



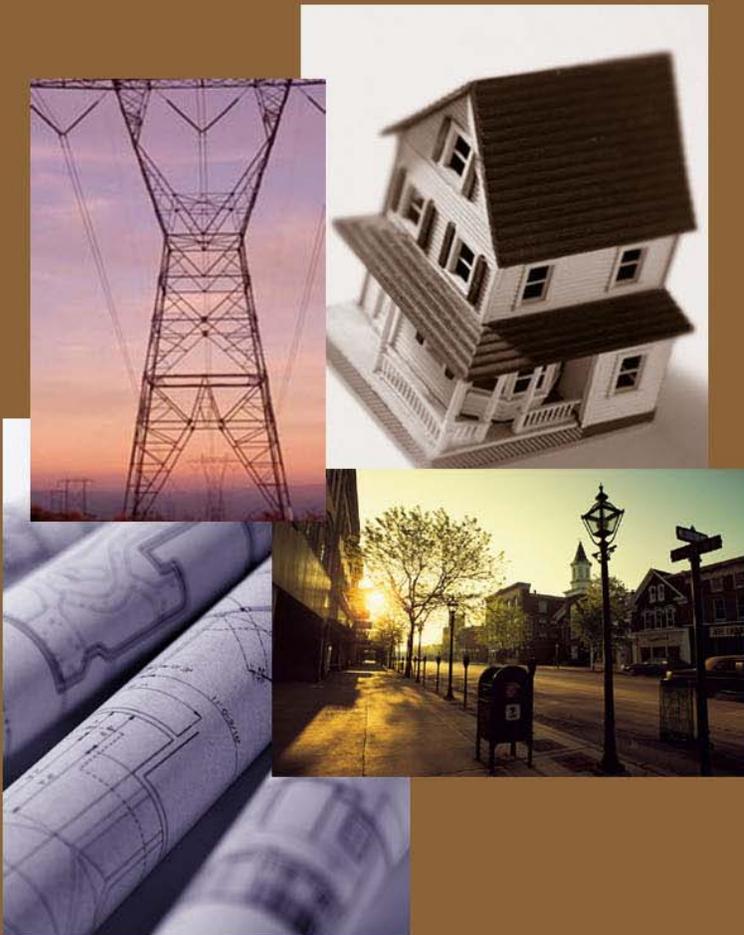
Center for
Technology in Government

Use of Parcel Data in New York State: A Reconnaissance Study

Meghan E. Cook
Sharon S. Dawes
Natalie C. Helbig
Roger J. Lishnoff

Center for Technology in Government
University at Albany, SUNY
187 Wolf Road
Albany, NY 12205
Phone: (518) 442-3892
Fax: (518) 442-3886
e-mail: info@ctg.albany.edu
<http://www.ctg.albany.edu>

June 2005



© 2005 Center for Technology in Government

The Center grants permission to reprint this document provided this cover page is included.

Table of Contents

EXECUTIVE SUMMARY	3
INTRODUCTION	6
PURPOSE OF THE STUDY.....	6
PARCEL DATA IN HISTORICAL CONTEXT.....	7
DEFINITION(S) OF PARCEL DATA	8
STAKEHOLDERS	11
USES OF PARCEL DATA	12
VALUE OF PARCEL DATA	17
TYPICAL FLOW OF PARCEL DATA IN NEW YORK STATE	19
ANALYSIS & ISSUES	22
STAKEHOLDER INTERESTS	22
ISSUES ASSOCIATED WITH DATA COLLECTION AND REPORTING	23
ISSUES ASSOCIATED WITH DATA USE	24
ISSUES ASSOCIATED WITH DATA MANAGEMENT	26
ISSUES ASSOCIATED WITH DATA SUPPLY AND DISTRIBUTION	26
PRINCIPLES FOR ENHANCING THE USE AND VALUE OF PARCEL DATA	27
APPENDIX A: STUDY METHODOLOGY	29
APPENDIX B: ORGANIZATIONS INTERVIEWED	30
APPENDIX C: SELECTED REFERENCES	31

Executive Summary

Land parcels are the foundation for many aspects of public and community life. This report presents the findings of a reconnaissance study of information about land parcels in New York State. Broadly defined, this information includes data about parcels that describe their nature, location, use, and association with physical and political geography. The purpose of the study, sponsored by the New York State Office of Real Property Services, was to provide information to help shape strategies for broader understanding and more effective use of parcel data in New York State. Accordingly, it identifies stakeholders and their interests as well as the needs and issues associated with the uses of parcel data in the public, private, and nonprofit sectors.

Parcel information pertains to the smallest unit or lowest common denominator of land ownership. Parcels in land-oriented systems are roughly analogous to cells in an organism; they represent the basic building blocks of larger units and systems. This study approaches the topic of parcel data with a goal of understanding its fundamental characteristics or dimensions. The data for this study was gathered primarily through 35 interviews with people in local and state government, private companies, and non profit organizations located throughout New York State.

Defining Parcel Data

The definition of parcel data depends on its intended use. Interviewees in the study usually defined “parcel data” by describing how they *use* it to support their work. Interviewees identified many elements of parcel data, but no two described it in exactly the same way. Taken together, their descriptions comprise a long list of specific attributes that can be divided into eight categories:

- parcel identification
- parcel location
- ownership
- occupancy and use
- structures and improvements
- taxation
- physical geography
- infrastructure

Range and Value of Parcel Data Uses

The use of parcel data conveys great value to individuals and to public, private, and non-profit organizations. This information is used for a very wide range of purposes from disputing boundary lines, to marketing products to targeted populations, to making disaster recovery plans. Most interviewees reported that parcel data is essential to their core functions. Parcel data uses identified and illustrated in this study can be categorized as addressing, billing, boundary setting, buying and selling land, design and engineering, districting, emergency response, marketing, notification and outreach,

permitting/enforcement, planning, public health monitoring, real property taxation, routing, siting, and zoning.

Stakeholders and Their Interests

Given such a wide array of uses, a similarly wide range of public, private, and non-profit organizations, as well as individuals, have a strong interest in parcel data. Direct stakeholders identified in this study include:

- Real Property Assessors
- Community/Neighborhood Groups
- County Real Property Tax Services Offices
- Non-Profit Professional Organizations
- Other County and Municipal Government Agencies
- Private Companies
- State Government Agencies
- Property Owners
- Property Occupants

Stakeholders play any or all of three main roles with respect to parcel data. These roles are data collectors, who gather parcel information directly from the field; parcel data users, who use parcel data to support their core functions; and data suppliers, who distribute data to other users. Some of the central issues identified in this study relate to the stakeholders and their interests including:

- **Accuracy, timeliness, and consistency.** All stakeholders are interested in accuracy, timeliness, and consistency of data, but at different levels and for different reasons.
- **Digital, on-line, and single point of access.** Most organizations interviewed would prefer a digital, online, single point of access source for parcel data.
- **Revenue generation.** The greatest divide among stakeholders occurs over the question of whether parcel data should be a source of revenue.

Flow and Management of Parcel Data

By tracing the flow of parcel data from the interviewees' organizations to others, we were able to construct a picture of the typical parcel data flow in New York State. In general, parcel data flows in two ways: (1) through routine and systematic channels associated with real property tax administration and (2) through many ad-hoc requests involving users outside the real property tax administration system. This arrangement generates several important issues. First, as data coverage moves from smaller to larger geographic areas, the detail and timeliness of the data decreases. The most detailed and up-to-date information pertains to and is maintained by localities. Very few, infrequently updated data elements are available from any source for the entire state. Consequently, regional and statewide uses of parcel data depend on the user's ability to construct a wider picture from many smaller units of information; and these in turn

depend on many separate requests to county and municipal sources. Second, users often discover errors or make improvements to parcel data but, with very few exceptions, no mechanisms exist for them to return corrections or improvements to the data sources. Third, policies and practices for responding to data requests from users are neither uniform nor predictable from time to time or place to place. Several alternative data management programs are in place at both the state and local levels that address some of these issues.

Principles For Treating Parcel Data as a Collective or Statewide Resource

Parcel data is fundamentally important to a wide range of organizations. Each organization has its own mission and practices, but all have one thing in common – parcel data is vital to their work. The findings of this study demonstrate the potential benefits, and the key difficulties, of treating parcel data as a collective or statewide information resource. Under New York State law, responsibility for parcel data is distributed among many organizations at the state, county, and municipal levels. As a consequence, changes in the treatment of parcel data will require a high degree of consensus. We therefore conclude by offering a set of principles that might guide a collaborative approach to future discussions, decisions, and investments.

