



METRO NET

Fiber Optics and Metro Rail: Strategies for Development

**Walter Siembab
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**Submitted To:
Joint Development Department
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Executive Summary

Issue

The LACTC owns the rights to build a fiber optic network adjacent to its 300 mile regional Metro Rail and Metro Link rail network. What strategies can be used to develop the fiber network in order to derive the maximum benefits?

Strategies

Three development strategies were identified:

Service Develop on-board and/or station services that utilize telecommunications to enhance ridership or, depending on policy, generate revenue. Video security at stations is an example of a service currently offered as an enhancement. This strategy will require the smallest fiber network.

Revenue Lease rights-of-way or fiber optic capacity in order to generate revenue. This strategy will require a slightly larger fiber network.

Mobility Use the fiber optics network to improve regional mobility. The fiber network and the station facilities developed specifically to take advantage of the communications system can form the infrastructure for physically decentralized organizations. Dispersal of employment and service centers to locations adjacent to the Metro system will improve regional mobility. This strategy will require the largest fiber network.

Research

The following research objectives were met:

- Verify consistency of strategies with relevant public policies.

All three strategies are consistent with the LACTC's mission and goals and the Joint Development Department's objectives. In addition, the Mobility strategy addresses requirements of the South Coast Air Quality Management Plan, reinforces the City Centers Concept and supports regional economic growth.

LACTC Administration

1. Develop, at as high a level in the organization as possible, the responsibility for coordinating the planning-for and evaluation-of all telecommunications related projects.
2. Provide a telecommunications education program for decision makers, management and staff who will be involved in choosing and implementing a strategic direction for development of the fiber network.
3. With the time available before the merger, develop a plan for a central telecommunications policy and planning responsibility in the MTA.
4. Create the capacity to monitor state and federal telecommunications legislation that might affect the LACTC's telecommunications strategy, and identify programs that could provide financing for developing the infrastructure.
5. Amend the 30-Year Strategic Plan to include the contributions (ridership, revenue and mobility) that will be made possible by the fiber network.
6. Take the lead in becoming a mobile institution.

Service Strategy

1. Since the fiber network will, at a minimum, be used to carry many of the telecommunications-based services of Metro Rail, conduct a comprehensive planning process for telecommunications services.
2. Based on the planning process for services, estimate the short and long term fiber capacities, station facilities and train car features that will be needed. Coordinate these requirements with the appropriate ongoing design and construction efforts.
3. In the short term, begin exploratory negotiations with cellular telephone vendors to offer on-board telephone service.

Revenue

1. Acquire in-depth knowledge of the regional market for rights-of-way, conduit, dark fiber and lighted fiber.

6. Approach a variety of public-serving institutions who might have an interest in becoming more mobile by decentralizing some activities to rail stations throughout the system.
7. Approach the State about its Info California program and the possibility of locating kiosks in station nodes. Similarly, approach the County of Los Angeles about the possibility of locating County kiosks in station nodes.
8. Approach the City and the County of Los Angeles and the State of California about the potential for allowing some employees to work one or two days a week at a Metro telework center.

Fiber Backbone

1. Approach the County of Los Angeles and the City of Los Angeles about their possible interest in participating in a private network for public sector entities possibly governed by a joint powers authority. This has been referred to in this report as Metro Net.
2. Approach the State of California about the possibility of joining Metro Net or of using a portion of the fiber backbone as a collector for CALNET traffic.
3. Consider negotiating for the Red Line power contractor to lay dark fiber for the discretionary use of the LACTC.
4. Begin discussions with GTE, Pacific Bell, Merrill Lynch Teleport, Metropolitan Fiber Systems, cable television companies, and other relevant telecommunications vendors in the region about potential opportunities for private-public joint developments. One objective would be to recruit a private entity to operate a commercial broadband network on the fiber backbone.

Adjacent Property

1. Teach representatives of cities with redevelopment projects adjacent to the rail system about the property development enhancements of the fiber backbone including a commercial broadband network and Metro Net.
2. Look for large-scale developers interested in development or joint development opportunities that would involve either telecommunications station facilities, access to the backbone network or both.

Conclusion

Fiber offers the LACTC a unique opportunity to increase rail ridership, generate revenue, and add a new dimension to regional mobility. Service, Revenue and Mobility strategies can each play a role, but priorities must be established and new organizational responsibility must be developed to coordinate the numerous programs that implement policy. The Mobility strategy requires the most investment and effort but promises by far the greatest impact on the region.

Section 1

Introduction Fiber Optics, Development Strategies and Public Policies

The LACTC has plans to create a 300 mile rail transit system to serve Los Angeles County and outlying areas before the year 2000. The rights of way for this extensive rail system can also be used for the development of a new telecommunications infrastructure.

LACTC's first priority should be to choose a strategy to guide the development and use of this infrastructure. This strategic direction for telecommunications development should also be used to coordinate and set priorities for programs in such areas as the following:

- Opportunities for joint development of the telecommunications infrastructure
- Opportunities for joint development at stations and adjacent real estate
- Federal grants for related infrastructure investments such as telework centers
- Internal uses such as video security and Metro Vision
- Excess telecommunications capacity

This report is the first step in identifying and evaluating strategic options.

The report has three objectives:

- Describe the strategic options using examples whenever possible.
- Identify the next steps in assessing costs and benefits.
- Provide background information for readers who are unfamiliar with telecommunications planning concepts, technologies and applications.

at stations and "wide area networks" (WANs) at larger scale land developments adjacent to the backbone.

Large organizations can integrate a decentralized work force by connecting their LANs to the backbone. Small organizations can more easily form collaborative work groups and sophisticated supplier - producer networks.

A high capacity transmission network allows the organizations that use it to operate more efficiently. It allows computer data files to be transferred in seconds rather than in tens of minutes. Elaborate graphic displays as in on-line shopping catalogs can be scanned in seconds by customers on the network. Medical x-rays can be shared with experts in other locations on the network whereas they can't be transmitted at all without the capacity. Work groups of multi-media workstations are feasible.

The use of telecommunications is generally more cost-effective than physical travel for those activities that don't require face to face interaction. A central workplace, central meeting place or central place of service delivery are no longer as cost-effective as decentralized activities integrated through telecommunications.

A high capacity network as opposed to a network of smaller capacity means that many more people and organizations can simultaneously use telecommunications.

The economic growth potential of Southern California can improve when households, small businesses and leading institutions adopt practices that:

- minimize the use of costly private transportation,
- maximize the use of public transportation, and
- maximize the use of a high-capacity fiber network.

These are some of the reasons why the potential to develop a 300 mile backbone network of almost unlimited capacity, integrated with the public rapid transit system, justifies careful deliberation.

1.2 Development Strategies

In consultation with management of the Joint Development Department, three strategies consistent with the LACTC mission and the Joint Development Policies were proposed as the basis for the research.

Service

A variety of additional Metro Rail services can be delivered using the fiber network. These services can be provided at no cost as an enhancement to system passengers, supported by advertisers, or sold to passengers in order to generate revenue. Video security at stations is an example of a service already offered as a passenger enhancement. A service strategy will require the smallest capacity fiber backbone. See Section 2.

Revenue

The fiber network can be used to generate revenue that could be used to offset operating deficits. Capacity on the network would be made available wholesale to vendors in different telecommunications markets. A revenue strategy will require the next largest capacity fiber network. See Section 3.

Mobility

The fiber network can be developed so that its use can improve regional mobility. The fiber network and the station facilities developed specifically to take advantage of the communications system can form the infrastructure for physically decentralized organizations. Dispersal of employment and service centers to locations adjacent to the Metro system will improve regional mobility. A mobility strategy will require the largest capacity fiber network. See Section 4.

The mobility strategy has three dimensions:

- Developing facilities at or near stations that are designed for connection to the backbone network. These facilities will house activities such as meetings, conferences, education, job training, information-work and service delivery. These facilities will make the Metro system itself a destination for many consumers, workers, students and business people. See Section 5
- Developing the backbone network itself including the dark fiber and the electronics necessary to light it for a variety of uses. Once constructed, different organizations will be required to market the full range of services. See Section 6.
- Linking access to the backbone network to the development of targeted parcels in order to stimulate property development adjacent to the rail system. See Section 7.

1.3 Development Strategies And Public Policy Priorities

As a first requirement, each strategy must be consistent with the public policies that create the context for Metro system developments. The most immediately relevant are the goals of the LACTC itself. First there are the LACTC mission, and second, the goals and policies of the Joint Development Department

In addition, the mobility strategy can contribute to:

- Air quality policy, specifically the South Coast Air Quality Management Plan
- The physical development concept known as the City Center Plan
- The LACTC's Regional Congestion Management Program, and
- Regional economic growth.

These plans and policies are discussed in sections 1.3.3., 1.3.4 and 1.3.5.

1.3.1 The LACTC's Mission

The LACTC slogan, "Leading the Way to Greater Mobility," suggests two specific goals (the following is quoted from the pamphlet "Meet the LACTC"):

- To plan and implement projects that improve mobility and maximize the effectiveness of transportation dollars in Los Angeles County.
- To build, through its subsidiary, the Rail Construction Corporation, the County's rail system, approved by voters in 1980.

The LACTC is responsible for strategic planning, setting policies, establishing priorities, and coordinating activity among county transportation operators and entities, as well as coordinating transportation activities among the 88 cities within Los Angeles County. The LACTC is also the Congestion Management Agency for Los Angeles County.

Clearly, prioritizing development strategies for the fiber network is within the LACTC's mission and goals. It appears that the priorities most in line with the mission and goals are Mobility first, Revenue second and Service third.

1.3.2 The Joint Development Department's Purpose And Priorities

Joint development opportunities are an important complement to the construction of Metro Rail. In addition, the Joint Development Department of the LACTC authorized this report.

The following purpose and policies are quoted from the "Los Angeles Transportation/Land Use Policies, Background Report," prepared by the LACTC and City of Los Angeles Departments of City Planning and Transportation, December, 1991.

Purpose:

The LACTC shall actively pursue a joint development program in order to extract the optimum benefit from the utilization of property owned and acquired by the LACTC consistent with community development objectives and LACTC transportation goals.

Policies:

The LACTC will aggressively pursue joint development opportunities with developers and/or municipalities to achieve the following policies:

1. Maximize limited capital resources by leveraging the public investment with public/private interests.
2. Encourage development on, over, and adjacent to the rail stations for both passengers' convenience and to create an economic draw that fosters activity around rail transit stations.
3. Generate project revenues whenever possible to finance rail development and operating costs.
4. Integrate the rail stations into the economic and social fabric of neighborhoods they serve while preserving communities' individual character.
5. Reduce dependency upon the private automobile for personal transportation by promoting community development, commercial and retail activities around rail stations.
6. Improve accessibility to and enhance the attractiveness of the stations by maximizing the design quality of the transit related development.

7. Create joint development investment opportunities for the private sector and/or municipalities.
8. Focus economic growth by coordinating comprehensive planning, zoning and development around station sites with local municipalities and communities.
9. Encourage economic development consistent with regional and local land use objectives.
10. Assure that projects enhance present and future public transportation facilities.

In summary:

The Service strategy satisfies Joint Development Policies #2 and #7 and perhaps #3 (depending on policy).

The Revenue strategy satisfies Joint Development Policy #3.

The Mobility strategy satisfies Joint Development Policies #1, #2, #4, #5, #7, #9, #10 and perhaps #3 (depending on policy).

1.3.3 South Coast Air Quality Management Plan

The 1991 South Coast Air Quality Management Plan (AQMP), Transportation, Land Use and Energy Conservation Control Measures (Appendix IVE), Control Measure 1a., Personal Work Trip Reduction includes county transportation commissions among the parties in the region with responsibility for developing telework/telecommuting centers. The control measure states in part:

"Local governments, county transportation commissions, SCAG and SCAQMD utilize local, state and federal funds to develop telecommuting centers and reduce the cost of the equipment, services or planning used to initiate telecommuting programs."

A "telecommuting or telework center" is one type of facility that would be developed at or near stations as part of the Mobility strategy. Access to the backbone network would reduce the cost of some equipment and services used in telecommuting. The LACTC's education and recruitment campaign in support of the Mobility strategy would reduce the cost of planning telecommuting programs. And, of course, the Mobility strategy would go far beyond telecommuting (the journey to work) by also developing facilities that would reduce the vehicle trips and vehicle miles traveled associated with the journey for work and the journey to service.

Local governments, not specifically including county transportation commissions, must comply with a number of other control measures that imply the need for telecommunications facilities. Under the Mobility strategy, these control measures could be opportunities for joint development with local governments and/or private investors.

Appendix IVE, Control Measure 1a, describes the intent to accomplish the following:

- Require educational institutions (initially junior colleges and colleges) to offer core curriculum that could be learned at alternate locations (such as at home) in order to reduce school related trips (VT and VMT). This could be accomplished at distance education centers located at Metro stations.
- Develop centralized ordering and home delivery services in order to reduce shopping trips. This could involve teleshopping facilities at Metro stations.
- Require all large, multi-site employers to have their employees report to the nearest work facility to their homes. Rail based telework facilities could help employers satisfy this requirement.
- Provide tax incentives to developers for establishing telecommuting/telework centers in housing rich areas. Wherever Metro stations occur among high concentrations of housing, there is an opportunity to joint venture with local governments and/or private developers for providing these centers.

Two other control measures found in Appendix IVE could similarly involve Metro based telecommunications facilities.

- Control Measure 2.d. Merchant Transportation Incentives asks local governments to require large retail establishments to offer customer mode-shift incentives and provide for non-motorized transportation needs.

While the letter of the measure is concerned with encouraging retail customers to use buses and bicycles, the intent would be served by customers teleshopping whenever possible.

- Control Measure 17 Growth Management sets VMT reduction targets for all subregions which local governments are encouraged to meet through a variety of means, including jobs-housing balance.

Telecommunications facilities could play a role in bringing some jobs to housing rich areas, but the South Coast Air Quality Management District and the Southern California

Association of Governments are revising this control measure. The revision should be analyzed in terms of the Mobility strategy's potential contribution.

1.3.4 Centers Concept Development Policy

The Centers Concept is a land use and growth strategy adopted by the City of Los Angeles almost 20 years ago.

"The Centers Concept of the Los Angeles General Plan establishes the primary framework for growth of the community. The Centers Concept was adopted by the City of Los Angeles in 1974. Similar concepts have been adopted by the County of Los Angeles and the Southern California Association of Governments (SCAG) for their areas of responsibility. The Concept envisions a series of Centers connected by a regional rapid transit system."

(Supplemental Environmental Impact Statement, Los Angeles Rail Rapid Transit Project, U.S. Department of Transportation, Urban Mass Transit Administration, July, 1989, Page 3-2-3)

The plan based on the Centers Concept designated 56 centers in Los Angeles County, 37 located within the City of Los Angeles. An important objective of the plan was to preserve the low density suburban life style of the area by channeling new development into designated centers. Each center would have a "high intensity of varied urban activities: residential, commercial, cultural, recreational, and appropriate industrial uses" (Concept Los Angeles, Department of City Planning, City of Los Angeles). A rapid transit system was envisioned to connect the centers.

The resulting urban form involved a hierarchy of central places which would also be connected by public rapid transit.

"Centers may include one or more local concentrations called 'nodes.' A node distinctly separated from the Center is termed a 'satellite.' Nodes and satellites will be connected to the rapid transit station in the core and to each other by a grade-separated auxiliary transit system." (Concept Los Angeles)

The plan made explicit assumptions about how this city form consisting of a hierarchy of mixed use centers would function.

"A typical center will function as a focal point for adjacent suburbs and nodes will have a "core" of about one-quarter mile radius containing a rapid transit station, high rise office structures, department stores, hotels, theaters, restaurants and government offices." (Concept Los Angeles)

Planning for the Metro system specifically respected these form and function aspects of the Centers Concept. For example, the new locally preferred alternative for the Metro Orange Line "would support implementation of the Centers Concept by connecting Centers, by promoting development at designated growth centers, by revitalizing economically stagnant areas, and by providing commercial services and employment near established population concentrations." (Supplemental Environmental Impact Statement, Page 3-2-7)

The Mobility strategy could possibly affect two problems that Metro Rail has so far failed to solve in relation to the Centers Concept.

