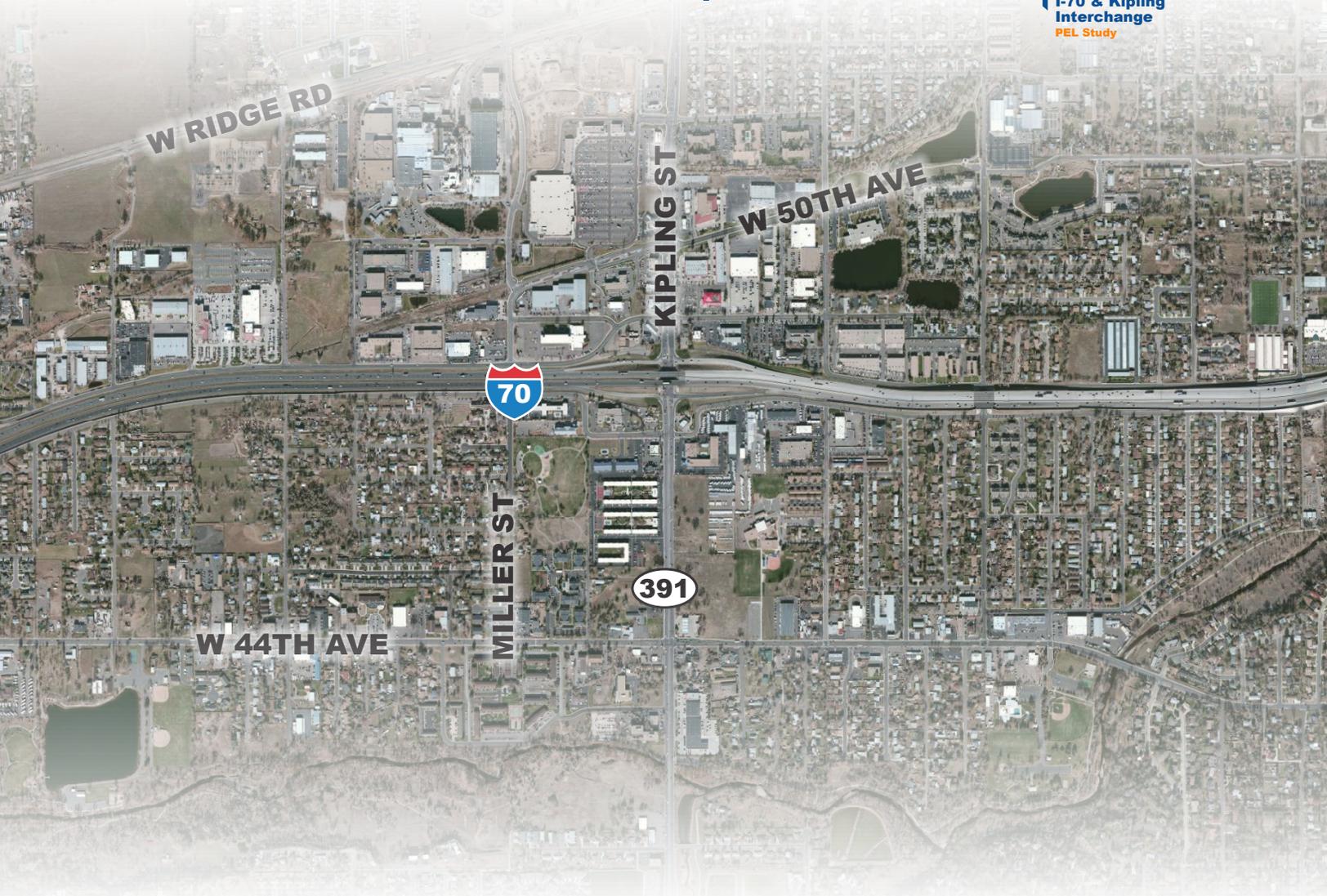


FINAL Planning and Environmental Linkages (PEL) Report



I-70 & Kipling Interchange | PEL Study



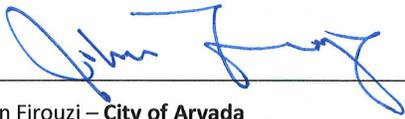
July 2013

Agency Support

The public agencies that were engaged in the preparation of this Planning and Environmental Linkages (PEL) Study for the I-70 and Kipling Interchange have expressed their support of this plan, as defined in this *Final PEL Report*, dated July 2013.

- Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) agree that this study fits the criteria for the FHWA PEL planning process. Through this process, the evaluation and findings of the PEL study can be more readily applied to subsequent National Environmental Policy Act (NEPA) evaluation. Resource agencies with jurisdiction in the interchange area have expressed support for the process and willingness to work cooperatively on future NEPA processes for individual interchange improvements. (See the Agency and Public Coordination section.)
- The agencies will work to complete the NEPA environmental evaluation requirements for specific improvements at the I-70 and Kipling Street interchange. Subsequent to future NEPA clearance, the agencies will work cooperatively to fund and implement the interchange area improvements.
- The agencies will develop collaborative transportation partnerships to support the interchange recommendations through the Denver Regional Council of Governments (DRCOG) planning process to help facilitate improvements to this interchange area.

Written letters of support from the agencies represented on the I-70 and Kipling Interchange PEL Study Technical Team have been requested and will be compiled by CDOT as they are received. The Technical Team supports the recommendations of this project as indicated by those letters.



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8-8-13

(Date)



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8-7-13

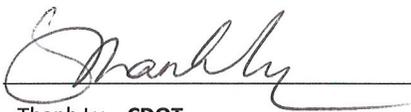
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Health Impact Assessment Overview, Connections and Strategies – May 14, 2013

Land Use and Business Impacts – March 15, 2013

Right of Way and Relocation Impacts and Cost Estimate – April 1, 2013

Evaluation of Early Action Improvement Options – April 18, 2013

Appendix B – Alternatives to be Carried Forward

Appendix C – Summary of Resource Agency Coordination and Input

Appendix D – Public Comment Summaries

Appendix E – Conceptual Design Plan Set for Recommended Alternatives

Appendix F – Traffic Volumes and Level of Service for Recommended Alternatives

Appendix G – Cost Estimates for Recommended Alternatives

Appendix H – Planning and Environmental Linkages (PEL) Questionnaire

Appendix I – Letters of Agency Support

List of Acronyms and Abbreviations

ADT – average daily traffic
AICP – American Institute of Certified Planners
AM – ante meridiem
BMPs – Best Management Practices
CDOT – Colorado Department of Transportation
CFR – Code of Federal Regulations
CPW – Colorado Parks & Wildlife
DRCOG – Denver Regional Council of Governments
EB – eastbound
FHWA – Federal Highway Administration
GIS – Geographic Information System
I-70 – Interstate 70
LOS – Level of Service
LT – left turn
MBTA – Migratory Bird Treaty Act
MPH – miles per hour
NEPA – National Environmental Policy Act
NB – northbound
NE – northeast
NW – northwest
PEL – Planning and Environmental Linkages
PE – Professional Engineer
PM - post meridiem
PTOE – Professional Transportation Operations Engineer
ROW – right-of-way
RT – right turn
RTD – Regional Transportation District
SB – southbound
Sec/veh – seconds per vehicle
SH – State Highway
SPUI – Single Point Urban Interchange
SW – southwest
TSM – Transportation System Management
U.S. – United States
USACE – U.S. Army Corps of Engineers
USFWS – U.S. Fish and Wildlife Service
Veh/hr – vehicles per hour
WB – westbound

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Looking north along Kipling Street towards I-70

Introduction

PEL Report

This report documents the results of a PEL study conducted to identify and evaluate transportation improvements at the Interstate 70 (I-70) and Kipling Street (State Highway [SH] 391) interchange. CDOT initiated the PEL study to develop a range of improvements to reduce congestion and improve operations and safety at the I-70 and Kipling Street interchange. A thorough and inclusive technical and public process helped to identify and screen a wide

range of improvement alternatives.

This study was conducted following FHWA PEL guidance regarding the integration of transportation planning and the NEPA process, which encourages the use of planning studies to provide information for incorporation into future NEPA documents (23 Code of Federal Regulations [CFR] 450). The goal of these early integrated planning efforts is to streamline subsequent alternatives analysis during the NEPA process(es).

This PEL study is intended to provide the framework for the long-term implementation of interchange improvements as funding is available and to be used as a resource for future NEPA documentation. The technical reports prepared for this PEL study are intended for use in support of future NEPA documentation with minimal re-evaluation of alternatives.

The following NEPA process principles were followed for this PEL study:

- Preparation of a project Purpose and Need
- Screening of alternatives
- Coordination with federal, state, and local agencies, including concurrence at key decision points to align with those of the NEPA process:
 - Purpose and Need
 - Range of alternatives
 - Screening evaluation criteria
 - Identification of recommended alternatives

A project Purpose and Need was developed in accordance with Council on Environmental Quality NEPA regulations (40 CFR 1506.13). A thorough and inclusive technical and public process was applied to identify a reasonable range of alternatives, as described by the Council on Environmental Quality guidance (40 CFR 1502.14). Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.

The initial alternatives were screened to eliminate those that did not meet the project Purpose and Need and those that were deemed unreasonable based on an alternatives evaluation process that determined impacts and feasibility considering traffic operations, multimodal accommodations, community impacts, environmental impacts, engineering, and cost. Based on the alternatives evaluation, interchange alternatives were identified to carry forward into future NEPA process(es).

This PEL Study Report summarizes the findings and recommendations for the I-70 and Kipling Street interchange improvements. The following interim reports (available on the project website and from project team members) were completed throughout the study process and provide additional information and details regarding the analyses:

- *Final Existing Transportation Conditions Report* (May 2012)
- *Final Environmental Scan Report* (May 2012)
- *Final Alternatives Development and Analysis Report* (June 2013)

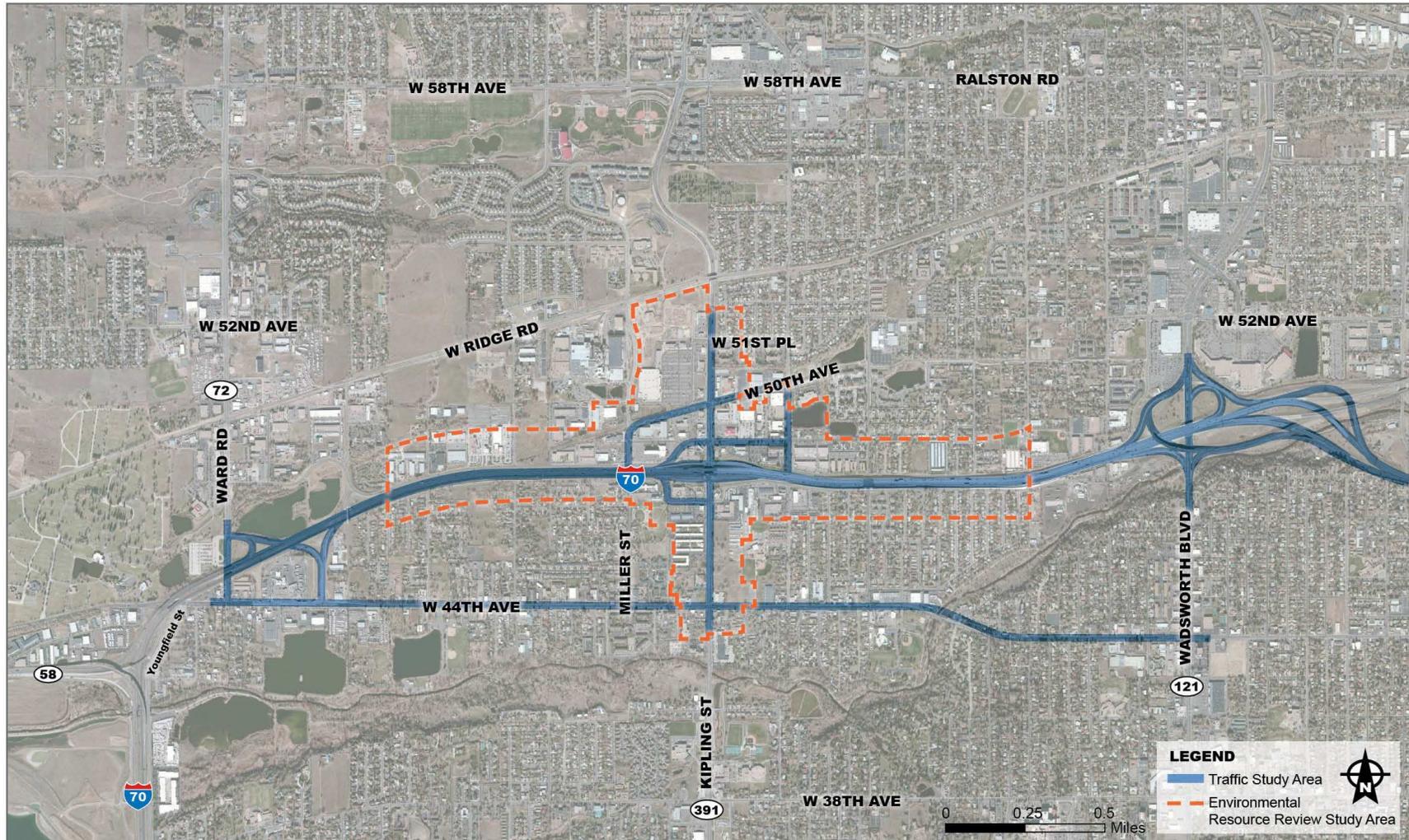
Study Area

The traffic study roadways and environmental study area are illustrated in **Figure 1**. The traffic study roadways include I-70 from Ward Road to Wadsworth Boulevard, which encompasses the interchanges adjacent to the I-70 and Kipling Street interchange. The traffic study roadways include Kipling Street from 44th Avenue to 51st Place, the major intersections approximately ½ mile north and south of the interchange. The traffic study area also includes 44th Avenue, which was evaluated as a parallel arterial to I-70 with the existing conditions evaluation.

The I-70 and Kipling Street interchange is located within the City of Wheat Ridge in Jefferson County. The boundary for the City of Arvada is located immediately north of the interchange between the 50th Avenue and 51st Avenue intersections. The interchange is located in a predominantly urban area and provides access to well-established commercial, residential and light industrial areas, as well as areas identified for urban renewal and new transit-oriented development in Wheat Ridge and Arvada.

The environmental study area is focused around the area of most likely physical impacts of interchange improvements along I-70 and Kipling Street. To take into account the potential for indirect or secondary effects to community or environmental resources as a result of a proposed action, the environmental study area was extended to the back property line of area parcels.

Figure 1: Study Area



I-70

The speed limit along I-70 through the study area is 65 miles per hour (MPH).

I-70 is a major east-west interstate highway that crosses the United States (U.S.) from Baltimore, Maryland to I-15 south of Salt Lake City, Utah. I-70 crosses central Colorado and travels through the middle of the Denver metropolitan area. Within the study area, I-70 has six through lanes. East of Kipling Street to Wadsworth Boulevard, I-70 has three through lanes eastbound and four through lanes westbound with the inside through lane merging at the Kipling Street bridge. There is also a westbound continuous auxiliary lane between the Wadsworth and Kipling interchanges.

Approximately ½ mile east of the Kipling interchange, I-70 was reconstructed in the early 1990s as part of the final connection of I-76. The Wadsworth interchange is a complex interchange including directional ramps from Wadsworth Boulevard and an eastbound exit ramp and westbound entrance ramp to/from I-76. Auxiliary and acceleration/deceleration lanes are provided through the Wadsworth and I-76 interchanges. East of I-76, I-70 provides six through lanes through the I-25 interchange and beyond.



Westbound I-70 approaching Kipling Street interchange

Kipling Street (SH 391)

Kipling Street is typical of many suburban arterials developed in the 1960s-1970s with numerous private driveway accesses, close intersection spacing, and limited storage for left turning traffic in the median.

Kipling Street is a principal north-south arterial within the Denver metropolitan area, providing almost 30 miles of continuity through the western Denver suburbs from C-470 in southern Jefferson County to Ralston Road in Arvada. It is designated SH 391 between US Highway 285 in Lakewood and 49th Avenue in Wheat Ridge. Within the study area, CDOT defines the functional classification of Kipling Street as Other – Principal Arterial, which is defined as a corridor that serves major centers of activity with relatively high traffic volumes and long trips, but with partial or no control of access.

Kipling Street has four through lanes and two continuous turn lanes from 44th Avenue to 51st Place with a posted speed limit of 40 MPH. The section north of I-70 contains six lanes with the additional lanes providing continuous auxiliary lanes between the westbound I-70 ramps and 50th Avenue.



Southbound Kipling Street approaching I-70 interchange

There are seven traffic signals along Kipling Street within the study area and only the southbound approach at the eastbound I-70 ramps and northbound approach at the 50th Avenue intersection have double left turn lanes. DRCOG provided traffic signal timing and coordination improvements along Kipling Street within the study area in 2009. That project resulted in travel time and speed improvements for travelers during peak hours in both directions of travel from 51st Place to Alameda Avenue in the City of Lakewood.

Logical Termini

Logical termini - rational end points for a transportation improvement and for environmental review.

Independent utility – usable and a reasonable expenditure, even if no additional transportation improvements are made in the area.

The study area boundaries meet the criteria for logical termini and independent utility as required by FHWA. The full logical termini analysis for the I-70 and Kipling Street interchange project is provided in a technical memo in **Appendix A**.

The FHWA guidance on NEPA and transportation decision-making includes policy regarding development of logical project termini, which are defined as rational end points for a transportation improvement and for environmental review. This guidance states that transportation projects must consider a “whole” or integrated project, satisfy an identified need, and be considered in the context of the local area. Otherwise, proposed improvements may only partially satisfy the need or may cause unexpected adverse impacts. An issue of “segmentation” may also occur when a transportation need extends throughout an entire corridor but environmental issues are evaluated for only a smaller segment of the corridor.

In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, the evaluated action must:

- Connect logical termini and be of sufficient length to address environmental matters on a broad scope;
- Have independent utility; i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and
- Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

There is a drop in traffic volumes and accident rates outside the proposed study area boundaries. The traffic volume and crash data findings demonstrate that the area incorporates logical termini. The proposed study area is of sufficient length to address environmental matters on a broad scope. Future transportation expenditures to justify the current investment would not be required given the locations of the logical termini along I-70 from Ward Road to Wadsworth Boulevard and on Kipling Street between 44th Avenue and 51st Avenue. Therefore, this project demonstrates independent utility.

In addition, no other reasonably foreseeable transportation projects would be restricted by the recommended improvements of this study.

Planning Context

A number of plans have been developed that relate to the study area, including plans for the adjacent land use, local transportation plans, and statewide plans. Previous local and regional plans that were considered during the alternatives development process include:

- *Envision Wheat Ridge* (2009)
- *City of Wheat Ridge Bicycle and Pedestrian Master Plan* (2010)
- *City of Arvada Comprehensive Plan* (2006)
- *City of Arvada Pedestrian and Bicycle Access Plan* (2009)
- *Jefferson County Countywide Transportation Plan* (2002)
- *Jefferson County Bicycle and Pedestrian Plan* (2012)
- *2035 Metro Vision Regional Transportation Plan* (2011)
- *2035 Statewide Transportation Plan* (2011)

The reconstruction of the I-70 and Kipling Street interchange is consistent with local and regional transportation plans. The project is included in DRCOG's Fiscally Constrained 2035 Regional Transportation Plan (RTP). The RTP includes the interchange reconstruction in its list of 2015 to 2024 regionally significant and funded roadway capacity improvement projects.

The I-70 and Kipling Street interchange reconstruction project is also consistent with local planning documents. Although not included as locally-funded, the project is included in the Wheat Ridge Comprehensive Plan and Jefferson County Countywide Transportation Plan.



Kipling Street and westbound I-70 ramps intersection

Purpose and Need

CDOT in cooperation with local communities and other agencies is preparing this PEL study to identify and assess potential transportation improvements at the I-70 and Kipling Street interchange. Thorough documentation of the process and recommendations is a critical element of the PEL process so the decisions can be used in future NEPA process(es). This Purpose and

Need was developed in coordination with agency stakeholders with review by the general public.

The specific needs, summarized below and shown in **Figure 2** on page 11, are based on the analysis and findings documented in this report and in separate documents prepared as part of this project, including the *Existing Transportation Conditions Report* (May 2012) and *Purpose and Need Statement* (May 2012).

Purpose of the Project

The purpose of the I-70 and Kipling Street interchange project is to reduce congestion, optimize operations, improve safety, and accommodate multimodal connections at the I-70 and Kipling Street interchange.

Need for Interchange Improvements

The existing design and configuration of the interchange no longer accommodates travel demands. Kipling Street is an important transportation corridor supporting mobility and economic activity in Jefferson County, including the cities of Wheat Ridge and Arvada. Improvements are needed to:

- Meet current and future traffic demands
- Improve operational efficiency of the interchange
- Improve traveler safety through the interchange
- Accommodate multimodal connections

Capacity and Operations

High traffic volumes and frequent congestion issues occur within the study area on Kipling Street north of the interchange and on I-70 east of the interchange. I-70 carries approximately 147,000 vehicles daily east of the Kipling Street interchange as measured by traffic counts taken in 2010. Existing daily traffic on Kipling Street collected for this project south of I-70 is approximately 42,000 vehicles, while north of I-70 the existing daily traffic is about 48,000 vehicles. By 2035, the average daily traffic (ADT) on I-70 is expected to increase about 25% to approximately 184,000 vehicles east of the Kipling Street interchange and the ADT on Kipling Street is expected to increase about 15% to about 55,000 vehicles north of I-70.

The interchange at I-70 and Kipling Street was constructed in 1967. Although it served the communities and traffic conditions when it was constructed, the tight diamond configuration with closely-spaced frontage road intersections can no longer effectively handle current or future traffic demands.

Existing traffic volumes at the interchange create operating conditions characterized by restricted movements and recurring back ups. Specific movements that currently exhibit operational problems include the peak turning movements from the Westbound I-70 Off Ramp and the ante meridiem (AM) peak traffic backs up along Kipling Street on the southbound approaches to the interchange.

Many drivers making the right turn from the Westbound I-70 Off Ramp desire to turn left at the Kipling Street and 49th Avenue/North Frontage Road intersection, located 375 feet north of the ramp. There are currently signs that indicate the right turn lane as a continuous acceleration lane, but there are right turning drivers that stop in the continuous flow lane in order to wait for a gap in traffic to get to the northbound left turn lane at 49th Avenue. This reduces the capacity of the ramp signal and causes traffic to queue up the off ramp and onto the I-70 mainline.

Close spacing between frontage road intersections and interchange ramps does not provide adequate distance between traffic signals for traffic to progress through the interchange. Because of the relatively high overall intersection volumes, turn phases and a long signal cycle length are needed during the peak hours. These required signal operations combined with the over-capacity traffic volume conditions create vehicle queues that spill back from the I-70 ramp signals through the adjacent intersections at the frontage roads. Traveling through the four ramp and frontage road traffic signals with queues backing up through intersections requires drivers to slow their speeds through the interchange area, which further limits the capacity of the entire interchange area and adversely affects through traffic on Kipling Street.

Because of the interchange location (on the edge of the I-70 mountain corridor) and the services provided (fuel, food, and lodging), many of the drivers using the interchange to and from the freeway are unfamiliar with the area. There is also a relatively high percentage of single unit trucks within the interchange area, providing area business service deliveries. The overall traffic operations are largely dependent on how easy it is for trucks and unfamiliar drivers to navigate the interchange and access the adjacent businesses.

Problems at the interchange have the potential to redirect traffic and create operational and capacity issues on other local roadways.

The recurring congestion contributes to the difficulties for unfamiliar drivers to maneuver through the interchange area.

South of I-70, the numerous driveways and unrestricted median encourages uncontrolled turns across Kipling Street that both increase potential for conflicts (and crashes) and disrupt traffic flow. Side-by-side opposing left turn lanes introduce multiple conflict points and create confusion because of the uncertainty of when and where drivers will enter the median lanes. In addition, drivers stopped in the turn lanes block the view of traffic in the through lanes, resulting in drivers making unsafe turns across through traffic. All of these conditions contribute to turbulence in the Kipling Street traffic flow and reduce its capacity.

Safety

The proposed action is needed to improve traveler safety through the interchange, including vehicles, pedestrians, and bicyclists.

Traffic Safety

The segment of I-70 at the Kipling Street interchange is above the average expected crash rate for the given average annual daily traffic. The occurrence of rear end crashes on I-70 in the vicinity of the interchange is closely tied to the heavy peak hour traffic volumes on the freeway. Over a three year period from 2008 through 2010, the majority of crashes on the four interchange ramps occurred on the Eastbound On Ramp and the Westbound Off Ramp and the majority of the crashes were rear end crashes during the post meridiem (PM) peak hour. On the Westbound Off Ramp, the majority of the crashes occurred at or near the free flow right turn lane from the off ramp to northbound Kipling Street when the lead vehicle did not utilize the free flow acceleration lane but instead stopped to yield to traffic on Kipling Street. The following vehicle then struck the lead vehicle.

Many of the crashes along Kipling Street in the study area occur because of congestion.

On Kipling Street, rear end crashes are the predominant crash type followed by approach turn crashes and broadside crashes. The following list describes the crash types that occur more frequently than expected in the study area and the potential cause:

- Rear-end crashes – related to congestion and frequent traffic signals through the corridor
- Approach turn and broadside – related to congested intersections, signal phasing, and signal head visibility
- Sideswipes when both vehicles are moving in the same direction – related to short weaving and lane-changing maneuvers

Pedestrian and Bicycle Safety

High traffic volumes and deficient pedestrian and bicycle facilities create safety concerns for pedestrians and bicyclists traveling through the study area. The interchange presents a particular challenge. The sidewalk on both sides of Kipling Street under the I-70 bridge is uncomfortable to use because of the proximity to the bridge piers and congested traffic lanes. The sidewalk on the west side of Kipling Street under the bridge also has steep sidewalk grades.

Over a three year period from 2008 through 2010, along Kipling Street in the study area, there were three crashes involving pedestrians and three crashes involving

bicycles. One of the pedestrian and one of the bicycle crashes occurred at the Kipling Street and 44th Avenue intersection. Two of the crashes involving bicycles occurred at the Kipling Street and South Frontage Road intersection. One of the pedestrian crashes occurred at the westbound I-70 ramps intersection.

The lack of access control along Kipling Street contributes to pedestrian and bicycle safety concerns. Along Kipling Street, pedestrians and bicyclists must cross many driveways where turning drivers are focused on entering or exiting Kipling Street and are not attentive to potential pedestrian conflicts.

Multimodal Connections

Automobiles, trucks, pedestrians, bicyclists, and buses travel through the I-70 interchange and Kipling Street lacks adequate facilities to accommodate effective connections. Effective multimodal connections provide direct links between facilities, such as existing sidewalks and multiuse paths, as well as accommodate efficient connections between modes, such as sidewalks at bus stops or multiuse paths leading to/from a rail station.

Transit Operations

Existing transit service on I-70 and Kipling Street in the study area includes local and express bus routes operated by RTD. RTD also plans to implement commuter rail transit along Ridge Road as part of the Gold Line commuter rail project, planned for opening to the public in 2016. A commuter rail station with associated transit-oriented development is planned at Ridge Road west of Kipling Street. With the opening of the commuter rail as currently planned, the proposed local bus service will remain the same as today. However, ridership for the bus route on Kipling Street serving the new rail station is expected to increase.

Buses, like other vehicles, will experience increased delays traveling through the I-70 and Kipling Street interchange area as traffic volumes increase. Buses also contribute to congestion by regularly stopping in the outside through-traffic lane, causing a temporary reduction in roadway capacity.

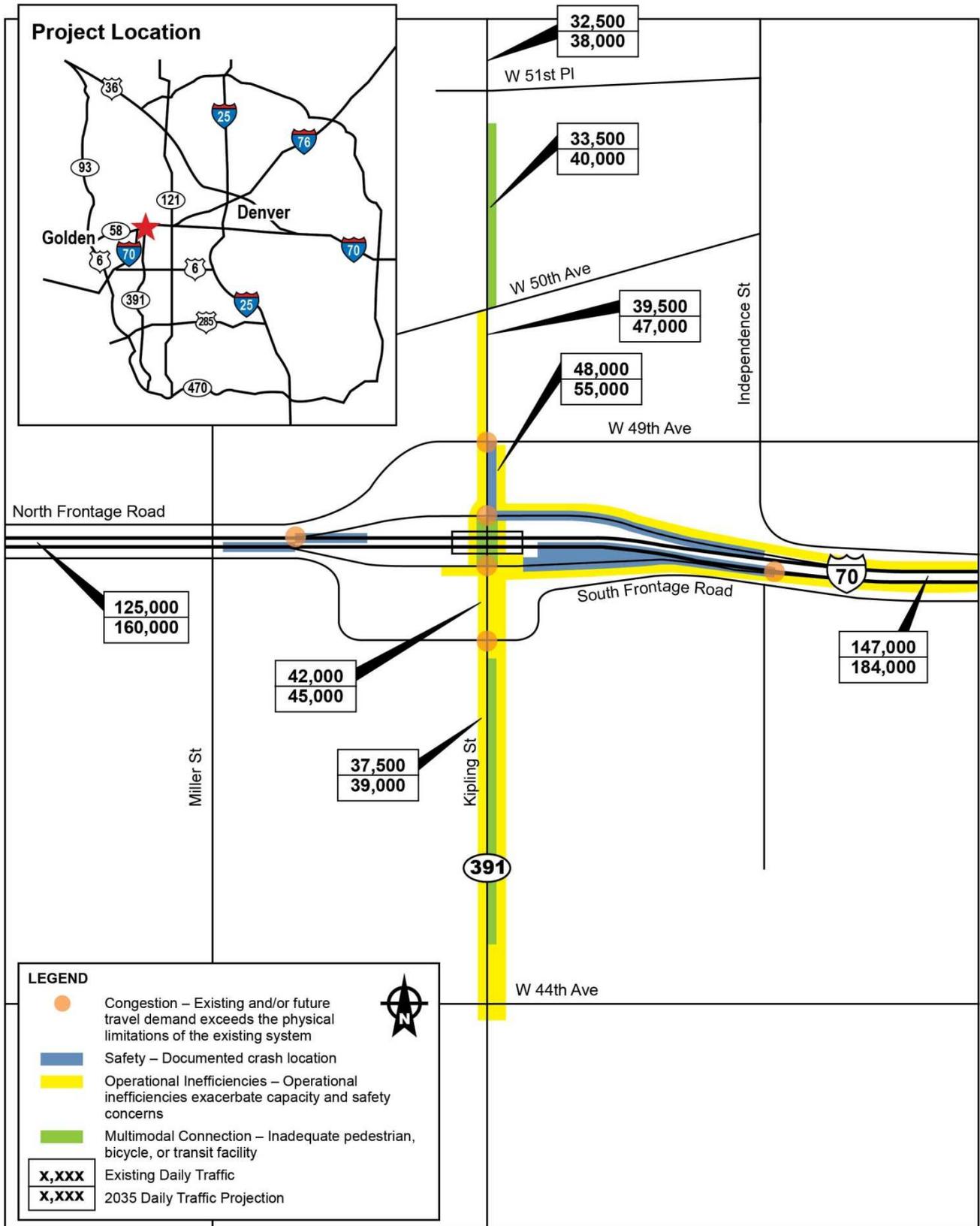
Pedestrian and Bicycle Facilities

Local and regional plans identify the need for pedestrian and bicycle improvements to the Kipling Street corridor and its crossing of I-70. These needs will become more critical as the volume of pedestrian and bicycle travel is anticipated to increase after the opening of the Gold Line commuter rail station at Ridge Road.

Most of the existing sidewalks within the study area are attached to the roadway curb, not buffered from travel lanes, and are often too narrow to accommodate both pedestrian and bicycle use. The sidewalk on both sides of Kipling Street under the I-70 bridge is perceived to be unsafe by pedestrians because of the proximity to the bridge piers and congested traffic lanes. A segment of sidewalk between 44th Avenue and the South Frontage Road on the east side is attached, with narrow asphalt pavement in poor condition. There is no sidewalk on the east side of Kipling Street between 50th Avenue and 51st Place.

Pedestrian and bicycle connections will become more critical with the opening of the Gold Line commuter rail station north of the study area.

Figure 2. Display of Interchange Needs





Looking south along Kipling Street towards I-70

Alternatives Evaluation Summary

An objective of the PEL study was to work with stakeholders to analyze and develop a range of short- and long-term improvements to reduce congestion and improve operational performance and safety at the interchange. The alternatives evaluation process included developing screening criteria based on the project Purpose and Need, developing a full range of alternatives, and documenting the elimination of alternatives to limit the need for consideration during future NEPA process(es). The alternatives screening process included public involvement and outreach efforts were conducted with the local agencies and area stakeholders.

General alternative concepts were developed and subjected to a Level 1 “fatal flaw” screening to eliminate alternatives that do not meet the project Purpose and Need. Alternatives from the Level 1 screening that were recommended for further evaluation were refined to complete additional and more detailed analysis to determine whether or not each alternative meets the Purpose and Need, compare how well each alternative would perform, and identify what impacts each alternative would have. The alternatives remaining after the Level 2 evaluation were further refined through conceptual design in Level 3 for final recommendation.

The development and evaluation of the interchange alternatives, summarized in this section, is documented in the *Final Alternatives Development and Analysis Report* (June 2013).

Transportation System Management (TSM) Improvements

TSM improvements identify options that would maximize the efficiency of the existing transportation system without major investments in new infrastructure. Several TSM strategies have been implemented within the study area and were considered as improvements on the corridor. The Kipling Street corridor was

The agency coordination and public involvement activities conducted for this project are summarized later in this report.

retimed by DRCOG in 2009, and CDOT optimizes the interchange signal timing as needed at the I-70 and Kipling Street ramps. Ramp metering is in place on the Eastbound I-70 On Ramp and is utilized during the morning peak period.

