EDM Real-Time Workflow

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Note

Contents

EDM Real-Time Workflow

Applications Needed:

- OpenWire
- WELLPLAN
- COMPASS
- EDM-OpenWorks Link
- Engineer's Link
- OpenWorks
- AssetView

Overview

The EDM Real-Time Workflow, is a typical workflow that can be used to capture WITSML data in the field, analyze it using Landmark's Drilling Engineering applications, and then transfer data to OpenWorks for analysis with AssetView. The intent of this workflow is to demonstrate integration and the flow of data between these applications. This workflow does not include an in-depth analysis using any of these software products. For information on using these products for additional analysis, refer to the documentation for the individual product.

The example workflow used in this section includes using OpenWire, WELLPLAN, EDM-OpenWorks Link, Engineer's Link, OpenWorks, and AssetView in the following manner:

1. OpenWire: This workflow begins in OpenWire. OpenWire is used to transfer data acquired via a WITSML provider to the EDM database.

2. WELLPLAN: WELLPLAN is used to perform engineering analysis on the data acquired from the WITSML provider. In this workflow, WELLPLAN will be used to match plan data to actual results by adjusting friction factors. Real time hydraulics data will also be reviewed. There are other analyses that could be performed

using WELLPLAN at this point. However, an in-depth analysis is outside the scope of this document.

3. COMPASS: COMPASS is used to plan and analyze well trajectories. In this workflow example, COMPASS will be used to view the 3D plot of the actual surveys and survey uncertainties. There are other analyses that could be performed using COMPASS at this point. However, an in-depth analysis is outside the scope of this document.

4. EDM-OpenWorks Link: This application is used to map (associate) a wellbore in an EDM database with a well in an OpenWorks database.

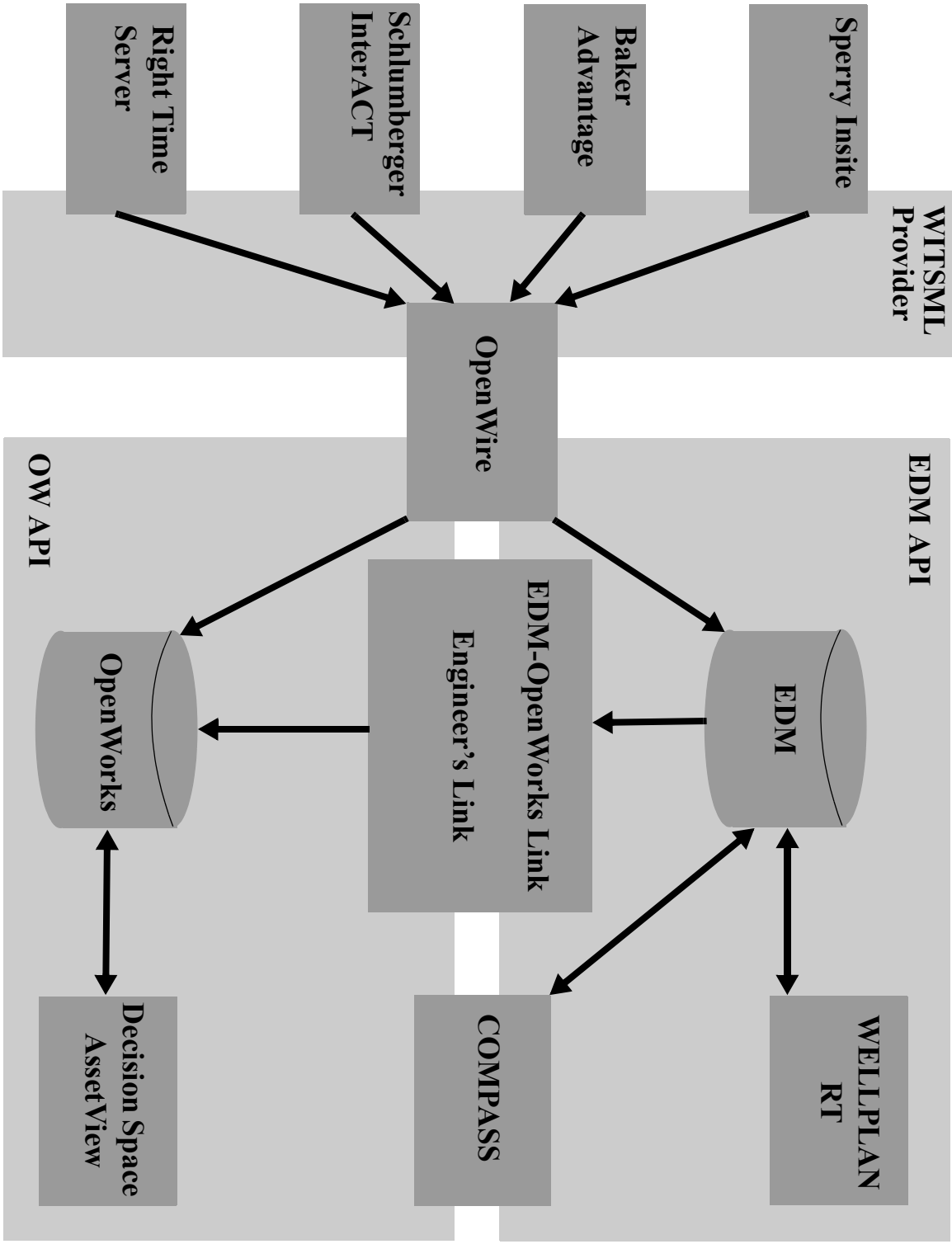
5. Engineer's Link: Use the Engineer's Link software to transfer the data from the EDM database to the OpenWorks database based on the mapping performed using EDM-OpenWorks Link.

6. OpenWorks: OpenWorks is a database management system that stores all aspects of general well-related data, as well as log acquisition data, surface and fault interpretations, cultural data, seismic acquisition and navigation data, computed map data and production. In this workflow, data transferred to the OpenWorks database from the EDM database using Engineer's Link is reviewed. There are other uses of OpenWorks that will not be discussed in this workflow.

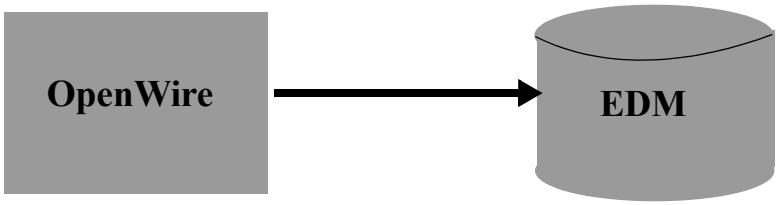
7. AssetView: AssetView works directly with several data sources using OpenWorks as it's main data store. It is a visualization tool, not an interpretation tool. AssetView integrates with OpenWorks data, SeisWorks data, Gocad, T-surfs and S-grids, and OpenWells operational data (3D DrillView Knowledge Management module within AssetView). The application is a collaboration tool for asset teams who need access to their asset's data in a personal computer environment while visualizing drilling operational data in the context of the earth model. This makes it extremely powerful for hazard avoidance while planning and drilling operations are occurring. The 3D DrillView Knowledge Management module (3DDV KM) uses OpenWells operational data to help visualize hazards, significant operational parameters, and other operations data. AssetView is also collaborative for real time operational purposes (when used in conjunction with OpenWire or Engineer's Link) as path plans and log curves can be updated in real time. In this workflow, data transferred from the EDM database to the OpenWorks database (using Engineer's Link) will be viewed in

3D using AssetView. AssetView has many other features that are outside the scope of this workflow.

Real-Time EDM to OpenWorks Data Flow



OpenWire to EDM



Overview

In this portion of the workflow, you will use the *OpenWire* application to transfer WITSML 1.2 data to an EDM database. OpenWire can transfer two types of data into an EDM database:

- Trajectories (wellpath/survey)
- Log curves (bit run logs)

The transfer process varies depending on the data type. Both processes are discussed in this workflow.

Important Information: How Trajectories Are Associated With Designs

If you want to analyze the data using WELLPLAN, you must specify that you want to create a *prototype* design. If you will be analyzing the data using COMPASS, you will be notified that COMPASS detects new trajectory data. When you create a survey header using OpenWire, COMPASS will automatically create an *actual* design if it does not already exist. If the *actual* design already exists, a new survey will be created when the survey header is created. The applications that use the EDM database always consider COMPASS as the *owner* of the survey data for all *actual* designs. No other application can make changes to the surveys associated with an *actual* design. That is why you must specify that you want to associate the real-time survey data with a *prototype* design if you are going to analyze, and possibly change, the real-time data using WELLPLAN. Refer to page 24 for specific information on creating the *prototype* design while using OpenWire.

Workflow Steps

1. Before you can transfer data to EDM using OpenWire, you must create the wellbore you will be transferring data to in the EDM database. If the wellbore does not exist in the EDM database, create the wellbore now. If you will be using WELLPLAN, you should create a *prototype* design. To analyze the data using WELLPLAN, you must create a case associated with the *prototype* design.

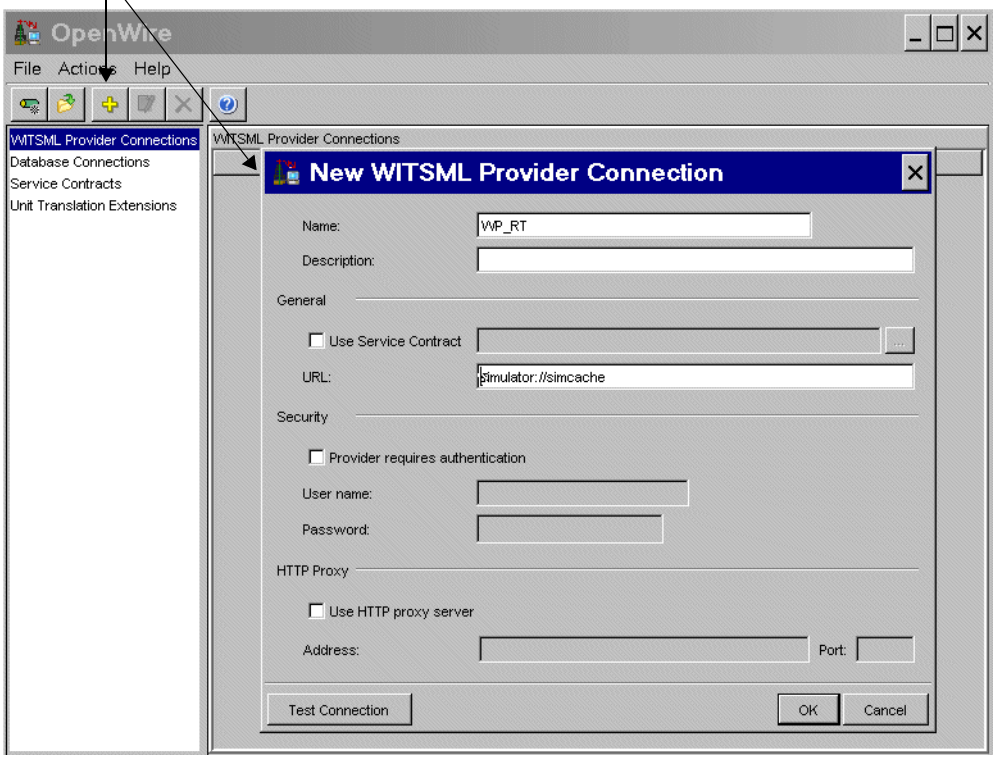
2. Launch OpenWire (**Start > Programs > Landmark > OpenWire** or click the OpenWire icon on the desktop) if it is not already active.

Creating a WITSML Provider Connection

3. Create a WITSML Provider Connection.

Click the button to open the **New WITSML Provider Connection** dialog. (You must have **WITSML Provider Connections** selected in the left-most pane of the window.)

Highlight **WITSML Provider Connections** prior to clicking the button.



a) With the **WITSML Provider Connections** selected (highlighted) in the left-hand task list, click the  button. The **New WITSML Provider Connection** dialog appears.

b) Enter the required information to create a new source connection to a WITSML Provider. In this example, we will be using demonstration files installed with the software. Typically you will be accessing data from a WITSML service contractor.

Use Service Contract: This option is not supported for EDM users. If you are using OpenWire to load data into an OpenWorks database, you can use Service Contracts.

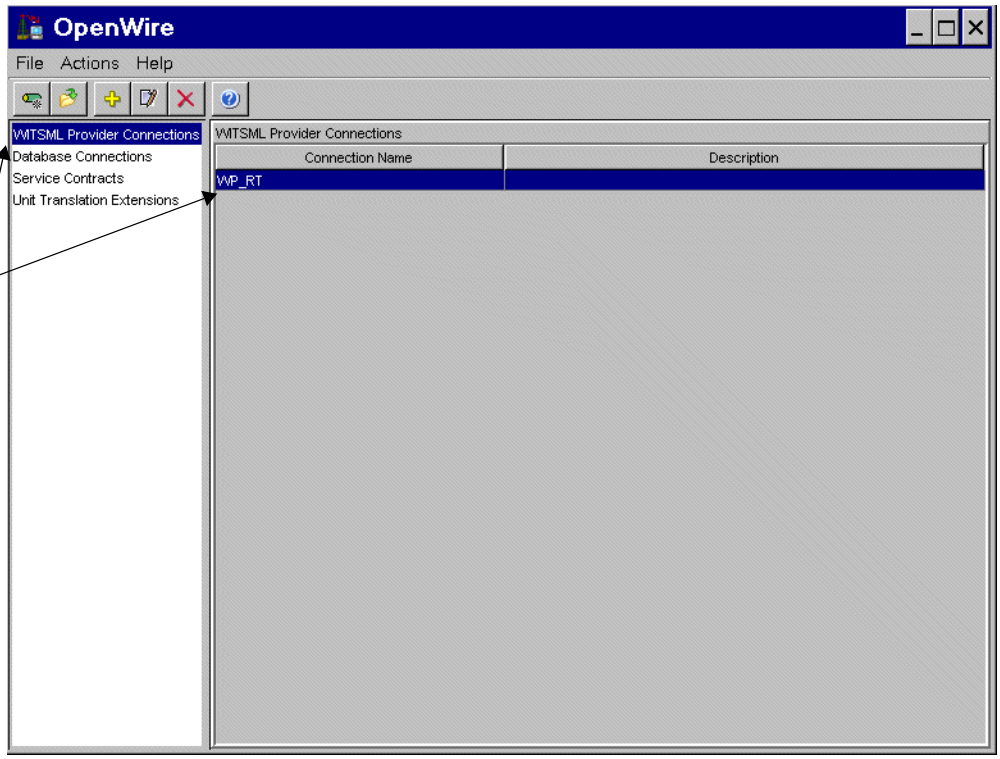
If the service provider requires a password and user name in order to access the WITSML data, check the **Provider requires authentication** box and specify the user name and password required.

If the service provider uses a proxy server, check the **Use HTTP proxy server** box and specify the address and port of the server.

c) Click the **Test Connection** button to connect to the WITSML Provider with the settings you provided. OpenWire will attempt to connect to the Provider and will display a message indicating whether or not the attempt was successful.

d) Click **OK** to create the new WITSML Source Connection based on the information you provided.

All existing WITSML Provider Connections are displayed in the window when the **WITSML Provider Connections** administrator is highlighted.



Note: When a Pipeline is created, all values from the WITSML Provider, Database Connection, Service Contracts, and Unit Translation Extensions are recorded in the *registry* of your computer.

The Pipeline Configuration File stores a reference identifier to the registry. If the registry entry is deleted, any Pipeline Configurations that reference that registry entry will no longer work. Because this information is stored in the registry, when you upgrade or reinstall OpenWire, the WITSML provider or destination database settings will not be deleted. However, you cannot use a Pipeline Configuration file created on one computer on another machine.

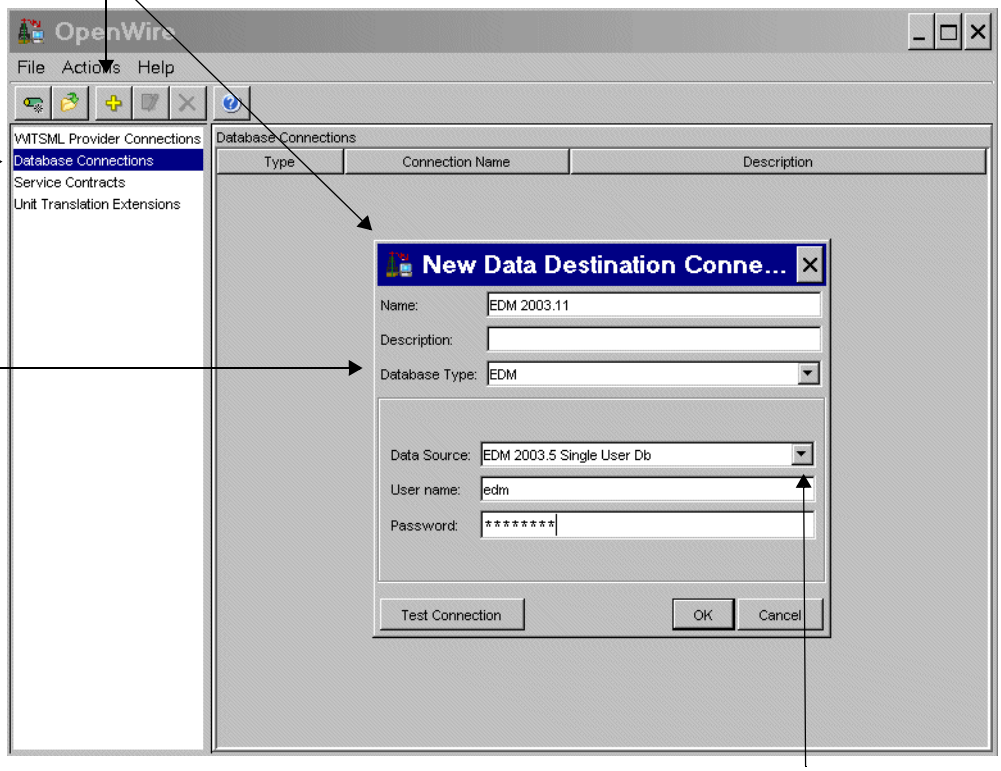
Creating a Database Connection

4. Create a database connection.

Click the  button to open the **New Data Destination Connection** dialog. (You must have **Database Connections** selected in the left-most pane of the window.)

Highlight **Database Connections** prior to clicking the **New** button.

Select **EDM** as the **Database Type**. Because OpenWire can also transfer WITSML data to OpenWorks, you must specify the database type.



Select the EDM data source you want to connect to. This drop-down list displays all the data sources available to you. If the data source you want isn't on the list, you must configure it. Refer to the *EDT Installation Guide* for instructions on setting up the data source.

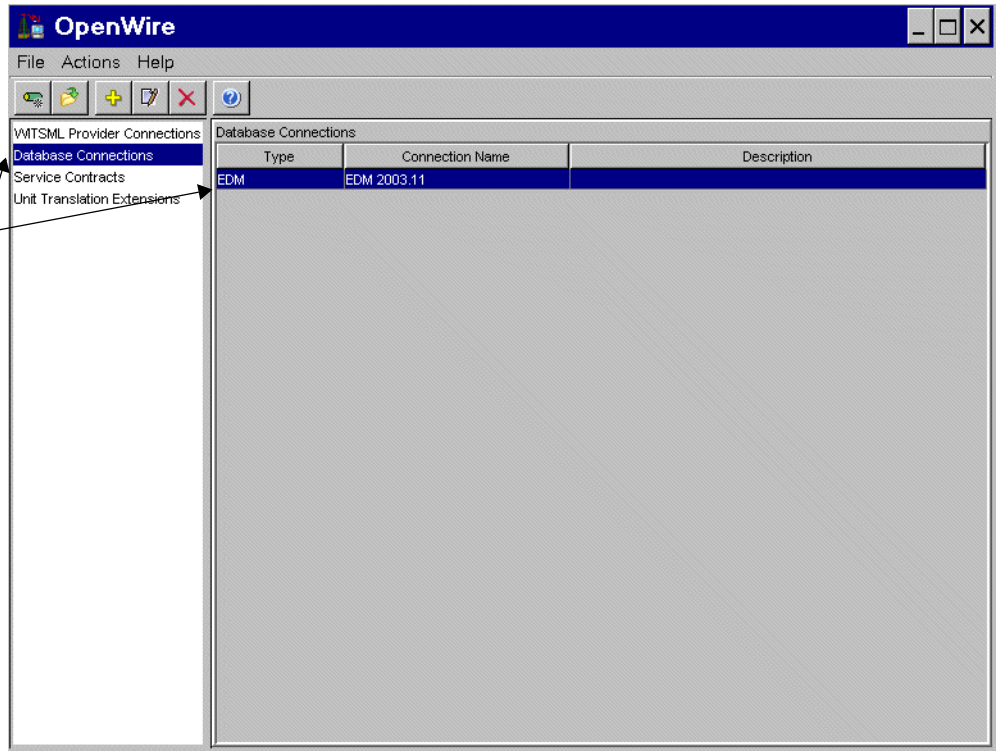
a) With the **Database Connections** selected in the left-hand task list, click the  button. The **New Data Destination Connection** dialog appears.

b) Enter the required information to create a new database connection. In this example, we are connecting to an EDM database.

c) Click the **Test Connection** button to test the database connection. A message indicating the connection was successful will be displayed.

d) Click **OK** to connect to the database and close the dialog.

