

# Placer Dome: Implementation of a Global Land Management GIS System

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## Abstract:

Placer Dome (PDG) is one of the largest Diversified Gold Mining companies of the world. Land management is a core business and the need to integrate to existing regional geographic land management systems with the company's business process models is crucial to the development of the Global Land Management System (LMS).

The success of the implementation of the LMS was the result of the understanding of the technology, but more importantly on the data, content, workflows and business requirements and the recognition of the stakeholders support and requirements from the very beginning.

PDG has taken full advantage of the recent advances in both database and spatial mapping technologies to help manage the development of a LMS that is based upon ArcSDE and an ArcIMS/ArcGis/Mapinfo platform.

LMS provides PDG with an avenue to standardize corporate policies for land management and create minimum metadata requirements with the ability to adapt to regional requirements.

**Placer Dome is the world's sixth largest gold mining company**, pursuing quality assets around the world. Our core gold business is strengthened by the contributions of our copper and silver assets.

Headquartered in Vancouver, Canada, Placer Dome now has interests in 17 mines in seven countries around the world, and our global workforce exceeds 13,000 people. With a market capitalization of US\$8.2 billion at the end of 2004, Placer Dome is traded on the New York, Toronto and Australian Stock Exchanges, as well as Euronext-Paris (Figure 1).

In 2005, Placer Dome expects to produce about 3.6 million ounces of gold and 415 million pounds of copper. Our financial strength is underpinned by a portfolio of gold assets that has been enhanced by the addition of AurionGold and East African Gold Mines, and is complemented by a strong balance sheet and significant and predictable cash flow.

Placer Dome was formed in Vancouver, Canada, in 1987 by the amalgamation of Placer Development Limited of Vancouver, and Dome Mines Limited and Campbell Red Lake Mines Limited of Toronto. Dome Mines was incorporated in Ontario, Canada, in 1910, Placer Development in British Columbia, Canada, in 1926, and Campbell Red Lake Mines in Ontario, Canada, in 1944.

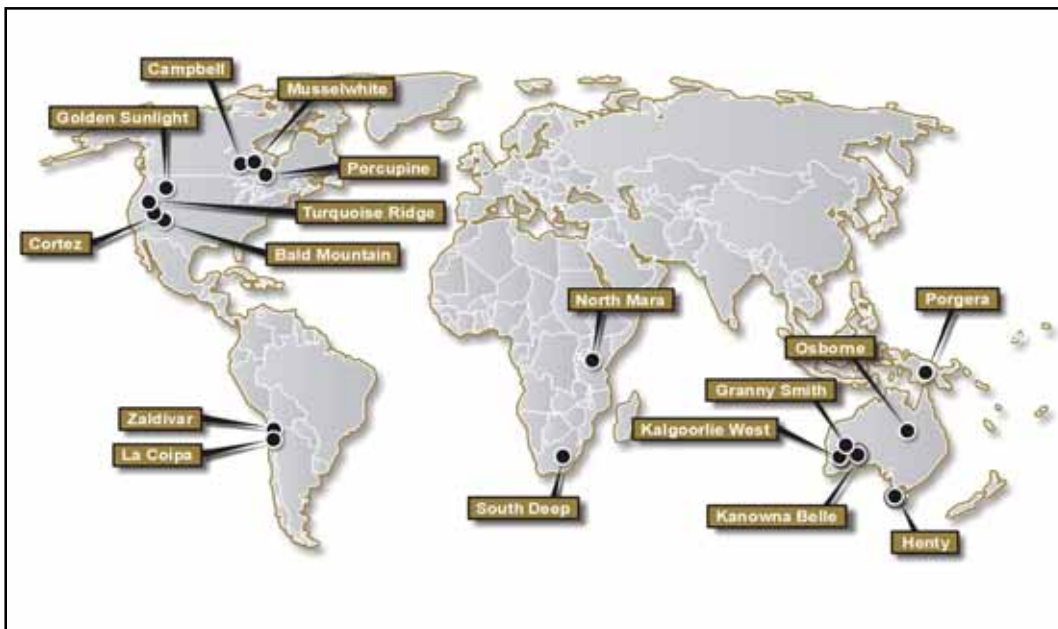


Figure 1: PDG Distribution of Global Operations

## The Global Data Base Architecture for Placer Dome Group

The global data base architecture for the PDG in regards to the geology and engineering departments is to standardize the storage of data into four primary areas (Figure 2). They are:

- Sample Management
- Spatial Data Management
- Production Data Systems
- Mill Processing Systems

The global goal is to separate proprietary (binary) data base storage at the thick client level and move this data into an open database storage structure for all primary geology and engineering applications used throughout PDG. The pragmatic adoption of these standards allows PDG to focus on web service architectures that opens a path to leverage existing technology investments, incrementally implement services, focus on tangible early wins and plug in elements over time.