When the Gold Line commuter rail line opens, there may be a reduction of trips on I-70 in the study area due to an increase in transit ridership. The Gold Line station located north of the study area may also result in a higher volume of traffic on Kipling Street. Variable message signs will be used for the Gold Line on the freeway and Kipling Street to alert passengers of parking availability, which may reduce trips through the interchange when the station parking lot is over capacity. The Gold Line commuter rail line is projected to open in 2016.

These improvement strategies alone will not be sufficient improvements for the corridor to operate acceptably in the long-term design year. In addition, safety and roadway geometric improvements are needed to improve interchange operations.

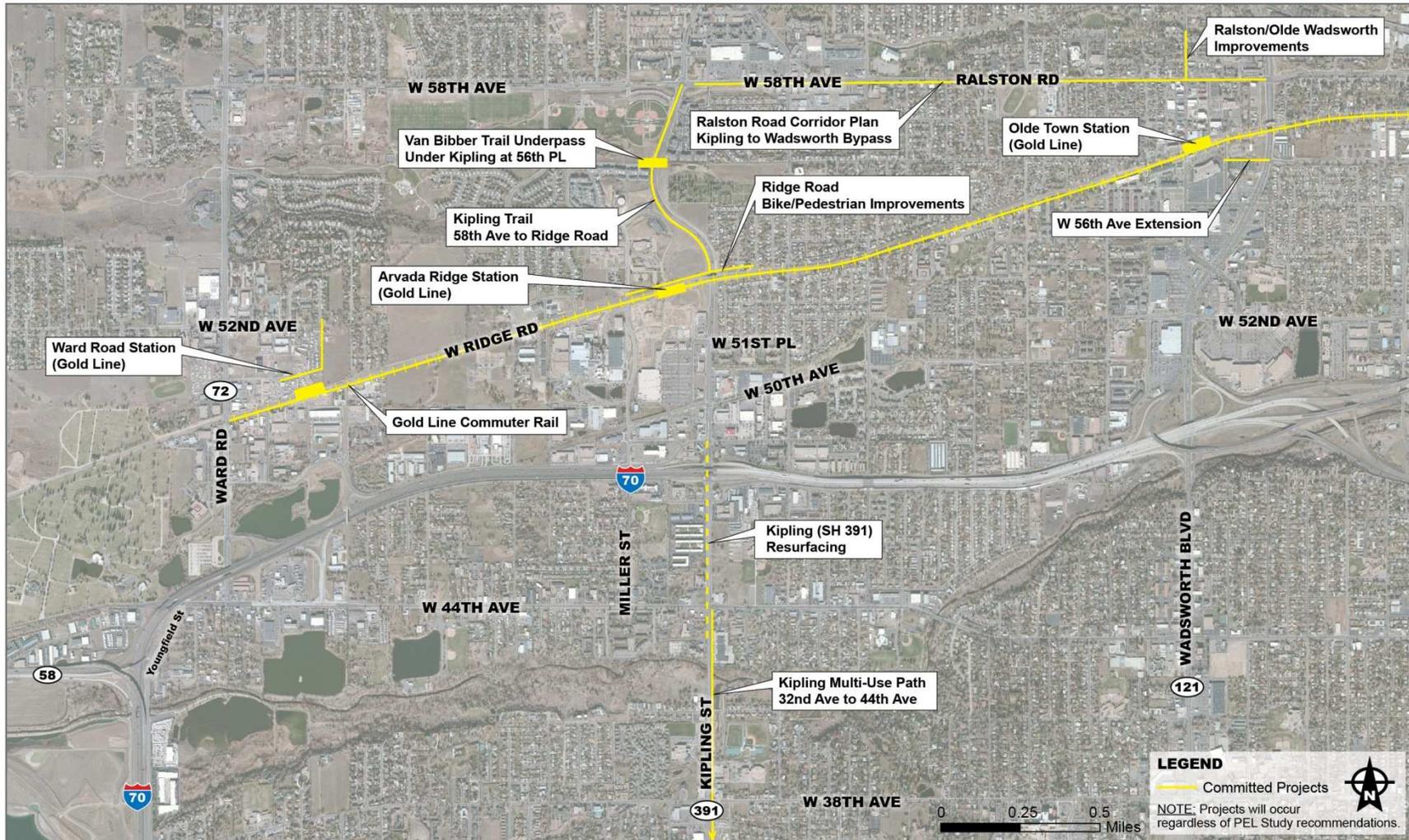
No Action Alternative

Improvements to the pedestrian and bicycle connections through the interchange will become more critical with the opening of the Gold Line commuter rail line and construction of new multi-use trails north and south of the interchange.

The No Action alternative does not meet the Purpose and Need. The No Action alternative is included as a baseline for comparison to the action alternatives. Under the No Action alternative, only improvements that are already planned and funded by CDOT, the County, or cities would be completed. There are no current transportation improvement projects within the area immediately adjacent to the I-70 and Kipling interchange. However, there are a number of engineering and planning efforts taking place in the near term within the larger area surrounding the interchange. Each of these programmed improvements with committed funding sources is shown in **Figure 3**. Although some of these projects are outside the defined study area, they will impact regional travel through the interchange and are considered part of the No Action alternative.

- **Kipling Multi-Use Path, 32nd Avenue to 44th Avenue** - Project includes the construction of a detached, multi-use trail on east side of Kipling Street.
- **Kipling Trail, 58th Avenue to Ridge Road** - The project includes construction of a new detached, multi-use trail connection on the west side of Kipling Street as part of the Transit Oriented Development Access Plan for the Gold Line Arvada Ridge rail station.
- **Ridge Road Bike/Pedestrian Improvements** - The project includes widening Ridge Road to provide an improved bicycle and pedestrian connection to the Gold Line Arvada Ridge rail station.
- **RTD Gold Line** - The commuter rail project includes future parking and transportation connection improvements at three stations surrounding the I-70 and Kipling interchange: the Arvada Ridge Station (at Kipling Street and Ridge Road), Ward Road Station, and Olde Town Station.
- **Van Bibber Trail Underpass** - This includes an underpass of Kipling Street at 56th Place connecting the residential areas east of Kipling to the recreational areas and Van Bibber Trail west of Kipling.
- **Ralston Road Corridor Plan** - This planning project includes preliminary design for multimodal transportation improvements along Ralston Road between Kipling Street and Wadsworth Bypass.

Figure 3: Committed Area Transportation Projects



Level I (Purpose and Need) Alternatives Screening

Level I screening was supported by the baseline data collected at the initiation of the study.

Level 1 screening identified a range of interchange improvements that could meet the project Purpose and Need, while eliminating concepts from detailed consideration that had “fatal flaws” (that did not meet Purpose and Need).

Level 1 screening criteria were developed to screen concepts in the following areas: traffic operations, safety, and multimodal connections. Alternative concepts were evaluated with a “Yes” or “No” answer to the following questions to demonstrate each alternative’s ability to meet the project Purpose and Need.

- Traffic Operations:
 - Can the alternative meet current and future traffic demands?
 - Does the alternative improve operations by addressing the interaction of the Kipling interchange with the frontage road intersections?
- Safety:
 - Does the alternative improve existing conditions that contribute to higher than expected crash rates?
- Multimodal Connections:
 - Can the alternative accommodate bicycle, pedestrian, and transit connections through the interchange?

An alternative with a “No” answer to any of the above questions was considered to not meet the project Purpose and Need and was eliminated as a stand-alone solution.

Thirty-two alternatives were considered during the Level 1 screening. Six alternatives were eliminated from further consideration because they did not meet the project Purpose and Need. The alternatives eliminated at Level 1 screening were:

- Alternative 2 – Diamond with Roundabout at Ramps
- Alternative 5 – Diamond with Roundabouts at Frontage Roads
- Alternative 14 – Three-Level Diamond
- Alternative 15 – Half Diamond to East at Garrison
- Alternative 16 – New Westbound Off Ramp West of Kipling
- Alternative 20 – Local Road I-70 Grade Separation at Miller & Independence

Fifteen alternatives were eliminated from consideration as stand-alone alternatives, but these small-scale alternatives were considered as elements of larger-scale alternatives in Level 2 screening. These were:

- Alternative 8 – Partial Cloverleaf with Loop SW Quadrant
- Alternative 10 – Improved Tight Diamond Added Lanes on Kipling & Ramps
- Alternative 13 – Double Crossover Diamond
- Alternative 18 – Southbound to Eastbound Flyover Ramp
- Alternative 19 – Bike Path I-70 Grade Separation at Interchange

- Alternative 22 – Added Turn Lanes at Ramps
- Alternative 23 – Ramp Meter Modifications
- Alternative 24 – Eastbound Ramp Merge Lane Modifications
- Alternative 25 – Close West Side of 49th Avenue
- Alternative 26 – Remove 49th Avenue Signal (closure or right in right out)
- Alternative 27 – Realign South Frontage Road Further South
- Alternative 28 – Close South Frontage Road at Kipling
- Alternative 29 – Widen/Improve Paths Under I-70 Bridge
- Alternative 30 – Bus Pullouts
- Alternative 32 – Close Driveways Between Ramps and Frontage Roads

In total, 12 alternatives were carried forward for consideration in Level 2 screening (including the No Action alternative). Those alternatives were:

- No Action
- Alternative 1 – Single Point Urban Interchange (SPUI)
- Alternative 3 – Diamond with Roundabouts at Ramps & Frontage Roads
- Alternative 4 – Diamond with Six-Leg Roundabouts at Ramps & Frontage Rd
- Alternative 6 – Fully Directional
- Alternative 7 – Partial Cloverleaf with Loops SW & NE Quadrants
- Alternative 9 – Partial Cloverleaf with Loops SW & NW
- Alternative 11 – Texas Frontage Road Diamond
- Alternative 12 – Traditional Diamond
- Alternative 17 – Button Hook Ramps
- Alternative 21 – Michigan Lefts at Ramps
- Alternative 31 – Single Roundabout Interchange

Level 2 Alternatives Screening

Alternatives from the Level 1 screening that were recommended for further evaluation were refined to add more definition of the proposed improvements, to better understand the operations and costs of the alternatives, and to provide information for further assessment in the Level 2 evaluation. The purpose of the Level 2 evaluation was to complete additional and more detailed analysis to determine whether or not each alternative meets the Purpose and Need, compare how well each alternative would perform, and identify what impacts each alternative would have.

In addition to the 12 interchange configuration alternatives carried forward from Level 1 screening, the following four new stand-alone alternatives were added for consideration in the Level 2 screening based on public and Technical Team input for combining elements of other alternatives:

- Alternative 33 – Loop SW Quadrant & Improved WB Ramps (combination of Level 1 Alternatives 8 and 11)

- Alternative 34 – Improved Tight Diamond with SB to EB Flyover (combination of Level 1 Alternatives 10, 18, and 11)
- Alternative 35 – Double Crossover Diamond Interchange (combination of Level 1 Alternatives 13, 26, and 28)
- Alternative 36 – Button Hook Ramps South & Improved WB Ramps (combination of Level 1 Alternatives 11 and 17)

With these additional alternatives, 16 alternatives (including the No Action alternative) were considered in the Level 2 screening.

At the end of the Level 2 screening, the following 11 alternatives were not carried forward for further consideration:

- Alternative 3 – Diamond with Roundabouts at Ramps & Frontage Roads
- Alternative 4 – Diamond with Six-Leg Roundabouts at Ramps & Frontage Rd
- Alternative 6 – Fully Directional Interchange
- Alternative 9 – Partial Cloverleaf with Loops SW & NW Quadrants
- Alternative 11 – Texas Frontage Road Diamond
- Alternative 21 – Michigan Lefts for Ramps
- Alternative 31 – Single Roundabout Interchange
- Alternative 33 – Loop SW Quadrant & Improved WB Ramps
- Alternative 34 – Improved Tight Diamond with SB to EB Flyover
- Alternative 35 – Double Crossover Diamond Interchange
- Alternative 36 – Button Hook Ramps South & Improved WB Ramps

Five alternatives (including the No Action alternative) were carried forward for further consideration. The four action alternatives meet the project Purpose and Need and goals while minimizing impacts to natural and community resources.

The alternatives carried forward from Level 2 screening were:

- No Action
- Alternative 1 – SPUI
- Alternative 7 – Partial Cloverleaf with Loops SW & NE Quadrants
- Alternative 12 – Traditional Diamond
- Alternative 17 – Button Hook Ramps

The draft design concepts for the four alternatives are shown in **Appendix B**.

Level 3 Alternatives Refinement

Based on coordination with the Technical Team, local agencies, area stakeholders, and the general public, an additional evaluation process was conducted at the beginning of the Level 3 evaluation to evaluate if the alternatives should be further narrowed prior to refining the conceptual design and traffic operations analysis for the recommended alternative(s), which are the alternative(s) that will be endorsed to be carried into the NEPA process as the Preferred Alternative(s).

Priority Criteria Evaluation

The evaluation criteria for Level 3 were prioritized to include criteria of most concern from comments received during small group meetings with the Technical Team and area stakeholders, presentations to local agency elected officials, and the open house held with the general public. For this level of screening, the criteria of highest priority for the evaluation of interchange alternatives were developed based on stakeholder input. The criteria were:

- Interchange Capacity
- Driver Expectancy
- Pedestrian and Bicycle Crossings
- Property Impacts
- Business Access
- Phased Construction Opportunities
- Project Costs

The four remaining alternatives were compared against these seven priority evaluation criteria using the Level 2 analysis results. The Partial Cloverleaf alternative (Alternative 7) and Button Hook Ramps alternative (Alternative 17) under perform compared to the SPUI (Alternative 1) and the Traditional Diamond (Alternative 12) on many of these priority criteria, including driver expectancy, pedestrian and bicycle crossings, property impacts, and business access.

Many of the drivers using this interchange are not from this area, so driver expectancy is important to optimize the operational efficiency of the interchange. The Partial Cloverleaf alternative is worse for driver expectancy because the loop ramps require out-of-direction turn movements (i.e., a driver must turn west to access eastbound I-70 via the loop ramp in the southwest quadrant). With drivers unfamiliar to the area, this can lead to sudden lane changes leading to the loop ramps. The Button Hook Ramps alternative is difficult for driver expectancy because it is an unusual interchange configuration and the unusual movements for ramp access to/from Kipling Street via the frontage roads are perceived difficult for drivers to negotiate.

There are serious concerns for the pedestrian and bicycle crossings with the Partial Cloverleaf and Button Hook Ramps alternatives because both configurations include crossings of free-flow loop ramp movements, which are substantially higher speed movements than the free-flow right-right turn movements provided in the SPUI and Traditional Diamond alternatives. The Traditional Diamond alternative has no pedestrian crossing of Kipling Street at the unsignalized 49th Avenue/North Frontage Road intersection.

The Partial Cloverleaf and Button Hook Ramps alternatives require more right-of-way (ROW) than the SPUI and Traditional Diamond alternatives for the ramp configurations. The physical ROW acreage for the Traditional Diamond alternative is similar, but most of the acreage and full property acquisitions are for the relocated South Frontage Road, which helps reduce the access impacts south of the interchange. The loop ramps of the Partial Cloverleaf alternative require closing the

direct frontage road access in the northeast and southwest quadrants, which impacts access to the surrounding businesses worse than the SPUI alternative.

The Button Hook Ramps alternative is worse for area business access than the SPUI and Traditional Diamond alternatives due to the unusual interchange configuration and perceived difficulty for drivers to negotiate through the interchange area via the frontage roads.

Comparatively, the SPUI alternative and Traditional Diamond alternative ranked high on the majority of the prioritized criteria.

The Partial Cloverleaf alternative would provide the highest interchange capacity of the four remaining alternatives with the loop ramps providing free-flow operations and simplified signal phasing; however, the SPUI and Traditional Diamond alternatives would also provide traffic operational benefits notably better than the typical CDOT operational standards. The Technical Team determined that the small operational benefits of the Partial Cloverleaf alternative over the SPUI and Traditional Diamond alternatives did not outweigh the additional property and business access impacts.

The SPUI alternative provides the least opportunities for phased construction of the ultimate interchange layout because the freeway bridge and ramps must be constructed as one construction project with a relatively large funding source. The SPUI construction cannot be phased with separate construction projects, which would need less funding at one time. However, comments from the public and stakeholders indicated that the substantially lower property impacts of the SPUI (less than 10% of any of the other remaining alternatives) are more important than the desire for major construction to occur earlier (which may be possible with a series of smaller funding sources rather than waiting for a single, large funding source). Also, the SPUI alternative does not preclude short-term improvements that will provide safety and capacity benefits.

Recommended Alternatives

The alternatives were not further narrowed and all four alternatives will be carried forward for further evaluation in future NEPA process(es). However, after a comparison of the four alternatives against the priority criteria, the SPUI and Traditional Diamond alternatives are the recommended alternatives from this PEL study evaluation.

Further definition and evaluation for the two recommended alternatives are described in the “Study Recommendations” section of this report.



Kipling Street at eastbound I-70 ramps intersection

Agency and Public Coordination

Understanding the ideas, perspectives, and needs of key stakeholders in the interchange area was critical to building broadly supported decisions and solutions.

Stakeholder involvement was emphasized throughout the PEL process and feedback was solicited from the agency

and public partners at key decision points to foster acceptance of recommendations.

Agency Coordination

Technical Team Meetings

CDOT provided multiple opportunities for the local jurisdictions, regional partners, resource agencies, and general public to engage and inform the study.

The study included the formation of a Technical Team that met frequently with the project team to provide technical input. The Technical Team included staff from CDOT, the cities of Arvada and Wheat Ridge, Jefferson County, DRCOG, RTD, and FHWA.

The Technical Team Charter, signed by all Technical Team members, identified roles, responsibilities, and the decision-making process for the project. The Charter established the concurrence points with meetings at key milestones within the study process and stated that concurrence for decisions presented at Technical Team meetings was provided with acceptance of the distributed meeting notes.

The Technical Team was heavily involved in shaping the alternatives evaluation criteria and performance measures, as well as the alternatives that were considered. Members of the Technical Team kept their respective elected officials updated and brought elected official feedback to the project team.

The evaluation criteria, performance measures, alternatives development, and alternatives screening were reviewed and approved by the Technical Team throughout the agency coordination process.

Concurrence was provided at the following key milestones:

- Technical Team Charter
- Purpose and Need Statement
- Evaluation Criteria
- Initial Alternatives Developed
- Level 1 Alternatives Screening Results
- Level 2 Alternatives Screening Results
- Level 3 Alternatives Evaluation Results
- Improvement Recommendations
- Final Study Recommendations

Ten meetings of the Technical Team were held:

- February 24, 2012
- March 12, 2012
- April 16, 2012
- June 1, 2012
- July 11, 2012
- August 24, 2012
- October 3, 2012
- November 9, 2012
- January 18, 2013
- April 19, 2013

Resource Agency Coordination

The study was coordinated with local, State and Federal resource agencies, including:

- City of Wheat Ridge Parks and Recreation Department
- Colorado Department of Public Health and Environment, Air Pollution Control Division
- Colorado Parks & Wildlife (CPW)
- Colorado State Historic Preservation Office
- DRCOG
- Jefferson County Parks and Open Space
- Jefferson County Planning and Zoning
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service (USFWS)

Information was distributed to representatives at these resource agencies at two points during the study. Early in the study a letter and study area map were mailed as an introduction to this PEL process and requested input on the existing conditions and concerns within the study area. A second letter was mailed serving as an update on the study following Level 2 alternatives screening. Graphics of the two recommended alternatives and a summary of critical considerations were enclosed for review to identify potential resource impacts and next steps required for future NEPA process(es). A summary of the resource agency coordination and input is included in **Appendix C**.

Other Agency Coordination

Small group meetings were held with individuals representing public agencies and organizations, emergency providers, and others directly affected by the project work to identify likely impacts and help shape the study recommendations.

Presentations to inform stakeholders and gather feedback were also made.

These meetings and presentations occurred as follows:

- Transportation Environmental Resource Council Briefing – February 13, 2012
- Jefferson County Transportation Action and Advocacy Group Presentation – April 11, 2012 and December 12, 2012 and May 8, 2013
- LiveWell Wheat Ridge Meeting – May 22, 2012 and May 14, 2013
- City of Arvada Council Workshop Presentation – November 12, 2012
- Colorado State Patrol and Arvada Fire District Meeting – November 29, 2012
- Wheat Ridge Police Department and Pridemark Paramedic Services Meeting – November 29, 2012
- City of Wheat Ridge Public Works and Community Development Meeting – December 7, 2012 and May 8, 2013
- City of Wheat Ridge Council Presentation – December 17, 2012
- RTD Meeting – February 12, 2013

During coordination with LiveWell Wheat Ridge, the potential for a Health Impact Assessment (HIA) for the study area was discussed. Although a formal HIA was not performed for this study, many of the goals of an HIA were incorporated into the alternatives evaluation process. An overview of the study process related to an HIA is provided in the *Health Impact Assessment Overview, Connections and Strategies* Technical Memorandum in **Appendix A**.

Public Participation

In an effort to gain as much community input as possible, public participation was emphasized throughout the study process. It was important that all participants, including potential users of the interchange and roadways in the vicinity, clearly understand each alternative. The website and graphics illustrated proposed alternatives, operational characteristics, appearance, impacts, and cost estimates.

General Public Meetings

This study held two public meetings in open house format. The first meeting, held on April 25, 2012, served to introduce the project and discuss interchange travel conditions and the need for improvement. At the second meeting, held on December 4, 2012, alternatives and Level 1 and 2 evaluation results were presented for comment. The meetings were each attended by 55 – 85 individuals.



Public meetings were well attended

Community Focus Groups

Community Focus Groups were formed to advise the project team of the concerns of various groups of stakeholders in the area. Three separate focus groups were formed, including representatives from:

- Businesses surrounding the interchange area
- Residents and homeowners' associations
- Multimodal groups

The project team, comprised of CDOT and project consultant staff, met with each focus group two times during the alternatives evaluation to review proposed improvement alternatives and evaluation criteria and to discuss likely impacts of improvements and possible mitigation or resolution techniques.

Meetings were held as follows:

- Residential Group Meeting – August 7, 2012 and November 12, 2012
- Business Group Meeting – August 8, 2012 and November 14, 2012
- Multimodal Group Meeting – August 8, 2012 and November 14, 2012

Information Distribution

The study utilized many methods of advertising and outreach. Each public meeting was preceded by a news release, which was sent to local media outlets as well as local jurisdictions' Public Information Officers for inclusion in their community bulletins. Flyers advertising the first public meeting were distributed door-to-door to apartment buildings, community gathering places and high traffic businesses in the immediate interchange area, as well as local agency offices.

A final public notice to this mailing list is planned at the end of the study to describe the recommended improvements and inform the public regarding next steps towards improvement implementation.

A postcard was distributed via U.S. Postal Service or email to over 4,500 property owners, tenants, and other interested individuals prior to each public meeting.

Public Comments

Input was solicited at the public and focus group meetings and community members were also able to submit comments via the project website throughout the course of the study. Public meeting graphics and summaries of comments received were subsequently posted on the project webpage,

<http://www.coloradodot.info/projects/i70kiplingpel>.

Comments received were shared with project staff and the Technical Team and considered during the alternatives development, evaluation and refinement process. Summaries of comments received are included in **Appendix D**.



Comments discussed during an open house meeting



Kipling Street and South Frontage Road intersection

Study Recommendations

Based on the results of the alternatives development and evaluation process, four interchange improvement alternatives will be carried forward into future NEPA evaluation. With the Level 3 alternatives evaluation, steps were taken to further narrow the alternative recommendations and to refine the design elements of the alternatives, considering design solutions to minimize costs and community impacts and maximize multimodal benefits. This evaluation information will be used to identify a Preferred Alternative during NEPA scoping.

Alternatives to be Carried Forward

All four action alternatives meet the project Purpose and Need and are considered reasonable alternatives. Therefore, the four action alternatives to be carried forward into future NEPA process(es) are:

- Alternative 1 – SPUI
- Alternative 7 – Partial Cloverleaf with Loops SW & NE Quadrants
- Alternative 12 – Traditional Diamond
- Alternative 17 – Button Hook Ramps

The design concepts for the four action alternatives are shown in **Appendix B**.

After a comparison of the four action alternatives against the priority criteria, the SPUI and Traditional Diamond alternatives were determined to meet the Purpose and Need to the highest degree while minimizing environmental and community impacts and they are the recommended alternatives from this PEL study.

Recommended Alternatives

Based on the Level 3 alternatives evaluation and public and agency input described in the *Alternatives Development and Analysis Report*, the SPUI and Traditional Diamond alternatives are recommended for consideration as the Preferred Alternative during a future NEPA process because these alternatives meet the

The SPUI and Traditional Diamond alternatives are recommended for consideration as the Preferred Alternative during NEPA scoping.

Purpose and Need to the highest degree while minimizing environmental and community impacts.

Technical Team members agreed to the identification of the SPUI and Traditional Diamond alternatives as the recommended alternatives. Meetings with stakeholders and a public open house were held to present the alternatives development and evaluation results and recommendations. Comments from the public and stakeholders indicated concurrence with the evaluation results with the highest level of support for the SPUI and Traditional Diamond alternatives.

These two recommended alternatives were refined to add more definition to the design elements of the alternatives, considering design solutions to minimize costs and property and business impacts while maximizing multimodal benefits. This information may be utilized for further assessment during a future NEPA process.

The potential phasing opportunities for each recommended alternative were also identified with the associated costs. To implement the project in phases, care must be taken to ensure that the transportation system operates acceptably at the conclusion of each phase. The ability of each phase to operate on its own is referred to as “independent utility”. Also, mitigation measures needed in response to project impacts must be implemented with the phase in which the impacts occur and not deferred to a later phase of the ultimate project.

The separate project phases should meet the following criteria:

- **Independent Utility** – Each phase should have independent utility to the extent that the phase provides a functional transportation system even in the absence of other phases.
- **Elements of the Purpose and Need** – Each phase should contribute to meeting the Purpose and Need for the overall project.
- **Environmental Impacts** – Individual phases should avoid the introduction of substantial additional environmental impacts that cannot be mitigated.
- **Mitigation Directly Related to Impacts** – Each phase should include appropriate mitigation measures to match the environmental impacts of that phase.

Conceptual Design Assumptions

The recommended alternatives’ conceptual designs were developed using the applicable CDOT and Wheat Ridge design standards. The plan set documenting the conceptual design of the recommended alternatives is included in **Appendix E**.

In order to accommodate multimodal connections, it is assumed a bi-directional shared use path will run on both sides of Kipling Street, consistent with local agency planning. The path will be ten feet wide, following the CDOT standard width. The opportunity to reduce the width of the shared use path to a sidewalk (five feet wide) on one side of Kipling Street to mitigate property impacts may be considered during the future NEPA process(es).

In order to accommodate multimodal connections, an on-street bicycle lane is assumed on Kipling Street in all alternatives, consistent with the *Jefferson County*

Bicycle Plan. The bike lanes are six feet wide, following the CDOT recommended width. A decision to not include on-street bike lanes along Kipling Street to mitigate property impacts may be considered during the future NEPA clearance process(es).

The project does not include additional through lane capacity on I-70 or Kipling Street.

The scope of this project does not include additional through lane capacity on I-70 or Kipling Street. The recommended alternatives include additional lanes through the interchange and at intersections, but the conceptual designs assume there is no widening of I-70 or Kipling Street outside of the interchange area. However, the bridge structure and ramps would be designed to accommodate future widening of I-70. It is assumed that the ramp meter for the Eastbound I-70 On Ramp would remain, although the need for the ramp meter may be reevaluated during the NEPA and/or final project phases.

Single Point Urban Interchange

The SPUI configuration consists of a single signalized intersection on Kipling Street serving all movements to/from the I-70 ramps and Kipling Street. The layout of the SPUI is shown in **Figure 4**. With the SPUI alternative, the frontage road intersections north and south of the interchange remain in the current locations as signalized intersections.

On I-70, the diverge for the Westbound Off Ramp will be modified to provide a shared exit lane with the current drop lane. Eastbound I-70 will also be modified to add an outside lane from the Eastbound On Ramp to connect to the outside lane that forms east of Garrison Street. This will provide an auxiliary lane for merge operations.

Property Impacts

The SPUI alternative will result in the full acquisition of the Conoco gas station and the car wash facility in the southeast quadrant due to Kipling Street widening and on-site circulation issues.

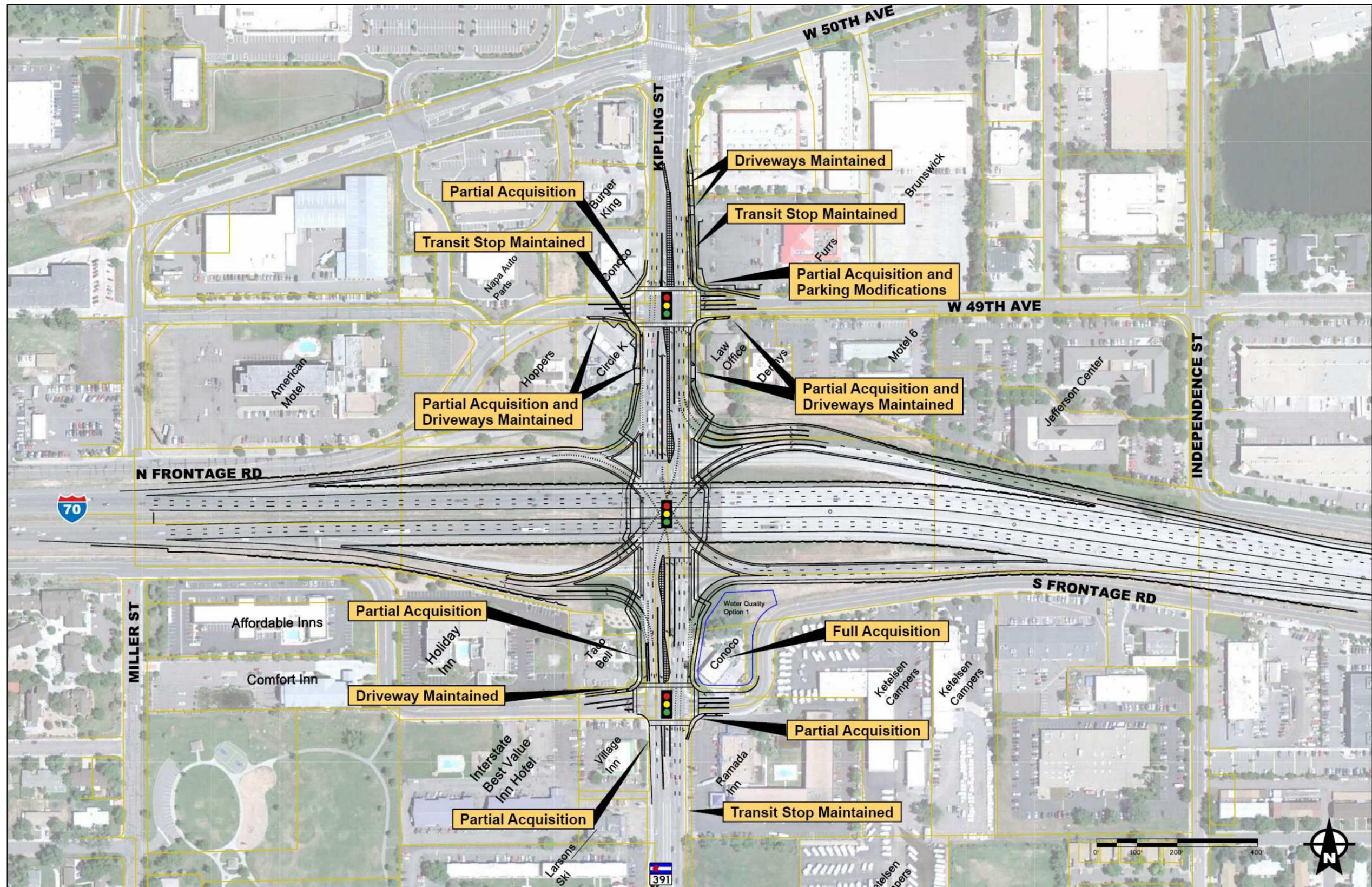
The SPUI alternative is expected to result in one full and seven partial property acquisitions.

There are seven properties with expected partial acquisitions related to the widening of Kipling Street through the interchange and at the corners of the frontage road intersections. For these properties, the driveways are assumed to be reconstructed and maintained in the current locations with minimal site circulation impacts. However, decisions to close driveways that create operational and/or safety concerns may be made during the future NEPA clearance process(es).

Providing the shared use path and transit stop north of 49th Avenue impacts the parking lot of the Furr's property on the northeast corner of the 49th Avenue/North Frontage Road intersection. It is a relatively large parking lot and circulation impacts are not expected at this conceptual level of evaluation. However, the number of parking spaces impacted and the need to mitigate will be considered during the future NEPA process(es).

The acquisition of the Conoco property in the southeast quadrant due to access and site impacts creates an opportunity for location of the required water quality detention for interchange stormwater treatment. Based on conceptual calculations, the size of the property may be adequate for water quality detention needed.

Figure 4. Alternative 1 – Single Point Urban Interchange



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Operations

With the SPUI layout, the locations of the existing transit stops are maintained. Pedestrian and bicycle connections to the transit stops are accommodated with the shared use paths and on-street bicycle lanes. The transit stops are located near the north and south frontage roads and the frontage road traffic signals provide signalized pedestrian crossings of Kipling Street.

The American Association of State Highway and Transportation Officials uses the term level of service (LOS) to describe the operational characteristics of intersections and roadways. LOS is related to control delay at intersections and is a measure of traffic flow and level of congestion, measured on a scale of A to F. LOS A describes conditions with essentially uninterrupted flow and minimal delay. LOS F describes a breakdown of traffic flow with excessive congestion delay. In urbanized areas, LOS D is generally considered to be acceptable for peak hour operations.

The 2035 traffic volumes and levels of service (LOS) for the SPUI are included in **Appendix F**. The traffic signal timing through the interchange would be optimized for the key movements. The Westbound I-70 Off Ramp is widened to provide three right turn lanes. The right turn lanes are signalized and the signal timing is synchronized with the 49th Avenue/North Frontage Road intersection to provide progression for the heavy right turn movement off the freeway to northbound Kipling Street. Double left turn lanes are provided to and from each of the ramps. The frontage road approaches to Kipling Street are also widened to optimize the side street capacity of the traffic signals and minimize the green time taken from Kipling Street.