Centers Not Served By Metro Rail

Over 50% of the original 56 Centers will never be served by the Metro system according to current plans. It will be many years before Metro service eventually reaches most of those approximately 25 Centers for which it is planned. In fact, an unmitigable adverse impact in the Metro Orange Line EIS is the growth that Metro Rail may attract to the Regional Core that would otherwise locate at City Centers not served by a rail station. (Environmental Impact Statement, Page 3-2-27)

Under a Mobility development strategy, the LACTC's fiber backbone network could be extended in a Phase II to City Centers not served by Metro Rail. This would mean that all designated Centers would be served by the Metro fiber network at a very reasonable cost. See a further discussion of Phase II development benefits in Section 4.3.

Incorrect Functional Assumptions Of Centers Concept

As stated above, a Center is expected to function as a "focal point for adjacent suburbs and nodes." In other words, the concept intends that Centers contain activities that attract residents from the immediately surrounding area. In cases where a local resident had a job in a distant Center, the resident would travel to the local Center in order to catch rapid transit (rail or otherwise) to the distant Center.

As we well know, Los Angeles County has successfully developed a number of Centers outside the Regional Core, but they are not multi-purpose, mixed-use Centers that serve the immediately surrounding population. Each Center tends to contain more specialized functions that have a regional attraction. Century City, for example, is specialized in office facilities for entertainment lawyers. Residents of Century City housing do not necessarily work in Century City offices.

Similarly, Fox Hills Corporate Pointe has specialized in offices for high tech industries. These offices do not necessarily serve residents of the adjacent Fox Hills apartments and condominiums.

Nor does travel follow the periphery-to-core and core-to-core pattern. Peter Gordon of the University of Southern California has suggested that the region has dispersed origins and destinations, with many trips going from periphery to periphery and never passing through a designated Center. (See Gordon, Richardson and Giuliano, Travel Trends in Non-CBD Activity Centers, U.S. Department of Transportation, April, 1989)

Gordon's research shows that many economic activities occur outside of Centers. Without further analysis, it is difficult to tell whether these non-central economic locations are in fact sub-centers or nodes in a more elaborate spatial-economic hierarchy.

The problem is that high density centers should function like Centers. As much as possible, the work place, place of service delivery (for education, health care or government services) and place of business coordination (for meetings or communication) should become the closest:

- Center or node, or
- Metro station.

The potential role for the Metro fiber network is to provide the infrastructure that will retrofit the region by integrating all Centers nodes and stations. The decentralized institutions can then offer local opportunities to work, acquire services and communicate. Centers will then function as centers. This is discussed further in Section 4.

1.3.5 Regional Economic Development

Even though there is not a coherent policy framework for regional economic development, it is still possible to review the Mobility strategy's potential contributions to regional economic health. The mobility strategy will make possible:

- Potential decreases in freeway congestion in addition to any congestion reduction that results from Metro Rail. This means that scarce freeway infrastructure could be used to increase the speed of physical throughput in the region. This would benefit parts suppliers and sub-assembly plants, port warehouse connections to inland distribution points, inland manufacture, processing and assembly plant connections to the port and so forth. The goal would be traffic conditions that support just-in-time production systems.

- Reduction in the consumption of imported gasoline and automobiles.
- Increased productivity of the work force. Research on home based telecommuters suggests that their productivity increases by more than 10% (see JALA Associates, Final Report, Telecommuting Pilot Project for the State of California, 1990). In addition, less time for travel results in more time for personal endeavors such as education.
- Increased administrative efficiency by large organizations throughout the region due to telecommuting, telework and teleservices. Potential increase in the speed of government permit processing through the reduction of centralized bureaucracies and the use of advanced communications.
- Increased availability of educational and vocational training opportunities in every neighborhood.
- Increased jobs associated with the proposed telecommunications developments and the related land developments (without assessing the potential job losses to those with marginal transportation dependent jobs).
- Potential stimulus to the electric car manufacturing that CAL START is attempting to initiate, by creating demand for low performance, short haul electric vehicles that can be produced with less capital and in the near term.

In summary, the Mobility strategy offers the opportunity for the LACTC to lead in developing a Southern California "Tele-Region."

A tele-region is one in which individuals and organizations make extensive use of telecommunications resources to conduct business and acquire services while minimizing the need for physical travel. High capacity networks function as robust economic pipelines that reinforce every Center and reach into every neighborhood. Centralized bureaucracies become flat and more dispersed.

1.4 Research Scope

Research was conducted in order to verify the validity of the initial strategic options, improve the definition of each, identify approaches to implementation and identify next steps in the evaluation of the strategies.

The contract specified the following:

- Review of relevant policy documents published by LACTC, County, City of Los Angeles, South Coast Air Quality Management District and other agencies.
- Interview of at least five other rail corporations regarding their experience with telecommunications.
- Interview of key public and private sector entities regarding their network plans, possible joint ventures and market opportunities.
- Review with LACTC attorney of possible legal restrictions on LACTC actions in the telecommunications arena.
- Interview of representatives of "telework" centers regarding approaches and costs.
- Review of development plans of property adjacent to one rail line for projects that might be affected by high bandwidth telecommunications services.

1.5 Legal Constraints

The opinion of the LACTC's attorney, Nossaman, Guthner, Knox & Elliott, regarding the authority of the LACTC to engage in the fiber optics telecommunications business was provided as attorney-client privileged communication. This opinion was used implicitly as a guide in crafting options and it appears that the options described in this report fall within the constraints outlined in the opinion. Because of its confidential nature, the opinion will not be explicitly mentioned further. Obviously, the LACTC should seek a specific legal opinion on the fiber development strategies before proceeding.

Section 2

Service Strategy

2.1 Background

The Service strategy represents the minimum development level of the fiber network. Of the three options, the Service strategy will result in the smallest capacity fiber system, the least additional station development and the least impact on adjacent property development.

But even at this development level, a substantial fiber network will be required. A 24-fiber network was built under the Blue Line and there is a 48-fiber system being built in each Red Line tunnel (the control demands are greater on the Red Line).

The two major uses of fiber capacity are currently train control and closed circuit television for security at each station. Train control is an inherent characteristic of the rail system while television for security represents a service offered at no charge as an amenity to riders.

A number of additional services are possible. Public service possibilities include transit information terminals and government kiosks for information and/or transactions. The commercial possibilities include automated teller machines (ATMs) for banking (like for the Star or Cirrus networks), remote terminals for on-line catalog shopping, cellular telephone service, news and entertainment (in the forms of games or programming).

In general, there are three ways of looking at each service. The first is to offer it at no charge as an amenity. This is a way to enhance ridership, much like television security does. The second produces revenue from advertising. This amounts to selling the attention of a captive audience to advertisers. The third produces revenue for-fee from direct sales to passengers.

Services can be offered on-board trains or at stations or both.

The following matrix is a way to envision the Service strategy options:

On-Board

	Free	Ad Supported	Passenger Supported
Public Info & Trans			
Commercial Info, Serv & Trans			

Station

	Free	Ad Supported	Passenger Supported
Public Info & Trans			
Commercial Info, Serv & Trans			

Virtually any service, public or commercial, can be offered free, as advertiser supported or for-fee. For example, the current Metro Vision proposal is for an advertising supported system of providing transit information (like expected arrival times of trains) and general news. This same technology under a different service policy would allow transit information to be provided advertiser free as an amenity (resulting in more information per minute) or to be provided only to those who pay for it (not a way to encourage ridership).

Similarly, even something as unusual as a satellite delivered entertainment channel such as ESPN could be provided for free to encourage ridership, advertiser supported like on cable television to produce revenue or for-fee through special video terminals on-board each train.

Research to identify potential costs and benefits can be commissioned at such time as the LACTC becomes interested in specific options.

One service that would likely have a high impact is on-board "information" services. These are a class of services that extend from "silent radio" (e.g., moving text delivered via a radio frequency) to on-board video.

Only one service was investigated -- mobile telephone. The research results and conclusions follow.

2.2 Research

AMTRAK Railfone

Railfone is a joint venture between AMTRAK and GTE. As part of their partnership, both firms made capital investments to create Railfone. GTE provided technical expertise in the design of system hardware, but AMTRAK used its own labor force to install Railfone equipment.

More importantly, GTE provided the billing and credit card charging system that it developed for its Airfone service (although Airfone uses a technology different from Railfone, the billing and credit card charge system is identical). Without GTE, AMTRAK would have been forced to invest millions of dollars to develop its own billing and credit card charge software.

The AMTRAK/GTE joint venture buys cellular phone services at wholesale rates from the cellular system licensee in each territory traversed by the train. The Railfone equipment on board each train transmits each call to the nearest cell site of the wireline-based cellular provider for the territory in which the train is travelling.

(Each geographically defined market in the United States has two cellular licenses. One of the licenses was automatically assigned to the local exchange carrier. The local exchange carrier, by providing a cellular service connected to its monopoly local exchange service, is the wireline-based cellular provider.)

In other words, as the train (equivalent to a multiple user automobile) moves between cell site service areas, call traffic is handed off from one cell site to another. Billing software tracks call traffic and automatically calculates charges based upon the applicable tariff.

To avoid termination of Railfone conversations at LATA boundaries, FCC waivers of rules prohibiting local exchange carriers from carrying interLATA traffic were required. Because the LACTC rail system operates wholly within the large Los Angeles LATA, no similar FCC waiver would be required.

AMTRAK Railfone also benefited from the location of many wireline based cellular sites along railroad rights-of-way which occurred prior to development of Railfone. Cell site locations along the railroad rights-of-way were attractive to cellular providers because the railroad often runs parallel to major highways where the bulk of automobile cellular phone customers travel.

As 50-50 partners, AMTRAK and GTE each earn approximately \$500,000 per year from Railfone.

Of course, cross-country rail travel should generate much more demand for rail telephone service than intra-urban rail service. The time spent on Metro Rail is probably under one half hour per trip while a traveller could spend from 2 hours to 4 days on AMTRAK. Nevertheless, the full range of service options should be evaluated for compatibility with the Metro Rail context; and, there will be many more passengers on Metro Rail than AMTRAK.

2.2.1 Cellular Telephone Providers

L.A. Cellular Telephone Company

LA Cellular is very interested in discussing the possibility of a joint venture with LACTC for providing cellular service on board the trains.

Pac Tel Cellular

Pac Tel Cellular is interested in discussing some type of relationship with LACTC for providing on-board cellular service. It appears doubtful that Pac Tel would offer the service itself and split the revenues with LACTC. Service reseller is the type of relationship that Pac Tel usually pursues.

There is a 21%-22% margin offered as a discount to resellers. That is, a reseller buys circuits and air time in volume at about 22% below retail. This amounts to \$45 per month for the circuit and \$.45 per minute peak and \$.27 off-peak for air time. A monthly volume of between \$1,200 and \$1,500 per circuit is required.

The market for cellular service on commuter trains is unknown. One way to mitigate the uncertainty suggested by Pac Tel is for LACTC to buy cellular service in volume for its own employees and contract with a third party to resell the unused portion on the trains.

Pac Tel expressed a concern over the design of the phone setting for on-board use and the possibility of signal blockage from the train car or other rail facilities.

The new personal communications networks (PCNs) based on micro cell technology which will be introduced around mid-decade may reduce the need for rail rights-of-way. Tall cellular towers with extensive sight lines will be replaced with a network of many smaller towers.

2.2.2 Continental Cablevision

Continental is currently testing the cellular telephone market in three other cities. It may be 3 years before the company makes a decision whether or not to enter this business. Continental could joint venture with an existing vendor or attempt to enter on its own (current FCC regulations limit the cellular to two providers per market area).

Other cable television companies are also testing the cellular telephone market. The introduction of personal communications networks (PCNs), a digital form of cellular, may change the FCC rules and bring many new competitors into the market.

2.3 Conclusions

Both L.A. Cellular and Pac Tel Cellular are interested in discussing options for providing on-board mobile telephony.

Pac Tel may be interested only in a reseller arrangement. In that case, the LACTC might want to evaluate its internal needs for mobile telephones and fold them into the deal. And the LACTC should consult with its attorney about the legality of a reseller arrangement. Pricing at cost as an amenity might mean service can be resold, while pricing as a profit center may not.

LA Cellular may be open to other types of partnership arrangements.

The region's cable television companies will most likely have varying interests in short and long term involvement in cellular telephone service. Nevertheless, they potentially offer a competitive option to the two established firms and should be consulted before making a deal. This is particularly true if the LACTC intends to enter into on-board information services as an amenity or revenue source. Cable companies may be a source of programming.

LACTC should evaluate its interest in other telecommunications services. Transit kiosks and government kiosks, should be seriously considered. A policy for each service should be established between free advertiser supported and for-fee.

Section 3

Revenue Strategy

3.1 Background: Why Rights-of-Way Have Value

The rights-of-way owned or controlled by the LACTC have market value because of newly authorized competition in certain telecommunications markets. After years of maintaining official barriers to entry, the federal and State governments have reversed this policy and invited inter-industry competition. As a result, new market entrants are constructing public networks and large consumers are constructing (or leasing) private networks.

Competitive public networks are being built to serve customers who want:

- redundant service--i.e. local access from more than one carrier to provide an alternative in case of system failure, and
- competitively priced high end services such as high speed data transport.

Private networks are being built by large consumers who want to control costs and acquire more immediate control of their service mix.

Wire based networks of any significance require the use of some public rights-of-way, whether acquired from city governments, electric or gas utilities, transportation companies or others who own them. Therefore, LACTC controls an extremely valuable resource for wire based telecommunications companies.

The remainder of the background discussion describes how and why the government encouraged competition in telecommunications markets.

The Former Telephone Natural Monopoly

Soon after its inception, telephone service came to be regarded as a natural economic monopoly. Telephone systems deliver service to local homes and businesses. They require high capital investments such as telephone instruments, transmission wires and cables, and intricate central switching equipment. The high capital investment necessary to enter the market makes telephone systems similar to water, gas and electric utilities which also depend on expensive infrastructure.

These utilities were also dependent on large economies of scale -- the greater the number of customers to share the company's high fixed costs, the lower the possible rate for

service. Regulators soon reached a consensus that competition in such natural economic monopoly industries was a waste of scarce capital resources. Having two or more telephone or gas companies in the same market area served only to increase fixed costs for all customers. This "destructive competition" was legally eliminated by the erection of legal barriers to entry -- legal and regulatory rules that allowed only one firm to provide service in a market area.

By 1910, the United States government and AT&T acknowledged the fact of natural economic monopoly in telephone service. In exchange for the grant of a legal monopoly status, the Bell System undertook the obligation of non-discriminatory, universal service and subjected itself to government rate regulation. As long as high capital investment costs were necessary to provide telephone service, the natural economic monopoly characteristics of telephone service remained a reasonable justification for the end-to-end legal telephone monopoly known as Ma Bell.

Technology Advances Undermine The Natural Economic Monopoly

The invention of microwave transmission technology and computer technology drastically undermined the natural monopoly rationale for parts of the service markets of the Bell telephone monopoly. Microwave technology allowed long distance communications without the high cost of installing terrestrial copper and coaxial cables between cities. The cost of long distance telecommunications dropped significantly. As a result, a number of small companies sought legal authority from government regulators to provide competitive long distance service to business, and later, to residential customers.

The Legal Monopoly Crumbles

AT&T responded to the growing competition with actions which its competitors claimed violated federal antitrust laws. The U.S. Department of Justice, responding to complaints from MCI and others, filed an antitrust law suit against AT&T seeking to break into independent parts the largest private corporation in the world. The law suit was settled in 1982 when AT&T consented to divest itself of ownership of the local telephone companies.

The Post Divestiture Telephone World

The terms of the divestiture are contained in a court entry known as the Modified Final Judgment (MFJ) which became effective January 1, 1984. Among other things, the MFJ

defined the markets that AT&T and the divested operating companies could and could not enter.

In the eight years since the divestiture occurred, a number of competitive markets have developed. These include:

- Long distance
- Customer premises equipment (CPE) with advances in digital computing that offers consumers varied and sophisticated telephone instruments far advanced over the standard plain black telephone of the former monopoly.
- The maintenance and repair of telephone wiring inside customer's buildings.
- Private networks where large consumers build an in-house telecommunications capability

The MFJ also established Local Access and Transport Areas (LATAs) to define service areas within which local phone companies (known as local exchange carriers) continue to have a monopoly. Calls that originate and terminate inside a LATA (intraLATA calls) were the exclusive domain of local exchange carriers such as Pacific Bell. Calls that originate in one LATA and terminate in another (interLATA calls) are the exclusive domain of interexchange carriers such as AT&T, MCI and Sprint.

