

Wisconsin Department of Natural Resources 2012 Plan to Integrate Land Information

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I. EXECUTIVE SUMMARY

This plan is submitted by the Wisconsin Department of Natural Resources (DNR). Preparation of this plan was coordinated by the DNR Bureau of Technology Services, (BTS), with input from other DNR program GIS application and data owners.

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The DNR is required by statute to provide an annual Plan to Integrate Land Information to the Wisconsin Department of Administration (WDOA). The DNR 2012 Land Information Integration Plan follows the standard format called for by the DOA. An electronic (.pdf-format) version of this Plan can be accessed on the DNR Internet website, at: <http://dnr.wi.gov/maps/gis/liip.html>.

Summary of DNR Land Information-Related Plans or New Initiatives

- **ArcGIS Server Upgrade** – DNR is currently at ArcGIS Server (AGS) version 10.0. BTS is advising DNR programs to anticipate an upgrade to AGS 10.1 during FY13, most likely during the third quarter of FY13. This will be DNR's first AGS upgrade in 2 years. The upgrade to 10.1 should significantly improve server performance and capacity, address needs for printing web maps and displaying dynamic legends, and provide new options for GIS solutions. In cases where DNR GIS applications use technology being deprecated by Esri at 10.1 (i.e., ArcIMS, VB6, fine grained ArcObjects, use of MXDs as a map definition resource for AGS map services), agency programs will need to plan and begin implementing changes in FY13. Since no changes in server architecture are currently planned for FY13, other GIS applications not using deprecated technology will primarily need to focus on testing.
- **Migration of DNR Web Mapping Applications off of ArcIMS** – In late 2011, BTS learned that Esri expects ArcIMS version 10.0 to continue to connect to ArcSDE 10.1 (previously Esri had indicated that ArcIMS 10.0 would not be compatible with ArcSDE 10.1). Since ArcIMS is DNR's primary web mapping software, it has become a priority for DNR programs to migrate their web mapping applications to other solutions, particularly ArcGIS Server map service-based applications. If the new information from Esri is correct, DNR's ArcIMS applications will continue to work until the agency needs to upgrade to AGS (and ArcSDE) 10.2. Depending on Esri's 10.2 release schedule, DNR programs may not need to fully migrate off of ArcIMS until sometime in calendar year 2014. Issues related to implementation of a DNR IT Governance Model (described below) are expected to have a major impact on the timing and nature of agency solutions for moving off of ArcIMS.
- **DNR IT Governance Model Impacts on GIS** – The DNR is in the process of adopting a Governance Model for IT. When implemented, the DNR's IT Governance process will be used to decide technology direction for all IT solutions, including GIS. Until the new IT Governance Model is in place, DNR programs are being advised to focus on planning for future GIS solutions (i.e., tools for migrating off of ArcIMS), particularly documenting business requirements and project planning. DNR programs are encouraged to work with their BTS Division Liaison (DL) during FY13 to initiate an ArcIMS migration project. During the Discovery and Initiation project phases, BTS will assist with evaluating technical and operational project feasibility, and making sure business requirements are identified. During the Elaboration phase, BTS will work with project teams to identify appropriate ArcIMS alternatives based on identified business, technical and user requirements.
- **DNR Business Planning for Sustainable GIS Solutions** – DNR programs are strongly encouraged to focus efforts on establishing sound, sustainable GIS business plans for FY13 in order to continue leveraging GIS server-based solutions. BTS and many other DNR programs utilizing GIS have had significant operational (staffing) challenges during FY12 and unfortunately, the availability, quality, and cost efficiency for many solutions has continued to degrade. In the past, BTS was able to help DNR program GIS application and data owners implement various solutions as programs underwent staffing changes. But BTS losses of GIS positions in recent years, combined with many programs now lacking staff with the time and/or expertise needed to be effective stewards of their hosted GIS solutions and data, the situation is no longer tenable. Unfortunately, there is no technological fix to this operational problem. Sound coordination, planning, change management and deployment practices need to be in place regardless of the solution type. Poorly managed application changes and unstable solutions require more administrative time and jeopardize the reliability and performance of the overall server environment. As a result, BTS will be ensuring that DNR programs have a sound long-term operational plan as a condition of hosting their GIS applications and services. Similarly, BTS intends to work with programs to promote data quality standards and practices that retain and maximize the value of investments in geospatial data.

- **Status of DNR Basemap Caches and Map Services** – In FY11-12, BTS staff developed several initial Image and Vector Basemap Caches to be consumed as AGS map services by the next generation of DNR web mapping applications. Here is a summary of the status of DNR basemap caches for FY12-13:
 - **Vector Basemap Caches** – More current or complete source data are available for several feature layers (particularly Public Lands) included in DNR vector basemap caches. However, at the present time BTS lacks the resources necessary to plan for or implement any major changes in DNR vector basemap caches. BTS will seek opportunities to collaborate with other DNR programs that have identified business needs for updated or more complete caches.
 - **Image Basemap Caches** –2010 USDA National Agricultural Imagery Program (NAIP) 1-meter resolution digital orthophotos will be used to replace the 2008 NAIP imagery in the DNR external (public) leaf-on image basemap cache. 2010 WI Regional Orthophoto Consortium (WROC) 18-inch imagery will be used to generate a new external leaf-off image basemap cache. Where available, 12-inch 2010 WROC or other higher-resolution imagery will be used to upgrade the DNR internal image basemap. Color Infrared (CIR) digital orthophotos produced by the DNR Division of Forestry will be used to prepare an initial CIR image basemap cache.
 - **Terrain/Topo Basemap Cache** – The initial form of this cache is based on USGS Digital Raster Graphics (DRGs). BTS currently lacks the resources needed to upgrade this cache.
 - **Public Availability of DNR Map Services** – At this time DNR AGS map services are only available for use by DNR web mapping applications. Because the DNR currently lacks a means of securing the agency’s AGS map services from unauthorized external access, promoting direct access to these services by the public would represent an unacceptable risk to the agency. Staffing resources permitting, DNR intends to establish a security model for AGS services in FY13 which would enable the public to directly access DNR AGS services presenting public domain or non-restricted source data.
 - **DNR Basemap Cache Tiling Scheme** –The initial series of DNR Basemap Caches use a tiling scheme based on the WTM83, NAD83 (1991) coordinate reference system and custom map scale thresholds based on input from DNR programs. If DNR programs identify a business need for alternative basemap caches based on the WGS Web Mercator tiling scheme adopted by Esri, Google Earth and Bing Maps; in the future DNR may develop WGS-referenced basemap caches, staffing resources permitting.

- **DNR-Managed Lands AGS-Based Web Mapping Application** – In FY11 the DNR Bureau of Facilities and Lands developed and deployed the agency’s first web mapping system based on ArcGIS Server and utilizing DNR map services (http://dnr.wi.gov/org/land/facilities/dnr_lands_mapping.html). The map viewer for the new DNR-Managed Lands (DML) application is based on JavaScript, and provides the ability to quickly find or browse for DNR properties near specific areas of interest. In FY12 several viewer enhancements and additional map themes were implemented. At this time the DML application is the only DNR public-facing web mapping application utilizing AGS map services (all of the others are currently ArcIMS-based).

- **Wisconsin Forest Inventory & Reporting System (WisFIRS) - Private Lands Management** is an application to assist in DNR management of privately-owned forest land (Managed Forest Law and Forest Crop Law Administration and Financials). This application is being developed and maintained by the DNR Division of Forestry (FR), WisFIRS is a web-based, integrated system that will feature ArcGIS Server technology which allows foresters to visually track and report on a variety of forestry activities. Access to WisFIRS is limited to DNR staff and working partners (certified plan writers and eventually cooperating foresters) collaborating with DNR/FR. This system will enable foresters to store data collected in the field, create management plans, track completed practices (e.g. timber sales), report accomplishments, calculate the financial aspects of the programs (e.g. millions of dollars collected and dispersed to municipalities annually) to name a few. Due to the importance of knowing where on the landscape practices are being done, GIS is being integrated throughout the system. WisFIRS will allow DNR and private consulting foresters to be more efficient in the administration of private forest law programs. Following full implementation, WisFIRS will serve hundreds of DNR staff and partners. WisFIRS is being implemented in a series of releases that are being delivered to its users in a step-by-step manner. WisFIRS activities in 2012 involved testing and deployment of Release 3, focusing on private lands management plan writing. The field based system, Plantrac, will also be re-developed and eventually the Tax Law administration component as well. In addition to these aspects of private lands, the GIS integration piece is anticipated to begin development in 2012.

