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# MassGIS Standard for Digital Parcel Files

**Version 2.1**
**(Replaces version 2.0)**
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*This standard for spatial accuracy and detail of assessor parcel mapping and related attribute information is for developing digital versions of assessor's property maps for use in planning, property assessment, and map display. There is no intent to provide a standard for developing a legally authoritative definition of property boundaries. Matters related to those more definitive interests remain the purview of the professional title attorney and/or professional land surveyor.*

# PREFACE

Version 2.1

This minor upgrade to the standard reflects experience gained in fiscal years 2011 and 2012 as standardized digital parcel mapping was developed for most communities in the Commonwealth. Most of the changes in version 2.1 were implemented as changes to the contract specification for the six original mapping vendors working on the statewide parcel mapping project, so this version serves to formally document changes that have already been put into practice. The two exceptions to this are the additions of the TAXPAR_ID field in the OthLeg feature class and the CAMA_ID field to the assessing extract, which have been discussed with mapping vendors, CAMA vendors, assessors and other stakeholders but not yet implemented.

Preface to Version 2.0

This version of the parcel standard incorporates changes suggested by experience at MassGIS with data developed under previous versions of the standard and also reflects comments from creators and users of parcel data. An earlier document describing proposed changes to the previous version of the standard has been circulated to the GIS community; many of these comments resulted in reconsideration of these changes in the final version of the standard, *so familiarity with the document describing proposed changes is not a substitute for a careful reading of this new version (for example, the structure of the LOC_ID has been changed)*. Also note that there is no longer a Level I, and that Level III incorporates most but not all of the requirements from Level II.

Level I of the standard at version 1.5.1 described an approach to digital parcel mapping that incorporated commonly accepted, reasonable approaches to developing digital parcel boundaries with the emphasis on best practices for boundary compilation and some minimal requirements for attribution. Level I best practices have been incorporated, where relevant, into Level II and Level I is no longer part of the standard. Communities, particularly if assistance from the state is forthcoming, should implement the Level II or Level III data model and attempt a complete linkage between mapping and tax list as described in this standard.

Level II of the previous standard is now being widely used. Digital parcel files that comply with Level II of the current standard have been created for dozens of cities and towns. Some resulted from the requirements of grant programs in 2002 and 2006; additionally, many communities have decided to use Level II of the standard as the specification they provide to contractors, or have adopted the standard for in-house work simply because they saw the benefit of standardized parcel data. In this version of the standard, we are leaving largely intact the substance of level II with respect to parcel-related data management in GIS. We do incorporate a new approach to boundaries of other legal interests in land (easements and so on) and other features, and we also have considerably revised guidance on boundary compilation and made quite a few changes to attributes.

Level III in Version 2.0 is brief but significantly different from the previous version. All requirements of Level II are incorporated at Level III, with the exception of the data model. At Level III we have simplified the relationship between mapped parcels and the tax list with a new data model.

One key assumption in writing Version 2.0 of the standard was that we did not have the option of adding records to the assessor tax list, so we worked solely with the geography to update the data

model. In doing so, we relied on proprietary features of the ESRI ArcGIS software, which is the GIS software almost universally used by municipal staff and by their mapping services vendors in Massachusetts. However, we did not feel that it was appropriate to *require* the use of any particular software, no matter how popular, and so for communities who wish to maintain parcel data at level II using non-ESRI GIS software, that is still a valid option.

Level III can be derived from Level II in a systematic and fairly automated fashion, and MassGIS will ask vendors and cooperators to do so because of the advantages of the new data model; this ability to "upgrade" from Level II to Level III will become clear in reading the new standard. Additionally, for communities using ESRI software, where we would expect and encourage adoption of level III as the standard, we do not require functionality that is not available at the least expensive level of the ESRI product suite (ArcView). Thus, the standard is still based on "simple features" rather than requiring the implementation of topology rules in the geodatabase. Also, we respect the fact that much parcel data is developed and managed in a CAD (non-GIS) environment; while we want to encourage the conversion of parcel data to GIS we do not expect the wholesale abandonment of CAD as a technology for parcel map maintenance. This was another argument for seeking a "lowest-common-denominator" approach for elements of the parcel standard.

We are fortunate that at the state level the creation of a statewide digital parcel data layer, as described in our 2007 *Strategic Plan for Massachusetts Spatial Data Infrastructure*, is increasingly being recognized and supported as a key goal. The implementation of a robust standard is a vital prerequisite to this effort.

As noted above, in developing this version off the standard we solicited comments from a broad cross-section of stakeholders in assessor parcel mapping. We received many suggestions and comments which resulted in changes to the standard. Some suggestions were not implemented. Some suggestions conflicted. Our decisions reflected the desire to minimize the standard's complexity, our understanding of the needs of assessors and the content of assessing databases, and, finally, what was required to use the data at a regional or state level. We are grateful for the comments and suggestions we have received from the GIS community and we look forward to working with the many organizations, public and private, that will be involved in creating a statewide parcel layer for Massachusetts. Finally, if you have questions about the standard, corrections, or suggestions for improvements, please forward them to either one of the MassGIS staff members listed below. Thank you.

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# INTRODUCTION

Public or private planning for economic development, managing growth, protecting environmental resources, delivering local and state government services including public safety and emergency response, managing transportation infrastructure and many other government functions require information about property boundaries. This standard applies to GIS mapping of property boundaries as shown on municipal assessor's maps with the intent of creating a product that is useful for assessors and also for other town departments and other levels of government. Ultimately, we need to be able to answer the most common, basic questions for anywhere in the state – who owns this parcel of land, how is it being used and what's on it or near it?

There are numerous benefits associated with having standards for the format, quality and documentation of assessor's maps in GIS. Standardization makes it much easier and more efficient to use digital parcel files. Often, the use of digital parcel maps spans entire regions or even the whole state. For digital parcel boundary files from multiple communities to be used together, they must all be developed according to the same specification and they must have common, well-defined and compatible data elements. Not only boundary mapping must be compatible, but attribute names and definitions must agree.

The ability to combine data from adjacent communities is relevant not only for regional purposes but also to individual towns. For example, parcel data from adjacent communities is needed to support abutter notification mailings, "comparables" for property assessments, mapping locations of students when schools are regional, reviewing proposed developments that straddle town boundaries, and police/fire tasks such as crime mapping, mutual aid dispatch support, and lost-person searches. Similarly, as regionalized municipal services become more common, the need for standardized digital parcel data will grow.

Standards for quality and for documentation provide assurance for the data generator that the files will be used appropriately and for the end-user that other kinds of relevant GIS information (such as locations of hazardous waste sites, wetlands, public water supplies) can be shown with the parcel mapping and correctly interpreted. Furthermore, developing mapping templates or end-user applications which can be used with data from different communities becomes much more cost-effective when the data are standardized. Without a standard, making digital files from multiple communities compatible requires a prohibitive amount of work.

## PURPOSE

The standard has four purposes:

1) It provides a consistent framework for the management of parcel data in GIS which should satisfy the needs of assessors to view and query mapping linked to their tax list and to produce hard-copy map products. Data products which are not useful to local assessors are not likely to be maintained; for that reason we have included guidance on options to handle dimensioning and annotation which are of particular interest to assessors, and options to support the production of familiar, useful map products. Along the same lines, the standards relating to compilation accuracy are primarily intended to support the assessing function, with the additional understanding that the mapping and attribution of *all* properties, even non-taxable ones, is a critical requirement. Individual assessors should determine if the reconciliation of parcel geometries at a survey level of accuracy is necessary for their day-to-day operations; at a minimum we presume that they need a reasonable depiction of the area, shape and situation of the property. The capability to view parcel boundaries on top of an orthophoto base map, combined with the ability to overlay mapping of improvements, wetlands, rights-of-way or other factors that might affect property valuation is highly advantageous to assessors.

2) It provides guidance for municipal staff and their contractors on compilation of parcel boundaries where the existing mapping is of poor quality or not in digital form.
3) It provides a format for the exchange and aggregation of assessors' tax parcel mapping and associated attributes. This makes it possible to merge digital property information from more than one community and to identify a single property parcel statewide based on a single unique identifier. The standard also supports the migration to more sophisticated data management techniques using "topological" rules in multi-user geodatabases – without requiring those techniques.
4) It establishes minimum specifications for mapping accuracy and for consistent and complete attribution. As the public expectation of access to data on-line continues to grow, so does the importance of data availability in a standardized, agreed-upon format, which will allow the state to avoid customized, one-off solutions and leverage investments in web mapping platforms across different communities and different vendors.

## AUTHORITY and PROCESS

As the Commonwealth's Office of Geographic Information, MassGIS has, through the Commonwealth's Chief Information Officer, legislatively assigned authority to "...coordinate all geographic information activities in state and local government…", and to "...set standards for the acquisition, management, and reporting of geographical information..." (MGL Ch. 7, Section 4A (d)). **Compliance with this standard is recommended by the Department of Revenue's Bureau of Local Assessment for any community that contracts for or otherwise arranges creation of a GIS version of their assessor's tax maps[1].** This requirement will not usually be burdensome for most communities, as digital parcel files developed by those experienced in the issues of GIS data and application development would comply with most, if not all, of the requirements as a matter of good professional practice. In addition, if funding from Public Safety and from the Information Technology Division continues through fiscal year 21013, MassGIS will be able to complete standardized tax parcel mapping for all communities in the Commonwealth (except Boston and, perhaps, Worcester and Springfield). While this standard product may not meet the tax mapping requirements of all communities, it will do so in many communities. Even in those communities where the standardized mapping is missing some elements regarded as necessary for the tax map, the cost to add those additional elements will in most instances be relatively modest. Once their mapping has been standardized, DOR strongly recommends that communities include include compliance with the standard in their specification for map maintenance. Guidance concerning how to do this can be found on the MassGIS web site at http://www.mass.gov/mgis/L3parcels.htm in the section on maintenance.

This standard was drafted by MassGIS staff, drawing upon their experience with parcel map conversion and with developing GIS applications in municipal government. The first version of the standard drew on work by other states, notably Vermont and Wisconsin. Both the first and second versions of the standard were reviewed by representatives from various assessor parcel mapping stakeholder groups. Many helpful comments and suggestions were received; many of them resulted in changes to the standard.

## OVERVIEW

This standard has two parts or levels[2]. Level II incorporates common-sense, reasonable approaches to compiling assessor map property boundaries in a digital format. It also implements a data management

[1] Assessor parcel maps are for tax assessment purposes and, unlike areas outside New England, are not the legal (cadastral) record of property ownership. In Massachusetts, the legal record of property ownership is found at the deed registration offices. While property boundaries on assessor maps often serve as a proxy for ownership, any authoritative representation of property ownership must be based on records from the registry of deeds and/or work by a licensed professional surveyor.

[2] As discussed later in this document, the Level I present in earlier versions of the standard has been eliminated from this version.

scheme that maximizes the value of the mapping both to the municipality and to other organizations by linking a map feature to every record in the assessor's tax list and vice versa.

At Level II, for the first time, we organize and segregate different kinds of information shown on the maps into three different map layers. Thus one layer stores the boundaries of ordinary parcels of land in fee ownership. A second layer stores the boundaries of other legal interests whose areas wholly or partly overlap parcels (e.g. conservation restrictions or easements). Coding the type of legal interest for these other polygons makes it possible to represent them using different outline symbols or area shadings or not to display them at all, so no functionality is lost in this approach. Public rights of way are treated differently – since for all practical purposes the abutting fee owner has no use of their property within the public right of way we retain those boundaries as conventionally shown within the tax parcel layer. Finally, in a third layer, we segregate polygons representing miscellaneous features such as water bodies, traffic islands, and so on.

At level II, we also address the many-to-many problem of multiple polygons linked to one tax record, and multiple tax records such as condos linked to one polygon. The solution is to create an "intersection table" that links the parcel mapping with the tax list. This enhanced link to the assessing data makes it possible for a high percentage of both taxable and tax-exempt properties represented on the assessor's maps to match to a record in the assessor's property database and vice versa[3]. The intent at level II is for the parcel mapping and associated database to become an inventory of all land in a city or town instead of simply an inventory of properties that receive a property tax bill. Also, at Level II we identify specific items of information for a "standard" extract of assessment information to associate with the parcel mapping. Finally, at Level II we continue the requirement for using the official legislatively approved municipal boundary, for developing the data using the North American Datum of 1983, for uniquely numbering polygons, and for creating metadata.