As mentioned, interexchange markets introduced competition. Now competition is evolving for local exchange carriers in the intra-LATA market.

Three new markets are particularly relevant to the LACTC.

The first, referred to as alternate local transport providers (ALTs) or competitive access providers (CAPs), provides competition to local exchange carriers for: (a) intraLATA point to point communications and (b) the transport of interLATA traffic from origination to the point of presence of the interexchange carrier.

CAPs have begun to construct state of the art fiber optic networks within the central business districts of a number of cities, including Los Angeles. The emerging competition in the local access market has created a new demand for right-of-way needed for the expansion of the CAP network outside the central business district.

CAPs, such as Metropolitan Fiber Systems and Merrill Lynch Teleport are aggressively expanding their Los Angeles networks now. Each CAP knows that the first company to serve a new area has a competitive advantage over the second and subsequent providers.

Expansion tends to follow the location of the biggest customers. This means that certain routes will have more value at a given time than others. For example, there was a high

demand for the Los Angeles central business district to Long Beach route in winter, 1991.

Rights-of-way can be obtained from individual cities, public utilities such as Southern California Edison or the Los Angeles Department of Water and Power, petroleum companies with gas pipelines such as Shell Oil, other telecommunications companies such as Western Union, and rail companies. Clearly, a CAP is most interested in obtaining the right-of-way needed from a single entity whenever possible.

The second new marketplace is for cellular telephone. This is a mobile telephone service based on new technology that has grown dramatically in the past five years. The basis for the service is a series of cells, each served by a tower which maintains radio contact with consumers driving in the cell. The growth in the market for mobile cellular services requires addition of many new cells and tower sites. In some cases, LACTC rights-of-way could be used as sites for the in-fill towers.

The third new marketplace is about to be created by the California Public Utilities Commission. The State's New Regulatory Framework will include competition for intra-LATA toll traffic. Local exchange carriers, inter-exchange carriers and CAPs will all be allowed to compete. Each industry group and each firm will evaluate its network in terms of the new market opportunities and challenges.

For local exchange carriers, inter-exchange carriers, CAPs, cellular telephone companies, cable television companies and potentially others, the stakes involved in network expansion and extension amount to billions of dollars of business.

3.2 Research

3.2.1 Survey Of Rail Corporations

A telephone survey of some of the major transit and rail systems in the United States was conducted in order to determine current practices regarding the use of rights-of-way to install telecommunications systems.

The following entities were contacted:

- AMTRAK
- Metropolitan Transit Authority - New York City
- Southeastern Pennsylvania Transportation Authority - Philadelphia
- Chicago Transit Authority
- Metropolitan Area Rapid Transit Authority - Atlanta

- Bay Area Rapid Transit - San Francisco
- San Jose-Santa Clara County Transportation Agency
- Washington Metropolitan Transit Authority - Washington DC
- Massachusetts Bay Transportation Authority - Boston

AMTRAK

AMTRAK's Real Estate Department split off the telecommunications specialty into the Corporate Development Division. That Division markets AMTRAK rights-of-way, RailPhone and a proprietary computer reservation system software.

AMTRAK leases right-of-way to local exchange carriers, competitive access carriers, and long distance carriers. They utilize standard right-of-way leasing agreements. They base rates on expert right-of-way valuation and comparisons to comparable tariffs paid by the Regional Bell Operating Companies.

AMTRAK is willing to share sample agreements and rate-setting policies. But, since it is a private corporation, it is not subject to public contracting laws.

In the past, AMTRAK has negotiated agreements with telecommunications developers to build excess capacity for AMTRAK ownership in exchange for access to the rights-of-way. AMTRAK then sold this excess capacity to other telecommunications vendors who compete in the same markets with the company that originally built the excess capacity. This approach is no longer favored because telecommunications vendors have objected to building the transmission system of competitors.

AMTRAK also enters into agreements which allow cellular telephone companies to use plots of their land for the construction of cellular site transmitter/receivers. These agreements include AMTRAK's right to install its own microwave antennas for internal communications on the cellular towers.

AMTRAK has a joint venture with GTE to provide on-train phone service called RailPhone. An equal partner with GTE, AMTRAK enjoys a 50% share of the profits. This service has been very profitable for the company. See Section III for a discussion of RailPhone.

Metropolitan Transit Authority - New York City

The MTA oversees four subsidiaries: The New York Transit Authority (which operates the subway system), the Long Island Railroad (which operates commuters trains on Long

Island) the Metro North Commuter (which operates commuter trains to Connecticut and northern New York suburbs) and the Triborough Bridge and Tunnel Authority (which operates the toll bridges and tunnels).

In terms of rights-of-way, the New York Transit Authority has the most valuable assets. The subway system itself runs through the Manhattan business center and has an internal dividing wall to separate public utilities from the tracks. This construction provides better protection to telecommunications facilities than comparable aerial installations or bridge attachments.

The NYTA has five major agreements allowing several vendors to install point to point telecommunications systems in the subway. Three agreements are with Teleport (CAP), one with MCI (long distance), and one with a cable television franchisee. At one time, Metropolitan Fiber Systems (CAP) was interested in using subway rights-of-way for its metropolitan area network but lost interest when the City of New York granted it a street franchise.

Using an UMPTA grant, the NYTA is constructing a 300 mile 12 fiber communications system to service its own internal transit needs. The NYTA has decided not to market excess capacity due to system security concerns.

Southeastern Pennsylvania Transportation Authority Philadelphia

In about 1988, Metropolitan Fiber Systems (MFS) approached SEPTA about leasing some of its right-of-way to install a fiber optic transmission network. SEPTA responded with an RFP. MFS was the highest bidder, although some smaller and more speculative companies also bid on the project.

The installation of the MFS system was relatively simple because SEPTA had empty conduit along the 6 mile route of its Blue Line subway. In addition to paying \$5 to \$7 per foot for the right-of-way, MFS provided dark fiber for SEPTA to connect all stations along the Blue Line.

SEPTA is preparing to issue a second RFP to see if any additional telecommunications vendors are interested in the rights-of-way.

Chicago Transit Authority

The CTA has agreements with a number of telecommunications vendors, including Illinois Bell, Teleport and MFS.

The CTA is preparing to issue an RFP for lease of the rights-of-way on the line between downtown and O'Hare Airport. The route has empty conduit which makes it easier and faster to install the fiber. However, since the train line lays in the center of an interstate highway, maintenance may be relatively more difficult than in other systems.

CTA may require the winner to supply several dark fibers for internal communications. Illinois Bell, Teleport and MFS are expected to bid. The RFP has been in the works for three months.

Metropolitan Area Rapid Transit Authority - Atlanta

Alternate local transport carriers have approached MARTA about leasing right-of-way on two occasions. The company involved did not follow up in either case.

MARTA currently has no right-of-way agreements with any telecommunications carriers and it has no formal policy for doing so.

Bay Area Rapid Transit - San Francisco

BART has two leases for use of its right-of-way for fiber optic networks. Pacific Bell has a fiber optic cable running through the transbay tube. BART receives \$96,000 per year in compensation for this lease.

The second lease is with the Clorox Company which runs a fiber cable between two office buildings. The cable runs through the 12th Street BART station in Oakland.

BART is also exploring the prospect of more aggressively marketing its rights-of-way to other telecommunications companies. The consulting firm of Kingston, Cole & Associates of Mill Valley recently completed a study that identified three companies that would be interested in having the right to lay fiber in all of BART's rights-of-way. These companies are: Pacific Bell, MFS and SP Telecommunications. SP Telecommunications is a subsidiary of the Southern Pacific Railroad.

BART is preparing to follow a two-step RFP process; a Request for Qualifications followed by a Request for Proposals. BART is interested in a partnership arrangement. The winning company will construct a fiber system for its use as a retailer, and additional fiber for BART to own and lease to other interested parties.

San Jose-Santa Clara County Transportation Agency

The SCCTA has not been approached by any telecommunications vendor. Although the transit system runs between the area's two convention centers, the centers are not linked by fiber. The party providing the information was unclear whether a special telecommunications link exists via some other technology such as microwave.

Washington Metropolitan Transit Authority - Washington DC

About three or four years ago, WMATA released an RFP to lease METRO right-of-way. The only bidder to respond and build was Institutional Communications Company (ICC) which allegedly is owned by the Kiewit Brothers. If this is true, ICC and MFS would have common ownership.

ICC has installed its own fiber system in METRO tunnels and rights-of-way. In some locations, ICC is leasing excess capacity from its system to METRO.

METRO uses both analog and digital fiber communications systems to control its trains. Fiber is presently being installed in the new Green Line.

Massachusetts Bay Transportation Authority - Boston

AT&T, MCI, Sprint, New England Digital Equipment Corp. (DEC) and Teleport all have lease agreements with MBTA. Charges are based on a zone system. Rights of way along the suburban commuter rail range from \$1.50 to \$2.50 a lineal foot. Rights of way along transit in the central business district cost about \$5.50 per foot. The original pricing policy proved to be too optimistic.

The MBTA Charter does not allow it to enter the telecommunications business.

3.2.2 Survey Of Non-Rail Right-of-Way Developments

State Of California - California Aqueduct

The State of California's right-of-way along the California Aqueduct represents a resource necessary for the long distance telecommunications market.

In 1986, the State of California, Department of Water Resources was approached by U.S. Telecom regarding availability of the California Aqueduct right-of-way for construction

of UST's network backbone. Coincidentally, the Department of Water Resources was exploring ways to revamp its communications infrastructure through the use of fiber optic technology.

The State's specific telecommunications needs and the prohibitive cost of building a separate fiber optic network resulted in the Water Resources Department issuing an unusual RFP. Instead of a monetary lease, the State would take: .

- Fiber and electronics in exchange for the use of the right-of-way
- Guarantees of security and access
- Maintenance and care of the network
- First buyback option of the network in the event of bankruptcy or change of ownership.

Five telecommunications companies responded to the RFP with MCI winning the bid. MCI's approximate cost of laying the fiber network was \$8,000 per mile. A network of 22 fibers in 4 buffer tubes was laid in 1987. The State received one tube with 6 fibers. The MCI network was operational within 3 months of initiating the contract. The State independently developed its own network capabilities.

Because of the aqueduct's easy accessibility, control by a single jurisdiction, and few crossings, MCI realized a savings in construction that increased the value of the network to \$17,000 per mile. By accepting fiber as payment in-kind for the right-of-way, the State estimates its network development savings at \$10,000,000 over the cost for developing the network itself.

The State General Services Department has leased some of its unused capacity back to MCI. The fibers in use have become part of the State communications network known as CALNET.

Department of Water and Power, City of Los Angeles

The DWP has an approximately 300 mile network of power lines and poles. This resource is of interest to competitive access providers (CAPs) and to interexchange carriers.

The power system has some unique features valuable to telecommunications providers. Aerial cables can't be accidentally damaged by a backhoe and power poles are very stable since they don't blow over.

Until fiber technology became feasible, power poles were not an option for telecommunications providers. Copper wire is susceptible to electrical interference while fiber is not. Data communications are used extensively by the power system for control, similar to a rail system.

The DWP intends to lease lighted fiber to telecommunications vendors as an additional source of revenue. But its requirements are opposite of the rail system examples and the California Aqueduct, previously discussed. Because of the potential danger from being on power poles and because of the essential nature of power distribution, the DWP will only lease capacity from a telecommunications system that it builds itself. Lessees will not be allowed on the power poles.

The DWP Director of Telecommunications has conducted research on lease rates obtained by power systems elsewhere and that information is proprietary. However, pricing elsewhere is not necessarily a guide to the market in Los Angeles. The first lease signed by DWP sometime in the spring of 1992 will provide some concrete clues to the relationship between route and value, at least for lighted fiber. A rough approximation of what DWP may get in its first lease is \$350,000 per year for a 15 mile segment of a 4 fiber pair.

Some firms, Metropolitan Fiber Systems for example, strongly prefer to build and maintain their own fiber plant. Lighted fiber under the control of DWP is not as attractive to MFS as empty conduit might be. Other firms prefer to lease rather than build fiber because it conserves capital and allows them to expand their service area more quickly. Since it is developing a substantial over-capacity in its telecommunications network -- both for future DWP use and for lease -- the DWP suggested that it might be willing to lease capacity at a substantial discount to other public sector organizations.

Finally, DWP is expecting to compete with Southern California Edison for the power contract for the MetroRail Red Line. Whichever power company wins will develop a fiber network to control the power network. If the RFP for the power system allows for the possibility, LACTC could get the fiber network it needs for control of the transit system from this source.

3.2.3 Survey Of Public Sector Organizations

Local public sector organizations with facilities in the region were contacted in order to determine the potential government interest in the LACTC's rights-of-way. Many of these government organizations have or are planning to build their own telecommunications network.

Information Technology Service - Telecommunications Branch, County of Los Angeles

The County of Los Angeles operates a variety of facilities and provides contract services to a number of cities located throughout the County. As a consequence, the County government has relatively high needs for telecommunications.

Accordingly, the County operates its own telecommunications network. This network consists of County owned microwave channels and PBXs as well as central office services and local access services acquired from Pacific Bell or GTE.

The County telecommunications network is facing a critical problem. The capacity of the microwave channels in its network has been reached making further expansion of service impossible without moving some of the traffic onto wire. At the same time, network planners intend to introduce new broadband services such as video conferencing.

The demand for more capacity has resulted in a search for rights-of-way that would allow development of a County-owned wire line telecommunications system. Existing County owned rights-of-way consists of County road beds and unincorporated real estate such as the mountain tops where their microwave transmitters are located.

Therefore, the County is generally interested in the LACTC's rights-of-way. The specific interest will vary according to the route and the timing of the availability. For example, the County is highly interested in the link between the central business districts of Los Angeles and Long Beach represented by the Blue Line rights-of-way. If the leasing mechanism or other arrangement is not in place before 1993, they will pursue a different solution.

- The level of County interest also varies according to the form of the resource offered. The highest interest is in existing conduit or duct bank in the right-of-way. This allows the quickest and easiest network construction.
- The next highest interest is in dark fiber to which the County would need only to add electronics. This is followed by an interest in undeveloped right-of-way where the County would need to trench and install conduit.

While development of this central office is not an immediate priority, it may become so in the near future.

Telecommunications Division, Department of General Services, State of California

The State of California has operated an internal telecommunications system for 20 years. Known as ATSS, the system consists of a network of private leased lines.

The State entered into an agreement in 1989 to build a modern private network in order to increase control over system operation and configuration, traffic monitoring, emergency operations and cost. The new system, known as CALNET, provides service to State offices and participating local governments.

The State, like the County of Los Angeles, has little access to sub-regional rights-of-way. The value of CALNET increases as the number of locations it serves increases. The State is selectively interested in those routes that can extend CALNET to offices that now must be served "offnet," that is by commercial vendors who make the linkage to CALNET. Long Beach is an example of a location now offnet.

Capital is the largest constraint for active involvement by the State in routes of interest. It will be fiscal 1993-94, if then, before money will be available to invest in additional facilities.

In the meantime, CALNET has services available for trade. This possibility provides another element for consideration in a joint powers authority for a potential regional private telecommunications network for public sector organizations.

The State has additional information to offer this project. The Department of Water Resources recently developed an agreement with MCI to lease rights-of-way along the California Aqueduct. In addition to paying rent, MCI agreed to install fiber for use by Water Resources for telemetry and control.

Department of Telecommunications, City of Los Angeles

The City's Department of Telecommunications (DOTC) is responsible for long range telecommunications planning for the City. The Department of General Services is responsible for day to day operations of the City's telephone system and for paying the bills.

The DOTC is currently performing a traffic analysis of its existing network which is primarily leased from Pacific Bell. These traffic data will be used in a master plan for future network development. The orientation of the Department is toward developing a network with more capabilities (e.g., more bandwidth) that costs less to use. The annual cost of telephone service currently exceeds \$15 million.

