

Migration of INDOT Road Inventory Certification

To a

GIS Shapefile Submittal

Paper to Digital

**Presented at ESRI Conference,
San Diego, California
July 27, 2005**

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Abstract

Currently the Indiana Department of Transportation (INDOT) annual road inventory update submittals are based on a series of hard copy documents. INDOT is working on a pilot project with the Town of Westfield, IN Public Works Department GIS Division to determine data and metadata standards for electronic submittals.

This paper, written by the GIS Coordinator for the Town of Westfield, will address the current status of this pilot project and a demonstration of datasets needed to accommodate the update process including:

- shapefiles of currently certified roads,
- new Mileage Certification Change Request Form,
- old and new corporation limits reflecting annexations,
- shapefiles of new/extended roads,
- document hotlinks to Shapefiles,
- ortho-photography,
- and the INDOT acceptance process.

Introduction

Purpose

The Town of Westfield is in the midst of growing at a very fast rate. The street department is within the Westfield Public Works Department. To address this annual road inventory issue, a GIS was established within the Public Works Department. This project is to utilize the newly formed GIS within the Town of Westfield, IN to update the road inventory mileage for the annual certification process conducted by INDOT. The certified mileage number is a variable in determining how much money is allotted to each Local Public Agency (LPA).

The main goal was to establish a process to get current certification records in place and to be able to annually update the data via the GIS. In 2003 The Town of Westfield had 28.32 certified road miles. After this project was used for the 2004 updating, the Town of Westfield now has 86.10 certified road miles. The complete 2004 submission was in a digital format. Previously submissions could contain several paper documents of plat maps and annexation documents as well as other supporting documentation. Paper submissions were very time consuming, very cumbersome and could also contain a very large quantity of paper that had to be delivered to INDOT. A huge benefit of this pilot project has been to establish means by which to eliminate the volumes of paper for each submission.

Background

Annually INDOT performs a road mileage certification process. The Program Development Division, Roadway Systems Unit, previously the Highway Inventory and Systems Unit, is in charge of reviewing the data and certifying all data and calculating current inventory data. They were originally calculated, during the 1920's and 30's, using index cards, starting at the township/trustee level, then at the county level and eventually at the state level. The Motor Vehicle Highway (tax) distribution started sometime around or before 1941. The current Local Road and Street (tax) distribution started in 1969. The index cards were processed into a Main Frame database in 1975 and 1976. In January of 2004 the Main Frame database was processed into an Access database.

INDOT reviews any new mileage submittals from local government units as well as confirming the current status for entities that submit no change documents. From this review a "Certification of Mileage" letter is submitted to the Indiana State Auditor's office to aid in motor vehicle tax distribution and the local roads street funds, both of which are associated with a gasoline usage tax. The local counties, cities and towns have the responsibility of submitting any new documentation to support any additions, deletions or revisions to their mileage count.

INDOT Road Inventory

The INDOT Road Inventory is a comprehensive, detailed itemization of roads throughout the entire State of Indiana. There are three main items maintained by INDOT in the inventory:

1. *Certified Roads* - (System 1, 2 & 3)
2. *Corporate Limits*
3. *Inventory Database*

Certified Roads

INDOT maintains a current certified road inventory file for the entire state of Indiana. All roads must be public roads and maintained by a Local Public Agencies (LPAs). The inventory is maintained in three distinct levels pertaining to roads:

1. System 1 Roads - State Roads
2. System 2 Roads - County Roads
3. System 3 Roads - Local Roads (City and Town)

The following graphic depicts all INDOT System Roads in Hamilton County, IN.

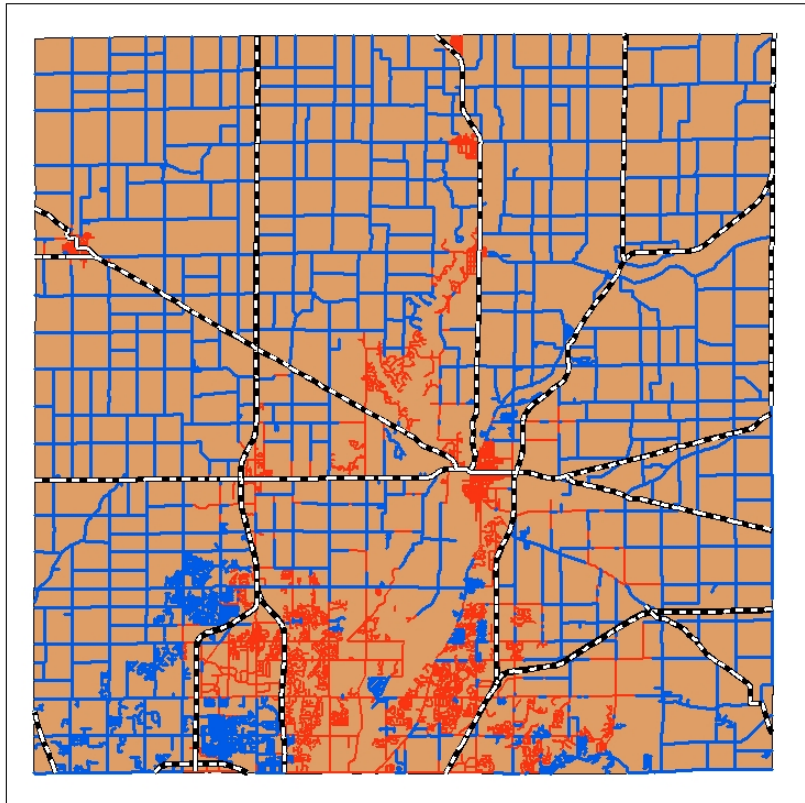


Figure 1. INDOT 2003 – System 1, 2 & 3 Roads - Hamilton County, IN

Corporate Limits

INDOT maintains a current certified corporate limits file for all entities in the state. This file is updated by confirmation of annexation documents.

