GIS Enterprise Geoportal Project: Software Recommendations Report

October 3, 2014

DIVISION OF ENTERPRISE TECHNOLOGY
Wisconsin Department of Administration

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EXECUTIVE SUMMARY

This document examines Wisconsin stakeholder needs and makes software recommendations for a Department of Administration (DOA) Division of Enterprise Technology (DET) ***enterprise geoportal system.*** Wisconsin is currently one of only nine states without a central state geospatial geoportal to ease the discovery, acquisition, and use of geospatial data and land information.

DOA has a statutory duty under Wis. Stats. Section 16.967(3), to ". . . serve as the state clearinghouse for access to land information." An enterprise geoportal could fulfill this duty, by facilitating the acquisition and efficient use of geospatial data.

Recommendations

Recommendation #1: DOA charters a Geoportal Implementation Plan Project, charged with the following:

- Engage with LION, SAGIC, and the stakeholder community in the Implementation Planning process
- Propose governance plan requirements for the new geoportal system
- Investigate and provide specifications for implementation of CKAN as a geoportal service
- Develop a plan to fund the $1,200 to $1,500 or more initial costs and the $2,000 to $3,000 or more per month of ongoing costs
- Further investigate and recommend necessary employee resources to operate, maintain, customize and support the system for the first year
- Report to DOA management with a proposed Geoportal Implementation Plan by the end of April , 2015

Recommendation #3: DOA identifies an interim management-level project sponsor for a Geoportal Implementation Plan Project

Recommendation #4: DOA pursue the replacement of the GIO position in a timely manner to coincide with subsequent efforts by Geoportal Implementation Plan work group

Recommended Timeline:

October 31, 2014	DOA charter and approve Geoportal Implementation Plan Project
October 31, 2014 – March 31, 2015	Weekly Geoportal Implementation Plan Project meetings and stakeholder engagement
April, 2015	Geoportal Implementation Plan Project team deliver report to DOA management
2015 or 2016	Begin a project to develop a new and improved Wisconsin Geospatial Data Repository

1 INTRODUCTION

This document examines Wisconsin stakeholder needs and makes recommendations on a solution for a Department of Administration (DOA) Division of Enterprise Technology (DET) ***enterprise geoportal***. The conclusions presented suggest the need for a geoportal which will make Wisconsin's government geospatial information a true enterprise asset.

GEOPORTAL

A Web portal used to discover and access geospatial data and related services from one or more spatial data repositories.

The mission of the Geographic Information Office within DOA is to facilitate coordination, promote efficient data sharing, maintain effective and robust geographic information systems, promote strategic state enterprise geospatial goals, and thereby better enable enterprise spatial information utilization. Briefly stated, an enterprise geoportal is essential to fulfilling the mission of the GIO and leveraging Wisconsin's enterprise spatial data assets across state and local agencies.

Discovery and access to government geospatial data is in the best interest of our communities and the state. Applications of geospatial data include economic development, social services delivery, public safety and emergency management, agriculture, natural resources management, and transportation.

Unfortunately, geospatial data from a majority of Wisconsin's government custodians is often difficult to discover, access, and utilize. According to Wis. Stats. Section 16.967(3), DOA is charged to ". . . serve as the state clearinghouse for access to land information." An enterprise geoportal could fulfill this duty, by facilitating the acquisition and efficient use of geospatial data.

Generally speaking, a geoportal serves a few key purposes:

- Provides access to priority geospatial data through a web-based data discovery and access tool
- Serve as a GIS community curated source of common and in-demand geospatial metadata
- Systematic search and discovery capabilities allowing for filtering by or identification of a resource's official agency custodian, technical documentation, time period represented, and area of coverage
- Sufficient administrative capabilities to allow for periodic assessment, monitoring, and update of content
- Extensible functionality to allow for potential addition of advanced or differing capabilities based on user feedback

Project Purpose

The purpose of this project was to investigate product solutions and implementation requirements for enterprise geoportal services. This report documents the efforts of a workgroup which was assembled to examine how several products meet user needs regarding geospatial data storage, discovery, and access. The workgroup was charged with producing recommendations for implementing a managed geoportal solution for use by state and partner agencies. Those workgroup recommendations and the basis for them comprise this report.

Project Scope

It is important to recognize that ***this recommendations report focuses primarily on geoportal software and infrastructure recommendations and is <u>not</u> an implementation project***.

A separate implementation project might follow this report, as this workgroup recommends. This report only features geoportal product recommendations, descriptions of geoportal maintenance estimates, and general governance requirements. Figure 1 below illustrates the scope of this software recommendations report.

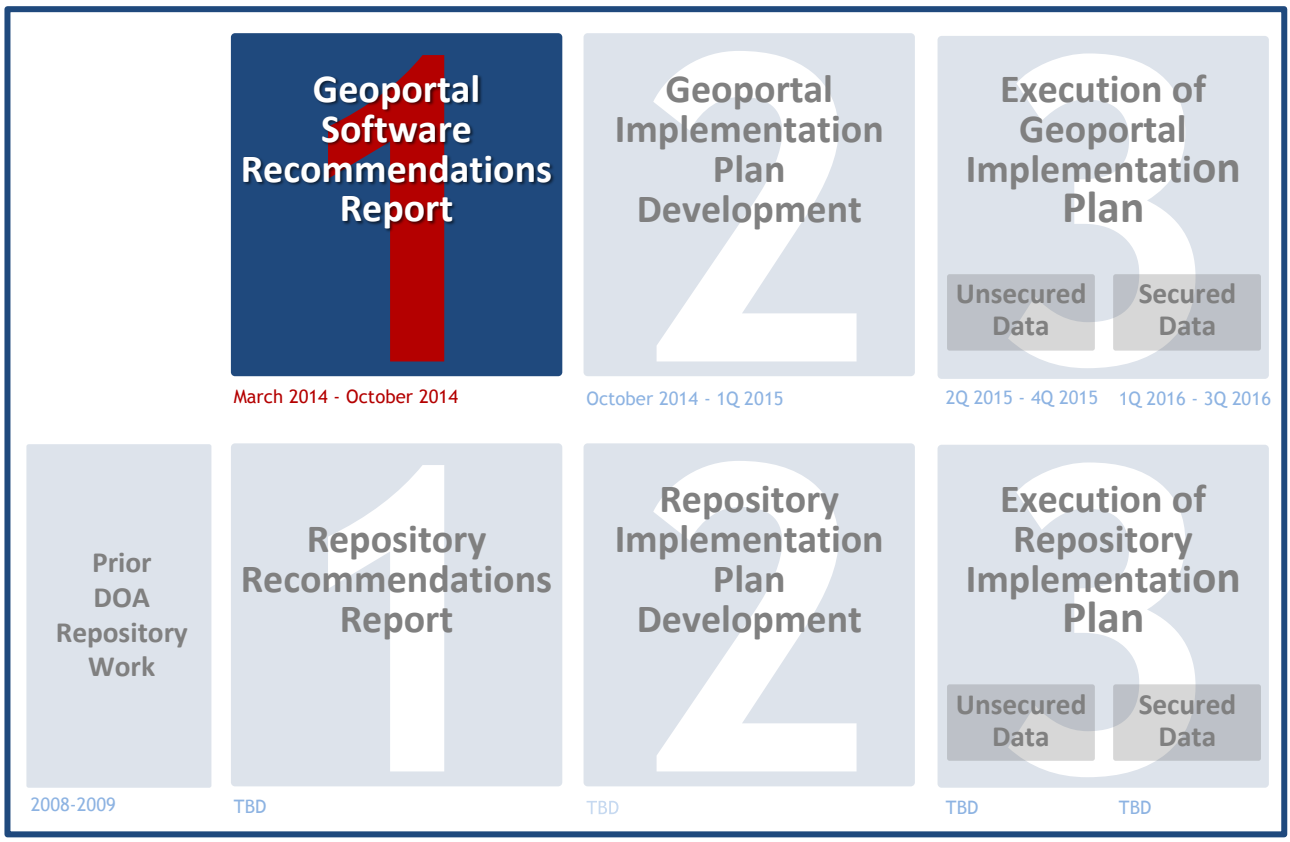

Figure 1. Scope of this report and potential future projects

This software recommendations project might be considered a first step toward an implementation plan that will address geoportal related issues in detail, such as government-to-government data sharing agreements.