Like other large employers in the region, the City must concern itself with the VMT and the AVR of its workforce. By the end of the year, the DOTC will complete its Telecommuting Pilot Project. If the results are positive, the long range policy might include a decentralized workforce with strategic implications for both office space acquisition and network development.

Department of Transportation, City of Los Angeles

The City's Department of Transportation (DOT) is constructing a sophisticated ground traffic control system that uses the acronym ATSAC. This system includes a network of sensors placed at intersections on 5 east-west transportation corridors between the ocean and the central business district. It also includes video surveillance at some of these intersections as well as at locations on the Santa Monica Freeway. The message signs along the Santa Monica Freeway are also part of ATSAC.

The communications backbone for ATSAC consists of a fiber cable that will be buried beneath most of the length of Venice Blvd. sometime this spring. Both MFS and Teleport have expressed interest in getting into the "Venice trench" while it is open. Those responsible for City communications are also interested in laying fiber in the open trench (ATSAC is being developed independently by the DOT and outside of the other telecommunications infrastructure of the City).

3.2.4 Survey Of Private Sector Organizations

Metropolitan Fiber Systems (MFS)

MFS is technically in the alternate local transport marketplace. This means that it provides high speed data, video, and voice services over private point to point leased lines. For example, MFS provides alternative transport between large businesses and their long distance carriers. It does not offer switched services nor does it provide local access to residences.

MFS is wholly owned by Kiewit, a mid-west mining and construction firm. Because of that, MFS has what many public sector entities lack -- ready capital.

With national and State telecommunications policies encouraging competition in every feasible service element of the old end-to-end telephone monopoly, MFS is engaged in an aggressive expansion of its facilities. It is interested in the high-end consumer regardless of that consumer's location.

The following list of locations are some of the MFS's areas of expansion:

Burbank	Hollywood
Santa Monica	LAX
Culver City	El Segundo
Long Beach	Brea
Glendale	Pasadena
Irvine	Anaheim
Sherman Oaks	LA Central City East

Of those, the route to Long Beach was the highest priority in December 1991. Its preference is to lease conduit and develop the fiber network itself. It has trained crews and available capital so that it can construct a network link before most public entities can issue an RFP.

For routes of interest, MFS is willing to pay rent, build a network link providing additional capacity to LACTC, and/or provide an equity position in the route segment that uses LACTC rights-of-way. Rights of way without conduit are less valuable because expensive trenching is necessary.

One of the central issues in identifying and evaluating options for telecommunications in LACTC's rights-of-way involves the advisability of developing private networks for public sector telecommunications vs keeping that traffic on networks built with private capital. MFS raised this issue as will most other firms in this marketplace.

Merrill Lynch Teleport

Merrill Lynch indicated an interest in acquiring LACTC rights-of-way depending on the route and the timing of availability. It is currently expanding its network to the north, southeast and west of the central business district.

Merrill Lynch is most interested in dark fiber, then empty conduit, undeveloped right-of-way and lighted fiber last. It would consider a partnership or revenue sharing.

L.A. Cellular

LA Cellular is very interested in the possibility of acquiring right-of-way for cellular towers. Its preference is to conduct one negotiation for a maximum number of sites such that sites could be added as justified by demand at a predetermined price.

Pacific Tel Cellular

Pac Tel Cellular is cautiously interested in pursuing rights-of-way for cellular towers. Determination of interest would depend on a closer comparison of cell tower construction plans with exact LACTC rights-of-way. Interest might also depend upon whether Pac Tel Cellular becomes involved in offering on-train services (see Section 2).

Continental Cablevision

Continental Cablevision owns an extensive coaxial cable network that it is selectively rebuilding with fiber. It holds franchises which grant the right-of-way to streets in several cities in the County. For the most part, its franchises are consolidated in one contiguous mass.

Continental holds a few franchises in outlying areas. At some point in the next several years, it will want to connect its headend in the Los Angeles cluster with those outlying systems as a cost saving measure. Two of these outlying systems, Tustin and Pomona, appear to be relatively close to the commuter rail portion of the rail system.

Since the mood of the federal government is to encourage inter-industry competition, cable television companies are good candidates to enter other regional markets, particularly point-to-point data and video that is the mainstay of the CAPs/ALTs business. In fact, Continental currently has a 50-50 partnership with Teleport in the Boston area.

Cellular telephone is another market that cable companies might enter in the next few years. Continental is already testing this possibility with experimental joint ventures in Stockton, Jacksonville, Florida and a town in New England.

Continental needs absolute control over its network. Therefore, it has no interest in acquiring lighted fiber. The firm might consider dark fiber but would prefer empty conduit or even undeveloped right-of-way.

U.S. Sprint

U.S. Sprint (USS) and the LACTC are currently engaged in a dispute over rights-of-way. USS and Southern Pacific Railroad had a right-of-way agreement which allowed USS to install communications facilities in SP's Southern California rights-of-way. SP subsequently sold or leased some of its railbed to LACTC but did not assign its right-of-way contract with USS.

U.S. Sprint has a pending claim that LACTC took actions impairing USS's rights. Until this dispute is resolved, USS would find it difficult to enter into a new deal for LACTC right-of-way.

Nevertheless, U.S. Sprint is interested in LACTC right-of-way for two reasons.

- The ability to provide redundant routes to customers in order to minimize the risk of loss of service.
- The potential profits in the CAP/ALT business. USS has considered forming an adjunct company to enter this market in competition with MFS and Teleport. Due to present market conditions and USS's available capital, the firm is primarily interested only in observing.

U.S. Sprint is interested in learning more about LACTC's plans to market its rights-of-way.

MCI

Like USS, MCI is interested in acquiring new right-of-way as a way of providing some customers with redundant routes. MCI also believes that the impending competitive market for intraLATA toll will lead to interest in rights-of-way along certain routes.

MCI is very interested in keeping abreast of LACTC's plans to market its rights-of-way.

3.3 Conclusions

Rail Corporations

Telecommunications policies among transit providers seem to be related to the size and age of the transit operation. The largest or oldest transit operations provide transmission capacity for internal communications needs and tend to have rights-of-way policies to

generate revenue. Size implies location in a major telecommunications market. Age implies the time to mature as an organization into additional concerns.

AMTRAK leads the way with RailPhone, a value-added telecommunications service developed with a joint venture partner (GTE). More information on RailPhone is presented in Section 2.

MARTA, on the other hand, is a relatively new development and the rail system of the San Jose - Santa Clara County Transportation Agency is both new and relatively small. Neither lease their rights-of-way to telecommunications vendors.

Survey respondents indicated that revenue could be made through leasing rights-of-way to telecommunications vendors. But revenue estimates must account for the available local competition. Public rights-of-way are a competitive market with utility companies, cities, telecommunications companies and a variety of rail firms as providers.

For example, the Metro Blue Line auction, held in the spring of 1992, had no bidders. One of the reasons for this was available telecommunication alternatives. Other reasons include a particularly onerous RFP, no allowable access to the Blue Line fiber, and a poor regional economy.

Enhancements can provide a competitive edge and higher lease rates. Enhancements such as existing conduit and a depth of 4 feet or more mean lower construction costs, shorter construction time and greater protection to the system from surface disruptions. Economic value also varies according to whether the rights-of-way are found in dense commercial areas or whether they connect one or more dense commercial areas. This suggests that different links in the LACTC system may lease at different rates.

It also suggests that if the rail system itself attracts significant levels of adjacent new development over time, the rights-of-way should also increase in value to telecommunications vendors.

No examples were found of a rail corporation developing telecommunications facilities to enhance mobility. This idea appears to be on the cutting edge.

Non-Rail Right-of-Way Developments

The State's experience illustrates one advantage of allowing a private telecommunications company to develop the fiber network -- the speed of construction. A private telecommunications company tends to maintain a staff of construction specialists which

is not true of all public sector organizations. And the private sector does not have the public sector's time consuming bid requirements.

The experience of DWP should be watched closely since it provides concrete information about the local market for lighted fiber. Although the route will differ from those available through the LACTC, the structure and value of the deal could provide important information about the value of the Blue Line's fiber.

DWP could also become a contributor to a regional private network for public organizations should the LACTC take the lead in developing it.

Public Sector Organizations

Demand for rights-of-way by large public sector network developers exists but is subject to several constraints.

First, the exact route determines the value. While this was shown to be true in the survey of transit systems, public sector interests are not always in the commercially dense central business districts. The County is interested in reaching small suburban civic centers for example. This suggests the same route may differ in its value to private telecommunications developers and to governmental entities.

Second, the value of each individual linkage will vary according to how the timing of its availability coincides with the network expansion or modernization plans of the public and private network developers in the region.

Third, public corporations in the early 1990s tend to lack capital. Therefore, some form of private capital and public rights-of-way and other resources may provide a realistic development opportunity. The County, in particular, is interested in developing a fiber backbone network but lacks both capital and the rights-of-way to do so.

The City of Los Angeles may need bandwidth along specific routes such as downtown to San Pedro. But the extent of these needs may not become known until after the master planning effort has been completed and until the long term implications of its telecommuting policy are known. The City also has right-of-way resources that might complement those of the County and LACTC.

Private Sector Organizations

A wide variety of players in the regional telecommunications marketplace may be interested in specific routes. These include CAPs who are the primary targets because they are currently developing their networks. But interexchange carriers, local exchange carriers, cellular companies, cable television companies and even individual large multisite firms will all be interested in some route at some time.

Many of these parties will jump in and out of the market as their business plans change to reflect available capital for investment or new strategies for inter-industry competition. LACTC can maximize the value of its rights-of-way by thoroughly understanding the needs of these potential consumers.

Most telecommunications retailers need to control their networks. This allows each firm to guarantee service, provide the correct level of maintenance, trouble shoot when there is a problem and add electronics to expand capacity when market conditions justify such an investment. Their interest is in empty conduit, undeveloped right-of-way or dark fiber. Lighted fiber is usually the last priority and, in some cases, is unacceptable.

Section 4

Mobility Strategy: Introduction

While the Revenue and Service strategies are familiar and straight forward, developing the fiber network for mobility is relatively novel and complex. For this reason, Section 4 contains an extended explanation of the Mobility strategy. Sections 5 through 7 report on the related research.

4.1 How A Fiber Network Can Increase Regional Mobility

A high capacity fiber backbone network represents the infrastructure for a new way of doing business. With it, large information industry organizations such as the City and County of Los Angeles, the State of California, Kaiser Permanente or the Bank of America can:

- produce their products and services at locations near or easily accessible to employee's residences, and
- deliver their products and services at locations near or easily accessible to the homes and offices of their consumers.

In other words, for the new infrastructure to be used effectively, organizations in the County must themselves become more mobile. As a result, employees, contacts, clients, consumers, constituents and students will face a much shorter journey to satisfy their needs. I have referred to this elsewhere as "institutional mobility." See "Institutional Mobility: A Cost-Effective Approach To Economic Growth And Environmental Protection," Walter Siembab and Tom Read, Western City, July, 1992.

Fiber in combination with Metro Rail will produce employment, consumer and communications opportunities that are easy to reach. Stations and adjacent locations will themselves become destinations.

Examples

Assume that a large, regional educational institution such as UCLA Extension will offer 10 telecourses at various Metro Rail and Metro Link stations each evening of the week. Instead of traveling to the Westwood campus or to the downtown branch, students will drive or bus to their nearest Metro station in order to take the train to the station at which

the desired course is offered. In this scenario, UCLA Extension would use the fiber backbone to deliver the tele-course to the station classroom at the scheduled time.

Some of these same station classrooms can be used during the day by other educational institutions. For example, Trade Tech might use a set of station classrooms during the day to offer a live interactive video course. The instructor could be located at the Trade Tech campus while the students participate from three different station classrooms.

Kaiser Permanente could offer a range of outpatient services at stations located on the Metro Red, Blue and Green Lines. Depending on the service, outpatients could travel either to one of the main hospitals or to the appropriate Metro station. A range of resources available at the central hospital can be accessed at the station clinics over the fiber backbone. These include computer-based records, x-rays and medical specialists via interactive video.

At the same time, Kaiser Permanente could decentralize its billing operation by arranging for data entry clerks to work out of a telework facility located at a Metro station near or a short ride from their residences. The fiber backbone would be used to connect the work stations at the station telework facilities to Kaiser's information processing center.

Incentives

The incentive for organizations to attempt the required innovations include:

- More efficient and lower cost service delivery, thereby cost-effectively improving consumer satisfaction,
- Increased employee productivity (generally experienced in telecommuting programs),
- Increased employee satisfaction from reducing a commute that, for the region, averages 30 miles roundtrip,
- More cost-effective business practices that utilize more telecommunications for meetings and document transfer and less travel in automobiles for those purposes.

These are possible because of the communications benefits from access to the fiber network.

To a private sector organization, the communications benefits will come from having a choice between two service vendors. At least one competitive access provider (CAP) should provide point-to-point service between stations throughout the backbone network.

The local exchange carriers (Pacific Bell and GTE) might also offer services along the fiber network, or could offer normal switched service from stations to other locations in the region.

Public sector organizations will have an additional incentive. Hypothetically, they could choose to join a consortium of interests who collectively own and operate a public sector private network on the backbone network (see Section 4.3 below and Section 6).

The Mobility strategy can potentially also provide benefits to start-up and small businesses and to free lance workers. The station facilities that would be developed under a Mobility strategy include commercial (on-demand) and publicly subsidized (first come, first served) work stations and teleconferencing rooms (see Section 5).

Commercial facilities would ensure that every start-up or very small business has access to a state-of-the-art work environment close to home or a reasonable train ride from home. Subsidized facilities ensure that under-capitalized entrepreneurs can also have access to these resources near home.

4.2 Organizational Development

There are two key components of the Mobility strategy. One is organizational development. The other, infrastructure development, is discussed under 4.3.

Two types of organizational development activities must occur and the LACTC can provide the leadership for both.

Existing Organizations

The first involves the transformation of existing organizations into "mobile institutions." Large public and private organizations need to understand the cost/benefit prospects from physically decentralizing work and services.

For several reasons public sector organizations are more likely to lead private businesses in this effort. Most importantly, State, County and local governments can directly gain more from the fiber network through joint development than can private businesses in general. This is discussed below under 4.4.

Public sector organizations are also facing enormous budget pressures that are forcing the redesign of public service delivery systems. Faced with cutbacks in the work force and with increasing demand for law enforcement personnel, cities and counties might be open to more cost-effective methods of producing and delivering their services. Information

services and transactions on kiosks, like with an automated teller machine, can provide greater convenience to consumers and save government money through end-user co-production of services/transactions.

Finally, it is particularly local governments who have responsibility for implementing and enforcing transportation control measures required by the AQMP. To take pressure off their local base of private businesses, cities may attempt maximum compliance for themselves. In order to enforce particularly some of the telecommuting and telework requirements discussed in Section 1, governments may have to demonstrate the techniques themselves.

If the LACTC decides to at least tentatively adopt the Mobility strategy, the LACTC should itself begin the transformation to a mobile institution. Steps to accomplish this would constitute a study in itself, however, a modest telecommuting program would be a place to begin.

The LACTC should also attempt to find funding for a project that would engage public and private organizations in a demonstration of the costs and benefits from decentralized service production and delivery to station locations along Metro Rail.

New Organizations

The second type of organizational development is the creation of new organizations that will make the implementation of the Mobility strategy more successful. Without going into detail, these organizations include the following:

- A new organization within the LACTC to centrally coordinate the various activities (from fiber construction to a tele-mobility demonstration project) in existing departments that contribute to the implementation.
- A joint powers authority (JPA) to operate a private network for government organizations over the fiber backbone (see 4.3 below). This may also include community advisory committees to the JPA.
- A non-profit corporation to foster use of the backbone network and its various station facilities among governments, large private businesses, small businesses and individuals.

4.3 Elements of the Infrastructure

In telecommunications jargon a network consists of "nodes" and the "connections" between them. This is analogous to a railroad network that has stations and tracks

between them. The stations and the tracks together constitute a rail network. Tracks alone don't provide opportunities for riders to reach multiple destinations.

So it is that the fiber network has two main elements; nodes in the form of telecommunications-related station facilities and the fiber backbone that connects them.

