Appendix A: Methodology and Analysis

This appendix describes the method used to prioritize pedestrian facility recommendations as part of the Seattle Pedestrian Master Plan.

Purpose

Seattle's strategy for prioritizing projects accounts for both the quality of the pedestrian environment and potential pedestrian activity levels. It is meant to focus resources in areas where conditions are difficult and where people need to be able to walk the most. The City is also accounting for socioeconomic and health factors such as lower rates of automobile ownership and higher rates of diabetes and obesity. As a result, projects are prioritized in areas that can serve community residents with the greatest needs.

The strategy includes a systematic citywide analysis of existing and future needs. The maps and the data are meant to be real-world, practical tools to inform decision making on a day-to-day basis. The strategy will help to prioritize pedestrian projects in the short-term. If the City can only afford to build or improve a certain number of sidewalks or curb ramps each year, which ones should be built first? It will also help the City make long-term decisions, for example by informing the process of selecting and programming projects.

The maps and data can help the City pursue future funding opportunities, while also enabling it to make focused and effective decisions if funding unexpectedly becomes available and projects need to be identified quickly. It is equally applicable in times when budgets are constrained, as the City is asked to do more with less. As new data become available, they can be incorporated into the framework identified in this plan.

Steps in the Analysis

The prioritization process includes several different steps. A variety of factors were considered in each step of the analysis. The steps are outlined below.

Step 1: Base Analysis
1a. Potential Pedestrian Demand
1b. Equity
1c. Corridor Function

Step 2: High Priority Areas
Combine the results of the potential pedestrian demand, equity and corridor function analyses from Step 1 in order to identify High Priority Areas

Step 3: Needs Assessment
Assess pedestrian needs through an analysis of conditions walking "Along the Roadway" and "Crossing the Roadway"

Step 4: Development of Project Lists
Combine the High Priority Areas analysis and the needs assessment to identify projects where conditions are difficult and where people need to be able to walk the most.

Step 1: Base analysis

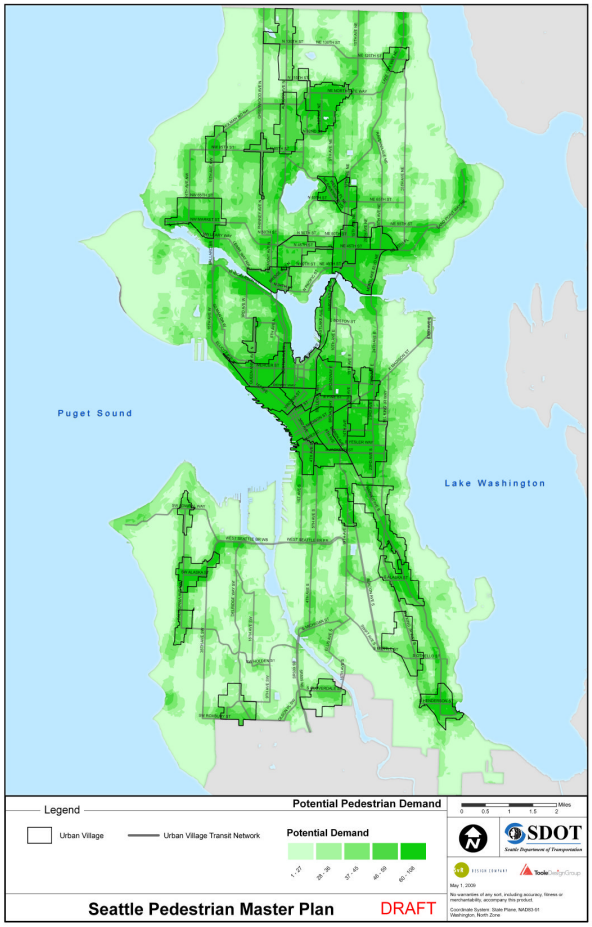
Step 1a: Pedestrian Demand

The Potential Pedestrian Demand map identifies existing destinations in Seattle such as transit stations, parks, schools, grocery stores, and libraries that are likely to generate pedestrian traffic. The map highlights where people need and want to walk, not only today but in the future. It identifies "hot spots" where pedestrian generators are located close to each other. These hot spots are shown as the darker green areas in Figure 1. The map also incorporates estimates of where people will be living and working in the future.

