Final Report
Version 9 Statewide Parcel Map Database Project
July 26, 2023

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OVERVIEW

The **Version 9 Statewide Parcel Map Database Project** (V9 Project) was a joint effort between the Wisconsin Department of Administration (DOA) Division of Intergovernmental Relations and the Wisconsin State Cartographer's Office (SCO). This document describes the V9 Project, which ran from January 2023 to June 2023 as part of the Statewide Parcel Map Initiative established by Act 20 of 2013.

Project Objectives Achieved

- Create an updated statewide parcel database and map layer by integrating county-level datasets.
- Provide for download of parcel database and display map layer online.
- Continue implementation of standard for parcel data known as the "Searchable Format," which is tied to Wisconsin Land Information Program grant funding for local governments.
- Assess and communicate county progress in achieving the Searchable Format.

The V9 Project successfully aggregated all known digital parcel datasets within the state, resulting in a statewide GIS parcel layer of **3.54 million parcels**. The statewide data was standardized to meet the Searchable Format and made publicly available online by June 30, 2023. The V9 Project represents another successful step in the Statewide Parcel Map Initiative, an effort important for improving the quality of Wisconsin's real estate information, economic development, emergency planning and response, and other necessary citizen services.

PROJECT BACKGROUND

The V9 Project was another phase in the incremental approach of the Parcel Initiative—improving the statewide parcel map with each annual iteration. The V9 Project builds upon the experience of the LinkWISCONSIN and V1-V8 Projects. V9 was the eighth round of implementing standards for data submissions—the Searchable Format—which the legislature directed the Department of Administration to create in coordination with counties as part of Act 20 of 2013. In the Searchable Format, county data submittal is ready for immediate aggregation into the statewide parcel layer. Counties are to achieve the Searchable Format for parcel and tax roll data each year by March 31st.

TECHNICAL APPROACH

The technical approach taken by SCO staff involved several steps, including preparation and ingest, local-level processing, aggregation, state-level processing, and quality assurance/ quality control. To support counties in achieving the Searchable Format, SCO developed a tool called the Validation Tool that counties are required to run in order to validate their data against the schema, as well as a suite of other geoprocessing tools. Once the statewide layer was created, data was distributed in several formats via a

V9 Statewide Parcel Layer - 2023
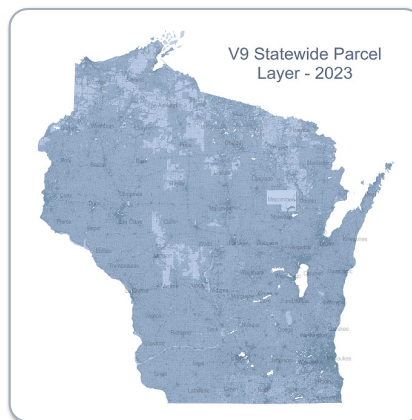
custom website and a web-based mapping application. The web app allows someone without GIS software to view and search the statewide parcel map.

BENCHMARK PROGRESS ASSESSMENT

The final V9 layer represents progress over previous years. Two counties have yet to complete their digital parcel mapping—Buffalo, and Burnett— notable progress, as that figure is down from 12 counties in 2014. Assessment and analysis of county data was conducted, with attention to what must be done for a county to meet the Searchable Format. The majority of counties came close to meeting the Searchable Format in their V9 data submissions. Very few

met the Searchable Format exactly, with only a small number of counties submitting data that did not require additional processing to meet all Searchable Format requirements. The majority of counties either required follow-up to obtain missing data or had processing steps performed on their behalf to get the data into the Searchable Format.

In addition to parcels, several other GIS data layers were collected as part of a collaboration with the UW-Madison Robinson Map Library. For V9, **385** new county data layers were cataloged, archived, and made available through the data portal GeoData@Wisconsin.

RECOMMENDATIONS

Recommendations to improve and achieve better efficiency, accuracy, and final products include reviewing and updating the data submission Validation Tool, revisiting the design of the Validation Tool output known as the Validation Summary Page, making small and custom changes to the new web application as needed and based on user feedback, and encouraging integration of PLSS coordinates into the parcel fabric by way of the WLIP Strategic Initiative grant application. These recommendations are designed to be minimally disruptive for counties, yet ultimately lead to a statewide parcel layer that continues to improve with each annual iteration. ■

1 PROJECT BACKGROUND

1.1 Background

The **Version 9 Statewide Parcel Map Database Project** (V9 Project) was a joint effort between the Wisconsin Department of Administration (DOA) Division of Intergovernmental Relations and the State Cartographer's Office (SCO) that ran between January 1, 2023 and December 31, 2023.

Wisconsin Act 20 of 2013 created statutory directives through s. 59.72 and s. 16.967 for the state and local governments to coordinate on the development of a statewide digital parcel map, which is referred to as the Statewide Parcel Map Initiative, or Parcel Initiative. One of the statutory requirements was for DOA to determine a "**Searchable Format**" for parcel data and for all county data to be posted online in this standard. V9 is the eighth round of requesting that counties submit local data in the Searchable Format.

The V9 Project followed successful collaboration between DOA and SCO on similar efforts. In the past, DOA and SCO have partnered on a project to create statewide parcel and address point layers for the LinkWISCONSIN Address Point and Parcel Mapping Project (2013-2014), the Version 1 (V1) Project (2015), the Version 2 (V2) Project (2016), the Version 3 (V3) Project (2017), the Version 4 (V4) Project (2018), the Version 5 (V5) Project (2019), the Version 6 (V6) Project (2020), the Version 7 (V7) Project (2021), and the Version 8 (V8) Project (2022).[1]

The V9 Project continued the approach of improving with each annual iteration through a process that allows for much involvement and collaboration with data contributors, who are primarily county land information offices, and data users—a wide array of persons from state agencies, private companies, and other entities and individuals.

1.1.1 V9 Project Goals

As part of the implementation planning for the statewide digital parcel map, the goals of the V9 Project were established in a memorandum of understanding (MOU) between DOA and SCO.

- **Meet statutory objectives and track progress.** The statewide parcel layer is built in an iterative fashion. V9 will continue to track the progress made with investments to local governments, specifically on benchmarks for parcel dataset development. A goal is to design an appropriate monitoring and evaluation framework to evaluate progress on the four benchmarks for parcel data:
    - Benchmark 1 – Parcel and Zoning Data Submission
    - Benchmark 2 – Extended Parcel Attribute Set Submission
    - Benchmark 3 – Completion of County Parcel Fabric
    - Benchmark 4 – Completion and Integration of PLSS

- **Incremental and continuous improvement.** Improvement of the statewide parcel layer itself, as well as the workflow and methods for each step in the aggregation process, with each new version of the layer. Exploration of areas for improvement should be based on research. As with the database, the hosting and display should keep pace with current technology and be continually improved to meet users' needs. Intake and aggregation process should be replicable and become more efficient with time, facilitating other improvements and/or opportunities for value-added products.

- **Outreach and technical assistance to counties.** This may take the form of further development of existing technical tools or the creation of new tools for counties and municipalities to use. It could also involve virtual or site visits and direct assistance.

- **Lean government principles and efficiency.** The V9 Project should seek to create and realize efficiencies in general, eliminate waste, and integrate or collaborate with other state GIS services where possible. An objective for this project is to move toward a more efficient, automated process for data aggregation where the locus of standardization labor is on the data contributors rather than the aggregator. Such a process would require fewer state resources be dedicated to the aggregation process and thereby reduce state costs for sustaining the statewide digital parcel map.

- **Responsiveness to public needs and economic development goals.** Evaluate parcel layer user suggestions and implement improvements where feasible.

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[1] See V8 Final Report (2022 July); V7 Final Report (2021 December); V6 Final Report (2020 October); V5 Final Report (2019 September); V4 Final Report (2018 November); V3 Final Report (2017 November); V2 Final Report (2016 November); V1 Interim Report (2016 June); V1 Final Report (2015 November); and Final Report: LinkWISCONSIN Address Point and Parcel Mapping Project (2014 September).

1.1.2 Project Timeline and Milestones

V9 Statewide Parcel Map Database Project Milestones	
Date	**Version 9 Project Milestone**
November 30, 2022	V9 call for data ready
January 1, 2023	V9 Project formal expenditure period start
January 2, 2023	Begin county data preparation assistance/outreach
March 31, 2023	V9 data submissions due
June 10, 2023	Draft V9 database for purposes of QA/QC
June 23, 2023	V9 web app updates complete
June 30, 2023	V9 parcel map available online
July 31, 2023	V9 final report with final V9 workflow documentation
September 29, 2023	Final E5 PLSS database
October 14, 2023	E5 PLSS final report, documentation, and publication ready
October 31, 2023	Draft V10 data Validation Tool ready
November 15, 2023	V10 data Validation Tool finalized
November 30, 2023	V10 call for data ready
December 31, 2023	County outreach for V10 conducted
December 31, 2023	E5 PLSS final end-user feedback appendix ready

1.1.3 Project Team

V9 Statewide Parcel Map Database Project Team	
Howard Veregin, Project Co-Lead	Wisconsin State Cartographer's Office
Peter Herreid, Project Co-Lead	Wisconsin Department of Administration
Ana Wells	Wisconsin State Cartographer's Office
David Vogel	Wisconsin State Cartographer's Office
Thomas Kazmierczak	Wisconsin State Cartographer's Office
Hayden Elza	Wisconsin State Cartographer's Office
Param Bhandare	Wisconsin State Cartographer's Office (student)
Branton Kunz	Wisconsin State Cartographer's Office (student)
Drew Ten Bensel	Wisconsin State Cartographer's Office (student)
Rachel Ren	Wisconsin State Cartographer's Office (student)
Davita Veselenak	Wisconsin Department of Administration

1.1.4 Outreach

V9 Conference Presentations and Outreach To-Date	
74th Wisconsin Society of Land Surveyors (WSLS) Annual Institute January 2023	Wisconsin County Surveyors Association (WCSA) Annual Membership Meeting Presentation
Wisconsin Land Information Association (WLIA) Annual Conference February 2023	Land Information Officers Network Annual Meeting, DOA and SCO updates; SCO In-Person Help Desk Hours
Wisconsin Land Information Council (WLIC) February 2023	WLIP program updates
V9 County Assistance/Outreach Sessions March 2023; Virtual	Individualized assistance offered and provided as requested
Wisconsin Land Information Association (WLIA) Spring Regional Meeting May 2023	WLIP updates at Land Information Officer Network meeting;

1.2 Documentation and Communication of Standards

The Submission Documentation set forth the required data submission standards for the V9 Project. There are four benchmarks listed by the WLIP Strategic Initiative grant application:

- Benchmark 1 – Parcel and Zoning Data Submission
- Benchmark 2 – Extended Parcel Attribute Set Submission
- Benchmark 3 – Completion of County Parcel Fabric
- Benchmark 4 – Completion and Integration of PLSS

Together, Benchmark 1 and 2 make up the Searchable Format. The Searchable Format is detailed in the Submission Documentation.

