Final Report

Transportation Plan

Town of Hudson, CO

November 3, 2008

Stantec

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1.0 EXECUTIVE SUMMARY

In 2003, the town adopted a set of goals and objectives to achieve their desired vision: ***"The Town of Hudson strives to grow and attain a population level that maintains its small town character yet provides services and amenities to improve its quality of life."*** Those relating to transportation include: 1) Complete asphalt paving and drainage improvements on local residential streets…; 2) Install better traffic channelization downtown to improve traffic safety; 3) Investigate the possible use of traffic calming devices…; 4) Increase the use of speed limit signs in neighborhoods. However, additional issues will need to be studied, to achieve the desired land use plan.

Based on this, and after meeting with key town officials, we see the following as goals and objectives for this transportation plan:

Goal: Develop a plan for an effective, multi-modal transportation system that maintains or improves the quality of life for town residents, and supports 10-year land use plans.

Objective #1: Upgrade roads to meet accepted design standards and guidelines for designated road classifications

Objective #2: Establish and meet Level of Service standards for projected 10-year future growth

Objective #3: Improve traffic safety – particularly in residential neighborhoods

Objective #4: Improve access to and within the town

Objective #5: Minimize adverse impacts of the railroad

Objective #6: Provide desired pedestrian, bicycle and transit facilities

Objective #7: Minimize truck impacts

Objective #8: Minimize unnecessary travel through and within the town

Objective #9: Assess and propose funding methods for the needed improvements

In order to develop a meaningful and realistic transportation plan that will address the needs of the Town of Hudson, it is first necessary to evaluate the existing conditions and future needs for transportation in the community. Data was collected concerning physical and traffic characteristics for all key roadways within the Town limits. Data concerning pedestrians, school operations, trucks, parcel access, and safety was also collected. Capacity analysis was conducted to determine how well the key intersections are operating, which concluded that except for relatively small periods of time at the I-76/SH 52 interchange, delays are acceptable within Hudson. Based on an assessment of all of this data, plus input from the public and key town officials, a set of existing transportation needs was developed. Each need was placed into one of three different categories, based on Stantec's assessment of priority. The three categories of needs are:

- Tier I – very desirable, should be undertaken as soon as funding allows

- Tier II – needed and as conditions warrant, could move to Tier I, Tier II projects should be undertaken after all the Tier I are completed.
- Tier III – these are more "wish list" type items – they are still important, but should follow the Tier II improvements

Roadway Infrastructure

- Updated road classification system (I)
- Improved road alignments
  - Vertical alignment of SH 52 over I-76 (I)
  - Horizontal alignment and configuration of SH 52/Dahlia intersection (I)
  - Horizontal alignment and configuration of SH 52/Hudson intersection (I)
- Improved road design standards (I)
- Updated typical cross sections (I)
- Improved access control on existing roads, particularly along SH 52 and Hudson Drive (II)
- Improved road surfaces (I)
- Improved signing, striping and lighting (I)
  - Warning and regulatory signs per MUTCD, CDOT and FHWA guidelines (standard types, size, visibility and placement)
  - Pavement marking per MUTCD and/or CDOT guidelines (layout, visibility, life)
  - Lighting per state standards
- Improved roadside drainage and edge treatments (I)

Public Transportation

- On-call transit system (III)

Access

- Restrict railroad pedestrian access along its entire length in the Town of Hudson (except at designated crossings) (I)

Pedestrian/Bike

- Continuous pedestrian/bike facilities and improved road and railroad crossing in the central village area (I & II)
- Improve wayfinding and information signs to key destinations within the town (III)

Capacity

- No existing capacity needs
- Improve wayfinding and information signs to key destinations within the town to minimize unnecessary vehicular travel (III)

Trucks

- Minimize truck impacts in the central village area (I)
- Provide overnight parking facilities for interstate trucks near I-76 (II)

Safety

- Improvements at the SH 52/railroad crossing (I)

- Improvements in the Beech Street school zone (I)
- Improved pedestrian awareness (I)
- Remove roadside obstructions (trees, rocks, prohibit on-street parking) (I)

In order to effectively develop a 10-year transportation improvement plan, it is essential that traffic impacts from potential future developments, both within and external to the Town of Hudson, are forecast and analyzed. By developing reasonable travel forecasts, future capacity and other needs can be assessed, forming the basis upon which future needed improvements can be determined.

Growth in travel is mainly comprised of two primary components – travel generated by development within the Town of Hudson (internally generated), and travel resulting from growth outside of the town (externally generated). For the external component, the 2035 Upper Front Range Regional Transportation Plan forecasts about 4.2% annual growth in traffic on SH 52 in the Town of Hudson. This growth includes traffic resulting from development both within and outside of the Town of Hudson. However, the proposed traffic volumes from the 10-year growth assumptions in the Town of Hudson (described below) represent a 6.52% annual increase in traffic on SH 52 – far in excess of the Upper Front Range forecasts. As a result, it was assumed that all of the regional traffic growth would occur due to this development in Hudson, and no background traffic growth rate was applied.

The one exception was the proposed Pioneer Development – a major, multi-phased new community development proposed to the northeast of Hudson. The “Pioneer Development Traffic Impact Analysis”, prepared by LSC Transportation Consultants, Inc. in 2007, presented the travel forecasts for the development by phase and year.

The Town of Hudson adopted a Comprehensive Land Use Plan in June 2007. This plan presented a vision for desired build-out land use in the Town. Land use types and anticipated densities were illustrated, but it was understood that this plan may take decades to be realized. In order to develop a list of 10-year future needs, it was necessary to make assumptions regarding how much of the Land Use Plan will be realized within a 10-year horizon. Based on inquiries received from developers to date, current planned developments, and estimates regarding potential supporting development, the anticipated 10-year growth was forecast.

The next step in developing the 10-year future travel projections was translating the development assumptions into traffic projections. Capacity analysis was conducted using the 2018 traffic projections, which indicated that unacceptable delays will be experience at many study area intersections, especially along SH 52/Main Street and at the I-76 interchanges with SH 52 and CR 49. A set of future transportation needs was developed as an outcome of this analysis. Many of the existing needs will continue to grow as development and traffic increases:

Roadway Infrastructure - Major travel ways and access roads will need to be designed and upgraded to provide sufficient infrastructure to meet current standards. As new developments occur, these needs will extend to the development location, so that sufficient access if provided to I-76 and the village area.

Public Transportation - In order to minimize automobile travel in the town, there will be a need for regular transit service, in the form of both bus service to and from Denver and surrounding communities, but also potentially a service within the town.

Access - A new grade-separated crossing of the railroad at CR 49 is needed to provide sufficient access to the potential industrial developments in the SH 52/CR 49 area, and to provide an alternative emergency vehicle access route. A new interchange at either CR 8 or CR 10 will be needed to provide an alternative access for trucks traveling to and from the southwest on I-76, to minimize truck impacts on the central village area. This new interchange is also needed to provide improved access to the south side of town, thereby making the area more attractive for development.

Pedestrian/Bike - Pedestrian and bicycle connections will be needed between new residential and industrial developments, and key destinations, such as retail areas and downtown. More recreational trails will also be needed to maintain the present quality of life.

Capacity - There will be a need for increased capacity along SH 52 through most of the town, as well as at the I-76 interchanges with SH 52 and CR 49. Adding a new railroad crossing at CR 49 will also provide increased capacity by diverting a significant amount of traffic destined to proposed industrial and retail developments, away from the SH 52 corridor. A new interchange at either CR 8 or CR 10 will also be needed to provide additional system capacity, particularly to divert truck traffic off of Beach St. and SH 52 in the central village area.

Trucks - There will be a need to accommodate heavy trucks from new developments, so that impacts to residential areas and the village area are minimized. As mentioned above, a new interchange is needed from I-76 at either CR 8 or CR 10 to provide an alternative access for trucks.

Safety - As congestion grows, the number of crashes is expected to increase. Safety along the SH 52/Main Street corridor will be the top safety concern, as high congestion will mix with high pedestrian volumes in the business core. Safety concerns along Beech Street will also increase, particularly in the school zone.

Improvement alternatives were developed that fill the identified existing and future needs. Ideas for alternatives were generated through discussion with Town of Hudson officials, engineering analysis, and Stantec's experience with similar transportation plans. In many cases, there was only one obvious alternative. Given that most needs have one obvious alternative and more detailed studies are needed before interchange alternatives can be evaluated, an evaluation process using criteria is not warranted at this time. There may be variations on alternatives, but these will be developed and evaluated during the design stage of any given project. It should be noted that a cursory review of the alternatives was conducted and all of the alternatives will meet one of more of the developed study objectives.

The following projects are recommended to meet <u>existing</u> needs:

1) Develop a set of standards to design and construct the town's transportation system
    a. Develop and implement a road classification system and develop associated typical road cross sections

   b. Develop design, access, sign/stripe and traffic study standards

2) Paving, drainage, access and sidewalk improvements for remaining non-paved streets in the central village area
   a. Pave remaining streets in the central village area, using the developed typical road cross sections and design standards
   b. Install signs and striping as per new town standards
3) Resurfacing of some currently paves roads
   a. Road resurfacing
   b. Drainage improvements
   c. Upgrade signs and striping as per new town standards
4) Pedestrian enhancements
   a. Beech Street school zone enhancements, including enhances signs, higher visibility raised crosswalks, a pedestrian refuge island, and neckdowns
   b. Sidewalks, striped crosswalks and improved pedestrian crossing signs
   c. Develop and implement a standard town wayfinding sign system for vehicles and pedestrians to direct people to key town destinations
   d. Implement a pedestrian safety awareness program, with brochures and safety reminder roadside signs
   e. Develop a town trail plan for future right-of-way preservation
5) Railroad crossing improvements and corridor fencing
   a. Better defined pedestrian crossing at SH 52 crossing, with pedestrian crossing gates
   b. Barbed wire fencing along both sides of the railroad right-of-way with the town, except at designated crossings or business access points
6) Realign the I-76 Westbound Frontage Road further west to provide greater separation from the I-76 Westbound Ramp

The following projects are recommended to meet projected <u>future</u> needs:

1) SH 52 widening and enhancements
   a. Widen SH 52 from CR 43.5 to Oak Street to a four lane cross section (as per new typical cross sections and design standards), with left turn lanes at key intersections and striped bike lanes
   b. Upgrade SH 52 from Oak Street to CR 49 to meet new typical cross sections and design standards
   c. Implement either the roundabout variation or the traffic signal variation at the Dahlia/Main and Hudson/Cedar intersections. If the traffic signal variation is

implemented, include traffic signal pre-emption coordination with the railroad crossing.

d. Provide a separate eastbound right turn lane and a separate northbound left turn lane at the SH 52/Beech Street intersection

e. Construct a sidewalk or trail on one side of SH 52 within the project limits (in places where one does not already exist)

f. Install traffic signals at the Ash Street, Beech Street and CR 47 intersections, with eastbound and westbound left turn lanes, and pedestrian crossing amenities

g. Investigate and install (where appropriate) neckdowns, pedestrian refuge islands, and bump-outs at key pedestrian crossings in the central village area

2) I-76/CR 49 interchange improvements

a. A detailed engineering study will be needed to determine the best configuration for interchange improvements. Variations could include a single point urban interchange (SPUI), fly-over ramps, and elimination of the service road on the south side. Note that interchange improvements must be planned and designed in conjunction with the CR 49 railroad underpass.

3) CR 49 railroad underpass

a. A detailed engineering study will be needed to determine the best configuration and location for this underpass.

4) I-76/SH 52 interchange improvements

a. A detailed engineering study will be needed to determine the best configuration for interchange improvements. Variations could include a single point urban interchange (SPUI) or a partial cloverleaf. Adding additional lanes to the current configuration will not provide sufficient capacity. In any variation, the bridge over I-76 will need to be reconstructed to eliminate current vertical sight distance deficiencies.

5) CR 49 improvements, railroad to SH 52

a. Realign curves to provide 45 mph design speed

b. Realign southbound approach at SH 52 to align with northbound approach

c. Pave and widen (1 paved lane per direction) road to new design standards and to handle heavy trucks (part of the new designated truck route)

d. Construct a sidewalk or trail on one side of CR 47 within the project limits

e. Install traffic signals at the SH 52 and Chem Tech Avenue intersections, with northbound and southbound left turn lanes, and pedestrian crossing amenities

6) New pavement and new road projects, remainder of town

a. Designate CR 8 (I-76 to CR 49) and CR 49 (CR 8 to I-76) as a truck route. Where feasible, “stop” signs should be installed on the side streets at intersections, to minimize starts/stops and delays to trucks. Enact an ordinance

to restrict heave truck traffic on Beech Street. Install truck route signs along and in advance of the truck route.

b. Construct the segment of CR 8 between CR 45 and CR 47 to new design standards and to handle heavy trucks

c. Construct a new connector road between CR 47 and CR 49 on the north side of I-76, to new design standards

d. Widen and pave CR 8 from CR 47 to CR 49 to new design standards and to handle heavy trucks

e. Widen and pave CR 49 from CR 8 to SH 52 to new design standards and to handle heavy trucks

f. Pave the following roads to new design standards: CR 47 from CR 8 to SH 52; CR 10 from just east of I-76 to CR 49; CR 43 from CR 10 to SH 52; CR 47 from the I-76 Frontage Road to the new east/west connector road (leading to CR 49); Main Street from the I-76 North Frontage Road to Hickory Street; CR 12.5 from the North Frontage Road to SH 52.

7) Resurfacing projects, remainder of town

a. Widen and resurface CR 8 from I-76 to CR 45to new design standards and to handle heavy trucks

b. Widen and resurface the following roads to new design standards and cross sections: CR 45 (Beech Street) from SH 52 to CR 8; I-76 North Frontage Road on various sections from CR 8 to CR 49; I-76 South Frontage Road on various sections from the central village area to CR 49.

c. Construct a sidewalk or trail on one side of CR 45 (Beech Street) from the central village area to CR 8.

8) I-76/CR 8 new interchange

a. Construct a half diamond interchange at I-76/CR 8, leading to and from the south.

9) Work with RTD to implement one or more bus routes between Hudson and the Denver metropolitan area.

2.0 GOALS AND OBJECTIVES

Starting out as a supply stop in 1882, Hudson's early history revolved around the railroad line that bisects the town. This line still serves as a vital freight link to and from Denver, and ironically, is now considered a barrier that negatively impacts mobility, safety and quality of life. Hudson's character has changed much over the years, through booms in commercial and agricultural development. In recent decades, job opportunities decreased, and Hudson has become a "bedroom community" for the greater Denver area.

A lack of tax income from commercial developments has made it difficult for the town to provide adequate transportation and other infrastructure. The Comprehensive Land Use Plan, dated June, 2007, demonstrates a desire on the part of the town to spur additional industrial and commercial growth in selected areas, to help boost the town's economic base. With that, comes the need for upgraded infrastructure, particularly transportation, to support and attract the desired development. Improved access, upgraded roads, spot safety improvements, and other measures would be needed. The downside with this development is the potential resulting impacts. Increased traffic, noise, pollution, increased demand for utilities and town services could negatively affect the quality of life for residents if not properly planned. The primary purpose of this project is to prepare this plan, and identify projects, programs and funding methods to achieve the desired development, while minimizing and mitigating any negative impacts on residents of the Town.

2.1 Goals and Objectives

In 2003, the town adopted a set of goals and objectives to achieve their desired vision: ***"The Town of Hudson strives to grow and attain a population level that maintains its small town character yet provides services and amenities to improve its quality of life."*** Those relating to transportation include: 1) Complete asphalt paving and drainage improvements on local residential streets…; 2) Install better traffic channelization downtown to improve traffic safety; 3) Investigate the possible use of traffic calming devices…; 4) Increase the use of speed limit signs in neighborhoods. However, additional issues will need to be studied, to achieve the desired land use plan.

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Objective #9: Assess and propose funding methods for the needed improvements

3.0 EXISTING CONDITIONS

In order to develop a meaningful and realistic transportation plan that will address the needs of the Town of Hudson, it is first necessary to evaluate the existing conditions and future needs for transportation in the community. Overall goals and objectives are important, as well as identifying the public policies that will influence the level of transportation spending necessary to respond to the needs of the citizens. The first step in this process is to identify the transportation issues and opportunities as perceived by the participants and affected parties.

3.1 Transportation Issues

Much information can be obtained just by observing, and also by listening to the people that use the transportation system daily. It is crucial to obtain this input if a balanced and comprehensive understanding of the perceived problems and concerns is to be developed. Stantec was able to obtain this input through a series of site visits, meetings with town staff and a public meeting. Stantec staff also conducted observations and inventory of the existing transportation system.

The issues and concerns expressed or observed ranged from general topics, such as future growth and taxes, to specific problems at locations such as improvements to the Main and Dahlia intersection, and additional railroad crossings. The following are some of the key issues either heard or observed.

- Many residential streets are still unpaved.
- Dust and mud are generated by traffic on unpaved roads
- Impact of truck traffic through Town
- Railroad tracks bisecting Town and a lack of crossing points
- Delays and safety at the Railroad crossing on Main
- The ability of the transportation system to handle growth in traffic volumes resulting from additional development within and adjacent to the town, while maintaining the quality of life
- Many roads and road features are sub-standard by today's standards
- Lack of pedestrian and bicycle infrastructure
- Role of private sector/developer funding in addressing transportation problems
- Safety concerns caused by roadway geometrics, sight distances, speed limits, and other factors
- Drainage
- Safety in school zones
- Safety and capacity at several intersections with unusual configurations
- Wayfinding signs
- Insufficient access to I-76

3.2 Existing System Data Collection

Data collection generally was performed during the time period of February 2008 to May 2008. The Stantec team traveled and observed all roadways within the Town limits. While traversing the existing roadway system, many features were reviewed including:

- Road surface type (paved, dirt)
- Road surface condition
- Road lanes and intersection geometry
- Traffic control
- Sign type/condition/location
- Roadside features/obstructions (trees/structures/ditches)
- Connectivity to other roads & highways
- Truck routes
- School zones
- Traffic calming
- Pedestrian infrastructure (sidewalks)
- Multimodal infrastructure (trails/bikeways)
- Drainage
- Railroad crossings and safety
- School bus routes
- Substandard intersections

Traffic data was collected at many strategic intersections throughout the town during the winter of 2008. Average daily traffic (ADT) counts were taken for a minimum of 24 hours on average weekdays. Turning movement counts were conducted to determine the directions of vehicle travel at several key intersections during the morning and afternoon peak periods of a typical weekday. The Intersection Count Locations are illustrated on Figure 1, while the existing ADT volumes and the existing morning and evening peak hour traffic volumes are shown in the report appendix.

Other key features were also noted. Figures 2a and 2b present the existing road surface types and number of lanes, for the central village area and key road in the remainder of the town, respectively. Figures 3a and 3b present similar data concerning existing road surface conditions. For the central village area, Figure 4 presents the existing pedestrian facilities, while Figure 5 shows existing traffic control.

3.3 Roadway Infrastructure

A roadway is made up of many different parts and pieces - the wearing surface (concrete, asphalt, gravel, etc.), curb/gutter, shoulders, subgrade, drainage (culverts, subdrains), striping, signage, lighting, and signals. It is very often the corridor for utilities such as sanitary sewer, water, electric and gas.

Pavement is typically the most expensive and noticeable part of a road. Future traffic counts, percentage of trucks, and roadway classification are used to determine the type and design of roadway pavements. Roads are typically designed to accommodate 20 to 30 years worth of traffic.

There are many design standards, rules and guidelines for designing roadways. The following design elements were reviewed to determine existing road infrastructure needs:

- Roadway classification
- Alignments (horizontal and vertical)
- Access control
- Sight distance
- Road surface type
- Road surface condition
- Number of lanes/cross sections
- Traffic control
- Drainage

Roadway Classification

The Town does not have a roadway classification system. This is an essential element in developing appropriate design standards and guidelines for town roads. There is a need to develop this system.

Alignments (horizontal and vertical)

Roadway horizontal and vertical alignments are average to good. The following locations were noted as needing horizontal or vertical alignment, or intersection configuration improvements:

Vertical Alignment
- SH 52 over I-76

Horizontal Alignment/Intersection Configuration
- SH 52/Main/Dahlia intersection
- Main Street/Cedar/Hudson Drive intersection

Access Control

There is a need for access control standards – particularly for new developments. At present, there is no consistency of width, materials and geometry of driveways and site frontages. Retrofit access control and definition are particularly needed for businesses along Main Street and all side streets near Main Street and SH 52.

Many communities and counties around the State of Colorado have developed their own access control manual. Many others have chosen to adopt CDOT's "State Highway Access Code". Although this document was written primarily for state highways, it can be applicable for municipal use.

Sight Distance

Due to the basic grid layout of streets, sight distance improvement needs are minimal. The exception is the SH 52 bridge over I-76. Sight distance appears substandard for vehicles turning onto and off of the I-76 eastbound and westbound ramps.

Road Surface Type

Road surface types are summarized in Figures 2a and 2b. There are several different surface types, including dirt, gravel, concrete and asphalt. There is a need to provide asphalt paving on all of the existing dirt/gravel roads in the central village area. With existing low traffic volumes, other roads within the town do not need asphalt paving at this time.

Road Surface Condition

Many of the dirt/gravel roads are generally narrow, rutted with poor drainage, with many roadside obstructions and uncontrolled accesses (Figures 3a and 3b). While the dirt/gravel roads may be in good condition for that type of surface, they are considered to be in poor condition for normal travel. The paved roads ranged from very good condition, like 8th and North Cedar, to poor like sections of Beech Street and the I-76 Frontage Roads. Providing asphalt paving on the roads in the central village area will improve the surface conditions to excellent on these roads (the central village area is considered to be the generally developed area within the town, roughly bounded by CR 43.5 on the west, 8th Ave. on the north, Holly St. on the east, and Remington on the south). Dirt/gravel roads outside of the central village area that are rated as having poor surface conditions need not be upgraded at this time, given the low use.

Number of Lanes/Cross Sections

As seen on Figures 2a and 2b, all roads within the town consist of one lane per direction. The exceptions are the single-lane dirt alleys, and the I-76 interchange with SH 52, which contains auxiliary turn lanes. In general, lanes are narrow and shoulders are substandard or non-existent. There is a need to upgrade road cross section standards and design criteria that correspond to roadway classifications. These standards should be implemented on existing asphalt paved roads and on residential streets in the central village area.

Traffic Control

Figure 5 illustrates the existing intersection traffic control within the central village area. There are currently no traffic signals within the town. “Stop” signs appear to be appropriately placed and in good condition. There are many other signs, however, that are of varying size, colors, and conditions. There is a need for adoption and implementation of uniform sign standards.

Drainage

Drainage throughout most of Hudson is via open ditch, culverts and some storm systems. Throughout much of Town, the roads are clay, sand and gravel, which after a precipitation event, turn to mud. On one of our visits, shortly after a spring snowfall event, we noticed several two-wheel drive vehicles having great difficulty on these muddy roads. Many of the existing roadside drainage ditches do not comply with roadside design guidelines. Several culverts likely do not have adequate cover to protect from collapse, and concrete headwalls offer additional safety issues. There is a need to incorporate drainage into the development of road standards and guidelines, based on roadway classification.

3.4 Public Transportation Services

There are currently no public transportation services within the Town of Hudson. At present, there does not appear to be a need for intra-town public transportation, except for perhaps some form of “dial-a-ride” service. Further investigation is needed to determine demand for such as service.

3.5 Access

I-76 and the railroad form two major barriers that bisect the town. Currently there are two interchanges off of I-76 allowing access to Hudson – at Main Street and CR 49. However, there is no railroad crossing on CR 49, which severely limits access to Hudson from that interchange. The primary interchange at Main Street is substandard in several ways, as described above. The at-grade railroad crossing at Main Street is functional, but has safety and mobility concerns. Aside from the two major barriers, connectivity throughout Town is currently good, with a basic grid road system.

The railroad through town is a major freight and passenger route, which ultimately connects the east coast to the west coast of the United States. Trains traverse through town at a fairly high rate of speed. While we were performing our data collection, we observed a train traveling through town at almost 50 mph. During the day, trains pass through on an average of every 40-50 minutes, with delays at the Main Street crossing varying from about 1 minute to over 3 minutes, depending on the speed and length of train.

There are two private at-grade railroad crossings, and one major public at grade crossing on Main St. No fencing along the railroad property was noted. Several pedestrians were noticed crossing the tracks along Hudson Drive. The pedestrian crossing at Main Street is also substandard. While observing the Main Street crossing, we witnessed the warning lights come on and the crossbars go down, then several seconds later the lights stop and the crossbars go back up, with no train in sight. This cycle happened at least three times in less than two minutes. Several small cars went around the bars and over the tracks during this time, creating a safety concern.

To summarize, there is a need to improve safety at the existing railroad crossing, and to restrict access along the railroad property through the entire town. While having a single interchange with I-76 that has an adjacent railroad crossing is somewhat of an inconvenience, based on traffic volumes and capacity analysis, there does not appear to be an existing need for additional interchanges or railroad crossings.

3.6 Pedestrian/Bike

Very few areas of Town offer good pedestrian and bicycle facilities. Currently, it was noted that existing pedestrians and bicyclists generally utilized the roadways. Of major concern are the railroad tracks bisecting town and the designated crossing for pedestrians (discussed later). Gutter pans work well to convey storm water, but they do not add a vertical separation between motorized vehicles and pedestrians. Existing pedestrian facilities within the central village area are shown on Figure 4. There is a need for improved and continuous pedestrian and bicycle facilities in the central village area, plus need for safety improvements of the existing Main Street railroad crossing. In addition, improvements to pedestrian road crossings in the central village area are also needed.

3.7 Capacity

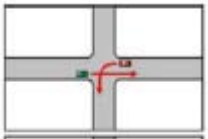
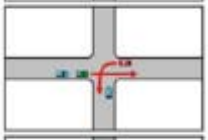
Capacity is a term utilized by transportation planners and traffic engineers to analyze roadway and roadway systems to depict their ability to convey vehicular traffic. A capacity analysis was performed for the roadway network in the project primary study area to quantify how well the

intersections are processing the traffic. **Synchro©** Version 7 software was utilized to analyze all study area intersections according to methods put forth by the Transportation Research Board's **Highway Capacity Manual** (HCM2000). This software is for modeling, optimizing, managing, and simulating traffic systems. This is the internationally recognized standard for assessing intersection operations.

Intersection operations are rated by Level-of-Service (LOS). The LOS of an intersection ranges from A to F, characterizing the operational conditions of the traffic flow (see below). LOS A represents the best operating conditions, where vehicles experience little to no delays. LOS F is a "failing grade", with high congestion and delays Typically LOS D is considered the minimum acceptable LOS appropriate for an urban setting.

A review of Table 1 (in the report appendix) indicates that all intersections in the study area are currently operation at acceptable LOS. There are no unacceptable delays, which is consistent with field observations. This indicates that traffic is flowing well, but does not indicate any measure of intersection or road safety.

Characteristics of Intersection Level-of-Service (LOS)

Intersection LOS Based on Vehicle Seconds of Delay				
Delay Description	LOS		Seconds of Delay	
			Signalized	Unsignalized
Minimal or no vehicle delay		A	≤ 10	≤ 10
Slight delay to vehicles		B	>10-20	>10-15
Moderate vehicle delays, traffic flow remains stable		C	>20-35	>15-25
More extensive delays at intersections		D	>35-55	>25-35
Long queues create lengthy delays		E	>55-80	>35-50
Severe delays and congestion		F	>80	>50

3.8 Trucks

Although truck traffic makes up only a fraction of the total traffic on the average roadway, usually under 10%, it is often the most destructive to pavement, noisiest and require special consideration due to their size, weight and longer stopping distance. We rely on trucks to deliver the goods we live on, so not allowing trucks to use town streets is unreasonable. The goal is to limit trucks to several strategic routes through and around town. Eliminating most pass-through truck traffic is very desirable.

Hudson has several roads which appear to have a high number of heavy trucks traveling on them: Main Street/ SH 52, the I-76 Frontage Roads and Beech Street. The Beech Street route is the most disconcerting, considering is passes right in front of an elementary school and through a designated school zone. There is a need to minimize the truck impacts in the central village area. A town ordinance currently prohibits the driving of a vehicle over 20,000 pounds (gross weight) on roads within the town.

