WESTERN CONNECTICUT COUNCIL OF GOVERNMENTS

Regional GIS Web Application Recommendations Report

PREPARED FOR:
WestCOG
Carl Zimmerman, PhD
1 Riverside Road
Sandy Hook, CT 06482
czimmerman@westcog.org

PREPARED BY:
Axiomatic, LLC
Patrick Santoso
500 Market Street, Unit 2B
Portsmouth, NH 03801
Patrick@axiomnh.com

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axiomatic

CONTENTS

** Appendices are not included, but are available upon request.

EXECUTIVE SUMMARY

Axiomatic, in partnership with WestCOG and its member communities, has conducted a study to determine the possibility for regional cooperation of Property Appraisal, and the viability of a regionalized Real Property Computer Assisted Mass Appraisal (CAMA) system. One of the primary findings of Task 1 of the study was the need for a Regional GIS solution to provide access to aggregated municipal appraisal and Parcel data.

Creating a regional GIS, in addition to supporting regional planning and economic development, would allow nine of the WestCOG member communities who currently devote resources to maintaining individual web-based municipal GIS portals to phase out those systems. Providing a regional solution for all of the member communities would also provide those remaining municipalities without portals with access to those tools and features (e.g. abutter list generation, area measurements, printing of lot lines). With an expanded CAMA data export (Level 3 data including sales, building, and land tables) it would be possible to replace individual online assessor's databases and portals, as well, providing additional cost savings to the communities.

In support of the regional GIS, Axiomatic conducted a study of the nine municipal GIS sites to determine both existing functionality and necessary municipal and regional data layers needed for a successful deployment. The recommended layers and their sources are contained in the Regional GIS Layers section. This study included the development of a Regional GIS Schema and Two Regional CAMA Schemas and establishes three levels of functionality if GIS and CAMA integration are pursued, as outlined in Table 1.

Function	Level 1	Level 2	Level 3
Flat CAMA Integration	✓	✓	✓
Internal Flat Property Record Cards	✓	✓	✓
Link to Property Record Cards Site		✓	✓
Vision PDF Property Record Card Export		✓	✓
Expanded CAMA Integration			✓
Internal Expanded Field Cards			✓

Table 1: CAMA integration levels and respective functionality.

Level 3 integration does allow functionality sufficient to eliminate the individual municipal GIS portals and the assessor database websites, however the export contains multiple tables and requires more time and effort for WestCOG and the participating municipalities. For this reason is recommended that the Flat CAMA integration be utilized to achieve Level 1 and Level 2 functionality and encourage participation. If the Regional GIS site is successful, Level 3 Data can be added to achieve full consolidation of the services.

There are several additional factors to consider to effectively deploy a regional GIS which are discussed in brief below:

- **Data Collection:** To reduce cost and maintain maximum control it is recommended that WestCOG manage the data collection internally if resources permit. If this services is contracted it is recommended the agreement be fixed cost and include solicitation and collection of all desired updates.

- **Standardization:** The data standardization tools are the heart of the regional GIS and are the most difficult to recreate. The tools used to convert the local data into the regional standardize and aggregate it into a contiguous data set should be owned and controlled by WestCOG. To this end they should be developed internally, or via contract which ensures they are wholly owned by WestCOG. To reduce costs it is possible to contract for template standardization tools, which can be used by WestCOG to replicate in each community. This report contains best management practices for processing and standardizing data as well as recommended update cycles. Following review of Massachusetts, New York, New Hampshire, and American Planning Association land use standards, the Massachusetts standard is recommended for use in WestCOG.

- **Online GIS Platform:** Axiomatic reviewed five potential GIS platforms. Their configuration ranges from complete custom solution, to hosted Commercial-Off-The-Shelf, to enterprise web GIS platform. Costs and a summary of functionality are provided in *Deployment & Maintenance: Platforms and Estimated Costs* and Appendix E.

The cost of the regional GIS can vary considerably depending on which portions (if any) are performed by WestCOG staff, and which GIS solution is chosen. For costing and return on investment (ROI) purposes WestCOG staff time was billed at $75.00 per hour, and consultants at $125.00 per hour. The first-year cost for year one ranges from $47,200.00-$57,200.00, with most the cost revolving around developing the standardization and aggregation tools. This first-year cost is driven largely driven by the cost associated with developing the standardization tools, which is estimated assuming it is performed by an external contractor. The estimated annual maintenance ranges from $17,950.00-$27,950.00, once again depending on which GIS solution is chosen, and the hosting configuration. With the assumptions outlined in the *Cost Summary & Return on Investment* the system has the potential for a $19,650.00

EXISTING SITE SURVEY

To improve adoption rates among the WestCOG communities with existing GIS and Assessor Database Portals, a regional solution must both incorporate the features and functionality of those portals and make efforts to expand or improve upon them. The core functionality that is provided by the existing sites must be present and fully-operational at the time of launch, as this is one of the critical adoption periods for a scenario such as this. Considerations must also be given to features and functionality that may affect the attainment of long-term goals, such as the implementation of data schemas or software that would prevent or complicate future enhancements.

To identify the required data and functionality for a regional GIS site, Axiomatic developed an inventory of existing municipal GIS and assessor database portals in the eighteen WestCOG communities. An overview of the identified solutions is shown in Table 2.

Municipality	GIS Portal		Assessor Database Portal	
	Deployed	Maintainer	Deployed	Maintainer
Bethel	Yes	Tighe & Bond	Yes	Tyler
Bridgewater	No	N/A	Yes	Vision
Brookfield	Yes	NE GEO	Yes	Vision
Danbury	No	N/A	Yes	Vision
Darien	Yes	Yes	Yes	Unknown
Greenwich	No	N/A	No	N/A
New Canaan	No	N/A	Yes	Appraisal Online
New Fairfield	Yes	Tighe & Bond	Yes	Vision
New Milford	Yes	App Geo	Yes	Vision
Newtown	Yes	NE Geo	Yes	Vision
Norwalk	No	N/A	Yes	Vision
Redding	Yes	CDM	Yes	Vision
Ridgefield	No	N/A	Yes	PropertyRecords
Sherman	No	N/A	No	N/A
Stamford	Yes[1]	Internal	Yes	Vision
Weston	No	N/A	Yes	qpublic
Westport	Yes	Sewell	Yes	Vision
Wilton	No	N/A	Yes	Vision

Table 2: Existing GIS and Assessor Database Web Portals

Nine of the eighteen communities have existing GIS web portals which, though featuring varying levels of GIS data, focus primarily on parcels and provide access to tax card (CAMA) information through separate assessor database web portals. There are five additional communities that, while they do not maintain a GIS portal, provide online assessor database web portals. Recommendations for required data and site functionality based upon the offerings of the existing solutions can be found in the GIS Files and Schemas and Recommended CAMA Implementation Strategy sections. Comprehensive GIS layer and site functionality breakdowns can be found in Appendix A.

[1] *Does not contain parcels only map index.*

GIS FILES AND SCHEMAS

REGIONAL GIS LAYERS

EXISTING GEOSPATIAL LAYERS IN MUNICIPAL GIS PORTALS

Axiomatic inventoried the existing WestCOG community GIS portals to determine the scope and variety of the geospatial data provided by each. These layers were then assigned a category based upon the data that they contained and their context to produce an abstracted "meta-inventory", shown in Table 3 through Table 6. This meta-inventory helps identify the critical geospatial datasets that are used across many of the existing GIS portals and those that are only implemented by a small subset of the communities but would be useful to include in the regional site.

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Basemap/Raster Layers									
Imagery, Aerial	No	Yes	No	Yes	Yes	Yes	Yes	No	No
Imagery, Satellite	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Street Map	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Thematic	No	No	No	Yes	No	No	No	No	Yes
Topographic	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Planimetric	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes

Table 3: Existing base map services and raster layers.

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Elevation Layers									
Contours	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Spot Elevations	No	Yes	No	No	No	Yes	Yes	No	Yes
Hydrology Layers									
Rivers/Streams	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Lakes/Ponds	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Watersheds	No	Yes	No	No	Yes	No	Yes	No	Yes
Wetlands	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Table 4: Existing physical geography layers.

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Infrastructure Layers									
Drainage	No	Yes	No	No	No	Yes	No	No	Yes
Railroads	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Roads, Centerlines	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Roads, Polygons	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Sidewalks	No	No	No	No	Yes	No	No	No	Yes
Utilities	Yes	Yes	No	No	No	Yes	Yes	No	Yes
Structure Layers									
Fences/Walls	No	Yes	No	No	No	Yes	Yes	No	Yes
Buildings	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Pools	No	Yes	No	Yes	No	Yes	No	No	Yes
Paved Areas	No	Yes	No	Yes	Yes	Yes	No	No	Yes

Table 5: Existing human geography layers.

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Boundary Layers									
Administrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Easements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Ecological	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Flood Zones	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Land Cover/Use	No	No	No	Yes	No	Yes	Yes	No	Yes
Parcels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Permits	No	No	No	No	No	No	No	No	Yes
Soils	No	Yes	No	Yes	Yes	No	Yes	No	Yes
Zoning/Districts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Annotation Layers									
PID	No	Yes	No	No	No	No	No	No	No
Map	No	No	No	No	No	No	No	No	No
Lot	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Sublot	No	No	No	Yes	Yes	No	No	No	No
Acreage	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Dimensions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Road Names	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Street Number	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Survey Number	No	No	No	No	No	No	No	No	Yes

Table 6: Existing boundary and annotation layers.

RECOMMENDED GEOSPATIAL LAYERS FOR REGIONAL SITE

In addition to the information provided in Appendix A, Axiomatic reviewed the inventory for two Connecticut's state GIS clearinghouses: University of Connecticut Libraries' Map and Geographic Information Center (MAGIC) and the Connecticut Department of Energy and Environmental Protection (CTDEEP). Based on the available datasets in these clearinghouses and the datasets currently in the possession of WestCOG, Axiomatic recommends that the layers listed in Table 7 be integrated into the regional GIS site. Each layer is categorized and includes a description, coverage (complete or partial) and the recommended authoritative source.

Category	Subcategory	Description	Coverage	Source
Ownership	Parcels	Parcel boundaries	Complete	Municipal
	Easements	Easement boundaries	Partial	Municipal
Annotation	Acreage	Parcel calculated acreage	Partial	Municipal
	Dimensions	Parcel boundary dimensions	Partial	Municipal
	Street Number	Parcel Street Number	Partial	Municipal
	Lot	Parcel Lot Number	Partial	Municipal
	Parcel ID	Parcel ID Number	Complete	Municipal
	Road Names	Road Name Labels	Complete	Various
Structures	Fences/Walls	Fences and walls	Partial	Municipal
	Buildings	Building footprints	Partial	Municipal
	Paved Areas	Paved areas (roads, driveways)	Partial	Municipal
	Pools	Pool footprints	Partial	Municipal
Districts	Zoning	Zoning Maps	Partial	Municipal
	Flood	Flood Insurance Risk Zones	Complete	CT DEEP
	Land Use	Land Use	Complete	WestCOG
Boundaries	County	County Boundary Lines	Complete	MAGIC
	Municipal	Municipal Boundary Lines	Complete	MAGIC
	CT State House	CT State House Districts	Complete	MAGIC
	CT State Senate	CT State Senate Districts	Complete	MAGIC
	Zip Codes	Zip Code Boundaries	Complete	MAGIC
	Soil	SSURGO	Complete	CT DEEP
	Bedrock	Bedrock polygons	Complete	CT DEEP

Roads	Road Centerline	Centerline including road name	Complete	WestCOG
Elevation	Contours	Two-foot elevation contours	Complete	CT DEEP
Names	GNIS	Geographic Names Info System	Complete	CT DEEP

Table 7: Proposed geospatial layer inventory.

GIS SCHEMA

Axiomatic has developed initial recommendations for optimized data schemas for point, line, and polygon features. The schemas are designed to carry the minimum amount of information that is required to support the regional GIS sites functionality and display requirements. These schemas are designed for efficiency and additional attribute fields may be required to accommodate specific use cases. The details of the data schemas can be found in Appendix B.

A separate schema has been provided for the parcel layer, accommodating the core requirements for both initial implementation of the regional GIS solution and for the needs of anticipated future enhancements (e.g. unique identifiers and linking identifiers). The schema for the parcel polygon file is detailed in Appendix B.

CAMA FILES AND SCHEMA

EXISTING CAMA DATA AND INTEGRATION LEVELS

Axiomatic inventoried each of the WestCOG communities Assessor Database Portal, and CAMA data exports (collected during Task 1 of the CAMA Regionalization Study) to determine the attributes required for each of the proposed levels of a regional GIS site. Thirteen of the WestCOG communities use Vision CAMA which means that there is already a high degree of interoperability with respect to a WestCOG-wide CAMA schema.

Municipal CAMA systems rely on complex relational databases that store temporal data in various tables. Many of these systems include pre-designed data exports that can provide external users with basic property information. For more advanced, custom data exports it requires municipal or vendor resources to build the appropriate export file.

Axiomatic has proposed three levels of integration between GIS and CAMA to support a regional GIS site as detailed in Table 8. Each integration point is further detailed in the following sections. Recommendations for implementation are provided in the *Recommended CAMA Implementation Strategy* section.

Function	Level 1	Level 2	Level 3
Flat CAMA Integration	✓	✓	✓
Internal Property Record Cards	✓	✓	✓
Link to Property Record Card Site		✓	✓
Vision PDF Property Record Card Export		✓	✓
Expanded CAMA Integration			✓
Internal Expanded Field Cards			✓

Table 8: CAMA integration levels and respective functionality.

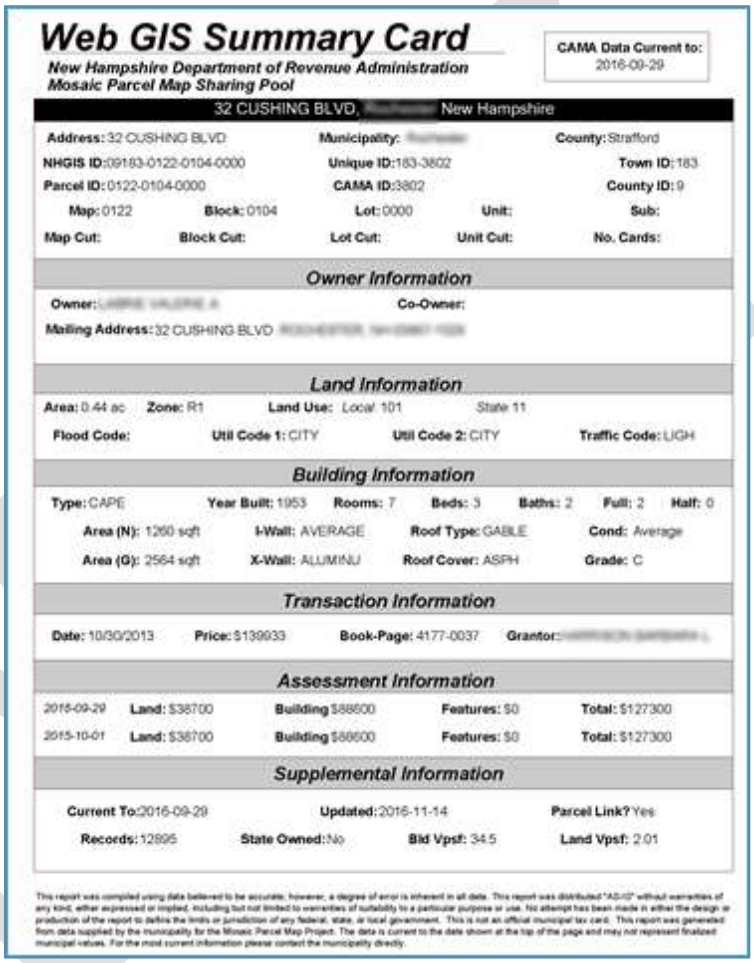
FLAT CAMA INTEGRATION

Example Site: Westport, CT
https://geopower.jws.com/westport/ApplicationsPage.jsp

"Flat" CAMA integration is the most common form seen in parcel-based GIS data portals. Flat integrations involve the linking of a single record per property. Information related to the property, such as multiple building sections or extra

features, is aggregated into a summary or simply into totals and stored in the record, as there is no support for one-to-many parent/child relationships with this type of implementation. Data from this type of system is easily exported to delimited text files. The flattening process generally only has an impact on more complex properties and would have little effect on the single-family residential properties in WestCOG, which make up most the records. The flat file typically contains summary information regarding the properties identification, current ownership, land, primary building, valuation, and last sale.

Flat CAMA integration will allow users of a regional GIS site to search for properties by all the standard attributes (e.g. owner, address, parcel identification number). It will also allow WestCOG to develop a summary-level property record card as shown in Figure 1. Note that the card contains high-level information about the property and does not provide in-depth information regarding building sections, outbuildings, or extra features.



Web GIS Summary Card

New Hampshire Department of Revenue Administration
Mosaic Parcel Map Sharing Pool

CAMA Data Current to: 2016-09-29

32 CUSHING BLVD, New Hampshire

Address: 32 CUSHING BLVD **Municipality:** **County:** Strafford
NHGIS ID: 09183-0122-0104-0000 **Unique ID:** 183-3802 **Town ID:** 183
Parcel ID: 0122-0104-0000 **CAMA ID:** 3802 **County ID:** 9
Map: 0122 **Block:** 0104 **Lot:** 0000 **Unit:** **Sub:**
Map Cut: **Block Cut:** **Lot Cut:** **Unit Cut:** **No. Cards:**

Owner Information

Owner: **Co-Owner:**
Mailing Address: 32 CUSHING BLVD

Land Information

Area: 0.44 ac **Zone:** R1 **Land Use:** Local 101 State 11
Flood Code: **Util Code 1:** CITY **Util Code 2:** CITY **Traffic Code:** LIGH

Building Information

Type: CAPE **Year Built:** 1953 **Rooms:** 7 **Beds:** 3 **Baths:** 2 **Full:** 2 **Half:** 0
Area (N): 1260 sqft **I-Wall:** AVERAGE **Roof Type:** GABLE **Cond:** Average
Area (G): 2564 sqft **X-Wall:** ALUMINU **Roof Cover:** ASPH **Grade:** C

Transaction Information

Date: 10/30/2013 **Price:** $139933 **Book-Page:** 4177-0037 **Grantor:**

Assessment Information

2016-09-29 **Land:** $38700 **Building** $88600 **Features:** $0 **Total:** $127300
2015-10-01 **Land:** $38700 **Building** $88600 **Features:** $0 **Total:** $127300

Supplemental Information

Current To: 2016-09-29 **Updated:** 2016-11-14 **Parcel Link?** Yes
Records: 12895 **State Owned:** No **Bld Vpsf:** 34.5 **Land Vpsf:** 2.01

This report was compiled using data believed to be accurate, however, a degree of error is inherent in all data. This report was distributed "AS-IS" without warranties of any kind, either expressed or implied, including but not limited to warranties of suitability to a particular purpose or use. No attempt has been made in either the design or production of the report to define the limits or jurisdiction of any federal, state, or local government. This is not an official municipal tax card. This report was generated from data supplied by the municipality for the Mosaic Parcel Map Project. The data is current to the date shown at the top of the page and may not represent finalized municipal values. For the most current information please contact the municipality directly.

Figure 1: A sample summary level property field card from the New Hampshire Mosaic state-wide system.

