Metro Regional Centerlines Collaborative (MRCC)
Guidebook & Best Practices Document

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Prepared for the partner agencies of the

Metro Regional Centerline Collaborative (MRCC)

Anoka County
Carver County
Dakota County
Hennepin County
Ramsey County
Scott County
Washington County
Metropolitan Council
Metropolitan Emergency Service Board
MetroGIS

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"Living Document Status" This document is intended to provide a clear and concise summary information about the MRCC road centerline data project, the MRCC dataset, and to provide detailed explanations about the methods and techniques employed to create this data. This document is a 'living document' and is subject to update and revision as deemed needed by the MRCC project partners. If you would like to suggest comments or revisions, please contact document author and editor MetroGIS Coordinator Geoff Maas at 651.602.1638 or via email at *geoffrey.maas@metc.state.mn.us*.

Downloadable resource icon. The blue 'key' icon found throughout this document represents a downloadable resource or link to information helpful to your access, use and understanding of the MRCC dataset.

Helpful tip. The green 'checkmark' icon found throughout this document represents a factoid, a more detailed description or other information to provide context for understanding the MRCC.

Project Overview and Summary

What is the Metro Regional Centerlines Collaborative (MRCC)?

The MRCC is a joint collaborative project involving the technical and managerial GIS staff from the Seven Metropolitan Counties (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington), the Metropolitan Emergency Services Board, Metropolitan Council and MetroGIS *to develop a road centerline data model and dataset that meets core business needs of local governments and regional interests and that is updated and made available to all who need it on a regular interval.*

Purpose of the Metro Regional Centerlines Collaborative:

Prior to the MRCC effort there was no authoritatively-sourced, publicly-available road centerline data solution that meets the core business needs of local, regional and state agencies in Minnesota. The road data solution historically in use in the metropolitan region has been purchased from a private vendor (at an annual cost of $65,000) by the Metropolitan Council. Under the agreement with the vendor, the Metropolitan Council could share and/or license the data with qualifying local and state governments and academic interests free of charge. This vendor-provided road data solution did not fulfill the counties or emergency services sectors business needs or accuracy requirements, it was not being edited or maintained by the local road authorities and the data was not fully publicly available.

Goal of the Metro Regional Centerlines Collaborative (MRCC) effort.

The goal of the MRCC is to facilitate *the creation and sustained maintenance and availability of a publicly-available metro regional road centerline dataset that meets the core business and usage needs of local and regional partner agencies.*

Foundational principles guiding the MRCC effort:

- Local jurisdictions—these being primarily cities and counties—produce the most current, most accurate and authoritative road network data;

- Developing a road dataset that is standardized across many local jurisdictions saves time, effort and money for data consumer and serves to reduce duplicative effort by the local, regional and state users and the emergency services interests requiring the data;

- An authoritative, continually-updated and standardized road centerline data is a much-needed, core geospatial data infrastructure layer supporting effective emergency services deployment, vehicle routing, geocoding, mapping, planning, applications development, and many other uses.

Purpose of this document

This Guidance and Best Practices Document is intended to provide both data producers and data consumers clear definitions of the contents, the terms in use and the techniques employed to create the data. Additionally, the document is to serve as a more detailed reference than the metadata alone for the MRCC dataset.

Overview of Data Elements

This document contains the details of the seventh and most current revision (Version 1.7) of the MRCC road data standard. This data model and document were prepared by the Metro Regional Centerline Collaborative (MRCC) partners. Working together since May 2014, the Seven Metropolitan Counties, along with the Metropolitan Emergency Services Board, Metropolitan Council and MetroGIS have documented their core road centerline data business needs and prepared the MRCC data standard and its attributes to satisfy those needs. This data specification is composed of **nine (9) element categories**. The contents of which are described in detail on the pages that follow.

Some of these elements are listed as mandatory, some are conditional, some optional. Clarification of these terms 'mandatory', 'conditional' and 'optional' as they relate to this project are provided in the 'Definitions' portion of this document.

The MRCC road centerline data standard builds upon other successful specifications and standards. Element components analogous to the recommended standards found in the Federal Geographic Data Committee's (FGDC) "Thoroughfare, Landmark, and Postal Address Data Standard" are indicated by their line number in that standard (e.g. "FGDC Standard: 2.2.2.5"). Additionally, the address attributes found in the MRCC standard are aligned to work with the Minnesota Address Point Data Standard (adopted by the Minnesota Geospatial Advisory Council on December 6, 2017, revised to v. 1.1 on March 28, 2018) and the Minnesota Parcel Data Transfer Standard (adopted on March 28, 2018, v. 1.0).

The full **FDGC "Thoroughfare, Landmark, and Postal Address Data Standard"** can be found here: *https://www.fgdc.gov/standards/projects/address-data*

The most current version of the **MRCC Local Centerline Dataset** is available on the Minnesota Geospatial Commons:

https://gisdata.mn.gov/dataset/us-mn-state-metrogis-trans-mrcc-centerlines

Definitions and Terminology

The following are definitions to key terminology contained in this document and found in the metadata related to the MRCC dataset.

Authoritative data source: The agency that produces data representing the feature as designated by state statute, administrative rule, court order or court opinion. For the MRCC, data coming from township, city, county and state agencies are considered as authoritative data sources, as each of these agencies have statutory power as road authorities to construct and maintain roadways. (Article XIV, Constitution of the State of Minnesota and Minnesota Statute Chapter 160.02, Subdivision 25) – See also: **Trusted data source;**

Blank values: Indicates that there is a possible valid value for this attribute, but it has not been entered as it is not known, as is therefore not populated. A 'NULL' value, 'Placeholder' value or 'True zero' value is not identical to a 'Blank' value – See also: **NULL value, Placeholder value** and **True Zero value;**

Centerline: A digital geometric representation of a roadway. In the MRCC, 'centerline' is generally understood to be the center of the pavement, however, some segments may be modified to facilitate the routing aspects of the digital model and will deviate slightly from the actual paved centerline. Please see the **MRCC Data Accuracy Statement** on Page 8.

Coincident: Two road segments, boundaries or other linear features which occur *in the same alignment as one another* (e.g. a road segment which also forms a county boundary and has a different name in the two counties it adjoins) – See also: **Coterminous;**

Conditional Element: The attribute is to be populated if it is relevant and/or available. For a conditional element, null values are valid. The presence of the attribute is essential to some functionality of the data model, but the dataset can still be utilized if conditional elements are not fully populated.

Coterminous: Have the same or shared boundary – See also: **Coincident;**

geoMSAG: A Master Street Address Guide that is derived from geospatial data;
– See also: **MSAG** and **MSAG Community;**

ESN — Emergency Service Number: The ESN is a code assigned to each line of the MSAG. It tells the dispatcher which fire protection, law enforcement and emergency medical service to send to any given address in the county. ESN boundaries are determined by overlaying Fire Service Boundaries, Ambulance Service boundaries and Law Enforcement boundaries (generally corresponding to municipal or corporate limits) on the same map. Formerly known as

Emergency Service Zone (ESZ), Emergency Service Number (ESN) is the preferred nomenclature in use for the MRCC.
Mandatory Element: The attribute must be populated in all instances; null values are not valid. The presence of a mandatory attribute is essential and for the functionality and completeness of the dataset.

MSAG: Master Street Address Guide – An MSAG is a compressed listing of every street name, house number range, community, and Emergency Service Number (ESN) in an E9-1-1 system. The MSAG defines all possible valid address locations within the 9-1-1 service area. Data required for creating an MSAG include street name, community name, house number ranges from each street, a 'side of street' designation (Odd, Even or Both) for house numbers and Emergency Service Number (ESN); – See also: **geoMSAG** and **MSAG Community;**

MSAG Community: The official NENA-accepted definition of "Community" for MSAG and E9-1-1 purposes is a postal-valid zip code delivery area. The MSAG Community of a given resident is determined to be equivalent to the post office where that resident receives mail through a rural route or would receive mail from rural delivery; – See also: **geoMSAG** and **MSAG;**

'NULL' values: A 'null' value indicates that there is no valid data value that can be entered for the attribute – See also: **Blank value, Placeholder value** and **True Zero value;**

Placeholder value: This is a text or numerical value intended to serve as a flag or indicator to the data user. Examples in MRCC dataset would be 'OOJ' (which stands for Out of Jurisdiction) or '-999' for an unknown integer value. In these examples, OOJ would be a *meaningful placeholder* as the value OOJ tells you this attribute is out of the source providers jurisdiction, in contrast, -999 is a *meaningless placeholder* as its indicates the value does not reference a legitimate use or meaning – See also **Blank value, NULL value** and **True Zero value;**

PSAP: Public Safety Answering Point is a call center service a specific geographic area responsible for answering calls to an emergency telephone number for police, fire, and medical response services and for dispatching these services to the point of call.

Optional Element: The attribute may be populated at the discretion of the data provider or authoritative source. Presence of the attribute is not essential, but its inclusion adds value and expands the functionality of the dataset.

Right of way: The strip of land established for the roadbed or roadway and traffic carried on it. Rights of way are described in legal documents that are formally recorded within a County Recorder's office. The linear geometry found in the MRCC dataset is *not* intended to represent the right of way of the roadway; – See also: **Centerline;**

Road centerline: Specific to the MRCC effort, this is defined a road centerline segment in the dataset that is a digital representation of the center of a road segment (e.g. center of pavement).

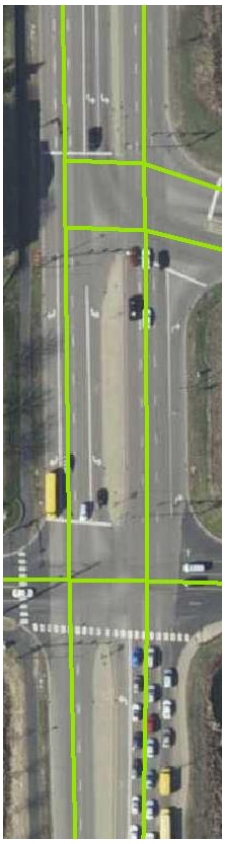
The digital data in the MRCC dataset *does not* attempt to represent a legal right of way, parcel boundary, municipal or county boundary or other legally defined or ascribed landscape fixture.

True Zero value: This indicates that the integer zero '0' is a valid entry for the attribute and is not being used as a placeholder or as a proxy for a 'Blank' value – See also: **'NULL' value, 'Blank; value** and **Placeholder value;**

Trusted data source: An agency that produces data through tradition or recognized common practice, however, they may not be the authoritative source. Related to the MRCC, city and county data producers are understood to have more accurate and more current digital representation of state and federal roadways within their jurisdiction – See also: **Authoritative data source;**

MRCC Data Accuracy Statement

Road centerline segments—as described, created, used and published in the MRCC dataset—are intended primarily to ***align with the center of existing paved surface of the roadway;*** centerlines in the MRCC dataset are not intended to represent the center of right of way or other possible legal descriptions of the roadway.