- ***Broad recognition of parcel data content, value, and uses.*** A broader appreciation for the many ways people think about and use parcel data can encourage opportunities for collaboration and joint investments.
- ***Standard parcel identification and location information.*** A common parcel identification scheme would allow data users to integrate and merge data from multiple counties and municipalities across New York State.
- ***On-line access in a variety of formats.*** Most users want ready access to electronic parcel information, ideally on the web, and via a self-service process.
- ***Ready access to authoritative sources.*** Many users would prefer a single authoritative source for all parcel data in the state, but many would also be satisfied with multiple sources that follow the same standards and policies.
- ***Feedback from data users to data sources for data improvement.*** By providing data users the opportunity and a mechanism to communicate corrections and enhancements back to the source, the overall integrity and quality of parcel data can improve with increasing benefit to all future users.
- ***Balanced approaches to the costs and benefits associated with collection, use, and supply.*** Progress toward treating parcel data as a collective resource will depend on willingness to discuss, experiment with, and evaluate policies and practices that balance costs and benefits for all stakeholders.

Introduction

Purpose of the study

Land parcels are the foundation for many aspects of public and community life. This report presents the findings of a reconnaissance study of information about land parcels in New York State. Broadly conceived, this information includes data about parcels that describe their nature, location, use, and association with physical and political geography. The purpose of the study, sponsored by the New York State Office of Real Property Services, was to provide information to help shape strategies for broader understanding and more effective use of parcel data in New York State. Accordingly, it identifies stakeholders and their interests as well as the needs and issues associated with the uses of parcel data in the public, private, and nonprofit sectors.

A reconnaissance study approaches a complex topic with the goal of understanding its fundamental characteristics or dimensions. It is not exhaustive or definitive in detail, but attempts to paint a broadly representative picture in wide brush strokes. The data for this study was gathered primarily through 35 interviews with people in local and state government, private companies, and non profit organizations located throughout New York State. We also made use of published report and web research. We believe the picture we paint in this report is accurate and captures the basic story of parcel data and its uses in these broad terms. However, we also know there are many specific variations on this story and we also describe some of them to illustrate the variety of practices now in use in New York State.

In keeping with the goal of fundamental understanding, we have not adopted the special terminology that is often used by the individuals we interviewed, terminology which reflects specific professional practices and legal requirements. Instead, to make this report useful to more general audience, we have tried to substitute plain language descriptions for these specific terms. Thus, for example, where a government tax professional might use the word “casdastre,” we use “real property tax map” where a geographic information system specialist might use “polygon,” we use “parcel boundaries.” In this way, we hope to make the findings more useful to a wider range of readers.

In this report, we describe the many attributes of parcel data, discuss its value to a variety of stakeholders, present typical data flows across organizational boundaries, and illustrate a wide range of uses. We then present the main issues and challenges associated with parcel data, and conclude with a set of principles for guiding future investments in this essential data resource.

Parcel data in historical context

Parcel information pertains to the smallest unit or lowest common denominator of land ownership. Parcels in land-oriented systems are roughly analogous to cells in an organism; they represent the basic building blocks of larger units and systems.

In general, the land recording function which collects parcel data is undertaken exclusively by government. The concepts and uses for land recording systems can be traced back to the early Roman Empire and are often associated with property tax and property rights systems. The recording of deeds, for example, is one of the oldest and most important record-keeping functions of government.

Each country has some standard for land recording and most land records originate and are maintained at the local level of government. In the United States, a land record depends on documentation (such as a deed), which is evidence of land ownership and ownership transfers. Each state varies in its laws, in the way land is recorded, and also in the terminology used. In 1980, a National Academy of Sciences study estimated that the US has more than “3000 land-title-record systems organized on a county basis and about 500 organized on a city or town basis” (National Academy of Sciences, 1980).

According to the Federal Geographic Data Committee (FGDC, 1980), continuing technological changes, coupled with trends in selling and developing land, have opened up new ways of looking at land recording systems. For the past thirty years, local governments have made a variety of efforts to computerize their land recording systems. The extent of computerization ranges from the basic use of word-processing programs to sophisticated web-enabled database applications across multiple departments. A general trend has been to use basic land-recording systems and geographic information systems, as well as other types of database systems to accomplish the goals of local governments (National Research Council, 1983). Nevertheless, in many localities all or nearly all information is collected manually.

In New York, as in most other places, parcel identification, description, and ownership information is collected as a function of real property laws and tax administration. Under New York’s Real Property Law, a state agency, the Office of Real Property Services (ORPS) establishes broad guidelines and qualifications for assessors who appraise and record land. However, these activities are mostly carried out under the jurisdiction of county and municipal governments, which each have their own rules and practices. Typically, deeds are recorded by county clerks as the official record of land ownership and ownership transfer. Assessors employed by cities or towns conduct real property appraisals for parcels located in their jurisdictions to establish their value for purposes of taxation. In addition, ORPS staff conduct direct appraisal of certain types of parcels such as forests. The information about individual parcels is specified in state guidelines and rules and organized into municipal assessment rolls used to prepare local property and school tax bills. Certain information is also transmitted to county real property tax service officials who prepare county-wide assessment rolls and tax maps, again following state guidelines. The final county tax rolls are submitted annually to ORPS. County clerks also provide ORPS with information on real property sales throughout the

year. When all assessment rolls are received, ORPS uses this information to set equalization rates intended to fairly distribute local property tax burden across municipalities; counties and municipalities use these rates to calculate tax bills for property owners.

The information that originates with these real property recording and tax functions has great utility for many other uses from school bus routing, to emergency response, to the siting of new businesses, to the protection of green space. These uses and issues related to parcel data are discussed throughout this report.

Definition(s) of Parcel Data

The definition of parcel data depends on its intended use. Interviewees in the study usually defined “parcel data” by describing how they *use* it to support their work. For example, planning departments said that parcel data is the parcel identification number but also the zoning codes, actual uses and boundaries, and physical characteristics. Planning departments need this information to run planning scenarios and make development decisions. By contrast, real property tax administration officials referred to parcel data as parcel identification and location, information about any structures on the parcel, the parcel owner, and the assessed value. More specifically within the area of taxation, some described parcel data as being the legal definition of the parcel (i.e., a deed), while others referred to the tax map characteristics.

After gathering parcel data definitions from each of the interviewees, we researched parcel data definitions and classifications in other states. Ohio, Wisconsin, and Nebraska have made concerted efforts to define parcel data but their definitions lack many of the nuances reported in our interviews. The Ohio Cadastral Task Force, for example, recommended a core group of attributes associated with parcel data that included a parcel identifier, a county code, a tax code, valuation data, and a lot description. In Wisconsin, a state law established a definition of ‘land information’ under the Land Records Modernization Plan which outlined a broad framework for thinking about parcel data as “...any physical, legal, or economic, or environmental information or characteristics concerning land, water, groundwater, subsurface resources, or air in this state.” Finally, in 2000, Nebraska issued the "Guidebook for a Local Government Multipurpose Land Information System" which outlined the general types of parcel characteristics as spatial reference attributes, cadastral reference attributes and parcel attributes. None of these definitions captures the variety or richness of detail that emerged in our interviews.

Taken as a whole, the interviewees in our study generated a long list of descriptive of parcel characteristics as shown in Table 1. Using layman's terms, the attributes are grouped into eight categories of common characteristics. For example, the category "parcel location" contains 'parcel address', which can be thought of as descriptive data (i.e., 123 Main Street) or spatial data (i.e., a set of coordinates), or both.

Although this listing does not include all possible attributes, it represents the common characteristics interviewees use to describe parcel data. The categories include:

- parcel identification
- parcel location
- ownership
- occupancy and use
- structures and improvements
- taxation
- physical geography
- infrastructure

Parcel identification and location attributes comprise the numbering scheme used to identify the parcel and the characteristics that describe its location on the earth as well as its location within the boundaries of a municipality, school, water, or other districts. Ownership attributes identify the owner and provide historical information about ownership. Occupancy and use attributes describe the type of current use as well as details about what people or organizations occupy the parcel. Structures and improvements present details about what is built on the property. Taxation attributes present tax rates, sales history, exemptions, and payment information. Physical geography describes the parcel in terms such as its soil type, size, and water features, while infrastructure attributes represent large-scale initiatives such as road and bridge placement, utility and power grids, and water and sewer lines.

