WESTERN CONNECTICUT COUNCIL OF GOVERNMENTS

Regional GIS Case Study – Nashua Regional Planning Commission

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EXECUTIVE SUMMARY

The Nashua Regional Planning Commission (NRPC) is a political subdivision and public agency located in the southern area of New Hampshire serving thirteen communities. In 2013, the NRPC convened a website subcommittee to provide a vision and web strategy that highlights the Commission's reputation as a nexus of planning data and information for the region.

The subcommittee found that only two of the thirteen communities had committed resources to municipality-wide GIS. As a result, there existed an opportunity for the NRPC to create an online GIS portal to serve both the needs of the commission and the member communities.

The NRPC began a series of outreach activities, contacting groups within the member communities (e.g. senior staff, boards of selectmen, city councils) and developed a pilot application to demonstrate the intended system functionality and obtain feedback on final system configuration and the scope of the data to be included. The foundational dataset is a composite parcel layer with linked Computer Assisted Mass Appraisal (CAMA) data exported from local CAMA systems. The NRPC worked with local officials to establish an annual data update schedule and developed custom extract, transform, and load (ETL) tools in Microsoft Access to standardize and combine the local data sets.

In 2014, after a six-month internal testing period, the NRPC launched the GIS LiveMaps web application. The application includes internal assessment field cards and links to external resources (e.g. Vision assessment field cards, Google Maps) as well as printing and markup tools. The NRPC selected MapGeo, a cloud-based Software as a Service (SaaS) platform built on the PostgreSQL/PostGIS/Geoserver/Leaflet stack using the Carto server-side mapping engine. The application is hosted on Amazon Web Services (AWS) which provides dynamically-adjusted capacity via the Elastic Compute Cloud (EC2) to meet fluctuating server loads and traffic volumes.

The NRPC has conducted several 90-minute training sessions and continues to promote the use of the application through email notifications, social media, and in-person at meetings and functions. Since the deployment of the application, the userbase has continued to grow, with over 1,000 unique visitors in February and March of 2014. In 2017, the system averaged 2,373 hits per month with 1,239 unique visitors. LiveMaps has received praise from multiple departments within its member communities, private real estate brokerages, and planning firms. Additionally, it was recognized in 2014 as a distinguished system in the URISA Exemplary Systems in Government Awards. Funding for the continued maintenance and operation of the system has been entirely provided by the NRPC, with no costs or fees charged to the member communities.

ACKNOWELDGEMENTS

This report has been compiled in partnership with Nashua Regional Planning Commission. The contents of this report have been informed by the URISA Exemplary Systems in Government Award Application prepared by GIS Manager Sara Siskavich in April 2014 and the NRPC Statement of Strategy 2016-2020 published in December 2016.

The content of these documents was augmented by email and phone conversations with Sara Siskavich, who, in addition to providing invaluable information, was the driving force behind the successful regional GIS implementation. Sara's efforts were nationally-recognized when the application was designated a distinguished system in the 2014 URISA Exemplary Systems in Government Awards.

BACKROUND & PROJECT DEVELOPMENT

NASHUA REGIONAL PLANNING COMMISION BACKGROUND

The Nashua Regional Planning Commission (NRPC) is a political subdivision and public agency serving thirteen municipalities (Amherst, Brookline, Hollis, Hudson, Litchfield, Lyndeborough, Mason, Merrimack, Milford, Mont Vernon, Nashua, Pelham, and Wilton) in Southern New Hampshire. The NRPC was founded in 1959 and is the oldest of New Hampshire's nine regional planning commissions (RPCs). These commissions receive their legislative authority from RSA 36:45-53 and, under state law, their primary duties are to prepare comprehensive master plans for regional development, to provide technical assistance to local municipalities, to compile regional housing needs assessments every five years, and to conduct other studies as needed to implement the provisions of the regional plans.

Additionally, the NRPC serves as the Metropolitan Planning Organization (MPO) for the Nashua, NH Urbanized Area (estimated population of 87,882[1]). The MPO is composed of NRPC Commissioners and representatives from the New Hampshire Department of Transportation (NHDOT), the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), and the Nashua Transit System (NTS). In addition to administering the federal transportation process, the Nashua MPO was designated as a Transportation Management Area (TMA), which grants the ability to administer Surface Transportation Program (STP) funds.