Spatial accuracy of MRCC dataset reflects the current industry standard for heads-up digitized data. The digitized centerline is intended to fall within and represent the paved or clearly discernable roadway surface of a georeferenced aerial image and not its legally platted right of way. The attributes within the MRCC roadway dataset that are related to 911, PSAP, MSAG Community, and ESN are intended to reflect the correct value associated with addresses and their locations for a given side of the street, however, the actual physical location (and resulting digital representation) of the street may not directly align to a municipal boundary. For example, if an entire road segment is located entirely in Minneapolis, but addresses on one side of that street are in Richfield, the Emergency Service Number (ESN) Left and Right values ideally should reflect ESN for Minneapolis on one side and Richfield on the other. However, as many of these attributes populating the MRCC data will in most instances will be acquired from polygons that are not topologically aligned this may not always be the case.

MRCC Category Elements

The MRCC Local Centerline Standard is comprised of nine categories, called ***elements.*** Each represents a sub-set of the data specification needed for the final dataset to serve its function and meet the business needs of its stakeholder user group.

Element 1— Identification Elements

Required for maintaining a unique identifier for each feature in the model;

Element 2 – Linear Reference Elements

These attributes are intended to support linear referencing system (LRS) usage;

Element 3 — Geocoding Elements

These are needed to support core geocoding functions;

Element 4 — Geocoding Side Element

These are needed to support and enhance geocoding functions. Inclusion of side elements enhances the effectiveness of the model and meet many needs for emergency responses uses;

Element 5 — Routing Elements

These are needed to support routing functionality of the data;

Element 6 — Cartography Elements

These are needed to facilitate symbolization and labeling of highways and streets on cartographic products and applications where feature labels are needed;

Element 7 — Enhanced 9-1-1/Next Generation 9-1-1 Elements

These are needed to support the PSAPs transition from E911 to NG911, and contains core NENA attributes for Next Generation 911 call routing and location validation compliance;

Element 8 – Maintenance Elements

These are needed for reliable documentation of data edit; modification tracking and data sources;

Element 9 – Business Elements

These are included are for satisfying other business needs of the MRCC participants and that may be useful to other users of the data;

A version of the **MRCC Standard (Version 1.7)** in an Excel spreadsheet containing all the data elements, their contents, and the full listing of domain values is available here: *http://www.metrogis.org/projects/centerlines-initiative.aspx*

Element 1
Identification Elements

Element 1.1 - Object ID

Database Name	OBJECT_ID		
Data Type	Object ID	Inclusion	Mandatory
Width	<NA/default>	Domain	
Examples	867, 5309		
Description	*This an esri-specific numeric identifier for the road centerline. This field is created and populated automatically upon insertion of data into ArcGIS.*		

Attribute is populated by default;

Element 1.2 - Route ID

Database Name	ROUTE_ID		
Data Type	String	Inclusion	Conditional
Width	16	Domain	
Examples	0100023953450694; 0200023953727125		
Description	A unique identifier for the road centerline based on MnDOT's route naming system. The identifier has the format of SSGGGGGGGGGGNNNN where: SS = Route jurisdiction (e.g. '01' = Interstate, '02' = U.S. Highway, '07' = County Road); GGGGGGGGGG = GNIS ID for route jurisdiction - left padded with zeros (e.g. 0002395345); NNNN = designated route number (e.g. 0694);		

Null and blank values **are permitted** for Element 1.2

Element 1.2 – Route ID. At present, this attribute is not populated in the MRCC v. 1.7 dataset. At some point in the future it is anticipated to conflate this information from MnDOT sources.

MnDOT Roadway Data
https://www.dot.state.mn.us/roadway/data/data-products.html#FHWA

Element 1.3 - Feature Unique ID

Database Name	UNIQUE_ID		
Data Type	String	Inclusion	Mandatory
Width	36	Domain	
Example	BE529DB3-D879-476F-B3CA-FF4E9B32A36B		
Description	A Globally Unique Identifier (GUID) for the road centerline; a GUID is a 36-character unique identifier generated using a standardized process to ensure a minimum probability of duplication.		

Null and blank values **are not permitted** for Element 1.3

Element 2
Linear Reference System Elements

Please note: As of the publication date on the cover of this document, the Linear Reference System (LRS) Elements are not populated within the MRCC dataset. Population of these elements will require a significant effort of conflating these attributes from MnDOT data into the MRCC data and is a longer-term goal of the project. Once completed, the MRCC dataset will be able to leverage a variety of data collected by MnDOT and stored in their LRS.

What is linear referencing? Linear referencing is the method of storing geographic locations by using relative positions along a measured linear feature. Distance measures are used to locate events along the line.

Please visit this link for a more complete explanation of linear referencing systems: *http://desktop.arcgis.com/en/arcmap/10.3/guide-books/linear-referencing/what-is-linear-referencing.htm*

Element 2.1 – Route System

Database Name	ROUTE_SYS		
Data Type	String	**Inclusion**	Mandatory
Width	2	**Domain**	St MnDOT Route System
Example	01, 02, 03		
Description	Route System is based on MnDOT's system. A two-digit system is used to describe the segment. 01 = Interstate, 02 = US Highway, 03 = MN Highway, and so on.		

Null and blank values **are not permitted** for Element 2.1

Element 2.2 – Route Direction

Database Name	ROUTE_DIR		
Data Type	String	**Inclusion**	(Not populated/Will conflate from MnDOT sources)
Width	1	**Domain**	St Route Direction
Example	I, D		
Description	Determines if a route goes in the direction of *increasing* or *decreasing* miles.		

Null and blank values **are permitted** for Element 2.2

Element 2.3 – Directional Route ID

Database Name	DIR_RTE_ID		
Data Type	String	Inclusion	Mandatory
Width	32	Domain	<NA>
Examples	1000023953450694WI; 1000023953727125-D		
Description	This is a concatenation of Element 1.2: ROUTE_ID and Element 2.2: ROUTE_DIR The identifier has the format of SSGGGGGGGGGNNNNAD where: SS = Route jurisdiction (e.g. '01' = Interstate, '02' = U.S. Highway, '07' = County Road); GGGGGGGGGG: GNIS ID for route jurisdiction - left padded with zeros (e.g. 0002395345); NNNN: designated route number (e.g. 0694); A: character for directional routes (e.g. W for I35W, use a hyphen "-"for no value); D: route direction of travel vs. mileage (e.g. D = decreasing, I = increasing).		

Null and blank values ***(unknown, it this truly Mandatory in the MRCC?)***

Element 2.4 – Local to State

Database Name	LOC_STATE		
Data Type	String	Inclusion	Mandatory
Width	10	Domain	<NA>
Examples	Same, Reverse		
Description	Indicator of relative direction of route and street, weather the local route runs the same as, or reverse of the state route;		

Null and blank values ***(unknown, it this truly Mandatory in the MRCC?)***

Element 2.5 – Primary Status

Database Name	PRIME_STAT		
Data Type	String	Inclusion	Mandatory
Width	10	Domain	St Primary Status
Example	Primary, Secondary		
Description	MnDOT's Primary or Secondary classification.		

Null and blank values ***(unknown, it this truly Mandatory in the MRCC?)***

Element 3
Geocoding Elements

Element 3.1 - Street Pre Modifier

Database Name	ST_PRE_MOD		
Data Type	String	**Inclusion**	Conditional - If Applicable
Width	15	**Domain**	<NA>
Examples	Old North First Street, Alternate North Avenue B		
Description	FGDC Element 2.2.2.1: A word or phrase that: 1. precedes and modifies the Street Name, but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both, or 2. Is placed outside the Street Name so that the Street Name can be used in creating a sorted list of street names. This attribute corresponds with Element 2.4 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.1

Element 3.2 - Street Pre Directional

Database Name	ST_PRE_DIR		
Data Type	String	**Inclusion**	Conditional - If Applicable
Width	9	**Domain**	Address Direction
Examples	North Main Street		
Description	FGDC Element 2.2.2.2: A word preceding the Street Name that indicates the direction or position of the thoroughfare relative to an arbitrary starting point or line, or the sector where it is located. Note: Do not use words that are part of the street name as a directional. For example, in North Shore Drive, "North" would be part of the street name if it is a drive named for the North Shore as opposed to the northern section of Shore Drive. This attribute corresponds with Element 2.5 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.2

Element 3.3 - Street Pre Type

Database Name	ST_PRE_TYP		
Data Type	String	**Inclusion**	Conditional - If Applicable
Width	35	**Domain**	**see note below*
Examples	County Road 14, Interstate 94, Avenue of the Stars		
Description	FGDC Element 2.2.2.3: A word or phrase that precedes the Street Name and identifies a type of thoroughfare in a complete street name. NOTE: Like the FGDC standard, this standard does not allow abbreviations for this element; This attribute corresponds with Element 2.6 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.3

Element 3.3 – Street Pre Type: The MRCC Build and Core Teams agreed not to have a fixed domain for this attribute. A list of recommended values was identified (Avenue, County Highway, County Road, County State Aid Highway, Highway, Interstate, State Highway, United States Forest Road and United States Highway) but these are not the only possible values. More 'Pre Type' values can be added as situations require. Of note, all values are to be spelled out fully (with no abbreviations).

Element 3.4 - Street Pre Separator

Database Name	ST_PRE_SEP		
Data Type	String	Inclusion	Conditional - If Applicable
Width	20	Domain	
Examples	Avenue of the Stars		
Description	If a Complete Street Name includes a prepositional phrase between a Street Name Pre Type and a Street Name, the prepositional phrase is treated as a separator. Note: This standard uses a separator element consistent with the NENA address standard. (This is only partly consistent with the FGDC separator element which attempts to include three different types of separators in one element.) This attribute corresponds with Element 2.7 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.4

Element 3.5 - Street Name

Database Name	ST_NAME		
Data Type	String	Inclusion	Mandatory
Width	60	Domain	
Examples	Central Street Southwest, County Road 7		
Description	FGDC Element 2.2.2.5: The portion of the complete street name that identifies the particular thoroughfare. For numbered streets (e.g. Third Street, 3rd Street), use the format and spelling as defined by each official local address authority. For street name formats like 2nd, 3rd and 4th, use lower case letters. Note: Like the FGDC standard, this standard requires mixed case for this element. This attribute corresponds with Element 2.8 of the Minnesota Address Point Data Standard		

Null and blank values **are not permitted** for Element 3.5

Element 3.6 - Street Post Type

Database Name	ST_POS_TYP		
Data Type	String	Inclusion	Conditional - If Applicable
Width	15	Domain	Address PostType
Examples	1234 Central Street Southwest		
Description	FGDC Element 2.2.2.6: A word or phrase that follows the street name and identifies a type of thoroughfare. NOTE: Like the FGDC standard, this standard does not allow abbreviations for this element. This attribute corresponds with Element 2.9 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.6

Element 3.7 - Street Post Directional

Database Name	ST_POS_DIR		
Data Type	Text	Inclusion	Conditional - If Applicable
Width	9	Domain	Address Direction
Examples	1234 Cherry Street North		
Description	FGDC Element 2.2.2.7: A word following the Street Name that indicates the direction or position of the thoroughfare relative to an arbitrary starting point or line, or the sector where it is located. NOTE: Like the FGDC standard, this standard does not allow abbreviations for this element. This attribute corresponds with Element 2.10 of the Minnesota Address Point Data Standard		

