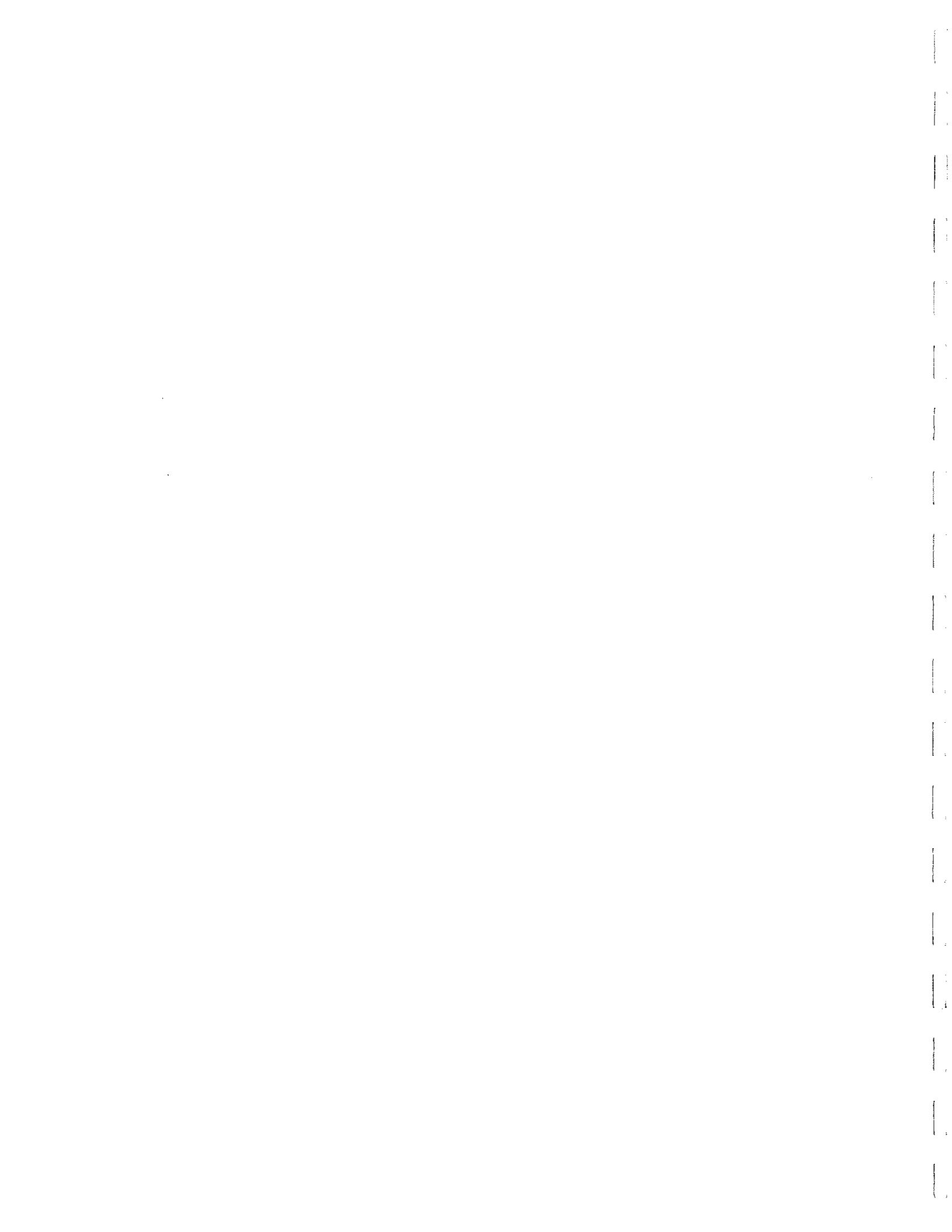


CITY OF SANTA MONICA TELECOMMUNICATIONS MASTER PLAN

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CITY OF SANTA MONICA
TELECOMMUNICATIONS
MASTER PLAN

ACKNOWLEDGMENTS

The City of Santa Monica would like to acknowledge the residents and businesses who attended the numerous meetings and workshops as well as the following persons for their invaluable contributions in the preparation of the Telecommunications Master Plan:

City Council

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Michael Feinstein
Ken Genser
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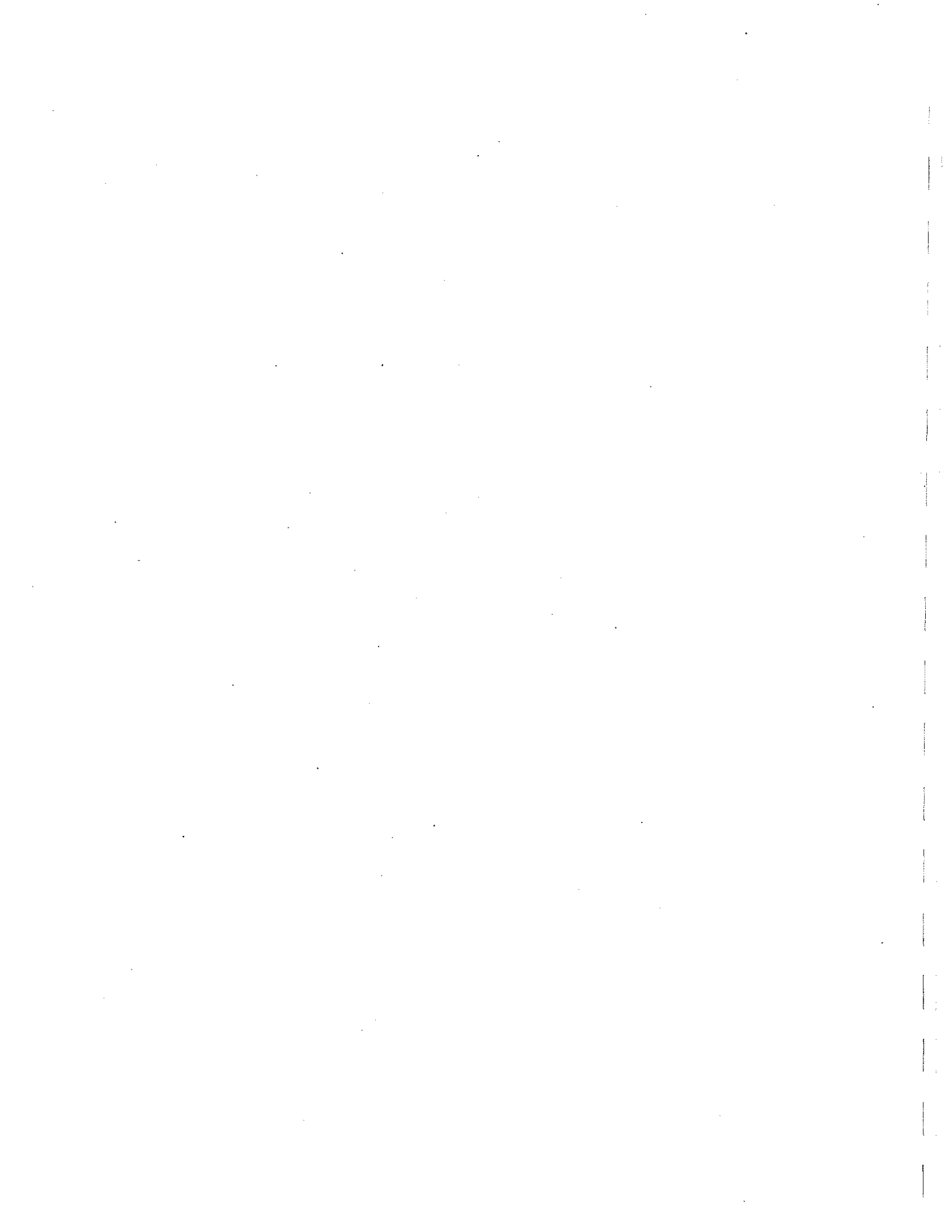


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EXECUTIVE SUMMARY

Introduction

The City of Santa Monica is poised on the threshold of the 21st century equipped with a comprehensive Telecommunications Master Plan that will enhance services to the public, build on the City's investment in public infrastructure and create new opportunities for telecommunications partnerships and competitive services. This Plan is the strategic road map for telecommunication development in the City over the next five years. It constructs a dynamic framework to guide implementation of policies, projects and future initiatives.

The Plan reflects the input of the City's advisory Telecommunications Working Group, the general public, the City's business community, public institutions, existing telecommunications providers, and City staff. It addresses:

- ways to expand the delivery of government services using innovative techniques that would leverage the City's other public projects whenever possible and initially construct an institutional fiber network with lease of excess capacity;
- universal access to telecommunication services to broaden community involvement and participation;
- a rational plan of growth and evolution of the City's telecommunication systems so that local and regional connectivity can be achieved;
- the impact of the Telecommunications Act on existing City ordinances, regulatory activities and economic development;
- protection of valuable public assets through modernized right of way management practices; and
- orderly deployment of wireless services made available in a manner consistent with the aesthetics of the community.

The Planning Process

The planning process has been informed through extensive public outreach. It involved the following key steps:

- **Community surveys, focus groups and provider interviews** to build a vision for the City's role and responsibilities in the telecommunications arena;
- **Ascertainment of the City's internal needs and infrastructure assets** to refine and enhance the delivery of services to the public;

- **Examination of the resources, risks and opportunities** available to the City, using the tools of economic modeling and case studies of other cities.

Looking at Community and Business Needs.

This component of the planning process focused on identifying the current telecommunications infrastructure, future telecommunications needs and services, and potential roles and partnerships to help the City meet such needs. The questions explored included how the City might encourage greater competition and consumer choice; what the City can do to promote universal access and telecommunication literacy; whether the City should construct its own network; how the City might enhance the delivery of government services; and what may be the appropriate role for telecommunications to enrich the economic climate of the City.

The research effort involved: a statistically valid random telephone survey of 400 residents; a survey of 70 Santa Monica businesses; and focus groups with representatives from the City's schools, business community and Chamber of Commerce, Public Electronic Network ("PEN") users, and utility companies. Provider interviews were conducted to ascertain current and future bandwidth capacity. In addition, the public was invited to the monthly meetings of the Telecommunications Working Group and a comprehensive public workshop on the Telecommunications Master Plan.

The information collected indicated that the general public and business community were essentially satisfied by the incumbent telecommunications companies today. The general public survey indicated that (1) home computer penetration is almost 60% in Santa Monica, much higher than the national average; and (2) many households already use the City's electronic services.

While the level of present services was deemed to be satisfactory, there was uncertainty in the business survey results over the ability of existing providers to deliver advanced telecommunications services in the future. This has important implications for the City because advanced telecommunications services were described by those surveyed, as important to the City's future economic, social and fiscal vitality.

Looking at the City's Internal Needs and Assets

An internal needs ascertainment demonstrated that the City would have to expand the capabilities of its information systems if it was going to continue to provide the advanced, electronic government services for which Santa Monica has been recognized for in the past. It also determined that the use of Geographical Information Systems (GIS) and an expanded finance and human resource system was going to impose significant strains on its existing facilities if network reliability and speed were not improved substantially.

The process also involved examination of more effective management of the right-of-way in light of the increase in applications to cut streets by the numerous telecommunications providers now authorized to do business in California. Interim ROW standards were drafted by the City's Engineering Division that encourage joint trenching, coordination of private utility installations with

City street and utility work, establish procedures to expedite utility plan checks, set trench repair methods and enhance public notification.

The City's zoning and permitting ordinances also were examined for ways to more effectively regulate the use of the rights-of-way and private property for antenna siting and other wireless services. Emphasis was placed on the sharing of facilities, particularly, the co-location of antenna structures.

Looking at the Economic Models

The consultants identified two economic models, beyond the current model of reliance upon existing providers, to determine the appropriate role for the City to undertake: *Building a municipal fiber network with the initial purpose of providing high-speed connectivity between City government and educational facilities; and building a full-service network passing every home and business in Santa Monica.*

Exclusive reliance upon the public switched telephone and the existing telephone provider was viewed as costly and short-sighted as the City continues to deploy high bandwidth services like GIS and video conferencing. It is expected that the competitive environment will drive the cost of these circuits down over time, but the financial impact and service limitations, over which the City will have no control, will be significant as City services become more sophisticated.

The City's consultant modeled the cost of constructing a full-service network -- as a direct competitor to GTE and Century Cable in selected product lines. The analysis concluded that the cost and risk were too high given the potential returns to the City. The vagaries of a competitive environment, particularly in a market where the incumbent providers were described as adequate by most survey respondents, was deemed too risky to support a minimum investment estimated to be \$35 million and an estimated 10 year loss after debt of \$19 million.

It was recommended that the City construct a municipal fiber network (MFN) in the form of a ring initially connecting major City facilities, Santa Monica College, and the School District (SMMUSD). Constructing an MFN was considered a prudent course of action, given the City's growing need for high bandwidth circuits. Such a network would provide faster network response time, improved reliability in case of an emergency and a solid foundation for the adoption of advanced government services in the future. In contrast to the full-service network, an MFN would cost approximately \$2 million and achieve a pay-back over a ten-year period. The basic architecture of the network would be optimized for serving public institutions, offering leased infrastructure to qualified private users and establish the first step in Santa Monica's contribution to regional connectivity. It could also serve as a backbone for a full-service network should conditions exist and a full-service network become economically viable.

Summary of Recommendations

Construct a Municipal Fiber Network with Lease of Excess Capacity

- Locate the MFN route in consideration of (1) the location of City facilities needing connection to a high speed network; (2) the location of other public institutions that could use the MFN; (3) the location of businesses and other telecommunications providers that might be interested in lease of capacity or being a partner in providing competitive services to the public and businesses of Santa Monica; and (4) the location of City owned conduit to reach Santa Monica's eastern border for the purpose of regional connection.
- Construct the MFN in three phases, over three fiscal years, to dovetail with existing public works projects and maximize cost savings.
 - **Phase I:** Connect City Hall, the Civic Auditorium, Virginia Avenue Park and the City Yards with a fiber run along Pico and Cloverfield. Santa Monica College and Santa Monica High School (a gateway to the SMMUSD network) will also be passed in Phase I. The Smart Corridor Project will offset some construction costs.
 - **Phase II:** Connect Main Library, Water Administration, Fire Headquarters, Transportation Building, Ken Edwards Center, Pier, and City Hall. This Phase is tied to the Transit Mall along Santa Monica Boulevard, Broadway and 4th Street. The MFN also will be used to implement an "Intelligent Transit System" in the Transit Mall area.
 - **Phase III:** Complete the MFN by running down Santa Monica Boulevard from Cloverfield; pass Fire Station No. 3 and the Madison School Campus of Santa Monica College. Once this Phase has been completed, the MFN will be optimized for survivability in the case of emergency or disaster.
- The network design will support future opportunities to:
 - Partner with telecom providers to expand the scope and quality of services in Santa Monica.
 - Combine the MFN with similar networks being developed by other cities in the region.
- Standards-based equipment and protocols will be used to maximize the ability of the MFN to interconnect with other MFN's and, if appropriate, with the public switched networks (GTE, PacBell and the new telephone competitors).

Refine and Modernize Right of Way Management Goals, Standards and Procedures (Analysis to continue beyond completion of the Plan).

- **Street Cuts:** As part of modernizing right of way management policies and procedures, the City will survey other cities, meet with utility providers, refine right of way management goals and standards, and recommend modifications, including the fees charged by the City.
- **Antenna Siting:** The antenna sections of the Zoning Ordinance have been reviewed and the City is exploring changes to the Ordinance in light of the Telecommunications Act of 1996 and to revisit “by-right” versus discretionary zoning approvals. Also, an inventory of public properties is being conducted to determine which properties may be appropriate for antenna siting. Staff will recommend policy changes, as appropriate.

Adopt a Universal Access Policy and Facilitate Meaningful Access to Telecommunications Services by All Segments of the Santa Monica Community.

Universal Access addresses the issue of availability in a manner that is non-discriminatory regardless of income, ability, language or geographic location.

To promote Universal Access the City will promote the following goals in its projects and initiatives:

1. Encouraging priority access for special populations such as the disabled or students.
2. Encouraging access at specific types of facilities such as schools and higher education institutions, libraries, and public facilities owned or controlled by government.
3. Encouraging availability of user-friendly equipment.
4. Ensuring appropriate privacy and security for users.
5. Developing or promoting affordable pricing mechanisms.
6. Promoting fair and equitable regulation of telecommunications providers.
7. Promoting interconnectivity, interoperability and open access.
8. Encouraging the creation of opportunities for user participation and interactivity.
9. Providing incentives or other mechanisms to promote businesses and others to support the policies.

Consider Action Items to Implement the Plan, after its Adoption by Council.

- Implement and continue to refine the City's role in promoting universal access policies.
- Complete the process to modernize rights of way management techniques and policies.
- Issue a Request for Proposals for optical terminal equipment to connect the buildings and sites passed in Phase I.
- Consider methods to manage and organize the MFN.
- Issue a Request for Proposals to determine whether a strategic partner is interested in using the MFN to extend services to the public and businesses of Santa Monica and to promote connectivity of the MFN to the region.

GLOSSARY

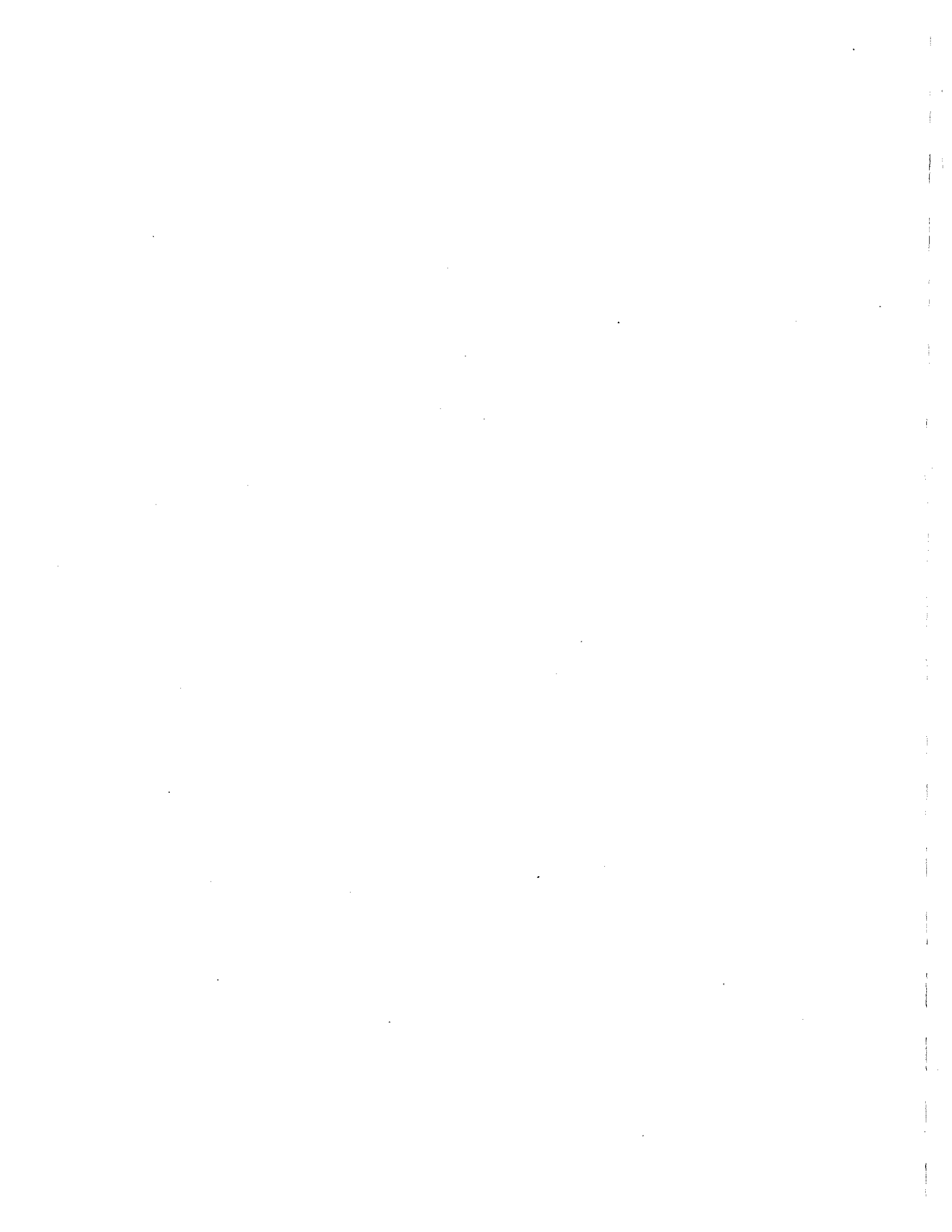
Set forth below are some terms that are used in the Master Telecommunications Plan. The definitions have been crafted in an attempt to make the concepts clear to a non-engineer and are thus not as detailed as an engineering definition.

- ADSL** Asymmetrical Digital Subscriber Line. A specially conditioned pair of copper telephone lines that can deliver high speed data services over a relatively short distance. Telephone companies have been experimenting with the delivery of one or two video signals over ADSL facilities as a possible method of competing with cable television.
- ATM** Asynchronous Transfer Mode. A method of transmitting voice, video and data over a single, digital fiber optic path. An ATM switch will take various digital input sources and send each to its assigned destination along the network where a similar switch will re-assemble the information in its native format.
- Bandwidth** a term used by engineers to indicate the amount of frequency spectrum that a radio or wire can carry. Many engineers draw an analogy between the volume of water carried by a pipe and the bandwidth of a cable.
- BBS** computer bulletin board. Accessed by a computer and a modem, a BBS is a series of menu screens that leads the caller into a file area, a "chat" area, etc. Small BBS's appeared two decades ago and were, in many ways, precursors to the Internet.
- Bypass** a service offered by competitive access providers (CAP's) to long distance users. A CAP will use its own wires or fibers to connect a heavy user of long distance services its long distance company of choice. Since the call never touches the local telephone network, the fees charged by the local telephone company are saved and shared by the user, the CAP and the long distance company.
- CLEC** Competitive Local Exchange Carrier. A new telephone company that seeks to compete with the incumbent telephone companies like GTE and PacBell in the local telephone market.
- DBS** Direct Broadcast Satellite. The DBS satellites operate from orbits just over 22,000 miles directly above the equator and provide video services to paying customers who use very small dishes to receive the signal. The services offered by the DBS operators are very similar to cable television services and are priced on a monthly basis at about the same level. DirecTV and Primestar are currently the two largest DBS companies in the United States.

- Ethernet** a transmission protocol for sending information between networked computers. Today, Ethernet comes in a fast version (10 million bits per second, or Mb/s) and a faster version (100 million bits per second, or 100 M/bs). An even faster version is under development.
- LEC** Local Exchange Carrier. The local, dominant telephone company. GTE is the LEC in Santa Monica.
- Local Loop** telephone jargon which refers generally to that portion of the public switched network between the local central office and the residential or business customer. This phrase can also be used loosely to refer to local telephone service in general.
- MMDS** Multi-Channel Multi-Point Distribution Service. A omni-directional microwave service that is used to deliver video channels to paying subscribers, much like a cable television system.
- PBX** Private Branch Exchange. A PBX is essentially a computer which routes telephone calls within a business or business unit. It connects to the local telephone company central office by trunk lines, receives all calls directed to the business and routes them to the correct phone. A PBX also provides features like call waiting, call forwarding, etc. Centrex service is essentially provided by PBX-type software located at the local central office.
- PCS** Personal Communications Service. This is a form of cellular telephone service which uses a large number of small, low-powered cells instead of the larger, higher-powered cells used by the existing cellular systems. PCS was originally designed to be a more sophisticated cordless phone system that would support neighborhood service. The technology grew faster than the regulatory permissions, however, and the service will look more like cellular when it is finally implemented.
- POTS** Plain Old Telephone Service. This is telephone jargon which can mean the same thing as "local loop" described above.
- SONET** Synchronous Optical Network. A method of transmitting digital information over fiber optic cable that was originally invented to carry large volumes of telephone traffic between telephone company central offices. It is now used in many optical networks as the transmission standard.
- T1** A telephone acronym for a circuit that has been conditioned to carry 1.544 Mb/s, or 24 digital voice grade circuits of 64 kb/s. This circuit can be carried over twisted copper pair or over fiber optic cable.

TDM

Time Division Multiplexing. A method of transmitting voice, video and data over a single, shared transmission path. An TDM hub will take various digital input sources and send each to its assigned destination along the network where a similar switch will re-assemble the information in its native format. TDM equipment performs a similar function as ATM equipment, but is not as bandwidth efficient. ATM is considered to be the more "modern" of the two methods.



I. INTRODUCTION

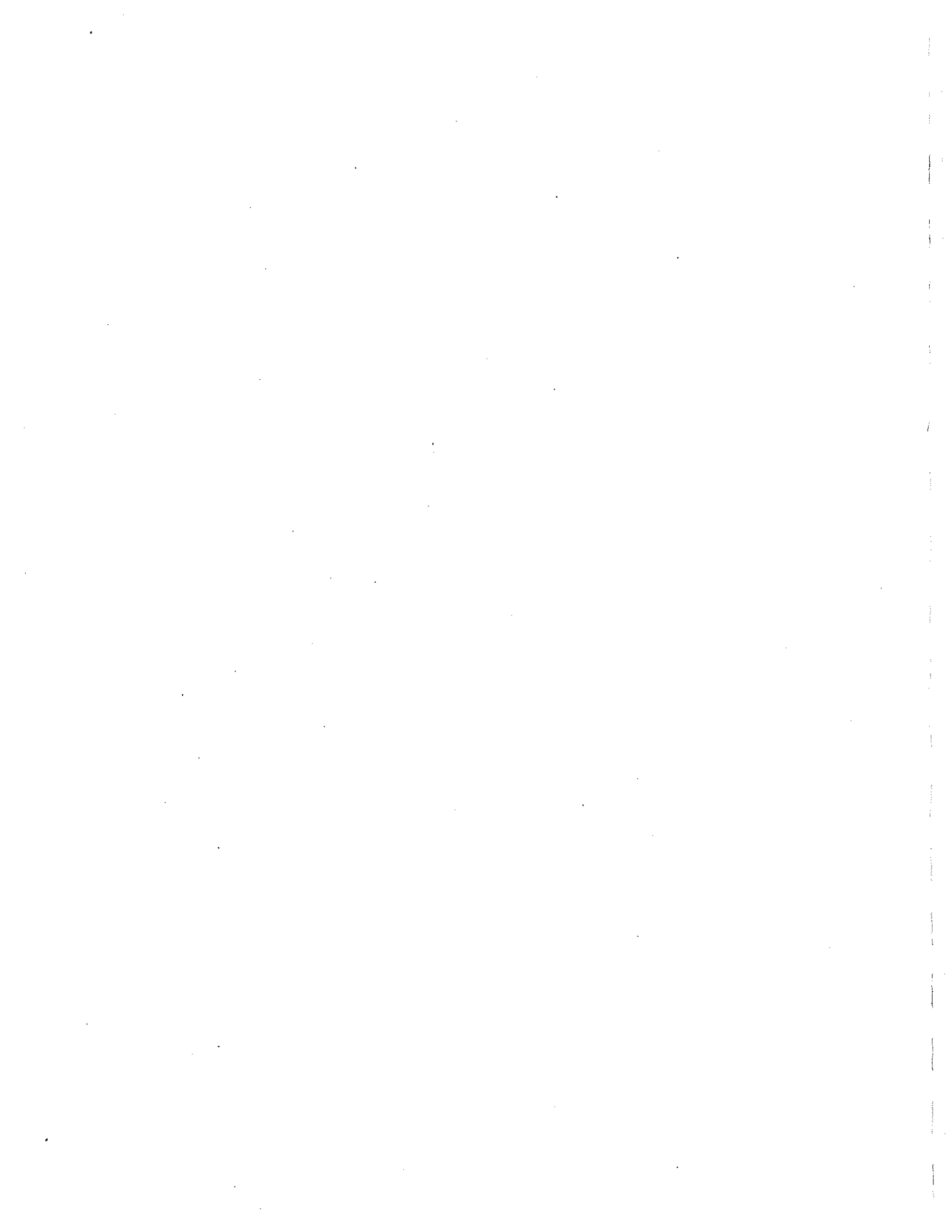
In the fall of 1996, The City of Santa Monica (City) engaged the consulting firm of Media Connections Group (MCG) to develop a Telecommunications Master Plan (hereinafter "Plan" or "Master Plan") for the City.