LINK TO PROPERTY RECORD CARD SITES

Example Site: New Fairfield, CT
http://hosting.tighebond.com/NewFairfieldCT_Public_new/

All but two of the WestCOG communities maintain assessor database portals that provide access to detailed property record cards. These detailed records include information not present in the flat file, allowing users to use the portals to search across a variety of fields and attributes and view detailed information about a parcel (e.g. identification, ownership, land, building sections, out buildings, extra features, valuation, permits, sales, building photos, and sketches. A sample of a field card from the town of New Fairfield's assessor portal is shown in Figure 2. Many of the existing GIS portals provide

direct access to these portals to display detailed property record cards, allowing users to select a parcel on the GIS site and navigate directly to the related property record card in the assessor's database. Implementing this type of functionality gives regional site users access to the detailed property record information while only requiring WestCOG to collect and normalize a flat file export from the CAMA system. ***This level of integration would require that municipalities continue to maintain their existing Assessor Database Portals.***

Figure 2: Sample property record card from New Fairfield's vision site (screen broken into three sections)

VISION PDF PROPERTY RECORD CARD EXPORT

Example Site: Montville, CT
https://www.axisgis.com/MontvilleCT/

For Vision CAMA users, it is possible to batch-print property record cards to PDF. The batch prints can then be associated with the appropriate CAMA record via a batch file naming process. The property record card PDF contains detailed property information including building photos, sketches and related information including building sections. Implementing this type of functionality gives regional site users access to the detailed property record information while only requiring WestCOG to collect and normalize a flat file export from the CAMA system. A sample of a Vision property record card export is shown in Figure 3. ***This level of integration may enable some municipalities to discontinue their existing Assessor Database Portals.***

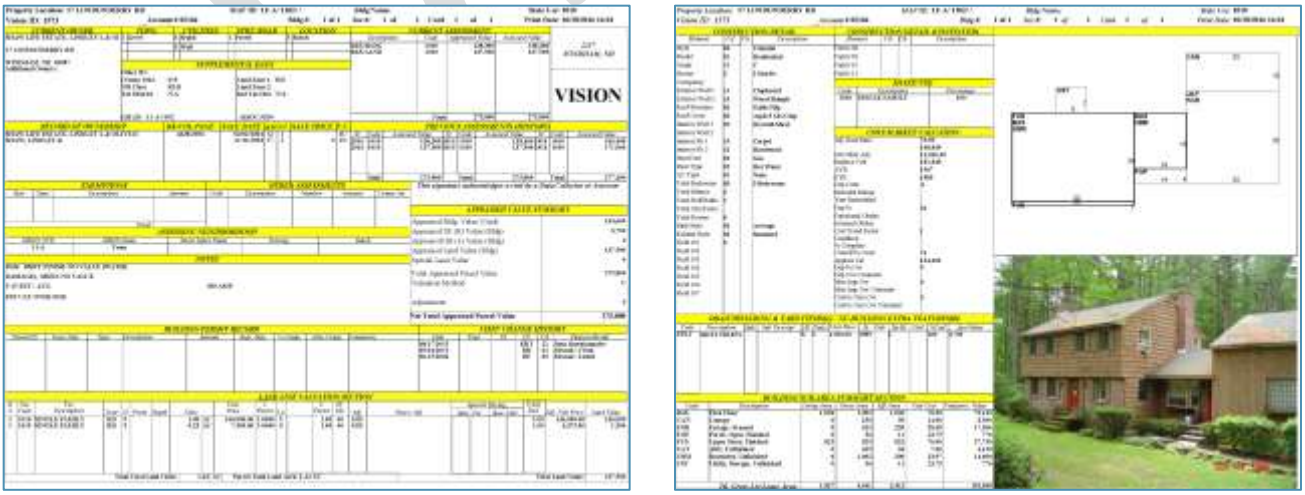


Figure 3: Example of a batch-printed Vision property record card.

EXPANDED CAMA INTEGRATION

Expanded CAMA integration is the most complicated form of integration when developing a GIS site, as it maintains the many-to-one relationships of buildings, extra features, and land. It requires exporting several tables from a municipalities CAMA system and creating a more complex relational database to manage the various child records (building sections, out buildings, extra features, permits, etc.) Utilizing an expanded CAMA integration allows for querying by any property attribute, but is typically more complex than most online GIS platforms can handle in their out of the box configuration.

INTERNAL EXPANDED PROPERTY RECORD CARDS

Example Site: Darien, CT
http://assessment.darienct.gov/pt/search/commonsearch.aspx?mode=owner

Once expanded CAMA integration is developed, the internal property record cards can be expanded to include as much information as an externally hosted property record card site. This would allow a municipality to discontinue hosting CAMA data on a standalone site and would provide a one-stop-shop for all GIS and CAMA records for the WestCOG region. A screenshot of the internal property record card site for Darien is shown in Figure 4. Note that the categories at left provide a detailed breakdown of the valuation for residential and commercial structures, outbuildings, and land.

Figure 4: Example of an expanded internal property record card from Darien, CT.

CAMA SCHEMA

Axiomatic is providing WestCOG with two proposed CAMA schemas. The first is flat, (buildings, out buildings, extra features and land lines are flattened to provide summary level information). The second schema is expanded to include multiple tables in a relational structure. This allows for a complete picture of municipal improvements which are related to a master parcel. Note that the flat schema is designed so that it can be transitioned into the expanded schema over time.

FLAT SCHEMA

The flat schema (corresponding to Level 1 and Level 2 of GIS and CAMA integration) flattens related information like buildings, out buildings, extra features and permits. A flat schema is the fastest and easiest way to integrate CAMA information into a GIS site. The flat schema contains attributes categorized as follows, identification (parcel ID, address, etc.), ownership, land, building, valuation and last known transaction. The full flat schema including field names, descriptions and types is provided in Appendix C. The flat schema has been designed to facilitate a transition to the expanded schema. For simplicity, Figure 6 only shows the Primary Key (camaidregional) for each unique assessing record, and the foreign key (linkid) to relate the CAMA file to the geospatial Parcel layer. Due to the many-to-one relationships (like Condos), this foreign key will not be a unique value in this table.

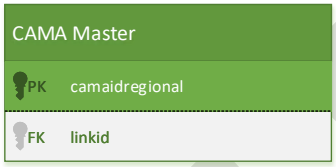


Figure 5: CAMA schema diagram showing primary and foreign keys.

EXPANDED SCHEMA

The expanded CAMA schema (GIS and CAMA integration Level 3) requires multiple export files be run from a CAMA system to obtain the necessary related data tables. The schema contains a primary CAMA table (CAMA Master) and six (6) related data tables, CAMA Sales, CAMA Building, CAMA Outbuilding, CAMA Extra Features, CAMA External. Each of the related tables uses the primary key "camaidregional". Figure 6 shows the expanded schema structure displaying only primary and foreign keys for simplicity. The expanded CAMA schema details are provided in Appendix C.

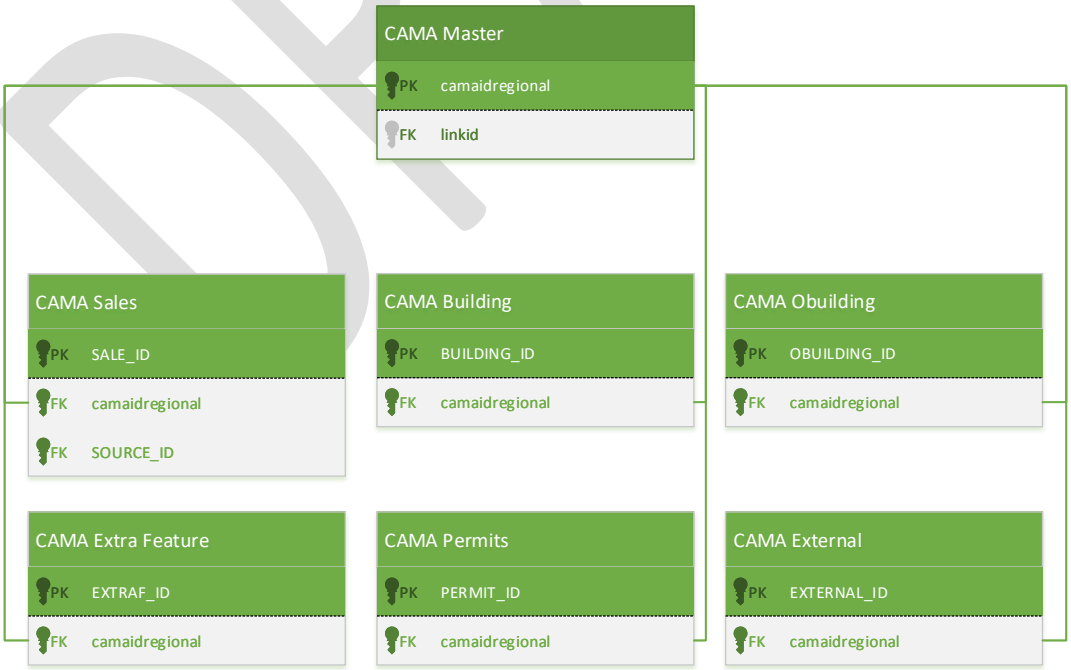


Figure 6: CAMA schema diagram showing primary and foreign keys.

CAMA-PARCEL LINK

CAMA data will be related to the GIS parcel file via the field "LINK_ID". This will allow many-to-one and many-to-many relationships between the data sets to be managed appropriately. The link between the GIS parcel and CAMA schema is shown in Figure 7. The linking ID is typically constructed during the Extract Transform Load ("ETL"), with the generic format of a leading municipal ID, followed by a municipal specific ID.

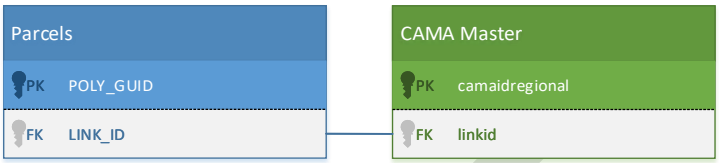


Figure 7: CAMA schema diagram showing primary and foreign keys.

RECOMMENDED CAMA IMPLEMENTATION STRATEGY

The level of functionality attainable for a regional GIS site is largely based on the level of detail in the CAMA data export which is acquired from each municipality. As this export becomes more complex (adding related tables for improvements, extra features, sales etc.) it requires more time from the municipality to generate as well as a more complex standardization (extract, transform, load ("ETL")) effort for WestCOG.

For this reason, Axiomatic has outlined GIS and CAMA integration with respect to functionality and data in three (3) levels. These levels correspond to level of effort to implement as well as WestCOG's short and long-term goals.

- **Level 1: GIS Site with Flat CAMA:** A GIS site with parcels, supporting GIS layers and integrated flat CAMA. This is the most basic level of integration and allows for viewing of GIS information and the ability to search and view basic property attributes. This type of integration has become common place for individual municipalities across Connecticut, New England and the US.

- **Level 2: GIS Site with Flat CAMA and Access to External Property Record Cards**: A GIS site with parcels, supporting GIS layers and integrated flat CAMA with links to external property record card sites (like Vision's Online Assessor Database). This is an intermediate level of integration as it allows for access to full CAMA data via the assessors stand-alone site. There is also an ability to integrate batch printed PDF property record cards to link to the parcel layer, reducing the reliance on the stand-alone Assessor Database. Integration is typically straightforward as many other communities use this type of cross site linkage. Most WestCOG communities will still need to support standalone Assessor Database Portals at their own cost to maintain complex searches (e.g. comparable sales search).

- **Level 3: GIS Site with Full CAMA Integration**: A GIS site with parcels, supporting GIS layers and expanded CAMA that can be used to fully replicate external property record card sites. This option allows for full CAMA integration without the municipalities continuing to support standalone Assessor Database Portals at an additional cost. The amount of information that must be extracted from the municipal CAMA systems is substantially higher than for Levels 1 and 2. This type of functionality is not typical for a municipal or regional GIS site but is becoming more common.

Function	Level 1	Level 2	Level 3
Flat CAMA Integration	✓	✓	✓
Internal Flat Property Record Cards	✓	✓	✓
Link to Property Record Card Site		✓	✓
Vision PDF Property Record Card Export		✓	✓
Expanded CAMA Integration			✓
Internal Expanded Property Record Cards			✓

Table 9: GIS levels and respective functionality.

Each successive level of GIS and CAMA integration will require an increased level of effort for both WestCOG and the municipalities. As the data becomes fully integrated in a single system (Level 3) with functionality sufficient to replace both the local GIS, and Assessor Database Portals the effort to ETL the information into the regional site increases significantly. A fully integrated site also requires more robust features and functionality which necessitate more resources to develop and maintain. A breakdown of the estimated effort for municipal effort, ETL, site maintenance and external dependencies is shown in Table 10.

Item	Level 1	Level 2	Level 3
Municipal Effort	>10 min per export	>20 min per export	>40 min per export
ETL Complexity	Average	Average	High
Database Design	Average	Average	Complex
Site Features	Minimal	Average	High
External Dependencies	Low	High	Low

Table 10: Estimated effort per level

Recommendations
❖ Begin with Level 1 to quickly establish a regional GIS site and minimize municipal time commitment to get a basic site running.
❖ Pilot Level 2 with select communities to establish amount of time required, and gain buy in. Incrementally include level 2 functionality for all municipalities.
❖ Study Level 3 integration with pilot communities. To better determine time commitments & willingness to consolidate online systems.

DATA STANDARDIZATION & CONVERSION REQUIREMENTS

LAND USE CODING

In Connecticut, there is no single, unified land use code standard. This presents a usability issue when aggregating data for use in a regional or statewide GIS and CAMA data portal. For that reason, it is necessary to create or adopt a regional

standard and translate each municipal specific code into the regional standard. While ideally all participating communities would adopt the regional standard, in practice this is not a realistic expectation.

Axiomatic analyzed and compared several national, and New England based land use coding standards to determine their feasibility for use in WestCOG. Brief summaries of each, and a recommendation for a WestCOG regional standard are included herein.

MASSACHUSETTS

The Massachusetts Department of Revenue, Division of Local Services has developed a robust land use coding guideline that is employed by most municipalities in the state. The land use coding structure calls for a three-digit identifier with each digit representing a classification. The first digit represents the major classification ranging from zero to nine that represents multiple-use, residential, open space, commercial, industrial, personal, forest, agricultural, recreational and exempt property respectively. The second digit represents a major division and the third digit represents a subdivision.

For example, a residential, single family property would have the major classification of one for residential, a major division of zero for residences and a subdivision of one for single family. The result is a land use code of "101" for a single-family residence. The Massachusetts system is well designed and has been adopted as the default land use coding system for major CAMA system developers such as Vision and Patriot which are both have their headquarters in the Bay State. The entire Massachusetts state land use code guide values can be found in Appendix D.

NEW YORK

The New York Office of Real Property Services has developed a robust land use coding classification system that is required for assessment oversight. Like in Massachusetts the system consists of a three-digit code that identifies classification, major division and subdivision respectively. New York has added an additional set of waterfront and ownership codes to categorize waterfront property that have complex ownership types like time shares, condominiums, etc.

For example, a residential, single family property would have the major classification of two for residential, a major division of one for single family and a subdivision of zero for year around residence. The result is a land use code of 210 for a single-family residence. The New York system is well designed and has been adopted as the default land use coding system for municipalities in New York. The entire New York state land use code guide values can be found in Appendix D.

NEW HAMPSHIRE

In New Hampshire there is no state guideline for standardized land use coding. The Department of Revenue Administration transforms local land use codes into a state standard that is used for property tax equalization. New Hampshire utilizes a two-digit land use code that identifies major classification and major divisions. New Hampshire also utilizes a set of two-digit suffix codes to identify waterfront and water access.

For example, a residential, single family property would have the major classification of one for residential and a major division of one for single family. The result is a land use code of 11 for a single-family residence. The New Hampshire system is adequate for the purposes of property tax equalization and general property identification but lacks the granularity that is desired for non-taxable property. The entire New Hampshire state land use code guide values can be found in Appendix D.

AMERICAN PLANNING ASSOCIATION

The American Planning Association ("APA") has developed the Land Based Classification Standard ("LBCS") which expands land use coding in five dimensions, activities, functions, building types, site development charter and ownership constraints. The LBCS is complicated and suggests that each property must have five distinct, four-digit codes to accurately describe its use. The APA defines the five dimensions as:

- **Activity**: Activity refers to the actual use of land based on its observable characteristics. It describes what actually takes place in physical or observable terms (e.g., farming, shopping, manufacturing, vehicular movement, etc.).
- **Function**: Function refers to the economic function or type of establishment using the land. Every land-use can be characterized by the type of establishment it serves.
- **Structure**: Structure refers to the type of structure or building on the land.
- **Site**: Site development character refers to the overall physical development character of the land. It describes "what is on the land" in general physical terms.
- **Ownership**: Ownership refers to the relationship between the use and its land rights.

Each of the dimensions has a four-digit identifier which delineates major classification, major division, minor division and subdivision respectively. For example, a residential, single family property with standard use and ownership would have the following coding:

- **Activity**: 1100-Residential activities/household activities
- **Function**: 1100-Residence or accommodations/private household
- **Structure**: 1110-Residential buildings/single-family buildings, detached units
- **Site**: 6000-Developed site with buildings
- **Ownership**: 1000-Not constraints-private ownership

The LBCS is very well constructed and provides immense details if utilized correctly. It is burdensome to implement however, as it requires much more insight into the property then is typically employed for property taxation. The entire APA-LBCS can be found in Appendix D.

LAND USE CODE STANDARD RECOMENDATION

Axiomatic recommends WestCOG utilize the Massachusetts Land use code standards. The Massachusetts system provides major classification, major division and subdivision delineations. This will provide the necessary granularity to provide WestCOG and its member communities with insight into the use of a property without being overly complicated.

It will be necessary perform a transformation on municipal CAMA data to implement a standardized land use coding system. During Axiomatic's initial review of the WestCOG communities, CAMA exports were obtained from the majority and analyzed for consistency in land use coding. Thirteen of the eighteen WestCOG communities use Vision CAMA platform, which maintains the Massachusetts land use coding system as their baseline configuration. Most municipal users create custom coding to identify specific property types that might not be specifically addressed in the baseline code list (e.g. waterfront). The land use code identifier for a single-family home for the CAMA databases collected during Task 1 are shown in Table 11. Note that the majority of the listed towns are using 101 as their indicator for a Single-family home. Based on the inventoried land use code systems, this best aligns to the Massachusetts standard.

Entity	Property Code
Bethel	101
Bridgewater	101
Brookfield	101
Danbury	101
Darien	101
Greenwich	101
New Canaan	101
Newtown	1010
Norwalk	101
Redding	101
Stamford	101
Westport	101
Wilton	1-1

Table 11: Local land use codes for a single-family home.

As most WestCOG communities are already utilizing a variation of the Massachusetts standard the required transformations will be substantially simpler and less time consuming than implementing a totally different system like LBCS. There is also a higher likelihood that WestCOG communities would be open to adopting a single regional standard over time if it is not a substantial deviation from their current coding system.

Recommendations
❖ Implement the Massachusetts land use coding system for the regional GIS site, transforming local data as needed for conformance.
❖ Encourage adoption of the MA land use coding system by WestCOG communities as a long-term goal.

ALIAS COMMON FIELD NAMES

There are several description fields that will contain unique values per municipality that could be aliased to a WestCOG specific list if desired. The alias fields will allow WestCOG to enforce consistency in data which can be useful for advanced queries and reports. The alias field values will be determined based on the most common nomenclature among the WestCOG communities CAMA systems. It must be recognized that the source field value must be maintained in addition to the alias field to ensure that WestCOG can replicate municipal attributes on property record cards. A list of fields to be potentially aliased is listed in Table 12.

Field Name	Example(s)
Building Style	*Colonial, Cape, Gambrel*
Building Model	*Single Family, Multi Family*
Building Grade	*Poor, Average, Good*
Building Condition	*A, B+, B*
Out Building Description	*Pool, Tennis Court*
Extra Feature Description	

Table 12: Additional common fields that can be aliased.

Recommendations
❖ Begin developing alias fields for common attributes and the corresponding transformation process(es) as necessary.