All existing Database Connections are displayed in the window when the **Database Connections** administrator is highlighted.



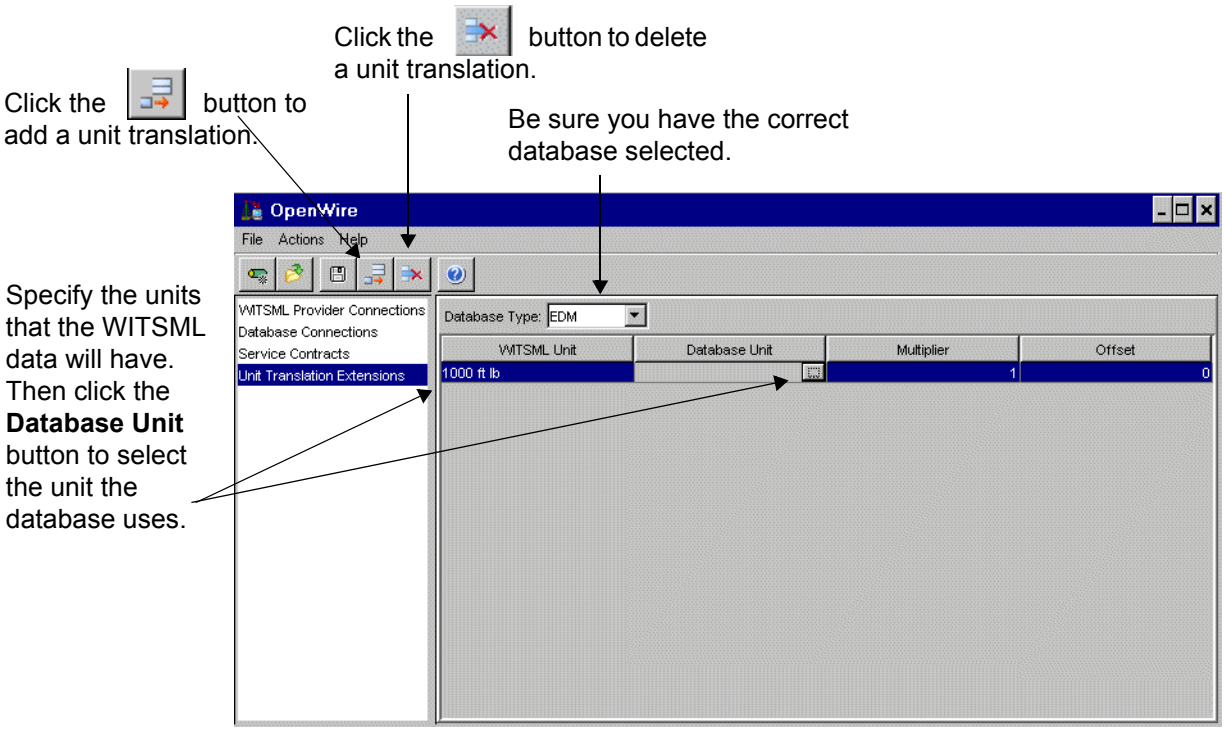
Note: When a Pipeline is created, all values from the WITSML Provider, Database Connection, and Unit Translation Extensions are recorded in the *registry* of your computer.

The Pipeline Configuration File stores a reference identifier to the registry. If the registry entry is deleted, any Pipeline Configurations that reference that registry entry will no longer work. Because this information is stored in the registry, when you upgrade or reinstall OpenWire, the WITSML provider or destination database settings will not be deleted. However, you cannot use a Pipeline Configuration file created on one computer on another machine.

Creating a Unit Translation Extension

5. Create a unit translation extension. This step is optional and will not be used in this example. Unit Translation Extensions allow you to map unit names that are not WITSML standard to OpenWorks or EDM units. You can use the Unit Translation Extension dialog to adjust curve data into the unit magnitude expected by the EDM or OpenWorks database. It may help you to think in terms of y = ax + b, where a is the **Multiplier** and b is the **Offset**. For example, if the WITSML curve data for torque is provided in 1000 ft-lbf, you must specify this in OpenWire because the EDM database expects torque to be expressed in ft-lbf. In this situation, you would use the Unit Translation Extensions as indicated below.

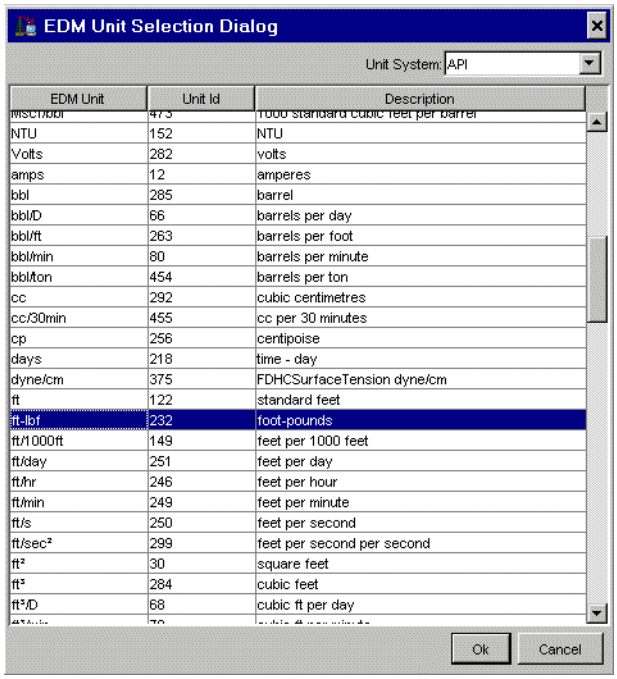
a) With **Unit Translation Extension** selected in the left-hand task list, click the button. A new blank row appears in the work area.



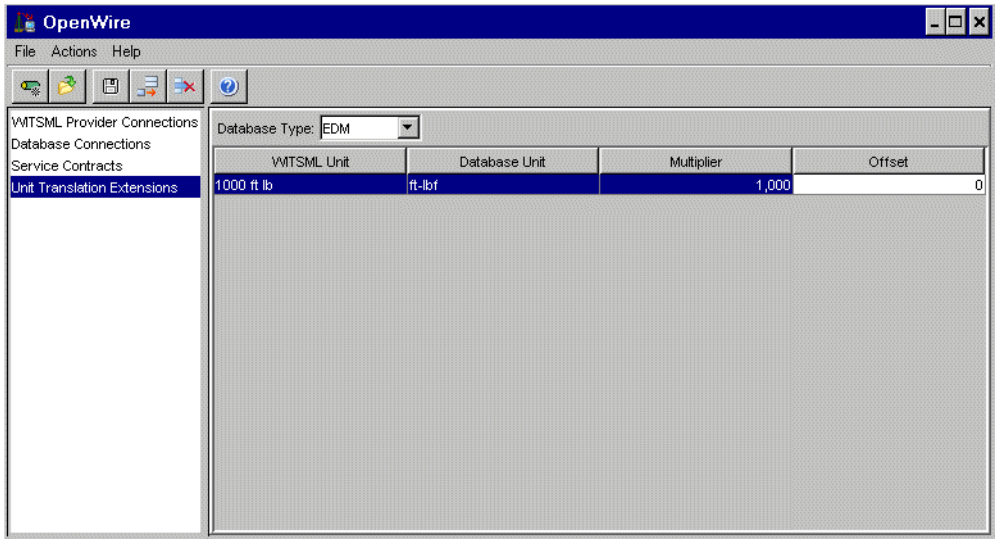
b) Enter the WITSML unit value in the **WITSML Unit** field that you want to map to an EDM unit value.

c) Select the EDM unit value in the **Database Unit** field that you want to map the adjacent WITSML unit value to.

Click on the unit to select it. It will highlight.



d) Specify how the WITSML unit relates to the database unit using the **Multiplier** and **Offset** cells. In this example, 1000 is entered in the **Multiplier** cell because the curve data is expressed in 1,000 ft-lb, but the EDM database records the data in ft-lbf. The **Offset** cell is not required in this example. Refer to the *OpenWire User Guide* for more information.



e) Insert additional rows if required as described in the above steps.

f) Save your Unit Translation Extensions using the  .

Saving Unit Translations...

You *must* save before leaving the Work Area, or all Unit Translation Extension changes will be lost. To save, use **Actions > Save** or click the  button.

6. Now that the WITSML Source Connections, Database Connections, and Unit Translation Extensions are defined, you are ready to create a Pipeline.

Creating a New Pipeline

1. Use the **Add Pipeline Wizard** to add a new pipeline. In the Main window, click the **Create a New Pipeline**  toolbar button.

Navigating the Pipeline Wizard...

On any Wizard panel you can click:

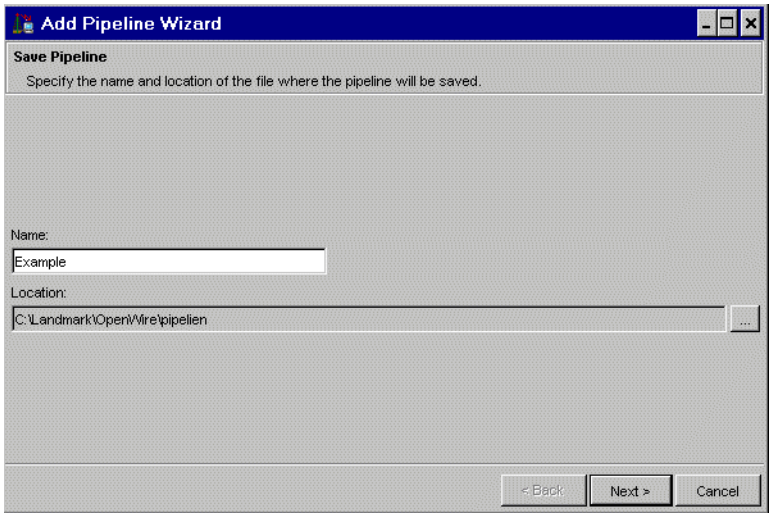
- **Next** to proceed to the next panel
- **Back** to return to a previous panel to re-enter information you are not satisfied with
- **Cancel** to leave the Wizard without saving anything.

Be aware that because later panels are dependent on the settings in the former panels, going back and changing a value will invalidate values in subsequent panels.

Using the Save Pipeline Panel

2. Use the **Save Pipeline** panel to specify the name and location of the pipeline configuration file. Click **Next** to proceed.

Specify the **Name** and **Location** of the Pipeline. The name should be unique because it will be used as the name of the pipeline configuration file. You can use the ... button to navigate (browse) to the desired folder.



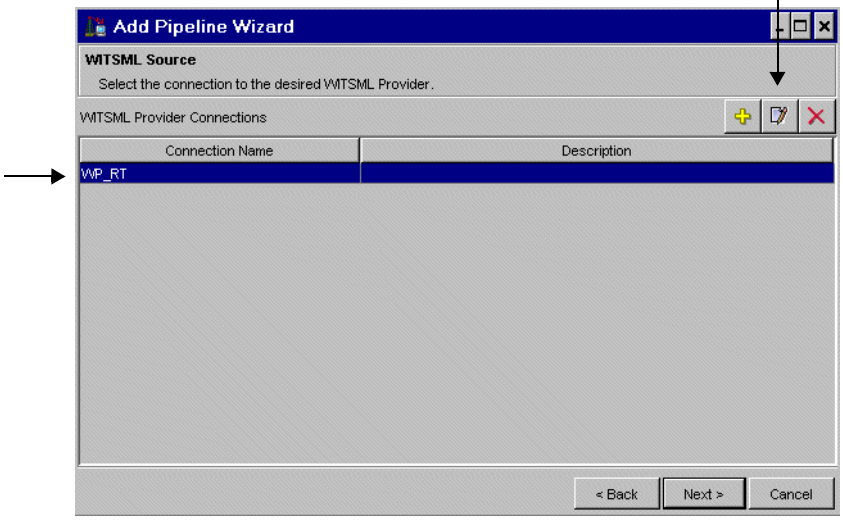
Using the WITSML Source Panel

3. Use the **WITSML Source** panel to select the WITSML Provider. Highlight the provider you want to use to select it. Click **Next** to proceed.

If you want to create, edit, or delete a provider, use the appropriate button.

In this example, there is only one WITSML provider to choose from. This is the provider we defined earlier in the workflow (refer to page 10).

Highlight the provider to select it.



4. The Wizard attempts to connect to the given URL with the given username and password. (You will see a message indicating a

connection is being attempted.) If successful, the **Database Destination** panel is displayed.

If the connection to the WITSML Provider fails...

OpenWire may not be able to connect to the designated WITSML Provider for a number of reasons:

- The connection parameters may be incorrect. If the connection was tested when constructing or editing the connection, the connection parameters are correctly setup and there must be another reason the connection fails.
- It is possible that the WITSML Provider application is not responding, the entire Web server is not responding, or the network connecting the Web server to OpenWire is broken. These situations are outside the control of OpenWire. The best solution may be to contact the Service Provider to help diagnose the problem.

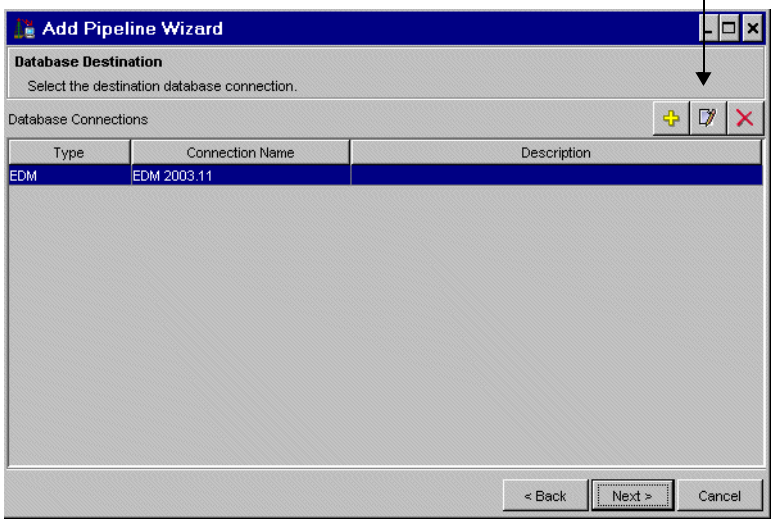
Using the Database Destination Panel

5. Use the **Database Destination** panel to select a destination. Click **Next**.

In this example, there is only one database connection to choose from. This is the database connection we defined earlier in the workflow (refer to page 13).

Highlight the database connection to select it.

If you want to create, edit, or delete a database connection, use the appropriate button.



6. The Wizard attempts to connect to the database connection selected. If the connection is successful, the **Well and Wellbore** panel is displayed.

Using the Well and Wellbore Panel

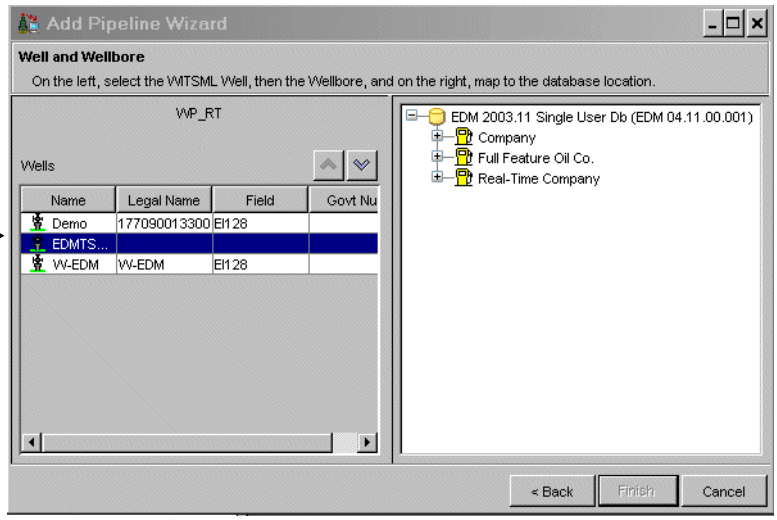
7. Use the **Well and Wellbore** panel to:

   a) Select the WITSML well from the Provider in the left panel. You must double-click on the desired well, or click the  button to select the provider well.

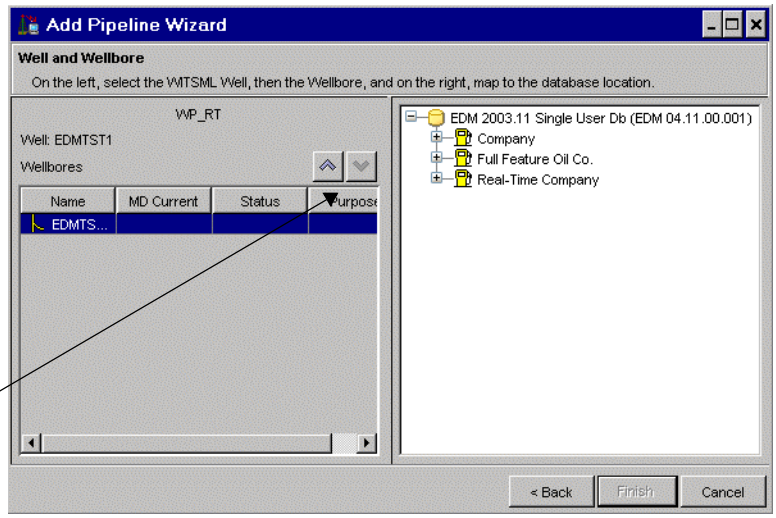
   b) Specify the hierarchical position in the EDM database that the data will be put in the right-panel.

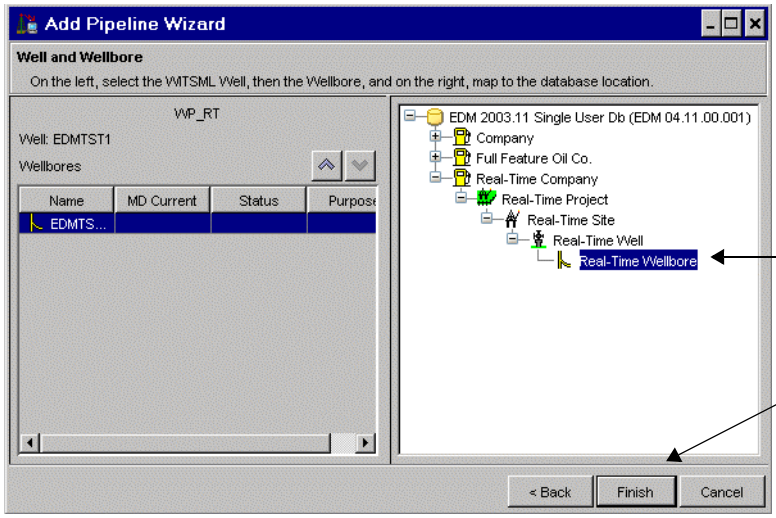
The selection of both of these steps results in a mapping between the WITSML well and the desired EDM well.

First, double-click on the WITSML well you want to use to select it. If there are more than one, double-click on the desired wellbore to select it. You can also select it by clicking the  button.



Notice that only the wellbores associated with the selected well are displayed. In this example, there is only one wellbore.





Expand the nodes until you locate the EDM Wellbore you want to load the WITSML Wellbore data into. (Right-click, and select **Expand All** or **Collapse All**.) Click on the wellbore to highlight it.

Click **Finish** after you have selected the wellbore.

8. Click **Finish**. The WITSML-EDM Pipeline is constructed, and the *Pipeline Window* will open. At this point, you have indicated the WITSML source, the EDM database to receive the data, and the EDM well to receive the data. You must now indicate what trajectory and/or log data you want to transfer into the EDM database.

Specifying the WITSML Objects To Load In the Pipeline

When a Pipeline is initially created through the *Add Pipeline Wizard*, the list of objects to load is empty. Although you could start such a Pipeline, no data would be loaded.

Thus, immediately after creating the Pipeline you should add the specific WITSML objects that you want to load, and perhaps change the default update interval.

The following are some important issues to consider concerning Pipeline objects:

- You can add or delete objects, or modify the update interval for existing Pipelines. You can only perform these actions when the Pipeline is stopped.

- You control the WITSML objects to be loaded to the database. Only objects from the select Well and Wellbore from the Provider may be selected to be loaded by this Pipeline. The objects that are put into this list become the list of objects that are processed every time an update is performed.

