Dallas Area Rapid Transit

Local Area Benefit/Cost Evaluation System

User's Guide

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Table of Contents

List of Tables

List of Figures

Background and Purpose

In 2015, the Dallas Area Rapid Transit (DART) contracted with the Texas A&M Transportation Institute to develop a benefit/cost and economic impact assessment tool. This tool provides prospective DART partners with macro-level estimates of the impacts of potential new transit stations at locations within cities that are not currently part of the DART service area. Specifically, this tool estimates property and sales tax impacts, primary and secondary employment figures, and regional economic activity impacts related to the construction and operation of prospective DART rail and bus rapid transit (BRT) stations.

This user's guide serves as a point-of-reference for users accessing and running the model. Organized based on how the user experiences the model, this guide also provides background information on assumptions used in the calculation process. The Scenario Wizard guides the user through the inputs required to calculate the economic and revenue outputs. In addition to the Scenario Wizard, the user may choose to make changes directly to one of the five model pages (summarized in Table 1 below.) Project location and assumption parameters are selected using the Scenario Wizard or by accessing the individual model pages once the user has completed using the Wizard. More information concerning the Scenario Wizard and model pages are provided later in this user's guide.

Table 1: DART Local Area Benefit/Cost Evaluation System Model Overview

Model	Description
Scenario Wizard	Select project location information, change land use characteristics, and change property and sales tax assumptions.
Property Tax Model Page	Make specific changes to model assumptions concerning property tax rates and land use percentages.
Sales Tax Model Page	Make specific changes to model assumptions concerning sales tax rates and land use percentages.
Economic Impacts Model Page	View key economic outputs from station improvements.
Traveler Impacts Model Page	View key traveler benefits and costs.
Development Model Page	Make changes in property and sales tax revenue by tax jurisdiction. This model also allows the user to change development assumptions in the model.
Summary Page	View summary of model outputs.
Glossary	View key terms used in this model.

The next chapter provides more information on the URL address to access the web-based model and beginning the scenario development process.

Accessing the Model

The user may begin by first clicking on the following address below. The model should work with most web browsers. If the hyperlink doesn't work, copy the hyperlink and paste it into your web browser. You will be asked to enter in a login and password. If you need a login and password assigned to you or need other assistance using this model, please contact David Ellis at d-ellis@tamu.edu, Jeff Borowiec at jborowiec@tamu.edu, or Brianne Glover at b-glover@tamu.edu.

http://dart.tti.tamu.edu

Once there, you will see the following home page (shown in Figure 1 below.) You may begin by clicking on the green "Begin Here" button immediately below the introductory paragraph on the first page. Clicking this button takes you directly into the Scenario Wizard. It is recommended that users begin the Local-Area Benefit/Cost Evaluation System by using the Scenario Wizard. Users can see outputs for each of the five models that make up the DART LAB-CE System by clicking on the model at the top of the page. The next chapter of this user's guide will provide you with detailed information for completing the scenario wizard.
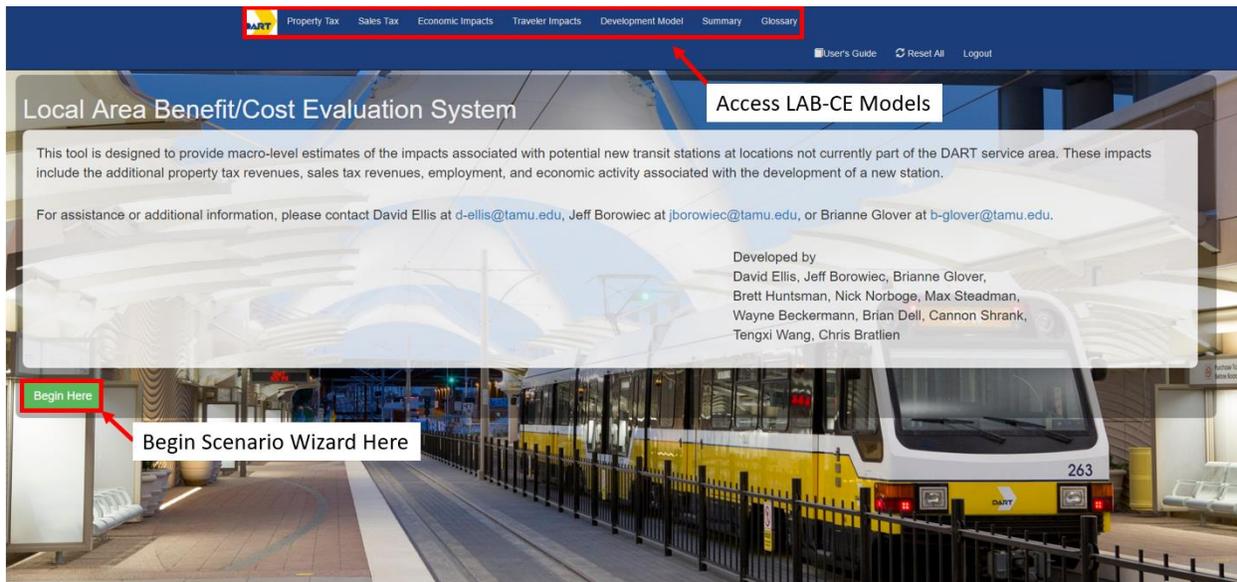
Figure 1: DART Local Area Benefit/Cost Evaluation System Home Page

Scenario Wizard

The Scenario Wizard allows you to enter parameters concerning your proposed project. Once you select "Begin Here," a page appears that allows you to enter scenario parameters of the proposed new station project. You will navigate through the following pages to enter estimates specific to your project:

- describe a scenario;
- land use;
- property tax; and
- sales tax.

Once you have navigated through these pages, you will see a summary page that presents an overview of the estimated project costs and benefits to your proposed project. Additionally, by clicking on the red "View/Print/Save a PDF Report" button in the upper right-hand corner, you can save your results (shown in Figure 2 below.) This allows you to save your results for that scenario and re-run the analysis for comparison purposes or develop entirely new scenarios. You can save and print as many scenario results as desired.

Future changes to the scenario can be made by going through the wizard again (you may do this by clicking on the DART logo on the top left of the screen) or by making changes to the individual model pages located at the top of the screen.
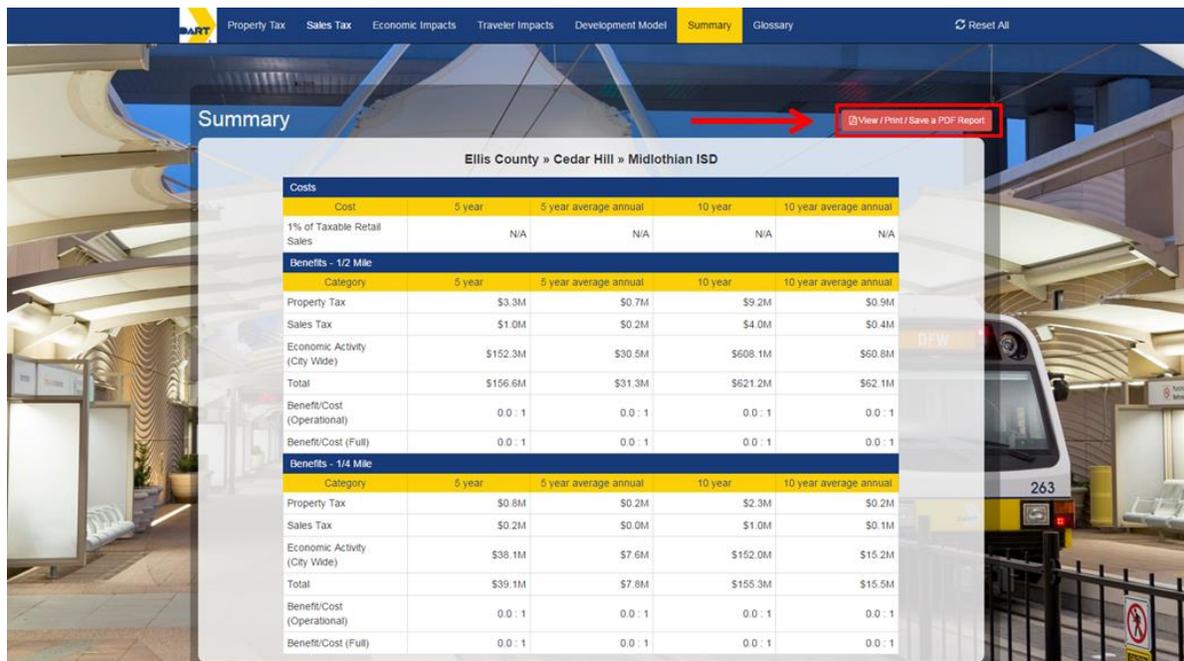
Figure 2: How to View/Print/Save Model Results

The subsections that follow provide further discussion regarding each page of the scenario wizard.

Describe a Scenario Page

The first page of the scenario wizard allows the user to enter in key parameters relating to the desired project scenario. The user then must select the following (as shown in Figure 3):

- type of service;
- closest existing station;
- service start date;
- county;
- city; and
- school district.

Figure 3: Scenario Wizard Describe a Scenario Page 1a

The type of service is light rail, bus rapid transit, or streetcar. These three levels of service have different capital and maintenance costs; therefore, the expected benefits are different. The closest station input is used to assist in calculating the traveler impacts. The service start date is the year the construction is

completed and service begins. This is when the benefits will start accruing. Table 2 provides additional definitions of the different types of service.[1]

Table 2: Type of Service Drop-Down Menu Definitions

Type of Service	Definition
Rail	This refers to DART's electrically powered system that generally operates at street level. DART currently operates approximately 90 miles of light rail.
Bus Rapid Transit (BRT)	This refers to DART bus rapid transit (BRT) service. BRT can operate on exclusive transit ways, High Occupancy Vehicle (HOV) lanes, expressways, or ordinary streets. A BRT system combines intelligent transportation systems, technologies, transit signal priority (TSP), rapid and convenient fare collection, and integration with land use policies.
Streetcar	This refers to DART streetcar service. This refers to a public vehicle running along certain streets. DART operates streetcar service on guided railways.