The demand analysis accounts for different types of pedestrian generators and it acknowledges that they will not all generate the same levels of pedestrian activity. For example, a regional transit station is likely to generate more pedestrian traffic than a local bus stop. Multi-family residential buildings and regional destinations such as the Pike Place Market are likely to generate more pedestrian activity than low density office and retail uses.

The analysis also accounts for the distance people are willing to walk to and from different types of destinations. It recognizes that these distances are not the same for all pedestrian generators. For example, people may be more likely to walk farther to a transit station than to a coffee shop.

Figure 1: Potential Pedestrian Demand



The Potential Pedestrian Demand map reflects the different amounts of pedestrian activity that are anticipated in different parts of the city. Evaluating potential pedestrian demand allows the City to focus investments in locations that will have the biggest impact on pedestrian convenience and safety. This information can inform the selection and prioritization of a range of pedestrian improvements such as sidewalks, curb ramps, and crosswalks.

Tables 1, 2, 3 on the following pages outline the factors that are incorporated into the potential pedestrian demand assessment and the data used in the analysis.

Table 1: Pedestrian Generators/Demand

Category	Sub-Category	Examples/Notes	Weight 1/8 Mile	Weight 1/4 Mile	Weight 1/2 Mile
High Generator Highest Possible Value: 70	University or College		15	10	5
	Major Generator	Pike Place, convention center, Greenlake and Myrtle Edwards Park, etc.	15	10	5
	Light Rail	-	10	5	3
	Multi-family, condominiums, and apartments		10	5	3
	Major Bus Stop	5 or more routes	10	3	1
	UVTN Route (definite rapid service)	-	10	3	1
Medium Generator Highest Possible Value: 35	School	Daycare, primary, public, private, etc.	5	3	1
	Major Retail	Grocery store, regional retail, etc.)	5	3	1
	UVTN Route (definite local service)	-	5	3	1
	Hospital	-	5	1	0
	Trails	-	5	3	1
	Community Services	Community centers, libraries, post offices, social services, etc.	5	3	1
	Park	Park, greenbelt, open space, etc.	5	3	1
Low Generator Highest Possible Value: 13	Minor Retail	General retail, office, etc.	3	1	0
	Minor Bus Stop	-	3	1	0
	Park and Ride Location	-	3	1	0
	Bridges	-	3	1	0
	Stairs	-	1	0	0

Table 2: Population and Employment Forecasts

Category	2025 Population Forecast (per sq. mile)	Weight	2025 Employment Forecast (per sq. mile)	Weight
1	0 - 2,527	0	0 – 1,040	0
2	2,528 – 7,929	2	1041 – 2,888	2
3	7,930 – 13,071	4	2,889 – 8,007	4
4	13,072 – 22,626	8	8,008 – 41,258	8
5	22,627 – 134,959	10	41,259 – 464,493	10

Table 3: Data Used in the Analysis

Data used in analysis	Components of the total demand score	Total demand score
Seattle Parcel Layer Seattle Parcel Layer Selection (Colleges and Universities Called out By Amelia) Major Generators - Selected Parcels from Parcel Layer Bus Stops Point Layer Bus Routes Polyline Layer Link Station Polygons Bridges and Stairs polyline layer Trail Layer 2025 Population and Employment Density Data UVTN Polyline	ColUn_Scr - University or College MajGen_scr - Major Generator LnkS_Scr - Light Rail MajBs_Scr - Major Bus Stop UVTN_R_scr - UVTN Route (definite rapid) Sch_Score - School MajR_Score - Major Retail UVTN_L_scr - UVTN (definite local service) Hosp_Score - Hospital Trails_scr - Trails ComC_scr - Community Services Park_scr - Park MinRet_Scr - Minor Retail MinBS_scr - Minor Bus Stop PnR_scr - Park and Ride Location Tot_Pd_SCR - Population Density Tot_Em_SCr - employment density Bridge_Scr - Bridges Stairs_Scr - Stairs MFHous_Scr - Multi Family Housing	TotalScore - TOTAL SCORE PedDem_NSC - Pedestrian Demand Score Normalized (0 - 40)

Step 1b: Equity Analysis

Seattle is accounting for socioeconomic and health factors such as lower rates of automobile ownership and higher rates of diabetes and obesity as part of its prioritization process. In doing so, the City is prioritizing pedestrian improvements in areas that can serve community residents with the greatest needs.

