FEASIBILITY STUDY

ESTABLISHING A FORMAL TELEWORK/TELECOMMUTING PROGRAM FOR STATE EMPLOYEES

OCTOBER 1997

AUDITOR'S TRANSMITTAL

October 1, 1997

The Honorable James B. Hunt, Jr., Governor
Members of the Council of State
The Honorable Marc Basnight,
President Pro-Tempore of the Senate
The Honorable Harold Brubaker,
Speaker of the House of Representatives
Members of the North Carolina General Assembly

Ladies and Gentlemen:

We are pleased to submit this feasibility study on *Establishing a formal Telework/ Telecommuting Program for State Employees*. The Office of the State Auditor is charged with examining issues which affect the effectiveness and efficiency of State government operations. In fulfillment of this mandate, we periodically address broad issues which have or could have significant impact on State agencies. This report represents the results of such an examination.

The objectives of the review were to identify the percentage of state employees currently working from home, the types of functions being performed by these employees, the types of management controls in place, and to examine the feasibility of increasing the use of telecommuting in State government. We were specifically interested in identifying the advantages and disadvantages of telecommuting to the State.

North Carolina's leaders have a history of being forward-thinking. As the State is poised to leap into the next century, the increased availability and affordability of technology offers possibilities for gains in productivity and reduction in costs. We believe the information contained in this report will enable the State's leadership to mold an effective plan to take advantage of those benefits.

Respectfully submitted,

Ralph Campbell, Jr.
State Auditor

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EXECUTIVE SUMMARY

The Office of the State Auditor is charged with recommending ways to improve the economy and efficiency of State government operations. With this in mind, we conducted a survey to determine current agency use of working-from-home positions and a corresponding review of research on the use of telecommuting. This report contains the results of that work.

"***Telework***," or working from home, is any situation where the employee does some or all of his work from his home. Based on survey results, North Carolina state agencies now employ this option for only 2.2% of positions. Most of these positions are mobile field and/or program inspectors or law enforcement personnel.

"***Telecommuting***," a subset of telework, is an umbrella term referring to a wide range of alternative officing and flexible work arrangements. It generally describes a work arrangement in which employees work in their homes and "commute" to their offices through the use of such technologies as computers, modems, fax machines, and electronic mail. Telecommuting also encompasses flexible officing situations such as regional or local "telework centers" where employees from different agencies can use the office facilities on a scheduled basis.

At the present time, several State agencies are allowing some limited telecommuting for their employees, such as report preparation from home or assignment to a regional office center closer to their homes instead of the central office in Raleigh. However, the State does not have a formal telecommuting policy, nor has it developed specific procedures for agencies to use in allowing telecommuting. Based on our work, we estimate the State could receive $23,297,416 in benefits from a telework/telecommuting program, involving 5% of eligible state employees. (See page 32 for summary.) The actual benefit to the State will depend on the number of employees participating.

Research shows that organizations that have implemented telecommuting projects report significant savings. Specific savings can be realized from the decreased need for individual offices and reduced rent/construction costs. Some experts predict that telecommuting can cut corporate real estate costs by 25-90 percent and reduce business costs $2 for every $1 invested in technologies. Other benefits come in the form of increased worker productivity (15-20%), decreased turnover, reduced absenteeism and long-term disability (up to 50%), access to disabled or chronically ill employees, and avoidance of an average 43 pounds of pollution, savings of two gallons of gasoline and 41 miles of travel a day for each telecommuter.

Estimated costs to equip the telecommuter depend on the type and amount of equipment each agency determines its telecommuters will need. Various companies with telecommuting projects report initial costs ranging from $1,700 for a phone line, personal computer, and modem to $4,500 which included those items plus fax, e-mail, and internet accounts. Annual upkeep ranged from approximately $700 to $2,150. Much of the costs involved depend on the type and frequency of telecommuting.

EXECUTIVE SUMMARY (concluded)

In summary, the majority of jobs in State government are information related--the type of job which best lends itself to telecommuting. We believe that increased use of telework (working from home) and telecommuting can offer the State benefits in terms of increased productivity of employees, avoidance of costs for office space, and decreased traffic congestion and pollution. The Governor, members of the Council of State, and the leadership of the General Assembly should work in concert to develop broad telecommuting polices that will allow State agencies to participate in the advantages of telecommuting.

REVIEW OBJECTIVES, SCOPE, AND METHODOLOGY

North Carolina General Statutes 147-64 empowers the State Auditor with authority to conduct reviews of any state agency or program. Generally, the purpose of such reviews is to determine whether resources are being used economically, efficiently, and effectively. The purpose of this project was to survey the state employee workforce to determine which employees are currently working out of their homes, to what extent they use telecommuting to perform their jobs, and the feasibility of allowing other state employees to perform some or all of their work requirements from their homes.

The objectives of the review were to answer the following questions:

- What percentage of the current state workforce is working from their homes?
- What types of functions can be performed effectively from the employee's home?
- What type of controls are in place to assure that an employee whose duty station is his home is performing the job?
- Is it feasible for other state employees to work from their homes?
- Does criteria exist for determining which types of jobs are appropriate for this program?
- Are there other states which have, or are embarking on, a work from home program?
- What are the advantages and disadvantages for the employer and the employee while working in a home based environment?

To achieve the objectives of the review, we first conducted research to determine the status of telecommuting in other states and industry in general. Next we designed a survey for North Carolina state agencies to determine the status of working from home in state government. The survey (see Appendix A, page 35) also attempted to determine the cost of equipping employees to work from home and to identify the on-going costs of so doing. We then attempted to identify the types of jobs which would be likely candidates for working from home (telework) and/or telecommuting. Finally, we outlined the general approach an agency would need to take to implement a telework/telecommuting program and did some projections of what this could mean to the State.

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BACKGROUND

The increasing capabilities of telecommunication and the increasing commuting time for employees has generated an impetus to move the worker and his work closer together. ***Telework***, or working from home, is any situation where the employee does some or all of his work from his home. ***Telecommuting***, a subset of telework, has been defined as "moving the work to the workers instead of moving the workers to work; periodic work out of the central office one or more days per week either at home or in a telework center (regional office)."[1] Generally, telecommuting is an umbrella term referring to the wide range of alternative officing and flexible work arrangements. Current estimates are that approximately 9 to 12 million Americans engage in some form of telecommuting.

"The term 'telecommuting' generally describes a work arrangement in which employees work in their homes and 'commute' to their offices through the use of such technologies as computers, modems, fax machines, and electronic mail."[2] Much telecommuting involves the completion of assignments generated at a central site. The employer sets work assignments and deadlines for completion. Tasks that are most appropriate for telecommuting are jobs where a person often works alone, handling information such as reports, proposals, data or research. Since most telecommuters spend two to three days a week at their central office, it's easy to save project work, reading, report drafting, research and the like, for the days at home and use office time for face-to-face meetings, team sessions, and use of office equipment and resources.[3]

Research shows that information type jobs which do not require direct contact with clients and oversight jobs which require the employee to be mobile are prime candidates for telecommuting and/or working from home. The Bureau of the Census projects that information or knowledge workers will be the fastest growing category of workers in the next decade. The information worker performs jobs involving the creation, storage, retrieval, manipulation and communication of records, messages, and documents. As the economy becomes more information based, the trend towards telecommuting will continue to grow--probably at a rate of about 20% - 30% per year.[4]

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[1] **Making Telecommuting Happen: A Guide for Telemanagers and Telecommuters**, Jack M. Nilles, Van Nostrand Reinhold, New York

[2] "Telecommuting: Who Really Benefits?," **Business Horizons**, November-December 1994

[3] "An Introduction to Telecommuting," **Telecommuting Made Easy**, June Langhoff, Aegis Publishing Group, 1995.

[4] "Telecommuting Issues and Solutions," Dan Minoli, January 1994, Datapro Communications Analyst

Telework and/or telecommuting can be adopted by the employer in varying degrees, from full-time home-based to part-time satellite or regional/local center, depending on the type of job requirements. Home-based telework, which has been occurring worldwide for more than 20 years, often requires only a telephone and a note pad. Exhibit 1 contains a list of some types of jobs which may in full or in part be conducted by a telecommuter.

Telecommuting has been identified as one solution to accommodate the demand for increased mobility and to enhance worker satisfaction. Recent government studies have underscored telecommuting's favorable impact on transportation, energy, and environmental goals. Telecommuting offers specific benefits for reduced pollution by reducing the number of cars being used to commute to work. According to one article, a 13% decrease in the number of vehicles being driven to the workplace would satisfy the requirements of the 1990 Clean Air Act.[5] Another researcher claims that if we all worked at home only once a week, we'd cut traffic by 20%.[6]

EXHIBIT 1
A SAMPLING OF TELECOMMUTABLE JOBS

Legend: ✓ = suitable; x- = may be suitable

JOB TITLE	FULL-TIME HOME BASED	PART-TIME HOME BASED	FULL-TIME SATELLITE CENTER	PART-TIME SATELLITE CENTER
Accountant/ Auditor/ Bookkeeper		✓	✓	✓
Actuary	x	✓	✓	✓
Advertising Executive	x	✓	✓	✓
Applications Programmer	✓	✓	✓	✓
Architect	✓	✓	✓	✓
Author	✓	✓	✓	✓
CAD/CAM Engineer		✓	✓	✓
Central Files Clerk			x	
Civil Engineer	✓	✓	✓	✓
Clerk-Typist	x	✓	✓	✓
Clinical Psychologist		✓	✓	✓
Computer Scientist		✓	✓	✓
Data Entry Clerk/Data Search	✓	✓	✓	✓
Department General Manager		✓	x	✓
Financial Analyst	✓	✓	✓	✓
General Secretary		✓	✓	✓
Laboratory Director		✓	x	✓
Lawyer	x	✓	✓	✓
Maintenance Technician		✓	✓	✓
Market Analyst	✓	✓	✓	✓
Personnel Manager		✓	✓	✓
Purchasing Manager	x	✓	✓	✓
Risk Analyst	✓	✓	✓	✓
School Administrator		✓	✓	✓
Statistician	x	✓	✓	✓
Technical Writer	✓	✓	✓	✓
University Professor		✓	✓	✓
Word Processor	✓	✓	✓	✓

Source: Excerpts from **Making Telecommuting Happen: A Guide for Telemanagers and Telecommuters**, Jack M. Nilles, Van Nostrand Reinhold, New York

STATUS OF TELECOMMUTING IN INDUSTRY AND GOVERNMENT

Industry:

Our research indicated that many industries, both here and abroad, have already begun some form of telecommuting for their employees. In Japan, private sector ventures are usually high-tech experiments funded by telecommunication firms, office

[5] "Don't Pollute, Telecommute," **PC Magazine**, C. Levin, February 22, 1994.
[6] Ibid., Langhoff

equipment suppliers, and construction companies. A 1986 experiment in Sweden involved managers working for half-pay during an 80 minute train ride in and out of Stockholm, an early telecommuting project. In the United States, the first telework center was established by Pacific-Bell in 1985. Recent studies include information on telecenters and related projects in California, Washington, Illinois, New York, Colorado, Kansas, Kentucky, Minnesota, and North Dakota.[7] Specific companies utilizing telecommuting included Pacific-Bell, JCPenney, IBM, AT&T, GTE, the Walt Disney Co., and Ernst and Young, to name a few. *PC World* says that 68 % of all companies now allow employees to telecommute.[8] Further, some states, such as California, offer handsome tax bonuses to companies with a telecommuting program: up to $2,000 a year in tax credits for each telecommuter the firm has.[9]

Government:

At the federal level, the National Performance Review recommended that the U.S. General Services Administration and the U.S. Office of Personnel Management develop a legislative proposal to enable flexiplace and telecommuting arrangements for more federal employees. Federal agencies operating in major metropolitan areas have been experimenting with telecommuting options since the early 1990's, primarily to find ways to meet the 1990 Clean Air Act requirements. In fact, President Clinton's memorandum on expanding family-friendly work arrangements directs federal agencies to support telecommuting and satellite work locations throughout the Executive Branch.

