AUTODESK UNIVERSITY 2013

Using the Power of AIMS and Autodesk® AutoCAD® Map 3D to Manage Assets and Facilities

Recep Alakus – Hume City Council, Victoria Australia

GS1452

Autodesk® Infrastructure Map Server software can be used with AutoCAD Map 3D software to efficiently manage and maintain assets and infrastructure without requiring a traditional tabular asset management application. This class demonstrates setting up a GIS infrastructure that incorporates Autodesk Infrastructure Map Server, AutoCAD Map 3D, and the spatial features of an Oracle® database. The system can be used not only for comprehensive asset management, but also graphically and in a geospatial environment. The class also illustrates numerous asset lifecycle management workflows for day-to-day operations, such as data capture and storage, reports, and analysis within a multiple-modules format. The class presents numerous case studies of management processes for road assets and building facilities, including field data capture of asset conditions and work order processes.

Learning Objectives

At the end of this class, you will be able to:

- Explain how the network-centric base GIS Infrastructure is set up with Autodesk Infrastructure Map Server
- Use Map 3D as the primary application to create and record spatial asset objects
- Develop workflow processes between Map 3D and an Oracle database
- Create actual and themed maps and map layers to display asset condition categories with Autodesk® Infrastructure Studio

About the Speaker

Recep Alakus have been working as GIS administrator at Hume City Council since the mid-90s. He developed Council's original GIS strategy and has been responsible for its implementation over the years. He has a background in architecture, and has acquired a certificate of cartography and a postgraduate diploma in GIS from Melbourne University. He is a foundation member of the Spatial Sciences Institute of Australia, and past chairman of its Victorian Region. He also served as a committee member on the Victorian State Local Government GIS Reference Group for some years. Recep was the winner of Victorian Spatial Sciences Excellence Award in 2007 and 2009, and was one of the finalists in Asia Pacific Spatial Excellence Awards. Recep is a regular presenter in Spatial Sciences Institute conferences in Australia, and has papers published in various journals. Recep also attended Autodesk University Conferences in USA three times and presented twice in 2008 and 2011.

recepa@hume.vic.gov.au

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Introduction / Background

Hume City Council's Intranet GIS Site which consists of Autodesk Infrastructure Map Server, Map 3D and Oracle Spatial is utilized to manage and maintain almost all of its municipal assets.

Its primary functions are asset inventory, management / maintenance of assets and facilities and asset condition modeling as well as assisting other services type functions such as waste collection emergency management processes, property valuations and demographics snapshots.

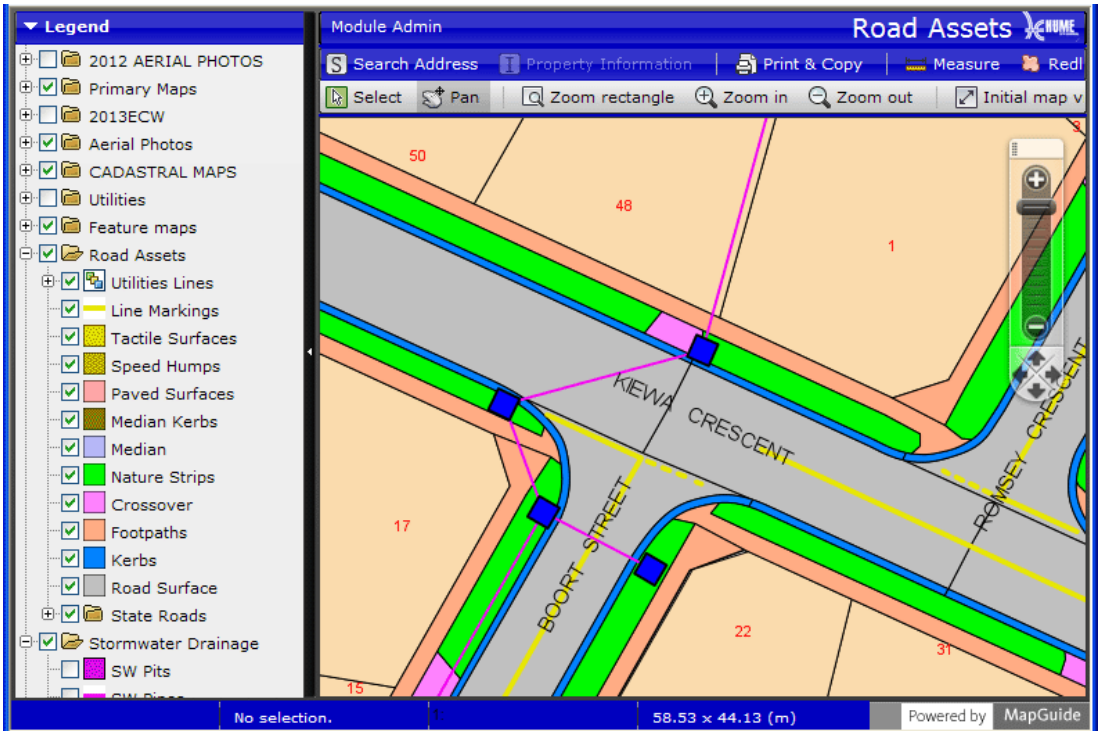
Almost all of the processes required for these tasks such as data capture, storage, reports, modeling and analysis are carried out over this site spatially and graphically and accessible to all staff over the councils IT network in a multiple module web interface.

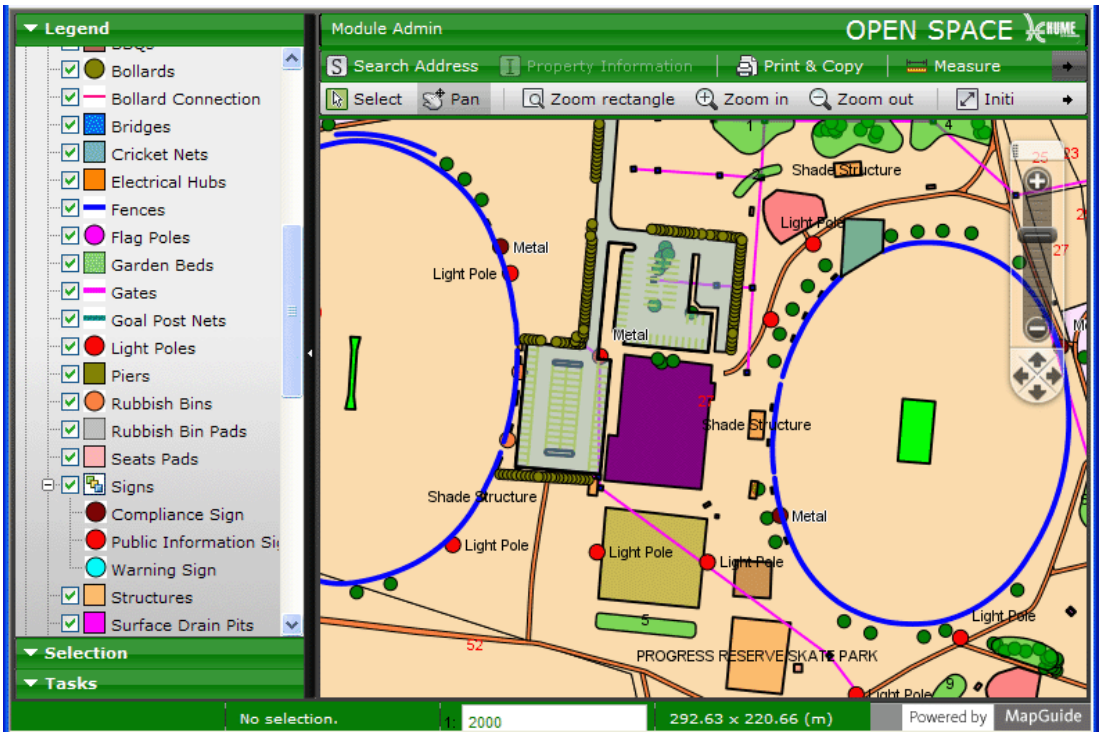
Although all modules map components are published through the AIMS 2013 server so far only the **Drainage** module is fully migrated in the TB (Topobase) format.

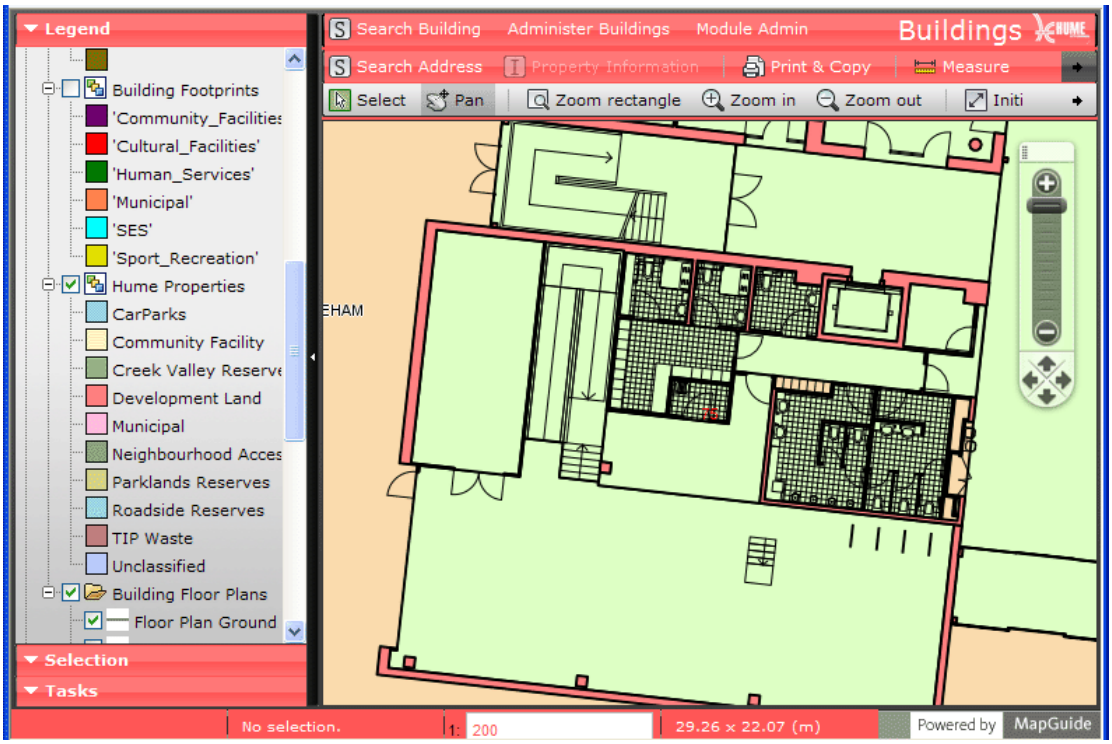


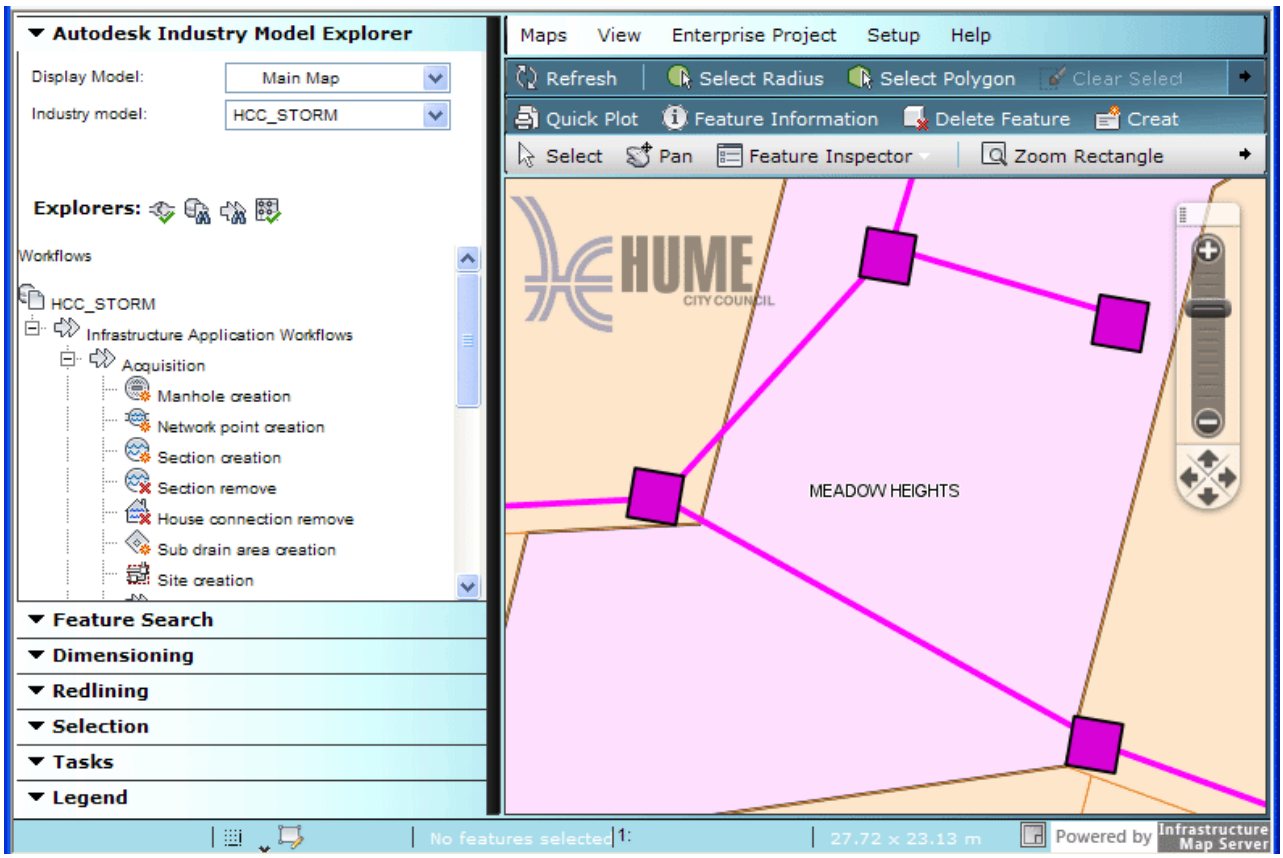
Snapshots from Exiting GIS Asset modules

The following screenshots are from currently available GIS modules used primarily for asset and facility management at Hume City Council.

