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Monograph 53

Environmental Quality of Multiple Roadway Boulevards

Peter Bosselmann and Elizabeth Macdonald
with
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University of California at Berkeley
Institute of Urban and Regional Development

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INTRODUCTION

Transportation and land use planners generally agree that high traffic volumes are incompatible with a good residential street. Danger to pedestrians and bicyclists and emissions from traffic, such as high noise levels and poor air quality, are the obvious reasons. In addition, traffic is also a barrier to social interaction. In 1969, Donald Appleyard demonstrated that residents living on streets with high traffic volumes are likely to have fewer friends and acquaintances among their neighbors, socialize less in their neighborhood, and identify less with their street as home territory than residents of streets with lower traffic volumes. He found that residents on high volume streets withdraw from the physical environment of the street and do not care for it.[1] After studying 21 residential streets with a wide range of traffic volumes, he concluded that the quality of residential street life starts to diminish when daily average traffic volumes exceed 8,000 cars.[2] Evidence of the detrimental effects of traffic on neighborhood livability has been compelling, and transportation planners have made it their goal to divert high volume through-traffic from residential streets whenever possible. Many cities have implemented traffic management plans designed to tame traffic on residential streets. Such plans created protected neighborhoods by routing non-local traffic along arterial streets.[3] According to these plans, through-traffic was directed to commercial areas or other non-residential land uses, but with limited success — most medium to high volume streets in existing cities are also residential streets. In the inner city neighborhoods of San Francisco where Appleyard carried out the initial study, more than 75 percent of all streets with 8,000 cars or more per day also serve predominantly residential land use. In communities with lower densities, the percentage of medium to high volume residential streets is even greater.

In the layout of new communities, planners have tried to address the problems faced by residents who live in the vicinity of high traffic volumes by designing arterial streets with limited or no access to properties. The rear of residential properties abut the arterial streets' right of way and homes are oriented toward local streets inside neighborhoods. A driver wanting to access a neighborhood will leave the arterial at designated neighborhood entrances and circle around the neighborhood on streets designed to accommodate local traffic only. Although the neighborhoods are protected from traffic, the roadway design separates neighborhoods and tends to make residents dependent on automobiles for most trips. As a result, non-motorized residents must rely on others for

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[1] Appleyard, Donald, and Mark Lintell. "The Environmental Quality of City Streets: The Residents' Viewpoint." *Journal of the American Planning Association,* Vol. 28, No. 2, March 1972.

[2] Appleyard, Donald. *Livable Streets.* University of California Press, 1981.

[3] Appleyard, Donald, and Dan Smith. *State of the Art Report.* Washington, D.C.: Federal Highway Administration, 1980.

transportation to educational, health, shopping, and recreational facilities, and for trips to places as close by as a friend's house in an adjacent neighborhood. Designed exclusively for cars, the arterial streets seldom have sidewalks, crosswalks, or bicycle paths.

Missing in the design repertoire is a street type that is designed to carry significant amounts of traffic, but is also attractive to live on — a street that protects residents from the negative effects of traffic, connects neighborhoods well with other parts of the city, and is designed for all modes of transportation, including walking and bicycling. Such a street should also accommodate non-residential, neighborhood-related commerce, schools, and other services.

Once more frequent in American cities, a landscaped boulevard is such a street type. Its center lanes accommodate through-traffic, and its local access lanes run parallel, separated from the center by rows of trees, pedestrian malls or other formal landscaping. The width of the right of way for a boulevard with multiple roadways is generally spacious; it can be accommodated in not less than a 120-foot width — or better yet, a 150-foot width.

Street widening programs of the 1950s and 1960s have diminished multiple roadway boulevards in American cities. The central area of Washington, D.C. used to have many boulevards, but the few remaining ones like K Street no longer serve residential land uses.

The landscape architect Frederick Law Olmsted created several boulevards in the northeastern states. In Brooklyn, New York, Olmsted and his partner Calvert Vaux planned the widening of major streets around Prospect Park and the planting of multiple rows of trees to create tree-lined avenues leading to the park. Enlarging this concept to take in the whole city, Olmsted developed a parkway system in which tree-lined boulevards were to radiate from the park to the outer reaches of the city and suburbs. Only two boulevards were actually built. The Eastern Parkway, then known as Jamaica Parkway, was completed in 1874. It was the first parkway design and consisted of a main carriage drive 65 feet wide flanked by double rows of trees with a spacious walk of 35 feet and local access roads on either side. The sidewalks along the access roads were also tree-lined. Homes on the parkway were set back by 30 feet from the sidewalk. The entire right of way width, excluding the distance buildings were set back, measured 270 feet[4]. The second boulevard, Ocean Parkway, extending from Prospect Park to Coney Island, was also completed in 1874.

Although initially conceived as pleasure drives, boulevards are useful as major traffic carriers and should be considered in the design of new communities. Multiple roadway boulevards like the Olmsted parkways have recently received research attention. Allan Jacobs and the co-author of this study have compared traffic data and accident statistics of multiple roadway boulevards with control

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[4] Dierickx, Mary B., and Vollner Associates. *A Historic Summary of Grand Army Plaza and Eastern Parkway.* For New York City Department of Transportation, Bureau of Highways. Capital Project No. HIJ-170, Contract No. THCK 170C. New York: October, 1982.

CITY OF BROOKLYN.

PLAN OF A PORTION OF **PARK WAY** AS PROPOSED TO BE LAID OUT

FROM THE EASTERN PART OF THE CITY

TO

THE PLAZA.

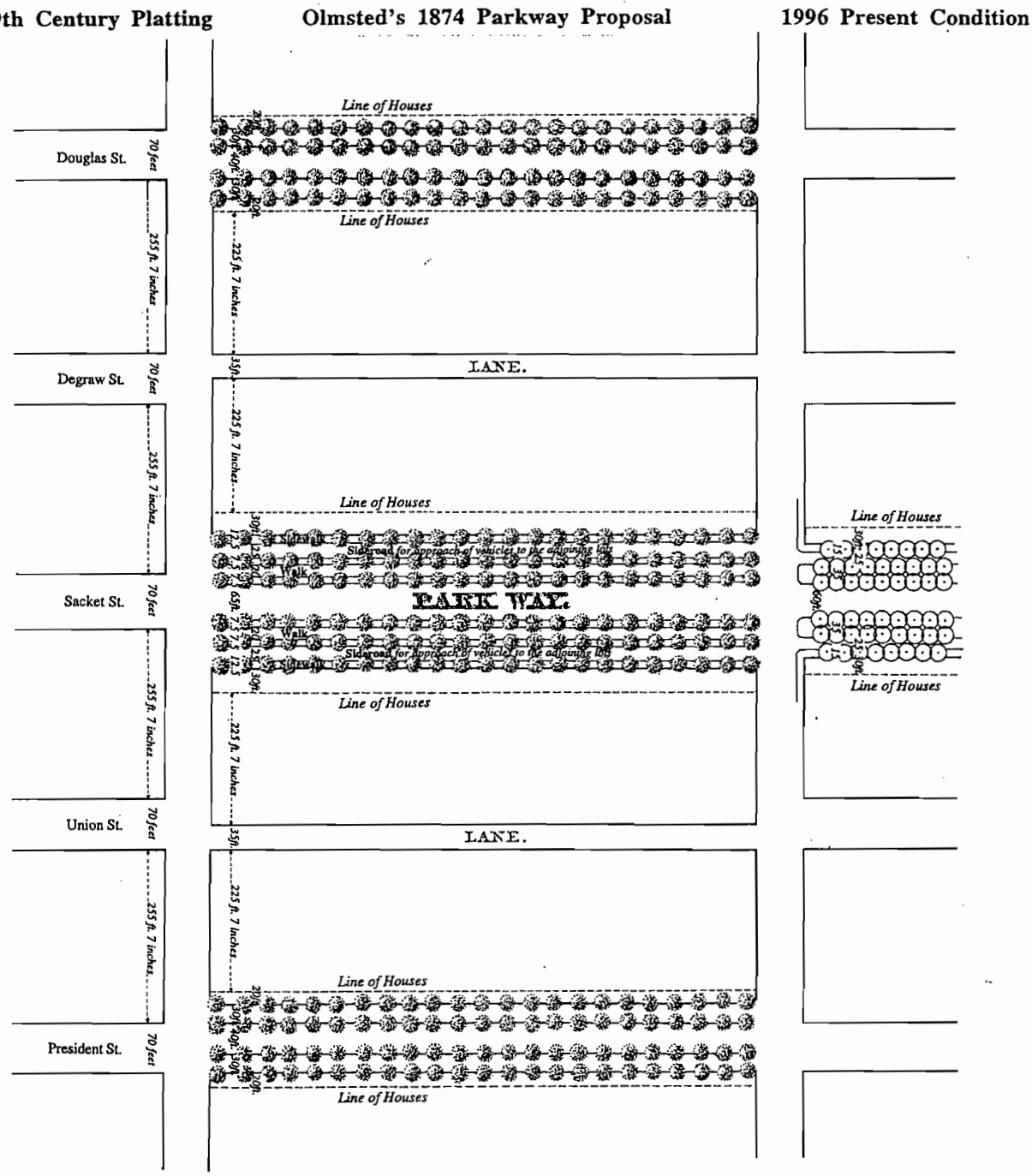


Figure 0.1

streets of conventional street design which carry similar amounts of traffic[5] . They found that multiple roadway boulevards, although perceived by traffic engineers to be unsafe because of their complex intersections, are not less safe than normally configured streets carrying similar amounts of traffic.

However, the question of what it is like to live on a boulevard has never been asked. Following the Appleyard study, we designed a research program involving residents on three boulevards, including the aforementioned Eastern Parkway and Ocean Parkway in New York, and an additional boulevard in a suburban setting in Chico, California. In the vicinity of each of these three boulevards, we selected two additional residential streets — one with low traffic volumes and one with as high a traffic volume as we could find. Thus, we studied the physical and traffic characteristics of a total of nine streets, along with resident responses to a questionnaire survey. This is a report on the study design and our findings.

[5] Jacobs, Allan B., Yodan Rofé, and Elizabeth Macdonald. *Boulevards: A Study of Safety, Behavior and Usefulness.* Working Paper No. 625. Berkeley, CA: Institute of Urban and Regional Development, University of California at Berkeley, 1994.

I. BACKGROUND AND RESEARCH HYPOTHESES

This chapter summarizes the conditions that led to the original livable streets project in San Francisco in 1969 and explains the research hypotheses for the present study.

The original residential street study was commissioned by the San Francisco Planning Department as background research for the 1972 citywide urban design plan. In the late 1960s, San Francisco planners responded to an increasing number of citizens' complaints about through-traffic on selected residential streets. The planners blamed the partially abandoned freeway building program for an increase of traffic on some local connected streets. Although the "freeway revolt" had enjoyed overwhelming support among San Francisco residents, the freeways that were completed channeled traffic to a reduced number of freeway exits and entrances. In San Francisco, the Central Freeway was proposed with two branches: one along Van Ness Avenue to connect with the proposed Embarcadero Freeway near Fort Mason, and a second branch along Oak and Fell Streets through the Panhandle and Golden Gate Park connecting to a north-south freeway along 19th Avenue and the Presidio Parkway to the Golden Gate Bridge. After the plans were abandoned, freeway "stumps" remained at Franklin and Gough streets near the Civic Center and at Oak and Fell streets in Hayes Valley. From these freeway exits, freeway traffic continued along pairs of residential streets made one-way to accommodate the traffic. Residents complained heavily and the San Francisco Planning Department commissioned a study of the affected streets.

For the initial 1972 study, Appleyard selected Franklin, Gough, and Octavia streets in San Francisco, one-way streets largely used by commuters on their way out of San Francisco to places north via the Golden Gate Bridge. In 1972, Franklin Street carried nearly 16,000 cars daily. One block to the west, Gough Street carried 8,000 cars in both directions, and yet another block to the west, Octavia Street, was used by only 2,000 cars. Measurement of traffic impacts included speed, noise level, and volume counts. On Franklin, drivers drove 30 to 50 miles per hour. Noise levels were in excess of 65 decibels 45 percent of the time, and 900 cars were counted during the morning commute hour. On Gough, cars drove 10 to 45 miles per hour; noise levels exceeded 65 decibels 25 percent of the time; and 550 cars passed during the morning peak. On Octavia, traffic moved at 15 to 20 miles per hour; the noise level readings reached and exceeded 65 decibels only 5 percent of the time; and only 200 cars passed during the morning commute.

In 1989, the Appleyard study tested three hypotheses:

1. Heavy traffic activity might be associated with more apartment renters and fewer owner-occupants and families with children.
2. Heavy traffic is associated with much less social interaction and street activity. Conversely, a street with little traffic and many families promotes a "rich" social climate and strong sense of community.

3. Heavy traffic is associated with a withdrawal from the physical environment. Conversely, residents of a street with low traffic show an acute, critical, and appreciative awareness of and care for the physical environment around them.

Through a questionnaire survey and door-to-door interviews, the study solicited resident responses on three selected city blocks — one on each of the three streets. Appleyard found that traffic had a major effect on the lives of the residents. People on Franklin, the street with heavy traffic flows, responded with fear when asked about traffic. On Octavia — which had identical street width, the least amount of traffic, and was only two blocks east of Franklin — residents complained about the occasional fast car, but they considered their street safe from traffic. The study confirmed the three hypotheses. Families that once lived on Franklin Street had moved away and leased or rented out their former homes. Traffic formed a barrier to social interaction. Residents on streets with heavy traffic withdrew from the physical environment of their street and cared less for the things that took place there than residents of streets with light traffic.

The current livability study is not intended to refute the original findings. This study is aimed at the stubborn problem of high traffic volumes on some residential streets — a problem that has not gone away although traffic management plans have tried to address it. The study tries to test the multiple roadway boulevard as a design solution that mitigates the effects of traffic on high-traffic streets and creates livable streets for its residents.

Following are the modified hypotheses used for this study. We expected to find that people living along multiple roadway boulevards do not withdraw from the environment or from their neighbors even though these streets carry very large volumes of traffic. In essence, we expected that the slow-moving access roads and planted medians would create a buffer against the heavy traffic in the center of the street and create a street environment in front of the houses not unlike that of a light-traffic residential street. We expected that people living on a boulevard would be aware of its special configuration and be concerned with caring for their street.

We also expected that the boulevard configuration would allow (perhaps even encourage) social interaction and street activity in spite of the presence of heavy traffic. We weren't sure, however, whether residents' social activity would tend to focus on their own side of the block because of the traffic, or whether activities would tend to be of a different type than on normally lightly trafficked configured streets.

Finally, we expected to find higher levels of home ownership on boulevards and more families with children than on normally configured residential streets that carry a lot of traffic.

II. RESEARCH DESIGN, CASE STUDIES, RESEARCH METHODS

This chapter presents the research methods used in the study and describes the case-study streets. What follows is first a description of the research design and objectives and then a description of the case-study street selection process. This is followed by detailed descriptions of the three selected case-study street groups. Finally, the research methods are described and collected data is presented.

Research Design and Objectives

The study objective was to ascertain whether a multiple roadway boulevard configuration might improve the livability of a high-traffic residential street by mitigating the impact of traffic. The intent was to measure livability by using a research design similar to that used by Donald Appleyard in his study but adapted in ways that made sense to particularly study boulevard livability and with improved methodologies as seemed appropriate.

In replication of the Appleyard study design, the general idea was to compare the livability of residential multiple roadway boulevards with the livability of nearby residential streets with similar population and housing characteristics but carrying different amounts of traffic. The Appleyard study compared the livability of a high-traffic residential street, a medium-traffic residential street, and a low-traffic residential street. To adapt this approach to the question of whether a multiple roadway boulevard configuration mitigates the impact of high traffic, the initial idea was to compare a high-traffic residential boulevard with two other kinds of streets: a high-traffic residential street carrying approximately the same amount of traffic as the center roadway of the boulevard, and a low-traffic residential street carrying approximately the same amount of traffic as the access roads of the boulevard. This approach initially drove the case-study selection process, but was modified during the process due to field condition discoveries.

As in the Appleyard study, we decided to look at one block of each street. We also decided to look at several case studies rather than just one, in order to increase the breadth of our analysis. More comparisons would help us better understand how traffic volume, speed and noise interact with physical variables such as street width, building distance from the sidewalk, building separation and heights, and residential density.

Street Selection

Boulevard Selection

The choice of which boulevards to include in the research was rather straight-forward. We were familiar with a number of boulevards which had been investigated in a previous University of California Transportation Center research study, "Boulevards: A Study of Safety, Behavior, and Usefulness" (Jacobs et al., 1994), in which we participated. Because of time and money constraints and

in order to limit the field investigation work, it made sense to choose from among these known boulevards. It also made sense to select U.S. boulevards, so that the research would be as comparable as possible with the original Appleyard research, although the previous boulevard safety study had looked at both U.S. and European streets.

Given the nature of the study, it was necessary to select boulevards that were predominantly residential. It was also important to select streets that were predominantly single-family in order to eliminate the many additional "livability" variables that might be present in large multi-family situations. Within this constraint, we also hoped to choose boulevards that would illustrate a variety of residential densities in order to learn the impact of this variable.

With these criteria in mind, two clear choices were available: the Esplanade in Chico, California and Ocean Parkway in Brooklyn, New York. We knew that the Esplanade had a mixture of single-family and multi-family dwellings interspersed with some commercial buildings and some houses which had been converted to offices, and that Ocean Parkway, while having some very high density residential blocks, also had many blocks of predominantly single-family and semi-attached row houses. In addition, we knew that the residential density on and around the Esplanade was very low, while the density on and around Ocean Parkway was substantially higher.

Field visits were made early in the study to confirm our selection of these boulevards, to select the best boulevard blocks to include in the study, and to select the control streets. We gained a detailed understanding of each boulevard and its urban context by driving along the boulevard and on surrounding streets. Possible case-study blocks on the boulevard were first identified and then the surrounding neighborhoods were investigated for possible high-traffic and low-traffic control streets having the same social and housing characteristics. As a result of this field investigation, we decided that both the Esplanade and Ocean Parkway would work as case-study streets, but we also decided to include a third boulevard: Eastern Parkway, also in Brooklyn, New York.

The decision to include Eastern Parkway in the study was made because of concerns that developed around the discovery that the most appropriate blocks of Ocean Parkway to be included in the study were inhabited primarily by a strong Hassidic Jewish community. It was anticipated that religious affiliation might influence the research results in this section of Bensonhurst; residents might interact because they know each other from settings other than their street. Nearby Eastern Parkway in Crown Heights has a mixed community consisting primarily of both religious Jews and immigrants from the West Indies. It also has a higher density than the other streets, consisting primarily of attached row housing mixed in with some larger apartment buildings, some commercial buildings, and some institutional buildings.

All three streets have narrow access roads, with only one lane of traffic on them, and have traffic controls at each intersection along the access road to discourage through-traffic. All three also have closely spaced trees on the medians. The streets differ, however, in that the Brooklyn

boulevards are considerably wider than the Chico boulevard (210' right of ways versus 165') and that their medians have specifically designed pedestrian pathways with paved areas and benches. The medians on the Esplanade are planted densely with bushes between the trees. The Brooklyn boulevards also carry considerably more traffic than the Esplanade.

	The Esplanade Chico, California	**Ocean Parkway** Brooklyn, New York (Bensonhurst)	**Eastern Parkway** Brooklyn, New York (Crown Heights)
Land Uses	Residential: Single-family. One small apt. bldg. and one 4-plex.	Residential: Semi-attached 2-plexes and 4-plexes. Two large apt. bldgs.	Residential: "Brownstone" row houses, converted from single-family to 2 to 4 units. Some large apt. bldgs. Other: Corner shops, bank, health center
Traffic Configuration	Center: 2 lanes each direction Access Roads: 1 lane (1-way) parking one side	Center: 3 lanes each direction Access Roads: 1 lane (1-way) parking one side	Center: 3 lanes each direction Access Roads: 1 lane (1-way) parking two sides
Average Daily Traffic Flow	24,200	42,040 estimated*	44,440 estimated*
Right of Way Width (feet)	165' to 175'	210'	210'
Pavement Width (feet)	Center: 66' (includes 10' center median) Access Roads: 20'–30' Total: 106'–116'	Center: 70' Access Roads: 25' each Total: 120'	Center: 70' Access Roads: 25' each Total: 120'
Median Width (feet)	10' and 28'	30' each	35' each
Sidewalk Width (feet)	5' each	15' each	15' each
Building Setbacks (feet)	25' to 35'	30'	30'
Distance from Facade to Facade Across Street (feet)	200' to 220'	270'	270'
Distance from Residence Facade to Street Edge (feet)	To Center Road: 60'–85' To Access Road: 30'–50'	To Center Road: 100' To Access Road: 45'	To Center Road: 100' To Access Road: 45'
Average Building Height (no. of stories)	1 and 2 story	2 story (apt. bldgs: 6-7 story)	2 story (apt. bldgs: 6-7 story)

* Estimated from peak hour traffic counts taken in field work. See page 39.

Figure 2.1
Summary of the Characteristics of the Selected Case-Study Boulevards

Boulevard Case Study Block Selection

For each of the three selected boulevards, there were clear choices for the best blocks to study. On the Esplanade, the blocks around Francis Willard Avenue had by far the most consistent pattern of single-family houses. On Ocean Parkway, a number of blocks between Avenue M and Avenue R were good candidates, although those between Avenue P and Avenue Q had the most consistent pattern of single-family and semi-attached row houses with the fewest large apartment buildings. On Eastern Parkway, the block with the most consistent "brownstone" row housing was between Nostrand Avenue and New York Avenue.

Control Street Selection

The general criteria for selecting the high and low traffic control streets was that they should be within the same neighborhood as the boulevard so that similar population and housing characteristics would hold. In other words, as far as possible the only variable between the streets would be traffic volume. In addition, we hoped to select control streets running parallel with the boulevard, rather than perpendicular, so that block length would be comparable. (All the boulevards run in the long-block direction.) In terms of traffic, the ideal goal was that the high-traffic control street would carry an amount of traffic similar to that carried in the center of the boulevard and the low traffic control street would carry an amount of traffic similar to that on the access roads of the boulevard.

For all three of the boulevards low-traffic control streets meeting these criteria were easy to find. In each case, at least several such streets were available in close proximity to the identified best boulevard study blocks. It proved impossible, however, to find any high-traffic control streets meeting the criteria. For all three case studies, the boulevards carried much more traffic than any other nearby street, and those nearby streets which did carry moderately high volumes were either predominantly commercial rather than residential, or were a mix of large project, multi-family, and commercial (e.g., Mangrove Street near the Esplanade, Coney Island Boulevard near Ocean Parkway). However, we were able to find for each boulevard a nearby medium-traffic street that met most of the selection criteria. These residential streets, while carrying nowhere near the traffic volume of the boulevard, carried considerably more traffic than other nearby residential streets. Unfortunately, the medium-traffic streets near the Esplanade and Ocean Parkway were cross streets rather than parallel streets and have much shorter block configurations.

Because of these field realities, we decided to structure the research differently than originally intended. Each case-study group of streets would be comprised of a high-traffic street (the boulevard), a medium-traffic street, and a light-traffic street. Blocks of the medium-traffic and light-traffic control streets which had similar housing types to the blocks selected on the boulevards were then identified and selected for the research.

Description of the Three Case-Study Groups

Detailed observation of the physical qualities of each of the selected blocks of the nine selected streets were observed, including cross-section width and configuration, land use, and traffic configuration. In addition, Sanborn maps of each block, which show the locations of property lines and the size and location of individual structures, were collected and photographs were taken of each street. This information was used to prepare plan/elevation boards for purposes related to survey response gathering.

Following are descriptions of each of the case-study street groups.

CASE STUDY #1
THE ESPLANADE STREET GROUP
CHICO, CALIFORNIA

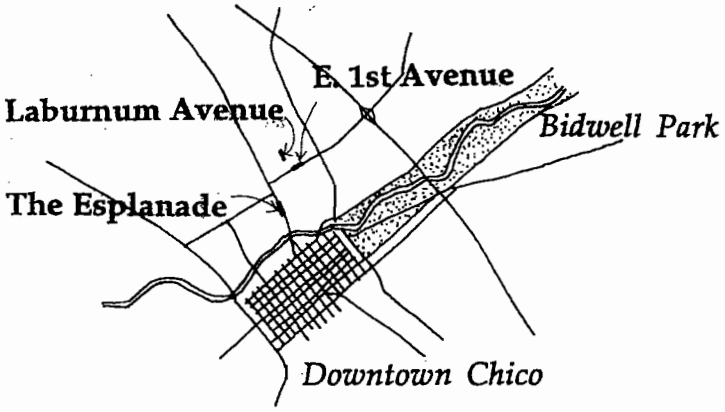
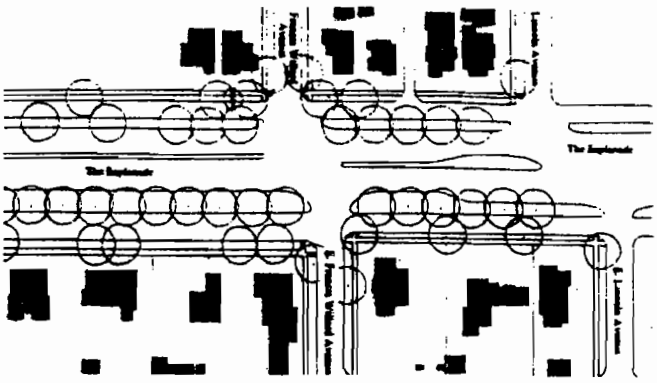


Figure 2.2
Urban Context Map
Approximate Scale: 1:100,000

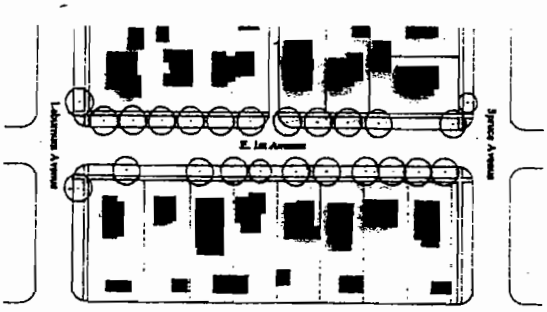
	Esplanade Heavy Street	**E. 1st** Medium Street	**Laburnum** Light Street
Land Uses	Residential: Single-family. One small apt. bldg. and one 4-plex.	Residential: Single-family.	Residential: Single-family.
Average Building Height (no. of stories)	1 and 2 story	1 story	1 and 2 story
No. of Households	17 (plus apt. bldgs)	14	15
Traffic Configuration	Center: 2 lanes each direction Access Roads: 1 lane (1-way) parking one side	1 lane each direction parking both sides	1 lane each direction parking both sides
Average Daily Traffic Flow	24,200	14,500	80 estimated*
Right of Way Width (feet)	165′ to 175′	80′	80′
Pavement Width (feet)	Center: 66′ (includes 10' center median) Access Roads: 20'–30' Total: 88'–98'	40′	40′
Median Width (feet)	10' and 28'	———	———
Sidewalk Width (feet)	5′ each	5′ each	5′ each
Building Setbacks (feet)	25′ to 35′	20′	20′
Distance from Facade to Facade Across Street (feet)	200′ to 220′	118′	122′
Distance from Residence Facade to Street Edge (feet)	To Center Road: 60′ to 85′ To Access Road: 30'–50'	40′	40′

*Estimated from peak hour traffic counts.

