GS6384 Vault is for More than Engineers: Integrating AutoCAD Map 3D and ArcGIS with Vault

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Lecture

In this class you will learn how to use Vault software in the context of AutoCAD Map 3D software, Esri's ArcGIS, Esri's ArcMap, and Esri's ArcCatalog GIS, with a simple plug-in developed with the Vault software API (application programming interface). We will demonstrate how to integrate ArcMap templates, SHP files, data connections, layers, and other GIS data sources with the Vault software to significantly improve the efficiency of the architecture, engineering, and infrastructure design process.

Key learning objectives

Learn how to store the templates, files, and data connections of ArcCatalog and ArcMap in Autodesk Vault

Learn how to configure Vault software security to better ensure clear distinctions between geographic information system (GIS) administrators and GIS end users

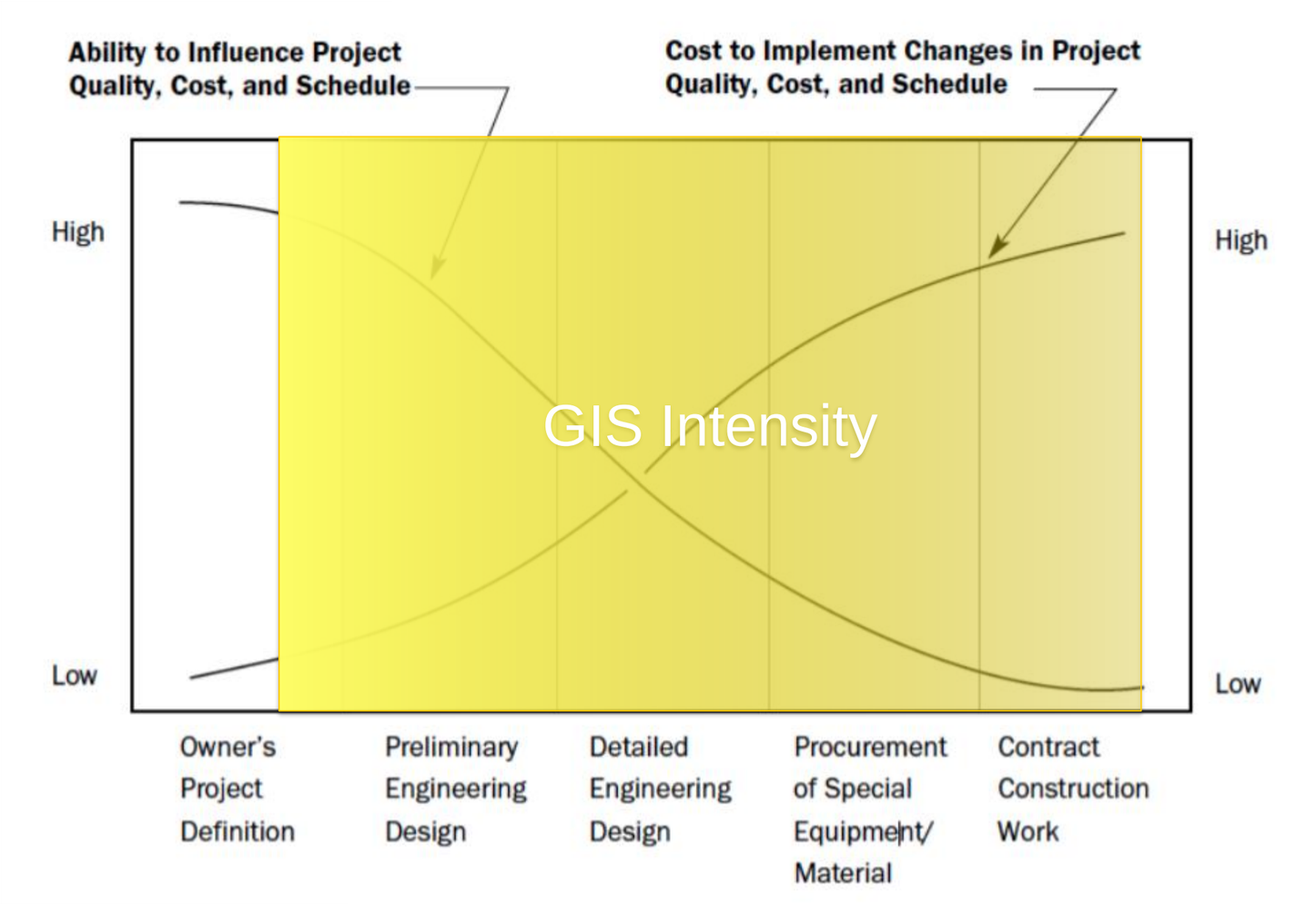
Learn how to use the data versioning features of Autodesk Vault to manage interim states of geographic information system projects

Learn how to publish DWG files, SHP files, and other files from AutoCAD Map 3D software and ESRI ArcMap to Vault

Workflow for Infrastructure Construction

Year 1 → Year 2 → Year 3+

Where GIS plays a role



http://commons.emich.edu/cgi/viewcontent.cgi?article=1937&context=theses

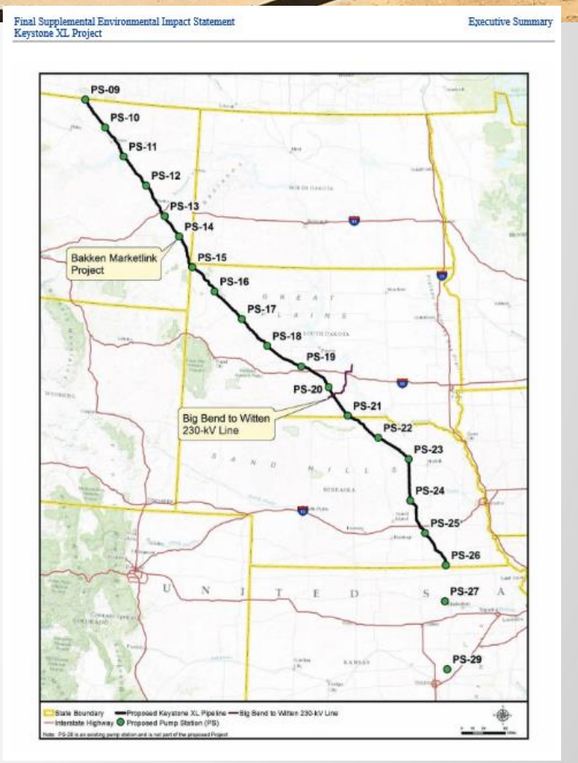
"many engineers still do not know how to integrate CAD with the GIS software. They also do not know how to find GIS data or how to use these data"

Common Needs for GIS in Engineering

- Environmental impact assessment (EIA) based on latest, verified version of engineering drawings
- Easily access as-designed and as-constructed engineering drawings for GIS as-built mapping
- Consistent engineering and GIS data versioning
- Standards enforcement across disciplines

