



U.S. Department of Transportation
Federal Highway Administration

Greening Transportation at the Border



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Acronyms

ADOT	Arizona Department of Transportation
BECC	Border Environment Cooperation Commission
Caltrans	California Department of Transportation
CBP	Customs and Border Protection
CBSA	Canada Border Services Agency
CSS	Cascade Sierra Solutions
DOS	Department of State
EBTC	Eastern Border Transportation Coalition
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
GHG	Greenhouse gas
GPS	Global positioning system
GSA	General Services Administration
HUD	U.S. Department of Housing and Urban Development
IMTC	International Mobility and Trade Corridor
INDAABIN	Instituto de Administración y Avalúos de Bienes Nacionales
JWC	U.S./Mexico Joint Working Committee
LEED	Leadership in Energy and Environmental Design
MOC	Memorandum of Cooperation
MOU	Memorandum of Understanding
MPO	Metropolitan planning organization
NADBANK	North American Development Bank
NAFTA	North American Free Trade Agreement
NASCO	North America's Superhighway Coalition
PPPs	Public private partnerships
RAP	Recycled asphalt pavement
RAS	Recycled asphalt shingles
SCT	Mexican Secretariat of Communication and Transportation
SEMARNAT	Mexican Secretariat of the Environment and Natural Resources
TBWG	Canada/U.S. Transportation Border Working Group
TSE	Truck stop electrification
USDOT	U.S. Department of Transportation

Executive Summary



Native plant species can be impacted by transportation facilities

Over recent years, increased attention has been given to implementing sustainable transportation options that can result in reduced environmental impacts while improving air quality, public health, and wildlife and habitat connectivity. These efforts to “green” transportation have been extended to the regions along the U.S./Mexico and U.S./Canada borders, areas that in the past have been shown, for example, to have high levels of air pollution. As such, federal transportation agencies in the North American countries have partnered to develop a “Greening Transportation at the Border” initiative, which is intended to promote the adoption of a variety of environmentally sustainable transportation practices along the borders.

On February 23–24, 2011, Federal agencies from the United States, Canada, and Mexico sponsored a workshop in San Diego, California, to discuss opportunities for improvement regarding the greening of transportation at the borders.¹ The workshop, which approximately 130 people attended, focused on the following four border transportation themes:

- Sustainability and Livability;
- Green financing and industry;
- Green technology; and
- Performance measures.

The report, which presents an overview of green transportation technologies, policies, and initiatives, is based on presentations given and discussions held at the workshop. It is intended to serve as a reference for agencies involved in border transportation planning, including national, state/provincial, and local governments. Some key findings and recommendations include:

¹ The workshop agenda and speakers were assembled by a coordinating committee consisting of representatives from the U.S./Mexico Joint Working Committee on transportation planning, the Environmental Protection Agency, Transport Canada, Canada Border Services Agency, Commission for Environmental Cooperation, Border Environment Cooperation Commission, North America’s Superhighway Coalition (NASCO), the Mexican Secretariat on Environment and Natural Resources, the Border Technology Exchange Program, New Mexico Border Authority, the U.S. Department of Commerce, the U.S. General Services Administration, CEMEX, and the Texas General Land Office.



Queuing at a land port of entry

- **Finding:** Emissions and particulate matter from vehicles crossing the borders have significant impacts on air quality and contribute to climate change.

Recommendation: The U.S., Mexico, and Canada should seek ways to reduce emissions and particulate matter at the border through targeted programs and technology improvements.

- **Finding:** Political boundaries and associated infrastructure that bisect ecosystems can negatively impact natural systems including watersheds and wildlife habitat.

Recommendation: The U.S., Mexico, and Canada should continue to implement connectivity tools, as well as more sustainable infrastructure development and site selection processes along the border.

- **Finding:** The negative environmental and public health impacts associated with border crossings extend beyond ports of entry into border communities.

Recommendation: Planning done at the border should take a holistic view of the border regions and include livability and sustainability as goals for border communities when considering transportation solutions.

- **Finding:** Green finance techniques for border projects have long been underutilized to improve productivity, reduce congestion, and improve environmental conditions.

Recommendation: Innovative financing techniques should be tested and employed on green transportation projects at the border to support the positive environmental and livable results associated with reduced congestion and greener borders.

- **Finding:** Poor air quality from vehicle emissions and other sources of particulate matter are significant problems in the border regions and have serious public health impacts.

Recommendation: Continue to fund and promote research on current exposures to emissions, particulate matter and unsatisfactory drinking water in the border regions, and develop new and implement new technologies and policies to limit these exposures.



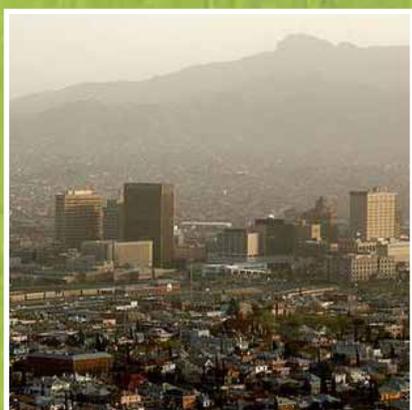
Efforts can be made to minimize impacts that transportation facilities have on ecosystems

- **Finding:** Currently, most environmental and transportation planning done along the border is conducted in a manner in which each country is responsible for the planning and projects along its side of the border.

Recommendation: Environmental and transportation planning should be done jointly for the border regions to ensure better environmental and quality of life outcomes for the border regions.

Introduction

The purpose of this report is to present opportunities for improvement regarding the “greening” of transportation at the U.S./Mexico and U.S./Canada borders. Greening refers to the adoption of environmentally sustainable practices to reduce environmental impacts. The report, which presents an overview of green transportation technologies, policies, and initiatives that can be applied in the border regions, is based on presentations given and discussions held at the “**Greening Transportation at the Border Workshop**” convened on February 23–24, 2011, in San Diego, California. The report is intended to serve as a reference for agencies involved in border transportation planning, including national, state/provincial, and local governments.



Congestion at land ports of entry can affect air quality in neighboring communities

Greening Transportation at the Border

The green border initiative is a vision of how the U.S./Canada and the U.S./Mexico border regions can become *sustainable* and *livable*.

A *sustainable* border region is one that strikes a balance between reducing impacts on the environment, promoting economic development, and supporting social equity. By adopting policies and technologies aimed at improving sustainability, the border regions can thrive long into the future.

