NEW JERSEY SOCIETY OF MUNICIPAL ENGINEERS

ANALYSIS OF NEW JERSEY'S MUNICIPAL ROAD REPAIR NEEDS

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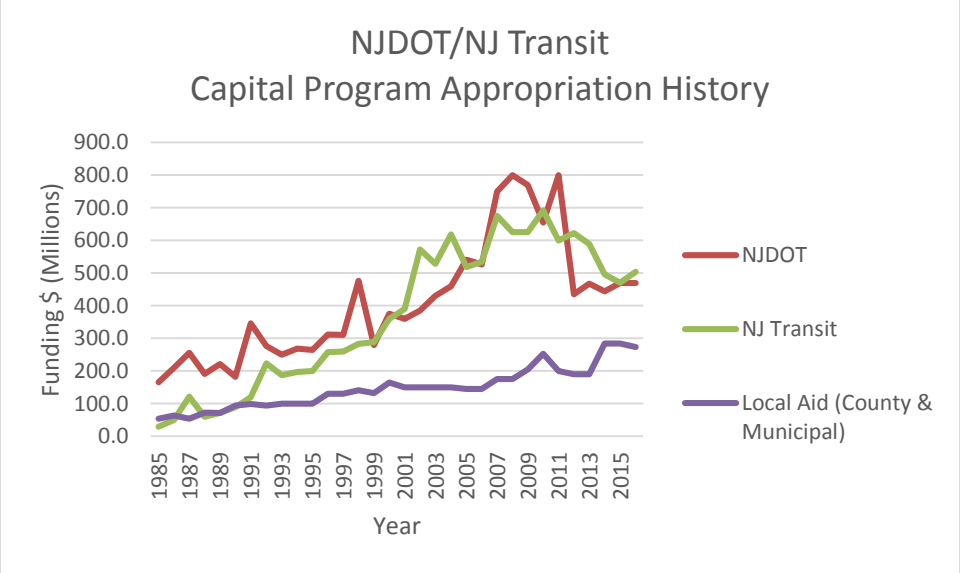
Introduction

New Jersey's municipal governments are responsible for the maintenance of over 29,000 miles of roads. That's approximately three times more centerline miles than all of the Counties, Authorities, Park Systems and the NJ Department of Transportation (NJDOT) put together. The majority of municipal roads are one lane in each direction while other entities are responsible for roads and highways with multiple lanes in each direction, higher speeds and greater traffic volumes. Nonetheless, the municipal road network is expansive and the cost to maintain it is large while the funds available for such maintenance are severely limited. Historically, there are many more municipal applications for Local Aid from NJDOT than there are awards. Maximum awards seldom exceed $250,000 and it is rare for a municipality to receive more than one Local Aid grant in a year. More frequently, a municipality will receive no funding at all in a given year. Demand for aid by municipalities far exceeds the supply from state coffers.

Graph 1 depicts New Jersey's Capital Appropriation History from 1985 through 2015, a period which saw funding for New Jersey Department of Transportation (NJDOT) and New Jersey Transit (NJT) grow substantially while Local Aid (funding for Counties and Municipalities) grew at a much slower pace. Funding for municipal road repair has clearly not kept pace with the expansion of the municipal road network caused by extensive suburban development during the past 30 years. Also, current New Jersey state law requires towns to accept additional local roads from developers or to agree to pay for public services on private roads via a developer's agreement. Thus, municipal governments are forced to assume additional costs for local road networks caused by development projects. These changes are placing additional strains on local government finances to provide these services out of local funding sources.

Graph 1 – NJDOT/NJ Transit Capital Program Appropriation History



Up until this point in time, there has not been a definitive and comprehensive projection of the overall New Jersey's funding needs to maintain the municipal road network – including the needs for maintenance of curbs, sidewalks, handicapped ramps, drainage systems, traffic signs and pavement markings. This analysis has been performed to help to inform public officials as to the ongoing need for a stable source of funding to keep New Jersey's municipal roads in acceptable and reliable condition.

Executive Summary

To keep New Jersey's 29,408 miles of municipal streets and roads in acceptable condition appears to require an annual expenditure of almost $ 1.3 billion on a continuing basis.

Annual funding from the NJ Transportation Trust Fund for Local Road Repairs (including both municipal and county roadways) has averaged $181.8 Million from 2000 – 2014 - an apparent gap of over $1.1 billion per year. Given the frail financial state of the New Jersey Transportation Trust Fund, it appears that future revenues are insufficient to maintain even this modest level of support to municipal government on a forward going basis.

Other sources of funding available to municipalities include: local property tax levies (currently capped at annual increases of 2%), assessments against abutting property owners and to a lesser extent parking revenues and other government programs such as the 2009 American Recovery and Reinvestment Act, of which a very small percentage of funding actually reached New Jersey's municipal governments.

New Jersey's municipal roadways are under daily attack by increasing traffic loads, weathering of the pavement surfaces, damage from water, ice and snow and excavations for utility maintenance. Local revenue streams appear to be grossly inadequate to maintain municipal roads curbs and sidewalks in acceptable condition. Unless reliable funding sources are developed, these municipal improvements will deteriorate, jeopardizing the safety and welfare of motorists, bicyclists and pedestrians, alike.

Background

Transportation funding and public finance in general have been under intense discussion in the last few decades at the national and state level in many states. With a large and aging transportation system and increased costs of infrastructure construction, many states struggle to find funding sources and new revenue streams to pay for public infrastructure. Governments that fail to address these matters run the risk of public bond default and potentially being unable to provide basic transportation and other public services. The well reported near bankruptcy of Puerto Rico, the painful failures in water quality in Flint, Michigan and the financial crisis in Atlantic City are all excellent examples of the intensity of this problem. Yet governmental units may take on the development and operations of major infrastructure systems with little thought to long term funding sources needed to provide the service. What then results is a scramble for resources to support the projects. Further, many governmental entities are not well versed in long term capital management and also may have political motivations to avoid addressing the full cost of any infrastructure project. Thus, even when we know the true cost of a project – the political will may discourage a full and open discussion of the true funding needs.

This report seeks to clarify the costs of one particular component of the public transportation infrastructure – local[i] roads, curbs and sidewalks. These local and generally municipally owned assets form the first and most proximate leg of most transportation journeys. Starting off on private property in most cases at a home, school, shopping or workplace location, a trip then transitions from using private capital (a driveway) onto the public local network of roads, bike lanes and sidewalks. The local road network may feed travelers onto more distant roads or transportation networks for a given trip – including mass transit – but many trips begin and end on the local road network[ii]. Thus the local grid serves as a logical and significant component of most trips. This then begs the question as to who should pay for the local street grid and how do we find ongoing sources of revenue that can provide the needed resources to support the network in a state of good repair.

This contentious issue motivated us to consider how we can assess both the full cost of the local street network and also to discuss the logical payers for local, street and pedestrian/bicyclist infrastructure. One of the first challenges was identifying the quantity of infrastructure that needed to be managed. We then explored various costing methods to scale the problem and finally, we discuss the potential payers that may be tapped to provide the needed resources.

As a primary source, the NJ Department of Transportation maintains an inventory of public road mileage by jurisdiction – NJDOT, Authorities such as the Garden State Parkway, New Jersey Turnpike and Atlantic City Expressway, Counties, Municipalities and Parks. The inventory, unfortunately, does not provide data about the length of curb and sidewalk on New Jersey's public roads – a rather troubling omission – as these improvements represent a significant portion of the cost to repair local roadways. This omission highlights the lack of a standard practice for the inclusion of curbs and sidewalks as part of the transportation system. This is clearly inconsistent with the goals of New Jersey's complete streets policy, effective December 3, 2009, which aims to serve all modes of travel including pedestrians, bicycles, wheelchairs as well as motor vehicles.

The NJDOT policy defines a "Complete Street" as a "means to provide safe access for all users by designing and operating a comprehensive, integrated connected multi-modal network of transportation options." The benefits cited for the construction and operation of complete streets include:

- Improved safety for pedestrians, bicyclists, children, older citizens, non-drivers and the mobility challenged.
- Providing connections to walking and bicycling trip generators.
- Promoting healthy lifestyles.
- Creating more livable communities.
- Reducing traffic congestion.

The NJDOT Complete Streets Policy has been implemented for all projects funded through the Department's capital program. Furthermore, the state policy "strongly encourages the adoption of similar policies by regional and local jurisdictions who apply for funding through Local Aid Programs."

Some key components of the NJDOT Complete Streets Policy include:

- Establish a checklist of pedestrian, bicycle and transit accommodations such as accessible sidewalks curb ramps, crosswalks, countdown pedestrian signals, signs, median refuges, curb extensions, pedestrian scale lighting, bike lanes, shoulders and bus shelters with the

presumption that they shall be included in each project unless supporting documentation against inclusion is provided and found to be justifiable.

- Additionally, in rural areas, paved shoulders or a multi-use path shall be included in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day.
- Establishing a procedure to evaluate resurfacing projects for complete streets inclusion according to length of project, local support, environmental constraints, right-of-way limitations, funding resources and bicycle and/or pedestrian compatibility.
- Improvements should also consider connections for Safe Routes to Schools, Safe Routes to Transit, Transit Villages, trail crossings and areas or population groups with limited transportation options.
- Establishing an incentive within the Local Aid Program for municipalities and counties to develop and implement a Complete Streets policy.
- Improvements must comply with Title VI/Environmental Justice, Americans with Disabilities Act (ADA) and should complement the context of the surrounding community.

The "New Jersey Complete Streets Policy Compilation" prepared by the Rutgers University. Edward J. Bloustein School of Planning and Public Policy reports that seven New Jersey Counties and 127 municipalities have adopted local complete streets policies. Unfortunately, funding to implement these policies is often lacking.

In 2006, Greenman – Pedersen, Inc., in conjunction with the New Jersey Association of County Engineers, prepared a report entitled, "Local Aid Perspective of the Transportation Trust Fund" which included estimates of the costs to maintain county and municipal roads. The parameters used to develop the road repair cost estimates included the following key components as shown in Table 1:

Table 1 – Local Road Repair Cost Parameters from the 2006 Greenman-Pedersen Study

Description	County Roads	Municipal Roads
Width	40'	30'
Pavement Thickness	17"	12"
Curb	20%	20%
Sidewalk	0%	0%
Resurfacing Frequency	12 years	20 years
Mill and Overlay Thickness	2"	2"

The New Jersey Society of Municipal Engineers were consulted by the authors of "Local Aid Perspective of the Transportation Trust Fund", prior to the publication of that report, and commented that the report should include a greater estimated cost for the construction and repair for curb and sidewalk on municipal streets. The final Greenman-Pedersen report omitted the cost of sidewalks for all local roadways – both county and municipal - after first describing them in the document as a municipal responsibility.

Perhaps the reason for the omission of comprehensive curb and sidewalk repair costs may have been because they are difficult to estimate – as not all roads having curbs or sidewalks along their entire frontage. Nonetheless, this omission compromises the analysis by significantly underestimating the cost to construct and repair municipal roadways as the value of curb and sidewalk replacement often represents 25% or more of the cost to construct a typical neighborhood street. Further, no additional cost allowance was made in their estimates to include the significant costs of sidewalks, curbs and crosswalks. Providing some range of costs for these components of infrastructure would have provided more solid guidance to governmental entities as to total costs for a given project – an omission which creates the potential for a significant cost overrun if these components are needed in a given project. Later in this report we will explore the percentage of projects that fall into this category – and the percentages are high – thus creating a significant uncaptured liability for local governments.