- **DNR Land Management System** – The Wildlife Management program currently manages over 700,000 acres, with ownership expected to increase significantly over the next 10 years under the re-authorized Knowles-Nelson Stewardship program. Integral to land management is the creation, inventory, management and reporting of tabular and geospatial information associated with master planning, fish and wildlife habitat, user recreation, land use agreements, biotic inventories, pesticide use, invasive species, prescribed burn plans, wetland restoration, climate change adaptation and many other activities. Limited staff resources for IT, combined with a continual increase in lands acquired, associated management responsibilities and user demands, has created a need for the Wildlife Program to achieve greater efficiencies in order to fully realize the ecological and recreational potential of DNR-owned lands. To help address this need, in FY11-12 the DNR Bureau of Wildlife Management initiated a project to develop a web-based Land Management System. The goal of the project is to provide tools and automated processes in a consistent workflow to assist staff in making informed decisions on land management activities.
- **DNR Law Enforcement GIS Initiative** – The DNR Bureau of Law Enforcement (LE) manages a force of over 140 wardens for which geography is a key consideration in carrying out their daily mission. In FY12, DNR/LE has initiated a project to acquire a GIS-based “Situational Awareness Solution” to provide real-time access to operations from any device, data capture tools, server-based GIS analytics, and interactive mapping capabilities. During the Elaboration phase, BTS will work with the project team to identify appropriate solutions based on identified business, technical and user requirements.

II. THE FIVE TECHNOLOGY ARCHITECTURES

A. Applications Architecture

A.1. Identify and characterize the major applications which incorporate land information or GIS/LIS.

➤ **DNR Web Mapping Applications/Services**

DNR web mapping applications have experienced a large and steadily increasing level of use by internal and external customers over the past several years, growing from more than 3 million hits in May 2007, to over 5 million hits in May 2008, to over nearly 6 million hits in November 2009, to over 7 million hits in May 2010. In the month of November (being historically the agency’s peak month for traffic on DNR web mapping applications), total hits peaked at over 6 million in 2007, over 10 million in 2008, and over 12 million in 2010. Statistics for DNR web mapping use have not been tracked since the end of 2010 due to the loss of BTS staff who previously compiled that information. However, the clear trend over the past several years is sustained and growing public demand for web mapping applications to access a wide range of DNR information.

Losses of DNR program GIS staff in 2011 has been a key factor in limiting programs’ ability to improve or maintain functionality of program web mapping applications, most of which are based on ArcIMS technology. Also, during 2012 (as in 2011), DNR programs have been advised to focus on planning for future GIS solutions, particularly documenting business requirements and project planning, rather than moving more rapidly toward implementing new solutions for migrating off of ArcIMS.

Many of the DNR web mapping services listed below can be accessed via the “List of GIS Interactive Web Applications” page on the DNR Internet website: <http://dnr.wi.gov/maps/gis/applist.html> :

- **Air Monitoring Network (“WISARDS”):** <http://dnrmaps.wi.gov/imf/imf.jsp?site=wisards>
Wisconsin’s ambient Air Quality Monitoring Network provides the public with timely access to air quality information, supports planning for air quality improvements, and establishes a mechanism for program accountability. The Air Monitoring Network focuses on EPA’s list of the most serious health-related air pollutants: ozone, particle pollution, sulfur dioxide, nitrogen dioxide, and carbon monoxide. Using continuous

monitoring data, DNR informs the public quickly when air pollution concentrations reach certain thresholds. Based on these notices, people sensitive to air pollution may adjust their daily activities to minimize adverse health effects. Currently, the Bureau of Air Management is reviewing all mapping options, GIS and non-GIS, to determine the most economical and sustainable approach for continuing to provide air quality information in a mapped format.

- ***Boat and Developed Shore Fishing Access Sites:*** <http://dnr.wi.gov/org/land/facilities/boataccess/index.html>
The DNR has created a statewide inventory containing over 2,000 identified public boat access sites and over 100 developed shore fishing sites. Currently, approximately half these sites have been verified by DNR staff and are available for viewing. The DNR provides inventory information visually through a mapping application and through a text listing by County.
- ***Chronic Wasting Disease Status Maps:*** http://dnrmaps.wi.gov/imf/imf.jsp?site=cwd_imf
The DNR Bureau of Wildlife Management sponsors the CWD web mapping application, which allows the public and DNR staff to find up-to-date information on the status of the disease in Wisconsin. The application integrates ArcIMS, ArcSDE, and Oracle technologies to help meet a critical public information need.
- ***Designated Waters:*** <http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.deswaters>
The data layers in this map theme of the Surface Water Data Viewer help users find waters and waterways with special resource or habitat designations, such as Areas of Special Natural Resource Interest (ASNRI), Public Rights Features (PRF), and Priority Navigable Waters (PNW).
- ***DNR-Managed Lands:*** http://dnr.wi.gov/org/land/facilities/dnr_lands_mapping.html
The ArcGIS Server-based DNR-Managed Lands application uses a JavaScript viewer and map services to enable users to quickly find or browse for DNR properties near specific areas of interest. The DNR-Managed Lands application fulfills the mapping tool requirement as indicated by WI state statute 23.09165, “*Stewardship programs information and public access notice.*” The application supports viewing and analysis of all properties the DNR manages, including:
 - Location and acquisition history of DNR-Managed Lands
 - Location of County and Federal public land
 - Location of lands acquired under the Knowles-Nelson Stewardship Program
 - Location of recreation opportunities such as hunting land and boat access sites
 - Tools for simple navigation (e.g., measurement, search by property)
 - Tools for the public to create custom maps
- ***DNR WebView:*** <http://dnr.wi.gov/maps/gis/appwebview.html>
This general-purpose online GIS data viewer was originally developed to demonstrate the potential of ArcIMS as a web mapping solution, and is approaching the end of its lifecycle. WebView will probably be decommissioned within the next two years due to the lack of BTS staff to migrate the application off of ArcIMS.
- ***High Capacity Well Viewer***
This interactive DNR intranet mapping application supports the high capacity well permit review process. Under that process, no wells shall be constructed, installed or operated to withdraw water from underground sources for any purpose where the capacity and rate of withdrawal of all wells on one property is in excess of 100,000 gallons a day without first obtaining DNR approval. The viewer provides staff with quick access to information they need to approve or deny these high capacity well permit requests.
- ***Natural Heritage Inventory (NHI) Portal***
Information about threatened and endangered species is available through Wisconsin's Natural Heritage Inventory (NHI) program, which is managed by the Bureau of Endangered Resources (ER). The NHI program leads the Bureau's efforts to collect, store and interpret data about the state's rare or endangered resources. This information is used to perform an evaluation of a proposed project for potential impacts to endangered resources, defined as state- and federally-listed species, Special Concern species, rare and high-quality natural communities, natural features, and State Natural Areas. Screening for impacts to endangered resource is

required for all actions that the Department conducts, funds or approves that have the potential to impact endangered resources.

The NHI Portal is currently available to DNR staff and those outside the DNR who hold a data sharing license. Generalized NHI data is available to the public at the PLSS Township level:

<http://dnr.wi.gov/org/land/er/nhi/CountyData/>. These data are intended as a general reference for the public, and are presented as a list of rare species (endangered, threatened and special concern) and other sensitive resources (high-quality natural communities and significant natural features) that are known to occur within each Township in a county. As such, the NHI County Data are appropriate for general planning and assessment purposes only. The NHI County Data are not an appropriate resource for screening or reviewing a proposed land development or land management project for potential impacts to endangered resources. The generalized NHI data is intended for information and general planning purposes rather than regulatory decision-making.