Table 1. Parcel Data Categories and Attributes Identified in the Study

Parcel Identification

- Section block & lot number - or specified ID number
- History of splits and merges of parcel that affect the ID number

Parcel Location

- Full address including street, city, state, and zip
- Acreage or lot size
- Tax map number
- Coordinates for mapping elements such as points and polygons
- Mapping projection (mathematical model) used to depict three dimensional data
- Datum (spatial reference system) used in the mapping projection
- Centroid (coordinates of the approximate geographic center of the parcel)
- Metes & bounds (perimeter description)
- District codes and boundary
- Municipal codes and boundary
- Election code and boundary
- Special districts codes and boundary
- Special water protection codes and boundary
- Fire districts code and boundary
- School districts codes and boundary
- Neighborhood code and boundary

Ownership

- Owner name
- Owner full address including street, city, state, and zip
- Owner telephone number
- Change in ownership history

Occupancy and Use

- Occupant name
- Occupant full address including street, city, state, and zip
- Occupant phone number
- Usage codes
- Zoning codes
- Farm lands codes
- Planning codes
- Residential and commercial zone
- Environmental Permit issued
- Easements (i.e., right of way)

Structures and Improvements

- Type of structure (e.g., residential, commercial)
- Age of structure
- Building footprint
- Number of stories
- Style of construction
- Number of bedrooms
- Number of baths
- Sewer; water; septic hook-up
- Square footage
- Condition (interior/exterior)
- Year built
- History of improvements
- Quality of construction (including materials and workmanship)
- Utility service

Taxation

- Tax rate
- Assessed value
- Sale price
- Sale date
- Exemptions
- Payment information

Physical Geography

- Flood plain data and boundary
- Wetlands data and boundary
- Habitat type and boundary
- Soil data and boundary
- Topography (landforms)
- Aquifer data (water under land surface)
- Land cover information (such as forests)
- Hydrography (bodies of water)

Infrastructure

- Road/Bridge data
- Tunnel data
- Power grid data
- Water/Sewer infrastructure
- Telephone/Cable infrastructure

Stakeholders

A wide range of organizations use and have interest in parcel data. A list of stakeholders identified in the study shows public, private, and non-profit organizations that all rely on parcel data every day. Table 2 describes the main stakeholder groups.

Table 2. Stakeholders Groups Identified in the Study
Assessors – municipal officials who collect basic parcel data.
Community/Neighborhood Groups – civil society organizations such as those for senior citizens, or business groups.
County Real Property Tax Services Offices – the hub for real property tax administration in NYS counties.
Non-Profit Professional Organizations – provide services such as environmental planning and economic development consulting.
Other County and Municipal Government Agencies – such as planning departments, emergency response services, public health agencies, and water authorities.
Private Companies – such as realtors, engineering firms, and lien and tax collectors, as well as data re-sellers.
State Agencies – state government organizations addressing such areas as transportation, homeland security, environmental protection, and health and human services.
Property Owners – own and pay taxes on parcels.
Property Occupants – people or businesses who live in or make their place of work on a parcel they may or may not own.

Stakeholders play three main roles with respect to parcel data: data collector, user, and supplier. A single stakeholder can play one or more than one of these roles.

- Data collectors gather parcel information directly in the field. Examples are assessors appraising real property or surveyors mapping a parcel. Assessors are the primary collectors of basic parcel data regarding identification, description, location, ownership, structures, and some uses. Other stakeholder groups collect specialized information pertaining to their particular work but this is almost always done as a complement to, rather than a substitute for, the basic data collected by the assessors.
- Parcel data users includes all those who employ the data in their work. Data users include almost all stakeholder groups including state agencies, county and municipal governments, non-profit organizations and many private sector companies. All use the data to carry out functions such as planning, economic development, infrastructure management, and buying and selling land.
- Parcel data suppliers distribute data collected (by themselves or others) to users. Data suppliers are usually the County Real Property Tax offices, NYS ORPS, and private data re-sellers.

Uses of Parcel Data

Public, private, and non-profit organizations, as well as taxpayers use parcel data in a range of ways such as disputing boundary lines, making disaster recovery plans, assessing property for equitable taxation, marketing products to targeted populations, routing school buses, and buying and selling land. The uses are varied and can range from a state agency planning a large infrastructure initiative to a private company reselling enhanced parcel data to the real estate community. Although each use is different, all rely on the core parcel data collected at the municipal level. Table 3 shows the range of parcel data uses identified in the study.

Table 3. Parcel Data Uses Identified in the Study	
Addressing	Notification and Outreach
Billing	Permitting/Enforcement
Boundary Setting	Planning
Buying and Selling Land	Public Health Monitoring
Design and Engineering	Real Property Taxation
Districting	Routing
Emergency Response	Siting
Marketing	Zoning

Every organization uses parcel data to perform a particular function and although not every function requires the same set of attributes; the intended use determines the attributes needed. For instance, an emergency response organization must have accurate and up-to-date occupancy and structure information in order to know the number of individuals living on a property and the location and placement of a building, but it may not need to know who owns the parcel or the details of the tax history. Conversely, an environmental protection organization may need detailed location and physical geography data for a specific region but may not need each parcel identification number or the sales data tied to the parcel.

This wide variation of uses across organizations underscores the core and fundamental nature of parcel data and explains why it has such high value for so many different stakeholders. The following stories highlight the broad range of parcel data uses across public, private, and non-profit organizations.

- Assigning billing records.** Successful public utility services depend on consistent delivery of service, effective management of daily operations, and the collection of revenue. The mission of a public water system is to provide clean, safe, water to customers. To achieve this goal, management must know the location of every customer’s water hook-up and who is responsible for payment. By using parcel identification data, parcel location data, ownership information, and occupancy and

use data, the organization registers billing information according to customer usage. In addition, the meter system is scanned for theft of services. One representative said, "I never really thought about it, but our 'whole system' is built around parcel data."

- **Buying and selling state-owned land.** State-owned land plays a role in many government functions ranging from environmental protection to transportation planning. Successful land management requires knowing where the agency owns property and the characteristics of that property. One state agency owns and manages approximately 260,000 acres of land and has over 6,000 deeds associated with those parcels, thus buying and selling land is an important function. When the agency staff are determining whether to buy or sell a parcel, they look at a variety of factors including parcel identification, location, and ownership information.
- **Buying and selling private land.** Private land sales occur daily. Some sales are single transactions between two parties, while other sales are more complex and involve multiple individuals and organizations. The most important characteristic of a land sale is to know who owns the property rights to a parcel. Part of the mission of one business is to purchase tax liens at auctions, which will be profitable real estate transactions for the organization and therefore, add to the company's economic viability. Tax lien auctions are local auctions for real estate sales, caused by delinquent taxes. The organization uses parcel identification data, parcel location data, ownership data, structure and improvement data, as well as taxation data to determine what properties (or tax liens) they will bid on at auctions and at what price.
- **Planning to acquire and protect open space.** Economic development and smart growth are important in today's competitive environment. A regional non-profit's mission is to work towards revitalizing different regions within New York State. They worked with a town, which commissioned the project, to determine which lands the town should purchase as part of its open space preservation initiative. The town was experiencing huge demand for residential development, outpacing the growth in nearby areas. By using a combination of parcel identification, location, ownership, occupancy and use data, as well as taxation, physical geography and infrastructure data, several scenarios were constructed which identified potential open space areas. An initial bond offering of \$15-20 million outlining an acquisition plan of these areas was put to the voters who approved it for implementation.
- **Prioritizing environmental initiatives.** Environmental restoration of old industrial sites, brown fields, or wetlands has been a major economic focus for local governments. One project was jointly conducted by a state agency, county government, and a nonprofit organization to help identify, document, and prioritize restoration projects within the county. In this project, content experts from local, state, and the private sectors came together to develop criteria for prioritization while data about each location within the county was obtained showing parcel identification, location, physical geography, occupancy and use, and surrounding

infrastructure. Using GIS capabilities, the criteria were integrated with the parcel data to show the highest priority restoration locations. One project participant said “The coordination and analysis efforts were invaluable to this project and it could not have been done without detailed parcel data and the knowledge of the experts being brought together in one powerful system.”