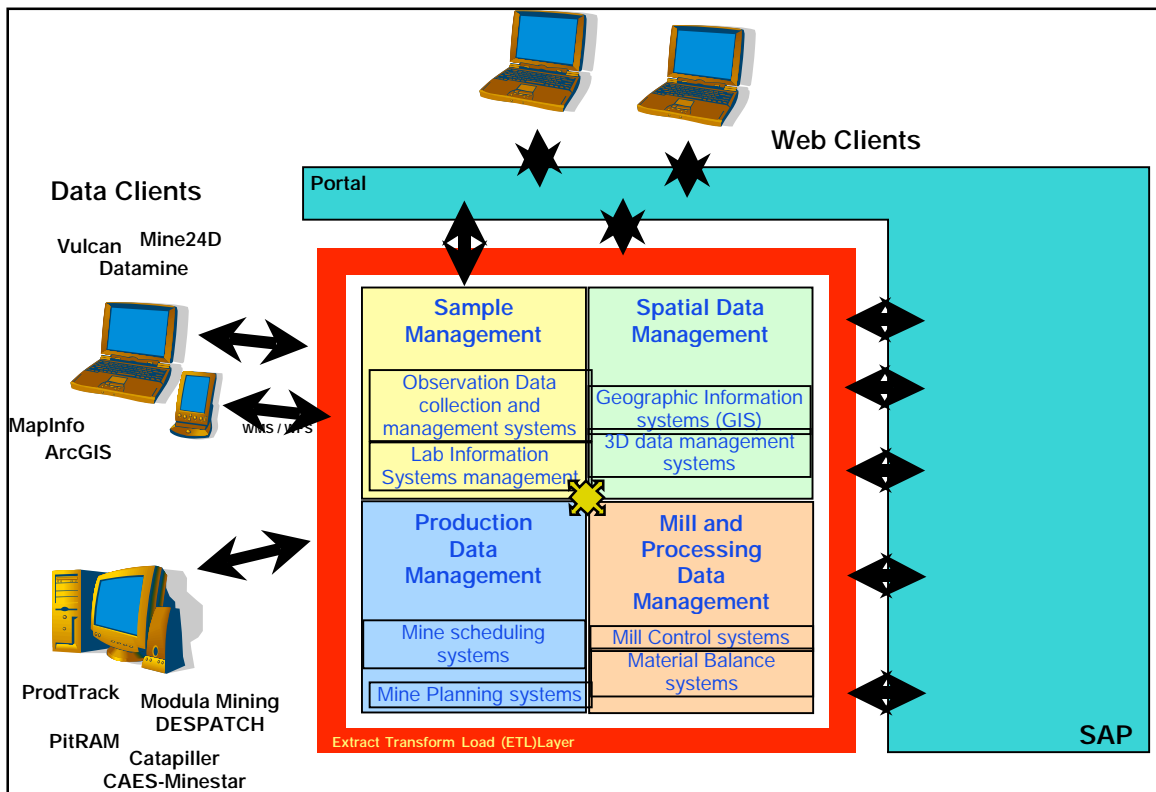


Figure 2: PDG Global Data Base Architecture

## The Global Land Management Project

The land management project was defined in 2003-2004 as part of the AMS Geological Process Strategy when a requirement for a Global Land Management tool was identified.

The project was to incorporate the management of Land assets, manage and address regional land management variations, and support the business process.

The present Placer Dome Land Management Systems are viewed as a number of different businesses (silos), running diverse and independent systems. Each system requires its own maintenance and set of tools to run, and is usually supported by a few select individuals.

The opportunity to standardize a Land Management system throughout Placer Dome will provide the company with the necessary tools to develop and support a consistent distribution framework of knowledge, training, and relationships, among different geographical regions.

The goals of this project are:

- To define the Global Land Management vision and strategy for Placer Dome;
- To define and implement systems architecture for delivery of regional and Global Land Management solutions throughout the company;
- Identify and implement specific land management initiatives that will make a positive contribution to PDG Global Land Management requirements.

