUS(I,2).GE.LIMIT2).AND.(RADIUS(I,2).LT.LIMIT3))THEN
                HEIGHT_FACTOR = 3 !500 FOOT
          ELSE IF (RADIUS(I,2).GE.LIMIT3)THEN
                HEIGHT_FACTOR = 4 !1000 FOOT
          ELSE
                STOP 'ERROR IN HEIGHT POINTER'
          END IF

                DO 100 J=5,80
                      INTERPOLATED(J)=PROPAGATE_TEMP(J,HEIGHT_FACTOR)
100             CONTINUE



        ELSE IF ((HEIGHT(I).GT.0).AND.(HEIGHT(I).LT.100)) THEN
                HEIGHT_FACTOR = 1         !ASSUME 100 FOOT TOWER IF SHORTER
                                          ! AND AN ANTENNA HEIGHT WAS GIVEN.
                DO 200 J=5,80
                      INTERPOLATED(J)=PROPAGATE_TEMP(J,HEIGHT_FACTOR)
200             CONTINUE


        ELSE
                CONTINUE! INTERPOLATE POSITIONS AND INDEX TABLE VALUES

          IF ((HEIGHT(I).GE.100).AND.(HEIGHT(I).LT.200)) THEN
                CONTINUE ! COL1 AND COL2
                DO 300 J=5,80
                  INTERPOLATED(J)=
     &                  (
     &                  PROPAGATE_TEMP(J,1) +    !100 FOOT COLUMN
     &                  (
     &                  ((FLOAT(HEIGHT(I)-100))/100.0)*
     &                  (PROPAGATE_TEMP(J,2)-PROPAGATE_TEMP(J,1))
     &                  )
     &                  )
```

```
300             CONTINUE

          ELSE IF ((HEIGHT(I).GE.200).AND.(HEIGHT(I).LT.500)) THEN
                  CONTINUE ! COL2 AND COL3
                  DO 400 J=5,80
                          INTERPOLATED(J)=
     &                    (
     &                    PROPAGATE_TEMP(J,2) +    !200 FOOT COLUMN
     &                    (
     &                    ((FLOAT(HEIGHT(I)-200))/300.0)*
     &                    (PROPAGATE_TEMP(J,3)-PROPAGATE_TEMP(J,2))
     &                    )
     &                    )
400                       CONTINUE

          ELSE IF ((HEIGHT(I).GE. 500).AND.(HEIGHT(I).LE.1000)) THEN
                  CONTINUE ! COL3 AND COL4
                  DO 500 J=5,80
                          INTERPOLATED(J)=
     &                    (
     &                    PROPAGATE_TEMP(J,3) +    !500 FOOT COLUMN
     &                    (
     &                    ((FLOAT(HEIGHT(I)-500))/500.0)*
     &                    (PROPAGATE_TEMP(J,4)-PROPAGATE_TEMP(J,3))
     &                    )
     &                    )
500                       CONTINUE


          ELSE IF (HEIGHT(I).GT.1000) THEN
                  STOP 'DATA CONTAINS HEIGHT GREATER THAN 1000 FEET'

          ELSE
                  STOP 'PROGRAM FAILED TO DETERMINE HEIGHT  '

          END IF


        END IF

C       THE DATA COLUMN FROM THE SELECTED OR CALCULATED PROPAGATION
C       TABLE IS LASTLY PLACED IN THE SINGLE DIMENSION ARRAY FOR INDEXING.

                  TEMP_1=INTERPOLATED (RADIUS(I,2)) !COVERAGE AREA FIELD STRENGTH

                  TEMP_2=(                          !CO_CHANNEL FIELD STRENGTH
     &                    (INTERPOLATED(RADIUS(I,2))) -
     &                    ((FLOAT(CO_CHANNEL)*10))
     &                    )

                  TEMP_3=(                          !ADJ_CHANNEL FILED STRENGTH
     &                    (INTERPOLATED(RADIUS(I,2))) -
     &                    ((FLOAT(ADJ_CHANNEL)*10))
     &                    )



                  ERP_WATTS=
     &                    ((EXP
     &                    (
     &                    (LOG (10.0)) *
     &                    (
     &                    ((TEMP_1/10.0) - DBU_VALUE) *
     &                    (-1.0 / 10.0)
     &                    )
     &                    )
     &                    ) * 1000.0
     &                    )
```

```
                CONTINUE


                DO 600 K= MIN_RADIUS, MAX_RADIUS
                   IF    (INTERPOLATED(K) .GT.TEMP_2) THEN
                         CONTINUE
                   ELSE
                         RADIUS(I,3)=K
                         GO TO 650
                   END IF
600             CONTINUE
                         RADIUS(I,3)=MAX_RADIUS ! VALUE NOT IN CONSTRAINTS
                         WRITE(40,*)
   &            '*****CO_CHANNEL DEFAULT--MAX_RADIUS PARAMETER USED*****'
650             CONTINUE



                DO 700 K=MIN_RADIUS, MAX_RADIUS
                   IF (INTERPOLATED(K) .GT. TEMP_3) THEN
                         CONTINUE
                   ELSE
                         RADIUS(I,4)=K
                         GO TO 750
                   END IF
700             CONTINUE
                         RADIUS(I,4)=MAX_RADIUS ! VALUE NOT IN CONSTRAINTS
                         WRITE(40,*)
   &            '*****ADJ_CHANNEL DEFAULT--MAX_RADIUS PARAMETER USED*****'
750             CONTINUE




        WRITE (40,900,IOSTAT=IERR,ERR=920)
   &            I,
   &            NAME_LIST(I),
   &            'PROPAGATE TYPE= ',PROPAGATE_TYPE(I),
   &            'JURISDICTION RADIUS= ',RADIUS(I,1),
   &            'COVERAGE RADIUS= ',RADIUS(I,2),
   &            'CO_CHANNEL RADIUS= ',RADIUS(I,3),
   &            'ADJ_CHANNEL RADIUS= ',RADIUS(I,4),
   &            'HEIGHT COLUMN= ',HEIGHT_FACTOR,
   &            'ANTENNA HEIGHT= ',HEIGHT(I),
   &            'FIELD STRENGTH*10 dBu/KW= ',TEMP_1,
   &            'WATTS ERP AT ANTENNA HEIGHT =',ERP_WATTS


900     FORMAT (
   &            1X,I4,'.',
   &            1X,A40/
   &            40X,A16,I1/
   &            40X,A21,I2/
   &            40X,A17,I2/
   &            40X,A19,I2/
   &            40X,A20,I2/
   &            40X,A15,I1/
   &            40X,A16,I4/
   &            40X,A26,F7.2/
   &            40X,A29,F8.1//
   &            )


920     CONTINUE

1000    CONTINUE
```

```
CLOSE (UNIT = 40)
RETURN
END
```

```
C       FILE NAME :     TRANSFER.FOR by Ronald J Gillory



        SUBROUTINE TRANSFER (ARRAY)

        REAL*4
     &          OKUMURA_OPEN (5:80,4),
     &          OKUMURA_SUBURBAN (5:80,4),
     &          OKUMURA_URBAN (5:80,4),
     &          PROPAGATE_TEMP (5:80,4),
     &          ARRAY (5:80,4)



        COMMON
     &          /ARRAY3/OKUMURA_OPEN,
     &          /ARRAY4/OKUMURA_SUBURBAN,
     &          /ARRAY5/OKUMURA_URBAN,
     &          /ARRAY10/PROPAGATE_TEMP

        DO 200 I=5,80

                DO 100 J=1,4

                        PROPAGATE_TEMP (I,J) = ARRAY (I,J)

100             CONTINUE

200     CONTINUE


        RETURN

        END
```

```
C       FILE NAME :  CONSTRAINTS.FOR


        SUBROUTINE CONSTRAINTS (RECORD_COUNT, INDEX )

        INTEGER
     &          RADIUS,
     &          RECORD_COUNT,
     &          CO_LIST,
     &          ADJ_LIST,
     &          INDEX,
     &          CO_ORDER,
     &          ADJ_ORDER

        REAL * 8
     &          DISTANCE

        INCLUDE
     &          'GRAPH_PARAMS.FOR'

        DIMENSION
     &          DISTANCE (MAXNODES,MAXNODES),
     &          RADIUS (MAXNODES,4),
     &          CO_LIST (MAXNODES,MAXNODES),
     &          ADJ_LIST (MAXNODES,MAXNODES),
     &          CO_ORDER(MAXNODES),
     &          ADJ_ORDER(MAXNODES)


        COMMON
     &          /ARRAY2/DISTANCE,
     &          /ARRAY6/RADIUS,
     &          /ARRAY20/CO_LIST,
     &          /ARRAY21/ADJ_LIST,
     &          /ARRAY22/CO_ORDER,
     &          /ARRAY23/ADJ_ORDER



        DO 1000 J = RECORD_COUNT, 1, -1

C       CHANNEL CONSTRAINT LIST
C       THE CONTENTS OF CO_ORDER AND ADJ_ORDER ARE THE INDEX(RANK OR ARGUMENT)
C       NUMBER THAT POINTS INTO THE CHARACTER ARRAY NAME_LIST.