- **Directing emergency response.** Public safety is a cornerstone of community development and sustainability. A reliable and well-run 911 call and command center is a goal for many communities. Dispatchers at the 911 center use parcel data for almost every incident. Dispatchers have several different computer applications on their terminals. One is a phone number and addressing system, another houses a GIS application. The dispatchers use many different attribute categories including identification, location, and ownership information to make decisions about emergency routing and can even instruct personnel on exactly how to enter the property safely. Dispatchers also use occupancy and parcel use attributes to determine how many people live in a unit or how the parcel is being used at the time of an incident. Structural and improvement data tells them whether the incident involves a one or a two-story house for example, or who they have to notify to turn off utility services like gas or water. This system gives emergency response teams better information and has shortened response times.
- **Planning crisis scenarios.** Crisis management is becoming more important to state and local governments. Governments are trying to execute emergency management scenarios and exercises, such as health related incidents and natural disasters. Their goal is to be prepared for the unexpected. One town uses parcel data and GIS capabilities to plan the coordination and management of different hypothetical crisis events. Through the use of emergency management scenario exercises, the fire chief can predict the implications of disasters such as brush fires or gas tank rollovers. He can use an application at his desk that incorporates various categories of information including parcel identification, parcel location, ownership, occupancy and use, physical geography, and infrastructure data to see how a crisis could play out. With the resulting information, the chief can determine where fire engines should be placed or how quickly different departments must respond to prevent gas from leaking into a nearby stream. A much more sophisticated system at the state level allows crisis teams to play out massive crisis scenarios involving large regions and data from scores of organizations.
- **Notification and outreach.** Outreach to individuals is fundamental to transparent and accountable governments and organizations. For example, people who reside near roadways are notified by state and local transportation and highway departments about spraying for pesticides. The main goal of spraying is to reduce overgrowth and promote roadway visibility, while maintaining the safety and health of citizens and the environment. State law requires that property owners within certain distances of potential herbicide spraying be notified of the pending spraying. Officials use parcel identification, ownership, occupancy, as well as location data, to inform residents of the spraying activities in a precise and timely manner.

- Outreach to property owners and occupants is also done for social and community purposes. One community group regularly asks its local assessor's office for mailing labels for all senior citizens in the town so they can do mailings about bus trips, courses, and events of interest to seniors.
- **Transportation routing.** State and local roadways and sub-divisions change frequently over the course of a year. New roads are constructed and older ones are changed. These changes affect different sectors ranging from the trucking industry to homeowners. Parcel identification, location, and ownership information is needed to handle different demands associated with transportation management for both internal and external operations. These operations include routing of oversized truckloads to avoid low bridges and limited access highways, creating and updating bus routes for school districts, directing emergency vehicles to the scene of an event, and creating priority routes for snowplows during bad weather. Some utilities use parcel data to coordinate their maintenance fleets using infrastructure data, structures and improvements, and parcel location data.
- **Real property assessment and taxation.** Parcel data is the foundation for real property tax administration, which requires specific data established by law. Assessors are required to collect and use this data to establish a fair assessment for every property. By using parcel identification, ownership, structure and use, physical geography, and taxation data, assessors are able to make accurate assessments of individual parcels. The county real property offices use parcel data to create county tax maps and county-wide assessment rolls, and the State Office of Real Property Services uses parcel data to create the final tax assessment roll as well as equalization rates.
- **Infrastructure management.** All kinds of public infrastructure benefit from the use of parcel data. For example, infrastructure, parcel identification, location, occupancy and use data, as well as structures and improvements data are all used to determine where fire hydrants should be located. A non-profit research organization worked with a regional consortium to figure out which municipalities owned fiber optic capabilities and where the lines were located. Parcel location, identification, ownership, occupancy and use data, in addition to infrastructure data was used to determine rights of ways and who should be contacted for permission to look at the land. A county health department initiated a special project to determine weak areas in their water supply infrastructure. Using infrastructure data, parcel location, occupancy and use, and physical geography data, the agency was able to identify areas where potential contamination of the water source could occur.
- **Facilities siting.** There is an old saying in real estate that nothing matters but "location, location, and location." Towns and cities are capitalizing on better location information to plan for smart growth or increase their ability to attract businesses and jobs. One town noted that five years ago a company wanted to relocate to their region but needed very specific requirements. The company needed to know what

fifty-acre parcels were for sale near access to a major highway. Using GIS capabilities and parcel identification, parcel ownership, infrastructure, and physical geography data, the town provided options for the company and won the business. In the process, the town secured several hundred new jobs for its residents.

- In another instance, a town was faced with designating an adult business zone. The town planning department used parcel identification and location data, planning and zoning codes, and GIS capabilities to run scenarios of possible zones for these businesses. They identified a list of potential places that were appropriate distances from churches, schools, and residential areas to zone for adult businesses. One of these proposed places was accepted and passed by the town board and the designated area was subsequently adopted into the town law.
- **Parcel data enhancement and distribution.** When a potential buyer or seller walks through the front door of a realty office, the realtor needs up to date information about property within their selling area. One data re-seller caters to this need by gathering parcel data from several municipalities and counties, enhancing it for easy use, and providing the data in a variety of formats (online and on CD) to anyone who is willing to buy it. Realtors are their biggest customer, ready to take advantage of the value added by someone else collecting and integrating the data then providing services such as report and query mechanisms as well as the ability to generate mailing labels.

Value of Parcel Data

Judging from the variety and importance of the foregoing uses, the value of parcel data appears to be immeasurable. Every organization we interviewed regarded parcel data as a crucial resource. Nearly all of the interviewees indicated that without parcel data, their work would either be greatly hindered or not possible at all. Parcel data is integral to the missions of many different organizations and many different functions within them. The value of parcel data, in terms of mission-oriented benefits, can be seen in everything from smart growth to public safety. However, because parcel data use is so deeply embedded in these various functions and programs, it is difficult to quantify its direct economic value.

“Parcel data is factual data and is it the foundation of accurate assessments. As assessments have gone up, there is an extra \$130,000 on the tax roles. This expands the tax base levy which has improved the town bond rating.”

~ A Town Assessor

Parcel data is extremely valuable to assessors, who use it every day to assess the value of real property. All of the assessors who participated in this study indicated that without the use of parcel data, they would either not be able to function or the quality of their assessments would be greatly diminished. Conversely, the more detail that goes into parcel data, such as ownership, zoning, and tax information, the more valuable that data becomes. In some instances, good parcel data can serve as a revenue generator, because if assessors can show that the town tax base is rising up, they can increase the revenue for the municipality.

Just as assessors are more dependent on good parcel data, their municipalities also rely on the data for economic development. Through the use of GIS applications more and more town planners are able to delineate the layout of the region and project how new building projects will affect the area. One town planner said, “The value of parcel data is potentially ‘tens of thousands’ of dollars in savings to the town.” He also indicated that by better use of parcel data, through a GIS application, the productivity of their town planning board has gone up tremendously. The application has allowed them to more easily answer questions about wetlands, zoning, and acreage, and focus more on advanced planning activities, such as scenario building

“With parcel data, there is more information for making decisions, which has led to efficient processes. If we could not use parcel data in our jobs that would be “catastrophic” because people in every department within the town depend on it to do their work. It is vital to show people everything about a specific parcel to make decisions for planning, zoning, and other functions.”

~ A Municipal Planning Department

County real property tax offices noted that they would not exist without parcel data. In addition, the value of parcel data for others is greatly enhanced by these offices when they turn descriptive data into tax maps. Parcel data is also essential to many other county function, such as marketing, demographic studies, allowing citizens to challenge

assessments, and providing tax roles to school districts. For counties who sell parcel data, the value includes an economic return in the form of direct revenue.

Parcel data is also of great value to the private sector. Like County RPTS and assessors, the majority of the private companies who participated in this study would be either greatly hindered or unable to function without it. One interviewee said, “Everything is tied to parcel data, so it would be difficult to accomplish anything without it.” Parcel data helps in scenario building and reduces development and planning time, which saves money and supports better decisions by companies and their clients. One private sector company stated, “It is not an option to *not* have parcel data. If we could not get it from others, we would have to collect it ourselves.”

“The availability of parcel data is a huge time and money saver for our clients because it lets them do scenario building, which results in the reduction of planning and development time.”