Level III is the highest level of the standard and **applies to any state Executive Branch entity that has committed resources or staff to developing parcel data, and by extension to any business or other entity that is receiving state funding for providing digital parcel information**. Level III makes the link between the assessor's database and the GIS simpler by eliminating the intersection table and storing a unique map parcel identifier directly in the assessor database extract.

There are two cases of many-to-many situations which we address differently in Level III than Level II. The first case involves multiple disjoint parcels that are treated as one parcel for tax purposes; at Level III these are merged into a single "multi-part" polygon (only currently possible using the ESRI software.) The second case involves two or more adjacent parcels of land being treated as one parcel for tax purposes. In the latter case we dissolve the polygons and we call the resulting polygon a "tax parcel" to distinguish it from ordinary fee ownership parcels. However, in order to avoid the loss of any useful information, before creating a multi-part polygon or dissolving adjacent parcels into one polygon, we copy the original (separately deeded) parcels into the "Other Legal Interests" layer described at Level II. Thus, the information is retained, while simplifying the data model for the tax parcel layer. In either case, with multi-part polygons or with the dissolved "tax parcels", it becomes possible to eliminate the intersection table required at Level II and to link directly between the assessor list and the map. This direct link requires that a unique identifier[4] for each tax parcel is associated with its corresponding record in the assessor's tax list database. Whether that direct link involves joining to a copy of information extracted from the assessor list or a direct link to a read-only view of the assessor database will depend on how and by whom the parcel data are being used. The direct link approach requires that the standard's unique map parcel identifier be embedded directly into the assessor's database.

[3] The specific percentages and related exemptions are in the discussion of Level II.
[4] See discussion of LOC_ID

Regardless of the level at which this standard is implemented, the implicit assumption is that in a city or town it will most likely be implemented by one or more of the following:

1. Professional GIS staff employed by a city or town.
2. Other non-municipal organizations (e.g., regional planning agencies) that undertake the conversion or maintenance of the assessor's maps under contract.
3. Consultants or CAMA software vendors.

All these entities, if they are doing any GIS work at all, should have the resources, the software, and the skills, to implement either level II or level III of the standard as laid out in this document. In most cases, where ESRI software is being used, level III will be the more logical and ultimately the more useful choice; it is also the level required to receive any state funding.

The files that must be created in implementing this standard are listed below with the naming convention for data exchange. In the file naming conventions, "xxx" refers to the TOWN_ID (e.g., 008, 251, etc) from the town boundaries data layer distributed by MassGIS.

1. Tax Parcels (map) in a GIS file format (file name in form MxxxTaxPar)
2. Other legal interests (map) in GIS file format (file name in form MxxxOthLeg
3. Miscellaneous features (map) in GIS file format (file name in form MxxxMisc)
4. Extract from assessor database (file name in form MxxxAssess); this extract may not be necessary in the municipal environment provided arrangements are made with the assessor to enable municipal staff to connect directly into a read-only view of the extract.
5. Level II **only**: Intersection Table (file name in form MxxxInt)

One or two additional tables are required for descriptive look-up and validation of code values for specific fields as discussed later in this document. The first of the look-up tables is required if there are additions to the domain for LEGAL_TYPE in the OthLeg layers and MISC_TYPE in the Misc layer. A second table provides a look-up of assessor use codes and additional entries are required to document any non-standard codes such as four digit extension to the DOR standard list.

## DEFINITIONS

The following definitions will help in understanding this standard:

*Assessor database* – This is the database of property assessment information maintained by the assessor; it is also referred to as the tax list, property list, CAMA system, CAMA database, etc.

*Attribute* – A single element of non-graphic (e.g., name of owner, property area, property value) information stored in a database field and usually, in the context of this standard, associated with a single geographic feature (e.g. a property parcel on a map).

*Base Map* – This refers to a map portraying basic reference features on the earth's surface (both natural and cultural) onto which other, specialized, features (e.g., property boundaries, water mains) are placed. A commonly used example is the statewide color orthoimage base map available through MassGIS.

*CAD* – Acronym for Computer Aided Design, software technology which supports the creation and maintenance of engineering and survey documents and many other kinds of drawings. Some CAD packages can support mapping scales and use real-world coordinates as well as storing drawing elements in "paper space".

*CAMA_ID* – The field in an assessing database extract containing the identifier from the assessing database that uniquely identifies each property record. This unique identifier is typically an arbitrary sequence-generated number, especially where a commercial CAMA package is being used with a normalized set of tables that are joined by unique IDs. For example, in a Patriot AssessPro database this unique ID is called the account number; in a Vision database it is the ParcelID or "PID"; in a PK-Systems database it is the "Key"; and in the CSC database it is the "Link_id" field.

*Deeded Parcel* - Individual parcel of land whose specific ownership is recorded on a deed at the Registry of Deeds – but as used in this document, "deeded parcel" is also taken to include parcels whose ownership is recorded in Land Court documents as "registered land" or land which is in probate.

*Digital Parcel File* – This refers to a computer file or files containing a graphic (vector) representation of the boundary information originally depicted and maintained on a city or town assessor's maps. Besides fee ownership, boundaries that may appear include public and private rights of way and various kinds of easements. These files are typically created in and maintained using GIS or CAD software.

*Digitizing* – This term refers to tracing the lines on a map so as to recreate them in electronic (digital) form. This tracing historically was done on a special digitizing table but is more commonly done these days by viewing a scanned version of the map on a computer screen and using the mouse cursor to trace the lines ("heads-up digitizing"). In some cases, the lines may be traced by software in a semi-automated fashion.

*Disjoint* – This term describes two or more polygons which do <u>not</u> share a common linear boundary, although they may touch at one or more points (vertices). An important and relatively common example is a single tax parcel which has been split by a road right-of-way into two distinct polygons.

*Intersection Table* – This separate database table is created in complying with Level II of this standard. It includes two fields: the PROP_ID and the LOC_ID. These fields are defined below. The intersection table provides a mechanism for correctly associating multiple assessing records (e.g., those for condominiums) with a single map parcel polygon and vice versa. Whenever a row is added to the

intersection table, BOTH the PROP_ID AND the LOC_ID must be filled. Each combination of PROP_ID and LOC_ID in the intersection table must be unique.

*LEGAL_TYPE* – This attribute identifies the type of legal ownership interest for a tax parcel in the "other legal interests" data layer. See the description of this attribute in the discussion of the attributes for the OthLeg feature class later in this document. Note, also, that the non-fee interests may be partial or overlapping with respect to the fee interest in a parcel. For example, a conservation or agricultural restriction will often apply to only part of a property. In developing GIS files to comply with this standard, only the polygons that appear on the assessor's maps need to be captured and coded. So, for example, if there are no conservation restrictions mapped on the assessor's maps, then no LEGAL_TYPE values of "CR" will exist.

*LOC_ID* – This identifier is specific to the MassGIS parcel mapping standard. It appears in three places: as an attribute of the parcel file, in the intersection table at Level II and in a field in the assessor list extract. The LOC_ID is a unique identifier for parcels. It is created by combining a letter identifying the units of the coordinates from which the identifier is created ( "F" for units of US Survey Feet and "M" for meters; Massachusetts State Plane System, NAD83 datum) with X and Y coordinate values of a point that lies within the polygon. The creation of a centroid point within each polygon can be automated, except that care must be taken with U-shaped parcels and with multi-part polygons that the point actually falls within the polygon. The letter indicating the units and the X and Y coordinate values of the point are then appended together, each separated by a single underscore character ("_"); coordinate values after the decimal point are truncated. This creates the LOC_ID. Examples of LOC_IDs are "F_552984_2956780" or "M_168529_901230." Mixed entries for the units specifier within the records for one community are not permitted. This identifier has two useful properties. First, it is unique (it is a database primary key) statewide. Second, because it is derived from coordinates, it can be used by GIS software to locate the parcel in the absence of any other identifier. Furthermore, every map parcel can easily be tagged with this identifier using standard capabilities in most GIS software.

*It is not explicitly required that the LOC_ID be inserted into the assessor's database, but all major CAMA systems have a field that could contain the information in this identifier. A field containing the LOC_ID must be added to the assessor database extract for compliance with Level III of this standard. In conversations with the vendors of the major CAMA systems, they have indicated that adding the LOC_ID as a map identifier is consistent with their existing database structures. Thus compliance with Level III of the standard can be achieved within a municipality if the parcel map polygons can be joined to a database view directly in their assessment database. In this case, when data complying with Level III are provided to a third party, the extract would need to include the field containing the LOC_ID.*

*MAP_PAR_ID* – This is a parcel identifier whose purpose is to unambiguously reference one or more polygons on the map. Although it may be called various names or may even be concatenated ("merged together") from more than one field, some such identifier must exist in any digital parcel file if that file is to be initially linked with information from an assessor's database. In digital parcel attribute files, the content of this field is usually created by concatenating various identifiers, (e.g., map number/map sub-number/parcel number/parcel sub-number, or map/block/lot or section/block/lot) that appear on assessor's maps. When implementing this concatenation, the preferred separator is an underscore ("_"). The various components of this identifier will vary from community to community.

Typically each parcel polygon on an assessor's map is labeled with the lot number. The map number may only appear once on the map sheet, and, if used, the block numbers may appear as needed to differentiate the different blocks on the map sheet. As discussed under Level II of this standard, while this identifier uniquely identifies one ownership interest, it may not be a unique identifier on the assessor's maps. The

key requirement for the MAP_PAR_ID is that it corresponds to a parcel identifier shown on the assessor's map. The recommended format for this ID, if it is concatenated from map, parcel and lot identifiers, is to separate them with an underscore.

*MISC_TYPE* – In the "miscellaneous features" layer (MxxxMisc), this attribute identifies and classifies miscellaneous features on an assessor tax map.

*Orthophoto* – When a photograph is taken from an airplane, there are distortions in the resulting image due to the motion of the aircraft, the variable distance between the camera lens and the ground in the middle of the photo and at the edge of the photo, and the variable distance from the camera lens to the ground due to elevation changes. An orthophoto is an aerial photograph from which distortions have been removed so that distances and areas can, within the limits of the orthophoto accuracy, be correctly measured.

*Planimetric base map* - A map that depicts the horizontal positions of natural (e.g., ponds, trees, elevation contours) and cultural features (e.g., paved areas, building footprints, poles).

*POLY_TYPE* - This attribute indicates whether a tax parcel represents a single parcel in fee ownership or a combined "tax" parcel, and may also be used to code rights-of-way and bodies of water, but ONLY where the boundaries of those features also constitutes a parcel boundary *In developing GIS files to comply with this standard, only the polygons that appear on the assessor's maps need to be captured and coded*. If the Commonwealth has jurisdiction over a body of water (Great Pond), or if the ownership of a body of water is private but ambiguous (e.g. many parcels fronting on a small pond) then POLY_TYPE may be coded "WATER". Bodies of water that are entirely contained within a parcel of land must <u>not</u> be retained in the tax parcel layer. Instead they should be included in the Misc feature class.

*Property* – In this standard, this word refers to a record in an assessor's database.

*PROP_ID* – This field contains the information needed to unambiguously associate a property (tax record) with a single parcel on the tax map. The PROP_ID field is required at Level II (in the intersection table) and at both Level II and Level III of this standard in the assessor database extract. . The PROP_ID <u>may</u> be constructed in a manner similar to the MAP_PAR_ID out of component fields like map/block/lot. In some cases a property ID will extend the map/block/lot identifier to uniquely identify each property record. Condominiums are the most common example. Each condominium is a record in the assessor's database because each condominium owner needs to receive a property tax bill. However, condominiums cannot be <u>uniquely</u> identified with the same information used to identify other properties (e.g., map/block/lot, etc.) because there will be two or more condominiums on one lot. This situation is commonly resolved by extending the lot number so for example the condominiums on "lot 1" have lot numbers 1A, 1B, 1C, etc.

*Registration* - In this document, registration refers to the process of finding reference points on a map/image document and assigning them coordinates from their known positions in the real world. Once coordinates are specified for enough points on the map/image document, the entire digital document may be mathematically transformed to real-world coordinates for GIS display and analysis. This is often referred to as "geo-referencing".