- There is no limit to the number of objects that you may load in a single Pipeline. However, the more objects in the Pipeline, the longer the update cycle will take, so you should adjust the update interval accordingly.

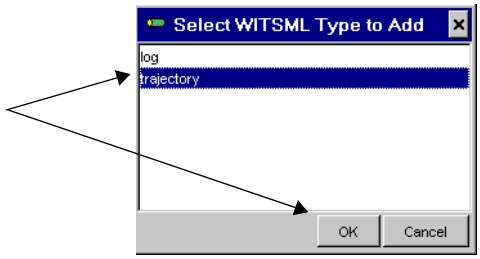
Adding a Trajectory to the Pipeline Load List

Minimum Curvature to Calculate Survey Data...

OpenWire uses minimum curvature to calculate survey data. You must use COMPASS to change to another calculation method.

1. To add one or more objects to the list, select **Edit > Add Item**, or click the  button.
2. You are presented with a dialog containing the supported WITSML data type that can be loaded from this Provider using OpenWire. Select **trajectory** and then click **OK**.

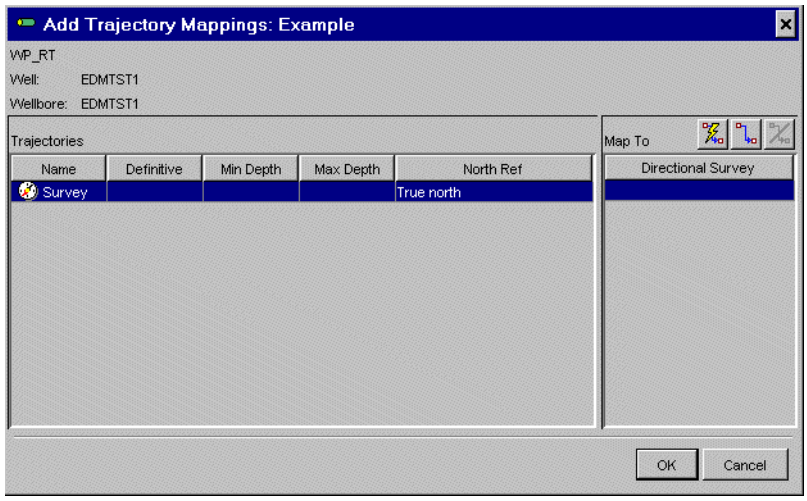
Select **trajectory** from the list and then click **OK**.



3. Select the survey you want to map from the list of trajectories. In this example, there is only one.

Click the button to map the trajectory to the desired directional survey in EDM. (Double-clicking on the desired survey will also activate the mapping dialog.)

Select the trajectory you want by clicking on it. This will highlight the selected trajectory and the right side of the screen will become enabled.



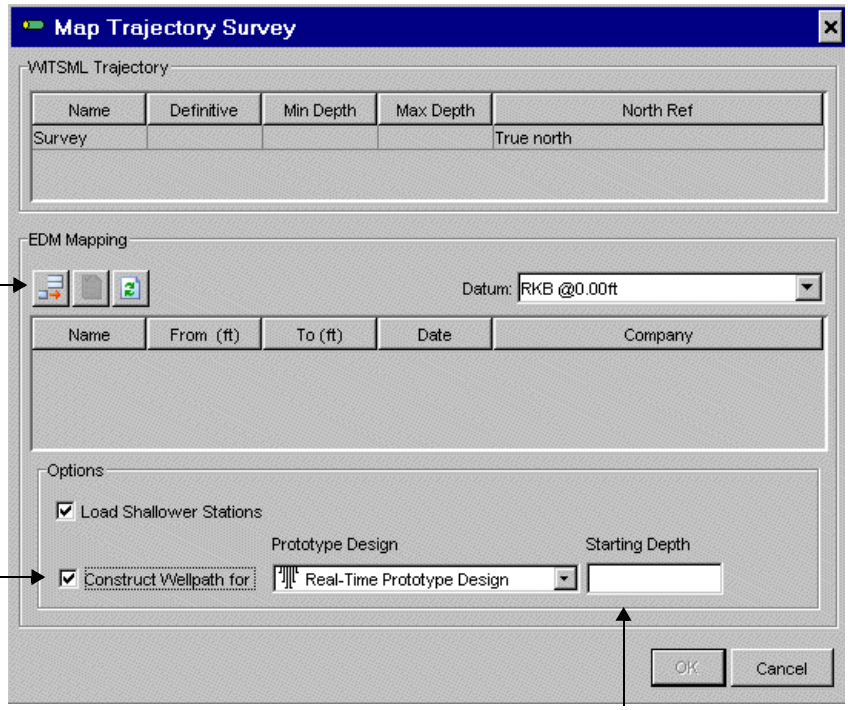
4. When you click the button, the **Map Trajectory Survey** dialog appears. Select the survey you want to map to. The top portion of the **Map Trajectory Survey** dialog displays the trajectory from the WITSML Provider. At this point you can either select the directional survey you want to map to in the list of existing directional surveys available in the EDM database, or you can create a new survey header in the EDM database.

Because there are no surveys listed in the bottom portion of the **Map Trajectory Survey** dialog, we must create one.

The top portion of the dialog displays the trajectory from the WITSML Provider that you selected in the previous step.

Because there was not a survey listed, you must create a new survey header by clicking the button.

If you want to analyze the trajectory data using WELLPLAN, you must check this box to add the surveys to the wellpath of a *prototype* design.



If you have manually entered data in the WELLPLAN's Wellpath Editor, you must specify the starting depth at a depth equal to or greater than the last data point you entered. If not, any data you manually entered may be overwritten with the real-time data. If you don't have COMPASS, you can use the **Starting Depth** field to create a sidetrack, because the real-time trajectory data will not overwrite any data above the specified **Starting Depth**.

Creating a Prototype Design for Use in WELLPLAN

You must check the **Construct Wellpath for** box and then select a *prototype* design from the drop-down list. You must specify a **Starting Depth** IF you have already entered survey data into the WELLPLAN Wellpath Editor. If you don't specify a starting depth, any existing data in the Wellpath Editor will be overwritten with the real-time data.

How OpenWire Handles Datums...

The selection of the datum on the **Map Trajectory Survey** dialog will shift all survey stations imported by OpenWire. The datum specified in OpenWire will not change the datum stored in the database. The datum displayed in the drop-down list is determined based on several rules.

- If there is an *actual* design in COMPASS for the wellbore you are mapping to, that datum will be the datum displayed in the drop-down list.
- If there is not an *actual* design in COMPASS, the datum will displayed in the drop-down will be the default datum assigned to the well.
- If neither of the previous rules apply, then the datum used will be the datum that was most recently edited or created.

5. The **EDM Survey Properties** dialog appears. Use the dialog to specify the properties of the survey you are creating.

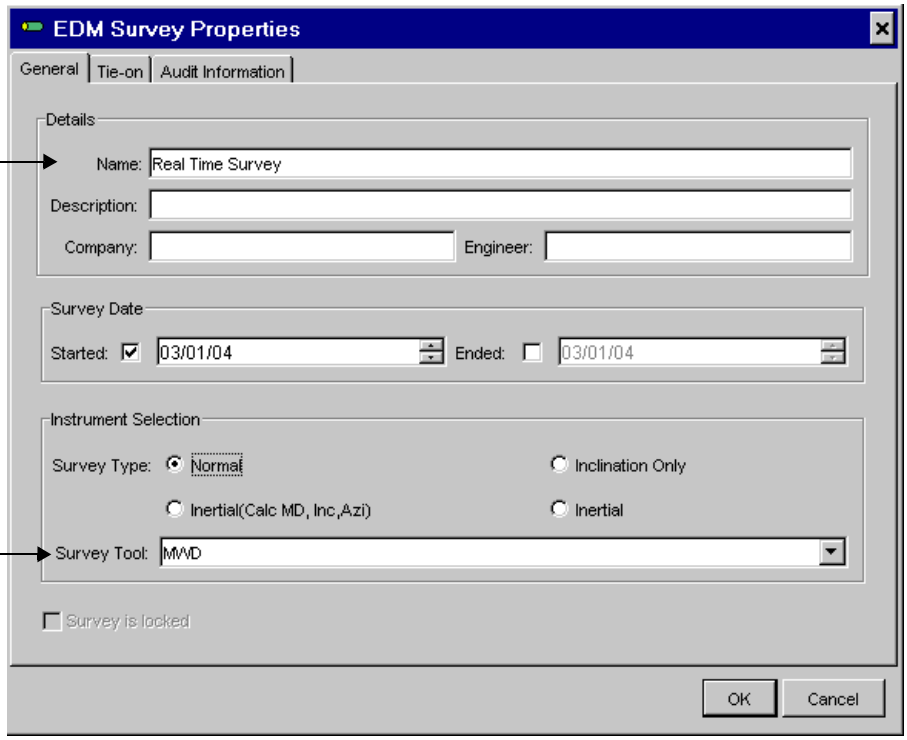
Behavior of the EDM Survey Properties dialog is consistent with COMPASS, with a few exceptions:

- You cannot lock the survey from OpenWire. Locked surveys will be displayed as read-only.
- You will not be able to create or edit survey tools from OpenWire. This must be done in COMPASS.
- The Validation tab will not be available from OpenWire—this is a COMPASS specific feature.

a) Use the **General** tab to specify a unique name for the survey, the start and end dates for the survey, how the survey data is defined, and the survey tool. The **Survey Tool** list is dependent on the list of tools defined in COMPASS for the specified Company. In this example, there is only one survey tool defined using COMPASS.

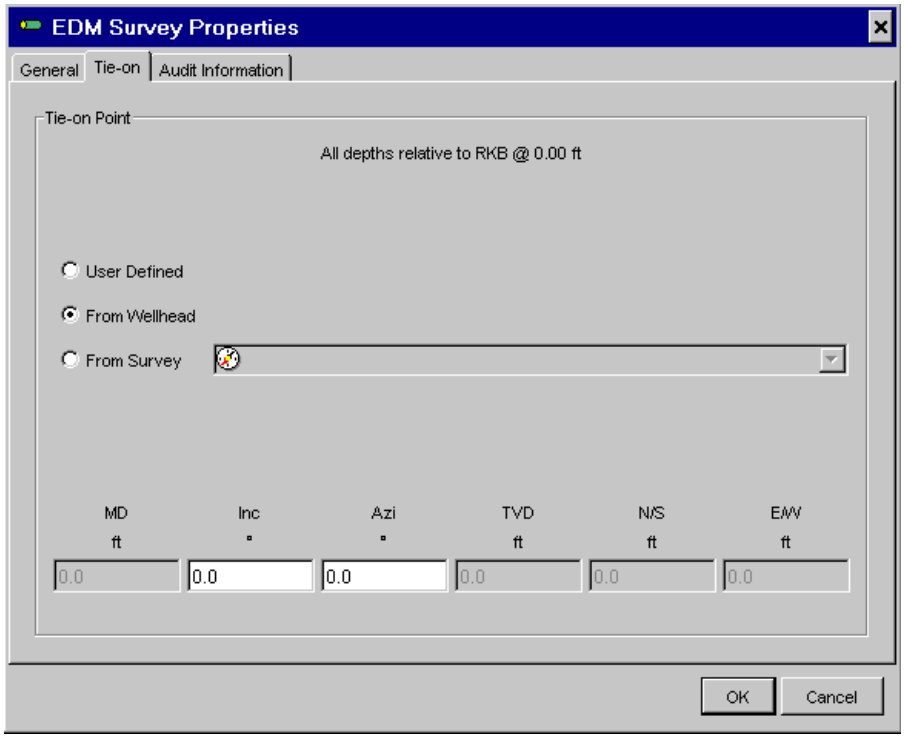
Specify a unique name for the survey.

The **Survey Tool** drop-down list is based upon survey tools entered for the Company using COMPASS. If the list is empty, you must use COMPASS to define the survey tool.



b) Use the **Tie-on** tab to define where the survey ties-on to any existing survey or to the wellhead.

In this example, the survey begins at the wellhead.



Defining the Tie-On Point...

- **User Defined:** Type in the co-ordinates and depth of the start point. This attaches the survey to a free point in space. No checking is made on the validity of the tie-on point.
- **From Wellhead:** The survey will begin at the N/S E/W co-ordinates of the well or the well reference point. You may still specify inclination and azimuth should the start point be non-vertical.
- **From Survey:** The survey stations will tie-on to the last point on the last point of the survey you select. NOTE: You must be careful that you select the correct survey for the correct wellbore to tie-on to. If two wellbores have the same survey name, it could be easy to incorrectly select the wrong survey. Be sure you tie-on to the correct wellbore.

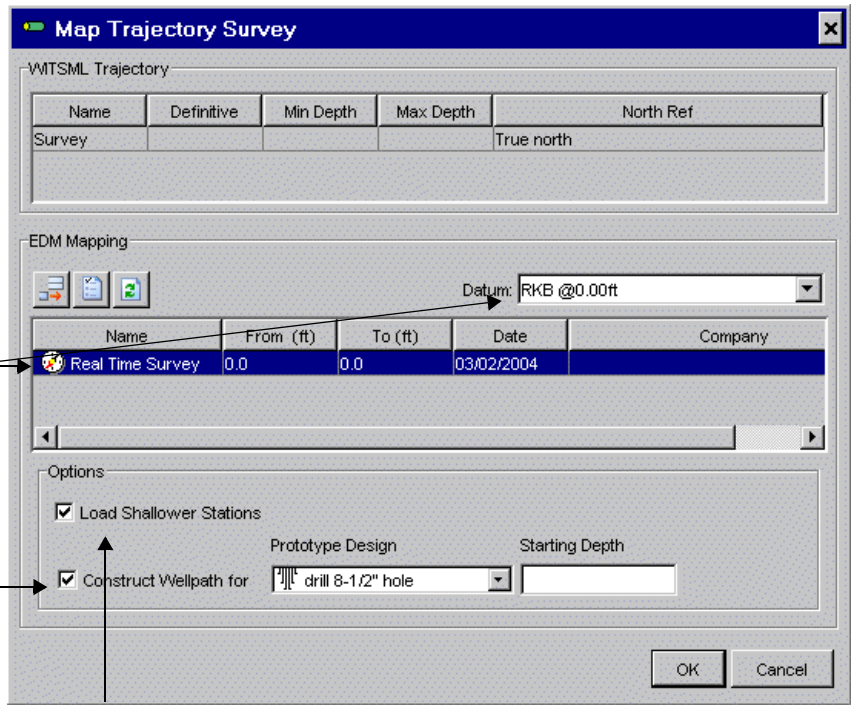
6. Click **OK** when you are finished specifying the survey information. A SAM (Simultaneous Access Monitor) notification will be sent to COMPASS and WELLPLAN indicating the survey was created. This notification allows these applications to refresh their screens and perform any required calculations.

7. When you click **OK** on the **EDM Survey Properties** dialog, you are returned to the **Map Trajectory Survey** dialog. Select the

survey you want to map to by clicking on it. You can also specify whether or not you want a *prototype* design created.

The datum shown is the datum that will be used for the highlighted survey. If you have more than one survey listed, they may have different datums.

Check **Construct Wellpath for** to create a *prototype* design. You must check this box if you are using WELLPLAN and you want to be able to edit the wellpath data.

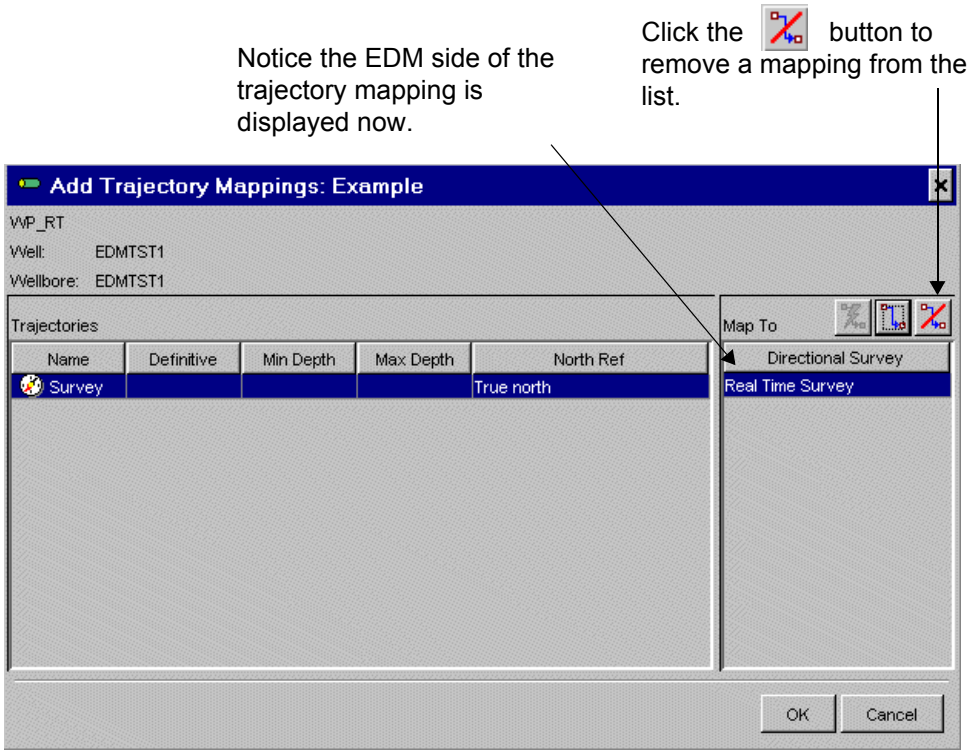


Check **Load Shallower Stations** to load all survey stations, even if there are multiple surveys at the same depth. When this box is checked, all survey stations are loaded, but the survey station with the latest time stamp will be tagged with the type **Normal**. The remaining and previous stations at the duplicate measured depths will be tagged **CheckShot**.

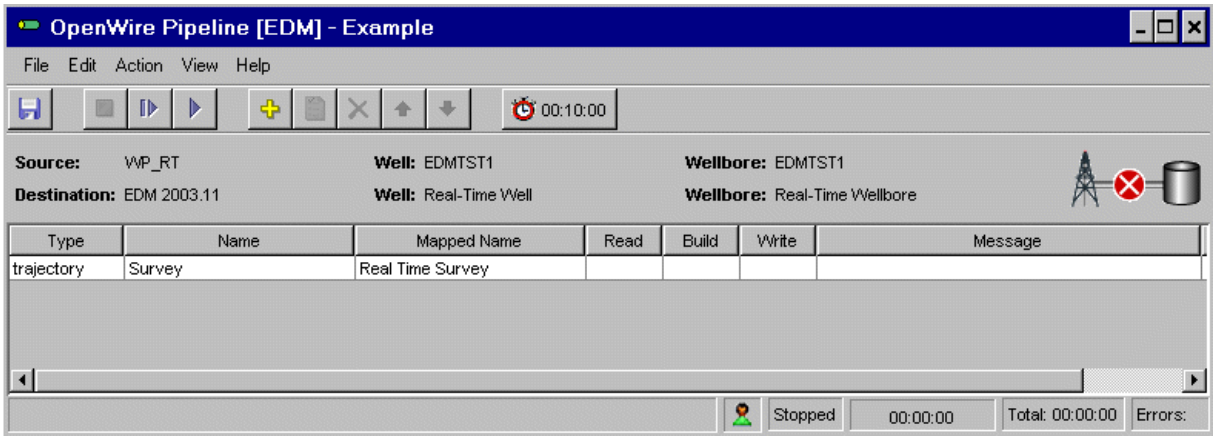
Creating *Actual* and *Prototype* Designs...

By default, an *actual* design will be created. Because WELLPLAN cannot edit an *actual* design survey, you may want to create a *prototype* design also. You can edit the survey data associated with a *prototype* design.

8. Click **OK** on the **Map Trajectory Survey** dialog and you are returned to the **Add Trajectory Mappings** dialog.

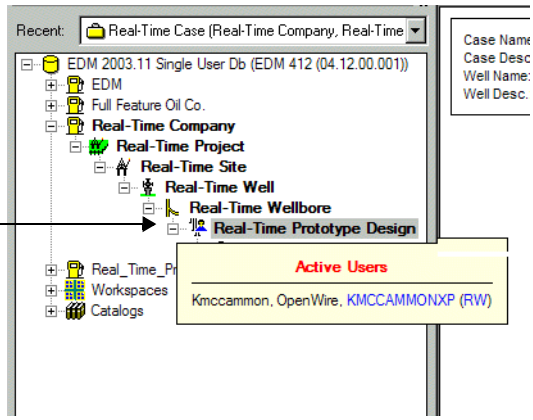


9. Click **OK** and the mapped trajectory will be added to the list of objects to load in the Pipeline Window. Click **Cancel** to close the dialog without adding the mappings to the list of objects to load in the Pipeline Window.



When the data is added to the Pipeline, SAM is activated.