- ***Pollution-load Ratio Estimation Tool (PRESTO)***
PRESTO is a statewide GIS-based water quality modeling tool that compares the average annual phosphorus load originating from point and nonpoint sources within a watershed. The comparison provides a screening tool for industrial and municipal dischargers to determine whether they are eligible for adaptive management as part of WI administrative code NR 217. Adaptive management allows a point source to control phosphorus discharges from other point and/or nonpoint sources to achieve compliance with applicable phosphorus water quality criteria in the most economically efficient manner possible. PRESTO also helps industry and municipalities determine if water quality trading is a feasible option within their watershed. Designing GIS-based tools such as PRESTO provides business with a visual, efficient, and transparent method for determining regulatory compliance. For more information, see: <http://dnr.wi.gov/org/water/wm/ww/presto/>.
- ***RR Sites Map:*** <http://dnrmaps.wi.gov/imf/imf.jsp?site=brrts2.gisregistry>
The DNR Bureau of Remediation & Redevelopment (RR) sponsors this web-based mapping system which provides information about contaminated properties and other activities related to the investigation and cleanup of contaminated soil or groundwater in Wisconsin. RR Sites Map provides locational information on geolocated sites with continuing obligations that are required under WI state statute 292.12. RR Sites Map includes map themes for Contaminated and Cleaned-Up Sites, the GIS Registry of Closed Remediation Sites, Liability Limitations & Clarifications, and DNR Financial Actions. RR Sites Map is part of the DNR's [Contaminated Lands Environmental Action Network](#) ("CLEAN"), an interlinked network of DNR databases tracking information on various contaminated land activities.
- ***State Natural Area Map Viewer*** [no longer available]
This application, developed to display the locations of Wisconsin's 653 State Natural Areas (SNAs), was decommissioned in 2011 due to the lack of program resources to maintain the application. SNAs protect outstanding examples of Wisconsin's native landscape of natural communities, significant geological formations and archeological sites. Encompassing over 358,000 acres, SNAs are valuable for research and educational use, the preservation of genetic and biological diversity, and for providing benchmarks for determining the impact of use on managed lands. They also provide some of the last refuges for rare plants and animals; more than 90% of the plants and 75% of the animals on Wisconsin's list of endangered and threatened species are protected on SNAs. For information about State Natural Area management, including public use and public access to these lands, contact the [State Natural Areas Program](#).
- ***Stewardship Grant Acquisitions:*** <http://dnr.wi.gov/org/caer/cfa/LR/Stewardship/mapping.html>
This application, sponsored by the DNR Bureau of Facilities and Lands, provides a way to locate and obtain information on lands acquired by local units of government and non-profit conservation organizations with the assistance of a grant from the Knowles-Nelson Stewardship Grant Program. This application fulfills the requirement of Wisconsin State Statute Sec. 23.09165(3)(a) that the DNR establish and maintain a no-cost interactive mapping tool at the DNR website that identifies all stewardship land that is open for public access.

- **Surface Water Data Viewer:** <http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer>
The DNR Surface Water Data Viewer (SWDV) is an interactive mapping tool featuring a wide variety of water-related data including the Floodplain Analysis Database, Impaired Waters, Use Designations, and Water Condition information, supporting water resources management decisions mandated under the Clean Water Act. The SWDV includes five different map themes: a general theme in which users manually select the data layers for viewing; wetlands; dam safety; floodplain; and designated waters (critical habitat and other sensitive aquatic resource areas)
 - **Dam Safety:** <http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.damsafety>
 - **Designated Waters:** <http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer.deswaters>
 - **Floodplain Analysis Database:** <http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.floodplain>
 - **Wetlands & Wetland Indicators:** <http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.wetlands>

- **Water Use System** [under development]
When available, the DNR Water Use System will comprise statewide water use registration, permitting, water use reporting and data management needs as directed by the Great Lakes Compact and Wisconsin Administrative Rule for groundwater and surface water withdrawals. Registration will also facilitate a fee system for registered water users. This project will likely include a billing and payment system. Prior to the initiation of this system, DNR has collected water use registration information on paper forms. Registration of water users and annual water use reporting and subsequent billing could continue via paper forms, but with limited staff and form complexity, an online web application would be more cost effective and will improve data integrity. For more information, see: <http://dnr.wi.gov/org/water/dwg/wateruse.html>.

- **Wisconsin Forest Inventory & Reporting System (WisFIRS) - Public Lands**
Developed and maintained by the DNR Division of Forestry (FR), WisFIRS is a web-based, integrated system featuring ArcGIS Server technology which allows foresters to visually track and report on a variety of forestry activities on DNR lands and County Forests. Access to WisFIRS is limited to DNR staff and partners (county forests) collaborating with DNR/FR. This Forestry GIS portal will use a number of ancillary layers to help field foresters determine various boundaries for forest management activities. WisFIRS fulfills requirements of WI State statutes, and Federal Reporting requirements.

➤ **DNR Migration Off of ArcIMS**

Over the past decade the DNR built nearly 30 web mapping applications using a shared GIS web application development environment (“framework”), based largely on ArcIMS and the MoxiMedia framework, which is implemented and supported by staff in multiple programs. This approach enabled the agency to significantly reduce application development and maintenance costs, improve quality, and provide a means of support as staff have moved into, out of, and within the agency. In late 2011, BTS learned that Esri expects ArcIMS version 10.0 to continue to connect to ArcSDE to 10.1 (previously Esri had indicated that ArcIMS 10.0 would not be compatible with ArcSDE 10.1). Since ArcIMS is DNR's primary web mapping software, it has become a priority for DNR programs to migrate their web mapping applications to other solutions, particularly ArcGIS Server map service-based applications. Depending on Esri's 10.2 release schedule, DNR programs may not need to fully migrate off of ArcIMS until sometime in calendar year 2014.

In FY11 the DNR Bureau of Facilities and Lands developed and deployed the agency's first web mapping system based on ArcGIS Server and utilizing DNR map services (http://dnr.wi.gov/org/land/facilities/dnr_lands_mapping.html). The map viewer for the New DNR-Managed Lands application is based on JavaScript, and provides the ability to quickly find or browse for DNR properties near specific areas of interest.

➤ **Evaluation & Recommendations for New GIS Visualization Tools**

During FY11, BTS staff completed an evaluation of web mapping visualization tools, including ArcGIS Explorer, Google Earth, Google Earth Pro, Bing Maps, and Google Maps. The results are summarized in a database listing

use case functions and compatibility to complete each function by mapping software. This information is considered an initial comparison of these GIS visualization packages. Esri's ArcGIS Explorer is currently recommended as the optimal geographic information visualization tool for use within the agency. Many factors contribute to this recommendation, such as minimal cost investment through the Wisconsin State Government master purchasing agreement with ESRI, DNR data compatibility, support system, extensibility, and data storage and sharing through ArcGIS Online.

➤ **ArcWorks**

"ArcWorks" consists of an ArcGIS-based extension and associated software components that provide staff with core data discovery and data loading functions. ArcWorks is designed to improve efficiency in creating quality GIS products, and to support the business needs of DNR programs. In FY11, BTS staff deployed a version of ArcWorks compatible with ArcGIS Desktop 10.0. However, the database that drives ArcWorks' data discovery capability has not been maintained in recent years due to BTS GIS staffing reductions.

➤ **RR Edit Tool**

The DNR Bureau of Remediation and Redevelopment geolocates any property of program involvement due to contamination or redevelopment efforts. The software supporting this geolocation editing was sunsetted, requiring a rewrite. The bureau defined a workflow and built a tool, implemented as an extension to ArcGIS. The tool allows staff throughout the state to edit spatial data directly into ArcSDE/Oracle databases. The spatial data edits are integrated with tabular data, utilizing database constraints for uniqueness. These updates are immediately available to external users through our external web mapping application, RR Sites Map. The RR Edit Tool supports maintenance of locational information on geolocated sites with continuing obligations that are required under WI state statute 292.12.

➤ **Drinking Water & Groundwater Mapping Applications**

DNR Water Division staff worked with BTS to develop three internal DNR business applications to support the needs of the Source Water Assessment Program (SWAP), which is now completed. This work now continues as part of the Vulnerability Assessments:

1. **The ArcView VA (Vulnerability Assessment) Tool** was developed to allow Water Division staff to digitize potential contaminant sources around public drinking water wells. This tool fulfills requirements of Federal Safe Drinking Water Act amendments of 1986.
2. **The VA Form** automatically creates a map of the site area to enable Water Division staff to complete Vulnerability Assessments. Contaminant sources from the map are also translated into the assessment form which is used to create the final assessment document.
3. **The Drinking Water & Groundwater Viewer** allows Water Division staff to quickly view wells, contaminant sources, and source water areas.

➤ **Surface Water Integration System** [IT infrastructure projects that support data integration in the Water Division.]

1. **Hydro Geodatabase** – statewide spatial database containing surface waters from the USGS 7.5 minute topographic maps.
2. **Register of Waterbodies (ROW)** - database with surface water body inventory information including name, location, size, characteristics etc.
3. **Embeddable Locator Tool (eLT)** – intranet web editing tool that is embedded in 7 major IT systems in the Water Division. Allows staff to locate water-related data on hydro geodatabase features.