Fiber Backbone

A fiber backbone network is simply a quantity of fiber strands that can satisfy all the transmission needs that will materialize in the long run and that will be partitioned into a set of discrete networks for use by different entities.

Because the backbone will potentially contain several distinct operating networks, it can become a large, multi-vendor marketplace that represents distinct investment opportunities.

Under a Service strategy, the backbone would hypothetically carry distinct networks for system control, closed circuit television, Metro Vision and cellular telephone service. As other services or internal communication needs are identified, this list will grow.

Under Revenue and Service strategies, the backbone might carry those networks plus, along certain routes, the network of a competitive access provider (CAP) such as Merrill Lynch Teleport or Metropolitan Fiber Systems.

Under a Mobility strategy, the backbone would hypothetically carry the various LACTC service networks plus a private network for public sector organizations plus at least one CAP along all routes, plus perhaps also the local exchange carrier in the appropriate franchise area.

The Mobility strategy would, in other words, require a much larger capacity backbone network than the other strategies. Along with a marginally higher development investment (the marginal cost of adding dark fiber is small), the Mobility strategy would greatly expand the opportunities for joint development and for new economic activities.

The CAPs play a significantly different role under the Revenue and Mobility strategies. Under a Revenue strategy, one or more CAPs would competitively bid for fiber capacity on routes. The routes and minimum bid requirements would be chosen so as to maximize income to Metro Rail. Not all routes would be of interest to CAPs.

Under a Mobility strategy, Metro Rail would encourage one or more CAPs to provide commercial service along all routes. This would mean potentially less revenue since the

business arrangements would reflect incentives to build and operate throughout the system, rather just on high demand routes. The benefit would be the availability of competitively priced high bandwidth services available to all commercial businesses that are part of the station developments and developments at adjacent properties.

The LACTC also has the option of extending the fiber backbone into a second phase of development. Through an agreement with surrounding municipal and county governments, the fiber backbone can be extended to locations not yet served or not planned for Metro Rail service. The result could be an extensive high capacity network that integrates every civic center, designated City Center and Metro Rail station into one powerful communications system dedicated to public service.

Station Facilities

Telecommunications related station developments form the second component of the fiber network. In real estate terms, these will consist of the various structures that will contain the telework, teleservice and communication activities of public and private institutions. In telecommunications terms, these will consist of the local area network (LAN) at each station.

Under the Service strategy, the LAN conceptually would link the closed circuit video surveillance cameras and other devices such as Metro Vision screens to the backbone.

Under the Revenue strategy, there are no particular station developments involved. The retail vendor (CAP) would simply use the backbone to connect to a particular client, probably at some distance from the fiber network.

Under the Mobility strategy, public institutions, large private institutions (such as Kaiser Permanente or Bank of America) and commercial service vendors such as the Office Technology Group would develop facilities specifically because of access to the fiber network.

Since station developments are also mandated to integrate into the social and economic fabric of surrounding neighborhoods, the public institution's developments in particular will involve some measure of consideration for local needs and interests.

4.4 Joint Development Opportunities

Joint development opportunities exist in both the construction and the operation of each element of the network -- fiber backbone and the telecommunications related station facilities.

Fiber Backbone

Each fiber development strategy offers a particular set of joint development opportunities. The Service strategy offers the least, the Revenue strategy the next most and the Mobility strategy offers the richest opportunities for joint development.

The LACTC, essentially following a Service strategy, routinely builds a fiber network as part of its rail construction operations. As previously mentioned, data transmission for the central control of trains and video transmission for station security via closed circuit TV are applications that use considerable fiber capacity.

A 24-fiber network was built for the Blue Line. There is a 48-fiber network in each Red Line tunnel because of the greater data requirements for train control.

These fiber networks are designed and built by a team of subcontractors. Although this involves other parties, subcontracting is not joint development. Joint development is not an option because the integrity of the train control system must be protected.

A Revenue strategy offers a couple of joint development opportunities. The LACTC could invite a competitive access provider to:

- build a portion of the fiber network in exchange for access to the rights-of-way, and/or,
- offer the LACTC a percentage of gross from marketing part of the fiber network (this is the approach taken by the Department of Water and Power, City of Los Angeles in offering its fiber to telecommunications vendors).

A Mobility strategy offers a number of joint development opportunities.

Distinct from a straight revenue approach where the LACTC would auction fiber to the highest bidder, the pursuit of mobility requires that the backbone network carry one or more commercial public networks. A private network for public entities is also required.

The objectives of a Mobility strategy can best be achieved if the commercial developments at the stations have a commercial telecommunications vendor to carry high

bandwidth communications between them. The local exchange carrier (Pac Bell or GTE) will offer switched narrow band service.

The revenue from this enterprise will not be as important as the fact that it delivers point-to-point commercial transmission services along the fiber route.

Another option is a joint powers authority (JPA) that would operate a private network for public entities on the backbone network.

This private network will be referred to here as Metro Net (Metro Tel or Metro Fiber are also possibilities as all are parallel to Metro Rail, Metro Link and so forth).

The LACTC cannot itself retail telecommunications services. It can authorize telecommunications contractors to use LACTC fiber to retail services (Revenue). It can operate a private network serving its own telecommunications needs as it does now (Service). Or it can join with other governments in creating a private network that meets collective telecommunications needs (Mobility).

Hypothetically, membership in the JPA Metro Net could be offered to any government or agency in the County that is willing to become institutionally mobile. Such a government would:

- direct a portion of its employees to report to Metro Net work stations one or more days a week instead of travelling to the respective city hall or government building,
- develop the capacity to make some of its services available through kiosks or through satellite offices located at Metro Net facilities,
- hold electronic meetings with other governments, individual contractors, constituents and its own distributed staff through Metro Net facilities.

The County of Los Angeles and the City of Los Angeles are both good candidates for such a joint venture. These specific cases are discussed further in Section 6. However, any agreement with the County would certainly have many complexities.

For example, the LACTC currently purchases services from the County so that some sort of barter could be included in the agreement. In addition, the County has resources such as microwave channels that could be used to hasten the Phase II extension of Metro Net to growth centers and civic centers that are not planned for Metro Rail service.

The endeavors to restructure existing institutions and build new ones must have a reasonable time frame. This sort of change does not usually occur quickly. A ten-year program seems appropriate.

Facilities

Development of telecommunications-related station facilities can hypothetically be developed by the Metro Net JPA, commercial interests or institutions like the Los Angeles Unified School District or Martin Luther King Hospital.

The real estate portions of these options follow traditional lines of joint development. However, the fiber backbone opens opportunities for additional types of development such as telework or teleservice centers. The options for physical development of these facilities are discussed in Section 5.

The communications system that serves:

- any development on or over LACTC property, or
- adjacent property in which the LACTC is a co-developer,

can easily be connected to the backbone. This local area network (LAN) or wide area network (WAN) in the case of several adjacent properties is an additional opportunity for joint development. A variety of telecommunications vendors including manufacturers and distributors of terminal equipment such as computers and video conferencing units are possible partners.

4.5 Impacts On Ridership

The Mobility strategy should result in a net increase in Metro Rail ridership.

It is true that the Mobility strategy may result in fewer or shorter trips in some cases. Using a previous example, there may be Trade Tech students who won't ride to the CBD campus at the Washington Blvd. Blue Line station as often because they are able to attend their classes at a station closer to their home.

Just as the Blue Line attracted bus riders as well as automobile riders, the Mobility strategy will reduce or eliminate some Metro Rail trips as it reduces or eliminates some automobile trips.

On the other hand, more people can be expected to ride Metro Rail because of the facilities developed as part of the fiber network. Using the Trade Tech example again, classes near home may make it possible for more single mothers to attend, or for those to attend who cannot afford to pay even the nominal amounts required to ride Metro Rail on a regular basis. Using new station facilities as more space for classes could mean an expanded enrollment.

Kiosks which provide for a range of transactions, services, and information for several different local governments could add to the convenience of Metro Rail riders or cause some citizens to travel to a rail station rather than a regular government facility. For example, kiosks providing services by the State of California, County of LA, Cities of LA, Lynwood, Compton and Carson could attract a significant number of riders to the Compton Blvd. station.

Even in cases where an individual drives directly to a desired station, the drive will most likely remain shorter than a drive to the regular destination. Furthermore, an increase in foot traffic around the stations will ultimately lead to greater value for the service enterprises that come to locate at or near the stations. More foot traffic may also potentially make the station areas safer.

4.6 Social Equity Issues

The Mobility strategy would also potentially impact a range of social equity issues. These include the distribution of public services, ability of individuals to access public services, and equity in telecommunications markets.

Service Delivery

Social equity is always an important issue when designing service delivery systems. For example, political leaders are sometimes accused of directing better police services to wealthy neighborhoods than to poor communities. When designing a new infrastructure for service delivery, it is therefore important to ensure that there is not an inherent inappropriate income bias.

The essence of institutional mobility is to move the delivery of services close to the consumers. This is especially an issue in low income communities. According to a report prepared for the Western Center on Law and Poverty by UCLA Professor Martin Wachs, "to be poor in Los Angeles is not only to be without money but also without mobility." Jobs, public welfare and social services are inaccessible to many poor people because they can't regularly afford even the public transit options.

Concerns for social equity can be best insured by beginning trials of the Mobility strategy first in the context of low income communities. The Metro Blue Line would be a good place to begin to demonstrate the Mobility strategy.

Service Accessibility

Infusing local institutions with new technology, new structures, and new practices means not only training managers and staff, but also teaching constituents how to effectively use these new opportunities.

In many cases, the service will be offered in a familiar fashion but at a new location. This will be the case with staffed satellite service centers.

In other cases, kiosks or other electronic devices may play a role in some aspect of the service delivery. For example, the State of California has successfully experimented with administering automated intake interviews for the Aid to Families with Dependent Children program through kiosks.

While the procedure is not complex, there may be an initial resistance to try. This will be reduced as familiarity with the new system grows just as it did around automated teller machines (ATMs) for access to banking services.

As the range of telecommunications facilities at stations grows, other categories of users will become involved. Some of these will include small businesses, entrepreneurs and free lance workers. The LACTC may want to sponsor special programs for these and other users to teach them how to effectively utilize the new infrastructure.

Telecommunications Markets

Although equity in telecommunications markets has not yet become a significant social issue, the shift from regulated monopolies to competition will widen the gap that currently exists in access to communication services between the poor, middle class and well-endowed.

The simple truth of competitive markets is that they tend to discipline prices but they do not serve all segments of society equally well. The automobile market serves some with limousines, some with jalopies, and others not at all (those that require public transportation). The housing market serves some with mansions, some with shacks and others are homeless (public housing has not been an adequate response to the failures of the housing market).

To be without communications abilities is to be truly powerless. This is particularly true when communications is seen as a cost-effective approach to mobility. Metro Net can become an important element of the social equity safety net that will be needed to shield individuals, small businesses, non-profit corporations and public corporations from the harshness of market competition.

For a more detailed explanation of the problem and for a comprehensive policy proposal see, "The Role of Local Government in a Competitive Telecommunications Marketplace," by Walter Siembab and Daniel Wright, presented at the Annual Conference of the National Association of Telecommunications Officers and Advisors, September, 1992.

Section 5

Mobility Strategy: Development of Station Facilities

5.1 Background: Station Facilities

In order to simplify the discussion to this point, telecommunications has been defined abstractly as nodes (station facilities) and the connections between them (backbone network.) The next Section (6) presents details regarding the backbone network while this Section refines the definition of station facilities.

Station facilities can be discussed in terms of at least three dimensions -- physical properties, equipment/services and conditions of access.

Physical Properties

A station facility can consist of a single room or a complex of rooms developed adjacent to the station or over the rail line. Alternatively, a station facility can be one element of an entire building on public or private land within a quarter mile of the station.

For the purpose of this discussion, assume the basic building block of each station facility consists of a modular room. Each station facility can consist of one or many of these modules.

The modular room comes in two basic internal designs:

- One is an open design that could be used for meetings, conferences and classroom style education.
- The other is a design with internally divided spaces that could be used for telework stations and individual style education or training.

If the two room types were used together, the resulting double room could provide the setting for delivery of a range of institutional services. The open module would serve as the waiting area while the divided module would house the professional and administrative staff.

Equipment/Services

Personal computing has evolved to the state where a desk top computer can support data, voice, image and video communications. Wide area communications can satisfy group needs for audio and video conferencing and include variations such as communicating grease boards.

Personal computing/communications lend themselves to the internally divided or work station spaces. Wide area communications lend themselves to the open module.

Both modules together can be used as a telework center with electronic meeting capabilities, or for delivery of social services where the professional staff uses the work stations and the service recipients use the open module as a waiting area. After 5 P.M., the work station module can be used for individualized vocational training and the open module can be used for a class in English as a second language.

The transaction kiosk has become an additional type of node technology. The public has become familiar with automated teller machines as an access node for many branch bank services. Government agencies have recently begun to employ similar technologies as access nodes for government services. For example:

- The "Info/California" program of the State of California had 15 transaction kiosks in operation in January, 1992. These kiosks allow access to information and services provided by 18 different State agencies.
- Los Angeles County introduced the 24 hour "AutoClerk" kiosk at the Long Beach County Courthouse in February, 1992. Motorists can pay parking tickets and moving violations through the AutoClerk.

Kiosks could be individually placed on or near station platforms. A set of kiosks for different public and private sector purposes could be established inside an open design module.

Finally, a set of local area network (LAN) services can be provided within the station node. A wide range of services is possible. The specific services will determine the type of equipment used and private contractors can provide them.

The station LAN would connect to the wide area network (WAN) via a local gateway. See Section 6 for a discussion of the telecommunication facilities that connect the node facilities.

Kiosks and LAN services are not explicitly discussed under 5.2 Research. Kiosks have unique wide area network needs. LAN services are implicit to the telework category.

Conditions Of Access

There are essentially three categories of access. Each will be explored in more depth under 5.2 Research.

The first is "subsidized." Although open to individuals and businesses, this category typically has severe restrictions on who may use the resources and/or the conditions of use. A non-profit corporation may control the resources. The social purpose of the subsidy involves either stimulating a market that has been slow starting, or providing a minimal level of service to a private market whose cost would otherwise exclude many.

By analogy, a typical cable television franchisee's public access studio and channel is available first come, first served. Many public access channels have restrictions on political endorsements and money solicitation. A single purpose, non-profit corporation often controls the public access resources. Public cable access provides a minimal level of service to the many who can not afford to purchase time on commercial broadcast or cable channels.

The second category of access is "commercial." Commercial facilities are of course the most common phenomenon. They presumably are more responsive to the full range of market needs and interests, and are generally open to all individuals and businesses based on ability to pay.

The third is "institutional." These facilities are those that are controlled by a particular firm or institution for its own purposes. In some cases, the purpose may be internal to the organization such as a single firm's satellite work center. In cases where the controlling institution has a public service mission, the clients or constituents may use the facility. A mini-city hall located at a remote location for the convenience of citizens is an example of a public-serving institutional facility.

5.2 Research

5.2.1 Nodes

For the purpose of conducting research, the categories of physical properties and equipment were combined into one. Open modules are assumed to need equipment for group communications and are referred to as "conferencing" facilities. Divided modules

are assumed to need equipment for personal computing and personal communications and are referred to as "telework" facilities.

The following matrix relating type of facility to conditions of access has six cells. The cells are the basis for research.

	Public Subsidy	Commercial	Institutional
Telework	1	2	3
Conferencing	4	5	6

Telework Facilities: Subsidized (1)

Assembly Bill 3069 (Clute) was signed into law by Governor Wilson on September 30, 1990. The legislation authorized the State to provide \$100,000 each to telework demonstration facilities located in Riverside and San Bernardino Counties. The State grant was subject to the condition that equal amounts would be obtained from the county transportation commissions of Riverside and San Bernardino Counties and from private industry. The State funds were drawn from the Petroleum Violation Escrow Account.

As a result of this pilot program, the Economic Development Partnership established the Telecommuting Work Center of Riverside County, and the Inland Empire Economic Development Council established the Telebusiness Work Center in Ontario (and a second center in Apple Valley).

Each management organization is required to report back to the legislature with the results of the pilot program. The original date for the report was July, 1992 but this may be extended due to a late start for the project and a longer than expected ramp up period.