Figure 2.3
Summary of Street Characteristics
Case Study #1



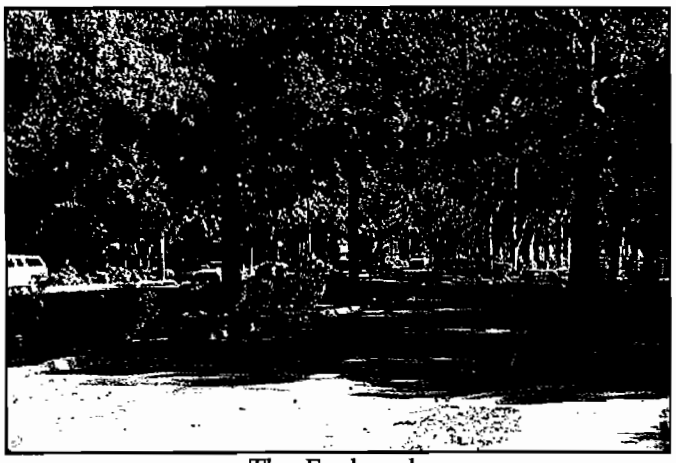
Plan: The Esplanade (boulevard)



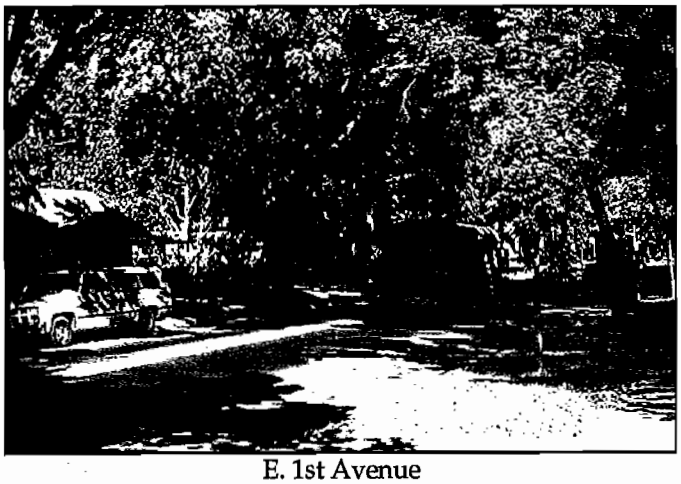
Plan: E. 1st Avenue (medium street)

Plan: Laburnum Avenue (light street)

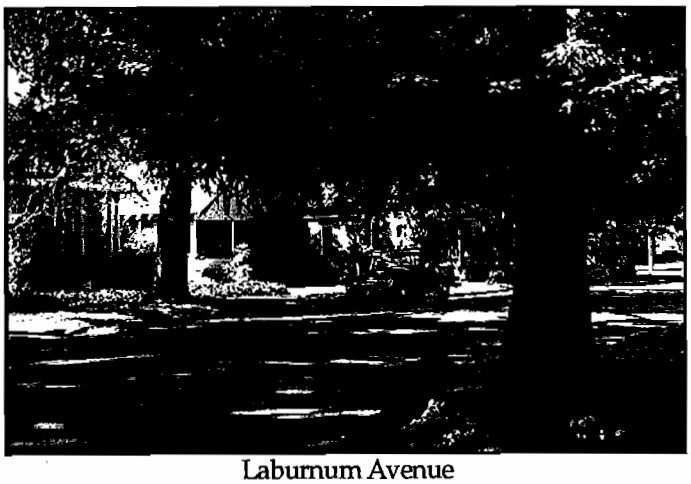
Figure 2.4
Case Study #1: Street Plans
Approximate Scale: 1" = 200' or 1:2400



The Esplanade

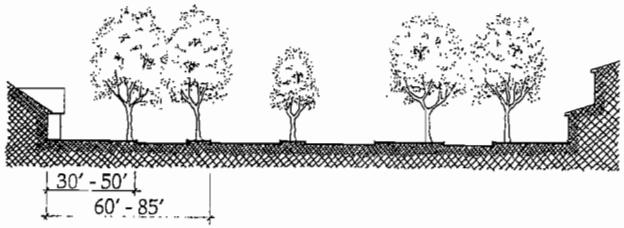


E. 1st Avenue

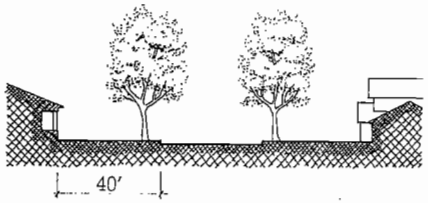


Laburnum Avenue

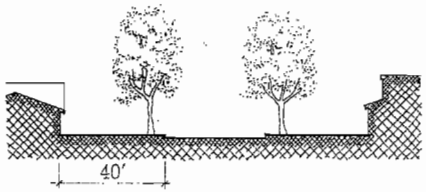
Figure 2.5
Case Study #1: Representative Photographs of the Streets



Section: The Esplanade (boulevard)

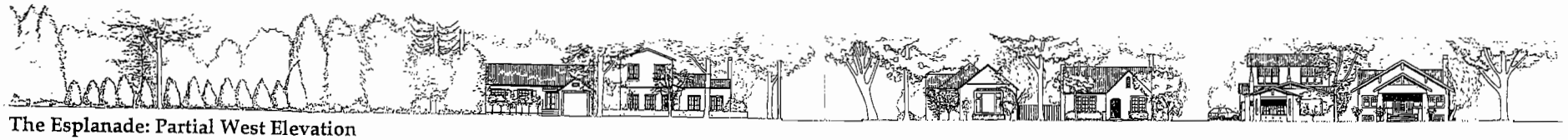


Section: E. 1st Avenue (medium street)



Section: Laburnum Avenue (light street)

Figure 2.6
Case Study #1: Street Sections
Approximate Scale: 1" = 50' or 1:600



The Esplanade: Partial West Elevation

E. 1st Avenue: North Elevation

Laburnum Avenue: West Elevation

Figure 2.7
Case Study #1: Street Elevations
Approximate Scale: 1" = 40' or 1:500

The Esplanade: Partial East Elevation

E. 1st Avenue: South Elevation

Laburnum Avenue: East Elevation

Figure 2.8
Case Study #1: Street Elevations
Approximate Scale: 1" = 40' or 1:500

CASE STUDY #2
THE OCEAN PARKWAY STREET GROUP
BROOKLYN, NEW YORK
(BENSONHURST NEIGHBORHOOD)

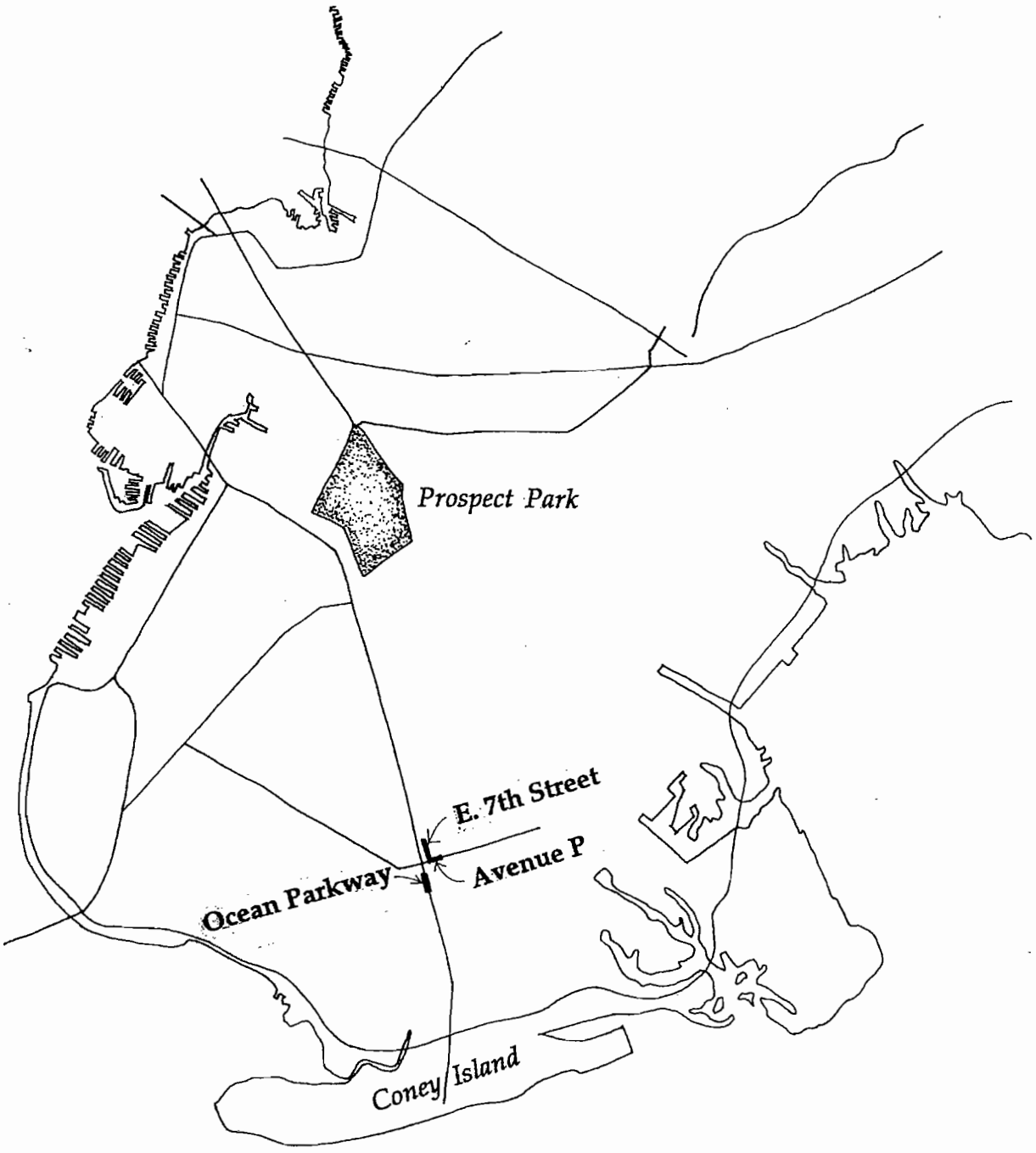
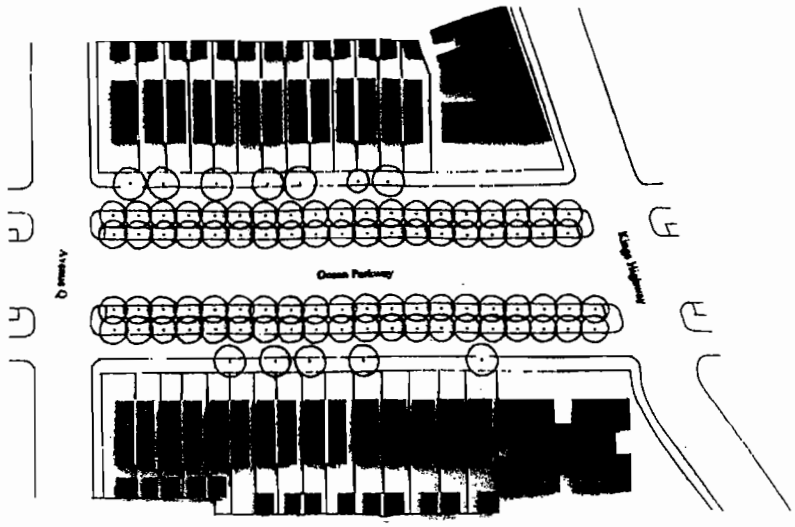


Figure 2.9
Urban Context Map
Approximate Scale: 1:100,000

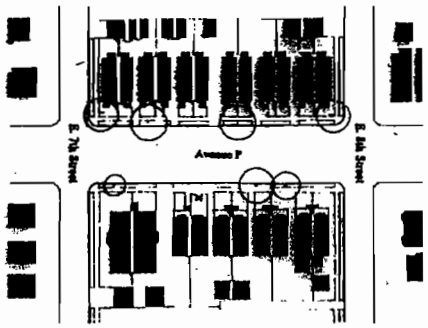
	Ocean Parkway Heavy Street	**Avenue P** Medium Street	**E. 7th Street** Light Street
Land Uses	Residential: Attached 2-plexes and 4-plexes. Two large apt. bldgs.	Residential: Attached 2-plexes	Residential: Attached 2-plexes and 4-plexes. One large apt. bldg.
Average Building Height (no. of stories)	2 story (apt. bldgs: 6-7 story)	2 story	2 story
No. of Households	51 (plus apt. bldgs.)	21	67
Traffic Configuration	Centers: 3 lanes each direction Access Roads: 1 lane (1-way) parking one side	2 lanes each direction parking both sides	1 lane each direction parking both sides
Average Daily Traffic Flow	42,040 estimated*	13,480 estimated*	1,120 estimated*
Right of Way Width (feet)	210′	80′	60′
Pavement Width (feet)	Center: 70′ Access Roads: 25′ each Total: 120′	60′	30′
Median Width (feet)	30' each	———	———
Sidewalk Width (feet)	15′ each	5′ each	5′ each
Building Setbacks (feet)	30′	16′ to 26′	10′ to 25′
Distance from Facade to Facade Across Street (feet)	270′	122′	75′ to 95′
Distance from Residence Facade to Street Edge (feet)	To Center Road: 100′ To Access Road: 45′	25′ to 35′	20′ to 40′

*Estimated from peak hour traffic counts.

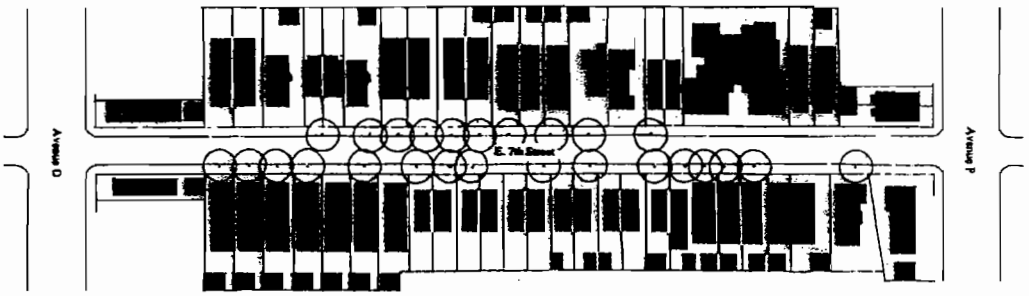
Figure 2.10
Case Study #2: Summary of Street Characteristics



Plan: Ocean Parkway (boulevard)



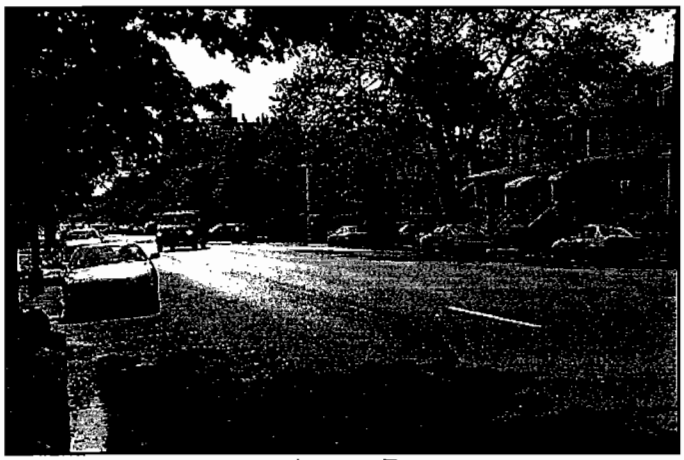
Plan: Avenue P (medium street)



Plan: E. 7th Street (medium street)

Figure 2.11
Street Plans
Approximate Scale: 1" = 200' or 1:2400

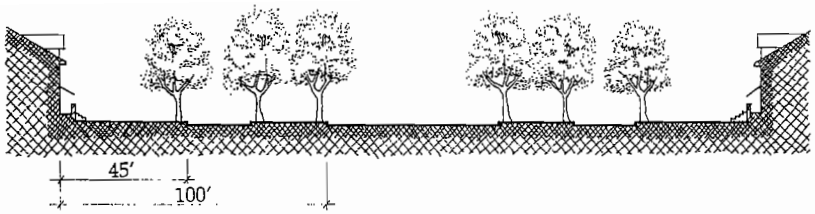
Ocean Parkway



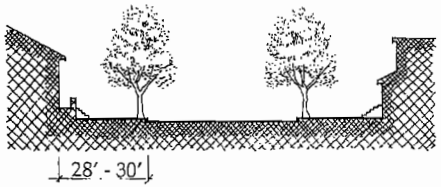
Avenue P

E. 7th Street

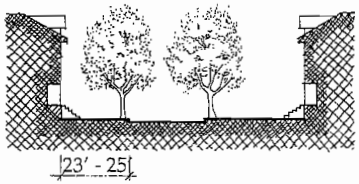
Figure 2.12
Case Study #2: Representative Photographs of the Streets



Section: Ocean Parkway (boulevard)



Section: Avenue P (medium street)



Section: E. 7th Street (medium street)

Figure 2.13
Case Study #2: Street Sections
Approximate Scale: 1" = 50' or 1:600

Ocean Parkway: East Elevation

Avenue P: North Elevation

E. 7th Street: Partial East Elevation

Figure 2.14
Case Study #2: Street Elevations
Approximate Scale: 1" = 40' or 1:500

Ocean Parkway: West Elevation

Avenue P: South Elevation

E. 7th Street: Partial West Elevation

Figure 2.15
Case Study #2: Street Elevations
Approximate Scale: 1" = 40' or 1:500

CASE STUDY #3
THE EASTERN PARKWAY STREET GROUP
BROOKLYN, NEW YORK
(CROWN HEIGHTS NEIGHBORHOOD)

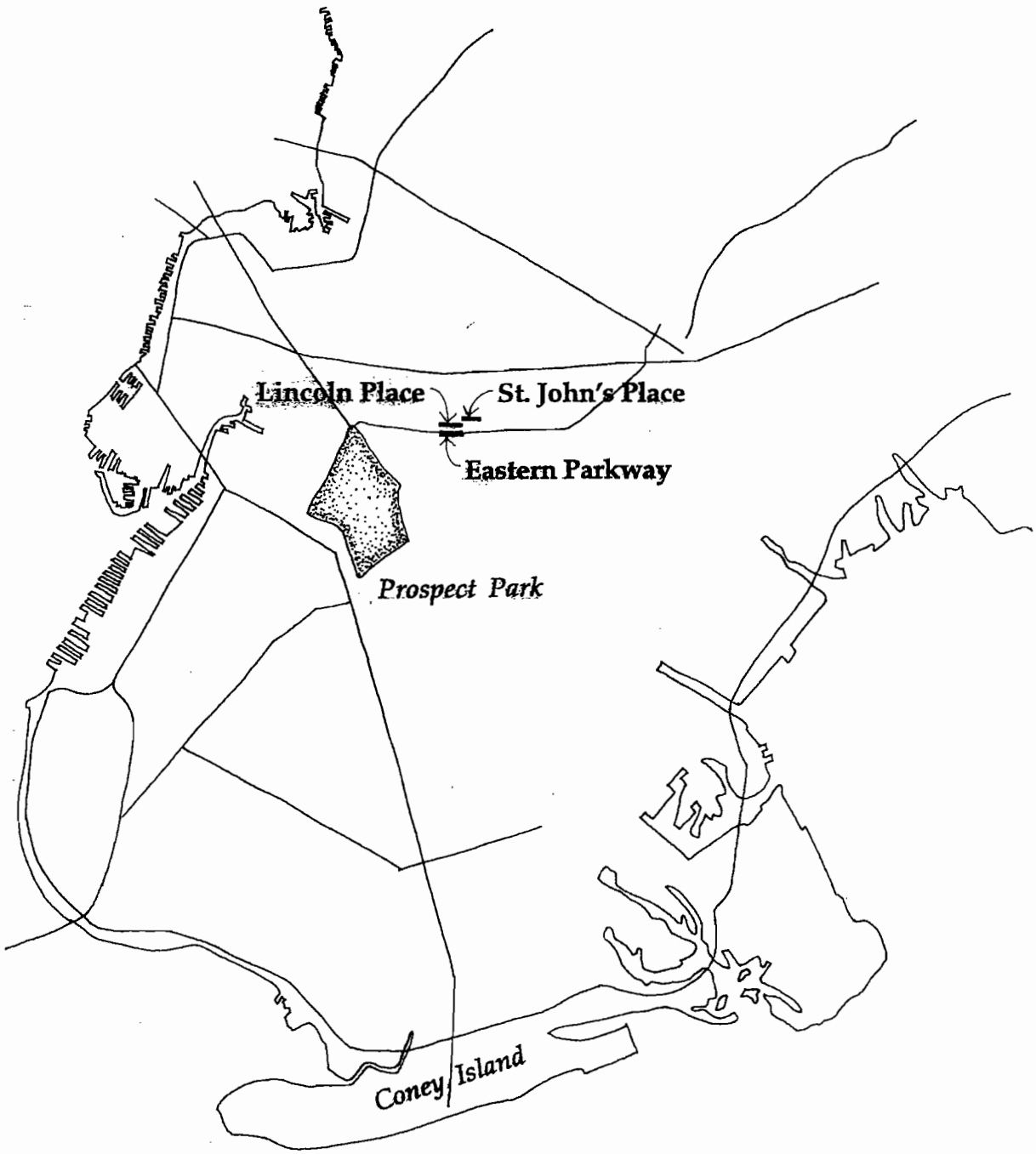
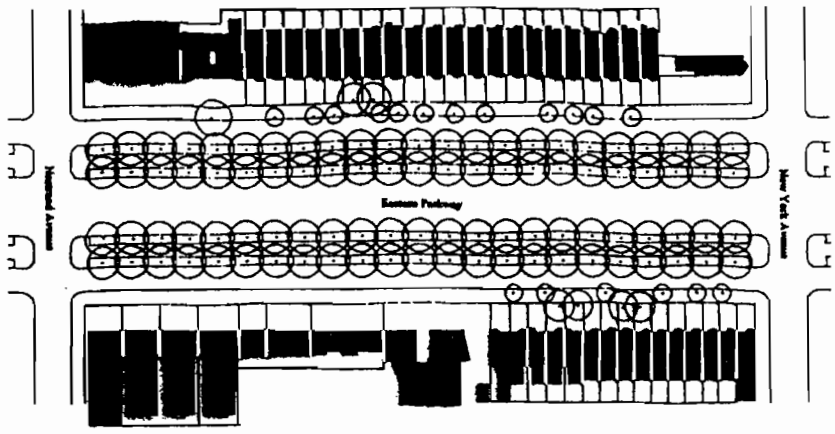


Figure 2.16
Urban Context Map
Approximate Scale: 1:100,000

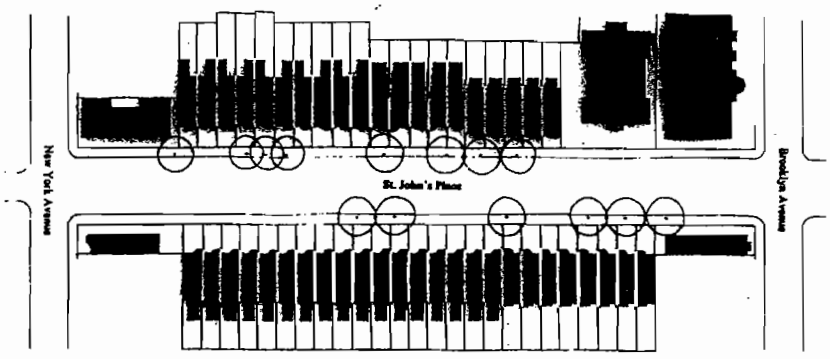
	Eastern Parkway Heavy Street	**St. John's Place** Medium Street	**Lincoln Place** Light Street
Land Uses	Residential: Row houses, mostly converted from single-family to 2 to 4 units. Some large apt. bldgs. Other: Corner shops, bank, health center	Residential: Row houses, some single family but many converted from single-family to 2 to 4 units Other: Church, school	Residential: Row houses, mostly converted from single-family to 2 to 4 units Other: Corner shops
Average Building Height (no. of stories)	3 story (apt. bldgs: 4-6 story)	2 and 3 story	3 and 4 story
No. of Households	102 (plus apt. bldgs.)	145	198
Traffic Configuration	Center: 2 lanes each direction Access Roads: 1 lane (1-way) parking both sides	1 lane each direction parking both sides	1 lane each direction parking both sides
Average Daily Traffic Flow	44,440 estimated*	3,960 estimated*	1,520 estimated*
Right of Way Width (feet)	210′	100′	70′
Pavement Width (feet)	Center: 60′ Access Roads: 25′ each Total: 110′	50′	34′
Median Width (feet)	35' each	———	———
Sidewalk Width (feet)	15′ each	12′ and 14′	13′ and 15′
Building Setbacks (feet)	30′	16′	10′
Typical Distance from Facade to Facade Across Street (feet)	270′	132′	90′
Typical Distance from Residence Facade to Street Edge (feet)	To Center Road: 100' To Access Roads: 45'	28'–30'	23'–25'

*Estimated from peak hour traffic counts.

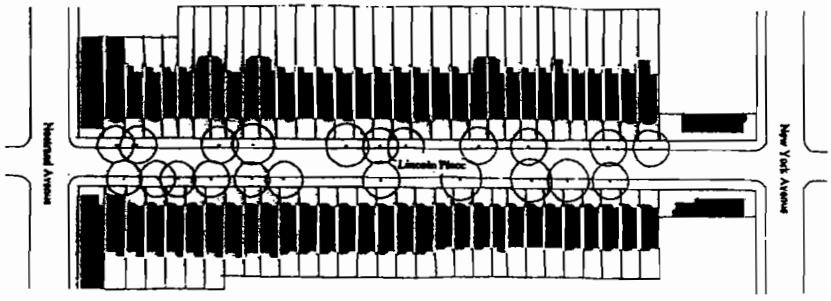
Figure 2.17
Summary of Street Characteristics
Case Study #3



Plan: Eastern Parkway (boulevard)

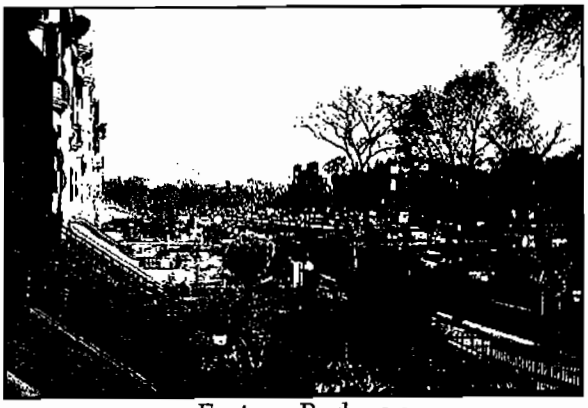


Plan: St. John's Place (medium street)



Plan: Lincoln Place (light street)

Figure 2.18
Case Study #3: Street Plans
Approximate Scale: 1" = 200' or 1:2400

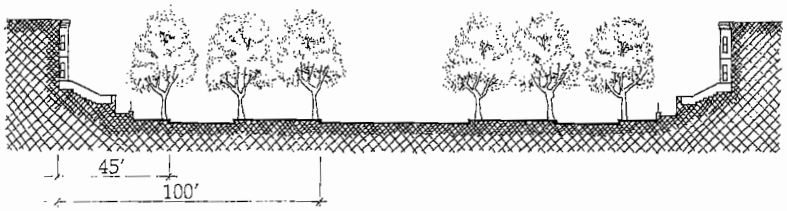


Eastern Parkway

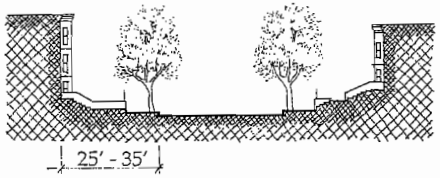
St. John's Place

Lincoln Place

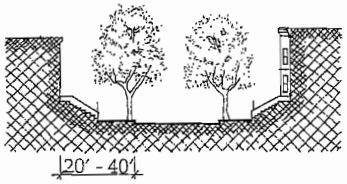
Figure 2.19
Case Study #3: Representative Photographs of the Streets



Section: Eastern Parkway (boulevard)



Section: St. John's Place (medium street)



Section: Lincoln Place (light street)

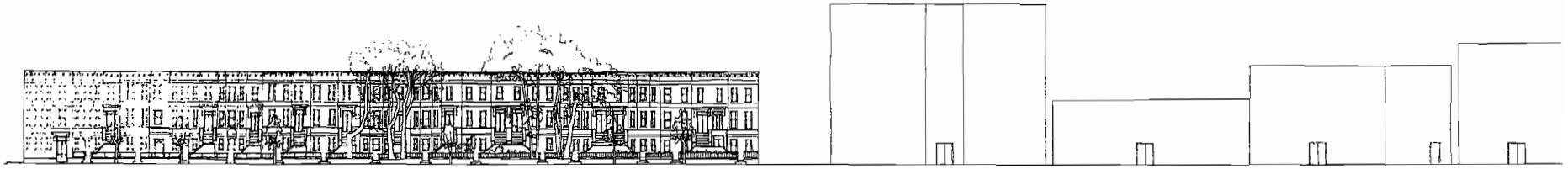
Figure 2.20
Case Study #3: Street Sections
Approximate Scale: 1" = 50' or 1:600

Eastern Parkway: Partial North Elevation

St. John's Place: Partial North Elevation

Lincoln Place: Partial North Elevation

Figure 2.21
Case Study #3: Street Elevations
Approximate Scale: 1" = 40' or 1:500



Eastern Parkway: Parital South Elevation

St. John's Place: Partial South Elevation

Lincoln Place: Partial South Elevation

Figure 2.22
Case Study #3: Street Elevations
Approximate Scale: 1" = 40' or 1:500

Research Methods

For each of the nine case-study streets, a number of data collection activities were undertaken. These included gathering street and neighborhood data from official sources, observing environmental characteristics, and conducting a survey. This data was then analyzed using statistical and comparative techniques. The research data collection activities are discussed below. Analysis of the research findings are presented in the following chapter.

Gathering Official Data

Information on population and housing characteristics for each street were obtained from 1990 Block Census Tract summaries. Accident statistics and official traffic volume counts for the streets were obtained from city agencies where such data existed.

Average Daily Traffic Flow.

Official ADT counts were only available for two of the Chico streets and none of the New York streets. Estimated ADT's for the streets for which no official data was available were arrived at by interpolating from peak hour traffic counts taken by the researchers. The method used was to multiply the peak hour count by ten.

