AUTODESK MAP 3D 2006

WHITE PAPER

Autodesk Map 3D 2006 and Oracle Spatial Basics

Many organizations, such as utilities, telecommunication providers, and government agencies, depend on geospatial data that is stored in an Oracle® Spatial database. Autodesk Map® 3D 2006 enables organizations to expand access to spatial data by letting other groups such as the engineering staff access data that was once accessible only to GIS professionals. Autodesk Map 3D 2006 is designed to reduce bottlenecks and data management costs with powerful CAD tools that are familiar to many users in the organization.

This paper shows how organizations can use Autodesk Map 3D 2006 to save data in an Oracle Spatial database environment.

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Terminology

When working with spatial databases, it is essential to understand the associated terminology and concepts. The following terms are used throughout this document.

DataStore—A collection or integrated set of objects contained in a single data storage location or repository such as an Oracle® Spatial database. Specific to Autodesk Map 3D, a DataStore is a set of feature classes contained in a single data storage location (feature source).

Feature—An abstraction of natural or manufactured real-world objects represented by drawing objects such as points and lines. For example, a line might represent a road feature, and a point might represent a fire hydrant.

Feature Class—A schema element that describes a type of real-world object (feature) such as a road or parcel and the specific properties such as layer, color, linetype, and attribute information that describe the object.

Feature Data Objects (FDO)—Technology that enables Autodesk Map 3D to read and write data in an external geospatial data repository such as Oracle Spatial.

Feature Source—A set of feature classes contained in a single data storage location or repository. Often, the terms *DataStore* and *feature source* are used interchangeably.

Provider—The software component that provides access to data in a particular DataStore.

Schema—A collection of database objects. Used to refer to the complete collection of defined tables and their relationships, metadata, and other information associated with one data set.

Service (also Oracle Service)—An executable process installed in the Microsoft® Windows® registry and administered by the operating system. Once a service is created and started, it can run even when no user is logged on to the computer.

Transaction—A unit of interaction with a database management system or similar system that is treated in a coherent and reliable way independent of other transactions. A single transaction might require several queries, each reading and/or writing information in the database.

Creating a Connection to Oracle Spatial

Before you can use Autodesk Map 3D 2006 to create and edit Oracle Spatial data, you must establish a connection to the Oracle server. The first step is to ensure that you have the Oracle client installed on the machine where Autodesk Map 3D 2006 resides.

Confirm Oracle Client Software

Before you can connect to an Oracle database, make sure you have the correct files installed in the correct directories.

There are two ways to install the Oracle client:

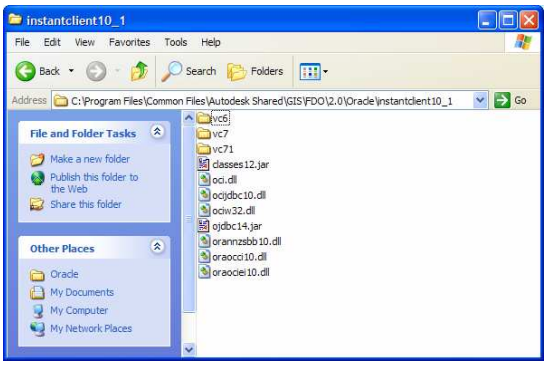
- **Oracle Installer**—Large distributable but convenient to install. Installation also includes client-side tools such as the Net Configuration Assistant, tnsping and sqlplus.
- **Oracle Instant Client**—Smaller distributable but does not include client-side tools. Files can be copied without an installer script.

Using the Oracle Installer

Use the Net Configuration Assistant to point to the Oracle service that you will use. You must provide a service name and machine name.

Using the Oracle Instant Client

1. Download the Oracle instant client from the Oracle website at www.oracle.com/technology/tech/oci/instantclient/instantclient.html.
2. Unzip the Oracle Instant Client into the following directory: *C:\Program Files\Common Files\Autodesk Shared\GIS\FDO\2.0\Oracle*.



3. The Oracle Instant Client does not install the Net Configuration Assistant, so download a working *tnsnames.ora* from your IT department or download a sample to modify from ftp://autodeskgeospatial.com/FDO/tnsnames.ora and save it in the *C:\Program Files\Common Files\Autodesk Shared\GIS\FDO\2.0\Oracle* directory.
4. In the System Control Panel (Advanced tab), add or modify two environment variables (user or system) as follows:
   - Edit the TNS_ADMIN variable and assign it the value that points to the directory that contains the *tnsnames.ora* file: *C:\Program Files\Common Files\Autodesk Shared\GIS\FDO\2.0\Oracle.*
   - Edit the PATH environment variable (or add it if necessary) and add the directory of the Instant Client: *C:\Program Files\Common Files\Autodesk Shared\GIS\FDO\2.0\Oracle\ instantclient10_1.*

Create a New Feature Source

Start Autodesk Map 3D and type **fdosysadmin** at the prompt.

Log on to the Data Source

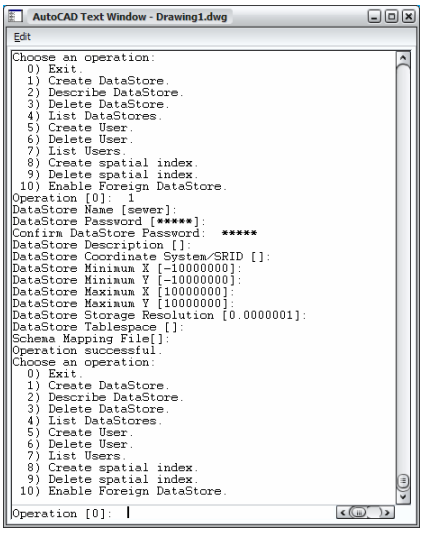
1. In the AutoCAD® Text Window provide the name of the data source (the Oracle service name).
2. Type **sys** for the administrator name (use the database Sys account).
3. Provide the password for the Sys account.

Note: If you do not have access to the Sys account, refer to technical solution *TS1052468: Creating FDO Roles Without SYS Privileges* available on the Autodesk website at www.autodesk.com/support.

Create the DataStore

1. Type **1** to create a new DataStore.
2. Provide a name for the DataStore. This name will be referenced throughout Autodesk Map 3D so use a descriptive name that's easy to recognize.
3. Enter a password, and confirm it.
4. Enter the Coordinate System/SRID (Oracle Spatial Reference Identification Number), the minimum and maximum Xs and Ys, and the storage resolution.

