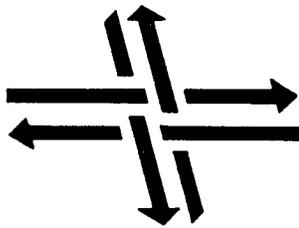




**THE PENNSYLVANIA QUALITY
INITIATIVE; A SYNTHESIS OF
CUSTOMER SATISFACTION AND
ADDITIONAL RESEARCH NEEDS**



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ADDITIONAL RESEARCH NEEDS**

Submitted to

The Pennsylvania Department of Transportation

Submitted by

Theodore H. Poister, Ph.D.

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Customer satisfaction is at the heart of the Pennsylvania Quality Initiative (PQI), which was created in 1994 to build a more effective partnership among all the stakeholders involved in the process of designing, building, operating, and maintaining Pennsylvania's highway system. Modeled on the National Quality Initiative (NQI), PQI is a consortium of government, industry, and professional organizations committed to the continuous quality improvement of this process. Charter members include PennDOT, the Pennsylvania Turnpike Commission (PTC), the Federal Highway Administration (FHWA), the Associated Pennsylvania Constructors (APC), the Pennsylvania Aggregate and Concrete Association (PACA), the Pennsylvania Asphalt Paving Association (PAPA), the American Public Works Association (APWA), and the Consulting Engineers Council of Pennsylvania (CEC). This report presents the finding of this research.

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Introduction

Customer satisfaction is at the heart of the Pennsylvania Quality Initiative (PQI), which was created in 1994 to build a more effective partnership among all the stakeholders involved in the process of designing, building, operating, and maintaining Pennsylvania's highway system. Modeled on the National Quality Initiative (NQI), PQI is a consortium of government, industry, and professional organizations committed to the continuous quality improvement of this process. Charter members include the Pennsylvania Department of Transportation (PennDOT), the Pennsylvania Turnpike Commission (PTC), the Federal Highway Administration (FHWA), the Associated Pennsylvania Constructors (APC), the Pennsylvania Aggregate and Concrete Association (PACA), the Pennsylvania Asphalt Paving Association (PAPA), the Northeast chapter of the American Concrete Pavement Association (ACPA), the American Public Works Association (APWA), and the Consulting Engineers Council of Pennsylvania (CEC).

PQI's charter, mission statement, and vision statement all emphasize the importance of customer satisfaction and the need to understand customers' expectations, and one of its eight standing subcommittees is mandated to focus on customer service. As an initial step in pursuing this mandate, PQI commissioned a research effort intended to synthesize the "voice of the customer" as it has been registered to date, and to develop an agenda for further market research that might be needed to better gauge motorists' satisfaction, expectations, concerns, and priorities regarding Pennsylvania highways.

This report presents the findings of this research. It begins with a review and synthesis of numerous motorist surveys that have been undertaken by various organizations over the past several years. This is followed by a synopsis of personal interviews conducted with numerous stakeholders in the PQI process concerning their perspectives on PQI itself, customer orientations in the "industry," and additional information requirements regarding customer satisfaction. Finally, the report presents an agenda for additional market research designed to address issues emerging from existing surveys as well as from stakeholder interviews.

Existing Surveys of Pennsylvania Highway Users

A number of surveys of highway users conducted over the past five years were reviewed for the purposes of this synthesis. These surveys include:

- ◆ The general purpose Pennsylvania Citizens Survey, conducted in late 1994 and early 1995 by Penn State Harrisburg, which included questions submitted by both the Pennsylvania Highway Information Association and the Pennsylvania Turnpike Commission. These data are based on 856 completed telephone interviews.
- ◆ The Highway User Study, conducted for the NQI in the fall of 1995 by Coopers & Lybrand and the Opinion Research Corporation, which focused only on the detailed tabulations for Pennsylvania respondents. Of the 2,205 respondents to the nationwide NQI survey, only 89 were Pennsylvanians.

- ◆ The Worst Roads Survey, conducted by *Overdrive* Magazine in November, 1997. A total of 270 truck drivers responded to this self-administered survey.
- ◆ The QUIK surveys (Quality, Use, Importance, Knowledge) of Pennsylvania citizens conducted for PennDOT in November 1995 and again in November 1997 by Penn State University and Diagnostics Plus. The QUIK95 telephone survey garnered 1,133 responses, while the QUIK97 survey produced 1,128 completed interviews.
- ◆ The Customer Service Survey on Safety and Traffic Flow, conducted for PennDOT in March 1998 by Orth-Rodgers & Associates, and B.T. Harder, Inc. This telephone survey completed interviews with a statewide sample of 1,024 licensed drivers.
- ◆ The County Maintenance Customer Service Index surveys, conducted by PennDOT in the fall of 1996, 1997, and 1998. The surveys were mailed out to 400 licensed drivers in each of Pennsylvania's 67 counties; in 1998 there were 6,159 returned surveys.

In addition, a pilot citizen survey, which was designed and tested in 1982 by the author in conjunction with an effort to develop performance measurement tools for PennDOT, is reviewed here for the sole purpose of providing a rough benchmark against which customer feedback from these more current surveys might be compared. This 1982 mail-out pilot was based on returned surveys from a random sample of 3,777 licensed drivers in Pennsylvania. Summaries of each of these surveys are presented in Appendix A. These surveys were conducted at different times for different purposes, with a variety of sampling frames, survey methods, and instruments. Yet, each one provides interesting feedback from the view of the motoring public. Here an attempt is made to synthesize their results in order to discern the "voice of the customer" regarding Pennsylvania highways.

PennDOT's Performance

The QUIK surveys asked Pennsylvania citizens to rate the importance and grade the performance of an all-inclusive set of facilities and services provided by PennDOT, ranging from Harrisburg International Airport to the state tourist map, welcome centers, vehicle registration and titling, vehicle inspections, driver licensing, support for public transit, highway planning and construction, and highway repair and maintenance. Performance was graded on a scale running from A for excellent, B for good, C for average, D for poor, and F for failing.

Highway repair and maintenance was seen as one of the most important services provided by PennDOT, but its performance in this area was rated lower than any other service, in the low "C" range. New highway planning and construction was also seen as being very important, with an average grade in the mid "C" range, while roadside beautification was seen as being fairly important, with a performance grade in the high "C" range. For the record, only 44 percent of the QUIK97 respondents graded PennDOT's highway repair and maintenance with an A or B, while 55 percent graded new highway planning and construction with an A or B, and 77 percent graded signs and line painting with an A or B. These grades were very similar to those registered on the QUIK95 survey.

These three services—highway repair and maintenance, new highway planning and construction, and (to a lesser degree) roadside beautification—are the only services that fall into the “high importance / poorer performance” quadrant of the performance matrix. This is the group of PennDOT services, all relating to highways, that in the eyes of Pennsylvania residents most needs to be improved. When those who had given PennDOT a low grade on highway repair and maintenance were asked what it would have to do better in order to get an A or B, the most frequent replies focused on pothole maintenance, more timely repairs, more frequent road work, and better resurfacing. When the same question was asked of respondents who gave new highway planning and construction a lower grade, the most frequent answers related to better planning, more prompt and complete execution of plans, and more frequent road work and updating of specific roads.

Snow removal was also rated as being extremely important, and its performance grade was in the low “B” range. Highway signs and line painting had a very similar extremely important and “B” performance rating, while roadside rest areas were also seen as being very important and received a “B” performance rating. While 68 percent of the respondents graded roadside beautification with an A or B, 78 percent did so for roadside rest areas, and 80 percent did so for snow removal.

The county level motorist surveys conducted annually by PennDOT also contain items on specific services. Overall, 67 percent of the respondents to the 1998 survey indicated that they were satisfied with the removal of snow and ice from state highways in their counties, while 68 percent reported that traffic line painting met or exceeded their expectations, and 77 percent said that traffic signs did so. As will be seen in a later section, these ratings were much more favorable than were those regarding pavement quality from the same county level survey.

The NQI Highway User Survey conducted in 1995 included a few questions on maintenance response time that related to selected items on the QUIK surveys. The sample size—which included only 89 respondents from Pennsylvania—obviously does not provide a high level of statistical confidence. Yet it is interesting to note that while 48 percent indicated that they were satisfied with the timeliness of snow removal, and 55 percent said they were satisfied with timeliness in cleaning rest areas, only 30 percent indicated that they were satisfied with the timeliness of pavement repairs. Thus, performance in both snow removal and maintaining rest areas again tended to be graded as higher than that for highway repair and maintenance. In the NQI survey, 47 percent of the respondents indicated that they were satisfied with the timeliness of guardrail and safety barrier repairs, while 57 percent said they were satisfied with the timeliness of removing litter from highways. In comparison with the other surveys reviewed in this synthesis, the small Pennsylvania subsample in the NQI survey may well be biased toward more negative ratings; however, the relative pattern of responses is still worth noting.

Another service area that has been addressed by some of these surveys concerns the management of work zones where highway maintenance or reconstruction is being done. For example, 85 percent of the respondents to PennDOT’s 1998 county level motorist survey indicated that work zone warning signs met or exceeded their expectations, while 75 percent said that travel lanes in work zones did so. However, only 51 percent indicated that the length of

delays encountered at work zones was acceptable. These ratings are quite consistent with the finding of the Orth-Rodgers/B.T. Harder survey that 70 percent of Pennsylvania licensed drivers rate PennDOT's performance in accommodating motorists through work zones as good or excellent.

Customer Satisfaction with Roads

While many of these surveys concerning PennDOT's performance obviously reflect directly on the quality and condition of its highway system, other surveys ask questions which focus even more directly on motorists' ratings of, and satisfaction with, the roads themselves. For example, 51 percent of the respondents to the 1994/95 Pennsylvania Citizens Survey indicated that they were satisfied or very satisfied with the condition of roads and highways in Pennsylvania. When asked what the greatest problems with the roads and highways in their area were, by far the predominant response, cited by 57 percent, concerned potholes. No other problem—bridge conditions, traffic congestion, snow removal, or assorted safety related factors—was cited by as many as 10 percent. In this same survey, 71 percent of those respondents who indicated that they used the Pennsylvania Turnpike reported that they were satisfied or very satisfied with the turnpike's road condition, while 84 percent indicated that they were satisfied with the turnpike overall. Thus, motorists were clearly expressing greater satisfaction with the turnpike than with other Pennsylvania highways in general.