Factors that were accounted for in the analysis include:

- Automobile ownership
- Low income population
- Disability population
- Diabetes rates
- Physical activity rates (self reported)
- Obesity rates.

Each of the six socioeconomic and health categories were broken into five quantiles (five groups with relatively equal records in each group). The top quantile for each category received five points. There were thirty possible points for any given area and the highest point value received was thirty.

Figure 2: Socioeconomic and Health Map

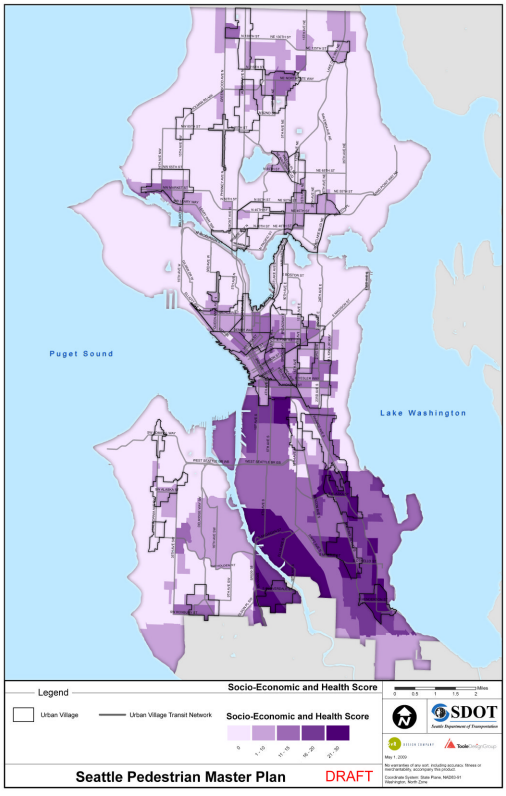


Table 4: Data Used in the Analysis

Data used in analysis	Key fields generated in the analysis
2000 Census Block Group Data with Associated Fields: Disability, % Automobile Ownership, Median Income HPA health Data for King County for Diabetes and Obesity Self reported health measures	DIABET_SCR – Diabetes Score OBESE_SCR – Obesity Score DissabSCOR – Disability Score LINC_SCR – Low income score PCAR_SCR – Car Ownership Score FinalScore – Combined Score SoE_NSCR – Final Score Normalized 0 – 35

Step 1c: Corridor Function Analysis

Street types were also factored into the prioritization analysis. Street types build on street classifications, which define how a street should function to support movement of people, goods and services. Street types provide a more specific definition of the design elements that support the street's function and its adjacent land use. Street types are included in the analysis because they are how the city organizes and plans for its street network. All street type categories were given a weighted value, based on the character of the street and its contribution to the pedestrian network, as outlined below.