Null and blank values **are permitted** for Element 3.7

Element 3.8 - Street Post Modifier

Database Name	ST_POS_MOD		
Data Type	Text	Inclusion	Conditional - If Applicable
Width	15	Domain	
Examples	1230 Central Avenue Extended		
Description	FGDC Element 2.2.2.8: A word or phrase that follows and modifies the Street Name, but is separated from it by a Street Name Post Type or a Street Name Post Directional or both. This attribute corresponds with Element 2.11 of the Minnesota Address Point Data Standard;		

Null and blank values **are permitted** for Element 3.8

Element 3.9 - Street Name Full

Database Name	ST_CONCAT		
Data Type	String	Inclusion	Mandatory
Width	150	Domain	
Examples	1230 Central Avenue Extended		
Description	Official complete name of the road as assigned by the official address authority. It is equivalent to the concatenation of all other street name fields (Elements 3.1 to 3.8) delimited with single spaces;		

Null and blank values **are permitted** for Element 3.9

Element 3.10 - Alternate Street Name1

Database Name	ST_NAME_A1		
Data Type	String	Inclusion	Conditional – If Applicable
Width	150	Domain	
Examples	United States Highway 13 is primary alternate name for 200th Street West		
Description	The primary alternate or alias name for the road centerline;		

Null and blank values **are permitted** for Element 3.10

In the MRCC standard, an ***alternate street name*** entry contains all address, street, and various subtype elements in a single attribute. The photo at right shows a typical signage treatment for a 'vanity name' or alternate street name. The primary street name is NE 18th Av (the cross street is NE Ulysses St) and the alternated name for NE 18th Av is 'Dziedzic Av' Alternate street names generally carry a different color scheme than the primary street signage (in this example, white with brown lettering). Other examples could be a city street and a county or state highway running concurrently. One example would be Central Avenue in Minneapolis. Central Avenue would serve as the primary name while State Highway 65—with which it runs concurrently—could potentially be used as an Alternate Street Name.

Element 3.11 - Alt1 Legitimate MSAG Value

Database Name	A1_MSAG_V		
Data Type	String	Inclusion	Conditional
Width	1	Domain	Alt Valid MSAG
Examples	**L** (Left), **B** (Both), **R** (Right), **N** (Neither)		
Description	The side(s) of the road centerline on which the Alternate Street Name 1 is a valid entry in the Master Street Address Guide (MSAG).		

Null and blank values **are permitted** for Element 3.11

What qualifies as a valid entry for an MSAG? Local PSAPs manage the MSAG for their PSAP service area and make the decision based on the official street name (or names) that can be legitimately used for addressing on that road.

3.12 Alternate Street Name2

Database Name	ST_NAME_A2		
Data Type	String	Inclusion	Conditional
Width	150	Domain	
Examples	United States Highway 13 is secondary alternate name for 66th Street West		
Description	The secondary alternate or alias name for the road centerline.		

Null and blank values **are permitted** for Element 3.12

3.13 Alt2 Legitimate MSAG Value

Database Name	A2_MSAG_V		
Data Type	String	**Inclusion**	Conditional
Width	1	**Domain**	Alt Valid MSAG
Examples	**L** (Left), **B** (Both), **R** (Right), **N** (Neither)		
Description	The side(s) of the road centerline on which the Alternate Street Name 2 is a valid entry in the Master Street Address Guide (MSAG).		

Null and blank values **are permitted** for Element 3.13

3.14 Alternate Street Name3

Database Name	ST_NAME_A3		
Data Type	String	**Inclusion**	Conditional
Width	150	**Domain**	
Examples	United States Highway 13 is a tertiary alternate name for Vermillion River Trail		
Description	The tertiary alternate or alias name for the road centerline.		

Null and blank values **are permitted** for Element 3.14

3.15 Alt3 Legitimate MSAG Value

Database Name	A3_MSAG_V		
Data Type	String	**Inclusion**	Conditional
Width	1	**Domain**	Alt Valid MSAG
Examples	**L** (Left), **B** (Both), **R** (Right), **N** (Neither)		
Description	The side(s) of the road centerline on which the Alternate Street Name 3 is a valid entry in the Master Street Address Guide (MSAG).		

Null and blank values **are permitted** for Element 3.15

Element 4
Geocoding Side Elements

Element 4.1 - Left From Address

Database Name	ADR_FR_L		
Data Type	Long Integer	Inclusion	Mandatory
Width	10	Domain	
Examples	100 - 178, 300 - 399		
Description	The first actual address number in the range of address numbers on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 41

Element 4.2 - Left To Address

Database Name	ADR_TO_L		
Data Type	Long Integer	Inclusion	Mandatory
Width	10	Domain	
Examples	100 - 178, 300 - 399		
Description	The last actual address number in the range of address numbers on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.2

Element 4.3 - Right From Address

Database Name	ADR_FR_R		
Data Type	Long Integer	Inclusion	Mandatory
Width	10	Domain	
Examples	101 - 179, 38 - 56		
Description	The first actual address number in the range of address numbers on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.3

Element 4.4 - Right To Address

Database Name	ADR_TO_R		
Data Type	Long Integer	Inclusion	Mandatory
Width	10	Domain	
Examples	101 - 179, 38 - 56		
Description	The last actual address number in the range of address numbers on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.4

Element 4.5 - Left ZIP Code

Database Name	ZIP_L		
Data Type	String	Inclusion	Mandatory
Width	5	Domain	
Examples	56301, 55068		
Description	A system of 5-digit codes that are used to identify the individual Post Office or metropolitan area delivery station associated with addresses on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.5

Element 4.6 - Right ZIP Code

Database Name	ZIP_R		
Data Type	String	**Inclusion**	Mandatory
Width	**5**	**Domain**	
Examples	**55409**, **55321**		
Description	A system of 5-digit codes that are used to identify the individual Post Office or metropolitan area delivery station associated with addresses on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.6

Element 4.7 - Left CTU ID

Database Name	CTU_ID_L		
Data Type	String	**Inclusion**	Mandatory
Width	**8**	**Domain**	CTU GNIS Codes
Examples	**02393894** (Aitkin), **00663402** (Albert Lea Township)		
Description	The official Federal Geographic Names Information Systems unique identifier code for the city, township or unorganized territory (CTU) of addresses on the left side of the road centerline. **Note**: This field follows the GNIS Feature ID Text Format of the state CTU Identifier Codes Standard.		

Null and blank values are **not permitted** for Element 4.7

Element 4.8 - Right CTU ID

Database Name	CTU_ID_R		
Data Type	String	**Inclusion**	Mandatory
Width	**8**	**Domain**	CTU GNIS Codes
Examples	**00666077** (Zumbrota Township), **02397370** (Woodland)		
Description	The official Federal Geographic Names Information Systems unique identifier code for the city, township or unorganized territory (CTU) of addresses on the right side of the road centerline. **Note**: This field follows the GNIS Feature ID Text Format of the state *CTU Identifier Codes Standard*.		

Null and blank values are **not permitted** for Element 4.8

Element 4.9 - Left CTU Name

Database Name	CTU_NAME_L		
Data Type	String	Inclusion	Mandatory
Width	50	Domain	Legal CTU Name
Examples	Saint Cloud, Akron Township		
Description	The name of the city, township, or unorganized territory (CTU) for addresses on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.9

Element 4.10 - Right CTU Name

Database Name	CTU_NAME_R		
Data Type	String	Inclusion	Mandatory
Width	50	Domain	Legal CTU Name
Examples	Lake City, Lynn Township		
Description	The name of the city, township, or unorganized territory (CTU) for addresses on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.10

Element 4.11 - Left County Code

Database Name	CO_CODE_L		
Data Type	String	Inclusion	Mandatory
Width	5	Domain	County FIPS
Examples	27053 (Hennepin), 27059 (Isanti)		
Description	The combination of the two-digit state and the three-digit county Federal Information Processing System (FIPS) codes for addresses on the left side of the road centerline. **Note**: Both state and county codes are national and state approved standards: *Minnesota county code standard; Minnesota state code standard.*		

Null and blank values are **not permitted** for Element 4.11

Element 4.12 - Right County Code

Database Name	CO_CODE_R		
Data Type	String	Inclusion	Mandatory
Width	5	Domain	County FIPS
Examples	27053 (Hennepin), 27059 (Isanti)		
Description	The combination of the two-digit state and the three-digit county Federal Information Processing System (FIPS) codes for addresses on the right side of the road centerline. **Note**: Both state and county codes are national and state approved standards: *Minnesota county code standard; Minnesota state code standard.*		

Null and blank values are **not permitted** for Element 4.12

Element 4.13 - Left County Name

Database Name	CO_NAME_L		
Data Type	String	Inclusion	Mandatory
Width	40	Domain	County Name
Examples	Ramsey, Washington		
Description	The name of the county for addresses on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.13

Element 4.14 - Right County Name

Database Name	CO_NAME_R		
Data Type	String	Inclusion	Mandatory
Width	40	Domain	County Name
Examples	Dakota, Scott		
Description	The name of the county for addresses on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.14

Element 4.15 - Left State Code

Database Name	STATE_L		
Data Type	String	Inclusion	Mandatory
Width	2	Domain	State Abbr
Examples	**MN** (Minnesota), **OOJ** (Out of Jurisdiction)		
Description	The abbreviation of the state for addresses on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.15

Element 4.16 - Right State Code

Database Name	STATE_R		
Data Type	String	Inclusion	Mandatory
Width	2	Domain	State Abbr
Examples	**MN** (Minnesota), **OOJ** (Out of Jurisdiction)		
Description	The abbreviation of the state for addresses on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.16

Element 4.17 - Left Parity

Database Name	PARITY_L		
Data Type	String	Inclusion	Mandatory
Width	1	Domain	St Parity
Examples	**O** (Odd), **Z** (Zero Address)		
Description	The even or odd property for address numbers on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 4.17

Element 4.18 - Right Parity

Database Name	PARITY_R		
Data Type	String	Inclusion	Mandatory
Width	1	Domain	St Parity
Examples	**O** (Odd), **E** (Even), **B** (Both)		
Description	The even or odd property for address numbers on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 4.18

What is Parity? Parity is a term borrowed from mathematics referring to a value if it is either even or odd. In reference to the MRCC, one side of a street may have odd values, even values, contain both odd and even values or have no values.

Element 4.19 - Postal Community Left

Database Name	POSTCOMM_L		
Data Type	String	**Inclusion**	Mandatory
Width	**40**	**Domain**	Post Comm
Examples	**Stillwater**, **Golden Valley**		
Description	A city name recognized by the USPS as valid for the ZIP Code of the addresses on the left side of the road centerline. **Note**: The USPS recognizes one or more city names as being valid for each ZIP Code. It also designates one of the city names as the default for the ZIP Code and asks for it to be used "whenever possible". In many places, this will be different than the name of the city or township in which the address is physically located.		

Null and blank values are **not permitted** for Element 4.19

Element 4.20 - Postal Community Right

Database Name	POSTCOMM_R		
Data Type	String	**Inclusion**	Mandatory
Width	**40**	**Domain**	Post Comm
Examples	**St. Paul**, **Minneapolis**		
Description	A city name recognized by the USPS as valid for the ZIP Code of the addresses on the right side of the road centerline. **Note**: The USPS recognizes one or more city names as being valid for each ZIP Code. It also designates one of the city names as the default for the ZIP Code and asks for it to be used "whenever possible". In many places, this will be different than the name of the city or township in which the address is physically located.		