The SPUI configuration provides a signalized triple right turn lane for the Westbound I-70 Off Ramp to northbound Kipling Street movement.

Currently, drivers do not effectively utilize the free flow right turn lane from the Westbound Off Ramp to northbound Kipling Street and the outside lane of Kipling Street at 49th Avenue is underutilized through the intersection. However, with the three right turn lanes and signalized control coordinated with the 49th Avenue/North Frontage Road signal, the traffic analysis shows that Kipling Street does not need to be widened north of 50th Avenue to achieve acceptable operations.

An important component of the SPUI layout is that the frontage road intersections north and south of the interchange remain in the current locations as full-movement, signalized intersections. That characteristic of the interchange configuration minimizes potential impacts to business access and residential neighborhoods surrounding the interchange. However, if operational issues related to the close signal spacing of the frontage roads are identified with changes in the anticipated land use or traffic volume conditions, the frontage road traffic signals may need to be removed or relocated to preserve the operations and safety of the interchange. If the 49th Avenue/North Frontage Road traffic signal is removed, improvements would likely be needed at the side street approaches of the 50th Avenue intersection to accommodate diverted turn movements.

Phasing Opportunities

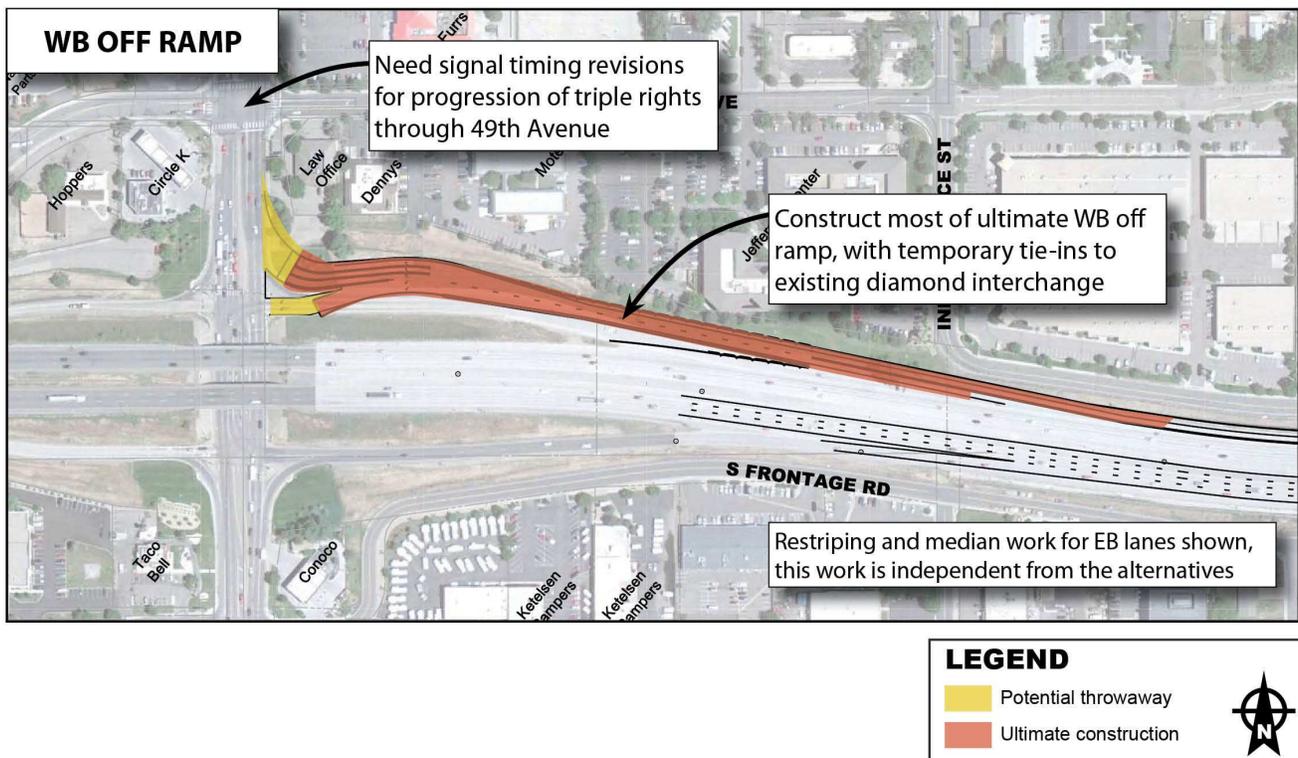
Limited opportunities exist for project phasing under the SPUI alternative.

Potential opportunities to construct the ultimate SPUI configuration in separate project phases were evaluated to identify the independent utility, potential environmental impacts and related mitigation, ROW impacts and cost. The single signalized intersection at the interchange requires a clear-span bridge for I-70 over Kipling Street because there cannot be a bridge pier in the intersection. Because the configuration of the ramps requires the new bridge, there are limited opportunities to reconstruct the interchange in separate, smaller-scale projects.

A potential separate project phase to construct the Westbound Off Ramp with temporary tie-ins at Kipling Street is illustrated in **Figure 5**. The area at Kipling Street would be potential throwaway pavement that would need to be reconstructed with the ultimate SPUI interchange construction. However, most of the ramp could be constructed in the ultimate location.

This project phase would provide the three, signalized right turn lanes on the Westbound I-70 Off Ramp to increase capacity for the heavy right turn movement from the ramp to northbound Kipling Street. The signal timing would also be modified to provide progression for the right turn movement through the 49th Avenue/North Frontage Road intersection. This would reduce peak hour queues on the ramp and improve safety for traffic exiting the freeway.

Figure 5: SPUI Alternative - Separate Project Phase Option



The characteristics of the project phase option are summarized in **Table 1**. As shown, the phase would contribute to meeting the project Purpose and Need by reducing congestion, optimizing operations, and improving safety (as a result of the reduced peak hour queues on the ramp). The phase would not accommodate multimodal connections. No environmental resources were identified within the area of the project phase option. The conceptual cost estimate for the Westbound Off Ramp phase of the SPUI is \$3.3 million.

There are no other separate project phase options for the SPUI that would meet independent utility and provide substantial operational, safety, or multimodal benefits.

Table 1: Evaluation of Separate Project Phases – SPUI Alternative

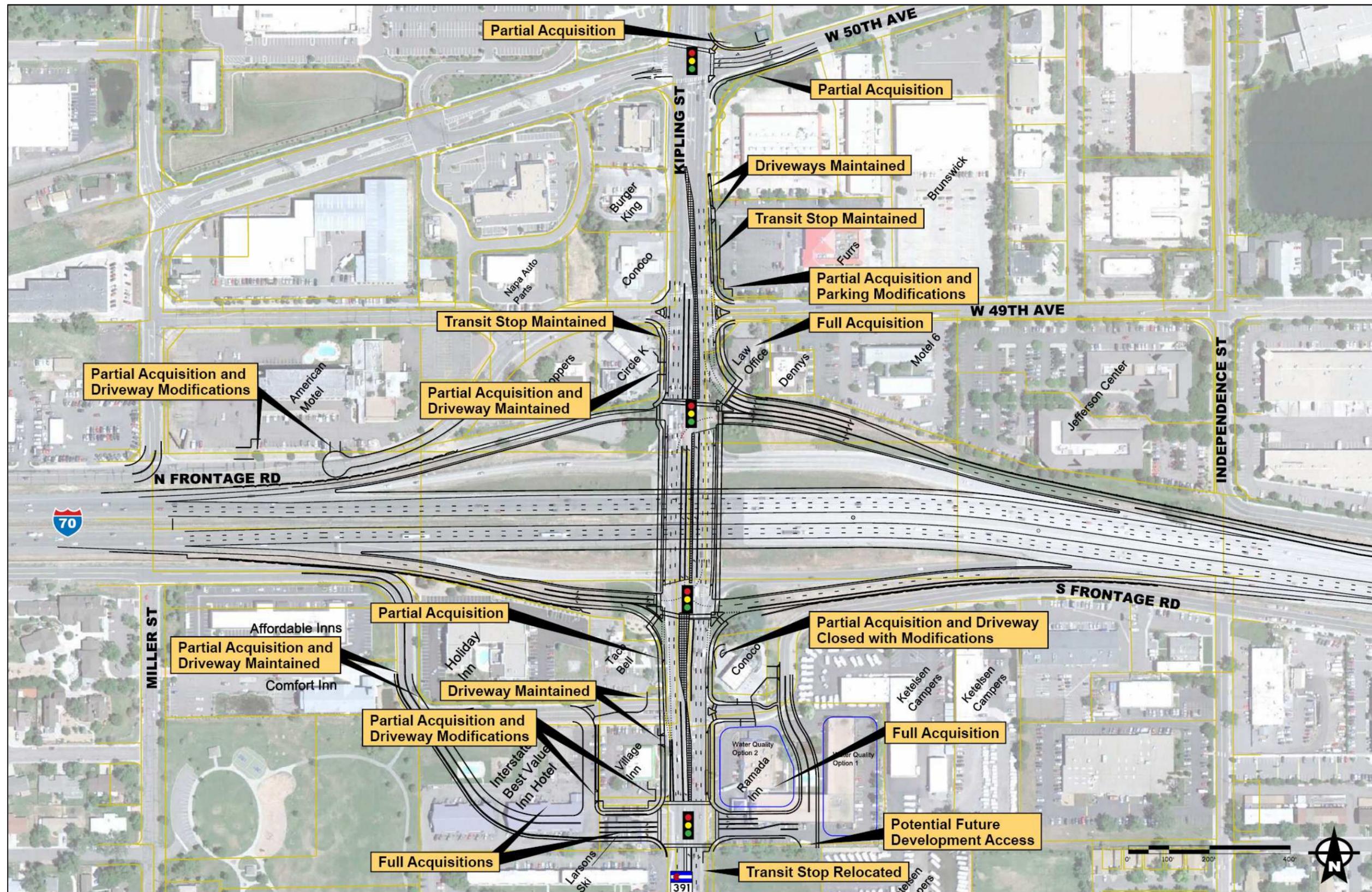
Criteria	Separate Project Phase
	Westbound Off Ramp
Independent Utility	Yes Project provides operational and safety improvements independent of the completion other phases
Purpose and Need Elements	<ul style="list-style-type: none"> • Reduces congestion • Optimizes operations • Improves safety
Potential Environmental Impacts	No resources identified within area
Potential Mitigation Requirements	Standard Best Management Practices (BMPs) during construction within CDOT ROW
ROW Impacts	None
Construction Duration	2 -3 months
Conceptual Cost Estimate	Construction = \$ 3.3 M ROW = \$0.0 M Total = \$3.3 M

Traditional Diamond

The Traditional Diamond layout consists of two signalized intersections on Kipling Street serving the I-70 ramps with increased spacing between the signals. The 49th Avenue/North Frontage Road intersection is limited to an unsignalized right-in/right-out intersection. The South Frontage Road is relocated with a traffic signal on Kipling Street south of the interchange, a minimum of 600 feet south of the traffic signal at the eastbound I-70 ramps. The layout of the Traditional Diamond is shown in **Figure 6**. On I-70, the ramp merge and diverge areas are in the same location and match the configuration of the SPUI alternative.

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Figure 6. Alternative 12 – Traditional Diamond



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Property Impacts

The Traditional Diamond alternative will result in the full acquisition of four properties. The law office property in the northeast quadrant is assumed to be a full acquisition due to the shift of the Westbound Off Ramp. The relocation of the South Frontage Road is expected to require full acquisition of the Interstate Best Value Hotel and Larson's Ski Shop west of Kipling Street and the Ramada Inn east of Kipling Street.

The Traditional Diamond alternative is expected to result in four full and ten partial property acquisitions.

There are ten properties with expected partial acquisitions related to the Kipling Street widening, freeway ramp shifts, and relocation of the South Frontage Road. Several properties with expected partial acquisitions are also assumed to have modifications to driveway access. In the northwest quadrant of the interchange, the removal of a section of the North Frontage Road requires the closure of one driveway for the American Motel. However, the property will still have two driveways on the North Frontage Road and three driveways on 49th Avenue.

In the southeast quadrant of the interchange, the driveway on Kipling Street for the Conoco gas station is assumed to be closed. The existing driveway on the south side of the property is assumed to be maintained via a right-in/right-out intersection on Kipling Street with a new driveway added on the east side of the property for access to the relocated South Frontage Road. Site modifications may also be required to mitigate circulation to the car wash facility.

In the southwest quadrant of the interchange, the Taco Bell property does not currently have direct access to Kipling Street and the existing driveways on the south side of the property are maintained. However, the driveways will access a side street north of the relocated South Frontage Road rather than directly accessing the frontage road. The relocation of the South Frontage Road requires the closure of one of the Village Inn direct accesses to Kipling Street. The other driveway on Kipling Street is assumed to be maintained with a new driveway added on the west side of the property for access to the relocated South Frontage Road.

Some properties with expected partial acquisitions are assumed to have driveways reconstructed and maintained in the current locations. However, decisions to close driveways that create operational and/or safety concerns may be made during the future NEPA process(es).

The acquisition of the Ramada Inn property in the southeast quadrant due to the South Frontage Road relocation creates an opportunity for the required water quality detention for interchange stormwater treatment. Based on conceptual calculations, the size of the property may be adequate for the water quality detention needed on one or both sides of the relocated South Frontage Road.

Operations

With the Traditional Diamond layout, the locations of the existing transit stops north of the interchange are assumed to be maintained. However, the traffic signal at the 49th Avenue/North Frontage Road intersection is removed, so pedestrians must walk to the 50th Avenue or westbound ramps intersection for a signalized crossing of Kipling Street. The transit stop south of the interchange is relocated south of the

The Traditional Diamond configuration provides a signalized triple right turn lane for the Westbound I-70 Off Ramp to northbound Kipling Street movement.

relocated South Frontage Road. The relocated South Frontage Road traffic signal provides a signalized pedestrian crossing of Kipling Street in the vicinity of the stop. Pedestrian and bicycle connections to the transit stops are accommodated with the shared use paths and on-street bicycle lanes.

The 2035 traffic volumes and LOS for the Traditional Diamond are included in **Appendix F**. The traffic signal timing through the interchange would be optimized for the key movements. The Westbound I-70 Off Ramp is widened to provide three right turn lanes with signalized control. The removal of the 49th Avenue/North Frontage Road traffic signal increases the distance to the next signal for the heavy right turn movement off the freeway to northbound Kipling Street. Double left turn lanes are provided to and from each of the ramps, except from northbound Kipling Street to westbound I-70, which is a single left turn lane. The frontage road approaches to Kipling Street are also widened to optimize the side street capacity of the traffic signals and minimize the green time taken from Kipling Street. In order to minimize impacts to the Circle K property in the northwest quadrant, a separate right turn lane for southbound Kipling Street to westbound I-70 is not provided. This does not notably degrade the peak hour operations of the intersection.

Because the 49th Avenue/North Frontage Road traffic signal is replaced with an unsignalized right-in/right-out intersection, traffic that would travel through or turn left from the side street at the intersection will need to divert to the 50th Avenue intersection to access Kipling Street. Due to this diversion, additional LOS analysis was conducted to identify any traffic impacts for the area in the northeast quadrant of the interchange under the Traditional Diamond alternative. This traffic analysis showed improvements would be needed on the westbound approach of the 50th Avenue intersection to accommodate the shift of the future traffic volumes for those movements.

The right-in/right-out intersection at 49th Avenue/North Frontage Road under the Traditional Diamond configuration results in diverted traffic to the 50th Avenue/Kipling Street intersection. Improvement to the westbound approach of this intersection would be needed.

The traffic analysis of the traffic diversion east of Kipling Street also showed the Independence Street intersections at 49th Avenue and 50th Avenue are able to accommodate the shift of future traffic volumes with acceptable operations. Under the Traditional Diamond 2035 traffic conditions, the operation of the all-way stop-controlled 49th Avenue and Independence Street intersection is projected to remain unchanged from the No Action 2035 condition. The intersection is projected to operate at LOS C in the AM peak hour and LOS B in the PM peak hour. The operation of the stop-controlled 50th Avenue and Independence Street intersection is projected to operate at LOS C in the peak hours under the Traditional Diamond 2035 traffic conditions and LOS B in the peak hours under the No Action 2035 condition.

Phasing Opportunities

Potential opportunities to construct the ultimate Traditional Diamond configuration in separate project phases were evaluated based on independent utility, potential environmental impacts and related mitigation, ROW impacts and cost. The configuration of the ramps and changes to the frontage roads north and south of the interchange create several opportunities to reconstruct the interchange in separate, smaller-scale projects.

The Traditional Diamond would provide several opportunities for project phasing.

The potential separate project phases are illustrated in **Figure 7**. The areas of potential throwaway pavement that would need to be reconstructed with the ultimate interchange are identified. The identified separate project phases were not developed to be built in succession and they may be constructed in any order. Any phase that includes the conversion of the 49th Avenue/North Frontage Road signal to an unsignalized right-in/right-out intersection also includes the lane construction on the westbound approach of the 50th Avenue intersection to accommodate the diverted turning movements.

The phases with the Westbound I-70 Off Ramp (with or without the Westbound I-70 On Ramp) would provide the three, signalized right turn lanes from the off ramp and remove the 49th Avenue/North Frontage Road traffic signal to increase capacity for the heavy right turn movement from the ramp to northbound Kipling Street. This would reduce peak hour queues on the ramp and improve safety for traffic exiting the freeway. The phase with both of the westbound I-70 ramps would provide additional circulation improvements for all westbound I-70 ramp movements through the Kipling Street intersection, although the southbound Kipling Street and Westbound I-70 Off Ramp left turn capacities would remain limited by the existing lanes under the I-70 bridge.

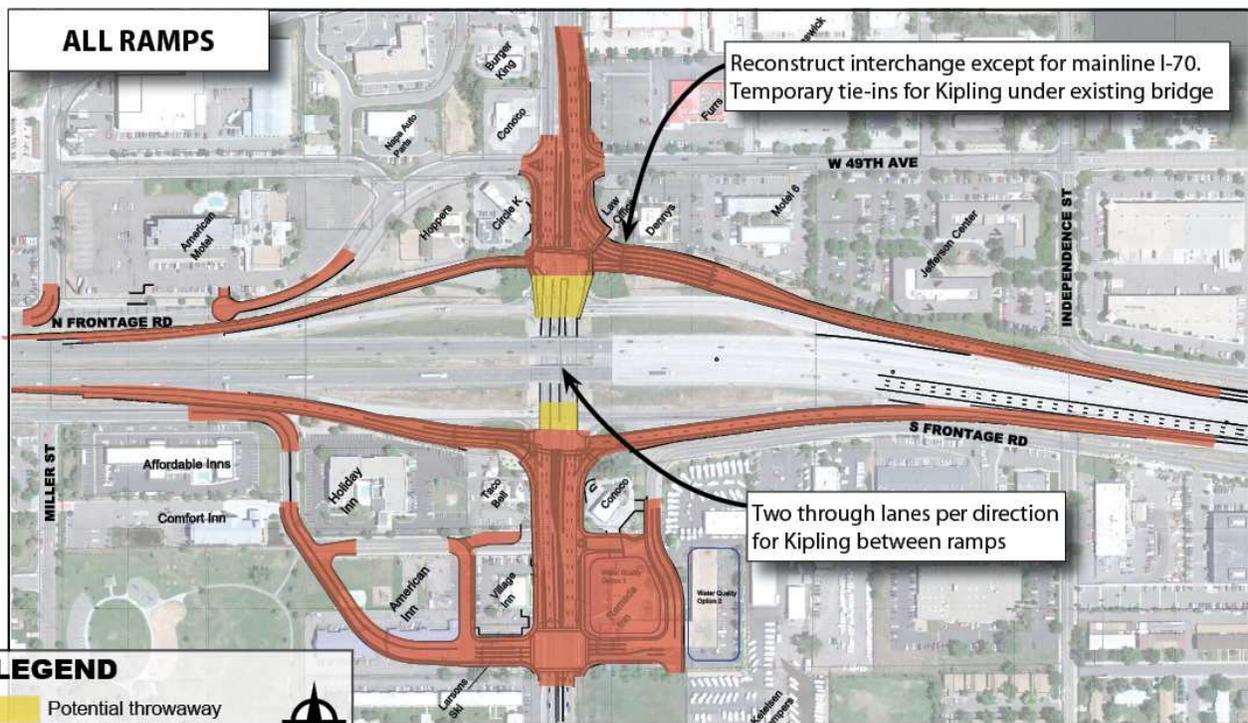
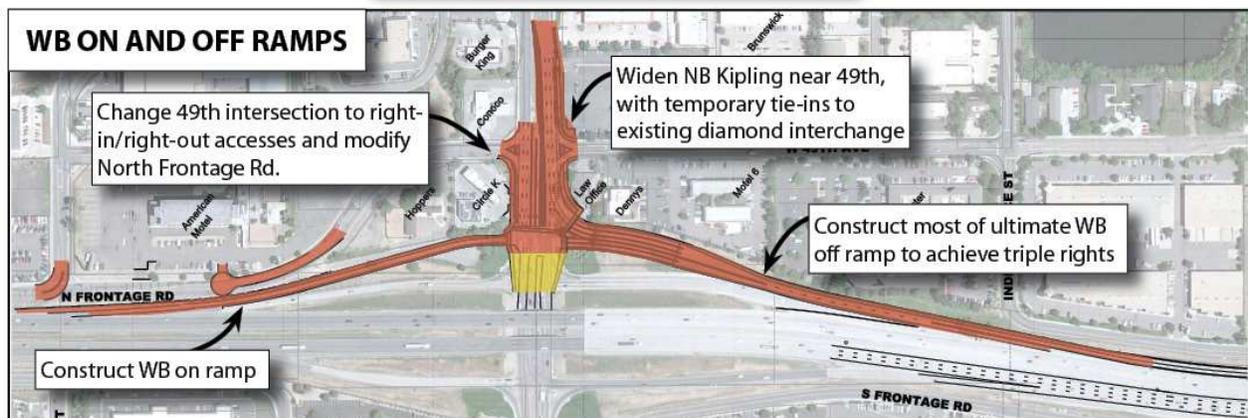
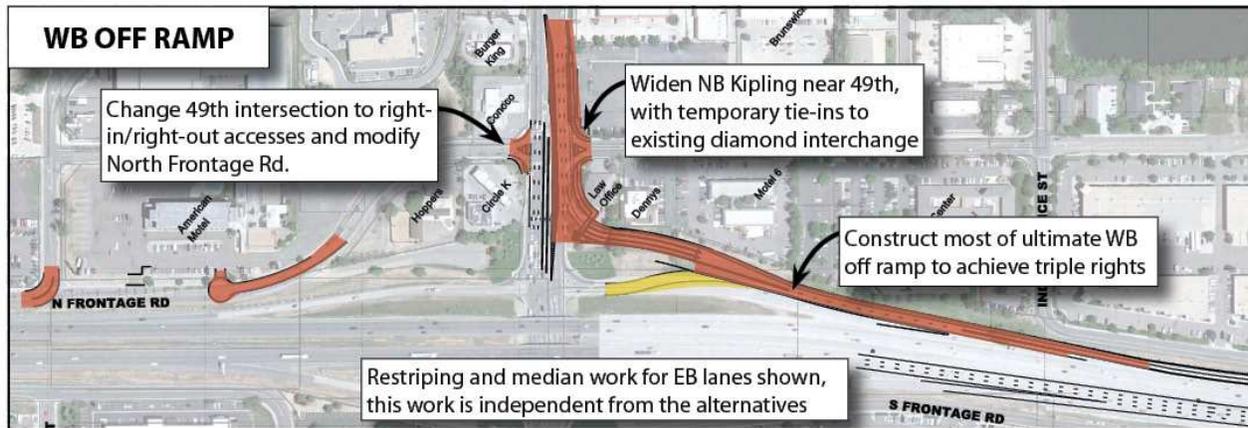
The project phases with the relocation of the South Frontage Road (with or without the eastbound I-70 ramps) would provide increased signal spacing and widen Kipling Street south of the freeway, which would increase capacity for the northbound Kipling Street to eastbound I-70 movement and improve safety with more maneuvering distance between signals. The phase with the relocation of the South Frontage Road and the eastbound I-70 ramps would provide additional circulation improvements with updated signalization, although the northbound Kipling Street capacity would remain limited by the existing lanes under the I-70 bridge.

The project phase with all ramp construction and the South Frontage Road relocation would provide the operational and safety benefits from the Westbound I-70 Off Ramp right turn movement to northbound Kipling Street and the increased signal spacing south of the freeway, in addition to the widening of Kipling Street north and south of the interchange. However, the benefits to traffic traveling under the I-70 bridge would be limited by the existing lanes under the bridge. This would impact the heavy movements for southbound Kipling Street to eastbound I-70 and the Westbound I-70 Off Ramp left turn, which would subsequently reduce the operational and safety benefits for other movements through the interchange.

The characteristics of the separate project phase options are summarized in **Table 2**. As shown, each of the separate projects would contribute to meeting the project Purpose and Need by reducing congestion, optimizing operations, improving safety (as a result of the reduced congestion), and accommodating multimodal connections (with construction of at least short sections of the shared use path).

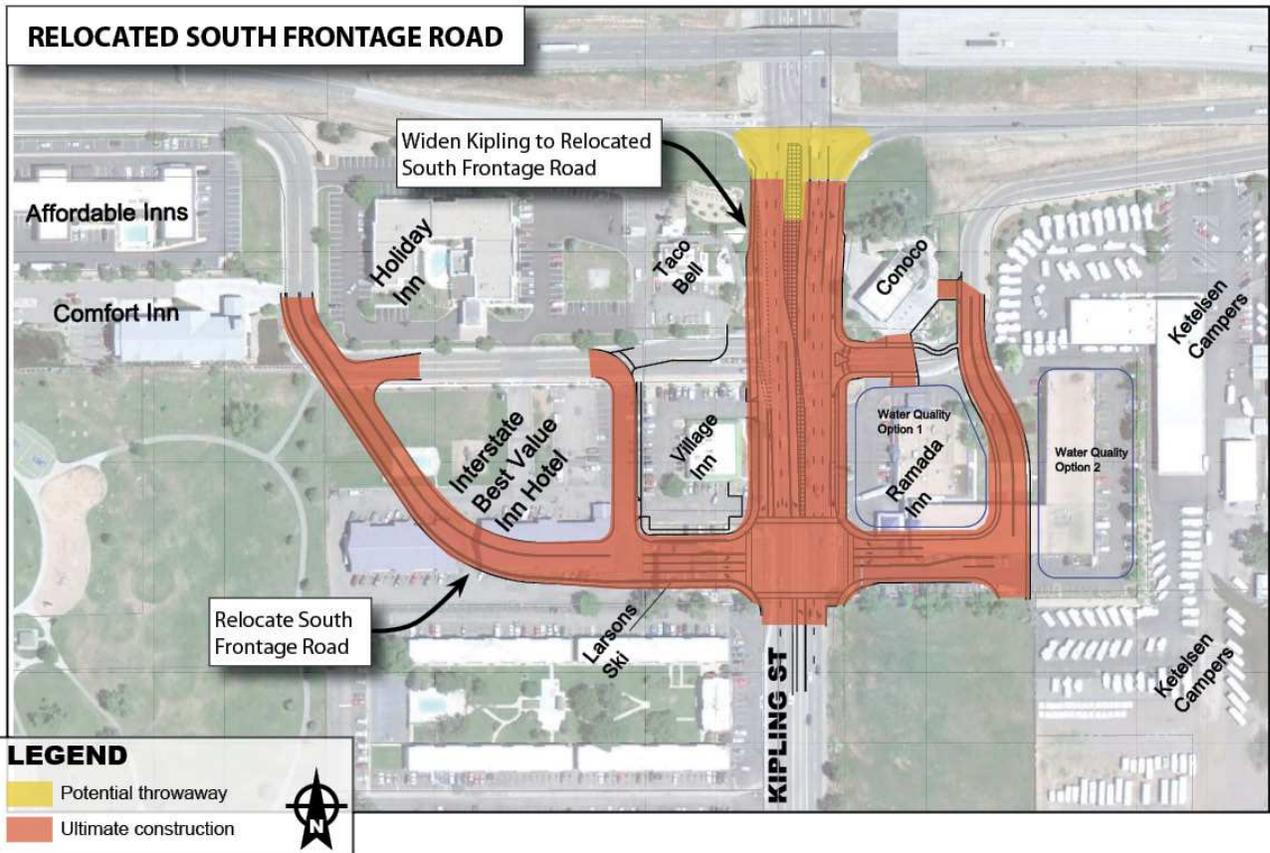
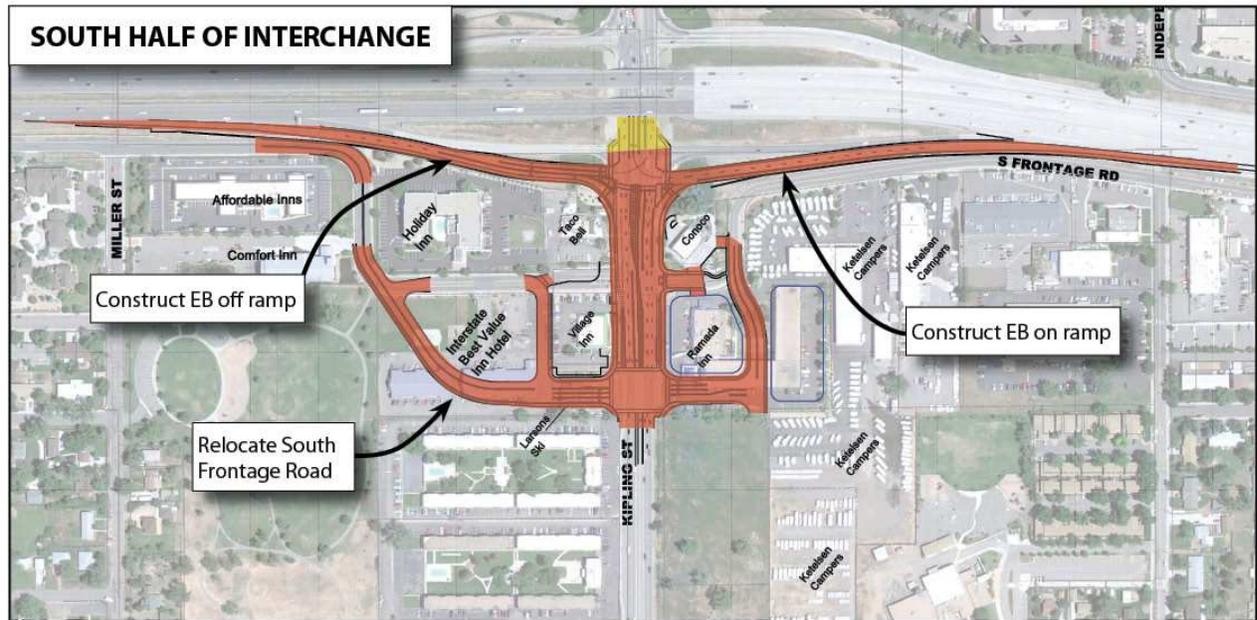
The project phases located north of the interchange would have potential impacts to hazardous material sites and wells. Expected mitigation requirements would be limited to standard BMPs during construction and avoidance or relocation of wells.

Figure 7: Traditional Diamond – Separate Project Phases



Note: Separate project phases can be constructed in any order.

Figure 7: Traditional Diamond – Separate Project Phases (continued)



Note: Separate project phases can be constructed in any order.

The project phases located south of the interchange would also have potential impacts to hazardous material sites and wells, as well as potential impacts to wetlands identified near the Eastbound On Ramp and noise receptors with the apartments adjacent to the relocated South Frontage Road. Expected mitigation requirements would be standard BMPs during construction and avoidance or relocation of wells, as well as potential noise mitigation and wetland permitting.

The ROW impacts for the project phase options range from less than one acre for the Westbound Off Ramp to 7.6 acres for the All Ramps project phase, which includes all of the ROW required for the ultimate Traditional Diamond alternative. The conceptual cost estimate for the project phases range from \$6.6 million for the Westbound Off Ramp to \$26.1 million for the All Ramps project phase. Implementing the All Ramps project phase would defer the estimated project cost of \$22.0 million for the replacement of the I-70 bridge over Kipling Street.

Although other separate project phases are physically possible to construct separately (such as the Eastbound On and Off Ramps), no other separate project phases of the Traditional Diamond are expected to meet independent utility and provide substantial operational, safety, or multimodal benefits.

Table 2: Evaluation of Separate Project Phases – Traditional Diamond Alternative

Criteria	Separate Project Phase				
	Westbound Off Ramp	Westbound On and Off Ramps	All Ramps (bridge not replaced)	South Half of Interchange	Relocated South Frontage Road
Independent Utility	Yes Project provides operational and safety benefits independent of the completion other phases				
Purpose and Need Elements	<ul style="list-style-type: none"> • Reduces congestion • Optimizes operations • Improves safety • Accommodates multimodal connections 				
Potential Environmental Resources Affected	Potential impacts to Hazardous Materials & Wells	Potential impacts to Hazardous Materials & Wells	Potential impacts to Hazardous Materials, Wells, Wetlands, Noise	Potential impacts to Hazardous Materials, Wells, Wetlands, Noise	Potential impacts to Hazardous Materials, Wells, Noise
Potential Mitigation Requirements	Standard BMPs during construction Avoidance/relocation of wells	Standard BMPs during construction Avoidance/relocation of wells	Standard BMPs during construction Avoidance/relocation of wells Noise mitigation 404 permitting	Standard BMPs during construction Avoidance/relocation of wells Noise mitigation 404 permitting	Standard BMPs during construction Avoidance/relocation of wells Noise mitigation
ROW Impacts	Full = 0.5 acres Partial = 0.3 acres Total = 0.8 acres	Full = 0.5 acres Partial = 0.5 acres Total = 1.0 acres	Full = 6.8 acres Partial = 0.8 acres Total = 7.6 acres	Full = 6.3 acres Partial = 0.4 acres Total = 6.7 acres	Full = 6.3 acres Partial = 0.4 acres Total = 6.7 acres
Construction Duration	3 months	6 months	12 months	8 months	6 months
Conceptual Cost Estimate	Construction=\$5.4 M ROW = \$1.2 M Total = \$6.6 M	Construction=\$7.1 M ROW = \$1.4 M Total = \$8.5 M	Construction=\$15.1 M ROW = \$11.0 M Total = \$26.1 M	Construction=\$8.0 M ROW = \$8.8 M Total = \$16.8 M	Construction=\$4.7 M ROW = \$8.8 M Total = \$13.5 M

Evaluation of Recommended Alternatives

The recommended alternatives were evaluated in more detail with the prioritized evaluation criteria established from the Level 3 alternatives evaluation, as described in the Alternatives Evaluation Summary section of this report and in the *Final Alternatives Development and Analysis Report*. The prioritized criteria were the criteria from the Level 2 alternatives screening that were of most concern from input and comments received during meetings with the Technical Team and area stakeholders, presentations to local agency elected officials, and the open house held with the general public. The prioritized criteria were:

- Interchange Capacity
- Driver Expectancy
- Pedestrian and Bicycle Crossings
- Property (ROW) Impacts
- Business Access
- Phased Construction Opportunities
- Project Costs

The purpose of the project is to reduce congestion, optimize operations, improve safety, and accommodate multimodal connections at the I-70 and Kipling Street interchange.