The City decided to embark upon the Master Planning process for several reasons:

- Congress had passed the Telecommunications Act of 1996, which was designed to establish competition in the local telephone market place.
- Technology advances were changing the traditional role performed by its existing telecommunication provider – GTE. GTE was anticipating meaningful competition in its core services for the first time because of the 1996 Telecommunications Act and because of new and cheaper network technologies.
- New telephone carriers, certificated by the California Public Utility Commission were requesting access to the City's rights of way (ROW), often along the same streets and alleys.
- The City's own information systems were becoming more sophisticated, requiring greater bandwidth in the local and wide area networks used by the City. Thus, the City's reliance on telecommunications systems to conduct its core business and to deliver services to the public is increasing substantially.

In response to these factors and Santa Monica's desire to remain at the forefront of telecom connectivity, the City determined that it required policies and strategies that would allow it to manage the ROW and position itself in the changing telecommunications environment.

This report is divided into eight sections. Section I is this introduction. Section II deals with the efforts undertaken to understand the telecommunications market in the City by gathering information from the telecommunication users, both inside the City's government organization and in the community at large. Section III discusses the structure of the telecommunication market from the supply side by examining the existing providers. Section IV describes the logical network options. Section V ties the demand and supply information with the possible roles the City could play in the telecommunications market place over the next five years. Section VI reviews the status of telecommunications planning in other cities. Section VII contains the recommendations of MCG to the City. Section VIII sets forth a list of action items for the City.



II. TELECOMMUNICATIONS NEEDS ASSESSMENT

In order to develop a telecommunications plan for the City, knowledge of the existing market for telecom services had to be obtained. The two components of market, supply and demand, were assessed. Demand (or needs) was further divided between the telecommunications needs of the City government and those of the City as a whole. Supply was analyzed for the market as a whole because the City represents just another customer to the private provider, a large and important customer, but not a unique market factor.

The needs assessment process was done as an integrated approach that was led by the Telecommunications Working Group and the City staff. The public and private surveys, for example, were designed to ascertain the community's demand for the delivery of government and telecommunications services available in the City.

Community Assessment

The Telecommunications Working Group

The telecommunications needs of the community are wide and varied depending on the market sector under review. The methodology applied in our analysis called for an investigation of the all market sectors within the limits of the project's budget. The investigation relied on the Telecommunications Working Group (TWG) as the central source of input from which other methods of investigation were launched. The TWG is composed of nine members (see Exhibit A). They conducted their work at public meetings with the assistance of the City staff and MCG. The City Council was represented at the meetings by at least one Council member, and usually more. The project was greatly aided by the direction and guidance it received from the TWG members, Council and members of the public that participated at the meetings.

The Telecommunications Working Group had an ambitious charge from the City Council to inform and focus the Master Plan and to represent the public interest in the overall project. Its advisory role was performed at a semimonthly meetings beginning in June 1997, at special subcommittee sessions and at outreach events. Several of the TWG members acted as facilitators at a public workshop held on February 9, 1998.

The following issues were covered at the TWG regular meetings.

- Master Plan goals and methodology.
- Public outreach to achieve the widest public participation in the planning process.
- Public and business survey development and analysis.
- Telecommunications provider interviews and outreach.

- Right of Way management, standards and goals.
- Santa Monica business outreach .
- Economic modeling: its uses, development, methodology, network scenarios and results.
- Telecommunications planning in other comparable cities.
- Telecommunications technology and platforms.
- Finance and taxation and its impact on the Master Plan .
- Universal Access.
- The past, present and future role in the City's telecommunications infrastructure as related to the public institutions of:
 - Public Electronic Network (PEN).
 - Electronic Delivery of Government Services.
 - CityTV.
 - Santa Monica Public Library.
 - Santa Monica-Malibu Unified School District.
 - Santa Monica City College.
- Electronic filing of taxes (a subject requested by a Santa Monica resident).
- Antenna siting in Santa Monica, appearance and contribution to telecom infrastructure.

Three TWG subcommittees were created to assist the working group as a whole and MCG in the areas of right of way issues, electronic delivery of services (including PEN), and community outreach. These subcommittees made presentations at the public meetings, held interviews and focus groups as part of the outreach and drafted some of the policy recommendations that are referenced in this report.

A three level approach was taken to learn the telecommunications needs of the community. The process included a series of interviews, surveys and meetings. Specifically, the needs of the general public were studied through a survey conducted by the research firm of Godbe Research and

Analysis. A phone interview was conducted of a statistically significant random sample of residents of Santa Monica. They were asked about their uses, needs, preferences and price sensitivities with regard to telecommunications services. The results of the survey were useful in assisting the TWG and MCG in developing a knowledge of the demand for existing and new telecom services in Santa Monica.

Knowledge of the needs of the business community was essential to the Plan because of the importance to the City of its commercial sector and of the critical element that commercial demand for telecommunications service plays in the analysis of feasible network options. The telecom demand of commercial and other institutions often represents the first step in justifying the investment for infrastructure and network services. Historically, telecom competition in the U.S. has been directed toward large users. Once services have been made available to the high demand customers, they are often offered to the general public at competitive prices.

The telecommunications needs of the businesses of Santa Monica were assessed through personal interviews with the largest users of telecom services in the City; through written surveys hand delivered or mailed to businesses; and through the use of public meetings to which the entire community was invited. The surveys were useful tools to gauge the level of satisfaction with existing services and to project future demands. Information on the business survey can be found in Exhibit E.

The third aspect of the community needs assessment relates to the telecommunications demands of the not-for-profit institutions that operate in the City. Often these entities have special requirements and limited budgets. Santa Monica College, the Santa Monica-Malibu Unified School District and the hospitals located in the City were considered important constituents. Separate meetings were held with representatives of these entities. Santa Monica College and SMMUSD were represented on the TWG.

As noted earlier, Santa Monica has a unique electronic institution called "PEN". It is a City sponsored forum that allows citizens to communicate with each other and City officials through a computer network. It has become part of the community's fabric of communications and has created an expectation of access that must be accommodated in Santa Monica telecommunications planning.¹ The PEN users have been involved in the TWG public meetings and a special on-line Master Plan Conference was held on PEN. Further, the Electronic Delivery of Government Services sub-committee of TWG held separate sessions to investigate PEN's specific needs as they related to the Plan.

As discussed, the TWG public meetings were critical elements of the community needs assessment. The public input gave the TWG, attending City Council members, City staff and MCG the opportunity to hear ideas that might not have been expressed without direct public input.

¹ The City recently upgraded PEN to provide direct Internet connectivity.

A formal public workshop was held as part of the Master Plan process. The workshop was used to explain the Master Plan's methodology, its findings and the preliminary recommendations. After a formal presentation clarifying questions were asked by the public. The attendees were broken into three groups to discuss right of way management, public and private partnerships and the electronic delivery of government services. The TWG members facilitated the discussions with City staff and MCG available for clarification. Some of the issues and observations raised by the public at the workshop are listed below.

Right of Way Management

- The City should proceed with a Municipal Fiber Network (MFN), but should be open to partners (both wireline and wireless) as future participants.
- No special tax assessments should fall on taxpayers for the MFN.
- The City should encourage joint ROW projects without discouraging private telecom projects.
- The City should encourage telecom carriers to utilize City infrastructure where feasible.
- The City should encourage regional telecommunications infrastructure development.

Public Private Partnerships

- The MFN makes sense, if the City approaches the business tasks carefully and remains aware of challenges in running and funding a municipal enterprise.
- The MFN is particularly attractive because of the opportunities it offers the SMMUSD and Santa Monica City College.
- The public members were interested in how the network might be integrated into services offered to businesses and homes.

Delivery of Governmental Services

- The City should keep the network invisible to the public and not add to the wire clutter of City street-scapes.
- The City should involve the Library in the network and offer dedicated PEN terminals.
- The City should extend the telecom presentation of City government meetings such as allowing public input before and during Council meetings.

- The City should extend its commitment to lifelong learning in Santa Monica by use of the MFN, City TV or via cable modems when they become available.
- The City should enable neighborhood groups to use the MFN for publishing information and conducting discussions.

The workshop's agenda is included in Exhibit F.

In summary, the community expressed common interests and needs on telecommunication issues. It expressed certain principles and identified the institutions considered vital for telecommunications access. The principles were: the promotion of democracy, including electronic democracy; continued accessibility to City government services, staff, appointed and elected officials; managing the public rights of way by balancing the impact to the public and existing infrastructure while encouraging competition; making advanced telecom services available to the community as a whole; facilitating telecommunications connections between the City's public institutions, especially its schools, college and library system; recognizing the City's role as a participant in the encouragement of the development of the City's infrastructure for commercial and residential use; encouraging competition among private providers in Santa Monica; and, supporting universal access to telecommunication services.

Public Survey

In August, 1997, the City conducted a telephone survey of the residents of Santa Monica using Godbe & Associates, a professional sampling company. The survey produced 400 useful responses and a confidence level of 95%.

The survey was designed to elicit information on the extent of computer and related equipment available in the City's homes and the degree to which the general public used advanced telecommunication systems from their homes for things like e-mail, conducting business with the City and work-at-home.

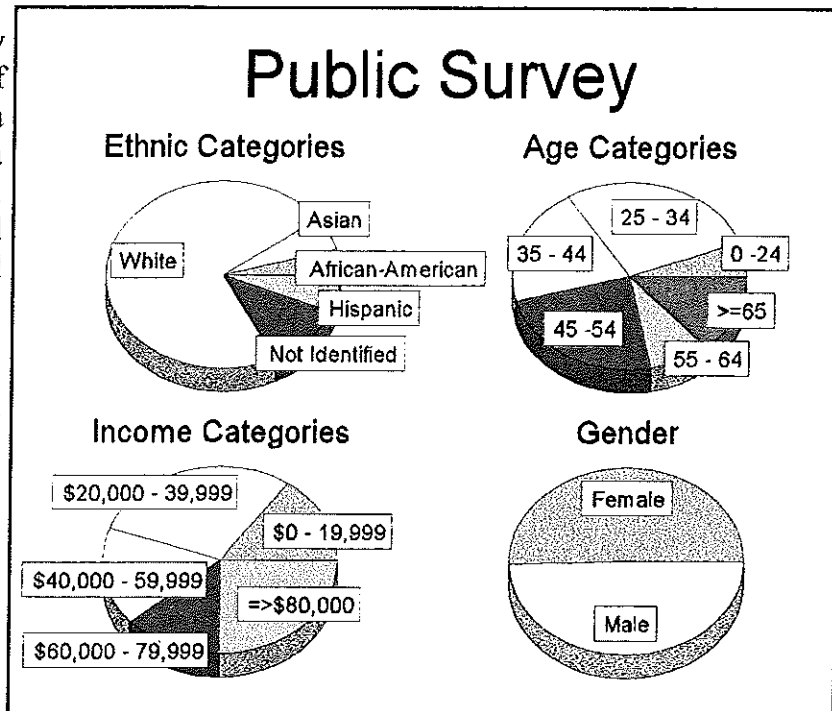


Figure 1

Demographics The respondents were evenly split between males (49.5%) and females (51.5%). Figure 1 depicts the basic demographic breakdown.



The ethnic breakdown was: Asians - 5.8%; African-Americans - 4.6%; Hispanics - 6.3%; and Whites - 72.3%.² This breakdown generally reflects the demographic profile of Santa Monica which is: Asians - 6.0%; African-Americans - 4.4%; Hispanics - 13.5%; and Whites - 79.7%.³

Household income was spread evenly across the spectrum with a bulge in the \$20,000 to \$40,000 category.

The ages of the respondents were weighted toward the 25 - 34 age category, but each major age group was represented in the sample.

Over 50% of the sample works at home, at least part of the time, and almost 7% work from their homes full time.

Computer Users

The nationwide penetration of personal computers in the home is about 41%.⁴ The penetration of PC's in Santa Monica is 59.0%, much higher than the national average. Almost as many households indicated they had access to a second computer, usually through a place of employment.

Over three quarters of the home computers in the City have modems installed and, thus, it was not surprising to find that 34.0% of the sample uses PC's to browse the World Wide Web. Over 30% of the sample uses Internet e-mail. Figure 2, shows the percentage of Santa Monica homes with computers.

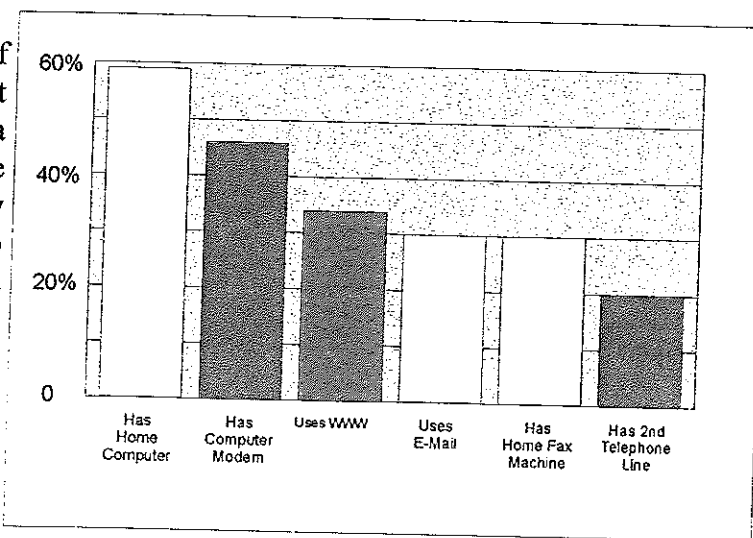


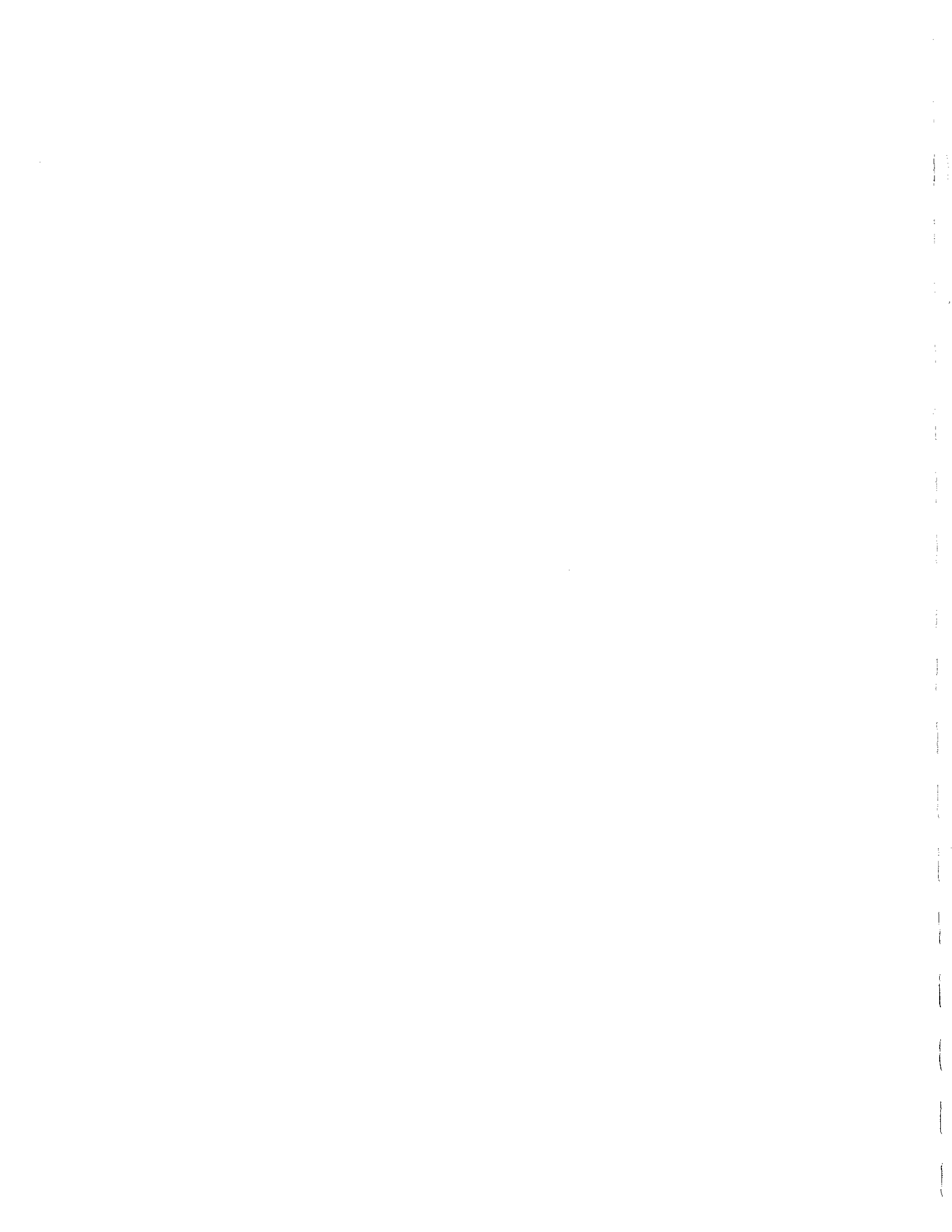
Figure 2

Figure 2 also shows that there is a high penetration of stand-alone fax machines -- 30% of the households in Santa Monica have a dedicated fax machine. One-fifth of the households have a second phone line used for a fax machine and/or a computer.

² Approximately 89% of those surveyed identified themselves by ethnic category. Approximately 11% declined to do so. The survey was not designed to study telecommunications use by ethnic group. Thus, while Hispanics are somewhat under-represented in the sample, the survey will not be used to predict the behavior of any ethnic sub-group.

³ Source: U.S. Census data updated for 1996.

⁴ Source: 1998 World Almanac, June, 1997.



The availability of this equipment suggests that the City has an opportunity to use advanced telecommunication services to reach an existing base of computer literate residents. To determine whether the general public was interested in using advanced services like interactive voice units and computer data bases, the survey asked whether the respondents were using the City's existing services, like PEN and the City's Internet Home Page.

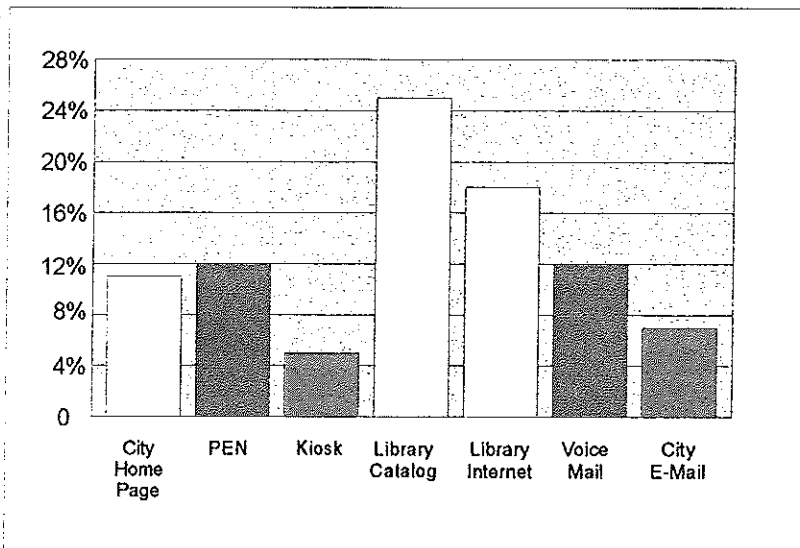


Figure 3

As Figure 3 depicts, usage of existing services is substantial. 11% of the sample (25% of the computer homes) have already used the City's Web site. About the same number have used PEN, the City's Public Electronic Network – a precursor to the Web site and the first municipally-supported public computer network in the U.S.

Almost 25% of the sample has used the Library's computerized card catalog and 18% of the sample (38% of computer households) have used the Library's Internet services.

Over 5% of the sample has used the City's automated fax services and 12% have used the City's voice mail services to communicate with City employees and members of the City Council.

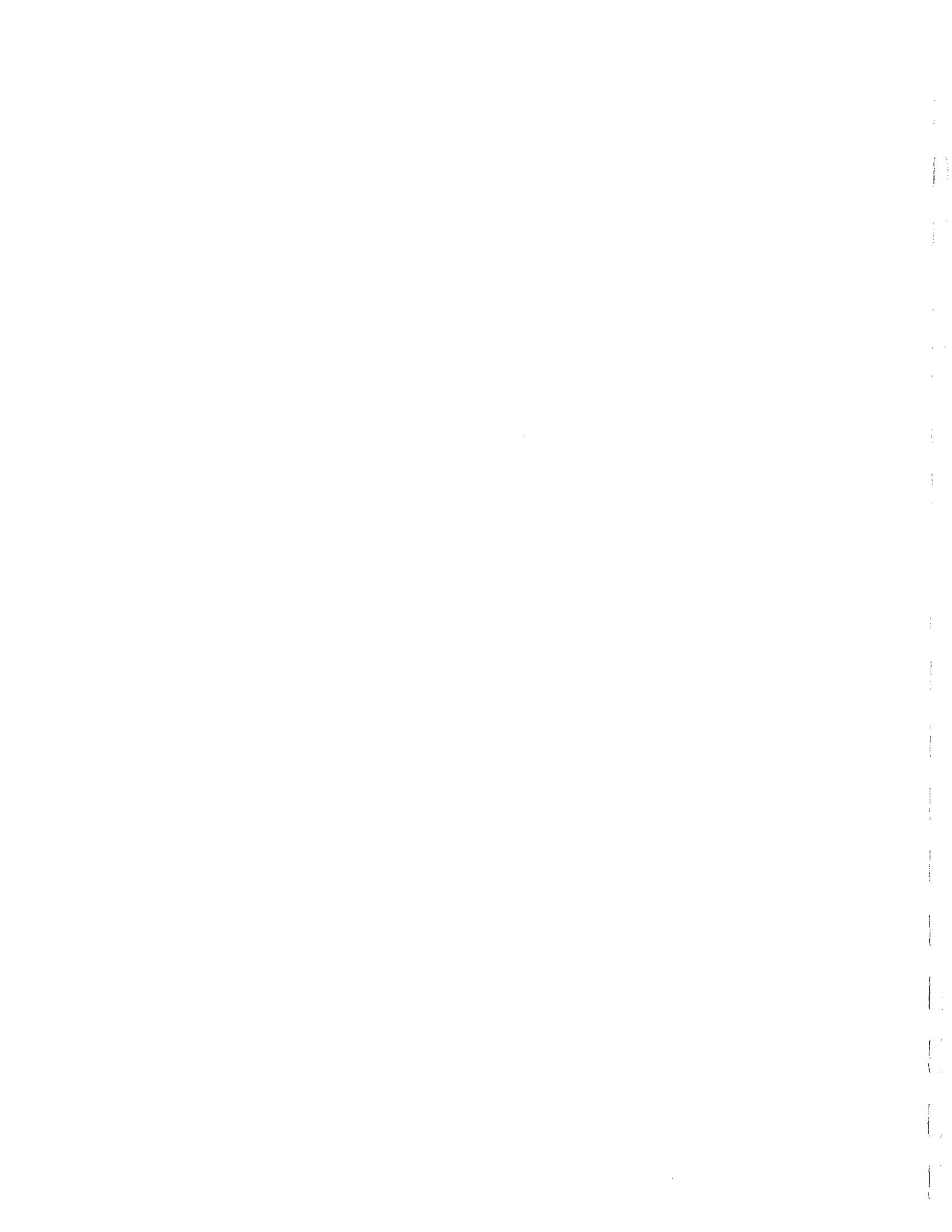
Over 5% of the sample has used the City's automated fax services and 12% have used the City's voice mail services to communicate with City employees and members of the City Council.

About 7% of the sample (and 14% of the respondents with a home PC) have already used the City's internal e-mail system. This is a surprisingly high percentage given the relatively short time that third parties have been able to access the City's e-mail system.

Video Information

Over 60% of the sample households subscribed to cable television or direct broadcast video services. One respondent subscribed to both services; 58% subscribed to cable; and, approximately 2% subscribed to DBS. A higher percentage of cable television service rated the service as either "excellent" or "good" than did DBS subscribers. Cable garnered a 77% positive rating while DBS garnered a 63% positive rating.⁵ The cable and DBS subscribers were asked whether certain aspects of service were important to them and the results are summarized in Figure 4 on the next page. Clearly, price and good technical service are very important to this group. Similar results have been

⁵ The sample for DBS was very small (only 8 respondents) and, thus, the DBS data should be viewed with caution. It should be noted, however, that the DBS penetration level found in the Santa Monica survey comports with other survey data for the greater Los Angeles area.



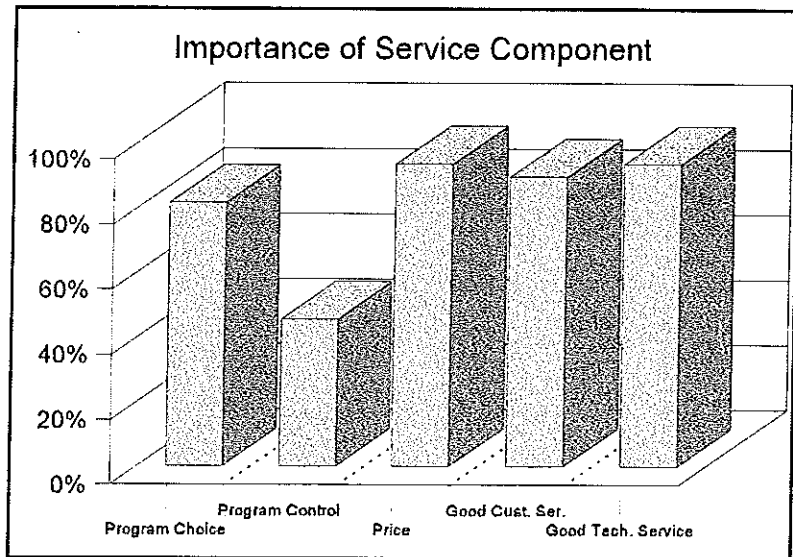


Figure 4

achieved in other surveys, although the relative importance of program choice is often valued nearer the importance of good customer or technical service. The results of this survey may reflect the fact that cable and DBS customers presently receive a large number of program services in Santa Monica.

