SPRINGBANK DRIVE FINAL CASE ANALYSIS

1.Background and motivation:

The City of London, located in Southwestern Ontario, is poised to undertake a significant infrastructure enhancement project involving the expansion of Springbank Drive, a crucial route in the city. This project, situated between Wharncliffe Road and Wonderland Road, is central to the city's ongoing efforts to accommodate increasing traffic demands and to improve overall urban connectivity. Springbank Drive, currently carrying approximately 24,000 vehicles per day forms a continuous route across the city in conjunction with Horton Street and Hamilton Road.

The proposed expansion involves widening the existing two-lane road to four lanes over a stretch of 2.55 kilometers, from Horton Street to Wonderland Road. This development is expected to include additional enhancements such as the construction of sidewalks, dedicated cycling lanes, new pedestrian and traffic signals, and improvements to road drainage and street lighting. This comprehensive initiative is anticipated to significantly increase traffic capacity and improve safety for all road users, reflecting the city's commitment to fostering a more accessible and efficient urban environment.

The execution of this expansion project necessitates the expropriation of a portion of property from the local homeowners, a step that is both sensitive and critical. It is imperative to acknowledge that while the project serves the greater good of the community, it also imposes certain inconveniences and alterations to the daily lives and property values of the affected residents. Appropriate compensation for the homeowners is not just a legal obligation under the Expropriations Act but a moral imperative to ensure equity and maintain public trust.

The fair and just compensation will not only address the immediate financial impacts due to the loss of property but also consider the long-term effects such as increased traffic volumes, and potential shifts in property market values. In this light, our role as Canning Consultants Inc. is to provide an objective, data-driven analysis to determine a compensation framework that is both equitable and reflective of the real impact of this transformative urban project.

2.Descriptive statistics:

Descriptive Statistics for variables used in Multiple Regression along with units of measurement
Sample size- sale of 104 properties
Sample Period (Dates of data collection) –January 1998 to May 2003

	Mean	Standard Deviation	Units of Measurement
Age Year	49.5	15.7	Age / years
Lot Frontage Area	902.8	255.6	Square Feet
Traffic Count	20221.2	8368.9	
Price	134469.2	27743.6	Canadian Dollars
Average View	0.577	0.5	How is the view of the comparable property (Reference category is Fair View)
Good View	0.221	0.42	
Average Interior Condition	0.452	0.5	how the interior conditions are (Reference category is Fair)
Good Interior Condition	0.337	0.47	
Excellent Interior Condition	0.115	0.32	
Four Lane Road	0.327	0.471	Reference category is typical residential location

The dataset included sales of 104 residential properties on and around Springbank Drive from January 1998 to May 2003. The source of the data is the database assembled by using Canning Company files. The ages of these houses range from relatively new (16 years) to quite old (118 years), indicating a mix of newer and older properties in the area. The sales dates range from 1998 to 2002, capturing a period that may reflect different market conditions. The highest-priced house is also the newest at 16 years, with a higher lot frontage area of 1100 sqft. Also, it is observed to have the least traffic count of 18000. In contrast, the oldest house, at 100 years, with only a fair interior condition and the busiest traffic exposure of 36,000 has comparatively lesser price.

3.Methodology and model:

Our model employs statistical techniques, notably multiple regression, to explore the correlation between various property attributes and their market values. Out of the 18 attributes analyzed, we selected key parameters that statistically and substantially significantly influence house prices and consequently, the compensation due to homeowners affected by the Springbank Drive road expansion. We omitted variables like swimming pool presence and central air conditioning due to their lower statistical relevance, and others like basement finished area and garage type, which lack sufficient degrees of freedom.

Considering our sample size of 104 and the non-normal distribution of error terms, we included 8 variables to enable the assumption of normally distributed parameter estimates. Our model factors in statistical and substantial significance aspects like lot frontage area, traffic count/number of lanes (affecting compensation), age of the house, and the interior condition (average, good, or excellent) and view (average or good) along with the price of the house. The house's age plays a qualitative role in price determination as generally new houses have modern

built and strength, and the interior condition and view are notably impactful as a well-finished house with less damage and good view would be more appealing.

Our valuation methodology is arguably more precise than the conventional approach, which relies heavily on comparing a handful of similar properties. This traditional method often suffers from the subjective biases of individual appraisers, making it challenging to objectively determine which property serves as the best comparator, given the uniqueness of each property.