Although safety was not specifically identified by project stakeholders as a prioritized evaluation criterion, the existing and projected safety issues at the interchange are closely related to the interchange capacity. Safety was also often discussed by project stakeholders as it relates to driver expectancy, since drivers unfamiliar with the area may make erratic maneuvers for complicated interchange movements. Pedestrian and bicycle crossings are inherently connected to multimodal safety based on potential vehicular conflicts.

The SPUI and Traditional Diamond alternatives were evaluated with additional conceptual design refinement and traffic operations analysis to further define alternative elements. The conceptual design details provided more detailed information on the potential property impacts, including changes in access/driveways, parking, and site circulation. Possible locations for additional infrastructure needs, such as grading, retaining walls, and water quality detention were also identified and considered in this evaluation.

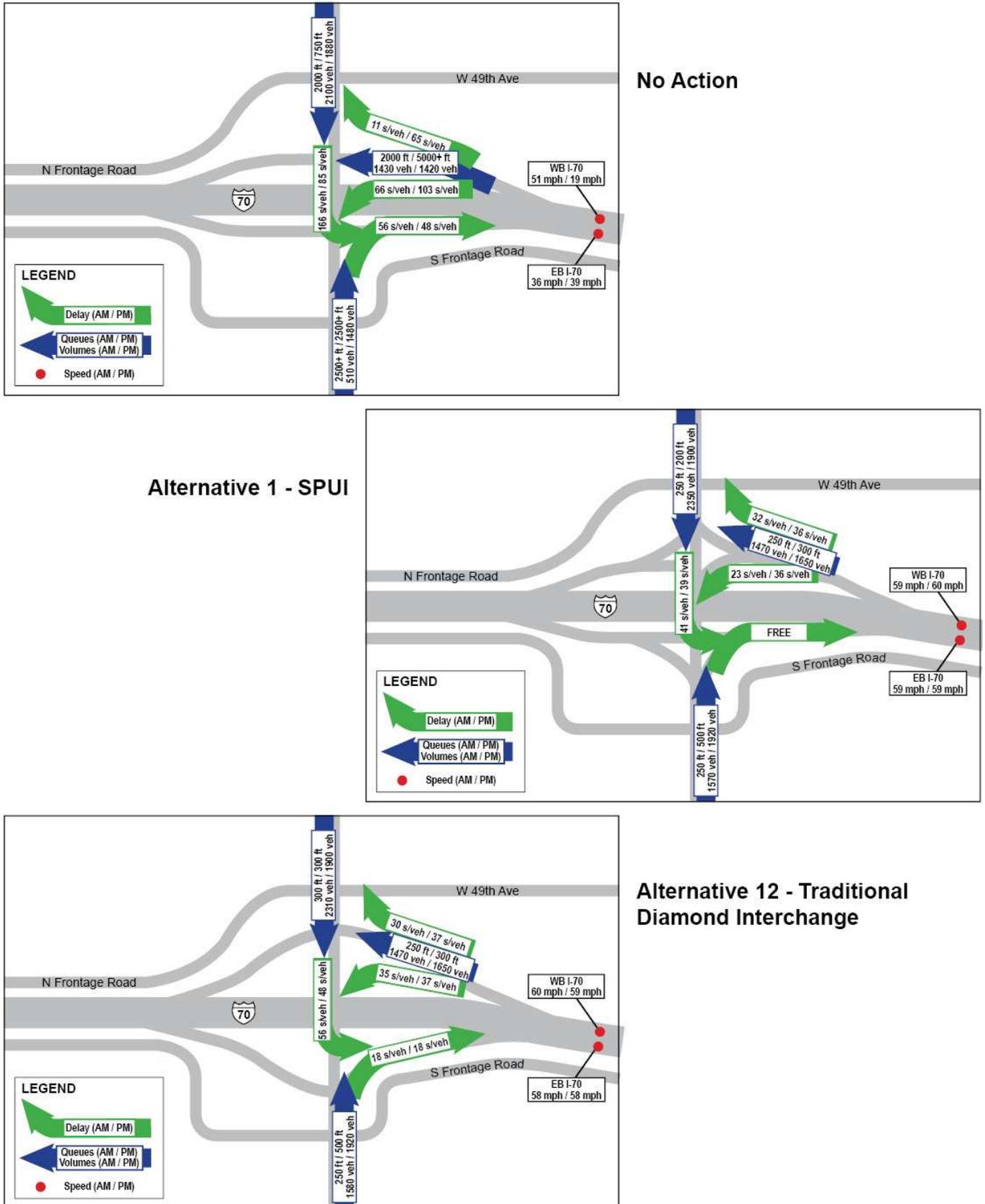
The traffic operations of the two recommended alternatives were analyzed in more detail using VISSIM (Version 5.30-10) traffic simulation software, in addition to the Synchro/SimTraffic analysis software. While the traffic analysis conducted with earlier screening provided comparative information about overall intersection operations and capacity, this analysis provided additional information on the vehicular interactions and delay for the key movements through the interchange, as well as the ramp merge and diverge operations on the freeway. Additional auxiliary lanes to optimize operations were included in the alternative refinements.

The evaluation is summarized in **Table 3**. The interchange capacity performance measures (delay, queues, volumes, and speed) are provided for the key movements through the interchange. These capacity performance measures are also illustrated by movement in **Figure 8**. This evaluation is not intended to provide a conclusion of a Preferred Alternative from this PEL study. The information is intended to streamline the identification of the Preferred Alternative in future NEPA process(es).

Table 3: Evaluation of Recommended Alternatives

Category	Performance Measure	NA	I	I2
		No Action	SPUI	Traditional Diamond
Interchange Capacity (2035 Conditions)	Peak hour avg vehicle delay approaching interchange (seconds per vehicle (sec/veh)) (AM/PM)	NB RT to EB I-70: 56 / 48 SB LT to EB I-70: 166 / 85 WB RT: 11* / 65 WB LT: 66 / 103 * Free RT w/low conflicting traffic	NB RT to EB I-70: Free SB LT to EB I-70: 41 / 39 WB RT: 32 / 36 WB LT: 23 / 36	NB RT to EB I-70: 18 / 18 SB LT to EB I-70: 56 / 48 WB RT: 30 / 37 WB LT: 35 / 37
	Peak hour queue lengths approaching interchange (feet) (AM/PM)	SB Kipling: 2000 / 750 NB Kipling: 2500+ / 2500+ WB Off-Ramp: 2000 / 5000+	SB Kipling: 250 / 200 NB Kipling: 250 / 500 WB Off-Ramp: 250 / 300	SB Kipling: 300 / 300 NB Kipling: 250 / 500 WB Off-Ramp: 250 / 300
	Traffic volumes through interchange (vehicles per hour (veh/hr)) (AM/PM)	SB Kipling: 2,100 / 1,880 NB Kipling: 510 / 1,480 WB Ramps: 1,430 / 1,420	SB Kipling: 2,350 / 1,900 NB Kipling: 1,570 / 1,920 WB Ramps: 1,470 / 1,650	SB Kipling: 2,310 / 1,900 NB Kipling: 1,580 / 1,920 WB Ramps: 1,470 / 1,650
	Travel speeds along I-70 east of Kipling (MPH) (AM/PM)	EB I-70: 36/39 WB I-70: 51/19	EB I-70: 59/59 WB I-70: 59/60	EB I-70: 58/58 WB I-70: 60/59
Driver Expectancy	Perceived Driver Expectancy	Moderate Directional interchange layout and typical urban interchange layout, but close signal spacing makes maneuvering difficult	Easy Directional interchange layout and full access to frontage roads with interchange layout familiar to Denver metro area	Easy Directional interchange layout and access to frontage roads with interchange layout familiar to Denver metro area
Pedestrian and Bicycle Crossings	User perception of comfort and safety of pedestrian and bicycle movements	Difficult Increasingly uncomfortable for pedestrians with increased vehicular congestion and sidewalks under the bridge with limited median refuge areas	Easy Shared use paths and bicycle lanes directly through the interchange and traffic signals at both frontage roads provide Kipling Street crossing	Easy Shared use paths and bicycle lanes directly through the interchange, but no signalized crossing at 49 th Avenue/North Frontage Road
ROW Impacts	Full acquisitions and partial acquisitions required (acres)	None	Full = 0.5 acres Partial = 0.71 acres Total = 1.21 acres	Full = 6.76 acres Partial = 0.85 acres Total = 7.61 acres
Business Access	Perceived difficulty to access area business	Moderate Increased congestion creates issues for accessing businesses due to congestion in peak travel times	Easy Typical interchange layout and full access to frontage roads	Easy Typical interchange layout, but limited direct access to 49 th Avenue/North Frontage Road and South Frontage Road access moved farther from interchange
Phased Construction Opportunities	Opportunities to construct in phases	N/A	Difficult Bridge with ramps must be constructed at once	Easy Opportunities for ramps to be constructed separately with bridge work later
Project Costs	Conceptual-level probable costs	None	Construction = \$43 - 48 M ROW = \$2 - 4 M Total = \$45 - 52 M	Construction = \$35 - 40 M ROW = \$10 - 12 M Total = \$45 - 52 M

Figure 8: Interchange Capacity Evaluation of Recommended Alternatives



Interchange Capacity

Both the SPUI and Traditional Diamond alternatives provide similar interchange capacity benefits in expected 2035 conditions compared to the No Action alternative. The alternatives substantially reduce the peak hour average vehicular delay expected under the 2035 No Action conditions for the key movements approaching the interchange.

The increased capacity at the Westbound Off Ramp and Kipling Street traffic signal substantially reduces the peak hour queues on the ramp under both recommended alternatives, as compared to the No Action alternative. This will reduce the potential for traffic to routinely back up to the I-70 mainline, which is currently a documented crash issue.

With both recommended alternatives, the modification of the Westbound Off Ramp diverge to provide a shared lane with the current drop lane also increases the capacity of the diverging movement and increases the travel speeds along I-70, improving safety related to speed differential and lane-changing maneuvers on the freeway.

Driver Expectancy

Many of the drivers using this interchange are not from this area, so driver expectancy is important to optimize the operational efficiency of the interchange. Both recommended alternatives provide typical urban interchange configurations familiar to the Denver metropolitan area.

Pedestrian and Bicycle Crossings

Both recommended alternatives provide shared use paths and bicycle lanes directly through the interchange. The alternatives have uncontrolled pedestrian crossings across free right turn movements from Kipling Street to the on ramps and the locations and design of the crossings determined during final design will need to consider the sight distance and speed of the right turning traffic.

With the SPUI alternative, the frontage road traffic signals provide signalized pedestrian crossings of Kipling Street. With the Traditional Diamond layout, the traffic signal at the 49th Avenue/North Frontage Road intersection is removed, so pedestrians must walk to the 50th Avenue or westbound ramps intersection for a signalized crossing of Kipling Street.

ROW Impacts

There are seven properties with expected partial acquisitions and one full property acquisition assumed for the SPUI, totaling 1.21 acres of impact. There are ten properties with expected partial acquisitions and four full property acquisitions assumed for the Traditional Diamond, totaling 7.61 acres of impact.

Business Access

Both recommended alternatives provide typical urban interchange configurations. Because the frontage road traffic signals remain north and south of the interchange with the SPUI alternative, it would be relatively easy for drivers unfamiliar with the area to access the surrounding businesses, such as the gas stations, hotels, and fast food restaurants.

The access to surrounding businesses with the Traditional Diamond alternative is typical to the Denver metropolitan area, but the 49th Avenue/North Frontage Road intersection is limited to unsignalized right-in/right-out movements and the South Frontage Road traffic signal is moved farther away from the interchange.

The potential business impacts for each of the recommended alternatives are described in more detail in the Land Use and Business Impacts Technical Memorandum in **Appendix A**.

Phased Construction Opportunities

The configuration of the SPUI requires the new bridge and ramps to be constructed together, so there are limited opportunities to reconstruct the interchange in separate, smaller-scale projects. This limits the ability to utilize available funding opportunities. The configuration of the Traditional Diamond ramps and changes to the frontage roads north and south of the interchange create several opportunities to reconstruct the interchange in separate, smaller-scale projects.

Project Costs

The conceptual cost estimates for the recommended alternatives result in similar expected overall project costs. The SPUI requires higher construction costs than the Traditional Diamond due to the clear-span bridge structure with retaining walls. However, the Traditional Diamond requires higher ROW costs due to more full property acquisitions. Total cost for both alternatives is estimated at \$45 - \$52 million.

The conceptual cost estimates are provided in **Appendix G**. The ROW cost estimates assume a square-foot unit cost for the amount of partial acquisitions and an acquisition, relocation, and demolition cost for the properties assumed as full acquisitions.

Early Action Improvements

Coordinating early action improvements with the recommended alternatives for ultimate interchange reconstruction allows the potential for projects to move forward that address existing deficiencies and fit within the ultimate interchange configuration. Early action improvements were evaluated for potential implementation prior to the long-term interchange reconstruction.

Improvements were developed and analyzed with the goal of addressing existing critical issues with reasonable costs and limited throwaway infrastructure that would need to be reconstructed with the ultimate interchange construction, considering the recommended alternatives of the SPUI and Traditional Diamond.

Because these improvements were considered to address existing issues, the improvements were analyzed under existing (2012) traffic conditions. The existing traffic capacity and safety issues for the interchange are described in the Purpose and Need section of this report with more details in the *Existing Conditions Report*. The highlighted critical issues are:

- Eastbound On Ramp short merge length
- Kipling Street queuing from Eastbound On Ramp merge congestion
- Westbound Off Ramp right turn delay and weave movement to 49th Avenue
- Westbound Off Ramp queuing to mainline I-70

These critical operational issues are focused on the capacity of the Eastbound On Ramp merge and the operations of the Westbound Off Ramp approach to Kipling Street. Therefore, options were considered to address these areas. The consideration of the different options is described in the Early Action Alternatives Technical Memorandum in **Appendix A**. The recommendations for the early action improvements are described below.

Eastbound On Ramp Continuous Lane

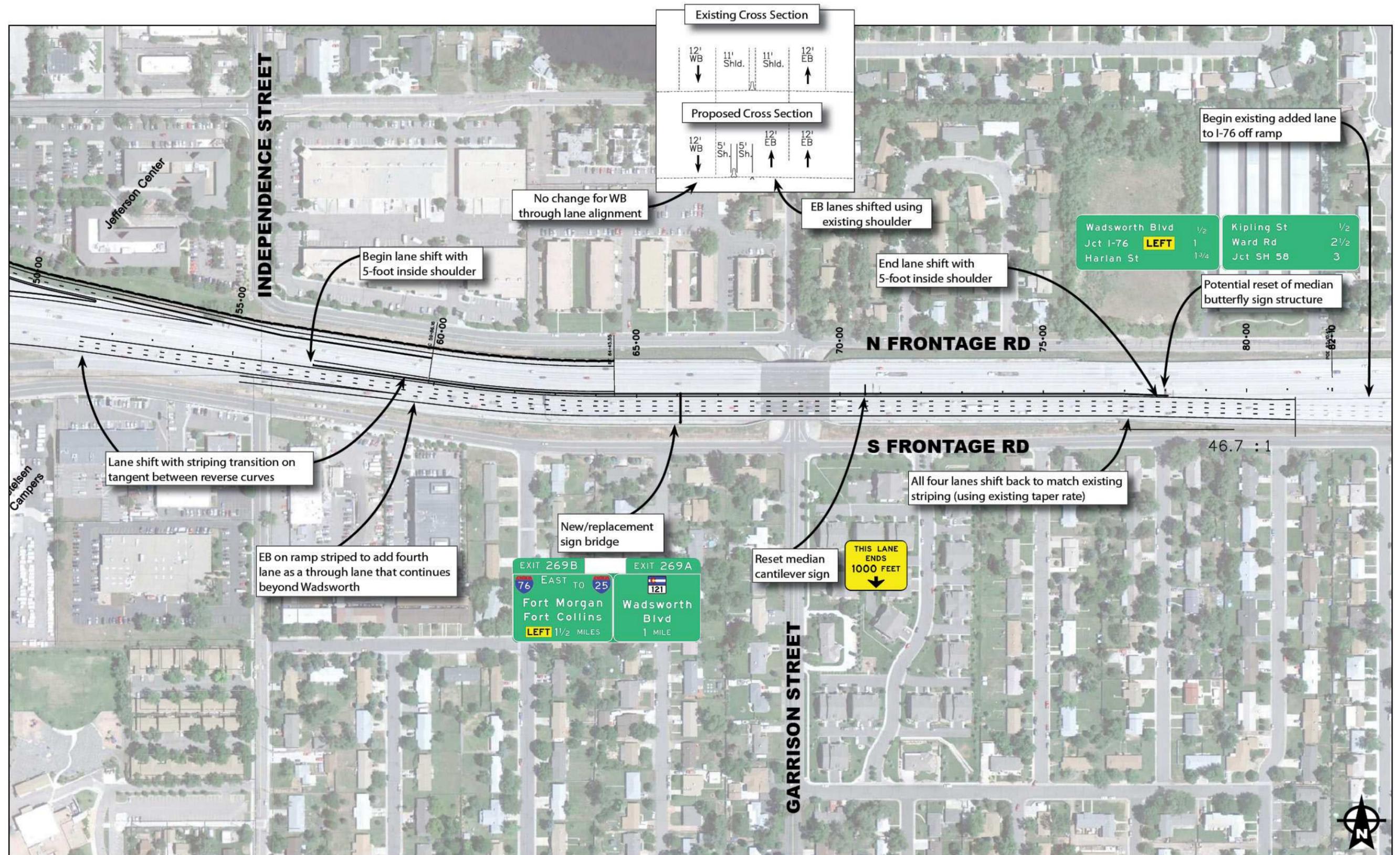
The segment of I-70 east of Kipling Street was reconstructed in the early 1990s to accommodate the final connection of I-76 and reconstruction of the Wadsworth Boulevard interchange. East of the Garrison Street bridge, a standard 10-lane template of I-70 was constructed, but only three eastbound lanes were constructed west of Garrison Street, while westbound I-70 has five lanes to Kipling Street.

A fourth lane on eastbound I-70 at Kipling Street would benefit the interchange traffic operations by reducing vehicle merge conflicts and allowing appropriate speeds to be maintained in all lanes. Also, the ramp meter signal on the Eastbound On Ramp would also be able to cycle more quickly, reducing the queue spillback to Kipling Street.

The concept for the Eastbound On Ramp continuous lane improvement is illustrated in **Figure 9**. With this improvement, the existing median barrier is shifted six feet to the north and the inside shoulders for the westbound and eastbound directions, which are currently 11 feet wide, are narrowed to five feet. There is no change for the lanes along westbound I-70 and the lane shift ends to meet the existing striping where an outside lane is added east of Garrison Street. This results in a continuous outside lane from the Eastbound On Ramp at Kipling Street to match the existing striping east of Garrison Street.

This Eastbound On Ramp improvement is consistent with either of the two recommended alternatives, so it can be implemented prior to the identification of a Preferred Alternative. There are no regional plans to widen this segment of I-70, so the implementation of this improvement would result in limited, if any, throwaway infrastructure with either the SPUI or Traditional Diamond alternative.

Figure 9: Eastbound On Ramp Continuous Lane Early Action Improvements



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The evaluation of the Eastbound On Ramp continuous lane improvement is summarized in **Table 4**. As shown, the early action improvement provides increases in speed on I-70 within the Eastbound On Ramp merge area. There are also travel time benefits along I-70.

Table 4: Evaluation of Eastbound On Ramp Continuous Lane

Condition	Eastbound I-70							
	Travel Time (seconds)				Kipling On Ramp Merge			
	Ward to Wadsworth		Kipling to Wadsworth		Speed (MPH)		Density (veh/hr/lane)	
	AM	PM	AM	PM	AM	PM	AM	PM
Existing	149	147	107	116	50	44	32.0	42.1
EB On Ramp Continuous Lane	142	143	93	109	58	59	25.3	19.6

The conceptual construction cost estimate for the improvement is \$600,000 - \$800,000, which includes shifting the median barrier, resetting three overhead sign structures, and restriping.

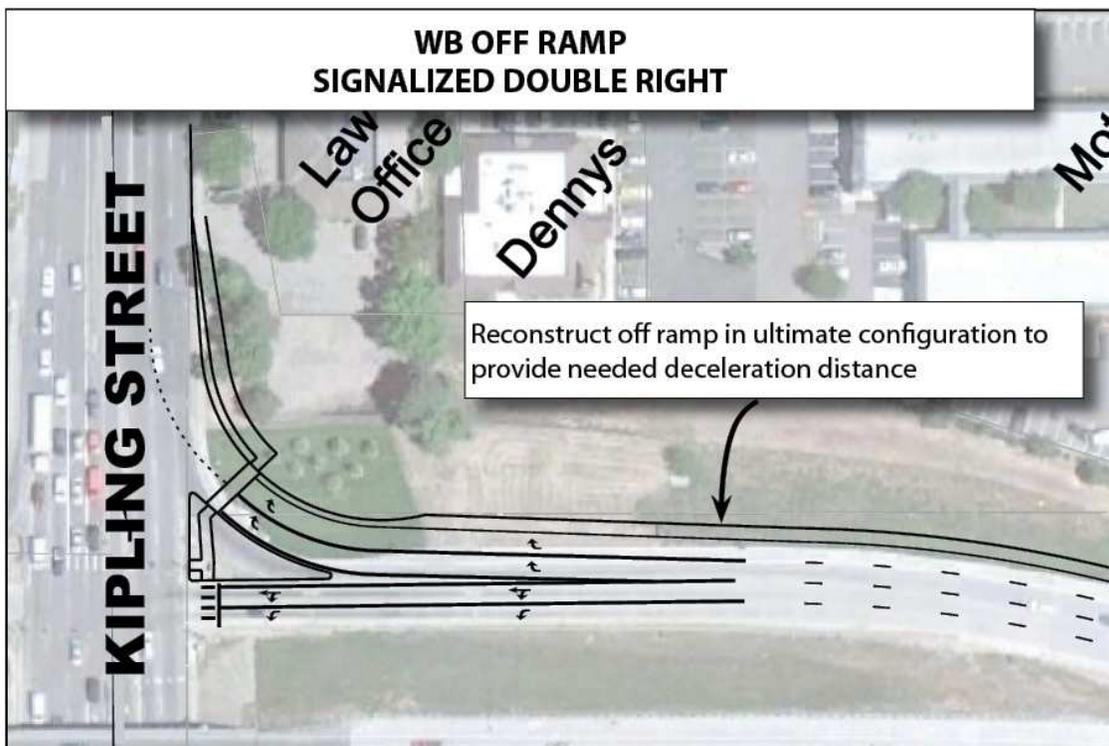
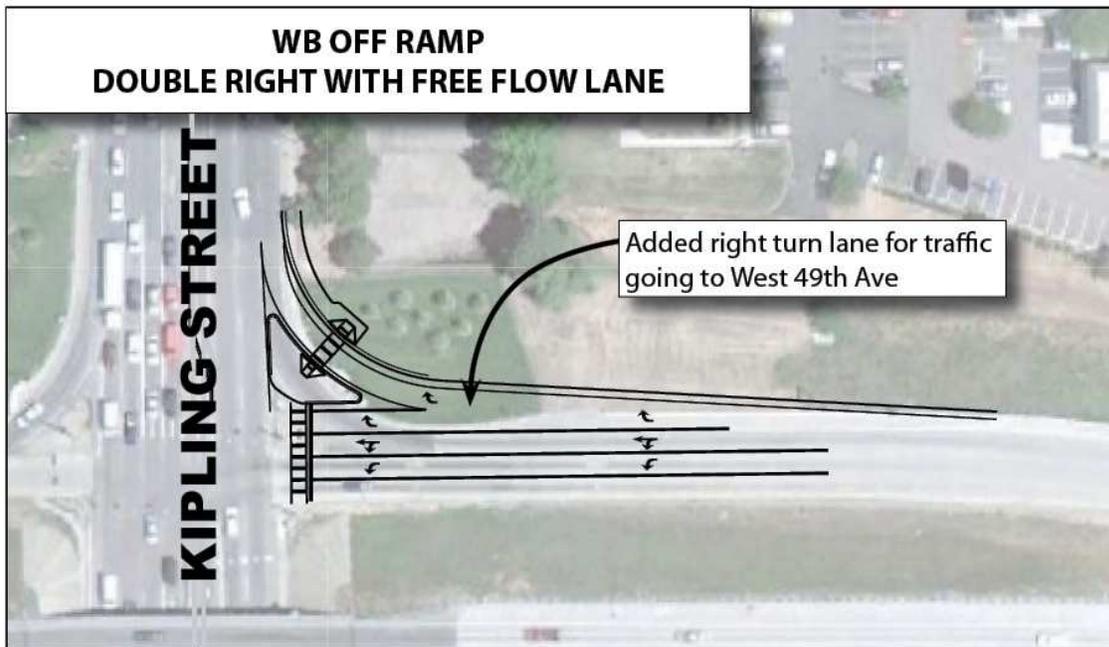
Westbound Off Ramp

Two options may be considered for addressing the operations of the Westbound Off Ramp approach to Kipling Street. The two options are:

- Double Right with Free Flow Lane – Construct a short right turn lane for use by drivers weaving to westbound 49th Avenue, leaving the far right lane as a free right continuous lane
- Signalized Double Right – Reconstruct the right turn lanes and signalize the double right turn movement

The concepts for the Westbound Off Ramp early action improvements are illustrated in **Figure 10**.

Figure 10: Westbound Off Ramp Early Action Improvements



The evaluation of the Westbound Off Ramp improvement is summarized in **Table 5**.

Table 5: Evaluation of Westbound Off Ramp Early Action Improvement

Condition	Westbound Off Ramp Approach					
	Delay (sec)		LOS		95 th % Queue (ft)	
	AM	PM	AM	PM	AM	PM
Existing	76.0	75.4	E	E	560	1310
Double Right with Free Flow Lane	26.6	19.3	C	B	490	870
Signalized Double Right	26.2	21.4	C	C	290	425

As shown, the option with the double right with free flow lane substantially reduces the delay at the intersection and improves the operations to LOS C in the AM peak hour and LOS B in the PM peak hour. The reason drivers ignore the current restriction on weaving to 49th Avenue from the right turn lane is because they share the lane and wait at the signal with the heavy left turning traffic. The weaving traffic is less than 100 veh/hr, so the storage needed is minimal. However, the change of having those drivers in their own lane, with appropriate signing and enforcement, may effectively separate the right turning drivers based on their destination and result in reduced queuing along the off ramp. The continuous right turn lane would also be modified in the immediate area of the interchange and signing and striping would be improved to maximize the efficiency of this concept and reinforce the continuous flow aspect of the right turn lane. However, there are concerns that drivers would continue to not utilize the free flow lane since it is similar to the existing condition and the operational benefits reported with the traffic models would not be accomplished. The conceptual construction cost estimate for the improvement is \$250,000 - \$300,000.

The signalized double right option would also substantially reduce the intersection delay and improve operations to LOS C in the peak hours. The option was developed to control the weave movement of traffic turning right at the ramp and turning left at 49th Avenue. Double right turn lanes should have enough capacity for near-term traffic demand, although triple rights are necessary for the ultimate capacity needs when the full interchange is reconstructed (with either recommended alternative). This option would also provide safety benefits for pedestrians with a signalized crossing of the right turn lanes, rather than a free flow lane. The conceptual construction cost estimate for the improvement is \$400,000 - \$450,000.

Because the location of the Westbound Off Ramp is different between the SPUI and Traditional Diamond alternatives, either of these options would include throwaway pavement that would need to be reconstructed with the ultimate interchange configuration. Since this “interim” status is true with either recommended alternative, this improvement can be implemented prior to the identification of a Preferred Alternative.



Vacant lot in northwest quadrant of Kipling interchange

Environmental Overview

One of the goals of the PEL process is to identify potential impacts early in the planning process so that impacts can be avoided or minimized to the extent possible. The recommended alternatives from this study have been conceptually designed to minimize environmental impacts while meeting the project Purpose and Need. Specific mitigation measures for remaining environmental impacts will be determined

during subsequent NEPA evaluation process(es), and will be included in final plans for incorporation into the project design.

Construction of the interchange improvements may result in direct, indirect, and cumulative impacts to environmental resources depending on the type and location of the resource in proximity to the improvements. The resources that may be impacted were evaluated in the *Environmental Scan Report* (May 2012). A summary of the overview findings is described below for the two recommended interchange alternatives (SPUI and Traditional Diamond alternatives).

Potential Impacts

Air Quality

Air quality is generally assessed by comparing concentrations of air pollutants to National Ambient Air Quality Standards, which are set to protect human health and welfare. Air pollutants related to transportation that are of concern include carbon monoxide, ozone, particulate matter (particulate matter with an aerodynamic diameter less than 10 microns), and Mobile Source Air Toxics (MSAT). MSATs are hazardous air pollutants, and six priority MSATs have been identified by the Environmental Protection Agency (EPA) as the priority transportation toxins to monitor.

The determination of regional air quality conformity is completed by DRCOG through their conformity analysis for the RTP. The I-70 and Kipling interchange reconstruction project is included as a funded roadway capacity improvement project in the RTP, so regional conformity for the interchange project has already been demonstrated.

Moving forward with the NEPA process, air quality impact analysis would be conducted for the identified Preferred Alternative for carbon monoxide and particulate matter. A local analysis may consist of hot-spot modeling for carbon monoxide concentrations at intersections or other locations where vehicle idling may result in higher carbon monoxide concentrations. A qualitative analysis for particulate matter hot-spots would be needed and potentially calculation of daily emission levels of the MSATs. Often a concurrence letter from the Colorado Department of Public Health and Environment, Air Pollution Control Division on conformity is required.

Noise

The FHWA has established activity categories based on various land uses to determine what is considered an acceptable noise level, known as Noise Abatement Criteria (NAC). If the NAC will be exceeded after the construction of roadway improvements, mitigation needs to be considered and may be warranted depending on the land use category. There are currently areas within the study area with noise exposures that exceed acceptable NAC levels (e.g., the commercial properties along I-70 west of Kipling Street, where no noise barriers currently exist). The potentially impacted properties are commercial, so interior noise levels may be the only consideration. Mitigation may be warranted as noise levels may increase with either recommended alternative and a noise barrier along I-70 west of Kipling Street may be considered. For Kipling Street south of 51st Place within the study area, noise barriers would probably not be feasible because of the many openings required for intersecting roadways and property access.

A detailed noise study will be required during future NEPA process(es). During construction, a common-sense approach to controlling noise impacts of construction equipment and activities should be considered. BMPs can be incorporated to minimize the effect of construction on local residents and sensitive receivers while not affecting construction schedules.

Water Wells

Approximately 250 existing water wells in the study area were identified through a survey of GIS data from the Colorado Division of Water Resources (2012). Approximately two-thirds of the wells are used as monitoring wells, which are constructed for the purpose of locating water, pump or aquifer testing, monitoring ground water, or collection of water quality samples. The remaining one-third of wells are used primarily for domestic or residential uses, and a few wells are used for municipal, commercial, or irrigation purposes.

Both recommended alternatives could potentially impact six wells clustered around the southeastern corner of I-70 and Kipling. Additionally, in the northwestern

corner, the SPUI alternative would impact three wells and the Traditional Diamond alternative would impact one well. With the exception of one well categorized for domestic use, all of the other potentially-impacted wells are classified as “other” usages, which means that they are likely used as monitoring wells.

Consideration of water well resources during the NEPA process will be necessary and will include a detailed analysis of the project design impacts to existing water wells, a plan for avoidance of existing wells during and after construction, and identification of the necessary permits for construction activities.

Land Use

The land adjacent to the recommended alternatives is currently zoned for commercial uses, with the exception of a small portion of residential units at the eastern project terminus. A significant portion of both alternatives lies within the I-70/Kipling Corridors Urban Renewal Area, which will guide future development (Wheat Ridge 2009). Future land uses around the interchange area are primarily planned for mixed use/commercial. Although the change between current and future land uses is subtle (commercial to commercial/mixed use), the footprint of the recommended alternatives is bigger than what currently exists. Additionally, the Traditional Diamond alternative extends farther south than the SPUI alternative and reaches to the border of an existing residential area which could negatively impact those residents.

Mitigation measures should be evaluated as part of the NEPA process for each particular business or residence affected by the identified Preferred Alternative. Because land use planning is under the purview of local agencies, ongoing coordination with local planners and other city officials is an important part of the process and will be an essential part of future project development. Ongoing conversations with property owners, businesses, and residences potentially affected will also be a critical part of future project development.

Additional analysis should be undertaken during the NEPA process to ensure that the identified Preferred Alternative does not exacerbate the existing community barrier effect presented by I-70. This may include a mitigation plan to address additional barrier effects brought by the new interchange configuration.