NJSME Curb and Sidewalk Survey

In 2015, as an effort to accurately estimate the full cost to maintain New Jersey's municipal roads, the New Jersey Society of Municipal Engineers developed a survey to collect data regarding the prevalence of curb and sidewalk installations on municipal streets. The survey also looked to explore the management and operational practices that municipal governments use to maintain their local transportation infrastructure.

The survey was sent to the appointed Municipal Engineers throughout the State of New Jersey – individuals responsible for the maintenance and repair of roadways within their municipal jurisdictions. The survey requests were sent via US Mail and e-mail. Responses were received digitally through an online link.

Surveys were completed by the engineers for 94 of the State's 566 municipalities (based upon the 2010 US Census – Princeton Borough and Princeton Township subsequently merged), representing 15.4% of the state's land area and 25.6% of the state's population.

The results were tabulated by both municipal area and municipal population density.

The population density analysis was grouped into six categories:

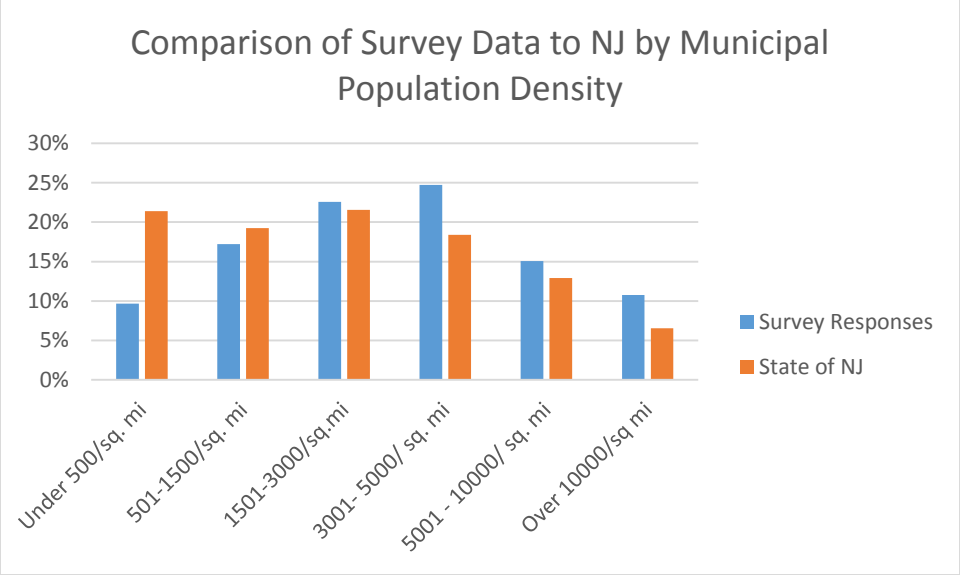
- Under 500 persons/ square mile;
- 501 – 1,500 persons/ square mile;
- 1,501 – 3,000 persons/ square mile;
- 3,001 – 5,000 persons/ square mile;
- 5,001 – 10,000 persons/ square mile;
- Over 10,000 persons/ square mile;

Graph 2 - shows the percentage of the survey responses submitted by municipalities within each of the above referenced groups and compares it to the percentage of municipalities within the entire State of New Jersey which fall into each group. The graph shows that the population density distribution of the survey sample closely matches the density distribution of the entire state with the exception of the lowest density category of municipalities who had a lower survey participation rate.

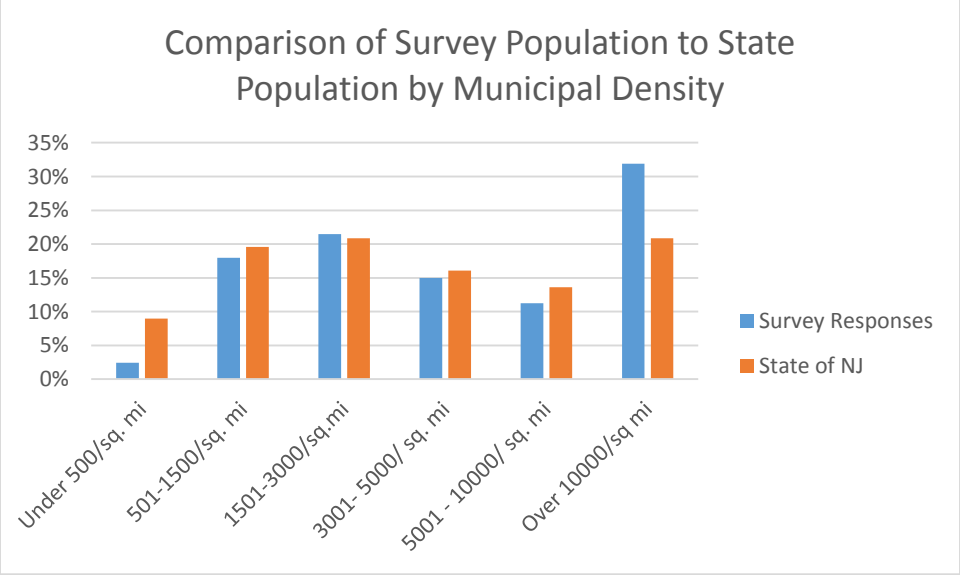
Graph 3 - shows the percentage of the municipal population versus total sample population represented by municipalities within each of the above referenced groups and compares it to the percentage of

population within the entire State of New Jersey which fall into each group. The graph shows that the population distribution of the survey sample closely matches the population distribution of the entire state with the exception of the lowest density category of municipalities who had a lower survey participation rate.

Graph 2 – Showing Percentage of Response Group versus entire State of New Jersey by Municipal Population Density.



Graph 3 - Showing Population of Response Group versus entire State of New Jersey by Municipal Population Density.



A similar analysis was performed by creating groups based upon the geographic area of the municipalities. The categories were:

- Under 1 square mile;
- 1.0 – 4.9 square miles.
- 5.0 – 9.9 square miles.
- 10.0 – 19.9 square miles.
- 20.0 – 49.9 square miles.
- 50.0 – 99.9 square miles.

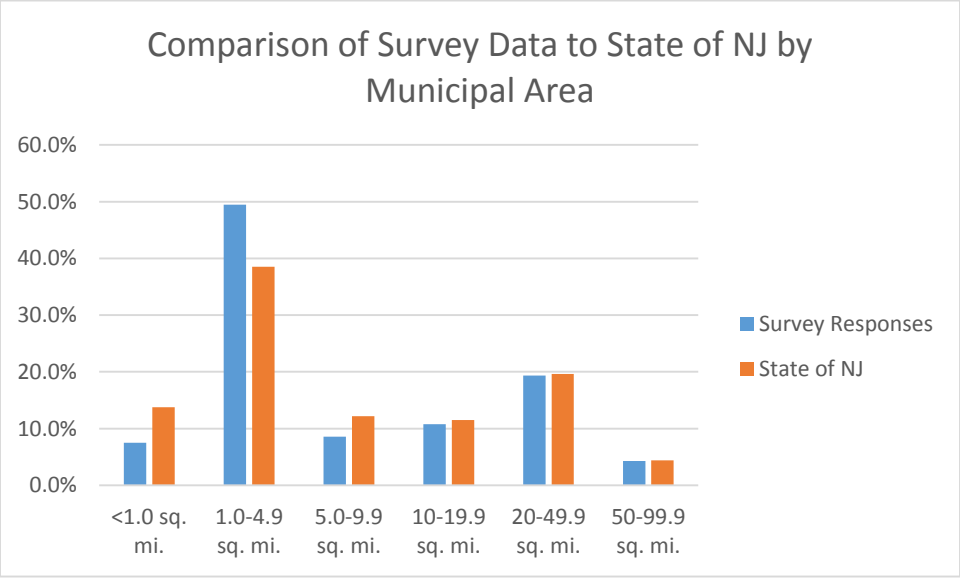
Graph 4 depicts the percentage of responding municipalities within each size category and compares it to the percentage of municipalities within each size grouping throughout the state.

Graph 5 depicts the percent of land area represented by survey respondents within each category and compares it to the percentage of all municipal land area within each size grouping throughout the state.

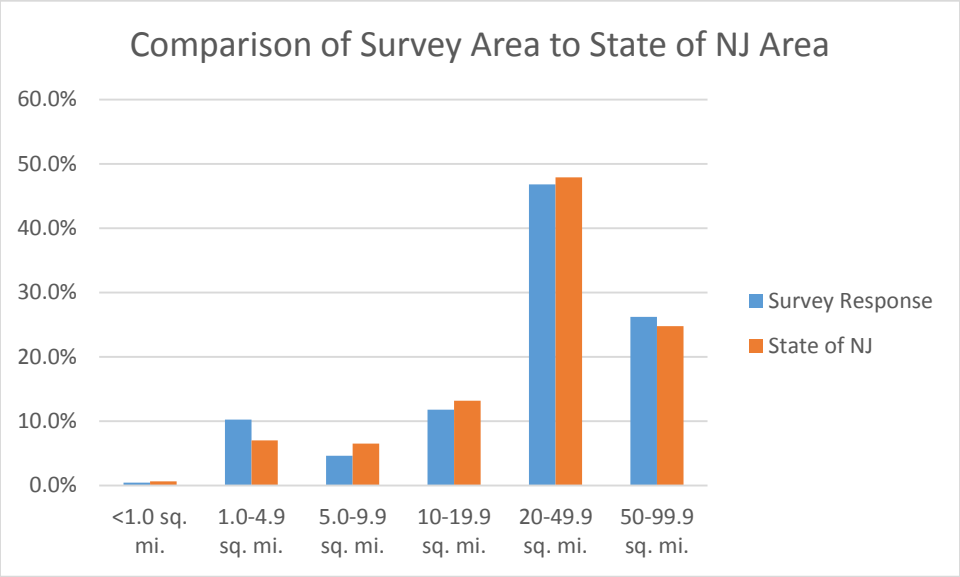
In each of these analyses, the sample distribution compares closely to the statewide distribution. Further tests of the statistical significance of these patterns will be explored in future work.

Table #2 shows the survey responses grouped by county. County response rates ranged from 0% to over 40%. The survey participation rates were low in the southern region of the state with only two total responses received from Atlantic, Cape May, Cumberland, Salem and Gloucester Counties, together. With the exception of Monmouth and Sussex Counties, the balance of the state was well represented in the survey.

Graph 4 – Showing Percentage of Response Group versus State of New Jersey by Municipal Area



Graph 5 - Showing Area of Response Group versus State of New Jersey by Municipal Area.



In addition to the name, and geographical area of the municipality, and total municipal street length, the survey asked the Municipal Engineers to estimate the length of street frontage within the municipal borders having curbs and/or sidewalks. The results were collected in the following categories:

- 0 – 20%
- 21 - 40%
- 41 - 60%
- 61 - 80%
- 81 – 100%

The data was analyzed using the midpoint of the range of each survey response as a representative estimate of the percentage of curb and/or sidewalk in the responding municipality. The data was then analyzed by sorting by both area and density of the responding municipality and the curb and sidewalk percentages were averaged in their respective categories. The results are depicted below in Table 3 and Table 4.