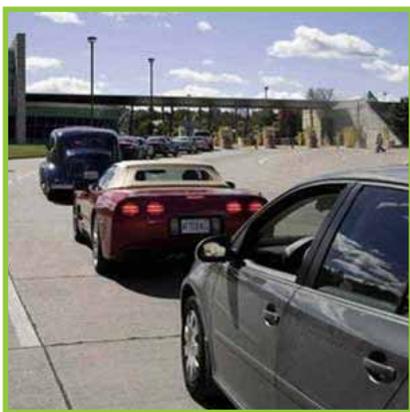
A *livable* border region is one that is healthy, safe, and affordable for residents and others crossing the border. FHWA has identified six guiding principles for livable communities, consisting of providing transportation choice (alternatives to automobiles in particular); promoting affordable housing; enhancing economic competitiveness; supporting existing communities; enacting policies that promote collaboration; and enhancing the value of communities and neighborhoods. A focus on livability intends to improve the quality of life in the border regions for the current generation.

With the concept of fostering sustainable and livable border regions in mind, Federal agencies from the United States, Canada, and Mexico convened the “Greening Transportation

at the Border Workshop” in February 2011 to formally kick-off a green border initiative for transportation. Presenters at the workshop gave information on the state the practice, challenges faced, and opportunities for implementing more sustainable transportation activities along the border.

Federal Green Border Initiatives

Federal agencies are already working together to coordinate efforts to green the border areas, thus capitalizing on expertise from a variety of disciplines. The U.S. Department of Transportation (USDOT), the Border Environment Cooperation Commission (BECC), the U.S. Environmental Protection Agency (EPA), and the General Service Administration (GSA) each sponsor programs that address transportation sustainability issues affecting border areas. For example, USDOT is working to create safer, greener, more livable communities in border areas by supporting the development of tools that measure the sustainability of highways and improving coordination on



Passenger vehicle queuing at a land port of entry

sustainability issues through formal partnerships. Two notable USDOT activities to address sustainability include its sponsorship of the Sustainable Highways Self-Evaluation Tool¹ and its involvement in the U.S. Department of Housing and Urban Development (HUD)/USDOT/EPA Partnership for Sustainable Communities.²

The EPA is working with Federal and state partners, as well as bilaterally with the Mexican Government, to reduce vehicle emissions. These efforts include raising fuel economy standards, sponsoring voluntary emissions reductions programs, and retrofitting diesel engines. Additionally, a variety of public agencies, including USDOT and several state agencies, are partnering with EPA to devise workable strategies to address the challenge of vehicle idling at border crossings.

The BECC, an organization that provides technical assistance and training to local organizations in order to help them confront environmental issues created by growth spurred by the North American Free Trade Agreement (NAFTA), certifies and finances the development of environmental infrastructure in border areas. One of BECC’s recent areas of emphasis has been wastewater collection and treatment facilities along the U.S./Mexico border. In parallel, GSA, the agency that facilitates the procurement of buildings and vehicles in the United States at 165 land ports of entry at the U.S./Mexico and U.S./Canada borders, has a program in place to ensure that new facilities meet minimum Leadership in Energy and Environmental Design (LEED)-Gold standards. GSA is also working to procure hybrid and electric vehicles for the Federal fleet.

¹ For more information, visit www.sustainablehighways.org/.

² HUD/DOT/EPA Partnership for Sustainable Communities: www.epa.gov/smart-growth/partnership/



Passenger vehicle queuing at a land port of entry

Greenhouse Gas Legislation — The California Experience

California has been a leader in addressing climate change through legislation. The state has a special interest in addressing climate change due to its high level of greenhouse gas (GHG) emissions from transportation sources (38 percent, the largest percentage among all categories of emissions sources). Additionally, California's densely developed and populated coast is particularly vulnerable to sea level rise, which has been linked to climate change. To address climate change issues, California has passed two key pieces of legislation aimed at reducing GHG emissions and integrating transportation and land use planning:

- **The Global Warming Solutions Act.** Enacted in 2006, the Act aims to reduce GHG emissions to 1990 levels by 2020. It establishes a cap and trade mechanism for reducing emissions from energy generation. It also sets higher fuel stan-

dards and establishes a program for capturing and reclaiming emissions from stationary sources by, for example, reclaiming methane from landfills.

- **Senate Bill 375.** Enacted in 2008, the Bill addresses transportation emissions by establishing per-capita GHG targets for metropolitan planning organizations (MPO) responsible for transportation and land use planning. California's 18 MPOs are responsible for developing strategies to meet regional targets. California's budget crisis, however, is affecting the ability of MPOs to fund some of the projects that would reduce GHG emissions.

Complementing these legislative efforts, the California Department of Transportation (Caltrans) is addressing climate change by purchasing alternative fuel trucks, deploying energy saving lighting at Caltrans facilities, and identifying critical transportation infrastructure that may be impacted by sea level rise.

California is leading the drive for legislative action on climate change. The U.S., Mexico, and Canada can build on California's efforts to enact national or international climate change legislation and policies.

U.S./Mexico Joint Working Committee on Transportation Planning



Congestion at land ports of entry delay the movement of goods

The U.S./Mexico Joint Working Committee on Transportation Planning (JWC) is a bi-national group with the primary focus of cooperating on land transportation planning and the facilitation of efficient, safe, and economical cross-border transportation movements. The JWC promotes effective communication concerning transportation planning between U.S./Mexico border states and works to develop a well-coordinated land transportation planning process along the border. Among other efforts, the JWC works to:

- Establish methods and procedures to analyze current and future transportation infrastructure needs;
- Evaluate transportation demand and infrastructure impacts resulting from future changes in land transportation traffic.

Following the enactment of the NAFTA on April 29, 1994, USDOT and the SCT signed a Memorandum of Understanding (MOU) establishing the JWC with a goal to “cooperate on land transportation planning and to establish methods and procedures to analyze current and future highway transportation infrastructure needs to facilitate efficient, safe and economical cross-border transportation movements.” In October 2000, a second MOU was signed between the two agencies to reinforce and strengthen the partnership between the U.S. and Mexico on transportation planning at the border.

The JWC is comprised of transportation professionals from the FHWA and the SCT. Additional members of the JWC include representatives from the U.S. Department of State, the Mexican Secretariat of Foreign Relations, the four U.S. border state Departments of Transportation (DOTs), the six Mexican border states, the GSA, EPA, Customs and Border Protection (CBP) of the Department of Homeland Security, Mexican Secretariat of Communication and Transportation (SEMARNAT), Instituto de Administración y Avalúos de Bienes Nacionales (INDAABIN), and Aduana Mexico.

Canada/U.S. Transportation Border Working Group (TBWG)



Border Transportation facilities can affect wildlife

The mission of the Transportation Border Working Group (TBWG) is to facilitate the safe, secure, efficient, and environmentally responsible movement of people and goods across the U.S./Canada border. The TBWG brings together multiple transportation and border agencies and other organizations to coordinate transportation planning, policy implementation, and the deployment of technology to enhance border infrastructure and operations. As such, this forum fosters ongoing communication, information sharing, and the exchange of best practices to improve the transportation and the safety and security systems that connect our two countries.

