A CLOSER LOOK AT PROXIMITY DAMAGES

When a percentage point can represent millions of dollars, yielding credible results is in everyone's best interest

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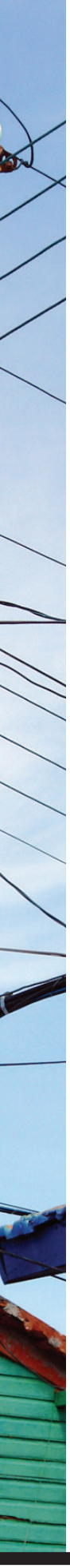
The question of possible proximity damages arises frequently in right of way projects, particularly when single-family homes are impacted. For most people, their home represents the single largest investment they will ever make. As such, whether a project is a petroleum pipeline, an electrical transmission corridor, a mass transit project, or simply the widening of an existing roadway, people whose homes abut or are proximate to the project are rightly concerned about how it will impact their home's value.

For every major project, right of way agencies and property owners will likely spend countless resources on appraisals that properly address the level of proximity damage. Agencies face paying millions of dollars for alleged damages, while property owners lament about the proximity damages to which they believe they are entitled, but for which they are not compensated. Consequently, millions of dollars are spent annually on litigating the differences of opinion.

It is understandable why the process aggravates both right of way professionals and property owners alike. However, much of the frustration is directed at the appraisal industry, primarily because there are wildly disparate estimates of proximity damages for the same property. Many on both sides wonder how it is possible for two seemingly qualified appraisers to come to such enormously different value conclusions. While some might resort to challenging the competence and/or integrity of a given appraiser and the motivations of their client, we would all be better served by taking a step back and analyzing the approach typically used in estimating proximity damages.



Getting a Fair Share

When an appraiser is hired to value a partial acquisition, the primary assignment is determining the before and after valuation and any resulting damages. The proximity impact determination is usually relegated to a secondary consideration. As such, if the appraisal fee is only a few thousand dollars for the entire assignment, it's likely that a relatively small portion will be allocated to the question of damages.

Consequently, the scope of work that is practical in analyzing proximity impacts is limited, even if appraisers are unwilling to admit it. As a result, the appraiser's primary research on proximity impacts is likely to be some form of paired sales analysis that attempts to quantify proximity impacts by considering as few as two sales transactions. Unfortunately, much of the wide variances seen in proximity damage estimates can be attributed to the reality that paired sales analysis is, at best, a minefield for well-intended appraisers, while at the same time serving as a goldmine for the unscrupulous.

Given that disparate proximity impact estimates often result from typical appraisal assignments, the right of way industry should consider whether there is a more reliable means of analyzing proximity damages. We also question whether this should be part of a typical appraisal assignment or whether it requires a specific skillset and should be contracted as a separate assignment.

In a typical appraisal assignment, the appraiser is asked to estimate the proximity impact for a specific property. To do so, appraisers rely on proxy data such as paired sales or published studies. For example, to estimate proximity damages, if any, for a property next to a proposed transmission line, an appraiser would use paired sales and/or published data to derive a damage factor, generally expressed as a percentage of value. However, neither the paired sales nor the published study is specific to the property being appraised. Instead, the proxy data reflects how proximity to power corridors impacted the prices of other properties. This information is then extrapolated to the subject property. The credibility of the damages estimate rests entirely on the how reliable this proxy data is.

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Standing Up to Scrutiny

It is not unusual for one appraiser to use paired sales and published studies that indicate no damages, while another appraiser might use paired sales and published studies that suggest damages of 10 percent or more. This variance could potentially be avoided if the question of proximity damages were not addressed merely as part of another appraisal assignment, but were instead its own assignment.

The scope of such an assignment should be to analyze proximity impacts using data and methodologies that stand up to scrutiny not only by appraisers, but also by experts in associated fields such as statistics and economics, something that paired sales and most published studies on proximity impacts do not. While the costs of such a study would obviously be much greater than a typical appraisal, it would yield better project results when faced with balancing the need to treat property owners fairly with the need to prudently allocate agency or company funds.

Recognizing the unreliability and often wild inconsistencies of the status quo, some right of way agencies have commissioned larger studies. And while some of these studies have been published, most of them only address proximity impacts from electrical transmission corridors. These studies have generally reflected value impacts that are only loosely connected to corridor characteristics such as width, voltage, location on property and associated property rights. While the variance appears modest, an understatement or overstatement of damages by only a few percentage points could easily translate into millions of dollars annually—either allocated to or withheld from property owners.

