MDT Unit Price Visualization Tool:

User Manual

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MDT Unit Price Visualization Tool

User Manual

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1 INTRODUCTION

The MDT Unit Price Visualization Tool is a powerful tool to generate visual maps that shows the distribution of unit prices of bid items across the state. It can serve as a quick tool to determine the unit price of a bid item in a certain location based on historical data and interpolation algorithm. It will also help evaluate variation in the unit price of a particular bid item based on its location and quantity of work. It is an add-in tool to Environmental Systems Research Institute (ESRI) ArcGIS for Desktop. The tool requires Spatial Analyst extension. This manual provides a step by step guide to generate and save visualized maps for desired bid items.

2 INSTALLATION AND INITIAL SETUP

2.1 Installation

In order to install the tool, double click the MDT_Bid_Visualization_xxxx.esriAddIn. An add-in installation confirmation dialog box will show up as shown in Figure 1. Click Install Add-In. Another dialogue box will appear confirming the successful installation.

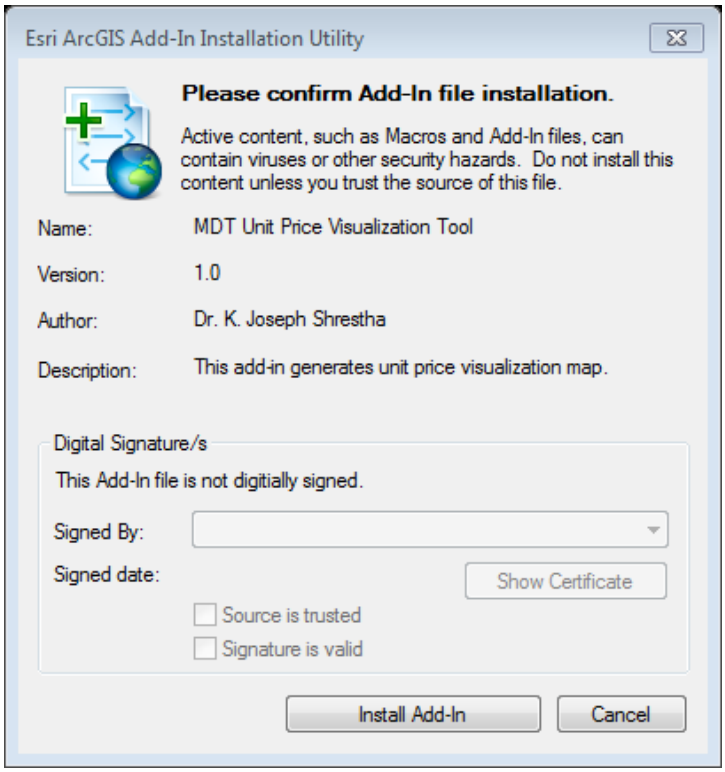


Figure 1 MDT Unit Price Visualization Tool Installation

2.2 Creating Menu Item

Once installed, open ArcMap and go to Customize Menu -> Customize Mode -> Commands and type “UPV” to locate the add-in (Figure 2). Drag and drop the tool to the Menu bar or any other toolbar. The tool will start by clicking on the “UPV”