Figure 1. V9 Submission Documentation

1.2.1 New for V9

All attribute names, definitions, domains, and other schema requirements remained the same as last year. A few minor changes and updates are summarized on this page.

- **Validation Tool Updated.** Our project partners at the State Cartographer's Office have redesigned the Validation Tool.

  The basic operation of the tool remains the same. As with previous years, counties will need to run the tool in Test Mode first, to identify errors and schema deviations in order to rectify them.

  The redesigned tool features:
  - ▶ **A redesigned interface**
  - ▶ **Integrated Explain Certification entry** - Explanations for legitimate schema deviations, known as "*Explain Certification*" information, is
    no longer uploaded as an external text (.txt) file.
    Instead, you enter the information directly into the tool interface in an *Explain Certification* window, the last time you run the tool in Final Mode.
  - ▶ **Automated final geodatabase creation** - In Final Mode, the final geodatabases are automatically created and populated, and put into a folder directory on your computer that you have chosen in the tool. The files created are:
    COUNTYNAME.ini (submission form)
    COUNTYNAME_**PARCELS**.gdb
    COUNTYNAME_**OTHER**.gdb

  All counties need to do is zip the directory containing these three auto-generated files and submit!

- **ESTFMKVALUE – No requirement to null ESTFMKVALUE for Ag/Undeveloped/Agricultural Forest & AUXCLASS Parcels.** While most properties are assessed at full market value, some classes of property—specifically 4, 5, and 5M—are not. In keeping with a precedent that was start during V6 in 2020, for V9, ESTFMKVALUE (Estimated Fair Market Value) values will continue to be nulled out for parcels that are wholly or partially PROPCLASS 4, 5, or 5M; enrolled in the MFL/CFL programs (AUXCLASS W1-W9); and tax exempt (AUXCLASS X1-X4). However, **counties are *not* required to null ESTFMKVALUE for Ag/Undeveloped/Agricultural Forest & AUXCLASS parcels for V9, but it is optional for counties to do so**. This processing step will be performed by the DOA/SCO technical team on behalf of counties who wish to submit with these values populated. See ESTFMKVALUE for further information.

- **Submit PLSS Data.** If the county has the PLSS attributes listed in Appendix C in a digital tabular format, including a **PLSS corner ID attribute**, they should be submitted. The unique corner ID could be alphanumeric or numeric. If for some reason corner ID will be different from what was submitted last year, please contact SCO before submitting.

- **Submit Other Layers.** For V9, DOA is continuing to combine the V9 data request with Jaime Martindale of the UW-Madison Robinson Map Library (RML). Therefore, we are requesting a few other layers, listed in Appendix D.

- **Zoning Data Submission Requirements.** For V9, counties only need to submit three layers of county-maintained zoning data: 1) General, 2) Shoreland, and 3) Airport Protection. These may be submitted AS IS, except for a DESCRIPTION/LINK field requirement.

- **Searchable Format.** Counties will need to meet the Searchable Format in order to execute their 2023 WLIP Strategic Initiative Grant and receive the payment. In some cases in which a county does not meet the Searchable Format requirements with their V9 submission or fails to rectify errors from prior years' Observation Reports, the county may need to re-submit data.

- **Clarified Documentation.** The V9 documentation has been revised. Discard any old documentation and links. Replace with this updated Submission Documentation and V9 links. An optional activity is to take contemporaneous notes on your data prep, grooming, and submittal process. Notes can be submitted to DOA in any format. To avoid flags in the Validation Tool and ensure that data submissions meet the Searchable Format requirements called for by State Statute 59.72(2), counties will need to carefully read the entirety of this Submission Documentation and the Validation Tool Guide before preparing data submissions.

1.3 Call for Data

The official V9 data request was sent to each county land information officer on **December 1, 2022** via email, and appears as Figure 2. It included a link to the Submission Documentation, which serves as a manual detailing the requirements of the Searchable Format.

Dear LIO,

On behalf of the Department of Administration, I am writing to request a subset of your GIS data. The data acquired through this request will be used to develop a statewide parcel layer for the next version of the Statewide Parcel Map Database Project, Version 9.

All counties must submit parcel/tax roll data in the Searchable Format standard no sooner than December 31, 2022 and no later than March 31, 2023. To be accepted, submissions will need to meet the specifications for the Searchable Format and be free from any unexplained errors. A successful data submittal adhering to the Searchable Format is necessary in order to receive payment on your county's 2023 Strategic Initiative Grant.

PREP
The V9 checklist in the Submission Documentation summarizes the data request. The digital PDF checklist contains hyperlinks to attribute definitions and links to the full schema. Although there are no changes to the schema, a page titled New for V9 summarizes what's new.

PARCEL FEATURE CLASS WITH TAX ROLL DATA
You will want to read the Submission Documentation in full, in order to understand the details of the V9 request. In addition, the V9 webpage contains all the necessary submission information and links to several tools to help you format your data.

OTHER LAYERS – PLSS & RML
Again for V9, all counties must **also submit PLSS corner data** (per Appendix C) and **additional GIS layers for RML** (Appendix D), which are being requested in order to aid in analysis of the statewide layer and as part of a collaborative effort with the UW-Madison Robinson Map Library.

VALIDATE WITH VALIDATION TOOL
The updated, redesigned tool you must run before you submit your data, the Validation Tool, can check your data for deviations from the schema and is also required to create the mandatory Submission Form.

ZIP & SUBMIT
After prepping your data and running the tool to create your Submission Form, submit your data to LTSB GeoData Collector, formerly known as the WISE-Decade platform. Log in using your credentials from the Legislative Technology Services Bureau.

Please note that the collection of municipal wards, municipal boundaries, and county supervisory districts will occur January 4th–18th. This collection is also conducted through the LTSB platform.

Please submit your V9 parcel/tax roll data package by **March 31, 2023**.

FEEDBACK AND HELP
For some of the questions you might have, personalized assistance may be available by contacting us. For technical questions, you can email the State Cartographer's Office at help@sco.wisc.edu or call 608-262-3065. Feel free to contact me with general questions as well.

We realize that a substantial amount of work goes into this annual data submittal. WLIP Strategic Initiative grants were designed to aid in this task. Like the numerous end users who have shared positive feedback as reported in the V8 Final Report, we sincerely appreciate your efforts to help make another update of the statewide parcel layer a success.

Thank you,

Peter Herreid
608-267-3369
Grant Administrator
Wisconsin Land Information Program

Figure 2. V9 Call for Data

1.4 V9 Assistance/Outreach

1.4.1 V9 Assistance/Outreach

For V9, an outreach element was included with the project to highlight the importance of county data preparation assistance and outreach. The table of V9 Conference Presentations lists outreach events that occurred via public presentations on the project.

All counties were encouraged to ask for assistance, if they so chose, in the call for data. Individualized assistance with data preparation was provided virtually as requested. LIOs may send questions to SCO via the SCO Help Desk at help@sco.wisc.edu.

SCO also offered in-person help desk hours at the State Cartographer's Office booth during the 2023 WLIA Annual Conference. Members of the parcel team were available on February 23-24. LIOs were encouraged to come by with any questions about the Validation Tool, the V9 Submission Documentation, or the parcel submission process in general. One LIO stopped by to introduce himself and inquired about the parcel schema address elements and their relationship to the NENA address elements being used for the NextGen911 project (for which there is an explanation of the "Standards for Parcel Site Addresses" topic in the V4_Final_Report).

With regard to project communications to the public, DOA publicized the statewide parcel layer in a LinkedIn post in March of 2023.
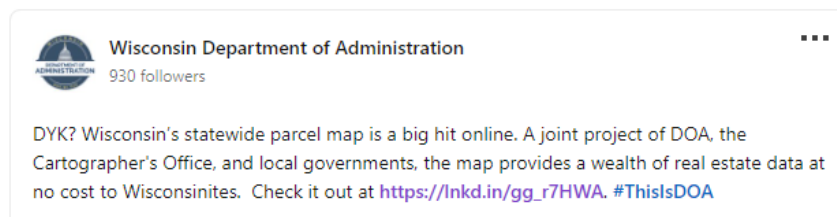
Figure 3. DOA LinkedIn post from March of 2023

2 TECHNICAL APPROACH

This chapter describes the strategy or a high-level version of the approach employed by the technical team in processing and aggregating local-level data for inclusion in the final deliverable and statewide parcel map.

2.1 Tool Development

2.1.1 Updated Validation Tool

A redesigned Validation Tool was rolled out with the V9 call for data in December of 2022. It is a tool built by the State Cartographer's Office that counties were required to use before submitting data. The Validation Tool checked data for deviations from the schema, and was also required to create the mandatory Submission Form.

Data submitters could run the tool in test mode to flag potential errors in the data. The tool was run again in final mode in order to create the ".ini" Submission Form, a required part of the submission package.

For more details or to download the tool, see the Validation Tool Guide.
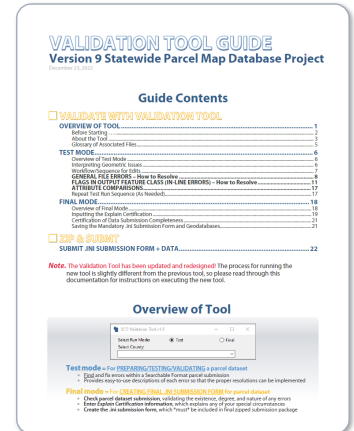
Figure 4. Validation Tool Guide

Validation Summary Page

The Validation Tool displays validation test results in a browser-displayed page called the "Validation Summary Page." The Validation Summary Page is a html file with a summary of Validation results that allows the user to visualize the potential errors observed in the dataset. This file opens automatically in a user's web browser upon completion of running the Validation Tool.