In the NQI Highway User Study conducted in 1995, only 32 percent of the Pennsylvania respondents indicated that they were satisfied or extremely satisfied with the major highways—interstate, other multi-lane highways, and major two lane highways—that they used most frequently. While the small number of Pennsylvania respondents to the NQI survey (only 89) reduces confidence in interpreting these results, it is nevertheless interesting to compare satisfaction levels with different aspects of these highway systems. As can be seen in Appendix A, for instance, the number who indicated that they were satisfied with most of the specific safety-related features—such as lane width, pavement markings, roadway lighting, and safety barriers—ranged from 41 percent to 64 percent, while reported satisfaction fell in similar ranges regarding specific features relating to bridge condition, visual appeal, and travel amenities. However, only 38 percent indicated that they were satisfied with the ride quality of the pavements, only 30 percent expressed satisfaction with pavement durability, and only 24 percent reported satisfaction with the level of traffic congestion.

The Customer Service Survey, conducted by Orth-Rodgers & Associates and B.T. Harder in 1998 for PennDOT's Bureau of Highway Safety & Traffic Engineering, asked respondents to rate Pennsylvania highways on a number of dimensions and asked about specific concerns relating to those dimensions. For example, 53 percent of the respondents rated the overall safety of the roads and highways as good or excellent; the most frequently cited concerns were potholes, road hazards without warning signs, and safety at intersections without left turn lanes. Similarly, 56 percent rated PennDOT's efforts to address traffic congestion on Pennsylvania highways as good or excellent; the major concerns cited related to rush hour congestion, congestion due to other bottlenecks, and delays due to poor traffic signal timing.

In this largely safety-oriented survey, 56 percent of the respondents rated existing road and highway signs as good or excellent, while fewer, 43 percent, rated paint and other traffic markings as good or excellent. The major concerns cited here related to the visibility of signs at night; the visibility of pavement markings at night, in rain, or in winter; the presence of reflectors in the roadway; and the absence of painted edge lines.

While the focus of the Orth-Rodgers & Harder survey was on safety and traffic flow issues, the annual county level survey of Pennsylvania motorists focused on the roads themselves, asking respondents to rate the quality of the highways and bridges in their county in terms of "ride quality." While the intent of this question was to solicit motorists' feedback regarding the *smoothness* of the ride—reflecting the high priority PennDOT has placed on reducing roughness—there is some concern that the wording may in fact have tapped into other dimensions of highway quality. In any case, in the 1998 version of this county level mail-out survey, conducted by PennDOT's Operations Review Group, the number of respondents who rated the ride quality on the roads they use as meeting or exceeding their expectations was 54 percent for interstate highways, 55 percent for numbered traffic routes, and 40 percent for all other (secondary) roads. For each of these three road classifications, these favorable ratings are 7 or 8 percentage points higher than in 1996 or 1997.

Pennsylvania Roads Versus Roads in Other States

It is also interesting to note how motorists rate Pennsylvania highways in comparison to those in other states. Five years ago, the Pennsylvania Citizens Survey, which as reported above estimated that 51 percent of the residents in the Commonwealth were somewhat or very satisfied with Pennsylvania highways, also asked how the condition of these roads and bridges compared with those in neighboring states. While only 3 percent indicated that Pennsylvania roads and bridges were better, 22 percent rated them the same as, and the great majority, 68 percent, worse than roads and bridges in other states.

The common perception of Pennsylvania residents that their roads are in worse shape than roads in other states appears to be matched by the views of professional truck drivers who often drive through many states on a routine basis. *Overdrive* magazine conducts an annual survey of its readers concerning the worst roads in the nation, and Pennsylvania typically is rated as the state with the worst roads. In the 1996 survey, Interstate 80 in Pennsylvania and the Pennsylvania Turnpike I-76 were tied as the worst roads. In the 1997 survey, Pennsylvania was again rated as the state with the worst roads, although a few respondents even called Pennsylvania's roads the best in the country. Despite the unscientific sampling frame of this survey, Pennsylvania's reputation of having roads in worse condition than other states appears to linger on.

Interestingly, the professional truck drivers who responded to the *Overdrive* survey identified potholes, traffic congestion, constant construction, dangerous on/off ramps, surface patching, and "washboarding" as the most important factors affecting the quality of a road. Similarly, when asked about the factors that determined their choice of the worst roads, the most frequent responses were potholes, patching, cracking, washboarding, traffic congestion, and

constant construction. This list provides some indication of the criteria that are most important to professional drivers, at least in rating the quality of the roads on which they drive.

Motorist Satisfaction Over Time

All the surveys reviewed here have been conducted within the past five years. While the county level motorist survey conducted annually by PennDOT does suggest some improvement in the ratings from 1995 to 1997, a longer term comparison might also be helpful in beginning to discern whether tangible improvements in road condition are reflected in more favorable motorist ratings over time.

While earlier data on customer satisfaction with public services are typically difficult to find, the author of this report conducted a pilot survey of Pennsylvania motorists in 1982, over fifteen years ago. This survey collected valid responses from 3,777 Pennsylvania licensed drivers, for a response rate of 45 percent.

A forerunner of PennDOT's annual county maintenance survey, in this pilot survey asked as one of its central questions, "How would you describe the present condition of the state roads in your county?" In 1982, only 23 percent of these respondents replied that the roads were in good or very good condition. Roughly 34 percent responded that the state roads in their county were in poor or very poor condition, while the remaining 43 percent said that their roads were in fair condition. In this same 1982 survey, slightly more than one-third of the respondents indicated that they frequently had difficulty in getting to work or other places due to problems with the roads they used. The specific problems cited most frequently concerned potholes and traffic congestion.

From the early 1980s to the mid-1990s, PennDOT's more aggressive maintenance efforts were able to reduce the highway maintenance backlog by nearly 50 percent. While these surveys used different item wording and different response scales, rough comparisons are still possible. Thus, compared with the 23 percent of respondents to the 1982 pilot survey who rated the roads as good or very good, the finding of the 1994 Pennsylvania Citizens Survey that 51 percent of those responding were satisfied or very satisfied with the condition of the roads in Pennsylvania does suggest that over the long run there may indeed be a direct relationship between tangible road condition and motorist ratings. In this case, as maintenance needs were reduced by almost half, the percent favorable motorist ratings nearly doubled. As compared with the responses to the original pilot survey in 1982, the tentative conclusion that improved road condition does bring about increased customer satisfaction in the long run would seem to be further corroborated by the results of PennDOT's county level surveys and, to a lesser degree, by the small Pennsylvania portion of the NQI sample.

Priorities for Improvement

In addition to gauging customer satisfaction with current conditions, some of these surveys also tap into what motorists' priorities might be for improving Pennsylvania's highway system. As discussed above, the 1995 and 1997 QUIK surveys make it clear that not only are

new highway construction and highway maintenance graded as performing at a sub-B level presently, but also that Pennsylvania residents regard both as being very important services, and thus high priority areas for improvement.

The 1994 Pennsylvania Citizens Survey also asked about the importance of various kinds of transportation improvements. A total of 80 percent of respondents to this survey gave improvement in the maintenance of existing roads and bridges high importance ratings, while 66 percent gave new roadway improvements to alleviate congestion and facilitate economic development high importance ratings, and 51 percent gave high importance ratings to transportation management strategies such as ride sharing, high-occupancy vehicle lanes, and staggered employee working hours.

Finally, the 1998 Customer Service Survey conducted by Orth-Rodgers and B.T. Harder asked Pennsylvania licensed drivers to rank the importance of improved safety, improved pavement smoothness, or reduced traffic congestion. Ranking safety improvement as the most important goal were 42 percent, while 39 percent ranked smoother pavements as the most important; the remaining 19 percent ranked reduced congestion as the most important goal. When asked where they would recommend allocating highway funds, 44 percent of respondents said they would spend the most money on improving safety, 38 percent on improving existing pavements, 11 percent improving traffic flow, and the remaining 10 percent on building new roads and highways.

The "Voice" of the Highway Customer

While these various surveys employed different methodologies, asked different questions, and included some contradictions among their responses, several themes begin to coalesce from this review that can help to establish the "voice of the customer" regarding Pennsylvania highways. Attempting to synthesize results across these several surveys yields the following observations:

- ◆ On average, Pennsylvania residents grade PennDOT's performance in maintaining and repairing highways in the low "C" range, which is lower than the rating of any other service it provides. PennDOT's performance in new highway planning and construction is graded in the mid "C" range, while snow removal, sign and line painting, roadside rest area maintenance, and roadside beautification are all rated in the low "B" range. PennDOT's performance in managing traffic in work zones is also rated in this "average" range. While these are passing grades, in the eyes of the customer there is considerable room for improving PennDOT's performance in all these areas.
- ◆ Highway repair and maintenance, as well as snow removal, are seen as being extremely important by Pennsylvania residents, and new highway planning and construction, as well as the painting of traffic lines and signs, are also accorded a very high level of importance in the eyes of the customer. Thus, there is a need for substantial improvement of performance in these areas if PennDOT is to achieve the high standards of excellence and customer satisfaction to which it aspires.

- ◆ These marginal ratings of PennDOT's performance in highway maintenance and related areas are consistent with customers' satisfaction, or lack thereof, with the roads themselves. The percentage of motorists who, on the whole are satisfied with Pennsylvania highways is close to 50 percent. Thus, up to one-half of the customer base for PennDOT's highway programs are less than satisfied with the condition and ride quality of the roads on which they drive. Satisfaction is somewhat higher for interstate highways and numbered traffic routes, and somewhat lower for secondary roads on the state system.
- ◆ Pennsylvania motorists' ratings of the Pennsylvania Turnpike are notably higher than their ratings of other roads in the state.
- ◆ Looking at specifics, one-half, or slightly more than one-half, of Pennsylvania motorists rate highway safety as good or excellent. This is also the case regarding traffic flow, and with respect to highway traffic signs. Few motorists rate painted lines and other traffic markings in the pavement as good or excellent. Potholes are still seen by many motorists as a major problem.
- ◆ Residents of the Commonwealth tend to rate Pennsylvania highways as being worse than roads and bridges in other states. This is corroborated by the view of many professional truck drivers that Pennsylvania highways, especially Interstate 80 and the Pennsylvania Turnpike, are among the worst in the country.
- ◆ While the percentage of Pennsylvania motorists who are basically satisfied with the highways they use is still quite low—about 50 percent—customer satisfaction has improved substantially over the long run as PennDOT has been able to improve highway condition and reduce the maintenance backlog over the past 15 to 20 years. In the short run, customer satisfaction with the roads may be also be gradually increasing.
- ◆ Pennsylvania residents feel that both highway maintenance and the construction of new highways are important, and that PennDOT's performance in both these areas needs to improve. Clearly, residents place a higher priority on maintaining and repairing existing roads than on building new ones. With respect to existing highways, improving pavements and rideability and reducing traffic congestion have traditionally been important to Pennsylvania motorists, but at this point it is also clear that improving safety is a high priority in the eyes of the customer.