In October 2000, Transport Canada and USDOT signed a Memorandum of Cooperation (MOC) highlighting the importance of coordination on transportation initiatives along the U.S./Canada border. The TBWG was formed out of the MOC to improve the transportation and inspection systems that connect the U.S. and Canada by:

- Enhancing border related infrastructure, operations, safety, security, and environmental stewardship by convening federal, state, provincial agencies, and other organizations to coordinate federal planning and policy implementation;
- Improving information technology applications and data sharing;
- Supporting states' and provinces' work with federal agencies and with each other as an essential component of this mission; and
- Fostering communication, information sharing, and the exchange of best practices.

The TBWG was formed as a bi-national group in 2001. It is co-chaired by FHWA and Transport Canada with membership including the 11 northern border state DOTs and the Provincial DOTs along the Canada-U.S. border. Also included in the membership are GSA, CBP, the Canadian Border Services Agency (CBSA), Department of State (DOS) and the



Canadian Foreign Affairs, regional public bi-national groups (International Mobility and Trade Corridor (IMTC) and Eastern Border Transportation Coalition (EBTC)), and other interested participants. TBWG meets twice a year and has several subcommittees that work together to achieve shared goals and activities.

Opportunities for Greening Transportation at the Border

Various government agencies, nonprofit organizations, and industry leaders throughout North America are developing and implementing new technologies and strategies to green the borders. The U.S., Mexico, and Canada are instituting policies to make the border regions more sustainable and livable, employing innovative methods for financing green transportation projects, utilizing new technologies and techniques to reduce GHG emissions, and measuring performance at the borders to understand and effectively address green border issues.

Sustainability and Livability

Government agencies and their public and private sector partners can reduce the environmental impacts of transportation by developing programs and implementing technologies that contribute to sustainable and livable communities and ecosystems. Current programs and technologies, implemented at the vehicle, roadway, and regional levels, have been shown to reduce GHG emissions, limit the ecological impacts of roadways, and promote healthy, livable communities.

Sustainable Freight Transportation

Freight transportation is a major contributor to GHG emissions in North America. Freight trucking, in particular, presents unique challenges. Due to anticipated growth in shipping demand, GHG emissions from freight trucking are projected to increase by 20 percent over 2007 levels by 2030. The projected growth in freight truck traffic is expected to make it difficult to reduce the total amount of GHG emitted from freight trucks. Also, heavy-duty truck fleet turnover occurs more slowly than for passenger vehicles, limiting the benefits from introducing technologies for new vehicles. However, because fuel is a major cost component to freight trucking (second only to driver costs) and because freight trucking is a profit-driven enterprise, carriers have a strong financial incentive to invest in fuel-saving technologies and strategies.



On-vehicle technologies can reduce environmental impacts



Trucks release particulates and harmful gases into the air, affecting public health near land ports of entry

The private and public sectors are instituting programs and policies to reduce GHG emissions and energy consumption attributed to freight transportation. Cascade Sierra Solutions (CSS) and EPA's Clean Diesel Collaboratives are two programs that partner with carriers to reduce fuel consumption, thereby reducing GHG emissions and saving money.

CSS is a nonprofit organization that aims to reduce fuel consumption and emissions from heavy-duty freight vehicles, mainly along the Interstate-5 corridor in Washington, Oregon, and California. CSS promotes a variety of technologies and policies to reduce the environmental impacts of freight trucking while reducing costs for carriers. Three major initiatives include implementing onboard technological improvements sanctioned under EPA's SmartWay program; replacing older, more polluting trucks with cleaner vehicles; and implementing Truck Stop Electrification (TSE) along the I-5 corridor. Through its programs, CSS has upgraded or replaced 4,000 trucks and implemented TSE at six locations, resulting in an estimated savings of 11 million gallons of fuel and 110,000 tons of carbon dioxide emissions.

EPA has established seven regional Clean Diesel Collaboratives across the United States to leverage funds and take a local approach to mitigating diesel emissions. Each collaborative is a public-private partnership consisting of EPA regional offices, state and local governments, nonprofit organizations, and representatives from the private sector. The West Coast Collaborative, for example, has a Clean Diesel Program, that includes a competitive grant program to fund projects that reduce diesel emissions, such as vehicle retrofitting and diesel engine repowering. The Clean Diesel Program also allocates funding directly to the participating states to fund statewide loan/grant programs to reduce diesel emissions. Through these and similar programs, EPA and its partners aim to reduce the environmental impacts of freight trucking across the United States.

Ecologically Sensitive Roadways

Often, roads have significant environmental impacts on the ecosystem through which they pass; vehicle emissions degrade air quality, stormwater runoff carries pollutants into hydrological resources, and roads form physical barriers to the passage of animals. Roads can be built sustainably if the proper techniques and technologies are applied. Additionally, roadways can be built and rebuilt with the local ecosystems in mind in order to minimize the impacts on plant and animal life. The Greenroads Rating System is encouraging and evaluating roadway sustainability, and SCT and the Arizona Department of Transportation (ADOT) are addressing habitat segmentation wildlife connectivity as a part of roadway reconstruction projects.

The Greenroads Rating System is a program that measures roadway sustainability and encourages the use of sustainable technologies, policies,

and products in roadway construction to reduce the environmental impacts of roads. Greenroads awards points to roadway construction projects that employ sustainable practices from initial planning through construction. The program includes a set of requirements to be eligible for a Greenroads rating and voluntary credits to recognize specific sustainable practices. Projects that meet certain criteria can be designated Greenroads Certified or certified at the higher levels of Silver, Gold, and Evergreen. The Greenroads Rating System was developed at the University of Washington with several partners and has been applied mainly to roadway projects in the Pacific Northwest. FHWA and transportation agencies in other countries are looking to apply similar roadway rating systems elsewhere.

SCT has implemented an ecological corridor initiative to address concerns with habitat segmentation and other impacts that roadways have on wildlife. Prior to roadway construction or reconstruction, SCT performs environmental impact studies along selected roadway corridors to ensure that ecosystems are being protected from damage during and after construction. SCT anticipates potential environmental impacts and requires that project proponents develop mitigation strategies to address these impacts. Some of these mitigation strategies include dedicated wildlife crossings; erosion-control techniques; and the planting of nursery-grown, native plant species along roadways. In addition, SCT has a wildlife management program to redistribute plant and animal life to protect them from the impacts of the roadway.