          IF (
     &          ((NINT(DISTANCE(INDEX,J)))-(RADIUS(J,1)))
     &                  .LE.(RADIUS(INDEX,3))
     &          .OR.
     &          ((NINT(DISTANCE(J,INDEX)))-(RADIUS(INDEX,1)))
     &                  .LE.(RADIUS(J,3))
     &          ) THEN
                CO_ORDER(INDEX) =
     &        CO_ORDER(INDEX) + 1 !WILL POINT TO THE NEXT USABLE ELEMENT
                CO_LIST(INDEX,CO_ORDER(INDEX))=J !ARGUMENT OF NAME_LIST
          END IF

          IF (
     &          ((NINT(DISTANCE(INDEX,J)))-(RADIUS(J,1)))
     &                  .LE.(RADIUS(INDEX,4))
     &          .OR.
     &          ((NINT(DISTANCE(J,INDEX)))-(RADIUS(INDEX,1)))
     &                  .LE.(RADIUS(J,4))
     &          ) THEN
                ADJ_ORDER(INDEX) =
     &          ADJ_ORDER(INDEX) + 1 !WILL POINT TO THE NEXT USABLE ELEMENT
                ADJ_LIST(INDEX,ADJ_ORDER(INDEX))=J !ARGUMENT OF NAME_LIST
```

```
            END IF

1000        CONTINUE
            RETURN
            END
```

```
C       FILE NAME :    POPULATE.FOR by Ronald J Gillory



        SUBROUTINE POPULATE (RECORD_COUNT)

        INTEGER
     &          RECORD_COUNT,
     &          EXPANDED_NAME,
     &          POPULATION,
     &          DEF_POPULATE,   !DEFAULT POPULATION FACTOR
     &          POPULATE_LIMIT, !MAXIMUM POPULATION FACTOR
     &          POPULATE_FACTOR,
     &          POPULATION_MULTIPLE,
     &          MAXNODES

        CHARACTER * 40
     &          NAME_LIST,
     &          CITY_COUNTY

        INCLUDE
     &          'GRAPH_PARAMS.FOR'


        DIMENSION
     &          POPULATE_FACTOR(MAXNODES,2),
     &          NAME_LIST(MAXNODES),
     &          EXPANDED_NAME(MAXNODES)

        COMMON
     &          /ARRAY8/POPULATE_FACTOR,
     &          /ARRAY1/NAME_LIST,
     &          /ARRAY24/EXPANDED_NAME


        OPEN    (
     &          UNIT = 50,
     &          STATUS = 'NEW',
     &          FILE = 'POPULATE.DAT',
     &          ACCESS = 'SEQUENTIAL',
     &          FORM = 'FORMATTED',
     &          ERR = 100,
     &          IOSTAT = IERR
     &          )

        GO TO 101
100     STOP 'ERROR OPENING POPULATE.DAT'
101     WRITE (6,*) 'POPULATE.DAT OPENED'

        DO 1000 I=1,RECORD_COUNT

        POPULATE_FACTOR(I,2)=   (
     &                          NINT
     &                          (
     &                          (FLOAT (POPULATE_FACTOR(I,1)))
     &                          /
     &                          (FLOAT (POPULATION_MULTIPLE))
     &                          )
     &                          )

        IF (POPULATE_FACTOR(I,2).LT.DEF_POPULATE ) THEN
                POPULATE_FACTOR(I,2)=DEF_POPULATE
        ELSE IF (POPULATE_FACTOR(I,2).GT.POPULATE_LIMIT) THEN
                POPULATE_FACTOR(I,2)=POPULATE_LIMIT
        END IF
```

```
            WRITE (50,900)
     &                  I,
     &                  NAME_LIST(I),
     &                  POPULATE_FACTOR(I,1),
     &                  POPULATE_FACTOR(I,2)
900         FORMAT (1X,I4,'.',1X,A40,I10,I10/)

1000        CONTINUE

            CLOSE (UNIT = 50)

            RETURN


            END
```

```
C       FILE NAME:  OUTPUT_MAIN_LF_V3.FOR by Ronald J Gillory

        SUBROUTINE OUTPUT_MAIN_LF
     &          (
     &          RECORD_COUNT,
     &          NUMNODES,
     &          NUMCOLORS
     &          )

        INCLUDE
     $          '($FORIOSDEF)'

        CHARACTER *40
     &          CITY_COUNTY,
     &          NAME_LIST

        INTEGER
     &          POPULATION,
     &          NAME,     !ARGUMENT REPRESENTS RANK,VALUE IS NAME_LIST INDEX
     &          EXPANDED_NAME,
     &          LINK,
     &          ALINK,
     &          NUMNODES,
     &          NUMCOLORS,
     &          COLOR,
     &          LPOINT,
     &          APOINT,
     &          TEMP,
     &          INFEAS,
     &          RANK,
     &          JURISDICTION,
     &          PROPAGATION,
     &          ANTENNA,
     &          SQUARE_MILES,
     &          LATD,LATM,LATS,
     &          LOND,LONM,LONS,
     &          RECORD_COUNT,
     &          PROPAGATE_TYPE,
     &          POPULATE_FACTOR,
     &          MAXNODES,MAXLINKS,
     &          RADIUS,
     &          HEIGHT,
     &          CO_LIST,
     &          CO_ORDER,
     &          ADJ_LIST,
     &          ADJ_ORDER,
     &          CONSTRAIN,
     &          I,J,K,L,M


        LOGICAL
     &          ADJACENT, !TRUE IF ADJACENT CHANNEL CONSTRAINTS ARE PRESENT
     &          SUCCESS,
     &          FLAG1,
     &          FLAG2,
     &          FLAG3,
     &          FLAG4

        REAL*8
     &          DISTANCE  !NODE TO NODE DISTANCES, ARGUMENTS REF NAME_LIST

        REAL*4
     &          OKUMURA_OPEN,
     &          OKUMURA_SUBURBAN,
     &          OKUMURA_URBAN,
     &          PROPAGATE_TEMP,
     &          INTERPOLATED,
```

```
&               TEMP_1

      INCLUDE
&               'GRAPH_PARAMS.FOR'

      DIMENSION
&               NAME_LIST( MAXNODES ),     !ARRAY CONTAINING THE RECORD NAMES
&               NAME(MAXNODES), !ARGUMENT IS RANK, VALUE IS NAME_LIST INDEX
&               EXPANDED_NAME(MAXNODES),
&               LINK(MAXLINKS), !CO CHANNEL LIST BY DESCENDING RANK SUBLISTS
&               ALINK(MAXLINKS),!ADJ CHANNEL LIST BY DESCENDING RANK SUBLISTS
&               COLOR(MAXLINKS), !RESULTING FREQUENCY ASSIGNMENTS
&               LPOINT(MAXNODES),!INDEXING ARRAY
&               APOINT(MAXNODES),!INDEXING ARRAY
&               TEMP(MAXLINKS),
&               INFEAS(MAXCOLORS,MAXNODES),
&               RANK(MAXNODES),
&               DISTANCE( MAXNODES,MAXNODES ), !ARRAY OF THE NODE DISTANCES
&               PROPAGATE_TYPE(MAXNODES), !ARRAY OF PROPAGATION OKUMURA TYPE
&               OKUMURA_OPEN( 5:80,4 ),    !PROPAGATION DATA ARRAY
&               OKUMURA_SUBURBAN( 5:80,4 ), !PROPAGATION DATA ARRAY
&               OKUMURA_URBAN( 5:80,4 ),   !PROPAGATION DATA ARRAY
&               PROPAGATE_TEMP(5:80,4),   !TEMP PROPAGATION ARRAY
&               INTERPOLATED(5:80),!HEIGHT INTERPOLATED PROPAGATION TABLE
&               POPULATE_FACTOR(MAXNODES,2),!ENTRY POPULATION &POPULATION FACTOR
&               RADIUS (MAXNODES,4),!ARRAY CONTAINING PROPAGATION RADIUS DATA
&               HEIGHT (MAXNODES),!ANTENNA HEIGHT ARRAY
&               CO_LIST (MAXNODES,MAXNODES),!CO CHANNEL CONSTRAINT LIST
&               CO_ORDER(MAXNODES),!NUMBER OF ELEMENTS/ROW IN CO_LIST
&               ADJ_LIST (MAXNODES,MAXNODES),!ADJ CHANNEL CONSTRAINT LIST
&               ADJ_ORDER (MAXNODES)!NUMBER OF ELEMENTS/ROW IN ADJ_LIST

      COMMON
&               /ARRAY1/NAME_LIST,
&               /ARRAY2/DISTANCE,
&               /ARRAY3/OKUMURA_OPEN,
&               /ARRAY4/OKUMURA_SUBURBAN,
&               /ARRAY5/OKUMURA_URBAN,
&               /ARRAY6/RADIUS,
&               /ARRAY7/PROPAGATE_TYPE,
&               /ARRAY8/POPULATE_FACTOR,
&               /ARRAY9/HEIGHT,
&               /ARRAY10/PROPAGATE_TEMP,
&               /ARRAY11/INTERPOLATED,
&               /ARRAY12/NAME,
&               /ARRAY13/LINK,
&               /ARRAY14/ALINK,
&               /ARRAY15/COLOR,
&               /ARRAY16/LPOINT,
&               /ARRAY17/APOINT,
&               /ARRAY18/INFEAS,
&               /ARRAY19/RANK,
&               /ARRAY20/CO_LIST,
&               /ARRAY21/ADJ_LIST,
&               /ARRAY22/CO_ORDER,
&               /ARRAY23/ADJ_ORDER,
&               /ARRAY24/EXPANDED_NAME,
&               /WORKING_AREA/TEMP


      OPEN    (
&               UNIT=70,
&               STATUS= 'NEW',
&               FILE= 'OUTPUT_LF_V3.DAT',
&               ACCESS= 'SEQUENTIAL',
&               FORM= 'FORMATTED',
&               ERR = 10,
&               IOSTAT= IERR
```

```
     &                )

              GO TO 11
10            STOP 'ERROR OPENING OUTPUT_LF_V3.DAT'
11            WRITE (6,*) 'OUTPUT_LF_V3.DAT OPENED'

              OPEN     (
     &                 UNIT=71,
     &                 STATUS= 'NEW',
     &                 FILE= 'OUTPUT_LF_ARRAY_V3.DAT',
     &                 ACCESS= 'SEQUENTIAL',
     &                 FORM= 'FORMATTED',
     &                 ERR = 14,
     &                 IOSTAT= IERR
     &                 )

              GO TO 15
14            STOP 'ERROR OPENING OUTPUT_LF_ARRAY_V3.DAT'
15            WRITE (6,*)'OUTPUT_LF_ARRAY_V3.DAT OPENED'

              DO I=1,NUMNODES

              WRITE(71,16)
     &                 I,
     &                 NAME_LIST(EXPANDED_NAME(NAME(I))),
     &                 COLOR(NAME(I))

16            FORMAT(1X,I4,4X,A40,4X,I4)

              END DO


              WRITE (71,*) 'COLOR ARRAY'

              DO 20     I = 1,NUMNODES
              WRITE (71,21) I,COLOR(I)
21            FORMAT (1X,I4,4X,I4)
20            CONTINUE


              WRITE (71,*) 'EXPANDED_NAME ARRAY'

              DO 25     I = 1,NUMNODES
              WRITE (71,21) I,EXPANDED_NAME(I)
25            CONTINUE

              WRITE (71,*) 'NAME ARRAY'

              DO 30     I = 1,NUMNODES
              WRITE (71,21) I,NAME(I)
30            CONTINUE


              WRITE (71,*) 'NAME_LIST ARRAY'

              DO 40 I = 1, RECORD_COUNT
              WRITE (71,31) I,NAME_LIST(I)
31            FORMAT (1X,I4,4X,A40)
40            CONTINUE



              WRITE (70,50)'NUMNODES=',NUMNODES
50            FORMAT(1X,A9,I4//)

              WRITE (70,53)'NUMBER OF FREQUENCIES=',NUMCOLORS
53            FORMAT(1X,A22,I4///)
```

```
      DO 1000 I = 1,RECORD_COUNT

        WRITE(70,100) I,NAME_LIST(I)
100     FORMAT (1X,I4,'.',1X,A40)

