Appendix 3:

Spatial Adjustment Planning and Data Migration Issues

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1 Overview

1.1 Purpose

In order to fully utilize the new, more spatially accurate tax lot file created by the Lane County Parcel Mapping Project, two significant challenges will need to be met. The first major challenge will be to spatially adjust taxing districts and other data which have been registered to fit over existing taxlot boundaries so that the data will align correctly with the new parcels.

The second challenge will be to reengineer geo-processing applications which currently depend on taxlot data in coverage or shapefile format. Since the new taxlots will be maintained by Lane County in an ArcGIS geodatabase environment, at a minimum, these processes will need to be modified to support this new data format. In the short term, applications needs could be supported by exporting taxlots as coverages or shapefiles. However, a longer term goal will be to provide a consistent data format for all GIS data. This will require the design of an ArcGIS geodatabase model to support administrative boundary and other data, and the migration of that data into the ArcGIS environment.

This appendix to the Admin-FIT Pilot report will explore the issues pertaining to adjustment and migration of administrative boundary data, identify preferred alternatives for spatial adjustment, and review data modeling and geodatabase implementation considerations.

1.2 Background

1.2.1 Regional GIS Data

The roots of the Regional Lane County Geographic Information System (GIS) can be traced back to 1968. That year, all of the County section corners were digitized to provide an electronic grid system for creating a parcel-level mapping system. The GIS was supported by partner agencies in a local computer processing consortium known as the *Regional Information System* (RIS). From 1970 to 1974 all tax lots, land use polygons and site addresses for the metropolitan area were digitized. In 1978, the coverage was extended to the rest of Lane County. Additional boundary file data layers were created such as zoning, city limits, urban growth boundary and census tract. The system was created within an IBM mainframe environment to support planning studies that were being conducted by the regional planning departments, but continued to expand with new information and new applications. This system was used extensively by the RIS partners primarily for planning-related projects until 1985.

In 1982, in response to increasing demand for more and better products, a multi-jurisdictional task force spent three years planning a major upgrade to the GIS. Labeled Common Mapping, the project recognized that all participants needed to use a common base map to save money and to be able to share geographic data. The Common Mapping Steering Committee (CMSC) partners migrated the graphic database and copies of the associated non-graphic data, to a DEC VAX system in 1985 with the purchase of Synercom Technology's Informap system. This marked a major evolution of the regional GIS into what was then known as the Common Mapping System. This system was used by a broader cross-section of local government departments.

In 1993, the Synercom system was replaced by a more sophisticated GIS system from ESRI called ARC/INFO. The GIS was run on UNIX workstations and over the next two years, with the acquisition of two regional servers, enabled the region to migrate to a more distributed regional system. The distributed GIS offered more flexibility and supported expanded use by more partner agency users. Key regional data layers including parcels and addresses in addition to a number of administrative and natural resource themes were maintained under a cooperative regional data maintenance agreement.

In 1998 the regional GIS migrated from UNIX to Microsoft Windows based workstations but still running ESRI's ARC/INFO software. Over the years, as the regional systems have evolved so too has the underlying geographic control data. While users of the GIS data have come to recognize shortcomings and inconsistencies in its spatial accuracy for increasingly sophisticated applications, the resources necessary to systematically address these issues have been scarce.

1.2.2 Lane County Parcel Mapping Project

In 2001, Lane County in concert with the regional partner agencies began participating in a new statewide Oregon Mapping (ORMAP) initiative to establish standard digital tax lot data across all 36 Oregon counties. The initiative included a funding mechanism through the state and the needed impetus to make improvements to the countywide GIS basemap. A year later, Lane County dedicated $1.1 million of local funding over 3 years to accelerate the tax lot remapping effort. In 2004, the regional partners obtained additional state funding to complete a NAD27 to NAD83/91 datum conversion, thereby, ensuring that agency and regional GIS data would share a common datum with the new county tax lots.

The regional GIS partner agencies are working cooperatively in support of Lane County's efforts to remap tax lots countywide. The resulting digital tax lots file, in combination with improved survey control and high resolution color orthophotography obtained in the spring of 2004, provides the basis for an improved GIS basemap on which to map and analyze infrastructure, cadastral, natural resources, administrative boundary, and other geographic information.

