

# The Costs and Benefits of Alternative Growth Patterns

## THE IMPACT ASSESSMENT OF THE NEW JERSEY STATE PLAN



- **Economy**
- **Environment**
- **Infrastructure**
- **Community Life**
- **Intergovernmental  
Coordination**

*Prepared by:*

Robert W. Burchell, PhD  
William R. Dolphin, MA

*Prepared for:*

**CENTER FOR URBAN POLICY RESEARCH**  
Edward J. Bloustein School of Planning and Public Policy  
Rutgers, The State University of New Jersey  
33 Livingston Avenue  
New Brunswick, New Jersey 08901-1982

**NEW JERSEY DEPARTMENT OF COMMUNITY AFFAIRS**  
Office of Smart Growth  
101 South Broad Street  
P.O. Box 204  
Trenton, New Jersey

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# Assessing New Jersey's Future

## PREFACE

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Relaxing on benches in Donaldson Park, Highland Park.  
Jon Erickson

**T**he *Impact Assessment of the New Jersey Interim State Development and Redevelopment Plan* is the underlying document that sets the framework for State Plan finalization and adoption. According to the State Planning Act, the impact assessment must cover five basic areas of investigation, each of which has several subareas. The impact assessment must also provide projections for future time periods and for different geographic regions of the state. The impact assessment must inform the state's policymakers and citizens about the differences between historic conditions (labeled TREND) and State Plan goals and policies (labeled PLAN).

The Center for Urban Policy Research (CUPR), a unit of the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, was selected to undertake the overall evaluation. CUPR's models have projected the disparities between historic conditions and State Plan goals and policies across a variety of variables. A team of expert reviewers knowledgeable about the state's growth patterns has commented on the TREND and PLAN population and employment projections at the municipal level, including overall growth and differences between TREND and PLAN.

Using these growth differences, the next step is for the State Planning Commission to gather public opinion. The commission will base decisions about the State Plan on the results of the impact assessment and on comments received from the public.

Although the impact assessment is an important baseline document, it is the State Plan itself that will be the blueprint for New Jersey's future. The State Plan must conceptualize New Jersey in its totality while addressing the needs of the State's 566 municipalities. The State Plan must adopt strategies for growth that balance economic, environmental and quality-of-life interests across a diverse state that encompasses fragile ecosystems, urban industrial areas, and rural agricultural land. It must also establish development incentives that facilitate implementation of such strategies. In short, the State Plan must take New Jersey through the next several

decades: it must provide a guide to improving the state's economy, environmental conditions, developmental infrastructure, quality of life, and intergovernmental communication.

*This report is more than an impact statement. It is a picture of growth over the next twenty years with an extended lens focused on 2028.*

Building a successful future for New Jersey is the most important goal of the plan and the planning process. A healthy economy, protected environments, good transportation systems, attractive places to live, a reasonable cost of living and governments that respond to community needs are components of the ideal future the State Plan aims to achieve. Can New Jersey achieve these goals without the State Plan?

The impact assessment measures two alternative futures for New Jersey: one in which growth is managed according to strategies in the State Plan, and one in which growth occurs in the absence of the State Plan. This report presents both alternatives and suggests which of the two scenarios would most benefit the state.

This report is more than an impact statement. It is a picture of growth over the next twenty years with an extended lens focused on 2028.

The atmosphere of this third impact assessment is one defined by viewing the future from a position two-thirds of the way through the most severe recession since the Great Depression. It is referred to as the "Great Recession." This recession, which has had an almost identical effect on the nation as it has on New Jersey, has caused a significant loss of employment that will take

half of the projection period to recover from and will slow population, household, and housing-unit growth over the next two decades.

Major changes have occurred in New Jersey since the State Plan was first conceived and the first impact assessment was completed. Along with Florida, Maryland, and Oregon, over the past forty years, New Jersey has in many ways jointly led the nation in efforts to plan for the future. New Jersey effectively shapes planning in its 566 municipalities in virtually every area of regulation, from *Mt. Laurel's* command to the Global Warming Response Act's requirement to reduce the state's carbon footprint. As the latest iteration of the *Impact Assessment of the New Jersey State Plan* shows, New Jersey has been more successful in protecting its remaining landscapes, reigning in sprawl, producing affordable housing, and improving its economic competitiveness than states that do not engage in growth management. This is not local news; it has been confirmed in the Lincoln Institute of Land Policy's new evaluation of the effectiveness of growth-management regulations.<sup>19</sup>

Nevertheless, New Jersey also continues to struggle in many of these areas with implementation of its programs. It still has conflicts over preservation and creation of affordable housing, protecting its waterways and wetlands, revitalizing its inner cities, and encouraging economic competitiveness. It has just begun to seriously ponder energy conservation and carbon footprint. In these economic times, the question of the effectiveness of the State Plan has never been more relevant—whether and how the State Plan contributes to the future of New Jersey's economy is up to its lawmakers and its communities. This report will help them decide whether the State Plan should continue to be a part of its future.

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# Executive Summary

## INTRODUCTION

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**T**he third impact assessment of the New Jersey *State Development and Redevelopment Plan* is undertaken at a time when techniques and procedures for analyzing this complex document are more sophisticated than those available in 2000, and when the document itself more clearly defines policies for growth and implementation. However, the charge given to the third impact assessment is essentially the same as that given to the first two: to assess the economic, environmental, community life, and intergovernmental coordination implications of the State Plan over a 20-year period. (The assessment period for this analysis is 2008–2028.) The purpose of the assessment is to guide policymakers in determining whether the Plan’s policies will be beneficial to the state’s future.

The State Planning Act (P.L. 1989, c. 332, N.J.S.A. 52: 18A202.1g et seq.) requires the impact assessment to be undertaken as part of the process of preparing the *State Development and Redevelopment Plan*. The assessment must be completed before the State Plan is finalized and voted upon by the State Planning Commission.

The impact assessment measures two alternative futures for New Jersey: one in which growth is managed according to the strategies in the State Plan (PLAN) and one in which growth continues according to historical trends (TREND). The third impact assessment draws upon the experience and knowledge the Center for Urban

Policy Research (CUPR) at Rutgers University has acquired during ten additional years of

*The findings of the impact assessment presented in this report indicate that the State Development and Redevelopment Plan can create a positive development future for New Jersey.*

conducting similar analyses nationwide. The assessment also draws upon ten years of data collection and GIS analysis by the New Jersey Office of Smart Growth (OSG). The result is a fundamentally revised, more comprehensive assessment. The new presentation format includes illustrative material, including photographs, maps, and tables. Tabular materials present data on the impacts of the TREND and PLAN scenarios and highlight differences between the two alternative scenarios by portion of the state, type of municipality (urban, inner-suburban, outer-suburban, rural), planning area, and center versus non-center locations. Naturally forming—as opposed to designated—centers are used in this analysis. These naturally forming centers have higher density than surrounding areas and have been and will be locations of future residential and nonresidential growth. The assessment uses current information about the state to establish a baseline for 2008 and then projects the impacts of each scenario for 20

years into the future. Although various methods may be used in making such projections, the best procedures available for conducting this task have been employed in the analysis.

The findings of the impact assessment presented in this report indicate that the *State Development and Redevelopment Plan* can create a positive development future for New Jersey. Development under the State Plan (PLAN) will produce economic benefits similar to those produced under TREND conditions. However, PLAN will direct more development into new and existing centers and less development into rural and environmentally sensitive areas. This will subsequently attract investment and expand the tax base of communities with new and existing centers. The Plan therefore will conserve land, slow the increase in housing prices, and substantially reduce the need for expanded local public services in rural and environmentally sensitive areas. Quality of life in the state will also improve, and governance will be improved by more effective intergovernmental coordination resulting from engagement between local, county, regional and state governments as a result of the processes and procedures instituted by the Plan.

## **ECONOMIC ASSESSMENT**

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### **OVERALL CONDITIONS**

Although some policymakers have been concerned that the State Plan will cause people to be driven from the state for economic reasons, this has not been the result in the past, and is not likely to result in the future. At the state and half-state levels, growth will be essentially the same. In fact, continuing to build infrastructure to support growth in centers actually has the potential to grow the economy of New Jersey even further.

Both PLAN AND TREND growth alternatives will accommodate 745,777 new people, 266,000 new households, and 262,000 new jobs (not including agricultural jobs or self-employment) over the 20-year period 2008–2028. Growth in New Jersey during the second and third decades of the millennium will be somewhat slower than it was during the 1990s and 2000s. The state's current growth rate is the result of a relatively diminished economy, lower immigration increases, and considerably more outmigration. These forces will diminish somewhat but will still be felt for most of the projection period. New Jersey will grow about 0.43 percent annually in population, 0.43 percent annually in households, and 0.33 percent annually in employment. Population and households will continue to grow faster in the southern region compared with the northern part of the state. Employment growth will also be more in the southern portion of the state; the northern portion will trail the southern portion in employment-growth numbers, but not as much as the difference in population and households. The state will be less industrial and more service-oriented than it is today; property values and income will rise at a much slower rate than in the 1990s and 2000s. All of these base conditions will occur with or without the State Plan.

## **POPULATION**

**[Box here with past and projected State numbers]**

New Jersey's 2008 population is five times larger than it was in 1900. At close to 1,160 people per square mile, New Jersey is the most densely populated state in the United States—a title that it has held since 1970. New Jersey's annual growth rate is one-half the national growth rate yet somewhat more than the growth rates of its neighboring states. New Jersey's population reached 8,682,661 in 2008, having increased from 8,414,347 in 2000. It will grow by 745,777 during the period 2008–2028.

The full population increase projected for New Jersey can be accommodated in the state under both TREND and PLAN development. This also holds true for the state's two halves.<sup>20</sup> However, the growth taking place below the regional level will be different under the two scenarios.

Generally speaking, under PLAN development, much more growth will occur in urban communities (20 percent), in communities with more densely developed planning areas (25 percent), and in communities with urban, regional, and/or town/village centers (30 percent).<sup>21</sup>

## EMPLOYMENT

**[Box here with past and projected State numbers]**

Total employment—the number of jobs located in a geographic area—is a key indicator of the scale of an area's economic base. As of 2008, New Jersey's total employment was approximately 4.0 million—not including agricultural and self-employment—a decrease of 23,400 jobs since 2000. New Jersey will lose 170,000 jobs from 2008 to 2010. It will recover some jobs (+36,000) from 2011 to 2013. From 2011 through 2019, New Jersey will recover the other 134,000 jobs lost from 2008 to 2010. It will produce an additional 262,000 jobs by 2028. The gross increase of jobs from 2011 to 2028 is 396,000 jobs. The net increase from 2008 is 262,000 jobs.

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<sup>20</sup>The three regions are defined by New Jersey counties as follows: northern New Jersey encompasses eight counties—Bergen, Essex, Hudson, Morris, Passaic, Sussex, Union, and Warren; central New Jersey encompasses six counties—Hunterdon, Mercer, Middlesex, Monmouth, Ocean, and Somerset; southern New Jersey encompasses seven counties—Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Salem (see map on page \_\_\_\_).

<sup>21</sup> Urban, suburban, and rural communities are defined by Rutgers University, Center for Government Services municipal classifications.

Overall, TREND and PLAN growth futures will create approximately the same number of net jobs (262,000). The primary difference between TREND and PLAN futures will be the location of new jobs in the state. Under PLAN versus TREND, about 35 percent more new jobs will be found in urban communities. Approximately 40 percent more new jobs will locate in communities with urban, regional, or town centers, rather than in communities without large centers. Since many of the new jobs will be in areas of excess labor, the jobless rate in urban and rural centers will be reduced over time.

PLAN's goal is to concentrate development in centers; a portion of this development is nonresidential growth. PLAN will be able to steer employment growth to the more densely developed planning areas of communities.<sup>22</sup>

## HOUSEHOLD GROWTH AND INCOME

**[Box here with past and projected State numbers]**

Households are the unit of measure of housing occupancy and the basic source of income supporting local expenditures. There are currently 3,157,454 million households in New Jersey, a figure that will grow by 266,000 over the period 2008–2028. The projected growth in number of households for the state and its three major regions is the same under the TREND and PLAN scenarios. Households will grow at a rate (0.43 percent annually) that is about the same as the population growth rate (0.43 percent annually). More than 70 percent of the growth in number of

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<sup>22</sup>More densely developed planning areas encompass State Plan planning areas 1, 2, and 3; less densely developed planning areas encompass State Plan planning areas 4 and 5. Communities with urban, regional, and/or town centers are communities with naturally forming/formed large centers; communities with village, hamlet, or no centers are referred to as “communities without large centers.”

households will take place in the southern region of the state (136,000).

Under PLAN, there will be noticeable differences in the locational growth of households below the regional level. Compared with TREND projections, PLAN policies will produce 1.2 times the household growth in urban communities and significant differences in communities with more densely developed planning areas (1.25 times more), and in communities characterized by the presence of urban, regional, and/or town centers (1.3 times more).

There will be similar growth in household income under TREND and PLAN at the state and half-state levels. This will not be true below the regional level. PLAN's policies will produce significant income growth in urban communities, in communities with more densely developed planning areas, and in communities with urban, regional, and/or town centers. A \$50 million gain in household income in urban communities under TREND will be accentuated under PLAN, and six times that amount will occur in urban household income gains over the 20-year projection period.

## EQUALIZED VALUATION

**[Box here with past and projected residential/nonresidential numbers]**

Property value relates to the economic health of political jurisdictions. New Jersey, as of 2009, has \$1.0 trillion in equalized real property value. Of that \$1.0 trillion total, residential parcels had a market value of \$780 billion (78 percent), nonresidential parcels were worth \$190 billion (19 percent), and vacant land and farm parcels were worth \$30 billion (3 percent).<sup>23</sup>

<sup>23</sup><http://news.rutgers.edu/focus/issue.2007-02-20.0978858197/-article.2007-02-21.4984375873>

Over a 20-year projection period, TREND and PLAN futures will have equivalent real property tax base growth of approximately \$120 billion. About one-third of this growth (\$40 billion) will take place in the northern region of the state (\$59 billion); the remainder (\$80 billion) will be found in the southern region of the state. TREND real property growth will be very uneven, however. Outer-suburban and rural communities will expand their property tax bases by 60 percent and 10 percent, respectively, under this scenario, and urban communities will expand their tax bases by only twenty (20) percent.

Under the PLAN scenario, there will be a purposeful relocation of development and an accompanying real property value shift to urban communities, communities with more densely developed planning areas, and communities with urban, regional, and/or town centers. Under PLAN development, urban communities will expand their property tax base by twice the rate observed for TREND development.

## FISCAL IMPACTS

Fiscal impacts determine whether growth pays for itself. The fiscal impact assessment compares the public-service costs versus revenues raised from accommodating new residents and workers under the two alternative growth scenarios. As New Jersey grows into the future, most development will continue to be residential in nature. This will contribute to annual fiscal deficits under any growth scenario. Under TREND development, by 2028, local governments will experience a fiscal deficit of \$3030 million annually; under PLAN development, the fiscal deficit will be \$200 million annually. By containing population and jobs around already developed suburban communities and by redirecting a share of growth to closer-in or more distant communities with urban, regional, and/or town centers, the State Plan, by 2028, will provide an annual \$100 million (current dollars)

fiscal advantage to local governments. This advantage reflects the ability under PLAN to draw on usable excess operating capacity in already developed communities and to benefit from their existing tax structure. Local costs under PLAN development will be somewhat higher than under TREND, but revenues will be higher still, leading to less negative fiscal impacts under PLAN development. While both growth scenarios will cause the state fiscal deficits, PLAN development will reduce these deficits by \$100 million annually.

## **ENVIRONMENTAL ASSESSMENT**

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### **AIR QUALITY ASSESSMENT**

Given tighter emission controls in the future than those imposed in the past, general air pollution levels attributable to traffic will be lower in 2028 than they are in 2008 regardless of which development scenario is opted for. Nitrogen oxides and non-methane hydrocarbons will be 50,000 and 75,000 metric tons lower, respectively, and carbon monoxide 700,000 metric tons lower by 2028 under these controls, representing reductions of between 40 percent and 50 percent from 2008 levels.

Air pollution emissions are related most closely to the addition of lane-miles of state highways under either development scenario. The future expansion of state roads does not vary significantly from one alternative to the other, however. New development under both TREND and PLAN will reduce the aforementioned improvements in air quality by about 5 percent because there will be the same population and job increases under both scenarios. Thus, TREND and PLAN are generally equal in their impacts and have only very minor effects on

the significant improvements anticipated over the next several decades in overall air quality levels.

### **WATER QUALITY ASSESSMENT**

Water pollutants in stormwater runoff from new development will be decreased by 5,000 tons under PLAN compared with TREND. Traditional development produces 15,000 tons of pollutants during the period 2008–2028. PLAN development produces 10,000 tons. The main water pollutants are total nitrogen, total phosphorous, biochemical oxygen demand, lead, and zinc.

PLAN offers modest improvements to contributions of heavy metals (zinc and lead) compared with TREND. Due to the concentration of development in all types of centers and more redevelopment of urban and regional centers, heavy metals may be contributed under PLAN at concentrations comparable to those of TREND.

By the same token, concentration of development under PLAN served by existing and planned public sanitary sewer systems should reduce pollution of ground and surface waters by reducing the number of septic systems.

### **CARBON FOOTPRINT ASSESSMENT**

The State Plan will have a positive impact on the environment of the state of New Jersey in many significant ways. The plan now considers the impact of land-use policies on climate change, as per the 2007 N.J. Global Warming Response Act (GWRA). The State Plan will reduce the climate change emissions of the state by 7 percent. This reduces the state's carbon footprint.

The three largest components of carbon emissions—transportation, buildings, and industry—are both affected and reduced by the presence of the State Plan.

## **DEVELOPABLE LAND**

Land consumption also remains a significant statewide issue. As in 2000, the present (2009) analysis concludes that sufficient undeveloped and unrestrained land remains available for all projected development, despite the continued growing influence of regulatory programs on land-use regulation, such as the Highlands Act. As in 2000, the State Plan will reduce land consumption by a significant measure.

As of 2008, New Jersey has accommodated 8.68 million people, 3.16 million households, and 4.0 million jobs on approximately 1.35 million acres. Of the state's 4.8 million acres, 1.9 million remain undeveloped and unprotected, two-thirds of which are forests and one-third of which are agricultural lands. A 20-year development future under the TREND scenario will convert 177,500 of the remaining 0.8 million acres to provide land for 266,000 households and 262,000 jobs. Development under the PLAN scenario will convert approximately 107,500 acres to accommodate a similar number of households and jobs, a saving of 70,000 acres. Overall, new development under TREND conditions will require over 65 percent more land than is required under the PLAN scenario.

Almost all of the saved developable acreage will be located in outer-suburban and rural communities, in communities with less densely developed planning areas, and in communities without urban, regional, and/or town/village centers.

## **AGRICULTURAL LAND**

New Jersey continues to experience significant conversion of agricultural land. As in 2000, the 2009 analysis shows that PLAN development will slow the agricultural land loss in the state. Of the total land converted for development under TREND conditions, approximately 45,000 acres will be agricultural land. Under PLAN conditions, approximately 30,000 acres of agricultural land will be converted. In the aggregate, approximately 15,000 acres of agricultural land will be saved under the compact development measures of the State Plan. Under the PLAN scenario, 33 percent of agricultural land committed to development under the TREND scenario will be saved in both outer-suburban and rural communities, communities with more and less densely developed planning areas, and in communities with and without urban, regional, and/or town/village centers. In absolute number of acres, more agricultural land will be saved in outer-suburban communities, in communities with less densely developed planning areas, and in communities without large centers.

## **ENVIRONMENTALLY FRAGILE LAND**

New Jersey also loses environmentally fragile land to development. Approximately 30,500 acres of the land converted for development under TREND will be environmentally fragile land. The land converted, which include forests, steep slopes, and critically sensitive watersheds, could be permanently damaged. PLAN development will convert one-half of this amount, or approximately 15,000 acres. Thus, all future development objectives will be met under the State Plan while saving about 15,500 acres of environmentally fragile land.

# INFRASTRUCTURE ASSESSMENT

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## ROADS

There are approximately 45,100 centerline miles of public and private local roadways in the state. TREND development to the year 2028 will require an additional 1,200 centerline miles of local roadway. PLAN development will require the addition of only 700 centerline miles of local roadway. Three-quarters of the amount saved (500), or approximately 375 centerline road-miles, will be in communities with less densely developed planning areas. Plan-guided development will require 500 fewer centerline miles of local roadway. Under the PLAN scenario, a statewide saving of approximately \$8005 million in local road infrastructure costs will be achieved because development will be directed to existing neighborhoods (through redevelopment and infill) and to outer-area centers.

## TRANSIT

Approximately 10.4 percent of workers 16 and older in New Jersey use transit for trips to work (2008). There are currently 427,500 worktrip transit users in the state. Two-thirds of those users (286,500) are in the northern part of the state. The State Plan, with its systems of centers, encourages new growth in moderate- and high-density population areas. Over the period from 2008 to 2028, TREND development density will create a demand for 8,000 new worktrip transit users. PLAN development density will create a demand for 12,000 new worktrip transit users—1.5 times the demand for public transit that would be created under the TREND development scenario. The vast bulk of this increase in demand will occur in the southern half of the state, in urban and inner-suburban communities, in communities with more

densely developed planning areas, and in communities with urban, regional, and/or town/village centers.

## WATER AND SEWER

Both housing costs and public-service operating costs are affected by the costs of providing basic development infrastructure. The two alternative scenarios will produce different levels of demand for water and sewer infrastructure. Development under PLAN conditions will be close-in, contained, and somewhat denser compared with development under TREND conditions. For example, there will be more multifamily units under PLAN development. PLAN development will therefore reduce the cost of water and sewer infrastructure.

The savings in water and sewer demand under PLAN conditions will be 2.5 million and 1.25 million gallons per day, respectively, from 2008 to 2028. The difference in demand may not seem significant until the hardware (infrastructure) and cost implications are considered. In the case of water and sewer lateral costs, the use of existing infrastructure and the construction of more multifamily housing units under PLAN development will produce water and sewer lateral cost savings of \$150 million and \$75 million, respectively, between 2008 and 2028. PLAN development will also save \$0.5 billion in full sewer costs (including savings in treatment and distribution infrastructure). Taking into account both laterals and full sewer costs, \$0.65 billion will be saved under PLAN development.

# COMMUNITY LIFE ASSESSMENT

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## QUALITY OF LIFE

The community life assessment consists of two elements: (1) quality of life, and (2) housing supply, demand and costs.

Quality of life is determined by how people relate to their environment. A community's environment can be measured empirically. Quality of life is measured in communities by 26 regional and 18 local factors that make up an index created specifically for this project. The regional index depicts quality of life through county ratings of wealth, education attainment, housing costs, weather, taxes and government spending, and so on. The local index depicts quality of life through local ratings of economic well-being, housing value and ownership, property tax base and rates, public safety, school achievement, and community amenities. The above sets of factors create a combined quality-of-life rating (from one to five) for each community. All households and jobs in a community under the TREND scenario or the PLAN scenario will be affected by the quality of life at those locations.

A combined quality-of-life rating of 3.25 out of 5.0 is observed when the quality-of-life measures described above are applied under TREND development conditions. Applying the same measures under PLAN development conditions (taking into account the effects of population redistribution under PLAN) results in an overall quality-of-life rating of 3.20 out of 5.0. These ratings for the year 2028 represent increases over the quality-of-life rating of 3.00 for 2000. The ratings reveal that both development scenarios (TREND and PLAN) will improve the quality of life of the state's residents: the quality-of-life rating will increase by 83.33 percent under TREND and

by 6.66 percent under PLAN. The difference between the TREND and PLAN scenarios is the somewhat lower quality of life that will be experienced by the portion of new population moving to the closer-in suburban and urban communities and by some of those moving to existing centers in the relatively short term.

## HOUSING SUPPLY, DEMAND, AND COSTS

### [Box here with household and housing unit growth]

People cannot enjoy life unless they have an affordable place to live. There must be a way to provide shelter at reasonable cost to meet the demand of future household growth. The projected increase in household demand over the period 2008–2028 is 266,000 households.

In the case of TREND development, household demand will foster a housing-unit increase of 286,000. The additional units, to account for household growth, will be taken from vacant units. This will comprise an additional 240,000 single-family homes (one- to four-unit structures), and 46,000 multifamily units (structures of five or more units). In the case of PLAN, there will be 220,000 single-family homes and 66,000 multifamily units.

Housing affordability, due to the recession, will decrease somewhat over the period 2008–2028. Positive change in the general affordability of the housing stock (i.e., a relative decrease in price related to a small decrease in income) will characterize the future. PLAN's increase in housing affordability will be 15 percent more than under TREND development. The percentage of the state's households able to afford housing will increase from approximately 70 percent to 80 percent under TREND and from approximately 70 percent to 85 percent under PLAN. PLAN's better position reflects the population increment moving to urban, regional, and/or town centers where

housing prices will be lower, given the densities of urban communities and centers, and the housing mix that will be found there. Under PLAN conditions, housing built in developed areas and in centers will exceed housing built elsewhere; therefore, housing costs under the PLAN scenario will be somewhat lower than those under the TREND scenario.

## **INTERGOVERNMENTAL COORDINATION ASSESSMENT**

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Where there is more coordination, more actions are achieved with less effort. As a result of coordination, governments are better able to serve their constituencies. In a 2006 survey, county planning directors were asked to rate the frequency and quality of contact between themselves and other levels and units of government before and after the State Planning process was implemented. They were also asked to provide their views on municipality-to-municipality and municipality-to-state contacts. While it is true that their responses indicate only a momentary judgment and are subject to change over time, the county planning directors nonetheless provide insight into intergovernmental coordination effects under the State Planning process as it has evolved.

County planning directors reported improvements in the frequency of contact between all levels of government viewed and improvements in the quality of contact between counties and local governments. The most significant improvements in the frequency of contact have occurred in the southern part of the state; the most significant improvements in the quality of contact have occurred in the central part of the state.

## **CONCLUSIONS**

The study team conducted a total of 20 impact assessments in the five major impact areas and their subareas. The results of the assessment reveal that the State Plan will offer improvement to the State of New Jersey in almost all of the measured indices; it will be a neutral factor in the remainder. The State Plan will save as much as \$1.0 billion in capital costs for local road and water and sewer infrastructure over the next 20 years and as much as \$100 million per year in reduced fiscal deficits statewide for municipalities and school districts. New Jersey residents will also reap the benefits of somewhat more affordable housing with the State Plan. Given these results and those that reveal savings in land consumption and improvements in quality of life and intergovernmental coordination, the study team concludes that the State Plan will help to make New Jersey a better place in which to live and work. More specific conclusions are found below.

## **ECONOMIC ASSESSMENT**

The *State Development and Redevelopment Plan*, if carried forth to fruition, will sustain the economy of the state; maintain growth in all regions; redevelop urban communities, communities with more densely developed planning areas, and communities with urban, regional, and/or town centers to a greater extent than they would be under traditional development conditions; and strike an appropriate balance between economic and conservation measures. Under the State Plan, jobs will be created in all locations in the state, but especially in locations with the highest rates of unemployment. This is particularly necessary under current recessionary conditions. Further, the State Plan will help reduce the fiscal deficits of most local public-service providers (i.e., municipalities, school districts, and counties) and save operating costs because growth is directed to the more established and mature public-service providers.

## ENVIRONMENTAL ASSESSMENT

The *State Development and Redevelopment Plan* contains measures that will protect the environment and improve environmental quality. Air and water quality are improved, and the state's carbon footprint is reduced. Lands in a variety of categories are protected, and the quality of the state's natural environments will be improved or left basically unchanged. Air quality will improve under both scenarios through the enforcement of emission control regulations and through federal programs requiring/rewarding greater fuel efficiency. PLAN will also reduce slightly air pollutants due to its concentration of development in centers. Water quality will improve under both scenarios as federal and state regulations require cleaner air and water. PLAN will provide cleaner water by keeping development out of pristine areas. The carbon footprint of the State of New Jersey will be reduced by emphasizing tighter house seals and more-efficient appliances in public and private buildings throughout the state. Concentrating growth in centers also increases the live/work opportunities for commuters, reducing overall vehicle miles traveled.

Land savings are also important to the environmental future of the state. One category of land saved is agricultural land, which is typically considered to be prime developable land. The PLAN scenario will save more than 50 percent of the agricultural lands that otherwise would be lost. At the same time, it will allow development to occur on other lands. There are costs that accompany land preservation. Implementation of the State Plan will require the elected officials and citizens of New Jersey to address the equity concerns of farmland owners. If both of these conditions—preserving agricultural land and acknowledging the costs of farmland preservation—are addressed, there will be no negative impacts on the agricultural industry in New Jersey.

Much of the protection of natural resources attributable to the State Plan is the result of directing future development in and around locations of existing development or to new centers in outlying areas. These centers are targeted by the State Plan for growth; adjacent areas, or environs, are designated as limited-growth areas. The emphasis on center-oriented development (both existing and future) will contribute significantly to the land savings discussed above.

## QUALITY OF LIFE ASSESSMENT

Quality of life in New Jersey, to the extent that it TREND conditions because of somewhat less expensive housing and a greater variety of housing choice in urban communities, in communities with more densely developed planning areas, and in communities with urban, regional, and/or town centers. In general, quality of life will improve in New Jersey over time. Households that move to redeveloping areas will, in the short term, experience a lower quality of life than they would have experienced in the rural fringe areas. This is due to conditions currently found in the redeveloping neighborhoods (housing deterioration, higher crime rates, lower graduation rates in schools). However, those conditions will gradually improve over time.

## **CONCEPTS OF THE STATE PLAN**

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The State Plan is the result of a long negotiation process. County planning directors have credited State Plan procedures and processes with improving both the quantity and the quality of various types of governmental interaction. Planning directors report significant increases in the number of contacts between most governmental agencies and an improvement in the quality of contact between county and local agencies. The study team concludes that intergovernmental coordination is improved as a result of the State Plan endeavor.

## **SUMMARY**

No impact assessment can measure every variable, but overall, the assessment has carefully and consistently measured all relevant areas for which it has been charged, and the results are clear. The goals, policies, and strategies of the State Plan will produce noticeable improvements in the state's economy, environment, infrastructure, community life, and intergovernmental coordination.

# The State Approaching 2010

## INTRODUCTION

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Comprising approximately 7,790 square miles, New Jersey is the fourth smallest state in the country. However, according to population estimates for 2008, the state is the eighth most populous. New Jersey's current population in 2008 (8.68 million) is 4.6 times what it was in 1900 (1.88 million). The state contains approximately 3 percent of the nation's population, and, at just under 1,160 people per square mile, it is the nation's most densely populated state. New Jersey's population is expected to increase to 9.43 million by the year 2028—an increase of approximately 8.6 percent. With its 21 counties, 566 municipalities, and 613 school districts, New Jersey has the highest density of local governments in the United States.



The path across Palmer Square, Princeton.  
Jon Erickson

New Jersey is a state of abundant resources, and it offers a highly desirable quality of life. However, New Jersey, like most states, has suffered during the “Great Recession” which, according to the National Bureau of Economic Research, began in this state in December 2007, ending a 61-month period of expansion. In 2007, the average monthly unemployment rate in New Jersey was 4.2 percent. However, in 2008, New Jersey's unemployment rate rose substantially, and in June 2009 it had reached a 15-year high of 9.2 percent. Since the onset of the Great Recession, New Jersey has lost approximately 170,000 jobs. New Jersey also lost an additional 23,400 jobs from December 2000 to December 2007.

In 2008, residential housing permits totaled 19,000—the lowest number since 1992. In 2009, to June, they totaled 9,000. This continued a trend of decline, as 25,400 were issued in 2007, while 34,323 were issued in 2006. Nonresidential construction activity decreased by 60 percent in 2008 and 70 percent in 2009.

For New Jersey residents, personal income rose by 3.2 percent in 2008. The personal income increase was down from 5.9 percent in 2007 and 7.3 percent in 2006. The rate of inflation was 3.7 percent. Retail sales totaled \$146.9 billion for the year 2008 and are projected to decrease to \$144.5 billion in 2009.

New Jersey's gross state product (GSP) in 2008 was approximately \$390.4 billion, down from \$391.3 billion in 2007 and up from \$386.9 billion in 2006.



**NJ TRANSIT bus service, downtown Newark.**

Jon Erickson

New Jersey is a state of many contrasts. Its northeastern corner contains the Gold Coast, a continuously redeveloping urban area bordering the Hudson River. Urban forms of transportation (ferry, light-rail, bus) are prevalent in this corner of the state. Until 2008, it was an area of above-average household and employment growth, and relatively significant household incomes and buying power. Bergen County, the state's most populous county, is particularly distinguished by its household income when compared with the household income of the state, the New York metropolitan region, and the country as a whole. Hudson County contains Jersey City. One of the few major cities in New Jersey to increase in population for three straight decades (1980s, 1990s, and 2000s) is Jersey City. This area is accessed by the Palisades Parkway, the New Jersey Turnpike, U.S. Route 1, and NJ Route 21. To the west of the Gold Coast, in Essex, southern Passaic, and Union counties, is the heart of the New York City-influenced urban core of the state. Three of the state's largest cities are found here, as well as 54 inner-suburban towns, townships, and cities. These are areas of relatively slow growth in number of households and in jobs, yet there has been some

increase in population due primarily to immigration from abroad. This has slowed considerably since 2008. Access in these areas is provided by Interstates 80 and 280 and a host of older state and county roadways. The Gold Coast and other northeastern New Jersey counties are part of the state's "mature urban core."

Further west, but still in the northern part of the state, are two mostly developed suburban counties, Morris and Somerset, and three developing counties, Hunterdon, Sussex, and Warren. The first three of these counties form a portion of the suburban "wealth belt" of the state. This development pattern is also established in Hunterdon County, but it is only beginning, and is thus less pronounced, in Warren and Sussex counties. This area is linked by Interstates 287, 80, and 78.