DATA PROCESSING & UPDATES BEST MANAGEMENT PRACTICES

EXTRACT, TRANSFORM, LOAD (ETL) PROCESS

The ETL process will allow WestCOG to take individual municipal data file and process them into a normalized regional file. This process will be critical for the long-term success of a regional initiative. It is recommended that the ETL tools be developed internally or procured in a manner that gives WestCOG control and ownership of them, as these tools will become the heart of the regional GIS.

STEP 1: COLLECTION OF GIS & CAMA DATA

The initial step in creating a regional GIS site will be to develop a repeatable data export for each communities CAMA and GIS data. The attributes included in each data export should align to the WestCOG master schema to ensure data completeness. Once the repeatable data export process for each community has been established it should be documented thoroughly.

CAMA DATA UPDATE FREQUENCY

In Connecticut property is valued annually to be current to October 1 (Chapter 203 - Sec. 12-62a) by each municipality. The municipality has until February 1 to create the "grand list" which contains all the taxable and tax-exempt property current to the assessment date. This is essentially the "official" valuation record for the year (although some municipalities do not complete the list until the end of February).

It is imperative that the underlying CAMA information in a WestCOG regional GIS data portal contains the official records for each property. This ensures that the information being displayed on the site coincides with property tax billing information. For this reason, CAMA exports should be collected by WestCOG at a minimum annually to coincide with grand list.

CAMA data is updated daily by municipalities to add new construction, update attributes for renovations, or record ownership changes. It is important to capture these changes regularly to ensure the data on the GIS website maintains utility (current owner and mailing address are critical for abutter notifications).

After deployment, it is recommended that WestCOG obtain more frequent CAMA updates. This allows the valuation information to remain consistent with the grand list while displaying the correct ownership information. The recommended quarterly CAMA data collection and update schedule is shown in Table 13.

Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CAMA		Primary Collection				Update			Update			Update

Table 13: CAMA data collection and update schedule

Recommendations

- WestCOG should collect CAMA data at a minimum annually from each community with the primary solicitation occurring during February and March. Supplemental ownership updates should be received every quarter (June, September, December) if desired.

GIS DATA UPDATE FREQUENCY

GIS parcel maps should be updated at a minimum annually to coincide with the assessment date of October 1. Many WestCOG communities are proactive with parcel map maintenance. Table 14 shows the update frequency for GIS data among the WestCOG communities as determined during part of Task 1 of the CAMA Regionalization Study. Note that only one respondent has GIS parcel information that is more than one year out of date. Axiomatic recommends that parcel information be updated at a minimum annually.

Municipality	Maintainer	Update Schedule	Last Update
Bethel	Tighe & Bond	Annually	10/01/2015[2]
Bridgewater	Assessor/WestCOG	On Demand	2016
Brookfield	Sharlow Tech Group & New England Geo	Quarterly	Q4 2016
Danbury	Sewall	Monthly	10/01/2016
Darien	Assessor	Daily	Ongoing
Greenwich	Assessor	Monthly	Ongoing
New Canaan	Tighe & Bond	Monthly	Ongoing
New Fairfield	Assessor	Semi-Annually	In Progress
New Milford	Assessor	Annually	10/01/2016
Newtown	IT/GIS	3 Years	10/01/2016
Norwalk	Internal	Monthly	Ongoing
Redding	CDM Smith	Annually	In Progress
Ridgefield	Internal	Ongoing	Ongoing
Sherman	-	-	-
Stamford	Internal	Ongoing	Ongoing
Weston	New England GEO	Annually	10/1/2016
Westport	Internal/Sewell	Quarterly	Ongoing
Wilton	CAI	Annually	10/1/2016

Table 14: Summary of Parcel Map Maintenance

For communities that update their information more regularly it is suggested that a second export is taken at the midpoint of the year. The recommended GIS data collection and update schedule is shown in Table 15.

Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Parcel	Primary Collection						Update					

Table 15: GIS parcel data collection and update schedule

Recommendations

- WestCOG should collect parcel data at a minimum annually from each community with the primary solicitation occurring during January and February. Supplemental parcel data updates should be received semi-annually (July) if desired.

[2] *Date from survey indicates the map was not updated last year. Verified through Tighe & Bond website.*

STEP 2: PROCESSING OF GIS & CAMA DATA

Once the CAMA and GIS data for each community is collected through the standard export process it must be normalized to the WestCOG master schema. Data processing may require a specific processor for each community or for common CAMA systems. This section contains best practices for processing the municipal specific data. There are a number of data transformation tools available to standardize the CAMA data, however Microsoft Access is one of the most commonly used platforms due to its cost, availability, and simplicity. This section outlines logical best practices for CAMA and Parcel data standardization and processing.

It is recommended that the ETL tools be developed internally or procured in a manner that gives WestCOG control and ownership of them, as these tools will become the heart of the regional GIS.

BASE PARCEL PROCESSING

Collected parcel (and other municipally sourced geospatial) data should be processed using ArcGIS desktop tools and custom python models. The python models standardize file types, field names, clean and repair geometry and remove extraneous attributes. Each python model is designed to run based on the standard export files defined in Step 1.

CAMA NORMALIZER AND PARCEL CROSS CHECK

CAMA data should be processed using a database tool that is tailored to each specific municipality. The database tool normalizes field names, transforms coding (like land use) and performs error identification and cross reference with GIS parcel data. The error identification and rectification process is critical for creating a well-constructed GIS site. The steps below are CAMA normalization best practices.

- **CAMA Normalization**: The CAMA data field names, types and sizes are aligned to the master schema. The "link id" (field that relates CAMA to parcels) is created from the parcel identification number.
- **Initial CAMA/Parcel Crosscheck**: CAMA records that do not have a matching GIS parcel record and GIS parcel records that do not have matching CAMA records are identified. These records are flagged for error resolution.
- **CAMA Error Resolution:** CAMA record "link id" fields can be modified to adjust for inconsistency, complex relationships or other issues that were identified in the initial CAMA/Parcel Crosscheck. Error resolution is managed through a series of "IF" statements that are designed to address specific error patterns. CAMA records flagged in the initial crosscheck are updated based on the error resolution process. The goal of the error resolution is to build a "link id" which can be successfully linked to the parcel layer.
- **Secondary CAMA/Parcel Crosscheck:** CAMA records that do not have a matching GIS parcel record and GIS parcel records that do not have matching CAMA records are re-checked. These records are considered final and are flagged as such. This allows users of the regional GIS site to understand they are looking at a record that does not have a corresponding CAMA or parcel record. It is best practice to share this list with the participating community so that the appropriate data changes can be made, to result in a successful CAMA/Parcel link.
- **Code Transformation**: Based on translation tables the CAMA data codes (like land use) can be transformed to the WestCOG standard. Doing code transformation at the local level is conducive to streamlining long-term maintenance.
- **Export**: Final CAMA and parcel files are exported from the process standardized and ready for aggregation.

STEP 3: AGGREGATION

Once each community is normalized through the transformation process it can be aggregated into the regional file. For CAMA, the separate exports are merged into a single database table (or tables for a complex CAMA schema) containing all communities. For GIS, python models are run to combine the applicable files into a single geodatabase feature. Once the information is aggregated it can be loaded into the regional GIS site.

Recommendations
❖ WestCOG should develop or procure CAMA and GIS ETL tools in a manner such that WestCOG maintains ownership and control of processing tools without license or restricted use. ❖ The ETL process should also provide a method for updating ownership information without updating values, land and building attributes. The ETL process should allow for the identification and rectification of errors using a semi-automated process.

SITE FUNCTIONALITY

The functional requirements for a Regional GIS Site have been derived from a comprehensive inventory and review of municipal GIS and Assessor database web applications within the WestCOG region. The functional requirements inventory focused on documenting GIS site functionality including but not limited to browser compatibility, navigation, searching, reporting, measure tools, markup tools, buffer tools, printing and external integration. The full functional requirements inventory is provided in Appendix A.

From the functional requirements inventory Axiomatic developed a list of critical functionality for the WestCOG regional GIS site to have corresponding to integration levels 1, 2 and 3. The list of functional requirements is shown in Table 16 and Table 17. Each functional requirement is listed by phase and is classified as required, desirable or optional for each of the three levels of integration.

- **Required (R)**: must be present to meet the needs of participating communities.
- **Desirable (D)**: not required but should be highly-prioritized and included if possible.
- **Optional (O)**: non-essential but considered beneficial.

Recommended Search and Navigation Functionality				
Category	**Sub Category**	**Level 1**	**Level 2**	**Level 3**
Desktop Browsers	Microsoft Internet Explorer (v11+)	R	R	R
	Microsoft Edge (v38+)	R	R	R
	Mozilla Firefox (v52+ ESR, v54+)	R	R	R
	Apple Safari (v6.2.8+)	R	R	R
	Google Chrome (v52+)	R	R	R
	Opera (v39+)	R	R	R
Mobile Browsers	Chrome (Android/iOS)	R	R	R
	Safari (iOS)	R	R	R
Navigation	Typical Functions	R	R	R
	Layer Controls	R	R	R
Basic Search	Street Number	R	R	R
	Street Name	R	R	R
	Owner Name	R	R	R
	Parcel ID	R	R	R
Advanced Search	Land Use	D	D	R
	Building Information	D	D	R
	Land Area	D	D	R
	Sale Date	D	D	R
	Value	D	D	R
	Ability to enter ranges (e.g. sale dates)	D	D	R

Table 16: Recommended Search and Navigation Functionality

GIS Functionality & Integration				
Category	**Sub Category**	**Level 1**	**Level 2**	**Level 3**
Selection	From Search	R	R	R
	Point	R	R	R
	Polygon	D	D	R
	Radius	D	D	D
Measure	Linear	R	R	R
	Area	R	R	R
	Variable Units	R	R	R
Buffer	Variable distance	R	R	R
	Visible	R	R	R
	Printable	R	R	R
	Add/Remove Parcels	R	R	R
	Access Mailing List	R	R	R
Markup	Visible	D	D	R
	Printable	D	D	R
Property Record Cards	Internal	R	R	R
	External	D	R	R
	PDF Replication	D	R	R
External Links	Property Record Cards	D	R	R
	Plans	O	O	D
	Deeds	O	D	D
	Permits	O	O	D
Printing	Custom	R	R	R
	Standard	R	R	R
Integration	Oblique	R	R	R
	Street View	R	R	R
	Photo Tool Tips	O	R	R
	Building Photos	O	R	R

Table 17: GIS Functionality and Integration

DEPLOYMENT & MAINTENANCE: PLATFORMS AND ESTIMATED COSTS

There are three key elements to the deployment of a regional GIS: (1) Data Collection, (2) Data Standardization, and (3) Technology Platform. They are each discussed in the following section. The costs presented herein are characterized by the following assumptions:

Assumptions
All eighteen towns are participating
Level 2 integration
Internal (WestCOG) and external (contractor) labor are estimated at $75 and $100 respectively
WestCOG will perform data collection using their own resources
WestCOG will hire a contractor to develop ETL tools
WestCOG will operate ETL tools using their own labor resources after year 1

OUTREACH

An important component of a successful regional GIS is outreach and marketing of services to member communities. It is recommended that a kick-off meeting be held with local officials to review the scope of the project, and any municipal time or financial commitments required. It may be advantageous to enter a Memorandum of Understanding ("MOU") with each member community to establish the data pathways (including any contact with required vendors), and anticipated update schedules. Participating communities should place a link to the regional GIS be placed prominently on the town or cities website. It may also be beneficial to form a regional GIS workgroup, or advisory committee comprised of municipal representatives to guide and inform the development of the data and platform.

Recommendations
❖ Conduct a kick-off meeting with municipal stakeholders.
❖ Optionally prepare Memorandum of Understanding (MOUs) between WestCOG and participating communities to clarify responsibilities.
❖ Encourage each municipality to include links to the regional GIS on the town website.
❖ Form GIS workgroup or advisory committee comprised of municipal officials.

DATA COLLECTION & STANDARDIZATION

DATA COLLECTION

The data collection for a flat file CAMA export and associated GIS layers is not overly burdensome once data pathways have been established. Generally, the data export from the CAMA system takes 5-10 minutes and files are sufficiently small that they can be emailed (in the case of larger communities an FTP may need to be setup). The bulk of the effort related to data collection is spent in establishing contact, and reminding participating communities to send their data. For geospatial information, it is generally easiest to establish municipal specific FTP sites where GIS files can be uploaded. A conservative level of effort estimation for setup is provided in **Error! Reference source not found.** for level 1 and 2 flat file integration. Table 19 includes an estimated maintenance cost. These estimates assume it will take multiple attempts to request and obtain a data export. These values may easily be halved for most communities, and some might not require any communication beyond an email reminder

Estimated Setup Costs					
Type	Hrs. Per	Number	Total Hrs.	Rate	Total Cost
CAMA	1	18	18	$75	$1,350
GIS	1	18	18	$75	$1,350
Total			**36**		**$2,700**

Table 18: Setup data collection cost totals assuming WestCOG labor

Estimated Maintenance Costs					
Type	Hrs. Per	Number	Total Hrs.	Rate	Total Cost
CAMA	.5	18	9	$75	$675
GIS	.5	18	9	$75	$675
Total			**36**		**$1,350**

Table 19: Data collection maintenance cost totals

It is recommended that WestCOG manage the data pathways (contacts and agreements) either internally or through a contractor with an agreement which restricts use of the data and contacts to project tasks only. If the internal resources are available to manage this task this would be the least cost method of data collection. If conducted through a contracted service this data collection task should be on a fixed cost basis per solicitation and include remedy for WestCOG to seek the data directly if the participating communities do not provide it.

Recommendations
❖ Manage data collection internally if resources are available
❖ If necessary contract on a fixed cost basis for data collection. Include a remedy for WestCOG to see the data directly if a participating community is being non-responsive.

STANDARDIZATION OF GIS AND CAMA DATA

Developing the data standardization tools to convert the locally sourced GIS and CAMA files into a regional standard is the most critical step of the process. It is recommended that the transformation tools be developed internally or procured in a manner that gives WestCOG control and ownership of them, as these tools will become the heart of the regional GIS. Best practices and platforms for these processes can be found in the *Data Processing & Updates Best Management practices* section. To reduce the overall maintenance cost, it may be advantageous to retain a consultant to develop sample data transformation processors which WestCOG can operate. Labor estimates for developing standardization tools, for CAMA, GIS, Land Use Code Normalization, and aggregation are provided in Table 20 and Table 21 respectively.

Estimated Setup Costs					
Type	Hrs. Per	Number	Total Hrs.	Rate	Total Cost
CAMA	6	18	108	$125	$13,500
GIS	6	18	108	$125	$13,500
Aggregation	60	1	60	$125	$7,500
Total			**276**		**$34,500**

Table 20: Setup standardization processor cost totals assuming contractor labor

Estimated Maintenance Costs					
Type	Hrs. Per	Number	Total Hrs.	Rate	Total Cost
CAMA	2	18	36	$75	$2,700
GIS	2	18	36	$75	$2,700
Aggregation	16	1	16	$75	$1,200
Total			**88**		**$6,600**

Table 21: Standardization processors maintenance cost totals

Recommendations
❖ To reduce overall cost, it may be advantageous to retain a consultant to build data transformation processors, which WestCOG can leverage with internal resources.
❖ WestCOG should develop or procure CAMA and GIS Transformation tools in a manner such that WestCOG maintains ownership and control of processing tools without license or restricted use.
❖ The ETL process should also provide a method for updating ownership information without updating values, land and building attributes. The ETL process should allow for the identification and rectification of errors using a semi-automated process.

ONLINE GIS PLATFORMS

Axiomatic evaluated five, web based GIS platforms that could potentially be used by WestCOG for their regional GIS. The five solutions were chosen to represent a broad base of options from hosted solution to enterprise configuration management. The five evaluated solutions are listed with basic information in Table 22. Detailed information about each of the evaluated systems can be found in Appendix E. It should be noted that based on Axiomatic's research Integrator and CorsonGIS (custom) appear to be only platforms which could natively achieve Level 3 Integration without new development.

Application	Manufacturer	Map Engine	Hosting Options
AxisGIS	CAI Technologies	Esri ArcEnterprise	Hosted (Cloud)
CorsonGIS (custom)	CorsonGIS Solutions	Esri ArcEnterprise	Hosted (Cloud)
MapGeo	Applied Geographics	Carto	Hosted (Cloud)
MapXpress	New England GeoSystems	Esri/Geocortex	Hosted (Cloud) Internal
Integrator	mPower Innovations	Esri ArcEnterprise OSGeo Mapguide	Hosted (Cloud) Internal

Table 22: Evaluated web based GIS platforms

Each of the evaluated solutions was compared against the list of recommended search and navigation functionality by level (Table 16). Table 23 shows each of the evaluated applications ability to meet the functional requirements for the regional GIS application.

AxisGIS	CorsonGIS	MapGeo	MapXpress	Integrator

Desktop Browsers	Microsoft Internet Explorer (v11+)	Yes	Yes	Yes	Yes	Yes
	Microsoft Edge (v38+)	Yes	Yes	Yes	Yes	Yes
	Mozilla Firefox (v52+ ESR, v54+)	Yes	Yes	Yes	Yes	Yes
	Apple Safari (v6.2.8+)					
	Google Chrome (v52+)	Yes	Yes	Yes	Yes	Yes
	Opera (v39+)	Yes	Yes	Yes	Yes	Yes
Mobile Browsers	Chrome (Android/iOS)	Yes	Yes	Yes	Yes	Yes
	Safari (iOS)					
Navigation	Typical Functions	Yes	Yes	Yes	Yes	Yes
	Layer Controls	Yes	Yes	Yes	Yes	Yes
Basic Search	Street Number	Yes	Yes	Yes	Yes	Yes
	Street Name	Yes	Yes	Yes	Yes	Yes
	Owner Name	Yes	Yes	Yes	Yes	Yes
	Parcel ID	Yes	Yes	Yes	Yes	Yes
Advanced Search	Land Use	**No**	Yes	**No**	Yes	Yes
	Building Information	**No**	Yes	**No**	Yes	Yes
	Land Area	**No**	Yes	**No**	Yes	Yes
	Sale Date	**No**	Yes	**No**	Yes	Yes
	Value	**No**	Yes	**No**	Yes	Yes
	Ability to enter ranges	**No**	Yes	**No**	Yes	Yes

Table 23: Search & Navigation Required functionality matrix for WestCOG regional GIS

Each of the evaluated solutions was compared against the list of recommended GIS and integration functionality by level (Table 17). Table 24 shows each of the evaluated applications ability to meet the functional requirements for the regional GIS application.

		AxisGIS	CorsonGIS	MapGeo	MapXpres	Integrator
Selection	From Search	Yes	Yes	Yes	Yes	Yes
	Point	Yes	Yes	**No**	Yes	Yes
	Polygon	**No**	Yes	**No**	**No**	Yes
	Radius	**No**	Yes	**No**	**No**	Yes
Measure	Linear	Yes	Yes	Yes	Yes	Yes
	Area	Yes	Yes	Yes	Yes	Yes
	Variable Units	Yes	Yes	**No**	**No**	Yes
Buffer	Variable distance	Yes	Yes	Yes	Yes	Yes
	Visible	Yes	Yes	Yes	Yes	Yes
	Printable	Yes	Yes	Yes	Yes	Yes
	Add/Remove Parcels	Yes	Yes	**No**	Yes	Yes
	Access Mailing List	Yes	Yes	Yes	Yes	Yes
Markup	Visible	Yes	Yes	Yes	**No**	Yes
	Printable	Yes	Yes	Yes	No	Yes
Property Record Cards	Internal	Yes	Yes	Yes	Yes	Yes
	External	Yes	Yes	Yes	Yes	Yes
	PDF Replication	Yes	**No**	**No**	Yes	**No**
External Links	Property Record Cards	Yes	Yes	Yes	Yes	Yes
	Plans	Yes	Yes	Yes	Yes	Yes
	Deeds	Yes	Yes	Yes	**No**	Yes
	Permits	Yes	Yes	Yes	**No**	Yes
Printing	Custom	Yes	Yes	Yes	**No**	Yes
	Standard	Yes	Yes	Yes	Yes	Yes
Integration	Oblique	Yes	Yes	**No**	Yes	Yes
	Street View	Yes	Yes	Yes	**No**	Yes
	Photo Tool Tips	Yes	Yes	**No**	Yes	Yes
	Building Photos	Yes	Yes	Yes	Yes	Yes

Table 24: GIS & Integration Required functionality matrix for WestCOG regional GIS

Table 25 Table 26 provide costs estimates for initial software fees, and ongoing hosting and maintenance. It should be noted that these costs will vary depending on the chosen platform as well as the hosting arrangement.