When completed, the new basemap will be more spatially accurate and uniform across the County than what currently exists in the regional GIS. However, in order to take advantage of the new basemap and provide for integration and shared regional use of critical multi-jurisdictional GIS data layers, significant refinement will be needed to spatially adjust and register legacy data to the new basemap.

1.3 Goals

The primary goals for this project are to improve the spatial accuracy of regional GIS data, ensure consistency and compatibility among agency and regional GIS data, and minimize impacts and costs of the transition to the new "adjusted" data files.

1.3.1 Improve Spatial Accuracy

Improvements in the quality and completeness of the underlying survey control network and availability of high quality digital orthophotography have contributed to a more uniform and spatially accurate rendering of tax lots across Lane County. While the tax lot boundaries exert little or no direct influence on the locations of a significant portion of commonly used geographic data (examples include natural, environmental and selected administrative boundaries) the relative locations of tax lots to these features as represented in the GIS (such as site address points, taxing district boundaries, wetlands, and others) is critical to mapping, reporting, and analysis functions at all levels of government.

Due to irregularities in the best available horizontal control network at the time legacy GIS data were originally converted to the present GIS, the distances that features will be "moved or adjusted" will vary across the county. In the Eugene-Springfield metro area where a reasonably dense network of high quality control was available, spatial adjustments will be minimal (typically less than 10 horizontal feet). In other portions of the county, such as in rural areas or in and around some of the small cities where better and more complete control data are now available, spatial adjustments will be more significant (ranging from 40 to 300 or more horizontal feet). If the regional partners are to adopt a new tax lot layer, it will be necessary to spatially adjust a considerable number of their existing GIS data holdings to preserve consistent data relationships and expected relative accuracy.

1.3.2 Ensure Data Consistency

In addition to improving the overall spatial accuracy of GIS data within Lane County, the spatial adjustment will help preserve current regional opportunities to share and integrate data from multiple data sources both inside and outside of the County. The longstanding cooperation among the partner agencies in Lane County is negatively impacted by the existence of multiple basemaps built on different spatial control that promote development of redundant and incompatible data sets. A collaborative approach to parallel regional and agency specific spatial data adjustment efforts will help ensure data consistencies both across agencies and for users of GIS who are hoping for a seamless transition to the adjusted data. Users should also generally expect to more easily integrate data from outside federal, state, or private agencies with local data following the spatial adjustment.

1.3.3 Minimize Regional Project Impacts

Making a seamless transition from current regional GIS data to adjusted data is a critical goal in light of the number of users of RLID and GIS throughout the region. The benefits associated with improved spatial data accuracy will not be of great value in the near term for users or applications that rely on temporal consistency. For example, users of RLID who determine the zoning or site address associated with a particular tax lot will not be impressed by announcements of improved spatial accuracy if an outcome is that the corresponding zoning or address are now different when they return to RLID to query the property. Agency staff responsible for data maintenance will be challenged by any implementation that calls for an extended adjustment timeframe as this would entail not only redundant data maintenance efforts but risk and additional costs to applications that must manufacture temporary data sets to integrate adjusted and unadjusted data. The spatial adjustment plan includes measures such as extensive pilot testing and quality control to minimize impacts of the adjustment project.

1.4 Assumptions

A core set of regionally accepted assumptions about the spatial adjustment work and associated data files will be recognized including:

1. Adjusted data will geocode correctly as determined by the MSAG, standard RLID QA reports, and other automated and manual assessments.
2. Data adjusted to better "fit" the new basemap will meet or beat the same ORMAP spatial accuracy standards applied to the new tax lots.
3. QA methods will not rely entirely on automated QC jobs and will include some visual review (ex. Standard Eugene zoning maps).

1.5 Roles and Responsibilities

LCOG will serve as the lead agency for coordinating both the adjustment of shared regional GIS files by RLID Project staff and parallel adjustment efforts of the partner agencies. Each of the regional partner agencies will have responsibility for adjusting to the new common basemap selected regionally shared data files in addition to agency-specific data files as specified by each respective agency. The GIS spatial data adjustment effort will be performed in a coordinated and systematic way that ensures the highest possible data integrity, while causing the least amount of disruption to ongoing data maintenance processes, RLID users, and general applications of regional GIS data.