Mercer, Middlesex, Monmouth, and Ocean counties, located in central New Jersey, are oriented to either the New Jersey Turnpike or the Garden State Parkway. Mercer and Middlesex counties are areas of significant employment growth and are also part of New Jersey's wealth belt. They are linked by the New Jersey Turnpike and a vastly improved Route 1. Monmouth and Ocean counties are areas of primary residential growth. These counties are the job and housing breadbasket of the state. With the additions of Burlington County, located west of Monmouth and south of Mercer, these areas historically account for significant numbers of residential and nonresidential building permits. More residential building permits were issued in Ocean County over the last decade than in any other county. Monmouth and Ocean counties are divided and linked by the Garden State Parkway. Almost all of the new "big suburbs" (Brick, Dover, Woodbridge, Edison, Hamilton, and Middletown Townships) are located in central New Jersey.

In the Philadelphia metropolitan area, Camden and Gloucester counties serve much the same role as that served by Essex and Passaic counties in the New York metropolitan area. All of these counties contain urban and suburban enclaves that have grown as a result of the influence of the two major cities. There is, however, one major characteristic that distinguishes the New York metropolitan area from the Philadelphia metropolitan area. Housing is relatively less expensive in New Jersey communities in the immediate New York metropolitan area, whereas this is not the case in the Philadelphia metropolitan area. Thus, the population commuting from New Jersey to Philadelphia is smaller than the population commuting from New Jersey to New York. Nonetheless, Gloucester County is an area of rapid residential development. Camden County and Gloucester County communities—as well as Burlington County communities—are enclaves for residents employed in Trenton and the Philadelphia metropolitan area. These areas are linked by Interstates 195 and 295.

Atlantic and Cape May counties are located in the southeastern section of the state. Even before casino gambling, Atlantic City was its own labor market, unrelated to either Atlantic or Cape May counties. With the advent of casino gambling in 1978, Atlantic County experienced a boom in its residential markets. Residential growth influenced by the casinos has also spread to Cape May County, especially the northern portion of the county. Atlantic County, once thought to be an extension of the retirement communities of southern Ocean County, has become a bedroom county for casino workers. Cape May County, once viewed as a source of non-school-oriented seasonal development, is experiencing significant year-round residential growth. Atlantic City is under siege nationally by expansions of Las Vegas and Native American casinos. It is under siege regionally from slot machines at New York and Pennsylvania race tracks and from the

growth of gambling casinos in Bethlehem and Chester, Pennsylvania.



Historical icon built 1882: Lucy the Elephant, Margate.  
Jon Erickson

Historically, Salem and Cumberland counties, located in the southernmost portion of the state, have been slow-growth areas. Until recently, Atlantic County absorbed most of the Atlantic City-generated growth, much as Gloucester County did for Philadelphia-generated growth. However, Salem and Cumberland counties are now experiencing, at their northeastern and northwestern edges, respectively, spillover growth from the southeastern and southwestern parts of the state.

## NEW JERSEY'S STATE PLANNING ACT AND PLAN

In 1985, in response to a loss of natural resources and increasing pressure to provide affordable housing, the Legislature of the State of New Jersey adopted the State Planning Act (N.J.S.A. 52:18A-196 et seq.). In the Act, the Legislature declared that the state of New Jersey needs sound and integrated “statewide planning” to conserve its natural resources, revitalize its urban centers, protect the quality of its

environment, and provide needed housing and adequate public services at a reasonable cost while promoting beneficial economic growth, development and renewal. Under the Act, the State Development and Redevelopment Plan was to be the culmination of a statewide process that involved the active participation of state agencies and local governments in the preparation of the State Plan by the State Planning Commission.

## THE STATE PLANNING ACT

The State Planning Act directs that ten important actions be taken including the following:

The State Planning Act points to the need for sound and integrated statewide planning and the coordination of statewide planning with local and regional planning organizations in order to conserve its natural resources, revitalize its urban centers, protect the quality of its environment, provide needed housing and adequate public services at a reasonable cost, while promoting beneficial economic growth, development and renewal (N.J.S.A. 53:18A-196);

The State Planning Act establishes a 17-member State Planning Commission to be representative of State government departments, county and municipal jurisdictions and members of the public (N.J.S.A. 52:18A-197);

The State Planning Act creates the Office of State Planning to assist the State Planning Commission in performing its duties and established the Executive Director of that Office as the Secretary to and Chief Executive of the State Planning Commission (N.J.S.A. 52:18A-201);

The State Planning Act identifies as one of the major responsibilities of the State Planning Commission the development of the *State Development and Redevelopment Plan* to serve as a tool for assessing suitable locations for infrastructure, housing, economic growth and conservation (N.J.S.A. 52:18A-196 (c));

The State Planning Act directs that the *State Development and Redevelopment Plan* should be a coordinated, integrated and comprehensive plan for the growth, development, renewal and conservation of the state and its regions and which shall identify areas for growth, agriculture, open space, conservation and other appropriate designations leading to the development of the State Plan Policy Map (N.J.S.A. 52:18A-199 (a));

The State Planning Act requires that the *State Development and Redevelopment Plan* represent a balance of development and conservation objectives best suited to meet the needs of the state by taking into account a wide scope of substantive concerns including land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and inter-governmental coordination (N.J.S.A.52:18A-200(f));

The State Planning Act authorizes and outlined a Cross-Acceptance process as a means of developing the *State Development and Redevelopment Plan* to be conducted as a process of review, revision and re-adoption of the *State Development and Redevelopment Plan* on a three-year cycle (N.J.S.A. 52:18A-202 and 52:18A-199);

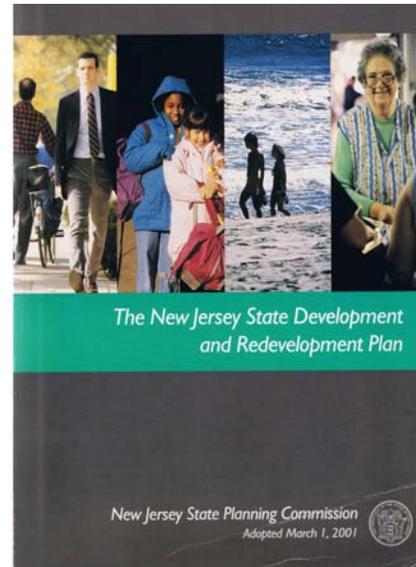
The State Planning Act elevates and enhanced the role of county planning by empowering county planning boards to negotiate the plan Cross-Acceptance process so that county planning boards are in effect encouraged to subject municipal plans and zoning ordinances to a new level of scrutiny (N.J.S.A. 52:18A-202 (b));

The State Planning Act invites the State Planning Commission to influence future development and redevelopment by directing it to review and make recommendations to the Governor and the State Legislature with respect to the “necessity, desirability and priority of state infrastructure investments” (N.J.S.A. 52:18A—199 (f));

The State Planning Act responds to the New Jersey Supreme Court's *Mt. Laurel* decisions announcing that it was in part a response to the judicial decisions requiring municipalities to provide opportunities for low- and moderate-income housing, while simultaneously expecting that a sound and comprehensive planning process would facilitate the provision of equal social and economic opportunity to benefit all of New Jersey's citizens so as to counteract a situation whereby concentrations of the poor and minorities were residing in older urban areas in ways that jeopardized the future well-being of this state, (N.J.S.A. 52:18A-196 (g) (h)).

## THE STATE PLAN

### Goals of the State Plan



Cover of 2001 *New Jersey State Development and Redevelopment Plan*.

New Jersey State Planning Commission

The following statements summarize the State Plan's overall planning goals:

1. Revitalize the state's cities and towns.
2. Conserve the state's natural resources and systems.
3. Promote beneficial economic growth, development, and renewal for all residents of New Jersey.
4. Protect the environment and prevent and clean up pollution.
5. Provide adequate public facilities and services at a reasonable cost.
6. Provide adequate housing at a reasonable cost.
7. Preserve and enhance areas with historic, cultural, scenic, and recreational value.

8. Ensure sound and integrated planning and implementation statewide.
9. Increase energy efficiencies and reduce greenhouse gas emissions.

On June 12, 1992, the 17-member State Planning Commission—which included both members of the public and state agency representatives—unanimously adopted the state’s *Development and Redevelopment Plan*. The major thrust of that and successor plans was to guide public and private development toward compact, mixed-use land forms that make the most efficient use of existing and planned infrastructure, as well as other systems, to meet present and future growth projections. A second State Plan was adopted in 2000.

## Policies of the State Plan

In March 2009, the New Jersey State Planning Commission and Office of Smart Growth released an interim version of the State Plan that promoted sustainable development, contained a new section on global warming, and proposed indicators to measure progress in reducing the state’s carbon footprint. In March 2009, a working draft of the Final Plan was released to the Impact Assessment team to analyze the effects of this Plan on the State of New Jersey. A revised Draft Final Plan will be formally released by the State Planning Commission prior to public hearings.

The March 2009 Draft Final Plan, as did its two predecessors, contains two major sections: Statewide Policies (SP)—Volume II, and the State Plan Policy Map (SPPM)—Volume III. An accompanying plan map serves as the geographic expression of the state’s policies. The third *New Jersey State Development and Redevelopment Plan* also contains an overview of the State Plan and the State Planning

Commission Findings (Volume I). This volume contains the Goals of the Plan.

The Statewide Policies section presents 20 comprehensive planning challenges and policies for achieving them. This section also identifies the parties responsible for implementing policies and achieving particular outcomes (state agencies, nonprofit or business groups, and local governments). The overall policies involve *equity* (1.0), *comprehensive planning* (2.0), *public investment priorities* (3.0), *infrastructure investments* (4.0), *economic development* (5.0), *housing* (6.0), *urban revitalization* (7.0), *transportation* (8.0), *historic, cultural, and scenic resources* (9.0), *air resources* (10.0), *water resources* (11.0), *open lands, natural systems, and recreation* (12.0), *energy resources* (13.0), *waste management, recycling, and brownfields* (14.0), *agriculture* (15.0), *coastal resources* (16.0), *planning regions established by statute* (17.0), *special resource planning areas* (18.0), *designing more sustainable built environments* (19.0), and *climate change* (20.0).

The State Plan Policy Map (SPPM) divides the state into five planning areas—metropolitan, suburban, fringe, rural, and environmentally sensitive—and five center types—urban, regional, town, village, and hamlet. These areas define various levels of development intensity and infrastructure service and help define priorities for investment.

The state’s 21 counties and 566 municipalities were asked over the period 2005–2008 to conduct an extensive review of their own land-use plans and the ordinances and regulations enacted to implement those plans. This cross-acceptance exercise included comprehensive negotiations on numerous policy issues and map changes between the State Planning Commission and local governments.

## Structure of the State Plan

The State Plan's Structure consists of six main components including the following:

- ***Vision Statement***—Provides a description of New Jersey's future in 2030 when the goals of the State Plan are expected to be achieved along with the likely major challenges facing the state during that period
- ***Goals***—Reiterates the goals contained in the State Planning Act
- ***Statewide Policies***—Provide more specific guidance for state, regional, county and municipal government officials on a wide range of public policy issues in 20 different public policy categories
- ***State Plan Policy Map***—Provides the geographic component, identifying and locating Planning Areas, Centers, and other geographical features that are important to the State Plan's guidance function
- ***Resource Planning and Management Structure***—Promotes the preferred forms for future growth and development in New Jersey, including the promotion of growth and development in already developed areas where infrastructure capacity already exists and designing and locating compact, mixed-use communities surrounded by protected natural landscapes on the metropolitan fringe and still rural and environmentally sensitive areas of New Jersey
- ***Monitoring and Evaluation***—Identifies key indicators and targets for achieving the State Plan's goals and summarizes the findings of the Infrastructure Needs Assessment and Impact Assessments



World War II Memorial, Trenton.

Jon Erickson

# CONCEPTS OF THE STATE PLAN

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## THE IMPACT ASSESSMENT OF THE STATE PLAN



Housing development in Edison.  
Jon Erickson

This impact assessment of the New Jersey *State Development and Redevelopment Plan* is the culmination of a year-long analysis to re-create the state's growth patterns and to evaluate how they may be altered as a result of the implementation of the State Plan. The analysis views the Plan's effects in four substantive areas, each with multiple subparts: economic assessment, environmental assessment, community life assessment, and intergovernmental coordination assessment. A unique aspect of this impact assessment is that multiple areas are viewed simultaneously, and the findings are used in the aggregate to evaluate the statewide and regional effects of two alternative growth scenarios.

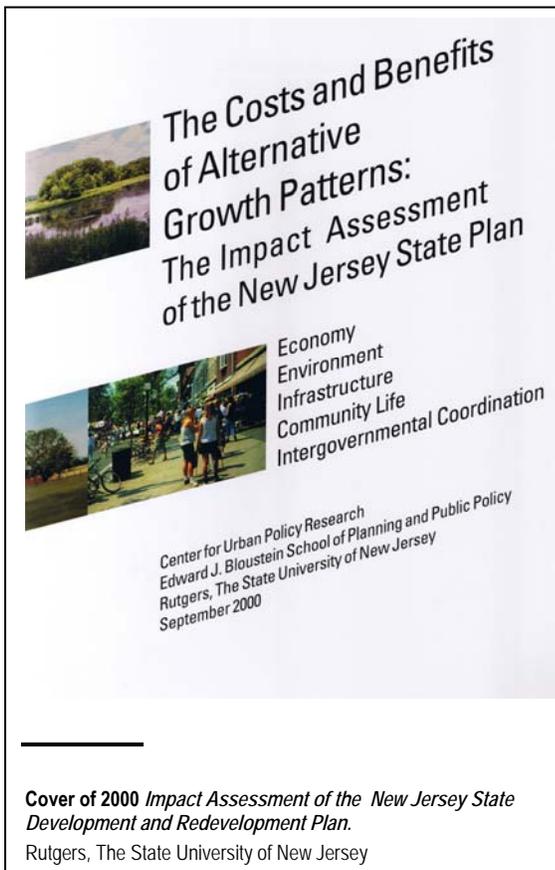
Another unique aspect of the evaluation is that it requires the summation of impacts in every New

Jersey community to determine statewide effects. The models, in most assessment areas, consider 566 community outcomes before they produce results for the statewide impact assessment. Further, there are multiple evaluations within most assessment categories. The evaluation is based on several fields in each of the four assessment categories.

The impact assessment applies a series of integrated models to formulate assessments in the various substantive areas. The databases and forecasting routines used in the models determine the results of the analysis. The Center for Urban Policy Research (CUPR) at Rutgers University interprets the results.

This is done by drawing upon information from two disparate growth scenarios. The two scenarios are described as "TREND" and "PLAN." TREND depicts a "business as usual" scenario and is determined from the best retrospective information to depict future conditions. The PLAN scenario is derived from a careful appraisal and interpretation of the State Plan to depict a future based on the plan.

Each evaluation depends on how TREND and PLAN unfold at the community level. Under the two alternative futures, household and job growth create the demand for land, requirements for infrastructure, needs for housing and public services, forthcoming fiscal constraints on communities, and the need for preparation for growth by various levels of government. This is why accurate projections are so important. Which future poses fewer negative impacts for communities experiencing growth and for communities experiencing decline? The task of the impact assessment is to determine the answer to that question and to report the findings.



Cover of 2000 *Impact Assessment of the New Jersey State Development and Redevelopment Plan*.  
Rutgers, The State University of New Jersey

Information is presented for each of the basic substantive impact areas according to the following template:

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**INTRODUCTION—CORE QUESTIONS**

**BACKGROUND**

- **Policy Statements from the Plan**

**IMPACT ASSESSMENT: METHODS**

- **Expected Differences between TREND and PLAN**
- **Critical Assumptions**
- **Scope and Depth of Analysis**

**IMPACT ASSESSMENT: FINDINGS**

- **TREND Findings**
- **PLAN Findings**
- **PLAN versus TREND Findings**
- **Comparison to Previous Impact Assessment Findings**
- **Conclusions and Implications of the Findings**

**PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

- **Monitoring Variable**
- 

Information is presented for each of three large commuting regions; by type, level of development, and center orientation of communities; and for the years 2008 and 2028.

# ECONOMIC ASSESSMENT

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**A**n analysis of economic factors has always been the primary focus of the State Plan Impact Assessment. In the initial draft of the State Planning Act, its impacts were considered to be primarily economic. As the Act sought legislative approval and interest group support, additional components of impact assessment seemed essential, given the encompassing nature of the State Plan and its likely broad-based effects.

From its conception, there has always been concern that the State Plan, despite being potentially beneficial to the environment and the quality of life of New Jersey's citizens, could negatively affect the state's economy. A multiplicity of goals—helping to preserve lands, revitalizing ailing cities, moving to a more diverse set of transportation options, using infrastructure more effectively, providing better and less expensive public services, and meeting citizens' needs for affordable housing and responsive government—could provide conflicting messages to the economy of a state second only to Connecticut in the wealth of its citizenry.

The assessment of impacts of the State Plan is undertaken to ensure that the Plan does not injure the state's economy. More efficient use of New Jersey's natural resources and more vibrant inner cities should not come at the expense of the main economic indicators of the state's prosperity. During the course of such an assessment, questions emerge as to what the appropriate indicators of economic well-being are, and what factors will determine whether or not the state is injured. Much of this is *not* specified in the original State Planning Act. The Act calls for



Photo of pharmaceutical company.  
Photo credit

general inquiries into population, jobs, income, and tax base growth. The initial impact assessment, however, established most of the ground rules for such an evaluation. The impact assessment considered losses in jobs, income, or tax base at the state level, or significant shifts in these indices at the regional level, as unhealthy for the state. Conversely, at the municipal and county levels, additional population, jobs, income, and tax base for declining municipalities and counties were a positive outcome. Growth in these economic indices in these locations directly supported revitalization goals for urban communities and indirectly supported conservation objectives and strategies for rural communities. Thus, the substantive composition and locational rules of the impact assessment were established.

Only the format of the assessment remained to be decided. Again, the format was structured in outline form by the State Planning Act, which called for specific periods of projection and

geographical levels for display of results. It could also be inferred from the Act that, after a brief introduction to the subject matter, a discussion of methods and data was required, as well as an analysis of TREND and PLAN findings, their differences, and the implications of the findings for the future of New Jersey. In addition, the Office of State Planning in the 2000 Impact Assessment asked the study team to provide specific recommendations on monitoring variables to be used for the future, and the study team has provided a comparison with the prior Impact Assessment as a component of the current assessment.

The results of the economic impact assessment—specifically the findings of TREND and PLAN futures as they relate to differences in population, employment, income, tax base, and the costs of providing local services—are found in the following pages.

The first of five major areas of assessment as it relates to the State Plan concerns economic impact. Of the eight goals of the State Plan, Goal 3 relates directly to the economy:

### **GOAL 3**

**Promote beneficial economic growth, development, and renewal for all residents of New Jersey**

The 1992, 2000 and 2009 economic assessments all deal with population, employment, household income, equalized valuation and fiscal impact. This evaluation of the 2009 State Plan examines the projected changes for the period from 2008–2028 due to growth under TREND versus PLAN conditions. Information on development differences is presented by region and by both density and type of communities.

## **POPULATION**

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### **INTRODUCTION— CORE QUESTIONS**



Relaxing in Van Vorst Park, Jersey City.  
Matt Crosby

This section of the impact assessment deals with growth in population under historic (TREND) conditions versus population growth that would occur with the New Jersey State Plan (PLAN). Population growth differences between the two development scenarios are examined at the state, regional, community, planning area, and centers levels. The most basic questions to be answered are:

- Will the Plan affect in-state population growth numbers?*
- Will population at the state or regional levels be altered relative to the basic differences in the growth objectives pursued by the PLAN regimen versus the TREND regimen?*
- Will PLAN achieve its goal of directing population differently below the regional level—i.e., to the more developed communities, planning areas, and concentrated development locations?*

## BACKGROUND



Residents walking along Kirkpatrick Street in New Brunswick.

Jon Erickson

In order to establish a context for the discussion of population trends in the state of New Jersey and its regions and counties for the period 2008–2028, some key characteristics of the state’s population growth pattern should be understood. New Jersey is a developed state with a population of 8.68 million in 2008. From 2000 to 2008, New Jersey’s population grew 3.2 percent. Since 2000, New Jersey has experienced population losses offsetting increases due to outmigration from the state to other locations nationwide. However, until recently, those losses were more than offset by both immigration and natural population increases (births minus deaths).

New Jersey is expected to experience population growth during the period from 2008 to 2028 of 40 percent less than it did in the previous two decades. It will grow by 745,777 to 9.43 million. This is due to several factors. First, New Jersey is near the epicenter of the Great Recession. Second, the state has relatively high taxes and wages. Third, the state has failed to actively retain its pharmaceutical industry. Fourth, the state is losing its competitiveness as a site for corporate leasing headquarters. Fifth, the state is no longer attracting immigrants.

New Jersey is currently growing at approximately one-half the national growth rate. Of the 50 states, 23 will experience greater growth than New Jersey in the period from 2008 to 2028. Population growth in the state of New Jersey, while still far behind that of California, Florida, Texas, Arizona, Nevada, and Georgia, is somewhat more than the 20 slower-growing states and higher than the population growth in the neighboring states of New York, Pennsylvania, and Connecticut. For the period 2008–2028, New Jersey’s population is projected to increase by 8.6 percent. This amounts to 0.43 percent annually.

New Jersey will grow in population, but its lack of economic competitiveness will cause both the outmigration rate to increase and immigration to decrease. New Jersey, after 2018 will recoup its job losses, and its population growth will be positive, but its rate of population growth will decrease over time.

## Policy Statements from the Plan

## IMPACT ASSESSMENT— METHODS

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**Farmer's Market in the downtown area, Highland Park.**  
Jon Erickson

Population and household projections reflect the Great Recession. The Great Recession has produced the largest loss of employment that most of all persons present today have experienced in their lifetime. From December 2007 to June of 2009 the United States lost 6.5 million private-sector employees from a base of 138.2 million, or 4.7 percent. It is estimated that nationwide it will take until 2018 to return to the employment level of 2000. New Jersey lost 170,000 private-sector jobs from January 2008 to June of 2009. This is from a base of 4.0 million in January 2008, or 4.0 percent. The state lost an additional 23,400 jobs from 2000 to 2008. New Jersey could take until 2020 to return to its 2000 job level.

According to the Harvard University Joint Center for Housing Studies,

Housing demand has withered under the weight of crushing job losses, house price deflation, and tighter credit standards. First-

time homebuyers are struggling to meet restricted underwriting guidelines, household growth is well below long-term trends, and immigration has slowed; as a result, the share of homes for sale and vacancies stand at near-record levels despite sharp decreases in housing production.

With regard to the latter, housing starts are projected nationwide at a level of 500,000 annually for 2009 and 600,000 for 2010. This is 20 to 30 percent of the 2005 level. Single-family sales nationwide are at 380,000 and 540,000 annually for 2009 and 2010, respectively—29.2 and 41.5 percent, respectively, of similar nationwide sales in 2005. Contrasted with employment, housing-unit trends are not 1-for-1 losses to the household inventory. *Households* are *occupied* housing units. Vacancy in housing units can increase; households can also double up. The above trends, wherein births are growing at a reduced rate, deaths are slightly decreasing due to improved health, immigration increase is slowing nationally yet impacting specific states much more so than others (New Jersey), and net outmigration from the Northeast is increasing (especially in New Jersey), all contribute to a slowing of population and household growth in the long run. Even though New Jersey has lost jobs in the past, since the Depression it has never lost population. This certainly will also be true in the future. Population and household growth will continue, but slowly, and New Jersey will grow at a reduced rate while attempting to recoup some of its job losses.

## PROJECTED POPULATION GROWTH

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### STATE OF NEW JERSEY, 2000–2028

<i>Year</i>	<i>Population</i>	<i>Change from Prior Period</i>
<b>2000</b>	8,414,350	
<b>2004</b>	8,620,770	206,420
<b>2008</b>	8,682,661	61,891
<b>2013</b>	8,804,367	121,706
<b>2018</b>	8,973,685	169,319
<b>2023</b>	9,185,948	212,263
<b>2028</b>	9,428,438	242,490
	<i>Total change:</i>	<b>745,777</b>

Population projections use all of the latest U.S. Census population estimates, including 2008 municipal numbers released July 1, 2009. This sets the change from 2000 to 2008 for all municipalities. The years 2000 and 2008 are used to establish the growth increment for this period by municipality. This increment forms the gross distribution of the projections from 2008 to 2028. The numbers at the local level are controlled at the state level by projections of births, deaths, immigration, and net migration (outmigration for New Jersey) and completed using regression analysis. Population is used to generate households, and households are fed into the land-fit analysis; afterward, if they don't fit, they are sent to a small reallocation pool and there re-tallied as households and readjusted to population after the correct population-to-household multipliers are reapplied depending on the location to which they are sent.

Each individual municipality is inspected for reasonableness in terms of the scale of the change from 2008 to 2028. Where projections cause severe changes that appear unwarranted, either excessively positive or excessively negative, they are dampened to bring them within a range of acceptability.

The unique aspect of this analysis, in addition to the aforementioned analysis by each and every community for reasonableness, is that the entire community's population is regenerated for the projection date and the population number at the projection date is the number that the original number at the beginning of the projection period is subtracted from. Thus, projections of changes in population to household ratios over time are allowed to affect the end date such that changes within the community are also affecting the resultant population/household increment. This is the most accurate way of completing local population and household projections and in fact, the preferred way to undertake such local projections.

## **EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

The purpose of the State Plan is to foster population growth in established areas of the state, particularly in central-city and inner-suburban locations. This is in concert with the State Plan's general goal of limiting growth in rural areas. It is anticipated that the TREND and PLAN scenarios will have essentially the same population and household growth at the state and half-state levels (north and south), but significantly different growth by type of community and State Plan planning area. It is also anticipated that under the PLAN regimen there will be more growth in communities with more densely developed planning areas and in communities with urban, regional, and/or town/village centers, and that there will be less

growth in these areas under the TREND regimen.

## **CRITICAL ASSUMPTIONS**

Population growth is projected through 2028 using the same formula for the TREND and PLAN scenarios. Population is converted to households using population-to-employment ratios that reflect a steadying of household size over the projection period for all age cohorts. Due to the population-diminishing effects of reduced immigration and increased outmigration, overall population growth will slow over the period.



## **SCOPE AND DEPTH OF ANALYSIS**

Population projections are undertaken for New Jersey's 566 municipalities under TREND conditions, using observed 2000–2008 trends to project a 2028 future. Population is converted to households and then to housing units and allowed to consume land in a community, or comparable (type and income) regionally located communities, until the land is almost exhausted. Projected employment is also simultaneously "fit" within communities. The "developable" land supply in each community is reduced to account for lands likely erroneously classified as developable. After both housing units and employment are assigned, a population change number is determined for the community.

## **IMPACT ASSESSMENT— FINDINGS**

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### **TREND FINDINGS**

TREND projections for New Jersey show the population growing from 8.68 million in 2008 to 9.43 million in 2028, an increase of \_\_\_\_\_. The majority of the population growth will take place in the central region of the state (\_\_\_\_\_) in suburban communities (\_\_\_\_\_), and in communities with urban, regional, and/or town centers (\_\_\_\_). A considerable amount of development will occur in communities with less densely developed planning areas (\_\_\_\_) and in communities without large centers (\_\_\_\_). There will be a loss of \_\_\_\_\_ in population in urban communities (see table \_\_\_\_).

### **PLAN FINDINGS**

### **PLAN VERSUS TREND FINDINGS**

### **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

### **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

## **PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

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### **MONITORING VARIABLES**

## EMPLOYMENT

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### INTRODUCTION— CORE QUESTIONS



KOS headquarters facility in Cranbury.  
Jon Erickson

This section of the impact assessment concerns employment projections under existing development (TREND) conditions versus State Plan-inspired (PLAN) conditions. It will be determined if the State Plan will cause jobs to be driven from the state. It will also determine whether the plan will be successful in directing jobs to locations that had been losing jobs. The most basic questions to be answered here are:

- **Will the plan affect state employment growth numbers?**
- **Will employment at the state or regional levels be altered relative to the basic differences in growth objectives pursued by PLAN versus TREND regimes?**
- **Will PLAN achieve its goal of directing employment differently below the regional level; i.e., to communities with more densely populated planning areas and to communities with urban, regional, and/or town centers?**

## BACKGROUND

In 2008, New Jersey is a state with 4,000,500 nonagricultural jobs, a number that, prior to 2000, had grown approximately 1 percent annually. Generally speaking, absolute job growth (numerical increase) has been most significant in the northern part of the state and least significant (except for Atlantic City) in the southern portion of the state. Relative job growth (percentage increase) is highest in the central part of the state.



View of Seton Hall Law School from the north end of the Hilton Hotel, Newark  
Jon Erickson

New Jersey's jobs are primarily in the services sector. Service-producing jobs—transportation, communication, and utilities; wholesale and retail trade; finance, insurance, real estate; and services—total 3.33 million, or 70 percent of all jobs. Goods-producing jobs—mining, construction, and manufacturing—make up 486,000, or 15 percent, of total jobs. There are now more government jobs in New Jersey (648,000) than goods-producing jobs.

## Policy Statements from the Plan

## IMPACT ASSESSMENT— METHODS

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**New Jersey Department of Environmental Protection, Trenton.**  
Jon Erickson

Employment projections are also based on the Great Recession impacting the State of New Jersey. This means that in January 2008 (4,000,500), the state had 23,400 fewer jobs than it did in 2000 (4,023,900). It also means that the state may lose at least an additional 170,000 jobs during 2008–09 and 2010. This may be conservative because the state has lost 160,000 jobs from January 2008 to June 2009 (18 months), and it has another 18 months to go on its prediction of a 170,000-jobs loss. The state is projected to gain 36,000 jobs from 2011 to 2013 (12,000 jobs each year for three years). This provides a net loss of 134,000 jobs from 2008 to 2013; an additional gain of 120,000 jobs from 2014 to 2018 (24,000 jobs each year for five

years); 105,000 jobs from 2018 to 2023 (21,000 containing another smaller recession); and 171,000 jobs from 2023 to 2028. This is shown below in tabular form:

**PROJECTED EMPLOYMENT GROWTH**

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**STATE OF NEW JERSEY, 2000–2028**

<i>Year</i>	<i>Employment</i>	<i>Change from Prior Period</i>
<b>2000</b>	4,023,000	
<b>2004</b>	4,021,400	-2,500
<b>2008</b>	4,000,500	-20,900
<b>2013</b>	3,866,500	-134,000
<b>2018</b>	3,986,500	120,000
<b>2023</b>	4,091,500	105,000
<b>2028</b>	4,262,500	171,000
	<i>Total change:</i>	<b>262,000</b>

Employment projections at the municipal level are extrapolated into 2008 to 2028 growth using municipal data from the 1990s and 2000s. Specifically, information was used for the years 1990 to 1999 and 2003 to 2007.

Employment projections were controlled at the State level by the aforementioned totals. Employment projections were individually viewed within a county to control for excessive positive or negative outcomes. If either of these conditions were found within a county, adjustments were made to dampen the extremes. In all cases, negative values had to be dampened more than positive values.

The employment projections were also controlled by county using NJDOL relative distributions of county employment projections to which were applied reduced state change control totals. Thus, the relative positions of the counties were maintained although the increment of

jobs each year for five years in a period change was lessened due to the ongoing recession.

The effect of National Stimulus efforts or other means of jump-starting employment growth is relatively small thus far because projects are just getting started. The projected Stimulus employment increase, much of which is in the construction industry, may slow a decline of primarily construction employment or even some nonconstruction employment which are already on a pace ahead of projected declines.

**EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

It is anticipated that there will not be significant differences between TREND and PLAN employment numbers at the state or regional levels. There should be significant differences between TREND and PLAN employment growth by type of community (urban, suburban, rural), State Plan planning area (metro, suburban, and fringe versus rural and environmentally sensitive) and State Plan centers (urban, regional, and town centers versus all other locations). If the State Plan is achieving its goals, there should be more employment development under the PLAN scenario in urban versus rural communities; in communities with more densely developed planning areas versus communities with less densely developed areas; and in urban, regional, and/or town centers versus communities without large centers.

**CRITICAL ASSUMPTIONS**

Employment projections for 2008 and 2028 are the same for the TREND and PLAN scenarios at the regional (north, central, south( and state levels. Under TREND conditions, employment projections at the municipal level are controlled

by relative employment distributions at the county level. Under PLAN conditions, municipal employment projections flow from population projections and experience the desired relationships between population and employment growth reflective of the Plan.

## SCOPE AND DEPTH OF ANALYSIS

Employment projections are made for each of the state's 566 municipalities under both TREND and PLAN conditions. Projections are completed by allowing households (including vacancy) and employment to consume available land in parallel. Under the TREND and PLAN scenarios, relationships between the existing number of households and the existing or desired number of jobs reserve land for future employment (under the TREND or PLAN regimens, respectively) relative to the projected amount of household growth in each scenario. Employment growth consumes land according to structure space per employee (including vacancy) and relationships of structure space to land space (including a platting coefficient).

## IMPACT ASSESSMENT— FINDINGS

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### TREND FINDINGS

At the state level, there is a gross change in non-agricultural employment of about 262,000 jobs, from 4.50 million in 2008 to 4.76 million in 2028. Under TREND conditions, southern New Jersey will gain the most jobs, more than \_\_\_\_\_. The northern region will gain \_\_\_\_\_ jobs. There will be 40 percent more growth in jobs in the southern region of \_\_\_\_\_ jobs, and a similar percentage of less growth in the northern region (table \_\_\_\_). In percentage terms, the South will gain \_\_\_\_\_ percent while North Jersey will lose about \_\_\_\_\_ percent, respectively.

