Highway Construction Impacts on Wyoming Businesses

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Highway construction projects can affect motorists and businesses in many ways. Even though construction projects are temporary situations, many businesses worry about the level of impact during construction and the length and magnitude of the recovery period. Highway construction may cause a temporary loss of customers, revenue, and property value as well as create noise and air pollution and other problems. Currently, there is little information that quantifies the estimated business impacts, particularly for rural areas such as Wyoming. This study investigated the business-related effects of highway construction projects in Wyoming and provided managers at the Wyoming Department of Transportation with case studies and impact estimates to better address business owners' concerns. The study also compared the businesses' perceptions of what happened to their sales during and after construction with the actual impact on the businesses' sales for the same time period. Perceived impact data were collected through surveys sent to businesses in the 12 case study projects across Wyoming, and Wyoming Department of Revenue tax data were used to examine the actual estimated sales data before, during, and after construction. In addition to sales revenue data, traffic volumes and right-of-way purchase information were compared with the business owners' perceptions. The result of the study was the quantification of actual impacts as well as an analysis of the difference between the actual and perceived impacts.

Typically, business owners are very concerned when a highway construction project is proposed near their businesses. Even though construction projects are only temporary situations, many business owners worry about the level of impact during the construction period and the length and magnitude of the recovery period. Currently there is little information available that quantifies the estimated business impacts. The information that does exist is for large-scale, multiyear projects and for urbanized areas. Projects in Wyoming, as in many rural states, tend to be smaller scale lasting one to two construction seasons. Also, in rural areas there tend to be fewer services available, making alternatives to businesses in the construction zone few and far between. A final aspect addressed by this study, but not in the existing information, is the question of impacts on businesses in communities heavily dependent on tourist traffic. This study investigates the business-related impacts due to highway construction projects in Wyoming. Moreover, it shall provide project managers at the Wyoming Department of Transportation (Wyoming DOT) and other departments of transportation (DOTs) that have similar rural characteristics with case studies and impact estimates so that they can better address business owners' concerns.

The main objective of this research effort is to address the concerns of individual business owners. The case study information along with quantified estimates of both perceived and actual business impacts from previous projects can be used by DOTs to address the concerns of business owners and to respond to unsupported statements of business owners in future projects. Also, this study includes a state-of-the-practice review of mitigation techniques for use in future projects to minimize construction impacts and foster better relationships with business owners.

LITERATURE REVIEW

The literature review focused on two broad areas: the quantification of actual impacts and the mitigation techniques used to minimize them. With regard to the quantification of actual impacts, information from previous studies in Texas shows that impacts experienced by businesses can vary as much as the businesses themselves (*1–3*). Usually, the travel-related businesses, such as restaurants and gas stations, experienced the greatest temporary impacts during construction. The Texas studies found that for most of the businesses, sales rebounded about 2 years after the completion of construction. When comparing the businesses' perceived sales volume with the actual Department of Revenue (DOR) business revenue data, the Texas study found that the businesses' perceptions of their sales performance during construction appeared to be pessimistic in relation to what actually took place (*1–3*). The Texas DOT obtained this information by querying the state's DOR for the performance information on the affected businesses. A later study done by the Center for Transportation Research at the University of Austin looked at the four most affected business sales types as identified by the earlier Texas studies (retail other, retail food, retail auto, and services) and found that the construction did not significantly affect business sales in the construction corridor (*4*).

Wisconsin DOT performed a study for the state legislature on the impacts of detours of state highways undergoing construction (*5*). The Wisconsin study found that the detours resulted in the decline of total sales ranging from 2% to 17%, with the level of impact once again being dependent on the type of business.

Nebraska and Wisconsin found that impact mitigation techniques are most successful when the business and the construction parties work together (*6, 7*). Open lines of communication with the businesses starting at the planning phase and continuing throughout the entire construction project are very important to discover and avoid potential problems. Holding regularly scheduled public information meetings is an easy way to encourage communication. As was mentioned by the studies above, a business's survival depends on good communication with the DOT, the contractor, the engineer and, most of all, its customers.

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Nebraska and Wisconsin have put in place specific programs to deal with concerned business owners and to encourage their involvement throughout the construction process. The Nebraska Department of Roads and Wisconsin DOT have created an "In This Together" program. The program consists of sending businesses a workbook describing a variety of methods that can help them thrive during highway construction. Both states also created an informational video. The video contains interviews with business owners affected by the construction, explaining the many creative projects they implemented to combat the negative effects of construction and to draw customers into their businesses. Some of the methods include holding special construction-themed sales, barbecues with free food for customers, or parties and street dances to celebrate the beginning of the construction. The In This Together programs help business owners realize that there are a limitless number of methods available to them to become involved with the construction process and turn a potentially negative situation into a positive one.

Another successful mitigation technique used by New Mexico includes encouraging the whole community to "own" the project by sponsoring business parties and celebrations related to the construction (*8, 9*). These studies show that when business owners, members of the community, and other stakeholders understand the reason for the construction project and what needs to be done, they are more likely to accept the project and, therefore, the construction impacts can be minimized.

SURVEY OF STATE DEPARTMENTS OF TRANSPORTATION

The literature review found very little published information about construction impacts on businesses and, in particular, mitigation techniques to minimize these impacts. Because all DOTs address these issues, it was believed that there was a large body of knowledge that remained undocumented. To see what business impact mitigation techniques are being practiced, a survey was sent to the 50 state departments of transportation. The following survey questions were asked of each state DOT:

1. How does your agency address business owners' concerns during project development?
2. How does your agency mitigate impacts to business owners during construction (e.g., special signing, force account items in the contract to provide a higher level of property access, advertisement campaigns)?