The following graphic depicts the INDOT Corporate Limit for the Town of Westfield through 2003.

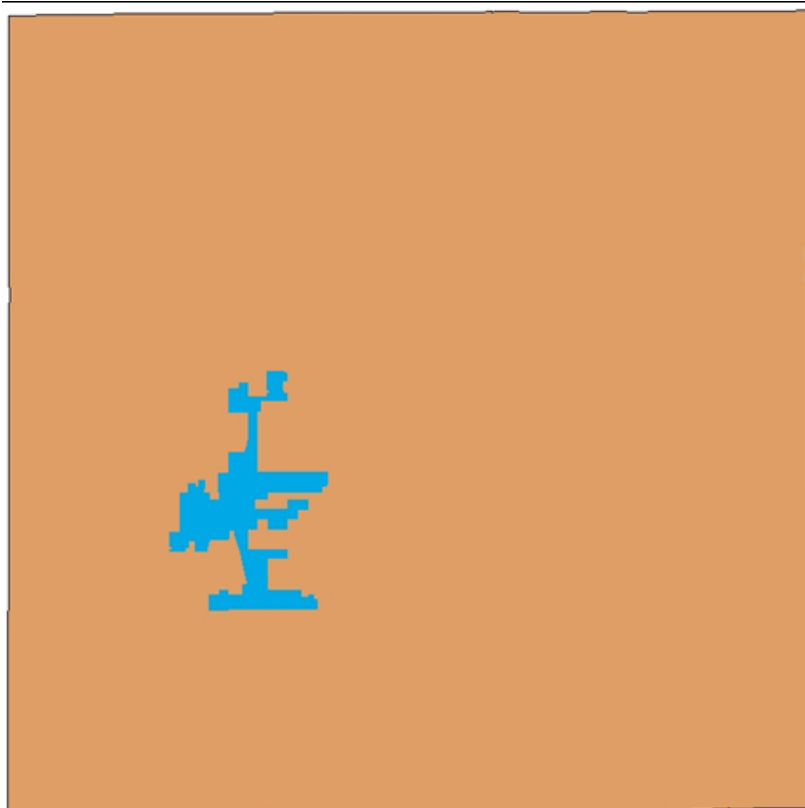


Figure 2. INDOT 2003 – Town of Westfield Corporate Limit

Inventory Database

The Inventory Database is the primary component of the annual certification process. The main database contains the Current Road Inventory and the Record Verification Summary.

The following graphic depicts Shapefiles of the INDOT Corporate Limits and the INDOT certified system roads through 2003.

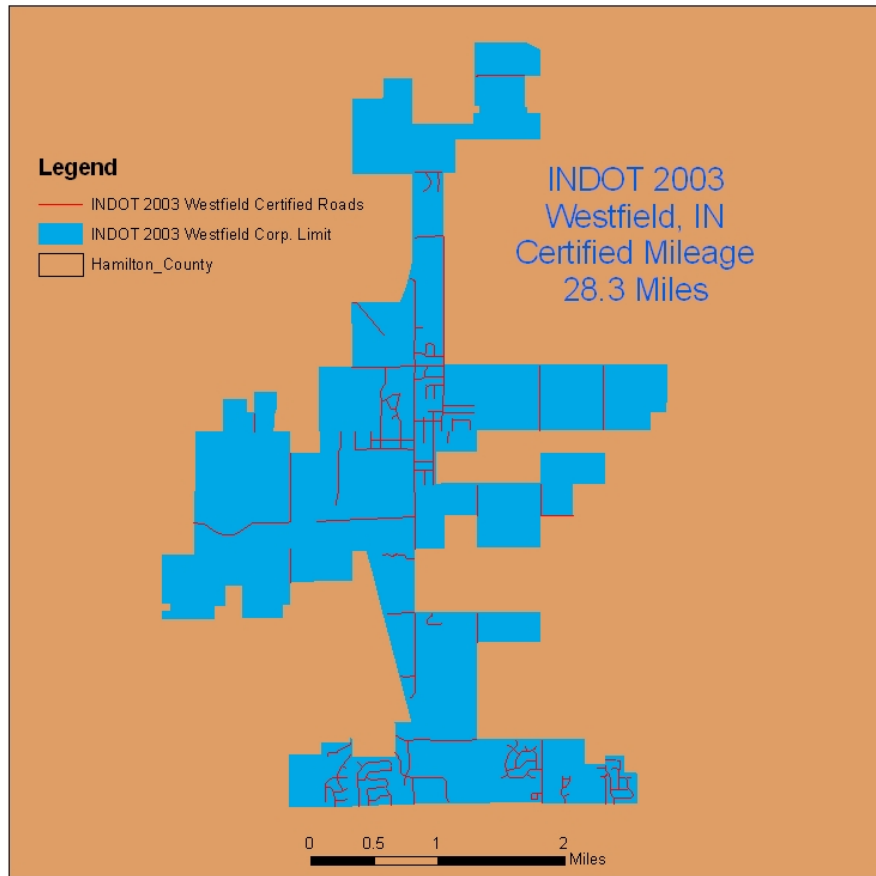


Figure 3. INDOT 2003 – Town of Westfield Certified Mileage and Corporate Limit Shapefiles

The following graphic depicts a detailed printout of the certified roads database. INDOT provides the details of the certified road mileage in this format.