Table 2 – Survey Responses by County

County	Number of Municipalities	Number of Responses	Response Rate
Atlantic	23	1	4%
Bergen	70	17	24%
Burlington	40	4	10%
Camden	37	6	16%
Cape May	16	1	6%
Cumberland	14	0	0%
Essex	22	5	23%
Gloucester	24	0	0%
Hudson	12	4	33%
Hunterdon	26	5	19%
Mercer	13	7	46%
Middlesex	25	10	40%
Monmouth	53	2	2%
Morris	39	6	15%
Ocean	33	6	18%
Passaic	16	4	25%
Salem	15	0	0%
Somerset	21	7	33%
Sussex	24	1	4%
Union	21	3	14%
Warren	22	5	23%
	566	94	17%

Table 3 – Average Curb and Sidewalk Frontages by Municipal Population Density

Density Category (Population per Sq. Mi.)	Curb Frontage	Sidewalk Frontage
Under 500	30%	26%
501-1,500	53%	44%
1,501-3,000	69%	57%
3,001- 5,000	81%	64%
5,001 – 10,000	89%	73%
Over 10,000	90%	86%

Table 4 - Average Curb and Sidewalk Frontages by Municipal Land Area

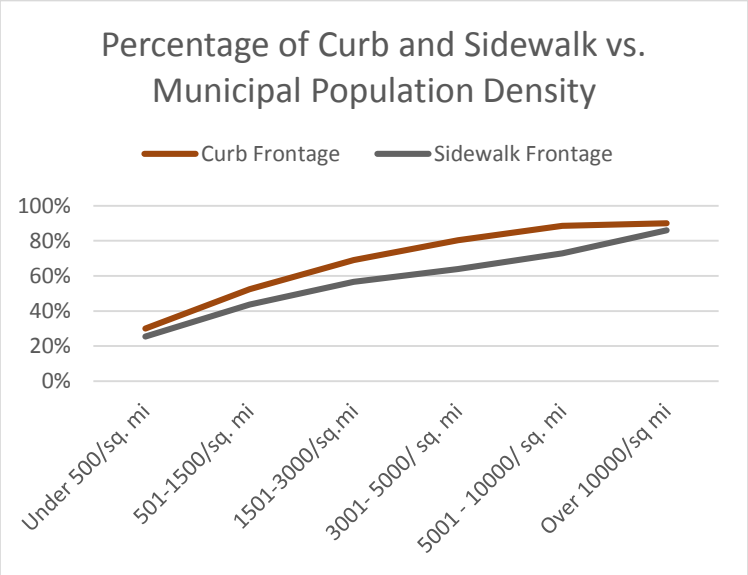
Area Category	Curb Frontage	Sidewalk Frontage
<1.0 sq. mi.	70%	56%
1.0-4.9 sq. mi.	83%	70%
5.0-9.9 sq. mi.	75%	58%
10-19.9 sq. mi.	62%	50%
20-49.9 sq. mi.	47%	30%
50-99.9 sq. mi.	40%	28%

These tabular results were plotted to determine if there was a distinct correlation between either municipal population density or municipal land area and the amount of curb and sidewalk on municipal streets.

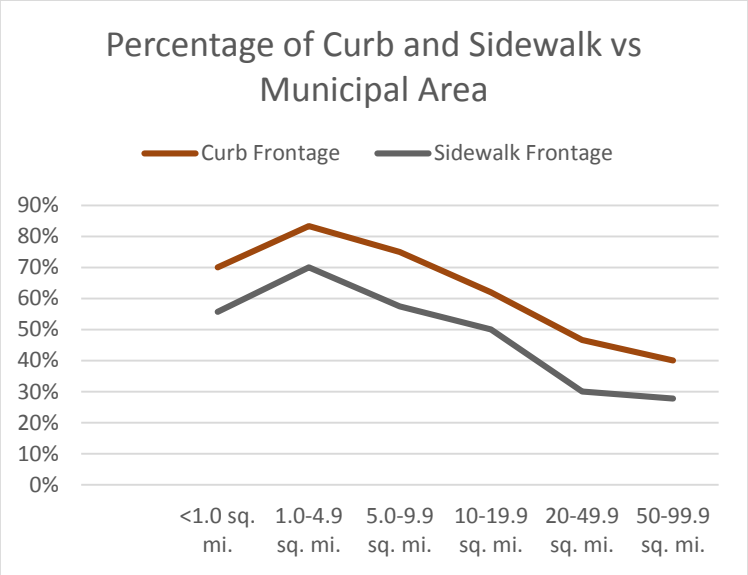
Inspection of Graph 6 – the "Density" graph - reveals that there is apparently a positive relationship between increasing population density and the amount of curb and sidewalk on municipal streets – curb frontage being slightly greater than sidewalk frontage in all cases.

Inspection of Graph 7 – the "Area" graph - shows a different pattern. As municipal size increases from less than one square mile to the range of 1 – 4.9 square miles the percentage of curb and sidewalk increases. As municipal area rises beyond that point, the percentage of curb and sidewalk on municipal roadways decreases.

Graph 6 – Relationship of Municipal Population Density to Amount of Curb and Sidewalk Frontage



Graph 7 – Relationship of Municipal Land Area to Amount of Curb and Sidewalk Frontage



As the relationship between municipal population density and curb and sidewalk correlated well, it was selected to develop an estimate of curb and sidewalk frontage in each of New Jersey's 21 counties. First, the population density of each municipality was obtained from the 2010 US Census. An estimated percentage of curb and sidewalk, as depicted in Table 3, was then associated with each municipality based upon its population density. The municipalities were then grouped by county and an average curb and sidewalk frontage was calculated for each county by adding the municipal curb and sidewalk percentages for each municipality and dividing by the number of municipalities in the county (See table 5).

The estimates of total curb and sidewalk length on municipal roadways in each county as shown in Table 5 were calculated by multiplying the municipal road mileage in each county, as tabulated by NJDOT for 2010 and shown in Appendix 'B', by the estimated percentages of curb and sidewalk frontage for the respective county.

This first method for deriving an estimated percentage of curb and sidewalk on municipal streets did not include a weighting factor for the relative length of roadway in each municipality. Review of the sample data indicated that there was generally a positive correlation between the area of a municipality and the number of miles of municipal roads. As shown in Graph 8, however, there is a wide variation of municipal road mileage for municipalities of similar land area.

The data suggested that the length of municipal roadway was related not only to the size of the municipality but also to its density of development. Graph 9 presents the relationship between the number of miles of municipal roadway per square mile versus the density of the responding municipality. This plot indicates that the relationship of the metric, municipal road miles to area of municipality in sq. miles, generally increases as population density increases. It appears, however, with

the exception of one outlying data point, that once the population density reaches approximately 15,000 persons/ sq. mi. the municipal centerline road mileage per square mile plateaus at just above 20 / sq. mi.

We chose to develop a weighting factor to reflect the influence of municipal area in the derivation of representative estimates of curb and sidewalk frontage on a county by county basis. The sample data was sorted by the population density categories established earlier and both the mean and median road miles/ sq. mile were established for each group. These results are depicted in Table 6.

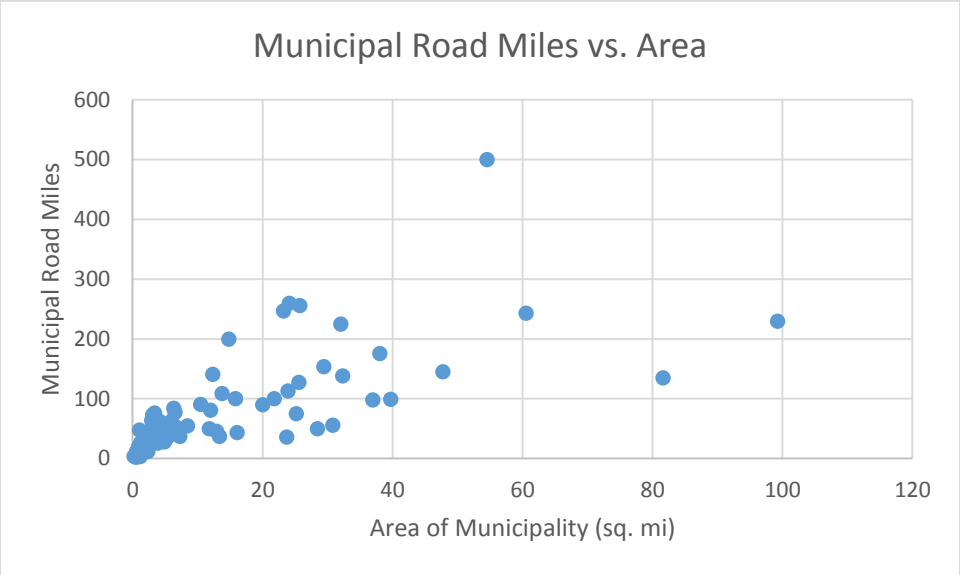
We then made projections of total municipal road mileage in each county by multiplying the area of each municipality by its corresponding road miles/ sq. mile factor from Table 6. The resulting projections were compared to the county by county road inventory maintained by NJDOT. The projections based upon the median values for road miles / sq. mi. were less at variance from the published quantities than the projections using the mean. For the this reason, along with the reduced possibility of outlying data points skewing the results, we selected the median miles per road/ sq. mile as the basis for developing a weighting factor to acknowledge the differing percentages of countywide road mileage among municipalities.

Table 7 shows the projections of road mileage and curb and sidewalk percentage by county using the second method, as described above. Note that while the statewide roadway projections derived by the use of this method were within 10% of the NJDOT inventory quantities there were large variations in Salem, Cumberland, Sussex and Warren Counties. These counties had significantly lower ratios of municipal road mileage to county road mileage than the state average of 4.56, which may explain why the projected municipal mileage figures are substantially above the recorded values.

Table 5 – Estimated Curb and Sidewalk Frontage by County Based Upon Municipal Average

County	2010 Municipal Road Miles	Estimated % Curb Frontage	Estimated% Sidewalk Frontage	Estimated Curb Length (mi)	Estimated Sidewalk Length (mi)
Atlantic	1,359	48%	39%	1,296	1,070
Bergen	2,409	76%	64%	3,673	3,079
Burlington	2,105	52%	43%	2,197	1,801
Camden	1,541	72%	59%	2,218	1,808
Cape May	734	45%	38%	666	553
Cumberland	660	34%	28%	444	373
Essex	1,392	79%	67%	2,187	1,869
Gloucester	1,121	51%	42%	1,147	942
Hudson	517	87%	82%	905	845
Hunterdon	1,075	40%	34%	868	722
Mercer	1,227	61%	51%	1,498	1,255
Middlesex	2,127	74%	61%	3,149	2,603
Monmouth	2,890	67%	55%	3,863	3,178
Morris	2,108	52%	43%	2,179	1,804
Ocean	2,535	53%	44%	2,698	2,211
Passaic	1,030	70%	59%	1,433	1,222
Salem	425	42%	35%	355	297
Somerset	1,399	48%	40%	1,339	1,111
Sussex	905	37%	31%	670	562
Union	1,158	80%	66%	1,857	1,532
Warren	690	38%	32%	527	440
Total Municipal Inventory (est. mi.)	29,407			35,165	29,277

