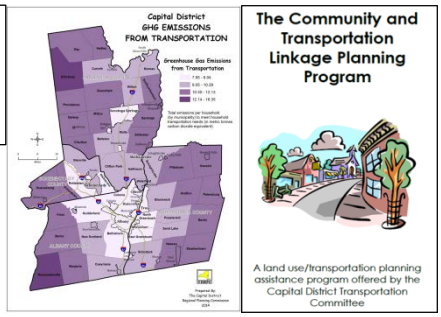

CDTC NEW VISIONS

ENVIRONMENT AND TECHNOLOGY TASK FORCE

White Paper

September 2015

Capital District Transportation Committee
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Contents

Introduction

The Environment and Technology Task Force was formed as part of the update of the New Visions Plan. The Task Force was asked to examine issues relating to the environment and technology, and to make recommendations for policies and actions for the New Visions 2040 Plan. The topics considered include:

- Alternative fuels, electric vehicles, fuel economy
- Greenhouse gas emissions and energy conservation
- Explore the potential impact of emerging technology on transportation in the Capital District; how should the New Visions Plan anticipate these impacts.
- New ITS technologies for operations planning and the impact of totally automated cars on New Visions Plans.
- Travel Demand Management
- Signal Technology- adaptive traffic signals; signals and technology supportive of transit and pedestrians
- Environmental Systems; smart growth
- TIP project evaluation update and increasing consideration of environmental impacts

Many of these topics are already considered and supported in the New Visions 2035 Plan. The Task Force considered ways in which the Plan could be updated and strengthened. New developments need to be considered, particularly in the area of automated vehicles. Especially relevant are two important documents have been completed since the New Visions 2035 Plan was approved: *The Capital Region Sustainability Plan*—developed as a result of the Governors Cleaner Greener Communities Initiative; and the *Capital District 2010 Regional GHG Inventory*, prepared for NYSERDA by CDRPC. The Task Force also considered the ongoing work of the Capital District Clean Communities program.

The Task Force is not a policy decision making committee, but rather has been asked to make recommendations to CDTC's Planning Committee and Policy Board. The Task Force members include:

- Adam Ruder, NYSERDA
- Alan Warde, NYSDOT
- Cara Wang, RPI
- Jim Yienger, Climate Action Associates
- Joe Berman, Golub Corporation
- Lynn Weiskopf, NYSDOT
- Maria Chau, FHWA
- Sanjay Goel, UAlbany
- Todd Fabozzi, CDRPC
- Chris O'Neill, CDTC staff
- Dave Jukins, CDTC staff
- Jen Ceponis, CDTC staff
- Sree Nampoothiri, CDTC staff

New Visions and the Environment

The New Visions Plan addresses environmental impacts and sustainability in a number of important ways and provides a framework for improving regional environmental quality. The following New Visions Planning and Investment Principle supports the environment:

> ***Environment– Transportation choices should improve our environment, not harm it.***
>
> *Environmental stewardship is crucial to the success of and quality of life in this region. Transportation investments must improve or preserve the region's cultural and natural environment. Transportation investments will not encourage development in environmentally sensitive areas and will help to preserve rural character. Transportation investments will support alternative fuel vehicles and greenhouse gas reduction. Environmental best practices will be incorporated into all projects.*

New Visions supports energy conservation, reduction in greenhouse gas emissions and air quality in the region by advocating sustainable development patterns and site design, urban reinvestment, and community-based land use planning, along with transit, bicycle, & pedestrian investments & strong participation in the Clean Cities program. The New Visions Plan has a strong emphasis on smart growth and fostering a safe, multi-modal and well managed system that works well for all users. The plan contributes to urban revitalization, attractive suburban and rural centers, and preservation of open space, while working to reduce vehicle miles of travel and related greenhouse gas emissions; and encouraging use of alternative fuels and advanced technology vehicles. Related beneficial environmental impacts include avoidance of disruption of natural and cultural resources and protection of environmental justice populations. Protecting the environment and creating a more sustainable transportation system is an important New Visions strategy, particularly in light of global climate change.

Strategies and Programs

Capital District Clean Communities- The U.S. Department of Energy's (DOE) Clean Cities program is a voluntary, locally based government/industry partnership. **Capital District Clean Communities (CDCC)** was formed primarily to take advantage of the environmental, public health, energy, and economic benefits that the Clean Cities program offers. CDCC's goal is to advance the energy, economic, & environmental security of the U.S. by supporting local actions to reduce petroleum use in transportation. Alternate fuels and advanced technology vehicles can benefit the Capital Region by creating commercial opportunities and by improving the environment.

The CDTC assumed the coordinator role for the CDCC in 2001. CDTC is the only MPO within NYS that supports the coordinator position. CDTC agreed to be the "home" of the Capital District Clean Communities program because the goals of the program fit well with the planning and investment principles that CDTC adopted as part of New Visions. The Capital Region provides substantial opportunities for the expansion of the alternative fuel marketplace, particularly with the large state

vehicle fleet that operates in the area. Stakeholders in CDCC recognize the need to provide greater fuel choices in the Capital Region and to reduce its dependence on imported oil.
The CDCC advances the goals of the Clean Cities program through coalition building and networking. Currently, ethanol, bio-diesel, CNG, Propane, hybrid and all-electric technologies are all part of the alternative fuel and advanced vehicle technology mix in the Capital Region and are the alternate fuels of choice in the Capital Region. In the last two years, the number of electric vehicle charging stations has grown from just 2 to almost 100, including a Tesla fast-charging station. The CDCC continues to work with large fleets and even transit operators to provide information on transitioning to alternative fuels. In 2013 the CDCC helped displace more than 1.6 million gallons of petroleum and reduce greenhouse gas emissions by 14,000 tons through not only alternative fuels and advanced vehicle technologies but also through idle reduction policies and programs, fuel economy improvements and VMT reduction programs like ridesharing.

Travel Demand Management- Travel demand management (TDM) refers to efforts to reduce auto travel and congestion by improving transit access, bicycle and pedestrian access, providing opportunities for carpooling and telecommuting, and other strategies. TDM reduces congestion, reduces the costs of driving, and it is an important way to reduce greenhouse gas emissions. CDTC strongly supports TDM by investing in transit, bicycle and pedestrian facilities, carpooling and land use planning. CDTC projects and investments that support TDM include:

- Federal funding for **transit** service in the Capital District is a major part of the CDTC TIP. New Visions incorporates CDTA's Transit Development Plan, which will improve and grow a variety of transit services for the Capital District, increasing mobility and supporting economic development and smart regional growth. One example is CDTC's investment in the BusPlus system on the Route 5 corridor.
- New Visions encourages development that incorporates **bicycle and pedestrian** accommodations into highway construction as well as city, village, and town plans and provides for recreational opportunities through creation of bike/hike trails.
- CDTC maintains the **iPool2** Ride2gether website which offers, in partnership with New York State's 511NY Rideshare, a ridematching service and a one-stop shop for traveler needs.
- CDTC maintains the **Capital Coexist** website, a localized education campaign geared towards encouraging people to bike and educating cyclists and motorists on safely coexisting when using the region's roadways.
- **Capital CarShare-** CDTC sponsors this car-sharing program in Albany, with six cars available**.** Future expansion could include Troy, Schenectady and Saratoga Springs. Providing the opportunity to rent a car on an as-needed basis makes not owning a car, or only owning one car in a household, more feasible.
- CDTC sponsored four demonstration/trial weeks of **Bike Share** during the summer (2014) in Albany, Schenectady, Troy and Saratoga Springs.
- Investments in **Park and Ride** lots have been supported by CDTC and CDTA and NYSDOT.
- **Guaranteed Ride Home**- this program provides a taxi trip home for a bus rider or carpooler when they need to.

