Hillsborough County
Metropolitan Planning Organization
P.O. Box 1110
601 E. Kennedy, 18th Floor
Tampa, Florida 33601-1110
P 813/272-5940
F 813/301-7172
http:\\ www.hillsboroughmpo.org
e-mail: transportation@plancom.org

January 22, 2013

Mr. David Hawk, Acting Administrator
U. S. Department of Transportation
Federal Highway Administration
Florida Division Office
545 John Knox Road, Suite 200
Tallahassee, FL 32303

Re: FHWA Vulnerability Assessment and Adaptation Options Pilot Projects Grant

Dear Mr. Hawk:

The Hillsborough County Metropolitan Planning Organization, in collaboration with the Hillsborough County Planning Commission, the Hillsborough County Hazard Mitigation Section, the Tampa Bay Regional Planning Council (TBRPC), and the University of South Florida (USF) is pleased to submit this application for the referenced grant.

Hillsborough County exists in an extremely vulnerable location on Tampa Bay, and has been fortunate not to be directly impacted by a major hurricane for over 90 years. For the majority or our history, the threat of destruction from storm surge flooding has not been uppermost in our citizen's minds. Nevertheless, we have been progressively planning for post-disaster redevelopment and hazard mitigation, and our grant application proposes to build on the best practices embodied in our local, regional and statewide plans. The County now faces additional threats from rising sea levels and the increasing frequency and severity of inland flooding triggered by a changing climate. Approximately 22% of our population lives today in areas that are at risk from flooding.

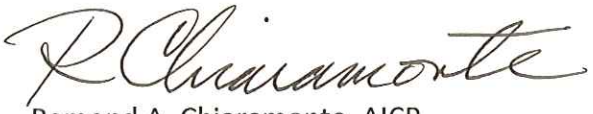
The purpose of our proposed pilot project is to build on our previous work, along with FHWA's Climate Change & Extreme Weather Vulnerability Assessment Framework and findings from the first round of pilot projects. We also hope to employ the Florida Department of Transportation's climate trends GIS assessment tool, the Tampa Bay Regional Planning Council's REMI model, and the NOAA Port resiliency planning tool to explicitly consider transportation in local, regional, and state-wide adaptation planning. Our specific aim is to identify potential adaptation/mitigation projects in the MPO's 2040 Plan to improve the resiliency of key transportation facilities.

Thank you for the opportunity to submit a proposal to become a pilot project. If further information is needed, please call me or either of the following staff contacts:

Richard P. Clarendon, AICP
Transportation Team Leader
email: clarendonr@plancom.org
phone: **813/273-3774 x368**

Allison Yeh, AICP, LEED GA
Principal Planner, Sustainability Coordinator
email: yeha@plancom.org
phone: **813/273-3774 x351**

Sincerely,



Ramond A. Chiaramonte, AICP
Executive Director

Cc: Karen Brunelle, FHWA Florida Division

Section I – Description of Proposed Effort

Responsible Agencies

This project will be led by the Hillsborough County Metropolitan Planning Organization (MPO) in partnership with the Hillsborough County Planning Commission, the Hillsborough County Public Works Department (Hazard Mitigation Section), the Tampa Bay Regional Planning Council (TBRPC), and the University of South Florida (USF).

Geographic Focus

The project evaluation area will be the jurisdictional boundaries of Hillsborough County, Florida. Hillsborough County is the economic hub of the Tampa Bay metropolitan region. Its industries are diverse and include the downtown Tampa businesses, the largest seaport in the state, tourism, higher education, medical services, and a thriving agricultural sector. Hillsborough County has the fourth largest population in the State, ranks first in population in the Tampa Bay region and has the largest land area with 1,051 square miles. The County seat is in the City of Tampa, which is the largest urban center in the region, and the state's third largest city behind Jacksonville and Miami. Home to the NFL Buccaneers and the NHL Lightning, Tampa has successfully hosted a number of major events, including several Super Bowls and the recent Republican National Convention. Tampa is also important from a national security perspective. It is home to MacDill Air Force Base, home to the US Central Command (CENTCOM) and Special Operations Command Center (SOCOM). The County's estimated 2010 population was 1,229,226, with a density of 1,170/sq mi. Transportation facilities do not terminate at political boundaries. The lessons learned in this pilot will be shared with 4.2 million stakeholders in the Tampa Bay CMSA.