   Note: These variables affect accuracy. For more information see the Autodesk Map 3D help.
5. Enter the Oracle tablespace you would like use.
6. Leave the Schema Mapping File empty. In this example you create a new schema.
7. After you have provided all the parameters, the DataStore will be created.



8. Use Option 4 (List DataStore) to verify that your newly created DataStore is ready.

Create the User

1. Type **5** to start the creation of a new user. Provide a user name and password (confirm the password)

   Note: This user name will be used in Autodesk Map 3D to log into the feature source.
2. Type **7** to verify that the user has been created.

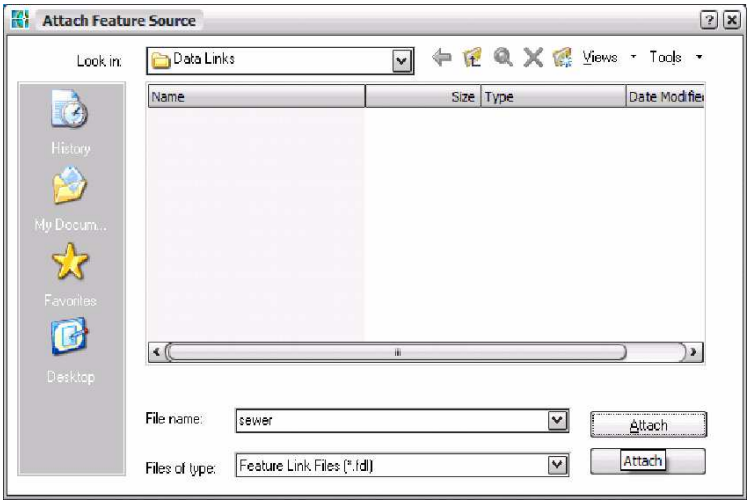
Connect Oracle to Autodesk Map 3D

Once you have created a DataStore and user, use Autodesk Map 3D to connect to the Oracle database.

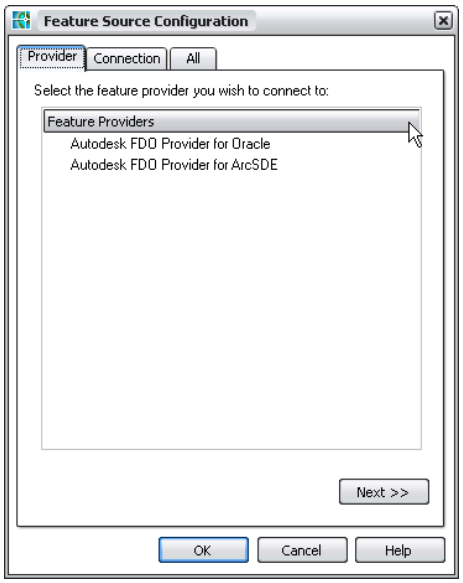
1. In Autodesk Map 3D open the drawing you want to use with Oracle Spatial.
2. On the Explorer tab of the Task Pane, click Attach and then choose Feature Source.

3. In the Attach Feature Source dialog box, specify a name for the feature link file (*.fdl*). An FDL file is where the connection information for the server is retained.

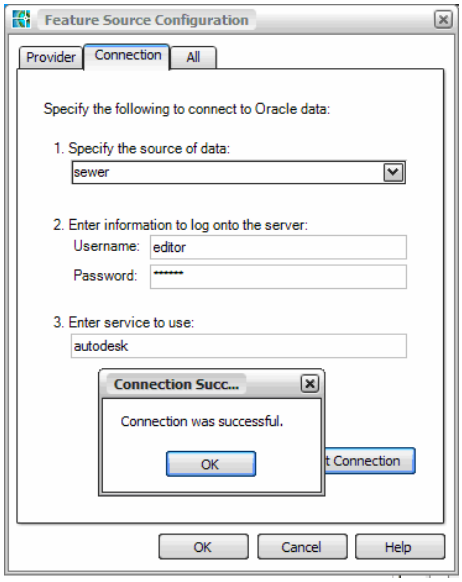
   Note: The name that you provide for the FDL file is used to identify the feature source. Use a descriptive name for easier recognition.



4. On the Provider tab of the Feature Source Configuration dialog box, select Autodesk FDO Provider for Oracle.



5. On the Connection tab of the Feature Source Configuration dialog box, specify the following to connect to the Oracle service:



- Specify the source of the data. This is the DataStore name that you created with the fdosysadmin tool.
- Enter the user name and password.
- In the Enter Service to Use box, type the Oracle service or DataStore you used to log on in fdosysadmin.
- Click Test Connection.

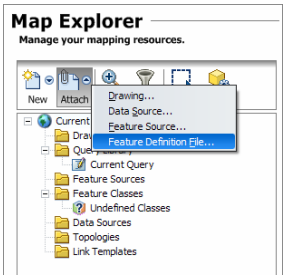
Note: If you receive an error message, make sure the Oracle instance is installed and running. You can use tnsping (in a command prompt) with the service name to check if the listener is running.

Working with Feature Classification

Autodesk Map 3D 2006 uses feature classification to categorize and organize data that resides in a spatial database. The following section shows how you can use feature classification tools in Autodesk Map 3D in conjunction with storage of data in an Oracle Spatial database.

Create Feature Classification Definitions

You can create feature classification definition files (in case of an empty database), or Autodesk Map 3D can do it automatically (in case the database already contains features).



Specify a Feature Definition File

Organizations often have predefined feature class definitions that align to established standards such as SDSFIE (Spatial Data Standard for Facilities, Infrastructure, and Environment) class descriptions. To use an existing feature definition file, do the following:

1. Make sure you are logged in to Autodesk Map 3D with Alter Feature Class (that is, superuser) privileges.
2. Attach a feature definition file.
3. Browse to an XML file with your favorite class descriptions. This example uses the SDSFIE class descriptions.

Generate Feature Definitions Dynamically

When working with Oracle data, Autodesk Map 3D creates feature definitions dynamically when you query the feature source. Dynamic feature definition creation requires the creation of a blank definition file.

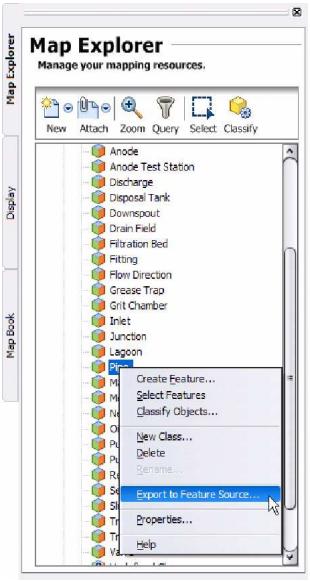
1. Make sure you are logged in to Autodesk Map 3D with Alter Feature Class (that is, superuser) privileges.
2. On the Explorer tab, click New and then select Feature Definition File.
3. Create a blank feature definition file. A feature definition file is an XML file that is stored outside the drawing and contains feature class information.