Smart Growth and Land Use Planning- New Visions supports sustainable development patterns and site design, urban reinvestment, and community-based land use planning. The Capital District Regional

Planning Commission (CDRPC) conducted an in depth analysis of the demographic distributions and land use patterns for four scenarios to test the impacts of growth:

- Status Quo Trend: CDRPC's baseline forecast (9% growth in population, 15% growth in households by 2030, current development patterns continuing); this is the official Plan forecast;
- Concentrated Growth: the baseline growth rate with more concentrated development patterns resulting from urban reinvestment and suburban planning;
- Trend Hyper-Growth: hyper-growth (29% population growth and 35% household growth by 2030), with status quo trend patterns of dispersed development;
- Concentrated Hyper-Growth: hyper-growth occurring in a concentrated pattern resulting from more urban reinvestment and suburban planning.

Under any growth scenario, it was found that the benefits of concentrated development patterns are significant for the transportation system and for regional quality of life. The New Visions Plan supports and encourages concentrated development in the Capital District. The urgency for coordinated, high quality planning is even greater under a scenario of high growth. This urgency will be necessary because the impacts of a high growth scenario with dispersed development patterns would threaten to make the region's quality of life unsustainable.

In support of urban reinvestment and regional equity, CDTC has programmed significant funding for transportation projects in the cities. One important way that CDTC has supported land use planning is by sponsoring the Transportation and Land Use Linkage Program. The Linkage Program which provides funding for cities, towns, and villages to prepare and implement community-based transportation and land use plans consistent with New Visions principles.

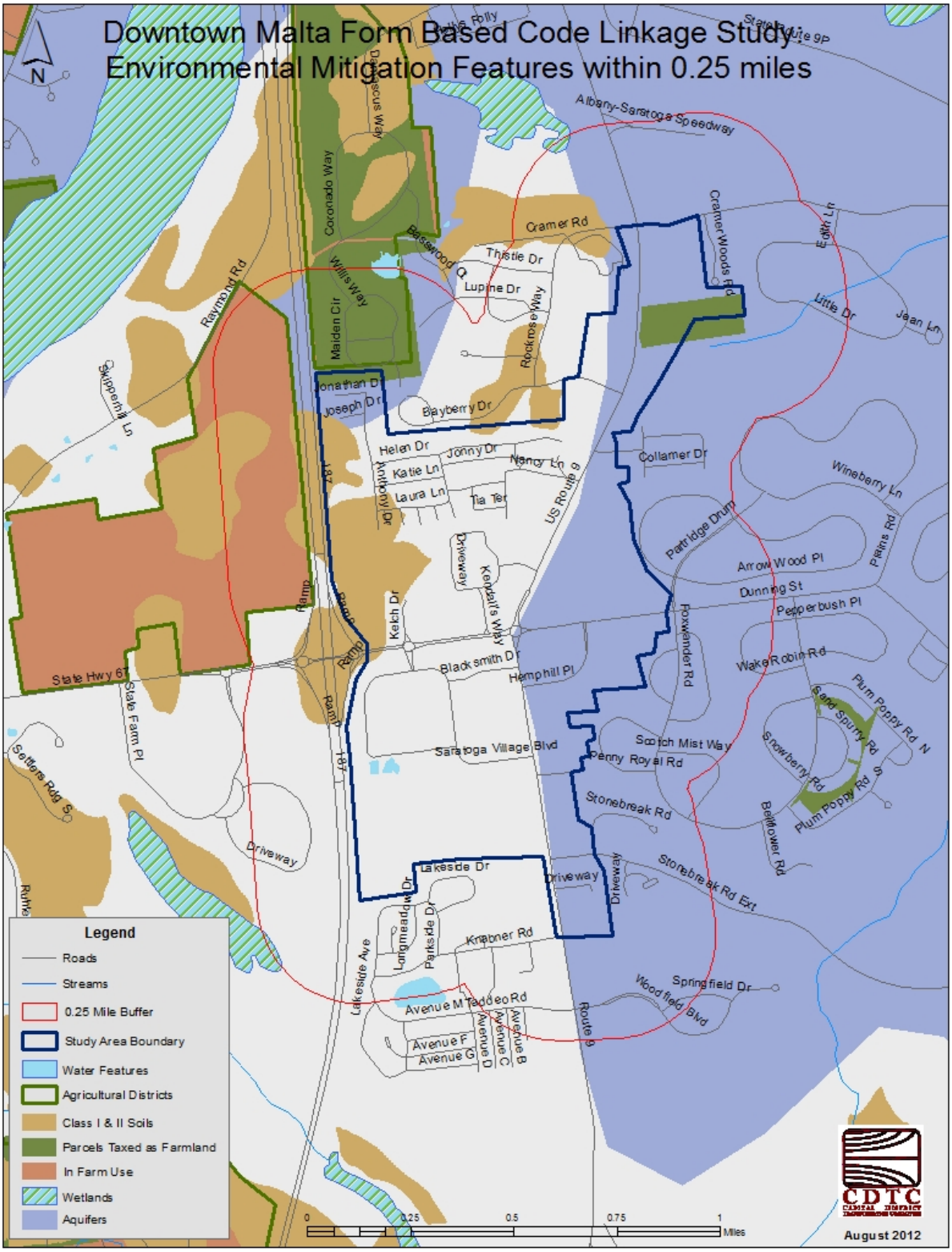
Protecting Environmental Systems- Environmental systems are strongly considered in planning and programming processes at CDTC. Important environmental features reviewed for CDTC TIP Projects and Linkage Studies include:

- Sole Source Aquifers
- Aquifers
- Reservoirs
- Water Features - Streams, Lakes, Rivers
- Wetlands
- Watersheds
- 100 Year Flood Plains
- Rare Animal Populations
- Rare Plant Populations
- Significant Ecological Sites
- Significant Ecological Communities
- State Historic Sites
- National Historic Sites
- National Historic Register Districts
- Federal Parks and Lands
- State Parks and Forests
- State Unique Areas
- State Wildlife Management Areas

- County Forests and Preserves
- Municipal Parks and Lands
- Land Trust Sites
- DEC Lands
- Adirondack Park
- Agricultural Districts
- Agriculture Parcels Taxed as Farmland
- Agriculture Parcels In Farm Use
- Class I & II Soils

CDTC policies that encourage smart growth and investment and development in urban areas serve to protect natural resources. Smart growth policies will also help to protect rural character and open space, and protect quality of life in the Capital region. CDTC has undertaken review of natural and cultural resource mapping, and consults with federal, state and local agencies on environmental issues as an important part of the environmental mitigation process. CDTC evaluates impacts to environmental systems for project candidates. Map 1 illustrates an analysis of environmental systems for a study area done for a Linkage study in Malta. This represents an illustration of CDTC's ability to use GIS mapping of environmental systems to analyze potential project impacts