Graph 8 - Graph of Municipal Road Mileage vs. Municipal Area



Graph 9 – Municipal Road Miles/ Sq. Mile plotted versus municipal density

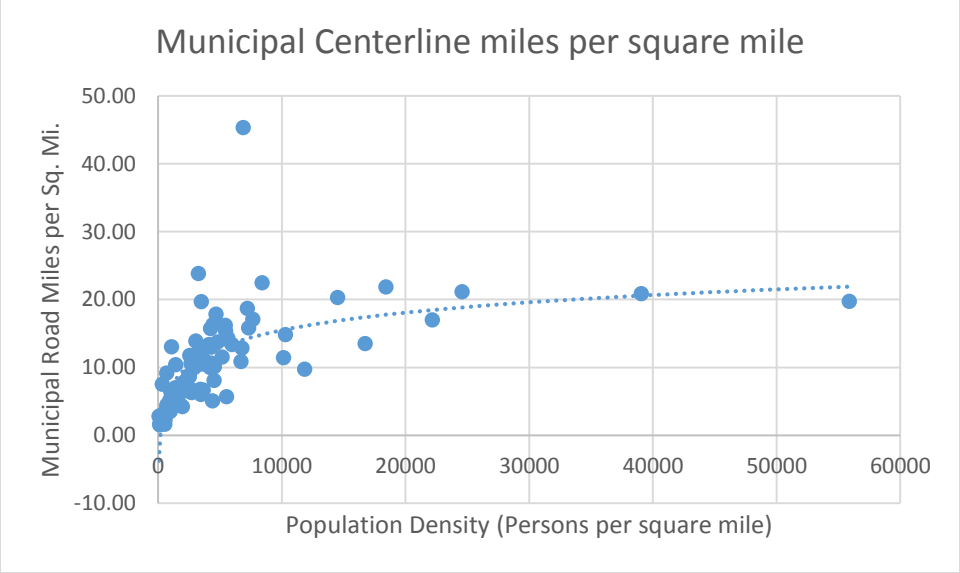


Table 6 – Average and Median Road Miles per Sq. Mi. by Density Category

Density	Average Road Miles / Sq. Mi.	Median Road Miles / Sq. Mi.
Under 500	2.97	2.77
501 -1,500	5.50	4.61
1,501 - 3,000	7.57	7.21
3,001 - 5,000	12.16	11.55
5,001 -10,000	16.83	15.58
Over 10,000	17.05	18.38

The survey also posed questions about municipal ordinances and policies pertaining to the repair and maintenance of curbs and sidewalks which will be the subject of a future report. A complete list of survey questions has been included in Appendix 'A'.

Table 7 – Projection of Curb and Sidewalk Percentages by County using median road miles/ sq. mi. as a weighting factor

County	Area (Sq. Mi.)	Density (Pesons / Sq. Mi.)	Actual Municipal Road Miles	Projection w/ Median					County Road Mileage	Ratio of Municipal to County Road Mileage
				Projected Municipal Road Mileage	Difference Between Projection and Actual	% Difference	% Curb	% Sidewalk		
Atlantic	555.7	494	1,359	1,803	444	33%	48%	39%	373	3.64
Bergen	233.0	3,884	2,409	2,212	(197)	-8%	78%	66%	440	5.48
Burlington	798.5	562	2,105	2,838	733	35%	44%	37%	500	4.21
Camden	221.3	2,321	1,541	1,454	(87)	-6%	68%	56%	376	4.10
Cape May	251.4	387	734	761	27	4%	35%	30%	199	3.69
Cumberland	483.7	324	660	1,396	736	112%	33%	28%	539	1.22
Essex	126.2	6,211	1,392	1,536	144	10%	83%	74%	212	6.57
Gloucester	322.0	895	1,121	1,203	82	7%	47%	39%	402	2.79
Hudson	46.2	13,735	517	727	210	41%	87%	81%	49	10.55
Hunterdon	427.8	300	1,075	1,397	322	30%	40%	33%	283	3.80
Mercer	224.6	1,632	1,227	1,192	(35)	-3%	61%	52%	172	7.13
Middlesex	308.9	2,622	2,127	2,367	240	11%	72%	59%	295	7.21
Monmouth	468.8	1,345	2,890	2,131	(759)	-26%	56%	46%	362	7.98
Morris	460.2	1,070	2,108	1,731	(377)	-18%	47%	39%	296	7.12
Ocean	628.8	917	2,535	2,391	(144)	-6%	48%	39%	374	6.78
Passaic	184.6	2,715	1,030	1,124	94	9%	68%	58%	234	4.40
Salem	331.9	199	425	952	527	124%	32%	27%	361	1.18
Somerset	301.8	1,072	1,399	988	(411)	-29%	41%	34%	230	6.08
Sussex	519.0	288	905	1,470	565	62%	31%	27%	314	2.88
Union	102.9	5,216	1,158	1,199	41	4%	82%	69%	176	6.58
Warren	356.9	305	690	1,058	368	53%	34%	29%	261	2.64
Total			29,407	31,930	2,523	9%			6,448	4.56

Cost Analysis Methodology

Once estimates of the municipal roadway centerline miles with:

a) both curb and sidewalk
b) curb but no sidewalk and
c) no curb or sidewalk

had been made, it was necessary to estimate the cost to construct a typical mile of municipal street based upon these three alternatives.

For the purposes of this cost analysis, it was first necessary to define a typical municipal street – one that was most representative of the average municipal roadway. We considered that a Neighborhood Street, as defined in the New Jersey Residential Site Improvements Standards (RSIS), was the most representative of a typical municipal street (with variations considering the elimination of sidewalk and the elimination of both curb and sidewalk). Its characteristics are: a width of 30', a 12" thick pavement section consisting of 6" of hot mixed asphalt atop a dense graded aggregate base course (See Appendix 'C', Figure 3). A Residential Neighborhood Street is not expected to carry Average Daily Traffic in excess of 1,500 vehicles. This cross section was selected as providing a conservative standard. There are certainly narrower rural roadways that carry very low traffic volumes. There are also wider cartways in more densely populated areas that carry greater traffic volumes, carry more truck traffic, provide for on street parking and may have more than two lanes.

Figure 1 - Typical Neighborhood Street with 50' x 100' lots

The roadway standards were then applied to a medium density neighborhood of homes on 50' x 100' lots (See Appendix 'C, Figure 1). Medium density development is defined by RSIS as more than 4 but less than or equal to 8 units per gross acre. The test neighborhood has a density of between 6 and 7 units per gross acre.

A sample project was defined as depicted in Appendix 'C', Figure 2 containing streets to serve three blocks of homes. A quantity take-off was performed to establish the units of work that go into constructing the streets in the test neighborhood and when dividing by the centerline length of roadway deriving a cost per foot to construct a typical neighborhood street. The quantity takeoff was then modified to develop the costs of constructing a neighborhood street with curbs but no sidewalks and the cost of constructing a neighborhood street without curbs or sidewalks. These cost estimates have been provided in Appendix 'D-1', 'D-2' and 'D-3'.

As in the earlier Greenman-Pedersen study, the life of a municipal street in New Jersey, with an average traffic load is estimated to be 60 years, if repairs are made at 20 year intervals. The scope of the anticipated intermediate year repairs includes milling 2" of asphalt pavement and replacing it with a 2" thick course of hot-mixed asphalt surface. At this time, it is also anticipated that some repairs to the asphalt base, curbs, sidewalks and drainage will be necessary. This analysis projects a need to repair 10% of these components. Failure to perform this mid- life cycle maintenance will result in the accelerated degradation of the street and a shorter period of time before a complete reconstruction is necessary.

The following equation arrives at the cost per mile shown in Table 6 for maintenance of municipal roadways in the State of New Jersey

Annual Cost of Street/ Mile = (Cost of Construction/ Mile + 2x Cost of Overlay/Mile)/60

Table 8 - Annual Cost to Construct and Maintain Typical Municipal Streets in New Jersey

Annual Roadway Cost Per Mile		
Roads with Both Curb and Sidewalk	Roads with Curb but No Sidewalk	Roads with no Curb or Sidewalk
$50,490	$42,185	$35,662

These annual roadway costs per mile were combined with the estimates of curb and sidewalk frontage derived by methods 1 and 2 to generate the estimates of the annual costs to repair municipal roads in each of New Jersey's 21 counties depicted in Tables 7 and 8.

The two methods of estimating annual municipal road repair needs vary by only 1%

- Method 1: $ 1,284,841,912
- Method 2: $ 1,271,539,979

Table 9 – Estimated Annual Maintenance Cost for New Jersey's Municipal Roads by County based upon Method 1

County	2010 Municipal Road Miles	Estimated % Curb Frontage	Estimated% Sidewalk Frontage	Annual Maintenance Requirements				% of Costs	% of Miles
				Roads with Both Curb and Sidewalk	Roads with Curb but No Sidewalk	Roads with no Curb or Sidewalk	TOTAL		
Atlantic	1,359	48%	39%	$ 27,020,171	$ 4,721,107	$ 25,388,652	$ 57,129,930	4.45%	4.6%
Bergen	2,409	76%	64%	$ 77,730,355	$ 12,446,701	$ 20,485,530	$ 110,662,585	8.61%	8.2%
Burlington	2,105	52%	43%	$ 45,460,410	$ 8,269,549	$ 35,968,080	$ 89,698,038	6.98%	7.2%
Camden	1,541	72%	59%	$ 45,638,413	$ 8,551,632	$ 15,490,693	$ 69,680,739	5.42%	5.2%
Cape May	734	45%	38%	$ 13,962,374	$ 2,377,840	$ 14,303,820	$ 30,644,035	2.39%	2.5%
Cumberland	660	34%	28%	$ 9,429,051	$ 1,477,608	$ 15,627,797	$ 26,534,456	2.07%	2.2%
Essex	1,392	79%	67%	$ 47,189,386	$ 6,686,866	$ 10,658,047	$ 64,534,299	5.02%	4.7%
Gloucester	1,121	51%	42%	$ 23,771,356	$ 4,295,555	$ 19,555,576	$ 47,622,486	3.71%	3.8%
Hudson	517	87%	82%	$ 21,330,487	$ 1,252,284	$ 2,312,590	$ 24,895,361	1.94%	1.8%
Hunterdon	1,075	40%	34%	$ 18,221,470	$ 3,062,736	$ 22,877,243	$ 44,161,449	3.44%	3.7%
Mercer	1,227	61%	51%	$ 31,690,308	$ 5,108,385	$ 17,055,366	$ 53,854,059	4.19%	4.2%
Middlesex	2,127	74%	61%	$ 65,718,837	$ 11,411,091	$ 19,788,219	$ 96,918,146	7.54%	7.2%
Monmouth	2,890	67%	55%	$ 80,217,642	$ 14,340,304	$ 34,281,231	$ 128,839,177	10.03%	9.8%
Morris	2,108	52%	43%	$ 45,551,049	$ 7,831,441	$ 36,381,407	$ 89,763,897	6.99%	7.2%
Ocean	2,535	53%	44%	$ 55,818,072	$ 10,172,348	$ 42,378,360	$ 108,368,780	8.43%	8.6%
Passaic	1,030	70%	59%	$ 30,861,015	$ 4,421,664	$ 11,196,278	$ 46,478,957	3.62%	3.5%
Salem	425	42%	35%	$ 7,495,683	$ 1,216,109	$ 8,833,912	$ 17,545,704	1.37%	1.4%
Somerset	1,399	48%	40%	$ 28,042,474	$ 4,791,703	$ 26,033,381	$ 58,867,558	4.58%	4.8%
Sussex	905	37%	31%	$ 14,184,573	$ 2,267,632	$ 20,338,196	$ 36,790,401	2.86%	3.1%
Union	1,158	80%	66%	$ 38,668,406	$ 6,786,943	$ 8,247,035	$ 53,702,384	4.18%	3.9%
Warren	690	38%	32%	$ 11,103,292	$ 1,823,266	$ 15,222,913	$ 28,149,471	2.19%	2.3%
Total State of NJ	29,407			$ 739,104,822	$ 123,312,765	$ 422,424,324	$ 1,284,841,912	100.00%	100.00%