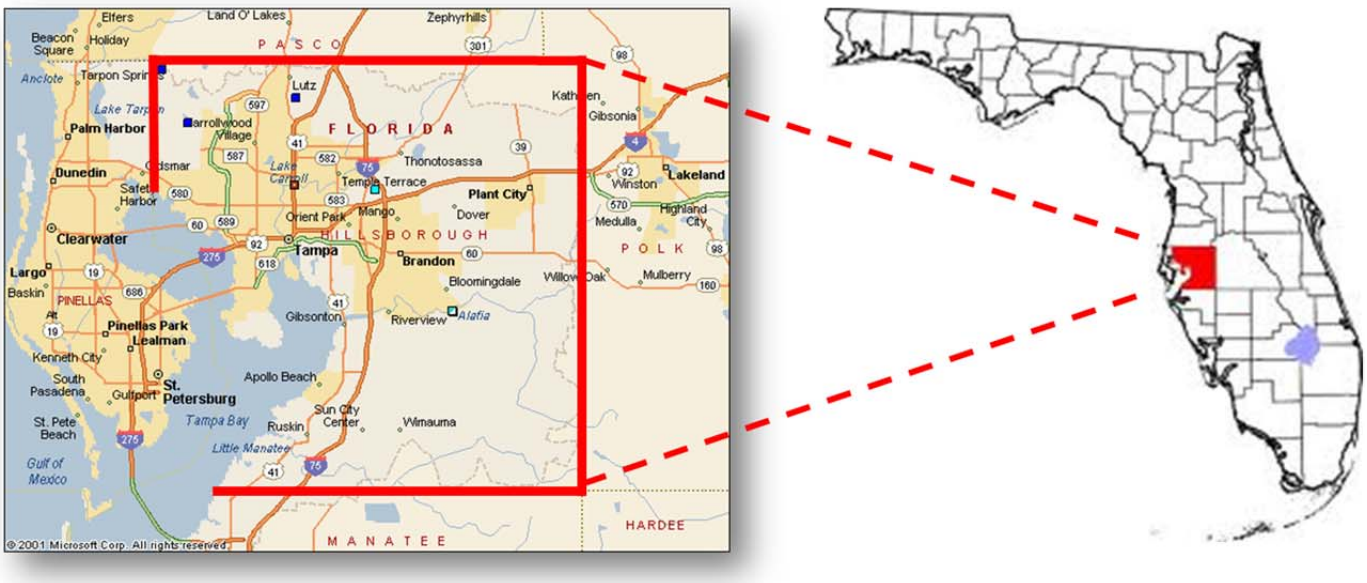


Figure 1. Hillsborough County, home to the City of Tampa, is located in the Tampa Bay metropolitan region of West Central Florida.

PURPOSE/GOAL

Many coastal communities face threats from extreme weather events, and Hillsborough County is no exception. Hillsborough County thrives in an extremely vulnerable location on Tampa Bay, and has been fortunate not to be directly impacted by a major hurricane for over 90 years. For the majority of the greatest growth period in its history, the threat of destruction from storm surge flooding has not been forefront in citizen's minds. Despite the calm, the County has been progressively planning for post-disaster redevelopment and hazard mitigation, and their Plan includes many *best practices*. Hillsborough County is one of six communities chosen by the State of Florida to be a case study to build the foundation for the State *Post-Disaster Redevelopment Planning –A guide for Florida Communities.* Due to climate change, the County now faces additional threats from sea level rise (SLR) and increasing frequency of severe inland flooding from heavy precipitation events. Approximately 22% of its diverse population is living in areas at risk from flooding.

The purpose of the proposed FHWA project is to leverage the FHWA Climate Change & Extreme Weather Vulnerability Assessment Framework and findings from the first round of FHWA Pilot projects, as well as the Florida Department of Transportation's climate trends GIS assessment tool, and the NOAA Port resilience planning tool to develop a process for including resiliency considerations in the transportation planning process at the local, regional, and state level. The goal is to identify mitigation/adaptation strategies that will be incorporated as projects in the MPO's 2040 Long Range Transportation Plan (LRTP)

VULNERABILITIES IN TAMPA BAY

Tampa Bay is vulnerable to a number of threats which are likely to be exacerbated by climate change. The threats are described below:

- **Inland Flooding from Precipitation:**
  Being on the Gulf of Mexico, the West Central Florida area experiences regular and frequent severe thunderstorm events. Unfortunately, when combined with Hillsborough County's flat topography and heavy urbanization, these events often lead to flash flooding. Ten of the worst flooding intersections in Tampa are all concentrated in the South Tampa neighborhood, which is adjacent to MacDill AFB at the tip of the peninsula (Figure 2). Flooding directly impacts access to/from MacDill AFB, and also affects transportation around downtown, airport, Westshore business districts and other major activity centerS. Efforts to upgrade stormwater drainage are costly and have had limited success. Inland flooding events also occur with regularity throughout the rest of Hillsborough County. With climate change, these inland flooding episodes are expected to become more frequent and more severe.