Map 1


Downtown Malta Form Based Code Linkage Study
Environmental Mitigation Features within 0.25 miles
N
Legend
Roads
Streams
0.25 Mile Buffer
Study Area Boundary
Water Features
Agricultural Districts
Class I & II Soils
Parcels Taxed as Farmland
In Farm Use
Wetlands
Aquifers
0
0.25
0.5
0.75
1
Miles
August 2012
CDTC
Albany-Saratoga Speedway
Cramer Rd
Thistle Dr
Lupine Dr
Cramer Woods Rd
Little Dr
Jean Ln
Raymond Rd
Skippenhill Ln
Jonathan Dr
Joseph Dr
Blayberry Dr
Helen Dr
Jonny Dr
Katie Ln
Nancy Ln
Anthony Dr
Laura Ln
Collamer Dr
Wineberry Ln
Partridge Drive
Arrow Wood Pl
Plains Rd
Dunning St
Pepperbush Pl
Foxwender Rd
Wake Robin Rd
Plum Poppy Rd N
Sand Spurry Rd
Plum Poppy Rd S
Snowberry Rd
Bellflower Rd
Kelch Dr
Kendall's Way
Blacksmith Dr
Hemphill Pl
State Hwy 67
State Farm Pl
Saratoga Village Blvd
Scotch Mist Way
Penny Royal Rd
Stonebreak Rd
Stonebreak Rd Ext
Lakeside Dr
Knabner Rd
Parkside Dr
Longmeadow Dr
Lakeside Ave
Avenue M
Taddeo Rd
Avenue F
Avenue G
Avenue D
Avenue C
Avenue B
Springfield Dr
Woodfield Blvd
Route 9
Ramp
Driveway

Climate Smart Communities

New York State's Climate Smart Communities program is an interagency effort of NYSERDA, the New York State Department of Environmental Conservation (NYDEC), the New York State Department of State (DOS), New York State Department of Transportation (NYDOT), New York State Department of Health, and the New York State Public Service Commission (PSC). Fifteen local governments in the CDTC planning area are participating:

- City of Albany
- County of Albany
- City of Cohoes
- City of Watervliet
- Town of Bethlehem
- Village of Green Island
- City of Rensselaer
- City of Troy
- Town of East Greenbush
- City of Saratoga Springs
- Town of Clifton Park
- City of Saratoga Springs
- City of Schenectady
- County of Schenectady
- Town of Niskayuna

The Capital District Regional Planning Commission (CDRPC), "as a recipient of a three-year grant (May 2012 through May 2015) from the New York State Energy Research and Development Authority (NYSERDA) to manage the Climate Smart Communities Pilot Program in the Capital District, provides technical support and guidance to the communities within the six-county region that have taken the Climate Smart Communities pledge. CDRPC and its consultant team… serve as strategic planning agents to empower local governments, connecting them with financial and technical programs, and with each other, offering training assistance and consistent tracking and reporting of successes and barriers to addressing the ten CSC pledge elements." (CDRPC)

Transportation is a significant contributor to greenhouse gas emissions. In the CDTC planning area, 41% of greenhouse gas emissions are from the transportation sector. The New Visions Plan supports reductions in greenhouse gas emissions. CDRPC conducted the *Capital District 2010 Regional GHG Inventory* for eight counties in the larger Capital Region. The inventory was prepared for The New York Energy Development and Research Authority (NYSERDA). The project created a greenhouse gas (GHG) emissions inventory baseline, which is an important component of long term sustainability planning. Greenhouse gas emissions per household to meet transportation needs are shown in Map 2. The map indicates that transportation greenhouse gas emissions per household are lowest in the urbanized areas. This is because the commuting trip in urban areas is shorter, requiring less driving; and because households located in the urban areas are more likely to have the option to walk, bike, or take transit to work. Map 3 shows greenhouse gas emissions per household, including domestic energy use. Map 3 shows the carbon footprint to be lowest in the urban area, with a more pronounced reduction per households in the cities. These maps indicate that New Visions policies encouraging smart growth, mixed use development and urban reinvestment will make an important contribution to reduction of greenhouse gas emissions.

Electric vehicles represent an opportunity to reduce greenhouse gas emissions and to save energy. Ninety-six percent of commuters in the CDTC planning area have a round-trip commute less than 60 miles, which is within the range of an electric vehicle that is charged overnight at home. The CDRPC study reported that because New York's power grid is one of the cleanest in the nation, switching

passenger cars from gasoline to electric will reduce emissions by 75% per mile. The New Visions plan supports investments in electric vehicle charging infrastructure. CDTC also supports investments that encourage alternative fuels such as biofuels and natural gas. **Capital Region Sustainability Plan**- This Plan was developed as part of the Cleaner Greener Communities Program. CDTC staff participated on the Transportation Committee and the Land Use and Livable Communities committees. CDTC supports the goals of the Capital Region Sustainability Plan. The Land Use and Livability goals are:

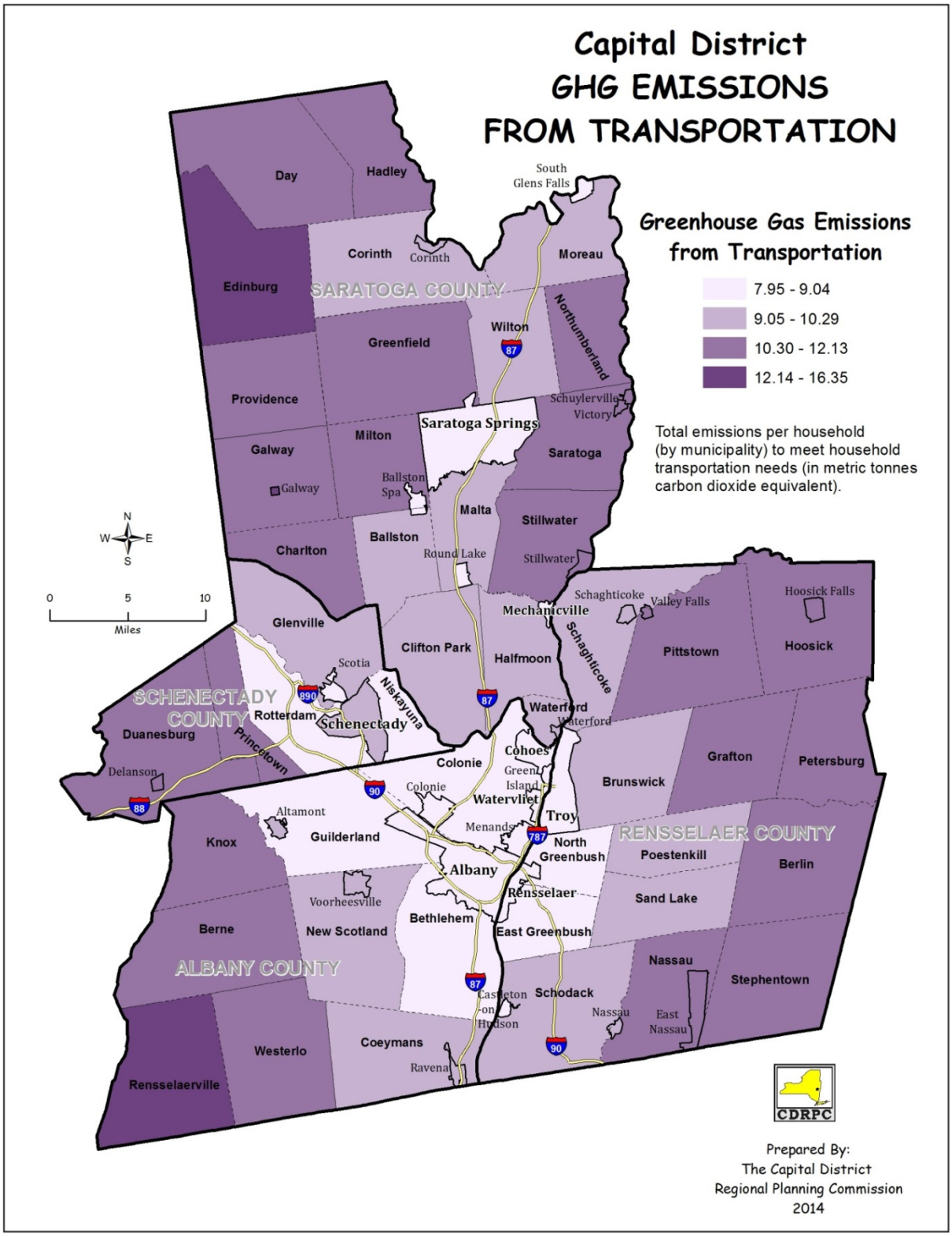
- Preserve, protect and enhance the Capital Region's natural and cultural resources, sensitive ecosystems and agricultural lands, and effectively provide and manage accessible public space to increase recreational and civic opportunities for all.
- Encourage investment and redevelopment in existing cities, town centers, villages and hamlets, and encourage compact, connected, walkable communities wherever major development occurs in the Capital Region.
- Promote diverse, energy efficient and healthy housing options for all residents of the Capital Region.