Table 10 - Estimated Annual Maintenance Cost for New Jersey's Municipal Roads by County based upon Method 2 - weighted average curb and sidewalk percentage by county

County	2010 Municipal Road Miles	Estimated % Curb Frontage	Estimated% Sidewalk Frontage	Annual Maintenance Requirements				% of Costs	% of Miles
				Roads with Both Curb and Sidewalk	Roads with Curb but No Sidewalk	Roads with no Curb or Sidewalk	TOTAL		
Atlantic	1359	48%	39%	27,020,171	4,721,107	25,388,652	57,129,930	4.49%	4.6%
Bergen	2409	78%	66%	79,746,050	12,857,874	18,714,238	111,318,163	8.75%	8.2%
Burlington	2105	44%	37%	39,089,436	6,648,452	41,838,362	87,576,250	6.89%	7.2%
Camden	1541	68%	56%	43,359,234	8,160,044	17,431,529	68,950,807	5.42%	5.2%
Cape May	734	35%	30%	11,051,263	1,727,017	16,910,141	29,688,422	2.33%	2.5%
Cumberland	660	33%	28%	9,170,374	1,409,559	15,868,029	26,447,962	2.08%	2.2%
Essex	1392	83%	74%	51,766,895	5,759,173	8,209,161	65,735,229	5.17%	4.7%
Gloucester	1121	47%	39%	21,897,286	3,748,351	21,341,831	46,987,469	3.70%	3.8%
Hudson	517	87%	81%	21,198,470	1,360,422	2,314,418	24,873,310	1.96%	1.8%
Hunterdon	1075	40%	33%	17,903,548	3,056,167	23,107,347	44,067,062	3.47%	3.7%
Mercer	1227	61%	52%	32,166,073	4,817,503	16,965,232	53,948,808	4.24%	4.2%
Middlesex	2127	72%	59%	63,834,771	11,339,043	21,179,854	96,353,668	7.58%	7.2%
Monmouth	2890	56%	46%	67,117,568	11,894,130	45,601,815	124,613,513	9.80%	9.8%
Morris	2108	47%	39%	41,578,425	7,177,551	39,740,075	88,496,051	6.96%	7.2%
Ocean	2535	48%	39%	50,218,631	8,842,629	47,457,383	106,518,642	8.38%	8.6%
Passaic	1030	68%	58%	30,167,989	4,139,418	11,924,368	46,231,775	3.64%	3.5%
Salem	425	32%	27%	5,875,103	878,127	10,264,257	17,017,487	1.34%	1.4%
Somerset	1399	41%	34%	24,012,312	3,907,844	29,627,096	57,547,252	4.53%	4.8%
Sussex	905	31%	27%	12,186,083	1,809,269	22,137,227	36,132,580	2.84%	3.1%
Union	1158	82%	69%	40,299,751	6,332,475	7,478,996	54,111,223	4.26%	3.9%
Warren	690	34%	29%	10,027,221	1,570,683	16,196,474	27,794,378	2.19%	2.3%
Total State of NJ	29407			699,686,655	112,156,839	459,696,484	1,271,539,979	100.00%	100.00%

Historical Transportation Funding in New Jersey

Graph 10 paints a clear picture of how municipalities fare when it comes to obtaining state and federal funding for the maintenance of their transportation infrastructure – they come in a distant last in the revenue stream despite having the responsibility for the upkeep of approximately 65% of New Jersey's non-tolled lane miles. Aid to Municipalities has also been stagnant for the past 10 years.

Graph 10 – Total New Jersey Transportation Funding 2006 - 2016

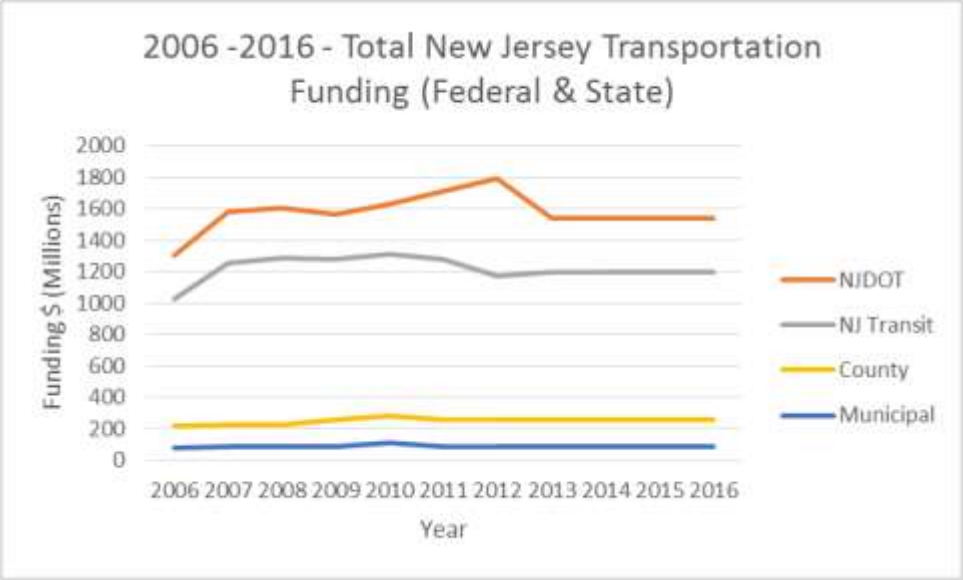


Table 9 gives a snapshot of how Local Aid dollars were distributed in 2014. Municipalities received only 30% of local aid despite being responsible for 79% of New Jersey's local lane miles.

Table 11 – NJ 2014 Local Aid Funding

Funding Source	Local Aid Programs - State and Federal	2014 Local Aid Funding	
		County (Millions)	Municipal (Millions)
State Transportation Fund	County/Municipal Aid	$ 78.75	$ 78.75
	Commissioner's Discretionary Fund	$ 3.75	$ 3.75
	Bridges	$ 25.00	$ -
	Safe Streets to Transit	$ -	$ 1.00
	Bikeways	$ -	$ 1.00
	Transit Village	$ -	$ 1.00
	Local Lead Projects: Design, R.O.W. & Construction	$ 94.00	$ -
	Local Preliminary Engineering	$ 2.00	$ -
	Local Aid Grant Management System	$ 0.10	$ -
	Safe Corridors Highway Safety Fund	$ -	$ 4.00
	Total Transportation Trust Fund	$ 203.60	$ 89.50
Federal Funds	Safe Routes to School	$ -	$ 5.20
	Local Safety/High Risk Rural Roads	$ 10.00	$ -
	Transportation Enhancement	$ 5.00	$ 5.00
	Local Lead Projects: Design, R.O.W. & Construction	$ 12.36	$ -
	Total Federal Funds	$ 27.36	$ 10.20
	Grand Total - State and Federal Local Aid	$ 230.96	$ 99.70
	County/Municipal Aid Share of Local Aid	70%	30%

Conclusions:

Based upon our analysis of the responses to the NJ Municipal Engineer's Society survey, we find that there is considerable variation in the management practices and operational methods of local governments with regards to sidewalk and curb infrastructure. We also find that sidewalks and curbs are widely deployed in New Jersey, with over 16,500 centerline miles of roads with curbs and almost 14,000 centerline road miles with sidewalks. This represents over 33,000 linear mile of curbs and 28,000 linear miles of sidewalks. The bulk of this infrastructure is the responsibility of municipal governments – who received on average only 30% of federal and state transportation local aid funding. Further, the municipal governments only draw about 3% of the overall New Jersey funding from the federal and state sources (see Graph 10 above)

This leaves municipal governments with three hard choices – first, invest local current year tax dollars into developing and improving local road and pedestrian facilities. This means that the investment in local transportation infrastructure has to compete with all other municipal spending – including health, public safety, recreation, library and public open space to name a few competing expenditures. It is not clear that municipal governments will be able to maintain the political will to invest in roads and sidewalks over the long haul – given the competing use of resources.

Second, they can borrow funds to invest in local roads and sidewalks – which further burdens a town with the future cost of paying off this debt. And third – they can let their pavement, curb, and sidewalk infrastructure deteriorate until it becomes a public hazard – and then perhaps they go back to choices one or two.

Given the existing caps on government spending (commonly discussed as the 2% cap on the tax levy and a 2% increase in spending) in New Jersey, it is becoming harder for towns to increase local spending to incorporate the capital needs of roads, curbs and sidewalks. One final option is to seek county, state and federal grants for local infrastructure – and these options are very limited.

Our analysis provides an overview of the general costs and funding sources available for the improvement and preservation of local streets, curbs and sidewalks. Given that we identified an annual need of over 1.2 billion dollars annually in New Jersey, and projected state and federal revenue sources of roughly 100 million dollars annually – the gap in funding is massive and the need to establish a long term funding mechanism for local streets, curbs and sidewalks seems pressing. One then needs to establish the potential funding sources and a revenue collection method and resource allocation model that would drive resources towards the governmental entities that are responsible for maintaining the public infrastructure in question.

The authors suggest that perhaps a mixed model of funding would be appropriate – with state and federal funding sources providing a good chunk (say 2/3 of funding) of local roads and sidewalk resources and the local tax payers providing the final 1/3 of funding out of local property taxes. This local component of spending reflects both the local benefit of transportation infrastructure to the local land owner and also the benefit to the residents of a local region who receive the direct benefit of improved mobility and the recreational opportunities that are provided by local transportation infrastructure.

Currently the primary source of state funding to municipalities is the Transportation Trust Fund. The New Jersey Department of Transportation reported the following sources of funding for the Transportation Trust Fund in Fiscal Years 2015 and 2016.

Table 12 – NJ Transportation Trust Fund Revenue Sources

FY 2015	Funding Source	FY 2016 Financial Plan
$516.0m	Motor Fuels Tax	$516.0m
$215.0m	Petroleum Gross Receipts Tax	$215.0m
$517.1m	Sales and Use Tax	$452.9m
$12.0m	Toll Road Authority Contributions	$12.0m
$1,260.1m	**Total**	**$1,195.9m**

Finally, allocating a portion of the federal and state fuel taxes to local infrastructure is appropriate and warranted – given the value to the regional and national road network that is provided by local infrastructure as the initial origin and final destination for most trips. Further, the current allocation of toll dollars from the New Jersey Turnpike Authority to the Transportation Trust Fund many be reflective of the value brought to the state toll roads from the non-toll road network. The missing component of this discussion is a more healthy allocation of funds from the Transportation Trust Fund to local governments. Ironically, the recent discussions of the need to find additional sources of funds for the TTF have mostly ignored the additional funding needs of the local road and sidewalk network.

The authors also suggest that, as an example, an appropriate state tax could be applied to local freight such as package delivery to provide an ongoing source of local funds that is paid by all residents who receive packages from online shopping entities such as Amazon or Ebay. The second author is a recent lead author of a study for the New York Metropolitan region planning organization who was looking to fund transportation infrastructure for the 10 downstate New York counties that make up the New York Metropolitan Transportation Council (the regional Metropolitan Planning Organization or MPO). The fee on boxes was proposed as a potential quasi-local source of funding that could be applied to urban freight to address some of the congestion and infrastructure needs caused by local freight. Applying a similar fee in New Jersey and allocating funds to local governments would allow the local areas to collect revenue from non-drivers for local transportation infrastructure.