~ A Private Company

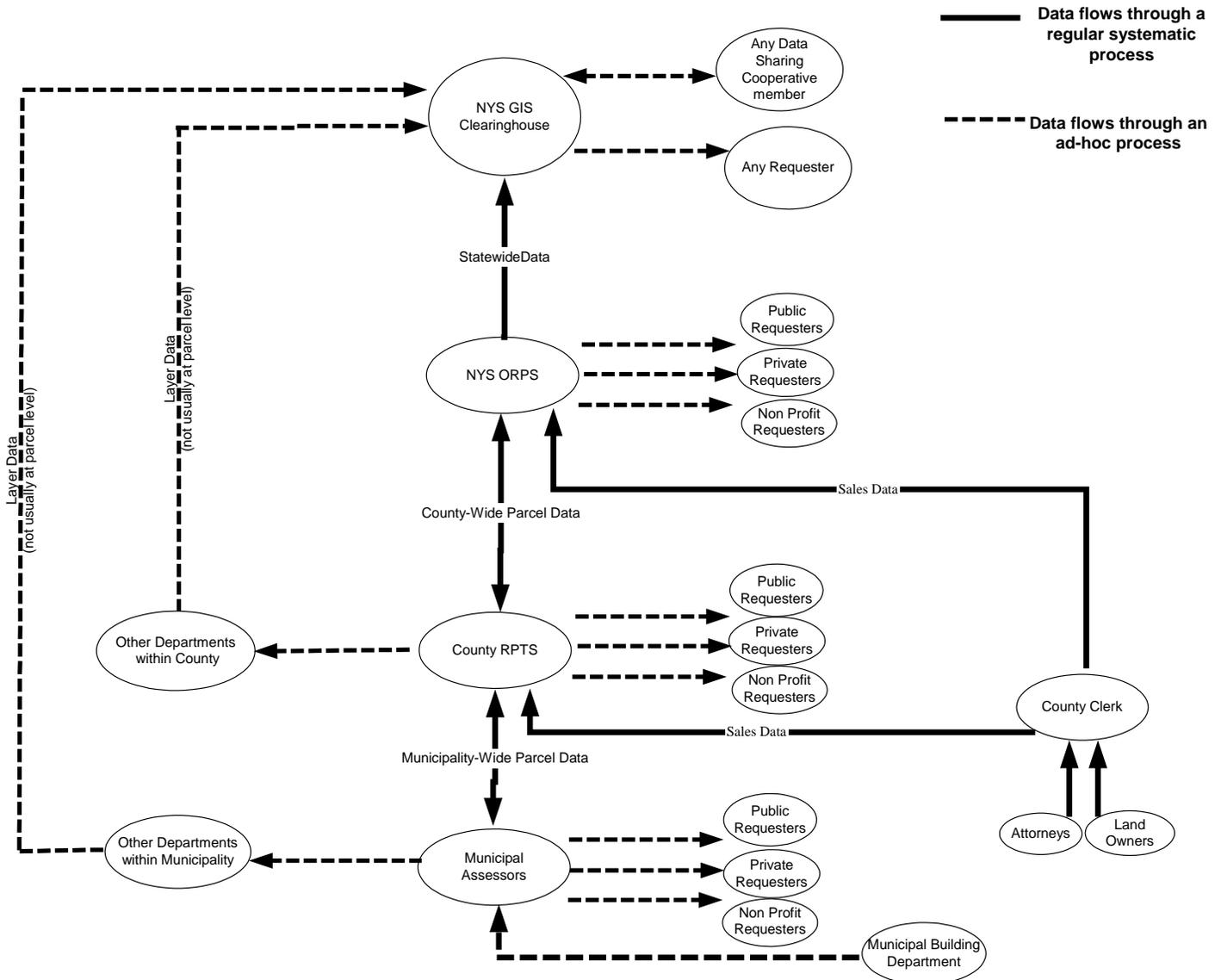
For non-profit organizations, parcel data has become more mission-critical over time. As environmental and community development organizations gained expertise in using information technology to carry out advanced planning techniques, parcel data rose in importance and value for many of their services.

Parcel data is invaluable to state agencies because it supports a wide range of public services, such as transportation, environmental protection, and homeland security. One state agency said that although they could try to carry out their core functions without parcel data, the lack of it would lead to inaccurate and haphazard decisions. Another reported that in addition to the work they do inside the agency, they field about 20 calls per day with questions that need some type of parcel information for an adequate answer.

Typical Flow of Parcel Data in New York State

An important part of this reconnaissance study involved tracing the flow of parcel data among disparate users and uses. Figure 1 depicts the typical flow of parcel data in New York State which can be characterized by both regular and ad-hoc processes. Much data flows regularly and systematically through the real property tax system, as shown by the solid arrows in Figure 1. However, all other data flows tend to be one-by-one, ad-hoc transactions between individual requesters and various data sources. These are represented by the broken arrows in the figure.

Figure 1. Typical Flow of Parcel Data in New York State



In the systematic data flow, the County Clerk sends deeds and sales documents (form RP-5217) to the County Real Property Tax Services (RPTS) office and copies of the sales information to ORPS. Mostly through field work, assessors collect and update assessment and attribute data for parcels in their municipalities. Assessors also receive construction and improvement information directly from municipal building departments. Assessors merge sales, ownership, inventory, improvement, and assessment information and submit it annually to the county RPTS which prepares tax maps and annually submits assessment rolls to ORPS at the state level. Data exchanges occur among all three levels of government to communicate changes and corrections for purposes of real property tax administration. In addition, ORPS annually sends statewide data (both centroid and selected parcel attributes) to the NYS GIS Clearinghouse.

In general, the ad-hoc data flow exemplifies access and use of parcel data for all purposes other than real property tax administration. At each stage of data flow, any number of individuals or public, private, or non-profit organizations request parcel data. Typically requests are directed to assessors, County RPTS offices, and ORPS, with counties receiving the largest proportion. These requests are not made on a systematic basis, but rather depend on the needs of the requester. Typically, each request is treated as a separate transaction.

Alternative Data Management Approaches

The typical data flow represents the most common situation throughout New York State, but the study revealed many variations and four notable alternative approaches to data management. These data management approaches include an on-line public access approach, a county-wide data sharing and services approach, a “communal” data management program, and the concept of a broad data sharing cooperative. Each is briefly described below.

- **The Town of Clarence web site** features an online tool for citizens to search for information about recent home sales. The goal is to get citizens involved in the assessment process and to work toward ensuring fair and equitable assessments. Having the data online represents a way for individuals who believe their assessments are not accurate to do fact checking and data gathering on homes similar to theirs. This allows citizens to take an active role in the defense of their assessment appeal. The openness of the data and widespread access has contributed to a reduction in Board of Assessment reviews and the number of complaints registered in small claims court. The tool allows citizens to search property sales by street or get a listing of the entire town and returns information about the assessed values, physical characteristics and sales information. In addition, each address listed shows a picture of the property and provides the property identification number. The site is updated as needed with new sales information and pictures.
- **Dutchess County’s “Parcel Explorer” and “Atlas” applications** represent another data management strategy. These countywide applications combine parcel

data with GIS capabilities in a user-friendly format, which allows several county departments to access assessment and planning data faster and more easily. The County GIS is an up-to-date resource that can generate customized maps, which include real property parcels, along with roads, wetlands, zoning, and many other fields. This system makes it possible for departments within Dutchess County, along with property owners, to make more informed decisions and has led to a quicker approval process for these decisions.

- **The Town of Southampton’s “Govern” system** goes a step further by allowing all the town departments to share the multiple data sets and by giving each department responsibility for managing and updating its own segment of the total data. While every department has access to the same central data repository, each views, uses, and edits the portion of the data that they use to support their own particular mission. The data is available in multiple formats to suit the needs of each department. Those who need to manage the data in a GIS format have the capability to do that, while other departments may see the data in graphical layout or in tabular form. In addition, the system has audit trails that allows everyone to see a record’s change history. Since each department has access to the data and uses it daily, updates are made several times a day. The timeliness of the data is beneficial not only for municipal functions but also for annual on-line subscribers (\$300 per year) and for citizens who regularly come in to the county offices to use the system for searches and queries.
- **The New York State GIS Clearinghouse and Data Sharing Cooperative** is a fourth alternative data management model. The Clearinghouse is a publicly accessible resource of information about GIS data, (including parcel data of various kinds), some in the form of actual data sets and some in the form of metadata descriptions that tell potential users how to obtain the data sets from different sources. The Data Sharing Cooperative is a special arrangement in which public and nonprofit organizations sign a standard data sharing agreement which entitles them to use the GIS data listed by the other members without cost but also obligates them to return any data enhancements or corrections to a designated “primary custodian” for each data set. Thus, cooperative members who use road data provided by the state department of transportation, for example, agree to notify DOT of errors and to share with DOT any enhancements they make in the course of their own work. In this way, all users follow a standard set of data exchange policies and shared data is readily available and subject to constant improvement.