NASHUA RPC LIVEMAPS – REGIONAL GIS

NEEDS ASSESSMENT AND STAKEHOLDER ENGAGEMENT

In 2013, the NRPC convened a website subcommittee to provide a vision and web strategy that highlights the organization's role as a nexus of regional planning data and information. One of the findings of the subcommittee was the relatively limited commitments to municipal GIS made by the members; only two of the thirteen communities in the NRPC had committed resources to GIS activities. The subcommittee correctly identified an opportunity for the NRPC to create a regional GIS portal that would serve both the needs of the commission and those of the member communities.

The NRPC worked with stakeholder groups within the communities to develop a pilot application. This pilot allowed the NRPC to identify use cases, demonstrate core system functionality, and provide an engagement mechanism to focus discussion and feedback. From the resulting feedback, the NRPC developed specifications for final system configuration and application functionality and determined the attributes of the dataset required to support that functionality.

[1] *U.S. Census Bureau, Population Estimates Program (PEP)*

Key Lessons Learned
❖ Engaging multiple levels of municipal stakeholders promotes municipal buy-in prior to starting the full-scale project.
❖ Creating a pilot application to demonstrate intended functionality, look and feel, and data layers promotes stakeholder engagement, and helps users develop use cases.

PROCUREMENT & MUNICIPAL DATA AGREEMENTS

The initial vision of the NRPC was to include the regional GIS within the RFP for the NRPC website re-design. Due to the nature of the technical skills and development experience required to build this type of GIS solution, the inclusion into the RFP proved to be impractical. The NRPC ultimately selected separate, specialized vendors for the two tasks. For the regional GIS implementation, the NRPC selected AppGeo, a vendor headquartered in Boston, MA with offices in East Hartford, CT. The implemented solution uses MapGeo, AppGeo's commercial off-the-shelf (COTS) GIS platform.

To establish an update process for municipally-sourced assessment data, a Memorandum of Understanding (MOU) was prepared and circulated to the NRPC member communities. The MOU outlined functionality, defined data requirements, and provided recommendations for data maintenance and update schedules. The MOU process was designed to facilitate the intra-commission partnerships among the communities and to clarify the expectations of the stakeholders. An unintended result of the process was the perception of formality. The NRPC addressed this through discontinuing the use of the MOUs, instead choosing to send out annual public data requests to each community. The data export formats and the ETL processors that accompany the data received from the requests are discussed in greater detail in the Technology and Data section.

When determining a schedule for municipal updates which include parcel[2] and assessment data, it is important to consider both the effective assessment date is (April 1st in New Hampshire) and the typical update completion time (Fall in New Hampshire).

While reviewing the data update frequency and intended objectives, specifically the currency of owner names and mailing addresses, the project team determined that the existing update schedule may not adequately support abutter list generation. Although the burden for abutter notification accuracy is ultimately the responsibility of the notifying party, the NRPC chose to display information to the user to indicate the validity of the presented data with respect to the time of the last update. For each community, the data source and the relevant metadata is maintained and displayed when the user downloads an abutter list from the system.

Key Lessons Learned
❖ A simplified process for requesting municipal data proved to be more effective and efficient than a formal MOU Process.
❖ Schedule data updates to coincide with statutory requirements and municipal workflows.
❖ For functions such as abutter list generation consider the impact of the currency of the data. NRPC added meta data to reflect the source and currency of municipally source data.
❖ Maintain metadata including "current to" dates for municipal data reflecting the last update to allow users to assess the currency of the data.

[2] *NRPC Maintains their own parcel file.*

SYSTEM LAUNCH & GROWTH

Following a six-month internal deployment, the master datasets were updated with the most recent available municipal data exports. During this time, the NRPC dedicated 0.2 FTE (eight hours per week) to the project. The system launched in February of 2014 following the completion of this update process. Since then, the NRPC has continuously promoted the system through email, social media, and commission meetings. At the request of the municipalities, the NRPC developed a 90-minute training program for employees, boards, and commissions. Conducting these training sessions has increased stakeholder adoption and allowed member communities to provide further input, driving the continued improvement of the system to meet new needs and address new use cases. The final NRPC LiveMaps application is shown in Figure 1.