Add Feature Definitions to the Oracle Schema

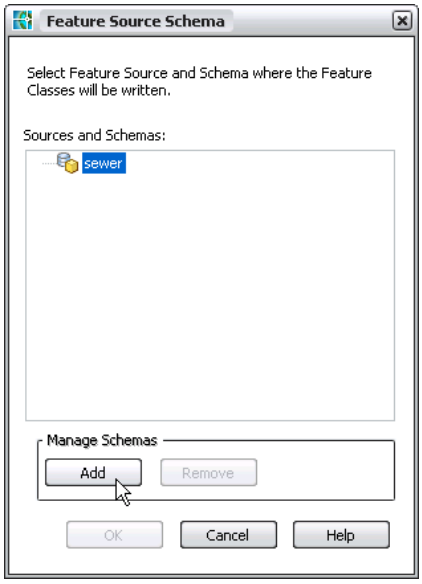
At this stage the Oracle DataStore has an empty schema. Before you can add feature instances into Oracle, you must export the feature definition to Oracle.

Note: It's good practice to have one-to-one name mapping between the features in the Autodesk Map 3D feature definition and Oracle Spatial.

1. On the Map Explorer tab, right-click the feature class you want to export to Oracle, and choose Export to Feature Source.



2. The Feature Source Schema dialog box appears; click the Add button to create a new feature in the database. It's good practice to give the Oracle feature in the database the same name as the feature class.



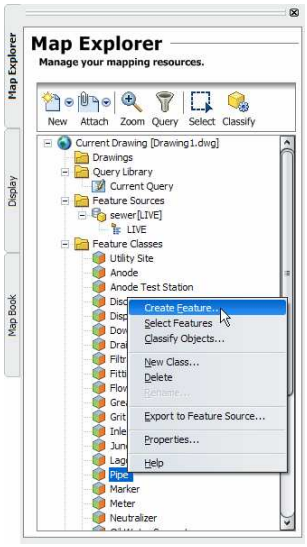
3. Export all the feature classes that you want to manage in Oracle Spatial.

Create New Features

Autodesk Map 3D is often used to create new geometry. Use feature classification to quickly and easily create new entities that inherit properties defined by a feature class.

Digitize a New Pipe Feature

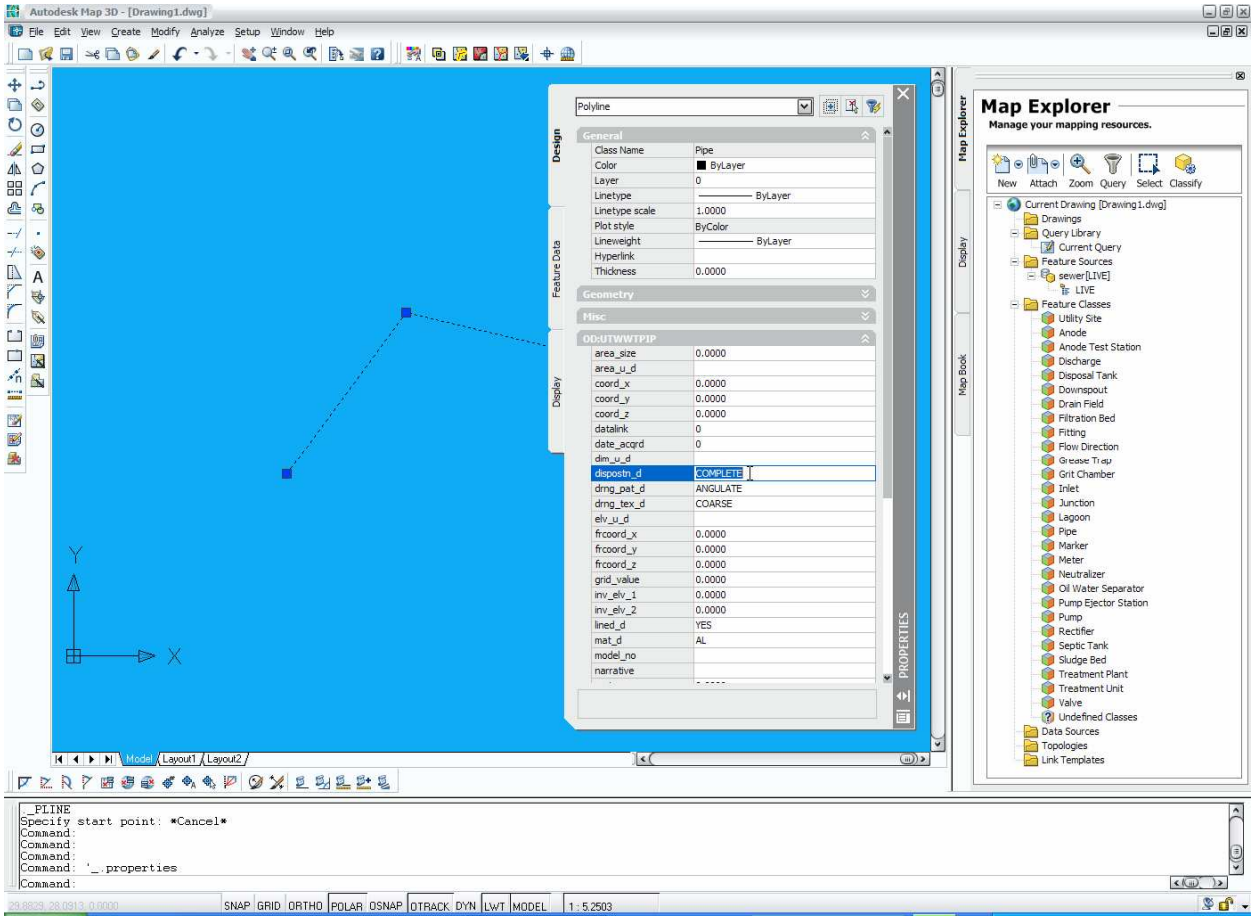
1. To digitize a new instance, right-click an existing feature class (or double-click the feature class), and choose Create Feature.



2. Digitize the feature on the map. Click Enter when you are done.

Edit Feature Attributes

- Double-click the feature, and change the *dispostn_d* attribute from INCOMPLETE to COMPLETE.