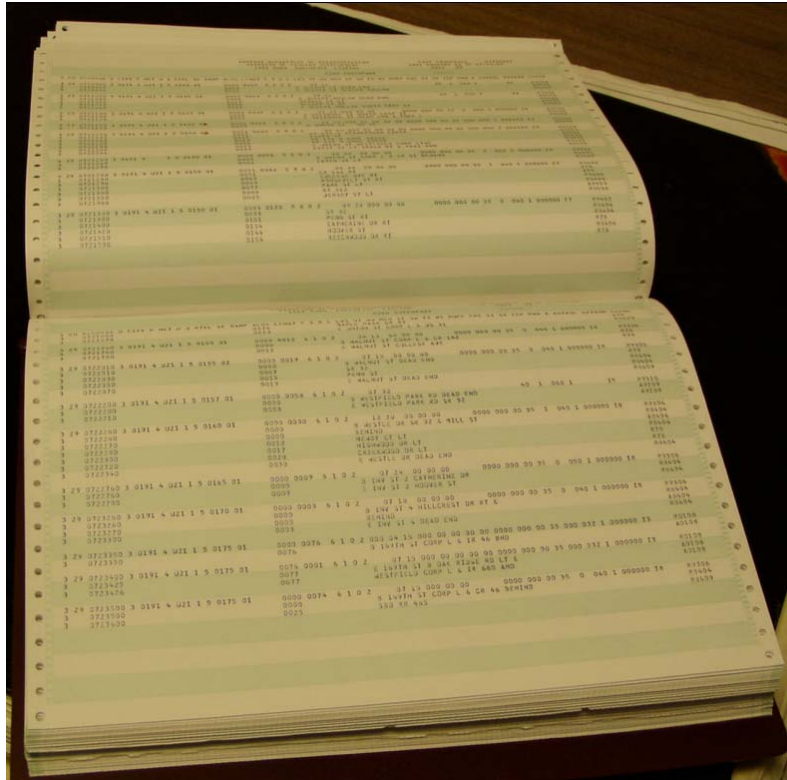


Figure 4. INDOT 2003 – Town of Westfield Certified Mileage Database Printout

Along with the inventory database, INDOT maintains a Certified Mileage Change List. The following graphic depicts the Certified Mileage Change List for 2003 for the Town of Westfield. The change list details the new roads for the latest calendar year. The following graphic depicts the 2003 Change List for the Town of Westfield.

COUNTY NAME		CITY/TOWN NAME		REASON FOR CHANGE														Certification Mileage	NOTES				
Hamilton		Westfield		UNIQUE NUMBER				ANNEXATIONS	JURISDICTION	VACATION	PROCESS REVIEW	HANDADD	Miles	NEW/ROADS	Req Miles	Beginning Route Mileage	Debit Mileage			Credit Mileage	Ending Route Mileage		
SUBMISSION DATE		CTID# - (C/CITY/SC/MMDDYY)		JCD	CITY	RTEL	RAMP	SC															
10/10/03		29/0191/66/101003																		28.07	Beginning Certification		
Subdivision	Street	From	To																				
	169th St.	IR 43	Noblesville Corp Line	529	0191	0175	0000	01															
	169th St.	IR 43	Noblesville Corp Line	529	0191	0175	0000	02															
	169th St.	IR 43	Noblesville Corp Line	529	0191	0175	0000	03															
TOTALS																							
																				28.32			
																				-28.07			
																				0.25			

Figure 5. INDOT 2003 – Certified Mileage Change List Town of Westfield

Annual Certification Process

After reviewing the 2003 data, Westfield Public Works Department (WPWD) started the Annual Certification Process in March of 2004. In May of 2005 WPWD received a Certification Letter for the 2004 submittal. The following describes the steps of the process which includes gathering and creating information for the submittal, submitting it, receiving the confirmation documentation from INDOT, and finally receiving the Certification/Summary Letter and Report.

The annual certification process includes the processing of the Town of Westfield, IN 2004 “Mileage Certification Change Request” Form, establishing the current certified datasets (base data), confirming new corporate limit and road updates, the acceptance statement, INDOT acknowledgement letter, the certification letter, and Submittal and Mileage Summary Report (Hand Add).

Processing of the Mileage Certification Change Request Form

The annual form that has been used for paper submissions was used for the new digital submission. Along with the letter is an enclosed “Mileage Certification Change Request” form. This is the form which must be used to submit changes for the next year of certification. All entities are required to submit at minimum this form annually. There is an option of checking the “NO WE WILL NOT have any changes” selection. If there are changes to be submitted then they would be detailed, and the data must be included with the submittal.

The following graphic is the initial Mileage Certification Change Request form sent to all entities in the state of Indiana by INDOT. This is the form that drives the certification process.