          DO 800 J = 1, NUMNODES

              IF (EXPANDED_NAME(J).EQ.I) THEN
                  DO 600 K = 1,NUMNODES

                    IF (NAME(K).EQ.J) THEN

                        WRITE (70,200) COLOR(NAME(K))
200                     FORMAT (1X,4X,I4)

                    END IF

600                 CONTINUE

              END IF

800       CONTINUE


1000    CONTINUE


C       THIS NEXT SECTION WILL PRODUCE AN OUTPUT FILE THAT CAN BE IMPORTED TO
C       PARADOX FOR REPORT GENERATION

        OPEN    (
     &          UNIT=72,
     &          STATUS= 'NEW',
     &          FILE= 'COLORS.TXT',
     &          ACCESS= 'SEQUENTIAL',
     &          FORM= 'FORMATTED',
     &          ERR = 1400,
     &          IOSTAT= IERR
     &          )

        GO TO 1500
1400    STOP 'ERROR OPENING OUTPUT_LF_ARRAY_V3.DAT'
1500    WRITE (6,*)'COLORS.TXT  OPENED'



        DO 5000 I = 1,RECORD_COUNT


          DO 4000 J = 1, NUMNODES

              IF (EXPANDED_NAME(J).EQ.I) THEN
                  DO 3000 K = 1,NUMNODES

                    IF (NAME(K).EQ.J) THEN

                        WRITE (72,2500)NAME_LIST(I),COLOR(NAME(K))
2500                    FORMAT(1X,A40,',',I4)



                    END IF

3000                CONTINUE
```

```
                    END IF
4000            CONTINUE

5000        CONTINUE


            CLOSE (UNIT = 70)
            CLOSE (UNIT = 71)
            CLOSE (UNIT = 72)
            STOP
            END
```

```
C           PROGRAM NAME:    GRAPH_PARAMS.FOR by Ronald J Gillory

      PARAMETER (
     &                  MAXNODES = 500,
     &                  MAXCOLORS=MAXNODES,
     &                  NUMBER_OF_CHANNELS = 240, !THIS IS THE COLOR LIMIT VARIABLE
     &                  MAX_BACKTRACKS = 100000,
     &                  MAXLINKS = MAXNODES * MAXNODES,
     &                  EARTH_RADIUS = 3963.34,   !MILES
     &                  PI = 3.14159265358979323846,
     &                  PACK_PARM = .FALSE., ! TRUE FOR END PACKING OF CHANNELS
     &                  COMBINER_INCREMENT = 10, ! TX COMBINER COLOR SEPARATION
     &                  HIGH_END_PARM = .FALSE., ! TRUE TO START ON THE HIGH END
     &                  IO =  6,
     &                  IN =  5,
     &                  IPSW = 1,
     &                  DBU_VALUE = 40,              !dBu CONTOUR FOR COVERAGE RADIUS
     &                  CO_CHANNEL = 35,             !dBu MARGIN
     &                  ADJ_CHANNEL = 15,            !dBu MARGIN
     &                  EXTRA = 3, ! MILES ADDED TO COVERAGE RADIUS FOR JURISDICTION
     &                  LIMIT1= 8, ! 200 FOOT TOWER HEIGHT MILEAGE,LESS THAN IS 100 FOOT
     &                  LIMIT2= 17,! 500 FOOT TOWER HEIGHT MILEAGE,LESS THAN IS 200 FOOT
     &                  LIMIT3= 27,! 1000 FOOT TOWER HEIGHT MILEAGE "  "  "  500 FOOT
     &                  MIN_RADIUS = 5, !MINIMUM COVERAGE RADIUS    5 OR LARGER
     &                  MAX_RADIUS = 80, !END OF THE LOOK UP TABLE IS 80
     &                  ABSOLUTE_MILEAGE = 70,  !EXEMPT FROM CONSTRAINT RULES
     &                  DEF_POPULATE= 3,             !DEFAULT POPULATION FACTOR OF MULTIPLE
     &                  POPULATE_LIMIT=50,           !POPULATION FACTOR LIMIT-MAX FREQ COUNT
     &                  POPULATION_MULTIPLE=25000 !ONE FREQUENCY PER THIS VALUE
     &                  )
```

OKUMURA_OPEN.DAT

695	754	833	892
667	728	808	869
643	706	788	850
623	686	770	834
605	669	755	819
589	654	741	806
574	640	728	794
561	628	716	783
547	614	703	770
532	599	687	754
518	584	672	739
505	571	658	724
492	558	645	710
480	545	632	697
468	533	619	684
457	521	606	671
446	510	594	658
435	499	583	646
425	488	571	634
415	477	560	622
405	467	549	611
396	457	538	600
387	447	528	588
378	438	517	577
369	428	507	567
360	419	497	556
352	410	487	545
343	401	477	535
335	392	468	525
327	384	458	515
319	375	449	505
312	367	439	495
304	358	430	485
296	350	421	475
289	342	412	465
282	334	403	456
277	329	397	449
273	324	391	442
269	319	385	436
265	314	380	429
260	309	374	423
256	305	368	416
253	300	363	410
249	295	357	404
245	291	352	398
241	286	346	391
237	282	341	385
234	278	335	379
230	273	330	373
227	269	325	367
223	265	320	361
220	261	315	355
217	257	309	350
213	252	304	344
210	248	299	338
207	244	294	332
204	241	289	326
200	237	285	321
197	233	280	315
194	229	275	310
191	225	270	304
188	221	265	298
185	218	260	293
182	214	256	287
179	210	251	282
177	207	246	276

174	203	242	271
171	200	237	266
168	196	233	260
166	192	228	255
162	189	223	250
160	185	219	244
158	182	214	239
155	179	210	234
152	175	206	229
150	172	201	223

OKUMURA_SUBURBAN.DAT

511	570	649	708
483	544	625	686
460	522	604	667
439	503	587	650
421	486	571	635
405	470	557	622
390	457	544	610
377	444	533	600
363	430	519	586
348	415	503	570
334	401	489	555
321	387	475	541
308	374	461	527
296	361	448	513
284	349	435	500
273	337	423	487
262	326	411	475
252	315	399	462
241	304	387	450
231	294	376	439
222	284	365	427
212	273	355	416
203	264	344	405
194	254	334	394
185	245	323	383
177	235	313	372
168	226	303	362
160	217	294	351
152	209	284	341
144	200	275	331
136	191	265	321
128	183	256	311
120	175	247	301
113	166	238	291
105	158	229	282
098	150	220	272
094	145	214	265
089	140	208	259
085	135	202	252
081	130	196	245
077	126	190	239
073	121	185	233
069	116	179	226
065	112	173	220
061	107	168	214
057	103	162	208
054	098	157	202
050	094	152	195
047	090	146	189
043	085	141	183
040	081	136	178
036	077	131	172
033	073	126	166
030	069	121	160
026	065	116	154
023	061	111	148
020	057	106	143
017	053	101	137
014	049	096	131
011	045	091	126
008	041	086	120
005	038	082	115
002	034	077	109
-01	030	072	104
-04	027	067	098
-07	023	063	093

-10	019	058	087
-13	016	053	082
-15	012	049	077
-18	009	044	071
-21	005	040	066
-24	002	035	061
-26	-02	031	055
-29	-05	026	050
-31	-08	022	045
-34	-12	017	040

OKUMURA_URBAN.DAT

413	473	551	611
385	446	527	588
362	424	507	569
341	405	489	552
323	388	473	538
307	373	459	525
293	359	447	513
280	346	435	502
265	332	421	485
251	317	406	473
237	303	391	458
223	289	377	443
211	276	363	429
198	264	350	416
187	252	337	402
175	240	325	390
164	228	313	377
154	217	301	365
144	207	290	353
134	196	279	341
124	186	268	330
115	176	257	318
105	166	246	307
096	156	236	296
087	147	226	285
079	138	216	275
070	129	206	264
062	120	196	254
054	111	186	243
046	102	177	233
038	094	167	223
030	085	158	213
023	077	149	203
015	069	140	194
008	061	131	184
000	053	122	174
-03	048	116	168
-07	043	110	161
-12	038	104	154
-16	033	098	148
-20	028	093	141
-24	023	087	135
-28	019	081	129
-32	014	076	122
-35	009	070	116
-39	005	065	110
-43	001	059	104
-47	-03	054	098
-50	-07	049	092
-54	-11	044	086
-57	-16	038	080
-60	-20	033	074
-64	-24	028	068
-67	-28	023	062
-70	-32	018	057
-74	-36	013	051
-77	-40	008	045
-80	-44	003	039
-83	-48	-01	034
-86	-51	-06	028
-89	-55	-10	023
-92	-59	-15	017
-95	-63	-20	012
-98	-66	-25	006
-101	-70	-29	001
-104	-74	-34	-04

-107	-77	-39	-09
-109	-81	-43	-15
-112	-84	-48	-20
-115	-88	-52	-25
-118	-91	-57	-31
-120	-95	-61	-36
-123	-98	-66	-41
-125	-102	-70	-47
-128	-105	-75	-52
-131	-108	-79	-57

```
!           PROGRAM NAME: MAIN_LF_V3.COM by Ronald J Gillory
$ SET VERIFY
$ FOR /LIS /CONTINUATIONS=25/CROSS_REFERENCE/EXTEND_SOURCE-
/DEBUG=ALL/NOOPTIMIZE -
            REGION_MAIN_LF_V3.FOR,-
            DISTANCE_CAL.FOR,-
            PREPROCESSOR_V2.FOR,-
            GLOBAL_BLOCKING_V2.FOR,-
            BLOCK.FOR,-
            LARGEST_FIRST_V3.FOR,-
            REORDER_V1.FOR,-
            GET_POINTERS_V1.FOR,-
            HEAP_SORT_V1.FOR,-
            XMIT.FOR,-
            WRITE_DISTANCE.FOR,-
            OKUMURA.FOR,-
            COVERAGE.FOR,-
            TRANSFER.FOR,-
            CONSTRAINTS.FOR,-
            POPULATE.FOR,-
            OUTPUT_MAIN_LF_V3.FOR
$ LINK /FULL/MAP/CROSS_REFERENCE/DEBUG/TRACEBACK -
            REGION_MAIN_LF_V3.OBJ,-
            DISTANCE_CAL.OBJ,-
            PREPROCESSOR_V2.OBJ,-
            GLOBAL_BLOCKING_V2.OBJ,-
            BLOCK.OBJ,-
            LARGEST_FIRST_V3.OBJ,-
            REORDER_V1.OBJ,-
            GET_POINTERS_V1.OBJ,-
            HEAP_SORT_V1.OBJ,-
            XMIT.OBJ,-
            WRITE_DISTANCE.OBJ,-
            OKUMURA.OBJ,-
            COVERAGE.OBJ,-
            TRANSFER.OBJ,-
            CONSTRAINTS.OBJ,-
            POPULATE.OBJ,-
            OUTPUT_MAIN_LF_V3.OBJ
$ DELETE *.OBJ;*
$ PURGE
$ RUN REGION_MAIN_LF_V3.EXE
```

APPENDIX 12

This following data is contained in the input file REGION_51.DAT .