➤ **Surface Water Integrated Monitoring System (SWIMS)**

SWIMS managed by DNR's Water Division. SWIMS is a water monitoring data system which holds primarily surface water monitoring results and various program-related datasets including Rivers, Lakes and Nonpoint Source Grant data, Watershed and Fisheries station locations, sensitive area designations and aquatic invasive infestation sites. SWIMS supports data gathered under Clean Water Act 106 for the purpose of understanding overall water condition in relation to state delegated authority to carry out Clean Water Act duties of ensuring that water quality meets water quality standards. SWIMS also supports and helps organize data for watershed grants (lakes, rivers, runoff, Aquatic Invasive Species, and Great Lakes grants).

➤ **Surface Water Assessment, Tracking and Electronic Reporting System (WATERS)**

The Water Assessment, Tracking and Electronic Reporting System (WATERS) is a tabular/GIS integrated assessment database managed by DNR's Water Division. This database provides critical information related to water condition, permit and grant-making decisions. The database is "internal" to the DNR, but the majority of products derived from the system have a direct impact on fulfilling CWA 305(b), 303(d), 205(j), 319 and 303(e) requirements. WATERS fulfills additional state requirements for trout waters (NR1.0), as well as NR121.

WATERS supports watershed planning and implementation, as well as water quality reporting under the federal Clean Water Act. WATERS holds:

- Water Division Objectives, Goals, Performance Measures, and Success Stories
- Clean Water Act Use Designations and Classifications (NR102, NR104)
- Outstanding and Exceptional Resource Waters Designations (NR102)
- Clean Water Act assessment data, including decisions regarding a waterbody meeting its attainable use or whether or not the waterbody is considered "impaired"
- Fisheries Trout Classifications (Administrative Code, NR 1.02(7))
- Watershed Planning

➤ **Wetlands Digital Data Compilation using an Ortho-Rectified Base**

DNR's Bureau of Watershed Management (WT) sponsors this project to re-compile wetland information onto digital orthophotography. A goal of this project is to modernize processes and improve data quality to create a statewide seamless digital Wetlands database.

A.2. Include a discussion of high-level and agency-wide land information integration efforts.

➤ **Data Management**

A major ongoing activity of BTS is to update, manage, and provide access to DNR's GIS Data Repository. This centralized repository contains collections of standardized enterprise geographic framework data that support a wide range of business needs related to: resource management, compliance monitoring and enforcement, permitting, public health and safety; outdoor recreation; wildlife management, Smart Growth and Comprehensive Planning; and U.S. EPA and Forest Service activities. DNR's enterprise geographic data management activities promote data integration and integrity within the agency, and provide DNR staff, partners, and customers with reliable access to core GIS Data Repository contents, in standardized formats. The contents of the GIS Data Repository include framework geographic data, non-spatial tables containing attributes of geographic data, non-spatial reference tables containing standard codes and information used by multiple DNR programs, metadata, supporting documents, and related materials.

The DNR has undertaken a multi-year transition from agency use of file-based GIS data structures to ArcSDE geodatabases. Although most of the DNR's core GIS data sets reside in ArcSDE and are accessed in ArcSDE by web mapping applications and desktop clients, many staff lacking a reliable network connection continue to rely on file-based GIS data sets (i.e., shapefiles and MrSID files).

- ***Maintenance of DNR Basemap Caches and Map Services***

In FY11-12, BTS staff developed several initial Image and Vector Basemap Caches to be consumed as AGS map services by the next generation of DNR web mapping applications. BTS staff plan to update existing image basemap caches in FY12 using newer aerial photography. BTS currently lacks the resources necessary to plan for or implement any major changes in DNR vector basemap caches, but will look for opportunities to collaborate with other DNR programs that have identified business needs for updated or more complete caches. The initial series of Basemap Caches use a tiling scheme based on the WTM83, NAD83 (1991) coordinate reference system and custom map scale thresholds based on input from DNR programs. In the future DNR may develop alternative Basemap Caches based on the WGS Web Mercator tiling scheme adopted by Esri, Google Earth and Bing Maps.

- **2010 Digital Orthophotography**
In FY11-12 DNR/BTS staff converted 2010 NAIP digital orthophotos and imagery from the 2010 Wisconsin Regional Orthophoto Consortium (WROC) to WTM-referenced compressed MrSID county mosaics. In FY 12-13 BTS plans to use these new digital orthophotos to upgrade the DNR's Internal and External Image Basemap Caches for consumption by DNR AGS map services.
- **Metadata Management Issues**
BTS staff prepare and maintain metadata for GIS Repository data, and to provide guidance to DNR staff preparing metadata for program geospatial data. Major changes in metadata management tools in ArcGIS version 10 have presented staff with challenges in using ArcGIS tools to preserve the value of agency investments in metadata developed over the past 15 years. Improving metadata consistency among various formats (i.e., ArcSDE geodatabases and shapefiles) of the same data sets also continues to be an ongoing challenge for DNR staff.

➤ **Data Administration**

Reliance on ArcSDE by DNR's GIS and Oracle users and applications continues to increase. In FY12-13 the GIS Data Administrator will be working with the agency's Data Architect and Oracle Database Administrator to development, implement, and maintain core geospatial and tabular data architecture components and related activities.

- **Adoption of the ST_GEOMETRY Data Type**
Data Administration goals for FY12 include migrating from the LONGRAW data type currently used in DNR ArcSDE/Oracle GIS databases to ST_GEOMETRY (an ESRI spatial data type that provides access to SDE tables in several DBMS environments, including Oracle). Oracle no longer supports LONGRAW, and for several years ESRI has encouraged ArcSDE/Oracle users to migrate from LONGRAW to ST_GEOMETRY. Successful adoption of ST_GEOMETRY will require collaboration with the WDOA staff who administer the DNR's Oracle databases in the shared server environment.

➤ **DNR Land Use Team**

Several laws give the Wisconsin DNR responsibility and authority to address land use issues. The agency is authorized to directly purchase and manage land for purposes of resource conservation, environmental protection, or recreation. Sections 30.26, 30.27, and 30.275, Wisconsin Statutes give DNR the responsibility to preserve, protect, and enhance urban and wild and scenic rivers. Activities carried out under this chapter have land use implications. DNR's Land Use Team integrates the agency's land use related policy activities, to ensure that all department actions promote and work toward the achievement of sound land use. For more information, see DNR's Community Planning and Land Use Management web pages: <http://dnr.wi.gov/org/es/science/landuse/>.

DNR is involved in a variety of planning efforts. Making the link between these state agency planning activities and local community planning efforts can enhance local resource stewardship and foster intergovernmental cooperation. Example activities include: Statewide Forest Planning, DNR Property Master Planning, Land Legacy, Sewer Service Area Planning, Wellhead Protection Planning, Source Water Assessment, Wisconsin Statewide Comprehensive Outdoor Recreation Plan, Wisconsin State Trails Network Plan, Landfill Siting, Nonmetallic Mining Reclamation, and Metallic Mine Permitting.

A.3. Identify any major GIS/LIS application interfaces developed at the DNR.

This information is provided in Section I.A.1.

B. Information Architecture

B.1a Identify the major land information data sets, and the corresponding metadata, developed, enhanced, or currently used within your agency. Particularly, identify any land information for which your agency has assumed custodianship.

DNR/BTS manages an extensive GIS Data Repository to help meet the business needs of DNR programs. The GIS Data Repository includes data obtained from data producers and partners outside of the agency, as well as data for which DNR programs are the custodians. Various statewide data layers from the DNR GIS Data Repository are available for download from the DNR Public GIS FTP site: <ftp://dnrftp01.wi.gov/geodata>. Additional information is posted on BTS Internet web pages: <http://dnr.wi.gov/maps/gis/dataoverview.html>.