### **Land Management Value Proposition**

The project's value proposition is based on standardizing PD's present Land Management System competency in terms of:

- Land Management security
- Consistency
- Accurate live reporting and accountability
- Land Management skill sets for staff
- Land Management monitoring and defined decision points

A standardized system will help minimize the potential loss of a strategic tenement or group of tenements.

A new system will provide interaction with the following systems:

- Legal Agreements database;
- Financial Management system (SAP/JDE)
- Document Management system
- Increase the level of Global Land Management support

And

- Improve information availability
- Integrate workflows with notifications and alerts
- Reduction in amount of time local LA's spend to complete reporting requirements
- A spatial component (GIS) is highly desirable

Land Information System implementations succeed or fail on the basis of the implementation team's understanding not only of the technology required, but more importantly on the data, content, workflows and business requirements of the organization.

A Successful implementation recognizes the needs of the stakeholders, assists in streamlining existing business processes, maintains the stakeholders continuous support and provides properly managed expectations that are well supported and maintained in the long term.

It is estimated that the total annual amount spent on Land Management within Canada, USA and Australia is in excess of \$ 500,000 USD/per annum. If all three of these countries used the same Land Management System to manage their tenements, PD would reduce their overall operating/maintenance costs by approximately 40%.

This would equate to a CFI = 1.2 and a Payback in 1.4 years.

### Global Land Management Business Goals

Business Goals	Project Objectives	Measure of Success
<ul style="list-style-type: none"> <li>• Combine spatial data from current database systems (MapInfo, ArcView,)</li> </ul>	<ul style="list-style-type: none"> <li>• Complete proof of concept of Land Management System to ensure these capabilities exist</li> </ul>	<ul style="list-style-type: none"> <li>• The ability to integrate data from different systems into one environment</li> </ul>
<ul style="list-style-type: none"> <li>• Combine financials with spatial data</li> </ul>	<ul style="list-style-type: none"> <li>• Complete proof of concept of Land Management System to ensure these capabilities exist</li> </ul>	<ul style="list-style-type: none"> <li>• The ability for Land Managers to be able to access financial data within a spatial environment.</li> </ul>
<ul style="list-style-type: none"> <li>• Implement a change detection Process</li> </ul>	<ul style="list-style-type: none"> <li>• Compare tenement data from current and previous month to identify changes</li> </ul>	<ul style="list-style-type: none"> <li>• The ability for Management, to be able to easily and quickly access tenement changes each month</li> </ul>
<ul style="list-style-type: none"> <li>• Comply with current Land</li> </ul>	<ul style="list-style-type: none"> <li>• Work through business work flows to ensure Land</li> </ul>	<ul style="list-style-type: none"> <li>• Streamline delivery of Tenement</li> </ul>

management Business Processes	Management System fully complies	information throughout Placer Dome
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## PDG Requirements to build a Corporate Global Land Management System

- Built using a three tier design architecture;
- Built using the Microsoft .NET environment;
- Support both Windows and Web forms;
- Support localization and multiple languages;
- Component-based and configurable to ensure ease of maintenance and sustainability;
- Built on an ArcSDE Database and using an ArcIMS web service to distribute data
- Use of Mapinfo, Arcview and Web clients
- Provides database connectors to external systems, eliminating the present situation of duplicating data;
- Use of Placer Dome Business rules and roles based approach to data management;
- Focus on workflow management;

## List of options considered to deliver a Corporate Global Land Management System

### 1) Maintain Status Quo/Current System

The four main issues that would need to find a solution are:

- Retraining the workforce not just in statutory requirements but also in the software applications that PDG presently uses
- Removal of the antiquated and poorly supported systems used by particular silos
- The ongoing costs to support individual systems, poor documentation and staff changes

### 2) Create In-house Global Land Management System

Placer Dome in the past has created in-house software. Over time, changes in staffing, business focus and software, has left the in-house systems unsupported and inadequate.

These systems were created at a time when each region had a land management department whose staff were capable of managing and supporting the creation of a new system along with their daily job responsibilities. Today, each region uses a very small group to manage their tenements, usually with the help of contractors.

Placer Dome's corporate philosophy is to become software users and not software developers due to the high risks associated with these types of solutions.

### 3) Purchase Global Land Management Solution

Land Information System implementations succeed or fail on the basis of the implementation team's understanding not only of the technology required, but probably more importantly on the data, content, workflows and business requirements of the organization. Successful implementations are ones that recognize the actual needs of the stakeholders assist in streamlining existing business processes, have stakeholder support from the beginning, have expectations properly managed and are well supported and maintained in the long term.