```
ANGELINA COUNTY          14 2 0000   68900    807 312100 944400
AUSTIN COUNTY            14 2 0000   20800    656 295700 961500
BRAZORIA COUNTY          18 2 0000  188200   1407 291000 952600
CHAMBERS COUNTY          14 2 0000   19400    616 294600 944100
COLORADO COUNTY          14 2 0000   20100    964 294200 963300
FORT BEND COUNTY         18 2 0000  188200    876 293500 954600
GALVESTON COUNTY         18 2 0000  213400    399 291800 944800
HARDIN COUNTY         14 2 0000   43400    898 302300 941900
HARRIS COUNTY            22 2 0000 2782414   1734 294600 952200
HOUSTON COUNTY           14 2 0000   23901   1234 311900 952800
JASPER COUNTY         14 2 0000   32400    921 305500 940000
JEFFERSON COUNTY         18 2 0000  254700    937 300500 940700
LIBERTY COUNTY        14 2 0000   54500   1174 300400 944700
MATAGORDA COUNTY         14 2 0000   42000    900 285900 955800
MONTGOMERY COUNTY     18 2 0000  250000   1047 301900 952700
NACOGDOCHES COUNTY       14 2 0000   54056    939 313600 944000
NEWTON COUNTY            14 2 0000   13400    935 305100 934500
ORANGE COUNTY            18 2 0000  125000    362 300600 934400
POLK COUNTY           14 2 0000   30000   1061 304300 945600
SABINE COUNTY         14 2 0000    9800    486 312100 935100
SAN AUGUSTINE COUNTY     14 2 0000    9069    524 313200 940700
SAN JACINTO COUNTY    14 2 0000   14982    572 303600 950800
SHELBY COUNTY            14 2 0000   24054    791 314800 941100
TRINITY COUNTY        14 2 0000   12290    692 310400 950800
TYLER COUNTY          14 2 0000   18600    922 304700 942500
WALKER COUNTY            14 2 0000   53542    786 304400 953300
WHARTON COUNTY           14 2 0000   41500   1086 291900 960600
WALLER COUNTY            14 2 0000   23500    514 300600 960500
```

Field Def: County,Coverage Radius,Propagation Type,Population,AreaSqMi,Lat,Long

File BLOCK.DAT

This input data file contains the information for frequency blocking by location and radius of coverage thereby creating areas of protection for co-channel and adjacent system operation. Frequencies are expressed by color sequence number and not frequency or channel.
Refer to Appendix 10 for Sequence-Frequency-Channel correlation.

Field Def: Lat,Long,Co-Radius,Adj-Radius,Juris-Radius,Location Name
315823,940115,070,040,000,PANOLA-1
114 <---Color Sequence Number
154
0 <----Terminator
315823,941722,070,040,000,PANOLA-1A
114
154
0
315823,943018,070,040,000,PANOLA-2
114
154
0
315823,943018,070,040,000,RUSK-2
12
52
0
315032,942825,070,040,000,RUSK-3
12
52
0
315032,944413,070,040,000,RUSK-3A
12
52
0
315032,945903,070,040,000,RUSK-4
12
52
0
315032,945903,070,040,000,CHEROKEE-4
24
64
0

313121,955206,070,040,000,CHEROKEE-5
24
64
0
312540,950000,070,040,000,CHEROKEE-6
24
64
0
313524,951621,070,040,000,CHEROKEE-7
24
64
0
313524,951621,070,040,000,ANDERSON-7
9
49
0
313347,952738,070,040,000,ANDERSON-7A
9
49
0
312943,954412,070,040,000,ANDERSON-8
9
49
0
315823,940115,070,040,000,DESOTA-1
16
64
232
192
0
314717,935031,070,040,000,DESOTA-9
16
64
232
192
0
314717,935031,070,040,000,SABINE-9
225
92
185
56
0

313508,935031,070,040,000,SABINE-10
225
92
185
56
0
312216,933754,070,040,000,SABINE-10A
225
92
185
56
0
311048,933134,070,040,000,SABINE-11
225
92
185
56
0
311048,933134,070,040,000,VERNON-11
222
15
181
59
139
17
0
305121,933309,070,040,000,VERNON-12
222
15
181
59
139
17
0
304154,933730,070,040,000,VERNON-12A
222
15
181
59
139
17
0

302612,933928,070,040,000,VERNON-13
222
15
181
59
139
17
0
302612,933309,070,040,000,CALCASIEU-13
14
56
98
140
182
16
58
100
142
0
301435,934304,070,040,000,CALCASIEU-17
14
56
98
140
182
16
58
100
142
0
300330,934150,070,040,000,CALCASIEU-14
14
56
98
140
182
16
58
100
142
0

300330,934150,070,040,000,CAMERON-14
233
18
0
295258,935046,070,040,000,CAMERON-15
233
18
0
294153,935046,070,040,000,CAMERON-16
233
18
0
301700,922430,070,040,016,acadia
239
88
199
46
157
90
0
322100,930400,070,040,018,bienville
234
9
194
0
320400,934330,070,040,020,desota
232
16
192
64
0
320630,932200,070,040,014,red river
230
19
0
304630,925230,070,040,009,allen
9
234
51
0
304730,924230,070,040,009,allen
9
234
51
0

303400,925200,070,040,009,allen
9
234
51
0
303430,924400,070,040,009,allen
9
234
51
0
303100,930100,070,040,009,allen
9
234
51
0
325300,933800,070,040,011,bossier
24
72
116
168
208
32
76
0
323730,933630,070,040,011,bossier
24
72
116
168
208
32
76
0
323300,932930,070,040,011,bossier
24
72
116
168
208
32
76
0
325300,935530,070,040,010,caddo
36
228

88
188
132
226
48
186
92
144
0
323900,935400,070,040,010,caddo
36
228
88
188
132
226
48
186
92
144
0
322400,934900,070,040,010,caddo
36
228
88
188
132
226
48
186
92
144
0
321930,933530,070,040,010,caddo
36
228
88
188
132
226
48
186
92
144
0

321930,935700,070,040,010,caddo
36
228
88
188
132
226
48
186
92
144
0
301330,913300,070,040,016,calcasieu
14
56
98
140
182
16
58
100
142
0
301330,931200,070,040,016,calcasieu
14
56
98
140
182
16
58
100
142
0
295100,914030,070,040,014,cameron
233
18
0
295300,932630,070,040,014,cameron
233
18
0
295230,931030,070,040,014,cameron
233
18

200

0
295400,924930,070,040,014,cameron
233
18
0
294200,924900,070,040,014,cameron
233
18
0
303330,933230,070,040,013,beauregard
232
11
192
53
0
304300,933230,070,040,013,beauregard
232
11
192
53
0
304400,932430,070,040,013,beauregard
232
11
192
53
0
303430,931530,070,040,013,beauregard
232
11
192
53
0
304800,922400,070,040,014,evangeline
231
12
191
54
0
303800,922400,070,040,014,evangeline
231
12
191
54
0

313730,924600,070,040,010,grant
10
237
52
0
314030,922830,070,040,010,grant
10
237
52
0
313200,924000,070,040,010,grant
10
237
52
0
313100,923500,070,040,010,grant
10
237
52
0
301830,925000,070,040,015,jefferson davis
229
20
189
62
0
301500,925000,070,040,015,jefferson davis
229
20
189
62
0
315700,930230,070,040,015,natchitoches
227
21
187
66
0
314630,931400,070,040,015,natchitoches
227
21
187
66
0