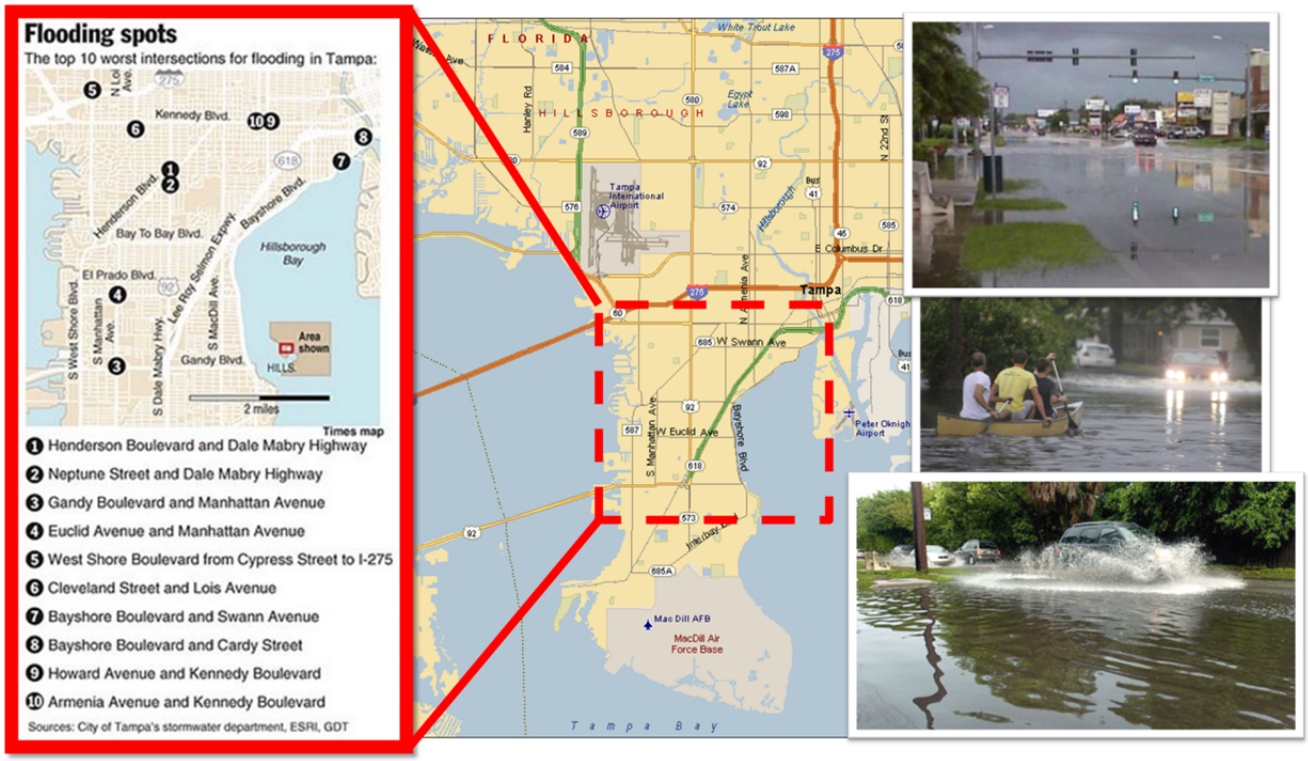


Figure 2. Frequent inland flooding from heavy precipitation in South Tampa, which provides critical access routes to MacDill AFB (bottom of map). The top ten worse flooding intersections are all in South Tampa.

- **<u>Storm Surge from Tropical Storms and Hurricanes:</u>**

  Florida is the most hurricane-prone state in the nation. While Southern Florida has experienced the most number of hurricanes, communities along the Gulf of Mexico are not exempt from this natural hazard and have seen their share. The low-lying areas of Hillsborough County are considered flood prone areas. Still, in recent years heavy development has occurred in many of the flood prone areas in the County and the high population density make these areas even more vulnerable to potential disasters. All coastal areas (158 mi. shoreline) of the 1,051 square mile Hillsborough County, and the flood plains along the three county rivers (Hillsborough, Alafaia, and Little Manatee), are considered hazard areas for hurricane storm surge. Since 1871, the County has experienced 37 hurricanes and major tropical storms, which is equivalent to an occurrence every 3.62 years.

  The Tampa Bay region has experienced periodic tropical storms, and some of them, such as Debby in 2012, have caused significant damage and interruption from flood and wind. Storm surge from Debby flooded Bayshore Boulevard, a major artery between downtown Tampa and MacDill AFB (Figure 3). High winds associated with Debby also caused the Sunshine Skyway Bridge (a major thoroughfare at the mouth of Tampa Bay) to be closed for several days, causing significant transportation interruption and detour. Although the Skyway Bridge is in Manatee County, south of Hillsborough County, detour traffic to the county was pushed to Hillsborough County surface roads and three cross bay bridges. Tropical Storm Debby reinforced the highly interdependent nature of transportation in Tampa Bay and exposed our vulnerability to even minor storms, the occurrence of which is expected to increase with climate change.

Despite close calls such as Hurricane Charlie in 2004, the Tampa Bay region has not been directly impacted by a major hurricane since 1921. Planners and emergency management professionals worry about "The Big One," a Category 5 hurricane with a northeasterly path over adjacent Pinellas County. The counterclockwise swirl of the hurricane will push massive storm surge into Tampa Bay, inundating the cities of St. Petersburg and Tampa. In the 2010 *Project Phoenix: The Tampa Bay Catastrophic Plan*, TBRPC and partners created a simulation for Hurricane Phoenix, a Category 5 hurricane which directly impacts Tampa Bay (http://www.tbrpc.org/tampabaydisaster/). Results are catastrophic (Figure 4). Downtown Tampa is inundated by a 26 ft. storm surge, and major roadways and bridges are washed away. The region experienced over $200 billion in economic losses and over 1000 lives are lost. Over half of the region's 3.3 million population are displaced, creating temporary shelter needs for 200,000. While the probability of a hurricane like Phoenix is low, it is distinctly possible (as shown by Hurricane Katrina). Climate change, which will warm Gulf of Mexico water, is expected to create more frequent and severe hurricanes in the Gulf.