The survey received a 100% response rate through follow-up calls and e-mails. The information compiled from the survey results showed that, with regard to the mitigation techniques, a large majority of DOTs felt that it is very important to establish communication between the stakeholders and DOTs early in the planning and project development process. By establishing a communication medium to gain stakeholder input on the project, the possible impacts can be recognized early and averted before the construction starts. DOTs also responded that communication lines should be kept open throughout the construction process so that possible impacts can be recognized and averted. Although communication does not alleviate the actual impacts to businesses, it does reduce the stress and uncertainty that business owners may feel during the impact period. As in the literature review, the DOT survey found that DOTs often use local television and radio stations, as well as newspapers and Internet sites, to keep businesses informed about construction schedules, upcoming closures, and other construction-related information. Many states have public information specialists responsible for providing the construction information to these local media sources.

The main mitigation issue survey respondents discussed was property access during construction. Allowing unabated access to businesses is very important for the businesses' survival. When unabated access is not possible, DOTs felt that providing a detour access point, creating a new access point, or even paying the business for temporary closure were effective means of helping the businesses. Special signing for business accesses and, in some cases, different colored directional cones can help potential customers navigate to their destinations. Oregon uses special blue cones to point out entrances to businesses. These blue cones stand out in the often confusing jumble of orange cones and clearly indicate where the business access points can be found.

Survey responses showed a divide about the issue of access signing and whether the business name could be put on these signs. Some DOTs felt that placing the business names on the signs was a form of advertising, whereas other DOTs felt that the name was necessary to minimize business impacts. Some DOTs, including Wyoming, place the individual business names at each entrance; other DOTs put the business names on a single sign at the entrance to the construction zone.

DOTs also used contractor incentives or penalties to speed up the construction process. Generally, it is believed that businesses experience fewer impacts when the construction project is completed in a timely fashion, which in turn, leads to a speedier recovery for those businesses affected by the construction process after project completion. Many DOTs believe that larger construction impacts for shorter periods of time produce lesser overall impacts than do smaller construction impacts for longer periods of time.

The Florida Department of Transportation (Florida DOT) is testing a program whereby the department conducts a survey of the local business owners and residential property owners at the beginning, middle, and end of the construction project. On the basis of the results of this survey, the contractor is paid a monetary incentive. The survey, titled the Business Accommodation Survey, asks the businesses 25 questions pertaining to reconstruction activities and project communications, access and parking, visibility and signage, congestion and traffic, utility outages, damage, and safety. Each question is assigned a score from zero to four based on whether the respondent strongly agreed, agreed, did not agree or disagree, disagreed, or strongly disagreed with the individual questions in the categories. The survey is filled out and returned, and an overall score is totaled from the responses given. Then an average score is computed for all of the businesses affected by the construction. Florida DOT then pays the contractor based on the contractor's business accommodation performance average score. If a contractor receives a score below 39, there is no payment. The contractor receives incentive payment amounts for scores above 39 based on the following formula: payment = (score – 39) × \$4,008. The maximum bonus payment allowed is \$152,000 (*10*).

As expected, given the federal planning requirements concerning public involvement and impact analysis, all states have some form of public involvement forum, although the level of involvement varied greatly from state to state.

PROJECT LOCATIONS

A total of 12 completed highway construction projects in the state of Wyoming were analyzed. The selected projects took place between 1998 and 2001. This time frame ensured that before-, during-, and

after-construction effects could be studied. It also helped minimize the number of businesses that may have changed ownership since that period. To ensure an adequate regional distribution, the projects selected came from each of Wyoming's seven commission districts. The project locations included communities with local, tourist, or mixed base economies as well as communities with a wide range of population sizes. Figure 1 shows the locations of the projects across the state of Wyoming, and Table 1 provides information about town populations, project costs, and numbers of affected businesses. As shown in Table 1, the population of towns in the study ranges from 807 to 53,001 (*11*).

The construction projects studied ranged from simple sidewalk and curb replacements to complete pavement rehabilitations. The construction cost for these projects ranged from $87,000 to $9 million. Many of the construction projects took place in the centers of towns or along major travel routes where significant numbers of businesses exist. Most of the affected businesses were travel oriented and consisted of restaurants, hotels, convenience stores, and automotive-related businesses. Other businesses such as retail trade and services along with some professional services were also affected by these construction projects.

TABLE 1 Project Town Populations, Costs, and Number of Businesses Affected

Project Town	Population	Project Cost ($1,000)	Number of Businesses
Moorcroft	807	87	3
Saratoga	1,726	200	22
Thermopolis	3,127	3,500	46
Wheatland	3,548	1,326	18
Worland	5,250	1,750	39
Lander	6,867	1,650	17
Cody	8,835	1,600	33
Gillette	19,646	572	22
Laramie 1	27,204	9,000	25
Laramie 2	27,204	1,100	29
Casper	49,644	8,058	50
Cheyenne	53,011	1,552	27
Average	17,197	2,533	28

DATA COLLECTION AND ANALYSIS

The data collected and analyzed for this research effort includes business categorizations, traffic volumes, tax revenues, commercial property rights-of-way, business and engineer surveys, and perceived versus actual impact data. This paper represents a small portion of a larger research effort so not all of the data collected will be discussed here. For information on the traffic volume and commercial property right-of-way data, please refer to the full research report, *Highway Construction Related Business Impacts: Phase I,* which can be obtained from the Wyoming Department of Transportation (*12*).