3.9 Safety

Crash data was review for roads within the town, for the 4-year period from 2002 – 2005. Statistics are summarized below in Table 2 (see report appendix), while high crash locations are indicated on Figure 6. One location stood out as having a higher crash total – SH 52 at Dahlia (11 crashes). The SH 52/Dahlia crashes appears to be caused by confusion due to the unusual intersection configuration.

As the amount of traffic continues to grow on the roadways in and around Hudson, vehicular and pedestrian safety is becoming an evermore important issue. Physical roadway/pedestrian improvements should be undertaken whenever budget allows. Along with the physical improvements, the Town should also do its part in educating the public on roadway, pedestrian and railroad safety. The education can be in the form of local officials speaking at group functions, brochures, telephone 'hotline' and posting information on the Town's web site.

Improvements to the existing school zone on Beech Street are warranted. Numerous roadside obstructions were noted, including trees, rocks, etc. These should be identified and removed.

3.10 Existing Needs Summary

The following list is a summary of existing needs. Locations of some of the needs are illustrated on Figure 12. Each need was placed into one of three different categories, based on Stantec's assessment of priority. Public and Town input for desired improvements did enter into the placement of each need. The three categories of needs are:

- Tier I – very desirable, should be undertaken as soon as funding allows
- Tier II – needed and as conditions warrant, could move to Tier I, Tier II projects should be undertaken after all the Tier I are completed.
- Tier III – these are more "wish list" type items – they are still important, but should follow the Tier II improvements

Roadway Infrastructure

- Updated road classification system (I)
- Improved road alignments
    - Vertical alignment of SH 52 over I-76 (I)
    - Horizontal alignment and configuration of SH 52/Dahlia intersection (I)
    - Horizontal alignment and configuration of SH 52/Hudson intersection (I)
- Improved road design standards (I)
- Updated typical cross sections (I)
- Improved access control on existing roads, particularly along SH 52 and Hudson Drive (II)
- Improved road surfaces (I)
- Improved signing, striping and lighting (I)
    - Warning and regulatory signs per MUTCD, CDOT and FHWA guidelines (standard types, size, visibility and placement)
    - Pavement marking per MUTCD and/or CDOT guidelines (layout, visibility, life)
    - Lighting per state standards
- Improved roadside drainage and edge treatments (I)

Public Transportation

- On-call transit system (III)

Access

- Restrict railroad pedestrian access along its entire length in the Town of Hudson (except at designated crossings) (I)

Pedestrian/Bike

- Continuous pedestrian/bike facilities and improved road and railroad crossing in the central village area (I & II)
- Improve wayfinding and information signs to key destinations within the town (III)

Capacity

- No existing capacity needs
- Improve wayfinding and information signs to key destinations within the town to minimize unnecessary vehicular travel (III)

Trucks

- Minimize truck impacts in the central village area (I)
- Provide overnight parking facilities for interstate trucks near I-76 (II)

Safety

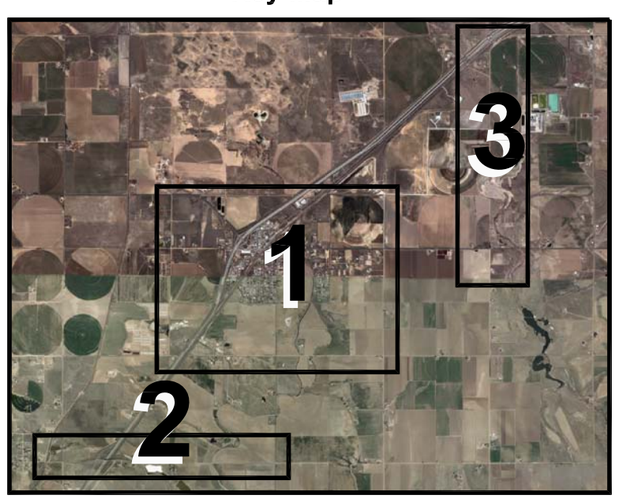
- Improve the vertical curve on the SH 52 bridge over I-76 (II)
- Reconfigure the SH 52/Dahlia intersection (II)
- Improvements at the SH 52/railroad crossing (I)
- Improvements in the Beech Street school zone (I)
- Improved pedestrian awareness (I)
- Remove roadside obstructions (trees, rocks, prohibit on-street parking) (I)

Intersection Turning Movement Count Location Map

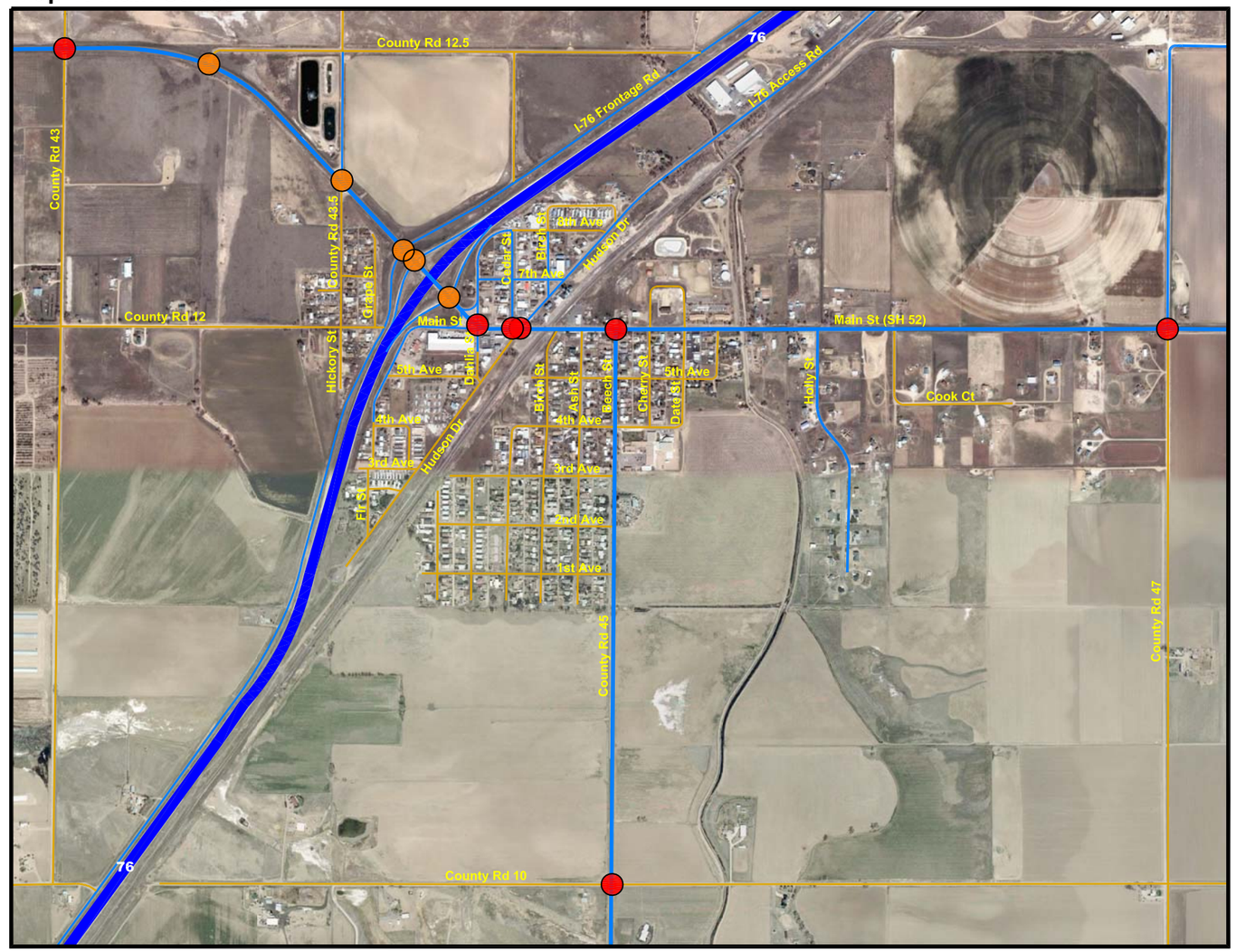
Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)

Key Map



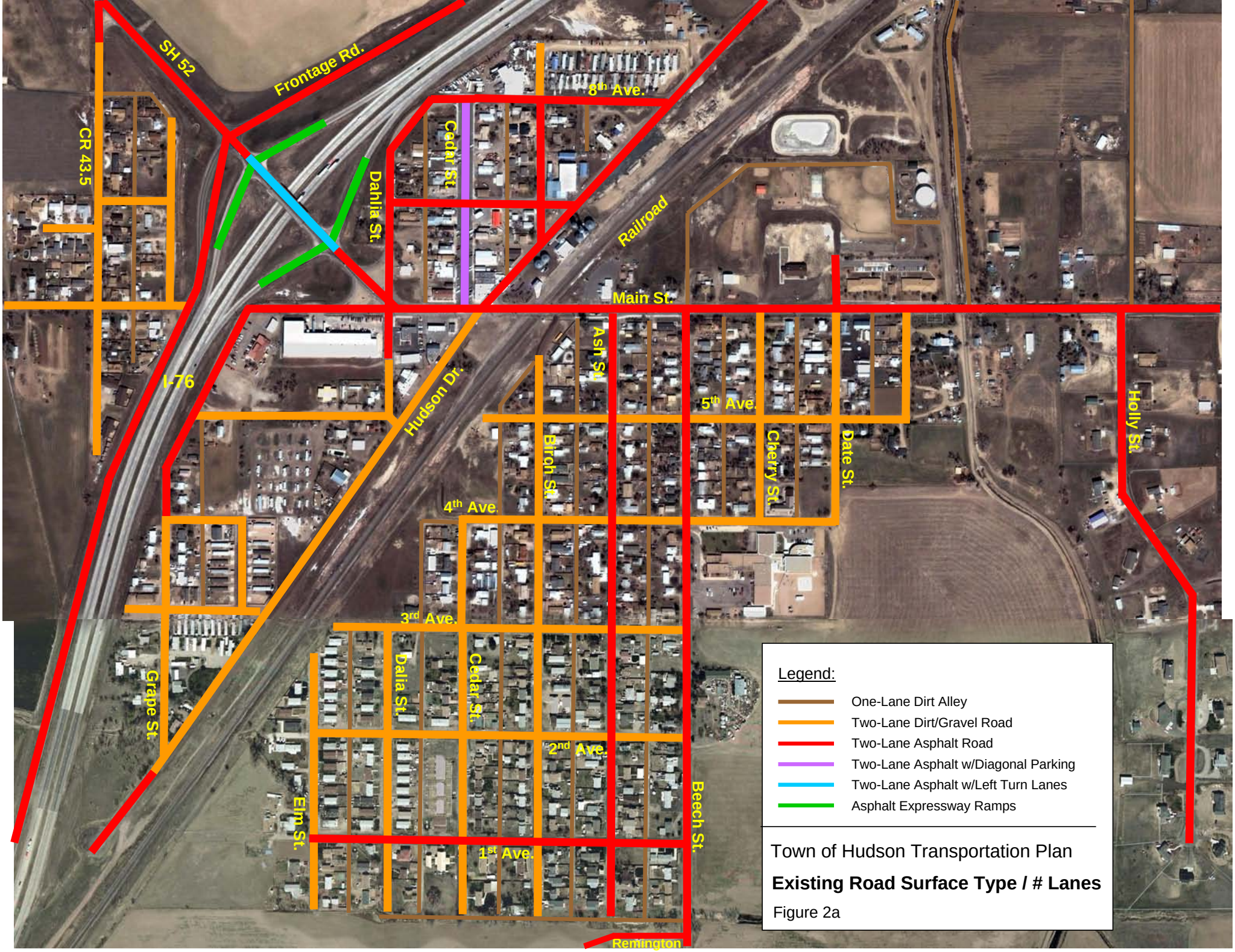
Map 1: Main Street



Map 2: County Road 8

Map 3: County Road 49

Figure 1



Town of Hudson Transportation Plan

Existing Road Surface Type / # Lanes

Figure 2a

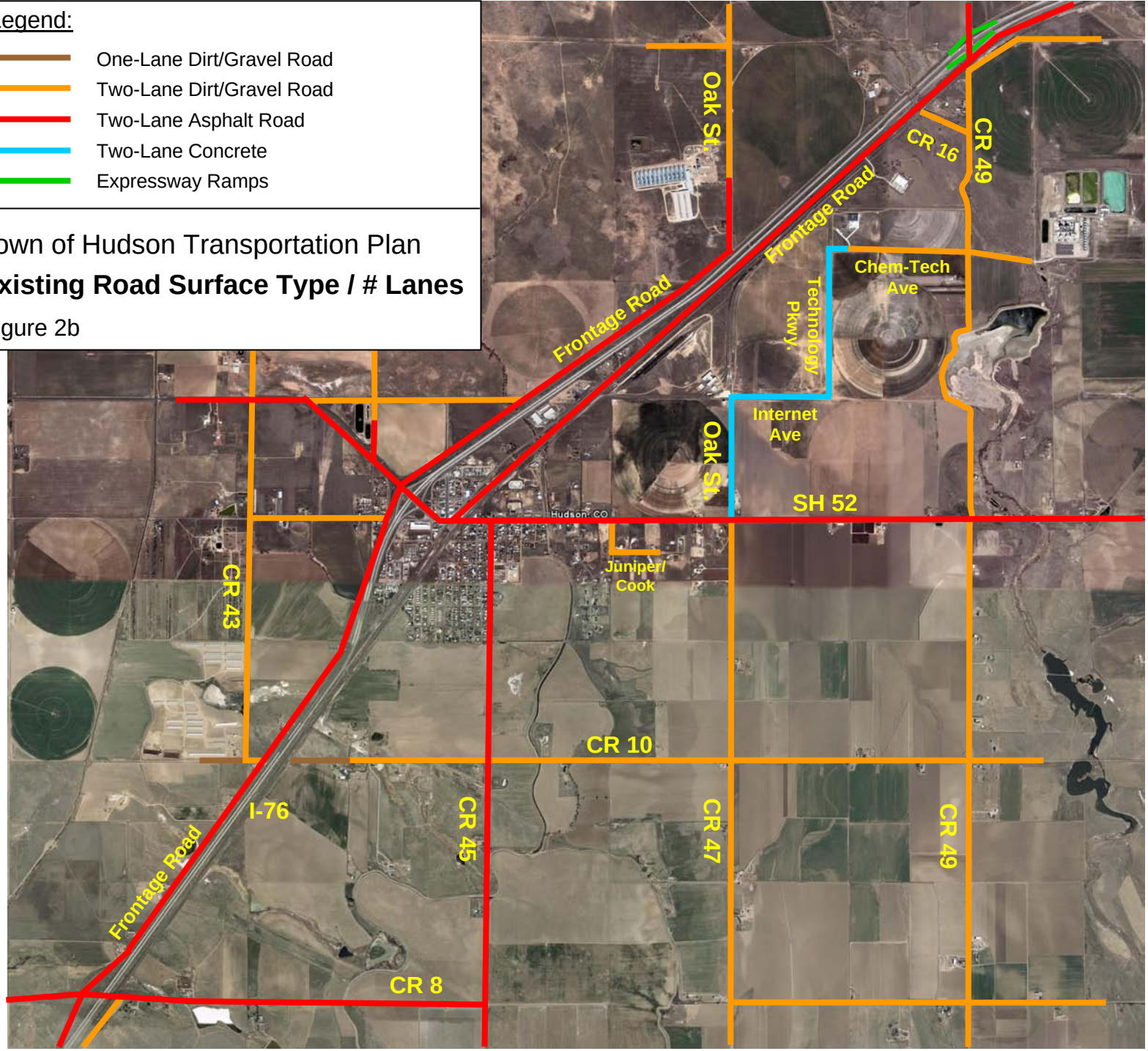
Legend:

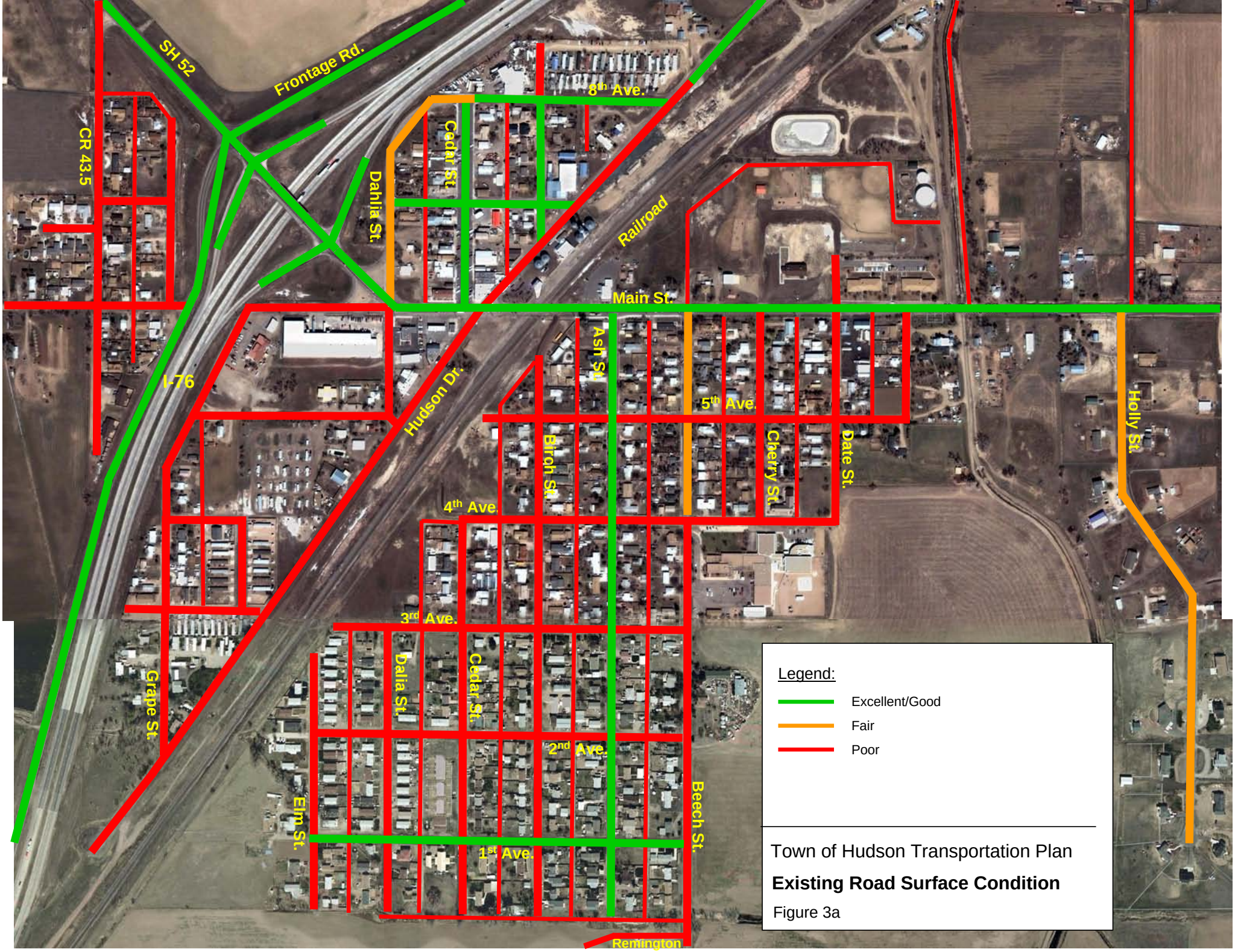
- One-Lane Dirt/Gravel Road
- Two-Lane Dirt/Gravel Road
- Two-Lane Asphalt Road
- Two-Lane Concrete
- Expressway Ramps

Town of Hudson Transportation Plan

Existing Road Surface Type / # Lanes

Figure 2b





Town of Hudson Transportation Plan

Existing Road Surface Condition

Figure 3a

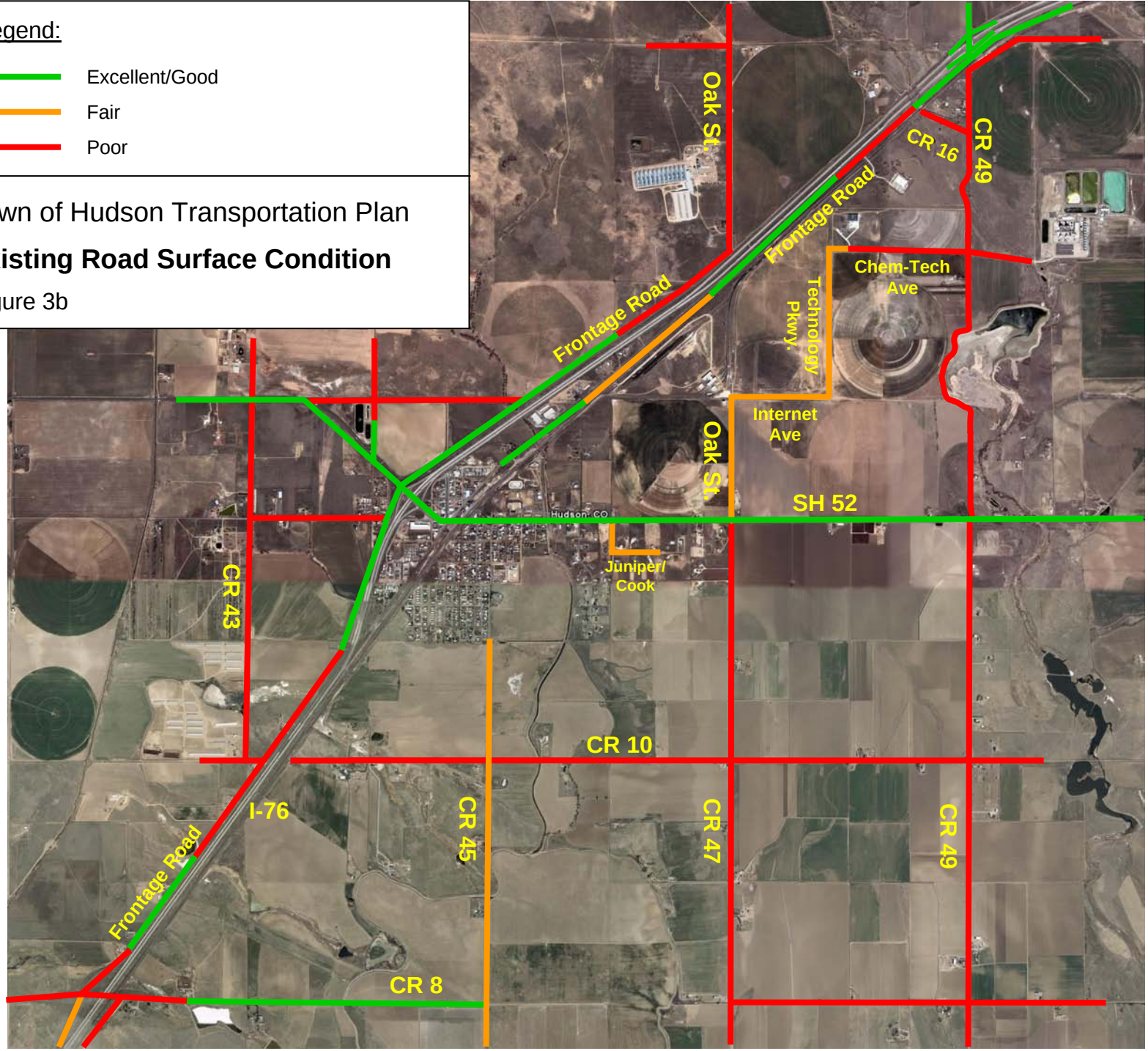
Legend:

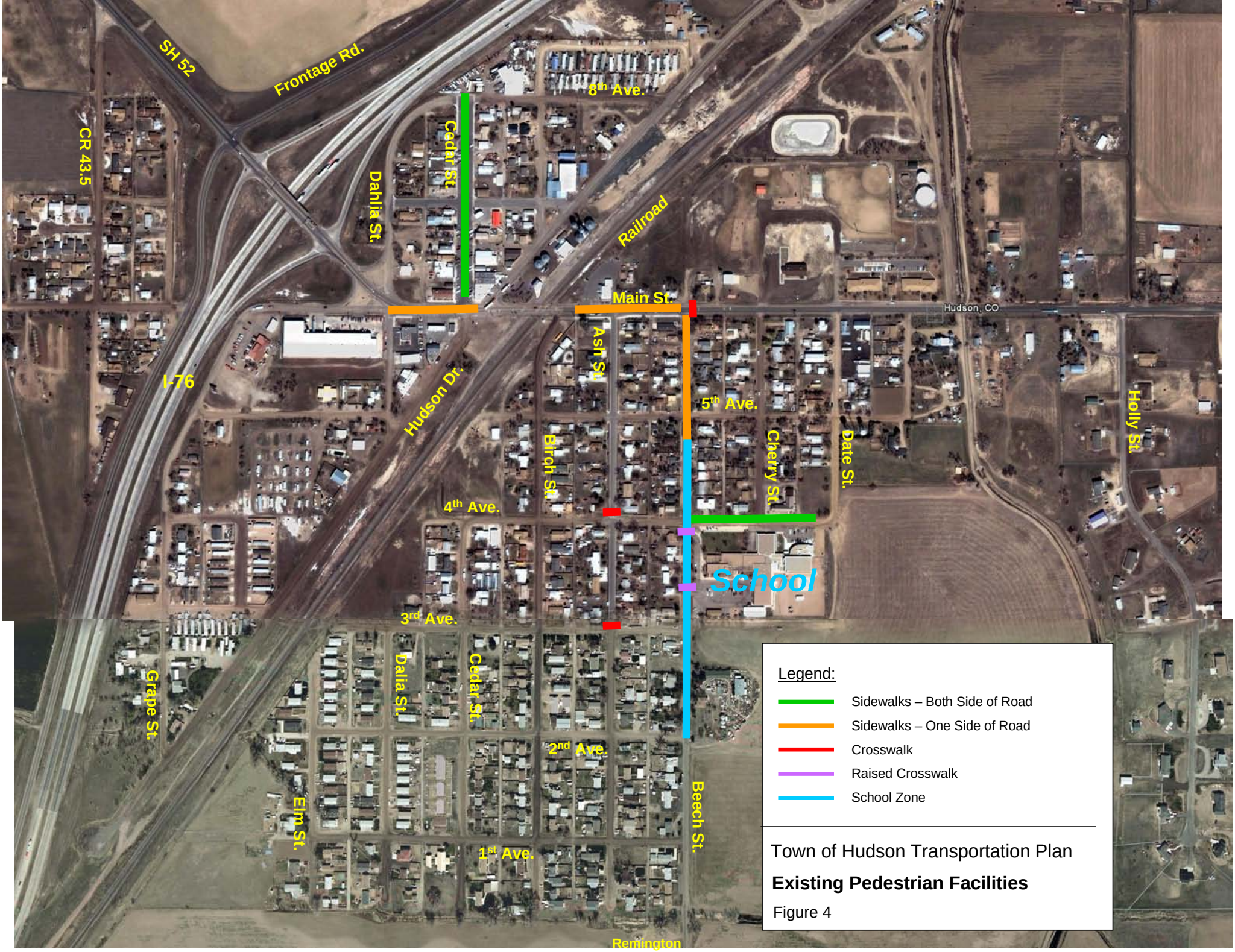
- Excellent/Good
- Fair
- Poor

Town of Hudson Transportation Plan

Existing Road Surface Condition

Figure 3b





Town of Hudson Transportation Plan

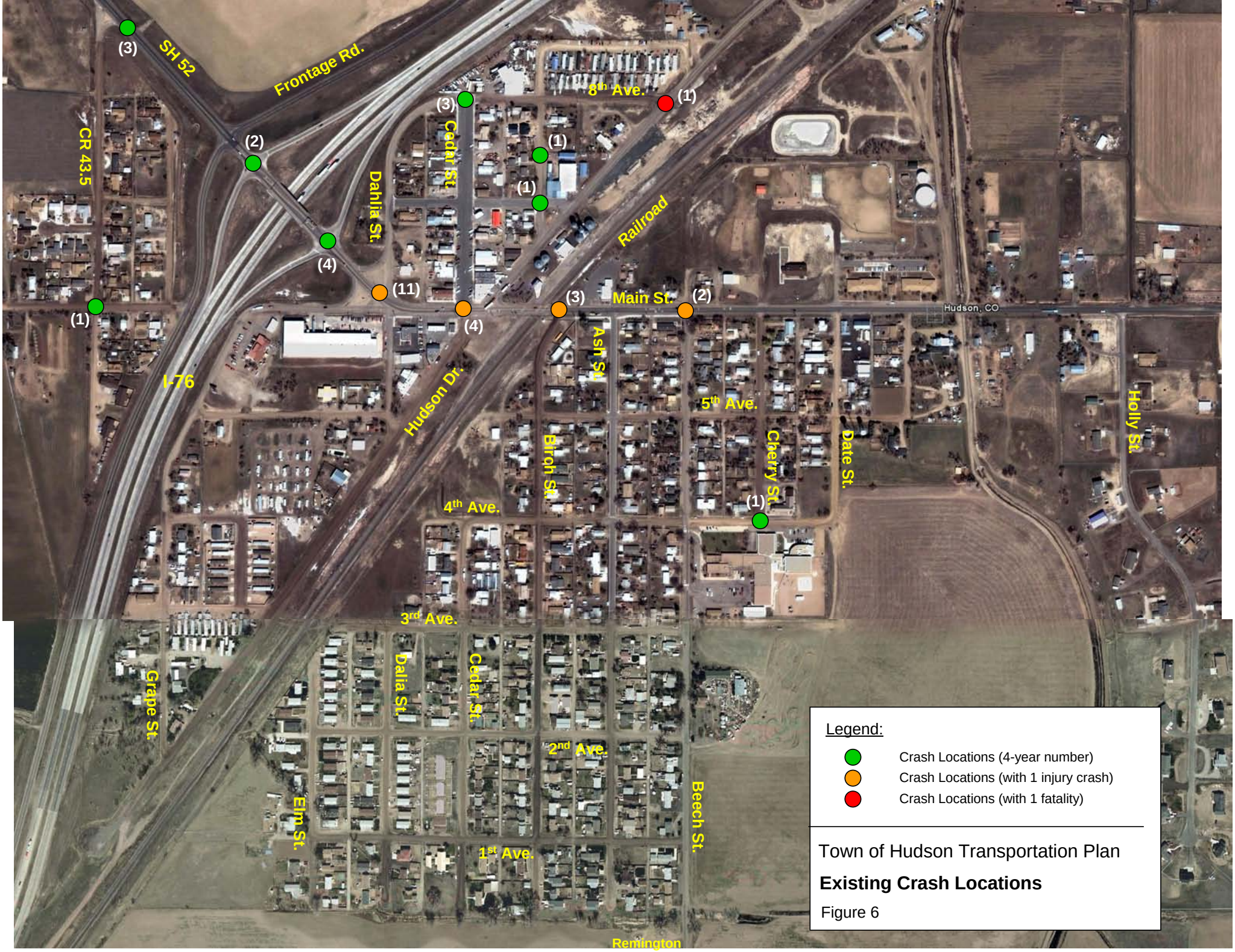
Existing Pedestrian Facilities

Figure 4

Town of Hudson Transportation Plan

Existing Traffic Control

Figure 5



Town of Hudson Transportation Plan

Existing Crash Locations

Figure 6

4.0 FUTURE CONDITIONS

In order to effectively develop a 10-year transportation improvement plan, it is essential that traffic impacts from potential future developments, both within and external to the Town of Hudson, are forecast and analyzed. By developing reasonable travel forecasts, future capacity and other needs can be assessed, forming the basis upon which future needed improvements can be determined. It is important to define what is meant by "reasonable travel forecasts".

