Appendix B

Systems Evaluation Process

This appendix defines the specific criteria used in the alternative systems evaluation process.

Phase I Screening

Phase I of the screening process included criteria that addressed the feasibility of the proposed system and attainment of study goals. These included basic engineering constraints as well as environmental criteria. The engineering and environmental criteria facilitated a fatal flaw analysis, assessing rail geometric constraints, and environmental issues that could trigger regulatory action. The criteria used to assess the overall project goals provided early identification of potentially preferred alignments.

Unless stated in the criteria description, the high, medium, low score for each criteria was based on a comparative analysis. Criteria were ranked based on deviation from the mean score that was established by combining the characteristics of all eight system alternatives. Scores that fell more than one standard deviation above the mean received a high ranking, those that fell more than one standard deviation below the mean received a low ranking. Those criteria scores within one standard deviation of the mean received a Medium ranking. The criteria evaluated in Phase I are as follows:

Establish a Technically Feasible and Cost Effective Transit System

Engineering Constraints:

- Low – the existing conditions are generally suitable for the transit guideway with little to no constraints that will require costly, complex, or unusual design solutions. *EXAMPLE: transit guideway in the existing wide median of an arterial street.*
- Medium – the existing conditions will require some significant modification to accommodate the transit guideway. *EXAMPLE: transit guideway in an arterial street with existing two-way left-turn lane. The street will require full reconstruction and traffic capacity and driveway access may be affected.*
- High – the existing conditions will require complete reconstruction that may include complex design solutions to accommodate the transit guideway. It is feasible but may cause compromises to operations and/or the existing conditions. *EXAMPLE: transit guideway in a narrow roadway with frequent driveways and/or parallel on-street parking. To create a safe condition, parking and driveways may need to be removed and/or the transit service's operations will be constrained to low speeds.*
- Fatal – the design solution is unreasonably complex, has no suitability to the existing conditions, and/or would cause a permanent undesirable operating condition. *EXAMPLE: transit guideway adjacent to freight railroad alignment downtown; would require obtrusive crash-wall arrangement on a downtown street and extensive railroad coordination during construction and operations.*

Potentially Significant Impacts to ROW:

- Low – the existing ROW is fully adequate for the transit guideway and any related improvements or modifications to existing infrastructure to include the area needed for stations and platforms.
- Medium – the existing ROW is mostly adequate for the transit guideway and any related improvements or modifications to existing infrastructure but may require "corner clips" and/or other small, partial ROW acquisitions to accommodate special design features such as stations, track alignment curvature, or traffic intersection modifications.

- High – ROW is required to accommodate the transit guideway, such as a continuous widening of an existing street ROW to accommodate improvements or a "greenfield" alignment through existing privately owned developed or undeveloped parcels.

Opportunity to avoid, minimize, or mitigate required liability insurance provisions: A "Yes" or "No" assessment used to describe the effect of the alternative on CSX liability costs. A "Yes" response indicates that the alternative would provide an opportunity to reduce or transfer the liability related to the crossing of existing CSX rail. A "No" response indicates that the alternative would provide no opportunity to address liability issue. In application of the factor to the evaluation matrix, "Yes" = a Low Constraint and "No" = High Constraint.

Potentially to have a negative effect on a Historic District or Resource Group: A quantitative assessment that identifies the length of each system that passes along/through a Florida Site File Historic Resource Group. The analysis was based on GIS data (shpo_res_groups_jan14) published by the State Historic Preservation Office.

Potential to have a Negative Effect on a Historic Structure: A quantitative assessment that identifies the number of Florida Site File Historic Standing Structures within 100 feet of an alignment. The analysis was based on GIS data (shpo_structures_jan14) published by the State Historic Preservation Office.

Potential to have a Negative Effect on a Historic Bridge: A quantitative assessment that identifies the number of Florida Site File Historic Bridges within 50 feet of an alignment. The analysis was based on GIS data (shpo_bridges_jan14) published by the State Historic Preservation Office.