313200,930030,070,040,015,natchitoches

227
21
187
66
0
311900,924500,070,040,013,rapides
24
68
110
152
196
26
70
112
0
311700,921900,070,040,013,rapedes
24
68
110
152
196
26
70
112
0
310300,923800,070,040,013,rapedes
24
68
110
152
196
26
70
112
0
310830,922430,070,040,013,rapedes
24
68
110
152
196
26
70
112
0

314000,933830,070,040,016,sabine
225
92
185
56
0
312900,933000,070,040,016,sabine
225
92
185
56
0
295530,922400,070,040,016,vermilion
219
34
178
67
132
27
0
295600,921230,070,040,016,vermilion
219
34
178
67
132
27
0
294300,922430,070,040,016,vermilion
219
34
178
67
132
27
0
294530,921200,070,040,016,vermilion
219
34
178
67
132
27
0
311030,932030,070,040,014,vernon

204

222
15
181
59
139
17
0
311030,930500,070,040,014,vernon
222
15
181
59
139
17
0
310030,932130,070,040,014,vernon
222
15
181
59
139
17
0
310030,925930,070,040,014,vernon
222
15
181
59
139
17
0
325330,932030,070,040,010,webster
12
224
55
184
97
0
324330,932000,070,040,010,webster
12
224
55
184
97
0

323100,931930,070,040,010,webster
12
224
55
184
97
0
315430,920100,070,040,016,winn
29
219
73
0
315830,923130,070,040,016,winn
29
219
73
0

APPENDIX 13

CHANNEL ASSIGNMENT BY COUNTY

	Channel	Frequency	Color Sequence
ANGELINA COUNTY			
	787	868.4500 MHz	197
	797	868.5750 MHz	207
	807	868.7000 MHz	217
AUSTIN COUNTY			
	654	866.7125 MHz	58
	664	866.8375 MHz	68
	692	867.2125 MHz	98
BRAZORIA COUNTY			
	653	866.7000 MHz	57
	663	866.8250 MHz	67
	691	867.2000 MHz	97
	701	867.3250 MHz	107
	729	867.7000 MHz	137
	739	867.8250 MHz	147
	767	868.2000 MHz	177
	777	868.3250 MHz	187
CHAMBERS COUNTY			
	664	866.8375 MHz	68
	702	867.3375 MHz	108
	730	867.7125 MHz	138
COLORADO COUNTY			
	685	867.1250 MHz	91
	695	867.2500 MHz	101
	705	867.3750 MHz	111
FORT BEND COUNTY			
	614	866.1875 MHz	16
	624	866.3125 MHz	26

764	868.1625 MHz	174
774	868.2875 MHz	184
784	868.4125 MHz	194
794	868.5375 MHz	204
804	868.6625 MHz	214
814	868.7875 MHz	224

GALVESTON COUNTY

615	866.2000 MHz	17
626	866.3375 MHz	28
765	868.1750 MHz	175
775	868.3000 MHz	185
785	868.4250 MHz	195
788	868.4625 MHz	198
795	868.5500 MHz	205
805	868.6750 MHz	215
815	868.8000 MHz	225

HARDIN COUNTY

743	867.8750 MHz	151
761	868.1250 MHz	171
774	868.2875 MHz	184

HARRIS COUNTY

608	866.1125 MHz	10
610	866.1375 MHz	12
612	866.1625 MHz	14
618	866.2375 MHz	20
620	866.2625 MHz	22
622	866.2875 MHz	24
628	866.3625 MHz	30
630	866.3875 MHz	32
632	866.4125 MHz	34
646	866.6125 MHz	50
648	866.6375 MHz	52
650	866.6625 MHz	54
656	866.7375 MHz	60
658	866.7625 MHz	62
660	866.7875 MHz	64
666	866.8625 MHz	70
668	866.8875 MHz	72
670	866.9125 MHz	74
684	867.1125 MHz	90
686	867.1375 MHz	92
688	867.1625 MHz	94

694	867.2375 MHz	100
696	867.2625 MHz	102
698	867.2875 MHz	104
704	867.3625 MHz	110
706	867.3875 MHz	112
708	867.4125 MHz	114
722	867.6125 MHz	130
724	867.6375 MHz	132
726	867.6625 MHz	134
732	867.7375 MHz	140
734	867.7625 MHz	142
736	867.7875 MHz	144
742	867.8625 MHz	150
744	867.8875 MHz	152
746	867.9125 MHz	154
760	868.1125 MHz	170
762	868.1375 MHz	172
770	868.2375 MHz	180
772	868.2625 MHz	182
780	868.3625 MHz	190
782	868.3875 MHz	192
790	868.4875 MHz	200
792	868.5125 MHz	202
800	868.6125 MHz	210
802	868.6375 MHz	212
810	868.7375 MHz	220
812	868.7625 MHz	222
820	868.8625 MHz	230
822	868.8875 MHz	232

HOUSTON COUNTY

684	867.1125 MHz	90
694	867.2375 MHz	100
704	867.3625 MHz	110

JASPER COUNTY

764	868.1625 MHz	174
778	868.3375 MHz	188
789	868.4750 MHz	199

JEFFERSON COUNTY

629	866.3750 MHz	31
657	866.7500 MHz	61
667	866.8750 MHz	71
685	867.1250 MHz	91

697	867.2750 MHz	103
707	867.4000 MHz	113
725	867.6500 MHz	133
737	867.8000 MHz	145
763	868.1500 MHz	173
777	868.3250 MHz	187

LIBERTY COUNTY

625	866.3250 MHz	27
806	868.6875 MHz	216
816	868.8125 MHz	226

MATAGORDA COUNTY

609	866.1250 MHz	11
619	866.2500 MHz	21
817	868.8250 MHz	227

MONTGOMERY COUNTY

652	866.6875 MHz	56
662	866.8125 MHz	66
690	867.1875 MHz	96
700	867.3125 MHz	106
728	867.6875 MHz	136
738	867.8125 MHz	146
766	868.1875 MHz	176
776	868.3125 MHz	186
786	868.4375 MHz	196
796	868.5625 MHz	206

NACOGDOCHES COUNTY

726	867.6625 MHz	134
737	867.8000 MHz	145
761	868.1250 MHz	171

NEWTON COUNTY

621	866.2750 MHz	23
665	866.8500 MHz	69
805	868.6750 MHz	215

ORANGE COUNTY

620	866.2625 MHz	22
660	866.7875 MHz	64
670	866.9125 MHz	74
799	868.6000 MHz	209
810	868.7375 MHz	220

POLK COUNTY

703	867.3500 MHz	109
723	867.6250 MHz	131
733	867.7500 MHz	141

SABINE COUNTY

722	867.6125 MHz	130
733	867.7500 MHz	141
760	868.1125 MHz	170

SAN AUGUSTINE COUNTY

684	867.1125 MHz	90
695	867.2500 MHz	101
705	867.3750 MHz	111

SAN JACINTO COUNTY

788	868.4625 MHz	198
798	868.5875 MHz	208
808	868.7125 MHz	218

SHELBY COUNTY

773	868.2750 MHz	183
785	868.4250 MHz	195
795	868.5500 MHz	205

TRINITY COUNTY

725	867.6500 MHz	133
735	867.7750 MHz	143
745	867.9000 MHz	153

TYLER COUNTY

631	866.4000 MHz	33
651	866.6750 MHz	55
661	866.8000 MHz	65

WALKER COUNTY

609	866.1250 MHz	11
619	866.2500 MHz	21
818	868.8375 MHz	228

WALLER COUNTY

616	866.2125 MHz	18
626	866.3375 MHz	28
817	868.8250 MHz	227

WHARTON COUNTY

787	868.4500 MHz	197
797	868.5750 MHz	207
807	868.7000 MHz	217

APPENDIX 14

COUNTY ASSIGNMENT BY CHANNEL

CHANNEL 608 FREQUENCY 866.1125 MHz
HARRIS COUNTY

CHANNEL 609 FREQUENCY 866.1250 MHz
MATAGORDA COUNTY
WALKER COUNTY

CHANNEL 610 FREQUENCY 866.1375 MHz
HARRIS COUNTY

CHANNEL 612 FREQUENCY 866.1625 MHz
HARRIS COUNTY

CHANNEL 614 FREQUENCY 866.1875 MHz
FORT BEND COUNTY

CHANNEL 615 FREQUENCY 866.2000 MHz
GALVESTON COUNTY

CHANNEL 616 FREQUENCY 866.2125 MHz
WALLER COUNTY

CHANNEL 618 FREQUENCY 866.2375 MHz
HARRIS COUNTY

CHANNEL 619 FREQUENCY 866.2500 MHz
MATAGORDA COUNTY
WALKER COUNTY

CHANNEL 620 FREQUENCY 866.2625 MHz
HARRIS COUNTY
ORANGE COUNTY

CHANNEL 621 FREQUENCY 866.2750 MHz
NEWTON COUNTY

CHANNEL 622 FREQUENCY 866.2875 MHz

HARRIS COUNTY

CHANNEL 624 FREQUENCY 866.3125 MHz
FORT BEND COUNTY

CHANNEL 625 FREQUENCY 866.3250 MHz
LIBERTY COUNTY