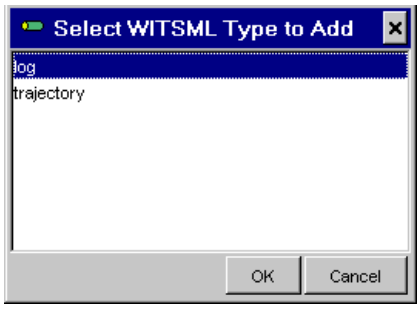
Notice the SAM icon is now displayed on the design icon. If you place the cursor over the icon, a message indicating use access rights will be displayed.



Adding Time-Based Logs to the Pipeline Load List

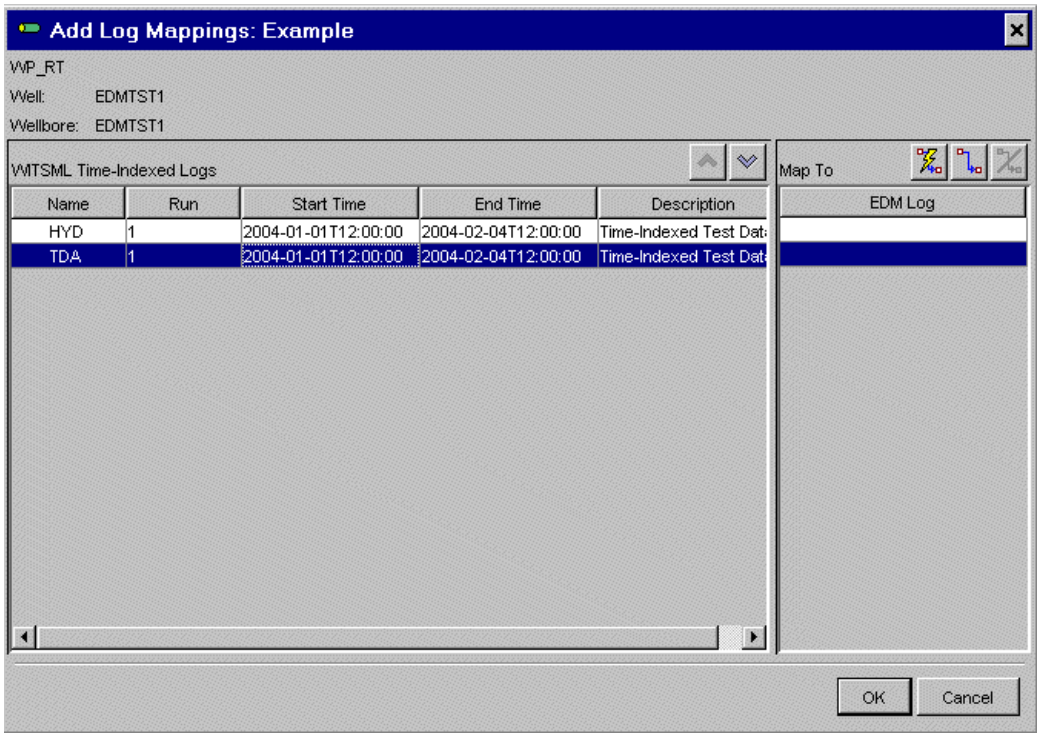
1. To add one or more objects to the list, select **Edit > Add Item**, or click the  button.

2. You are presented with a dialog containing the supported WITSML data types that can be loaded from this Provider using OpenWire. Select **log** from the list.



3. The **Add Log Mappings** dialog is displayed. This is a list of the logs the Provider has available using the WITSML source you specified earlier in the workflow. Select the log you want to map

by double-clicking on the log name. In this example, double-click on the log named **TDA** (or highlight it and click the  button).



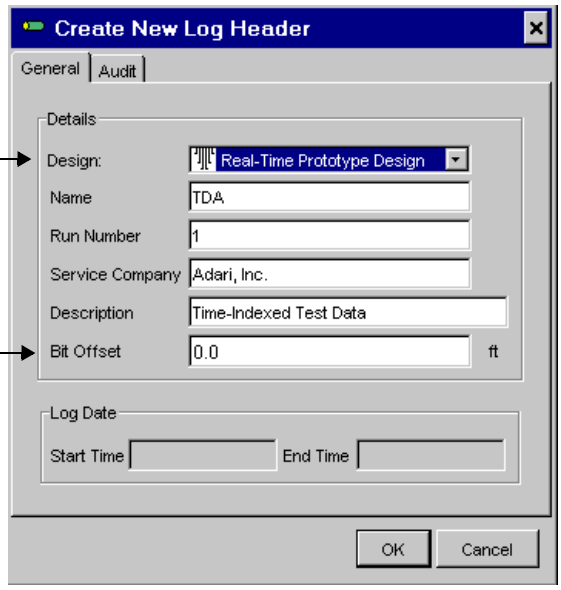
Workflow Data Used in this Example...

Normally log data you receive will not be divided into log groups based on torque drag (TDA) or hydraulics (HYD) data. The data used in this workflow differs from what you will normally find. This data was designed with simplicity in mind so that the workflow steps would be as easy to follow as possible.

4. Click the button to create a new EDM log. The **Name** and **Run Number** defaults from the log. Specify the bit offset from the logging tool, if any.

Select the (actual or prototype) design you want to add the log data to. In this example, select the *prototype* design we used for the trajectory.

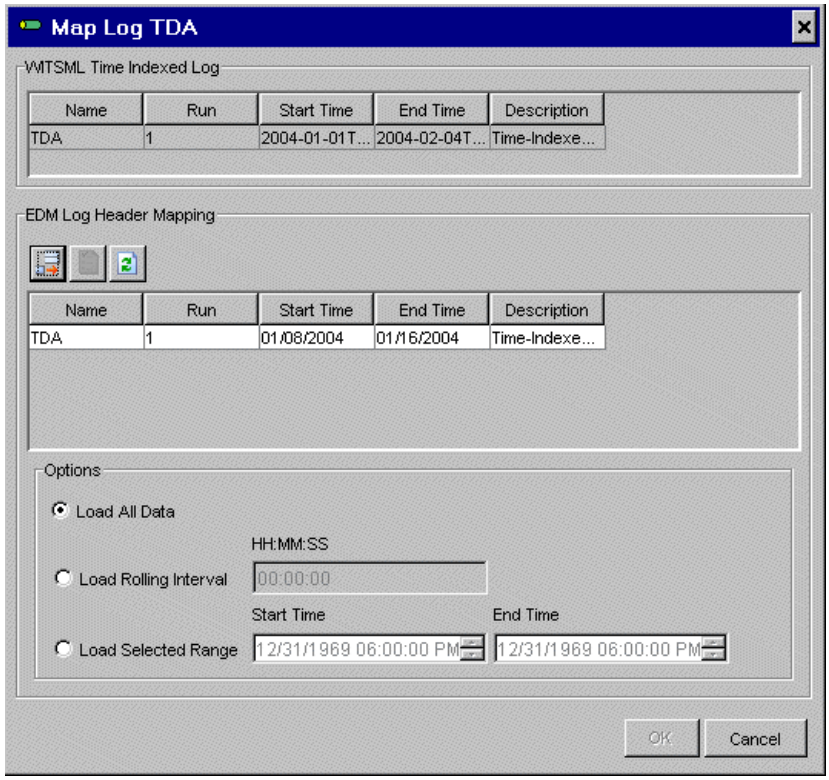
OpenWire transfers the **Bit Offset** data to WELLPLAN. WELLPLAN uses the bit offset to determine the correct measured depth for the log reading.



Loading Log Data into Actual and Prototype Designs...

Unlike loading trajectory data, log data is not loaded to an actual design by default. You must specify which type of design (actual or prototype) you want the log data loaded to.

5. Click **OK,** and the **Map Log** dialog is displayed. The log header information you created will be displayed. At this point, you can also specify loading options.



Loading Options...

Normally you will click the **Load All Data** option. This option loads and stores all log data in the database.

If you are concerned about the database space that is used by the log data, you can use the **Load Rolling Interval** option. This option keeps only the data for a specified length of time. For example, if you specify you want to keep 30 days of data, when you use OpenWire to transfer data on the 31st day, the data for the first day will be removed from the database.

You may want to use the **Load Selected Range** option for one-time loading situations. For example, you may want to go back and reload data because of tool misruns.

6. Highlight the TDA log, and click **OK**. The **Add Log Mappings** dialog is displayed. This dialog contains a list of data types in the WITSML log file. You must use this dialog to associate the WITSML mnemonic for the log data with the expected mnemonic

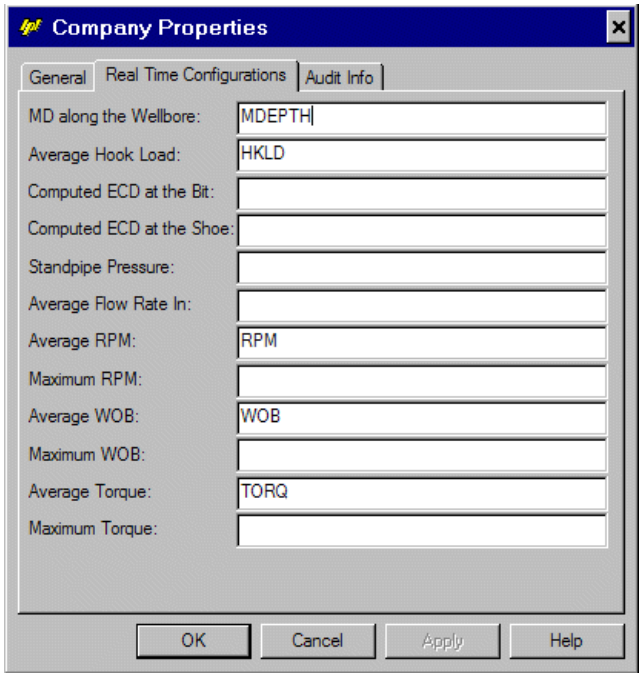
in the EDM database. You must assign an EDM mnemonic to every curve you want to import.

Highlight the curve you want to assign an EDM mnemonic to, and then click the  button to automatically map the curve. You can click the  . to manually map the curves.

You can change the EDM mnemonic by double-clicking on the EDM mneumonic.The **Map Log Curve** dialog is displayed. You can change the name or accept the default, and click **OK**.

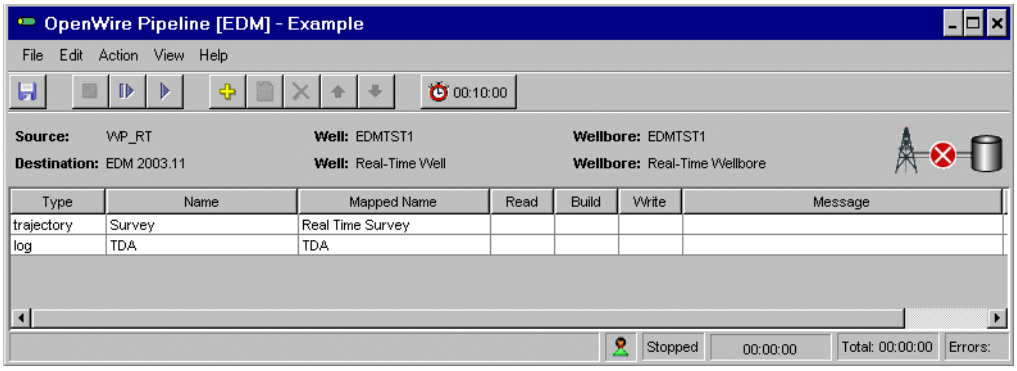
Verifying Mnemonics Used in WELLPLAN

7. You must be sure the WELLPLAN **Company Properties > Real Time Configuration** tab is expecting the same mnemonics as those specified in the **EDM Log Curve** section of the **Add Log Mappings** dialog. Refer to the online help for more information about this tab.

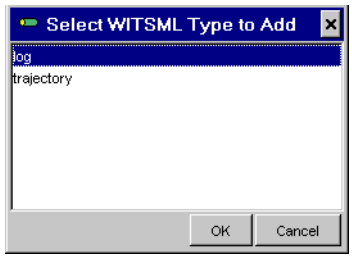


Adding Another Time-Based Log to the Transfer File

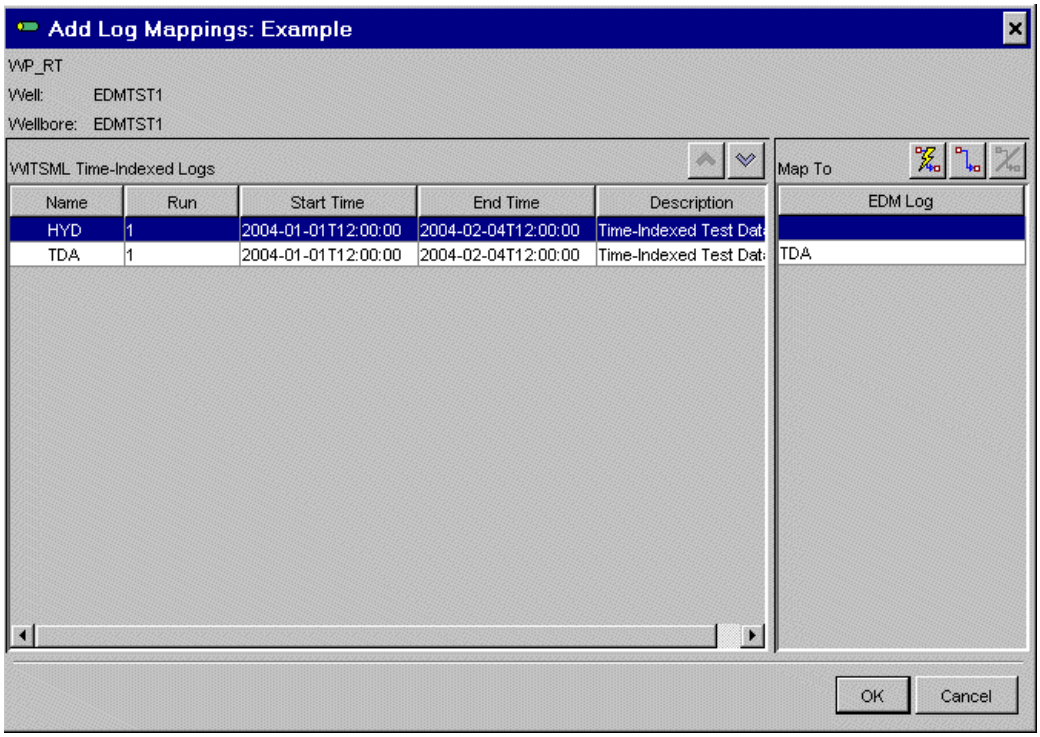
8. After you have completed the mappings for that log, you can map another log. In this example, we will map another log. Notice the Pipeline now contains trajectory and one log curve.



9. Click the  and indicate another log is to be added to the Pipeline.

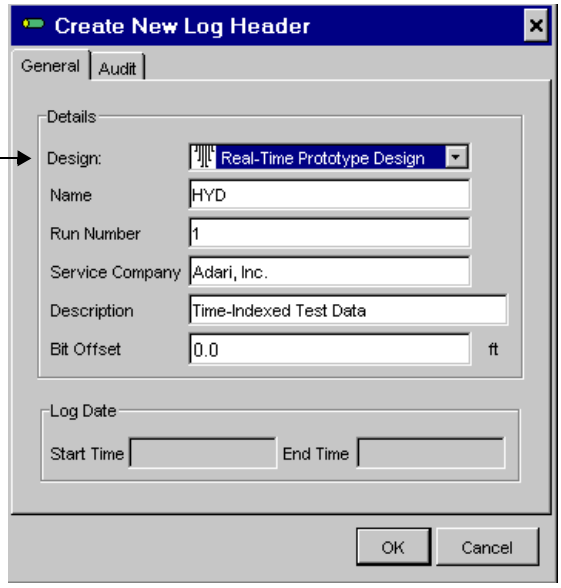


10. The **Add Log Mappings** dialog is displayed. Select the log you want to map by double-clicking on the log name. In this example, double-click on the log named **HYD** (or highlight it and click the  button).

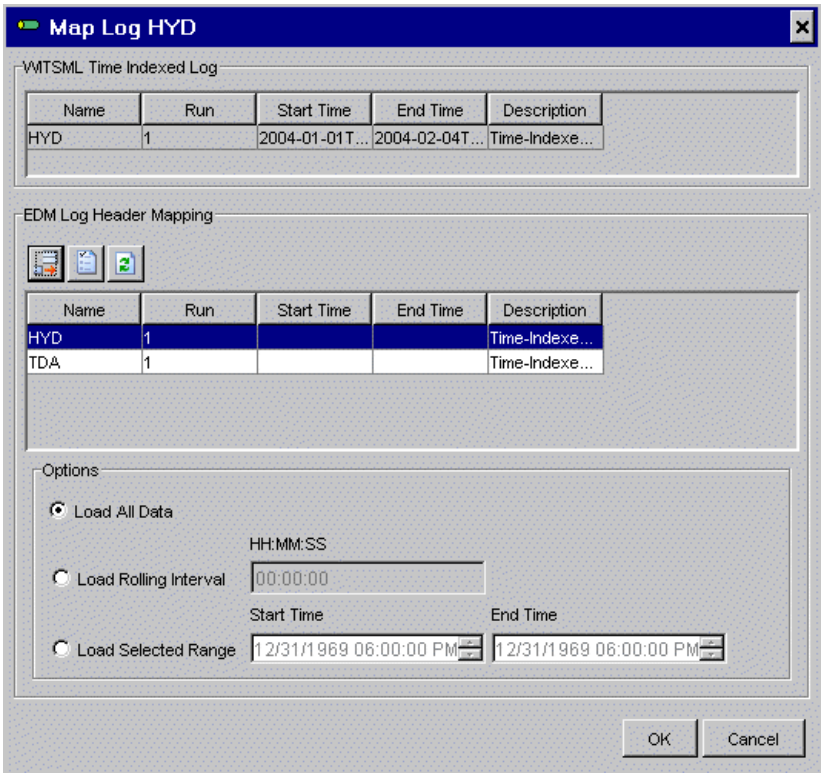


11. Click the  button to create a new EDM log.

Select the design you want to add the log data to. In this example, select the *prototype* design we used for the trajectory.

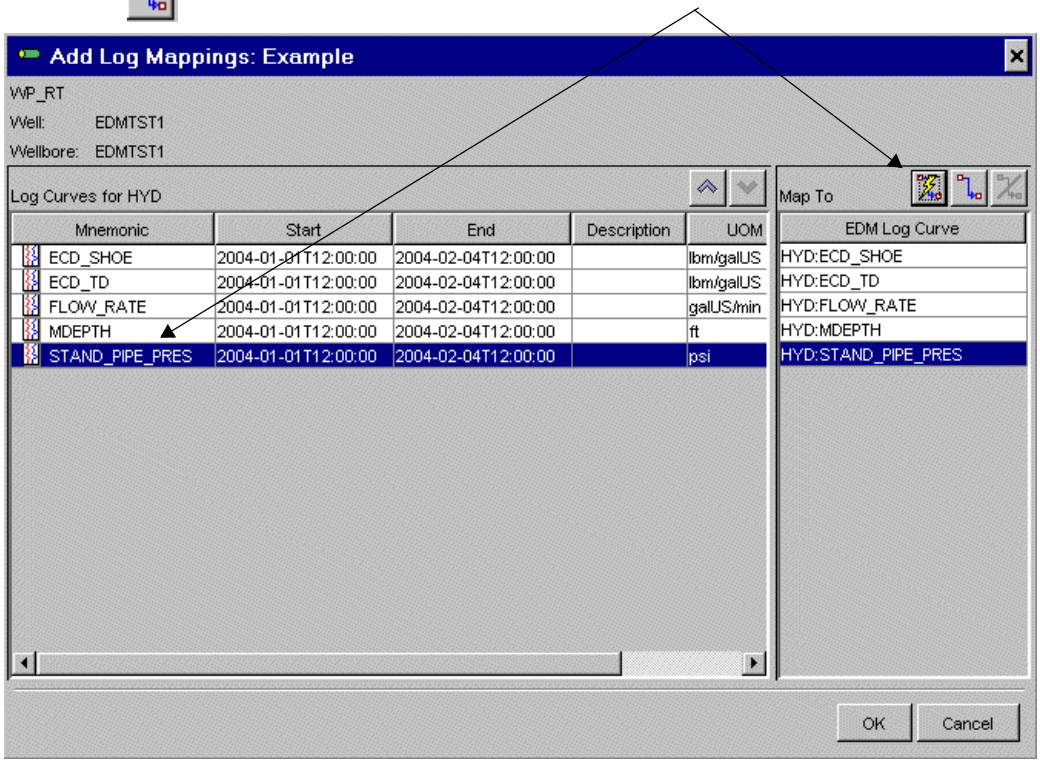


12. Click **OK** and the **Map Log** dialog is displayed. Specify loading options.

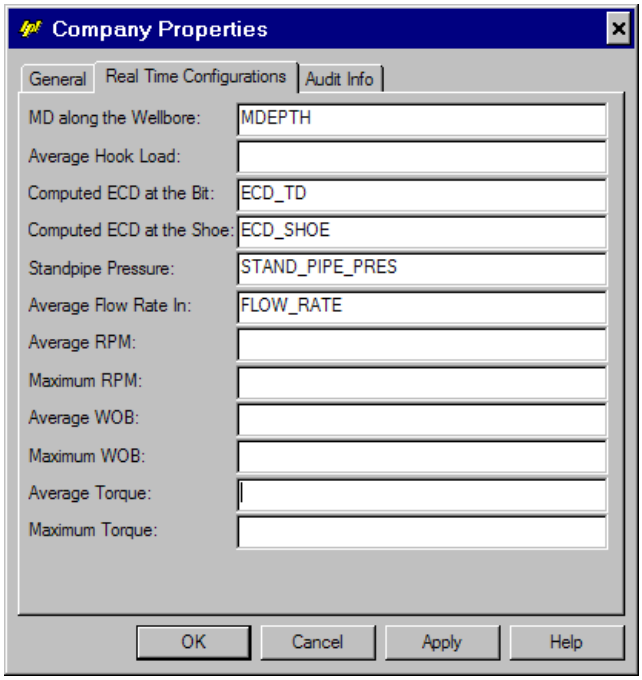


13. Click **OK**. The **Add Log Mappings** dialog is displayed. You must assign an EDM mnemonic to every curve you want to import.