With significant financial impacts to right of way agencies and property owners alike, questions regarding the credibility of a given study in estimating proximity impacts become very practical for the right of way community. Exacerbating the saliency of these questions for the right of way community is the fact that certain federal agencies, such as the Federal Energy Regulatory Commission, have become increasingly concerned with the impact that right of way projects have on the value of abutting or proximate properties. Unfortunately, even cursory review of the scope and methodology of currently available studies indicates that proximity impacts are not being adequately analyzed, even when larger studies have been commissioned.

Addressing the Inadequacies

The most serious shortcomings of the published studies are lack of analytical rigor, limited scope of data and time, failure to use the latest advances in geocoding and computing, and failure to consider differences in the type or scope of corridors. Resolving these shortcomings requires that practitioners and their clients alike reconsider the assignment scope. To ensure that a proximity impact analysis will yield credible results requires significantly more data than is reflected in currently available studies. Additionally, the modeling must

leverage expertise in various practice areas, not merely those of an appraiser or economist.

Recognizing these shortcomings, we have been compiling national databases over the past several years to address the issue. Further, unlike many previous studies compiled solely by appraisers or economists, we have leveraged expertise in statistics, real estate valuation, and economics to collaboratively develop analytical models for those databases that yield meaningful and reliable results from the perspective of all three areas of study. Combining significantly larger data sets with more robust modeling allows for considerably improved study results.

Case Study to Address Impact

To illustrate the type of analysis that refocused assignments can provide, we considered proximity impacts of electrical transmission corridors on single-family homes in Salt Lake County, Utah, where a significant amount of research has already been conducted on proximity to power lines. Using a larger data set and more robust analyses, we are able to address several important issues that have been inadequately addressed in previous work.

While previous research focused on specific neighborhoods or subdivisions with certain data limitations, our data covers almost all single-family home transaction sales in Salt Lake County from 2001 through 2014. Our transmission line data contains location information for each type of high-voltage overhead transmission line, as well as medium-voltage transmission lines and substations. In contrast to previous studies, we are able to examine the effects of one type of line, while controlling for effects of others.

Due to limited data, previous research had only considered a single type of line or the combined effects of various power lines. This led to inadequately supported proximity impact estimates. For example, if a 46kV corridor runs within 200 meters of a 345kV transmission corridor, ignoring the 46kV line may result in proximity impacts relating to that line being erroneously attributed to the 345kV line.

Adding recreational space can work to enhance the area under a transmission corridor.

With more than 100,000 sales from one county, we were able to consider a wider range of property characteristics than past studies. Also, previous studies have substituted the influence of macroeconomic conditions by simply introducing time variables. In contrast, we directly tested the influence of macroeconomic conditions on the influence of power lines on property values. Additionally, our data begins before the 2007 housing crash and stretches through the recovery period, thereby allowing for impacts to be tested for market condition sensitivity as well.

We also went beyond a typical appraisal and applied tests for spatial autocorrelation to investigate the implications of Waldo Tobler's first law of geography that states, "Everything is related to everything else, but near things are more related than distant things." This analytical step is crucial for improving the extrapolative reliability of the study by accounting for atypical neighborhood or community market responses to transmission corridors.

For Salt Lake County, we obtained transmission line locations at regular intervals for all individual transmission lines by type as well as the location of all substations. Using this data, we calculated the distance from each transmission line and substation location data point to the location of each of the county's approximately 350,000 properties. This resulted in more than 60 billion proximity computations. Next, we calculated the minimum distance from each property to each transmission line.

We then matched each parcel to the sales in our transaction database during the study period. This resulted in a combined database of all sales information, including detailed property characteristics, and distances from each property to each type of transmission line and to the closest substation. We then combined the resulting database with our economic variable database to allow us to account for market changes. In total, our model

for Salt Lake County from 2001 to 2014 period includes a total of 127,584 home transactions and 450 explanatory variables.

The overall results of our regression indicate a fit of 91.5 percent. In other words, the variables in our model explained over 91 percent of the variation in home prices in Salt Lake County over a 14-year period. Our results with regard to transmission lines appear below.

Salt Lake County 2001-2014

345 kV Line

Proximity (meters)	Effect	P-Value
100	0.90%	0.2702
100-200	0.90%	0.1844
200-300	0.90%	0.0753
300-400	0.70%	0.1127

138 kV Line

Proximity (meters)	Effect	P-Value
50	-5.10%	<.0001
50-100	-2.90%	<.0001
100-200	-2.10%	<.0001
200-300	-1.80%	<.0001
300-400	-1.10%	<.0001

46 kV Line

Proximity (meters)	Effect	P-Value
50	-0.50%	0.4055
50-100	-2.50%	<.0001
100-200	-0.90%	<.0001
200-300	0.20%	0.3364
300-400	0.30%	0.1142

Substation

Proximity (meters)	Effect	P-Value
50	-2.90%	0.0613
50-100	-0.40%	0.8455

The highlighted areas show the most significant value impact from the transmission lines.