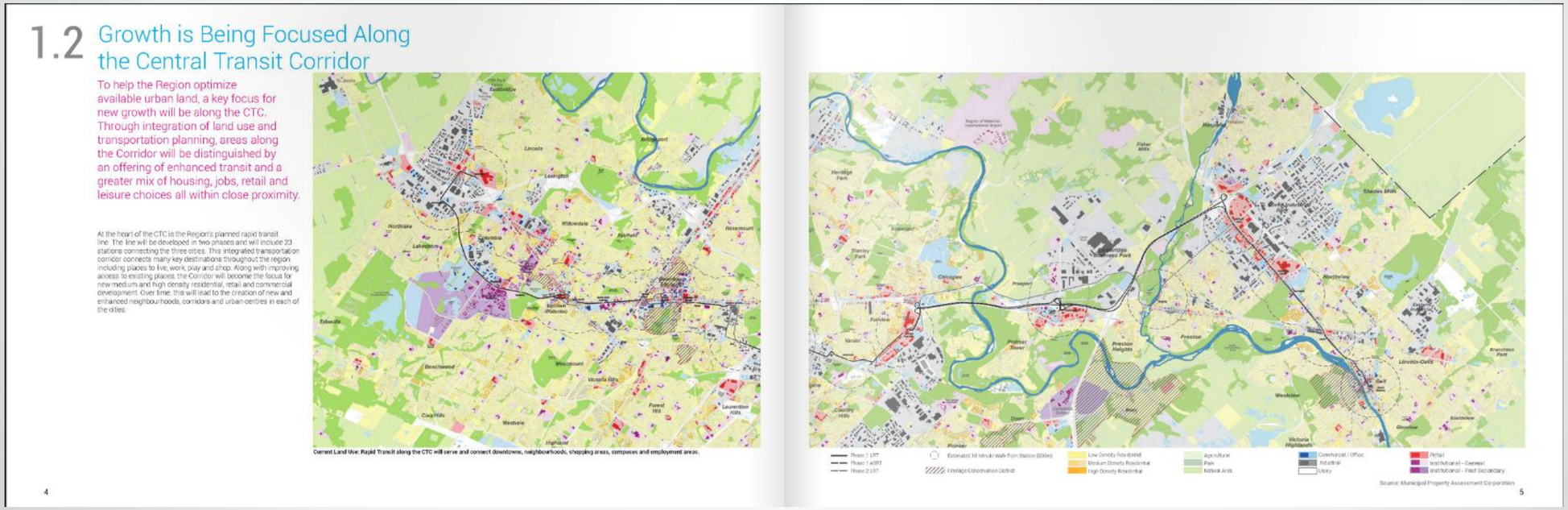
Scenario

- Oil & Gas pipelines
  - GIS corridor planning based on latest surveys
  - Stakeholder engagement & exhibits
  - Preparation of basemap materials for civil drawings
  - EIA



Scenario

- Major transportation corridor development or reconstruction



1.2 Growth is Being Focused Along the Central Transit Corridor

To help the Region optimize available urban land, a key focus for new growth will be along the CTC. Through integration of land use and transportation planning, areas along the Corridor will be distinguished by an offering of enhanced transit and a greater mix of housing, jobs, retail and leisure choices all within close proximity.

At the heart of the CTC is the Region's planned rapid transit line. The line will be developed in two phases and will include 23 stations connecting the three cities. This integrated transportation corridor connects many key destinations throughout the region including places to live, work, play and shop. Along with improving access to existing places, the Corridor will become the focus for new medium and high density residential, retail and commercial development. Over time, this will lead to the creation of new and enhanced neighbourhoods, corridors and urban centres in each of the cities.

Current Land Use: Rapid Transit along the CTC will serve and connect downtowns, neighbourhoods, shopping areas, campuses and employment areas.

4

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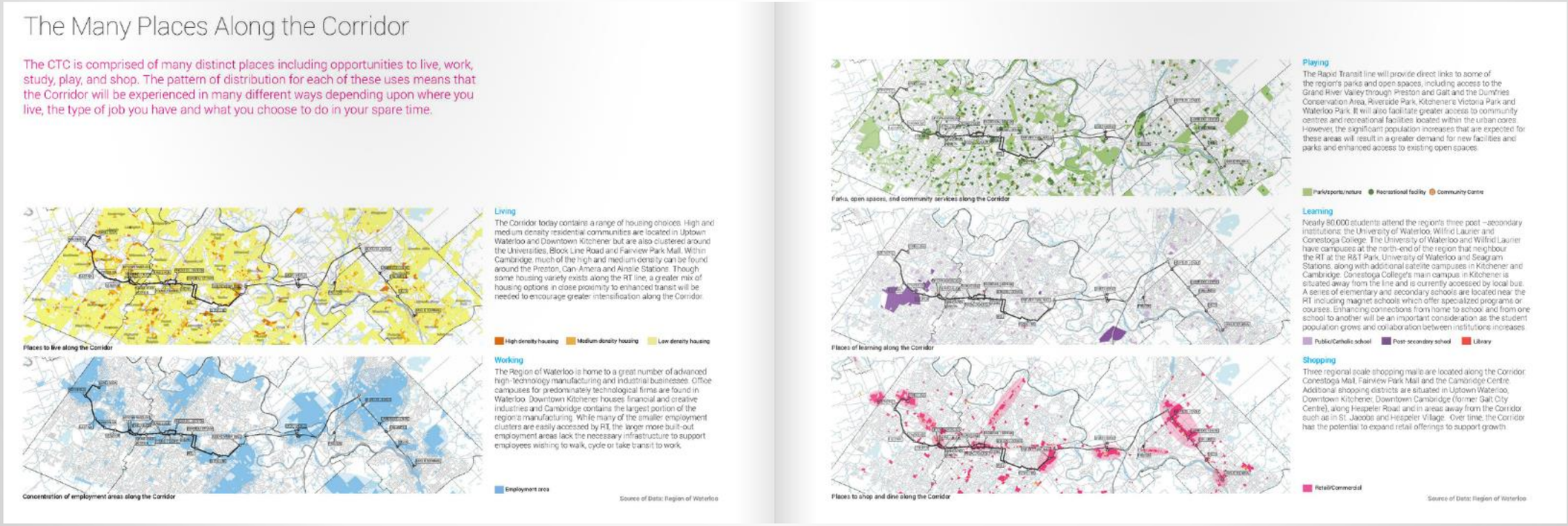
Scenario