Null and blank values are **not permitted** for Element 4.20

Supplemental information on
Geocoding Side Elements

Actual (Assigned) Vs. Theoretical Addresses

After carrying both actual (assigned) and theoretical address ranges in early draft versions of the standard, the MRCC opted to drop theoretical ranges and carry only the **actual (assigned)** address ranges.

Under state statute (§412.221, Sub. 18) only cities are vested with the ability to assign legal addresses, so any address range within a city (incorporated municipality) will reflect the ranges they have legally assigned to their street or road segment.

In townships and un-organized areas, there remains an obvious need for address ranges. County governments generally hold sway in these areas and often assign addresses out of necessity. When a city annexes an area of an adjoining township, they may renumber that segment of road which now fall into the city to match their existing road system. This happens with some frequency in the metro counties.

Theoretical ranges differ from actual ranges in that they are mathematically interpolated based on their location along a given street segment line (e.g. a point in the exact middle of a segment with a theoretical range of 0 to 100 would have a value of '50').

What is the difference between CTU and a Postal Community?

CTU_L or **CTU_R** is the name of the city, township or unorganized territory which is on the left or right side of a given street segment. **Postal Community (POSTCOMM_L or POSTCOMM_R)** is the name of the city of the mailing address as defined by the U.S. Postal Service. These two fields may be different since the USPS allows the use of more than one city name for some ZIP codes.

Element 5
Routing

Element 5.1 - Elevation From

Database Name	ELEV_FROM		
Data Type	Short Integer	**Inclusion**	Mandatory
Width	**4**	**Domain**	St Elevation
Examples	**-2** (starting node is 2 levels *below* grade), **0** (starting node is at grade)		
Description	The vertical position, relative to grade (ground level), of the starting (FROM) node of the road centerline. It is used to identify which other road centerlines in an underpass/overpass situation connect to the given node for routing purposes.		

Null and blank values are **not permitted** for Element 5.1

Element 5.2 - Elevation To

Database Name	ELEV_TO		
Data Type	Short Integer	**Inclusion**	Mandatory
Width	**4**	**Domain**	St Elevation
Examples	**1** (ending node is 1 level above grade), **5** (ending node is 5 levels above grade)		
Description	The vertical position, relative to grade (ground level), of the ending (TO) node of the road centerline. It is used to identify which other road centerlines in an underpass/overpass situation connect to the given node for routing purposes.		

Null and blank values are **not permitted** for Element 5.2

Element 5.3 - One Way

Database Name	ONEWAY		
Data Type	String	**Inclusion**	Mandatory
Width	**1**	**Domain**	St One Way
Examples	**T** (To Point Against Arc), **F** (From Point With Arc), **B** (Both), **N** (Non-routable)		
Description	The direction of traffic movement in relation to the FROM and TO nodes (i.e. direction of digitization) of the road centerline.		

Null and blank values are **not permitted** for Element 5.3

5.4 Impedance Speed

Database Name	SPEED_IMP		
Data Type	Short Integer	Inclusion	Conditional
Width	4	Domain	
Examples	65, 80		
Description	The maximum possible safe speed in miles per hour (MPH) at which the road centerline could carry an emergency service vehicle or the impedance value used for controlling Computer Aided Dispatch.		

Null and blank values **are permitted** for Element 5.4

What impedance speed? Impedance speed is defined as an alternate measure to speed limit which used for controlling recommendations for suitable routing in Computer Aided Dispatch (CAD) systems. Factors that could *impede* vehicle travel (closure, number of lanes, traffic, slope, engineering considerations, posted speed, etc.) are used to determine an impedance value.

5.5 Emergency Access

Database Name	EMERG_ACC		
Data Type	String	Inclusion	Conditional
Width	10	Domain	Yes No Unknown
Examples	Yes, Unknown, No, NA		
Description	Any street that would be used in a routing model for emergency vehicles, but would not be in a routing model for public or commercial use.		

Null and blank values **are permitted** for Element 5.5

5.6 Speed Limit

Database Name	SPEEDLIMIT		
Data Type	Short Integer	Inclusion	Conditional
Width	3	Domain	
Examples	35, 65		
Description	Posted traffic speed limit in miles per hour (MPH) for the road centerline.		

Null and blank values **are permitted** for Element 5.6

How is speed limit defined for the MRCC? Speed limit is generally defined as the maximum speed at which a vehicle may legally travel on a particular road segment. These speed limits are generally posted in black and white signage along the route. An important consideration is that speed limits can change and differ at the *sub-segment level* and *temporally.* For example, a single segment of road may have a portion that is posted as a higher or lower speed limit than the rest of the segment, or, differ during certain times of day (e.g. when school is in session). In the MRCC, the speed limit in the attribute is the posted speed for the majority of the segment the majority of the time. Data for speed limit in the MRCC dataset has no legal standing is to be used only for reference and modeling purposes.

Supplement to Routing Elements

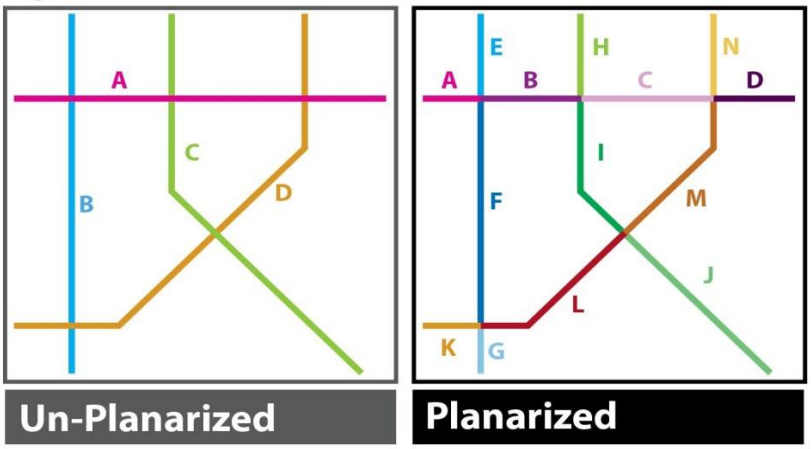
Planarization and Routing Guide

The purpose of this supplemental guide is to provide a simple reference for agencies who are preparing their road centerline data for routing. The guide illustrates and describes common concepts related to preparing data for routing and provides a number of examples of planarization and attribution reflecting 'best practices' in producing a routable centerline dataset.

What is planarization?

Planarization is simply the process of splitting linear features at the places where they intersect other linear features. Each resulting linear segment gets its own unique ID and set of attributes; Figure 1 at right shows a very simplified example of un-planarized and the same geometry after it has been planarized.

Figure 1



There are tools in GIS software that can automate the geometry splitting process of planarization. In addition to simply splitting the line geometry, specific attributes are added to indicate how these segments connect (or do not connect) with one another. In the MRCC standard, these attributes are Elements 5.1 ('ELEV_FROM' [Elevation From]) and 5.2 ('ELEV_TO' [Elevation To]). Specific examples of how these are attributed are found later in this document.

Why are we planarizing our data for the centerline dataset?

One of the core goals for the MRCC dataset is to support routing functionality. Planarization of the data and populating the attributes identified in Elements 5.1 through 5.5 will meet that goal. Planarization of the geometry and populating of the supporting routing attributes is essential for being able to use the road centerline data effectively in the computer aided dispatch software in use by many of the participant counties and adds functionality for other emergency services and routing uses. The following pages contain maps, illustrations and accompanying narrative describing basic geometry and attribution treatments for preparing the data.

Basic Example: Grade-Separated Interchange

In Figure 2 a common example of a grade-separated interchange is shown. This example shows the intersection of Interstate 35W and County Road D in northwestern Ramsey County where County Road D travels above Interstate 35W. The line geometry representing these roads in the geospatial data—while unable to show the lines in three dimensions—can be attributed to demonstrate that the county road is not directly routable to the interstate (except via the on and off ramps nearby).

The 'ELEV_FROM' attribute contains the elevation value from which the segment starts (for example: a value of '0' is at grade) and the 'ELEV_TO' attribute contains the elevation value of where the segment ends (a value of '1' is above grade, '-1' is below grade, etc.). These attributes follow the direction in which the segment was digitized.

Attributes in the **ELEV_FROM** and **ELEV_TO** columns as applied to the grade-separated interchange example in Figure 2 would be as follows:

	ELEV_FROM	ELEV_TO	Notes
Cyan segment	0	1	County Road D rises from grade above Interstate 35W
Magenta segment	1	1	County Road D above Interstate 35W
Green segment	1	0	County Road D returns 'down' to grade

As this road centerline geometry line work was digitized from east to west, the 'ELEV_FROM' and 'TO' attributes will follow suit. The **cyan segment** 'rises' from a '0' value (ELEV_FROM) to a '1' value (ELEV_TO) at the point where it hits the Interstate 35W segment to show:

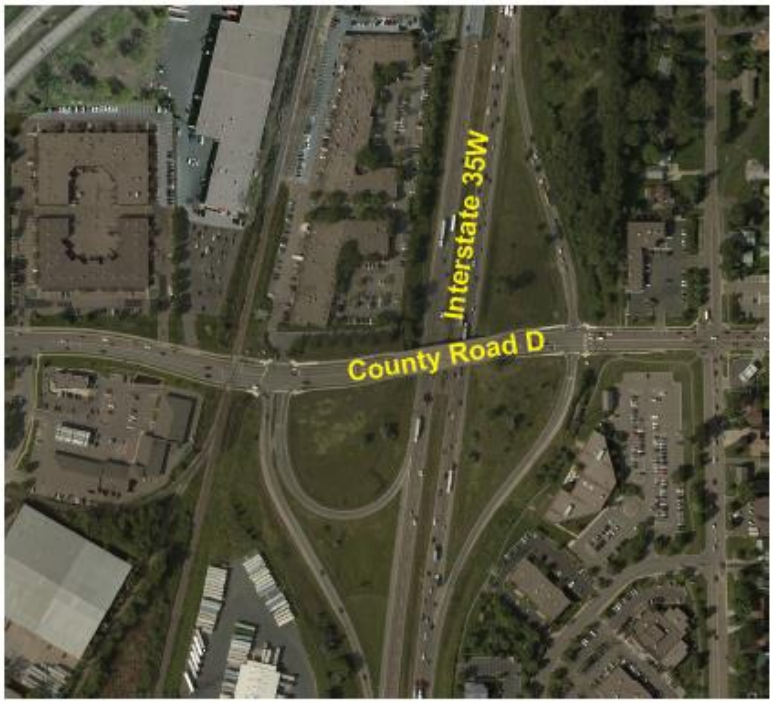
- It is *above* the interstate;
- It *does not connect* and *cannot be routed* to the interstate below;

The short **magenta segment** traverses the center of the bridge length between the two lanes of interstate below. Both the 'ELEV_FROM' and 'ELEV_TO' values of the **magenta segment** would be '1'; to show that it has no direct connection or routability to the segments of the interstate below it.