	Esplanade Heavy Street	**E. 1st** Medium Street	**Laburnum** Light Street
Average Daily Traffic Flow	24,200 (1990 24-hr. count)	14,500 (1990 24-hr. count)	80 estimated

	Ocean Parkway Heavy Street	**Avenue P** Medium Street	**E. 7th Street** Light Street
Average Daily Traffic Flow	42,040 estimated	13,480 estimated	1,120 estimated

	Eastern Parkway Heavy Street	**St. John's Place** Medium Street	**Lincoln Place** Light Street
Average Daily Traffic Flow	44,440 estimated	3,960 estimated	1,520 estimated

Figure 2.23
Summary Table of Average Daily Traffic Flow

Environmental Characteristics Observation

Detailed observation of the environmental characteristics of each of the case-study blocks was undertaken. The three environmental characteristics observed — vehicle speed range, street noise levels, and peak-hour traffic counts — were similar to those included in the Appleyard study although data collection methods varied somewhat. The observations were conducted as follows:

Vehicle Speed Range.

The average vehicle speed range for each case-study street was determined by driving along the street for some distance and keeping with the general flow of traffic. The range of typical speeds encountered was then recorded.

	Esplanade Heavy Street	**E. 1st** Medium Street	**Laburnum** Light Street
Vehicle Speed Range (m.p.h.)	Center: 35–40 mph Access: 20–25 mph	30–35 mph	20–30 mph

	Ocean Parkway Heavy Street	**Avenue P** Medium Street	**E. 7th Street** Light Street
Vehicle Speed Range (m.p.h.)	Center: 25–45 mph Access: 10–15 mph	15–30 mph	15–20 mph

	Eastern Parkway Heavy Street	**St. John's Place** Medium Street	**Lincoln Place** Light Street
Vehicle Speed Range (m.p.h.)	Center: 25–30 mph Access: 25 mph	25–30 mph	5–15 mph

Figure 2.24
Summary Table of Vehicle Speed Ranges

Street Noise Levels.

The intent of this observation was to obtain an indicator of the percentage of time that the noise level on the street exceeds 65 decibels. This decibel level is commonly accepted as the point above which noise becomes extremely bothersome. A sound meter was used to record sound levels. Because of time and money constraints, only one measurement was made per street. Measurements were taken during peak-hour traffic flow times using the following technique:

Each measurement was taken by a team of two researchers standing mid-block at the property line along one side of the street. One team member kept track of time and wrote down sound meter readings called out by the other team member who was reading the meter. Ten consecutive 15-second readings were made for each street. For each 15-second sequence the person reading the sound meter

called out the meter reading at a continual and regular rhythm, making sure to particularly note sharp noise level changes. Typically, eight to ten meter readings were called out for each of these 15-minute sequences. After completing a sequence, the researchers waited for 15 seconds and then began another sequence. The readings from the ten sequences were then combined and the total percentage of readings over 65 decibels was calculated.

	Esplanade Heavy Street	**E. 1st** Medium Street	**Laburnum** Light Street
Noise Levels (% time above 65 decibels)	45.3%	64.9%	0%

	Ocean Parkway Heavy Street	**Avenue P** Medium Street	**E. 7th Street** Light Street
Noise Levels (% time above 65 decibels)	14.7%	57.1%	0% less than 58 average

	Eastern Parkway Heavy Street	**St. John's Place** Medium Street	**Lincoln Place** Light Street
Noise Levels (% time above 65 decibels)	48.6%	15.8%	0.8%

Figure 2.25
Summary Table of Street Noise Levels

It should be noted that commercial traffic is restricted from Ocean Parkway but from none of the other streets, which helps explain its lower noise level. It should also be noted that the noise level on St. John's is much lower than that for the other two moderate streets because it carries much less traffic.

Vehicle Volume Counts.

Peak-hour vehicle volume counts were taken for each boulevard and each control street. Fifteen-minute counts were taken at peak traffic times and then translated into peak-hour hourly counts. Counts were in general done by one researcher. The counting technique used varied slightly by street type because of the different traffic flows. For the light-traffic streets, one 15-minute count was made that included cars traveling in both directions. For the medium traffic street and the boulevards, one 15-minute count was made for traffic traveling in one direction and then a subsequent count was made immediately after for traffic traveling in the other direction. These numbers were then added together to obtain a total 15-minute volume. For the boulevards, counts of the traffic in the center and on the

access roads were kept separate. Hourly traffic counts were arrived at by multiplying the 15-minute counts.

	Esplanade Heavy Street	**E. 1st** Medium Street	**Laburnum** Light Street
Peak Hour Traffic Flow (vehicles/hour) Thursday 10/12 around 2:30 PM	Total: 2340 Center: 2,300 W. Access: 32 E. Access: 8	888	8

	Ocean Parkway Heavy Street	**Avenue P** Medium Street	**E. 7th Street** Light Street
Peak Hour Traffic Flow (vehicles/hour) Friday 9/29 around 3:30 PM	Total: 4,204 Center: 3,952 W. Access: 164 E. Access: 88	1,348	112

	Eastern Parkway Heavy Street	**St. John's Place** Medium Street	**Lincoln Place** Light Street
Peak Hour Traffic Flow (vehicles/hour) Friday 3/22 around 5:00 PM	Total: 4,444 Center: 4,116 N. Access: 240 S. Access: 88	396	152

Figure 2.26
Summary Table of Peak Hour Traffic Flows

The Survey

The survey was a major focus of the study. It was designed to approximate the interview used in the Appleyard study in terms of focus and intent although, for the purposes of this study, a structured questionnaire was used similar to the one developed by Appleyard for later research. The purpose of the survey, as in the Appleyard study, was to understand the character and day-to-day use of the study streets as well as the concerns and satisfactions of the residents. Again like the Appleyard study, residents were not told that the effect of traffic was the primary concern of the research; instead the survey was introduced as a neighborhood street study attempting to ascertain the quality of street life in the city.

Survey Design

The survey contained 34 questions of several different types. Several introductory and concluding questions were purely informational, asking about such things as length of residence and particular family characteristics. The bulk of the questions allowed residents to choose an answer from a list of nominally scaled responses. Several questions asked residents to note the occurrence and/or frequency of certain activities on their street block. Four questions were open-ended, allowing residents to describe particular aspects of their street in their own words. The two final questions asked residents to make simple diagrams on provided maps of their block. These questions were intended to ascertain residents' neighboring patterns and their feelings about the extent of their home territory. On one map, residents were asked to indicate the houses on their block where they had friends or acquaintances. On another map, residents were asked to draw a circle around the area of their block which they considered to be their home territory.

A copy of the survey is included in Appendix A.

In order to facilitate residents' ability to draw these diagrams accurately, plan/elevation boards were prepared for each case-study block which would help orient residents to the maps provided for them to draw on.

Survey Response Goals and Survey Implementation

The general survey goals were several: 1) to obtain a similar number of completed surveys for each of the streets within a particular case-study group; 2) to obtain a representative sample of completed surveys in terms of block coverage. Because of limited time and money resources, we could not hope to obtain completed surveys from each resident of each block. Actual goals varied for each case-study group of streets because of the differences in numbers of residents per block. In Chico, where the total number of residents per block was small, it was important to get as many responses as possible, ideally one per household. On the more populated Brooklyn streets, surveys were conducted on each group of streets during intensive Thursday through Sunday field visits undertaken in early spring. Researchers walked from door to door carrying the plan/elevation boards, surveys, and letters of introduction. Methodologies used for the California and New York streets were slightly different. In Chico, California, surveys were mailed in advance to all addresses on the block being studied along with a cover letter explaining the research and indicating that researchers would visit on a certain weekend in order to pick up the completed survey and at the same time ask residents to draw the diagrams for the last two questions.

In Brooklyn, New York, where the number of residents was much larger, the survey was not pre-mailed in order to save on costs. Instead, surveys were administered on the spot or, time not permitting, surveys were left with residents and then picked up the following day.

Survey Response Analysis

The survey responses were analyzed using a variety of techniques, including averaging responses, charting responses on graphs, and preparing composite drawings based on individual respondents' drawings. Comparative analysis was done both within each case-study group and between the three groups.

Where differences in responses were found between streets within a case-study group, statistical tests were performed to determine if the differences were statistically significant. These tests included difference in means tests, one-way ANOVA tests, and Mann-Whitney tests.

The survey results and analysis are presented in the following chapter. Selected important statistical tests are included in Appendix B.

III. SURVEY RESULTS AND ANALYSIS

This chapter describes the survey response and presents discussion of the results. Responses are related to the three original Appleyard hypotheses and the modified hypothesis.

Survey Respondents

A total of 99 surveys were completed in the three study areas: 35 in Chico, 33 in Brooklyn's Crown Heights where the Eastern Parkway is located, and 31 in the Bensonhurst district in Brooklyn. Of the 99 respondents, 36 belonged to households with residences on the three boulevards, 27 lived on the three medium-trafficked streets, and 36 on three streets with light traffic.

In Chico, the sample size of 35 respondents represented approximately 50% of all households on the three selected city blocks. The three Chico streets contain 14 to 17 households (not including the apartment buildings on the Esplanade), and each street block has a population of approximately 30 to 50 people.

The 31 respondents from the three Bensonhurst streets in Brooklyn represent a smaller number of households. The Ocean Parkway block has 51 residential units (not including apartment buildings), East 7th has 67, and Avenue P has 21 households. The sample size represents 33% of households on Avenue P and only 19% on East 7th Street. Ocean Parkway ranges in between with 22% of households. The higher residential density in Crown Heights resulted in an even smaller sample size. The Eastern Parkway block has 102 households (not including apartment buildings), St. John's Place has 145, and Lincoln Place has 198. The sample size represents 12% of households on Eastern Parkway and 6% of households on the other two streets.

On all nine streets, respondents live in homes or apartments that are evenly distributed over the entire block and on both sides of the street.

Residents were willing to take the 15 to 20 minutes it took to answer the questionnaire. Some Brooklyn residents requested that we come back at another time after they had read the cover letter. Others preferred to return the questionnaire by mail in a pre-paid envelope.

	Boulevard	Medium	Light	Total
Chico	13	11	11	35
Bensonhurst	11	7	13	31
Crown Heights	12	9	12	33
	36	27	36	99

Figure 3.1
Number of Respondents by Study Area and Street Type

Testing the Hypotheses

The Appleyard study found direct correlation between traffic volumes and renter occupancy; as traffic volumes increase, the number of renters increases. He also found an inverse correlation between traffic volumes and households with children — few families with children on streets with high traffic volumes, many families with children on lightly trafficked streets. The same inverse relationship existed between traffic and social interactions, and people's care for and awareness of the physical setting. Conversely, the original study associated low traffic with home ownership, high level of social interaction, rich social climate, strong sense of community and acute and critical awareness of the physical environment. The modified hypothesis for this boulevard livability study is based upon the premise that street design — i.e., local access roads and landscaping on boulevards — can have a mitigating effect on traffic. It predicts that residents on multiple roadway boulevards, despite the heavy traffic volumes, will have response characteristics similar to those of residents on streets with low traffic volumes, and different from those of residents on streets with medium traffic.

Tests of the modified hypotheses are discussed in the following sections. For reference, Figures 3.2, 3.3, and 3.4 show the traffic variables for the different streets in each case study. Quotes from the surveys, included on the drawings, give a sense of residents' concerns about the traffic on their street.

Testing Hypothesis I: Renting Versus Owning and Distribution of Families with Children

The modified hypothesis predicts a proportionally greater number of home owners on the boulevards and on streets with low level traffic volumes, but predicted more renters than owners on streets with medium traffic. Likewise, the distribution of families with children would be similar — more households with children on streets with low traffic volumes and on the boulevards, but few households with children on streets with medium traffic.

Results: No correlation between traffic volume and owner or renter occupancy was found. The distribution of owners and renters on all streets followed neither the original Appleyard hypothesis nor the modified hypothesis. With regard to families with children, the inverse correlation predicted by Appleyard existed in two of the three study areas, but in Crown Heights (Eastern Parkway) the distribution of households with children was consistent with the modified hypothesis.

Discussion: Owners Versus Renters

On the Esplanade in Chico, half of the residents owned their homes; the other half rented, but the same owner-to-renter distribution was found on the two Chico control streets. Likewise, all three streets in Crown Heights, including the Eastern Parkway, had similar owner-to-renter distributions — approximately half and half. In the Bensonhurst area, the majority of residents on Ocean Parkway owned their homes; however, on Avenue P — the street with medium traffic — all respondents also

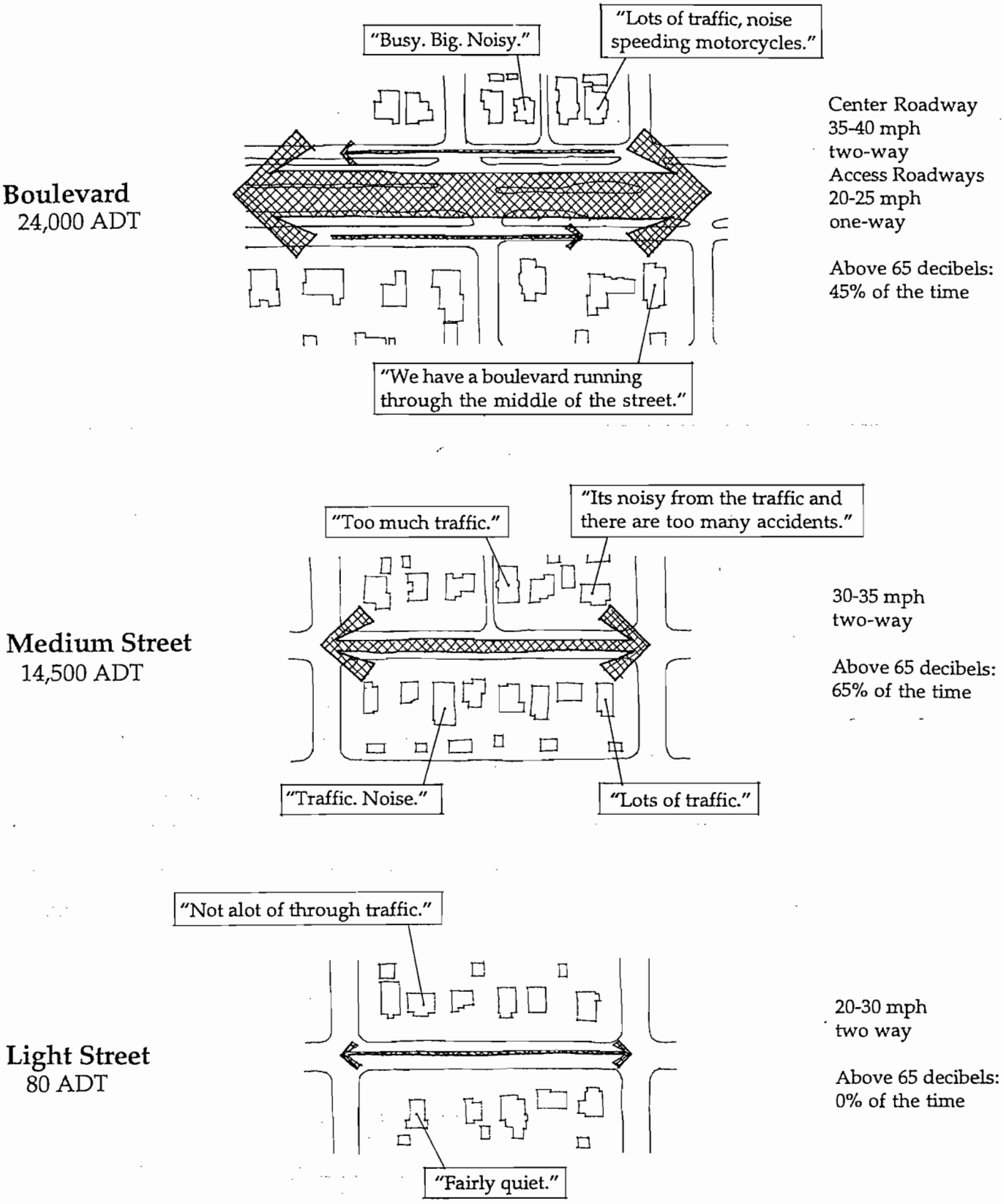


Figure 3.2
Case Study #1: Traffic Hazards Map

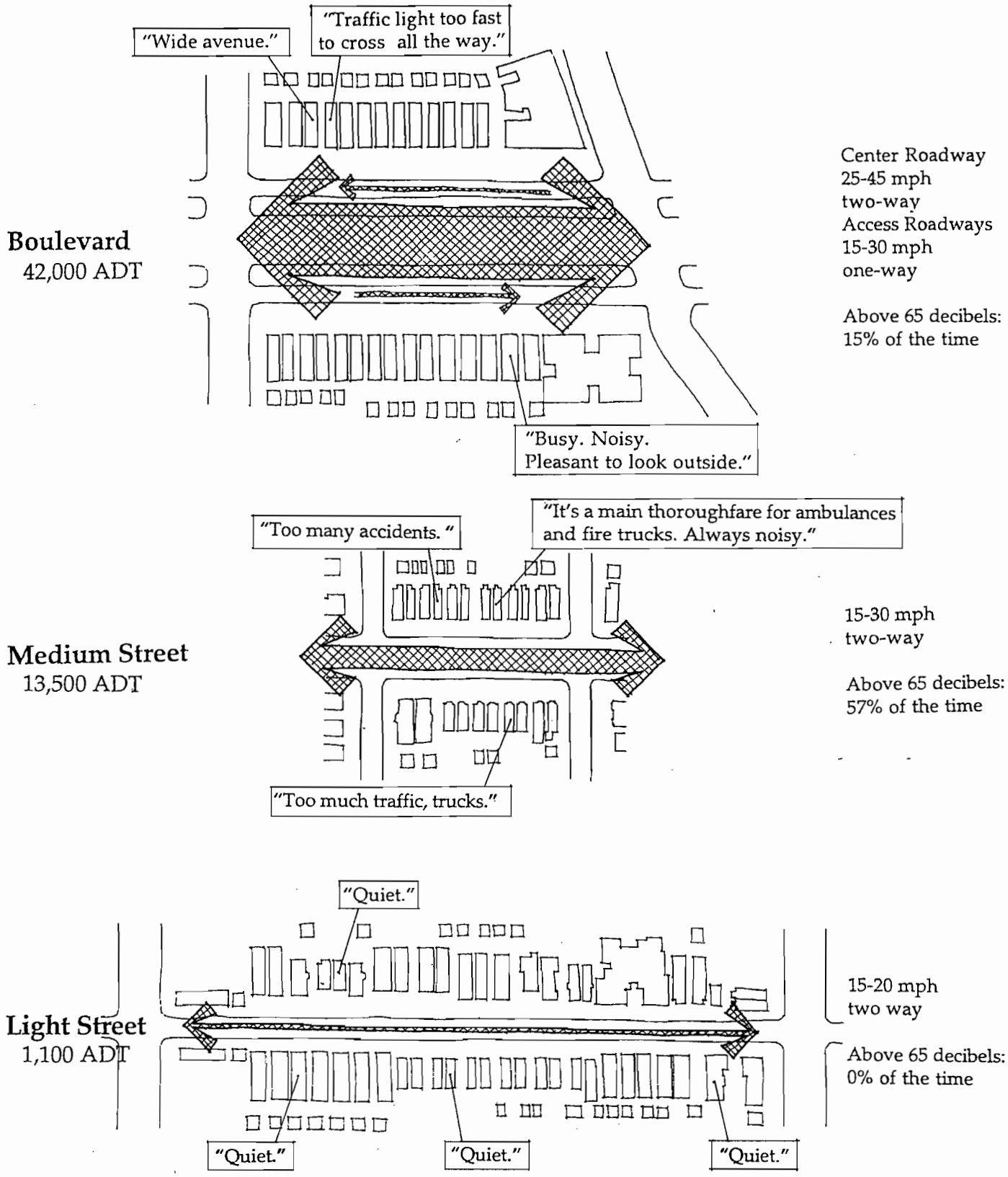


Figure 3.3
Case Study #2: Traffic Hazards Map

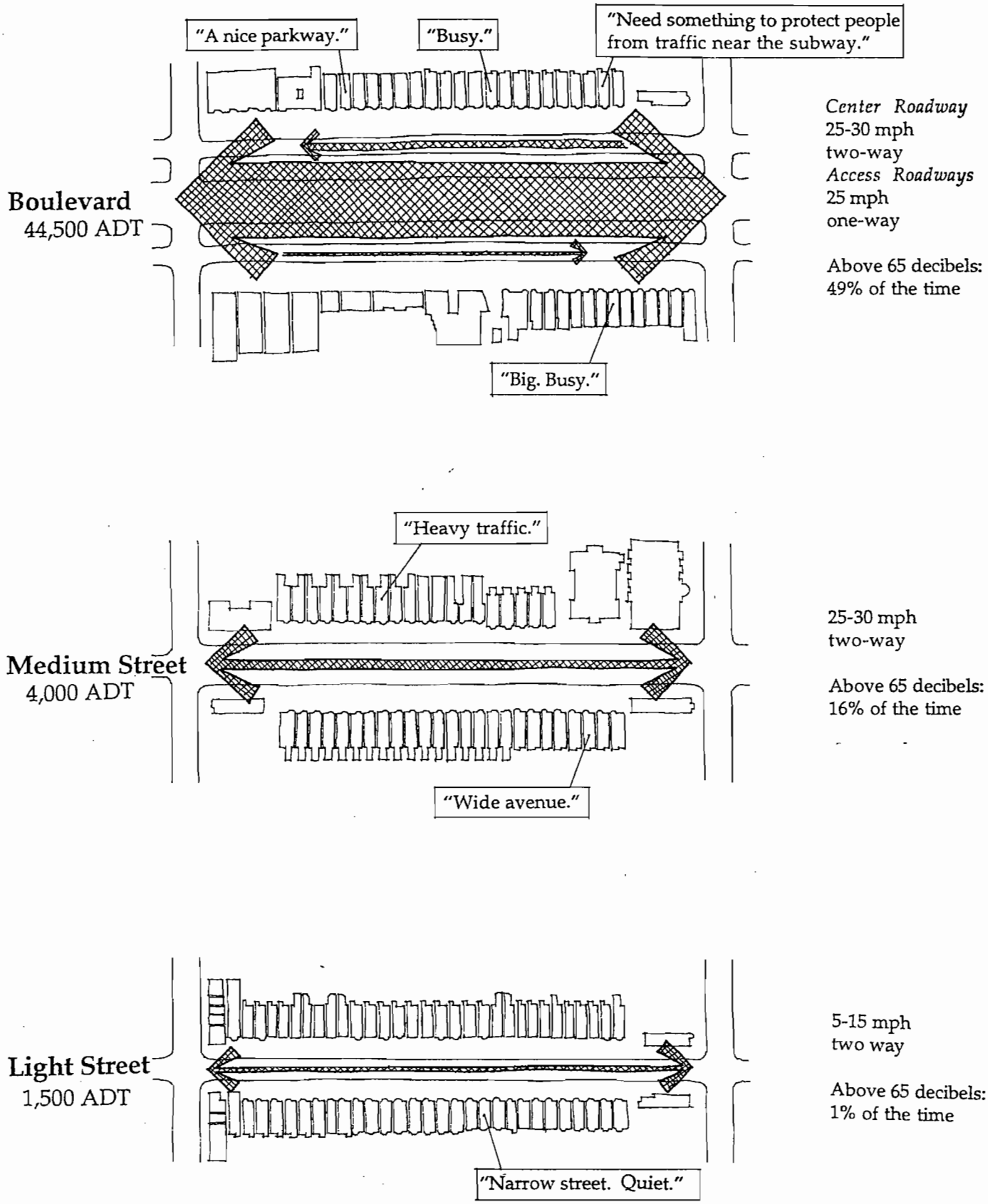


Figure 3.4
Case Study #3: Traffic Hazards Map

owned their homes, whereas households on 7th Street, a low traffic street, were again evenly split between owners and renters.

Seven of the nine streets surveyed had an equal distribution of owners and renters and on two streets owners prevailed, but no correlation between traffic volumes and ownership was found.

	Boulevard		Medium		Light	
	Owners	Renters	Owners	Renters	Owners	Renters
Chico, California	7	6	5	6	5	6
Bensonhurst, Brooklyn	8	3	7	0	7	6
Crown Heights, Brooklyn	7	5	4	4	6 (1, NA)	5 (1, NA)

Figure 3.5
Renters versus Owners

Discussion: Distribution of Households with Children

In Chico, the distribution of households with children consistently followed the Appleyard study. On the Esplanade, one child lived in one of the 13 households; on East 1st Avenue — the street with medium traffic — a total of 7 children lived in 4 of the 11 households; and on Laburnum — the street with light traffic — a total of 6 children lived in 3 of 11 households. The medium traffic street and the low traffic street have similar numbers of households with children. The boulevard street design has not attracted families. There might have been more children in the past, but at this point in time, the population is aging more so than on the other two Chico streets. Moreover, some family homes have been converted and are now occupied by unrelated adults associated with the nearby university.

In the Bensonhurst district of Brooklyn, distribution of families with children also followed the original Appleyard hypothesis: Ocean Parkway, the most heavily trafficked street, has fewest children, a total of 9 from three households; on Avenue P every household (but one) has children, a total of 17; and on 7th Street again nearly every household has children, a total of 34 children.

In Crown Heights, the distribution of families is consistent with the modified hypothesis. In fact, the largest number of households with children was found on the Eastern Parkway; a total of 16 children and youths lived in 6 of the 12 households. Lincoln Place, the street with the lowest traffic volume, had a total of 8 youths in 4 of the 12 households interviewed, and the medium traffic street had only 5 children from 3 of the nine households. (See Figure 3.6.)

	Boulevard		Medium		Light	
	Household	No. of Children	Household	No. of Children	Household	No. of Children
Chico, California	1	1	4	7	3	6
Bensonhurst, Brooklyn	3	9	6	17	9	34
Crown Heights, Brooklyn	6	16	3	5	4	8

Figure 3.6
Households with Children

Testing Hypothesis II: Social Interaction and Street Activity

Consistent with the modified hypothesis, we would have expected to find higher levels of social interaction and street activities on the boulevards and on the lightly trafficked street than on the streets with medium traffic.

Results: We found that generally boulevard residents have similar numbers of friends and acquaintances as residents on streets with light traffic, and more than residents on the medium traffic street. At least this was true for the two Brooklyn boulevards, but not for the Esplanade in Chico where residents have fewer friends than residents on the medium street. However, for none of the resident groups were the differences statistically significant. We also found that residents on boulevards and on light streets observed more street activities more frequently than residents on the medium streets. This statement was found to be true for all three case-study groups. On streets with medium traffic, there appeared to be fewer activities and they occurred less frequently than on boulevards and on streets with light traffic. Some of the differences in activity types and frequency were found to be statistically significant.

Discussion: Friends and Acquaintances

On Eastern Parkway, respondents had more acquaintances and friends than respondents on any of the two control streets. The 12 Eastern Parkway residents interviewed had 76 friends and acquaintances, or 6.3 per respondent, versus 3.3 on St. John Avenue, and 4.7 on Lincoln Place, the street with low traffic.

The distribution of friends and acquaintances in the Bensonhurst neighborhood followed a similar pattern. On 7th Street, the street with low traffic, 13 residents interviewed befriended or were acquainted with 72 people, or 5.5 households per respondent. On Ocean Parkway we found an average of 4.5 friends or acquaintances per household. But on Avenue P, residents have only an average of 2.3 friends or acquaintances.

On Chico streets, we found the greatest number of friends and acquaintances on the street with medium traffic, East 1st Avenue with 3.6 per resident, followed by Laburnum, the street with the lowest traffic volume, an average of 2.7 friends and acquaintances per resident, followed by the Esplanade where residents have an average of 1.9 friends or acquaintances.

	Boulevard: High	Boulevard: Medium	Boulevard: Light
Chico	1.92	3.63	2.72
Bensonhurst	4.54	2.33	5.5
Crown Heights	6.33	3.33	4.75

Figure 3.7
Friends and Acquaintances (Average Number per Respondent)

In two of the three study areas, the landscaped boulevards with local access streets were associated with significantly more friends and acquaintances than on streets with unmitigated traffic, the medium trafficked streets. In these two Brooklyn areas friendship patterns were similar to those on streets with light traffic. In Chico, the boulevard residents have few friends.

Although the survey results indicate differences in the average numbers of friends and acquaintances per resident for the different types of streets, tests showed that these differences cannot be described as statistically significant for any of the case-study groups. Nonetheless, given the very high volumes of traffic on the boulevards, it seems somewhat significant that friendships and relationships on two of the boulevards — the Brooklyn boulevards — were more similar to those on the light streets than on the medium streets.

