

Pedestrian Network Analysis

Better Walking Access to Transit in the Portland Metro Region

Technical Memo #1: Targets, Methodology, and Data Inventory

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Project Technical Advisory Committee

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1.0 Introduction

This memo is the first of three technical memos produced by TriMet, as part of the agency's Pedestrian Network Analysis project. The Pedestrian Network Analysis project will provide TriMet and its partners with a way to prioritize and program investments that provide better pedestrian access to transit stops and stations.

As the region's primary transit provider, TriMet is committed to working with local, regional, and state partners to make the region a more livable place. It recognizes the interplay between walking, biking, and taking transit and believes each of these modes complement and strengthens the others. Indeed, every transit rider is a pedestrian. Walking and biking provide access to TriMet's service. Thus, the quality of the local pedestrian network is often a "make or break" factor, when a person is considering whether to take transit. It can determine whether someone wants, or is able, to use TriMet's fixed route transit services.

Technical Memo 1 lays the groundwork for the project and covers four main topics:

- Project Overview
- Project Performance Targets
- Methodology to Select Focus Areas
- Data Needs, Gaps, and Collection Strategy

1.1 Project Overview

The purpose of the Pedestrian Network Analysis project is threefold:

- 1) **To develop a general and transferable methodology** for identifying and prioritizing areas in a community where changes to the walking environment are likely to provide multiple benefits, including better access to transit service;
- 2) **To apply this methodology at a region-wide scale** and identify areas within TriMet's service district where changes to the walking environment are expected to increase walking and transit use; and
- 3) **To conduct on-the-ground walkability assessments and make pedestrian focused recommendations for ten areas**, with the ultimate goal of securing funding and implementing the recommendations for projects within these areas.

The project team will look at all of TriMet's 7,000 + transit stops, analyzing each stop using geographic information systems (GIS) data to understand where there are pedestrian network deficiencies, combined with destinations with high, or potentially high, transit use. Once each transit stop is evaluated and scored, the team will identify clusters of stops that scored highly and recommend ten focus areas for an on-the-ground walkability assessment. The ten areas will be assessed for various types of pedestrian obstacles, including sidewalk gaps, lack of crossing protection, lack of pedestrian refuges, poor lighting, unfavorable pedestrian signal timing, and/or places where *direct* pedestrian paths to major destinations are missing. Pedestrian project recommendations will be provided for each of the ten focus areas, along with order of magnitude costs. The ten focus areas are intended to be a start to a much larger effort of working with communities to improve the walking environments near transit stops.

1.2 Timeline

The project timeline spans the 2010 calendar year. Task progression is driven by the desire to have one package of focus area project recommendations complete by mid-July. It is anticipated that transportation regional flexible fund (RFF) project submissions will be due in late summer or early fall, and it is in this project's best interest to have a package of proposed improvements ready to submit for RFF funding. Beyond July, the project team will work to complete the remaining project recommendations, completing the project in 2011. Figure 1 shows the project timeline and task sequencing.

1.3 Objectives and Outcomes

The primary objective of the Pedestrian Network Analysis project is to identify and implement capital investments that will result in more people choosing to walk and take transit. Investments resulting from this project will serve two purposes: they will allow more people to access transit in a safe, comfortable, and attractive environment; and they will facilitate more localized, short walking trips. A number of considerations will be taken into account throughout the project, including:

- addressing the needs of seniors, people with disabilities, the economically disadvantaged, and school children;
- making existing transit customer walking trips safer, more direct, and comfortable;
- improving pedestrian safety and comfort through design and operations;
- attracting new transit and walking trips;
- leveraging other public and private investments.