Each of the participating partner agencies is responsible for allocating staff time and other resources sufficient to coordinate and perform spatial adjustment work within agreed project timeframes. Designated RLID and Agency staff members will form the Spatial Data Adjustment Project Team. Agency GIS Coordinators or Project Team designees will participate in project coordination and technical project meetings, and oversee the work efforts of their respective agency staffs. RLID Project staff will assume the additional responsibility of assembling data adjusted by the respective agencies, performing independent QC, and working with the affected agencies to resolve data issues resulting from integration of agency files into the countywide master regional file.

1.5.1 Spatial Data Adjustment Project Team

The Project Team will carry-out the work activities described in this plan. The team includes RLID Project staff and designated staff from each of the participating partner agencies.

1.5.2 GIS Coordinators

The coordinators will review the team's progress, with particular emphasis on resource and scheduling issues. Jeff Schenck will lead the Project Team and report progress to the GIS Coordinators and Project Team members.

1.5.3 Subcommittees

The RLID subcommittees will play a key role in refining data standards and spatial adjustment methodologies and will help monitor spatial adjustment impacts on regional and agency GIS users.

1.5.4 Partner agencies

Each partner will need to develop their own spatial data adjustment plans for the agency data they will be adjusting. The project team will provide support and assistance.

1.6 Issues

1. Significant risk to the partner agencies results from committing to a spatial adjustment plan of action and timeframe while uncertainty remains around how Lane County will maintain the new tax lots.
2. Commitment by the regional partners to implement the regional spatial adjustment plan does not absolve each respective partner from the need to conduct similar adjustment processes on their respective agency data sets.
3. Outside of the general spatial ORMAP accuracy standards attributed to the new tax lot file, the regional partners lack a set of GIS spatial accuracy standards or minimum requirements specifications.

1.7 Schedule and Cost

The ideal project timeframe would see the spatial adjustment work completed as soon as possible after the new tax lot file is completed with the following considerations:

1. Recent tax lot updates are in place ensuring currency that is comparable to the existing regional GIS tax lots files.
2. A regionally acceptable tax lot maintenance schedule is in place.
3. Resources are appropriated to ensure timely project completion.

Costs associated with the spatial adjustment are to be shared by all of the participating partners. RLID program staff efforts will be funded through the regional GIS projects fund. In addition, each partner agency will need to dedicate staff time and resources to adjust their respective portions of the shared regional data as well as adjust their respective agency GIS data holdings.

RLID Project Team staff and the regional GIS partners will share work and coordinate efforts to schedule and complete spatial data adjustment for high priority regional data within the shortest possible timeframe given available resources, availability of final remapped Lane County tax lots, and assurance that operational procedures are in place to maintain the currency of the tax lot data.

1.7.1 Timeframe

Spatial adjustment of high priority data is to be completed within 6 months following the release and regional adoption of a remapped tax lots file *that is under maintenance consistent with regional standards*. The objective is to accommodate some amount of dual maintenance of new and legacy data file versions (out of necessity given the project timeframe) while still ensuring minimal disruption to current users of regional GIS data.

Based on current projections by the Lane County Parcel Mapping Project, the re-mapped tax lot layer should be completed and ready for regional use by the end of the first half of FY2006. While it is expected that each of the regional partners will continue to spatially adjust project data and lower priority data files over a period of years as needs arise, the objective of the project is to complete adjustment of the priority regional data by the end of FY2006.

1.7.2 Costs

Project costs are based on initial hour estimates for RLID Project Team staff to adjust, QC review, and document high and medium priority regional data. Actual costs of the overall spatial data adjustment include both RLID Project Team staff hours and agency staff in-kind work efforts on both regionally shared and agency-specific data. The plan assumes the partner agencies will absorb costs of in-kind staff work on regional data files as well as agency specific project data—funding for these efforts is not part of the Regional GIS Projects Fund proposal.

A combination of partners' in-kind support and unpaid intern labor hours are planned to handle the more than 230 estimated hours for metadata updates and QC review of selected regional data that are not expected to require spatial adjustment. The supplemental cost of $52,000 includes an estimated 160 hours for project coordination and management by LCOG as well as an estimated 598 RLID Project Team staff hours to adjust shared regional files. The project funding is proposed under the Regional GIS Projects Fund which comprises pooled partner agency shares for annual high priority GIS projects that serve common partner needs.