Most states and some county governments currently use some form of telework. We know from past dealings with other states that most have regional and/or local offices for many state agencies. The Minnesota Administration Department began a telecommuting pilot project in November 1995 involving sixty employees. The Minnesota Transportation Department and the state's Pollution Control Agency already had telecommuting programs.[10] Other states with formal telework/telecommuting programs include: Arizona, California, Colorado, Florida, Massachusetts, Washington, Georgia, Oregon, and Utah.[11]

North Carolina, too, has several state agencies already participating in some form of telecommuting and/or working from home arrangements. Some state employees do not have an assigned "office" in which to perform their jobs. Agencies which have "field representatives" (such as child day care inspectors) typically allow the employees to use their homes as part-time work sites and report to a regional office on a periodic or as needed basis. Other state employees such as DOT road maintenance employees, ALE officers, DOR and OSA regional field auditors, and some DHR social service workers report to a local field office for work assignments or specific field assignments. Some employees are now routinely performing administrative (report preparation, telephone advice) functions from their homes. The Department of Revenue has fourteen satellite auditors located in eight states: New Jersey,

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[7] "Promoting Telecommuting: An Application of the National Information Infrastructure," Draft for Public Comment, September 7, 1994.

[8] **PC World**, February 1997

[9] "Telecommuting: Making the Commitment Work," **Managing Office Technology**, February 1997.

[10] "Minnesota Plan Sends Workers Home," **State and Local Government Computer News**, March 1997.

[11] "If It's Good for the Environment, It's Good for the Budget," **National Council of State Legislatures**.

Connecticut, Pennsylvania, Ohio, Texas, Georgia, Illinois, and California. These auditors work from their homes. They access DOR systems via dial-in modems for taxpayer information and communicate with DOR employees via e-mail. Source documents can be faxed to their laptop computers. These employees come to the DOR building twice a year. Additionally, the interstate section also has sixteen auditors based in Raleigh who travel extensively throughout the United States. They use dial-in modems when they are away from their offices. The State has even been a forerunner in promoting telecommuting jobs through its use of prison inmates to man tourist information telephone lines. In short, if a job, or a major portion of it, does not depend on a fixed location for the worker, then it is telecommutable.

Last fall when North Carolina was struck by Hurricane Fran, a number of state agencies demonstrated the potential of telecommuting. Most Raleigh offices were officially closed due to the devastation caused by Fran. Yet, numerous state employees continued to work from their homes and, thus, were able to keep state government operating. Some agencies, such as the Office of the State Auditor, routinely have personnel working from remote locations across the state. These "satellite" offices continued to function. Additionally, some personnel who normally work in the Raleigh office were able to perform duties such as report writing from their homes through the use of laptop computers in a stand-alone status. Voice mail allowed these employees to continue to receive and respond to messages from clients.

Other agencies, such as the Department of Revenue, employed some of the same technologies along with individual pagers to continue functioning. DOR operations personnel, systems programmers and network support personnel were declared essential. Network personnel and systems programmers checked systems from home and were available via pager if difficulty occurred. Some operations personnel came in to manage printers and tape. Others monitored the systems from home, as they do routinely on weekends.

However, current levels of telecommuting involve only a small, narrow portion of our employee population. While it is estimated that 40% of today's workers could be telecommuting, only about 10% are nationally doing so.[12] Thus far program focus has been primarily on workstation relocation rather than on reengineering jobs so that they can be telecommutable. Industry, once again, is leading the way with some large private firms shifting sizable segments of their office workforce, particularly in sales and financial management, to telecommuting arrangements. As telecommuting expands, technological readiness will be crucial to gaining widespread acceptance and confidence. Many cities across the nation have already made great strides in promoting telecommuting. *PC World* and *Money* magazines recently ranked 300 cities based on the ability to telecommute.[13] North Carolina has four areas ranked in the top 115: Raleigh-Durham-Chapel Hill-18; Charlotte-39; Greensboro-Winston-Salem-72; and Wilmington-115. Thus, we are in a unique position to expand telecommuting in North Carolina for both industry and government.

[12] **Telecommute America!**, October 23, 1995
[13] **PC World**, April 1997

WORKING FROM HOME (TELEWORK)

Some of North Carolina's state government operations already incorporate opportunities for employees to perform state-assigned functions from home to some extent. Examples of these jobs are shown in Table 1. We have included rough estimates of time worked from a location other than the central office based on previous audit work.

TABLE 1
ESTIMATED PERCENT OF WORK TIME

JOB TITLE	HOME	CENTRAL OFFICE	REGIONAL/ LOCAL OFFICE	FIELD
Highway Patrol Trooper		5%	5%	90%
DMV Enforcement Officer		5%	65%	30%
Wildlife Officer			10%	90%
Child Day Care Consultant	5%		15%	80%
Child Day Care Regional Supervisor	20%	2%	3%	75%
Assistant State Auditor		1%	14%	85%
Assistant State Auditor Supervisor		5%	20%	75%
Park Ranger	15%	2%	8%	75%
Revenue Field Tax Auditor		1%	9%	90%
ESC Field Tax Auditor	1%	2%	35%	62%
Food Inspection Supervisors			20%	80%

Source: Compiled by Office of the State Auditor

As can be seen from the list, the types of jobs that are already set up to be, at least in part, performed from home or a location other than the central office fit into the categories identified earlier. That is, either an "information" job or a "mobile" job. While there are some elements of both categories in these jobs, the major criteria that makes them telework jobs is their mobile nature. Some of these employees have been supplied with laptop or portable computers and use these extensively in the performance of their duties, thus combining elements of teleworking and telecommuting.

There is another group of state jobs assigned to various local or regional offices but with limited mobility requirements. These jobs, too, fit the definition of telework. Overall efforts for these programs are directed by the central office in Raleigh, but normally daily assignments are handled from the local/regional level. Examples of this type job are the local Employment Security offices, the local Department of Motor Vehicle licensing offices, and the regional Department of Transportation offices. Most of the local/regional offices are now connected to their central offices via computer, thus making these jobs fall into the telecommuting category as well as the telework category.

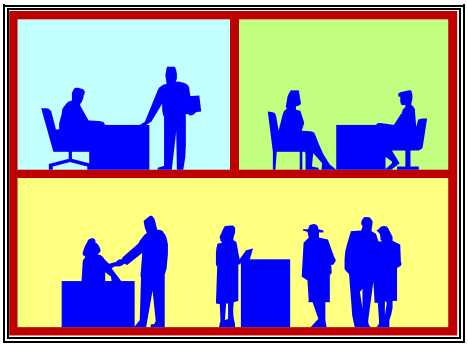
TELECOMMUTING

As discussed previously, telecommuting is a subset of telework. True telecommuting involves moving the work to the worker. There are several scenarios which promote telecommuting in some fashion, with two main types of telecommuting jobs: home-based and telework centers. Then there are variations of those two to suit the needs of the employer and the employee.

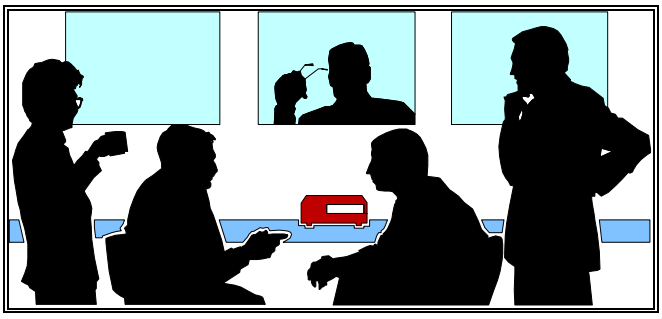
> Home can be an effective base for telecommuting, allowing significant cost reductions for both employer and employee, allowing employees access to jobs that otherwise might not be available, allowing employers access to people who otherwise would not be available, providing significant productivity gains and a host of indirect benefits to society (energy

> conservation, pollution reduction, etc.). . . . . For most employees, home-based telecommuting works only as a part-time option.[14]

The other variation of telecommuting is the satellite telework center or "telecenter". This is an office building to which employees regularly report for work. It looks very much like any "normal" office building, with individual offices or cubicles, desks, computers, telephones, conference rooms, etc. The major difference is that all of the telework center's employees work there because they live closer to that facility than to their principal office, regardless of what their jobs are. That is, the building may not belong to just one agency, but may be shared by several agencies. The interconnectiveness of the employees in a given organization comes through telecommunications, not through collocation. Satellite telework centers can save significant amounts of commuting costs and time while still providing environments like those of traditional offices. Costs to the agencies can be reduced by sharing construction/rent costs and possibly sharing support personnel. Some experts predict that telecommuting can cut corporate real estate costs by 25-90 percent.[15]



To work, a telecenter shared by several different agencies will require a structured scheduling procedure so that all employees using the center can have adequate time. This concept, called "hoteling," is designed to accommodate employees who spend the majority of their workdays out in the field with clients. To meet worker needs on in-office days, the "hotel coordinator" takes reservations, assigns space, provides office support, and programs phone numbers. Use of a telecenter in this manner allows the agency to reduce its space requirements since the offices are shared by employees. (Using this concept, Ernst & Young in Chicago reported a 7% reduction in space requirements during the first year of the program.[16])



In North Carolina, we use a variation of this concept extensively through the many local and regional offices of state agencies. Currently, most state agencies with regional or local offices maintain their own separate buildings. Recent trends, however, have been to house several different agencies in the same building. Again, North Carolina is a leader in this area, promoting such forward thinking concepts as the One-Stop Career Centers which house representatives from the different job training and job search programs in one building.

[14] Ibid., Nilles.
[15] "Telecommuting Facts and Figures," **Managing Office Technology**, February 1997.
[16] Ibid., "Promoting Telecommuting"

Telework/telecommuting has many inherent advantages and disadvantages for both the employer and the employee. Most research to this point says that the employer ultimately gains more from telecommuting than does the employee. This line of reasoning seems to depend on the ability of the employer to reduce its overhead costs by decreasing its need for office space. The employee, on the other hand, normally is asked to give up living space in his home to devote to his telecommuting work area without specific compensation from the employer for the use of the space. But, the employee gains significant increased freedom and flexibility in doing his job. Table 2 outlines the major advantages and disadvantages for both the employer and employee.

TABLE 2
ADVANTAGES/DISADVANTAGES OF TELECOMMUTING

	ADVANTAGES	DISADVANTAGES
EMPLOYER	Reduced physical plant costs (office space, parking, furniture, etc.)	Less direct supervision/control over employee; requires task management
	Rent/Construction cost avoidance	Coordination of work among employees more difficult
	Possible lower employee turnover rates	Some initial computer costs for system implementation
	Possible increased employee productivity	Monthly system charges for communication requirements
	Accommodation of disabled or chronically ill employees	Possible reimbursement to employee for use of space in home
	Selling point for new employees	Less immediate access to employee
EMPLOYEE	Commuting vehicle savings; time savings; lowered auto insurance premiums	Planned work time interrupted by family or other distractions; stress
	Reduces peril of commuting accident	Lack of interaction with other staff members (reduces learning from their experiences)
	Reduces personal costs (clothing, food, travel)	Possible lowered morale from isolationism
	Possible improved employee morale from greater control over work	Requires self-motivation and self-discipline
	Flexibility to perform other tasks/ appointments during day	Possible "workaholism"
	Employee able to set schedule to work when most productive	May lack area in home to dedicate as "work space"

Source: Compiled from literature

WHY TELECOMMUTE?

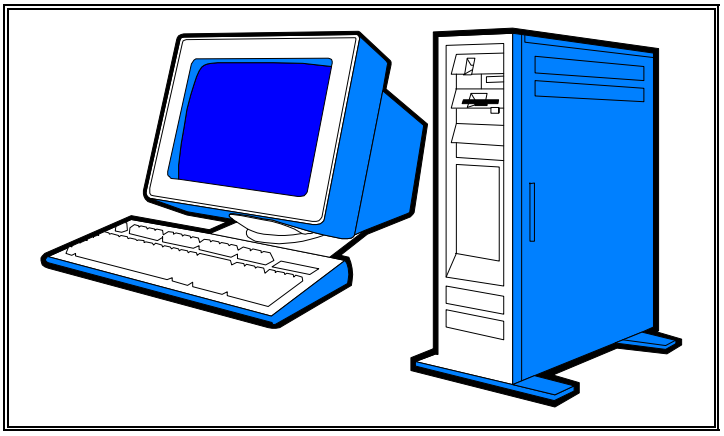
There are three main forces promoting telecommuting: the environment, economics, and the quality of life. In terms of the environment, many of the nation's metropolitan centers have problems meeting the requirements of the 1990 Clean Air Act and will have even more problems meeting the 1997 requirements. Other areas, including Raleigh-Durham, are growing at rates which pose potential troubles. One way to improve air quality, reduce future environmental risks, and conserve energy resources is for employers to adopt telecommuting as part of a regional transportation strategy.