ADOT is addressing roadway sustainability in its long-range plans as well as at the project level. Faced with rapid population growth, ADOT has made sustainability a top priority in its long-range transportation plans in order to limit GHG emis-



Recycling asphalt pavement conserves resources and reduces the environmental costs of transportation projects

sions from transportation. Specifically, ADOT will promote multimodal transportation, encourage sustainable development patterns, and consider impacts that transportation poses for the environment. At the project level, ADOT is addressing habitat segmentation by construction-dedicated wildlife crossings. For example, in 2010, ADOT constructed a bridge to link two Bighorn Sheep habitat areas across U.S. Highway 93. This type of project-level improvement will allow for the safe movement of wildlife in a busy transportation corridor, promoting economic development and environmental sustainability.

Livability at the Borders

Transportation can play a major role in making a community more livable. The City of El Paso is an example of a community that is employing green transportation strategies to improve the lives and livelihoods of its residents. While El Paso once had a comprehensive streetcar network, some areas in the city are now beset with traffic congestion. As a result, air quality has deteriorated and obesity rates have skyrocketed. Because of the auto-centric transportation system, urban development sprawls



Vision for a livable street in El Paso, Texas

out across the metropolitan area, reducing opportunities to walk, bicycle, and use transit.

The City of El Paso has set ambitious goals to make the city more livable and sustainable. The transportation elements of the plan include implementing bus rapid transit, promoting the use of cleaner fuels, and performing “urban retrofits” on major thoroughfares. These “urban retrofits” will transform wide roadways designed exclusively for automobiles into community streets that accommodate all modes and provide convenient and safe access to residential and commercial areas. These strategies will help improve air quality and public health, making El Paso a more livable community.

Green Financing and Industry

Addressing growing transportation and environmental infrastructure issues in border regions will require the use of innovative financing and emerging technologies. Innovative solutions for border issues include the use of public private partnerships (PPPs) to finance transportation projects, the development of new bilateral financial instruments to promote investment, the use of congestion pricing to influence transportation demand, and the development of new technologies to facilitate the transportation of freight and reduce vehicle emissions.

Financing Infrastructure Investment

A number of public agencies and institutions are actively financing investment in transportation infrastructure to address congestion and environmental issues in the U.S./Mexico border region. For example, the North American Development Bank (NADBANK), which was established in 1994 under the NAFTA, is supporting efforts in municipalities,

such as Chihuahua, Mexico, to develop more sustainable transportation systems by investing in bus rapid transit systems. NADBANK's mission is to enhance the affordability, financing, long-term development, and effective operation of infrastructure that promotes a clean, healthy environment for the citizens of the region. Additionally, the BECC supports capacity expansion projects at ports of entry designed to reduce border crossing times and improve air quality. The BECC is taking steps to finance the modernization of existing bridges at Puerto Mexico to enhance the capacity of the border crossing to process vehicles. Regulatory reforms could allow bi-national debt financing instruments that would enable sub-national governments to coordinate across the border to issue bonds for projects that address border issues. Socially responsible financial products could attract individual and commercial investors to invest in environmental infrastructure projects.



Warm-mix asphalt (right) results in less GHG emissions than hot-mix asphalt (left)

ADOT is considering the use of PPPs to finance transportation projects throughout the state and at the border. ADOT is developing a PPP program aimed at leveraging potential revenue streams to finance transportation projects. ADOT is also considering ways to enhance the use of solar power to power lighting, signals, and signage. In Texas, construction has recently begun on the West Rail Relocation Project, a project to relocate the Union Pacific railroad tracks out of downtown Brownsville and Matamoros sponsored by USDOT, Texas DOT, and Cameron County, Texas. The project involves construction of the first new rail bridge between the United States and Mexico in over a century. It eliminates 11 at-grade crossings and is expected to reduce the risk of train/car collisions.

Applying Innovative Solutions

New technologies and financing mechanisms can potentially address issues of congestion, air quality, and limited investment in border regions. Reduced congestion means less idling and fewer emissions. One approach to minimizing wait times at the border that FHWA supports is the use of congestion pricing combined with enhanced traveler information systems. Congestion pricing is a system of charging transportation network users in periods of peak demand to reduce traffic congestion. A congestion pricing project is under consideration at the Otay Mesa Port of Entry near San Diego, California. Similarly, efforts are underway to develop a support network of infrastructure for plug-in electric vehicles and to explore the feasibility of a "Universal Freight Shuttle" system. The latter would be an automated freight transport system that operates on an elevated guideway. The shuttle system could potentially include scanning and inspection systems to provide a cost-effective

solution for moving and inspecting freight at ports of entry while reducing congestion and emissions.

Green Technologies and Strategies

There are a variety of green technologies and strategies that can reduce GHG emissions at and near the borders. Efforts are being made to reduce emissions through implementing anti-idling strategies, employing green construction materials and practices, and installing vehicle technology enhancements on new and existing vehicles.

Port of Entry Technologies and Strategies

Congestion and delays at ports of entry can significantly increase emissions at border crossings, impacting human and environmental health. In order to minimize emissions due to congestion, various ports of entry at both the U.S./Mexico and the U.S./Canada borders are considering strategies to reduce unnecessary idling, including employing batch vehicle processing and TSE technology. In addition, Canada is evaluating and improving the energy efficiency of its port of entry facilities in order to reduce energy consumption and GHG emissions.

In many congested ports of entry, vehicles waiting to be processed slowly move along the roadway as traffic advances, running their engines during the entire wait time. Batch vehicle processing is one strategy to reduce this unnecessary idling. Officials at the Canadian side of the Peace Arch Port of Entry in British Columbia installed a series of traffic lights to keep vehicles from advancing until the queue at the processing point is diminished. While remaining stationary at the traffic light, drivers are encouraged, though not required, to shut off their engines. Peace Arch officials evaluated the

effectiveness of this strategy and found that 83 percent of drivers shut off their engines. Over the course of a year, officials estimate that this strategy could save 40,000 gallons of fuel and result in over 800,000 fewer pounds of GHG emissions. At a cost of roughly \$500,000 to implement, the batch vehicle processing strategy using traffic signals is an affordable and effective way to reduce unnecessary idling.

TSE is a strategy that was originally developed to reduce emissions from idling trucks at rest areas during driver layovers. When arriving at the truck stop, drivers shut off their engines and connect to an electricity source (and, in some cases, communications and heating/cooling systems), thereby reducing diesel emissions. This same technology, implemented in conjunction with batch vehicle processing, could be instituted at congested ports of entry where wait times to process freight vehicles are long. While waiting for the signal from border officials to advance to processing, truck drivers would connect to a centralized power system instead of idling. While TSE could have significant air quality benefits, the installation of the technology has a high capital cost.

Additionally, TSE requires ample land for implementation, which is scarce at some ports of entry. Transportation officials are considering the benefits and constraints of implementing TSE at congested ports of entry.