An ongoing task of BTS is to develop and maintain metadata for the contents of the DNR GIS Data Repository. As metadata becomes available, it accompanies requested data sets. Examples of these metadata are also accessible on the DNR Internet site: <http://dnr.wi.gov/maps/gis/metadata.html>. In some cases, metadata describing DNR program GIS data is also available on web pages maintained by the custodial DNR program elsewhere on DNR's website. The following is a description of land information for which DNR has custodial responsibilities:

Contaminated Lands

The Bureau of Remediation & Redevelopment (RR) is the custodian for DNR's Contaminated Lands data, which includes locations for the vast majority of contaminated sites in Wisconsin. This data is part of the DNR's Contaminated Lands Environmental Action Network ("CLEAN"), an interlinked network of DNR databases tracking information on various contaminated land activities: <http://dnr.wi.gov/topic/brownfields/clean.html>. For additional information contact:

Tim Panzer, RR/5; Timothy.Panzer@Wi.gov, 608.267.2465

County Forests

The DNR Division of Forestry (FR) is the custodian for the state's County Forest GIS layer, which is created by extracting quarter-quarter sections from the 1:24,000-scale Landnet data layer. An Oracle database identifies PLSS quarter-quarter-sections containing County Forests. Due to the fact that Fractional and Government lots are not identified by Quarter-Quarter section in the Oracle database, it was not possible to include them in this layer. These excluded areas account for approximately 2% of the total County Forest areas. The County Forest data layer is available for download from the DNR Public GIS FTP site: <ftp://dnrftp01.wi.gov/geodata/forestry/>. For additional information contact:

Janel Pike, FR/4; Janel.Pike@Wi.gov, 608.266.2050, or
Courtney Klaus, FR/4; Courtney.Klaus@Wi.gov, 608.266.9272

County Parks

In 2012 the DNR Bureau of Facilities & Lands and BTS initiated a collaborative project to incrementally improve the quality of statewide information about the location of County Parks, using data provided by Wisconsin local and regional data producers. When available on a statewide basis through the DNR-Managed Lands web mapping application, County Parks locations will be presented in relation to State Parks and Federal recreational lands. This information is intended to promote accessibility and provide a broad range of recreational opportunities to members of the public planning vacations or other visits. For additional information contact:

Ann Runyard, LF/6; Ann.Runyard@Wi.gov, 608.267.7471, or
John Laedlein, TS/1; John.Laedlein@Wi.gov, 608.264.8914.

Dams Inventory

The DNR Bureau of Watershed Management (WT) is the custodian for the state's dam inventory, which is maintained in a state-wide relational database. The Dams Inventory fulfills requirements of WI State Stats. Chapter 31, *Regulation of Dams and Bridges Affecting Navigable Waters*. For additional information contact:

Meg Galloway, WT/3; Meg.Galloway@Wi.gov, 608.266.7014.

DNR-Managed Lands

The DNR Bureau of Facilities and Lands (LF) is the custodian for DNR-Managed Lands data. The statewide DNR-Managed Lands data is available for download from the DNR ftp site in zipped personal geodatabase format, under: <ftp://ftp.wi.gov/DNR/public/Lands/>. DNR/LF staff make updates to the DNR-Managed Lands data on an ongoing basis; the version on the FTP site is updated periodically. For more information, contact:

Ann Runyard, LF/6; Ann.Runyard@Wi.gov, 608.267.7471.

Fire Occurrences

The DNR Division of Forestry (FR) has been working on collecting the location of each fire occurrence as represented by a point at either (1) the center of the “forty” (quarter-quarter section) in which the fire occurred, or (2) the center of the section in which the fire occurred where the DNR, Division of Forestry has primary fire suppression responsibilities. The Fire Occurrences data layer is available for download from the DNR Public GIS FTP site:

<ftp://dnrftp01.wi.gov/geodata/forestry/>. For additional information, contact:

Janel Pike, FR/4; Janel.Pike@Wi.gov, 608.266.2050, or
Courtney Klaus, FR/4; Courtney.Klaus@Wi.gov, 608.266.9272

Forest Tax

The purpose of Wisconsin's forest tax laws is to encourage sustainable forestry on private lands by providing property tax incentives to landowners. The Forest Tax data layer is available for download from the DNR Public GIS FTP site: <ftp://dnrftp01.wi.gov/geodata/forestry/>. For additional information, contact:

Janel Pike, FR/4; Janel.Pike@Wi.gov, 608.266.2050, or
Courtney Klaus, FR/4; Courtney.Klaus@Wi.gov, 608.266.9272

Floodplain Zoning

The DNR Bureau of Watershed Management (WT) is the custodian for the state’s Floodplain Zoning data. For additional information, contact:

Meg Galloway, WT/3; Meg.Galloway@Wi.gov, 608.266.7014.

Hydrography

A statewide 1:24,000-scale surface water GIS data layer was completed in 2001 as the result of a cooperative project initiated by DNR and is used as the integration “framework” for all water division data. A geodatabase version of the 24K hydrography layer has been updated on an ongoing basis since its release in 2009. DNR continues to work with federal partners (USGS and USFS) to determine a long-term plan for maintaining a single, statewide hydrography layer for Wisconsin. 24K Hydrography data and user documentation are available for download in both file-based geodatabase and shapefile format from the DNR Public GIS FTP site: ftp://dnrftp01.wi.gov/geodata/hydro_24k/. Information about features of the 24K hydrography geodatabase is posted on the DNR website:

<http://dnr.wi.gov/maps/gis/datahydro.html>. For more information, contact:

Ann Schachte – DG/5; <mailto:Ann.Schachte@Wi.gov>, 608.267.2301

Landnet

The DNR Bureau of Technology Services is the custodian for the Landnet geographic data layer, which is a representation of the Public Land Survey System (PLSS), automated primarily from sources compiled at 1:24,000 scale. 24K Landnet data and technical documentation are available for download from the DNR Public GIS FTP site:

<ftp://dnrftp01.wi.gov/geodata/landnet/>. For additional information, contact:

John Laedlein, TS/1; John.Laedlein@Wi.gov, 608.264.8914.

Natural Heritage Inventory

The DNR Bureau of Endangered Resources (ER) Program plays a critical role in the development and maintenance of data on Wisconsin's rare resources. ER’s Natural Heritage Inventory (NHI) program leads the Bureau's efforts to collect, store and interpret these data. For additional information, contact:

Julie Bleser, ER/4; Julie.Bleser@Wi.gov, 608.266.7308

Recreational Trails

The DNR does not currently have a complete statewide GIS file of Wisconsin State Trails. The DNR Bureau of Parks and Recreation (PR) is currently updating its locational information for state trails from several different sources, which are in work. For information about the potential availability of Wisconsin recreational trails GIS data, or additional information, contact:

Brigit Brown, PR/6; Brigit.Brown@Wi.gov, 608.266.2183.

State Natural Areas

The DNR Bureau of Endangered Resources' State Natural Areas Program tracks and maintains a wide assortment of Natural Area data including management history, information on plant and animal species, rigorous baseline data, site inspection information, research and educational project data, acquisition information, and GIS project and site boundaries. For additional information about State Natural Area data, contact:

Dawn Hinebaugh, ER/6; Dawn.Hinebaugh@Wi.gov, 608.266.5243

Stewardship Grant Acquisitions

The DNR Stewardship Grant Acquisitions GIS data layer is maintained by the DNR Division of Customer and Employee Services (CAES). This data layer identifies lands acquired by local units of government and non-profit conservation organizations with the assistance of a grant from the Knowles-Nelson Stewardship Grant Program. The DNR Stewardship Grant Acquisition data is used to fulfill the requirement of WI State Statute Sec. 23.09165(3)(a) for public access to information about the location of all stewardship land that is open to public access. This data layer is available for download from the DNR Public GIS FTP site:

ftp://dnrftp01.wi.gov/geodata/DNR_Stewardship_Grant_Acquisition/ . For additional information, contact:

Jillian Steffes, CFA Grants Section, Jillian.Steffes@Wi.gov, 715.365.8928.

Wildlife Management

The DNR Bureau of Wildlife Management (WM) is the custodian for several statewide data layers: Deer Management Units (DMUs), Bear Management Zones (BMZs), Turkey Management Zones (TMZs), and management units related to Chronic Wasting Disease (CWD). Those data layers are available for download from the DNR Public GIS FTP site: ftp://dnrftp01.wi.gov/geodata/wildlife_mgmt/. DNR/WM also collects and maintains the statewide sampling results for CWD Deer Sampling data. For additional information, contact:

William Ceelen, TS/1; William.Ceelen@Wi.gov, 608.267.7690.

Watersheds

The DNR Bureau of Watershed Management (WT) is the custodian of the Wisconsin DNR Watersheds geographic data layer, which is the most detailed statewide representation of DNR watersheds in Wisconsin. In general, the watersheds represented in this data set are areas that drain water into a common river system or lake. However, because watershed delineations are used primarily for DNR management purposes, in some cases the delineations are not based strictly on hydrography, topography, or other physical characteristics of the environment. In most cases the watershed boundaries were derived from 1:24,000-scale sources. The DNR Watershed data layer is available for download from the DNR Public GIS FTP site <ftp://dnrftp01.wi.gov/geodata/watersheds/>. For additional information about this data set, contact:

Lisa Helmuth, WT/3; Lisa.Helmuth@Wi.gov, 608.266.0164.