Under historical or TREND growth, inner and outer suburban areas will grow just over \_\_\_\_\_ jobs, while urban New Jersey will gain \_\_\_\_\_ jobs. Inner-suburban communities will grow slowest in percentage terms, at about \_\_percent growth from the period 2008–2028. Outer suburban areas and rural areas will growth the most, at \_\_ percent and \_\_percent, respectively.

**PLAN FINDINGS**

**PLAN VERSUS TREND FINDINGS**

**COMPARISON TO THE PREVIOUS  
IMPACT ASSESSMENT FINDINGS**

**CONCLUSIONS AND  
IMPLICATIONS OF THE FINDINGS**

**PRINCIPLES FOR FUTURE  
MONITORING BY THE OFFICE  
OF SMART GROWTH**

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**MONITORING VARIABLES**

# HOUSEHOLD INCOME

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New market and affordable housing in Perth Amboy.  
Jon Erickson

## INTRODUCTION— CORE QUESTIONS

Households are the primary holders of income in New Jersey, and their individual wealth determines New Jersey’s economic position relative to other states. Households are the unit of measure of housing occupancy and the basic source of income supporting local consumer expenditures. Levels of household income also define and differentiate neighborhoods and communities. If overall household income can rise in a declining area, it can contribute to an area’s rebirth. Core questions in this impact assessment as they relate to household income are as follows:

- **Will PLAN affect aggregate household income growth in the state?**
- **Will aggregate household income at the state or regional level be diminished due to PLAN policies or goals as they**

relate to development location or land preservation?

- **Will PLAN achieve its goal of directing more household income into urban communities, communities with more densely developed planning areas, and communities with urban, regional, or town centers than would be possible under TREND conditions?**

## BACKGROUND



Main Street in Oldwick.  
Matt Crosby

Geographically, New Jersey’s household growth will take place unevenly in the future under the TREND scenario. The suburban portion of the state alone will experience about the same magnitude of growth as the entire growth of the southern portion of the state. Urban and inner-suburban communities will grow slowly, while outer-suburban and rural communities will grow significantly.

Aggregate household income in the state of New Jersey as of 2008 is approximately \$190 billion, with 60 percent of it concentrated in the northern part of the state. Another 40 percent of income is held by households in the southern part of the state.

As of 2007, New Jersey's median household income was \$64,470, higher than every state except Maryland. In the United States, the median household income was \$48,451.

## Policy Statements from the Plan



Walking area along Sinatra Drive, Hoboken.  
Matt Crosby

## IMPACT ASSESSMENT— METHODS

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Household projections are undertaken using population projections and historical population-to-household ratios. These ratios represent a number that is divided into population to produce households. These numbers are almost equivalent to average household size except that they include a projection of the non-household population in their totals. As such, population-to-household ratios are slightly smaller than average household size numbers.

Households are taken into the future using the above methods and fit to individual communities using vacant land estimates, existing densities, and a redevelopment factor. The amount of vacant land in a community has been reduced by lands inaccurately classified as developable through the GIS analysis. If there is no fit, a small pool of reallocation is redirected to communities of similar socioeconomic characteristics in the same portion of the State. This is more often a function of restricted Highlands or

Pinelands growth rather than the inability to contain normally projected household growth. In the southern portion of the state there were no households in the reallocation pool; in the northern portion of the state there were fewer than 1,000 households in the reallocation pool. This reallocation pool is much smaller than any other pool produced by land-fit analysis of future projections of households or housing units. Accordingly, the projections are more accurate as many fewer households had to be reallocated to other locations because they did not meet the land fit.

**PROJECTED HOUSEHOLD GROWTH**

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**STATE OF NEW JERSEY, 2000–2028**

<i>Year</i>	<i>Households</i>	<i>Change from Prior Period</i>
<b>2000</b>	3,064,645	
<b>2004</b>	3,134,825	70,180
<b>2008</b>	3,157,454	22,629
<b>2013</b>	3,201,588	44,134
<b>2018</b>	3,263,158	61,570
<b>2023</b>	3,340,345	77,187
<b>2028</b>	3,423,523	88,178
	<i>Total change:</i>	<b>266,000</b>

**EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

It is anticipated that, as was the case with population growth, household and household income growth under PLAN will be the same as TREND at the state and regional levels but significantly greater than TREND in urban communities and in communities that are more densely developed and have urban, regional, or town centers. Greater household and household income growth in these areas will result from PLAN’s attraction of households to these locations.

**CRITICAL ASSUMPTIONS**

Similar overall demographic and economic forces impact both TREND and PLAN growth. Differences in the location of households and the resultant household income of places are due primarily to the effects of the policies of PLAN. All projections of income are in current dollars.

**SCOPE AND DEPTH OF ANALYSIS**

Household projections are undertaken for the state’s 21 counties and 566 municipalities. Projections are made for a 20-year period using the most current estimates of the relationship between population and households over time. TREND projections reflect the best estimate of historical conditions extended into the future. PLAN projections react specifically to the goals and policies of the PLAN scenario. Information is presented for multiple time periods and multiple geographies for comparison purposes.

# IMPACT ASSESSMENT— FINDINGS

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		<i>2000 Household Income (billions)</i>	<i>2008 Household Income (billions)</i>	<i>2013 Household Income (billions)</i>	<i>2028 Household Income (billions)</i>	<i>Change in Income 2008 - 2018</i>
<b>Statewide Total</b>		179.06	190.43			
<b>Community Type</b>	Urban	24.98	25.24			
	Inner Suburban	89.98	93.20			
	Outer Suburban	53.54	60.05			
	Rural	10.56	11.94			
	Total	179.06	190.43			
<b>Region</b>	North	125.40	120.43			
	South	53.66	70.00			
	Total	179.06	190.43			
<b>Region</b>	North	65%	60%			
	South	35%	45%			

## HOUSEHOLDS

As of 2008, New Jersey has 3,157,454 households, which will grow by 266,000 households by the year 2028 to a total of 3,423,523 households. This represents a growth of 8.50 percent over the 20-year period. Of the 271,069 new households, approximately \_\_\_\_\_ will be located in the northern region, \_\_\_\_\_ in the central region, and \_\_\_\_\_ in the southern region.

Households in northern New Jersey will grow by 0.43 percent over the 20-year period. In the central part of the state, households will grow by \_\_\_ percent over the 20-year period, or \_\_\_ percent annually; in southern New Jersey households will grow by \_\_ percent over the 25-year period, or \_\_\_ percent annually.

Under TREND development, household growth in communities with more densely developed planning areas will amount to \_\_\_\_\_ households; in communities with less densely developed planning areas (rural and environmentally sensitive), growth will amount to \_\_\_\_\_ households (see table \_\_\_\_\_).

Under the TREND regimen, growth in communities with urban, regional, and/or town centers will amount to \_\_\_\_\_ households; growth in communities with urban, regional, and/or town centers will amount to \_\_\_\_\_ households (see table \_\_\_\_). Under TREND development, growth in communities with regional, urban, and/or town centers and growth in those communities without large centers will be almost identical.

Household income in the state of New Jersey in 2008 totals \$178.8 billion. Ignoring real income gain and considering household growth impact alone, aggregate household income in the state will grow by \$\_\_ billion, or\_\_ percent, by 2028. Under TREND conditions, of the \_\_\_\_\_ billion in income growth, approximately \$\_\_\_\_\_ billion will take place in the central region, \$\_\_\_\_\_ billion in the northern region, and \$\_\_\_\_\_ billion in the southern region (see table).

Under TREND conditions there will be a moderate loss of household income in urban communities of \$\_\_\_\_\_ million. On the other hand, there will be a gain of \_\_\_\_\_ billion in household income in outer-suburban communities (see table). If retail income is 30 percent of household income, and it takes an average of \$250 in expenditures to support one square foot of retail space, there would be a loss of \_\_ million square feet of retailing space in urban and inner-suburban communities over the 20-year period, and a combined gain of\_\_ million square feet of retail space in suburban and rural communities over the same period.

Under the TREND regimen, there will be a gain in household income in communities with more densely developed planning areas and in communities with urban, regional, and/or town/village centers of \$\_\_\_\_\_ billion and \$\_\_\_\_\_ billion, respectively (see table 7B). In communities with less densely developed planning areas and in communities without large centers, there will be a gain of household income

of \$\_\_\_\_\_ billion and \$\_\_\_\_\_ billion, respectively (see table \_\_\_\_\_).

## **HOUSEHOLD INCOME**

### **TREND FINDINGS**

### **PLAN FINDINGS**

### **PLAN VERSUS TREND FINDINGS**

### **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

### **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

**PRINCIPLES FOR FUTURE  
MONITORING BY THE OFFICE  
OF SMART GROWTH**

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**MONITORING VARIABLES**

# EQUALIZED VALUATION

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## INTRODUCTION— CORE QUESTIONS



The skyline of Atlantic City from the marina area.  
Jon Erickson

Real property value, both residential and non-residential, determines the tax base of a community. It is the primary basis for the support of operational public services at the local level. Residential property value represents the most significant portion of intergenerational wealth.<sup>14</sup> In many cases, most of a family's inheritance comes from resources accrued from the escalating value of residential property. Revenues drawn from nonresidential properties offset both municipal and school district costs, although for the most part these properties contribute only to municipal costs. Nonresidential real property value is thus a key ingredient in paying for local public-services costs. Both types of property have their own characteristic revenue-raising benefits.<sup>15</sup>

Given the individual benefits of property value discussed above, it is obvious that an expanding property tax base is good for communities. This

leads to the equalized valuation core questions regarding the impact of the State Plan:

- Will the State Plan affect the overall growth of real property in the state?
- Will real property value below the regional level be altered due to basic differences in PLAN versus TREND futures?
- Will PLAN achieve its goal of a more even distribution of real property tax base growth in urban versus suburban and rural communities?

## BACKGROUND



New residential development along Wigwam Brook in Jamesburg.  
Jon Erickson

As of 2008, the equalized real property value in New Jersey was just over \$1.35 trillion, or \$155,082 per capita.<sup>16</sup> Real property value increased by 145 percent from 2000 to 2008 (\$548 billion to \$1.35 trillion). Bergen County accounts for 13.6 percent of the total real property value, ahead of the individual counties of Monmouth (9.5 percent), Middlesex (8.2 percent), Ocean (8.1 percent), and Morris (7.6

percent). Currently, New Jersey’s “wealth belt” counties (Hunterdon, Mercer, Middlesex, Monmouth, Morris, and Somerset) comprise a 1.5 to 1.0 ratio with the “mature urban core” counties (Essex, Passaic, and Union), constituting over 52 percent of real property value.<sup>24</sup> With these two groupings, 42 percent of New Jersey’s counties contain 52 percent of the state’s real property value. Thirty years ago the “mature urban core” counties contained 22 percent of New Jersey’s real property value; today, their share amounts to only 17 percent. Approximately 75.0 percent—\$1.01 trillion—of the \$1.35 trillion equalized real property value is residential;<sup>25</sup> 29.2 percent (\$295.4 billion) is nonresidential; and 2.9 percent (\$29.2 billion) is vacant or farmland. In New Jersey, net taxable equalized real property value grew by \$737 billion during the period 2000 (\$609,519,990,931) to 2008 (\$1,346,526,223,853).<sup>26</sup>

The 2006 equalized real property value per capita varied from \$59,985 (Cumberland County) to \$210,435 (Morris County). In 2000 equalized real property value per capita varied from \$34,000 (Cumberland County) to \$103,000 (Morris County). Actually, in both years (2000 and 2008), Cape May County had the highest equalized real property value per capita (\$150,000 and 571,181, respectively), but these are highly inflated figures because they do not take into account seasonal owner-occupants in the per capita calculation.<sup>27</sup>

## Policy Statements from the Plan

## IMPACT ASSESSMENT— METHODS

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Older restoration of town houses near the square in Jersey City.  
Matt Crosby

Projections of equalized real property value are undertaken using unique values of single-family units (one to four units), apartment units (five units or more), commercial, industrial, and agricultural and vacant land for each community. Not included in the totals are government and other non-taxable properties. The number of single-family and multifamily units is derived from the U.S. Census count of single and multifamily units, together with the Division of Local Government Services estimates of real property value by type of property. This is necessary because the latter source has only parcel information and not unit information for individual properties. For multifamily properties, units cannot be determined from parcel information.

A 2008 base is established by projecting units (residential) and structures (nonresidential) to 2008. However, caution must be exercised when using this estimate. The ongoing recession has severely affected home prices, and the subprime mortgage market downturn has increased the number of foreclosures. The U.S. Department of Housing and Urban Development has estimated that in New Jersey over 69,000 houses are in foreclosure and 4.26 percent of all residential addresses are either vacant for over 90 days or are in foreclosure.<sup>28</sup> The Center for Responsible Lending estimates that by the end of 2009, in addition to the number of foreclosures, another 1.8 million homes in neighborhoods surrounding foreclosed homes will lose value. This drop will be approximately \$19.3 million dollars, or \$10,800 per affected home. This unregistered decrease is not included in the overall analysis.

Foreclosure rates vary significantly by county and municipality. The lowest rates are for Morris and Hunterdon counties (with less than a 2 percent foreclosure rate on all mortgages) to the highest rates in Essex and Cumberland counties (rates greater than 6 percent). Every urban county has a rate of greater than 5 percent. A number of New Jersey's mature urban cities (Newark, Camden, Paterson, East Orange, and Irvington) have foreclosure rates above 10 percent.<sup>29</sup> As indicated above, foreclosures have negative impact on the value of nearby homes. The Center for Responsible Lending estimates the average loss in proximate home value per unit in New Jersey is \$10,857; this is above any decrease in home value resulting from a weak housing market. The number of homes affected by foreclosures in New Jersey is estimated to be 1,781,424. The impact is particularly strong in Essex and Hudson counties, where almost 5,000 home foreclosures occurred in 2005 and 2006. In those two counties the decrease in house

values and tax base as a result of subprime mortgage foreclosures is over \$2.8 billion. Accordingly, overall equalized real property value for the State of New Jersey has increased while a number of cities have experienced a decrease in home values.<sup>30</sup>

## **EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

TREND and PLAN growth in equalized real property value can vary at the state, regional, and subregional levels. The determining factor is where the growth will take place under each scenario. Given the current distribution of growth under TREND conditions, and the higher level of real property value in developing rural communities, TREND would exhibit somewhat more growth in equalized property value during the period 2008–2028. This expected difference favoring TREND can be altered by the presence, in rural communities, of centers, which might lower values somewhat due to densities and housing types, and/or by the economic resurgences of certain urban communities. Overall, expected differences between the two development scenarios are small due to the number of countervailing forces acting simultaneously.

## **CRITICAL ASSUMPTIONS**

Net taxable equalized real property value projections by units of property type are compiled using information from U.S. Census estimates and the 2007 Division of Local Government Services' property tax information. It is assumed that the one- to four-unit dwellings in the U.S. Census are situated on the parcels listed as residential in the 2007 Division of Local

Government Services databases and make up the aggregate net taxable equalized real property value found in this publication. Using this procedure, the number of residential units per parcel arrived at is almost equivalent to one. It is further assumed that the total of units listed as multifamily (five or more units) in the 2008 U.S. Census estimates make up the value listed as apartments on the Division of Local Government Services Web site. The number of units in the census divided by the number of apartment parcels is the number of units per parcel of multifamily development.

For nonresidential uses, the aggregate equalized real property value and number of commercial and industrial parcels are linked to employment through multipliers of employees per 1,000 square feet.

## **IMPACT ASSESSMENT— FINDINGS**

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### **TREND FINDINGS**

### **PLAN FINDINGS**

### **PLAN VERSUS TREND FINDINGS**

### **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

### **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

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## PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH

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### MONITORING VARIABLES

## FISCAL IMPACTS

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### INTRODUCTION— CORE QUESTIONS



An emergency fire department vehicle, Hillsborough.  
Jon Erickson

Fiscal impact is the public-service costs versus revenues of future development. Fiscal impact *analysis* measures how a public-service jurisdiction will fare in the future in terms of the magnitude of revenues raised to pay for the level of costs incurred.

On the cost side of the ledger are operating, statutory, and capital costs. On the revenue side are property tax, nontax, and intergovernmental transfer revenues. These are estimated for the jurisdiction in which development is taking place. For non-educational costs—police, fire, public works, general government, recreation, and culture—the jurisdiction is the municipality, and for educational costs, including those involved with both instruction and administration, it is the school district. The county is also involved in the provision of non-municipal, non-school-district local public services. These include health, welfare, incarceration, courts,

parks, roads, and so on. When costs are subtracted from revenues, the net fiscal impact on the community's fisc is determined.

Taking into consideration an array of local circumstances, the increment of development is evaluated as producing either a positive or negative impact over time. Factors considered are the amount, type, size, and value of projected development; the existing value and composition of real estate in the community; and the locality's, school district's, and county's basic fiscal indices, such as tax rate, equalization ratio, tax base per capita, and levels of intergovernmental and nontax revenues per capita. The combined municipal, school district, and county impacts are estimated to determine whether a development is a net contributor to or a net drain on the revenues of a community.

Usually, residential types of development of conventional size and price (single-family homes, town houses, and garden apartments) are net fiscal drains; open spaces (agricultural, forest, and parklands) are fiscally cost neutral; and nonresidential types (office, industrial, and retail) are net contributors to the local fisc. This generality applies to a development's potential impact on the municipality, the school district, and the county.

The core questions for the fiscal impact component of the State Plan are:

- **Are TREND and PLAN costs of public services versus revenues generated the same at regional and state levels?**
- **Does PLAN relative to TREND result in fiscal savings or costs in particular types or locations of communities?**
- **Does PLAN relative to TREND contribute to or reduce disparities between communities in terms of services provided versus taxes levied?**

## BACKGROUND



A new single-family residential subdivision in Clinton.  
Jon Erickson

The 566 communities in 21 counties in New Jersey occupy all the land that exists in the state. New Jersey comprises 249 boroughs, 247 townships, 52 cities, 15 towns, and 3 villages. No New Jersey municipality straddles more than one county, and there is no unincorporated land in the state. All of the municipal entities provide an array of noneducational public services, including general government, police, fire fighting, public works, recreation and culture. Counties provide other public services (welfare, jails, health, etc.) not typically provided at the local level.

New Jersey has 616 school districts. Of these, 189 districts operate a full K–12 school system serving a single municipality. An additional 192 districts operate K–6 or K–8 elementary schools and participate in 49 regional junior high/high school districts. Another 107 districts operate only K–8 schools and send high school students elsewhere on a tuition basis. In 20 cases, there are combined regional elementary and high school districts. In another 26 cases, there are no school districts: they are non-operating, and all students go elsewhere for primary and secondary education on a tuition basis. Finally, in addition to the above, each of the 21 counties operates a vocational school district, and 8 of the 21 coun-

ties operate special-service school districts to which the other 13 counties may send students with special needs. Governor Jon Corzine recently signed legislation to give county school superintendents the authority to eliminate “non-operating” school districts.

To say that New Jersey is a cross weave of public-service jurisdictions is to just begin to understand the state. To accommodate 566 municipalities’ quest for governmental form, New Jersey passed (1) a Township Act in 1798, with revisions in 1899 and 1989; (2) a Borough Act in 1878, rescinding it in 1897; (3) a City Act in 1897, with minor revisions in 1899 and more significant ones in 1988; (4) a Town Act in 1888, with slight revisions in 1895 and more major ones in 1988; (5) a Village Act in 1891, repealing it in 1961. Further, in the late eighteenth century, New Jersey passed a Home Rule Act to codify the powers of local governments and to establish all of the above forms of local government on the same legal footing.

The above legal rulings were spurred by the first municipalities to be incorporated as cities in 1784 (the cities of Burlington, New Brunswick, and Perth Amboy); as townships in 1798 (Alexandria Township); as towns in 1845 (Belvidere Town); as boroughs in 1868 (Washington Borough); and as villages in 1892 (Ridgefield Park).

In New Jersey, public services are provided in municipalities that vary in size from more than 100 square miles (Hamilton Township, Atlantic County; Washington Township, Burlington County; and Jackson Township, Ocean County) to 0.1 square mile (East Newark Borough, Hudson County; Loch Arbour Village, Monmouth County; Shrewsbury Township, Monmouth County). Public services are delivered in municipalities that range in population density from about 42,000 persons per square mile (West New York Town, Hudson County; Union City,

## Policy Statements from the Plan

Hudson County; and Guttenberg Town, Hudson County) to fewer than 10 persons per square mile (Washington Township, Burlington County; and Walpack Township, Sussex County).

Public services are provided and consumed on a daily basis in all of these diverse locations. A wide array and scope of services for the most part meet the educational and noneducational needs of the population. They are delivered in large and small, developed and developing, and rich and poor locations with an amazing amount of competency and consistency, and they are funded through a bundle of revenues, the distribution of which varies often by the jurisdiction’s residents’ ability to pay. This is the context within which the state’s fiscal future—with and without the State Plan—will be evaluated.

## IMPACT ASSESSMENT— METHODS

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Senior transportation vehicle picking up passengers at senior residence in Highland Park.

Jon Erickson

An analysis of the fiscal impacts of public-service provision involves three basic steps: the calculation of (1) costs, (2) revenues, and (3) net fiscal impact. This is done for the primary local service providers (municipalities, school districts, and counties) using their information on basic fiscal indices.

### MUNICIPAL, SCHOOL DISTRICT, AND COUNTY COSTS

In order to calculate future per capita local costs, information on expenditures is taken from municipal and county budgets summarized in the New Jersey Department of Community Affairs, Division of Local Government Services, *Property Tax Information* (2008—the most current year available for non-valuation data). This information is available for all 566 municipalities and is reported as expenditures for municipal, school, and county functions plus

capital improvements, debt service, and deferred charges. The annual expenditure for municipal and county services is then divided between services rendered to local residences and businesses, using information on the distribution of land parcel value and numbers between residences (single-family and apartments) and businesses (commercial and industrial). The percentage value and parcel distribution for residential properties are averaged and applied to the expenditures for municipal and county services and divided by the existing population to derive noneducational expenses incurred by residents. This is the first component of future per capita local costs. As a subset of this procedure, the remaining portion of municipal and county costs is divided by the existing amount of “at-place” employment, and the results are expressed as the cost per employee.

An abbreviated procedure is used to determine the second component of future per capita local costs. An additional cost per capita is developed by dividing school expenditures (both local and regional) reported in the Division of Local Government Services by the existing resident population, as reported in the Rutgers University Center for Government Services *2008 New Jersey Legislative Data Book*, or other sources of current population estimates.

The third component of future per capita local costs is county costs paid by the municipality and also reported by the Division of Local Government Services. This value is also divided by the local resident population.

The next step is to translate the three components of future per capita local costs into future aggregate local costs, including school expenditures. The three residential components of per capita costs are summed and multiplied by the number of future residents expected from residential development. The remaining component, municipal and county costs per employee, is multiplied by the number of workers from

future nonresidential development. Future local public costs are the sum of per capita local public costs (municipal, school district, and county) multiplied by the new increment of residents and the sum of per-worker local public costs (municipal and county), multiplied by the new increment of workers. This calculation is performed for the full growth increment in each municipality under each development scenario.



Pumper parked at the fire department lot in Union.  
Jon Erickson

## MUNICIPAL, SCHOOL DISTRICT, AND COUNTY REVENUES

Revenues for the municipality, school district (both local and regional), and county are calculated as follows. The values of residential and nonresidential property are individually multiplied by the combined *municipal, school district, and county components* of the total equalized real property tax (as reported by the Division of Local Government Services) to determine local property tax revenues. Property tax revenues are then supplemented by other revenues as follows. Nontax local revenues are expressed per capita and projected into the future relative to the increment of population.

Intergovernmental transfers are expressed per existing \$1,000 of equalized real property value and also projected into the future relative to the increment of real property value. Total municipal, school district, and county revenues are the sum of property tax, nontax, and intergovernmental transfer revenues. The property tax share of all revenues is also obtained from information reported by the Division of Local Government Services.

## NET FISCAL IMPACT

Net fiscal impact is the subtraction of total local public costs from total local public revenues (municipality, school district, and county). It involves separate calculations for residential and nonresidential development, even though the overall fiscal impact is the result of the summation of the two individual impacts. The difference between total local revenues and total local costs for the municipality is the net fiscal impact of the increment of development on the municipality. This difference is summed for the 566 municipalities for each development scenario, and the differences in the summed values represent the differences in fiscal impact occasioned by the TREND and PLAN alternative futures.

## EXPECTED DIFFERENCES BETWEEN TREND AND PLAN

At the state and regional levels, there is no way to predict the relationship between expected development and future fiscal impacts. On one hand, the analysis controls for essentially equivalent population and employment growth at the state and regional levels. On the other hand, this growth in households and employment will be distributed very differently in terms of its location within regions of the state. This



Office space complex in Route 22 area of Bridgewater

Matt Crosby

will also affect resulting fiscal impacts. The State Plan encourages the growth of significant numbers of households and jobs in the more developed urban and suburban parts of the state. These communities usually have both higher public-service costs and public-service revenues per capita. Thus, one would expect higher public-service costs and higher tax-generated revenues under PLAN conditions. Since the TREND development scenario and the PLAN development scenario each contain significant amounts of residential development as a component of future growth, the likelihood is that both future growth scenarios will produce an overall negative fiscal impact. Although actual conditions will vary considerably, it is anticipated that moderate positive differences in net fiscal impact will be observed at the state and regional levels under PLAN conditions, but a variety of differences in fiscal impact will be observed below the regional level.

## CRITICAL ASSUMPTIONS

The most critical assumption in the analysis of the fiscal effects of land development is that

costs and revenues are initially balanced on both sides of the cost–revenue equation. In most budgets, at the outset, costs must equal revenues. This principle enters into the calculation of the local real property tax rate. The real property tax rate, when applied to the tax base, closes the gap between future anticipated expenditures and all other revenues.

Another critical assumption is the full charging of each new resident, worker, and schoolchild. All new residents, workers, and schoolchildren to a community are fully charged at their current rates under both the TREND scenario and the PLAN scenario. (They are charged at the site and under fiscal circumstances pertaining to that locale.) A final assumption is that all fiscal comparisons take place under financial indices reflective of current conditions. Thus, expenditures, tax rates, and most other fiscal variables enter the financial projections under today’s conditions. This assumption acknowledges that there are no changes in the forces that impact the local service sector, and inflation on both sides of the equation is equal.

## SCOPE AND DEPTH OF ANALYSIS

A fiscal impact analysis is undertaken for the growth that is impacting each of the 566 municipalities under both TREND and PLAN development scenarios. Fiscal impact analysis includes all municipal, school district, and county costs and revenues that local governments will occasion. This analysis further acknowledges all of the regional school district relationships of which the municipality is a part. The analysis also takes into account full operating, debt service, and capital costs on the cost side of the equation, and the array of tax, nontax, and intergovernmental transfer revenues on the revenue side of the equation.

# IMPACT ASSESSMENT— FINDINGS

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## TREND

### Fiscal Parameters— TREND Costs

For the 2008 analysis, statewide per capita costs, averaged and weighted for the communities in which development will take place under TREND conditions, are approximately \$\_\_ per capita annually for municipal services, \$\_\_ per capita annually for school district services, and \$\_\_ per capita annually for county services. This totals \$\_\_ per capita annually for local services. Per-employee costs are \$\_\_ annually for municipal and \$\_\_ for county services—a total of \$\_\_ per capita annually (see table).

### Fiscal Parameters— TREND Revenues

For the 2008 analysis, annual revenues per capita are \$\_\_ from the property tax, \$\_\_ from nontax sources, and \$\_\_ from intergovernmental transfers—a total of \$\_\_ per capita annually.

Per-employee revenues are \$\_\_ from the property tax and \$\_\_ from nontax sources—a total of \$\_\_ per employee annually (see table \_\_).

### Fiscal Parameters— TREND Equalized Tax Base/Rate

The equalized tax base per capita for residential properties, weighted for the communities in which TREND development will take place, is

\$\_\_; the equivalent nonresidential tax base per employee is \$\_\_. The average equalized tax rate for TREND development communities is \$\_\_ per \$\_\_ equalized real property value (see table \_\_).

### *Costs*

The aggregate local cost of providing public services for over 1 million new residents is approximately \$\_\_ billion. The aggregate cost includes all municipal, school district, and county services that would be required by the new residents and workers. The costs are current costs, i.e., the costs were calculated under the assumption that all development over the period would occur according to today's fiscal parameters.

Public service costs in the central region of the state total \$\_\_ billion; approximately \$\_\_ million in the south; and approximately \_\_ billion in the northern region.

Just about \_\_ percent of future public-service costs will take place in suburban communities (\$\_\_ billion); \_\_ percent will take place in rural communities (\$\_\_ billion); and \_\_ percent will occur in urban communities (\$\_\_ million). Approximately one-half of future public-service costs will take place in communities with more densely developed planning areas (\$\_\_ billion) and one-half in communities with less densely developed planning areas (\$\_\_ billion).

Slightly more than \_\_\_\_ of future public expenditures will take place in communities with urban, regional, and/or town/village centers (\$\_\_ billion); slightly less than half will take place in communities without large centers (\$\_\_ billion) (see table \_\_).

## *Revenues*

Revenues under TREND conditions for development during the period 2008–2028 will be \$\_\_\_ billion. By region, the distribution of revenues will be approximately the same as the distribution of costs— \_\_\_ billion); \$\_\_ million in the south, \_\_\_ billion in the north and \_\_\_ billion in the central region.

By type of community, \_\_ percent of the revenue gain will occur in suburban communities (\$\_\_\_); \$\_\_\_ million in rural areas; and a \_\_\_ million gain in urban areas.

Revenues in communities with more densely developed planning areas are approximately the same as revenues in communities with less densely developed planning areas (approximately \$\_\_\_ billion each); this is also true of communities with urban, regional, and/or town/village centers and communities without large centers (again, revenues are approximately \$\_\_\_ billion in each category of community).

## *Net Fiscal Impact*

Under the TREND scenario, development during the period 2008–2028 will cause an annual fiscal deficit of \$\_\_\_ million by the final year of the projection period. The deficit will occur in all regions; in all municipality types; in communities with more densely developed planning areas and in communities with less densely developed planning areas; and in communities with and without urban, regional, and/or town centers. The deficit will be proportionally larger in the central region and lower in the northern region; it will be higher in urban communities and lower in suburban communities.

The deficit in communities with more densely developed planning areas and in communities with less densely developed

planning areas will be about the same, but it will be considerably higher in communities with urban, regional, and/or town centers than it will be in communities without large centers).

## **PLAN**

### **Fiscal Parameters— PLAN Costs**

### **Fiscal Parameters— PLAN Revenues**

### **Fiscal Parameters— PLAN Equalized Tax Base/Rate**

### *Costs*

### *Revenues*

### *Net Fiscal Impact*

## **PLAN VERSUS TREND FINDINGS**

## **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

## **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

All of the classical findings of fiscal impact analysis are borne out in this study. Overall, residentially driven growth is costly, especially if it takes place in communities that do not have

sophisticated public-service systems. In these cases there are dramatic changes that must be undertaken to adjust to the service demands of increasing development. At population sizes between 5,000 and 15,000, communities must provide reasonably sophisticated police and fire-fighting services and have educational systems that deal with school district demand for a student body of 1,000 to 3,000. In addition, government administration must be experienced, recreation and cultural services must be complete, and public works departments must be full-time and have regularly appointed tasks. Governments in these locations must accommodate the public-service needs of both residential and nonresidential development using full-time staffs, which frequently have union representation. As such, the price tag for benefits is high and the cost of providing public services is expensive.

On the other hand, once a critical mass has been reached (above 25,000 in population) there are few service areas that must be either initiated in whole or significantly expanded. Government services can be provided by adding the increment of population to a staff that need not expand to a level that small public service staffs might have to. This is done within a context of revenues that maximize the yield from real property valuation, and in addition, draw on more than property tax revenues to meet the costs of local government. While costs may be higher in such locations, revenue yields from property tax and non-property tax sources are even higher. PLAN steers development into locations with established service providers. In those locations, the system is large enough to absorb demand without directly causing a comparable increase in costs. Further, in these locations, the revenue structure is more varied and can better support the costs of growth.

The costs of development are better borne by mature service providers. At the local level,

these are municipalities whose population size is greater than 25,000 and whose school district enrollment is more than 5,000. More than 200 of New Jersey's 566 communities have a population below 5,000. In almost all of these communities, the school district serves fewer than 1,000 pupils. Of this group, those communities that are growing find that the costs of responding to growth are high because existing levels of public services are low. To minimize future local public-service costs, one must transfer some of the growth of these communities into larger, more mature service-providing communities. The variable to be monitored to confirm that growth is not taking place out of proportion in the small jurisdictions of the rural service providers is the share of growth taking place in municipalities of population size less than 5,000 versus the share of growth taking place in municipalities of population size greater than 25,000.

## **PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

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### **MONITORING VARIABLES**

# ENVIRONMENTAL ASSESSMENT

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**T**he second major area of assessment as it relates to the State Plan concerns environmental impact. Of the eight reorganized goals under the new State Plan, two relate directly to the environment. Those goals are:

## GOAL 2

**Conserve the state's natural resources**

## GOAL 4

**Protect the environment, and prevent and clean up pollution**

The 1992 and 2000 environmental assessments primarily dealt with land consumption caused by development. In 2008, land consumption still figures significantly into the health of the environment in New Jersey. As in 1992 and 2000, the assessment determines how much developable, agricultural, and environmentally fragile land will be lost during the period from 2008–2028 due to growth under TREND versus PLAN conditions. As in the economic assessment, information on development differences is presented by region and both density and type of communities.