Raising the federal and state motor fuels would create additional funds for the Transportation Trust fund, with some of those resources to the local transportation networks seems warranted if these funds were then allocated to local road needs. As an alternative, funds could be allocated from other state sources to provide funds for local roads, curbs and sidewalks, but given the condition of New Jersey State Government finance, additional allocations to the TTF seem unlikely – without finding a dedicated source of revenue to contribute to the fund.

By implementing and blending the funding sources from federal, state and local sources we could provide a dedicated stream of revenue for local transportation needs. This would reduce the burden on any one payer class and would allow us to provide an ongoing stream of revenue for local transportation systems. These revenue sources could also be indexed to some measure of inflation such as the Consumer Price Index – this would preserve the purchasing power of the revenue sources and thus provide a stable base of funding for local streets, curbs and sidewalks.

This report has identified that we have much work to do to address the funding crisis for local roads. It is clear that the deferred maintenance and ongoing investment challenges are extensive in scale and that the funding gap is massive. Yet these needs are largely ignored on the state and federal level – and thus these costs and problems are left to the local governments. Like many state and federal unfunded mandates, the local governments then have to struggle to find funding sources to address problems that are clearly not just local in scope. In part this is due to the federal, state and county partners taking a rather large share of TTF funding dollars for their own needs and leaving a very small residual amount of resources to address local needs. We can and must do better to provide a more equitable funding pool that is reflective of the true responsibility for infrastructure operation and investment.

Table 13 - NJDOT Previous Trust Fund (2007 - 2011)

Year	Local Aid Funds (Millions)	Less Commissioner's Discretionary Funds (Millions)	County Share (Millions	Municipal Share (Millions)	County Bridge Funds (Millions)	Additional Funds (Millions)		Total Funding (Millions)	
						County	Municipal	County	Municipal
2007	$ 175.00	$ 17.50	$ 78.75	$ 78.75	$ -	$ -	$ -	$ 78.75	$ 78.75
2008	$ 175.00	$ 17.50	$ 78.75	$ 78.75	$ -	$ -	$ -	$ 78.75	$ 78.75
2009	$ 200.00	$ 17.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75
2010	$ 250.00	$ 17.50	$ 78.75	$ 78.75	$ 25.00	$ 25.00	$ 25.00	$ 128.75	$ 103.75
2011	$ 200.00	$ 17.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75

Table 14 - NJDOT Current Trust Fund (2012-2016)

Year	Local Aid Funds	Less Commissioner's	County Share	Municipal Share	County Bridge	Additional Funds		Total Funding	
						County	Municipal	County	Municipal
2012	$ 190.00	$ 7.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75
2013	$ 190.00	$ 7.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75
2014	$ 190.00	$ 7.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75
2015	$ 190.00	$ 7.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75
2016	$ 190.00	$ 7.50	$ 78.75	$ 78.75	$ 25.00	$ -	$ -	$ 103.75	$ 78.75

Table 15 - Federal and State Funding from 2006 to 2016 for NJDOT, NJT and Local Aid

	NJDOT			NJ Transit			County			Municipal	Total
Year	State (Millions)	Federal (Millions)	Total (Milions)	State (Millions)	Federal (Millions)	Total (Milions)	State (Millions)	Federal (Millions)	Total (Milions)	Aid (Millions)	Tranportation Aid
2006	526	781	1307	534	493	1027	73	140	213	73	2620
2007	750	834	1584	675	580	1255	88	140	228	88	3155
2008	750	857	1607	675	611	1286	88	140	228	88	3209
2009	725	837	1562	675	605	1280	113	140	253	88	3183
2010	675	954	1629	675	637	1312	138	140	278	113	3332
2011	725	984	1709	675	600	1275	113	140	253	88	3325
2012	728	1063	1791	672	497	1169	113	140	253	88	3301
2013	728	811	1539	672	529	1201	113	140	253	88	3081
2014	728	811	1539	672	529	1201	113	140	253	88	3081
2015	728	811	1539	672	529	1201	113	140	253	88	3081
2016	728	811	1539	672	529	1201	113	140	253	88	3081

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All of the Municipal Engineers who completed the NJSME Curb and Sidewalk Survey

For their authorization of the curb and sidewalk survey which was for the basis of this report and for their continued efforts to maintain the infrastructure of New Jersey's municipalities

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http://www.state.nj.us/transportation

Appendix 'A'- New Jersey Society of Municipal Engineer Curb and Sidewalk Survey Questions

1. Name of Municipality
2. County
3. Type of Government
    - Borough
    - Township
    - City
    - Other
4. Street Frontage with curb
    - 0 – 20%
    - 21 – 40%
    - 41 - 60%
    - 61 – 80%
    - 81 – 100%
5. Street Frontage with sidewalk
    - 0 – 20%
    - 21 – 40%
    - 41 - 60%
    - 61 – 80%
    - 81 – 100%
6. Who is responsible for curb repair and maintenance on municipal roads?
    - Municipality
    - Abutting Property Owner
    - Other
7. Who is responsible for curb repair and maintenance on County roads?
    - County
    - Municipality
    - Abutting Property Owner
    - Other
8. Are abutting property owners assessed for curb repairs?
    - Yes
    - No
    - Sometimes
9. If owners are assessed, what share do they pay?
    - 100%
    - More than 50% but less than 100%
    - Less than 50%
10. When does the municipality perform curb repairs
    - Never
    - On a complaint basis

- Spot Repair Program
- Spot repairs when the road is paved
- Full replacement when the road is paved
- Other

11. Who is responsible for sidewalk repair and maintenance on municipal roads?
    - Municipality
    - Abutting Property Owner
    - Other
12. Who is responsible for sidewalk repair and maintenance on County roads?
    - County
    - Municipality
    - Abutting Property Owner
    - Other
13. Who is responsible for sidewalk repair and maintenance on State Highways?
    - NJDOT
    - County
    - Municipality
    - Abutting Property Owner
    - Other
14. Are abutting property owners assessed for sidewalk repairs?
    - Yes
    - No
    - Sometimes
15. If owners are assessed, what share do they pay?
    - 100%
    - More than 50% but less than 100%
    - Less than 50%
16. Does the municipality have an ordinance that requires abutting property owners to repair defective curbs and/or sidewalks upon notice from the municipality?
    - No
    - Yes - Curbs only
    - Yes - Sidewalks Only
    - Yes – Both Curbs and sidewalks
17. If such an ordinance exists, who performs the inspections and issues notices of violation?
    - Municipal Engineer
    - Code Enforcement
    - Public Works
    - Police Department
    - Other
18. How frequently are these inspections performed?
    - Annually
    - 1 – 5 years
    - Over 5 years

- Prior to paving the road
- On a complaint basis only
- Other

19. Does this ordinance allow the municipality to make repairs and assess the costs to the abutting property owner?
    - Yes
    - No
20. When does the municipality performs sidewalk repairs
    - Never
    - Handicapped Ramps only
    - On a complaint basis
    - Spot Repair Program
    - Spot repairs when the road is paved
    - Full replacement when the road is paved
    - Other
21. Who is responsible for installation of handicapped ramps and curb cuts on municipal roads?
    - Municipality
    - Abutting Property Owner
    - Other
22. Who is responsible for installation of handicapped ramps and curb cuts on municipal roads?
    - County
    - Municipality
    - Abutting Property Owner
    - Other
23. Who is responsible for installation of handicapped ramps and curb cuts on municipal roads?
    - NJDOT
    - Municipality
    - Abutting Property Owner
    - Other
24. What percentage of intersections under municipal jurisdiction, which have both curbs and sidewalks, have compliant curb ramps?
    - 0 -25%
    - 26-50%
    - 51 – 75%
    - Over 75%
25. What percentage of intersections under county jurisdiction, which have both curbs and sidewalks, have compliant curb ramps?
    - 0 -25%
    - 26-50%
    - 51 – 75%
    - Over 75%
26. What percentage of intersections under state jurisdiction, which have both curbs and sidewalks, have compliant curb ramps?

- 0 -25%
- 26-50%
- 51 – 75%
- Over 75%

27. Please provide remarks about any special local programs or requirements regarding the maintenance of curbs and sidewalks.

Appendix 'B'

New Jersey's Public Road Mileage By Jurisdiction

Year Ending: 2010

COUNTY	JURISDICTION					TOTAL
	NJDOT	Authority	County	Municipal	Park	
Atlantic	144	56	373	1,359	19	1,952
Bergen	106	40	440	2,409	0	2,995
Burlington	156	38	500	2,105	219	3,018
Camden	102	28	376	1,541	7	2,054
Cape May	75	31	199	734	21	1,060
Cumberland	89	0	539	660	0	1,288
Essex	59	19	212	1,392	0	1,682
Gloucester	152	20	402	1,121	0	1,696
Hudson	35	21	49	517	0	622
Hunterdon	115	1	283	1,075	15	1,489
Mercer	119	13	172	1,227	10	1,540
Middlesex	137	40	295	2,127	9	2,607
Monmouth	205	27	362	2,890	25	3,509
Morris	162	0	296	2,108	16	2,582
Ocean	141	39	374	2,535	110	3,198
Passaic	55	5	234	1,030	10	1,334
Salem	86	9	361	425	5	886
Somerset	104	0	230	1,399	0	1,734
Sussex	111	1	314	905	101	1,431
Union	68	20	176	1,158	6	1,427
Warren	103	5	261	690	76	1,134
TOTAL	**2,323**	**411**	**6449**	**29,408**	**649**	**39,241**
					STATEWIDE TOTAL	**39,241**