Economic considerations for both the employer and the employee also play a part in the decision to adopt telecommuting. Telecommuting allows the employer to distribute its workforce to less congested areas to avoid the high cost of "doing business downtown." As discussed earlier, use of local or regional telework centers where employees share office space on a scheduled basis can allow agencies to greatly reduce their need for space. Additionally, studies have shown that telecommuting from home has the additional benefit of increased worker productivity.

But perhaps the most significant driving force behind telecommuting is changing social values and more diverse and flexible life style preferences. Longer daily commutes added to the nine hour workday reduce time for family and community interaction. Telecommuting has important benefits for certain segments of the population. Specifically, working parents benefit

from reduction in commute time, which allows them more time to spend with their children. Single parents, comprising 9% of all households, can especially benefit. Flexible workplace arrangements have proven to be a valuable tool in helping organizations recruit and retain key personnel and increase accessibility for all employees, especially those physically handicapped. Disabled workers can benefit enormously from working at home, saving companies some of the costs of in-depth compliance with the Americans with Disabilities Act.[17] The increased flexibility and reduction in travel may allow a greater proportion of retirement age workers to remain in the workforce and allow companies to offer effective alternatives to disabled workers.

The literature on telecommunications reports significant benefits:

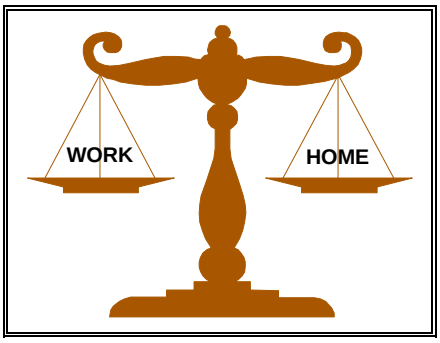


- increase worker productivity by as much as 15 to 20 percent;
- decrease absenteeism, often by half, and long-term disability costs are also reduced;
- reduce business costs $2 for every dollar invested in technologies;
- cut organizational real estate costs by 25 to 90 percent;
- increase free time for many workers, leading to improved family life, an increase in social, religious, and volunteer activity, and improved neighborhood quality; and
- limits the strain on overtaxed transportation systems and reduces air pollution.[18]

AT&T reported the following results from its telecommuting project which involved 22,500 employees telecommuting regularly:

- 76% felt they accomplish more when they work at home;
- 32% said they spend the non-driving time with their families;
- 29% said they used the non-driving time to do even more work;
- managers report per telecommuter productivity increases between 10-16%; and
- each telecommuter averaged avoiding generation of 43 pounds of pollution and saved two gallons of gasoline and 41 miles of travel a day by working at home.[19]

Despite the potential of this flexible workstyle to produce more and better work, many employers are reluctant to permit employees to try it. Equally as many employees are afraid to ask their employer to allow them to telecommute because they fear being viewed as a less than committed worker. The main reason given by employees for wanting to telecommute was to help balance their work and personal lives.



[17] Ibid., **Managing Office Technology**, February 1997.
[18] Ibid., **Telecommute America!**
[19] Ibid.

SETTING UP A TELECOMMUTING PROJECT

Any organization considering telecommuting as an option must first develop a well thought out plan. The plan should take the following into consideration:[20,21]

⇒ **Support from the top of the agency.**

Any new initiative in an agency can only succeed if it has the support of top management. This is especially true for a telecommuting program which relies on mutual trust between the employer and the employee to be effective.

⇒ **Develop a policy for participation.**

A telecommuting policy will provide your organization with clear, consistent guidelines. The policy should be broad enough to allow individual work groups to customize it. It should address such issues as who provides insurance for both the employee and the equipment.

⇒ **Determine steps for the approval of potential participants.**

All employees are not candidates for participation in a telecommuting project. Employers need to take into consideration the type of work the employee does, as well as the employee's individual characteristics and enthusiasm about participation. Employees should sign a telecommuting agreement.

⇒ **Designate an implementation committee and outline the process.**

Implementing a telecommuting program requires forming strong partnerships with many areas of the organization. Representative from the various sections affected should be included on the committee.

⇒ **Communicate details about the program to all levels of the organization.**

Communication is a key in the success of any new initiative. The more all levels of the organization know about the telecommuting program, the better the program will be.

⇒ **Develop a training program for managers.**

Training for all participants is a key issue for the telecommuting program. Managers must understand that telecommuting is a critical business issue which can further the organization's objectives.

⇒ **Develop a training program for selected participants and for co-workers.**

Telecommuting is about change. Training can help all participants understand the program and how it will affect them personally. It can facilitate a smooth transition for telecommuters who are changing the location of their work either part-time or full-time.

⇒ **Determine equipment and technology needs for participants.**

A full scale telecommuting program will require the organization to assess its current technology capabilities and clearly identify what is needed to implement the program. This assessment should include a decision on whether to provide telecommuters a second telephone line for business purposes and a determination of whether the agency will reimburse the telecommuter for his "home office" costs.

⇒ **Clearly define performance expectations and standards for participants.**

All employees need to clearly understand what is expected of them in the performance of their jobs. This is especially critical for the telecommuter since he will be working on his own for periods of time. Specific deadlines must be set and understood. There must be rewards for meeting the expectations and penalties for not meeting them.

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[20] "Group and Organizational Participation," **Telecommute America!,** October 23, 1995

[21] "Frequently Asked Questions When Investigating Telecommuting as a Work Option," Sandra Sullivan, Southington, CT, undated.

The goals of the pilot program should be established early on. There are two schools of thought on the purpose of a pilot program:

1. To prove or disprove that telecommuting is a viable work option; or
2. To take a trial run to investigate whether telecommuting policy and guidelines are adequate to support expansion of the program.

In either case, the pilot program should facilitate two-way, on-going communication about policy and guidelines. The pilot should be long enough to incorporate different scenarios and test the technical support issues. Usually a six month trial period is sufficient. During the pilot, there should be regular, weekly meetings to gather feedback. Adjustments to the policy and guidelines should be made quickly to respond to problems identified.

The organization's telecommuting policy should be clear and represent management's goals for the program. As with any policy, it should be written in broad terms to allow groups within the organization to customize it for their use. The policy should contain the following components:[22]

- ◊ Definition and interpretation of telecommuting at your organization;
- ◊ Policy statement explaining the organization's commitment to telecommuting;
  can be a simple, one sentence statement
- ◊ Principles of telecommuting at your organization;
  include statements regarding business needs, terms and conditions of employment, equipment provision, work space designation, the telecommuting agreement, scheduling, etc., and establish the voluntary nature of the program
- ◊ Selection of telecommuting candidates;
  include job characteristics, telecommuter characteristics, and supervisor characteristics used in determining participants; include requirement to sign the telecommuting agreement
- ◊ Details of equipment assignment;
  include list of equipment organization is providing, who is responsible for its care and policy regarding personal use of equipment, proprietary information and security
- ◊ Performance measures and success evaluation for the program;
  include details for program evaluation specifically and general discussion of individual performance measures
- ◊ Policy on time-keeping; and
  restate organization's existing policy or develop one specifically for the program; be sure to include specific language regarding overtime work
- ◊ Statement on safety.
  include statement on ergonomics of the home work space.

After you have analyzed the jobs and your employees, pick your best candidates to start a pilot project. Keep adding telecommuters as appropriate for the jobs and the employees. Start with

[22] "Telecommuting Guide," Smart Valley Telecommuting Team, California, undated

volunteers only and screen them based on the criteria you have developed for your agency. Make sure the employees chosen have adequate work space within their homes, access to telephone and electrical outlets, and have the necessary equipment to effectively communicate with the central/regional/local office as needed.

As noted above, all telecommuters should sign a telecommuting agreement developed by the organization. This agreement should clearly spell out the terms under which the employee is allowed to telecommute and should indicate that either the employee or the employer may terminate the arrangement. Exhibit 2 contains a sample telecommuting agreement.

EXHIBIT 2
TELECOMMUTING AGREEMENT

I have read and understand the attached Management Telecommuting Policy, and agree to the duties, obligations, responsibilities and conditions for telecommuters described in that document.

I agree that, among other things, I am responsible for establishing specific telecommuting work hours, furnishing and maintaining my remote work space in a safe manner, employing appropriate telecommuting security measures and protecting company assets, information, trade secrets, and systems. I also understand and have completed the attached list of specifics relative to my telecommuting status.

I understand that telecommuting is voluntary and I may stop telecommuting at any time after notifying my immediate supervisor. I also understand that the company may at any time change any or all of the conditions under which I am permitted to telecommute, or withdraw permission to telecommute.

_____ _____
[Dated, employee signature] [Dated, supervisor signature]

Attachment: Specifics re: telecommuting status

1. Remote work location street address, city, state, zip code.
2. Description of work space at remote work location.
3. Telecommuting schedule (i.e., days per week).
4. Regular telecommuting work hours including meal breaks and other breaks.
5. Company assets to be used at remote work location, including asset numbers.
6. Company information systems to be accessed from remote work location.
7. Non-company equipment, software, and data to be used at remote work location.

Source: "Telecommuting Guide," Smart Valley Telecommuting Team, California

SELECTING THE TELECOMMUTER

There is no magic formula to determine whether a particular job or a particular individual is a candidate for working from home (telework) or telecommuting. However, there are a few key management principles which should be applied in making the determination.

1. Pick your teleworkers/telecommuters carefully;
2. Set up the proper working environments; provide technology and support;
3. Jointly establish performance evaluation procedures;
4. Train the telecommuters, their supervisors, their co-workers, and as appropriate their families;
5. Give frequent feedback to the telecommuter on how well he is doing;
6. Get frequent feedback on how well you're doing; and
7. Modify your procedures and rules as needed in response to changes in the situation.

It's easy to see that some jobs lend themselves to telework/telecommuting. The way to decide whether a job can be telecommuted is to analyze its requirements. First, break each job down into the collection of tasks which comprise the job. Tasks are such things as writing reports, analyzing figures, collecting information, providing information, developing plans, digging ditches, painting walls, etc. Most jobs can be broken down into a dozen or so tasks. The main question is how well can some or all of these tasks be done from home (assuming you have

EXHIBIT 3
GENERAL JOB TASK ANALYSIS

Scoring: Excellent = 5; Very Good = 4; Good = 3; Fair = 2; Poor = 1

Nature of Tasks	Importance to Job (0 = not important; 10 = applies all the time)	Suitability for Work At: Traditional Office Only	Telework Center	Part-Time Home	Full-Time Home
High level of face-to-face interaction with others		Best solution	Depends on location of others	Poor	No
Large amount of face-to-face interaction but may be clumped in time		Excellent	Excellent	Good to Excellent	Fair to Poor
High level of interpersonal contact but via telecommunications		Excellent	Excellent	Excellent	Good to Excellent
Fragmented tasks, many "fire drills" requiring coordination		Good to Excellent	Good to Excellent	Fair to Good	Fair to Poor
Fragmented tasks, but often requires high concentration		Poor	Good to Fair	Good to Excellent	Good to Excellent
Requires extended concentration, medium to long duration		Poor	Poor to Good	Excellent	Excellent
Need physical access to special, fixed resources		Excellent	Excellent (possibly)	Good if access can be clumped	Poor
Involves sensitive information requiring physical security		Excellent	Good to Excellent	Good to Poor	Poor
Involves sensitive information that can be protected readily (e.g., by encryption)		Excellent	Excellent	Excellent to Good	Excellent to Good
TOTALS					

Source: **Making Telecommuting Happen: A Guide for Telemanagers and Telecommuters**, Jack Nilles, Van Nostrand Reinhold, New York

the necessary equipment) and how much of the job needs to be done in an office? Exhibit 3 contains a tool to use in job analysis for the purpose of determining whether it is telecommutable or assignable to a remote location.