For a Land Information System implementation to be successful, it is essential that all the Components of the system are fully understood, documented and optimized. The essential components are illustrated below in Figure 3.

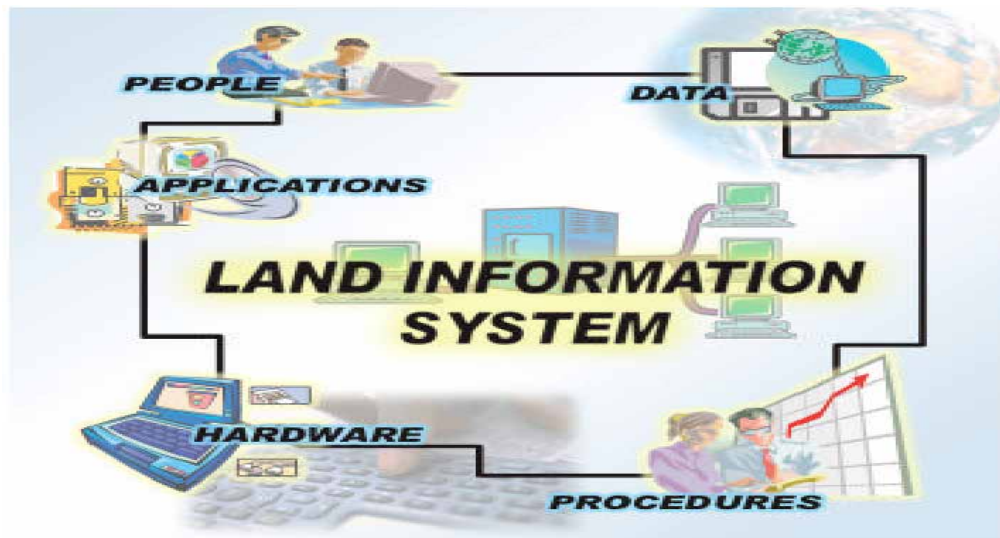


Figure 3: Components of a Successful Land Management System

The focus of Placer Dome's Global Land Management System is to manage and facilitate the **workflows** required for the efficient administration of mineral title. Placer Dome's Tenement Land Management system will be designed to achieve this by scheduling and managing rule-based **actions** within an intuitive and easy to use application.

### The Global Land Management Ingredients

The four main ingredients that are needed to implement a Global Land Management System are (Figure 4):

- Integration with SAP and Lotus Notes

- Use of ESRI SDE and ARCIMS on a object Relational Database Management System
- Incorporation of PDG Business Rules
- Web Client delivery to allow maximum flexibility for each region without the burden of application thick client development