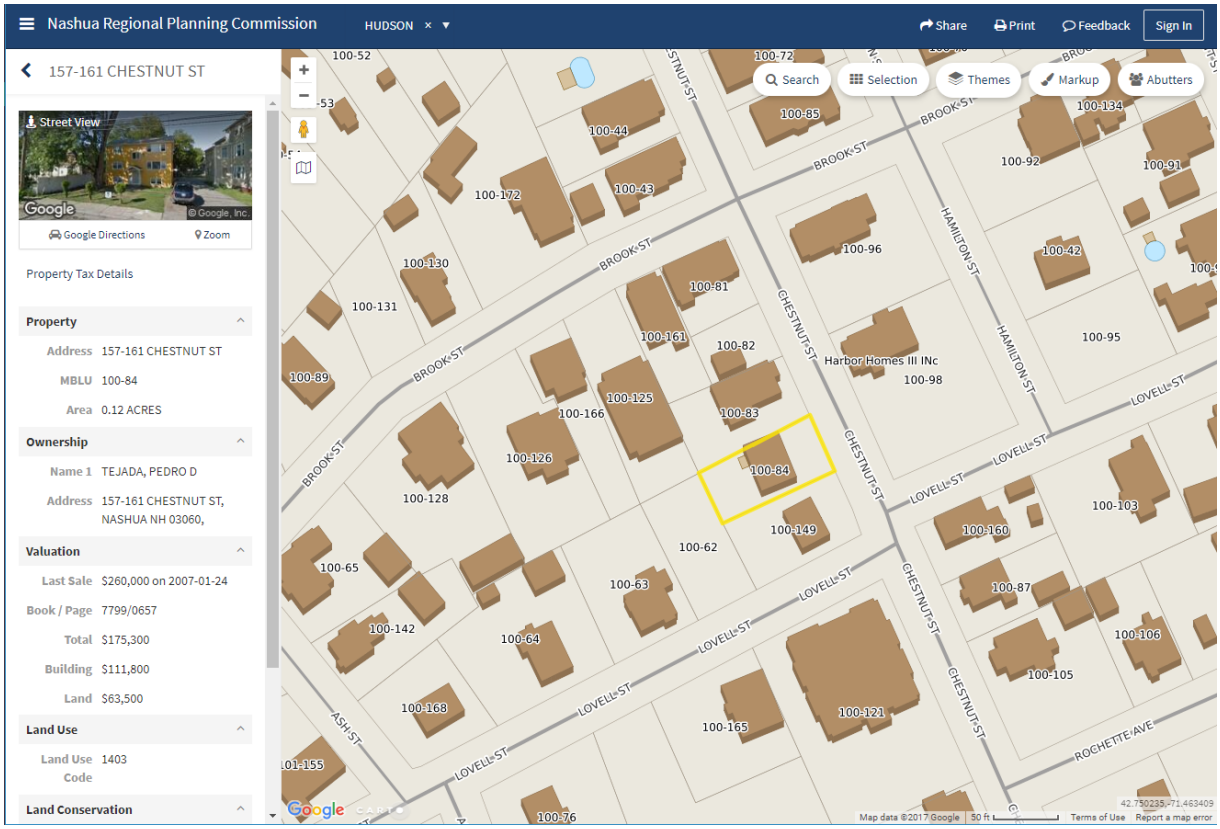

Figure 1: The interface of the NRPC LiveMaps Application.

LiveMaps has seen increasing usership, from over 1,000 visitors in February and March of 2014 to over 2,300 monthly hits in 2017. The site successfully demonstrated the utility of a regional GIS in March of 2016 when the NRPC added the proposed route for the 420-mile Kinder Morgan New England Direct pipeline to the site, resulting in increased traffic and the highest monthly hits (over 3,100) to-date.

The NRPC LiveMaps application continues to provide significant value to member communities and the private sector. The application has received praise from local boards, municipal departments, private real estate brokerages, and various planning groups.

"By putting all this information into a single web site with public access it has simplified the home buying process for many of our customers who are increasingly diligent in researching potential homes to buy. In summary, it has allowed us to share accurate and complete data on the listing we are selling and on the homes, we are presenting to our home buyers. It is a terrific resource."

- Dave Hennessey, Vice President at Coldwell Banker Residential Brokerage

"I can vouch for the [former] pain of skipping among three websites and a database just to figure out who owns land of interest adjacent to our conversation parcels […]. We hope to make serious use of MapGeo."