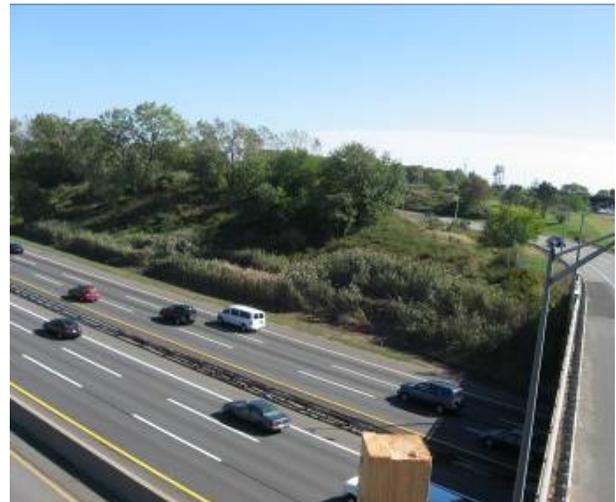
However, since 2000, a new urgency has altered the focus of environmental issues as air pollution, water pollution, and climate change

have moved to center stage both globally and in the state of New Jersey. Years of debate over the existence and extent of anthropogenic-induced global warming have coalesced into consensus and a call to action.

## AIR QUALITY

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### INTRODUCTION— CORE QUESTIONS



**New Jersey Turnpike entrance, Woodbridge**  
Jon Erickson

The quality of air is vital to health and well-being of all New Jersey residents. The improvement of air quality has been a long-standing goal of the State of New Jersey. The primary method of regulating air resources has been through establishing standards for motor vehicles, industrial and power-generation facilities and the development of cleaner burning fuels. Recent evidence has shown that compact

growth may significantly reduce air pollution as a result of a reduction in motor vehicle miles of travel and emissions.<sup>i</sup>

The core questions for air resources in the State Plan are:

- **What types of air pollution are potentially improved through land-use planning?**
- **Will the State Plan improve air quality over what would occur if there was no plan?**
- **Can areas that are now classified as non-attainment areas become attainment areas through state and local government regulation of development and redevelopment?**



Smokestack of large industrial facility, Union Township

Jon Erickson

## BACKGROUND

The U.S. Environmental Protection Agency (EPA) requires the development of a State Implementation Plan (SIP) to help the state meet the provisions of the Clean Air Act (CAA). The Clean Air Act requires National Ambient Air Quality Standards for six air pollutants. The six are particulate matter, ground-level ozone, carbon monoxide (CO), sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and lead.<sup>ii</sup>

Thirteen of New Jersey's 21 counties are designated non-attainment areas for particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>). These particles are referred to as "fine" particles and pose significant health risks. Among the health problems related to PM<sub>2.5</sub> are respiratory diseases, cardiovascular diseases and asthma. Roughly one in three people in the United States are at a higher risk of health problems related to PM<sub>2.5</sub>. Major sources of PM<sub>2.5</sub> are motor vehicle exhaust, power plants and wood burning and some industrial processes.<sup>iii</sup>

All 21 New Jersey counties are in non-attainment areas for the USEPA average eight-hour time frame standard of 0.08 ppm for ground-level ozone. Ozone is associated with a variety of health problems including asthma and lung tissue damage. Ozone is caused by a chemical reaction between nitrogen oxide and volatile organic compounds (VOC) in the presence of sunlight. Major causes of ozone pollution at the ground level are motor vehicle exhaust, industrial pollution, gas vapors and chemical solvents

Five counties (Camden, Bergen, Essex, Hudson and Union) and twelve municipalities outside those counties (Atlantic City, Burlington City, Clifton, Freehold Borough, Morristown, Passaic, Paterson, Penns Grove, Perth Amboy, Somerville, Toms River and Trenton) exceed the

USEPA standard for carbon monoxide (CO) of 9 ppm for an 8-hour nonoverlapping average. At low concentrations, CO causes fatigue in healthy people and chest pain in people with heart disease. At higher concentrations, CO causes impaired vision and coordination, headaches, dizziness, confusion, nausea, angina, impaired vision, and reduced brain function. At very high concentrations, CO exposure can be fatal. CO is caused by a variety of sources including unvented kerosene and gas space heaters; leaking chimneys and furnaces; back-drafting from furnaces, gas water heaters, wood stoves, and fireplaces; gas stoves; generators; and other gasoline-powered equipment including motor vehicle exhaust.<sup>iv</sup>

All or part of Harmony, Liberty, Mansfield, Oxford and White Townships in Warren County are the only areas in New Jersey that exceed USEPA standards for sulfur dioxide (SO<sub>2</sub>). SO<sub>2</sub> has health-related impacts related to asthma and respiratory diseases and aggravates heart disease. SO<sub>2</sub> is a primary cause of acid rain. SO<sub>2</sub> is primarily a by-product of large stationary sources such as coal and oil combustion, steel mills, refineries, pulp and paper mills, and from nonferrous smelters.<sup>v</sup>

The entire state of New Jersey has met USEPA attainment standards for last two air pollutants, nitrogen oxide and lead.<sup>vi</sup>

Compact growth can decrease air pollution through the reduction of VMT. One study found that, on average, air pollution from particulate matter, NO<sub>x</sub>, CO, CO<sub>2</sub> and VOC was reduced by 5 to 6 percent under more compact development compared with uncontrolled growth. Other factors such as changes in technology, median household income, and available transportation alternatives also determine the extent of air pollution reduction resulting from a compact growth, or PLAN, scenario.<sup>vii</sup>

The State Plan includes one policy directly related to air resources:

## **Policy Statements from the Plan**

### **10.0 Air Resources**

Protect and enhance air resource quality by improving intergovernmental coordination and integration to achieve National Ambient Air Quality Standards (NAAQS). Enhance coordination and integration between the State Plan and the NJDEP Air Resources State Implementation Plan (SIP) and regulations along with the relevant transportation plans prepared by New Jersey's three Metropolitan Planning Organizations (MPOs) and NJDOT by reducing imported fossil fuel dependence while promoting the use of cleaner, renewable fuels. Encourage multiple levels of government to plan and implement policies, programs and regulations that will result in land-use patterns that reduce Vehicle Miles Traveled (VMTs) and encourage the use of multi-modal transportation alternatives to automobiles in ways that are consistent with the vision and goals of the State Plan.

### **THE CHALLENGE:**

*To improve the coordination and integration of plans, policies and programs across State departments and agencies and on multiple government levels to encourage land-use patterns that will result in less Vehicle Miles Traveled (VMTs) and encourage multi-modal transportation alternatives to the automobile to improve air quality and reduce greenhouse gas emissions.*

## **IMPACT ASSESSMENT— METHODS**

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The 1992 evaluation also looked at both air and water pollution under TREND and PLAN conditions. These analyses were not specifically required by the State Planning Act. The 1992 evaluation found that transportation-based air pollution would decline appreciably over the projection period, mainly due to anticipated decreases in pollutants resulting from cleaner fuels, more efficient engines, more stringent emission inspections, and the fact that a larger portion of the fleet would be equipped with anti-pollution devices. These factors (i.e., reductions in non-methane hydrocarbons, carbon monoxide, and nitrous oxide) accounted for 99.85 percent of the 40 percent improvement in transportation-based air pollution over the 20-year projection period. PLAN versus TREND conditions accounted for only 0.15 percent of the projected improvement in transportation-based air pollution.

The conclusions of the 1992 and 2000 evaluations regarding air pollution hold true today, with significant improvements in pollution levels the result of improved emission controls, cleaner fuels, more fuel-efficient automobiles, and less-significant impacts on air pollution attributable to changes in the location rather than the amount of development. Due to the overwhelming relationship between air quality and the enforcement of emission controls, and the relatively insignificant relationship between air quality and land-use patterns, the 1992 findings were reaffirmed for the 2000 Impact Assessment.

The conceptual basis of the transportation-based Air Pollution Model is straightforward. The amount of traffic generated within a region is a function of the types and amounts of land use and the intensity of activities. This kind of traffic

can be labeled “internally generated” flows. However, a region is also subject to the amount of traffic passing through—“externally produced” flows. Middlesex County, for example, has a great deal of externally generated traffic with the New Jersey Turnpike, many state roads, and the Garden State Parkway. Both affect air-pollution levels and must be accounted for.

The CUPR Air Pollution Model has a traffic component and a pollution component. The traffic component generates five-year projections of traffic at the county level on the basis of the county's future population and lane-miles of state highway. Traffic is expressed in vehicle-miles traveled (VMT) in a year. This is the principal component of the Model.

The pollution component, which uses projections of traffic as inputs, computes the amounts of carbon monoxide, non-methane hydrocarbons, and nitrogen oxide that the projected traffic will pump into the air of the county. The amount of a pollutant transmitted to the air in a county in a particular year is projected by multiplying the emission factor for that pollutant by the VMT projection for the county in that particular year.

## **EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

In the TREND scenario, development will be most intense at the fringe of cities and in hitherto undeveloped rural areas. In addition, residential development is likely to occur in more scattered locations, possibly at a distance from nonresidential development. In contrast, PLAN encourages the redevelopment of urban and close-in suburban areas of the state. PLAN further targets development to existing Centers and new Centers, in both cases emphasizing some mixed-use development or,

more probably, the development of residential and nonresidential facilities in close proximity.

It is likely that clustered development and the greater correspondence between residence and workplace under PLAN will lead to the construction of fewer lane-miles of roads and fewer vehicle-miles traveled than is the case under TREND. Thus, there is a potential that PLAN will generate a slightly smaller statewide total amount of air pollutants than TREND.

## SCOPE AND DEPTH OF ANALYSIS

1. The distribution of population among the various regions will remain the same under TREND and PLAN. Under both development scenarios, the population of New Jersey will increase essentially the same from 8.68 million in 2000 to 9.43 million in 2028, representing a growth rate of 6.7 percent for the 1990-2010 period. In addition, the East Central region is projected to have the fastest growth rate (16.8 percent) while a population decline of 3.6 percent is projected for the Northwest region. Population changes in the 1990-2010 period are presented in table \_\_\_\_\_.

2. The number of vehicle-miles traveled (VMT) in a county can be predicted on the basis of an observed functional relationship between VMT and the population and lane-miles of state highway in the county. This functional relationship has been established by multiple regression using 2008 VMT,<sup>31</sup> 2008 population, and

<sup>31</sup> VMT was estimated by the New Jersey Department of Transportation on the basis of Average Daily Traffic (ADT). County ADT by road type is multiplied by the number of lane-miles of this road type in the county and by 365 (days) to arrive at the county VMT for the road type in question. The VMT data were supplied by Data Resources Section, New Jersey Department of Transportation. Information received from Louis C. Whiteley, Section Chief, Data Resources Section, and Mike Savage of the Section was of great assistance in completing this analysis.

2008 number of lane-miles, and has the following parameter estimates:

$$\text{VMT} = -676.43644 + .00597 \text{ POP} + 2.99958 \text{ LMILES}$$

### *Regression statistics*

R-square = .92542

F-ratio = 111.68552, significant at .0001

Standard error of the estimate = 493.64177

VMT is in units of one million miles.

3. Automobiles will be less polluting in the future, and the use of cleaner automobiles will increase over time. This state of affairs will come about as a result of increased use of cleaner fuels, more efficient (low-emitting) engines, more stringent emission inspection, and a larger proportion of the fleet equipped with and served by antipollution devices and cleaner fuel. Average amounts of non-methane hydrocarbons, carbon monoxide, and nitrogen oxide emitted per vehicle mile, therefore, will decline steadily over the projection period. The following table presents the critical values for automobile emissions that are used in the projection of transportation-based air pollution.

[table]

4. As a stringent test of PLAN, throughout the projection period there will be no significant changes relative to the base in the availability of public transit, the propensity to use public transit, and the level of usage of high-occupancy vehicles. The AVO implementation measures taken in response to the federal Clean Air Act are projected to reduce only marginally—by 2 percent—growth in the volume of traffic, which is expressed in terms of vehicle-miles traveled (VMTs). The changes in the volume of traffic in subsequent locations, therefore, will be not so much a result of changes in travel behavior, but

rather a direct consequence of changes in the types and amounts of land use and intensity of activities in these locations.

Projections of total lane-miles of state highway in the two halves of the state in the years 2008 and 2028 under TREND and under PLAN conditions are presented in table \_\_\_\_\_. Together with the population projections contained in table \_\_\_\_, they provide the basis for the projection of vehicle-miles traveled (VMTs) under the two development scenarios. Projections of VMTs are presented in table \_\_\_\_\_.

## **IMPACT ASSESSMENT— FINDINGS**

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### **TREND**

The major finding is that under both scenarios for future growth—TREND and PLAN—there will be more of a decrease in air pollution from the general population related to conditions that they are experiencing than there will be from an increase in air pollution attributable to the incremental population over that period. There will be a net decrease in air-pollution levels over the time period.

Under TREND, the amounts of air pollutants emitted by automobiles will decline between 2008 and 2013, and will decrease even more between 2013 and 2028.

Tables \_\_\_\_, \_\_\_\_, and \_\_\_\_\_ present the projections of transportation-based emissions of, respectively, non-methane hydrocarbons (NMHC), carbon monoxide (CO), and nitrogen oxides (NO<sub>x</sub>) in 2008 and 2028 under TREND conditions.

### **Statewide Findings**

Between 2008 and 2028, statewide reductions in transportation-based air pollution projected under TREND are 77,210 metric tons of NMHC, 702,745 metric tons of CO, and 51,736 metric tons of NO<sub>x</sub>. These amounts represent, respectively, 43.3 percent, 51.8 percent, and 38.3 percent of the quantities emitted in 2008.

Thus, under TREND, the largest reduction in emission, in both absolute and relative terms, is projected for carbon monoxide. The other reductions are nonetheless significant.

### **Findings by Region**

The northern half of the state will experience some of the largest reductions of transportation-based NMHC, CO, and NO<sub>x</sub>: 19,087 metric tons, 169,074 metric tons, and 13,068 metric tons, respectively, in the 2008-2028 period. In percentage terms, these amounts represent also the largest reductions over time: 47.8 percent, 55.6 percent, and 43.1 percent, respectively, of the amounts emitted in 2008.

In absolute terms, the southern part of the state will experience somewhat smaller reductions in transportation-based emission.

### **PLAN**

Under PLAN, the amounts of air pollutants emitted by automobiles will also decline between 2008 and 2013, and will decrease even more between 2013 and 2028. Tables \_\_\_\_, \_\_\_\_, and \_\_\_\_ contain the projections of transportation-based emissions of NMHC, CO and NO<sub>x</sub> in 2008 and 2028 under PLAN conditions.

## Statewide Findings

Between 1990 and 2010, statewide reductions in NMHC, CO, and NO<sub>x</sub> projected under PLAN are, respectively, 77,339 metric tons (or 43.4 percent), 703,581 metric tons (or 51.9 percent), and 51,843 metric tons (or 38.3 percent). In other words, under PLAN, the reductions are about the same as they are under TREND.

## Findings by Region

PLAN also projects the largest absolute reductions of NMHC, CO, and NO<sub>x</sub> for the northern part of the state: 19,129 metric tons, 169,347 metric tons, and 13,103 metric tons, respectively, in the 2008-2028 period.

In absolute terms, the southern region will experience somewhat smaller reductions in all three air pollutants.

## PLAN VERSUS TREND FINDINGS

In both development scenarios, substantial reductions are projected for all three major transportation-based air pollutants and for the two halves of the state. Statewide, projected reductions in emission in the 2008-2028 period range from 38.3 percent (for NO<sub>x</sub>) to 51.9 percent (for CO). No region will experience an increase in emission under either development scenario or projection period. Lower levels of reduction are projected at the regional level for the southern region of the state. Higher levels of reduction are projected for the northern region.

For New Jersey as a whole, the reduction in transportation-based air pollution under PLAN will be only slightly greater than under TREND. The differential effects of PLAN are dwarfed by the aforementioned general changes taking place under TREND conditions. Tables \_\_, \_\_, and \_\_ present statistics comparing the ameliorative impacts of TREND and PLAN on transportation-based emissions of, respectively, NMHC, CO, and NO<sub>x</sub>. While transportation-based air pollution in the 2008-2028 period will be reduced under both development scenarios, implementation of PLAN means that an additional 129 metric tons of NMHC, 835 metric tons of CO, and 107 metric tons of NO<sub>x</sub> will be removed from the air in the state, beyond the reductions that are expected to occur if present development patterns are allowed to continue. These amounts represent, respectively, 0.17 percent, 0.12 percent, and 0.21 percent of the reductions projected statewide under TREND in the 2008-2028 period.

The northern region will experience greater reduction in transportation-based air pollution under PLAN than under TREND. The northern region will also benefit under PLAN.

The southern region will experience less reduction in transportation-based air pollution under both TREND and PLAN in the 2008-2028 period. The southern region will benefit somewhat less from the ameliorative impacts of TREND and PLAN. Reductions in transportation-based air pollutants under TREND and PLAN will be lower by 8 metric tons of NMHC, 50 metric tons of CO, and 6 metric tons of NOx.

## **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

## **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

The projected reduction in transportation-based air pollution is due mainly to the use of less-polluting automobiles. This has a much greater effect than land-use induced measures affecting only the growth increment in the population. Under TREND as well as PLAN, the volume of traffic—expressed in vehicle miles traveled (VMT)—is projected to decrease between 2008 and 2028 in both the northern and southern regions. Yet, under both development scenarios, transportation-based air pollution is projected to fall in the state. Thus, the projected reductions are due

much more to the decrease over time in the EPA emission factors than to any change in land-use patterns.

Between 2008 and 2028 the amount of carbon monoxide emitted by a car traveling one mile is projected to fall from 23.08 grams to 10.50 grams. For NMHC and NOx, the projected decreases are, respectively, from 3.03 to 1.62 grams, and from 2.30 to 1.34 grams. These projected decreases reflect the expectations that automobiles in the future will be progressively less polluting and more energy-efficient than those currently on the road (U.S. Environmental Protection Agency, 2006).

If the volume of traffic is reduced, or its growth slowed down, greater reductions in emission can be expected. The implementation of employer-employee measures (such as mandatory employer trip reduction, reserved carpool/van-pool spaces, and telecommuting) and transit and travel demand measures (for example, capital improvement in public transportation, high-occupancy vehicles [HOV], summer rail, summer rail HOV and toll bypass, midday shuttles, suburban bus and rail), and pricing measures (such as gas tax increase, toll and parking fee increases, urban parking tax, transit fare reduction, and federal transit benefit increase) may augment the basic trends in air pollution fostered by tighter emissions controls. Even so, they would pale in comparison to the emission achievements.

The increment of transportation-based air pollution follows growth. There may be some larger differences observable at the subregional level. This is related to which subregions will grow or decline. At the regional level, the differences between TREND and PLAN with respect to impacts on transportation-based air pollution are somewhat less significant. This is because, as indicated in tables \_\_\_ and \_\_\_, TREND and PLAN projections for population

and lane-miles are essentially the same at the regional level.

However, the situation may be different at the subregional level. Greater reductions in transportation-based air pollution can be expected under PLAN than under TREND among areas projected to decline; lesser reductions are expected in those areas projected to grow.

The average regional increment is only one-quarter of one percent compared to the changes taking place in the overall population. Even if local effects were ten times this level, at 2.5 percent, the differential effects of land-use patterns would be relatively small.

## **PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

### **MONITORING VARIABLES**

# WATER QUALITY

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## INTRODUCTION— CORE QUESTIONS



Sanitary sewer in Hillside.  
Jon Erickson

Water quality is vital to the health and well-being of all New Jersey residents. The improvement of water quality has been a long-standing goal of the State of New Jersey. The primary method of regulating water quality has been to eliminate or control point sources such as sewage outfalls and pollution from industrial sites. More recently the State of New Jersey has concentrated much of its effort on controlling non-point sources of water pollution such as farmland runoff and storm sewer contamination. Recent evidence has shown that growth patterns may significantly affect water pollution as a result of an increase in agricultural and urban land uses.<sup>viii</sup>

The core questions for water resources in the State Plan are:

- What types of water pollution are potentially improved through watershed management and land-use planning?
- Will the State Plan protect and improve drinking water quality over what would occur if there was no plan?
- Can areas that are now polluted be effectively cleaned up through state and local government regulation of development and redevelopment?

## BACKGROUND



Lake Carnegie, South Brunswick.  
Photo credit to whom?

New Jersey, the fifth smallest state in the nation in 2008, contains a wide variety of water resources, geologic characteristics and biota. Within the state's 7,840 square miles are 127 miles of coastline; 15,000 miles of rivers and streams; and 69,920 acres of lakes and ponds of at least two acres. In addition, there are 1,482

square miles of fresh and saline marshes and wetlands, and 1,069 square miles of coastal waters.<sup>10</sup>

Water pollution occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water. When it is unfit for its intended use, water is considered polluted. Two types of water pollutants exist: point source and nonpoint source. Point sources of pollution occur when harmful substances are emitted directly into a body of water. A nonpoint source delivers pollutants indirectly through environmental changes—e.g., when fertilizer from a field is carried into a stream by rain, in the form of runoff. The technology exists for point sources of pollution to be monitored and regulated. Nonpoint sources are much more difficult to control. Pollution arising from nonpoint sources accounts for most of the contaminants in streams and lakes.

The New Jersey Department of Environmental Protection (DEP) evaluates water quality based on the water's ability to support seven categories of use: aquatic life, recreation, drinking water supply, fish consumption, shellfish harvest, industrial water supply and agricultural water. It is important to note that factors that impact one water use do not necessarily impact other uses. DEP's data show a correlation between benthic macroinvertebrate community impairment and different physiographic land types, land uses and other anthropogenic factors. Recent data analysis has concluded the following:

1. Fish and invertebrate communities were commonly impaired in urban streams.
2. Invertebrate community impairment was related to total urban land and total wastewater flow upstream of a site.

3. Changes in aquatic community structure were statistically related to environmental variables.

For example, an increase in impervious surfaces was related to a negative response in the aquatic invertebrate community. Conversely, the same data analysis also demonstrated that the more forests and wetlands in a stream's drainage basin, the more protection there is for invertebrate community health.<sup>11</sup>

Given the expectations of population growth in New Jersey (an estimated 745,000 more residents by the year 2028), land-use changes may have a measurable effect on water quality and aquatic communities.

The primary focus of Section 305(b) reporting is the evaluation of existing data and information to assess the overall "health" of waters of the state and to determine the status of use attainment. The primary focus of 303(d) reporting is identifying impaired waters and pollutants causing impairments that require TMDLs. The Integrated Report focuses on both use attainment and impairment and their respective causes and sources.

The New Jersey Department of Environmental Protection does not generally have access to data that verifies the source or cause of use non-attainment; therefore, it has developed a method for identifying the following list of potential sources of specific pollutants:

- Major Municipal Point Sources
- Industrial Point Sources
- Package Treatment Plants
- Combined Sewer Overflows
- On-Site Wastewater Treatment Systems
- Agricultural Land Use
- Urban Land Use
- Upstream Impoundments

- Atmospheric Deposition
- Natural Sources<sup>ix</sup>

The first five potential sources of water pollution are point sources, and the rest are examples of nonpoint source (NPS) pollution, which is caused by precipitation moving over and through the land and carrying natural and synthetic pollutants into surface and ground water. Much progress has been made in controlling point source discharges of pollutants since the enactment of the federal Clean Water Act. However, due to its ubiquitous nature, progress in controlling NPS pollution has lagged behind. The DEP estimates that between 40 and 70 percent of pollutant loads emanate from nonpoint sources.

NPS pollution cannot always be traced back to a single point: it is diffuse in origin, can emanate from anywhere in the watershed and is most often the result of human activity. NPS pollution may include chemicals and pathogens carried into streams by rainfall, such as oil and grease from roadways and parking lots; fertilizers from lawns, golf courses, and agricultural fields; and bacteria from improperly maintained septic systems, pet waste, and large congregations of waterfowl. However, NPS pollution can also include impacts not typically thought of as pollution, such as increased water temperature resulting from the clearing of streamside vegetation, or significant changes in the hydrology of the stream resulting from either increased stormwater runoff, which can erode the stream bed and banks, or the loss of water in the stream during dry weather resulting from the loss of recharge in a watershed under development and/or increased water withdrawals within a water supply watershed. Because of the diffuse and intermittent nature of nonpoint sources of pollution, traditional monitoring and permitting approaches are not as effective as they are for point sources.

Addressing NPS pollution requires a comprehensive control strategy that includes source identification, establishment of best management practices, public education, and cooperation between many levels of government and the local community.

The State Plan policy related directly to water pollution is as follows:

## Policy Statements from the Plan

### 11.0 Water Resources

Acknowledge water resources as a public resource, while protecting and enhancing water resources through improved coordination and integration of watershed-based planning and management aimed at protecting water supplies. Reduce point source and nonpoint source pollution, promoting water conservation and encouraging locations, types and designs of development to reduce adverse impacts on water resources and flood hazards. Protect the natural functions of streams and wetland systems, maintaining and enhancing ground water and ensuring that principles of sustainability guide planning, management and use of water resources.

#### THE CHALLENGE:

*To manage water resources and land uses that affect them more comprehensively by employing a watershed-based planning and management approach as a framework to make better informed and more sustainable decisions.*

## IMPACT ASSESSMENT— METHODS

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Round Valley Reservoir, Clinton  
Jon Erickson

In the 1992 evaluation, an average 30 percent fewer tons of uncontrolled nonpoint-source water pollutants could be directly attributed to the land development patterns of PLAN. Higher densities, less overall impervious surface, and more clustering of land uses in older urban communities, typically located far from headwaters, contributed to less water pollution under PLAN.

The findings of the 1992 evaluation indicated most of the water pollution generated (97 percent) was in the form of organic matter (biochemical oxygen demand [BOD]) and plant nutrients (total nitrogen [TN]). Total phosphorous (TP), zinc (ZN), and lead (PB) were relatively minor contributors. Projected PLAN development saved 4,560 tons of nonpoint-source water pollutants from the 15,163 tons of pollutants generated by TREND. While the analysis was coarse-grained, there were findings that indicated that PLAN development patterns could significantly alter the magnitude of future uncontrolled nonpoint-source pollutants. There is no reason to believe that, given the even more pronounced local road and land savings asso-

ciated with PLAN under the current evaluation, water pollution reductions would not be at least at the same percentage savings as observed in the 1992 evaluation. In this analysis (2008), it is clear that significant savings in uncontrolled nonpoint-source-based water pollution can be realized from the type of development patterns produced by the PLAN regimen.

The Water Pollution Model involves the following steps:

- Project the acreages of new residential and nonresidential development by type and density of development and by degree of imperviousness
- Determine the proportions of the various hydrologic soil groups in the county
- Determine the hydrologic soil groups of the new land uses
- Assess the quality of the stormwater runoff from the new land uses, where quality is affected by land use and soil group, and measured in terms of loadings for biochemical oxygen demand, total nitrogen, total phosphorus, zinc, and lead in the stormwater runoff from the land use
- Compare the amounts of water pollutants generated by new development under TREND with those generated by new development under PLAN.

The basic inputs for the Water Pollution Model are:

- Number of new housing units and new employment by type under PLAN and TREND
- Density and imperviousness levels by type and location of new residential and nonresidential development

- Percentage distribution of hydrologic soil groups in a county<sup>32</sup>
- Loadings rates (for biochemical oxygen demand, total nitrogen, total phosphorus, zinc, and lead) of the stormwater runoff from the various land use/soil group combinations

The basic outputs of the Water Pollution Model are:

- The pollutant loadings of the new development under TREND and PLAN
- The differences between TREND and PLAN with respect to pollutant loadings

## EXPECTED DIFFERENCES BETWEEN TREND AND PLAN

It is anticipated that:

- The more compact and higher-density pattern of development favored by PLAN will consume much less land than under TREND, although such land will pollute more per acre; the net result, however, is that new development under PLAN will cause less water pollution than new development under TREND
- At an individual county level, the stormwater runoff from an area that is designated as a growth area under PLAN may be more polluted under PLAN than under TREND

<sup>32</sup>Soil composition information is at the county level. Development takes place at the municipal level. Development at the municipal level is aggregated to the county level to enable use of the soil composition information.

The Model investigates the first possibility by comparing the statewide total pollutant loadings under TREND and PLAN, while the second possibility is verified by carefully examining the differences in loadings between TREND and PLAN in areas that are designated growth areas.

## CRITICAL ASSUMPTIONS

The Water Pollution Model does not take into account the impact of best management (BMPs)—which include land-use management practices and pollution abatement management practices—on the amounts of water pollutants that will be generated under TREND and PLAN. The amounts projected by the Model represent the uncontrolled nonpoint-source pollution that will be generated by new development in the absence of BMPs.

Both development scenarios are expected to encourage BMPs. Thus, if PLAN and TREND differ with respect to water pollution from new development, such differences are not caused by the extent to which BMPs are encouraged in one scenario but disregarded in the other. They reflect differences in the two scenarios with respect to the amount, type, and location of new development.

The amounts of pollutants in stormwater runoff from a land use are determined by the type of land use, which takes into account the level of density and imperviousness, and the hydrologic characteristics of the soil on which the land use is sited. The Water Pollution Model uses loading rates that have been estimated in a comprehensive non-point sampling and modeling study performed by the Northern Virginia Planning District Commission, and adopted by the New Jersey Department of Environmental Protection. These loading rates are presented in table \_\_\_\_, which indicates that the higher the density of the land use and the greater the degree of im-

perviousness, the higher the pollutant loading of the stormwater runoff will be. In addition, of the four hydrologic soil groups (A, B, C, and D),<sup>33</sup> group A has the lowest loading for any land use and type of water pollutant.

How much land belonging to a particular hydrologic soil group will be taken up for new development in a county depends on how much land of that soil group there is in the county. In the absence of data, it is not possible to determine the soil group and acreage of the land in a county that is available for a particular type of development or redevelopment. It is, therefore, not possible to determine the soil group of the various new land uses that are projected for a county under TREND and PLAN.

The Water Pollution Model allocates a new land use to a particular soil group in a county in proportion to the percentage share of this soil group in the acreage of land available for development or redevelopment. For example, if 100 acres will be taken up by new single-family development in a county where 25 percent of the acreage is Soil Group A, then 25 acres of the new residential development in the county will be sited on Soil Group A.

The pollutants from roadway stormwater runoff reflect the characteristics of the land use traversed by or adjacent to the roadway. In the Water Pollution Model, the amount of land taken up by a new land use includes the amount set aside for roadways that will serve the mobility and utility purposes of those who will live or work in the development. In this manner, the model takes into account the additional impacts of roadways on water pollution. The "plating coefficient" or overage of land consumption is 5 percent in an urban setting, 10

percent in a suburban area, and 25 percent in a rural setting.

The amount of land consumed by new development in a community reflects the density that will prevail in that community. Communities in New Jersey are classified into urban, suburban, and rural in descending order of development density. It follows from Assumption 4 that new development—for example, new single-family detached housing in an urban community—is likely to have higher density than a new single-family detached housing development in a suburban community.

In the Water Pollution Model, the amount of land consumed by a new land use is computed on the basis of the residential density that will prevail in the local community and may differ between TREND and PLAN. The Model assigns to each new land use the loading rate that reflects the density of the community in which the land use is developed. Thus, a new land use in an urban community is assigned the loading rates for the most densely developed (which is also the most impervious) variation of that land use. Table \_\_\_ shows, for example, that the BOD loading rates for single-family detached housing in an urban area used in the Model are 25 lbs./acre/year on soil group A (sandy loam), and 32 lbs./acre/year on soil groups B, C, and D (loam, silt loam, and clay loam, respectively).

Negative projections for new development imply that current land uses will be either rendered inactive or demolished and the land left idle. The inactive half will continue to pollute at the loading rates of the current land uses while the idled half will pollute at the rates applicable to idle land. Since loading rates for idle land are lower than those of other land uses for all types of pollutants and on all soil groups, a negative projection for new development implies a reduction in water pollution on half of the projected acreage. Such a reduction is equivalent to half of the acreage projected multiplied by the differ-

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<sup>33</sup> Groups A, B, C, and D correspond to sandy loam, loam, silt loam, and clay loam, respectively.

ence between the loading rates of current land uses and the rates for the new land use, i.e., idle land.

In the northern counties, new development is expected to have the highest density and degree of imperviousness applicable to a land use. Northern counties often lack soil surveys and are very densely developed. New development in these counties are assigned the “urban” loading rates, whether or not the municipalities where such development will take place are designated as urban.<sup>34</sup> Similarly, southern counties are assigned suburban/rural loading rates.

In addition, the loading rates selected are for development on soil groups B, C, and D, which generally are higher than those of soil group A.

## SCOPE AND DEPTH OF ANALYSIS

## IMPACT ASSESSMENT FINDINGS

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### TREND FINDINGS

Statewide, new development that occurs between 2008 and 2028 under TREND will generate 12,201 tons of BOD, 177 tons of total phosphorus, 2,469 tons of total nitrogen, 132 tons of zinc, and 184 tons of lead a year. Thus, most of the water pollutants generated by new development will be in the form of organic matters and plant nutrients.

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<sup>34</sup> Communication with Ralph Lund, New Jersey Assistant State Soil Scientist

Of the two regions in the state, the southern region will receive the largest amounts of all type pollutants from new development in the region: 3,288 tons of bio-chemical oxygen demand (BOD), 39 tons of total phosphorus, 635 tons of total nitrogen, 35 tons of zinc, and 50 tons of lead. The amounts generated in the northern region will be somewhat lower. TREND outputs are presented in table \_\_\_\_.

### PLAN FINDINGS

Under PLAN, new development will produce 8,818 tons of BOD, 100 tons of total phosphorus, 1,417 tons of total nitrogen, 103 tons of zinc, and 165 tons of lead a year in 2010. Organic matter and plant nutrients will figure most prominently in the water pollutants from new development under PLAN, a situation comparable to TREND.