The Sustainability Plan Transportation Goals are:

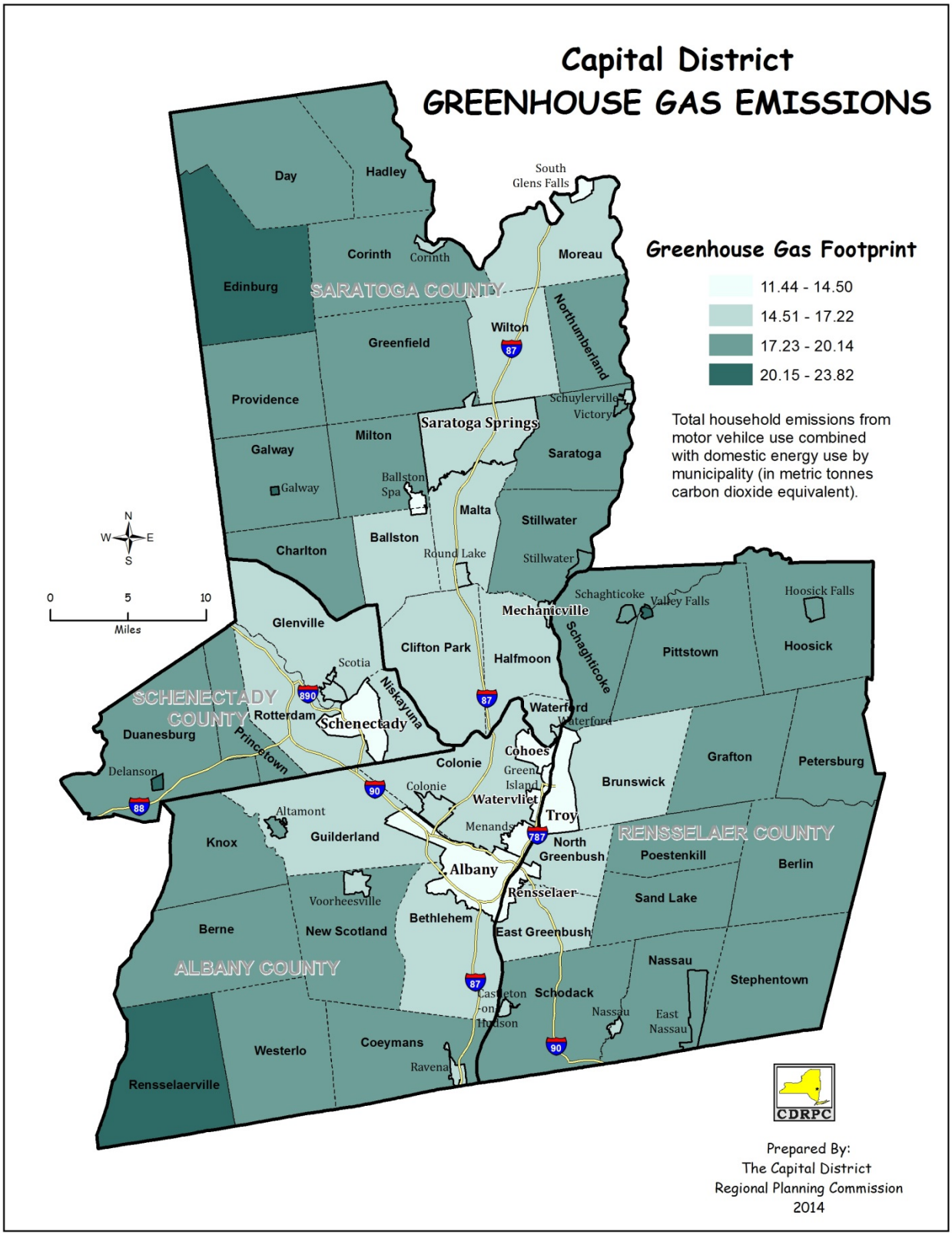
- Provide viable options as alternatives to personal vehicles and single occupancy vehicle commuting.
- Create walkable and bikeable communities interconnected by regional transit and trail networks.
- Encourage the use of alternative fuels and transportation technologies.
- Encourage expanded use of efficient and sustainable freight movement, respecting quality of life of communities.

LED Street Lighting- LED lighting is an energy efficient technology that should be considered for street and highway lighting. Improved lighting with LED technology can improve visibility, increase pedestrian safety and security, significantly reduce energy costs and decrease greenhouse gas emissions. Incentive funding from National Grid and potentially other organizations is currently available to help offset the costs of implementing energy efficiency improvements. The Albany International Airport has converted parking and street lighting to LED lighting with incentive funding assistance, and 18 out of 30 buildings have been retrofitted to LED and CFL lighting. This has generally led to an eighty percent reduction in lighting energy usage for those facilities with an estimated two year payback for the capital investment. Municipalities and operating agencies in the CDTC area are encouraged to invest in LED lighting.