Estimated Setup Costs	
Type	Total Cost
Application Development/License	$10,000-$20,000

Table 25: Estimated Application Development or Licenses Costs

Estimated Maintenance Costs	
Type	Total Cost
Application Hosting/License	$10,000-$20,000

Table 26: Estimated Maintenance License & Hosting Costs

COST SUMMARY & RETURN ON INVESTMENT

Total Estimated costs for setup and Maintenance are provided in Table 27 Table 28 respectively.

Estimated Total Setup Costs	
Type	Total Cost
Data Collection	$2,700
ETL Processor Development (includes first year data processing)	$34,500
Application Development/License/Hosting	$10,000-$20,000
Total Estimated Setup Cost	$47,200-$57,200

Table 27: Estimated setup cost totals

Estimated Total Maintenance Costs	
Type	Total Cost
Data Collection	$2,700
ETL Processors	$6,600
Application License/Hosting	$10,000-$20,000
Total Estimated Maintenance Cost	$17,950-$27,950

Table 28: Estimated Total Maintenance Costs

RETURN ON INVESTMENT

To calculate the potential return on investment for the development of a regional GIS, Axiomatic has estimated the total five-year cost of the project as $160,350 as shown in Table 29.

Year	Year 1		Year 2	Year 3	Year 4	Year 5	Total
Type	Setup	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	
Cost	$52,200	$16,350	$22,950	$22,950	$22,950	$22,950	$160,350

Table 29: Five-year total cost for regional GIS

Currently nine (9) WestCOG communities have a hosted GIS application. For the purposes of this report, it is estimated that each community spends $2,000 annually to maintain their external GIS site. In addition to the realized (known) costs, there is the potential for the other 9 communities to have an unrealized savings of $2,000 annually each. The total municipal savings is shown in Table 30.

Total	Year 1	Year 2	Year 3	Year 4	Year 5	Total
	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	
Realized	$18,000.00	$18,000.00	$18,000.00	$18,000.00	$18,000.00	$90,000
Unrealized	$18,000.00	$18,000.00	$18,000.00	$18,000.00	$18,000.00	$90,000

Table 30: Five-year municipal cost (realized and unrealized) for regional GIS

Based on the estimated project cost and the existing (realized and unrealized) costs, it is estimated that the total savings over a five-year period is $19,650 as shown in Table 31.

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
WestCOG Cost	$(68,550)	$(22,950)	$(22,950)	$(22,950)	$(22,950)	$(160,350)
Municipal Cost	$36,000	$36,000	$36,000	$36,000	$36,000	$180,000
Municipal Savings	($32,550)	$13,050	$13,050	$13,050	$13,050	$19,650

Table 31: Five-year savings

APPENDIX A. EXISTING DATA AND FUNCTIONALITY

GIS PORTAL FEATURES AND FUNCTIONALITY

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Interface – General									
Panels, Floating (Movable): Pop-up UI panels float above the interface and can be moved by the user using the mouse. ***(Recommended)***	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Panels, Resizable: UI panels can be resized by the user using the mouse. ***(Optional)***	Yes	No	Yes	No	No	No	No	Yes	Yes
Panels, Show/Hide or Minimize: There are UI controls that allow a use to minimize or toggle the visibility of a panel. ***(Optional)***	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Panels, Close: There is a UI control that allows the user to close or dismiss a floating panel. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interface – Navigation									
View History, Previous/Back: There is a UI control available that allows the user to jump to the previously-viewed extent. ***(Recommended)***	No	Yes	Yes	No	No	Yes	Yes	No	Yes
View History, Next/Forward: There is a UI control available that allows the user to jump to the following extent, provided they have returned to a previous extent. ***(Recommended)***	No	Yes	Yes	No	No	Yes	Yes	No	Yes
Zoom, Auto, to Layer Extents: There is a UI control available to zoom to the extents of the selected layer. ***(Recommended)***	No	No	No	No	No	No	No	No	Yes
Zoom, Auto, to Layer Visibility: The user can issue a command that automatically adjusts the view extent to the minimum scale from which the currently selected layer is rendered (requires that layers have visible ranges defined). ***(Recommended)***	No	No	No	No	No	No	No	No	Yes
Zoom, Auto, to Feature/Selection: When selecting a search result or other record or a feature, the UI allows the user to issue a command that pans/zooms to that particular feature on the map. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Zoom, Auto, to Map Extents: There is a UI control available to zoom to the extents of the map. ***(Recommended)***	Yes	Yes	No	No	No	Yes	Yes	No	Yes
Zoom, Scale, Upper Limit (1 in = x ft): Maximum scale. ***(Required)***	4	50	No	50	129	50	20	No	17.7
Zoom, Scale, Lower Limit (1 in = x ft): Minimum scale. ***(Required)***	1056000	10000	No	8000	66274	10000	4622324	No	145000
Zoom, Manual, via Mousewheel: The user can change zoom levels using the mousewheel. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom, Manual, via Keyboard: The user can change zoom levels (incrementally or continuously) with keyboard keys. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom, Manual, via UI Control: There is a visible UI control for adjusting the zoom level. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Pan, Manual, via UI Control: There is a visible UI control for panning the extent. ***(Recommended)***	No	Yes	Yes	No	No	Yes	No	No	Yes
Pan, Manual, via Mouse: The user can pan the extent using the mouse. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pan, Manual, via Keyboard: The user can pan the extent using the keyboard. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pan, Auto, to Feature/Selection: When selecting a search result or other record or a feature, the UI allows the user to issue a command that pans/zooms to that particular feature on the map. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Interface – Measurement									
Area, Multiple, Non-Contiguous: The user can define multiple, non-contiguous polygons and calculate the resulting total area. ***(Optional)***	No	No	No	No	Yes	No	No	No	No
Area, Box: The user can define an area by clicking and dragging to create a contiguous, rectilinear polygon without convex corners. ***(Optional)***	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Area, Radius/Diameter: The user can define an area by establishing either the centerpoint or the edge of a circle and specifying the radius/diameter. ***(Optional)***	No	No	No	No	Yes	No	No	No	No
Area, Freehand Polygon: The user can define an area by drawing a closed, freehand path with the mouse. ***(Recommended)***	No	No	No	No	Yes	No	No	No	No
Area, Custom Polygon: The user can define a polygon by specifying the locations of multiple vertices. ***(Required)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Area, Self-Closing: The user can issue a command that automatically closes the current polygon by connecting the most recently specified vertex to the first vertex. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Area, Self-Intersecting: The user can define a single, self-intersecting polygon. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Area, Units - Acres: The UI displays the area of the selection in the specified units. ***(Required)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Area, Units - Square Miles: The UI displays the area of the selection in the specified units. ***(Recommended)***	No	No	Yes	No	No	No	Yes	No	Yes
Area, Units - Square Kilometers: The UI displays the area of the selection in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes
Area, Units - Square Feet: The UI displays the area of the selection in the specified units. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Area, Units - Square Yards: The UI displays the area of the selection in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes
Area, Units - Hectares: The UI displays the area of the selection in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Area, Units - Square Meters: The UI displays the area of the selection in the specified units. ***(Optional)***	No	No	Yes	Yes	No	No	Yes	No	Yes
Distance, Line: A measurement tool that allows the user to specify a startpoint and endpoint. ***(Required)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Distance, Path: The user can define a path composed of multiple line sections by establishing a start point, specifying a series of intermediate points, and establishing an endpoint. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Distance, Path, Self-Intersecting: The user can create paths that intersect themselves. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Distance, Multiple/non-contiguous: The user can create multiple unconnected lines or paths and calculate the total linear distance of all of them as a set. ***(Optional)***	No	No	No	No	Yes	No	No	No	No
Distance, Path, Freehand: The UI allows the user to define a continuous, non-rectilinear path using the mouse ***(Optional)***	No	No	No	No	No	No	Yes	No	No
Distance, Units - Miles: The UI can display the total distance in the specified units. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Distance, Units - Meters: The UI can display the total distance in the specified units. ***(Optional)***	No	No	Yes	Yes	No	No	Yes	No	Yes
Distance, Units - Kilometers: The UI can display the total distance in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes
Distance, Units - Feet: The UI can display the total distance in the specified units. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Distance, Units - Yards: The UI can display the total distance in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes
Distance, Units - Nautical Miles: The UI can display the total distance in the specified units. ***(Optional)***	No	No	Yes	No	No	No	Yes	No	Yes
Point Location, Coordinates - Decimal Degrees (DD): The UI displays the geographic coordinates of a specified point in decimal degrees. ***(Required)***	Yes	No	Yes	Yes	No	No	Yes	No	Yes
Point Location, Coordinates - State Plane (SPCS): The UI displays the geographic coordinates of a specified point in state plane coordinates. ***(Optional)***	No	Yes	No	Yes	No	Yes	No	No	No
Point Location, Coordinates - Degrees Minutes Seconds (DMS): The UI displays the geographic coordinates of a specified point in degrees, minutes, and seconds. ***(Recommended)***	No	No	Yes	No	No	No	No	No	Yes
Interface – Layers									
Groups, Pre-Defined Layer Sets/Groups: The UI provides a control that allows a user to quickly enable or disable pre-defined groups of related or contextually-relevant layers. ***(Recommended)***	Yes	No	Yes	No	No	No	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Legend, List of Layers with Symbology: The UI provides a legend showing the symbology of the active/available map layers. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Symbology, Per-Layer, Single: The map rendering engine supports a single symbology type for a layer. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Symbology, Per-Layer, Categorical or by Attribute: The map rendering engine supports category- or attribute-based symbology for a layer, allowing multiple classifications and symbologies to be shown for different layer features based on pre-defined criteria. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Symbology, Per-Layer, Quantitative: The map rendering engine displays layer features using a color scale or other graduated symbology based upon values in a quantitative field. ***(Optional)***	No	No	No	No	No	No	Yes	No	No
Visibility, All-Off: The UI has a control that allows a user to turn off all visible layers. ***(Recommended)***	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Visibility, Basemap On/Off: The UI has a control that allows the user to disable basemaps. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Annotations, Parcel Dimensions: The parcels layer displays the length each segment of the parcel boundaries or the radius of curved boundaries. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Annotations, Parcel Number/ID: The parcels layer displays the parcel number or other identifier for each parcel. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Annotations, Individual Layer Annotation Toggles: The UI allows the user to enable or disable annotations for individual layers. ***(Recommended)***	Yes	No	Yes	Yes	No	No	Yes	No	Yes
Interface – Identification									
Direct, Identify on Visible Layer(s): The UI allows the user click and identify a visible feature on the top-most (or a pre-defined "primary") layer. ***(Required)***	Yes	No	No	No	No	No	No	No	Yes
List, Results list across visible layer(s): The UI allows the user to click and identify all features across all visible layers at that location (generally displayed as a list of results). ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Interface – Selection									
Tools, Select By Point (Click): The UI allows the user to select a single feature by clicking on it with the mouse. ***(Required)***	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Tools, Select by Area (Click and Drag box): The UI allows the user to click and drag to define a box, and selects all features within it or intersected by it ***(Recommended)***	No	No	Yes	No	No	No	No	No	Yes
Tools, Select by Area (Polygon): The UI allows the user to create a multi-vertex polygon and	No	Yes	Yes	No	No	Yes	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
select all features within or intersected by it. ***(Recommended)***									
Tools, Select by Line (Intersects): The UI allows the user to define a start point and an end point and select all features intersected by the resulting line. ***(Recommended)***	No	Yes	Yes	No	No	Yes	Yes	No	Yes
Tools, Select by Path (Intersects): The UI allows the user to define a path by establishing a start point, specifying multiple intermediate points, and establishing an end point and selects all features intersected by the resulting path. ***(Optional)***	No	Yes	Yes	No	No	Yes	Yes	No	Yes
Tools, Select by Freehand Path (Intersects): The UI allows the user to "draw" a path in one or more continuous motions with the mouse and selects all features intsersected by the resulting path. ***(Optional)***	No	No	No	No	No	No	Yes	No	No
Sets, Add to Selection Set: The UI provides a method for displaying and tracking a set of selected features. ***(Recommended)***	Yes	No	Yes	No	Yes	No	Yes	No	No
Sets, Remove from Selection Set: The UI provides a method for removing features from a selection set. ***(Recommended)***	Yes	No	Yes	No	Yes	No	Yes	No	No
Sets, Load/Save/Export Set: The UI provides the user with a method for saving, recalling, or exporting a set of selected features. ***(Optional)***	No	No	Yes	No	Yes	No	Yes	No	No
Clear/Reset, Clear/Reset Selection(s): The UI provides the user with a method for clearing the current selection or deselecting all selected features with a single command. ***(Required)***	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes
Select Tool, Select on Visible Layer(s): The UI allows the user to click and select all features across all visible layers at that location. ***(Optional)***	No	No	Yes	No	No	No	No	No	Yes
Select Tool, Select on Parcel Layer: The UI allows the user click and select a visible feature on the top-most layer or a pre-defined "primary" layer such as the parcel layer. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Buffer, From Polygons: The UI allows the user to select a polygon and issue a command to select all neighboring features intersected by an area created by expanding the borders of the initial polygon by a certain distance (requires the UI to support selection sets). ***(Required)***	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Buffer, From Centerpoints: The UI allows the user to select a feature and issue a command to select all neighboring features intersected by a circle whose centerpoint is defined by the centerpoint of the original feature and whose radius is a set distance (requires the UI to support selection sets). ***(Required)***	No	No	Yes	No	No	No	No	No	No
Buffer, Specified Distance: The UI allows the user to specify the buffer distance. ***(Required)***	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Buffer, Units - Meters: The UI allows the user to specify the buffer distance in the given units. ***(Optional)***	No	No	Yes	No	No	No	No	No	No
Buffer, Units - Feet: The UI allows the user to specify the buffer distance in the given units. ***(Required)***	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Export – Data									
File Type, File Geodatabase (gdb): The UI provides the user with the ability to export data in the specified format. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
File Type, Shapefile (shp): The UI provides the user with the ability to export data in the specified format. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
File Type, AutoCAD 2007 (dxf): The UI provides the user with the ability to export data in the specified format. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
File Type, AutoCAD 2007 (dwg): The UI provides the user with the ability to export data in the specified format. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
File Type, Microstation v8 (dgn): The UI provides the user with the ability to export data in the specified format. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Export – Result Set									
File Type, Portable Document Format (pdf): The UI allows the user to export the result set in the specified format. ***(Optional)***	Yes	No	Yes	No	No	No	No	No	Yes
File Type, Excel (xls, xlsx): The UI allows the user to export the result set in the specified format. ***(Optional)***	No	Yes	No	No	Yes	Yes	No	No	No
File Type, Text Delimited (csv): The UI allows the user to export the result set in the specified format. ***(Recommended)***	Yes	No	No	No	No	No	Yes	No	Yes
Export – Printing									
File Type, Portable Document Format (pdf): The UI allows the user to export the result set in the specified format. ***(Optional)***	Yes	No	Yes	No	No	No	No	No	Yes
File Type, Excel (xls, xlsx): The UI allows the user to export the result set in the specified format. ***(Optional)***	No	Yes	No	No	Yes	Yes	No	No	No
File Type, Text Delimited (csv): The UI allows the user to export the result set in the specified format. ***(Recommended)***	Yes	No	No	No	No	No	Yes	No	Yes
Layout, Pre-Defined Layout(s): The print functionality provides pre-defined templates or layouts which provide various elements such as map frames, legends, titles, etc. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Layout, Page Size Selection: The print functionality allows the user to select from a pre-defined list of layout sizes. ***(Recommended)***	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes
Layout, Page Rotation Selection: The print functionality allows the user to select portrait/landscape layouts. ***(Recommended)***	Yes	No	Yes	Yes	No	No	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Layout, Custom Map Title: The print functionality allows the user to specify a custom map title. ***(Recommended)***	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Layout, Print Scale Selection: The print functionality allows the user to specify the scale of the printed map. ***(Optional)***	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes
Layout, Legend Toggle: The print functionality allows the user to toggle the display of the map legend on/off. ***(Optional)***	Yes	No	Yes	No	No	No	No	No	Yes
Preview, Print Preview: The print functionality shows the user a preview of the printed map with their selected options. ***(Optional)***	Yes	Yes	No	Yes	No	Yes	No	No	Yes
Preview, Printed Map Extent Shown: When the user accesses the print dialog, the UI indicates the extent of the printed map as an overlay in the interface itself, so that the user has immediate visual feedback for adjusting the printed scale, etc. ***(Optional)***	Yes	No	No	Yes	No	No	No	No	Yes
Search – Tools									
Scope Limit, Search All Layers: The UI allows the user to specify whether their search query should apply to all layers. ***(Recommended)***	No	No	No	No	No	No	No	No	Yes
Scope Limit, Select single layer to search: The UI allows the user to specify a single layer to search. ***(Required)***	No	No	No	No	No	No	No	No	Yes
Scope Limit, Select multiple layers to search: The UI allows the user to select more than one layer to search ***(Recommended)***	No	No	No	No	No	No	No	No	No
Basic, Full Text Search (All Fields, etc): The search function performs a basic text search across all field(s) in the selected layer(s) ***(Required)***	Yes	No	No	No	Yes	No	No	No	Yes
Query Builder, Field Selection: The UI offers a query builder that allows the user to select specific fields within a layer. ***(Optional)***	Yes	No	No	No	No	No	No	No	Yes
Query Builder, Operators: The UI offers a query builder that allows the user to select specific search operators. ***(Optional)***	Yes	No	No	No	No	No	No	No	Yes
Query Builder, Value Auto-populate: The query builder auto-populates combo boxes or dropdowns based on the selected fields as the user types. ***(Optional)***	Yes	No	No	No	No	No	No	No	Yes
Query Builder, Multiple query parameters: The query builder allows the user to build compound queries from multiple parameter/operator/field sets. ***(Optional)***	Yes	No	No	No	No	No	No	No	Yes
Advanced, Manual-entry of query string: The user can manually enter a query rather than using a query builder. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Advanced, Validation of user-entered query: On attempting to run the manually-entered query, the UI validates it and indicates to the user if validation has failed. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Pre-Defined, Field Sets: The search functionality has pre-defined sets of relevant fields across one or more layers (i.e. a parcel	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
search interface that displays search fields for owner, parcel number, and parcel location). ***(Optional)***									
Search – Results									
List, Tabular Results: The UI displays the results of a search as a tabular list. ***(Recommended)***	Yes	No	No	No	No	No	Yes	No	Yes
List, Sort/Order (Ascending/Descending): The UI allows the user to sort the results by clicking on column headers. ***(Recommended)***	Yes	No	No	No	No	No	Yes	No	Yes
List, Clear List button: The UI allows the user to clear the search results. ***(Recommended)***	Yes	No	No	No	Yes	No	Yes	No	Yes
Select, Select Multiple Results: The UI allows the user to select multiple results in the search list. ***(Optional)***	Yes	No	No	No	No	No	No	No	No
Select, Zoom to Selected Result: The UI allows the user to automatically zoom/pan to a selected search result. ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Advanced Functionality									
Abutters, Abutter Selection (via Buffer): The UI has a tool that allows the user to select all abutters from a specific property in a result set (this requires buffer functionality). ***(Required)***	No	Yes	No	Yes	Yes	Yes	Yes	No	No
Abutters, Abutter List Generation: The UI displays a list of all abutters for the specified property (requires abutter selection, buffer tool, etc). ***(Required)***	No	Yes	No	Yes	Yes	Yes	Yes	No	No
Abutters, Abutter List to Mailing Labels: The UI provides a way to generate or export a mailing list or mailing labels for the identified abutters. ***(Required)***	No	Yes	No	Yes	Yes	Yes	Yes	No	No
Layout, Mark-Up Tools: The UI provides functionality for the user to add annotations and other markup for the purposes of printing. ***(Optional)***	No	No	No	No	Yes	No	Yes	No	No
External Links, External Files: On selecting a feature, the UI displays and allows the user to navigate to relevant external links (e.g. files, external sites, Google Maps). ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Bookmarks, Pre-Defined Location List: The UI provides a list of pre-defined locations that the user can select and pan/zoom to. ***(Recommended)***	No	No	No	No	No	No	No	No	Yes
Bookmarks, Pre-Defined Home Location: The UI provides a way for the user to return to the default map extent/home view. ***(Recommended)***	Yes	No	No	No	No	No	No	Yes	No
Bookmarks, Custom User Locations: The UI allows a user to define and save a list of custom locations. ***(Optional)***	No	No	No	No	No	No	No	No	Yes
Property Card – Summary									
Property, Photo: Property card displays a photo in the UI. ***(Required)***	Yes	Yes	Yes	Yes	No	Yes	No	No	No
Property, Sketch: Property card displays a building sketch in the UI. ***(Required)***	Yes	Yes	Yes	Yes	No	Yes	No	No	No
Property Card – Details									