2 Spatial Adjustment Work Activities

A typical spatial adjustment process will consist of the following steps: determine requirements; select method and tool; prepare; adjust; QA.

2.1 Requirements

Spatial adjustment can be defined as the modification of feature geometry to better "fit" newer, more accurate control. While the overall goal is to improve the absolute accuracy of the data, a more immediate need may be relative accuracy, or the spatial relationships among features in different data sets. What constitutes correct *fit* will vary depending upon the data and how it is used. Fit may require that a feature in one data set *snap to,* or match exactly, a corresponding feature in another dataset. An example would be land use polygons which share many, but not all, line segments with tax lot boundaries. Other examples include: site address points must *fall within* the correct tax lot and administrative boundary polygons; a school district must *contain* the correct tax lot centroids and site address points.

2.2 Methods

2.2.1 Simple edit

The simplest method for performing a spatial adjustment consists of identifying features which need adjustment, their desired locations (to-point), and then performing the edit operations required to correct the locations. An example of this method would be selecting vertices in a zoning boundary, and moving the vertices so that they include the correct tax lot polygons. This process is both reliable and highly accurate.

2.2.2 Rubber-sheeting

This classic adjustment technique can save time in some cases, but caution is advised. The rubber-sheeting process can cause distortion of line and polygon shapes, potentially severe. Unlike the simple process described previously, all features in the adjustment area are subject to movement. Due to the complexity of the algorithms involved, it may be difficult to predict how a given feature will move.

The rubber-sheeting method requires the creation of a set of link features, which describe the from- and to- point locations. After creating a series of links, the adjustment is performed as a single edit operation. If the fit requirements are not rigorous, a small number of links may provide an adequate adjustment. In some cases, the links may even be re-used to adjust other data sets which are tied to the control data on which the links were constructed. However, it should be noted that since the TINs produced by the rubber-sheeting process are a function of both the links created and the data itself, the actual adjustment performed will be different for every data set.

If this method is employed, the following techniques are strongly recommended, in order to minimize risk: "work in small chunks" by limiting the adjustment area; use *identity links* to *nail down* features which should not move; check adjusted features extensively for correct shape and location.

2.2.3 Derivation

Whenever possible, derive data from data that has already been adjusted and verified. For example, adjust elementary school attendance areas first, and then derive their respective middle school attendance areas, high school attendance areas, and school districts, by selecting and merging the appropriate polygons.

2.2.4 Hybrid and other approaches

In some cases, a hybrid approach may work best. For example, city limits often follow tax lot boundaries. Using an overlay process, a set of tax lot polygons could be selected, and an initial boundary could be generated from their outline. Simple editing could then be used to refine and complete the boundary.

In the section of this document which describes the pilot studies which have been performed, some experimental approaches are described for adjusting land use and site address data. The hybrid approach described for land use adjustment combines a highly-automated derivation methodology, with simple editing. For site addresses, an automated approach to rubber-sheeting is described. Since the site addresses are point features, shape distortion is not an issue.

2.3 Identify Regional Data for Adjustment

In particular, spatial data adjustment procedures will need to be applied to those regional GIS layers that have been mapped and developed with reference to the regional GIS parcel files. Among these data layers are boundary and area features such as land use, zoning, and a host of administrative service boundaries for which relationships to underlying tax lots are important. Other GIS data feature types, such as site address points and road centerlines, must be adjusted so that these features fall within the correct tax lots or within rights-of-way partially defined by tax lots.

Some of the regional and agency GIS data holdings have not been mapped with reference to the regional parcel files and will not require significant, if any, spatial adjustment in order to closely register to the new tax lots. Examples of these data are GIS layers obtained from federal, state, or other outside agencies that have not been locally adjusted to better fit regional GIS data. Typically, these data include natural or environmental features such as soils, terrain or surface water.

2.4 Conduct Pilot Studies

Project team staff has undertaken a series of pilot projects to evaluate data adjustment methods and tools. Findings of these pilot efforts will be documented and reviewed with the regional partners for approval. Specific spatial data adjustment procedures will be specified and refined through the pilot evaluations. See Appendix 3-A for descriptions of the adjustment pilots.