- John Harvey, Chair Amherst Conversation Commission

Key Lessons Learned
❖ Providing training for participating municipalities, and private groups can significantly improve system adoption and user satisfaction.
❖ Marketing of system launch and capabilities through regional meetings, social media and email blasts can increase system adoption.
❖ A regional GIS can provide a unique vehicle to view and evaluate the impact of multi-town initiatives as exemplified by the Kinder Morgan Northeast Direct Natural Gas Pipeline.

TECHNOLOGY & PLATFORM

LIVEMAPS APPLICATION

OVERVIEW

The NRPC selected MapGeo by AppGeo as the platform for LiveMaps. MapGeo is a COTS cloud-based web mapping application built on the PostgreSQL/PostGIS/Geoserver/Leaflet stack using a Carto server-side mapping engine accessible by end users via web browser.

The application is hosted on Amazon Web Service's EC2 (Elastic Computing Cloud) which provides scalable capacity to meet usage needs. The application integrates natively with Google Maps, providing users with a familiar experience, street-level data, and detailed location information. MapGeo is designed as a parcel searching and viewing site that focuses on allowing users to quickly and easily query parcel information and is used by many regional planning organizations and municipalities across the country. MapGeo also has an administrative interface, providing detailed usage statistics to assist the NRPC with data administration, system maintenance, and the evaluation of functionality.

FUNCTIONALTY HIGHLIGHTS

MapGeo provides the core GIS functionality that users have come to expect in a clean, mobile-friendly web interface. Through the integration of Google Maps, much of the "look and feel" of the site and the use of the interface is already familiar to most users. One of the keys to the usability of the MapGeo interface for regional GIS is the municipality filter and dropdown.

LAYER CONTROLS, MARK-UP, AND MEASUREMENTS

MapGeo provides typical layer controls including ability to modify transparency, and select from several different base maps. It also supports theming by various layer characteristics to support land use or flood plain layers. The application also supports user markup, which is printable, as well as linear and area measurements as shown in Figure 2.

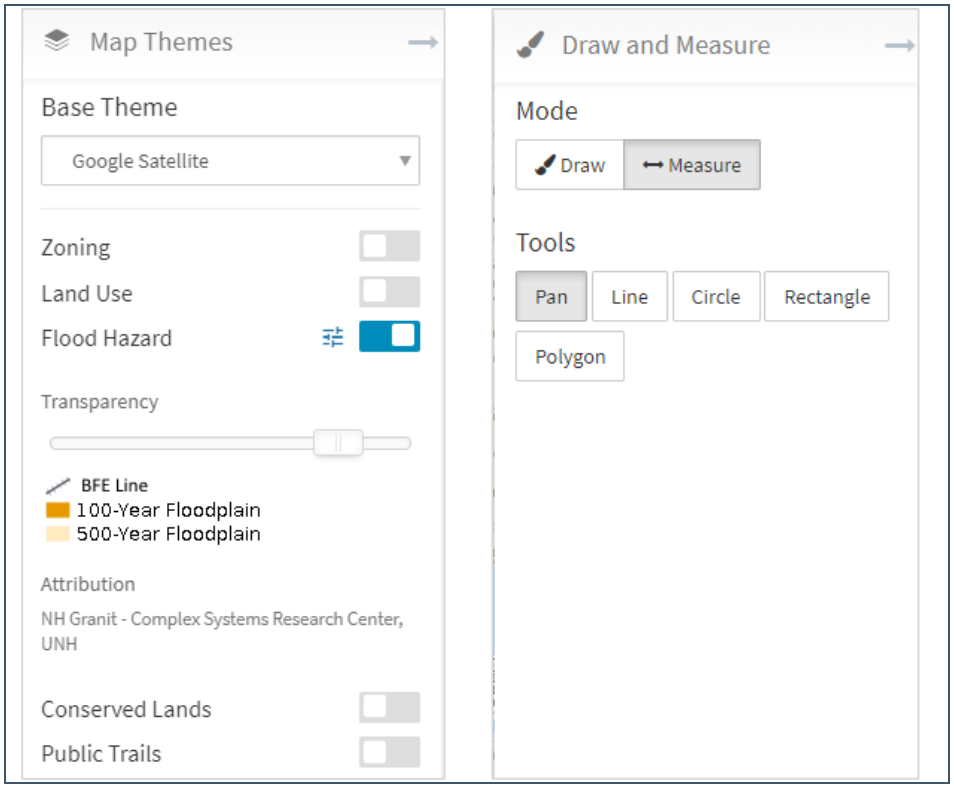

Figure 2: MapGeo's markup and measurement tools.