Once the type of service is selected, the user can select the county and city of their choice. The cities and counties that are available to choose include those with existing service as well as major outlying cities that abut current service areas. Some cities with extremely small populations were not included. Selecting this will automatically populate available school district options. (Please note: many city boundaries overlap with several county and school district boundaries, so users will need to be aware of the boundaries within which a potential station would fall.)

The county, city, and school district are important in determining the tax impacts. Tax rates and growth patterns vary across the region, so you should be as specific as possible in selecting these entities. They should correspond to the expected location of the station.

As the user selects a county, only the cities within that county will be populated in the city menu. The same is true for the school district that is selected. Once the county and city are selected, the school district menu is populated with only those school districts within the previously selected jurisdictions.

In some cases, special taxing districts may be applicable (shown in Figure 4 on the next page.) Special taxing districts are independent governmental units that exist separately from general purpose local governments. These taxing districts can be used to fund special services in an area, such as ambulatory services or utility services and can raise revenue by taxation, special assessment, or charges for services provided.[2] You may select whether you wish to have that rate apply in the model. The default rates that appear in this model are current as of 2015.

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[1] Further information on types of DART transit service and future capital investment can be found in the DART Fiscal Year 2016 Business Plan.

[2] For more information about special taxing districts in Texas, please visit http://www.texastransparency.org/Local_Government/Special_Purpose.php
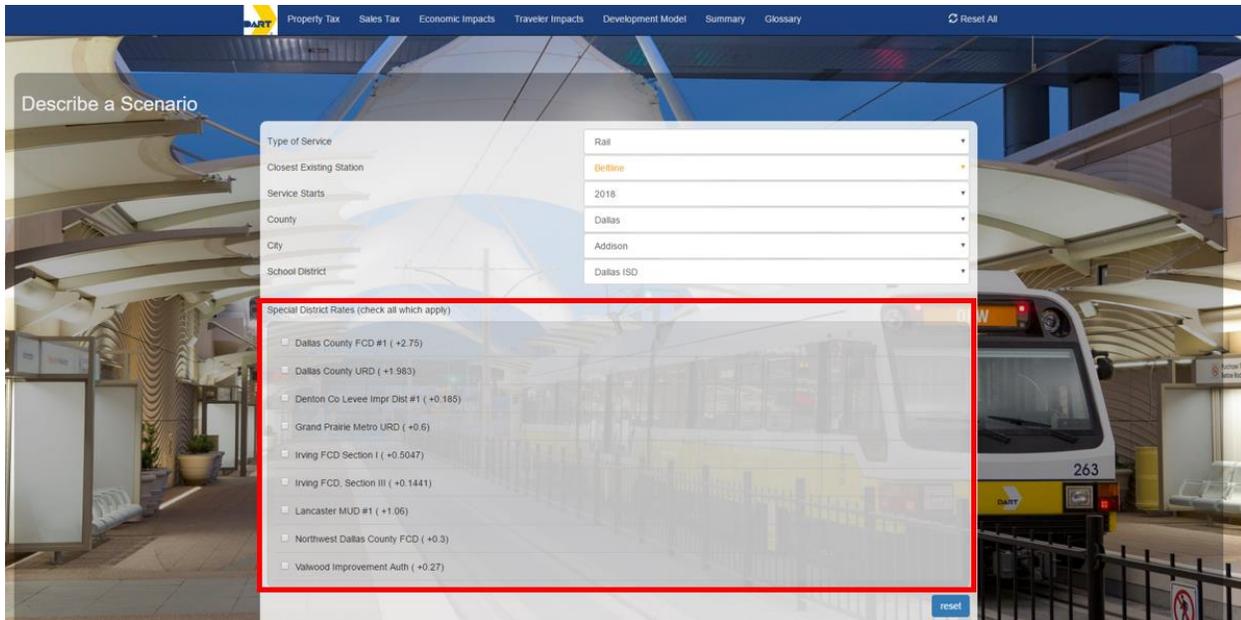
Figure 4: Scenario Wizard Describe a Scenario Page 1b

In those cases, they will appear for the user to select. In most cases, not all of the special taxing districts will be applicable. They are made available to accommodate the occasion that a potential station location is located within one. Those subsequent tax impacts can then be included in the analysis.

If necessary, in the top right-hand corner of the page is a "Reset All" button, which clears all current responses and returns the user to the model's default settings.

Below the initial scenario selection options are four more specifically transit and growth-related variables you are required to provide for your project. These are:

- approximate miles to connecting station;
- annual ridership at new station;
- discount rate; and
- travel growth rate.

A definition of these inputs is provided in the glossary or can be seen by hovering the cursor over the box. Figure 5 shows how these appear in the model.
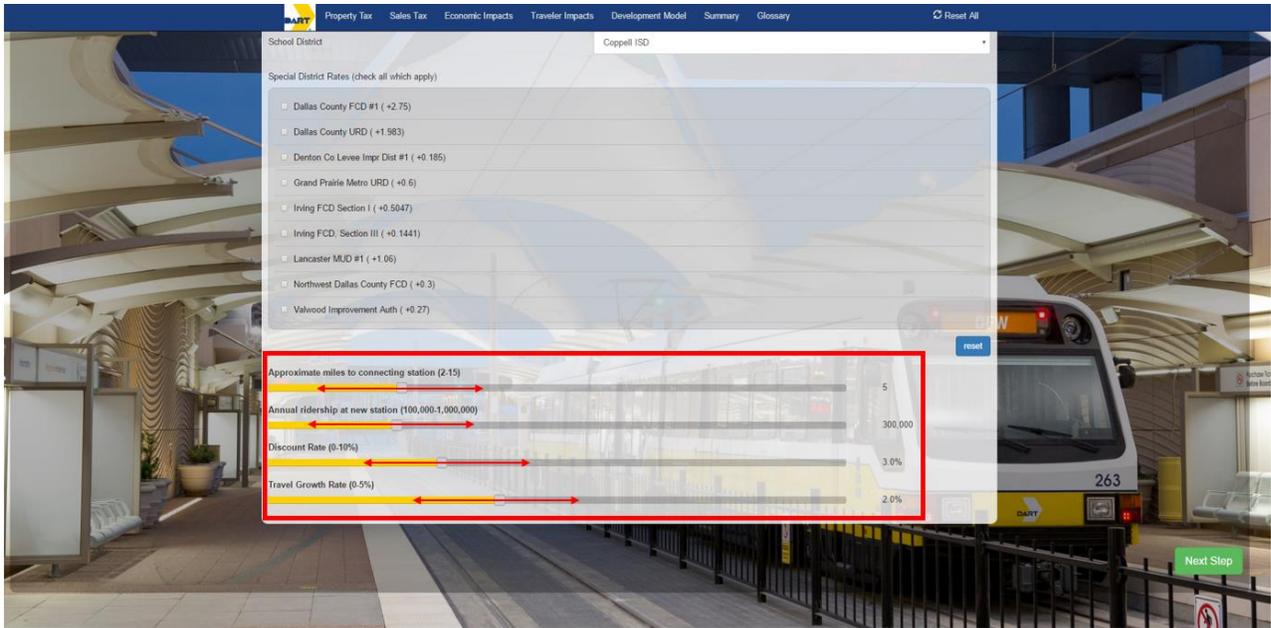
Figure 5: Scenario Wizard Describe a Scenario Page 1c

These sliders allow you to change relevant assumptions in the model. The approximate distance to a connecting station, annual new ridership, the discount rate, and travel growth rate are all assumptions that can greatly affect the model outputs. If you are unsure about the ways in which these assumptions might affect your model outputs, it is recommended that you save your results and run this model again with the desired changes to your assumptions. This will allow you to see how changing these assumptions might affect your final output numbers. Table 3 provides additional information about each of these assumptions. Again, it is worth noting that the user does have the ability to save each scenario created for comparison purposes.

Table 3: Scenario Wizard Slider Title and Descriptions

Slider Title	Description	Default Value
Approximate miles to connecting station (2-15)	This slider refers to the distance in miles between the potential DART station and the nearest existing DART station in operation.	5 miles
Annual ridership at new station (100,000 – 1,000,000)	This slider refers to the estimated annual ridership the new station will experience during the first year of operations. Please refer to DART Ridership Statistics for more information: https://www.dart.org/about/dartreferencebookmar16.pdf[3]	300,000 passengers/year
Discount rate (0-10%)	The discount rate is a method of evaluating the time value of money (i.e., concept whereby money available at the present time is worth more than the same amount in the future due to its potential earning capacity.) A conservative discount rate is generally considered to be 3%, whereas a more aggressive discount rate is generally considered to be 7%.	3%
Travel Growth Rate	This slider refers to the annual growth rate of vehicles traveling on local roadways.	2%

Once you are finished inputting the desired inputs into this page, please click the green "Next Step" button in the lower right-hand side to advance to the next input page of the scenario wizard.

Land Use Page

The next page on the Scenario Wizard is the Land Use Page. What the user first sees is the acreage by land use type in the ¼ and ½ mile radius around the proposed station and the percentage of the total that it comprises. Here, you will be able to select whether they would like to change the land use type and which calendar year those changes to begin. This is a one-time change that the model allows to take place.

The default values that are populated in the model are the current land use type percentages based on the jurisdiction the user selected on the "Describe a Scenario" page. These are the land-use percentages for the city selected. The populated values were calculated by collecting land use data from each city, analyzing it by using Geographic Information System (GIS) software, and applying the results to classifications discussed below. If necessary, in the top right-hand corner of the page is a "Reset All" button, which clears all current responses and allows the DART model user to start over.

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[3] For reference, FY 2015 ridership statistics can be found on pages 30 – 40 within the DART Annual Reference Book.

Please note that you should consider a city's current land use percentages in terms of past changes and current trends. Many cities have this information online but city officials with knowledge of their city's growth patterns and available land will be integral in providing this level of information.

As new stations are announced and eventually constructed, the use of surrounding land will typically experience some degree of change. The Land Use Page presents default percentages based on current land uses in 2014 within the previously chosen city. However, users may change the percentages to reflect anticipated changes resulting from station construction. It would be expected that these changes would take place in the commercial and multi-family land use categories providing for denser development surrounding the station. It is of the utmost importance to notice both the operation start date and the land use changes start date.