The southern region is also projected to receive the largest amounts of pollutants under PLAN: 2,557 tons of BOD, 22 tons of total phosphorus, 389 tons of total nitrogen, 31 tons of zinc, and 51 tons of lead. Again, the northern region will have smaller amounts of pollutants from new development. PLAN outputs are presented in table \_\_\_\_.

### PLAN VERSUS TREND FINDINGS

Water pollution from new development will be much lower under PLAN than under TREND for all categories of pollutants. Table \_\_\_\_ shows that PLAN development scenario will lead to a pollution level that is much lower than what can be expected from new development under current conditions. Pollution from new development under TREND conditions is projected to exceed the development-related pollution under PLAN by 3,382 tons of BOD, 77 tons of total

phosphorus, 1,052 tons of total nitrogen, 29 tons of zinc, and 19 tons of lead.

The meliorative impact of PLAN on water pollution is significant. One indicator of the improvement in water quality that PLAN may bring about is the difference between TREND-generated pollution and PLAN-generated pollution expressed as a percentage of the amount generated under TREND conditions. Table \_\_\_ shows that the reductions in water pollution brought about by PLAN range from 10 percent (for lead) to over 40 percent (for total phosphorus and total nitrogen) of the amounts projected for new development under TREND.

The southern region will benefit the most from the meliorative impacts of PLAN. In absolute terms, the differential impacts of PLAN on water quality will be most noticeable in this region. Table \_\_\_ shows that this region accounts for nearly 70 percent of the improvement in water quality that PLAN will bring about. In absolute terms, the most profound impact of PLAN on water quality will also be felt in the southern region, where the gain in water quality will amount to between 43 and 67 percent of the amounts of pollutants generated under TREND conditions.

## **COMPARISON TO PREVIOUS IMPACT ASSESSMENT FINDINGS**

These findings, which highlight the meliorative effect of PLAN on water pollution in the State, comport with intuitive feelings about the close relationship between land-use patterns and water pollution. A development scenario that encourages the conservation of open space as well as the redevelopment of existing residential and nonresidential space is likely to produce a smaller amount of new impervious space statewide, which in turn will reduce the amount of runoff and pollutants from new development.

## **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

It is also likely, however, that the channeling of people and economic activities to selected communities and areas in the state will lead to an increase in pollutant generation, hence a deterioration in the quality of stormwater runoff in these areas. However, the Water Pollution Model is not specifically designed to detect changes in water pollution at the municipal level.

# PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH

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## LAND CONVERSION



Truck moving earth in Edison  
Jon Erickson

## INTRODUCTION— CORE QUESTIONS

Land conversion is the process by which vacant, undeveloped, or less-intense land uses are converted to a more intense land use such as the residential development of agricultural land. There are a number of mechanisms that can be used to prevent undesirable land conversion including zoning, purchase or transfer of development rights, and open space acquisition programs. The State Plan is intended to direct new development in such a manner as to effectively control land conversion.

The core questions to be answered here are:

- Is land conserved due to development under **PLAN** versus **TREND** conditions?
- If a land is conserved, does it vary significantly by region?
- Does the land saving vary significantly by maturity, density, or development concentration of communities?
- Does the plan create opportunities for redevelopment and continued revitalization of the state's urban areas and centers?



Construction site in Hillside  
Jon Erickson

## BACKGROUND

Accommodating a population increase of about 745,777 people and 266,000 jobs over the period 2008–2028 will require approximately 286,000 housing units and 87 million square feet of nonresidential space.

Given an assumption of one unit of residential space to 1,000 square feet of nonresidential space, an accompanying amount of nonresidential space is required. Northeastern United States land conversion averages indicate that for every combined unit developed, 0.305 acres of land are consumed. For New Jersey, the average is close to 0.390 acres.

Thus, for the combined 373,000 units of residential and nonresidential space needed for future development, almost 148,200 of the approximately 800,000 remaining acres would be consumed. Close to 60 percent of these 148,200 acres would be agricultural and environmentally fragile land. Residential development would consume approximately three-quarters of this land conversion. Thus, under normal conditions, over the next 20 years, more than 18 percent of the remaining land will be developed. While there may be some difficulty accommodating development in specific locations of the state, for the most part, projected TREND development can be accommodated by the land remaining in the state with about 4.5 times as much land remaining as will be consumed.

Land conversion due to development is projected using a simulation model. This model translates households and employment projections to the demand for residential and nonresidential land. The model accounts for both vacancy of structures and inefficient use as well as other land development requirements, such as zoning laws, which force the consumption of additional land. The model uses different development locations and densities for TREND versus PLAN growth, calculates the land converted under each development alternative, and expresses these, as well as their differences, in acres. The land conversion model requires a basic unit of geography that can be divided into more and less densely developed areas. The basic geographic unit in this analysis is the municipality. The more or less densely devel-

oped areas within a municipality are historic development locations under TREND conditions and a varying combination of TREND locations, State Plan Planning Areas, and environs under PLAN conditions. The model employs historic information to determine the location and density of development under the TREND scenario and the State Plan Policy Map and associated development standards for centers and environs to determine the location and density of development under the PLAN scenario.



**Development site in Piscataway**  
Jon Erickson

In order to understand potential land losses in New Jersey, one must first consider the scale of land resources that currently exists in the state compared with land that remains possible to develop. New Jersey comprises 4.8 million land acres, 1.35 million acres of which are developed.

As of 2008, close to 900,000 acres have been purchased under the state's Green Acres program. Another 400,000 acres are protected in state forests (208,000 acres) or in fish and wildlife management areas (192,000 acres), and an additional 100,000 acres are protected in state and county parks. Finally, about 171,000 acres

are held under various forms of farmland protection. Of 4.8 million acres, 1.7 million remain undeveloped and unprotected. Approximately two-thirds of the latter are forestlands; about one-third are agricultural lands.

The analysis that follows distinguishes between developable lands, agricultural lands, and environmentally fragile lands. Developable lands are those lands in the path of growth not protected by local, state, or federal environmental laws. Agricultural lands are lands that best support farming. They include cropland, pastureland, rangeland, forestlands, and other farm uses. Forestland portions of agricultural lands are those lands that act as a windbreak, watershed, or buffer to farming operations. These lands are classified as agricultural lands, even though they do not produce crops. Environmentally fragile lands are lands that are particularly vulnerable to the activities of nature and man. Water-based environmentally fragile lands are floodplains, wetlands, and critical sensitive watersheds; those environmentally fragile lands that are geologically based are steep slopes, sinkholes, and erosion-prone areas. Except for floodplains and wetlands, which are federally regulated, fragile lands are not universally regulated and deserve special consideration. Besides the fragile lands grouped with agricultural lands (forestlands), the vast majority of environmentally fragile lands have tree cover, which results in their being classified through aerial photography as woodlands. Since there is a great deal of overlap between fragile lands and forestlands, forestlands in this analysis serve as a prime surrogate for environmentally fragile lands.

The State Plan policies related directly to land are:

## **Policy Statements from the Plan**

### **12.0 Open Lands, Natural Systems, and Recreation**

Plan for the acquisition, management and protection of open spaces, natural systems and recreational areas for the purposes of preserving biological diversity, protecting water resources, wetlands, forested lands, critical slopes, scenic vistas. Reduce the amount of greenhouse gases to supplement and improve existing land acquisition, regulatory and management techniques in ways that are consistent with the vision and goals of the State Plan.

#### **THE CHALLENGE:**

*To improve the protection of New Jersey's valuable and diverse open lands, natural systems and recreational open spaces in the face of increased population pressures, competing demands for alternative land uses and a highly fragmented institutional framework.*

## IMPACT ASSESSMENT— METHODS

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**Large home subdivision in Readington**  
Jon Erickson

Household projections within each municipality for the period 2008–2028 are divided by area-specific overall occupancy rates to obtain gross housing-unit projections that are then allocated by housing type within each community. Under TREND development, growth projections for municipalities flow from historically based information. Residential growth is allocated to a municipality according to historic development densities as determined by satellite photography, wherein the number of units in a residential area is divided by the amount of land these units occupy. Employment growth is also allocated to communities based on historic growth and development densities.

Under PLAN development, growth in a municipality takes place by first determining the amount of development that will remain as TREND development. Once this determination is made, the remaining development is allocated

to centers of various types within a municipality, with residual development (if any) allocated to environs. Centers are State Plan designated, proposed, and identified centers and other areas that are like centers in character. Environs are areas outside center boundaries—areas within a municipality, developed at densities lower than centers, but nonetheless permitting some level of development. To convert residential structures to the demand for raw land, densities for centers in specific planning areas are used. Densities are available for centers of various types (see table \_\_). Densities are also available for environs and redevelopment areas; very little development takes place in environs—densities are relatively low. Reasonably significant development takes place in redevelopment areas—densities are relatively high. All calculations of density take into account additional land required for roads, street hardware, utilities, and open space. This can amount to an additional land requirement of 15 to 20 percent.

## LAND CONVERSION FOR NONRESIDENTIAL STRUCTURES

Employment growth is translated to the demand for nonresidential land through the use of historic employment densities. Although nonresidential structures are calculated and used elsewhere in this analysis, they are not used directly in the calculation of nonresidential land conversion. Historic employment densities (employees per acre under TREND development) or desired relationships between residential and nonresidential development and center employment densities (PLAN) determine the land consumed by employment housed in a particular community.

In this analysis for both residential and nonresidential development, land converted uses historic development densities for TREND development. It uses calculated center and en-

virons densities for PLAN development. The primary differences between TREND and PLAN development are the densities for residential development and PLAN's relationship of households to employment, which adjusts local employment upward or downward, as necessary. In the course of this analysis, the term nonresidential unit will be used. This is the amount of space required to house future employment growth in units of 1,000 square feet. It is determined from industry standards of employment occupancy but is not used directly in the land conversion calculation.



**Ongoing construction in Atlantic City**  
Jon Erickson

Development occurs under TREND conditions according to historical projections of households and employment for a 20-year projection future. Thus, TREND development is a detailed extraction of past growth to portray future levels and locations of growth. This flows directly from the population, household, and employment projections found in the economic portion of this impact assessment.

## EXPECTED DIFFERENCES BETWEEN TREND AND PLAN



**Green Acres program**  
Jon Erickson

Land conversion to support an equivalent number of households and jobs at the state and regional levels should be less under the PLAN scenario than under the TREND scenario. This is true because under PLAN development, growth is directed to communities with more densely developed planning areas and to communities with urban, regional, and/or town/village centers. This is also true because PLAN development prescribes a greater amount of redevelopment than the TREND scenario does. This characteristic of PLAN development—consuming less land than the TREND scenario—should be visible at both the state and regional levels, and even more obvious at the local level. In the latter case, very significant differences should be apparent in rural municipalities, in communities with less densely developed planning areas, and in communities without urban, regional, and/or town centers.

## CRITICAL ASSUMPTIONS

TREND residential densities are determined by satellite imagery; nonresidential densities are determined similarly, with the exception that under PLAN development, a jobs-housing relationship exists in centers. There is further a range in this relationship that prevents future employment density from varying significantly from historical employment density in most situations.

Development under PLAN conditions occurs according to three individual factors. The first step concerns the amount of development that prevails under TREND conditions. TREND projections at the local level were invested in heavily in the analysis. PLAN projections have certain relationships to TREND projections depending on whether municipalities are urban, inner-suburban, outer-suburban, or rural.

The second step under PLAN development is to allocate a component of future growth to centers. The model allocates growth to centers within a community. The State Plan Policy Map has created a series of five planning areas and six categories of centers where development can take place at different scales. Centers are naturally forming areas, the density of which is 100 percent greater than surrounding areas. The number of centers relates to the number of the above density concentrations; the scale of the center relates to the scale of the naturally forming area. The various planning areas receive growth in relation to the number and scale of centers. Both planning areas and centers are graduated from locations of the most densely developed (metropolitan planning area or PA-1) and the largest centers (urban, regional, and town) to the least developed (environmentally sensitive planning area or PA-5) and the smallest centers (village, hamlet). The concept behind the establishment of these differing development-receptive locations is that development will

generally take place in the more densely developed locations PA-1 to PA-3 versus PA-4 and PA-5. Yet development is permitted in all planning areas in centers. Centers of varying types are found in most planning areas; however, the more densely developed planning areas contain the largest number of significant-sized centers. Thus, the State Plan envisions more urban and regional centers in PA-1 and more village and hamlet centers in PA-4 and PA-5. This would provide more overall growth to the former and less overall growth to the latter.

Each of the various types of centers has cores and surrounding community development areas defined by a center boundary. The concept is that the cores will have most of the public and private nonresidential services and the community development areas will contain the bulk of the residential development. Each center has defined limits of geographical scale as well as development standards associated with them. These are shown in table \_\_\_ and in figure \_\_\_.

The third step of the process under PLAN development is to allocate development to environs. Environs are areas outside center boundaries that can accept residual development at comparatively low densities. Environs exist only in PA-2 to PA-5. In PA-1, environs are replaced with redevelopment areas that allow for development in excess of the density that would occur under TREND conditions. Environs development density varies by planning area from 0.4 unit per acre in PA-3 to 0.1 unit per acre in PA-5 for the purposes of this analysis.

The environs encompass a diversity of conditions, and they vary in form and function throughout New Jersey. In some parts of the state, the environs are predominantly agricultural or undeveloped. In other parts of the state, the environs may currently have limited development, such as scattered housing, retail, office space, or warehousing. In some counties,

the environs are already quite developed with a variety of low-density uses, such as larger-lot housing and private educational facilities. In the highway corridors, the environs may even include highway-oriented facilities such as rest stops and large warehousing and distribution centers. The policy (figure \_\_) objectives for PA-3 to PA-5 call for the protection of the environs from development occurring in centers. Here, environs should be primarily open land and form large contiguous areas of undisturbed lands or farmland (see figure \_\_).

## SCOPE AND DEPTH OF ANALYSIS

The analysis of comparative land conversion under TREND and PLAN conditions involves different levels of residential and nonresidential development being projected for each scenario for the state's 566 communities. Each community has a TREND density for residential and nonresidential development; each community has a composite residential and nonresidential density under the PLAN scenario according to the number and types of centers that are contained within the communities.

It should be understood that in communities across the state, under PLAN development, approximately one-third of future development proceeds as if it were TREND development. Thus, in this impact assessment, full subscription to the PLAN regimen is not assumed.

## IMPACT ASSESSMENT— FINDINGS

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### TREND FINDINGS

Under TREND conditions, growth in New Jersey will total 260,500 dwelling units and 131 million square feet of nonresidential space. The latter will accommodate a growth in employment of 262,000 jobs over the period 2008–2028. One hundred thirty-one million (131 million) square feet of nonresidential space is equivalent to 131,000 units of nonresidential space at 1,000 square feet per unit. This combined growth of 391,500 units of residential and nonresidential development will be concentrated mostly in central New Jersey (\_\_ percent), followed by southern (\_\_ percent) and northern (\_\_ percent) New Jersey (see table \_\_). \_\_ percent of this development will take place in suburban communities (\_\_ development units), \_\_ percent in urban communities (\_\_ development units), and \_\_ percent in rural municipalities (\_\_ development units) (see table \_\_). \_\_ percent of this development will be in communities with less densely developed planning areas (\_\_ development units), and \_\_ percent (\_\_ development units) will occur in communities without large centers. \_\_ percent of future residential and nonresidential development (\_\_ development units) will be in communities with more densely developed planning areas, and \_\_ percent (\_\_ development units) in communities with urban, regional, and/or town centers (see table \_\_).

Currently, there are approximately \_\_ million acres of undeveloped and unreserved land in New Jersey. Under both TREND and PLAN conditions, \_\_ of the 1 million acres to be purchased for future open space will come from developable land (see page \_\_). TREND's location of the million acres is roughly proportional to current incidence; PLAN's

location follows the conservation objectives of the State Plan. Under TREND conditions, 154,440 acres of land are converted to urban uses by 391,500 units of future development. Approximately \_\_\_ percent of this acreage will be converted in central New Jersey (\_\_\_ acres), \_\_\_ percent in southern New Jersey (\_\_\_ acres), and \_\_\_ percent in northern New Jersey (\_\_\_ acres) (see table \_\_\_). More than \_\_\_ of this land conversion will take place in suburban communities (\_\_\_ acres), \_\_\_ percent (\_\_\_ acres) will take place in communities with less densely developed planning areas, and \_\_\_ percent (\_\_\_ acres) in communities without large centers (see table \_\_\_). The remaining land conversion will take place in rural municipalities (\_\_\_ percent, for a total of \_\_\_ acres), in communities with more densely developed planning areas (\_\_\_ percent, or \_\_\_ acres), and in communities with urban, regional, and/or town centers (\_\_\_ percent, or \_\_\_ acres). Only \_\_\_ percent (\_\_\_ acres) of land will be converted in urban communities (see table \_\_\_).

## PLAN FINDINGS

Under PLAN conditions, there will be the same growth in New Jersey of \_\_\_ dwelling units and \_\_\_ units (1,000 square feet each) of nonresidential space. This amounts to \_\_\_ development units. Residential and nonresidential growth will be focused primarily in central New Jersey (\_\_\_ percent), with growth in southern New Jersey (\_\_\_ percent) and northern New Jersey (\_\_\_ percent) lagging (see table \_\_\_). This is where the similarities end. \_\_\_ percent of this development will take place in suburban communities (\_\_\_ development units), \_\_\_ percent in urban communities (\_\_\_ development units), and \_\_\_ percent in rural municipalities (\_\_\_ development units) (see table \_\_\_). Further, \_\_\_ percent will take place in communities with more densely developed planning areas (\_\_\_ development units) and \_\_\_

percent in communities with urban, regional, and/or town centers (\_\_\_ development units) (see table \_\_\_). Only \_\_\_ percent of the development units constructed over the period will be in communities with less-developed planning areas (\_\_\_ development units) and in communities without large centers (\_\_\_ development units) (see table \_\_\_).

Under the PLAN scenario, future residential and nonresidential development in the state will convert approximately \_\_\_ acres over the period 2008–2028. Under PLAN conditions, \_\_\_ acres will be converted in the southern part of the state; \_\_\_ acres will be converted in the central part of the state; and \_\_\_ acres will be converted in the northern part of the state (see table \_\_\_). Under PLAN development, approximately \_\_\_ acres will be converted in suburban communities, \_\_\_ acres in urban communities, and \_\_\_ acres in rural communities. Under the PLAN scenario, \_\_\_ acres will be converted in communities with less densely developed planning areas and \_\_\_ acres will be converted in communities without large centers (see table \_\_\_).

## PLAN VERSUS TREND FINDINGS

PLAN versus TREND development will cause no difference in the increase of total future (2008–2028) residential and nonresidential development at the state or regional levels in New Jersey. PLAN development will increase by nearly \_\_\_ fold (\_\_\_ percent) the amount of development projected for urban communities (\_\_\_ development units); it will decrease by \_\_\_ percent the amount of development projected for suburban communities (\_\_\_ development units); and it will decrease by \_\_\_ percent the amount of development projected for rural communities (\_\_\_ development units) (see table \_\_\_).

PLAN versus TREND development will increase by \_\_\_ percent the amount of development in communities with more densely developed planning areas (\_\_\_ new units) and by \_\_\_ percent the development in communities with urban, regional, and/or town centers (\_\_\_ new units) (see table \_\_\_). PLAN versus TREND demonstrably shifts the locus of development to sites in the midst of or near existing development.

PLAN development in New Jersey saves \_\_\_ acres from development during the projection period 2008–2028. Significant land savings occur in the central and northern parts of the state, in suburban communities, in communities with less densely developed planning areas, and in communities without large centers. The PLAN development scenario will save \_\_\_ acres from development in central and northern New Jersey; \_\_\_ acres or \_\_\_ percent of which will be in central New Jersey (see table \_\_\_). PLAN development will further save \_\_\_ acres in communities with less densely developed planning areas and \_\_\_ acres in communities without large centers (see table \_\_\_). Thus, PLAN development, which redirects residential and nonresidential growth to urban communities, to communities with more densely developed planning areas, and to communities with urban, regional, and/or town centers, is able to save one-third of the land converted during the 2008–2028 development period. Very significant land savings are evidenced in all of the types of locations the State Plan is attempting to serve.

## COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS

In the 2000 State Plan Impact Assessment, in order to accommodate a projected 2000–2020 growth of 260,500 households and 262,000 jobs under TREND conditions, 154,400 acres were converted to urban uses. In the current evaluation, in order to accommodate a projected 2008–2028 growth of \_\_\_ households and \_\_\_ jobs under TREND conditions, \_\_\_ acres are converted. In the 2000 evaluation, 825,000 development units—residential (450,000 units) and nonresidential (375,000 units)—would consume 292,000 acres, or 0.355 acres per development unit. In the current State Plan evaluation, \_\_\_ development units would consume \_\_\_ acres, or under PLAN conditions in the 1992 evaluation, a similar amount of development (396,000 residential and nonresidential development units) would consume 165,000 acres, or approximately 0.20 acres per development unit. In the most recent analysis, under PLAN conditions, \_\_\_ development units consume \_\_\_ acres, or \_\_\_ acres per development unit. Savings under PLAN conditions in the 2000 evaluation amounted to 122,000 acres, or approximately 39 percent; savings in the current evaluation amount to \_\_\_, or about \_\_\_ percent. The slightly lower percentage of land savings in the current evaluation may be attributable to the fact that under current modeling practices, almost one-third of the development under PLAN conditions is assumed to take place as TREND development.

## **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

PLAN development provides a 55,440-acre saving of land converted over a 20-year development period, while accommodating the same level of residential and nonresidential development as TREND development. Under both scenarios of future development, similar numbers of housing units and amounts of nonresidential space are developed to accommodate projected household and employment growth. This is true at both the state and regional levels. Below the regional level (northern, central, and southern New Jersey), development takes place differently and in different locations. Under PLAN, more development takes place at higher densities in urban communities, in communities with more densely developed planning areas, and in communities with urban, regional, and/or town centers. This produces significant land savings in all of the locations where PLAN development seeks such savings.

## **PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

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Land conversion per development unit could be reduced by one-third if the regimen of the State Plan is followed. A goal of no more than one-quarter acre per development unit is certainly desirable. This goal can be achieved under the current guidelines for the development and redevelopment of centers.

### **MONITORING VARIABLES**

The monitoring variable to be considered is the number of acres consumed by development divided by the amount of residential and nonresidential space developed (expressed in development units).

# AGRICULTURE



Pumpkins for sale along Main Street in Chester  
Matt Crosby

## INTRODUCTION— CORE QUESTIONS

Farmland preservation is a key component of New Jersey’s Smart Growth Plan.<sup>20</sup> Farming is important to New Jersey’s economy, and the food the industry produces is important for the health of its citizens, but the role of farmland in the State Plan is more extensive than its productive capacity.

Conserving farmland is an essential part of a sustainable development plan for New Jersey. According to the NJ Smart Growth Tool Kit, “Under the innovative conservation planning approach, land conservation is the central organizing principle around which livable communities are created...innovative conservation planning efforts help New Jersey

grow in ways that consume less land and strike a balance between preservation and growth.”<sup>35</sup>

The core questions for agriculture in the State Plan are:

- **Will the State Plan save agricultural lands that would be lost under existing development trends?**
- **Can these lands be saved throughout the State of New Jersey, especially in rural areas facing development pressure and areas that lack rural centers?**
- **Is the agricultural land saving (if any) a significant component of all lands likely to be lost to development?**

## BACKGROUND



Cornfields in Princeton Township  
Jon Erickson

Of the 4.7 million acres in the state, 1.7 million remain undeveloped and unprotected. Of that acreage, half is in agriculture and forestry. As the Agriculture Plan explains, “there is more to planning for agriculture than raising money to

buy land or development rights. Farmland preservation must also be about farming preservation.”<sup>36</sup>

## FARMLAND PRESERVATION BENEFITS

- **Helps keep municipal taxes down**
- **Increases property values**
- **Benefits the environment**
- **Adds to a community's character**
- **Is part of New Jersey's heritage**
- **Ensures that New Jersey residents continue to have access to an abundant supply of locally produced fresh food and agricultural products.**

New Jersey agriculture is highly specialized and high-value. The bounty of New Jersey's soils and climate, and the importance of the sector in its cultural history, earned it the moniker found on every New Jersey license plate, “The Garden State.” What would the Garden State be without any gardens left?

New Jersey's agricultural sector is very different from the large-scale production agribusiness found in the heartland of the United States. New Jersey farmers concentrate on high-value produce, truck crops and agri-tourism, and direct-to-consumer marketing of farm products, leaving low-value production of grain and meat to the corporate farming operations of the Midwest and West. There are 10,327 farms in New Jersey as of 2007.

Proximity to major northeastern markets and access to a wide variety of consumers are key advantages of New Jersey farmers. This is borne

out in data about the operations of New Jersey farms. As of 2007 there were 4,626 full-time farm operators and 5,702 part-time farm operators. New Jersey farms averaged 93 acres in 1992 and as of 2002 averaged 81 acres. Nearly all are family-owned, and their output per acre is among the highest in the country. The average per-acre value of New Jersey farmland in 1999, including land and buildings, was \$8,370, the highest average value of farmland anywhere in the nation.<sup>37</sup>

New Jersey is one of the nation's top 10 producers of fruits and vegetables; the state ranks second in blueberry production, third in cranberry production, and fourth in peach production. Farmers can market certain vegetables, fruits, horticultural products, ornamentals, and berries directly. Many farmers in New Jersey are able to bypass middlemen and therefore net higher prices for products. Additionally, the cost of transporting farm products to markets is relatively low. The market value of agricultural products sold is \$987 million, 86 percent of which comes from crop production and 14 percent of which comes from livestock production.

Although only 20 percent of the state's land—less than 1 million acres—is used for farming, agriculture is the third-largest industry in New Jersey. The \$56 billion food and agriculture industry ranks behind only pharmaceuticals and tourism in the economic benefits it brings the state. In 2007, New Jersey's 10,327 farms, occupying 733,450 acres—a decrease of 76,550 acres since 2002—generated cash receipts totaling \$987 million. That was an increase of \$44 million over 2000. In 2007, the top agriculture commodity was the nursery/greenhouse/sod industry, with cash receipts of \$382 million. The next four agriculture commodities in cash receipts were horses and mules, with \$94

million; peaches and chicken/eggs, both generating \$33 million; and field crops, generating \$65 million.<sup>38</sup>

Policies such as the Farmland Tax Assessment program (FTA), which assesses agricultural land at its current-use value rather than its higher speculative or development-use value, also help farmers keep production costs at manageable levels. Off-farm employment opportunities are abundant for New Jersey farmers, who are generally better educated than farmers elsewhere in the United States. Many New Jersey farmers can subdivide their land and sell off small parcels to developers at prices well in excess of the prices in other states, another major advantage. Revenues raised through such sales are an alternative source of credit for financing new technology and production. As of 2008, 169,981 acres of farmland have been preserved under the New Jersey Farmland Preservation Program.<sup>39</sup>

New Jersey farmers, however, face many disadvantages not experienced by their counterparts across the Northeast and the rest of the United States. Most of these are related to encroachment by development and the adverse effects of suburbanization. In most parts of the state, the farming component of the typical farm household's income is not sufficient to cover farm production and family expenses. To maintain viability, many farmers rely on other sources of revenue, such as off-farm income and proceeds from the sale of land and other farm assets.

New Jersey farmers' product mix reflects land constraints and the unique opportunities faced in the state. Over time, the agricultural product mix has become highly diversified rather than more specialized. The top three subsectors of New Jersey agriculture (livestock, vegetables, and nursery) accounted for about 80 percent of farmers' revenue in 1964, but only 60 percent in 2000. From 2000 to 2007 the mix of agricultural production changed with nursery, horses and mules, and blueberries accounting for approximately 60 percent of revenues, or \$565.2 million of \$945.9 million total receipts.<sup>40</sup>

There are many unique challenges impacting New Jersey agriculture. These forces have shaped the State Plan in New Jersey. The importance of agriculture is acknowledged in the State Planning Act, which specifically requires the New Jersey State Planning Commission to coordinate planning activities and establish statewide planning objectives in agriculture and farmland retention. The State's farmland plan speaks of an "important balance between the state's cities, suburbs and rural areas." Yet, past development has not adequately struck that balance, with a historical loss of 10,000 acres of farmland per year. From 1998 to 2002 the loss was approximately 5,000 acres of farmland per year;<sup>41</sup> more recently the loss of farmland has returned to a level of approximately 10,000 acres a year.<sup>42</sup>

## CHALLENGES TO FARMING IN NEW JERSEY



A new subdivision in Somerset, Franklin Township  
Matt Crosby

Suburbanization, including population movement to rural areas, has resulted in the loss of farmland. From 1950 to 2007, land in farms in New Jersey dropped by about 60 percent—from 1.80 million to 0.73 million acres; the number of farms declined by two-thirds—from 26,900 to 9,800 farms. Since the early 1970s, the size of New Jersey farms has been decreasing, partly as a result of suburbanization pressure to subdivide farms, while the average size of farms in the rest of the country has been growing substantially. Since 1970 the average New Jersey farm shrank from 123 acres to 78 acres in 2008.<sup>43</sup>

In the major farming regions of New Jersey, adequate water resources and large, contiguous tracts of land with minimal land-use conflicts are essential to sustaining successful farming operations and farmland productivity. Agricultural management practices are utilized to protect prime fertile soils, water, and other natural resources. More-intensive farming opera-

tions and the growing encroachment of housing into lands once considered the domain of crops and livestock have produced the need for “right to farm” and other supportive ordinances necessary to ensure a future for the agricultural industry.

Crops and farmland offer habitat to birds, other wildlife, and a host of insects and small creatures that perform functions such as pollination and decomposition. Farmlands, when worked responsibly, filter pollutants from the water and air and play a role in flood prevention.

In addition to its economic significance, agriculture is an important contributor to New Jersey’s quality of life. Agriculture generates positive externalities that are enjoyed by rural and urban residents, such as rural and pastoral scenery.

## Agricultural Economy



Sheep grazing in Long Valley  
Matt Crosby

Agricultural production and agriculture’s contribution to New Jersey’s economy have also diminished. From the mid-1960s to 2007, New Jersey’s agricultural output declined by more

than one-fifth. However, agriculture remains a significant economic activity, particularly in rural areas of New Jersey. According to the Agricultural Statistics Service, gross farm income of New Jersey farmers totaled \$840 million in 2000 and \$946 million in 2007, while net farm income increased from \$275 million to \$312 million. Statewide, farmers contributed more than \$82 billion to the state's economy and spent more than \$389 million on goods and services related to production, paid \$52 million in property taxes, and made \$26 million in principal and interest payments on outstanding debt. New Jersey farms directly employed more than 22,000 workers on a full-time-equivalent basis and indirectly supported another 17,500 workers.<sup>44</sup>

Retaining productive taxpaying farmland is critically important to all New Jersey residents for a number of reasons external to its economic value alone. For instance, farming is responsible for the largest portion of scenic vistas in the state. The preservation of farmland is key to retaining these vistas. The State Agricultural Development Committee (SADC) administers the Farmland Preservation Program. Between 1983 and 2000, the program has been instrumental in the permanent preservation of almost 60,000 acres of farmland. From 2000 to 2005 the farm acreage preserved increased to 166,000, more than doubling preserved acreage. This represents less than 17 percent of existing farmland; however, the other 83 percent remains unprotected.<sup>45</sup>

## *Planning for Agriculture*



Farmers market in East Brunswick  
Jon Erickson

As the 2006 Agriculture Smart Growth Plan states, "Many New Jersey towns are fed up with ...development and want to stop growth completely."<sup>46</sup> However, it is not within the state's economic or social interest to stop growth entirely. The Agriculture Smart Growth Plan states that "New Jersey should not stop growth, but it can plan for it in a way that protects the state's most valuable farmland and other natural resources and ensures the continued viability of its agricultural industry."<sup>47</sup> Underlying this statement is the fact that towns cannot stop growth because of constitutional guarantees of property rights, mitigated by the reality that towns already exercise strong regulatory authority over land use.

Specific policies related to agriculture are found for each planning area. PA-4 is the area where most farming takes place. The planning objective for PA-4 is protecting the rural character of the area by encouraging a pattern of development that promotes a stronger rural

economy in the future while meeting the immediate needs of rural residents, and by identifying and preserving farmland and other open land. This objective is based on an acknowledgment that (1) agriculture is an important part of New Jersey life, as it contributes to the economy of the state as well as to the quality of life of state residents; and (2) to preserve open space through farmland retention, agriculture needs to be a viable economic activity.

In New Jersey as in other states, farmland protection is an essential component of comprehensive growth management programs. This portion of the environmental assessment evaluates losses of agricultural land due to the land conversion activities of residential and commercial development. The analysis focuses on potential land losses that would render agricultural activities in the state of New Jersey less viable and would cause the loss of positive externalities to the state. Farmland is principally located in the rural planning area (PA-4), although critical farmland can also be found in PA-3 and PA-4B as well.

Agricultural land conversion in the Impact Assessment measures lost prime agricultural land. The TREND model determines what share of available land in a community is agricultural and projects development at historical densities to determine what percentage of agricultural land will be converted. The PLAN model assesses land conversion by allowing development to consume land in centers in specific planning areas that have more or less agricultural lands as part of their developable land mix.

Under TREND, towns are already exercising strong growth management behavior, and in fact, redirecting that growth under PLAN will not have the effect of reducing development in New Jersey. A more balanced growth management scheme can be seen as regulatory reform while actually increasing development oppor-

tunities and allowing for economic growth in the state.

Without incentives to limit towns from enacting anti-growth regulations, most enact reactionary solutions to subdivision applications, such as large-lot zoning. Large lot zoning restricts development opportunities and economic growth, does not preserve farmland, and encourages a type of “meta-sprawl.” As the Agriculture Plan states, “Downzoning spreads homes out in such a way that consumes more land, with none of the remaining land useable for farming, forestry or recreation.”<sup>48</sup> The State Plan aims to modify that paradigm by giving communities the tools to plan and zone before subdivision applications are filed. It allows them to simultaneously allow the growth they want to see while affording them the tools to plan to preserve farmland in the state.