Neighborhood/Business Displacement

ROW within the study area is generally owned by CDOT and local municipalities, though the recommended alternatives will also impact local commercial and residential property. The potential land use and business impacts of the recommended alternatives are described in more detail in the *Land Use and Business Impacts Technical Memorandum* in **Appendix A**.

During the NEPA process, impacts to neighborhoods, businesses, and individual residences should be identified and avoided or minimized where possible. If property acquisition is required for ROW, acquisition proceedings will conform to the requirements set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended) and the Uniform Relocation Act Amendments of 1987 (as amended).

Wetlands and Waters of the U.S.

Based on U.S. Geographic Survey data (1994) and GIS data (2012), one irrigation ditch located in the southeast corner of the study area would be impacted by the recommended alternatives. This ditch has been identified as a potential wetland and/or historic resource.

Under the Section 404 of the Clean Water Act, impacts to Waters of the U.S., including wetlands and open water features, must be avoided, minimized, or mitigated to ensure that there is no net loss of functions and values of jurisdictional wetlands. To the extent practicable, future design should incorporate avoidance and minimization of impacts to known wetland areas. Where avoidance and minimization would not be practicable, mitigation for impacts to wetlands could be achieved through the use of temporary and permanent BMPs.

A Section 404 permit would likely be required from the USACE to authorize placement of dredge or fill material in any Waters of the U.S. including wetlands and open water features. Impacts under 0.5 acres can be permitted under existing Nationwide Permits. Impacts greater than 0.5 acres would require obtaining an Individual Permit. An Individual Permit includes a public notice and would trigger additional NEPA coordination with the USACE. Generally, mitigation would be required under either permit type for impacts exceeding 0.1 acre of jurisdictional Waters of the U.S., including wetlands and open water features. Prior to application for a permit, a wetland delineation survey should be conducted including a jurisdictional determination. This would include documented wetland boundaries and a determination of impacts.

CDOT regulates wetlands regardless of USACE jurisdiction. A CDOT Wetland Findings report may be required if permanent wetland impacts exceed 500 square feet or if temporary impacts exceed 1,000 square feet, regardless of whether USACE has jurisdiction.

Noxious Weeds

The project team reviewed the State of Colorado and Jefferson County noxious weed lists (Colorado Department of Agriculture, 2012; Jefferson County, 2012) and visited the study area on March 29, 2012 to map noxious weeds. While the site visit was conducted out of the growing season, noxious weeds were still present in the study area. The eastern terminus of both recommended alternatives would affect the Slough Ditch (located between Oak and Miller Street) which was found to have a noticeable weed infestation. It is expected that additional weeds are present in the study area, so a second site visit and weed mapping are recommended to occur in the growing season.

As the project moves into the NEPA process, CDOT will require the preparation of an Integrated Noxious Weed Management Plan which would include steps to control existing noxious weeds. Additionally, the construction contractor for any project phase would be required to follow the revised CDOT Standard Specifications and implement the standard CDOT BMPs.

Threatened and Endangered Species and Wildlife

The project team reviewed State and County information on wildlife and Threatened, Endangered, and Special Status species that could occur within the study area. While no suitable habitat was observed for any of the 12 federally-listed species with potential to occur in Jefferson County, there are state-listed species present.¹ Black-tailed prairie dogs habitat was observed in all quadrants of the study area in open fields and vacant areas. Although no active prairie dogs were observed, there would be potential for this species to inhabit these areas. Prairie dog habitat and some of the culverts may provide habitat for migrating burrowing owls which are a state Species of Concern and also protected under the Migratory Bird Treaty Act (MBTA). There is moderate potential for the northern leopard frog and the common garter snake, both State Species of Concern, to occur in the wetland habitat ditch that could potentially be impacted by the recommended alternatives.

Tree removal, vegetation grubbing and other construction activities have the potential to destroy nests of bird species protected under the MBTA. Nearby construction activities during the breeding season may cause raptors to abandon nests. Several potential raptor nests were observed in the study area, and the mature trees throughout the study area provide additional raptor nesting habitat. In addition, the mature trees may also provide winter roost sites for bald eagles. Similarly, winter construction activities may cause bald eagles to abandon roosting areas and the USFWS has published guidelines to minimize disturbance (USFWS, 2007).

Due to the raptor nests and nesting habitats that were observed in the study area, careful construction practices will be necessary. Construction activities should schedule clearing and grubbing operations and work on structures to avoid impacting migratory birds protected by the MBTA. Pre-construction surveys for nesting birds should be completed and should follow the methods set forth by the USFWS, the CPW or CDOT Section 240 Protection of Migratory Birds Standard Specification (CDOT, 2011).

Cliff swallows often nest under bridges and within box culverts and were observed nesting under the I-70 overpasses over Carr Street, Garrison Street and Kipling Street. Nesting locations may change from year to year, and areas should be re-surveyed prior to construction. No bridge or box culvert work may take place if there are nesting birds present. Bridge or box culvert work that may disturb nesting birds should be completed before birds begin to nest or after the young have fledged (typically between April 1 and August 31). If work activities are planned between these dates, old swallow nests should be removed before nesting begins and appropriate measures taken to assure no new nests are built prior to construction. Appropriate measure to keep birds from nesting include installing plastic sheeting to prevent swallows from accessing the bridge or removing any new nests within three days. Failure to keep new nests from becoming established may postpone project construction.

¹ CPW also designates State-Specific Species of Concern (CPW, 2012a)

Hazardous Materials

The hazardous materials review provided information about properties within the study area that pose a potential risk of environmental contamination from hazardous materials. Sites with known (current and historic) soil and/or groundwater contamination are distinguished as sites with “recognized environmental conditions.”² After review of the database search of local, state, tribal, and federal environmental agency databases and a windshield survey, a total of 41 sites with recognized environmental conditions were “flagged” within and adjacent to the study area.

The SPUI alternative could potentially impact the Circle K gas station in the northwest corner with a partial acquisition and driveway reconstruction. The Conoco gas station in the southeast corner of the interchange is expected to be a full acquisition and potential location for water quality retention. The Traditional Diamond alternative could potentially impact the Circle K and Conoco gas stations with partial acquisition and driveway modifications.

Moving into the NEPA process, a hazardous materials assessment, such as a Modified Phase I Environmental Site Assessment, would typically be needed as part of future project development. During the final planning and design process, this information can be used to identify avoidance options, when possible, and to assist with the development of specific contaminated soils/groundwater material management or mitigation measures to protect worker health and safety. It is anticipated that properties targeted for construction undergo further site assessments and/or preliminary site investigations as part of the ROW acquisition process, and may require remediation prior to acquisition or development.

Historic Resources

A file search for historic resources was conducted in the study area. This file search identified only one site, the Colorado Central and Colorado and Southern Railroad, as an Officially Eligible site. It was listed on the National Register of Historic Places in 1998. The railroad parallels Ridge Road through the northern portion of the study area and is therefore out of the impact area for both recommended alternatives. The Slough Ditch has been identified as a potentially historic resource, but based on a survey in 2000 it was determined that the ditch is not officially eligible as historic.

Parks and Recreation

Section 4(f) of the Department of Transportation Act of 1966 stipulates that FHWA and other Department of Transportation agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or

² Recognized environmental conditions, as defined by the American Society for Testing and Materials Standard E 1527-05, include sites with “*the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.*”

public and private historic sites unless there is no feasible and prudent alternative to the use of land, and the action includes all possible planning to minimize harm to the property resulting from use.

Two potential Section 4(f) resources exist within the study area, Fruitdale Park and an unnamed off-street trail along Kipling Street. Fruitdale Park is under the jurisdiction of the City of Wheat Ridge and located southwest of the I-70 and Kipling Street interchange. The unnamed, off-street paved trail is maintained by the City of Arvada and originates at West 50th Avenue on the west side of Kipling Street and terminates north of the study area. Neither of these two potential Section 4(f) resources would be impacted by the recommended alternatives.

Additionally, the Land and Water Conservation Fund (LWCF) Act of 1965 established a Federal funding program to assist states in developing outdoor recreation sites. Section 6(f) of the act prohibits the conversion of property acquired or developed with these funds to a non-recreational purpose without the approval of the National Park Service (National Park Service, 2008).

A file search was conducted in April 2012 to determine whether LWCF 6(f) funds were used on either recreation facility within the study area. Neither facility was constructed using 6(f) funds. Therefore, neither recommended alternative would impact 6(f) resources.

Cumulative Impacts

During the NEPA process, additional analysis and agency coordination will need to be performed, based on the environmental scan that was conducted. Resources that may be cumulatively impacted by future projects when combined with other past, present, and reasonably foreseeable future projects may include noise impacts to local residents, economic impacts to local businesses, and direct/indirect loss of wetlands due to surface disturbance and increased impervious surface area. Wildlife habitat loss may also occur due to planned development.



Westbound I-70 approaching Kipling interchange

Next Steps

The PEL process is intended to provide the framework for the long-term implementation of the recommended interchange improvements as funding is available and to be used as a resource for future NEPA documentation.

FHWA has developed a standard questionnaire to summarize the planning process and ease the transition from planning to a NEPA analysis. That questionnaire, included in **Appendix H**, summarizes the information that has been analyzed with the PEL study and the issues a future project team should be aware of to efficiently

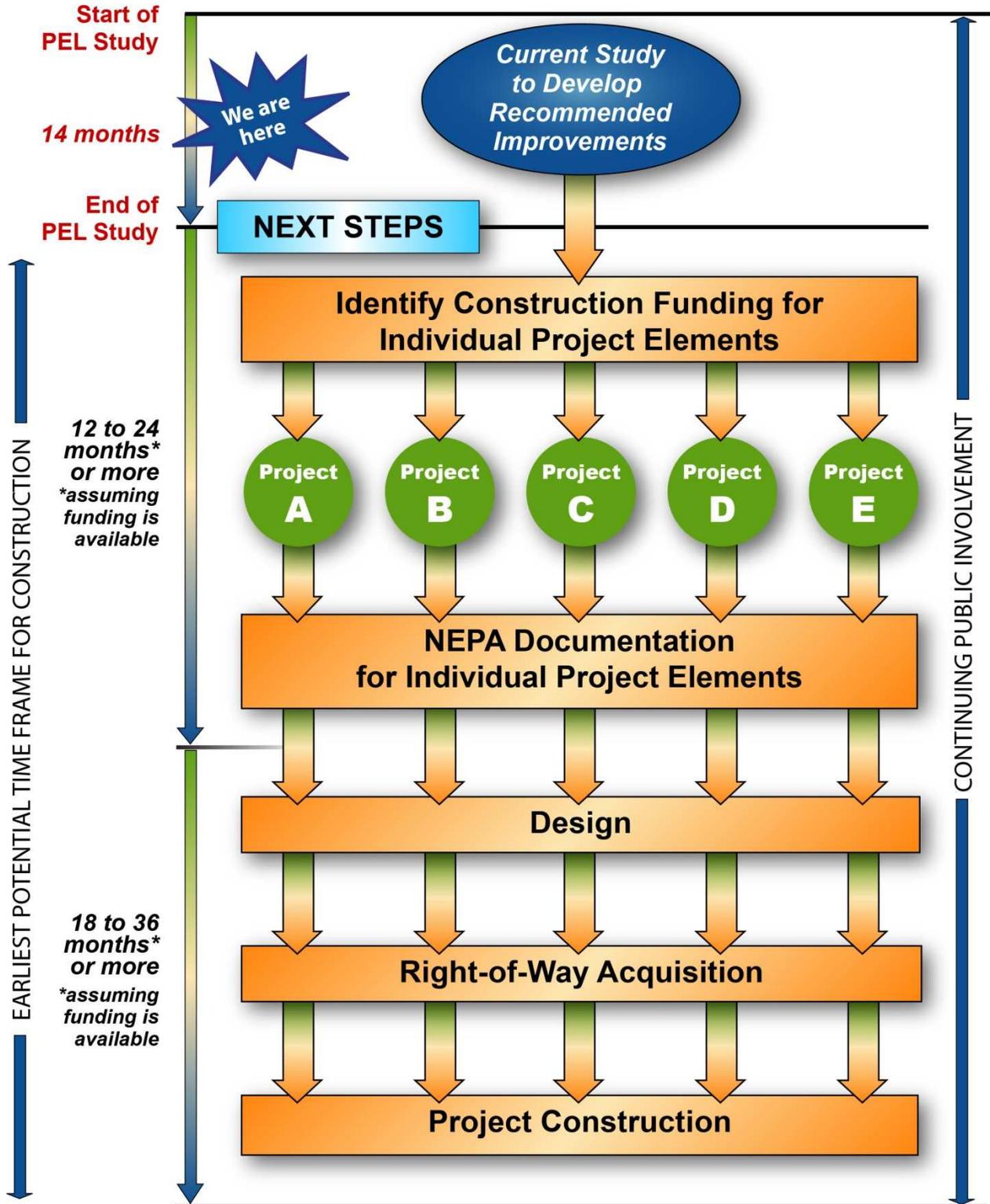
move forward in future NEPA process(es). Letters of agency support are included in **Appendix I**.

The next steps in the overall interchange reconstruction implementation process are outlined and illustrated in **Figure 11**. As described with the recommended alternatives and potential short-term improvements, separate project phases may be implemented if funding is available. These steps include:

- Secure necessary funding to move projects forward into the NEPA process
- Complete NEPA analyses of interchange alternative or phased project elements
- Complete design
- Obtain ROW
- Complete Intergovernmental Agreement with local agencies regarding maintenance
- Complete construction

These steps will be coordinated with FHWA to ensure consistency with the NEPA process for the recommended alternatives, short-term improvements, or phased project elements. Individual projects may be initiated as funding becomes available for elements of the interchange reconstruction. It is anticipated that these improvement projects could move forward with individual NEPA processes with this PEL study providing the documentation of the intent to implement the full interchange improvements over time, as funding becomes available.

Figure 11: Overall Project Process



APPENDIX A

Technical Memoranda

- Logical Termini Analysis – July 9, 2012
- Health Impact Assessment Overview, Connections and Strategies – May 14, 2013
- Land Use and Business Impacts – March 15, 2013
- Right of Way and Relocation Impacts and Cost Estimate – April 1, 2013
- Evaluation of Early Action Improvement Options – April 18, 2013



I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study Logical Termini Analysis 7/9/12

BACKGROUND

The Federal Highway Administration (FHWA) guidance on National Environmental Policy Act (NEPA) and transportation decision-making includes policy regarding development of logical project termini, which are defined as rational end points for a transportation improvement and for environmental review. This guidance states that transportation projects must consider a “whole” or integrated project, satisfy an identified need, and be considered in the context of the local area. Otherwise, proposed improvements may only partially satisfy the need or may cause unexpected adverse impacts. An issue of “segmentation” may also occur when a transportation need extends throughout an entire corridor but environmental issues are evaluated for only a smaller segment of the corridor. In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before they are fully evaluated, the evaluated action must:

1. Connect logical termini and be of sufficient length to address environmental matters on a broad scope;
2. Have independent utility; i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and
3. Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

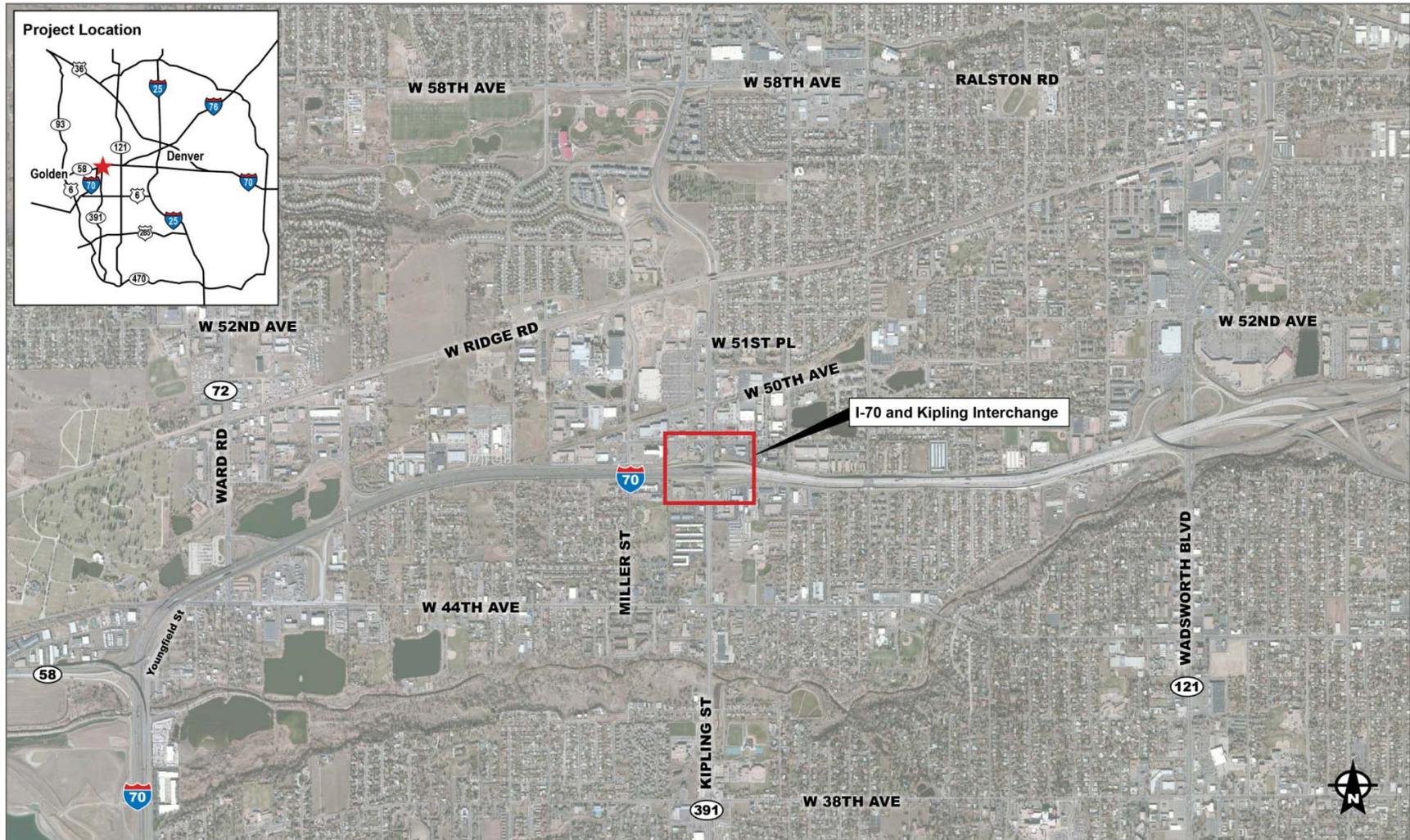
The I-70/Kipling Interchange Planning and Environmental Linkage (PEL) Study was evaluated on the basis of these criteria, as described below.

CONNECT LOGICAL TERMINI AND BE OF SUFFICIENT LENGTH FOR ENVIRONMENTAL EVALUATION

The Colorado Department of Transportation (CDOT) in cooperation with local communities and other agencies is preparing this PEL Study to identify and assess potential transportation improvements at the interchange of Interstate 70 (I-70) and Kipling Street (State Highway (SH) 391). The study location is at the interchange of Kipling Street with I-70 (see **Figure 1**). I-70 is a major east-west interstate highway that crosses central Colorado and travels through the middle of the Denver metropolitan area.

Kipling Street is a principal north-south arterial, providing almost 30 miles of continuity through the western Denver suburbs from C-470 in southern Jefferson County to Ralston Road in Arvada. It is designated State Highway 391 (SH 391) between US 285 in Lakewood and 49th Avenue in Wheat Ridge. Within the study area, CDOT defines the functional classification of Kipling Street as “Other – Principal Arterial”. Kipling Street has four through travel lanes plus auxiliary turn lanes and acceleration/deceleration lanes at major intersections. The section north of I-70 contains six lanes with the additional lanes providing continuous auxiliary lanes between the westbound I-70 ramps and 50th Avenue.

Figure 1: Project Location and Interchange Map



For projects such as this that address congestion, end points are typically major intersecting roadways that show ingress and egress to and from the study area. The study area for this PEL study along I-70 begins west of the Ward Road interchange and extends through the Wadsworth Boulevard interchange, a distance of approximately 3.5 miles. Along Kipling Street, the study area extends from 44th Avenue, south of the I-70 interchange, to 51st Avenue, north of the interchange.

Identified rational end points for potential improvements resulting from this study are the I-70 and Ward Road interchange to the west and the I-70 and Wadsworth Boulevard (SH 121) interchange to the east. These locations represent major ingress and egress points to and from the I-70 corridor in proximity to the study interchange. Improvements completed in 2011 at the I-70 and Ward Road interchange included reconstructing the eastbound I-70 on and off ramps further east to increase merging distances for the heavy truck movements accessing I-70. Just west of Ward Road, new ramp connections at SH 58 were completed in 2008. Major ramp and freeway lane improvements at the Wadsworth Boulevard interchange were completed in the mid 1990's.

CDOT reported 2011 daily traffic volumes on I-70 build from 105,000 vehicles per day (vpd) west of Ward Road to 125,000 vpd west of Kipling Street to 147,000 vpd from Kipling Street to Wadsworth Boulevard. East of the Wadsworth Boulevard and I-76 interchange complex, the daily traffic volume on I-70 drops about 50%. Daily traffic volumes on Kipling Street are highest at the I-70 interchange, with 44,500 vpd between the I-70 ramps and 48,000 vpd immediately north of the interchange. North of 51st Place, daily traffic volume is 32,500 vpd and Kipling Street ends at Ralston Road, north of 58th Avenue. South of the I-70 interchange, Kipling Street carries 37,500 vpd north of 44th Avenue. South of 44th Avenue, the daily traffic volume drops to 34,000 vpd.

The drop in traffic volumes on I-70 and on Kipling Street outside the proposed study area boundaries reinforces these as appropriate study area end points.

Safety

The segment of I-70 at the Kipling Street interchange is above the average expected crash rate for the given average annual daily traffic (AADT). The occurrence of rear end crashes on I-70 in the vicinity of the interchange is closely tied to the heavy peak hour traffic volumes on the freeway. Over a three year period from 2008 through 2010, the majority of crashes on the four interchange ramps occurred on the eastbound on ramp and the westbound off ramp, and the majority of the crashes were rear end crashes during the PM peak hour. On Kipling Street, rear end crashes are the predominant crash type followed by approach turn crashes and broadside crashes. Many of the accidents along Kipling Street are related to congested traffic conditions.

Accident rates for the interchange area from the *2010 CDOT Accident and Rates Book*, the most recent accident rates compiled by CDOT for statewide facilities, were evaluated for trends in the areas surrounding the I-70 and Kipling Street interchange. **Table 1** summarizes the accident rates for the sections of I-70 and Kipling Street surrounding the interchange area, as well as the 2010 statewide average for similar functionally classified roadways.

Table 1. CDOT 2010 Accident Rates – I-70 and Kipling Street (SH 391)

Milepost	Section Length	Description	Accident Rates ⁽²⁾			
			PDO ⁽¹⁾	Injury	Fatal	Total
I-70						
265.33	0.94	SH 58 interchange structures	0.79	0.07	0.00	0.86
265.72	0.41	Ward Road interchange structures	1.45	0.13	0.00	1.58
266.99	1.15	Sign bridge structure	1.42	0.11	2.12	1.55
267.39	0.39	Kipling Street interchange structures	1.38	0.13	6.29	1.57
268.41	1.00	Garrison Road overpass structures	1.16	0.12	0.00	1.29
269.00	0.40	Milepost 269	1.20	0.16	0.00	1.36
269.33	0.31	Wadsworth (SH 121) loop ramp structure	2.18	0.24	0.00	2.43
269.99	0.70	Harlan Street interchange structures	0.55	0.14	0.00	0.69
Statewide Average – Urban Interstate			1.07	0.09	0.45	1.16
Kipling Street (SH 391)						
8.47	0.49	32nd Avenue to 38th Avenue	2.26	0.16	0.00	2.42
9.64	1.13	38th Avenue to 49th Avenue (end of state highway)	6.85	1.09	0.00	7.94
Statewide Average – Urban Other Principal Arterial			3.44	0.33	0.76	3.78

Source: Crashes and Rates on State Highways 2010, CDOT Safety and Traffic Engineering Branch Accident Data Management Unit

⁽¹⁾ PDO = Property Damage Only

⁽²⁾ PDO and Injury Rates in Million Vehicle Miles Traveled and Fatal Rate in 100 Million Vehicle Miles Traveled

As shown, the 2010 accident rate for the section of I-70 at the Kipling Street interchange is 1.57 crashes per million vehicle-miles traveled (MVMT), which is higher than the 2010 statewide average of 1.16 crashes per MVMT for Urban Interstate Facilities. In fact, the accident rates along I-70 west and east of Kipling Street are above the statewide average. West of the Ward Road interchange (at SH 58 interchange) and east of the Wadsworth Boulevard interchange (at Harlan Street interchange), the accident rates are below the statewide average.

The Kipling Street (SH 391) corridor from 38th Avenue through the interchange area has a 2010 accident rate of 7.94 crashes per MVMT, which is more than twice the 2010 statewide average of 3.78 crashes per MVMT for facilities classified as Urban Other Principal Arterial. South of 38th Avenue, the 2010 accident rate for Kipling Street is below the statewide average.

There is a significant drop in the 2010 accident rates outside of the proposed study area boundaries. This verifies the area incorporates logical termini.

Capacity

The existing and future daily traffic volumes and capacities along I-70 and Kipling Street in the vicinity of the interchange are summarized in **Table 2**. Currently, the daily volume to capacity (V/C) ratios for I-70 and Kipling Street at the interchange are below 1.00, indicating that traffic volumes are lower than the road capacity. There are no plans in the current fiscally-constrained *DRCOG 2035 Regional Transportation Plan* to widen I-70 or Kipling Street. Future traffic projections indicate that traffic volumes on I-70 east and west of the Kipling Street interchange will exceed roadway capacity by the year 2035. In contrast, traffic volumes on I-70 west of Ward Road and east of the Wadsworth and I-76 interchange complex are forecasted to remain below roadway capacity. Future traffic projections for Kipling Street show that the arterial corridor at the I-70 interchange will

exceed roadway capacity for urban street facilities. This concentration of capacity issues at the I-70 and Kipling Street interchange establishes that the proposed study area is connected to logical termini.

Table 2. 2010 and 2035 Daily Traffic Volumes and Capacities – I-70 and Kipling Street (SH 391)

Location	2012			2035		
	Volume (V)	Capacity (C) ⁽¹⁾	V/C	Volume (V)	Capacity (C) ⁽¹⁾	V/C
I-70						
SH 58 to Ward Road (6 lanes)	118.0	148.5	0.79	151.5	148.5	1.02
Ward Road to Kipling Street (6 lanes)	125.0	148.5	0.84	160.0	148.5	1.08
Kipling Street to Wadsworth (6 lanes)	147.0	148.5	0.99	184.0	148.5	1.24
Wadsworth to Harlan (6 lanes)	97.8	148.5	0.66	126.0	148.5	0.85
Kipling Street (SH 391)						
38th Avenue to 44th Avenue (4 lanes)	34.0	37.9	0.90	37.0	37.9	0.98
44th Avenue to I-70 (4 lanes)	37.5	37.9	0.99	39.0	37.9	1.03
I-70 to 51st Place (4 lanes)	39.5	37.9	1.04	47.0	37.9	1.24
51st Place to Ralston Road (4 lanes)	32.5	37.9	0.86	38.0	37.9	1.00

Source: 2010 Highway Capacity Manual and traffic counts by All Traffic Data

⁽¹⁾ Capacity estimates based on generalized daily service volumes in 2010 Highway Capacity Manual for urban street and freeway facilities

Note: Volume and capacity are two-way daily numbers shown in thousands

Environmental Evaluation

An Environmental Scan Report will be prepared to identify existing environmental conditions and the potential for direct, indirect, and cumulative impacts from future improvements to the I-70/Kipling interchange. This information will be applied during alternatives screening to determine opportunities to avoid or minimize environmental impacts from roadway and intersection improvements, and accommodates the need to address environmental matters on a broad scope. Furthermore, the traffic volume and crash data findings demonstrate that the project is of sufficient length to address operational issues on a broad scope.

INDEPENDENT UTILITY

The criteria for independent utility are intended to determine if the recommended alternative would create a “usable” project that would not require future transportation expenditures to justify the current investment. A “usable” project is generally considered to be one where quantitative and qualitative benefits can be documented. Independent utility can be demonstrated if the project does not result in traffic bottlenecks or safety problems on adjacent sections of the roadway, even if the project is phased over a period of time.

The evaluation of the I-70 and Kipling interchange will consider regional traffic volumes and patterns. Along Kipling Street, the physical constraints of the lanes under the I-70 bridge and adjacent frontage road signal spacing degrade the traffic operations through the interchange area. The evaluation of interchange alternatives will depend greatly on the analysis of signal operations and progression to show if one or both frontage road signals need to be removed, moved, or partially modified to fit with new interchange configurations.

Alternatives to be considered will include short-term options that do not require bridge reconstruction along with long-term solutions that include a new bridge. Concepts will be developed and evaluated with an analysis

of operations, safety, multimodal connections, community and environmental impacts, constructability, and cost criteria in coordination with CDOT, FHWA, and local agency stakeholders.

Examples of short-term options that may address key movements on and off I-70 without replacing the bridge include signalized double right turns for the Westbound I-70 Off Ramp or adjustments to the north and south frontage road intersections. These “stand-alone” options could be a phase of an ultimate solution, but they would have documented quantitative and qualitative benefits and these short-term improvements would help eliminate bottlenecks at the interchange and improve safety.

In conjunction with other plans, short- and long-term improvements to the I-70 and Kipling interchange would result in a cumulative beneficial effect to adjacent roadways. Future transportation expenditures to justify the current investment would not be required given the locations of logical termini along I-70 from Ward Road to Wadsworth Boulevard and on Kipling Street between 44th Avenue and 51st Avenue. Therefore, this project demonstrates independent utility.

CONSIDERATION OF ALTERNATIVES FOR OTHER REASONABLY FORESEEABLE TRANSPORTATION PROJECTS

Planned area transportation projects with identified funding are shown in **Figure 2**. These projects currently under evaluation or development will be incorporated into improvements identified in this project and would not be negatively affected. In addition, this project would not restrict consideration of alternatives of the other transportation improvements currently identified for the area, such as the future Arvada Ridge Station for RTD’s Gold Line commuter rail project at Kipling Street and Ridge Road located north of I-70, and the potential extension of the Kipling Trail and multi-use path projects planned north and south of the interchange area. None of the other reasonably foreseeable transportation projects within the area would be restricted by the recommended improvements of this study.

CONCLUSION

There is a drop in traffic volumes and accident rates outside the proposed study area boundaries. These traffic volume and crash data findings demonstrate that the area incorporates logical termini. The proposed study area is of sufficient length to address environmental matters on a broad scope. Future transportation expenditures to justify the current investment would not be required given the locations of the logical termini along I-70 from Ward Road to Wadsworth Boulevard and on Kipling Street between 44th Avenue and 51st Avenue. Therefore, this project demonstrates independent utility.

In addition, no other reasonably foreseeable transportation projects would be restricted by the recommended improvements of this study.

Figure 2: Area Transportation Projects



REFERENCES

CDOT Safety and Traffic Engineering Branch Accident Data Management Unit

2010 Crashes and Rates on State Highways 2010

David Evans and Associates, Inc.

2012 I-70 & Kipling Interchange PEL Study Existing Transportation Conditions Report. May.

FHWA

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<http://environment.fhwa.dot.gov/projdev/tmtermini.asp>. November 5.

Transportation Research Board (TRB)

2010 Highway Capacity Manual 2010



MEMORANDUM

DATE: May 14, 2013
TO: Stacy Tschuor, PE, PTOE
FROM: Chris Vogelsang, PE
SUBJECT: Health Impact Assessment Overview, Connections and Strategies
PROJECT: I-70 & Kipling Planning and Environmental Linkages (PEL) Study

Introduction

Our transportation system has been developed by transportation and community planners, funding agencies and others at Federal, state and local with the goal of moving people and goods efficiently. Today there is a growing awareness across communities that transportation systems also impact quality of life and health and attention should be paid to those potential impacts. In response, agencies are seeking innovative policies and programs that protect and promote health while accomplishing the primary transportation objectives. One tool for assessing the potential impacts of transportation systems on health is called a Health Impact Assessment (HIA).

This document is intended to highlight the characteristics and purposes of an HIA and to provide an overview of how the I-70 & Kipling PEL Study process and outcomes support HIA goals. Although a formal HIA was not performed for this project many of the goals of an HIA were incorporated into the alternatives evaluation process. The following sections cover HIA characteristics and goals, the I-70 & Kipling PEL Study process and relationship to HIA goals, and potential next steps to incorporate HIA principles as the recommended alternatives move towards implementation.

HIA Description and Process

An HIA is a process that helps evaluate the potential health effects of a plan, project or policy before it is built or implemented. The National Research Council defines an HIA as “a systematic process that uses an array of data sources and analytic methods, and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA’s provide recommendations on monitoring and managing those effects.” An HIA can provide recommendations to increase positive health outcomes and minimize adverse health outcomes. HIA’s bring potential public health impacts and considerations to the decision-making process for plans, projects, and policies that fall outside the traditional public health arenas, such as transportation and land use.

The major steps in conducting an HIA include

- Screening (identifying plans, projects or policies for which an HIA would be useful),
- Scoping (identifying which health effects to consider),
- Assessing risks and benefits (identifying which people may be affected and how they may be affected),
- Developing recommendations (suggesting changes to proposals to promote positive health effects or to minimize adverse health effects),
- Reporting (presenting the results to decision-makers), and
- Monitoring and evaluating (determining the effect of the HIA on the decision).

Rationale for Performing an HIA

The Centers for Disease Control and Prevention (CDC) has identified transportation policies that can have profound positive impact on health. CDC supports strategies that can provide a balanced portfolio of transportation choices that supports health and reduces health care costs.