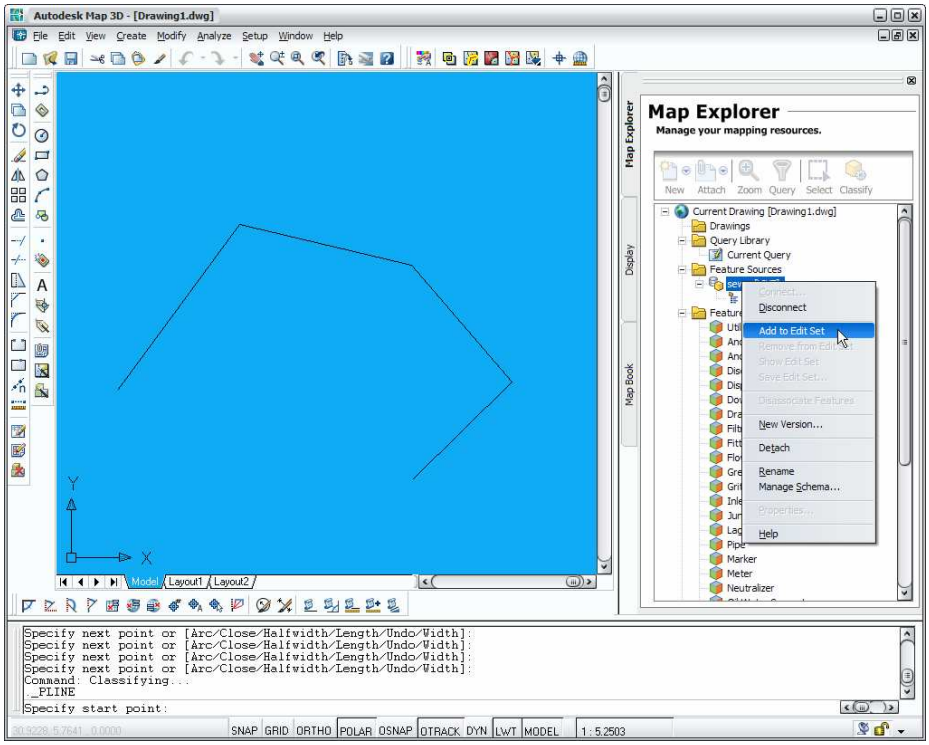


Write Edits to DataStore

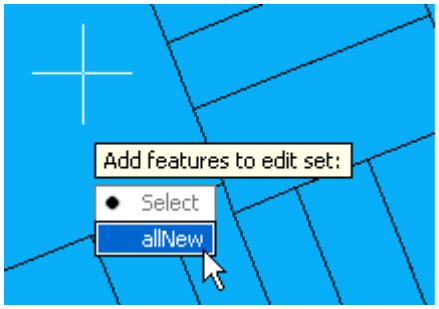
Now that you have digitized the feature and set the attributes correctly, you next add the feature to the edit set.

Add Objects to Edit Set

1. On the Map Explorer tab, under Feature Sources, right-click the displayed feature source, and choose Add to Edit Set.



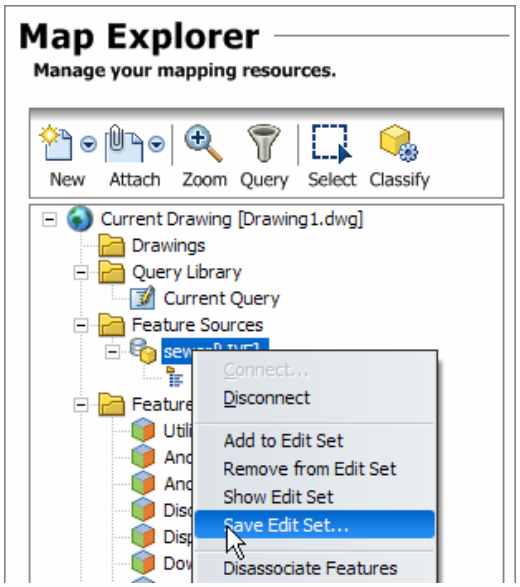
2. You are then prompted to either manually select the edited features or choose allNew to automatically select the edited entities. For this example, add all the newly created features to the edit set.



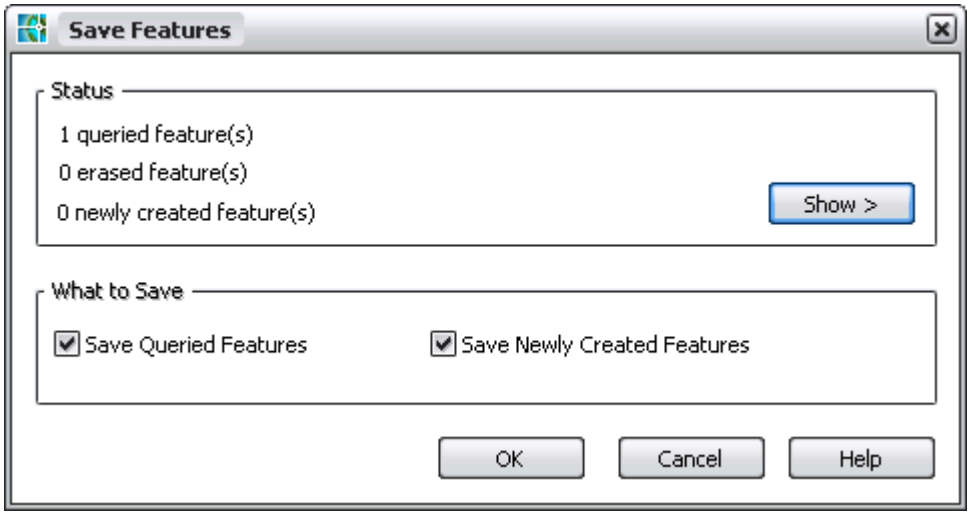
Save Edits

Once you have added objects to the edit set, you can then save the edited entities to the DataStore.

1. On the Map Explorer tab, under Feature Sources, right-click the displayed feature source, and choose Save Edit Set.



2. The Save Features dialog box appears. Click the Show button to verify that the correct objects will be saved to the DataStore, and then click OK to save the edits to Oracle.



Note: When objects are saved to the DataStore, they disappear from the drawing.