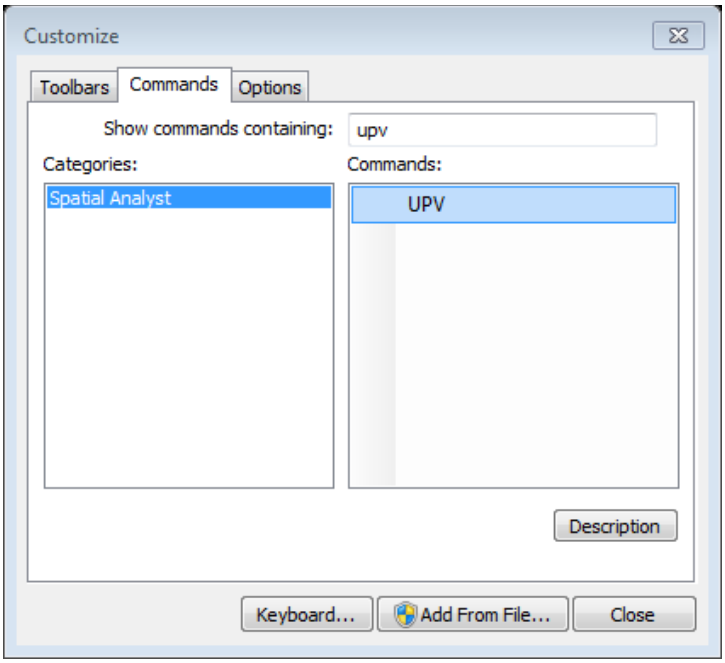


Figure 2 Creating Shortcut for the Tool

Once you launch the program, it will show the Unit Price Map Generator interface (Figure 3).

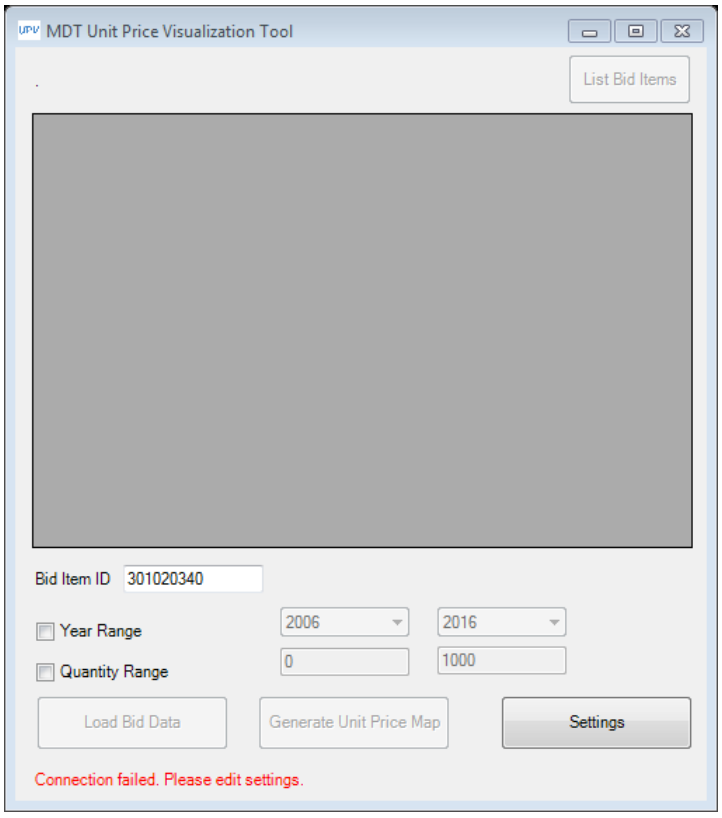


Figure 3 Unit Price Map Generator Main Interface

2.3 Oracle Connection

The tool relies on data from an Oracle database. Click on the Settings button to change the connection details (Figure 4). Your IT administrator should be able to help you with the settings. The output path is the location where all the maps are saved. Once the values are changed, click "Save" button and then "Connect" button. If connection is successful, a green message stating "Connected to the Oracle database" will appear at the bottom left corner of the screen.