*Scan* - This refers to the process of making a digital image of a document (e.g., a map, text document, or photo). A scanned document can be displayed on a computer screen, but until locations on the document are assigned ("registered") to map coordinates, it cannot be overlaid with map features in a GIS database.

*Tax Parcel* – This refers to an area of land, comprised of one or more deeded parcels, which is associated with a single tax record in the assessor's property database. As described in the standard, a tax parcel

may be created from several deeded parcels to simplify data management, but the information associated with the underlying deeded parcels in such cases must be transferred to the Other Legal Interests layer.

# DIGITAL PARCEL FILE STANDARD

# LEVEL I

Level I is no longer part of the standard. Technology, skills and data management practices have evolved to the point where every community should be able to attain level II. The likelihood of assistance from the state level to develop Level III parcels further reinforces the decision to "raise the bar." The requirements at Level I have therefore been folded into Level II as described below.

# REQUIRED AND OPTIONAL ELEMENTS FOR BOTH LEVEL II AND LEVEL III

Compliance with the required elements in this section should be the minimum acceptable standard for developing a digital parcel file by ANY community in the Commonwealth of Massachusetts. Requirements include digitizing assessor's maps in accordance with the boundary compilation requirements described below, assigning an identifier (the MAP_PAR_ID) to each parcel polygon, and then joining the resulting map information to information extracted from the assessor's database. Attributes are fairly extensive, but will be found in almost all assessor data sets. Parcel mapping must conform to the municipal boundary derived from survey data distributed by MassGIS.

The following summarizes the required elements for digital parcel files conforming to this standard at either Level II or Level III:

A. *Parcel Boundary Compilation* – The digital parcel file must conform to minimum compilation standards and horizontal accuracy requirements for property boundary locations.
B. *Parcels, Other Legal Interests and Miscellaneous Features*– The other legal interests in land and miscellaneous features, if shown on the assessor map, must be stored in separate map files ("data layers").
C. *Attributes for Map Layers* – The attributes of the parcel polygons must include an identifier, the MAP_PAR_ID, for each polygon that should link to an assessor's record plus additional attributes relating to type and metadata.
D. *Assessor's Database Record Attributes* – The property attributes (see Appendix A) are, for the most part, directly extracted from the assessor's database. If necessary, an attribute field called PROP_ID must be added to this copy of the assessing data.
E. *Horizontal Datum* – The digital parcel file must use the North American Datum of 1983 (NAD83) or a successor and the state plane coordinates system.
F. *Metadata* – This file provides information needed to better understand the digital parcel file.
G. *Legislatively Approved Municipal Boundary* – The parcel boundaries must be coincident with the official survey boundary for municipalities from DOT Survey Section and MassGIS as distributed by MassGIS.
H. *Data Delivery Format* – The data must be delivered in either shape file (Level II only), ESRI personal geodatabase or ESRI file geodatabase format.

Each of the above elements is explained in detail below.

Additionally, there is some guidance for the following optional elements which applies at Levels II and III:

I. *Text Labels/Annotation* – Assessor maps often include important text-based information as well as mapped features. In keeping with our principal objective of creating a data product that is useful to assessors, the standard is not prescriptive with respect to labeling/annotation and how it is stored and used.
J. *LOC_ID Archive* – Tracking changes in the parcel layer can often help resolve questions about why parcels are represented in a particular way, what the source information may have been, etc.

Earlier implementations of this standard used an "intersection table" at Level II, which provided a flexible and vendor-neutral way of ensuring that all tax parcels on the assessor map are linked with a tax list record and vice versa. This approach is still part of the standard (for Level II only) and is covered in detail following the discussion of elements shared between Levels II and III. Finally, the last section addresses the new elements which are unique to Level III.

## A) Parcel Boundary Compilation

Background

Assessor paper maps are converted to a form useable in a GIS using one of two approaches:

1. Individual maps are scanned, registered to a geographic coordinate system using a base map, and then lines from the maps are converted to digital form, usually by "heads up" digitizing on a computer screen. The base map is typically an orthophoto base map such as the one available from MassGIS, although it may also be a detailed planimetric base map.
2. Deeds for each property are examined, and the property boundaries are re-constructed and pieced together along with those of adjacent properties based on the coordinate geometry of the boundary distances and bearings. This too results in a digital file. This method costs the most, but provides the highest accuracy result, although this level of positional accuracy is not required for tax mapping purposes. This approach also requires that an individual with suitable experience and professional qualifications be involved in the mapping process.

Sometimes a combination of the above methods may be required.

Even if a digital file already exists, as it most often does, it still may need correction of geographic and other errors so the file conforms to the standard. Both compilation from paper maps and rectification or reformatting of digital files covered by this discussion of digital parcel boundary compilation.

Boundary Compilation Standards

Digital parcel boundary compilation MUST result in a GIS data file (the "TaxPar" file) containing polygon features representing tax parcels (see definition) as shown in the assessor's maps or other sources. Compilation at Level II MAY also result in two other files: the first is the "OthLeg" file, containing polygons representing the boundaries of other legal interests such as easements and conservation restrictions, if such are shown on the assessor's maps; the second is the "Misc" file for storing miscellaneous polygons often found on assessor maps (e.g., traffic islands, ponds, portions of parcels that fall outside of a community but that the assessor wants on their tax maps). Taken together, these files must reflect the best professional judgment of the individual developing the digital assessor map about how to compile existing mapping (and any other source documents or research) such that:

- Boundaries shown on the assessors' parcel map are represented as well as possible;

- Polygons representing other legal interests may overlap ordinary parcels or each other, but if the assessor map or research related to the compilation indicates that their boundaries are coincident with other mapped features then that coincidence must be enforced;
- No "slivers" occur and there are no overlaps between tax parcels;
- Boundaries match without any "jogs" or discontinuities at map sheet edges; and
- All polygons are closed.

Attaining these objectives requires striking a balance between a) being as faithful as possible to the original map sources and any other research that is done, and b) using visible features on the orthoimagery base map to make plausible adjustments to the mapping. In general, compilation should give credence to the configuration and orientation of parcel boundaries on the original assessor map *provided* most boundaries on that map appear to be in the correct location as referenced to the orthoimage base map. However, it may still be necessary to make localized adjustments so that the match between the assessor map and the orthoimage base map improves. In some instances, it may not be possible to resolve geographic discrepancies without deed/plan research, and whether or not such research is part of developing a digital parcel file would be up to the community involved.

The base map on which boundaries are compiled or adjusted must be the most recent publicly available orthoimagery either from MassGIS OR some other source such as Bing which is at least as current and accurate[5]. Developing the digital assessor map will typically involve digitizing assessors' mapping boundaries after first registering the tax maps to an orthoimage base map. Registration is accomplished by matching visible or implied features on the map to corresponding features on the orthoimage base. Better results may be achieved by georeferencing on a block-by-block basis rather than globally. Applicable criteria for geographic registration of the map and compilation of boundaries shown are:

1) Continuous Lines and Closed Polygons
2) Respect for the accuracy of subdivision plans or other sources
3) Fidelity to original assessor map
4) Coincidence with street rights-of-way
5) Coincidence with other base map features
6) Edge-matching across map sheets

<u>These criteria are listed in order of priority from first to last</u>, meaning that unless specific circumstances warrant different priorities, respect for the accuracy of a surveyed subdivision plan takes precedence over fidelity to the assessor map which takes precedence over coincidence with street rights-of-way, etc. Each of the above criteria is discussed in detail below.

*Continuous Lines and Closed Polygons* - Lines must be geometrically continuous and all boundaries must be geometrically closed with no "undershoots" or "dangles" where boundaries intersect. The conversion process must not create "sliver polygons" (gaps or overlaps between properties) which are not on the assessor's maps.

Also, as discussed below in relation to municipal boundaries, all rights-of-way (ROWs) must be closed off at a city or town boundary and at a coastline or shoreline where they terminate in a water feature. In other words, the entire area of the tax parcel layer must be composed of polygons. **It is allowable to further subdivide ROW polygons to reduce their complexity, thus reducing the time to draw or query, and to delineate the distinction between public and private rights of way if so desired.**

[5] If parcels are viewed on top of orthos that are different than the ones on which they were compiled, then some displacement of boundaries relative to the orthos may appear. In dense urban areas with small lots, building lean and the horizontal accuracy of the MassGIS orthophotos are issues in how lot lines appear relative to orthos.

*Respect for Subdivision Accuracy* - Where subdivision information of survey level accuracy has been submitted to a city/town and is being incorporated into a GIS or CAD data set, the compilation procedure should respect the accuracy of those boundaries relative to the rest of the map. Similarly, internal subdivision arcs presumed to be of survey accuracy should not be edited. Subdivisions may need to be moved, rotated, or adjusted in their entirety. Subdivision boundary arcs should not be adjusted relative to adjacent boundaries unless the adjacent boundaries are known to be of equivalent or better accuracy. When adjacent boundaries presumed to be of equal accuracy do not coincide within the limits of the horizontal accuracy of the map, then further research is needed. When the boundaries of adjacent properties are less accurate than the subdivision, they should be adjusted to fit those from the subdivision. An exception to this requirement should only be made if there is a documented error in the subdivision map.

Sometimes the MassGIS orthoimagery or other base map will not show recent subdivisions. Alternatively, there may not be sufficient information to guide the geo-referencing and boundary compilation, unless the source files already have state plane or some other real-world coordinate system or such a system can be introduced. If the update source contains such coordinates, it may need to be projected so that its coordinate system is the same as the parcel data to be updated. Alternatively, existing parcel boundary junctions in common between the existing parcel(s) and the new subdivision may provide sufficient information to geo-reference the subdivision. In the absence of any information, the best possible representation of the boundaries must be made.

*Fidelity to Original Assessor Map* - Assessor map sheets must be geo-referenced such that a) the amount of total registration error on any one map sheet is minimized, and b) road rights-of-way are correctly aligned to match as closely as possible the equivalent areas on the orthoimage base map (see further discussion below for map sheets with few or no roads).

**Figure 1**

Once the best geo-referencing "fit" is achieved, there may still be substantial discrepancies between the linework of the assessors map and features visible on the orthoimagery base map. If these discrepancies involve moving internal (not road right-of-way) arcs for an entire parcel so that the parcel's location better matches what is visible on the orthoimagery (e.g., not cutting through single family homes and following hedges, fences, and especially stone walls) then usually those adjustments should be made. Similarly, a discrepancy between the parcels and the orthoimage base map may involve a group of parcels bounded on three or four sides (a "block" of parcels) by paved road rights-of-way. In these situations, if moving the entire block as one unit results in a better fit relative to the visible features then it should be moved.

However, if it is the best professional judgment of the individual performing the work that the boundaries shown in a specific area on an assessor's map are accurate, and that discrepancies between the polygons digitized from the assessor map and the orthoimagery result from other causes such as differences between as-built features and those shown on a plan, (see example in middle of Figure 1), then the BND_CHECK attribute of the affected parcel polygons must be updated as a way of indicating that this judgment has been made. This is a new attribute; see discussion later in this document.

A final important element of fidelity to the original assessors map concerns the municipal boundary. As described later in this document, the legislatively approved municipal boundaries distributed by MassGIS must be incorporated into the parcel layer in complying with this standard. However, some municipal boundaries are legally defined to follow road or, occasionally, rail rights-of-way[6]; these boundary arcs are identified in the BND_QUAL attribute of the MassGIS TOWNSSURVEY_ARC data layer. In mapping such boundary segments, MassGIS staff only had visible features on the orthophotos as a guide. Thus the accuracy of the municipal boundaries that follow rights-of-way is less than that of the rest of the data layer. The assessor's map(s) may show this portion of the boundary more accurately than how it is mapped in the municipal boundary data layer. Therefore, MassGIS will accept tax parcel data layers where the portion of the municipal boundary that follows a road or rail right-of-way is based on the boundary from the assessor's parcel map. The exception to this would be if the person managing development of the tax parcel data layer determines that the quality of the geo-referencing and subsequent digitization of the boundary from the assessor map does not support its use. In these cases, the boundary from the MassGIS data layer would be retained. In situations where there are disputes between communities or uncertainty about the boundary location, the boundary in the MassGIS data layer will be used. Similarly, when a municipal boundary follows a stream channel, the only guide MassGIS staff had for delineating this boundary was what they could see on the orthoimage base map. That boundary as depicted on the tax map may or may not be based on a more authoritative source. Whatever the situation, boundaries following shorelines and water features will usually be different than what is provided in the MassGIS data. While in the interests of seamless data presentation, MassGIS strongly prefers that its mapping of boundaries coincident with water features be used, particularly if the boundaries on the tax map are of uncertain or dubious origin, MassGIS *will* accept tax parcel data layers where the portion of the municipal boundary that follows a stream channel is based on the boundary from the assessor's parcel map. Also see pg. 27 of standard for discussion of coastal boundary delineation.