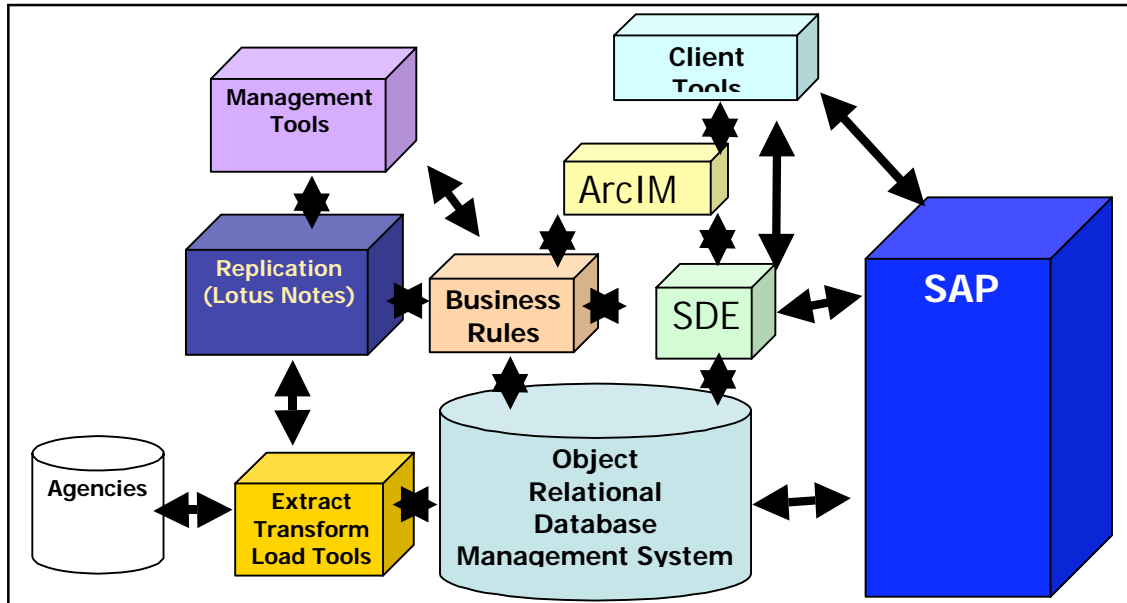


Figure 4: Ingredients for a Corporate Land Management System

## The Expected Benefits for Each Solution

### Maintain Current System

#### Tangible Benefits

- Since nothing will change there will be very little added to the current systems other than local stakeholders improving some of the internal processes to help these systems work a little smarter with the current infrastructure.

#### Intangible Benefits

- Present systems are understood by current Land Administrators
- Risks are generally known with present systems

### Create In-house Global Land Management System

#### Tangible Benefits



- Will reduce overall management costs by eliminating 3<sup>rd</sup> party contractors
- Will reduce training, knowledge transfer and maintenance costs throughout Placer Dome

#### Intangible Benefits

- Use of the same Land Management solution throughout Placer Dome
- Increased value to Placer Dome through improved decision making and improved management of technology
- Increased value to Placer Dome by reducing overall Land Management Costs
- Increased internal knowledge level amongst Placer Dome staff
- Decreased risk associated with new initiatives and projects
- Component based and configurable to ensure ease of maintenance and sustainability
- Provides database connectors to external systems, eliminating the present situation whereby data is duplicated
- Use of Business rules and roles based approach to data management
- Focuses on workflow management

### **Purchase of Global Land Management Solution**

#### Tangible Benefits

- Will reduce overall management costs by eliminating 3<sup>rd</sup> party contractors
- Will reduce training, knowledge transfer and maintenance costs throughout Placer Dome

#### Intangible Benefits

- Use of the same Land Management solution throughout Placer Dome
- Increased value to Placer Dome through improved decision making and improved management of technology
- Increased value to Placer Dome by reducing overall Land Management Costs
- Increased internal knowledge level of Placer Dome staff
- Decreased risk associated with new initiatives and projects
- Component based and configurable to ensure ease of maintenance and sustainability

- Provides database connectors to external systems, rather than requiring the duplication of data
- Use of Business rules and roles based approach to data management
- Focuses on workflow management

## **Placer Dome Solution to Global Land Management**

The Placer Dome solution for Land Management has focused on two keys areas:

- 1) The implementation of a change detection process in regions where State governments are presently distributing their Land management data in an SDE export format. This process was built and implemented by ESRI Australia PTY Ltd (Brisbane Based).
- 2) The Implementation of a global land management solution for PDG. Flexicadastre Corporate (FC) is the software of choice and has been created by Spatial Dimension PTY Ltd.

### **The Change Detection Process**

ESRI Australia PTD Ltd. has provided professional and expert GIS/IT application development and Database consulting services to PDG. ESRI has the internal skills and expertise necessary to design, implement and maintain a successful enterprise wide GIS Change detection process.

The Change Detection Project consists of a number of processes which combine into a methodology designed to automate Placer Dome's change detection process for Western Australia Government Tenement data.

The intended use of the Change Detection methodology is to streamline the download, database storage, manipulation and display of Western Australia Tenement data made available through WA DOIR's website. The process involves (Figure 5):

- obtaining data monthly in ArcSDE export format,
- importing new data into ArcSDE 9 on SQL Server,
- archiving old data,
- creating database views based on the current and previous months data,
- unioning the previous and current month data,
- performing queries in order to show a variety of measures of change detection,
- emailing URLs containing HTML reports via SMPT to a list of Stakeholders,
- displaying the latest change data on an ArcIMS "Generals/Approvals" website for Land Managers, Management and general users (Figure 6)
- allowing Land Managers to Approve/ Not Approve the changes.

This Change Detection Methodology has been achieved by engineering an application from scratch, programming the automated functionality as a series of compiled Visual Basic applications that make use of ESRI's ArcObjects (version 9), SDE commands and using the SQL Server database as a storage mechanism for queries, views, lookup tables and data tables.