As part of its goal to reduce GHG emissions at ports of entry by 11 percent in 2020, the CBSA is incorporating green building practices in new and renovated port of entry facilities. CBSA has a policy that all new buildings will be LEED-Silver certified to reduce the environmental impacts of new port

of entry facilities. For existing facilities, CBSA is performing energy audits to determine current energy use and recommend ways to reduce energy consumption. Finally, the agency is retrofitting outdoor lighting with lower-energy technologies to reduce the carbon footprint of port of entry facilities. These strategies, combined with efforts to reduce unnecessary idling, are intended to help ports of entry become greener.

Roadway Technologies and Strategies

Several technologies and practices can be employed in the manufacture and installation of pavement surfaces that reuse and conserve natural resources while reducing GHG emissions. By incorporating Recycled Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) into new pavement mix, agencies can conserve natural resources. Additionally, warm-mix asphalt, a technology pioneered in Europe, requires that the asphalt mix be heated to 100 degrees less than



Freight vehicles can be retrofitted to reduce GHG emissions

traditional hot-mix asphalt, reducing GHG emissions and improving air quality for road construction workers. Finally, California is paving many of its roads with rubberized asphalt, which allows for reduced pavement thickness (and, therefore, fewer resources used), the recycling of existing resources, and GHG reductions.

There are also technologies and strategies to make concrete a more sustainable product. At the most basic level, recycled materials, including existing concrete, can be incorporated into concrete mix. Concrete can also be made to be porous to allow stormwater to seep into the water table instead of entering wastewater treatment. Also, special additives to the cement mix can remove some pollutants from the air. Above all, a sustainable concrete product is one that has a long, useful life so as to reduce the need for reconstruction.

Separately or combined, these technologies can be applied in the border regions to limit the GHG emissions generated during roadway construction and to conserve natural resources.

Vehicle Technologies and Strategies

The United States and Mexico have developed programs to promote green transportation practices among shippers, carriers, and vehicle manufacturers. EPA's SmartWay Transport Partnership and Mexico's Transporte Limpio (Clean Transportation) are showing businesses that going green makes economic and environmental sense.

Through the SmartWay Transport Partnership, EPA partners with over 2,700 companies, including carriers, shippers, and logistics companies.

The program promotes in-vehicle technologies that reduce fuel consumption and emissions. By using EPA-certified equipment, carriers who install



Truck stop electrification technology can be applied at some ports of entry to reduce emissions

packages of technologies on their trucks result in a 10-20 percent reduction in fuel consumption. EPA funds improvements through several finance programs, conducts outreach and education to disseminate information about SmartWay, and performs international activities to expand the scope of the program and learn best practices from outside of the United States. As part of the program, EPA collects data on carriers' and shippers' fuel consumption to evaluate their performance. Currently, the SmartWay partner companies constitute 10 percent of the trucks in the industry and 30 percent of the miles traveled. Since 2004, SmartWay partners have saved 14.7 million metric tons of carbon dioxide, 1.5 billion gallons of fuel, and \$3.6 billion in fuel costs.

Some of the success of the SmartWay Transport Partnership can be attributed to the program's branding. As a well-known green brand, shippers are giving preferred status to SmartWay carrier partners to supplement their internal green policies; and carriers are advertising their SmartWay affiliation to potential customers in addition to saving on fuel costs.

Jointly administered by SCT and SEMARNAT, Mexico's Transporte Limpio is based on EPA's SmartWay Transport Partnership. The program is currently focused on reducing fuel consumption and emissions from long-haul shipping companies. Companies interested in participating in Transporte Limpio undergo an evaluation of their environmental performance and enter the program for three years, during which their environmental performance is assessed. At the end of the term, an action plan is developed to further reduce fuel consumption and emissions. In 2010, 38 companies participated in Transporte Limpio, which involved 5,000 trucks. Overall, officials estimate that carbon dioxide emissions were reduced by 300,000 tons as a result of the program.

Both SmartWay and Transporte Limpio officials are looking to expand their programs to include more participants, further reducing fuel consumption and related emissions. Other countries are looking to the U.S. and Mexico as models to emulate.

Performance Measures

Performance measurement provides data that can be used to diagnose problems and develop effective solutions. Wait times at ports of entry are a significant concern, not only for the economic impacts of delays, but for the unnecessary idling that increases emissions in the border regions. Agencies are measuring wait times and air quality at and near ports of entry to understand the scope of the problems and implement strategies to minimize the air quality impacts of border crossings.

Port of Entry Wait Times

Congestion and delays at ports of entry increase wait times to cross the border. Increased wait times

result in vehicles idling for longer periods, increasing GHG emissions and diminishing air quality in the border region. Measuring wait times at ports of entry is the first step to understanding the scope of the problem and what solutions may be implemented to reduce delays, unnecessary idling, and emissions.

Transport Canada has been measuring wait times at border crossings in Ontario for several years. The agency uses global positioning system (GPS) and Bluetooth technologies to record wait times for passenger and commercial vehicles. Through its data collection efforts, Transport Canada has developed a baseline for wait times at several ports of entry for comparison with future analyses, which may use more sophisticated technologies and techniques. The agency found that while crossing times vary by time of day, the patterns remain relatively constant over longer periods of time, indicating that wait times at the ports of entry are relatively predictable. Transport Canada is investigating technologies that will



Vehicle queuing at the San Ysidro Land Port of Entry

provide a finer grain of detail about each segment of the border crossing process, specifically to better understand unnecessary idling.

FHWA, Texas DOT, and the Texas Transportation Institute are collaborating to implement wait time measurement systems at ports of entry along the U.S./Mexico border in Texas and Arizona. The team is using radio-frequency identification technology to determine the time that each vehicle enters and exits the port of entry and, in some cases, at interim locations at the crossing location. This data can be used to measure wait times throughout the day and over time to understand demand patterns. Wait time information can be shared with those crossing the border via the internet. Providing this information will allow drivers to shift to ports of entry with shorter wait times, reducing delays and associated emissions due to unnecessary idling. Additionally, this data can be shared with the agencies operating the ports of entry to help them make decisions that improve processing efficiency.

Air Quality

Vehicles passing through and idling at ports of entry release a host of toxic pollutants into the atmosphere, impacting the health of people in vehicles (drivers and passengers), people outside of vehicles (port of entry employees and pedestrians), and residents in border communities. Measuring the quality of the air inside and outside of vehicles at ports of entry and in border communities will help border officials understand the scope of the air quality problem in the border region. This data will help agencies address and mitigate air pollution at the border.

Researchers at San Diego State University performed a study to assess the in-vehicle pollutant exposures experienced by frequent cross-border



USEPA's Smartway program promotes green technologies

commuters at the Tijuana-San Diego border crossing at San Ysidro. Participants in the study varied their exposure to ambient air by having the windows open or closed and/or using air conditioning with and without interior air recirculation. The study found that exposure to ultrafine particles and carbon monoxide was highest at the ports of entry while exposure to black carbon was higher in both the U.S. and Mexico, and exposure to PM_{2.5} was higher in Mexico. However, because of the amount of time spent at the border by crossing vehicles, there is significant concern about the human health impacts of air pollution at the border.