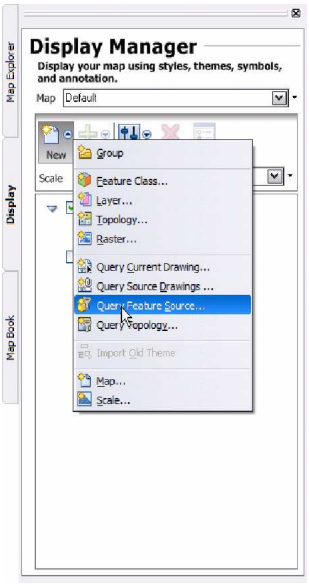
Edit Offline

If you disconnect from the feature source while you have objects in the edit set, those objects remain locked in the feature source (if the feature source supports locking). You can edit the drawing offline. When you reconnect to the feature source, the objects in the edit set are linked back to the locked objects in the feature source, and you can save your changes back to the feature source. This releases the lock.

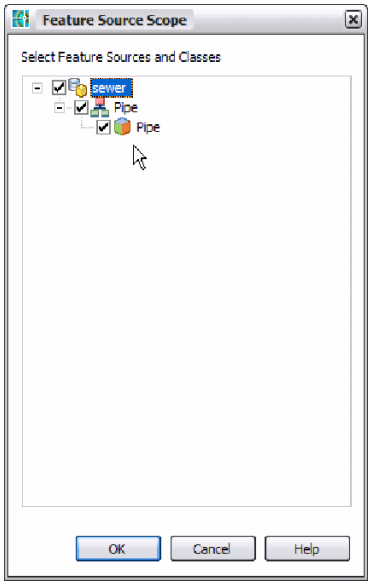
Query Features into the Map

To query the features from the feature source, use Autodesk Map 3D software's Display Manager. Make the Display Manager visible by clicking the Display tab in the Task Pane.

1. On the Display Manager tab, click New, and then choose Query Feature Source.



2. The Feature Source Scope dialog box appears with a list of all feature classes. Expand the list and select the feature class or classes that you want to query into your drawing project.



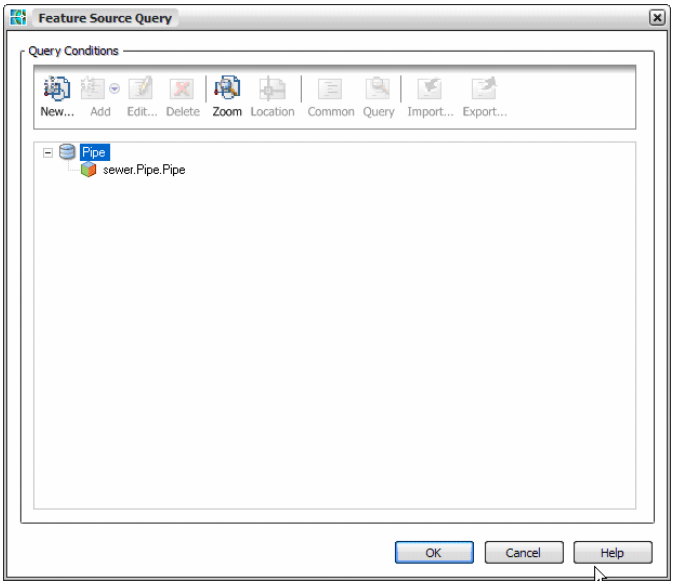
3. Click OK.

The Feature Source Query dialog box shows the feature class you selected. In this dialog box you can add query conditions to filter data based on location and properties, and specify custom SQL query statements.

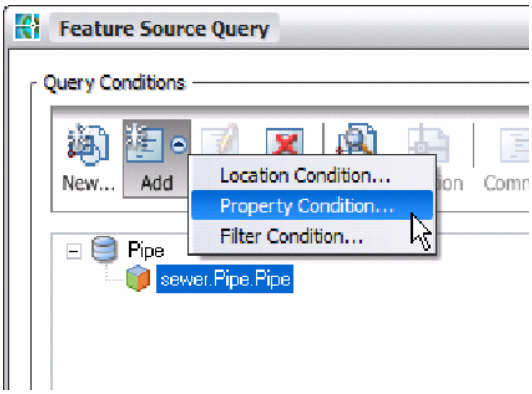
Define a Property Query Condition

For this example you query all pipes that have a COMPLETE status within a certain rectangle.

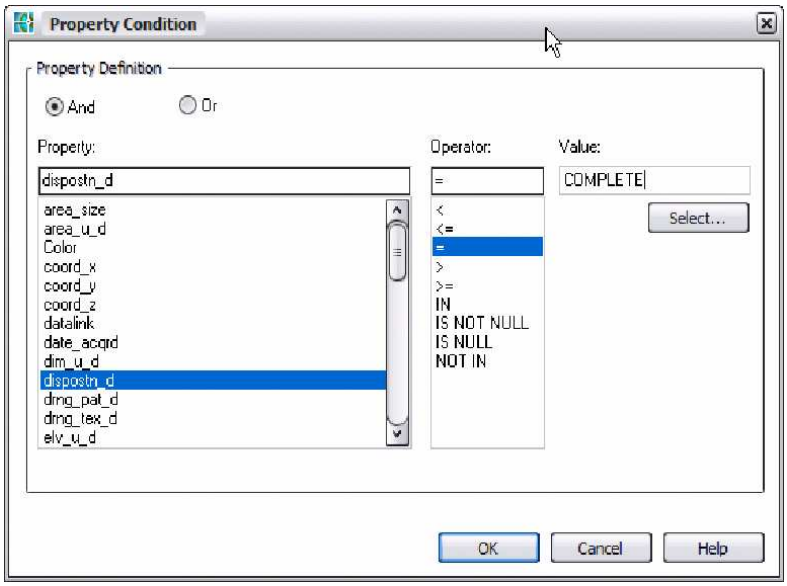
1. Select the feature, and the Add button highlights.



2. Click the Add button, and choose Property Condition.



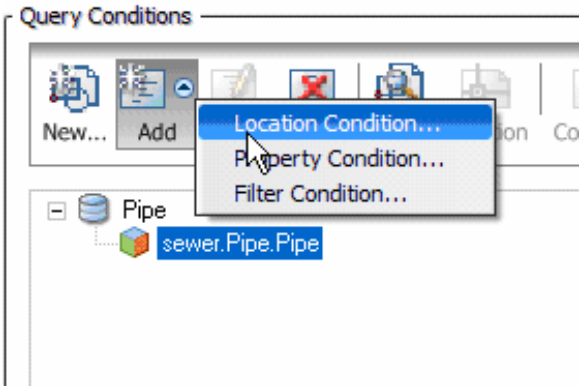
3. Set dispostn_d = COMPLETE, and click OK.