2.5 Determine Project Approach and Partner Agency Roles

Three alternative approaches to performing the spatial adjustment work were considered by the RLID Steering Committee including: 1) LCOG RLID Project Team staff taking on full responsibility for spatial data adjustment of the specified regional data files; 2) LCOG RLID Project Team staff sharing work and coordinating efforts with an outside data services contractor; and 3) LCOG RLID Project team staff and partner agency staff sharing work and coordinating efforts. The preference of the Committee is the third alternative which offers each of the partner agencies the greatest opportunity to directly participate in the data adjustment work and to help ensure the adjusted data meet their respective agency needs.

2.6 Identify Transition Support Needs

Providing effective communications and support during the transition phase will be critical to the success of this project. In order to minimize impact to Agency GIS users and RLID users, the team will develop a plan to provide effective project management including work coordination, reporting of project status, and relevant information about data issues that may arise.

2.7 Develop Detailed Work Procedures

Detailed work procedures will be developed by modifying the initial adjustment procedures based on pilot study findings and partner agency review. A typical work flow will consist of research and preparation, adjustment, and quality assurance.

2.7.1 Research and Preparation

Hard-copy maps showing the data to be adjusted, the old and new taxlots, and any supporting data, such as orthophotography, will prove beneficial for research efforts. Data experts can annotate the maps to indicate desired corrections. The maps can also be annotated to monitor progress, but a another useful technique is to add an attribute item to the data being adjusted to serve as a status flag. Setting this item to an appropriate value when a feature has been adjusted allows for appropriate symbolization on a progress map, or features counts in a status report.

Customization efforts should focus on macros or map templates, which will greatly reduce the startup time required for defining the edit, display and snapping environment.

2.7.2 Adjustment

For the simple method, the adjustment process will consist primarily of repetitively selecting and moving the vertices of polygon features. In some cases, it may be necessary to add and delete vertices to achieve the desired fit.

For rubber-sheeting, no features are modified. Instead, adjustment and identify links are created, and a “limited adjustment” area is defined, before adjustment is performed. However, after the adjustment, some clean-up may be required to correct features which did not adjust properly.

The derivation and hybrid approaches have been previously described in the methods section.

2.7.3 Quality Assurance

A critical geo-processing requirement is the correct assignment of administrative boundary information to a given taxlot. An example would be emergency response information such as police, fire, and ambulance district. This process can be used for quality assurance by comparing the results before and after a spatial adjustment is completed. Any taxlot whose boundary information has changed could indicate a potential problem with the spatial adjustment process.

Another useful quality indicator is a comparison of the area extent, or acreage, of each taxing district before and after the spatial adjustment.

2.8 Preferred Alternative

For adjustment of taxing districts, simple editing with ArcEdit is the preferred alternative for LCOG. Derivation will be used wherever appropriate. In cases where the district mostly follows the taxlot boundary, a hybrid approach may be used.