According to the State Agency Geospatial Information Committee, data sharing and geospatial coordination during emergency operations and normal operations are top priorities for those working with GIS data. Because this report focuses on software recommendations, strategic issues such as data sharing are out of this project's scope. Thus, they would be better addressed in a separate Geoportal Implementation Plan Project, which the workgroup recommends follow this report.

To reiterate, this workgroup's emphasis was on geoportal software recommendations. Nevertheless, the workgroup was mindful of the relationship that often exists between a geoportal and a repository. A repository is a central IT infrastructure piece necessary for the storage and provision of enterprise spatial data assets
Considering an enterprise repository was outside of this project's scope. However, the workgroup members were informed by their experiences with spatial data repositories, including what has been referred to as the "Wisconsin Spatial Data Repository."

The Wisconsin Spatial Data Repository was a DET project that began in 2008. That project established the framework for a DET geospatial data repository but never led to the implementation and widespread use of that repository infrastructure.

The project team recommends that more work on an Enterprise Repository should be done in the near future. This includes dealing with the issues of governance, roles, responsibilities, service offering definitions, costs and access to both unsecured and secured data.

Wisconsin Geospatial Data Context

Wisconsin has a long and proud legacy as a leader in the application of geographic information systems (GIS) within government. This history and current investigative work are the foundation for the project described in this report.

- Some state agencies and counties began developing processes and procedures to use digital versions of spatial data sets for planning and analysis in the early 1980's.
- In 1989, the Wisconsin Land Information Program and the Wisconsin Land Information Board were created by Wisconsin Act 311, to establish a mechanism for land records modernization statewide.
- In 1997, the Wisconsin Land Council[2] was created, and attached to the Department of Administration, to identify state goals and priorities and make recommendations to the Governor for implementation of Comprehensive Planning.
- In 1999, the State Cartographer's Office introduced Version 2 of its WISCLINC Clearinghouse followed by a year-long series of FGDC-funded workshops on geospatial metadata development and publishing through a Clearinghouse.
- In 2005, the State of Wisconsin hired its first Geographic Information Officer (GIO), located in the Division of Enterprise Technology in the DOA. The GIO was given broad responsibilities, which included facilitating the coordination of GIS activities among stakeholder groups, encouraging the adoption of appropriate standards and data sharing policies, and identifying strategic directions for statewide GIS.
- In 2005, the State Cartographer's Office introduced its final version of WISCLINC—a voluntary clearinghouse effort hosting metadata and links to GIS data housed elsewhere in the state.
- In 2006, the GIO, through the "Wisconsin Enterprise GIS (WEGIS) 2006-2007 Business Plan" announced an initiative for an enterprise GIS data repository and enterprise web mapping infrastructure and services.
- In 2008, the DOA Division of Intergovernmental Relations partnered with the State Cartographer's Office to utilize the National States' Geographic Information Council 's (NSGIC)

[1] https://docs.legis.wisconsin.gov/1989/related/acts/31
[2] Statutory Sections 15.07 (16), 16.966, 16.967. Repealed in 2003.

GIS Inventory tool as part of the annual County Land Information Office Survey to update the state's understanding of county-level GIS data holdings with a subsequent report in 2009.[3]

- In 2012, the State Cartographer's Office made known their intention to retire the WiscLINC website in lieu of a UW-focused spatial data portal (in partnership with the UW-Madison Robinson Map Library) to provide access to county GIS data (much of which is restricted to academic use) to faculty, staff, and students.

State and National Trends

National organizations have long advocated for the use of federated repositories and spatial data infrastructures,[4] and geoportals. Many states have successfully implemented geoportals.[5] ***Wisconsin is currently one of the nine states without a state geoportal.***

States need a system for discovery and access to geospatial data sets and associated services. Modern state geoportals provide effective online access through keyword, thematic, and map-based searching options.

Using a geoportal to index related information, such as online map applications, federated external data sources, and other geo-services provides the most complete geoportal implementation. This is observed as a best practice in other state implementations, which were researched by this workgroup.

Benefits of Free and Open Data

In examining the return on investment of a potential geoportal, future decisions take into account the value of free and open government data. There are cases where data managed by government agencies is not available to the public, for reasons such as privacy and security. In the case of geospatial data, this workgroup suggests that publicly funded non-sensitive geospatial information be classified as ***free and open data, in accordance with best practices established by the National States' Geographic Information Council***.[6]

Backed by extensive research,[7] the Minnesota-based organization MetroGIS argues that adopting a free and open data policy would have the following benefits:

- Saves money, as their research has shown that the practice of charging for data has not proven to be profitable
- Data should be thought of as a public asset and therefore made more openly available to the residents that are being served
- Increases transparency and shows a "willingness to provide good public service"
- Promotes economic growth, especially in a "digital economy" where businesses depend on data
- such as this to make decisions
- Allows for innovation—providing the data in the open and in open formats means that it is more
- accessible for anyone to use in novel and innovative ways[8]

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[3] http://www.doa.state.wi.us/Documents/DIR/Land_Information/Land_Information/FINAL_County_GIS_Inv_Report_May2009.pdf
[4] http://www.nsgic.org/public_resources/Strategic-Framework-for-NSDI_Final-050109.pdf
[5] http://www.nsgic.org/geospatial-maturity-assessment
[6] http://www.nsgic.org/public_resources/NSGIC_Data_Sharing_Guidelines_120211_Final.pdf
[7] MetroGIS Data Producers Work Group (October 23, 2013). *MetroGIS: Free & Open Access to Data*. Retrieved August 11, 2014, from http://metrogis.org/MetroGIS/media/gis-documents/publications/
[8] MinnPost. (December 11, 2013). *MetroGIS Recommends 7 Counties Make Geospatial Data Free And Open*. Retrieved August 11, 2014, from http://www.minnpost.com/politics-policy/2013/12/

Wisconsin Geoportal Needs

In our state there are several instances where the ownership, use, and management of spatial data assets pose challenges. These are issues which can be addressed with a geoportal. In general a geoportal would be useful for identifying geospatial data issues that could be solved by the data producers themselves, the GIS community or through other systems, like a geospatial repository system. Elaborated below are some of the general spatial data management challenges that might be resolved with a geoportal solution.

Access to Geospatial Data Not Currently Accessible to the Public

Delivering geospatial information to the public is a financial commitment that some government business operations cannot justify. Perhaps leveraging services and data from outside sources where possible, agency business areas are creating and utilizing GIS datasets internally, but the resulting geospatial data assets are not made accessible outside a given program area.

For example, state agencies as large as the departments of Public Instruction and Workforce Development, with countless "locatable" assets and customers dispersed across the state, have not yet developed infrastructure that makes these spatial data holdings accessible to others.

Identification of Geospatial Datasets without Formal Stewardship

Many datasets have been produced at state agencies out of project-based need, with no formal agency assigned as custodian. There is an enterprise-wide need to be able to access datasets without formal stewardship. A geoportal will help identify these datasets without formal stewardship.

Identification of Datasets Requiring Aggregation

Some datasets with regional and statewide value are housed and maintained by county and municipal custodians, but not widely accessible. Examples of data potentially critical to state and regional operations, include address points, land parcels (property ownership boundaries), zoning, public lands, building footprints, LIDAR-based elevation data, aerial imagery and accurate localized data on transportation, hydrography and utilities. These data are currently assembled by state agencies on an ad-hoc project basis but should be aggregated into standardized statewide layers, reducing redundancy and increasing return on investment on these detailed local government data.

Identification of Datasets that are Stored Redundantly

Because spatial analysis and mapping with GIS software has become core to many state agency business areas, agencies tend to warehouse the geospatial data they use repeatedly but have gathered from elsewhere.

Identical copies of geospatial data are often stored in individual databases in municipalities, counties and state agencies, consuming space and resources. These duplicate copies represent statewide roads, water bodies, waterways, public lands, administrative boundaries, place names, imagery, and many others. State imagery alone can occupy terabytes of space. In some state agency cases identical copies of large datasets are housed on neighboring servers at the state data center. This is not only an issue because of the duplications in resourcing, space and cost. It can also cause problems with regard to accuracy and currency reducing efficiency.