The **green segment** comes down from the bridge back to grade, having a 'ELEV_FROM' value of 1 and at 'ELEV_TO' value of '0'. Of note, all road lines shown in white carry an 'ELEV_FROM' and 'ELEV_TO' value of '0' (zero).

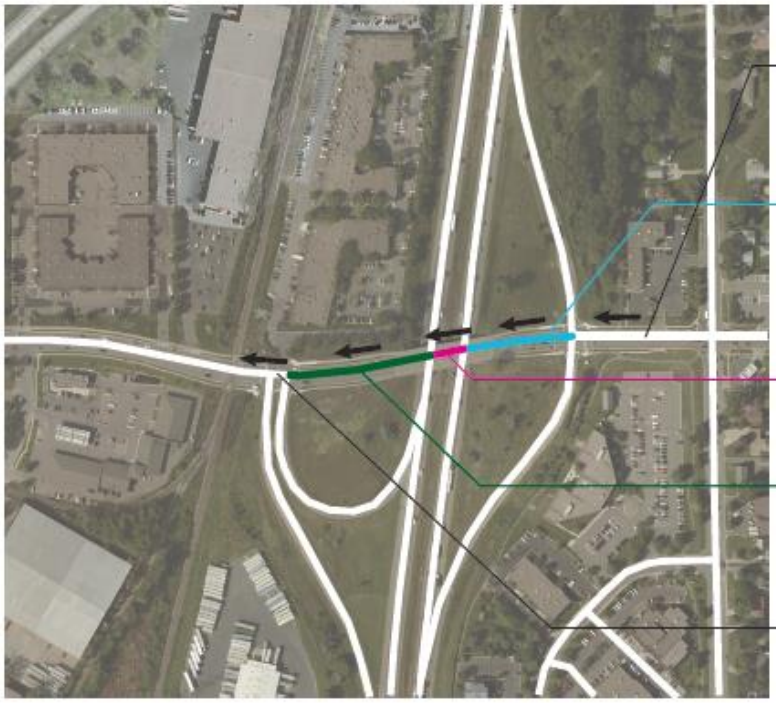
These concepts can be applied to more complicated situation as we will explore in the following examples.

Figure 2



In this example, the traffic flows both ways, however, the small black arrows *(in the lower map)* indicate the *direction in which these segments were digitized.*

The 'ELEV_FROM' attribute contains the elevation value at which the segment starts (a value of '0' is at grade, '1' is above grade, '-1' is below grade, etc.) and the 'ELEV_TO' attribute contains the elevation value of where the segment ends.



ELEV_FROM	ELEV_TO
0	0

ELEV_FROM	ELEV_TO
0	1

ELEV_FROM	ELEV_TO
1	1

ELEV_FROM	ELEV_TO
1	0

ELEV_FROM	ELEV_TO
0	0

Medium-Complexity Example: Cloverleaf

In Figure 3, a more complex example is shown: the cloverleaf interchange of the intersection of State Highway 252 and Interstate 694 in north-eastern Hennepin County.

Similar to treatment of line work in Figure 2, each intersection creates a 'break' in intersecting lines and the attributes (-1, 0, 1, etc.) indicate how they connect (or don't connect) in the vertical dimension.

In Figure 3, shown at (a): the diagonal ramp coming in from the northwest goes *beneath* the northwestern cloverleaf ramp (which is 'at grade' and has a value of '0') meaning the ramp needs a negative 'ELEV_TO' value (in this case '-1') where it hits the clover leaf, a negative 'ELEV_FROM' value (again, '-1') where it leaves clover leaf ramp, and a '0' (at-grade) 'ELEV_TO' value where it rejoins the network at I-694.

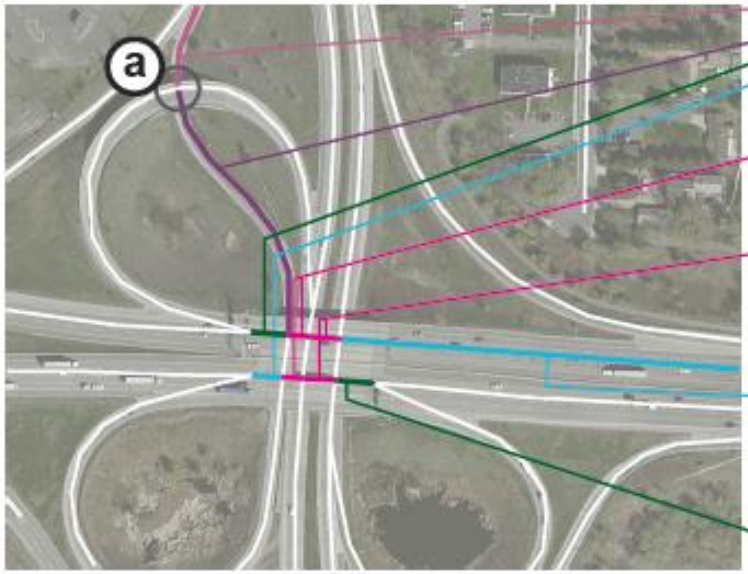
At the bottom of Figure 3 is a detail of the intersection. As shown in (b), each intersection of lines results in a split, *even if these segments are not connected vertically on the actual landscape.* This ensures accurate routing ability between features with like 'ELEV_FROM' and 'ELEV_TO' attributes.

On-ramps coming in at an angle can be connected ('snapped') to the intersections of the segments they connect to or are close to; as shown in example (c). While sacrificing a bit of accuracy, this can greatly reduce the number of small remnant segments that would potentially be created.

As shown in example (d), the white dashed lines indicate the paths of the actual physical ramps however, the priority of creating data for routing is to ensure the segments connect in the model to facilitate routing connectivity not to spatially depict the exact physical ramp position.

The trade-offs of modification of linear features topology *(as shown in examples (c) and (d) in Figure 3)* to facilitate modeling and maintenance are more fully discussed and illustrated in Figures 5 and 6.

Figure 3



ELEV_FROM	ELEV_TO
0	-1

ELEV_FROM	ELEV_TO
-1	0

Westbound

ELEV_FROM	ELEV_TO
1	0

Eastbound

ELEV_FROM	ELEV_TO
0	1

ELEV_FROM	ELEV_TO
1	1

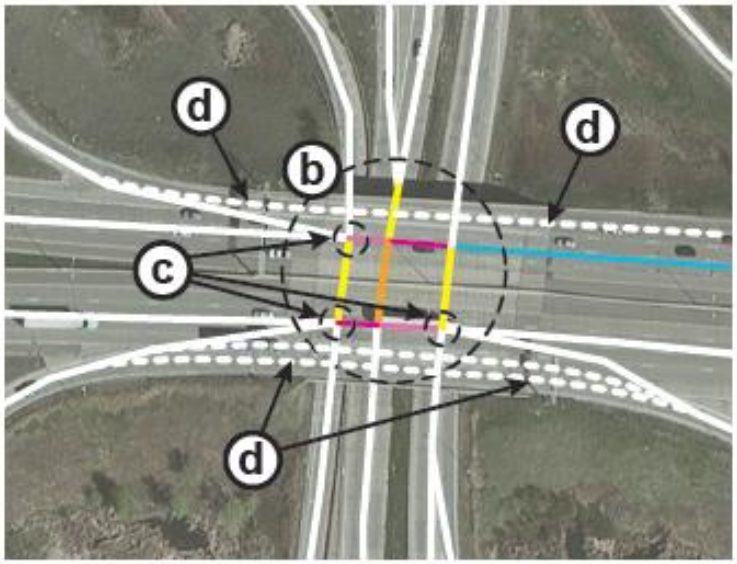
ELEV_FROM	ELEV_TO
1	1

Westbound

ELEV_FROM	ELEV_TO
0	1

Eastbound

ELEV_FROM	ELEV_TO
1	0



(a) *Roads below grade will use negative values;*

(b) *Each intersection of lines creates separate segments;*

(c) ***Best practice:*** *On/off ramps should connect to minimize small segments*

(d) ***Best practice:*** *Connectivity of the ramp to the main road is of more importance for routing and maintenance than the accurate representation of the shape of the ramp;*

Complex System Example

In Figure 4 a more complex example is shown containing various on-and-off ramps near the Mall of America, in the City of Bloomington, which aligns and connects State Highway 77 with Lindau Lane and the adjacent frontage roads. As with the prior figures and examples, each intersection creates a break in intersecting lines and the integer attributes (-1, 0, 1, etc.) are used to indicated connectivity.

The example shown in Figure 4 presents a complex set of circumstances, which are easily handled by correctly assigning integers in the 'ELEV_FROM' and 'ELEV_TO' fields. A unique case, shown at the top of the page 7 at (e), shows a northbound ramp that goes *over* American Boulevard East and then goes *beneath* another ramp, which would be attributed in this way:

	ELEV_FROM	ELEV_TO	*Notes*
Magenta segment	1	1	*Northbound ramp goes over American Blvd East*
Light green segment	1	-1	*Ramp then goes beneath adjacent ramp*
Violet segment	-1	0	*Ramp returns to grade*

At (f) the east-bound off-ramp connecting to Lindau Lane is *above* the west-bound on-ramp coming from Lindau Lane, and both ramps are *above* Highway 77; all three roadways are effectively stacked atop one another. The west-bound ramp that turns south on the west side of Highway 77 would be attributed in this way:

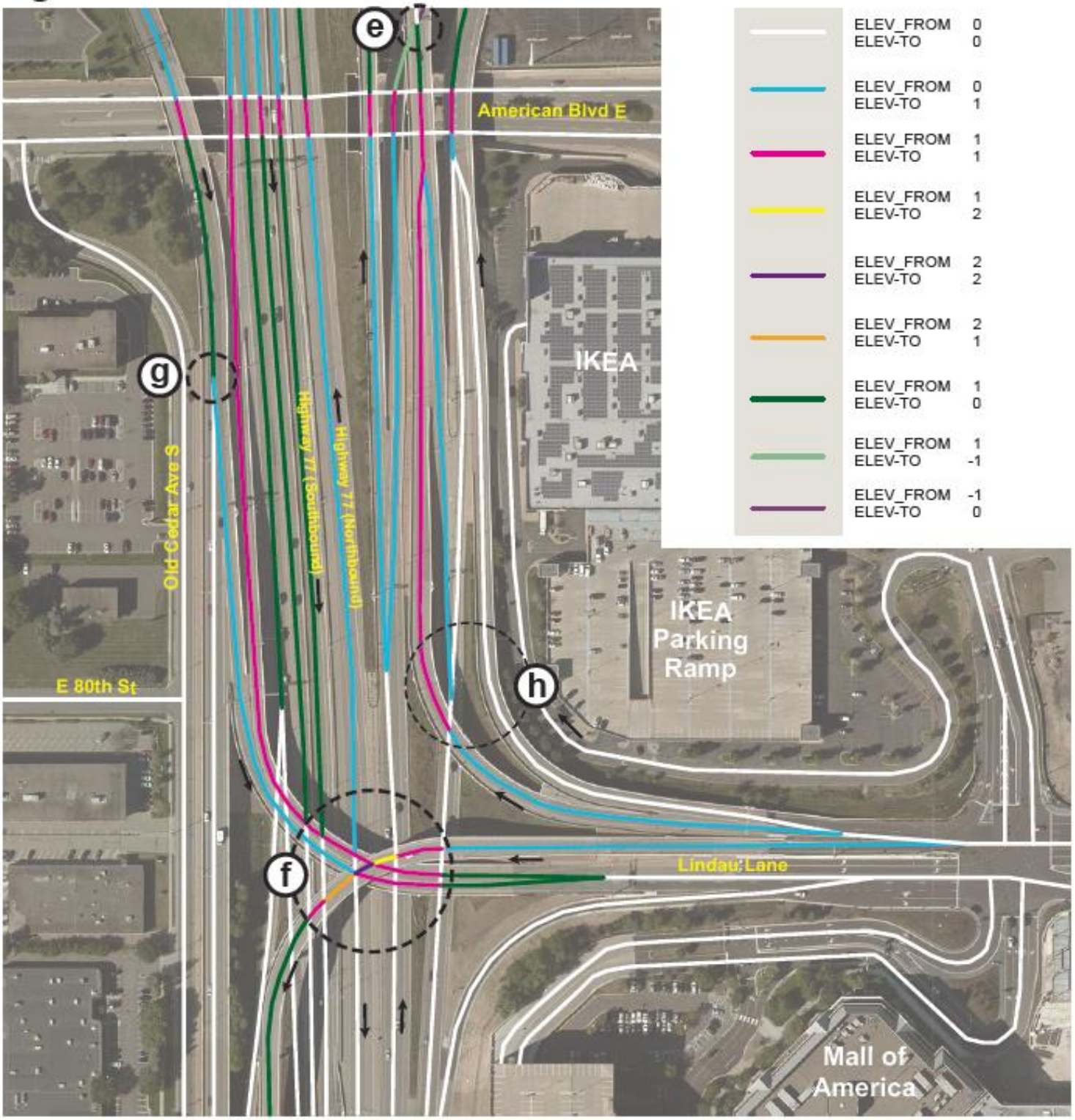
West bound ramp segments	ELEV_FROM	ELEV_TO	*Notes*
Cyan segment (long)	0	1	Westbound ramp rises to go over Hwy 77
Magenta segment (short)	1	1	Westbound ramp is above Hwy 77
Yellow segment (short)	1	2	Westbound ramp over eastbound ramp and Hwy 77
Purple segment (short)	2	2	Westbound ramp over eastbound ramp and Hwy 77
Orange segment (short)	2	1	Westbound ramp descending
Magenta segment (short)	1	1	Westbound ramp above 'at grade' ramps below
Dark green segment (long)	1	0	Westbound ramp return down to grade

Other examples illustrated on Figure 4:

At (g), the southbound split becomes a ramp *(**cyan**, going from 'grade ['0'] up one level ['1'])* and a frontage road *(remaining at grade ['0'] shown in white).*

At (h), the various northbound ramps are attributed using the same method: frontage roads remaining at grade '0', on-ramps rising up to '1', and so on.

Figure 4



(e) *Unusual configuration*

(g) *Split where one route becomes a ramp, and the other remains at grade*

(f) *Ramp rising above another ramp and above the divided highway*

(h) *Off-ramp, on-ramp and frontage road*

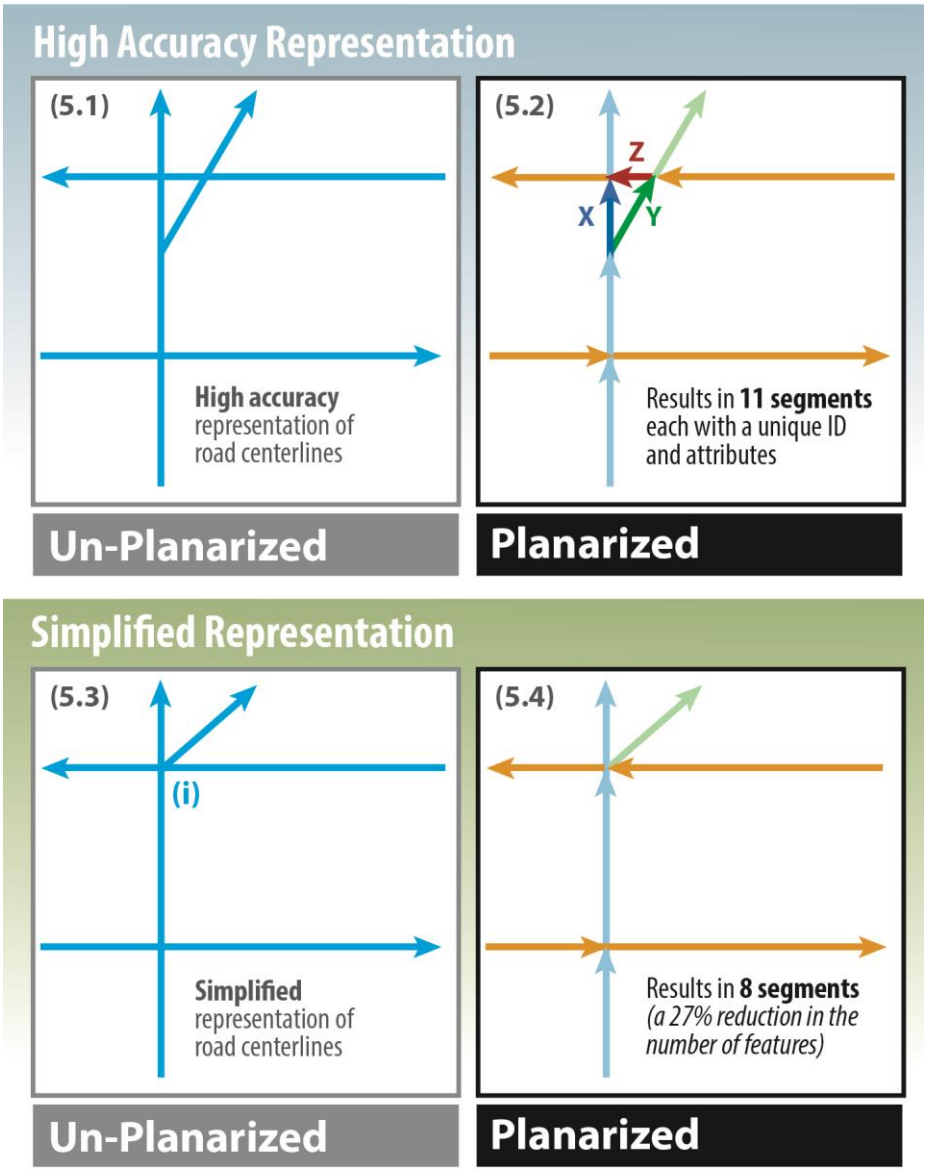
Changing Topology for Simplicity of Modeling and Maintenance

As discussed in the 'Cloverleaf Example' on pages 5 and 6, there is often a trade-off between ***highly accurate road centerline representations*** and the ***complexity of the final planarized product.***

Small adjustments in where, and how, road segments are represented can result in significant reductions in the number of segments when planarized. This is particularly true in the case of roads that do not intersect at grade.

In Figure 5, moving the representation of where the under-passing road begins can reduce the number of small segments that need to be handled. When the lines in 5.1 are planarized, three small segments result (segments x, y, and z; shown in 5.2); each of which needs to be assigned an ID and given attributes.

Figure 5



By simplifying the geometry—in this example: moving the diagonal ramp to start *at* the intersection, as shown at point **(i)** in Figure 5.3—the resulting planarization (shown in Figure 5.4) results in fewer segments that are more easily managed and attributed.

Each agency producing centerline data needs to determine which technique will work best to capture, depict, and attribute its own road features.

Changing Topology for Simplicity in Routing

There is also a trade-off to be had regarding highly accurate road centerlines and simplicity for routing purposes.

Figure 6 illustrates two treatments of road segment geometry at an intersection in the City of St. Paul.

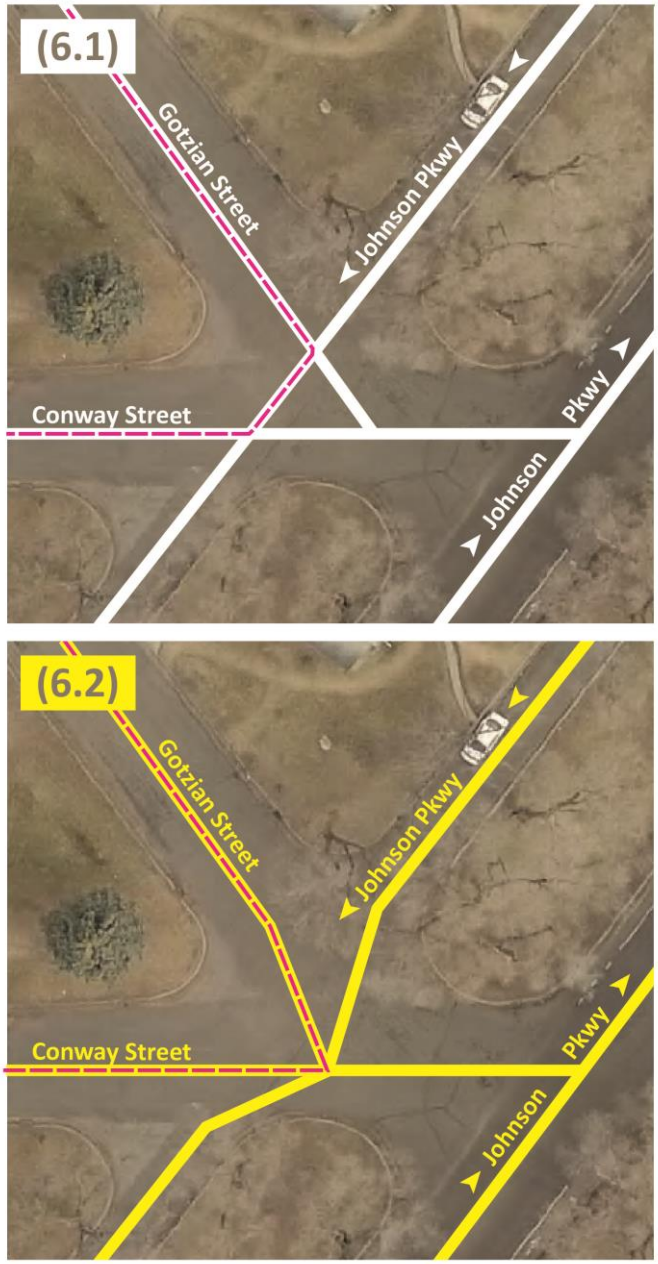
In 6.1, the segments are a highly accurate representation of the actual roadway. However, this geometry would likely provide confusing routing instructions for a driver who wanted to travel from southbound Gotzian Street to westbound Conway Street.

The routing system would likely give the following directions: ***"Travel south on Gotzian, turn right on Johnson Parkway, then turn right on Conway."*** *(as illustrated by the pink, dashed line in 6.1)*

The modified geometry shown in 6.2, simplifies the intersection connections to facilitate clearer routing; our example would now read: ***"Travel south on Gotzian Street, turn right on Conway Street."*** *(as illustrated by the pink dashed line in 6.2)*

Each agency producing centerline data needs to determine which representations will best balance its need for accurate geometric representations of the streets versus facilitating routability in its system.