The Validation Summary Page provides a general overview of the condition of the dataset. It summarizes error status for "GENERAL FILE ERRORS" and for "FLAGS IN OUTPUT FEATURE CLASS (IN-LINE ERRORS)." The parcel data is ready for submission upon completion of an error-free Validation Tool test mode run and a corresponding Validation Summary Page file that says no errors have been found.

Figure 5. Validation Summary Page (example). This displays in full "GENERAL FILE ERRORS" and summarizes error status for "FLAGS IN OUTPUT FEATURE CLASS."

2.1.2 Geoprocessing Tool Development

To support counties in achieving efficient and accurate adherence to the standards in the Submission Documentation, the SCO developed a suite of publicly available geoprocessing tools using the ArcGIS ArcPy Module, Python 2.7, and open source libraries. In total, seven tools were created, and made publicly available through the data submission webpage.

The tools were supported under ArcGIS version 10.3 through version 10.8. Each of these tools were designed to enable efficient solutions to the most common and time-consuming problems related to preparing parcel and tax roll data to be submitted in the statewide schema. Accompanying the tools were user guides that documented how to prepare the data, run the tool, and troubleshoot if necessary.

Figure 6. V9 Data Submission Webpage with Links to Schema and Tools

- **Address Parsing Tool.** Allows the user to parse site addresses from one long string into sub-address elements. Data submitters might use this tool if SITEADRESS data is not available as fully parsed address elements as required by the Searchable Format.

- **DOR XML Parse Tool.** Allows the user to translate Department of Revenue Tax Roll XML into a GIS table. For tax roll data in XML format that is to be used for parcel submission.

- **Data Standardize Tool.** Allows the user to standardize file geodatabase feature class data via the creation of a lookup table through a two-tool sequence. The first tool is used to create a summary table of a field. This table is edited and subsequently used as input to the secondary tool. The output of the second tool includes all original field domains as well as newly standardized domains in a new field.

- **Condo Stack Tool.** Allows user to model condominiums by stacking condo parcel geometries by owner. A data submitter might use this tool to model condo parcel geometries to match tax roll records with a 1:1 relationship.

- **Class of Property Dissolve Toolset.** Allows the user to format class of property data to statewide schema definitions. This suite of tools may be helpful if a submitter wishes to reformat their class of property information so as to meet the requirements of the schema definitions of PROPCLASS and AUXCLASS. This tool also handles various common formats that class of property exists as and may be helpful if the submitters data exists in one of these formats.

- **Null Fields And Set To Uppercase Tool.** Allows the user to format all attributes within a feature class to <Null> and UPPERCASE. This tool may be helpful to a submitter if they wish to format their blank fields or fields annotated with a specific string to a true SQL <Null> or if they wish to set all fields to UPPERCASE alpha characters.

- **Field Mapping Workflow Documentation.** Allows a user to map parcel or zoning attributes to the statewide schema. This is not a tool but rather a guide that may be useful to a submitter if they have PARCEL or ZONING data formatted to the schema specifications, but the fields do not have the appropriate FIELD NAME, ALIAS NAME, DATA TYPE, or PRECISION.

- **Summary Table Guide.** Not a tool but a guide for GIS software summary tables, to examine data in preparation for submitting Searchable Format data. This guide is of particular use for cleaning, validating, and standardizing data.
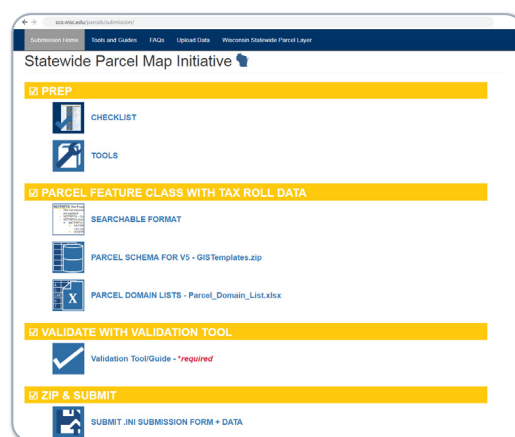
The following table displays the number of downloads for each of the respective tools:

Tool Download Stats								
	# of Downloads V1 & V2 (2015-16)	# of Downloads V3 (2017)	# of Downloads V4 (2018)	# of Downloads V5 (2019)	# of Downloads V6 (2020)	# of Downloads V7 (2021)	# of Downloads V8 (2022)	# of Downloads V9 (2023)
Validation Tool	Not applicable	108	118	84	117	112	95	116
Address Parsing Tool	Not available	48	46	36	27	37	34	22
DOR XML Parse Tool	Not available	24	36	17	34	24	31	19
Data Standardize Tool	Not available	28	27	22	40	39	29	20
Condo Stack Tool	Not available	21	19	9	16	15	19	15
Class of Property Dissolve Toolset	Not available	20	19	13	20	22	17	16
Null Fields and Set to UPPERCASE Tool	Not available	51	59	52	34	57	50	42
Field Mapping Workflow Documentation	Not available	36	34	21	19	18	17	20
Summary Table Guide	Not available	13	11	11	22	13	9	11

Note. Source of data is Google Analytics. Numbers represent unique downloads. Validation Tool began with V3 in 2016.

2.1.3 Preparation and Ingest

In the data request, land information officers were asked to submit data to the Legislative Technology Services Bureau (LTSB) of the Wisconsin State Legislature, through their WISE-Decade platform. WISE-Decade is LTSB's suite of mapping tools designed to assist counties and municipalities with legislative and legal requirements as required by state statute. Some file uploads were also accommodated using UW-Madison's enterprise Box.com account through an alternative upload widget.

The ingest phase began after the call for data. An automated email notification was sent to the project team any time a data submission to the WISE-Decade platform occurred. Once notified, the technical team would download the data via FTP login through Windows Explorer. After download, the data underwent a brief inspection, was documented as submitted, and then classified within the project's file directory. Depending on the amount of data submitted at any given time, the new data would either be assessed immediately or be queued for assessment according to the date the data was received. Also, upon receipt of data, the county data directory was backed-up locally, while additional data backups were routinely made to an external drive throughout the development phases.

Robinson Map Library and Other GIS Data

For other, non-parcel GIS layers, the Robinson Map Library (RML) also performed an intake assessment of submitted GIS datasets. For V9, **385 other layers feature classes were added to GeoData@Wisconsin**—comprised of rights-of-way; roads/streets/centerlines; hydrography; address points; buildings/building footprints; land use and parks/open space; trails; and other recreation data. RML staff and students write thorough and complete metadata for all of the data layers, archive them, and make them available for download on GeoData@Wisconsin.

2.1.4 Intake Assessment

Once data was copied to local directories, the required .ini Submission Form was automatically ingested into the technical team's master intake spreadsheet. This .ini file played an important role in cataloging the data submitted. Information obtained from the .ini file included feature class names, condo modeling format, submitter name and email address, generic error counts, completeness relative to V8 data, and a section that allowed contributors to explain unsolvable errors, missing data, and other known issues present within the data submitted.

Next, the team recorded general notes related to attribute quality and completeness, geometric location, and other issues observed. The focus of this assessment was to determine if data met the submission requirements and establish what processing steps would need to be performed to get the data into the Searchable Format for aggregation, as the majority of counties did not submit data that exactly matched the Searchable Format.

To document the internal team intake workflow, a summary-level workflow documentation was created and is updated on a regular basis.

Showstop, Re-Approach, and Resubmit Requests

If, upon internal team discussion, it was determined that data was missing or incomplete, the county was re-approached and asked to resubmit corrected data or provide justification for the missing data. Several counties had to be re-approached to obtain data missing from initial submission, to get clarification on peculiar data observations, and for the correction of erroneous data. In total, approximately 22 emails were sent to resolve issues related to the fitness of data submissions. In a few cases, multiple follow-up emails were required to an individual county before their data submission could be deemed complete and proceed past the initial assessment phase.

V9 Versus Previous Re-Submits and Clarifications							
	V3 (2017)	**V4** (2018)	**V5** (2019)	**V6** (2020)	**V7** (2021)	**V8** (2022)	**V9** (2023)
# of counties that had to be re-approached	29 counties (40%)	38 counties (53%)	19 counties (26%)	26 counties (36%)	27 counties (38%)	15 counties (21%)	**11** counties (15%)
# of emails sent to resolve issues	83 emails	60 emails	24 emails	34 emails	39 emails	19 emails	**22** emails

For V9, any intake issues that required county follow-up were sent to DOA via email so that a follow-up email could be sent to the county, under a "showstopper" umbrella for either for missing data, questions to counties, or clarifications on the data submission.

After it was determined that the data submitted could be efficiently manipulated and processed, detailed processing steps were written and recorded in a Microsoft OneNote notebook. These steps provided the team with the information needed to massage the data into the final format and prepare it for the aggregation phase.

2.1.5 Geometric Gap Analysis

To identify gaps in the statewide parcel coverage where digital parcels do not exist, a manual inspection was performed on every dataset. It is the responsibility of the county to integrate all available parcel datasets into their parcel data submission, even if the municipal jurisdiction (city, village) is the data steward for the parcel dataset.

The geometric incompleteness of the V9 statewide parcel layer and the **2 counties yet to complete county-wide digital parcel mapping** are summarized in the table below.

V9 Gaps Summary		
County	**Number of Munis with Gaps**	**Municipalities with Gaps in Parcel Coverage**
Buffalo	5	Part of: Alma (C), Buffalo (C), Fountain City (C), Milton (T), Nelson (T), plus several small gaps in various townships
Burnett	3	Part of: Swiss (T), Union (T), West Marshland (T), plus few small gaps in Grantsburg (T) and Anderson (T)

For V9, there was no missing geometric data in the form of gaps where parcel data is maintained by a municipality but not aggregated to county-level parcels. However, some tax roll data that is maintained by municipalities independent of counties presented some challenges.