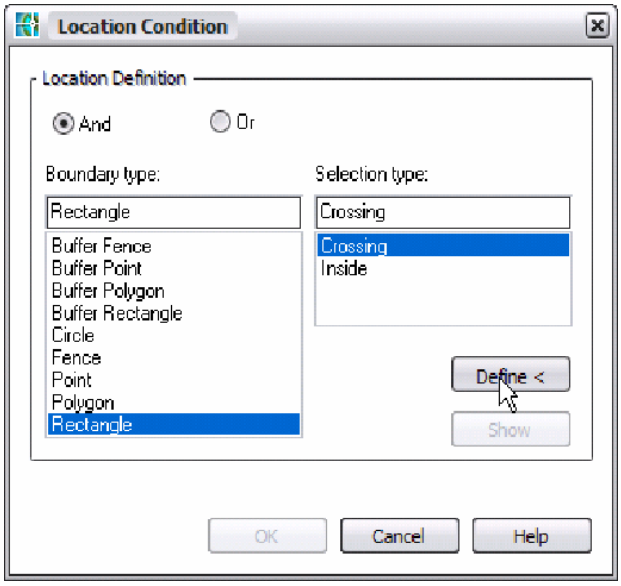
Add a Location Condition

Add multiple query conditions to further refine the query.

1. Click the Add button, and choose Location Condition.

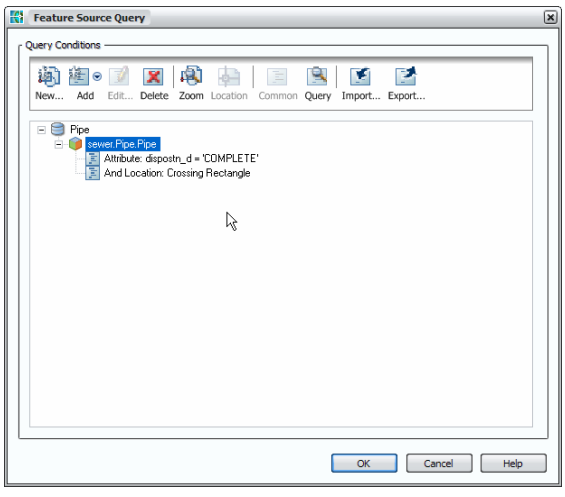


2. Select the Rectangle boundary type, and then click Define. This enables you to set the bounding rectangle for your query. Click OK.



4. When the query has been defined, click OK to retrieve the data from the DataStore.

Note: Data may not be immediately visible in the map. Use AutoCAD zoom tools to zoom to the extents of the map.



Working with Long Transactions and Versions

Often, several departments in an organization use enterprise spatial databases, such as Oracle Spatial. This interdepartmental use of spatial data creates challenges when it comes to managing that data. As a result, enterprise databases must provide the ability for multiple concurrent users to create and edit the same data without creating duplicates or multiple copies of the original data. With expanded spatial database access introduced in Autodesk Map 3D 2006, a true multiuser editing environment is now available to users of enterprise spatial databases. Before illustrating how Autodesk Map 3D supports a multiuser editing environment, it is useful to introduce some specific terminology.

Every edit or change to data stored in a database is a *transaction*. There are two types of transactions:

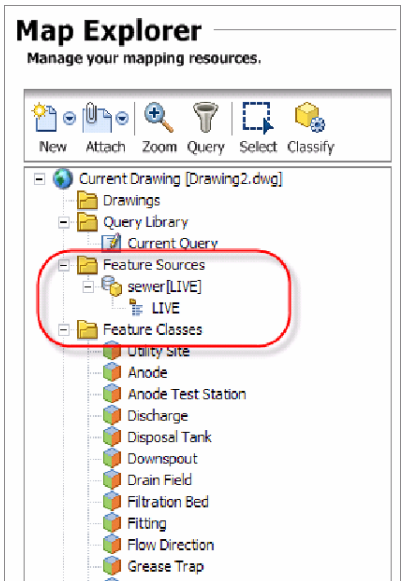
- **Short transactions**—Changes made to data usually completed within a matter of seconds and within a single session; normally used for ordinary maintenance of the database.
- **Long transactions**—Changes made to data over several sessions; normally used for larger projects, such as a major equipment upgrade or extension to a service network. The data may change many times before it is considered permanent, and the time required before committing the changes may be several hours to several months.

Autodesk Map 3D 2006 supports long transactions. Versioning is a type of long transaction. Simply stated, versioning is a method by which changes to a multiuser database are recorded and managed by creating a "version" or alternate view of the database without duplicating the original data.

Using the versioning features of Autodesk Map 3D 2006, designers and analysts can create and store more than one scenario in the database. This is particularly useful when working with designed versus as-built information or for creating what-if scenarios during the design phase of a project.

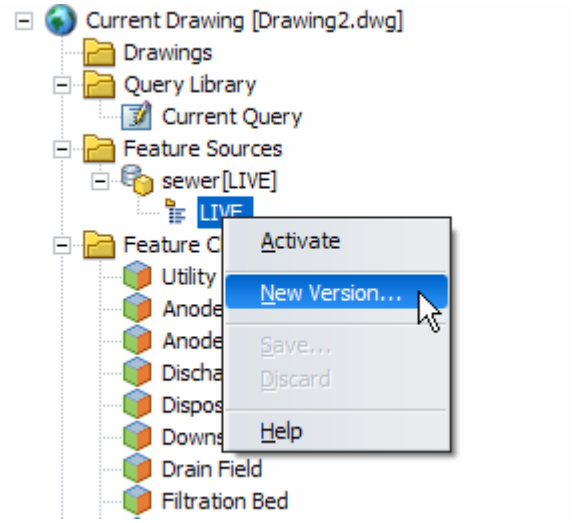
Create a Version

All version-enabled Oracle databases contain a live version, which is the original published view of the database. This original parent version is the root of a version tree. Successive versions are children of the live version. When first connecting to an Oracle database, Autodesk Map displays this live version on the Map Explorer tab.

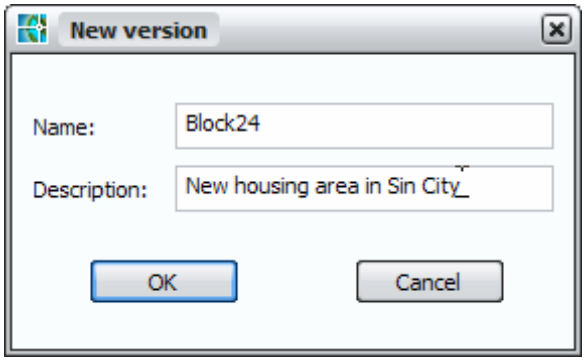


Note: By default, Oracle tables are version enabled.