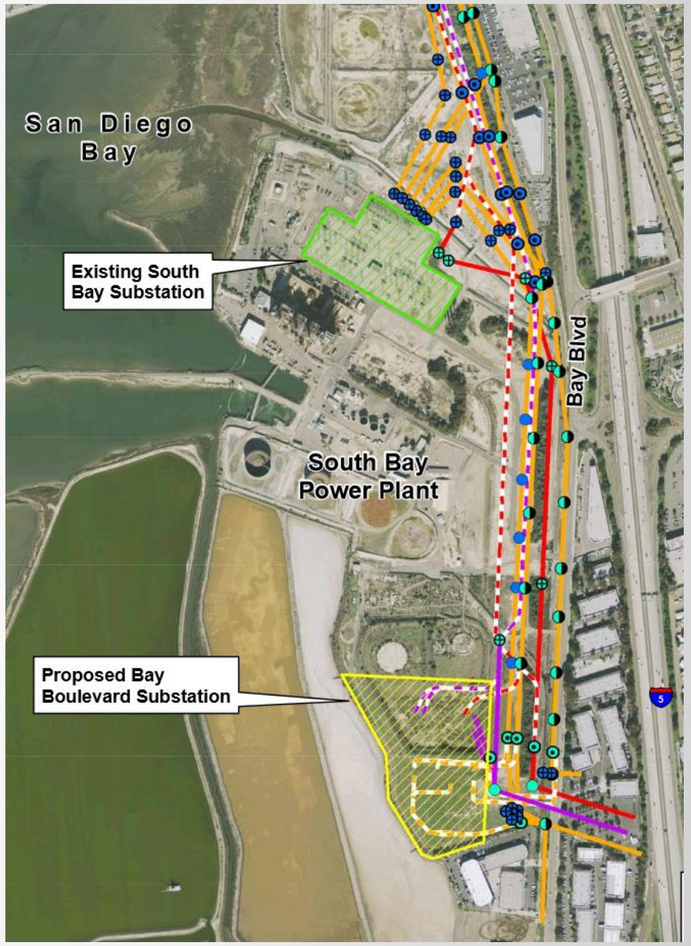
- Major transportation corridor development or reconstruction



Scenario

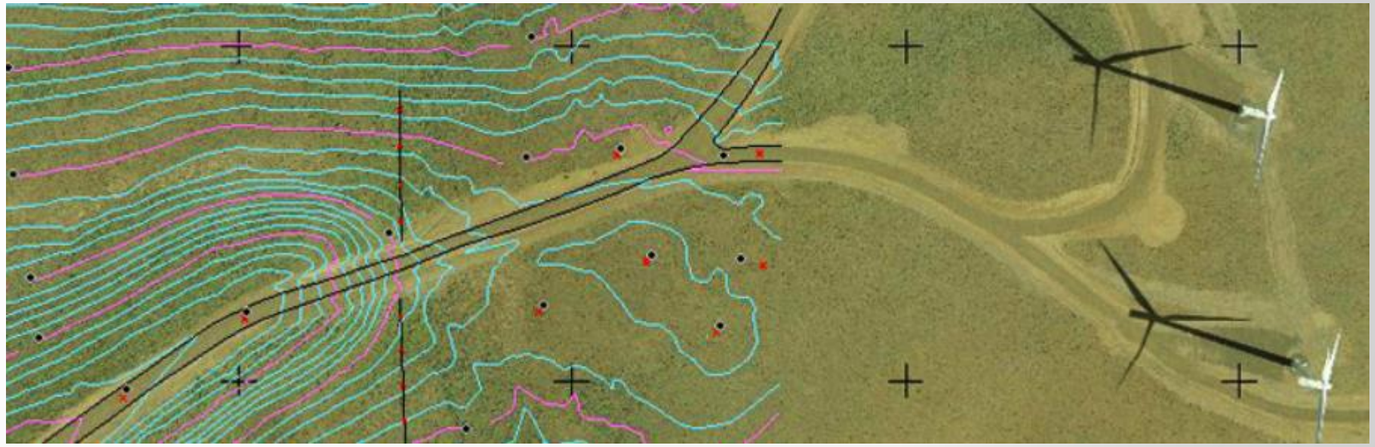
http://www.cpuc.ca.gov/environment/info/dudek/sbsrp/SouthBaySub.htm

- Substation relocation
  - Community engagement
  - Site survey, engineering and mapping documentation
  - Iterative GIS documentation due to nature of planning, alternative consideration



Scenario

- Green energy new build
  - Line of sight impacts
  - Sound analysis
  - Wildlife impact
  - Site location alternatives



Why Integrated GIS & Engineering Documents

- Cost & Profitability
  - EAI alone typically < 1% of total construction budget
  - However, that 1% often exceeds hundreds of thousands of $ on large-scale, long-term projects
  - Enforced standards and version control reduces project ramp-up
- Liability
  - Incorrect environmental assessments, if proven, can incur significant liability costs in the event of an unplanned event
- Trust
  - Knowing that all project documents are managed by the same process gives stakeholders confidence in the integrity and transparency of the larger process

Why Integrated GIS & Engineering Documents

- Expanding scope of impact assessment
  - Social aspects (such as impacts on employment, community interaction);
  - Risks (such as threats to native animals, water supplies);
  - Life cycle (such as the impacts at each stage of the project – design through to operation and closure); and
  - Energy (such as use of non-renewable energy sources, Greenhouse gas emissions)

Value Proposition

- Seamless workflow for GIS in engineering/construction business processes
- Access to latest engineering design information to minimize re-work
- Ability to easily share and version-control all project documents in a single system
  - Concerns about file management of massive scans
- Ability to enforce consistency for both engineering and GIS