ROADWAY SYSTEMS UNIT
Mileage Certification Change Request

Please PRINT or TYPE all requested information. Year/Date of Submittal: _____

NAME of County _____ City/Town: _____

Name of Office & Title: _____

Address: _____
(Street)

_____ (City) _____ (Zip Code)

Telephone: (____) _____ E-Mail _____ Fax _____

.....

Please check ONE of the following:
 No. We WILL NOT have any changes. (Even if no changes, please return this form.)
 Yes. We have changes.

Before changes to your mileage for certification can be made, you MUST include items 1 thru 4 for each new submission. For annexations you must include items 4 and 5.

____ 1.) Copy of measurable (scaled) plats/aerial photos, showing new streets/roads.

____ 2.) Copy of your current (scaled) map, marking location of plats in red. Mark streets/roads to be deleted/vacated in orange.

____ 3.) Copy of minutes of governing body accepting new streets/roads into your system.

____ 4.) Please list each road and its additional requested mileage as an attachment/separate listing.

____ 5.) Copy of ordinance(s) establishing new corporation limits, along with drawing the correct corporation line on a scaled map or our map. (Annexations/De-annexations). It helps us to have a **surveyor's drawing** showing the metes and bounds for same and **NOT** going by lot number references. **We need the names in cities/towns for roads annexed from the county if different from in county.**

NOTE: If you have aerial photos showing the roads/subdivisions being submitted, please enclose same with your submittal; this will speed our getting your roads into the inventory route listing. Please keep us current with changes to your corporation limits whether there are roads involved or not. This helps with maintaining accurate maps as we move into the GIS arena and other related items such as functional classification and urban area boundary issues. If you require a copy of the INDOT active map of your jurisdictions, please notify us. Also, if you need a copy of our inventory for your jurisdiction, please notify us. See reverse of this form for further explanation.

Should there be any questions regarding information being requested, please call Steve Brockmann: 317-232-5482

.....

Return completed form and all submissions to:

INDOT/Program Development Division
Roadway Systems Unit, Supvr.
100 N Senate Ave (IGCN) - Rm N808
Indianapolis, IN 46204

Revised 10/15/04SB

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Figure 6. INDOT – Mileage Certification Change Request Form

Project Kick-off – Base Data Established

In March of 2004 INDOT was contacted by the GIS Division of the WPWD to inquire into the possibility of submitting a digital GIS dataset containing the 2004 road updates. Discussions between the two parties led to a verbal recognition to allow for the start of a pilot project with WPWD. Once this process began it became apparent that the outcome of this project could in the future encompass more than just the Town of Westfield. Through this pilot project, the Road Inventory Unit was open to the idea of establishing criteria by which all entities may be able to submit digital data.

The process began by obtaining an itemized paper Certification Inventory form INDOT for the Town of Westfield. This list contained a total of 28.32 miles certified miles in it. INDOT has its System 1, 2 and 3 certified Roads in Shapefile format along with its official Corporate Limit Shapefile. These files were requested from INDOT.

Corporate Limit Updates

The INDOT Corporate Limit file was overlaid onto the Annexation Shapefile for the Town of Westfield. This overlay detailed where the new INDOT Corporate Limits file for the Town of Westfield should be extended. The Annexation file was linked to a series of digitally scanned annexation documents.

The following graphic depicts the overlay of the 2003 INDOT Corporate Limit Shapefile for the Town of Westfield in blue and the new annexation boundaries in a shade of green.

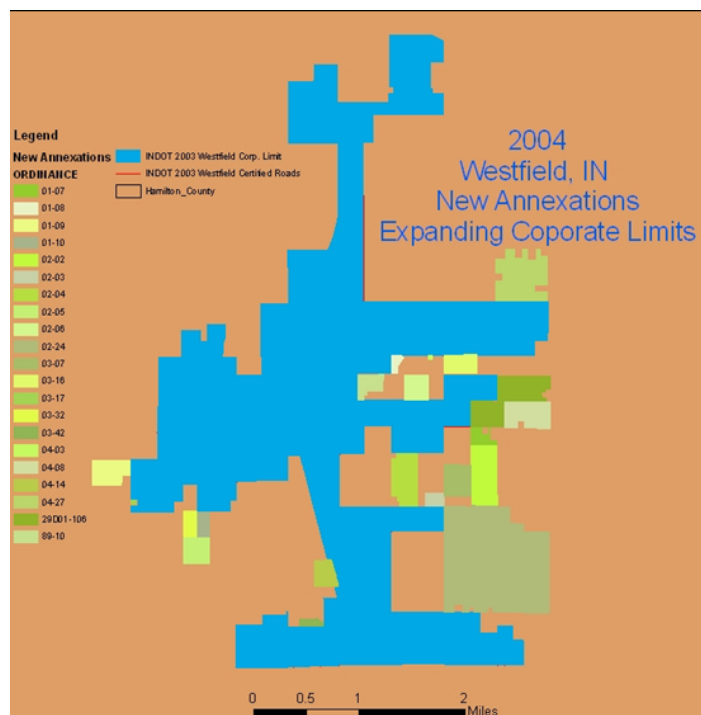


Figure 7. Town of Westfield Annexation File Overlaid by INDOT's Corporate Limit File

All Annexation Ordinance documents were scanned into a digital PDF format. Each of the files was individually linked to the annexation Shapefile feature. The previous process for this submittal item was to submit copies of all of the paper ordinance documents along with all plat maps of the annexation areas and any other relevant paper documents. The following graphic depicts a header of an officially recorded annexation ordinance document which has been digital scanned into a PDF and linked to the appropriate annexation Shapefile feature.