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Valuation, Appraised: The UI displays the current appraised value of the selected property. ***(Required)***	No	Yes	Yes	No	No	Yes	No	No	No
Valuation, Assessed: The UI displays the current assessed value of the selected property ***(Required)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Valuation, Historical values: The UI displays historical valuations with relevant dates for appraised/assessed values. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Property, Owner(s): The UI displays the current owner of record. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Property, Land Acres: The UI displays the area of the property in acres. ***(Recommended)***	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Property, Land Use: The UI displays the land use code of the property. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	No	No	No
Property, Class/Type: The UI indicates the class or type of structure. ***(Optional)***	Yes	Yes	Yes	No	No	Yes	No	No	No
Property, Zoning: The UI indicates the property zoning. ***(Recommended)***	No	Yes	Yes	Yes	Yes	Yes	No	No	No
Property, Census Tract: The UI indicates the US Census tract for the property. ***(Optional)***	No	Yes	No	No	No	Yes	No	No	No
Property, Neighborhood: The UI indicates the neighborhood code for the property. ***(Optional)***	No	Yes	Yes	No	No	Yes	No	No	No
Property, Structure Details: The UI displays the details for the structure(s) on the property (e.g. roof material, year built, heating/utilities, etc). ***(Recommended)***	No	Yes	Yes	No	No	Yes	Yes	No	No
Property, Map/Block/Lot/Unit: The UI displays the map/block/lot/unit for the property. ***(Recommended)***	No	Yes	No	Yes	No	Yes	No	No	No
Sales, Sale Date/Price/Book-Page/History: The UI displays the sale history of the property. This also provides the owner history. ***(Recommended)***	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
Property Card – Additional Functionality									
Export, Generate Parcel Map/Assessor Map: The UI allows the user to generate a parcel map directly from a property card. ***(Optional)***	No	Yes	No	Yes	No	Yes	No	No	No
Export, Generate Printable Property Card: The UI allows the user to generate a printable property card. ***(Recommended)***	No	Yes	Yes	Yes	No	Yes	No	No	No
Export, Generate Abutters List: The UI allows the user to generate the abutters list from a property card. ***(Optional)***	No	Yes	No	Yes	No	Yes	Yes	No	No

GIS PLATFORM FEATURES

	AxisGIS	CorsonGIS	MapGeo	MapXpress	Integrator
Platform Details					
Developer	CAI Technologies	Corson GIS Solutions	AppGeo	New England GeoSystems	mPower
Engine(s)	Esri	Esri	Carto	Esri	Esri, Autodesk, OSGeo
Desktop Browser Compatibility					
Microsoft Internet Explorer (v11+)	Yes	Yes	Yes	Yes	Yes
Microsoft Edge (v38+)	Yes	Yes	Yes	Yes	Yes
Mozilla Firefox (v52+ ESR, v54+)	Yes	Yes	Yes	Yes	Yes
Apple Safari (v6.2.8+)	Yes	Yes	Yes	Yes	Yes
Google Chrome (v52+)	Yes	Yes	Yes	Yes	Yes
Mobile Browser Compatibility					
Chrome (Android/iOS)	Yes	Yes	Yes	Yes	Yes
Safari (iOS)	Yes	Yes	Yes	Yes	Yes
Navigation Functionality					
Typical Functions	Yes	Yes	Yes	Yes	Yes
Layer Controls	Yes	Yes	Yes	Yes	Yes
Basic Search Functionality					
Street Number	Yes	Yes	Yes	Yes	Yes
Street Name	Yes	Yes	Yes	Yes	Yes
Owner Name	Yes	Yes	Yes	Yes	Yes
Parcel ID	Yes	Yes	Yes	Yes	Yes
Advanced Search Functionality					
Land Use	No	Yes	No	Yes	Yes
Building Information	No	Yes	No	Yes	Yes
Land Area	No	Yes	No	Yes	Yes
Sale Date	No	Yes	No	Yes	Yes
Value	No	Yes	No	Yes	Yes
Ability to enter ranges	No	Yes	No	Yes	Yes
Selection Functionality					
From Search	Yes	Yes	Yes	Yes	Yes
Point	Yes	Yes	No	Yes	Yes
Polygon	No	Yes	No	No	Yes
Radius	No	Yes	No	No	Yes
Measurement Tools					
Linear	Yes	Yes	Yes	Yes	Yes
Area	Yes	Yes	Yes	Yes	Yes
Variable Units	Yes	Yes	No	No	Yes
Buffer Functionality					
Variable distance	Yes	No	Yes	Yes	Yes
Visible	Yes	No	Yes	Yes	Yes
Printable	Yes	No	Yes	Yes	Yes
Add/Remove Parcels	Yes	No	No	Yes	Yes
Access Mailing List	Yes	No	Yes	Yes	Yes
Markup Tools					
Visible	Yes	Yes	Yes	No	Yes
Printable	Yes	Yes	Yes	No	Yes
Property Card Functionality					
Internal	Yes	Yes	Yes	Yes	Yes
External	Yes	Yes	Yes	Yes	Yes

	AxisGIS	CorsonGIS	MapGeo	MapXpress	Integrator
PDF Replication	Yes	No	No	Yes	No
External Link Functionality					
Field Cards	Yes	Yes	Yes	Yes	Yes
Plans	Yes	Yes	Yes	Yes	Yes
Deeds	Yes	Yes	Yes	No	Yes
Permits	Yes	Yes	Yes	No	Yes
Printing Functionality					
Custom	Yes	Yes	Yes	No	Yes
Standard	Yes	Yes	Yes	Yes	Yes
Integrations					
Oblique	Yes	Yes	No	Yes	Yes
Street View	Yes	Yes	Yes	No	Yes
Photo Tool Tips	Yes	Yes	No	Yes	Yes
Building Photos	Yes	Yes	Yes	Yes	Yes

GEOSPATIAL LAYERS

	Bethel	Brookfield	Darien	New Fairfield	New Milford	Newtown	Redding	Stamford	Westport
Basemaps									
Imagery, Aerial	No	Yes	No	Yes	Yes	Yes	Yes	No	No
Imagery, Satellite	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Street Map	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Thematic	No	No	No	Yes	No	No	No	No	Yes
Topographic	Yes	No	No	Yes	Yes	No	Yes	No	Yes
Planimetric	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Boundaries									
Administrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Easements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Ecological	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Flood Zones	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Land Cover/Use	No	No	No	Yes	No	Yes	Yes	No	Yes
Parcels	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Permits	No	No	No	No	No	No	No	No	Yes
Soils	No	Yes	No	Yes	Yes	No	Yes	No	Yes
Zoning/Districts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Elevation									
Contours	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Spot Elevations	No	Yes	No	No	No	Yes	Yes	No	Yes
Hydrology									
Rivers/Streams	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Lakes/Ponds	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Watersheds	No	Yes	No	No	Yes	No	Yes	No	Yes
Wetlands	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Infrastructure									
Drainage	No	Yes	No	No	No	Yes	No	No	Yes
Railroads	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Roads, Centerlines	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Roads, Polygons	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Sidewalks	No	No	No	No	Yes	No	No	No	Yes
Utilities	Yes	Yes	No	No	No	Yes	Yes	No	Yes
Structures									
Fences/Walls	No	Yes	No	No	No	Yes	Yes	No	Yes
Buildings	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Pools	No	Yes	No	Yes	No	Yes	No	No	Yes
Paved Areas	No	Yes	No	Yes	Yes	Yes	No	No	Yes
Annotations									
PID	No	Yes	No	No	No	No	No	No	No
Map	No	No	No	No	No	No	No	No	No
Lot	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Sublot	No	No	No	Yes	Yes	No	No	No	No
Acreage	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Dimensions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Road Names	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Street Number	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Survey Number	No	No	No	No	No	No	No	No	Yes

ASSESSOR'S DATABASES

	Bethel	Bridgewater	Brookfield	Danbury	Darien	New Canaan	New Fairfield	New Milford	Newtown	Norwalk	Redding	Ridgefield	Stamford	Weston	Westport	Wilton
Parcel Search																
By Address	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
By Owner	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
By Account	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
By Map/Block/Lot/Unit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
By PID	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Fields	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Street Listing																
Street List	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Filtering	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sorted (Alphanumeric)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Sales Search																
Date (Range)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Price (Range)	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land Area (Range)	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Area (Range)	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
By Neighborhood/Zone	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
By Style/Type	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Results List	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Record View																
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Account	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
PID	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Map/Block/Lot/Unit	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appraised Value	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assessed Value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Owner of Record	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Ownership History	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Building Photo	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Sketch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Attributes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building, Year Built	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building, Living Area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building, Tabular Sub Areas	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land Use	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land Use Neighborhood/Zone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Land Line Size	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Outbuildings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Valuation History, Assessment	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Valuation History, Appraisal	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
External Map Link (Google)	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
External Map Link (Bing)	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
External Map Link (Yahoo)	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
External Map Link (GIS Portal)	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Sales History	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Permit History	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No
Comp Sales/Recent Sales	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Utilities	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No

APPENDIX B. GIS SCHEMA

RECOMMENDED ATTRIBUTES BY LAYER TYPE

PARCEL

Contains non-spatial data.

Field Name	ArcGIS Data Type	SQL Data Type	Description
ObjectID	OBJECT ID	INTEGER	ObjectID created by ArcGIS, unique.
GUID	GUID	UNIQUEIDENTIFIER	Primary key, globally unique identifier for record.
TYPE	TEXT	NVARCHAR	Parcel type
LINK_ID	TEXT	NVARCHAR	Concatenated Parcel ID allowing link to CAMA
DISPLAY_ID	TEXT	NVARCHAR	Local Parcel ID formatted for display
TOWN_ID	TEXT	NVARCHAR	
TOWN_NAME	TEXT	NVARCHAR	
PID	TEXT	NVARCHAR	Local concatenated Parcel ID
MAP	TEXT	NVARCHAR	
BLOCK	TEXT	NVARCHAR	
LOT	TEXT	NVARCHAR	
BLGD	TEXT	NVARCHAR	
SUB	TEXT	NVARCHAR	
ST_NUM	TEXT	NVARCHAR	
CURRENT_TO	DATE	DATETIME2(7)	Date record is current to
UPDATED	DATE	DATETIME2(7)	Timestamp of last update to record.
PERIMETER	DOUBLE	DECIMAL	Perimeter of polygon in feet
AREA	DOUBLE	DECIMAL	Area of polygon in acreage

RECOMMENDED ATTRIBUTES BY GEOMETRY TYPE

POINT

Zero-dimensional.

Field Name	ArcGIS Data Type	SQL Data Type	Description
ObjectID	OBJECT ID	INTEGER	ObjectID created by ArcGIS, unique.
GUID	GUID	UNIQUEIDENTIFIER	Primary key, globally unique identifier for record.
TYPE	TEXT	NVARCHAR	Parcel type
TOWN_NAME	TEXT	NVARCHAR	
TOWN_ID	TEXT	NVARCHAR	

VALUE	TEXT	NVARCHAR	
ROTATION	DOUBLE	DECIMAL	
DISPLAY_VALUE	TEXT	NVARCHAR	
CURRENT_TO	DATE	DATETIME2(7)	Date record is current to
UPDATED	DATE	DATETIME2(7)	Timestamp of last update to record.
X_COORD	DOUBLE	DECIMAL	
Y_COORD	DOUBLE	DECIMAL	
Z_COORD	DOUBLE	DECIMAL	

POLYLINE

One-dimensional.

Field Name	ArcGIS Data Type	SQL Data Type	Description
ObjectID	OBJECT ID	INTEGER	ObjectID created by ArcGIS, unique.
GUID	GUID	UNIQUEIDENTIFIER	Primary key, globally unique identifier for record.
TYPE	TEXT	NVARCHAR	Parcel type
TOWN_NAME	TEXT	NVARCHAR	
TOWN_ID	TEXT	NVARCHAR	
VALUE	TEXT	NVARCHAR	
DISPLAY_VALUE	TEXT	NVARCHAR	
CURRENT_TO	DATE	DATETIME2(7)	Date record is current to
UPDATED	DATE	DATETIME2(7)	Timestamp of last update to record.
LENGTH	DOUBLE	DECIMAL	Perimeter of polygon in feet

POLYGON

Two-dimensional.

Field Name	ArcGIS Data Type	SQL Data Type	Description
ObjectID	OBJECT ID	INTEGER	ObjectID created by ArcGIS, unique.
GUID	GUID	UNIQUEIDENTIFIER	Primary key, globally unique identifier for record.
TYPE	TEXT	NVARCHAR	Parcel type
TOWN_NAME	TEXT	NVARCHAR	
TOWN_ID	TEXT	NVARCHAR	

VALUE	TEXT	NVARCHAR	
DISPLAY_VALUE	TEXT	NVARCHAR	
CURRENT_TO	DATE	DATETIME2(7)	Date record is current to
UPDATED	DATE	DATETIME2(7)	Timestamp of last update to record.
PERIMETER	DOUBLE	DECIMAL	Perimeter of polygon in feet
AREA	DOUBLE	DECIMAL	Area of polygon in acreage

APPENDIX C. CAMA SCHEMA

FLAT SCHEMA: PARCEL MASTER

Name	Description	Data Type	Parameters	Minimum
Identification				
townname	Town Name	Text		X
townid	Town ID	Integer		X
countyname	County Name	Text		X
countyid	County ID	Integer		X
parcelid	Concatenated CAMA Parcel ID	Text		X
linkid	Concatenated CAMA Parcel ID that links to regional CAMA	Text	Links to Parcel Layer (related)	X
parceldisplayid	Parcel ID formatted for display	Text		X
camaidregional	CAMA Account/Parcel ID with Regional Prefix	Text	Unique Key	X
camaidlocal	CAMA Account/Parcel ID	Text		X
map	Map	Text		
mapcut	Map Cut	Text		
block	Block	Text		
blockcut	Block Cut	Text		
lot	Lot	Text		
lotcut	Lot Cut	Text		
unit	Unit	Text		
unitcut	Unit Cut	Text		
subunit	Sub Unit	Text		
subunitcut	Sub Unit Cut	Text		
building	Building	Text		
buildingcut	Building Cut	Text		
numberofcards	Numer of Assessment Cards	Integer		X
streetname	Parcels Street Name	Text		X
streetnumber	Parcels Street Number	Text		X
situsaddress	Physical Location of Parcel	Text		X
situszipcode	Zip Code for Physical Location of Parcel	Text		X
Owner				
Owner	Parcels Owner	Text		X
Co_Owner	Parcels Co-Owners	Text		X
Owner_Occupied	Does the owner occupy parcel	Boolean		X
Mailing_Address	Mailing Address	Text		X
Mailing_Address_2	Mailing Address_2	Text		X
Mailing_City	Mailing City	Text		X
Mailing_State	Mailing State	Text		X
Mailing_Zip	Mailing Zip	Text		X
Land				

Name	Description	Data Type	Parameters	Minimum
landareaac	Land Area (acres)	Decimal		X
landareasf	Land Area (square feet)	Integer		X
landfrontage	Parcel Frontage	Integer		
landdepth	Parcel Depth	Integer		
landuselocal	Local Land Use Code	Text		X
landuselocaldesc	Local Land Use Code Description	Text		X
landusereg	Regional Land Use Code	Text		X
landuseregdesc	Regional Land Use Code Description	Text		X
zonelocal	Local Zone Code	Text		X
zonelocaldesc	Local Zone Code Description	Text		X
localnhbd	Local Neighborhood Code	Text		X
waterfront	Water frontage in Feet	Integer		
viewfactor	View Factor	Decimal		
Valuation				
valyear1	Valuation Year 1	Decimal		X
valyear2	Valuation Year 2	Decimal		
valyear3	Valuation Year 3	Decimal		
valappbldg1	Building Appraised Value 1	Decimal		X
valappbldg2	Building Appraised Value 2	Decimal		
valappbldg3	Building Appraised Value 3	Decimal		
valappobldg1	Out Building Appraised Value 1	Decimal		X
valappobldg2	Out Building Appraised Value 2	Decimal		
valappobldg3	Out Building Appraised Value 3	Decimal		
valappxfeat1	Extra Feature Appraised Value 1	Decimal		X
valappxfeat2	Extra Feature Appraised Value 2	Decimal		
valappxfeat3	Extra Feature Appraised Value 3	Decimal		
valappimp1	Improvement Appraised Value 1	Decimal		X
valappimp2	Improvement Appraised Value 2	Decimal		
valappimp3	Improvement Appraised Value 3	Decimal		
valappland1	Land Appraised Value 1	Decimal		X
valappland2	Land Appraised Value 2	Decimal		
valappland3	Land Appraised Value 3	Decimal		
valapptotal1	Total Appraised Value 1	Decimal		X
valapptotal2	Total Appraised Value 2	Decimal		
valapptotal3	Total Appraised Value 3	Decimal		
valasdbldg1	Building Assessed Value 1	Decimal		X
valasdbldg2	Building Assessed Value 2	Decimal		
valasdbldg3	Building Assessed Value 3	Decimal		
valasdobldg1	Out Building Assessed Value 1	Decimal		X
valasdobldg2	Out Building Assessed Value 2	Decimal		
valasdobldg3	Out Building Assessed Value 3	Decimal		
valasdxfeat1	Extra Feature Assessed Value 1	Decimal		X
valasdxfeat2	Extra Feature Assessed Value 2	Decimal		