Identification of the authoritative source for a particular dataset

A geoportal can identify what data sources are determined by the GIS community to be the authoritative data source for a particular use. To make this identification process work well there will have to be clear definitions and processes established by the GIS community on what constitutes an authoritative dataset for a particular subject area.

Fulfilling Statutory Responsibilities for Land Information

Under the statues governing DOA's Land Information Program (s. 16.967), DOA is to "serve as the state clearinghouse for access to land information," and "maintain and distribute an inventory of land information available for the state." Act 20, the state's biennial budget for the years 2014-2015, requires DOA to plan and create a statewide digital parcel map, which will require aggregating local-level geospatial datasets (see "Identification of Datasets Requiring Aggregation" section above) and making those resources available and accessible to the public.

Project Logistics

DET Charter and Stakeholder Identification

The charter for this recommendation project was initiated in January 2014. It was approved by DET and the project began in February of 2014. The project charter appears as Appendix A.

To identify stakeholders, the workgroup contacted a variety of state coordination groups. The groups listed below illustrate the diversity of stakeholders who aim to leverage and maximize the benefits of geospatial information assets and their efficient application. Consulted groups are listed below, as well as additional organizations that advocate for or support efficient access to modernized geospatial data. Some of these groups are focused on the geospatial discipline, while others utilize GIS as part of their core organizational business.

- Association of Public-Safety Communication Officials – WI Chapter
- Wisconsin County Surveyors Association
- Wisconsin Geographic Information Coordination Council
- Wisconsin Land Information Officers Network (LION)
- Wisconsin Land Title Association
- Wisconsin Real Property Listers
- Wisconsin Register of Deeds
- Wisconsin Society of Land Surveyors
- Wisconsin State Agency Geospatial Information Committee (SAGIC)
- Wisconsin State Cartographer's Office (SCO)

Project Team

Voting members for this project were selected from three key stakeholder groups. The project team consisted of two representatives from LION, two from SAGIC, one from SCO, and several auxiliary (non-voting) members listed in the table on the following page.

Project Team Members		
Voting Member	**Organization**	**Role**
Al Brokmeier	Kenosha County – LION	County LIO Stakeholder
Sara McCurdy	Polk County – LION	County LIO Stakeholder
Mitch Moline	DOT – SAGIC	State Agency Stakeholder
Jerry Sullivan	DNR – SAGIC	State Agency Stakeholder
AJ Wortley	SCO	Community Outreach and Technologies Expert
Auxiliary Members		
Curt Pulford	GIO	Project Manager (until June 2014)
Lee Samson	GIO	Architecture and Technical Support, Project Manager (after June 2014)
William Cozzens	Waukesha County – LION	County LIO Stakeholder
Peter Herreid	WLIP	WLIP Grant Administrator
Davita Veselenak	WLIP	WLIP Staff and Communications
Jaime Stoltenberg	UW-Madison	Cataloguing and Acquisitions
Martin Goettl	UW-Eau Claire	Data Access and Data Management

Project Schedule

Task Name	Duration	Start	Finish
Establish Stakeholder Team	2 weeks	Mon 2/24/14	Fri 3/7/14
Stakeholder Business Requirements	4 weeks	Mon 3/10/14	Fri 4/4/14
Geoportal (discovery) requirements			
Discuss/refine list			
Business requirements document			
Evaluate Wisconsin Spatial Data Repository	1 week	Mon 5/4/14	Fri 5/9/14
Evaluate Geoportal Products On Requirements	6 weeks	Mon 5/10/14	Fri 6/13/14
Build checklist from requirements			
Review geoportal Server			
Review GeoNetwork			
Review ArcGIS Online (AGOL)			
Review Voyager			
Compile findings			
Selection of test products			
Geoportal Product Proof-of-Concept(s)	6 weeks	Mon 6/15/14	Fri 7/25/14
Load product 1			
Test product 1			
Load product 2			
Test product 2			
Review products, rate as tested			
Document product recommendation			
Geoportal Governance/Resource Needs Review	2 weeks	Mon 7/21/14	Fri 8/1/14

Review data/metadata tasks			
Document governance requirements			
Estimate resource needs			
Document resource recommendation			
Final Report Draft	9 weeks	Mon 8/4/14	Fri 10/3/14

2 PROJECT EXECUTION

Requirements Phase

The project team worked collaboratively to define geoportal business use cases, followed by deriving functional/non-functional requirements desired in a geoportal, as shown in the tables below.

Geoportal Business Use Cases		
	Use Case Name	**Description**
Use Case 1	Orient new state agency employee	Provide all relevant resources through a single maintained source
Use Case 2	Access a repository through a geoportal	Use a geoportal to access a repository
Use Case 3	Find data by search	Simple keyword search Spatial search Federated search Advanced options for experts Smart matching and ranking Thesaurus service Search results are simple to understand yet contain detail for power users
Use Case 4	Find data by browsing	Find data without searching Filter within category Classification and relationships
Use Case 5	Create a map	Use preview service Provide integration points for map viewer platforms
Use Case 6	Share a resource	Share resource location or resource
Use Case 7	Preview service that shows basic version of map	A demonstration interactive map that provides some utility, but can be easily accessed by the lay person
Use Case 8	Access individual county datasets—parcels and other locally created "Statewide Framework Data Layers" GIS data created with WLIP funding	A portal to point individual local datasets and a repository, if local GIS datasets are not easily accessible, that avoids the hassle of having to contact individual county staffers and to sign multiple license agreements.
Use Case 9	Access aggregated, state-created datasets—parcels and other statewide aggregated layers from local GIS data	Statewide parcel layer and other layers aggregated from local data
Use Case 10	Geospatial portal as a broker (middleman)	Search a remote geospatial portal or endpoint
Use Case 11	Download data	Allow the DOA portal to act as a remote endpoint
Use Case 12	Serve as point of contact for county resources	Direct state agency requests and inquiries regarding county layers first through a DOA portal
Use Case 13	Backup facility	A secondary location for critical data in the event of an emergency
Use Case 14	Ability to monitor change in data submittal/collection	Reporting

Geoportal Requirements – Derived from Use Cases		
Description of Requirement	**Functional/ Non-Functional Requirement**	**Priority**
• Search capabilities	Functional	1.Critical
• Browse lists/categories	Functional	1.Critical
• Download data	Functional	1.Critical
• Interoperability (geoportal to access a repository)	Functional	1.Critical
• Maintenance automations	Functional	1.Critical
• Preview (map) service	Functional	2.Very Important
• Specific Search/Browse (Access to locally created "Statewide Framework Data Layers" created with WLIP funding)	Functional	2.Very Important
• Secured Endpoint	Functional	2.Very Important
• Recognizing (translating?) data format	Functional	
• Wisconsin GIS library (Providing all relevant resources through a single, maintained, source)	Functional	4.Slightly Important
• Simple mapping utility	Functional	4.Slightly Important
• Reporting	Functional	
• Maintainability	Non-Functional	1.Critical
• Price	Non-Functional	1.Critical
• Accessibility	Non-Functional	2.Very Important
• Availability	Non-Functional	2.Very Important
• Efficiency (resource consumption for given load)	Non-Functional	2.Very Important
• Performance/response	Non-Functional	2.Very Important
• Reliability	Non-Functional	2.Very Important
• Documentation	Non-Functional	4.Slightly Important

Initial Product Evaluation Phase

Five products were systematically evaluated in the initial product evaluation phase. They were:

Esri Geoportal Server	www.esri.com/software/arcgis/geoportal
GeoNetwork	www.geonetwork-opensource.org/
CKAN	http://ckan.org/
Voyager Search	https://voyagersearch.com/
Esri ArcGIS Online	www.esri.com/software/arcgis/arcgisonline

The team used a common evaluation form to evaluate the products. Those evaluation checklists appear as Appendices B-F.

Product Proof-of-Concept Testing Phase

In the proof-of-concept phase, two products that were evaluated as most viable by voting members were installed, tested, and subject to hands-on evaluation.