Map 2


Capital District
GHG EMISSIONS
FROM TRANSPORTATION
Greenhouse Gas Emissions from Transportation
7.95 - 9.04
9.05 - 10.29
10.30 - 12.13
12.14 - 16.35
Total emissions per household (by municipality) to meet household transportation needs (in metric tonnes carbon dioxide equivalent).
N
W
E
S
0
5
10
Miles
Day
Hadley
South Glens Falls
Corinth
Corinth
Moreau
Edinburg
SARATOGA COUNTY
Northumberland
Wilton
Greenfield
Providence
Schuylerville
Victory
Saratoga Springs
Milton
Galway
Saratoga
Galway
Ballston Spa
Malta
Stillwater
Charlton
Ballston
Round Lake
Stillwater
Schaghticoke
Valley Falls
Hoosick Falls
Mechanicville
Glenville
Schaghticoke
Pittstown
Hoosick
Clifton Park
Halfmoon
Scotia
Niskayuna
SCHENECTADY COUNTY
Rotterdam
Schenectady
Waterford
Waterford
Duanesburg
Princetown
Cohoes
Colonie
Grafton
Petersburg
Delanson
Colonie
Green Island
Brunswick
Watervliet
Altamont
Troy
Menands
Knox
Guilderland
North Greenbush
RENSSELAER COUNTY
Poestenkill
Berlin
Albany
Rensselaer
Sand Lake
Voorheesville
Bethlehem
Berne
New Scotland
East Greenbush
Nassau
ALBANY COUNTY
Stephentown
Castleton-on-Hudson
Schodack
Nassau
East Nassau
Westerlo
Coeymans
Ravena
Rensselaerville
CDRPC
Prepared By:
The Capital District
Regional Planning Commission
2014

Map 3


Capital District
GREENHOUSE GAS EMISSIONS
Greenhouse Gas Footprint
11.44 - 14.50
14.51 - 17.22
17.23 - 20.14
20.15 - 23.82
Total household emissions from motor vehilce use combined with domestic energy use by municipality (in metric tonnes carbon dioxide equivalent).
N
W
E
S
0
5
10
Miles
Day
Hadley
South Glens Falls
Corinth
Corinth
Moreau
Edinburg
SARATOGA COUNTY
Wilton
Northumberland
Greenfield
Providence
Schuylerville
Victory
Saratoga Springs
Milton
Galway
Saratoga
Galway
Ballston Spa
Malta
Stillwater
Charlton
Ballston
Round Lake
Stillwater
Schaghticoke
Valley Falls
Hoosick Falls
Mechanicville
Glenville
Schaghticoke
Pittstown
Hoosick
Clifton Park
Halfmoon
Scotia
Niskayuna
SCHENECTADY COUNTY
Rotterdam
Schenectady
Waterford
Waterford
Duanesburg
Princetown
Cohoes
Colonie
Grafton
Petersburg
Delanson
Colonie
Green Island
Brunswick
Watervliet
Altamont
Troy
Menands
RENSSELAER COUNTY
Knox
Guilderland
North Greenbush
Poestenkill
Berlin
Albany
Rensselaer
Voorheesville
Sand Lake
Bethlehem
Berne
New Scotland
East Greenbush
Nassau
ALBANY COUNTY
Stephentown
Castleton-on-Hudson
Schodack
Nassau
East Nassau
Westerlo
Coeymans
Ravena
Rensselaerville
CDRPC
Prepared By:
The Capital District
Regional Planning Commission
2014

New Visions and Technology

The New Visions Plan supports the use of technology in a number of important ways. Rapidly changing technology will have impacts to transportation both in the short term and the long term and must be considered in developing transportation plans and projects. The following New Visions Planning and Investment Principle gives strong consideration to technology:

> ***Technology – We must plan for new, smarter, better, and rapidly-changing transportation technology.***
>
> *Advancements in technology, such as self-driving cars, self-adjusting traffic signals, smart phone apps, ridesharing, carsharing, and bikesharing will have tremendous and wide-reaching impacts on future transportation. These impacts include, but are not limited to, decreasing congestion, providing transportation to more seniors and people with disabilities, reducing traffic crashes, and more.*

Automated Vehicles- Totally automated vehicles (self-driving cars) until recently were considered by many a concept for the distant future. Demonstrations by Google of a totally automated vehicle have made the full development of this technology plausible, although the timeline is uncertain. However, incremental improvements in vehicle automation are expected on the short term horizon. Because the impacts of automated vehicles have the potential to be dramatic, it would not be responsible to ignore them in a plan with a horizon year of 2040.

The U.S. Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) has taken steps to enable vehicle-to-vehicle (V2V) communication technology for light vehicles. According to the National Highway Traffic Safety Administration, "The U.S. Department of Transportation is currently collaborating with some of the world's largest automobile manufacturers to research how wireless technology can enable vehicles to communicate with each other and with the infrastructure around them. Connected vehicle technology—vehicle-to-vehicle and vehicle-to-infrastructure communications—could one day alert motorists of dangerous roadway conditions, impending collisions, or dangerous curves. Connected vehicles could also "talk" to traffic signals, work zones, toll booths, school zones, and other types of infrastructure." Automatic braking is already becoming an option on cars.

The safety benefits of these crash avoidance systems are expected to be dramatic. Annual fatalities from automobile crashes exceed 30,000 in the United States. Significantly reducing fatalities and severe injuries is arguably the most important benefit of these technologies. An additional benefit can be realized: electronically crash-proofing can mean that in the future, it may be possible to make vehicles lighter, which will make them less expensive and more energy efficient.

There is debate about when totally automated vehicles could be fully integrated into the vehicle fleet. There is also debate about some of the potential impacts of full implementation of this innovation. However, the following statements about potential impacts can be made:

- **Potential for near zero crash fatalities, near zero crash injuries**- The safety impacts of totally automated vehicles potentially could be more significant than near-term crash avoidance

technologies already emerging in the market place. By removing driver error, virtually all vehicle crashes could potentially be prevented, including vehicle/pedestrian crashes and vehicle/bicycle crashes.

- **Significant increase in highway capacity-** On Interstate highways and expressways, narrower lanes, higher speeds, and closer spacing between cars may become feasible and safe. This would mean higher capacities on highways. Crash related incidents could be essentially eliminated, and congestion could be dramatically reduced without widening facilities. While it is possible that increases in speed could induce more traffic and more longer distance driving, offsetting the benefits of increased capacity, these potential effects are unknown. Reduction in congestion would seem to be the most likely outcome in the Capital District. Capacities on arterials would also increase, without increasing speeds, due to more efficient traffic flow at intersections.
- **Potential for light vehicles**- electronically crash-proofing vehicles could mean that, in the future, it may be possible to make vehicles lighter—which will make them less expensive and more energy efficient.
- **Seniors could drive longer, people with disabilities could drive-** Totally automated vehicles would mean that the driver is not needed to be in control of the vehicle, but would simply tell the vehicle where to go. Younger people could potentially "drive" as well, with parental supervision.
- **Potential Impacts on Transit-** The impacts of automated vehicles on transit are unknown. It is possible that in some markets, totally automated vehicles could make transit less competitive, but it is also possible that in some markets, transit could become more competitive and attractive. For example, automated shuttles could bring people to main line transit stops. In addition, totally automated transit vehicles could increase transit viability.
- **Potential Impacts on Smart Growth**- It is difficult to predict the impact of totally automated vehicles on development patterns. It is possible that commuting a longer distance will become more stress-free and more attractive, encouraging development further away from urban centers. However, auto use will still have a cost that will increase with distance. Totally automated vehicles could also make urban centers more attractive and more accessible. The increasing market appeal of urban living may counterbalance the attractiveness of driving longer distances hands free.
- **Totally Automated Trucks-** Freight movement can also be impacted in many ways that are difficult to foresee with certainty. In the relative near term, trucks may be able to operate on Interstate highways without a driver, so that a driver would only be needed once the truck leaves the Interstate. This could allow a driver to rest while the truck is in operation, increasing the number of hours a driver can spend safely operating the vehicle, and therefore leading to significant reductions in cost.
- **Potential Disbenefits of Totally Automated Vehicles-** One of the issues that will need to be addressed as automated vehicle technology develops is the importance of protecting the privacy of travelers. Another important issue will be equitable access to technology for lower income groups. A third concern is the transition period when totally automated vehicles will be mixed with vehicles operated by human drivers.