Analysis & Issues

Stakeholder interests

Parcel data is used in many ways by many different people and organizations. Virtually every individual, community, and organization has some interest to be considered. The nine stakeholder types described earlier constitute the major groups identified in the study. The interests of these groups coincide with respect to their mutual desire for accuracy, timeliness, and consistency of parcel information. However, important differences exist among them regarding data sources and access methods, as well as cost and revenue considerations.

Table 4 shows both the areas of common agreement and the areas of divergence among these key stakeholder groups. All stakeholder types have a strong interest in high quality data, generally characterized as data that is factually accurate, up-to-date, and consistent from time to time and place to place.

Stakeholders		Interests								
Type	Examples	Consistency	Accuracy	Timeliness	Revenue Generation	Low or No Cost Retrieval	Online Access	Choice of Format	One Authoritative Source	
Assessors		X	X	X		X				
County Real Property Tax Services		X	X	X	X					
Other County and Municipal Government Agencies	Emergency Response	X	X	X		X	X	X	X	
	Planning	X	X	X		X	X	X	X	
	Water Authority	X	X	X		X	X	X	X	
State Agencies	Environment	X	X	X		X	X	X	X	
	Homeland Security	X	X	X		X	X	X	X	
	Transportation	X	X	X		X	X	X	X	
	Real Property	X	X	X		X	X			
Private Companies	Data Reseller	X	X	X	X		X	X		
	Digital Map Conversion	X	X	X		X	X	X	X	
	Engineering/Planning	X	X	X		X	X	X	X	
	GIS Consultants	X	X	X		X	X	X	X	
	Lien/ Tax Collector	X	X	X		X	X	X	X	
	Realtor	X	X	X		X	X	X	X	
	Utility	X	X	X		X	X	X	X	
Non-profit Organizations	Environmental groups	X	X	X		X	X	X	X	
	Planning organizations	X	X	X		X	X	X	X	
	Research organizations	X	X	X		X	X	X	X	
Community Groups		X	X	X		X	X	X	X	
Property Owners		X	X	X		X	X	X	X	
Property Occupants		X	X	X		X	X	X	X	

Accuracy, timeliness, and consistency. These general agreements, however, mask a great deal of variation. The interviews demonstrated that accuracy, timeliness, and consistency are important to everyone, but at different levels and for different reasons. Some of these differences are illustrated below.

- An engineering firm is planning a residential subdivision. To this company, “accurate” means highly detailed survey grade information. By contrast, a town attempting to designate a rough boundary for a new municipal park in an area that has not changed ownership in decades would say an area bounded by certain streets is “accurate” for this purpose.
- A tax collection organization needs parcel data updates only when the final tax assessment roll comes out because their core mission is to collect delinquent taxes and the preliminary tax roles do not help them do their job. However, a realtor may need to know the current tax status of a property, how much the taxes are today, and who the taxes are paid to. This information could change daily depending on the number of homes the realtor is handling within a given time period. The difference in the frequency of the transaction (i.e., annual versus daily) determines how each user defines “timely.”

Digital, on-line, and single point of access. Most stakeholders strongly prefer that parcel data be available in electronic format, online, from one authoritative or trusted source, and in a variety of formats, which they can select to meet their particular needs. These features add convenience, flexibility, and efficiency to information search, access, and use. They also add confidence that data is authentic and well-documented so it can be used in appropriate ways. These interests are typically less important or not shared by the organizations most likely to collect the basic data – assessors and county real property tax offices.

Revenue generation. The greatest conflict among stakeholders occurs over the question of parcel data as a source of revenue. Here, county real property tax offices and private sector data resellers have markedly different interests than those of all the other stakeholder types. The private sector re-sellers would not exist but for the opportunity to package and sell parcel information to a variety of customers. County RPTS offices are increasingly treating parcel data as a revenue source and charging a wide range of fees for county-level data, including tax maps, even to other government agencies. These fees appear to vary widely from place to place and even from situation to situation. By contrast, most municipal assessors, all state agencies, and nearly all public, private, and civic users endorse a philosophy that the data is a public resource and should be made readily available to requesters at no more than the cost of reproduction or distribution.

Issues associated with data collection and reporting

The value of parcel data begins to be built with the act of data collection. The study showed three issues associated with data collection that reduce this value from the very start: inconsistent numbering and indexing systems, inconsistent terminology used to

describe key attributes, and factual errors introduced by inaccurate property transfer reports, and the inability of assessors to have complete access to privately owned property for appraisals.

All counties are required to have a parcel identification system which usually consists of a complex number denoting the section, block, and lot for a given parcel with respect to a historical land survey. However, counties and some municipalities can and do adopt different numbering and indexing systems and some systems work in such a way that the history of parcel sub-divisions cannot be traced by the use of the ID numbers. The lack of a uniform identification system statewide causes great difficulty for users who need to integrate data of different types, or match up parcels across the boundaries of different jurisdictions. Similarly, different municipalities and counties may use different terms to describe the same attribute leading to confusion about whether information from different jurisdictions is comparable.

In addition, the information that is reported about property sales is criticized by nearly every county and assessor. Most contend that buyers, sellers, and their attorneys pay little attention to the accuracy of the required report (the RP5217) which is filed with the deed in the County Clerk's office. Because no enforcement mechanisms exist, these errors proliferate despite much work on the part of assessors and county RPTS staff to catch and correct them.

In addition, assessors report difficulty in obtaining complete and accurate property information because property owners can deny them access to buildings and other structures. In these cases, appraisals reflect the assessor's best judgment rather than direct, detailed observation of the property. Errors are therefore introduced into the property record from the earliest point.

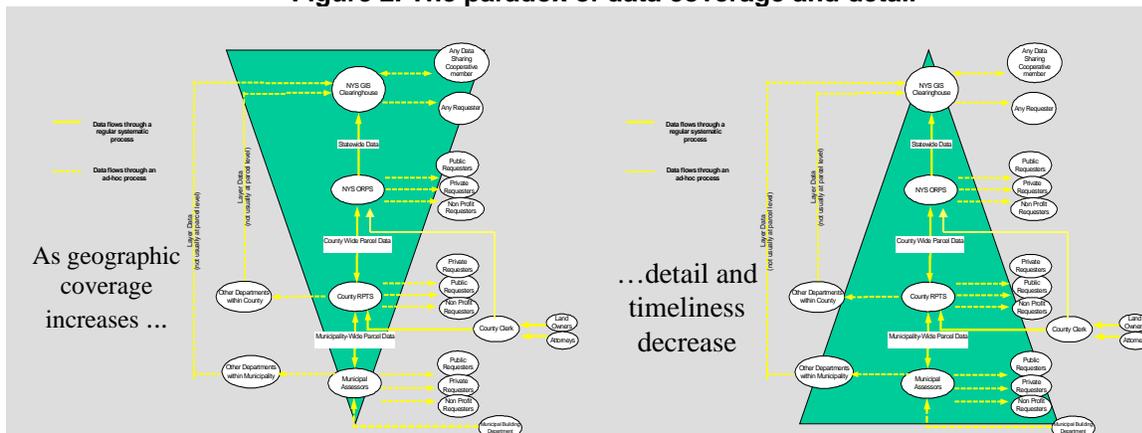
Issues associated with data use

As illustrated throughout this report, parcel data is employed in a very wide range of public, private, and civic uses. However, almost every person interviewed expressed a desire for better quality data. Most users spend considerable resources obtaining, improving, and standardizing parcel data before they are able to use it for their own needs. Much of this cost is associated with an organization's need to supplement, verify, correct, or integrate data collected by others. Even when the data they begin with is of high quality, however, it may not be sufficiently detailed or readily comparable to other sources, or derived from systems that are technically compatible. All of these problems make parcel data more difficult and more expensive to use.

One of the most obvious issues for data users is the inverted relationship between geographic coverage and the timeliness, detail, and completeness of parcel data. At the point of basic data collection, generally conducted by municipal assessors, parcel data is most up-to-date and contains the most detail regarding a variety of attributes. Most municipalities report assessment data to the county and state levels only once a year but some municipalities do not report all of their parcel inventory and improvement data.