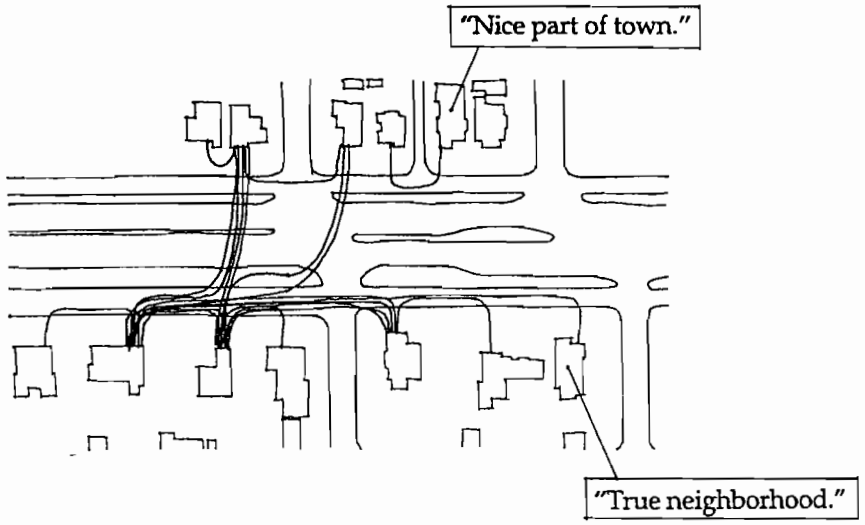
While the landscaped boulevard design and the local access streets in Brooklyn could function as a causative agent for friendship patterns, social interaction is likely to depend also on other variables such as residential density, the
presence or absence of children, length of residence, or on common concerns and issues that affect the residents.

Friendship Patterns

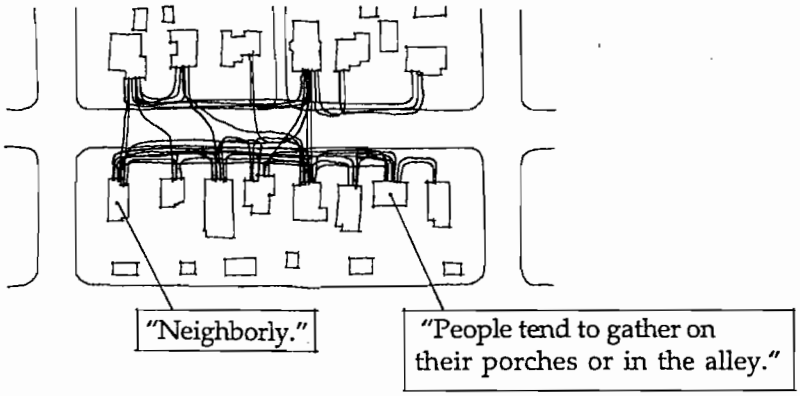
The distribution of friends and acquaintances varied by street type. As shown in Figures 3.8, 3.9, and 3.10, residents on the boulevards — particularly the two wider ones, Eastern Parkway and Ocean Parkway — had friends and acquaintances predominantly only on their own side of the street, while many residents on the light streets had friends and acquaintances on both sides of the street.

On boulevards, the combination of great street width and traffic appears to discourage encounters among neighbors and friendships. In all three areas, boulevard residents had fewer, if any,

Boulevard



Medium Street



Light Street

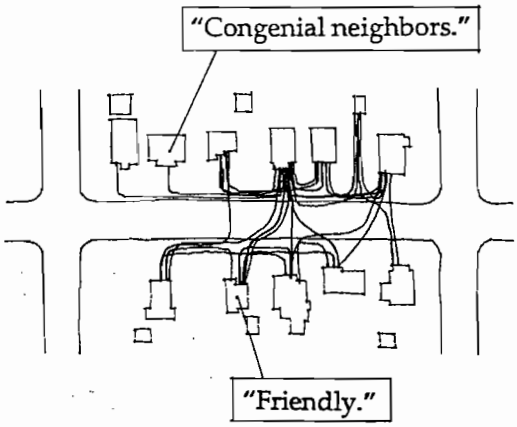


Figure 3.8
Case Study #1: Composite Neighboring Map

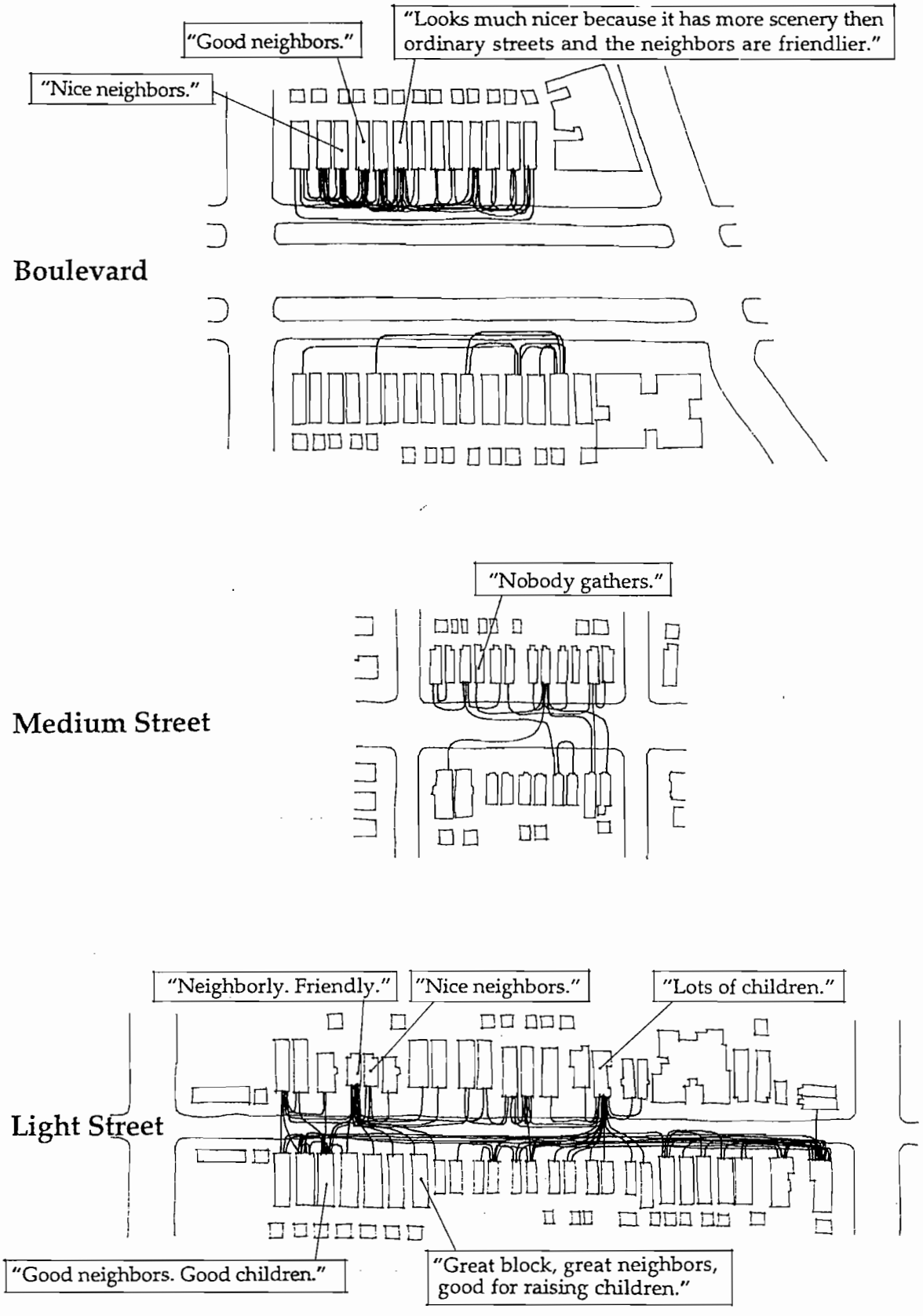


Figure 3.9
Case Study #2: Composite Neighboring Map

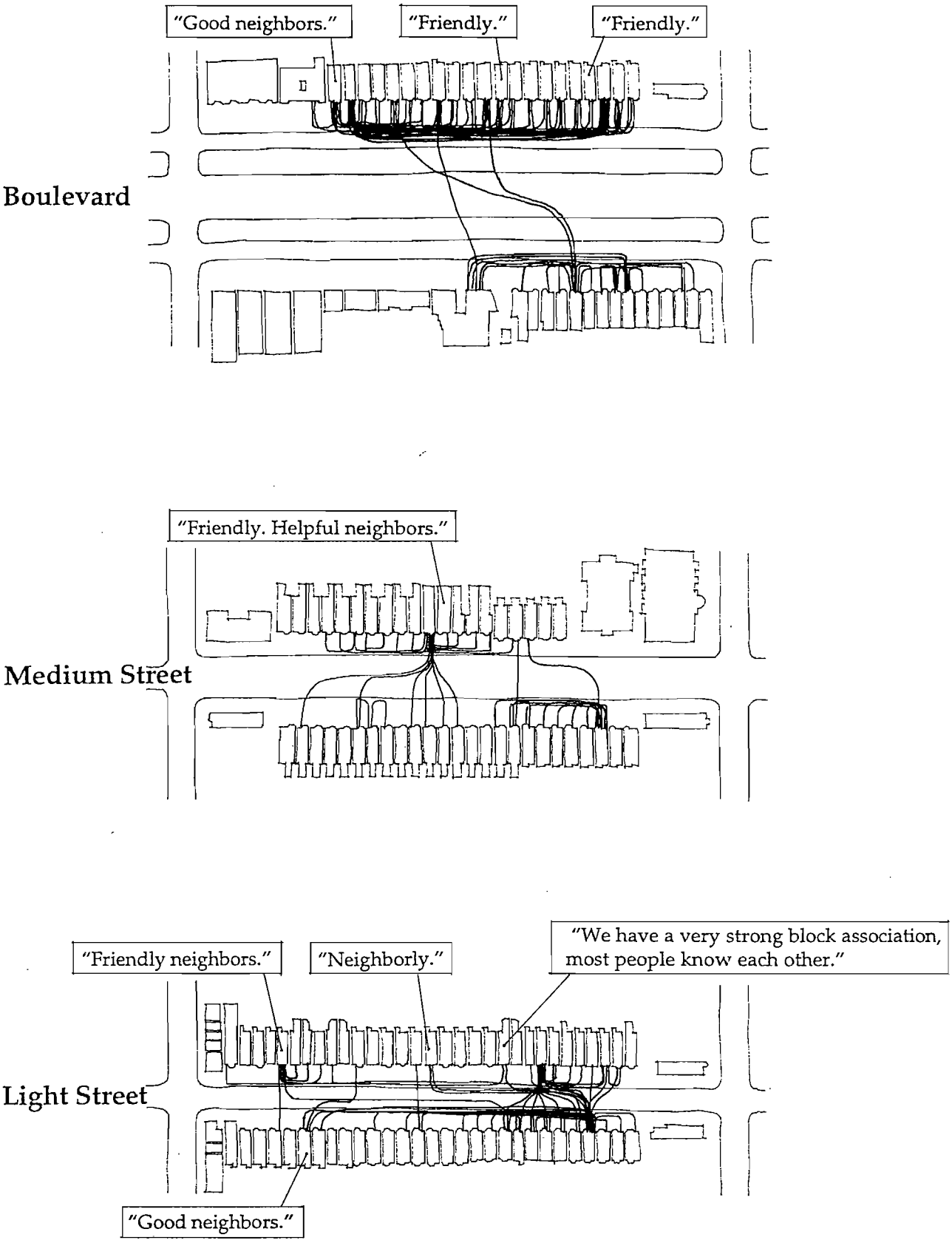


Figure 3.10
Case Study #3: Composite Neighboring Map

friends across the street, but knew their next door neighbors and had many friends and acquaintances in the row of homes on their side of the street.

In Chico, among the eleven Esplanade respondents, we counted seven across-the-street friendships — a high number for boulevard residents. On the medium street, East 1st Avenue, eleven respondents indicated eight such friendships, and among the ten residents on the light street, we counted ten across-the-street friendships.

Ocean Parkway respondents do not know neighbors across the street from their homes, but maintain active friendships and acquaintances among next door neighbors and with people in homes on their side of the street. On Avenue P, a medium-trafficked street, next door neighbors know each other and among the seven respondents we counted five across-the-street friendships. On the lightly trafficked street, East 7th Street, seventeen across-the-street friendships existed.

Likewise, Eastern Parkway respondents frequently know their next door neighbors, but only two respondents indicated friendships across the parkway. On St. John's Place (medium), we counted eight, and on Lincoln Place sixteen across-the-street friendships.

In all three areas, across-the-street friendships are consistent with the Appleyard study: the higher the traffic volume, the fewer friendships across the street.

Density and Social Interaction

The study design, through the selection of the streets in each area, controlled for density. Each street within each case-study group has approximately the same density. In a comparison between the three study areas, however, Crown Heights has the highest residential density (30-45 du/per acre) and residents also have the highest number of friends and acquaintances, followed by Bensonhurst (11 du/per acre), and by low density Chico (4 du/per acre). As would be expected, density clearly has an effect on the absolute numbers of friends and acquaintances. Brooklyn residents have a greater number of neighbors on their block available to know and to befriend than Chico residents.

Length of Residence and Social Interaction

Comparing length of residence with friendship patterns revealed no answers for Chico's Esplanade. Their length of residence on the Esplanade ranges evenly from less than 3 years to twenty years or more. On 1st Avenue and Laburnum, residents were found more frequently in the less-than-3-years category; few people have lived there more than 10 years. In Chico, residents did not appear to form more friendships with increased length of residence.

Likewise, in the Crown Heights area, the intensive friendship patterns on Eastern Parkway did not seem to be correlated with long period of residence. Respondents have lived here as briefly as 2 or 3 years, or as long as 20 years or more. St. John, the medium street, had residents with the longest tenure, but the lowest number of friends in this group of three streets.

In Bensonhurst, the two streets with highest number of friendships — Ocean Parkway and 7th Street — also had the greatest number of residents residing longer than 10 or even 20 years on their street. Here the length of residence could have a compounding effect on neighbors' interactions.

Social Interaction as a Result of Children Living on the Street

Children living on a street clearly foster social interaction, and that is consistent with the Appleyard study. Eastern Parkway respondents have the greatest number of children in the Crown Heights group of streets: 11, plus 4 teenagers, and the greatest number of friends. St. John's Place, the street with medium traffic, has only 4 children and 1 teenager, and fewer friendships. However, in Bensonhurst on Ocean Parkway, neighbors with few children (8 children, 0 teenagers) have significantly more friends and acquaintances than residents on Avenue P where respondents listed 10 children and 7 teenagers. In Chico, the absence of children on the Esplanade is consistent with the relatively low number of friends and acquaintances. The two Chico control streets with higher levels of social interaction also have more children.

Absence or presence of children may be a causative agent for friendship patterns in eight of the nine streets studied.

Social Interaction as a Result of Common Interests and Concerns

People in neighborhoods interact because there are issues of common interest to the residents which need to be addressed. Such issues exist in each area, and they were sometimes voiced in the survey — for example, concern was raised about the impact of the university and its students on the adjacent Chico neighborhoods. In Crown Heights, racial tensions have existed. We were aware of it prior to conducting this study, but residents made no mention of it in their responses to open-ended questions, and we did not ask specifically about it. In the Bensonhurst area, the majority of residents on all three streets belong to orthodox Jewish congregations. Residents are likely to know each other from social settings other than their street. But these are conditions that residents of all three Bensonhurst streets share. In all three cases, we had no reason to believe that issues like those mentioned affected the socializing or neighboring on one street more than another.

Social Interaction and Street Activities

We asked residents how frequently they observed particular activities on their streets. The activities were of three types: 1) neighborly and small child centered activities (talking, sitting, parents with children, and children with toys); 2) exercise and older child activities (bike riding, pet walking, jogging, roller skating, and ball playing); and 3) home-based activities (building things, gardening, and garage sales).

In Chico, residents on the Esplanade frequently observed people engaged in exercise activities such as bike riding, pet walking, and jogging, as well as people stopping to talk. Although the people involved in these activities are not necessarily residents, the street design seems to encourage such activities. Other neighborly and small child activities such as sitting outside, parents supervising children, and children playing with toys were only sometimes to rarely observed. Residents of the light street also frequently observed bike riding and pet walking and people talking, but they also frequently observed people sitting, parents with children, children with toys, and gardening. Frequently observed activities on the medium street included bike riding and pet walking, as well as talking, sitting, parents with children, and children with toys. For this case study, there are fairly clear rankings for different types of activities: the light street ranks first for neighborly and small child activities, followed by the medium street, and then the boulevard. The boulevard ranks first for exercise activities followed by the medium street, and then the light street.

In Bensonhurst, residents on Ocean Parkway fairly frequently observed people walking pets, jogging, roller skating, talking, and sitting as well as parents with children, and children with toys. Residents on the light street most frequently observed people bike riding, parents with children and children with toys, but they also often observed people talking, sitting outside, walking pets, and gardening. Residents on the medium street generally observed fewer activities than residents on the other two streets — most often people talking, sitting, parents with children, pet walking, and gardening. Rankings for different types of activities are less clear for this case study, although there was clearly much more child based activity and bike riding activity observed on the light street than on the other two, whereas the boulevard ranked the highest in terms of pet walking, jogging, and roller skating.

In Crown Heights, activities were observed more frequently on the boulevard and the light street than on the medium street. Eastern Parkway residents frequently observed people bike riding, pet walking, and jogging, as well as talking, sitting, and parents with children. Similar activities were observed by residents of the light street, as well as children with toys and roller skating. On the medium street, talking and gardening were the activities most frequently observed. Exercise activities were generally observed less than on the other streets, and sitting, parents with children, and children with toys were only sometimes observed.

From these results, some general observations can be made. Residents on all nine streets said that neighborly and small child based activities were sometimes to frequently observed. But in all three case studies, the light streets ranked the highest in these activities, followed by the medium street in Chico, and by the boulevards in both Brooklyn case studies.

For exercise activities, the boulevards ranked highest in exercise activities observed in all three case studies, followed by the medium street in Chico, and by the light streets in the Brooklyn case studies. The boulevards seem to work as linear parks for people from surrounding areas.

Home based activities were in general not frequently observed on any of the streets, but gardening was sometimes observed — particularly, interestingly enough, on the medium streets.

Summary of Hypothesis II

Figures 3.11, 3.12, and 3.13 summarize the answers to survey questions directed toward social interactions.

The evidence is not necessarily conclusive, but many answers support the modified hypothesis. Social interaction on the boulevards is more frequently observed than it is on medium-trafficked streets, and is more similar to that
observed on light streets. With regard to friendship patterns, the residents on boulevards have more friends than residents on medium streets. Chico's Esplanade is the exception. Here, contrary to the Appleyard study and the modified hypothesis, the medium street fosters the greatest number of friends and acquaintances per resident, greater even than on the light street, Laburnum. Laburnum is also a somewhat poor performer with regard to street activities. According to the Appleyard hypothesis, the light street should have more activities than streets with medium or higher traffic, and generally this is true in the Brooklyn streets, but on Chico's Laburnum, residents have lived the shortest period of time compared to the other two light streets in the study. Apparently, the social make-up of the street has recently been transformed, and Laburnum is not the stable, long-term, family residence type neighborhood street generally associated with lightly trafficked streets. Thus, the Chico triplet of streets is inconsistent with the Appleyard hypothesis in terms of social interaction and street activities.

Consistently, all three boulevards are used as linear parks for the people in the area: people walking, stopping to talk, sitting on benches, jogging, and dog walking interact with each other and neighbors are aware of these activities. Bike riding and roller skating are also frequently observed on boulevards although these activities are more solitary and contribute less to social interaction.

Testing Hypothesis III: The Effects of Traffic on Environmental Awareness

The Appleyard hypothesis predicts that heavy traffic is associated with a withdrawal from the physical environment and conversely that residents on a street with low traffic volumes show an acute, critical, and appreciative awareness of and care for the physical environment around them. The modified hypothesis for this study predicts that on multiple roadway boulevards the landscaped malls and local access roads will serve as a buffer, protecting residents from the heavy traffic in the center lanes, and because of this residents will not be withdrawn but will be aware of their physical environment and care about their street.

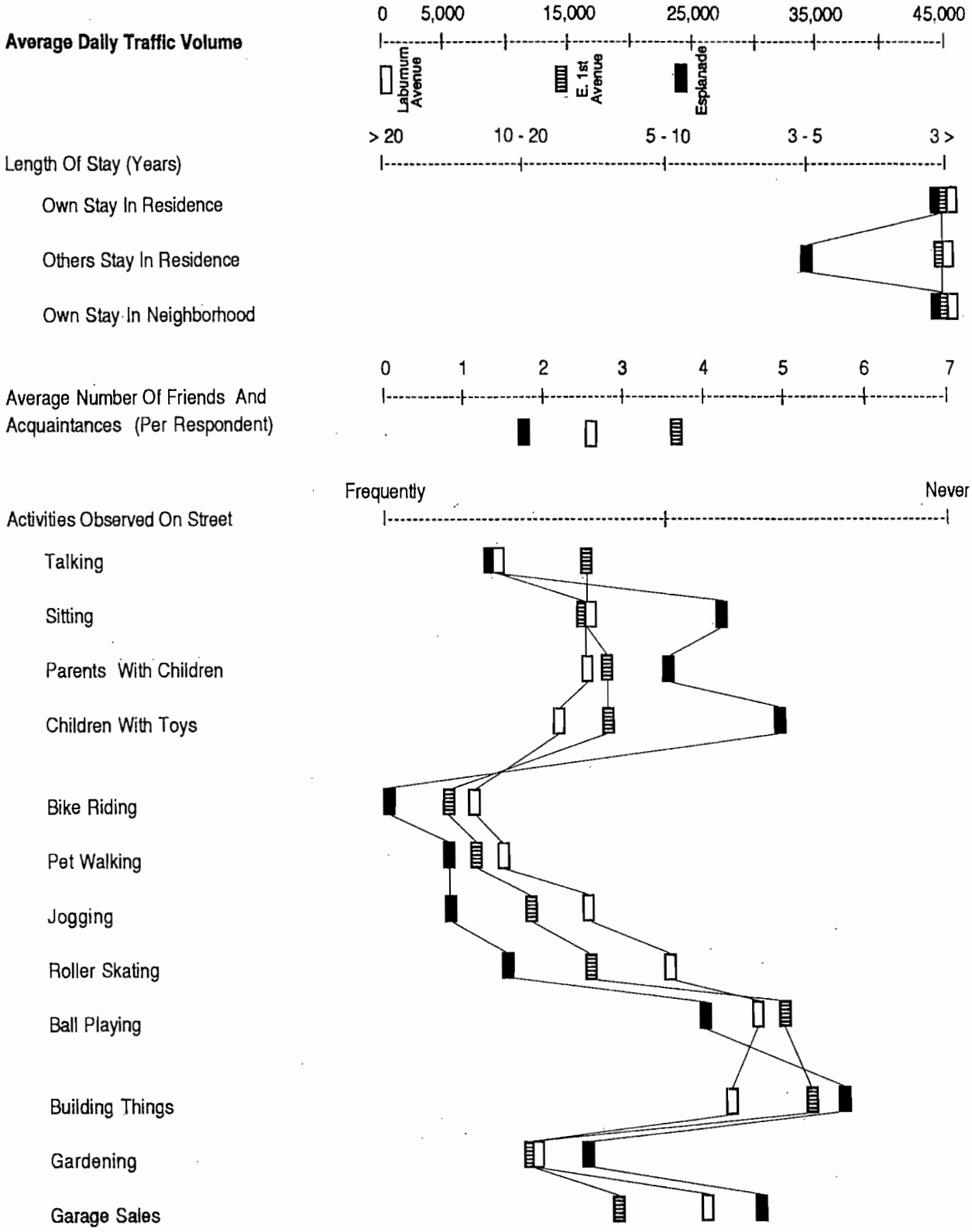


Figure 3.11
Summary of Survey Questions Testing Hypothesis II
Social Interaction
Chico Streets

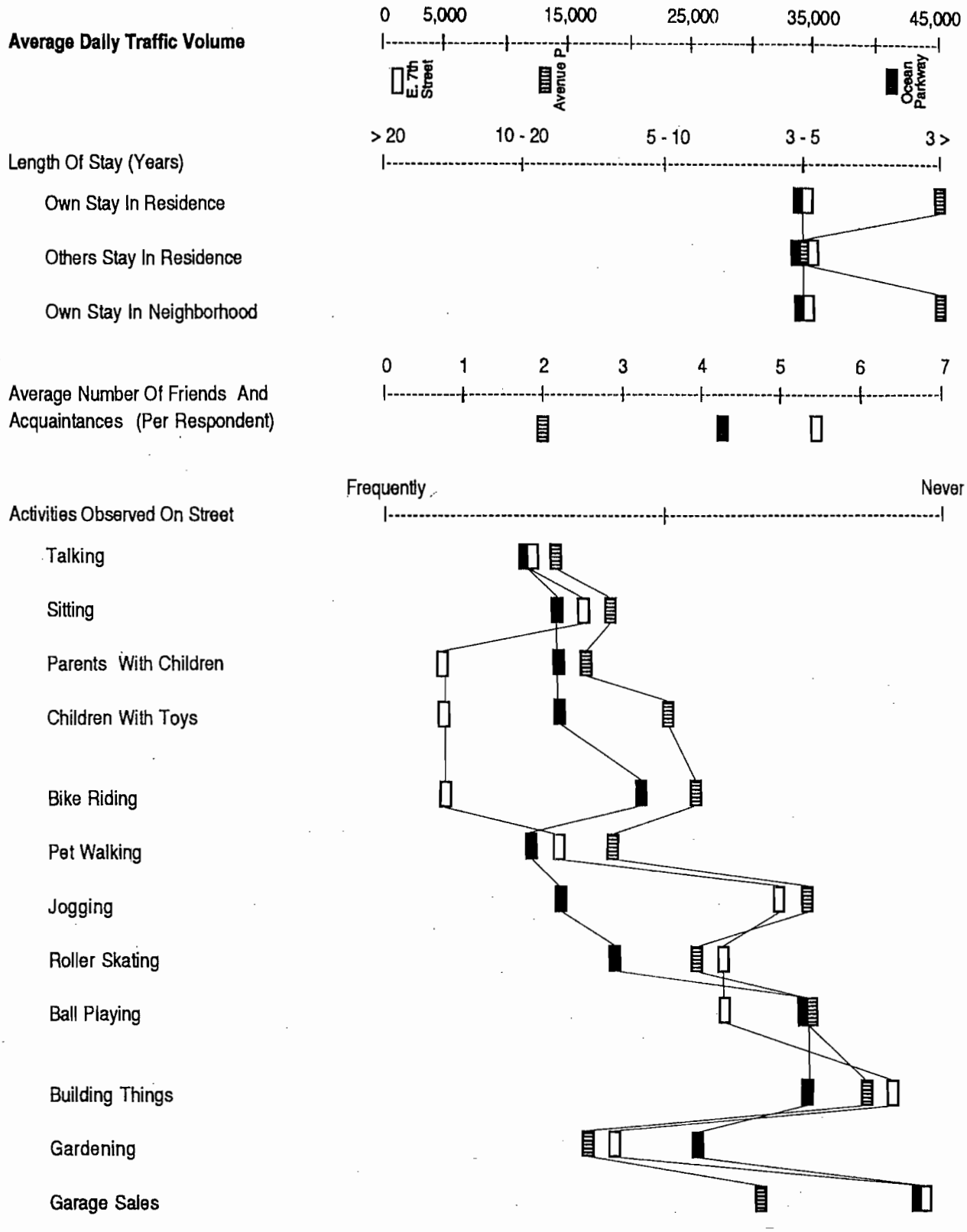


Figure 3.12
Summary of Survey Questions Testing Hypothesis II
Social Interaction
Bensonhurst Streets

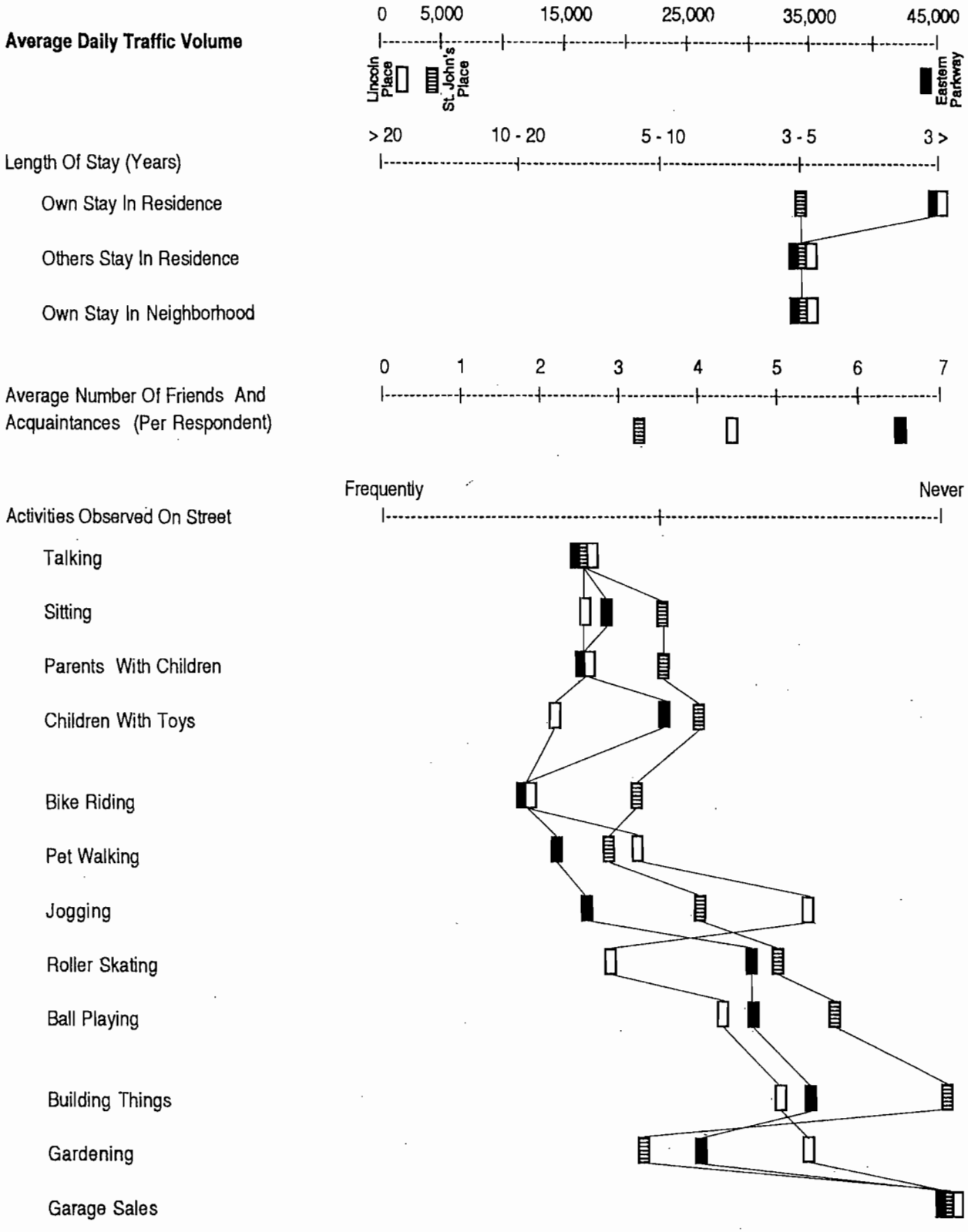


Figure 3.13
Summary of Survey Questions Testing Hypothesis II
Social Interaction
Crown Heights Streets

Results: Our findings generally confirmed the modified hypothesis. In comparison with the medium and light streets, the three boulevards ranked equal or second to the light streets in terms of residents' awareness and care for the street. Boulevard residents are not withdrawn; they suffer less from traffic than residents on the medium streets; and they know their street and are aware of its special configuration.