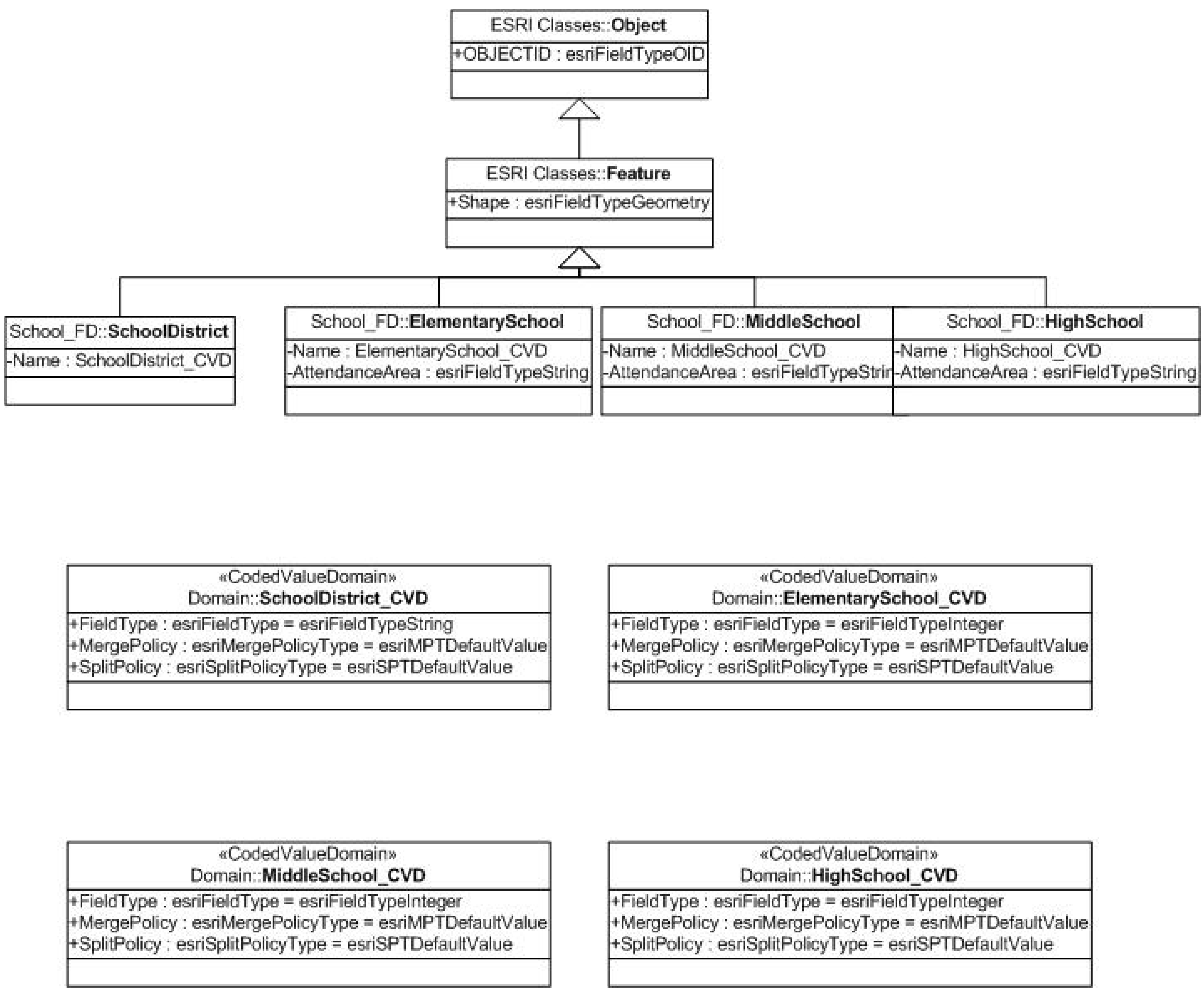
3 ArcGIS Migration

3.1 Data Model

Conceptually, a taxing district can be thought of as a real-world object with certain properties and behavior. Since a taxing district has a well-defined shape, the geometry for this type of object is best represented using the vector model, with each district boundary described by a polygon. The primary property for a taxing district would be its designation or jurisdictional identifier. For example, a school district boundary would require the name of the district, and in some cases a code. This property is represented by a text item or attribute which is linked to the polygon.

Before choosing a data model, the desired functionality must be carefully considered. The requirements for a production model, which will support maintenance activities, will differ considerably from a publication model, which will be optimized for mapping and analysis applications. A production model could include domains and topology to enforce data integrity, and versioning to support long transactions. Data might be segregated by jurisdiction for security reasons. In a publication model, domains and topology would serve little purpose, and versioning could degrade performance. Data that has been segregated for security reasons might need to be re-aggregated for ease of use.

ESRI's Census Data Model includes a polygon feature class representing school districts, with subtypes for elementary, middle, and high. For production, a recommended enhancement to this template is a set of domains to enforce the data integrity of the attribute values for each subtype. One possible schema is shown below.



Also, to enforce spatial integrity, a topology should be created. In order for a topology to be created, a feature class must belong to a feature dataset. Topology rules appropriate for school districts might include:

Topology rules within each subtype
- No overlaps
- No gaps

Topology relationships between different subtypes
- Elementary completely covered by middle
- Middle completely covered by high

Any exceptions to these rules should be marked as such. The recommended cluster tolerance for a topology is an order of magnitude more precise than the accuracy requirement of the data. For example, if the data must be accurate to the nearest foot, the cluster tolerance should be .1 feet or smaller. This will prevent degradation of accuracy during topology validation.