- Operation Start Date: the year during which the DART station opens and is fully operational;
- Land Use Changes Start Date: the year during which land uses surrounding a station actually begin to reflect the effects of the new station opening.

Please be aware that land use changes typically do not occur rapidly, especially in areas where rezoning and other governmental approval is needed. It may also take time for an area to experience more multifamily and commercial development as people realize the benefits of proximity to transit. Therefore, it is recommended that you enter dates that are reasonable and take into account local situations that may impact time needed to see change. Figure 6 below shows how this page looks without making changes to the default land use settings.
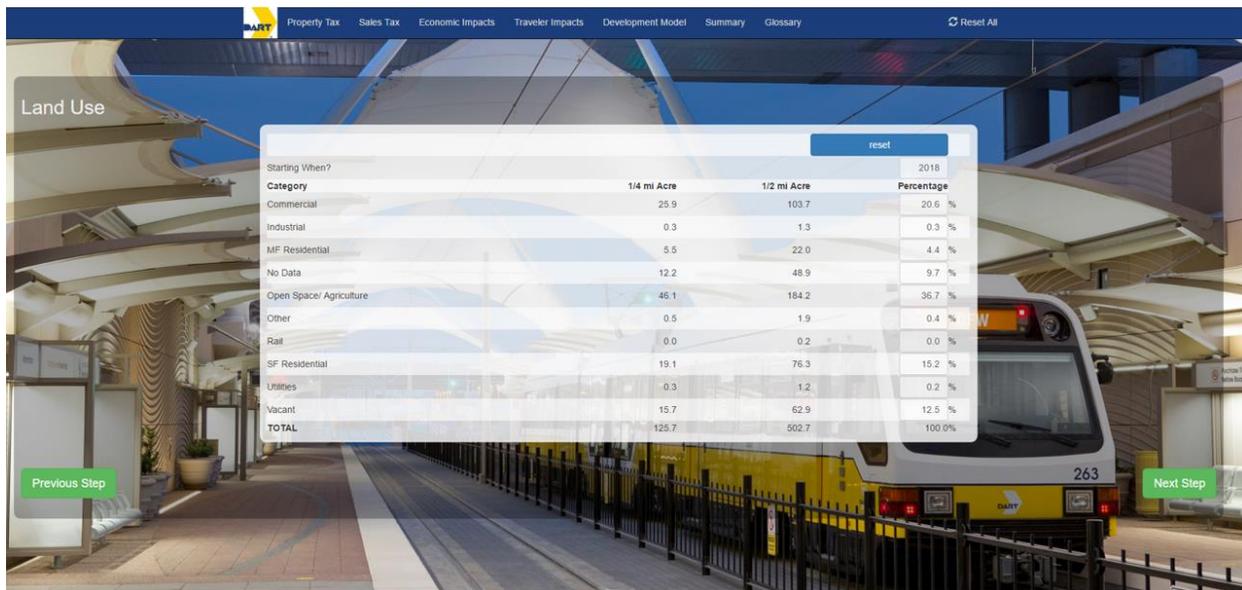
Figure 6: Scenario Wizard Land Use Page 1a

Additionally, the Land Use Page model also helps you keep track of any changes to the default assumptions that you make (shown in Figure 7 below.) If you make changes to any land use category, the cell will highlight in a turquoise color. For the model to calculate properly, it is also important for the total land use percentage to total to 100%. Therefore, if you make changes to the default assumptions and that total exceeds 100%, the total column will highlight yellow and you will be prohibited from advancing to the next page.
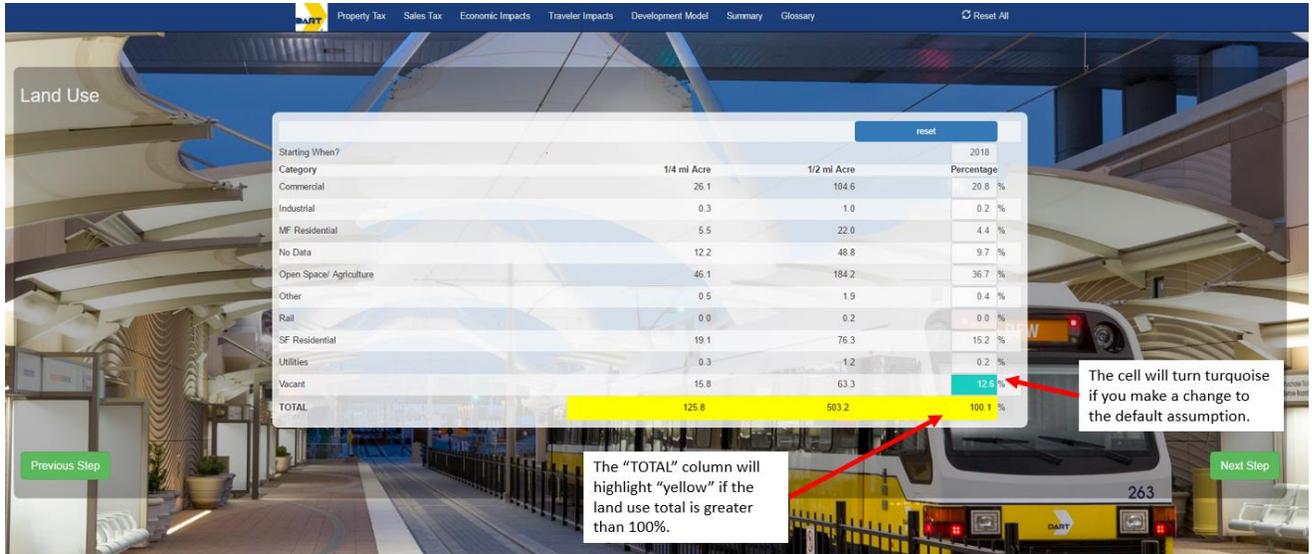
Figure 7: Scenario Wizard Land Use Page 1b

Finally, the reset button on the Land Use page allows for the land-use percentages to be reset to the default settings. This is not to be confused with the reset button on the top navigation bar will reset all of the inputs for the entire model, as shown in figure 8 below.

Figure 8: Scenario Wizard Land Use Page 1c

Finally, for your reference the various land use categories within the model are defined below in Table 4 below.

Table 4: Standardized Land Use Categories

Land Use Category	Definition
Commercial	Parcels with land and improvements associated with businesses that sell goods or services to the general public.
Industrial	Parcels with land and improvements of businesses that add value to a product through development, manufacturing, fabrication or processing.
Multi-Family (MF) Residential	Parcels with residential improvements containing two or more residential units under single ownership. Properties classified as MF Family generally include apartment complexes.
No Data	Includes parcels with no data present.
Open Space/Agriculture	Parcels with acreage qualified for productivity (e.g. farming) valuation under Texas Constitution, Article VIII, 1-d or 1-d-1, and Tax Code Chapter 23, Subchapters C, D, E and H. Also includes rural land that is not qualified for productivity valuation and the improvements, including residential, on that land. Rural land in this category is outside of the city limits and is not considered personal property.
Other	Includes all other Texas Property Classifications not included in the condensed classifications. The majority of these classification deal with tangible and intangible personal property used for residential, commercial, industrial, or utility purposes.
Rail	A subgroup of the 'Utilities' property code. Includes parcels with railroad rolling stock used in the operation of a railroad.
Single Family (SF) Residential	Parcels with single-family residential improvements and land on which they are situated. Typically, SF Residential properties are single-family homes on tracts of land or platted lots. Townhouses, condominiums, row houses, owner-occupied duplexes, and mobile homes are also included in this category.
Utilities	Parcels that include the real and personal property of utility companies and co-ops.
Vacant	Unimproved land parcels usually located within or adjacent to cities with no minimum or maximum size requirement including Colonia properties that may not be sold pursuant to Local Government Code Chapter 232.

The land use categories explained above come from the Texas Comptroller of Public Accounts' Property Classification Guide, which can be accessed here: http://comptroller.texas.gov/taxinfo/proptax/pdf/96-313.pdf . Some cities may have more specific and nuanced land use categories based on local needs, but those uses were assigned to broad categories for purposes of consistency across municipalities within the model. For example, if a city has spate land use classifications for heavy industrial and light industrial, both would be included within the model's single industrial land use category.

When the user is finished, they can advance by clicking on the green "Next Step" button at the bottom right of the page. This moves the user to the property tax input tab.

Property Tax Page

This Wizard page allows the user to adjust property tax growth rate assumptions. Because the benefits of any infrastructure investment can depend heavily on growth assumptions, the DART model user is also given the ability to adjust those growth rates. The default growth rates in the model are based on both historical growth patterns in the city selected and case studies involving property values surrounding six current DART stations discussed below. By using the mouse, the user can slide the cursor to the left or right as desired to adjust each model assumption, as shown in Figure 9 below.
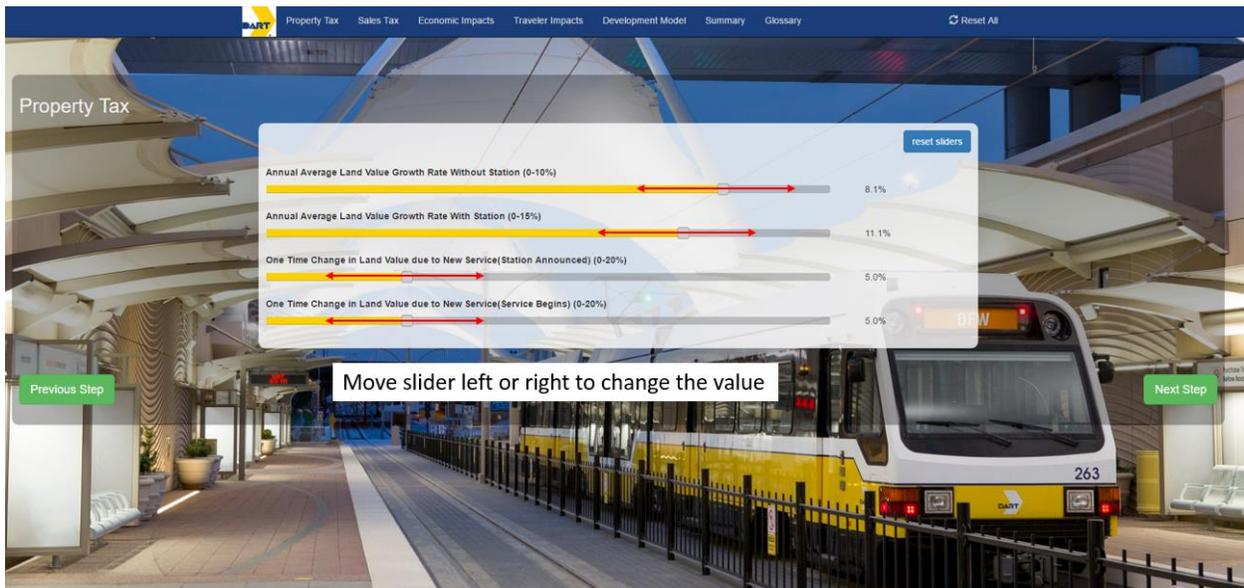
Figure 9: Scenario Wizard Property Tax Growth Rates Page