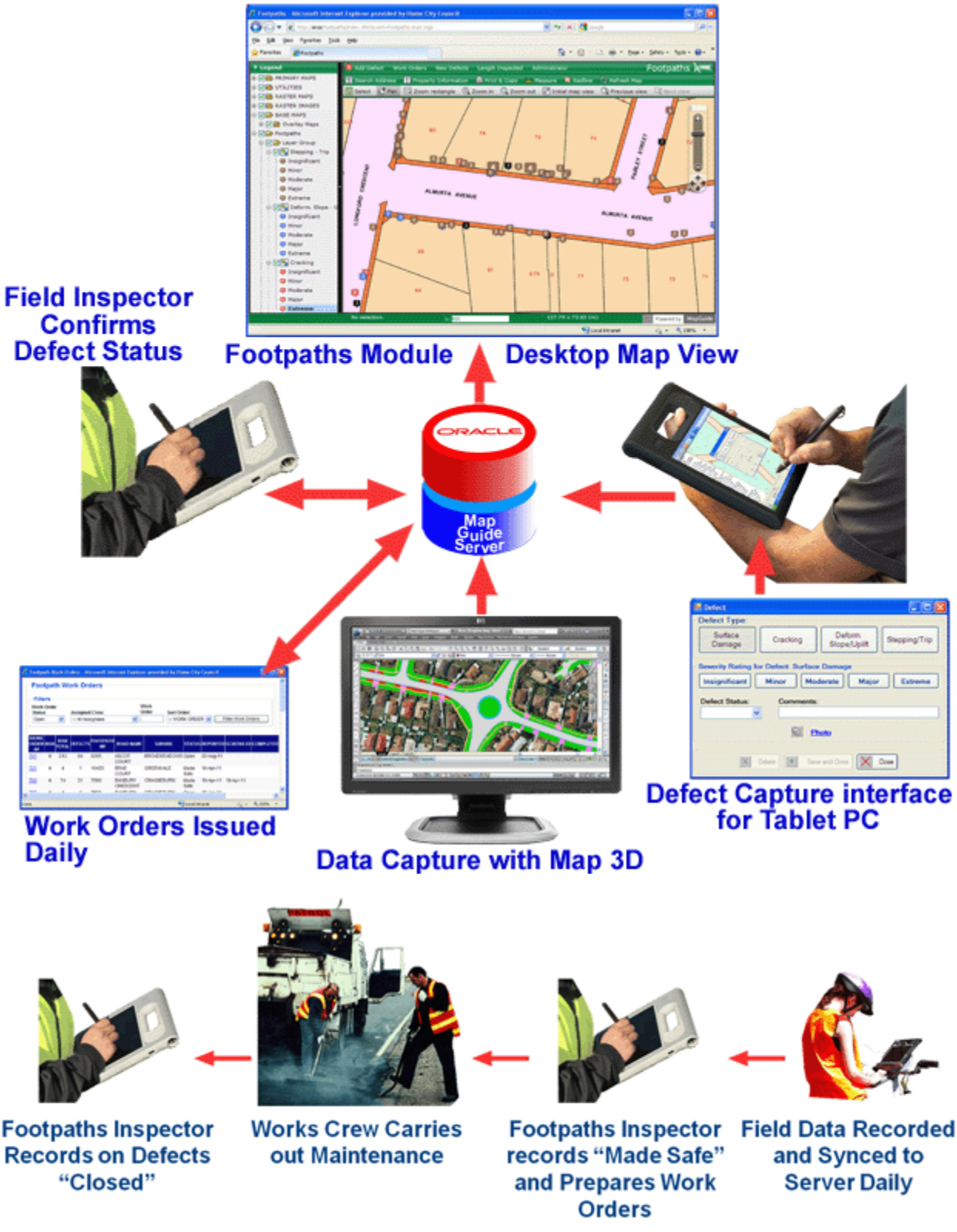




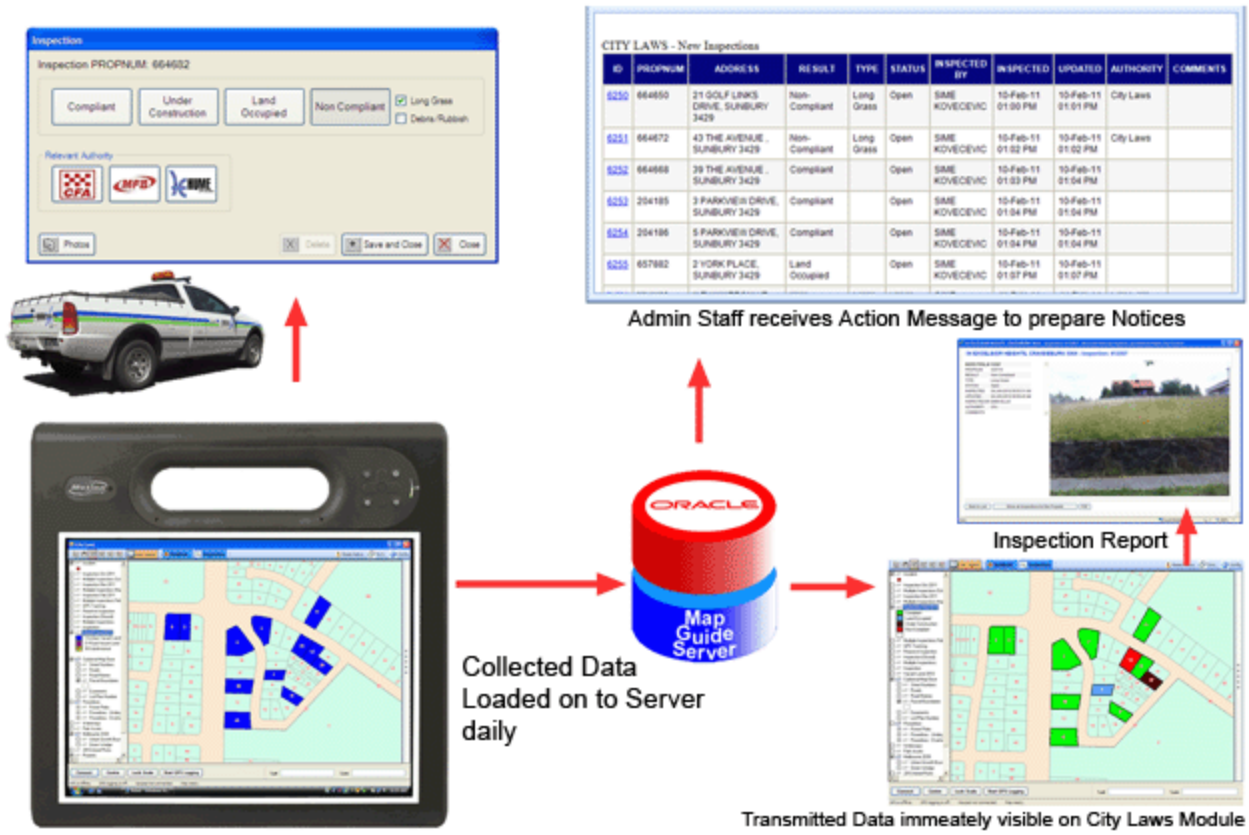

Legend
Building Footprints
'Community_Facilities'
'Cultural_Facilities'
'Human_Services'
'Municipal'
'SES'
'Sport_Recreation'
Hume Properties
CarParks
Community Facility
Creek Valley Reserve
Development Land
Municipal
Neighbourhood Acces
Parklands Reserves
Roadside Reserves
TIP Waste
Unclassified
Building Floor Plans
Floor Plan Ground
Selection
Tasks
Search Building
Administer Buildings
Module Admin
Buildings
Search Address
Property Information
Print & Copy
Measure
Select
Pan
Zoom rectangle
Zoom in
Zoom out
Initi
No selection.
1: 200
29.26 x 22.07 (m)
Powered by MapGuide


Autodesk Industry Model Explorer
Display Model:
Main Map
Industry model:
HCC_STORM
Explorers:
Workflows
HCC_STORM
Infrastructure Application Workflows
Acquisition
Manhole creation
Network point creation
Section creation
Section remove
House connection remove
Sub drain area creation
Site creation
Feature Search
Dimensioning
Redlining
Selection
Tasks
Legend
Maps
View
Enterprise Project
Setup
Help
Refresh
Select Radius
Select Polygon
Clear Select
Quick Plot
Feature Information
Delete Feature
Creat
Select
Pan
Feature Inspector
Zoom Rectangle
HUME
CITY COUNCIL
MEADOW HEIGHTS
No features selected
1:
27.72 x 23.13 m
Powered by Infrastructure Map Server

Asset Management Fork flow and Field Data Recording Processes



FIRE INSPECTION FIELD WORK PROCESSES



HARD WASTE COLLECTION PROCESSES

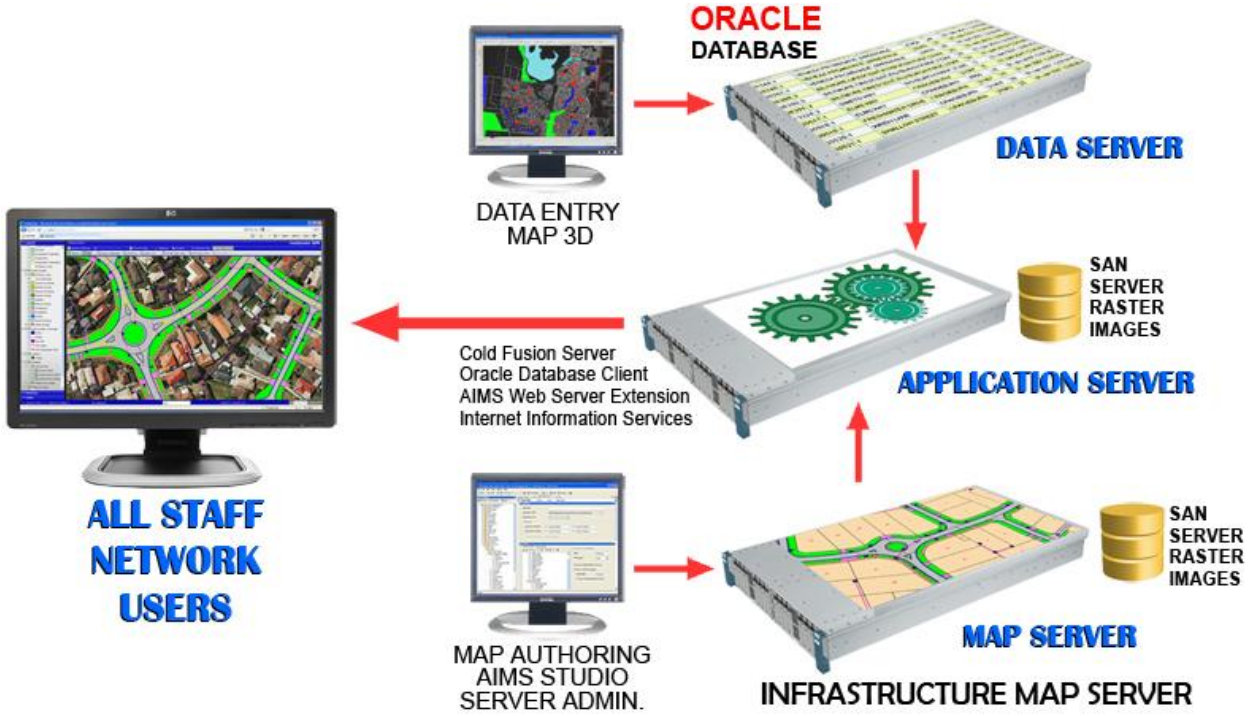


1. Setting up Network Infrastructure

Council's network centric GIS site consists of 3 dedicated servers utilizing Autodesk Infrastructure Map Server processes. Each server hosts numerous applications to carry out the required processes to publish spatial information.

- Application Server
- ColdFusion Server
- ORACLE Database Client
- AIMS Web Server Extension
- ISS (Internet Information Services)
- Map Server
- AIMS (Autodesk Infrastructure Map Server)
- Database Server
- ORACLE (Locator) Database

SAN (Storage Area Network) servers added to site to store raster images and aerial photos.



Additional administrative and management tools are installed on site administrators PC.

Autodesk Infrastructure Studio

To compile and author all the components of the maps to be published such as creating resources and connections, map layers and map groups.