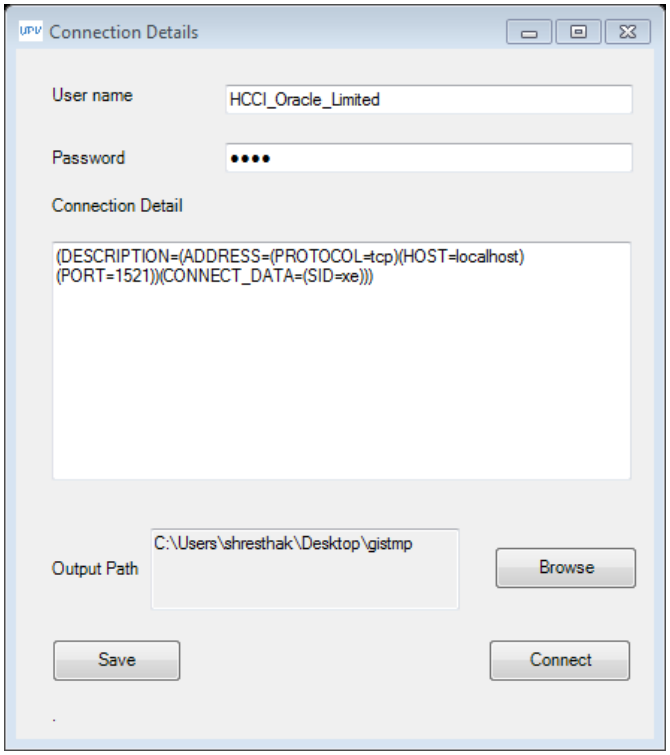


Figure 4 Connection Settings and Output Path

2.4 Enabling "Spatial Analyst" Extension

The tool uses Spatial Analyst extension for the ArcMap and will throw an error if the extension is not enabled. To enable the Spatial Analyst extension, go to Customize Menu -> Extensions (Figure 5).

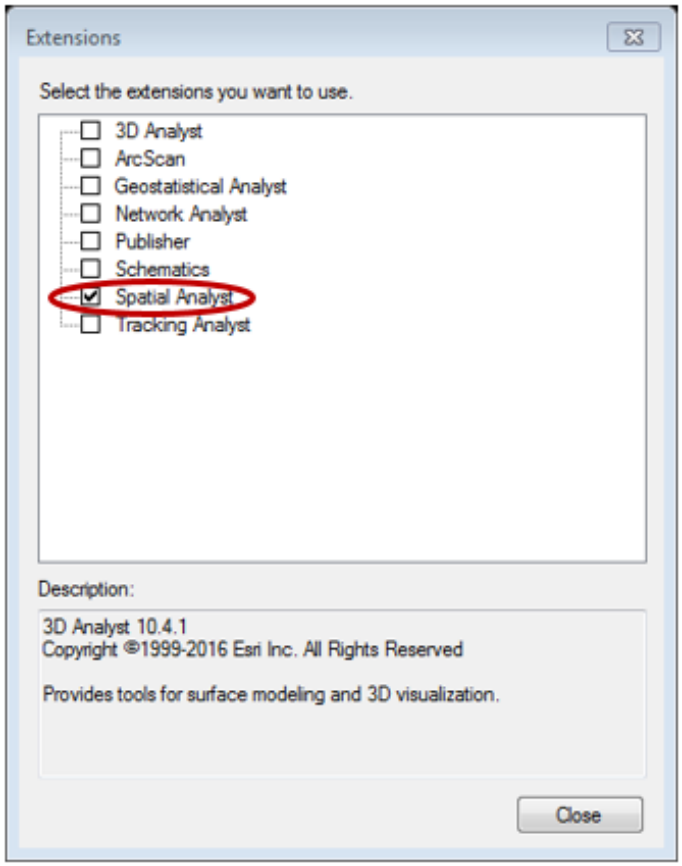


Figure 5 Enabling Spatial Analyst

The tool can now be used to generate unit price maps.

3 GENERATING VISUALIZATION MAP

Unit price maps can be generated in four steps: a) type bid item ID, b) set calendar year and quantity range to filter projects, c) click on the "Load Bid Data" to unit price data, d) click on the "Generate Unit Price Map" to generate maps. A video tutorial is also available on YouTube (https://youtu.be/Q9B04ed6CXo).

3.1 Listing Available Bid Items

If a bid item ID is not known, click on the "List Bid Items" to list all available bid item IDs, descriptions, and units. Double click any bid item id (REFITEM_NM column) to copy the ID to the Bid Item ID field. Changing a Bid Item ID will change the color of "Load Bid Data" button to red indicating the next step in the process of generating the maps (Figure 6).