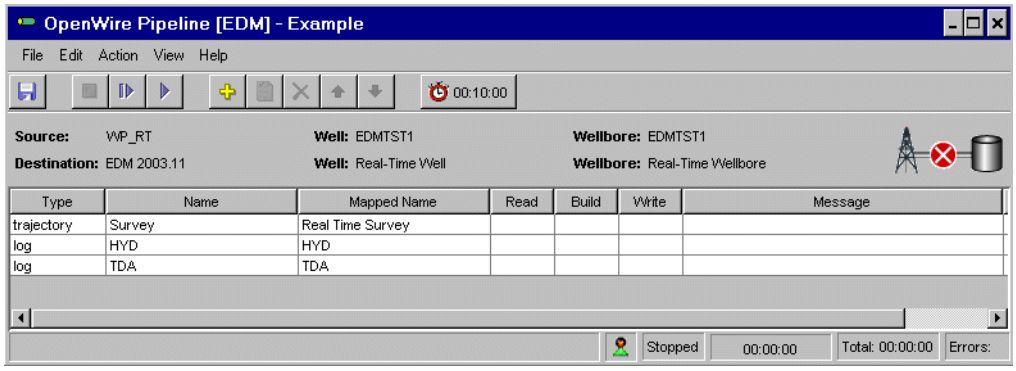
Highlight the curve you want to assign an EDM mnemonic to, and then click the  button to automatically map the curve. You can click the  to manually map the curves.



14. You must be sure the WELLPLAN **Company Properties > Real Time Configuration** tab is expecting the same mnemonics as those specified in the **EDM Log Curve** section of the **Add Log Mappings** dialog. Refer to the online help for more information about this tab.



15. Click **OK**. The Pipeline Window is displayed.



16. Save the Pipeline by clicking the **Save** button.

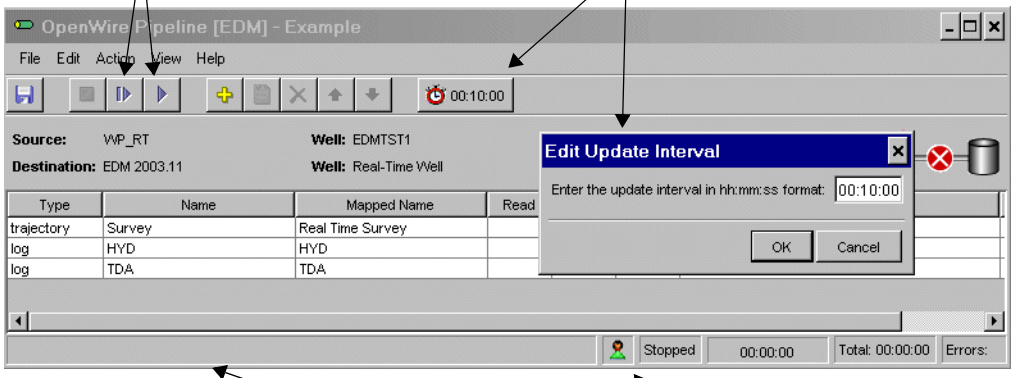
17. Now you have specified the objects you want to load using the Pipeline. It is time to run the Pipeline!

Running the Pipeline

1. You can manually run the Pipeline or you can set a time interval for the Pipeline to automatically run on.

Click the button to run the Pipeline if you have specified an **Update Interval**. Click the button to manually run the Pipeline when you want to.

Click the alarm clock button and the **Edit Update Interval** dialog is displayed. Specify the time interval you want the Pipeline to automatically run on.



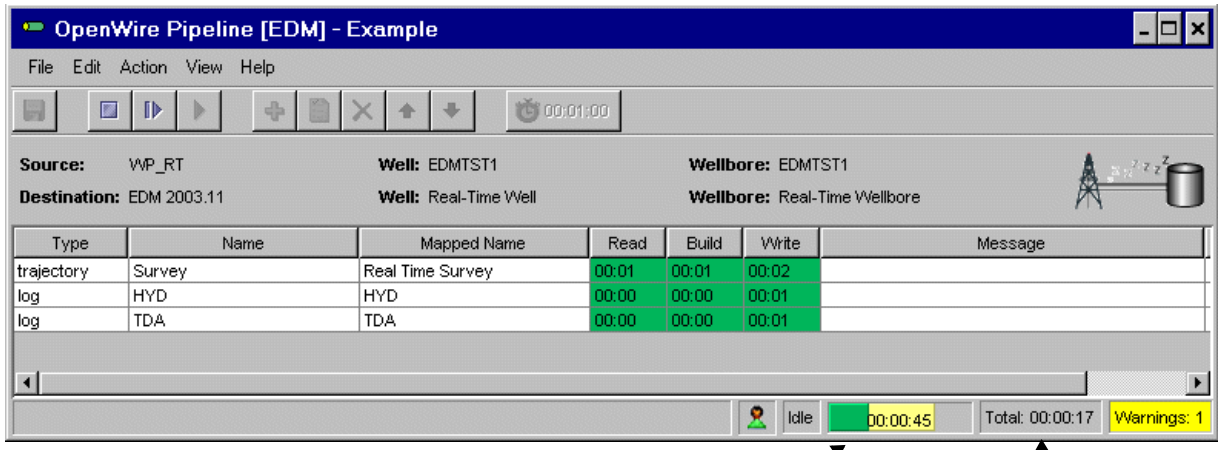
Messages indicating the progress of the transfer will be displayed.

2. The Pipeline window indicates the progress of the transfer.

   As the Pipeline is in operation, the background color of the **Read**, **Build**, and **Write** cells may be:

   - Green to indicate normal operation
   - Yellow to indicate warning.
   - Red to indicate an error has occurred.

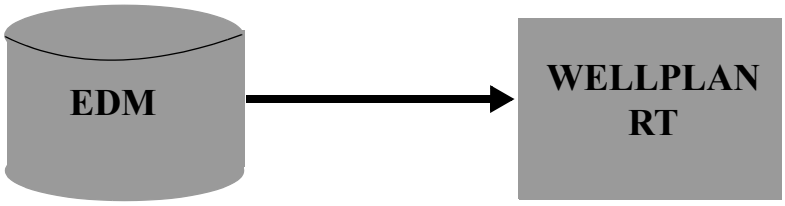
You can review the error log using **View > Error Log,** or by double-clicking on this display of errors and warnings.



This time indicates how long it has been since OpenWire last looked for new data from the provider. The background color is green when an update is occurring and turns to yellow after the update has finished. It remains yellow until the next update begins. You can use this information to determine how often you should schedule an update.

This time indicates how long the update took to complete.

WELLPLAN Workflow



Overview

In this portion of the workflow, you will use the *WELLPLAN* application to analyze data that you transferred to the EDM database using OpenWire.

WELLPLAN Filtering of Real-Time Torque Drag and Hydraulics Data

OpenWire loads all real-time log data into the EDM database. WELLPLAN filters the data stored in the database prior to performing an analysis. All WELLPLAN plots using real-time data will display an unlimited number of records.

Filtering of Hydraulics Data

WELLPLAN loads an unlimited number of records into the actual tables. WELLPLAN analyzes the log data associated with the last 200 real-time flow rates stored in the EDM database. If there are less than 200 flow rates in the EDM database, all will be analyzed.

Filtering of Torque Drag Data

In order for WELLPLAN to use the log curve data for torque drag analysis, it must know what operation (tripping in, tripping out, rotating on bottom, rotation off bottom, or sliding) the data represents. The operation type is not specified in the WITSML data from the provider.

All WITSML log curve data from the provider is associated with a depth. For this discussion, log curve data (hookload, WOB, etc.) associated with a measured depth will be referred to as a record.

WELLPLAN will:

- Always analyze the first record, unless the measured depth is *null*.
- Analyze a record every 30 ft, unless that record is identical to the previous record. If the record is identical to the previous record, it will not be analyzed.
- The exception to the 30 ft analysis rule is when a record's measured depth is within 2 ft of the previous record's measured depth. In this case, if there is no associated WOB, and there are values for hookload and RPM, the record is considered to represent rotating on bottom and is added to the analysis.

The following table indicates how the records are allocated to the remaining operations.

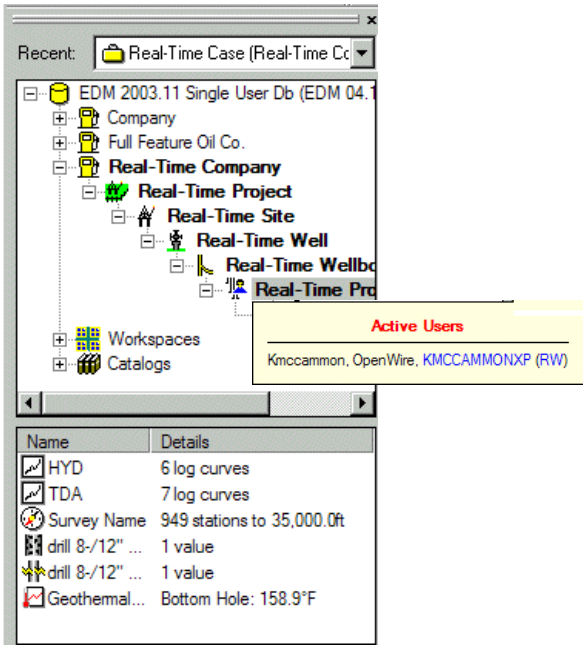
Operation Type	Depth curve value compared to previous record	RPM	WOB	Flowrate
Tripping In	Increasing	Yes or No	No	Yes or No
Tripping Out	Decreasing	Yes or No	No	Yes or No
Sliding	Increasing	No	Yes	Yes
Rotating On Bottom	Increasing	Yes	Yes	Yes or No
Rotating Off Bottom	Depth same within 2 ft of previous	Yes	No	Yes or No

Workflow Steps

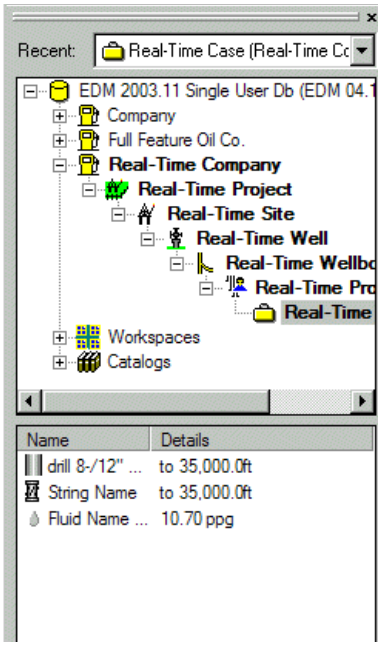
1. Launch and login to WELLPLAN (**Start > Programs > Landmark Engineer's Desktop > WELLPLAN**) if it is not already active.

2. Open the case associated with the prototype design you loaded the log and trajectory data into. Notice that the Well Explorer indicates the log curve data that was loaded.

Highlight the *design* to review data associated with the design level.



Highlight the *case* to review data associated with the case level.



Access The Torque Drag Module And Analyze Real-time Data

3. Activate the **Torque Drag Analysis** module by clicking the button.

4. Configure analysis parameters to reflect the analysis you want to perform. Refer to the *WELLPLAN Online Help* for assistance.

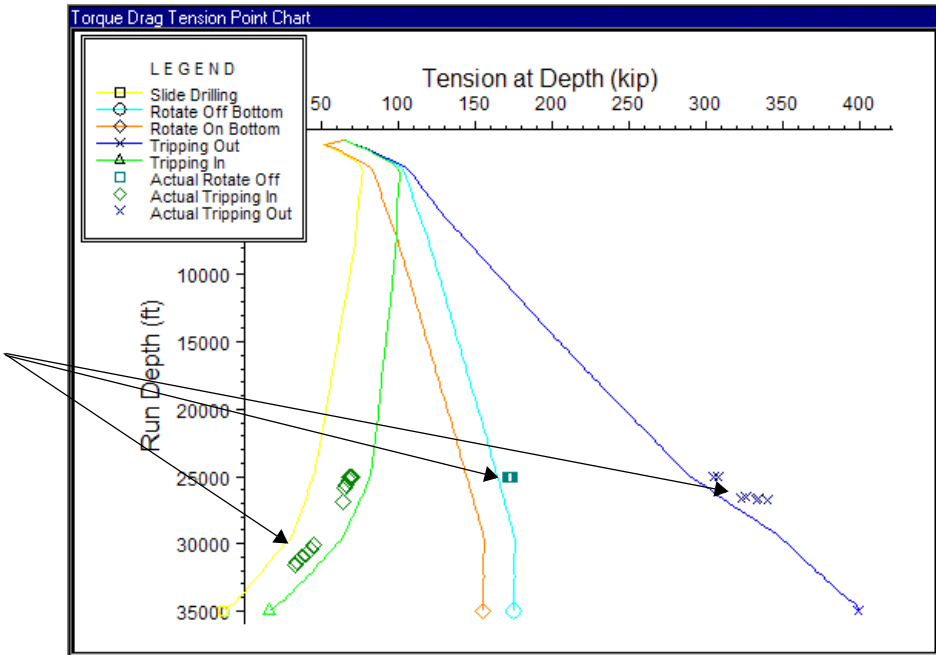
5. Review the real-time torque drag surface load data that was loaded into the **Case > Actual Loads** table.

Actual Loads

	Bit Depth (ft)	Measured Weight				Torque	
		Trip In (kip)	Trip Out (kip)	Off Bottom (kip)	Slide (kip)	On Bottom (ft-lbf)	Off Bottom (ft-lbf)
1	25000.0	69.3					
2	25030.0	68.5					
3	25060.0	67.5					
4	25300.0	67.2					
5	25600.0	65.6					
6	25900.0	64.8					
7	26900.0	63.5					
8	26800.0		340.2				
9	26760.0		332.5				
10	25000.0		305.0				35364.9
11	25031.0	68.3					36370.5
12	25000.0		307.5				37376.6
13	25000.0			170.9			37870.2
14	25001.9			171.6			38366.7
15	25000.9			172.6			38891.7
16	24999.1			173.3			39390.7
17	30100.0	44.3					
18	30400.0	42.2					
19	30729.0	39.7					
20	31033.0	36.6					
21	31300.0	34.1					

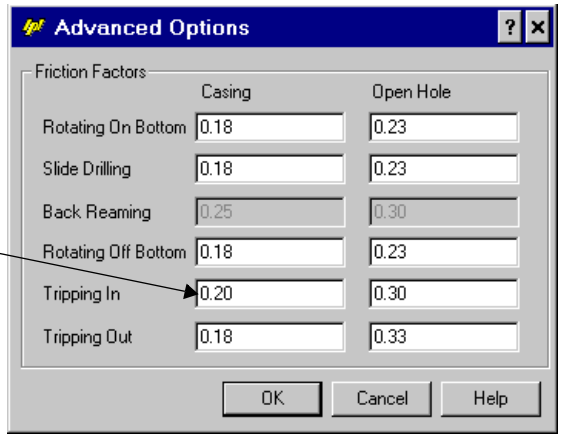
6. Select the **Drag Chart** analysis mode, and view the **View > Plot > Tension Point Chart**.You can also view the real-time data using the **View > Plot > Torque Point Chart**.

Notice the actual load data that was loaded using OpenWire is displayed.

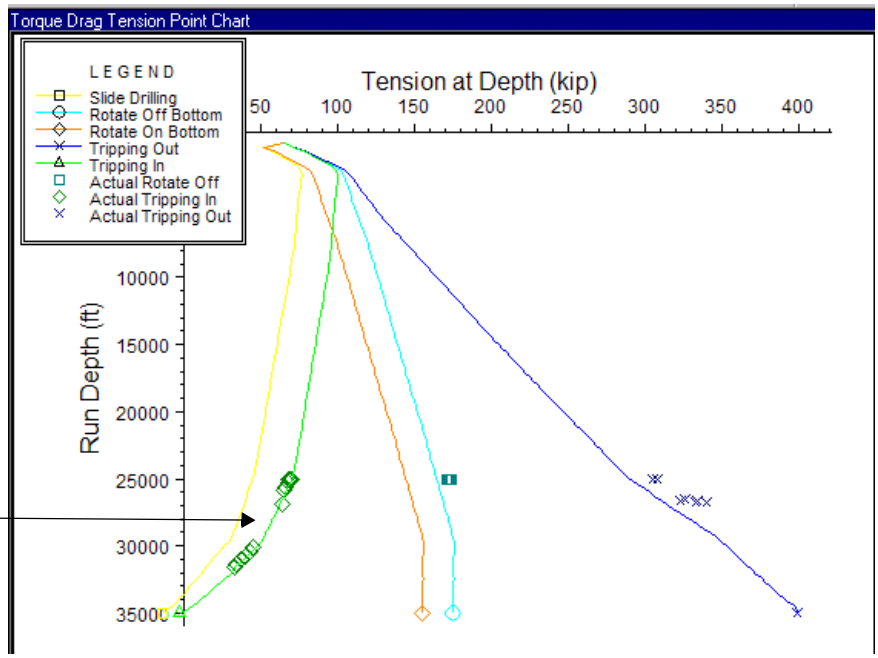


7. You can use **Advanced Friction Factors** to adjust the friction factors so that the planned results more closely aligns with the actual data loaded using OpenWire.

In this example, a slight adjustment was made to the cased hole tripping in friction factor.



8. Refer back to the **Torque Drag Tension Point Chart**.



Notice the planned data more closely matches the actual data after the friction factor adjustment.

Access The Hydraulics Module And Analyze Real-time Data

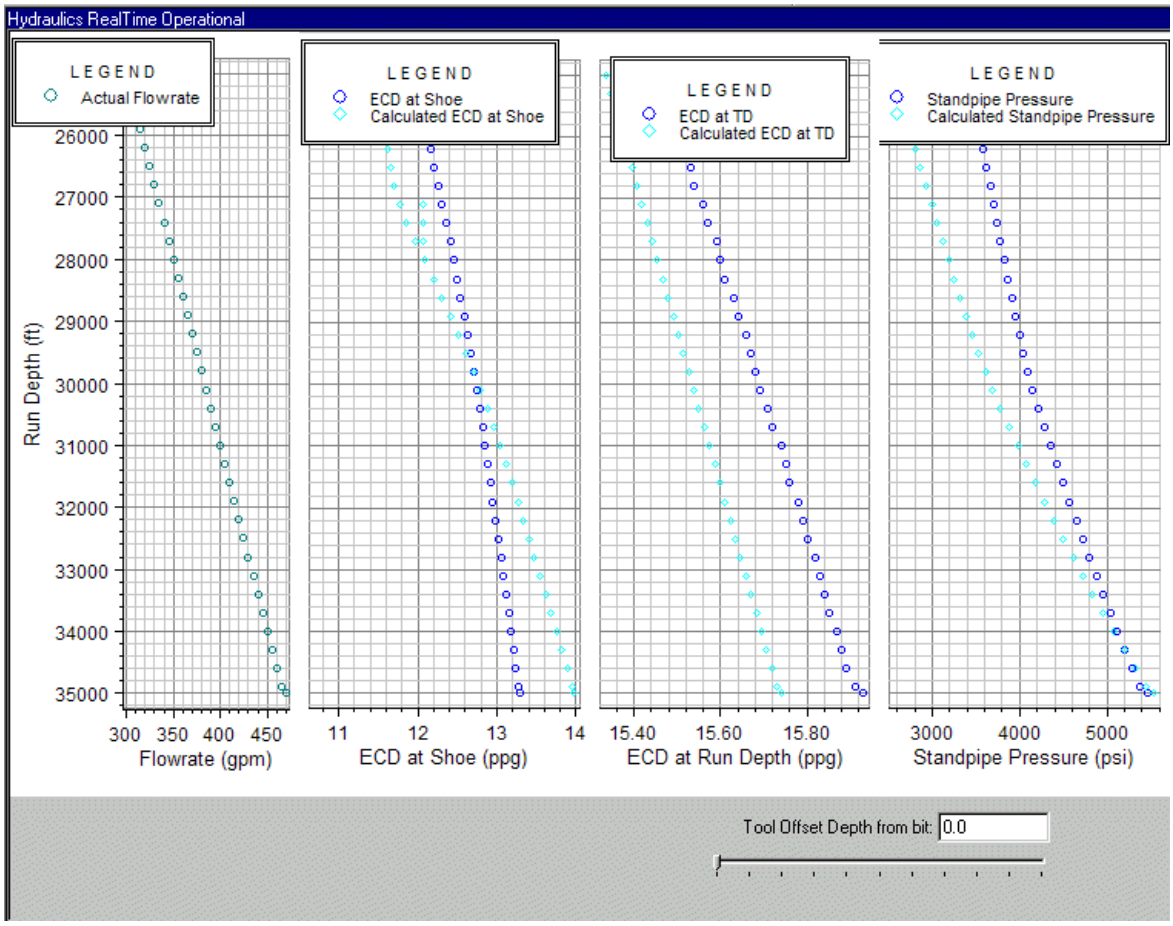
9. Activate the Hydraulics module, and select the Real Time mode.