Potential to have a Negative Effect on a Historic Cemetery: A quantitative assessment that identifies the number of Florida Site File Historic Cemeteries within 50 feet of an alignment. The analysis was based on GIS data (shpo_cemeteries_jan14) published by the State Historic Preservation Office.

Potential to have a Negative Effect on a Park: A quantitative assessment that identifies the number of Parks directly impacted by an alignment. The analysis was based on GIS data (gc_parksbnd_jan14) published by the State of Florida.

Potential to have a Negative Effect on a Wetland: A quantitative assessment that identifies the length of each system that passes within a designated wetland. The analysis was based on GIS data (nwip_oct13) published as part of the National Wetlands Inventory.

Potential to have a Negative Effect on a Floodplain: A quantitative assessment that identifies the length of each system that passes within a designated Floodplain (A, AE, or V). The analysis was based on GIS data (fema9629) published by the Federal Emergency Management Agency.

Maximize System Flexibility and Utilization of Assets

Percent of the Alignment that Utilizes Dedicated Transit Envelope (Marion St. or I-275): A quantitative assessment that identifies the length of each system that passes within a dedicated transit corridor. Two such corridors have been identified within the City of Tampa and include the Marion Street Transit

Corridor which extends from Whiting to the Marion Transit Center and the I-275 Transit Corridor which will occupy the median of I-275 from the Bay to just west of the I-4 Interchange.

Percent of the Alignment that Utilizes an Existing CSX corridor: A quantitative assessment that identifies the length of each system that passes along an existing CSX rail corridor. The analysis was based on GIS data (rails_transtat_2014) published by the Florida Department of Transportation.

Percent of the Alignment that Utilizes Existing TECO Line Streetcar Corridor: A quantitative assessment that identifies the length of each system that passes along the existing TECO Line Streetcar corridor. The analysis was based on GIS data developed from aerial analysis depicting the existing system.

Does the Alignment Enhance, Limit, or Have No Effect on the Development of Other Rail Alternatives:

- Good – The transit guideway in this location is able to accommodate the typical operational characteristics of the mode and would be a compatible piece of a cohesive transit system. *EXAMPLES: Tram on urban arterials, Light Rail in the median of a highway or wide boulevard, FRA-compliant Commuter Rail in an existing heavy-rail corridor.*
- Fair – The transit guideway, though technically feasible, may not be completely consistent with the typical operational characteristics of the mode and could potentially create a "pinch point" or complex operational condition. *EXAMPLES: Tram on residential streets or freeway medians, Light Rail adjacent to operational freight lines or on downtown streets, Commuter Rail within street ROW.*
- Poor – The transit guideway would not be compatible with the typical operational characteristics of the mode and would constrain the system operationally. *EXAMPLES: Light Rail on narrow residential streets, Commuter Rail on dense urban or downtown streets.*

Phase II Screening

Phase II of the screening process includes criteria that address system benefit. This involved a qualitative assessment of impacts to economic activity and mobility. Evaluation of potential benefits helps to provide decision makers with a means of focusing future systems on the improvement of specific elements within the community.

Unless stated in the criteria description, the High, Medium, Low score for each criterion is based on a comparative analysis. Criteria were ranked based on deviation from the mean score that was established by combining the characteristics of all eight system alternatives. Scores that fall more than one standard deviation above the mean received a High ranking, those that fell more than one standard deviation below the mean received a Low ranking. Those criteria scores within one standard deviation of the mean received a Medium ranking. The criteria evaluated in Phase II are as follows:

Support Redevelopment, Economic Development, and Create Revenue

Land Designated for use as Parking with a Building Value < $250,000 or a Lot Value that Exceeds the Building Value by 2.5x or More: identifies the total acreage of potentially underutilized property within ¼ mile of an alternative. Based on elements of a methodology used in Clark County Washington that assessed future land development patterns, the analysis identifies areas for potential redevelopment. Property value information was taken from Hillsborough County Property Appraiser's parcel data. The analysis compares building value to parcel value.