Business Categorization

The tax revenue data from the Wyoming Department of Revenue (DOR), used to examine actual sales trends, was required to meet strict confidentiality standards to facilitate releasing this information. Because of this, data on businesses received from the DOR were classified using the 1987 standard industrial classification (SIC) code. This code classifies businesses by primary activity, determined by principal product or group of products produced and/or distributed and/or services rendered. The University of Wyoming research team prepared a list of potentially affected businesses for each project area and sent it to DOR. DOR compiled the

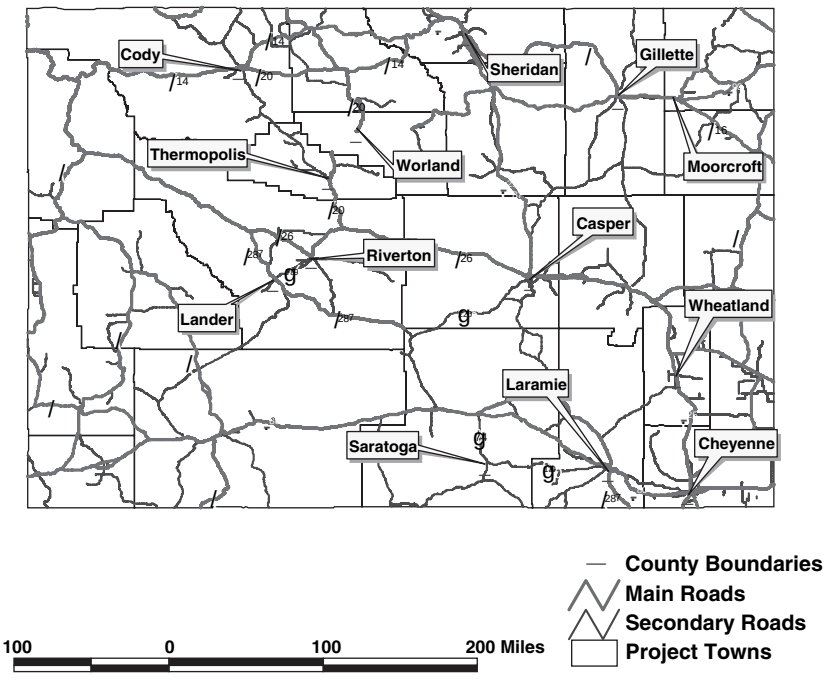

FIGURE 1 Project locations across Wyoming.

tax revenue data for the before-, during-, and after-construction periods and returned the data with only the SIC codes to identify the businesses.

The businesses were also classified by customer base. The customer base is broken down into local, tourist, and mixed base categories. Local businesses include retail sales, retail service, and professional services; tourist-based businesses include hotels, fast food restaurants, automobile shops, and other businesses located near major travel routes. Mixed categories, such as gas stations or restaurants, include both tourist- and local-based businesses. The research team used local knowledge of the project area to further classify the percentages by customer base. Table 2 lists the percentage of businesses in each category.

Tax Revenue Data

The majority of the analysis was performed using the tax revenue data collected from the Wyoming DOR. The data consisted of sales and lodging taxes collected from the project businesses for each case study from 1997 to 2003. Businesses reported their sales monthly, quarterly, or yearly. The tax revenue data were converted into estimated sales by dividing the tax revenue value by the tax rate for that period. Because some businesses reported sales figures only in yearly format, all of the data were aggregated into yearly sales figures. The yearly data for each business were compared with the previous year's data and displayed by percent difference in sales. These data were used to examine the before-, during-, and after-construction trends in the sales.

The raw tax data from the Wyoming DOR were aggregated by SIC codes for businesses in each of the 12 study projects. When possible, data were collected for the 2 years before, 2 years during, and 2 years after the construction took place. Upon aggregation, it was possible to compare businesses in different cities with each other for the same time period relative to when the construction took place. For example, the data for the period 2 years before construction were aggregated regardless of the actual calendar years for each project. The individual businesses were divided into three categories (retail sales, retail service, and professional service) and then compared with each other to determine whether there was any overall net gain or loss in business revenue.

Figure 2 shows the average change in sales for all businesses for the periods before (2 years before construction), during (1- to 2-year construction period), and after (2 years postconstruction). Figures 3 through 5 break each of the main categories (retail sales, retail service, and professional service) into more specific subcategories. As Figure 2 shows, the retail sales and retail service businesses experienced decreased sales growth during and after construction, whereas professional services saw rapid growth during construction with a return to negative growth after construction.

Figure 3 presents results for the retail sales category for all businesses in the 12 project areas. For the period during construction, goods and automotive retail categories showed increases in sales, although at reduced growth rates relative to the period before construction. Food-related retail showed a negative change in sales and appears to have suffered the greatest effects in the retail category. Food- and goods-related retail showed rebounds after construction, whereas automotive retail continued to have decreasing growth.

Figure 4 shows results from the retail service categories. The general and gas service categories experienced negative sales growth before construction, which continued at lower rates during construction. Both categories showed continued improvement after construction. General repair showed the least effect due to construction, with little change in growth rates for all periods. General recreation and hotels experienced slower growth during construction with rebounds after construction.