Aside from the characteristics of a person's job, some people will work out better as telecommuters than others. The ideal home-based telecommuter is a person who is strongly self-motivated and self-disciplined, who has all the skills for the job, who has a home environment all set up for telecommuting, and who is enthusiastic about the idea.[23] Employees who are innovative and flexible in their attitudes will have less problems adapting to telecommuting. Employers need to be aware of family situations before selecting telecommuters. If work disruptions from the family become intrusive, productivity and morale can fall. If the family environment is supportive, productivity and morale can soar.

The telecommuter will also have to change the way he thinks and approaches his job. Most employees have to learn how to work in their homes. This requires developing or adopting self-supplied cues to "go to work," to continue working, and to stop working. Table 3 contains a checklist for the employee who is teleworking/telecommuting.

TABLE 3
CHECKLIST FOR THE TELECOMMUTER

Schedule your work time.
Accurately account for your work hours.
Anticipate and accept shifts in household responsibilities.
Control interruptions.
Resist temptations offered by the freedom from on-site restrictions.
Accept responsibility for your work assignments and the quality of the work.
Clearly understand and agree to the performance expectations for your job.
Communicate as frequently as needed with your direct supervisor to clarify work related questions.
Source: Compiled from literature

As noted earlier, specific training for the telecommuter should help facilitate the transition to telecommuting. Management should consider offering courses in time management, communication with co-workers and clients, how to set up the home office, how to maintain social contact with co-workers, managing the workflow, and project reporting[24] among others. Training should also be scheduled for co-workers of the telecommuter. Telecommuting schedules should be properly communicated, and co-workers should be aware of how to contact the telecommuter in the case of a business emergency. Additionally, the telecommuter should post his schedule on his voice mail and e-mail.

Lastly, management should be aware that many would-be-telecommuters may not volunteer to participate due to fear of career sabotage. That is, employees may feel that in a telecommuting situation they may not receive high profile assignments, may not be viewed as highly committed to the organization, may feel they will not be considered for promotions, and may feel their performance levels are not readily apparent to their supervisors. These barriers will need to be addressed by the employer in order to have a successful telecommuting project.

[23] Ibid., Nilles.
[24] Ibid., Sullivan.

EQUIPPING THE TELECOMMUTER

Generally, the employer must supply the employee with the necessary equipment and supplies to effectively do his job. With the case of the true teleworker/telecommuter, this becomes an even more important consideration. The rapid changes and improvements in technology have opened up more opportunities for using telecommuting to cut operational costs for agencies. Research has shown that telecommuting generally decreased the start-up costs for adoption of a new technology, computer-based technologies in particular. However, agencies should be aware that the technology needed for full-scale telecommuting is roughly the same as that required in the principal office, plus more for telecommunications.

In terms of available technology to support telecommuting, North Carolina again finds itself in a unique position to take advantage of this type flexible work option. The Information Resource Management Commission has supported the use of technology by state agencies for a number of years. The General Assembly has recognized the need for advanced technology, has funded specific requests from individual agencies, and has funded the ultimate telecommuting tool--the North Carolina Information Highway.

Specific minimum needs for true telecommuting include some type of personal computer (desk top or portable), a LAN or WAN at the principal office, dial-in capabilities, printer (as necessary), e-mail, fax capabilities, and voice mail. A June 1995 article in *Business Week* estimated the cost of outfitting a telecommuter with the right gear to be about $4,500 for the initial setup and $2,150 in annual upkeep. However, Pacific Bell reported spending approximately $1,700 for a phone line, personal computer and modem for each work-at-home employee. JCPenney reported that start-up costs were less than half that of an equivalent office installation.[25]

One of the main issues to be addressed in any telework/telecommuting situation is the security of data generated and located at a site other than the principal office. Sensitive information is easiest to protect from intruders if it is kept securely locked in the agency's vaulted, main office computers with no access allowed from the outside. However, it is not possible to totally exclude outside access to data while operating in a telecommuting environment.

While telecommuters could be restricted to using only non-sensitive data while connected to the principal office, this would restrict the amount of telecommuting possible and the benefits for both the employer and the employee. It would be better to use security programs to protect agency data. Another possibility is to have the employee use his computer in a stand-alone mode as much as possible, connecting to the LAN only when he needs to transfer data. This method would require downloading data from a central system and then disconnecting from the LAN. Various protection devices, such as data encryption, could also be employed during the transfer process. The goal of security measures for telecommuting should be to create a remote network that is a seamless and

[25] Ibid., Langhoff.

secure connection between mobile users, telecommuters, and remote offices to the central site, the Internet, and on-line services.[26] The connections and security should operate transparently to the user, with network managers maintaining control over who gets access to what.

To prevent unauthorized access to sensitive information, remote networking must offer a multitude of security choices, including standard security such as passwords, token cards and calling line identification. Specific security procedures to consider in a telecommuting situation include:

- Train telecommuting employees in computer security, particularly how intruders get information and how the employee can protect against that risk.
- Install virus protection software on all computers.
- Control access to the LAN with passwords including letters, numbers and symbols.
- Transmit sensitive or critical information in an encrypted format, especially when using e-mail.
- Do not store critical or sensitive data on the hard drive if working in a telework center; use removable storage media.
- Set a password to access the hard drive of any computer used in a work-at-home situation.
- Use anti-static carpet or rugs in the work-at-home area to prevent static electricity from damaging the sensitive equipment.
- Keep the home work area neat and refrain from eating, drinking or smoking when using the computer.[27]

MANAGING THE TELECOMMUTER

Effectively managing the telecommuter requires some of the same skills needed to manage in a face-to-face situation. The core virtue of quality telecommuting is mutual trust. If the employer trusts employees to do their jobs whether or not they are physically seen, and employees trust their employer to give competent direction and guidance, the telecommuter can be effectively managed. The manager's job is to provide specific, measurable, and attainable standards for all employees to meet, including telecommuters. Each employee should know what must be done, when, and how well it must be done. Table 4 contains a checklist for effective management of the teleworking/telecommuting employee.

TABLE 4
EFFECTIVE MANAGEMENT OF TELEWORKING/TELECOMMUTING

Agree on clear performance criteria.
Reward for work well done; penalize for work poorly performed.
Establish and use quality communications; utilize your teleconferencing capabilities.
Focus on the product of the work, not the process.
Hold periodic face-to-face meetings which have specific objectives.
Schedule required office time at the principal/regional/local office.
Give specific and frequent feedback on the telecommuter's work; look for indications of problems and handle them quickly.
Keep telecommuters linked to the office by making sure they get internal memos, notices of training, etc.
Give the telecommuter varied jobs just as you would someone in the principal office.
Cross-train the telecommuter just as you would someone in the principal office.
Offer the same opportunities for advancement as are available in the principal office.
Establish a telecommuter help desk for technical issues.
Source: Compiled from literature

[26] "All the Pieces of the Network Puzzle," **Connections**, July, 1, 1996.
[27] "Computer Security for Telecommuting," U.S. Fish and Wildlife Service, undated.

Telecommuting does not eliminate the use of teams; it merely alters the concept. The industrial age team model was supported by sporting analogies. All the players work together all the time in order to win the game. Telecommuting lends itself to a different model of a team, as explained by Edward Demming. Demming introduced the "orchestra" as the new team model where each player needs to practice and periodically be brought together to make sure the music is in tune.[28] In this sense, telecommuters can remain as fully participating team members who have diverse assignments which fit together to form a whole. Remember, generally the telecommuter only works out of the office for one or two days a week.

Managers are dealing with constant change. Because of the changes in work sites, telecommuting can sometimes cause managers to be overwhelmed with trust and control issues. The lack of management control and the loss of the team concept are the most common concerns expressed from supervisors of telecommuters.[29] While these fears are understandable, training in how to manage telecommuters can help assure successful programs. Managers need to learn to manage by results instead of by observation.

AGENCY SURVEY RESULTS

The Office of the State Auditor mailed a survey to the 24 major executive branch agencies in North Carolina during December 1996. The results of the survey are contained in Appendix A, page 35. We received 44 completed surveys from these agencies or their major divisions. Of particular interest is the fact that of the 32,947 positions in these agencies, only 726 (2.2%) were listed as working from home.

The majority of the working-from-home employees fall into the "mobile" class of teleworkers/telecommuters. Table 5 shows the breakdown of job types now working from home. Note that 54.7% are clearly mobile field inspectors/program inspectors. The next largest category is law enforcement personnel, 15.8%. The survey did not ask agencies to identify those employees who were assigned to a regional or local office as opposed to the central office in Raleigh.

TABLE 5
TYPES OF STATE EMPLOYEES
CURRENTLY WORKING FROM HOME

Job Type	Number	% of Total
Accountants/Auditors/ Bookkeepers/Finance/Budget	47	6.5
Computer-related Personnel	33	4.6
Engineering	4	0.1
Field Inspectors/Counselors	89	12.3
Law Enforcement	115	15.8
Doctors, Nurses, Technicians	15	2.1
Program Managers	11	1.5
Program Inspection/Regulatory	308	42.4
Field Research	12	1.7
Correction Officers/ Probation/Parole	6	0.1
Miscellaneous (category not specified)	87	12.0
TOTAL	**726**	**100.0**

As reported by the responding agencies, the average initial cost to outfit the employees working from home was $5,789, with an average annual cost to maintain of $2,758. However, these figures included the cost of providing vehicles to the employees. When the vehicle costs are factored out, the average initial cost becomes $1,963 and the average annual cost becomes $216. We should note

[28] Ibid., Sullivan.
[29] Ibid., **Telecommute America!**

that we are unable to determine the extent of telecommuting being done by the 726 employees who are working from home.

Survey responses further showed that most agencies have chosen to designate employees' homes as duty stations due to the convenience to the employee's work (56.8%) and the cost savings (usually travel and subsistence) to the agency (52.3%). Agencies allowing employees to work from their homes most frequently use accuracy of documents prepared (52.3%) and the number of documents or reports prepared (45.5%) to measure performance. The most frequent methods used to supervise employees working from home were review of written reports (50.0%), use of weekly itineraries (45.5%), and periodic accompaniment by the supervisor (45.5%). The most common functions performed by employees working from home were report writing (50.0%), territorial monitoring, (40.9%), and files management (38.6%).

Only eight (18.2%) of the responding agencies/divisions felt there were currently other positions within their agencies whose functions could be performed from the employee's home. Specific positions identified included filed supervisors, data entry clerks, computer programmers, computer network managers, personnel analysts, complaint investigators, preschool teachers, SBI agents, criminal specialists, and ALE agents. A number of respondents noted that most of their employees could conceivably work from home if they had computer connections and systems set up to handle the work. Several other respondents indicated that while the survey asked only about employees whose duty station is designated as their home, they do allow and encourage, on a limited basis, some teleworking/telecommuting such as checking of e-mail and voice mail, preparation of reports and forms, etc. from the employee's home, for employees assigned to the central office of the agency.

CONCLUSION: WHAT COULD TELECOMMUTING MEAN TO NORTH CAROLINA?

The basic reasons for implementing any type of flexible working program --whether in the public or private sectors--is to find a more economical and efficient way to do business. This is true of telework/telecommuting programs. In a recent article, AT&T[30] management offered this definition of telecommuting:

> A *business strategy . . . promoting flexible work environments by effectively utilizing communications based office technology, which creates measurable business value for the company, the individual, and their customers.*

The studies reviewed show that the major impetus for *private companies* to explore telecommuting seems to revolve around the potential to reduce the costs of office space while improving employee job satisfaction by allowing more flexible methods of work. The major impetus for *governmental agencies* to implement a telecommuting program

[30] "Teleworking Related Quotes," AT&T, 1995.

revolves around the need to control and reduce the amount of pollution, especially in major urban areas. The other benefits of telecommuting appear to be "extras" for governmental entities.