Figure 1- Project Timeline



- TAC Meeting ◆
- Draft Deliverable ■
- Final Deliverable ●

Other Key Regional Planning Dates:	
April 17, 2010	TPAC workshop on 2014-15 Regional Flex Fund (RFF) process & project evaluation
May 30, 2010	TPAC review of TriMet TIP
June 2010	Final adoption of RTP by ordinance
June 15, 2010	Draft list of RFF projects due (voluntary)
July 15, 2010	RFF Final Applications due
Aug. 29, 2010	TPAC review of technical evaluation and qualitative analysis of RFF project submissions
Oct. 13 – Dec. 1, 2010	Public comment period. Listening posts on RFF Preliminary Recommendation
Dec. 11, 2010	JPACT discuss policy issues for final recommendation

2.0 Performance Targets

This section accomplishes three things. First, it provides a brief overview of current transportation policy trends relevant to this project. This policy synopsis gives context to the overall Pedestrian Network Analysis project and provides the basis for the recommended, project-based performance targets. Second, it recommends three performance targets for this project. Performance targets provide transparency, guidance, and accountability to outside parties who want an understanding of the project’s objectives, priorities, and self-evaluation mechanisms. Third, it suggests a strategy for monitoring progress toward meeting the three project performance targets.

2.1 Federal, State and Regional Policy

Transportation policymakers at all levels are placing an emphasis on creating walkable, bikeable, transit-rich, livable environments. The expectation is that if more high quality walking, biking and transit travel options are available, people will begin shifting their travel behavior toward these more environmentally sustainable, affordable, and healthy modes of travel. Furthermore, there is recognition that these non-auto modes of travel support one another and, when planned in tandem, can maximize the use of the overall walking /biking/transit transportation system. The Pedestrian Network Analysis project is consistent with this policy direction.

Figure 2 lists recent policy initiatives undertaken by various sectors of government or institutions. While the list is by no means comprehensive, it demonstrates the trend of current transportation policy initiatives. A brief overview of each initiative is outlined below. A summary of each can be found in Appendix A.

Figure 2 - Summary of Federal, State and Regional Level Policy Initiatives

Federal	State	Regional
<ul style="list-style-type: none"> • Sustainable Communities Partnership (DOT/EPA/HUD) • Transportation For America - Dangerous by Design • FTA New Starts Policy Shift Toward Measuring Livability Benefits 	<ul style="list-style-type: none"> • Oregon Statewide Planning Goals - Goal 12 - Transportation • House Bill 2001 – Jobs & Transportation Act <ul style="list-style-type: none"> ○ GHG reduction ○ Congestion Pricing ○ Least Cost Planning 	<ul style="list-style-type: none"> • Active Transportation Partnership • Regional Transportation Plan (RTP) Performance Targets

2.2 Project Targets

Recognizing a primary objective of this project is to get people to walk and take transit more often, the performance targets for this project will evaluate whether people will actually walk and take transit more often if they feel safer and more comfortable as a pedestrian. The targets below are based on results from a 1998 pedestrian access to transit project the City of Portland undertook in the Roseway neighborhood of northeast Portland. As part of this project, residents of the area were surveyed before pedestrian improvements were made and 6 months after construction. The project found residents clearly felt safer and more secure while walking in the area and there was a self-reported ten percent increase in transit trip making.

Based on this previous study, we recommend setting three performance targets to aim for and to help us assess the impact pedestrian investments have in a focus area:

- **30% increase in the number of residents who perceive the Focus Areas to be safe and comfortable**
- **20 % increase in pedestrian volumes within a Focus Areas**
- **10% increase in ridership at transit stops within a Focus Areas**

We anticipate the first thing to change in a focus area, once improvements are made, is a person's perception of whether or not the area is a safe, attractive, and comfortable place to walk. Therefore, this has the highest percentage increase (30%), given that it is likely the first thing most people will notice. Once the area is perceived as safer and more attractive, the assumption is people will begin to take more trips by foot and by transit. The increase in pedestrian volumes has the second highest percent increase (20%) because it is an activity most people automatically know how to do and feel comfortable with. As a mode of travel, transit requires more time, money, and knowledge than simply walking. Therefore, while we expect an increase in transit use at the stops, because of enhanced access, we estimate it will show the least change over time (10%). If we are able to achieve a ten percent increase in ridership, this will be consistent with Portland's 1998 transit pedestrian access project.