Assessing the potential future impacts of totally automated vehicles with certainty is not possible. The concept of scenario planning is useful for dealing with uncertainty in forecasts of the future. CDTC has already relied on scenario planning to assess different levels of growth in the Capital District and different levels of concentrated development versus dispersed development. Because transportation

investments have long lasting impacts, the New Visions Plan must look to the future, and the plan is currently considering a horizon year of 2040.

Given the uncertainty surrounding automated vehicles, the following policies in the Plan should be considered:

- **Potential for totally automated vehicles to impact highway and bridge design.** In designing for new capacity projects, intersection projects, and other infrastructure projects, 20 year traffic forecasts are considered, and for bridge projects, 30 year traffic forecasts are considered. The New Visions Plan has strong policies against the addition of physical highway capacity except under certain conditions. The design process currently seeks to provide level of service "D" or better in the design year (either 20 years from now or 30 years from now). The New Visions Plan asserts that future potential congestion is a lower priority than existing congestion, which in many locations is worse than level of service "D". The potential for future increased capacity resulting from totally automated vehicles should be strongly considered in highway and bridge design. Designing a larger footprint to anticipate 2040 traffic conditions may be totally unnecessary if automated vehicles are fully established in the fleet by then. Designing a larger footprint that is unnecessary is not only prohibitively expensive but can work against the New Visions policies to encourage complete streets and demand management. The New York State Department of Transportation should consider if changes to the current design approach are needed to reflect potential changes in future demand as well as potential changes in the congestion threshold that triggers a need for increased capacity. Further, as automated vehicles and other technology changes emerge, the New York State Department of Transportation should work with its partners within AASHTO and the Federal Highway Administration to consider implications to design standards such as lane and shoulder widths.

- **Smart Growth-** The CDTC New Visions Plan supports sustainable development patterns and site design, urban reinvestment, and community-based land use planning. While the impacts of totally automated vehicles on smart growth are uncertain, the region should continue to develop as an attractive region with vibrant urban and suburban communities that are walkable; and rural character and open space should continue to be protected. As the impacts of automated vehicles unfold, the regional vision can prevail and technology should be used to enhance communities.

- **Anticipate Technology with Flexibility and Smart Near-Term Investments**- While future technologies may lead to dramatic improvements, that potential will not lessen the need for making the best use of transportation investments in the near-term. In the near term, transportation investments will be needed to improve safety and mobility for all residents. The New Visions Plan must proceed with short term and medium term investments, while maintaining flexibility to implement technology as it arrives.

Traffic Signal Technology- One area where technological advancements continue to improve opportunities for improving mobility is traffic signal technology. CDTC supports improvements to traffic signals that improve travel efficiency and traffic flow while reducing delay. Examples of traffic signal technology are listed below.

- **Signal coordination** provides the opportunity for cars to move along an arterial with only infrequent stops at traffic signals, and significantly reduces delay.

- **Transit Signal Priority** (TSP) is an innovation which allows buses to activate signals for extended green time as they approach a signal if they are behind schedule. The extended green time is usually ten seconds, which allows transit vehicles to provide higher quality service. It should be noted that autos in the same traffic stream with the bus will benefit as well. Because the green phase is typically extended only two or three times per hour, the impact on side streets is minimal. CDTC supports TSP as an important tool for improving transit service. TSP has been implanted in the Route 5 BusPlus corridor and is being developed for other corridors. Queue jumper signal phases also have the potential to improve transit on time performance by allowing buses to advance on green ahead of other vehicles, without disrupting traffic flow.

- **Pedestrian Signals-** Innovations in pedestrian signals include pedestrian activation of advanced walk phases, where pedestrians can begin crossing before vehicles enter the intersection; exclusive pedestrian phasing, where all vehicles, including right-turn-on red movements, are stopped while the pedestrian crosses. Countdown timers for pedestrians make crossing easier. In addition, new type of signal for midblock pedestrian crossing has been introduced, called a HAWK beacon. This signal requires autos to stop only when a pedestrian needs to cross. Innovative technology holds promise for improving midblock pedestrian crossings, school crossings, and speed control.

Implementation of signal technology improvements has the potential improve traffic mobility and safety at low cost. Signal technology also can enhance pedestrian, bicycle and transit access and provide an important component of complete streets. The CDTC Regional Operations and Safety Advisory Committee is developing recommendations for implementing and operating signal technology.

ITS technologies for transportation operations- Traffic signals are considered to be one type of Intelligent Transportation System (ITS) technology. ITS can be defined as using technology to make smarter use of transportation networks. It includes communications with drivers as well as communications within the transportation system. CDTC has long recognized the value of using ITS to improve travel for all modes, including autos, transit, bicycles and pedestrians, and freight. Emerging ITS technologies include:

- **Adaptive signal control** is a control strategy where the signal controller makes adjustments to cycle length, off-sets and phase timings in real-time based on changes in the traffic characteristics on the arterial. This can be especially valuable during an incident on an expressway, when traffic may divert to a parallel arterial. Adaptive signal control has been recommended for the Northway/Route 9 corridor in the I-87/US 9 Integrated Corridor Management Plan. Under adaptive control, traffic signals in a network communicate with each other and adapt to changing traffic conditions to reduce the amount of time cars and trucks spend idling. Using fiber optic video receivers similar to those used in dynamic control systems, the new technology monitors vehicle numbers and makes changes in real time to minimize congestion wherever possible.

- **Self-Organizing Signals**- One example of Adaptive Signal Control is a system being developed and tested at the University at Albany called Self-Organizing Signals. This proposed system is based on the theory of self-organizing traffic signals. Analogous to biological systems, each traffic signal in the system would communicate with the immediately adjacent signals and based on traffic sensor information would adjust the signal timing plan. This innovative approach has the potential to respond to minor changes in traffic flow as well as major changes to traffic flow in a way that optimizes the system. CDTC will continue to monitor the development of this innovative approach.

- **Active Traffic Management** (ATM) is defined as the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing traffic conditions. Non-recurrent congestion refers to congestion that results from traffic crashes, weather events or other incidents. Speed harmonization can help to reduce flow breakdown and the onset of stop-and-go driving behavior in support of improved mobility. An example of a speed harmonization strategy is the use of variable speed displays. They are set (and varied) according to prevalent roadway and operating conditions, including visibility, weather, lane constraints (e.g., work zones), crashes and other incidents, and real-time traffic flows/congestion levels. Variable speed displays may be advisory or regulatory. Another example of active traffic management is Dynamic Lane Assignment (DLA), which consists of lane control signals – typically installed in conjunction with variable speed displays – providing advance notice that a lane(s) is closed ahead and to start the merge process into the available lanes well in advance of the actual closure.