Site Administrator

A web based Interface to manage overall site and to monitor status of servers. Infrastructure Web Server Extension

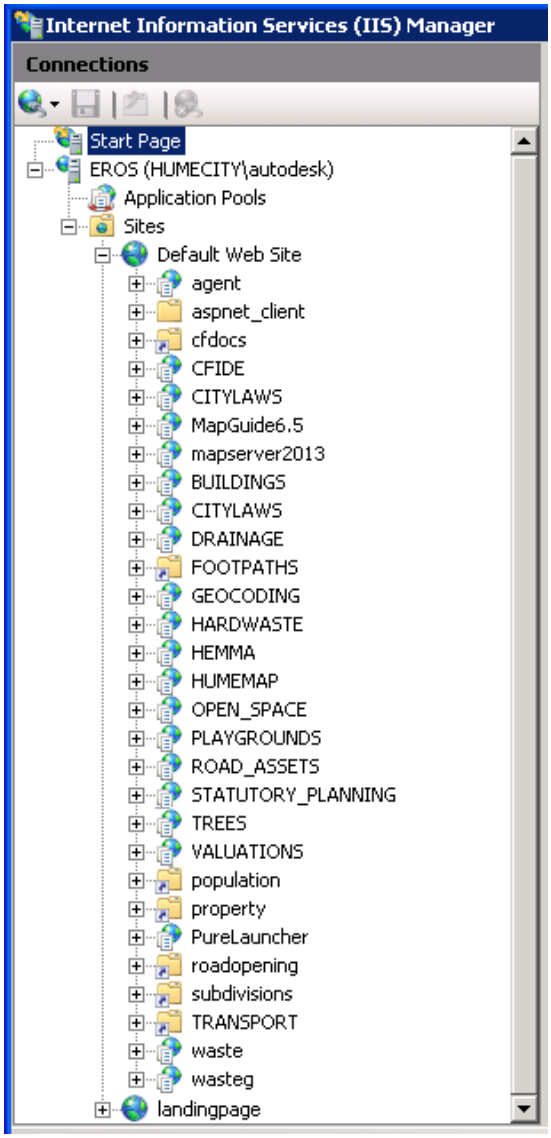
Web based Application Programming Interface for additional developments supporting Infrastructure Map Server.

1.1. Setting up Virtual Sites in Internet Information Services

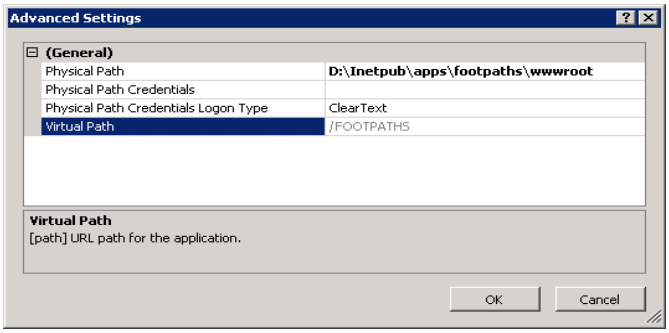
Due to numbers of different management processes and numerous numbers of map layers involved for the management of various asset categories, it become essential to create a GIS site with multiple modules. Each module contains numbers of generic map layers such as cadastral map base, aerial photos and relevant unique map layers and management tools.

All of these modules are accessed by all staff and data editing is allowed only to each custodian group with password access.

Each module name has to be registered as Virtual Directory in Default Web Site of Internet Information Services Manager and relevant Physical Path address entered.

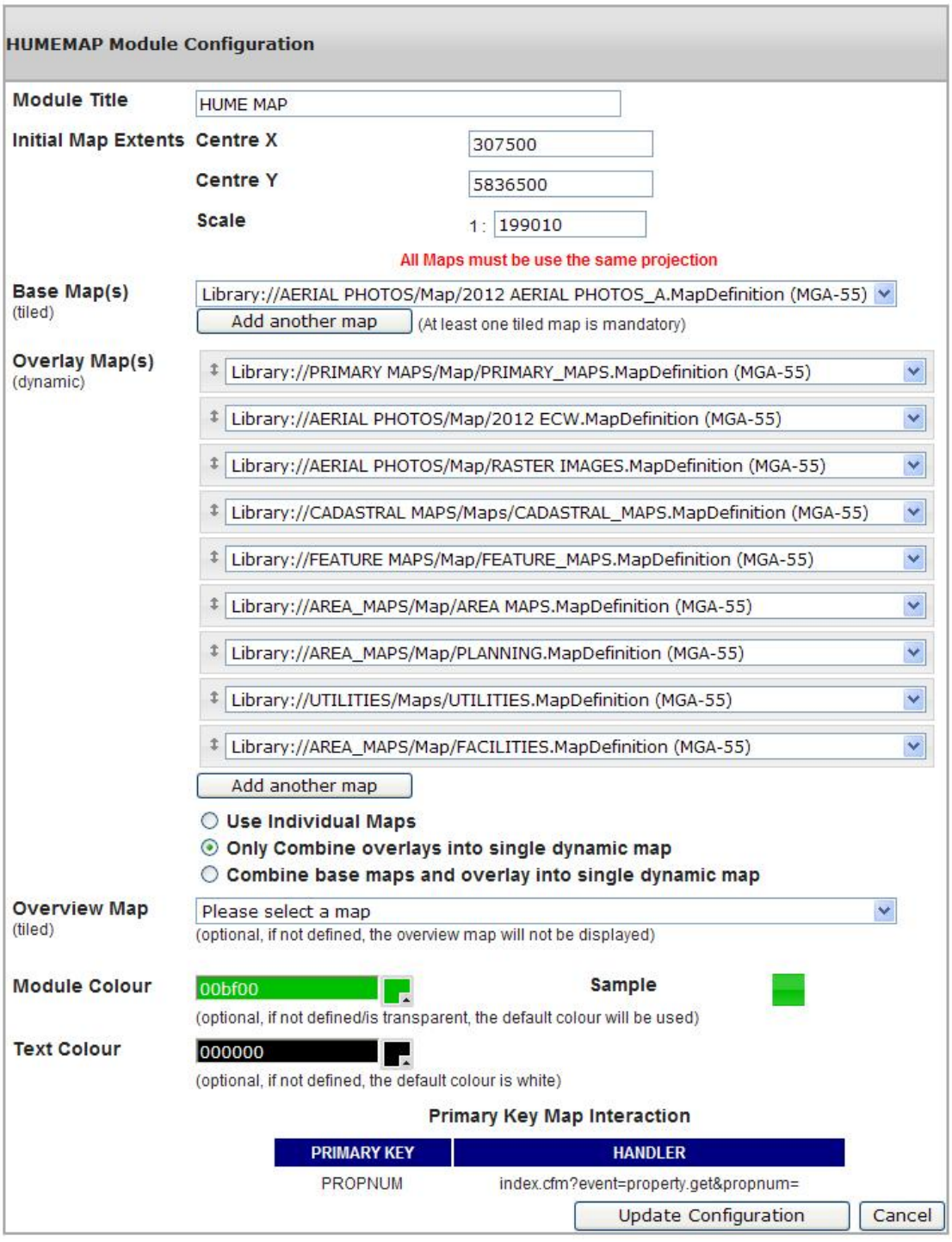






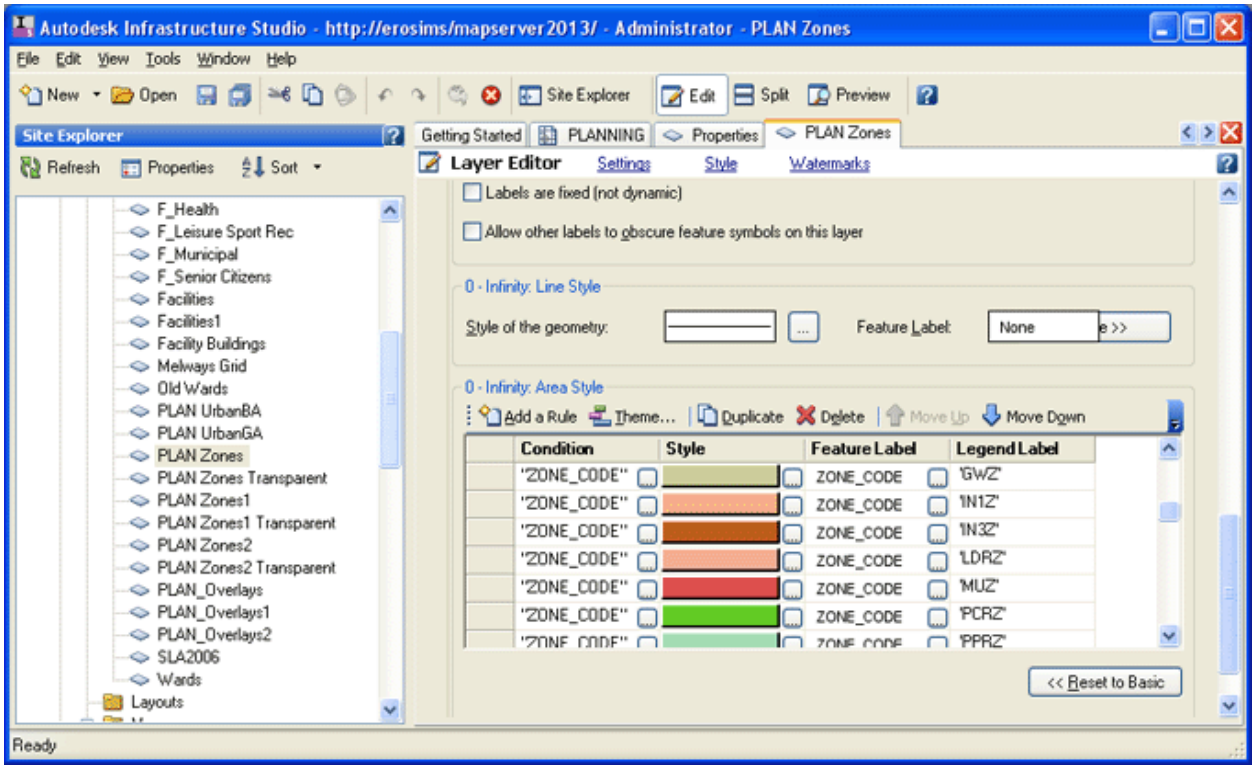
1.2. Module Configuration – Virtual Map Definition

Module Configuration Interface is an efficient tool to bundle all the required tiled base map, dynamic map groups and numbers of Primary Key Interactions into a flexible viewer. Each configured Map Modules is then linked to Map Room front page as a separate map view.