*Coincidence with Street Rights-of-Way* - As a general rule, the street rights-of-way depicted on the assessor's maps should be compiled so that, when the street has a sidewalk, they coincide with the apparent "back-of-the-sidewalk" visible on the orthoimage base map. If there is no sidewalk, the centerline of the paved way is centered on the right of way. If in locating the boundaries of the public street right of way there is an inconsistency between following visible "back of sidewalk" features and maintaining a correct and consistent width of the right of way, priority should be given to showing a correct and consistent width, provided that approach is consistent with the assessor's map; the exception to this is highway rights-of-way, which often have irregular widths or substantial distances between the edge of the pavement and the actual edge of the right-of-way. With very few exceptions once geo-referencing has occurred, arcs representing road centerlines from the current state Department of Transportation roads data layer (see http://www.mass.gov/mgis/eotroads.htm) should fall completely within the rights-of-way on the geo-referenced map sheet.[7] This last specification still allows for significant variation in the geographic location of the rights-of-way on the map while still providing a check on the geo-referencing result. The agreement between the street center lines and the geo-referenced rights-of-way does not have to be perfect; it is expected that centerlines may sometimes have brief lateral intersection with a right-of-way boundary due to imperfections in the DOT's road centerline data. The road centerline data may also include arcs for which there is not a right-of-way indicated on the assessor map. In these

> Note *Legal parcel boundaries may not always be coincident with visible features. Some features (e.g. edges of fields, pond/lake shorelines) can move over time. Therefore, assumptions about coincidence with visible features must be carefully reviewed, case-by-case.*

[6] MassGIS has a comprehensive inventory of these locations

[7] The DOT roads were digitized from orthophoto imagery to approximately follow visible road centerlines.

instances, the road would, of course, cross parcel boundaries. In other situations, e.g. Plum Island, the visible right of way will have no relationship to the right-of-way represented by the assessor map– this would be a situation where the BND_CHK attribute would be used to validate the inconsistency.

*Coincidence with Other Base Map Features* – As discussed earlier, property boundaries are often coincident with clearly defined and visible features on the base map. These include features such as the "back-of-the-sidewalk", stone walls, hedges and tree lines, etc. Therefore, within the limits of the orthoimage base map's absolute accuracy and other constraints (such as what can reasonably be interpreted from the orthoimagery), and when appropriate as determined by the map compiler, parcel boundaries should be registered as accurately as possible to features visible on the base map. When using the MassGIS orthophotos as a compilation base, such features should not be displaced in excess of three (3) meters relative to corresponding features on the base map.

*Edge Matching Across Map Sheets* - No bends or other deformities in the boundary lines corresponding to seams in the original map sheet layout should be visible.

Additional Guidance: Geo-Referencing Map Sheets with Few or No Roads

Assessor map sheets in rural areas may have few or no roads and geo-referencing these sheets can be problematic. If such sheets include the community boundary, it can be geo-referenced to the MassGIS municipal boundaries data layer (see http://www.mass.gov/mgis/townssurvey.htm)

Another possibility is to refer to the MassGIS open space data layer (http://www.mass.gov/mgis/osp.htm) which has both polygon and line features. The accuracy of the line features in this data layer varies, but some of them were developed from sources accurate enough to be valuable in geo-referencing assessor parcel boundaries. The accuracy of these arcs can be determined by reference to the feature attribute SOURCE_TYPE in the OPENSPACE_ARC data layer available from the MassGIS web site. The domain for the SOURCE_TYPE for this attribute includes the following codes:

SV = Geo-referenced Survey; this is the equivalent of a geo-referenced sub-division plan
GSV = Geographic Coordinates from Survey
CS = COGO from Survey
CD = COGO from Deed

Lines in the open space data layer having one of the above values in their SOURCE_TYPE attribute will likely be useful for improving the geo-reference of the corresponding arcs from assessor maps. This will be true because the quality of the source records will be roughly equivalent to or even better than the records used in creating the assessor maps. Arcs in the open space data layer with this level of quality are commonplace, particularly in western and central Massachusetts.

## B) Parcels, Other Legal Interests and Miscellaneous Features

As outlined in the overview to the document and referenced in the overview for this section and in the discussion of compilation standards, Level II requires organizing assessor map information into as many as three separate GIS data layers, to represent the various geographic features commonly found on tax maps. These three data layers are:

**a.** Polygons for ordinary tax parcels (plus the public rights of way associated with physical streets as shown on the assessor maps and water features whose boundaries are coincident with parcel boundaries).

**b.** Polygons representing other "invisible" legal boundaries such as conservation restrictions or easements that overlap tax parcels. Also included in this layer are adjacent tax parcels with

common ownership that are eventually dissolved into single polygons in the ordinary tax parcel layer. There may be few or even no features in this layer; these features are required only if such boundaries are shown on the original map or digital source file.

**c.** Polygons representing miscellaneous features such as wetlands, ponds(whose shorelines are not legally or functionally being used as parcel boundaries) , traffic islands, buildings from condominium complexes, abutting parcels in adjacent communities, and the like. There is no specific requirement for this layer and it is at the discretion of the community as to whether the mapping of these additional features should be preserved. However, unless otherwise instructed, features that the assessor expects and wants to see on the tax map and that are not available from some other digital source should be included in this layer

The distinction between (a), (b) and (c) is that there is no overlap allowed between different tax parcels (and public rights of way and certain water features) whereas other legal interests or other features will overlap with parcels and may even overlap with other interests.

Creating these separate layers is the first step towards a more "topological" approach such as the ESRI "parcel fabric" without actually requiring any additional effort or any particular software. Where boundaries are actually coincident between these different layers, the standard requires that editing techniques such as "snapping" must be used to enforce that coincidence. ESRI "map topology" can be used to facilitate editing coincident features in different layers; this is available at the ArcView level in ArcGIS.

## C) Attributes for Map Layers (3 layers)[8]

Full definitions for all attribute and database table fields are found in Appendix A.

### i) *Attributes of tax parcel layer (Mxxx_TaxPar)*

The following attributes are required for the tax parcel file at Level II:

**MAP_PAR_ID** – This is the parcel ID that appears on the assessor's map. A MAP_PAR_ID value is only required where the POLY_TYPE (see below) entry is "FEE", but may be populated for rights-of-way and water features that have been assigned IDs on the tax maps. (Polygons classified as POLY_TYPE = "TAX"will have their MAP_PAR_ID values retained in the MAP_PAR_ID attribute for their constituent LEGAL_TYPE = "FEE" polygons in the OthLeg feature class.

**LOC_ID** – This attribute (see full discussion in the definitions portion of this document) uniquely identifies (statewide) a tax parcel polygon.

**POLY_TYPE** – This attribute identifies the kind of polygon in the tax parcel layer. Most polygons will be coded "FEE"; those representing dissolved parcels will be coded "TAX". Polygons may also be coded "WATER" if the parcel boundaries are coincident with the shoreline of a water feature not entirely contained within one parcel and "ROW"(including bicycle paths), "PRIV_ROW", or "RAIL_ROW" if the right of way polygon does not overlap tax parcel polygons. When a "RAIL_ROW" crosses a "ROW" or "PRIV_ROW" at a grade crossing, the "RAIL_ROW" breaks the "ROW" or "PRIV_ROW". Rights-

[8] Note on field specifications – character fields specify the minimum number of characters, number fields specify the minimum total number of digits and, optionally, the number of digits after the decimal point e.g. (number 4,2) would be 99.99 Dates are given as integers in YYYY or YYYYMMDD format to avoid the occasional difficulties encountered with importing and exporting date formats – dates as integers in this format are platform independent and can be sorted and queried using integer comparison. Field specs may be translated to various specifications such as Varchar, Short Int, Float, etc according to the database system in use.

of-way that overlap tax parcel polygons (e.g., access easements) belong in the "other legal interests" data layer.

*Private rights-of-way (POLY_TYPE = "PRIV_ROW") in the TaxPar feature class only occur as discrete polygons that do not overlap with other polygons in TaxPar.*

**MAP_NO** – Map number of the assessor's map sheet from which the mapping of the parcel in the digital file was created. This attribute only needs to be populated if the information is readily available – creation of standards-compliant parcel files from CAD files or other digital sources may not provide this information.

**SOURCE** – The most recent boundary feature source (valid values are "ASSESS" (assessor map – this choice includes existing digital files including CAD files and is the default), "SUBDIV" (subdivision plan), "ANR" (subdivision approval not required), "ROAD_LAYOUT", and "OTHER").

**PLAN_ID** – Identifying information for plan (e.g, subdivision or road plan) used to update the digital file.

**LAST_EDIT** – The date this parcel polygon was last edited, formatted as YYYYMMDD. Initial value will be the date the GIS file was brought to compliance with this standard. This cannot be null or zero.

**BND_CHK** – This attribute is used to identify parcels where, although there is a discrepancy between the parcel boundary and features visible on the orthoimage base map, the boundary shown is believed to be correct. In addition, this attribute will enable those conducting QA to identify parcels where the boundary compilation may need editing. The domain of values for the BND_CHECK attribute will be:

Null = indicates that no particular attention has been given to checking the compilation of the given parcel

"CC" = this value indicates the compilation has been checked and is entered by the compiler to indicate an apparent discrepancy between the map data and the orthoimage base map where, in their professional judgment and based on the available evidence, the compilation is correct. This might include such anomalies as a parcel boundary cutting off a corner of a building, or a boundary displaced from a feature such as a stone wall that might often indicate the boundary location.

"NR" = This rarely used value indicates that the boundary needs research from primary sources; use of this value by the data developer MUST be accompanied by a separate communication to MassGIS explaining why the circumstances require its use.

"OK" = this value is entered only by MassGIS staff, and indicates that a discrepancy between the boundary compilation and the orthoimagery previously coded as "CC" by the data developer has been approved as being consistent with known information. If a polygon coded in this way is subsequently edited, this attribute would be changed to null or "CC".

Data developers should expect to code only a small minority of parcel polygons as "CC" – most parcels would simply carry null values in this field.

**NO_MATCH** – This attribute is for identifying parcel polygons whose exclusion from calculations of Level III match rates between parcel polygons and the assessor's tax list has been approved by MassGIS. The default value is "N". The value for parcels approved for exclusion from the match, is "Y".

Background - Some communities have collections of parcels where ownership is unknown or in dispute. These collections are typically failed subdivisions (e.g. "Sherwood Forest" in Becket, "Edgewood Park" in Holden) or "lottery" parcels given away as prizes at events like county fairs or as part of business promotions in the 19th and 20th century. Lottery parcels were typically very small (usually non-conforming by today's zoning requirements) and were usually clustered together around a pond or on a large wetland (for example, South Meadow Cedar Swamp in Carver). Also, some communities have

"odds and ends" or "scraps" of land where ownership is unknown and the value of the unpaid tax bill does not justify the cost of determining ownership. In such circumstances, where it is unduly burdensome to determine the ownership of these properties, they may be excluded from the match rate calculations of the standard.

Process- *For data being funded by the state, the exclusion must be formally requested from MassGIS.* The request should be made via email and must include a shape file of the parcels at issue and some documentation (e.g., from the assessor) that the ownership is unknown or in dispute. This documentation does not have to be parcel-specific – a general statement relative to the shape file is sufficient. MassGIS will approve the exclusion via email. Once approved, the NO_MATCH attribute of the TaxPar data layer must be set to "Y". Note that properties where the orthoimage base map reveals a structure that could carry a site address MUST be the subject of extra effort to link them with a tax record as MassGIS is very reluctant to approve a NO_MATCH request for these properties.