Subtypes with overlapping polygon features, such as elementary, middle, and high school attendance areas, can increase the complexity of an editing session. The select features tool will “drill down” to select all of the overlapping features, whereas the edit tool will only select a single feature. The “N key” provides a shortcut for stepping thru overlapping features with the edit tool. Alternately, an attribute query which specifies the subtype can be used to select the desired feature for editing. Due to this complexity, it may be desirable to separate the subtypes into separate feature classes.

A personal geodatabase is recommended for prototyping, single-user edit applications, and small- to medium-sized databases with a limited number of users. Multi-user update and work flow scenarios will require versioning, which is provided by an enterprise, or ArcSDE geodatabase. An enterprise geodatabase will also scale up to support larger datasets and numbers of users.

4 References

Designing Geodatabases: Case Studies In GIS Data Modeling, Arctur & Zeiler, ESRI Press, 2004.

ArcGIS Parcel Production Data Design Considerations, Fairview Industries Oregon Parcel Data Model, 2003.

Appendix 3-A
Pilot Spatial Adjustment Methodologies & Preliminary Findings

Pilot studies have been completed on 4 data layers: site addresses; land use; city limits; and street centerline. Reference base layers relied upon included: new parcels, street centerline, and orthophotography.

Small City Road Centerlines

Street centerlines were adjusted in three geographic areas: Florence; Veneta; Cottage Grove.

For the Florence adjustment, ArcEdit was used to adjust a coverage consisting of the entire Lane County street centerline layer. Rubber-sheeting did not work well, due to shape distortion. Moving intersection nodes worked well for gridded streets; not so well for curved or irregular streets. What worked better for irregular streets was to disconnect a section of streets, move the section as a unit; and reshape and/or reconnect features where required.

For Veneta, ArcMap with an ArcView license was used to adjust a Shapefile consisting of an extract of Veneta street features. A student performed this adjustment. Some errors which resulted from this process were probably due to a lack of experience working with topology. The use of map topology would probably have been beneficial. Nodes could have been adjusted using the topology edit tool. Convert the Shapefile back to a coverage a number of problems, such as the introduction of unwanted nodes.

The Cottage Grove study evaluated the use of ArcMap to adjust a feature class in a personal Geodatabase. Map topology was used. An attribute flag was use to color-code the adjusted arcs. Some problems with nodes resulted from converting the data to a feature class and back.

Recommendations: use ArcEdit to adjust the coverage in its native format. Use a combination of moving nodes, and moving a section of disconnected streets. Data conversion is not robust enough.

Land Use

An automated process has been developed to synthesize an “adjusted” land use layer, by combining the geometry of the new tax lot polygons, with attributes from the un-adjusted land use layer. Testing has found the model to be reliable and efficient, within the stated limitations.

Limitations: land use polygons must have a map-lot number which can be matched to the new parcel layer. Only taxlots with a single land use can be “adjusted”.

Recommendations: Early testing indicates this method could assign land uses to approximately 70% of the new taxlots. This would free up resources to be concentrated on the more labor-intensive process of adjusting the split-land use taxlots.

City Limits

For this migration, a process using both automated and supervised adjustment was employed. First, the current city limits file for Florence was overlaid on the new parcel file for the city. An automated process selected those new parcels that intersected the current city limits file and merged them into a preliminary file that would serve as a base for a new city limits file. Next, the boundary of the new file was adjusted to incorporate areas where the city limits were either not concurrent with the parcels, by its legal description, or areas where the degree of mis-registration caused parcels to be omitted in the initial automated process.

This method was fairly smooth in that, through observation, the city limits will more often than not, follow parcel boundaries so the creation of the initial file was very quick. Researching areas where the city limits followed some boundary other than that of the parcels was somewhat time-consuming, though. These areas were determined through analysis of the legal description as well as the A&T maps in both digital and paper format.