San Diego State University partnered with Casa Familiar in San Ysidro to measure air quality for

pedestrians crossing the border as well as within Tijuana. The study found that exposure to PM_{2.5}, ultrafine particles, and carbon monoxide was much higher for pedestrians crossing the border at San Ysidro than they were within Tijuana. Reducing vehicle congestion at the port of entry could improve air quality for all users.

Air quality is a major concern for communities on both sides of the U.S./Mexico border due to emissions from vehicles passing through and idling at ports of entry. However, the concern is greater in border communities in Mexico — substandard transit vehicles release high levels of pollutants into the air, traffic congestion in the cities increases exposure to vehicle emissions, and poor roadway surfaces (dirt in some cases) contribute to unhealthy air in urban areas. Mexico's BECC is planning for and designing sustainable transportation infrastructure to improve air quality in border communities using air quality assessment data. For example, areas of the city with unpaved roads have very high levels of airborne particulates. In Tijuana, paving previously unpaved roads has been shown to reduce particulates by 25 percent. By measuring air quality, BECC is able to implement the strategy that has the greatest positive impact on local air quality.

Findings and Recommendations

Several findings that reach across disciplines emerged from the presentations made during the Greening Transportation at the Border Workshop. From these findings, recommendations were culled from the discussion and sessions throughout the workshop that FHWA and its partners in Canada and Mexico could undertake to improve the environmental sustainability and livability along the border regions:

Finding: *Emissions and particulate matter from vehicles crossing the borders have significant impacts on air quality and contribute to climate change.* Recent research at major universities and through government agencies suggests that older vehicles, unpaved roads, and freight operations at the border lead to a major decline in air quality at the border.

Recommendation: *The U.S., Mexico, and Canada should seek ways to reduce emissions and particulate matter at the border through targeted programs and technology improvements. Potential technology innovations include:*

- **Cleaner vehicles (USA):** EPA's SmartWay Transport Partnership promotes a variety of green transportation technologies aimed at limiting the environmental impacts of freight transportation through vehicle retrofits to reduce fuel consumption.
- **Cleaner vehicles (Mexico):** Mexico initiated Transporte Limpio (Clean Transportation) to reduce fuel consumption and emissions among long-haul freight carriers. Financial incentives have encouraged private companies to participate in the program.
- **Develop program with NADBANK and others to fund projects to pave unpaved roads.**
- **New alternatives to hot-mix asphalt and traditional concrete:** The use of recycled asphalt pavement, recycled tires, and recycled asphalt shingles can reduce emissions before and during construction. The use of warm-mix asphalt further reduced emissions generated during production and installation. New varieties of concrete can



New pavement technologies reduce greenhouse gas emissions during construction

reduce stormwater runoff and lower emissions during the production and installation of concrete.

- **Truck stop electrification:** Truck drivers connect their vehicles to electric outlets to power the vehicle during layovers to reduce emissions from excess idling.

Finding: *Poor air quality from vehicle emissions and other sources of particulate matter are significant problems in the border regions and have serious public health impacts. Border employees, people crossing the borders, and residents living near the borders are exposed to very high levels of particulate matter and other pollutants that research has demonstrated lead to significant health problems.*

Recommendation: *Continue to fund and promote research on current exposures to emissions, particulate matter, and unsatisfactory drinking water in the border regions and develop and implement new technologies and policies to limit these exposures. Topics to conduct further research on include:*

- **Health impacts to pedestrians at the border:** Develop a better understanding of the health impacts to pedestrians along the border of emissions and particulate matter and how to mitigate these impacts.
- **Mitigation of ultrafine particulates in the border regions:** Research methods to reduce the generation of and exposure to ultrafine particulates.
- **Methods to reduce GHG emissions at the border:** Develop better methods to reduce the concentration of GHG emissions along the border regions.

Finding: *Political boundaries and associated infrastructure that bisect ecosystems can negatively impact natural systems, including watersheds and wildlife habitat. Severing historic migration routes or stream channels, as well as increasing habitat fragmentation, can lead to a loss of ecosystem services and species.*

Recommendation: *The U.S., Mexico, and Canada should continue to implement connectivity tools, as well as more sustainable infrastructure development and site selection processes along the border. Tools that can support better ecosystem stability include:*

- **Wildlife crossing structures and technologies:** Improved wildlife crossing structures and technologies can reduce habitat fragmentation as well as wildlife-vehicle collisions. Wildlife crossings have been successfully installed in the border region in Arizona and Chihuahua.
- **Green Roads/Sustainable Highways Self-Evaluation Tool:** These tools are aimed at



Wildlife passages under roadways can prevent vehicle-wildlife collisions

helping transportation agencies to identify and improve the sustainability of roadways through a self-evaluation of transportation development and construction processes.

- **Modified Long-Range Transportation Planning:** Incorporating environmental assessment into Long-Range Transportation Planning can prevent environmental impacts through early identification of critical environmental resources.
- **Use of native plants in landscaping and mitigation:** Native plants grown in nurseries and placed near the construction site allow transportation agencies to landscape projects and mitigation sites with plants prepared to thrive in the project climate. Use of native plants will ensure better survival rate for the plants and will help restore and maintain ecosystem viability.

Finding: *The negative environmental and public health impacts associated with border crossings extend beyond ports of entry into border communities. Livability and sustainability principles are more often applied at land ports of entry than throughout the border regions, despite the fact that border communities are also, if not more, impacted by the traffic, congestion, and pollution generated by the border crossings than individuals crossing the border.*

Recommendation: *Planning done at the border should take a holistic view of the border regions and include livability and sustainability as goals for border communities when considering transportation solutions.*

- **HUD/USDOT/EPA Partnership for Sustainable Communities Grants:** These grants and

support for other programs like them help to stimulate sustainable and livable communities that connect housing, employment, and economic development with transportation and other infrastructure improvements.

- **Incorporation of livability and sustainability principles into transportation and land-use planning:** By including guidelines for new development that require the incorporation of livability and sustainability principles, communities can help to improve the quality of life in border communities.

Finding: *Green finance techniques for border projects have long been underutilized to improve productivity, reduce congestion, and improve environmental conditions.*

Recommendation: *Green finance techniques should be tested and employed at the border to yield the positive environmental and livable results associated with reduced congestion and greener borders. Such techniques include:*

- **Congestion Pricing:** Tolling and congestion pricing can shift demand at land ports of entry and, thereby, reduce idling from delays at border crossings and resulting emissions. Collected revenue can be dedicated to green border initiatives.
- **Public-Private Partnerships:** PPPs leverage private funds to develop projects that governments would not be able to afford with limited revenues, including green border projects.
- **Innovative Finance:** Governments should consider bonds and other innovative financing structures to attract private investment in green transportation projects at the borders.