## ii) *Attributes of other legal interests layer (Mxxx_OthLeg)*

The following fields are required for polygons in the "Other Legal Interests" file:

**MAP_PAR_ID** – This is the parcel ID that appears on the assessor's map. A MAP_PAR_ID value is only required where the LEGAL_TYPE (see below) entry is "FEE".

TAXPAR_ID – This attribute only needs to be populated for polygons where LEGAL_TYPE = "FEE" and will contain the LOC_ID value for the corresponding polygon (single or multi-part) in the TaxPar feature class having POLY_TYPE ="TAX" that the OthLeg "FEE" parcel contributes to.

**LEGAL_TYPE** – This identifies the kind of legal interest. The initial domain of values for this attribute is as follows, but can be extended:

> *Private rights-of-way in feature class OtheLeg (LEGAL_TYPE = "PRIV_ROW") only occur when they overlap a portion of one or more polygons in feature class TaxPar; they are a form of easement.*

"FEE" = parcel of land copied from the tax parcel layer to preserve boundaries
"PRIV_ROW" = private right of way
"RAIL_OVER" = rail right-of-way crosses over another right-of-way; at a grade crossing, the RAIL_ROW polygon breaks a ROW polygon.
"ROW_OVER" = a road right-of-way crosses over another right-of-way
"EASE" = easement (e.g., for a driveway or for utilities)
"CR" = conservation restriction
"APR" = agricultural preservation restriction
"CRX" = conservation restriction exclusion
"APRX" = agricultural preservation restriction exclusion
"OTHER"

This domain can be expanded with codes that are different from those listed. The standard requires appending to a lookup table for any new codes. This lookup table, called Mxxx_LUT (where xxx is the TOWN_ID), must adhere to the following specification:

| FIELD NAME | DEFINITION | EXPLANATION |
|---|---|---|
| TOWN_ID | Number, 3 | Town-ID from MassGIS towns data layer |
| FIELD_NM | Character, 10 | Specifies field (LEGAL_TYPE or MISC_TYPE) in which code is used |

| | | |
|---|---|---|
| CODE | Character, 20 | Code for LEGAL_TYPE or MISC_TYPE code |
| CODE_DESC | Character, 50 | Definition of the code |

Note that this same table may also be used to contain additional values for the MISC_TYPE attribute of the miscellaneous features data layer. Thus, the structure of this table includes the FIELD_NM so that it can be joined to individual attributes by creating a definition query or view based on the FIELD_NM field value.

**LS_BOOK** – Registry of Deeds book for last sale. If known, this is useful, and it should be filled in, but there is NO requirement to do legal research to find it.

**LS_PAGE** – Registry of Deeds page for last sale. Again, if known, this is useful, and it should be filled in, but there is NO requirement to do legal research to find it.

**REG_ID -** this is the equivalent to Registry of Deeds book and page information but for registered or probate land; it may also be known as the certification number. This is because land in Land Court or Probate does not have a normal book and page identifier. It should be filled in if known but there is NO requirement to do legal research to find it.

ii) *Attributes of miscellaneous features layer (Mxxx_Misc)*

The following fields are required for the "Miscellaneous Features" file:

**MISC_TYPE** – This attribute identifies the kind of miscellaneous feature.

The domain of values for this attribute in this layer is:

"WETLAND" = wetland area (as shown on the assessor map, not as mapped by DEP)
"ISLAND" = island within a body of water, if not representing a separate parcel
"TRAFFIC_ISLAND" = a raised area within a right of way, shown for reference
"WATER" = could be represented by a double line, or a lake/pond or reservoir, whose boundary is not co-incident with parcel boundary (not sure an edit was needed here… new wording implies "double line" and "lake/pond" are things that do the representing, but one is a representation and the other is a real feature)-DM
"OUTSIDE" = A portion of a parcel that falls outside the boundary of a community but since part of the parcel is in the community, the assessor wants to depict it in its entirety.
"BLDG" = the outline of a building, typically containing condominiums, that are retained on the assessors map to better illustrate the circumstances on a specific property parcel.

Again, this domain can be expanded at the users' discretion, but any new codes must be included in the look-up table as specified in the discussion of the LEGAL_TYPE attribute.

## D) Assessor's Database Record Attributes

Accessing attributes from the assessor's database through the parcel file is usually accomplished by obtaining a copy of the necessary assessor's information (e.g., as a delimited text file or Excel spreadsheet file), importing it to a database table in the GIS software, and joining it to the digital parcel map based on a common identifier as discussed below. As part of this process, the field names in the database containing the copy of the assessor's information are defined ahead of time (See Appendix A).

Initially, joining information from the assessor's database (in digital form) to the digital parcel file occurs by joining information in a database field common to both. **This generally requires adding or using an existing identifier for the individual property records exported from the assessor's database; this identifier will need to match that of the MAP_PAR_ID created as an attribute for each digital parcel polygon.** Note that it may not be possible, without quite a bit of additional research and data clean up, to make this join between the assessor's list and the digital parcel map for every single parcel or property record. Level II of this standard provides a mechanism for improving the match percentage. As noted above, a property record identifier being used in the assessor's database as a link to a parcel polygon mapping may or may not satisfy the uniqueness definition of the PROP_ID. On the other hand, if the assessor database has been set up so that there is a single property record for each parcel on the map (the ideal situation), then it will be much easier to adapt it to the linking mechanism described above.

A list of attributes from the assessor's database is below; it includes information commonly needed for GIS applications involving parcel data, both at a town and a regional level. All these fields are required to be populated with whatever content is available.

**PROP_ID** – unlike the items below, this attribute may not come directly from the assessor's database. It may sometimes be constructed from information typically found in multiple columns in the assessor's database (see definition for more information). <u>It must be unique within the city or town</u>.

**BLDG_VAL** – current assessed value for the main building(s) on the property.

**LAND_VAL** – current assessed value for land.

**OTHER_VAL –** other structures or physical improvements that are separately valued.

**TOTAL_VAL** – current total assessed value for land and structures. Because some databases include other categories of valuation not included above, this may not represent the total of the fields above.

**FY** – Fiscal year of assessed value formatted as YYYY.

**LOT_SIZE** – deed area in EITHER square feet OR acres, but not both.

**LS_DATE** – last sale date formatted as YYYYMMDD.

**LS_PRICE** – last sale price.

**USE_CODE** – state three digit use code with <u>optional</u> extension digit to accommodate the four-digit codes commonly used by assessors. If the codes contain a four-digit use code, because the meaning of the fourth digit varies from community-to-community, the standard requires a lookup table. This look-up table, called MxxxUC_LUT (where xxx is the TOWN_ID) must adhere to the following specification:

| FIELD NAME | DEFINITION | EXPLANATION |
|---|---|---|
| TOWN_ID | Number, 3 | Town-ID from MassGIS towns data layer |
| USE_CODE | Character, 4 | Code from CAMA database |
| USE_DESC | Character, 150 | Definition of the four character code |

Two digit codes are not allowed –a code which is numerically in the range 0-99 must be left-padded with a zero.
**SITE_ADDR**– this field will contain the complete original site address as <u>listed in the tax record</u>.

The complete site address may be one of the following:

1. An ordinary numbered address ("10 Main St.") also known as a thoroughfare address
2. A street name without a number, or with "0" as the number ("0 Marley St")
3. A landmark address ("Town Hall")
4. An intersection-style address ("corner Maple and Vine")
5. Two full numbered addresses ("1 Maple / 14 Vine")
6. A hybrid form including numbered address and cross street ( "10 Main at Vine")

Additionally, in many input address records, there will be secondary location information to specify the relative or absolute location of the property, the unit number etc. For example, the site address field might contain any of the following: "off Marshall St.", "North Side Tisbury Lane", "10 Main St. left side", "47 Maple St. (Rear)" or "34 Vine St. Unit B." Many assessors have codes for the relative location ("ES" for "East Side" etc.). All this information should be retained in the SITE_ADDR field.

*This parcel standard does not require parsing of address information. However, if the site address is already parsed into several fields in the assessing extract that can be used to populate the ADDR_NUM, FULL_STR, and LOCATION fields, the standard requires this work to be done.*

**ADDR_NUM** – this field will contain address number information, either a single house number with alpha prefix (this is extremely rare) or fractional or letter suffix (e.g. A14, 25, 103 ½ or 12A) or a range of valid address numbers (e.g., 12-16 or 12A–12B). The only characters permitted are numbers, letters, "/" for fractional addresses and hyphens separating ranges of numbers as well as "&" or "+" to indicate a collection rather than a range. This specification is intended to provide flexibility while allowing for address numbers to be parsed and geocoded. If address numbers are now stored in several fields, e.g. the number and the number suffix are stored separately, then those fields can readily be concatenated to provide the format required here. Undeveloped properties may not have an assigned address number or may have "0" as an address number. If "0" is entered to signify no address number, it should be translated to null to avoid confusion, since occasionally it will be used as a real "vanity" address.

**FULL_STR** – this field will contain the full street name, which may be stored in separate fields in the assessor database. Note that additional, secondary location information should not be stored in this field, but this standard[9] does not require parsing and eliminating such content.

In the case (rare) where street name elements are stored in separate fields they should be concatenated. For example, if an assessor's database has the street name ("North Reading") in one field and the street post-type ("Road") in another field, then these two parts of the street name would be combined in the FULL_STR field to read "North Reading Road".

**LOCATION** – this is the place to put secondary location information. Frequently, descriptors such as "Side", "South Side", "Rear", "Basement" as well as building and unit descriptors such as "#1" or "Unit A" are found in assessor data. If a field for such secondary information already exists in the original data set, that content should be preserved in this field. The most common such field would be a UNIT field. Again, note that the standard does not require scrubbing address fields – this field layout is provided to facilitate doing so. The key point is not to lose information that is contained in the site address.

**CITY** – city or town where the property is located.

[9] **The recommended standard for address content is the United States Thoroughfare, Landmark, and Postal Address Data Standard which can be found on-line. However, strict adherence to the FGDC standard is not required for this standard.**

**ZIP** – zip code where the property is located, if available.

**OWNER1** – Name of first owner of record.

**OWN_ADDR** – the complete owner mailing address, including the street number, name, etc. This is not the site address, rather it is the address to which the tax bill is sent, thus it may include PO Boxes, out-of-state addresses and other entries which would not be allowed in the site address field. If this field is blank then the site address and the owner's mailing address are presumed to be the same.

**OWN_CITY** – the city for the property owner's address

**OWN_STATE** – for US addresses, the state where the property owner lives, using the postal service abbreviations for state.

**OWN_ZIP** – the zip code of the owner's address.

**OWN_CO** – the country where the owner lives.

**LS_BOOK** – Last sale Registry of Deeds book.

**LS_PAGE** – Last sale Registry of Deeds page.

**REG_ID** – this is the equivalent to Registry of Deeds book and page information but for registered or probate land.

**ZONING** – this is the code to indicate the zoning district within which the property lies not including overlay zoning districts.

**YEAR_BUILT** –format YYYY; this is an extremely important attribute for any kind of planning analysis of growth trends or for change detection.

**BLD_AREA** – This information applies primarily to apartment buildings and commercial/industrial properties; assessor's data is based on exterior building measurements. Building area may be recorded as gross square-feet, adjusted gross square-feet, or finished area. Basement area may or may not be included in finished area. Partial story-heights and attic areas may be treated differently by different CAMA systems. Gross area may include non-living areas such as porches and decks, or attached garages. Contact the specific community to be sure you correctly understand this information for that community.

**UNITS** – Number of living/dwelling units and also other units, for example, commercial condos and storage units in a warehouse (this was formerly named "LIV_UNITS" in previous standard version.)

**RES_AREA** – Total residential living area in square feet (not gross building area) as defined by the assessor (e.g., this may or may not include only heated space). This is a useful attribute when evaluating development proposals relative to surrounding residences, but a difficult one to create because it may require adding areas from multiple fields in the assessor's database. This information applies primarily to 1, 2 & 3 family dwellings based on exterior building measurements or residential condominiums based on deeded unit areas. Building area may be recorded as gross square-feet, adjusted gross square-feet, or finished area. Basement area may or may not be included in finished area. Partial story-heights and attic areas may be treated differently by different CAMA systems. Gross area may include non-living areas such as porches and decks or attached garages.