Either type operation should consider teleworking options when:

- ⇒ The entity is growing, adding staff, and running out of space.
- ⇒ Rental or lease costs are increasing.
- ⇒ The entity is under pressure to reduce costs, and there is a need to examine current facility and overhead expenses.
- ⇒ Some departments or functions already perform a significant portion of their jobs away from the office.
- ⇒ Leases are up for renewal and management is looking at options.
- ⇒ Dispersal of employees would reduce the organization's exposure in case of emergencies and natural disasters such as earthquakes or serious weather problems.[31]

In other words, a telework/telecommuting program is a sound business option which North Carolina state government should consider.

To understand what a telecommuting program could mean for North Carolina, we have included the following series of tables showing potential benefits and/or cost reductions or avoidances that the State could likely expect. All computations are based on the data contained in the preceding sections of this report and information obtained from various State agencies about North Carolina. We have shown the effect of each "potential" at differing levels of implementation since *there is no set formula for determining which jobs within State government can be telecommuted***.** This is a decision that will have to be made by each agency using the general criteria described in this report.

State Employee Population: The first step in trying to determine what telecommuting could mean to North Carolina is to determine the number of employees who would potentially be telecommuters. As shown in the survey of state agencies (contained in Appendix A, page 35), there are already a number of state employees who are "teleworking" (home is assigned duty station) to some degree and others who are telecommuting on an informal, part-time basis. However, after reviewing the data summarized in this report, it is our opinion that a significantly larger number of state employees could be potential participants in a formal telework/telecommuting program. According to the Office of State Personnel, there are

TABLE 6
AVERAGE COMPENSATION FOR STATE EMPLOYEES

Average Salary	$28,339
Benefits @ 43% of Salary	12,186
TOTAL COMPENSATION*	$40,525
TOTAL HOURS WORKED ANNUALLY (after sick leave, vacation, holidays, training) **NOTE**: 40 weeks used throughout unless otherwise noted.	1600 (or 40 weeks)
AVERAGE COMPENSATION per HOUR	$25.33

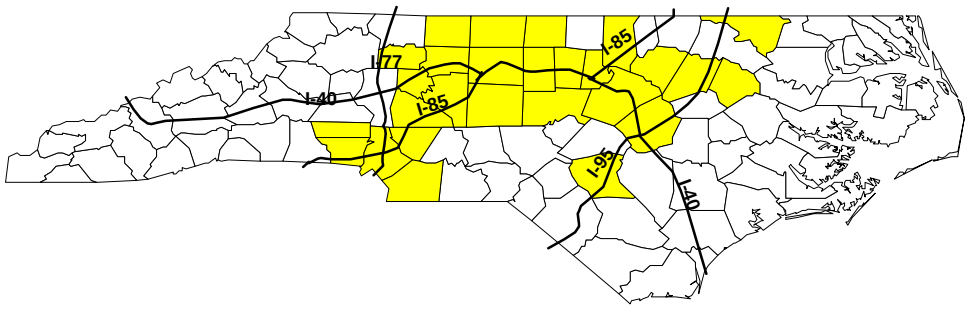
Source: *Office of State Personnel
Computed by the Office of the State Auditor Based on North Carolina Data

[31] Adapted from Teleworking, A Discussion about Working Alternatives, *Steelcase*.

85,288 state employees excluding all exempt positions within the University system. Table 6 shows the average compensation for these State employees.

Reduction in Pollution: A major benefit which can be derived from a telework program for the State would be the potential to reduce the amount of pollution, especially in the metropolitan areas. Records from the North Carolina Division of Motor Vehicles show that as of July 7, 1997, there are 6.4 million vehicles registered in North Carolina. Appendix B, page 37 shows a breakdown by county of registration. Information obtained from the Department of Environment and Natural Resources, Division of Air Quality, shows that there are 27 (Exhibit 4 below) counties which are most likely to be impacted by the most recent (July 1997) changes to the Clean Air Act.[32] Appendix C, page 40 contains data on estimated vehicle miles traveled in these counties.

EXHIBIT 4
COUNTIES THAT MAY NOT MEET
1997 CLEAN AIR STANDARDS
(highlighted)

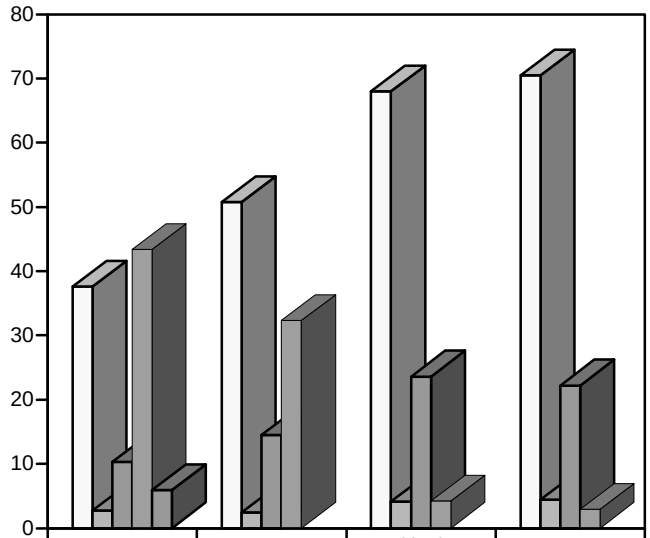


Source: Department of Environment and Natural Resources, Division of Air Quality

Specifically, the Air Quality Attainment Planning Branch of DENR believes that each of these counties could potentially be affected by the new ozone standard. The final guidance from EPA may consider additional criteria, in which case the attached list would likely increase unless there was a significant improvement in air quality. Failure by the State to meet planning requirements for the standards could mean possible loss of federal highway funds as well as failure of the transportation plan to show conformity with the air quality plan.

[32] "Stricter Clean Air Rules OK'd," **The News and Observer**, July 26, 1997.

EXHIBIT 5
1990 NOx EMISSION SOURCES
(tons per day)



	North Carolina	Forsyth County	Mecklenburg County	Wake County
Mobile	37.6	50.8	68	70.5
Area	2.7	2.4	4.1	4.4
NR Mobile	10.3	14.5	23.6	22.2
Point	43.4	32.3	4.2	2.9
Biogenic	5.9			

Source: DENR, Division of Air Quality

Studies conducted by the US Environmental Protection Agency have shown that vehicles are a significant source of pollution for the following pollutants: hydrocarbons, carbon monoxide, nitrogen oxides, and carbon dioxide. A 1995 study on annual emissions and fuel consumption[33] shows the average commute generates approximately 1.05 pounds of total pollutants for each mile driven. Table 7 shows the average mileage driven and pounds of pollution generated by six randomly chosen state employees.

TABLE 7
AVERAGE AMOUNT OF POLLUTION GENERATED BY STATE EMPLOYEES

EMPLOYEE #	ROUND-TRIP MILES/DAY	POUNDS/ MILE	TOTAL POUNDS/ DAY
1	120	1.05	126.0
2	60	1.05	63.0
3	56	1.05	58.8
4	54	1.05	56.7
5	20	1.05	21.0
6	30	1.05	31.5
TOTALS	**340**		**357.0**
AVERAGE	**56.7**		**59.5**

Source: Computed by the Office of the State Auditor

[33] "Annual Emission and Fuel Consumption for an 'Average' Passenger Car and Light Truck," **US Environmental Protection Agency**, National Vehicle and Fuel Emissions Laboratory, February, 1995.

The total amount of pollution generated from commuters, of course, depends on the number of commuters each day. Therefore, the amount of pollution that could be avoided if the State allowed employees to telecommute depends on the number of employees participating and the number of days each week the employees telecommute. Table 8 shows the **potential daily pollution avoidance** the State could expect at different levels of telecommuting.

TABLE 8
POTENTIAL POLLUTION AVOIDANCE FOR STATE USING AVERAGE DAILY GENERATION

	NUMBER OF EMPLOYEES AT DIFFERENT PERCENTAGES				
	.01	**.02**	**.03**	**.04**	**.05**
Total # Employees: 85,288	853	1706	2559	3412	4264
X Avg. Pounds Generated	59.5	59.5	59.5	59.5	59.5
Total Daily Generation	**50,754**	**101,507**	**152,260**	**203,014**	**253,708**

Source: Computed by the Office of the State Auditor

Increase in Productivity:

Entities that have established a telework program report that a major benefit is an increase in productivity for the telecommuter. Employers have reported an average increase in productivity of 12.5% if the proper controls are in place. Logically, this increase will be evidenced only on those days the employee telecommutes. Therefore, the telecommuter can accomplish 9 hours of work for every 8 hours of telecommuting time. Table 9 shows the potential benefit in terms of average compensation that the employer could expect to receive from a telecommuter.

TABLE 9
VALUE OF EXTRA "PRODUCTIVITY" RECEIVED BY EMPLOYER PER TELECOMMUTER

	NUMBER OF DAYS WORKED AT HOME PER WEEK				
	1	**2**	**3**	**4**	**5**
HR. COMPENSATION: $25.33	$25.33	$50.66	$75.99	$101.32	$126.65
X 40 WEEKS					
ANNUAL BENEFIT	**$1,013.20**	**$2,026.40**	**$3,039.60**	**$4,052.80**	**$5,066.00**

Source: Computed by the Office of the State Auditor Based on North Carolina Data

We have assumed that for each day the employee telecommutes, the employer will receive an extra hour of productivity from the telecommuter. Therefore, the total productivity benefit the State can expect to receive from a telecommuting program will depend on the total number of State employees participating in the program, as well as the number of days per week they each telecommute. Table 10 shows the estimated annual **daily productivity benefit** the State could expect if 1% to 5% of all State employees participated in the program.

TABLE 10
POTENTIAL DAILY "PRODUCTIVITY" BENEFIT BASED ON PERCENTAGE OF STATE EMPLOYEES PARTICIPATING

TOTAL # EMPLOYEES	85,288	85,288	85,288	85,288	85,288
X % PARTICIPATING	0.01	0.02	0.03	0.04	0.05
# PARTICIPATING	853	1,706	2,559	3,412	4,264
X ANNUAL BENEFIT/EMPLOYEE	$1,013.20	$1,013.20	$1,013.20	$1,013.20	$1,013.20
ANNUAL BENEFIT PER DAY	**$864,259.60**	**$1,728,519.20**	**$2,592,778.80**	**$3,457,038.40**	**$4,320,284.80**

Source: Computed by the Office of the State Auditor Based on North Carolina Data

Table 11 shows the total estimated **annual productivity benefit** the State could expect based on the number of days per week the employees telecommute. (All numbers have been rounded for easier computation.) Obviously, the potential benefit increases as the

number of employees telecommuting increases and the number of telecommuting days per week increases.

TABLE 11
POTENTIAL ANNUAL "PRODUCTIVITY" BENEFIT BASED ON NUMBER OF DAYS TELECOMMUTING PER WEEK

NUMBER OF DAYS	1	2	3	4	5
NUMBER OF EMPLOYEES: 853	$ 864,260	$1,728,520	$2,592,780	$3,457,040	$4,321,300
1,706	1,728,520	3,457,040	5,185,560	6,914,080	8,642,600
2,559	2,592,780	5,185,560	7,778,340	10,371,120	12,963,900
3,412	3,457,040	6,914,080	10,371,120	13,828,160	17,285,200
4,264	4,320,285	8,640,570	12,960,855	17,281,140	21,601,425

Source: Computed by the Office of the State Auditor Based on North Carolina Data

Decrease in Space Needs: As noted earlier, private companies have used telecommuting to reduce their need for office space. Several studies on private company telecommuting programs indicated reductions of 10% to 30% in building needs. However, we found no governmental program which reported those kinds of reduction in building needs. Arizona and California personnel indicated that while their programs had not reduced the need for state office space as yet, this was an area where they were beginning to consider the possibilities. In both states, as in most governmental programs, individual agencies have been allowed to set up their telecommuting program to fit their needs. Some of the agencies are beginning to explore the concept of "hoteling" for state employees.

In North Carolina, we have numerous State buildings, including warehouses, etc., located throughout the State. Table 12 shows a breakdown of the number of **office buildings only** by county. Total square footage equals 10,573,379 or approximately 124 square feet per employee. Of the total square footage, 3,142,624 (29.7%) is leased at a total cost to the State of $30,923,420 annually.