Travel forecasting is more of an art than a science. Nobody has a "crystal ball" which can predict exactly how and when future development will occur, or what exact travel patterns will be. However, through examination of historical trends, existing travel patterns, patterns in nearby towns, and the desired land use plan of the Town of Hudson, it is possible for transportation planners to make a "best guess" at a 10-year land use plan. It is not critical that the numbers be exactly correct; rather, it is more important that general travel patterns and land uses be estimated to the extent that needed improvements can be determined. If the forecasts are within +/- 20%, then the proposed improvements will be appropriate. This plan is focusing more on the higher-cost, "larger-scale" improvements, like interchange modifications or a new railroad crossing, rather than turn lanes and traffic control upgrades. While these "smaller-scale" improvements will be examined and proposed, it is anticipated that each proposed development will need to prepare a more detailed traffic studies, and items like these will be addressed at that point.

4.1 Regional Growth and Transportation Plans

Growth in travel is mainly comprised of two primary components – travel generated by development within the Town of Hudson (internally generated), and travel resulting from growth outside of the town (externally generated). For the external component, estimates can be gleaned from forecasts prepared by regional planning agencies.

The 2035 Upper Front Range Regional Transportation Plan forecasts about 4.2% annual growth in traffic on SH 52 in the Town of Hudson. This growth includes traffic resulting from development both within and outside of the Town of Hudson. The proposed traffic volumes from the 10-year growth assumptions in the Town of Hudson represent a 6.52% annual increase in traffic on SH 52 (based on weekday evening peak hour data and projections) – far in excess of the Upper Front Range forecasts. As a result, it was assumed that all of the regional traffic growth would occur due to this development in Hudson, and no background traffic growth rate was applied.

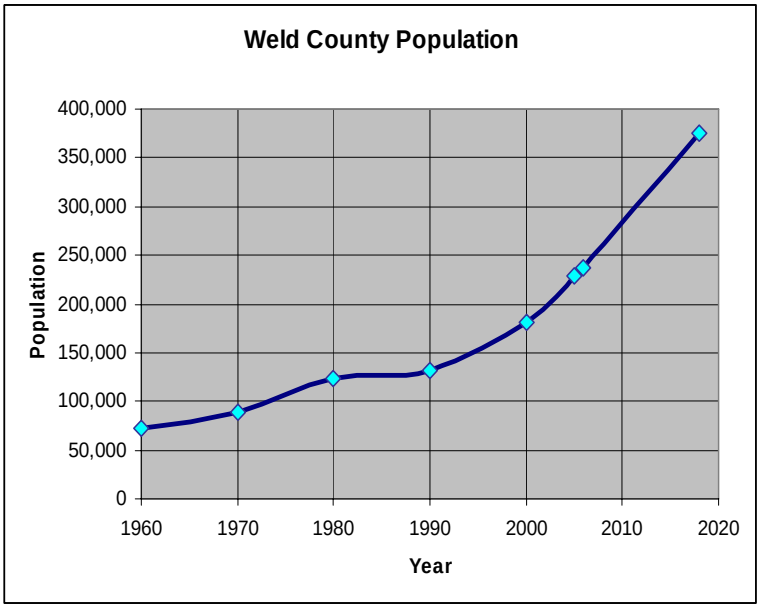
The one exception was the proposed Pioneer Development – a major, multi-phased new community development proposed to the northeast of Hudson. The development includes construction of new interchanges, and major interchange upgrades as it is phased over 20 or more years. The "Pioneer Development Traffic Impact Analysis", prepared by LSC Transportation Consultants, Inc. in 2007, presented the travel forecasts for the development by phase and year. The 2016 forecasts were added to the existing volumes for the purposes of this Town of Hudson Transportation Plan. The Pioneer Development 2016 Forecasts will only impact the I-76/CR 49 interchange within the Town of Hudson.

4.2 10-Year Land Use Plan

The Town of Hudson adopted a Comprehensive Land Use Plan in June 2007 (Figure 7). This plan presented a vision for desired build-out land use in the Town. Land use types and anticipated densities were illustrated, but it was understood that this plan may take decades to be realized.

In order to develop a list of 10-year future needs, it was necessary to make assumptions regarding how much of the Land Use Plan will be realized within a 10-year horizon. Based on inquiries received from developers to date, current planned developments, and estimates regarding potential supporting development, the anticipated 10-year growth was forecast and is illustrated on Figure 8. Table 3 presented the various assumptions and calculations used to develop this 10-year forecast.

For the residential component, the State Demographer's 10-year forecast for population growth in Adams/Weld counties is 194,673 people. Pioneer Communities' estimate of market capture in the I-76 corridor was between 25% - 40%. Taking an average of 32.5% and assuming 40% of that is in Southern Weld County equals 25,307 people. If we assume that Hudson would capture about 20% of this southern Weld County/I-76 market, then 5,061 people will move into Hudson by 2018. Assuming 3 people per household, this translates to 1,687 housing units. To be conservative and to make sure the major improvements will be sufficient, 1,900 housing units were assumed for the 10-year forecasts.



Source: US Census Data

For commercial development, 760,000 square feet is assumed, to occur mostly around the SH 52 and CR 49 interchanges. This translates to about 120 square feet of commercial per person in Hudson, which is on the high side, but is reasonable as it includes a significant amount of highway-oriented commercial, where people stop to shop as they are passing by on I-76 and do not live in Hudson.

The final major component is industrial development, which will likely occur in two places – at and near the prison site to the north, and on the proposed industrial lands bounded by SH 52, CR 49 and the railroad tracks. There have been recent, serious inquiries regarding developments of several sites on these lands, so the probability of significant industrial development occurring within the next 10 years is high. The assumption was made that about 35% of the industrial land will be developed by 2018, translating to about 2,541,000 square feet.

4.3 10-Year Future Travel Projections

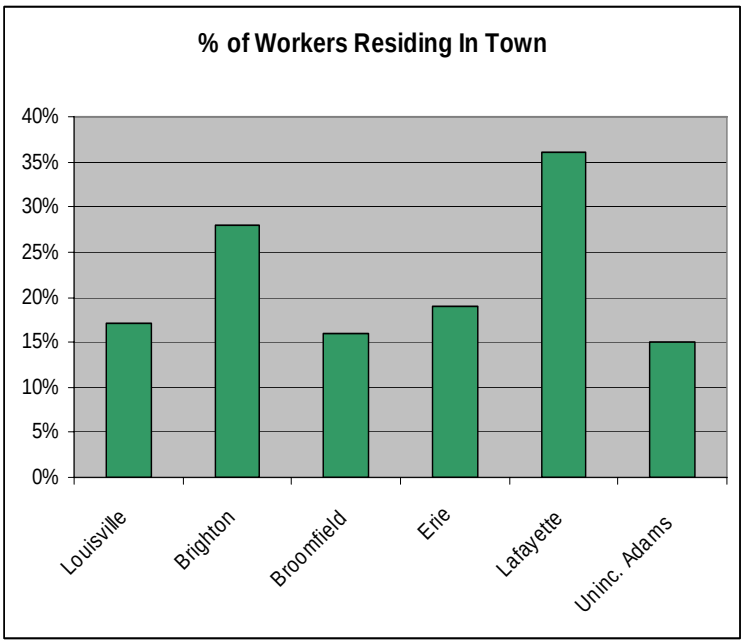
The 10-year land use assumptions needed to be converted into vehicular trips in order to analyze road capacity in the year 2018. Also, traffic anticipated to occur from development outside of the Town of Hudson that may travel through Hudson, must be assessed.

The next step in developing the 10-year future travel projections was translating the development assumptions into vehicular trips. The traffic generated by this development was estimated based on trip rates and equations from ITE *Trip Generation (7th edition, 2003)*. This is the nationally accepted standard reference for trip generation rates. Rates were used to estimate weekday morning and evening peak hour trips and daily trips (Table 4).

The assignment of these trips to the road network was a bit more complicated. Normally, a travel demand computer model would be used to simulate the complex interactions of trips between land uses, applying a standard gravity model. A gravity model applies the theory that people are more likely to travel from origins (residences) to destinations (commercial, industrial) that are closer. Without a travel demand model, this distribution and assignment needed to be estimated "manually", one development at a time.

Residential trips needed to be split into two components – those that are destined to work and those destined to other places, like shopping, school, etc. No data was specifically available for the Hudson area, but applying typical percentages, it was assumed that 80% of the morning peak hour trips from homes were destined to work, while only 50% of the evening peak hour trips to home were from work. This is logical as people tend to shop and do other activities in the late afternoon and evening.

The work trips from home needed to be divided even further – into those who work in Hudson and those who commute to other towns and cities. Workforce Commuting Pattern data from the Denver Regional Council of Governments (DRCOG) was examined – particularly for those communities that were somewhat similar in size and distance from Denver as Hudson is. Data for six different towns on the north side of the Denver Metro area, plus unincorporated Adams County, revealed that 15% - 36% of the residents worked in the town. To be conservative, it was assumed that 30% of Hudson's residents would work in Hudson. Given the high assumed amount of industrial development over the next 10 years, this is a valid assumption.



The final assumption was regarding trip distribution. For trips to and from outside of Hudson, 25% was assumed to come to/from the southwest via I-76, 25% from the west via SH 52, 15% from the northeast via I-76, 15% from the east, 10% from the south and 10% from the north via county roads.

Employing all of these assumptions, trips were applied to the road network for each of the developments. The 10-Year Development Volumes and the 2018 Total Volumes (existing plus Pioneer Development plus the 10-year development forecasts) are located in the report appendix.

4.4 2018 Future Capacity Conditions

A capacity analysis was performed for the roadway network in the project primary study area to quantify how well the intersections will process traffic, assuming the 2018 total traffic forecasts. **Synchro©** Version 7 software was used again. Table 5 (see the report appendix) presents the 2018 Levels of Service.

A review of Table 4 indicates that unacceptable levels of service will be experience at many study area intersections, especially along SH 52/Main Street and at the I-76 interchanges with SH 52 and CR 49. Table 4 does not include any improvements, including additional railroad crossings or new interchanges.

4.5 Future Railroad Activity

Information was unavailable concerning potential future railroad activity along the existing rail line through Hudson. With recent economic changes, it is difficult to forecast the extent of activity on this BNSF rail line. However, when a line is used not only by BNSF, but also UP and Amtrak, with the expected continued population growth along the Front Range, and with the planned developments in Hudson, traffic along this rail line is sure to increase over the next decade. Rail traffic will also likely increase as a result of industrial developments within the Town of Hudson.

This increased railroad activity, coupled with the large forecast increase in traffic along SH 52 due to the development in Hudson, will produce significantly greater delays and queues at the existing single railroad crossing. This will have negative impacts on commerce, emergency vehicle access, and general quality of life in the village area.

4.6 Future Needs

Many of the existing needs, described in Section 1.8, will continue to grow as development and traffic increases.

Roadway Infrastructure

Major travel ways and access roads will need to be designed and upgraded to provide sufficient infrastructure to meet current standards. This will include pavement, drainage, signing, striping, traffic control and other associated items. As new developments occur, these needs will extend to the development location, so that sufficient access if provided to I-76 and the village area.

Public Transportation

If the forecast level of development occurs within the next 10 years, Hudson will draw upon other communities within the Denver metro area for its employment base. Conversely, people that will reside in Hudson will desire to travel to other communities. In order to minimize automobile travel in the town, there will be a need for regular transit service, in the form of both bus service to and from Denver and surrounding communities, but also potentially a service within the town.

Access

A new grade-separated crossing of the railroad at CR 49 is needed to provide sufficient access to the potential industrial developments in the SH 52/CR 49 area, and to provide an alternative emergency vehicle access route. A new interchange at either CR 8 or CR 10 will be needed to

provide an alternative access for trucks traveling to and from the southwest on I-76, to minimize truck impacts on the central village area. This new interchange is also needed to provide improved access to the south side of town, thereby making the area more attractive for development.

Pedestrian/Bike

Pedestrian and bicycle connections will be needed between new residential and industrial developments, and key destinations, such as retail areas and downtown. More recreational trails will also be needed to maintain the present quality of life.

Capacity

It is clear that the SH 52 corridor is not capable of handling the forecast traffic load under its current configuration. There will be a need for increased capacity along SH 52 through most of the town, as well as at the I-76 interchanges with SH 52 and CR 49.

Adding a new railroad crossing at CR 49 will also provide increased capacity by diverting a significant amount of traffic destined to proposed industrial and retail developments, away from the SH 52 corridor. It is also evident the upgrades in traffic control, as well as separate turning lanes, will be needed at many key intersections. In order to reduce unnecessary travel, a better system to direct people to key destinations is needed.

A new interchange at either CR 8 or CR 10 will also be needed to provide additional system capacity, particularly to divert truck traffic off of Beach St. and SH 52 in the central village area.

Trucks

The industrial developments will undoubtedly generate a significant number of new heavy trucks in the town. There will be a need to accommodate these trucks so that impacts to residential areas and the village area are minimized. As mentioned above, a new interchange is needed from I-76 at either CR 8 or CR 10 to provide an alternative access for trucks, to minimize truck impacts on the central village area.

Safety

As congestion grows, the number of crashes is expected to increase. Safety along the SH 52/Main Street corridor will be the top safety concern, as high congestion will mix with high pedestrian volumes in the business core. Safety concerns along Beech Street will also increase, particularly in the school zone. With more traffic, delays caused by the railroad crossing will also increase significantly, thereby increasing the chance that people will drive around the lowered gates.

4.7 Future Opportunities and Constraints

Forecast future development will present both tremendous opportunities and difficult constraints:

<u>Opportunities</u>:

- Fund needed transportation improvements through the use of impact fees
- Provide an additional access point to the central village area by crossing the railroad at CR 49, and to I-76 at CR 8 or CR 10
- Develop a continuous pedestrian and bicycle network

- Construct and improved drainage system
- Increase the economic viability and attractiveness of Hudson

Constraints:

- Funding for solutions to existing needs.
- Right-of-way needs for improvements
- Meeting requirements of FHWA, CDOT and BNSF railroad
- Upgrading town services to meet the future development demands
- Changing the mindset and culture of the town from rural to suburban. Hudson residents are used to a generally rural environment, with limited development and low traffic volumes. If development occurs as forecast, traffic volumes will increase, and the town will begin to have a more suburban character. Road standards, traffic control and pedestrian facilities will have to expand and improve to match the new travel and development characteristics. Residents will need to understand the implications of the planned developments.

Table 3

TOWN OF HUDSON
10-YEAR GROWTH FORECAST

Development Name	Development Acres	Buildout: Residential Units	Buildout: Commercial Sq. Ft.	Buildout: Industrial Sq. Ft.	% Buildout in 10 years	Residential Units*	Commercial Sq. Ft.**	Industrial Sq. Ft.**
Hudson Hills	150	150	0	0	100%	200	0	0
Andrews	36	84			100%	100	0	0
Prison site	126			230,000	100%	0	0	230,000
Sand Hills remainder	194			1,267,596	10%	0	0	127,000
Hudson Village Square remainder	38		331,056		100%	0	331,000	0
Boulder Scientific	85			300,000	100%	0	0	300,000
Shaklee Property, Residential	290	813			50%	400	0	0
Shaklee Property, Commercial	99		858,132		50%	0	429,000	0
Shaklee Property, Industrial	51			333,234	30%	0	0	100,000
Hudson Industrial Park	460			3,005,640	35%	0	0	1,052,000
Taoka Property	320			2,090,880	35%	0	0	732,000
Misc other residential	600	2400			50%	1200	0	0
TOTALS	**2448**	**3447**	**1,189,188**	**7,227,350**		**1,900**	**760,000**	**2,541,000**

* Rounded to nearest 100 RU
** Rounded to nearest 1,000 SF

Assumptions:			
% of residential land in public use:			30%
% of commercial land in public use:			20%
% of industrial land in public use:			20%
Average people/du			2.78
	average du/acre (net)	**FAR**	**sq. ft. / job**
Urban	5		
MF	8		
Suburban	3		
Estate/rural residential	1		
MU is half residential 5/ac and half business			
Retail			400
Office		0.2	250
Industrial		0.15	1000

Table 4

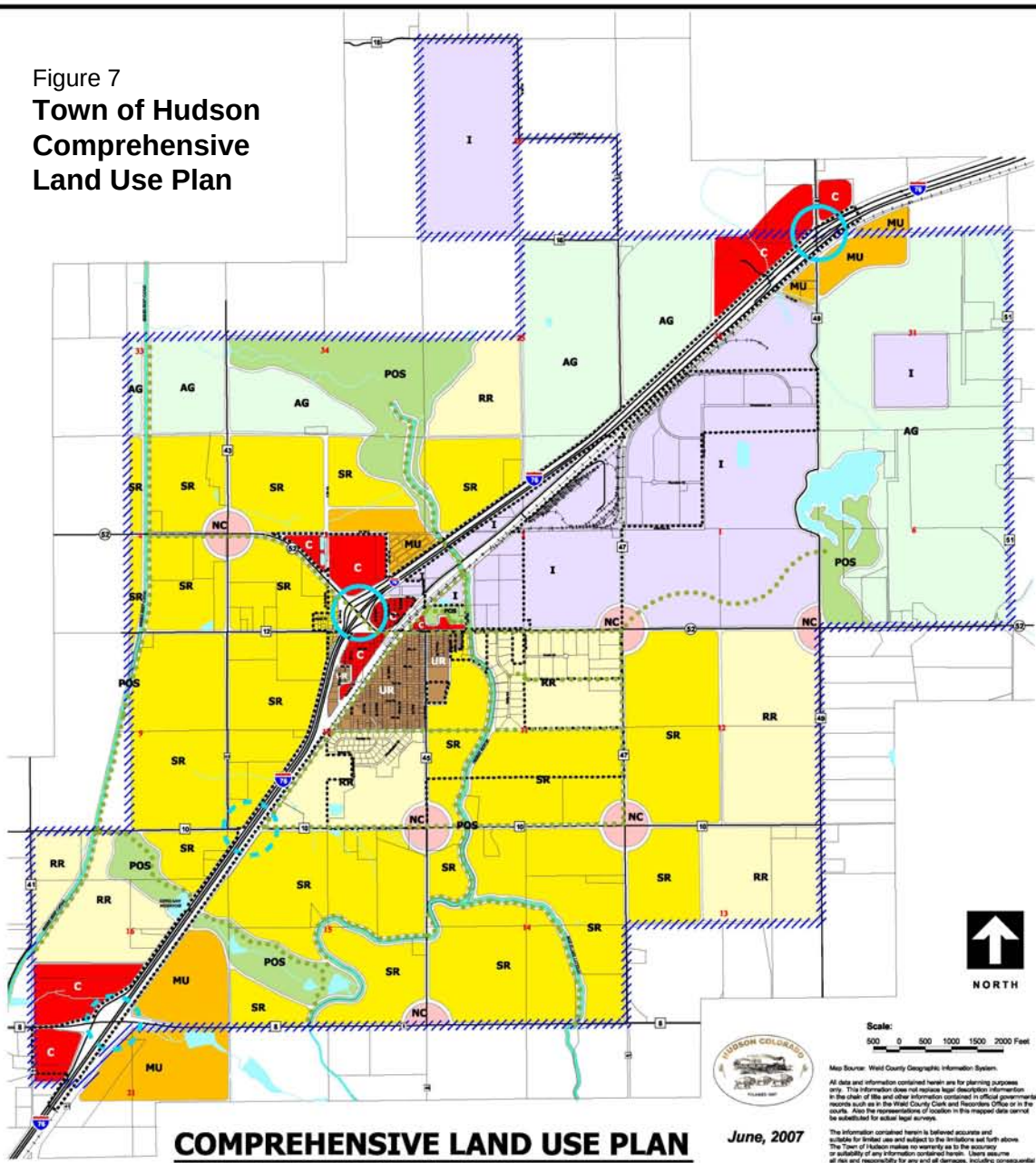
TOWN OF HUDSON
10-YEAR GROWTH FORECAST
Trip Generation

Development Name	Residential Units	Commercial Sq. Ft.	Industrial Sq. Ft.	*TRIP GENERATION (ITE)* AM Peak Enter	AM Peak Exit	PM Peak Enter	PM Peak Exit	Daily 2-Way
Hudson Hills	200	0	0	38	112	128	74	1,914
Andrews	100	0	0	19	56	64	37	957
Prison site	0	0	230,000	186	25	28	198	1,603
Sand Hills remainder	0	0	127,000	103	14	15	109	885
Hudson Village Square remainder	0	331,000	0	209	132	596	645	14,213
Boulder Scientific	0	0	300,000	243	33	36	258	2,091
Shaklee Property, Residential	400	0	0	76	224	256	148	3,828
Shaklee Property, Commercial	0	429,000	0	270	172	772	837	18,421
Shaklee Property, Industrial	0	0	100,000	81	11	12	86	697
Hudson Industrial Park	0	0	1,052,000	852	116	126	905	7,332
Taoka Property	0	0	732,000	593	81	88	630	5,102
Misc other residential	1,200	0	0	228	672	768	444	11,484
TOTALS	**1,900**	**760,000**	**2,541,000**	**2,898**	**1,648**	**2,889**	**4,370**	**68,528**

Trip Generation Rates	AM Peak Enter	AM Peak Exit	PM Peak Enter	PM Peak Exit	24-Hour 2-Way
Residential (Single Family Detached)	0.19	0.56	0.64	0.37	9.57
Retail (Shopping Center)	0.63	0.40	1.80	1.95	42.94
Industrial (General Light Industrial)	0.81	0.11	0.12	0.86	6.97

Figure 7

Town of Hudson Comprehensive Land Use Plan



COMPREHENSIVE LAND USE PLAN
TOWN OF HUDSON, COLORADO

LAND USE CATEGORIES

RR Rural Residential

Density: Less than two dwelling units per acre.

Land Uses: Rural Residential development is predominantly single-family, detached homes on small acreages of over 1/3 acre. Road improvements will not necessarily include a full street section with curb, gutter and sidewalks. Open space will focus more on equestrian and other types of trails and community or regional parks. Because residents have larger private lots there will be less dependence on neighborhood parks.

A Rural Residential area can accommodate both large lot development and cluster development in which low overall densities are preserved in small clusters of homes combined with commonly-owned open space.

SR Suburban Residential

Density: Two to five dwelling units per acre.

Land Uses: Predominantly detached residential development with allowance for small attached, small neighborhood-compatible commercial or mixed-use components. Assuming that about 30% of land is absorbed by streets and other non-residential uses, residential lot sizes in this category would range from about 6,000 to 15,000 square feet. Streets should be a full paved section with curb, gutter and sidewalk. Parks and trails should provide for off-street circulation. Neighborhoods should be centered on schools or other public activity centers to encourage neighborhood cohesion.

UR Urban Residential

Density: Greater than five dwelling units per acre.

Land Uses: Detached single family on small lots, zero lot line, attached and multi-family residential development.

MU Mixed Use

Density: Dependent upon the approved PUD or site plan. Will tend to be higher-density, with the possibility of land uses mixed within individual buildings.

Land Uses: A mixture of land uses such as retail, office, entertainment, and residential. Compatibility is dependent upon design and approval of a PUD or site plan. May also include specialized land uses such as public facilities, senior citizen facilities, and recreation. Mixed-use developments tend to encourage walking.

C Commercial

Density: Density in commercial areas is dependent upon the floor area ratios and setbacks identified in the zoning code. Overall, the floor area ratio will be approximately 0.2.

Land Uses: This is a generalized category that can apply to a variety of central business, highway-oriented, office/flex space, or neighborhood commercial developments. The marketplace and the Town's zoning and site plan processes will influence the character of commercial development on particular parcels.

NC Neighborhood Commercial

Density: Density in Neighborhood Commercial areas is dependent upon the floor area ratios and setbacks identified in the zoning code. Overall, the floor area ratio will be approximately 0.2.

Land Uses: These are possible locations for neighborhood oriented, low intensity commercial development. The commercial development in these areas provide convenient access to basic goods and services to residents of nearby neighborhoods.

I Industrial

Density: Floor area ratios will typically be in the 0.15 range.

Land Uses: Uses that provide employment opportunities. Both light industrial uses such as warehousing and heavy uses such as manufacturing, and institutional uses can be accommodated with appropriate on- and off-site design.

AG Agricultural

Density: Forty acres or larger parcels.

Land Uses: Farming, ranching, equestrian centers, grazing of farm animals and other low-intensity agricultural uses that are compatible with nearby developments. Agricultural land may be considered for annexation to the Town and held for future development.

POS Park and Open Space

Density: N/A. Site size will depend on function as neighborhood, community or regional parks.

Land Uses: May be passive open space or active parks with developed recreation facilities. Parks, trails and recreation facilities can serve as activity centers for neighborhoods and as gathering places for people from throughout the community.