2.2 Independent Data Stewards

V9 Tax Roll Gaps Summary / Independent Municipalities	
County	**Municipalities with Independent Tax Roll Data and/or Independent Parcel Geometries**
Ashland	City of Ashland
Dane	City of Madison
Dodge	City of Watertown
Douglas	City of Superior (performs export for Douglas County)
Eau Claire	City of Eau Claire
Fond du Lac	City of Fond du Lac
Langlade	City of Antigo
Manitowoc	City of Manitowoc (Transcendent Technologies), City of Two Rivers (Patriot Properties, Inc.)
Milwaukee	City of Milwaukee, City of Wauwatosa, and all other municipalities
Outagamie	City of Appleton
Racine	City of Racine
Rock	City of Beloit, City of Janesville
Rusk	City of Ladysmith
Washington	City of West Bend
Waukesha	City of New Berlin, City of Waukesha, City of Brookfield
Winnebago	City of Oshkosh, City of Neenah, City of Menasha

Note.   ***** This list is <u>not</u> exhaustive. Other municipalities that maintain parcel and/or tax roll data independently of the county may exist.
   • The fact that a county is listed here does <u>not</u> necessarily indicate that the county submission was incomplete—rather, it shows that extra effort was required by either the county and/or the project team to acquire and/or format the municipal data.
   • DOA seeks information on additional independent municipalities. Please send information to WLIP@wisconsin.gov.
   • **Locating Property Information and Tax Assessment Data in Wisconsin** - Reference page 4 of the V9 Attribute Schema documentation for hyperlinks that you can use to locate data.

2.2.1 Aggregation

The process of aggregating individual county datasets began upon the completion of all required processing tasks for each county. After verifying these tasks were complete and ensuring that data was in the Searchable Format, the finalized feature class for each individual county was identified and the full path was documented to allow the technical team to run a batch processing tool for aggregation.

Next, a new statewide working database was created that contained a merged feature class consisting of all 72 individual county parcel datasets.

Statewide logic

Statewide logic is tweaked each year, with adjustments and minor function modifications consistent with the schema.

State-level processing was performed on the resulting feature class. This processing included steps such as casting select fields from string to double, construction of the STATEID attribute for all records, creation of LATITUDE/LONGITUDE fields (populated with values for the inside centroid of each parcel polygon), and general data cleaning tasks (e.g., removal of leading/trailing spaces, converting empty strings to <Null>, setting all attributes to UPPERCASE).

2.2.2 Quality Assurance/Quality Control

Beginning with the V2 call for data in the year 2016, data submitted has been required to meet certain documented standards, which make up the Searchable Format. These attribute field standards, attribute domain standards, and geometric representation standards were assessed as part of the QA/QC phase, as documented in the internal project assessment notes. Maintaining high quality datasets from one version to the next is of paramount importance to the Parcel Initiative. A variety of QA/QC methods were used throughout the project, including manually focused techniques, as well as more automated techniques that allowed for visualization across the entire state.

Manual cleanup techniques and tasks were performed across many of the datasets submitted. These included: address element standardization, address number cleanup, miscellaneous street name element parsing, excess field removal, et cetera. Often, the tasks were completed during the processing phase, prior to aggregation into the statewide feature class.

The automated QA/QC techniques were most often performed after the statewide feature class had been aggregated. With 3.5 million parcels, it is not feasible to manually inspect every record. For this reason, summary tables and a variety of maps were created during this process.

Summary tables were created as a byproduct of the state-level processing and provided a discrete set of domains that existed for a particular attribute field. These tables are particularly valuable for fields such as PREFIX, STREETTYPE, SUFFIX, and PROPCLASS, which have specific attribute domain standards. These tables, used in conjunction with the Data Standardize Tool, allowed for corrections to be made efficiently and accurately. Maps were produced, typically using a choropleth scheme, allowing the visualization of spatial trends within individual municipalities, counties, and statewide. These trends could be hard to observe from the tabular data alone. Maps provided another valuable tool for discovering errors and issues that existed in the data and allowed for corrections to be made.

2.2.3 Final Deliverables

Geometric Coverage

Continued progress is being made in completing the digitization of parcels across the Wisconsin landscape, as indicated by the statistics below.

V9 Spatial Coverage Versus Previous Years											
	V1	V2	V3	V4	V5	V6	V7	V8	V9	Additional Coverage in V9	Percent Additional Coverage in V9
Number of features	3,434,149	3,466,359	3,486,200	3,491,037	3,504,785	3,507,127	3,520,942	3,529,979	3,540,285	**10,306 features**	**0.29%**
Coverage (in sq. miles)	53,656	55,280	56,060	56,193	56,403	56,410	56,389	56,426	56,452	**26 square miles**	**0.04%**

Note. The coverage in square miles calculation does not represent a true 1:1 comparison between the actual area of the state in square miles and total parcel coverage in square miles. In instances where condo parcels are stacked, the square mileage value is inflated. Differences from year-to-year may be present due to varying ways in which non-parcel features and other unparcelled areas are geometrically represented or omitted.

The final parcel layer totaled 3.54 million parcels and is shown in Map 1 on the following page.

V9 Statewide Parcel Layer - 2023
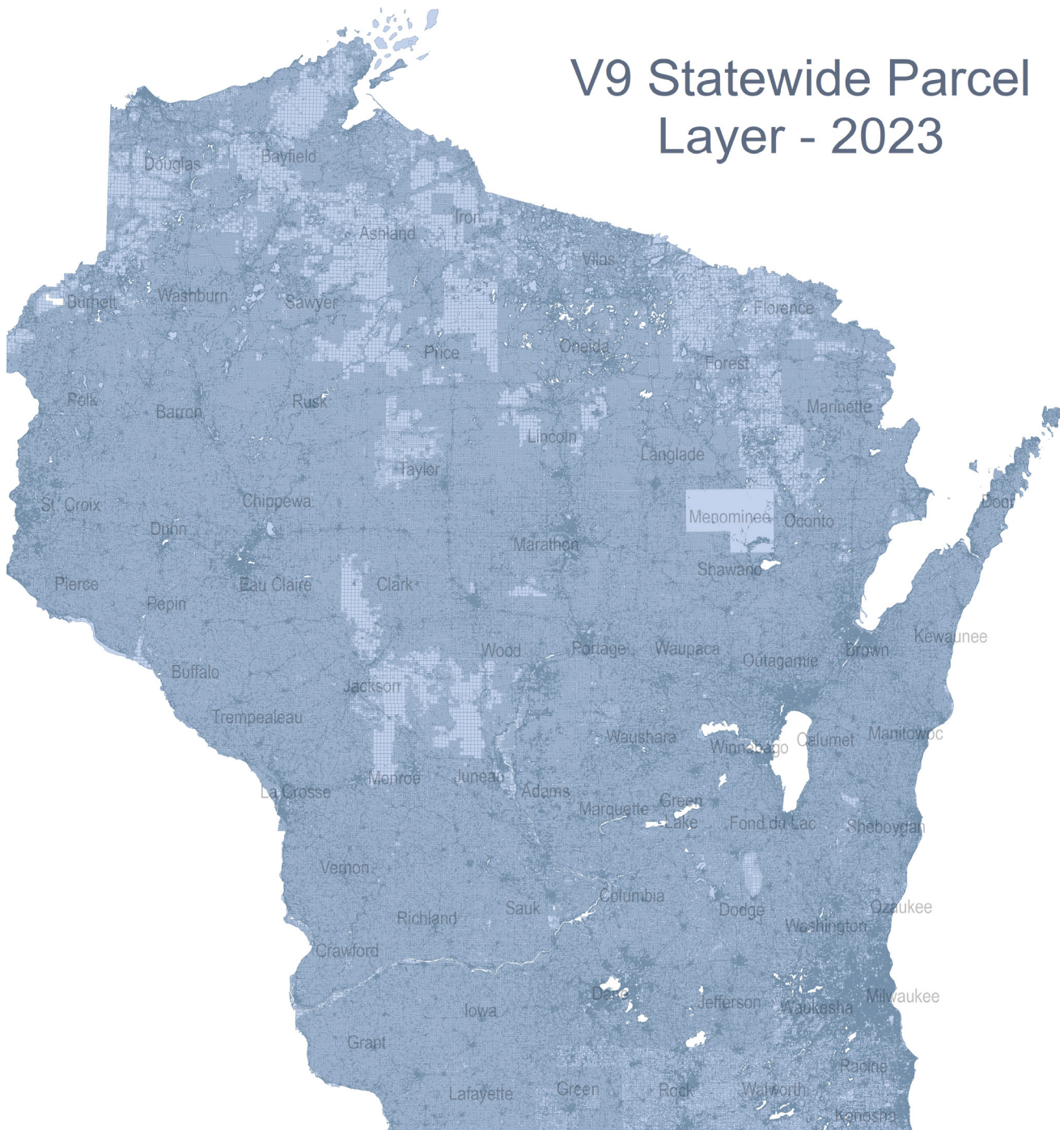
Map 1. Version 9 Statewide Parcel Layer Completed in June 2023

2.2.4 Note on Zoning

Although five publicly available Wisconsin county-administered zoning layers were aggregated as part of the Statewide Parcel Map Initiative for V3 and V2 (in 2017 and 2016), zoning data was **not aggregated** at the statewide level for V4-V9 in 2018-2023.

For information regarding the statewide zoning layers from 2016-2017, please see the Parcel Project Zoning Change Log and page 5 of the V3_Wisconsin_Statewide_Parcels_Schema_Documentation.

Three zoning types were collected for V9—county **general zoning**, **shoreland**, and **airport protection**.

The Searchable Format for zoning data entails inclusion of **DESCRIPTION/LINK** information with the submission, in order to provide the user with definitions of the zoning classes.

Individual county datasets are publicly available through UW-Madison Robinson Map Library's geospatial data portal, GeoData@Wisconsin. All zoning types are bundled as a single feature class and are indexed on page 22 of the V9_Wisconsin_Statewide_Parcels_Schema_Documentation.

For the most current county zoning data, consult the individual county's land records websites.