CHANNEL 626 FREQUENCY 866.3375 MHz
GALVESTON COUNTY
WALLER COUNTY

CHANNEL 628 FREQUENCY 866.3625 MHz
HARRIS COUNTY

CHANNEL 629 FREQUENCY 866.3750 MHz
JEFFERSON COUNTY

CHANNEL 630 FREQUENCY 866.3875 MHz
HARRIS COUNTY

CHANNEL 631 FREQUENCY 866.4000 MHz
TYLER COUNTY

CHANNEL 632 FREQUENCY 866.4125 MHz
HARRIS COUNTY

CHANNEL 646 FREQUENCY 866.6125 MHz
HARRIS COUNTY

CHANNEL 648 FREQUENCY 866.6375 MHz
HARRIS COUNTY

CHANNEL 650 FREQUENCY 866.6625 MHz
HARRIS COUNTY

CHANNEL 651 FREQUENCY 866.6750 MHz
TYLER COUNTY

CHANNEL 652 FREQUENCY 866.6875 MHz
MONTGOMERY COUNTY

CHANNEL 653 FREQUENCY 866.7000 MHz
BRAZORIA COUNTY

CHANNEL 654 FREQUENCY 866.7125 MHz
AUSTIN COUNTY

CHANNEL 656 FREQUENCY 866.7375 MHz
HARRIS COUNTY

CHANNEL 657 FREQUENCY 866.7500 MHz
JEFFERSON COUNTY

CHANNEL 658 FREQUENCY 866.7625 MHz
HARRIS COUNTY

CHANNEL 660 FREQUENCY 866.7875 MHz
HARRIS COUNTY
ORANGE COUNTY

CHANNEL 661 FREQUENCY 866.8000 MHz
TYLER COUNTY

CHANNEL 662 FREQUENCY 866.8125 MHz
MONTGOMERY COUNTY

CHANNEL 663 FREQUENCY 866.8250 MHz
BRAZORIA COUNTY

CHANNEL 664 FREQUENCY 866.8375 MHz
AUSTIN COUNTY
CHAMBERS COUNTY

CHANNEL 665 FREQUENCY 866.8500 MHz
NEWTON COUNTY

CHANNEL 666 FREQUENCY 866.8625 MHz
HARRIS COUNTY

CHANNEL 667 FREQUENCY 866.8750 MHz
JEFFERSON COUNTY

CHANNEL 668 FREQUENCY 866.8875 MHz
HARRIS COUNTY

CHANNEL 670 FREQUENCY 866.9125 MHz
HARRIS COUNTY
ORANGE COUNTY

CHANNEL 684 FREQUENCY 867.1125 MHz
HARRIS COUNTY
HOUSTON COUNTY
SAN AUGUSTINE COUNTY

CHANNEL 685 FREQUENCY 867.1250 MHz
COLORADO COUNTY
JEFFERSON COUNTY

CHANNEL 686 FREQUENCY 867.1375 MHz
HARRIS COUNTY

CHANNEL 688 FREQUENCY 867.1625 MHz
HARRIS COUNTY

CHANNEL 690 FREQUENCY 867.1875 MHz
MONTGOMERY COUNTY

CHANNEL 691 FREQUENCY 867.2000 MHz
BRAZORIA COUNTY

CHANNEL 692 FREQUENCY 867.2125 MHz
AUSTIN COUNTY

CHANNEL 694 FREQUENCY 867.2375 MHz
HARRIS COUNTY
HOUSTON COUNTY

CHANNEL 695 FREQUENCY 867.2500 MHz
COLORADO COUNTY
SAN AUGUSTINE COUNTY

CHANNEL 696 FREQUENCY 867.2625 MHz
HARRIS COUNTY

CHANNEL 697 FREQUENCY 867.2750 MHz
JEFFERSON COUNTY

CHANNEL 698 FREQUENCY 867.2875 MHz
HARRIS COUNTY
CHANNEL 700 FREQUENCY 867.3125 MHz
MONTGOMERY COUNTY

CHANNEL 701 FREQUENCY 867.3250 MHz

BRAZORIA COUNTY

CHANNEL 702 FREQUENCY 867.3375 MHz
CHAMBERS COUNTY

CHANNEL 703 FREQUENCY 867.3500 MHz
POLK COUNTY

CHANNEL 704 FREQUENCY 867.3625 MHz
HARRIS COUNTY
HOUSTON COUNTY

CHANNEL 705 FREQUENCY 867.3750 MHz
COLORADO COUNTY
SAN AUGUSTINE COUNTY

CHANNEL 706 FREQUENCY 867.3875 MHz
HARRIS COUNTY

CHANNEL 707 FREQUENCY 867.4000 MHz
JEFFERSON COUNTY

CHANNEL 708 FREQUENCY 867.4125 MHz
HARRIS COUNTY

CHANNEL 722 FREQUENCY 867.6125 MHz
HARRIS COUNTY
SABINE COUNTY

CHANNEL 723 FREQUENCY 867.6250 MHz
POLK COUNTY

CHANNEL 724 FREQUENCY 867.6375 MHz
HARRIS COUNTY

CHANNEL 725 FREQUENCY 867.6500 MHz
JEFFERSON COUNTY
TRINITY COUNTY

CHANNEL 726 FREQUENCY 867.6625 MHz
HARRIS COUNTY

CHANNEL 726 FREQUENCY 867.6625 MHz
NACOGDOCHES COUNTY

CHANNEL 728 FREQUENCY 867.6875 MHz
MONTGOMERY COUNTY

CHANNEL 729 FREQUENCY 867.7000 MHz
BRAZORIA COUNTY

CHANNEL 730 FREQUENCY 867.7125 MHz
CHAMBERS COUNTY

CHANNEL 732 FREQUENCY 867.7375 MHz
HARRIS COUNTY

CHANNEL 733 FREQUENCY 867.7500 MHz
POLK COUNTY
SABINE COUNTY

CHANNEL 734 FREQUENCY 867.7625 MHz
HARRIS COUNTY

CHANNEL 735 FREQUENCY 867.7750 MHz
TRINITY COUNTY

CHANNEL 736 FREQUENCY 867.7875 MHz
HARRIS COUNTY

CHANNEL 737 FREQUENCY 867.8000 MHz
JEFFERSON COUNTY
NACOGDOCHES COUNTY

CHANNEL 738 FREQUENCY 867.8125 MHz
MONTGOMERY COUNTY

CHANNEL 739 FREQUENCY 867.8250 MHz
BRAZORIA COUNTY

CHANNEL 742 FREQUENCY 867.8625 MHz
HARRIS COUNTY

CHANNEL 743 FREQUENCY 867.8750 MHz
HARDIN COUNTY

CHANNEL 744 FREQUENCY 867.8875 MHz
HARRIS COUNTY

CHANNEL 745 FREQUENCY 867.9000 MHz
TRINITY COUNTY

CHANNEL 746 FREQUENCY 867.9125 MHz
HARRIS COUNTY

CHANNEL 760 FREQUENCY 868.1125 MHz
HARRIS COUNTY
SABINE COUNTY

CHANNEL 761 FREQUENCY 868.1250 MHz
HARDIN COUNTY
NACOGDOCHES COUNTY

CHANNEL 762 FREQUENCY 868.1375 MHz
HARRIS COUNTY

CHANNEL 763 FREQUENCY 868.1500 MHz
JEFFERSON COUNTY

CHANNEL 764 FREQUENCY 868.1625 MHz
FORT BEND COUNTY
JASPER COUNTY

CHANNEL 765 FREQUENCY 868.1750 MHz
GALVESTON COUNTY

CHANNEL 766 FREQUENCY 868.1875 MHz
MONTGOMERY COUNTY

CHANNEL 767 FREQUENCY 868.2000 MHz
BRAZORIA COUNTY

CHANNEL 770 FREQUENCY 868.2375 MHz
HARRIS COUNTY

CHANNEL 772 FREQUENCY 868.2625 MHz
HARRIS COUNTY
CHANNEL 773 FREQUENCY 868.2750 MHz
SHELBY COUNTY

CHANNEL 774 FREQUENCY 868.2875 MHz
FORT BEND COUNTY
HARDIN COUNTY

CHANNEL 775 FREQUENCY 868.3000 MHz
GALVESTON COUNTY

CHANNEL 776 FREQUENCY 868.3125 MHz
MONTGOMERY COUNTY

CHANNEL 777 FREQUENCY 868.3250 MHz
BRAZORIA COUNTY
JEFFERSON COUNTY

CHANNEL 778 FREQUENCY 868.3375 MHz
JASPER COUNTY

CHANNEL 780 FREQUENCY 868.3625 MHz
HARRIS COUNTY

CHANNEL 782 FREQUENCY 868.3875 MHz
HARRIS COUNTY

CHANNEL 784 FREQUENCY 868.4125 MHz
FORT BEND COUNTY

CHANNEL 785 FREQUENCY 868.4250 MHz
GALVESTON COUNTY
SHELBY COUNTY

CHANNEL 786 FREQUENCY 868.4375 MHz
MONTGOMERY COUNTY

CHANNEL 787 FREQUENCY 868.4500 MHz
ANGELINA COUNTY
WHARTON COUNTY

CHANNEL 788 FREQUENCY 868.4625 MHz
GALVESTON COUNTY
SAN JACINTO COUNTY

CHANNEL 789 FREQUENCY 868.4750 MHz
JASPER COUNTY

CHANNEL 790 FREQUENCY 868.4875 MHz
HARRIS COUNTY

CHANNEL 792 FREQUENCY 868.5125 MHz
HARRIS COUNTY

CHANNEL 794 FREQUENCY 868.5375 MHz
FORT BEND COUNTY

CHANNEL 795 FREQUENCY 868.5500 MHz
GALVESTON COUNTY
SHELBY COUNTY

CHANNEL 796 FREQUENCY 868.5625 MHz
MONTGOMERY COUNTY

CHANNEL 797 FREQUENCY 868.5750 MHz
ANGELINA COUNTY
WHARTON COUNTY

CHANNEL 798 FREQUENCY 868.5875 MHz
SAN JACINTO COUNTY

CHANNEL 799 FREQUENCY 868.6000 MHz
ORANGE COUNTY

CHANNEL 800 FREQUENCY 868.6125 MHz
HARRIS COUNTY

CHANNEL 802 FREQUENCY 868.6375 MHz
HARRIS COUNTY

CHANNEL 804 FREQUENCY 868.6625 MHz
FORT BEND COUNTY

CHANNEL 805 FREQUENCY 868.6750 MHz
GALVESTON COUNTY
NEWTON COUNTY

CHANNEL 806 FREQUENCY 868.6875 MHz
LIBERTY COUNTY

CHANNEL 807 FREQUENCY 868.7000 MHz