SEARCHES, SELECTION & ABUTTER LISTS

The MapGeo search tools allows users to search in one or several towns by Location, Address, Owner Name, or Parcel ID number. It also provides several advanced searching features including: (1) ability to search for exact matches using quotes, (2) ability to search for multiple criteria using “Or”, (3) ability to search for results not containing words (e.g. John -Smith would search for ‘Johns’ that don’t contain ‘Santoso’. The search tool, searching only Hudson is shown in Figure 3.

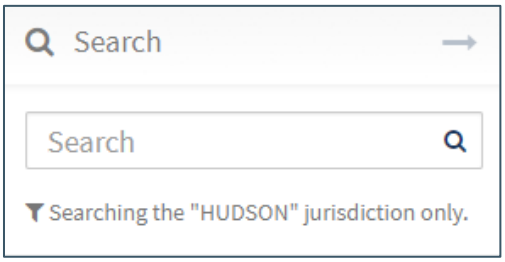

Figure 3: MapGeo’s search tool demonstrating the municipality-based filtering.

MapGeo provides comprehensive selection tools, allowing users to create selection groups through both direct point selection and through defining custom polygons. The interface also allows users to combine the selection sets of multiple free-form shapes to define non-contiguous sets. In edit mode, users are free to add and remove individual features from their selection set. The selection set can be exported to either an Excel Spreadsheet or to custom mailing labels, as shown in Figure 4.

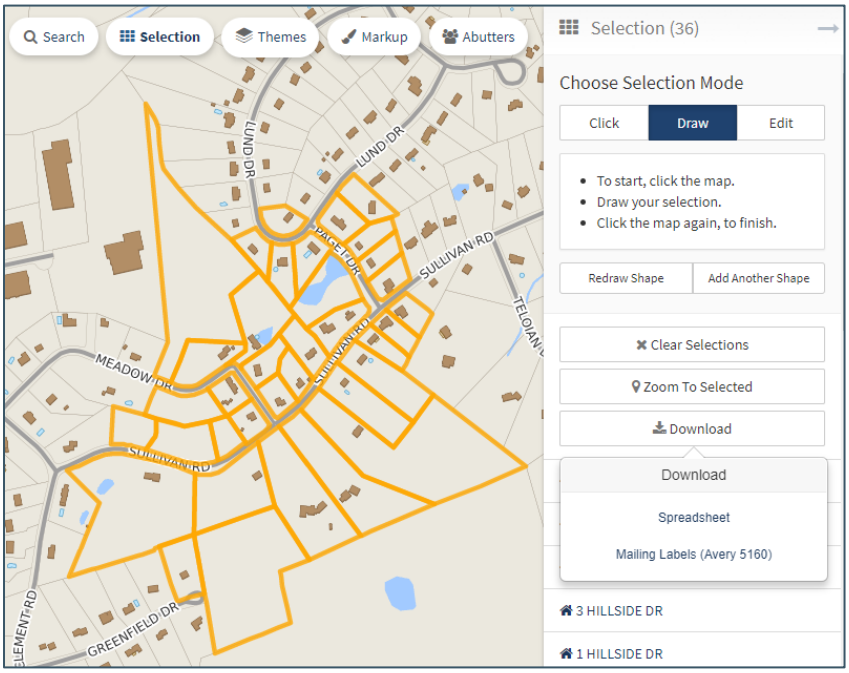

Figure 4: MapGeo's selection interface showing an active selection set and the related tools.

With a parcel selected, the user can view property details and access links to external resources (e.g. the official property record card, driving directions, or official tax maps) as shown in Figure 5. Users can also use the abutters tool to specify a buffer distance and select the parcel abutters. Abutter lists, as with other selection sets, can be exported to Excel or to mailing labels. The abutter lists contain the last updated date for the ownership and mailing information.