At the county level a new kind of information is maintained in the form of tax maps, but the county tax maps and assessment rolls are not as detailed as the information in the municipal assessors offices. When ORPS supplies data files to the statewide GIS Clearinghouse, the files contain even less detail, generally comprising about 25 descriptive attributes and usually the parcel centroid (i.e., the location of the approximate geographic center of a parcel). Thus a user seeking statewide information from a single source has access to the smallest amount of information, while a user whose purpose is limited to single town can make use of the greatest amount of information. Figure 2 below illustrates this paradox:

Figure 2. The paradox of data coverage and detail



As a consequence of this paradox, any use which requires regional or statewide information also requires the user to make many separate requests from different data suppliers. Usually requests go to counties where the tax maps and associated attribute data offer relatively good basic coverage for most applications. However, this process is time-consuming, costly, and unpredictable because counties do not follow uniform procedures or policies for dealing with data requesters. These problems and expenses add to the cost of many projects and can sometimes cause users to abandon their projects.

In addition, most users require data from other sources or require data that is more detailed than that collected in the process of real property tax functions. For example, most engineering uses require survey quality data, which tax maps do not provide. Such users did not expect that county or municipal data should meet this standard, but they believed that their own data investments should be devoted to expanding or supplementing this basic data, not to acquiring it (or correcting it) in the first place.

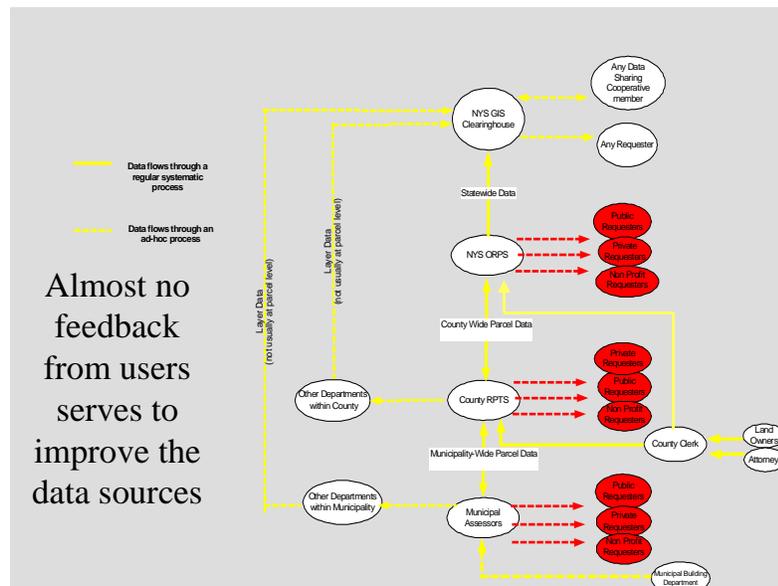
Interviewees also mentioned incompatible technologies as a barrier to more effective data use. For example, not all parcel maps use the same mapping projection, which is a mathematical model for converting locations on the earth's surface in a way that allows flat maps to depict three dimensional features. Although some technologies convert

files originating from different mapping projections easily, there are still others that do not preserve the integrity of shape, the accuracy of area, distance, or direction.

Issues associated with data management

Data management associated with real property tax functions works in a relatively standard way all over the state. However, parcel data management outside of tax functions vary widely and the typical arrangement is best described as *ad hoc*. Users of parcel data must make many individual data requests to different data sources. As noted above, a few local governments have data management strategies in place that address the needs of external users, but in most places requests are handled on a one-by-one basis. At the same time almost no feedback mechanisms exist between data users and data collectors, so that the investments that users make in data improvements are not built back into improvements in the original data sources.

Figure 3 shows the lack of update and feedback mechanisms in the typical data flow. Note that nearly all the arrows point in only one direction – from the data source to a requester. Many users obtain data from municipal, county, and state sources, but (with the notable exception of the statewide GIS Data Sharing Cooperative) users are neither expected nor allowed to return data corrections, enhancements, or other improvements to the data sources. When users obtain annual or other updates from their data sources, they can actually make the situation worse because the data they have



improved can be replaced by some of the same old errors that still exist in the source files. The difficult choice is to forgo the updates in order to keep their own corrections, lose some of their corrections in order to obtain updated files for other records, or engage in very costly and time consuming matching and integration activities.

Figure 3. Lack of feedback mechanisms to improve data

Issues associated with data supply and distribution

Data supply and distribution methods and costs vary widely from time to time and place to place. Some of the costs are associated with fees charged by various localities or

private data suppliers for the data itself, although there are no standard policies about fees. Interviewees reported wide variation in fees and data sharing policies across and within the levels of government. For example, some sources require a formal data sharing agreement or contract to be signed before providing data, while others provide it on request. Some require formal Freedom of Information Law requests, others treat these requests as routine. Similarly, costs of data sets vary. For example, some offices charge only for reproduction or no charge at all while others have price lists or subscription fees. Some local governments, such as Suffolk County, reported obtaining significant revenue from the subscription sale of parcel data, while state agencies and most local governments charge little or nothing. Consequently a range of approaches is in use including:

- ◆ Single transactions at no or low cost to requesters
- ◆ Single transactions at revenue-generating cost to requesters
- ◆ Standardized access mechanisms such as web sites at no or low cost to users
- ◆ Standardized subscription services that offer restricted access for an annual fee

This variety of access methods and philosophies causes confusion and adds both direct and indirect costs for many users, although it generates some cash flow for certain data suppliers. As noted above in the discussion of stakeholder interests, conflicting views on this topic are a major barrier to achieving a readily usable statewide parcel data resource.

Principles For Enhancing the Use and Value of Parcel Data

Parcel data is fundamentally important to a wide range of organizations. Each organization has its own mission and practices, but all have one thing in common – parcel data is vital to their work. The findings of this study amply demonstrate the potential benefits, and the key difficulties, of treating parcel data as a collective statewide information resource. Under New York State law, responsibility for parcel data is distributed among many organizations at the state, county, and municipal levels. As a consequence, changes in the treatment of parcel data will require a high degree of consensus. We therefore conclude by offering a set of principles that might guide a collaborative approach to future discussions, decisions, and investments.

Broad recognition of parcel data content, value, and uses. Each user approaches parcel data with a different set of needs generated by specific missions and goals. Taken together, however, all these individual needs add up to a comprehensive picture

of parcel data attributes and value across many domains. Broad appreciation for the many ways people think about and use parcel data can encourage opportunities for collaboration and joint investments.

Standard parcel identification and location information. A common parcel identification scheme would allow data users to integrate and merge data from multiple counties and municipalities across New York State. Easily integrated data would allow users to save resources by reducing the effort required to obtain and refine or correct data before it can be used. It could also potentially reduce the number and frequency of requests made of each county and municipality.

On-line access in a variety of formats. Most users want ready access to electronic parcel information, ideally on the web and via a self-service process. Depending on their needs, users want tabular, graphical, and GIS formats. However, many users are willing and able to convert data into their preferred format, as long as the data is available electronically. In addition, readily available logical subsets and more frequent updates would make parcel data more useful and more usable, thus generating greater value for each of the individual users.

Ready access to authoritative sources. Many users would prefer a single authoritative source for all parcel data in the state, but many would also be satisfied with multiple sources that follow the same standards and policies.

Feedback from data users to data sources for data improvement. By providing data users the opportunity and a mechanism to communicate data errors and enhancements back to the source, the overall integrity and quality of parcel data can improve with increasing benefit to all future users.

Balanced approaches to the costs and benefits associated with collection, use, and supply. Costs related to collection, use, and supply of parcel data are complex and difficult to measure. Benefits are relatively easy to describe but equally difficult to quantify. Progress toward treating parcel data as a collective resource will depend on willingness to discuss, experiment with, and evaluate policies and practices that balance costs and benefits for all stakeholders.

Appendix A: Study Methodology

The Center for Technology in Government worked with the New York State Office of Real Property Services to conduct this reconnaissance study of the use of parcel-level data in New York State. The study documented the current and potential uses of this data, and their value to organizations in the public, private, and non-profit sectors. It also identified the issues associated with the collection, use, and sharing of parcel data. This study was conducted from September 2004 through February 2005.

The study data consist of 35 interviews as described below plus background information provided by the Office of Real Property Services, and official publications and web sites pertaining to parcel data that were prepared by federal, state, local, nonprofit, and private sector organizations. The interviewees were selected to provide the investigators with an understanding of the logical, purposive flows of data from original data collectors to other organizations, as well as the value and issues associated with this data flow.