The cost of leased space for State agencies has been an on-going concern to State leaders. Several different options for addressing this issue have been discussed and explored by the Council of State members and by the General Assembly. In fact, in 1993, the Council of State addressed this issue in some detail. At that time, State agencies had executed 930 leases for 3,023,665 square feet of space (for all types of buildings) at an annual cost of $25,472,350 ($8.42 per square foot). The corresponding numbers of 1997 are: 911 leases for 3,675,002 square feet of space at an annual cost of $35,497,512 ($9.66 per square foot). This represents an increase in the square footage leased of 21.5%, but an increase in the cost of the leased space of 39.4%. During this same period of time, the number of State employees has grown approximately 17%.

TABLE 12
STATE OF NORTH CAROLINA
SUMMARY SCHEDULE OF STATE-OWNED AND LEASED OFFICE SPACE BY COUNTY

	State-Owned		State-Leased			State-Owned		State-Leased	
County	# Bldgs.	Square Feet	# Bldgs.	Square Feet	County	# Bldgs.	Square Feet	# Bldgs.	Square Feet
Alamance	6	8,113	4	15,565	Johnston	11	16,548	9	17,831
Alexander	3	5,960	3	3,157	Jones	1	1,038	1	220
Alleghany	3	3,769	1	945	Lee	7	7,147	5	13,959
Anson	8	19,372	3	5,045	Lenoir	17	47,194	9	17,125
Ashe	4	6,371	2	1,240	Lincoln	4	4,986	5	8,785
Avery	5	8,217	3	2,417	Macon	5	4,559	4	5,458
Beaufort	11	16,853	6	54,735	Madison	2	1,946	5	5,117
Bertie	1	1,144	1	417	Martin	7	5,294	3	6,274
Bladen	6	6,109	3	3,392	McDowell	8	17,069	5	8,860
Brunswick	7	9,392	5	7,271	Mecklenburg	19	160,362	17	37,717
Buncombe	30	142,830	38	119,293	Mitchell	3	2,076	3	2,792
Burke	37	298,871	4	12,071	Montgomery	9	10,453	1	771
Cabarrus	4	7,355	9	30,870	Moore	12	28,737	7	15,968
Caldwell	6	12,897	7	17,132	Nash	10	22,611	4	22,460
Camden	0	0	1	210	New Hanover	32	118,441	24	90,171
Carteret	9	40,904	14	18,505	Northampton	4	5,700	1	560
Caswell	8	15,441	1	273	Onslow	7	6,281	7	23,093
Catawba	6	16,530	19	48,696	Orange	83	1,019,429	44	251,360
Chatham	7	12,719	5	4,556	Pamlico	2	3,159	2	460
Cherokee	3	2,479	6	11,222	Pasquotank	11	22,771	14	18,530
Chowan	0	0	6	11,982	Pender	12	13,561	6	8,515
Clay	1	548	1	284	Perquimans	3	15,184	1	308
Cleveland	11	30,503	9	21,380	Person	4	5,411	6	5,269
Columbus	10	14,835	6	7,480	Pitt	43	179,888	29	115,163
Craven	14	16,318	13	38,293	Polk	0	0	1	378
Cumberland	16	68,144	23	84,028	Randolph	9	12,053	7	17,832
Currituck	2	1,526	1	286	Richmond	8	15,733	9	21,076
Dare	3	2,548	6	4,740	Robeson	9	44,640	6	22,062
Davidson	6	8,686	9	16,708	Rockingham	10	16,137	7	20,682
Davie	2	4,801	2	1,507	Rowan	10	41,935	7	12,115
Duplin	6	6,893	5	6,456	Rutherford	5	8,357	5	10,780
Durham	20	90,789	18	61,891	Sampson	18	29,678	8	12,269
Edgecombe	6	26,504	4	12,317	Scotland	4	3,735	3	7,712
Forsyth	15	63,595	27	152,099	Stanly	7	29,162	5	10,037
Franklin	4	6,680	5	7,037	Stokes	5	14,784	1	592
Gaston	8	11,277	4	15,747	Surry	10	15,039	8	10,208
Gates	2	1,146	1	290	Swain	3	6,030	1	2,100
Graham	2	3,170	1	459	Transylvania	1	1,525	2	3,197
Granville	26	106,492	3	4,415	Tyrrell	1	936	2	4,860
Greene	2	2,106	1	732	Union	6	13,569	7	16,505
Guilford	34	195,475	27	100,466	Vance	14	13,426	7	11,424
Halifax	14	19,509	6	10,770	Wake	158	3,629,543	150	1,194,319
Harnett	8	6,816	6	15,179	Warren	3	947	3	1,283
Haywood	7	10,954	5	10,764	Washington	7	7,216	4	1,175
Henderson	7	15,504	4	10,775	Watauga	11	118,127	8	18,678
Hertford	9	11,939	4	6,249	Wayne	17	44,952	7	14,998
Hoke	6	85,375	3	3,189	Wilkes	15	30,573	9	16,206
Hyde	4	4,366	2	3,736	Wilson	13	66,138	5	12,208
Iredell	6	13,661	11	41,294	Yadkin	3	2,934	2	2,137
Jackson	7	72,973	3	12,210	Yancey	5	5,282	1	1,250
GRAND TOTALS						**1,090**	**7,430,755**	**838**	**3,142,624**

Source: NC Department of Administration, State Property Office

While we are unable to determine the exact effect telecommuting would have on space needs, we have assumed that the State would be able to decrease its need for leased space.

Table 13 shows the number of square feet of office space North Carolina could avoid leasing based on the percentage of employees telecommuting. Table 14 shows the associated lease costs which could be avoided if employees were telecommuting and did not require the 124 square feet of space 5 days each week. For instance, if 3% of the 85,288 State employees telecommuted 3 days per week and management coordinated use of space, the State could avoid the need to lease 190,390 square feet each year for a savings of $1,873,434.

TABLE 13
ANNUAL LEASED OFFICE SPACE AVOIDED BASED ON NUMBER OF DAYS TELECOMMUTING PER WEEK (in square feet)

NUMBER OF EMPLOYEES	1% (853)	2% (1,706)	3% (2,559)	4% (3,412)	5% (4,264)
NUMBER OF DAYS PER WEEK: 1	21,154	42,309	63,463	84,618	105,747
2	42,309	84,618	126,926	169,235	211,494
3	63,463	126,926	190,390	253,853	317,242
4	84,618	169,235	253,853	338,470	422,989
5	105,772	211,544	317,316	423,088	528,736

Source: Computed by the Office of the State Auditor Based on North Carolina Data

TABLE 14
ANNUAL LEASED COSTS AVOIDED BASED ON NUMBER OF DAYS TELECOMMUTING PER WEEK (Average = $9.84 per square foot)

NUMBER OF EMPLOYEES	1% (853)	2% (1,706)	3% (2,559)	4% (3,412)	5% (4,264)
NUMBER OF DAYS PER WEEK: 1	$208,159	$416,319	$624,478	$832,637	$1,040,552
2	416,319	832,637	1,248,956	1,665,274	2,081,105
3	624,478	1,248,956	1,873,434	2,497,912	3,121,657
4	832,637	1,665,274	2,497,912	3,330,549	4,162,210
5	1,040,797	2,081,593	3,122,389	4,163,186	5,202,762

Source: Computed by the Office of the State Auditor Based on North Carolina Data

Reduction in Employee Turnover Costs:

One benefit of a telecommuting program reported by both private and governmental agencies is an increase in employee satisfaction and a significant reduction in employee turnover. The studies reviewed reported a reduction in employee turnover of between 10% and 18%. A 1996 study conducted by the University of Wisconsin[34] found that the national average annual employee turnover rate for all companies is 12%. This study further found that 75% of the demand for new employees is simply to replace workers who have left the company.

The types of tangible costs associated with employee turnover are shown in Table 15. However, there are intangible costs which include: uncompensated increased workloads other workers assume due to vacancies, stress and tension caused by turnover, decreased productivity due to loss of work group

TABLE 15
TYPES OF COSTS ASSOCIATED WITH EMPLOYEE TURNOVER

SEPARATION COSTS	REPLACEMENT COSTS
Exit Interviews	Attracting Applicants; Advertising
Administrative Functions re: Termination	Entrance Interviews; Testing; Medical Exam
Separation/Severance Pay	Travel/Moving Expenses
Increase in Unemployment Compensation	Administrative Functions Re: Hiring, Orientation

Source: "How Much Does Your Employee Turnover Cost?"

[34] "How Much Does Your Employee Turnover Cost?," William H. Pinkovitz, Joseph Moskal and Gary Green, University of Wisconsin Center for Community Economic Development, ~1996.

synergy, etc. Taking these factors into account, the Wisconsin study estimated average cost of turnover was $2,288 per vacancy. We learned during this study that the North Carolina Office of State Personnel does not capture the costs of turnover.

Therefore, we have used the $2,288 figure to compute the current estimated cost of turnover (for all reasons) for North Carolina. This data is shown in Table 16. Again, the actual decrease in turnover costs that the State could expect from implementing a telecommuting program depends on the percentage of decrease in turnover. Table 17 shows the potential for avoided turnover costs for reductions ranging from 5% to 10%.

TABLE 16
NORTH CAROLINA'S
ESTIMATED COST OF TURNOVER

Total # Employees	85,288
Annual Turnover Rate*	0.126
Number Turnover	10,746
Avg. Cost of Turnover per Employee	$ 2,288
NC's ANNUAL COST OF TURNOVER	**$24,586,848**

Source: *North Carolina Office of State Personnel
Computed by the Office of the State Auditor

TABLE 17
POTENTIAL AVOIDED COSTS FROM REDUCED TURNOVER

	PERCENT REDUCTION					
	.05	**.06**	**.07**	**.08**	**.09**	**.10**
NC's TURNOVER RATE	.126	.126	.126	.126	.126	.126
LESS AMT. OF REDUCTION	.006	.008	.009	.010	.011	.013
REDUCED TURNOVER RATE	.120	.118	.117	.116	.115	.113
X TOTAL # EMPLOYEES	85,288	85,288	85,288	85,288	85,288	85,288
REDUCED # TURNOVER	10,235	10,064	9,979	9,893	9,808	9,638
X COST OF TURNOVER	$2,288	$2,288	$2,288	$2,288	$2,288	$2,288
REDUCED ANNUAL COST	**$23,417,680**	**$23,026,432**	**$22,831,952**	**$22,646,624**	**$22,440,704**	**$22,051,744**
LESS CURRENT TURNOVER COST	$24,586,848	$24,586,848	$24,586,848	$24,586,848	$24,586,848	$24,586,848
POTENTIAL AVOIDED COST	**$ 1,169,168**	**$ 1,560,416**	**$ 1,754,896**	**$ 1,940,224**	**$ 2,146,144**	**$ 2,535,104**

Source: Computed by the Office of the State Auditor Based on North Carolina Data

Increased Availability of Disabled Workers:

A further benefit to the State would be increased availability of disabled workers. Several recent court cases[35,36] have been decided in favor of allowing a disabled worker the option of telecommuting while recuperating from injuries whether the injuries were work related or not. This trend has the potential of reducing the State's liability for worker compensation cases. Further, a formal telework/telecommuting program would allow the State to recruit and hire permanently disabled workers who would not be part of the normal workforce due to their inability to commute to a central location. Again, a telecommuting program could serve to help the State meet its obligations under the Americans with Disabilities Act. Various private industries such as IBM[37] have been utilizing telecommuting for over 20 years as a means of accommodating disabled workers.

[35] Fleming LTD, Telework Consulting, July 1997.
[36] "Disabled Would-Be Telecommuter Wins Suit Against Employer," JALA International, June 6, 1997.
[37] "Telework: The Ultimate Reasonable Accommodation," Karen Topp Goodwyn, Fleming LTD, June, 1997.

Benefits to the Employee:

While the benefits to the State are somewhat difficult to quantify, the benefits to individual employees participating in a formal telework/telecommuting program are more evident. The most prominent benefit would be the reduction in commuting which could be realized from either working at a local telecenter or from working at home. Tables 18 and 19 show the "true cost of commuting" in terms of time spent commuting and vehicle costs.