Thus, the “bottom line” from the customers' viewpoint is that while highway capacity, pavement condition, ride quality, and highway safety in Pennsylvania have all advanced over the past several years, there is still considerable room—and a real need—for further improvement. Obviously, these are all interrelated, inasmuch as improved pavement condition and reduced congestion can help improve highway safety, because adding capacity to existing highways or building additional roads also tends to reduce congestion and improve safety. Thus, for PennDOT the implications of the “voice of the customer” are two-fold. At the policy level, the department needs to continue moving ahead with an accelerated and balanced program of ongoing maintenance work, safety improvement projects, and capacity expansion. At the

operating level, customers' interests will be best served by (1) continually striving to make all maintenance operations as productive, high quality, and effective as possible, (2) undertaking safety improvement projects that have the greatest potential for reducing accidents and saving lives, and (3) expanding the overall capacity of the system through major construction and reconstruction projects, which are also likely to reduce congestion and improve safety on existing highways.

PQI Stakeholder Perspectives

To complement the results of existing surveys and obtain further insight regarding customer satisfaction and additional information needs, personal interviews were conducted with a total of 18 individuals representing organizations with a vested interest in the PQI process. Multiple attempts to interview two other individuals were canceled or failed to materialize due to scheduling conflicts. A list of those individuals who were interviewed is included in Appendix B. These stakeholder interviews shed additional light on the PQI process itself, varying customer orientations among the stakeholders, and the need for further market research as a basis for improving Pennsylvania highways in the eye of the motoring public.

The PQI Process

Most of the stakeholders who were interviewed agree that PQI has been beneficial to a degree, and that it is an essential mechanism for facilitating cooperation among the various participants to improve the quality of Pennsylvania highways. However, the predominant view is that performance to date falls short of potential.

Within PennDOT, the underlying premise is that the specification-driven procurement process keeps the department at arms length from its contractors. This results in an adversarial process and a very segmented approach that adversely affects the department's ability to serve its customers. The challenge for PQI is to find opportunities for PennDOT to work more closely with its contractors, while maintaining the integrity of the system. From PennDOT's perspective, "PQI is vitally important to bring the highway contractors into the process in order to reduce the space between them and the ultimate customers, highway users." For example, several years ago PennDOT began pushing for more road work to be done at nighttime to reduce inconvenience for motorists, even though the builders were opposed to the idea. In part, PQI is a necessary forum to bring the industry along on such issues.

On one level PQI is seen by PennDOT as, potentially at least, an effective mechanism for improving the process by bringing to the surface opportunities for building relationships with builders and stimulating them to be more productive in serving the customer. Design/Build and Design/Build/Operate strategies are seen as part, but not all, of the solution. A key question concerns how much of the existing procurement process is intractably rooted in law versus the extent to which it might be improved through changes in departmental policy and practices. The department would like to develop a new institutional framework that gets beyond legalities, contracts, and claims, to bring the "can do" approach that contractors have been able to demonstrate on occasion, in response to emergencies, into normal operations.

PennDOT would like to find “win/win” solutions that allow contractors to make more money while serving motorists better. As one department representative said, “We need PQI to create and invent this stuff, to make the connections and make them work. PQI needs to sponsor demonstration projects to bring about mutual, joint change to improve the process.”

While PennDOT representatives acknowledge the department probably has not focused enough on making PQI work, they recognize that all the parties involved will have to change parts of their processes. PennDOT also realizes that it does not have all the answers and thus cannot simply teach the industry how to serve the ultimate customer better, but that the kinds of improvements needed along these lines are likely to result only from seeking solutions jointly.

PQI is seen as an outreach effort to involve contractors, vendors, and consultants in PennDOT’s quality improvement process. Some participants feel that it has brought PennDOT closer to industry, and that it has encouraged more of a partnering mode in, for instance, establishing greater cooperation in developing specifications. In general, PQI is seen by both PennDOT participants and other stakeholders as providing a good forum for communication with industry, regarding work zone issues and quality issues, for example.

Enhancement of the awards program was mentioned by many stakeholders as a highlight of PQI. The awards typically recognize the owner, designer, and builder. This creates a sense of interest, competition, and excitement, and encourages cooperation among these parties. In the words of one stakeholder, the awards ceremonies at the annual conference have “raised awareness of the importance of quality and the need to do a better job.” It was also noted that adding awards for partnering, working with local communities, and customer service, does encourage the industry to be more concerned with quality improvement and customer satisfaction.

Yet, there is a sense that PQI can and should do more along these lines. For example, it was pointed out that contractors know a lot about scheduling projects, and that they could help along these lines with an eye toward decreasing disruption to the public. At the same time, other PennDOT representatives also expressed concern that to date “PQI is almost all PennDOT,” with too little contribution from other stakeholders in terms of accepting assignments or providing financial support; this, however, is seen as beginning to change.

The industry view is also cautious. Industry representatives indicated that while they don’t know whether quality has actually improved as a result of PQI, awareness of its importance has certainly increased: “PQI has begun to creep into the vocabulary, although the industry doesn’t focus on quality first and foremost.” However, partnering has been well received by some contractors, with projects completed on time, within budget, and with fewer claims. This makes the process less adversarial and is consistent with the spirit of PQI. Another industry participant responded that PQI has been successful in getting the industry involved in the process from a construction and materials perspective, adding that “it has given us some influence on the specification process and the design manual.”

However, observing that it sometimes looks like PQI no longer exists except for the transportation industry spring conference, one stakeholder from the consulting community said,

“It doesn’t seem to be the driving force anymore, although it still has a high profile.” According to another, PQI has floundered because it didn’t get sufficient leadership from NQI. “Other than piggybacking on the annual conference and the awards program,” he said, “PQI really isn’t doing much.”

Still another industry representative indicated that PQI may have been beneficial to date “around the edges,” but pointed out that improvement efforts can be burdensome on the contractors in terms of time requirements. Although they want to cooperate, it’s difficult for the contractors to allocate human resources to work on things like PQI. “Traditionally the highway construction industry has been very competitive, and it has a very high bankruptcy rate,” he said. “PennDOT’s specifications are tighter, and the requirements are more demanding. The threshold to be competitive in this industry has been raised, and yet prices are still pretty much the same. There are not many slack resources for working on committees.”

Some stakeholders external to PennDOT expressed confusion or frustration with the large number of innovative processes coming out of the department in recent years, and their lack of understanding as to how all these programs relate to one another as well as how they relate to PQI. The engineering management system (EMS), the construction management system (CMS), the combined engineering and construction management system (ECMS), PQI, and the Baldrige process were all mentioned in this regard. As one industry representative observed, “Maybe there will be fewer contentious moments as a result of PQI, but there are too many games going on at the same time.” There is a shared sense among many stakeholders that this is confusing to outsiders, and they expressed the hope that PQI can serve as a clearinghouse to integrate these initiatives.

Two substantive issues which emerged in interviews with industry stakeholders concern nighttime work and “thin-lift” overlays. While PennDOT is convinced that customers want reconstruction and resurfacing work done at night, as mentioned above, the contractors were not at all enthusiastic about this. They cited difficulties in recruiting and retaining qualified workers, safety issues, noise constraints in urban areas, and inordinate set-up time requirements—in addition to sacrifices in quality due to difficulties in seeing well at night, even with state-of-the-art lighting devices—as real and continuing problems. “Plus, they want the job done more quickly, and at higher quality. That’s a tough order, and it doesn’t always work. The industry has responded, but it’s very tough on the workers.” Thus, industry stakeholders would like to see PQI used as forum to revisit the issue of nighttime work collectively, perhaps resulting in less nighttime work being programmed or stronger incentives for contractors to undertake it.

Secondly, in its quest to improve ride quality and decrease IRI values, PennDOT is using asphalt “hot-mix” overlays over failed concrete pavements. According to the producers, using these 2 or 3 inch “thin-lift” overlays may be a good solution in the short term, but not so good over the long run. When these roads require resurfacing again in just a few years, the traveling public is likely to perceive that the hot mix doesn’t last, when the real problem is the flawed foundation. This may be good for short-term rideability, but bad for long-term performance. “While this does mean good business for the hot mix producers now, in a few years it may backfire. We need to redesign this approach, in terms of the mix and thickness of the overlays, within the context of PennDOT’s overall preventive maintenance strategy,” one stakeholder said.

This was seen by the producers as a problem concerning quality, which should be addressed by PQI through its Asphalt Quality Improvement Task Force.

Design/Build approaches were also identified by industry stakeholders as a worthwhile topic for PQI to address. Unlike some other states such as New Jersey, Pennsylvania has used Design/Build cautiously, which may be highly appropriate. There are some Design/Build projects in the works, mostly bridge replacements, but they do not really lend themselves fully to the Design/Build strategy because most the parameters are already set. Greater use of Design/Build, and even Design/Build/Operate, might encourage the industry to take a longer term view of customer service, but applications might be more limited in states like Pennsylvania where most of the infrastructure is already in place.

When asked about what else PQI might do to improve the quality of the highway construction process, one industry stakeholder mentioned the idea of a balanced letting schedule. The suggestion is that perhaps PQI might be an appropriate forum for discussing how PennDOT could implement a balanced letting schedule that would allow contractors to bid on projects in the winter so that they could be ready to go in April when the construction season begins.

Finally, various stakeholders raised the issue of inclusiveness. For example, it was noted that although the APWA is largely an association of local public works officials, the local jurisdictions are not meaningfully involved in PQI yet. Other PennDOT representatives pointed out that the user point of view should be incorporated in PQI, and that efforts are underway to bring the American Automobile Association and the Pennsylvania Motor Truck Association into the consortium. In addition, while it was also pointed out that intermodal projects have been recognized in PQI's awards program, including projects focusing on rail and port interconnections, bikeways, and the Port Authority of Allegheny County's airport busway project, other stakeholders suggested that PQI should go beyond highways and involve transit authorities as well as representatives of other modes of transportation.