"...adding amenities in transmission line corridors may be an acceptable solution."

The results indicate both practically and statistically significant effects from 138kV and 46kV lines, but no negative effects from 345kV lines. In fact, we notice a slight positive effect on properties within 400 meters of 345kV lines. This result underscores the need for careful analysis when attempting to extrapolate results from one area or corridor type to another.

Opportunity for Compromise

The open space corridors and associated recreational amenities often resulting from high-voltage transmission lines are viewed by many as a preferable alternative to abutting other homes. This reality suggests potential for compromise between homeowners and right of way agencies in planning new projects that may reduce the potential for, if not cost and duration of, litigation between the parties.

For example, adding amenities in transmission line corridors may be an acceptable solution to existing or potential homeowners and a cost-effective outcome for the utility. Further, such results underscore the added benefit of cooperation—especially in large-scale right of way projects—between appraisers and other experts skilled in high-level data analysis and statistical modeling. Not only do high-level data analysis techniques permit more accurate estimates of property value impacts from proximity to transmission lines, they also offer the possibility of more accurately identifying potential sources and calculating the impacts of mitigation.

Using the same dataset, we can estimate the potential effects of adding a nearby park or a landscaped trail. The availability of such results can facilitate a mutually satisfactory agreement with both parties, where perhaps the community and other project stakeholders can come together to fund improvements that mitigate any negative impacts.

Another interesting observation of the analysis is that homes within 50m of 46kV lines see relatively no effect, but homes within 50 to 100m see a 2.5 percent decrease. We expect blockage of view may be one reason for this finding. The lines may actually be more noticeable by homes at a medium distance rather than directly adjacent. Since mountain views are an important value variable for homes in Salt Lake County, we are not surprised to see this negative effect.

This study is merely illustrative of the advanced analytical tools available to the right of way community. In its current form, there are refinements that would improve the data's reliability, such as analysis of property rights and inclusion of additional market areas. Therefore, even though the indicated proximity factors are more reliable than existing research, additional refinement would improve reliability.

Developing more analytically sound databases and models would allow for broader applications and create greater value for the right

Transmission lines along open space corridors like the Provo River Parkway Trail are viewed by many as preferable to those abutting private homes.

of way community. For example, in addition to analyzing proximity value factors by line type, our model allows for us to calculate aggregate value impacts for a given corridor or corridor type. Below is the indicated value impact on homes of all 138kV corridors in Salt Lake County by distance and in total.

Aggregate Value Impact

Proximity to 138 kV line (meters)	**Total Impact**
Less than 50	-$2,365,415
50-100	-$3,985,451
100-200	-$10,349,946
200-300	-$12,331,579
300-400	-$8,898,034
TOTAL	**-$37,930,425**

A similar analysis could be used to estimate and compare the total value impact of various possible alignments of a proposed corridor. Such would be useful not only for budget planning purposes, but also for obtaining regulatory approvals and for addressing potential public opposition to a project.

Justifying the Cost

Obviously, the primary deterrent to conducting this kind of analysis is cost. A proximity study costing tens or even hundreds of thousands of dollars may, on initial glance, be difficult to justify. However, the cost is more realistic when compared to the real costs that may be incurred from the use of inadequate analytical tools. Arguments based on conflicting appraisals can often lead to significant legal costs and sizeable awards. While not a panacea for all valuation disputes, one might expect that robust analyses leveraging statistical, economic and valuation expertise in addressing broader data sets will result in less disagreement than analyses that rest wholly on appraisers' judgment within the context of a typical appraisal assignment.

While the foregoing study specifically addresses electrical transmission corridors, the data and methodology introduced can also be used to analyze other right of way projects such as roadways, oil and natural gas pipelines, water and wastewater pipelines and mass-transit routes.

The same data and models can be used in analyzing other geospatial value questions such as correlation between home value and proximity to negative externalities (correctional facilities, sources of pollution, solid waste facilities) or positive externalities (public parks, universities, transit stations), correlation between improving performance of neighborhood schools and home values, and proximity to earthquake and liquefaction risk areas.

The interests of right of way agencies, companies and the general public are aligned in recognizing and leveraging the ongoing confluence of increasing availability of data and improving analytical tools. Knowingly requesting and utilizing analyses that are methodologically unreliable as the basis of decision-making is obviously is not beneficial to any party. Given this, the right of way community would be well served by taking a closer look at how proximity impacts are analyzed. ✪

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