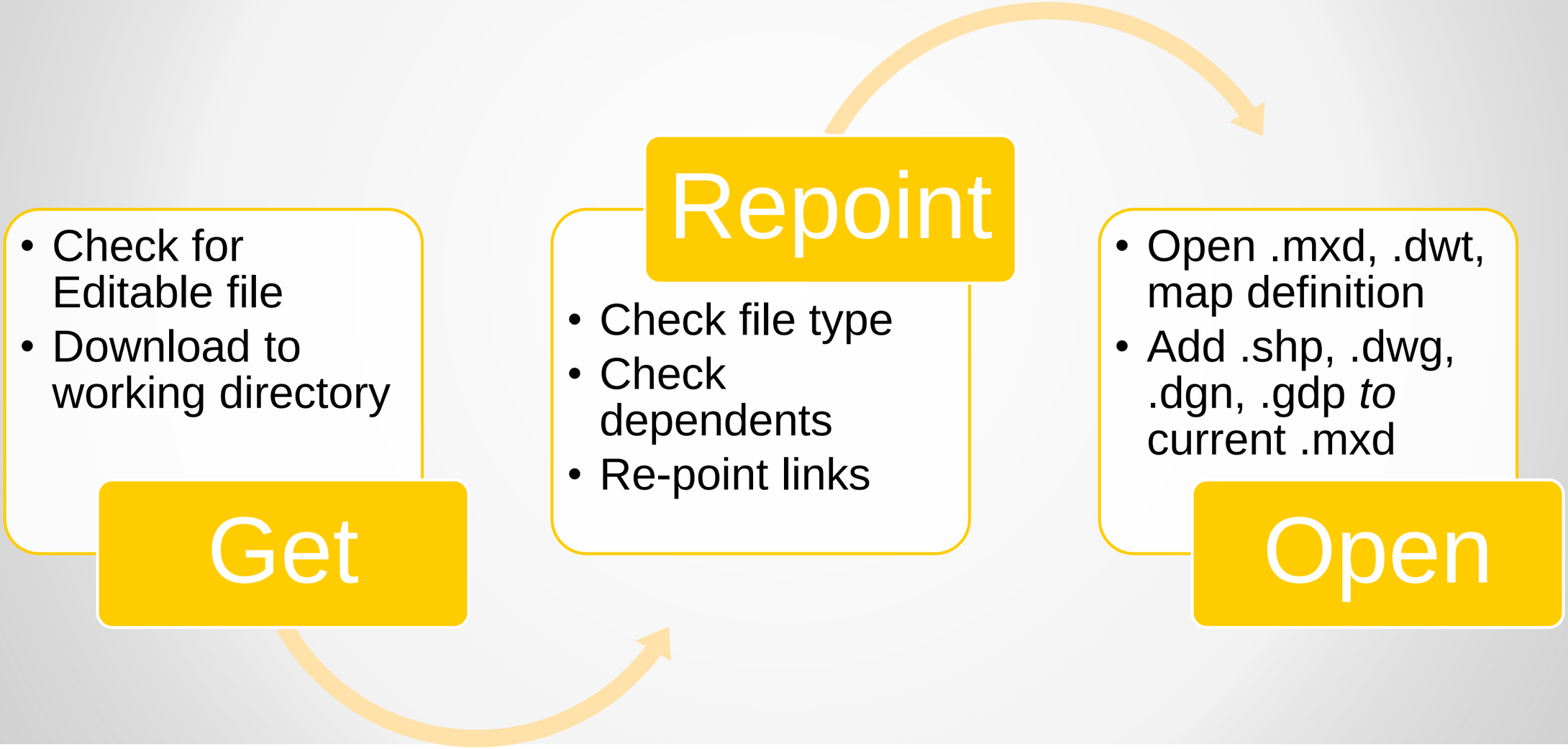
Proposal

- Use the Vault API to create simple plug-ins for AutoCAD Map and ESRI ArcMap/ArcCatalog that
  - Manages and clones standard template projects
  - Provides versioned documents on a project basis (GIS documents are versioned in a consistent fashion with engineering documents).
  - Allows similar metadata editing and search capability
  - Ensures document locking and integrity

What we are NOT suggesting

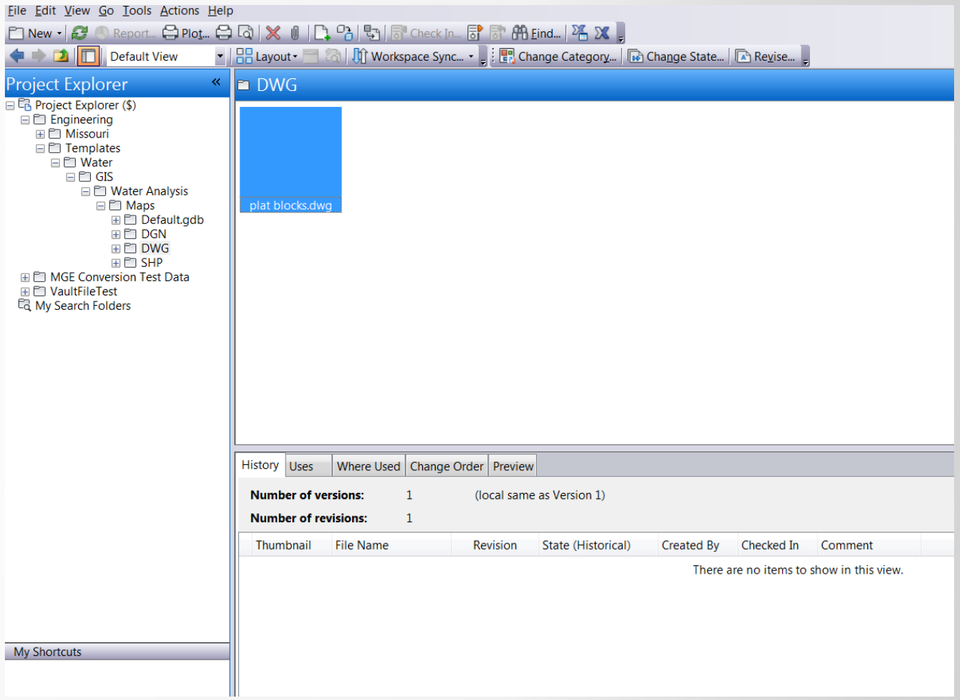
- Large scale as-built or as-designed GIS data in an enterprise GIS is NOT stored in Vault
- Standardized projects with *connections* to enterprise databases *are* stored in Vault
  - Easily pull in other engineering documents
  - Update map references accordingly

What happens in the ArcMap or AutoCAD Map client



Thoughts on Map

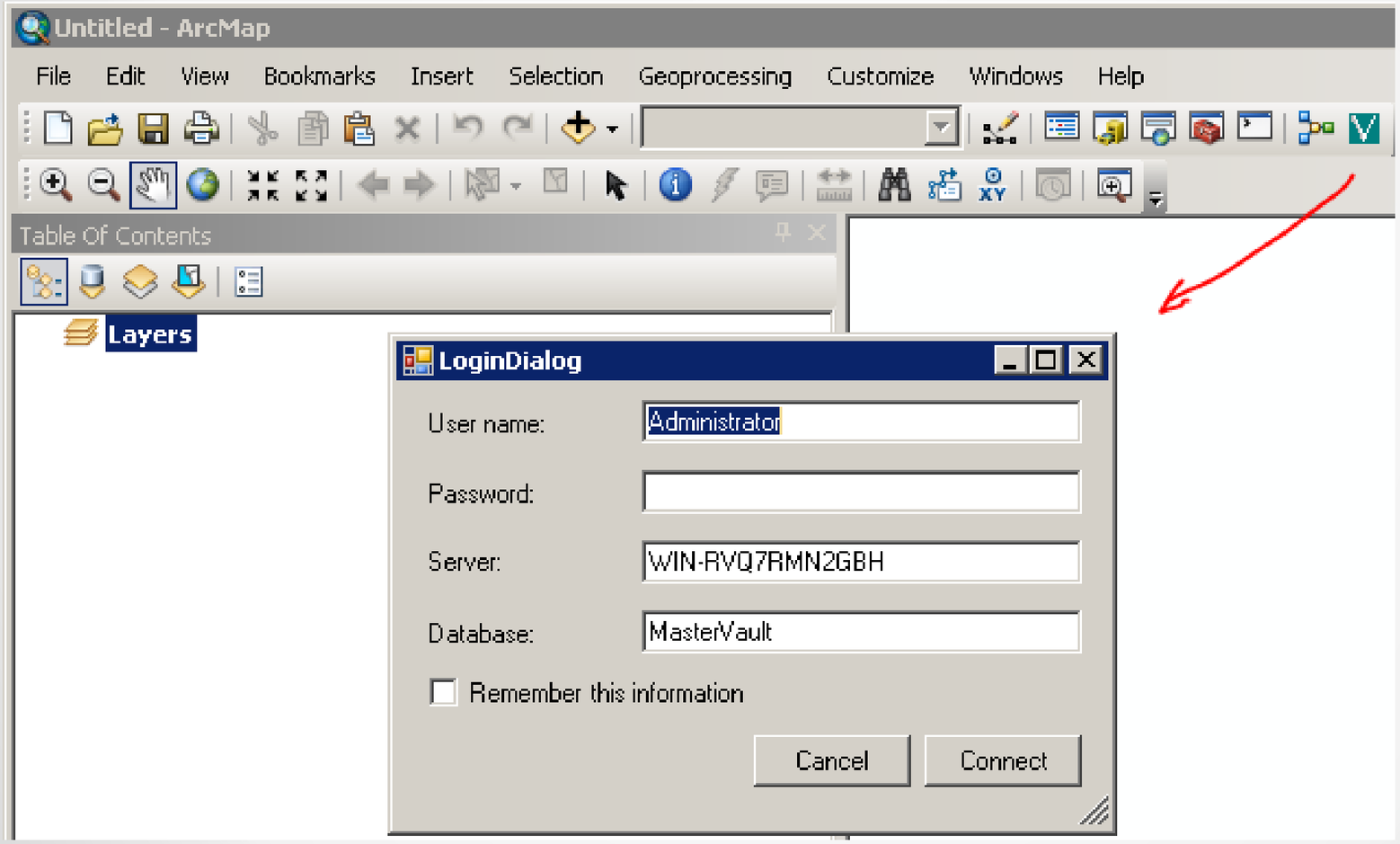
- Don’t re-invent the wheel
  - Try to use existing Vault client for Map
  - Not sure if hooks are available to handle Vault client events.
  - Can check timestamps after load
  - Perform identical logic (open tbdm, add referenced layer files)