Transportation policy can:

- Reduce injuries associated with motor vehicle crashes
- Encourage healthy community design
- Promote safe and convenient opportunities for physical activity by supporting active transportation infrastructure
- Reduce human exposure to air pollution and adverse health impacts associated with these pollutants
- Ensure that all people have access to safe, healthy, convenient, and affordable transportation

The following are key reasons and goals for bringing public health considerations into solving transportation issues similar to those documented at the I-70 and Kipling interchange.

- *Reduce injuries associated with motor vehicle crashes*
Motor vehicle crashes are the leading cause of death for people ages 1 to 34. Improving the safety and efficiency of motor vehicles and their occupants is critical to improving transportation policy and the public's health.
- *Improve Air Quality*
Transportation-related air pollutants are one of the largest contributors to poor air quality. Exposure to traffic emissions has been linked to many adverse health effects including: premature mortality, cardiac symptoms, exacerbation of asthma symptoms, diminished lung function, increased hospitalization and others. Motor vehicles are a significant source of air pollution in urban areas.
- *Expand Public Transportation*
Public transportation systems reduce the necessity for single occupancy vehicle trips, reduce the production of automobile emissions, increase incidental physical activity, and provide necessary transportation access for people with physical, economic, or other limitations that impede their access to and use of a single occupancy motor vehicle.

Policies that encourage public transportation infrastructure are needed to improve access for all people.

- *Promote Active Transportation*
Active transportation systems should connect the places where people live, learn, work, shop, and play by providing safe and convenient walking and bicycling facilities. The safety of all road users can increase as more people choose active transportation.
- *Encourage Healthy Community Design*
Healthy community design incorporates elements (such as transportation networks, street designs, and zoning/land use policies) that work synergistically to promote health and safety.

HIA Relationship to a National Environmental Policy Act (NEPA) Process

An HIA is procedurally similar and complementary to the Environmental Impact Assessment (EIA) conducted under NEPA. NEPA requires that Environmental Impact Statements (EIS) include consideration and analysis of health effects of specified federal agency actions. NEPA does not refer by name to an HIA as a separate requirement, and the current practice of health analysis in an EIS has been limited. Although a voluntary process, an HIA is an appropriate way to meet statutory requirements for health effects analysis, when conducted within the context of an inter-disciplinary EIA.

I-70 & Kipling PEL Study Evaluation Process

The I-70 & Kipling PEL Study process utilized a tiered screening process of recommended alternatives based on criteria that were tied to the project Purpose and Need. Three levels of screening were performed on an initial set of 33 potential alternatives (including the no-action alternative) utilizing evaluation criteria categories such as:

- Traffic Operations
- Safety
- Transit Connections
- Sidewalk/Path Links
- Right of Way and Access Impacts
- Project Cost

These categories are supportive of the HIA goals in the following ways:

- *Traffic Operations*: Improvement of traffic operations in the study area supports a reduction in delay and an improvement in local and regional air quality.
- *Safety*: Improving safety in the project area is directly tied to the HIA goal of reducing injuries associated with motor vehicle crashes. An additional important goal of the PEL study was to improve motor vehicle safety without reducing pedestrian and bicyclist safety in the study area. Specific detail was paid to differences between potential alternatives in terms pedestrian and bicyclist safety at motor vehicle conflict areas.

- *Transit Connections:* This PEL evaluation criterion is directly tied to the HIA goals of expanding public transportation. An explicit criterion of the screening process was the improvement or impact to public transportation access in the study area. Factors like potential transit stop locations, ease of active transportation access, and ties to local land use were considered.
- *Sidewalk/Path Links:* This PEL evaluation criterion is directly tied to the HIA goal of promoting active transportation. Special attention was paid to mobility and safety of active transportation connections to and through the study area including bicycle lanes, shared use paths, sidewalks, pedestrian crossings, and motor vehicle/pedestrian/bicycle interactions.
- *Right of Way and Access Impacts:* The minimization of impacts to existing land uses in the study area is a key tenet of NEPA and is intended to minimize adverse impacts to existing economic characteristics and livability of a project in a community.
- *Project Cost:* Quantifying potential project costs and comparing potential benefits to the costs of alternatives allows for the optimization of benefits versus costs and the maximization of public benefits from an entire program of potential improvements in the region.

The three level screening evaluation process resulted in four alternatives being carried forward into the NEPA process with two recommended alternatives (a single point urban interchange and a traditional diamond interchange). Each of the recommended alternatives performed well in the criteria categories noted above and would result in substantial benefits to the study area.

Potential Alternatives/HIA Next Steps

As the I-70 & Kipling PEL Study concludes and the alternatives move towards implementation, the following actions should be taken to reinforce HIA goals.

Consider Performing a formal HIA: If project budget and timeline permits, an HIA for the project area may be considered. This would include gathering community and transportation system data (much of which is readily available or developed as part of the PEL and/or NEPA process). A potential tool to use is a Rapid HIA. A Rapid HIA focuses on readily available data and community characteristics to assess potential health impacts of a project. Hennepin County, Minnesota performed a similar assessment on the Lowry Corridor Project, Phase 2 in 2007 that primarily relied on community characteristics to assess the health impacts. “The HIA practitioners mapped the community assets, including convenience stores, markets, drug stores, religious facilities, schools, hospitals, commercial land use, mixed land use, and parks, to determine disparities in access. They also compiled data on the demographic, racial, health, crime, and family characteristics of each neighborhood from an ongoing health surveillance project in Hennepin County. They then completed a table on the expected impact of the project components on the determinants of health; the level, likelihood, and distribution of the impact; and measurable indicators specific to the project and county that could assess the health impact.” (Source: CDC Transportation Health Impact Assessment Toolkit)

Incorporate multi-disciplinary thinking into the design and implementation process: Experts in the fields of air quality, noise, active transportation, and construction impact mitigation as well as health professionals should be consulted for input into the final design and construction process to get a wider perspective and employ targeted and successful strategies for limiting impacts to community health during construction and to ensure maximum benefits to community health.

Form partnerships with local stakeholder and community members: This allows active input into the process from people likely to be affected, reduces the stress of uncertainty associated with potential changes, allows for specific feedback that can improve a project, and provides agencies with direct on the ground information related to implementation practices and impacts.

Monitor air quality before, during, and after implementation: This allows for potential adjustments during the implementation process to reduce air quality impacts and to determine actual benefits of projects.

Design considerations: The following goals and elements should be incorporated into the final design as much as possible:

- *Maintain walking access to key neighborhood services* during and after implementation.
- *Include landscaping and green space in the plan.* Plants and trees filter air contaminants and absorb carbon dioxide and other harmful gases from the environment while producing oxygen. Plants and trees utilized should produce low levels of allergens to limit impacts to sensitive individuals.
- *Create walkable streets* by including wide, detached sidewalks in the project. Sidewalks should be available everywhere and be well maintained. Handicap access at crossings and key destinations should be improved and maintained.
- *Intersections should have clearly marked crosswalks* and well placed pedestrian signals at signalized intersections.
- *Bike lane and shared use path conflict areas should be clearly marked* and identified so as to minimize potential safety issues. Use of new FHWA approved markings and signing for these areas should be considered.
- *A common wayfinding system for pedestrians and bicyclists* should be developed and implemented in the project area consistent with adjacent communities.
- *Provide good street lighting in the project area*, especially at conflict areas or high pedestrian/bicycle locations. Lighting design should also minimize stray light incursion into homes and businesses.

Construction period considerations:

- *Use ITS technologies* to provide real time information to travelers in the project area
- *Develop an information outreach campaign* to provide information to the public and businesses about upcoming construction activities and impacts
- *Develop safe and clearly marked alternative routes*
- *Develop adaptive traffic management strategies* that tie to construction activities and conditions that minimize delay and potential crashes. Monitor alternative routes and traffic conditions to determine adaptive management implementation.

- *Provide construction schedules to emergency services personnel to limit the impact of construction on emergency response times*
- *Schedule construction activities that impact traffic for low traffic volume periods*
- *Use approved noise control devices for generators, compressors, and similar equipment*
- *Limit operating periods for equipment that produces loud noises, especially at nighttime*
- *Maintain walking and bicycling access to key neighborhood services and transit stops*
- *Develop strategies to minimize revenue loss for local businesses and obstacles to access businesses during construction*

Conclusions

Although a formal HIA was not performed at this stage of the project development and evaluation process, many goals of an HIA were represented in the I-70 & Kipling PEL Study three level evaluation process and criteria. The two recommended alternatives incorporated HIA goals better than those that were not carried forward. Potential next steps include incorporating HIA goals into NEPA, design, and implementation to maximize project benefits and to minimize potential community health impacts.

Technical Memorandum

I-70 Kipling Interchange Traffic Engineering & PEL Project #: C 0703-333 (16549)

Land Use and Business Impacts

March 15, 2013

Prepared by:



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Objective

The objective of this technical memo is to describe potential land use and business impacts of the recommended alternatives identified in the I-70 & Kipling Interchange PEL Study and to identify critical issues as the project moves into future NEPA process(es). Two alternatives were recommended by the study: the Single Point Urban Interchange (SPUI) and the Traditional Diamond Interchange. Both are expected to be carried forward into the future NEPA clearance process.

In general, both recommended alternatives for interchange improvements would positively benefit existing and future retail and commercial uses due to improved multimodal connections and capacity increases. Individual commercial sites would be impacted by interchange improvements that change specific access and circulation. In some circumstances, these impacts would be positive due to improved or faster vehicular access. In other locations, the reduction of access points or the addition of turn movements to access a site will increase travel times to the site, resulting in negative impacts – either real or perceived.

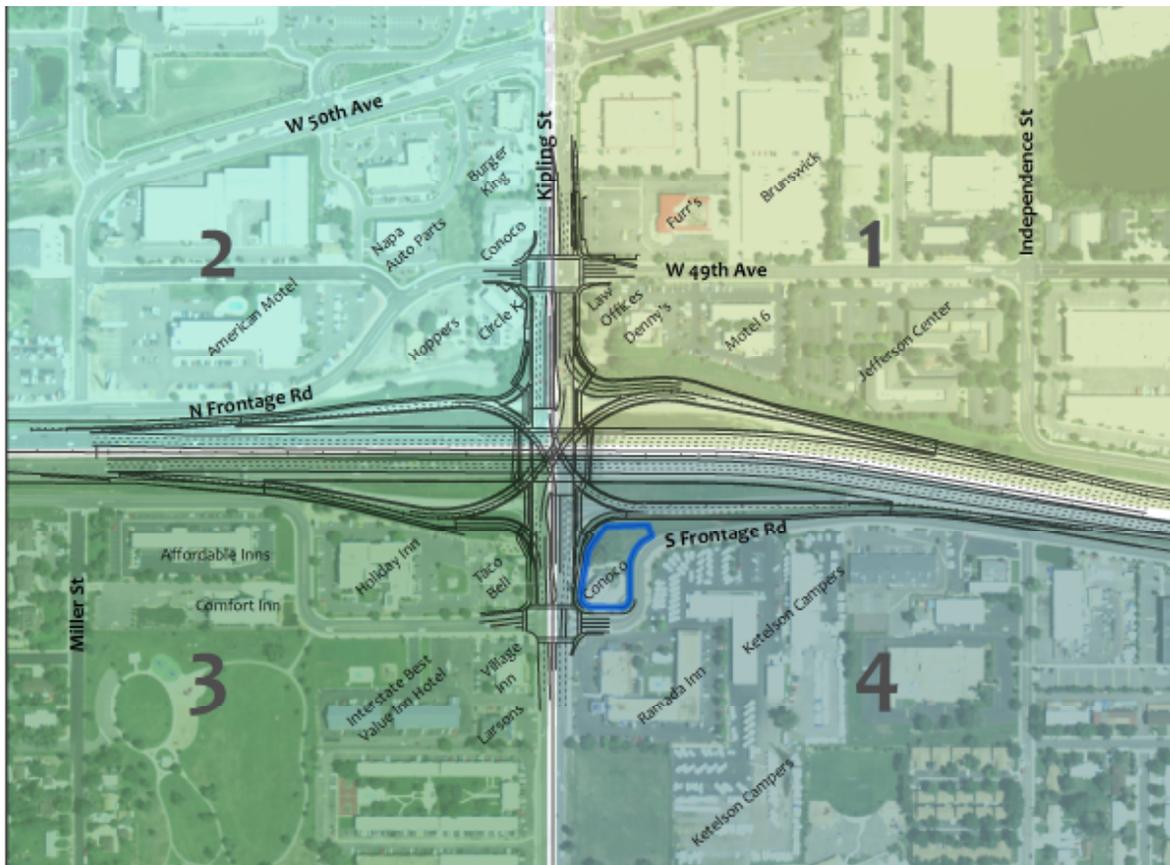
For each alternative, the recommended improvements would improve multimodal connections and increase vehicular capacity in the general interchange area which has been negatively impacted by traffic congestion. While there are important differences between the two alternatives from an operations and constructability perspective, this memo focuses on the land use and business impacts, which vary between the two.

The impacts of the SPUI alternative will be discussed first followed by a discussion of the Traditional Diamond Interchange. The potential business and land use impacts are summarized by quadrant starting in the northeast corner, moving counterclockwise through the area. The quadrants are numbered in each figure for reference.

Single Point Urban Interchange

Figure 1 depicts the SPUI interchange alternative.

Figure 1
Single Point Urban Interchange



Northeast (1) – There is a 4,966 square foot Class C office building built in 1978 with a single tenant law firm (labeled law offices) on the southeast corner of West 49th Avenue and Kipling Street. The office has access from Kipling as well as West 49th Avenue. Under this alternative, the office’s current Kipling access may be impacted although the office is expected to retain its West 49th Avenue access. The Denny’s restaurant to the east will be unaffected as its primary access is off of West 49th Avenue. Other businesses in the quadrant will not be affected. A full movement, signalized intersection is anticipated for West 49th Avenue and Kipling.

Northwest (2)– The Conoco and Circle K gas stations will maintain their current access points on Kipling and 49th Avenue under this scenario, although the driveways will be reconstructed in slightly shifted locations. Access to other businesses in the area including Hoppers Restaurant, Napa Auto Parts, and the American Motel would be unchanged.

Southwest (3) – The South Frontage Road and Kipling Street intersection would be a full movement, signalized intersection. Access to the businesses immediately south of the highway, including Taco Bell, Village Inn and Larsons Ski and Sports would be unchanged. There are a number of hotels in

this area including Affordable Inns, Comfort Inn, Holiday Inn, and Interstate Best Value Inn offering about 380 hotel rooms in the general vicinity. None of the businesses in this quadrant will be affected in this alternative.

Southeast (4) – This scenario would require the acquisition of the Conoco station in this quadrant due to the impacts of the Kipling Street widening on the car wash facility and the site circulation. The Conoco lot is 21,693 square feet. Despite the changes to this quadrant, this scenario would maintain full access to the 121 room Ramada Inn as well as Ketelson Campers and should not have an impact on their operations. Elimination of the Conoco station would improve driver visibility of the Ramada Inn and Ketelson Campers.

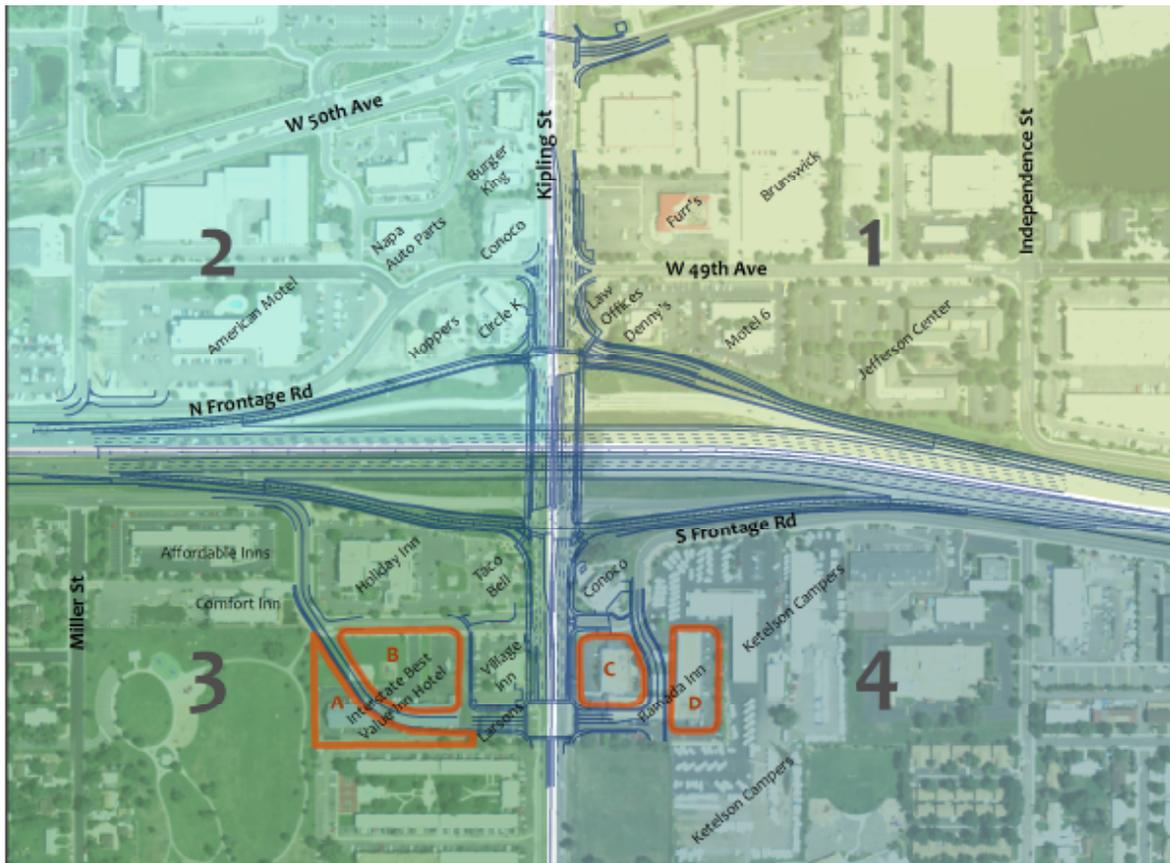
Conclusion

Overall, the SPUI alternative would provide improved traffic operations for businesses within the interchange area with minimal direct impacts or changes in access conditions for the remaining properties after construction.

Traditional Diamond Interchange

The Traditional Diamond Interchange alternative is shown in Figure 2.

Figure 2
Traditional Diamond Interchange



Northeast (1) – There is a Class C 4,966 square foot office building built in 1978 on the southeast corner of West 49th Avenue and Kipling with a single tenant law firm (law offices). The building would be acquired under this alternative. Although the westbound I-70 off ramp is expected to be moved very close to the back of the building, the parking and access for the Denny’s restaurant on the northeast quadrant of the interchange would remain unaffected. Visibility of the Denny’s building from the interchange and Kipling Street would be improved with the elimination of the law office building. West 49th Avenue and Kipling would become a right-in right-out intersection, so customers and employees of businesses along 49th Avenue such as the Motel 6 and the Jefferson Center for Mental Health would not be able to make a left turn at West 49th Avenue to southbound Kipling, requiring out-of-direction, circuitous travel via Independence Street and 50th Avenue.

Northwest (2) – Because West 49th Avenue and Kipling Street would be a right-in right-out intersection, a traveler driving north on Kipling would be unable to make a left turn on West 49th Avenue to access businesses in the vicinity such as Napa Auto Parts, Hoppers Sports Grill or the American Hotel. Access to these businesses, particularly businesses in the vicinity of the Napa Auto Parts and Hoppers Sports Grill, would be circuitous and may be difficult to explain to customers. Napa Auto Parts and Hoppers customers, for example, would need to turn left at 50th Avenue and take the first left directly south of the Super Target parking lot to 49th Avenue to access the businesses. American Motel would be visible from the highway, however its access would shift (if travelling north on Kipling) to west on West 50th Avenue, south on Miller Street to West 49th Avenue. Businesses further west on the North Frontage Road would be accessed (if travelling north on Kipling) by taking a left on West 50th Avenue, south on Miller Street to the North Frontage Road. This change in access may be perceived as a negative impact for existing businesses along the North Frontage Road.

Southwest (3) – Under this alternative, access to Taco Bell, which is currently along the existing South Frontage Road, would be via the realigned South Frontage Road, which would intersect with Kipling south of Village Inn. Village Inn’s access would also shift to the South Frontage Road as would access to the 113-room Affordable Inns, 65-room Comfort Inn, and 104-room Holiday Inn. The 100-room Interstate Best Value Inn Hotel and the 4,966 square foot Larsons Ski and Sports building would be acquired under this scenario. The ski and sports business could potentially be relocated to another building in the I-70 corridor area.

Southeast (4) – Under this alternative, a right-in, right-out access is provided south of the Conoco station. For northbound Kipling travelers, the Conoco station would be accessed from the new access. Travelers driving southbound on Kipling would make a left turn at the realigned South Frontage Road and travel north to access the Conoco station through its back entrance.

Ketelson Campers would be accessed via the realigned South Frontage Road. While more circuitous to potentially reach, the company’s current high visibility from I-70 would not be affected. Since Ketelson Campers is more of a “destination” business (i.e. a potential buyer usually travels purposely to Ketelson Campers because they are in the market for campers), the route there can be explained or directions provided on the website. Visitors leaving the Ketelson Campers business can exit on West 48th Avenue and make a right on to Kipling to access I-70. The new location of the South Frontage Road signal farther away from the I-70 ramps will facilitate turning movements by large recreational vehicles and vehicles pulling campers to and from Ketelson Campers.

The 66,932 square foot 121 room Ramada Inn would be acquired under this alternative for the relocated South Frontage Road. One or both of the remaining parcels may be used for water quality detention, although the specific parcel (C or D in Figure 2) has not been determined.

Conclusion

The City of Wheat Ridge commissioned an “I-70 Kipling Corridors Survey” in June 2009, as a first step in designating the area south of the interchange as the I-70 Kipling Corridors Urban Renewal Area. The survey is a necessary step if urban renewal is to be used as a tool by the City of Wheat Ridge to address blighted conditions in the area. The Colorado State Urban Renewal statutes provide a list of eleven factors or categories that, through their presence may allow an area to be declared as blighted. While the survey found the presence of a number of factors, there were several observations made about properties in the I-70 and Kipling interchange area. The survey found:

- **Unsanitary or Unsafe Conditions** - The Blight Survey consultants obtained a memorandum from the Wheat Ridge Police Department dated October 31, 2008 indicating that, “public safety responses to incidents of crime are unusually high and show ‘clustering’ near the I-70 / Kipling Street interchange. Many of Wheat Ridge’s hotels and motels are located in this area, and some routinely generate high levels of emergency calls.”
- **Existence of Factors Requiring High Levels of Municipal Services or Substantial Physical Underutilization or Vacancy of Sites, Buildings, or Other Improvements** – “The Wheat Ridge Police Department analyzed data from its Computer-Aided Dispatch and Records Management System collected over the past year (2008-2009) to determine any patterns of unusual law enforcement throughout the Survey Area. This effort identified several properties and rights-of-way near the I-70 & Kipling interchange area that received high numbers of ‘priority one’ emergency calls in the past year (2008-2009). These properties include numerous high-density hotel and residential properties which generated anywhere between 100 and 450 calls for service each in the past year, disproportionately burdening the Police Department’s limited resources. Additionally, vehicle crimes including theft and break-ins are also frequent in the Survey Area, showing ‘clustering’ near the I-70 / Kipling Street interchange when displayed geographically.”¹

A number of high-density hotel and residential properties are located in the vicinity of the interchange. However, it should be noted that not all of the I-70 and Kipling area hotels and motels are problematic. Holiday Inn and Comfort Inn have strong brand affiliation, amenities, and corporate management, with up-to-date facilities compared to other lodging facilities in the area.

Property acquisition and new road construction would eventually result in leftover parcels (see Figure 2) potentially available for future development including:

- Parcel A: 42,030 square feet adjacent to Fruitdale Park to the west. Given its proximity to the park, it could potentially be attractive as a park expansion.
- Parcel B: 60,810 square feet potentially suitable for highway oriented commercial uses.

¹ City of Wheat Ridge. “I-70/Kipling Corridors Conditions Survey” June 2009.

- Parcel C: 31,615 square feet with Kipling Street frontage and accessible primarily via the realigned South Frontage Road.
- Parcel D: 37,630 square feet potentially suitable for highway oriented commercial activity. It is also surrounded on three sides by Ketelson Campers.

The Traditional Diamond Interchange alternative impacts more individual commercial sites with changes to access and circulation. In some circumstances, these impacts would be positive due to improved or faster vehicular access. In other locations, the reduction of access points or the addition of turn movements to access a site will increase travel times to the site, resulting in negative impacts – either real or perceived. However, in general, the Traditional Diamond Interchange alternative would positively benefit existing and future retail and commercial uses due to improved multimodal connections and capacity increases.

References

City of Wheat Ridge. "I-70/Kipling Corridors Conditions Survey" June 2009.

Wheat Ridge Urban Renewal Authority. "I-70/Kipling Corridors, Urban Renewal Plan". Adopted May 2009.



I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study
Right-of-way and Relocation Impacts and Cost Estimate
April 1, 2013

METHODOLOGY

The proposed conceptual designs were overlaid onto the existing aerial mapping, county parcel maps, and CDOT right-of-way (ROW) information to determine the ROW needs for each alternative. The number of impacted parcels and approximate acreage was determined along with relocation needs for impacted businesses. This information was used to determine conceptual ROW cost estimates for each alternative. The approximate ROW Acquisition, relocation and demolition costs were estimated based on a combination of the best available data and input from the CDOT Region 6 ROW Unit.

Temporary ROW impacts and potential easements during construction were not considered at this time.

ANALYSIS OF RECOMMENDED ALTERNATIVES

Alternative 1- Single Point Urban Interchange (SPUI)

The expected ROW impacts for the SPUI alternative are shown in **Figure 1**. The conceptual design for the SPUI includes full acquisition of one business property and partial acquisition of seven business properties. It is estimated that the total land area to be acquired for this alternative is approximately 52,800 square feet (sf) at a cost of \$3,055,400. The ROW cost estimate for the SPUI is found in **Appendix A. Table 1** lists the estimated properties impacted for the interchange reconstruction and the associated roadway improvements.

Table 1. Single Point Urban Interchange ROW Impacts

Assessor's Parcel Number	Property Address	Land Use	Full or Partial Acquisition	Tenant-Occupied
39-222-00-004	4700 Kipling St	Commercial	Partial	Yes
39-211-00-010	4775 Kipling St	Commercial	Partial	Yes
39-211-12-002	4795 Kipling St	Commercial	Partial	Yes
39-164-00-021	4885 Kipling St	Commercial	Partial	Yes
39-153-00-013	4890 Kipling St	Commercial	Partial	No
39-211-12-002	4900 Kipling St	Commercial	Partial	Yes
39-164-00-007	4901 Kipling St	Commercial	Partial	Yes
39-222-00-003	4750 Kipling St	Commercial	Total	Yes

Figure 1. Single Point Urban Interchange ROW Impacts



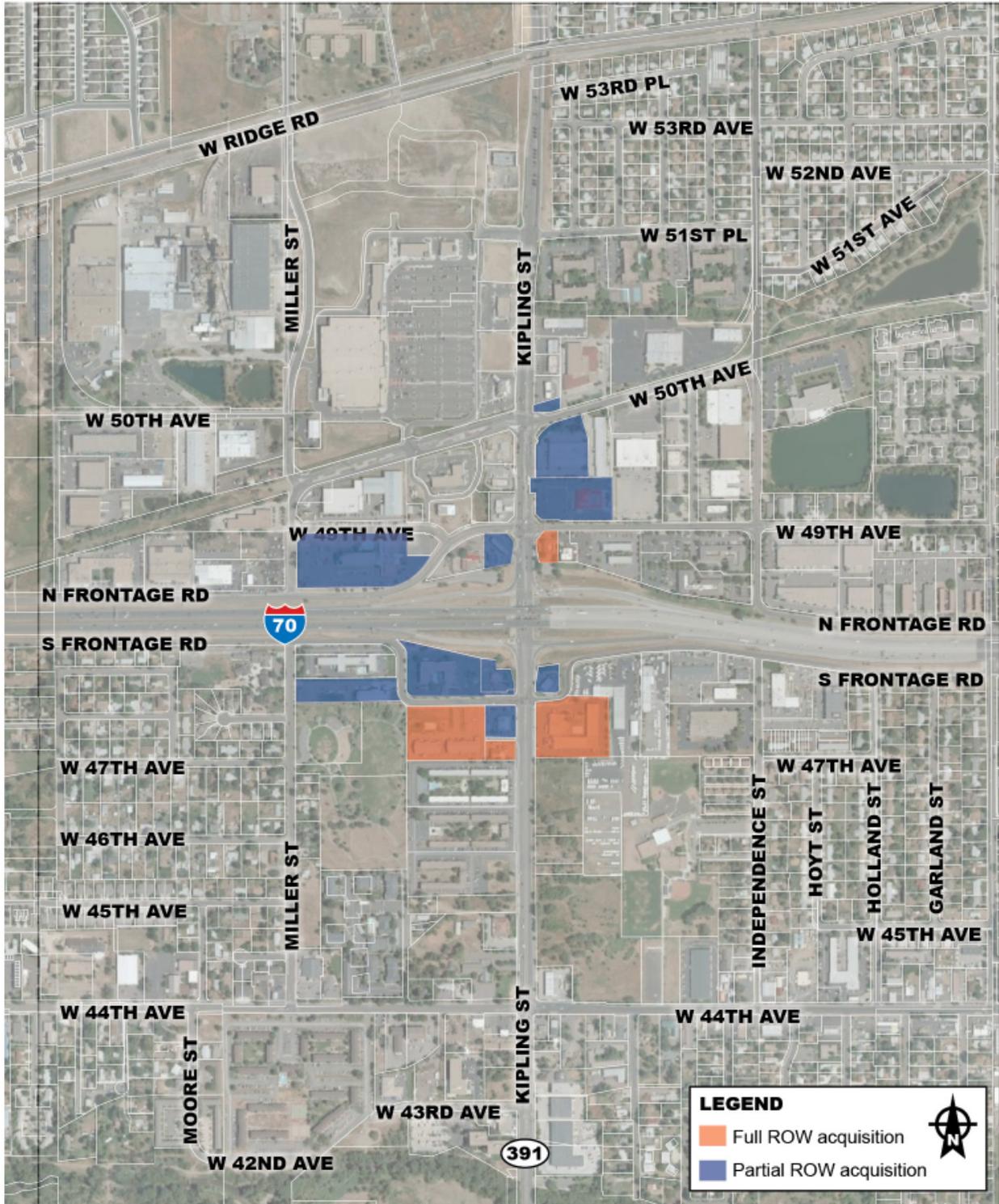
Alternative 12- Traditional Diamond Interchange

The expected ROW impacts for the Traditional Diamond Interchange are shown in **Figure 2**. The conceptual design for the Traditional Diamond Interchange includes the full acquisition of four business properties and partial acquisition of ten business properties. It is estimated that the total land area to be acquired for this alternative is approximately 331,600 sf at a cost of \$10,980,600. The ROW cost estimate for the Traditional Diamond Interchange is found in **Appendix B. Table 2** lists the estimated properties impacted for the interchange reconstruction and the associated roadway improvements.