Name	Description	Data Type	Parameters	Minimum
valasdxfeat3	Extra Feature Assessed Value 3	Decimal		
valasdimp1	Improvement Assessed Value 1	Decimal		X
valasdimp2	Improvement Assessed Value 2	Decimal		
valasdimp3	Improvement Assessed Value 3	Decimal		
valasdland1	Land Assessed Value 1	Decimal		X
valasdland2	Land Assessed Value 2	Decimal		
valasdland3	Land Assessed Value 3	Decimal		
valasdtotal1	Total Assessed Value 1	Decimal		X
valasdtotal2	Total Assessed Value 2	Decimal		
valasdtotal3	Total Assessed Value 3	Decimal		
Building				
bldgcount	Number of Buildings	Integer		
bldgareag	Gross Area	Integer		X
bldgarean	Net Area	Integer		X
bldgayb	Actual Year Built	Date		X
bldgeyb	Effective Year Built	Date		X
bldgstyle	Style	Text		X
bldgmodel	Model	Text		X
bldggrade	Grade	Text		X
bldgpctgood	Percent Good	Decimal		X
bldgcondition	Condition	Text		X
bldgstories	Stories	Integer		X
bldgxwall1	Exterior Wall Type 1	Text		
bldgxwall2	Exterior Wall Type 2	Text		
bldgrooftype	Roof Type	Text		
bldgroofcover	Roof Cover	Text		
bldgiwall1	Interior Wall Type 1	Text		
bldgiwall2	Interior Wall Type 2	Text		
bldgifloor1	Floor Type 1	Text		
bldgifloor2	Floor Type 2	Text		
bldgheattype	Heat Type	Text		
bldgheatfuel	Heat Fuel	Text		
bldgactype	AC Type	Text		
bldgrooms	Total Rooms	Integer		X
bldgbedrooms	Bedrooms	Integer		X
bldgfamrooms	Family Rooms	Integer		
bldghalfbath	Half Baths	Integer		X
bldgfullbath	Full Baths	Integer		X
bldgrcn	Replacement Cost New	Decimal		X
bldgrcnld	Replacement Cost New Less Depreciation	Decimal		X
bldgextrafixt	Extra Fixtures	Integer		
bldgtotalfixt	Total Fixtures	Integer		

Name	Description	Data Type	Parameters	Minimum
bldgbathstyle	Bath Style	Text		
bldgbsmntfin	Basement Finished Area	Integer		
bldgfireplaces	No of Fireplaces	Integer		
bldgwhirlpool	No of Whirlpools	Integer		
bldgattictype	Attic Type	Text		
bldgbasemtype	Basement Type	Text		
bldgkitchstyle	Kitchen Style	Text		
Counts				
obldgcount	Outbuilding Count	Integer		X
xfeatcount	Extra Features Count	Integer		X
permitcount	Permit Count	Integer		X
External Resources				
photopath	Photo Path	Text		
photolink	Photo Link Attribute	Text		
sketchpath	Sketch Path	Text		
sketchlink	Sketch Link Attribute	Text		
gislink	GIS Site Link	Text		
camalink	CAMA Site Link	Text		X
Last Transaction				
lstsalegrantor	Sale Grantor Name	Text		X
lstsalegrantee	Sale Grantee Name	Text		
lstsaleprice	Sale Price	Decimal		X
lstsaledate	Sale date	Date		X
lstsalebook	Sale Book	Text		X
lstsalepage	Sale Page	Text		X
lstsaleinstno	Sale Instrument Number	Text		
lstsalequalification	Sale Qualification	Text		
lstsalequalificationcd	Sale Qualification Code	Text		

FLAT SCHEMA: SALES

Name	Description	Type	Parameters
camaid	CAMA Account/Parcel ID	Text	Needed as this would be stored in a related table
salegrantor	Sale Grantor Name	Text	
salegrantee	Sale Grantee Name	Text	
saleprice	Sale Price	Decimal	
saledate	Sale date	Date	
salebook	Sale Book	Text	
salepage	Sale Page	Text	
saleinstno	Sale Instrument Number	Text	
salequalification	Sale Qualification	Text	
salequalificationcd	Sale Qualification Code	Text	

EXPANDED SCHEMA: PARCEL MASTER

Name	Description	Data Type	Parameters
Identification			
townname	Town Name	Text	
townid	Town ID	Integer	
countyname	County Name	Text	
countyid	County ID	Integer	
parcelid	Concatenated CAMA Parcel ID	Text	
linkid	Concatenated CAMA Parcel ID that links to regional CAMA	Text	Links to Parcel Layer (related)
parceldisplayid	Parcel ID formatted for display	Text	
camaidregional	CAMA Account/Parcel ID with Regional Prefix	Text	Unique Key
camaidlocal	CAMA Account/Parcel ID	Text	
map	Map	Text	
mapcut	Map Cut	Text	
block	Block	Text	
blockcut	Block Cut	Text	
lot	Lot	Text	
lotcut	Lot Cut	Text	
unit	Unit	Text	
unitcut	Unit Cut	Text	
subunit	Sub Unit	Text	
subunitcut	Sub Unit Cut	Text	
building	Building	Text	
buildingcut	Building Cut	Text	
numberofcards	Numer of Assessment Cards	Integer	
streetname	Parcels Street Name	Text	
streetnumber	Parcels Street Number	Text	
situsaddress	Physical Location of Parcel	Text	
situszipcode	Zip Code for Physical Location of Parcel	Text	
Owner			
Owner	Parcels Owner	Text	
Co_Owner	Parcels Co-Owners	Text	
Owner_Occupied	Does the owner occupy parcel	Boolean	
Mailing_Address	Mailing Address	Text	
Mailing_Address_2	Mailing Address_2	Text	
Mailing_City	Mailing City	Text	
Mailing_State	Mailing State	Text	
Mailing_Zip	Mailing Zip	Text	
Land			
landareaac	Land Area (acres)	Decimal	
landareasf	Land Area (square feet)	Integer	
landfrontage	Parcel Frontage	Integer	

Name	Description	Data Type	Parameters
landdepth	Parcel Depth	Integer	
landuselocal	Local Land Use Code	Text	
landuselocaldesc	Local Land Use Code Description	Text	
landusereg	Regional Land Use Code	Text	
landuseregdesc	Regional Land Use Code Description	Text	
zonelocal	Local Zone Code	Text	
zonelocaldesc	Local Zone Code Description	Text	
localnhbd	Local Neighborhood Code	Text	
waterfront	Water frontage in Feet	Integer	
viewfactor	View Factor	Decimal	
Valuation			
valyear1	Valuation Year 1	Decimal	
valyear2	Valuation Year 2	Decimal	
valyear3	Valuation Year 3	Decimal	
valappbldg1	Building Appraised Value 1	Decimal	
valappbldg2	Building Appraised Value 2	Decimal	
valappbldg3	Building Appraised Value 3	Decimal	
valappobldg1	Out Building Appraised Value 1	Decimal	
valappobldg2	Out Building Appraised Value 2	Decimal	
valappobldg3	Out Building Appraised Value 3	Decimal	
valappxfeat1	Extra Feature Appraised Value 1	Decimal	
valappxfeat2	Extra Feature Appraised Value 2	Decimal	
valappxfeat3	Extra Feature Appraised Value 3	Decimal	
valappimp1	Improvement Appraised Value 1	Decimal	
valappimp2	Improvement Appraised Value 2	Decimal	
valappimp3	Improvement Appraised Value 3	Decimal	
valappland1	Land Appraised Value 1	Decimal	
valappland2	Land Appraised Value 2	Decimal	
valappland3	Land Appraised Value 3	Decimal	
valapptotal1	Total Appraised Value 1	Decimal	
valapptotal2	Total Appraised Value 2	Decimal	
valapptotal3	Total Appraised Value 3	Decimal	
valasdbldg1	Building Assessed Value 1	Decimal	
valasdbldg2	Building Assessed Value 2	Decimal	
valasdbldg3	Building Assessed Value 3	Decimal	
valasdobldg1	Out Building Assessed Value 1	Decimal	
valasdobldg2	Out Building Assessed Value 2	Decimal	
valasdobldg3	Out Building Assessed Value 3	Decimal	
valasdxfeat1	Extra Feature Assessed Value 1	Decimal	
valasdxfeat2	Extra Feature Assessed Value 2	Decimal	
valasdxfeat3	Extra Feature Assessed Value 3	Decimal	
valasdimp1	Improvement Assessed Value 1	Decimal	
valasdimp2	Improvement Assessed Value 2	Decimal	

Name	Description	Data Type	Parameters
valasdimp3	Improvement Assessed Value 3	Decimal	
valasdland1	Land Assessed Value 1	Decimal	
valasdland2	Land Assessed Value 2	Decimal	
valasdland3	Land Assessed Value 3	Decimal	
valasdtotal1	Total Assessed Value 1	Decimal	
valasdtotal2	Total Assessed Value 2	Decimal	
valasdtotal3	Total Assessed Value 3	Decimal	

EXPANDED SCHEMA: SALES

Name	Description	Data Type	Parameters
camaid	CAMA Account/Parcel ID	Text	Needed as this would be stored in a related table
salegrantor	Sale Grantor Name	Text	
salegrantee	Sale Grantee Name	Text	
saleprice	Sale Price	Decimal	
saledate	Sale date	Date	
salebook	Sale Book	Text	
salepage	Sale Page	Text	
saleinstno	Sale Instrument Number	Text	
salequalification	Sale Qualification	Text	
salequalificationcd	Sale Qualification Code	Text	

EXPANDED SCHEMA: BUILDING

Name	Description	Data Type	Parameters	Sample 1	Sample 2
camaid	CAMA Account/Parcel ID	Text	Needed as this would be stored in a related table		
cardno	Card Number	Integer			
bldgno	Building Number	Integer		1	1
bldgsectno	Section Number	Integer		1	1
bldgareag	Gross Area of Section	Integer		2,500	
bldgarean	Net Area of Section	Integer		2,360	5,943
bldgflr1area	First Floor Area	Integer			
bldgayb	Actual Year Built	Date		1981	1968
bldgeyb	Effective Year Built	Date		1981	1968
bldgstyle	Style	Text		Colonial	Heavy Industrial
bldgmodel	Model	Text		Residential	Ind/Com
bldggrade	Grade	Text		C+	C
bldgpctgood	Percent Good	Decimal		81	
bldgcondition	Condition	Text		Average	
bldgstories	Stories	Integer		2	1
bldgxwall1	Exterior Wall Type 1	Text		Cdar/pine/rdwd	Brick/Masonry

Name	Description	Data Type	Parameters	Sample 1	Sample 2
bldgxwall2	Exterior Wall Type 2	Text			
bldgrooftype	Roof Type	Text		Gable	Flat
bldgroofcover	Roof Cover	Text		Asphalt Shngl	Vinyl/Asphalt
bldgiwall1	Interior Wall Type 1	Text		Drywall/Sheet	
bldgiwall2	Interior Wall Type 2	Text			
bldgifloor1	Floor Type 1	Text		Harwdoos	
bldgifloor2	Floor Type 2	Text		Carpet	
bldgheattype	Heat Type	Text		Forced Air	
bldgheatfuel	Heat Fuel	Text		Oil	
bldgactype	AC Type	Text		None	
bldgrooms	Total Rooms	Integer		10	
bldgbedrooms	Bedrooms	Integer		4	
bldgfamrooms	Family Rooms	Integer			
bldghalfbath	Half Baths	Integer		2	
bldgfullbath	Full Baths	Integer		1	
bldgextrafixt	Extra Fixtures	Integer			
bldgtotalfixt	Total Fixtures	Integer			
bldgbathstyle	Bath Style	Text		Average	Average
bldgbsmntfin	Basement Finished Area	Integer			
bldgfireplaces	No of Fireplaces	Integer			
bldgwhirlpool	No of Whirlpools	Integer			
bldgattictype	Attic Type	Text			
bldgbasemtype	Basement Type	Text			
bldgkitchstyle	Kitchen Style	Text		Average	
bldgrcn	Replacement Cost New	Decimal			
bldgrcnld	Replacement Cost New Less Depreciation	Decimal		Average	
bldgcombhactype	Heat/AC Type	Text			Heat/AC Split
bldgframe	Frame Type	Text			Steel
bldgpartitions	Room/Partition Style	Text			Average
bldgceilingtype	Ceiling Type	Text			Sus-CEIL & WL
bldgwallht	Wall Height	Integer			10
bldgpercomwall	Percent Common Wall	Decimal			0
bldgunits	Building Units	Integer			

EXPANDED SCHEMA: OUTBUILDINGS

Name	Description	Data Type	Parameters	Sample 1	Sample 2	Sample 3	Sample 4
camaid	CAMA Account/Parcel ID	Text	Needed as this would be stored in a related table				
bldgno	Building Number/Card Number	Integer	Ties back to building table	1	1	1	1
obldgcode	Code	Text		FNS	PMPC	SHD1	TEN
obldgdesc	Code Description	Text		Fence 10'	Pump House Comm	Shed	Tennis Court
obldgsubcode	Sub Code	Text			CB	FR	
obldgsubdesc	Sub Code Description	Text			Cinder/Frame	Frame	
obldgunittype	Unit Type	Text		LF	SF	SF	Unit
obldgunits	Units	Integer		9,806	484	160	1
obldgvalue	Appraised Value	Decimal		95,700	101,600	1,200	21,000
obldggrade	Grade	Text					
obldgcondition	Condition	Text					
obldgayb	Actual Year Built	Date					
obldgeyb	Effective Year Built	Date					

EXPANDED SCHEMA: EXTRA FEATURES

Name	Description	Data Type	Parameters	Sample 1
camaid	CAMA Account/Parcel ID	Text	Needed as this would be stored in a related table	
bldgno	Building Number/Card Number	Integer		1
xfeatcode	Code	Text		HTUB
xfeatdesc	Description	Text		Hot Tub/Whirlpl
xfeatunittype	Unit Type	Text		Units
xfeatunits	Units	Integer		1
xfeatvalue	Value	Decimal		3,200

EXPANDED SCHEMA: PERMITS

Name	Description	Data Type	Parameters	Sample 1
linkid		Text		
prmno	Number	Integer		29169
prmdate	Date	Date		5/1/2003
permpurp	Purpose	Text		Building
permamnt	Amount	Decimal		3,000,000
permcomp	Percent Complete	Decimal		100
permcert	Certification Date	Date		9/22/2004
permflag	Flag	Text		C

EXPANDED SCHEMA: EXTERNAL RESOURCES

Name	Description	Data Type	Parameters	Sample 1
type	Type of Link	Text		Photo
linkid	Linking ID	Text		
url	URL for link	Text		//westcog/photos/

APPENDIX D. EVALUATED LAND USE CODES

MASSACHUSETTS

CODE 1 RESIDENTIAL	
10 Residences	
101	Single Family
102	Condominium
103	Mobile Home (includes land used for purpose of a mobile home park)
104	Two-Family
105	Three-Family
106	Accessory Land with Improvement - garage, etc.
107	(Intentionally left blank)
108	(Intentionally left blank)
109	Multiple Houses on one parcel (for example, a single and a two-family on one parcel)
11 Apartments	
111	Four to Eight Units
112	More than Eight Units
12 Non-Transient Group Quarters	
121	Rooming and Boarding Houses
122	Fraternity and Sorority Houses
123	Residence Halls or Dormitories
124	Rectories, Convents, Monasteries
125	Other Congregate Housing which includes non-transient shared living arrangements
13 Vacant Land in a Residential Zone or Accessory to Residential Parcel	
130	Developable Land
131	Potentially Developable Land
132	Undevelopable Land
14 Other	
140	Child Care Facility (M.G.L. Chapters 59 §3F; 40A §9C) (see also Code 352)
CODE 2 OPEN SPACE	
20 Open Land in a Residential Area	
201	Residential Open Land
202	Underwater Land or Marshes not under public ownership located in residential areas (typically, privately owned ponds, lakes, salt marshes or other wetlands of non- commercial use)
21 Open Land in Rural Area	
210	Non-Productive Agricultural Land (that part of an operating farm not classified as Chapter 61A Agricultural/Horticultural or Chapter 61 Forest Land)
211	Non-Productive Vacant Land
22 Open Land in a Commercial Area	
220	Commercial Vacant Land (acreage without site improvements and not in commercial use)
221	Underwater Land or Marshes not under public ownership located in commercially zoned area
23 Open Land in an Industrial Area	
230	Industrial Vacant Land (acreage without site improvements and not in commercial or industrial use)
231	Underwater Land or Marshes not under public ownership located in an industrial area

26 Forest Land	
261	All land designated under Chapter 61
262	Christmas Trees
27 Agricultural/Horticultural - Productive Land	
270	Cranberry Bog
271	Tobacco, Sod
272	Truck Crops - vegetables
273	Field Crops - hay, wheat, tillable forage cropland etc.
274	Orchards - pears, apples, grape vineyards etc.
275	Christmas Trees
276	Necessary related land-farm roads, ponds, land under farm buildings
277	Productive Woodland - woodlots
278	Pasture
279	Nurseries
28 Recreational Land	
280	Productive woodland -woodlots
281	Hiking - trails or paths, Camping - areas with sites for overnight camping, Nature Study - areas specifically for nature study or observation
282	Boating - areas for recreational boating and supporting land facilities
283	Golfing - areas of land arranged as a golf course
284	Horseback Riding - trails or areas
285	Hunting - areas for the hunting of wildlife and Fishing Areas
286	Alpine Skiing - areas for “downhill” skiing and Nordic Skiing - areas for “cross-country” skiing
287	Swimming Areas and Picnicking Areas 288 .....Public Non-Commercial Flying - areas for gliding or hand-gliding
289	Target Shooting - areas for target shooting such as archery, skeet or approved fire-arms
29 Agricultural/Horticultural - Non-Productive Land	
290	Wet land, scrub land, rock land
CODE 3 COMMERCIAL	
30 Transient Group Quarters	
300	Hotels
301	Motels
302	Inns, Resorts or Tourist Homes 303..... (Intentionally left blank)
304	Nursing Homes - includes property designed for minimal care with or without medical facilities
305	Private Hospitals
306	Care and Treatment Facilities - designed and used on a transient basis, including half-way houses or other types of facilities that service the needs of people
30 Storage Warehouses and Distribution Facilities	
310	Tanks Holding Fuel and Oil Products for Retail Distribution, either Above Ground or Underground (Underground tanks of service stations would be real estate, however, above ground tanks that rest on concrete saddles or steel frames that can be separated without damage are personal property.)
311	Bottled Gas and Propane Gas Tanks
312	Grain and Feed Elevators
313	Lumber Yards
314	Trucking Terminals
315	Piers, Wharves, Docks and related facilities that are used for storage and transit of goods

316	Other Storage, Warehouse and Distribution facilities (see also Industrial Code 401)
317	Farm Buildings - barns, silo, utility shed, etc.
318	Commercial Greenhouses
30 Retail Trade	
321	Facilities providing building materials, hardware and farm equipment, heating, hardware, plumbing, lumber supplies and equipment
322	Discount Stores, Junior Department Stores, Department Stores
323	Shopping Centers/Malls
324	Supermarkets (in excess of 10,000 sq. ft.)
325	Small Retail and Services stores (under 10,000 sq. ft.)
326	Eating and Drinking Establishments - restaurants, diners, fast food establishments, bars, nightclubs
33 Retail Trade - Automotive, Marine Craft and Other Engine Propelled Vehicles, Sales and Service	
330	Automotive Vehicles Sales and Service
331	Automotive Supplies Sales and Service
332	Auto Repair Facilities
333	Fuel Service Areas - providing only fuel products
334	Gasoline Service Stations - providing engine repair or maintenance services, and fuel products
335	Car Wash Facilities
336	Parking Garages
337	Parking Lots - a commercial open parking lot for motor vehicles
338	Other Motor Vehicles Sales and Services
34 Office Building	
340	General Office Buildings
341	Bank Buildings
342	Medical Office Buildings
35 Public Service Properties (see Code 9 for Exempt Public Service Properties)	
350	Property Used for Postal Services
351	Educational Properties
352	Day Care Centers, Adult (see also Code 140)
353	Fraternal Organizations
354	Bus Transportation Facilities and Related Properties
355	Funeral Homes
356	Miscellaneous Public Services - professional membership organizations, business associations, etc.
35 Cultural and Entertainment Properties	
360	Museums
361	Art Galleries
362	Motion Picture Theaters
363	Drive-In Movies
364	Legitimate Theaters
365	Stadiums
366	Arenas and Field Houses
367	Race Tracks
368	Fairgrounds and Amusement Parks
369	Other Cultural and Entertainment Properties