**STYLE** – code indicating style of structure ("colonial", "ranch" etc.).

**STORIES** – the number of stories assigned by the assessor to each structure. Typically recorded as a full story for each floor, except under roof-line floors, which may be adjusted by factors ranging from 10% to 90% of a full story depending on roof slope and wall height; examples include one-half stories and attics. Note that in the Patriot AssessPro database, letters (e.g. A, H) may be assigned to indicate partial story heights.

**NUM_ROOMS** – the number of rooms identified by the assessor; this information may be primarily recorded for residential records. Contact the specific community to be sure you correctly understand this information for that community.

**CAMA_ID** – the unique, typically arbitrary sequential number that is the internal record identifier in the assessing database. For example the Patriot "Account #" or the Vision Parcel Id ("PID").

Note that the above fields are required for the standard, but nothing precludes a community from including additional information from the assessor's database as needed for GIS use. These additional items of information would, in effect, be additional "optional" attributes.

*Finally, two fields may need to be added to this extract for data exchange purposes:*

**LOT_UNITS** – This identifies the deed area units in the LOT_SIZE field: "S" for square feet and "A" for acres. This field will typically have to be added to comply with the standard.

**LOC_ID** – see earlier discussion.

*These two additional fields may exist in the standard extract from a specific CAMA software vendor.*

## E) Horizontal Datum

While some communities have their own horizontal survey datum, or use the North American Datum from 1927, complying with this standard requires using the North American Datum of 1983, or a successor. This will facilitate using digital data from other sources (e.g., MassGIS and the regional planning agencies) and from adjacent communities. Likewise, the community must use the State Plane Coordinate reference grid with units of US Survey feet OR meters. Note that Nantucket, Martha's Vineyard, and the Elizabeth Islands have their own zone in the state plane coordinate system, the Island Zone. Unless otherwise instructed, developers of parcel data for the islands under the standard should use the mainland zone.

## F) Metadata

MassGIS requires that metadata complying with the Federal Geographic Data Committee's metadata standard be produced by any organization that delivers or creates digital GIS data (See Appendix C). That is the requirement for this standard, at a minimum for the tax parcel data layer. For more information about metadata and links to web sites that provide metadata tools see the following location on the MassGIS web site: http://www.state.ma.us/mgis/munimeta.htm. In developing metadata for the TaxPar data layer, particular attention should be paid to metadata about the source materials, the data development methodology, data development dates, and contact information.

## G) Legislatively Approved Municipal Boundary

If the boundary between adjacent cities or towns agrees in the digital parcel file from each community, then it will be much easier to use digital parcel information jointly or in regional GIS applications. Digital parcel files (the tax parcel data layer) complying with this standard must include a town boundary based on the legislated record of each town's boundary[10] as distributed by MassGIS at the time the digital parcel file is completed[11] . The final digital tax parcel data layer must include the new town boundary incorporated directly into the digital parcel file. All property boundaries must be clipped at the town boundary. The municipal boundary must also close off all street rights-of-way at the edge of the community. One effect of this requirement is that the road rights-of-way will become polygons; these must then be classified as "ROW" (or "PRIV_ROW" or "RAIL_ROW" if appropriate) in the POLY_TYPE attribute field of the TaxPar data layer. Property boundaries should also be adjusted to the new 1: 5000 coastline unless an existing digital, larger-scale, coastline is preferred. As noted, right of way polygons may be subdivided to improve drawing and querying performance. There are three exceptions to the above requirement for using the municipal boundary from MassGIS. First is the coastline. A community's coastline boundary may be retained in place of the one from MassGIS, particularly if on a rocky coast it is clear that the tax map coastline is more detailed. Second, where a community boundary follows a stream or river channel, the version of that boundary depicted on the tax map may be based on sources, particularly survey-derived sources, that are better than the MassGIS equivalent; in these cases, MassGIS will accept the boundary from the municipal tax map. Third, some municipal boundaries follow rights-of-way[12]. Where this is true, the version of this boundary shown on the tax map may be a better representation of this boundary than the equivalent from the MassGIS data layer

## H) Data Delivery Format

The data must be delivered in either shape file (Level II only), ESRI personal geodatabase, or an ESRI file geodatabase format.

## I) Additional Guidance (Optional) on Text Labels / Annotation

The following guidance is provided to suggest best practices for labeling and annotation data to be stored in the GIS product. There is no requirement for including such information or for how it should be stored if it is included.

Assessor's maps often include important text-based information as well as mapped features. This might include labels and annotation such as lot numbers on parcels, lot area, property boundary dimensions (length), reference to monuments or other survey related data, easement type/purpose (e.g., water/sewer/drain, vehicular access) and so on.

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[10] Because developing a municipal boundary for the digital parcel file based on the statutory boundary may involve resolving significant property boundary discrepancies, use of the statutory city/town boundary requirement is subject to waiver if appealed to MassGIS. A waiver of this requirement may be granted if the statutorily correct boundary causes properties to move from one town to another. A waiver may also be granted if, in the judgement of the Director of MassGIS there are other circumstances that would make this requirement exceptionally burdensome for a community to implement. Waivers are only valid if granted in writing.

[11] Also see the discussion of municipal boundaries in the discussion of "Fidelity to Original Assessor Map".

[12] Also see the discussion of municipal boundaries in the discussion of "Fidelity to Original Assessor Map". These arcs are identified in the BND_QUAL attribute of the TOWNSSURVEY_ARC data layer found on the MassGIS web site at http://www.mass.gov/mgis/townssurvey.htm.

Using GIS software capabilities for labeling property polygons based on links to the assessor database attributes is the recommended approach for labeling properties with lot numbers, deed areas and other polygon attributes. However, in some cases, cartographic considerations may dictate the use of annotation which is offset or otherwise difficult to obtain from labeling. Other text labels that may be desired include parcel boundary dimensions and other linear annotation, These cannot be maintained, obviously, as attributes of polygon features without creating a "shadow" layer of line features based on polygon boundaries.

In keeping with our principal objective of creating a data product that is useful to assessors, the standard is not prescriptive with respect to labeling/annotation and how it is stored and used. Annotation as managed by the ESRI software in a separate "feature class" is a flexible and useful way to store text information and can be exported in a generic form by linking the text with point locations. Of course, line feature layers can be created and given text attributes to store dimensions or other linear kinds of annotation as well. There is no clearly "best" way to do this and the main utility of the labeling is to assessors themselves, who have varying preferences, thus we do not mandate any particular approach.

Several recommendations, however, are made with respect to managing text as annotation or as labels for other types of features:

1. It is often important to distinguish between dimensions or measures whose source is the GIS software itself, those which derive from a deed description or survey plan and those whose provenance in the assessor database or the mapping is simply unknown. The discrepancies, in fact, may lead to significant discoveries regarding the true area of parcels that are being under-valued. To the extent possible, labeling and formatting display conventions and additional explanatory text should be used to clearly identify the source of the text in question. For example, feature specific metadata for dimensions is highly recommended – source, currentness, and so on can be stored as attributes for both annotation and line features and used to control the formatting of the text output. Source values might include "DEED", "SURVEY PLAN", "SCALE" or others.
2. One primary consideration with dimensional values may relate to zoning requirements such as frontage requirements for ANR or subdivision development and special attention should be paid to establishing a legally supported source for such dimensions if their exact magnitude may be in doubt.
3. A full-fledged effort to manage dimensions as geometric line feature attributes would have to include distinguishing the left and right dimensions, along with their respective sources. However, given the "back-lot" problem (dimensions which are divided on one side and not on the other), a more sophisticated environment, such as the "parcel fabric" provided by ESRI in their latest release of the ArcGIS software, is probably required in order to go this route. Note that the full implementation of the "parcel fabric" requires higher levels of the ArcGIS suite.
4. Some communities maintain, either in-house or through a contractor, parcel maps in CAD format. In this case the dimension information is stored in a text layer in the CAD file. It is possible to export this text information to the GIS environment; it appears there as annotation with an anchor point. Some limited testing indicates that it may be possible to automate moving this annotation into a line attribute, with reference to the correct left/right side of the line, although some feature-by-feature checking might still be needed.

## J) Additional Guidance (Optional) on Archiving LOC_IDs

The standard creates a unique identifier for parcel map polygons called LOC_ID. As parcel boundaries change because of subdivision or combination, it may be useful to archive LOC_IDs that disappear as a result. So, for example, if a four-acre property is subdivided into four one-acre parcels, its present

LOC_ID will disappear, to be replaced by four new LOC_IDs. Conversely, if two parcels are combined into one, one of the existing LOC_IDs will disappear. A much preferable alternative to simply deleting these LOC_IDs is to archive them. This archive table would contain the following fields:

NEW_LOC_ID – the LOC_ID of the property or properties formerly associated with the OLD_LOC_ID
OLD_LOC_ID – the LOC_ID that has been eliminated
DATE – date when the update occurred (Use YYYYMMDD format)

So, in the above example of the four-acre property that was subdivided, the archive table would contain four NEW_LOC_ID entries, one for each of the four new one-acre properties. Each of these would have the same entry in the OLD_LOC_ID and DATE fields.

For the case where two parcels were combined to one, the same NEW_LOC_ID would be entered twice, once each for each of the LOC_IDs that was deleted and entered as the OLD_LOC_ID. This second case presumes that one of the two existing LOC_IDs would be retained for the combined parcel. If both original LOC_IDs were deleted and replaced with a new LOC_ID, then the new LOC_ID would be entered to the NEW_LOC_ID field twice, once for each of the original LOC_IDs entered to the OLD_LOC_ID field.

# REQUIREMENTS FOR LEVEL II ONLY

## A) Enhanced Link from Parcel Polygons to Assessor's Tax Records

Accessing information in the assessor's database via the parcel map is among the most important requirements for a municipal GIS. Typically the assessor's listing for a single property parcel can be joined in a GIS to the corresponding parcel polygon on the map using the assessor's property identifier (e.g., map/block/lot; section/block/lot, etc.) or a new identifier constructed from similar data elements. However, there is not always a one-to-one correlation or link between the polygons on the assessor's map and the records in the assessor's database. For example, the following situations occur:

1. Two (or more) polygons on the assessor's map may be assigned the same MAP_PAR_ID or equivalent and linked to just one record in the assessor's database (commonly indicated on maps with "fish-hook" symbols linking the parcel polygons involved.) For example, a small river may run through a single property splitting it into two separate polygons. By assigning a unique LOC_ID to each polygon and developing an additional database table, the "intersection table" discussed below, this situation can be corrected.
2. Several polygons with different MAP_PAR_IDs may have only one corresponding record in the listing, often because the assessor wishes to issue just one assessor's tax bill per owner. In this instance there are parcel identifiers on the map that may not match any records in the assessor's database.
3. Individual units in a condominium complex will each have a record in the assessor's database, but the property identifier associated with each condominium usually cannot be directly linked to a parcel of land on the property map. Also, note that the common property (land and exterior of structures) of a condominium association may or may not be separately listed as a "master record" for a condominium.