Customer Orientations

The various stakeholder groups who were interviewed had different perspectives on who their primary customers were, but these divergent views were not necessarily incompatible or counterproductive. Clearly, within PennDOT there is a uniform consensus that the principal customer of the department's highway programs is the motoring public. This customer orientation has been nurtured for years by PennDOT's sustained commitment to continuous quality improvement, but with the current emphasis on the Baldrige process, the focus on the motoring public as the number one customer has been sharpened significantly.

On the other hand, the contractors think of PennDOT as their direct customer. The prevailing attitude in the industry is, "As long as I meet the department's specifications, I'm serving my customers well." While employees responsible for the maintenance and protection of traffic in work zone (MPTs) are encouraged to view passing motorists as their customers, the builders themselves consider the customer as the owner of the facility being built or reconstructed.

When asked whether PQI was serving to extend the construction companies' view of the customer to the motorists, one industry stakeholder said, "No, the contractors are not there yet. The focus is on the owner, because that's where the paycheck comes from." However, the contractors are well aware that the ultimate customer is, of course, the motoring public. As characterized by another stakeholder from the industry, the owner represents the public's interest and thus is the "front line" customer. From the contractor's perspective, though, "the customer is whoever is on the other end of that contract."

PennDOT has been promoting the customer focus through the Baldrige process. As part of this the department has talked about the contractors as its customers, or perhaps more appropriately, as its partners. But in the contractors' view under the traditional procurement process, the department is clearly their customer. This could be different, however, with Design/Build projects, which would encourage the builders themselves to be more concerned with the needs and preferences of the motorists who might be using a given facility.

The view of the customer is a little different from the perspective of the materials producers. Very often the larger builders are also producing aggregate, asphalt, or concrete themselves, but if the contractor is a different company, then the producer views the contractor as the most immediate customer on that particular job. However, the producers are very well aware of the chain of customer relationships that runs from the contractor to PennDOT to the motoring public. In fact, the producers often view the department as the customer because they work directly with PennDOT personnel in designing pavements. To the concrete pavers, the owner—PennDOT in this case—is the customer, even when the pavers are subcontracting with the builder.

The consulting engineers also look to PennDOT as the primary customer. Although it goes without saying that the design has to be constructable, the designers do not think of the builder as the customer. Representatives from the consulting community made it clear that they know the motoring public is ultimately the customer, but in terms of their part of the overall process, they think of the department as the customer. Pointing out that the work of designing highway projects has increased dramatically over the past several years, consultants said, "Many other interests have to be taken into account, and the job goes far beyond pure engineering principles and criteria. Now we have environmental impact assessments, archeology, and wetlands, etc. all involved." In part because of this broadening of responsibilities, and in part due to a more open style within PennDOT, the consultants feel more like partners with the department now. They tend to see their mission as helping PennDOT determine what kinds of projects and designs make the most sense in these more complex circumstances, including what will best serve the motoring public; however, they still see the department as their direct customer.

This relationship changes with Design/Build projects, however. Usually the builder gets the contract from PennDOT and partners with an engineering firm, and this definitely changes the consulting engineer's concept of who the customer is. When this is a successful partnership, the designers look to the builder as their customer, but this only works if the department lets the builder do his/her work and doesn't interfere with a lot of detailed instructions.

In sum, PennDOT has made a strong commitment to strengthening a customer orientation in the highway sector and has communicated its view of the motoring public as the principal customer of its highway programs very effectively. All the other PQI stakeholders are well aware of this commitment, and none doubt its genuineness or seriousness. This is not to say, however, that they are all equally convinced that the department possesses the resources or capability to bring about substantial improvements in customer satisfaction. As one external stakeholder put it, "PennDOT is really concerned with quality, but every time it talks about quality and customer service, it follows up with talk about cost containment. That is not always possible. Engineers and contractors know what it takes to build a road to last, but we don't have the money to do that." For their part, the other stakeholders in the process—the consulting engineers, the contractors, the suppliers, and the pavers—all tend to view the department as their direct customer. Increasingly, however, they are becoming sensitive to the "forward linkages" through the department to the highway user as their ultimate customer.

Additional Information Requirements

Thus, all the PQI stakeholder groups share a common understanding of the motoring public as the ultimate customer of Pennsylvania highways. In addition, many of these stakeholders have a clear idea of what the customer cares about most. For example, when asked this question, one PennDOT official responded that the biggest customer concerns are a smooth ride, safety, congestion, and snow and ice removal, in that order. He also pointed out that there are substantial regional differences regarding both congestion and ride quality. Another PennDOT representative had a similar but slightly different list, consisting of smooth highways, safe highways, clear lines, minimal inconvenience, and fast snow removal.

A governmental stakeholder from outside PennDOT said that the public is looking primarily for roads that are built right and will last, roads that are of high quality, and projects that are completed quickly and minimize disruption and inconvenience to existing traffic patterns. One industry representative indicated that the customer wants a smooth ride, roads with no potholes, no congestion or delays, and safety at nighttime. Another industry representative summed it up this way: "It's pretty clear what the customer wants: to move more quickly." A representative of the producers said that motorists have two criteria in mind, "smooth roads and durability, roads that last." One of the consulting engineers said that what the customers really care about is whether there are any potholes in the road and how long their commute will take.

However, while there is a fairly widespread consensus regarding what the motoring public really cares about—smooth roads, durable pavements, safe highways, roads that are free from congestion and delays, prompt snow and ice removal in the winter, and minimal disruption of traffic when roads do need to be repaired or resurfaced—the stakeholder interviews brought to the surface a number of questions regarding customers' expectations and preferences that need to be addressed through additional market research. Some of these issues concern tradeoffs among some of the criteria mentioned above, while others focus on more particular parts of the process.

Altogether, the following twelve topics were identified through the stakeholder interviews as issues that should be addressed through further market research:

1. Continued monitoring of motorists' satisfaction with Pennsylvania highways is essential. The public is becoming more knowledgeable, and as increased demands for accountability have accompanied increased funding from the state revenue enhancement as well as TEA21, we need to keep tracking satisfaction levels and look for trends over time.
2. PennDOT needs to have a clearer understanding of the public's perception of the efficiency and effectiveness of its maintenance operations. At this point it is not known what criteria motorists use to evaluate this. Is it road condition, ride quality, or other factors? The Operations Review Group (ORG) has been conducting an annual survey to track motorists' ratings of ride quality on state maintained roads but it is not clear what the responses to this county level survey are really based on. In order to be more useful, the county level survey conducted annually by ORG needs to provide more meaningful information about the effectiveness of what the department is doing. Exactly what are people responding to, and what do they care about? These questions are of fundamental importance, in terms of programming maintenance, reconstruction, and safety projects, as well as refining more credible customer service indexes (CSIs) for the county level maintenance units.
3. An assessment of the statistical reliability of the county level motorist survey would help the department to evaluate changes over time with a greater degree of statistical confidence.
4. Beyond tracking trends, we need to determine whether motorists' satisfaction increases as the roads are actually improved as a result of PennDOT's more aggressive construction and maintenance programs, or whether improved highway condition generates greater customer expectations which serve to keep satisfaction levels static. Research is needed to examine the relationships over time among tangible road conditions, motorists' perceptions, expectations, and customer satisfaction.
5. PennDOT needs to test the validity of the ranges it has established to represent good, fair, and poor ride quality on the International Roughness Index (IRI). The Department is relying heavily on IRI as a measure of performance, and it has established these ranges separately for interstate highways, numbered traffic routes, and secondary roads. However, the cut points are somewhat arbitrary, derived by collapsing FHWA's seven point scale. It is important to examine the extent to which these ranges reflect motorists' criteria for ride quality, or alternatively, what IRI values delineate acceptable versus unacceptable ride quality from the customer's perspective.
6. We need to learn what levels of traffic congestion might be reasonable in the eyes of the motoring public. Obviously, reducing congestion is a high priority in many areas, but motorists may be willing to tolerate certain levels of congestion as acceptable.

7. We need to examine preferences for more thorough, longer lasting, treatments that take longer to complete and mean greater disruption of traffic as opposed to shorter term treatments which mean less immediate inconvenience but will also require additional work to be done sooner. For PennDOT, the question of making “quick fixes” that require shorter cycle times versus longer term repairs that will be more durable may be in large part a resource issue, but the public might view it differently. What do motorists want for their money, “quicker fix” smooth roads requiring more frequent repair work, or roads that last? How much delay are motorists willing to tolerate? Can they accept more delay if maintenance crews don’t have to come back too soon?
8. It would be instructive to know how the public assesses the tradeoff between the time it takes to complete road repairs or reconstruction and the inconvenience it causes in the work zones. Is there a dominant preference, for example, for closing down a facility and rebuilding it quickly rather than rebuilding more slowly over time while keeping the road open and minimizing disruption? Will customers tolerate more disruption of traffic at work zones in order to get the job done more quickly?
9. It might be helpful to understand more about motorists’ preferences regarding how traffic is handled at work zones. Do the long “cattle chutes” cause more irritation than they are worth?
10. The department should explore motorists’ perceptions and possible concerns regarding bridge safety. Some 38 percent of PennDOT’s bridges are functionally obsolete or structurally deficient. The official position is that these bridges are safe within posted weight limits, but it is not clear what the impact of the visual appearance of these bridges, or the weight limits themselves, might be on motorists’ perceptions of safety. There is obviously a concern with safety in general, and it would be helpful to know whether weight restrictions on bridges generate a fear factor and the extent to which factors such as narrow bridges, poor approaches, poor geometrics, etc., make motorists feel unsafe.
11. It is important to learn more about how well the highway system serves the needs of elderly drivers, especially in terms of safety. Safety has emerged as a heightened concern as a result of the survey conducted by Orth-Rodgers Associates Inc., and Barbara T. Harder Inc. for PennDOT’s Bureau of Highway Safety & Traffic Engineering, especially with respect to aggressive drivers. Elderly drivers are likely to be particularly concerned with safety issues, and research is needed to examine this assumption and determine what might be done to address these concerns.
12. We need to target a survey on commercially licensed drivers, to learn more about what their concerns are, how satisfied they are at present with Pennsylvania highways, and how their needs could be better served.

Market Research Agenda

From the variety of customer surveys that have been conducted over the past several years, it is possible to triangulate a “fix” on PennDOT’s highway system and related services in the mind of the motorist. Yet, as revealed in personal interviews with numerous stakeholders in the PQI process, there are a number of second-order issues that need to be addressed by additional market research. This section proposes an agenda for this further research in terms of the questions to be posed and the kinds of research projects that could address them.