Table 2. Traditional Diamond Interchange ROW Impacts

Assessor's Parcel Number	Property Address	Land Use	Full or Partial Acquisition	Tenant-Occupied
39-164-00-018	10101 I-70 Frontage Rd	Commercial	Partial	Yes
39-211-12-001	10101 I-70 Frontage Rd	Commercial	Partial	Yes
39-211-00-005	10200 I-70 Frontage Rd	Commercial	Partial	Yes
39-222-00-003	4750 Kipling St	Commercial	Partial	Yes
39-211-00-010	4775 Kipling St	Commercial	Partial	Yes
39-211-12-002	4795 Kipling St	Commercial	Partial	Yes
39-164-00-021	4885 Kipling St	Commercial	Partial	Yes
39-211-12-002	4900 Kipling St	Commercial	Partial	Yes
39-153-14-011	4990 Kipling St	Commercial	Partial	Yes
39-153-00-007	5100 Kipling St	Commercial	Partial	Yes
39-222-00-004	4700 Kipling St	Commercial	Total	Yes
39-211-00-011	4715 Kipling St	Commercial	Total	Yes
39-211-00-009	4735 Kipling St	Commercial	Total	Yes
39-153-00-013	4890 Kipling St	Commercial	Total	No

Figure 2. Traditional Diamond Interchange ROW Impacts



Appendix A

Single Point Urban Interchange
ROW Impacts Cost Estimate

I-70/Kipling PEL

DEA Job Number: CDOT00R60012

Conceptual Cost Estimate Alternative 1 - SPUI

Unit Cost Basis: Jefferson County Assessors website

Assessor's Parcel Number	Property Address	Business Name	Property Value	Property Area (sf)	Impact Area (sf)	Percent Impact	\$25/sf for Partial impact	Relocation Cost	Demolition Cost	ROW Impact Cost
39-222-00-004	4700 Kipling St	Ramada Inn		121,557	4,865	4%	\$121,632			\$121,632
39-211-00-010	4775 Kipling St	Village Inn		31,842	2,064	6%	\$51,589			\$51,589
39-211-12-002	4795 Kipling St	Taco Bell		28,358	2,861	10%	\$71,524			\$71,524
39-164-00-021	4885 Kipling St	Circle K		30,490	6,659	22%	\$166,468			\$166,468
39-153-00-013	4890 Kipling St	Law Office		22,015	1,578	7%	\$39,455			\$39,455
39-211-12-002	4900 Kipling St	Furrs		113,030	10,663	9%	\$266,570			\$266,570
39-164-00-007	4901 Kipling St	Conoco		25,178	2,414	10%	\$60,356			\$60,356
39-222-00-003	4750 Kipling St	Conoco	\$1,500,000	21,693	21,693	100%		\$300,000	\$200,000	\$2,000,000

\$2,777,593

+10% Contingency \$277,759

Total \$3,055,353

Appendix B

Traditional Diamond Interchange
ROW Impacts Cost Estimate

I-70/Kipling PEL

DEA Job Number: CDOT00R60012

Conceptual Cost Estimate Alternative 12 Traditional Diamond with RIRO

Unit Cost Basis: Jefferson County Assessor website and CDOT Region 6 ROW Staff

Assessor's Parcel Number	Property Address	Business Name	Property Value	Property Area (sf)	Impact Area (sf)	Percent Impact	\$25/sf for Partial impact	Relocation Cost	Demolition Cost	ROW Impact Cost
39-164-00-018	10101 I-70 Frontage Rd	American Motel		230,650	7,102	3%	\$177,550			\$177,550
39-211-12-001	10101 I-70 Frontage Rd	Holiday Inn Express		230,650	3,756	2%	\$93,908			\$93,908
39-211-00-005	10200 I-70 Frontage Rd	Comfort Inn		76,491	1,815	2%	\$45,383			\$45,383
39-222-00-003	4750 Kipling St	Conoco		21,693	1,728	8%	\$43,205			\$43,205
39-211-00-010	4775 Kipling St	Village Inn		31,842	8,149	26%	\$203,718			\$203,718
39-211-12-002	4795 Kipling St	Taco Bell		28,358	3,227	11%	\$80,686			\$80,686
39-164-00-021	4885 Kipling St	Circle K		30,490	3,059	10%	\$76,476			\$76,476
39-211-12-002	4900 Kipling St	Furrs		113,030	6,481	6%	\$162,028			\$162,028
39-153-14-011	4990 Kipling St	Strip Mall		95,282	1,558	2%	\$38,953			\$38,953
39-153-00-007	5100 Kipling St	Car wash		16,213	3,278	20%	\$81,940			\$81,940
39-222-00-004	4700 Kipling St	Ramada Inn	\$3,000,000	121,227	121,227	100%		\$750,000	\$300,000	\$4,050,000
39-211-00-011	4715 Kipling St	Larsons Ski Shop	\$500,000	17,705	17,705	100%		\$200,000	\$50,000	\$750,000
39-211-00-009	4735 Kipling St	American Inn	\$2,500,000	133,729	133,729	100%		\$750,000	\$300,000	\$3,550,000
39-153-00-013	4890 Kipling St	Law Office	\$700,000	22,015	22,015	100%		\$150,000	\$50,000	\$900,000

\$9,982,390
 +10% Contingency **\$998,239**
Total \$10,980,629

TECHNICAL MEMORANDUM

Project: I-70 & Kipling Interchange PEL Study
Subject: Evaluation of Early Action Improvement Options
Date: April 18, 2013

Introduction

This technical memorandum has been prepared as a companion document/appendix to the I-70 / Kipling Interchange Planned and Environmental Linkage (PEL) Study. The project team is nearing completion of the screening of alternatives in the PEL, with the recommended alternatives being:

Alternative 1 - Single Point Urban Interchange (SPUI)
Alternative 12 – Traditional Diamond Interchange

Knowing the potential results for the recommended alternatives for ultimate reconstruction of the interchange allows the identification of early-action work that addresses existing deficiencies and fits with the ultimate interchange with little to no throw-away infrastructure.

This memorandum outlines recommendations for the early action projects which address the most pressing critical issues within the interchange, describes the potential benefits, costs, and how each project fits into or complements the ultimate interchange reconstruction.

Critical Short Term Issues

The existing traffic and safety issues at the I-70 and Kipling Street interchange are detailed in the *Existing Conditions Report* and project Purpose and Need statement. There are primary issues at two locations that are candidates for correction with relatively low-cost and low-impact construction in the near-term.

1. Eastbound I-70 / Eastbound On Ramp merge and ramp meter

The existing EB on ramp has a combination of sub-standard design criteria and high traffic volume demand that combine to create traffic congestion and safety issues on eastbound I-70. This occurs in both the AM and PM peak periods.



- The volume demand is managed by a ramp meter that restricts the on ramp traffic volume to 1,400 vehicles per hour (vph) even though the demand exceeds 1,500 vph.
- The acceleration distance from the ramp meter is about 600 feet, where current design criteria would have at least 1,200 feet of acceleration distance.
- When the sum of the unrestricted EB I-70 through traffic plus the on ramp traffic exceeds an hourly flow equivalent of about 6,200 vph, the congestion causes I-70 speeds in all lanes to drop below 40 mph.
- Even before the critical traffic volume is reached, the speeds in the outside lane of I-70 are 20 mph or more lower than the adjacent inside lanes, causing safety issues associated with speed differential in adjacent lanes.
- Although the ramp meter somewhat manages the critical merge with mainline I-70, the ramp meter must cycle so quickly to accommodate the demand from Kipling Street and not spill the queue back onto Kipling Street. Often the volume is too high for this to be managed, resulting in the queue spilling back onto Kipling Street, particularly south of the interchange.



2. Westbound Off Ramp right turn issues

The WB to NB right turn volume from the ramp onto Kipling Street is very high and has what is signed and striped for a continuous-flow acceleration lane onto northbound Kipling Street. However, this right turn does not operate to its potential or as intended in the peak periods, causing queuing up the ramp and onto mainline I-70, with queuing of up to one mile sometimes observed.

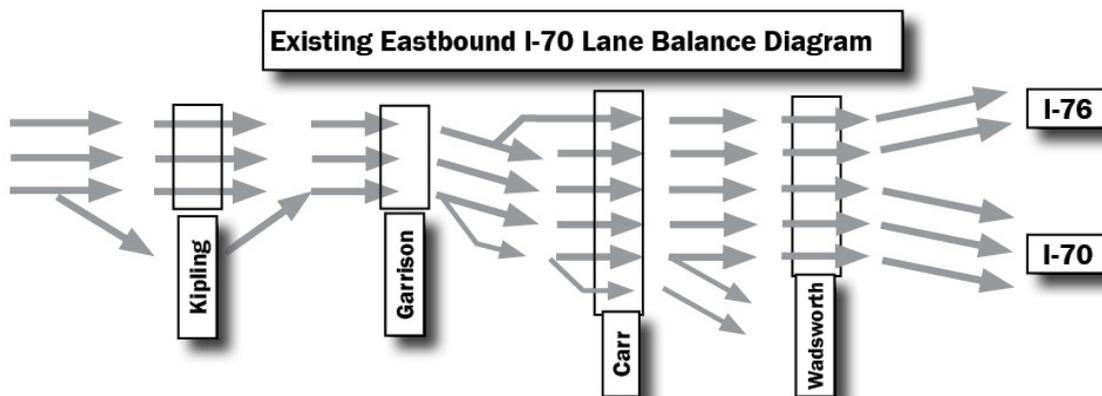
- One cause of the queuing is the relatively small number of drivers who wish to turn left at 49th Avenue who stop in the continuous right turn lane, despite signing prohibiting this.
- The continuous lane from the ramp ends at 50th Avenue, about 800 feet to the north. There are many drivers reluctant to use this full merge/weave area and slowly creep along in the acceleration lane and merge prior to 49th Avenue.

Interim solution for Issue 1 : Eastbound On Ramp Continuous Lane

The project team developed alternatives to address the identified critical issues described in the previous section. These alternatives have been designed at a conceptual level with the consideration of the recommended alternatives of either a SPUI or Traditional Diamond Interchange replacing the existing I-70 and Kipling Street interchange. The goal was to design something that can be implemented at a reasonable cost with minimal throwaway or that can be logically expanded upon to achieve the ultimate interchange reconstruction.

The opportunity to increase the eastbound capacity of I-70 is relatively straightforward since there is more than ample existing capacity 1/2 mile downstream from the Kipling on ramp. This segment of I-70 was reconstructed in concrete in the early 1990s to accommodate the final connection of I-76 and reconstruction of the Wadsworth interchange.

East of Garrison a standard 10-lane template of I-70 was constructed, but for an unknown reason it was reduced so only three eastbound lanes were constructed west of Garrison, while the westbound direction kept five lanes up to Kipling. The existing lane balance in this area is shown below:



A 4th lane in the eastbound direction would benefit the traffic operations in the following ways:

- The eastbound and westbound directions of I-70 would have similar capacity in this segment, and the eastbound capacity would be appropriate for the traffic volume demand. This should greatly reduce vehicle merge conflicts and allow appropriate speeds to be maintained in all lanes.
- The ramp meter for the EB ramp meter could cycle more quickly, reducing or eliminating queue spillback onto Kipling. The ramp meter cycling at a maximum of 4 seconds per lane could accommodate up to 1,800 vph. The current ramp meter mixes cycles of 4 and 8 seconds to try and minimize disruption of mainline I-70 traffic, with a maximum capacity of about 1,400 vph. It might be considered to not even use the ramp meter at this high of a volume demand, since there would now be adequate downstream capacity and acceleration length with the 4th lane.

Three options were evaluated to achieve the 4th eastbound lane, two of the options use the existing pavement with only moving of median barrier and restriping, and one option considers widening on the south side of I-70 to achieve what is assumed to be a maximum ultimate cross section of I-70. These are described below:

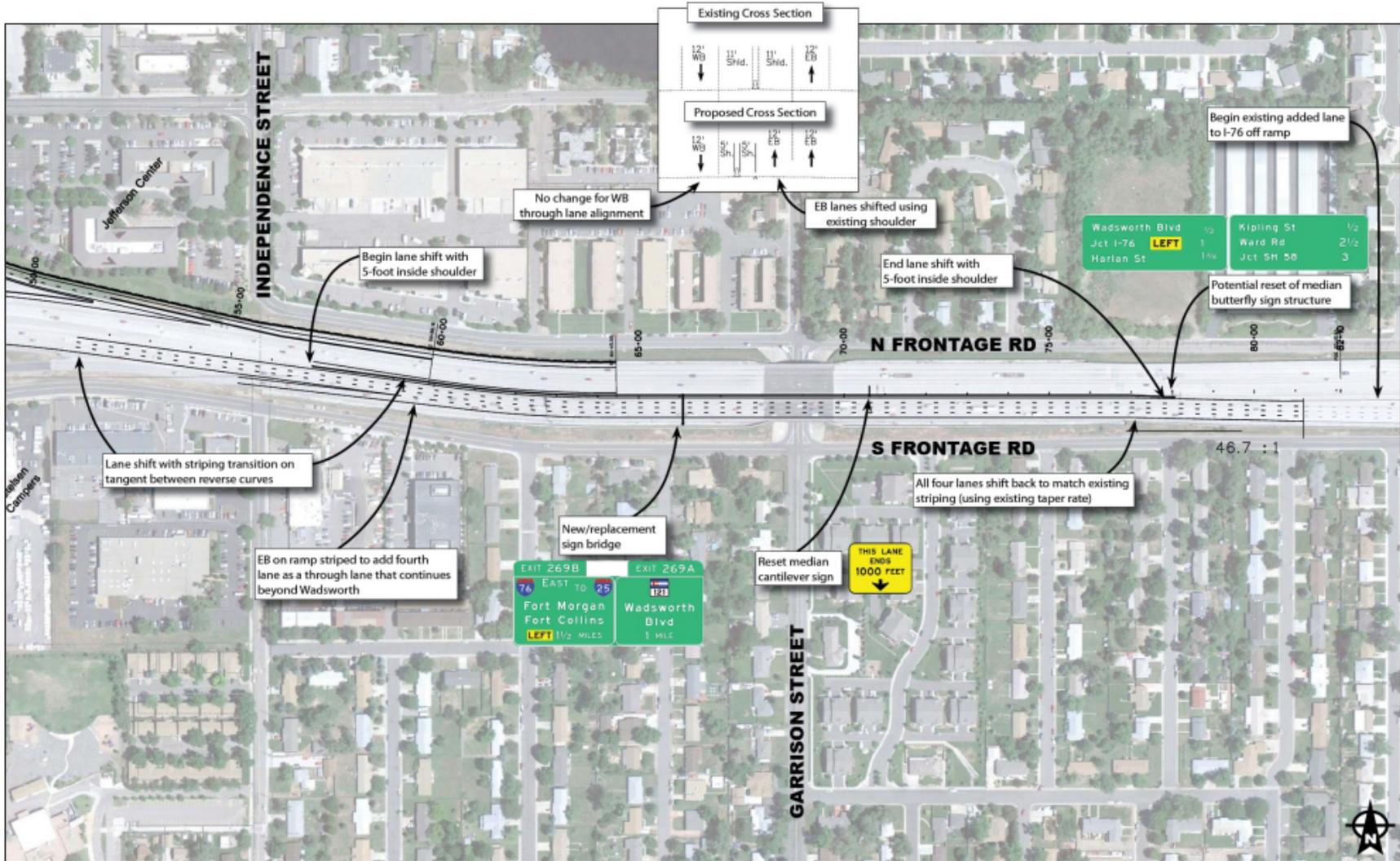
1. Move median barrier, reduced inside shoulders, no changes to westbound I-70 lanes.
2. Move median barrier, maintain inside shoulders, drop WB inside I-70 lane 1 mile sooner.
3. Widen eastbound I-70 to the south to achieve likely maximum ultimate cross section.

These options are described in more detail below:

EB On Ramp Continuous Lane Option 1 - Move median barrier, reduced inside shoulders

This is the recommended option of the three that were evaluated because it is the least disruptive to westbound I-70, achieves the goal of connecting the 4th EB lane to existing infrastructure, it is likely the least cost, and still allows future changes to I-70 to occur. The concept is illustrated on aerial in the figure on the next page.

Eastbound On Ramp Continuous Lane Improvements



The added 4th lane by moving the barrier would only be considered throwaway if I-70 were ever widened west of Kipling. There are no regional plans that currently show the potential to widen I-70 west of Kipling. In addition, the EB 4th lane concept fits with either recommended alternative of the PEL Study, so the EB 4th lane can be implemented without a decision made for the ultimate I-70 and Kipling Street interchange.

Three design items discussed by the project team for Option 1 were evaluated and are described in more detail below:

- Sight distance with narrowed inside shoulders - the curve at the west end of the revised median area would have a 5 foot inside shoulder if the same section as the tangent section were used. This concept was developed on scaled aerial mapping, but based on this mapping the inside shoulder at the mid-point of the curve should be about 6 to 7 feet to achieve 570 feet of sight distance necessary at 60mph. Since this also occurs in a sag vertical curve, the median barrier may not a sight distance obstruction in this area, and the 5 foot inside shoulder may be adequate. This should be evaluated more closely in final design with good ground survey, with the combination of the sag vertical curve and the opportunity to adjust the restriping to achieve the sight distance.
- Drainage with moving the median barrier - This existing segment of I-70 was constructed without median drains. The drainage in the curve occurs through slots in the median barrier, so south-side water crosses the north-side mainline. Drainage on the tangent section is to the outside - typical for a normal crowned section. If Option 1 were implemented, a slotted median barrier would be used in the curve, so drainage in the curve would be unchanged. In the tangent section, the median barrier move would result in the 5 foot shoulder being north of the crown line, so drainage of that shoulder area may be accommodated by slotted barrier or by the addition of median inlets. This should be evaluated more closely during final design.
- Crown Line “rollover” adjacent to mainline lane - in the tangent section of the eastbound lanes, the EB inside lane would be on normal crown, but the adjacent inside shoulder would be 2% in the opposite direction, resulting in a “rollover” of 4% between the inside travel lane and the inside shoulder. This is within the allowable range of rollover along the freeway, and it could be reduced if the inside shoulder were overlaid. If there were an overlay done to point all drainage

back to the south, it could be done at 0.5% to 1% and still have adequate exposure on the median barrier.

EB On Ramp Continuous Lane Option 2 - Move median barrier, maintain inside shoulders, drop WB lane about 1 mile sooner

This option was explored but not pursued further. Option 2 would be slightly more expensive than Option 1 described above due to several additional signing changes and the physical changes to the highway and other issues described above would be similar. It is not recommended to pursue Option 2 for the following reasons:

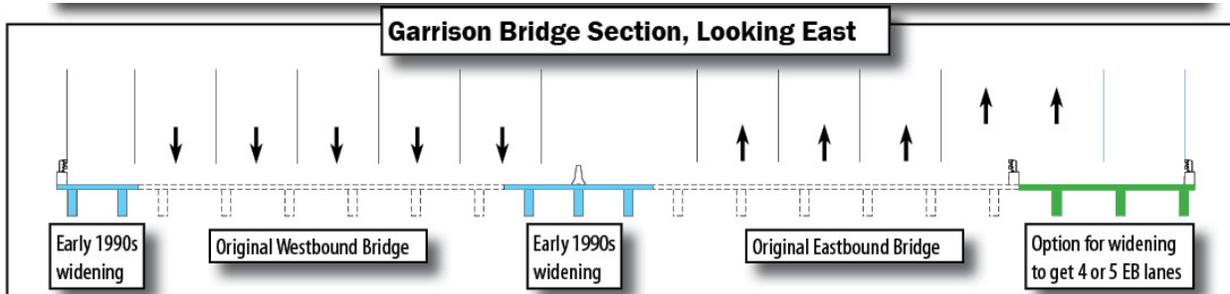
- Several on ramps from I-76 and from Wadsworth are merging at the same location that would be used for the inside lane drop.
- If I-70 were ever widened in the future to the 10-lane template, there would be additional throwaway infrastructure in addition to that shown in Option 1.

EB On Ramp Continuous Lane Option 3 - Widen Eastbound I-70 to the south for Ultimate 8-Lane plus Auxiliary Lanes Cross Section.

This option is feasible without physically impacting properties or the existing South Frontage Road. However, this option is not recommended for the following reasons:

- Substantially more cost than Options 1 or 2. Additional costs for bridge widening at Garrison Street, retaining walls along the South Frontage Road, reconstruction of about 3,000 feet of noise wall, and additional 12 to 24 feet of pavement for 3,000 feet would be in excess of \$10 Million.
- The existing Garrison Street bridge was built as a pair of 3-lane bridges in the mid-1960s, and the 36 foot gap between the original bridges was filled, along with a 12 foot widening of the north bridge, in the early 1990s. The original bridges and the widenings were done using parabolic-T girders similar to many bridges of that era in Colorado. Consideration of widening this bridge would likely have to consider full replacement due to the age of the original structure, which was built in 1967 and rehabilitated in 1979.
- The potential ultimate cross section of I-70 as 8 through lanes plus auxiliary lanes (8+2) has not been officially endorsed or approved through NEPA analysis or Regional Transportation Plans. The planning context and environmental

impacts of the bridge widening would probably require a higher level of NEPA documentation than the other alternatives. The reconstruction of the noise wall would require a noise study.



Interim solution for Issue 2: Revise WB Off Ramp at Kipling

The project team evaluated two options for addressing the right turns that are independent of the I-70 and Kipling Street interchange Preferred Alternative decision. However, these two options would be all throwaway when the I-70 and Kipling Street interchange is ultimately reconstructed, with either recommended alternative.

The two independent options for addressing the WB to NB right turns at the WB Off Ramp are:

1. Double Right with Free Flow Lane - Construct a short right turn lane for use by the drivers weaving to WB 49th Avenue, leaving the far-right lane as a free-right continuous lane. This is a design common along I-25 through the Denver Tech Center and works well for separating the two types of right turning traffic.
2. Signalized Double Right - Reconstruct the right turns and signalize for double-rights. The signalization of all right turns eliminates the weaving issue but may not fully address the queuing issue of vehicles back to I-70.

These options are described in more detail below:

WB Off Ramp Option 1 – Double Right with Free Flow Lane

This early action improvement assumes that no decision has been made on the Preferred Alternative for the interchange, so implementing the double right with free flow lane option would have a design life in the range of 5 years. The estimated cost for the improvement is \$250,000 - \$300,000, and none of the work would be re-usable when the interchange is reconstructed.

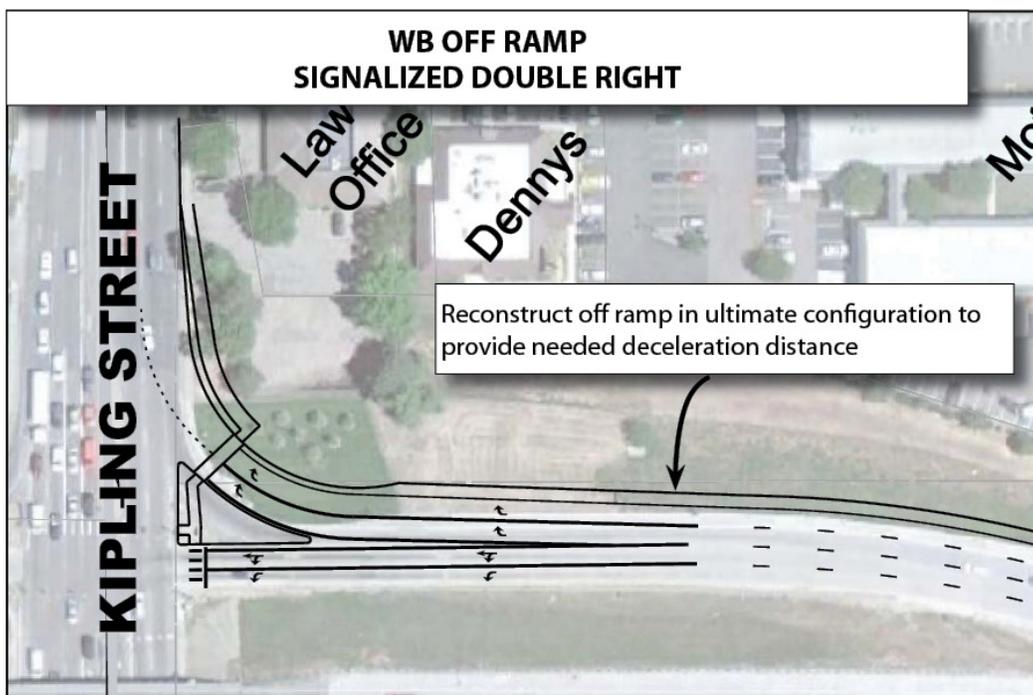
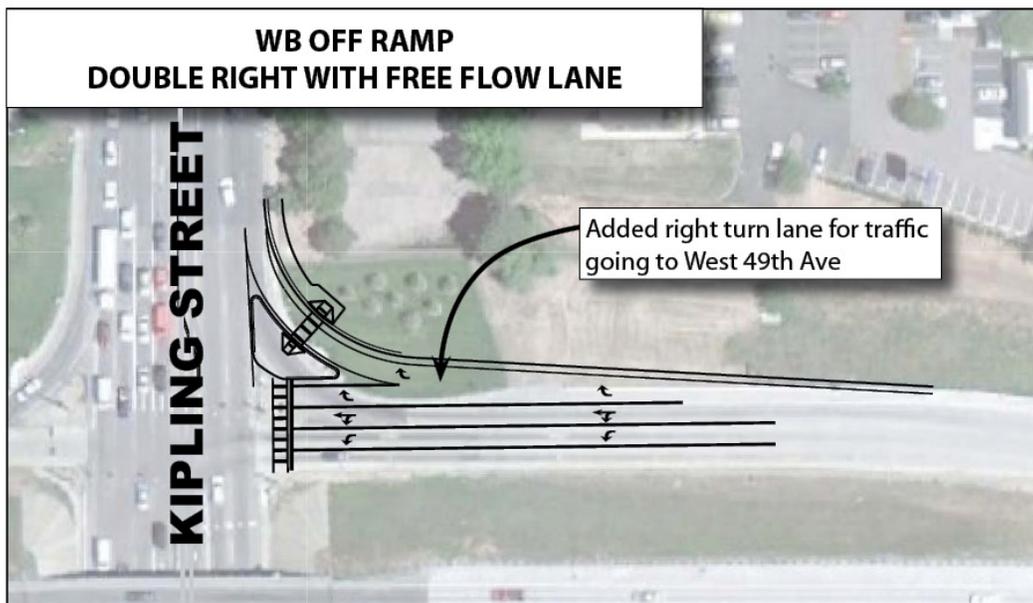
The reason drivers ignore the current restriction on weaving to 49th Avenue from the right turn lane is because they have to share the lane and wait at the signal with the heavy left turning traffic. The weaving traffic is less than 100 vph, so they need minimal queue storage if they are in their own lane. But the simple change of having those drivers in their own lane, with appropriate signing and enforcement, should properly segregate the right turning drivers based on their destination and result in greatly reduced queuing on the off ramp.

The continuous right turn lane would be modified in the immediate area of the interchange, and signing and striping would be improved to maximize the efficiency of this concept and reinforce the continuous flow aspect of the right turn. The concept is shown in the figure on the next page.

WB Off Ramp Option 2 – Signalized Double Right

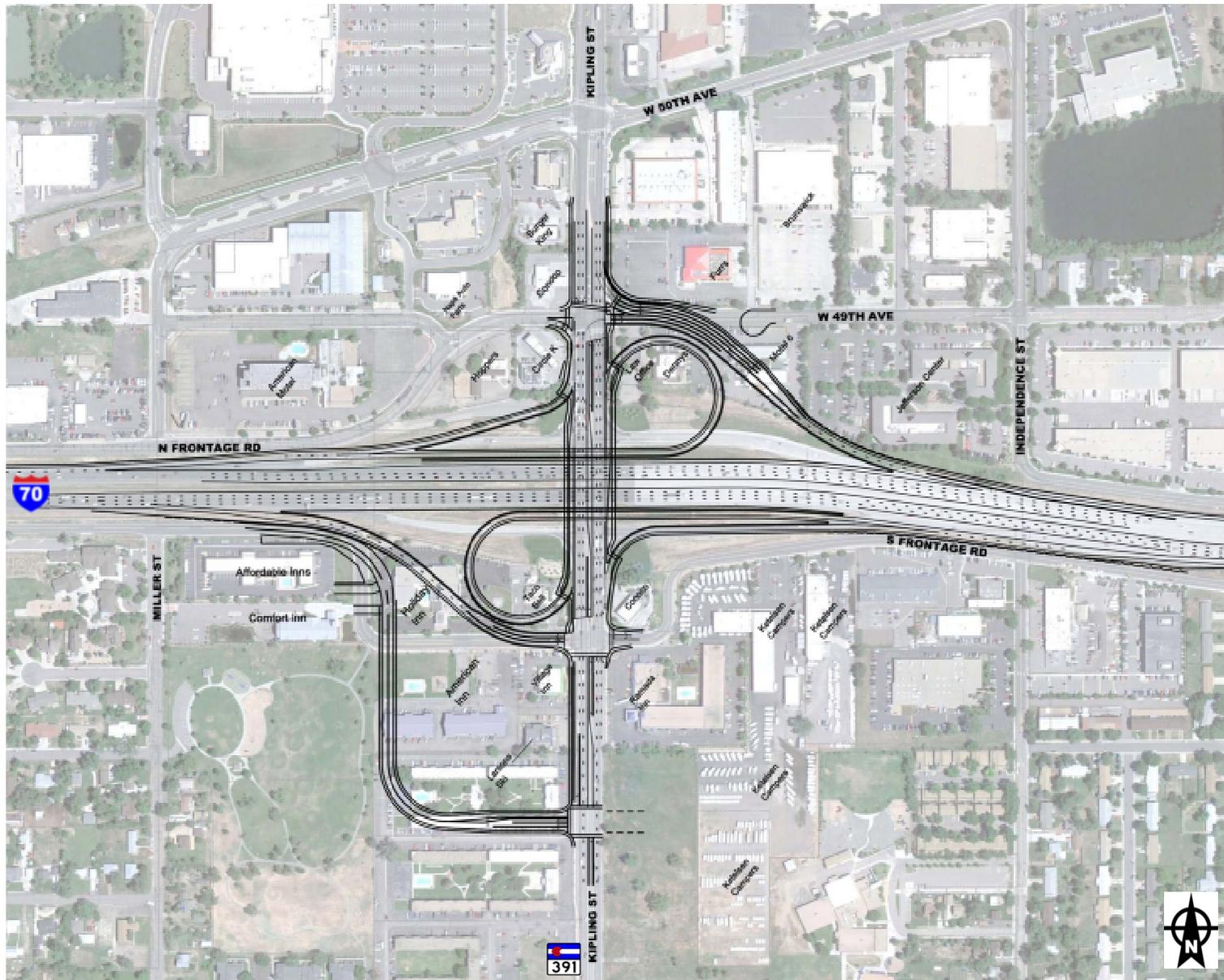
This option was developed because it may be the most effective way to control the weave of ramp traffic going to turn left at 49th Avenue. Double-rights should have enough capacity for near-term traffic demand, but triple-rights are necessary for the ultimate capacity needs when the full interchange is reconstructed. The estimated cost for implementing the signalized double rights is \$400,000 - \$450,000, and none of the work would be re-usable when the interchange is reconstructed. This concept is shown in the figure on the next page.

Westbound Off Ramp Improvements

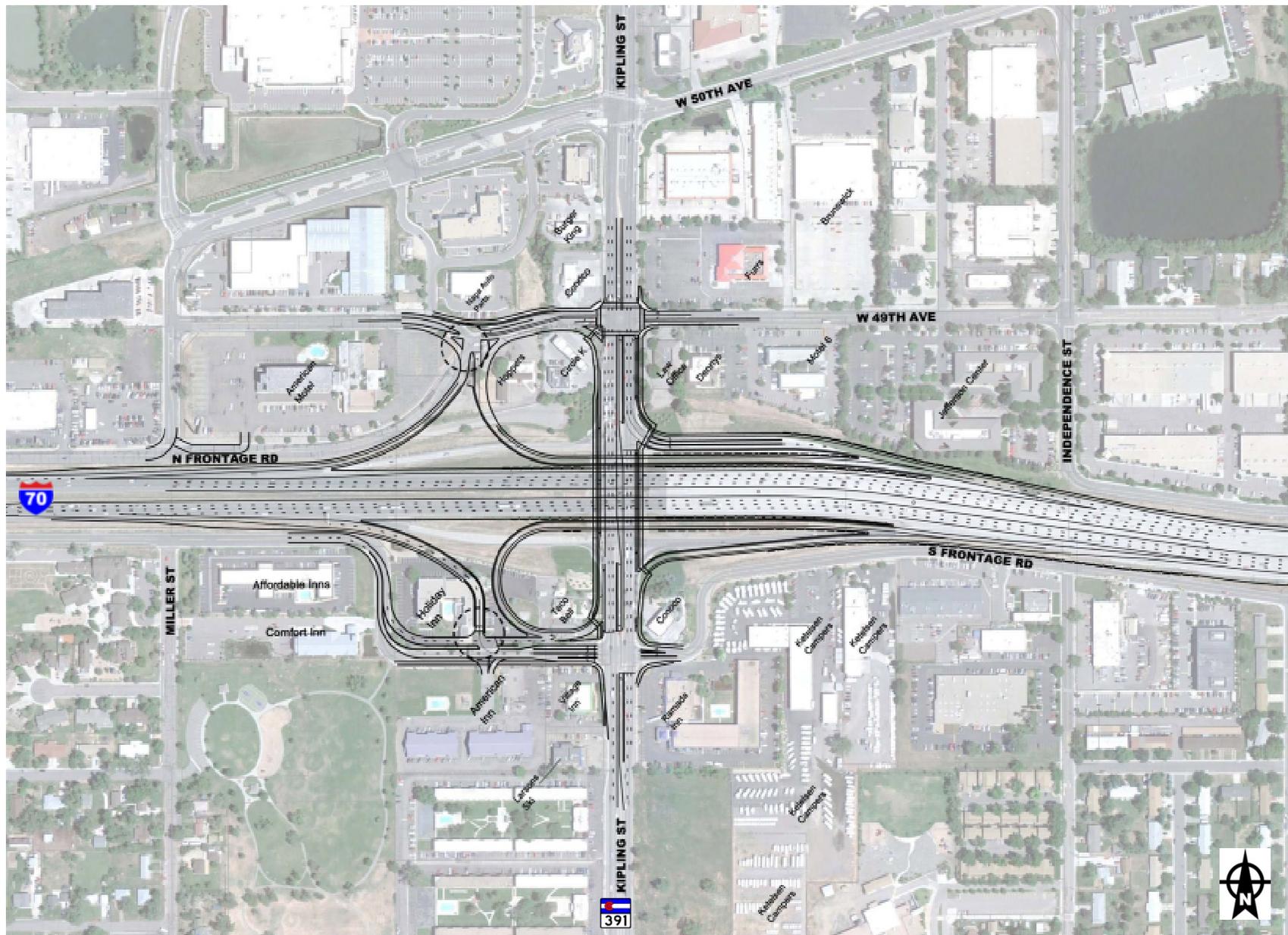


APPENDIX B
Alternatives to be Carried Forward

Alternative 7 – Partial Cloverleaf with Loops SW & NE Quadrants



Alternative 17 – Button Hook Ramps



APPENDIX C

Summary of Resource Agency Coordination and Input

I-70 & Kipling Interchange PEL Study
Resource Agency Coordination



Agency Name	1st Outreach - Project Intro & Scoping Letter Sent	Agency Response Received?	Agency Comments	2nd Outreach - Update Letter Sent	Updated Information Provided to Agency	Agency Response Received?	Agency Comments	Follow-up Needed/ Action Items
Colorado Parks and Wildlife	4/13/2012, to Jerri McKee	4/26/2012, via letter to Jay Hendrickson from Liza Hunholz	We do not foresee this area containing any environmentally sensitive areas nor species of concern. There may be small pockets of prairie dogs and raptor nests in the area. We ask that prairie dogs, burrowing owls and nesting raptors be taken into account. For planning purposes: • Revegetate with native vegetation. • If noxious weeds are present, wash construction equipment on site or pull plants from machinery before leaving the site. • Plant open space areas and detention sites in native vegetation and leave un-mowed.	1/3/2013, to Jerri McKee, District Wildlife Manager	Project update, graphics of the two remaining action alternatives and a summary of critical considerations. The study area was assessed for: habitat for state and federally-listed species, prairie dogs and migratory birds. No suitable habitat was observed for any of the 12 federally-listed species with potential to occur in Jefferson County. Habitat for black-tailed prairie dogs was observed, although no active prairie dogs or burrowing owls were observed. There is moderate potential for the northern leopard frog and the common garter snake, both State Species of Concern, to occur in the wetland habitat. Noxious weeds were present.			Check document to ensure addressed in mitigation. Follow up in letter.
Colorado State Historic Preservation Office	4/13/2012, to Amy Pallante	4/24/2012, via letter to Kirk Webb from Edward Nichols	No formal undertaking, so will not participate at this time.	1/3/2013, to Amy Pallante	Project update, graphics of the two remaining action alternatives and a summary of critical considerations. A file search was performed for the study area. The file search revealed that three surveys had been conducted and two potentially eligible historic resources were identified in the study area: the Slough Ditch, and the Colorado Central and Colorado and Southern Railway. No archaeological resources were identified. Once the alternatives being considered have been screened, properties adjacent to the remaining alternatives will be evaluated for potential eligibility for the NRHP. Avoidance and Minimization measures considered during the alternatives evaluation will be documented as part of this PEL study process for use in the future 106 Consultation.	1/8/13, via letter to Kirk Webb from Edward Nichols	Any avoidance, minimization or mitigation measures under Section 106 should be determined through consultation with the SHPO and other consulting parties and be specific to the qualities that make a property eligible for the National Register of Historic Places.	Response letter from Kirk Webb to Edward Nichols was mailed 2/6/13.
Colorado Department of Public Health and Environment, Air Pollution Control Division	4/13/2012, to Jim DiLeo	No	N/A	12/19/2012, to Jim DiLeo	Project update, graphics of the two remaining action alternatives and a summary of critical considerations.	1/2/2013, via email to Kirk Webb from Jim DiLeo	APCD has no preference on either alternative.	None
Jefferson County Parks and Open Space	4/13/2012, to Tom Hoby	No	N/A	12/19/2012, to Tom Hoby	Project update, graphics of the two remaining action alternatives and a summary of critical considerations.	No	N/A	None
Jefferson County Planning and Zoning	4/13/2012, to John Wolforth	No	N/A	12/19/2012, to John Wolforth	Project update, graphics of the two remaining action alternatives and a summary of critical considerations.	No	N/A	None
U.S.Army, Corps of Engineers	4/13/2012, to Timothy Carey	4/20/2012, via letter to Jay Hendrickson from Timothy Carey	Drainages, ponds and a potential aqueduct exist in the area that should be considered during analysis. Ongoing coordination is warranted. Clear Creek is outside the study area, but proximity may be relevant if drainage from proposed work could reach it.	1/3/2013, to Timothy Carey	Project update, graphics of the two remaining action alternatives and a summary of critical considerations. Field maps of the study area were reviewed for potential wetlands and Waters of the U.S. (WUS), and a study area visit was conducted to map potential wetlands and/or WUS. Numerous irrigation ditches, stormwater conveyance channels and detention ponds associated with larger commercial and residential complexes are located within the study area. Several swales/ depression areas that accumulate stormwater runoff along roadsides are present as well.	1/15/13, via email to Kirk Webb from Matthew Montgomery	Any wetlands within the project boundary are likely non-jurisdictional. An approved jurisdictional determination should be requested for any aquatic resources within the project boundary, and the a Section 404 permit should be obtained if necessary.	Check document to ensure addressed in mitigation. Follow up in letter.