This page features sliders that can change the following:

- Annual Average Land Value Growth Rate without Station: represents the rate at which land surrounding a potential station would appreciate in value annually if no station were constructed.
- Annual Average Land Value Growth Rate with Station: reflects the rate at which land surrounding a potential station would grow in value annually if a station were to be constructed.

- One Time Change in Land Value due to New Service (station announced): represents the initial, one time increase in property values within a quarter- or half-mile radius of the new station when the station is announced (but before the station is constructed.)
- One Time Change in Land Value due to New Service (service begins): represents the initial, one time increase in property values within a quarter- or half-mile radius of the new station once service begins.

Land values may begin to appreciate considerably in an area when a new station is announced, even if construction on the station begins much later. These values are also affected by zoning restrictions and other governmental decisions that may spur or impede development and thereby land value.

As with the previous Land Use page, the default values can be restored by hitting the "Reset Sliders" button. Once the final selections are made, the user can advance by clicking on the green "Next Step" button at the bottom right of the page. This moves the user to the Sales Tax Tab.

Sales Tax Page

This Wizard page allows the user to provide "Cost of Service" information and adjust sales tax growth rate assumptions, as shown in Figure 10. The first line the users see is any 4A and 4B tax revenue that the city currently has. It will show both the rate and the dollar amount. If the city does not have 4A or 4B tax revenue, it is shown as zero. Below this is a box for the user to provide their own "Cost of Service" estimate. This will be the cost used in performing the benefit/cost analysis. (Please refer to Appendix 2 for more information about 4A and 4B tax authority under Texas law.)

The "Cost of Service" percentage refers to the amount of a city's taxable retail sales. It is framed this way because current funding models for DART are based off of sales tax revenues. The model allows the user to either enter in a percentage or a fixed amount. Checking the box next to "Fixed Cost" changes the unit analysis to the right of the "Cost of Service" field from a "%" to a "M," indicating a fixed dollar amount in millions. This allows the user to enter in a fixed amount rather than a percentage value. This change is illustrated in Figure 11.

Regardless of funding mechanism, this approach can be used to arrive at a variety of costs to be used in this analysis. Familiarity with the city's taxable retail sales are required to do so. Knowing the city's taxable retail sales will allow a particular funding level to be used.

Figure 10: Scenario Wizard Sales Tax Page 1a
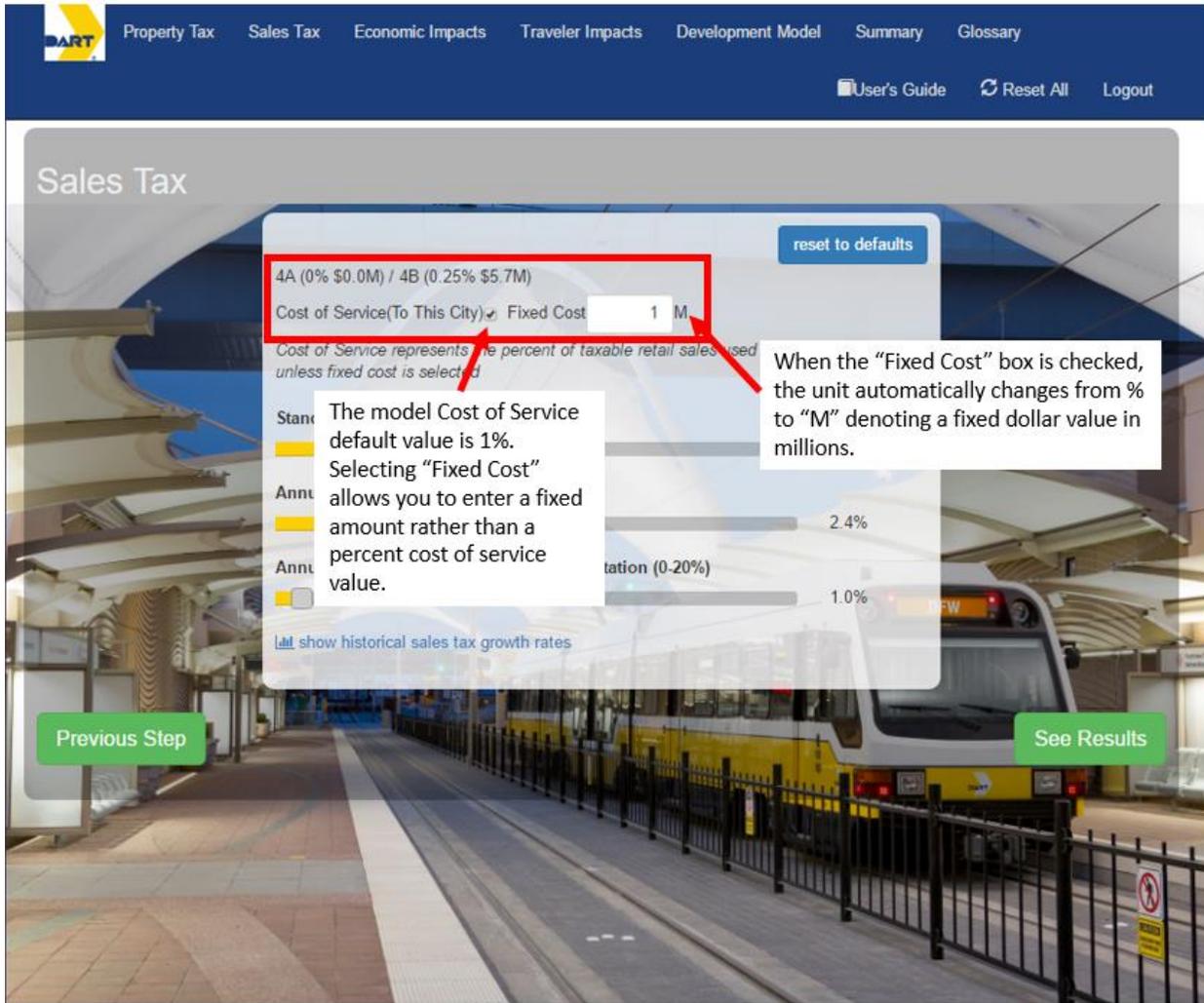
[Figure 11: Scenario Wizard Sales Tax Growth Rates Page 1b](#)

Because the benefits of any infrastructure investment can depend heavily on growth assumptions, the model user is also given the ability to verify, and if necessary, adjust these growth rate assumptions. The default growth rates in the model are based on historic patterns and case study research that supports standard growth in sales, inflation, and average additional sales growth due to transit stations. By using the mouse, the user can slide the cursor to the left or right as desired to adjust each model assumption, as shown below. Inputs can be reset to default rates by using the "Reset to Defaults" button.

The user is also able to access the historical sales tax revenue and growth rates for the selected city. By clicking on the "show historical sales tax growth rates" link, the user is able to see tax revenue data going back to 2003. This will help the user formulate appropriate inputs for their scenario. An example from this model page can be seen in Figure 12.

Once these adjustments are made, the user can advance by clicking on the green "See Results" button at the bottom right of the page. This will advance you to the results or "Summary" page.

Figure 12: Scenario Wizard Sales Tax Growth Rates Page 1c

Summary Page

The summary page provides an overview of the estimated project costs for the service selected and the estimated benefits and compares them as shown below in Figure 13. Both the costs and benefits are presented through a five- and ten-year perspective, along with the respective average annual impacts for property tax, sales tax, and economic activity. The cost is shown in terms of the cost of service value that the user entered in the model wizard.

Benefits shown within the summary page include increased property and sales tax revenues along with city-wide economic activity. Definitions for each term appear when you move your mouse cursor over

the term. As transit options increase and associated development occurs, more money is likely to be spent in these surrounding shops, resulting in increased local and state sales tax receipts. Developers may also begin constructing new commercial, multifamily, office, and other structures that draw traffic and increase property values, which results in greater sales and property tax revenues. As residents and developers draw closer to new transit centers, new businesses may follow and old businesses may experience more customers and a greater employee applicant pool, resulting in greater economic activity.

The aforementioned benefits are considered both within ½ and ¼ mile of the proposed new station. Depending on the particular city, benefits may be more concentrated or dispersed. Again, specific station case study analysis was used to formulate the results presented.