Last, Figure 5 shows results from the professional service categories. Business services and "other" service categories experienced large increases in growth during construction and the loss of the

TABLE 2 Change in Sales Revenues During Construction

City	Number of Businesses	Percent of Project Businesses			Percent Change			Percent of Businesses Experiencing Increase in Sales During Construction
		Local	Tourist	Mixed	Before	During	After	
Moorcroft	3	33	67	0	–7.2	–8.3	–11.5	0
Saratoga	22	79	5	16	*	18.0	40.3	78.6
Thermopolis	46	37	47	16	7.2	1.7	2.6	68.0
Wheatland	18	100	0	0	13.6	0.5	–0.9	62.5
Worland	39	79	3	18	*	–1.3	–1.2	72.7
Lander	17	69	23	8	*	–0.2	13.2	66.7
Cody	33	44	38	18	14.0	–3.3	5.8	36.8
Gillette	22	60	33	7	29.5	39.9	–3.8	88.9
Laramie 1	25	32	50	18	4.9	1.6	1.9	52.6
Laramie 2	29	23	54	23	11.3	7.0	–0.5	53.8
Casper	50	52	17	31	–4.3	1.8	9.9	50.0
Cheyenne	27	30	41	29	11.4	–0.8	4.1	50.0
Average	28	53	32	15	8.9	4.7	5.0	—
			Standard Deviation		10.1	12.7	12.8	—

*Data not available for that time period.

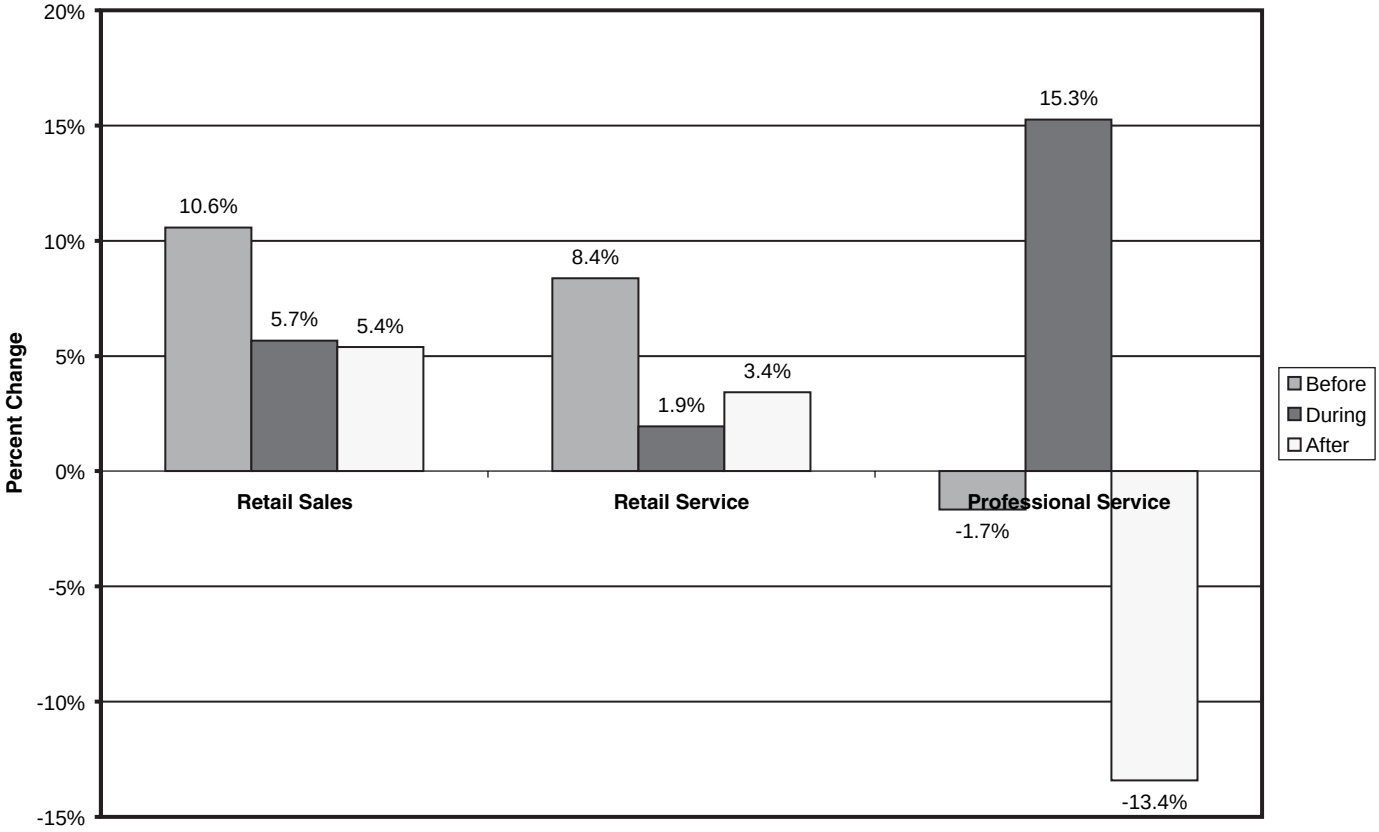

FIGURE 2 Average change in sales for general business categories.