Figure 3. Storm surge flooding on Bayshore Blvd. from Tropical Storm Debby. June 2012.

The flooding closed Bayshore Blvd. for several days and handicapped traffic between downtown Tampa and MacDill AFB, including access to Tampa General Hospital. Tampa General serves a dozen counties in West Central Florida with a population in excess of 4 million residents and is also the only level I trauma center and one of only 4 burn centers in Florida.

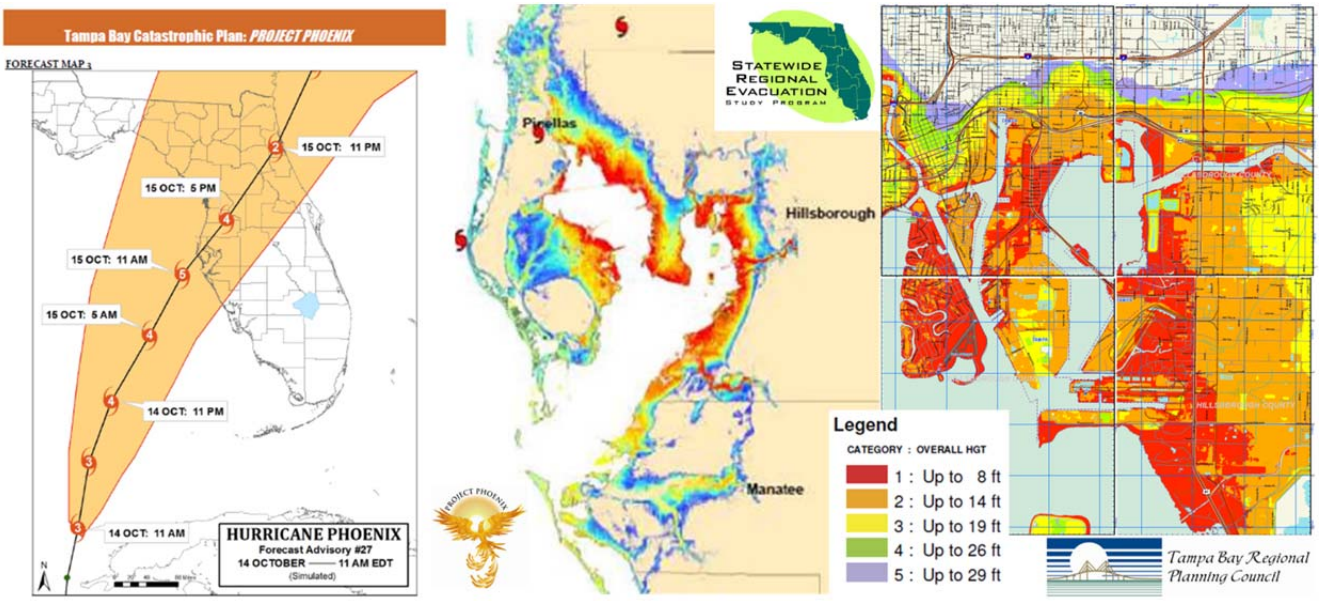


Figure 4. Storm surge impacts on Tampa Bay from *Project Phoenix*, a Category 5 hurricane simulation conducted by the Tampa Bay Regional Planning Council. The direct impact of the hurricane (Left) pushes massive storm surge into Tampa Bay (Center), including up to 26 ft. in downtown Tampa (Right). Extensive flooding, property damage and loss of lives ensue throughout Hillsborough County and the rest of Tampa Bay. Tampa Bay has not experienced a direct hurricane impact since 1921.

- **Sea Level Rise**

For the Florida Gulf Coast, high population growth rates of coastal and riverine areas make it vital that land-use planners begin to prepare for the rise of sea levels in these areas. The coastline and areas along the rivers are in many cases highly developed with residential, commercial, and recreational uses. With continuing population growth in Florida, coastal and riverine areas will continue to develop. This includes the almost 25,000 km (15,534 miles) of Florida's coast located below 3.5 meters (11.5 feet) in elevation. As sea levels rise, these areas will flood. For this reason, planners must begin to examine the land areas within their respective counties and municipalities and decide which land uses will be protected, if any. Consideration must also be given to what the estimated cost of holding back the sea will be.

In 2009, with the assistance of Stratus Consulting which utilized USGS and USEPA data, the non-profit group Clean Air-Cool Planet generated a series of sea level rise scenario maps for US coastal cities. SLR maps for Tampa are shown in Figure 5, and results are sobering. Much of downtown Tampa and coastal Hillsborough County are low-lying, and will be flooded by the 1 m rise in sea level expected by 2100. When a 3 ft. storm surge (associated with a mild storm) is overlaid, even more area is impacted, including many businesses and roadways. **The three approaches to adapting to SLR are retreat/divesting, accommodating through infrastructure modifications, or defending through sea walls or storm barriers.** Any of these options are expected to be difficult and costly.