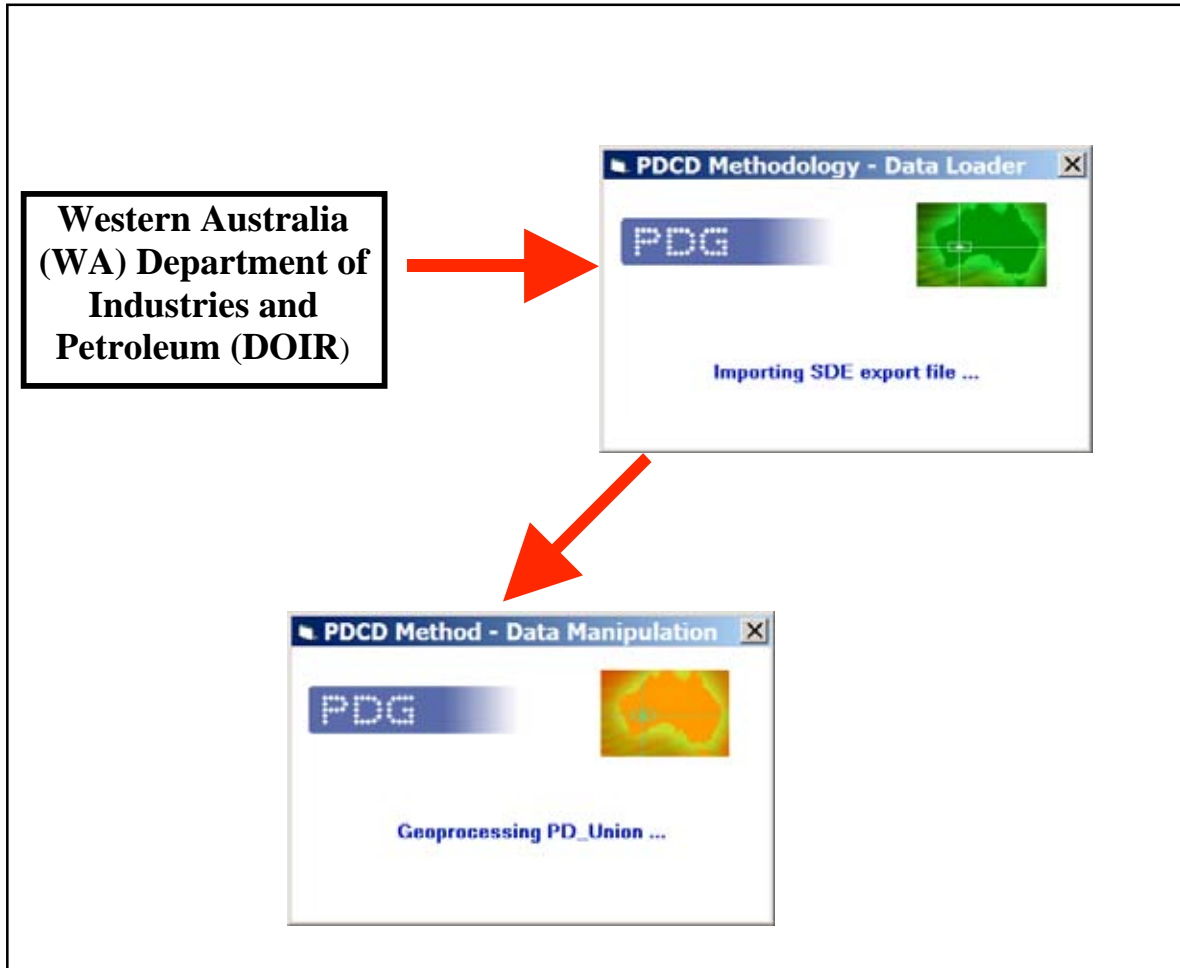