Units of local government can also exercise zoning in Wisconsin, in which case end users might consult municipal/town web mapping sites for municipal-level zoning GIS data. It is generally best to **contact the authoritative jurisdiction** for the most complete zoning data.

2.3 Data Distribution

2.3.1 Database Download Webpage

The data was distributed via two primary means: a website with download links and a web-based mapping application. The V9 database was formally released to the general public on June 30, 2023, through the DOA land information email listserv and the data page at www.sco.wisc.edu/parcels/data.
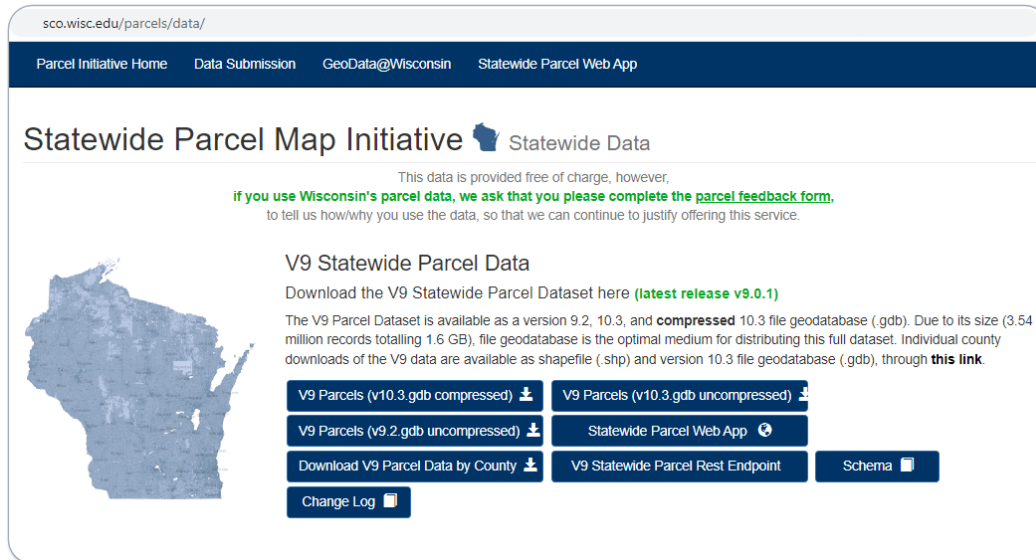
Figure 7. V9 Data Page

The custom webpage for data distribution was built and hosted by SCO, with the aim of flexibility. The site supports desktop, mobile, and tablet devices.

2.3.2 Web Application

The Wisconsin Statewide Parcel Map web application underwent a significant overhaul for its 2023 release, making use of *ArcGIS Experience Builder Developer Edition*. This update introduced current JavaScript libraries, integrated the new ArcGIS Online-hosted V9 Parcel layer, reduced custom coding, and expanded fuzzy search capabilities.

The redesign focused on improving and modernizing the user interface, with attribute search tips integrated directly into the query boxes, and a simplified basemap toggler for easier map layer control. Additionally, the implementation of fuzzy search capabilities allows for enhanced attribute search functionality and improved accuracy.

ArcGIS Experience Builder offered several built-in functionalities straight out of the box, but some additional customization was required:

Figure 8. V9 Web App

- Custom widgets were developed, allowing for parcel fill transparency adjustment at the street zoom levels, simplified basemap toggling, and Google Analytics integration
- A custom CSS file allowed us to modify the aesthetic of the application. This integrated the search tips directly into the query boxes and hid some features from the application interface.

Overall, the comprehensive redesign of the Wisconsin Statewide Parcel Map application includes significant technological updates and continues to integrate user feedback to enhance the application. By leveraging modern technologies and prioritizing user-centric design, the application is now well-equipped to effectively meet the diverse needs of its users, while continuing to serve as an indispensable tool for parcel data exploration.
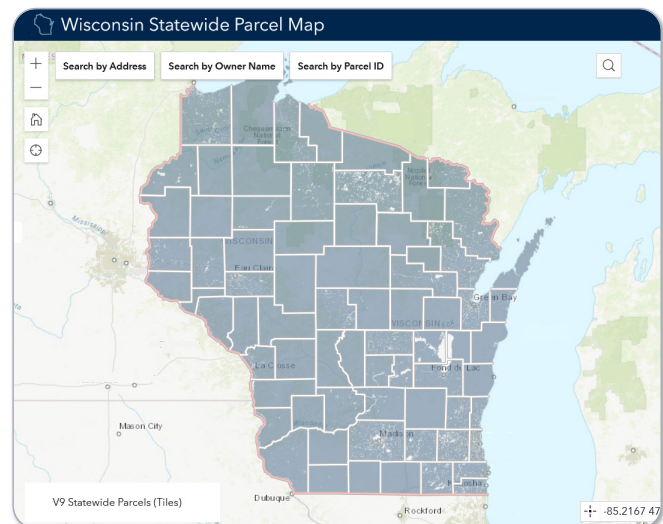
Improvements to the V9 Web App

- **New Feature Service.** In previous years, the feature service for the statewide parcel layer was hosted by the Legislative Technology Services Bureau. The V9 app featured a new ArcGIS Online-hosted V9 Parcel layer. The V9 parcel layer was published to ArcGIS Online using ArcGIS Pro as a feature service. A hosted view, *Wisconsin Statewide Parcels*, was then created and published. This view is used in the Statewide Parcel application and is available for public use. It allows for zero downtime minor version updates during a parcel release year, if an update to the layer is required. Moreover, it facilitates future major version updates and releases without interrupting the parcel application and end users consuming the hosted view. One major difference between the new hosting mechanism and the previous LTSB mechanism is the physical location of the server hosting the layer. When LTSB hosted the feature service, the physical server was located on-site. In contrast, the new process relies entirely on the ArcGIS Online cloud service.

Figure 9. V9 User Feedback Form

- **Inclusion of the V9 parcel data feature layers.** At the time of the release of the V9 statewide layer, only the V9 feature layer was included in the app at maps.sco.wisc.edu/parcels. However, users can still download a historic copy of the V1-V8 data at sco.wisc.edu/parcels/data and from GeoData@Wisconsin.

- **Updates to supporting text/links and user feedback form.** All of the supporting text and links associated with the parcel application including, the Wisconsin Statewide Parcel Map app splash screen, *About* section, *Search Tips*, and data download links were updated. Updates were also made to the user feedback form (shown in Figure 9) and land information county contacts page, which directs users to Wisconsin's county-maintained land information websites.

- **Standardized site address field for searching.** By way of a feature service, the V9 parcel application includes a field called "**STAND_SITEADD**," which facilitates a simplified, more streamlined search of parcels by site address.
  - In the file geodatabase for the statewide layer, the site address field—SITEADRESS—appears "as is," with the physical street address of the parcel appearing exactly as it is provided by the county.
  - As a result of the differences in formatting for site address data at the county level, an end-user might need to perform multiple iterations of a search in order to find one desired address.
  - Particularly for the PREFIX and STREETTYPE fields, variations in spelling and abbreviations can be found in the SITEADRESS field.
  - The standardized site address field, STAND_SITEADD, is created by:
    ❶ **Concatenating the elements that make up SITEADRESS**, which counties are to submit as individual address elements:

ADDNUMPREFIX	ADDNUM	ADDNUMSUFFIX	PREFIX	STREETNAME	STREETTYPE	SUFFIX	UNITTYPE	UNITID

    ❷ **Further refining the PREFIX field**, so that it is standardized to a select number of domains:

CTH	STH	USH	INTERSTATE
N CTH	N STH	N USH	
E CTH	E STH	E USH	
S CTH	S STH	S USH	
W CTH	W STH	W USH	

- **Improvements to End User Schema Documentation.** The V9 end user schema (V9_Wisconsin_Statewide_Parcels_Schema_Documentation) was also updated. The documentation contains several notes for end users including links to some of Wisconsin's assessment/tax data resources, *Locating Property Information and Tax Assessment Data in Wisconsin*.

2.3.3 Data Access and Download Statistics

Across the various formats that are offered, the statewide parcel database has received large numbers of downloads and access via web mapping services. **V8 received over 17,000 thousand downloads and over 10 million hits on web services** in the year following the V8 release date. Download and web app statistics for all years appear on the following page.

Statewide Parcel Layer Download and Access Statistics

	Downloads	Hits on Services or App Views/Requests
V1 **V1 Parcels**		
V1 Parcels (during V1 year)	**3,625** Total	unknown
V2 **V2 Parcels**		
V1 Parcels (during V2 year)	131	451,374
V2 Parcels (during V2 year; all formats)	859	1,341,401
V2 Individual County Parcels, all 72 counties combined (all formats)	3,248	NA
	4,238 Total	**1,792,775** Total
V3 **V3 Parcels**		
V3 Parcels (during year after release; all formats)	868	unknown
V3 Individual County Parcels, all 72 counties combined (all formats)	2,203	unknown
	3,071 Total	
V4 **V4 Parcels**		
V4 Parcels (during year after release; all formats)	1,142	4,453,517
V4 Individual County Parcels, all 72 counties combined (all formats)	4,204	NA
	5,346 Total	**4,453,517** Total
V5 **V5 Parcels**		
V5 Parcels (during year after release; all formats)	1,715	10,090,958
V5 Individual County Parcels, all 72 counties combined (all formats)	5,637	NA
	7,352 Total	**10,090,958** Total
V6 **V6 Parcels**		
V6 Parcels (during year after release; all formats)	1,755	unknown
V6 Individual County Parcels, all 72 counties combined (all formats)	6,771	NA
	8,526 Total	
V7 **V7 Parcels**		
V7 Parcels (during year after release; all formats)	2,461	11,424,840
V7 Individual County Parcels, all 72 counties combined (all formats)	8,805	NA
	11,266 Total	**11,424,840** Total
V8 **V8 Parcels**		
V7 Parcels (during year after release; all formats; June 21, 2022-June 20, 2023)	4,980	10,039,237*
V7 Individual County Parcels, all 72 counties combined (all formats)	12,619	NA
	17,599 Total	**10,039,237** Total

Note.
- Data that is not available is denoted with "unknown." The source for download data is Google Analytic events, as well as Box access statistics. Numbers are approximate. The source for hits figures is LTSB up through V8. Figures for hits are approximate.
- V6 hits figures for Hits on Services or App Views/Requests were unavailable due to an LTSB server migration that occurred during V6.
- "**Hits**" numbers are subject to variation in definition. Here, hits may be "transactions." For ArcGIS server, a transaction is defined as any time the server or services is hit or pinged. Therefore, the number of hits is not an indicator of the number of unique users. A transaction is counted each time that a user makes a request to the service and data is returned.
  - For example, each of these actions within the parcel web app would be counted as a transaction:
    - a) searching the web app on owner name, parcel ID or site address;
    - b) panning the map to an uncashed area when viewing the map at neighborhood level (large scale); and
    - c) clicking on the map to procure the parcel attribute information of an area.
- * V8 hits figure is partial. LTSB reconfigured their servers in October 2022 and no statistics prior to that are available.