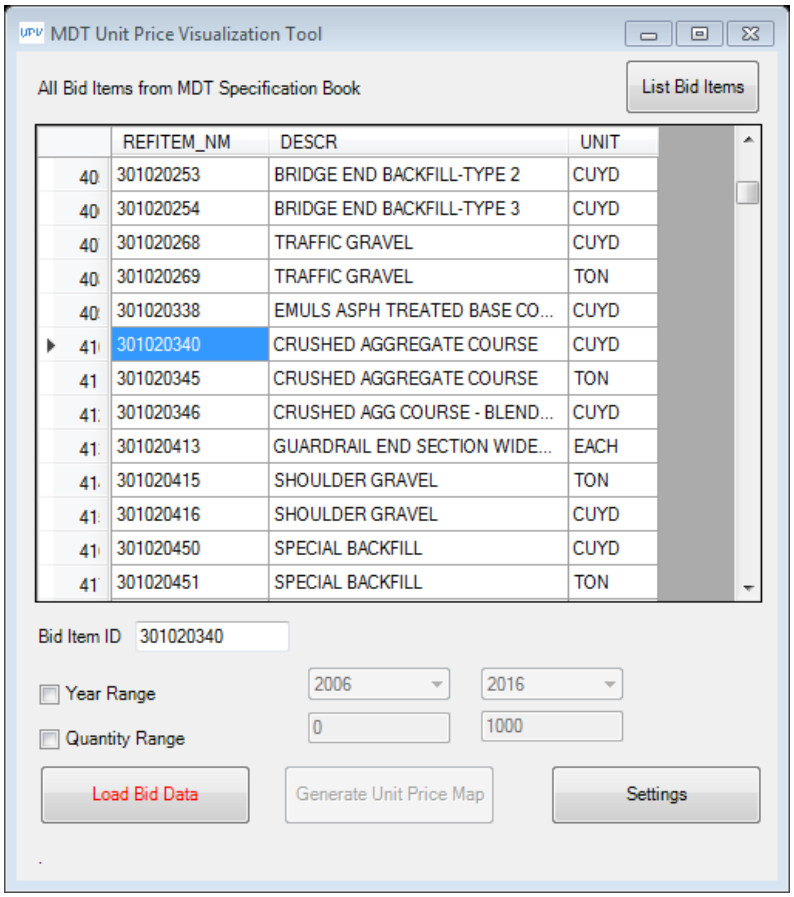


Figure 6 General Interface of the Tool

3.2 Calendar Year and Quantity Filter

The "Year Range" checkbox enables users to populate bid data from a specified range of calendar years to generate maps. Similarly, the "Quantity Range" checkbox allows users to list bid data within a specified range of quantities. This can be useful if the unit price of an item fluctuates widely over years or if unit prices are very high for smaller quantities of the item. If any filter parameters are changed, data needs to be reloaded by clicking the "Load Bid Data" button.

3.3 Loading Bid Data

Click on the "Load Bid Data" button to load data based on which maps will be generated (Figure 7). Clicking this button will change the color of "Generate Unit Price Map" to red.