10. Review the actual data by using **Parameter > Actual Data**.

Actual Data

	Run Depth (ft)	Flow Rate (gpm)	ECD at Shoe (ppg)	ECD at TD (ppg)	Stand Pipe Pressure (psi)
1	25000.0	300.0	11.95	15.46	3437.9
2	25300.0	305.0	12.01	15.47	3473.3
3	25600.0	310.0	12.06	15.49	3509.4
4	25900.0	315.0	12.11	15.50	3546.2
5	26200.0	320.0	12.16	15.52	3583.6
6	26500.0	325.0	12.21	15.53	3621.8
7	26800.0	330.0	12.26	15.54	3660.6
8	27100.0	335.0	12.31	15.56	3700.2
9	27400.0	340.0	12.36	15.57	3740.5
10	27700.0	345.0	12.41	15.59	3781.4
11	28000.0	350.0	12.45	15.60	3823.1
12	27100.0	335.0	12.31	15.56	3700.2
13	27400.0	340.0	12.36	15.57	3740.5
14	27700.0	345.0	12.41	15.59	3781.4
15	28000.0	350.0	12.45	15.60	3823.1
16	28300.0	355.0	12.50	15.61	3865.5
17	28600.0	360.0	12.54	15.63	3908.6
18	28900.0	365.0	12.59	15.64	3952.4
19	29200.0	370.0	12.63	15.66	3997.1
20	29500.0	375.0	12.67	15.67	4042.2
21	29800.0	380.0	12.71	15.68	4088.2
22	30100.0	385.0	12.75	15.69	4138.8
23	30400.0	390.0	12.78	15.71	4208.3
24	30700.0	395.0	12.82	15.72	4278.8

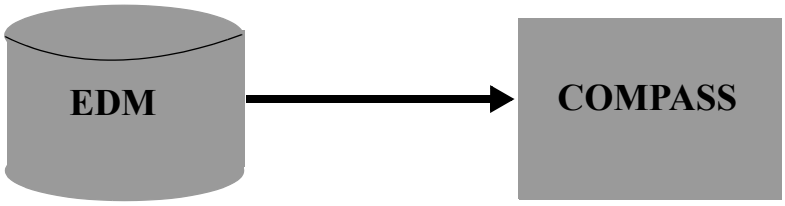
11. Review the **View > Plot > Operational** plot.



Adjusting Planned Results to Match Real-Time Data...

Using the **Case > Fluid Editor**, you can adjust the mud rheological properties to try to adjust the planned results so that they better match the real-time data. You can also change the **Tool Offset Depth from bit** to adjust the planned data. Initially the **Tool Offset Depth from bit** defaults to the bit offset specified using OpenWire.

COMPASS Workflow



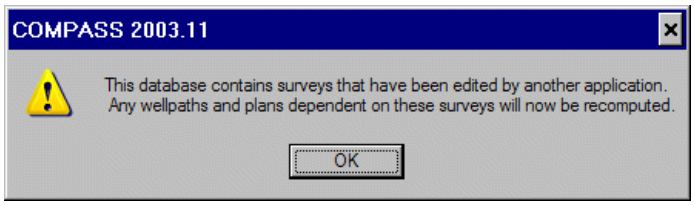
Overview

In this portion of the workflow, COMPASS is used to view the trajectory data loaded using OpenWire.

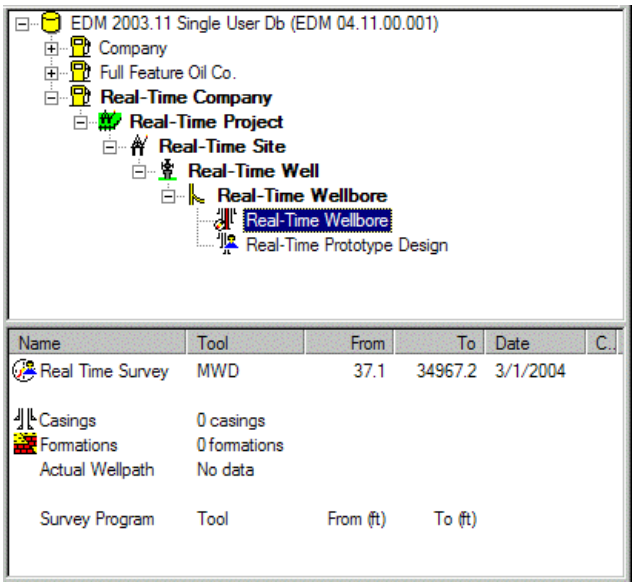
Workflow Steps

1. Launch COMPASS by using **Start > Landmark Engineer's Desktop > COMPASS**.

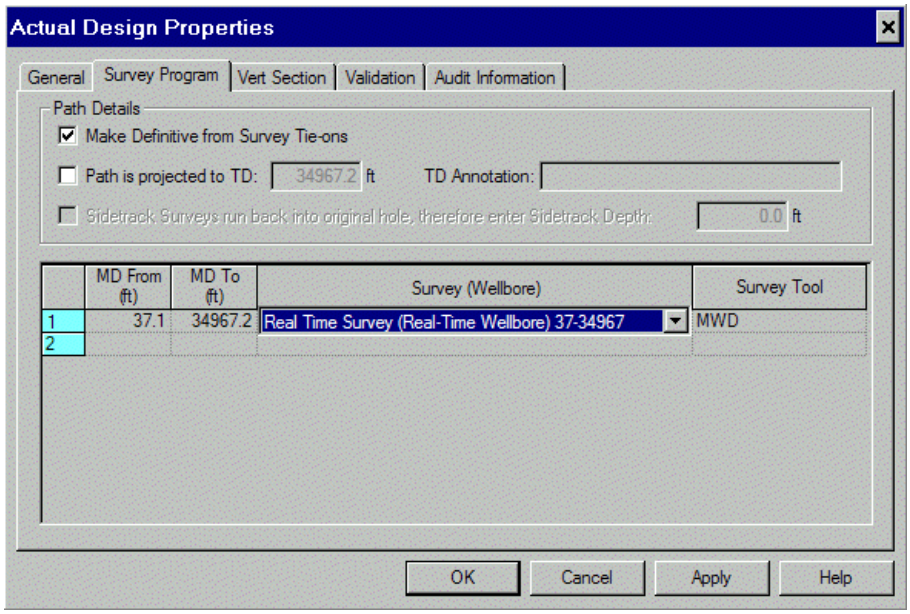
2. A message indicating that COMPASS has found surveys edited by another Landmark application is displayed. COMPASS must compute the wellpath based on these surveys. COMPASS will create an *actual* design using the computed surveys, but will not alter the wellpath in the *prototype* design used in WELLPLAN.



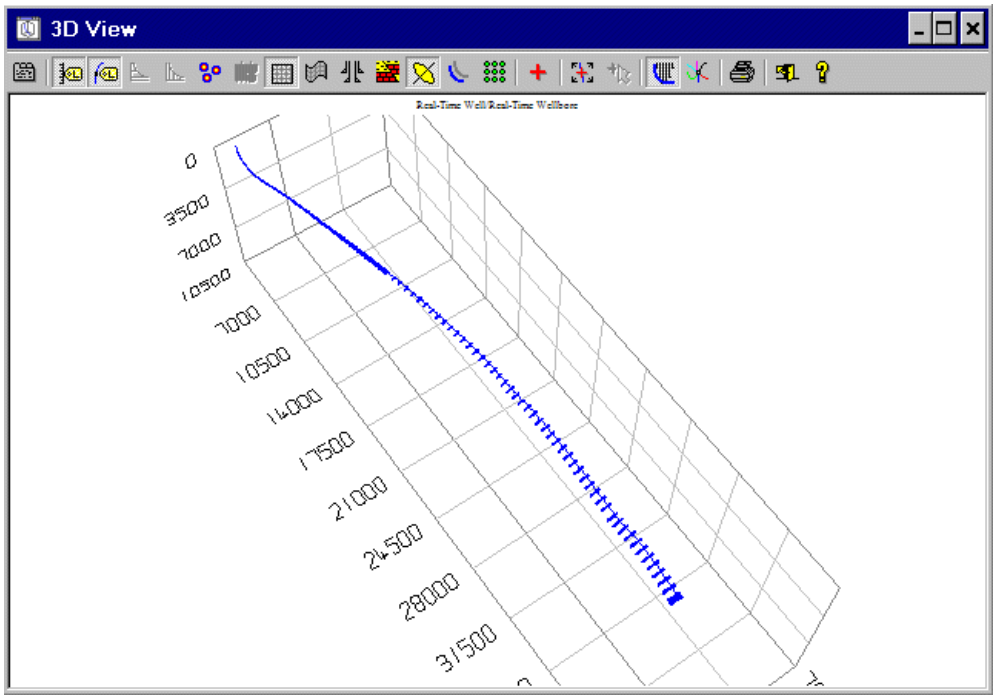
3. Notice in the COMPASS Well Explorer an *actual* design has been created.



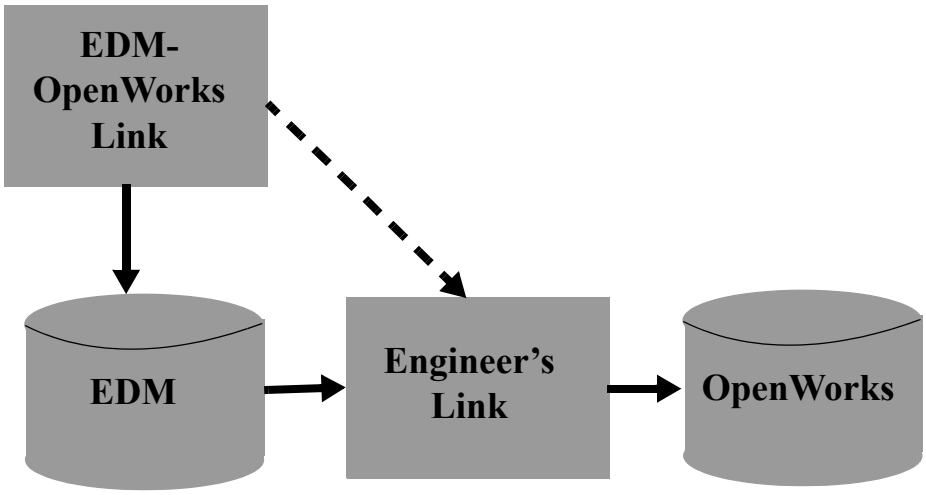
4. In order for COMPASS to know that you want to use this survey to create the wellpath of the *actual* design, you must add the survey to the survey program using **Design > Properties > Survey Program** tab.



5. View the wellpath, including error ellipses, by clicking the  on the COMPASS toolbar. If the error ellipses are not displayed, refer to the COMPASS online help for assistance.



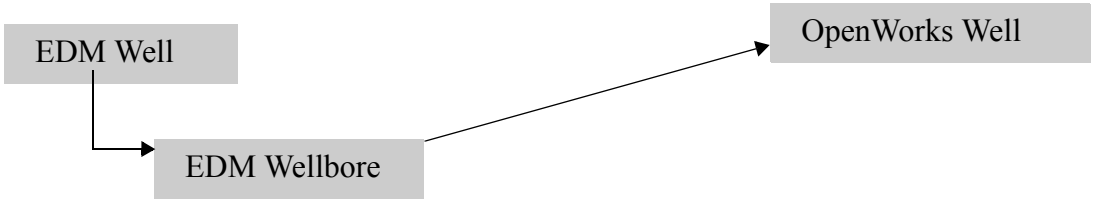
EDM-OpenWorks Link Workflow



Overview

In this portion of the workflow, you will use the *EDM-OpenWorks Link* application to map a wellbore in the EDM database to a well in an OpenWorks database.

An EDM Wellbore is mapped and transferred to an OpenWorks Well!



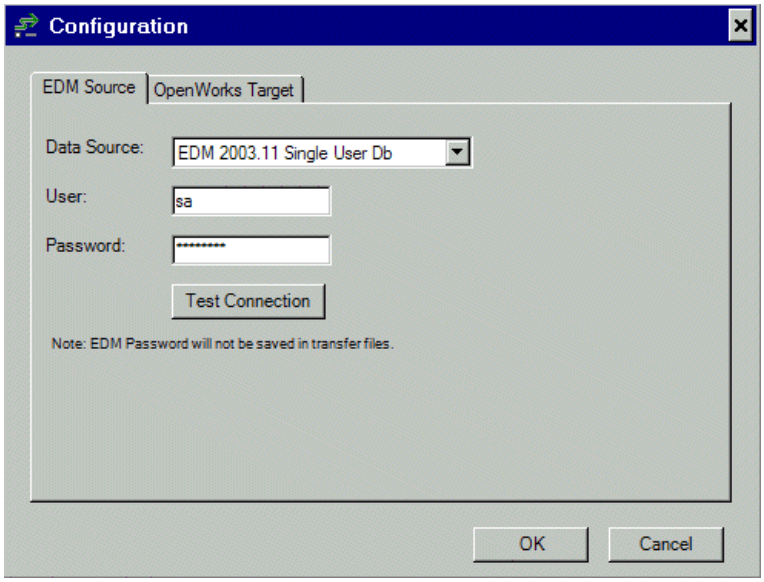
If you have a question about using the *EDM-OpenWorks Link* application that is not addressed in this document, please refer to the online help for the application.

Workflow Steps

1. Start the EDM-OpenWorks Link application (**Start > Landmark Engineer's Desktop > Tools > EDM to OpenWorks Link**).

2. Login to the EDM-OpenWorks Link application.

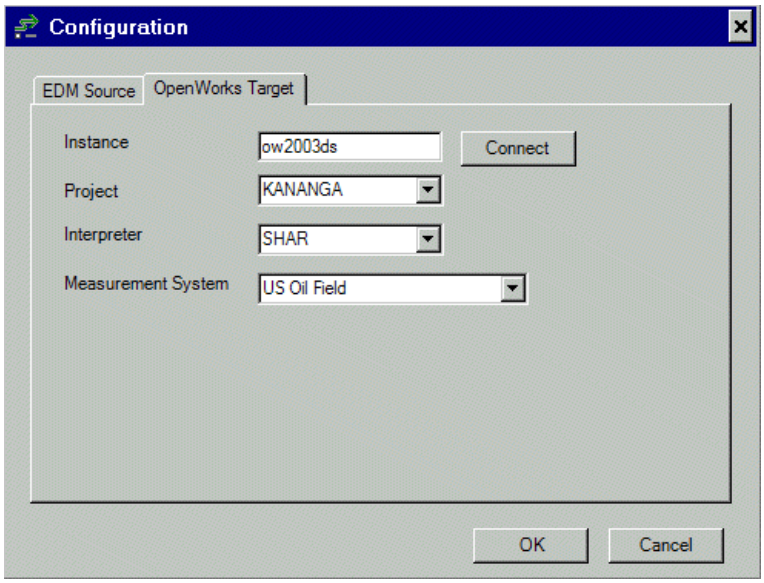
3. Setup and test the connection to the EDM source database using **Tools > Configuration > EDM Source**.



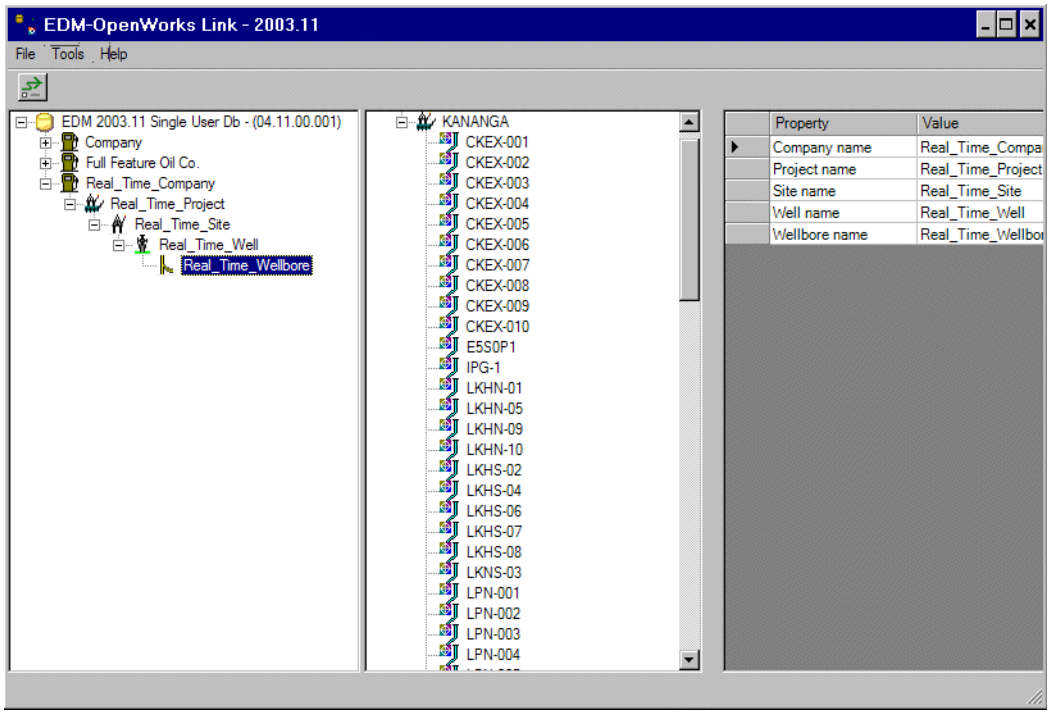
You must have a version 2003.11 EDM database...

The EDM-OpenWorks Link application will only function correctly with EDM version 2003.11. If you have an earlier version of the EDM database, you must migrate your data to a version 2003.11 database prior to using the EDM-OpenWorks Link application.

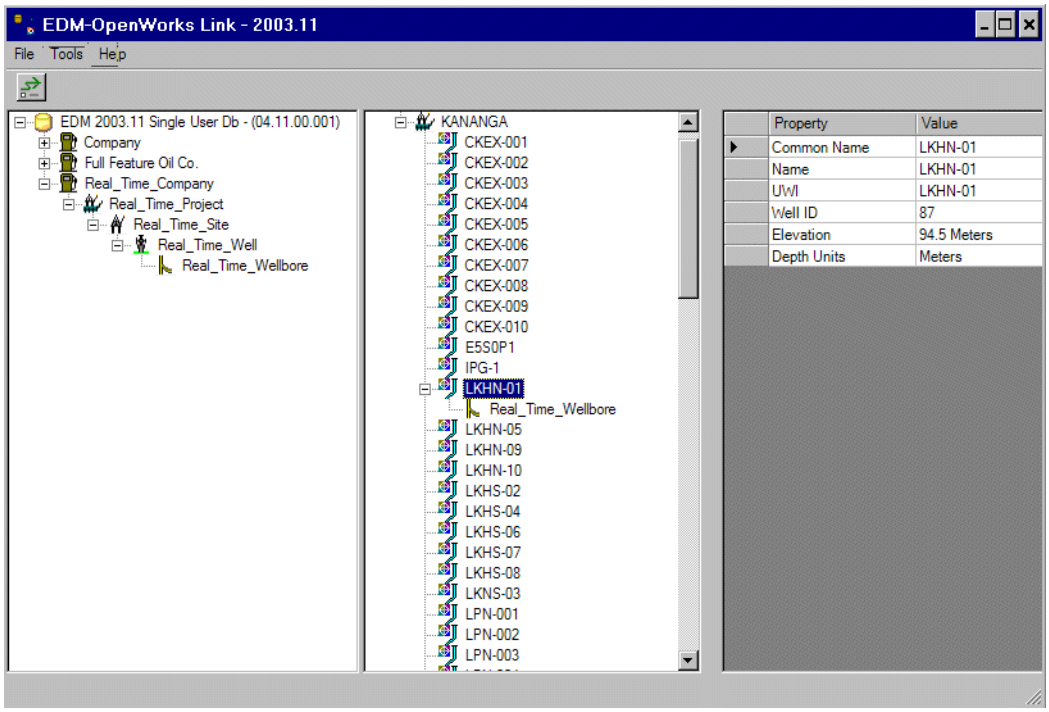
4. Connect to the OpenWorks database using **Tools > Configuration > OpenWorks Target** tab.