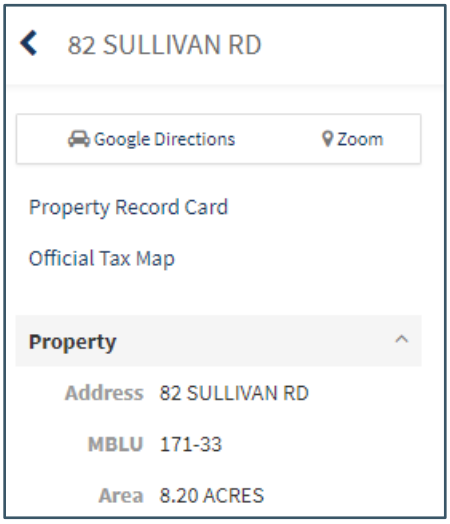

Figure 5: MapGeo's interface for property details and external resource links.

Axiomatic inventoried information about MapGeo in the "Regional GIS Web Application Recommendations Report" for the Western Connecticut Council of Governments (WestCOG) in July 2017. That information is displayed in **Error! Reference source not found.**. MapGeo is currently used by the town of New Milford, CT.

Category	Feature	MapGeo
Desktop Browsers	Microsoft Internet Explorer (v11+)	Yes
	Microsoft Edge (v38+)	Yes
	Mozilla Firefox (v52+ ESR, v54+)	Yes
	Apple Safari (v6.2.8+)	Yes
	Google Chrome (v52+)	Yes
	Opera (v39+)	Yes
Mobile Browsers	Chrome (Android/iOS)	Yes
	Safari (iOS)	Yes
Navigation	Typical Functions	Yes
	Layer Controls	Yes
Basic Search	Street Number	Yes
	Street Name	Yes
	Owner Name	Yes
	Parcel ID	Yes
Advanced Search	Land Use	**No**
	Building Information	**No**
	Land Area	**No**
	Sale Date	**No**
	Value	**No**
	Ability to enter ranges	**No**
Selection	From Search	Yes
	Point	Yes
	Polygon	Yes
	Radius	**No**
Measure	Linear	Yes
	Area	Yes
	Variable Units	**No**
Buffer	Variable distance	Yes
	Visible	Yes
	Printable	Yes
	Add/Remove Parcels	Yes
	Access Mailing List	Yes
Markup	Visible	Yes
	Printable	Yes
Property Record Cards	Internal	Yes
	External	Yes
	PDF Replication	**No**
External Links	Property Record Cards	Yes
	Plans	Yes
	Deeds	Yes
	Permits	Yes
Printing	Custom	Yes
	Standard	Yes
Integration	Oblique	**No**
	Street View	Yes
	Photo Tool Tips	**No**
	Building Photos	Yes

Table 1: MapGeo technical specifications and functionality (continued)[3]

AVAILABLE DATA AND LAYERS

The NRPC developed a list of data layers during the pilot phase of the program. These layers were reviewed with stakeholders and updated based on the feedback received. The NRPC elected to include only the data layers which were available for all thirteen communities, ensuring a consistent user experience and reducing maintenance issues through the elimination of municipality-specific datasets. A list of the available datasets and their authoritative source is provided in Table 2.

Dataset	Maintainer
RPC Boundary	NRPC
Major Roads (NH)	NHDOT
Major Roads (MA)	MassDOT
Local Roads	NRPC
Regional Planning Agencies (MA)	MassGIS
Town Facilities	NRPC
Conserved Land	NRPC/Granit
Rivers and Streams	Granit
Parcels	NRPC
Contours	USGS
Aerial Imagery	NHDOT
MapQuest Basemap	MapQuest
MapQuest Aerial	MapQuest

Dataset	Maintainer
OpenStreetMap Basemap	OpenStreetMap
Town Boundaries	Granit
Land Use	NRPC
Zoning	NRPC
Dams	NHDES
Base Flood Elevation	FEMA
Flood Plans	FEMA
Sub-watersheds	Granit
Watersheds	Granit
Sub-basins	Granit
Aquifer Transmissivity	Granit
Flood Storage Land	Granit
Prime Farmland	Granit

Table 2: LiveMaps GIS datasets and respective maintainers.