New On-Line Services

The respondents were asked to pick the type of on-line information that the City should focus upon. Of those respondents expressing an opinion, information

on City events and City departments were valued most highly. Information on City programs was rated the next highest. The results of the survey are summarized in Figure 5.

Conclusions

The public survey produced some very useful information for the Master Plan. The population of Santa Monica can be generally characterized as "computer savvy." The penetration of PC's and their use to surf the World Wide Web and communicate via e-mail are already well established.

Moreover, the population is clearly used to using advanced forms of telecommunications to exchange information with the City and with each other.

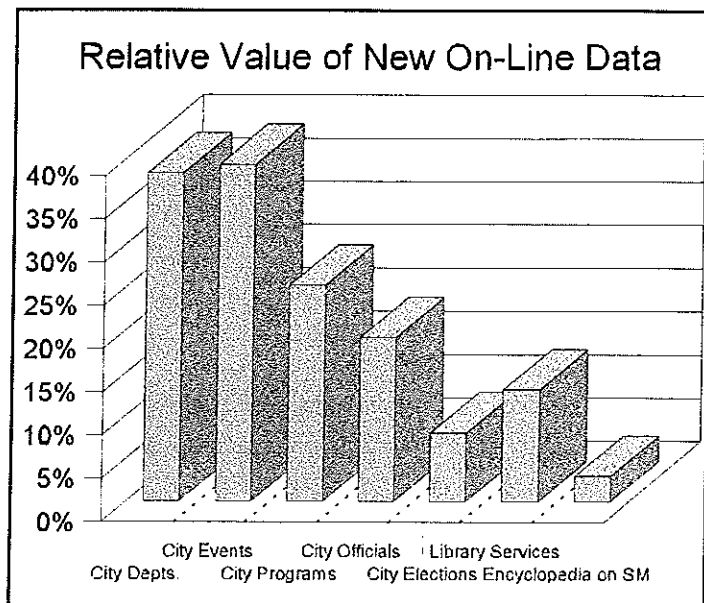


Figure 5

This behavior clearly supports the extension of electronic services, both in reach and in sophistication.

Exhibit D to this report contains a summary of the data from the survey for each question asked and for each demographic component of the respondent universe. A copy of the survey interview sheet, used by the interviewers to conduct the survey, is also attached.



Business Survey

The business survey was intended to give the business community an opportunity to report in a confidential manner its opinions about City services and about many facets of telecommunications services in Santa Monica. The introductory letter of the questionnaire contained information about the City's telecommunications Master Plan and requested feedback from the businesses in several ways -- in response to objective questions and through answers to open-ended subjective questions.

The survey form, which is set forth in Exhibit E, was sent by mail to 220 businesses selected by the City because of their size and the likelihood that they would be above-average telecom users. Another 30 businesses were selected for personal visits by City staff. These "Top 30" were large businesses that were primarily involved in the entertainment or high technology industries.

Of the 250 businesses contacted, 70 returned completed questionnaires to MCG. All the respondents answered the objective questions in the survey. Some offered more detail in the comments section of the questionnaire. Some businesses attended the TWG meetings. Some directly contacted the City Manager's office with input regarding the issues under review.

The survey dealt with quantitative and qualitative issues of telecom service in the City. Exhibit E presents the results on the questionnaire used to solicit responses.

The survey also asked questions about the nature and quality of communication between businesses and the City government. As mentioned above, Santa Monica has made a significant effort to deliver City services electronically. This survey was an opportunity to gauge the value to the business community of those efforts.

The third and final section of the business survey inquired of the future needs and expectations for telecommunications services as envisioned by the business community. The questions asked about future demands for telecommunications services and about the need for the City to further refine its electronic service offerings.

The table on the next page was constructed to show the highlights of the survey as answered by each of three groups. The table reports the business survey results from 70 total respondents (Full Survey), from 13 of the larger telecom users (Larger Respondents) and 57 smaller telecom users (Smaller Respondents) in the City.

QUESTION	FULL SURVEY	LARGER RESPOND.	SMALLER RESPOND.
Does the company have a LAN?	80%	100%	75%
Does the company have a phone system?	87%	100%	84%
Telco installations involve reasonable waits.	15% Disagree	8% Disagree	16% Disagree
Digital circuits are priced at reasonable levels.	16% Disagree	31% Disagree	12% Disagree
Percentage of companies using 2nd carrier.	38%	77%	29%
Percentage of companies using Cable TV.	27%	46%	25%
Companies expecting increase in voice circuits over next five years.	74% Agree	85% Agree	71% Agree
Companies expecting increase in data circuits over next five years.	66% Agree	92% Agree	60% Agree
Companies expecting existing providers to meet future needs.	53% Agree	69% Agree	49% Agree
Companies believing that availability of reasonably priced advanced voice and data circuits will be important to business.	81% Agree	92% Agree	78% Agree
City department with the most recurring contacts.	Library	Planning	Library
City department with the greatest number of total contacts.	Finance & Planning	Planning, Finance, City Manag.	Finance & Library

This data provides useful information on the use of telecommunication technologies by the local businesses which responded.

As shown in Figure 6, local area networks and owned PBX systems are virtually universal among the larger companies in the City. These companies are good candidates for the competitive access and competitive local exchange carriers who have entered the market, intent on serving these high volume customers. Their objective of maximizing revenue per customer while minimizing capital investment is satisfied with this high end market segment.

The smaller companies, also, have a high penetration of LAN and PBX equipment. This is somewhat unusual, yet is indicative of the relative sophistication of this market compared to others in the U.S.

Over 75% of the large users buy services from a second carrier. For smaller businesses, the percentage is 25%. Again, it is apparent that the large users have clear access to competitive carriers while the smaller users are not as well marketed by the CLEC's at this time.

Both large and small companies use Cable TV, but the relatively low penetrations reflect the entertainment nature of cable's core services. The Santa Monica system clearly has not utilized the high bandwidth of its hybrid fiber coaxial network to provide business services at this time.

A wider disparity of response was given to the question about the time it takes to get lines or equipment installed by telephone companies. Overall, 15% were not satisfied with the response time. However, only 8% of the larger users were dissatisfied while 16% of the smaller user were not pleased. This supports the expectation that the competition for top of the market is probably driving higher service quality to that segment of the market. It may also reflect the fact that the larger companies are more likely to employ professional telecom managers whose expectations on installation times have been tempered through experience.

The acceptability of the price of data circuits would appear to contradict the benefit conferred by competition, as shown by a 31% disapproval of data circuit prices among the larger telecom users, while only 12% of the smaller companies are dissatisfied. The difference may be due to the nature of the service demands of the two groups. The smaller users are demanding less advanced and lower priced circuits than the larger users and are therefore more satisfied with current pricing. As the circuit's bandwidth rises above a certain threshold (generally above the T1 category), the circuits are considered more esoteric and the carriers exact a premium for them.⁶ While the CAP/CLEC's may undercut the LEC's price, the higher speed circuits are still expensive, as is their installation cost.

According to the survey, voice circuit demand will continue to rise for all categories of users. This is not surprising for the larger group, but the similar percentage for the smaller group is less predictable and indicative that wire line circuit demand will continue to grow into the foreseeable future. The data circuit demand is closer to expectation with an overwhelming demand among the

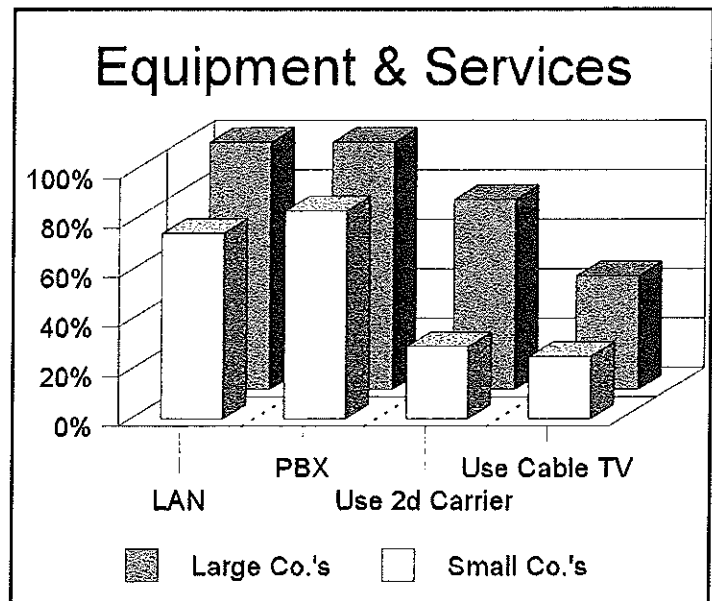
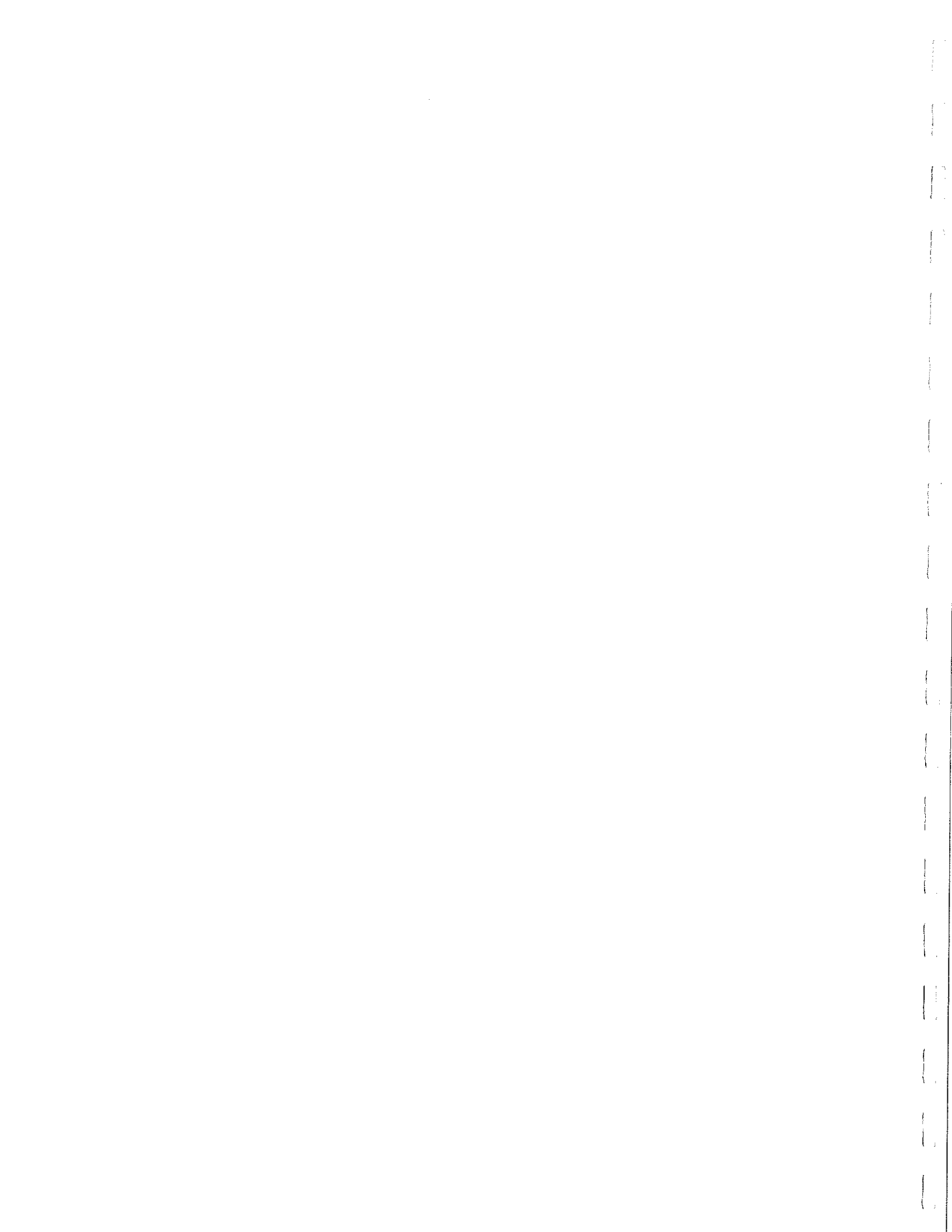


Figure 6

⁶ As explained in the glossary, a "T1" circuit is a telephone circuit that has been specially conditioned to carry high speed computer data at 1.5 million bits per second. This is approximately 27 times faster than the fastest "dial-up" computer modem in widespread use today.



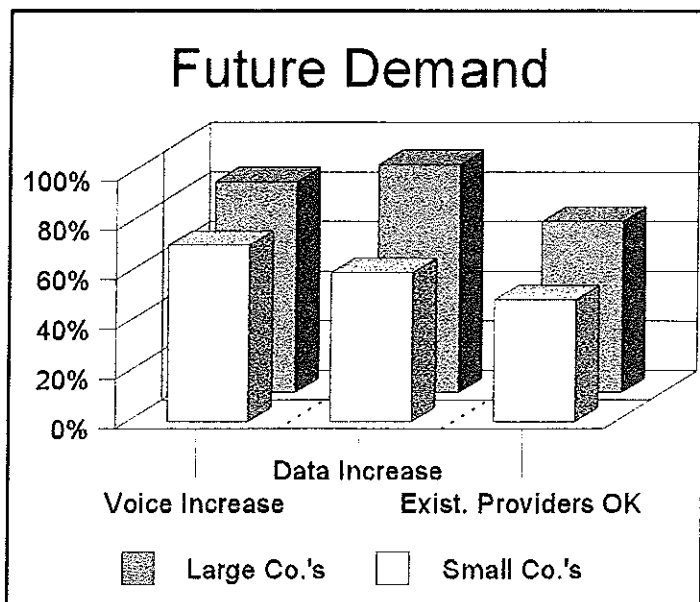


Figure 7

large users (92%) and a more modest demand by smaller users (60%). Figure 7 depicts the companies' projection of future circuit demand by type.

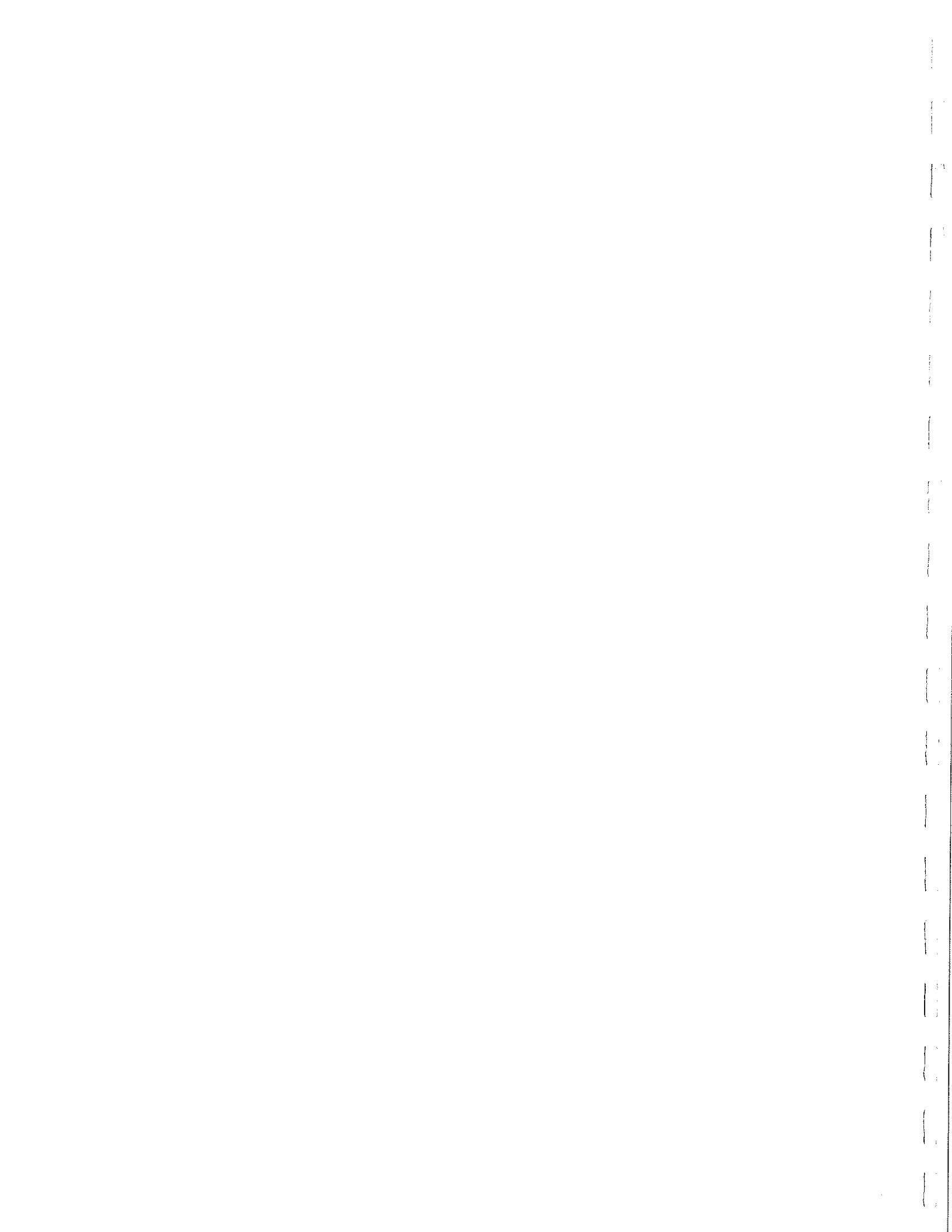
In order to gauge the ability of the current providers to satisfy the future telecommunications demands, the survey asked the opinions of the business users. The results were interesting. As Figure 7 shows, the smaller users were equally divided on the question. As to be expected, the better-served large users were more sanguine. Just over two thirds of them expected the existing providers to be up to the challenge. Thus, the data supports the conclusion that the business community is adequately served by the existing telephone carriers and it does not

suggest that the City should construct a MFN for the purpose of serving the business community in the capacity of a CLEC.

Since there was an overwhelming agreement on the importance of digital service among the larger users, the City must continue to monitor the quality of the existing supply on a periodic basis and, if necessary, take appropriate steps to enhance the telecom infrastructure to encourage the entry of new competitors in Santa Monica. This is supported by the survey data which shows less support, among both large and small companies, for the proposition that existing providers will be able to meet future demands (Figure 7).

Institutional Assessment

The City's Internal Telecommunications Committee (ITC) is composed of department heads and representatives who have background and vision with regard to technology deployment and the delivery of City services. Central to the task of technology application is the requirement to share and distribute information, hence, telecommunications. The ITC has taken a lead role by guiding the project toward the various needs and priorities of the City administration. The City's projects and plans for the development, expansion and repair of its streets, water mains, traffic management systems and other public works projects are often critical elements in the development of a cost-efficient telecom infrastructure. The ITC coordinated the assembly and presentation of an abundance of information about these projects and plans. Its efforts in this area were instrumental in the development of the plans proposed in this report.



Existing Services

The Information Services Division (ISD), in coordination with other members of the technology committee, described the telecommunications needs and expectations of the City's employees. Contrary to MCG's experience in some locations, the vision of this division was generally ahead of the service demands of most of the City staff. Rather than responding to a deluge of demand, ISD has anticipated telecom development and been prepared to propose, install and manage the introduction of new services as they become technologically and economically feasible. Santa Monica has already taken advantage of many of the cost savings opportunities that are sometimes part of a telecommunications plan. For example, the City owns its own telephone switch (PBX) and that has greatly reduced the need to purchase Centrex lines from GTE. Other leading projects being undertaken by ISD that complement the telecommunications plan include:

- Computer replacement and upgrade program which involved over 200 devices in the first year.
- Software version control, essential in the exchange of files over the City network.
- Ongoing City Internet Home Page enhancement.
- City *intranet* development.⁷
- GIS system expansion and distribution.
- City network hardware upgrades.
- Continued capacity increases of the City networks.
- Expansion of e-mail functionality and Internet capabilities.
- Expansion of imaging systems.
- Combining voice and data systems.
- Introduction of client-server technologies.

The City has been a national leader in the electronic delivery of government services. It established the first, municipal, public electronic network in the U.S. ("PEN"). It offers a long list of services that are provided electronically to the public, ranging from access to the Library's catalog, to government multimedia kiosks placed in various parts of the City. Parts of the City's databases are on-line, offering Council agendas and minutes, the Municipal Code, City and Social Services

⁷ *Intranet* is an extension of the Internet concept to the movement of information electronically within an organization using high speed systems and graphical menus whenever possible.

directories, permit information, assessor data and the local business directory. The Plan proposes to leverage these advanced services by offering them via faster, more robust delivery networks.

Department Interviews

As part of the internal needs assessment effort, MCG and staff interviewed representatives from the major City departments. In some instances, the interviewee was the head of the department, in others, it was a senior member of staff. The interviews were structured to encourage a dialogue about the way each department worked today, the way the department could work if telecommunications support was seamless and the future needs of the department. The interview team attempted to avoid discussions about technologies, systems and equipment; rather, it attempted to direct the conversation toward an identification of each department's mission followed by a critical analysis of the functional ways the department worked well and ways it could work better. In the interview sessions, the discussion focused on work methods, work products and possible improvements in the work environment.

One benefit of the master planning process is that it crosses department boundaries in a concerted effort to gather information on the telecommunication needs of the City as a whole. One logical outcome is the determination that certain improvements in the City's telecommunication systems will satisfy needs in a number of departments simultaneously. Another logical outcome is that some departments will have unique needs that can only be satisfied through improvements directed toward the department's requirements.

Set forth below is a short summary of the interviews. It should be noted that some of the needs discussed in some of the interviews may have been satisfied through intervening improvements in City systems, human resources and/or hardware. An effective master plan is a living, evolving blueprint for change and, as such, will always contain components that identified needs that have already been satisfied—especially in an area as dynamic as telecommunications. The language used in the summaries reflects the contemporaneous notes taken during the interviews.

Planning and Community Development

Many of the needs identified by the Planning & Community Development Department related to better communications between field inspectors and the office.

- There needs to be better connectivity between inspectors and the office. Laptops could be used to carry information on buildings being constructed or repaired. For instance, enhanced Building Code compliance could be achieved if an inspector could tell immediately if a building modification was being done according to a permit.
- In addition, it would be useful to be able to download information to laptops in the field, either through a port or via a wireless system. The information to be downloaded would be text primarily, but in some instances, it would be useful to be able to download GIS maps.

- It would also be useful if inspectors could provide a print-out of corrections in the field, or arrange to fax them immediately to the contractor's office.

The department could also improve its overall efficiency if the staff was relieved of providing repetitive information to the general public.

- The office receives numerous, repetitive phone calls for things like building compliance (as part of a sale) and status of an inspection. An interactive voice unit that would provide repetitive information automatically to touch-tone phone users would save a lot of staff time.
- The plan check system has many manual components. Each plan is checked by Street Maintenance; Civil Engineering; and Waste Water Management. The City needs an interactive system that will track an application and monitor its status. If the applicant could check on the status of the plan using a computer or a telephone to access an automated information system, that would be helpful.
- The department could use an automated fax-back system to send out simple documents like sandblasting permit applications and similar handouts.
- It would also be useful if the department could somehow automate the issuance of Residential Building Reports to the escrow agents and/or the title companies registered with the City. These reports must be produced before escrow can close on the sale of a residential building in Santa Monica.
- It would be helpful if the department could send notices to local newspapers electronically. The same can be said for notices that must be sent to the County office in Long Beach and to the State of California in Sacramento.
- It would be useful to automate the issuance and renewal of residential parking permits.
- An automated system used to schedule building inspections and automatically prepare routes for the inspectors each day would be very useful. The same system could provide status reports to building owners automatically.

Finally, a number of suggestions involved upgrades to the City's geographic information system.

- If an inspector could access the GIS data base from the field, she could check easily on the number of buildings permitted for a land parcel, etc.
- The present GIS data base is not updated with all pertinent information. For instance, new buildings are rarely added; street lights are not in the system; and, underground utility locations are not in the system.

- An integrated planning system would automatically trigger GIS updates as projects are completed and this would be beneficial.
- It would be useful to tie the GIS system to a global positioning system ("GPS") for certain tasks. For instance, it would be useful in managing the sign ordinance because you could use a digital camera to record a sign and a GPS locator to provide coordinates to the GIS software. The same systems could be used to locate steel and concrete frame buildings for the earthquake retrofit program.

Community and Cultural Services

The department would like to use technology to get the public involved in government. The department (and the City) use various ways to get public input now: public hearings; focus groups; questionnaires; and random surveys. It would be useful if there were additional ways to gather public views.

The department has the largest number of direct contacts with the public of any City department. It would like to improve the way it interacts with the public by:

- Allowing people to sign up for activities at any City location run by the department. The public can sign up for swimming lessons at the pool now, but they cannot sign up for tennis lessons at the pool. Signing up for classes and other activities through the City's Web site would be useful.
- Creating a master mailing list. There are several lists now that need to be combined.
- Improving access to recreational programs. Recreational programs are spread over three divisions within the department and there are many separate phone numbers for activities as a result. The system should be more user-friendly.

Other needs were identified as well.

- Tree trimming and park maintenance schedules should also be placed on a central data base.
- Complaints about parks, swimming pools, etc. are handled by a complaint specialist who keeps a log. There should be a complaint tracking system that would permit the creation of management reports by site, type of complaint, etc.
- The grant management system involves 60 programs and 30 different organizations. The system needs to be integrated and made simpler.
- The department uses case management software to track services to the homeless. The system works, but it seems unnecessarily complicated.

- The City's cable channel is used by the department. It would be useful if there was a catalogue system for the tapes in the City's video library.

It would also be useful if the capital improvement program was integrated with the operating budget. It is impossible to determine how the department is operating overall unless this is done.

It would also be useful to have CIP on-line so that the status of any capital project could be viewed using the computer network.

Environmental & Public Works Management

This is a large department with a number of work units. For clarity and organization, the discussion has been organized by division.

Engineering

The City is considering a proposed policy on street cuts such that a utility would not be permitted to cut a newly resurfaced street for three years⁸ unless a waiver is obtained from the Director of Environmental & Public Works Management (due to an emergency) and a penalty is paid. The City requires utilities to do a "T Section" type of repair after a street has been cut. This is more expensive than a simple trench-wide patch, but it is more durable and provides better street cover and is one reason Santa Monica has some of the best street surfaces in the Los Angeles basin.