5. In the **EDM Source Window**, expand the tree to the wellbore, click on the EDM wellbore you want to map to an OpenWorks well. Notice the **Properties List** provides information about the wellbore you have highlighted. You can use this information to help ensure you have selected the correct wellbore.



6. Drag the highlighted wellbore from the previous step to the OpenWorks well you want to map the wellbore to in the **OpenWorks Target Window**. Again, notice the **Properties List** provides information about the item you have selected (when you click on it). You can use this information to help ensure you have selected the correct well. The Well ID is assigned by the system and is a good way to identify the well.



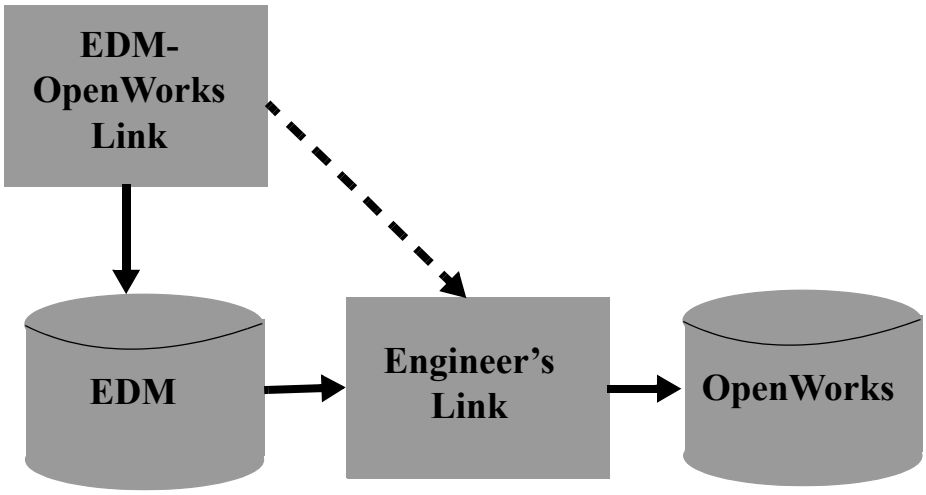
After you release the mouse button, it displays the wellbore.

Click on the well in OpenWorks and notice the well properties are displayed.

7. Release the mouse to complete the mapping process. At this point, you could map additional EDM wellbores to OpenWorks well. However, this workflow will map only one wellbore to a well.

8. Use **File > Exit** to close the application.

Engineer's Link Workflow



Overview

In this portion of the workflow, the *Engineer's Link* application is used to transfer from the EDM database to a project in an OpenWorks database.

Engineer's Link transfers the following types of data from the EDM database into the OpenWorks database.

- **Directional Survey Data**: This includes the survey station data (measured depth, inclination, and azimuth), as well as any data representing the uncertainty of the survey station (covariant matrix and wellbore uncertainties).

- **Log Curve Data**: Log curve data includes trajectory and bit run logs that have been loaded into the EDM database.

- **Position Log Data:** Engineer's Link creates positional log data based on the directional survey data. OpenWorks requires each survey station to be expressed in cartesian coordinates (X, Y, and

Z). The Positional Log Data is a representation of the directional survey data expressed in cartesian coordinates.

Engineer's Link Overwrites Data in OpenWorks Database With Data in EDM Database

Engineer's Link transfers the data for the specified wellbore in the EDM database to the OpenWorks well. If, for some reason, the OpenWorks database already had log curve or trajectory data for the well, it will be deleted and the data for the associated EDM wellbore will be added.

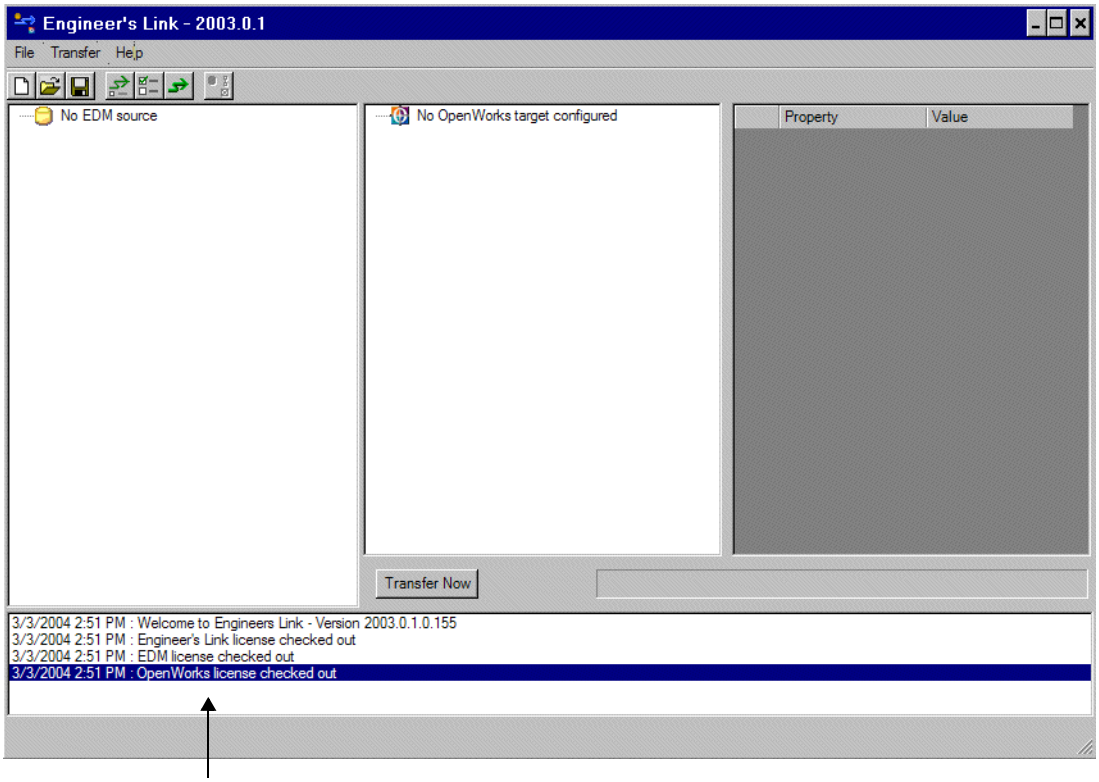
If you have a question about using the *Engineer's Link* application that is not addressed in this document, please refer to the online help for the application.

OpenWorks and Datums...

Prior to using Engineer's Link, be sure the elevation in the OpenWorks Wellheader is properly aligned with the datum elevation in EDM.

Workflow Steps

1. Start the Engineer's Link application. Notice the informational messages that are displayed at the bottom of the main window. You may want to refer to this section of the window for status messages as you use the application.



Notice the messages displayed in the bottom of the window. These messages contain information about licenses and other useful information.

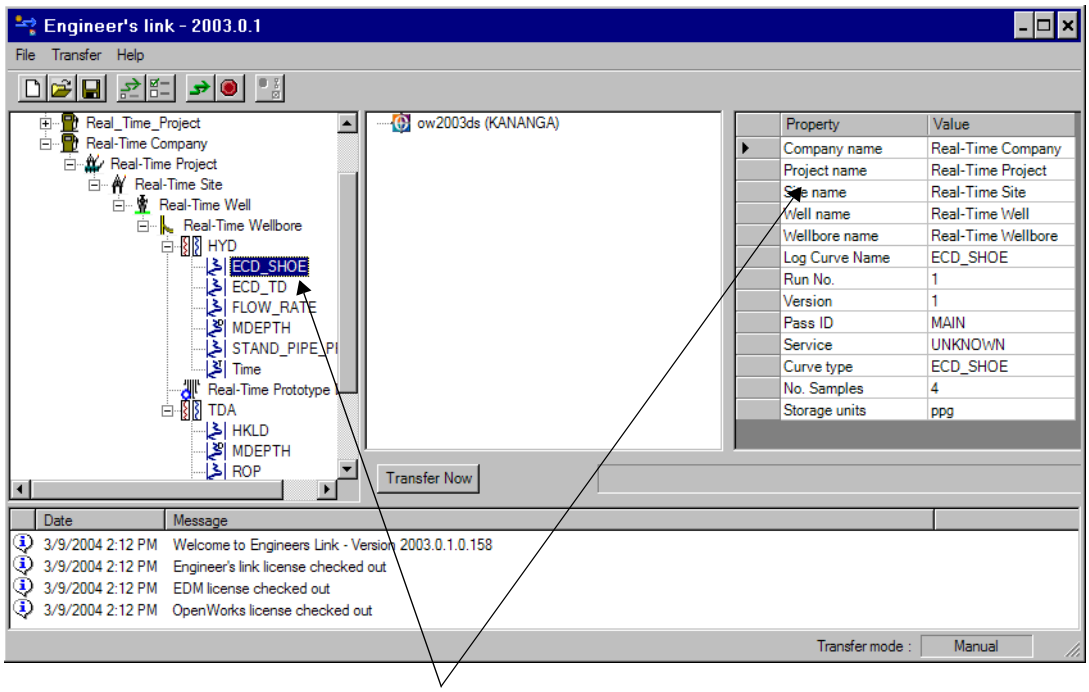
2. Create a new transfer configuration file using **File > New**.

3. Configure and test the connection to the EDM source database. The **Configuration** tabs will appear automatically when you create a new transfer file, however you can also use **Transfer > Configuration > EDM Source** to access the **Configuration** tabs.

You must have a version 2003.11 EDM database...

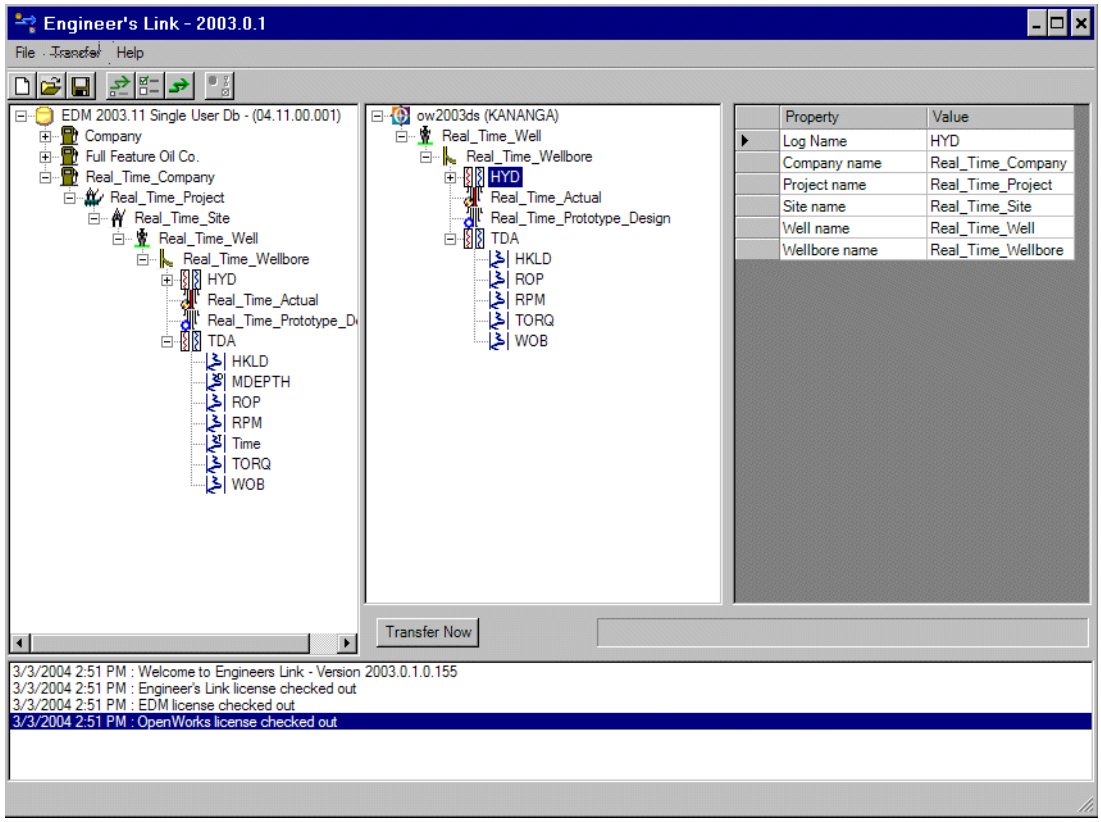
The Engineer's Link application will only function correctly with EDM version 2003.11. If you have an earlier version of the EDM database, you must migrate your data to a version 2003.11 database prior to using the EDM-OpenWorks Link application.

4. Connect to the OpenWorks database using **Transfer > Configuration > OpenWorks Target** tab. Expand the EDM Tree, and select (click on) the EDM wellbore that you want to transfer to OpenWorks.

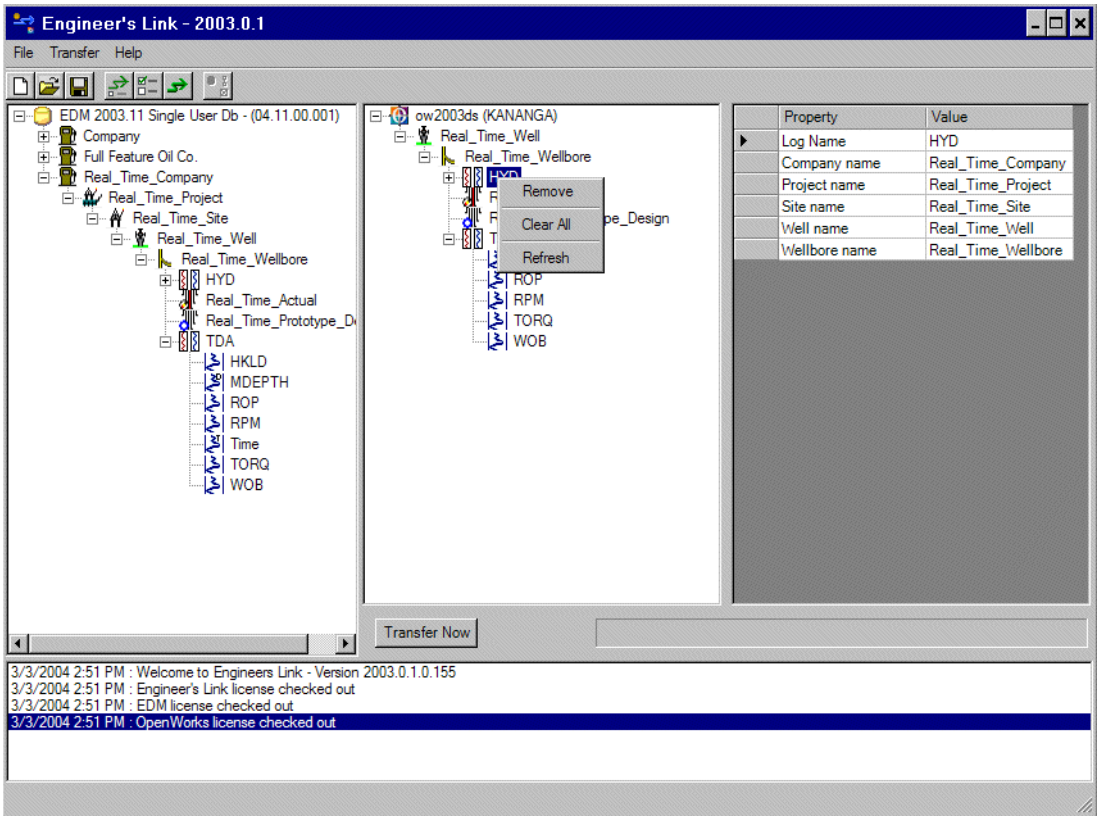


Click on an item in the EDM Source Tree. Notice that the Properties list displays information about that item. Expand the logs to view associated curves.

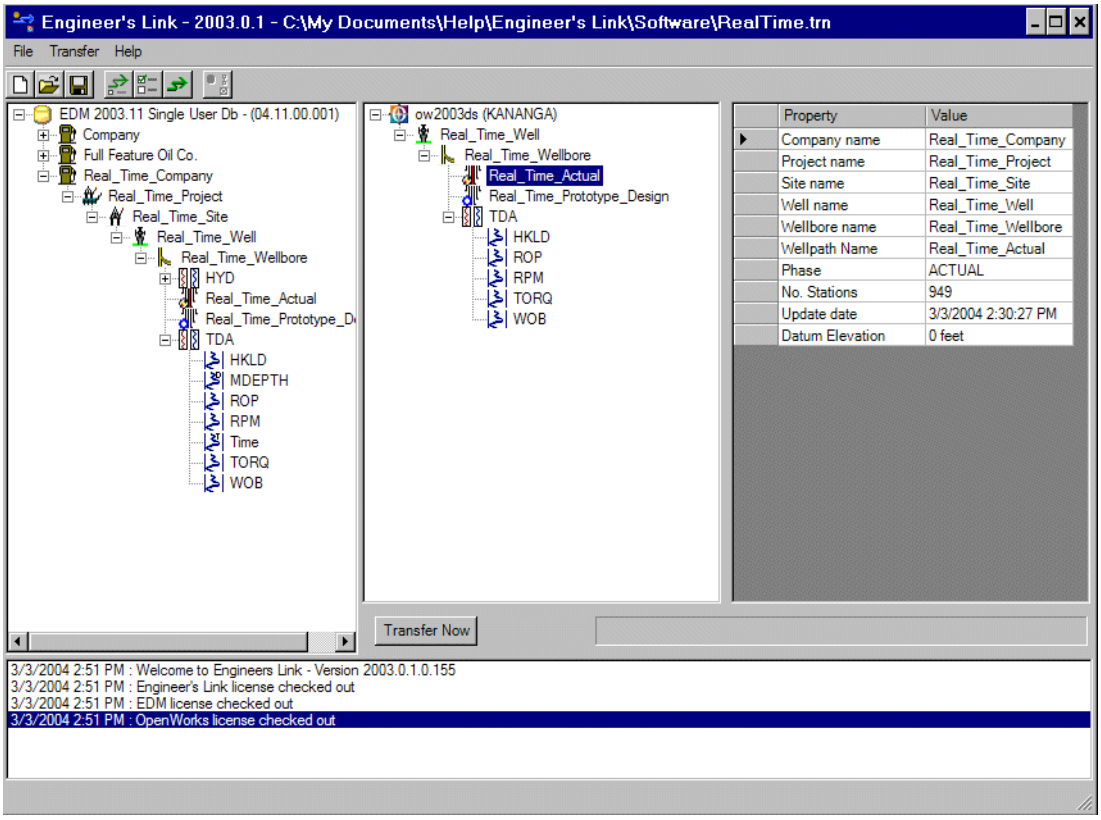
5. Drag the selected well to the OpenWorks Target Tree area. Release the mouse when you have the well in the OpenWorks Target Tree area.



