Technical Appendix

Air Quality Assessment

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Introduction

Air pollution originates from various sources. Emissions from industry and internal combustion engines are the most prevalent sources. The impact resulting from transportation projects ranges from intensifying existing air pollution problems to improving the ambient air quality.

The Federal Clean Air Act of 1970 established the National Ambient Air Quality Standards (NAAQS). These standards were established to protect the public from known or anticipated effects of air pollutants. The most recent amendments to the NAAQS contain criteria for sulfur dioxide (SO_2), particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). In addition to these criteria pollutants, additional focus has been placed on determining the impact of transportation facilities on greenhouse gases, most notably carbon dioxide (CO_2).

The primary pollutants from motor vehicles are unburned hydrocarbons, nitrous oxides, carbon monoxide, and particulates. Hydrocarbons and nitrogen oxides can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and NO_2. Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources. As a result, the impacts of transportation facilities is often best assessed at the regional level.

The purpose of this Appendix is to provide a summary of air quality conditions in the CRTPA region along with exploring best practices for future emissions reductions.

Attainment Status & Transportation Conformity

Required by the Clean Air Act section 176(c) (42 U.S.C. 7506(c)), transportation conformity ensures that federal funding and approval are given to highway and transit projects that conform to the air quality goals established by the state air quality implementation plan (SIP). Emissions are monitored at selected locations across the state of Florida to determine how the various regions are performing against the NAAQS. If an area is determined to exceed the standards at the levels specified by the standards, it will be designated as non-attainment.

At this time, all counties within the CRTPA region are designated as attainment areas for all criteria pollutants. There are three air quality monitors in this region, located at:

- Tallahassee Community College, Leon County
- Miccosukee Greenway, Leon County
- St. Marks Wildlife Refuge, Wakulla County

Monitoring data for these locations as well as all monitors within the state can be found at the following location: http://www.dep.state.fl.us/air/air_quality/airquality.htm.

For this report, monitoring data for these sites was pulled for 2015. Each monitoring location was assessed both for its overall air quality index as well as the individual monitoring values. The air quality index is a way of combining the effects of all monitored pollutants into a single value. The air quality index can be divided into the following categories:

Good: No health impacts are expected when air quality is in this range.

Moderate (Ozone): Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Moderate (Particle Pollution): Unusually sensitive people should consider reducing prolonged or heavy exertion.

Unhealthy for Sensitive Groups (Ozone): Active children and adults, and people with respiratory disease should limit prolonged outdoor exertion.

Unhealthy for Sensitive Groups (Particle Pollution): People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion.

Unhealthy (Ozone): Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion: everyone else, especially children, should limit outdoor exertion.

Unhealthy (Particle Pollution): People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.

Very Unhealthy (Ozone): Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion: everyone else, especially children, should limit outdoor exertion.

Very Unhealthy (Particle Pollution): People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

In 2015, there were 75 days classified as "moderate" recorded by the monitor at the Tallahassee Community College. The St. Marks Wildlife Refuge monitor had 41 days classified as "moderate". There were no days that went above the moderate classification.

The 2015 monitoring values for ozone and PM2.5 all fall below the established values in the NAAQS, as shown in the table below.

2015 Maximum Monitored Air Quality Emissions		
Location	Pollutant	Value
NAAQS	*PM2.5 (24 hr)*	*35 ug/m³*
Tallahassee Community College (Leon County)	PM2.5 (24 hr)	29.9 ug/m³
St. Marks Wildlife Refuge (Wakulla County)	PM2.5 (24 hr)	32.2 ug/m³
NAAQS	*8-hour Ozone*	*0.070 ppm*
Tallahassee Community College (Leon County)	8-hour Ozone	0.069 ppm
St. Marks Wildlife Refuge (Wakulla County)	8-hour Ozone	0.063 ppm

Air Quality Assessment

Since the CRTPA area is in attainment for all criteria pollutants, there is not an air quality analysis required for the completion of the RMP. However, Florida state statues do impose the criteria of considering the reduction of greenhouse gas emissions.

In order to understand the air quality conditions currently being faced by the region and the conditions that will be in place in the future, an air quality analysis was conducted for PM2.5, ozone (consisting of volatile organic compounds and oxides of nitrogen), and carbon dioxide. This analysis was conducted using the EPA's approved air quality modeling software, MOVES2014a. Where available, local data was referenced for this analysis. Overall vehicle miles traveled by county were obtained from the travel demand model. In order to seamlessly use data from the model, the base year for the analysis was identified as 2007. The future year scenario was identified as 2040 and incorporated the cost feasible plan projects. The travel demand model uses a single vehicle type and daily model conditions, meaning that default information was referenced to obtain the level of detail needed for the MOVES2014a model. In addition, default data was used for vehicle source type populations, age distribution, and fuel types. Meteorological data was obtained from the Leon County WeatherSTEM service, referencing the monitor located on the Florida State University campus.