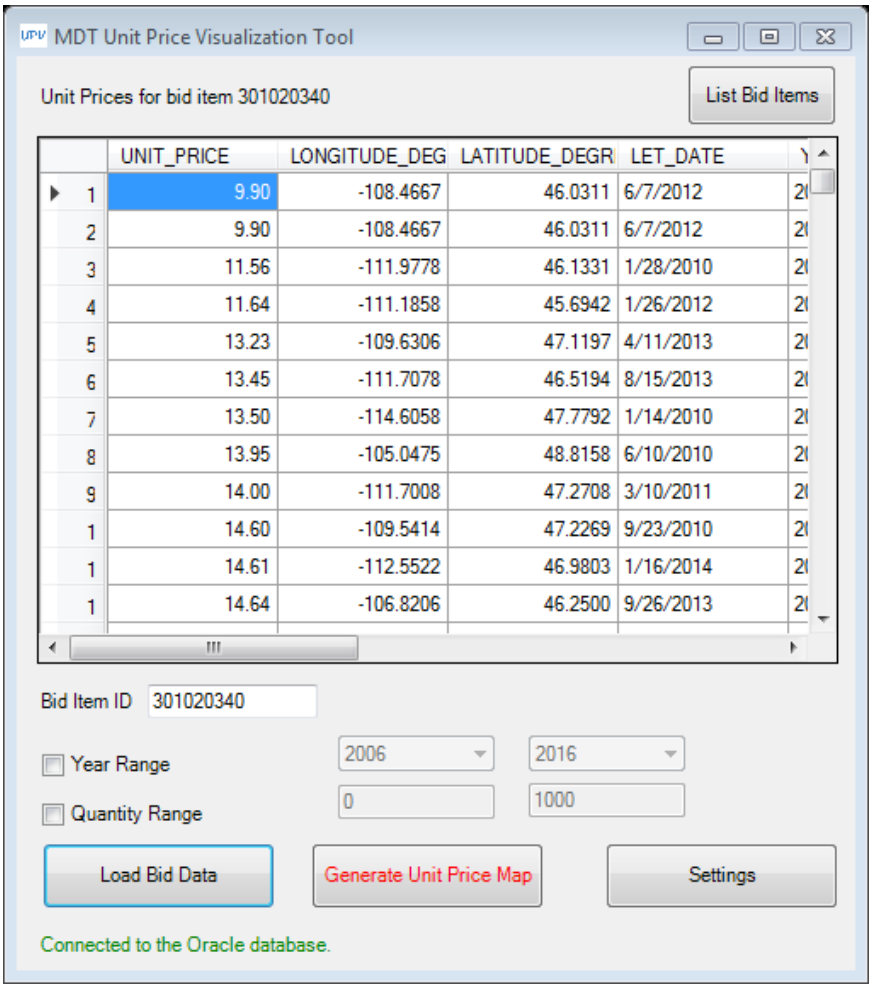


Figure 7 Unit Price List

3.4 Generating Unit Price Visualization Map

Click on the “Generate Unit Price Map” button to generate a unit price visualization map (Figure 8). The map will show color coded unit prices based on the lowest (green) and highest (red) unit price locations. A legend is automatically added in the layout view.