There are a number of CIP projects that may provide opportunities for telecommunications development.

Water Treatment Plant

The Water Treatment Plant is actually located in the City of Los Angeles. The site has its own Meridian switch with a 24 line capacity, of which 14 are in use. There is one off-premise extension from City Hall which is "always busy." Computer connectivity is provided by a GTE-supplied T1 line from the plant to City Hall.

SCADA (System Control And Data Acquisition) connectivity is provided by GTE using a connection from the plant to the GTE central office and from there to nine sites in Los Angeles and Santa Monica. GTE also provides connectivity for an alarm system used by the system. The GTE lines are subject to interruption, often from GTE service technicians who do not realize the circuit is in use (no dial tone apparent) and appropriate one of the circuit elements for a new connection elsewhere.

At times, the servers in City Hall slow down, perhaps due to high traffic volumes. It would be useful if there was greater capacity.

⁸ The policy covers new slurry-sealed streets for one year and resurfaced streets for three years.

Waste Water Treatment is located at the City Yards and it would save a lot of time if there was video conferencing capability between the plant and the City Yards.

Irrigation Control

The City controls the irrigation at 28 sites now, including parks, school sites and the college. To upgrade the system to automatic control would require about 40 phone lines at a cost of \$15,000 a year.

An alternative might be the use of radio, but the capital cost would be high. In light of the need to conserve water, it would be good if the system could be controlled from one place with the ability to monitor each site.

Waste Water

The Northridge earthquake caused substantial damage to the sewer system. Many pipes are cracked. The City has budgeted \$50 Million over five years to repair the system. Most pipes will be re-lined, but some will be upgraded to enhance capacity. For instance, the sewer line on Colorado Boulevard may have to be replaced because it is too small.

Water Main Replacement

The City slowly replaces its water mains over time -- approximately eight blocks a year. Old mains are abandoned in place, but the ends are generally capped and covered with concrete. Many pipe runs have butterfly or gate valves located in mid-span and these are generally closed when the pipe is abandoned.

The City is in the process of working on a project near the southeast corner of the City. This project will replace pipe running toward the Business Park. The project may provide some opportunity to use the old pipe as telecommunications conduit.

There is a project along Cloverfield that will also involve street widening. The project will run from the City Yards north toward Sony and the Water Garden complex. It might be useful for laying telecommunications conduit as well.

Beach Improvement Group Project

There are five capital projects grouped together because they involve the beach area. The projects will include the replacement of street light wiring and conduit in Palisades Park. It is also possible that the irrigation main may be replaced. Both of these projects could provide an opportunity to lay telecommunications conduit.

In addition, the asphalt promenade will be replaced with a concrete promenade. This may provide opportunities for telecommunications conduit.

Traffic Management Systems

The Smart Corridor project, which will enable traffic engineers to move vehicles from the freeways to surface streets when appropriate (among other things), will involve the installation of fiber cable from City Hall to Pico Boulevard, east along Pico to Cloverfield where it will turn north and run into the City Yards.

City Yards

Over 500 employees report to the City Yards each day for work. Most of the employees are members of field, maintenance or repair crews. About 25 employees have desks with computers.

The City Yards contains a number of work groups and facilities including: construction crews for the Water Division; the City warehouse; street repair, parking and traffic crews; Public Facility Maintenance; Fleet Maintenance; Streets Division; Electrical Division; Household Hazardous Waste Facility; small engine repair for recreation and parks; Solid Waste; and a fire training tower.

The phones use mostly Centrex lines provided by GTE. There is connectivity with the server in City Hall, but it operates slowly at times. A faster connection would be nice, particularly with engineering.

Security is provided by a security service. The biggest need for the Yards at present would be video surveillance cameras that were monitored by the Police Department.

Yards management needs a number of updated tools. A maintenance data base covering all 160 City buildings that could be updated at the Yards and at City Hall would be a very useful tool. A similar system should be implemented for field work. The Yards has dispatched a street repair crew to work on a section of street only to find the street blocked off by the Water Department for pipe repair.

An important need is the development of a complete and up-to-date GIS data base. For instance, some of the underground electric maps are linen and go back to the 1920's. The City's GIS data base should have a layer for everything starting with the sewer pipes and ending with the location of overhead traffic light lines.

Training occurs at the City Yards. The Yards does not need a video training facility to connect employees to form a virtual class, but it could use a video training facility to bring instructors to the students.

City Library

The Library is the information provider and community center for the City. The library system consists of the main building and three branches. The Library has an annual budget of about \$5 Million and it has the equivalent of 90 full time employees.

The Library circulates about 1,000,000 books a year. It provides reference services to its customers at the rate of about 32,000 requests a month. Questions come from walk-ins, telephone and by PEN. Telephone requests are usually better than requests by PEN because voice requests are interactive and often people do not articulate their needs well.

The catalog system, which is computerized, can be accessed by terminals in the library buildings and through the Library's computer bulletin board. The Library has a CD-ROM server with a number of reference works on it. Access is from terminals in the Library buildings. It would be better if the information could be accessed from outside. One problem is restricted access and manner of use. Another problem is connectivity and speed. The response time between the main building and the branch libraries is very slow.

The Library is in the process of moving from an old main frame system to a modern client-server system. Two Unix servers have been installed as part of the upgrade.

The Library has several data bases that are maintained for public use. One is the Community Services data base and another is the health services data base.

A number of individual needs were identified. These include:

- Creating a collection of Santa Monica photographic images that could be accessed on-line. The Library's Web page will be used to do this. Response time will be a problem.
- The new ordering system will automatically notify the user when a requested book has arrived. At present, users are notified by mail and this is very slow. Keeps books out of circulation too long.
- The Library provides meeting rooms for public use. It would be really useful if the Library could provide video conferencing between its buildings. This would reduce traffic and save time.
- The new circuits being installed by GTE will permit the Library to connect its phones to the PBX in City Hall via three T1 lines. This should improve the telephone system.
- The Library now offers Internet access to the general public at the Main Library and at the branches. The use of the Internet as a research tool is expected to grow exponentially with time. Internet access is via a 10 Mb/s circuit to City Hall and from there by T1 to the Internet Service Provider.

The Santa Monica City Library has a clear mission to participate in the dissemination of information to the City's residents. The Library has, for example, proposed a service using local students as "Information Navigators" to assist others in the use of electronic library systems (see Exhibit G). The Library's objectives include the support of lifelong learning and advancing universal access of telecommunications services to the City's residents. In order to further this objective, the

availability of bandwidth is critical. The Library has leased additional bandwidth from GTE to provide high speed access to the Internet and to provide better connectivity between its branches and the main library facility. The demand for speed and capacity will continue to grow. The management of the demand and control of bandwidth cost will become an important consideration for the library system in the fulfillment of its mission.

Finance

Up-to-date telecommunication services are vital for a healthy local economy. Major portions of the City's General Fund revenues such as the Sales Tax, Business License Tax and Transient Occupancy Tax (hotel/motel bed tax) depend on a healthy local economy. Currently, there are about 19,000 businesses licensed to do business in Santa Monica. Of these businesses, about 12,500 are located in Santa Monica, and about 8,000 are other than apartment owners.

A major and growing component of the local economy is the entertainment industry and its associated businesses which heavily rely on the availability of state-of-the-art telecommunication services.

Should the federal and/or state government pass legislation establishing a "tax free" Internet environment, major portions of City revenues could be adversely impacted. The development of such legislation should be carefully monitored.

Internally, the availability of state-of-the-art telecommunication services is essential for full implementation of the City's new automated financial management information system. This new system will be fully Internet enabled. The Finance Department plans to aggressively implement Internet commerce to improve customer service (such as accounts payable and purchasing transactions), improve the productivity of all City staff, and realize cost savings.

Transportation

The Santa Monica bus system is widely used throughout the LA area, not just in Santa Monica. The department is developing a Transit Mall at the foot of Santa Monica and Broadway. The Mall should have kiosks that could be used to call up bus schedules, but that could also be used to find information about area businesses and restaurants. If the kiosks were tied into the City's computer system, a customer could reserve a library book while waiting for her bus, or transact other business with the City.

The Transportation Building, located off Olympic is connected to City Hall for both telephone and data using GTE provided lines.

In the future, automated vehicle location systems that use satellites and radio to locate busses on a real-time basis, could be tied directly to the kiosk system so a passenger could see exactly where the next bus is at any time.

Buses will be equipped with voice and data systems in the future.

The bus yard is busy 24 hours a day. Nevertheless, security could be improved. It would be nice to have a pervasive video surveillance system that was monitored in a central location, perhaps the Police Department.

Police Department

The department operates from City Hall, but it also has a substation at the Municipal Pier, the 3rd Street Promenade and at Virginia Park. There is also a kiosk on the Promenade and an annex at the Transportation Building. The connectivity between the main station and the substations needs to be upgraded to be faster and more reliable.

The department uses data channels to feed information to mobile data terminals ("MDT's") in the squad cars. The data channels is often bogged down due to high use. It would be very useful to have a better system. It would also be useful to be able to transmit real-time video, even if it was only 30 frames a second.

The department uses surveillance cameras in the jail facility now. The quality is not good and the system should be upgraded.

Cellular phones are sometimes used in field situations when the radio would be inappropriate. There are "dead" cellular spots within the City and this is a problem. The department needs a secure and reliable radio system. It would also be useful to be able to deactivate a hand held unit that has been lost or stolen. This cannot be done now.

It would be useful if suspect photographs and field notes could be sent to officers in the field. It would also be useful if building floor plans could be sent to field units in certain situations. The department would also like a system that would match an officer to a car. It is sometimes difficult to know immediately which officer has taken which patrol car.

The department would like to install GPS systems in the patrol cars. It would be helpful in circumstances where an officer has requested assistance during a vehicle pursuit.

Communication across jurisdictions is much better than it used to be, but it is still not perfect. It would be helpful if the dispatcher could change radio frequencies during a mutual aid situation. The City's emergency radio system needs to be upgraded.

The department uses an automated voice response system for handling routine calls. It also uses voice mail and has a page on the City's Web site. Parties can file a petty theft report on the Web site and other uses may be developed in the future.

Fire Department

There are four fire stations located in the City and there is a training facility at the City Yards. The main Fire Station is located on 7th Street between Santa Monica and Broadway. Paramedical services constitute the greatest percentage of responses each year.

The department does not use computer-aided dispatch at this time. It also does not use MDT's in the department's vehicles. Its phones are connected to the City's PBX at City Hall. The department primarily uses personal computers which are connected from site to site by frame-relay circuits supplied by GTE.

The trucks carry information on the 18 largest hazardous material sites in the City. The total hazmat records exceed 465 and the rest are not carried routinely in the trucks. The department also has information on about 120 buildings in the City located in a pre-incident data base. It would be useful if hazmat information could be downloaded to command cars at an incident. While it would be useful to download the pre-incident reports as well, the fire fighters need to carry a copy of this material in their pockets at a fire scene. Therefore, an electronic image on a MDT would not be good enough. A print-out would be helpful.

If at all possible, it would be helpful to be able to download and print out information from the City's GIS data base at a fire scene. Ideally, a commander could obtain information from permitting, licensing, hazmat and pre-incident planning by clicking on a map location. Today, the department does carry fax machines in the hazmat or Chief's vehicle which can receive information from the closest fire station (which has inspection responsibility).

Communications between fire and police is acceptable now. One problem is that fire cannot listen in on 800 MHZ calls without using walky talkies now. It would be helpful if the truck radios could receive fire frequencies (154 and 400 MHZ) as well as police at 800 MHZ.

The ability to communicate outside the City public safety organizations could be much better. The department needs to communicate with County and with other fire departments at times.

The department would also like to be able to send real-time video from the field. This would be especially useful in hazmat responses so the video could be transmitted back to the emergency operations center located in the police department.

The department could use video conferencing for training purposes. It would also like to be able to access the City's payroll and finance data bases from the main Fire Station.

Resource Management

Resource Management is located in four different locations with principal offices at the Santa Monica Airport. Current field communications through dedicated air frequencies, shared frequencies and common walkie talkies are acceptable now. However, the Resource Management Department

offices at the Airport, Pier, City Hall and the Pico/Cloverfield multi-tenant venue need to be connected by high speed circuits.

In its capacity as liaison to the Westside Small Business Development Center, also located at the Airport, the department is in need of video conferencing for training and educational purposes. Many daily vehicular trips by members of the business community could be reduced or eliminated by provision of such service.

Home based businesses are becoming an important, emerging segment of the community. The department has heard considerable interest from that sector for fast Internet and wide area network access so as to expand the presence in the local marketplace.

As the department explores further non-financial assistance to strengthen the City's various commercial districts, it is apparent that provision of high bandwidth access will become more critical to local businesses in coming years.

Information Services Division

ISD is a division within the City Manager's Office. Nevertheless, because it is so critical to the Master Planning process, it was treated as a department during the department assessment process.

ISD is in the process of upgrading the 810 personal computers in the City to Pentium based machines. The upgrade will be completed in fiscal year 1998/99 and is part of the City's ongoing computer replacement program. At the same time, the network cards in the machines are being upgraded to accept 100 Mb/s Ethernet connections to the City's local area networks ("LAN'S").⁹ ISD believes the City's development of a sophisticated GIS data base and the increased reliance of management on access to the financial, payroll and other City data bases will necessitate the use of high speed Ethernet connections within City Hall and between City Hall and other City buildings. The presence of a high speed network will also permit the City to move to an image-based records system in the future.

The City relies on GTE to provide connectivity between City buildings except for a City-owned fiber run connecting City Hall with the Civic Auditorium. A fiber circuit from GTE has just been installed between City Hall and the Main Library. This circuit, which is expensive, will provide 10 Mb's Ethernet connectivity between the two sites. Most sites, however, are connected via partial T1's - many at 256 kb/s or less.¹⁰ In order to provide useful access to the GIS data base, the remote user should be connected via a 10 Mb/s circuit at a minimum, and a 100 Mb/s circuit will become necessary if the GIS system is accessed by numerous remote users simultaneously.

⁹ Ethernet is a system transmitting information between networked computers. Regular Ethernet moves at 10 Mb/s (millions of bits per second) and moving to 100 Mb/s will provide much greater speed.

¹⁰ As noted earlier, a T1 circuit carries data at 1.5 Mb/s. Sometimes a T1 circuit is broken down into multiple, slower circuits. A 256 kb/s (thousands of bits per second) circuit is one of the subdivisions that has become standard. It represents about 1/6 of a T1.

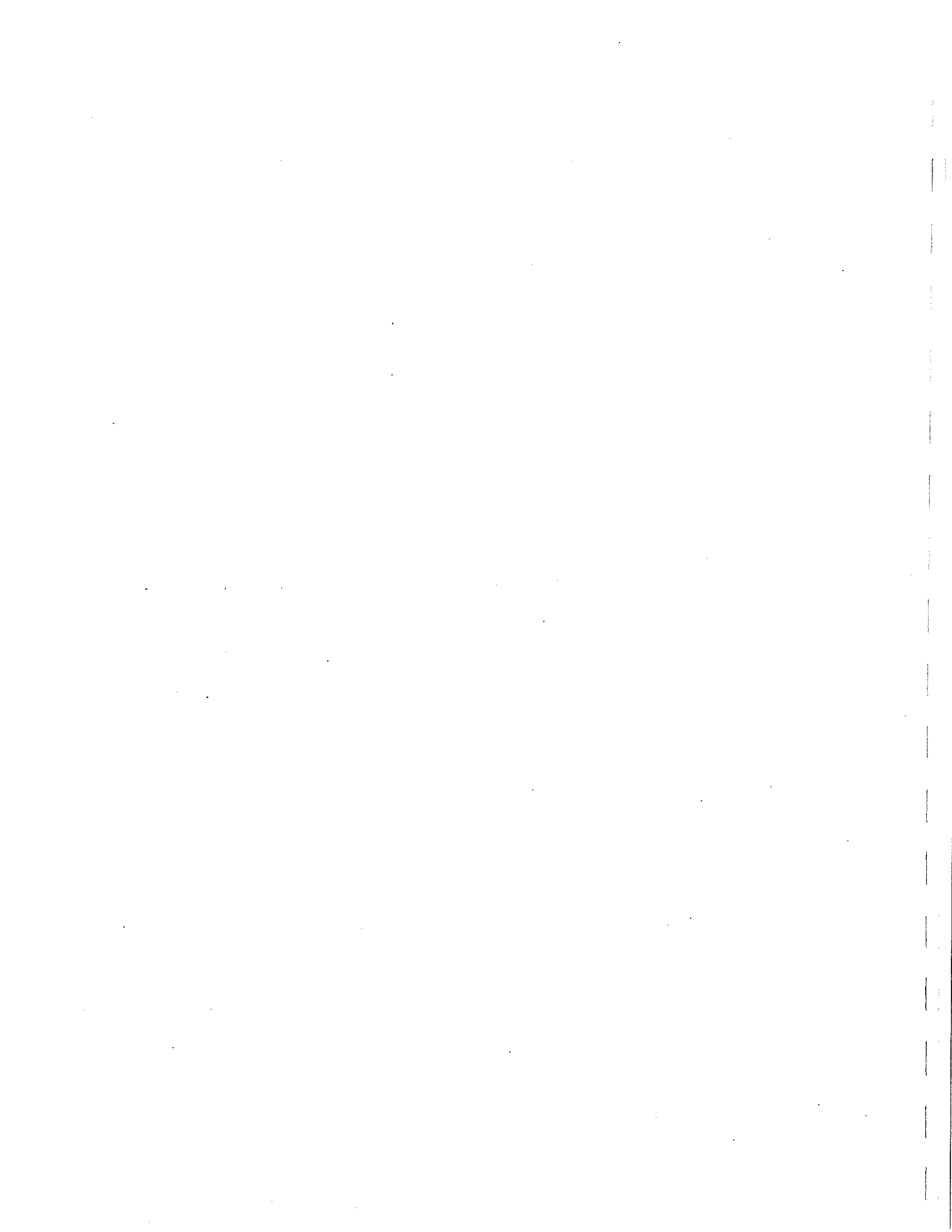
Other systems will require high speed access. For instance, the present CD-ROM service at the branch libraries is very slow due to the graphical nature of the information transmitted. It would be nice if high speed circuits could be used.

ISD believes the following City sites should be connected by fiber so that high speed Ethernet circuits can be installed at:

- The Main Library (and its branches). The uses will include imaging, CD-ROM access and catalog access.
- The Utilities Division (5th Street) and Yards. The uses will include T1 for voice, GIS access, voice recognition software and the new utility billing system.
- The City Yards. The uses will include imaging, GIS access (five stations possible), T1 telephone lines and access to the Financial Management System ("FMS"). Video security is also a need.
- The Transportation Building. The uses will include access to GIS, FMS and payroll systems. In addition, there is a need for video security there.
- The Airport. The uses will include access to the FMS, payroll and GIS data base by Resource Management, video surveillance and T1 lines for the phones.
- Fire Headquarters. The uses will include access to the GIS data base, payroll, fire incidents and FMS.
- Finance. The uses will be centered on the FMS, payroll and imaging systems, but will also include T1 lines for telephones.
- The Pier. The uses will include video surveillance and T1 for telephone. Other uses will include access to the FMS, GIS, payroll, business license and toxic management systems.

If the principal City sites were connected with a fiber network, ISD could move the remote servers to City Hall, centralize server maintenance and focus emergency service to one site. Network reliability will be substantially improved. Satisfaction with network performance will be improved significantly as well.

Finally, if a fiber ring were established in the City, the City's critical systems would be connected via a self-healing fiber network that would provide far more reliability and security than is available from the public telephone network. The "self-healing" description comes from the basic ring design, which moves every piece of information simultaneously on two separate optical fibers – one moving in clockwise direction and the other moving in a counter-clockwise direction. If the ring is cut, every service point on the ring will be still be connected by one fiber or the other.



III. TELECOMMUNICATIONS SUPPLY IN SANTA MONICA

To set the context for the efforts taken to ascertain the telecommunications services available in Santa Monica, a short review of the legal and economic structure of the telecommunications market in California is appropriate.

An Overview of the California Telecommunications Market

The telephone market place in Santa Monica is experiencing the emergence of new competitors to the incumbent local exchange carrier – GTE. The City has issued permits to AT&T, MediaOne, and Teleport Communications Group (TCG) to install fiber optic cable in the streets. While AT&T is a well-known long distance carrier, it has been certificated by the California Public Utilities Commission to provide local telephone service throughout the state. In addition, MFS and Nextlink Communications are building and operating fiber optic networks in Southern California. These companies, referred to generally as “competitive local exchange carriers, or CLEC’s,” are well-financed, have experienced telephone management and are rapidly expanding their networks to reach large business customers as the first phase in their strategy to capture market share from Pacific Bell and GTE.¹¹

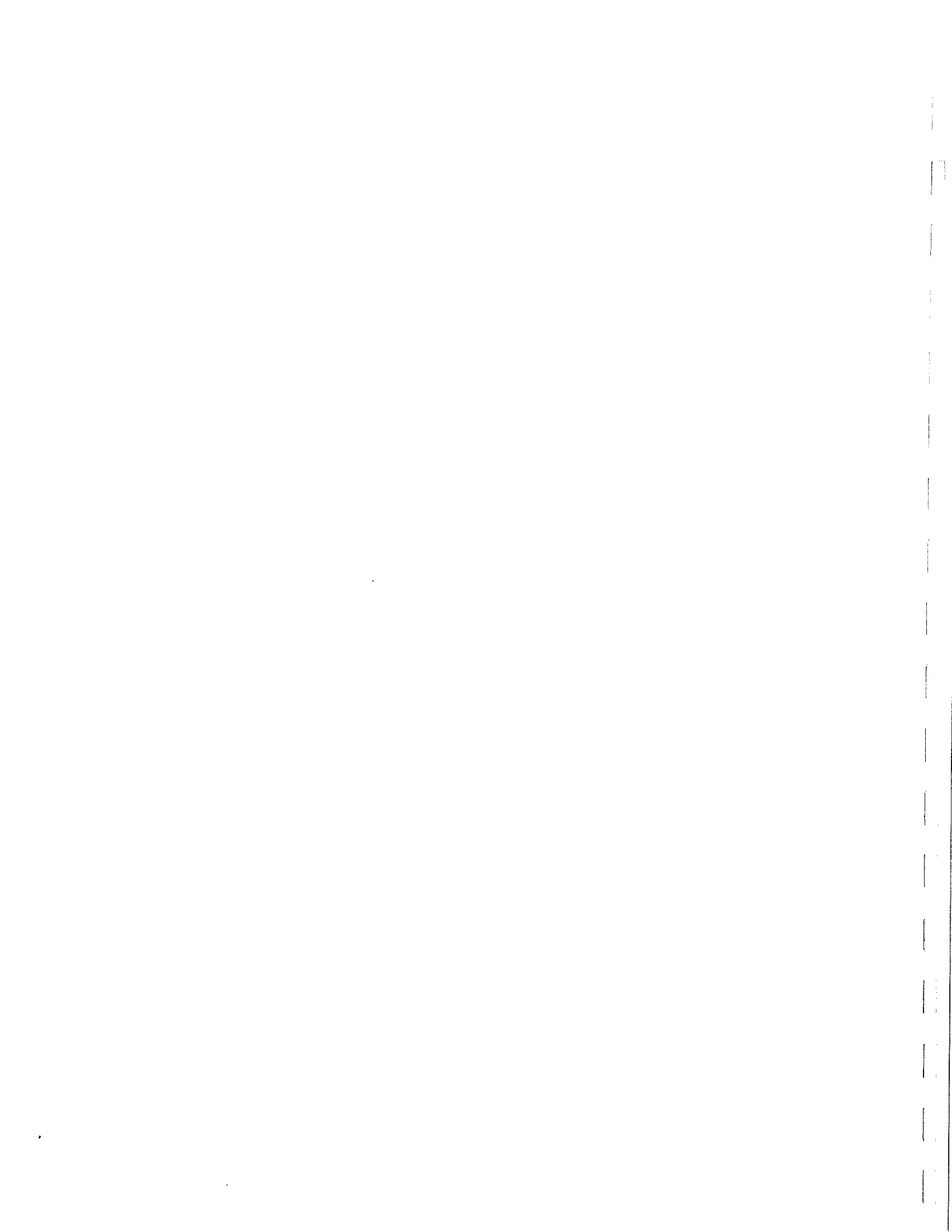
The video market place has not experienced the same degree of competitive activity at this time. The City’s public survey, discussed in detail in Section II herein, revealed that Century Cable, the incumbent cable operator in Santa Monica has a 58% penetration of the market while direct broadcast satellite services, including DirecTV and Echo Star, have less than a 2% share. In addition, PacBell has invested in a local, terrestrial microwave video delivery company and could provide some competition in the future.¹²

While it is possible that competing cable television companies may seek to compete with Century Cable in the future, the City has not experienced any activity in this area to date. Santa Monica, however, has been the focus of activity by several competing telephone carriers. This section, therefore, will focus on competition in the telephone market place.¹³

¹¹ The City has also met with representatives of PacBell, which is a competitive local exchange carrier in GTE’s local wiring service areas – which includes Santa Monica.

¹² After its acquisition by SBC, PacBell abandoned its efforts to compete with cable via its own hybrid fiber coaxial network. The company has issued an RFP seeking to sell the assets in San Jose, Orange, Santa Ana and San Diego to the highest bidder. While it has announced its intention to proceed with its microwave video companies, there is speculation that PacBell may well abandon this effort as well.

¹³ Century Telecommunications, an affiliated company to Century Cable, is a certificated telephone company in California and is providing telephone service to at least one customer in Santa Monica.



Early Competition in the Telephone Market

The Telecommunications Act of 1996 opened the telephone market to competition in a meaningful way for the first time. While this report will not go into details of the Act, it is important to note that the Act was a political compromise between the existing monopoly carriers, the seven regional Bell operating companies (like PacBell), and the long distance companies (like AT&T and MCI). The local exchange carriers ("LEC's") already carry long distance traffic on their networks, but they carry it for the long distance companies. Without a significant capital investment, the seven Bell companies could carry the same traffic, or a portion of it, for their own benefit and capture the revenue that now flows to the long distance carriers.