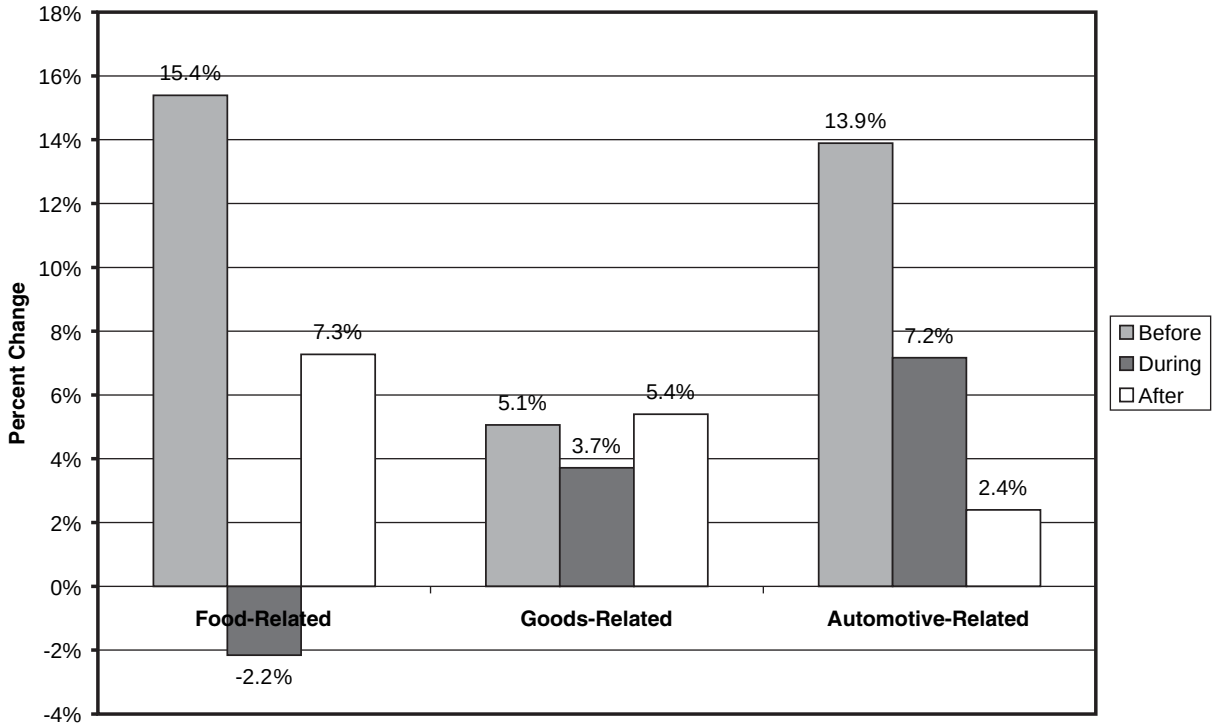

FIGURE 3 Average change in sales for retail sales categories.

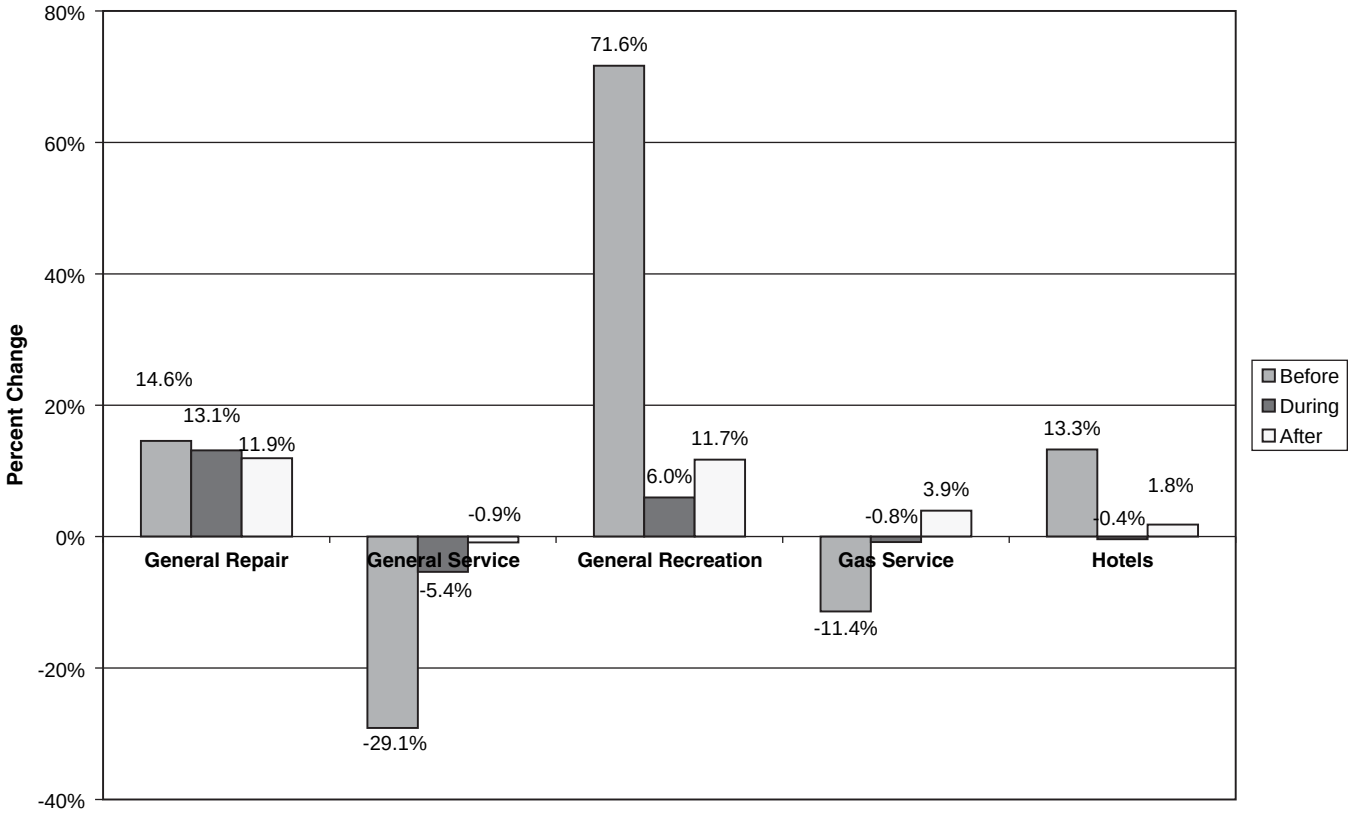

FIGURE 4 Average change in sales for retail service categories.