In the long-run, the performance targets will help TriMet and its partners understand which types of investments are most effective and which types of focus areas are most responsive to investments. The performance targets are not intended as a pass/fail evaluation tool, but rather as a structured way for TriMet and its partners to guide expectations, learn from experience, and make informed decisions going forward. If based on experience the targets are found to be too aggressive or not aggressive enough then they can be adjusted.

2.3 Performance Monitoring

When measuring performance, it is critical to acknowledge the resources needed to monitor progress and place parameters around what exactly will be measured; when it will be measured; who will measure it; and how it will be measured. Figure 3 outlines parameters for the project’s proposed performance targets. All of the targets can be measured quantitatively. The first performance target, increasing ridership at stops located within the focus areas, does not require extensive new resources due to TriMet’s existing investment in regular passenger counts. In contrast, the other two performance measures are resource intensive and require data collection efforts by individuals or through the purchase of new automatic pedestrian counting equipment.

Figure 3 - Pedestrian Network Analysis Performance Target Parameters

Performance Target	Quantifiable Measure	When?	Who?	How?
1. 30% increase in perceived safety and comfort level	Number of people who feel safe and comfortable walking in the focus area	Before investments & 1 year after completion of full set of recommended focus area investments	TriMet / Local Assistance	Manual In-field attitudinal surveys
2. 20% increase in pedestrian volumes in focus area	Number of pedestrians counted crossing the street at each intersection and at key sidewalk locations.		TriMet / Local Assistance	Observation /manual pedestrian counts or installation of automated pedestrian counters
3. 10% increase in ridership at stops	Number of Boardings and Alightings at each stop		TriMet	automated passenger counters on transit vehicles

As capital projects in each focus area are funded, it will be critical to secure funding for measurement of these performance measures. The basic guidance provided here is intended to help TriMet and its partners secure resources for measuring performance. Details about how each measure will be assessed, for example what questions will be included in an attitudinal survey, will be provided closer to project implementation.

3.0 Focus Area Methodology

There are innumerable locations in the Portland metro region where the walking environment near a transit stop is unsafe or uncomfortable. This project will narrow the universe of locations to those where there are also many activities people typically want to access by transit or foot. By identifying these locations and choosing ten to focus on, the project will be able to develop a manageable list of high-impact projects that TriMet and its partners can pursue for funding first.

TriMet will use a three step process to identify locations where it expects changes to the walking environment will have the most impact. Step one, the base analysis, will evaluate the overall transit supportiveness of an area, including density, mix of uses, and the proximity of TriMet's transit stops to a variety of essential destinations like grocery stores, schools, senior housing/services, social services, major employers, etc. This step allows the project to concentrate on areas where pedestrian investments would likely have the highest impact on the largest number of existing or potential transit users.

Step two, the overlay analysis, will analyze deficiencies and opportunities near TriMet's transit stops. Deficiencies are defined as locations that exhibit characteristics that make a place unpleasant to walk within, like high auto traffic speeds, missing sidewalks, etc. Opportunities include locations where there may be an opportunity to take advantage of an urban renewal area or provide more access to fixed route transit service, where people are currently taking TriMet's paratransit LIFT service.

Composite scores will be calculated for each transit stop, using scores generated in the base and overlay quantitative analysis steps. Based on the composite scores, clusters of high scoring stops will be identified and evaluated from a number of qualitative perspectives. Ten locations will be chosen for further on-the-ground field assessment. Based on the field assessment, site specific recommendations will be made so TriMet and its partners can seek funding for designing and building the recommended changes.

It is important to remember the methodology outlined in this memo will be applied at a regional scale, encompassing parts of three counties, most of the Metro area, and all the Tri-Met service district. The results are not meant to indicate the only places where changes to the walking environment are needed, rather they are meant to guide local agencies in their decision making processes and encourage agencies to take a more in-depth look at places within their own communities where TriMet believes there may be benefits from an improved walking environment near existing transit service.

3.1 Base Analysis

As a starting point, the base analysis is designed to address the question:

Where in TriMet’s service district are there areas with transit supportive characteristics?