Question 1: What are the trends in motorists’ satisfaction with Pennsylvania highways over time? Does customer satisfaction increase, decrease, or remain the same, and does satisfaction trend differently in different parts of the state?

Replication of customer surveys could be carried out on an annual basis. These surveys may employ telephone interviews or mail-out questionnaires, but it is critical to use instruments with proven measurement and statistical reliability. This need may be addressed by the annual survey conducted by PennDOT’s Operations Review Group, assuming a more sensitive instrument and increased sample sizes are used to provide statistical reliability at the county level.

Question 2: What criteria do motorists use to evaluate Pennsylvania highways and the effectiveness of PennDOT’s maintenance program? How important are ride quality, road condition, traffic congestion, and safety in influencing overall customer satisfaction? What kind of instrument can best tap into motorists’ perceptions and ratings of highway quality?

To great extent these issues are already being addressed by a research project titled “Probing Motorists’ Perceptions of Highway Quality,” which is currently under way through Penn State and Georgia State Universities.

Question 3: What size samples are required to evaluate changes in customer satisfaction over time at the county level with adequate statistical reliability?

Research employing readily available data could analyze the variability, precision, and statistical significance of the county level surveys. Required sample sizes could then be determined for evaluating specific magnitudes of change in customer satisfaction for different levels of desired significance. This research could easily be undertaken as an extension to the “Probing Motorists’ Perceptions” project mentioned above.

Question 4: What are the relationships over time among tangible road conditions, motorists’ perceptions, expectations, and customer satisfaction? To what extent, if any, is the “bar raised” by more demanding expectations on the part of motorists as actual conditions on the roads improve over time?

Panel studies of samples of highway users, stratified by market segments, could address these issues. Feedback from the panels would be solicited at two-year intervals, possibly using focus group techniques with some panels and individual telephone interviews with others. In large part the questions would be designed to find out whether motorists perceive improvements and, if so, the extent to which this leads to greater expectations and/or increased satisfaction. The initial sample sizes would have to be sufficiently large to allow for attrition over time and still have useable samples.

Question 5: What range of values on the International Roughness Index (IRI) represents acceptable versus unacceptable ride quality from the motorist's point of view on different classes of highway? Can we discern ranges on the IRI scale that correspond to excellent, good, fair, and poor ride quality in the mind of the customer?

Experiments could be conducted on a large sample of roads to determine what ranges of IRI values represent various levels of motorists' ratings of ride quality on different classes of highways. Building on prior research that has established close correlations between IRI and motorists' ratings of smoothness, this investigation should employ a highly structured experimental design to control for speed and other factors that might influence these ratings. These experiments should be conducted on interstate highways, numbered traffic routes, and secondary roads in a sample of selected counties representing major metropolitan centers, suburban areas, medium size cities, and predominantly rural areas to determine the extent to which acceptable zones of IRI values might vary in the eyes of motorists in these different kinds of communities.

Question 6: What levels of traffic congestion might be acceptable to motorists in different specific conditions? Will commuters tolerate certain levels of congestion as a reasonable part of their normal routine?

Focus groups could be conducted in major metropolitan areas, smaller urban areas, suburban communities, and rural counties. These could be followed by well-structured panel studies conducted on a wide variety of roads in different kinds of settings designed to determine motorists' ratings of traffic flow and to discern "zones of acceptance" in terms of levels of traffic congestion.

Question 7: How do customers assess the tradeoff between more thorough, more durable, road repairs that take longer to complete and mean greater disruption of traffic, as opposed to shorter term treatments that mean less immediate inconvenience but also require additional work to be done sooner? What do motorists want for their money, "quicker fix" smooth roads which will require more frequent maintenance work, or roads that last?

Statewide telephone or mail-out surveys of motorists could be conducted, focusing on the tradeoffs between “quick fixes” and longer term repairs in terms of traffic disruption, frequency of repairs, and resource requirements. Survey items could include generic opinion questions as well as hypothetical scenarios asking respondents to make decisions between shorter and longer term repairs.

On-site surveys of motorists at work zones might be a possibility if logistical issues could be worked out. These would have to be short and not add to inconvenience or traffic disruption, and crafting questions that would not lead to biased results would have to be the utmost concern. Alternatively, brief cordon line surveys could be conducted near sites where maintenance or reconstruction work needs to be programmed for the future to solicit motorists’ preferences regarding shorter term versus longer term solutions.

Question 8: What are motorists’ preferences with respect to the time it takes to complete road repairs or reconstruction and the amount of inconvenience it causes around work zones? Will customers tolerate more severe disruption of traffic at work zones in order to get the job done more quickly?

Focus group sessions should be conducted with groups of motorists and professional drivers, and possibly with representatives from such organizations as the American Automobile Association and the Pennsylvania Truckers’ Association, to explore their concerns and preferences regarding the duration of major repair or reconstruction projects versus the severity of the disruption of normal traffic patterns they cause.

Then, larger sample and more structured surveys should be conducted to solicit similar kinds of feedback on a more systematic basis. An instrument should be used that specifies the tradeoffs of, for example, closing down one direction of an interstate highway for reconstruction work and diverting all traffic to the other side.

Finally, cordon line surveys could be conducted at existing or future sites of major reconstruction projects to obtain input from drivers on particular highways concerning tradeoffs between duration of work and disruption of traffic at those sites.

Question 9: What are customer preferences regarding the logistics of how traffic is handled at work zones? Do the long “cattle chutes” cause more irritation than they are worth?

Either a statewide sample survey of motorists, or cordon line surveys approaching existing or future work sites could provide further insight regarding these issues.

Note: Questions 7, 8, and 9 address closely related issues that should probably be addressed together. Combining the work for these two questions as outlined above would provide a more comprehensive approach to these issues, as well as produce a more cost-effective research project.

Question 10: What impact, if any, do weight limits or the visual appearance of functionally obsolete and structurally deficient bridges have on motorists' perceptions of safety? Is there a "fear factor" here, and how serious might it be?

Surveys of motorists, preceded by focus group sessions, could be keyed specifically to the issue of perceptions regarding bridge safety. These questions could possibly be incorporated in more general purpose surveys of Pennsylvania motorists, but it might be preferable to conduct a one-time, discrete research project on this topic.

This approach could be complemented by a few selected cordon line surveys at approaches to a sample of bridges that are functionally obsolete or weight limited, but that would not capture feedback from motorists who possibly avoid using those bridges on purpose because they may appear to be unsafe.

Question 11: How well does Pennsylvania's highway system meet the needs of elderly drivers, especially in terms of safety? More precisely, what are the particular safety concerns of elderly drivers, and what might be done to address these concerns?

Current follow-up work to the BHS&TE survey mentioned above might well begin to address this issue. Further insights could be obtained through focus groups and surveys targeted specifically to elderly drivers.

Question 12: What are the particular concerns of commercially licensed drivers with regard to highway condition, ride quality, traffic flow, and safety on Pennsylvania highways? How satisfied are professional drivers at present with the roads in Pennsylvania, and how might their needs be better served?

Telephone or mail-out surveys to a sample of commercially licensed drivers, preceded by a few focus groups, could illuminate this issue. The sampling frame could be the list of all commercial drivers licensed in Pennsylvania.

Alternatively, the population of interest would be defined as all commercially licensed drivers who use Pennsylvania highways, including many who are licensed by other states. The preferred approach might be to use brief personal interviews or self-administered questionnaires for out-of-state drivers at weight stations on Interstate highways to complement the systematic sampling of Pennsylvania commercial drivers.

The brief problem statements and suggested research approaches are sequenced above in a logical progression in terms of substantive content. However, some of them might be

considered more important than others. Items 1 through 3 comprise a package of research that is largely in process at this point and can be continued expeditiously. Item 4 logically follows the first 3, and it should be initiated fairly soon in order to obtain panel data which can serve as a baseline for evaluating the relationships among road improvements, perceptions, expectations, and customer satisfaction over time.

Item 5 concerning acceptable versus unacceptable ranges on the IRI scale from the motorist's point of view is especially urgent, given the department's strong commitment to improve ride quality and rely on IRI as a principal performance measure. Item 6 concerning levels of traffic congestion that are acceptable to motorists in different circumstances is worthwhile, but it is not urgent at this point.

Items 7, 8, and 9 comprise a research package concerning the tradeoffs between more frequent, shorter term pavement treatments versus more durable repairs, tradeoffs between longer periods to complete road work with minimal disruption versus shorter completion times with more severe inconvenience, and tradeoffs among various logistical tactics for managing traffic in work zones. Given that these are issues of real concern to PennDOT managers and to the contractors, as well as to motorists, they should be addressed in the near future. Item 10 concerning bridge safety, item 11 concerning the needs of elderly drivers, and item 12 concerning the needs of professional drivers are all important, but they can be deferred for a while if necessary.

Appendix A

Summaries of Existing Customer Surveys

1982 Citizen Survey Pilot

**Designed and conducted by Professor Theodore H. Poister
The Pennsylvania State University
Published in *Performance Monitoring* (Lexington Books, 1983)**

This was a pilot of a citizen survey that was developed by the author in conjunction with work performed for PennDOT concerning a variety of performance measurement tools. This mail-out survey was sent to a random sample of 8,896 licensed drivers in Pennsylvania in the spring of 1982. A total of 3,777 valid, completed surveys were returned for a response rate of 45 percent.

“How would you describe the present condition of state roads in your county?”

Very Good	1.8%
Good	21.5%
Fair	42.5%
Poor	23.5%
Very Poor	10.7%

Rating	Change in Road Condition over Past Two Years	Condition of Roads in Home County Compared with Other Counties
Better	18.6%	12.5%
Same	48.8%	50.7%
Worse	29.9%	24.8%
Don't Know	2.7%	12.0%

“Do you have difficulty getting to work or other place you need to go because of transportation problems?”

Never	27.5%	Rough Roads	44.1%
Rarely	37.5%	Traffic Congestion	61.4%
Sometimes	30.3%	Traffic Signals	18.4%
Often	4.8%	Closed Roads or Bridges	24.9%
		Speed Limits	11.9%

1994 Pennsylvania Citizens Survey

Prepared by the Center for Survey Research
Institute of State and Regional Affairs
Penn State Harrisburg

Submitted to:
The Pennsylvania Highway Information Association (March 1995)

This was an omnibus telephone survey conducted annually by Penn State Harrisburg for various governmental agencies and other organizations. The transportation-related items were requested by the Pennsylvania Highway Information Association. The results are based on 856 telephone interviews completed between December 14, 1994, and February 8, 1999.