Total Scores

25 Points
Regional connectors
Commercial connectors
Local connectors

15 Points
Main streets
Mixed streets
Green streets

10 Points
Residential
Residential green
Industrial access
Industrial arterial

Figure 3: Street Type Analysis

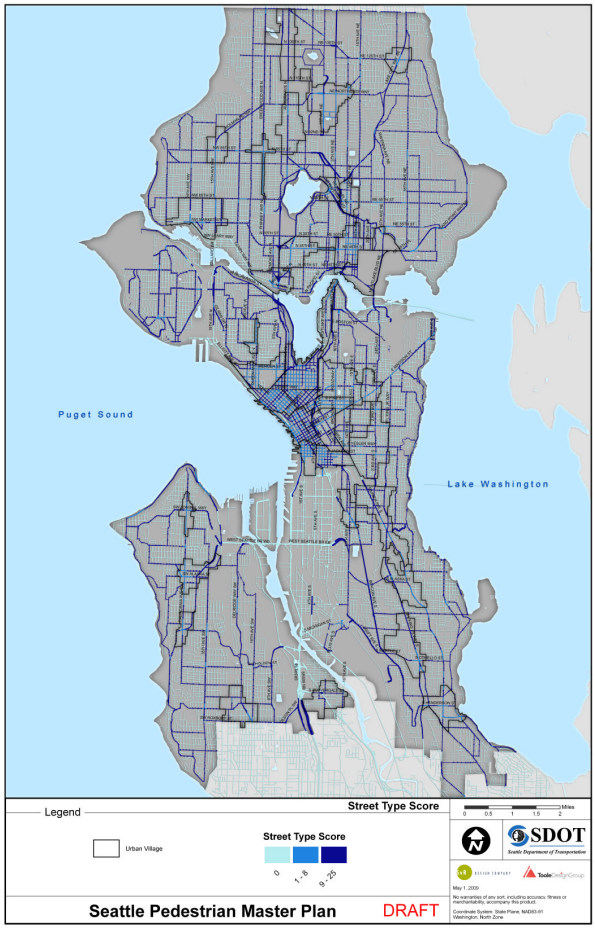


Table 5: Data Used in the Analysis

Data used in analysis	Key fields generated in the analysis	Street type score
Seattle Street Type Polyline, modified by TDG and SVR	TDG_StType – street type score StTyp_NSCR – Street type score normalized 0 - 25	ScoreonStreetRightofWay.shp

Step 2: High Priority Project Areas

The results of the potential pedestrian demand, equity and corridor function analysis were combined together in order to identify High Priority Areas throughout the city. The combined scores were added together, using the ratio outlined below.

- The **potential pedestrian demand** analysis was used as a measure for vibrancy. It contributed to **40%** of the total score.
- The socioeconomic and health analysis was used as a measure of **equity**. It contributed to **35%** of the total score.
- The corridor function analysis was used as a measure of **land-use and transportation**. It contributed to **25%** of the total score.

Figure 4 shows the results of combining the potential pedestrian demand, equity and corridor function analyses into one weighted score.

Figure 4: High Priority Project Areas

Step 3: Needs assessment

The needs assessment is a systematic effort to identify and compare opportunities for pedestrian improvements throughout the city. The opportunities for improvements are approximated using variables that contribute to the pedestrian environment, including motor vehicle speed limit, the width of the road and the presence of features such as traffic signals, curb ramps, and crosswalks. Point values were assigned to all roads and intersections to capture the combination of all of these variables. The analysis provides a measure of the quality of the existing physical environment.

The needs assessment is not based on a field evaluation. It is derived from roadway characteristics gleaned from available data.

"Walking along the Roadway"

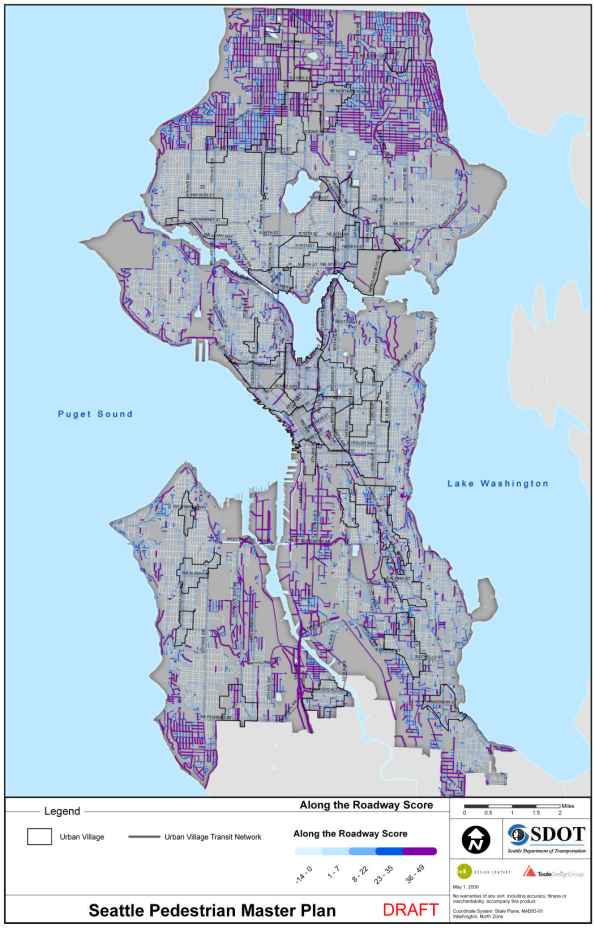
The presence of sidewalks and the amount of traffic impact a person's experience walking along a road. Whether there is a physical buffer such as a tree or parked cars also contributes to their experience. The "Walking along the Roadway" map shown as Figure 5 groups these types of roadway characteristics together in order to compare roads throughout the city.

