# Computed Numeric and Text Fields

A *computed field* is a field in a database table that does not contain static data but instead uses an expression to compute a value from values stored in other fields in the same table or a related table. The computed field expression is evaluated separately for each record in the table, so the same expression can return different values in different records. There are two types of computed fields: computed numeric and computed text.

In addition to references to other fields, a computed field can use arithmetic operators and constants, can define and use variables, and can use conditional logic to determine the value to return. The names of computed fields are shown in blue in table windows, so it is easy to distinguish them from standard data fields. Computed field values are automatically updated if values in any referenced field are changed. The expression result shown is also automatically used in operations involving the field, such as saving the table to another form (text, CAD, HTML), exporting the table to another database format, or referencing the computed field in the expression for another computed field.

Computed fields can be used to concatenate text from other fields for use as dynamic labels or DataTips, to perform simple or complex numeric computations using other tabular values, and in new tables that present the salient data from a number of related tables.
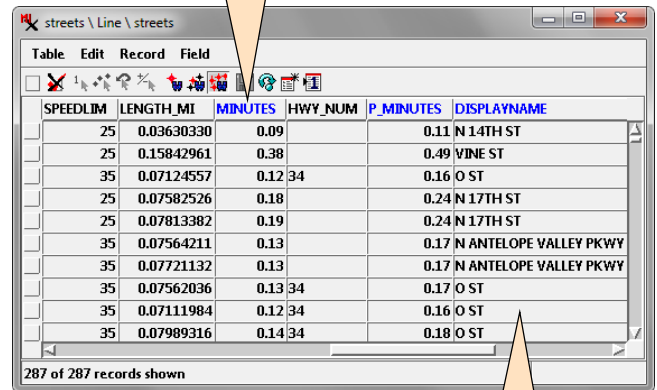
## Creating Computed Fields

Computed numeric and text fields are not defined as separate field types, but as a *property* of numeric or text fields of various types. For example, a computed numeric field could have any of the numeric field types, and the exact value returned by the field's expression would depend upon that data type. The same numeric expression would return a decimal value for a floating-point field and an integer value for an integer field.

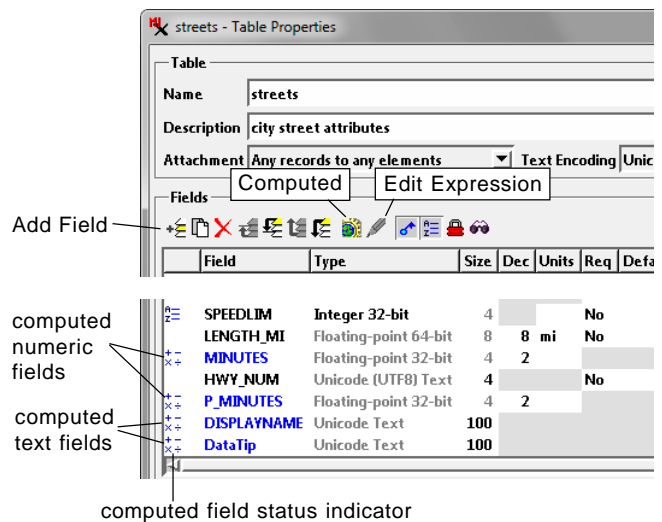To create a computed field in a table (see illustration to the right):
- Open the Table Properties window for the table.
- Press the Add Field icon button and select the desired numeric or text data type.
- With the field selected in the list, press the Computed icon button.
- The Query Editor automatically opens so you can enter the numeric or string expression for the computed field.
- Press [OK] on the Query Editor when you have completed the expression.
- The computed nature of the field is shown by the blue color for the field name and by the Computed indicator in the status column next to the field name.
- You can reopen the Query Editor to edit the expression by selecting the field in the list and pressing the Edit Expression icon button.