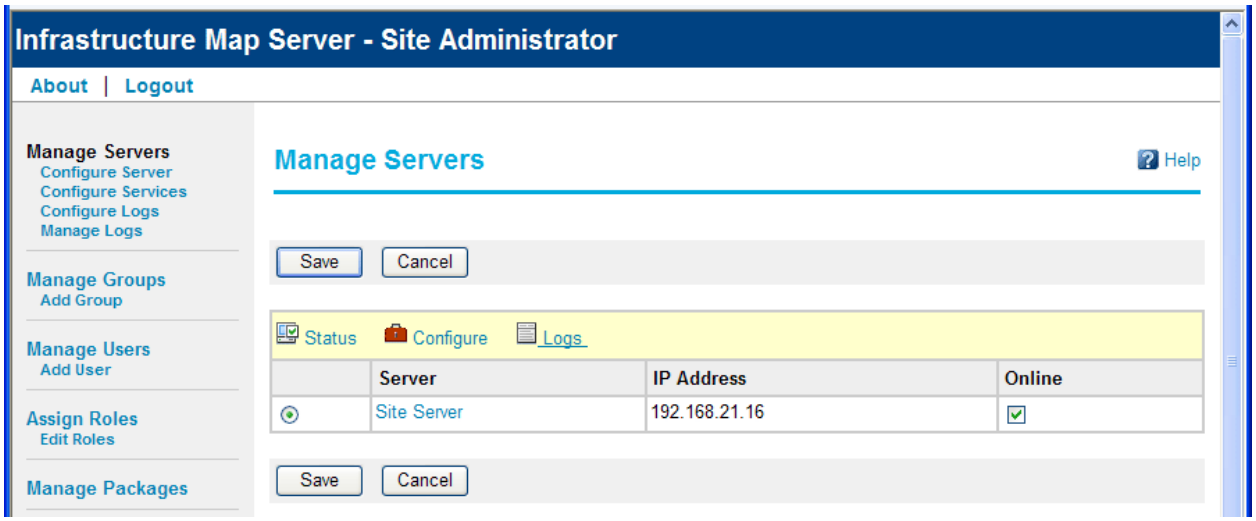


1.3. Additional Authoring and Administrative applications

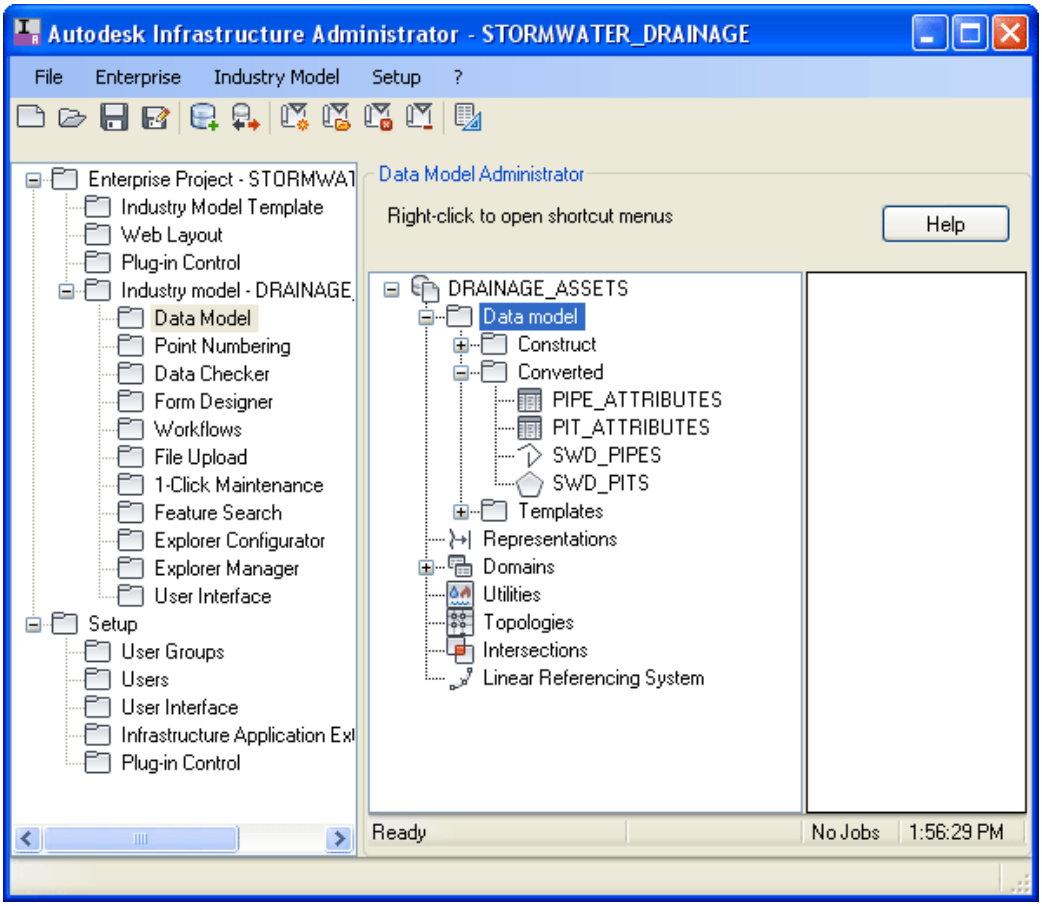
AIMS Studio is where all the data sources, map layers and maps are created and assembled. This is where map layer styling, coordinate definition, building up themes and setting up zoom scale levels are also created. Compiled maps or map layers can also be previewed.



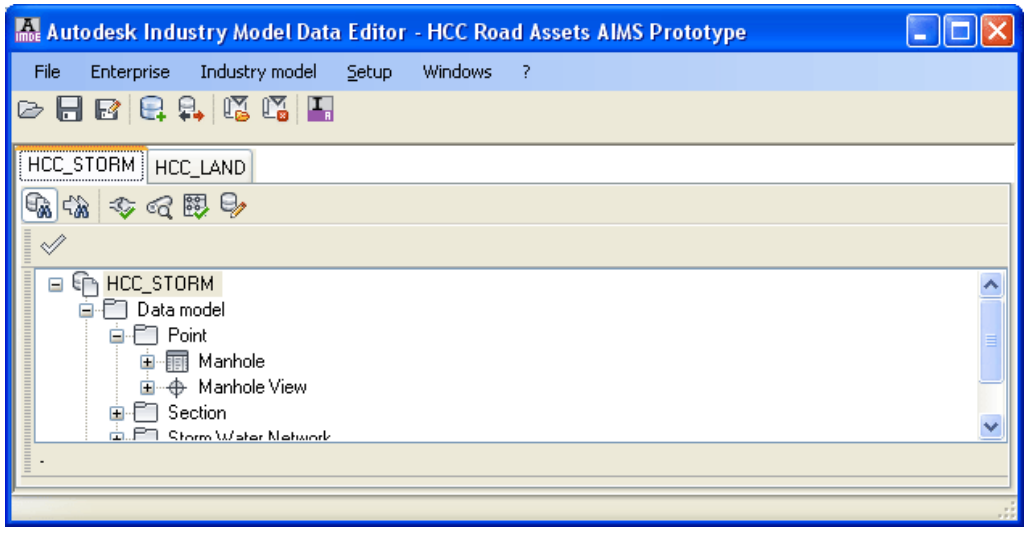
The AIMS Site Administrator is used to manage and configure many aspects of site servers such as assigning roles to the individual servers and monitoring them.



The Autodesk Infrastructure Administrator module is used to create and manage Enterprise Projects and Industry models both in Oracle database or SQL server environments.



The Autodesk Industry Model Data Editor is used for creating and managing specific or unique industry based data models.



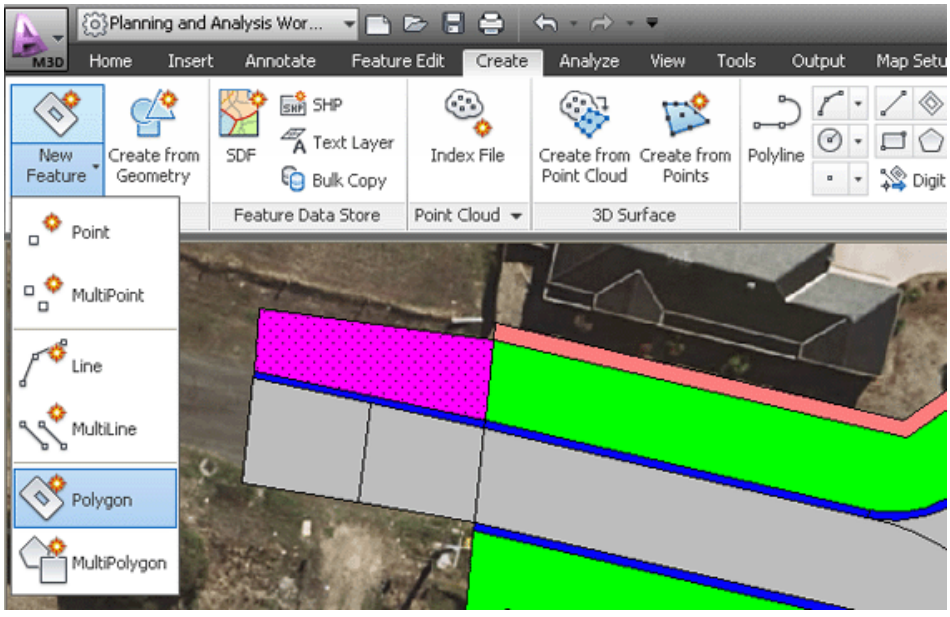
2. Data capture with Autodesk® AutoCAD® Map 3D and Feature Attributes

A whole host of data formats can be loaded and inserted on to AIMS data source or central data base. At Hume City Council majority of local area map layers and all of the assets are captured as spatial objects, in dwg format an loaded on to ORACLE and edited using Map 3D.

Most of the assets capture is carried out by either digitizing form aerial photos or by producing feature polygons from the original subdivision development CAD drawings with Map 3D.



There two options available to create feature polygons depending on the volume of the data to capture or availability of existing CAD drawings.



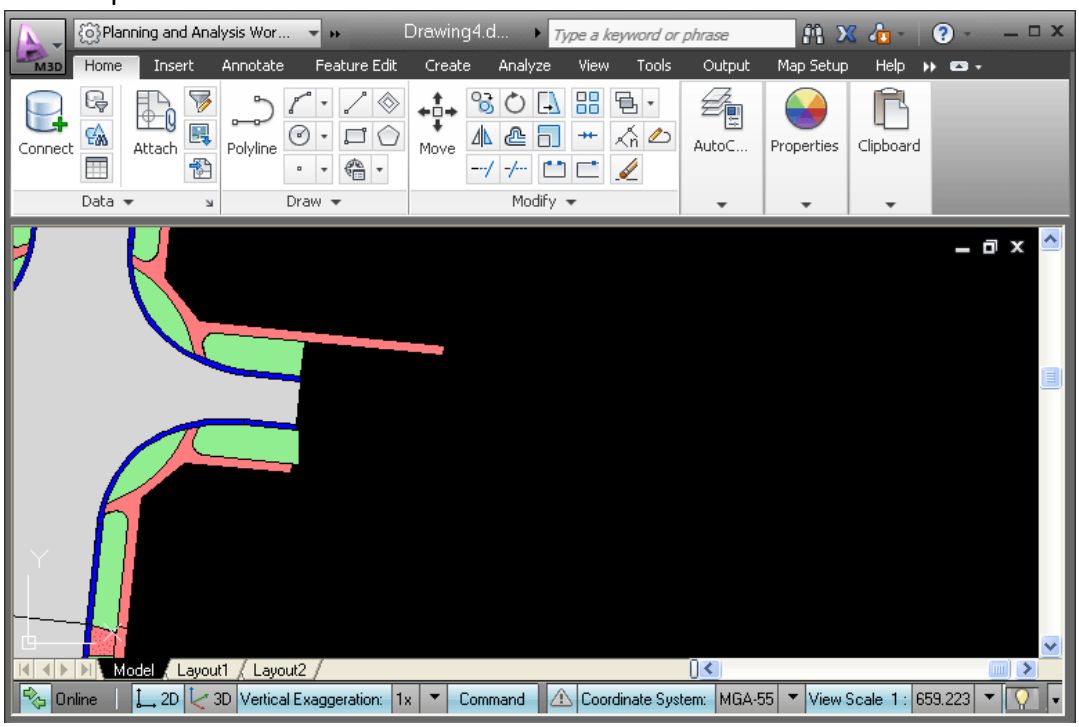
The “New Feature” process is more suitable when a small volume of feature polygons is to be created.

It creates polygons instantly in the current table and updates after

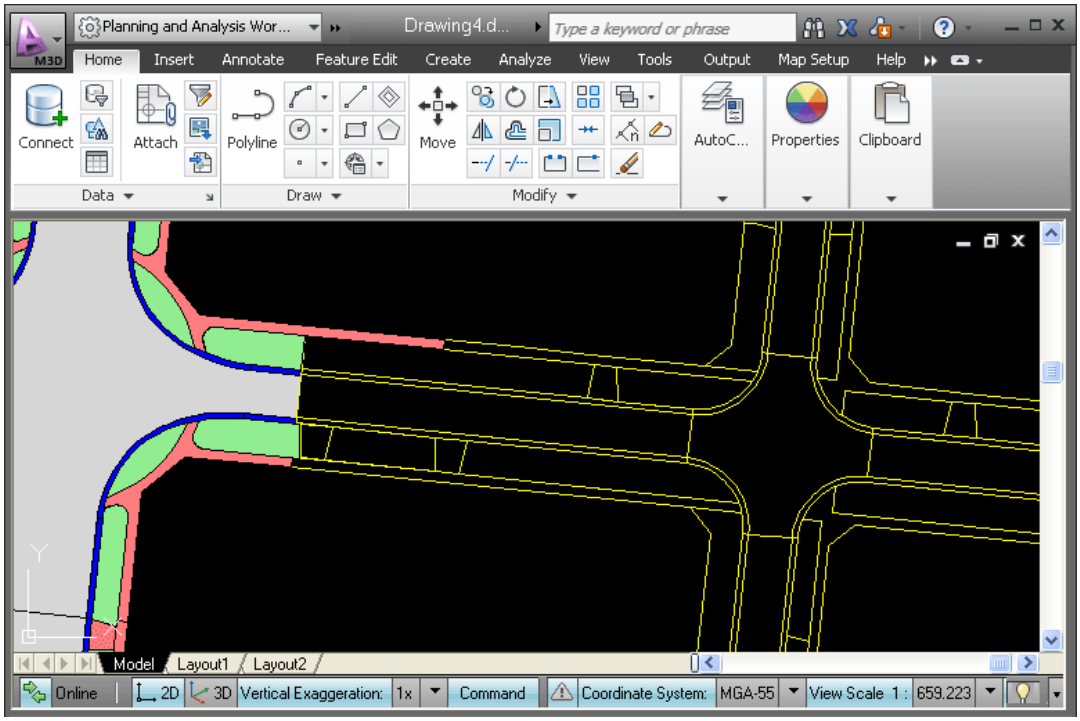
“Check In”.

Another option is to prepare all polygon components separately in a CAD environment and with correct geographical coordinates then insert them on to the FDO data connection map view.