ANGELINA COUNTY
WHARTON COUNTY

CHANNEL 808 FREQUENCY 868.7125 MHz
SAN JACINTO COUNTY

CHANNEL 810 FREQUENCY 868.7375 MHz
HARRIS COUNTY

ORANGE COUNTY

CHANNEL 812 FREQUENCY 868.7625 MHz
HARRIS COUNTY

CHANNEL 814 FREQUENCY 868.7875 MHz
FORT BEND COUNTY

CHANNEL 815 FREQUENCY 868.8000 MHz
GALVESTON COUNTY

CHANNEL 816 FREQUENCY 868.8125 MHz
LIBERTY COUNTY

CHANNEL 817 FREQUENCY 868.8250 MHz
MATAGORDA COUNTY
WALLER COUNTY

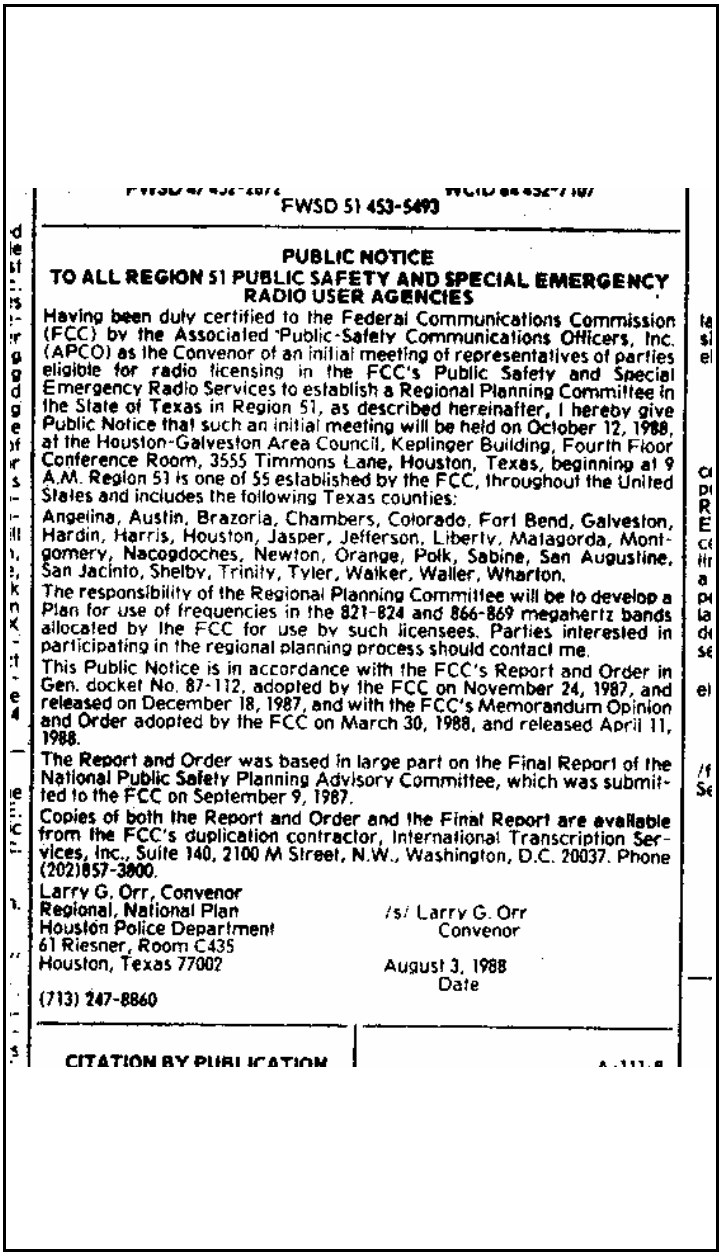
CHANNEL 818 FREQUENCY 868.8375 MHz
WALKER COUNTY

CHANNEL 820 FREQUENCY 868.8625 MHz
HARRIS COUNTY

CHANNEL 822 FREQUENCY 868.8875 MHz
HARRIS COUNTY

APPENDIX 15

PUBLIC NOTIFICATIONS



FWSD 51 453-5493

PUBLIC NOTICE
TO ALL REGION 51 PUBLIC SAFETY AND SPECIAL EMERGENCY RADIO USER AGENCIES

Having been duly certified to the Federal Communications Commission (FCC) by the Associated Public-Safety Communications Officers, Inc. (APCO) as the Convenor of an initial meeting of representatives of parties eligible for radio licensing in the FCC's Public Safety and Special Emergency Radio Services to establish a Regional Planning Committee in the State of Texas in Region 51, as described hereinafter, I hereby give Public Notice that such an initial meeting will be held on October 12, 1988, at the Houston-Galveston Area Council, Keplinger Building, Fourth Floor Conference Room, 3555 Timmons Lane, Houston, Texas, beginning at 9 A.M. Region 51 is one of 55 established by the FCC, throughout the United States and includes the following Texas counties:

Angelina, Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Hardin, Harris, Houston, Jasper, Jefferson, Liberty, Matagorda, Montgomery, Nacogdoches, Newton, Orange, Polk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler, Walker, Waller, Wharton.

The responsibility of the Regional Planning Committee will be to develop a Plan for use of frequencies in the 821-824 and 866-869 megahertz bands allocated by the FCC for use by such licensees. Parties interested in participating in the regional planning process should contact me.

This Public Notice is in accordance with the FCC's Report and Order in Gen. docket No. 87-112, adopted by the FCC on November 24, 1987, and released on December 18, 1987, and with the FCC's Memorandum Opinion and Order adopted by the FCC on March 30, 1988, and released April 11, 1988.

The Report and Order was based in large part on the Final Report of the National Public Safety Planning Advisory Committee, which was submitted to the FCC on September 9, 1987.

Copies of both the Report and Order and the Final Report are available from the FCC's duplication contractor, International Transcription Services, Inc., Suite 140, 2100 M Street, N.W., Washington, D.C. 20037. Phone (202)857-3800.

Larry G. Orr, Convenor
Regional, National Plan
Houston Police Department
61 Riesner, Room C435
Houston, Texas 77002

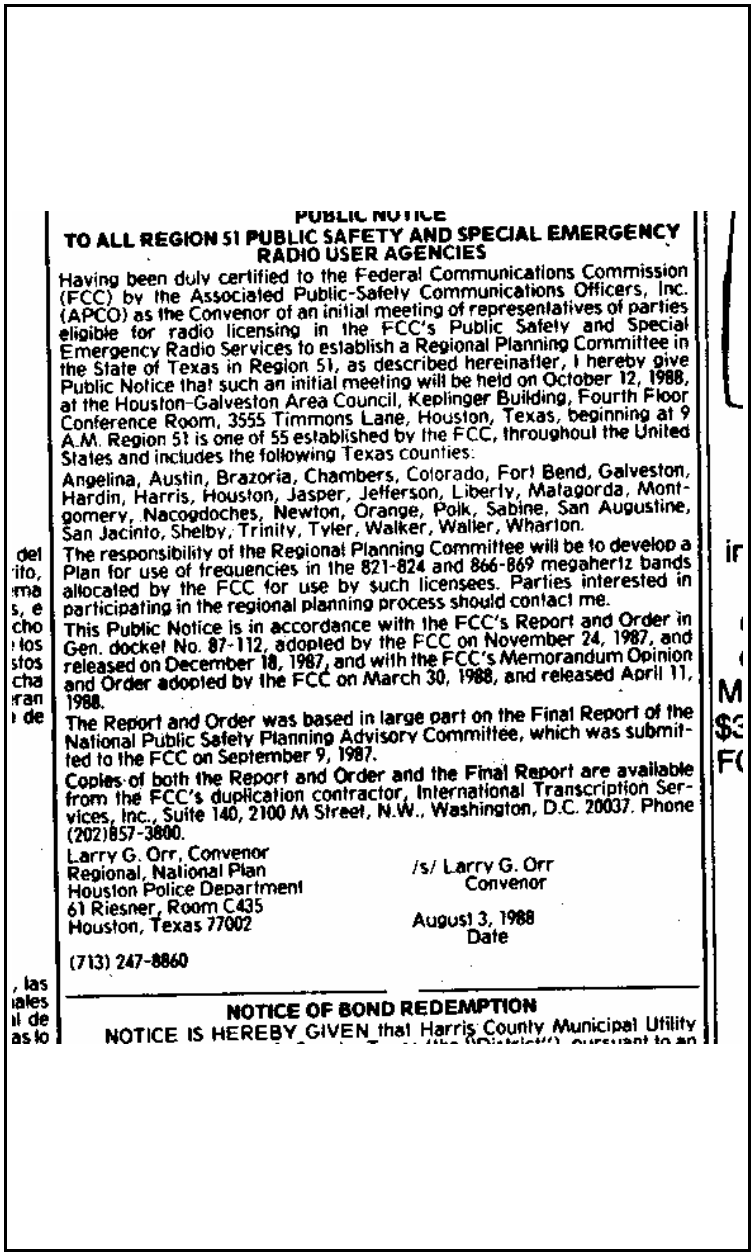
(713) 247-8860

/s/ Larry G. Orr
Convenor

August 3, 1988
Date

CITATION BY PUBLICATION

August 12, 1988 Newspaper Advertising, Houston Chronicle



PUBLIC NOTICE

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Larry G. Orr, Convenor
Regional, National Plan
Houston Police Department
61 Riesner, Room C435
Houston, Texas 77002

(713) 247-8860

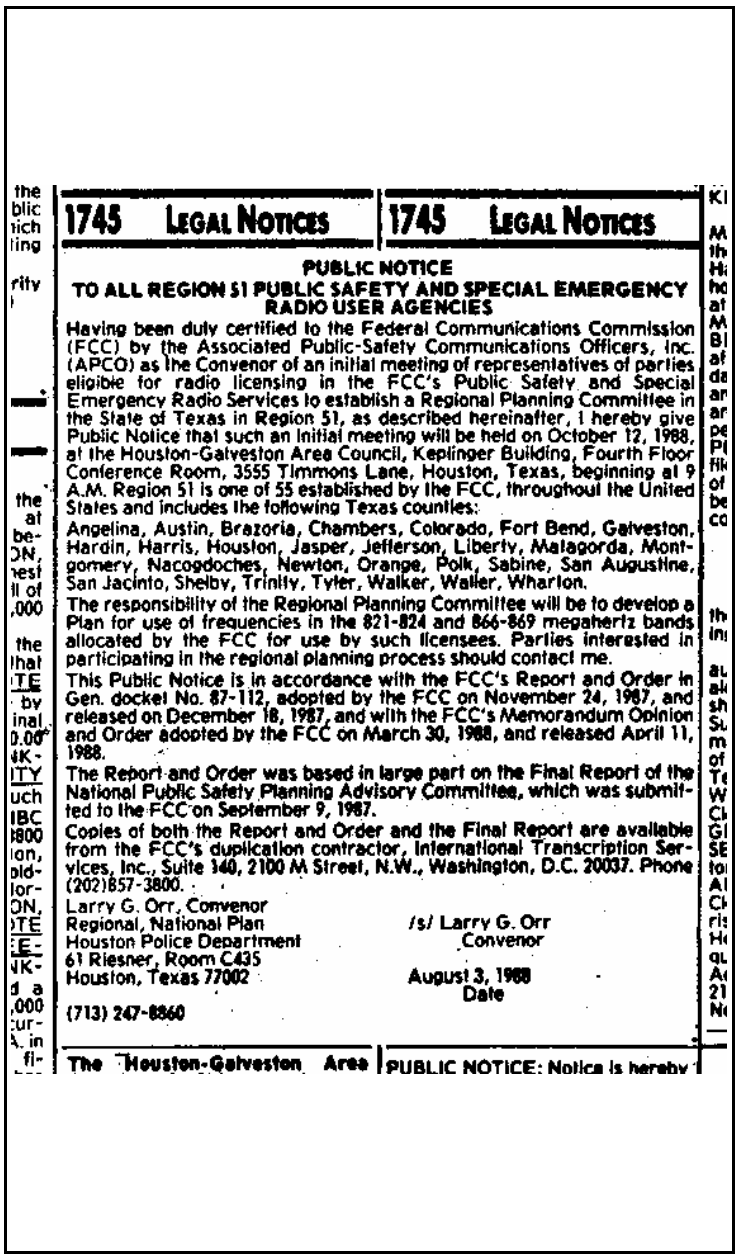
/s/ Larry G. Orr
Convenor

August 3, 1988
Date

NOTICE OF BOND REDEMPTION

NOTICE IS HEREBY GIVEN that Harris County Municipal Utility

August 26, 1988 Newspaper Advertising, Houston Chronicle



1745 LEGAL NOTICES

1745 LEGAL NOTICES

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Larry G. Orr, Convenor
Regional, National Plan
Houston Police Department
61 Riesner, Room C435
Houston, Texas 77002

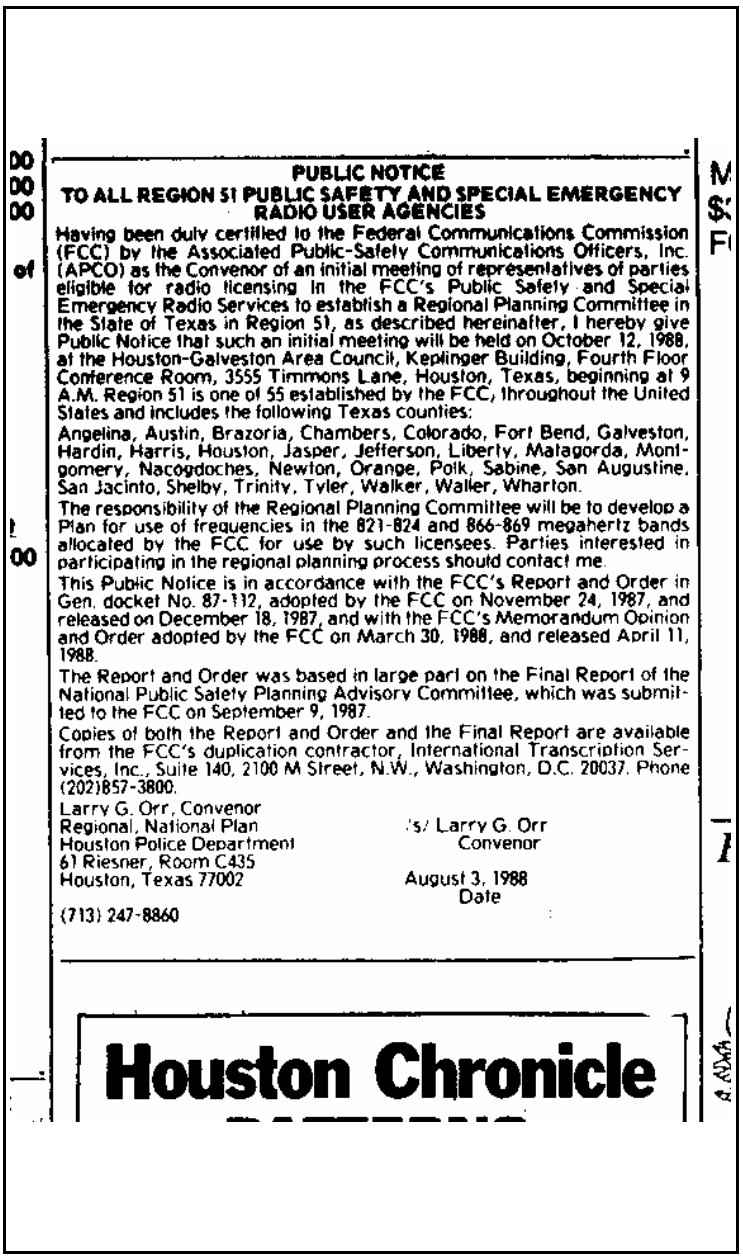
(713) 247-8860

/s/ Larry G. Orr
Convenor

August 3, 1988
Date

The Houston-Galveston Area | PUBLIC NOTICE: Notice is hereby

September 9, 1988 Newspaper Advertising, Houston Chronicle



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Larry G. Orr, Convenor
Regional, National Plan
Houston Police Department
61 Riesner, Room C435
Houston, Texas 77002
(713) 247-8860

/s/ Larry G. Orr
Convenor

August 3, 1988
Date

Houston Chronicle

September 23, 1988 Newspaper Advertising, Houston Chronicle

AFFIDAVIT OF PUBLICATION

AD #7840508
7881415
9290703

STATE OF TEXAS:

COUNTY OF HARRIS:

Before me, the undersigned authority, a Notary Public in and for the County of Harris, and the State of Texas, on this day personally appeared:

W. O. LIGHTER, who after being duly sworn, says that he is the MANAGER- ACCOUNTS RECEIVABLE of The Houston Chronicle, a daily newspaper published in said County and State, and that the publication, of which, the annexed is a true copy, was published to-wit:

Advertising ran August 12, 26 & September 23, 1988

W. O. LIGHTER
MANAGER-ACCOUNTS RECEIVABLE

Sworn and subscribed to before me, this the 28th day of September, 1988 A. D.

Notary Public in and for the
County of Harris, State of Texas

PUBLIC NOTICE

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Larry G. Ott, Convenor
Regional National Plan
Houston Police Department
611 Rusk, Room 5405

/s/ Larry G. Ott
Convenor

CONTROLLERS OFFICE

88 OCT 3 P2:47

LEE BRITON
STATE OF TEXAS
1992

41007-50

TMSG Transmitted message number: 880801978 Date: 081888 Time: 0915
From: Division COMMUNICATIONS DIV_____ Name: LARRY G. ORR_____
To: TLETS CDC: REG2 Agency: REGION TWO TEXAS_____
NLETS ORI: _____ Agency: _____ State: __
Mesg code: __ Control: _____
ALL REGION 51 PUBLIC SAFETY AND SPECIAL EMERGENCY RADIO USER AGENCIES
PAGE TWO
THIS PUBLIC NOTICE IS IN ACCORDANCE WITH THE FCC'S REPORT AND ORDER IN GEN. DOCKET NO. 87-112, ADOPTED BY THE FCC ON NOVEMBER 24, 1987, AND RELEASED ON DECEMBER 18, 1987, AND WITH THE FCC'S MEMORANDUM OPINION AND ORDER ADOPTED BY THE FCC ON MARCH 30, 1988, AND RELEASED APRIL 11, 1988. THE REPORT AND ORDER WAS BASED IN LARGE PART ON THE FINAL REPORT OF THE NATIONAL PUBLIC SAFETY PLANNING ADVISORY COMMITTEE,WHICH WAS SUBMITTED TO THE FCC ON SEPTEMBER 9, 1987.