**Computed Numeric Field**

streets.LENGTH_MI * 60 / streets.SPEEDLIM;



**Computed Text Field**

string stname$ = streets.STNAME + " " + streets.STTYPE;

if (streets.STPRE <> "")
    return streets.STPRE + " " + stname$;
else
    return stname$;



Add Field    Computed    Edit Expression

computed numeric fields

computed text fields

computed field status indicator

## Simple Computed Fields

A computed field expression can be as simple as a reference to another field. To streamline creation of such simple computed fields, the Add Field icon button menu provides a *Simple Computed* option. When you add a field using this option, you are prompted to choose the source table and field. A new field with the same name as the source field is created as either computed numeric or computed text depending on the type of field you select as the reference. The numeric or text data type is also automatically set from the source field.

(over)

A computed field created by the Simple Computed option is not a separate type of field. Although by default the field shows the contents of the reference field, you can open the Query Editor and create a more complex expression for the field if you choose.

The Simple Computed option is especially useful when you create a table that consists entirely of computed fields that show the most significant data from various other related tables. Such a table is analogous to a "table view" in an enterprise database and might be prepared to simplify the presentation of the data (with the source tables hidden) or to facilitate exporting the salient attribute information. When you create such a table, choose the attachment type *Exactly one record for every element*, which automatically creates a record for each element (see the Technical Guide entitled *Record Attachment Types*). These records are then virtually populated by the field expressions.

## Computed Numeric Fields

Computed numeric fields can perform computations of any complexity. The illustration below shows a table with population data for counties in the state of Nebraska for years 2010 and 2000. Computed numeric fields are used to show the 2010 population density per square kilometer and the change and percent change in population during that 10-year period.

NEcntyPop2.POP_2010 / NEcntyPop2.AREA_KM2;

NEcntyPop2.POP_2010 - NEcntyPop2.POP_2000;



100 * NEcntyPop2.POP_CHNG / NEcntyPop2.POP_2000;

The Watershed process in TNTmips uses computed numeric fields for some hydrologic attributes that can be calculated from values that are present in other fields in the tables for

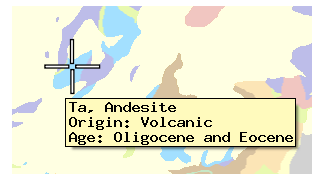2 * sqrt(SetSum(POLYSTATS[*].Area) / PI) / ATTRIBUTES.`BASIN LENGTH`



stream lines and watershed and basin polygons. For example, the ATTRIBUTES table for watershed polygons illustrated below left includes an ELONGATION RATIO computed field that computes the ratio of 1) the diameter of a circle of area equal to the watershed area to 2) the basin length, the maximum polygon dimension measured from the stream outlet.

## Computed Text Fields

Computed text fields can be used to combine text from different fields into a single string. For example, the components of a street address (number, street direction, street name, street type) might be stored in separate fields, and a computed text field can be used to show the complete address for use as a dynamic label or DataTip. You can also combine attribute information from different fields along with text and newline codes ("\n") to create multiline text to show in a DataTip (see illustration below). Although only the first text line is shown in table views of standard text fields, all of the text lines are shown when the field is used as the source for a DataTip shown in the View window.

MAPUNITS.PTYPE + ", " + MAPUNITS.UNIT + "\n" +
"Origin: " + MAPUNITS.CAT2 + "\n" +
"Age: " + MAPUNITS.AGE;

Sample string expression for a computed text field that combines information from different fields into multiline text for a DataTip.



HTML formatting can also be applied for string expressions intended for use as a DataTip; see the Technical Guide entitled *Design DataTips using HTML* for more information.

The string expression for a computed text field can concatenate strings using the "+" and "+=" operators as shown above or use the *sprintf()* and other string processing functions to create formatted text. Expressions referencing numeric fields must convert the number to text.

The script for a computed field can include conditional tests that produce a different result depending on the contents of the fields used in the expression. In such scripts the *return* keyword should be used to explicitly return the desired result. In the street name computed text example illustrated on the previous page, some streets have a prefix indicating the street direction while others do not. The string expression for the DISPLAYNAME field first combines the street name and type (with intervening space) into a stname$ variable. For records in which the STPRE field is not empty the prefix is combined with the variable value and returned, otherwise the stname$ variable value is returned.

## Making Computed Fields Permanent

Once you have created computed fields, and you don't anticipate changes in the supporting field values, you have the option to convert the computed field results to static permanent values. In a tabular view of the table, right-click on the field name (column heading) and choose *Make field permanent* from the menu.