36 Indoor Recreational Facilities	
370	Bowling
371	Ice Skating
372	Roller Skating
373	Swimming Pools
374	Health Spas
375	Tennis and/or Racquetball Clubs
376	Gymnasiums and Athletic Clubs
377	Archery, Billiards, other indoor facilities
35 Outdoor Recreational Properties (excluding those classified under General Laws 61B)	
380	Golf Courses
381	Tennis Courts
382	Riding Stables
383	Beaches or Swimming Pools
384	Marinas - including marine terminals & associated areas primarily for recreational marine craft
385	Fish and Game Clubs
386	Camping Facilities - accommodations for tents, campers or travel trailers
387	Summer Camps - children's camps
388	Other Outdoor facilities - e.g., driving ranges, miniature golf, baseball batting ranges, etc.
389	Structures on land classified under Chapter 61B Recreational Land
39 Vacant Land - Accessory to Commercial parcel or not specifically included in another class	
390	Developable Land
391	Potentially developable Land
392	Undevelopable Land
393	Agricultural/Horticultural Land not included in Chapter 61A
CODE 4 INDUSTRIAL	
40 Manufacturing and Processing	
400	Buildings for manufacturing operations
401	Warehouses for storage of manufacturedproducts
402	Office Building - part of manufacturing operation
403	Land - integral part of manufacturing operation
404	Research and Development facilities
41 Mining and Quarrying	
410	Sand and Gravel
411	Gypsum
412	Rock
413	Other
42 Utility Properties	
420	Tanks
421	Liquid Natural Gas Tanks
423	Electric Transmission Right-of-Way
424	Electricity Regulating Substations
425	Gas Production Plants
426	Gas Pipeline Right-of Way

427	Natural or Manufactured Gas Storage
428	Gas Pressure Control Stations
40 Utility Properties - Communication	
430	Telephone Exchange Stations
431	Telephone Relay Towers
432	Cable TV Transmitting Facilities
433	Radio, Television Transmission Facilities
44 Vacant Land - Accessory to Industrial Property	
440	Developable Land
441	Potentially Developable Land
442	Undevelopable Land
45 Electric Generation Plants	
450	Electric Generation Plants
451	Electric Generation Plants, Renewable
452	Electric Generation Plants, Agreement Value
CODE 5 PERSONAL PROPERTY	
501	Individuals, Partnerships, Associations, Trusts, Limited Liability Companies and other non-incorporated entities filing for federal income tax purposes as non- incorporated entities
502	Business Corporations, as defined in Chapter 63 §30 and taxable under Chapter 63§39, including unincorporated entities treated as corporations for federal income tax purposes.
503	Classified Manufacturing Corporations*, as defined in Ch. 63 §42B, including unincorporated entities treated as corporations for federal income tax purposes.
504	Utility Corporations, other than Telephone & Telegraph and Pipeline Corporation, taxed as business corporations, including unincorporated entities treated as corporations for federal income tax purposes.
505	Machinery, Poles, Wires and Underground Conduits, Wires and Pipes of all Telephone and Telegraph Companies, as determined by the Commissioner of Revenue.
506	Pipelines of 25 Miles or More in Length for Transmitting Natural Gas or Petroleum, as determined by the Commissioner of Revenue.
508	Cellular/Mobile Wireless Telecommunications Companies
550	Electric Generation Plants Personal Property
551	Electric Generation Plant P.P., Renewable
552	Electric Generation P. P., Agreement Value
CODE 6 FOREST LAND	
601	All land designated under Chapter 61
602	Christmas Trees
CODE 7 AGRICULTURAL/HORTICULTURAL	
71 Productive Land (Including Necessary and Related Land)	
710	Cranberry Bog
711	Tobacco, Sod
712	Truck Crops - vegetables
713	Field Crops - hay, wheat, tillable forage cropland etc.
714	Orchards - pears, apples, grape vineyards etc.
715	Christmas Trees
716	Necessary Related Land-farm roads, ponds, Land under farm buildings
717	Productive Woodland - woodlots
718	Pasture

719	Nurseries
71 Non-Productive Land	
720	Wet land, scrub land, rock land
CODE 8 RECREATIONAL LAND	
801	Hiking - trails or paths
802	Camping - areas with sites for overnight camping
803	Nature Study - areas specifically for nature study or observation
804	Boating - areas for recreational boating and supporting land facilities
805	Golfing - areas of land arranged as a golf course
806	Horseback Riding - trails or areas
807	Hunting - areas for the hunting of wildlife
808	Fishing Areas
809	Alpine Skiing - areas for “downhill” skiing
810	Nordic Skiing - areas for “cross-country” skiing
811	Swimming Areas
812	Picnicking Areas
813	Public Non-Commercial Flying - areas for gliding or hand-gliding
814	Target Shooting - areas for target shooting such as archery, skeet or approved fire-arms
815	Productive Woodland - woodlots
CODE 9 EXEMPT PROPERTY	
90 Public Service Properties	
900	United States Government
901	(Intentionally left blank)
90 Commonwealth of Massachusetts – Reimbursable Land	
910	Department of Conservation and Recreation, Division of State Parks and Recreation
911	Division of Fisheries and Wildlife, Environmental Law Enforcement
912	Department of Corrections, Division of Youth Services
913	Department of Public Health, Soldiers' Homes
914	Department of Mental Health, Department of Mental Retardation
915	Department of Conservation and Recreation, Division of Water Supply Protection
916	Military Division – Campgrounds
917	Education – Univ. of Mass, State Colleges, Community Colleges
918	Department of Environmental Protection, Low-level Radioactive Waste Management Board
919	Other
90 Commonwealth of Massachusetts – Non-Reimbursable	
920	Department of Conservation and Recreation, Division of Urban Parks and Recreation
921	Division of Fisheries and Wildlife, DFW Environmental Law Enforcement, Department of Environmental Protection
922	Department of Corrections, Division of Youth Services, Mass Military, State Police, Sheriffs' Departments
923	Department of Public Health, Soldiers' Homes, Department of Mental Health, Department of Mental Retardation
924	Mass Highway Department
925	Department of Conservation and Recreation Division of Water Supply Protection conservation restrictions and sewer easements, Urban Parks
926	Judiciary
927	Education – Univ. of Mass, State Colleges, Community Colleges

928	Division of Capital Asset Management, Bureau of State Office Buildings
929	Other
93 Municipal or County Codes (GASB 34 Codes)	
930	Vacant, Selectmen or City Council 931 .....Improved, Selectmen or City Council 932 .....Vacant, Conservation
933	Vacant, Education
934	Improved, Education
935	Improved, Municipal Public Safety 936 .....Vacant, Tax Title/ Treasurer
937	Improved, Tax Title/ Treasurer 938 .....Vacant, District
939	Improved, District
94 Educational Private (GASB 34 Codes)	
940	Elementary Level
941	Secondary Level
942	College or University
943	Other Educational
944	Auxiliary Athletic
945	Affiliated Housing
946	Vacant
947	Other
95 Charitable (GASB 34 Codes)	
950	Vacant, Conservation Organizations
951	Other
952	Auxiliary Use (Storage, Barns, etc.)
953	Cemeteries
954	Function Halls, Community Centers, Fraternal Organizations
955	Hospitals
956	Libraries, Museums
957	Charitable Services
958	Recreation, Active Use
959	Housing, Other
96 Religious Groups (GASB 34 Codes)	
960	Church, Mosque, Synagogue, Temple, etc.
961	Rectory or Parsonage, etc.
962	Other
97 Authorities (GASB 34 Codes)	
970	Housing Authority
971	Utility Authority, Electric, Light, Sewer, Water
972	Transportation Authority
973	Vacant, Housing Authority
974	Vacant, Utility Authority
975	Vacant, Transportation Authority
98 Land Held by other Towns, Cities or Districts (GASB 34 Codes)	
980	Vacant, Selectmen or City Council, Other City or Town
981	Improved, Selectmen or City Council, Other City or Town
982	Vacant, Conservation, Other City or Town

985	Improved Municipal or Public Safety, Other City or Town
988	Vacant, Other District
989	Improved, Other District
99 Other	
990	121A Corporations
991	Vacant, County or Regional
992	Improved, County or Regional, Deeds or Administration
993	Improved County or Regional Correctional
994	Improved County or Regional Association Commission
995	Other, Open Space
996	Other, Non-Taxable Condominium Common Land
997	Other

NEW YORK

Code	Category	Description	Notes
100	AGRICULTURAL		
105	Agricultural Vacant Land (Productive)	Land used as part of an operating farm. It does not have living accommodations and cannot be specifically related to any of the other divisions in the agricultural category. Usually found when an operating farm is made up of a number of contiguous parcels.	
110	Livestock and Products		
111	Poultry and Poultry Products: eggs, chickens, turkeys, ducks and geese		
112	Dairy Products: milk, butter and cheese		
113	Cattle, Calves, Hogs		
114	Sheep and Wool		
115	Honey and Beeswax		
116	Other Livestock: donkeys, goats		
117	Horse Farms		
120	Field Crops	Potatoes, wheat, hay, dry beans, corn, oats, and other field crops.	
129	Acquired Development Rights	Land for which development rights have been acquired by a governmental agency (e.g., certain agricultural lands in Suffolk County).	
130	Truck Crops (Mucklands)	Muckland used to grow potatoes, sugar beets, onions, snap beans, tomatoes, cabbage, lettuce, cauliflower, sweet corn, celery, etc.	
140	Truck Crops (Not Mucklands)	Nonmuckland used to grow onions, snap beans, tomatoes, cabbage, lettuce, cauliflower, sweet corn, celery, carrots, beets, peas, etc.	
150	Orchard Crops		
151	Apples, Pears, Peaches, Cherries, etc.		
152	Vineyards		
160	Other Fruits	Strawberries, raspberries, dewberries, currants, etc.	
170	Nursery and Greenhouse	Buildings, greenhouses and land used for growing nursery stock, trees, flowers, hothouse plants, mushrooms, etc.	
180	Specialty Farms		
181	Fur Products: mink, chinchilla, etc.		
182	Pheasant, etc.		
183	Aquatic: oysterlands, fish and aquatic plants		
184	Livestock: deer, moose, llamas, buffalo, etc.		
190	Fish, Game and Wildlife Preserves		
200	RESIDENTIAL		

Code	Category	Description	Notes
210	One Family Year-Round Residence	A one family dwelling constructed for year-round occupancy (adequate insulation, heating, etc.).	If not constructed for year-round occupancy, see code 260.
215	One Family Year-Round Residence with Accessory Apartment	A one family, year round residence with a secondary self contained dwelling unit. Accessory apartments are usually contained within or added to the principle residence and are often occupied by immediate family members.	
220	Two Family Year-Round Residence	A two family dwelling constructed for year-round occupancy.	
230	Three Family Year-Round Residence	A three family dwelling constructed for year-round occupancy.	
240	Rural Residence with Acreage	A year-round residence with 10 or more acres of land; it may have up to three year-round dwelling units.	
241	Primary residential, also used in agricultural production		
242	Recreational use		
250	Estate	A residential property of not less than 5 acres with a luxurious residence and auxiliary buildings.	
260	Seasonal Residences	Dwelling units generally used for seasonal occupancy; not constructed for year-round occupancy (inadequate insulation, heating, etc.). If the value of the land and timber exceeds the value of the seasonal dwelling, the property should be listed as forest land (see category 900).	If constructed for year-round occupancy, see code 210.
270	Mobile Home	A portable structure built on a chassis and used as a permanent dwelling unit.	
271	Multiple Mobile Homes	More than one mobile home on one parcel of land; not a commercial enterprise.	
280	Residential	Multi-Purpose/Multi-Structure	
281	Multiple Residences	More than one residential dwelling on one parcel of land. May be a mixture of codes 210's, 220's, and 230's, or all one type.	
283	Residence with Incidental Commercial Use	A residence which has been partially converted or adapted for commercial use (e.g. residence with small office in basement). Primary use is residential.	
300	VACANT LAND		
310	Residential		
311	Residential Vacant Land	Vacant lots or acreage located in areas.	
312	Residential Land Including a Small Improvement (not used for living accommodations)	Includes a private garage on a parcel of land separate from the residence. Does not include a small garage where space is being rented out (see code 439).	
314	Rural Vacant Lots of 10 Acres or Less	Located in rural residential areas.	
315	Underwater Vacant Land	Underwater land, in a seasonal residential area, not owned by a governmental jurisdiction.	
320	Rural		
321	Abandoned Agricultural Land	Nonproductive; not part of an operating farm.	

Code	Category	Description	Notes
322	Residential Vacant Land Over 10 Acres	Located in rural areas.	
323	Other Rural Vacant Lands	Waste lands, sand dunes, salt marshes, swamps, rocky areas, and woods and brush of noncommercial tree species not associated with forest lands.	
330	Vacant Land Located in Commercial Areas		
331	Commercial Vacant Land with Minor Improvements		
340	Vacant Land Located in Industrial Areas		
341	Industrial Vacant Land with Minor Improvements		
350	Urban Renewal or Slum Clearance	Vacant lots or acreage undergoing urban renewal or slum clearance; improvements must be abandoned.	
351	Shell Building (Residential)	Vacant land with a residential building envelope. The improvement reflects the framework or outer structure of a building without any interior finish.	
352	Shell Building (Commercial)	Vacant land with a commercial building envelope. The improvement reflects the framework or outer structure of a building without any interior finish.	
380	Public Utility Vacant Land	Public utility company vacant land.	
400	COMMERCIAL		
410	Living Accommodations		
411	Apartments		
414	Hotel		
415	Motel		
416	Mobile Home Parks (trailer parks, trailer courts)	The mobile homes are usually owner occupied but the land and facilities are rented or leased. (See code 270 for individual mobile homes.)	
417	Camps, Cottages, Bungalows	Usually rented on a seasonal basis.	
418	Inns, Lodges, Boarding and Rooming Houses, Tourist Homes, Fraternity and Sorority Houses	Sleeping accommodations with or without meals or kitchen privileges.	
420	Dining Establishments		
421	Restaurants	Facilities which serve full course meals with or without legal beverages.	
422	Diners and Luncheonettes	Usually year-round facilities with counter service and limited seating.	
423	Snack Bars, Drive-Ins, Ice Cream Bars	Usually seasonal, with window and/or car service, possibly limited counter service (e.g., A&W Root Beer, Tastee Freeze Ice Cream, etc.).	
424	Night Clubs	Facilities which feature an extensive menu, legal beverages and live entertainment.	
425	Bar	Facilities which serve only legal beverages, not food.	

Code	Category	Description	Notes
426	Fast Food Franchises	Year-round, with counter service, limited menus and a drive-up window (e.g., McDonald's, Burger King, etc.).	
430	Motor Vehicle Services		
431	Auto Dealers (Sales and Service)	Includes truck or farm machinery dealerships, auto or truck rental agencies, motor home sales and service facilities, etc.	
432	Service and Gas Stations	Sell gasoline and/or provide minor repairs and services.	
433	Auto Body, Tire Shops, Other Related Auto Sales	Specialized auto equipment and repair (e.g., Goodyear Tire Center, Firestone Stores, etc.).	
434	Automatic Car Wash	Car is pulled through a series of cleaning processes.	
435	Manual Car Wash	Car is driven into a stall; revolving brushes rotate around the car (semiautomatic).	
436	Self-Service Car Wash	Usually a multi stall structure featuring a car owner operated coin system with spray type hoses for washing and rinsing a car.	
437	Parking Garage	Usually a multistory structure with elevators and/or ramps, used mainly for car storage.	
438	Parking Lot	A commercial open parking lot for motor vehicles.	
439	Small Parking Garage	A garage with two or more stalls, usually found in a residential area, being rented for parking.	
440	Storage, Warehouse and Distribution Facilities		
441	Fuel Storage and Distribution Facilities	Facility for fuel storage and distribution including gasoline, oil, liquid petroleum bottled gas, natural gas, and coal.	
442	Mini Warehouse (Self Storage)	This use reflects the partitioned warehouse space used for multiple tenant self service storage.	
443	Grain and Feed Elevators, Mixers, Sales Outlets		
444	Lumber Yards, Sawmills		
445	Coal Yards, Bins		
446	Cold Storage Facilities	Used for perishables, produce or other items.	
447	Trucking Terminals		
448	Piers, Wharves, Docks and Related Facilities		
449	Other Storage, Warehouse and Distribution Facilities		
450	Retail Services		
451	Regional Shopping Centers	Multi occupant facilities with ten or more stores, usually featuring a large department store or two, and ample paved parking.	
452	Area or Neighborhood Shopping Centers	Smaller shopping facilities which usually feature a junior department store, several other stores, and ample parking; may include a supermarket.	
453	Large Retail Outlets	These facilities are usually complemented by a large supermarket and have ample parking (e.g., Ames, Wal-Mart, etc.).	

Code	Category	Description	Notes
454	Large Retail Food Stores	These facilities usually belong to a chain and sell food and sundry items (e.g., Price Chopper, Hannaford, Topps, Wegmans, P&C, Big M, etc.).	
455	Dealerships (Sales and Service other than auto with large sales operation)	Boats (also refer to code 570), snowmobiles, garden equipment, etc.	
460	Banks and Office Buildings		
461	Standard Bank/Single Occupant		
462	Drive-In Branch Bank		
463	Bank Complex with Office Building		
464	Office Building		
465	Professional Building		
470	Miscellaneous Services		
471	Funeral Homes		
472	Dog Kennels, Veterinary Clinics		
473	Greenhouses		
474	Billboards		
475	Junkyards		
480	Multiple Use or Multi-purpose	A building readily adaptable, with little physical change, for more than one use or purpose.	
481	Downtown Row Type (with common wall)	Usually a two or three story older structure with retail sales/services on the first floor and offices and/or apartments on the upper floors; little or no on-site parking.	
482	Downtown Row Type (detached)	The same type of use as in code 481, above, but this is a separate structure without party walls.	
483	Converted Residence	A building usually located in a residential area, which has been partially converted or adapted for office space (e.g., a doctor's or dentist's office with an apartment upstairs).	
484	One Story Small Structure	Usually a modern, one occupant, building adaptable for several uses (e.g., retail clothing store, small office, warehouse, pet shop, etc.).	
485	One Story Small Structure (Multi occupant)	Usually partitioned for two or more occupants, such as a liquor store, drug store, and a laundromat; limited parking on site.	
486	Minimart	Combination snack bar, market and gas station.	
500	RECREATION AND ENTERTAINMENT		
510	Entertainment Assembly		
511	Legitimate Theaters	Used primarily for live presentations of the performing arts (opera, drama, musicals, symphonies, ballet, etc.).	
512	Motion Picture Theaters (excludes drive-in theaters)		
513	Drive-In Theaters		
514	Auditoriums, Exhibition and Exposition Halls		

Code	Category	Description	Notes
515	Radio, T.V. and Motion Picture Studios		
520	Sports Assembly		
521	Stadiums, Arenas, Armories, Field Houses		
522	Racetracks	Used for auto, horse, motorcycle, go-cart, or drag racing.	
530	Amusement Facilities		
531	Fairgrounds		
532	Amusement Parks		
533	Game Farms		
534	Social Organizations	Elks, Moose, Eagles, and Veterans' Posts, etc., whose primary purpose is social activities for members.	
540	Indoor Sports Facilities		
541	Bowling Centers		
542	Ice or Roller Skating Rinks		
543	YMCA's, YWCA's, etc.		
544	Health Spas		
545	Indoor Swimming Pools		
546	Other Indoor Sports	Tennis courts, archery ranges, billiard centers, etc.	
550	Outdoor Sports Activities		
551	Skiing Centers	May include sleeping and dining facilities; not ski facilities of resort complexes.	
552	Public Golf Courses	May include other associated sports facilities and/or dining facilities.	
553	Private Golf Country Clubs	Includes those with other sports and dining facilities.	
554	Outdoor Swimming Pools		
555	Riding Stables		
556	Ice or Roller Skating Rinks (may be covered)		
557	Other Outdoor Sports	Driving ranges, miniature golf, tennis, baseball, batting ranges, polo fields, etc.	
560	Improved Beaches	Improvements include bath houses, parking facilities, etc.	
570	Marinas	Improvements include docks and piers, boat storage facilities, repair shops, etc.	
580	Camps, Camping Facilities and Resorts		
581	Camps	Used by groups of children and/or adults.	
582	Camping Facilities	Improved areas/parks with accommodations for tents, campers or travel trailers or RV's.	
583	Resort Complexes	Dude ranches, resort hotels with sports facilities, etc.	
590	Parks		
591	Playgrounds		
592	Athletic Fields		
593	Picnic Grounds		