In the critical planning areas where agriculture is threatened, the Agriculture Plan states, “[G]rowth should be focused in existing and new rural centers where development is mixed in use and compact. Ideally, the areas outside of these centers are maintained for agriculture by using planning techniques that address landowner equity and support farming.”<sup>49</sup>

*Equity* is a significant concern of the State Plan. Reducing densities and restricting development to preserve farming may conserve scenic vistas and allow for the continuation of an important part of the state’s economic heritage, but there are real estate valuation implications of such measures. Likewise, shifting growth toward centers also has significant valuation implications. In order to balance the gains and losses landowners will face under PLAN, the state has designed a system to help equalize those inequities. This concept is contained in

—

Transfer of Development Rights (TDR) and Purchase of Development Rights (PDR).

## Transfer of Development Rights (TDR) as a Method of Equitably Securing Agricultural Land



Residential building under construction in Jersey City  
Matt Crosby

The system, which allows for Transfer of Development Rights (TDR) and Purchase of Development Rights (PDR), assists with equity concerns that are a principal concern of the State Plan. As stated in the preamble of the Agricultural Plan, equity is a primary goal of the State Plan:

Although preserving land is of central importance to achieving smart growth, the plan recognizes that land preservation can disproportionately impact property values. The New Jersey courts have been vigilant in ensuring that the “benefits and burdens flowing from implementation of the State Plan are borne on an equitable basis.”

In one case in which a downzoning was overturned, the court invoked the equity provision of the State Plan in upholding the

landowner’s right to reasonable investment-backed expectations:

It is the position of the State Planning Commission that the State Plan should neither be used in a manner that places an inequitable burden on any one group of citizens nor should it be used as a justification for public actions that have the effect of diminishing equity. It is also the position of the Commission that the achievement, protection and maintenance of equity be a major objective in public policy decisions as public- and private-sector agencies at all levels adopt plans and policies aimed at becoming consistent with the State Plan.<sup>50</sup>

New Jersey signed into law the State Transfer of Development Rights (TDR) Act on March 29, 2004.<sup>51</sup> This bill makes New Jersey the first state in the nation to authorize TDR on a statewide level. The legislative findings in the act are as follows:

The Legislature finds and declares that as the most densely populated state in the nation, the State of New Jersey is faced with the challenge of accommodating vital growth while maintaining the environmental integrity, preserving the natural resources, and strengthening the agricultural industry and cultural heritage of the Garden State; that the responsibility for meeting this challenge falls most heavily upon local government to appropriately shape the land use patterns so that growth and preservation become compatible goals; that until now municipalities in most areas of the State have lacked effective and equitable means by which potential development may be transferred from areas where preservation is

most appropriate to areas where growth can be better accommodated and maximized; and that the tools necessary to meet the challenge of balanced growth in an equitable manner in New Jersey must be made available to local government as the architects of New Jersey's future.<sup>52</sup>

According to the Office of Smart Growth, “Transfer of development rights is a realty transfer system where development potential in a specified preservation area can be purchased by private investors for use in a targeted growth area. In exchange for a cash payment, land-owners in the preservation area place a restrictive easement on the property that will maintain the resource into perpetuity. The land in the designated receiving area can then be developed at a higher density than allowed under the baseline zoning.”<sup>53</sup>

The law states that a “sending zone shall be composed of land with one or more of the following characteristics:” Agricultural land, woodland, floodplains, wetlands, threatened or endangered species habitat, aquifer recharge area, recreation or park land, waterfront, steep slopes, unique or aesthetic, architectural or historical structure; or other areas which shall remain at low densities for reasons of inadequate transportation, sewerage or other infrastructure, or for such other reasons as proscribed by the *State Development and Redevelopment Plan* or local or regional plans.

The TDR law further states that “A receiving zone shall be appropriate and suitable for development and shall be at least sufficient to accommodate all of the development potential of the sending zone, (1) the availability of all necessary infrastructure; (2) all of the provisions of the zoning ordinance including those related

to density, lot size and bulk requirements; and (3) given local land market conditions as of the date of the adoption of the development transfer ordinance.” The law states that the sending zones shall have adequate infrastructure to support development, but does not speak of “Centers” or any other measure in the State Plan that references where density is appropriate.

A future amendment to the TDR law should reference and incorporate the State Plan for describing appropriate receiving zones as it does for sending zones.

The State Plan policy addressing agriculture is:

## **Policy Statements from the Plan**

### **15.0 Agriculture**

**Promote agriculture as an industry and preserve the agricultural land base by coordinating planning and innovative land preservation techniques to support agricultural sustainability in recognition of agriculture’s valuable contributions to conserving the State’s natural resources and its quality of life, while accommodating growth in rural areas in ways that are consistent with the State Plan’s vision and goals.**

#### **THE CHALLENGE:**

*To promote agriculture as an economically viable industry in this highly urbanized state by defining and supporting appropriate agricultural niches, while also continuing to preserve the farmland base when agricultural land values often adversely compete with land values for residential and commercial development.*

## IMPACT ASSESSMENT— METHODS

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Newtonville  
Jon Erickson

### EXPECTED DIFFERENCES BETWEEN TREND AND PLAN

TREND conditions in all planning areas show conversion of agricultural lands in equal measure with other types of developable land and at suburban and exurban prevailing densities. PLAN predicts that agricultural land will be converted at the prevailing density levels of centers. PLAN therefore predicts that less agricultural land will be converted to urban use given expected population growth. The analysis includes a projection of the demand for residential and nonresidential development from 2008–2028.

### CRITICAL ASSUMPTIONS

Farmland will be lost under both TREND and PLAN development scenarios. Under the

TREND scenario, farmland is converted at historical development densities. Under the PLAN scenario, farmland is actively protected in the fringe (PA-3), rural (PA-4), and environmentally fragile (PA-5) planning areas. This is achieved primarily by guiding growth to centers in PA-3 to PA-5 and limiting development in the exurban and rural areas of PA-4 and PA-5. In the fringe planning areas (PA-3), development is favored and conflicts between center growth and agricultural land preservation are more frequently decided in favor of growth. In the rural planning areas (PA-4), development is directed to centers, and much of the undeveloped land is retained as agricultural as priority is given to farmland preservation. In the environmentally sensitive planning areas (PA-5), agricultural uses are considered of secondary importance if they conflict with preservation of environmentally fragile land. Of the three planning areas, retention of prime agricultural land and agricultural uses is given the greatest priority in the rural planning area (PA-4), where most prime agricultural land is located.

### SCOPE AND DEPTH OF ANALYSIS

Very little agricultural acreage is found in metropolitan planning areas (PA-1) and suburban planning areas (PA-2). Agricultural land found in the fringe planning areas (PA-3) are not often considered prime. Agricultural lands found in the rural–environmentally sensitive planning areas (PA-4B), while of considerable environmental significance, are classified as agricultural rather than environmentally sensitive. Although the most significant difference in agricultural land conversion under the TREND and PLAN scenarios is in PA-4, agricultural land conversion occurs in other planning areas as well.

# IMPACT ASSESSMENT— FINDINGS

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## TREND FINDINGS

Under the TREND scenario, approximately \_\_\_ percent (\_\_\_ acres) of developed land is classified as agricultural. Of that land converted, \_\_\_ percent is prime agricultural land and \_\_\_ percent is nonprime agricultural and environmentally fragile agricultural land respectively.

Of the \_\_\_ acres of agricultural lands converted to other uses, \_\_\_ acres, or \_\_\_ percent, is consumed in the central part of the state; \_\_\_ acres, or \_\_\_ percent, will be lost in the southern part of the state; and \_\_\_ acres, or \_\_\_ percent, will be lost in the northern part of the state (see table \_\_\_). \_\_\_ percent of this agricultural land loss (\_\_\_ acres) will take place in rural communities, with the remaining \_\_\_ percent (\_\_\_ acres) in suburban communities. There are no agricultural land losses in urban communities (see table \_\_\_). Under TREND development, \_\_\_ acres, or \_\_\_ percent of the agricultural land losses, will take place in communities with less densely developed planning areas, and \_\_\_ acres, or \_\_\_ percent, will take place in communities without urban, regional, and/or town centers (see table \_\_\_).

## PLAN FINDINGS

Under PLAN development, only \_\_\_ acres of agricultural land are consumed for development purposes. \_\_\_ percent of these agricultural lands \_\_\_ percent (\_\_\_ acres) will be lost in the central part of the state; \_\_\_ percent (\_\_\_ acres) will be lost in the southern region; and the remaining \_\_\_ percent (\_\_\_ acres) will be lost in the northern part of the state (see table \_\_\_). Under PLAN

development, \_\_\_ acres, or more than three-quarters of the agricultural land consumed, will be lost in communities with less densely developed planning areas; \_\_\_ acres, or \_\_\_ percent, will be lost in communities with urban, regional, and/or town centers (see table \_\_\_).

## PLAN VERSUS TREND FINDINGS

PLAN development saves approximately \_\_\_ acres, or \_\_\_ percent, of the agricultural lands likely to be lost. In the central portion of the state, approximately \_\_\_ acres, almost \_\_\_ percent of lands likely to be converted, will be saved; in the southern portion of the state, approximately \_\_\_ acres, or \_\_\_ percent, will be saved; approximately \_\_\_ acres, or \_\_\_ percent, of agricultural lands will be saved in the northern part of the state (see table \_\_\_).

## COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS

In the 2000 evaluation, it was projected that a total of 125,000 farm acres would be consumed under TREND development and 57,000 acres under PLAN development—a difference of 68,000 acres for the 2000 to 2020 period. Approximately \_\_\_ percent more farm acreage is expected to be consumed during the current period of evaluation under the TREND scenario. The absolute savings under the PLAN scenario for the projection period 2008–2028 are \_\_\_ percent greater than they were in 2000; the relative savings are almost \_\_\_ as high (\_\_\_ percent versus \_\_\_ percent) as they were predicted in 1992. The state is getting to a point where much of the remaining unprotected developable land is farmland—thus land losses to development are farmland losses.

## CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS

PLAN development during the period 2008–2028 saves more than \_\_\_ of agricultural lands that would be consumed under the TREND regimen, while accommodating the same level of residential and nonresidential development. Similar numbers of housing units and nonresidential space are developed to accommodate projected households and employment growth under both future development scenarios. Under PLAN conditions, agricultural land saving is not as significant in communities with more densely developed planning areas. Most of the land saved is in rural communities, in the southern part of the state, in communities with less densely developed planning areas, and in communities without urban, regional, and/ or town centers.

## PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH

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Agricultural land is being consumed at a \_\_\_ to 1 rate in terms of total acreage converted for development purposes. For every acre taken under TREND development, \_\_\_ acres of farmland are lost. Under PLAN development, this will be reduced to \_\_\_. Agricultural land losses should be compared to overall land taken for development, and the resulting ratio should not exceed \_\_\_ to 1. The monitoring variable will ensure that agricultural lands are not consumed at greater than \_\_\_ percent of current levels.

## MONITORING VARIABLE

### ENVIRONMENTALLY FRAGILE LAND



Frenchtown  
Jon Erickson

Environmentally fragile lands are lands that are particularly vulnerable to the activities of nature and human beings.<sup>54</sup> They do not lend themselves well to development. The primary categories of water-based environmentally fragile lands are floodplains, wetlands and critical sensitive watershed; those that are geologically based are steep slopes, sinkholes and erosion-prone lands.<sup>55</sup> Except for floodplains and wetlands, which are protected through federal and state regulations, fragile lands are not universally protected and deserve special consideration. The effects of disturbing hillside, aquifers, streams and wetlands can range from safety hazards such as flooding or landslides to drought, poor water quality or the shortage of other valuable natural resources. Economic consequences include the cost of

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providing additional public facilities such as flood prevention devices or new water sources and loss of value in real estate, a problem in erosion-prone areas.

The citizens of New Jersey face escalating threats to the state's biodiversity in the form of habitat loss. Each year, development claims thousands of acres of wetlands and forests, disrupting wildlife habitat and impacting rivers, streams, and watersheds. Twenty percent of wetlands have been lost since 1900. Wetlands work as natural sponges, soaking up and storing rain and runoff. This is a cost-effective way of improving water quality and managing stormwater. When wetlands are developed, water that would have been stopped or slowed may flood. Increased flooding destroys property and can cause lives to be lost. Furthermore, water birds rely on wetlands for food and sustenance; their population is declining in direct proportion to wetlands loss. Water birds require large undisturbed areas for nesting and breeding. The current decline in their numbers related to habitat loss may be irreversible. Even though wetlands protection is the poster child for curbing habitat loss, thanks to federal and state protection, New Jersey in the year 2000 is approaching its goal of "zero loss"—zero acres lost to ongoing development. Unprotected forestlands are the new significant sites of habitat loss.

Besides fragile lands within agricultural lands, the vast majority of nonagricultural, non-wetland fragile lands have some sort of tree cover, which results in their being identified as forestlands. Since there is a great deal of overlap between fragile lands and forestlands, forestland is often chosen as an indicator of environmentally fragile land. Since 1956, New Jersey has lost 8,000 forestland acres each year to other uses.

The core questions to be answered under this portion of the analysis are:

- **Will the State Plan (PLAN) save environmentally fragile lands that would be lost under existing development trends (TREND)?**
- **Can these environmentally fragile lands be saved throughout New Jersey, especially in the undeveloped and pristine areas of the state?**
- **Are the overall savings significant relative to the amount of environmentally fragile lands that would be consumed by development under TREND?**

## BACKGROUND

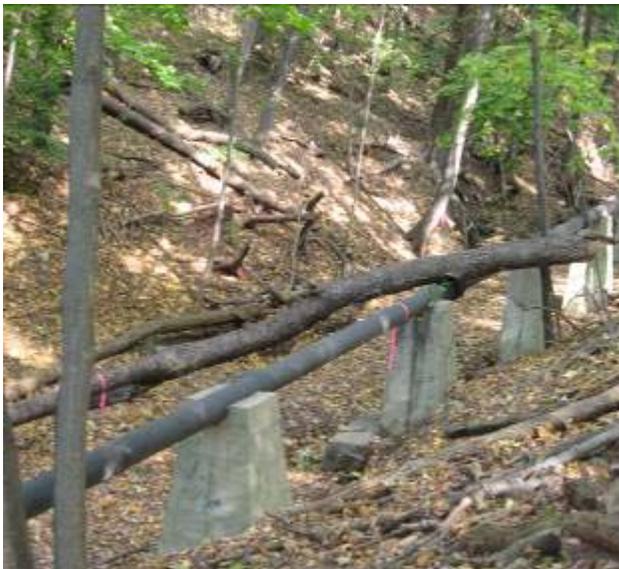
New Jersey has a total land area of 4,748,000 acres. There are about 1,864,300 acres classified as forestland in New Jersey, 75 percent of which is privately owned. Approximately 464,000 (956,073 acres in State or Federal Parks, Forests and Wildlife Management Areas) acres are in state forests, parks, and other public lands. New Jersey forestlands are unique; probably in no other state are there so many species of trees to be found, as well as such a wide variety of topography, soils, drainage, and vegetation, all in a relatively small area. From the Kittatinny Range to the Pine Barrens, three of the five major forest regions in the United States are found in New Jersey. Forestlands usually lie atop aquifer-recharge areas. An aquifer is a natural holding tank of geologic material that supplies groundwater to natural springs and water wells. Aquifer recharge is the process by which rainwater seeps down through the soil into an underlying aquifer. Half the water used by New Jersey residents on a daily basis is extracted from underground aquifers. The State Plan envisions that development be limited in aquifer recharge areas, since urbanization affects the quality and availability of clean water.

## Forests and Underground Aquifers



**Bull's Island Park, Raven Rock**  
Jon Erickson

## Steep Slopes



**Severe slope in a relatively urban setting: Essex Fells**  
Jon Erickson

In addition to providing filtering for water supplies, remaining forests in New Jersey are often found on steep slopes. Trees, roots and ground cover prevent soil erosion on such

slopes. Soils in New Jersey's forests tend to be thin and shallow, dry, saline and/or acidic, all of which contribute to making such areas difficult to develop.

According to the New Jersey State Plan, one of five planning areas is the environmentally sensitive planning area (PA-5). The environmentally sensitive planning area covers more than 1 million acres throughout New Jersey and contains large contiguous land areas with valuable ecosystems, geological features, and wildlife habitats.<sup>34</sup> Most environmentally fragile lands are found in the Delaware Bay and other estuary areas, the Highlands region, the Meadowlands region, the Pinelands region, and coastal areas. Some have remained undeveloped or rural in character. Other areas, particularly New Jersey's coastal barrier islands, have experienced advanced levels of development but remain highly vulnerable to natural forces. Environmentally sensitive planning areas are characterized by watersheds, trout streams, and drinking water-supply reservoirs; recharge areas for potable water aquifers; habitats of endangered and threatened plant and animal species; coastal and freshwater wetlands; prime forested areas; scenic vistas; and other significant topographical, geological, or ecological features, particularly coastal barrier spits and islands.

Existing centers within the environmentally sensitive planning area often are the focus of residential and commercial growth and public facilities and services for their region; they also provide the backbone for the state's recreation and tourism industries. The wide diversity of natural and built systems has resulted in small rural towns such as High Bridge, Ogdensburg, and Hopatcong and villages such as Cape May Point, Far Hills, Bedminster, Mauricetown, Fortescue, Fairton, Leesburg, Stone Harbor, Seaside Heights, and Surf City. Environmentally sensitive planning areas encompass regional centers, including Newton in the northwest and

Wildwood on a barrier island. These centers generally are linked to each other by rural roads and separated from other development by open spaces or linked to the mainland by state highways crossing coastal wetlands and waterways. Centers on the barrier islands are almost all sewered, whereas centers in other environmentally sensitive areas often are not sewered.<sup>35</sup>

State Plan policy related to environmentally fragile land is listed below:

## Policy Statements from the Plan

### 12.0 Open Lands, Natural Systems, and Recreation

Plan for the acquisition, management, and protection of open spaces, natural systems and recreational areas for the purposes of preserving biological diversity, protecting water resources, wetlands, forested lands, critical slopes, scenic vistas. Reduce the amount of greenhouse gases to supplement and improve existing land acquisition, regulatory and management techniques in ways that are consistent with the vision and goals of the State Plan.

#### THE CHALLENGE:

*To improve the protection of New Jersey's valuable and diverse open lands, natural systems and recreational open spaces in the face of increased population pressures, competing demands for alternative land uses and a highly fragmented institutional framework.*

## Historic, Cultural, and Scenic Resources



Loew's Theatre in downtown Jersey City  
Matt Crosby



Convention Hall (view from land side), Asbury Park  
Matt Crosby

The policy in the State Plan relating to the protection of historic, cultural, and scenic resources is:

## Policy Statements from the Plan

### 9.0 Historic, Cultural, and Scenic Resources

Protect, enhance, and where appropriate, rehabilitate historic, cultural and scenic resources by identifying, evaluating and registering significant historic, cultural and scenic landscapes, districts, structures, buildings, objects and sites, and ensuring that new growth and development are compatible with historic, cultural and scenic values and in ways that are consistent with the vision and goals of the State Plan..

#### THE CHALLENGE:

*To protect, enhance and, where appropriate, rehabilitate historic, cultural and scenic resources through appropriate means that will enhance not only the historic, cultural heritage and scenic resources, but also make significant contributions to the State's economy.*

## IMPACT ASSESSMENT— METHODS

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Battlefield Park, Princeton

Jon Erickson

In order to calculate environmentally fragile lands lost, lands in PA-5 and PA5B converted for development purposes under the two growth scenarios are compared. PA-5 is the environmentally sensitive planning area; PA-5B is the environmentally sensitive/barrier island planning area. The environmentally sensitive planning area (PA-5) located in the northern half of the state contains the vulnerable steep slopes and scenic vistas of Morris, Somerset, and Passaic counties. In the extreme southern half of the state, in Cumberland and Salem counties, environmentally sensitive lands in the form of coastal wetlands are being protected in PA-5. Finally, again in the northern part of the state, PA-5 areas in Hunterdon, Warren, and Sussex counties are being protected to retain undeveloped prime forested areas and mature stands of plant species. PA-5B, located in the southern part of the state in Monmouth, Ocean, Atlantic, and Cape May counties, provides necessary protection for barrier islands, beaches, and

coastal spits. In order to compare the alternative futures, each community will have household and job growth that it must accommodate under TREND or PLAN conditions. Household projections produce a demand for dwelling units that requires development acreage according to prevailing residential densities. Employment projections produce a demand for nonresidential space that requires development acreage according to prevailing nonresidential densities. Under TREND and PLAN conditions, land is drawn from developable land that is either non-agricultural, agricultural, or environmentally fragile. None of these lands are protected by wetlands legislation, floodplains or coastal regulations, and so on. Those protected lands cannot be claimed for development.

TREND growth claims unprotected environmentally fragile land equal to its percentage incidence locally. The PLAN scenario claims unprotected environmentally fragile land according to the following schedule. First, for the share of PLAN development that occurs outside centers, its percentage incidence is converted as all land is converted. Second, for the share of development that occurs as center development, environmentally fragile land is converted according to the number of centers and their development densities that occur in PA-5 and PA-5B. Third, for the share of development that occurs in environs, environmentally fragile land is converted according to the amount of these environs that are developed and fall in PA-5 and PA-5B. The latter takes place according to the allowed development density.

## **EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

It is expected that the environmental objectives of the PLAN growth alternative will save some environmentally fragile lands. The specific provision in the State Plan relating to the

conservation of environmentally fragile lands is as follows: Protect and preserve large, contiguous tracts and corridors of recreation, forest, or other open space land that encompasses natural systems and sensitive natural resources including endangered species, ground and surface water resources, wetland systems, natural landscapes of exceptional value, critical slope areas, and other significant environmentally sensitive features.

## **CRITICAL ASSUMPTIONS**

On the other hand, environs density in PA-5 and PA-5B under the State Plan is sufficiently low (one unit per 10 acres) that lands used for development as opposed to occupied by development may diminish the overall land savings associated with PLAN development. Environmentally fragile lands are counted as lost (consumed) only if these lands are required for development and are designated as PA-5 or PA-5B lands unprotected by federal, state, and most local regulations. One unit on 10 acres under PLAN consumes 10 acres for development, even though only one acre (or less) is occupied by the structure. In this case, land used for development is 10 acres; land occupied by development is one acre. This density level is a CUPR assumption.

## **SCOPE AND DEPTH OF ANALYSIS**

All of the residential and nonresidential development units can consume environmentally fragile land according to where growth is taking place (in a municipality) and the amount of environmentally fragile land that exists in that location (from Landsat).

## TREND FINDINGS

Lands lost are mostly found in the southern part of the state (\_\_\_ acres, or \_\_\_ percent). A lesser amount of environmentally fragile land will be lost in the northern part of the state (\_\_\_ acres, or \_\_\_ percent) (see table \_\_\_). The northern portion of the state will experience only \_\_\_ percent of projected household growth over the two-decade period, but in the process of development more than \_\_\_ percent of all environmentally fragile land lost will be in this region.

Under TREND conditions, \_\_\_ acres of environmentally fragile lands will be consumed in suburban communities and \_\_\_ acres in rural municipalities. In urban communities, only a small amount of environmentally fragile land (\_\_\_ acres) will actually be consumed due to lack of demand for development acreage in these areas. Under TREND conditions, \_\_\_ acres will be consumed in communities with less densely developed planning areas (communities that have mostly PA-4 and PA-5 areas within their bounds). Approximately \_\_\_ acres will be consumed in communities with more densely developed planning areas (communities with predominantly PA-1, PA-2, or PA-3 areas within their bounds) (see table \_\_\_). In the TREND scenario, more environmentally fragile land will be lost (\_\_\_ acres). Under TREND conditions, of the \_\_\_ total acres converted to urban uses during the period 2000 to 2028, approximately \_\_\_ acres will be unprotected environmentally fragile lands. Most of the environmentally fragile land will be lost in communities without large centers; less environmentally fragile land will be lost (\_\_\_ acres) in communities with urban, regional, and/or town centers (see table \_\_\_).

## PLAN FINDINGS

Under the PLAN scenario, a total of \_\_\_ acres of environmentally fragile lands will be consumed or lost to development. Approximately \_\_\_ of these acres will be lost in developed planning areas; \_\_\_ acres will be lost in communities with more densely developed planning areas (see table \_\_\_). Under PLAN, \_\_\_ acres of environmentally fragile lands will be lost in communities with urban, regional, and/or town/village centers; \_\_\_ acres will be lost in communities without large centers (see table \_\_\_).

## PLAN VERSUS TREND FINDINGS

TREND development consumes \_\_\_ more environmentally fragile acres, or \_\_\_ percent more than development under PLAN conditions. Approximately \_\_\_ acres are saved in the northern part of the state, \_\_\_ acres in the central part the state, and \_\_\_ acres in the southern part of the state (see table \_\_\_). Approximately \_\_\_ acres are saved in suburban communities under PLAN development, and \_\_\_ acres are saved in rural municipalities (see table \_\_\_). Approximately \_\_\_ acres are saved in developing communities with less densely developed planning areas; \_\_\_ acres are saved in communities with more densely developed planning areas. Finally, \_\_\_ acres are saved in communities with urban, regional, and/or town centers; \_\_\_ acres are saved in communities without large centers (see table \_\_\_). Clearly, there is a significant saving of environmentally fragile land if development for the period 2008–2028 proceeds according to the PLAN regimen.

## COMPARISON TO PREVIOUS IMPACT ASSESSMENT FINDINGS

More than \_\_\_ the amount of environmentally fragile land will be consumed during current projections under both scenarios than was the case in the 2000 evaluation. In 1992, approximately 36,500 acres were expected to be consumed under TREND; 7,150 acres would be consumed under PLAN. The overall magnitude of land consumed varies between the two analyses because, first, under current technologies environmentally fragile land is charted much more accurately, and second, over time it has become one of the few sources of developable land available.

## CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS

PLAN development, with its strong conservation element, steers growth to locations in a way that minimizes the amount of environmentally fragile land consumed. More than \_\_\_ acres can be saved in the course of normal development by building in more dense locations—more urban communities and centers in all types of communities. Land that is saved need not be purchased to prevent the loss of critical habitats, aquifer-recharge areas, forestlands, and so on. Unfortunately, even under PLAN conditions, \_\_\_ acres of environmentally fragile lands will be lost to development during the 2008–2028 projection period.

## PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH

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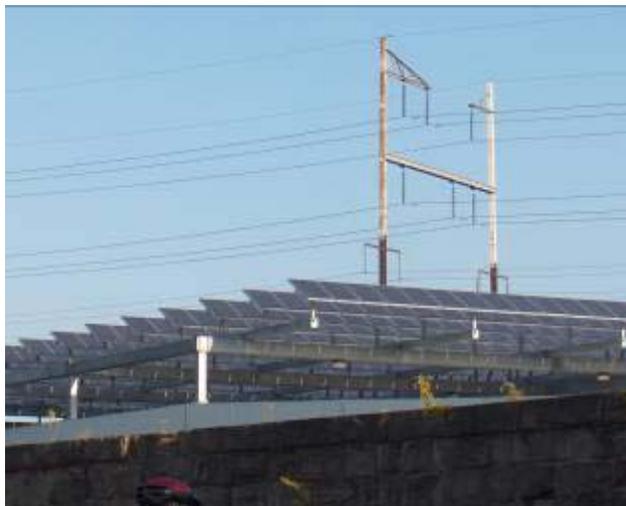
The key monitoring variable in determining whether PLAN offers an effective land conservation strategy is the share of land taken for development that is environmentally fragile. This portion should not exceed \_\_ percent, or approximately \_\_\_ of \_\_\_ total acres consumed for development.

## MONITORING VARIABLES

The number of acres of environmentally fragile lands converted, divided by the total lands converted, should not exceed 10 percent:

$$\frac{\leq 10\% \text{ Acres of Environmentally Fragile Lands Converted}}{\text{Acres of Developable Land Converted}}$$

## CLIMATE CHANGE AND ENERGY RESOURCES



Johnson & Johnson Headquarters, New Brunswick: Going solar  
Matt Crosby

## INTRODUCTION— CORE QUESTIONS

Climate change or global warming has become a major policy issue at the state, national, and international level over the past decade. Central to the issue of climate change is the development and use of various types of energy resources. The 2009 State Plan addresses climate change for the first time. The new emphasis on climate change leads to core questions concerning the impact of the State Plan:

- **Will the State Plan affect global warming?**
- **Will climate changes be altered due to basic differences in PLAN versus TREND projections?**
- **Will PLAN result in changes in land-use and transportation patterns that will reduce global warming?**

## BACKGROUND

Although many of the solutions to the climate crisis will have to be implemented by international authorities, governments at all levels are beginning to take action on the climate crisis. On June 21, 2007, New Jersey passed the Global Warming Response Act (GWRA), an aggressive bill that set targets to reduce greenhouse gas emissions by 20 percent (to 1990 levels) by 2020 and caps emissions at 80 percent of 2006 levels by 2050.<sup>38</sup> It requires the New Jersey Department of Environmental Protection (NJDEP) along with the Board of Public Utilities (BPU), the Department of Transportation (NJDOT), and the Department of Community Affairs (DCA) to develop a strategy to meet or exceed New Jersey's 2020 Stabilization Target for returning the state to 1990 greenhouse gas emission levels. NJDEP has been tasked with biennial monitoring, reporting and recommending action as needed.

In response to the GWRA, the draft State Plan includes a new chapter on the State Plan's ability to curb New Jersey's contribution to emissions that cause global climate change.

The *New Jersey Draft Global Warming Response Act Recommendation Report* states that as a result of the ever-increasing emissions of carbon dioxide the surface of the earth has warmed by over 1.3 degrees Fahrenheit. The report also notes that according to recent modeling efforts, regardless of any prospective policy changes, the average temperatures in New Jersey and surrounding states will rise 2.5 to 4 degrees Fahrenheit in the winter and 1.5 to 3.5 degrees Fahrenheit in the summer. These rising temperatures are expected to have the following health impacts:<sup>40</sup>

1. Increased heat stress, especially for the elderly, the urban poor and other vulnerable urban populations.

2. Increased levels of ground-level ozone which will result in quadrupling the number of days the state will fail to meet federal air quality ozone standards. Reducing motor vehicle and industrial emissions reductions may lower the increase.
3. Increased secondary fine particle formation, which has negative health impacts on children, the elderly and other vulnerable groups.
4. A possible facilitation of the northern spread of insects carrying diseases such as West Nile virus.

In addition to human health impacts, global warming could lead to the following changes in the natural ecosystems:<sup>41</sup>

1. Loss of critical habitation; especially hard-hit will be threatened and endangered species.
2. Changes in climate and water supply could impact agriculture and make New Jersey less favorable to blueberry and cranberry farming.
3. Warmer temperatures could result in an increase in evaporation and transpiration of moisture, thereby causing a reduction of water supply and dryer soil conditions. Conversely, warmer air holds more water vapor. Increased water vapor may result in more intense rain events.
4. Rising sea levels will have a more severe impact on New Jersey's coastline because of geological subsidence. The rising sea levels are not expected to significantly impact the permanent coastal flooding in the 2008–2028 time period but will increase the severity of storm-specific flooding in coastal and bay areas .

The possible economic impacts of global warming on New Jersey's tourism, agriculture and port industries are enormous. A reduction of the \$35 billion tourism industry, significant changes in the ability of the land to support crops, and the severity of weather conditions on the operations of ports could have a huge negative impact on the economy. However, if New Jersey responds expeditiously with appropriate policies to increase energy efficiency and reduce CO2 emissions, economic gains could help offset the economic impact of higher energy prices.<sup>42</sup>

The causes of anthropogenic climate change are multifarious—but all stem from a single source: the burning of carbon and its release into the atmosphere. The system that modern civilization has built is wholly dependant on the burning of massive amounts of fossil fuels for its sustenance. Cheap fossil fuels and a lack of concern about carbon emissions perpetuated wasteful practices in many aspects of U.S. society throughout the last 50 years.

It is evident that New Jersey's land uses follow this paradigm. The landscape of most of the United States, including most of New Jersey, consists largely of auto-oriented, single-use sprawl. When it was originally adopted, the State Planning Act directed the State Planning Commission to prepare and adopt a “coordinated, integrated and comprehensive plan for the growth, development, renewal and conservation of the State and its regions.”<sup>56</sup> The State Plan's purpose is to “identify areas for growth, agriculture, open space conservation and other appropriate designations.”<sup>57</sup> The plan calls for “concentrating new growth in...compact centers, in or near existing villages, suburbs, and urban neighborhoods.”<sup>58</sup> In short, the Plan

created a new smart growth paradigm in New Jersey.

It is likely that the State Plan already guides growth in a manner consistent with climate change goals, even if it is not explicit. However, the question of how much impact the State Plan can have on New Jersey's reduction in carbon emissions remains unknown.

There is also a connection between sprawl and residential energy use. The first link is through the transmission and distribution of electricity (T&D). Energy loss through T&D is greater in spread-out areas because longer wires are needed to connect electricity uses. Rong identifies the second link as the housing stock itself. Energy usage varies based on the housing type and size with smaller, denser units requiring less energy than larger, spread-out units. The age and quality of the unit also impacts its energy needs. The third link is between urban sprawl and the creation of urban heat islands (UHIs). Urban heat islands increase localized temperatures, which has both positive and negative effects on residential energy use. Higher temperatures can mean less energy use for heating during the winter, but more energy use for cooling in the summer.