4.Results:

Result Table for 2 models for variables used in Multiple Regression along with units of measurement
Model 1- Traffic Count
Model 2- Number of Lanes
Sample size- sale of 104 properties
Sample Period –January 1998 to May 2003

Results

	Dependent variable:	
	price	
	(1)	(2)
Lot Frontage Area	37.38***	38.10***
	(9.25)	(9.43)
Traffic Count	-0.75*	
	(0.31)	
Four Lane Road		-8,626.80
		(5,558.54)
Age Year	-23.57	-49.63
	(157.98)	(160.09)
Average Interior Condition	10,267.76	11,137.69
	(8,335.40)	(8,478.53)
Good Interior Condition	18,536.91*	18,772.03*
	(8,714.82)	(8,889.07)
Excellent Interior Condition	22,626.35*	22,504.87*
	(10,933.94)	(11,157.34)
Average View	9,493.96	10,811.00
	(6,369.11)	(6,461.95)
Good View	10,927.72	14,773.30

	(8,139.97)	(7,997.87)
Constant	95,616.77**	81,894.59**
	(17,420.20)	(16,042.78)
Observations	104	104
R2	0.36	0.34
Adjusted R2	0.31	0.28
Residual Std. Error (df = 95)	23,118.34	23,512.64
F Statistic (df = 8; 95)	6.67***	6.05***

Note: ***' 0.001 '**' 0.01 '*' 0.05

In our analysis, we evaluated two separate multiple regression models: one accounting for traffic count and the other for the number of road lanes. This distinction was necessary due to the high correlation and significant impact these factors have on property compensation values.

While both models yielded comparable coefficients for most variables, the relationship between traffic count and house price is statistically significant at a 5% significance level. In contrast, the correlation between the presence of a four-lane road and house price did not show statistical significance. The estimated coefficient of Lot Frontage area is statistically significant at 0.1% level of significance. Controlling for amount of traffic, age, view and the interior condition 1 sq foot of increase in lot frontage area will increase the price by 37.38(Model 1) or 38.1(Model 2) Canadian dollars on average. The estimated coefficients of Age, Average View, Average Interior Condition, Good are not statistically significant. Controlling for Lot frontage area, interior conditions, age and view increase in 1 unit of traffic count will decrease the price of the house by 0.75 Canadian dollars on average. On average, the house on four lane road will cost 8,626.8 Canadian dollars less relative to the house on typical residential location (Two lane road), controlling for the other factors. As anticipated, there is an inverse relationship between the house price and both the traffic count and the number of lanes.

From the estimated coefficients of the Multiple regression model, it can be concluded that age and traffic count or number of lanes have a negative relation with the price of the house as expected. It can be inferred from the model that the lot frontage area is statistically significant at 1% level of significance. On average, the premium associated with a good view relative to a fair view is $10972, controlling for the amount of traffic count, age, lot frontage area and the interior condition of the house. Also, there is a predicted change of $22626 in the price of a house with excellent interior condition relative to a fair interior condition controlling for the other factors. From the R-squared value, it can be noted that 36% of the variation in house prices can be explained by the estimated regression equation.

Given these findings, we opted for the model incorporating traffic count due to its notably lower standard error of 0.31, in contrast to the model with the four-lane road factor, which had a significantly higher standard error of 5,558.

5.Implications:

Mathematical Expression –
Traffic Count
Model1 Price Compensation = 12000 + 37.38 * Lost Frontage Area + 0.75 * (33000 – Traffic Count)
Number of Lanes
Model 2 Price Compensation = 12000 + 38.1 * Lost Frontage Area + 8626.8 * (1- LANESRD*)
*LANESRD - Original Variable from the supplement file.

	Estimates of compensation	
Property	Model 1 Traffic Count (Canadian Dollars)	Model 2- No of lanes (Canadian Dollars)
1	21561	21198
2	19348	21236
3	17736	12495
4	19423	21313
5	12636	21275

6.Limitations:

- **Limitation on the Number of Variables:**
  Due to the relatively small size of the dataset (104 samples), the model is bound to include a limited number of variables. This decision is likely influenced by the principle of **parsimony**, which suggests that simpler models (with fewer variables) are preferred then the dataset is small. Including too many variables in a small dataset can lead to Overfitting. Given that the error terms do not follow a normal distribution, employing a logarithmic model would be more appropriate for conducting this analysis. For example, we were unable to include Basement area, Exterior amenities due to limitation on the number of variables.

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