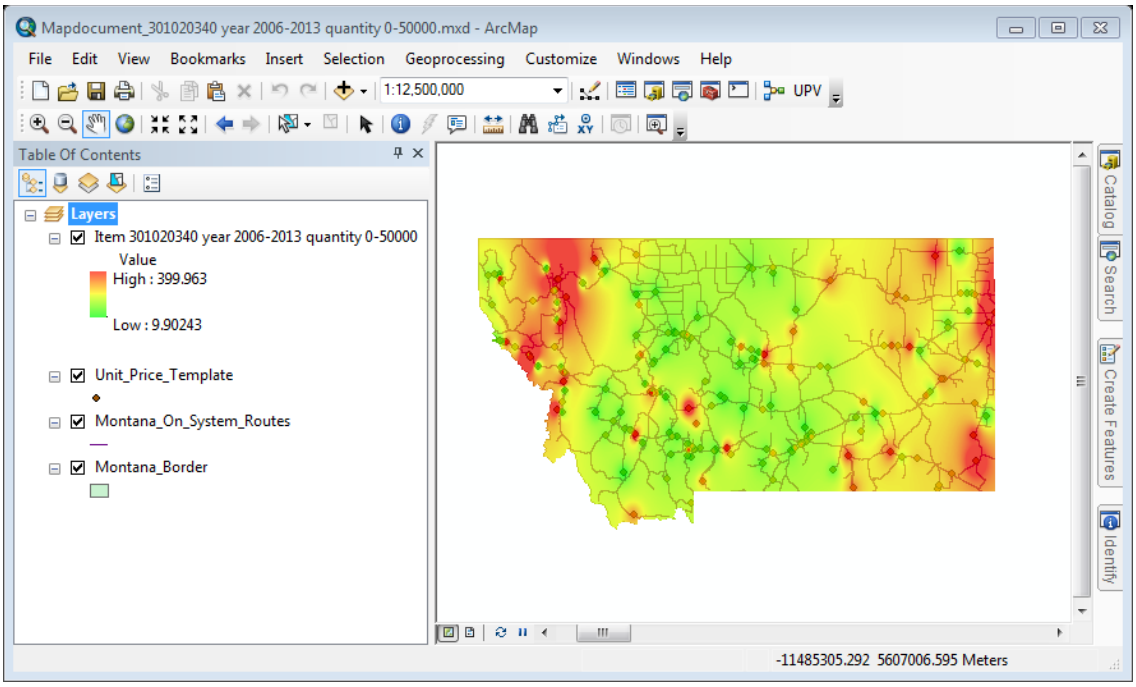


Figure 8 Unit Price Visualization Map

3.5 Unit Price Labelling

The visualization maps are based on the unit prices of various items at various locations. Those unit prices from previous projects can be displayed in the map. Right click on the Unit_Price_Template -> Properties (Figure 9).

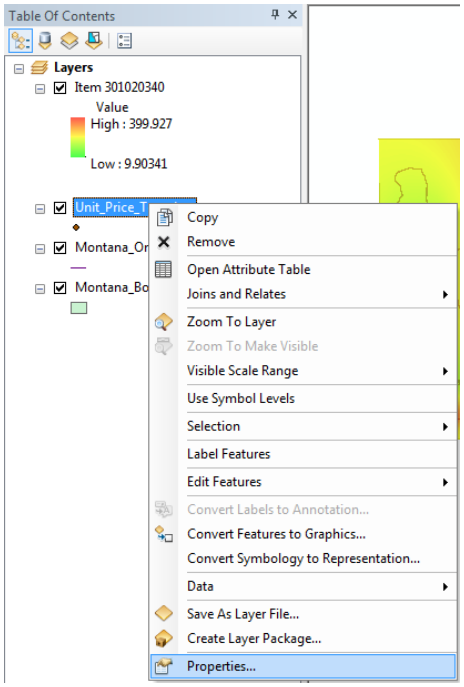


Figure 9 Properties of Unit Price Template Layer

Go to Labels tab and choose Unit_Price from Label Field dropdown box (Figure 10). Check the "Label features in the layer" checkbox. Click OK. It should now show the unit prices of the item at various locations (Figure 11). If desired this label can be turned off again by clicking on the "Label Features" on the right click menu of the Unit_Price_Template Figure 9).