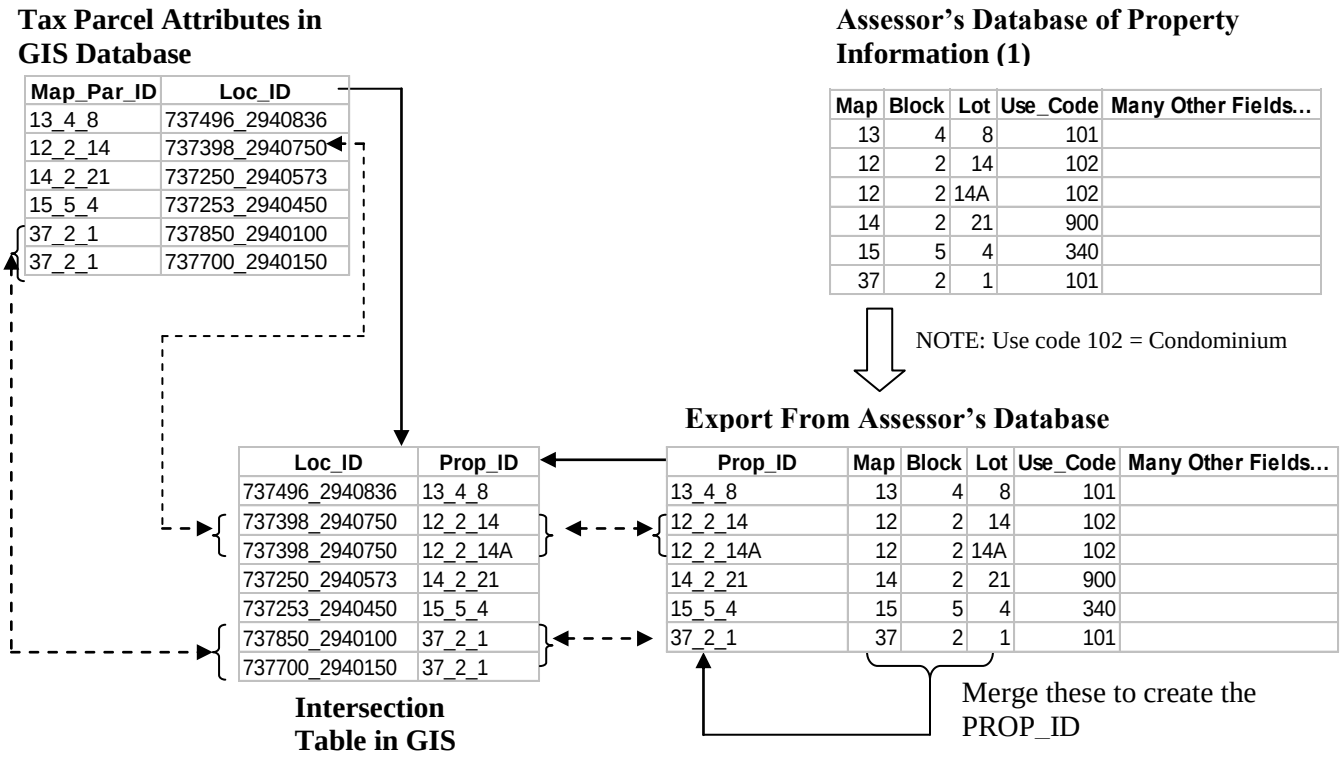
## B) Intersection Table

The intersection table is simply a means of completely specifying all possible linkages between assessor's property records and mapped parcels. Because of the intersection table, digital parcel maps complying with Level II of the standard will achieve a higher, and sometimes much higher, match between parcels shown on assessor's maps and corresponding listings in the assessor's database. This will be particularly true in communities with many condominiums or with frequent occurrences of multiple parcels covered by a single assessor's tax bill.

The intersection table contains two fields: LOC_ID and PROP_ID; both of these fields are discussed in detail elsewhere in this document. The LOC_ID field must be generated and included in the digital parcel mapping attributes and in the intersection table. The PROP_ID field must be generated and included in the extract or report from the assessor's database as a unique identifier for each property; it too is included in the intersection table.

Any <u>one</u> record in the intersection table matches one parcel polygon to one assessor's record and vice-versa. Conversely, because the intersection table is an independent table, it makes possible the matching of multiple parcels to one assessor's record or of multiple assessor's records to one parcel. **The role of the intersection table is best understood by studying Figure 2 below.**

**Figure 2: Role of Intersection Table in Linking Parcels and Assessor's Database Records**




**(1)** Field names other than map, block, and lot may be used, depending on the community.
**(2)** The intersection table makes it possible to associate the two condo units with the same property polygon on the map (property identified as 12_2_14). Similarly, the two separate map polygons identified as 37_2_1 are inserted to the intersection table using their unique Loc IDs.

Complying with level II of the standard requires that for communities with more than 1000 property ownership polygons on the assessor map, at least 99% of the polygons must link to a corresponding assessing record and vice-versa. For communities with fewer than 1000 such polygons, the linking rate between the map and the data and vice-versa need only be at least 98%.

One approach to creating the intersection table is to create the table and then to put all the PROP_IDs into that table. Then join the intersection table TO the parcel polygon (map) attribute table; the join fields would be the PROP_ID and the MAP_PAR_ID. Where there is a match between the two tables, the LOC_ID in the parcel attribute table can then be copied into the corresponding field in the intersection table. This then leaves records in the intersection table with null LOC_ID values; most of these will be condominium records or map polygons for which there is no corresponding assessor's record. Alternative strategies will be needed to fill the empty LOC_ID fields in the table.

While the approach described above may initially seem complex, it is based on standard database design principles and is not overly burdensome to implement, particularly given the long-term benefits. In addition, the major vendors of computer assisted mass appraisal (CAMA) software in Massachusetts are able to support a standard data extract that meets these requirements in their software. The key steps required for implementing the intersection table are:

1. Assigning a LOC_ID to records in the assessor's database that do not match to a property on the assessor's maps (e.g. condominiums), and
2. Assigning a PROP_ID from the assessor's database to properties from the assessor's maps that do not match a property listing in the assessor's database.

# REQUIREMENTS FOR LEVEL III ONLY

Complying with this level of the standard includes compliance with all of the Level II requirements EXCEPT that the final product does not include an intersection table to link polygons to tax records. Instead, as described in the overview, and in detail below, Level III requires the creation of multi-part polygons and the dissolution of internal polygon boundaries in those (rare) cases where adjacent parcels are being "bundled" for tax purposes. Compliance with Level III is strongly recommended for communities building GIS databases using ESRI software and will be required as a condition for using any state funding for GIS data development.

Complying with this level of the standard has four parts:

A. Creating multi-part polygons where necessary
B. Dissolving internal polygon boundaries where necessary
C. Adding the LOC_ID to the tax list extract
D. Achieving the specified match rate

Each of these parts is discussed below.

## A) Creating Multi-part Polygons Where Necessary

A multi-part polygon in the ESRI software is a single polygon feature that contains several noncontiguous polygons but is represented in the attribute table as one record. Municipal boundaries that include islands or land areas separated by water (e.g. Gloucester) are a common example. The standard at Level III requires using multi-part polygons for situations where one assessor's tax bill (one CAMA record) corresponds to two or more polygons on the assessor map (a one-to-many or 1:M situation) AND those

polygons do not share a boundary (although they may touch at one or more points). The latter restriction is a result of how multi-part polygons are defined in ESRI's ArcGIS software – contiguous polygons cannot be treated as multi-part.

Before a multi-part polygon corresponding to a single tax bill can be created, the constituent polygons must first be copied to the Othleg feature class along with their respective MAP_PAR_IDs; these IDs must be preserved in case they are needed for labeling parcels. Two issues with using multi-part polygons are making sure the LOC_ID is from a location inside the multi-part polygon AND that the LOC_ID used for the multi-part polygon is also put into the TAXPAR_ID attribute of the corresponding polygons in the OthLeg feature class. Also, there may be an issue with the acreage value in the assessing database being for only one of the polygons covered by the tax record.

The identification of those polygons needing to be joined is essentially another step in the process used to build the intersection table at Level II, that is, to identify multiple polygons with the same MAP_PAR_ID which are linked to a single record in the assessor database. The transition from Level II to Level III should be fairly straightforward for this reason.

### B) Dissolving Internal Polygon Boundaries to Create "Tax Parcels"

The ideal resolution of the situation where adjacent parcels are being grouped together by the assessor is to add a record to the property database. This may not be possible or it may result in multiple tax bills being sent, with some inconvenience to both the assessor and the taxpayer. A fairly typical case is two adjacent lots in the same ownership where one has a structure and the other is not buildable under current zoning; the second lot extends the landscaping and provides an amenity for the first lot. In this case, as discussed in the overview, those parcels being grouped are first copied into the "other legal interests" data layer, along with their respective MAP_PAR_IDs, and then, in the tax parcel data layer, the internal boundary is dissolved. The LOC_ID of the developed parcel should be retained and also copied into the TAXPAR_ID attribute of the corresponding polygons in the OthLeg feature class.

### C) Adding LOC_ID to the Tax List Extract

As discussed earlier in the standard, there may be many-to-many relationship between polygons on the assessor map and records in an assessor database. At Level II, this relationship is modeled using the intersection table. To eliminate the intersection table, the "many" on the polygon side of the many-to-many relationship needs to become one, as described in Section B above. Then the LOC_ID can be added to the assessor database extract. Ideally, it will be added directly into the assessor database. (The major CAMA vendor databases have an existing field where the LOC_ID could be stored.) The intersection table used at Level II may be an intermediate step in integrating the LOC_ID with assessment information or some other strategy may be used to populate this field.

### D) Match Rate

There are three match rate calculations for Level III of the standard: a rate for tax records linking to corresponding parcels with a structure (building or other) valued over $1,000; a rate for tax records linking to corresponding parcels with a structure (building or other) valued at less than $1,000; and a rate for parcel polygons linking to the assessing database.

The Level III match rates are: For communities with over 1000 parcel polygons the match rate for tax records with a structure valued at more than $1,000 must be at least 99.8%. For all other tax records, the

required match rate is at least 97%. The match rate for communities with 1000 or fewer polygons is at least 99% for tax records with a structure valued over $1,000[13] and at least 95% for all other records.

Since it cannot have different levels based on characteristics of the tax record, the match rate from the mapping to the assessor's database for communities with more than 1000 parcels will be at least 99% and for communities with 1000 or less polygons will be at least 98%. For purposes of determining match rates from map polygons to the assessing database, only polygons classified as POLY_TYPE = "FEE" or "TAX" are considered; any polygons where NO_MATCH = "Y" that have been approved by MassGIS are excluded from the match calculation.

The table below provides sample calculations of the match rate requirements going from the assessing database extract to the map parcels..

Communities > 1000 parcels

| Sample parcel #s | Has Structure | Max non-match Count | | No structure | Max non-match Count | |
|---|---|---|---|---|---|---|
| | **0.998** | | | **0.97** | | |
| 1100 | 1098 | 2 | | 1067 | 33 | |
| 5000 | 4990 | 10 | | 4850 | 150 | |
| 7500 | 7485 | 15 | | 7275 | 225 | |
| 10000 | 9980 | 20 | | 9700 | 300 | |
| 15000 | 14970 | 30 | | 14550 | 450 | |
| 25000 | 24950 | 50 | | 24250 | 750 | |
| 50000 | 49900 | 100 | | 48500 | 1500 | |
| 100000 | 99800 | 200 | | 97000 | 3000 | |
| 145000 | 144710 | 290 | | 140650 | 4350 | = Boston |

*Average number of parcels in a municipality, excluding Boston, is 6,200*

Communities <= 1000 parcels

| Sample parcel #s | Has Structure | Max non-match Count | | No structure | Max non-match Count | |
|---|---|---|---|---|---|---|
| | **0.99** | | | **0.95** | | |
| 950 | 941 | 10 | | 903 | 48 | |
| 850 | 842 | 9 | | 808 | 43 | |
| 600 | 594 | 6 | | 570 | 30 | |
| 500 | 495 | 5 | | 475 | 25 | |
| 300 | 297 | 3 | | 285 | 15 | |
| 165 | 163 | 2 | | 157 | 8 | = Monson |

[13] Determining if a property parcel has a structure value above or below $1,000 must be based on information from the municipality's assessment database as included in the BLDG_VAL or OTHER_VAL fields in the assessing extract included with the standard.