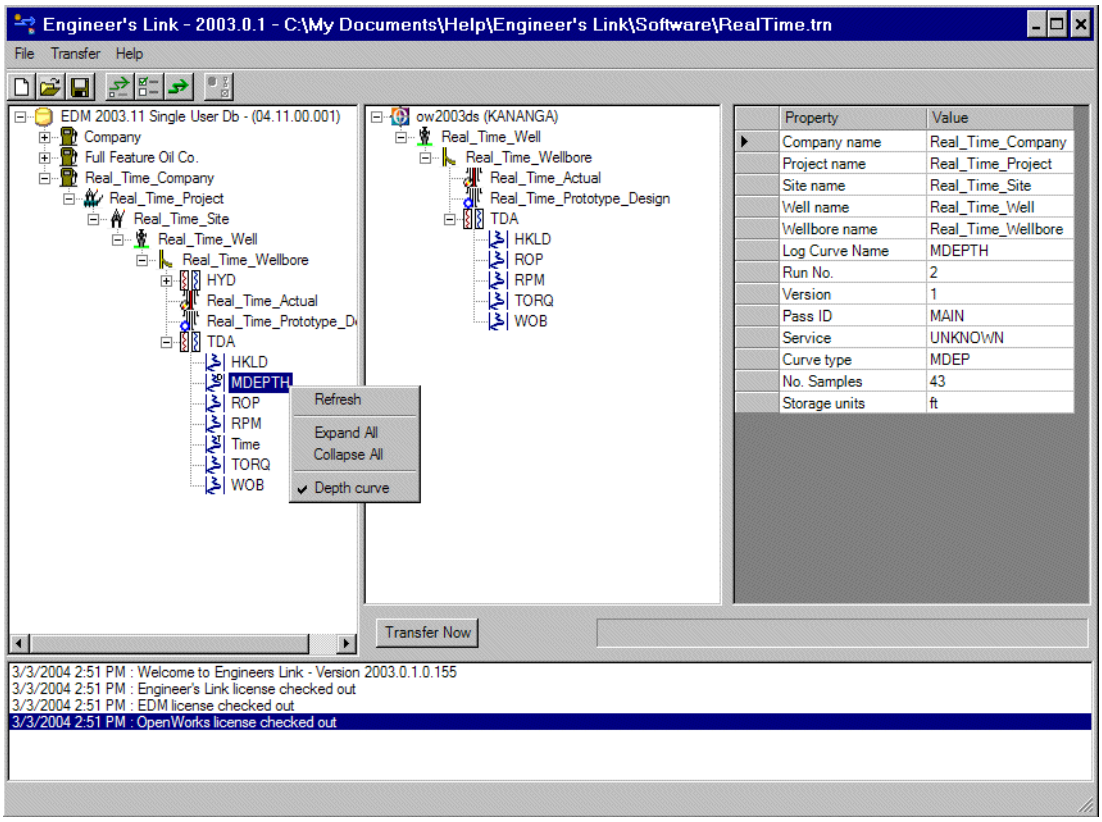
6. You can remove EDM items from the OpenWorks Target Tree that you don't want to transfer to OpenWorks—In this example, HYD from OpenWorks Target Tree. To remove an item, right-click on it, and select **Remove** from the right-click menu.



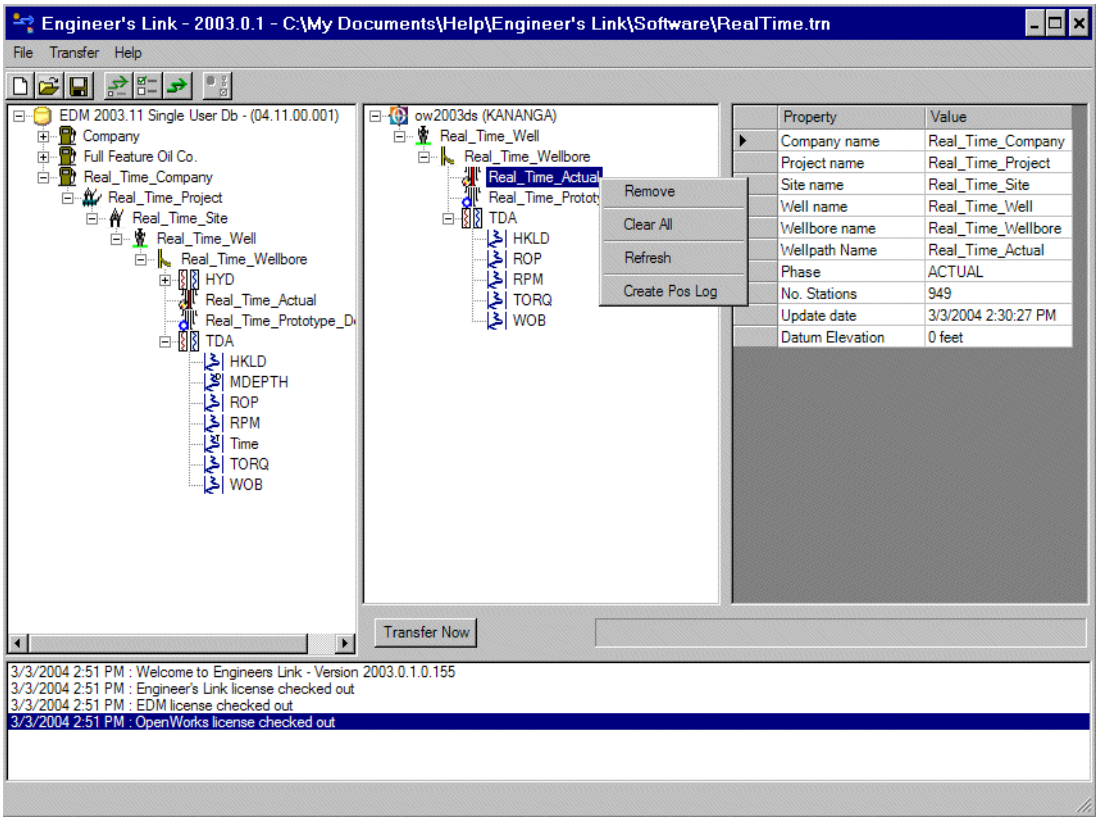
7. Notice the curve HYD is removed.



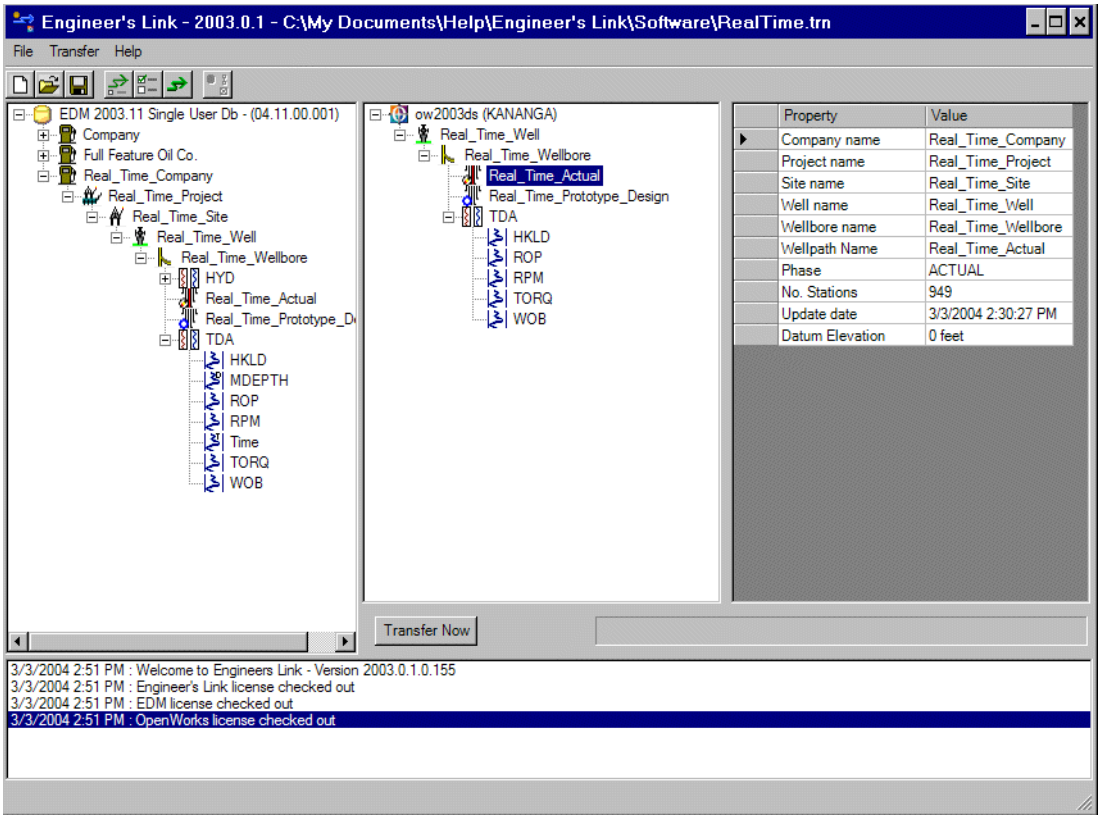
8. You must designate which log curve is the measured depth curve. Highlight the depth curve, right-click, and select **Depth Curve**. Notice the check mark. If you look closely at the curve name, a very small *D* is displayed next to the log curve name indicating it is the designated depth curve.



9. You must indicated which EDM design is to be used to determine the OpenWorks Position Log. Right-click on the desired design, and select **Create Pos Log**. If you don't designate a position log, the OpenWorks Position Log table will not be computed.



10. Use **File > Save** to save the current configuration to a file (*.trn). Once you have saved the configuration file, you can open it at another time to perform the same transfer.



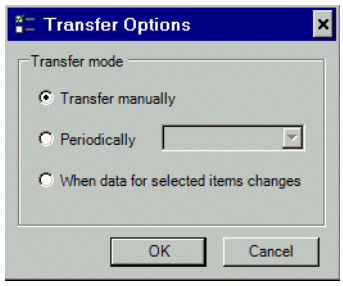
11. Specify the frequency that you want transfers to take place using **Transfer > Transfer Options**.

    - You can specify that you want to tell Engineer's Link when to transfer data by clicking the **Transfer manually** button. If this button is checked, you must use the **Transfer Now** button, or **Transfer > Transfer Now** to initiate the transfer.

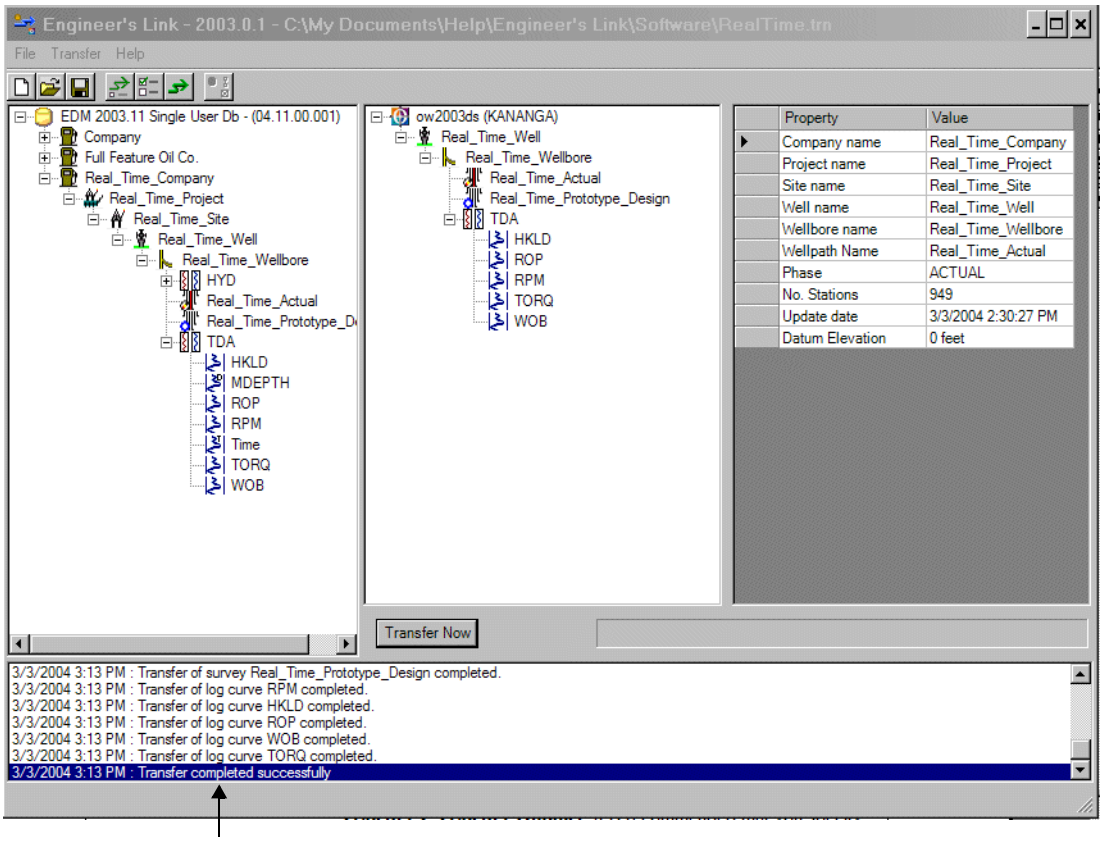
    - You can also specify that transfers occur at a specified time interval by marking the **Periodically** button and specifying a time interval.

    - It is recommended that you specify transfers to occur when the Engineer's Link is notified of a data change within EDM. Data changes in the EDM database are monitored by SAM. To indicate you want transfers to occur based on data changes

with EDM, check the box associated with **When data for selected items changes**.



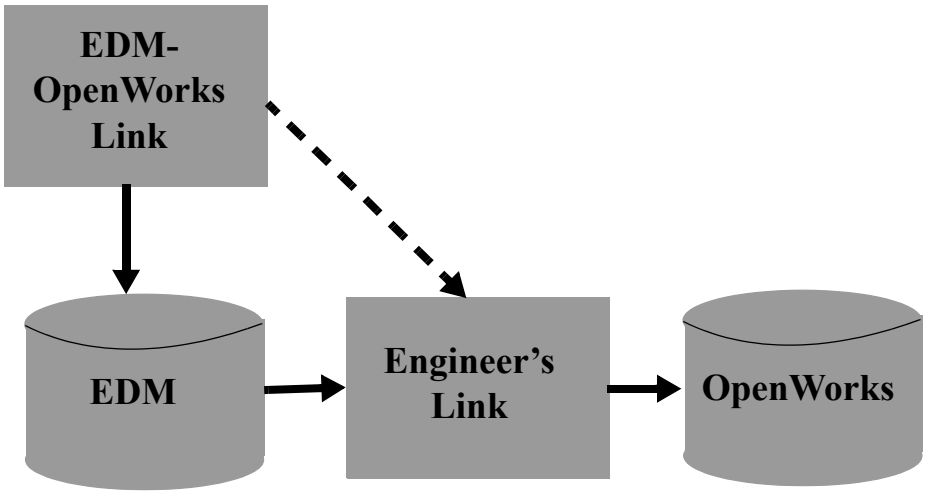
Because we are performing the workflow as a demonstration, we want to start the data transfer immediately. To start the transfer immediately, click the **Transfer Now** button.



Notice the message indicating that the transfer was a success.

12. After the transfer is complete, use **File > Exit** to close the application.

OpenWorks Workflow



Overview

In this portion of the workflow, you will use the *OpenWorks* application to view data that you transferred from the EDM database to a well in the OpenWorks database.

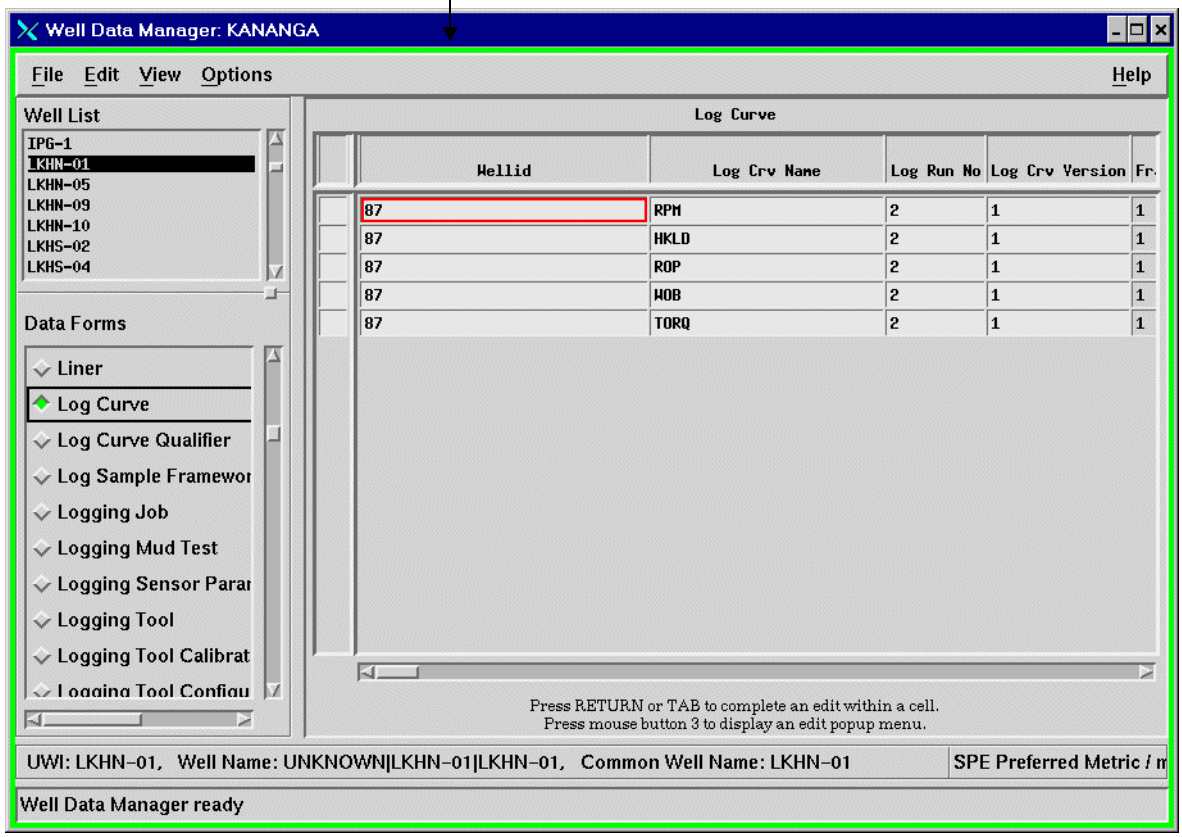
Workflow Steps

1. Launch OpenWorks Well Data Manager using **Start > Programs > Landmark > OpenWorks > Data Managers > Well Data Manager**.

2. Select the well you transferred the EDM wellbore data to.

3. Review the data in the **Log Curve** table.

The Point Dispatcher (PD) is active if the box around the window is green. It is not active if the box is red. When active (green), the OpenWorks PD will listen and update when new data comes through OpenWire.



4. Review the data in the **Directional Survey Data** table.

Directional Survey Data

Depth	Inclination	Azimuth	True Vert Depth
25385.54	83.4700	87.9700	5091.82
25483.94	83.6700	88.1300	5102.84
25575.74	83.1700	87.5500	5113.36
25670.94	83.3500	87.9800	5124.53
25766.04	82.8100	88.1500	5135.99
25861.24	83.0400	88.1900	5147.71
25956.34	83.2700	88.3200	5159.05
26048.24	83.4400	88.7900	5169.68
26143.34	82.5800	88.5700	5181.26
26245.04	82.8500	88.7000	5194.15

Notice the covariant data.

Directional Survey Data

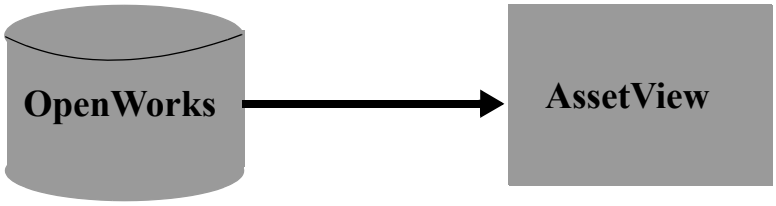
Covariant Xz	Covariant Yy	Covariant Yz	Covariant Zz
-10768.39	746598.56	-3009.78	71523.86
-10850.07	753229.19	-3025.00	72133.86
-10924.54	759418.62	-3038.04	72693.91
-11002.19	765859.62	-3051.64	73277.20
-11080.52	772328.00	-3065.56	73867.42
-11160.92	778827.25	-3079.30	74457.51
-11243.46	785365.94	-3093.95	75057.19
-11321.58	791719.75	-3108.06	75642.18
-11401.18	798298.50	-3121.31	76238.02
-11489.18	805356.94	-3135.50	76875.58

5. Review the data in the **Position Log Data** table.

Position Log Data

Absolute X	Absolute Y	X Offset	Y Offset
633330.50	6150425.50	0.000	0.000
633330.50	6150425.50	0.000	0.000
633330.54	6150425.53	0.039	0.032
633330.59	6150425.57	0.095	0.072
633330.68	6150425.62	0.180	0.123
633330.80	6150425.69	0.304	0.185
633330.97	6150425.76	0.472	0.258
633331.19	6150425.84	0.687	0.344
633331.45	6150425.94	0.951	0.445
633331.78	6150426.06	1.277	0.562

AssetView



Overview

In this portion of the workflow, you will use the *AssetView* application to view data that you transferred from the EDM database to a project in the OpenWorks database.

In a 3D display window, you can render:

- Well Trajectory
- Wellbore Uncertainty Errors
- Bit Run Log Curves

Workflow Steps

1. Use the Decision Space AssetView application to view the data in a 3D window. For details of using AssetView, refer to the AssetView online help.