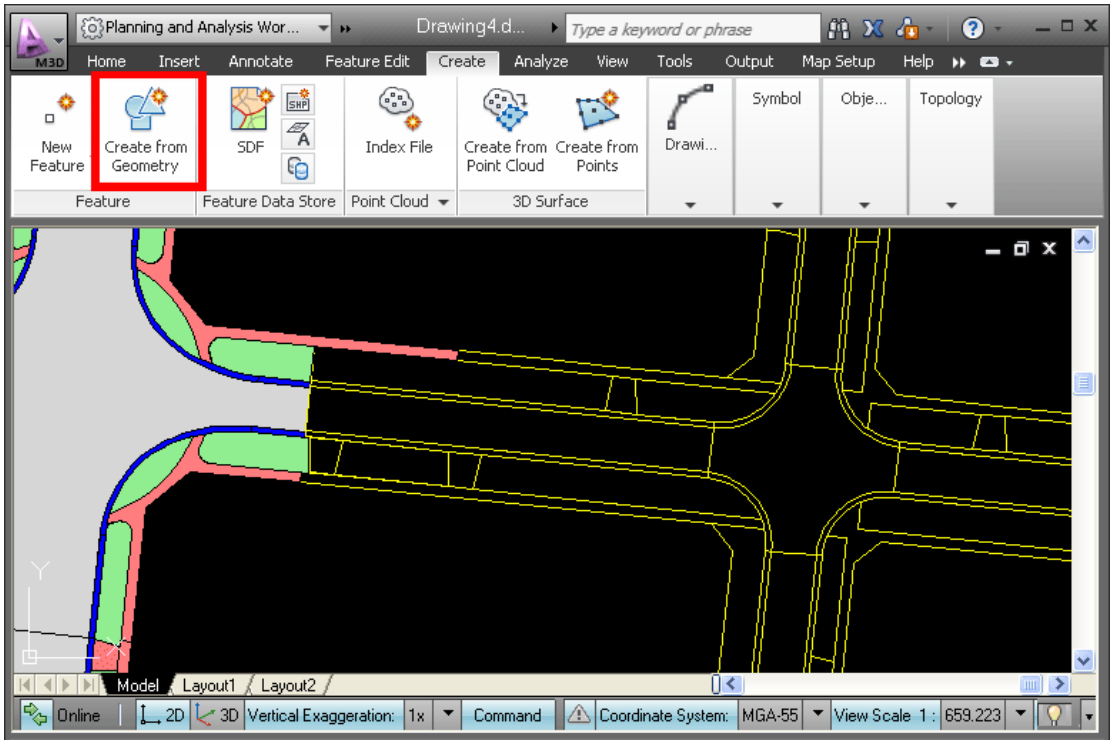
FDO map data view



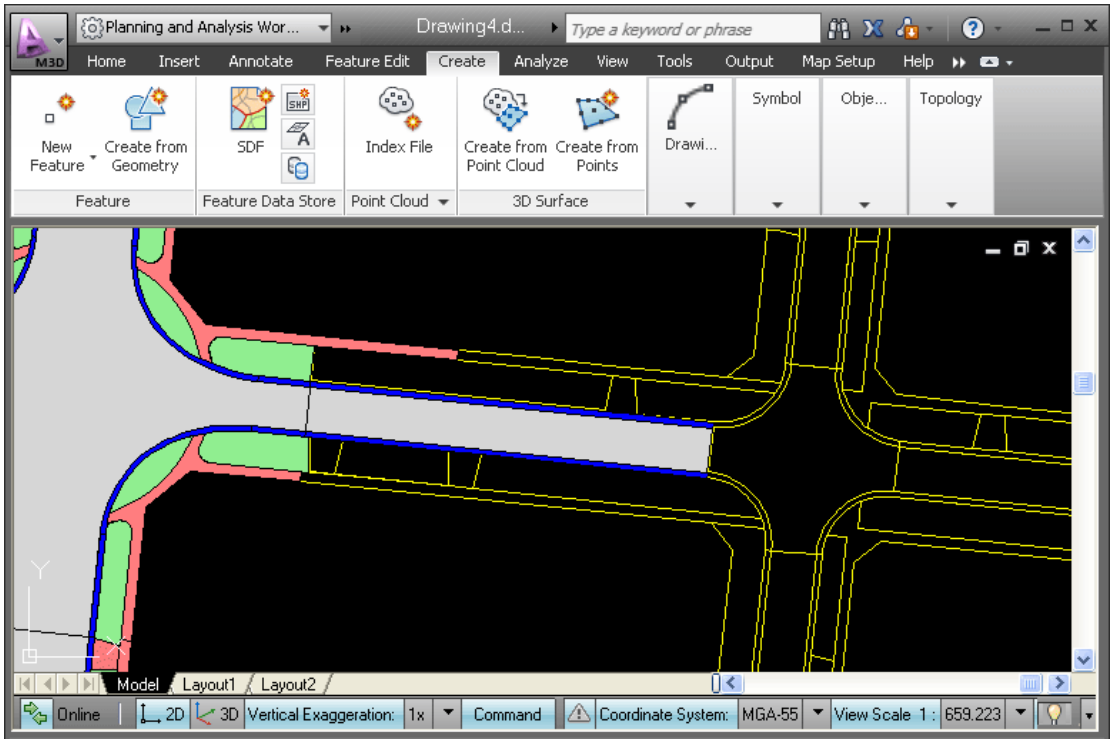
CAD drawing inserted



In “Create” tab click on “Create from Geometry” to convert drawing object

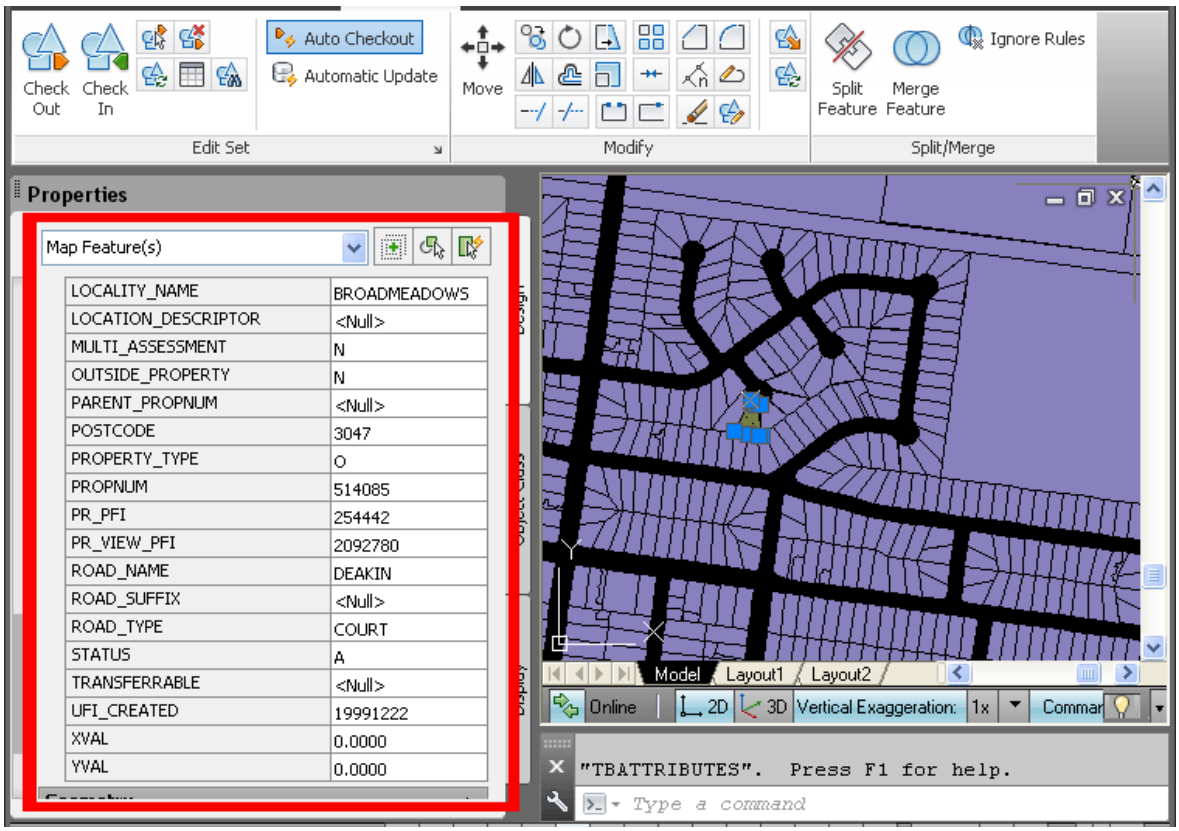


New feature objects created by converting CAD objects for each feature table

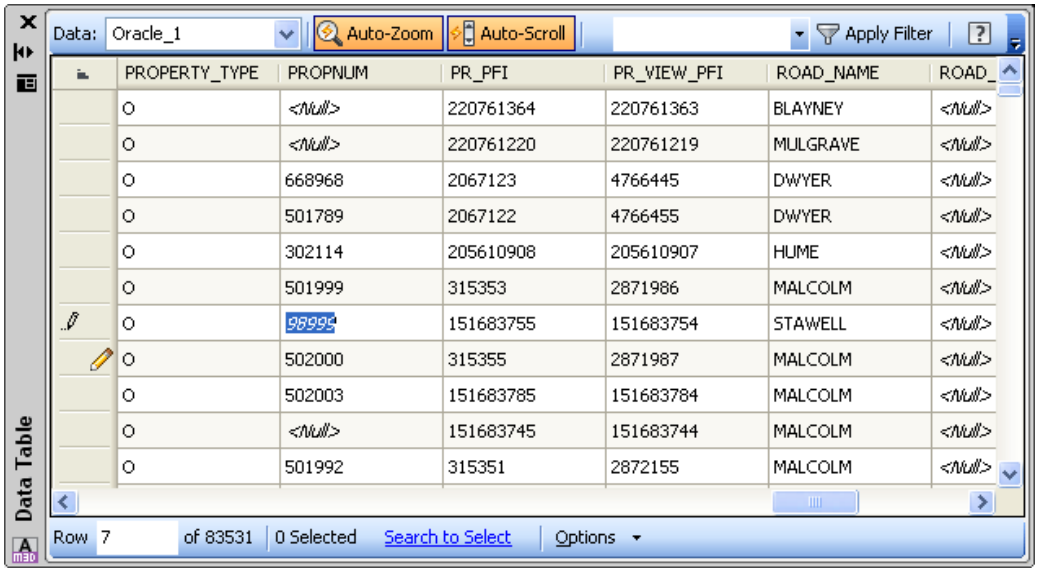


2.1. Adding data and recording of attributes

There are numerous options to add attribute data to feature objects. Using Object Data processes for this purpose and modifying them with Properties, has been around some time.

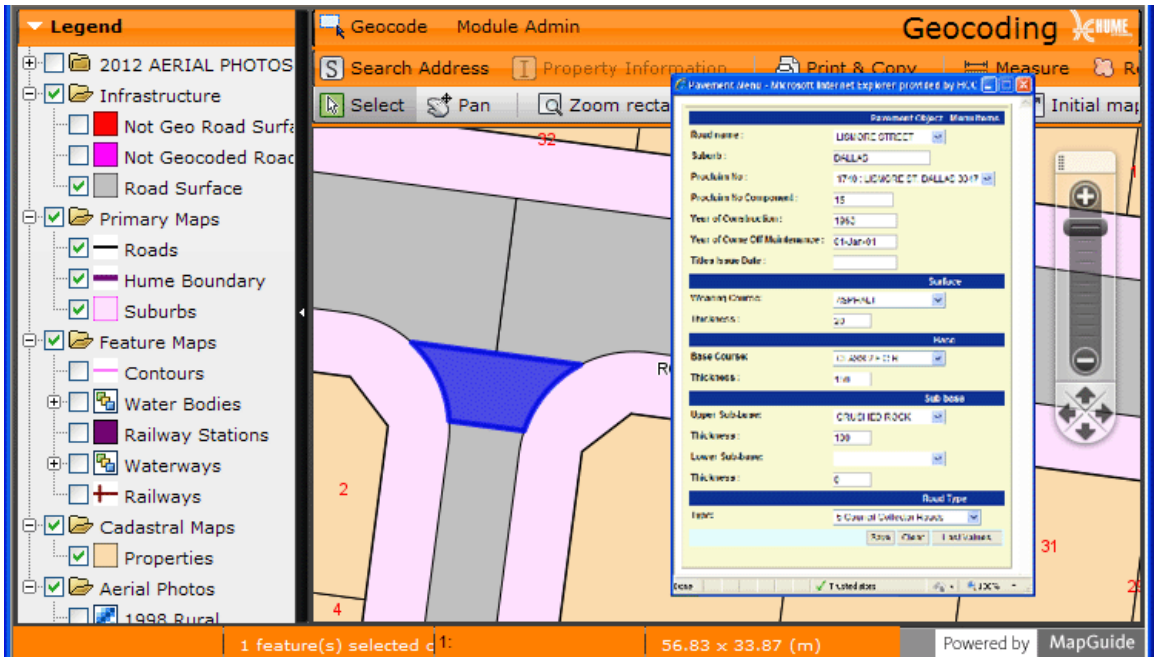


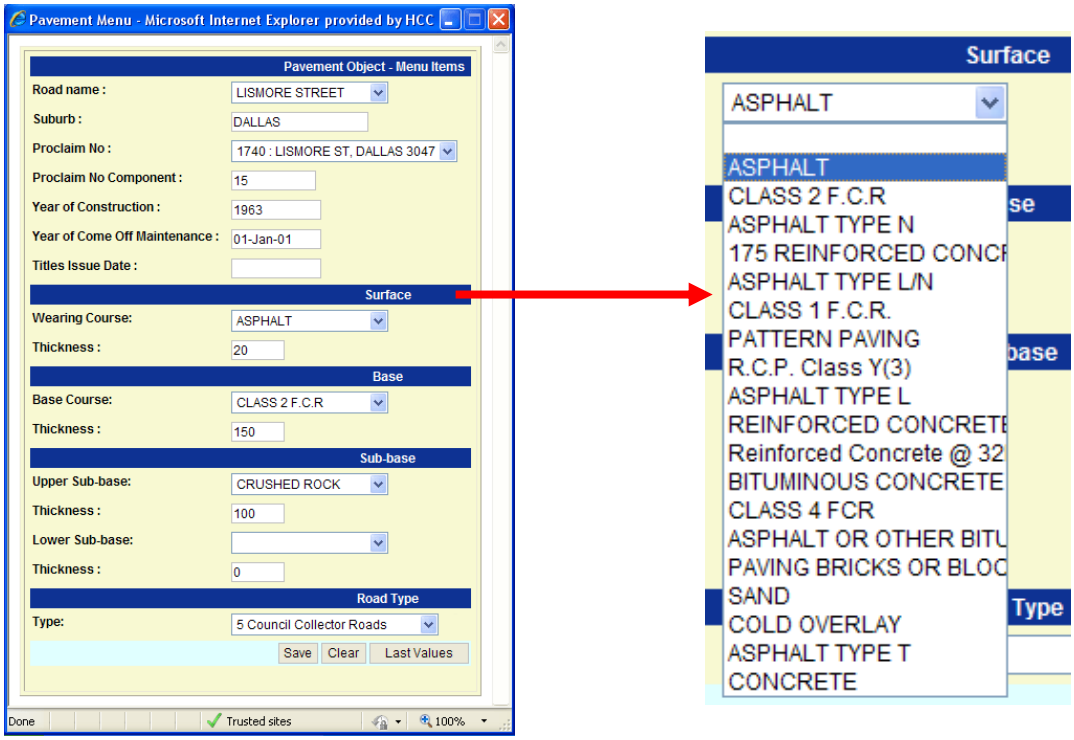
Adding attribute data and editing and on the Data window is also available.