Infill Development Opportunity - Vacant Land: identifies the total acreage of vacant land within ¼ mile of an alternative based on Hillsborough County Property Appraiser's parcel data. The analysis identifies parcels that are coded as vacant by the Department of Revenue Code.

Future Population (2040) within one quarter-mile: total projected 2040 population within ¼ mile of each alternative. The analysis is based on results of the TBRPM, and uses the population estimates by TAZ.

Future Employment (2040) within one quarter-mile: total projected 2040 employment within ¼ mile of each alternative. The analysis is based on results of the TBRPM, and uses employment estimates by TAZ.

Enhance Mobility Into and Within Downtown Tampa

Number of direct connections to existing TECO Line Streetcar Stations: the total number of Stations that will be served by an alternative. The analysis was based on manual count of stops along each alignment.

Number of connections to existing TECO Line Streetcar stations within one quarter-mile: the number of stations within ¼ mile of an alternative. A GIS based buffer analysis was used to identify the number of proximate stations.

Number of districts to which the service has direct connection: the number of central city markets/neighborhoods accessed by each alternative. Based on a modification of the neighborhoods map produced in the InVision Plan, the assessment sums the number of individual neighborhoods crossed by each alternative.

Number of Major Activity Centers served by each facility within one quarter-mile of each alignment: the number of activity centers served by each alternative. The based on a shapefile (Points_of_interest) produced by the City of Tampa that identifies major points of interest within the City of Tampa. The assessment used a buffer analysis to identify the number of activity centers that fall within ¼ mile of each alternative.

Provides Service to Racial Minority Group: the length of each alternative that passes through a "High Minority" area. Based on current US Census Data (2012 ACS 5yr Estimate). The analysis identified US Census Block Groups that contain a minority population at rates greater than that of the county overall. The analysis reported the length of each alternative that passes through the "High Minority" block groups.

Provides Service to Ethnic Minority Group: the length of each alternative that passes through a "High Hispanic" area. Based on current US Census Data (2012 ACS 5yr Estimate), the analysis identified US Census Block Groups that contain a Hispanic population at rates greater than that of the county overall. The analysis reported the length of each alternative that passes through the "High Hispanic" block groups.

Provides Service to Low Income Group: the length of each alternative that passes through a "Low-Income" area. Based on current US Census Data (2012 ACS 5yr Estimate), the analysis identified US Census Block Groups that contain a low-income population at rates greater than that of the county

overall. The analysis reported the length of each alternative that passes through the "Low-Income" block groups.

Existing Residential Units Within One Quarter-Mile: based on 2013 parcel level Hillsborough County Property Appraiser Data. The assessment identifies the number of existing housing units within ¼ mile of each alternative. The assessment was done through the use of a GIS based buffer analysis.

Existing Commercial Use Within One Quarter-Mile: based on 2013 parcel level Hillsborough County Property Appraiser Data. The assessment identified commercial use based on Department of revenue (DOR) use codes. The assessment identified the total square footage of commercial use within ¼ mile of each alternative. The assessment was done through the use of a GIS based buffer analysis.

Serves Existing Population Centers: total (2010) population within ¼ mile of each alternative. The analysis was based on data from the TBRPM by TAZ.

Serves Existing Employment Centers: total (2010) employment within ¼ mile of each alternative. The analysis was based on data from the TBRPM by TAZ.

Does the alignment connect to the Marion Transit Center (Downtown Intermodal Site): A "Yes" or "No" assessment that identifies the presence of a connection with the Marion Transit Center. In application of the factor to the evaluation matrix, "Yes" = a High value and "No" = a Low value.

Does the alignment connect to the HART MetroRapid: A "Yes" or "No" assessment that identifies the presence of a connection with the MetroRapid system. In application of the factor to the evaluation matrix, "Yes" = a High value and "No" = a Low value.

Bus Stops that fall within one quarter-mile of the alignments: the number of bus stops that fall within ¼ mile of each alternative. Based on 2013 HART bus stop data (HART_Stops), the analysis utilized a GIS buffer analysis to identify the number of stops present.