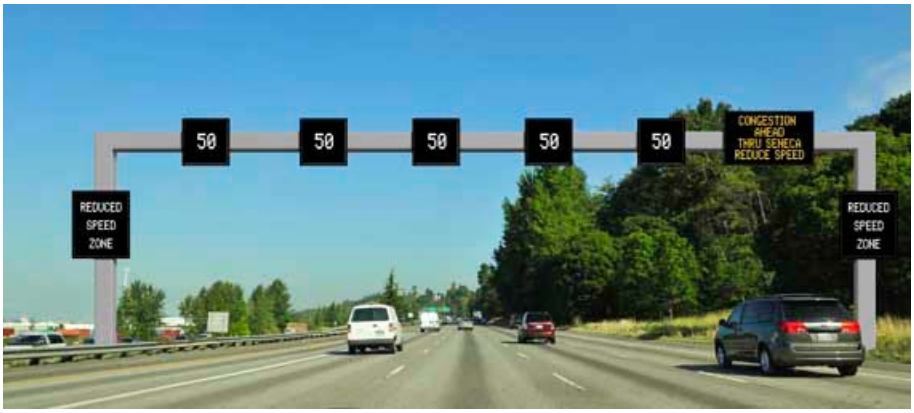


Figure 1. Variable speed displays in Seattle

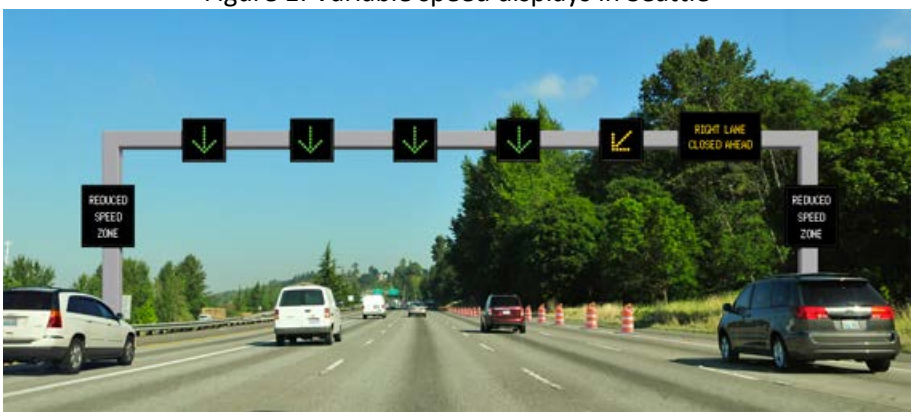


Figure 2. Dynamic Lane Assignment in Seattle

Solar Powered Roadways- FHWA has funded research and development for the concept of solar powered roadways. This technology development has the potential to make roadways a source of solar power using solar energy. Roadways represent a public resource that receives extensive exposure to sunlight. With solar power embedded in the pavement itself, additional benefits can include lighting that is imbedded in the pavement to make lane striping highly visible; electronic heating elements that would melt snow and ice without use salt or other de-icing chemicals; and road information responsive to changing conditions, for example a cross walk that lights up when a pedestrian is crossing.

Performance Measures

Two important performance measures were identified by the Environment and Technology Task Force: greenhouse gas emissions and energy consumption. Both of these measures are used in the New Visions 2035 Plan. Significant recent changes in requirements for future fuel economy will need to factored in for the forecasts of future energy consumption and greenhouse gas emissions. Issued in 2010, federal Corporate Average Fuel Economy (CAFÉ) and Greenhouse Gas emissions regulations will require passenger cars to achieve an average fleet fuel economy of over 54.5 mpg (miles per gallon) in model year 2025; light trucks will be required to achieve an average of over 39 mpg. Since the existing fleet of light duty vehicles has an average fuel economy of 17 to 23 mpg, this will represent a significant reduction in greenhouse gas emissions by 2025, and an even larger reduction by 2040 when almost all future vehicles will have met the 2025 CAFÉ targets. Requirements for first-ever standards for medium- and heavy-duty vehicles are also under development. For the 2040 horizon year of the Plan, the CAFÉ standards could result in a reduction in fuel consumption and greenhouse gas emissions in the Capital region in the range of 50% to 60%.

Other performance measures in the New Visions Plan have implications to the impacts of the environment and technology are addressed in more detail by other committees. For example, technology investments can have significant impacts to travel speeds and travel reliability and safety. These performance measures are discussed in the Regional Operations and Safety Advisory Committee White Paper. The Complete Streets Advisory Committee discussed the impacts of green infrastructure investments, documented in their white paper. CDTC will organize all of the performance measures for New Visions 2040 into the final draft plan document.

CDTC Forecasts a Moderation of VMT Growth with the New Visions Plan. The CDTC New Visions Plan was developed with the expectation that increases in daily vehicle travel would be dampened from the trend forecast. The reduction of future VMT growth will result in direct reductions in future greenhouse gas emissions. The New Visions Plan can be expected to reduce VMT growth through a combination of actions, including the substitution of internet based communication for travel, increased carpooling, increased non-auto travel (transit, walking and cycling), shorter trip lengths (due to proximity of activities), spreading of peak hour trips to off-peak hour, increased telecommuting and slowing of the projected growth in the number of cars. The New Visions Plan is much broader than highway capital projects. It

includes travel demand management strategies, operational strategies, land use policies (such as urban reinvestment and encouragement of mixed use development) and investments in transit, walking, and bicycle facilities.

CDTC's New Visions policy forecast results from planned transportation investment, demand management and the shifts of vehicular traffic to other modes and other times of day produced by improved regional land use patterns, community structure, site design and the better accommodation of bicyclist, pedestrian and transit modes. There is increasing evidence that younger people prefer to be independent of driving as a lifestyle choice. The policy forecast remains CDTC's target traffic condition used in project design and reflects plausible success in implementing the plan through the horizon year of 2040. CDTC forecasts for the New Visions Plan assume that PM peak hour trip growth rate will dampen so that it corresponds to the growth rate in households.

If CDTC were to assume that the New Visions Plan will not succeed in moderating the growth of auto VMT, this would become a self-fulfilling prophecy. This is because design of highway projects is based on PM peak hour traffic forecasts for twenty years, and for bridge projects, for thirty years. Assuming linear trend forecasts of travel ignores the socioeconomic trends, trends in gas prices, and land use planning, and ironically leads to larger foot prints for highway projects, and diversion of resources into highway capacity and urban disinvestment. Linear trend forecasts for VMT would undercut the New Visions Plan and the CDTC Congestion Management System, and would encourage and contribute to increased fuel consumption and air quality emissions.

CDTC assumes that the desired outcome will be achieved by the set of land use and transportation actions in the plan. CDTC thus embraces its tempered, policy-based traffic forecasts for all planning and design work – not the forecasts based on previous trends. As a result, TIP projects are implemented in the Capital District at scopes and with design details that reflect the desired outcome.