The *Draft Global Warming Response Act Recommendation Report* suggests a number of long-term indicators that touch on land-use planning and transportation. The indicators are:<sup>47</sup>

1. Limit vehicle miles traveled (VMT) growth between now and 2020 to a rate of growth of no more than one percent per year.
2. Ensure that all VMT in New Jersey is "green" VMT (i.e., vehicles that get 33 miles per gallon or more) by 2023.
3. Hold greenhouse gas (GHG) emissions from on-road to a total of no more than 40 MMT by 2020.

4. That 90 percent of development in New Jersey will occur in areas already served by public infrastructure and 99 percent of that development will be in the form of redevelopment.
5. That at least 90 percent of all buildings in New Jersey be fully occupied,
6. That all new land-use and transportation investments will consider the need to adapt to the impacts of climate change.
7. That all New Jerseyans will have alternative transportation options to get to work beyond single-occupancy vehicles (SOVs).

The report envisions a New Jersey in which people will be able to move about freely and easily: there will be a wide variety of attractive, sustainable travel options, including walking, biking, ridesharing and mass transit. People will be able to live and work in well-designed, compact, sustainable, walkable, transit-friendly communities.

## RESIDENTIAL BUILDING STOCK

The impact of the residential building stock on greenhouse gas emissions varies by housing unit type, size, and location. Large units in lower-density areas, e.g. single-family detached units that are also the most popular type, create the most emissions in both their construction and maintenance. These units also have substantial energy loss through T&D emissions. Smaller units in multifamily complexes use less energy and therefore create fewer emissions. These types of units also contribute to lower emissions in other areas such as transportation (discussed below) because higher-density residential areas can reduce auto trips. However, so long as Americans' desire for single-family detached units on quarter-acre lots (or larger) continues, the

best approach for reducing residential housing stock emissions will be through more efficient building technologies and energy usage.<sup>59</sup>



Recently constructed row houses in Atlantic City  
Jon Erickson

This conclusion assumes two unsupported theories—that demand for single-family residences is fixed into the future (or at least likely to remain at previous levels) and that it is largely such demand that drives land-use patterns. It is expected that the former will decline in a future with rising energy costs and revitalized urban areas. The latter is empirically difficult to prove, since land-use patterns are driven by a combination of influences such as market demand and regulatory restrictions. However, the State Plan can help to reduce such barriers to the extent that it is the latter that influences urban form.

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## TRANSPORTATION



A New Jersey Transit bus on Main Street, Metuchen  
Jon Erickson

According to Professor Clinton Andrews of Rutgers University, “Increased use of transit-oriented development has the potential to reduce auto trips, and therefore emissions, but the relationship is difficult to quantify. The presence of heavy rail seems to cause some reduction in auto use, but only on the order of five to six percent. The existence of pedestrian facilities and quality design features is also necessary to encourage people to forms of transportation other than driving. The presence of transit aside, there is some evidence that increasing the overall network density of an area reduces auto travel. This suggests that even in the absence of transit, encouraging denser, village-style development could contribute to a reduction in automobile use.”<sup>60</sup>

Other research that has been conducted has shown a connection between smart growth and reducing climate change emitting gasses.

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<sup>60</sup> CITE FOR CLINTON ANDREWS

Better community planning and more compact development help people live within walking or bicycling distance of some of the destinations they need to get to every day—work, shops, schools, and parks, as well as transit stops. If they choose to use a car, trips are short. Rather than building single-use subdivisions or office parks, communities can plan mixed-use developments that put housing within reach of these other destinations.<sup>61</sup>

According to Professor Reid Ewing in his most recent book, *Growing Cooler*:

The body of research surveyed . . . shows that much of the rise in vehicle emissions can be curbed simply by growing in a way that will make it easier for Americans to drive less. In fact, the weight of the evidence shows that, with more compact development, people drive 20 to 40 percent less, at minimal or reduced cost, while reaping other fiscal and health benefits.<sup>62</sup>

As these forms of development have become more common, planning researchers and practitioners have documented that residents of compact, mixed-use, transit-served communities do less driving. Studies have looked at the issue from varying angles, including:

- research that compares overall travel patterns among regions and neighborhoods of varying compactness and auto orientation;
- studies that follow the travel behavior of individual households in various settings; and
- models that simulate and compare the effects on travel of different future development scenarios at the regional and project levels.

Regardless of the approach, researchers have found significant potential for compact development to reduce the miles that residents drive.<sup>63</sup>



**Fishing at Longport**  
Jon Erickson

One study found that “residents of the most walkable neighborhoods drive 26 percent fewer miles per day than those living in the most sprawling areas. A meta-analysis of many of these types of studies finds that households living in developments with twice the density, diversity of uses, accessible destinations, and interconnected streets when compared to low-density sprawl drive about 33 percent less.”<sup>64</sup>

Integral to the question of climate change is also the venerable concern about land consumption. Land consumption affects climate by increasing mobile source emissions and reducing New Jersey’s open space, forests and farmland, which aid in sequestration of carbon. Over one-half of New Jersey’s remaining agricultural land has been lost since 1950; 20 percent of the state’s wetlands have been lost since 1900. Implementation of the State Plan has already slowed

sprawl, and by extension, New Jersey's climate impacts. PLAN development will mitigate New Jersey's climate impact as well as enable New Jersey to adapt to the inevitable climate change that does occur.

The State Plan in many ways already addresses the issue of climate change. According to other studies that have been conducted, PLAN will likely have a significant impact. Other studies show that smart, planned growth has a significant effect on mitigating climate change, and the same is undoubtedly true in New Jersey.

The following sections of the State Plan pertain to climate change and energy resources:

## **Policy Statements from the Plan**

### **13.0 Energy Resources**

Ensure an adequate energy supply through facility modernization, and technological improvements, while shifting away from fossil fuel consumption and in favor of alternative renewable energy sources, cogeneration and conservation in ways that will promote beneficial economic growth while significantly reducing dependence on foreign energy imports and reduce greenhouse gas emissions in ways that are consistent with the vision and goals of the State Plan.

#### **THE CHALLENGE:**

*To secure a long-term energy supply, become more energy efficient and independent from foreign energy sources while conserving energy and reducing energy-related pollution including greenhouse gas emissions.*

## **Policy Statements from the Plan**

### **20.0 Climate Change**

Encourage land-use changes in the State's predominant settlement pattern and the transformation of the State's transportation system to lessen vehicle miles traveled (VMTs) and thereby reduce greenhouse gas emissions in ways that are consistent with the vision and goals of the State Plan.

#### **THE CHALLENGE:**

*To employ the State Plan's vision and goals more effectively to coordinate and integrate public and private sector activities to implement the State Plan's long-standing policy recommendations to reduce New Jersey's contributions to greenhouse gas emissions by achieving the limits articulated by Executive Order No. 54, the Global Warming Response Act, the New Jersey Energy Master Plan and The Draft Global Warming Response Act Recommendation Report.*

## **IMPACT ASSESSMENT— METHODS**

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### **EXPECTED DIFFERENCES BETWEEN TREND AND PLAN**

It is expected that PLAN development will produce less vehicle miles traveled (VMT) than TREND development. The more development in urban and inner-suburban counties, the less VMT. PLAN will have less VMT than TREND.

### **CRITICAL ASSUMPTIONS**

Vehicle miles traveled will be less in counties with greater densities. Those who move to denser counties will adopt the travel patterns of those counties

### **SCOPE AND DEPTH OF ANALYSIS**

The climate change assessment is a new component in the 2009 Impact Assessment. It was not done in either 1992 or 2000. The climate change assessment is undertaken by pairing travel miles and travel costs of those who live in counties of different development types with those households likely to locate in such a county. Those who live/commute in denser counties tend to make fewer automobile trips and use transit more; those who live in rural counties behave just the opposite—i.e., they make more trips using an automobile and very few using transit. This analysis assumes that those who will locate to a county of a particular type will alter their travel habits consistent with those who already live in that county.

In a prior study,<sup>65</sup> highly detailed modeling attempted to determine the travel behavior and cost of travel of those who lived in more dense versus less dense counties. The results, in the form of regression coefficients, determined trips per person in privately owned vehicles and by transit, as well as costs.

**TABLE 11.23 from Sprawl study**

## **IMPACT ASSESSMENT— FINDINGS**

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### **TREND FINDINGS**

### **PLAN FINDINGS**

### **PLAN VERSUS TREND FINDINGS**

### **COMPARISON TO PREVIOUS IMPACT ASSESSMENT FINDINGS**

### **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

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<sup>65</sup> Cite Costs of Sprawl study

**PRINCIPLES FOR FUTURE  
MONITORING BY THE OFFICE  
OF SMART GROWTH**

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**MONITORING VARIABLE**

# INFRASTRUCTURE ASSESSMENT

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**I**nfrastructure is defined as roads, bridges, mass transportation, airports, ports and waterways, water supply, waste treatment and disposal, energy supply, and communications. Infrastructure in the nation's cities and local jurisdictions is the support for the national economy. It is the foundation upon which industrial wealth is based; it is utilized by every citizen and all industries.<sup>66</sup> During the twentieth century, the United States invested massively in infrastructure: expanding ports, building road systems, creating airports, erecting dams, establishing power grids, and constructing water treatment facilities. In 1975, the United States spent 2.4 percent of its GDP on infrastructure. Japan stepped up infrastructure investment during the 1960s and 1970s, developing bullet trains, state-of-the-art highways, and signature airports and ports. Today, China spends about 9 percent of its gross domestic product on infrastructure development; India and Russia follow suit in attempts to ramp up new industry. As population growth and urbanization in developing countries strain inadequate infrastructure, mature, industrialized economies—in Western Europe, Canada and Australia—try to modernize aging systems and networks to remain competitive. The United States, meanwhile, must employ all efforts to stay ahead. In 2008, the Urban Land Institute's (ULI) *Infrastructure: Ante Up or Fall Behind on Infrastructure* warned that if more investment in certain crucial infrastructure areas was not entered into soon, the negative impacts on

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<sup>66</sup> Portions taken from *Infrastructure: Ante Up Or Fall Behind On Infrastructure*, by the Urban Land Institute; and Ernst & Young, *Infrastructure 2008: A Competitive Advantage*, co-published in April 2008 by the Urban Land Institute and Ernst & Young.

transportation efficiency, industrial productivity, and national competitiveness would severely cost the nation. According to ULI, if the United States was to improve its competitiveness and sustain its economic growth, there had to be continued investment in, and development of, basic local infrastructure

Infrastructure investments also have multiplier effects, especially since some investments are dedicated to high-return activities of small firms. ULI recognized this with the admonition that immediate attention must be paid to developing programs to determine the most promising new investment areas for public works. Strategic economic development seeks to improve both the quality of life and the standard of living of a state's residents. It does this by targeting areas of critical capital spending to expand existing growth nodes and to encourage new enterprises in areas where they currently do not exist. Business location decisions are heavily influenced by factors in a state that encourage business growth. In addition to a skilled labor force, these factors include adequate public facilities and high quality of life. Clogged transportation arteries frustrate commuters and disrupt the delivery of goods and services. The absence of water and sewer curtails the construction of businesses and housing.

A movement builds behind a solution for funding new roads and transit, easing road congestion and reducing car emissions. The initiative depends on new technologies and should influence behavior change. It's called user fees. But these aren't your old-fashioned tolls, imposed at a uniform rate and limited to a few major roads. Twenty-first-century user fees can entail the use of transponder technologies to

track driving by satellite and charge not only by the mile, but also by how, when, and where you drive. The idea is you pay more for traveling on congested roads during rush hour; driving heavier vehicles, which cause more road wear and tear; owning less fuel-efficient, higher-emission cars; and going longer distances.

In a free enterprise economy a state's economic health depends upon growth. Growth produces jobs, housing, and commerce. Growth is needed to generate tax revenues to maintain roads, transit systems, water and sewer systems, and other infrastructure. The best approach is to neither limit growth nor passively accept its consequences; it lies in managing public investment in infrastructure and natural resources wisely and in viewing economic development strategically. The reality is that without growth the bills cannot be paid; conversely, with too much growth, the bills escalate. The key is to provide enough infrastructure in an efficient way to enable growth to take place when and where the public wants it.

## ROADS

### INTRODUCTION— CORE QUESTIONS

In 2007, New Jersey had 8,371 miles of lanes, 4,503 miles of shoulders, 595 miles of ramps. Approximately 400 miles of roads in the state are under the jurisdiction of special authorities. Most of these roads are tolled; they are administered by the New Jersey Turnpike Authority, the New Jersey Highway Authority (Garden State Parkway), South Jersey Transportation Authority (Atlantic City Expressway), the Palisades Interstate Parkway, and Bridge Authorities. Other roads in the state account for more than 35,000 center line miles:

6,393 from county roads, 28,344 from municipal roads, and 649 from parks. The total of 13,469 centerline miles (NJDOT—lanes, shoulders, and ramps; 409 “other authority”-maintained roads; 6,392 county-maintained roads; 28,344 locally maintained roads; and 649 park-maintained roads) equals 49,263 center-line miles of roads in New Jersey. These road facilities serve the 5.7 million vehicles registered in the state, as well as traffic from other states. Some 65 billion vehicle-miles are traveled on the state's roads annually, a figure representing a 170 percent increase over the past 30 years (in the same time period, the state's population grew by only 27 percent and its labor force by 62 percent). Between 2003 and 2004, statewide annual vehicle-miles of travel (VMT) increased by about 2 percent, from 71.26 billion VMT to 72.68 billion VMT.

Of New Jersey's registered vehicles, 90 percent are passenger cars. Passenger car ownership has increased dramatically in the state. There is a contradiction in number of road-miles statewide between statistical tabulations (36,000) and GIS-mapped findings (45,000) state, up 130 percent in the past 30 years. Today, there are 1.6 passenger cars per household in New Jersey; the majority of the state's households own two or more vehicles. With more than 35,900 miles of public roads, 6,300 bridges, and 51 public-use airports, New Jersey has the most comprehensive and integrated transportation system in the nation. More than 80 percent of the statewide daily VMT occurs in urban areas. Of these urban daily VMT, about 75 percent takes place exclusively in the New York–Northeast New Jersey metropolitan area and 15 percent occurs in the Philadelphia area. The remaining 10 percent of urban daily VMT is distributed among the western and southern metropolitan areas and among small urban centers.

New Jersey is defined by two principal roadways—the New Jersey Turnpike and the Garden State Parkway. The New Jersey

Turnpike, operated by the New Jersey Turnpike Authority, is a major north-south automobile and truck route, traversing New Jersey from the George Washington Bridge to the Delaware Memorial Bridge Turnpike, generating nearly \$590 million in toll revenue (2008). The New Jersey Turnpike is the roadway used to traverse the state in a direction linked with I-95 to other destinations on the east coast of the United States.

The Garden State Parkway, operated by the New Jersey Turnpike Authority, runs 173 miles through 50 municipalities in 10 counties, from the New York State line at Montvale to the Cape May ferry in Cape May. Established by the New Jersey State Legislature in 1952, the Parkway includes a total of 359 exits and entrances. In 2008, the Garden State Parkway generated in excess of \$295 million in tolls. The Garden State Parkway is the major north-south commuting route in the state, linking the inexpensive housing markets of southern New Jersey with the lucrative employment markets of northern New Jersey. This roadway is also the principal carrier of New Jersey shore-goers in the summertime and Atlantic City visitors in all seasons.

In sum, New Jersey is a state with a significant number of lane-miles of different classes of roadways, from local to interstate. It is also a state that has been shaped by two major non-interstate roadways, the New Jersey Turnpike and the Garden State Parkway. Under any growth scenario, both of these two major roadways will be widened at their southern end. Also, under any growth scenario, local roads will be added to accommodate growth in the extreme northern and southern portions of the state and along its western edge from north to south.

The core questions to be answered in the course of this analysis are:

- **Is it possible to save a significant number of lane-miles of new roads under PLAN development as opposed to TREND development?**
- **If so, what will be saved in revenues by not building these roads, and to whom will these savings accrue?**
- **In what types of location and where in the state will potential road-building savings occur?**

## BACKGROUND

Fears about climate change and the demand for green space help people in the state link sustainability concerns with land-use decisions and needed funding for infrastructure improvements. Carbon-footprint issues galvanize attention, particularly about transportation, which is responsible for fully one-third of all emissions. People begin to understand how better-planned, higher-quality infrastructure helps the environment. Less congestion, from pricing schemes and new road systems, not only speeds travel but also reduces pollutants from idling engines. Denser, pedestrian-friendly communities near mass transit and shopping amenities decrease car dependence. Rail and bus service produces lower carbon footprints than automobiles do. Public green space in urban and suburban environments becomes more coveted.

The New Jersey Department of Transportation (DOT) and NJ TRANSIT recognize New Jersey's growing population and changing transportation needs. In order to meet future needs, the agencies plan for both the short term and the long term.

Federal and state laws require NJDOT and NJ TRANSIT to develop a Long Range Transportation Plan (LRP). The LRP identifies

## Policy Statements from the Plan

how New Jersey's transportation system can meet user expectations for the next 25 years. It establishes a vision and policy structure, sets forth strategies, provides a framework for directing investment, and identifies the financial resources to sustain the plan's vision.

As a statewide transportation policy document, *Transportation Choices 2030* sets the direction for future investments. The Regional Transportation Plans prepared by the state's three metropolitan planning organizations discuss how these strategies will be implemented in each region through specific studies and projects. This plan also satisfies federal and state legal mandates.

The integration of transportation and land-use planning, also referred to as smart growth, serves as the foundation for this long-range plan. Focusing development and redevelopment in centers that support public transit, walking and bicycling, and that shorten trips that must be made by car, is essential to achieving a sustainable transportation system. Continued investment in the following is also crucial to ensure New Jersey's continued growth and prosperity:

- Expanded and enhanced public transportation.
- Intelligent transportation systems (ITS) to improve operations.
- Facilities to move more freight by rail and policies that support moving freight during non-rush hours.
- Measures that shift travel out of cars, move trips to other times of the day and eliminate some auto trips.

# **2030 GOALS AND OBJECTIVES: LONG-RANGE TRANSPORTATION PLAN**

## **I. Improve and maintain the transportation infrastructure**

- Maintain the structural integrity and smoothness of ride on the state's highway system
- Reduce structural deficiencies and functional obsolescence on the state's bridges
- Maintain public transportation vehicles and facilities in a state of good repair

## **II. Integrate transportation and land use planning**

- Make transportation investments consistent with smart growth policies
- Establish partnerships at all levels of government and with the private sector to coordinate transportation and land-use decisions
- Encourage development and redevelopment around transit stations and services

## **III. Increase safety and security**

- Reduce the number and rates of transportation-related deaths and injuries
- Control access to sensitive transportation facilities (as defined by NJDOT's Office of Transportation Security)
- Improve emergency response and recovery

## **IV. Increase mobility, accessibility and the reliability of travel**

- Relieve congestion and delay for both highways and transit
- Expand the availability of public transit and increase the level of service
- Make walking and bicycling more practical
- Enhance connections between and among modes, especially access to transit
- Operate the transportation system efficiently
- Provide customers with real-time travel information
- Expedite incident management

## **V. Enhance the environment**

- Promote environmental stewardship
- Lower transportation emissions
- Reduce negative environmental impacts
- Exceed the requirements of environmental regulations
- Incorporate context-sensitive solutions in transportation design
- Encourage greater energy efficiency

## **VI. Optimize freight movement**

- Relieve congestion on heavily traveled truck routes
- Improve truck connections to the ports
- Increase the amount of freight shipped by rail by at least the same rate that the volume of overall goods movement increases
- Support the development and reuse of under-utilized properties for freight purposes

## **VII. Continually improve the process of providing transportation facilities and services**

- Involve customers in the decision-making process by providing clear information and a forum for discussion
- Improve customer satisfaction with NJDOT and NJ TRANSIT
- Deliver projects and services in a timely and cost-effective manner

## **VIII. Operate the transportation system efficiently**

- Promote smooth flow of traffic on major roadways and transit lines
- Provide customers with real-time travel information
- Expedite incident management

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Source: 2030 New Jersey Statewide Long-Range Transportation Plan

# IMPACT ASSESSMENT— METHODS

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## OVERVIEW

The 2009 analysis of road infrastructure for both TREND and Plan alternatives follows the earlier methodology found in the 2000 and 1992 assessments. There is no realistic way of doing a full-blown network model for New Jersey that moves from future projections of trips generated through distribution to assignment. At this time traffic modeling in New Jersey is split among regions, with differing approaches and modeling packages. There also is the issue of scale. The projections of population and households to 2028 are at the municipal level, making the municipality the unit of analysis for model construction.

## EXPECTED DIFFERENCES BETWEEN TREND AND PLAN

The CUPR ROAD model used in this analysis asserts that there is a connection between population density and the provision of road infrastructure. Furthermore, the model focuses on those roadway elements provided by municipal and county governments in support of development. As communities grow, local and collector streets are constructed. These roads support access to residential, commercial and industrial development. Population density has been found to be an excellent surrogate for the pressures of development and the need for local roads. The relationship between population density and road infrastructure is nonlinear and generally supports the concept of the efficiency of infill development over residential and commercial construction in empty fields.

If population goes predominantly to outer-suburban and rural communities under TREND, given a lack of roads in these locations, more roads will have to be built. If population goes more to urban and inner-suburban communities under PLAN, given a surplus of roads in these locations, fewer roads will have to be built.

The CUPR ROAD model employed in this study was developed in 2005. The local road data used to construct the ROAD model were taken from the 2003 Streets USA files provided by ESRI. This dataset represents the New Jersey road system as of 2000, making it comparable to 2000 census information. Visual inspection of aerial photographs with both the local road files available from New Jersey Department of Transportation (NJDOT) and the Streets USA files showed that Streets USA to be slightly more complete. There was a small set of new suburban developments in Streets USA that did not appear in the NJDOT database. The Streets USA database is an enhancement of the federally supported TIGER network, contains appropriate roadway identifiers, and paints an excellent picture of road infrastructure in New Jersey. Using GIS, local road links were identified and separated from the state and federal systems. The lengths of the road segments were measured and summed by municipality. The calculation was based on centerline road length, ignoring the number of lanes in the roadway. While the presence of state and federal highways, such as Route 18 and Route 1 in central New Jersey, is broadly connected to population geography and size, these roadways are not specifically local decisions. These highways are regional in scale and effect, planned and constructed by the state department of transportation to serve broad multi-county needs.

The ROAD model operates at the municipal level, keyed to the population projections developed for TREND and Plan. The general model is both simple and robust—street length

density is predicted by population density. Also, the relationship is nonlinear, suggesting interesting policy implications. A number of alternative statistical models have been tested, but remarkably the model structure discussed below and used in earlier state plan impact studies, is found to be the most appropriate.

## CRITICAL ASSUMPTIONS

The ROAD model consists of four submodels, each of which is designed for a different set of New Jersey municipalities. The Base submodel operates on the bulk (490) of New Jersey’s 566 municipalities. As shown in table \_\_\_\_, fully 80 percent of municipalities have population densities of 5,000 per square mile or less. Only 13 have densities exceeding 15,000 persons per square mile. These very dense cities require a separate model design—the Dense City submodel.

<b>TABLE . Population Density Groupings, New Jersey Municipalities, 2008</b>					
		<i>Frequency</i>	<i>Percentage</i>	<i>Valid Percentage</i>	<i>Cumulative Percentage</i>
Valid	5,000 or less	457	80.7	80.7	80.7
	5,000 to 10,000	76	13.4	13.4	94.2
	10,000 to 15,000	20	3.5	3.5	97.7
	Over 15,000	13	2.3	2.3	100.0
	Total	566	100.0	100.0	

New Jersey is also characterized by an extensive shoreline and a host of summer communities that have a large seasonal population. These “seasonal communities” have road systems built to support summer traffic, but have small year-round populations. Some of these are in the process of conversion from occasional to year-round occupancy, such as Egg Harbor Township, yet still reflect road systems that are overbuilt for populations counted by Census as year-round. For the purposes of this study, these recreational communities are defined as those with more than 10 percent of housing units classified as in occasional use as of Census 2000

(table \_\_\_\_). They range from Harvey Cedars with 81 percent occasional use to Spring Lake Heights, Dover Township in Ocean County and Vernon at 11 percent. Some of these municipalities are converting from recreational to full-time, but still have embedded infrastructure from the earlier periods. The relationships between population and street density are different from the majority of New Jersey communities. These seasonal communities have an abundance of roads relative to their year round populations, and require a separate analytic approach—the Seasonal Community Submodel.

<b>TABLE . Occasional-Use Dwelling Units, New Jersey Municipalities, 2008</b>					
		<i>Frequency</i>	<i>Percentage</i>	<i>Valid Percentage</i>	<i>Cumulative Percentage</i>
Valid	10 percent or less	505	89.2	89.2	89.2
	More than 10 percent	61	10.8	10.8	100.0
	Total	566	100.0	100.0	

Finally, there are five municipalities in New Jersey with less than 100 housing units. These are excluded from the model due to their size. Their road infrastructure will be calculated using a ratio technique. The five towns municipalities are shown in table \_\_\_\_.

<b>TABLE . Small Municipalities, New Jersey: Total Households, 2008</b>		
<i>Municipality</i>	<i>County</i>	<i>Households</i>
ROCKLEIGH BORO	BERGEN	80
TETERBORO BORO	BERGEN	8
PINE VALLEY BORO	CAMDEN	21
TAVISTOCK BORO	CAMDEN	7
WALPACK TWP	SUSSEX	34

To summarize, four different modeling approaches are used to project 2028 road needs. The four models are:

- **Base Submodel**—The 490 municipalities with over 100 households that have population densities less than 15,000

persons per square mile and are not classified as seasonal.

- **Dense City Submodel**—There are 13 municipalities with population densities in excess of 15,000 persons per square mile
- **Seasonal Community Submodel**—There are 58 municipalities that have a significant number of dwelling units that are occupied seasonally.
- **Small Community Submodel**—The five extremely small towns with less than 100 households require a straightforward ratio approach.

## Base Submodel

Given a power function analysis of municipalities that have a population density of 15,000 or less, are not a “recreational community,” and are not extremely small, we see a strong fit of the power function. The statistical fit is very strong with an R-square of .88 (or 88 percent explained variation). The power function is estimated at:

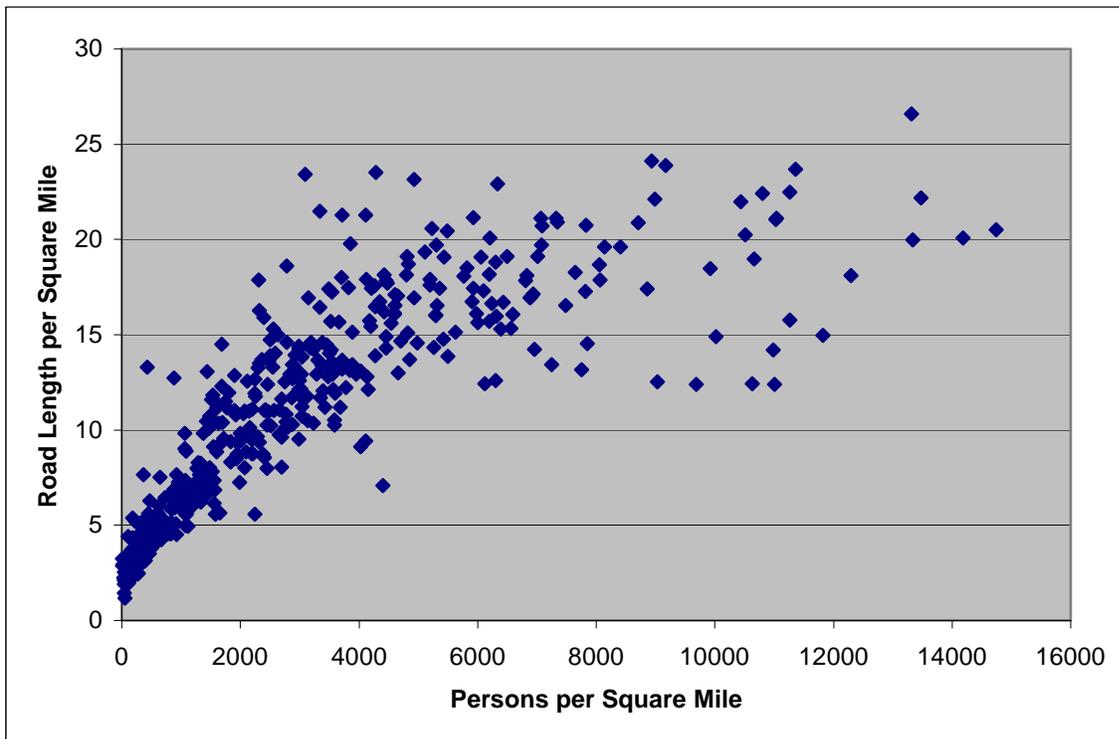
$$\text{Local Road Density} = .305 * \text{Population Density}^{.457}$$

**TABLE . Base Submodel Statistics**  
**— Model Summary and Parameter Estimates —**

*Dependent Variable: Road Density*

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Power	.880	3563.078	1	488	.000	.305	.457

Note: The independent variable is population density in 2008.



**FIGURE \_\_\_\_\_.** Road density versus population density, base municipalities

### Dense City Submodel

For the higher-density municipalities (N = 13), the pattern is generally the same as for the base municipalities. The 13 communities are listed in table \_\_\_\_\_. They are typically

older, containing heavily urban concentrations and development patterns featuring dense road systems.

		Municipality	County
1		CLIFFSIDE PARK BORO	BERGEN
2		FAIRVIEW BORO	BERGEN
3		EAST ORANGE CITY	ESSEX
4		IRVINGTON TWP	ESSEX
5		EAST NEWARK BORO	HUDSON
6		GUTTENBERG TOWN	HUDSON
7		HOBOKEN CITY	HUDSON
8		JERSEY CITY	HUDSON
9		UNION CITY	HUDSON
10		WEEHAWKEN TWP	HUDSON
11		WEST NEW YORK TOWN	HUDSON
12		PASSAIC CITY	PASSAIC
13		PATERSON CITY	PASSAIC
Total	N	13	13

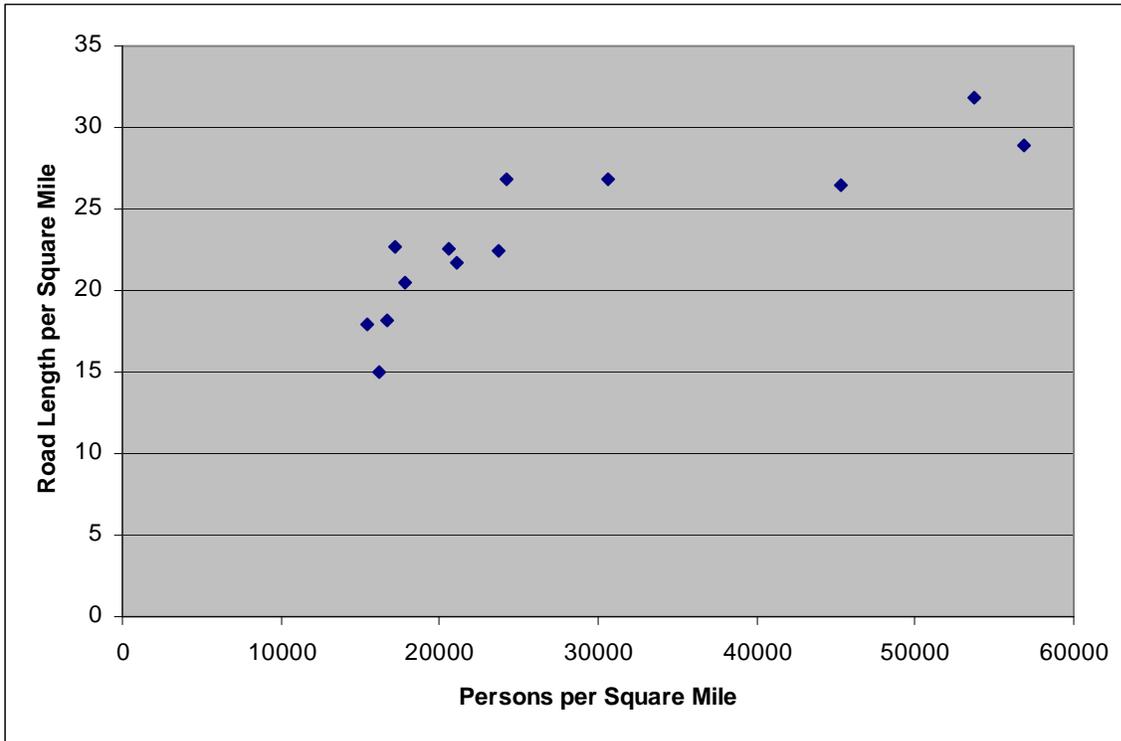
As shown in table \_\_\_\_, the relationship is nonlinear. The power function shows an R-

square of 73 percent, which is quite strong:

$$\text{Local Road Density} = .436 * \text{Population Density}^{.391}$$

<b>TABLE . Dense-City Submodel Statistics</b> <b>— Model Summary and Parameter Estimates —</b>							
<i>Dependent Variable: Road Density</i>							
Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Power	.728	29.442	1	11	.000	.436	.391

Note: The independent variable is population density in 2008.



**FIGURE \_\_\_\_\_.** Road density versus population density, dense municipalities

### Seasonal Community Submodel

In those municipalities that have sizeable seasonal populations, as do a number of towns along the New Jersey shoreline, a separate analysis is required. There are 61 seasonal communities where the Census-defined occasional use measure is greater than 10 percent (table \_\_\_\_). Of these 61 municipalities 3 are very small with less than 100 households in 2000. None of these have population densities greater than 15,000 persons per square mile. Most (54 municipalities) have densities less than 5,000 persons per square mile.

.Once again, the nonlinear power function has the greatest explanatory power. The R-square is very strong with a 75 percent explanatory power (table \_\_\_\_). Interestingly, the optimal breakpoint defining a seasonal community is 10 percent or more occasional use. The model is less robust at higher occasional use percentages, reflecting the seasonal heritage of these communities even as they convert to full-time.