Statewide Parcel Layer Web Mapping Application Statistics

	Sessions	Users	Pageviews
V1 App (July 31, 2015 – Oct 16, 2016)	Data not available	Data not available	Data not available
V2 App (Oct 17, 2016 – September 6, 2017)	9,788	4,271	16,402
V3 App (Sep 7, 2017 – July 30, 2018)	31,013	15,602	56,423
V4 App (July 31, 2018 – June 30, 2019)	75,815	42,258	117,338
V5 App (June 30, 2019 – June 30, 2020)	121,326	65,239	164,188
V6 App (June 30, 2020 –June 2021)	156,517	78,837	196,033
V7 App (June 30, 2021 – June 20, 2022)	142,430	72,405	170,670
V8 App (June 21, 2022 – June 20, 2023)	168,417	87,401	200,902

Note.
- The first date in the date range represents the public release date for the web app.
- Data source is SCO's implementation of Google Analytics.

Zoning Data Download Stats

Zoning Download Statistics

V1 V1 Zoning	Downloads	Hits on Services or App Views/Requests
NA – No statewide zoning data was produced as part of V1	NA	NA

V2 V2 Zoning (Aggregated for V2)	Downloads	Hits on Services or App Views/Requests
Wisconsin_Zoning_2016 - All 5 zoning layers in one database	128-174	NA
Airport	19-36	3,524
Farmland	39-56	3,837
Floodplain	26-44	4,448
General	61-80	8,138
Shoreland	27- 47	4,469
	300-437 Total	24,416 Total

V3 V3 Zoning (Aggregated for V3)		
Wisconsin_Zoning_2017 - All 5 zoning layers in one database	127	unknown
Airport	17	unknown
Farmland	37	unknown
Floodplain	27	unknown
General	65	unknown
Shoreland	28	unknown
	301 Total	

V4 V4 Zoning		
SCO Data Page – All Zoning (all zoning types combined; from January 2017–Dec 2018)	113-194	NA
GeoData@Wisconsin -"2018" year data (GeoData stats not available)	NA	NA
GeoData@Wisconsin - Any year zoning data (GeoData stats; January 2017–Dec 2018)	89	NA
	202-283 Total	

V5 V5 Zoning		
SCO Data Page - Zoning (all zoning types combined; from January 2019–Dec 2019)	196	NA
GeoData@Wisconsin - "2019" year data (GeoData stats not available, except Q4 [20])	20	NA
GeoData@Wisconsin - Any year zoning data (2019 sans September 2019)	227	NA
	443 Total	

V6 V6 Zoning		
SCO Data Page - Zoning (all zoning types combined; from January 2020–Dec 2020)	302	NA
GeoData@Wisconsin - "2020" year zoning data (from January 2020–Dec 2020)	91	NA
GeoData@Wisconsin - Any year zoning data (from January 2020–Dec 2020)	456	NA
	849 Total	

V7 V7 Zoning		
SCO Data Page - Zoning (all zoning types combined; from January 2021–June 2022)	237	NA
GeoData@Wisconsin - "2021" year zoning data (from January 2021–June 2022)	310	NA
GeoData@Wisconsin - Any year zoning data (from January 2021–June 22)	1,371	NA
	1,918 Total	

V8 V8 Zoning		
SCO Data Page - Zoning (all zoning types combined; from January 2022–June 2023)	560	NA
GeoData@Wisconsin - "2022" year zoning data (from January 2022–June 2023)	159	NA
GeoData@Wisconsin - Any year zoning data (from January 2022–June 2023)	887	NA
	1,606 Total	

Note.
- V2 zoning figures appear as a range (e.g., 128-174) due to differences in Google Analytics versus Box access statistics.
- "All zoning" means any and all zoning types—aggregated statewide layers (produced for V2/V3), individual county layers, and statewide layers produced by DATCP for farmland preservation zoning.
- Statewide GIS data for farmland and floodplain zoning may be available either from GeoData@Wisconsin and/or the following:
  - **Zoning – Farmland:** See Wisconsin DATCP for statewide farmland zoning data
  - **Zoning – Floodplain:** See FEMA for statewide floodplain zoning data

3 BENCHMARK PROGRESS ASSESSMENT

3.1 Benchmark 1-4 Progress Assessment

In the years 2016-2021, the notes from the Statewide Parcel Map Database Project intake process and assessment were formerly communicated to counties through documents called the Observation Reports. The reports were individualized for each county, and contained observations related to the data submitted, with focus on how local data compared to the statewide schema.

The V7 Observation Reports showed precisely how local data compared to the benchmarks for parcel data laid out in the WLIP grant application and the Submission Documentation, evaluating how close counties came to the Searchable Format for submission of parcel data.

Project staff documented what must be done yet to achieve the Searchable Format and thus meet Benchmarks 1 and 2. The intention was that the action items from the Observation Report be used as a checklist to help develop and groom the county's data to meet the Searchable Format in the future, and, where applicable, to call attention to reoccurring errors for those counties who submitted data with the same deficiencies or errors that had been pointed out to them in the past as issues to remedy.

Observation Reports were omitted from V8-V9. After several years of creating and sharing the Observation Reports with counties, the incremental gains achieved going through the exercise again for V8 and thereafter were projected to be marginal at best. Given that it required a significant amount of staff time to complete the Observation Reports, it was decided that staff time could be more productively directed to other areas of the Project, such as improving the Validation Tool.

3.1.1 OWNERNME1 – Redaction of Owner Names

For the owner name attribute, some counties redacted owner names. Partial owner name redaction was conducted by 10 counties for V9, although some counties redacted only a very small number of records. An additional county—Kenosha—withheld all owner names, consistent with a local county board resolution.

Over time, this represents an improvement compared to the V1 database, in which 22 counties did not permit owner name display in the V1 statewide layer.

V9 Owner Name Redaction		
County	**Scope**	**Percent Redacted**
Kenosha	**Entire county dataset**	**100.00**
Barron	Partial	0.61
Brown	Partial	0.14
Columbia	Partial	0.31
Dane	Partial	10.10
Jackson	Partial	0.73
Manitowoc	Partial	0.19
Sauk	Partial	0.17
Sheboygan	Partial	0.20
Vilas	Partial	0.35

3.1.2 Benchmark 1 & 2 Progress Assessment

Benchmarks 1-4 were initially defined in detail within the V1 Interim Report:

- Benchmark 1 – Parcel and Zoning Data Submission
- Benchmark 2 – Extended Parcel Attribute Set Submission
- Benchmark 3 – Completion of County Parcel Fabric
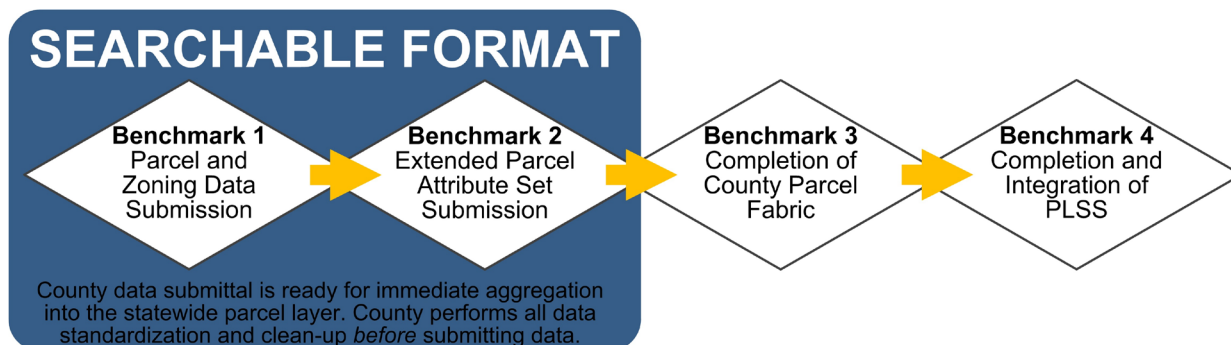- Benchmark 4 – Completion and Integration of PLSS

Figure 10. Searchable Format with Benchmarks

Benchmark 1 and 2 are explored below for the purpose of assessing progress from year to year. For both of these benchmarks, progress between the successive projects can be captured in comparing the individual V2 Observation Reports, V3 Observation Reports, V4 Observation Reports, V5 Observation Reports, V6 Observation Reports, and V7 Observation Reports.

Benchmark 1 & 2 – Parcel/Zoning Data Submission & Extended Parcel Attribute Set Submission

Benchmark 1 and 2 were satisfied by submitting parcel, tax roll, and relevant zoning information using the required standards detailed in the Submission Documentation. Because Benchmark 1 and 2 are closely related and go hand-in-hand, they are often discussed together. The main distinction is that for Benchmark 2, counties must submit parsed address components with their parcel data.

For parcel and tax roll data submitted for V1, V2, and V3, there were two submission format options—the "Export Format" and the "Searchable Format." For V4 and beyond, the Searchable Format was the only submission option.

The Searchable Format is a format that directly meets the data model requirements of the final statewide parcel layer. This format is not expected to change in the foreseeable future and is intended that only essential modifications be made for future iterations of the statewide parcel database. The Searchable Format is the format that all counties will be expected to use for future versions of the project.