Rationale for VMT Moderation with the New Visions Plan. The New Visions Plan calls for investments in transit, pedestrian and bicycle facilities, planning for smart growth, demand management, and other investments that will encourage a reduction in VMT growth per capita. The New Visions Plan is expected to reduce VMT growth by 5% below projected trend levels by 2030. Working with the best secondary sources available, an attempt to quantify future VMT reductions was made. These estimates are not scientifically provable, yet they are as likely to be conservative as they are to be optimistic. The effects of the New Visions Plan will be cumulative over time, and the different components of the plan will reinforce each other. The various New Visions initiatives work together to create viable places to live, work, shop and play that provide shorter trip options and non-auto options for travel.

Reductions in VMT will result in a corresponding reduction in fuel consumption and greenhouse gas emissions. VMT reductions are expected to result from New Visions Plan investments as follows:

Table 1
Forecasts of Future Reduction in VMT per Household

Investment Strategy	Reduction in VMT per Household
Smart growth, mixed use development and transit oriented development	1.5%
Investments in transit	1.5%
Investments in bicycle and pedestrian facilities	1.5%
Investments in demand management	0.5%

CDTC will update its forecasts of fuel consumption and greenhouse gas emissions using the recently released version of the Environmental Protection Agency (EPA) methodology, called the MOVES Model. The forecast will take into consideration the long term improvements in fuel economy that are expected to result from new CAFÉ standards, as well as CDTC forecasts of travel in the Capital District.

Because of the importance of reducing greenhouse gas emissions in the short term, it is important to understand existing patterns of greenhouse gas emissions. CDRPC's report *Capital District 2010 Regional GHG Inventory* estimates greenhouse gas emissions and energy consumption related to on-road transportation for the four counties of CDTC's planning area as shown in Table 2.

Table 2
Greenhouse Gas Emissions and Fuel Consumption
For On-Road Transportation

	Greenhouse Gas Emissions (MTCDE)	Energy Consumption (MMBT)
Albany	1,496,750	22,450,196
Rensselaer	619,296	9,272,632
Saratoga	1,177,072	17,628,401
Schenectady	459,058	6,879,141
Total	3,752,176	56,230,370

MTCDE= Metric Tons of Carbon Dioxide Equivalent
MMBT= energy unit equal to 1 million British thermal units

The following table from the *Capital District 2010 Regional GHG Inventory* illustrates that a 5% reduction in VMT (in the eight county area) would lead to a 5% reduction in transport related greenhouse gas emissions, a 1.6% reduction in total greenhouse gas emissions (across all sectors) and an annual fuel cost savings of $97,348,191. A 10% shift of VMT from light duty gasoline cars and trucks to electricity would result in a 6.9% reduction in transport related greenhouse gas emissions, a 2.2% reduction in total greenhouse gas emissions (across all sectors) and an annual fuel cost savings of $87,470,126. A 5% shift from gasoline to ethanol would result in a 2.6% reduction in transport related greenhouse gas emissions, a 0.3% reduction in total greenhouse gas emissions (across all sectors).

Table 3
Reducing Transportation Emissions in the Capital District

Shift light duty gasoline cars and trucks to electricity[1]

	GHG Savings			
% Shift of VMT	Emissions (MTCDE)	% transport	% of total baseline	Fuel Cost Savings[2]
10	340,176	6.9%	2.2%	$87,470,126
20	680,351	13.7%	4.4%	$174,940,253
50	1,700,878	34.3%	10.9%	$437,350,632
100	3,401,756	68.6%	21.8%	$874,701,263

Reduce overall travel demand (VMT)

	GHG Savings			
% Reduction of VMT	Emissions (MTCDE)	% transport	% of total baseline	Fuel Cost Savings
2	99,217	2.0%	0.6%	$38,939,276
5	248,042	5.0%	1.6%	$97,348,191
10	496,085	10.0%	3.2%	$194,696,381
20	992,170	20.0%	6.3%	$389,392,762

Shift from gasoline to E-85 (cellulosic or advanced cornstarch)

	GHG Savings			
% Shift	Emissions (MTCDE)	% transport	% of total baseline	Fuel Cost Savings
2	51,281	1.0%	0.3%	--
5	128,202	2.6%	0.8%	--
10	256,404	5.2%	1.6%	--
20	512,809	10.3%	3.3%	--

1 Electric vehicle efficiency set to 0.34 Kwh / mile (UCS, 2012), total cost of electricity $0.17/KWh
2 Presumed $4.00/gallon for gasoline
3 Assumes sustainable ethanol has 60% lifecycle emissions reduction per gallon over gasoline

Performance Objectives- CDTC will develop short term objectives and long term objectives for reductions in greenhouse gas consumption and energy consumption for the on-road transportation sector. The goals will be supportive of the State Energy Plan. Two relevant goals currently mentioned in the energy plan are:

- Increase the number of alternative fueling and charging stations
- Working through innovative public-private partnerships, investments in clean energy transportation strategies will help New York to reduce the intensity of its carbon emissions from the energy sector in support of State Energy Plan goals.

Recommendations

The following are recommendations by the Environment and Technology Task Force for CDTC Planning Committee consideration.

1. **Project Review Process**- CDTC should continue its project review process to evaluate environmental impacts during project selection. Use geographic information systems data (GIS) to overlay limits of candidate TIP projects, of project types that have a significant potential for environmental impacts, against natural and cultural resources mapping as part of the evaluation process for candidate projects during the next and subsequent TIP updates. Opportunities to improve the process will be considered.

2. **Greenhouse Gas Emissions**- CDTC should consider expanding its project review process to further evaluate greenhouse gas emission impacts during TIP project selection.

3. **Consider the potential for totally automated vehicles in highway and bridge design**. The potential for future increased capacity resulting from totally automated vehicles should be strongly considered in highway and bridge design. Operational capacity increases related to automated vehicles may result in less congestion without adding physical capacity. Designing a larger footprint to anticipate 2040 traffic conditions may be totally unnecessary if automated vehicles are fully established in the fleet by then. Designing a larger footprint that is unnecessary is not only prohibitively expensive but can work against the New Visions policies to encourage complete streets and demand management. The New York State Department of Transportation should consider if changes to the current design approach are needed to reflect potential changes in future demand as well as potential changes in the congestion threshold that triggers a need for increased capacity. As these changes emerge, the New York State Department of Transportation should work with its partners within AASHTO and the Federal Highway Administration to consider implications to design standards.

4. **Smart Growth-** The CDTC New Visions Plan supports sustainable development patterns and site design, urban reinvestment, and community-based land use planning. While the impacts of totally automated vehicles, other emerging technologies, and alternative fuels on smart growth are uncertain, the region should continue to develop as an attractive region with vibrant urban and suburban communities that are walkable; and rural character and open space should continue to be protected. As the impacts of automated vehicles unfold, the regional vision can prevail and technology should be used to enhance communities.

5. **Anticipate Technology with Flexibility and Smart Near Term Investments**- While future technologies may lead to dramatic improvements, that potential will not lessen the need for making the best use of transportation investments in the near term. In the near term, transportation investments will be needed to improve safety and mobility for all residents. The New Visions Plan must proceed with short term and medium term investments, while maintaining flexibility to implement technology as it arrives. Further study will be necessary to anticipate the impacts of new technologies as they come on line.