- **NADBANK:** NADBANK facilitates financing for environmental projects along the U.S./Mexico border region by promoting sustainable development among the communities throughout the region. NADBANK can be a major player in the development of new green border projects.

Finding: *Currently, most environmental and transportation planning done along the border is conducted in a manner in which each country is responsible for the planning and projects along its side of the border.*

Recommendation: *Environmental and transportation planning should be done jointly for the border regions to ensure better environmental and quality of life outcomes for the border regions.*

- **Continued meetings of the Joint Working Group and the Transportation Border Working Group:** The U.S., Mexico, and Canada should continue to meet regularly to discuss joint implementation of green practices at the border.



Queuing at the San Ysidro land port of entry

Appendix A

Green Transportation at the Border Workshop Agenda

February 23, 2011

- 8:00 am **Purpose of the Workshop** — James Cheatham, FHWA; José San Martín, SCT; and Hal Parker, CBSA
- 8:10 am **Welcoming Remarks**- Laurie Berman, Caltrans
- 8:20 am **Keynote Speaker(s)**
Maria Luisa O’Connell, Senior Advisor for Trade Relations,
Customs and Border Protection
John Beale, Deputy Assistant Administrator, Office of Air and
Radiation, EPA
- 9:00 am **Coordinated Federal Efforts:**
James Cheatham, Director, Office of Planning, FHWA
Maria Elena Giner, General Manager, BECC
Sue Stendebach, Senior Advisor on International Air Quality,
Office of Air and Radiation, EPA
John Simpson, Office of Federal High-Performance Green
Buildings, GSA
- 10:00 am **Break**
- 10:15 am **Key California Legislation on Green House Emission**
LaNae Van Valen, Caltrans
**Greening Transportation: The Key to Sustainability in
El Paso**
Marty Howell, City of El Paso
- 11:00 am **Sistemas Integrales para la Construcción Sustentable**
Daniel Ramos Rodriguez, CEMEX

- 11:20 am **European Experience**
Francois Chaignon, COLAs Inc.
- 11:40 am **Green Roads Rating System**
Loren Bloomberg, CH2M HILL
- 12:00 pm **Lunch (Provided)**
Luncheon Topic/Speaker: “Financing Sustainable Urban Transportation Projects in the US-MEX Border Region”, Gerónimo Gutiérrez, Managing Director, NADBANK
- Concurrent sessions (Livability/Sustainability and Green Financing/Industry)**
- 1:00 pm **Introduction to Livability/Sustainability Session**
(Moderator-Esther Hitzfelder, TxDOT)
- 1:10 pm • Sustainable Freight in North America — Bruce Agnew, Discovery Institute and Juan Villa, TTI
• Corredor Biológico en la Frontera — Alberto Ramón de León Mier y Terán, SCT and Francisco Javier López Flores, BIIA
• Linking Sustainability and Transportation — Todd Williams, ADOT
- 2:20 pm • Green Technologies in Asphalt Pavements — Robert Lee, TxDOT
• Establecimiento de Viveros con Epecies Nativas (Establishment of Nurseries with Native Species) — Alberto Ramón de León Mier y Terán, SCT and Francisco Javier López Flores, BIIA
• Clean Diesel Collaboratives — Francisco Dóñez, EPA
- 1:00 pm **Introduction to Green Financing/Green Industry Session** (Moderator- Melisa Montemayor, TxDOT)

- 1:10 pm
- BECC/NADBANK Project Certification and Financing – Maria Elena Giner, BECC
 - HOT Lanes and Congestion Pricing — Robert Arnold, FHWA
 - 3P for Solar Lighting – Gail Lewis, ADOT
 - Preparación de Proyectos de Inversion en Transporte Fronterizo para su Certificación ante BECC (Development of Border Transportation Investment Projects for BECC Certification — Francisco Calvario, SCT
- 2:20 pm
- Electric Vehicle Project — Andrew Hoskinson, ECOTality North America
 - Universal Freight Shuttle — Dr. Stephen Roop, TTI
 - Rail Relocation: Emission and Livability Impacts — Pete Sepulveda, Cameron County, Texas
 - Financing Border Environmental Infrastructure — Dr. Salvador Espinosa, San Diego State University
- 3:15 pm **Break**
- 3:30 pm **Late Afternoon “Chat”:** Informal Interviews on Greening efforts by Different Organizations/ Agencies or Private Sector Groups by the masters of ceremonies:
- Roger Petzold, FHWA will interview:
- Bruce Agnew, Director; Chair of the Advisory Committee for the CEC’s Sustainable Freight in North America report, Discovery Institute, Cascadia Center
 - Francisco Conde, Directors of Special Projects and Communications, NASCO
- Manuel Cuan, SCT will interview:
- Juan Jose Erazo Garcia Cano, Director de Proyectos Intermodales y Fronterizos, SCT
 - Jose Ruiz or Rafael Escando, NADBANK

Marc Aubin, Transport Canada will Interview:

- Ron Rienas, Gen Mgr, Peace Bridge Authority
- Lynda Harvey, Natural Resources Canada

5:00 pm Adjourn for the day

February 24, 2011

8:00 am **Follow-up** – James Cheatham, FHWA; José San Martín, SCT; and Hal Parker, CBSA

Concurrent Sessions (Green Technology and Performance/Reliability Measures)

8:10 am **Introduction to Green Technology Session** (Moderator — Marc Aubin, Transport Canada)

- 8:20 am
- Reducing Diesel Emissions at Ports of Entry — Dave Fege, EPA
 - Red light Green Light Anti-idling Peace Arch POE — Todd Carlson, Washington DOT
 - SmartWay Transport and Transporte Limpio — Buddy Polovick, EPA and Ramiro Barrios Castrejón, SEMARNAT

- 9:30 am
- Renewable and Energy Efficiency Strategies at Ports of Entry — Anthony Kleppe, GSA and Hal Parker (Stephan Bowman), CBSA
 - Roadway Renewable Energy Systems — Eric Weaver, FHWA
 - Rubberized Asphalt Program — Shawn Rizzuto, Caltrans

8:10 am **Introduction to Performance/Reliability Measures Session** (Moderator — Marisa Walker, Arizona DOT)