Source: Bureau of Transportation Data Development, Roadway Systems Section

Appendix ‘C’ - Typical Neighborhood Street

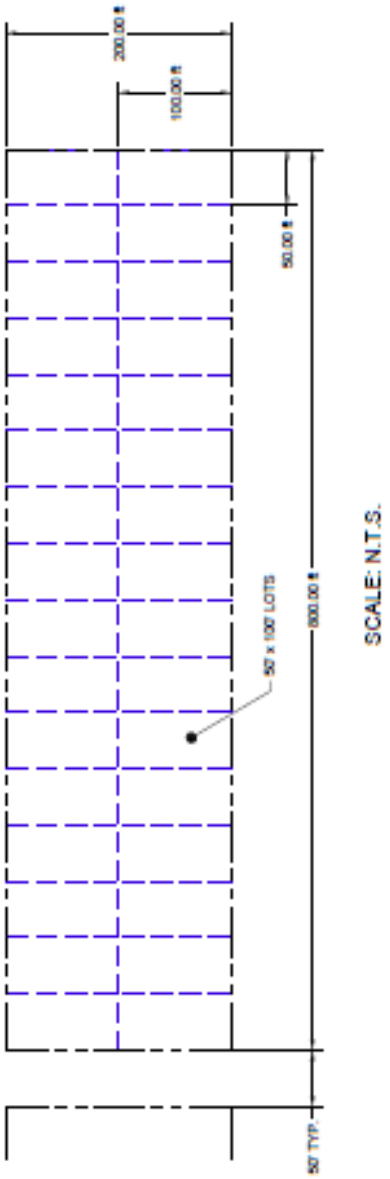

Figure 2 Typical Neighborhood Block with lot size of 50' x 100' - Medium Density

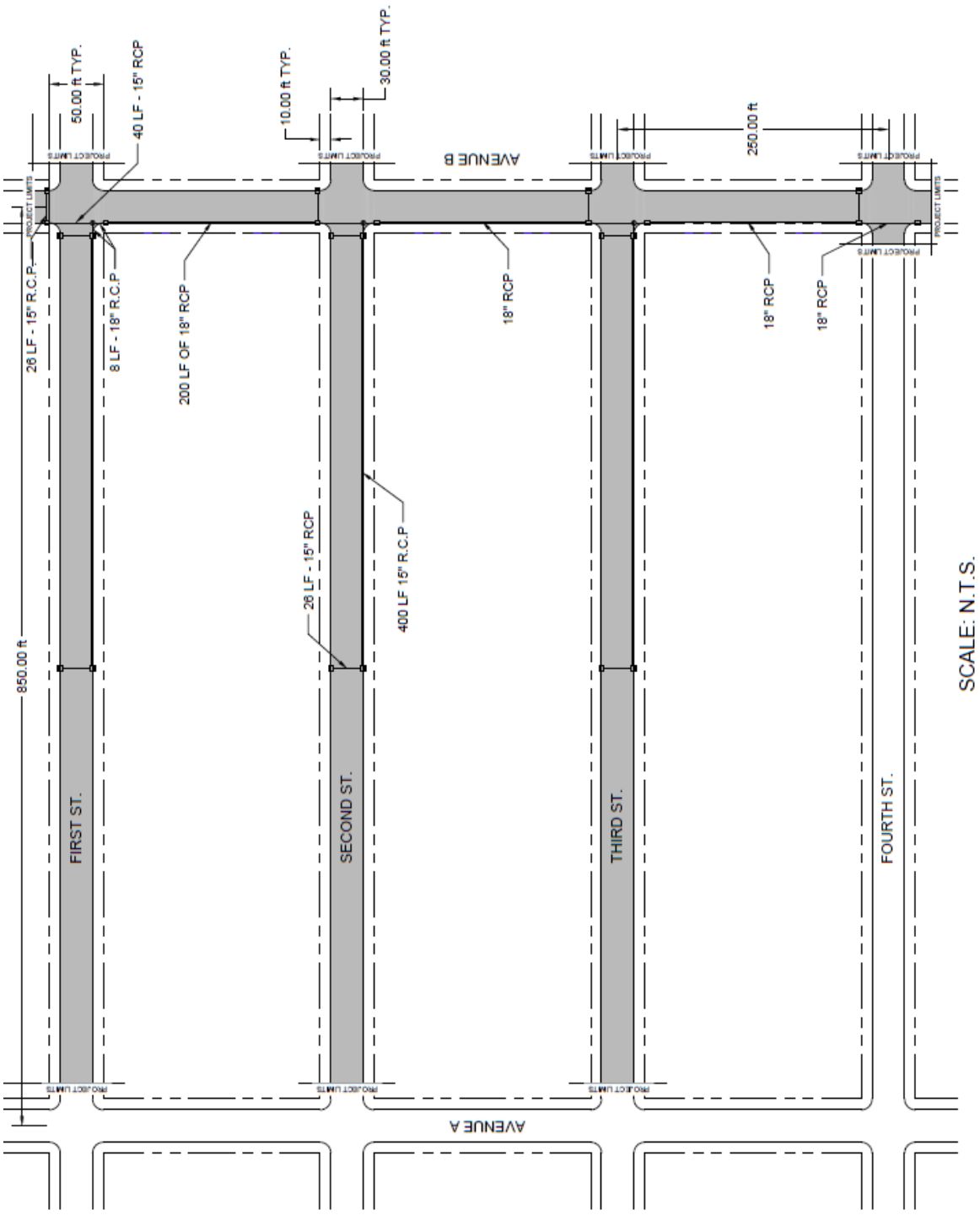

Figure 3 - Sample Neighborhood Street Project for Quantity Take-off

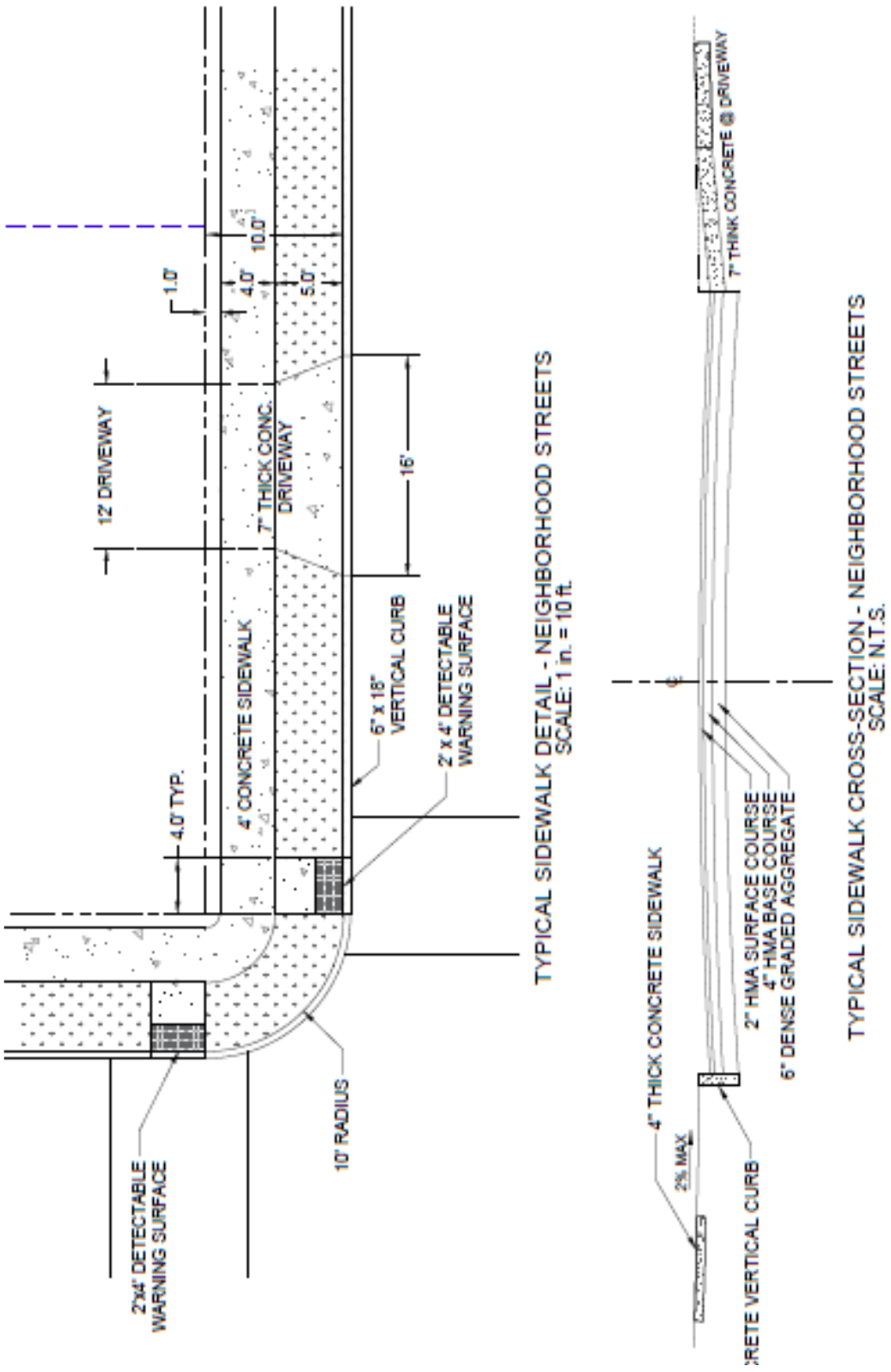

Figure 4 - Neighborhood Street Details and Cross-Section

Appendix ‘D’ –Cost Estimates for Typical Municipal Roadway

(Assuming 3300 Lf of centerline - 3 blocks of 200' x 800' with 50' x 100' lots, 50' ROW, 30' pavement width, 4' sidewalk both sides, 12' wide driveway on each lot, ADA curb ramps)

Table D-1 Cost to Reconstruct Neighborhood Street with curb and sidewalk both sides

ITEM	DESCRIPTION	EST. QTY.	UNIT MEAS.	ENGR'S EST. UNIT COST	EXTENDED COST
1	TYPE 'B' INLETS	18	EA.	$2,750.00	$49,500.00
2	15" R.C.P.	1590	L.F.	$60.00	$95,400.00
3	18" R.C.P.	750	L.F.	$70.00	$52,500.00
4	SELECT BACKFILL	1200	C.Y.	$20.00	$24,000.00
5	REMOVE VERTICAL CONCRETE CURB	6192	L.F.	$3.00	$18,576.00
6	6"X18" VERTICAL CONCRETE CURB	6192	L.F.	$20.00	$123,840.00
7	REMOVE EXISTING SIDEWALK & DRIVEWAY APRON	1194	S.Y.	$9.00	$10,746.00
8	2' X 4' TACTILE WARNING SURFACES - CAST IRON	24	EA	$500.00	$12,000.00
9	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK	705	S.Y.	$50.00	$35,244.44
10	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK	489	S.Y.	$65.00	$31,777.78
11	RESTORATION	3700	S.Y.	$15.00	$55,500.00
12	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
13	ROADWAY EXCAVATION (unclassified)	3850	C.Y.	$23.00	$88,550.00
14	SOIL AGGREGATE BASE COURSE	1925	C.Y.	$25.00	$48,125.00
15	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
16	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	2989	TON	$66.00	$197,245.13
17	HMA 9.5 M64 - FABC SURFACE COURSE	996	TON	$68.00	$67,740.75
18	STRIPES AND SIGNS	1	LS	$10,000.00	$10,000.00
	SUBTOTAL				$924,295.10
G	GENERAL ITEMS - 10% - INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$92,429.51	$92,429.51
T	TRAFFIC CONTROL - 5% - INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$46,214.75	$46,214.75
	TOTAL PROJECT CONSTRUCTION COST				**$1,062,939.36**
	Cost per linear foot				$322.10

Table D- 2 – Cost to Reconstruct Neighborhood Street with curbs but no sidewalk

ITEM	DESCRIPTION	EST. QTY.	UNITS	ENGR'S EST. UNIT COST	EXTENDED COST
1	TYPE 'B' INLETS	18	EA.	$2,750.00	$49,500.00
2	15" R.C.P.	1590	L.F.	$60.00	$95,400.00
3	18" R.C.P.	750	L.F.	$70.00	$52,500.00
4	SELECT BACKFILL	1200	C.Y.	$20.00	$24,000.00
5	REMOVE VERTICAL CONCRETE CURB	6192	L.F.	$3.00	$18,576.00
6	6"X18" VERTICAL CONCRETE CURB	6192	L.F.	$20.00	$123,840.00
7	REMOVE EXISTING SIDEWALK & DRIVEWAY APRON		S.Y.	$9.00	$0.00
8	2' X 4' TACTILE WARNING SURFACES - CAST IRON		EA	$500.00	$0.00
9	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK		S.Y.	$50.00	$0.00
10	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK		S.Y.	$65.00	$0.00
11	RESTORATION	3700	S.Y.	$15.00	$55,500.00
12	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
13	ROADWAY EXCAVATION (unclassified)	3850	C.Y.	$23.00	$88,550.00
14	SOIL AGGREGATE BASE COURSE	1925	C.Y.	$25.00	$48,125.00
15	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
16	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	2989	TON	$66.00	$197,245.13
17	HMA 9.5 M64 - FABC SURFACE COURSE	996	TON	$68.00	$67,740.75
18	STRIPES AND SIGNS	1	LS	$10,000.00	$10,000.00
	SUBTOTAL				$834,526.88
G	GENERAL ITEMS - 10% - INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$83,452.69	$83,452.69
T	TRAFFIC CONTROL - 5% - INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$41,726.34	$41,726.34
	TOTAL PROJECT CONSTRUCTION COST				**$959,705.91**
	Cost per linear foot				$290.82