Town Limits

Growth Management Area

Existing and Proposed Arterial Streets

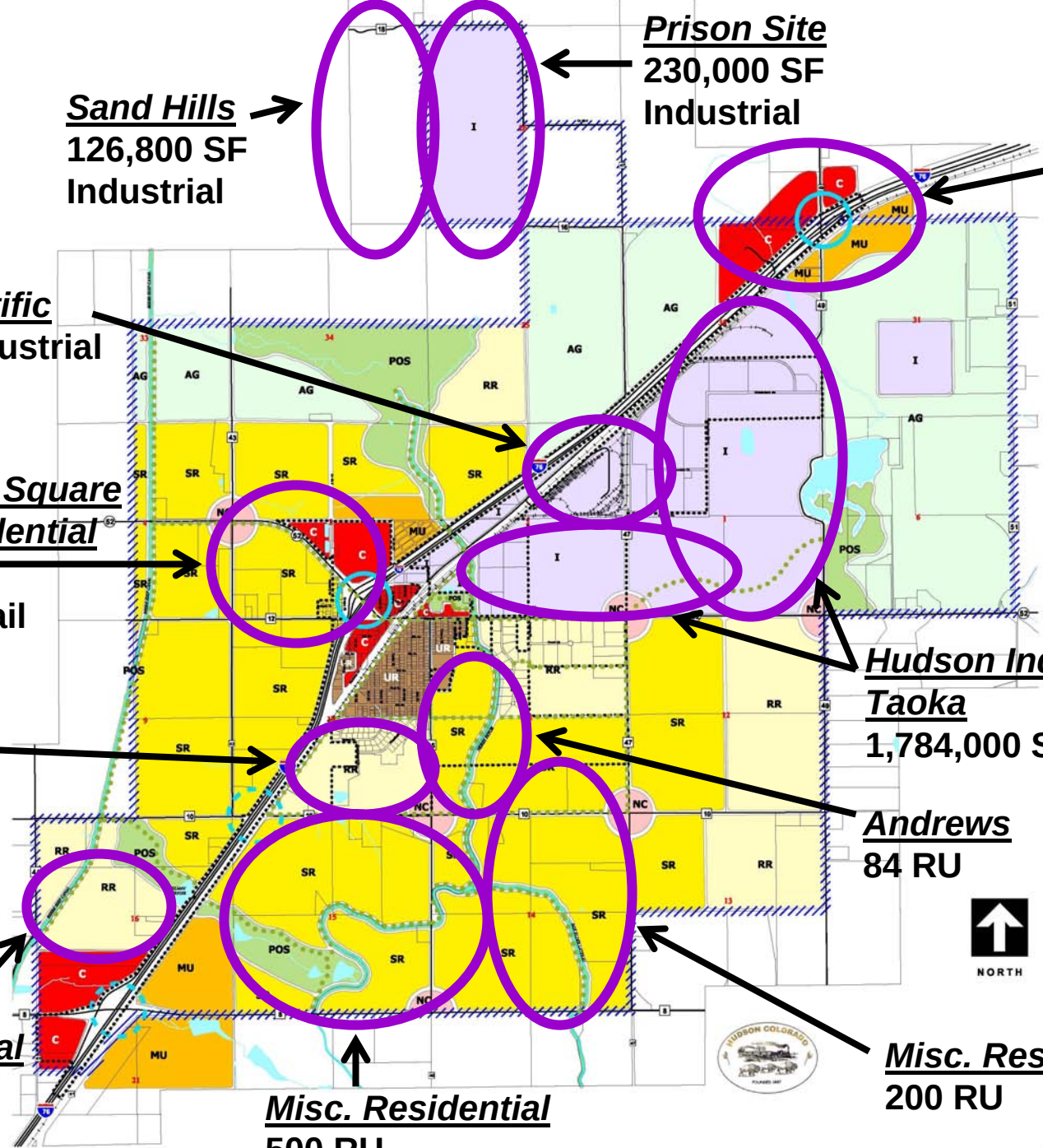
Conceptual Pedestrian and Bicycle Trails or Bike Lanes. Specific Location to be Determined Later.

Existing I-76 Interchange Area

Future I-76 Interchange Area

Figure 8

Anticipated 10-Year Growth



5.0 IMPROVEMENT ALTERNATIVES

Improvement alternatives were developed that fill the identified existing and future needs. Ideas for alternatives were generated through discussion with Town of Hudson officials, engineering analysis, and Stantec's experience with similar transportation plans. In many cases, there is only one obvious alternative. Where appropriate, alternative variations are mentioned and should be studied further to determine which would be feasible and best meet identified needs.

This section presents the alternatives that satisfy existing and future needs separately. Each of the two sections was further organized by type of need – roadway infrastructure, public infrastructure, access, pedestrian/bike, capacity, trucks, and safety.

Existing Conditions

Roadway Infrastructure

Specific Need	Potential Solutions
Road Classifications	Develop and Implement a Road Classification System (illustrated in Project Recommendation section)
Vertical Alignment - SH 52 over I-76	Interchange improvements associated with future development (see next section)
Horizontal Alignment - SH 52/Dahlia	Intersection improvements associated with future development (see next section)
Horizontal Alignment - SH 52/Hudson Dr.	Intersection improvements associated with future development (see next section)
Road Design Standards	Develop and Implement Road Design Standards
Typical Cross Sections	Develop and Implement Typical Cross Sections Associated with Road Classifications (illustrated in Project Recommendation section)
Improved Access Control on Existing Roads	Develop and Implement Access Control Standards
Improved Road Surfaces	Pave remaining dirt/gravel roads in the Central Village Area (illustrated in Project Recommendation section)
Improve appearance, placement and visibility of signs and striping	Develop and Implement Sign and Striping Standards
Improve roadside drainage	Develop and Implement Drainage Design Standards as part of Road Standards

Public Transportation

Specific Need	Potential Solutions
On-Call Transit	Develop and Implement a Call-n-Ride Service

Access

Specific Need	Potential Solutions
Restrict Railroad Pedestrian Access	Fencing along both sides of railroad right-of-way within the Town of Hudson, except at designated crossings

Pedestrian/Bike

Specific Need	Potential Solutions
Continuous Pedestrian/Bike Facilities and Improved Crossings in Central Village	Provide sidewalks, striped crosswalks and improved pedestrian crossing signs, where needed (illustrated in Project Recommendation section)
Improve wayfinding and information signs to key destinations within the town	Develop a standard town wayfinding sign system and place at key locations along trails and sidewalks to direct people to important town destinations.

Capacity

Specific Need	Potential Solutions
Improve wayfinding and information signs to key destinations within the town	Develop a standard town wayfinding sign system and place at key locations along roads to direct people to important town destinations.

Trucks

Specific Need	Potential Solutions
Minimize truck impacts in Central Village	Truck weight restrictions are currently in-place on Beech Street. Install additional traffic calming measures on SH 52 and Beech Street to minimize truck impacts (such as bump-outs, neckdowns, speed tables and raised crosswalks)
Provide overnight parking facilities for trucks near I-76	Loves truck stop provided some facilities, but trucks are still parked overnight on the I-76 ramps and services roads. Provide an additional truck lot off of SH 52 on the west side of I-76.

Safety

Specific Need	Potential Solutions
SH 52 / Railroad Crossing	Signal, gate and channelization improvements
Improve Beech Street school zone	Signs, striping, better raised crosswalks
Improved pedestrian awareness	Education and sign program
Remove roadside obstructions	Identify and remove obstructions as part of implementation of cross section standards

Future Conditions

Roadway Infrastructure

Specific Need	Potential Solutions
Improved Road Surfaces	Pave Remaining Town Roads Variations: Cross section, drainage
Upgrade CR 49 from SH 52 to Railroad to Collector Road	45 mph Design Speed on Curves, appropriate cross section
Realign CR 49 at SH 52	Realign southbound approach
Provide road facilities that meet classification and handle future traffic	Upgrading town roads outside of central village area to proper design standards
Access Control on New Paved Roads	Implement Access Control Standards
Improved Roadside Drainage	Implement Drainage Design Standards

Example Wayfinding Signing

Public Transportation

Specific Need	Potential Solutions
Transit to connect Hudson with Denver Metro Area	Regional Bus Service to Minimize Car Travel

Access

Specific Need	Potential Solutions
Additional Railroad Crossing	Railroad Crossing near CR 49 (under railroad). Variations: see sketch below
Additional I-76 Access	Partial Interchange at CR 8. Variation: Interchange at CR 10, Full Interchange

CR 49 Railroad Underpass Variations

CR 8 / I-25 Half Diamond Interchange

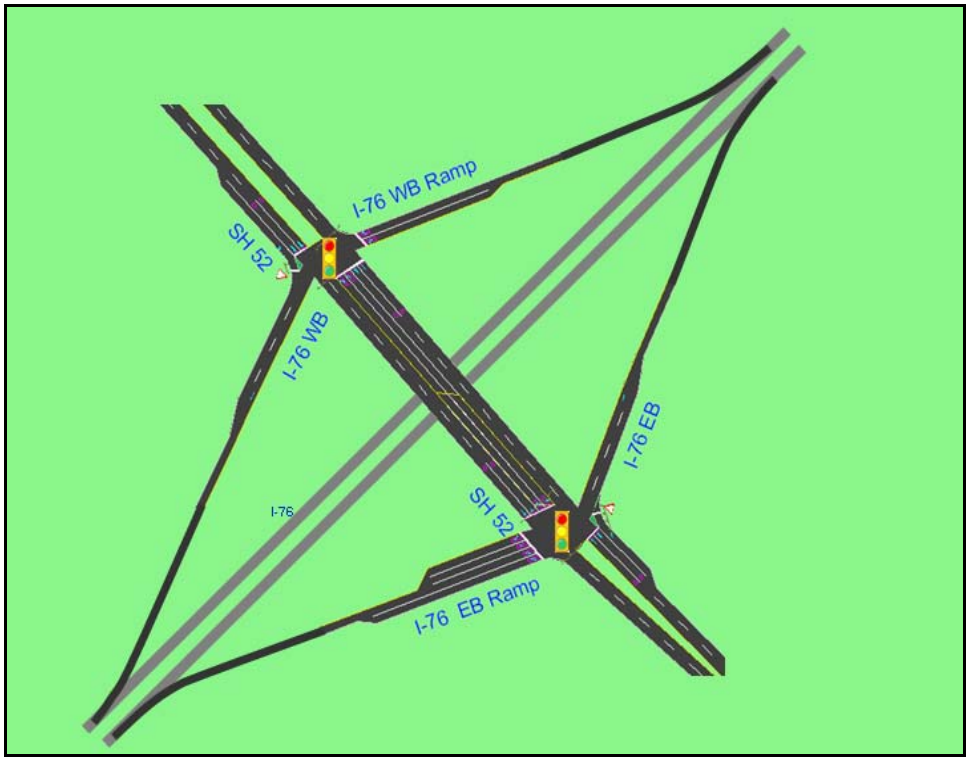
Pedestrian/Bike

Specific Need	Potential Solutions
Improve pedestrian crossing safety along SH 52	Pedestrian signals, signs and striping at signalized intersections. Consider raised crosswalks, bump-outs and neckdowns in central village area.
Accommodate pedestrians and bicyclists	Construct pedestrian and bicycle facilities connecting new developments with the central village area and key destinations. Consider a town trail system.

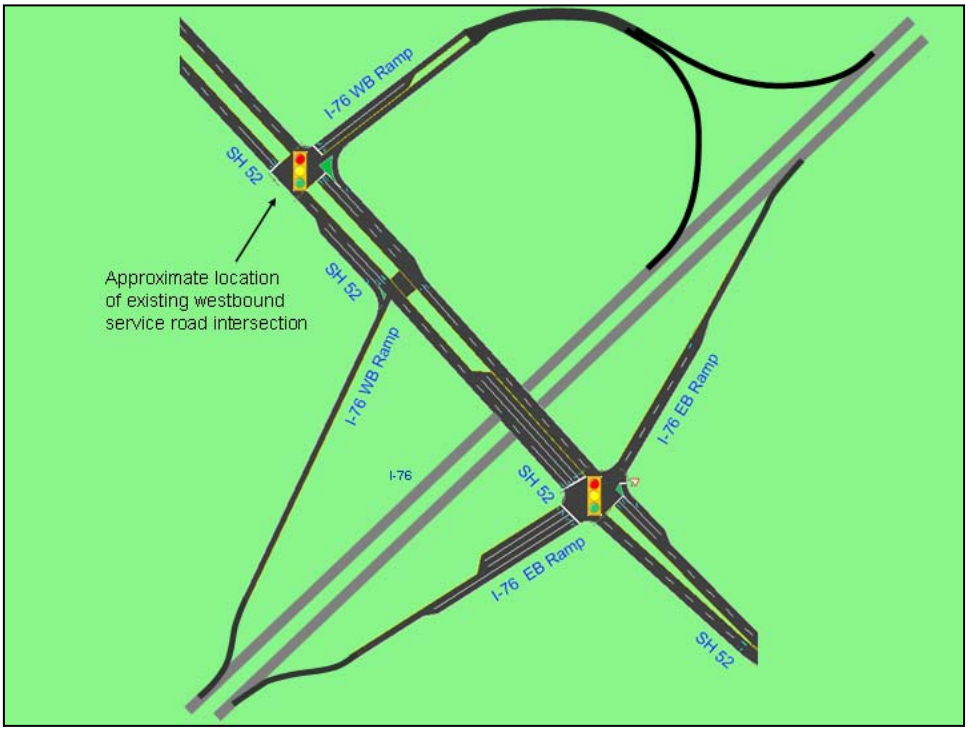
Pedestrian Safety Improvement Examples

Capacity

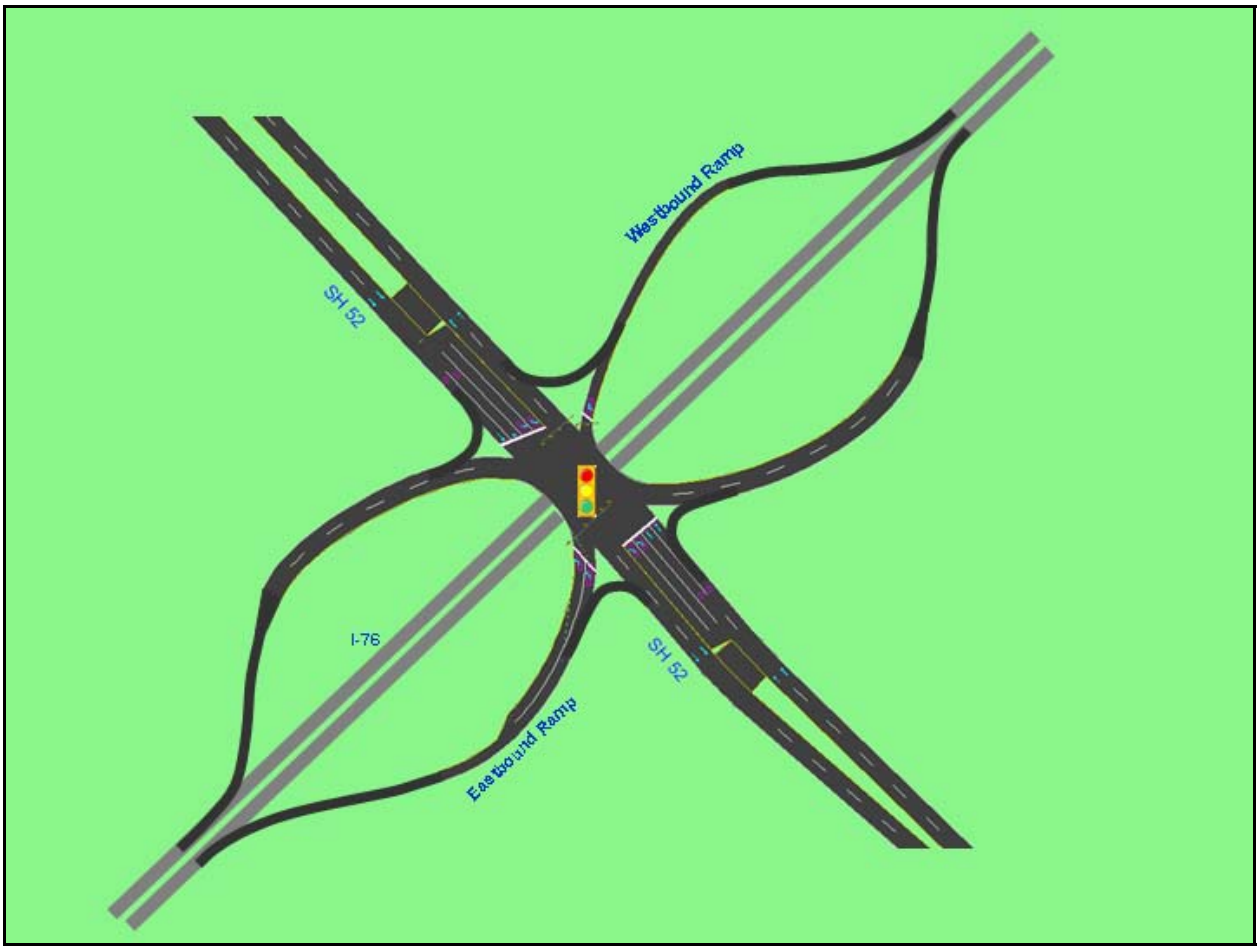
Specific Need	Potential Solutions
Provide sufficient capacity to handle development traffic	SH 52 widening to 5 lanes (turn lanes where needed). Variations: 1) Roundabouts at the Dahlia and Hudson intersections (would allow maintaining 5-legs of intersection at Dahlia, and both Hudson and Cedar Street access to SH 52) 2) Traffic signals at the Dahlia and Hudson intersections (would require removal of the southern leg of Dahlia from the Dahlia/Main intersection, and Hudson from the Cedar/Hudson intersection to provide sufficient capacity)
	I-76/SH 52 Interchange reconfiguration and widening. Variations: Additional lanes vs. partial cloverleaf vs. single point interchange (see sketches below)
	I-76/CR 49 Interchange reconfiguration and widening. Variations: Single Point, Eastbound Fly-Over and Elimination of the Service Road (see sketches below).



I-76/SH 52 Interchange – Add Mode Lanes Variation



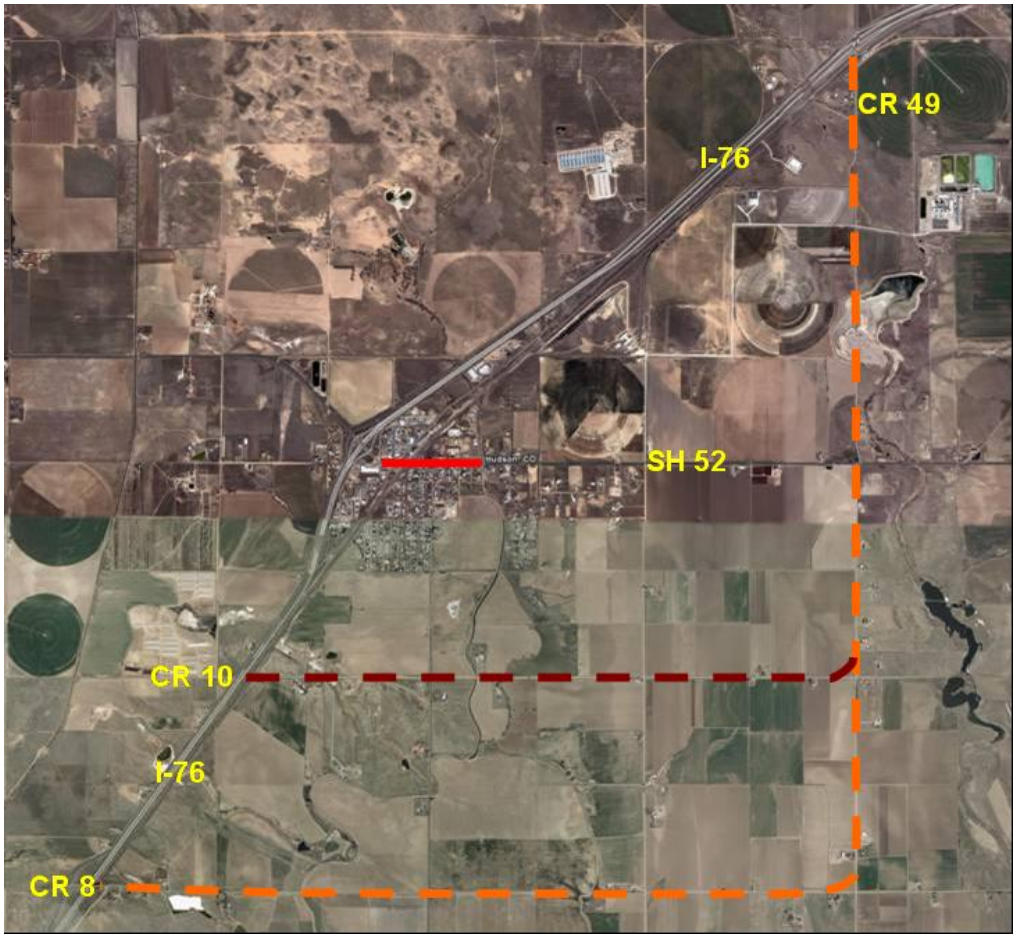
I-76/SH 52 Interchange – Partial Cloverleaf Variation



I-76/SH 52 Interchange – Single Point Urban Interchange (SPUI) Variation

Trucks

Specific Need	Potential Solutions
Minimize truck impacts in Central Village	Designated truck route around village, connecting CR 49 area to I-76 at new CR 8 interchange. Variation: CR 10, truck restrictions



Potential Truck Routes

Safety

Specific Need	Potential Solutions
SH 52/Railroad Crossing	Grade separation, signal pre-emption

Alternative Evaluation

Depending on the level of detail in the plan, the next step would be to evaluate how the alternatives will meet the developed goals and objectives. Evaluation criteria are typically developed to assist in this evaluation:

- The evaluation criteria must be able to measure the extent to which different alternatives address the identified problems.
- Criteria should be able to determine the extent to which goals and objectives are met.
- Impacts that are likely to distinguish the alternatives or provide information on the overall viability of any alternative should be reflected in the criteria.
- The costs of implementing any alternative should be reflected in the criteria.
- The criteria should measure how different alternatives address local concerns.
- The criteria should focus on key issues relevant to making decisions.
- The criteria should account for both existing and future traffic conditions.

Based on past experience and understanding specific need of the Town of Hudson, the following criteria would be appropriate:

a. **Safety** - Alternatives that may most likely enhance safety, reduce accidents or reduce the severity of accidents were considered beneficial. This factor considered the safety of cars, trucks, pedestrians, bicyclists, in villages and in school zones.
b. **Community Acceptance** - This factor considered the degree to which an alternative may likely be accepted by the public.
c. **Environmental Effects** - An alternative's effects on air quality, noise, wetlands, floodplains, wildlife, as well as visual impacts, was considered.
d. **Traffic Impacts** - This factor considered an alternative's potential to improve traffic operations, reduce congestion and improve wayfinding.
e. **Maintenance Issues** - The required annual maintenance needed was assessed.
f. **Mobility** - This factor assessed the impacts that alternatives may have on trucks, freight and produce movements within and through the town.
g. **Economic Impacts** - This factor focused on economic effects. Each of the alternatives was assessed to determine if they may have a positive or negative impact on existing businesses, potential future development and the economy, including improving access to developable lands.
h. **Community Impacts** - Quality of life is the focus of this factor. Potential property and building impacts, plus safety, noise, speeds, business and other issues specific to the communities along the corridor were included here.
i. **Travel Reduction** – The extent to which an alternative will get people out of their cards and into alternative transportation modes will be assessed.
j. **Satisfies Identified Needs** - This factor assessed how well an alternative satisfies an identified need.

Given that most needs have one obvious alternative and more detailed studies are needed before interchange alternatives can be evaluated, an evaluation process using criteria is not warranted at this time. There may be variations on alternatives, but these will be developed and evaluated during the design stage of any given project. For planning costing purposes in this study, “high-end” alternatives were assumed.

It should be noted that a cursory review of the alternatives was conducted and all of the alternatives will meet one of more of the developed study objectives, and would likely reflect positively in an application of the above evaluation factors.

Capacity Analysis with Major Alternatives

Most of the potential solutions will have relatively minor and/or localized effects on traffic flow. However, solutions involving I-76 interchanges will have a significant influence on travel patterns and resulting traffic impacts throughout the town. As such, it is important to conduct a capacity analysis for the roadway network in the project primary study area to verify that intersections will operate at satisfactory Levels of Service with the proposed future improvements to I-76 interchanges, under forecast 2018 conditions. **Synchro©** Version 7 software was used again.

The CR 49 railroad underpass will have by far the most significant effect on travel patterns in the area, so 2018 traffic volumes were redistributed, assuming that this underpass is in place. A new interchange at I-76 and CR 8 will also have a significant effect, but more so on heavy truck traffic than automobile traffic (due to it being designated as the southern terminus of the proposed truck route through town). Travel pattern changes resulting from projects at these two locations will also significantly reduce traffic using the I-76/SH 52 interchange, and thus will change the amount and type of improvements needed at the interchange and along the SH 52 corridor through town.

The 2018 Total Volumes with the CR 49 railroad underpass and CR 8 partial interchange are presented in Table 6 in the report appendix, as is a table presenting the resulting 2018 Levels of Service. Analysis shows that Levels of Service “D” or better will be provided, with the exception of the un-signalized intersections of SH 52 with CR 12.5 and CR 43. The Levels of Service “E” for the “stop” sign-controlled approach is typical, however, and the delay is not excessive. It can be concluded that the projected development in 2018 can be handled by the transportation system, with the proposed new interchange at I-76/CR 8, the CR 49 railroad underpass, and modifications to the I-76/SH 52 interchange. Detailed engineering studies will need to be conducted to determine the best variation of each these improvements.