PARCEL AND CAMA DATA

The land record dataset is the most comprehensive dataset provided by LiveMaps, comprised of parcel polygons and detailed property attributes exported from the CAMA databases of the participating municipalities. The NRPC maintains and updates this dataset for all the member communities, whether the community maintains their own data or the responsibility has been given to a third-party vendor. Exports from each of the individual CAMA systems are obtained through annual requests to each municipality's assessing department. The export process is highly-automated, requiring only a few minutes per community. The resulting files contain detailed tabular data for each property. An example of a formatted property card displaying this data is shown in Figure 6.

The combined dataset, maintained using esri ArcGIS, contains approximately 65,000 parcels, with the majority located within the City of Nashua. Currently, the NRPC is the primary maintainer for all but three of their member communities (Nashua, Hudson, and Amherst) and a desire has been expressed to eliminate redundant parcel maintenance efforts for those three in the future.

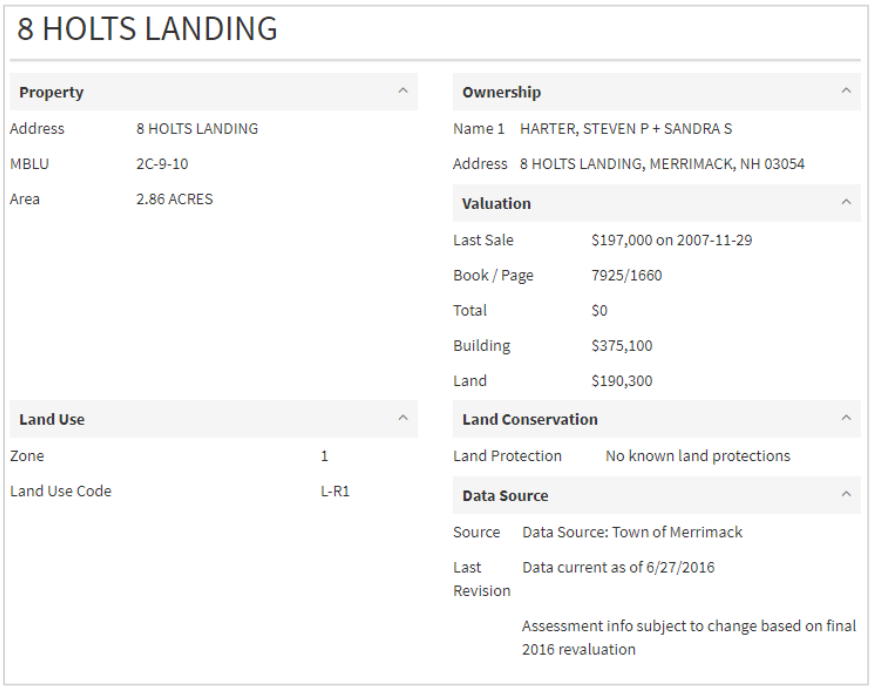

Figure 6: An example of an internal property record card showing the data obtained from the municipality.

The NRPC uses custom-developed extract, transform, and load (ETL) processes in Microsoft Access to process the municipal CAMA data exports. The ETL process standardizes and combines the data with appropriate metadata in preparation for import into the LiveMaps database. The Microsoft Access CAMA processing tools were created internally at the NRPC and are maintained by NRPC staff.

To display the property information in a format suitable for printing and reference purposes, LiveMaps generates property record cards for those municipalities that do not have the data available on an external site. For those that do, LiveMaps provides a link directly to the property card on the external site. This functionality corresponds to the "Level 2" functionality defined in the "Regional GIS Web Application Recommendations Report". Each of the municipalities within the NRPC is listed in Table 3 with their corresponding CAMA system and the field card functionality provided to the users.

Town	CAMA System	Field Card Source
Amherst	Vision	External (Vision)
Brookline	Vision	LiveMaps
Hollis	Vision	External (Vision)
Hudson	Patriot	External (Patriot)
Litchfield	Vision	LiveMaps
Lyndeborough	Vision	External (Vision)
Mason	Avitar	LiveMaps
Merrimack	Avitar	LiveMaps
Milford	Vision	External (Vision)
Mont Vernon	CNP	LiveMaps
Nashua	Patriot	External (City of Nashua)
Pelham	Vision	External (Vision)
Wilton	Vision	External (Vision)

Table 3: NRPC CAMA systems and corresponding field card sources.