It provides a measure of how comfortable different roads are to walk along. Points were assigned to characteristics that negatively impact walking. A road with a higher number of total points indicates that it is more uncomfortable to walk along than a road with a lower number of total points.

The map accounts for whether there is a sidewalk on a road or not and whether there is a physical buffer such as a parked car or a tree. It also accounts for the volume and speed of traffic on the adjacent road. It is meant to reflect the quality of the physical pedestrian environment along different roads in Seattle.

Understanding how roads compare to each other helps to prioritize potential pedestrian projects. For example, a busy road with no sidewalks needs pedestrian accommodations more than a quiet, narrow road with sidewalks.

Figure 5: Walking along the Roadway Map



Tables 6 and 7 on the following page outline all of the factors that contribute to the "Walking along the Roadway" score and the data used in the analysis.

Table 6: Walking Along the Roadway Scores

Factor/Criteria	Sub-Factor/Criteria Use	Characteristic	Points Allocated
Street classifications (used to indicate traffic volumes)	Art-Class Designation	0 (Residential and Non-Arterial Commercial/Industrial Streets)	1
		3 (Collector Arterial)	3
		2 (Minor Arterial)	4
		1 (Principal Arterial)	5
Arterial Speed limit		30+	1
		35+	3
		40+	4
		45+	5
Buffer	Buffer Width	None	10
		Narrow (1-3 feet)	2
		Standard (4-6 feet)	0
		Wide (>6 feet)	-5
Sidewalk Status	Sidewalk Width and Presence	Missing	20
		Narrow (>4 feet)	10
		Standard (4-6 feet)	0
		Wide (>6 feet)	-10
Slope	Sidewalk Slope Analysis	Low (0 - 8 %)	0
		Moderate (9 - 12 %)	2
		High (13+ %)	3
Parking	Calculated using regulatory signs as a proxy measure	On-street parking	0
		No on-street parking	5
Curb		Yes	0
		No	2
Length of Block		Less than 600 feet	0
		More than 600 feet	3

Table 7: Data Used in the Analysis

Data used in analysis	Components of the "Along the Roadway" score	Total "Along the Roadway" score
Traffic Signal Point File Street Centerline File (SNDSEG) Sign Point File Speed Limit Polyline File Street Width Polyline Sidewalk Polyline File Topo line (for slope analysis)	SpeedScr - Speed Limit Score ARTScore - Arterial Classification Score SWcond_scr - Sidewalk Status Score Buffer_scr - Buffer Score SlopeScr - Slope Score Park_Scr - Parking Score Curb_Scr - Curb Score BlkLn_Scr - Distance Between Signals Score Sector - Sector Project - Project Area CreekSub - Creek Sub Basin	TotalScore - TOTAL SCORE

"Crossing the Roadway"

Safe street crossings are an important part of an accessible pedestrian system. The presence of curb ramps and crosswalks make it more comfortable to cross a road on foot. Traffic signals and stop signs make it is easier to cross the road. A wide road is more difficult to cross than a narrow road. Likewise, a road with a lot of traffic is more difficult to cross than one with less traffic.

The "Crossing the Roadway" map groups these types of roadway characteristics together in order to compare intersections throughout the city. Points were assigned to characteristics that negatively impact crossing conditions. An intersection with a higher number of total points indicates that it is more difficult to cross than an intersection with a lower number of total points.

The Crossing the Roadway map reflects how comfortable it is to cross different roads in Seattle. Understanding how intersections compare to each other helps to prioritize potential projects. For example, an intersection with a traffic signal, ADA compliant curb ramps, and crosswalks needs less attention than one without any of these features.

Tables 8, 9, and 10 outline all of the factors that are incorporated into the "Crossing the Roadway" score and the data used in the analysis.