TABLE 18
HOURS PER YEAR SPENT COMMUTING

One-Way Minutes	Round-Trip Minutes	Hours per Year (Assumes 240 workdays per Year)	Equivalent 40 Hour Weeks
10	20	80	2
20	40	160	4
30	60	240	6
40	80	320	8
50	100	400	10
60	120	480	12

Source: **Working From Home**, Fred and Sarah Edwards

Perhaps the most important benefit to the employee would be the "extra" time gained from not having to commute. In effect, the agency would be rewarding its best employees with the equivalent of "extra leave" for the time that the employee did not have to spend commuting. As noted previously in this report, any time the employee gains from telecommuting could be used to benefit the family, the community, the church, etc.

Further, the potential savings to the employee from not having to commute can be significant. Table 19 contains data on the cost of commuting based on the type care driven. Using this information, we have included in Table 20 the potential savings for our sample of six state employees. Since State agencies are restricted in ways to reward employees, the use of a telecommuting program could be a significant reward for employees who have proven they are capable of quality work with little supervision. As can be seen from our example, the further the employee has to commute, the greater the benefit from being allowed to telecommute. One study estimates ". . . the average telecommuter, with

TABLE 19
COSTS PER MILE TO COMMUTE

Vehicle Type	General Vehicle Cost Inspected	Maintenance, Accessories, Parts & Tires	Gas & Oil (includes taxes)	Insurance	Total Cost Per Mile (in cents)
Subcompact	8.6	5.5	4.8	7.1	26.0
Compact	8.7	5.5	5.4	7.0	26.6
Intermediate	10.7	6.1	6.3	7.0	30.1
Full-Size	13.5	6.6	6.8	7.2	34.1
Compact Pick-up	8.7	5.9	5.7	7.2	27.5
Full-Size Pick-up	9.5	6.4	8.5	7.2	31.6
Minivan	11.8	6.0	7.0	7.0	31.8
Full-Size Van	14.2	6.8	11.1	8.5	40.6

Source: *National Transportation Statistics, Annual Report*, US Department of Transportation, June 1992, Table 28.

TABLE 20
SAMPLE OF POTENTIAL EMPLOYEE SAVINGS FROM TELECOMMUTING

				NUMBER OF TELECOMMUTING DAYS/WEEK		
EMP. #	COST/ MILE	MILES/ DAY	COST/ DAY	1	2	3
1	0.266	120	$31.92	$1,276.80	$2,553.60	$3,830.40
2	0.301	60	$18.06	722.40	1,444.80	2,167.20
3	0.341	56	$19.10	763.84	1,527.68	2,291.52
4	0.316	54	$17.06	682.56	1,365.12	2,047.68
5	0.266	20	$ 5.32	212.80	425.60	638.40
6	0.266	30	$ 7.98	319.20	638.40	957.60

Source: Computed by the Office of the State Auditor
NOTE: We have included a worksheet for computing individual savings possible from telecommuting as Appendix D, page 41.

young children at home, will gain from one-eighth to one-sixth of their pay if they change from full-time commuting to full-time telecommuting."[38]

Cost of Implementation: There are some costs involved in establishing a telework/telecommuting program, especially for developing a training program for participants, co-workers of participants, and supervisors of participants. There are a number of other states which have already begun telework programs and have developed training packages which they may be willing to share for minimal costs.[39,40] Other costs involved may be for specific equipment provided by each agency to telecommuters. However, decision makers should keep in mind that employees can participate in a "telework" mode without needed specific telecommunications equipment. Also, many employees already have equipment at home that they may be willing to use for the privilege of telecommuting. Other employees may be willing to purchase equipment if the State could work out some type of reduced cost program for purchases. Therefore, the cost of equipping employees participating in the program would vary greatly from agency to agency.

In order to better understand the potential costs, we present in Table 21 an estimate of the costs to equip and maintain the program based on the work of one of the early pioneers in telecommuting who says an agency can expect the cost of equipping and maintaining a program to be 5% of the employee's annual salary.[41]

TABLE 21
ESTIMATE OF COST TO EQUIP AND MAINTAIN A TELECOMMUTING PROGRAM

	NUMBER OF EMPLOYEES AT DIFFERENT PERCENTAGES				
	.01	**.02**	**.03**	**.04**	**.05**
Total #: 85,288	853	1706	2559	3412	4264
X 5% of Average Salary	$1,416.95	1,416.95	1,416.95	1,416.95	1,416.95
Estimated Annual Costs	$1,208,658	$2,417,317	$3,625,975	$4,834,633	$6,041,875
Source: Computed by the Office of the State Auditor					

[38] "The Economics of Teleworking," Noel Hodson, 1992.
[39] Ibid., National Council of State Legislatures.
[40] "Telecommuting: Get Off the Road and Get On-Line," North Bay Council, February, 1995.
[41] Ibid. Nilles

Summary and Recommendation: The Office of the State Auditor has spent the last year thoroughly researching the feasibility of implementing a telework/telecommuting program for the State of North Carolina. In our opinion, the benefits to be derived from such a program are significant, especially in the areas of reduced pollution (approximately 253,708 pounds per day with 5% of state employees telecommuting) and the potential to reduce the need for office space. The costs of implementing the program, which are minimal, would be recouped from the anticipated increase in productivity, the decrease in turnover, and the decrease in the need to lease office space. Benefits to the employees participating in the program would also be significant. Table 22 summarizes the most likely annual benefits and costs to the State with 5% of the eligible state employees participating. We again caution the reader that these numbers are estimates only. The actual benefits and costs depend on the number of employees participating.

TABLE 22
SUMMARY OF BENEFITS AND (COSTS) TO THE STATE

ITEM	AMOUNT
Annual Productivity Benefit (5% of employees for 5 days per week)	$ 21,601,425
Reduced Office Lease Costs (5% of employees for 5 days per week)	5,202,762
Avoided Turnover Costs (10% reduction)	2,535,104
Cost of Implementation (5% of Annual Salary for 5% of employees)	(6,041,875)
NET ESTIMATED BENEFIT	**$23,297,416**

Source: Computed by the Office of the State Auditor

Therefore, we recommend that the Governor, members of the Council of State, and the leadership of the General Assembly work in concert to establish criteria for a state-wide telecommuting program. The program should be administered through the Office of State Personnel as one of the flexible work options offered by the State to its employees, and tailored by each participating agency to meet its specific needs. It is our opinion that OSP should recruit four or five agencies in which to set up pilot programs before opening the program statewide. These pilots should have very structured procedures and should incorporate measurable criteria in order for the agency, OSP, and state leadership to evaluate their effectiveness.

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OFFICE OF THE STATE AUDITOR
AGENCY OPERATIONAL/COMMUNICATIONS SURVEY

44 Total Responses

Purpose: The purpose of this survey is to gather general information relative to the use of employees' homes as duty stations and the resulting effects on operations. Please complete and return this survey in the enclosed envelope by ***January 15, 1997.***

Please mark all applicable boxes for each question. Additional pages may be attached if you feel that more descriptive answers are necessary. If your agency is too large for the contact person to reasonably answer the survey questions, the survey may be duplicated and sub-assigned to appropriate division-level staff to complete and return to the contact person for forwarding to the State Auditor.

Agency Contact Person_____ **Phone No.**_____
Contact Person's Title_____ **E-Mail:**_____
Agency Name_____
Sub Agency Name (division, etc. if applicable)_____

1. Please estimate the number of positions your agency has within the following categories, and show which categories, if any, have their duty station designated as their home.*(You may add additional categories if you believe your personnel should be classified other than those categories shown.)*

Categories	Estimate Number of Agency Personnel	Personnel Whose Duty Station is Their Home
a. ☐ Accountants/Auditors/ Bookkeepers/ Finance/Budget	790.5	47.0
b. ☐ Admin. Assistants, Secretaries, Typists	3171	
c. ☐ Artists	12	
d. ☐ Attorneys, Law Clerks	101	
e. ☐ Communications	89	
f. ☐ Computer-related Personnel	392.5	33
g. ☐ Construction: Facilities	14	
h. ☐ Construction: Infrastructure		
i. ☐ Data Entry Personnel	282.5	
j. ☐ Engineering (CAD users)	1332	4
k. ☐ Farming Industry		
l. ☐ Field Inspectors/Counselors	455	89
m. ☐ Inventory/Storage Mgmt.	33	
n. ☐ Law Enforcement (BLET qualified)	931	115
o. ☐ Maintenance: Facility	377	
p. ☐ Maintenance: Vehicles	688	
q. ☐ Medical: Doctors, Nurses, Technicians	448	15
r. ☐ Personnel Managers	65	
s. ☐ Program Managers: State-level, Regional level	661	11
t. ☐ Program Inspection/ Regulatory	839	308
u. ☐ Property Management	20	
v. ☐ Purchasing	100.5	
w. ☐ Research, Field	159	12
x. ☐ Research, Laboratory	111	
y. ☐ Security: Institutional	36	
z. ☐ Social Services: Direct client contact	2057	
aa. ☐ Systems Analysts/Engineers/ Programmers	192	
bb. ☐ Other: (Please list by general category if not shown above)	1449	86
Correction Officers	13095	5
Probation/Parole	3024	1
DOC Administration	2022	

2. What criteria was used by agency to assign employees' homes as their duty station?
(Please check all answers that apply, and list other criteria as appropriate.)

a.	☐ Convenience to field work	25	56.8%
b.	☐ Direct interaction with clients	15	34.1%
c.	☐ Cost savings to agency	23	52.3%
d.	☐ Other Criteria	13	29.5%

_____
_____

3. Does the agency provide these employees with any kind of equipment to support their work functions? If no, skip to question #5.

a. ☐ Yes 24 54.5% *b.* ☐ No 5 11.4% No Response: 15 34.1%

4. Please list the type(s) of equipment your agency furnishes these employees.

Equipment	Estimated Initial Cost	Estimated Annual Cost
a) Telephone	$ 77,016	$ 36,284
b) Computer	1,177,650	30,903
c) Modem	68,292	2,638
d) Fax Machine	71,097	10,252
e) Copier	1,400	385
f) Automobile/truck	2,777,795	1,845,401
g) Other (*please list*)	29,870	76,595
TOTALS	$4,203,090	$2,002,458
AVERAGE/EMPLOYEE	$ 5,789.38	$ 2,758.21
AVG. WITHOUT VEHICLE	1,963.26	216.33

5. For those employees working from their homes or away from direct supervision**...**
(Please check one or more of listed responses and list others as appropriate.)

5.a. How does management measure or evaluate these employees' work performance?

a. ☐ Number of clients served 18 40.9%
b. ☐ Number of documents/reports prepared 20 45.5%
c. ☐ Accuracy of documents prepared 23 52.3%
d. ☐ Others (please list): 16 36.4%
_____
_____

5.b. How are these employees supervised?

a. ☐ Weekly Itineraries 20 45.5%
b. ☐ Written reports by employee 22 50.0%
c. ☐ Statistical performance observation 18 40.9%
d. ☐ Periodic accompaniment by supervisor 20 45.5%
e. ☐ Others (please list): 13 29.5%
_____

5.c. Please indicate what functions the employees perform from their homes or unsupervised locations.

a. ☐ Report writing 22 50.0%
b. ☐ Being available for public assistance 16 36.4%
c. ☐ Files Management 17 38.6%
d. ☐ Territorial monitoring 18 40.0%
e. ☐ Others (please list): 14 31.8%
_____

6. Are there other positions within your agency whose functions you feel could be performed from the employee's home?

a. ☐ Yes 8 18.2% *b.* ☐ No 24 54.5% No Response: 12 27.3%

7. If you answered Yes to question 6, please list the position titles below and indicate what functions you feel could be performed from the employee's home.