The sample drawn for this survey consisted of telephone numbers selected at random from all of Pennsylvania's 1,536 telephone exchanges using a random-digit-dialing sampling procedure, guaranteeing that every household in Pennsylvania had an even probability of being included. In addition, a randomized respondent selection technique ensured that every adult within each sampled household had an equal probability of being interviewed. The sampling error for this survey is plus or minus 3.3 percentage points (at the 95 percent confidence level) when the percent indicating a particular response is 50 percent.

Results

"As a Pennsylvania driver, how would you evaluate the condition of Pennsylvania's roads and bridges today compared to the roads and bridges in neighboring states?"

Better	3%		
Same	22%		
Worse	68%	Don't know: 4%	Non-driver: 3%

"How satisfied are you with the condition of the roads and highways in Pennsylvania that you usually travel?"

Very satisfied	6%
Somewhat satisfied	45%
Somewhat dissatisfied	35%
Very dissatisfied	14%

“What is the single greatest problem with the roads and highways in your area?”

Potholes	57%
Road or bridge conditions	7%
Poor maintenance	7%
Congestion	6%
Too much construction	3%
Roads too narrow/no shoulders	3%
Uneven road surfaces	2%
Snow removal/winter maintenance	2%
Signage/pavement markings/lighting	2%

“How important are good roads and bridges to maintaining and creating new jobs in Pennsylvania?”

On a scale from 1 to 10, with 10 being of vital importance.

Responses in the 8-10 range: 72%

How important is ... ?”

8 - 10 range

- maintenance of existing roads, bridges, and transportation facilities:	80%
- new roadway improvements to alleviate congestion, facilitate economic development:	66%
- new public transportation capacity:	49%
- transportation management such as ride sharing, high occupancy vehicle lanes, and employee staggered working hours:	51%
- improved freight goods movement:	46%

“If additional money must be raised to fund highway and bridge construction and maintenance, which one of the following sources would you find most acceptable?”

- Gasoline and diesel fuel taxes	33%
- Driver license fees	28%
- Car and truck registration fees	25%

1994 Pennsylvania Citizens Survey

**Prepared by the Center for Survey Research
Institute of State and Regional Affairs
Penn State Harrisburg**

**Submitted to:
The Pennsylvania Turnpike Commission (March 1995)**

These data come from the same source as the previous one, the seventh annual omnibus survey conducted by Penn State Harrisburg's Center for Survey Research. In addition to the items included for PHIA, this survey also included items for the Pennsylvania Turnpike Commission. The total sample size was 856.

"Do you ever use the Pennsylvania Turnpike?"

Yes 76%
No 24%

"How often do you use the Pennsylvania Turnpike?"

Once per week or more frequently: 10%

"How satisfied are you with the Pennsylvania Turnpike's road condition?"

Very Satisfied	27%
Somewhat Satisfied	44%
Somewhat Dissatisfied	17%
Very Dissatisfied	12%

"Overall, would you say you are very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied with the Pennsylvania Turnpike?"

Very Satisfied	29%
Somewhat Satisfied	55%
Somewhat Dissatisfied	12%
Very Dissatisfied	4%

“Please tell us how satisfied you are with the Pennsylvania Turnpike’s ...”

	<u>Very Satisfied/ Somewhat Satisfied</u>	<u>Somewhat Dissatisfied/ Very Dissatisfied</u>	<u>Don't Know/ Refused</u>
Road Conditions	71%	29%	
Traffic at Interchanges	78%	21%	1%
Traveler Safety	80%	18%	2%
Tolls	69%	31%	
Toll Collectors	92%	8%	
Service Plazas	79%	11%	10%

NQI Highway User Study

Detailed Tabulations: Pennsylvania

**Prepared by Coopers & Lybrand L.L.P. and Opinion Research Corporation
January 1997**

Telephone survey conducted in fall, 1995
Nationwide sample of 2,205 respondents
Pennsylvania sample: N = 89

The NQI survey focused on "major highways" including:

- ◆ Interstates
- ◆ Other multi-lane highways
- ◆ Major two lane highways

Overall satisfaction with these highways?

32% satisfied or extremely satisfied

29% dissatisfied or extremely dissatisfied

<u>Safety</u>	<u>Satisfied / Ext Sat</u>	<u>Dissatisfied / Ext Dissat</u>
Roadway Lighting	41%	23%
Shoulder width	37%	31%
Safety Barriers	52%	19%
Lane width	64%	15%
Warning signs	61%	13%
Construction signs	61%	11%
Detour directions	44%	28%
Pavement markings	53%	16%
Pavement - wet weather	42%	28%
<u>Traffic Flow</u>		
Level of congestion	24%	37% *
Toll booth delays	63%	16%
Construction delays	17%	43% *
Accident cleanup	55%	19%

<u>Pavement Condition</u>	<u>Satisfied / Ext Sat</u>	<u>Dissatisfied / Ext Dissat</u>
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Smooth ride	38%	36% *
Surface appearance	34%	33% *
Durability	30%	40% *
Quiet ride	37%	37% *

Bridge Condition

Smooth ride	39%	15%
Visual appearance	56%	13%
Durability	45%	20%

Visual Appeal

Sound barriers	54%	16%
Landscaping	52%	20%
Rest areas	60%	21%
Compatibility with natural environment	53%	14%

Maintenance Response Time

Litter removal	57%	18%
Snow removal	48%	22%
Pavement repairs	30%	49% *
Guardrail & barrier repairs	47%	16%
Rest area cleaning	55%	13%

Travel Amenities

No. rest areas / service plazas	46%	22%
Variety of RA/SP services	42%	19%

Which one of these highway characteristics should receive the most attention and resources for improvement?

Safety	16%
Traffic flow	28%
Pavement conditions	38%
Bridge conditions	6%
Visual appeal	0%
Maintenance response time	10%
Travel amenities	1%

“Ruining a bad reputation: The Keystone State works to make history of its ‘worst roads’ status”

“As in years past, truckers said the Keystone State has the worst roads—but they also named it as the state with the most improved roads. A few even called Pennsylvania’s highways the best in the nation.”

“Overall, 34 states were mentioned in the survey at least once for having the worst roads; however, six got nearly 70 percent of the vote.”

Last year’s survey saw a tie between Pennsylvania’s I-80 and the Pa. Turnpike I-76, for the worst road, but this year’s survey found Arkansas’ Interstate 40, which ranked fifth last year, to be the single worst road in the United States.

“Despite the beauty of the surrounding countryside, truckers who run through Pennsylvania tell *Overdrive* the roads are in desperate shape. They say potholes, congestion and traffic, constant construction, cracks and patches make Pennsylvania’s road a misery.”

The author wondered whether the roads are still so bad, or whether perceptions just die hard, so she rode the Pennsylvania Turnpike from Harrisburg to Pittsburgh and back and I-80 from the Ohio border to Williamsport to see for herself. Most of the road surface, whether asphalt or concrete, was found to be in good condition.

There are 50 miles of original pavement, dating as far back as 1965, in Mercer and Venango counties, that need serious attention. “Some of this stretch lived up to the bone-jarring journey I had expected.”

Material sent by Allison Hatfield.

There were 270 respondents to last year’s survey, mostly veteran truck drivers. Nearly 80 percent had over 10 years of driving experience

Please rank the following road condition factors in order of importance in terms of how they affect the quality of a road (1 having the biggest impact and 18 having the least impact).

- | | | |
|----|------------------------|---|
| 1. | Potholes | 5 |
| 2. | Congestion and Traffic | 5 |
| 3. | Constant Construction | 6 |
| 4. | Dangerous on/off ramps | 7 |
| 5. | Patches | 7 |

6.	Washboarding	7
7.	Cracks	8
8.	Lack of Shoulders	8
9.	Narrow Lanes	8
10.	Poor Pavement Markings	8
11.	Poor Road Signs	8
12.	Rules Restricting Trucks	8
13.	Poor Snow Removal	9
14.	High Tolls	10
15.	Lack of Rest Areas	10
16.	Standing Water	10
17.	Other	10
18.	Local Drivers	11

Factors determining choice of the worst road:

Potholes	10.9%
Patches	9.7%
Cracks	9.6%
Washboarding	8.7%
Congestion and Traffic	8.5%
Constant Construction	7.5%
Local Drivers	5.8%
Poor Pavement Markings	5.7%
Dangerous On/Off Ramps	5.3%
Lack of Shoulders	4.3%
Lack of Rest Areas	4.3%
Narrow Lanes	3.9%
Standing Water	3.0%
Rules Restricting Trucks	3.0%
Poor Road Signs	2.9%
Poor Snow Removal	2.8%
Other	2.3%
High Tolls	<u>1.6%</u>
 Total	 100.0%

Report of the Customer Service Survey: Safety and Traffic Flow Issues

Prepared by Orth-Rodgers & Associates, Inc. and B.T. Harder, Inc.

August 1998

Telephone survey conducted in March 1998 for PennDOT's Bureau of Highway Safety & Traffic Engineering.

Target Population: Pa. Licensed drivers

Sample Size: 1,024

Confidence Level: 95% confidence intervals at +/- 3.1%.

Purpose: To solicit more detailed information on customers' concerns regarding safety and traffic flow issues on Pennsylvania highways. Also, to provide a basis for developing a Customer Service Index for the BHSTE.

"Would you please rank the following items in order of importance to you as a driver on Pennsylvania's roads and highways?"

First Choice - Most Important

-Improving safety	42%
-Improving smoothness of pavements	39%
-Reducing traffic congestion	19%

"If you were in charge of spending PennDOT's money for these four items, where would you spend the most money, the next most highest amount, etc.?"

First Choice - Highest Amounts

-Improving safety	44%
-Improving existing pavements	38%
-Improving traffic flow	11%
-Building new roads & highways	10%

Importance ratings for Intelligent Transportation Systems (ITS)

-High Importance	69%
-Highway & driver education materials available throughout the Commonwealth	68%

Existing Road and Highway Signs

Overall Grade: 56% said signage is good or excellent

- Concerns:
- Being able to spot and read signs at night
 - Size of letters
 - Enough signs to provide directions

Many specific recommendations.