The table on the following page shows the emissions inventory results for PM2.5, VOC, NOx, and CO_2. PM2.5 emissions represent an average weekday, whereas VOC, NOx, and CO_2 emissions represent an average weekday in July. As shown in the table, emissions for all pollutants are expected to decrease significantly between 2007 and 2040. The reductions in delay realized through the cost feasible planning projects help to further promote air quality emissions reductions.

Air Quality Emissions Summary			
Pollutant	County	2007 Emissions (tons/day)	2040 Emissions (tons/day)
PM2.5	Gadsden	108	8
	Jefferson	43	4
	Leon	223	21
	Wakulla	24	2
NOx	Gadsden	3,534	640
	Jefferson	1,421	345
	Leon	6,957	694
	Wakulla	787	82
VOC	Gadsden	1,170	202
	Jefferson	518	111
	Leon	3,811	601
	Wakulla	412	71
CO_2	Gadsden	789,508	572,606
	Jefferson	308,540	266,173
	Leon	2,200,905	1,729,336
	Wakulla	219,462	201,699

Best Practices

Tallahassee is the State Capital with a central city with many large employers – State, City, regional governments, FSU and FAMU campuses. In addition, Tallahassee includes significant levels of downtown retail and growing residential (particularly students on campus and expanding downtown residential). There is a desire and need to create more multimodal facilities in downtown. Road diets have already been constructed downtown; the Gaines Street Corridor is a prime example. Bus Rapid Transit (BRT) is in the planning stages.

Surrounding the city is substantial suburban commercial and residential development. Density tends to be too low to support frequent transit except along key corridors connecting activity centers. The suburban challenge is the lack of attractive, convenient connectivity to transit from developments along but removed from key arterials. In these areas connectivity and access for bicycling and walking is fragmented. The street network comprises mainly large fast arterials with no or limited shoulders, sidewalks, or bike lanes. The low density development pattern also means greater distances between destinations that discourage active transportation and use of transit.

FDOT's new design standards are multimodal friendly, so as streets are rebuilt the network will improve. New FDOT standards include 7' bike lanes and 11' lanes standard for roads with speeds greater than 35 mph. For roads with speeds less than 35 mph the standard is 7' bike lanes and lane widths between 9' and 11'.

The regional context points to two different approaches tailored to the specific set of circumstances of the city and the surrounding areas. In the near future cars are likely to remain the predominant mode in suburban areas, and the built environment and low density limit transportation mode choices. This trend creates a greater pressure on the community and the transportation system since demographic changes over the next ten years project a doubling of persons age 65 and older, most of whom are aging in place. In addition, the instances of poverty, youths, and disabled populations are all primarily now located in suburban environments. This growth in traditionally transit dependent populations in suburban areas indicates an increased demand for mobility services in the areas most difficult to serve by transit.

The following groups of strategies are intended to offer people greater transportation choice and reduce vehicle miles traveled, and concentrate efforts where they will make the greatest impact.

Strategies for Urban Areas

Density, mix of land uses, and bicycle and pedestrian facilities all offer commuters greater transportation choice. Strategies to increase mode choice can be more ambitious (e.g. reducing parking supply through smart management) when commuters have real options. Some of the strategies to consider include:

- Parking Management
  - Reduced/eliminated minimum parking requirements
  - Unbundled parking
  - Public parking pricing
  - Parking Cash-Out
  - Shared parking
- Subsidized transit passes (commuter benefits are available in Florida but need to be expanded/sold to major employers)
  - Example: EcoPass with VTA in Santa Clara County, CA
  - Example: Go Pass with Caltrain
  - In Gainesville (UF) the tuition fee includes a free transit pass
- Transit improvements – BRT downtown, Improved University and Public Transit Integration, expanded/enhanced StarMetro Services

- Car sharing
- Land Use
    - Incentivize infill development
    - Incentivize development near existing mixed use and/or transit nodes
    - Transit Oriented Development (TOD) codes

Strategy Effectiveness

The following table summarizes the range of reductions in vehicle miles traveled for the above strategies. Note that for modeling purposes the total potential reduction is usually lower than the sum of individual reductions, because not all strategies would typically be employed together and because each additional strategy starts from a reduced base.