- 8:20 am
- Defining Environmental and Human Health benefits of Mobility Projects and Measuring Results — Renata Manning-Gbogbo, BECC (Mario Vasquez)
 - In-vehicle and pedestrian exposures to air pollution at the San Diego-Tijuana border crossings in relation to wait times — Dr. P.J.E. Quintana
 - GHG Strategy Development: Recent Experiences — Andrew Martin, SANDAG
- 9:30 am
- US/Mexico Border Wait-times Studies — Juan Villa TTI and Esther Hitzfelder, TXDOT
 - Reflecting on 1st Technology-Based Efforts to Estimate Border Wait-Times at Can/US Border Crossings in Southern Ontario — Tony Shallow, Transport Canada
 - Findings: Measurements of Mobile Source Emissions in Mexican Border States — Veronica Garibay Bravo, SEMARNAT (Ramiro Barrios Castrejón)
- 10:45 am **Break** (regroup in the main conference room)
- 11:00 am **Panel of Policy Makers Addressing Questions from the Audience**
 FHWA, EPA, GSA, SCT, SEMARNAT, CBSA, Arizona DOT, BECC, Caltrans, SANDAG, and Port of Long Beach
- 11:50 am **Closing Remarks**
 James Cheatham, FHWA; José San Martín, SCT; and Hal Parker, CBSA
- 12:00 pm **Adjourn**

Appendix B

Workshop Participants

Arizona DOT

Gail Lewis
Sandra Quijada
Marisa Walker
Todd Williams

BECC

Maria Elena Giner
Jorge Hernandez
Mario E. Vasquez

BIIA Consultants

Francisco Lopez

C & M

Carlos Contreras

CAL Department of Foreign Affairs

Dana McBain

Caltrans

Anthony Aguirre
Laurie Berman
Bill Fegge
Karen Jewel
Mario Orso
Sergio Pallares
Shawn Rizzutto
Ismael Salazar
LaNae Van Valen

Cameron County

David Garcia
Pete Sepulveda

Canadian Consulate

Sree Sanyal

Cascadia

Bruce Agnew

CBP

Anna Hinken
Jim Pattan
Maria Luisa O'Connell
Jim Pattan

CBSA

Stephan Bowman
Hal Parker

CEMEX

Daniel Ramos

CETRATET Sonora

Jose Alfredo Espinoza Melendrez

CH2M Hill

Loren Bloomberg

City of El Paso

Marty Howell

City of Sunland Park

Jesical Avila
Andrew Moralez

CODEFRONT Nuevo Leon

Juan Carlos Gastelum

COLAS Inc.

Francois Chaigon

Consulate General Canada

Omeed Mosavat

Consultant

Salvador Lopez

CTR-UT

Alejandra Cruz-Ross

DOS

Georgina Scarlata

DZL

Robert Schroeder

EBTC

Kris Wisniewski

Ecototality

Andy Hosikinson

EDF

Erica Morehouse

El Paso MPO

George Pinal

EPA

Lisa Almodovar
 John Beale
 Francisco Doñez
 Dave Fege
 Nathan Lau
 Doug Liden
 Bill Luthans
 Buddy Polovik
 Lorena Lopez-Powers
 John Simpson
 Sue Stendebach
 Susan Sturges
 Tomas Torres
 Christine Vineyard

FHWA

Robert Arnold
 Travis Black
 Nelda Bravo
 James Cheatham
 Chris Dingman
 David Franklin
 Sylvia Grijalva
 Roger Petzold
 Manuel Sanchez
 Eric Weaver

Gannett Fleming Inc.

Matthew Schiemer

GSA

Abdee Gharavi
 Anthony Kleppe
 Ofelia Navarro
 Jim Oberg
 Ramon Riesg
 Matthew Schiemer

HNTB

Kirk Von Spaeth
 Mark Weber

INDAABIN

Alejandro Zuñiga Camacho
 Roberto Gomez

NAD Bank

Rafael Escandon
 Jose Ruiz

NASCO

Franciso Conde

NR Can

Linda Harvey

Nuevo Leon

Gerardo M. Mejia

Parsons Brinkerhoff

Toni Bates

PBA

Ron Reinas

Pharr Int'l Bridge

Edger Delgadillo
 Rick Martinez
 Jesse Medina
 Artemio Palacios

Port of Long Beach

Mario Cordero

Promotora de la Industria Chihuahua

Sergio Jurado Medina
 Raul Murillo

SANDAG

Tina Casgar
 Stacy Covina
 Gary Gallegos
 Andrea Hoff
 Andrew Martin
 Ron Saenz
 Hector Vanegas

SCT

Alberto Deleon
 SCT Baja California
 Sergio Barranco

SCT Chihuahua

Eduardo Esperon
 Gustavo Fernandez

SCT DGAF

Nalleli Espinosa

SCT DGDC

Francisco Calvario
 Manual Cuan
 Juan Jose Eraco
 Oscar Fernandez
 Leticia Pulido

SCT-IMT

Jorge Acha
 Guadalupe Lopez

SDSU

Salvador Espinoza
 PGE Quintana

SEMARNAT

Ramiro Barrios

SIDUR Sonora

Fernando Salazar

SRE

Sean Cazares

SRE Consulate General Mexico

Roman Fernandez

Transport Canada

March Aubin

Kathy Palko

Tony Shallow

TTI

Stephen Roop

Juan Villa

TxDOT

Esther Hitzfelder

Robert Lee

Melisa Montemayor

Manuela Ortiz

UABC

Alejandro Mungaray

USDOT Volpe Center

Jared Fijalkowski

Julianne Schwarzer

WCOG

Gordon Rogers

Wilbur Smith Associates

Isabel Victoria

WSDOT

Todd Carlson

Yuma MPO

Paul Putane

Appendix C

List of Participating Agencies and Companies

Federal Highway Administration (FHWA)

www.fhwa.dot.gov

US-Mexico Joint Working Committee (JWC)

www.borderplanning.fhwa.dot.gov/mexico.asp

Transportation Border Working Group (TBWG)

www.thetbwg.org

Environmental Protection Agency (EPA)

www.epa.gov

Transport Canada

www.tc.gc.ca/eng/tc-main.htm

Canada Border Services Agency (CBSA)

www.cbsa-asfc.gc.ca/

Commission for Environmental Cooperation (CEC)

www.cec.org

Border Environment Cooperation Commission (BECC)

www.cocef.org

North America's Superhighway Coalition (NASCO)

www.nasco-itc.com

Mexican Secretariat on Communications and Transportation (SCT)

www.sct.gob.mx

Mexican Secretariat on Environment and Natural Resources (SEMARNAT)

www.semarnat.gob.mx

Border Technology Exchange Program

international.fhwa.dot.gov/gtep/btep.cfm

New Mexico Border Authority

www.nmborder.com

U.S. Department of Commerce

www.commerce.gov

U.S. General Services Administration (GSA)

www.gsa.gov

CEMEX

www.cemex.com

Texas General Land Office

www.glo.texas.gov