For their part, the long distance carriers want to enter the local telephone markets -- which can be more than twice the revenue size of the long distance market, depending on the territory. The Act established a pathway for achieving these objectives. First, recognizing the difficulty any company will have in duplicating the imbedded local telephone networks, it opened the local markets to competition from new entrants -- including the long distance carriers. Then, if the local telephone market becomes competitive to a minimal level established by the Act, the local telephone companies can enter the long distance business in their territories.¹⁴

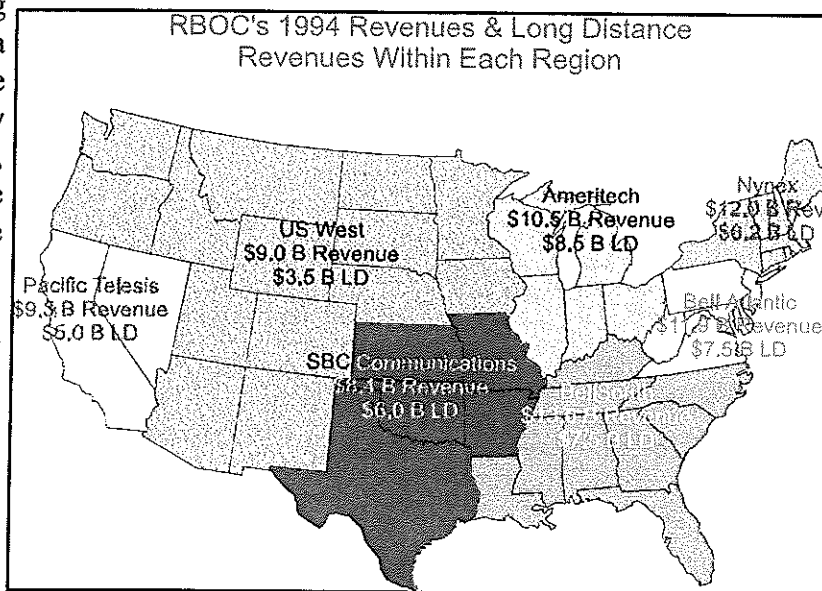


Figure 8

The potential revenues for the local telephone companies are substantial. For instance, approximately 40% of all long distance calls that start in California end in California. PacBell sometimes carries these calls *entirely* on its network, yet it must split the revenues with the caller's long distance carrier. If PacBell became both the local and long distance carrier for the customer, it could keep all the revenue. Given its name recognition, PacBell has a significant incentive to enter the long distance market. Figure 8 shows the revenues earned in 1994 for local telephone service and for long distance calls in each of the seven Regional Bell Operating Company's ("RBOC") service areas. The ratio between these two revenue groups has remained essentially constant since that time.

¹⁴ It should be noted that GTE already offers long distance service given its "special" status as a non-Bell local exchange carrier. Similarly, Sprint offers local telephone service in several areas of the United States as a result of their merger with United Telephone years ago. Las Vegas is Sprint's largest local serving area. It also serves a number of communities in the Midwest.



For the long distance carriers, the local markets provide two compelling attractions. First, it will permit them to enter a far more stable competitive environment that has a larger revenue base and is very close to their existing core business. Customers are not as prone to switch local service as they are to switch long distance companies.

Second, the long distance companies believe that they will be able to satisfy their customers better if they can provide *all* telephone services. Like the local Bell companies, the long distance carriers want to provide one-stop shopping for their customers.

The future thus holds significant competition for business telephone customers. Any number of companies will compete in the business telephone market first. Indeed, the Santa Monica business survey, discussed in detail in Section II, showed that 39% of the survey sample already used a second telephone company.

Competition for residential, wireline service is likely to come much more slowly.¹⁵ The cost of duplicating the local telephone network in the City's neighborhoods is a financial barrier that even the largest companies probably will not hurdle.¹⁶ Competition, if it comes, will surely come from competitors that will resell the "local loop" already established by GTE and PacBell in California. The 1996 Telecommunications Act requires the dominant local exchange carrier in a service area to offer its network elements to new competitors so that competition can begin before the incumbent LEC's network is overbuilt.

Examples of the New Competitors

As noted above, there are a number of new telephone companies in California. In fact, the CPUC has issued a list of over 75 new companies certificated to provide local telephone service in California. These companies are divided into two categories: (1) companies that will compete with the incumbent local exchange carriers by (a) investing in their own networks and (b) by leasing components of the LEC networks at wholesale and reselling the same components at retail; and (2) companies that will compete *solely* by reselling network components leased from the local exchange carriers.¹⁷

¹⁵ Competition for local service, both residential and business, is present and very active in the wireless area. At the moment, however, the wireless carriers have not priced their services to compete for plain old telephone service ("POTS"). At one point, Cox Communications was testing a pricing strategy for PCS that would have charged a basic rate for wireless calls from the home and cellular-like charges for calls away from home. This pricing strategy has not been implemented yet.

¹⁶ In an interview with the City staff, a representative from PacBell confirmed that the company did not intend to overbuild the GTE local network "in the foreseeable future." In a similar interview with another city in which MCG was present, an AT&T representative expressed the same sentiment.

¹⁷ Competition through resale will develop slowly. The incumbent LEC's have filed numerous law suits challenging the pricing formulas established by the Federal Communications Commission. The LEC's want the prices to be close to retail and the network blocks subject to resale to be large, consisting of as many network elements as possible. The CLEC's, in contrast, want the networks to be broken.

In order to appreciate the development of the competitive market, this report will focus on three of the new carriers who will offer facilities-based competition to GTE and PacBell. With one exception, these companies started building fiber networks *before* the 1996 Act deregulated the local, switched telephone markets. They did this by becoming Competitive Access Providers ("CAP's") and bypassing the local telephone networks to connect large long distance users directly to their long distance carrier's network.

Competitive Access Providers

The economic engine that drives the CAP business is the presence of "access" fees that are collected by the LEC's for originating and terminating long distance calls for the long distance carriers. These fees are a remnant of the break-up of the old AT&T network and were designed to compensate the local carriers for carrying AT&T's traffic. At the time the access fees were established, there was no serious competition in the long distance business and it was felt that the fees were necessary to protect the LEC's and to promote long distance competition by leveling the playing field for companies that did not have AT&T's close relationship with the seven RBOC's.

Under the access fee scheme, for each dollar of long distance revenue earned by a long distance carrier, approximately 20¢ was paid to the local carrier that connected the caller to her long distance carrier and approximately 20¢ was paid to the local carrier that provided the local connection to complete the call at the other end. If the long distance company's call was carried by a CAP from the customer's premises to the long distance company's point of presence in the local market, the first 20¢ was saved. If the terminating end was handled the same way, almost 40% of each revenue dollar was available to split between the caller, the CAP company and the long distance company. The avoidance of access fees drove large long distance customers (airlines, direct mail companies, large corporate headquarters, etc.) and their long distance carriers to support the development of the CAP fiber networks in local markets. MFS Communications is widely recognized as the first major CAP company in the U.S.

As the result of the passage of the 1996 Act, the FCC is in the process of re-examining the access fee structure. It is likely that access fees will disappear as local competition develops. Nevertheless, the fiber networks built by the CAP's, who are now CLEC's in California, will become the back bones for facility-based competition to the incumbent local telephone companies in many markets, including Southern California and Santa Monica.

down to their smallest elements and want the prices for each element to be far below their "retail" price.

Competitive Local Exchange Carriers

A short discussion of three CLEC's is set forth below.

MFS Communications Company, INC. (MFS)

Until 1996, MFS was an independent public company, trading under the symbol MFST on NASDAQ. It was started by Peter Kiewit Sons' in 1987 and has multiple wholly-owned subsidiaries including MFS Telcom, which operates the CLEC business.

Today, MFS operates networks in 41 locations in the United States. Its expansion rate has been high given that it served only 14 markets at the end of 1993. Its revenue doubled during 1994 rising from \$141 million at 12/31/93 to \$287 million at 12/31/94. By the end of 1995, its revenue rose to above \$470,000,000. In April 1993 it employed 654 compared to 2,971 at year end 1994. MFS has been built through a combination of acquisition and system construction to its present size.

MFS is expanding the breadth as well as depth of its market as it prepares to enter the local wireline phone business. It has been positioning itself since 1993 to move beyond the competitive access ("CAP") service on which the company was founded. Under the new California competitive local telephone rules approved July 24, 1995, MFS petitioned the California PUC for permission to provide full telephone service statewide.

Shortly after the California Public Utility Commission issued its new rules governing competition in the local loop on July 24, 1995, MFS, on behalf of a subsidiary, MFS Intelnet Inc., filed an application to compete directly with GTE and PacBell. In the application, MFS indicated that it had established CAP networks in Los Angeles, Oakland, Orange County, San Diego, San Francisco and the Silicon Valley

In 1996, Worldcom, a young and rapidly expanding long distance carrier, purchased MFS for \$14 Billion.¹⁸ In 1997 the same company announced the acquisition of MCI for \$37 Billion and another CLEC company, Brooks Fiber, for \$2 Billion. The MCI acquisition is expected to close in mid-1998. The Brooks Fiber deal closed in January, 1998. MFS and Brooks logically will become the local network base for MCI and Worldcom in California and elsewhere.

¹⁸ Worldcom also purchased UUNet and, as a result, claims to be the world's largest Internet Service Provider. In February, 1998, Worldcom purchased CompuServe from AOL, further adding to its Internet service business.

Teleport Communications Group (TCG)

TCG is a CLEC company owned by a group of cable television operators, as follows:

TCI	30%
Comcast	15%
Cox	22%

Continental Cablevision used to own 20% of TCG, but divested its interest shortly after its acquisition by U.S. West.

Like MFS and Brooks, TCG operates on a national scale. Besides participating with its members' owned cable systems, it has created joint ventures in different major markets with the local cable operators, even if they are not among the TCG owners. This strategy was basic to the launch of TCG, because it used the facilities, and networks of local operators on a shared basis. Whenever possible, TCG still follows this strategy. The network costs and logistic hurdles are reduced for the CLEC, while the operators acquire a potential revenue stream and learn about the telephony business from the inside.

Until very recently, TCG was not a publicly traded entity, allowing for little financial information. MCG has gleaned the following information from various sources available to it. At calendar year end 1992, TCG had estimated revenues of \$75 million and had 450 employees. Merrill Lynch predicted that the revenue would rise by 85% from 1993 to 1995 and that income would be negative until 1999, assuming no debt is carried. Merrill projects a negative NPV on TCG's investment of \$460 million through the year 2004 at a modest 12% discount rate. The investment only becomes positive after a residual market valuation is considered.

As of mid-1995, TCG was serving 21 major markets in the U.S. Many of those markets coincide with the market specific licenses won by the PCS wireless consortium called Wireless Co.. As discussed elsewhere in this report, Wireless Co. is an attempt by Sprint, TCI, Cox and Comcast to enter the local telephone service business with the newly developed, recently auctioned, cellular like phone service. The consortium also intends to market a wireline phone service in some of these same markets and others. This service would directly compete with Pac Bell in the California market and especially in the Bay Area where TCG already has an under-utilized switch in service.

The senior management of TCG comes from AT&T. AT&T has also been one of TCG's largest business partners in its CAP business. For a long time, TCG has been considered a logical acquisition target for AT&T in spite of its nexus with Sprint (through the wireless venture formed by its cable owners). In January, 1998, AT&T announced that it had reached an agreement in principle to acquire TCG.

Nextlink Communications

Nextlink Communications is the newest of the CLEC's discussed here and the only one that did not start out as a CAP. Nevertheless, since it was started by Craig McCaw, the single largest

shareholder in AT&T, its pedigree is quite good. Nextlink purchased the 80 mile fiber network built by Linkatel in Southern California, has expanded the fiber plant to almost 200 miles and has begun to provide CAP type services in eleven Southern California cities. About five months ago, it activated a Nortel DMS-100 switch in Santa Ana and will use the switch as the basis for providing CLEC services to businesses located along the fiber network. Nextlink will soon install a second Class 5 telephone switch on the fiber network it has created.

The company's expressed market goal is to serve mid-sized businesses that will be passed over initially by the other CLEC's as they rush to secure the largest business customers. The company intends to establish its reputation for providing good service to this market niche before the competition spills over from the larger business market.

Nextlink recently went to the public debt market with a series of corporate bonds. It sought to raise \$350,000,000 and the bond series was over-subscribed by a very healthy margin, reflecting the market's confidence in the developing CLEC business and in Craig McCaw's management. It is likely that Nextlink will be very active in the Southern California market in the next several years.

Given McCaw's nexus to AT&T, it is very possible that this company will be acquired by AT&T within the next five years.

The Business Opportunities in Santa Monica

Two of the three CLEC's discussed above, MFS and TCG, provide service to customers in Santa Monica today. The third company, Nextlink, is expanding its fiber network in several West Side cities at present and will likely enter Santa Monica in the next year or so. As noted earlier, the business survey indicated that 39% of the companies surveyed already take service from more than one telephone carrier. Clearly, competition in the business telephone market has already come to Santa Monica.

Moreover, the level of satisfaction expressed by the businesses surveyed was positive. Most companies are satisfied with the level of service being provided by GTE. Therefore, in its economic modeling, MCG did not assume that a new carrier would capture significant segments of the business telephone market merely by building yet another network in the market.

The residential market will be served primarily by the incumbent LEC for the foreseeable future. As noted earlier, and as MCG's economic modeling predicts, overbuilding GTE's local telephone network in the neighborhoods would be a very expensive capital undertaking. That is why AT&T, PacBell and other logical overbuilders have not started competitive local, residential networks in Santa Monica, or elsewhere. If the City were to decide to establish a competitive, local residential telephone service in Santa Monica, it would do so on the social benefit to be derived from the investment, not from the economic return.

Finally, there doesn't seem to be a ground swell of dissatisfaction in the residential market over the telephone service provided by the incumbent LEC. When asked the open-ended question, "What

telecommunication service would you most like to have?" in the general public survey, only 2.5% of the sample indicated that they wanted service from another phone company.

The research done on the overall legal and economic state of the telephone market in California and the information collected in the business survey and general public survey did not obviate the need to talk with the existing providers. For one thing, the relative satisfaction with the existing market does not guarantee satisfaction in the future where the same surveys suggest that demand will be greater and the types of services requested will be more sophisticated.

In addition, there are on-going issues relating to permitting, right of way management and the satisfaction level of the carriers as customers of City services that needed to be investigated. Therefore, MCG and the City staff conducted a number of provider interviews.

Provider Interviews

In order to estimate the current and future supply of telecom services in Santa Monica, MCG and the City staff interviewed several existing and potential providers in the City. The interviews were held to discuss various issues surrounding the relationship between City Government and providers to all sectors of the City, including right of way issues and current and future service offerings. The City also used these discussions to explain the purpose and scope of the Master Plan, to invite comment, contribution and potentially to elicit partnership suggestions. MCG and staff treated the specifics of this information confidentially, and used it to help determine the telecommunications market conditions in Santa Monica, from the perspective of current and future providers. This market research also enabled MCG to characterize the supply of services from the perspective of the users.

The basic agenda followed at most meetings included the following:

Introduce Master Plan Concept:

- Discuss the needs assessment process undertaken to determine how businesses, not-for profit institutions, city government and residents perceive the scope, quality, cost and value of services that they receive or hope to have.
- Explain the City's need to learn of existing providers' objectives and plans so the City can determine whether it can properly use its regulatory powers to support and enhance the new services to be provided in the community and so the City can project needs for and manage access to its rights of way.

Topics & Questions for Discussion:

- How many Santa Monica households and businesses are offered service and how many do they serve?
- Are there ways that the City can better facilitate the provision of service by this and all competitors?

- Are there major changes coming to the existing service that will effect the value or perception of value by their customers?
- Are there any new services that are being planned for launch?
- Would the provider consider a joint venture or similar relationship with the City? If so, would they encourage or answer an RFP that invites a joint venture with the City to share a common infrastructure including conduit and fiber?

The interviews were, at times, difficult and yet were rewarding overall. The carriers were very sensitive to revealing "competitive" information to a public body. In the end, however, quite a bit of information was exchanged, particularly information that related to rights of way management issues. A summary of the providers interviews is appropriate given the confidence in which the information was offered to MCG and City staff.

Residential Voice Service

One of the most significant pieces of information gathered is that there is no single provider, other than GTE that intends to offer voice service to Santa Monica residents. While it is not a surprise that no provider has immediate plans to compete with GTE for this market segment, it was expected that some provider would be considering such service in the near or distant future.

The lack of immediate competition in the residential phone market is logical, however. Unlike large, commercial customers, who often pay substantial fees for data, voice and video services, individual households pay a relatively modest amount for all these services. The relatively small revenue per customer and the relatively large capital costs involved in reaching each customer make the home market a difficult one to serve without the revenue support of many large business customers using the same network. Ironically, the fractionalization of the business telephone market through competition will make it far more difficult for a second carrier to duplicate the local telephone network in the residential areas of Santa Monica.

Video Entertainment Service

At this time there is no evident wireline-based competition for Century's cable-delivered entertainment services. Pacific Bell's MMDS entertainment service, which is available in other parts of Southern California, currently is not being promoted in Santa Monica. There is speculation about the interest of Pacific Bell and its new parent, SBC, interest in further development of the MMDS technology.

An Open Video System certificate holder, Digital Broadcasting OVS ("DBOVS") has indicated an intent to provide various services to Southern California communities, including Santa Monica, through ADSL technology. ADSL, or asynchronous digital subscriber line, is a telephone

technology that permits the carriage of a video signal through a "regular" telephone line. The technology is under development, but has not been deployed, except in technical trials.¹⁹

DBOVS has indicated that it will use ADSL to deliver entertainment video to residences, but it is unlikely that the service will be available in the near future. Thus, for the moment and into the foreseeable future, like GTE in voice, Century will be the sole land based provider of entertainment telecommunications services in Santa Monica. As is demonstrated in the model and analysis section of this report (see Section V, *infra*), wireline telecommunications services to residential customers will be an expensive business to launch.

It is possible that at some future date GTE will enter the video entertainment market by delivering services through the construction of a hybrid fiber coaxial network, or through the use of ADSL technology. The former would require a major investment for the carrier, but remains a feasible, if distant possibility. The use of ADSL is more likely, but the service might well be limited to high revenue program streams, like video on demand, that would better justify the necessary investment. Such offerings will be welcomed by some local customers, but they do not compete across the spectrum of services identified with cable television.

Today, Direct Broadcast Service (DBS) offers the only immediate competition to Century for telecommunications entertainment service in Santa Monica. Its satellite service is available to every single-family residence in the City. While the cost of equipment and lack of local television stations has been an impediment to mass sales, it is now possible for residents to choose their entertainment service provider. Three competing DBS providers are available nationwide, DirecTV, EchoStar and Primestar. All have generally comparable program offerings and represent direct product substitutes for each other and traditional cable television.

High Speed Data Service to Residences and Small Business

Electronic data service to the home and small business in Santa Monica and most of the nation is the province of the local exchange carriers through the use of the traditional telephone copper plant. Dial-up modem access to the Internet, for example, is sufficient for low data speeds and services like e-mail. However, it is too slow for large file transfers such as video or audio clips. New systems are being launched by the cable industry and the LEC's using cable modem and ADSL technology, respectively. Neither is available in Santa Monica today and by the evidence, neither will be offered for approximately two years. The time table may change if the data services offered elsewhere in the nation are very successful, or if one provider starts to move sooner than expected. Neither wants to lose the market opportunity, yet neither has committed to make the investment today.

¹⁹ There are several types of digital subscriber lines. They are sometimes collectively referred to as "XDSL" where the "X" stands for any of the various types.

Voice, Video and High Speed Data Service to Large businesses and Institutions

While residents have few telecommunications service choices, businesses and other large institutions have several. As a result of the AT&T Modified Final Judgment and the Telecommunications Act of 1996, the monopoly of the local exchange carriers (GTE in the case of Santa Monica) has been broken as a matter of law, but these actions have resulted in significant change in only one market segment thus far -- high volume telecom users.

MCG and the City staff interviewed some of the CAP/CLEC providers who are now or have indicated an immediate intent to provide service in Santa Monica. In general they have similar strategies: (1) serve the entertainment industry, particularly along the Olympic corridor, but elsewhere as well when a concentration of demand can be determined; (2) reach the GTE central office on Arizona Street; and (3) secure the City's telephone business. To a lesser extent, these providers also focus resources on the health care industry and will clearly serve any customer with a large enough telecom demand to justify the expense of extending facilities to reach the new customer.

The table on the next page summarizes the likely market behavior of the present providers in the next five years based on the interviews and published information relating to market plans.

Providers to Residences & Small Businesses		
	Today	Within Five Years
Voice	GTE	GTE
Video	Century Cable DBS	Century Cable DBS GTE?
High Speed Data	None	Century Cable GTE

Several CLEC's have announced plans to serve small businesses with voice service within the next two years, but they have not started to market small businesses as of early 1998.

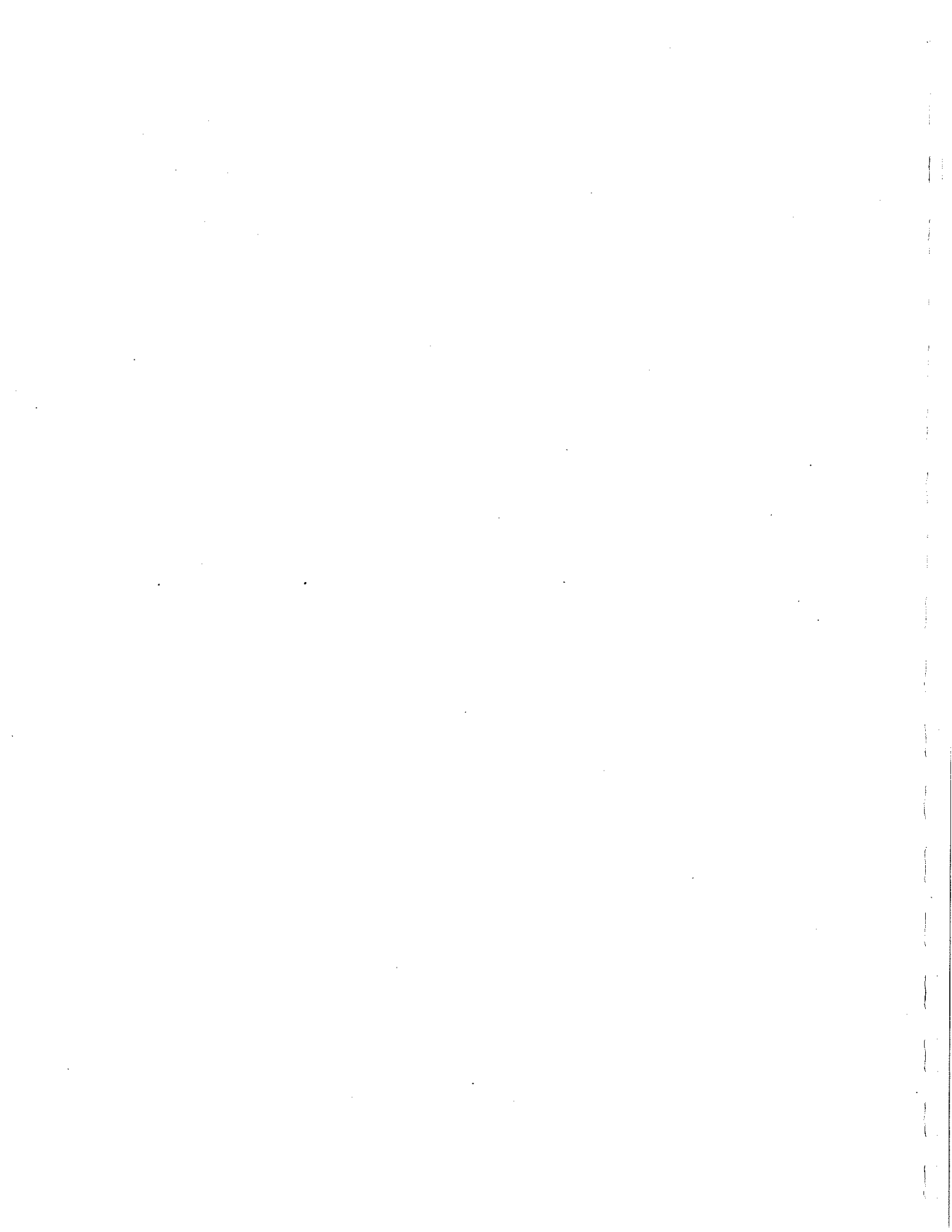
Providers to Large Businesses & Institutions		
	Today	Within Five Years
Voice	GTE TCG MediaOne PacBell	GTE TCG (AT&T) MediaOne PacBell Others
Video	Century Cable DBS	Century Cable DBS GTE? CLEC's?
High Speed Data	GTE TCG MediaOne PacBell	GTE Century Cable TCG (AT&T) MediaOne PacBell Other CLEC's

In the opinion of MCG, this level of service is adequate to meet the needs of the majority of the private market for most telecommunications services. In the case of the business community, a competitive market exists and, given the quality of the new entrants in the market and the developing business segments, especially entertainment, the supply of competitive services will deepen and widen. As the CLEC pump is primed by the desire to reach the entertainment companies and the health care institutions, other businesses will become secondary targets. Within 5 years much of the City's large users will be served by multiple service providers and the smaller businesses will become the primary targets of the CLEC's.

In the case of residential telecommunications service, Santa Monica can not be defined as an under served community, given the 750 MHZ HFC cable system operated by Century Cable and the reliable, universal telephone service offered by GTE. However, there are certain services that some of the City's residents want and are not available. In particular, the high speed residential data service that is potentially available from GTE and Century Cable is not yet offered. As important incremental services that have a developing market, it is logical that high speed residential data service will become widely available through GTE's ADSL offerings and Century's cable modems within the next several years.

Facilities Based Providers

A fundamental objective of the City with respect to telecommunications is the development of extensive infrastructure that can enable service through a network of conduit. The provider of the service is of lesser significance than the presence of the network infrastructure because any number of providers could make use of the network of conduit once it is in place. The infrastructure cost, the difficulty in getting conduit installed, the deleterious effect on the City's street system and the inconvenience to the public as the ROW is repeatedly entered all support the value of logical, economical and well planned infrastructure as a City priority. Some of the telecommunications providers in the City do not have facilities based networks of their own. Rather, they rely on the lease of other providers facilities to reach their customers. Such a strategy has obvious advantages for the providers in keeping capital investment costs low at the early stages of business development. However, until they begin to develop network facilities of their own, they are not contributing to the City's infrastructure. As a result, the City should encourage all qualified providers to provide telecom services to Santa Monica, but specifically encourage providers who are planning to add to the infrastructure. Further, providers who are willing to cooperate with the City's infrastructure plans as conduit lessors or partners in the extension of conduit throughout the City, should be especially encouraged.



IV. NETWORK OPTIONS

As previously described, the City has both institutional and community-wide objectives related to telecommunication planning. In order to satisfy those objectives, three logical options were developed by MCG and the City's staff.

Continued Reliance on Existing Providers

The City is a long-time user of the existing networks owned and operated by GTE and Century Cable and service has generally been rated as adequate to good. The public survey and business survey indicate positive attitudes toward the services of both providers. Therefore, the City could choose to do nothing at all.

Some of the strengths of the present approach are:

- There is no capital cost associated with the distribution network. The investment and the risk has been taken by GTE and Century Cable.
- Maintenance and operational responsibilities for the networks will be undertaken by their owners. The City need not acquire the expertise to repair and replace worn or damaged distribution network components.
- Federal and state regulations assure a minimum level of service quality which in most offerings is quite high.

There are also negative considerations to relying on the present approach. Some of the negative factors are:

- The costs of using these networks is not fixed and is likely to rise over time. Competition is coming to the telephone market, particularly for high volume telecom users like the City, and there is the possibility of driving some voice, data and video circuit costs down over time. However, it is also likely that areas of telephone service less susceptible to competition may actually cost more in the next several years.²⁰ Moreover, as noted earlier, competition has been slower to develop in the cable television market. Century is still the *de facto* monopoly provider of video entertainment services in Santa Monica.