To answer this question, the project team will use readily accessible land use and transportation data, available in a Geographic Information Systems (GIS) format, to analyze two primary geographies:

- 1) Overall transit environment by Transportation Analysis Zone (TAZ)
- 2) Immediate area proximate to a transit stop

Each analysis step in Figure 4 will look at TriMet’s transit stops from a variety of perspectives. If a transit stop or transportation analysis zone (TAZ) is in the top quartile of a given analysis step it will receive a score of one or two for that individual step, depending on how it is weighted. While all the elements are important and will be counted in the composite score, the elements with a score of 2 are considered most important and therefore are counted more heavily. If a stop does not fall within the top twenty-five percent of stops in that analysis step, it will receive a score of 0. For example, the top twenty-five percent of stops nearest to a high school will receive a score of one. All other stops will receive a score of zero for not being nearest to a high school.

Following the analysis of each individual element, the team will create composite scores for each transit stop to answer three sub questions:

- *Which Transportation Analysis Zone (TAZ) exhibits the most transit supportive characteristics?*
- *Which transit stops (independent of the TAZ information) exhibit the most transit supportive characteristics?*
- *Which transit stops within the high performing TAZs exhibit the most transit supportive characteristics?*

Figure 4 – Elements of the Base Analysis

Transit Environment	Score for top performing TAZ or Stop
Combined Residential and Employment Density by TAZ	2
Residential / Employment Ratio by TAZ	1
Average Intersection Density by TAZ	1
Transit Stops	
Combined boardings and alightings	2
Distance to nearest high school	1
Distance to nearest grocery stores	1
Distance to nearest pre-school, middle, or elementary school	1
Distance to nearest major attraction (e.g. university, hospital, stadium, major employer)	1
Distance to nearest multi-modal facility	1
Distance to nearest park	1
# of connecting transit lines	2
Distance to nearest social service site	1
Distance to nearest senior housing/services site	1

3.2 Overlay Analysis

Once the results from the base analysis are established, the overlay analysis will address the question:

Which transit stops are near areas with the most deficiencies and/or opportunities?

Figure 5 outlines the analysis steps to give scores to stops based on both deficiencies and opportunities. Using a process identical to the process used for the base analysis, the project team will evaluate each element separately, then analyze the composite scores to identify areas where there are transit supportive land use and transportation characteristics, combined with a large number of deficiencies and opportunities.

Figure 5 – Elements of the Overlay Analysis

Deficiencies	Weight
Distance to a street without a sidewalk	2
Located on a street with high traffic volumes	1
Located on a street with high posted speeds	2
Located near a pedestrian crash site	2
Opportunities	
Located near an address with high paratransit (LIFT) activity	2
Stops with a high number of vehicle ramp deployment	1
Locations with recent TriMet bus stop and sidewalk improvements	2
LIDs/BIDs/Urban Renewal Areas	1

3.3 Ten Focus Areas

Based on the results of the GIS analysis, the project team will evaluate the highest scoring stops from a number of perspectives to choose ten areas to focus on first. Factors that will be considered include:

- Where are the focus areas located in relation to Metro's 2040 concept map designations? The focus areas should be geographically distributed region-wide.
- Is each type of pedestrian generator (major attractor, grocery store, high school, pre-, elementary/middle school, senior housing/services, social services, multi-modal facility, and parks) represented within at least one of the ten focus areas?
- Are WES, MAX, Frequent Service Bus, and Standard Bus represented within at least one of the ten focus areas?
- Where are the areas in the region with above average low-income and communities of color? Clusters of high scoring stops in these areas should be strongly considered as focus areas.
- Is there one Oregon Department of Transportation (ODOT) facility within at least one focus area?
- Where are local planning initiatives already underway or recently completed? Focus areas should try to leverage these investments.

4.0 Data Inventory

To move forward with the analysis, it is necessary to assess what data is required to carry out the methodology outlined above, and whether the project team already has the data in its possession, or if it will need to acquire it from outside sources.

4.1 Needs

Most of the data needed for this project is easily accessible, either through Metro's RLIS dataset or via TriMet's GIS and Operations Analysis departments. A summary of data needs, existing sources, identified gaps, and suggested supplemental sources are outlined in Figure 7. For the purpose of identifying the focus areas, all data needs are at a regional scale.