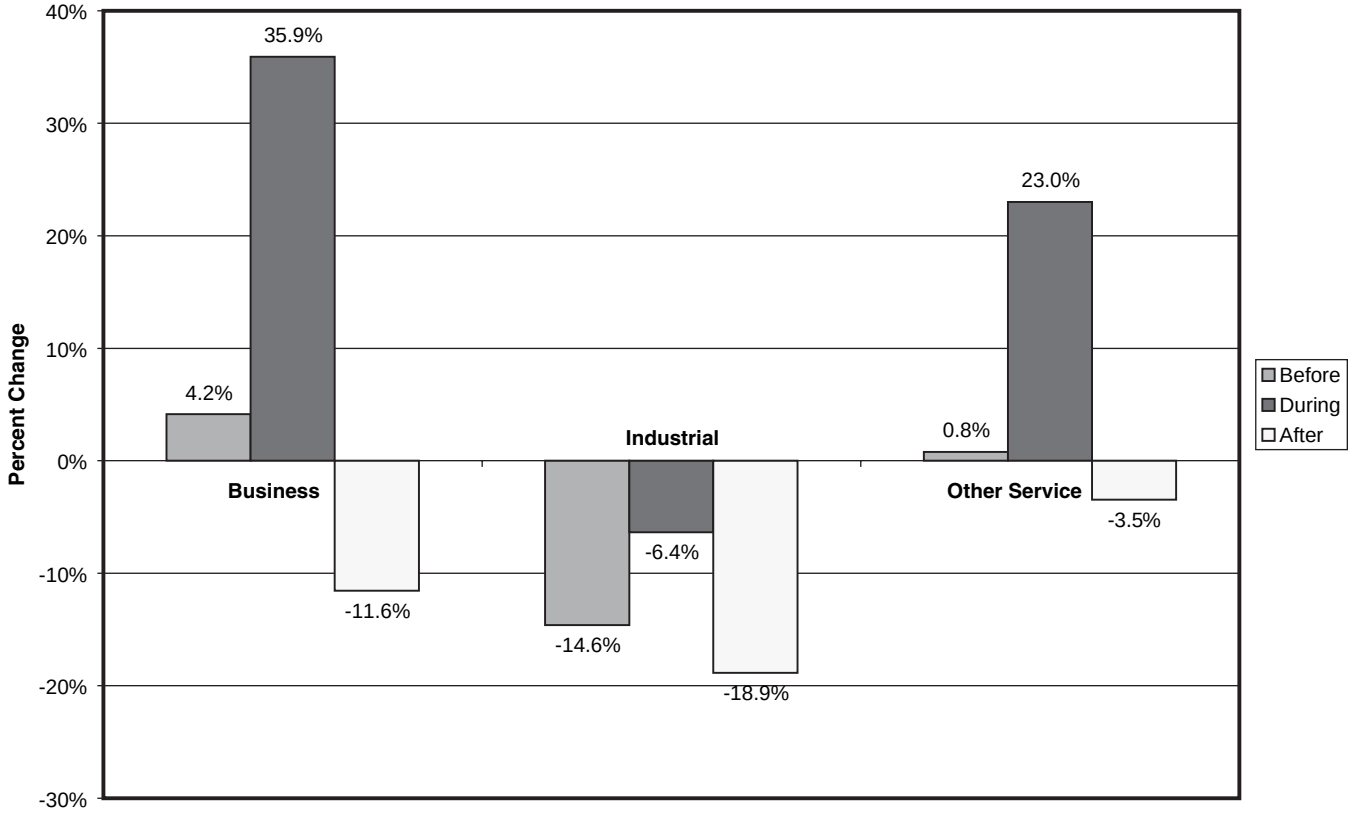

FIGURE 5 Average change in sales for professional service categories.

increases after construction. Industrial services experienced losses in sales before, during, and after construction with the least negative growth during construction.

In reference to the literature review section, earlier studies found that retail other, retail food, retail auto, and services were most sensitive to construction effects (*4, 5*). This study found that food retail, general service, gas service, and industrial professional service were the business types most affected.

On further analysis of every project in all 12 towns, it was found that the average change for all businesses before, during, and after their respective construction projects were 8.9%, 4.7%, and 5.0% (see Table 2). As shown in Table 2, the standard deviations for these averages are fairly large, reflecting the great variation in the individual project effects. The standard deviations for the retail sales category were 15.1% before, 26.5% during, and 23.8% after. The businesses categorized as retail service had standard deviations of 31.4% before, 21.2% during, and 23.2% after. The professional service category's standard deviations were 10.0% before, 37.3% during, and 34.4% after.

The yearly estimated sales information was also compared with the total county sales of the corresponding county to see whether trends in the project area corresponded with countywide trends. Table 3 shows results of that comparison. The Cody and Casper projects both experienced decreases in project sales, whereas countywide trends indicated positive growth. In these cases, negative sales growth could not be attributed to countywide trends. These projects occurred in larger towns in which the greater decrease in sales during the construction project could be due to the availability of other business districts to the local and traveling public.