About Geoportal Proof-of-Concept Evaluation Process

To evaluate the contributor perspective, project members were given some instructions on how to load metadata on the systems. They were then given the ability to add, delete or modify metadata as the wished. We tried to load metadata that included a variety of resource references. This includes links to downloadable data, web services and web applications.

Members of the project team were able to evaluate the user perspective by searching for and listing data available on the systems. For both systems users were able to do keyword searches and dataset browsing.

Both of these products have metadata harvesting tools. These are tools that can take a large set of files or metadata in XML format and load them into the system as new metadata entries. We did not have time to thoroughly test these tools, but we did confirm that they should work for harvesting metadata if fully implemented.

Product 1: Esri Geoportal Server

Esri Geoportal Server is a free, open source product that enables discovery and use of geospatial resources including geospatial datasets, online applications, and Web service APIs. It allows organizations to publish metadata for their geospatial resources to facilitate user discovery and access. The geoportal Server supports federated connections to standards-based clearinghouse and metadata serving applications.

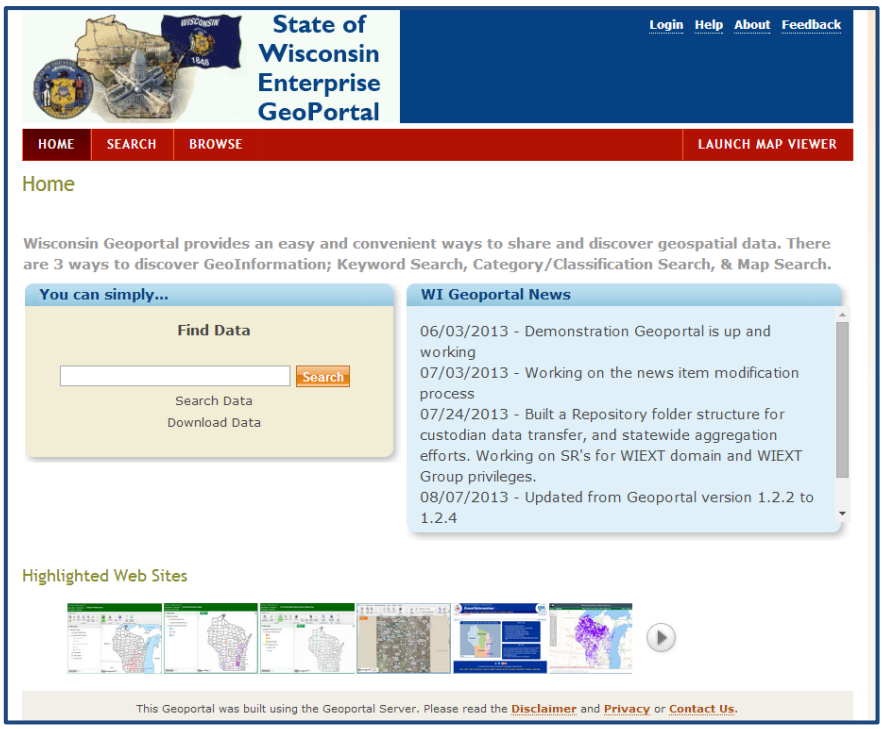

Figure 2. Esri Geoportal Main Page

Esri Geoportal Server functions well at searching for particular tags or keywords if provided and using a standard vocabulary.

Standard search options are supported. Publishers and administrators can login and add new resource entries. This software does require that metadata contain particular keywords and attributes to enable

appropriate indexing of resources. This implies that in some cases metadata from data custodians will require edited before loading into the system.

Esri Geoportal Pros and Cons

Pros	Cons
• Customizable • Some good tools for harvesting data • Open source	• Requires some editing of metadata to index the resource correctly • May require multiple entries for the same data set with different access options (e.g. data download versus web service) • Publisher role privileges are limited. Publishers require Administrator approval before changes are available to users.

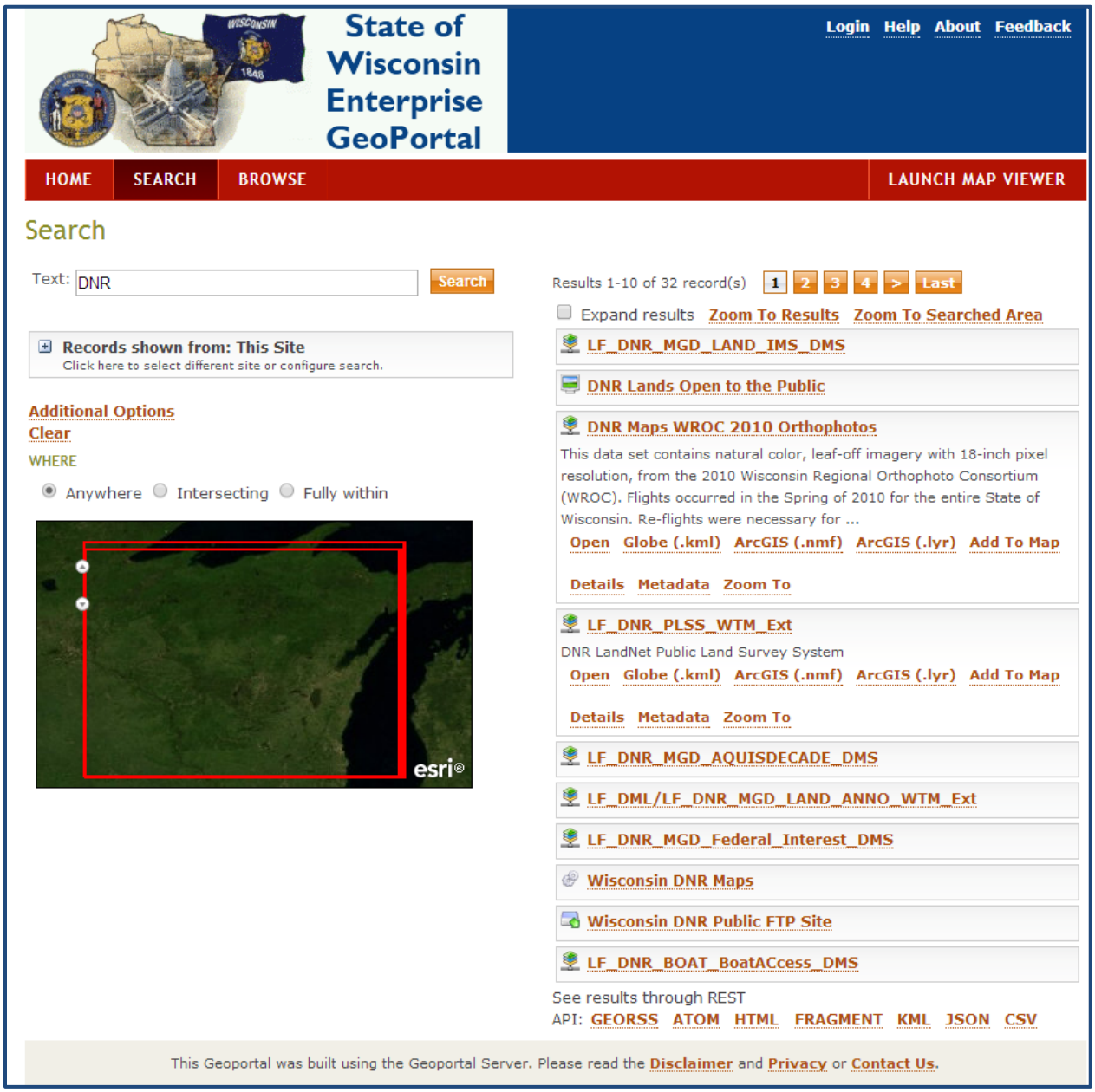

Figure 3. Esri Geoportal search page

Product 2: CKAN

CKAN is a data management system that makes data accessible—by providing tools to streamline publishing, sharing, finding and using data. CKAN is aimed at data publishers seeking to make their data open and available, such as national and regional governments, companies, and organizations.

CKAN, unlike Esri Geoportal Server, was not designed specifically to be a geospatial data catalog but rather a catalog for any type of data. Add-on spatial extensions and some customizations were made by the workgroup in order to use CKAN as a geospatial data catalog.