2.2. Geocoding

Recording of large numbers of attributes is carried out on a separate Geocoding map module at Hume City Council. This is a much more efficient and streamlined process for entering data on web based windows dedicated for each asset types. Each window contains all the known information about the particular asset component such as material, type, dimensions and year of construction.

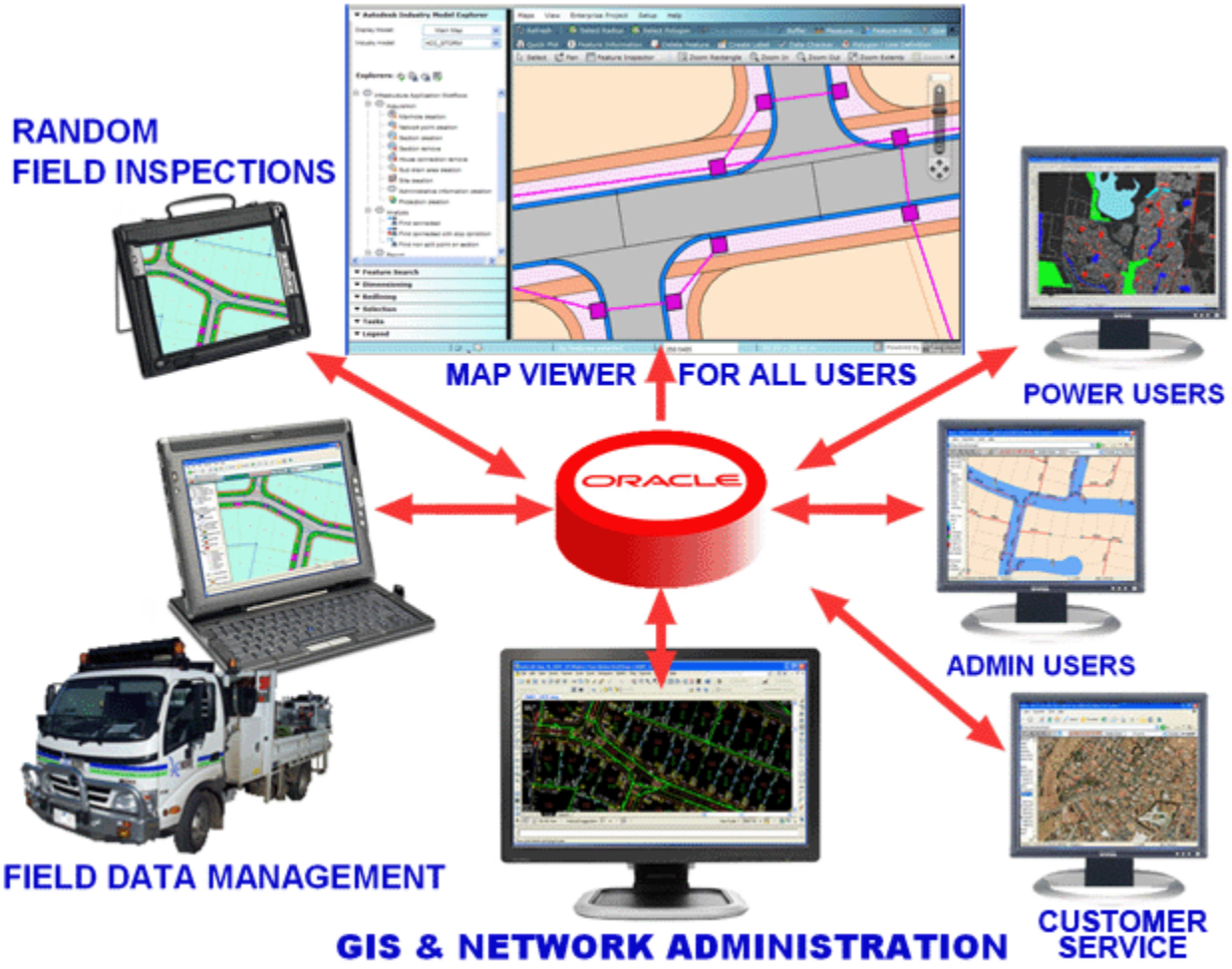




3. Workflow processes between Autodesk® AutoCAD® Map 3D and Oracle

Proper functioning of the core central database is essential for successful management outcomes for any of the network application processes. Although Map 3D is used as the primary application to load asset features and all other spatial objects and map layers, there are others users and their processes constantly add and modify feature attributes.

Proper use of Map 3D interacting with Oracle database results in good workflow processes and satisfactory management outcomes.



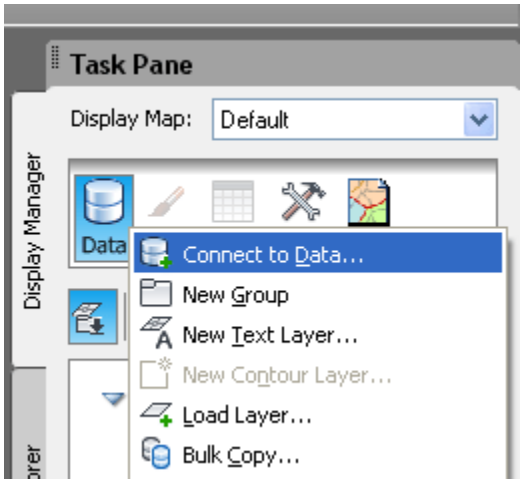
The ability to write CAD and assets feature data with Map 3D directly to Oracle database and to retrieve and edit is the most important part of Hume City Council's GIS processes.

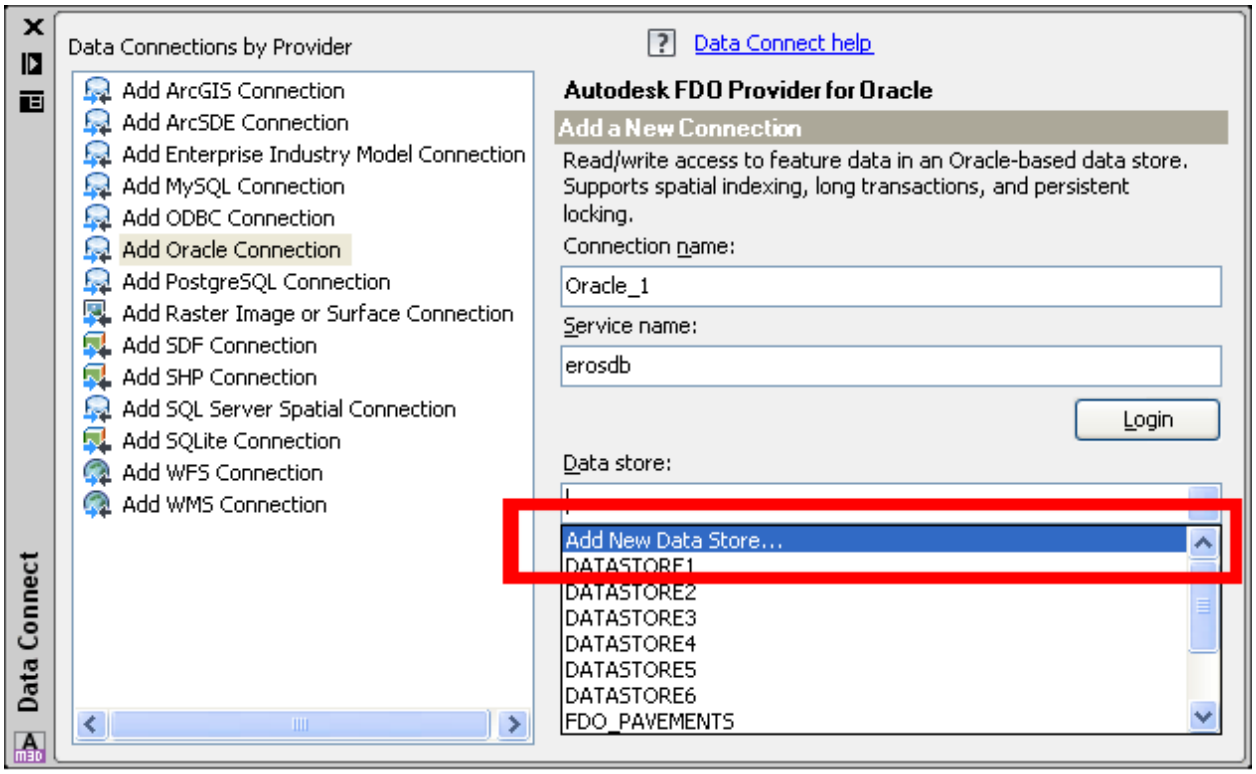
It is important to set up database tables for each of the asset categories properly so that retrieval processes work efficiently.

3.1. Setting up a new Data Store

Map 3D can be used to set up a new Oracle Schema and load drawing components as spatial features while at the same time defining feature classes and spatial coordinates.

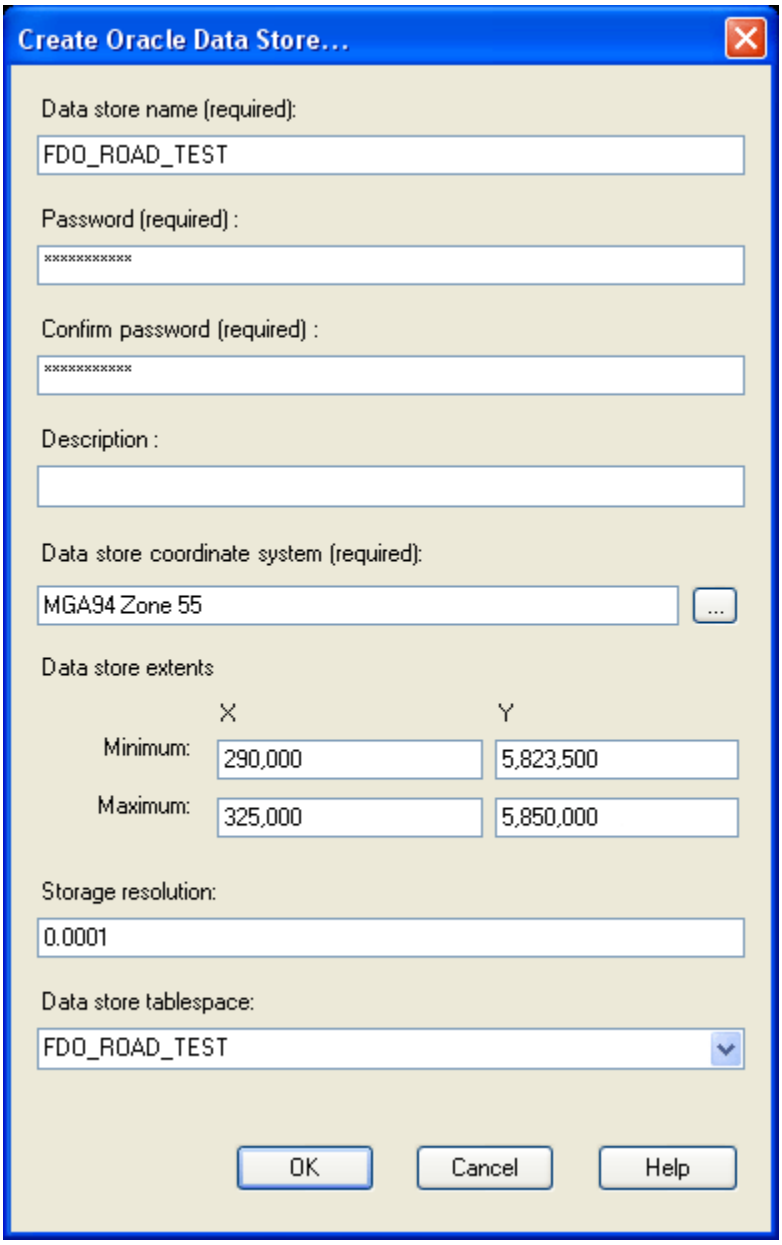
Connect to Oracle data base using Map 3D **Task Pane** and select “Add New Data Store”