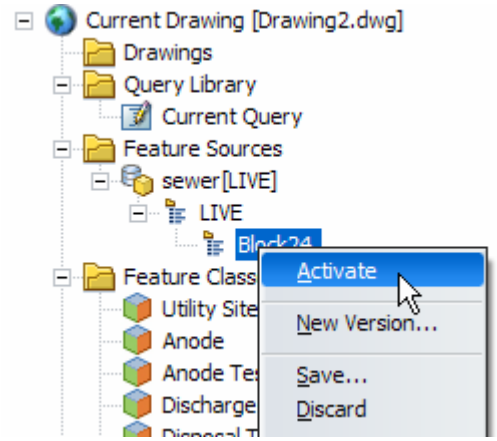
1. To create a new version, on the Map Explorer tab, right-click the feature source and choose New Version.



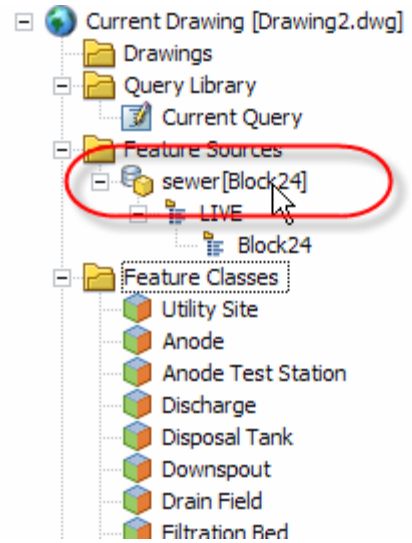
2. The New Version dialog box appears. This is where you provide a name and description of your new version.



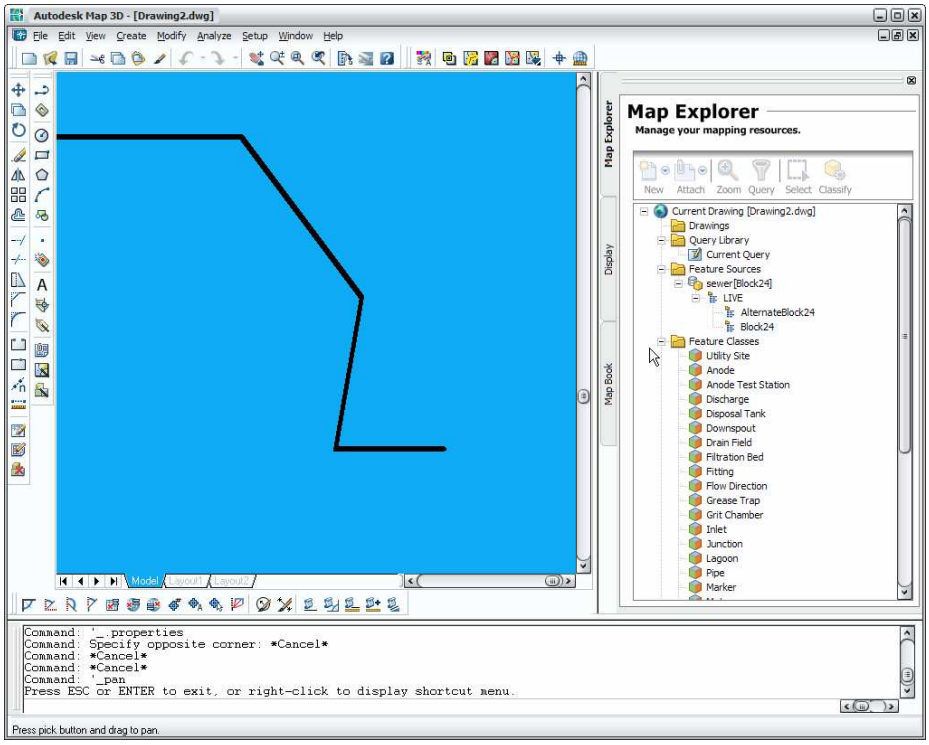
3. Once you have created a version, you must activate it. Note that the new version lies beneath the live or parent version. Right-click the version, and choose Activate.



4. Now that the new version is active, the version appears next to the feature source name defined earlier. Use the Display Manager (Display tab) to query in the appropriate data as outlined in the “Query Features into the Map” section earlier in this document.