²⁰ For instance, if competition develops slowly in the residential telephony market, or in the small business telephony market, the incumbent providers may charge more for these services as revenues from the competitive services declines.

- New demands for bandwidth by the City will always entail a network cost. New services, such as video conferencing high speed data and imaging transport, are bandwidth intensive and the costs of using the public switched telephone network could be prohibitive.
- The cable and telephone networks have been designed to handle general applications and, therefore, will not be as efficient as a network designed for the City's specific use.
- Network modifications, such as temporary connections or service to a new facility, may be affected by the willingness of GTE and Century to accommodate special requests on a timely basis and may be impacted by GTE's tariff structure.
- The City will be bound to the technology cycles of GTE and Century Cable. If significant competition does develop in the cable and telephone markets, it is possible that capital spending by these companies may be negatively impacted as revenues in their core business declines.

Weighing the negative and positive factors, the *status quo* is not recommended as the basic paradigm for the City's primary telecommunications network. It is likely, however, that low bandwidth services, such as alarm signals, telemetry and control signals will continue to be carried over the existing switched telephone network, particularly from remote sites. Similarly, it is likely that the City will continue to take services from, and provide video to Century Cable over the next ten years.

Municipal Fiber Network

A Municipal Fiber Network ("MFN"), is a network that has been specifically designed to: (1) provide full bandwidth connectivity between City sites as its primary function; and (2) provide telecommunications conduit and, perhaps, dark fiber for lease to third parties as a secondary function, when appropriate. An MFN is usually connected to the public switched telephone network via trunk lines running from a City-owned telephone switch (PBX) to a telephone company central office; however, the MFN's basic design is tailored to the unique needs of an organization that is spread out over a relatively large area and needs to transmit vital information quickly in a very reliable manner.

The object of an MFN is to create a "virtual" building by connecting City sites in such a way that voice, data and video move with the ease and speed associated with facilities that share a common physical structure. The backbone of a modern MFN is a digital stream moving at very high speeds that will take any common computer, telephone or camera input and send it to any appropriate destination in the City, as if the sender and receiver were directly connected by a dedicated wire running from one work area to a near-by work area.

In the case of Santa Monica, the recommendation of this Master Plan is to construct an MFN in the form of a fiber ring that will be used to connect every major, and many minor, City buildings. Specifically, the Plan recommends the construction of a SONET network in a design that will fulfill

the City's immediate needs and position the City to connect its MFN to the public, telephone networks and, if feasible, to other MFN's being developed in the greater Los Angeles Metropolitan Area.

SONET (Synchronous Optical Network) is the dominant standard for transporting large volumes of digitized telephone calls between telephone switches. SONET has become the dominant standard for municipal and private fiber networks as well. As the name implies, the physical transmission path is always fiber-optic cable. SONET is scalable in speed from 53 Mb/s (equivalent to about 800 simultaneous phone calls) to 10 Gb/s (equivalent to over 150,000 simultaneous calls) over a single fiber pair.

SONET networks are almost always built in a "Ring" configuration, with various termination points placed around a closed circuit. All communications are sent in both directions around the circuit so that, if a cable is accidentally cut, no data is lost. This makes SONET a highly reliable, as well as high capacity, network. SONET is the preferred architecture of the new competitive local exchange carriers because of its reliability and flexibility.

In addition to voice, high-speed data, video and many other applications can share the same network. Special terminal equipment is required, however, to convert the signals to a common digital form for transmission, then back at the end. Its multi-application capability makes SONET a logical candidate for governments and companies whose operations are divided among several locations, but who need to function as a single entity. With a SONET network, the telephones on a small outlying office can appear as extensions on a centrally located PBX, while data terminals can be part of a virtual local area network spread across the entire city.

The details of the recommendation are set forth in Section VII, *infra*.

Full Service Network

The full service network ("FSN") assumes the construction of a hybrid fiber coaxial network that could provide voice, data and video services to every residence and business in Santa Monica. The FSN services would be directly competitive with both the services provided by the existing telephone network and with the services provided by the existing cable television network. The FSN would also be used to carry the City's voice, data and video traffic just as in the case of the MFN. In fact, the fiber backbone of an MFN, in this case a SONET ring, can be used as the backbone of a hybrid fiber coax FSN and, thus, the former network can evolve into the latter.

Basic Architecture

In HFC networks, signals are transported from centralized processing facilities (headends) to individual neighborhoods using fiber optics, then transferred to coaxial cables for distribution. Often only a single optical cable is used to connect headends to fiber nodes, but some operators use a ring configuration which provides the same reliability advantages as a SONET ring.

The shared coaxial distribution cables extending from the optical receiver to groups of homes are usually short (a mile or two) and may include up to five booster amplifiers in series along each

cable route. Typically the coaxial distribution plant connected to each fiber node will pass 500-2,000 homes. The lack of redundant routing in the coaxial plant (and usually in the fiber plant, as well) plus the field-power amplifiers limits the attainable reliability, compared with the all-passive SONET network.

Like SONET, HFC networks can carry many different types of signals simultaneously. The terminal equipment is less costly however, as they do not have to be converted to a common, digital format for transmission. For that reason, HFC networks are considerably less expensive to construct than SONET networks, on a site-by-site basis, for delivery of services such as multi-channel video. Also, HFC networks have much greater capacity in one direction than the other and are, therefore, best suited for delivery of a large quantity of programming from a central location to many receivers. The cable system serving Santa Monica uses a basic HFC architecture.

To use an HFC network to do telephony requires substantial additional investment in powering equipment. The coaxial portion of the HFC architecture is typically powered by the local electric utility's power network and is thus susceptible to interruption when electric power is interrupted for any reason. To achieve the degree of reliability expected for plain old telephone service (which includes 911 service), the network operator must either: (1) run power to each fiber/coax node from a central location with an uninterruptable power supply ("UPS"); or (2) install a UPS at each fiber/coax node to provide power to the coaxial portion of the network when the public power network fails.²¹

Higher Cost

The important fact to consider is that the capital investment in an FSN is much greater than in the case of the MFN. The higher cost is caused by the increase in fiber and coaxial plant miles needed to reach *all* the homes and businesses in the City and by the terminal equipment required in the customers' premises. MCG estimates that it would cost approximately \$35 million, at a minimum, to construct an FSN in Santa Monica.

²¹ In Connecticut, SNET is building an HFC network that uses power distributed from a central power source that has a UPS feeding the entire network. In California, PacBell started to build an HFC network to provide voice and video services to residences and businesses that used UPS's located at each fiber/coax node. These units, roughly the size of a small car, contained a natural gas generator which fed the coaxial portion of the network through a bank of batteries. These nodal units were very controversial and were very expensive to install and maintain. PacBell abandoned its HFC efforts after it was acquired by SBC.

V. TELECOMMUNICATIONS MODELS & ANALYSIS

Model Overview

The financial models presented in this report are not designed as stand-alone recommendations for a course of action by the City. Rather they are intended to indicate: (a) a minimum feasibility, that is, they indicate a potential payback in a term acceptable to the City; and (b) whether one option or scenario is preferable to another, if more than one meets the minimum feasible standards. In order to establish the feasibility of a scenario that involves the City's investment of capital in an infrastructure project that promotes the Master Plan objectives, the scenario must prove viable as determined by various criteria including the political, managerial and economic conditions that would exist if the scenario were launched. It is the purpose of financial models to describe the financial elements of a plan and to test their acceptability. This section identifies the potential, infrastructure related, business opportunities that MCG and the City staff considered potentially successful candidates, creates financial scenarios for these businesses and tests them, where appropriate, against a standard of simple payback and Net Present Value ("NPV").²²

There are five core businesses operating under two different infrastructure models that are considered in this Plan.

Municipal Fiber Network Model	
City Use and Third Party Leasing	Incremental Conduit Lease Network Model
City Government Use Only	Segment by Segment Internal Network Model
Full Service Network Model	
Scenario I - Stand Alone Service	Cable Television Service to Homes and Commercial/Non-Commercial Institutions
Scenario II - Plus Incremental Service	High Speed Cable Modem Service to Homes and Commercial/Non-Commercial Institutions
Scenario III - Plus Incremental Service	Wireline Telephone Service to Commercial/Non-Commercial Institutions and Homes

²² Present Value is the current worth of a future inflowing stream of cash associated with an investment. It is calculated by discounting the stream by a specific discount rate. Net Present Value incorporates the outflows or investment amounts into the calculation. The result is the net increase in wealth resulting from the investment.

The network models and their underlying services are described below.

Municipal Fiber Network

The MFN model considers the scope, services, capital and operating costs associated with developing and operating City owned infrastructure consisting of telecommunications conduit, fiber and associated terminal equipment. It allows the City to consider segments of plant of various sizes installed on differing dates with specific combinations of conduit and fiber. For example, the City may choose to install conduit running from City Hall to one of its distant facilities for some future use. The model will price the approximate cost of developing the conduit and predict a payback of the segment according to various conduit lease assumptions beginning in year three. Likewise, the model will estimate the cost of building conduit and fiber along other segments that the City intends to use immediately for the expansion of the City government's own telecommunications system. A return or payback date can be estimated, as a result of the ownership of its own network, based on the amount of savings the City realizes from its ability to dispense with various privately supplied circuits.

The MFN model has the advantage that it can be developed gradually if: (1) the City proves the demand for the infrastructure; (2) it proves the value of the new and alternative services that become available to the City government; (3) the political will exists to undertake the risks of such investments; and (4) the City has the ability to manage the network or finds partners to deliver competitive services and products using the network.

MCG has developed two scenarios for the MFN model. In MFN Scenario A, it has developed a model that approximates the design and utilization of a three phase network that MCG and the City staff recommend to the City for immediate consideration. This model includes MCG's estimate of cost, revenue generated by leasing some percentage of the unused conduit capacity and payback. MFN Scenario B uses the same network design considered in Scenario A, but without the lease component.

In each MFN scenario, a three phase plan is assumed. Phase I is a segment that runs from City Hall to the City Yards (see Exhibit K). It contains 3.0 route miles, passes ten City facilities,²³ the Santa Monica High School, Santa Monica City College Main campus and Stewart Street campus, requires network investment of approximately \$308,000 and building equipment and entry cost of \$375,000. This phase will ride on the Pico Street Smart Corridor project. If constructed without the Smart Corridor companion project, the network component would cost approximately \$170,000 more.

In Phase II, the planned segment connects the Pier, the Main Library, Fire Headquarters, the Utility Administration Office, the Transportation Building, DWRRF and the Ken Edwards Center to the MFN. The route represents 2.4 route miles, which will accommodate four conduits for its full length. The approximate network and building equipment/entry cost will be \$323,000 and \$657,000,

²³ Five of these facilities will be entered by the network.

respectively. If constructed without the transportation mall, recycled water and companion projects, the network component would cost approximately \$59,000 more.

Phase III completes the fiber ring by connecting City Yards with the Phase II fiber via Santa Monica Blvd. The route requires 2.5 miles which will also provide four conduits for its full length. This leg is essential to close the ring, permitting the network to become self-healing. The approximate network and building equipment/entry cost will be \$244,000 and \$170,000, respectively. If constructed without the Santa Monica Blvd. repaving project, the network component would cost approximately \$158,000 more.

As shown in the MFN financial model Exhibit J , the MFN will require capital cost of approximately \$2 million spread almost equally over a three phase, three year period. In addition to the capital cost, the city will incur the labor and maintenance costs of operating its own network infrastructure. One of the advantages of the MFN plan is the gradual business commitment implied by the plan. It will allow the City to progressively build a management structure to operate the investment. The City's existing network investment is currently managed by the Information Services Division. At the initial phases of the MFN plan, MCG expects that ISD will manage the transition to a wider network. It may add personnel as projected within the division. Alternatively, it may seek a management agreement with a private service contractor. Under the MFN plan, the City will have time to plan for this management transition.

The municipal fiber network plan will allow the City to reduce certain telecom costs incurred today and in the future. Estimates of these savings are based on today's rates for the identified services. It is possible that the rates will be reduced in the future on some segments of the planned City network. If reduced, the analysis would show a slower payback.²⁴

The lease of excess conduit is weighed as a possibility in Scenario A of the MFN. The demand for such conduit is very difficult to quantify until the conduit is in place and ready to lease. The logical tenants of telecom conduit are the CLEC's. The strategy of these companies is to build (or lease) plant when they have a specific customer to reach. As a result, their business plans are very limited in their term of projection. The builder of infrastructure with a plan to lease is subject to some speculation risk. MCG recognizes this and as a result, made a high level estimate of the demand for the excess conduit, by assuming that, for purposes of this scenario, 30% of the available conduit will be leased in the year it becomes available. No increase in demand or fee is assumed thereafter. Given the speculative nature of the conduit demand until it is available to lease, we consider this assumption neither aggressive nor conservative, but prudent.

In order to test the sensitivity of the model, as measured by Net Present Value, Scenarios A and B were calculated under two different discount rates. The first discount accounts for the City's

²⁴ The possibility of a changing tariff should not prevent a network analysis. In all likelihood, some of the impetus to the reduction of City telecom costs will occur because the City is considering the development of an owned network. It is logical that the providers will take greater pains to provide service at the most competitive prices once the loss of the City's business is considered a realistic possibility.

estimated cost of capital (6.0%) and the second adds a subjective discount for various elements of risk (4.3% risk factor). The discount factors are shown on the summary section of the models in Exhibit J. The following NPV results were achieved.

Discount Rate	Net Present Value Scenario A	Net Present Value Scenario B
6.0% (Cost of Capital)	\$225,000	(\$264,000)
10.3% (COC + Risk)	(\$24,000)	(\$399,000)

The results indicate a range of net present values from \$225,000 in the conduit lease case (Scenario A), if discounted only for the cost of capital, to a negative \$399,000, if no conduit is leased (Scenario B) and the full risk discount is applied.

Full Service Network

The FSN model assumes the construction of a broadband, HFC telecommunications network. As described earlier, it is a network of optical fibers, coaxial wires, and optical and electrical equipment designed to transmit analog and digital signals for the delivery of video, data, voice and interactive services to residences, businesses and institutions throughout the City. This system is ideally suited to transmit large amounts of information from a single source to many points along its route. It has become the logical system to deliver multiple entertainment television channels to a large audience in a discrete geographical area to homes and with less success to businesses. MCG recognizes that the Full Service Network has a very high hurdle to overcome due to the capital intensive nature of the HFC network. As a result, it has made aggressive assumptions about the market share the City would garner if it entered the competitive market of video, data and voice delivery to Santa Monica's businesses, institutions and residents.

Scenario I of the FSN assumes that the network is used to offer cable television-like entertainment services to all residences and businesses. The capital investment in this type of FSN is much less than in the case of an HFC network that must provide the degree of reliability demanded by a telephone provider. Nevertheless, the investment will not pay back in the ten year period modeled by MCG because the existing providers of video entertainment services (Century Cable and the various DBS services) already control the market and a new entrant will have to compete on price to attract subscribers away from the existing providers. MCG has experience operating competitive cable television systems, and it believes the market penetration assumptions used to estimate the revenue potential of a competitive cable television service in the model are aggressive. In spite of this, the City will need to operate the cable system for a very long time before it recovers its investment, and the net present value will not approach a positive number for a longer time, if ever.

Scenario II of the FSN model was constructed to provide both cable and high speed data services to businesses and homes. The incremental capital investment needed to provide high speed

data services is modest and the revenues are good. Therefore, the depth of loss is less in the ten year projection period.

The final scenario, Scenario III, of the FSN, assumes that the network is used to provide switched voice services to the residences and businesses of Santa Monica. The capital costs for the FSN are very high, not only because of the need to invest in basic telephony switching equipment, but also because of the expense in providing the higher level of network reliability necessary for lifeline telephone service. These costs, and the technical complexities associated with the implementation of telephony services provide a greater loss for the City than under the cable television and high speed data scenarios. This is true even though the revenue potential is higher for telephony.

The various full service network scenarios can be summarized below:

Scenario	Initial Capital	10 Year Capital	10 Year Revenue	10 Year Op. Expense	Operating Inc./Loss	10 Yr. Inc Aft. Debt	NPV After Debt
I	\$35M	\$42M	\$37M	\$20M	\$17M	(\$19M)	(\$21M)
II	\$36M	\$45M	\$47M	\$26M	\$21M	(\$15M)	(\$17M)
III	\$45M	\$57M	\$73M	\$47M	\$26M	(\$19M)	(\$21M)

The table indicates that in the three scenarios, the cost of the bare network, plus the customer premise equipment, ranges from \$35 to \$45 million prior to the offering of service. After ten years the network and equipment costs rises to \$57 million in the third scenario. The revenues and resulting operating income costs (before financing or opportunity cost of capital) are also shown. In simple terms, after the third business level (telephony) is added in Scenario III, the combined network services will yield approximately \$26 million of cumulative net operating income over a ten year period, against the cumulative capital investment of approximately \$57 million. Before the important effects of interest and of the time value of money, the project assumes an expenditure of \$57 million and a ten year income of \$26 million, or a negative \$31 million.

Risk Reflected in Models

Risk is incorporated in financial models in various ways depending on the nature of the risk. The risks that are anticipated in these models include :

- General business uncertainty associated with the local, national and world economy.
- Specific business risks associated with launching and operating a complex telecommunications business. Included in this category are technology risks, capital market and valuation risks, and changes in competitive environment.
- Political risk ranging from the impact of state and federal regulations to the difficulty of operating a business by an entity whose single highest objective is not profit and the increase of wealth.

Specific business risk is anticipated in the model design by assigning market shares and product penetrations to the revenue component of the analysis. For example, if the telephony business is expected to have a greater competitive challenge than data service the specific projected market penetrations would reflect the difference. Conversely, the market potential of the telephony service would represent a much larger universe than the nascent data service. The market potential of the two markets and corresponding market shares would be assigned by the model maker and indicated in the body of the model. Appropriate assessment for such specific risk should be sought in the body of the projections themselves. In the FSN models the pages called Assumptions and Data include the assumptions that underlay the projections.

General Business and Political risk are not easily incorporated in the model. Rather, these risks, if found to be appropriate to the analysis, could be accommodated by increasing the discount rate found in the Net Present Value calculation. These risk assignments are specifically stated in the municipal network model and are incorporated in the NPV calculation. In the case of a full service network model, MCG would have burdened the return assessment because it believes there is political and specific business risk associated with the City operating in a competitive market. In this analysis, in which an aggressive presentation of the assumptions is intended to give the FSN scenarios their best appearance, they did not project achievement of the minimal hurdle of a positive net present value *before* consideration of any extraneous risks. As a result, no further risk discount was applied in the full service model.

VI. PLANS & STRATEGIES OF OTHER CITIES

One important step in the assessment of the telecommunications options available to Santa Monica is the investigation of the role other cities have taken in their pursuit of similar objectives. MCG has reviewed the activities of several West coast cities that have taken distinct steps in their approach to telecom planning and/or project implementation.

Communities have found different reasons to consider telecom planning issues. The most common include: (1) the telecommunications industry has focused on the city and multiple right of way permits are being requested, often along the same routes; (2) the city is forward thinking and recognizes the value of well conceived infrastructure policies and plans; (3) community awareness of telecom opportunities is high in the city; (4) economic development is important to the city and telecommunications infrastructure is viewed as important to it; and (5) the city owns one or more utilities and the development of a telecom system is considered a logical extension of those activities.

Cities that have been reviewed for this report are: Anaheim, Beverly Hills, Burbank, Los Angeles, Milpitas, Palo Alto, Pasadena, Tacoma, Sacramento, San Diego, San Francisco, and San Jose. All these are California cities with the exception of Tacoma Washington. The group can be divided between those cities that have begun the formal planning process and those that have begun to implement their plans.

Formulation Stage

The following is a summary of the planning approaches and initiatives taken by the first group.

Sacramento

Sacramento is focusing first on the orderly development of its telecom infrastructure and rights of way issues. It has passed an ordinance that imposes charges on utilities that cut streets for the purpose of reimbursing the taxpayer for the damage done by such cuts. The same ordinance establishes incentives to encourage coordination among the city's utility departments and private carriers in infrastructure development.

Beverly Hills and San Francisco

San Francisco and Beverly Hills began to develop telecommunications master plans in early 1998. While independent of one another, they have some elements in common such as educational components aimed at the city's staff and a broad spectrum of interested members of the public. They will undertake needs assessments of the government communications and those of the community at large. Subject to the results of the needs assessments, the cities will develop plans for the satisfaction of the needs, as appropriate.

Tacoma

Tacoma completed an analysis that concluded the city's best opportunity will be to extend the fiber optic based telemetry plans of its electric utility into a city wide telecommunications network that would serve its community with voice, data and video. This is the most ambitious plan proposed by any city in the past several years. The ability to ride on the underlying investment of the electric utility's expansion in conjunction with the apparent voter disapproval of its existing cable provider gave this project its justification.

Pasadena

Pasadena has recently completed a study that led to the preparation of a plan by which the city's Department of Water and Power will develop a 19 mile fiber optic route that will first serve the telemetry needs of the DWP and then act as the backbone to provide other telecommunications services to the community. Pasadena is exploring a possible partnership with private companies in the development of the opportunity.

Implementation Stage

The second group of cities mentioned above have begun to implement various telecom projects as follows.

Anaheim

Anaheim, through its Public Utilities Department, has joined SpectraNet International (SNI) in the first phase of a partnership plan that places the management of the City's owned fiber network in the hands of SNI. The first phase is being implemented and includes the delivery of telecom services to city facilities. Once the city's facilities have been connected, large commercial users will be offered the service. The partnership's long term plan is to offer services to all of Anaheim, including the residents. Anaheim entered the partnership as owners of a 50 mile fiber network that passes many of the city facilities and many large commercial telecom users as well.

Burbank

Burbank has a cluster of entertainment companies headquartered within its city limits. The companies include Warner Bros., NBC, Paramount, and Disney. Most of the companies have large numbers of employees located at the main studios and other offices throughout the city. In order to link studio production with management offices and with post production facilities, the studios need high speed data links. Their bandwidth needs are extraordinary, reportedly including demands for over 1.5 gb/s (1.5 billion bits per second) to enable the instant download of films clips.

In response to this demand, the city's electric utility created a ring of dark fiber that it leases to connect the three corners of a triangle: the downtown offices; the studios; and the old Lockheed campus where most of the new studio growth is occurring.

The city is using five optical fibers to connect about 5 municipal facilities today.

Los Angeles

Los Angeles has been attempting to clarify its vision with respect to telecommunications policies and infrastructure development for the past several years. Given the size of the city, the task is considerable. Los Angeles is most notable for its forward-thinking plan to join MFS, then a competitive access provider (now a CLEC), in the reuse of an abandoned oil pipeline that crossed the Sepulveda Pass. The pipeline was cleaned and became the conduit through which fiber optic cable was pulled for MFS and the city.

The project facilitated the development of MFS's CLEC network, thus promoting competition in the telephone market in Los Angeles. The ROW was protected by reducing the amount of trenching and boring that would have been necessary to accommodate the MFS route plans. This is one of the best examples of how public and private partnerships can provide multiple layers of benefit.

San Jose

San Jose has taken advantage of a major public works project to develop a telecommunications conduit system for the future use of the city and for telecom providers. A large scale water recycling project was initiated by the regional water district, a large part of which is in San Jose. The City determined that it should use the trenching project to accommodate telecom infrastructure. Using an RFP, it first invited private users to join the city in a joint project. The city was not satisfied with the RFP responses and subsequently pursued the project alone.

Today, the City is nearing the completion of a conduit system that transverses much of the city along a 40 mile route. Most of the route has conduits that will be available for city network expansion and lease to qualified private providers. The city's intent regarding the external scope of the project is to encourage facilities-based telecommunications competition in the city; reduce adverse impact on the ROW by these desirable network operators; and to earn a return on its investment.

San Jose is now in the process of developing its own master plan to direct its internal network development and to establish a plan to facilitate further external telecom development. Besides the impressive scope of the project, this city is noteworthy for taking the conduit opportunity before it had completed its master plan. Because the opportunity was attractive and the water recycling project would not wait, the city chose infrastructure investment based on the value of the one time opportunity.

Palo Alto

Palo Alto, through its electrical utility, has designed and constructed a high speed fiber optic network that passes many high technology companies and the Stanford Industrial Park. The city leases dark fiber to carriers and other qualified entities needing high speed access to the recently completed DEC Internet Exchange and to two Pacific Bell central offices.

The project is only one year old, but it is attracting wide spread interest among carriers and Internet service providers attempting to access the DEC exchange point and other locations in Palo Alto.

Milpitas

Milpitas developed one of the first telecommunications master plans that contained policies and strategies for human resources, new infrastructure development and upgrades to existing telephone and computer systems. It also recommended the construction of a fiber ring around the City to carry municipal information between city facilities and for the lease of excess capacity to private telecom providers. The multiphase plan is now being implemented.

San Diego

San Diego reviewed its telecommunications opportunities over a two year period. It began with the issuance of an RFP to determine if municipal government network (Private Virtual Network, PVN) and/or a citywide full-service, municipally supported network (Regional Telecommunications Network, RTN) would serve the city's interests. It employed a blue ribbon panel to evaluate the responses and make recommendations regarding their merit and feasibility to the City Council. After six months of review the panel concluded that the internal needs of the city, as identified in the PVN, would not be met as quickly as the needs of the private sector. While the panel believed the region could benefit from a dedicated network serving public entities, it found that the submittals to the RFP were not fully responsive and the city was not prepared to embark on the network without an acceptable partner. As a result, the panel recommended that a new RFP be issued in an attempt to solicit responsive submittals for the development of a network based on a Public/Private partnership. Such network would first service city and county facilities, then other public service entities and finally, residents of certain under-served areas of the city, if feasible.

The result of the second RFP led to the development of a bulk telecommunications service plan and eventually to the selection of a preferred vendor, Teleport Communications Group, to supply telecommunications services to city facilities and those of any other public institution that chose to participate in the bulk services contract. The choice of the bulk contract approach was based on the unique circumstances that exists in San Diego.

The same committee concluded that the external needs of the city, as served by the RTN concept, would not be an appropriate opportunity for the public sector participation. They found that the existing telecom providers were committed to the delivery of private sector services in San Diego.

VII. MASTER PLAN RECOMMENDATIONS

The master planning process was undertaken in Santa Monica to achieve five conceptual goals:

- Rationalize the management of the City's public rights of way in light of a competitive telecommunications market.
- Assure the continued delivery of government services and encourage the expanded delivery of government services using advanced telecommunications methods.
- Leverage the City's ongoing public works projects to support the cost-effective installation of telecommunications infrastructure.
- Encourage universal access to information through telecommunications by facilitating competition in the telecommunications market place.
- Establish rational plans for the growth and evolution of telecommunication services in Santa Monica.