Discussion

Different from how the first and second hypotheses were tested, it was necessary to ask a large set of questions to determine residents' awareness or withdrawal from the physical environment and their concerns about traffic which might contribute to this. Questions asked included: how responsible residents felt for the way their street looked (Q7); how they felt about the upkeep of front yards and sidewalks (Q8); how much their street felt like home (Q9 and 33); if they perceived any special physical characteristics about their street (Q14); whether they felt their street was remote or connected to city life (Q16); whether they considered their street safe or dangerous because of traffic (Q17); to what extent they were aware of traffic (Q18); their sense of the traffic volume (Q 19 and 20) and speed (Q20); how easy or difficult it was to cross their street (Q22); the extent to which traffic interfered with their activities (Q 24); and whether they had done anything to adapt because of traffic noise (Q25). We also asked how residents might alter their street if they had the money and power to do so (Q 26).

The responses to these questions are discussed individually below, followed by a summary.

Responsibility

Residents on all three boulevards felt a high level of responsibility for their street. In all three case studies, the average was higher than for residents on the medium traffic street and as high or higher than for residents on the light traffic streets, although tests show that none of the differences are statistically significant. Residents on all nine streets seem to feel responsible for their street and what happens on it.

Upkeep

Residents on all three boulevards felt that their streets are satisfactorily to very well kept up, as did residents on all the medium and light streets. In Chico, however, there were statistically significant differences between how the three streets were perceived: the light street was perceived as the best kept up, followed by the boulevard and then the medium street.

Sense of Home and Home Territory

Residents of all nine streets indicated that their street felt like home to them. In the Chico and Crown Heights case studies, residents on all three streets perceived their street similarly. In the Bensonhurst case study, where statistically significant differences between streets occurred, the boulevard was perceived as feeling the most like home, followed by the light street and then the medium street.

Residents were asked to indicate on a map of their block the extent of what they considered to be their home territory. These responses were compiled into composite maps, shown in Figures 3.14, 3.15, and 3.16. Most respondents on all the streets circled the area immediately surrounding their house as their home territory. Boulevard residents and residents on the light street sometimes circled an area extending beyond their individual houses to include as well a group of neighboring houses, or the street space in front of their house, or their entire block. In general, the home territory indicated by residents of the light streets was the most extensive, with the boulevards ranking second and the medium streets third. The exception is the Chico case study, in which residents on the medium street indicated home territories as extensive as residents on the boulevard.

Physical Characteristics

When asked if there were any physical characteristics on their street that were different from other streets, residents of all three boulevards agreed that their streets were different. "It is a boulevard," "it has side roads," "it is The Esplanade," reported residents in Chico. On the Eastern Parkway, residents mentioned the historic street lamps, the parkway, the benches, the trees, and the fact that Eastern Parkway enjoys "landmark status." Ocean Parkway residents mentioned the mall, the bike path, the trees, and the local access roads.

The majority of medium and light street residents, however, indicated that there was nothing special about their street. Residents of the medium streets who mentioned anything at all indicated that their street was particularly wide (which it is not) or that it was a thoroughfare. Residents of the light streets also mentioned few things — generally that their street had trees and/or old homes along it.

It is apparent that the boulevard residents are aware of the unusual physical design of their street and that many perceive their street to be special, not just as a residential street, but also as an important street in some larger city-wide or historical context.

Remoteness and Connectedness to City Life

The question about whether residents felt their street was remote or connected to city life was intended to ascertain if boulevard residents felt more connected to an urban way of life because of the

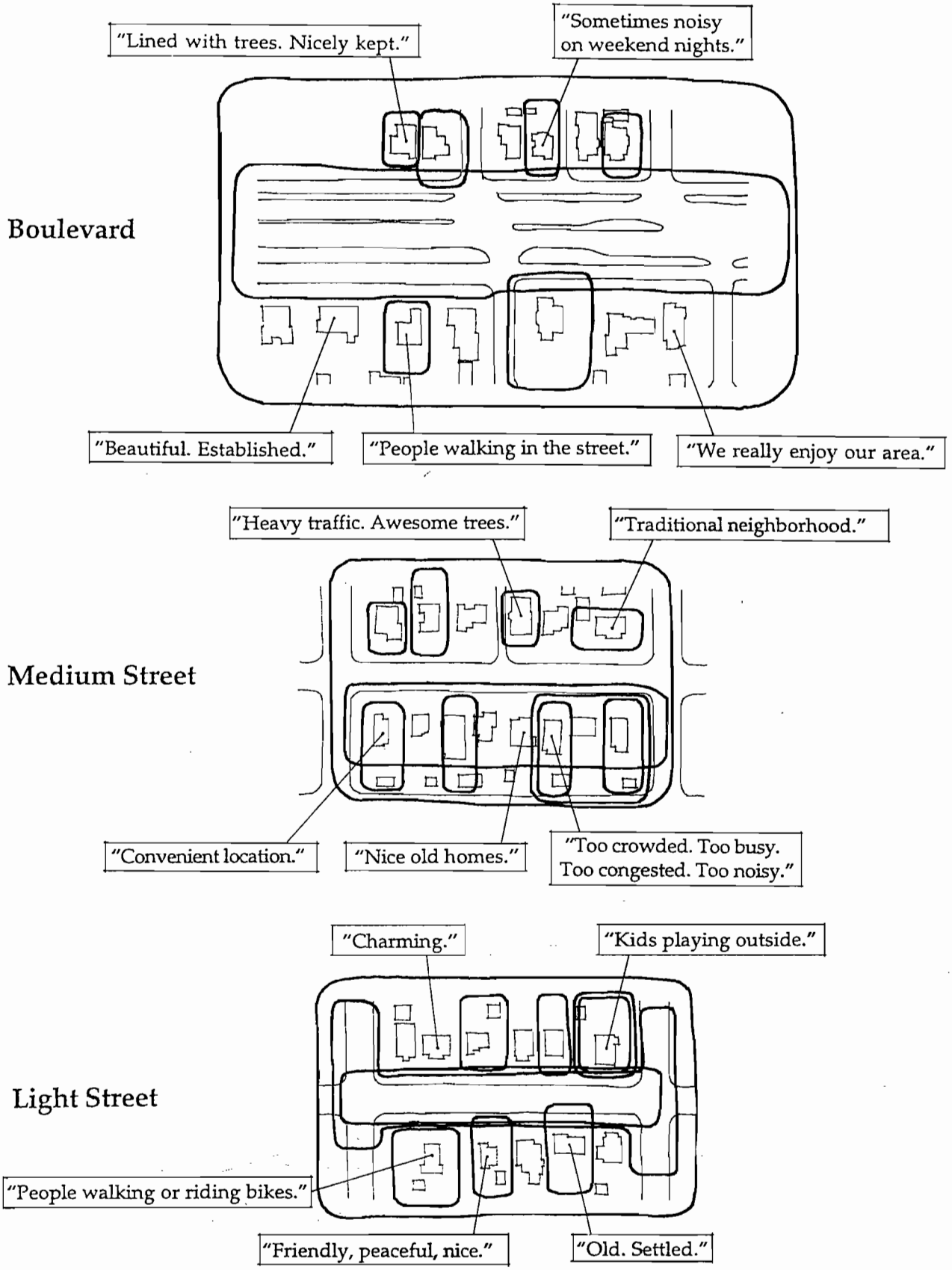


Figure 3.14
Case Study #1: Composite Home Territory Map

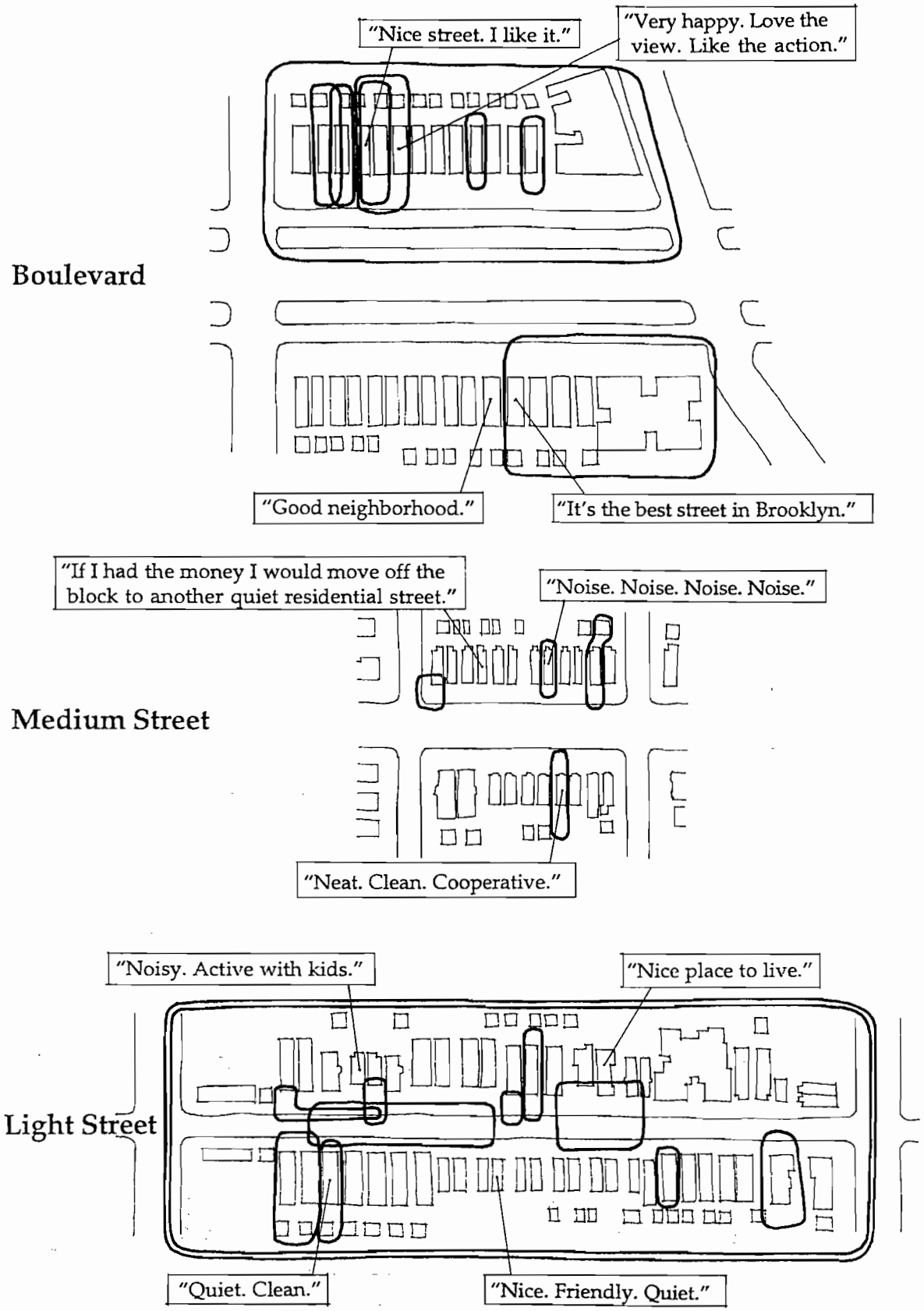


Figure 3.15
Case Study #2: Composite Home Territory Map

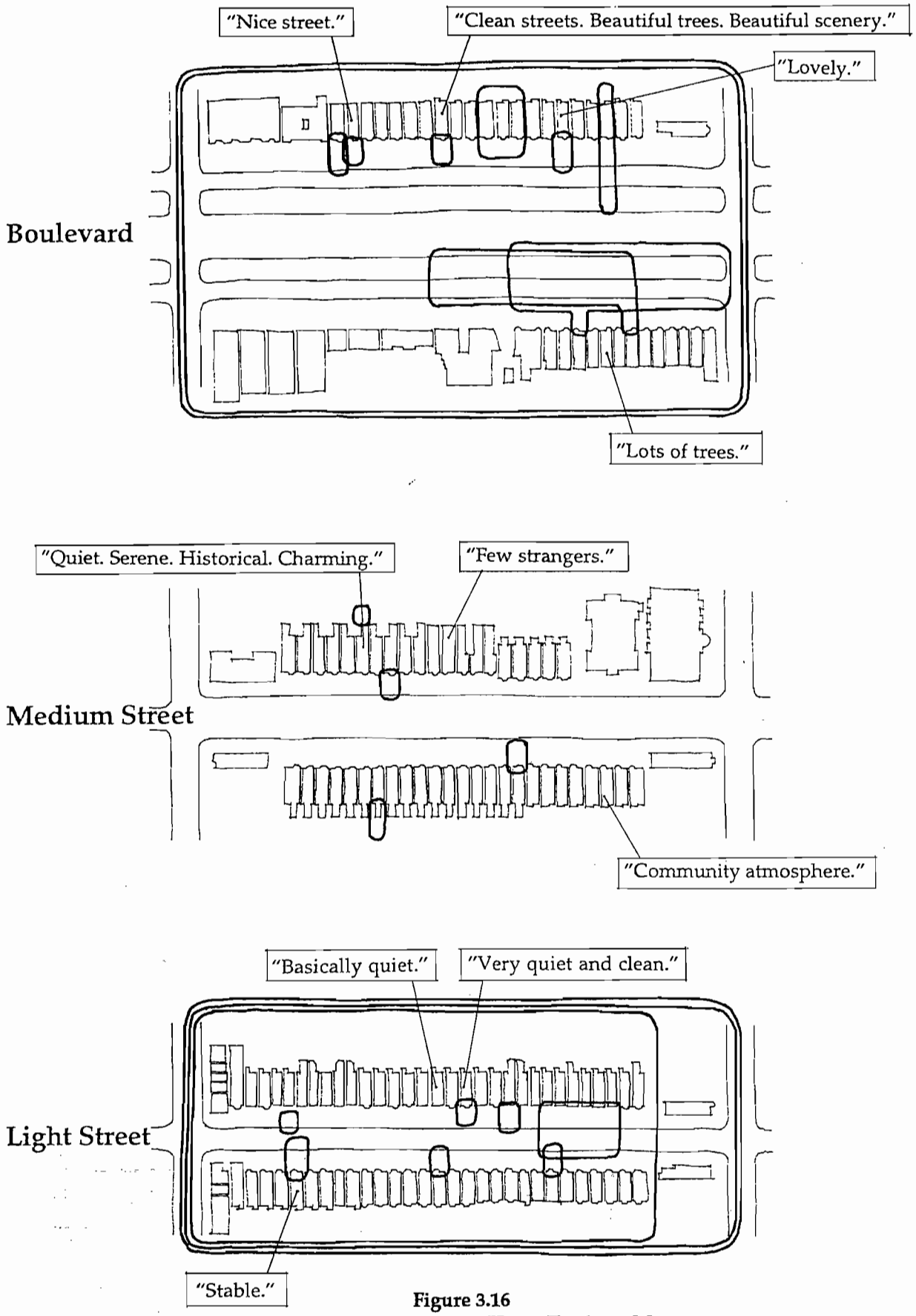


Figure 3.16
Case Study #3: Composite Home Territory Map

role their street plays as a major traffic carrier. The question, however, proved to be problematic. In Chico, the question seemed to be understood as intended. Esplanade residents felt connected to city life while residents on the light street felt remote from city life. In Bensonhurst and Crown Heights, however, boulevard residents were ambivalent — as many felt remote as felt connected.

From comments people made as the survey was administered, it became apparent that "connection to city life" has a different meaning in the small town of Chico than it does in Brooklyn. For Brooklyn residents, city life seems to be associated with The City — i.e., midtown or downtown Manhattan.

Safety From Traffic

Residents on all the boulevards and all the light streets generally felt neutral to somewhat safe from the traffic on their streets, as did residents on the medium street in the Crown Heights case study — the lowest volume medium street. On the other hand, residents of the medium streets in the other two case studies generally felt that their streets were neutral to somewhat dangerous. These findings are interesting since the boulevards carry so much more traffic than the medium streets; however, tests show that the perceived differences between streets are not statistically significant.

Awareness of Traffic

Residents on all three boulevards are sometimes to very often aware of traffic on their street. However, in the two case studies which have the higher volume medium traffic streets, Chico and Bensonhurst, residents on the medium traffic streets were more often aware of traffic than residents on the boulevard. These findings are supported by the observed street noise levels. Noise levels at the curbs of these medium traffic streets were substantially greater than on the counterpart boulevards. On the Esplanade the curb noise level was above 65 decibels 45% of the time, while its medium traffic control street was above 65 decibels 65% of the time. The respective figures for the Ocean Parkway streets are 15% and 57%. (The very low noise levels on Ocean Parkway can be explained in part by the fact that commercial vehicles are restricted from being driven on it.)

In all three case studies, residents of the light traffic street were only sometimes aware of traffic, which correlates with the very low noise levels on these streets — almost never above 65 decibels. In Bensonhurst, where boulevard residents are also only sometimes aware of traffic, the difference in traffic awareness between the boulevard residents and the light street residents was not statistically significant.

It should be noted that residents on the different streets within each case study generally had similar perceptions of the heaviest traffic times on their streets. Almost all the Chico residents felt that traffic was heaviest in the afternoon and early evenings; Bensonhurst residents for the most part felt traffic was heaviest during the morning commute; and most Crown Heights residents thought it was

equally heavy during morning and afternoon commute hours. The exception is the medium street in Crown Heights, where residents perceived the afternoon commute as heavy but didn't notice the morning commute much.

Speed of Traffic

Residents on all three boulevards generally indicated that the speed of traffic on their street was about right to somewhat too fast, although a number of residents on Eastern Parkway thought that traffic on their street was much too fast. Comparison with the medium traffic streets is interesting. Although in Crown Heights no significant difference was perceived between streets, in both the Chico and Bensonhurst case studies the speed of traffic on the boulevard was considered more favorably by residents than the speed of traffic on the medium street, and the difference is statistically significant. In fact, in Chico the speed of traffic on the boulevard was considered as favorably as the speed of traffic on the light street.

These perceptions of traffic speed seem very significant given the fact that field observations documented traffic moving 5 to 10 mph faster in the center lanes of the Esplanade than on its medium traffic control street, and 10 to 15 mph faster in the center lanes of Ocean Parkway than on its medium street. It seems that the boulevard configuration may help residents feel more comfortable with higher traffic speeds on their street than if the street was normally configured, although it is important to note that on all three boulevards field measurements showed that the speed of traffic on the access roads of the boulevards, the roadways directly in front of people's houses, approximated those found on the light streets.

Traffic Volume

Residents on the three boulevards had different perceptions about the volume of traffic on their streets. In Chico, people on the Esplanade tended to think the traffic on their street was about average for a residential street, whereas Bensonhurst and Crown Heights residents on Ocean Parkway and Eastern Parkway tended to think traffic on their street was fairly heavy to very heavy. These perceptions correlate with the actual amounts of traffic on these streets — Ocean Parkway and Eastern Parkway carry roughly twice as much traffic as the Esplanade.

What is interesting is that not all boulevard residents perceived the traffic on their street to be very heavy for a residential street, although most professionals would agree that it is. Furthermore, in all three case studies residents on the medium streets perceived the amount of traffic on their street as heavier than did residents of the boulevards, and in all three cases the differences are statistically significant. This is highly significant given the fact that actual traffic volumes on the boulevards are 2.5 times (the Esplanade), 3 times (Ocean Parkway) and 11 times (Easter Parkway) higher than on the counterpart medium streets.

These findings seem related to the physical configuration of the boulevards, particularly because when boulevard residents were asked their perception of the amount of traffic on just the access road in front of their house, in both the Chico and Bensonhurst case studies responses were similar to responses from residents on the light streets.

Again, the boulevard configuration seems to mitigate the negative perception of traffic volume.

Crossing the Street

Residents on two of the boulevards, the Esplanade and Eastern Parkway, generally felt that crossing their street was neither easy nor difficult but simply average. On Ocean Parkway, however, residents generally perceived crossing as somewhat difficult.

Comparing boulevard residents' responses with medium street residents' responses, the results are ambiguous. In Chico, residents on the medium street felt that crossing was more difficult than on the boulevard, while in Bensonhurst crossing the boulevard was perceived as harder. In Crown Heights, there was no significant difference in how the streets were perceived.

Traffic Interference with Activities

Residents on the three boulevards were generally not at all or only sometimes bothered by traffic as they went about their daily activities inside or outside their homes. Residents that were bothered either sometimes or often tended to be bothered most while sleeping, which held true for the other streets as well.

In comparison with the medium and light streets, there were no statistically significant differences between any of the streets in the Crown Heights case study, where very few residents on any of the streets said they were bothered by traffic during any activities, but there were important differences in the other two.

In Chico, Esplanade residents were not at all or only sometimes bothered by traffic as they went about their daily activities, while medium street residents were bothered sometimes or often, and light street residents were generally bothered not at all. Some Esplanade residents had difficulty sleeping, some were bothered when watching TV, and some were bothered when walking outside — although on average no more so for any of these activities than residents of the light street. On the medium street, residents were bothered during the same activities, but significantly more so, and also when they were talking inside or when children were playing outdoors.

In Bensonhurst, very few Ocean Parkway residents were often bothered by traffic, some were sometimes bothered, and most were not at all bothered. Those who were bothered were mainly bothered while sleeping. As in Chico, medium street residents were bothered sometimes to often while doing a number of activities, while light street residents were rarely bothered at all. Of statistical

significance is that boulevard residents were less bothered than medium street residents while sleeping and talking.

The patterns for Chico and Bensonhurst again correlate with street noise levels. In these case studies, the curb noise levels are much higher on the medium traffic streets than on the boulevards.

Adaptive Behavior

Residents on the boulevards have generally done less to adapt their behavior because of traffic nuisance than residents on the medium traffic streets.

In Chico, few residents on the Esplanade have done anything to adapt to traffic nuisances. Few keep their windows shut and they generally have not added heavy curtains, fenced or walled in their front yards, and they don't go out less often. On the medium street, however, every resident reported keeping their windows shut because of traffic. Some residents had also added heavy curtains and tend to live more at the back of their house; some go out less often, and some forbid their children to play outside, or have told them not to cross the streets, or accompany them when they walk to school.

In Bensonhurst, a greater number of residents on Ocean Parkway keep their windows shut because of traffic, but fewer than on the medium street where all residents keep their windows shut. Some residents also tell their children not to play outside or to cross the street, and some walk their children to school, but again not as many as on the medium traffic street. In fact, the adaptive behavior on Ocean Parkway is similar to that of residents on the light street — few have done anything to adapt although the traffic danger to children is perceived equally on all three streets.

In Crown Heights, some Eastern Parkway residents keep their windows shut because of traffic, more than on the light street, but many more keep windows shut on the medium street.

Improvements

What would residents do to change their street if they had the money and power to do so? Although this open-ended question did not address traffic specifically, residents on the medium traffic street who would do anything most often wanted to slow or reduce traffic on their streets whereas boulevard residents who would make changes generally mentioned other things.

In Chico, Esplanade residents frequently said they would do nothing although some suggested that traffic, parking, and bike laws should be enforced on the street. A number of medium traffic residents wanted to slow traffic and some mentioned that a nearby freeway off-ramp (the source of traffic on 1st Avenue) should be closed. Some light street residents would improve the paving on their street, which currently lacks formed gutters.

In Bensonhurst, some Ocean Parkway residents wanted more police to supervise the night time use of the benches on the medians. Medium street residents wanted to eliminate commercial traffic from

their street and some wanted better sidewalks and more trees. Most light street residents did not want to make any improvements.

In Crown Heights, Eastern Parkway residents wanted more parking along their street, as did light street residents who also sometimes mentioned they would like more street lights and trees. Some medium street residents would eliminate busses from their street.

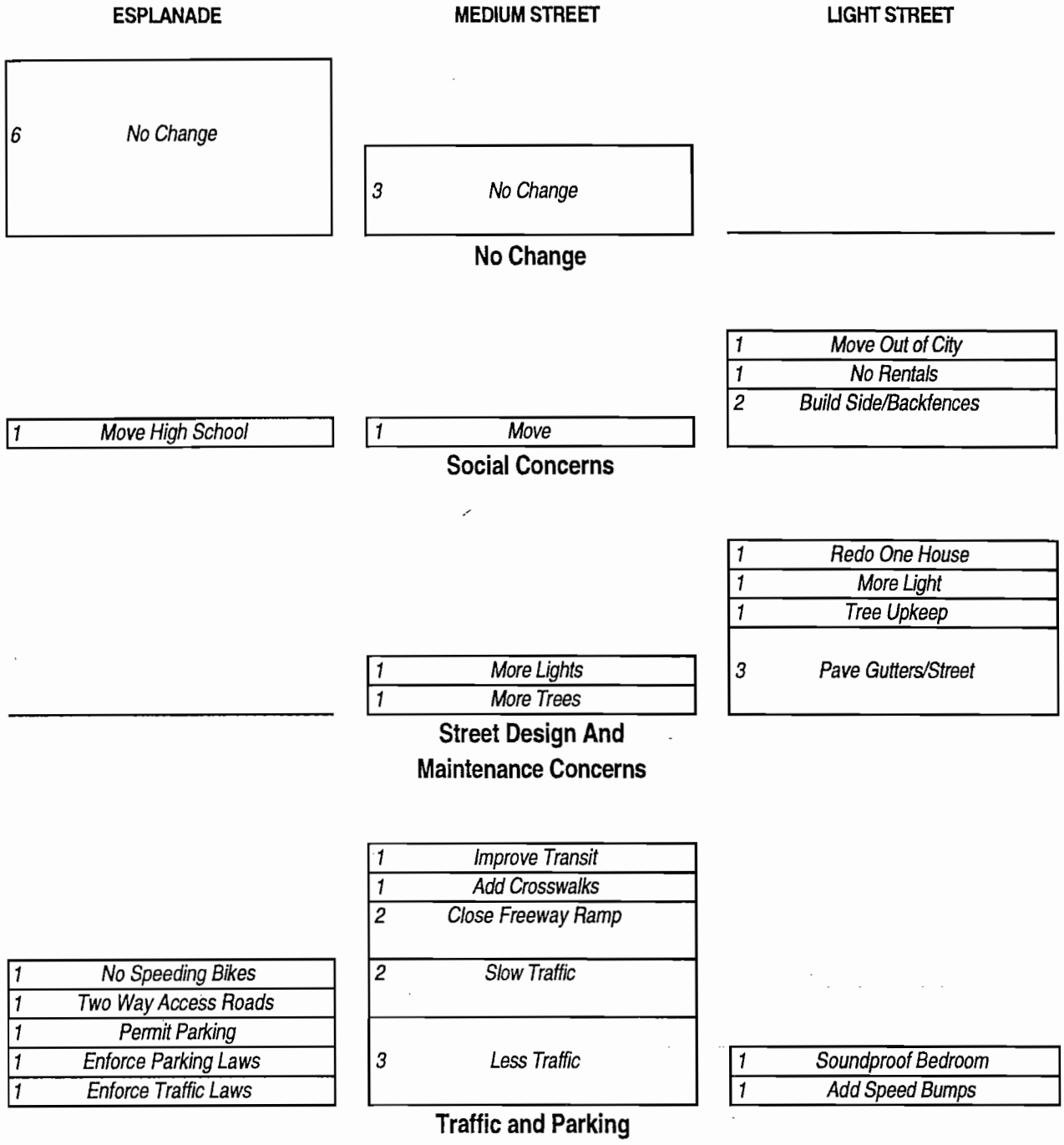
Responses to this question are illustrated graphically in Figures 3.17, 3.18, and 3.19. Because these are unusual graphics, they require an explanation. For each street, individual responses to each question were grouped into several broad categories. Within each category, responses are graphed in a bar-chart configuration, the height of each block in the bar chart being correlated with the number of times a particular response was given. It should be noted that like responses were grouped under a single representative word or phrase. Direct quotes from this and other open-ended questions are included elsewhere, in the text and on various graphics. Also, since more than one answer was allowed, the total number of residents who responded to a question and the total number of answers given are indicated for each street to give a sense of the number of responses per resident.