Figure 7 – Pedestrian Access to Transit Data Needs, Sources, and Gaps

Data Need	Existing Source	Gap	Supplemental Source
TAZ shapefile	Metro	No	-
# of Residential Units by TAZ	RLIS	No	-
# of Employees by TAZ	RLIS	No	-
Street Shapefile w/ Classifications	RLIS	No	-
Transit Stops	TriMet	No	-
Transit Ridership by Stop	TriMet	No	-
Transit Lines	TriMet	No	-
High School locations	RLIS	No	-
Grocery Store locations	-	Yes	Industry NAICS Code
Major Attractors locations	RLIS	No	-
Park locations	RLIS	No	-
Sidewalk Network	Metro	Update	Metro/Local Jurisdiction Supplement
Major Employer Locations	-	Yes	Metro/Local Jurisdictions / Chamber of Commerce
Race Demographic by Census Tract	Census	No	-
Poverty Rate by Census Tract	Census	No	-
Pedestrian Crash Data	-	Yes	ODOT, County, Local DOTs, PSU
Top LIFT Destinations	-	Yes	TriMet ATP Department
Vehicle Ramp Deployment locations	TriMet	No	-
MTIP Bus Stop Improvements	TriMet	No	-
TV Hwy Sidewalk Improvements	TriMet	No	-
TriMet Ticket Outlet Locations	TriMet	No	-
TriMet Owned Property	TriMet	No	-
Areas of major local planning initiatives	-	Yes	Local Jurisdictions
LIDs/BIDs/Urban Renewal District Shapefiles	-	Yes	Metro/Local Jurisdictions
County Shapefile	RLIS	No	-
2040 Land Use Shapefile	RLIS	No	-
Park Shapefile	RLIS	No	-
Senior Housing/Services locations	-	Yes	Industry NAICS data
Social Service locations	-	Yes	Industry NAICS data
Multi-modal facilities	RLIS/TriMet	No	-
Road Speeds	-	Yes	Metro Demand Model
Road Volumes	-	Yes	Metro Demand Model

4.2 Gaps and Future Needs

In general, the current data gaps are where local information is required. Other gaps include identifying grocery stores, pedestrian crash, and major employer locations, region-wide, and acquiring LIFT data from TriMet's Accessible Transportation Program (ATP). It is anticipated that most of these data gaps are easily surmountable.

As the project moves forward into the more detailed analysis of the focus areas, it will be necessary to reassess the project's data needs. Information about signal timing, vehicle turning movements, pedestrian and bike counts by time of day, etc. will be the type of data needed in the future. However, for the purpose of determining the focus areas, this more detailed data collection effort is unnecessary.

5.0 Next Steps

Once the methodology is accepted by the project's technical advisory committee, TriMet staff will complete the analysis and present the results in a second technical memo. For every analysis step, a map will be provided, displaying where the top stops are located, along with key assumptions, findings, and any relevant caveats that need to be included. Based on the analysis and consultation with technical advisory members, TriMet will make recommendations on ten areas across the region where it will conduct an on-the-ground walkability assessment and make recommendations on how to improve the walking environment in the area.

Appendix A

Federal

Sustainable Communities Partnership (DOT/EPA/HUD)

(<http://www.epa.gov/dced/partnership/index.html>)

The Sustainable Communities Partnership is a federal interagency initiative, announced in June 2009, among the U.S. Department of Housing and Urban Development (HUD), U.S. Department of Transportation (DOT), and the U.S. Environmental Protection Agency (EPA) to coordinate investment strategies. Six principles guide the work of this initiative:

- 1) Provide more transportation choices;
- 2) Promote equitable, affordable housing;
- 3) Enhance economic competitiveness;
- 4) Support existing communities;
- 5) Coordinate policies and leverage investment;
- 6) Value communities and neighborhoods.

Better pedestrian access to transit plays a crucial part in meeting all of the Sustainable Communities Partnership livability principles.