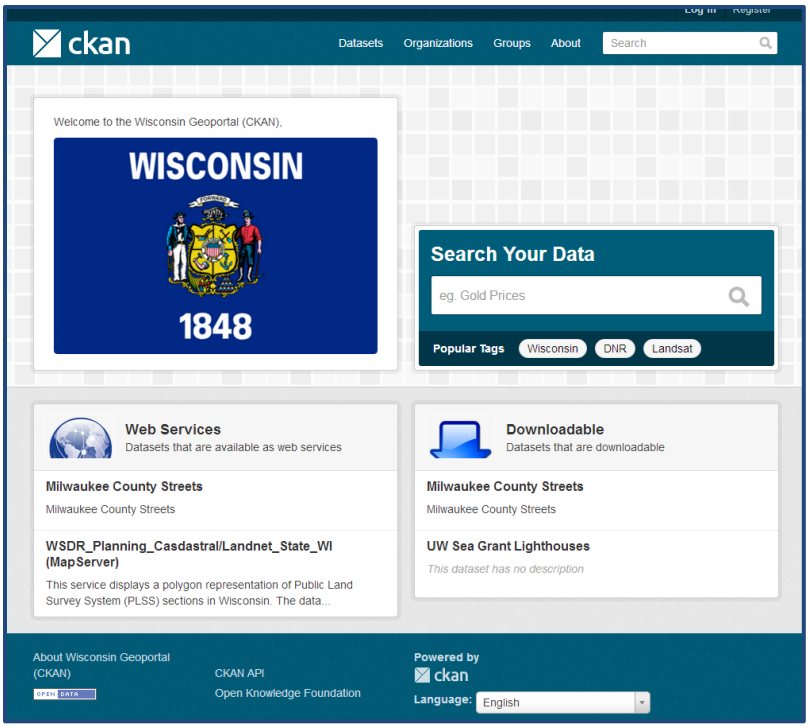

Figure 4. CKAN main page

The software did not have the metadata entry tools provided by Esri Geoportal server and harvesting tools were not as extensive. It did allow for a more flexible organization and categorization of datasets and their associated resources.

CKAN Pros and Cons

Pros	Cons
• Customizable • Open source • Flexible organization of datasets with multiple access options • More flexible in general	• No direct metadata entry tools • Requires a bit more maintenance and customization to operate as a geospatial catalog

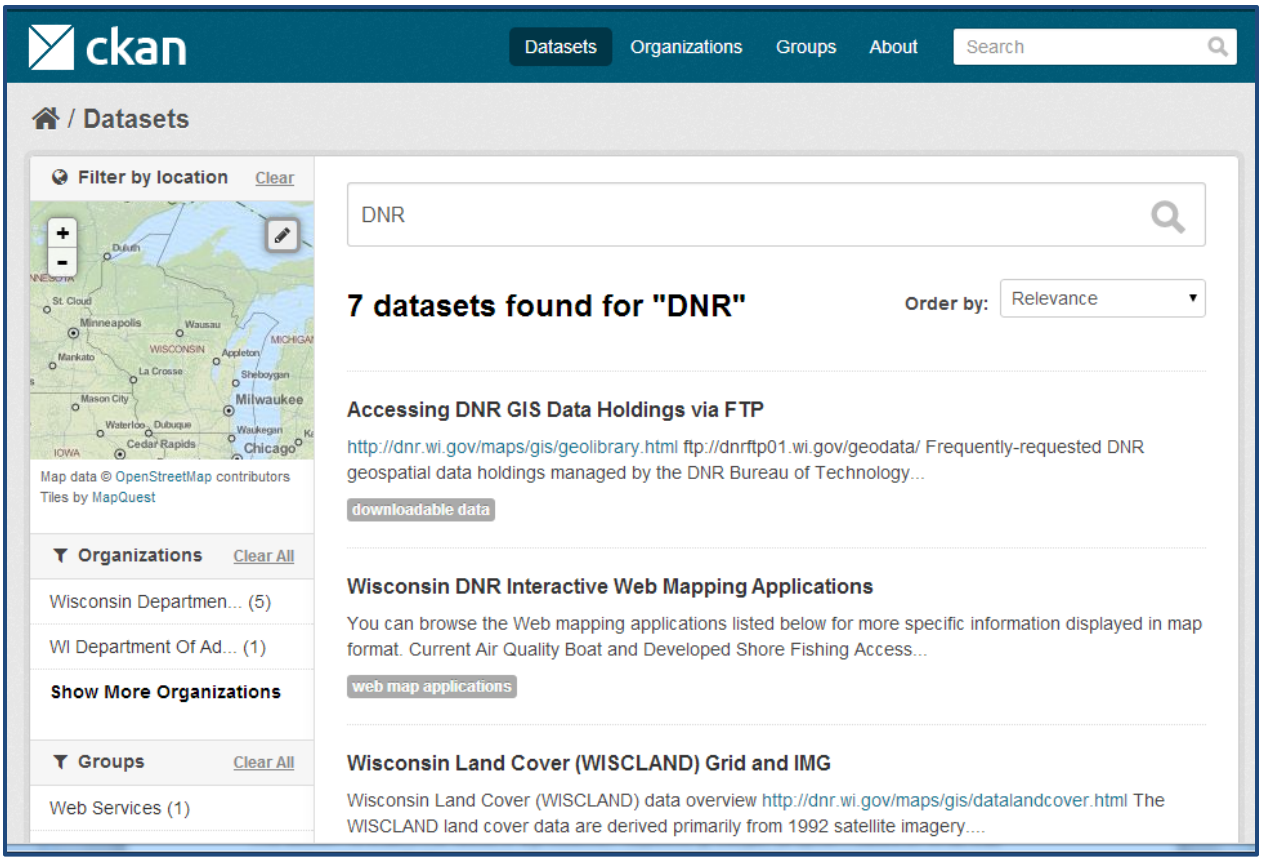

Figure 5. CKAN search page

3 RESOURCE NEEDS ANALYSIS

Geoportal Governance Needs

This section forecasts the needs of a production geoportal system based on lessons learned and workgroup discussions during the proof-of-concept test by the workgroup's GIS support team and the evaluation team.

Both the Esri Geoportal and CKAN software will require the same level of governance. There will need to be a set of well documented policies, procedures, standards, and guidelines for operating and maintaining the system. These will be maintained by the GIS support team. A review board will be needed to review and update the policies, procedures, standards and guidelines and provide general oversight and feedback from stakeholders. Ideally this review board would consist of representatives of the major potential contributors to the geoportal as well as some primary stakeholder end-user representation. This may include but is not limited to state agency, local government, non-profit, academic and private sector representatives.

Figure 6 displays a possible configuration for a geoportal management scenario.