In light of these goals, it was decided that the Plan should have the following deliverables:

- Rights of way management standards.
- Cellular and PCS antenna siting policies.
- Recommendations for ordinance changes to conform to the Telecommunications Act of 1996.
- A universal access policy.
- Recommendations for enhancements to the electronic delivery of government services.

Each of these deliverables is discussed below in detail.

Right of Way Management

Santa Monica has already experienced a significant increase in permit applications seeking permission to install telecommunication facilities, mostly fiber optic cable, in its rights of way. As the business survey confirmed, many businesses in the City are using more than one telecom provider as of the writing of this Plan.²⁵

²⁵ Almost 40% of the businesses responding to the City's telecommunications survey are using more than one telecommunication provider for voice and/or data services.

All of the applicants seeking to install conduit and fiber cable are companies that have been certificated as competitive local exchange carriers by the California Public Utility Commission. Thus, these companies may, as a matter of law, utilize the dedicated rights of way in the City to deliver their services. The City may, however, regulate the time, manner and place of entry by the CLEC's, as with any other carrier.

And, as can be predicted by the business goals and practices of the CLEC's,²⁶ a number of the applications requested permission to install facilities to reach the GTE central office, located at Arizona and 7th Street, to pass the major entertainment company locations and to run along major business corridors in the City. In its role as the manager of the public rights of way, the City viewed these applications with concerns that were not apparent in the era before telecommunications competition.

These concerns included:

- A potential lack of coordination by the CLEC's, leading to multiple requests to cut the same streets, many of them major streets, by each company.
- The impact on street life from each cut meant that these streets predictably would need repair sooner, thus increasing the cost of street maintenance to the tax payers of Santa Monica.²⁷
- The surface quality of these streets would be degraded during their useful life, thus impacting the ride quality in a City known for having some of the better streets in the greater Los Angeles metro area.
- The presence of work crews would disrupt traffic flow, causing delays and potentially impacting public safety in the City.
- The presence of work crews would impact the businesses along the construction routes.
- Excessive noise, dust and odd work hours associated with the utility construction would adversely affect the public.

As a first step in attempting to gain greater control over the permitting process, the City developed a questionnaire which it required each telecommunications company to complete as part of the application process. A copy of the questionnaire appears in Exhibit H. The questionnaire is

²⁶ See discussion in Section III, *supra*.

²⁷ A number of City's have done studies on the impact of cuts on the average life of a street. While the predicted impact varies according to a number of factors, including the street repair method employed, as a rough rule of thumb, the overall life of the street pavement will be reduced as a result of each utility cut.

designed to elicit information about whether the applicant: (1) has checked other applications pending before the City to see if joint construction is possible; (2) is willing to join other companies should the opportunity arise; and (3) is willing to lease conduit and/or fiber capacity to companies that might choose to lease in lieu of constructing parallel facilities. The questionnaire also asks some basic questions about the nature of the telecommunication facility to be installed so that subsequent companies can determine whether there was, at the time of installation, excess conduit available to lease.

When the questionnaire was first introduced, there was resistance from the carriers, particularly from the incumbent carrier, which felt its bona fides were long established. The City made clear that it intended to treat new and old companies equally; that it had responsibilities in the management of the rights of way that it intended to pursue; and that it was in the best interests of all users of the rights of way to cooperate whenever competitive concerns were not compromised.²⁸ The questionnaire is now a part of the permitting process.

The Engineering Division also established interim standards for rights of way activities. These standards are attached hereto as Exhibit I. The interim standards, like the questionnaire, were designed, in part, to collect better information on facilities located in the rights of way. Santa Monica has long had an ordinance requiring the utility companies to file "as built" drawings with the City. In light of the increasingly crowded nature of some of the rights of way, and in light of the universal use of computer design programs by the utilities, the City has notified the carriers that it will enforce this requirement strictly.

The interim standards also make clear that the City will continue to insist on high quality restoration procedures once a street has been cut. The City requires a "T Section" method of repair that essentially requires a trench cap a distance beyond the physical limit of the trench itself. It is felt that this method results in a longer-lasting and a smoother restoration.

Finally, as the second step of a two-step process, the City will survey other cities, meet with utility providers, review the Draft Future Right of Way Management Goals and current Interim Right of Way management Standards and recommend modifications to the future goals and interim standards and fees charged by the City associated with this effort. City staff then will return to Council for formal hearing and adoption, if appropriate, of the new fee ordinance related to utility excavation permits and management of the public right of way. This second step process will take approximately six months.

²⁸ Competition in the telephone market has changed the relationship between the City and GTE, the incumbent telephone carrier in Santa Monica. GTE used to share long term construction plans with the City and with the gas and electric utilities. In the new, competitive environment, GTE is reluctant to share its business plans. Similarly, the CLEC's are reluctant to share their plans. In light of these concerns, the City has started quarterly meetings with all the utilities doing business in Santa Monica to see whether street construction in the next quarter can be coordinated. While short term planning is far less useful to the City than the older, long term method, it should prove to be better than no planning at all. The telephone carriers seem to be willing to reveal their construction plans on a quarterly basis since the public nature of the permitting process will cause disclosure in any event.

Antenna Siting Policies

Competition in the telephone market place has blossomed in the wireless arena as well. In 1995, the Federal Communications Commission auctioned frequency spectrum covering the United States for use by personal communication systems ("PCS"). PCS is a wireless telephone service that is functionally equivalent to cellular telephone service. However, unlike cellular, which is a relatively mature service, the PCS licensees in California are now in the process of deploying their networks and, like cellular, there are multiple companies providing this new service. The level of activity in the business of antenna construction is very high.

Moreover, like their wired counterparts, the wireless telephone companies often want to locate their facilities in essentially the same areas. Therefore, many of the same issues arise. A major difference is that the PCS companies often seek to locate their antenna facilities on private property (building rooftops, for example), thus avoiding rights of way and direct public management of their activities. The City thus has two regulatory areas impacted by the explosion of wireless antenna construction, zoning (for privately owned sites) and rights of way policies (for facilities located above sidewalks, etc.).

Finally, the City can lease its owned property for antennas. Unlike right of way management, the City assumes the traditional role of landlord in such instances.

The Telecommunications Act of 1996 contained several provisions relating to antenna installations and the roles of local authorities in regulating their placement, appearance and technical specifications. Generally, cities retain their traditional zoning and rights of way authorities as long as they are not used to prohibit the deployment of wireless services. The federal government has preempted states and cities from establishing technical standards for antennas.

The City amended many of the pertinent zoning provisions in 1994 as the result of cellular antenna installations and the growing popularity of earth station antennas used to receive satellite transmissions by residents (for video) and businesses (for video, voice and data). As part of the general master planning process, the City hired a consultant to review its antenna-related ordinances and policies.

Recommended Ordinance Changes Related to ROW Management

In a parallel effort to the review of antenna siting provisions, the City also undertook a review of all its ordinances pertaining to the placement of utility facilities in the public rights of way. Generally, the suggested changes are designed to rationalize some conflicting provisions; preserve the City's right to charge franchise fees to telecommunication companies using the rights of way if the state code is changed to permit it; and to conform to the provisions of the Telecommunications Act of 1996.

Universal Access Policy

Santa Monica is a city that prides itself on the depth and breadth of citizen interaction with government. The processes used by the City for virtually every facet of its activities to preserve and foster the City's health, safety and welfare actively encourage citizen participation. This concern for extensive public involvement was extended naturally to the development of a policy supporting the greatest availability of information through pervasive access to telecommunications services.

The Telecommunications Working Group developed a recommended policy structure, which is appended hereto as Exhibit B. This recommendation reflects extensive public outreach efforts by the TWG and the City staff. It also reflects the input of several TWG members who brought a particular sensitivity to this issue as well as extensive experience in Santa Monica's Public Electronic Network.

The City has a history of supporting universal access by providing the public with electronic means of communication. The deployment of workstations and touch screen kiosks in libraries and other public facilities supports public access that eliminates factors that creates environments of have and have-nots. Through the City's Public Electronic Network (PEN) and Home Page, the public has free e-mail, can participate in electronic conferences on important issues, can search government databases and request government services electronically. Libraries provide free access to the Internet and training in its use.

To promote Universal Access, the TWG recommended that the City promote the following goals in its projects and initiatives associated with the Master Plan:

1. Encouraging priority access for special populations such as the disabled or students.
2. Encouraging access at specific types of facilities such as schools and higher education institutions, libraries, and public facilities owned or controlled by government.
3. Encouraging availability of user-friendly equipment.
4. Ensuring appropriate privacy and security for users.
5. Developing or promoting affordable pricing mechanisms.
6. Promoting fair and equitable regulation of telecommunications providers.
7. Promoting interconnectivity, interoperability and open access.
8. Encouraging the creation of opportunities for user participation and interactivity.
9. Providing incentives or other mechanisms to promote businesses and others to support the policies.

Input from community groups such as the School District Technology Advisory Committee, the School District Inter-cultural Advisory Council and the PEN Users Group assisted the group and City staff in developing strategies to facilitate universal access. Recommendations that have been implemented or will be considered further include:

- Provide free Internet e-mail through PEN (already implemented);
- Increase number of public access workstations in libraries and public facilities;
- Strategic placement of touch screen kiosks in parks and public places;
- Enhance public computer training centers at Memorial and Virginia Avenue Parks;
- Target equipment installations and services to support youth, low-income families and the elderly;
- Develop Info Navigator program for training members of the public to support public access to technologies in libraries;
- Develop partnerships between the School District and College that expand application of technologies in the classroom and school libraries;
- Incorporate existing and new technologies to build community participation and interactivity.

The planning process was predicated on the furtherance of the goals set forth in the group's recommendations.

Development of a Municipal Fiber Network

As explained in Section V, *supra*, the planning process resulted in a decision to recommend that the City construct and operate a municipal fiber network. This section will discuss the internal uses of the recommended MFN; possible external uses, including leasing facilities to third parties and seeking partners to operate and, perhaps, extend the network; and recommended changes in the City's human resources to support the MFN.

Basic Network Design

As discussed in Section IV, *supra*, the Master Plan proposes that the City anchor its network design in standards that will facilitate the acquisition of fiber optic terminal equipment; enhance the *interoperability* of the network (the ease with which information carried on the MFN can be "handed off" to other fiber networks); and facilitate the physical *interconnection* of the City's MFN with other fiber networks – municipal (other city MFN's), private (such as the network operated on the Santa Monica College campus) and public (GTE, PacBell, etc.).

In order to enhance the interoperability and interconnectivity of the MFN, the basic design will be to construct a fiber ring that uses SONET transmission standards for the backbone.²⁹ Moreover, the cost projections associated with the MFN have assumed that the City will deploy ATM switches at its major sites and TDM hubs at the smaller sites.³⁰ These technologies are used on virtually all modern fiber networks today, thus assuring that the City can exchange information easily with other fiber networks if it becomes appropriate.

Enhancements to the Electronic Delivery of Government Services

In many planning documents, this discussion would follow a description of the network architecture and its proposed route, but in the case of Santa Monica, where the electronic delivery of government services is far more pervasive than in most cities, it logically should precede such a discussion. Exhibit C contains a list of the City's existing electronic services and one of the challenges in designing the MFN was to support and extend the City's extensive electronic offerings.

Existing Electronic Services

The City offers the following services today (or will by June 30, 1998):

- Dial-up Internet access to the Library catalog system.
- Fax on demand services for certain forms and literature.
- Call processing with informational menus to provide automated and after-hours service.
- Voice mail available to the general public.
- E-mail available to the general public.
- Telephone response systems that can be used to schedule inspections and check on inspection status.
- Dial-up systems for computer access to government information (BBS).

²⁹ SONET, or Synchronous Optical Network, is discussed earlier in Section IV. It is the standard utilized by the public, switched telephone networks and it has become the standard for modern fiber optic networks in the United States.

³⁰ ATM, or Asynchronous Transfer Mode, and TDM, or Time Division Multiplexing, are defined in the Glossary. TDM is the most widely deployed standard in private networks today and ATM is the newest technology. The cost projections use actual cost quotes from recent city RFP's for this type of equipment.



- A fully developed Internet Web site with hot links to many City department pages and to Web sites maintained by businesses and institutions in Santa Monica.
- Multi-media kiosks located in public places that can be used to access City information electronically by the general public.
- Use of the local cable television system to deliver video services, including City Council meetings.
- Internet work stations in the libraries and in government buildings, open to public use.
- The Public Electronic Network (PEN).

The types of information that are available electronically include:

- Council agendas; commission agendas; minutes; staff reports.
- The municipal code.
- City and Social Services directories.
- Information on maximum allowable rents.
- Request forms for certain City services.
- A directory of local businesses.

PEN

Using PEN and its Web site, the City encourages its citizens to use electronic mail and participate in local debate through on-line conferences. It provides input forms for public comment, forms for City services and has appointed liaisons in each department to handle electronic communications. Figure 9 on the next page shows the PEN home page.

PEN supports a small, but active community, that engages in vigorous electronic debate and holds conferences on subjects of interest. The City

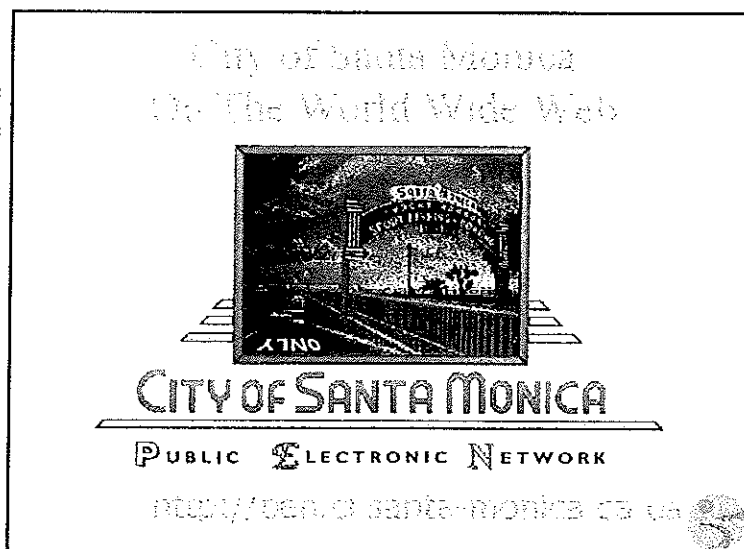
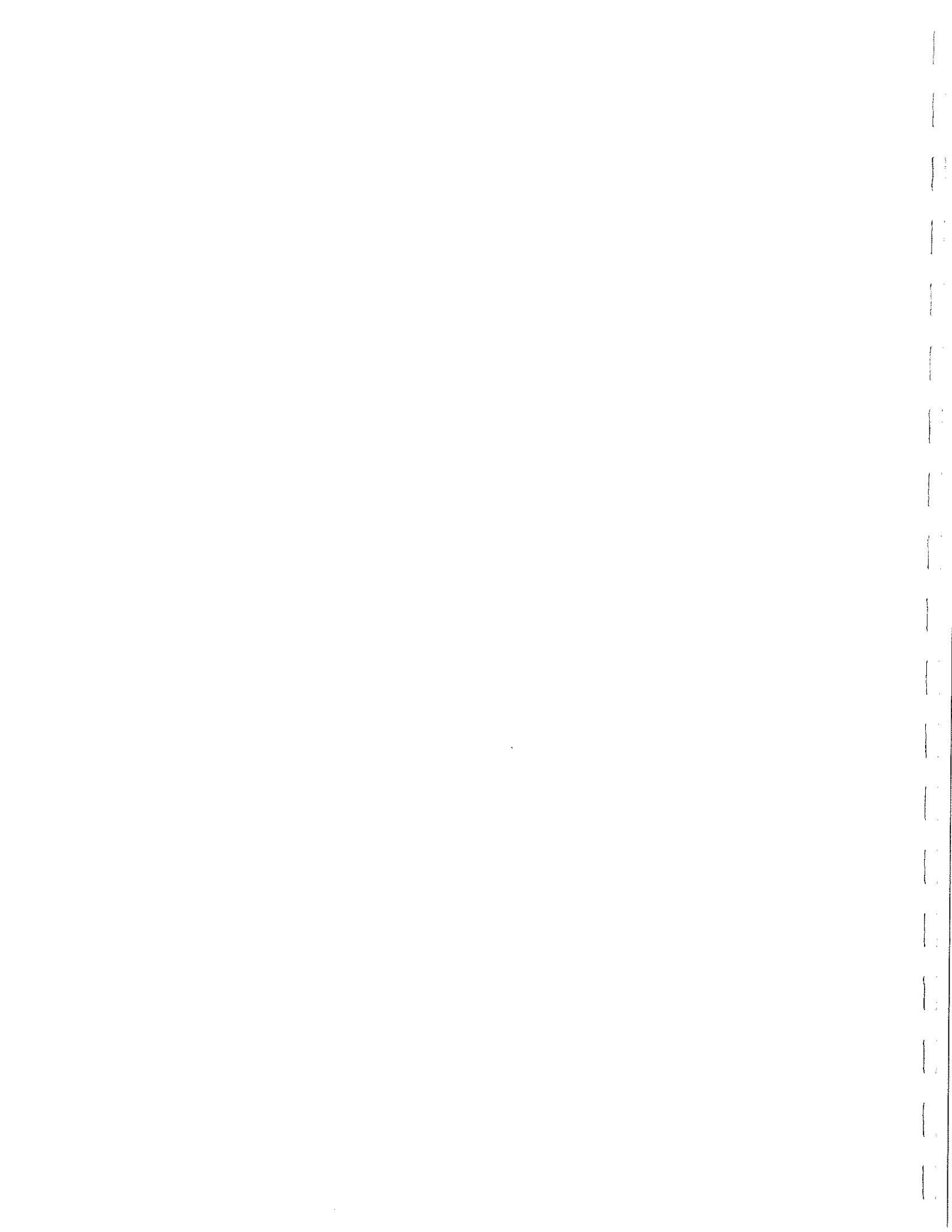


Figure 9



recently implemented a gateway between PEN and the Internet which permits people who live or go to school in Santa Monica to send and receive Internet e-mail for free.

Most importantly, the public survey undertaken by the City as part of the planning process, and discussed in detail in Section II, *supra*, indicated that the citizens of Santa Monica were already using the City's electronic services to a significant degree. Figure 3 on page 8 shows the high degree of use by the sample.

Future Needs

It became apparent that the City would use more bandwidth-intensive presentations in its electronic delivery systems as the systems became more sophisticated and more attractive. The greater use of graphics and greater access to large data bases would significantly slow the systems' response times. Moreover, as the number of users grew, the demands on the systems would grow as well.³¹ It was clear that high bandwidth connectivity was going to be needed between the file servers holding the City's information and managing the City's networks, and the work stations used by both internal and external customers.

At the same time, it became clear that the City's internal customers, its employees, were going to face the same problems because the internal systems were becoming more sophisticated, larger and subject to greater use each day. The City's use of sophisticated information networks, designed to improve efficiency, support greater job satisfaction, and thus provide the public with greater service breadth and quality, were going to need very high speed connectivity as well.

New information tools, such as video conferencing, integrated voice and data systems, and advanced client-server platforms will require higher bandwidth networks.

Network Decision

These considerations led to the conclusion that the City should construct a municipal fiber network to connect its employees and the public to the City's information systems. The use of fiber optic cable would ensure that the City would have virtually unlimited bandwidth available for service reliability and expansion.

The staff and MCG considered the option of continuing to purchase fiber connectivity from one of the telephone carriers doing business in Santa Monica. However, as detailed in Section IV, *supra*, it was decided that the increased reliability, better security, the fitness for purpose and the acceptable cost of a municipal fiber network favored that approach. Accordingly, this Plan recommends the construction of an MFN.

³¹ The City is currently investing in new Web authoring tools and is training all departments to organize and publish additional information and services.



It should also be restated here that staff and MCG considered the construction of an advanced full service network and decided that the risk and the cost were simply too great.³² Nevertheless, it should be noted that the MFN recommended in this plan could be used as the backbone for a full service network should the City determine that community needs and, if appropriate, market conditions, support an extension of the network.

Preliminary Network Design

The master planning process was not intended to produce a detailed network design, in the sense of planning drawings. That process will occur as a follow-up to the adoption of this Plan, should the Council concur. However, a general design recommendation was a goal of the project, including a recommended route for the fiber cable.

Location of City Facilities

The first task undertaken by the planning group was to locate all City facilities and determine the existing voice, video and data uses at each site. Figure 10 shows the location of the City's facilities and shows the bandwidth being used by each site today. Larger versions of Figures 10-13 can be found in Exhibit K.

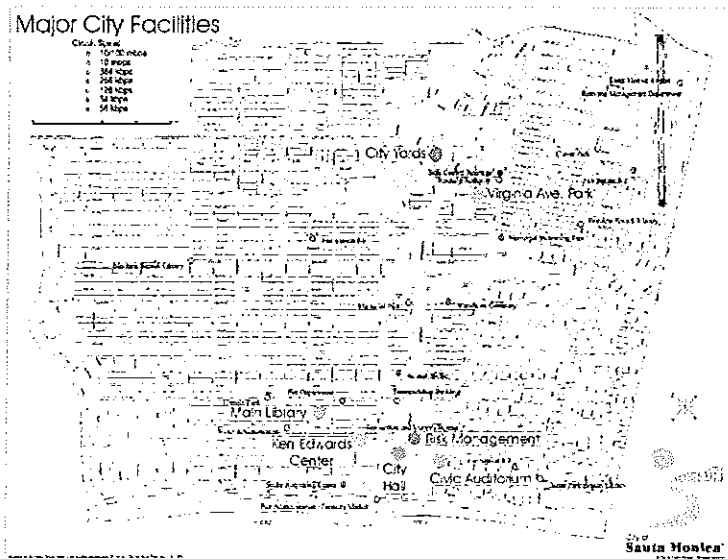


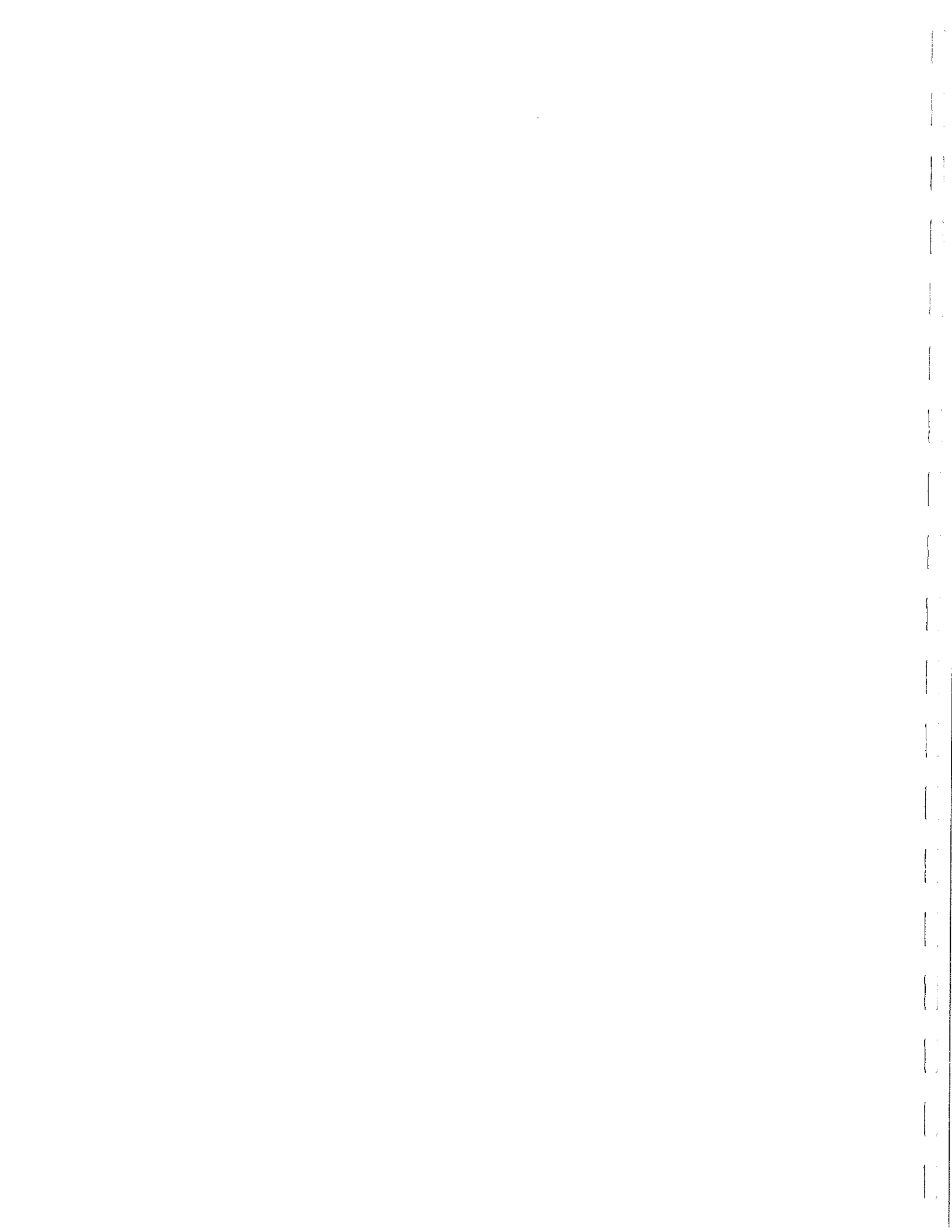
Figure 10

As discussed earlier in Section II, MCG and staff discussed the work functions being performed in each department and department visions for work to be done in the future. These discussions occurred at the work site in each case. The information gathered was combined with ISD forecasts to estimate future types of telecommunications services that would be needed at each site. These estimates were in turn used to forecast bandwidth needs on a site-by-site basis.

Location of Education Institutions

Staff and MCG met with representatives of the Santa Monica-Malibu Unified School District (SMMUSD) to discuss its telecommunications plans. SMMUSD had already developed a master plan

³² See the discussion in Section II, *supra*. Neither the business survey, nor the general public survey indicated an abiding unhappiness with the existing voice, data and video providers in Santa Monica. Had such attitudes been prevalent, the decision to construct an FSN might have been different. The cost and risk of such an undertaking might have been balanced by a compelling need to provide acceptable telecommunications service to a clearly under-served customer base.



and had, in fact, secured funding to connect its buildings using T1 or partial T1 lines supplied by GTE. It was determined that the SMMUSD network could be connected to an MFN by interconnecting at any SMMUSD site.

Similarly, staff and MCG met with representatives of Santa Monica College (SMC). Like the schools, SMC has developed an internal plan and has already constructed a campus network using fiber optic cable. Using GTE circuits, the main campus is connected to the College Academy located on Stewart Street near the City

Yards and the Santa Monica Studio property. SMC also connects to its Madison School Campus located on Santa Monica Boulevard using circuits leased from GTE. SMC expressed a desire to connect to SMMUSD and to connect its campuses using higher bandwidth circuits.