Vault API Requirements

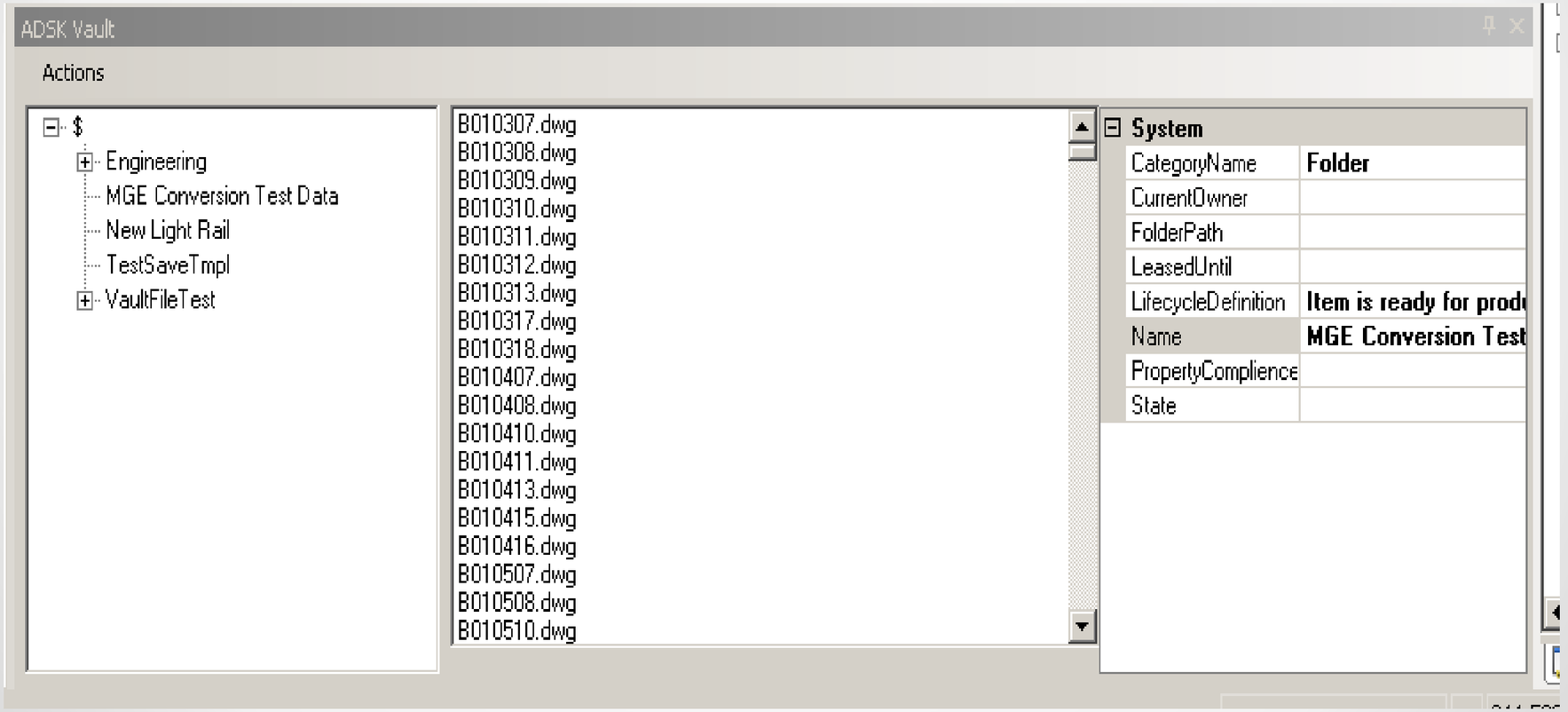
- Simple use of standard Vault APIs
  - C# .NET
  - Vault web services (Autodesk.Connectivity.WebServices)
  - Vault extensibility tools (Autodesk.Connectivity.Explorer.ExtensibilityTools)