Figure 6



Element 6
Cartography Elements

Element 6.1 - Route Name

Database Name	ROUTE_NAME		
Data Type	String	**Inclusion**	Conditional
Width	**30**	**Domain**	St MnDOT Prefix
Examples	**CSAH** (County-State Aid Highway), **CON** (Connector [Ramp])		
Description	The primary Route Name designator for the road centerline based on MnDOT's routing system. This is used mainly for map labelling.		

Null and blank values **are permitted** for Element 6.1

Element 6.2 - Route Number

Database Name	ROUTE_NUM		
Data Type	String	**Inclusion**	Conditional
Width	**5**	**Domain**	
Examples	**65**, **35W**		
Description	The primary Route Number designator (with optional letters) for the road centerline based on MnDOT's routing system. This is used mainly for map labelling.		

Null and blank values **are permitted** for Element 6.2

These elements are provided primarily to facilitate automated label placement and use of automated shield icon generation for map presentation;

Element 7
Enhanced 911/NextGen 911 Elements

7.1 Left Emergency Service Number

Database Name	ESN_L		
Data Type	String	**Inclusion**	Mandatory
Width	**5**	**Domain**	ESN
Examples	**26** (Washington County Sheriff's Office), **1011** (Isanti County Sheriff's Office)		
Description	The 3 to 5 digit Emergency Service Number (ESN) for addresses on the left side of the road centerline. ESNs are included in the MSAG for a given Public Safety Answering Point (PSAP) and represent unique combinations of individual fire, law, emergency medical response, and other emergency agencies.		

Null and blank values are **not permitted** for Element 7.1

7.2 Right Emergency Service Number

Database Name	ESN_R		
Data Type	String	**Inclusion**	Mandatory
Width	**5**	**Domain**	ESN
Examples	**233** (Carver County Sheriff's Office), **1046** (University of Minnesota Police Department)		
Description	The 3 to 5 digit Emergency Service Number (ESN) for addresses on the right side of the road centerline. ESNs are included in the MSAG for a given Public Safety Answering Point (PSAP) and represent unique combinations of individual fire, law, emergency medical response, and other emergency agencies.		

Null and blank values are **not permitted** for Element 7.2

7.3 Left MSAG Community

Database Name	MSAG_C_L		
Data Type	String	**Inclusion**	Mandatory
Width	**30**	**Domain**	MSAG
Examples	**Bayport**, **Wakefield Twp**		
Description	The Community name associated with the addresses on the left side of the road centerline as given in the Master Street Address Guide (MSAG) used for 9-1-1 purposes. This may or may not be the same as the Municipal Jurisdiction Name or the Postal Community Name and may use all uppercase values.		

Null and blank values are **not permitted** for Element 7.3

7.4 Right MSAG Community

Database Name	MSAG_C_R		
Data Type	String	Inclusion	Mandatory
Width	30	Domain	MSAG
Examples	Mahtomedi, Odessa		
Description	The Community name associated with the addresses on the right side of the road centerline as given in the Master Street Address Guide (MSAG) used for 9-1-1 purposes. This may or may not be the same as the Municipal Jurisdiction Name or the Postal Community Name and may use all uppercase values.		

Null and blank values are **not permitted** for Element 7.4

7.5 Left PSAP

Database Name	PSAP_L		
Data Type	String	Inclusion	Mandatory
Width	5	Domain	PSAP
Examples	HE-E (Hennepin County East), FTSN (USAF Fort Snelling), OOJ (Out of Jurisdiction)		
Description	The 4-5 character Public Safety Answering Point (PSAP) identifier code from the ALI display (ELT) for the addresses on the left side of the road centerline.		

Null and blank values are **not permitted** for Element 7.5

7.6 Right PSAP

Database Name	PSAP_R		
Data Type	String	Inclusion	Mandatory
Width	5	Domain	PSAP
Examples	EDIN (Edina Police Department), MPLS (Minneapolis Emergency Communications)		
Description	The 4-5 character Public Safety Answering Point (PSAP) identifier code from the ALI display (ELT) for the addresses on the right side of the road centerline.		

Null and blank values are **not permitted** for Element 7.6

Definitions of ESNs, MSAGs and PSAPs are found in the 'Definitions and Terminology' portion of this document (beginning on page 5).

Element 8
Maintenance Elements

Element 8.1 - Lifecycle Status

Database Name	STATUS		
Data Type	String	Inclusion	Mandatory
Width	20	Domain	Feature Status
Examples	Active, Planned, Not Built		
Description	The lifecycle status of the road centerline.		

Null and blank values are **not permitted** for Element 8.1

Element 8.2 - Effective Date

Database Name	EFF_DATE		
Data Type	Date	Inclusion	Conditional
Width		Domain	
Examples	10/12/2001, 03/24/1998		
Description	The earliest date on which the road centerline is known to exist. **Note:** This is a conditional element. It must be populated for new road centerlines and where the data exists to populate it for existing road centerlines. However, many cities and counties do not have data indicating when older road centerlines first came into existence. In such cases, the field is not required to be populated.		

Null and blank values **are permitted** for Element 8.2

Element 8.3 - Retired Date

Database Name	RET_DATE		
Data Type	Date	Inclusion	Conditional
Width		Domain	
Examples	06/01/2012, 09/28/2020		
Description	The date on which the road centerline was retired from active status.		

Null and blank values **are permitted** for Element 8.3

Element 8.4 - Editing Organization

Database Name	EDIT_ORG		
Data Type	String	Inclusion	Conditional
Width	40	Domain	
Examples	Hennepin County Survey, Dakota County GIS Department		
Description	The organization that made the last substantial change to the data record including geospatial edits. **Note**: This is not intended to be used to identify an aggregating organization that ran a batch process to populate fields derived from existing data (e.g. populating the State Code).		

Null and blank values **are permitted** for Element 8.4

Element 8.5 - Edited Date

Database Name	EDITED_DT		
Data Type	Date	**Inclusion**	Conditional
Width		**Domain**	
Examples	**11/27/2013**, **04/13/2014**		
Description	The date of the last substantial change to the data record including geospatial edits. **Note**: This is not intended to be used to identify the date a batch process was used to populate fields derived from existing data (e.g. populating the State Code).		

Null and blank values **are permitted** for Element 8.5

Element 8.6 - Source of Data

Database Name	SOURCE		
Data Type	String	**Inclusion**	Mandatory
Width	**75**	**Domain**	Source
Examples	**Anoka County, Hennepin County Survey**, **Dakota County GIS Department**		
Description	The organization that provided the road centerline. This is the originating county or Tribal Nation.		

Null and blank values are **not permitted** for Element 8.6

Element 9
Business Elements

Element 9.1 - Functional Class

Database Name	FUNCTIONAL		
Data Type	String	**Inclusion**	Optional
Width	**4**	**Domain**	St FunctionalClass
Examples	**4220** (Minor Arterial, Other Arterial (Twin Cities Metro)), **6320** (Minor Collector)		
Description	Classification of a road centerline based on the character of traffic service the road it represents is intended to provide. Code in a conflation of the federal designation (first digit) and the Metropolitan Council designation (next three digits).		

Null and blank values are permitted for Element 9.1

As of this writing, the work flow by which this attribute is populated remains unclear. Also, differences in option between the Minnesota Department of Transportation and the Metropolitan Council in its role as Metropolitan Planning Organization for the metro region persist in how roads in the metro are classified.

Element 9.2 - Surface Type

Database Name	SURF_TYPE		
Data Type	String	**Inclusion**	Optional
Width	**32**	**Domain**	Surf Type
Examples	**Paved**, **Unpaved**		
Description	Type of road surface.		

Null and blank values are permitted for Element 9.2

Definition of the 'Metropolitan Area' for the MRCC Project

Metropolitan counties. For the MRCC effort, the following nine counties are considered the metropolitan area. These nine counties are the service area of the Metropolitan Emergency Services Board (MESB):

Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott and Washington.

Non-metro counties which border and potentially have concurrent/boundaries streets with the metropolitan counties include the following:

- Pine County (bordered by Chisago County)
- Kanabec County (bordered by Isanti County)
- Mille Lacs County (bordered by Isanti County)
- Sherburne County (bordered by Anoka and Isanti Counties)
- Wright County (bordered by Hennepin and Carver Counties)
- McLeod County (bordered by Carver County)
- Sibley County (bordered Carver and Scott County)
- Le Sueur County (bordered by Scott County)
- Rice County (bordered by Scott and Dakota Counites)
- Goodhue County (bordered by Dakota County)

Use of the value "Out of Jurisdiction" (OOJ)

Out of Jurisdiction. For the MRCC effort, the project participants have decided that counties are not to provide data for any segments that are not within their jurisdiction. For segments of road that form a county boundary, each county is to provide the data for only its side of the road and enter 'OOJ' for the fields which are out of their jurisdiction. This facilitates situation where there are differences in street names, address ranges, direction and other data.

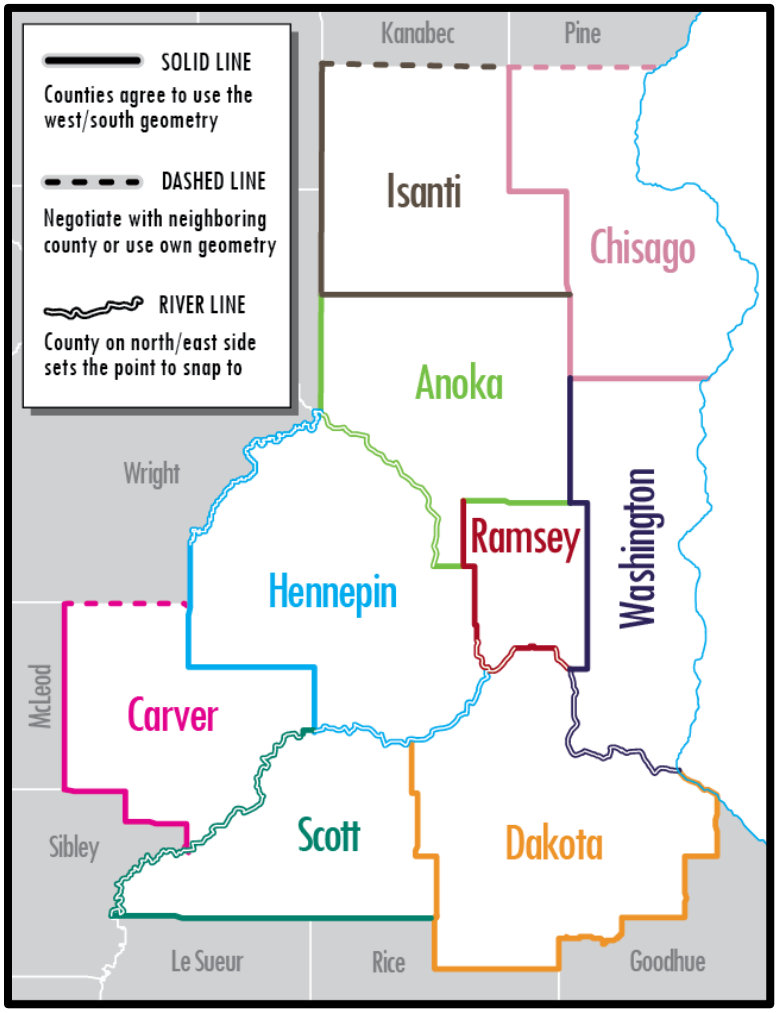
For more detail on this aspect of the MRCC, please see the **Concurrent Exclusive Technique for Shared County Boundary Segments** on the following page.