Individual businesses in Saratoga, Thermopolis, Lander, Cheyenne, and Laramie experienced the worst decline in revenue during construction. The losses for these individual businesses located in each town were 57.8%, 46.0%, 44.6%, 36.9%, and 35.2%, respectively. As can be seen from Figure 1 and from Table 1, these towns are spread across the entire state and have populations that vary from 1,726 to 53,011. For the Cheyenne and Laramie projects, most of the businesses in the construction zone were in the tourist or mixed categories, whereas Worland's, Thermopolis's, and Saratoga's project businesses were primarily in the local sector. Researchers were unable to find commonality in those projects. Future work will be done on the data obtained from this research work to determine whether any characteristics of these projects and towns made the projects more susceptible to large business impacts.

The Wisconsin survey found that sales levels declined from 2% to 17%, depending on business types (*5*). The Wyoming businesses appeared to experience a smaller impact on average than the Wisconsin study reported. Although some of the Wyoming businesses did suffer loss of sales, on average the businesses had positive growth for the periods before, during, and after construction. As noted in the previous paragraph, there were some notable exceptions to this observation. In the five projects discussed previously the average sales declines were in the range of 35% to 58%, significantly higher than the range experienced in Wisconsin.

Another indicator evaluated by the research team was the percent of businesses experiencing increased sales revenue during and after construction. In many cases the project areas contained a mix of thriving and struggling businesses. A large increase or decrease in the sales of a single business often skewed the aggregated sales revenue numbers. To counter that, the overall health of the business district was analyzed using the percent of businesses with positive growth. For example, in Thermopolis, 68.0% of the businesses experienced an increase in sales during construction; however, after construction only 42% of businesses experienced an increase. On the basis of that indicator, the general strength of the Thermopolis business area declined after the construction was completed. Table 3 shows results of the indicator for all 12 project towns. The majority of businesses in Moorcroft, Cody, Casper, and Cheyenne experienced declining sales growth, using 50% as a cutoff value. Cody, Casper, and Cheyenne are large towns by Wyoming standards. Moorcroft is the smallest town included in the study, indicating that although projects in larger towns may create larger localized negative impacts to businesses, smaller towns are not completely immune from negative impacts. It is important to note that there are only three businesses in Moorcroft, which presents issues associated with a small sample size.

TABLE 3 Project Business and County Sales Trends

General Information				Project Sales Trends			County Sales Trends		
Town	Population	County	County Population	Before	During	After	Before	During	After
Moorcroft	807	Crook	5,887	N/A	Decrease	Decrease	Increase	Decrease	Increase
Saratoga	1,726	Carbon	15,639	N/A	Increase	Increase	Decrease	Increase	Increase
Thermopolis	3,172	Hot Springs	4,882	Increase	Increase	Decrease	Decrease	Increase	Decrease
Wheatland	3,548	Platte	8,807	Increase	Increase	Decrease	Increase	Increase	Increase
Worland	5,250	Washakie	8,289	N/A	Increase	Decrease	Increase	Decrease	Decrease
Lander	6,867	Fremont	35,804	N/A	Increase	Increase	Decrease	Increase	Increase
Cody	8,835	Park	25,786	Increase	Decrease	Increase	Increase	Increase	Increase
Gillette	19,646	Campbell	33,698	Increase	Increase	Decrease	Increase	Decrease	Decrease
Laramie 1	27,204	Albany	32,014	Increase	Increase	Increase	Increase	Increase	Increase
Laramie 2	27,204	Albany	32,014	Increase	Increase	Increase	Increase	Increase	Increase
Casper	49,644	Natrona	66,533	Decrease	Decrease	Increase	Increase	Increase	Increase
Cheyenne	53,011	Laramie	81,607	Increase	Decrease	Increase	Increase	Decrease	Increase

Business and Engineer Survey Data

The survey used to query businesses in the construction zones aimed to determine the perceived impacts to businesses both during and after construction. The perceived impact data were then compared with the actual economic impacts as determined from the Wyoming Department of Revenue data. The businesses were assured of strict confidentially; this was accomplished through a survey code. The total response rate was 29.6%, with 98 of 331 surveys returned. Follow-up calls were made to businesses to achieve this response rate. In many cases, the length of time that had elapsed since the completion of the construction made it difficult for businesses to respond.

The business survey was divided into four major parts. The four sections included an evaluation of the project contractor and Wyoming DOT personnel, the impacts on businesses during and after construction, basic information about the business, and information on relocated businesses. The questions were geared toward recognizing the possible economic, customer, and aesthetic impacts that construction could have caused.

An engineer survey was also created and sent to the resident and project engineer for each project. This survey was designed to determine the engineers' perceptions of the construction projects and asked questions similar to the business surveys. The total response rate for the engineer surveys was 100%, with 22 of 22 surveys returned.

In general, a majority of the project businesses perceived that the number of customers per day and sales numbers declined during construction. After construction, many of the project's businesses perceived no change or an increase in the number of customers and sales. Most project businesses felt that the noise level and air pollution increased during construction, whereas they reported no change or a decrease in the noise level and air pollution after construction.

Most of the resident engineers felt that the contractor performed a fair to very good job during construction. In general, the resident and project engineers for each site tended to notice slight to moderate decreases in the number of customers visiting the businesses in the project area during construction and a slight to moderate increase after construction. The majority of resident and project engineers also noticed an increase in the noise and air pollution levels during construction and a decrease afterward. Their opinions on the construction impacts tended to be similar to those of the business surveys returned, although less severe in many cases.