There is some concern among the commercial vendors of similar facilities that the State is subsidizing competitors. In response, the Telework Centers claim that they:

- serve a different market niche -- the support services offered are comparatively few,
- provide low cost facilities to firms who want to try telecommuting, and are, therefore, incubators for firms who will eventually move to commercial work centers -- employees are limited to a one year tenancy in the subsidized centers, and
- limit availability to a small class of inbound commuters -- those living in the Inland Empire and travelling certain transportation corridors to work.

They do not, however, require users to live within a maximum distance of the facility, nor to agree to walk or ride transit. Such requirements may characterize telework centers in the future.

Table 5-1 provides a summary of the characteristics of each center vs the characteristics of two commercial telework centers.

Telecommuting Work Center of Riverside County

The Economic Development Partnership, Inc. is a non-profit corporation whose mission is to bring new jobs and business investment to the Inland Empire. Private sector supporters providing either cash or in-kind donations include Pacific Bell, IBM, Southern California Gas Company, Commuter Transportation Services - Orange County, the SCAQMD and Stockwell and Borne.

The facility is open only to employers in Orange County and southern Los Angeles County whose workers live in the Inland Empire and travel the 91 and I10 freeway corridors to work. Self-employed individuals are not allowed.

The WorkCenter offers 12 cubicles and 19 offices (with doors). Employers may put several people in each office and may authorize different workers to use the WorkCenter on each day of the week.

Cubicles are offered at no charge and employers are charged \$100 per month for an office, regardless of the number of workers using the office. Market value was estimated at \$600 per month for a comparable office and \$300 per month for a cubicle.

At the time of this survey, 8 offices and 0 cubicles were occupied. The offices are used by TRW (2 offices with 3 workers per office, 5 days per week), Pacific Bell (2 offices with 3 workers in one and 4 workers in the other), IBM (1 office with 1 worker, 5 days per week), Edison (2 offices with 2 workers per office, 5 days per week) and Xerox (1 office, no other details). The space used for the WorkCenter is leased for \$160,000 a year.

Telebusiness WorkCenters, Ontario and Apple Valley

The Inland Empire Economic Council is a non-profit corporation whose mission is to promote economic growth in the Inland Empire while improving the quality of life.

Private sector supporters providing either cash or in-kind donations include GTE/Contel, IBM, Southern California Edison, Commuter Transportation Services, TotalPlan, and Patton's. The San Bernardino County Air Pollution Control District was an additional government contributor.

The facility has about the same restrictions as the Riverside center. The target employees are those who travel the I10 corridor to Los Angeles County.

The WorkCenter offers 26 cubicles and no offices. Unlike Riverside, the Ontario center provides a computer and modem with each workstation. Individual users are expected to provide their own software. Each work station also has a dot matrix printer and a central laser printer is planned.

Employers are charged \$100 per month for a computer equipped cubicle. Market value was estimated at \$850 per month for a comparably equipped cubicle.

At the time of this survey, 5 work stations were occupied, all by Edison, and 3 more were committed, to Xerox, GTE and Kaiser.

The space required \$107,000 in tenant improvements. There is \$77,000 per year in rent concessions from the building owner.

Telework Centers: Commercial (2)

Executive Suites and the Ontario Comm Center were surveyed for services and rates. The comparisons with the subsidized telework centers are shown in Table 5-1.

The major differences between commercial and subsidized telework centers are:

- No restrictions on use -- as one consequence, commercial centers tend to serve smaller businesses than the subsidized centers.
- More upscale environment with local area network services available a la carte as value-added. Ontario Comm Center, for example, offers central word processing, internal and external electronic mail, personalized telephone answering, mail handling and guest reception.
- Substantially higher cost.

Table 5-1

Subsidized and Commercial Telework Centers

	Telework Centers		Commercial Work Centers		
	<u>Riverside</u>	<u>Ontario</u>	<u>Ontario Comm Center</u>	<u>Executive Suites</u>	<u>Barristers</u>
<u>Physical Plant</u>					
Office Size (sq. ft.)	120 to 320	N/A	225	120 to 200	120 to 170
Module Size (sq. ft.)	35	49	N/A	N/A	N/A
Office Design	Traditional/Modular	Modular	Traditional	Traditional	Traditional
24 Hour Access	Yes	Yes	Yes	Yes	Yes
<u>Equipment Provided</u>					
Telephone on Desk	Yes*	Yes*	Yes*	Yes*	No**
Fax	Yes*	Yes*	Yes*	Yes*	Yes*
Xerox	Yes*	Yes*	Yes*	Yes*	Yes*
Computer on Desk	No	Yes	Yes	Yes	No
Modem	No	Yes	Yes	No	No
Laser Printer	No	No	Yes	Yes	Yes
Filing Cabinets	Yes	Yes	Yes	No**	No**
<u>Secretarial Services</u>					
Receptionist	No	No	Yes	Yes	Yes
Telephone Answer	No	No	Yes	Yes	Yes
Word Processing	No	No	Yes*	Yes	Yes
<u>Conference Facilities</u>					
Conference Room(s)	Yes	Yes	Yes*	Yes	Yes
Teleconference Capability	No	No	Yes*	No	No
Lounge/Kitchen Area	Yes	Yes	Yes	Yes	Yes
<u>Basic Price (per month)</u>	Free	\$100	\$175 to \$900	\$450 to \$900	\$550 to \$1000

* Cost for usage added to monthly statement

** Ordered through outside vendor

Source: Walter Siembab & Associates

Table 5-2

Commercial Video Conference Room

	<u>Affinity Communications</u>	<u>Conference Express</u>
<u>Physical Plant</u>		
Office Size (sq. ft.)	N/A	500 to 800
Design	N/A	Boardroom
Seating Capacity/Location	N/A	10 to 20
# Primary Locations	37	5
# Secondary Locations	55+	1000+
<u>Equipment Capability</u>		
Full Motion Video	No	Yes
Computer Graphics	N/A	Yes
Zoom/Close-up	N/A	Yes
# of Cameras/Room	N/A	3
Control of Cameras	N/A	Participants
<u>Additional Services</u>		
Fax	N/A	Yes*
Secretarial	N/A	Yes*
Catering	N/A	Yes*
<u>Conference Facilities</u>		
Conference Room(s)	Yes	Yes
Teleconference Capability	No	No
Lounge/Kitchen Area	Yes	Yes
<u>Basic Price (per hour)</u>		
Two Sites (USA)	\$725 to \$1050	\$775 to \$875

* Additional Cost

Telework Centers: Institutional (3)

Pacific Bell operates a satellite work center in North Hollywood. The center has 13 cubicles and 1 executive office. It also has a 10 person conference room. Pacific Bell has operated a satellite work center in Los Angeles County since 1985. The previous location was in Woodland Hills.

Each work station is equipped with a personal computer, 1200 baud modem and dot matrix printer. In addition, a local area network provides access to a laser printer. Facsimile and photo-copying equipment is also available on-site.

The telecommuting work option is open to management employees only. The satellite center is used by those eligible employees who are able to significantly reduce the length of their normal commute. Approximately 25 employees frequently use the satellite facility.

There are few additional examples of institutional telework centers. Many businesses operate with multiple sites, but in most cases assignments are not based on residential location.

Conferencing Centers: Subsidized (4)

There are no subsidized audio or video conferencing centers at this time. There is a possibility that, if the period of demonstration is extended by the California Legislature to 3 years or more, at least one of the subsidized telework centers will offer video conferencing.

Conferencing Centers: Commercial (5)

Two commercial centers were surveyed -- Conference Express and Affinity Communications. The features of each are compared in Table 5-2.

Conference Express supports a network of 49 similarly equipped meeting rooms around the nation. The rooms are modelled after corporate board rooms. CE uses US Sprint Meeting Channel Network to transport full motion video images.

There are 2 rooms in Los Angeles County, one each in the Los Angeles central business district and Long Beach, and 1 in Orange County, in Irvine. Video conferencing is, at this time, essentially a substitute for long distance corporate travel.

Affinity Communications provides a significantly different type of service from Conference Express, at a price that is approximately 30% less. AC brokers unused time

in video conference rooms owned by private businesses in 63 cities nationwide. The room setup varies with location.

Most significantly, Pictoretel low bandwidth equipment and AT&T Accunet switched 56KB network for communications transport is used. The video images are less than full motion.

There are 8 video conference rooms available through Affinity Communications in Los Angeles and Orange Counties.

Conferencing Centers: Institutional (6)

Many large private firms own a video conferencing facility on site for internal communications. ARCO and Pacific Bell are two examples.

For the most part, these facilities are used for long distance communications between corporate branches located in different cities. Intra-urban applications have not yet developed.

The County of Los Angeles recently developed the capability to video conference between its communication headquarters in East Los Angeles and offices in Downey. The capability cost \$140,000 for equipment at each conference room.

The room is dedicated to internal communications and there are no plans for its use in the County's public service missions.

5.2.2 Demand: Station Node Facilities

The specific type of telecommunications node (the number, mix and uses of each module) that should be developed at each station will depend upon the characteristics of the surrounding neighborhood. While this is mandated by Joint Development Policy #4, it is also common sense that the supply of facilities should reflect demand for them.

In other words, the first task is to determine the number of modules of each type in the matrix below that are needed at each station:

	Public Subsidy	Commercial	Institutional
Telework			
Conferencing			

There are two main approaches to determining the node facilities. One is to start with the characteristics, needs and interests of the residents, employers and employees that currently can be found in the neighborhood of each station.

For example:

- What is the population density?
- How many residents will each station serve?
- What are the distributions of age, income and education level of the residents?
- What is the population's demand for health care, jobs and education?
- What are the job skills and employment rate of the population?
- What is the population's demand for employment and vocational training?
- How many have jobs that at least partially involve information rather than materials processing?
- How many have employers that will allow them to telecommute from the telework center at the rail station?
- What is the density of businesses?
- How many will need access to videoconferencing facilities?
- How many workers are employed?
- What are their needs for health services or for continuing education?
- Would access to health or education services at a Metro Rail station influence their decision to use Metro Rail for the journey to work?

There are at least two sources of data for answering these questions. One is published data such as the population census and the census of business. The other involves empirical research in the neighborhood of each station. For example, research might entail leadership interviews, household and business surveys, or focus groups organized by neighborhood organizations such as religious institutions or home owner associations.

The second approach to determining the node facilities is to start with leading institutions, employers, retailers and other service providers in the County and the region in order to determine: a) the presence of their clients-customers-constituents in the

neighborhoods of each rail station, and b) their willingness to develop a virtual presence at specific rail stations for the purpose of either producing or delivering services.

The scope of this report does not include an analysis of the telecommunications potential at each station. Considerable effort will be required to answer the richness of the questions identified above.

Nevertheless, some preliminary data were assembled for the 16 stations of the Metro Rail Green Line. The purpose of these data is to illustrate some of differences that could affect the choice of telecommunications node facilities at each station.

The data sources for Green Line included the census tract population count from the 1990 Census, a windshield survey of each station and the Thomas Guide, 1992 Census Tract Edition.

The concept of the station neighborhood was examined in terms of two different areas. The first is defined by a quarter mile radius around each station. This is referred to as the "Potential Impact Area" in the "Supplemental Environmental Impact Statement/Subsequent Impact Report" for the Red Line. It contains the people and activities found, more or less, within walking distance of each station.

The second area is the "market area" surrounding each station. The market area is the total territory that could be served by a station (or other type of center). It is sometimes referred to as the hinterland of a station (or center), or the donut around the hole (see Gordon, et.al.). The limit of the market area of a station is the maximum distance an individual must travel before it is a shorter trip to travel to a different station.

The size of the market area served by each Metro Rail station will vary according to the proximity to other rail stations and to some maximum distance beyond which people will not use transit. The market area will be further limited if Metro Net is used to implement the centers concept. The proximity to other rail stations and to non-rail centers will define the market area of each station.

As 1990 census data become available, a reasonable profile of the population found in the walking area and market area of each rail station can be easily assembled.

Table 5-3 presents the 1990 residential population estimated to live within one quarter mile of each of the 16 Green Line stations. The census tract containing each station was identified using the Thomas Guide, and the square mile area of the census tract estimated. Where the station was on the border between 2, 3 or 4 census tracts, all areas and populations were used in calculating the population density. The population density was then converted to a one quarter square mile basis for comparability.

4. Begin discussions with GTE, Pacific Bell, Merrill Lynch Teleport, Metropolitan Fiber Systems, cable television companies and other relevant telecommunications vendors in the region about potential opportunities for private-public joint developments. One objective would be to recruit a private entity to operate a commercial broadband network on the fiber backbone.

Adjacent Property

1. Pursue with the County of Los Angeles the extent to which either a commercial broadband network or Metro Net would enhance the attractiveness of rail-adjacent candidate sites for the County data processing center,
2. Teach representatives of cities with redevelopment projects adjacent to the rail system about the property development enhancements of the fiber backbone including a commercial broadband network and Metro Net.
3. Look for large scale developers interested in development or joint development opportunities that would involve either telecommunications station facilities, access to the backbone network or both.

Table 5-3
Walking Area: Population Within One-Quarter Mile of Station
Los Angeles Metro Green Line

<u>Station</u>	<u>Census Tracts</u>	<u>Approximate Square Miles</u>	<u>Total Population</u>	<u>Population Per One-Quarter Mile</u>
Studebaker #1	5519	1.26	4,656	925
Lakewood #2	5517	.9	5,393	1,500
Longbeach Blvd. #3	5405	1.0	11,050	2,575
	5403	.7	5,442	
	5402	1.12	14,117	
	5417	<u>.7</u>	<u>5,671</u>	
		3.52	36,280	
Wilmington #4	5407	.76	3,207	1,210
	5406	<u>.56</u>	<u>3,192</u>	
		1.32	6,399	
Avalon #5	2410	.79	5068	1,605
Harbor #6	2414	.76	3,677	1,210
Vermont #7	6028	.69	8,169	1,345
	2413	<u>.58</u>	<u>2,906</u>	
		2.08	11,175	
Crenshaw #8	6005.02	.69	2,217	260
	6027	<u>1.45</u>	<u>5</u>	
		2.14	2,222	
Hawthorne #9	6017	.58	1,055	455

Table 5-3
Walking Area: Population Within One-Quarter Mile of Station
Los Angeles Metro Green Line

<u>Station</u>	<u>Census Tracts</u>	<u>Approximate Square Miles</u>	<u>Total Population</u>	<u>Population Per One-Quarter Mile</u>
Aviation #10	2780	11	2,428	125
	6200	<u>7.7</u>	<u>6,796</u>	
		18.7	9,224	
Mariposa #11	6200	7.7	6796	220
El Segundo #12	6200	7.7	6796	220
Douglas	6200	7.7	6796	220
Marine Avenue #14	6023.02	2.57	3,208	300
	6205.01	<u>1.89</u>	<u>5,088</u>	
		4.46	5,286	
Westchester #16	2780	11	2,428	55

Table 5-4 presents a summary of the conditions currently visible around each of the 16 Green Line stations.

Data from Tables 5-3 and 5-4 together support the following observations. The observations are illustrative of the relationship between the walking area and the telecommunications node development. The eventual (in)accuracy of the observations is irrelevant to this discussion.

- Stations 2 through 7 seem to be located in predominantly residential areas. Access to social services and retailing might be a primary need at these stations.
- Station 2 is in Lakewood and is adjacent to a senior apartment complex. This suggests that organizations dealing with health care, health education, counseling, family gerontology, nutrition education, physical fitness or geriatric law (such as wills) might want a virtual presence at that location. Assuming seniors are on a fixed income, a subsidized videoconference facility may also be appropriate. This will enable walking area residents to interact with seniors elsewhere who also have access to subsidized videoconferencing, and to interact with institutions who do not have a virtual presence at the rail station.
- Stations 4 through 7 appear to be adjacent to middle and low income residents. These stations may best serve the walking area by incorporating the virtual presence of tele-institutions that offer vocational training, career counseling, job search/placements, community college courses, drug abuse screening/diagnosis, screening for aid to families with dependent children or consumer assistance. The Kenneth Hahn Plaza is adjacent to Station 4 and may currently house institutions that offer some of these services. The station developments provide an opportunity to use Metro Rail to reinforce the Hahn Plaza area as a service center.
- Stations 8 through 16 appear to be located in predominantly commercial and industrial areas. Access to business communications services and to employee services might be a primary need at these stations.
- Stations 12 through 14 are adjacent to aerospace facilities and industrial warehouses, some of them vacant. Availability at the rail station of commercial and subsidized videoconferencing facilities and of a range of employee services, particularly continuing education and university extension, might provide an inducement to businesses to locate in the vacant buildings.