The above vulnerabilities were addressed in a recent multi-day workshop called Resilient Tampa Bay (February, 2011). Resilient Tampa Bay (http://sgs.usf.edu/rtb/) was a multi-stakeholder event sponsored by the Dutch government and co-organized by the University of South Florida, TBRPC, Hillsborough MPO, and Tampa Bay Estuary Program. Participants, representing different disciplines and interests, formed working groups to identify geographically-specific vulnerabilities and recommend preliminary solutions.

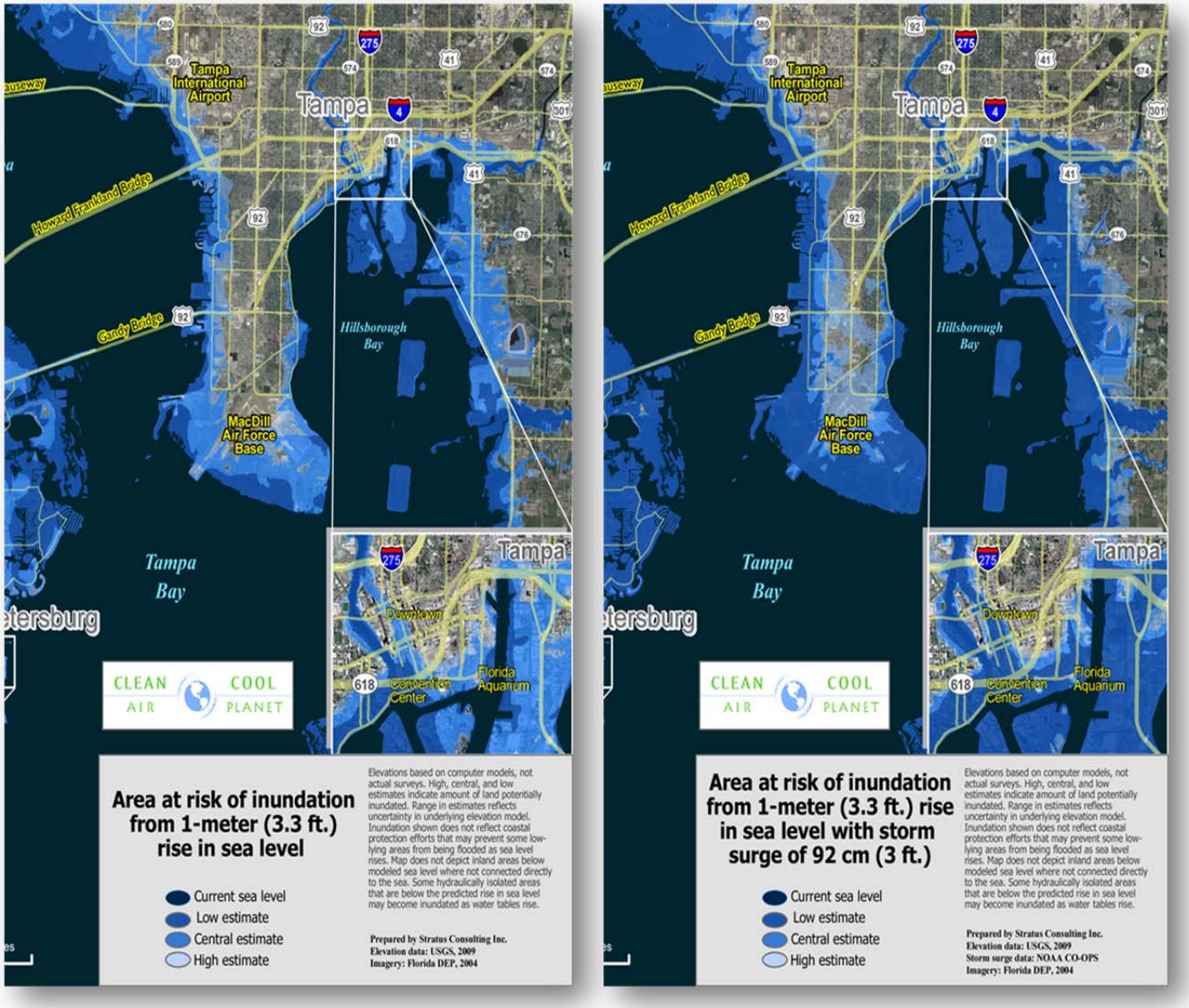


Figure 5. SLR projections showing significant impact on downtown Tampa and coastal Hillsborough County. The left panel shows a 1 m (3.3 ft) rise, while the right panel shows a 3 ft. storm surge on top of a 1 m rise (Source: Stratus Consultants via Clean Air-Cool Planet).