ArcMap Scenarios



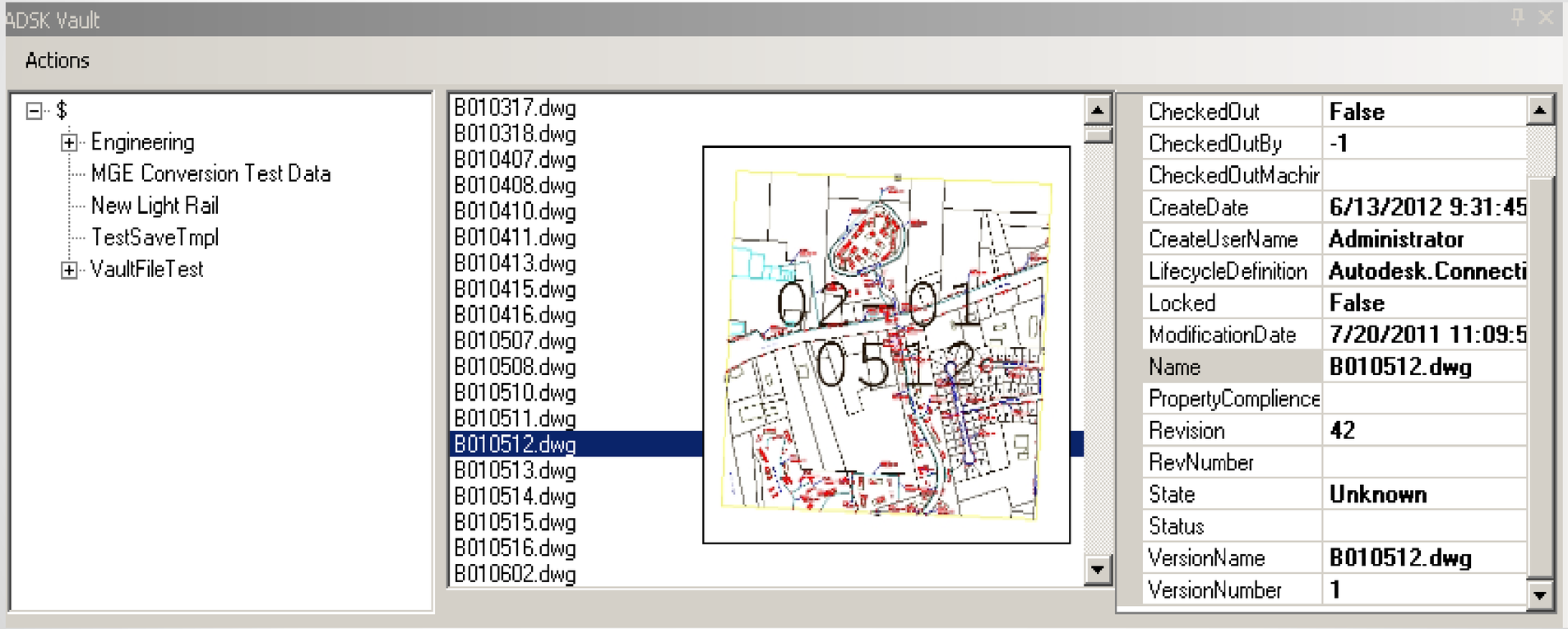
Vault browser dockable window

- Folders, files and Properties (folder or file)



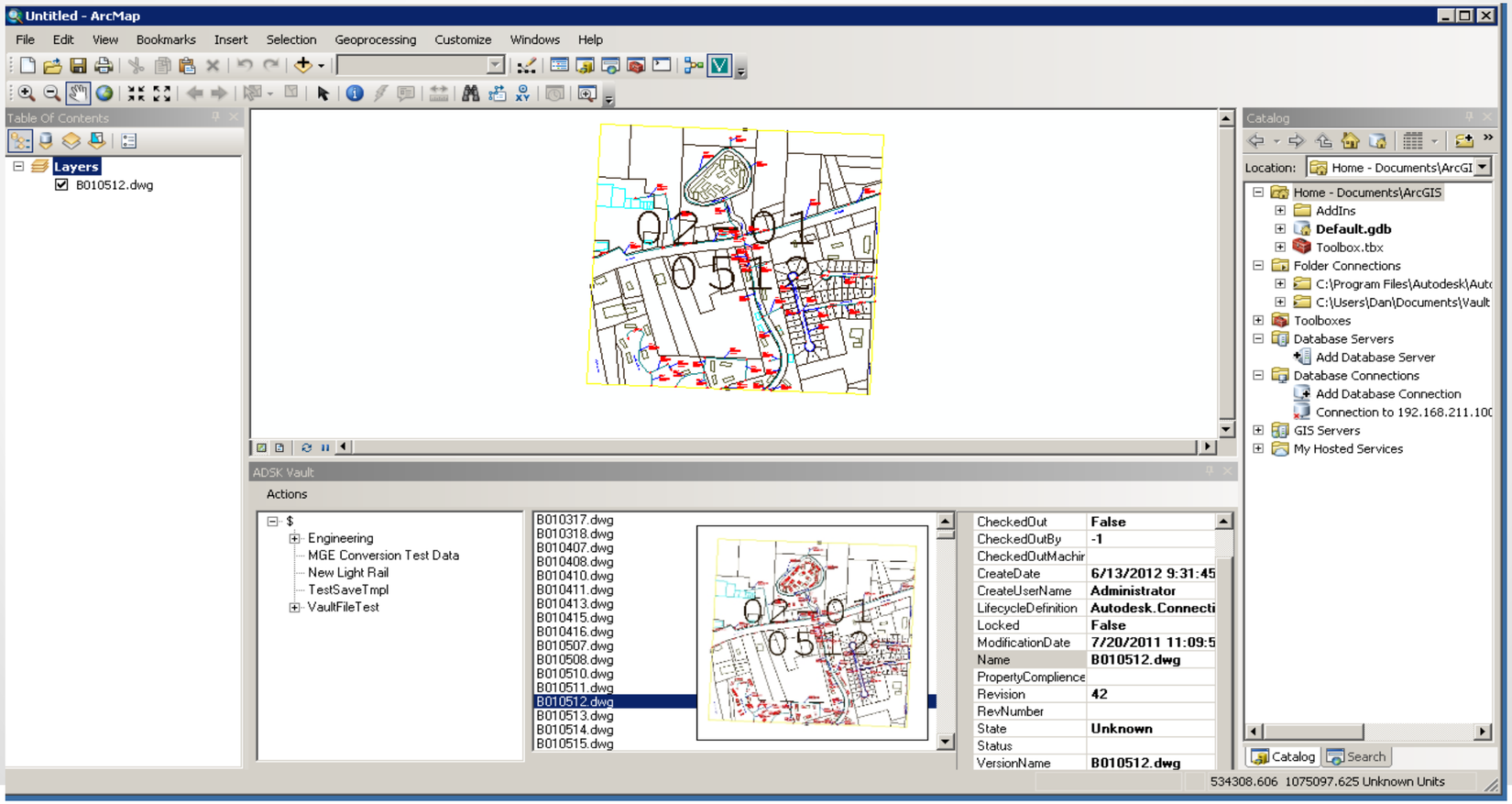
Preview

- Single-click on a .gdb folder, SHP folder or DWG file will display its preview if any in the vault.