Paint and Other Traffic Markings

Overall Grade: 43% good or excellent

- Concerns:
- Seeing pavement markings at night, in rain, or in winter
 - Enough reflectors
 - Not painting white edge lines, not painting lines on low volume roads

Accommodating Motorists through Construction Work Zones (CWZ)

Overall Grade: 70% good or excellent

- Concerns:
- Timely and accurate information re CWZ congestion and detours
 - Adequate sign information for safe travel in CWZ.
 - Safety of driving conditions

Highway Safety - Safety of Roads and Highways

Overall Grade: 53% good or excellent

- Concerns:
- Potholes (70%)
 - Road hazards without adequate warnings (58%)
 - Safety at intersections without left turn lanes (52%)
 - Skidding on wet pavements or driveways
 - Ability to see traffic when stopped at intersections
 - Safety on sharp curves

Driver Safety

Overall Grade: 41% good or excellent

“In fact, driver behavior such as drinking, aggressiveness, inattention, use of cellular telephones, fatigue, and non-use of seatbelts produced a flash point of concern.”

Concerns:	-Encountering drinking drivers	78%
	-Encountering aggressive drivers	77%
	-Encountering inattentive drivers	75%
	-Drivers using cellular phones	65%
	-Encountering tired drivers	64%
	-Drivers not using seat belts	54%

Existing Traffic Congestion

Overall Grade: 56% good or excellent

Concerns:	-Rush hour congestion	45%
	-Congestion related to other bottlenecks	45%
	-Delays due to poor traffic signal timing	43%
	-Rush hour congestion on urban interstates and Freeways	40%
	-Congestion related to construction work zones	37%
	-Congestion due to crashes and accidents	35%

Quality, Use, Importance, Knowledge: Survey of Pennsylvania Citizens about PennDOT Services

Prepared for the Pennsylvania Department of Transportation by the Pennsylvania State University and Diagnostics Plus, November 1995.

QUIK97 Quality, Use, Importance, Knowledge: Survey of Pennsylvania Citizens about PennDOT Services

Prepared for the Pennsylvania Department of Transportation by Diagnostics Plus and the Pennsylvania State University, November 1997.

The purpose of these surveys is to gauge Pennsylvania residents' evaluation of the quality of PennDOT services, their use of these services, the importance of these services to them, and their knowledge of these services. These surveys were conducted as telephone interviews with random samples of Pennsylvania residents over the age of 21, completing approximately 100 interviews in each of PennDOT's eleven engineering districts.

1995 N = 1,133

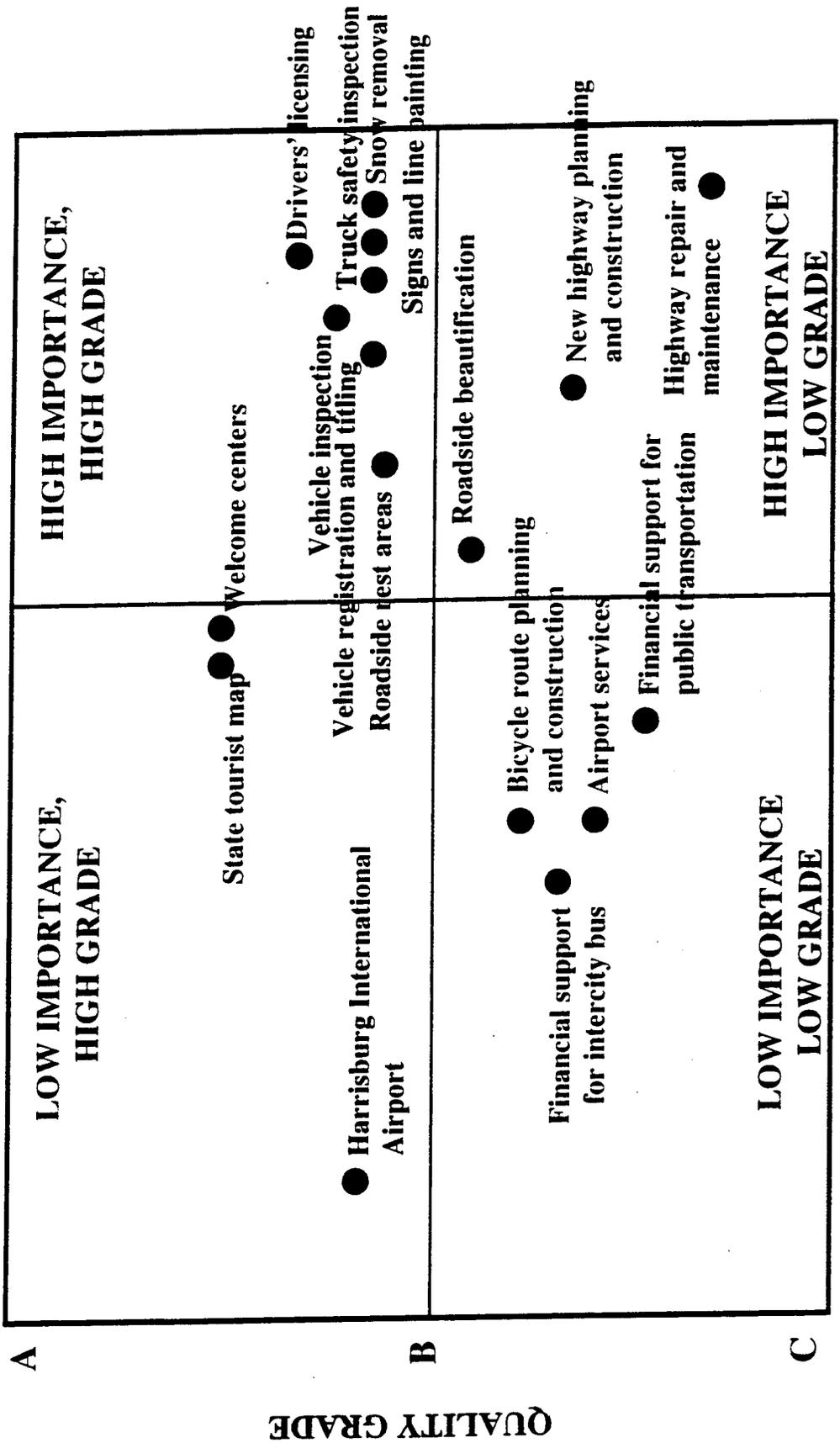
1997 N = 1128

Quality vs. Importance

The services were arrayed on a chart crosscutting quality and importance. Highway repair and maintenance is seen as one of the most important services provided by PennDOT, but its performance in this area is rated lower than any other service, in the low "C" range. New highway planning and construction is also seen as very important, with an average grade of about "C", while roadside beautification is seen as being fairly important, with a grade in the high "C" to low "B" range. This is the group of PennDOT services, all relating to highways, that needs to be improved the most in the eyes of Pennsylvania residents.

Services that are seen as being important and whose performance is graded higher on the average, in the "B" range, include vehicle inspection, drivers' licensing, vehicle registration and titling, roadside rest areas, truck safety inspection, signs and line painting, and snow removal. Services that are seen as less important but with high quality, included the state tourist map and the welcome centers as well as Harrisburg International Airport. Finally, those services seen as being less important, but whose quality is lower, in the high "C" or low "B" range, include bicycle route planning and construction, financial support for intercity buses, airport services, and financial support for public transportation.

PENNDOT SERVICES IMPORTANCE/QUALITY MATRIX



Grades for Highway Services

The grades given by the QUIK97 respondents to highway related services, the central issue of concern to PQI at this point, are summarized below:

<u>Service</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D or F</u>	<u>▲ 95</u>
Highway planning and construction	14.0%	41.5%	32.3%	7.4%	Same
Highway repair and maintenance	15.3%	28.6%	34.7%	20.4%	Up
Signs and line painting	31.6%	45.8%	18.1%	4.1%	Up
Snow removal	35.9%	44.3%	15.0%	4.3%	Same
Roadside beautification	19.6%	48.8%	27.6%	3.4%	Same
Roadside rest areas	31.4%	46.3%	17.9%	3.0%	Same

Improving Highway Planning and Construction

The following question was asked of those respondents who gave PennDOT a poor grade on highway planning and maintenance: "What would PennDOT have to do better in order to get an A or B on new highway planning and construction?"

Better planning	18.8%
More prompt and complete execution of plans	15.1%
More frequent road work/updating specific roads	11.1%
More timely repairs	9.8%

Improving Highway Maintenance Performance

The following question was asked of those respondents who gave PennDOT a poor grade on highway maintenance: "What would PennDOT have to do better in order to get an A or B on highway repair and maintenance?"

Pothole maintenance	28.4%
More timely repairs	16.6%
More frequent road work	12.9%
Better surfacing	11.1%
Better repairs	8.0%

1996 County Maintenance Customer Service Index
1997 County Maintenance Customer Service Index
1998 County Maintenance Customer Service Index

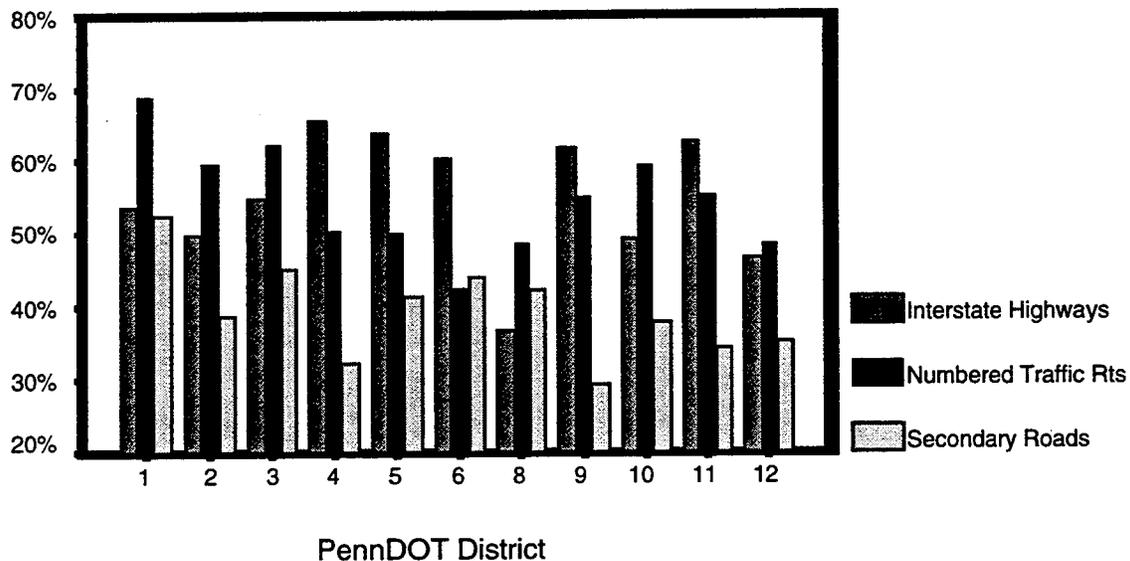
Conducted annually by PennDOT Operations Review Group

This is a mail-out survey of licensed drivers in Pennsylvania taken each fall. It is sent out to approximately 400 randomly selected licensed drivers in each of Pennsylvania's 67 counties. In 1998 there were 6,159 returned surveys, slightly fewer than 100 per county, for a response rate of 23 Percent. In 1997 the response rate was 22 percent, and in 1996 it was 27 percent.