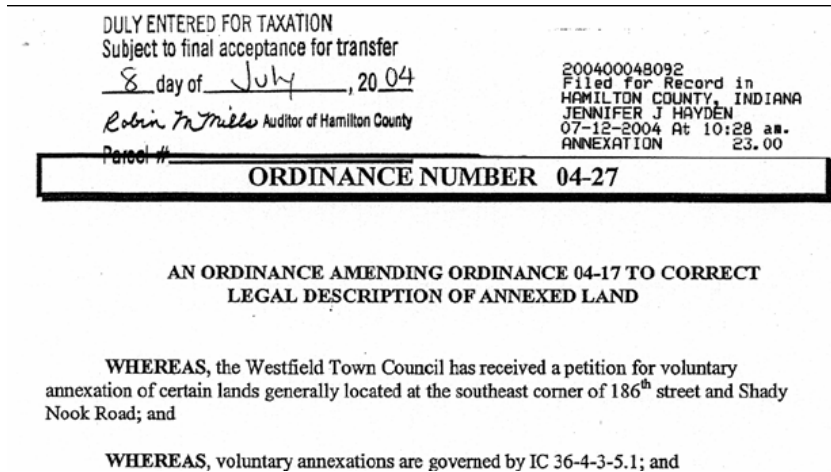


Figure 8. Example of a header of a digital PDF Annexation Ordinance document for the Town of Westfield

The following graphic is a depiction of all the annexation files for the 2004 submission. All of these files are linked to the corresponding Street/New Road and Annexation features.

Submittal Items – Annexation Ordinance Files

- Scanned into a digital format and saved as a PDF
- Individually Linked to the Corresponding **Street & Annexation** Shapefile Feature

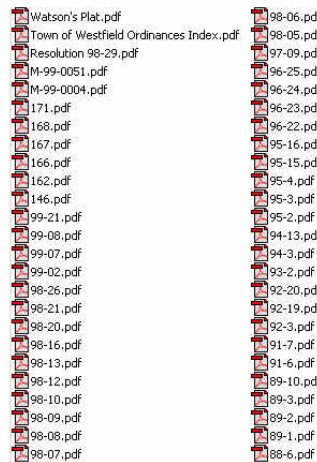


Figure 9. Annexation Documents Listing

Certified Roads Updates

All new or existing roads to be updated and certified must be public roads and maintained by an LPA for the road to be included in an entities inventory. The INDOT Road System layers were overlaid onto the WPWD Street layer. A manual GIS clip process was conducted because the line work was not exactly in the same location. All line work was relatively close, within a few feet. This clip process entailed deleting from the submittal Shapefile based on the WPWD Street layer, all road segments that were already included in the INDOT road inventory. The new roads Shapefile were then overlaid onto the annexation boundaries and town limits Shapefiles. The following graphic depicts the new road segments overlaid onto the annexation boundaries and town limits Shapefiles.

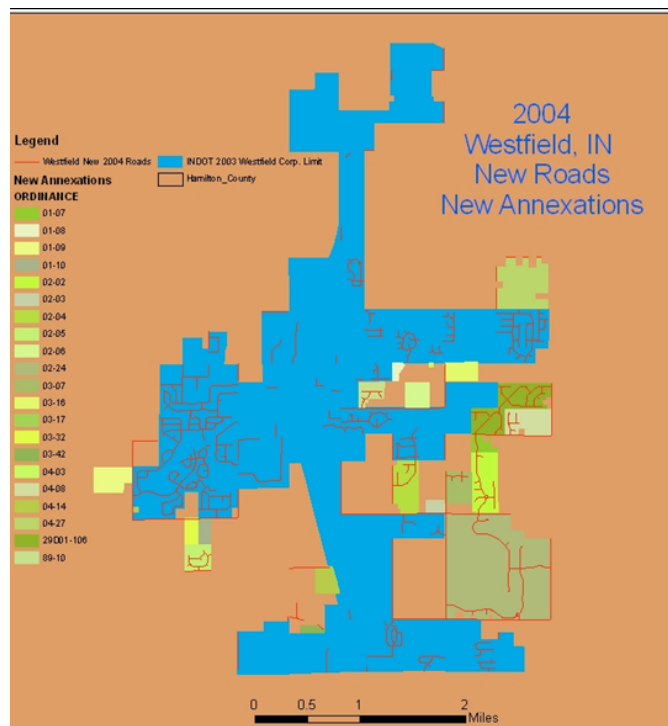


Figure 10.

The Town of Westfield New Roads 2004 Shapefile overlaid onto the INDOT Corporate Limits Shapefile and the New Annexations Shapefile.

Reference Ortho- Photography

Ortho-photography was used to confirm almost all new roads for Hamilton County in April of 2004. The use of ortho-photography also eliminated additional paper copies that had previously been submitted. The following graphic depicts the Town of Westfield New Roads 2004 overlaid onto the 2004 Ortho-photography along with the annexation boundaries and town limits Shapefiles.