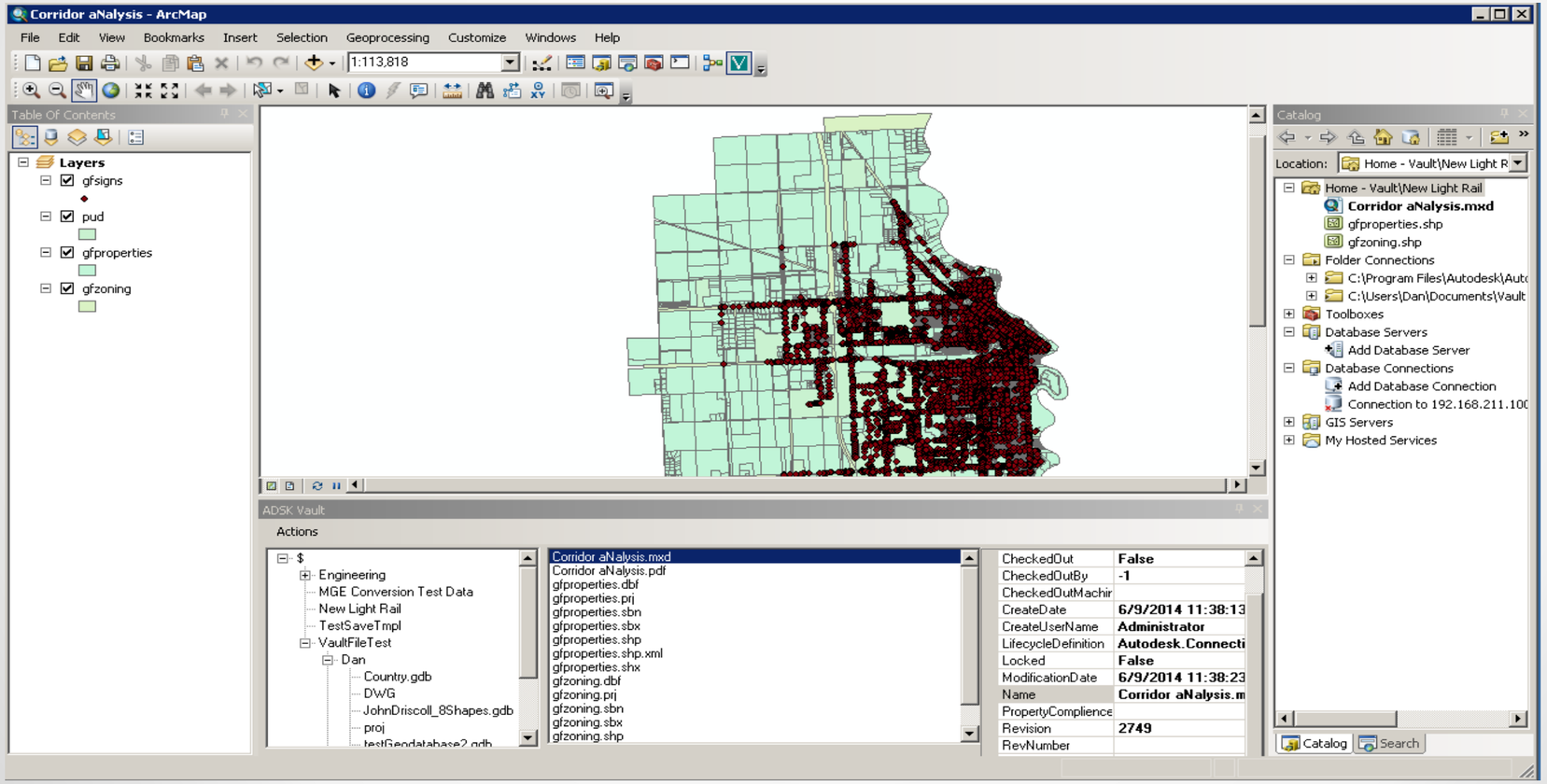
Downloading data (I)

- Automatic data loading into ArcMap on double-click (.gdb SHP, .mdx or DGW). Example for a DWG file:



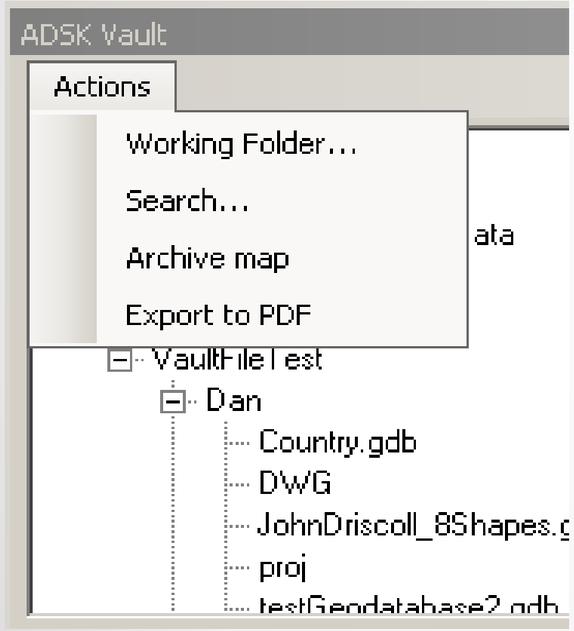
Downloading data (II)

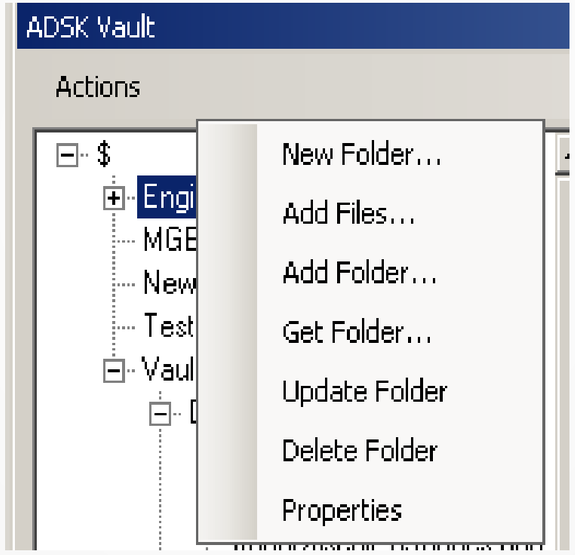
- Load a ArcGis .mxd project, example:

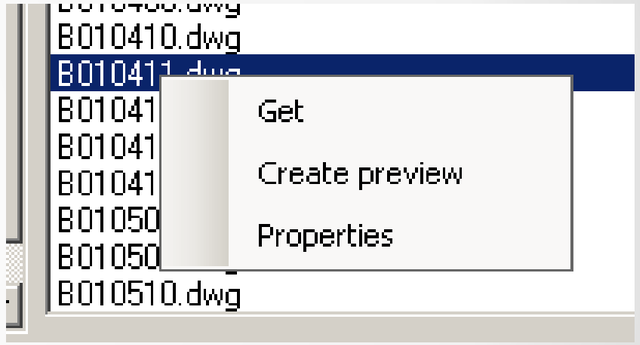


Options

- General options, context menus on folder and files
- Example: automatic archiving the current map