**Table 5-4
Station Windshield Survey
Los Angeles Metro Green Line**

<u>Station</u>	<u>North Side</u>	<u>South Side</u>	<u>Other Developments</u>
Studebaker #1	-Middle class residential -Strip commercial	-Middle class residential -Strip commercial	
Lakewood #2	-Senior apartment complex	-Strip commercial -Residential middle class	-Rockwell facility (1 mile North)
Longbeach Blvd. #3	-Strip commercial -Middle class residential	-Retail -Middle class residential	-Adjacent to Lynwood City Center
Wilmington #4	-Very poor housing -Poor retail/commercial	-Mixed Development -New Commercial (Kenneth Hahn Plaza) -Residential middle class -Light industrial/warehouse East of residential	-M.L. King County Hospital -Dash/commuter shuttles operate at Hahn Plaza
Avalon #5	-Strip commercial	-Strip commercial	-Retail with low income housing at Imperial Highway
Harbor #6	-Strip commercial	-Poor residential	-Retail with low income housing at Imperial Highway
Vermont #7	-Poor residential	-Poor residential -Retail on Imperial Highway	-L.A. County Social Services Building at Normandie and Imperial Highway (1/4 mile)
Crenshaw #8	-Residential middle class -Large retail area 1/2 mile away	-Adjacent to Hawthorne airport	-Large Northrop Plant 1 mile South East
Hawthorne #9	-Strip commercial and retail -Low income housing	-Commercial and retail -Some housing/apartments	

**Table 5-4
Station Windshield Survey
Los Angeles Metro Green Line**

<u>Station</u>	<u>EastSide</u>	<u>West Side</u>	<u>Other Developments</u>
Aviation #10	-City of L.A. Water & Power Facility -Airport facilities and warehouses	-Strip commercial -Single family homes behind commercial	
Mariposa #11	-Industrial/warehouse	-Light Industrial -New office highrises (Sepulveda Blvd.)	
El Segundo #12	-Aerospace facilities/warehouse	-Aerospace facilities -New office highrises (Sepulveda Blvd.)	
Douglas #13	-Light industrial/warehouse	-Aerospace facilities (TRW) -New condo complex	-Adjacent to County electrical grid
LAX Gateway #15	-Lower middle class residential -Strip commercial	-Airport industrial/warehouses	-LAX (1/2 mile away)
Westchester #16	-Strip commercial -Middle class residential -Airport Parking (Lots C & D)	-Strip commercial -Residential (1/2 mile West)	-City of L.A. open land (2 blocks West)

- Stations 15 and 16 are in areas influenced by the Los Angeles International Airport. The station node development might best become a large electronic shopping mall offering many tele-shopping stations for use by Westchester residents, LAX passengers with time between flights, arriving and departing passengers, or family and friends dropping or picking passengers. The extensive parking opportunities at LAX adjacent to Station 16 may also attract shoppers from the larger market area (see below) to the station. A tele-shopping station would include a divided module and a number of computer stations. Each station would be equipped with a) laser disc catalogs of participating retailers that offer full motion video and audio descriptions of products and b) credit or debit card readers for electronic ordering, or on-line equivalents of a and b.

The station telecommunications nodes will also serve, without a vehicle-trip, all those within walking distance of any station in the Metro Rail system. In other words, a senior living in the walking area adjacent to Station 6 could easily take Metro Rail to Station 2 in order to access the senior-serving institutions with a virtual presence at that station. Residents adjacent to Stations 2 through 7 could take Metro Rail to the electronic shopping mall at Stations 15 and 16 in order to gain access to many of the retailers in the County.

The market area of each station adds another dimension to the possibilities. Table 5-5a through 5c characterizes the approximate market areas for Stations 4, 7 and 9. Data are based on the 1990 population census and the 1992 Thomas Guide.

Each station may well provide rail transit, telecommunications, telework and tele-institutional services for between 60,000 and 80,000 residents and many more non-resident employees.

The Wilmington (#4) market area includes the Martin Luther King Hospital. The station could house services complementary to the hospital so that certain clients would be able to satisfy other needs nearby their medical needs. There may be a joint development possibility with MLK Hospital whereby intake could begin at the station for transit riders allowing time for queuing and information processing during the walk to the hospital.

The Vermont (#7) market area includes Los Angeles Southwest College and the County Social Services Building. There may be a joint development opportunity with the college whereby enrolled computer science students could use a station telework facility to provide commercial data entry or programming services to businesses elsewhere in the County. County social service employees may be able to utilize a videoconferencing facility to conduct business with other County departments, municipal governments and non-profit corporations.

Table 5-5a

**MARKET AREA
(Approximately 2.25 Square Miles)**

Los Angeles Metro Green Line - Wilmington Station

<u>Other Metro Line Stations in Area</u>	<u>Total Population</u>	<u>Adjacent Civic Centers</u>
Imperial 103rd Street Long Beach Blvd.	81677	Watts

<u>Census Tracts</u>	<u>City/Area</u>	<u>Population</u>	<u>Major Institutions/Landmarks</u>
5407	Unicorp.	3207	Martin Luther King Hospital; Fire Station
5406	Unicorp.	3192	Library; Kenneth Hahn Plaza
2410	Los Angeles	5068	Post Office
2409	Los Angeles	4272	High School; 2 Public Schools
2426	Los Angeles	4631	Public School
2420	Los Angeles	3086	109th Street Recreational Center
2427	Los Angeles	3809	Watts Towers; Jr. High School
2430	Los Angeles	5280	Public School
2431	Los Angeles	4565	Public School
5403	Lynwood	5422	Fire Station
5404	Unicorp.	1638	Public School
5405	Lynwood	11050	Public School
5416.01	Compton	9206	Jr. High School; Compton Center
5415	Unicorp.	5510	Library; Public School
5414	Unicorp.	6315	Post Office; Public School
5413	Compton	5406	Jr. High School; 2 Public Schools

Table 5-5b

**MARKET AREA
(Approximately 2.25 Square Miles)**

Los Angeles Metro Green Line - Hawthorne Station

<u>Other Metro Line Stations in Area</u>		<u>Total Population</u>	<u>Adjacent Civic Centers</u>
Crenshaw		82151	Inglewood

<u>Census Tracts</u>	<u>City/Area</u>	<u>Population</u>	<u>Major Institutions/Landmarks</u>
6016	Unicorp.	4427	High School; Public School
6015	Unicorp.	7992	2 Public Schools
6021.01	Hawthorne	9310	Robert F. Kennedy Medical Center; 2 Public Schools
6017	Hawthorne/Unicorp.	5890	Fire Station
6012.02	Inglewood	3370	
6011	Inglewood	6339	Centinella Hospital; Borders Hollywood Park Library; Public School
6018	Inglewood/Unicorp.	8175	Near Morningside High School
6019	Inglewood	7489	Library
6020.01	Inglewood	2527	Crenshaw Imperial Plaza
6005.02	Inglewood	2217	Hawthorne Plaza; Post Office; Public School Library
6021.02	Hawthorne	2527	
6024.02	Hawthorne	5869	
6024.01	Hawthorne	9049	Hawthorne Memorial Hospital; Public School
6025.01	Hawthorne	6970	Cemetery; Hawthorne Airport; Fire Station

Table 5-5c

**MARKET AREA
(Approximately 2.25 Square Miles)**

Los Angeles Metro Green Line - Vermont Station

<u>Other Metro Line Stations in Area</u>		<u>Total Population</u>	<u>Adjacent Civic Centers</u>
Harbor		60749	Vermont/Manchester
<u>Census Tracts</u>	<u>City/Area</u>	<u>Population</u>	<u>Major Institutions/Landmarks</u>
6028	Unincorp.	8169	L.A. Southwest College; L.A. County Social Work Building
6003.01	Unincorp	6828	Public School
6002.02	Unincorp	5685	
2414	Los Angeles	4754	Public School
2411	Los Angeles	7478	Jr. High School; Fire Station
2413	Los Angeles	2906	
2414	Los Angeles	3677	Public School
5409.01	Unincorp	4474	Public School; Athens Park
5409.02	Unincorp	4330	Jr. High School; Public School; Library
2911	Los Angeles	8536	Rosecrans Recreational Center
6029	Gardena	3912	Post Office; Fire Station

The Hawthorne (#9) market area includes three hospitals. Nurses from these hospitals might attend classes in continuing education if they were conveniently offered through a community college at the rail station.

5.3 Conclusions

Telecommunications node facilities can be specified in terms of physical properties, equipment and/or services available and conditions of access. These facilities can be used to serve individuals or groups and to provide video, voice, or data communications services. They can be used by a very wide variety of institutions to produce or to deliver services.

Although telework and video conferencing facilities are unfamiliar to many people, commercial, subsidized, and institutional varieties of each have been established in Southern California. The exception is subsidized video-conferencing rooms and even they will probably exist within a year.

A 225 square foot corporate style office housing up to three work stations with a full range of office services (computing, telephone, fax, reception, mail) can be marketed at a profit for \$1200 per month including the cost of the building and suburban land. A similar facility for rail stations could be produced for considerably less depending on the cost of land (none if built on air rights), use of modular facilities and purchase of critical materials and equipment in quantity. The actual range of costs will need to be researched.

The mix of development at each station is mandated to reflect the conditions of the surrounding community. The relevant community includes both a walking area of a distance of approximately one quarter mile radius and a larger market area of about 2 to 3 square miles. Considerable research is required in both these areas and with potential tele-institutions in order to determine the mix of physical facilities, equipment and conditions of access at each station.

Joint development opportunities exist with a wide range of institutions. For example, nodes for public serving institutions can provide the infrastructure for delivering education, health care, vocational training and more. Research is needed into which of the eligible institutions are interested in these opportunities.

Section 6

Mobility Strategy: Development of Backbone Network

6.1 Background

The physical connections that link the station nodes are the second type of telecommunications facility with joint development potential.

Nodes and connections are being discussed separately because each involves a different set of joint development opportunities with different players and unique economic and regulatory contexts. These connections can also extend well beyond the Metro Rail station nodes.

Two issues will be discussed. They are public sector needs for private networks and their implications for joint development opportunities.

Private Networks

In the last decade or so, technological innovation has forced public policy to shift the nature of telecommunications from a public utility regulated monopoly with end-to-end homogeneous service to a competitive market with many distinct service elements and differentiated niches. As a result, telecommunications must be understood as a commodity, not a utility.

It is essential for every organization to identify its communication needs and to minimize the cost of satisfying those needs. It is the cost-minimizing process that leads large, multi-site organizations to assemble private networks.

In realm of needs, telecommunications have become strategically important to every organization. An organization's strategic use of telecommunications involves uncoupling service production from service delivery, decentralizing service production near to the residential location of the work force, and moving service delivery near to the point of service consumption. The organization's network integrates the work force, delivers the services, and whenever possible, engages the end user in co-production of the service. The banking industry provides a good example of this strategy. (See "Telecommunications Issues For Local Governments," League of California Cities, December, 1990, and "A Telecommunications Framework For Cities," League of California Cities, December, 1991 for similar proposals for local governments.)

Large telecommunications consumers have a tendency to build or lease from competitive vendors (CAPs or the local exchange carrier) point to point private line service. In this way, these consumers avoid the costs of using the public switched network (which is entered by way of the local exchange carrier) for high volume communications between fixed locations.

Given the air pollution, freeway congestion and energy consumption constraints of the region, many large employers will adopt the network strategy described above and migrate to more decentralized production and more network delivered services. Large multi-site organizations tend to build a their own backbone network for transporting the high volume traffic between their local area networks or smaller activity nodes.

Large public-serving institutions in need of a backbone network are likely candidates for joint development. If they are willing to adopt a network organizational strategy, the need for a backbone network will increase.

Public Needs

A competitive marketplace distributes goods according to the ability to pay. It therefore follows that the less well endowed organizations may find it difficult to acquire all needed communications.

The less well endowed organizations are often small consumers who lack the resources to purchase communications services in large quantities. Small businesses, small city governments and social service non-profit corporations are examples.

The station facilities that are developed to provide subsidized telework or video conferencing services will also have low cost or free access to Metro Net. The actual joint developments that build all or part of the potential 300 mile system will reflect the public needs in a world of private networks.

Joint Development Opportunities

There are two types of joint development opportunities. One consists of the options for actually building that part of the potential-network that is needed. It would not be prudent to build 1000 lighted fibers over 300 miles. The objective is to find the joint development opportunities that would incrementally light the potential-network as it is needed. This means making the deals that will build a particular capacity between particular locations.

There are a number options for obtaining the network connections. These include:

- a. straight purchase of transmission services from the local exchange carrier or one of the alternate local transport carriers
- b. joint venture with one or more private carriers
- c. joint development with one or more public corporations such as the County and City of Los Angeles and all other cities in the County who contract with County government for one or more services, e.g., sheriff, library, etc.
- d. joint development with one or more private carriers and one or more public corporations (i.e., b. and c. combined)
- e. development by LACTC as an ancillary network to the rail system control network
- f. development by an electric utility as part of their contract for building the power control network for the rail system

The second type of joint development opportunity (b.) consists of using access to the built portion of the LACTC network as an incentive for encouraging property development near each station or for locating institutional or commercial facilities in the telecommunications nodes at each station. These options will be discussed in Section 7.

6.2 Research

The straight purchase option (a.) and the joint venture option (b.) should be explored with the pool of carriers once the requirements from the node developments has been established. It is very likely that the rights-of-way auctions discussed in Section 3 can and should include construction of fiber for discretionary use by the LACTC.

Development by LACTC (e.) should be pursued once options b., c., d. and f. have been pursued. The LACTC has the opportunity to test f. when it lets the power contract for the Red Line. If the RFP has not been issued, construction of a fiber network along the Red Line for discretionary use by the LACTC should be considered as part of the power contract.

The research in this project focussed on the potential for strategic alliances with other government agencies (option c.). One of the region's characteristics is the lack of

cooperation or even coordination among local governments and between levels of government.

There are four categories of government involved:

- State of California
- County of Los Angeles
- City of Los Angeles -- the regionally dominant city
- Eighty seven smaller cities in Los Angeles County

State of California

The State operates a private long distance network (inter-LATA, intra-state) to satisfy its internal communication needs and to minimize the cost of its external long distance communications needs. This network, known as CALNET, is also available at competitive prices to county and city governments throughout the state.

The CALNET point of presence is located in the Los Angeles central business district. The LACTC regional backbone network could function as a collector of voice and data traffic from city and county facilities throughout the region.

The joint development opportunities with the State include a) some potential revenue from serving the collector function for CALNET, and b) possible location of State facilities at or near the rail system.

County of Los Angeles

The County operates an extensive private communications network using primarily microwave with Pacific Bell leased lines. The problem is that the microwave system is approaching its capacity while the demand for communications continues to grow. For example, high bandwidth services such as video conferencing are beginning to be introduced. Another constraint on system expansion is the lack of available microwave frequencies and paths in Los Angeles County.

The County is interested in building a fiber backbone network but it generally lacks the rights-of-way to the locations it must reach. This in part because the County failed to retain rights-of-way to streets after city incorporation.

The County government provides a wide array of services on a contract basis with cities throughout the County. In fact, 87 out of the 88 cities in the county purchase at least one service on contract from the County.

The County government occupies 1,800 structures throughout the County in order to deliver its services to residents and businesses in unincorporated areas and to provide contract services to cities. Often, these facilities are clustered in city civic centers. Long Beach is an example.

The County government also offers telecommuting as a work option for many of its employees. Approximately 1,200 of the 80,000 employees currently telecommute at least 1 day a week.

County-wide service delivery, contract services, 1,800 facilities, a growing number of telecommuters and the evolution of high bandwidth telecommunications needs create the need for a regional backbone network.

The joint development opportunities with the County include:

- a) a joint powers regional backbone for public corporations where LACTC provides the rights-of-way and the County provides access to the County microwave network and access to County owned digital switches, and
- b) possible location of County facilities at or near the rail system.