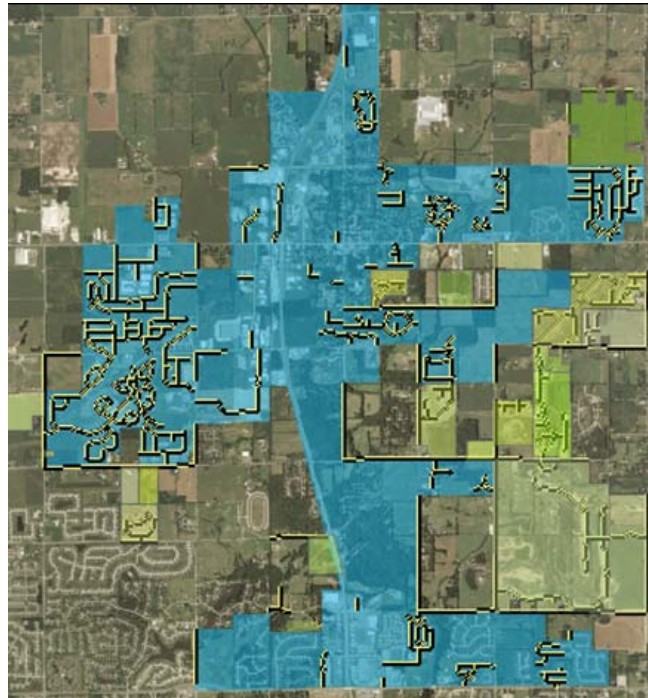


Figure 11. Town of Westfield New Roads 2004 Overlaid onto Ortho-photography

Annexation Document Hot Links

All new road segments were then linked to their appropriate annexation document. The following graphic depicts the Westfield New Roads 2004 segments and the Westfield_IN_New_Annexations_2004 Shapefiles linked to their corresponding annexation documents.

**Submittal Items –
Annexation Ordinance Files**

- Individually Linked to the Corresponding **Street & Annexation** Shapefile Feature

Attributes of Westfield New 2004 Roads							
FULL NAME	WES_ID	ANNEX_DOC	FROM_ENTIT	TO_ENTITY	ROADLENGTH	NEW	DATE_ADDED
TOURMALINE DR	52760.010	94-3.pdf	ADDISON CT	ASHLEY WOOD DR	1299.32	Y	12/14/2004
QUAIL WOOD LN W	52230.010	94-13.pdf	AGATE LN	PINE RIDGE DR W	762.52	Y	12/14/2004

Attributes of Westfield_IN_New_Annexations_2004					
ORDINANCE	ORDINANCE1	RECORDED N	RECORDED D	CORPORATIO	ANNEX_DOC
01-07	12/20/2001	0200007264	1/24/2002	WESTFIELD	01-07.PDF
01-08	12/20/2001	0200007265	1/24/2002	WESTFIELD	01-08.PDF

Figure 12. New Roads and New Annexation Shapefile Tables Hot Linked to Annexation Documents

Acceptance Statement

An itemized new street list was generated from the database file of the Westfield New Roads 2004 Shapefile. This list was put into an Acceptance Statement document and signed by the Town of Westfield Town Council President. This acceptance statement acknowledges jurisdictional ownership of the listed road segments and is submitted to satisfy item number 4 of the Mileage Certification Change Request. The following graphic is a depiction of page one of this document.

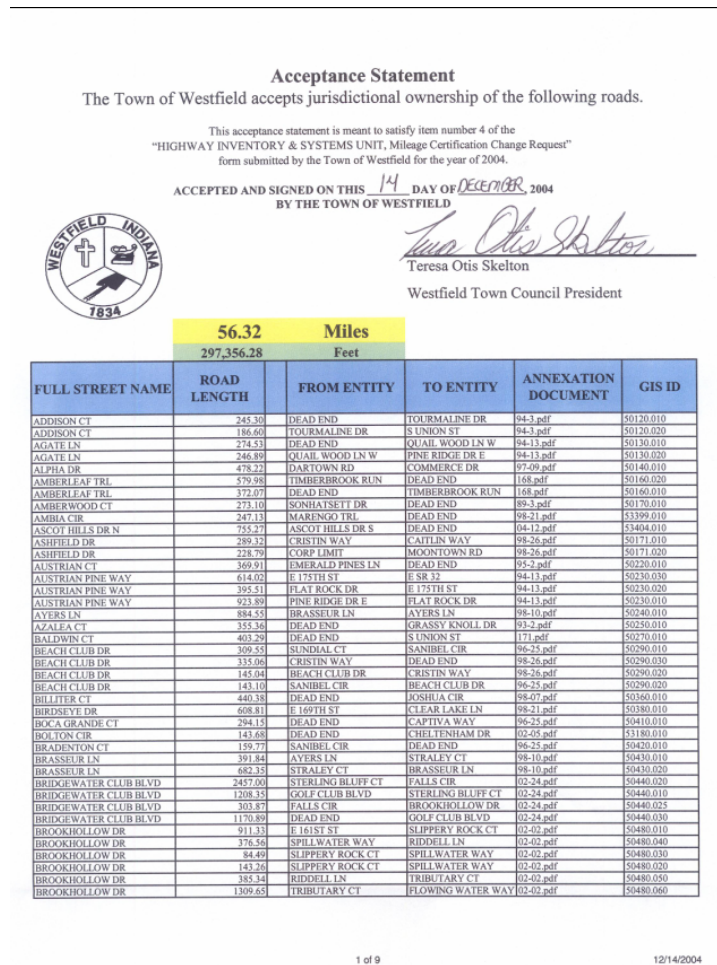


Figure 13. The Acceptance Statement Signed by the President of the Town of Westfield, Town Council.