Wisconsin Land Cover

The Wisconsin Land Cover data layer was the result of a 5-year work effort through the WISCLAND consortium to interpret the state's land cover (primarily vegetation) from 1992-1993 satellite images. The WISCLAND data and documentation are available for download from the DNR Public GIS FTP site: <ftp://dnrftp01.wi.gov/geodata/landcover/>. For additional information, contact:

John Laedlein, TS/1; John.Laedlein@Wi.gov, 608.264.8914.

Wisconsin Wetland Inventory

The DNR Bureau of Watershed Management (WT) is the custodian of the Digital Wisconsin Wetland Inventory (WWI) geographic data layer. WT has implemented a process using Orthomapper software to create digital orthophotos from the interpreted aerial photos, using existing digital orthophotography for control

The DNR public Surface Water Data Viewer application includes a Wetlands theme that portrays the state's wetlands and related information: <http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer.wetlands>). Also, the DNR WWI program has an agreement with the federal government under which all the digital WWI data available for Wisconsin may be viewed and downloaded using the USFWS National Wetlands Inventory (NWI) "Wetlands Mapper" application: <http://www.fws.gov/wetlands/Data/Mapper.html> .

The DNR WWI program shares digital WWI data upon request and at no cost with all Wisconsin counties and municipalities that have made provisions for the state's Shoreland Wetland Zoning program in their ordinances (administrative rules contained in Chapters NR115 and NR117, Wisconsin Administrative Code, set minimum statewide standards for shoreland-wetland ordinances). For more information about the WWI data, contact:

Lois Simon, WT/4; Lois.Simon@Wi.gov, 608.266.0756.

Other Geographic Data Managed by the DNR Water Division

In addition to the major data sets described above, the DNR Water Division has custodial responsibilities for several other water-related data layers. For information about potential points of contact for these data layers, refer to the DNR Water Division web pages: <http://dnr.wi.gov/environmentprotect/water.html> .

- Aquatic Invasive Infestations (Zebra Mussel, Eurasian Water Milfoil, etc.)
- Contaminant Source Inventory (sources located inside delineated protection areas around public wells ONLY!)
- Designated Use Classifications (Water Quality Standards, State Admin. Code, ch. NR102)
- Eurasian Water Milfoil sites
- Fish Contaminant/ Advisory sites
- Impaired waters (303d) (Water Quality Standards, State Admin. Code, ch. NR102)
- Outstanding and Exceptional Resource Waters (Water Quality Standards, State Admin. Code, ch. NR102)
- Sediment Contamination sites
- Sport Fish Waters (Trout, Walleye, Muskellunge, Smallmouth Bass, Sturgeon)
- Subwatersheds (statewide, patchwork created for Non-Point Priority watershed project areas)
- Surface Water, Wisconsin Pollutant Discharge Elimination System (WPDES) Outfalls
- Surface Water and Fisheries Monitoring Stations
- Variance Waters (Water Quality Standards, State Admin. Code, ch. NR104)
- Watershed Program Grant Locations (Rivers, Lakes, Runoff, Aquatic Invasive Species, etc.)
- Watershed Planning Areas
- Waterway and Wetland Permits (Chapter 30)
- Wells – Private, public, and monitoring wells
- Wetlands – Potentially Restorable
- Wisconsin Lakesheds (lake watersheds for lakes/ponds and reservoir/flowages 5 acres in size or larger)

Other Geospatial Data Managed by the DNR Forestry Division

In addition to the data sets described above, the DNR Forestry Division has custodial responsibilities for several other forest-related data, some of which are available for download from our website. For information about potential points of contact for these data layers, refer to the DNR Forestry Division web pages:

http://dnr.wi.gov/forestry/GIS/Data_Maps/data_download/.

- Dispatch Groups
- Fire Response Units
- Fire Protection Areas
- State Forest Invasive Plant Inventory

Other DNR Forestry data layers available upon request:

- WisFIRS Public Forest Reconnaissance data layers (e.g. stands, completed treatments)
- Communities at Risk
- Fire Landscapes / Fire Risk
- Lookout Towers
- Forest Legacy Areas

For additional information, contact:

Janel Pike, FR/4; Janel.Pike@Wi.gov, 608.266.2050, or
Courtney Klaus, FR/4; Courtney.Klaus@Wi.gov, 608.266.9272

B.1b. Identify mechanisms of access or distribution of land information and metadata, e.g., via the Internet, WISCLINC, standard or custom CD-ROM products, FTP (file transfer protocol), zip file, etc.

- Metadata accessible on the DNR website: <http://dnr.wi.gov/maps/gis/metadata.html>
- Various statewide geospatial datasets, mostly managed by BTS, are available for download at no cost from the DNR Public GIS FTP site: <ftp://dnrftp01.wi.gov/geodata/> . The data are provided under the terms described on the DNR Legal Notices web page: <http://dnr.wi.gov/org/legal/> .
- Internet Map Service-based data download: Several DNR web mapping applications include an “Extract Shapefile” function that can be used to extract and download data (mostly in zipped shapefile format) for a user’s area of interest.
- BTS and DNR program GIS staff provided geospatial metadata to the Wisconsin (Ramona) GIS Inventory Survey as required under the 2009 Land Information Integration and Modernization Survey (LIIMS) plan, and intend to provide updates or new metadata to the GIS Inventory in the future: <http://www.sco.wisc.edu/wisclinc/survey/> .

B.1c. Identify all major land information or metadata, if any, that your agency makes available through your agency web site(s), and any land information data or metadata your agency plans to make available later either through your agency web site(s) or through WISCLINC. Include a discussion of that land information necessary for local comprehensive planning under Wisconsin ss. 66.1001(2).

The Bureau of Technology Services currently provides access to a variety of agency land information data through FTP (<ftp://dnrftp01.wi.gov/geodata/>), the BTS web pages (<http://dnr.wi.gov/maps/gis/>), and through web mapping services such as DNR WebView (see Section II.A.1).

B.1d. Identify any policies, content or technical standards your agency utilizes for the collection and use of land information or metadata.

- The DNR’s “*Locational Data Standards*” are posted on the DNR Internet site: <http://dnr.wi.gov/maps/gis/location.html>
- DNR also maintains the following document for internal use: “*ArcSDE Database Objects: Naming and Structure Conventions*”.
- DNR’s de facto standard for geographic metadata is the “Content Standard for Digital Geospatial Metadata” (CSDGM) of the U.S. Federal Geographic Data Committee; <http://www.fgdc.gov/metadata/contstan.html> . In cases where CSDGM metadata are not available from DNR custodial programs, available informal documentation accompanies requested data.
- DNR defined the de facto statewide coordinate system used by all state agencies, Wisconsin Transverse Mercator, based on the 1991 adjustment to the North American (Horizontal) Datum of 1983. This coordinate system, known as WTM83, NAD83 (1991), has been registered with the International Association of Oil and Gas Producers (OGP), Geomatics Committee (<http://www.epsg.org>), and is a standard part of the suite of Esri ArcGIS products. See <http://www.dnr.state.wi.us/maps/gis/wtm8391.html> .

B.1e. Identify major land information that may relate to or depend upon other State Agency land information (from yours or another agency) for technical integration.

BTS GIS Services frequently shares requested land information with federal, state, and county or regional government agencies for purposes of technical integration. Commonly requested DNR land information include those data cited in Section II.B.1c. Individual DNR programs may have technical relationships with other government agencies which involve integration of land information to meet programs' business needs. Information about these relationships can be obtained by contacting the responsible DNR program directly (for contact information, refer to the listing of DNR custodial data in Section II.B.1a, or to the DNR Internet site: <http://dnr.wi.gov>).

B.1f. Identify and describe land information from outside sources, for which the agency has a need and requires access to carry out day-to-day responsibilities, functions and statutory requirements. Identify any barriers or obstacles to accessing such data. This may include federal, state, regional, local, tribal or municipal data. Include a discussion of the agency's intended use and application for such data.

BTS seeks to obtain land information from sources outside DNR needed to help agency programs meet their business requirements. BTS plays a key role in converting externally produced land information to standardized formats that facilitate integration with DNR program data.