Code	Category	Description	Notes
600	COMMUNITY SERVICES		
610	Education		
611	Libraries		
612	Schools	General, elementary and secondary.	
613	Colleges and Universities		
614	Special Schools and Institutions	Used for the physically or mentally impaired.	
615	Other Educational Facilities		
620	Religious		
630	Welfare		
631	Orphanages		
632	Benevolent and Moral Associations		
633	Homes for the Aged		
640	Health		
641	Hospitals		
642	All Other Health Facilities		
650	Government		
651	Highway Garage	Used for the storage and maintenance of highway equipment by any governmental jurisdiction; includes associated land.	
652	Office Building	Owned by any governmental jurisdiction; includes associated land.	
653	Parking Lots	Owned by any governmental jurisdiction; includes land and appurtenant structures such as open single level lots as well as multilevel parking garages.	
660	Protection		
661	Army, Navy, Air Force, Marine and Coast Guard	Installations, Radar, etc.	
662	Police and Fire Protection, Electrical Signal	Equipment and Other Facilities for Fire, Police, Civil Defense, etc.	
670	Correctional	Used by any governmental jurisdiction for housing within the criminal justice system.	
680	Cultural and Recreational		
681	Cultural Facilities	Museums, art galleries, etc.	
682	Recreational Facilities	Nature trails, bike paths, etc.	
690	Miscellaneous		
691	Professional Associations		
692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land		
693	Indian Reservations		

Code	Category	Description	Notes
694	Animal Welfare Shelters		
695	Cemeteries		
700	INDUSTRIAL		
710	Manufacturing and Processing		
712	High Tech. Manufacturing and Processing	These buildings are used as research laboratories with a high percentage of office/laboratory space. The construction costs of these facilities are higher than other warehouse/manufacturing facilities reflecting their architectural design, super adequate upgrades, and more comprehensive finish.	
714	Light Industrial Manufacturing and Processing	These structures may have been built for a specific manufacturing process. They feature high ceilings and open construction which allows for good workflow.	
715	Heavy Manufacturing and Processing	These are large area structures design and built for production. They will have extensive concrete foundations for industrial equipment and a high voltage electrical system.	
720	Mining and Quarrying	This category includes parcels used in or necessary adjunct to the provision of mining and quarrying, i.e., sand and gravel, limestone, trap rock, salt, iron and titanium, talc, lead and zinc, gypsum, and other mining and quarrying.	
730	Wells		
731	Oil	Natural Flow (for production)	
732	Oil	Forced Flow (for production)	
733	Gas (for production)		
734	Junk		
735	Water used for Oil Production		
736	Gas or Oil Storage Wells		
740	Industrial Product Pipelines	Pipelines used by nonutility companies, and not in Special Franchise.	
741	Gas		
742	Water		
743	Brine		
744	Petroleum Products		
749	Other		
800	PUBLIC SERVICES		
820	Water		
821	Flood Control	Land used for the accumulation, storage or diversion of water for flood control purposes only.	
822	Water Supply	Land used for the accumulation, storage, transmission or distribution of water for purposes other than flood control or production of electricity (e.g., aqueducts and pipelines).	
823	Water Treatment Facilities		
826	Water Transmission	Improvements	
827	Water Transmission	Outside Plant	
830	Communication	Includes all telephones, telecommunications, telegraph, radio, television and CATV property.	

Code	Category	Description	Notes
831	Telephone	Telephone and telecommunications land, buildings, towers, antennae, etc., except cellular telephone towers - see 837	
832	Telegraph		
833	Radio		
834	Television other than Community Antenna Television		
835	Community Antenna Television		
836	Telephone Outside Plant	Poles, wires, cable, etc.	
837	Cellular Telephone Towers		
840	Transportation		
841	Motor Vehicle	Land used in the provision of transportation services by motor vehicles (e.g., bus terminals, taxicab garages, truck terminals and warehouses, etc.). Does not include public highways, bridges, tunnels, subways and property used in the maintenance (except by persons providing transportation services), manufacture and sale of motor vehicles.	
842	Ceiling Railroad	Real property for which the State Board establishes the maximum taxable assessed value.	
843	Nonceiling Railroad		
844	Air		
845	Water	Land used for water transportation (e.g., canal).	
846	Bridges, Tunnels and Subways		
847	Pipelines	Pipelines used by utility companies for the transportation of petroleum products.	This code will be deleted once the Utility Company Assessment Roll Standards (UCARS) have been adopted. After that the appropriate Pipeline designation should be chosen from the 740 series.
850	Waste Disposal	Does not include facilities used exclusively for the disposal of waste from an industrial process, which should be coded as industrial property.	
851	Solid Wastes	Incinerators and waste compacting facilities. Does not include landfills and dumps (see code 852).	
852	Landfills and Dumps		
853	Sewage Treatment and Water Pollution Control		
854	Air Pollution Control		
860	Special Franchise Property	Real property for which the State Board establishes assessments.	
861	Electric and Gas		
862	Water		
866	Telephone		

Code	Category	Description	Notes
867	Miscellaneous		
868	Pipelines		
869	Television		
870	Electric and Gas		
871	Electric and Gas Facilities	General electric and gas facilities, buildings, and land including offices, garages, service centers, etc.	
872	Electric SubStation	Electric Power Generation Facilities. Includes all land and facilities associated with electric generating stations, i.e. power plant equipment, reservoirs, dams, power house, penstock pipe, waterway structures, etc.	
873	Gas Measuring and Regulation Station		
874	Electric Power Generation Facility	Hydro	
875	Electric Power Generation Facility	Fossil Fuel	
876	Electric Power Generation Facility	Nuclear	
877	Electric Power Generation Facility	Other Fuel	
880	Electric and Gas Transmission and Distribution		
882	Electric Transmission Improvement		
883	Gas Transmission Improvement		
884	Electric Distribution	Outside Plant Property	
885	Gas Distribution	Outside Plant Property	
900	WILD, FORESTED, CONSERVATION LANDS AND PUBLIC PARKS		
910	Private Wild and Forest Lands except for Private Hunting and Fishing Clubs	This division includes all private lands which are associated with forest land areas that do not conform to any other property type classification, plus plantations and timber tracts having merchantable timber.	
911	Forest Land Under Section 480 of the Real Property Tax Law		
912	Forest Land Under Section 480-a of the Real Property Tax Law		
920	Private Hunting and Fishing Clubs		
930	State Owned Forest Lands		
931	State Owned Land (Forest Preserve) in the Adirondack or Catskill Parks Taxable Under Section 532-a of the Real Property Tax Law		

Code	Category	Description	Notes
932	State Owned Land Other Than Forest Preserve Covered Under Section 532-b, c, d, e, f, or g of the Real Property Tax Law		
940	Reforested Land and Other Related Conservation Purposes		
941	State Owned Reforested Land Taxable Under Sections 534 and 536 of the Real Property Tax Law		
942	County Owned Reforested Land		
950	Hudson River and Black River Regulating District Land		
960	Public Parks		
961	State Owned Public Parks, Recreation Areas, and Other Multiple Uses		
962	County Owned Public Parks and Recreation Areas		
963	City/Town/Village Public Parks and Recreation Areas		
970	Other Wild or Conservation Lands		
971	Wetlands, Either Privately or Governmentally Owned, Subject to Specific Restrictions as to Use		
972	Land Under Water, Either Privately or Governmentally Owned (other than residential	more properly classified as code 315)	
980	Taxable State Owned Conservation Easements		
990	Other Taxable State Land Assessments		
991	Adirondack Park Aggregate Additional Assessments (Real Property Tax Law, Section 542(3))		
992	Hudson River-Black River Regulating District Aggregate Additional Assessments (Environmental		

Code	Category	Description	Notes
	Conservation Law, Section 15-2115)		
993	Transition Assessments for Taxable State Owned Land (Real Property Tax Law, Section 545)		
994	Transition Assessments for Exempt State Owned Land (Real Property Tax Law, Section 545)		

NEW HAMPSHIRE

PROPERTY CODES	PROPERTY TYPES	CONDENSED NAME	*CLASS	**CLASSIFICATION CODES
Improved Residential Land & Building or Building Only Codes				
11	Single Family Home	SFHM	R	GC1
12	Multi-Family 2-4 Units	MFHM	R	GC1
13	Apartment Building 5+ Units	APT5	C	GC1
14	Single Residential Condominium Unit - Even if the unit is part of multi unit block - Condex	RC1U	R	GC1
15	Residential Condominium 2-4 Unit Building - purchase of multiple units	RC24	R	GC1
16	Residential Condominium 5+ Unit Building - purchase of multiple units	RC5+	C	GC1
17	Manufactured Housing with Land (see definition in Glossary)	MHWL	R	GC1
18	Manufactured Housing without Land (see definition in Glossary) RSA 674:31 (metal frame, permanent chassis)	MHNL	R	GC1
19	Unclassified/Unknown Improved Residential - Land/Camper/Camp/Garage outbldg	UUIR	U	GC1
20	Building Only - Residential (Land Leased Properties) RSA 674:31-a (Includes pre-site built housing)	RSBO	R	GC1
Land Only Codes				
22	Residential Land	RESL	R	GC3
23	Commercial Land	COML	C	GC3
24	Industrial Land	INDL	I	GC3
25	Mixed Use Residential/Commercial Land	RECL	C	GC3
26	Mixed Use Commercial/Industrial Land	CMIL	C	GC3
27	Unclassified/Unknown Land	UUKL	U	GC3
Non-Residential Land & Building Codes				
33	Commercial Land & Building	CMLB	C	GC2
34	Industrial Land & Building	INLB	I	GC2
35	Mixed Use Residential/Commercial Land & Building	RCLB	C	GC2
36	Mixed Use Commercial/Industrial Land & Building	CILB	C	GC2
37	Unclassified/Unknown Non-Residential Land & Building	UULB	U	GC2
38	Building Only - Commercial/Non-Residential	NRBO	C	GC2
Non-Residential Condo Codes				
44	Commercial Condominium	COMC	C	GC2
45	Industrial Condominium - Airport Hangars	INDC	I	GC2
46	Unclassified/Unknown Non-Residential Condominium	UUNC	U	GC2
Other Codes				
55	Boatslip Only - Dockominium	BSLP	R	GC4
56	Condominiumized Land Site - Campgrounds	COLS	R	GC4
57	Unclassified/Unknown Other - Easements	UUOT	U	GC4
58	Garage/Storage Unit - Condo garage spaces, parking	STUT	R	GC4
59	Dry Berth	DBTH	R	GC4
CODE	**MODIFIER CODES**	**CONDENSED NAME**		
70	Waterfront	WTRF		
71	Water Access	WTRA		
72	Island	ISLD		
73	Waterfront Influence	WTRI		
74	View +	VEW+		
75	View -	VEW-		

AMERICAN PLANNING ASSOCIATION

The American Planning Association documents for Land Use Codes are available in PDF format from the following links:

- Land-Based Classification Standards: LBCS Tables
- Land-Based Classification Standards: Examples of Classification and Coding Schemes Collected for the LBCS Project
- Land-Based Classification Standards: Five Dimensions for Classifying Land-Use Data

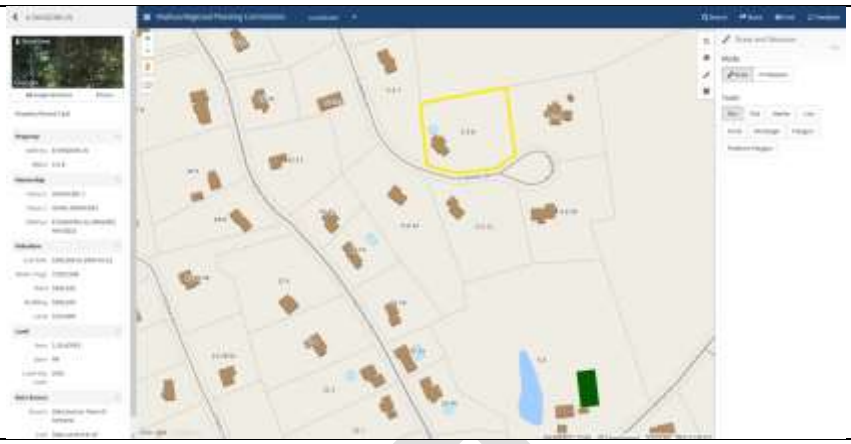
APPENDIX E. APPLICATIONS REVIEWED

CAI TECHNOLOGIES-AXISGIS

Company Name	CAI Technologies
Location	Littleton, NH
Website	www.cai-tech.com/
Mission Statement	Since Cartographic Associates, Inc. was founded in 1985, our mission has been to develop long-term, mutually beneficial relationships with our clients. As CAI Technologies, our mission has not changed. While technology, processes, and virtually everything else in our world continues to change, our staff members' commitment to our clients' success has not. The CAI Technologies team listens to our clients' needs, understands how to utilize technology and delivers optimal solutions for success. At CAI Technologies we are very proud to serve all our clients, large and small, and we recognize that our success is tied directly to theirs
Product Name	AxisGIS
Product Site	https://www.axisgis.com/WindhamNH/
Server Engine	Esri ArcEnterprise (using AWS) (http://www.esri.com/)
Hosting Options	Cloud Only
Screen Shot	
Estimated Setup	$5,000-$10,000
Estimated Annual	$30,000-$35,000
Estimated Extra Costs	$1,000/town to Batch replicate field cards

APPGEO-MAPPGEO

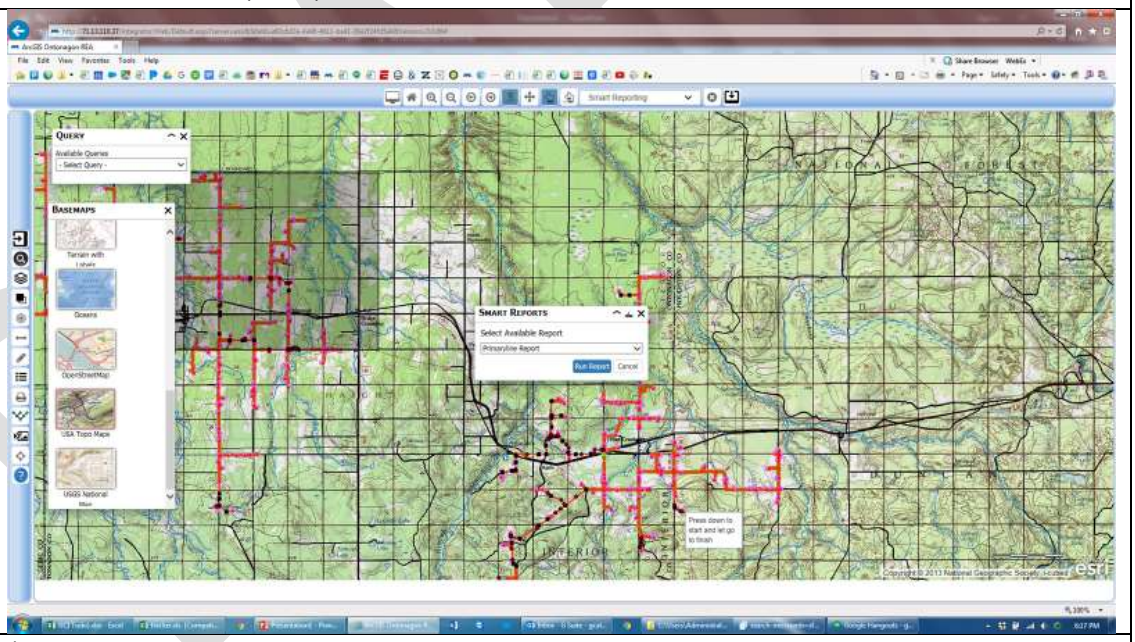
Company Name	Applied Geographics (AppGeo)
Location	Boston, MA
Website	https://www.appgeo.com/
Mission Statement	We believe that information referenced to geography empowers government, citizens and businesses to operate with greater efficiency, deliver improved services, and make better decisions.
Product Name	MapGeo
Product Site	https://stocktonca.mapgeo.io/?latlng=37.973764%2C-121.284422&zoom=12

Server Engine	Carto (https://carto.com/)
Hosting Options	Cloud Only
Screen Shot	
Estimated Setup	$14,000
Estimated Annual	$12,000
Estimated Extra Costs	

CORSONGIS-CUSTOM SOLUTION

Category	Value
Company Name	CorsonGIS
Location	Portland, ME
Website	http://corsongis.com/
Mission Statement	Corson GIS Solutions is a web-mapping solutions provider and Esri Business Partner. With 20 years of comprehensive Geographic Information System experience, Corson GIS Solutions understands how to build affordable web and mobile solutions to solve our customer's industry-specific needs.
Product Name	Develops custom solutions using ArcGIS stack
Product Site	https://webapps2.cgis-solutions.com/peterboroughnh/parcel/
Server Engine	Esri ArcEnterprise (using AWS) (http://www.esri.com/)
Hosting Options	Cloud Only
Screen Shot	
Estimated Setup	$10,000
Estimated Annual	$10,000

MPOWER INNOVATION-INTEGRATOR

Category	Value
Company Name	mPower Innovations
Location	Appleton, WI
Website	http://www.mpowerinnovations.com/
Mission Statement	mPower Innovations is a developer of innovative GIS software solutions that draws upon more than 30 years experience in the geospatial industry. We empower our clients by eliminating costly third party consulting and proprietary development that many other consultants and software providers require. mPower Integrator is an advanced software solution that takes Web GIS functionality and ease of use to a new level. Our clients can easily develop, distribute and own their own advanced, robust GIS applications. With Integrator you can access any ODBC data source, perform administrative tasks, assign user rights, and passwords. The user interface is very intuitive and requires no technical programming. "Pick and Click" wizards are used to quickly create queries, reports, assign new users, access rights and more.
Product Name	Integrator
Product Site	http://gis.co.plymouth.ia.us/Integrator/Web/Default.aspx?server=mapguide&SiteId=43bc5ca8-81f2-4630-a140-456c6a4de936
Server Engine	Esri ArcEnterprise(http://www.esri.com/), AutoDesk Infrastructure Map Server (https://www.autodesk.com/products/infrastructure-map-server/overview), OSGEO Mapguide Open Source (http://www.osgeo.org/)
Hosting Options	Local Network, Cloud (Azure)
Screen Shot	
Estimated Setup	$25,000
Estimated Annual	$4,000

NEW ENGLAND GEO

Company Name	New England GeoSystems
Location	Middleton, CT

Website	http://www.ne-geo.com/
Mission Statement	We are confident that New England GeoSystems' commitment to success and our ability to develop and adapt to our clients way of doing business will result in a successful GIS implementation as well as establish a beneficial and positive long-term relationship. I feel that not only will we provide you with excellent service, unmatched quality, and competitive and flexible pricing but I believe that we will establish the relationship you are looking for in a GIS / Mapping / Internet consultant.
Product Name	mapXpress
Product Site	http://maps.newtown-ct.gov/ags_map/
Server Engine	Esri ArcEnterprise (using AWS) (http://www.esri.com/)/Geocortex (http://www.geocortex.com/)
Hosting Options	Cloud/Internal
Screen Shot	
Estimated Setup	$20,000-$25,000
Estimated Annual	$18,000