FOCUS AREA

Existing studies and data from the TBRPC, universities, and the Local Mitigation Strategy Group will be used to prioritize adaptation needs for transportation linkages to critical facilities which may be affected by extreme weather conditions. Recognizing the limited time frame and resources available, we have chosen to focus our effort on the areas of **Inland Flooding, Sea Level Rise (SLR) and Storm Surge**, and applying risk analysis in the evaluation process. Risk is the product of probability and consequence. Each of these threats has a different risk factor due to differences in probability of occurrence and consequence of event. The threats also occur on different timelines. Findings from the Resilient Tampa Bay 2011 Workshop, summarized in Table 1, help to illustrate this point. For example, inland flooding in certain neighborhoods (e.g. South Tampa) occurs on a regular basis during the summer rainy season, and is expected to worsen with climate change. While inland flooding is a great nuisance to local residents (as well as causing some property damage) and disrupts transportation routes, the consequence of which for the most part localized and contained. On the other hand, a direct impact from Category 5 hurricane, while a rare event, would cause catastrophic damage throughout the Tampa Bay Region. It is also something that has the potential to happen every hurricane season. A threat such as SLR has both high probability (1m or more before the end of century) and high consequence (significant loss of waterfront in downtown Tampa), but is very steady and incremental. The gradual nature of SLR is a mixed blessing; it affords us more time to adapt, but can also breed complacency and denial. In summary, a comprehensive portfolio of adaptation efforts needs to consider the risk and urgency of all threats and prioritize response strategies accordingly.

Table 1. Climate change-associated threats to Tampa Bay (Source: Resilient Tampa Bay 2011 Workshop)

Threat	Probability	Consequence	Frequency	Time frame
Inland flooding	Very High	Low	Often, seasonal	Now
Sea level rise	High	High	Slow but constant	Decades
Storm surge (Tropical storm)	Medium	Medium	Occasional	Now
Storm surge (Severe hurricane)	Low	Very High	Rare	Now

The goal is to develop scenarios for the business as usual approach versus "no regrets approach" for 5-10 vulnerable yet critical transportation assets in Hillsborough County and mitigation projects for inclusion in the 2040 LRTP update. The project will also provide a test case for including adaptation considerations into the Florida Department of transportation Efficient Transportation Decision Making (ETDM) process. The ETDM is a multi-agency initiative to identify and address potential environmental impacts early in the process of planning transportation projects.

The currently adopted LRTP's Chapter 5: Transportation Safety & Security discusses an "All Hazards Approach" to maximize the benefits of planning and infrastructure development recognizing that it is fundamental to ensure that the transportation system is prepared for catastrophic events. One of the objectives is **"…to increase the security and resiliency of the multi-modal transportation system."** In 2009, stakeholders were interviewed on what they perceived were the Critical Infrastructure/Key Resources essential to the quality of life economic vitality of the county. The resources listed below, as identified by the stakeholders, are transportation assets or facilities linked by transportation assets.

Hillsborough MPO 2035 Long Range Transportation Plan
Table 5.9: Critical Infrastructure/Key Resources (CI/KRs)

1. Interstate Systems (I-4, I-75, I-275)
2. U.S. Highways (e.g., U.S. 92, U.S. 301)
3. State Roads (e.g., S.R. 60)
4. Selmon Crosstown and Veterans Expressways
5. Tampa International Airport
6. MacDill Air Force Base
7. Peter O Knight Airport
8. Plant City Airport
9. Tampa Executive Airport
10. Port of Tampa
11. Howard Frankland Bridge ((I-275)
12. Freight Activity Centers
13. Rail Networks
14. Pipeline Network
15. HART Transit System

EXISTING ADAPTATION EFFORTS

National Policy

In June 2011 the US Department of Transportation issued a Climate Change Policy. The policy stated that the USDOT supports climate adaption efforts and directed USDOT agencies (e.g. FHWA and FTA) to consider climate change impacts on current systems and future investments. The intent of this pilot study is to adhere to the guiding principles listed below and to develop a process for integrating these guiding principles into the local transportation decision making process and provide a test case for incorporating climate change variables into the state Efficient Transportation Decision Making Process (ETDM).

USDOT Guiding Principles for Adaptation

- **Adopt integrated approaches.** Climate change adaptation strategies should be integrated into core policies, planning, practices, and programs.
- **Prioritize the most vulnerable.** Adaptation plans should prioritize helping people, places, and infrastructure that are most vulnerable to climate impacts. They should also be designed and implemented with meaningful involvement from all parts of society. Issues of inequality and environmental justice associated with climate change impacts and adaptation should be addressed.

- **Use best-available science.** Adaptation should be grounded in best-available scientific understanding of climate change risks, impacts, and vulnerabilities. Adaptive actions should not be delayed to wait for a complete understanding of climate change impacts, as there will always be some uncertainty. Plans and actions should be adjusted as our understanding of climate impacts increases.
- **Build strong partnerships.** Adaptation requires coordination across multiple sectors, geographical scales, and levels of government and should build on the existing efforts and knowledge of a wide range of stakeholders. Because impacts, vulnerability, and needs vary by region and locale, adaptation will be most effective when driven by local or regional risks and needs.
- **Apply risk-management methods and tools.** A risk management approach can be an effective way to assess and respond to climate change because the timing, likelihood, and nature of specific climate risks are difficult to predict. Risk management approaches are already used in many critical decisions today (e.g., for fire, flood, disease outbreaks), and can aid in understanding the potential consequences of inaction as well as options for risk reduction.
- **Apply ecosystem-based approaches.** Ecosystems provide valuable services that help to build resilience and reduce the vulnerability of people and their livelihoods to climate change impacts. Integrating the protection of biodiversity and ecosystem services into adaptation strategies will increase resilience of human and natural systems to climate and non-climate risks, providing benefits to society and the environment.
- **Maximize mutual benefits.** Adaptation should, where possible, use strategies that complement or directly support other related climate or environmental initiatives, such as efforts to improve disaster preparedness, promote sustainable resource management, and reduce greenhouse gas emissions including the development of cost-effective technologies.
- **Continuously evaluate performance.** Adaptation plans should include measurable goals and performance metrics to continuously assess whether adaptive actions are achieving desired outcomes. In some cases, the measurements will be qualitative until more information is gathered to evaluate outcomes quantitatively. Flexibility is critical to building a robust and resilient process that can accommodate uncertainty and change.