An ongoing obstacle is a lack of funding to acquire the data from producing agencies which view the sale of land information as a revenue source. BTS's ability to obtain these data from federal agencies, state agencies, regional planning commissions, tribal governments, and local units of government depends on data sharing or other inter-agency cooperative relationships. Federal agencies are currently preparing national level data sets (NRCS soils as an example) that can be distributed and used collectively by state agencies in the future. Further cooperation through the Wisconsin State Agency Geographic Information Coordination Team (<http://sagic.wi.gov/>) and related coordination groups should advance these efforts. In many cases, BTS has been successful in building inter-agency data sharing relationships as a means of obtaining needed data so that it can be made available throughout the DNR and to partners and other customers. Information exchanges also take place between other DNR programs and local governments. Examples of land information needed by DNR and produced by outside sources include:

- **Address Data / Centralized address verification, standardization, and geo-coding services**
- **Census Data**
- **Digital Orthophotos**
- **Elevation**
- **Tax Parcels**
- **Minor Civil Divisions (dynamically updated to reflect incorporations, etc.)**
- **Soils**
- **Structures**
- **Transportation Data**
- **Tribal Lands**

At this time, the future level of resources available to BTS to support spatial data acquisition, conversion and management on behalf of the DNR, its partners and customers, is unknown.

B.2. Identify the software used to develop and provide access to geospatial metadata (e.g., ArcCatalog, U.S. Geological Survey-developed tools...). State whether the software generates metadata consistent with the FGDC Content Standard for Digital Geospatial Metadata, adopted by WLIP.

Software used to develop and provide access to geospatial metadata varies within DNR, but include: ArcCatalog; Microsoft Word, and Notepad. BTS encourages DNR programs to develop, maintain and provide access to geospatial metadata in a consistent form (i.e., CGDSM-compliant) regardless of the tools used.

BTS staff are in the process of evaluating major changes in metadata management tools in ArcGIS version 10. The goal is to determine the preferred approach using ArcGIS tools to preserve the value of agency investments in metadata over the past 15 years, and to communicate the new metadata management processes to agency staff. Improving metadata consistency among various formats (i.e., ArcSDE geodatabases and shapefiles) of the same data sets also continues to be ongoing goal for DNR/BTS.

B.3. For any metadata or land information on the agency's web site(s), please provide the title, Internet URL's, which include the CSDGM abstract, and the purpose. For metadata not accessible via the agency's web site(s) or Internet, please provide a list of all major metadata and the access method that is or would be applied for outside-agency use.

Sample metadata for many DNR GIS Repository datasets can be accessed on the DNR Internet site: <http://dnr.wi.gov/maps/gis/metadata.html> .

In many cases, metadata describing DNR program geospatial data is available elsewhere on the DNR website, on web pages maintained by the custodial DNR program. A large quantity of DNR metadata for natural resources-related information has also been entered into the Wisconsin EcoAtlas (<http://ecoatlas.wiatr.net>) as part of the Aquatic and Terrestrial Resources Inventory (ATRI).

B.4. Identify the agency's plans for future metadata collection and maintenance.

BTS will continue to promote metadata collection and consistency.

BTS and DNR program GIS staff provided geospatial metadata to the Wisconsin (Ramona) GIS Inventory Survey as required under the 2009 Land Information Integration and Modernization Survey (LIIMS) plan, and intend to provide updates or new metadata to the GIS Inventory in the future: <http://www.sco.wisc.edu/wisclinc/survey/>.

C. Technology Architecture

Address the agency's approach to GIS technology implementation and include a discussion of the agency's vision of future technology architecture, software purchases and upgrades. Include a discussion of Enterprise-standard GIS/LIS workstation/desktop software, and related software.

DNR's GIS technology architecture provides the foundation that supports land information development and use throughout the agency. The Department's vision of technology architecture for GIS implementation provides for:

- Multi-tier levels of functionality and capability appropriate for staff needs.
- More web-based and distributed architecture.
- Optimize server-based GIS systems by utilizing new and improved virtual hardware technology.
- User-authentication capability, to grant levels of use and access permissions.
- Expanded ability to access geographic data and functions with a variety of interfaces, including GIS clients, web browsers and other lightweight clients.
- Acceptable performance serving large GIS data sets and digital map data to the standard desktop.
- Enterprise database serving and management to enable staff access to current data from remote locations.
- Adequate performance when linking GIS data with Oracle data tables from the standard desktop.
- Improved data management options which implement effective transactional update capabilities for geographic and related data.

DNR Strategic Planning for Technology Services

Following the Shared Information Services (SIS) migration during 2006-2007, DNR's server-based IT resources are now substantially managed by the WDOA Division of Enterprise Technology (DET). This has effectively resulted in the outsourcing of most of the networking and server components of the agency's architecture to an enterprise oriented services. These operational changes have required DNR to comply with policies and procedures set for the state enterprise by DET, as well as relinquishing considerable control over its capacity to change the architecture to meet its business needs.

During the past year, the DNR Bureau of Technology Services (BTS) has been further realigned to provide increased support services coordination and productivity response support to agency staff, and to serve as intermediary on technical problem resolution activities that relate to enterprise server and network performance capabilities. The role of the BTS Delivery Services Section (DSS) and Support Services Section (SSS) has continued to become increasingly important as the agency moves from individual technology solutions to "architected" solutions designed to be stable and improve the technology infrastructure of the state enterprise. This will require DSS and SSS - in conjunction with the other sections of BTS and DNR programs - to continue providing leadership in defining technology directions and standards for the agency that will enable the DNR to maximize the capacity of IT to satisfy its business needs within the restrictions imposed by reliance on a state enterprise architecture. This will be accomplished based on strategic initiatives underway that include realignment of staff and other resources, in close cooperation with DET and consistent with architecture standards defined by DET. Likewise, within these standards, DSS will continue to work with DET to achieve implementation of any changes in the enterprise architecture needed to meet DNR's IT requirements.

Within BTS, staff will align closely with the Systems Development Framework (SDF) to optimize standardization of key systems deliverables for the agency. This approach will allow us to better integrate the GIS activities of the agency and enterprise GIS resources into DNR's architecture and support processes.

Standard GIS/LIS Workstation/Desktop Software

ArcGIS Desktop is the standard professional desktop GIS software at the DNR. ArcGIS Desktop users were in the process of upgrading to version 10.0 during FY11. DNR ArcView 3.x users may continue to use that software, although it is no longer supported by DNR as a standard software tool. Following the DNR's upgrade to Windows 7 in

FY11-12, all agency users of Arcview 3.x are expected to upgrade to desktop ArcGIS 10.0, or will transition to alternative web-based GIS tools such as ArcGIS Explorer.

GIS Server-based Software

1. **ArcSDE** - ESRI Spatial Database Engine (ArcSDE) is DNR's enterprise geographic data service. Following the DNR SIS migration, DNR currently runs ArcSDE on Windows blade servers, with links to the Oracle 11g database on Linux servers. Separate "development", "user acceptance test" (UAT) and "production" SDE/Oracle database instances are maintained. The DNR ArcSDE/Oracle databases are currently at version 10.0, with upgrade to 10.1 expected early in 2013.
2. **ArcIMS** - ESRI ArcIMS Internet map serving software is used for new web mapping application development. ArcIMS utilizes SDE for geospatial data serving. In late 2011, BTS learned that Esri expects ArcIMS version 10.0 to continue to connect to ArcSDE to 10.1. Since ArcIMS is DNR's primary web mapping software, it has become a priority for DNR programs to migrate their web mapping applications to other solutions, particularly ArcGIS Server map service-based applications. If the information from Esri is correct, DNR's ArcIMS applications will continue to work until the agency needs to upgrade to AGS (and ArcSDE) 10.2. Depending on Esri's 10.2 release schedule, DNR programs may not need to fully migrate off of ArcIMS until sometime in calendar year 2014.
3. **ArcGIS Server (AGS)** - ESRI ArcGIS Server is a GIS enterprise application server that provides geospatial analysis and mapping capabilities throughout the organization while maintaining centralized data management and application support.

Address Standardization & Geocoding software

The DNR currently has no standard address verification, standardization or geocoding solution. We are hopeful that these services will become available through DOA in the future.

Image processing/remote sensing tools

1. **GeoExpress** - This software (a product of LizardTech, Inc.) is used for scanned airphoto mosaicking, compression, and re-projection. Digital orthophotos in Multi-Resolution Seamless Image Database (MrSID) compressed image format are used extensively by DNR staff using desktop GIS software.
2. **OrthoMapper** - This software (a product of Image Processing Software, Inc.) is used for soft-copy photogrammetry by the DNR Wetlands Inventory program.