Figure 6: Crossing the Roadway Map

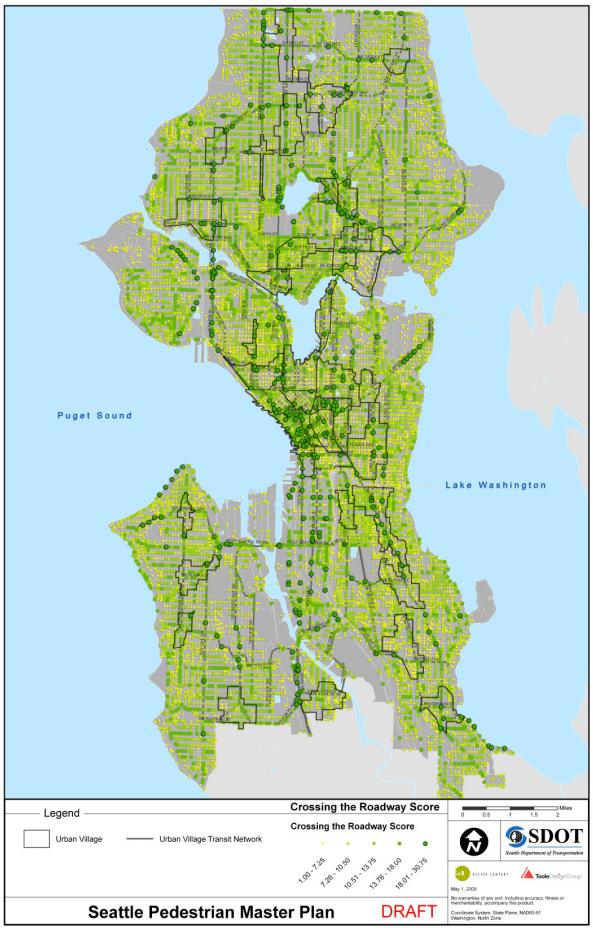


Table 8: Crossing the Roadway, Segment Value Calculation

Factor/Criteria	Sub-Factor/Criteria Use	Notes	Points Allocated
Street classifications (used to indicate traffic volumes)	Art-Class Designation	0 (Residential and Non-Arterial Commercial/Industrial) 3 (Collector Arterial) 2 (Minor Arterial) 1 (Principal Arterial)	1 3 4 5
Arterial Speed limit		1mph-30mph 35+ 40+ 45+	1 3 4 5
Road Width		0-24 24-36 36-48 48-60 61+	0 2 4 6 10
Note: Residential areas and Interstate Highways are not counted			
Distance between traffic signals and stop signs		0-500 feet 500-1000 feet 1000-2000 feet 2000+ feet	0 2 4 5
Note: Residential areas and Interstate Highways are not counted			

Table 9: Intersection Value/Balance Calculation

Intersection Average Value		Raw score	Points Allocated
Crosswalk	Counted within 50 feet of the intersection	3/4 crosswalks per intersection 1/2 crosswalks per intersection 0 crosswalks per intersection	0 1 2
Curb Ramps		None (per missing ramp) Directional (per ramp) Diagonal (per ramp)	1 0 0.5
Signal Control		Signal Pedestrian signal None	-3 -1 3
Stop Sign Control	Counted within 100 feet of the intersection		(-.25/stop sign)
Number of collisions at Intersection (3 years)		0 1 2-3 4+	0 5 10 20
Notes * Please note that "Crossing the Roadway" scores are for intersections only.			