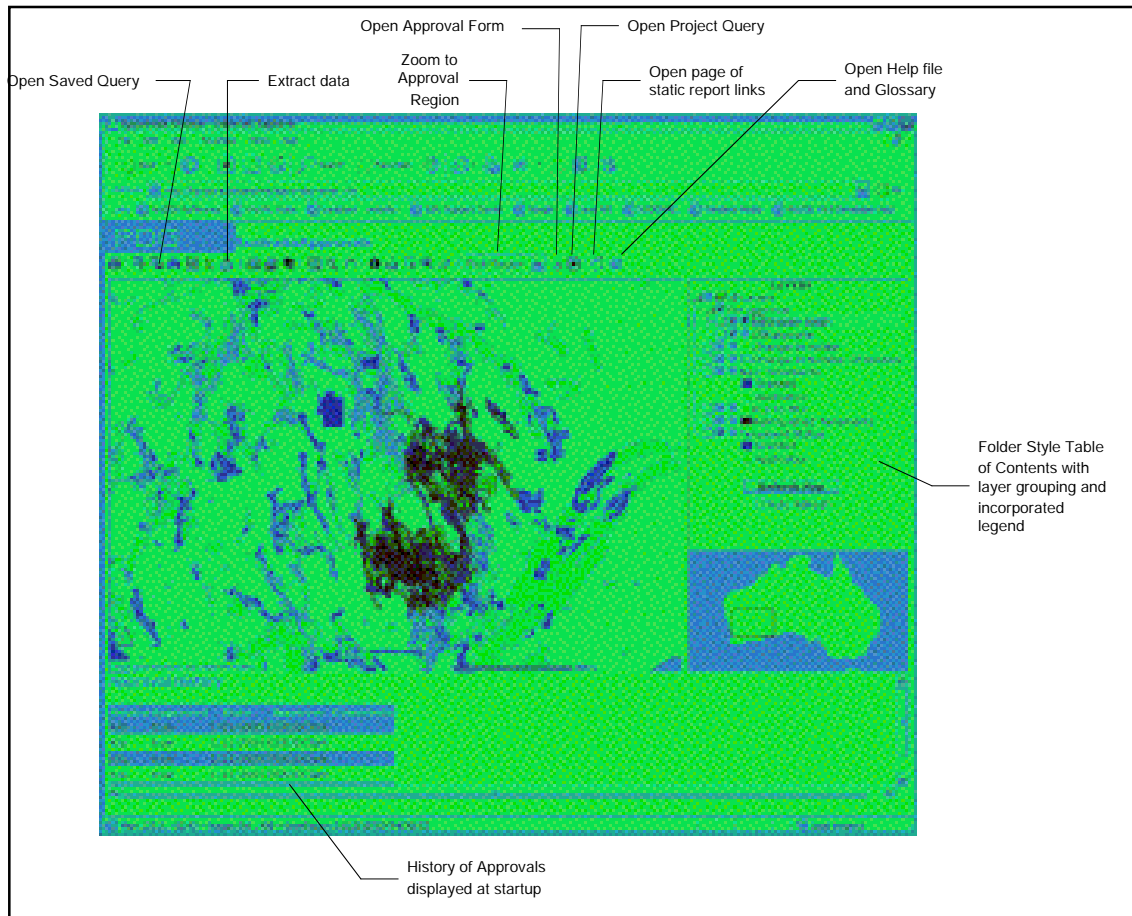