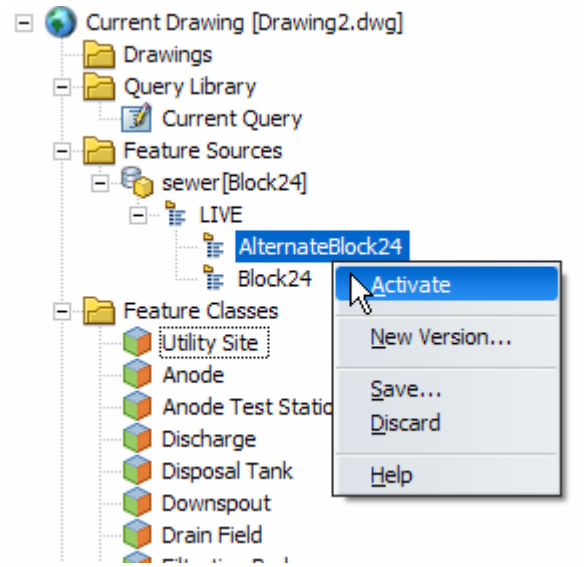


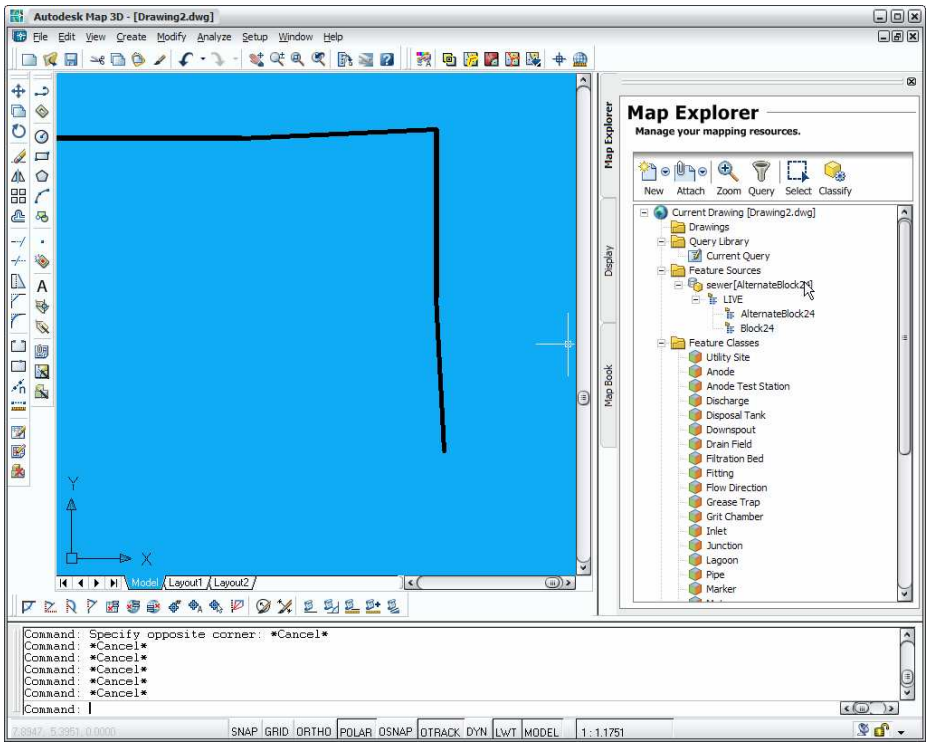
5. Once you have queried the data into Autodesk Map 3D, you can edit it and save it to the versioned table. Use the same procedure for saving edits to the DataStore for versioned and nonversioned tables. See “Write Edits to DataStore” earlier in this document.



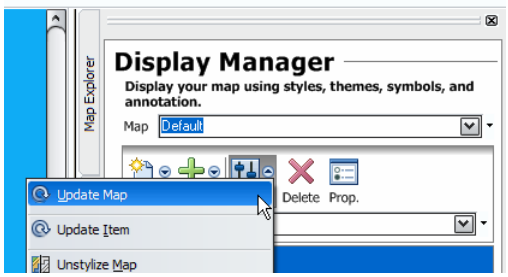
One of the benefits of versioning is that you can quickly compare different views of the data, such as a series of proposed road designs. In Autodesk Map 3D you simply switch between the different versions or parent.

6. On the Map Explorer tab, right-click the version that you want to make current, and choose Activate.



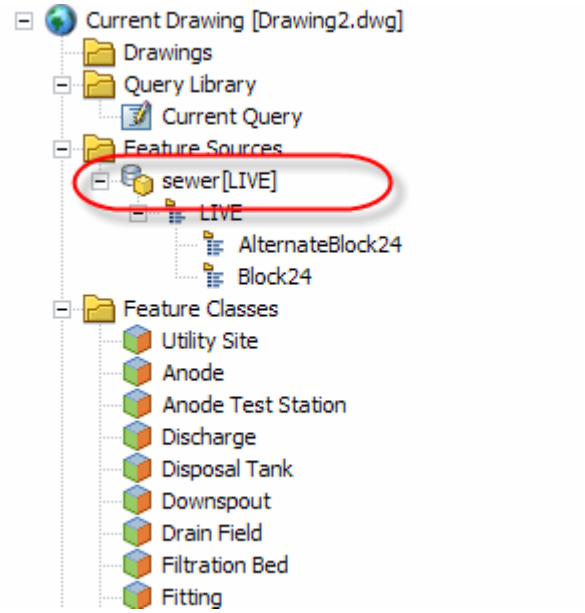


7. Once you have activated a version, switch to the Display Manager (Display tab) and choose Tools>Update Map. Updating the map requeries the DataStore and displays the version that is active.

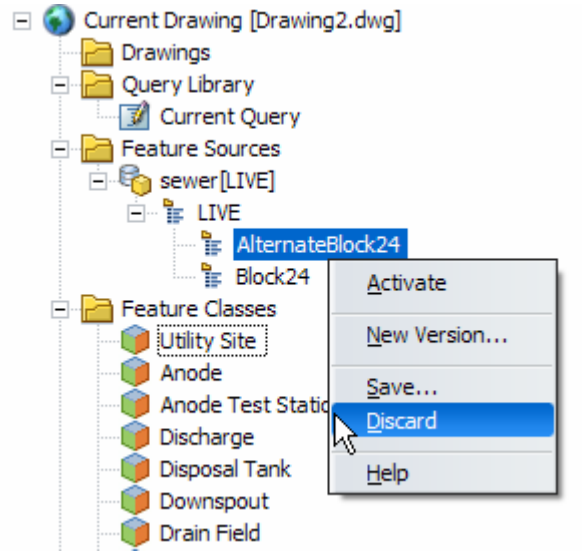


Commit or Discard a Version

When the project is finished, or at the end of an editing session, you can discard or commit (save) edited features to the parent version, and reconcile any conflicts. Before discarding or committing versions to the parent, make sure the parent is active and the name of the parent appears next to the feature source name.



- To save or discard a version, right-click the version name on the Map Explorer tab, and choose Save or Discard.



Working with the FDO Provider for Oracle

Autodesk Map 3D software's Feature Data Objects (FDO) uses a provider to connect to different DataStores. When working with the Autodesk FDO Provider for Oracle, you must follow specific parameters as well as understand some limitations.

Requirements

Autodesk Map 3D 2006 requires the following software when connecting to Oracle Spatial.

- **Oracle 10g** Client, release 10.1.0.2
- **Oracle Database 9i**, release 9.2.0.6 with Oracle patch 4069364 or **Oracle Database 10g**, release 10.1.0.3 with Oracle patch 3981131

Tips and Suggestions

Use the following tips and suggestions when working with Autodesk Map 3D and Oracle Spatial.

Schema and Feature Classes—The current release of the FDO Provider for Oracle supports creation of new schemas and feature classes. Use Schema Manager to manage the schema.

Symbol Styles—If you've applied a symbol style to an object from a feature source and you want to edit the object, you must turn off the symbol style while you edit the object. Otherwise, the symbol interferes with the feature class definitions and attribute data.

Coordinate Systems—If you have a coordinate system assigned to the current drawing, avoid queries that retrieve features from more than one coordinate system within one feature source. If a single feature source query retrieves features from more than one coordinate system, the objects may appear in the wrong location in your drawing. If the features are in different feature sources, or are all in the same coordinate system, this is not an issue.

Direct Connect—The current release of the FDO Provider for Oracle does not support direct connections.

Documentation—In-depth documentation can be found in the *Autodesk FDO API Developer's Guide* available in the Autodesk Developer Center at www.autodesk.com/developer.

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