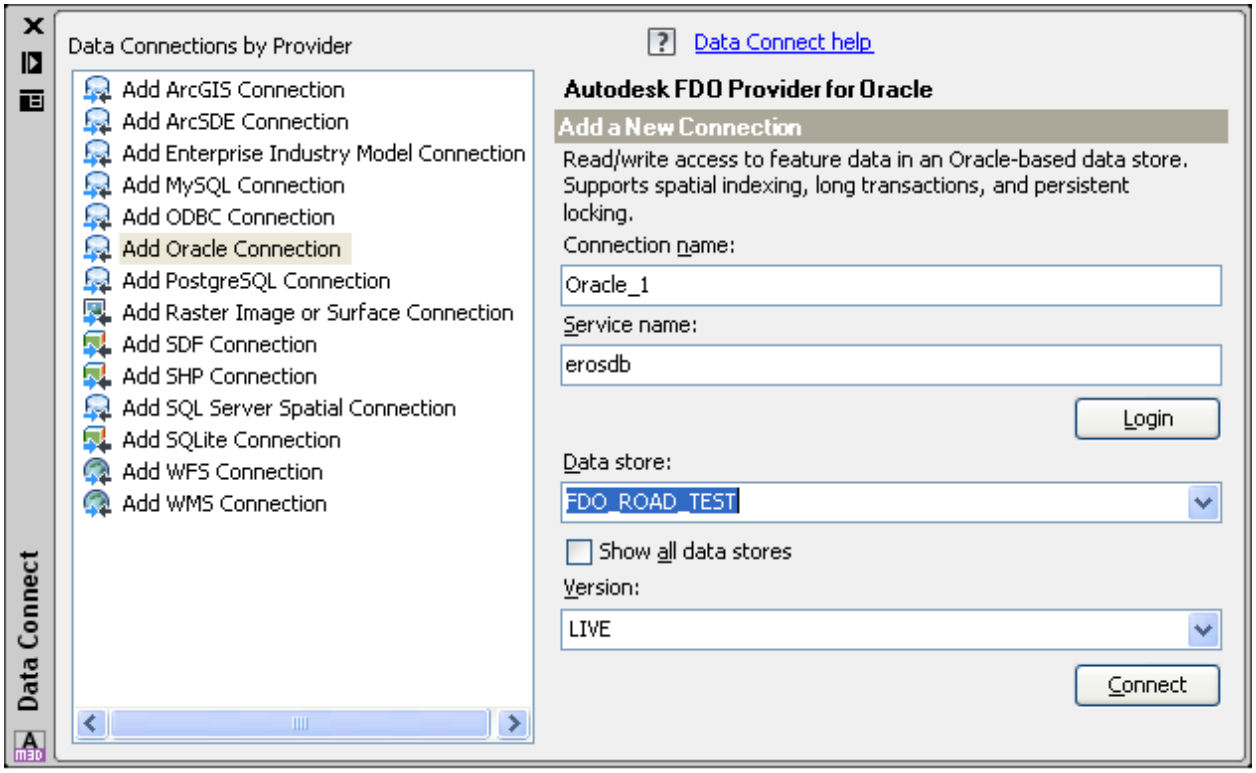
In “Create Oracle Data Store” window you will be asked to enter:

- Data store name
- Password
- Data store coordinate system
- Data store extents
- Storage resolution – Default 0.0001
- Data store tablespace

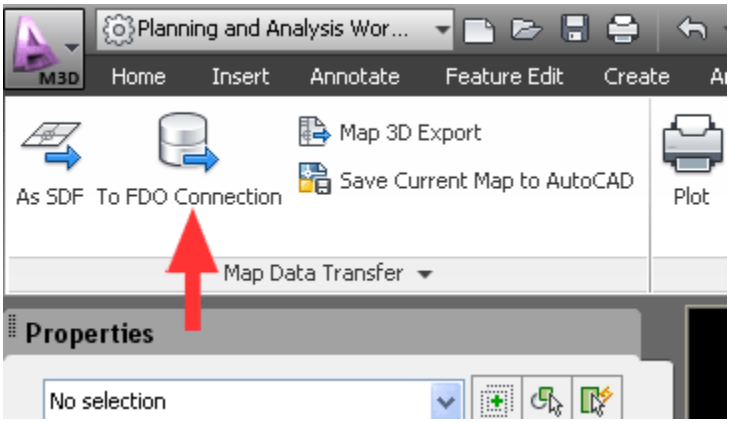


Edit Schema window will confirm the creation of a new schema. You will be prompted; “Do you want to edit the default schema?”

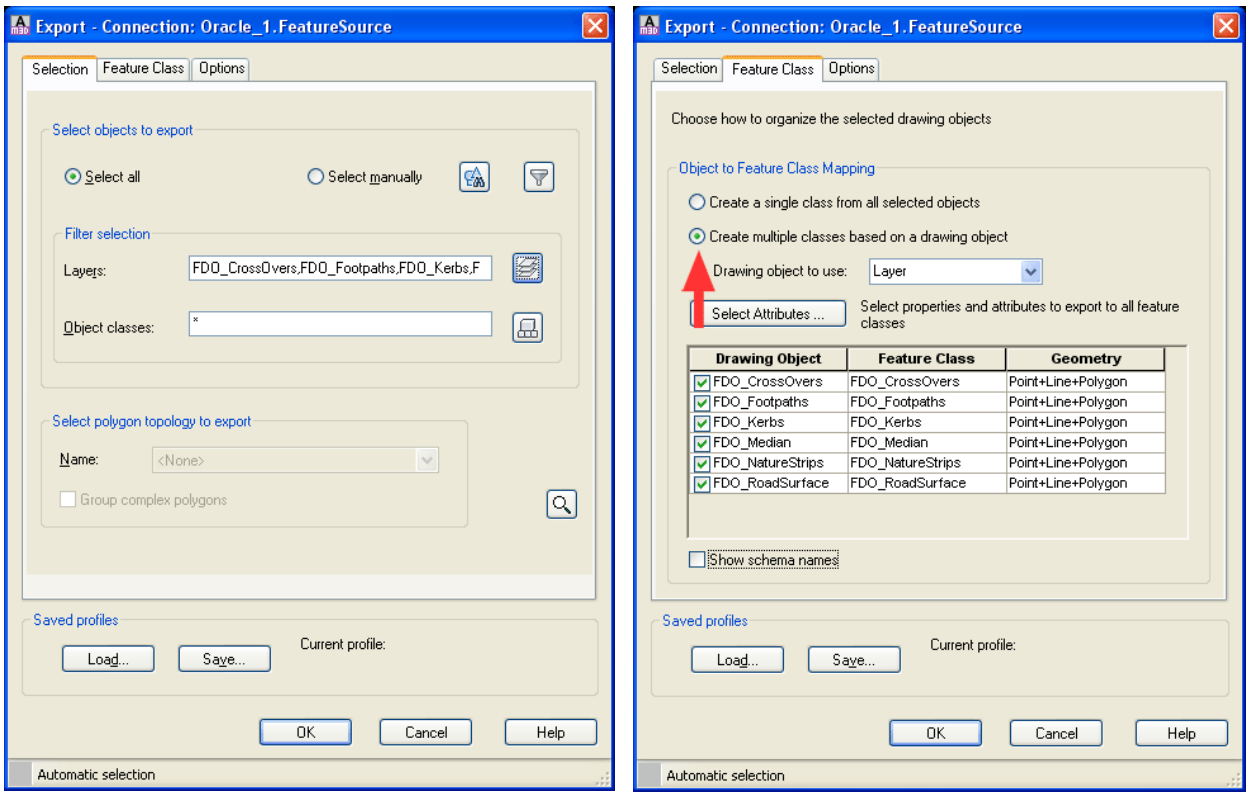
Connect to new schema



Using “FDO Connection” button on Output tab of Map 3d export the spatial features of current drawings to new schema. You will be prompted “…select the Database connection…” on **Map Export to FDO** window.



In the **Export – Connection** window select appropriate items and if there are multiple drawing layers on the drawing data to be exported tick the circle with “Create multiple classes based on a drawing object on Feature Class tab.



Once the export process completed new schema is ready add further data and carry out additional processes such as adding attributes.

Please refer to the supplementary handout to migrate any existing Oracle data tables to AIMS TB format.

GS1452 Supplementary Handout

Migrating existing Oracle data to AIMS TB Format

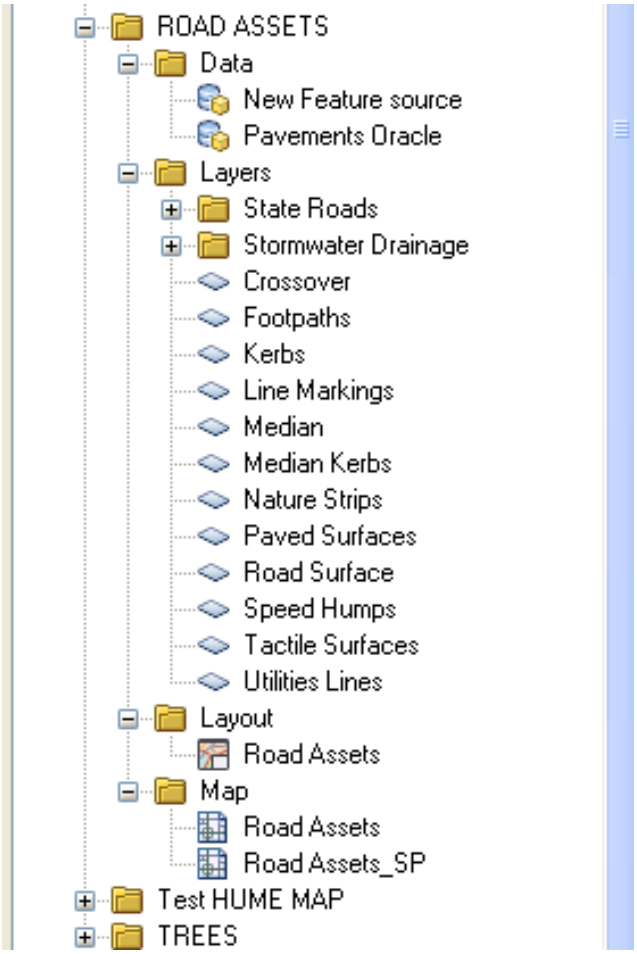
4. Creating actual and themed maps and map layers to display asset condition categories with Autodesk® Infrastructure Studio

Autodesk Infrastructure Studio is where all the necessary components required for building map views are created and assembled.

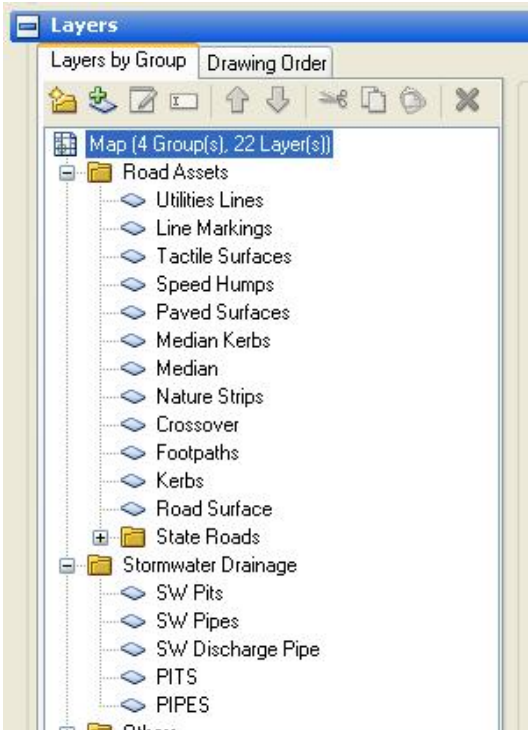
Four key components are required.

- **Data** – Data source identified from Oracle schema
- **Layers** – Map layers are created from the tables in data source and all the stylization processes such as defining zoom levels, layer themes, tool tips, label styles etc.
- **Layout** – Web layout template for displaying maps
- **Maps** – This is where all map layers are assembled, spatial coordinates entered, legend structure and layer order defined.

Studio Library Structure



Map Layers Definition

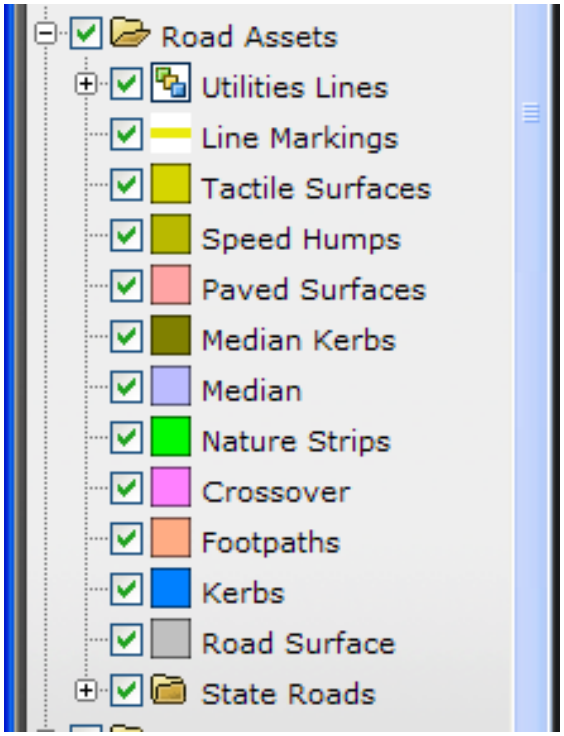


4.1. Themed Map Layering Processes

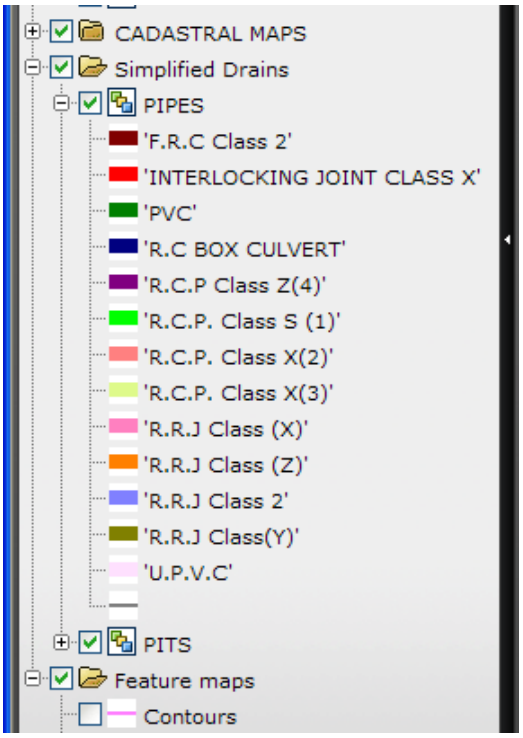
There are numerous ways themed map layers can be created.