Perceived Versus Actual Impacts

In examining the perceived construction impacts on sales collected from the business surveys and comparing them with the actual sales impacts collected from the Wyoming DOR, a chi-squared statistical test was performed to determine whether the responses of the two populations were statistically different from each other. The output of the chi-squared test is a *p*-value that corresponds to a confidence level for the statistical difference between the two populations. In some cases, there were not enough data because of small sample sizes to produce a *p*-value for analysis. The chi-squared analysis tested the null hypothesis that the two populations (perceived and actual) were the same. A *p*-value of .10 and a corresponding confidence level of 90% were used as the basis for accepting or rejecting the null hypothesis. If the *p*-value was .10 or less the null hypothesis was rejected and the two populations were determined to be different. In similar terms, if the null hypothesis was rejected, the difference between the actual and the perceived impacts were said to be significant. Table 4 displays the *p*-values found for each comparison.

Of the 12 projects, seven had enough data to produce a *p*-value for the during-construction comparison. The lack of adequate data resulted from too few businesses in the project area or low survey response rates from businesses. Three of the seven projects had *p*-values small enough to be confident that the perceptions of the businesses were statistically different from the actual data. After construction, eight of the 12 projects had enough data to produce a *p*-value. Of those eight projects, three had small enough *p*-values to be confident that the businesses' perceptions were statistically different from the actual impacts (See Table 4).

In the cases in which the *p*-values indicated a statistical difference during and after construction, the businesses' responses were generally pessimistic when compared with the actual impacts, meaning that the survey results indicated larger impacts than those that actually occurred. Saratoga was the only project in which businesses' reported perceptions were more pessimistic about the level of impact for both the during- and after-construction periods. All other projects had no difference between perceived and actual impacts either for both periods or for the during or after period.

In general the comparison between perceived and actual impacts found that for 60% of the projects there was no significant difference between actual and perceived impacts for both the during and after periods. The highest discrepancy between the two was for the during period, in which 42% of the projects had a more pessimistic view of impacts than what actually occurred.

TABLE 4 Chi-Squared Analysis for Perceived Versus Actual Impacts

Town	Time Period	*p*-Value	Reject or Accept	Statistical Difference?
Saratoga	During	.006	Reject	Yes
	After	.007	Reject	Yes
Worland	During	.200	Accept	No
	After	.166	Accept	No
Moorcroft	During	*		
	After	*		
Lander	During	*		
	After	*		
Wheatland	During	*		
	After	.230	Accept	No
Laramie 1	During	.115	Accept	No
	After	.598	Accept	No
Cody	During	.627	Accept	No
	After	.085	Reject	Yes
Thermopolis	During	.066	Reject	Yes
	After	.657	Accept	No
Cheyenne	During	*		
	After	*		
Laramie 2	During	.144	Accept	No
	After	.036	Reject	Yes
Gillette	During	*		
	After	*		
Casper	During	.098	Reject	Yes
	After	.886	Accept	No

*Insufficient data to calculate *p*-value.

CONCLUSIONS

Research into potential mitigation tools for minimizing business impacts found that although it was a great concern to transportation agencies, there was limited information available. All agencies were dealing with these types of issues, most on a case-by-case basis, but no comprehensive source of information was available. The prevalent trend to mitigate the negative impacts of construction is the use of public informational media, such as the use of public information specialists, websites, news and newspaper sources, and newsletters or fliers to provide the public with the details and importance of the project. Most agencies are using some form of increased public awareness.

This project aimed to provide the Wyoming DOT with estimates on the level of impact and the magnitude of recovery for businesses located in construction zones. Although impacts on businesses vary widely, generalizations about impacts can be made. Most businesses in the construction zone experienced reduced positive growth but not negative growth in sales. The food-related retail, gas service, and hotel service categories suffered the greatest negative impacts during construction; the professional service categories experienced the greatest positive growth. The research also showed that significant increases occurred in the 2 years after construction, indicating businesses rebounded quickly. Businesses that saw rapid increases during construction showed negative growth after construction, bringing them closer to their preconstruction sales levels.

Project managers at the Wyoming DOT and all other transportation agencies dealing with construction projects in small, rural towns can use the quantified estimates in this study to address business owners' concerns. Also, this information can be used as part of larger information and cooperation campaigns to proactively address potential impacts. The case study information contained in the full report will be useful to Wyoming DOT when addressing the concerns of business owners in towns across Wyoming during the development and construction stages of future projects.

This paper represents a brief overview of the extensive research effort. The full research report can be obtained from the Wyoming DOT (*12*).

ADDITIONAL RESEARCH

The data obtained in this study could be analyzed using advanced statistical and econometric models. Current efforts are under way to apply panel data techniques to see whether this additional analysis yields further insight into the variables affecting the level of business impacts.

A focused study on mitigation techniques is also warranted. As previously discussed, information on the full "toolbox" of techniques does not exist and would certainly be of use to all transportation agencies.

ONGOING PHASE II OF THE RESEARCH

Phase II of the Wyoming DOT study will examine the construction impacts experienced during and after four current construction projects in Wyoming. This current impact information will be compared with Phase I data to gain a more complete understanding of the construction and business climate in Wyoming. By selecting current projects, it is possible to collect more detailed data on traffic volumes and business owners' perceptions. A major advantage in Phase II is that business owners do not have to rely on memory to report their perceived impacts. Phase II is scheduled to be completed in the spring of 2005. Phase II will put more effort into looking at the impacts on tourist- versus nontourist-based communities and businesses.

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