INDOT Acknowledgement Letter

The final document required for the submittal is the acceptance statement. Once it is signed, the submittal is packaged and sent to INDOT. After they review the initial submittal, they generate an acknowledgement letter and send it to the appropriate entities. The following graphic is a depiction of the 2004 INDOT Acknowledgment Letter sent to the Town of Westfield.

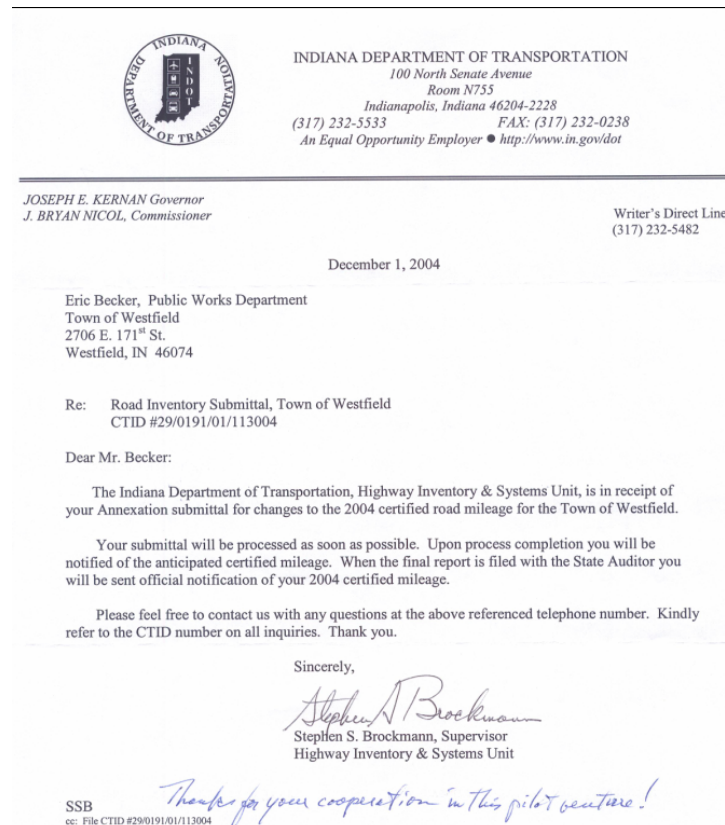


Figure 14. 2004 INDOT Acknowledgment Letter for the Town of Westfield's Mileage Certification Change Request

Certification Letter/Certification Summary Letter

Each year INDOT creates a Certification Letter which goes to the Indiana State Auditor's Office. This letter contains a database which lists all Certified Roads and Street Mileage by Indiana Counties and Incorporated Cities and Towns for the previous calendar year. INDOT runs a program against this database to generate individual Certification Summary Letters. For year 2004 there were 674 line items in this database from which to generate letters. These letters contain a Subject line, for example, "2004 Certification of Jurisdiction

Miles Town of Westfield.” The letter contains a Summary of Certification Table listing. The following is an example:

2004 Mileage Certification 86.10 miles
 2003 Mileage Certification 28.32 miles
 Difference (2004-2003) 57.78 miles

The following graphic is a depiction of the 2004 Certification Letter/Certification Summary Letter for the Town of Westfield’s Mileage Certification Change Request.

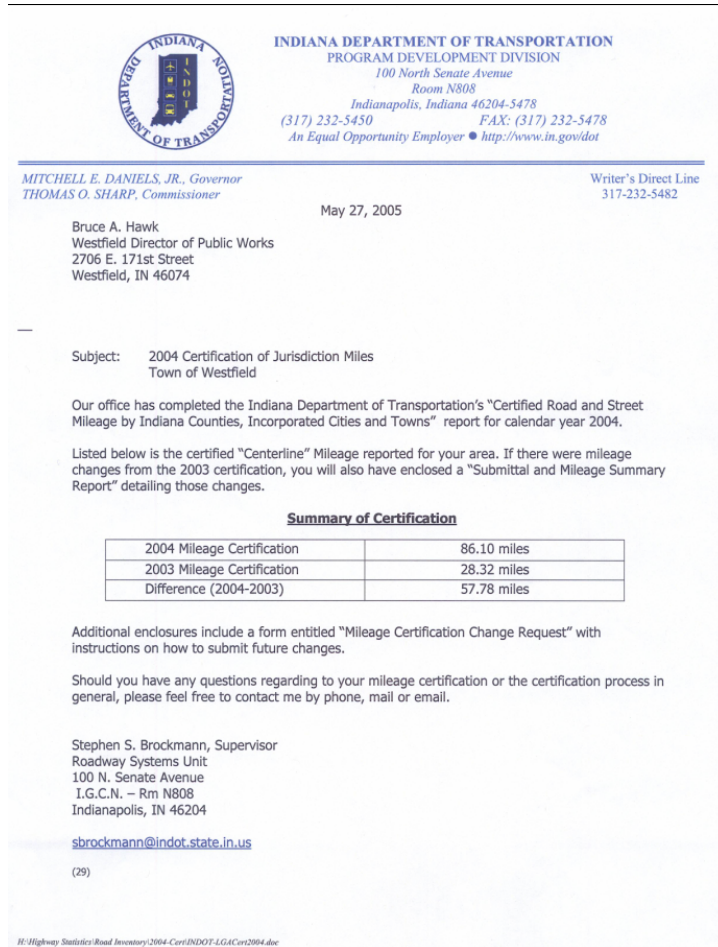


Figure 15. INDOT 2004 – Certification Summary Letter - Town of Westfield, IN

Submittal and Mileage Summary Report (Hand Add)