Field Supervisors, data entry clerks, computer programmers, personnel analysts, complaint investigators, SBI agents, ALE agents

(attach additional pages if necessary to completely respond to question)

APPENDIX B
VEHICLE REGISTRATIONS BY COUNTIES AND TOWNS
AS OF JULY 7, 1997

COUNTY OR TOWN	AUTOS	TRUCKS	BUSES	TRAILERS	MOTOR-CYCLES	MOBILE HOMES	TRACTOR TRUCKS	SPECIAL MBLE EQ	WRECKER	REC-(RV) VEHICLES	OTHER	TOTAL
ALAMANCE	73,811	24,153	89	11,352	1,372	25	706	32	45	372	5	111,962
ALEXANDER	16,794	9,008	22	3,776	426	6	174	5	18	87	0	30,316
ALLEGHANY	5,310	3,179	5	919	83	3	77	2	7	28	0	9,613
ANSON	11,248	5,101	15	1,806	185	4	232	8	18	21	0	18,638
ASHE	12,395	7,534	19	2,101	232	6	121	24	11	88	0	22,531
AVERY	10,179	4,903	11	1,188	113	9	131	4	7	77	0	16,622
BEAUFORT	23,631	10,555	64	6,405	280	9	663	31	26	149	19	41,832
BERTIE	10,469	4,480	41	1,996	92	4	196	1	11	33	0	17,323
BLADEN	16,197	7,442	19	2,466	214	5	378	4	26	52	3	26,806
BRUNSWICK	35,375	15,114	34	6,331	594	18	1,224	23	38	340	86	59,177
BUNCOMBE	110,738	39,328	159	12,829	2,283	35	781	45	63	707	1	166,969
BURKE	44,146	19,421	97	7,485	845	18	455	22	48	223	0	72,760
CABARRUS	65,546	23,680	90	10,908	1,491	26	754	32	43	292	0	102,862
CALDWELL	40,516	19,391	79	8,478	871	12	771	28	18	260	0	70,424
CAMDEN	3,549	1,877	6	793	62	1	64	3	5	19	1	6,380
CARTERET	32,397	12,453	32	7,178	541	16	119	21	26	289	0	53,072
CASWELL	11,534	5,671	15	1,296	140	1	41	5	6	51	0	18,760
CATAWBA	78,263	30,835	146	17,415	1,794	26	2,220	38	50	377	0	131,164
CHATHAM	26,474	11,392	34	4,358	535	10	323	22	27	139	1	43,315
CHEROKEE	11,004	6,482	32	1,848	165	13	62	5	9	117	0	19,737
CHOWAN	7,149	3,029	30	1,642	56	4	124	2	6	42	0	12,084
CLAY	3,907	2,294	12	744	89	0	8	4	4	55	0	7,117
CLEVELAND	49,489	21,518	131	6,900	965	13	643	31	44	187	0	79,921
COLUMBUS	26,960	12,333	41	3,747	410	11	377	23	34	69	5	44,010
CRAVEN	46,076	15,523	50	7,385	798	17	315	28	43	269	9	70,513
CUMBERLAND	144,258	41,244	178	12,670	2,835	49	751	48	167	533	2	202,735
CURRITUCK	8,744	4,531	8	2,151	135	7	81	7	12	131	0	15,807
DARE	16,440	6,000	12	3,199	298	6	37	11	20	132	0	26,155
DAVIDSON	79,496	33,399	102	17,417	1,887	28	1,101	27	54	427	1	133,939
DAVIE	19,265	8,885	16	4,368	401	2	236	10	25	112	0	33,320
DUPLIN	22,876	11,806	72	3,686	290	10	664	27	42	66	5	39,544
DURHAM	112,914	23,445	189	7,683	1,342	17	396	23	53	285	1	146,348
EDGECOMBE	28,358	10,828	45	3,700	351	9	562	30	15	73	0	43,971
FORSYTH	170,870	44,093	352	18,187	2,827	30	1,552	72	92	611	4	238,690
FRANKLIN	22,167	10,402	34	3,420	435	12	213	10	25	121	1	36,840
GASTON	96,190	35,478	229	12,037	2,081	45	434	37	76	367	1	146,975
GATES	5,172	2,583	10	1,066	41	2	112	0	5	22	0	9,013

COUNTY OR TOWN	AUTOS	TRUCKS	BUSES	TRAILERS	MOTOR-CYCLES	MOBILE HOMES	TRACTOR TRUCKS	SPECIAL MBLE EQ	WRECKER	REC-(RV) VEHICLES	OTHER	TOTAL
GRAHAM	3,447	2,494	6	1,000	60	11	71	1	0	37	0	7,127
GRANVILLE	22,448	10,091	36	3,328	435	12	200	4	24	83	0	36,661
GREENE	7,913	3,840	24	1,208	97	3	85	0	7	28	0	13,205
GUILFORD	236,819	55,666	331	27,063	3,159	45	4,663	73	92	700	4	328,615
HALIFAX	28,454	10,169	36	4,656	444	6	201	11	33	106	0	44,116
HARNETT	39,181	17,290	56	5,729	723	16	285	17	58	228	4	63,587
HAYWOOD	27,343	14,390	22	5,220	525	34	148	9	28	306	0	48,025
HENDERSON	48,326	18,195	83	6,890	834	33	783	12	40	433	0	75,629
HERTFORD	11,490	4,232	45	1,957	92	2	242	7	12	38	1	18,118
HOKE	12,469	4,972	20	1,415	273	6	115	1	8	56	1	19,336
HYDE	2,547	1,611	7	725	20	2	73	0	1	11	1	4,998
IREDELL	63,679	26,160	81	12,668	1,584	23	936	41	47	342	0	105,561
JACKSON	13,918	7,498	20	2,278	265	16	149	7	17	118	0	24,286
JOHNSTON	55,715	25,634	72	9,818	1,022	30	474	23	74	300	9	93,171
JONES	4,725	2,463	2	1,028	60	1	93	0	11	16	0	8,399
LEE	26,822	10,296	36	3,473	496	8	305	31	15	127	1	41,610
LENOIR	31,435	11,701	65	5,426	382	18	443	11	36	121	2	49,640
LINCOLN	32,142	15,489	62	6,149	714	10	367	12	30	194	0	55,169
MACON	14,997	8,061	12	2,686	298	14	69	16	10	203	0	26,366
MADISON	9,031	5,640	17	1,216	146	7	70	4	9	57	0	16,197
MARTIN	13,067	5,658	36	2,696	119	5	136	7	17	53	0	21,794
MCDOWELL	19,735	9,881	14	2,929	364	15	205	14	18	142	0	33,317
MECKLENBURG	368,091	74,775	434	34,445	4,736	73	5,035	218	139	725	12	488,683
MITCHELL	8,135	4,490	24	986	109	8	88	14	2	59	0	13,915
MONTGOMERY	12,220	6,169	25	2,542	219	4	168	11	15	57	0	21,430
MOORE	42,298	14,685	37	4,899	680	6	743	15	32	245	15	63,655
NASH	47,484	16,885	96	7,450	662	20	665	31	52	181	0	73,526
NEW HANOVER	88,503	22,281	84	11,158	1,306	24	757	61	47	420	1	124,642
NORTHAMPTON	10,997	4,612	27	1,685	139	3	182	1	14	57	0	17,717
ONSLOW	60,202	21,931	81	7,305	1,167	23	428	13	88	288	3	91,529
ORANGE	57,404	13,778	57	4,721	928	18	180	7	35	184	2	77,314
PAMLICO	6,404	3,002	27	1,748	108	3	65	4	2	50	0	11,413
PASQUOTANK	16,320	6,074	28	2,586	217	9	198	7	24	68	0	25,531
PENDER	19,094	8,669	18	3,964	286	12	198	6	22	127	0	32,396
PERQUIMANS	5,633	2,838	2	1,266	59	6	97	2	3	62	0	9,968
PERSON	19,275	9,316	11	2,721	318	14	143	22	23	96	0	31,939
PITT	60,746	18,311	102	8,124	858	35	343	9	58	173	0	88,759
POLK	9,778	4,397	7	1,333	201	11	77	0	4	87	0	15,895
RANDOLPH	67,959	32,119	118	14,348	1,581	21	1,275	51	62	378	2	117,914
RICHMOND	22,520	9,476	33	3,235	343	2	293	5	30	79	0	36,016

COUNTY OR TOWN	AUTOS	TRUCKS	BUSES	TRAILERS	MOTOR-CYCLES	MOBILE HOMES	TRACTOR TRUCKS	SPECIAL MBLE EQ	WRECKER	REC-(RV) VEHICLES	OTHER	TOTAL
ROBESON	52,754	21,621	84	4,890	972	20	3,014	7	56	139	3	83,560
ROCKINGHAM	51,861	21,723	65	7,531	777	15	532	11	41	262	1	82,819
ROWAN	67,454	26,087	125	13,743	1,407	17	803	36	69	322	0	110,063
RUTHERFORD	31,934	14,465	68	4,723	611	14	431	29	34	163	0	52,472
SAMPSON	28,883	13,505	48	5,089	383	10	748	11	36	94	3	48,810
SCOTLAND	17,399	5,969	24	1,804	270	6	165	5	17	37	2	25,698
STANLEY	29,806	14,155	48	6,193	719	3	476	23	18	150	0	51,591
STOKES	23,849	12,882	43	3,732	635	5	120	8	19	113	0	41,406
SURRY	37,864	20,784	53	7,765	708	15	1,119	24	51	172	1	68,556
SWAIN	6,064	3,481	92	953	133	8	29	1	9	49	0	10,819
TRANSYLVANIA	15,860	6,922	25	2,303	315	13	56	10	8	183	0	25,695
TYRRELL	1,657	882	3	469	32	0	39	0	2	8	0	3,092
UNION	57,394	25,445	59	9,840	1,471	42	1,317	84	42	225	0	95,919
VANCE	21,664	7,719	31	3,213	294	9	362	5	21	95	0	33,413
WAKE	344,241	83,476	700	33,457	4,991	108	2,175	117	147	889	5	470,306
WARREN	9,286	3,928	15	1,280	118	5	125	0	13	28	1	14,799
WASHINGTON	6,946	2,960	17	1,749	64	8	122	1	12	27	0	11,906
WATAUGA	19,383	8,087	30	2,288	391	9	260	8	14	139	1	30,610
WAYNE	56,841	20,321	95	8,272	838	22	782	45	69	242	5	87,532
WILKES	6,859	3,109	9	903	170	2	407	4	5	21	0	11,489
WILSON	38,057	13,012	69	5,232	454	14	547	12	35	149	2	57,583
YADKIN	19,334	10,600	41	3,558	333	12	198	5	18	94	0	34,193
YANCEY	8,658	5,209	11	1,254	140	11	121	1	7	66	0	15,478
SUMMARY:	**4,102,721**	**1,440,971**	**6,569**	**575,245**	**69,814**	**1,486**	**52,094**	**1,970**	**3,201**	**17,925**	**227**	**6,272,223**

Source: Division of Motor Vehicles Registration Section

APPENDIX C
VEHICLE INFORMATION FOR COUNTIES
POTENTIALLY AFFECTED BY NEW (1997) OZONE STANDARD
(Based on 1995 data)

COUNTY	NUMBER REGISTERED	VEHICLES MILES TRAVELED	COUNTY	NUMBER REGISTERED	VEHICLES MILES TRAVELED
Alamance	110,835	2,917.1	Johnston	90,170	3,713.3
Cabarrus	100,980	2,879.7	Lincoln	54,211	1,242.2
Caswell	18,897	511.2	Mecklenburg	486,581	13,103.2
Chatham	42,961	1,284.1	Nash	73,899	3,266.7
Cumberland	209,072	6,712.1	Northampton	18,030	826.1
Davidson	137,468	3,544.3	Orange	77,279	2,742.0
Davie	32,050	1,089.2	Randolph	111,663	2,973.1
Durham	148,367	5,151.3	Rockingham	83,207	2,249.1
Edgecombe	45,296	1,315.5	Rowan	109,706	2,995.0
Forsyth	240,353	6,967.6	Stokes	40,553	799.2
Franklin	36,225	1,012.4	Union	93,123	2,587.3
Gaston	149,005	4,298.3	Wake	458,893	13,233.3
Granville	35,795	1,373.5	Yadkin	33,920	1,179.4
Guilford	331,135	9,688.7			

Source: NC Dept. Environment and Natural Resources, Div. of Air Quality

APPENDIX D COMMUTING COST WORKSHEET		
Step	Item	
1	Daily Round-Trip Commuting Distance	
2	X Total Cost per Mile (for your type vehicle)	$.
3	= Daily Round-Trip Commuting Cost	
4	X 20 (# of working days per month)	
5	= Monthly Round-Trip Commuting Cost	$.
6	X 12 (# months per year)	
7	= Annual Round-Trip Commuting Cost	$.

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