One of the principal questions asked the respondent to "rate the quality of our highways and bridges" in terms of ride quality on a scale that runs from "Excellent," "Exceed Expectations," "Meets Expectations," "Fair," and "Poor." The results show that the percent of respondents indicating that the roads meet or exceed their expectations increased noticeably from 1996 to 1998 for all three functional systems. For interstate highways and numbered traffic routes, the percent indicating this basic level of satisfaction rose from about 46 percent in 1996 to roughly 54 percent in 1998, while the percent rating the secondary roads in their counties as meeting or exceeding their expectations increase from 33 percent in 1996 to 40 percent by 1998. Nevertheless, with bare majorities indicating that the interstates and numbered traffic routes in their home counties meet or exceed their expectations, and well under half reporting satisfaction with the ride quality of the secondary state roads in their county, these results would seem to square with the overall grade of C- accorded to highway repair and maintenance by the QUIK survey.

Survey Year	Interstate Highways	Numbered Traffic Routes	Secondary Roads
1996	46.7%	45.8%	33.1%
1997	46.7%	47.9%	34.9%
1998	53.7%	55.2%	40.1%

Percent Respondents Rating Roads as Meeting or Exceeding Expectations

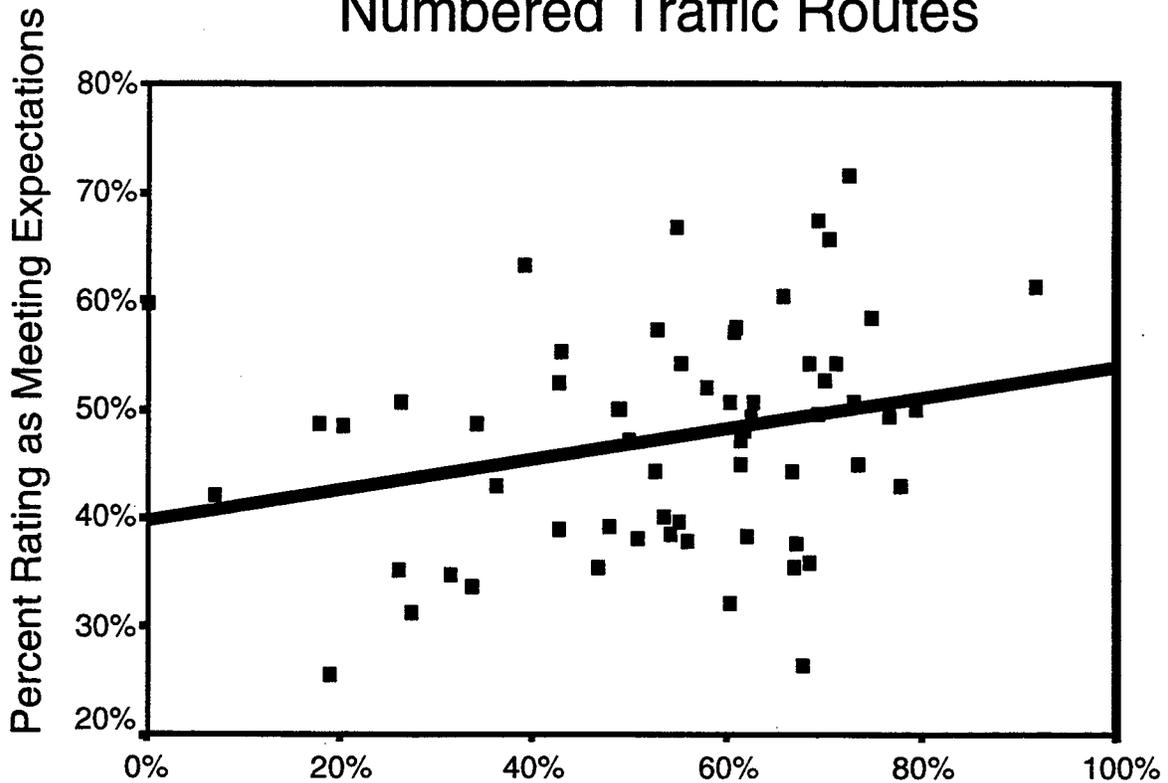


Source: 1998 County Maintenance Customer Service Survey

There is substantial variation in these ratings among the districts. For example, respondents were more satisfied with numbered traffic routes than with interstate highways in Districts 1, 2, 3, 8, 10, and 12, while in Districts 4, 5, 6, 9, and 11 they appeared to be more satisfied with the interstates than with numbered traffic routes. Overall, the motorist ratings tended to be highest in District 1, followed by District 3, and lowest in Districts 8 and 12. Respondents in District 6, the Philadelphia metropolitan region, tended to be satisfied with the quality of their interstate highways but less so with their numbered traffic routes and secondary roads. Those in District 11, the Pittsburgh area, tended more than those in many other districts to be satisfied with their interstates and numbered traffic routes, but less satisfied than those in many other districts with their secondary roads.

These motorist ratings are probably influenced by numerous factors including actual road condition, traffic flow, and amenities as well as individual driving experiences and expectations about what level of service should be afforded. They do not correlate strongly with actual ride quality. A scatterplot of motorists' ratings of numbered traffic routes from the 1997 survey against the percent of a county's numbered traffic routes that had what the Department considered to be good IRI values in 1997 shows a very weak statistical relationship. Some counties that have good IRIs on numbered traffic routes also have relatively strong motorist ratings, but the survey respondents in other counties with good IRIs nevertheless give their numbered traffic routes much less favorable ratings. Conversely, some counties with lower IRIs have relatively poor motorist ratings, while others have much more positive ratings.

Motorists' Ratings vs. IRI Numbered Traffic Routes



% Numbered Traffic Routes with Good IRI in 1997

Survey respondents were also asked to provide feedback on work zone operations. Overall, 85 percent of the respondents indicated that work zone warning signs met or exceeded their expectations, while 75 percent indicated that travel lanes in work zones met or exceeded their expectations. Only 51 percent indicated that the length of delays encountered at work zones was acceptable. Motorist satisfaction with the latter two items also varied considerably from district to district. For example, while only 68 percent of the respondents in District 12 indicated that work zone travel lanes met or exceeded their expectations, 80 percent of the respondents from District 1 did so. Similarly, only 36 percent of the respondents in District 6 and 38 percent of those in District 11, the two major metropolitan regions, indicated that work zone traffic delays met or exceeded their expectations; 60 percent of the respondents from District 9 and 62 percent of those from District 1 indicated that these delays were acceptable.

Motorists' Ratings of Work Zone Conditions

	Warning	Travel	Length
1	86%	81%	62%
2	88%	79%	57%
3	87%	77%	60%
4	85%	77%	52%
5	85%	75%	45%
6	80%	70%	36%
8	86%	72%	45%
9	85%	76%	60%
10	84%	70%	50%
11	85%	73%	38%
Total	85%	75%	51%

Motorists responding to this county level highway maintenance customer service survey were also asked to rate the quality of maintenance related services provided by PennDOT "on the road." Overall, 67 percent indicated that they were satisfied with the removal of ice and snow from state highways in their counties, while 68 percent reported that traffic line painting met or exceeded their expectations, and 77 percent said that the highway traffic signs on state roads in their counties met or exceeded their expectations.

QUIK and County Maintenance CSI Comparison

PennDOT Engineering	QUIK97 Grade for Highway	% Motorists in 1997 Rating NTRs as Meeting or Exceeding
1	2.3	54.1%
2	2.6	48.7%
3	2.4	57.6%
4	2.2	48.0%
5	2.3	40.1%
6	2.2	40.2%
8	2.3	41.6%
9	2.3	47.9%
10	2.4	52.7%
11	2.3	54.5%
12	2.3	40.2%

Appendix B

List of Stakeholder Interviews

Governmental Stakeholders

Brad Mallory, PennDOT, Secretary of Transportation	July 14, 1999
Mike Ryan, PennDOT, Deputy Secretary for Highway Administration	January 8, 1999
Gary Hoffman, PennDOT, Chief Engineer	January 8, 1999
Amar Bajandas, PennDOT Director, Bureau of Construction	March 10, 1999
Jeff Haste, PennDOT Director, Bureau of Municipal Services	March 11, 1999
Tom Bryer, PennDOT Director, Bureau of Highway Safety and Traffic Engineering	March 11, 1999
Rebecca Rosser Yearick, PennDOT Director, Office of Communications & Customer Service	March 25, 1999
Betty Serian, PennDOT Deputy Secretary for Safety Administration	August 17, 1999
John Durbin, Executive Director Pennsylvania Turnpike Commission	May 26, 1999
Ron Carmichael, Division Administrator Federal Highway Administration	January 7, 1999

Private Sector Stakeholders

Henry Hecht, Executive Vice President Associated Pennsylvania Constructors (APC)	March 10, 1999
Ron Geist, Director Pennsylvania Highway Information Association (PHIA)	March 10, 1999
Bill Cummings, Vice President Tony DePaul & Son	August 10, 1999
Ron Cominsky, Executive Director Pennsylvania Asphalt Pavement Association (PAPA)	May 26, 1999
Frieda Brinskelle, Executive Vice President American Concrete Paving Association (ACPA)	July 14, 1999
Ron Drnevich, President Gannett Flemming, Engineers and Planners	May 26, 1999
John Van Natta, Executive Vice President Consulting Engineers Council of Pennsylvania (CEC)	May 26, 1999
Steve Lester, Vice President Urban Engineers, Inc.	June 3, 1999