Table 10: Data Used in the Analysis

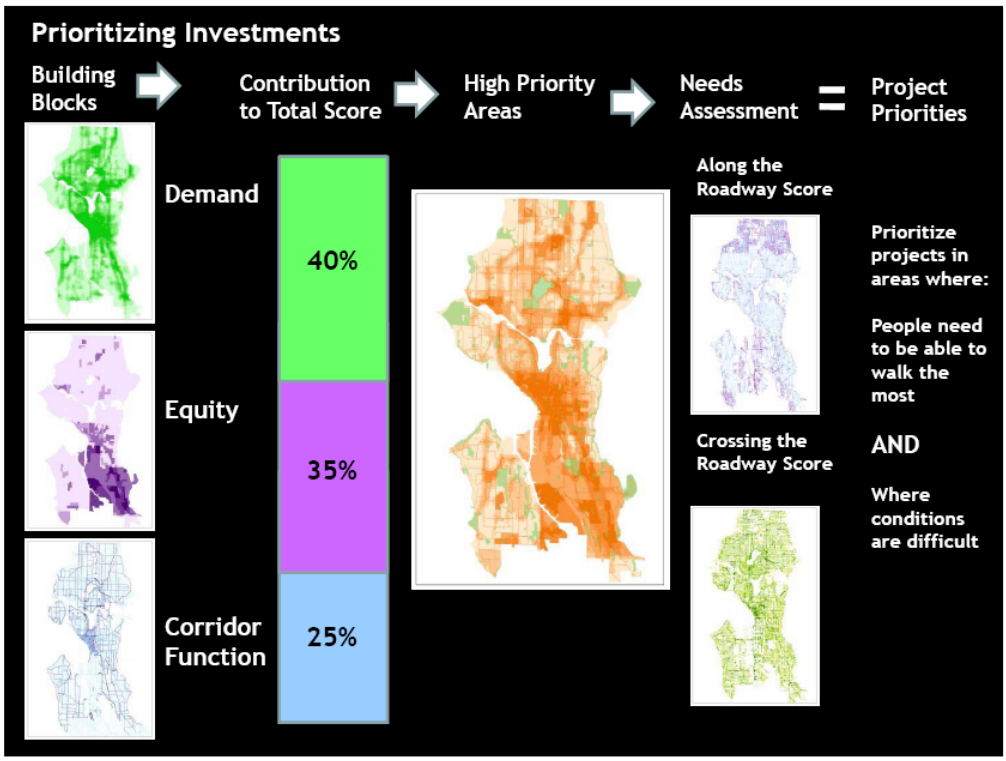
Data used in the analysis (Received from SDOT and/or SVR)	Components of the "Crossing the Roadway" score	Total "Crossing the Roadway" score
Curb Ramp Line File Traffic Signal Point File 3 Year Crash Intersection Point File Street Centerline File Sign Point File Speed Limit Polyline File Street Width Polyline File	CW_SCR – Crosswalk Score TrafC_Score – Traffic Signal Score Tot_CR_Scr – Total Curb Ramp Score Crash_Scr – Pedestrian Crash Score AvSeg_SCR – Average Segment Score Stop_Scr – Stop Sign Score Sector – Sector Project – Project Area CreekSub – Creek Sub Basin	TotalScore – Total Score

Step 4: Development of project lists

The City is combining its potential demand and needs assessments to focus resources in areas where conditions are difficult and where people need to be able to walk the most. The composite ranking accounts for both the quality of the pedestrian environment (supply) and anticipated pedestrian activity levels (demand). The City is also accounting for socioeconomic and health factors corridor function in the analysis.

Project lists were generated using the information developed as part of the steps outlined above. The primary project list, which represents the City's 2030 Plan, includes roads and intersection in the highest tier of the Along the Roadway and Crossing the Roadway analysis that occurred within the highest tier of the High Priority Area map.

Figure 7: Prioritizing Projects



The data developed as part of this plan are meant to be flexible and dynamic. As new data becomes available it can be incorporated into the framework outlined above. In addition, issue specific analyses and project lists can be developed as needed.

Some of the types of project lists that can be developed are highlighted below.

- All locations with "Along the Roadway" and/or high "Across the Roadway" scores
- High priority project areas and high priority corridors can be identified, using the steps outlined above, as well as through a review of additional factors such as pedestrian crash locations and Urban Village Transit Network (UVTN) lines
- All recommendations within the high priority project areas and corridors discussed above
- All missing sidewalks within high priority areas
- Locations with high "Along the Roadway" and/or high "Across the Roadway" scores that occur within urban villages
- All recommendations sorted by sector

Data Considerations

Preliminary recommendations for streets and intersections are included within the GIS data developed as part of the planning process. Tables 11 and 12 on the following page outline factors that led to specific recommendations contained within the data. These recommendations are based entirely on what can be surmised from the data. Additional analysis and field work will be required to determine the type of improvements that are needed.

Table 11: Along the Roadway Score Recommendations

IF	THEN
Sidewalk is Missing	Construct Sidewalk
Sidewalk is Narrow (<4')	Widen Sidewalk
Sidewalk has no Buffer	Consider Opportunity to Add Buffer
Sidewalk has no Curb	Consider Opportunity to Add Curb
High Priority Along the Roadway	Undertake a planning analysis to evaluate the range of improvements needed such as new or improved sidewalks, buffer, and on-street parking

Table 12: Crossing the Roadway Score

IF	THEN
X missing curb ramps (not on missing sidewalk segments)	Construct X Missing Curb Ramps
0-2 Crosswalks at Intersection	Evaluate Intersection for possible addition of crosswalks
2 or more collisions in 3 years	Assess intersection for possible crossing and other design improvements
High Priority Crossing the Roadway	Undertake an engineering analysis to evaluate the range of improvements needed such as signalization, pedestrian crossing islands, curb ramps, and crosswalks