GPS (Global Positioning System) tools

Due to reductions in staff over the past several years, BTS currently lacks the resources to provide DNR staff with training or other enhanced technical consulting support services for Global Positioning System (GPS) tools, even as DNR program user requirements for this technology continues to grow. BTS continues to support use of the DNR Garmin GPS Tool, which allows DNR staff to upload and download GPS data in WTM coordinates. BTS also seeks to coordinate with DNR program staff utilizing GPS to promote the effective use and integration of field data collection into the technology infrastructure.

Large-format plotting/other output capabilities tools

Hewlett-Packard large format roll-feed plotters and various color laser printers are in use.

Metadata-collection tools

This information is provided in Section B.1f.2 .

D. Organizational Architecture

D.1 Identify the Agency's plans for GIS/LIS training and include a discussion of any specific GIS/LIS-related training activities you wish to see offered for State employees.

GIS training-related issues and trends at DNR include:

- A need for more affordable GIS training.
- Staff are making increasing use of on-line or computer-based training, particularly Esri's online fee, self-study and instructor-led courses.
- Use of Wisconsin DNR land information as part of the training.
- Requests from DNR staff for GIS training that is customized to meet their specific business needs.
- Staff who do receive training often do not have an opportunity to use it in a timely manner to retain skills learned.

D.2 Describe any formal or informal land information sharing or development agreements your agency currently supports or is a party to (e.g., Memoranda of Understanding/Agreement, other cooperative agreements, consortia agreements, etc.). Include a description of potential partners and mutual projects of this nature, which your agency either plans to pursue or would be interested in pursuing.

Formal Data Sharing Agreements & Consortia:

- Memorandum of Agreement between DNR, the Wisconsin Department of Transportation, and Wisconsin Power and Light: "Natural Resource Regulatory Permitting & Information".
- 1999 Memorandum of Agreement between DNR and the Department of Administration "to ensure optimal accuracy of Geographic Information Systems (GIS) data between the agencies and to develop procedures for resolving errors in data".
- Agreements between DNR and various Counties in which DNR acknowledges restrictions that the Counties have placed upon their digital orthophotography or other data products.
- Agreements between the DNR Bureau of Wildlife Management or the DNR Bureau for Remediation and Development, and various Counties for land ownership (parcel) data.
- WISCLAND (the Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data, a partnership of public and private organizations seeking to facilitate landscape GIS data development and analysis). Although the WISCLAND consortium has been largely inactive since completion of the statewide Land Cover data set several years ago, WISCLAND remains a potential mechanism for cooperative inter-agency GIS/LIS data development or improvement.
- During 2001, a Cooperative Technical Partners Memorandum of Agreement between DNR and the Federal Emergency Management Agency (FEMA) for Digital Flood Insurance Map data was established.
- In 2005, the DNR became a participant in the WisconsinView consortium: <http://www.wisconsinview.org/>. WisconsinView is one of several "StateView" members of AmericaView, a nationwide program that focuses on remote sensing and related geospatial technologies in support of applied research, K-16 education, workforce development, and technology transfer.
- Natural Heritage Inventory (NHI) – Being exempt from the Wisconsin Open Records Law, the NHI program is only able to share specific locational information through data sharing agreements, such as Cooperative Agreements and License Agreements. The Heritage Program currently averages 20-30 active agreements with various state, local, and federal government agencies as well as limited agreements with several state utility companies.

Cooperative & Collaborative Arrangements:

The DNR BTS and GIS Services Sections maintain informal data sharing arrangements with:

- Federal Agencies – These include the USGS, USDA/NRCS, US EPA, US Park Service, and the USFS.
- State Agencies – These include the Wisconsin Departments of: Administration; Agriculture, Trade and Consumer Protection; Emergency Management; Health and Family Services; Public Service Commission; Transportation; Board of Commissioners of Public Lands.
- Departments & Programs of the University of Wisconsin System – These include the UW-Madison Department of Forest & Wildlife Ecology; UW Land Information and Computer Graphics Facility (LICGF); UW Space Science Engineering Center (SSEC) UW-Milwaukee American Geographical Society (AGS) Collection; Wisconsin Geological & Natural History Survey (WGNHS).
- Wisconsin Regional Planning Commissions (RPCs)
- The Wisconsin State Cartographer's Office (SCO)

DNR is an active participant in interagency and intergovernmental data sharing and standards development efforts.

Groups in which DNR participates and intends to continue to pursue GIS/LIS integration and cooperation include:

- State Agency Geographic Information Coordination (SAGIC) Team – DNR is an active participant in SAGIC: <http://sagic.wi.gov/>. SAGIC's goals include identifying and promoting strategic state agency priorities for GIS, raising awareness and improving communication among state agencies for GIS, and facilitating GIS collaboration within state government.
- Wisconsin Geographic Information Coordination Council (WIGICC) – WIGICC serves as the primary forum and coordinating body for geographic information and technology in Wisconsin; <http://wigicc.org/>. DNR is represented on the WIGICC Council, DNR staff actively participate in WIGICC committees and workgroups, and many DNR staff are members of the WIGICC Network.
- Wisconsin Land Information Association (WLIA) – The DNR is an active participant in WLIA activities: <http://wlia.org/index.cfm>.
- WISCLAND – The DNR was a co-founder, active participant, and supporter of WISCLAND (the Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data), a partnership of public and private organizations seeking to facilitate landscape GIS data development and analysis. WISCLAND is currently inactive.
- USGS/FGDC – Potential participant in standards and framework data development for metadata and transportation data models, and geodetic, cadastral, and transportation framework data for the National Spatial Data Infrastructure (NSDI).
- Natural Heritage Inventory (NHI) – Being exempt from the Wisconsin Open Records Law, the NHI program is only able to share specific locational information through data sharing agreements, such as Cooperative Agreements and License Agreements. The Heritage Program currently averages 20-30 active agreements with various state, local, and federal government agencies as well as limited agreements with several state utility companies.

DNR's Division of Forestry participates in a Wisconsin partnership that developed the Landtype Association (LTA) layer of the National Hierarchical Framework of Ecological Units (NHFEU) for the entire state.

D.3 Identify any internal agency GIS/LIS-related groups.

- DNR/BTS staff participate in periodic DNR GIS User Group Meetings in cooperation with other DNR programs active in GIS/LIS.
- DNR Regional GIS User Groups meet periodically.
- The DNR Land Use Team provides access to land use-related publications and other information about DNR activities with land use implications: <http://dnr.wi.gov/org/es/science/landuse/plan/pubs.htm> .

D.4 Identify any other organizational needs you anticipate.

- There is an ongoing need to align GIS/LIS and Information Technology budgets with agency business requirements; the information provided in the Land Information Plans should be used to re-prioritize land information funds to accomplish this alignment across State Agencies.

E. Security Architecture

E.1 Provide any policy or statutory provisions related to privacy, cost recovery, liability, legal disclaimers, copyright or licensing related of land information, mapping, data distribution, usage, and the Internet. Address any open records laws issues that relate to the data distribution needs of the agency.

- DNR reviews and maintains its overall IT security model, including security components related to its Oracle databases (including SDE) and application development and deployment procedures. As DNR develops more Internet-based applications, including those that allow external update of internal databases, its security model must take additional steps to protect data from unauthorized access and use.
- BTS is also increasing its security resource staff to play a more active role in security coordination, implementation and enforcement, and will increase the number of staff working on security issues under current plans.
- DNR is continuously evaluating and addressing “Homeland Security” concerns as new data sets and applications are built or existing ones are enhanced.
- DNR complies with the Open Records Law when handling requests for data and applications, including those involving land information. Depending on the context, DNR uses various disclaimers to notify users of appropriate uses of and support for requested data and applications. The legislature has granted Open Records Law exemptions to certain DNR that manage environmentally sensitive information, such as the Natural Heritage Inventory of rare and endangered species, and the Wisconsin Wetlands Inventory. Under these exemptions, the custodial program may be allowed to restrict access to certain information, or to charge fees.
- DNR adheres to all legal and other requirements for computer matching of personally identifiable information; Act 88 “opt out” related to facility contacts, recreational licenses, park vehicle admissions, and boat, ATV, and snowmobile registrations; and other applicable state and federal laws and rules designed to protect the privacy of individuals and the habitats of endangered species.
- DNR employs standard database administration practices, through the use of virus-checking software, password-protected logins, and establishment of an Internet firewall, to establish secure systems as appropriate.
- DNR/BTS includes a statement of legal information with all BTS distributions of DNR geographic data to requesters outside of the agency. The legal information statement was downloaded from the following DNR Internet Legal Notices web page: <http://dnr.wi.gov/org/legal/> .