Dallas County » Lewisville » Coppell ISD

Show per-year benefits and costs

Costs				
Cost	5 year	5 year average annual	10 year	10 year average annual
Cost of Service (Fixed Amount)	$50.0M	$10.0M	$100.0M	$10.0M

Benefits - 1/2 Mile				
Category	5 year	5 year average annual	10 year	10 year average annual
Property Tax	$4.8M	$1.0M	$25.2M	$2.5M
Sales Tax	$2.0M	$0.4M	$6.4M	$0.6M
Economic Activity (City Wide)	$60.5M	$12.1M	$99.5M	$9.9M
Total	$67.2M	$13.4M	$131.1M	$13.1M
Benefit/Cost (Operational)	1.3 : 1	1.3 : 1	1.3 : 1	1.3 : 1
Benefit/Cost (Full)	1.0 : 1	1.0 : 1	1.1 : 1	1.1 : 1

Benefits - 1/4 Mile				
Category	5 year	5 year average annual	10 year	10 year average annual
Property Tax	$1.2M	$0.2M	$6.3M	$0.6M
Sales Tax	$0.5M	$0.1M	$1.6M	$0.2M
Economic Activity (City Wide)	$15.1M	$3.0M	$24.9M	$2.5M
Total	$16.8M	$3.4M	$32.8M	$3.3M
Benefit/Cost (Operational)	0.3 : 1	0.3 : 1	0.3 : 1	0.3 : 1
Benefit/Cost (Full)	0.2 : 1	0.2 : 1	0.3 : 1	0.3 : 1

Figure 13: Model Summary Output

Once completing the initial *Describe a Scenario* portion of the model and reviewing the summary, the user can go back through the individual model pages or tabs at the top of the page and change any input data to see how different results may be achieved. It should be noted once again that any changes made to the individual model pages will alter the inputs made while using the Scenario Wizard. The five model pages will be explained in detail below.

Property Tax Model Page

This model page presents the model output relating to property tax impacts in greater detail than the summary page. It also allows you to make specific changes to any property tax rate and land use percentage assumptions. You can make adjustments to the property tax rate assumptions by clicking on the *Property Tax Rates* button, as shown in Figure 14. Please note that the default rates are based on current property tax rates as of April 2016. For more information on local property tax rates, please visit the Texas Comptroller of Public Accounts Property Tax Rates and Levies page at http://comptroller.texas.gov/taxinfo/proptax/taxrates/.

The left side of this page also presents variables that were introduced during the scenario wizard, but now may be changed and immediately reflected on the right side of the page within the chart. For example, you can change service start dates, land value growth rates, and other variables. All changes will be presented in both ¼ and ½ mile perspectives.
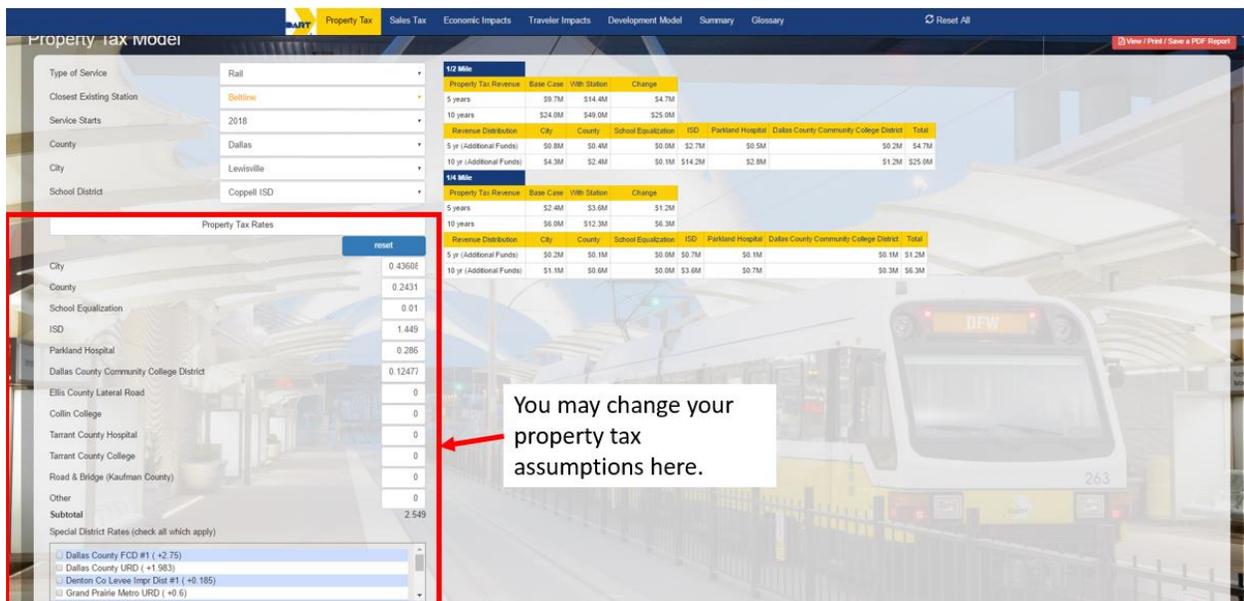
Figure 14: Property Tax Model Page Property Tax Rate Assumptions

In addition to property tax rate changes, you can also make land use percentage assumption changes. When you click on the land use percentage tab, a drop-down menu will appear that will allow you to enter in a starting year and make changes to the estimated land use percentage assumptions, as shown in Figure 15 below. Please note that the default land use assumptions are based on land use data as of April 2016. You should consider a city's current land use percentages in terms of past changes and current trends Many cities have this information online.

In the case of the land use percentages, when the user provides inputs that exceed 100 percent of the land use, the total row is highlighted in yellow.
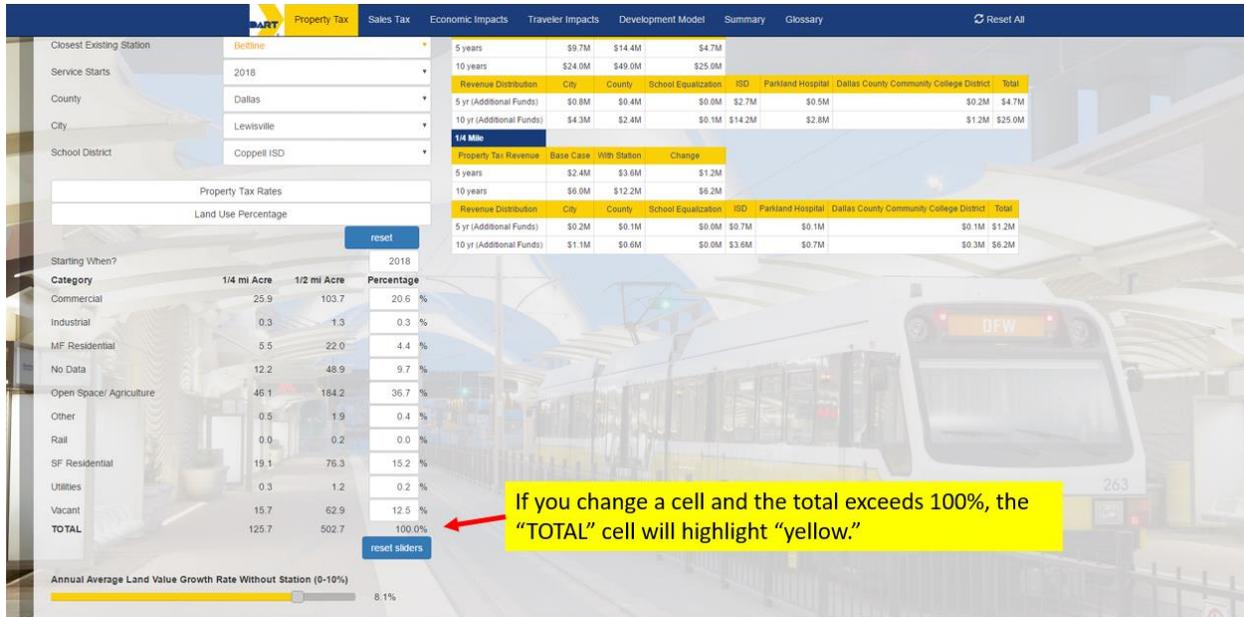
Figure 15: Property Tax Model Page Land Use Percentage Assumptions

The property tax revenue shown is distributed according to taxing entity so each authority can see the impacts to its organization. The tax impacts associated with the station development are under the "Change" category. The "Base Case" is what one would expect the tax revenue to be if the station was not built. The "With Station" column represents the tax revenue expected with the station as defined by the user. The change is the tax revenue attributed to the development of the station at that location.

24

Sales and Use Tax Model Page

This model page presents the model output relating to sales and use tax impacts in greater detail than the summary page. It also allows you to make specific changes to any sales and use tax rate and land use percentage assumptions. You can make adjustments to the property tax rate assumptions by clicking on the *Sales Tax Rates* button, as shown in Figure 16. The default rates are based on current sales tax rates as of April 2016. For more information on local property tax rates, please visit the Texas Comptroller of Public Accounts Sales Tax Rate Locator at https://mycpa.cpa.state.tx.us/atj/addresslookup.jsp).

The left side of this page also presents variables that were introduced during the Scenario Wizard, but that can now be changed and immediately reflected in the output on the right side of the page. For example, the user can change service start dates, land value growth rates, and other variables. All changes will be presented in both ¼ and ½ mile perspectives and with the tax revenue showing for each of the taxing entities.
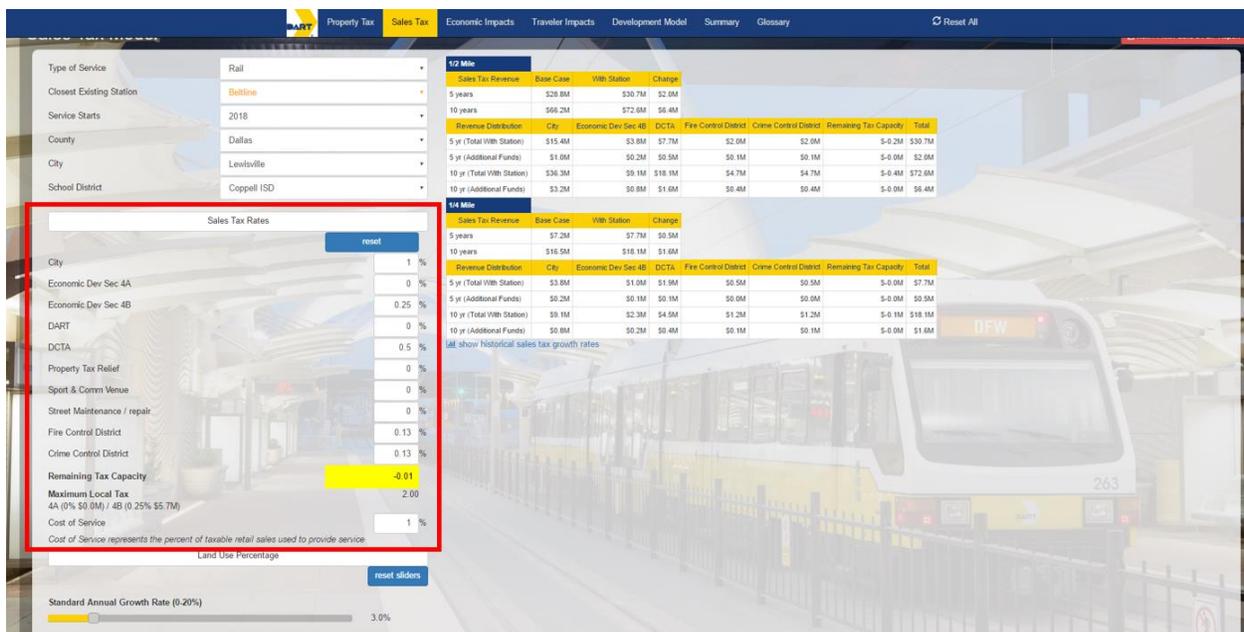
Figure 16: Sales and Use Tax Tab Tax Rate Assumption Adjustments