Coincident Exclusive Technique for Shared County Boundary Segments

Managing coincident geometry. A unique aspect of developing an inter-jurisdictional road centerline dataset is the management segments of road which are coterminous with county boundaries. Road segments which form county boundaries present a special challenge as the names, address ranges and directional considerations may *differ* between adjoining county jurisdictions on the same road segment. Over the course of its development, the MRCC participants have adopted a technique called 'coincident exclusive' for submitting data to meet this challenge. The descriptions and graphics on this and the following pages attempt to illustrate this technique for how ***data producers*** will be submitting their data for inclusion into the dataset and how ***data consumers*** can anticipate it for their various business uses.
The MRCC project team decided on the following guiding principles for handling coincident geometry:

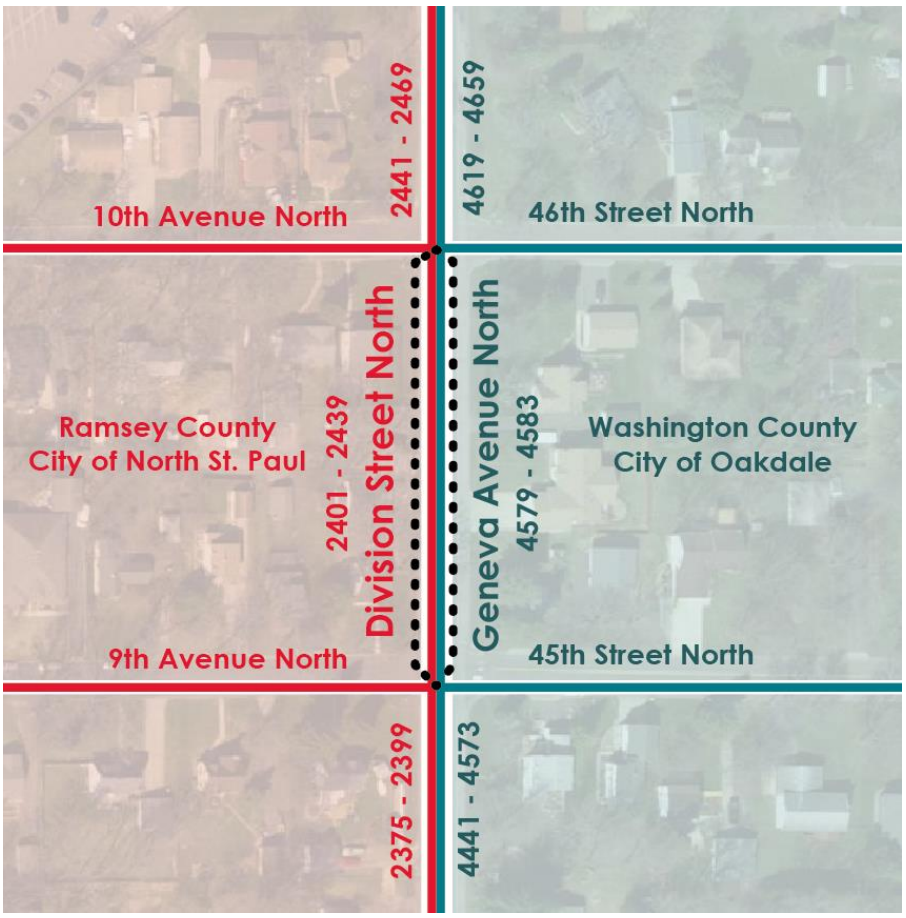
>> Counties sharing a segment along a boundary will ***both provide the geometry of the segment.*** The aggregated final dataset will therefore contain 'stacked' or duplicate lines. Counties will provide geometry and attributes only for its side of the segment. Counties will use the value 'OOJ' (out of jurisdiction) for any value outside of their county.

>> Counties will generally agree to use the segment geometry from the county to their ***north*** and ***east.*** Counties can be said to maintain their south and west boundary *(e.g. both counties agree to use that geometry)* and 'cede' their north and east boundary *(i.e. a county will copy, use, populate and submit their northern and eastern neighbor's geometry with values for their side of the segment)*



Coincident Example:

The map at right illustrates a standard example for where and how the 'coincident exclusive' technique is used. In this example, a road forms the boundary between Ramsey County (left side in ***red***) and Washington County (right side, in ***teal***).



In Ramsey County, the street is known as **Division Street North**, while in Washington County, the street is known as **Geneva Street North** (*to make matters more interesting, a portion of this road is also coincident with State Highway 120, which would be carried as an alternate street name*). Also shown are the address ranges for each segment, which differ between the two counties (*in Ramsey County, the ranges are in the 2300s to the 2400s, while in Washington County they are in the 4400s to the 4600s*).

For the segment highlighted (*surrounded by the black dots*) both Ramsey and Washington County would use the Washington County segment of geometry (this ensures they match exactly), as per the map on page 42; counties agree to use and share the geometry of their northern and eastern neighbor.

Ramsey County would then fill in only its side of the data of the segment (*all left-side attributes*) that it submits, and Washington County, in turn, would fill in only its side of the data of the segment (*all right-side attributes*). Ramsey would then populate all its out-of-jurisdiction/right-side attributes with the value 'OOJ' and Washington County would populate all out-of-jurisdiction/left-side attributes with the attribute 'OOJ'.

The table on the following page illustrates how the two counties would populate and submit their data for a coincident segment.

Element	Attribute	Value	Element	Attribute	Value
1.1	UNIQUE_ID	125409	1.1	UNIQUE_ID	164292
1.2	ROUTE_ID	300000120	1.2	ROUTE_ID	300000120
1.3	UNIQUE_ID	630D0810-2837-4AC6-BCDC-4F3FD7E1DA9A	1.3	UNIQUE_ID	616S88119-7171-5AB56-ACDC-5H1EF6H1D9D9
2.1	ROUTE_SYS	3	2.1	ROUTE_SYS	3
2.2	ROUTE_DIR	B	2.2	ROUTE_DIR	B
2.3	DIR_RTE_ID	<conflate from MnDOT>	2.3	DIR_RTE_ID	<conflate from MnDOT>
2.4	LOC_STATE	<conflate from MnDOT>	2.4	LOC_STATE	<conflate from MnDOT>
2.5	PRIME_STAT	Primary	2.5	PRIME_STAT	Primary
3.1	ST_PRE_MOD		3.1	ST_PRE_MOD	
3.2	ST_PRE_DIR		3.2	ST_PRE_DIR	
3.3	ST_PRE_TYP		3.3	ST_PRE_TYP	
3.4	ST_PRE_SEP		3.4	ST_PRE_SEP	
3.5	ST_NAME	Division	3.5	ST_NAME	Geneva
3.6	ST_POS_TYP	Street	3.6	ST_POS_TYP	Avenue
3.7	ST_POS_DIR	North	3.7	ST_POS_DIR	North
3.8	ST_POS_MOD		3.8	ST_POS_MOD	
3.9	ST_CONCAT	Division Street North	3.9	ST_CONCAT	Geneva Avenue North
3.10	ST_NAME_A1	State Highway 120	3.10	ST_NAME_A1	State Highway 120
3.11	A1_MSAG_V	N	3.11	A1_MSAG_V	N
3.12	ST_NAME_A2		3.12	ST_NAME_A2	
3.13	A2_MSAG_V		3.13	A2_MSAG_V	
3.14	ST_NAME_A3		3.14	ST_NAME_A3	
3.15	A3_MSAG_V		3.15	A3_MSAG_V	
4.1	ADR_FR_L	2401	4.1	ADR_FR_L	0
4.2	ADR_TO_L	2439	4.2	ADR_TO_L	0
4.3	ADR_FR_R	0	4.3	ADR_FR_R	4579
4.4	ADR_TO_R	0	4.4	ADR_TO_R	4583
4.5	ZIP_L	55109	4.5	ZIP_L	OOJ
4.6	ZIP_R	OOJ	4.6	ZIP_R	55128
4.7	CTU_ID_L	2395261	4.7	CTU_ID_L	OOJ
4.8	CTU_ID_R	OOJ	4.8	CTU_ID_R	2395287
4.9	CTU_NAME_L	North Saint Paul	4.9	CTU_NAME_L	OOJ
4.10	CTU_NAME_R	OOJ	4.10	CTU_NAME_R	Oakdale
4.11	CO_CODE_L	123	4.11	CO_CODE_L	OOJ
4.12	CO_CODE_R	OOJ	4.12	CO_CODE_R	
4.13	CO_NAME_L	Ramsey	4.13	CO_NAME_L	OOJ
4.14	CO_NAME_R	OOJ	4.14	CO_NAME_R	Washington
4.15	STATE_L	MN	4.15	STATE_L	MN
4.16	STATE_R	MN	4.16	STATE_R	MN
4.17	PARITY_L	O	4.17	PARITY_L	Z
4.18	PARITY_R	Z	4.18	PARITY_R	Z
4.19	POSTCOMM_L	Saint Paul	4.19	POSTCOMM_L	OOJ
4.20	POSTCOMM_R	OOJ	4.20	POSTCOMM_R	Oakdale
5.1	ELEV_FROM	0	5.1	ELEV_FROM	0
5.2	ELEV_TO	0	5.2	ELEV_TO	0
5.3	ONEWAY	B	5.3	ONEWAY	B
5.4	SPEED_IMP	37	5.4	SPEED_IMP	50
5.5	EMERG_ACC	No	5.5	EMERG_ACC	No
5.6	SPEEDLIMIT	35	5.6	SPEEDLIMIT	35
6.1	ROUTE_NAME	State Highway	6.1	ROUTE_NAME	State Highway
6.2	ROUTE_NUM	120	6.2	ROUTE_NUM	120
7.1	ESN_L	76	7.1	ESN_L	OOJ
7.2	ESN_R	OOJ	7.2	ESN_R	22
7.3	MSAG_C_L	North Saint Paul	7.3	MSAG_C_L	OOJ
7.4	MSAG_C_R	OOJ	7.4	MSAG_C_R	Oakdale
7.5	PSAP_L	RAMS	7.5	PSAP_L	OOJ
7.6	PSAP_R	OOJ	7.6	PSAP_R	WASH
8.1	STATUS	Active	8.1	STATUS	Active
8.2	EFF_DATE	1/1/1900	8.2	EFF_DATE	1/1/1900
8.3	RET_DATE	<null>	8.3	RET_DATE	<null>
8.4	EDIT_ORG	Ramsey Co	8.4	EDIT_ORG	Washington Co
8.5	EDITED_DT	5/30/2013	8.5	EDITED_DT	1/29/2018
8.6	SOURCE	Ramsey	8.6	SOURCE	Washington
9.1	FUNCTIONAL	4212	9.1	FUNCTIONAL	4212
9.2	SURF_TYPE	Paved	9.2	SURF_TYPE	Paved