A “Submittal and Mileage Summary Report” is generated if there is data classified as a “Hand Add” item.

Hand Add items are recognized new roads with the mileage based on the submittal value yet to be field verified. INDOT uses this process to add submitted data to the inventory before it is officially added to the Certified Roads Systems Shapefiles and itemized in the Inventory database. The Inventory database printout has a paragraph at the end recognizing the Hand Adds. This paragraph recognition is repeated annually until it is field verified by INDOT. The entire new 2004 Town of Westfield submittal is classified as a Hand Add.

This spreadsheet lists every road segment submitted. The “From” and “To” Roads are listed from south to north and west to east. Additionally a “From” or “To” value may be a “Dead End” or “Corporate Limit”, accordingly. The submitted mileage is listed as well as the ongoing total by line item. A Notes column states the value of the year submitted and “CREDIT PENDING FIELD CHK”.

SUBMITTAL AND MILEAGE SUMMARY SHEET																			
COUNTY NAME		CITY/TOWN NAME			REASON FOR CHANGE										Certification Mileage	NOTES			
HAMILTON		WESTFIELD			REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS	REVISIONS			REVISIONS		
SUBMISSION DATE		CTIDB - (COUNTY/COMM/DEVY)			UNIQUE NUMBER										Beginning Route Mileage	Debit Mileage	Credit Mileage	Ending Route Mileage	
11/29/04		26019161/113004			JCO	CITY	RT	EL	RAM	FSC									
Subdivision	Street	From	To																
	ADISON CT	DEAD END	TOURMALINE DR										X	0.05		0.05		26.32	Beginning Certification
	ADISON CT	TOURMALINE DR	S UNION ST										X	0.54		0.54		26.37	2004 CREDIT PENDING FIELD CHK
	AGATE LN	DEAD END	QUAIL WOOD LN W										X	0.05		0.05		26.40	2004 CREDIT PENDING FIELD CHK
	AGATE LN	QUAIL WOOD LN W	PINE RIDGE DR E										X	0.05		0.05		26.45	2004 CREDIT PENDING FIELD CHK
	ALPHA DR	DARTOWN RD	COMMERCE DR										X	0.09		0.09		26.50	2004 CREDIT PENDING FIELD CHK
	AMBERLEAF TRL	TIMBERBROOK RUN	DEAD END										X	0.11		0.11		26.59	2004 CREDIT PENDING FIELD CHK
	AMBERLEAF TRL	DEAD END	TIMBERBROOK RUN										X	0.07		0.07		26.70	2004 CREDIT PENDING FIELD CHK
	AMBERLEAF TRL	COMBATSETT RD	DEAD END										X	0.64		0.64		26.77	2004 CREDIT PENDING FIELD CHK
	WINSLOW DR	TROY LN	NEWBERRY LN										X	0.10		0.10		26.83	2004 CREDIT PENDING FIELD CHK
	WOOD HOLLOW CT	DEAD END	TIMBERBROOK RUN										X	0.06		0.06		26.89	2004 CREDIT PENDING FIELD CHK
	WOODS TREAM CT	DEAD END	HARVEST MEADOWS DR W										X	0.03		0.03		26.93	2004 CREDIT PENDING FIELD CHK
	YEOMAN WAY	GREENSBORO DR	JAYSON CIR										X	0.05		0.05		26.98	2004 CREDIT PENDING FIELD CHK
	YEOMAN WAY	JAYSON CIR	KENNARD LN										X	0.11		0.11		26.10	2004 CREDIT PENDING FIELD CHK
																		26.10	ENDING CERTIFICATION
			TOTALS											0.00		57.78		57.78	TOTAL HAND-ADD

Figure 16. INDOT 2004 – Submittal and Mileage Summary Report - Town of Westfield, IN

Conclusion

The project for converting a paper submittal to a digital submittal has allowed the Town of Westfield to simplify its road certification process. It has also established a base from which future submissions can be modeled. This model will allow the Town of Westfield to keep up with the fast growth of the town, saving time for the entire submittal process. By working through this pilot process, INDOT can share this process with other entities to simplify their processes in the future.

Acknowledgments

I would like to acknowledge cooperation from Steve Brockman, Kirk Mangold, Dave Black and others within INDOT for their time and efforts in meeting with me and working through the details of this project. I would also like to acknowledge the WPWD director, Bruce Hauk, for giving me support and allowing me to take on this project at full capacity.

Bibliography

INDOT Program Development Division, February 26, 2003, Highway Inventory and Systems Unit Computer Printout Supplement, A User's Guide, Indianapolis, Indiana.