In addition to sales and use tax rate changes, you can also make land use percentage assumption changes. When you click on the *Land Use Percentage* button, a drop-down menu will appear that will allow you to enter in a starting year and make changes to the estimated land use percentage assumptions, as shown in Figure 17 below. The default land use assumptions are based on land use data

as of April 2016. You should consider a city's current land use percentages in terms of past changes and current trends; many cities have this information online.
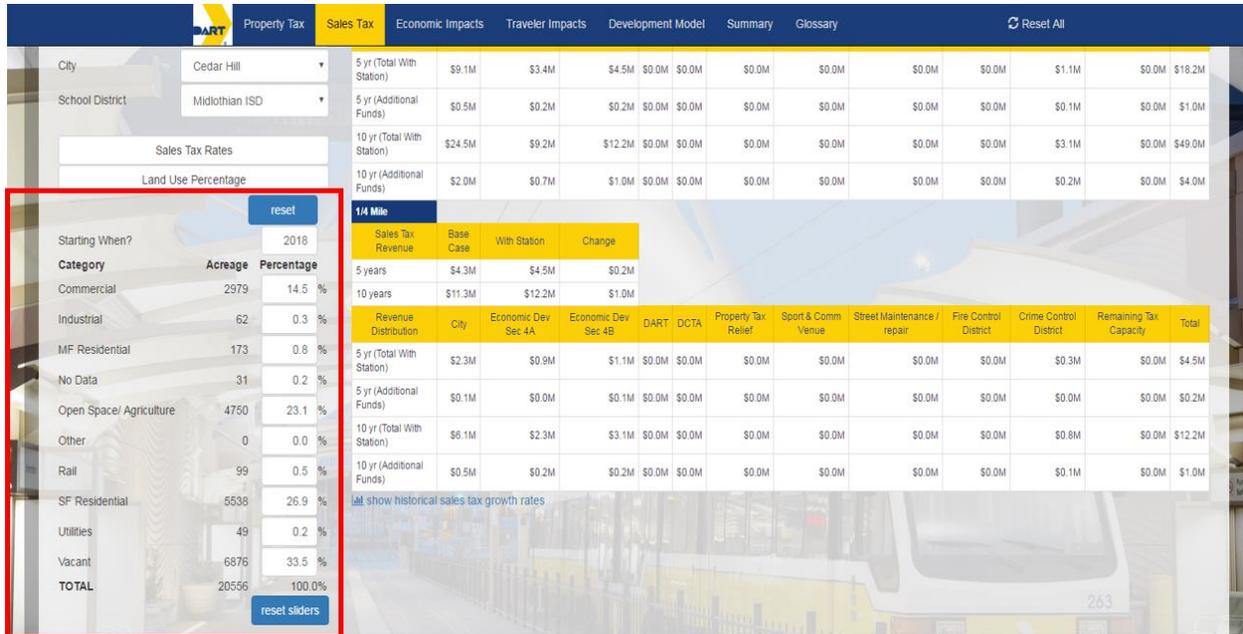
Figure 17: Sales and Use Tax Tab Land Use Percentage Assumption Adjustments

Economic Impacts Model Page

The economic impacts page presents the economic impact results over a 10-year period ½ and ¼ mile from the proposed station. These impacts are derived from TTI's in-house economic impact model. The model works as a typical Input/Output model using retail sales as the input. The estimated impacts included in the model are listed below with the output page from the model shown in Figure 18 below:

- Retail sales revenue;
- Number of jobs created both directly within the retail sector and indirectly economy wide;
- Personal income changes; and
- General economic activity.
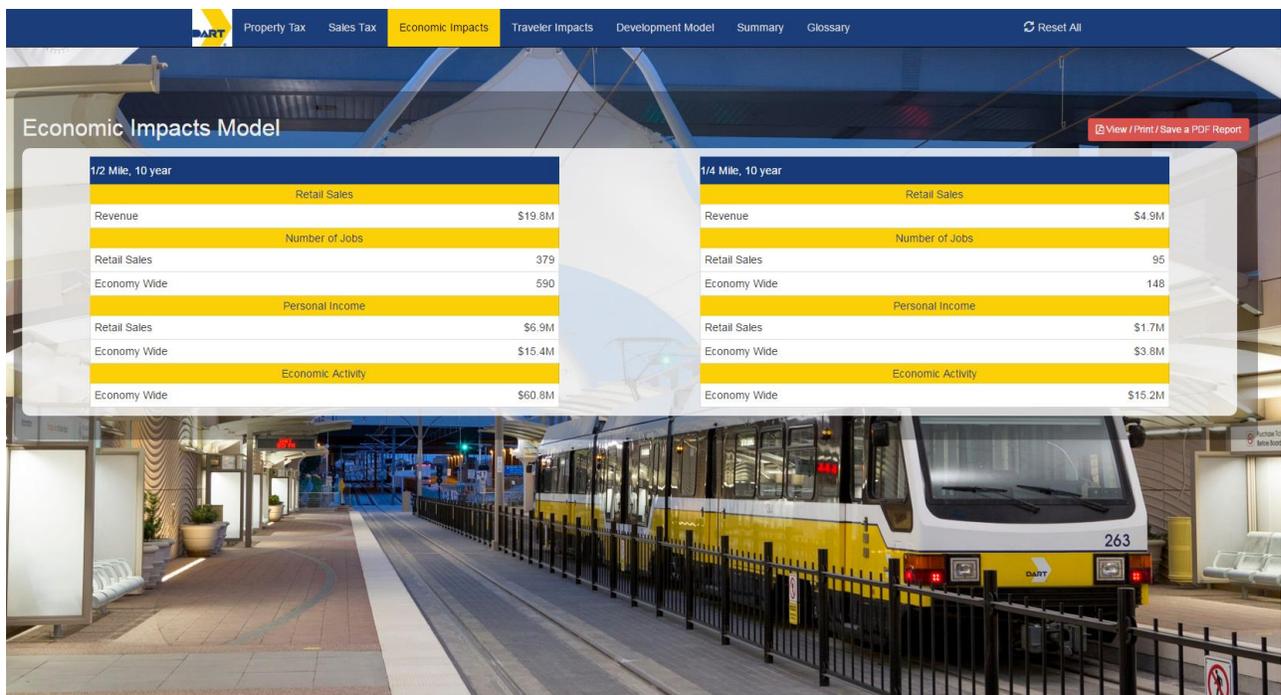
Figure 18: Economic Impacts Model Page Output

The inputs needed to calculate these economic impacts are provided to the model in the course of using the wizard. They are based off the selected city's retail sales numbers (gross sales) and the expected growth rates that the user selects for the model.

The impacts are noted over a 10-year period and are in terms of retail sales, number of jobs, personal income, and economic activity. The number of jobs is reported in full-time equivalent jobs although realistically many part-time jobs may be created. These can differ by industry and the impacts calculated here are specific to retail sales.

Traveler Impacts Model Page

The traveler impacts model page presents a detailed summary of the benefits and costs (in 2015 dollars) of the proposed station development project. Table 5 below defines each of these benefit and cost categories further. Figure 19 below illustrates how this output appears in the model.