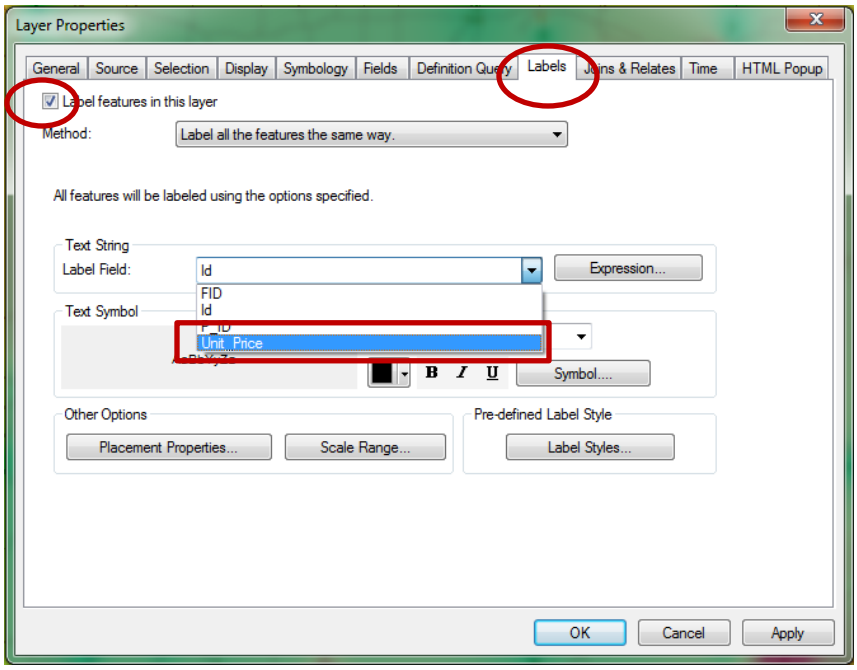


Figure 10 Labels Properties

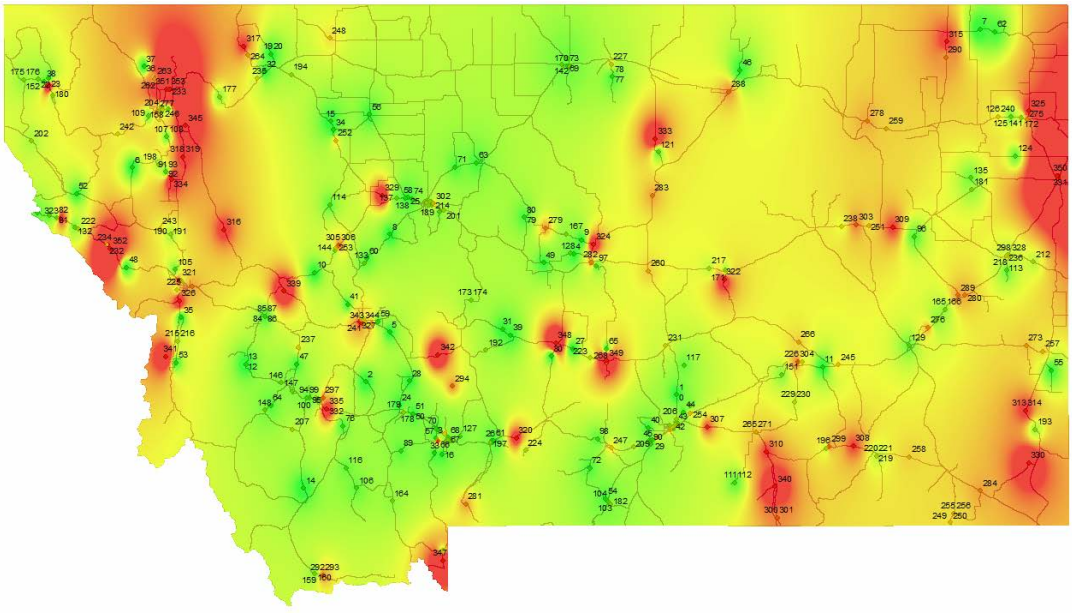
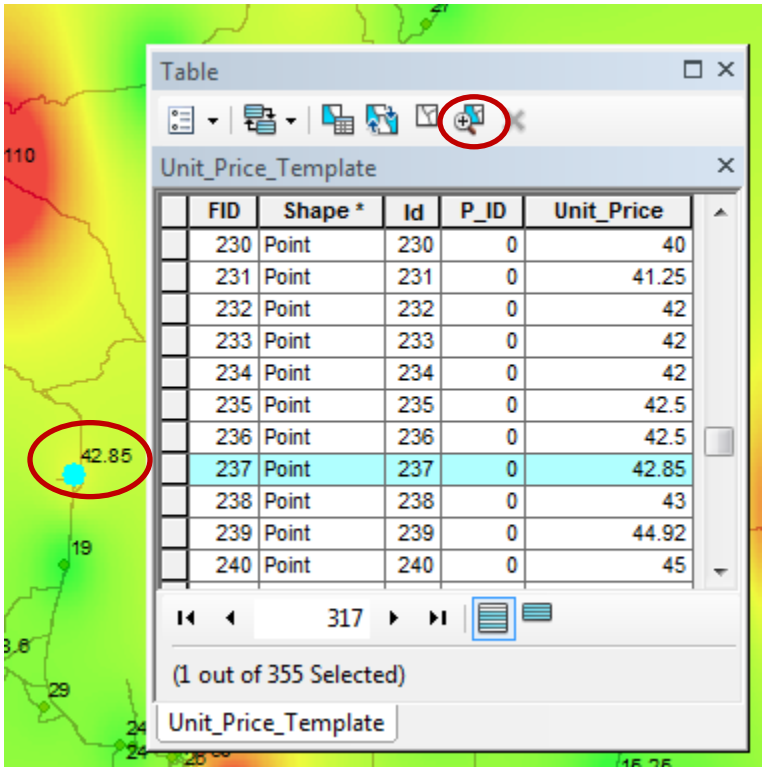