Federal/State Resources and Initiatives

The following federal and state initiatives will inform and have synergist potential for this project:

- FEMA Community Resilience Innovation Challenge
- FHWA Gulf Coast Study Phases I &2
- FHWA Invest 1.0 Sustainability Self-Assessment Tool
- FDOT Efficient Transportation Decision Making Process (ETDM)
- FDOT GIS Sketch Planning Tool
- FTA Adaptation Pilots
- NCHRP 25-25 Task 73: Improved Environmental Performance of Highway Maintenance – a Key to Transportation Sustainability
- NOAA Coastal Services Port Resilience Planning Tool

Regional/Local Efforts

Since 2009, partners throughout Tampa Bay, including the Hillsborough MPO, Hillsborough Planning Commission, Tampa Bay Regional Planning Council, Tampa Bay Estuary Program and the University of South Florida, have collaborated on knowledge exchange activities specifically related to climate change. A few activities are highlighted below:

- **The Dutch Approach to Climate Change: A Dialogue with Tampa Bay (June 12, 2009)**
  http://mbr.eng.usf.edu/florida-holland-water/CCA1/index.htm
  This workshop was the first of its kind to introduce the Dutch approach to climate change, focusing on climate adaptation, to Tampa Bay. Organizing partners and speakers include the Hillsborough Planning Commission and the University of South Florida (USF)

- **A Second Dutch Dialogue with Tampa Bay on Climate Change Adaptation: Building Resiliency and Sustainability into Infrastructure and Spatial Planning (Nov. 18, 2009)**
  http://mbr.eng.usf.edu/florida-holland-water/CCA2/index.htm
  This follow up workshop continued the dialogue on Dutch approach to climate change, with emphasis on infrastructure (transportation, water, energy). Organizing partners and speakers include the Hillsborough MPO, Hillsborough Planning Commission, and USF. Other speakers and panelists include Mr. Robert Kafalenos (FHWA) and Ms. Kathy Neill (Florida DOT) and Mr. Eugene Henry (Hillsborough Public Works Department).

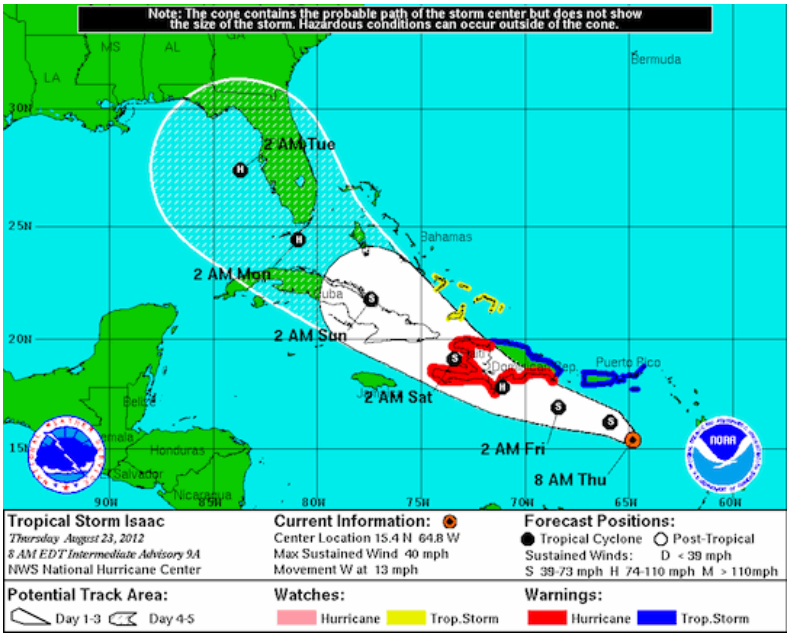
- **Resilient Tampa Bay (Feb. 21-21, 2011)**
  http://sgs.usf.edu/rtb/index.php
  This multi-day workshop continued the collaboration with the Dutch on climate change, with emphasis on local partnership building, geographical vulnerability assessment and recommendations on adaptation strategies. Organizing partners and speakers include TBRPC, Hillsborough MPO, Tampa Bay Estuary Program and USF.