Summary of Hypothesis III

Figures 3.20, 3.21, and 3.22 illustrate the results of the survey questions asked to test Hypothesis III — how much residents are aware of and care for their street, and how much they are affected by traffic nuisance.

In Chico, Esplanade residents were aware of the special nature of their street and cared for it. They felt as responsible for their street as residents of the other streets, thought it was well kept up, and perceived it as home. In terms of traffic nuisance, they were aware of traffic on their street, but not as often as residents on the medium traffic street, and it interfered with their activities less (comparable with what was found on the light street). Residents on the Esplanade did not find their street dangerous because of traffic; they did not in general feel that traffic speeds were excessive on their street, or that traffic volume was much too heavy. In terms of safety, traffic speed, and traffic volume, the medium street was perceived worse. In terms of awareness of and care for the street and lack of traffic concerns or interference with activities, the Esplanade ranked second behind the light traffic street.

In Bensonhurst, Ocean Parkway residents were also aware of the special characteristics of their street and cared for the physical environment. Their feelings of responsibility for the street, sense of street upkeep, and sense of home were as high or higher than for the other streets in the case study. Again, the boulevard performed better than the medium street in terms of traffic concerns and nuisance. Boulevard residents felt their street was safer; they were less often aware of traffic and they were less bothered by it than residents on the medium street. Except for people's ability to cross the street and in



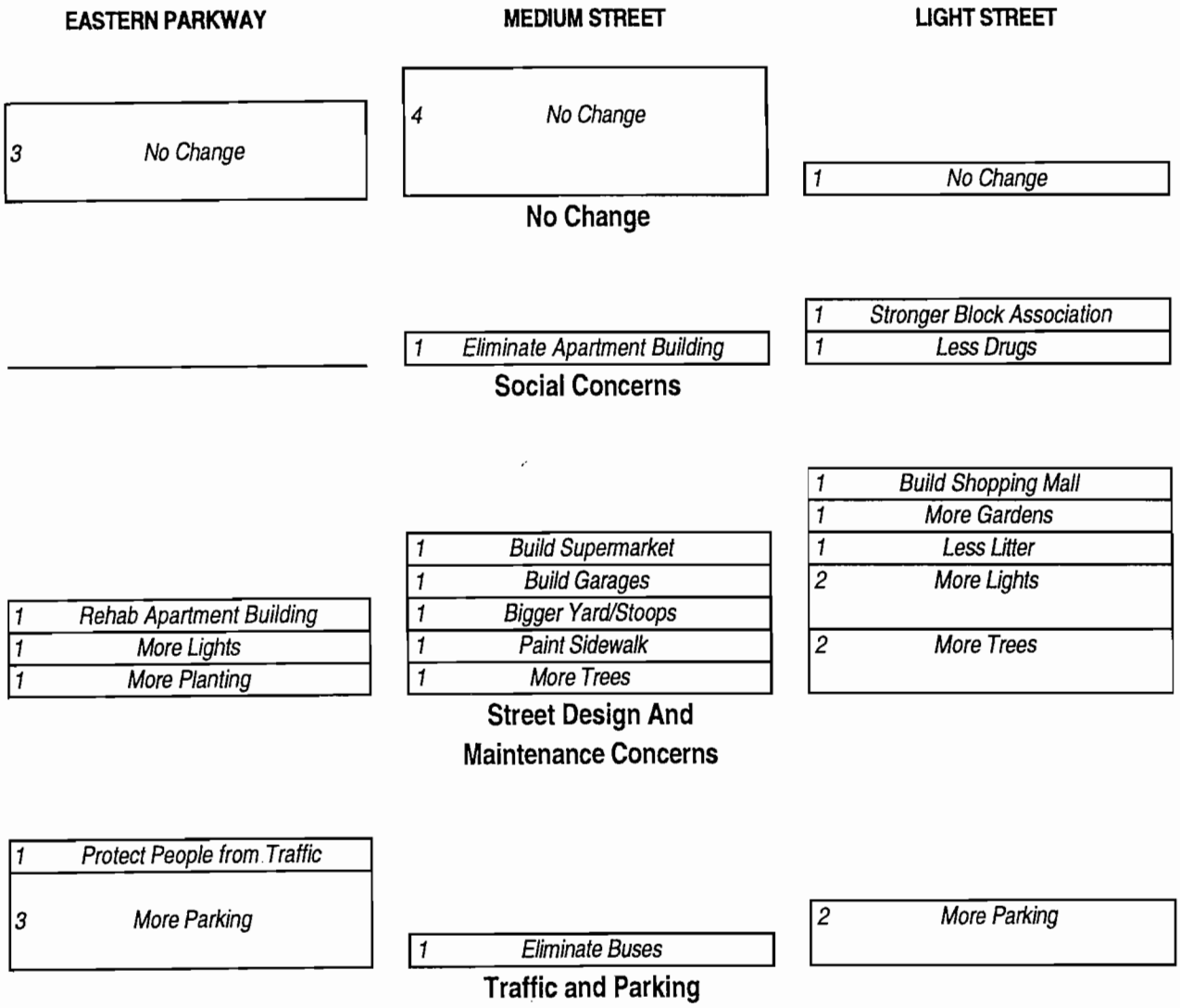
* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.17
Chico Streets
Question 26: Suppose For A Moment That You Had The Money And Authority To Change Your Street And The Surroundings Outside Of Your Home In Any Way You Wanted. Is There Something That You Would Like To Change Most Of All?

OCEAN PARKWAY	MEDIUM STREET	LIGHT STREET
		8 No Change
2 No Change		
No Change		
1 More Police 1 No Homeless 1 Bench Curfew		
Social Concerns		
	1 Flatter Streets 1 New Sidewalks 1 Maintain Street 2 More Trees	
1 Build New House 1 Prune Trees		1 Clean Graffitti 1 More Trees
Street Design And Maintenance Concerns		
	1 Change Noisy Street Grates 1 Move to Quieter Street	
		1 Sometimes Make Pedestrian Only
1 Free Parking 1 Reduce Noise	3 No Commercial Trafic	1 Signal at Corner 1 Slow Traffic
Traffic and Parking		
(9 Respondents : 9 Answers)*	(7 Respondents : 10 Answers)*	(11 Respondents : 13 Answers)*

* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.18
Bensonhurst Streets
Question 26: Suppose For A Moment That You Had The Money And Authority To Change Your Street And The Surroundings Outside Of Your Home In Any Way You Wanted. Is There Something That You Would Like To Change Most Of All?



* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.19
Crown Heights Streets
Question 26: Suppose For A Moment That You Had The Money And Authority To Change Your Street And The Surroundings Outside Of Your Home In Any Way You Wanted. Is There Something That You Would Like To Change Most Of All?

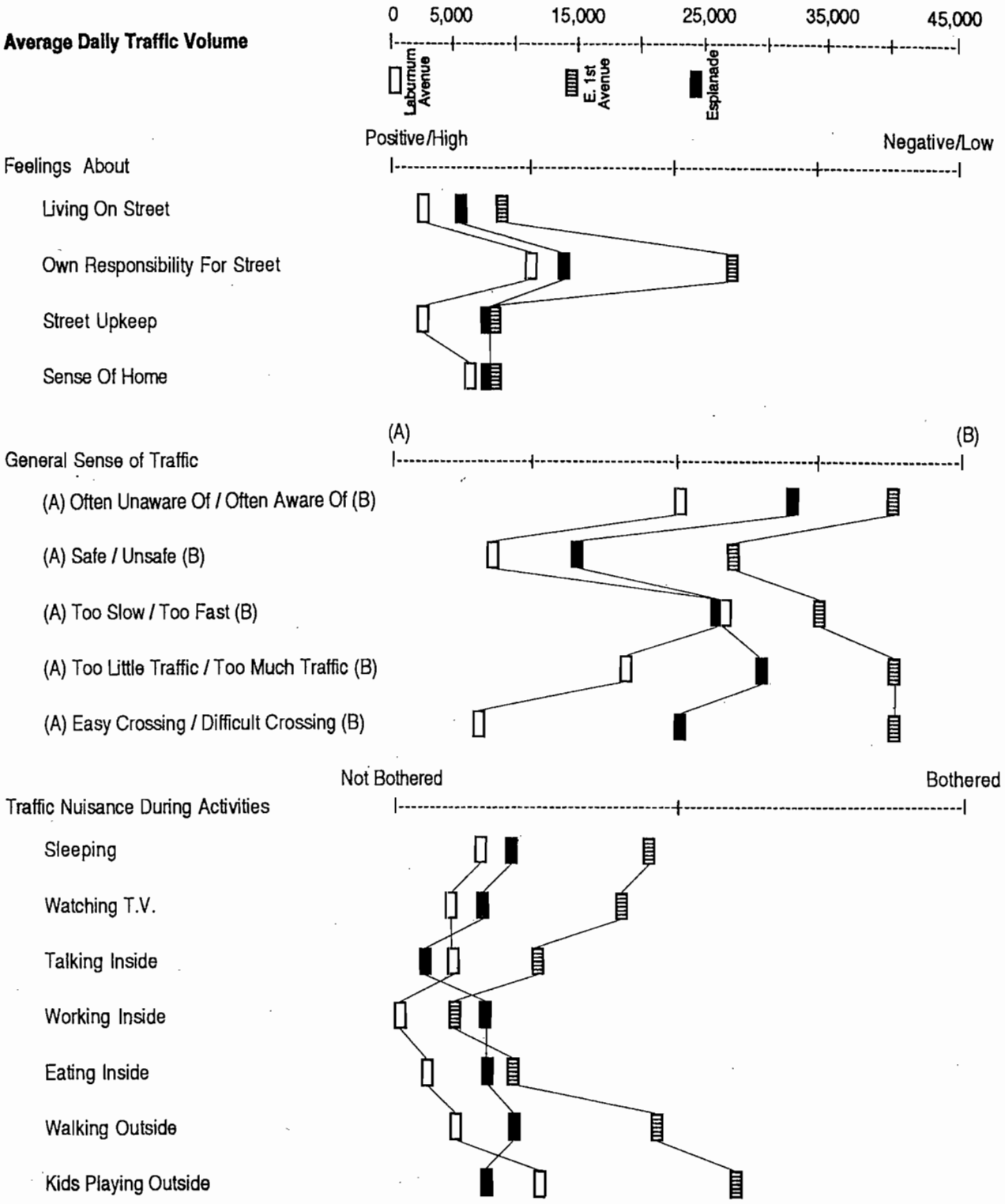


Figure 3.20
Summary of Survey Questions Testing Hypothesis III
Awareness of and Care for the Street on which Residents Live
Chico Streets

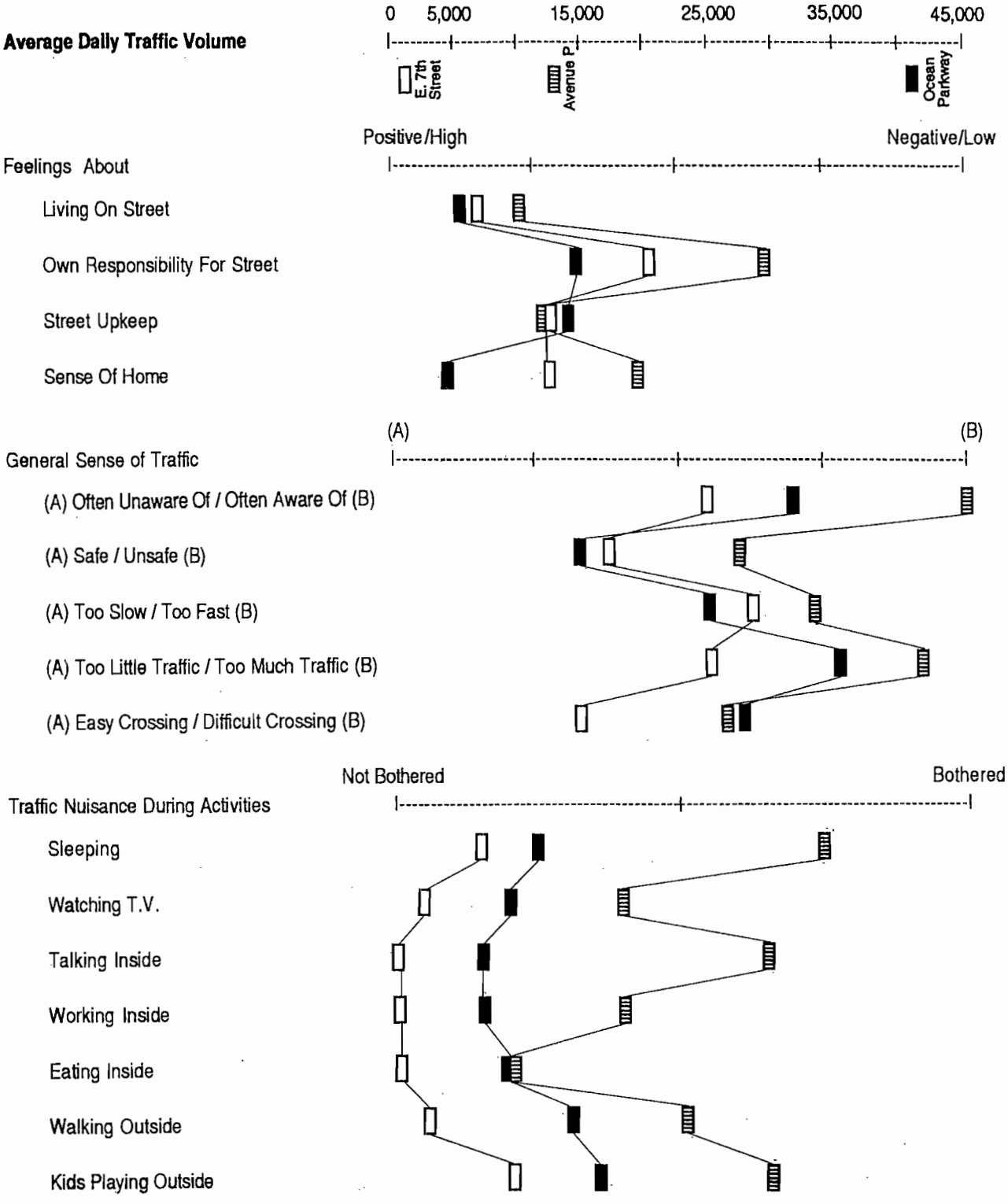


Figure 3.21
Summary of Survey Questions Testing Hypothesis III
Awareness of and Care for the Street on which Residents Live
Bensonhurst Streets

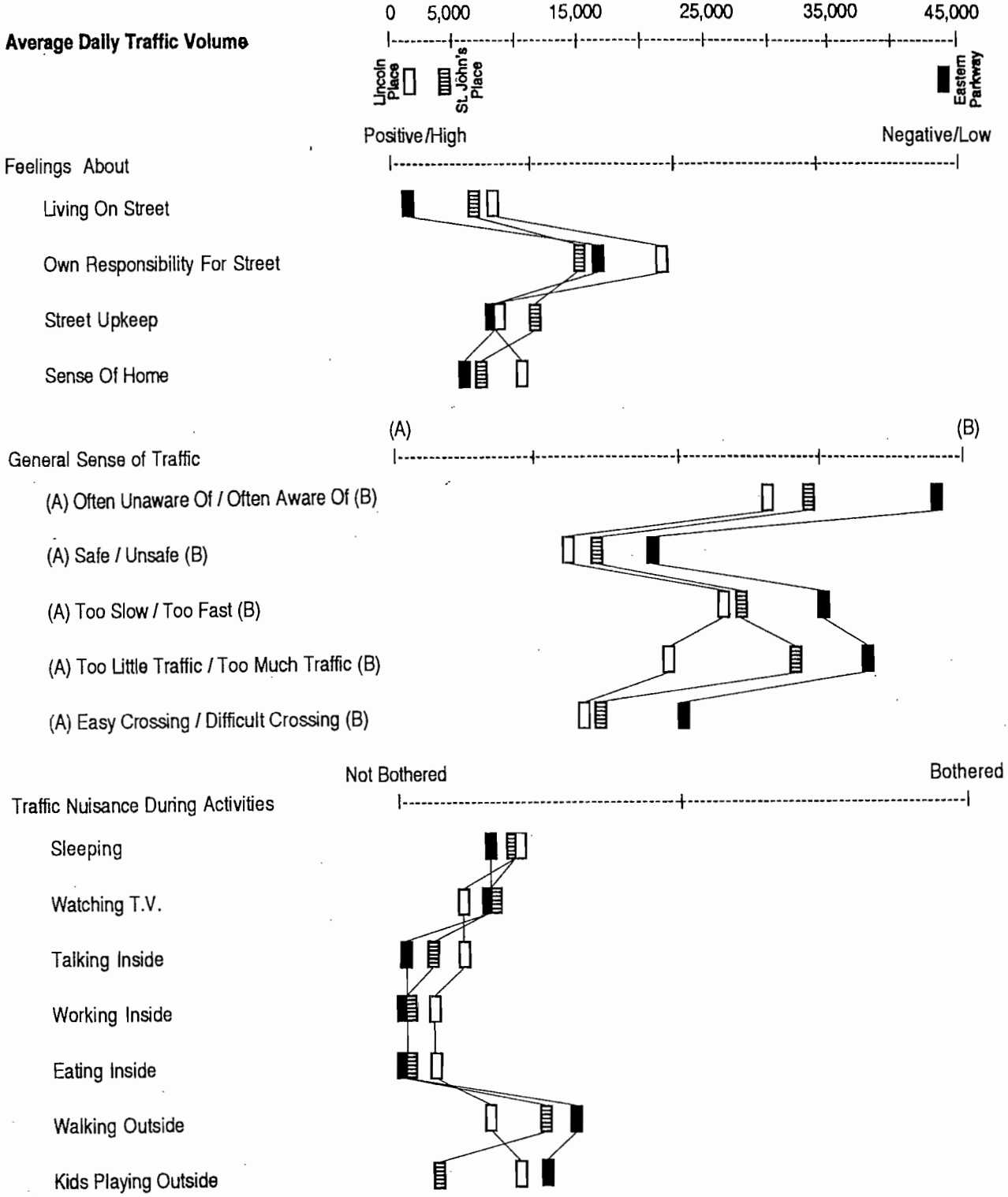


Figure 3.22
Summary of Survey Questions Testing Hypothesis III
Awareness of and Care for the Street on which Residents Live
Crown Heights Streets

response to possible street improvements, Ocean Parkway was perceived better by residents than the medium street, second to the light street. Traffic on the medium street was much more of a nuisance to residents and interfered much more with activities than did traffic on Ocean Parkway or the light street.

In Crown Heights, similar patterns occur, although the traffic concerns were not as great on the medium street as in the other two case studies, as could be expected since this medium street carries significantly less traffic than the other two medium traffic streets (less than 1/3rd).

General Questions

Several open-ended questions not previously discussed, which were not meant to specifically address a particular hypothesis, were asked in the survey. The responses illuminate residents' concerns and feelings having to do with both Hypothesis II and Hypothesis III.

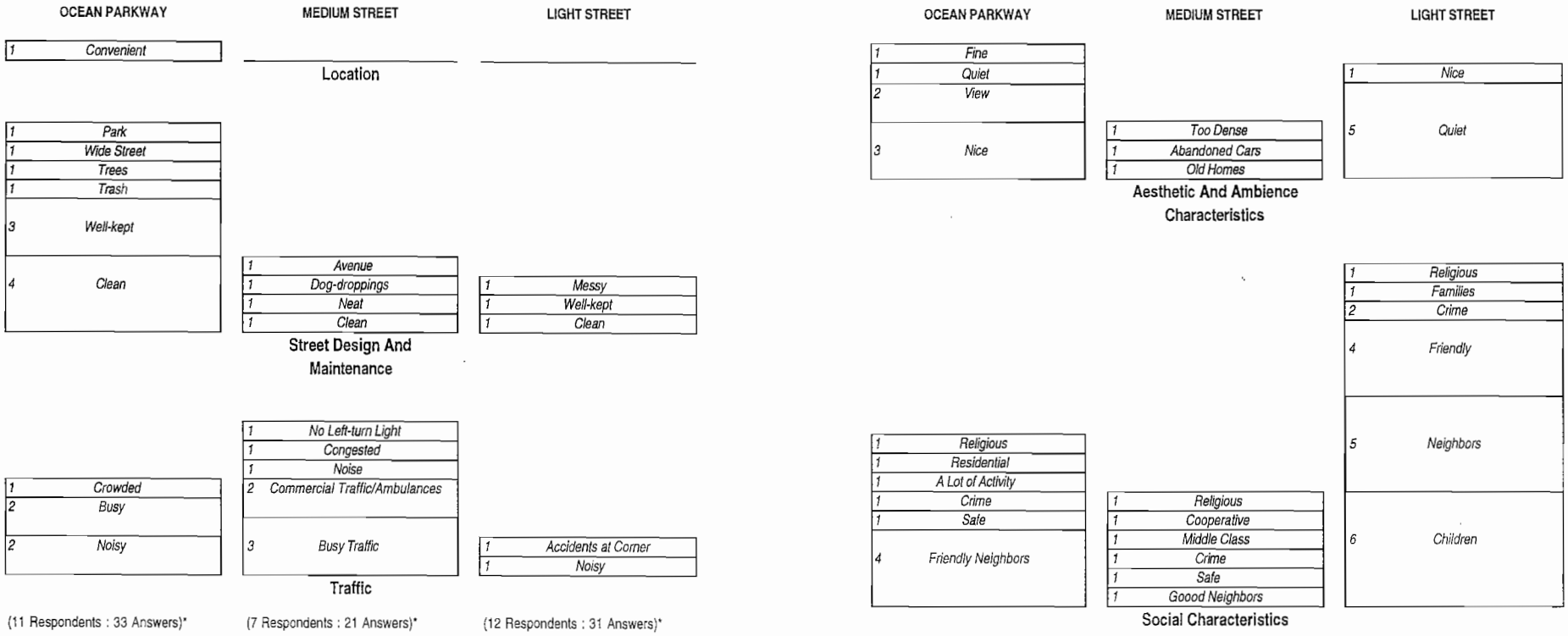
One question, which came toward the beginning of the survey before any questions related to traffic, asked residents to list four or five things that came to mind about their street (Q5). A later question, which came toward the middle of the survey, but still before any questions about traffic, asked residents to list anything that bothered them about living on their street (Q16). Residents' responses to these questions are summarized below and illustrated in Figures 3.23 through 3.28. The figures are bar charts, which should be read in the same manner as the earlier similar figures described on page 69.

Things That Come to Mind

In response to this question, few residents on any of the light streets mentioned anything having to do with traffic, while a number of residents on the boulevards and medium streets did — particularly in Chico but also in Bensonhurst. A few more comments about traffic were made by residents on the medium traffic streets than on the boulevards. Positive aesthetic observations about their street — that it was pretty or beautiful or offered good views — were most often mentioned by residents of the boulevards whereas light street residents most often described their streets as quiet.

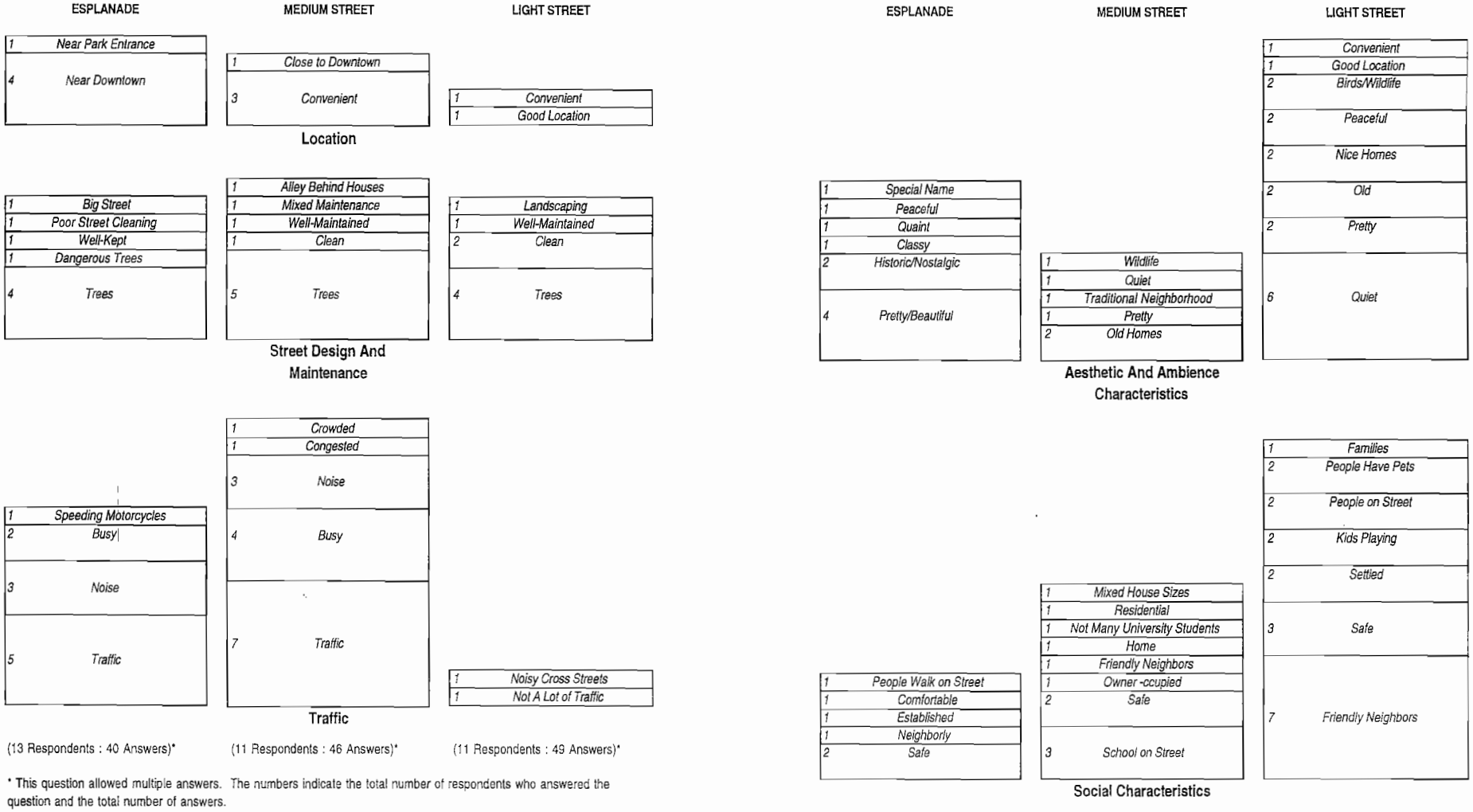
Things That Bother

Again, few residents on any of the light streets mentioned anything having to do with traffic, and those who did, only mentioned parking problems — or in Chico, traffic nuisance from nearby 1st Avenue. In Chico and Bensonhurst, a number of people on both the boulevards and the medium streets mentioned that they were bothered by traffic or noise. In both cases, however, residents on the medium traffic street mentioned these concerns more often. In Crown Heights, few residents on any of the streets were bothered by traffic.