Figure 5: The Change Detection Process

The following screenshot is of the ARCIMS Viewer and annotates new features that the new viewer includes (Figure 6).



**Figure 6: Screenshot of ArcIMS Approvals Viewer**

## The Global Land Management System – Flexicadastre Land Management System

Spatial Dimension Pty (Ltd) has provided the expert application development, database consultancy services and GIS/IT skill set that is required to design, implement and maintain a successful enterprise wide GIS Global Land Management System.

FlexiCadastre Corporate consists of three main components. These are the FlexiCadastre WebForms application (with an integrated arcIMS GIS component), the central database and an ArcSDE spatial database layer. The interactions between these components are shown in the Figure 7 below.

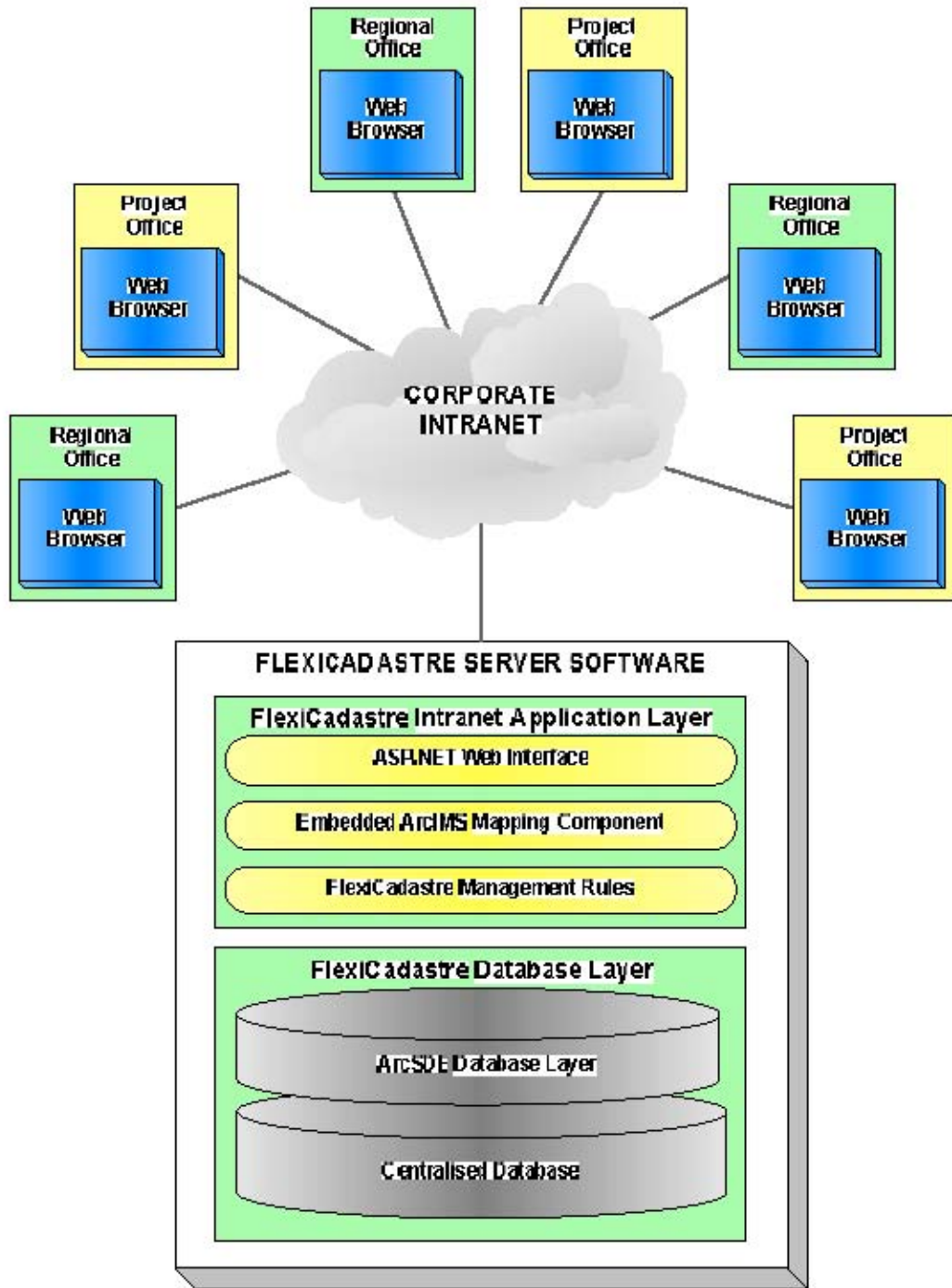


Figure 7: FlexiCadastral Corporate Structure

The FlexiCadastre uses an easy to use GUI with quick access to commonly used functionality (figure 8).



Figure 8: FlexiCadastre Web Services Interface

### Acknowledgements:

I would like to acknowledge the following for their contribution towards this global initiative:

From Placer Dome:

Andrew Scott, Iain Allen, Roger Cooper, Virginia Wright, John Brassard, Judy Kacan, Wayne Groenveld, John Harris, Oliver Quing, Adrian Iarge, Thet Aung, Mike Muhling, Kas Deluka, Brian Iverson, Gary Snow, Christine Saari, Paul McFarlane, Mark Hamilton, Gavin Bills, Gavin Clark, Colin Green, Peter Barrs

From Spatial Dimension Pty Ltd:  
William (Bill) Feast and Toby Mills

From ESRI Australia Pty Ltd:  
Nathan Thompson, Dan Clarke, Richard White

Bios:

Glen Kuntz

Title: Global Spatial Data Systems Coordinator

Degree: Bsc. Geology in 1991 and currently registered as a Professional Geoscientist in British Columbia and Ontario

Work History:

For the past 14 years I've worked in a production mine site environment in mining regions such as Australia, Africa, South America, USA and Canada.

Have been using the combination of 2D and 3D GIS/mining applications since 1986 in the Mining and Oil industries both in private and public sectors.

I have been working with Placer Dome since Jan 1998, starting at Campbell Mine in Redlake Ontario as a Senior Resource geologist, responsible for the calculation of each years resource/reserve statement.

In March 2004, my family moved to Brisbane to take over the role of Global Spatial Data Systems Coordinator. Some of my main responsibilities are to develop and coordinate a Global Spatial Data management Strategy for the implementation of corporate spatial data standards worldwide as defined in our Global Spatial data management Strategy, facilitate and negotiate Global Software License agreements, promote industry open database standards and facilitate Communication of industry trends and best practices to the Placer Dome Group.