City of Los Angeles

The City of Los Angeles also operates a private network with a mix of microwave and Pacific Bell leased lines. Like the County, the City is interested in evaluating the construction of a fiber backbone network.

The City government occupies facilities located throughout the City, with major clusters in West Los Angeles, Van Nuys and San Pedro. The Blue Line to Long Beach and the Red/Orange Line to the Valley could provide a substantial opportunity for the City to develop its fiber backbone.

The joint development opportunities with the City include:

- a) a joint powers regional backbone for public corporations where LACTC provides the rights-of-way and the City provides street rights-of-way and network linkages that could help extend the LACTC regional backbone into a Centers Network (using excess capacity from the ATSAC network for example), and
- b) possible location of city facilities at or near the rail system.

87 cities in Los Angeles County

The other cities in the County vary in size and in communications needs. But state municipal leadership has begun to look toward more extensive use of telecommunications for solving air quality and other urban problems.

The League of California Cities adopted a "Telecommunications Framework For Cities" in 1991 that describes a program by which cities will become more effective telecommunications users, consumers and policy makers. As this program gets implemented, more cities will become conscious of the strategic value of their communications network and likely candidates for joint network development opportunities.

In addition, the League of California Cities received a grant for 1992-93 from the South Coast Air Quality Management District to demonstrate the use audio and video conferencing as substitutes for local government business travel, and to demonstrate the use of city halls as telework centers for government employees.

The joint development opportunities with the other cities in the County include:

- a) a joint powers regional backbone for public corporations where LACTC provides the rights-of-way and cities provide street rights-of-way (referred to as Metro Net), and
- b) possible location of city facilities at or near the rail system.

6.3 Conclusions

The 300 mile rights-of-way provides the opportunity for developing the following types of networks:

- Backbone Network -- the basic platform for other networks. The backbone is like a shopping mall which individual vendors use to locate their telecommunications business. Customers come to the mall and choose a business that will satisfy their communications needs.
- Commercial Networks -- for-profit vendors can operate one or more commercial networks to connect station facilities and other developments adjacent to the backbone network.
- Metro Net -- private network for a consortium of public sector organizations (from city and County governments to also possibly community colleges and public school districts) who make commitments to become mobile institutions and decentralize work production and distribute service delivery. Possibly will be administered by a joint powers authority.
- Metro Net Extension -- Phase II development of Metro Net that would extend service to City Centers not otherwise reached by Metro Rail, and to civic centers.
- Private Networks -- private networks operated by large, public or private sector, multi-site organizations. One example would occur if the County chose not to join a JPA for Metro Net but opted instead to maintain a separate network on the backbone.

The backbone network can be developed entirely by the LACTC (and the RCC). It can also be developed as a joint venture with a private telecommunications company. For example, one or more CAPs (such as MFS or Merrill Lynch) could conceivably build all or most of the backbone in exchange for concessions regarding access to the rights of way.

There is a caution in this approach (option d.). Private firms such as a CAP may lack the incentive to build for free a platform for the government's private network because of the potential high volume government traffic that would be diverted from the private market competitive networks.

The backbone could also be developed as a joint venture with another public sector organization such as the County of Los Angeles. And it could also be developed jointly with other public sector organizations and other private sector organizations.

It would make good sense to explore a range of possible joint ventures with Pacific Bell, GTE and other interested parties before any plans are adopted. Joint ventures can include network developments as well as station facilities and developments on adjacent sites.

For example, there may be several vendors interested in operating a commercial network on the backbone because of its very high capacity and relationship to station facilities and adjacent developments. And these vendors may want to participate in the real estate portion of the venture as well as the network portion.

At least one commercial network throughout the entire backbone is necessary because of the need for service to commercial businesses who will not have access to Metro Net. Large multi-site businesses as well as commercial telework centers and video teleconferencing centers will all require the high bandwidth digital services available with fiber.

The County government has a number of communication needs that could be solved via Metro Net. This is particularly true if Metro Net were extended to City Centers or civic centers since virtually every city in Los Angeles County contracts with the County of Los Angeles for the provision of at least one service (such as fire or library).

The County's need for additional telecommunications capacity is related to existing congested microwave network, the expansion of service to include high bandwidth services such as video conferencing and the lack of the street rights-of-way necessary for wire-line network development.

Metro Net can potentially be used as incentive to encourage all local governments including community colleges and public schools to develop an organizational form that strategically uses telecommunications to integrate a decentralized work force and deliver services. Access to the network can be made contingent upon a commitment to just that strategy.

Section 7

Mobility Strategy: Development of Adjacent Property

7.1 Background: Broadband Services To Adjacent Property

Since the introduction of competition into telecommunications markets and the AT&T divestiture, analysts have predicted that telecommunications services would become an important factor in real estate development. With rapid technological innovation and competitive deployment, the thinking suggested that certain locations would attract telecommunications investment before others.

To some extent, this has proven true. CAPs build the first segments of their networks in the central business district of the metropolitan markets that they enter. Certainly that was true in Los Angeles where both MFS and Teleport began their operations in the CBD and the Wilshire corridor.

Pacific Bell, the local exchange carrier for many areas in the County, has an investment plan to modernize its switching plant, moving from analog to digital switches at an approximate cost of \$15 million each. However, the plan does not necessarily follow a path defined by market potential since many of the oldest switches are in the poorer parts of town. These switches may get upgraded first because they are the oldest, not because they are in the best markets.

And for the most part, surveys of factors in locational choice list land cost, labor cost, housing cost, amenities, taxes, airport access and so forth ahead of telecommunications services.

Nevertheless, the potential for telecommunications services to influence property development decisions exists, particularly for businesses that are uniquely dependent on high volume or high speed communications. Transaction businesses like banks or video-image transfer businesses like entertainment production are examples.

The resource of the LACTC regional backbone network (and potential-network) is so extraordinary that it suggests that if telecommunications can influence property development decisions anywhere, it will happen here.

7.2 Research

The research for joint development opportunities was originally conceived of as a windshield survey of developable land adjacent to one of the Metro Rail lines, and a list of redevelopment projects adjacent to one of the lines.

Unlike the situation with physical transportation, telecommunications services can be accessed anywhere along the network, not just at the transit station. Therefore, the relevant survey would not be limited to property near stations.

Preliminary observation suggests that much of the Blue Line, Green Line and even the Red Line passes through old industrial areas or low income residential areas. The opportunity for redevelopment adjacent to Metro Rail, public or private, is high.

Table 7-1 presents the redevelopment projects that are located adjacent to either the Blue Line or the Green Line. These would provide the first choice for network influenced development.

However, a review of the existing plans for these redevelopment projects in Table 7-1 shows that currently none are designed to utilize LACTC's extraordinary resource.

Following the completion of the research described, an unexpected opportunity emerged that concretely demonstrates the potential value of the LACTC fiber backbone network.

The County of Los Angeles issued an RFP that sought property development proposals for the construction of a new County data processing center. Among the many locational criteria, including adjacency to a hotel, within so many miles of the existing data center in Downey and so forth, were telecommunications criteria.

The facility will be the home to the central data processing function for most County departments. It will therefore require access to a network that can collect very large volumes of data input and distribute large volumes of data output.

In addition, the facility will also house the IBM western regional disaster recovery center. This function also requires specialized telecommunications services.

The telecommunications criteria included service from more than one central office, digital switching available through the central office and fiber transport to the site. Pacific Bell, The local exchange carrier for many of the potential sites, issued a two page statement regarding its policy for candidate sites. It simply stated that whatever the

**Table 7-1
Local Redevelopment Projects
Green and Blue Metro Lines**

City	Metro Line Stop(s)	Project/Plans
Long Beach	Blue Line (15, 16, 17)	986 acre project proposed. "High quality housing for empty nesters." Need to change plan and proceed with EIR.
Long Beach	Blue Line (20)	Small 2000 square foot project. Pedestrian oriented/retail. RFP has been issued.
Long Beach	Blue Line (17, 18,19,21,22)	\$75 million expansion of exhibition hall and convention center.
Compton	Blue Line (12)	Shopping center at Willowbrook & Alameda. Transit center mixed development nearby. Future plans include an Auto Plaza with retail shopping.
Signal Hill	Blue Line (-)	Auto Center (Spring/Cherry). No other real consideration.
Lynwood	Green Line (3)	Motel/hotel adjacent to proposed station. No specific plans yet. Still working on the redevelopment area.
Huntington Park	Blue Line (7)	Single room occupancy housing site near Slauson stop is being discussed. 3 to 5 years away. Station is just outside the City limits.
Vernon	Blue Line (6)	No real plans. Bus shuttle from station to local businesses.

**Table 7-1
Local Redevelopment Projects
Green and Blue Metro Lines**

City	Metro Line Stop(s)	Project/Plans
Hawthorne	Green Line (9,14)	Costco Development and Ocean Gate Project are planned. A 23 acre urban village is under construction at Rosecrans and 405 Highway.
Lawndale	Green Line (14)	Nothing planned. Condos are located nearby.
Manhattan Beach	Green Line (14)	Not in the area. No projects are directly linked to Metro Line.
Inglewood	Green Line (8)	Nothing planned yet.
Downey	Green Line (2,1)	No extensive redevelopment program or areas planned around Metro Line. City limits don't extend down that far.
Norwalk	Green Line (1)	No plans yet. Currently, single family residential zone.
Bellflower	Green Line (1,2)	No plans yet. However, a redevelopment zone covers the entire length of the rail through the City.
Redondo Beach	Green Line (14)	No plans yet. However, 5 acres are adjacent to proposed station.
Los Angeles	Blue Line (-)	"Cultural Crescent" planned to link Metro Line station with Watts Towers. Proposed 200 acre project to include facilities for retail/cultural/ social activities.

existing service to any site considered by the County, Pacific Bell would provide the modern infrastructure required by the County in a responsive time frame.

Yet, the County's telecommunications needs classically represent a situation where the location decision should be influenced by the availability of the LACTC regional backbone network. Informal contact with County personnel (not responsible for selecting the winning proposal) confirmed this proposition. Access to as much as 8 to 12 fibers along the route of Metro Rail in the County would be considered extremely attractive by a senior staff member.

This possibility can be further tested by the LACTC making a joint development proposal to the County with some property adjacent to the rail system that otherwise meets the criteria specified in the RFP.

7.3 Conclusions

The LACTC regional backbone network (and potential-network) can be used to influence property development along the Metro Rail corridor. When combined with a station stop, the potential is especially high.

Although more evidence is needed, there may be a potential to stimulate an entire corridor of telecommunications dependent businesses, especially those that must exchange great volumes of high bandwidth information with other businesses. This would include those that routinely use high speed data, image or video transfer. Incubation of small businesses with this unique requirement is an option with regional economic development potential. The absence of plans for redevelopment projects that reflect this potential suggests the need for an education program to raise the awareness of affected city governments. At a minimum, this would include Long Beach, Compton, Signal Hill, Lynwood, Huntington Park, Vernon, Hawthorne, Lawndale, Manhattan Beach, Inglewood, Downey, Norwalk, Bellflower, Redondo Beach and Los Angeles.

Section 8

Recommendations

The first recommendation is that the LACTC should complete as soon as possible all studies needed to evaluate options and adopt a strategic direction for telecommunications developments. Designing the strategic fiber network before proceeding a great deal further with rail construction, station design and development plans for adjacent property will save a substantial amount of money and realize benefits in a shorter time frame.

The following recommendations address each of the three strategies plus what the LACTC should do administratively regardless of the strategy chosen.

LACTC Administration

1. Develop, at as high a level in the organization as possible, the responsibility for coordinating the planning-for and evaluation-of all telecommunications related projects. For example, projects such as the design of the fiber network, lease of excess fiber capacity, development of Metro Vision, development of Info California kiosks and programs funding regional telework facilities have not been centrally coordinated.
2. Provide a telecommunications education program for decision makers, management and staff who will be involved in choosing and implementing a strategic direction for development of the fiber network.
3. With the time available before the merger, develop a plan for a central telecommunications policy and planning responsibility in the MTA.
4. Create the capacity to monitor state and federal telecommunications legislation that might affect the LACTC's telecommunications strategy, and identify programs that could provide financing for developing the infrastructure.
5. Amend the 30 Year Strategic Plan to include the contributions (ridership, revenue and mobility) that will be made possible by the fiber network. Look for the opportunity to utilize potential telecommunications contributions when planning additional transit systems. For example, the Crenshaw corridor study should include a component on the communications needs of the area as well as the transit needs.

6. Become a leader in moving to institutional mobility. Initiate a telecommuting program and expand it after the transition to the MTA. Analyze LACTC services (and MTA services) and begin to decentralize them to existing or future Metro Rail or Metro Link stations, Civic Centers, or City Centers.

Service Strategy

1. Since the fiber network will, at a minimum, be used to carry many of the telecommunications-based services of Metro Rail, conduct a telecommunications services planning process. This should comprehensively identify and evaluate service proposals and should establish a revenue and pricing policy for each service. Existing proposals such as the one for Metro Vision should be considered with a range of new options from silent radio to entertainment television.

The following matrices can be used to organize planning for potential services:

On-Board

	Free	Ad Supported	Passenger Supported
Public Info & Trans			
Commercial Info, Serv & Trans			

Station

	Free	Ad Supported	Passenger Supported
Public Info & Trans			
Commercial Info, Serv & Trans			

2. Based on the planning process for services, estimate the short and long term fiber capacities that will be needed to provide the desired services. Also estimate the special station facilities or train car facilities that will be needed to implement the services. Coordinate these requirements with the appropriate ongoing design and construction efforts.
3. In the short term, begin exploratory negotiations with cellular telephone vendors to offer on-board telephone service. L.A. Cellular and Pac Tel Cellular are the FCC licensed providers in the Los Angeles market. There are also several resellers. The

5. Evaluate the cost-effectiveness of acquiring conduit and/or fiber as part of the contract with the electric utility that provides power for the Metro Rail system. These resources can be resold for revenue or used in one of the applications that do not involve control of the rail system such as video security.

Mobility

These recommendations apply to an LACTC decision to develop the fiber network to enhance regional mobility.

In general, a full range of potential benefits and costs should be estimated and the overall feasibility needs to be tested.

One way to accomplish this is through a demonstration project. A portion of the Metro Blue Line fiber network is available for use. In addition, a Blue Line demonstration would address social equity concerns since the route runs through several low income neighborhoods.

The following are recommendations in each specific area:

Telecommunications Station Developments

1. Estimate costs for building and equipping a range of possible station developments. These should include different configurations of open and closed modules with the appropriate computing and teleconferencing equipment. Costs of transaction kiosks should also be estimated.
2. Approach a wide range of equipment manufacturers and suppliers about potential opportunities for private-public joint developments. The equipment should include work stations to fax machines.
3. When census data on population characteristics and employment are available by census tract, conduct a detailed analysis of the types of telecommunications facilities at each station that are justified by the walking area and the market area.
4. Determine the interest of different organizations who could become candidates for managing telecommunications facilities that will offer subsidized communication services. These could include the cable public access non-profit corporation in each market area, a local economic development corporation or a transportation management organization (TMO) serving the market area.

5. Determine the interest of different organizations who could become candidates for operating the commercial facilities. Those surveyed for this report are a place to begin.
6. Approach a variety of public serving institutions who might have an interest in becoming more mobile by decentralizing some activities to rail stations throughout the system. These should include:
 - educational institutions who are already involved in distance education such as community colleges or USC,
 - large health care institutions plagued with AVR problems, and
 - social service agencies who are important to residents in each walking area and market area.
7. Approach the State about its Info California program and the possibility of locating kiosks in station nodes. Similarly, approach the County of Los Angeles about the possibility of locating County kiosks in station nodes.
8. Approach the City and the County of Los Angeles and the State of California about the potential for allowing some employees to work one or two days a week at a Metro telework center.

Fiber Backbone

1. Approach the County of Los Angeles and the City of Los Angeles about their possible interest in participating in a private network for public sector entities possibly governed by a joint powers authority. This has been referred to in this report as Metro Net.
2. Approach the State of California about the possibility of joining Metro Net or of using a portion of the fiber backbone as a collector for CALNET traffic.
3. Consider negotiating for the Red Line power contractor to lay dark fiber for the discretionary use of the LACTC.

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