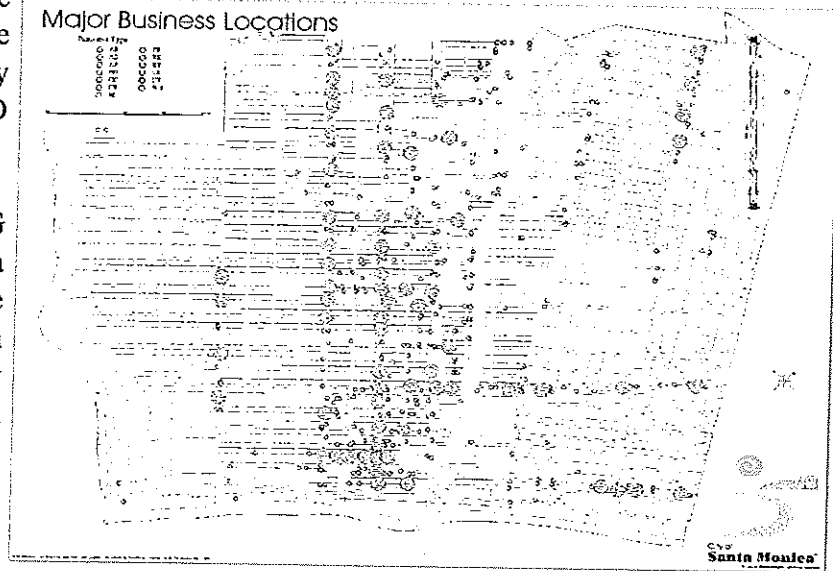


Figure 11

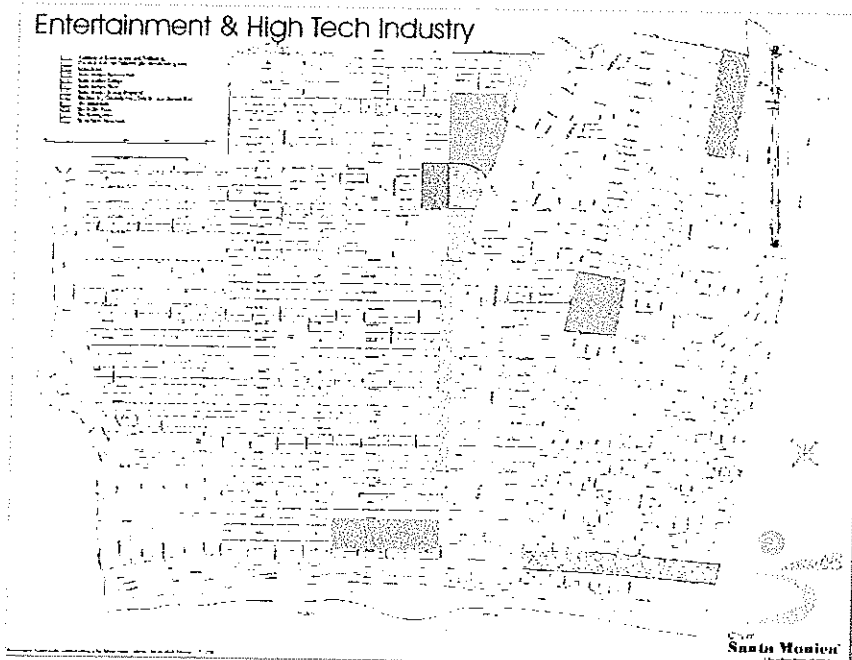


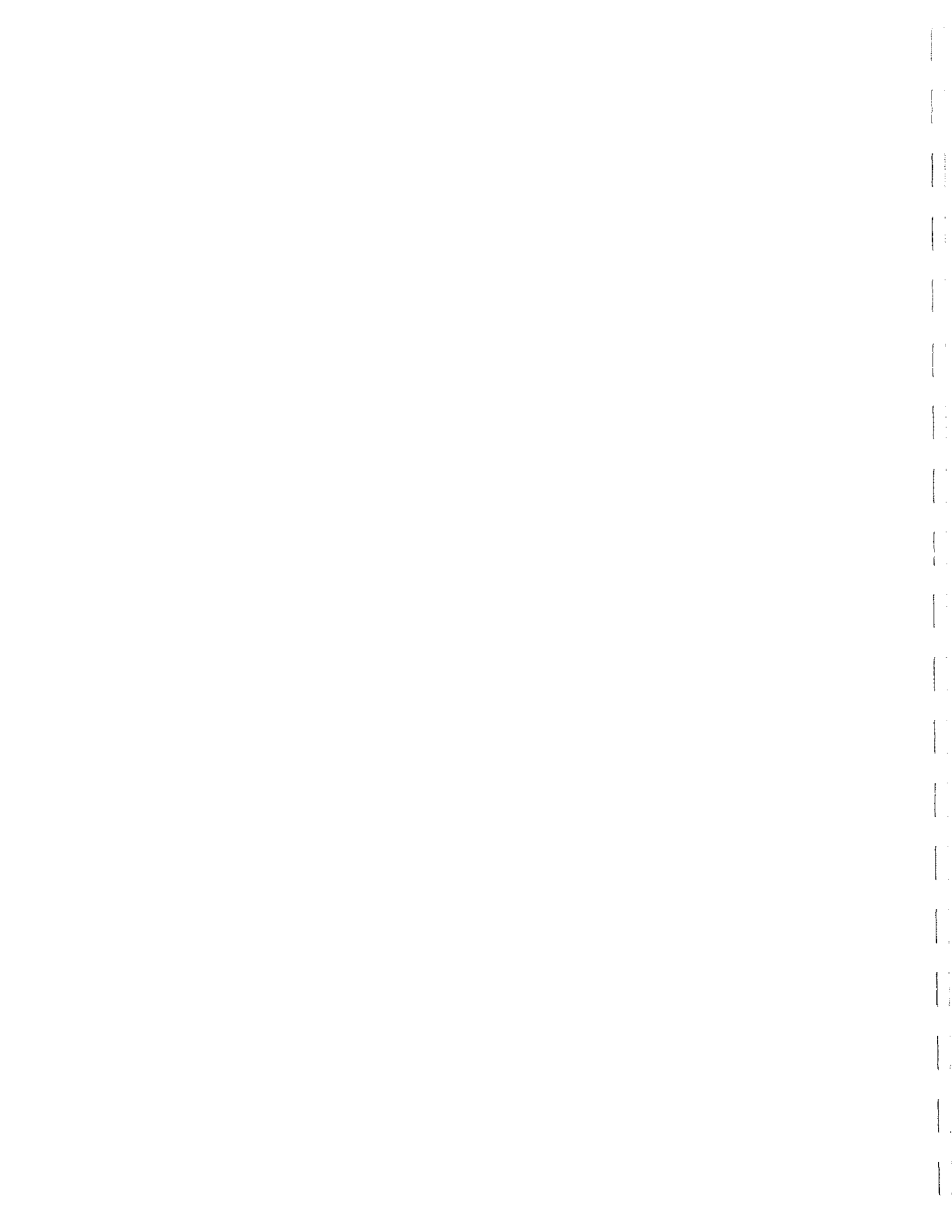
Figure 12

SMC was represented on the Telecommunications Working Group and was actively involved in the planning process throughout.³³

Business Corridors

Using GIS maps supplied by the Finance Department and produced by ISD, the internal group determined that many of the larger businesses in Santa Monica were located along Santa Monica Boulevard, Colorado Avenue, Lincoln Boulevard and clustered around

³³ The hospitals doing business in the City were contacted as well. Hospitals have increasing demands for high speed circuits to support video conferencing, remote viewing of surgical procedures (for consulting and teaching purposes) and other uses.



the Third Street Promenade area. Figure 11 shows the locations of businesses in the City with reported gross receipts of \$750,000 or more. It was felt that these businesses would be logical targets for competitive local exchange carriers seeking to establish a revenue foothold in Santa Monica.

Similarly, the group looked at the locations of the high technology and entertainment industries in the City. These types of business logically would be customers for high bandwidth circuits. Figure 12 shows the general locations of the high tech and entertainment companies.

This information was gathered in case the City decides, as is recommended in this Plan, to lease excess conduit and, perhaps, fiber to new telecommunication companies who want to speed their time to market by gaining fast access to the business corridors in the City. The overall network design was not driven by the location of the City's businesses, but when choices were available and one choice would pass through the business locations, it was selected.

Public Works Projects

Finally, the internal group looked at all major public works projects scheduled for the next five years to determine if any of them presented an opportunity to save costs by "piggy-backing" conduit installation on the project. The group examined projects related to traffic management (Smart Corridor, for example); water pipe replacement; street reconstruction; street light upgrades; transit projects; and even irrigation projects. The project maps were overlaid on the other maps discussed above and a network design evolved.

The suggested route of the municipal fiber network; the suggested timing for construction of the MFN; and the predicted budget for the projects reflects the process outlined above. An effort was made to produce a comprehensive network plan that best served the overall needs of the City and its citizens at the lowest possible cost.

The Municipal Fiber Network

This Master Plan recommends that the City construct a municipal fiber network in the form of a fiber ring that will, when it is completed in three years, run from City Hall to the Civic Auditorium; east along Pico

Boulevard past the High School, Virginia Avenue Park and the College; along Cloverfield past the City Yards to Santa Monica Boulevard; west on Santa Monica Boulevard to Fourth Street, past the

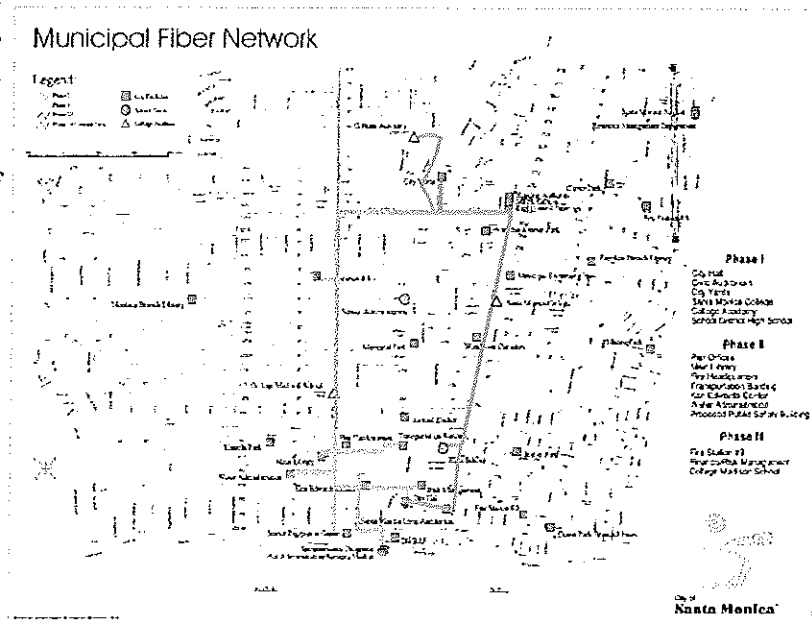


Figure 13



Main Library, Fire Administration, , the Water Administration Building and the Ken Edwards Center; and then back into City Hall. Figure 13 shows the ring and its phases.

The fiber network will also serve the Transit building, the Municipal Pier and the DWRRF building through lateral fiber runs from the main ring.

A ring architecture is recommended because it provides a high degree of reliability and survivability in case of a fiber cut or a natural disaster that breaches the fiber run at any point. Information on a fiber ring is sent twice – once in a clockwise direction on one set of fibers and again in a counter-clockwise direction on a second set of fibers. As Figure 14 shows, if the flow of information is interrupted, all points on the ring will continue to be served by one set of fibers or the other until the breach is repaired. The electronic equipment used with the fiber ring

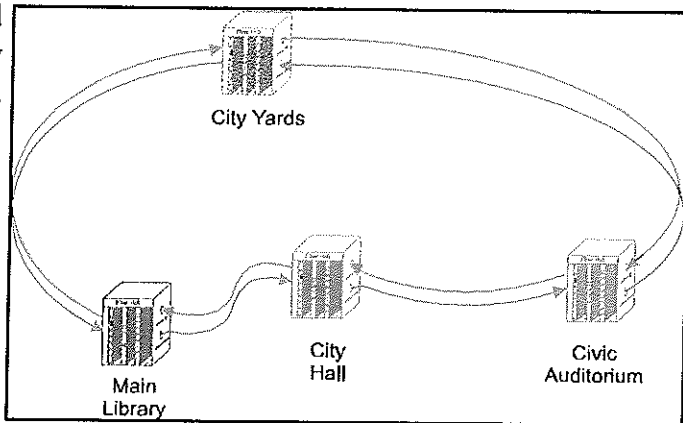


Figure 14

constantly monitors the information flow from both sets of fibers and, in case of an interruption on one set, automatically switches to the other set before any information is lost. This is the basic way that SONET networks operate.

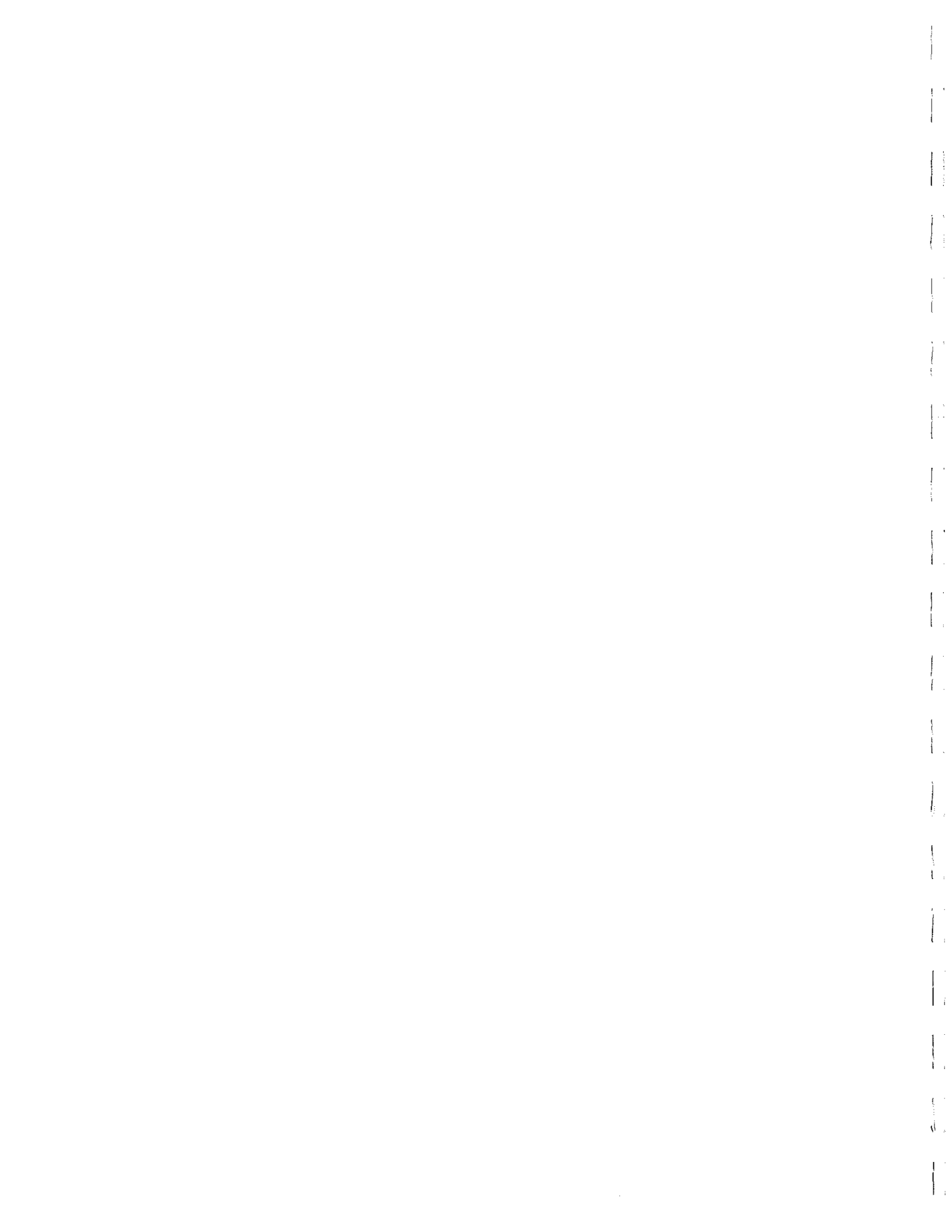
This architecture is used by the public telephone network to connect central offices. It is not, however, used often in the distribution system that runs from a central office to a customer's premises. As noted earlier in the discussion on CLEC's and CAP's, see Section III, *supra*, the CAP networks were built, in part, to supply fiber ring protection to large telecom users.

It is recommended that the fiber ring be built in three phases, spread over three fiscal years, in order to take advantage of public works projects that will reduce the cost of construction. On the entire project, over all phases, MCG estimates that the City will save approximately 31% of the stand-alone construction costs for the optical fiber network itself.

Phase I

Phase I is set forth in pink on Figure 13. It has been designed to piggy-back on the Pico Smart Corridor Project. If approved, this project will occur in the current fiscal year and will connect the two main City facilities – City Hall and the City Yards. It will also pass Virginia Avenue Park, Santa Monica College and the Santa Monica High School. MCG estimates that this phase, including building entry costs and terminal equipment costs will be approximately \$682,000.

The College has indicated that it will use the network to connect its campus with Santa Monica High School (and thus to the entire SMMUSD network) for purposes of classroom instruction among other uses. It will also pay to construct a lateral off the planned route of the fiber ring to reach the College Academy on Stewart Street. This will save the College significant circuit lease costs.



Phase II

Phase II is represented in yellow on Figure 13. It will run throughout the proposed downtown Transit Mall area and will also connect to DWRRF and the Pier. The Transportation Department intends to use the network to provide advanced information displays to its riders. In the future, it is anticipated that global positioning technology will be coupled to scheduling data bases to show riders exactly when the next bus serving a particular route will arrive.

The City will use the second phase to connect the Main Library to City Hall, thus replacing the most expensive data circuit now leased by the City. It will also connect Fire Headquarters to Police Headquarters and to City Hall. The Ken Edwards Center, Transportation Building and the Utility Administration Office will also be connected to the MFN in this phase.

MCG estimates that Phase II will cost approximately \$979,000, including terminal equipment.

Phase III

Phase III is represented in blue on Figure 13. It will complete the fiber ring. When this is done, the redundancy and reliability of the overall network design will be achieved. MCG estimates that Phase III will cost approximately \$414,000, including terminal equipment and the installation of empty conduit along Santa Monica Boulevard, east from Cloverfield to the City limits. This will permit the City to interconnect with a Los Angeles MFN and, perhaps, connect to municipal networks being constructed or operated by Burbank, Glendale, Pasadena and others. The conduit could also be leased to third parties.

The City will connect Fire Station No. 3 and Finance/Risk Management to the network in Phase III.

The College will be able to connect to the Madison School campus when this phase is completed. The hospitals, which are located a block north of the fiber ring, could connect to the network as well.

Benefits of a Municipal Fiber Network

The benefits of installing and operating a municipal fiber network are summarized below:

- The City's phone and data systems will become more reliable and more secure.
- As the PBX "virtual building" is expanded using the network, other City offices could become direct phone extensions, as some remote sites are today.
- Access to the City's high speed fiber network would be available to:
 - Santa Monica College's three campuses.

- Santa Monica-Malibu Unified School District buildings, via access through Santa Monica High School.³⁴
- The fiber link between the College and the High School will enable the introduction of distance learning projects that are ready for launch.
- The Santa Monica College “strategic partners” in the entertainment industry may be able to directly link into the Stewart street campus for valuable access to the College’s intern program.
- Data service will be dramatically improved as the computer to computer connections will increase from 256,000 bytes to as much as 100,000,000 bytes per second. The speed difference has obvious appeal to the system users, but it also has the benefit of permitting additional data applications that were not previously practical. For example, the high network throughput should permit ISD to locate all its servers in one place, enhancing network maintenance and reliability. It is reasonable to assume overall better efficiency and productivity by the City staff as a result of improved data speed and reach into multiple City data resources. Most significantly, the staff efficiency will enable them to offer their internal and external customers faster and more responsive service.
- If connected to the network over time, today’s phone bill to the 13 City facilities could be reduced by approximately \$79,000 per year, based on today’s usage and pricing.
- At this time the cost of telecommunications services to Santa Monica is entirely outside the control of the City. Prices can rise or fall, services can be dropped or added as the market place directs. Some of these will inure to the benefit of the City, others may not. Because of the City’s high telecom volumes and its high level of use, it finds itself in the place of a consumer that is so large it can justify its role as a supplier. The MFN enables the City to better control its critical telecommunications functions and plan for their development with a greater degree of certainty.
- Today’s annual data line charges to the 13 facilities could be reduced by \$46,000, but if the system connecting these facilities were upgraded by the current private providers to speeds necessary to offer new applications and expanded functions, the cost would rise to \$134,000 a year and carry one time installation charges of \$55,000 (at today’s prices).
- Video services not previously available could be offered to all facilities along the route. These include, video monitoring of multiple facilities from a single, economically

³⁴ All of the school facilities will be linked by virtue of SMMUSD’s own network. Also, building entry costs and the termination equipment of the College and School District will be an investment responsibility of the institutions.

manned control center; video conferences between PC's on the City network, and studio-based video conferencing for training and information.

- Emergency shelter and disaster management could be improved by (1) the greatly increased "survivability" of critical data, voice and video paths, once the fiber ring is complete; (2) the inherent security of a dedicated, underground telecommunications system, (3) the redundancy that the City system would offer to the public switched network; (4) the ability to create alternate emergency centers at other locations along the network, and (5) the ability to establish emergency shelters with robust and secure connections between the central emergency center and neighborhoods at selected locations such as fire stations.
- Improved transit dispatching and on-street operations coordination which will improve customer information, provide higher service reliability and improve operating efficiency. When global positioning capability is achieved, the system will be expanded to provide real-time interfaces at other major transit centers served by the Big Blue Bus. It is also envisioned that the system will be fully integrated with the Transportation Department's paratransit operations. This will enable senior and disabled passengers to achieve a significant increase in transportation mobility and access.
- Once the Main Library (Phase II) is connected to the City network it will be able to offer its resources directly to SMMUSD and SMC, and vice versa.
- It will be possible to consider the extension of the City network to citizens if certain locations along the route are equipped with terminals. Access to City government and the Internet are feasible at very little increased equipment costs once a facility is connected to the network.
- Phase II will extend conduit to Santa Monica's western border. This will permit the creation of a fiber link to the other West Side cities that will be developing their own internal fiber systems over the next five years. The administration and emergency response benefits to such a link would be immediate and the economic benefits of shared regional services could follow.
- The possible lease of conduit to facilitate the entry of new competition in the telecommunications market place in Santa Monica.
- The possible lease of dark fiber to speed the entry of new competition in the telecommunications market place in Santa Monica.

A list of the technical advantages of the MFN are as follows:

- The basic architecture is a redundant, self-healing fiber ring.

- The fiber backbone will have sufficient fiber strands to support laterals and sub-rings.
- The flexibility and sophistication of an ATM/SONET transport system.
- There are no technical shortcomings or compromises made in this Plan.

Negative Considerations to an MFN

In the interest of balance the following are shortcomings that might be associated with the MFN plan, particularly if the development of a municipal fiber network is compared to the option of not investing in any network plan, or investing in the more ambitious full service network plan, discussed above.

- Initial plan has a route of less than eight miles, limiting the reach of the network.
- Public institutions will be the only connected facilities in the initial phases.
- Many City facilities will not be connected to the network until Phase II of plan is completed.
- The network will not be redundant and self-healing until Phase III of plan is complete.
- By following the approach recommended herein, the timing of network development relies on other City projects, which could be delayed or even canceled.
- While the plan could evolve into a network serving the high bandwidth commercial users of the City, it does not enter into that business within the scope of the three phases contained in the Plan.
- Similarly, the plan will not provide network service to residences in its first three phases.
- Given the nature of the Phase I (sharing conduit with Smart Corridor) lease of excess conduit to third parties over most of the first segment will not be possible.

Human Resources Recommendations

Progress rarely comes without some cost. In the case of the municipal fiber network, MCG recommends that the City define the requirements for MFN management in the short term and make appropriate personnel assignments to accomplish this important project and assist in planning network growth.

The fiber ring itself, will require virtually no maintenance. Emergency restoration is important, of course, even when the redundancy and safety of a ring is achieved in Phase III. Cities that do not own their own electric utility, like Santa Monica, should consider retaining an engineering firm to

perform that function. There are firms that contract to provide similar services to CLEC's, institutional network operators and others.

The electronics should be covered by an on-going service contract with the manufacturer that specifies a response time. Four hour service is usually acceptable, particularly when the fiber ring is in place. The cost of this maintenance, based on current pricing, has been included in MCG's cost estimates. However, the City will need a trained individual to handle routine network administration and simple moves, adds and changes.

In addition, if the City decides to lease conduit and/or dark fiber to third parties, the manager should be responsible for administering the program. This would hold true, even if the City hires an outside firm to provide network management services. The City needs a knowledgeable network manager who is employed directly by the City and responsible only to it.

The financial models used to cost the network assume that a manager is hired at a total annual salary of \$75,000 (including benefits).³⁵

Future Opportunities

As discussed earlier, the MFN has been designed to enhance its interconnectivity and its interoperability. Thus, the Plan anticipates that the City may choose to connect its fiber network to other fiber networks in the future.

It is possible that one or more CLEC's may wish to use some portion of the City's MFN to reach customers located along the network. If so, the CLEC may wish to interconnect its network with some of the fibers in the City's network. This could be done without diminishing the value or security of the MFN to the City since each fiber strand is, in essence, a network within a network. Some fibers will enter City facilities and some will not. The fiber strands that are not physically connected to the City's equipment could be used by third parties without compromising the integrity of the City's information backbone.

Similarly, it will be possible to connect the City's MFN to other MFN's. The Plan proposes to install conduit along Santa Monica Boulevard to the eastern boundary of the City in anticipation of such interconnections. A number of cities on the west side have constructed, or are constructing fiber networks. They include Burbank, Glendale and Pasadena.

Staff will come back to Council in the future as these opportunities arise.

³⁵ Actual compensation and benefits are, of course, subject to the City's classification and compensation plan.

VIII. ACTION ITEMS

In order to effectuate the recommendations contained in the Plan, the following action items should be undertaken by the City:

- Implement and continue to refine the City's role in promoting universal access service policies.
- Complete the process, recently undertaken, to modernize rights of way management, procedures and policies. The interim standards adopted by Engineering should be reviewed and finalized. The study will look at fees charged for utility permits.
- Obtain bids for the equipment necessary to connect the Phase I buildings to the MFN. When this is done, the City should require the bidding parties to specify projected costs for connecting the Phase II and Phase III sites as well.
- Review options available for the management of the MFN, particularly in the first year of operation.
- Draft a request for proposals to determine whether a strategic partner, acceptable to the City, is interested in managing the MFN and using it to extend services to the citizens and businesses of Santa Monica.
- Pursue discussions with other West Side cities over the future interconnection of the municipal fiber networks under construction in the region.