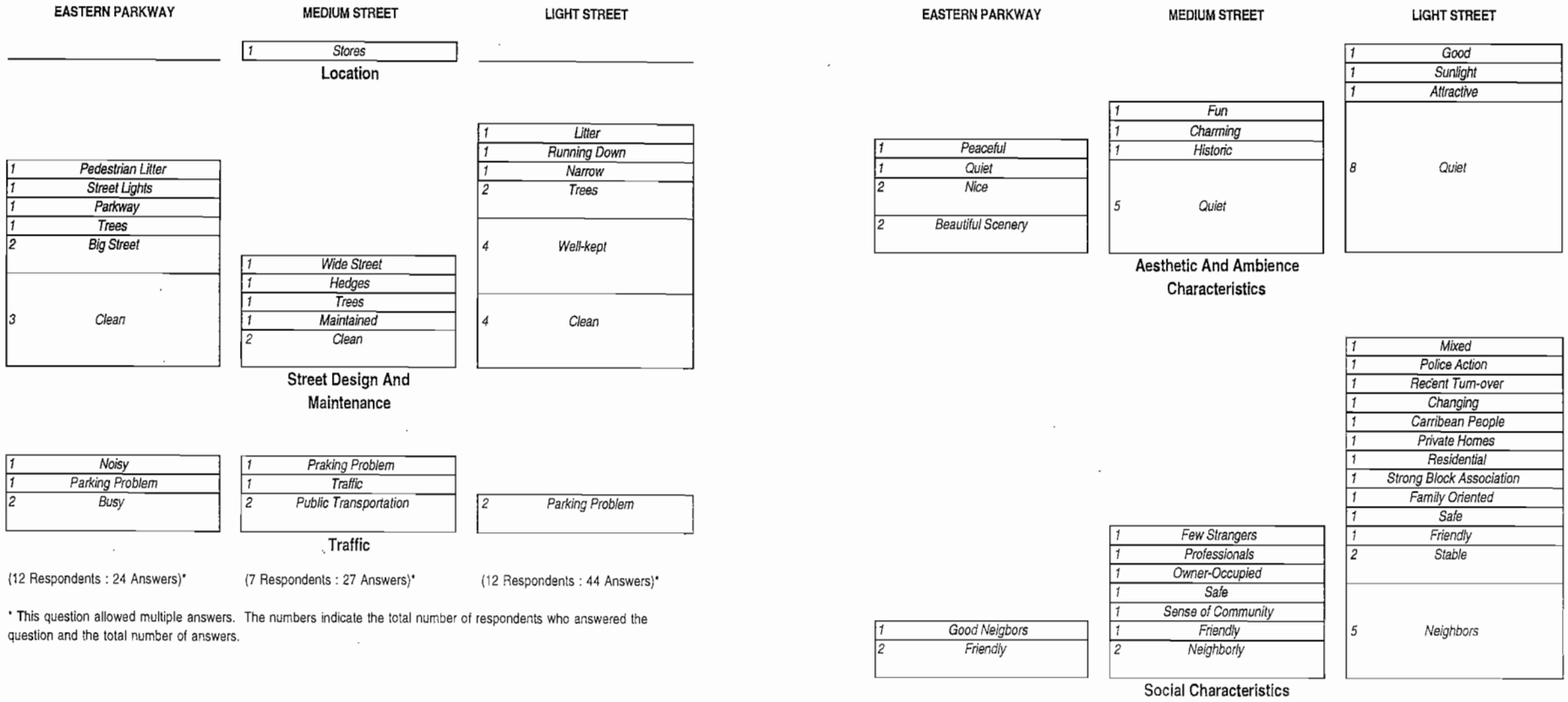
* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers..

Figure 3.24
Bensonhurst Streets
Question 5: If You Were To Describe Your Street, What Are The First Four Or Five Things That Come To Mind?



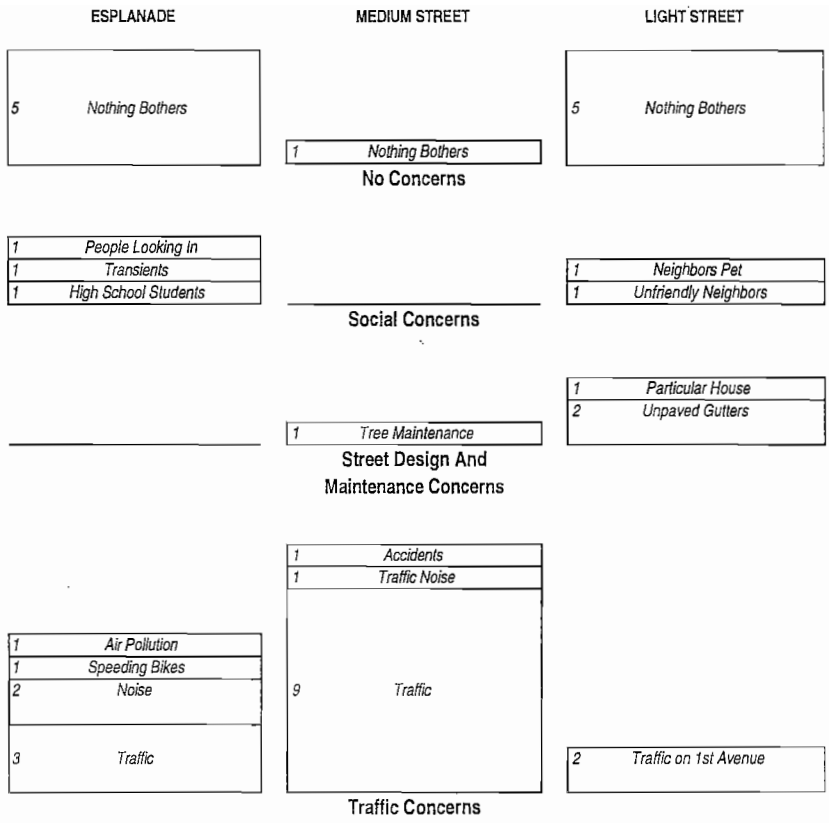
* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.23
Chico Streets
Question 5: If You Were To Describe Your Street, What Are The First Four Or Five Things That Come To Mind?



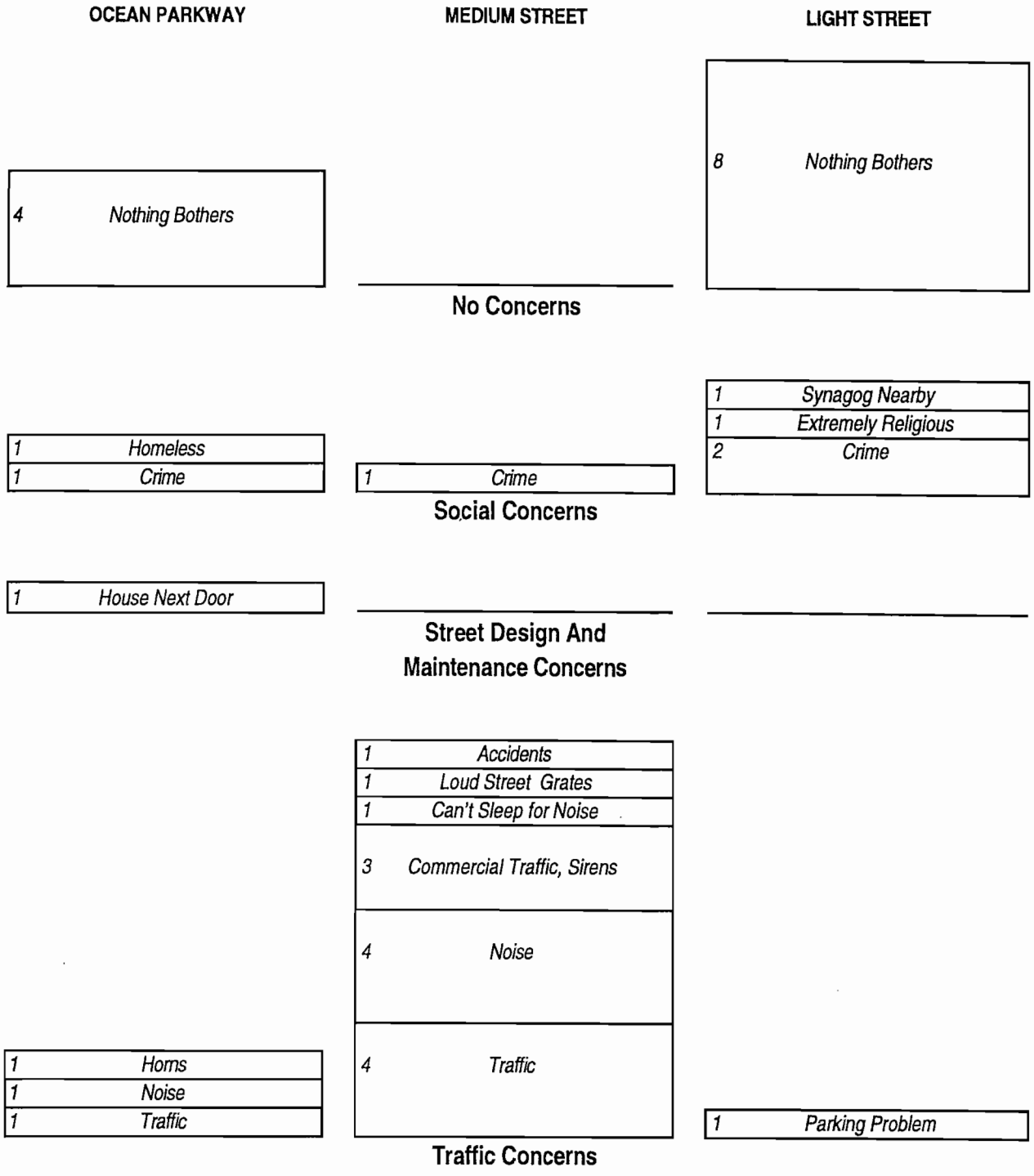
* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.25
Crown Heights Streets
Question 5: If You Were To Describe Your Street, What Are The First Four Or Five Things That Come To Mind?



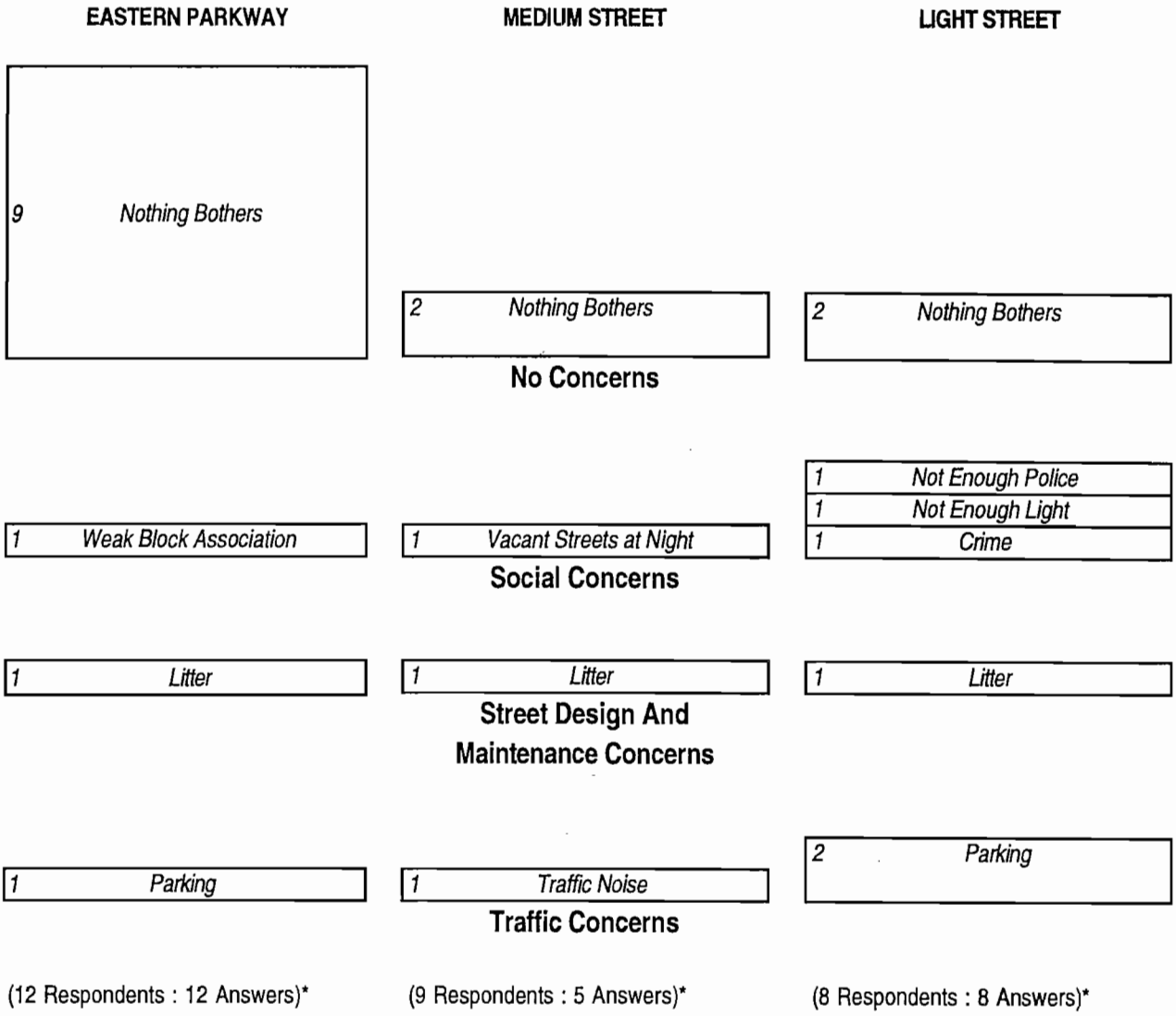
* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.26
Chico Streets
Question 16: Is There Anything That Bothers You About Living On This Street? If Yes, What?



* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.27
Bensonhurst Streets
Question 16: Is There Anything That Bothers You About Living On This Street? If Yes, What?



* This question allowed multiple answers. The numbers indicate the total number of respondents who answered the question and the total number of answers.

Figure 3.28
Crown Heights Streets
Question 16: Is There Anything That Bothers You About Living On This Street? If Yes, What?

IV. CONCLUSIONS

The three boulevards we studied are known for the significant amounts of traffic they carry in their cities. The purpose of our study was to learn about the qualities of boulevards as residential streets. We asked what is it like to live there and to what extent traffic affects livability. The research resulted in the following findings.

In the overall assessment, boulevard residents rated their living conditions higher than residents on streets with medium traffic. Only residents on lightly trafficked streets rate living conditions higher.

This finding is significant because traffic volumes on the boulevards by far exceeded those on the medium-trafficked streets. The Esplanade in Chico has 2.5 times the traffic of the medium street; Ocean Parkway has 3 times the traffic; and Eastern Parkway 11 times the traffic of their paired medium streets in the Brooklyn comparisons.

The landscaped malls and the local access streets mitigate traffic impacts.

This finding is supported by our own field measurements. For example, noise levels measured at the property line exceeded the 65 decibel threshold more frequently on medium streets than on boulevards. Even on the Eastern Parkway where noise above 65 decibels is more frequent relative to the medium street in the Crown Heights group of streets, in absolute terms the very busy parkway is not the noisiest street. E. 1st Street in Chico followed by Avenue P in Bensonhurst (both medium streets) are much noisier. Street configuration affects residents' exposure to noise. Boulevard residents suffer less from street noise than residents on medium-trafficked streets.

Exposure to street noise is directly related to the distance between building façades and the center lanes. This distance ranged from 60 to 100 feet for the three boulevards. On the control streets (medium and light streets), the same distance ranges from 25 to 40 feet. The greater distance reduces noise exposure significantly. But findings indicate that distance alone does not produce the psychological and physiological barriers necessary to create a sense of remoteness from traffic. An effective barrier consists of closely spaced trees on the malls, a local access street designed predominantly for use by residents, landscaping along sidewalks and inside private front yards. These layers of landscaping reduce people's awareness of traffic. For example, boulevard residents in our study were generally not bothered by the speed of traffic on the center lanes. They consistently judged the speed of traffic to be just about right — not too fast, not too slow. Field measurements of traffic speed, however, indicated that cars traveled faster on boulevards than on streets with medium traffic. But residents living on the medium streets consistently judged the traffic speeds as being too fast. Landscaping forms a visual barrier, and greater distances between homes and traffic reduces residents' exposure to noise. Together, they create a sense of remoteness from traffic.

Boulevard residents have lived in their homes as long as residents on the other streets in our study.

Boulevard residents are not predominantly renters; to the contrary, mostly homeowners live on boulevards. The split between owners and renters is similar to the other streets.

Boulevard residents value their street as a special place; they are aware of its unique configuration and know about its history. To open-ended survey questions, boulevard residents mention amenities and neighborhood characteristics more frequently than concerns about traffic.

Additional Observations

Traffic Awareness

Boulevard residents are aware of the traffic, but do not rank the traffic on their street as severely as residents on medium streets. (The exception is the medium street in the Crown Heights group because of significantly lower traffic volumes.) Traffic interferes with daily activities on medium-trafficked streets to a greater extent than on boulevards. Residents on medium streets took more steps to block out traffic than those on boulevards.

Street Activities

Eastern and Ocean Parkways accommodate more private activities like sitting outside, stopping to talk with others, or parents spending time with their children than the medium streets. This is true to a lesser extent for the Esplanade, where there are no benches and walkways on the landscaped separators between local access streets and the center roadway.

All three boulevards function as linear parks. Exercise activities are frequent. The boulevards rank first as places to jog, bicycle, and stroll.

Neighboring

Residents on the boulevards may know fewer neighbors from homes across the street, but traffic does not prohibit neighboring on their own side of the street. In response to open-ended questions, boulevard residents have good things to say about their neighbors and the friendly quality of the street. They have more friends and acquaintances among neighbors than do residents on the medium streets.

Application of Study Findings and Future Studies

Boulevards are special streets. The research shows that they are generally more livable than conventional streets with medium or high traffic volumes, but boulevard designs are not a panacea for all residential streets with high or medium traffic volumes. For example, streets in inner city locations are rarely wide enough to introduce boulevard designs, which require a minimum of 120 feet — or better

yet, a 150-foot right of way. In places where such width exists, however, boulevards are possible and residents would benefit from local access streets in front of their homes that are separated from the faster moving through-traffic by formal landscaping. But deciding on a boulevard design also changes the existing physical structure of a city in that boulevards are most appropriate when they make important connections between urban districts. Like Olmsted's parkways in Brooklyn, which were intended to connect Prospect Park with the rest of New York City, modern boulevards in the context of existing cities would also have to be designed with such connections in mind. The boulevard residents in our study were aware of the special nature of their streets in the overall structure of their city.

In suburban locations, similar reasoning applies. Boulevards can play an important role in connecting new communities to existing places. Unlike arterial parkways with limited access functions, boulevards would better connect suburban neighborhoods with one another for a variety of travel modes including foot traffic, bicycling, and public and private transportation.

Before we recommend the use of boulevards, however, this team of researchers intends to test the boulevard designs with regard to air quality. High traffic volumes are associated with air pollution — i.e., carbon monoxide concentrations and airborne diesel exhaust particles. Future research needs to address the role of street trees as a mitigator of pollutant dispersion in urban street canyons. A follow-up study of this research will study airflow patterns on specific boulevards like Eastern Parkway. We propose to use wind tunnel experiments in order to model the airflows in street canyons. We will create model scenarios and test the presence and absence of street trees and different right of way cross sections. Following wind tunnel studies, we will map pollutant dispersion patterns in the different design scenarios. We are encouraged to pursue these follow-up studies because in the overall assessment there was significant agreement among boulevard residents that their streets are livable, pleasant to live on, special, friendly, and well connected to other parts of their community.

APPENDIX A

Neighborhood Street Study

Thank you for participating in this survey. This information will be used in a study of the quality of street life in your city that we are conducting through the Institute of Urban and Regional Development at the University of California at Berkeley. Your identity will remain confidential.

Please answer each question listed below. It should take about 15 minutes to complete the whole questionnaire. We will be coming to your door sometime during the weekend of March 22 and at that time would like to ask you a few additional questions. If for some reason we miss you, please mail this survey back in the envelope provided.

If you have any questions, please do not hesitate to contact Elizabeth Macdonald at (510) 642-4874. Again, thanks for your help.

1. Which street and block do you live on?

2. How long have you lived here?

3. How long have you lived in this neighborhood?

4. How long do you think most people on this street have lived here? (check one)

- ❑ less than 3 years
- ❑ 3 - 5 years
- ❑ 5 - 10 years
- ❑ 10 - 20 years
- ❑ more than 20 years

5. If you were to describe your street, what are the first four or five things that come to mind?

6. Which of these statements best describes your feelings generally about living on this street? (check one)

- ❑ I'm very happy here
- ❑ I'm fairly happy here
- ❑ I'm neither happy nor unhappy here
- ❑ I'm fairly unhappy here
- ❑ I'm very unhappy here

7. Do you feel you have a level of responsibility for the way this street looks and for what happens on it? (check one)

- ❑ extremely responsible
- ❑ quite responsible
- ❑ somewhat responsible
- ❑ slightly responsible
- ❑ not at all responsible

8. Which of these statements best describes the way the buildings, sidewalks and front yards are kept up on this street? (check one)

- ❑ very well kept up
- ❑ fairly well kept up
- ❑ satisfactory
- ❑ not very well kept up
- ❑ not at all kept up

9. Thinking about your street, the block you live one, which of these statements best describes how much this street feels like home to you? (check one)

- ❑ most definitely feels like home
- ❑ usually feels like home
- ❑ sometimes feels like home
- ❑ suppose it could feel like home
- ❑ never feels like home

10. Are there places on your street where people tend to gather? Is so where?

11. The following is a list of activities that occur on some streets in your city. Please indicate how often, if at all, the activity goes on here on your street--that is on the street itself, on the sidewalks, or in the front yards.

people talking	❑ frequently	❑ occasionally	❑ never
people sitting outside	❑ frequently	❑ occasionally	❑ never
parents supervising kids	❑ frequently	❑ occasionally	❑ never
kids playing with toys	❑ frequently	❑ occasionally	❑ never
bike riding	❑ frequently	❑ occasionally	❑ never
walking pets	❑ frequently	❑ occasionally	❑ never
jogging	❑ frequently	❑ occasionally	❑ never
roller skating	❑ frequently	❑ occasionally	❑ never
ball games, frisbee	❑ frequently	❑ occasionally	❑ never
building things	❑ frequently	❑ occasionally	❑ never
gardening	❑ frequently	❑ occasionally	❑ never
car washing	❑ frequently	❑ occasionally	❑ never
car repairing	❑ frequently	❑ occasionally	❑ never
garage sales	❑ frequently	❑ occasionally	❑ never

12. Thinking about the pedestrian activity on your street, would you say there is too much, too little or just about the right amount? (check one)

- ❑ far too many pedestrians
- ❑ a few too many pedestrians
- ❑ just the right amount
- ❑ not quite enough
- ❑ not nearly enough
- ❑ don't know or don't care

13. How do you feel about bicycle activity on your street? (check one)

- ❑ far too many bicyclists
- ❑ a few too many bicyclists
- ❑ just the right amount
- ❑ not quite enough
- ❑ not nearly enough
- ❑ don't know or don't care

14. Are there physical characteristics to your street that are considerably different then other streets you know in your city? If so, what are they?

15. Can you rank your street in terms of remoteness or connectedness to city life? (check one)

- ❑ remote from city life
- ❑ somewhat remote from city life
- ❑ neither remote nor connected to city life
- ❑ somewhat connected to city life
- ❑ closely connected to city life
- ❑ not sure

16. Is there anything that bothers you about living on this street? If yes what?

17. Some people in cities think their streets are dangerous because of traffic, others think their streets are safe. Which statement best describes the situation on this street? (check one)

- ❑ safe
- ❑ somewhat safe
- ❑ neither safe nor dangerous
- ❑ somewhat dangerous
- ❑ very dangerous
- ❑ don't know

18. Which statement best describes how often you are aware of the traffic on this street? (check one)

- ❑ very often
- ❑ quite often
- ❑ sometimes
- ❑ hardly ever
- ❑ never

19. At which of these times is traffic the heaviest on this street? (check one)

- ❑ morning commute hours
- ❑ lunchtime
- ❑ after school
- ❑ afternoon/evening commute hours
- ❑ evenings from 7 to 11 pm
- ❑ weekends
- ❑ it's about the same all the time
- ❑ don't know

20. Do you think that the overall speed of traffic on this street is too fast, about right, or too slow? (check one)

- ❑ much too fast
- ❑ somewhat too fast
- ❑ about right
- ❑ somewhat too slow
- ❑ much too slow

21. How would you rate the amount of traffic on this street, for a residential street? (check one)

- ❑ very heavy
- ❑ fairly heavy
- ❑ about average
- ❑ fairly light
- ❑ very light

22. How difficult or easy is it to cross your street? (check one)

- ❑ very difficult
- ❑ fairly difficult
- ❑ about average
- ❑ fairly easy
- ❑ very easy

23. What about the traffic on this street over the last few years? Has it improved, gotten worse, or has it stayed pretty much the same? (check one)

- ❑ improved a great deal
- ❑ improved somewhat
- ❑ stayed the same
- ❑ gotten somewhat worse
- ❑ gotten a great deal worse

24. For each of the following activities, please indicate if traffic on your street bothers you often, sometimes or not at all.

when watching t.v.	❑ often	❑ sometimes	❑ not at all
when walking on the street	❑ often	❑ sometimes	❑ not at all
when sleeping	❑ often	❑ sometimes	❑ not at all
when talking in my house	❑ often	❑ sometimes	❑ not at all
when working in my house	❑ often	❑ sometimes	❑ not at all
when eating in my house	❑ often	❑ sometimes	❑ not at all
when kids are playing outside	❑ often	❑ sometimes	❑ not at all

25. Which, if any, of these things have you done because of traffic nuisance and/or noise?

- ❑ keep windows shut and/or shades down
- ❑ fenced or walled-in yard
- ❑ added heavy curtains, drapes, or blinds
- ❑ planted trees or shrubs in the front yard
- ❑ go out on the street less often
- ❑ forbid children to play on the street
- ❑ accompany children to school
- ❑ tell children not to cross certain streets
- ❑ live more in the back of the house, away from the street
- ❑ other things (please indicate what):
- ❑ none of these things

26. Suppose for a moment that you had the money and the authority to change your street and the surroundings outside of your home in any way that you wanted. Is there something that you would like to change most of all?

27. Do you or other members of your household, own a car, truck, or motorcycle?

- ❑ yes
- ❑ no

28. Including yourself, how many people live in your household?

29. How many people are there in each age group?

under 5 years old	_____
5 - 9 years	_____
10 - 14 years	_____
15 - 19 years	_____
20 - 50 years	_____
50 - 65 years	_____
over 65 years	_____

30. Do you own or rent?

- ❑ own
- ❑ rent

31. Do you have a back yard?

- ❑ yes
- ❑ no

32. About how much of your time do you spend at your home, inside or outside, during the following times?

weekday mornings	❑ all	❑ most	❑ about half	❑ little	❑ none
weekday afternoons	❑ all	❑ most	❑ about half	❑ little	❑ none
weekday evenings (after 6)	❑ all	❑ most	❑ about half	❑ little	❑ none
weekends	❑ all	❑ most	❑ about half	❑ little	❑ none

For the last part of this survey, which will take place when we visit, we would like you to draw two simple diagrams using the map provided at the time. We will ask you to do the following:

33. Please draw a line around any area which you consider to be your home territory.

34. Please draw lines from the building where you live to the other buildings shown where you have friends or acquaintances.

Thank you for completing this survey.

APPENDIX B

Case Study #1:
CHICO STREETS

Selected Statistical Tests

This is a comparison of the general feeling variables between all three streets
It shows that there are signifcant differences and that generally the heavy street
i.e the boulevard is ranked better than the medium street. This is contrary to expectations
based on Appleyard's study.