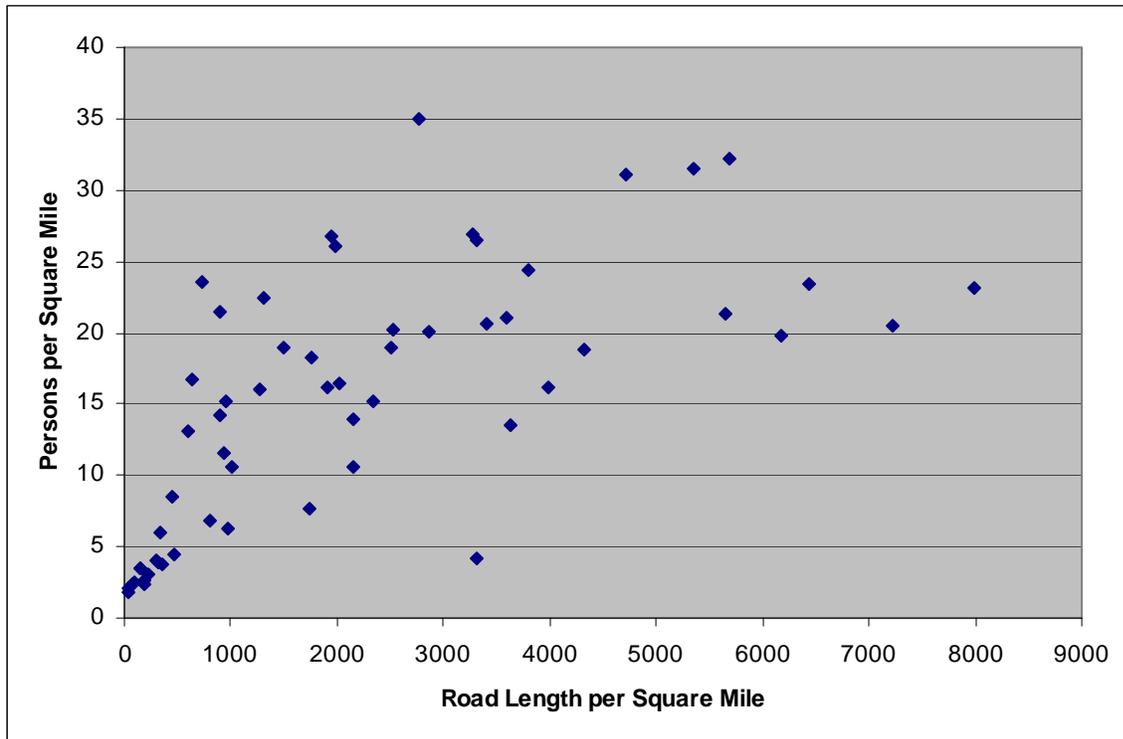
$$\text{Local Road Density} = .245 * \text{Population Density}^{.544}$$

**TABLE . Seasonal Community Submodel Statistics  
— Model Summary and Parameter Estimates —**

*Dependent Variable: Road Density*

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Power	.747	165.263	1	56	.000	.245	.544

The independent variable is population density in 2008.



**FIGURE \_\_\_\_\_.** Road density versus population density, seasonal municipalities

Finally, the set of five very small municipalities are modeled assuming the ratio of road lengths to population density found in 2000 will continue into the future.

# IMPACT ASSESSMENT— FINDINGS

## TREND

The results of the TREND projections to 2028 are broken out by three different categories. As shown in table 12 there are broad variations in additional miles required by municipal type. The local road systems in outer suburban municipalities grow by almost a third, while the inner suburbs grow modestly. Rural areas are also impacted, adding 2,400 miles, or 27 percent, to the year 2000 inventory. Overall, statewide population growth requires fully 25 percent additional centerline miles.

<i>Municipal Type</i>	<i>Total Local Centerline Miles, 2000</i>	<i>Additional Centerline Miles, 2008–2028</i>	<i>Percentage Increase, 2008–2028</i>
Urban	3,027	622	20.5
Inner Suburban			13.7
Outer Suburban	12,510	1,715	32.8
Rural	9,000	2,403	26.7
TOTAL	42,289	10,559	25.0

The regional differences in new local roadway construction are also striking (table \_\_). The central part of the state receives the greatest amount of local roadway development, fully 30 percent. The northern and southern parts of the state develop at a scale less than the state as whole, and significantly less than the North.

<i>Region</i>	<i>Total Centerline Miles, 2000</i>	<i>Additional Centerline Miles, 2008–2028</i>	<i>Percentage Increase, 2008–2028</i>
North	13,719	3,025	22.0
Central	14,670	4,411	30.1
South	13,900	3,124	22.5
TOTAL	42,289	10,559	25.0

The planning area analysis splits the state into two classes: PAs 1-3 and PAs 4 and 5. The PAs 1-3 lands receive the least growth, adding only 4,500 miles of roadway, while PAs 4 and 5 have significantly more development and must add more than 6,000 miles of roadway (table \_\_).

<i>Planning Area</i>	<i>Total Centerline Miles, 2000</i>	<i>Additional Centerline Miles, 2008–2028</i>	<i>Percentage Increase, 2008–2028</i>
PAs 1, 2, 3	21,846	4,478	20.5
PAs 4, 5	20,443	6,081	29.7
TOTAL	42,289	10,559	25.0

The CUPR ROAD model operates at the municipal level and offers projections of local road needs to future years. The model has been used both in New Jersey for State Plan evaluation as well as in other states and at a national level. Analysis of TREND projections to 2028 shows the need for an additional 10,560 miles of local road infrastructure. There are significant variations by municipal type, region and planning area.

## **PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH**

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### **MONITORING VARIABLES**

### **PLAN FINDINGS**

#### **PLAN VERSUS TREND FINDINGS**

#### **COMPARISON TO THE PREVIOUS IMPACT ASSESSMENT FINDINGS**

#### **CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS**

# TRANSIT

## INTRODUCTION— CORE QUESTIONS

Transit is multiple-occupancy vehicular passenger services provided to the general public primarily via bus, rail, vanpool, and special-service vehicles. The “flexible funding” provisions of ISTEA and its successors, TEA-21 (the Transportation Equity Act for the 21st Century) and SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users), refer to those programs whose funds may be used for either transit or highway projects.

The significance of these provisions cannot be overstated. The bill drafters intended to give planners and decision makers at state and local levels the authority to transfer funds in either direction between highways and transit, based on locally defined needs and goals. This freedom of financing greatly enhances the ability to use alternative solutions to achieve a more balanced transportation network. A key to determining whether the flexible funding provisions are affecting transportation investment decisions as the legislation’s authors in Congress intended is to identify the amount of funding available for transfer and to establish to what extent local policy-makers actually do transfer those funds between highway and transit allocation. This process can inform us as to how well communities understand and are implementing these innovations in transportation decision making.

Under ISTEA, TEA-21 and SAFETEA-LU, money appropriated for most programs can be transferred to another one, with certain restrictions. The complexity of the conditions for transfer depends upon the program initially

receiving the funding. During the first eight years of flexible funding, from FY1992 to FY1999, \$33.8 billion in highway money from the Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality Improvement Program (CMAQ) alone was available for transfer. Of this amount, \$4.2 billion was transferred from highway programs to transit projects administered by the Federal Transit Administration (FTA). This accounts for 12.5 percent of all STP and CMAQ money available over the eight years. New Jersey was the ninth of 50 states in percentage amount of such transfers (17.4 percent) and the sixth of 50 states in the dollar amount (\$171.1 million). This was 1.5 times the median percentage amount and twice the average absolute amount transferred in other states. New Jersey clearly is aware of the significance of ISTEA and TEA-21 and the role of transit in transportation policy. Why is this so? New Jersey is served by a wide variety of transit modes that are vital to the state’s economic and social well-being and its quality of life. Four of the top 10 cities nationwide with the highest percentage of workers using public transit are found in New Jersey (Newark, Jersey City, Elizabeth, and Atlantic City) (see figure \_\_\_\_). Most of these services are provided by one carrier, NJ TRANSIT. This statewide organization is a quasi-public entity that covers a service area of 5,325 square miles and a service population of 7.7 million.

NJ TRANSIT is the nation’s third-largest provider of bus, rail, and light-rail transit, covering a service area of 5,325 square miles; it links major points in New Jersey, New York, and Pennsylvania. The agency’s fleet of 2,035 buses, 133 locomotives and 900 revenue train cars, and 13 light-rail vehicles serves more than 400,000 customers on 238 bus routes, 11 rail lines, and 3 light-rail lines statewide. NJ TRANSIT provides more than 223 million passenger trips encompassing about 2.92 billion passenger miles each year. NJ TRANSIT

controls 997 miles of rail line and 107 miles of light-rail line accommodating 58.8 million trips a year.

Passengers use 162 different rail stations and 52 light-rail stations in 15 of New Jersey's 21 counties. The rail system has 11 different lines divided into three main divisions. The Hoboken Division operates lines to and from Hoboken Terminal on the Morris & Essex, Main/Bergen, Pascack Valley, and Boonton lines. The Newark Division includes the Northeast Corridor, North Jersey Coast, and Raritan Valley lines. The Atlantic City Rail Line operates service between Atlantic City and Philadelphia. The map of rail lines shows the "spoke" design of these lines, which radiate out from New York City (see figure \_\_\_\_).

Although NJ TRANSIT is the predominant bus operator in the state (2,035 buses), one-third of bus transportation in New Jersey is provided by 110 private companies (973 buses). Together, public and private carriers serve every region of the state, from small towns and suburbs to heavily populated cities. With 238 bus routes, NJ TRANSIT carries 164.3 million riders annually, collected from 20,000 bus stops throughout the state. This is three times the annual rail ridership in the state. In addition to direct NJ TRANSIT operations, there are a variety of other systems such as contract carriers funded by NJ TRANSIT, specialized fixed-route systems such as WHEELS serving train stations and employment centers, and demand-response systems for the elderly and disabled. The broad distribution of bus lines in New Jersey is shown in figure \_\_\_\_.

Ridership on NJ TRANSIT's New York City-centered rail system has grown by more than 65 percent since 1991 through expansion projects that increased ridership to a total of 130,000 daily riders in 2008. To handle the crowds, the agency added 400 cars and 57 locomotives over a five-year period (2003-2008).

Core questions relating to this portion of the analysis are:

- **Will PLAN development, because of its location and increased density, contribute to increases in transit use in the state?**
- **If these transit increases occur, are they meaningful in terms of their impact on trips via other modes?**

## BACKGROUND

With 8.7 million residents and nearly 1,160 people per square mile, New Jersey is the most densely populated state in the nation. Without a large array of mobility options, the state would experience gridlock.

The creation of transit hubs is vital to success. Relatively recently, NJT opened the Wayne Route 23 Transit Center and Mount Arlington Center, both intermodal facilities with convenient highway access and parking. In addition, NJT unveiled the newly renovated Hackensack Bus Terminal with improved customer amenities and the Trenton Transit Center, which was rebuilt and expanded to offer more amenities and improved connections between bus, light rail, and commuter rail services.

In renewing the Transportation Trust Fund, NJ TRANSIT invested more than \$350 million during the last three years on new equipment such as multilevel railcars and modern buses, and is expanding maintenance facilities to improve reliability and efficiency. Funding from the New Jersey Turnpike Authority will help to advance the new mass transit tunnel in order to relieve congestion on the Turnpike's spurs and other highly congested areas.

## Access to the Region's Core

The mass transit tunnel project remains the state's number one transportation investment that will pay dividends for generations. When this critical regional project is complete, new trans-Hudson tunnels will double rail capacity between New Jersey and New York, opening new job markets and economic opportunities to maintain the region's competitiveness. In the short term, new modern equipment is providing more seats and linking travelers to work, educational, recreational, and cultural destinations.

These transit investments have contributed to the profound ridership increase and removed automobiles from the road while reducing energy consumption and more than a million tons of greenhouse gas emissions annually in New Jersey. Once the new mass transit tunnel project is completed, greenhouse gases will be reduced by another 20 percent, creating a legacy for this generation and beyond.<sup>67</sup>

## Policy Statements from the Plan

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<sup>67</sup> This section taken from \_\_\_\_\_.

## IMPACT ASSESSMENT— METHODS

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Transit in New Jersey will be evaluated using two different models. The first is a regression-based model that predicts increases in the number of people using transit based on population density and proximity to a bus or train station. The model uses information on these three variables for all 566 municipalities. A regression equation predicting change in transit users (for the worktrip) in each municipality is created. Since density of a municipality varies according to population increases under a TREND or PLAN scenario, differences between the two should be noticeable. A second community-profile model predicts change in number of transit users according to current levels of transit use. This model keeps the percentage incidence of current transit users constant by municipality and assumes that those locating to a municipality under one or the other future development scenario will adopt a pattern of transit use consistent with existing levels. This generates different transit usage levels under each scenario.

## EXPECTED DIFFERENCES BETWEEN TREND AND PLAN

PLAN conceivably will place more population in older, mature municipalities that are both more densely developed and more likely to have transit service. Since bus or rail services are more likely to be available there, it is expected that residents will be more likely to use these services. Therefore, one can conclude that there probably will be more transit use under the PLAN development scenario.

## CRITICAL ASSUMPTIONS

The measure of transit use is the percentage of transit use by municipality for the worktrip, as found in the 2000 U.S. Census and derived from the Census Transportation Planning Package (CTPP). This is influenced by those tallied by the latest 3-year release of the *American Community Survey* (2008). No other statewide transit-use indicator exists at this time. The use of the worktrip to estimate transit mode choice is quite reasonable: The worker is more likely to consider transit as an option for the repetitive worktrip than for a recreational, shopping, or social trip.

## SCOPE AND DEPTH OF ANALYSIS

### Regression Model

The regression analysis of transit use in municipalities employs statistical analysis and geographic information systems (GIS) technology. After extensive examination of available municipal data, a regression equation has been developed that predicts municipal transit use as dependent on three variables—municipal population density, proximity to a bus line, and proximity to a train station. The basic assumption is that increased population density is keyed to lower rates of car ownership and to greater proximity to bus and train services. In the regression model, the train stations and bus lines are superimposed on municipal boundaries using GIS. All municipalities are classified either as having or not having bus and train service. The regression equation is shown below:

$$\text{PercentTransitUse} = c + x \text{ PopDensity} + y \text{ NearBus} + z \text{ NearRail}$$
$$c = 0.753 \quad x = 0.0007319$$
$$(t = 18.324 \text{ and significance level} = 0.000) \quad y = 1.004$$
$$(t = 2.564 \text{ and significance level} = 0.011) \quad z = 2.476 \quad (t = 7.054 \text{ and}$$
$$\text{significance level} = 0.000) \quad N = 566 \quad \text{Adjusted R Square} = 0.497$$

The three explanatory variables predict about one-half of the total variation in the data. They clearly are independent of each other and appear to be reasonable choices. The propensity to use transit varies by population density and access to rail and bus. The propensity for transit use under both TREND and PLAN scenarios is determined by estimating the number of persons who would use transit to commute to work in each municipality. This estimate of additional transit users is obtained by multiplying the percentage of transit use in a municipality (from the regression equation) by the number of resident workers.

## Planning Area Centers

### *Community Profile Model*

The second analysis of transit ridership predicts future transit use based on past use. Differing population projections under the TREND and PLAN scenarios by municipality multiplied by existing use percentages also by municipality will produce different levels of populations in communities and thus different levels of new transit users. Again, the individual component of transit use considered is worktrips in 2000, influenced by those tallied by the latest three-year release of the *American Community Survey*.

## TREND FINDINGS

As would be expected, transit use increases somewhat under TREND conditions—by 14,000 worktrip users, or 5 percent. This figure represents about 8 percent of the increase of all trips; almost 92 percent of all new worktrips will be made using an automobile. Not surprisingly, transit growth follows. Reported results are the average of the two methods.

Sixty-eight (68) percent of the growth will take place in the northern half of the state; the growth in transit worktrip users will increase by 55 percent in this region (approximately 9,500). Thirty-two percent of the population growth will take place in the southern region; transit worktrip users will increase by 30 percent in this region (approximately 4,500).

Transit worktrip users under TREND conditions will increase more in inner-suburban communities (10,500) than in rural (3,000), outer-suburban (1,000), or urban (-200) communities. Transit worktrip users will increase to a greater degree in the communities with more densely developed planning areas (9,000) as opposed to communities with less densely developed planning areas (5,000), and about the same in communities with urban, regional, and/or town centers (7,000) as in communities without large centers (7,000) (see table \_\_\_\_\_).

## PLAN FINDINGS

Under PLAN conditions, most of the above-cited transit trends are increased by nearly 30 percent. Transit for worktrip users will increase by 18,000, or 9 percent overall. Approximately 14,000 of these additional worktrip users will be in the northern half of the state and 4,000 in the southern half. Approximately 8,000 of these additional worktrip users will be found in suburban communities, 7,000 will be found in urban communities, and 3,000 will be found in rural communities. Reported results are the average of the two methods. Eleven thousand (11,000) transit users will emerge in communities with more densely developed planning areas, and 7,000 will emerge in communities with less densely developed planning areas. Finally, 13,000 transit worktrip users will be found in communities with urban, regional, and/or town centers; and 5,000 in communities without large centers (see table \_\_\_\_).

## PLAN VERSUS TREND FINDINGS

PLAN versus TREND findings are as expected. Under the PLAN scenario, the worktrip transit use increase will be one and one-half times that of TREND development—an additional 4,000 transit worktrip users. Transit use will increase dramatically in the northern (8,000) and southern (6,000) parts of the state, in urban/inner-suburban communities (11,500), in communities with more densely developed planning areas (9,250), and in communities with urban, regional, and/or town centers (12,000). Transit use will be far greater under PLAN conditions than under TREND conditions in each of the more urban, more densely developed, and more center-oriented communities examined in this impact assessment (see table \_\_\_\_).

## COMPARISON TO PREVIOUS IMPACT ASSESSMENT FINDINGS

Neither the 1992 nor the 2000 State Plan Assessments contained the kind of statistical and GIS analysis of transit use found here. Instead, transit use was established using a normative model of the expected relationship between transit propensity and net residential density. However, in both the current evaluation and the 1992/2000 analyses, similar findings are evident—PLAN development is more likely to support transit use than is TREND development. In a dense and small state, where it is increasingly obvious that road building will not provide a way out of traffic congestion, the center-oriented compact development of the PLAN scenario offers increased opportunities for transit use to lessen congestion in the region by enhanced service in its more urbanized areas.

## CONCLUSIONS AND IMPLICATIONS OF THE FINDINGS

PLAN development over the next 20 years will enable a near-30 percent increase over TREND in transit use for the worktrip. In other words, by locating a portion of the future growth in population to the more densely developed planning areas from areas that are not as densely developed, transit use will increase by one-half. This change will not require extraordinary transit subsidy or punishing gasoline tariffs. Rather, more compact development patterns will create density to the point where transit use will become feasible, and current use patterns will be extended to new populations that will locate to these higher-density areas.

# PRINCIPLES FOR FUTURE MONITORING BY THE OFFICE OF SMART GROWTH

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## MONITORING VARIABLES

Transit use is best monitored by continually examining ridership numbers and by identifying opportunities for transit enhancement. The construction of transit-friendly developments and the commitment of NJ TRANSIT and other providers to offer increased transit services should be encouraged. This means that the Office of Smart Growth must monitor center development and encourage infill activities in conjunction with the monitoring of transit provision.

# WATER AND SEWER INFRASTRUCTURE

## INTRODUCTION— CORE QUESTIONS

### Water Infrastructure

At present, repairs and replacements of the state's water and sewage pipes and treatment plants are estimated at more than \$20 billion. With the average age of sewer lines being over 70 years and the estimated life expectancy of pipe at 50 years, unanticipated failures may occur in the near future. If the ever-increasing need to keep pace with regulatory discharge requirements is added to the age factor, the cost assessment increases to nearly \$24 billion.

New Jersey's water needs outpace its current ability to fund projects by a large margin. For the Drinking Water State Revolving Fund (SRF) program, the state's most recent Intended Use Plan lists 181 projects at a total cost of at least \$625 million.<sup>68</sup> In 2008, federal contributions to New Jersey's drinking water funding efforts decreased by 35.5 percent since the Drinking Water SRF was implemented in 1997 (51.9 percent when adjusted for inflation).<sup>69</sup>

For the Clean Water State Revolving Fund program, which goes toward wastewater infrastructure, the state's most recent Intended Use Plan lists 94 projects at a total cost of \$892 million.<sup>70</sup> In 2008, the state received \$27.8 million in federal funding<sup>71</sup>—enough to finance 3.1 percent of its needs.

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<sup>71</sup>

Federal contributions to New Jersey's wastewater funding efforts have decreased by 66.8 percent since the Clean Water SRF was fully implemented in fiscal year 1991, and 79.0 percent when adjusted for inflation.<sup>72</sup>

Public water supplies in New Jersey are currently provided by more than 656 community water systems (ranging from systems for individual subdivisions to large metropolitan systems) and 3,990 noncommunity water systems. The total number of public water systems in New Jersey is 4,646. A combination of reservoirs, river intakes, and well systems is used, with more than half the total supply drawn from groundwater. The New Jersey Department of Environmental Protection published a Statewide Water Supply Plan in 1996 that included a \$1.087 billion action plan. A United States Environmental Protection Agency Drinking Water Infrastructure Needs Survey (DWINS), published in 1997, estimated 20-year needs from 1995 to 2015 in New Jersey to be \$3.613 billion in 1995 dollars. Needs for all states totaled \$136.7 billion. The 1996 Water Supply Plan updated a 1982 plan. Using a water balance model and projections of population growth to 2040, NJDEP analyzed surpluses and deficiencies among water supplies by watershed and advanced programs of management measures and capital improvements. Estimating a total safe yield for surface water supplies in New Jersey of approximately 850 million gallons per day and a total safe yield for groundwater supplies of approximately 900 million gallons per day, NJDEP projected that the total safe yield of 1,750 million gallons per day was generally sufficient to meet estimated 1990 demands of 1,500 million gallons per day but would not satisfy the projected 2040 demand of 1,790 million gallons per day for a population of 8,933,212. (This population is currently projected to be exceeded by 197,061 by 2020).

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The Water Supply Plan included a number of studies and projects that were currently proposed, in progress, or completed since 1982, and contained \$786.55 million in capital projects. Many of these capital projects involved private and other public funds, as the Water Supply Bond Fund contributed or is proposed to contribute \$21.55 million toward these projects. The 1996 Federal Safe Drinking Water Act Amendments directed USEPA to conduct a survey of the infrastructure needs facing community public water systems. Non-community water systems, private individual water supply wells, and projects solely for future growth were not addressed by the survey. The first survey, released in 1997, was used to develop a formula to allot funds for Drinking Water State Revolving Fund grants to states.

The breakdown of costs in New Jersey reflects what is typical nationwide—i.e., the total costs for large systems are significantly higher but are the smallest on a per-household basis. Conversely, investments for small systems tend to have the highest per-household costs. Included in the costs presented below are \$175.6 million (1995 dollars) in present needs to meet current Federal Safe Drinking Water Act requirements in New Jersey (\$212.1 million for 20-year needs). Approximately \$384.4 million in costs is estimated to meet needs associated with the adoption of proposed new Federal Safe Drinking Water Act regulations. It is estimated that an additional \$1,127.8 million is required to address related needs in New Jersey, such as distribution system improvements (including transmission mains from source to treatment or from treatment to distribution systems). The needs identified in the NJDEP Statewide Water Supply Plan and the USEPA Drinking Water Infrastructure Needs Survey overlap, but not completely.

The USEPA study does not address non-community public water supplies or private individual water supply wells. The USEPA study addresses future needs that may result from changes in performance standards, but not future needs associated with new growth. In contrast, the NJDEP plan does not distinguish between capital projects needed for current needs and projects to meet future needs occasioned by projected growth. The impact assessment contained here estimates these latter needs.

## **Sewer Infrastructure**

In 2006, the date of the most recent nationwide needs assessment for wastewater treatment facilities, there were 145 sewage treatment plants and 516 collection systems in New Jersey, discharging approximately 1.5 billion gallons of waste water into New Jersey water resources. Domestic treatment systems account for 80 percent of these discharges. Systems are both publicly and privately owned. Thirty-seven combined sewer facilities, in which untreated sewage including bacteria, viruses, and other pathogens might be released from sanitary sewer systems with storm water runoff during high-flow (storm) periods, existed in New Jersey in 1996. In 1999, five municipal sewage treatment plants and 12 sewage collection systems were refused permission to connect new customers because of violations of water quality standards, a substantial reduction from 1992 when 89 treatment plants and 23 collection systems were faced with connection bans. The United States Environmental Protection Agency (USEPA), using data provided by the New Jersey Department of Environmental Protection (NJDEP), projected that by 2016 there will be 153 sewage treatment plants and 553 collection systems in operation. The total 1996 documented and modeled needs through 2016 are estimated by USEPA at \$6.958 billion for New Jersey and \$139.5 billion for the entire

nation. Additional needs estimated by NJDEP increase the total to \$8.026 billion. USEPA's 1996 Clean Water Needs Survey (CWNS) presented estimates of capital costs eligible for funding under the State Revolving Fund (SRF) program established in the 1987 Amendments to the Federal Clean Water Act (FCWA). The CWNS covers publicly owned municipal wastewater collection and treatment facilities, facilities for the control of combined sewer overflows (CSOs), activities designed to control storm water (SW) runoff and nonpoint-source (NPS) pollution, and programs designed to protect the nation's estuaries. The CWNS defines a "need" as a cost estimate for a project eligible for funding under the State Revolving Fund program of FCWA to prevent or abate a public health or water quality problem. The cost estimates in the 1996 CWNS database were either reported by the states or modeled by USEPA. Reported needs include costs for facilities used in conveyance, storage and treatment, and recycling and reclamation of municipal wastewater. In addition, costs for structural and nonstructural measures and costs to develop and implement state and municipal storm water and nonpoint-source pollution programs were included. For the modeled categories, USEPA prepared cost estimates for eligible facilities and program activities. Needs estimates in the CWNS do not include annual costs for operations and maintenance. They also do not include needs that are ineligible for federal assistance under Title VI of the FCWA, such as house connections to sewers and costs to acquire land that is not utilized in the treatment process. The 2007 USEPA cost estimate is included in the sewer cost impact assessment.

This section of the infrastructure impact assessment compares the impacts of growth on water and sewer usage and costs under two development scenarios—TREND and PLAN. Water and sewer infrastructure are among the components of infrastructure that must be provided to accommodate development. This

analysis will determine the effect on water and sewer demand and cost when development occurs at different locations and in different configurations throughout the state. The result of this analysis will enable a comparison of water and sewer infrastructure usage and costs depending upon the development scenario.

The key questions examined in this section are as follows:

- **How do water and sewer infrastructure demands vary according to future development scenarios?**
- **How do water and sewer infrastructure costs similarly vary?**
- **Which development scenario will entail the least infrastructure development and most cost savings?**

## BACKGROUND

### Water and Sewer Service Structure

Water-based utility requirements are directly related to water and sewer demand. Water demand relates to the number of people in a dwelling unit or per 1,000 square feet of nonresidential space, also taking into consideration whether the properties they occupy have lawns that are watered regularly. Water service is people and property driven, and models or standards of water use take both of these types of demand into account. The specific means of obtaining and distributing water varies with the level of development of a community, and density is often the surrogate for level of development. Water hookups from public systems are primarily an urban or suburban service. This occurs regularly in PA-1 and PA-2 and can be expanded into fringe area (PA-3)

centers. In environs of fringe planning areas, package water treatment facilities are often the norm. This is also the case for centers in rural (PA-4) and environmentally sensitive (PA-5) planning areas. Water service in environs of rural and environmentally sensitive planning areas is provided by individually dug or drilled wells. These sources of water service, which vary by planning area, will be presumed to meet the needs of population and employment growth under the two growth scenarios. This distribution of type of service by type of planning area is shown in table \_\_\_\_.

Sewer demand (sanitary sewers only) is a function of the number of gallons of occupant-driven water consumption that remains in the system and ultimately must be disposed of. While it parallels water demand, sewer demand involves lower amounts because the non-domestic water usually does not remain in the system for disposal. This remaining quantity varies from 60 percent to 97 percent of the total water consumption for residential and non-residential uses. Sewer hookups from public systems like those for water are primarily an urban or suburban service (PA-1 and PA-2). Otherwise, sewer services are delivered in package plants (PA-3) or via septic systems (PA-4 and PA-5).

The specific types of sewer service for centers and environs follow similar declensions as those discussed for water service. Sewer service types that will be utilized to meet the demands of household and employment growth under the two scenarios are indicated in table \_\_\_\_.

### *Utility Demand*

The typical standard for domestic water consumption is about 75 gallons per day per person. (The national average per capita in 1999 was 72 gallons per day.) Nondomestic water use is approximately 10 to 50 percent of this

number. Indoor water demand is calculated per capita; outdoor water use is calculated per unit. Outdoor water use varies by location: more in suburban and rural areas; less in urban areas. The two types of use combine to define an equivalent dwelling unit (EDU) for water and sewer use for each type of unit. In single-family attached and multifamily housing, the water and sewer demand is reduced to account for both reduction in household size and outdoor water consumption. The water and sewer demand by type of residential unit is presented in table \_\_\_.

To place nonresidential uses on a per-unit basis, each 1,000 square feet of nonresidential space is defined as a single unit. Using the relationship between employees and space occupancy that establish structure requirements when computing land conversion, the water and sewer demand is defined for each nonresidential unit. Water consumption is approximately 25 gallons per day per employee. Employees per 1,000 square feet are 3.0, 2.5, 1.5, and 1.0 for office, retail, industrial, and warehouse uses, respectively. In all uses except retail and industrial, individual employee requirements were used exclusively to establish water and sewer demand. For retail uses, demand was doubled to account for customer use of public restrooms. For industrial uses, product use and internal cleaning increased water consumption per employee by about 50 percent. For all nonresidential uses, outdoor water use is 2 to 3 percent of the total water demand.

Nonresidential demand numbers do not include fire equipment testing requirements (e.g., sprinkler systems). These are not included because there is a lack of nationwide uniformity of requirements for system testing in new construction.

## **Water and Sewer Connections (Laterals)**

Water and sewer interceptors, or mains, are connected to single or multiple residential and nonresidential units by laterals. The schedule relating laterals to units (see Table 36) has been incorporated into the water and sewer model. The square footage per lateral cited for nonresidential connections corresponds to the nominal building size for that use. Water and sewer laterals are fully counted for each unit developed in planning areas. In the environs of rural and environmentally sensitive planning areas, housing is exclusively single-family detached, and these units are served by individual wells and septic systems. Individual wells and septic systems comprise approximately 30 percent of future growth. These are counted in the same fashion as water and sewer laterals for single-family houses (one for one unit) but are priced differently. Water and sewer lateral counts by municipality and planning area include wells and septic systems, which are each counted as single laterals.

## **Water and Sewer Costs**

Water and sewer services are provided to the vast majority of new users as a shared cost of the entire system at full capacity. This is commonly referred to as the hookup or “tap-in” fee. The “tap-in” fee and the shared cost of a unit’s lateral comprise the cost of connecting to water and sewer systems.

The individual costs of water and sewer infrastructure are calculated by drawing from a variety of New Jersey and Northeast regional sources, specifically selected engineering firms and municipal authorities in the Middle Atlantic region. The costs of the four types of water and sewer services are calculated (public, public extended, package systems, and on-site treatment systems).

## IMPACT ASSESSMENT— METHODS

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The CUPR Water And Sewer Demand Model forecasts the differential impacts of alternative land-use development patterns on water and sewer demand. It forecasts water and sewer demand as a function of future population and employment multiplied by use rates, combined with selected variables that have been shown to affect usage. Total population, the type of dwelling units served, and intensity of land use are among the most important factors influencing residential water and sewer demand. In general, the larger the population, the greater the proportion of single-family units; the larger the land area surrounding a dwelling unit, the larger the demand for service.

Different types of dwelling units have different water requirements associated with them. Single-family units, for example, require more water to meet landscaping needs and other outdoor water uses; multifamily units use less water for outdoor purposes. Demand for water is therefore generally higher in suburban and rural communities, where single-family homes predominate, than in urban communities, where multifamily development exists at higher ratios. Sewer demand, by contrast, depends on the amount of indoor water use. Generally, water used outdoors does not flow back into sewers.

To measure water demand, the model combines the two components of residential water use to arrive at total daily water demand: 1) daily per capita water use, which reflects indoor water use; and 2) daily per-housing unit water use, which reflects outdoor water use. Indoor uses include bathing, cooking, laundering, and toilet flushing. Outdoor uses include lawn watering, car washing, and other uses such as swimming pools.

The daily per capita water-use rate used in the model has been obtained from the New Jersey Department of Environmental Protection (NJDEP). It is widely accepted and cited in the literature as a standard per capita water-use rate. This rate is multiplied by total population for each municipality to arrive at indoor water demand by municipality. To calculate the per-housing unit water use per day, the model distinguishes among housing unit types. Water-use rates by housing unit type, which have been obtained from New Jersey water companies, are multiplied by the number of housing units by type in each municipality to arrive at total outdoor water use. Total indoor water use is then combined with total outdoor use to determine total residential water demand per municipality. Sewer demand is based on indoor water use, with the model assuming that a share of all water used indoors will flow into a sewer system. Nonresidential demand calculations are more straightforward. Water- and sewer-use rates by type of employee are combined with change in the number of employees to arrive at nonresidential demand projections. Municipal residential and nonresidential water demand are added to arrive at a total municipal water demand projection associated with growth under the TREND scenario. The same is done to project total sewer demand. These are then aggregated to county and state levels.