Major Pedestrian and Bike facilities that intersect alignment: the pedestrian and bicycle infrastructure intersected by each alternative. The assessment identifies the number of Coast bike share stations, greenways and trails, Special Pedestrian Streets (as designated in the InVision Plan), and designated bike lanes that intersect each alternative. Based on locally digitized maps, the analysis utilized GIS to identify the number of bike/ped elements present.

Major Pedestrian and Bike facilities that are within one quarter-mile of alignment: the pedestrian and bicycle infrastructure that falls within ¼ mile of each alternative. The assessment identifies the number of Coast bike share stations, greenways and trails, Special Pedestrian Streets (as designated in the InVision Plan), and designated bike lanes that fall within the ¼ mile buffer of each alternative. Based on locally digitized maps, the analysis utilized GIS to identify the number of bike/ped elements present within the ¼ mile buffer.

Appendix C

Costs Estimation Methodology

COSTS ESTIMATION METHODOLOGY

The rough order-of-magnitude (ROM) costs were calculated with a "top-down" method. Total capital cost data from similar systems in the US were extrapolated adjusted according to the conditions of this study. This was done by applying per-mile costs for other systems with certain characteristics to portions of the study routes that have similar characteristics.

The goal of this effort was to enable relative comparisons between the systems. The actual cost of a system could reasonably be expected to fall within the ranges provided but is subject to countless other external factors/unknowns. All external factors/unknowns being equal, we are confident in the relative comparability of the system ROM cost ranges.

General assumptions/notes:

- Upgrade to existing TECO Line Streetcar to accommodate other technology was included as applicable.
- Extra cost for Hillsborough River crossing was not specifically included but is assumed to fit within the contingency range.
- Extra cost for modification of existing CSX crossing or installation of new CSX crossing downtown was not specifically included but is assumed to fit within the contingency range of 30%.
- Extra cost for operating agreements, liability insurance, or other payments (e.g., to CSX) were not specifically included but are assumed to fit within the contingency range.
- Cost estimates for long-term recommendations (Section 9.2) were not adjusted for inflation.

Order-of-Magnitude Capital Cost: This was calculated based on approximate order-of-magnitude costs for similar systems in the United States. Costs were calculated, generally, using comparable per-mile costs and validated by comparing the estimates to actual comparable system costs. This includes all capital costs (guideway, stations, power systems, vehicles, ROW) for a reasonable system build-out. A per-mile capital cost was assigned to each segment of the systems as a function of:

- Functional Density *(Urban, Suburban)* – It is assumed that costs increase relative to the density of the existing built environment.
- Mode *(Light Rail, Tram, Commuter Rail)* – Comparable costs were determined by reviewing similar projects across the United States by mode.
- Type of Existing Conditions *(developed lot, existing railroad or TECO, local street, arterial street, highway)* – These classifications were used to determine the probable extent of capital improvements that would be necessary per mode based on the existing conditions.

Light Rail:

	Light Rail Transit	
	Urban	Suburban
	$/Route-Mile	
Developed Lot	$200,000,000	$160,000,000
Existing Railroad or TECO	$20,000,000	$16,000,000
Local Street	$56,000,000	$44,800,000
Arterial Street	$64,000,000	$51,200,000
Highway (I-275)	$80,000,000	$64,000,000

Tram:

	Tram	
	Urban	Suburban
	$/Route-Mile	
Developed Lot	$175,000,000	$140,000,000
Existing Railroad or TECO	$4,375,000	$3,500,000
Local Street	$49,000,000	$39,200,000
Arterial Street	$56,000,000	$44,800,000
Highway (I-275)	$70,000,000	$56,000,000

Commuter Rail:

	Commuter Rail	
	Urban	Suburban
	$/Route-Mile	
Developed Lot	$100,000,000	$80,000,000
Existing Railroad or TECO	$10,000,000	$8,000,000
Local Street	$28,000,000	$22,400,000
Arterial Street	$32,000,000	$25,600,000
Highway (I-275)	$80,000,000	$64,000,000