# APPENDIX A: FIELD DEFINITIONS

| Field Name | Type | Size | # Dec. Places | Valid Values | Null allowed? |
|---|---|---|---|---|---|
| **Tax Parcel Attributes** | | | | | |
| MAP_PAR_ID | C | 26 | | | YES |
| LOC_ID | C | 18 | | M_<X>_<Y> (for meters)<br>F_<X>_<Y> (for US Survey Feet) | NO |
| POLY_TYPE | C | 15 | | FEE, TAX, ROW, PRIV_ROW, RAIL_ROW, WATER | NO |
| MAP_NO | C | 4 | | | YES |
| SOURCE | C | 15 | | ASSESS, SUBDIV, ANR, ROAD_LAYOUT, OTHER | NO |
| PLAN_ID | C | 40 | | | YES |
| LAST_EDIT | N | 8 | | format YYYYMMDD | NO |
| BND_CHK | C | 2 | | null value (default), CC, NR, OK | YES |
| NO_MATCH | C | 1 | | Y, N (default) | NO |
| **Other Legal Interests Attributes** | | | | | |
| MAP_PAR_ID | C | 26 | | | YES |
| LEGAL_TYPE | C | 15 | | FEE, RAIL_OVER, ROW_OVER, EASE, CR, APR, CRX, APRX, (domain is extensible - see text) | NO |
| TAXPAR_ID | C | 18 | | M_<X>_<Y> (for meters)<br>F_<X>_<Y> (for US Survey Feet) | YES(1) |
| LS_BOOK | C | 16 | | | YES |
| LS_PAGE | C | 14 | | | YES |
| REG_ID | C | 15 | | | YES |
| | | | | | |
| **Miscellaneous Features Attributes** | | | | | |
| MISC_TYPE | C | 15 | | WETLAND, ISLAND, TRAFFIC_ISLAND, WATER, OUTSIDE, BLDG (domain is extensible - see text) | NO |
| **Intersection Table (Level II only)** | | | | | |
| LOC_ID | C | 18 | | | NO |
| PROP_ID | C | 18 | | | NO |
| | | | | | |
| **Field Name** | **Type** | **Size** | **Dec. Places** | **Valid Values** | |

| Attributes from Assessor Database | | | | | |
|---|---|---|---|---|---|
| **Field Name** | **Type** | **Size** | **# Dec. Places** | **Valid Values** | **Null allowed?** |
| PROP_ID | C | 30 | | | NO |
| BLDG_VAL | N | 9 | | | NO(6) |
| LAND_VAL | N | 9 | | | NO(6) |
| OTHER_VAL | N | 9 | | | NO(6) |
| TOTAL_VAL | N | 9 | | | NO(6) |
| FY | N | 4 | | | NO(2) |
| LOT_SIZE | N | 11 | 2 | | NO(2) |
| LS_DATE | C | 8 | | | NO(2) |
| LS_PRICE | N | 9 | | | NO(2) |
| USE_CODE | C | 4 | | Set by Dept. of Revenue | NO(2) |
| SITE_ADDR | C | 80 | | | NO(2) |
| ADDR_NUM | C | 12 | | | NO(2) |
| FULL_STR | C | 60 | | | NO(2) |
| LOCATION | C | 60 | | | NO(2) |
| CITY | C | 25 | | | NO |
| ZIP | C | 10 | | | NO(2) |
| OWNER1 | C | 80 | | | NO(2) |
| OWN_ADDR | C | 80 | | | NO(2) |
| OWN_CITY | C | 25 | | | NO(2) |
| OWN_STATE | C | 2 | | | NO(3) |
| OWN_ZIP | C | 10 | | | NO(2)(3) |
| OWN_CO | C | 30 | | | NO(2) |
| LS_BOOK | C | 16 | | | NO(2) |
| LS_PAGE | C | 14 | | | NO(2) |
| REG_ID | C | 15 | | | NO(2) |
| ZONING | C | 8 | | | NO(2) |
| YEAR_BUILT | N | 4 | | format YYYY | NO(2) |
| BLD_AREA | N | 9 | | | NO(2) |
| UNITS | N | 4 | | | NO(2) |
| RES_AREA | N | 7 | | | NO(2) |
| STYLE | C | 20 | | | NO(2) |
| STORIES | C | 6 | | | NO(2) |
| NUM_ROOMS | N | 3 | | | NO(2) |
| LOT_UNITS | C | 1 | | S (sq. ft.) OR A (acres) | NO (4) |
| CAMA_ID | N | 8 | | | NO |
| LOC_ID | C | 18 | | M_<X>_<Y> (for meters)<br>F_<X>_<Y> (for US Survey Feet) | YES (5) |

(1) Cannot be null for LEGAL_TYPE = "FEE"
(2) Can be null only if information not present in assessing extract
(3) Not required for owners with non-US addresses unless needed
(4) This may be added by the CAMA vendor in their MassGIS extract; if not it must be added
(5) In initial development of standardized data, this field will be added to the assessing extract. This field must be populated for joining to the TaxPar feature class. Thus only those records not participating in the calculation of the match rate between assessing data and the tax map will not have a LOC_ID; as LOC_IDs become embedded in CAMA vendor (MassGIS or other extracts the LOC_ID will no longer have to be added.
(6) Because this is an assessed value field, we assume that zero occurs rather than null.

# APPENDIX B: ADDITIONAL GUIDANCE ON ADDRESSES

Where the site address field is not broken up into its constituent elements, but the vendor or the town wish to do so for their own purposes, the full site address field should be parsed into the three standard fields ("ADDR_NUM", "FULL_STR", "LOCATION", as described earlier in this document) – in most cases, for ordinary numbered addresses, this will be straightforward, but for each of the cases (2)-(5) listed in the description of the SITE_ADDR field, the content needs to be sorted out according to a few simple rules.

The address number for the first thoroughfare-style address listed goes into the ADDR_NUM field. The full street name of the first street listed, but only the street name, goes into the FULL_STR field. Secondary location information goes into the LOCATION field, but this is also the place to store additional information found in the SITE_ADDR field.

In case (2) above, the landmark address (anything like "Town Hall" or "Water Treatment Plant" which doesn't reference a street) goes into the location field.

In cases (3) and (5), an intersection or hybrid style address, the cross street should go into the LOCATION field in the form shown "@ Maple Street." Consistently using the "@" symbol will greatly assist in subsequent process

Likewise, for case (4), a compound address, the second address should be listed in the LOCATION field prefixed by "&" – thus "10 Maple and 22 Vine" becomes "10 Maple" in the FULL_STR field and "& 22 Vine" in the LOCATION field.

***The intent of these rules is to preserve any information which may be useful in linking the parcel information to other sources of address information such a local census or emergency service listing. For most records, case (1) will apply and no editing will be required. For other cases, a review of the content of the FULL_STR field will identify patterns that can be extracted systematically using regular expressions or similar programming tools. For example, searching for the word "UNIT" or the "#" character can be used to parse out information to be moved to the LOCATION field using a script. Again, parsing the full address is NOT required – the schema to do so is provided because of the many benefits that accrue from doing so.***

# APPENDIX C: METADATA REQUIREMENTS

Below are the metadata fields, as located using ArcMap 10's FGDC metadata editor add-in, that should be populated for the TaxPar data layer. The guidance provided represents the minimum amount of details necessary to pass MassGIS' QA, but as always, it is recommended to add anything else of value.

The following **topics**, *tabs*, and fill-in boxes must be populated with the appropriate information.

**Identification** → *General* → Abstract – brief description of data set ("Assessor's parcel data for Town/City of <name>. "Developed from existing digital data" OR "Developed from existing mylar maps")
**Identification** → *General* → Data Set Credit – At a minimum, should list the vendor. May also include the town and any other entities (i.e. subcontractors) who have contributed to the creation of the level 3 parcel dataset.
**Identification** → *Contact* → Details… (We'll leave it to you to decide if the best contact is someone at your company or someone in each community.)

- ***Contact Information*** → Person (if you wish to have an office or business entity as the primary contact instead of an individual, you may leave this field blank)
- ***Contact Information*** → Organization (if an individual is not listed in 'Person', please make sure the 'Primary Contact' radio button is changed to 'Organization')
- ***Contact Information*** → Position (if no individual listed, you may leave this field blank)
- ***Contact Information*** → *General* → Contact Voice Telephone
- ***Contact Information*** → *General* → Contact Email Address
- ***Contact Information*** → *Address* → Address Type (must choose correct dropdown)
- ***Contact Information*** → *Address* → Address
- ***Contact Information*** → *Address* → City
- ***Contact Information*** → *Address* → State or Province
- ***Contact Information*** → *Address* → Postal Code
- ***Contact Information*** → *Address* → Country

**Identification** → Citation…

- ***Citation Information*** → Title ("Parcel data for <muni name>, MA complying with Level 3 of MassGIS digital parcel standard")
- ***Citation Information*** → Originator (1)
- ***Citation Information*** → Originator (2) ("Town/City of <name> Assessment Office (or equivalent)") ** Please note that the 'or equivalent' part of the text is not intended to be included verbatim in the metadata. It is included to account for the fact that sometimes source materials used may come from a different office than the assessing office in a given community.

**Identification** → *Time Period* → Calendar Date (of most recent submittal to MassGIS. This should represent the vintage of the delivered parcel dataset.)
**Identification** → *Status* → Update Frequency (only if known, otherwise leave as "unknown")
**Identification** → *Spatial Domain* → Bounding Coordinates and G-Polygon → North/South/East/West (this information is available in the Layer properties, Source tab (see info in "extent" area on that tab); these coordinates are important for discovery of a data set based on coordinates rather than key words)
**Identification** → *Keyword* → Place (1) (name of the town/city)
**Data Quality** → *Source Information* → *General* → Source Scale Denominator (this should be a single number, i.e. 1": 200' is represented as '2400' only. If there are multiple scales, then multiple numbers are acceptable. If not known, "unknown" is acceptable.)
**Data Quality** → *Source Information* → *General* → Type of Source Media (e.g., paper, mylar, linen, CAD, shape file, etc.)

**Data Quality** → *Source Information* → *General* → Source Citation Abbreviation (formal or informal title of the source materials. Can be a file name or layer name or map title. If the source materials have the same name as the new level 3 parcels, please add distinctive identifying information, such as a date.)
**Data Quality** → *Source Information* → *General* → Source Contribution (this should be more descriptive than the Source Citation Abbreviation and include a brief explanation of how the source materials contribute to the level 3 parcels, as well as any descriptive information about the source materials themselves. i.e. "These maps contain delineated property boundaries for tax assessment purposes that have been converted into GIS polygons representing parcels and other boundary features." or "This GIS dataset represents a digital version of assessor tax maps that were previously converted and processed to be compliant with MassGIS Level 2 parcel standards, and now provides the basic framework for the upgrade to level 3.")
**Data Quality** → *Source Information* → *Source Time Period of Content*→ Calendar Date
This date should represent the vintage of the source materials, not the level 3 parcel deliverable. If source materials cover a range of time, click on radio button for "Range of Dates/Times" and fill in…
**Data Quality** → *Source Information* → *Source Time Period of Content*→ Ending Date (only if a range of dates/times has been selected)
**Data Quality** → *Process Step* → Process Description (should include a description of any platform or file conversions, a general list of the kinds of GIS functions used during processing, and the types of solutions used to resolve common issues in creation of level 3 parcels. If you needed to dissolve WATER polygons, say so. If you needed to adjust linework based on orthophoto evidence, say so. If a projection change was required, say so. If topology errors were resolved, say so. These are just examples of useful information. Add anything that you feel a user of the data (or yourself!) might like to know about the generation of this data. To simplify the process, we do not require that each Process Step be recorded separately, though the metadata editor allows for that level of detail via the Process Step incrementation available at the bottom of the GUI)
**Data Quality** → *Process Step* → Process Software and Version
**Spatial Reference** → *General* → Projected Coordinate System Name (if standard is conformed to, this should always be "Massachusetts State Plane Mainland, " and specify (meters) or (feet).
**Entity Attribute** → *Detailed Description* → *Entity Type* → Label (name of feature class)
**Entity Attribute** → *Overview Description* → Dataset Overview (the expectation is that this will contain more detailed information than the Abstract. i.e. "M###TaxPar represents a version of digital municipal parcels for the community of <muni-name> that is considered 'level 3' compliant per the specifications outlined in the MassGIS Standard for Digital Parcel Files. Its features can be linked in a GIS or database environment to a set of standardized assessing attributes in the table M###Assess by using the unique identifying values in the LOC_ID field. This data is also intended to be used in conjunction with associated (and optional) features in the ancillary data layers M###OthLeg and M###Misc. As one of the data sets identified by Massachusetts' Strategic Plan for Spatial Data Infrastructure (http://www.mass.gov/mgis/stratplan.html), this data enters the public domain as a valuable resource for mapping, planning, and analysis at all levels of government as well as the private sector. "
**Distribution** → *General* → Resource Description (the FGDC site defines this as 'the identifier by which the distributor knows the data set.' So please just set this as the feature class name of the TaxPar layer)
**Metadata Reference** → *General* → Metadata Date (date when metadata is completed. If any edits or updates are made to the metadata, this date should be updated to reflect that.)