COPIES OF BOTH THE REPORT AND ORDER AND THE FINAL REPORT ARE AVAILABLE FROM THE FCC'S DUPLICATION CONTRACTOR, INTERNATIONAL TRANSCRIPTION SERVICES, INC, SUITE 140, 2100 M STREET, N.W. WASHINGTON,D.C. 20037.PS 202 857 3800.
LARRY G.ORR, COVENOR (713) 247 8860
REGIONAL, NATIONAL PLAN
HOUSTON POLICE DEPARTMENT
61 RIESNER, ROOM C435
HOUSTON TEXAS 77002
ACCEPTED

TMSG Transmitted message number: 880801977 Date: 081888 Time: 0909
From: Division COMMUNICATIONS DIV_____ Name: LARRY G. ORR_____
To: TLETS CDC: REG2 Agency: REGION TWO TEXAS_____
NLETS ORI: _____ Agency: _____ State: __
Mesg code: _____ Control: _____
ALL REGION 51 PUBLIC SAFETY AND SPECIAL EMERGENCY RADIO USER AGENCIES

HAVING BEEN DULY CERTIFIED TO THE FEDERAL COMMUNICATIONS COMMISSION (FCC) BY THE ASSOCIATED PUBLIC-SAFETY COMMUNICATIONS OFFICERS,INC.(APCO) AS THE CONVENOR OF AN INITIAL MEETING OF REPRESENTATIVES OF PARTIES ELIGIBLE FOR RADIO LICENSING IN THE FCC'S PUBLIC SAFETY AND SPECIAL EMERGENCY RADIO SERVICES TO ESTABLISH A REGIONAL PLANNING COMMITTEE IN THE STATE OF TEXAS IN REGIN 51, AS DESCRIBED HEREINAFTER, I HEREBY GIVE PUBLIC NOTICE THAT SUCH AN INITIAL MEETING WILL BE HELD ON OCTOBER 12, 1988, AT THE HOUSTON-GALVESTON AREA COUNCIL, KEPLINGER BUILDING, 4TH FLOOR CONFERENCE ROOM, 3555 TIMMONS LANE, HOUSTON,TX,BEGINNIING AT 9 A.M.

THE RESPONSIBILITY OF THE REGIONAL PLANNING COMMITTEE WILL BE TO DEVELOPE A PLAN FOR USE OF FREQUENCIES IN THE 821-824 AND 866-869 MEGAHERTZ BANDS ALLOCATED BY TTHE FCC FOR USE BY SUC LICENSEES. PARTIES INTERESTED IN PARTICIPATING IN THE REGIONAL PLANNING PROCESS SHOULD CONTACT ME.
CONTINUED ON PAGE TWO PD HOUSTON TX

ACCEPTED

REGIONAL TELETYPE NOTIFICATION

APPENDIX 16

ADJACENT REGIONS TO REGION 51
NATIONAL PLAN CHAIRMAN LISTINGS

REGION 18

William Vincent
Lafayette Civil Defence
P.O. Box 3286
Layfayette, La. 70502
(318) 268-5060

REGION 40

Charles Bowles
Regional Plan Update Committee
3310 Matador Lane
Garland, Tx 75042
(214) 276-7855

REGION 49

Jeff Haislet
Brazos Co Emergency Comm
Executive Director
P.O. Box 2291
Bryan, Tx 77806
(409) 779-0911

REGION 53

Don Brooks
City of San Antonio
P.O. Box 839966
San Antonio, Tx. 78283-3966
(512) 299-7022

The following Letter to adjacent region chairmen soliciting comments or questions on the Region 51 plan was mailed with copies of the plan.

April 5, 1991

Mark G. Zeringue
Houston Police Department
Communications Maint. Div.
Room C413
61 Riesner Street
Houston, Texas 77002

Sir,

As Chairman of a region adjacent to Region 51, I am providing you a copy of the Region 51 Plan, with addenda, which was presented to the full Regional Committee on April 1, 1991. The Region 51 Planning Committee unanimously approved this plan, and we are currently generating the final document for submittal to the FCC. As part of the final submittal, I am soliciting your comments, and I would like for you to pay particular attention to those sections which deal with the adjacent regions. I believe that we have provided more than adequate protection for each of the adjoining regional frequency assignments. Our assignments are specified in the body of the enclosed plan. If you have any comments or questions please give me a call at area code (713) 247-5743.

I as part of the submittal of the Region 51 Plan, I would like to include letters from each of the adjoining regions Chairmen indicating their concurrence with the Region 51 Plan. To expedite this process I have enclosed a form letter which can be used to indicate your concurrence. Please sign and FAX this letter to (713) 247-4368. Your favorable and timely comments regrading the Region 51 plan will be greatly appreciated.

Mark G. Zeringue, Chairman
Region 51 Planning Committee

Mr. Don Brooks, Chairman
Region 53 Planning Committee
City of San Antonio
P.O. Box 839966
San Antonio, Texas 78283-3966

APR 10 '91 02:25PM CITY OF SA PURCH

Mr. Mark G. Zeringue
Houston Police Department
Communications Maint. Div.
Room C413
61 Riesner Street
Houston, Texas 77002
(713) 247-5743

Dear Mark,

Upon review of the Region 51 Plan, I concur that the Region 51 Plan adequately addresses the interface between our two regions.

Don Brooks, Chairman
Region 53

Date: 4-10-91

Region 53 Response

Mr. William Vincent, Chairman
Region 18 Planning Committee
P.O. Box 31014
Lafayette, La. 70593

Mr. Mark G. Zeringue
Houston Police Department
Communications Maint. Div.
Room C413
61 Riesner Street
Houston, Texas 77002
(713) 247-5743

Dear Mark,

Upon review of the Region 51 Plan, I concur that the Region 51 Plan adequately addresses the interface between our two regions.

William Vincent, Chairman
Region 18

Date: 04-12-91

FROM LAFAYETTE 911/CD 04/12/91 15:48 P. 2 TOTAL P. 2

Region 18 Response

Mr. Jeff Haislet, Chairman
Region 49 Planning Committee
Brazos Co. Emergency Comm.
Executive Director
P.O. Box 2291
Bryan, Texas 77806

Mr. Mark G. Zeringue
Houston Police Department
Communications Maint. Div.
Room C418
61 Riesner Street
Houston, Texas 77002
(713) 247-5748

Dear Mark,

Upon review of the Region 51 Plan, I concur that the Region 51 Plan adequately addresses the interface between our two regions.

Jeff Haislet

Jeff Haislet, Chairman
Region 49

Date: 4-15-91

REGION 40 REVIEW COMMITTEE
3310 MATADOR DRIVE
GARLAND, TEXAS 75042
214-276-7855

April 8, 1991

Mr. Mark G. Zeringue
Chairman, Region 51
Houston Police Department
Communications Maint. Div.
Room C413
61 Riesner Street
Houston, Texas 77002
(713) 247-5743

Dear Mr. Zeringue:

I have reviewed the Region 51 Plan and concur that it properly addresses the interface between Region 40 and Region 51.

Thank you,

Sincerely.

C O Bowles

Charles O. Bowles,
Chairman, Region 40

Region 40 Response