The "Export Format" was a format for data exchange. Data received in this format—from 2016-2017—was processed by the parcel aggregation team to meet the data model requirements of the final statewide parcel layer. This format was acceptable for counties to use for submitting parcel and tax roll data for the V1, V2, and V3 projects, but the Export Format was phased out for the V4 Project, when it was no longer accepted. The Export format is not compatible with the desirable asynchronous update model and is a major obstacle to achieving the objective of automation and efficiency in statewide parcel aggregation. It was originally devised to accommodate variations in local data and allow counties time to gradually adjust to the submission requirements of the Searchable Format.

Parcel Data Evaluated Against Benchmark 1 & 2

Assessing progress in county achievement of the Searchable Format—equivalent to attaining Benchmark 1 and 2—can be performed by referencing the V2, V3, V4, V5, V6, and V7 Observation Reports. The Observation Reports track all substantial manipulation that needed to be performed on each county parcel data submission, on a per attribute basis. The table in the V7 Report on page 21 summarizes the progress between V2 and V7. Assessing progress in county achievement of the Searchable Format took a different shape with V8 and V9, residing in team discussions, internal team notes (e.g., OneNote notes), and evaluation against county grant applications.

The majority of counties came close to meeting the Searchable Format in their initial V9 parcel data submissions. Given the complexity and size of the local data, not all counties submit "perfect" Searchable Format submissions on their first attempt. Few counties met the standard for parcel data exactly with their initial data submission.

- Met Searchable Format for V9 parcel data submission on initial data submission: ~**13** counties (18%)
  Bayfield, Barron, Chippewa, Dunn, Eau Claire, Green, Juneau, Kenosha, Pepin, Polk, Portage, and Taylor.

3.1.3 Benchmark 3 and Benchmark 4 Progress Assessment

Data for Benchmark 3, Completion of County Parcel Fabric—collected via the 2023 WLIP grant application (at the end of calendar year 2022)—is summarized below, as well as data for Benchmark 4, Completion and Integration of PLSS. These are the two counties who have yet to complete county-wide digital parcel mapping and **39 of 72 counties have PLSS remonumentation work remaining**.

Benchmark 3 Progress		
As of 2022	**Counties with Incomplete Parcel Fabric**	**Estimated Year of Parcel Fabric Completion**
	Buffalo	2027
	Burnett	2024
	Crawford	2023

3.3 E5 PLSS Sub-Project

As part of V5-V9, a full statewide Public Land Survey System (PLSS) layer, Edition 1, Edition 2, Edition 3, Edition 4, and Edition 5 were created and will be reported on separately.

E5 statewide PLSS data can be downloaded from www.sco.wisc.edu/parcels/data.

For background information on PLSS in Wisconsin, see the State Cartographer's Office webpage on Land Surveying and PLSS Topics.

Benchmark 4 Progress		
As of 2022	**Counties with Incomplete PLSS** (Self-Reported; 39 of 72 counties)	**Estimated Year of PLSS Network Completion**
	Ashland	2035
	Bayfield	2039
	Buffalo	2029
	Burnett	2026
	Chippewa	2025
	Clark	2030
	Columbia	2028
	Crawford	2023
	Dane	2026
	Douglas	2030
	Dunn	2030
	EauClaire	2028
	Florence	2035
	Forest	2040
	Grant	2059
	Green	2037
	GreenLake	2025
	Iowa	2023
	Iron	2030
	Jackson	2030
	Lafayette	2030
	Langlade	2028
	Marathon	2025
	Marinette	2050
	Marquette	2030
	Monroe	2024
	Oconto	2031
	Oneida	2030
	Portage	2024
	Price	2030
	Richland	2024
	Rock	2024
	Rusk	2030
	Sauk	2030
	Sawyer	2035
	Taylor	2024
	Vilas	2025
	Waupaca	2024
	Waushara	2030

4 RECOMMENDATIONS

The collaborative exercise of DOA and SCO producing final reporting on each year's parcel aggregation project, complete with recommendations, is a requirement of the project MOU. The recommendations contained within each year's final report and documentation of lessons learned are essential elements of the WLIP's regular program planning activities and serve as tools to help to evaluate the project and lay out a course for the future.

The methodology for composing the recommendations in the final project report for each year's parcel database were described in detail on page 24 of the V6 Final Report. Recommendations below cover several areas, such as technology, tools, data request details, project workflow, and sustainability. Importantly, they take into account state-level needs at the same time as those of other end users and the local governments who produce the data that makes up the statewide parcel layer.

Recommendations for V10 and Beyond

1. **Validation Tool: Strengthen Validation Tool checks**
   - A redesigned Validation Tool was rolled out with the V9 call for data in December of 2022.
   - Regular updates and audits of the Validation Tool functions and checks allow for providing consistent and accurate alerts to data submitters during the validation process. Updates and modifications are made to the Validation Tool on an annual basis in the interest of providing quality feedback for the data preparation process.
   - As with previous years, a goal is to make edits to the revamped V10 Validation Tool to accommodate issues with the most common flags or those noted on the submission form. Tool logic can be refined, so that counties do not need to explain as much for common flags.
   - Another aspect of annual tool edits are updates for changes in technology and software.
     - If needed, make Validation Tool Python compatible for all common versions of Python (e.g., 2.7 and 3.0) in use.
   - For V10, edit validation checks and flags, including but not limited to:
     - **PARCELID.** Flag records with null PARCELID values that do not appear to be "new" tax parcels (i.e., with future TAXROLLYEAR values), especially non-parcel features with null PARCELID.
     - **PARCELDATE.** PARCELDATE calls for the actual modification date of the parcel geometry. The current version of the workflow documentation considers a suspiciously large number of records with a uniform date to be >97%. Alter the workflow documentation and flag to make it 51%.
     - **UNITTYPE & UNITID**. If UNITTYPE field contains a value of "UNIT" or "APARTMENT," check if UNITID contains a value. If not, flag and direct user to ensure all expected fields are populated.
     - ▶ **Action Item:** Make changes to tool, for draft V10 tool due on October 31st, to be finalized by November 15th.

2. **Validation Tool: Audit V9 Tool**
   - To improve for V10, review the outcomes and results of the V9 Validation Tool as a "lessons learned" exercise prior to the V10 call for data draft tool deliverable due on October 31st.
   - For example, how did the new mandatory sections, Explain-Certification, and other new components work out?
     - ▶ Evaluate tool outcomes, such as the "**Explain-Certification.txt Must-Haves**":
       - NOTICE OF NEW STREET NAMES
       - NOTICE OF NEW NON-PARCEL FEATURE PARCELIDs
       - NOTICE OF MISSING DATA/OMISSIONS
       - ERROR SUM ERRORS THAT ARE UNRESOLVABLE
       - EXPLAIN-CERTIFICATION "OTHER" SECTION
   - ▶ **Action Item:** Review Validation Tool outcomes relating to tool user interface and structure and, if needed, implement Validation Tool changes as appropriate.

3. **Redesign of Validation Tool output Validation Summary Page**
   - The "Validation Summary Page" is the HTML webpage that pops up with a summary of tool results when county data submitters run the validation tool.
   - Although updates occur each year, a more thoroughly revamped version of the Validation Summary Page can be considered for V11.
   - Consideration should be given to what Observation Report-style feedback can be dynamically included within the page and what additional information would be valuable (e.g., pre-rendered queries for isolating records, stem-and-leaf chart to display significant increase/decrease in attribute field values, et cetera).
     - ▶ **Action Item:** Research new Java Script libraries for creating the page and determine what is or is not feasible.
     - ▶ **Action Item:** Account for changes to be planned by the end of February and their implementation in the V10 milestone timeline as a preparatory measure for the draft V11 tool deliverable.

4. Web app: Formal assessment of user feedback and update of application
- The current web application is a 2023 update to an app that was built in 2016 and used through 2022. The V2-V8 app design reflected both functional and cosmetic updates implemented via Web AppBuilder for ArcGIS, with added value through custom coding.
- Development of the new V9 web app utilized Esri ArcGIS Experience Builder.
- With future modifications, there is the potential to explore additional features.
- Examine user feedback for new web application to determine what is or is not working.
- Identify desired features noted by end users and explore feasibility of including these within the web app.
  - ▶ **Action Item:** Discuss developing a formal response template and FAQ list for quick response.
  - ▶ **Action Item:** Make small app edits, such as *Search Tips* text box changes, as needed when they arise throughout the year.
  - ▶ **Action Item:** Include V10 app update project planning in V10 MOU milestones, establishing a timeline for custom app edits and a draft V10 app. Include time for testing prior to release of app.
  - ▶ **Action Item:** Review V9 hosting options and costs, including credit usage, to plan for V10 hosting.

5. Make no changes to parcel schema for V10
- Changes to the parcel schema, other than potentially reducing requirements for data submittal (e.g., deleting attributes or making them optional), would be disruptive to data submitters. This disruption would likely not be worth the small, incremental benefits that any changes would garner.
- An external change may be needed before a drastically different approach to statewide parcel aggregation is viable. For example, county-wide assessment, a legislative change, DOR is able to provide a statewide database of tax roll data in its XML standard, or all local governments achieve DMA's Wisconsin NG9-1-1 GIS Data Standard & Best Practices. These or other developments at the state or federal level would warrant a deep reexamination of the parcel schema and data aggregation process, as would any leaps in technology.
  - ▶ **Action Item:** Stay abreast of other state and national standards and their enforcement and levels of compliance at the local level, as data is available.
  - ▶ **Action Item:** Strive to maintain consistency with other enforced standards, while also taking into account local conditions and the diversity in local government land information systems that may stand in the way of a statewide "multi-purpose" standard for any one relevant GIS data layer (other than parcels that have geometry with tax roll attributes called for by statute 59.72(2)(a)).