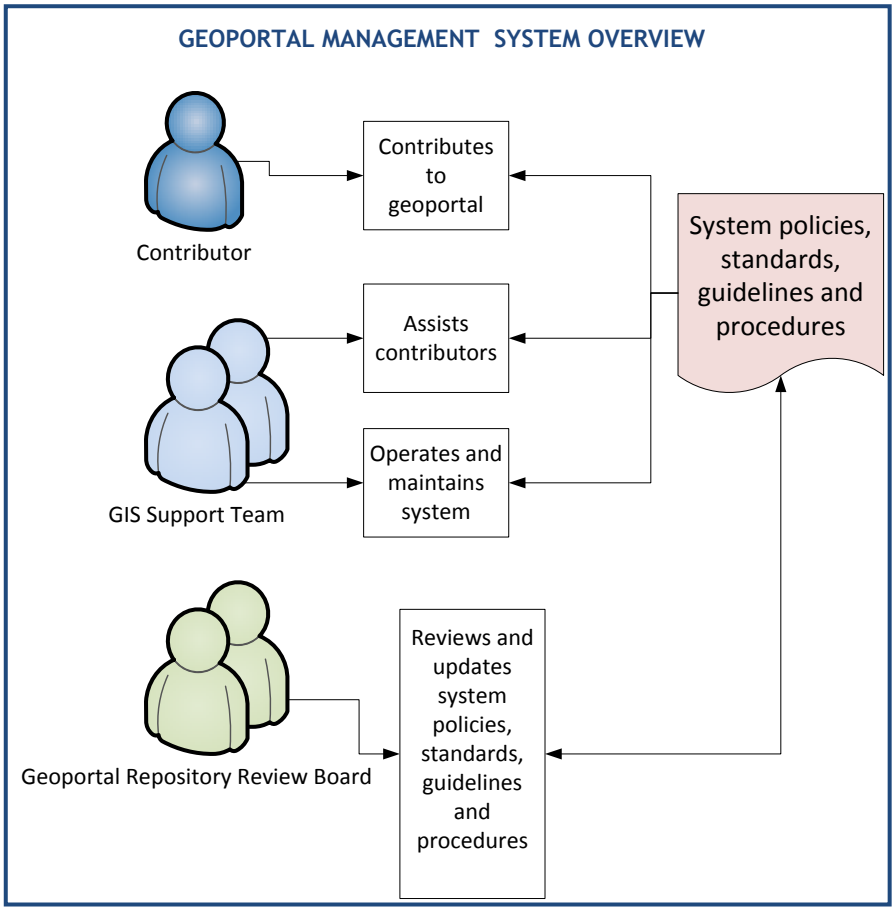

Figure 6. Geoportal management system overview

The suggested GIS support team consists of DET staff working in the GIS area of the Division, other DET staff, the Geographic Information Officer, and DIR staff from the Land Information Program. The GIS support team in conjunction with the review board will be responsible for drafting initial policies, procedures and guidelines.

It is recommended that, at minimum, the following policies, procedures and guidelines be developed before the system is put into production:

- Establish Service Level Agreement for geoportal services, including:
    - Service Description
    - Service Hours
    - Service Availability
    - Customer Support
    - Service Performance and reliability
    - Capacity
- Metadata guidelines
    - Guidelines for Titles, Descriptions, Keywords, Time period of content, Appropriate technical documentation, and Authoritative custodian identification
- Naming convention for files
- Standard tag and keyword taxonomy for effective catalog entry
- Role-based policy for editors (publishers) and administrators
- Roles and responsibilities documentation for:
    - ***Contributors***: geospatial data producers that contribute data
    - ***GIS Support team members***: Responsible for day-to-day maintenance, technical development and enhancement, and security and sustainability of the system
    - ***Review board members***: support policy development, contribute to periodic assessment, provide oversight and solicit stakeholder feedback

Geoportal Roles & Responsibilities

The major roles of support staff should be defined and documented. This includes but is not limited to of roles of data contributors, GIS support team members, and review board members.

Responsibilities for each of these roles should be clearly documented. One approach is to use a RACI matrix[9] (Responsible, Accountable, Consulted, and Informed). The definitions for the key roles in a RACI matrix are:

- ***(R) Responsible*** – Those who do the work to achieve the task. There is at least one role with a participation type of responsible.
- ***(A) Accountable*** (also known as approver or final approving authority) – The one ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those responsible.
- ***(C) Consulted*** – Those whose opinions are sought, typically subject matter experts; and with whom there is two-way communication.
- ***(I) Informed*** – Those who are kept up-to-date on progress, often only on completion of the task or deliverable; and with whom there is just one-way communication.

[9] http://en.wikipedia.org/wiki/Responsibility_assignment_matrix

Proposed RACI Matrix for Geoportal[10]					
	Responsibility Category	Responsibility	Contributors	Support Team	Review Board
1	Content	Adding new metadata to geoportal for a new dataset	R, A	C	
2	Content	Assisting contributors with metadata entry	A	R	
3	Policies, procedures, standards and guidelines	Making an adjustment to metadata standards	C	R	A
4	Policies, procedures, standards and guidelines	Putting an new metadata standard in place	I	R	A

Geoportal Operations and Maintenance Estimates

To operate and maintain the geoportal system, the workgroup recommends creating: 1) a development system and 2) a production system. Both Esri Geoportal and CKAN require some technical modifications to add or update certain functionality (e.g., add a new extension). There is a need to have a system on which to test changes before update of the production system. For the development system, this workgroup recommends something similar to but slightly better than the test systems employed for this project. For the production systems, it is recommended that the web server and application server components of the geoportal software be separated out. This means a geoportal will require at least two servers.

As part of these estimates some initial and ongoing costs estimates are provided here. These are rough cost estimates provided to give an idea of the resource requirements for operations and maintenance for the system. A future Implementation Plan Project for the geoportal system is necessary to provide more detailed and accurate cost estimates.

[10] This is a limited example of what a RACI matrix for a geoportal could look like. Any such potential governance mechanisms will need to be fully examined by the Implementation Plan Project team.

Geoportal Service Estimates

Geoportal Server Needs		
	Esri Geoportal	**CKAN**
Non-Production System (Web and Application Server in one)	1 x Windows Server 2008 R2 (64 bit) 2 CPUs, 8Gb RAM 80 Gb disk space	1 x Linux Server (SLES) 64 bit 2 CPUs,8Gb RAM 80 Gb disk space
Production System (Separate servers for Web and Application servers)	2 x Windows Server 2008 R2 (64 bit) 4 CPUs,8Gb RAM 100 Gb disk space	2 x Linux Server (SLES) 64 bit 4 CPUs,8Gb RAM 100 Gb disk space

To operate and maintain the systems, a support staff is required, with basic system administration skills for the particular operating system being used. Both products require some experience with the Apache web server and the Tomcat servlet engine. The recommended installation procedure for CKAN involves setting up Linux-style user using some accounts with that are only available to Linux users that have access to root-level privileges. This might limit who can assist with system support and development on CKAN systems.

Geoportal Staffing Needs		
	Esri Geoportal	**CKAN**
Support Staff Skills	Windows Administration Skills Experience with Apache, Tomcat	Linux Administration Skills Experience with Apache, Tomcat
Developer Skills	Java Enterprise Edition programming skills (e.g. Java Server Faces, JSP) HTML, CSS, JavaScript	Python development skills using the Pylons web framework HTML, CSS, JavaScript
Initial Install Time	4 – 8 hours	6 – 10 hours

For the CKAN system, the workgroup used the DOA standard Linux Server OS: SUSE Linux Enterprise Server (SLES). Unfortunately, there were no installation instructions for this OS provided by the CKAN developers. The team found that by using instructions for the CentOS version of Linux and compiling packages by hand we could get things working on SLES without a problem.

Someone with developer skills may be needed to customize the sites. Necessary customizations would include everything from simple web layout changes to adding new functionality in the form of custom code or extensions. Esri Geoportal customization would require some knowledge of Java EE (Enterprise Edition) and CKAN customization would require Python and Pylons knowledge.

Total ongoing costs for the two geoportal products should be about the same. Esri Geoportal costs might be higher depending on what database is used to store some of the records.

Geoportal Cost Estimates - Initial Set Up			
		Esri Geoportal	CKAN
Initial Staff Time[11]	Staff Time ($80/hour)	$320 - $640	$480 - $800
Ongoing (per month)[12] Technical Costs	Non-production Server	$ 433.42	
	Production Server	$ 1,261.68	
	Disk Space (280 Gb)	$ 137.20	
	Staff Time[13] ($80/hour) Average of 0.75 hours / week	$240.00	
	Total Ongoing	**$ 2,072.30**	

Other Operation and Maintenance Considerations

To operate and maintain the geoportal it is necessary to commit at least one full time employee to this work for at least a year. This resource would be needed for the following tasks:

- Basic operation and maintenance work that may take 1-2 or more hours per week
- Technical assistance work for contributors and users of the system, requiring anywhere from 10-25 hours per week
    - Documentation – including the development of policies, procedures, standards and guidelines
    - Act as the geoportal custodian – responsible for developing the technical environment and database structure of the geoportal
    - Assistance with data entry by custodians and other contributors
    - Assisting users with searches – interactive or non-interactive
    - Preparation of datasets for sharing
- Customization of the system could take anywhere from 0–5 hours per week
- Maintenance will require periodic assessment of the overall collection with attention to:
    - Dataset lifecycle and necessary update frequency
    - Datasets superseded by higher quality or newer data
- Maintenance will entail preservation of superseded or updated datasets
- Maintenance will entail analysis of gaps in collection supported by business area demand

[11] Initial staff time does not include all the documentation and customization that may be needed
[12] Ongoing costs based on July 10, 2014 DET Wisconsin Enterprise Services Platform Rate Sheet
[13] Ongoing staff time only includes operation and maintenance time—*not* customization or technical assistance time

Geoportal Funding Model

The current plan is that this geoportal service will be free for both users and contributors. DOA's Division of Enterprise Technology (DET) will pay for the initial development, operations and maintenance of this system, without drawing from Land Information Fund revenue. Additional work on this funding model will be part of the implementation plan development project.