To do this, NYS Office of Real Property Services (NYS ORPS) selected five demographically, operationally, and geographically diverse counties in New York State to be the starting point for the study: Chemung, Dutchess, Erie, Saratoga, and Suffolk. In order to identify individuals in public, private, and non-profit organizations within each county, a representative of NYS ORPS asked the Real Property Tax Official within each County to suggest people to be interviewed who use or otherwise interact with that county's parcel data. Accordingly, interviewees were identified in public, private, and non-profit organizations that collect, prepare, and use parcel-level data created by the real property tax administration in each county.

New York State agencies were also included in the study. They were selected by identifying agencies that collect and use parcel-level data as a major part of their responsibilities. CTG staff contacted each agency's representative to the NYS GIS Coordinating Body and asked him or her to identify the person in each agency who had the most knowledge about that agency's collection and use of parcel-level data.

Face-to-face interviews were conducted in the interviewees' offices at their convenience. Telephone interviews were used for those who could not participate conveniently in a face-to-face interview. Each interview was tape-recorded (unless the interviewee declined to be taped) and lasted approximately one and a half hours. During each interview, the investigator also sketched and verified a diagram showing the main flows of parcel data between the focus organization and others. Topics covered in the interviews included:

- Mission & programs of the organization pertaining to parcel data
- Uses and potential uses of parcel data
- Collecting and obtaining parcel data
- Dissemination or supply of parcel data to others
- Value of parcel data to interviewees and their programs
- Data sharing methods and policies
- Data management and maintenance practices
- Data forms and formats
- Data storage and preservation
- Costs associated with parcel data
- Issues and barriers associated with parcel data collection, use, and dissemination
- Data flow between the focus organization and others.

Appendix B: Organizations Interviewed

- Applied GIS, Inc.
- Chemung County Office of Real Property Tax Services
- Chemung County Planning Department
- City of Elmira
- Dutchess County Department of Emergency Response
- Dutchess County Real Property Tax Service Agency
- Dutchess Land Conservancy
- Erie County Office of Real Property Tax Service Agency
- Erie County Water Authority
- Institute for Local Governance and Regional Growth, University at Buffalo
- Kapell Real Estate, Inc.
- Landata (REIData, Inc.)
- Nature Conservancy
- New York State Department of Environmental Conservation
- New York State Department of State
- New York State Department of Transportation
- New York State Office of Cyber Security & Critical Infrastructure Coordination
- New York State Office of Real Property Services
- New York State Thruway Authority
- Niagara Mohawk, A National Grid Company
- Saratoga Associates
- Saratoga County Real Property Tax Services
- Southern Tier Central Regional Planning & Development Board
- Suffolk County Planning Department
- Suffolk County Real Property Tax Service Agency
- Suffolk County Water Authority
- Town of Clarence
- Town of Clifton Park
- Town of Greenfield
- Town of Corinth
- Town of Pleasant Valley
- Town of Southampton
- URS Greiner Woodward Clyde
- Weiler Mapping, A Division of James W. Sewall Company
- Xspand, Inc.

Appendix C: Selected References

Web Sites of Interest

Cornell University Geospatial Information Repository (CUGIR)- A National Geospatial Clearinghouse Node. An active online repository in the National Spatial Data Clearinghouse program, this site provides geospatial data and metadata for New York State. There is an emphasis on features relevant to agriculture, ecology, natural resources, and human-environment interactions. <http://cugir.mannlib.cornell.edu/>

Federal Geographic Data Committee (FGDC). This site provides information on the activities of the FGDC and the National Spatial Data Infrastructure (NSDI) project. The NSDI is a cooperative effort of State, local and tribal governments, the academic community, and the private sector and reports on the policies, standards, and procedures for organizations to cooperatively produce and share geographic data. <http://www.fgdc.gov/>

Federal Geographic Data Committee - National Geospatial Clearinghouse. The Clearinghouse is a collection of over 250 spatial data servers that have digital geographic data. <http://clearinghouse1.fgdc.gov/>

New York State Geographic Information System Clearinghouse. The NYS GIS Data Sharing Cooperative is a group of governmental entities and not-for-profit corporations which have executed Data Sharing Agreements for the purpose of sharing in the creation, use, and maintenance of GIS data sets in New York State. <http://www.nysgis.state.ny.us/>

Oklahoma City Economic Development Information System (OKCEDIS). The OKCEDIS is an Internet GIS application that offers immediate access to economic, business, planning, geographic, and demographic information in real time via the web. The website application allows users to view, create, and print maps; perform site selection searches; and customize and analyze demographic and business data. <http://www.okcedis.com>

Reports, Articles, and Practical Guidelines

Arkansas State Land Information Board. (2003). Cadastral Mapping Standard – DRAFT. Retrieved January 2005 from http://www.nationalcad.org/data/documents/Arkansas-Draft_Digital_Cadastre_standard.pdf.

Burgei, D. (2004). Cadastral Task Force Status Report. Cadastral Task Force. Retrieved January 2005 from <http://www.nationalcad.org/data/documents/Ohio-Core-Data.pdf>.

Cowen, D. & Craig, W. J. (2004). A Retrospective Look at the Need for a Multipurpose Cadastre. ESRI. Retrieved January 2005 from <http://www.esri.com/news/arcnews/summer04articles/a-retrospective-look.html>.

- Federal Geographic Data Committee: Subcommittee on Cadastral Data. (2004). Cadastral Core Data Standards - Version 5. Retrieved January 2005 from <http://www.nationalcad.org/data/documents/Cadastral%20Core%20Data%20Version%2005.pdf>.
- Florida Department of Revenue; Property Tax Administration and Mapping and GIS Section in cooperation with Florida Geographic Information Board. (2001). State of Florida Cadastral Mapping Guidelines and Standards. Retrieved January 2005 from <http://www.nationalcad.org/data/documents/florida-cad-standards.html>.
- Government Accountability Office (2004). Geospatial Information: Better Coordination Needed to Identify and Reduce Duplicative Investments. Report Number GAO-04-703. Retrieved January 2005 from <http://www.gao.gov/new.items/d04703.pdf>.
- Kaufmann, J. & Steudler, D. (1998). Cadastre 2014: A Vision for a Future Cadastral System. Retrieved January 2005 from <http://www.nationalcad.org/showdocs.asp?docid=83&navsrc=Standards&navsrc2>.
- Meyer von, Nancy, (Eds.) (2002). Parcel Identifiers for Cadastral Core Data: Concepts and Issues. Federal Geographic Data Committee. Retrieved January 2005 from <http://www.nationalcad.org/data/documents/parcelID.pdf>.
- Parcel Data and Hurricane Isabel: A Case Study (2004). Retrieved January 2005 from <http://www.nationalcad.org/data/documents/Parcel%20Data%20and%20Hurricane%20Isabel%20prelim%20report.pdf>.
- PSOMAS. (2003). California Digital Land Records Information: Requirements and Findings. Retrieved January 2005 from <http://www.nationalcad.org/data/documents/CA-land-records-needs.pdf>.
- Rutberg, K. (2003). A Review of Geospatial Metadata Standards for the New York City Department of Environmental Protection's Sewer Mapping Project. Hunter College, Department of Geography. Retrieved January 2005 from http://www.karenrutberg.com/karen/academic/geospatial_standards_krutberg.pdf.
- Stage, D. & von Meyer, N. (2003). An Assessment of Parcel Data In The United States. Federal Geographic Data Committee's Subcommittee on Cadastral Data. Retrieved January 2005 from http://www.nsgic.org/hot_topics/cadastral/Assessment_of_Parcel_Data_in_50_States.pdf.
- State of Nebraska, Nebraska Advisory Committee on Standards for Multipurpose Land Information Systems. (2000). Nebraska Guidebook for a Local Government Multipurpose Land Information System. Retrieved February 2004 from http://www.calmit.unl.edu/gis/LIS_Stds_Intro.html#table_of_contents .
- State of Ohio, Cadastral Task Force. (2004). Cadastral Task Force Status Report. Retrieved February 2004 from <http://www.nationalcad.org/data/documents/Ohio-Core-Data.pdf> .

State of Wisconsin, Department of Administration, Land Modernization and Integration Plan, Final Instructions. Retrieved in February 2004 from http://www.doa.state.wi.us/dir/documents/wlip_limiplans_instructions.pdf

The National Academy of Sciences. (1980). Need for a Multipurpose Cadastre. Retrieved January 2005 from <http://books.nap.edu/openbook/NI000560/html/index.html>.

Walsh, T. (2004). Illinois county puts property data on the Web. Government Computer News. Vol 23, Issue 24. Retrieved January 2005 from http://www.gcn.com/23_24/state-local/26981-1.html.