6. Communicate to counties again that they do not need to null out ESTFMKVALUE
- The V8 and V9 schema definition for ESTFMKVALUE (Estimated Fair Market Value) states that ESTFMKVALUE should not be populated for parcels that contain PROPCLASS 4, 5, or 5M or have an AUXCLASS designation.
- The New for V9 page indicated:
  - **ESTFMKVALUE – No requirement to null ESTFMKVALUE for Ag/Undeveloped/Agricultural Forest & AUXCLASS Parcels.** While most properties are assessed at full market value, some classes of property—specifically 4, 5, and 5M—are not. In keeping with a precedent that was start during V6 in 2020, for V9, ESTFMKVALUE (Estimated Fair Market Value) values will continue to be nulled out for parcels that are wholly or partially PROPCLASS 4, 5, or 5M; enrolled in the MFL/CFL programs (AUXCLASS W1-W9); and tax exempt (AUXCLASS X1-X4). However, **counties are *not* required to null ESTFMKVALUE for Ag/Undeveloped/ Agricultural Forest & AUXCLASS parcels for V9, but it is optional for counties to do so**. This processing step will be performed by the DOA/SCO technical team on behalf of counties who wish to submit with these values populated.
  - ▶ **Action Item:** In V10 call for data, remind counties that they can leave ESTFMKVALUE populated for parcels that contain PROPCLASS 4,5, or 5M or have an AUXCLASS designation, but it is also okay if they null out these values according to the V9 schema definition.
  - ▶ **Action Item:** DOA author a draft of "New for V10" page, making sure the directive is either in New for V10 page and/or in the attribute definition itself (thus altering the text of the schema definition).

7. Edits to Submission Documentation that are non-substantive
- **Typos.** For V10 Submission Documentation, consider edits to
  - ▶ **OWNERNME1** description: "If not feasible to parse owners into separate fields, more than one owner may be included in this field." -> "If **it is** not feasible to parse owners into separate fields, more than one owner may be included in this field.
  - ▶ **ASSDACRES** description: "Parcels less than <1 acre may = <Null> (or in some cases may appear as legitimate values of "0")" -> "Parcels **smaller than** 1 acre may = <Null> (or in some cases may appear as legitimate values of "0")"
  - ▶ **Other GIS Data Layers**: "Parks/OpenSpace (e.g., county forests)" -> "Parks/**Open Space**"
  - ▶ **Action Item:** Weigh and edit V10 Submission Documentation if edits are needed, making note in a V10 schema tweak log for edits to schema definitions in all places they appear, such as file geodatabase metadata and end user schema documentation.
  - ▶ **Action Item:** For V10 Submission Documentation, budget extra time to add a digit to make V9 read as "V10," with an additional text character digit.
  - ▶ **Action Item:** Budget time for V10 Validation Tool documentation edits, as tool guide file is in Adobe Illustrator or InDesign, so Validation Tool Guide has sufficient time if it needs to be reconstructed or heavily revised.

8. Parcel assessment workflow improvements
   - Workflow documentation has several benefits, including that it helps document the workflow process with an eye toward replicability of the project, provides information to be considered in planning efforts for future iterations of the statewide database, including helping to identify efficiencies and improvements to be gained and steps that might move the Parcel Initiative closer to the Four A's (Authoritative Automated Asynchronous Aggregation), and helps DOA understand the technical process better, such as what is QA/QC'ed and what is not.
   - As such, the workflow documentation should be a living document that is scrutinized, refined, and added to throughout the development of each statewide parcel database.
      ▶ **Action Item:** Update workflow documentation for V10.

9. DOA re-inventory county links to the statewide parcel map
   - According to s. 59.72(2), a county shall post parcel data in the Searchable Format on the internet. Instead of each county posting parcel data directly on the internet, counties provide parcel data in the Searchable Format (or close to this standard) to DOA, which contracts with SCO to aggregate all 72 county parcel datasets into the statewide digital parcel map database. This statewide database is made publicly available at the SCO data download webpage, www.sco.wisc.edu/parcels/data, which is also linked from GeoData@Wisconsin, a site curated by the UW-Madison Robinson Map Library.
   - In 2022, county land information officers were asked to link to the statewide parcel map webpage if their county website did not already do so. Counties had discretion where to place the weblink and with what accompanying text, so as not to disrupt the structure of county websites.
   - All counties voluntarily complied.
      ▶ **Action Item:** DOA reinventory/check county website links to statewide parcel map and request link from any counties without a link.

10. Consider Parcel Initiative during 2024 update of county land information plan instructions
   - County land information plans are required to be updated every three years based on instructions created by DOA, according to s. 59.72(3)(b).
   - This represents an opportunity to gather additional information from counties or to add planning requirements where relevant and necessary.
      ▶ **Action Item:** When DOA is updating land information plan instructions, keep in mind any useful objectives for gathering information or planning related to the Parcel Initiative.
      ▶ **Action Item:** Encourage SCO and SAGIC, among others, to review the draft land information plan instructions.

11. Encourage counties to integrate PLSS points
   - Parcel Benchmark 4, Completion and Integration of PLSS, requires counties to complete their PLSS and integrate PLSS coordinates into a digital parcel layer. According to PLSS status tables in county land information plans finalized at the end of 2021, about 14 counties have a significant backlog of PLSS points to be integrated.
   - In 2022 a definition for "integration" was created with feedback from county land information offices. This definition is to be included in the 2023 WLIP grant application and is defined as such:

   > *Integration means the optimization of the geospatial accuracy of the digital parcel layer which improves the accuracy of where parcel boundary lines are represented on the digital parcel map. In cases where the result would be a materially significant improvement to the geospatial accuracy of the digital parcel layer, parcels have been tied to and, if necessary, adjusted geometrically to the inputted PLSS coordinates. This definition does not imply a restriction on a county's options for integration, whether it is snapping parcel boundary lines to PLSS corner coordinates one corner at a time, entirely redrawing parcel boundaries one survey township at a time, or another chosen approach. (For example, "rubber sheeting" is not required.)*

      ▶ **Action Item:** During the 2024 update of land information plan instructions, highlight the definition of "integration" and consider any additional relevant plan instructions related to integration.
      ▶ **Action Item:** Require counties to update their PLSS status tables as a first step and distinct item due in the land information plan update process during 2024.
      ▶ **Action Item:** Based on PLSS integration information received during the first half of 2024, follow up with counties that have significant backlog to inquire why.
      ▶ **Action Item:** Consider modifying 2025 Strategic Initiative grant application so that Benchmark 4 prioritizes integration if there is a significant backlog of survey grade PLSS corner coordinates to integrate.
      ▶ **Action Item:** Gather feedback from stakeholders on any proposed change to Benchmark 4 in a 2025 WLIP grant application.

12. Act on recommendations from 2023 Local Land Regulations and Comprehensive Plan Inventory Report
- A forthcoming 2023 report will update the 2011 Wisconsin Local Land use Regulations and Comprehensive Planning Status Report.
- To create the report, the following inventory was collected in a Table of Results spreadsheet:
  - Last known date of comprehensive plan adoption
  - Whether a general zoning ordinance has been adopted
  - Whether a subdivision ordinance has been adopted
  - Link to the local government's ordinances webpage, if available
- The comprehensive plan includes various types of land information, including current and future land use maps, which should guide the implementation of land regulations.
- Zoning regulates how land can be used.
- Subdivision ordinances govern how and if a parcel may be split into multiple parcels.
- According to s. 66.1001, zoning and subdivision ordinances must be consistent with a comprehensive plan.
- The unpublished draft version of this report found that 39% of local governments do not have a website or do not appear to post a complete listing of ordinances.
- The draft report also found that most local comprehensive plans are out of date.

  ▶ **Action Item:** Publicize the results of the report to various local government groups, such as the Wisconsin Towns Association, League of Municipalities, Wisconsin Counties Association, and Wisconsin Clerks Association.
  ▶ **Action Item:** Make the Table of Results a living document that is updated regularly, based on corrections and comp plan update notifications received from local governments.
  ▶ **Action Item:** Reach out to the 477 local governments that exercise zoning or subdivision regulations and do not have a current comprehensive plan adopted.
  ▶ **Action Item:** Encourage local governments (counties and municipalities) to post ordinances online in searchable format and preferably an interactive map display for zoning classifications and the comprehensive plan's future land use map.
  ▶ **Action Item:** Inform counties that hosting municipal ordinances on the county website is a WLIP grant-eligible activity. Pierce County hosts town ordinance webpages and could serve as a model.

13. DOA seek to attend county land information council meetings in any county with a new LIO
- In 2014-2015, the WLIP grant administrator attended land information council meetings in all 72 counties. The goal was to build relations with land information officers and council members, while also educating them about the importance of the Parcel Initiative.
- Full county participation in statewide parcel map projects is critical, because DOA needs all counties to share their parcel data according to exacting standards. Even though the GIS data is digital and transmitted online, personal connections matter for project success.
- County visits also presumably help with land information officer retention. Sometimes land information officers feel siloed in a county or not fully supported. Encouragement and connecting people with resources can go a ways in making them feel valued in their positions.
- A state employee simply showing up to a county meeting demonstrates care for what happens at the county.
- Coming informed by the county's land information plan, recent grant applications, and expenditure reports signals that someone is paying attention to the county.
- Written communications can reinforce a welcoming message. With significant LIO turnover in recent years, an idea is to offer individual one-on-one meetings with those who are interested to discuss the Project data preparation tools, possible workflows and data preparation tips. This will allow discussion to be tailored to individual county needs and questions and can be achieved by way of a "welcome email" from the WLIP grant administrator.
  ▶ **Action Item:** Attend land information council meetings in counties with new LIOs, where the DOA grant administrator has not visited the county since the LIO came into office.

14. Determine if directions are needed in Submission Documentation regarding Act 12 of 2023
- Wisconsin Act 12 of 2023 exempts personal property from taxation.
- Some properties previously taxed as personal property could be taxed as real property.
- These changes are to be complemented for property tax assessments as of January 1, 2024, so, if any, they would have effects on V11.
  ▶ **Action Item:** Watch for or seek clarification on changes to real property tax listing, determining if V11 Submission Documentation should be expanded to address Act 12 of 2023 when appropriate.

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Appendix
A. V9 User Feedback

ABOUT USER FEEDBACK

This V9 Final Report appendix will be a compilation of comments provided by users of the **V9** Wisconsin statewide parcel layer, received via email and by way of the V9 online user feedback form.

To view user feedback from previous years, see the V8 Final Report, V7 Final Report, V6 Final Report, V5 Final Report, V4 Final Report, and V3 Final Report (for V1-V3).

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