Figure 11 Unit Price Visualization Map with Unit Price Labels

3.6 Location with Specific Unit Price

Figure 7 shows a list of unit prices and their corresponding latitudes and longitudes. To locate the unit prices in the map, right click on the Unit_Price_Template (Figure 9). Click on the "Open Attribute Table." It will show a list of unit prices (Figure 12). If any row is selected, it will highlight the location of the project in the map. Alternately, "Zoom to Selected" icon can be clicked to zoom the map to the project location.



FID	Shape *	Id	P_ID	Unit_Price
230	Point	230	0	40
231	Point	231	0	41.25
232	Point	232	0	42
233	Point	233	0	42
234	Point	234	0	42
235	Point	235	0	42.5
236	Point	236	0	42.5
237	Point	237	0	42.85
238	Point	238	0	43
239	Point	239	0	44.92
240	Point	240	0	45

Figure 12 Attribute Table

3.7 Saving Generated Visualization Maps

The maps are automatically saved to the output path set in the Settings window. Each map is saved in folders named "<item ID> <year lower year limit – upper year limit if set> <quantity lower quantity limit – upper quantity limit if set>". Map generation may take several seconds or a few minutes depending on the number of unit price records used to generate the map. If a very few number of data are provided, the tool may not be able to generate a map and will throw an error message. Once a map is generated, another map can be generated by updating the bid item ID and filter criteria. The new map will be automatically saved to its own folder.

4 DATABASE SETUP FOR BID DATA VISUALIZATION TOOL

Both MDT Bid Data Visualization Tool and HCCI Calculation & Bid Analysis System use the same Oracle database. A database administrator can create an "HCCI_Oracle_Limited" schema and corresponding username and password. The "AllHCCIBidVisualizationDatabaseSetup.sql" file can be used to generate all required tables and data. The database administrator can create a

data update script to automatically update data in “M_BIDTABS_WINNING” and “M_PROJECT_CHARACTERISTICS” from existing databases (PPMS and SiteManager databases). Sample data are provided for those tables which should be deleted before adding data from other databases.

5 TROUBLESHOOTING

5.1 Ensure that Sufficient Number of Data are Available to Generate Map

If only a few unit price data (for example, two or three) are available to generate a map, it might show an error (Figure 13). Change the filter criteria so that more unit price data are included. For some items with a very few number of data points, the tool may not be able to generate any map.

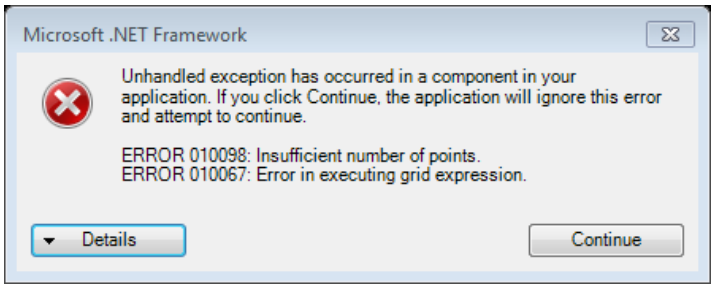


Figure 13 Insufficient Number of Unit Price Data

6 REMARKS

- This unit price visualization tool (and also the HCCI tool that was developed as part of the contract #8232-001) can show data up to the year before the current year. This is to ensure that the seasonality effect is minimized in unit price calculation in the unit price visualization tool and the sufficient number of data points are used for highway construction cost index calculation. However, the inclusion of current year’s data to date is technically feasible and can be implemented if desired in the future.
- The years in both tools are calendar years, not fiscal years.