- **ResilientTampaBay on Linkedin (94 members)**
  http://www.linkedin.com/groups?viewMembers=&gid=2970757&sik=1358139286106
  Resilient Tampa Bay is an effort launched by the University of South Florida and various local partners to envision and design a vibrant economic future for Tampa Bay around its water assets by becoming more resilient to present and future water threats (urban flooding, storm surge and sea level rise). This LinkedIn group provides a working forum for us to exchange information and ideas specific to Tampa Bay, as well as share best practice knowledge on resiliency for coastal cities around the world. The project kicks off with a workshop in Feb 2011 (http://www.ResilientTampaBay.org), focusing on knowledge exchange between local and Dutch experts.

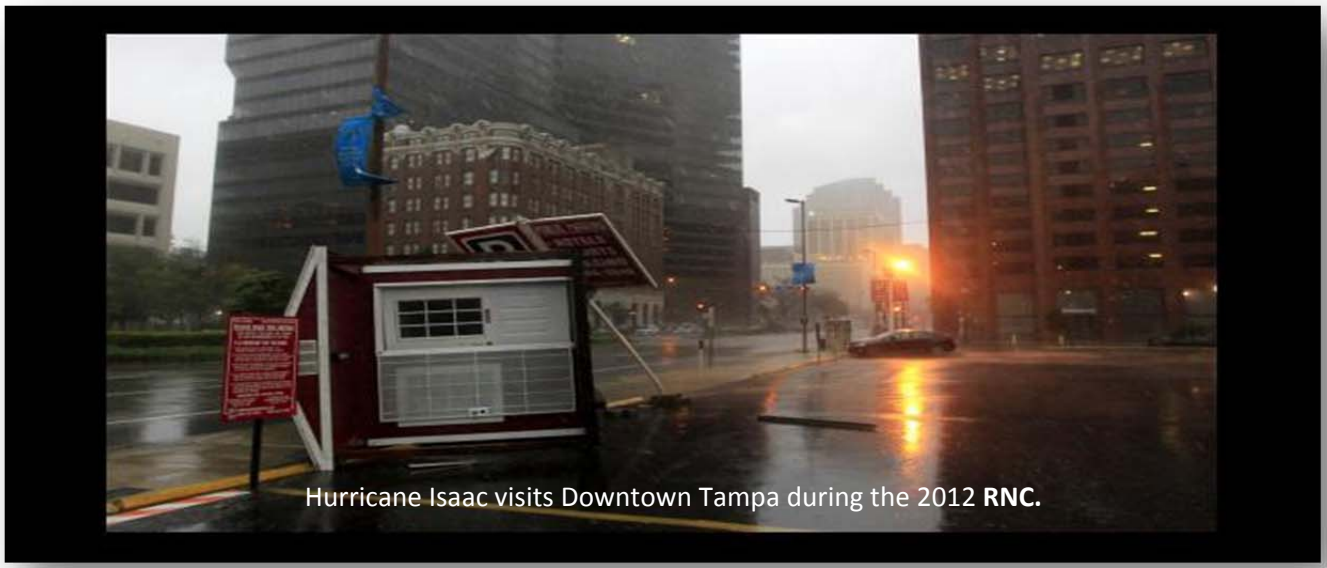
- **Meta-Leadership Summit for Preparedness | Resilient Tampa Bay (May 25, 2011) &**
  Connecting the Dots: The Resilient Tampa Bay Meta-Leadership Post-Summit Meeting (Dec. 16, 2011)
  http://www.cdcfoundation.org/sites/default/files/upload/pdf/Summits/34-Tampa.pdf
  The Meta-Leadership Summer for Preparedness was a national initiative designed to empower business, government and nonprofit leaders to work together during a public health or safety crisis. The Summits were launched by the CDC Foundation, Centers for Disease Control and Prevention, the National Preparedness Leadership Initiative – Harvard School of Public Health and the Robert Wood Johnson Foundation. Organizers include TBRPC, Hillsborough County and USF, among other partners.

- **Clean Cities Tampa Bay (ongoing):**
  http://psgs.usf.edu/patel-center/clean-cities-tampa
  This organization is being reestablished (formerly the Sun Coast Clean Cities Coalition) and is seeking designation from the U.S. Department of Energy's federal clean cities coalition. The goal is to enable the region to compete for funding to promote alternative transportation strategies to reduce dependence on petroleum and contribute to a healthier region.

- **Climate Change Adaptation Florida on Linkedin (203 members)**
  http://www.linkedin.com/groups/Climate-Change-Adaptation-Florida-2192588/about Climate Change Adaptation Florida is a network of individuals and organizations who are interested in understanding the potential impact of unavoidable consequences of climate change on our societies, especially coastal urban areas, and developing appropriate adaptation strategies. Main focus areas include but are not limited to land use planning, infrastructure redesign and disaster mitigation. The forward-looking emphasis is on climate change ADAPTATION, rather than mere mitigation. The inspiration of this LinkedIn group is the "The Dutch Approach to Climate Change: A Dialogue with Tampa Bay" held at the University of South Florida on June 12, 2009. http://mbr.eng.usf.edu/florida-holland-water/



[August 2012] Hurricane Isaac headed directly for Tampa Bay in an early projected path, threatening the Republican National Convention. The threat of the hurricane resulted in the cancellation of the first day of the RNC.



Hurricane Isaac visits Downtown Tampa during the 2012 **RNC.**