4 RECOMMENDATIONS

Geoportal Product Choice

After proof-of-concept evaluations, the workgroup voted on which product to recommend. The results of the vote were 5 votes for CKAN, and no votes for Esri Geoportal Server.

Some of the key reasons listed for the CKAN choice include:

- Large number of ready to use metadata tools available through CKAN extensions
- Well designed and documented API for doing custom queries and applications
- Broader developer base
- Cleaner look and feel, with more aesthetic user interface/user experience
- Indexing by both organizations and controlled tag groups
- Searching by both organizations and controlled tag groups
- Peer support, including Minnesota implementation and federal-level data.gov
- Potential for longevity of product
- Cost

It is worth nothing that the CKAN product recommendation is based on evaluation criteria derived from business use cases. Due to rapid advancements and changes in technology, the workgroup recognizes that the recommended product choice might not be the best solution or recommendation for a future geoportal, at a different point in time. However, the efforts of the workgroup have value, because ***the business use cases from this project will retain their relevance, and can be applied to future projects and product decisions***.

Lessons Learned

The workgroup was able to learn several lessons in the time this project began in March 2014 to the release of this report in October.

- Clearly communicate the scope of your project from the onset of the project
- Forming a project team that included members from major stakeholder groups is a good way to get some stakeholder group involvement in the project, however, further efforts should be taken to secure stakeholder group involvement
- Engage the stakeholder community at several points in the process of a project
- Be clear and establish an understanding that members of a workgroup are representatives of their respective agencies, and thus bear the responsibility to ensure that their actions and recommendations represent the interests of the membership of their organizations
- Whenever possible, have a full-time project manager whose focus is exclusively project management
- The project team should clearly identify what project deliverables should be produced and who should review them
- Clearly establish who is responsible for documenting each phase of a project, so that reporting can be as comprehensive as possible
- Leave ample time for reporting and documentation at a project's close

Next Steps

The next step after this project concludes is for DOA to implement recommendations, beginning with the primary task to start a charter for a Geoportal Implementation Plan Project. This project would review the needs and recommendations listed in this report and start building an enterprise geoportal system.

Below is a potential timeline for these recommendations:

October 31, 2014	DOA charter and approve Geoportal Implementation Plan Project
October 31, 2014 – March 31, 2015	Weekly Geoportal Implementation Plan Project meetings and stakeholder engagement
April, 2015	Geoportal Implementation Plan Project team deliver report to DOA management
2015 or 2016	Begin a project to develop a new and improved Wisconsin Geospatial Data Repository

Such a timeline may appear aggressive but is achievable.

Appendix A: Project Charter

DIVISION OF ENTERPRISE TECHNOLOGY Wisconsin Department of Administration	***Enterprise Repository Geoportal Project Charter***

Area	☐ **Infrastructure X- Application** ☐ **Security**
DET Bureau or Office	**Enterprise Repository Geoportal**
Agency Requesting	**DET**
Executive Sponsor	**Herb Thompson**
Business Sponsor	**Curtis Pulford**
Project Manager	**Curtis Pulford**

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PROJECT DEFINITION

This project will investigate product solutions for enterprise repository and geoportal services. Specifically it will examine how several products meet user needs regarding information resource discoveries, standardization, storage, and access to data. The project will examine and implement a proof of concept(s) for harvesting metadata and securely sharing spatial data and files between state and partner agencies. The result will be a proposal to implement a managed solution for use by state and partner agencies.

PROJECT JUSTIFICATION

Current work on Act 20 initiatives related to geospatial data has prompted stakeholder groups to discuss strategy for geospatial data layer management. Four areas where a DET repository has been cited as solution are: Serving layers without formally recognized ownership (soils, imagery, civil divisions, etc.); A location for aggregation of municipal layers (parcels, zoning, addressing, etc.); Servicing agencies that have spatial data, but do not have GIS server capabilities, and; Reducing redundant storage of all common framework themes.

Discussions with the State Agency Geographic Information Council (SAGIC), County Land Information Officers, and several other large stakeholder groups across the state have documented a need for DOA to assume responsibility for the enterprise delivery of repository and geoportal services. These services would discover, inventory, catalog, and provide access to all authoritative spatial data assets managed by Wisconsin government agencies.

PROJECT SCOPE

Project Items in Scope

- Defining business requirements
  - For repository functions
  - For geoportal functions
- Defining needed standards
  - Related to business requirements
  - Related to governance model
  - Related to data/metadata
- Investigating open source geoportal products
  - Esri - geoportal Server
  - Open Source Geospatial Foundation - GeoNetwork
- Investigating COTS geoportal products
  - Esri – ArcGIS Portal Appliance
  - VoyagerSearch – Voyager Server
- Piloting one or more geoportal products
- Develop recommendation for:
  - (existing) repository upgrade needs

- Geoportal product implementation
- Governance model and standards developments
- Resource requirements

Project Items Out of Scope

- Mandated government to government data sharing agreements
- Aggregation of municipal datasets into Repository
- Map authoring tools
- Map services from data
- Data services from maps

Project Milestones and Estimated Completion Dates

Project Milestone	Date Estimate	Deliverable(s) Included	Confidence Level
Establish Stakeholder Team	2 weeks after start	Meeting schedule, Roles and responsibilities	High
Stakeholder Business Requirements	4 weeks after team building	Documentation prioritizing requirements for data repository and geoportal	Medium
Data / Metadata Standards	4 weeks after requirements	Standards recommendations for input/export	Medium
Evaluate products re: requirements	3 weeks after req's and standards	Report documenting pros and cons based on product literature and support	Low
Product Proof of Concept(s)	6 weeks (1 wk. build, 2 wk test, for ea.)	Evaluation reporting on test products	Low
Final Report	5 weeks	Recommendation outlining repository upgrade, geoportal implementation, maintenance and governance needs	Low

RESOURCE ESTIMATES

Resources within DOA will handle logistics, documentation, website and other communications. The entire Project Team will work together largely through GoToMeeting Web conference calls.

External team member estimates, (3x22) below, are based on expectation for a 1 hour conference call, and 2 hours of independent research, documentation, or testing – over an expected 19-22 week commitment.

DET Bureau/Section	Project Team Role	Project Team Member(s)	Project Hours
[Department]	[Role Title]	[Name(s)]	[Estimate]
DOA/DET	Project Manager	Curtis Pulford	224 hrs.
DOA/DET	GIS server support	Lee Samson	100 hrs.
DOA/DIR	InterGov Relations	TBD	44 hrs.
TBD	SAGIC Liaison	(2) TBD	66 hrs. (3x22wks)
UW SCO	University Liaison	TBD	66 hrs. (3x22wks)
LION	County Land Information Officer Liaison	(2) TBD	66 hrs. (3x22wks)

PROJECT STAKEHOLDERS

Stakeholders	Relationship to Project
DOA	Geographic Information Office, Land Information Program, spatial data custodian, spatial data consumer
State Agency GIS (SAGIC)	Primary spatial data custodian and spatial data consumer
County Land Information Officers (LION)	Primary spatial data custodian and spatial data consumer
State Cartographers Office	Spatial data cataloger, spatial data consumer, university coordination
Additional GIS Stakeholders	Spatial data consumers

PROJECT CONDITIONS

Project Assumptions

- Commitment from two SAGIC agency representatives for weekly meetings and assignments.
- Commitment from UW, State Cartographers Office, for weekly meetings and assignments.

- Commitment from two county Land Information Officer representatives for weekly meetings and assignments.

Project Risks

#	Risk Area	Likelihood	Risk Owner	Project Impact-Mitigation Plan
1	Multi-partner scheduling conflicts	High	Project Manager	The project will begin with an understanding that meeting times are fixed. Missed opportunities will affect liaison stakeholder communications, but will not delay the project completion
2	Product availability for proof of concept	Low	Project Team	Four products are currently viable for evaluation. Should problems arise in acquisition or licensing for test purposes, those products would be eliminated from contention.