6.0 PROJECT RECOMMENDATIONS

Project Recommendations

The following projects are recommended to meet existing needs:

1) Develop a set of standards to design and construct the town's transportation system
    a. Develop and implement a road classification system and develop associated typical road cross sections (Figure 91, 9b and 10)
    b. Develop design, access, sign/stripe and traffic study standards
2) Paving, drainage, access and sidewalk improvements for remaining non-paved streets in the central village area
    a. Pave remaining streets in the central village area (Figure 11), using the developed typical road cross sections and design standards
    b. Install signs and striping as per new town standards
3) Resurfacing of some currently paves roads
    a. Road resurfacing (Figure 11)
    b. Drainage improvements
    c. Upgrade signs and striping as per new town standards
4) Pedestrian enhancements (Figure 11)
    a. Beech Street school zone enhancements, including enhances signs, higher visibility raised crosswalks, a pedestrian refuge island, and neckdowns
    b. Sidewalks, striped crosswalks and improved pedestrian crossing signs
    c. Develop and implement a standard town wayfinding sign system for vehicles and pedestrians to direct people to key town destinations
    d. Implement a pedestrian safety awareness program, with brochures and safety reminder roadside signs
    e. Develop a town trail plan for future right-of-way preservation
5) Railroad crossing improvements and corridor fencing
    a. Better defined pedestrian crossing at SH 52 crossing, with pedestrian crossing gates
    b. Barbed wire fencing along both sides of the railroad right-of-way with the town, except at designated crossings or business access points
6) Realign the I-76 Westbound Frontage Road further west to provide greater separation from the I-76 Westbound Ramp

The following projects are recommended to meet projected future needs:

1) SH 52 widening and enhancements (Figures 12 & 13)
    a. Widen SH 52 from CR 43.5 to Oak Street to a four lane cross section (as per new typical cross sections and design standards), with left turn lanes at key intersections and striped bike lanes
    b. Upgrade SH 52 from Oak Street to CR 49 to meet new typical cross sections and design standards
    c. Implement either the roundabout variation or the traffic signal variation at the Dahlia/Main and Hudson/Cedar intersections. If the traffic signal variation is implemented, include traffic signal pre-emption coordination with the railroad crossing.
    d. Provide a separate eastbound right turn lane and a separate northbound left turn lane at the SH 52/Beech Street intersection
    e. Construct a sidewalk or trail on one side of SH 52 from CR 49 to CR 43.5 (in places where one does not already exist)
    f. Install traffic signals at the Ash Street, Beech Street and CR 47 intersections, with eastbound and westbound left turn lanes, and pedestrian crossing amenities
    g. Investigate and install (where appropriate) neckdowns, pedestrian refuge islands, and bump-outs at key pedestrian crossings in the central village area
2) I-76/CR 49 interchange improvements
    a. A detailed engineering study will be needed to determine the best configuration for interchange improvements. Variations could include a single point urban interchange (SPUI), fly-over ramps, and elimination of the service road on the south side. Note that interchange improvements must be planned and designed in conjunction with the CR 49 railroad underpass.
3) CR 49 railroad underpass (see diagram in Section 5)
    a. A detailed engineering study will be needed to determine the best configuration and location for this underpass.
4) I-76/SH 52 interchange improvements (see diagrams in Section 5)
    a. A detailed engineering study will be needed to determine the best configuration for interchange improvements. Variations could include a single point urban interchange (SPUI) or a partial cloverleaf. Adding additional lanes to the current configuration will not provide sufficient capacity. In any variation, the bridge over I-76 will need to be reconstructed to eliminate current vertical sight distance deficiencies.
5) CR 49 improvements, railroad to SH 52 (Figures 12 & 13)
    a. Realign curves to provide 45 mph design speed
    b. Realign southbound approach at SH 52 to align with northbound approach
    c. Pave and widen (1 paved lane per direction) road to new design standards and to handle heavy trucks (part of the new designated truck route)

   d. Construct a sidewalk or trail on one side of CR 47 within the project limits
   e. Install traffic signals at the SH 52 and Chem Tech Avenue intersections, with northbound and southbound left turn lanes, and pedestrian crossing amenities

6) New pavement and new road projects, remainder of town (Figures 12 & 13)
   a. Designate CR 8 (I-76 to CR 49) and CR 49 (CR 8 to I-76) as a truck route. Where feasible, “stop” signs should be installed on the side streets at intersections, to minimize starts/stops and delays to trucks. Enact an ordinance to restrict heave truck traffic on Beech Street. Install truck route signs along and in advance of the truck route.
   b. Construct the segment of CR 8 between CR 45 and CR 47 to new design standards and to handle heavy trucks
   c. Construct a new connector road between CR 47 and CR 49 on the north side of I-76, to new design standards
   d. Widen and pave CR 8 from CR 47 to CR 49 to new design standards and to handle heavy trucks
   e. Widen and pave CR 49 from CR 8 to SH 52 to new design standards and to handle heavy trucks
   f. Pave the following roads to new design standards: CR 47 from CR 8 to SH 52; CR 10 from just east of I-76 to CR 49; CR 43 from CR 10 to SH 52; CR 47 from the I-76 Frontage Road to the new east/west connector road (leading to CR 49); Main Street from the I-76 North Frontage Road to Hickory Street; CR 12.5 from the North Frontage Road to SH 52.
7) Resurfacing projects, remainder of town (Figures 12 & 13)
   a. Widen and resurface CR 8 from I-76 to CR 45to new design standards and to handle heavy trucks
   b. Widen and resurface the following roads to new design standards and cross sections: CR 45 (Beech Street) from SH 52 to CR 8; I-76 North Frontage Road on various sections from CR 8 to CR 49; I-76 South Frontage Road on various sections from the central village area to CR 49.
   c. Construct a sidewalk or trail on one side of CR 45 (Beech Street) from the central village area to CR 8.
8) I-76/CR 8 new interchange (see diagram in Section 5)
   a. Construct a half diamond interchange at I-76/CR 8, leading to and from the south.
9) Work with RTD to implement one or more bus routes between Hudson and the Denver metropolitan area.

Note that the priority of these future projects will depend highly on which developments will occur first (see below). Many improvements are needed to provide sufficient access to specific development sites and/or to mitigate impacts to the central village area.

Roadway Functional Classification System

Functional classification is the process by which streets and highways are grouped according to the type of service they provide. A road classification system defines the function of streets, and in the turn, the appropriate design criteria. Traditionally, classification systems were based on access and mobility functions of streets and highways for motor vehicle traffic only. Streets are actually multi-modal corridors that serve many more functions than just access and mobility, including processing pedestrians, bicycles, and serving as gathering places. An effective classification system accounts for all of these users, and includes design standards that integrate all street functions.

The following general street classifications are proposed for the Town of Hudson:

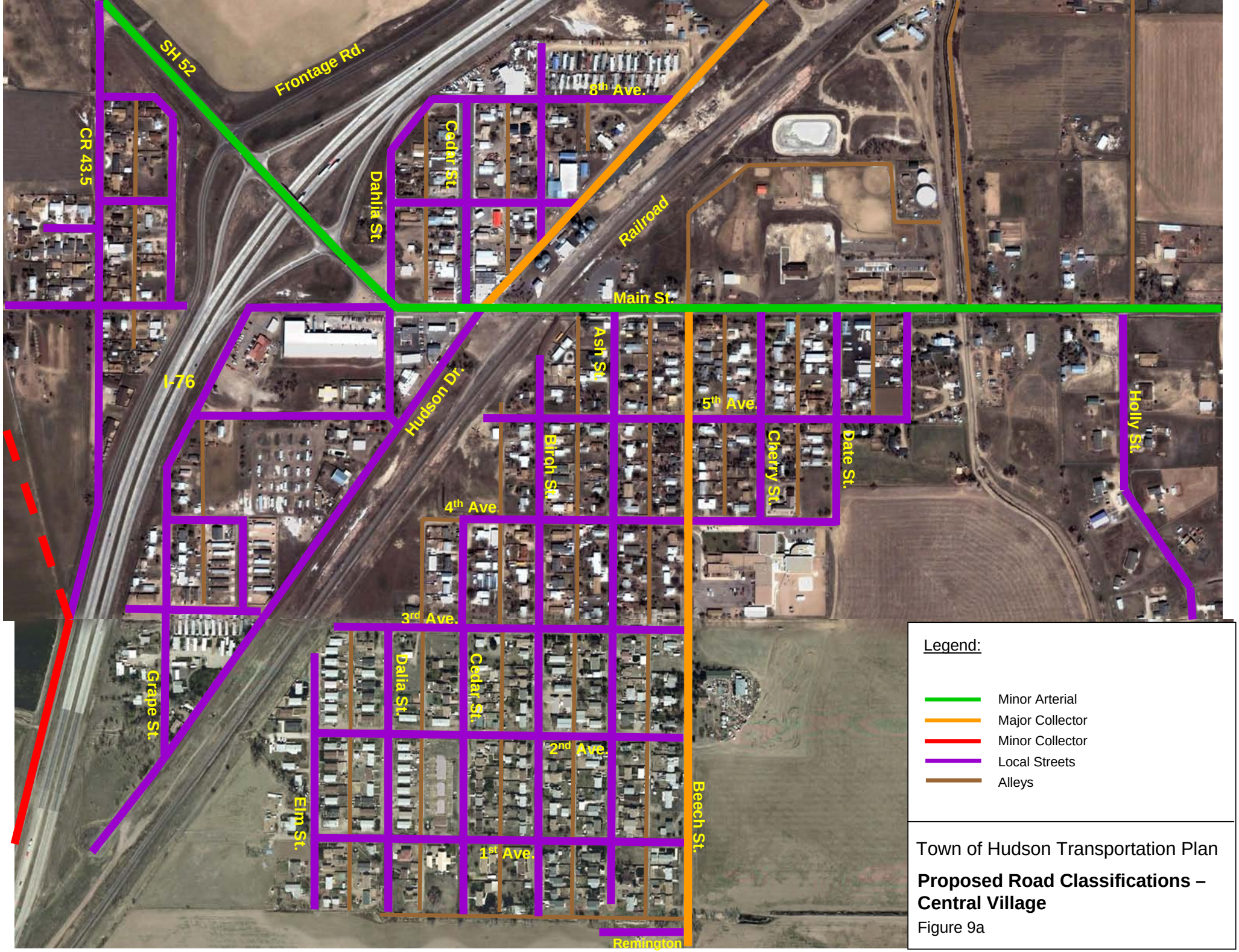
- **Arterial** – Arterials are designed to emphasize mobility over land access, providing access to principal arterials (highways and freeways). They connect cities with adjacent communities and the highway system.
- **Major Collector** – Major collectors emphasize mobility over land access, distributing traffic between major traffic generators or minor collectors and the arterial system.
- **Minor Collector** – Collects and distributes traffic between local streets and major collectors and/or the arterial system. Minor collectors provide more of a land access function than mobility.
- **Local Street** – Provides direct driveway access to adjacent properties within residential neighborhoods. Generally, local streets have low speeds and volumes.
- **Alleys** – Generally one-lane roads that provide access to individual parcels from the local streets. They tend to serve as utility or delivery access roads.

The proposed roadway classification system for the Town of Hudson is illustrated in Figures 8a and 8b. Associated proposed typical roadway sections are illustrated in Figure 9. It should be noted that these are general design standards. Variations to these standards should be considered that better fit specific road circumstances.

Planning-Level Estimates of Probable Costs

In order to develop reasonable estimates of probable costs for the alternatives, it is necessary to combined many of them into projects. Typically, alternatives are implemented simultaneously, since they involve the same facilities and because they result in cost savings due to economies of scale. Alternatives could be grouped in one of two basic ways: 1) by location (ie: SH 52 improvements); or 2) by type of improvement (ie: all paving). Existing solutions were grouped by type of improvement, as most of the alternatives cover multiple locations. Future solutions were groups mostly by location. The solutions are described in Table 6.

Detailed assumptions made in the production of the estimates of probable costs are presented in the report appendix. Where variations of alternative were considered, the highest cost alternative was assumed in this estimate. For each project, construction cost estimates were developed using the best available unit prices. Conservative contingencies were applied due to the recent volatility in asphalt and other material prices. Right-of-way costs were based upon recent land transaction cost data. 10% of construction cost figures were used to estimate design and construction management costs. Finally, typical planning costs for interstate interchange justification studies and design standard development were added. All figures are summarized on Table 6.



Town of Hudson Transportation Plan

Proposed Road Classifications – Central Village

Figure 9a

Legend:

- Minor Arterial
- Major Collector
- Minor Collector
- Local Streets
- Alleys

Town of Hudson Transportation Plan

Proposed Road Classifications – Remaining Town

Figure 9b

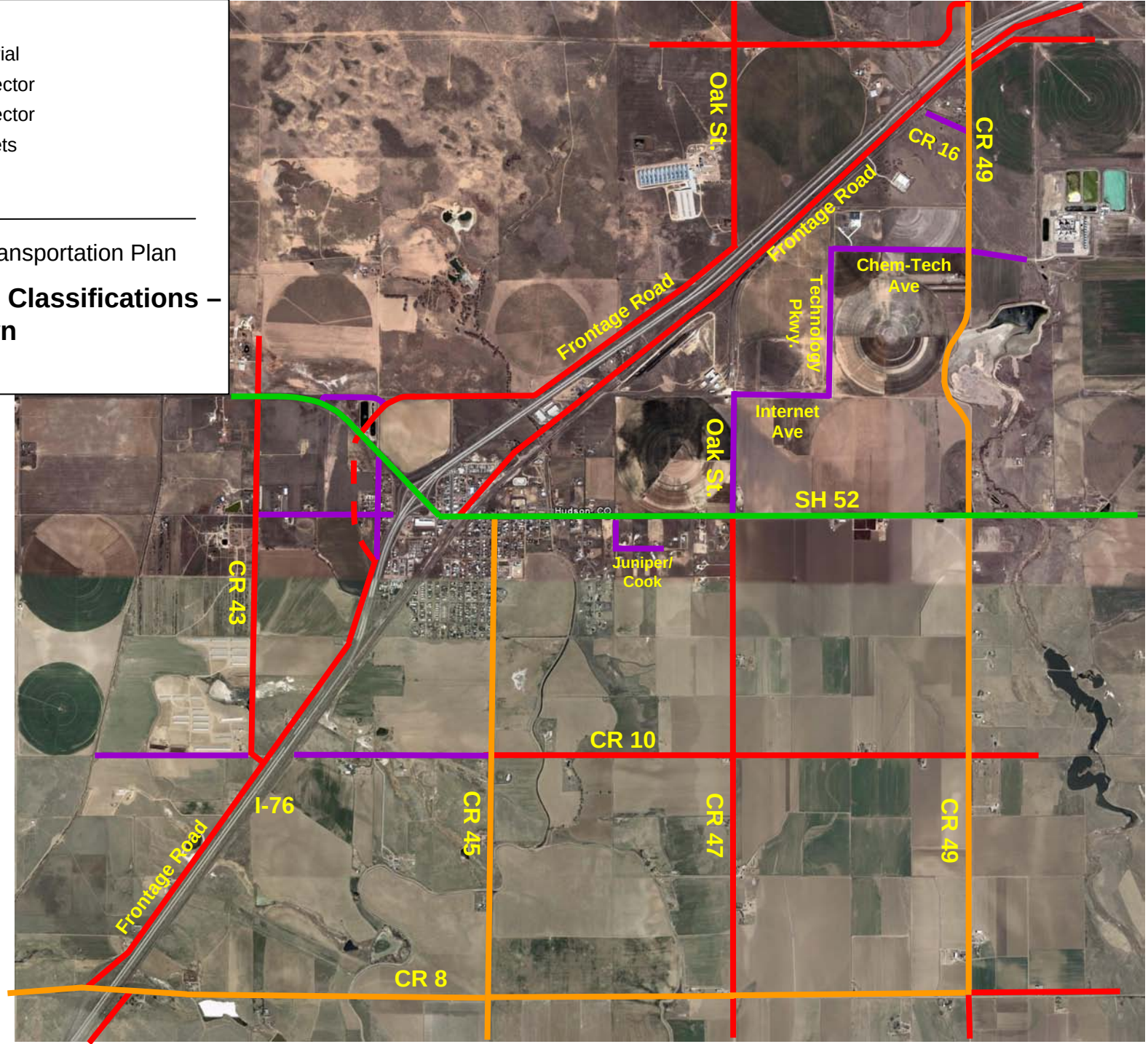
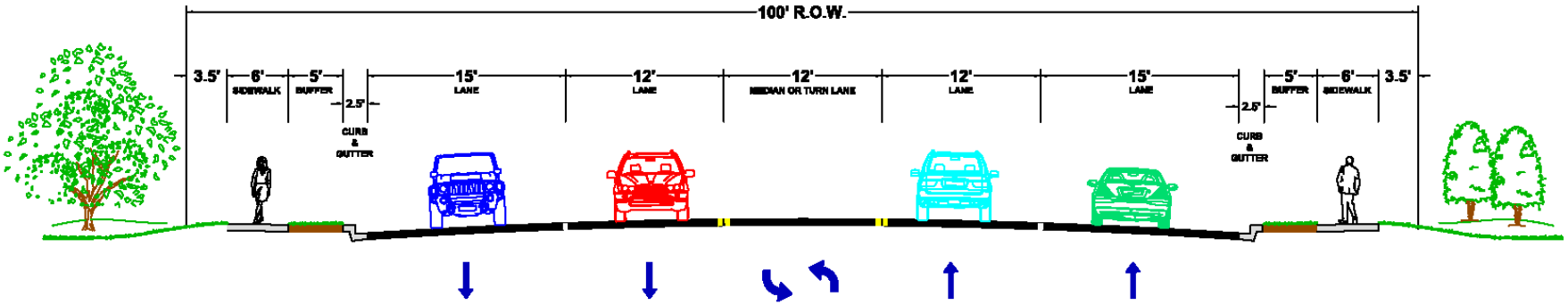
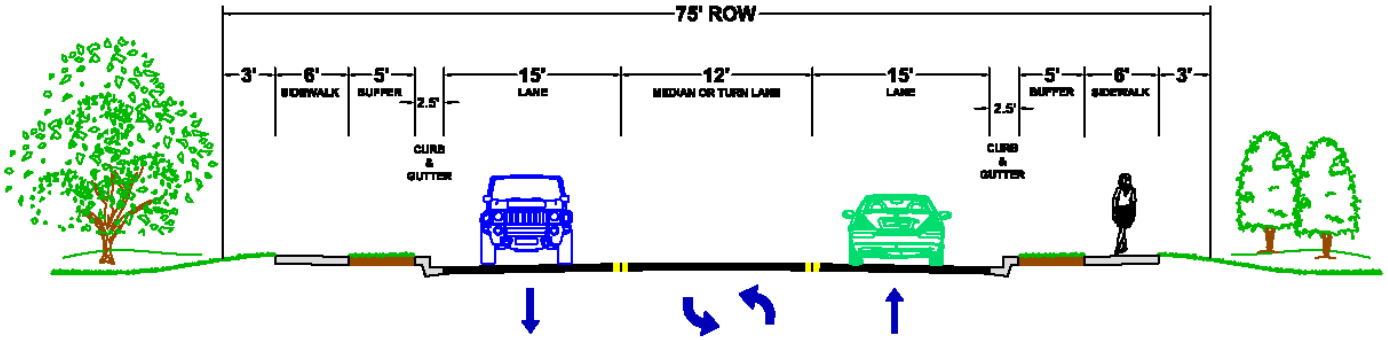


Figure 10 – Proposed Typical Roadway Sections



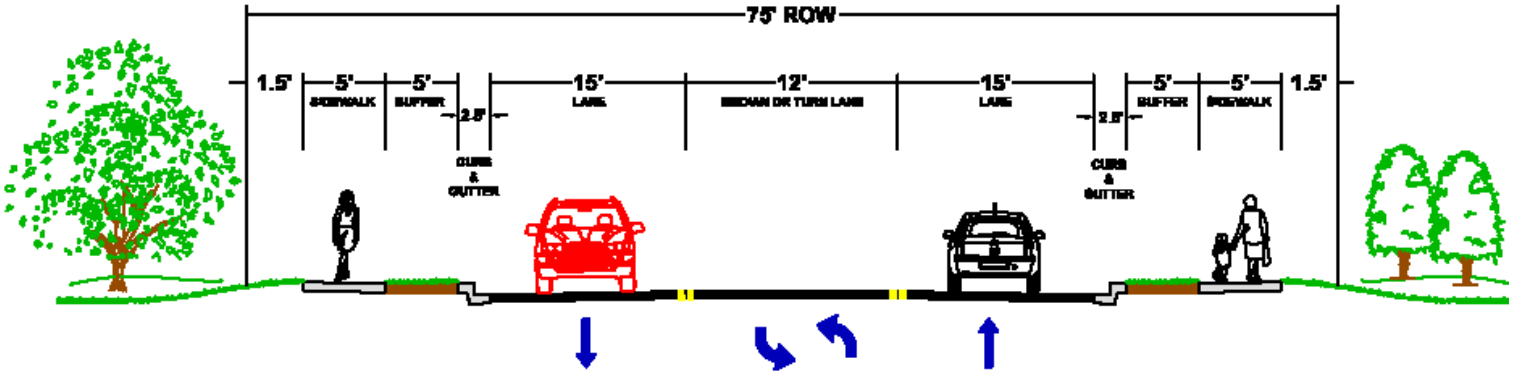
ARTERIAL

**WIDE ENOUGH TO INCORPORATE BIKE LANES*



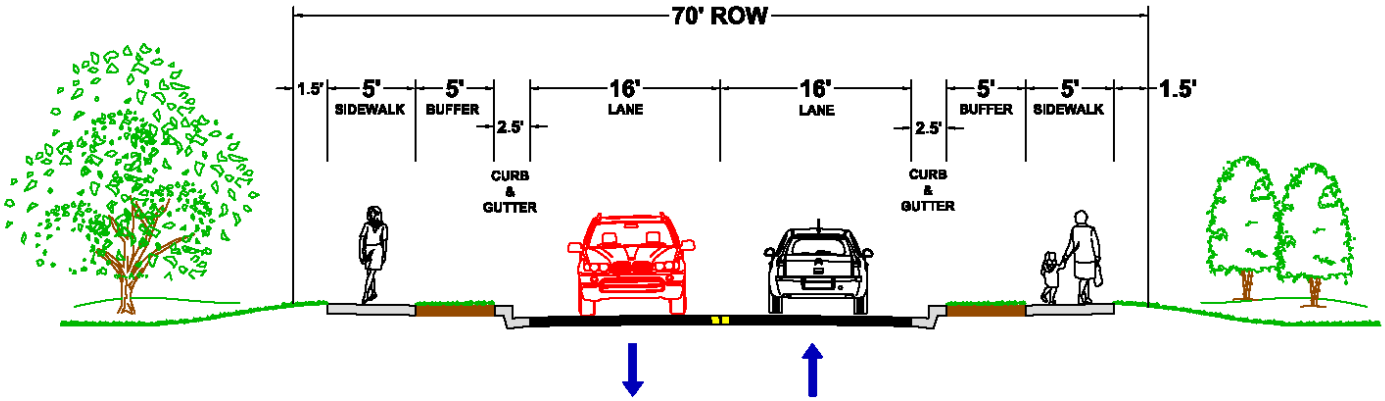
MAJOR COLLECTOR

**WIDE ENOUGH TO INCORPORATE BIKE LANES*



MINOR COLLECTOR

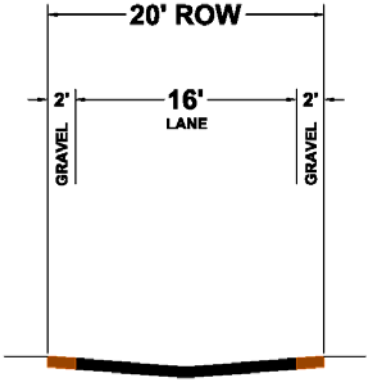
**WIDE ENOUGH TO INCORPORATE BIKE LANES*



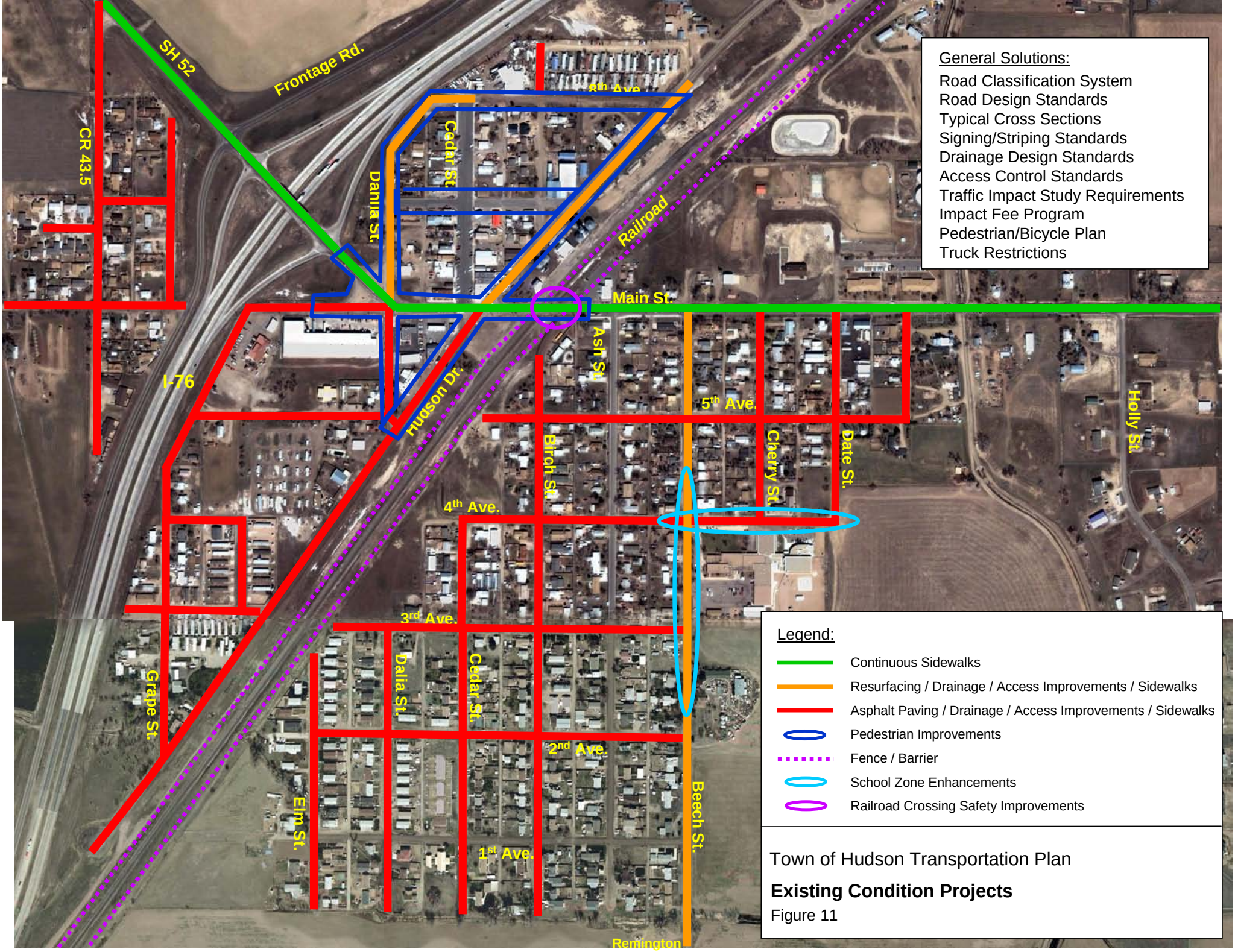
LOCAL STREET

**WIDE ENOUGH TO ACCOMMODATE ON-STREET PARKING*

Figure 10 (continued) – Proposed Typical Roadway Sections



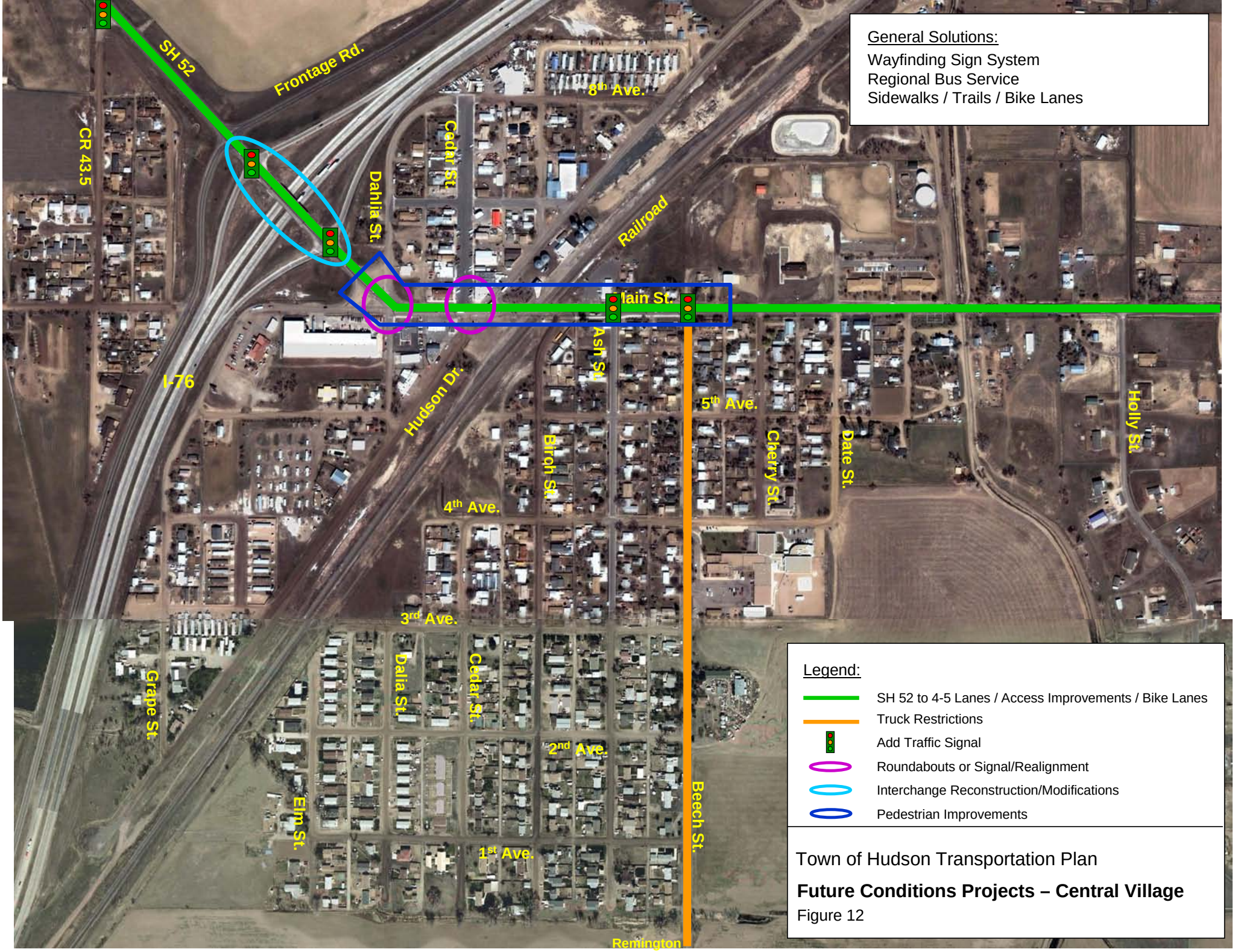
ALLEY



Town of Hudson Transportation Plan

Existing Condition Projects

Figure 11



Town of Hudson Transportation Plan

Future Conditions Projects – Central Village

Figure 12

Legend:

- Bike Lanes / Sidewalks
- Resurfacing
- Asphalt Paving
- New Asphalt Road
- Add Traffic Signal
- Realignment
- Interchange Reconstruction/Mod.
- Railroad Underpass
- Sidewalks or Trails
- Auxiliary Turn Lanes
- New Partial Interchange

Town of Hudson Transportation Plan

Future Conditions Projects – Remaining Town

Figure 13

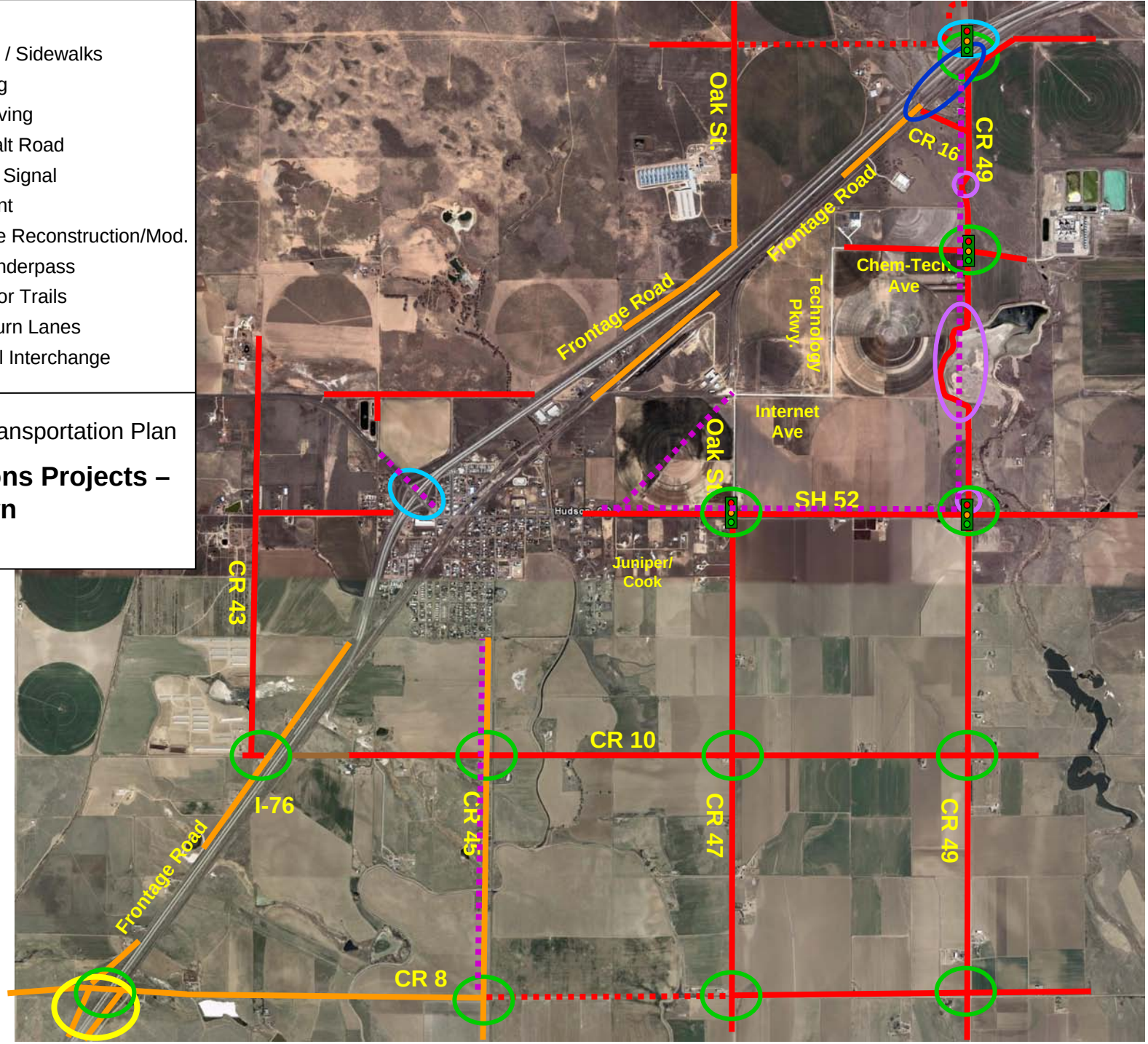


Table 7 – Estimate of Probable Costs Summary

EXISTING CONCERNS/SOLUTIONS

		OPINION OF PROBABLE COSTS					
PROJECT	**GENERAL PROJECT DESCRIPTION**	**PLANNING**	**DESIGN**	**ROW**	**CONSTRUCTION**	**CONST. MGMNT**	**TOTAL**
1	Develop a set of standards to design and construct the town's transportation system.	$80,000	$0	$0	$0	$0	**$80,000**
2	Paving, drainage, access and sidewalk improvements for remaining non-paved streets in the central village area	$0	$912,600	$204,848	$9,126,000	$912,600	**$11,160,000**
3	Resurfacing paved areas, drainage, access, sign/striping and sidewalk improvements for currently paved streets in the central village area	$0	$70,237	$37,273	$702,371	$70,237	**$880,000**
4	Pedestrian enhancements	$0	$43,313	$230,303	$433,125	$43,313	**$750,000**
5	Railroad crossing improvements and corridor fencing	$0	$5,638	$0	$56,375	$5,638	**$70,000**
					TOTAL - EXISTING		**$12,940,000**

FUTURE CONCERNS/SOLUTIONS

		OPINION OF PROBABLE COSTS					
PROJECT	**GENERAL PROJECT DESCRIPTION**	**PLANNING**	**DESIGN**	**ROW**	**CONSTRUCTION**	**CONST. MGMNT**	**TOTAL**
1	SH-52 widening and enhancements, CR 43.5 to CR 47		$1,324,969	$0	$13,249,691	$1,324,969	**$15,900,000**
2	I-76/CR 49 interchange improvements	$600,000	$2,500,000	$120,000	$25,000,000	$2,500,000	**$30,720,000**
3	CR 49 railroad underpass		$300,000	$0	$3,000,000	$300,000	**$3,600,000**
4	I-76/SH 52 interchange improvements	$600,000	$2,500,000	$120,000	$25,000,000	$2,500,000	**$30,720,000**
5	CR 49 improvements, railroad to SH 52		$1,033,868	$145,455	$10,338,678	$1,033,868	**$12,550,000**
6	New paving, new road construction, remainder of town		$2,974,956	$475,372	$29,749,563	$2,974,956	**$36,170,000**
7	Resurfacing projects, remainder of town		$1,093,407	$0	$10,934,069	$1,093,407	**$13,120,000**
8	I-76/CR 8 new half diamond interchange	$400,000	$800,000	$36,000	$8,000,000	$800,000	**$10,040,000**
					TOTAL - FUTURE		**$152,820,000**

PROJECTS TOTAL	***$165,760,000***

7.0 FUNDING ASSESSMENT

Introduction

Current Federal and State Highway Users Trust Funds which derive their revenues primarily through a tax on a gallon of gasoline and diesel fuels have not kept pace with increasing travel, population growth, an aging transportation system and an increasing cost of construction. Since the motor fuel tax can only be increased through Federal and/or State legislation many communities throughout the nation have been investigating a number of alternative options for funding needed transportation improvements. The following summary is an overview of financing options that have been implemented or ideas that would require further investigation and legislative action.

Development Impact Fees

The use of development impact fees (DIF) is now relatively commonplace nationwide as a way to finance public facilities. Although their use is widespread, the calculation and application of DIFs varies greatly. While needed transportation improvements associated with site access and site frontage are normally handled through site plan review requirements, DIFs can be an effective method to finance transportation improvements needed outside of the boundaries of the specific new development, but still benefit the development, as long as a rational basis is established which ties impacts to specific improvement costs. This is often called a development's "fair share" contribution and is typically based on development size or trip generation.

It is important to note that DIFs must be tied into impacts from the new developments. They cannot be used to fix existing problems or for facility maintenance. One disadvantage to the use of DIFs is that each development would contribute only part of the cost of an improvement. Municipalities would need to front the cost of an improvement until all developments considered in the impact fee calculations were completed, if an improvement is needed sooner. One solution to this is to enter into agreements with developer where they front the cost of an improvement and get reimbursed as other developments are completed.

Special Districts

A Special District could be formed to fund various improvements. Property within the district will benefit from proposed roadway improvements and can be assessed for a portion of the cost of the improvements, if a case can be made that shows that property values will increase as a result of the improvements.

Design-Build Finance-Operate (DBFO) – Toll Franchise

A public infrastructure owner awards a franchise to a private sector partner to design, build, finance and operate (DBFO) a transportation project for a pre-determined concession period. In exchange, the private sector partner has the right, through the franchise agreement, to collect all revenues generated by the project during the franchise period. The public sector may provide limited financial assistance, taking such forms as development period cost-sharing, right-of way provisions or limited revenue guarantees, but the private sector partner bears the revenue risk

and hopes that the funds generated will be adequate to pay the underlying project loans and interest and make a fair profit on its investments of time, expertise and money.

DBFO concessions can be awarded for the construction of a new facility or for the modernization, upgrade or expansion of an existing facility. DBFO concessions often extend for a period of 25 to 30 years or even longer, and are awarded under competitive bidding conditions. Under a DBFO approach, ownership of all assets, both existing and new, remains with the governmental entity awarding the concession. The government entity usually stipulates maintenance standards and specific improvements to be made over the franchise period to insure that the assets are properly used and maintained during the concession period.

Private DBFO Shadow Toll Concessions

Shadow tolling is an adaptation of the traditional toll DBFO, model, where public sector project sponsors pay “tolls” rather than motorists. With shadow tolling, a concession is awarded to a private contractor who has then the responsibility to design, build finance and operate a designated road section for an agreed period of time. The term “shadow tolling” is used, as there are no toll collection facilities and users pay no fees, rather the sponsoring public agencies make payments to the concessionaire based on traffic volumes and service levels.

63-20 Public Benefit Corporation

The primary reason that relatively few toll projects have been procured using the DBFO concession model in the US is the fact that public agencies are able to obtain cheaper, tax-exempt debt. Using this type of debt keeps interest costs low and generates attractive opportunities for both private and corporate investors. Recently, a number of highway and transit projects have been funded by debt issued by non-profit corporations, which, pursuant to the Internal Revenue Service, Rule 63-20 and Revenue Proclamation 82-26 are able to issue tax-exempt debt on behalf of private project developers. For this scenario, the City would need to find a private sector developer that would be willing to enter into a project partnership and the city. The partnership would still need to establish a debt repayment plan.

Tax Increment Financing

Tax Increment Financing (TIF), is a tool which has been used for redevelopment and community improvement projects throughout the United States for more than half a century. With federal and state sources for redevelopment generally less available, TIF has become an often-used financing mechanism for municipalities.

TIF is a tool to use future gains in taxes to finance the current improvements that will create those gains. When a public project such as a road, school, water treatment plant, event center, etc. is constructed there is an increase in the value of surrounding real estate, and often new investment. This increased site value and investment creates more taxable property, which increases tax revenues. The increased tax revenues are the “tax increment.” Tax Increment Financing dedicates that increased revenue to finance debt issued to pay for the project. TIF is designed to channel funding toward improvements in distressed or underdeveloped areas where development would not otherwise occur. TIF creates funding for public projects that may otherwise be unaffordable to localities.

Value Capture Financing

Value Capture Financing (VCF), is similar to a TIF with the exception that the debt repayment is generated by an incremental amount of the State Sales Tax rather than an incremental amount of new real estate and/or local sales taxes.

VCF would require state legislation to allow the Department of Transportation to enter into an agreement with local governments to form, in essence, a Public Highway Authority (PHA) that could issue debt. Once a PHA is formed it would have the authority of defining a VC area where a portion or all of the states sales tax would be used to retire the debt.

Preliminary legal research has indicated that since the state sales tax revenue does not go into the state treasury but directly into paying the debt service, the revenue is not subject to TABOR limitations creating an advantage to the state budget.

State Infrastructure Bank

The Colorado State Infrastructure Bank (SIB) acts as a bank to provide capital for funding projects in the short-term. As project loans are re-paid, more capital becomes available for new projects. Advantages of the SIB includes low interest rates, creates a revolving fund and simplified administration.

The SIB is managed by the Colorado Department of Transportation, Office of Financial Management and Budget. SIB customers are typically sponsors of highway or inter-modal projects, and can either be public entities (such as local governments, special districts, and other state agencies), or private corporations and non-profit organizations.

To be eligible for SIB assistance, a project must be a qualified project, which includes projects authorized by the commission, right-of-way acquisitions, maintenance projects and safety projects.

Developer Contributions

Many developers today understand that road improvements are necessary to improve access and make their developments viable. Funding amounts can be negotiated between the town and private developers as a form of public/private partnership.

8.0 IMPLEMENTATION

Action Plan

This Transportation Plan will need to be reviewed and adopted by the Hudson Town Council. Implementing the plan recommendations present several significant challenges, including:

- Cost of improvements and lack of funding
- Right-of-way needs and corridor preservation
- Lead time needed for planning, design and construction of major road and interchange improvements
- Timing improvements with proposed development
- Uncertainty in the economy

In order to meet these challenges and successfully implement the plan recommendations, an action plan as been developed and is presented in Table 8.

Table 8
Implementation Action Plan

Implementation Strategy	Responsible Party	Timing
Adopt the Town of Hudson Transportation Plan	Town Council	Year 2008
Adopt the recommended Roadway Functional Classification System (as shown on Figures 8a and 8b)	Town Council	Year 2008
Program recommended transportation improvements into a Town Capital Improvement Program (CIP)	Town Manager	Annually
Update this Transportation Plan every five (5) years to effectively monitor planned versus actual development and check if planned improvements are still valid	Town Council and Town Manager	Year 2013/ Every 5 years after
Investigate the availability of federal, state, DOLA and other local funding for improvements	Town Manager	Annually
Develop and adopt a Development Impact Fee program based on transportation infrastructure needs recommended in this Transportation Plan	Town Council and Town Engineer	2009
Incorporate Recapture Agreements into the development permit process and negotiate for each specific proposed development	Town Council and Town Engineer	2009 and as developments occur
Implement a Value Capture Financing program to fund improvement for existing needs	Town Council, Town Engineer and Town Manager	2009
Coordinate with CDOT, Weld County, DRCOG and surrounding communities on a regular basis on transportation improvements and traffic issues	City Engineer	Ongoing

Implementation Strategies

The projects identified in this plan represent the vision for the town within an assumed 10-year planning horizon. This horizon is not fixed, however, as developments could occur at any time, based on economic conditions. The improvements for future conditions could also occur at any time, based on when specific developments occur. In this light, developing an implementation plan for the improvements is a complex process, as it depends highly on funding availability, economic, and political factors, plus involves many different entities from both the public and private sectors.

Although this plan contains many projects that are tied directly in with development, there are many that are not. The town needs to prioritize these projects for implementation. A method will need to be developed by the town to prioritize projects, taking into account issues such as:

- Project's importance to the quality of life in the town
- Ease of implementation and potential opposition
- Funding availability and any requirements that might delay a project or restrict what can be done
- Potential barriers, such as right-of-way acquisition or development timing.

Typically, evaluation criteria, based on the above issued, are developed, ratings and factor weights (based on factor importance) are assigned, and decisions made based on the result. Prioritization should be reviewed periodically, to make sure that the issues have not changed significantly.

CDOT will play a major role in the funding and implementation of projects on SH 52 and the interchanges and service roads for I-76. DRCOG may also program federal and state funds for certain projects. Projects may be eligible for Surface Transportation Program (STP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), Transportation Enhancements, and other federal and state funds. The Town of Hudson should submit projects to the Upper Front Range MPO for consideration. Weld County has several roads that are included for improvement under this plan, so county officials will play a role implementation.

The town currently has some funding available to pave many of the roads in the Central Village area. Projects that will be funding in part or entirely with town funds should be added to a 5-year Capital Improvement Program (CIP), which helps streamline project implementation and coordination with other town plans. It is recommended that the town pursue funding through the State Infrastructure Bank, plus use Value Capture Financing and/or Tax Increment Financing to issue debt for the remainder of the projects to meet existing needs.

To fund many of the future need projects, a Developer Impact Fee program should be established, in conjunction with negotiated developer contributions for right-of-way and improvements. Agreements will be required with developers to front and complete needed projects. Weld County already has an agreement in place with the Pioneer Development to fund study, design and construction of improvements at the I-76/CR 49 interchange and the CR 49 railroad underpass. The Town of Hudson should work with Weld County and Pioneer to established their own agreement regarding funding of these improvements. Since the need for the railroad underpass and I-76/CR 49 interchange improvements is critical for Hudson to attract desired industrial development, and the Town's timeframe will likely outpace the Pioneer Development, the Town or a developer may have to front the cost of the study, design and construction.

In a new and developing areas the Town of Hudson could also implement a “recapture agreement” to obtain needed right-of-way and recover all or a portion of the infrastructure costs incurred by the Town prior to actual development occurring. A “recapture agreement” would need to be made a mandatory requirement in a development agreement and/or permitting process.

Various criteria could be used in determining the actual recapture assessment to be included in the development agreement or permit. It is recommended, however, that the most equitable assessment and least complicated would be a formula based on a platted square footage, estimated trip generation and an estimate of heavy trucks for the development. Using these three criteria would also provide consistency with the infrastructure design process.

To fully recover the infrastructure costs, the recapture assessment analysis should also include the recovery of any interest charges related to the debt service on bonds issued to build the infrastructure.

Table 9 highlights the anticipated financial responsibilities for the proposed projects.

Table 9
Financial Responsibility for Transportation Improvement Implementation

Improvement Type	Town of Hudson	Weld County	CDOT	RTD	DRCOG/ Federal	Private Sector
State/County Roads	✓	✓	✓		✓	✓
Local Roads	✓					✓
Intersection Improvements	✓	✓	✓			✓
Interchanges	✓		✓		✓	✓
Railroad Underpass	✓	?	?			✓
Sidewalks	✓	✓	✓		✓	✓
On-Street Bicycle Facilities	✓	✓	✓		✓	✓
Off-Street Trails	✓					✓
Bus Routes	✓			✓		

APPENDIX

Table 1
Existing Condition (2008) - Level-of Service and Delay (Worst Approach)

Intersection	Weekday AM Peak		Weekday PM Peak	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
SH 52 at CR 43.5 (Hickory St.) (*Northbound)*	B	10.7	A	0.0
SH 52 at CR 12.5 *(Southbound)*	A	8.9	A	0.0
SH 52 at I-76 Frontage Road (W) *(Westbound*)	B	11.0	B	13.2
SH 52 at I-76 WB Ramps *(Westbound)*	B	12.2	B	11.7
SH 52 at I-76 EB Ramps *(Eastbound)*	B	10.1	B	12.8
SH 52 at CR 49 (W) *(Northbound)*	A	9.2	A	9.6
SH 52 at CR 49 (E) *(Southbound)*	A	0.0	A	9.3
SH 52 at CR 47 (*Northbound)*	B	10.7	A	9.9
SH 52 at CR 43 (*Northbound)*	B	10.9	A	0.0
CR 8 at CR 45 (*Eastbound)*	A	9.1	A	8.8
CR 8 at I-76 Frontage Road (W) (*Northbound)*	A	9.7	A	9.3
CR 8 at I-76 Frontage Road (E) (*Northbound)*	A	8.5	A	8.4
CR 10 at CR 45 (*Westbound)*	A	9.4	A	8.8
CR 16 at I-76 Frontage Road (E) (*Westbound)*	A	9.1	A	8.5
CR 49 at I-76 EB Ramps *(Eastbound)*	A	9.3	B	10.2
CR 49 at I-76 WB Ramps *(Westbound)*	A	8.6	A	9.5
Main Street at Dahlia Street** (*Northbound)*	A	9.0	A	5.1
Main Street at Cedar Street/Hudson Drive (*Southbound)*	B	11.3	B	13.1
Main Street at Hudson Drive (*Southbound)*	B	12.6	B	12.5
Main Street at Beech Street (*Northbound)*	B	12.5	B	11.0

Table 2
Existing Crash Statistics

Intersection	Year						Total Number of Crashes	Severity		Predominant Type
	2000	2001	2002	2003	2004	2005		PDO	Injury	
SH 52 North of I-76	0	1	1	0	1	0	**3**	3	0	Rear End, Broadside
SH 52 & I-76 WB Ramp	0	0	1	0	1	0	**2**	2	0	Broadside
SH 52 & I-76 EB Ramp	0	1	0	2	1	0	**4**	4	0	Broadside, Approach Turn
Hickory & 6th	0	0	0	0	0	1	**1**	1	0	Collision with Fixed Object
SH 52 7 Dahlia (area)	4	0	0	6	1	0	**11**	10	1	Rear End, Approach Turn, Broadside, Overtaking Turn
Cedar & Main	1	0	1	0	1	1	**4**	3	1	Broadside, Approach Turn
Cedar & 8th	0	0	2	0	0	1	**3**	3	0	Collision with Fixed Object (2), Collision with Parked Car (1)
Hudson & 8th	0	0	0	0	1	0	**1**	0	1*	Collision with Fixed Object (*fatality)
Birch & 7th	0	0	0	0	0	1	**1**	1	0	Collision with Parked Car
Birch & 6th	0	0	1	0	0	0	**1**	1	0	Collision with Fixed Object
Birch & Main	0	0	0	2	0	1	**3**	2	1	Approach Turn
Beech & Main	0	0	0	2	0	0	**2**	1	1	Unknown
Cherry & 4th	0	0	0	0	0	1	**1**	1	0	Collision with Parked Car
Total	***14***	***6***	***11***	***20***	***8***	***11***	***70***	***52***	***18***	

Table 5
Future Condition (2018) (no CR 49 railroad crossing or CR 8 interchange)
Level-of Service and Delay (Worst Approach)

Intersection	Weekday AM Peak		Weekday PM Peak	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
SH 52 at CR 43.5 (Hickory) *(AM – Southbound, PM – Northbound)*	C	18.2	C	19.2
SH 52 at CR 12.5 *(Southbound)*	A	9.7	A	0.0
SH 52 at I-76 Frontage Road (W) *(Westbound)*	F	Err	F	Err
SH 52 at I-76 WB Ramps *(Westbound)*	F	Err	F	Err
SH 52 at I-76 EB Ramps *(Eastbound)*	F	Err	F	Err
SH 52 at CR 49 (W) *(Northbound)*	B	14.7	D	26.1
SH 52 at CR 49 (E) *(Southbound)*	B	10.1	B	12.4
SH 52 at CR 47 (*Northbound)*	F	Err	F	Err
SH 52 at CR 43 (*Northbound)*	C	20.9	A	0.0
CR 8 at CR 45 (*Eastbound)*	B	11.5	B	11.8
CR 8 at I-76 Frontage Road (W) (*Northbound)*	C	19.8	B	13.7
CR 8 at I-76 Frontage Road (E) (*Northbound)*	A	9.3	A	8.6
CR 10 at CR 45 *(AM – Westbound PM – Eastbound))*	C	18.4	D	25.3
CR 16 at I-76 Frontage Road (E) (*Westbound)*	A	9.1	A	8.5
CR 49 at I-76 EB Ramps *(Eastbound)*	F	834.0	F	Err
CR 49 at I-76 WB Ramps *(Westbound)*	E	46.0	F	Err
Main Street at Dahlia Street** (*Northbound)*	F	Err	F	Err
Main Street at Cedar Street/Hudson Drive (*Southbound)*	F	Err	F	Err
Main Street at Hudson Drive (*Southbound)*	F	Err	F	Err
Main Street at Beech Street (*Northbound)*	F	Err	F	Err

Err = Approach delay is too great to calculate

Table 6
Future Condition (2018) with CR 49 Railroad Crossing and Other Major Improvements Level-of Service

Intersection	Weekday PM Peak LOS
SH 52 at CR 43.5 (Hickory St.)	D
SH 52 at CR 12.5	D
CR 49 at I-76 Frontage Road	C
SH 52 at I-76 WB Ramps	B
SH 52 at I-76 EB Ramps	C
SH 52 at 49	B
SH 52 at CR 47	C
SH 52 at CR 43	D
CR 8 at CR 45	B
CR 8 at I-76 Frontage Road (W)	A
CR 8 at I-76 Frontage Road (E)	A
CR 10 at CR 45	D
CR 16 at I-76 Frontage Road (E)	A
CR 49 at I-76 EB Ramps	C
CR 49 at I-76 WB Ramps	C
Main Street at Dahlia Street	B
Main Street at Cedar Street/Hudson Drive	B
Main Street at Beech Street	B

Average Daily Traffic (ADT) Count Map

Legend

Paved Road

Gravel/Dirt Road

ADT Traffic Count:

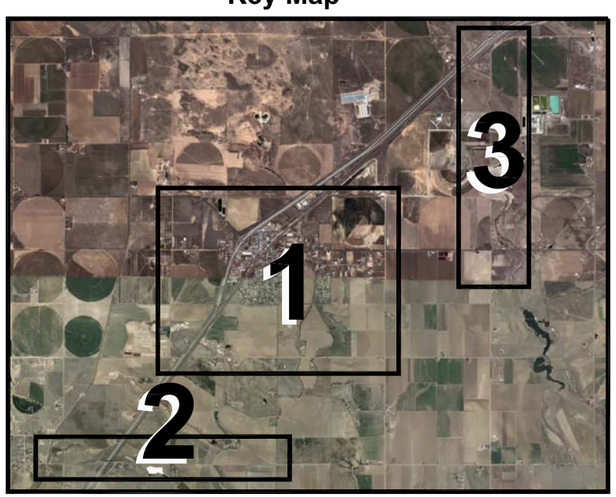
FHU 2005

CDOT 2006

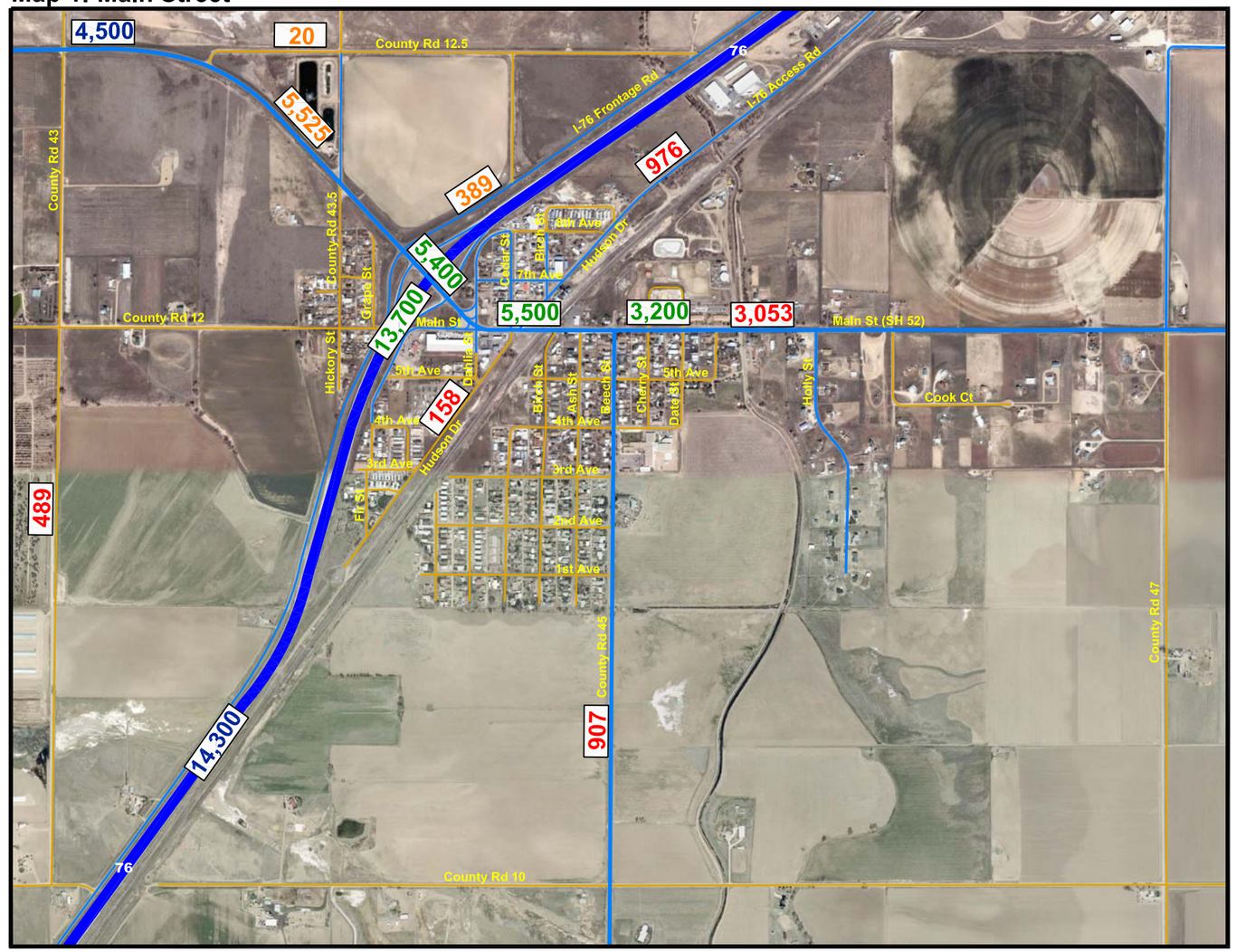
LSC 2007

Hudson 2008

Key Map



Map 1: Main Street



Map 2: County Road 8

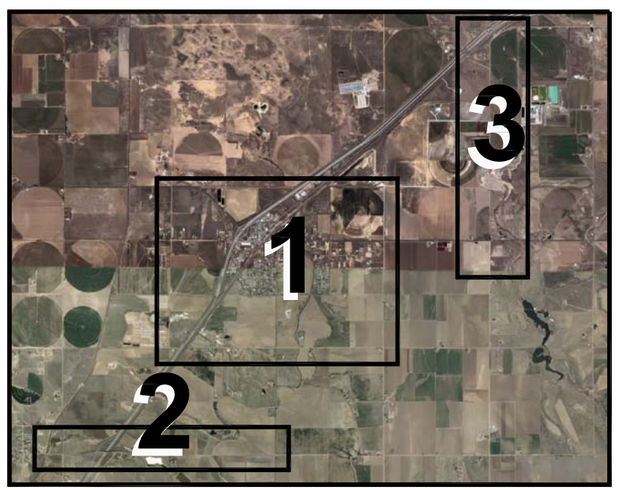
Map 3: County Road 49

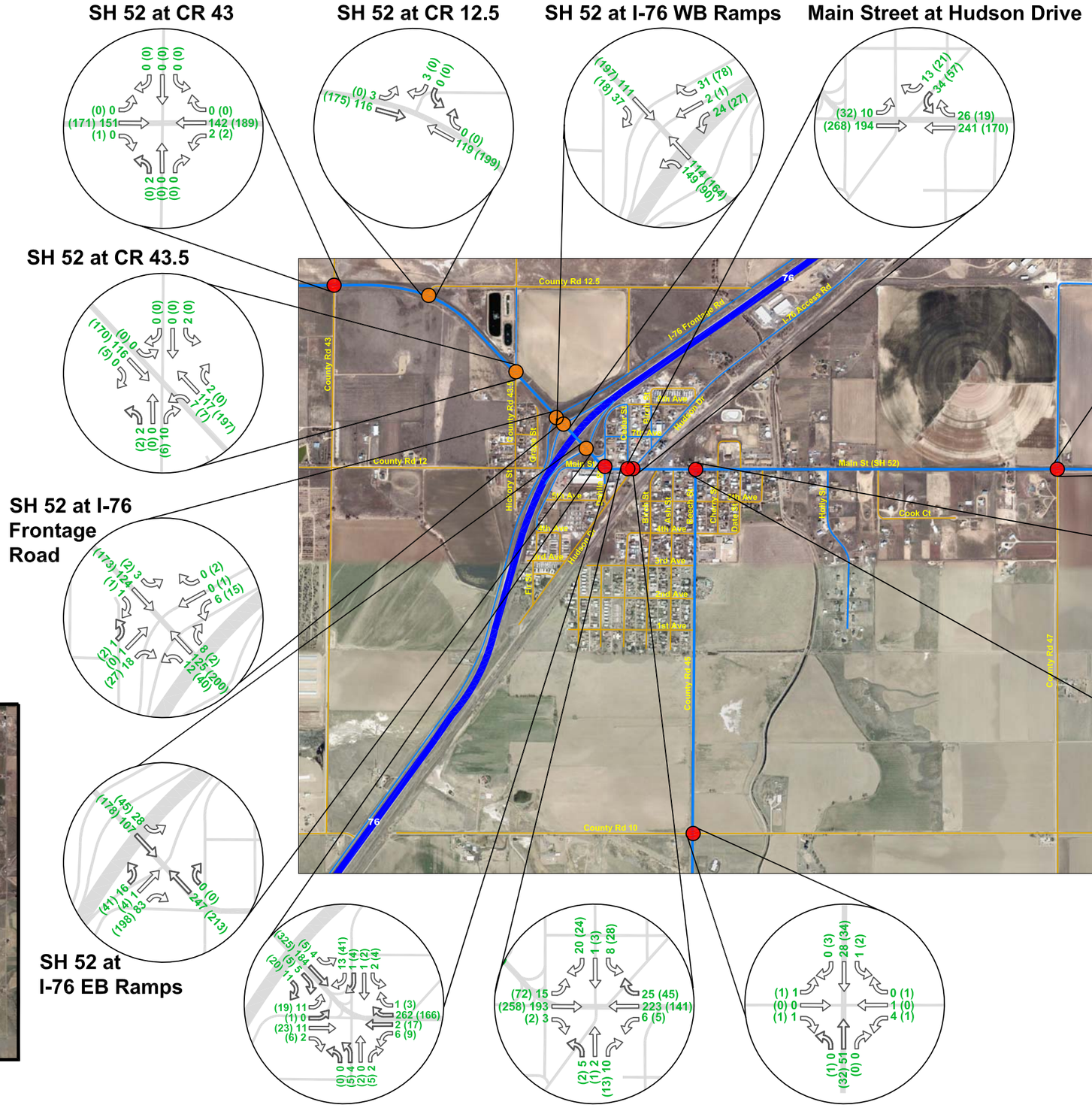
Existing Turning Movement Counts Map 1: Main Street

Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2008)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Count
- (XXX) PM Peak Hour Count

Key Map



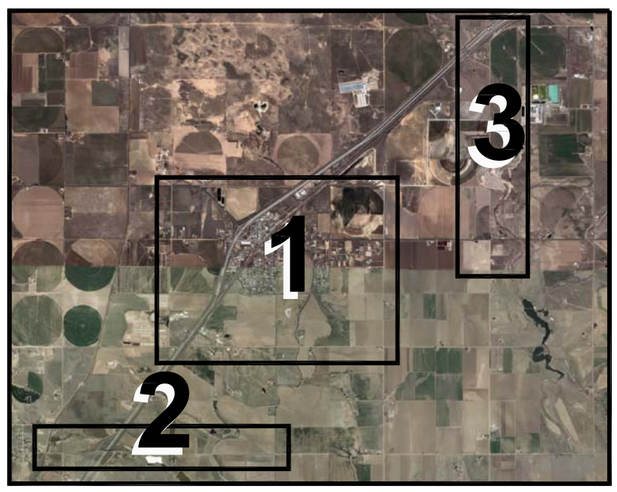


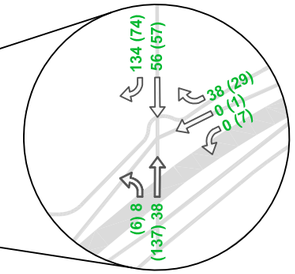
Existing Turning Movement Count
Map 2: County Rd 49
Map 3: County Rd 8

Legend

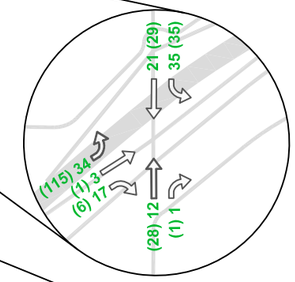
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Count
- (XXX) PM Peak Hour Count

Key Map



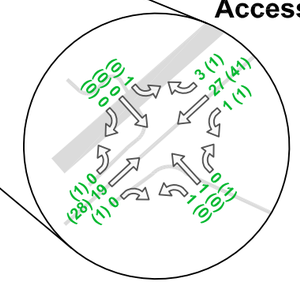


CR 49 at I-76 WB Ramps

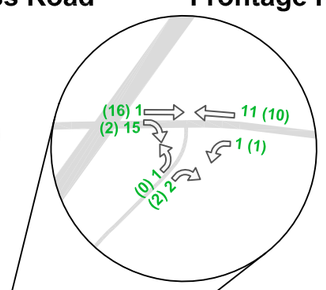


CR 49 at I-76 EB Ramps

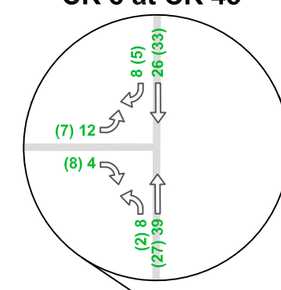
CR 16 at I-76 Access Road

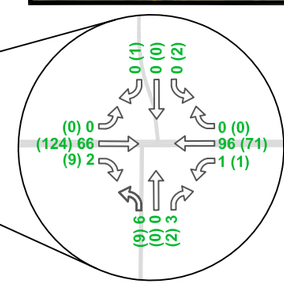


CR 8 at I-76 Frontage Road

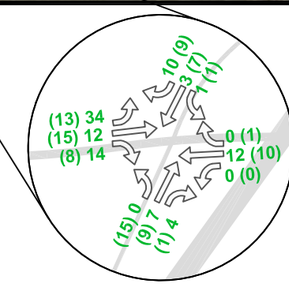


CR 8 at CR 45





SH 52 at CR 49



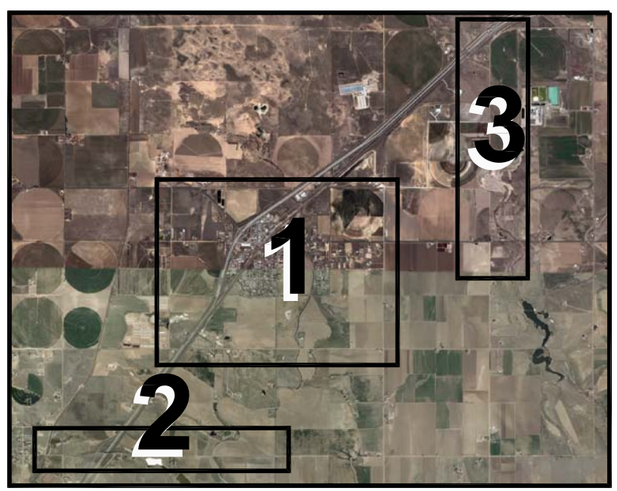
CR 8 at I-76 Frontage Road

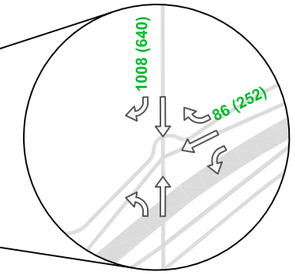
Pioneer Development
2016 Traffic Volumes
Map 2: County Rd 49
Map 3: County Rd 8

Legend

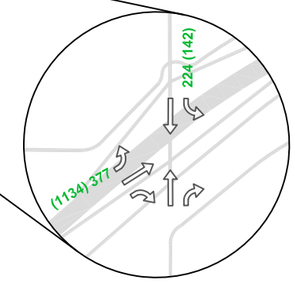
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map





CR 49 at I-76 WB Ramps



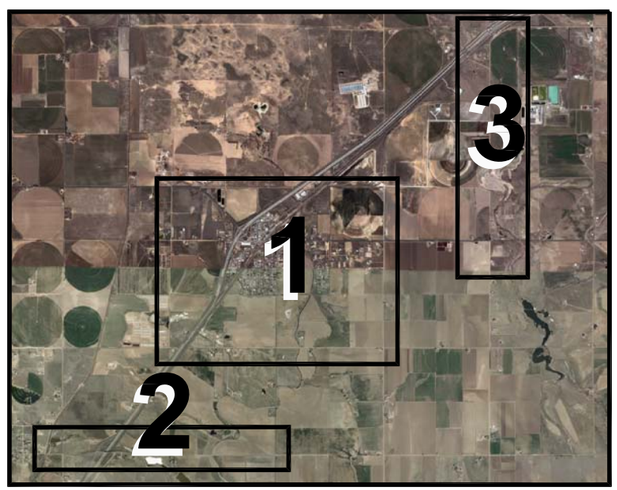
CR 49 at I-76 EB Ramps

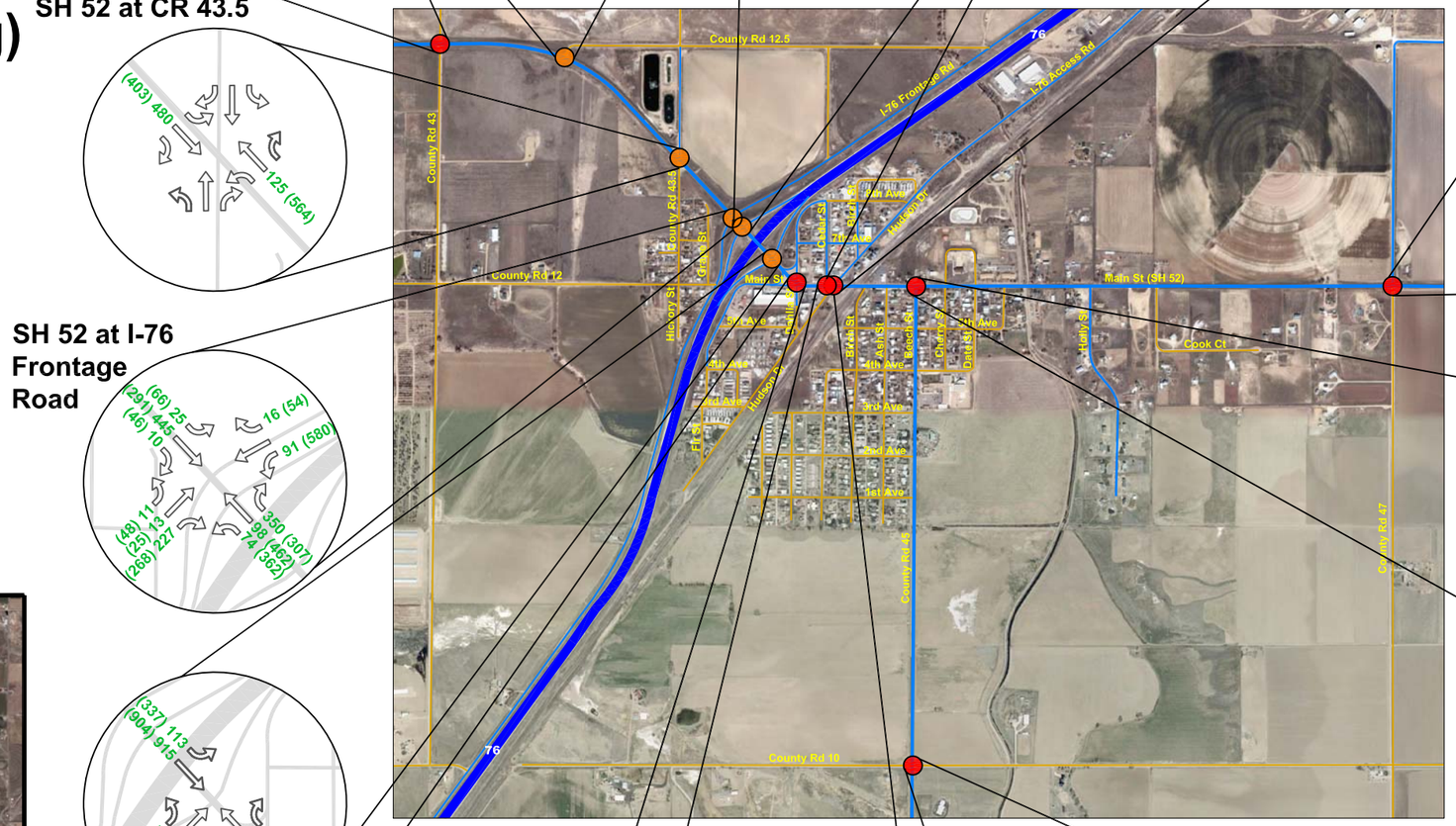
10-Year Traffic
New Development
(No CR 49 RR Crossing)
Map 1: Main Street

Legend

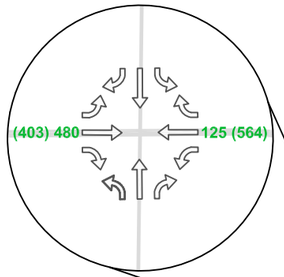
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2008)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map

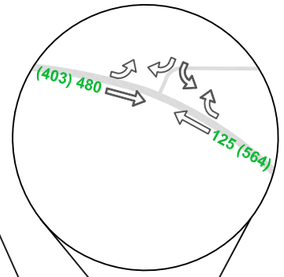




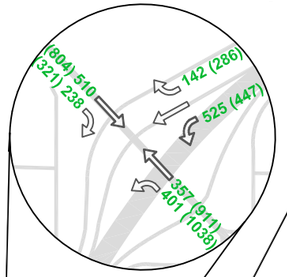
SH 52 at CR 43



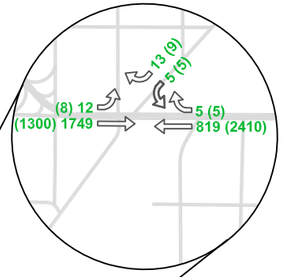
SH 52 at CR 12.5



SH 52 at I-76 WB Ramps

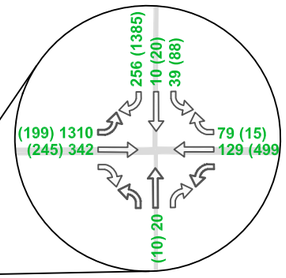


Main Street at Hudson Drive



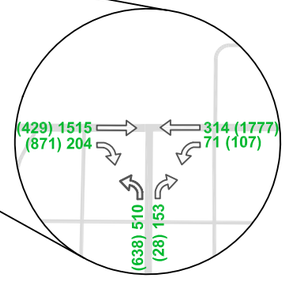
SH 52 at CR 43.5

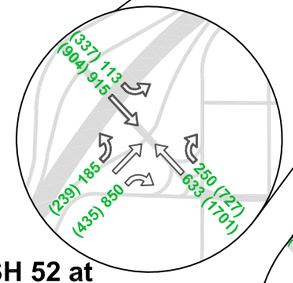
SH 52 at CR 47



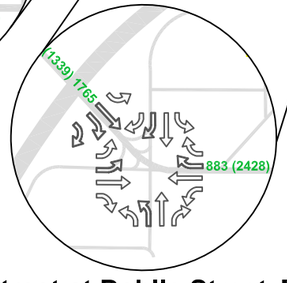
SH 52 at I-76 Frontage Road

SH 52 at CR 45

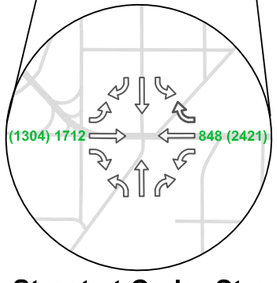




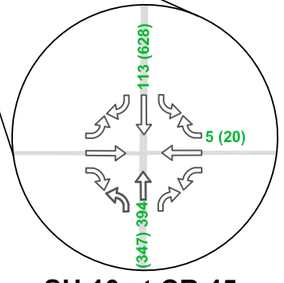
SH 52 at I-76 EB Ramps



Main Street at Dahlia Street



Main Street at Cedar Street



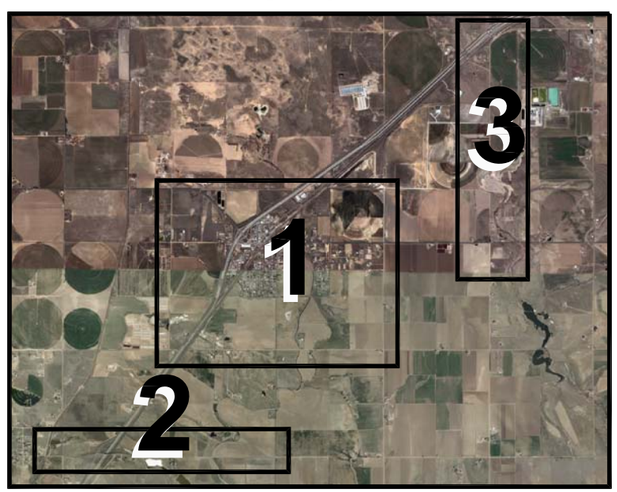
SH 10 at CR 45

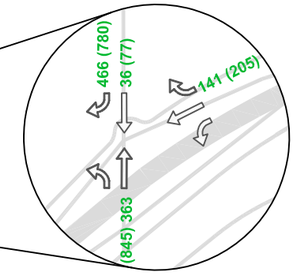
10-Year Traffic
New Development
(No CR 49 RR Crossing)
Map 2: County Rd 49
Map 3: County Rd 8

Legend

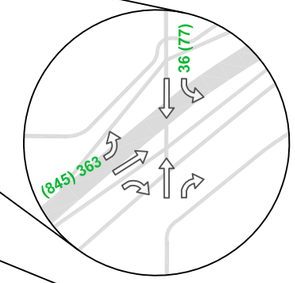
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map



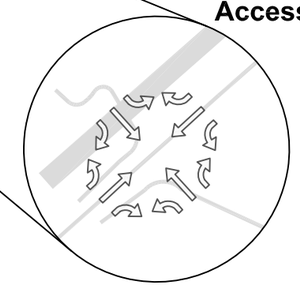


CR 49 at I-76 WB Ramps

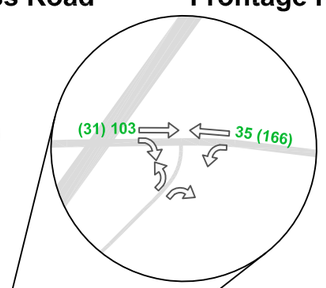


CR 49 at I-76 EB Ramps

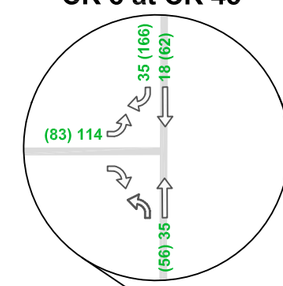
CR 16 at I-76 Access Road

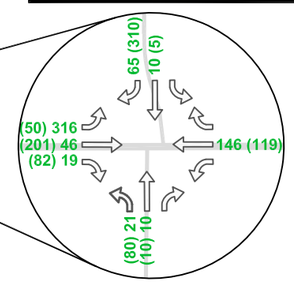


CR 8 at I-76 Frontage Road

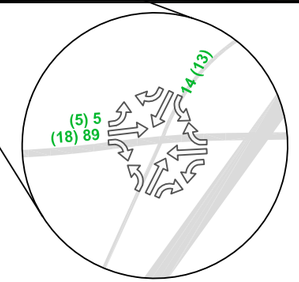


CR 8 at CR 45





SH 52 at CR 49



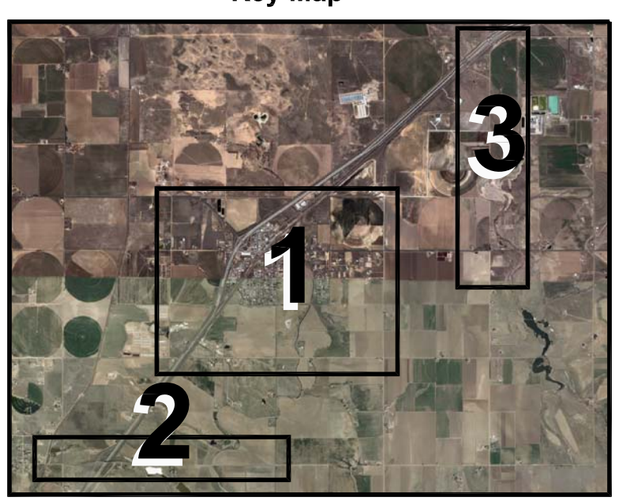
CR 8 at I-76 Frontage Road

2018 Total Volumes (No CR 49 RR Crossing) Map 1: Main Street

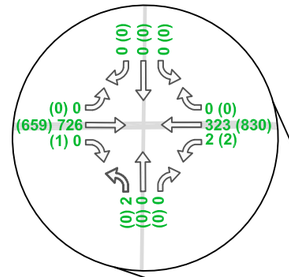
Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2008)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