The second part shows paired comparisons between each two streets. There are no significant
differences between the boulevard and the light street. But there is also only one
statistically significant difference between the boulevard and the medium street which is
in feelings of responsibility

	N	Mean	Std Dev	Minimum	Maximum	Label
GNRLFLG	35	1.486	.702	-1	2	General Feelings
RESPNSBL	35	3.486	1.197	1	5	Responsibility for street
UPKEEP	35	1.457	.611	0	2	Street Upkeep
HOMFEEL	35	4.314	.796	2	5	Feeling of Home
STTYPE	35	1.057	.838	0	2	Street Type

- - - - - Kruskal-Wallis 1-Way Anova

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases		
22.50	11	STTYPE = 0	Light
12.86	11	STTYPE = 1	Medium
18.54	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
4.9212	2	.0854	6.4519	2	.0397

- - - - - Kruskal-Wallis 1-Way Anova

RESPNSBL Responsibility for street
by STTYPE Street, Type

Mean Rank	Cases		
22.23	11	STTYPE = 0	Light
11.23	11	STTYPE = 1	Medium
20.15	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
7.2518	2	.0266	7.8191	2	.0200

- - - - Kruskal-Wallis 1-Way Anova

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases		
22.73	11	STTYPE = 0	Light
14.50	11	STTYPE = 1	Medium
16.96	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
3.7580	2	.1527	4.7829	2	.0915

- - - - - Kruskal-Wallis 1-Way Anova

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases		
17.32	11	STTYPE = 0	Light
17.86	11	STTYPE = 1	Medium
18.69	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
.1100	2	.9465	.1359	2	.9343

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases		
14.59	11	STTYPE = 0	Light
8.41	11	STTYPE = 1	Medium
	--		
	22	Total	

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
26.5	160.5	.0233	-2.5431	.0110

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases		
14.86	11	STTYPE = 0	Light
8.14	11	STTYPE = 1	Medium
	--		
	22	Total	

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
23.5	163.5	.0128	-2.5058	.0122

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases		
14.14	11	STTYPE = 0	Light
8.86	11	STTYPE = 1	Medium
	--		
	22	Total	

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
31.5	155.5	.0557	-2.1691	.0301

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
11.32	11	STTYPE = 0 Light
11.68	11	STTYPE = 1 Medium
	--	
	22	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
58.5	124.5	.8977	-.1496	.8811

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases	
10.45	11	STTYPE = 1 Medium
14.23	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
49.0	115.0	.2066	-1.4496	.1472

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
9.09	11	STTYPE = 1 Medium
15.38	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
34.0	100.0	.0301	-2.2561	.0241

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
11.64	11	STTYPE = 1 Medium
13.23	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
62.0	128.0	.6085	-.6355	.5251

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
12.18	11	STTYPE = 1 Medium
12.77	13	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
68.0	134.0	.8646	-.2235	.8231

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases	
13.91	11	STTYPE = 0 Light
11.31	13	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
56.0	153.0	.3918	-1.1314	.2579

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
13.36	11	STTYPE = 0 Light
11.77	13	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
62.0	147.0	.6085	-.5809	.5613

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
14.59	11	STTYPE = 0 Light
10.73	13	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
48.5	160.5	.1863	-1.5578	.1193

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
12.00	11	STTYPE = 0 Light
12.92	13	STTYPE = 2 Heavy
	24	Total

U	W	Exact 2-Tailed P	Corrected for ties Z	Corrected for ties 2-Tailed P
66.0	132.0	.7762	-.3543	.7231

Relationships of rank with traffic variables all of them seem to be significant needs

	N	Mean	Std Dev	Minimum	Maximum	Label
SAFETY	34	.588	1.459	-2	2	Safety from traffic
TFFCAWR	35	3.743	1.245	1	5	Awareness of traffic
SPEED	35	.514	.562	0	2	Traffic speed
VOLUME	35	.600	1.035	-2	2	Traffic volume
CROSSDIF	35	-.029	1.562	-2	2	Crossing difficulty
TFCTREND	29	-.552	.632	-2	0	Traffic trend
STTYPE	35	1.057	.838	0	2	Street Type

- - - - - Kruskal-Wallis 1-Way Anova

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases		
24.00	11	STTYPE = 0	Light
11.18	11	STTYPE = 1	Medium
17.33	12	STTYPE = 2	Heavy
	--		
	34	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
9.1180	2	.0105	10.0517	2	.0066

- - - - - Kruskal-Wallis 1-Way Anova

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases		
12.45	11	STTYPE = 0	Light
24.36	11	STTYPE = 1	Medium
17.31	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
7.5234	2	.0232	8.1637	2	.0169

- - - - - Kruskal-Wallis 1-Way Anova

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases		
15.68	11	STTYPE = 0	Light
24.18	11	STTYPE = 1	Medium
14.73	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
5.8897	2	.0526	7.6584	2	.0217

- - - - - Kruskal-Wallis 1-Way Anova

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases		
10.23	11	STTYPE = 0	Light
27.45	11	STTYPE = 1	Medium
16.58	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
15.9445	2	.0003	17.3940	2	.0002

- - - - - Kruskal-Wallis 1-Way Anova

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases		
7.91	11	STTYPE = 0	Light
27.36	11	STTYPE = 1	Medium
18.62	13	STTYPE = 2	Heavy
	--		
	35	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
19.8997	2	.0000	20.9193	2	.0000

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases		
12.91	11	STTYPE = 0	Light
19.68	11	STTYPE = 1	Medium
10.93	7	STTYPE = 2	Heavy
	--		
	29	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
5.5895	2	.0611	7.0630	2	.0293

	N	Mean	Std Dev	Minimum	Maximum	Label
VOLUMEAC	30	.533	1.106	-2	2	Traffic volume on access road
STTYPE	35	1.057	.838	0	2	Street Type

- - - - - Kruskal-Wallis 1-Way Anova

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
9.55	11	STTYPE = 0 Light
23.59	11	STTYPE = 1 Medium
12.56	8	STTYPE = 2 Heavy
	--	
	30	Total

Chi-Square	D.F.	Significance	Corrected for ties Chi-Square	D.F.	Significance
15.2148	2	.0005	16.3613	2	.0003

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
10.09	11	STTYPE = 0 Light
8.57	7	STTYPE = 2 Heavy
	--	
	18	Total

U	W	Exact 2-Tailed P	Z	Corrected for ties 2-Tailed P
32.0	60.0	.5962	-.7513	.4525

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
8.86	11	STTYPE = 0 Light
11.56	8	STTYPE = 2 Heavy
	--	
	19	Total

U	W	Exact 2-Tailed P	Z	Corrected for ties 2-Tailed P
31.5	92.5	.3100	-1.1242	.2609

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
11.50	11	STTYPE = 1 Medium
6.36	7	STTYPE = 2 Heavy
	--	
	18	Total

U	W	Exact 2-Tailed P	Z	Corrected for ties 2-Tailed P
16.5	44.5	.0441	-2.1928	.0283

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
13.27	11	STTYPE = 1 Medium
5.50	8	STTYPE = 2 Heavy
	19	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
8.0	44.0	.0018	-3.1613	.0016

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases	
14.23	11	STTYPE = 0 Light
9.96	12	STTYPE = 2 Heavy
	23	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
41.5	156.5	.1335	-1.6487	.0992

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
10.55	11	STTYPE = 0 Light
14.15	13	STTYPE = 2 Heavy
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
50.0	116.0	.2284	-1.2842	.1991

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases	
12.86	11	STTYPE = 0 Light
12.19	13	STTYPE = 2 Heavy
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
67.5	141.5	.8201	-.2836	.7767

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
9.55	11	STTYPE = 0 Light
15.00	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
39.0	105.0	.0629	-1.9988	.0456

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
10.09	11	STTYPE = 0 Light
8.57	7	STTYPE = 2 Heavy
	--	
	18	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
32.0	60.0	.5962	-.7513	.4525

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
8.86	11	STTYPE = 0 Light
11.56	8	STTYPE = 2 Heavy
	--	
	19	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
31.5	92.5	.3100	-1.1242	.2609

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases	
7.91	11	STTYPE = 0 Light
16.38	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
21.0	87.0	.0025	-3.0532	.0023

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases	
9.95	11	STTYPE = 1 Medium
13.88	12	STTYPE = 2 Heavy
	--	
	23	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
43.5	109.5	.1693	-1.4504	.1469

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
15.27	11	STTYPE = 1 Medium
10.15	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
41.0	168.0	.0821	-1.8874	.0591

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases	
16.00	11	STTYPE = 1 Medium
9.54	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
33.0	176.0	.0257	-2.5256	.0115

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
17.14	11	STTYPE = 1 Medium
8.58	13	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
20.5	188.5	.0020	-3.1506	.0016

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
11.50	11	STTYPE = 1 Medium
6.36	7	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
16.5	44.5	.0441	-2.1928	.0283

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
13.27	11	STTYPE = 1 Medium
5.50	8	STTYPE = 2 Heavy
	19	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
8.0	44.0	.0018	-3.1613	.0016

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases	
16.36	11	STTYPE = 1 Medium
9.23	13	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
29.0	180.0	.0129	-2.5629	.0104

Case Study #2:
BENSONHURST STREETS

Selected Statistical Tests

	N	Mean	Std Dev	Minimum	Maximum
GNRLFLG	30	1.400	.724	0	2
RESPNSBL	30	3.200	1.270	1	5
UPKEEP	30	.867	.860	-2	2
HOMFEEL	30	4.067	1.172	0	5
STTYPE	31	.935	.892	0	2

- - - - - Kruskal-Wallis 1-Way Anova

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases		
15.92	12	STTYPE = 0	Light
12.21	7	STTYPE = 1	Medium
17.14	11	STTYPE = 2	Heavy
	--		
	30	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.3821	2	.5011	1.7067	2	.4260

- - - - - Kruskal-Wallis 1-Way Anova

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases		
16.00	12	STTYPE = 0	Light
10.00	7	STTYPE = 1	Medium
18.45	11	STTYPE = 2	Heavy
	--		
	30	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
4.0100	2	.1347	4.3132	2	.1157

- - - - Kruskal-Wallis 1-Way Anova

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases		
17.00	12	STTYPE = 0	Light
14.79	7	STTYPE = 1	Medium
14.32	11	STTYPE = 2	Heavy
	--		
	30	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
.5927	2	.7435	.7154	2	.6993

- - - - - Kruskal-Wallis 1-Way Anova

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases		
13.04	12	STTYPE = 0	Light
11.50	7	STTYPE = 1	Medium
20.73	11	STTYPE = 2	Heavy
	--		
	30	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
6.2592	2	.0437	7.2031	2	.0273

Only feeling of home is statistically significant from the general feeling variables. It is best for the boulevard, than for the light street and then for the medium street. Responsibility for street is close to being significant with a value of about 11%.

	N	Mean	Std Dev	Minimum	Maximum
HOMFEEL	30	4.067	1.172	0	5
RESPNSBL	30	3.200	1.270	1	5
STTYPE	31	.935	.892	0	2

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases		
6.43	7	STTYPE = 1	Medium
11.45	11	STTYPE = 2	Heavy
	--		
	18	Total	

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
17.0	45.0	.0556	-2.1648	.0304

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases		
6.07	7	STTYPE = 1	Medium
11.68	11	STTYPE = 2	Heavy
	--		
	18	Total	

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
14.5	42.5	.0268	-2.3032	.0213

There is statistically significant difference between medium and heavy streets for feeling of home, and for responsibility. In both cases the boulevard ranks higher.

	N	Mean	Std Dev	Minimum	Maximum
HOMFEEL	30	4.067	1.172	0	5
RESPNSBL	30	3.200	1.270	1	5
STTYPE	31	.935	.892	0	2

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
9.00	12	STTYPE = 0 Light
15.27	11	STTYPE = 2 Heavy
	23	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
30.0	168.0	.0268	-2.4298	.0151

Boulevard ranks higher than the light street in the feeling of home variable. Significant at the 5% level.

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
11.29	12	STTYPE = 0 Light
12.77	11	STTYPE = 2 Heavy
	23	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
57.5	140.5	.6075	-.5464	.5848

	N	Mean	Std Dev	Minimum	Maximum
HOMFEEL	30	4.067	1.172	0	5
RESPNSBL	30	3.200	1.270	1	5
STTYPE	31	.935	.892	0	2

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
10.54	12	STTYPE = 0 Light
9.07	7	STTYPE = 1 Medium
	19	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
35.5	63.5	.5918	-.5777	.5635

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
11.21	12	STTYPE = 0 Light
7.93	7	STTYPE = 1 Medium
	19	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
27.5	55.5	.2268	-1.2632	.2065

There is no significant difference beween the light and medium street along these two variables

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases	
7.64	7	STTYPE = 1 Medium
10.68	11	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
25.5	53.5	.2463	-1.3023	.1928

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
12.96	12	STTYPE = 0 Light
10.95	11	STTYPE = 2 Heavy
	23	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
54.5	120.5	.4865	-.7727	.4397

- - - - - Kruskal-Wallis 1-Way Anova

SAFETY Safety from traffic BOULEVARD RANKS BEST BUT NOT SIGNIFICANT
by STTYPE Street Type

Mean Rank	Cases		
12.27	11	STTYPE = 0	Light (2)
7.60	5	STTYPE = 1	Medium (3)
14.71	7	STTYPE = 2	Heavy (1)
	--		
	23	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
3.2433	2	.1976	3.5521	2	.1693

- - - - - Kruskal-Wallis 1-Way Anova

TFFCAWR Awareness of traffic BOULEVARD RANKS BETWEEN LIGHT AND MEDIUM
by STTYPE Street Type SIGNIFICANT

Mean Rank	Cases		
11.81	13	STTYPE = 0	Light
24.00	7	STTYPE = 1	Medium
15.86	11	STTYPE = 2	Heavy
	--		
	31	Total	

			Corrected for ties			
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance	
8.1857	2	.0167	9.3659	2	.0093	***

- - - - - Kruskal-Wallis 1-Way Anova

SPEED Traffic speed BOULEVARD RANKS BEST SIGNIFICANT AT 10%.
by STTYPE Street Type

Mean Rank	Cases		
16.69	13	STTYPE = 0	Light
20.79	7	STTYPE = 1	Medium
12.14	11	STTYPE = 2	Heavy
	--		
	31	Total	

			Corrected for ties			
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance	
4.0011	2	.1353	5.2640	2	.0719	**

- - - - - Kruskal-Wallis 1-Way Anova

VOLUME Traffic volume BOULEVARD RANKS SECOND - SIGNIFICANT
by STTYPE Street Type

Mean Rank	Cases		
10.00	13	STTYPE = 0	Light
23.93	7	STTYPE = 1	Medium
18.05	11	STTYPE = 2	Heavy
	--		
	31	Total	

			Corrected for ties			
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance	
11.5410	2	.0031	12.9364	2	.0016	***

- - - - - Kruskal-Wallis 1-Way Anova

SPEEDACS Traffic speed on access road — BOULEVARD RANKS BEST NOT SIGNIFICANT
by STTYPE Street Type

Mean Rank	Cases		
15.23	13	STTYPE = 0	Light
19.07	7	STTYPE = 1	Medium
11.50	9	STTYPE = 2	Heavy
	--		
	29	Total	

Chi-Square	D.F.	Significance	Corrected for ties Chi-Square	D.F.	Significance
3.1307	2	.2090	4.0237	2	.1337

- - - - - Kruskal-Wallis 1-Way Anova

VOLUMEAC Traffic volume on access road — BOULEVARD RANKS BEST - SIGNIFICANT
by STTYPE Street Type

Mean Rank	Cases		
13.42	13	STTYPE = 0	Light
24.93	7	STTYPE = 1	Medium
9.56	9	STTYPE = 2	Heavy
	--		
	29	Total	

Chi-Square	D.F.	Significance	Corrected for ties Chi-Square	D.F.	Significance	
13.6433	2	.0011	15.6474	2	.0004	***

- - - - - Kruskal-Wallis 1-Way Anova

CROSSDIF Crossing difficulty — BOULEVARD RANKS WORST - SIGNIFICANT
by STTYPE Street Type

Mean Rank	Cases		
10.73	13	STTYPE = 0	Light
19.07	7	STTYPE = 1	Medium
20.27	11	STTYPE = 2	Heavy
	--		
	31	Total	

Chi-Square	D.F.	Significance	Corrected for ties Chi-Square	D.F.	Significance	
7.5943	2	.0224	9.5993	2	.0082	***

COMPARISON BETWEEN LIGHT AND MEDIUM STREET ALONG THE TRAFFIC VARIABLES
SIGNIFICANT DIFFERENCES ONLY IN VOULEM AND AWARENESS OF TRAFFIC

- - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases		
9.55	11	STTYPE = 0	Light
6.20	5	STTYPE = 1	Medium
	--		
	16	Total	

U	W	Exact 2-Tailed P	Corrected for ties Z	2-Tailed P
16.0	31.0	.2212	-1.3546	.1755

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
7.54	13	STTYPE = 0 Light
16.00	7	STTYPE = 1 Medium
	20	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
7.0	112.0	.0012	-3.2514	.0011	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases	
9.58	13	STTYPE = 0 Light
12.21	7	STTYPE = 1 Medium
	20	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
33.5	85.5	.3507	-1.0509	.2933

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
7.50	13	STTYPE = 0 Light
16.07	7	STTYPE = 1 Medium
	20	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
6.5	112.5	.0008	-3.3021	.0010	***

TWO WAY COMPARISON BETWEEN LIGHT AND BOULEVARD
THE ONLY SIGNIFICANT DIFFERENCE IS IN THE TRAFFIC VOLUME VARIABLE

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases	
8.73	11	STTYPE = 0 Light
10.71	7	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
30.0	75.0	.4789	-.8239	.4100

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
11.27	13	STTYPE = 0 Light
13.95	11	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
55.5	153.5	.3607	-.9586	.3378	

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEED Traffic speed

by STTYPE Street Type

Mean Rank	Cases	
14.12	13	STTYPE = 0 Light
10.59	11	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
50.5	116.5	.2284	-1.4754	.1401	

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
9.50	13	STTYPE = 0 Light
16.05	11	STTYPE = 2 Heavy
	--	
	24	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
32.5	176.5	.0218	-2.4483	.0144	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
12.65	13	STTYPE = 0 Light
9.83	9	STTYPE = 2 Heavy
	--	
	22	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
43.5	88.5	.3237	-1.1875	.2350	

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
12.92	13	STTYPE = 0 Light
9.44	9	STTYPE = 2 Heavy
	22	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
40.0	85.0	.2349	-1.4408	.1496

TWO WAY COMPARISON BETWEEN MEDIUM AND BOULEVARD STREETS
ALL THE VARIABLES EXCEPT THE TREND ARE SIGNIFICANT MOST AT THE 0.05 LEVEL

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases	
4.40	5	STTYPE = 1 Medium
8.00	7	STTYPE = 2 Heavy
	12	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
7.0	22.0	.1061	-1.7816	.0748	**

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
12.00	7	STTYPE = 1 Medium
7.91	11	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
21.0	84.0	.1259	-2.0226	.0431	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases	
12.57	7	STTYPE = 1 Medium
7.55	11	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
17.0	88.0	.0556	-2.2684	.0233	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
11.86	7	STTYPE = 1 Medium
8.00	11	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
22.0	83.0	.1509	-1.6345	.1022	*

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases	
9.19	13	STTYPE = 0 Light
16.41	11	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
28.5	180.5	.0107	-2.7374	.0062

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases	
8.93	7	STTYPE = 1 Medium
9.86	11	STTYPE = 2 Heavy
	18	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
34.5	62.5	.7242	-.4123	.6801

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases	
14.14	7	STTYPE = 1 Medium
8.54	13	STTYPE = 0 Light
	20	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
20.0	99.0	.0456	-2.3846	.0171

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SPEEDACS Traffic speed on access road
by STTYPE Street Type

Mean Rank	Cases	
10.86	7	STTYPE = 1 Medium
6.67	9	STTYPE = 2 Heavy
	16	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
15.0	76.0	.0907	-1.9877	.0468	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Mean Rank	Cases	
12.86	7	STTYPE = 1 Medium
5.11	9	STTYPE = 2 Heavy
	16	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
1.0	90.0	.0003	-3.3488	.0008	***

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFCTREND Traffic trend
by STTYPE Street Type

Mean Rank	Cases	
7.67	6	STTYPE = 1 Medium
9.73	11	STTYPE = 2 Heavy
	17	Total

		Exact	Corrected for ties		
U	W	2-Tailed P	Z	2-Tailed P	
25.0	46.0	.4623	-1.0014	.3166	

Case Study #3:
CROWN HEIGHTS STREETS

Selected Statistical Tests

This is a comparison of the general feeling variables. The first table gives the means Fro all of them. The Other tables are differences in ranks tests to see whether they are sufficiently different to be statistically significant.
In none of the tests is the difference significant.

	N	Mean	Std Dev	Minimum	Maximum	Label
GNRLFLG	33	1.545	.971	-1	5	General Feelings
RESPNSBL	33	3.424	1.200	1	5	Responsibility for street
UPKEEP	33	1.212	.781	0	2	Street Upkeep
HOMFEEL	33	4.333	1.080	1	5	Feeling of Home
STTYPE	33	1.000	.866	0	2	Street Type

- - - - - Kruskal-Wallis 1-Way Anova

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GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases		
15.04	12	STTYPE = 0	Light
16.33	9	STTYPE = 1	Medium
19.46	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.3106	2	.5193	1.6359	2	.4413

Although there is no statistical significance the boulevard ranks highest in general feeling the quiet street ranks lowest.

- - - - - Kruskal-Wallis 1-Way Anova

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases		
14.00	12	STTYPE = 0	Light
18.78	9	STTYPE = 1	Medium
18.67	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.8158	2	.4034	2.0272	2	.3629

Again there is no statistical difference but the medium street and boulevard are virtually tied. Again the quiet street ranks lowest.

- - - - - Kruskal-Wallis 1-Way Anova

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases		
17.33	12	STTYPE = 0	Light
14.67	9	STTYPE = 1	Medium
18.42	12	STTYPE = 2	Heavy
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
.7959	2	.6717	.9182	2	.6319

The boulevard ranks highest for upkeep.

- - - - - Kruskal-Wallis 1-Way Anova

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases		
14.92	12	STTYPE = 0	Light
19.50	9	STTYPE = 1	Medium
17.21	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.1642	2	.5587	1.5261	2	.4662

The boulevard ranks second, it is interesting that the quiet street ranks lowest for feeling of home.

The following are tests that compare between each two streets along the same variables. They also show no significant difference.

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases		
10.63	12	STTYPE = 0	Light
11.50	9	STTYPE = 1	Medium
	--		
	21	Total	

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
49.5	103.5	.7544	-.3531	.7240

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
9.71	12	STTYPE = 0 Light
12.72	9	STTYPE = 1 Medium
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
38.5	114.5	.2773	-1.1463	.2517

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
11.75	12	STTYPE = 0 Light
10.00	9	STTYPE = 1 Medium
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
45.0	90.0	.5538	-.6826	.4948

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
9.83	12	STTYPE = 0 Light
12.56	9	STTYPE = 1 Medium
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
40.0	113.0	.3451	-1.1444	.2525

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases	
10.92	12	STTYPE = 0 Light
14.08	12	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
53.0	131.0	.2913	-1.2225	.2215

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
10.79	12	STTYPE = 0 Light
14.21	12	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
51.5	129.5	.2415	-1.2512	.2109

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
12.08	12	STTYPE = 0 Light
12.92	12	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
67.0	145.0	.7987	-.3135	.7539

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
11.58	12	STTYPE = 0 Light
13.42	12	STTYPE = 2 Heavy
	--	
	24	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
61.0	139.0	.5512	-.7032	.4819

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

GNRLFLG General Feelings
by STTYPE Street Type

Mean Rank	Cases	
9.83	9	STTYPE = 1 Medium
11.88	12	STTYPE = 2 Heavy
	--	
	21	Total

		Exact		Corrected for ties
U	W	2-Tailed P	Z	2-Tailed P
43.5	88.5	.4639	-.8460	.3975

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

RESPNSBL Responsibility for street
by STTYPE Street Type

Mean Rank	Cases	
11.06	9	STTYPE = 1 Medium
10.96	12	STTYPE = 2 Heavy
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
53.5	99.5	.9723	-.0386	.9692

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

UPKEEP Street Upkeep
by STTYPE Street Type

Mean Rank	Cases	
9.67	9	STTYPE = 1 Medium
12.00	12	STTYPE = 2 Heavy
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
42.0	87.0	.4221	-.9129	.3613

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

HOMFEEL Feeling of Home
by STTYPE Street Type

Mean Rank	Cases	
11.94	9	STTYPE = 1 Medium
10.29	12	STTYPE = 2 Heavy
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
45.5	107.5	.5538	-.7264	.4676

- - - - - Kruskal-Wallis 1-Way Anova

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases		
17.06	9	STTYPE = 0	Light
15.44	8	STTYPE = 1	Medium
11.73	11	STTYPE = 2	Heavy
	--		
	28	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
2.2223	2	.3292	2.5952	2	.2732

- - - - - Kruskal-Wallis 1-Way Anova

TFFCAWR Awareness of traffic — On the boulevard there is much more awareness of traffic.
by STTYPE Street Type

Mean Rank	Cases		
12.38	12	STTYPE = 0	Light
14.78	9	STTYPE = 1	Medium
23.29	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
8.3011	2	.0158	9.4833	2	.0087

- - - - - Kruskal-Wallis 1-Way Anova

SPEED Traffic speed
by STTYPE Street Type

Mean Rank	Cases		
13.75	12	STTYPE = 0	Light
16.00	9	STTYPE = 1	Medium
21.00	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
3.5053	2	.1733	4.2095	2	.1219

- - - - - Kruskal-Wallis 1-Way Anova

VOLUME Traffic volume
by STTYPE Street Type

Significant difference in assessment of Traffic volume.

Mean Rank	Cases		
11.25	12	STTYPE = 0	Light
18.06	9	STTYPE = 1	Medium
21.96	12	STTYPE = 2	Heavy
	--		
	33	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
7.5059	2	.0234	8.8433	2	.0120

- - - - Kruskal-Wallis 1-Way Anova

CROSSDIF Crossing difficulty
by STTYPE Street Type

Mean Rank	Cases		
14.79	12	STTYPE = 0	Light
16.44	9	STTYPE = 1	Medium
19.63	12	STTYPE = 2	Heavy
	--		
	33	Total	

Boulevard ranks most difficult but no statistical significance.

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.5400	2	.4630	1.6847	2	.4307

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases		
10.38	12	STTYPE = 0	Light
11.83	9	STTYPE = 1	Medium
	--		
	21	Total	

No significant difference in awareness of traffic between light and medium streets.

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
46.5	106.5	.6016	-.5612	.5746

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Significant difference in traffic volume assessment between light and medium streets.

Mean Rank	Cases	
9.00	12	STTYPE = 0 Light
13.67	9	STTYPE = 1 Medium
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
30.0	123.0	.0955	-2.0414	.0412

Both for awareness of traffic and for traffic volume there is a statistical difference between the light street and the boulevard.

- - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
8.50	12	STTYPE = 0 Light
16.50	12	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
24.0	102.0	.0045	-3.0066	.0026

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
8.75	12	STTYPE = 0 Light
16.25	12	STTYPE = 2 Heavy
	24	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
27.0	105.0	.0083	-2.7903	.0053

Between the medium and boulevard streets there is significant difference for awareness of traffic only, not for traffic volume - despite the very large difference in volume.

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

TFFCAWR Awareness of traffic
by STTYPE Street Type

Mean Rank	Cases	
7.94	9	STTYPE = 1 Medium
13.29	12	STTYPE = 2 Heavy
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
26.5	71.5	.0491	-2.2499	.0245

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUME Traffic volume
by STTYPE Street Type

Mean Rank	Cases	
9.39	9	STTYPE = 1 Medium
12.21	12	STTYPE = 2 Heavy
	--	
	21	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
39.5	84.5	.3100	-1.1151	.2648

	N	Mean	Std Dev	Minimum	Maximum	Label
SPEEDACS	32	.375	.833	-2	2	Traffic speed on access road
VOLUMEAC	32	.063	1.190	-2	2	Traffic volume on access road
STTYPE	33	1.000	.866	0	2	Street Type

- - - - - Kruskal-Wallis 1-Way Anova

SPEEDACS Traffic speed on access road
by STTYPE Street Type

There is no sign. difference between speed on access road and other streets

Mean Rank	Cases		
15.21	12	STTYPE = 0	Light
17.50	9	STTYPE = 1	Medium
17.09	11	STTYPE = 2	Heavy
	--		
	32	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
.3734	2	.8297	.4670	2	.7918

- - - - - Kruskal-Wallis 1-Way Anova

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

Significant difference for volume on acccess road, the boulevard actually ranks the lowest. At the 10% level

Mean Rank	Cases		
15.54	12	STTYPE = 0	Light
21.89	9	STTYPE = 1	Medium
13.14	11	STTYPE = 2	Heavy
	--		
	32	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
4.5095	2	.1049	5.5439	2	.0625

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

VOLUMEAC Traffic volume on access road
by STTYPE Street Type

The difference between the access road and the medium street is significant at the 5% level.

Mean Rank	Cases	
13.22	9	STTYPE = 1 Medium
8.27	11	STTYPE = 2 Heavy
	--	
	20	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
25.0	119.0	.0674	-1.9720	.0486

- - - - - Mann-Whitney U - Wilcoxon Rank Sum W Test

SAFETY Safety from traffic
by STTYPE Street Type

Mean Rank	Cases	
12.72	9	STTYPE = 0 Light
8.68	11	STTYPE = 2 Heavy
	--	
	20	Total

		Exact	Corrected for ties	
U	W	2-Tailed P	Z	2-Tailed P
29.5	114.5	.1308	-1.6746	.0940

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