Table D-3 - Cost to Reconstruct Neighborhood Streets with no curb or sidewalk

ITEM	DESCRIPTION	EST. QTY.	UNITS	ENGR'S EST. UNIT COST	EXTENDED COST
1	TYPE 'B' INLETS	18	EA.	$2,750.00	$49,500.00
2	15" R.C.P.	1590	L.F.	$60.00	$95,400.00
3	18" R.C.P.	750	L.F.	$70.00	$52,500.00
4	SELECT BACKFILL	1200	C.Y.	$20.00	$24,000.00
5	REMOVE VERTICAL CONCRETE CURB		L.F.	$3.00	$0.00
6	6"X18" VERTICAL CONCRETE CURB	450	L.F.	$20.00	$9,000.00
7	REMOVE EXISTING SIDEWALK & DRIVEWAY APRON	0	S.Y.	$9.00	$0.00
8	2' X 4' TACTILE WARNING SURFACES - CAST IRON	0	EA	$500.00	$0.00
9	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK	0	S.Y.	$50.00	$0.00
10	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK	0	S.Y.	$65.00	$0.00
11	RESTORATION	3700	S.Y.	$15.00	$55,500.00
12	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
13	ROADWAY EXCAVATION (unclassified)	3850	C.Y.	$23.00	$88,550.00
14	SOIL AGGREGATE BASE COURSE	1925	C.Y.	$25.00	$48,125.00
15	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
16	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	2989	TON	$66.00	$197,245.13
17	HMA 9.5 M64 - FABC SURFACE COURSE	996	TON	$68.00	$67,740.75
18	STRIPES AND SIGNS	1	LS	$10,000.00	$10,000.00
	SUBTOTAL				$701,110.88
G	GENERAL ITEMS - 10% - INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$70,111.09	$70,111.09
T	TRAFFIC CONTROL - 5% - INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$35,055.54	$35,055.54
	TOTAL PROJECT CONSTRUCTION COST				**$806,277.51**
	Cost per linear foot				$244.33

Table D-4 - Overlay of Neighborhood Street with curb and sidewalk

ITEM	DESCRIPTION	EST. QTY.	UNITS	ENGR'S EST. UNIT COST	EXTENDED COST
3	DRAINAGE IMPROVEMENTS	1	L.S.	$20,000.00	$20,000.00
4	REMOVE VERTICAL CONCRETE CURB	600	L.F.	$3.00	$1,800.00
5	6"X18" VERTICAL CONCRETE CURB	600	L.F.	$20.00	$12,000.00
6	2' X 4' TACTILE WARNING SURFACES - CAST IRON	3	EA	$500.00	$1,500.00
7	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK	70	S.Y.	$50.00	$3,500.00
8	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK	50	S.Y.	$65.00	$3,250.00
9	RESTORATION	1	LS	$10,000.00	$10,000.00
10	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
11	ROADWAY EXCAVATION (unclassified)	385	C.Y.	$23.00	$8,855.00
12	SOIL AGGREGATE BASE COURSE	193	C.Y.	$25.00	$4,825.00
13	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
14	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	300	TON	$66.00	$19,800.00
15	HMA 9.5 M64 - FABC SURFACE COURSE	1328	TON	$67.95	$90,254.59
16	MILL PAVEMENT - 2" THICK	11550	SY	$3.00	$34,650.00
17	STRIPES AND SIGNS	1	LS	$5,000.00	$5,000.00
	SUBTOTAL				$218,984.59
1	GENERAL ITEMS - 10% -INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$21,898.46	$21,898.46
2	TRAFFIC CONTROL - 5%- INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$10,949.23	$10,949.23
	TOTAL PROJECT CONSTRUCTION COST				**$251,832.28**
	Cost per linear foot				$76.31

Table D – 5 Cost to overlay neighborhood street with curb but no sidewalk

ITEM	DESCRIPTION	EST. QTY.	UNITS	ENGR'S EST. UNIT COST	EXTENDED COST
3	DRAINAGE IMPROVEMENTS	1	L.S.	$20,000.00	$20,000.00
4	REMOVE VERTICAL CONCRETE CURB	600	L.F.	$3.00	$1,800.00
5	6"X18" VERTICAL CONCRETE CURB	600	L.F.	$20.00	$12,000.00
6	2' X 4' TACTILE WARNING SURFACES - CAST IRON		EA	$500.00	$0.00
7	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK		S.Y.	$50.00	$0.00
8	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK		S.Y.	$65.00	$0.00
9	RESTORATION	1	LS	$5,000.00	$5,000.00
10	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
11	ROADWAY EXCAVATION (unclassified)	385	C.Y.	$23.00	$8,855.00
12	SOIL AGGREGATE BASE COURSE	193	C.Y.	$25.00	$4,825.00
13	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
14	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	300	TON	$66.00	$19,800.00
15	HMA 9.5 M64 - FABC SURFACE COURSE	1328	TON	$67.95	$90,254.59
16	MILL PAVEMENT - 2" THICK	11550	SY	$3.00	$34,650.00
17	STRIPES AND SIGNS	1	LS	$5,000.00	$5,000.00
	SUBTOTAL				$205,734.59
1	GENERAL ITEMS - 10% -INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$20,573.46	$20,573.46
2	TRAFFIC CONTROL - 5%- INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$10,286.73	$10,286.73
	SUB-TOTAL				**$236,594.78**
	Cost per linear foot				$71.70

Table D – 6 Cost to overlay neighborhood street with no curb or sidewalk

ITEM	DESCRIPTION	EST. QTY.	UNITS	ENGR'S EST. UNIT COST	EXTENDED COST
3	DRAINAGE IMPROVEMENTS	1	L.S.	$20,000.00	$20,000.00
4	REMOVE VERTICAL CONCRETE CURB	60	L.F.	$3.00	$180.00
5	6"X18" VERTICAL CONCRETE CURB	60	L.F.	$20.00	$1,200.00
6	2' X 4' TACTILE WARNING SURFACES - CAST IRON		EA	$500.00	$0.00
7	INSTALL 4"THK.STANDARD CONCRETE SIDEWALK		S.Y.	$50.00	$0.00
8	INSTALL 7"THK. STANDARD CONCRETE SIDEWALK		S.Y.	$65.00	$0.00
9	RESTORATION	1	LS	$5,000.00	$5,000.00
10	SAWCUTTING - BIT. CONC. PAVEMENT	210	L.F.	$5.00	$1,050.00
11	ROADWAY EXCAVATION (unclassified)	385	C.Y.	$23.00	$8,855.00
12	SOIL AGGREGATE BASE COURSE	193	C.Y.	$25.00	$4,825.00
13	RESET MANHOLE FRAME AND COVER	10	EA.	$250.00	$2,500.00
14	HMA 19 M64 - BITUMINOUS STABILIZED BASE COURSE	300	TON	$66.00	$19,800.00
15	HMA 9.5 M64 - FABC SURFACE COURSE	1328	TON	$67.95	$90,254.59
16	MILL PAVEMENT - 2" THICK	11550	SY	$3.00	$34,650.00
17	STRIPES AND SIGNS	1	LS	$5,000.00	$5,000.00
	SUBTOTAL				$193,314.59
1	GENERAL ITEMS - 10% -INCLUDING: PERFORMANCE AND PAYMENT BONDS, MOBILIZATION,RECORD DOCUMENTS, CLEARING SITE, PROJECT SIGNS, CONSTRUCTION PHOTOS	1	L.S.	$19,331.46	$19,331.46
2	TRAFFIC CONTROL - 5%- INCLUDING: SIGNS, BARRICADES, DRUMS,CONES, TRAFFIC DIRECTORS, POLICE SAFETY SERVICES	1	L.S.	$9,665.73	$9,665.73
	SUB-TOTAL				**$222,311.78**
	Cost per linear foot				$67.37

Table D – 7 - ANNUAL COST FOR MUNICIPAL NEIGHBOHOOD STREET REPAIR

(Based upon a 60 year life cycle with overlays at 20 year intervals)

	30' Neighborhood Street with curb and sidewalk on both sides		30' Neighborhood Street with curb on both sides - No Sidewalk		30' Neighborhood Street with no curb or sidewalk	
Description	Cost per centerline foot	Cost per centerline mile	Cost per centerline foot	Cost per centerline mile	Cost per centerline foot	Cost per centerline mile
Overlay 1	$76.31	$402,931.64	$71.70	$378,551.64	$67.37	$355,698.84
Overlay 2	$76.31	$402,931.64	$71.70	$378,551.64	$67.37	$355,698.84
Reconstruction	$322.10	$1,700,702.98	$290.82	$1,535,529.45	$244.33	$1,290,044.01
Total Life Cycle Cost	$474.73	$2,506,566.26	$434.21	$2,292,632.73	$379.06	$2,001,441.69
Annual Repair Cost	$7.91	$41,776.10	$7.24	$38,210.55	$6.32	$33,357.36

Appendix 'E' - Appropriations

Trust fund Capital Program Appropriation History State Funds – From NJDOT

NJDOT/NJ TRANSIT Capital Program				
Appropriation History ($ Million)				
FY	**Highways**	**NJT**	**Local Aid***	**Total**
1985	166.0	29.0	54.0	249.0
1986	209.5	50.0	64.0	323.5
1987	256.0	121.0	54.0	431.0
1988	191.0	60.0	72.0	323.0
1989	221.9	71.5	71.6	365.0
1990	182.4	89.0	93.6	365.0
1991	346.1	119.8	99.1	565.0
1992	276.0	223.0	94.3	593.3
1993	249.5	187.5	100.0	537.0
1994	268.5	196.5	100.0	565.0
1995	265.0	200.0	100.0	565.0
1996	312.0	258.0	130.0	700.0
1997	310.5	259.5	130.0	700.0
1998	476.1	283.0	140.9	900.0
1999	279.8	288.0	132.2	700.0
2000	375.1	360.0	164.9	900.0
2001	360.0	390.0	150.0	900.0
2002	385.0	572.5	150.0	1,107.5
2003	430.0	528.0	150.0	1,108.0
2004	460.0	618.2	150.0	1,228.2
2005	541.0	519.0	145.0	1,205.0
2006	526.0	534.0	145.0	1,205.0
2007	750.0	675.0	175.0	1,600.0
2008	800.0	625.0	175.0	1,600.0
2009	770,0	625.0	205.0	1,600.0
2010	655.0	692.0	253.0	1,600.0
2011	800.0	600.0	200.0	1,600.0
2012	435.0	622.0	190.0	1,247.0
2013	467.4	589.5	190.1	1,247.0
2014	444.4	495.5	284.1	1,224.0
2015	469.9	470.5	284.6	1,225.0
2016	469.9	503.5	273.6	1,247.0
Total	**13,149.0**	**11,855.5**	**4,721.0**	**29,725.5**

*Local Aid includes both Municipal and County Aid

[i] For the purposes of this report the use of the term "local" refers to municipal streets and road unless referring to "Local Aid" which is defined by NJDOT as funding to Counties and Municipalities. While NJDOT combines County and Municipal funding into the term Local Aid, the funds available for counties are more extensive than those available to municipalities.

[ii] One of the authors recently completed an auto trip that spanned into another country – Canada. This trip transitioned just as described on both ends – with private parking facilities receiving the vehicle at both ends. Thus, our description applies in general to most vehicular trips.