Typical themed map layering can be achieved simply by defining certain map components by defining in different colors defining the colors by different type materials from the attribute tables.

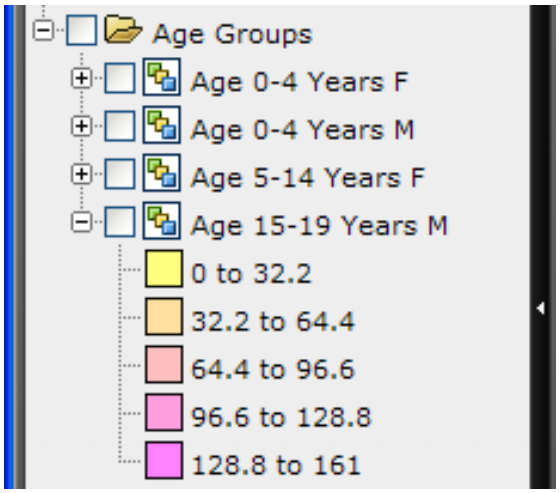
Themes based on Map Layers



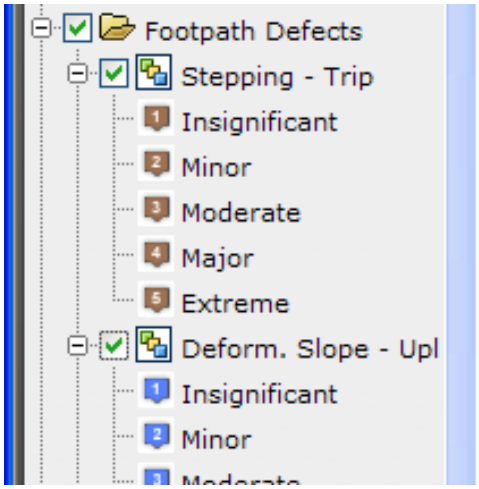
Themes based on Feature Attributes



Themes based on External Database



Themes based on GSP Points Data



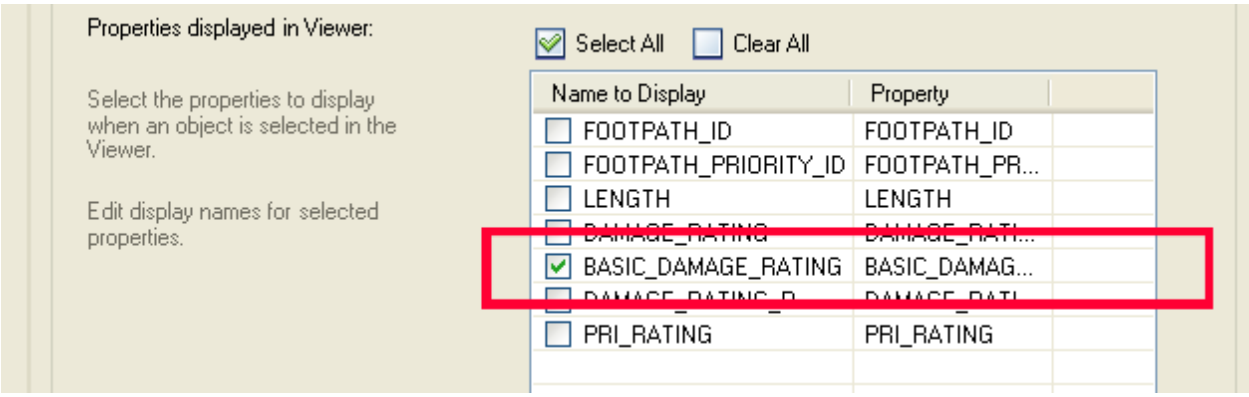
4.2. Formulated Themed Map Layers – Asset Conditions

It is possible to create a new database table or view from available data where asset condition formulas are applied. These conditions can then be displayed as themed map layers to illustrate specific asset conditions.

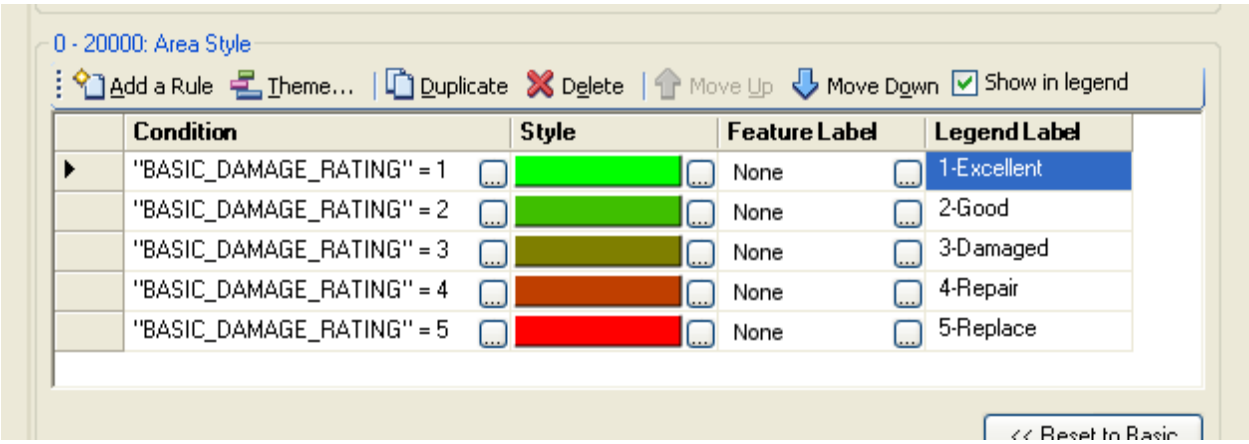
To create asset conditions themed map layers of Footpaths for Hume City Council, the first step was to create a separate V-Table in Oracle Footpaths schema with numerous conditions and formulas that categorizes condition data.

This table calculates total defect points collected in the field with a Tablet PC with damage points for each footpath components. Then it assigns 5 categories of condition status for each component.

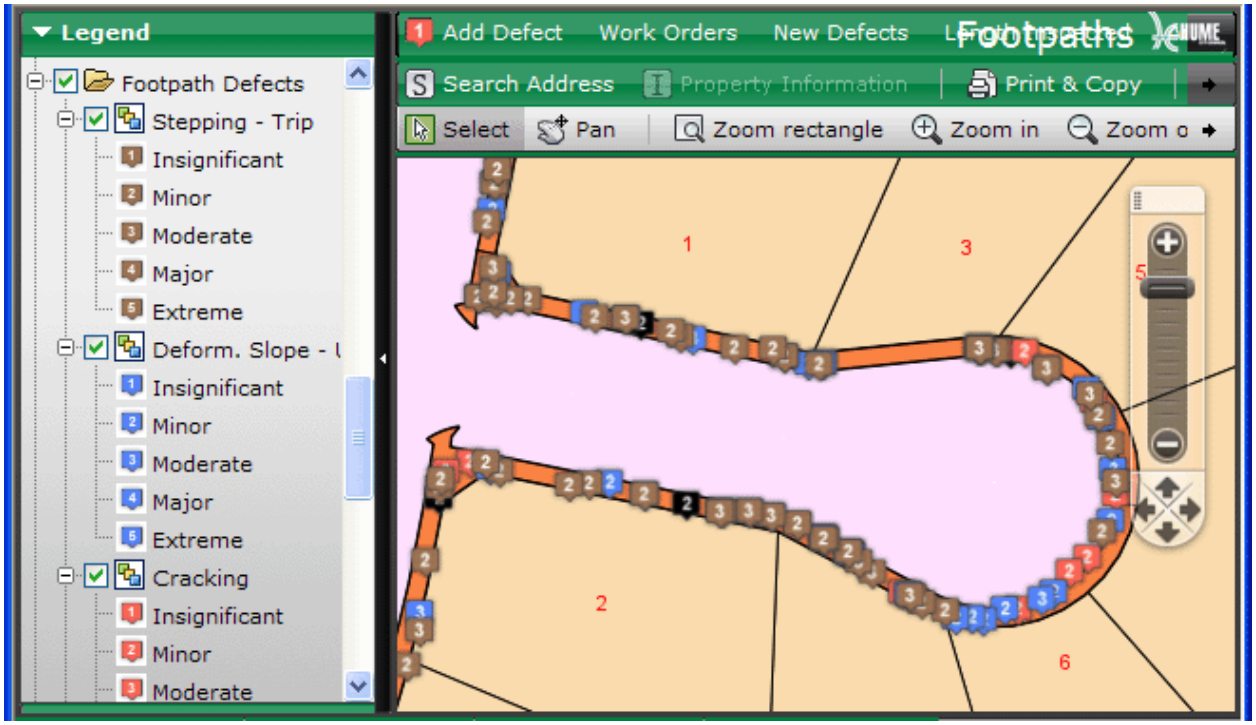
Basic Damage Rating table in Feature Data Setup section of Autodesk Infrastructure Studio



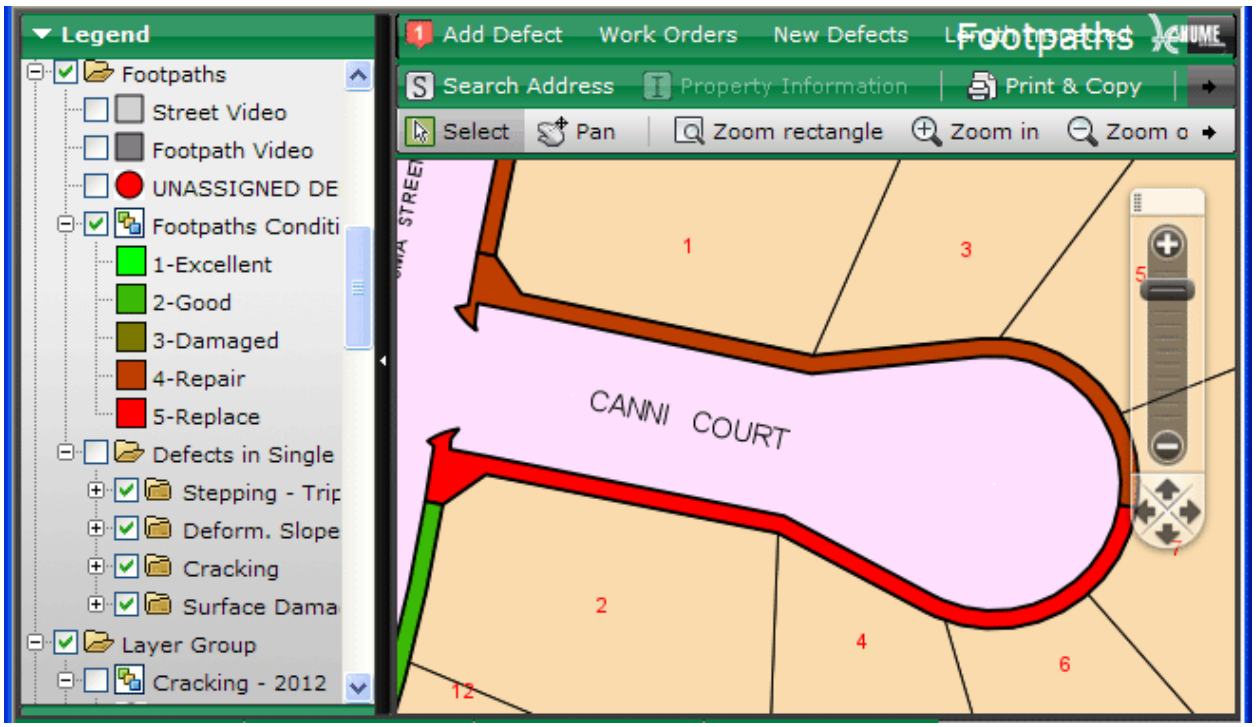
Asset condition rating is themed in Style section



Display of Defect points over Footpaths



Themed asset condition layer showing status of footpaths in separate colors



Acknowledgments

I wish to thank Director of Ennoble Consultancy Zac Spitzer and Open Source specialist, Jackie Ng for their contributions for the overall development work for and improvements of GIS applications of Hume City Council over the years.

Recep Alakus

October 2013

Useful Links

http://themapguyde.blogspot.com.au/

http://docs.autodesk.com/MAP/2013/ENU/index.html

http://wikihelp.autodesk.com/Infr._Map_Server/enu/2013/Help/0001-Getting_0

http://forums.autodesk.com/t5/Autodesk-MapGuide-Enterprise/bd-p/233/page/14

http://osgeo-org.1560.x6.nabble.com/MapGuide-Open-Source-f4182606.html

http://trac.osgeo.org/fusion/wiki/MapGuideTutorial