Dangerous by Design: Solving the Epidemic of Preventable Pedestrian Deaths (And Making Great Neighborhoods)

(<http://t4america.org/resources/dangerousbydesign/>)

The Dangerous by Design initiative was a joint effort of Transportation for America (T4 America) and the Surface Transportation Policy Project (STPP). The Dangerous by Design report, published in 2009, documents where the most pedestrian fatalities occur in the U.S., what makes roads unsafe for pedestrians, and recommends actions for improving pedestrian safety. This report will help inform the project in these crucial areas.

Federal Transportation Administration (FTA) New Starts Policy Shift

(http://www.fta.dot.gov/planning/planning_environment_11045.html)

Recently the FTA proposed new funding guidelines for its New Starts Program. New Starts is the primary funding source for major capital transit improvements, such as light rail, bus rapid transit, and streetcar. The new guidelines place an emphasis on measuring livability benefits, including economic development, environmental, social, and congestion relief benefits, in addition to the time and cost savings previously considered. Providing better walk access to transit will be critical to making these new livability benefits materialize.

State

Oregon Statewide Planning Goals - Goal 12 Transportation

(<http://www.oregon.gov/LCD/docs/goals/goal12.pdf>)

Goal 12 lays the framework for what regional and local transportation plans must include. The nine elements below are required of all transportation plans and are important to keep in mind when conducting any transportation planning effort:

1. Consider all modes of transportation including mass transit, air, water, pipeline, rail, highway, bicycle and pedestrian;
2. Be based upon an inventory of local, regional and state transportation needs;
3. Consider the differences in social consequences that would result from utilizing differing combinations of transportation modes;
4. Avoid principal reliance upon any one mode of transportation;
5. Minimize adverse social, economic and environmental impacts and costs;
6. Conserve energy;
7. Meet the needs of the transportation disadvantaged by improving transportation services;
8. Facilitate the flow of goods and services so as to strengthen the local and regional economy; and
9. Conform to local and regional comprehensive land use plans. Each plan shall include a provision for transportation as a key facility.

Oregon House Bill 2001 - Jobs & Transportation Act

(<http://www.oregon.gov/ODOT/JTA.shtml>)

Oregon's House Bill 2001, adopted by the Oregon Legislature in 2009, is driven by three core themes:

- accountability, innovation and environmental stewardship;
- highway, road and street funding; and
- multimodal funding.

Specific directives that relate, both directly and indirectly, to this project include:

- Develop a congestion pricing pilot project in the Portland metro area by October 2012.
- Develop a least cost transportation planning model for use by the state, Metropolitan Planning Organizations and local governments.
- Participate in and finance the development of transportation plans needed to reduce greenhouse gas emissions.

Regional

Metro's Active Transportation Partnership

(<http://www.oregonmetro.gov/index.cfm/go/by.web/id=30078>)

Metro's Active Transportation Partnership is a project to take bicycling and walking to a new level. It provides direction and coordination between regional partners to plan, build, and promote safe and attractive bike and pedestrian facilities, including projects that provide better access to transit.

Regional Transportation Plan (RTP) Performance Targets

As part of the accepted 2035 Regional Transportation Plan, the Joint Policy Advisory Committee on Transportation (JPACT) endorsed progressive performance targets for the Portland Metropolitan Region. The accepted performance targets include:

- **Safety** – By 2035, reduce crashes, injuries and fatalities by 50 percent compared to 2005.
- **Congestion** – By 2035, reduce vehicle hours of delay per person by 10 percent compared to 2005.
- **Climate change** – By 2035, reduce carbon dioxide emissions by 40 percent below 1990 levels.
- **Active transportation** – By 2035, triple walking, biking and transit trips compared to 2005.
- **Clean air** – By 2035, ensure zero percent population exposure to at-risk levels of air pollution.
- **Travel** – By 2035, reduce vehicle miles traveled per person by 10 percent compared to 2005.
- **Affordability** – By 2035, reduce the average household combined cost of housing and transportation by 25 percent compared to 2000.
- **Access to daily needs** – By 2035, increase by 50 percent the number of essential destinations accessible within 30 minutes by bicycling and public transit for low-income, minority, senior and disabled populations compared to 2005

Providing better pedestrian access to transit will help the region meet all of these performance targets.