Strategy	VMT Reduction	Source	Notes
Reduced / eliminated parking requirements Shared parking	5-12.5%	TCRP Report 95, Chapter 18: Parking Management and Supply: Traveler Response to Transportation System Changes. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c18.pdf	Primarily applicable in urban and suburban areas. Effects are negligible in rural areas. Note that the policies should be paired with measures to manage parking spillover.
Unbundled parking	2.6 – 13%	Quantifying Greenhouse Gas Mitigation Measures, CAPCOA, August 2010	Primarily applicable in urban and suburban areas.
Public parking pricing	Up to 4.2%	"Costs and Cost Effectiveness of Transportation Control Measures", Apogee 1994, via http://www.vtpi.org/tdm/tdm26.htm	
Parking cash-out	12%	Donald Shoup, The High Cost of Free Parking. APA Planners' Press, 2005. Donald C. Shoup, Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies, http://www.arb.ca.gov/research/apr/past/93-308a.pdf	
Subsidized transit passes	19% reduction in drive-alone mode share	Average reduction in employee drive-alone mode share based on the following studies: Santa Clara Valley Transportation Authority (1997). Eco Pass Pilot Program Survey Summary of Findings. King County Metro (2000) FlexPass: Excellence in Commute Reduction, Eight Years and Counting. www.commuterchallenge.org/cc/newsmar01_flexpass.html Christopher White, Jonathan Levine, and Moira Zellner (2002). Impacts of an Employer-Based Transit Pass Program: The Go Pass in Ann Arbor, Michigan. www.apta.com/research/info/briefings/documents/white.pdf Jeffrey Brown, Daniel Baldwin Hess, and Donald Shoup (2003). Fare-Free Public Transit at Universities. http://shoup.bol.ucla.edu/FareFreePublicTransitAtUniversities.pdf University of Washington Facilities Services, The U-PASS Online and Telephone Survey Report (2006), www.washington.edu/commuterservices/programs/upass/reports.php	
Car sharing	0.4-0.7%	Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Technical Appendices. Cambridge Systematics. http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf	

Strategy	VMT Reduction	Source	Notes
Infill development	13-72%	"Growing Cooler – The Evidence on Urban Development and Climate Change". Ewing, et al, 2008. Urban Land Institute.	
Transit-oriented development	0.5-24.6%	"Travel Characteristics of Transit-Oriented Development in California". Lund, H. and R. Cervero, and R. Willson. 2004.	

Strategies for Suburban Areas

Greater distances between destinations, infrequent transit and lack of bike and pedestrian facilities limit transportation options. Strategies to reduce vehicle miles traveled therefore focus on employer-based programs. However, increasing bicycling and walking can be effective for shorter trips (<5 miles) with improved infrastructure.

- Employer-based Transportation Demand Management (TDM) Policies
    - Carpooling/ Vanpooling
    - Telecommuting/ Alternative Work Schedules
    - Guaranteed Ride Home Program
- Express bus combined with Park & Ride facilities
- Expand bicycle and pedestrian facilities and connectivity through new FDOT design guide
- Expand flex services in lower density areas, especially where these services can serve general public, ADA, and TD demand – included in the updated StarMetro TDP.

Strategy	VMT Reduction	Source	Notes
Employer-Based TDM	1-6.2% voluntary, 4.2-21% mandatory	Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Technical Appendices. Cambridge Systematics. http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf	
Carpool/vanpool	5-15%	TDM Encyclopedia, Victoria Transportation Policy Institute. http://www.vtpi.org/tdm/tdm34.htm;	Reductions tend to be large because ride sharing appeals most to those with long commutes. 15%+ possible with incentives like parking cash-out
Telecommuting/ Alternate Work Schedule	20%+	TIAX (2007), The Energy and Greenhouse Gas Emissions Impact of Telecommuting and e-Commerce, Consumer Electronics Association (www.ce.org); at www.ce.org/Energy_and_Greenhouse_Gas_Emissions_Impact_CEA_July_2007.pdf Accessed at VTPI, http://www.vtpi.org/tdm/tdm43.htm	The effects are highly dependent on job type or activity, telecoms service quality, and employer support. But even 1 day worked from home is a 20% reduction in VMT.
Guaranteed Ride Home Program	See note	"Guaranteed Ride Home", Victoria Transportation Policy Institute http://www.vtpi.org/tdm/tdm18.htm	It is hard to quantify the effect, but VTPI notes that the presence of a guaranteed ride home program is central to a majority of users choosing an alternate mode.

Strategy	VMT Reduction	Source	Notes
Express Bus + Park & Ride	0-3% + 0.1-0.5%	"Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies That Influence It. Transit Cooperative Research Program. TCRP 27, 1997. TDM Encyclopedia; Victoria Transport Policy Institute. Bus Rapid Transit; http://www.vtpi.org/tdm/tdm120.htm "Transportation and Global Climate Change: A Review and Analysis of the Literature" FHWA http://www.fhwa.dot.gov/environment/glob_c5.pdf	BRT VMT reduction estimate based on GHG reduction
Build out complete bicycle/pedestrian network	1-5%	Center for Clean Air Policy (CCAP) Transportation Emission Guidebook. http://www.ccap.org/safe/guidebook/guide_complete.html	Effects can be quite large in denser areas where average trip lengths are less than 5 miles.