Site Addresses

Reference layers (adjusted to):	New taxlots
Data format:	Coverage
Tools:	Workstation ArcInfo (combination of Arc, Tables, ArcPlot, and ArcEdit)

Methodology:

Generated links from centroids of old parcels to centroids of corresponding new parcels, and then applied those links to an ArcEdit "adjust". Limited parcels which are allowed to participate in link generation to the following:

- Has to consist of just one polygon in both old and new data (no "5 records" in the old mainframe parlance).
- Has to have a maplot number match between old and new data.
- Has to be of roughly same size (no expansion or shrinkage of 15% or more).

Lessons learned:

Filtering the parcels is important. Added an additional filter (parcel must contain address point to participate in generation of links) but address points on edges of towns and cities ended up with no nearby links in the out-of-town direction and their adjustment was skewed. Results were improved when “identity” links were added in areas where no addresses are found. Results were further improved by breaking the county up into 12 sub-areas (6 townships in the metro area and 6 larger rural areas).

Because these are just points and not line or polygon features, there is no shape distortion issue, nor the typical kinds of topology errors associated with adjustment of lines and polygons. In addition, post-adjustment re-combining of the 12 the sub-areas doesn’t involve any of the edge-matching issues that would be encountered with line or polygon features.

An important QA step is to create a spatial overlay between adjusted address points, old lot numbers, and new lot numbers, so you can examine those instances where the lot number changed. So far, those have been generally OK or even good changes, improvements and not errors.

Dunes City

Data adjusted:
City Limits
Urban Growth Boundary
Zoning
Comp Plan
Land Use
Wetland Inventory
Riparian inventory

Reference layers (adjusted to):
New Parcel Base

Data format:
Source data was in coverage format. Shapefiles were used as intermediate file types, with finished products incorporated into a geodatabase. No topological rules were employed during adjustment.

Tools used:
Spatial Adjustment tool set within ArcMap-ArcInfo. Primarily used links with occasional use of the limit adjust.

Methodology:
The spatial adjustment methodology varied depending on the data set used. In general, objects to be adjusted were used to select intersecting new tax lots. These lots were then visually compared to the current parcel base, with links established between the same vertices of tax lots (old to new) where such features could be identified.

For outer boundaries, such as city limits and UGB, a “halo” of tax lots was thus selected. Similar techniques were used for isolated and linear features, such as wetlands and riparian corridors. An exception to this occurred with the riparian layer where it was directly tied to a feature in the parcel base, in this case lakes. A buffer operation was used to create the riparian area where it abutted lakes, and then manually unioned with spatially adjusted riparian corridors that do not abut the lake features.

For area-filling data, such as zoning and comp plan, only non-low-density residential categories were adjusted (as the majority of the urban area is in this category), these were updated onto the city limits and UGB respectively, and then reattributed manually. Care needs to be taken with such an approach to make appropriate decisions about roadways, water features, and other entities within the urban landscape.

Land use was the most difficult layer to adjust with the least satisfactory results. A frequency analysis was used to isolate (land use) tax lots with more than one use. These land use polygons were written to a new file. These polygons were converted to line features and centroid points containing attributes. A series of selections were made to select only the internal line work of the current parcels (those lines marking divisions between land use within a tax lot) by converting the tax lots to lines, selecting identical land use geometry, and then switching the selection within the land use lines. Current parcels are then compare to new parcels and links are created between the two, these links are then used to adjust the internal line work of the land use poygons and the land use centroids. These lines are manually edited to eliminate overshoots and dangles, and then geometry rebuilt with these lines, the outer tax lot lines, and the centroids.

Lessons learned (what worked/did not work):
As stated above, land use is the most problematic layer to adjust, especially depending on the amount of local discrepancy in the area of adjustment. The amount of hand editing to achieve closed polygons is great, and the operation diminishes the quality of the data. The area and shape of the land use polygons internal to their tax lot can be greatly distorted, and on occasion the centroid will not be placed within the polygon after both are adjusted.

In general, the adjustment framework is similar or identical in concept and execution to those procedures employed in workstation.

Limitations:
To maintain or improve the quality of the data, greater care and research is needed to verify land use geometry against plat maps, tax assessor’s records and aerial photography. For data layers that are not so finely articulate in their geometry, the methods above produced acceptable results as determined by calculations of aerial extent of categories before and after adjustment. [It may be worth noting that the aggregate area of land use was within an acceptable level of variance, but individual land use polygons varied greatly in their area before and after adjustment.