APPROVALS

Prepared by Curtis Pulford_____
Project Manager

Approved by Herb Thompson (Sponsor) and Senior Leadership Cabinet
Executive Sponsor

Curtis Pulford_____

Business Sponsor

SUPPORTING DOCUMENTS

Document Title	Document Purpose	Link To Document
Enterprise Spatial Information 'Repository / Geoportal' Investigation	Background, documenting stakeholder needs	

PROJECT CHARTER VERSION CONTROL

Version	Date	Author	Change Description
Draft	01/28/2014	Curtis Pulford	Draft document created
V.1	02/17/2014	CP	Change 1 – Reflecting S.L. comments, entered into PMO system
V.1a	02/28/2014	CP	Change 2 – Abridged version created for publication

Appendix B: GeoNetwork Geoportal Evaluation Checklist

Item	Description	Priority	Ability To Meet Requirement	Comments On Ability
1	**Download data**	**1.Critical**	1-Fully Meets	
2	**Interoperability (geoportal to access a repository)**	**1.Critical**	1-Fully Meets	
3	**Maintainability**	**1.Critical**	2-Partially Meets	Little sponsorship, not sure on longevity
4	**Price**	**1.Critical**	1-Fully Meets	
5	**Search capabilities**	**1.Critical**	1-Fully Meets	
6	**Browse lists / categories**	**1.Critical**	1-Fully Meets	
7	**Maintenance automations**	**2.Very Important**	3-Capable	Doesn't seem to have a clear and visible path to automation
10	**Accessibility / Availability**	**2.Very Important**	1-Fully Meets	
12	**Efficiency (resource consumption for given load)**	**2.Very Important**		
13	**Performance / Response**	**2.Very Important**	1-Fully Meets	
15	**Preview (map) service**	**2.Very Important**	1-Fully Meets	Very nice and easy
16	**Secured Endpoint**	**2.Very Important**	2-Partially Meets	One by one / Layers
17	**Documentation**	**4.Slightly Important**	2-Partially Meets	Fair
18	**Wisconsin GIS library (Providing all relevant resources through a single, maintained source)**	**4.Slightly Important**	4-Additions Necessary	Not really designed for this.
20	**Reporting**	**4.Slightly Important**	2-Partially Meets	Some. Those seen are very good.

Appendix C: CKAN Geoportal Evaluation Checklist

Item	Description	Priority	Ability To Meet Requirement	Comments On Ability
1	**Download data**	**1.Critical**	1-Fully Meets	
2	**Interoperability (geoportal to access a repository)**	**1.Critical**	1-Fully Meets	
3	**Maintainability**	**1.Critical**	3-Capable	No sponsorship - Developers go elsewhere?
4	**Price**	**1.Critical**	1-Fully Meets	
5	**Search capabilities**	**1.Critical**	1-Fully Meets	
6	**Browse lists / categories**	**1.Critical**	1-Fully Meets	
7	**Maintenance automations**	**2.Very Important**	2-Partially Meets	Excellent harvesting. Potential to automate individual submissions/updates
10	**Accessibility / Availability**	**2.Very Important**	1-Fully Meets	
12	**Efficiency (resource consumption for given load)**	**2.Very Important**		
13	**Performance / Response**	**2.Very Important**	1-Fully Meets	
15	**Preview (map) service**	**2.Very Important**	2-Partially Meets	Not intuitive. Seen elsewhere with custom development
16	**Secured Endpoint**	**2.Very Important**	1-Fully Meets	Very good
17	**Documentation**	**4.Slightly Important**	2-Partially Meets	Fair
18	**Wisconsin GIS library (Providing all relevant resources through a single, maintained source)**	**4.Slightly Important**	4-Additions Necessary	Not really designed for this type of thing.
20	**Reporting**	**4.Slightly Important**	1-Fully Meets	Excellent

Appendix D: Voyager Search Geoportal Evaluation Checklist

Item	Description	Priority	Ability To Meet Requirement	Comments On Ability
1	**Download data**	**1.Critical**	1-Fully Meets	
2	**Interoperability (geoportal to access a repository)**	**1.Critical**	1-Fully Meets	
3	**Maintainability**	**1.Critical**	2-Partially Meets	
4	**Price**	**1.Critical**	4-Additions Necessary	100K, plus 20 K maintenance, 10K for individual add-ons.
5	**Search capabilities**	**1.Critical**	3-Capable	
6	**Browse lists / categories**	**1.Critical**	1-Fully Meets	
7	**Maintenance automations**	**2.Very Important**	3-Capable	
10	**Accessibility / Availability**	**2.Very Important**	1-Fully Meets	
12	**Efficiency (resource consumption for given load)**	**2.Very Important**		
13	**Performance / Response**	**2.Very Important**	1-Fully Meets	
15	**Preview (map) service**	**2.Very Important**	4-Additions Necessary	
16	**Secured Endpoint**	**2.Very Important**	3-Capable	
17	**Documentation**	**4.Slightly Important**	4-Additions Necessary	
18	**Wisconsin GIS library (Providing all relevant resources through a single, maintained source)**	**4.Slightly Important**	1-Fully Meets	
20	**Reporting**	**4.Slightly Important**	3-Capable	

Appendix E: Esri ArcGIS Online Geoportal Evaluation Checklist

Item	Description	Priority	Ability To Meet Requirement	Comments On Ability
1	**Download data**	**1.Critical**	4-Additions Necessary	
2	**Interoperability (geoportal to access a repository)**	**1.Critical**	4-Additions Necessary	
3	**Maintainability**	**1.Critical**	1-Fully Meets	
4	**Price**	**1.Critical**		
5	**Search capabilities**	**1.Critical**	1-Fully Meets	
6	**Browse lists / categories**	**1.Critical**	1-Fully Meets	
7	**Maintenance automations**	**2.Very Important**	2-Partially Meets	
10	**Accessibility / Availability**	**2.Very Important**	1-Fully Meets	
12	**Efficiency (resource consumption for given load)**	**2.Very Important**		
13	**Performance / Response**	**2.Very Important**	1-Fully Meets	
15	**Preview (map) service**	**2.Very Important**	1-Fully Meets	
16	**Secured Endpoint**	**2.Very Important**	1-Fully Meets	
17	**Documentation**	**4.Slightly Important**	2-Partially Meets	
18	**Wisconsin GIS library (Providing all relevant resources through a single, maintained source)**	**4.Slightly Important**	4-Additions Necessary	
20	**Reporting**	**4.Slightly Important**	4-Additions Necessary	

Appendix F: Esri Geoportal Server Evaluation Checklist

Item	Description	Priority	Ability To Meet Requirement	Comments On Ability
1	**Download data**	**1.Critical**	1-Fully Meets	
2	**Interoperability (geoportal to access a repository)**	**1.Critical**	1-Fully Meets	
3	**Maintainability**	**1.Critical**	2-Partially Meets	No ESRI announcements on long term plans
4	**Price**	**1.Critical**	1-Fully Meets	
5	**Search capabilities**	**1.Critical**	1-Fully Meets	Thesaurus service is an available add on in GitHub
6	**Browse lists / categories**	**1.Critical**	1-Fully Meets	
7	**Maintenance automations**	**2.Very Important**	2-Partially Meets	
10	**Accessibility / Availability**	**2.Very Important**	1-Fully Meets	
12	**Efficiency (resource consumption for given load)**	**2.Very Important**		
13	**Performance / Response**	**2.Very Important**	1-Fully Meets	
15	**Preview (map) service**	**2.Very Important**	2-Partially Meets	Requires a plug in (flash or JavaScript)
16	**Secured Endpoint**	**2.Very Important**	2-Partially Meets	requires customization
17	**Documentation**	**4.Slightly Important**	2-Partially Meets	Documentation and other requirements are, in some cases, specific to the version
18	**Wisconsin GIS library (Providing all relevant resources through a single, maintained, source)**	**4.Slightly Important**	1-Fully Meets	
20	**Reporting**	**4.Slightly Important**	3-Capable	Will need some customization