Table 5: Traveler Impacts Model Page Benefits and Costs Definitions

Benefit/Cost Category	Description
Vehicle Operating Cost Savings	Vehicle operating costs include, but are not limited to: fuel, purchase payments, insurance premiums, tires, and repairs.
Business Time and Reliability Cost Savings	Savings associated with the ability to maintain relatively stable travel time variability, or how long it takes to complete the same trip on different days with commercial vehicles. In other words, the variable represents reduced business operating costs that occurs when travel time variability associated with traffic congestion is diminished. This variable includes mode-specific improvements in breadth of market access (for labor and freight delivery markets), improvements in reliability (affecting inventory stocking and delivery scheduling processes) and improvements in intermodal connectivity (for travel to and through road, rail, air, and marine transfer terminals).
Personal Time and Reliability Cost Savings	Savings associated with the ability to maintain relatively stable travel time variability, or how long it takes to complete the same trip on different days with passenger vehicles.
Safety Benefits	The reduction in average crash rates (per 100 million VMT) for all modes, and average costs incurred for each crash type ($/accident).
Logistics/Freight Cost Savings	Savings related to costs for freight handling, including costs of loading dock handling, inventory warehousing, and product delivery.
Business Output	The value of business production. For productivity analysis, it is measured as net Value Added. (For other analyses, it may be measured as gross business revenue.)
Positive Economic Effect of Wage Income	The degree to which wage compensation is positively affected by the effects of commuting time reliability on business productivity.
Total Benefits	
Capital Costs	Capital Costs include startup costs to initialize, design, and construct the project.
O&M Costs	Costs to operate and maintain the improvement.
Total Costs	
Benefit/Cost Ratio	The benefit/cost ratio is simply the total benefits derived from the project divided by the total cost of the project. A benefit/cost ratio of greater than 1.0 is positive (the benefits of building the project outweigh the cost).
Construction Jobs	Jobs attributed to capital investment
O&M Jobs	Jobs attributed to the investment in Operations & Maintenance
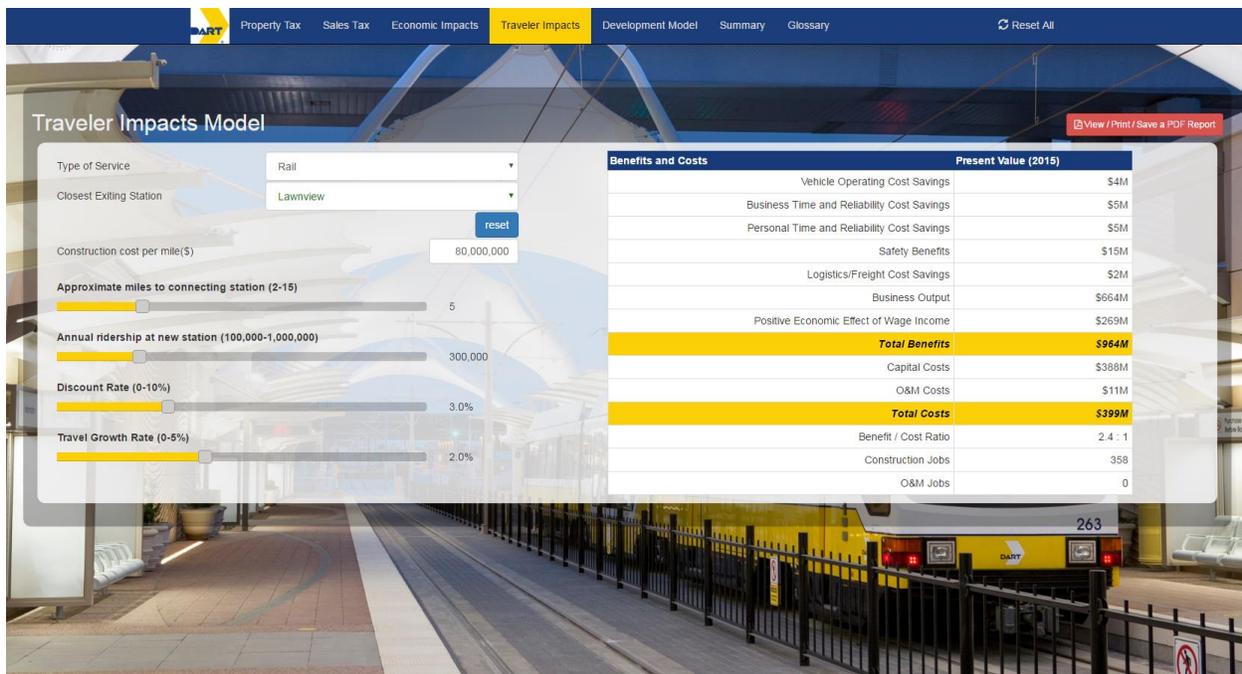
Figure 19: Traveler Impacts Model Page Benefits and Costs Output

As with the Economic Impact Model, the Traveler Impact Model provides estimates based on the user's input using the Wizard and default estimates for construction and maintenance costs. However, unlike the Economic Impact Model page, the user can make changes on the Traveler Impacts Model page. The user can change the type of service and location as well as the construction cost per mile.

The user is also able to make changes to the other variables that are included in this model which include distance to the connecting station, annual ridership, the discount rate, and the traveler growth rate.

Development Model Page

The Development Model page allows users to assess the property and sales tax impacts associated with a specific development. It is not tied into the main model but is a separate calculation that allows users to estimate the property and sales tax revenues for a particular development in a particular location.

This model provides an opportunity for users to better understand what a development means to their community. Using the drop down menus, you can select the location – county, city, school district – along with total value of the development and the square footage of the commercial space.

This model centers on the total property value and sales tax revenues associated with a particular development. Users should be sure to include the total value of the development. For example, if the development is mixed use and includes both commercial space and multi-family housing, the value of both should be included.

The sales tax impacts are derived from the commercial space at the development. The model provides a default revenue per square foot value but allows the user to change it to accommodate specific types of retail establishments. Retail sales vary by type of business and location. Local understanding of this value will provide more accurate estimates to the users. An example of the Development Model page is shown below in Figure 20.
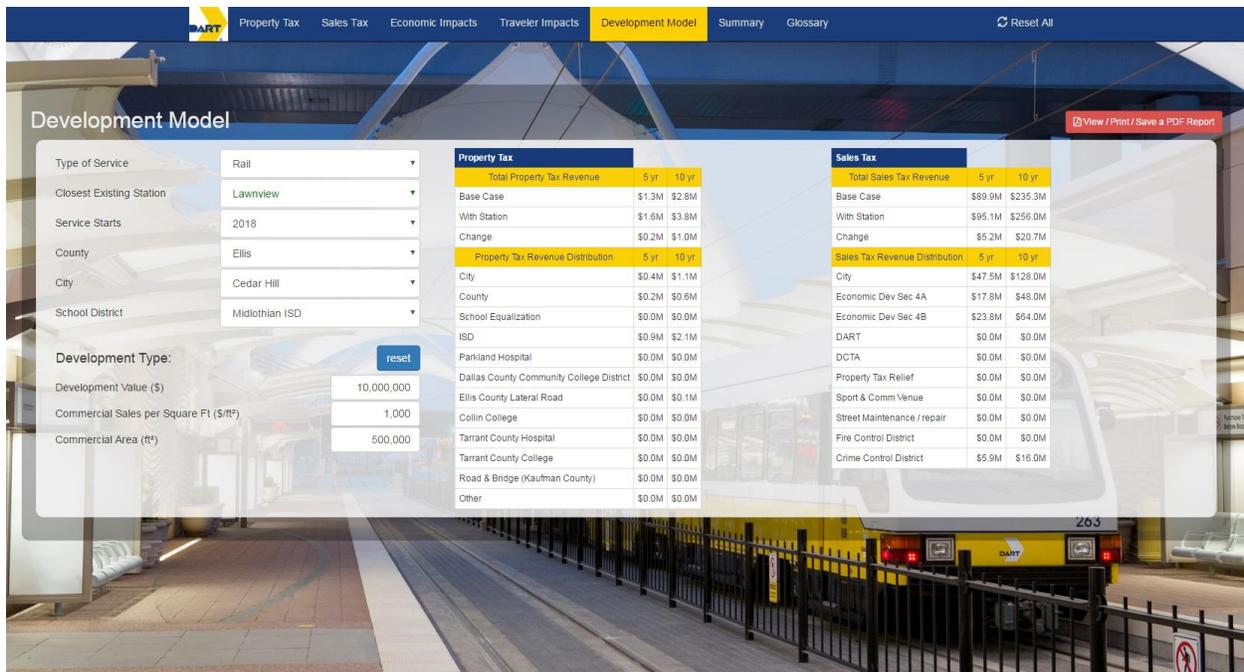
Figure 20: Development Model Page Assumptions and Output

Appendix 1: Data Sources and Analysis

TTI researchers obtained parcel-level tax history information from four counties where DART offers service: Dallas (Dallas Central Appraisal District), Tarrant (Tarrant Appraisal District), Denton (Denton Central Appraisal District), and Collin (Central Appraisal District). Researchers obtained the assessed property value for every parcel within these counties for all years where data was available. In addition to these data, researchers also obtained DART station and railway location information from the North Central Texas Council of Governments' central GIS database.

The 2014 total property tax rates used in this model were obtained from the Texas Comptroller of Public Account's online window on state government. The levy data were calculated by the Comptroller's office from the self-reported information and do not reflect actual tax collections, yet the rates are all assumed to be correct due to a reporting requirement in Section 5.091 of the Tax Code. Each school district, city, county, and special district has their rates displayed, but these rates may vary each year.

Many entities that levy the property tax near the Dallas-Fort Worth area have overlapping boundaries, which complicates reaching a total property tax rate. For example, one city may be in several counties, school districts, and special districts.

Appendix 2: 4A/4B Sales and Use Taxes

One potential source of funding for building new DART rail and facilities is revenue from state 4A/4B sales and use taxes. The origins of Texas 4A and 4B sales and use taxes can be traced back to the Development Corporation Act of 1979. Specifically, 4A taxes were authorized in 1989 through legislation stating, "a Section 4A development corporation could be funded by the imposition of a local sales and use tax dedicated to economic development."[4] In the next legislative session, a law was passed that established a range of one-eighth to one-half of one percent that the 4A tax could be set at. During this time, 4B taxes were also created. A couple of key points include the following:

- A city may pass a 4A or 4B tax if a majority of voters approve it, and
- the rate for either a 4A or 4B sales and use tax can be 1/8, 1/4, 3/8, or 1.2 of one percent.

Both 4A and 4B taxes have strict guidelines regarding what the revenues received from them can be used for. Light rail is among the types of projects that are permitted under these taxes, along with a number of other project types. Under Section 502.052 of the Texas Local Government Code language provides, "a corporation may, as authorized by the corporation's board of directors, spend tax revenue received under this subtitle for the development, improvement, expansion, or maintenance of facilities relating to the operation of commuter rail, light rail, or motor buses."[5]

There are three ways in which a city can be eligible to enact a 4A sales and use tax: 1) it has a population under 50,000 and within DART or VIA jurisdiction, but it has not chosen to become part of the transit authority; 2) the city is located within a county with a population of less than 500,000 people; 3) the city has a population of less than 50,000 people and is located in two counties, one of which is Bexar, Dallas, El Paso, Harris, Hidalgo, Tarrant, or Travis.[6]

4A sales and use tax revenue can be used to fund the following:
- land, buildings, equipment, facilities, expenditures, targeted infrastructure and improvements to create or retain jobs for manufacturing and industrial facilities, military facilities, and distribution centers, among others;
- business-related airports, port related facilities, and certain airport-related facilities 25 miles from an international border; and
- eligible job training classes, certain career centers and certain infrastructural improvements which promote or develop new or expanded business enterprises.