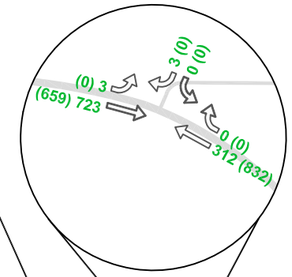
Key Map



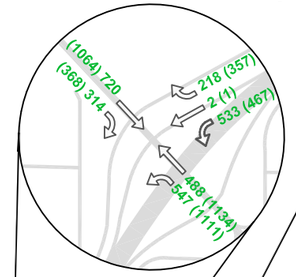
SH 52 at CR 43



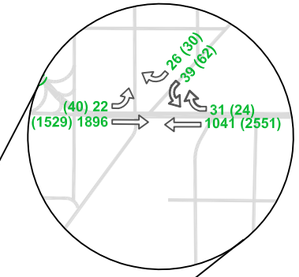
SH 52 at CR 12.5



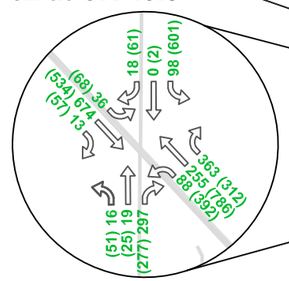
SH 52 at I-76 WB Ramps

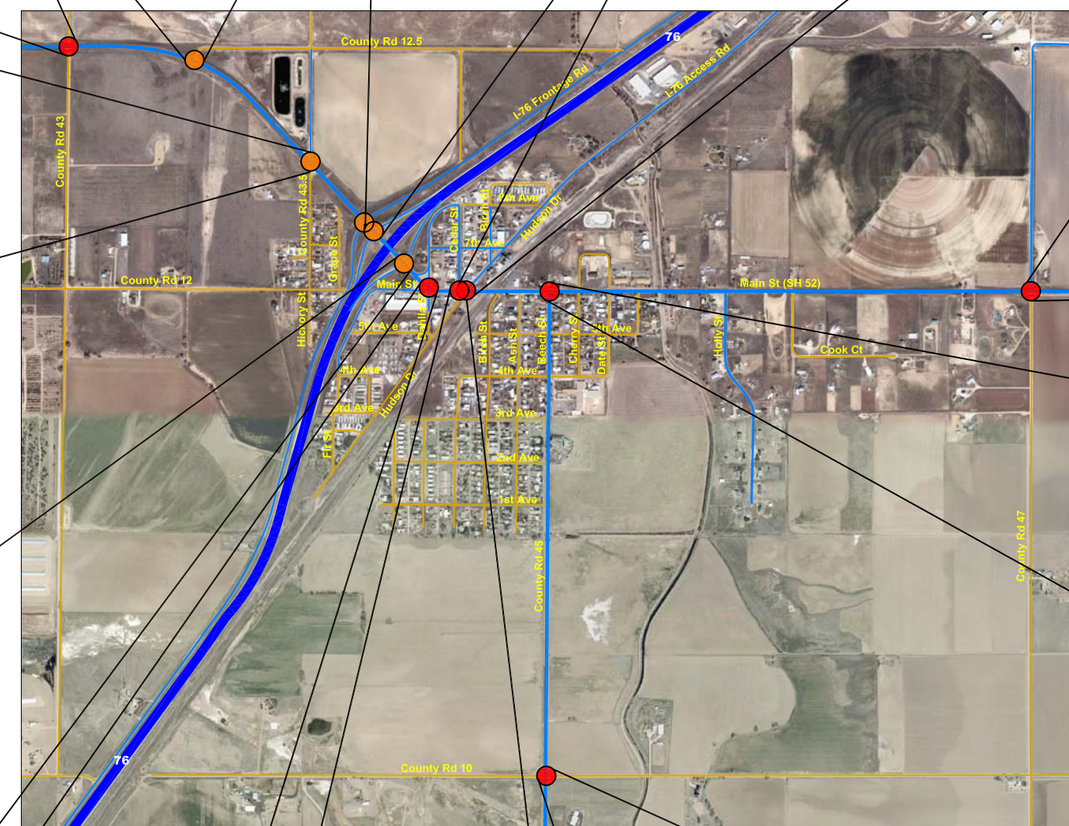


Main Street at Hudson Drive

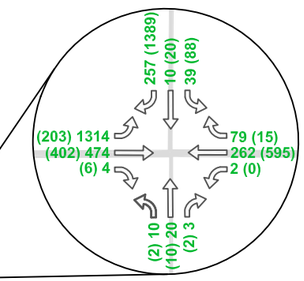


SH 52 at CR 43.5

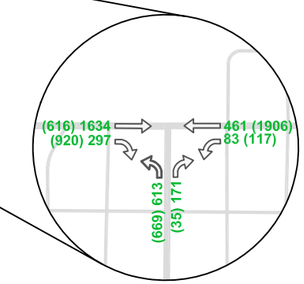




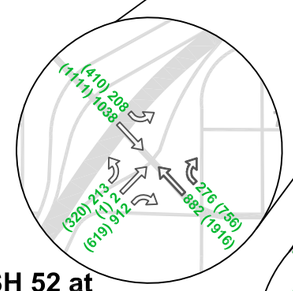
SH 52 at CR 47



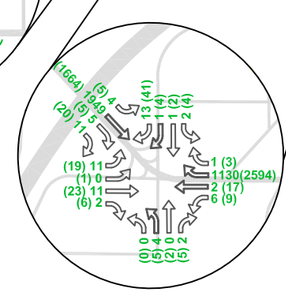
SH 52 at CR 45



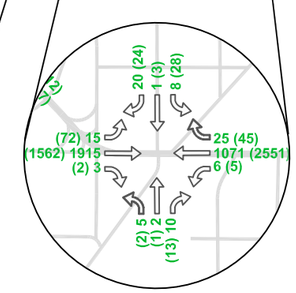
SH 52 at I-76 EB Ramps



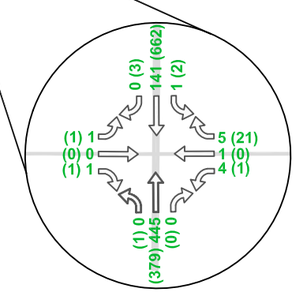
Main Street at Dahlia Street



Main Street at Cedar Street



SH 10 at CR 45

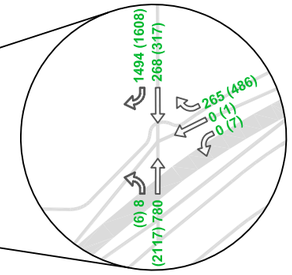


2018 Total Volumes
(No CR 49 RR Crossing)
Map 2: County Rd 49
Map 3: County Rd 8

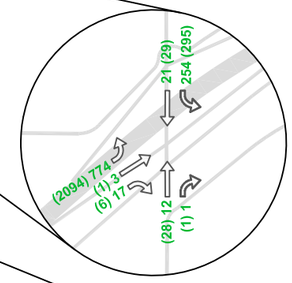
Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map

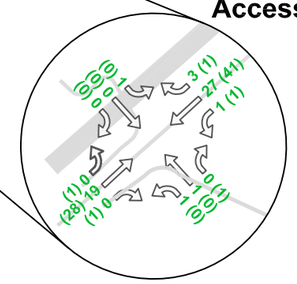


CR 49 at I-76 WB Ramps

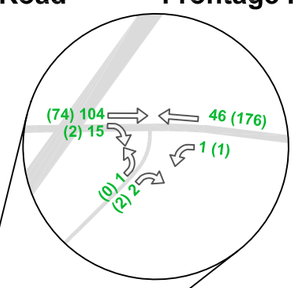


CR 49 at I-76 EB Ramps

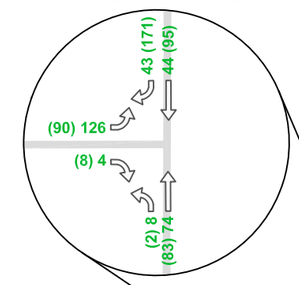
CR 16 at I-76 Access Road

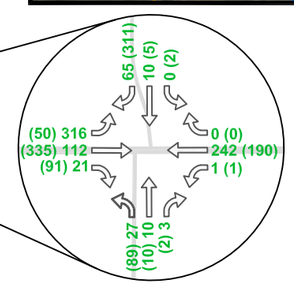


CR 8 at I-76 Frontage Road

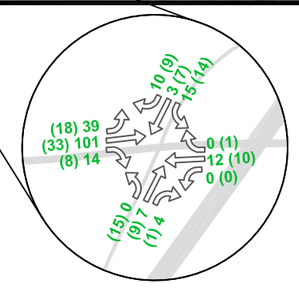


CR 8 at CR 45





SH 52 at CR 49



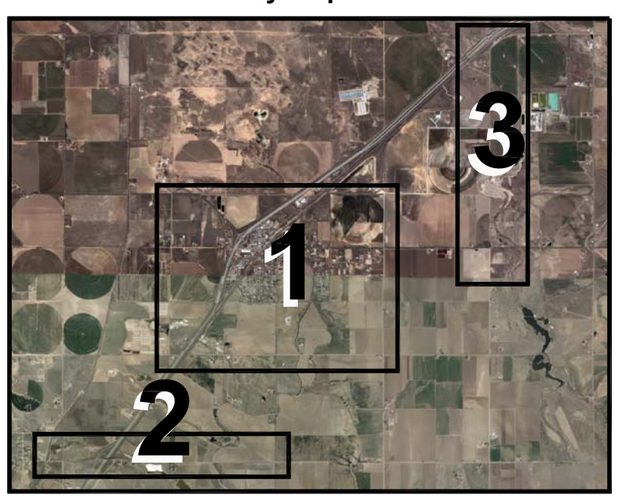
CR 8 at I-76 Frontage Road

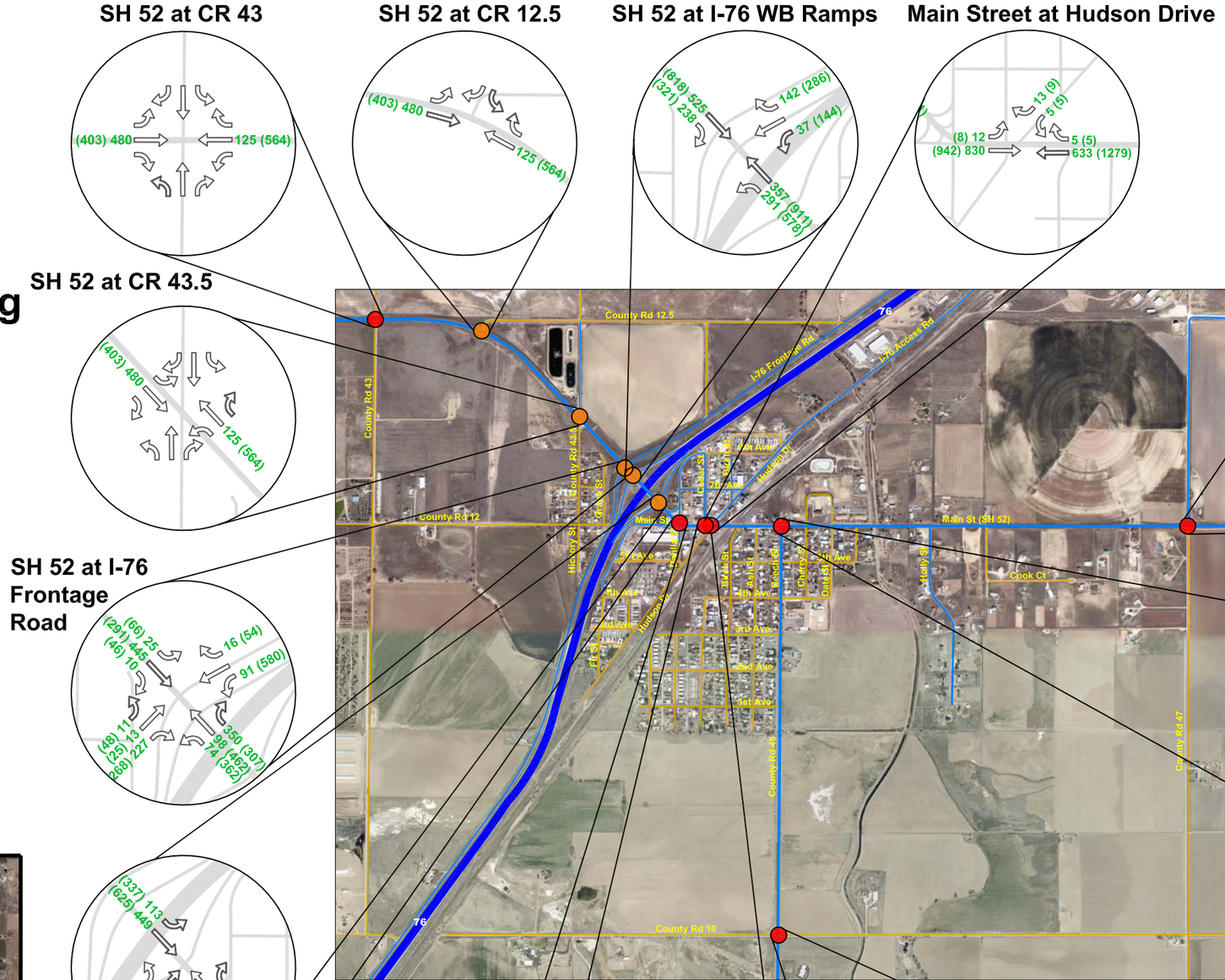
10-Year Traffic New Development (With CR 49 RR Crossing and CR 8 Interchange) Map 1: Main Street

Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2008)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map





SH 52 at CR 43

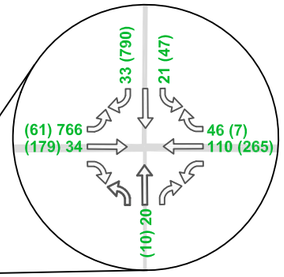
SH 52 at CR 12.5

SH 52 at I-76 WB Ramps

Main Street at Hudson Drive

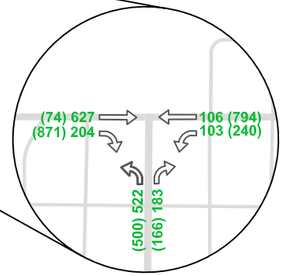
SH 52 at CR 43.5

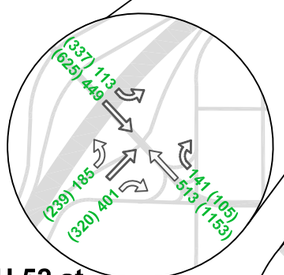
SH 52 at CR 47



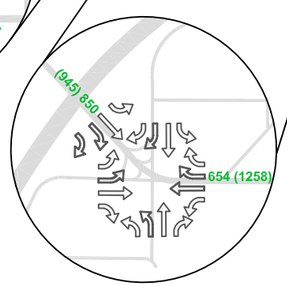
SH 52 at I-76 Frontage Road

SH 52 at CR 45

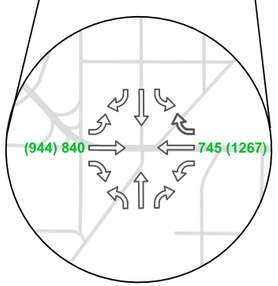




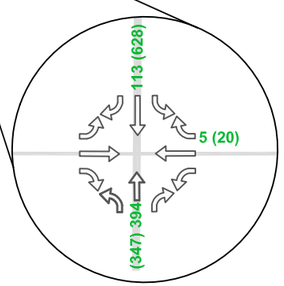
SH 52 at I-76 EB Ramps



Main Street at Dahlia Street



Main Street at Cedar Street



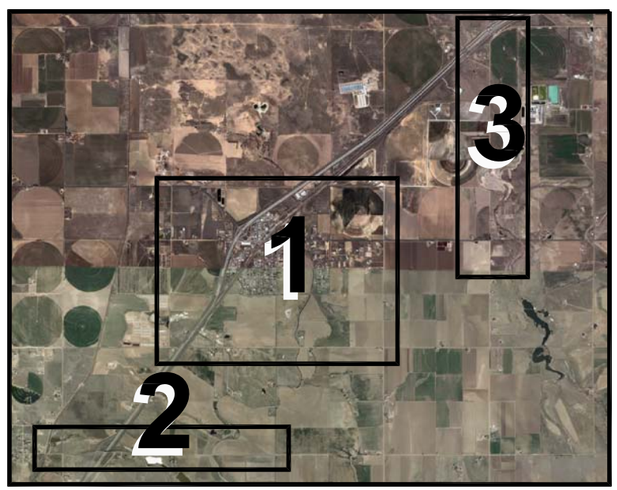
SH 10 at CR 45

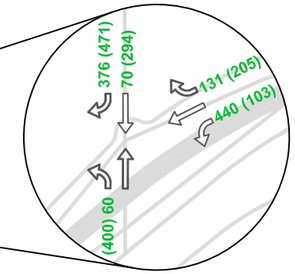
10-Year Traffic New Development (With CR 49 RR Crossing and CR 8 Interchange) Map 2: County Rd 49 Map 3: County Rd 8

Legend

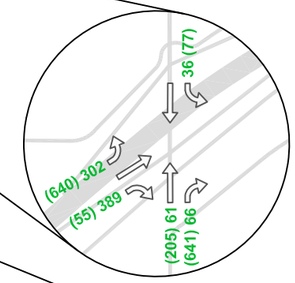
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map



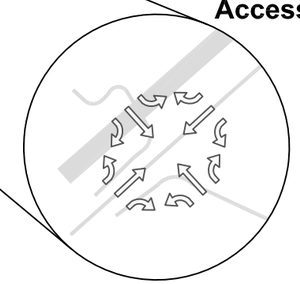


CR 49 at I-76 WB Ramps

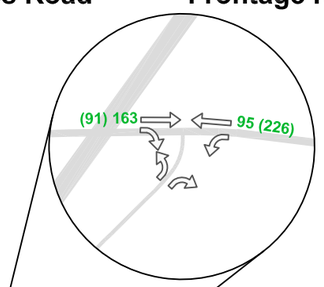


CR 49 at I-76 EB Ramps

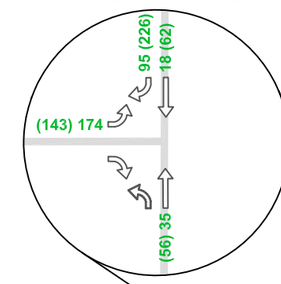
CR 16 at I-76 Access Road

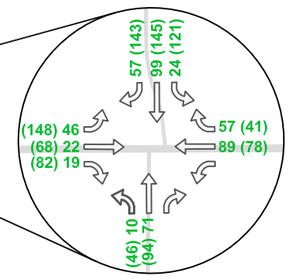


CR 8 at I-76 Frontage Road

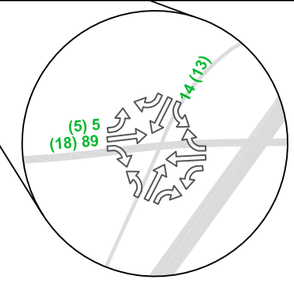


CR 8 at CR 45





SH 52 at CR 49



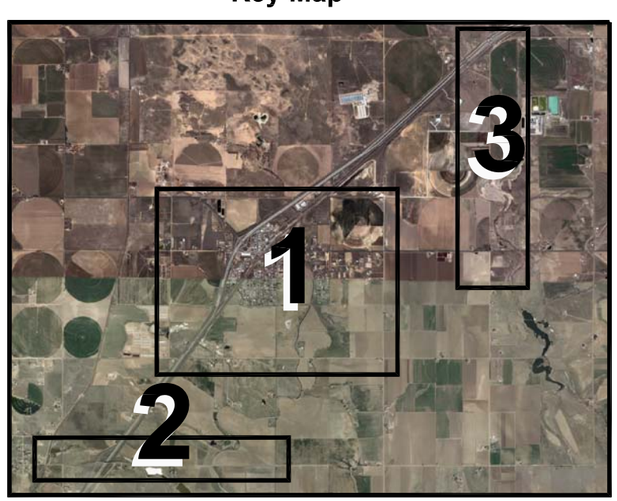
CR 8 at I-76 Frontage Road

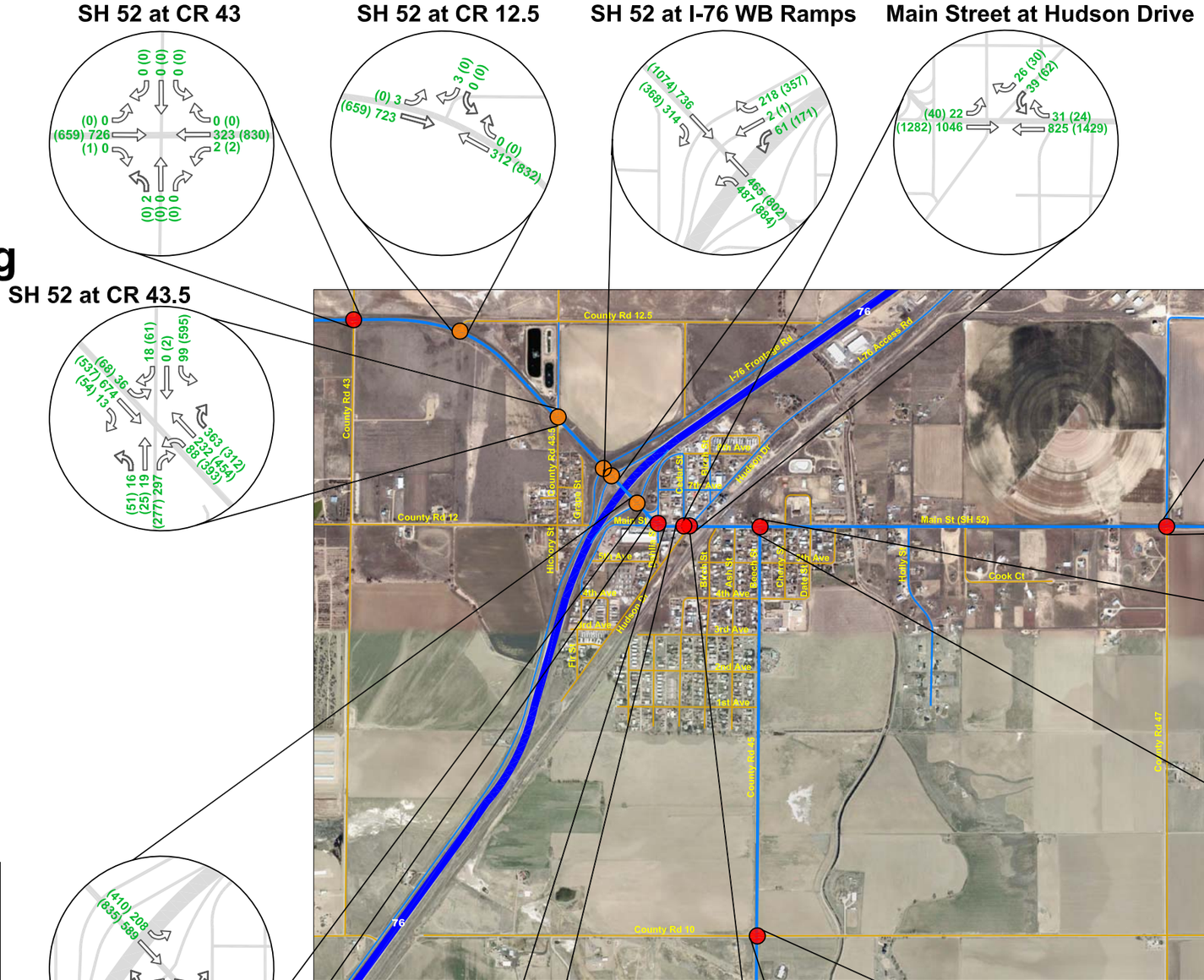
2018 Total Volumes (With CR 49 RR Crossing and CR 8 Interchange) Map 1: Main Street

Legend

- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2008)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map





SH 52 at CR 43

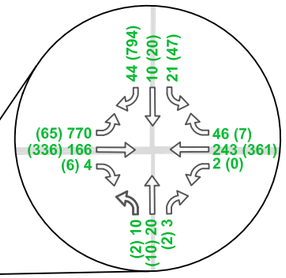
SH 52 at CR 12.5

SH 52 at I-76 WB Ramps

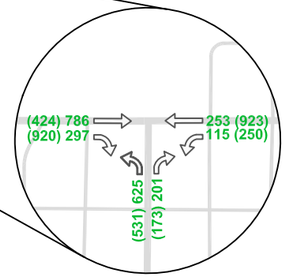
Main Street at Hudson Drive

SH 52 at CR 43.5

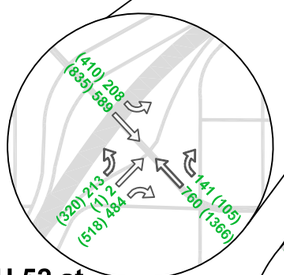
SH 52 at CR 47



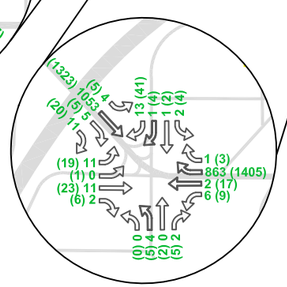
SH 52 at CR 45



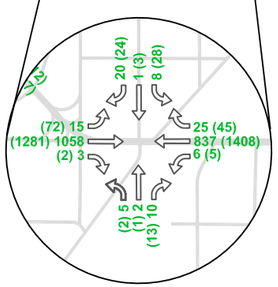
SH 52 at I-76 EB Ramps



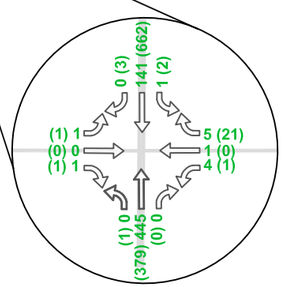
Main Street at Dahlia Street



Main Street at Cedar Street



SH 10 at CR 45

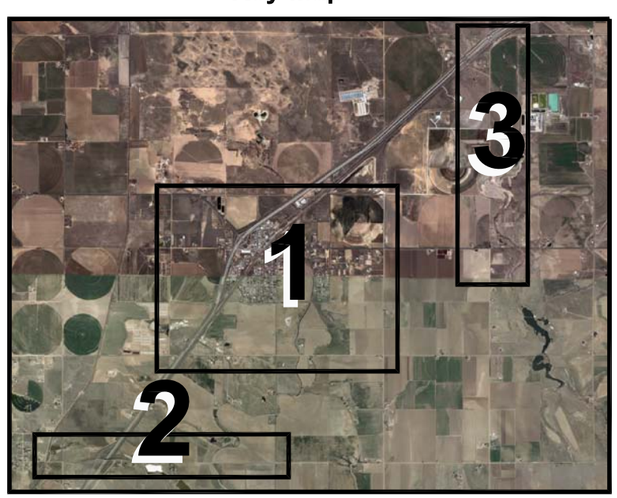


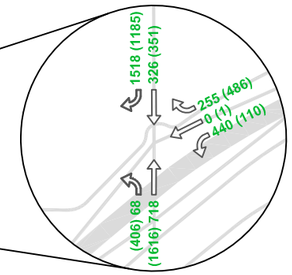
2018 Total Volumes (With CR 49 RR Crossing and CR 8 Interchange) Map 2: County Rd 49 Map 3: County Rd 8

Legend

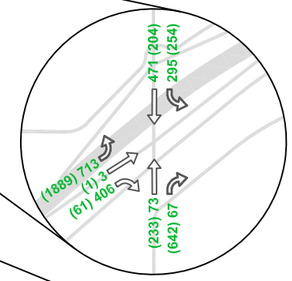
- Paved Road
- Gravel/Dirt Road
- Intersections Counted by LSC (2007)
- Intersections Counted by the Town of Hudson (2008)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume

Key Map



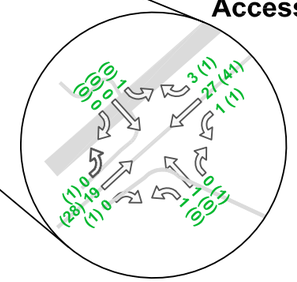


CR 49 at I-76 WB Ramps

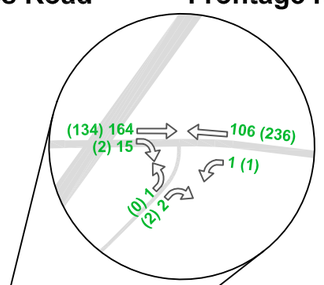


CR 49 at I-76 EB Ramps

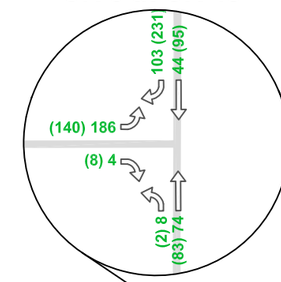
CR 16 at I-76 Access Road

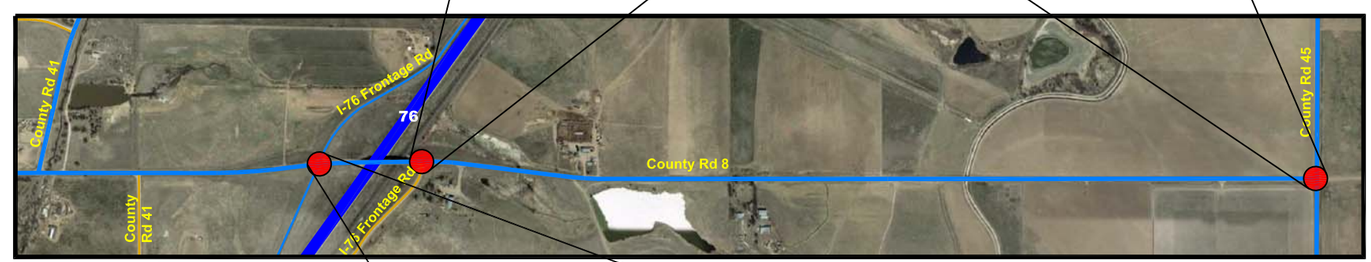


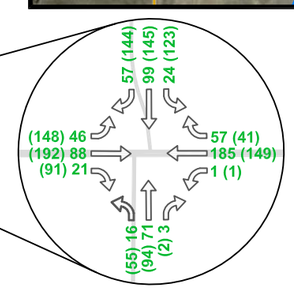
CR 8 at I-76 Frontage Road



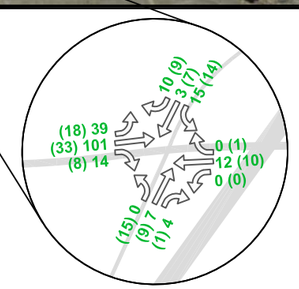
CR 8 at CR 45







SH 52 at CR 49



CR 8 at I-76 Frontage Road