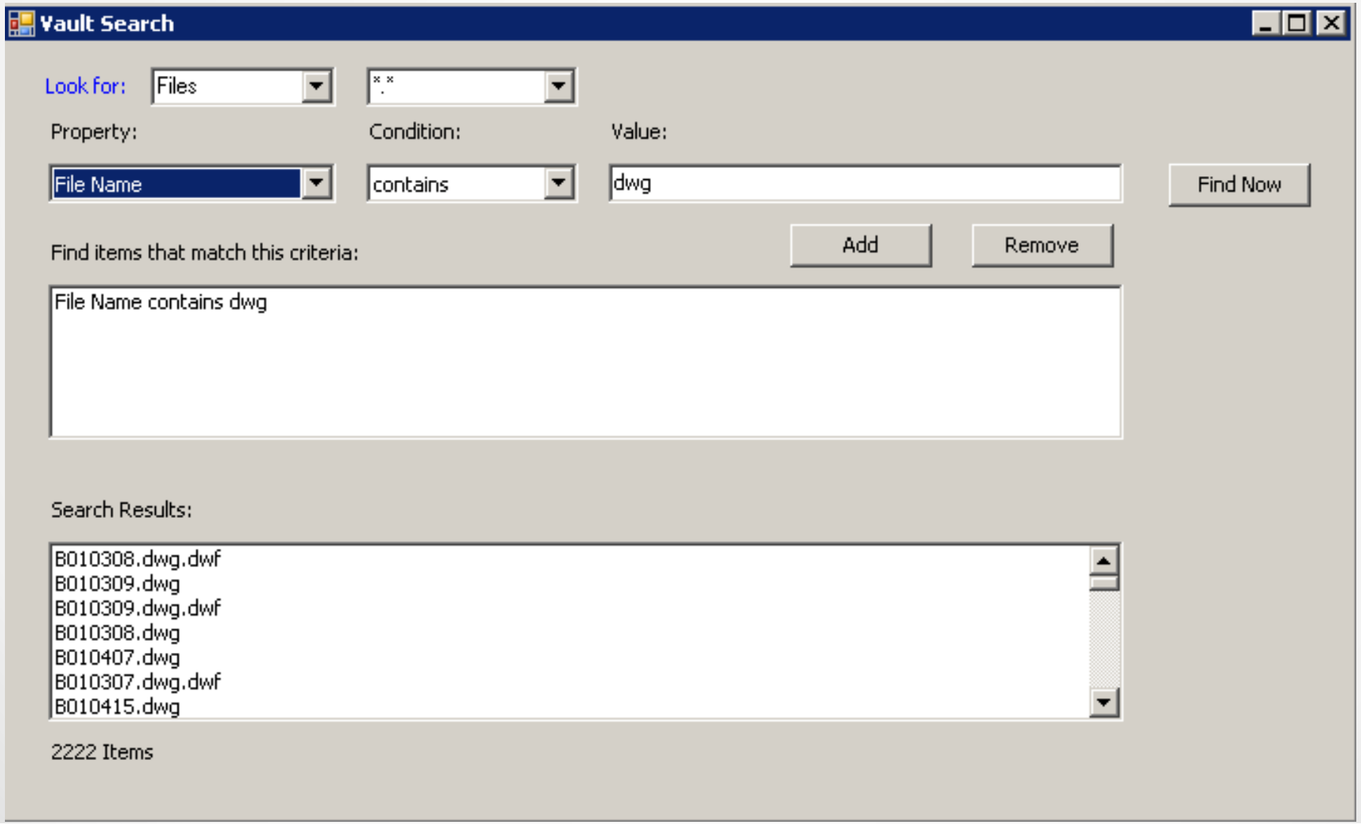






Search

- Search the vault using filters on properties
- Selected files can be uploaded automatically

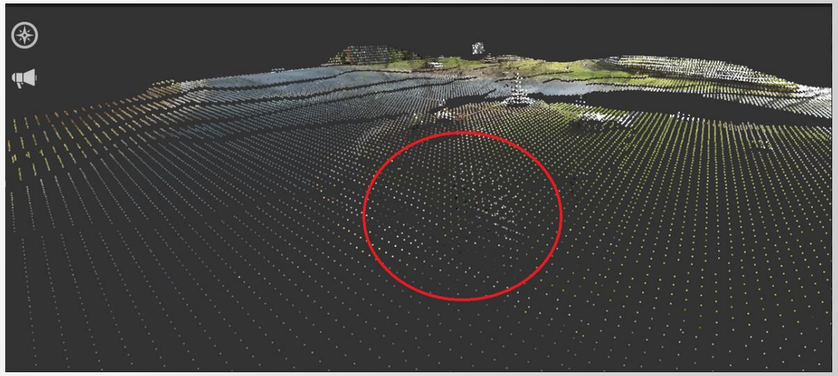


Work remaining

- Reliably re-point *all* files within the reference system for AutoCAD Map and ArcMap
  - This is already handled by Vault for xref files
  - Depends on standards
- Add detailed version history to ArcGIS browser

Concerns for the future

- Cloud computing and data management
  - ESRI ArcGIS Web Services
  - Autodesk 360
- 3D visualization with Infraworks & ArcScene
- Model integration
  - Autogeneration of Infraworks models (or model references & styles that are configured but not imported)
  - Autodesk BIM 360 Glue
- Massive data sets & reality capture



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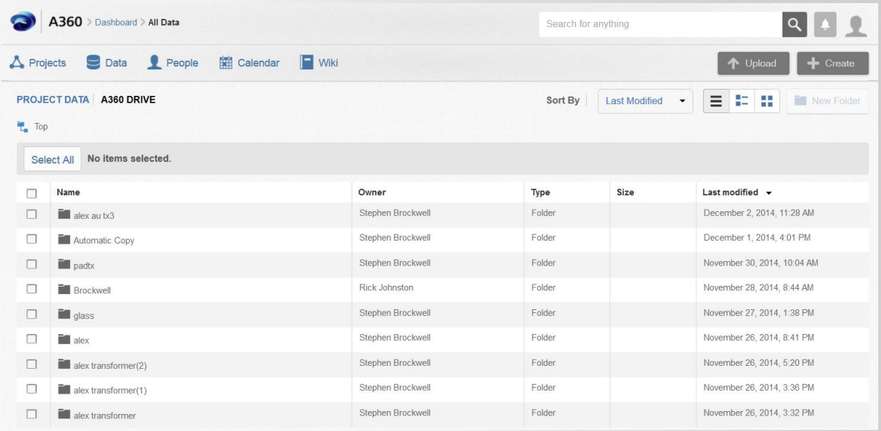

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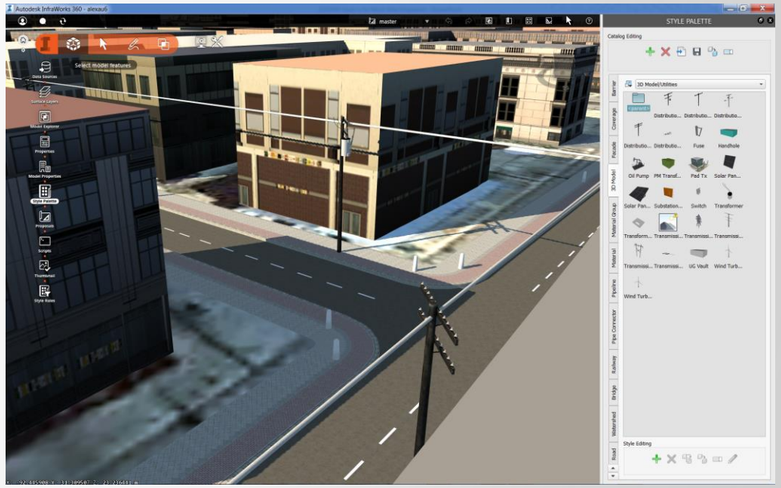

Video Demonstration

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