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[4] 2015 Economic Development Handbook. Texas Municipal League. Updated January 2015. http://www.tml.org/p/EconomicDevelopmentHandbook2015_TML.pdf

[5]Texas Local Government Code Sec. 502.001. For a text of this legislation, please visit http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.502.htm

[6] Texas Local Government Code Section 504. For a text of this legislation, please visit http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.504.htm

There also three different ways that a city can be eligible to enact a 4B sales and use tax: 1) it is a 4A-eligible city; 2) it is located in a county with a population of at least 500,000 people and its total tax rate is not greater than 8.25 percent; 3) the city has a population of at least 400,000 people and is located in more than one county, and its total tax rate is not greater than 8.25 percent.[7]

4B sales and use tax revenue can be used to fund the following:
- land, buildings, equipment, facilities, expenditures, targeted infrastructure and improvements to create or retain jobs for manufacturing and industrial facilities, military facilities, and distribution centers, among others;
- community development initiatives such as land, buildings, equipment, facilities, expenditures, and improvements for professional and amateur sports facilities, park facilities and events, entertainment and tourist facilities, and affordable housing;
- water supply facilities or water conservation programs if approved by a majority of the qualified voters of the city voting in an election called and held for that purpose; and
- promote new and expanded business development.

Dallas area cities with 4A & 4B tax capacity include the following:

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[7] Texas Local Government Code Section 505. For a text of this legislation, please visit
http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.505.htm

Table 6: Cities with 4A and 4B Tax Capacity

City	Economic Dev Sec 4A Tax	Economic Dev Sec 4B Tax	2014 Taxable Receipts	Existing 4A Sales Tax Capacity	Existing 4B Sales Tax Capacity
Allen	0.50%	0.50%	$1,149,309,100	$5,746,545.50	$5,746,546
Balch Springs	0.25%	0.25%	$281,409,930	$703,524.83	$703,525
Cedar Hill	0.375%	0.50%	$566,737,981	$2,125,267.43	$2,833,690
Coppell	0.00%	0.50%	$875,609,639	-	$4,378,048
DeSoto	0.375%	0.125%	$381,033,805	$1,428,876.77	$476,292
Duncanville	0.00%	0.50%	$356,760,859	-	$1,783,804
Euless	-	0.50%	$652,288,126	-	$1,630,720
Flower Mound	0.00%	0.25%	$692,001,971	-	$1,730,005
Forney	-	0.50%	$194,047,398	-	$970,237
Frisco	0.50%	0.50%	$3,008,192,199	$15,040,961.00	$15,040,961
Grapevine	0.00%	0.50%	$2,260,471,619	-	$11,302,358
Hurst	0.00%	0.50%	$906,438,744	-	$2,266,097
Lancaster	0.25%	0.50%	$187,200,009	$468,000.02	$936,000
Lewisville	0.00%	0.25%	$2,006,219,445	-	$5,015,549
McKinney	0.50%	0.50%	$1,452,590,724	$7,262,953.62	$7,262,954
Mesquite	0.00%	0.50%	$1,593,918,682	-	$7,969,593
Rockwall	0.50%	0.00%	$841,180,271	$4,205,901.36	-
Southlake	0.00%	0.50%	$960,012,410	-	$4,800,062
Sunnyvale	0.50%	0.50%	$102,506,503	$512,532.52	$512,533
The Colony	0.50%	0.50%	$488,597,881	$2,442,989.41	$2,442,989

Note: Questions regarding the tax rates or amounts referred to in the above chart may be answered by visiting the Comptroller's Sales Tax Rate History Database at https://mycpa.cpa.state.tx.us/taxrates/ratehist.do and the Allocation Historical Summary Database at https://mycpa.cpa.state.tx.us/allocation/AllocHist.jsp.

Appendix 3: Data and Pending Information

The DART Local Area Benefit-Cost Evaluation System relies on publicly available data provided by state and local agencies to calculate its economic benefit outputs. TTI researchers obtained these data from several agencies, including:

- Texas Comptroller of Public Accounts,
- North Central Texas Council of Governments,
- Collin Central Appraisal District,
- Denton Central Appraisal District,
- Kaufman County Appraisal District,
- Rockwall Central Appraisal District,
- Tarrant Appraisal District, and
- U.S. Census Bureau.

Obtaining data from multiple agencies was necessary to develop the DART Local Area Benefit-Cost Evaluation System; however, this data collection process also presented challenges.   Due to differences in agency data reporting methods and requirements, the availability and consistency of data varied significantly. These inconsistencies were especially apparent concerning appraisal district information. In some cases, GIS data was not available meaning no acreage, land values, orland uses were avaialble for use in the model.   Table 7 below summarizes cities with missing land use information.

Table 7: Land Use Parcel Information Data Limitations

City	County	Estimated Parcel Acreage Missing*	Parcel Percentage Missing*
Rockwall	Rockwall	Not Available	100.00%
Rowlett		766.90	7.52%
Garland		16.92	0.06%
Dallas		10,206.84	5.33%
Forney	Kaufman	Not Available	100.00%
Mesquite		1,817.46	7.84%
Dallas		1,646.80	0.86%
Cedar Hill	Ellis	1,808.13	9.63%
Glenn Heights		921.89	32.57%
Grand Prairie		2,020.19	4.72%

* This column is an estimation of missing data based on a TTI analysis. Roadways and natural features, such as lakes, are not included in this missing data estimation calculation.

In addition to missing GIS data for Rockwall, Kaufman, and Ellis counties, some data was limited in the amount of records available. Denton and Tarrant counties had data dating back to 2014 and 2009, respectively. Dallas and Collin counties, on the other hand, had data dating back to 2003.

Appendix 4: Data Development

Land-Use, Property Tax, and Acreage Data Collection

Property value, land use, and acreage model inputs were calculated using data on several cities in proximity to the DART light rail line. These cities included: Addison, Allen, Arlington, Balch Springs, Carrollton, Cockrell Hill, Coppell, Dallas, DeSoto, Duncanville, Euless, Farmers Branch, Flower Mound, Frisco, Garland, Glenn Heights, Grand Prairie, Grapevine, Highland Park, Hurst, Irving, Lancaster, Lewisville, McKinney, Mesquite, Plano, Richardson, Rockwall, Rowlett, Southlake, Sunnyvale, The Colony, Cedar Hill, Forney, and University Park.

Early collection processes involved contacting the city's local planning offices to request data. The data received from the small number of offices with the capability to provide such information was not usable. Many cities only had current zoning which may not reflect current land use. To counteract this, researchers sought information from the County Appraisal Districts (CAD) of Collin, Dallas, Tarrant, Denton, Rockwall, Kaufman, and Ellis counties. The information requested came in the form of Geographic Information System (GIS) feature classes and tables that was analyzed through the ESRI ArcGIS software suite.

Collin and Dallas CAD data were the most complete and included data from 2003 to 2014. The majority of the study cities fell completely or partially within these two counties. Tarrant County offered data from 2009 to 2014. Denton County only offered data for 2014. Rockwall, Ellis, and Kaufman Counties did not have historical GIS data available.

Boundaries for the cities and counties to perform acreage and percentage land use analysis came from the Census Bureau's TIGER shapefile database. City limits, county lines, school districts, and special district boundaries were acquired through this database.

Data Manipulation

The data received from the appraisal districts had many fields included. Of these, a State Code Property Classification was used to group and classify parcels by land use. A new field was created for each year in each set of the CAD data named 'Land_Use.' This field used a grouping of existing state codes into 10 distinct land use categories: Single Family Residential, Multi-Family Residential, Commercial, Industrial, Open Space/ Agriculture, Utilities, Rail, Other, Vacant, No Data. An example of how these were converted is shown below.

> *Commercial*
>
> "LAND_TYPE_" = 'F1' OR "LAND_TYPE_" = 'F3' OR "LAND_TYPE_" = 'F4' OR "LAND_TYPE_" = 'M10' OR "LAND_TYPE_" = 'M5' OR "LAND_TYPE_" = 'M6' OR "LAND_TYPE_" = 'M7' OR "LAND_TYPE_" = 'M8' OR "LAND_TYPE_" = 'M9'

An additional field was created for acreage of each parcel in a field named 'Acres.' This field was calculated through the ArcMap program using the 'Calculate Geometry' tool. This automatically calculated the area of each parcel based on the projection used in the map. For all analyses, NAD 83 State Plane FIPS 4202 Texas N Central (US Feet) was the datum and projection in use.

Processes

Once the data had been grouped and classified on land use types, it then needed to be extracted for each city for each year. This was done through the ArcGIS tool *Model Builder.* Before the model was created, every parcel was converted into centroids to ensure location accuracy within the city limits of each examined city. Parcel centroids were placed in the model and a spatial selection tool was used. The city limit of the analyzed city was set as the selecting feature and the parcels were set as the input feature.

Once the correct parcels were selected, the *Frequency* tool was used to calculate the number of occurrences of each land use type. The number of acres for each associated land use type was summarized and included in the resulting table. A field was added to each table called "PctTotal" to calculate the number of acres for each land use type as a percentage of the total acreage of the corresponding city.

In addition to summarized acreage, researchers summarized the total appraised value of each parcel within the city limits. This showed total appraised value for each land use type and allowed researchers to calculate value per acre.

Station Case Studies

The same process was used in conducting the DART light rail station and street car case studies. Using the *Model Builder* tool, the city limits shapefile that was used as the selecting feature was replaced with either a half or quarter mile radius buffer of a particular station.

Parcels intersecting the half or quarter mile station buffer were selected and frequency analyses were run to determine the percentage of each land use type, total appraised value, and total acreage of the area in the available years.

Sales Tax

Within the half and quarter mile buffers of each DART light rail case study location, sales tax data was requested from the State Comptroller's office.

Researchers requested business data within selected zip codes for three years before and three years after station opening. These points were geocoded through TAMU Geoservices using the addresses found in the data received. The resulting points within a half and quarter mile buffer of each station were selected and placed in to an excel document.

This document of selected businesses was returned to the comptroller's office to query a list of aggregated sales tax data.