I-70 & Kipling Interchange PEL Study
Resource Agency Coordination



Agency Name	1st Outreach - Project Intro & Scoping Letter Sent	Agency Response Received?	Agency Comments	2nd Outreach - Update Letter Sent	Updated Information Provided to Agency	Agency Response Received?	Agency Comments	Follow-up Needed/ Action Items
U.S. Department of Agriculture, Natural Resources Conservation Service	4/13/2012, to Terri Skadeland	No	N/A	1/4/2013, to Russell Knight	Project update, graphics of the two remaining action alternatives and a summary of critical considerations.	1/9/2013, via letter to Kirk Webb from Russell Knight	There is no prime and/or unique farmland in the study area, and therefore is not subject to the Farmland Protection Policy Act.	None
U.S. Environmental Protection Agency	4/13/2012, to Robin Coursen	No	N/A	12/19/2012, to Robin Coursen	Project update, graphics of the two remaining action alternatives and a summary of critical considerations.	No	N/A	None
U.S. Fish and Wildlife Service	4/13/2012, to Alison Michael	4/18/2012, via letter to Kirk Webb from Susan Linner	Potentially affected species to monitor include orchid and butterfly plant. Consider migratory birds, wetlands and depletions to S. Platte.	1/3/2013, to Alison Michael	Project update, graphics of the two remaining action alternatives and a summary of critical considerations. No suitable habitat was observed for any of the 12 federally-listed species with potential to occur in Jefferson County. Five of these listed species occur downstream of the study area along the South Platte River. Habitat for black-tailed prairie dogs was observed, although no active prairie dogs or burrowing owl were observed. Several raptor nests were present.	1/16/13, via email to Kirk Webb from Alison Michael	There are no species listed under the federal Endangered Species Act that will be directly affected by your project. The Platte River species will be affected by depletions to the system caused by your project, but those depletions are addressed in the 2012 programmatic biological assessment and opinion with FHWA. We appreciate CDOT's efforts to avoid impacts to migratory birds.	Check document to ensure addressed in mitigation. Follow up in letter. Revisit the project's impacts to federally protected species in NEPA.

APPENDIX D
Public Comment Summaries

I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study
Public Meeting #1 Summary
4/25/12

Public Meeting #1 was held on April 25, 2012 at the Wheat Ridge Recreation Center (4005 Kipling Street, Wheat Ridge, CO 80033). The meeting was held from 5:00 – 7:30 PM in an open house format. Approximately 40 members of the public attended, along with 15 agency and consultant staff members. Following is a summary of project comments submitted by attendees on comment sheets, via email and during telephone conversations, and recorded by open house staff during one-on-one conversations with attendees during the meeting. This summary includes comments received through May 8, 2012.

EXISTING TRAFFIC CONDITIONS

- Too many speed limit changes southbound. (2 comments)
 - Keep consistent speed on Kipling Street. The existing speed on Kipling changes from 35 mph to 45 mph in a very short distance.
- Intersections and traffic signals should be revised to improve progression (2 comments)
 - It takes three and four light changes to get through the intersections.
- All light flow-times need lengthening all directions and turn arrows need to function all hours of the day and night (not be restricted), including 38th Ave.
- Existing conditions are poor due to congestion.
- I-70 is congested near Youngfield and diversion on 38th, 44th and Kipling St. is evident around 5pm weekdays.
- The ramp meter at the on-ramps at the Kipling and the Wadsworth interchanges work well. There should be more of that – like on the westbound on-ramp at Kipling.
- On- and off-ramps back up for long distances. (5 comments)
 - Traffic backs up on I-70 westbound at the Kipling exit, also at Kipling & 49th.
 - Traffic exiting I-70 westbound at Kipling and then attempting westbound turn on 49th constantly slow traffic (3 comments)
 - Need to prohibit westbound turn onto 49th.
 - Causes back-ups on ramp for northbound Kipling traffic.
 - Vehicles getting off I-70 to Kipling Street are blocking vehicles getting on I-70, and also blocking through lane traffic on Kipling Street due to the short signalized intersection. Consider using a traffic camera at the intersection to enforce.
- Difficult to merge onto I-70 eastbound.
- Eastbound on-ramp metering has caused vehicles to stop and not be able to get up to speed, resulting in a high number of crashes.
- Getting off of I-70 westbound is a problem (2 comments)
 - Westbound I-70 to Kipling right lane has large back-ups.
- Wadsworth expectancy leads people to Kipling.

- Issues exist with traffic blocking the South Frontage Road intersection. Northbound cars pull into the intersection when the light is green, but the next signal (eastbound ramps) is red. (2 comments)
 - There is a short distance between the traffic signals at the south frontage road intersection and the I-70 eastbound ramps intersection traveling northbound on Kipling Street. Northbound traffic frequently runs the red light and nearly causes severe angle crashes, probably because the northbound motorists see the ramp intersection signal green for northbound traffic and do not pay attention to the northbound red indication at the frontage road. This is a concern regarding short signal spacing and perhaps the need for programmable signal heads at the I-70 eastbound ramp intersection.

EXISTING ROADWAY FEATURES

- Signage needs improved (9 comments)
 - Lane signage at the exit needs improved.
 - The sign at southbound Wadsworth to I-70 east and west is misleading. It states the right lane is for westbound I-70 only and is a continuous lane and also is the correct lane to go east on I-70 without a lane change.
 - Kipling Street southbound has poor signage indicating laneage (through versus turn lanes for eastbound on-ramp).
 - Need signage at 44th eastbound on-ramp to note accel lane ends unexpectedly.
 - Need to remove the “stay right except to pass” sign.
 - Need to install signs warning of heavy traffic ahead approaching westbound off-ramp.
 - People from westbound I-70 off-ramp don’t see the sign to get to the center right turn lane to go to westbound 49th Ave/I-70 Frontage Rd. Maybe another sign should be added where vehicles exit the I-70 westbound off-ramp.
 - Need signage to show that accel lane ends for the eastbound I-70 ramp merge at Ward Road.
 - Need a sign to prohibit blocking of South Frontage Road intersection.
- Accel and decel lanes/turn lanes are too short (6 comments)
 - Eastbound on-ramp doesn’t have enough acceleration distance (2 comments)
 - Collector/Distributor with cloverleaf ramps might help with ‘short’ ramps.
- At Wadsworth/I-70, the westbound on-ramp acceleration lane is too long.
- Sight distance is horrible approaching the westbound off-ramp.
- The entry ramp from Kipling to eastbound I-70 is way too short, and the cars want to move immediately across traffic to get to eastbound I-76 (2 comments)
 - The solution: 1) End the far left westbound lane of I-70 at the Carr St overpass. This lane causes more problems on westbound I-70 when it and the exit lane for Kipling end at the same time (5 lanes into 3 all at once). 2) Move all the concrete barriers from the slight curve just after eastbound I-70 and Kipling, to where that westbound lane was to just past the Carr St overpass, another slight curve (need to extend 2 highway signs as well). 3) Now do a lane shift on eastbound I-70 and the far left lane is now what used to be the shoulder of eastbound I-70, the barrier is where the westbound shoulder line

was and the westbound shoulder is where the westbound lane was. You now have the far right lane of eastbound I-70 to do as you wish. * Extend the on-ramp from Kipling to eastbound I-70 all the way to the exit lanes of Wadsworth.

- TxDOT provides on-ramps side-by-side with frontage roads. This would be a sensible approach to the weave problem on the north side of the interchange.
- Interchange needs more lanes to handle capacity during peak hours.
- Do not widen I-70. It's not needed if people would drive better.
- Need to keep up lane painting more frequently.

ALTERNATIVE MODES

- Maintain and improve bike and pedestrian connections.
- Trail and bike lanes will be great for walking and bicycling - would use it to access destinations.
- There is significant need to make changes to the roadway and bike/pedestrian facilities because this area has significant traffic and is not an environment that supports safe multimodal transportation.
- Need better marked crosswalks.
- Enforce pedestrian crossings if not at crosswalks.
- Schools should educate students to cross at crosswalks.
- Buses result in a backup on Kipling, maybe pullouts would help.
- Signing and electronic boards are important to communicate access to rail.
- Direct connection to Ridge Station needs to be clarified with interchange project.
- Live Well Wheat Ridge is a community initiative working to create healthier environments to reduce obesity. We focus on land use and transportation decisions to support access to healthy food and increase access to multimodal environments. Live Well Wheat Ridge could provide walking audits to document barriers to safe pedestrian environments in the study area. We will contact you if we schedule one in the study area. We could also give you feedback on current uses in the study area. For example, at 44th and Independence is the Jefferson Center for Mental Health. There are also several neighborhoods in the study area that have significant access issues due to I-70 and the interchange.
- Concern about walkability to reach grocery and retail that sells healthy foods.

EMERGENCY SERVICES

- Fire department north of Gold Line – potential emergency service response issue
- Switching cars at Coors Glass blocks the road – potential emergency service response issue
- Arvada Fire Dept. trucks turn off lights and siren when they encounter congestion at the interchange.
- Arvada Fire Dept. would like access to more I-70 cameras to view accidents. TOC coordination could benefit dispatch.

- Arvada FD signal pre-emption – compatibility older per-emption equipment with newer signal equipment
- Arvada Fire Dept. responds to high number of call from hotels in the northwest and southeast quadrants.

GENERAL COMMENTS

- Concern regarding added traffic to Independence and possibly diverting traffic to Miller to balance north-south travel.
- Concerned about any increase in traffic and noise that could result from the new interchange and the negative impact that could have on the character of the neighborhood – keep with the Wheat Ridge 2020 vision and don't harm the residential/rural/small town nature of the area. Don't let what happened to 44th and I-70 happen here (more noise, light pollution and concrete).
- There has been a need for improvement for years, I hope it is improved.
- A multi-level interchange, like at I-25 and I-70, would work well at I-70 and Kipling.
- There should be more concrete noise walls along roads.
- CDOT should educate the public about driving in the correct lane. The left lane should be for fast drivers traveling long distances, the middle lane should be for trucks (all going 50 mph), and the right lane should only be for drivers immediately entering or exiting the freeway.
 - Staying in the correct lanes should be regulated by CDOT.
 - There should be a lot of multi-lingual signs about which lanes to drive in.



I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study Community Focus Group Meetings Round #1 Summary

The I-70 & Kipling Interchange PEL Project Team held the first set of Community Focus Group meetings in early August 2012. Three Community Focus Groups were formed to share information and gather feedback from individuals with specific interest areas: Residential, Business, and Multimodal Travel.

Invitation letters to join the Focus Groups were sent via USPS and/or email to 115 individuals. Twenty-six individuals stated interested in the meetings and either attended or requested meeting materials be provided to them.

The following meetings were held at Red Rocks Community College (5420 Miller Street, Arvada, Colorado):

- Resident and Homeowner Association Focus Group – August 7, 2012
- Business Focus Group – August 8, 2012
- Multimodal Travel Focus Group – August 8, 2012

The purpose of this first round of Focus Group meetings was to review the results of alternatives development and Level 1 alternatives evaluation, and discuss the alternatives moving forward into Level 2 screening. At each meeting, a brief PowerPoint presentation was given by the Consultant Project Manager to provide an overview of the project and progress to date. Following the presentation and descriptions of the alternatives moving forward, focus group members were asked to give their feedback on the alternative concepts, help the project team understand potential impacts, and suggest ways to refine alternatives to balance needs of various user groups. A summary of comments from each meeting is listed below.

Resident and Homeowner Association Focus Group – August 7, 2012

- Interchange and the Kipling and 44th corridors are too congested
- Roundabouts won't work because most people don't know how to use them
- Improving visibility under the I-70 bridge would improve the westbound off ramp to 49th weave problem
- Signage will be important for some of the less common designs
- Concern with business impacts from right-of-way needed for loop ramps
- Businesses need easy access
- Gas stations at the interchange are important
- Cars blocking intersections causes congestion
- Make sure cars won't get stuck on the on-ramps when merging onto I-70 with new alternatives (it happens now)

Business Focus Group – August 8, 2012

- North frontage road impacts to Medved – Medved prefers options providing easy access to the north frontage road west of Kipling
 - One-way frontage road would impact their access to gas stations
- Road impacts to 49th east of Kipling would affect Jefferson Center for Mental Health
- Buttonhook and Texas Frontage Road Diamond preferred for keeping access to frontage roads
- Michigan Lefts alternative seems difficult for access and driver expectancy
- Ketelson concerned with impacts to their property, including impacts that would affect their access from I-70/Kipling but not require relocation
- Medved and Ketelson draw traffic during peak and off peak times (service, truck deliveries)

Multimodal Travel Focus Group – August 8, 2012

- Avid bicyclists avoid Kipling because it is unsafe, but some ride it if they don't know alternate routes (prefer Tabor, Garrison)
- Improvement of pedestrian refuge areas at intersections is critical
- Frontage road proximity to ramps is a problem because there are a lot of crossings in small area
- Include pedestrian oriented features in improvements, such as those in 32nd and Youngfield project
- Need walkable solutions for low income population in the area
- More people would bike/walk if there were better/safer facilities
- Alternatives with roundabouts would need to be paired with another bicycle/pedestrian friendly treatment
- Like Texas Frontage Road and Buttonhooks alternatives because they minimize conflict points and provide benefit to all modes
- Partial Cloverleaf alternatives have more vehicular free flow movements, making it more difficult for pedestrians/bicyclists
- Traditional Diamond alternative would be acceptable
- Regardless of the alternative chosen, the sidewalks should be widened in accordance with CDOT or City of Wheat Ridge design guidelines
- Majority of bicyclists who do and will use this corridor are commuters, however a portion are likely to be recreating bicyclists traveling to the Clear Creek green belt and other points
- There will likely be an increase in bike/pedestrian volumes once other trail/path improvements are made in the area

I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study Summary of Round #2 Community Focus Group & Emergency Service Provider Meetings November 2012

The I-70 & Kipling Interchange PEL Project Team held the second set of Community Focus Group meetings in November 2012 at Red Rocks Community College (5420 Miller Street, Arvada, Colorado). Three Community Focus Groups were reconvened to share information and gather feedback from individuals with specific interest areas: Residential, Business, and Multimodal Travel. Over 35 individuals stated interest in the meetings and either attended or requested meeting materials be provided to them. In addition, two meetings were held with area emergency service providers. The following meetings were held:

- Resident and Homeowner Association Focus Group – November 12, 2012
- Business Focus Group – November 14, 2012
- Multimodal Travel Focus Group – November 14, 2012
- Wheat Ridge Police and Pridemark Paramedic Services – November 20, 2012
- State Patrol and Arvada Fire District – November 29, 2012

The purpose of these meetings was to gather feedback on the results of Level 2 alternatives evaluation, with focus on the four remaining action alternatives:

- Single Point Urban Interchange (SPUI)
- Partial Cloverleaf with Loops in SW and NE Quadrants (Partial Cloverleaf)
- Traditional Diamond (Diamond)
- Button Hook Ramps (Button Hook)

At each meeting, a brief presentation was given by the Consultant Project Manager. Following the presentation and descriptions of the alternatives moving forward, attendees were asked to give their feedback on the four remaining action alternatives, help the project team understand potential impacts, and suggest ways to refine alternatives to balance needs of various user groups. A summary of comments from each meeting is listed below.

Resident and Homeowner Association Focus Group – November 12, 2012

- Removing traffic lights as part of the SPUI will improve traffic flow.
- Some of the hotels in the southwest quadrant have spent a lot of money to improve and will need the frontage road access to survive.
- Property impacts for the relocated frontage road are a concern.
- The Diamond provides better spacing, which seems better for traffic flow.
- The Diamond seems to provide the only feasible and safe multimodal accommodations (no crossings of continuous ramp traffic).
- The addition of a signal for the relocated frontage road causes concern about even more congestion for the large volumes of northbound Kipling traffic from 44th Avenue.

- It makes the most sense to show the relocated frontage road as far north as possible to avoid more out of direction travel.
- It seems the weave to I-76 would be worse with the Button Hook alternative.
- A lot of semi trucks use the interchange. The roundabout and loop ramps with the Button Hook are scary for them, especially with less traction in winter.
- The Button Hook alternative would cause a bottleneck where the ramps merge.
- Impacts to the Holiday Inn from the Button Hook ramps are a concern.
- Roundabouts are a concern.
- The SPUI seems to be the best solution, as long as cost isn't prohibitive.
- There is concern that the cheapest alternative, or the one that can be constructed the fastest would automatically be chosen.
- Please make an effort to inform everyone about the project.
- A benefit of living in this area is that you can get anywhere in the city in minutes. Concern was noted that some alternatives with out-of-direction movements will ruin that.

Business Focus Group – November 14, 2012

- The Partial Cloverleaf has significant ROW impacts, and is impacting the most expensive piece of property in the Interchange (Holiday Inn).
- Holiday Inn plans to do a \$2M remodel in the next few years.
- If southbound Kipling traffic is not allowed to turn left, all that traffic will have to go on a residential street and past a middle school. The relocated frontage road is important.
- Please don't implement confusing alternatives.
- Seeing the visual impact and curb appeal of the alternatives in a simulation would be nice.

Multimodal Travel Focus Group – November 14, 2012

- Alternative layouts need accommodate pedestrians; cyclists can find other routes.
- Free right turn movements are not preferred because they are dangerous for pedestrians and bicyclists.
- If the distance between signals is too great, people will be less likely to use a marked crossing to cross Kipling.
- It seems the SPUI has the least impact to the businesses and properties.
- There is concern regarding how bicyclists will navigate free-flow traffic over the crosswalk in the Partial Cloverleaf. Even if they are designed to lower speeds, free flow ramps are scary. (The southwest loop ramp free flow situation is the worst.)
- From a cyclists perspective, both the north to east and south to west movements of the Partial Cloverleaf are major concerns. This alternative is not liked at all.
- A relocated frontage road would cause out-of-direction travel for pedestrians with the Diamond.
- Crossing at Diamond ramps is not a good situation for pedestrians. However, for pedestrian/bicycle travel north-south this is an improvement over existing conditions.

- There is concern about how bike traffic will be accommodated through the loops and roundabout areas of the Button Hook.
- For the Button Hook, the southwest quadrant is the primary conflict point.
- The SPUI is most appealing because of controlled flow of traffic through the intersection (no merging traffic).
- The SPUI is preferred because of the controlled movements, even if it is more difficult for a pedestrian to go through than the Diamond.
- Studies are showing that detached multiuse paths adjacent to roadways are very problematic, and can cause accidents.

Wheat Ridge Police and Pridemark Paramedic Services – November 20, 2012

- The SPUI will eliminate the problem of cars turning left on 49th Avenue.
- The SPUI at I-25 & University works really well.
- The long traffic back-ups on northbound Kipling are an issue (sometimes queues to 38th Avenue).
- The largest existing issue is the traffic backing up onto I-70 from the westbound off ramp.
- The Partial Cloverleaf frontage road relocation seems like a good idea.
- 2,500 people live in the Kipling Village apartments.
- Most of the injury accidents are from left turns. The Partial Cloverleaf would eliminate a lot of the injury accidents.
- Partial Cloverleaf would be expensive because of the property acquisition required.
- The Diamond looks to be most unfriendly for traffic flow due to the right-in/right-out intersections.
- A two-lane exit on westbound I-70 is needed. Currently, people use the single lane as a double lane, which causes crashes. Rear end accidents on the ramp are frequent.
- On the Diamond, people would not obey left turn restriction at the frontage roads, which would cause a dangerous situation.
- The Diamond would cause dangerous u-turns.
- The Button Hook alternative looks very confusing. People don't like roundabouts.
- It seems like the Button Hook alternative would take traffic off Kipling, but add it to the side streets.
- The Button Hook and Partial Cloverleaf alternatives are the least favorite of paramedics because of sideways forces for patients in the back of ambulances with loop ramps.
- The SPUI is preferred, but the Partial Cloverleaf seems to provide the most traffic flow improvement.
- The design should be kept simple, to provide less opportunity for driver error.

State Patrol and Arvada Fire District – November 29, 2012

- The Partial Cloverleaf seems messy.
- The SPUI is the best alternative. The elimination of a signal is a benefit.
- The SPUI at I-25 & University is easy to drive, and the C-470 and Morrison SPUI operates well.
- The SPUI and Diamond ramps make emergency response (fire) easier, as opposed to accelerating on a loop.
- Current stacking and congestion onto eastbound I-70 causes problems for Arvada Fire response.
- Not having a full cloverleaf layout as an option is appreciated, because the weave causes problems.



I-70 & Kipling Interchange Planning Environmental Linkage (PEL) Study
Public Meeting #2 Summary
12/4/12

Public Meeting #2 was held on December 4, 2012 at the Wheat Ridge Recreation Center (4005 Kipling Street, Wheat Ridge, CO 80033). The meeting was held from 5:00 – 7:00 PM in an open house format. Over 75 members of the public attended, along with agency and consultant staff members.

The purpose of this meeting was to present and gather feedback on the evaluation process and the Level 1 and Level 2 alternatives screening results. Specifically, attendees of the meeting were asked to focus their feedback on the four remaining action alternatives. Attendees were asked to note their most favorite of the four alternatives by putting a green dot sticker on the graphic of that alternative, and to note the alternative they thought should be eliminated from further consideration with a red dot sticker. The Single Point Urban Interchange Alternative was favored by the majority of attendees.

“Votes” are listed below:

- Single Point Urban Interchange: 44 in favor, 8 against
- Traditional Diamond: 11 in favor, 9 against
- Partial Cloverleaf with Loops SW & NE Quadrants: 10 in favor, 13 against
- Button Hook Ramps: 2 in favor, 29 against

Following is a summary of project comments submitted by attendees on comment sheets, via email and recorded by open house staff during one-on-one conversations with attendees during the meeting. This summary includes comments received through December 17, 2012.

ALTERNATIVES EVALUATION

- Would like a full cloverleaf exchange.
- Any alternative that would move the frontage road access needs to consider the impact on the already overloaded light at 44th and Kipling.
- Impressive screening process.
- Looks thorough.
- Ease of snow removal should be considered.
- Like the alternatives that are the most pedestrian friendly and the least confusing.
- Objective should be to not adversely impact economic development at interchange quadrants – do not create real estate parcels that no one would develop – this is prime real estate for Wheat Ridge and the County.
- Glad the roundabouts were eliminated.
- Need to list the disadvantage of the SPUI that signals are too closely spaced and traffic backs up to form grid locks.

SINGLE POINT URBAN INTERCHANGE

- SPUI will be hard to drive (hard to see signals).

- The other SPUI configurations I have driven through work well. (3 comments)
- Like the simple design. (4 comments)
 - Least impact and like the simplicity.
 - Easiest to follow – less confusing.
 - Seems to be the simplest, most straight-forward concept. More complex = more accidental turns, lower efficiency.
- Like that the SPUI has two lanes that turn south for exiting westbound I-70 traffic.
- Favored by businesses and community members most impacted. Project started and completed in a relatively short time a plus.
- Preserves prime commercial real estate at all quadrants.
- Works best with minimum property impact. It also allows for possible movement of the frontage road.
- LiveWell Wheat Ridge staff support the Single Point Urban Interchange Alternative. We partly support this alternative due to the inclusion of bicycle lanes and a multi-use path through the interchange.
- Need safe pedestrian and bicycle crossing. (3 comments)
 - Paint the portion(s) of any on-street bike lanes below I-70 and across the entry / exit points to highway ramps a separate color (e.g. green or red) to clearly differentiate the facilities from adjacent vehicle lanes. Clear demarcation could enhance safety and increase usage. An acceptable distance from entry / exit ramps, paint in lane could be discontinued. If painting is not feasible, please consider bike lane symbol stamps. The City of Golden recently added bike lanes on Ford Street and provides a good example of the symbol stamps.
 - To ensure pedestrian safety at the pedestrian crossing at the westbound off ramp and reduce potential for conflict, please consider a Rapid Flashing Beacon at the end of the ramp.
 - SPUI is not pedestrian friendly.
- Single point light on Kipling doesn't seem right with Kipling flow – three close lights.
- The single point signal isn't enough to slow people down.
- Allows for maximum traffic flow, yet traffic flow is simpler and more direct.
- Seems to handle traffic well and does not impact surroundings too much.
- Does not address grid lock at Kipling and South Service Road.
- Too congested for AM or PM rush hour.
- This seems to be a large bridge and therefore higher cost.
- Concerned about the congestion while under construction since it all has to be done at once.
- The graphic shows University at I-25 as a typical example although Alt. 1 is much more compressed.

TRADITIONAL DIAMOND INTERCHANGE

- If the Diamond is chosen, need to look at tying in 52nd to 50th in the northeast quadrant.

- Would hurt the businesses located on the frontage road. (3 comments)
 - Worried about effects of right-in/right-out restrictions on businesses.
- Don't care for right-in/right-out frontage roads. (3 comments)
 - The Diamond should be eliminated. Right in/right out intersections would cause confusion and congestion on other streets.
 - Frontage road accessibility unacceptable.
- Disadvantage that frontage road is further from the freeway.
- Be sure the Diamond isn't prohibiting fire access. (2 comments)
 - Emergency response issues if frontage road access is restricted.
- This is the best alternative for bicyclists, but I would suggest two changes to the plan: Add a stoplight at the Kipling / 49th Ave intersection and a stop light at the South Frontage Road / Kipling intersection south of I-70.
- Favorite for simplicity and for being pedestrian friendly.
- In the long run this eliminates gridlock at South Service Road and Kipling – fewer traffic lights.
- Minimizes lights on Kipling. It is an appropriate trade off to sacrifice the frontage road flow for Kipling flow.
- Seems the least impactful and less expensive.
- Boring, but it works best.
- Without instruction on how it will work I never would have picked as my favorite.

PARTIAL CLOVERLEAF WITH LOOPS SW & NE QUADRANTS

- Partial Cloverleaf is best for operations.
- Easy to understand. Like that it creates two ramps for eastbound traffic.
- Apartment property owners (3 buildings) don't like frontage connections thru their buildings.
- Reduces the use of frontage roads.
- Too much impact on the local businesses. (3 comments)
 - Seems to take way too much expensive land.
- It is very important to have lights at the frontage road especially if freeway is shut down.
- Advantage – less stoplights.
- Don't like cloverleaves. (4 comments)
 - Cloverleaf ramps are very confusing - lose all sense of direction.
 - Confusing loops – liked this one least.
- Cloverleaf should be free flowing.
- Requires less space than Diamond interchange.
- 49th Avenue closure unacceptable (2 comments)
 - There is already far too much traffic on Independence and 52nd Avenue.
 - Frontage road access and 49th Avenue closure unacceptable.
- Not interesting structurally.

- Since 49th Avenue would be closed, need to improve West 50th to connect with West 52nd without having to turn onto Independence.
- Like that it can be done in phases.
- Poor for pedestrians.

BUTTON HOOK RAMPS

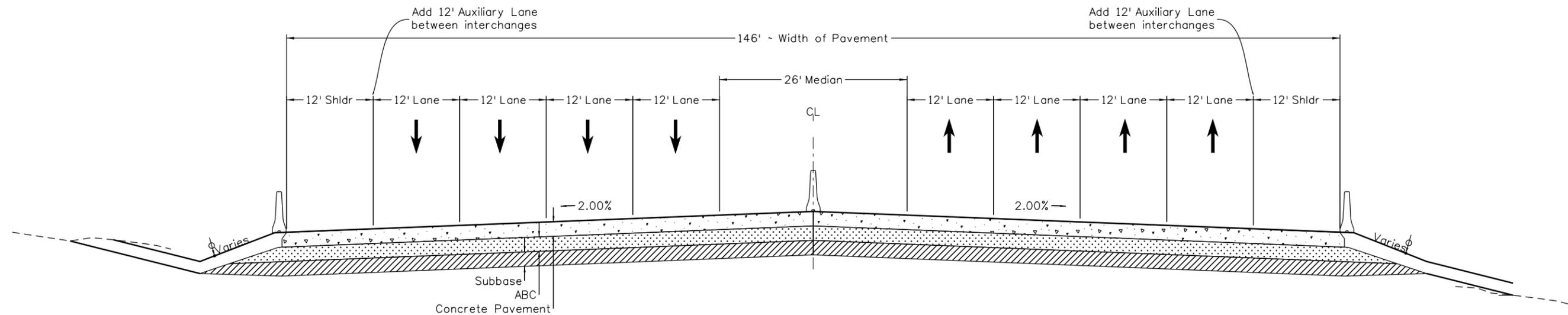
- Looks complicated. (4 comments)
- Will cause driver confusion. (4 comments)
- Thought we got rid of the mousetrap. No way.
- No roundabouts. (3 comments)
 - Roundabouts anywhere are a bad idea, no one knows how to drive them.
 - Roundabouts just don't work.
- Too congested and bad snow removal.
- Consider snow removal, snow trucks and melt off. Button Hook Ramp has too much slide in winter.
- Like the relocation of South Service Road.
- Too much impact on the local businesses. (2 comments)
- Best alternative due to lowest impact.

GENERAL COMMENTS

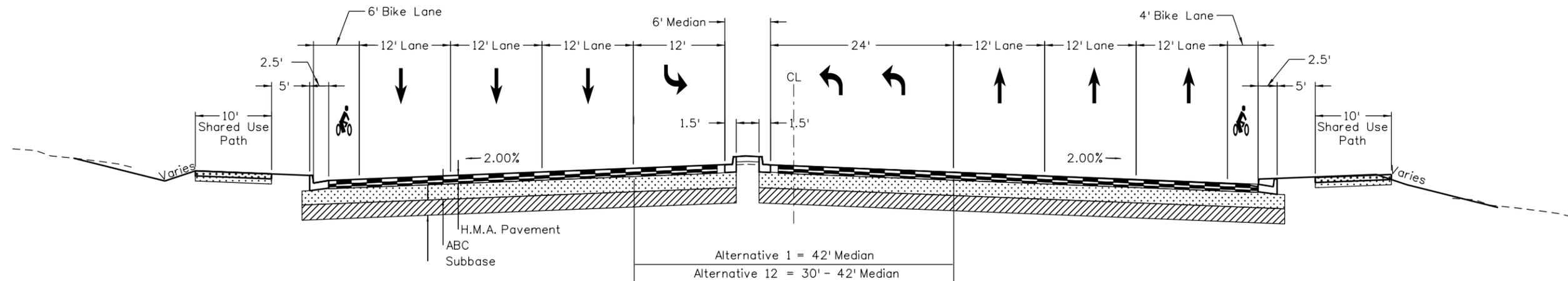
- Lower I-70 speed limit needed (2 comments)
 - Lower the speed limit on I-70 to 55 mph as far west as 32nd Avenue.
 - Lower the speed limit on westbound I-70 through the curve.
- Consider revising the lane marking/geometry/signage in the weave area between the Wadsworth westbound on-ramp and Kipling off-ramp.
- The exit ramp from I-70 westbound to Kipling is dangerous because of the hill and sudden curve. Need to give warning signs of curve and lane division.
- The merge lane from Kipling to eastbound I-70 is too short. (2 comments)
 - Immediate Solution: Move the merge traffic light back into the entrance ramp allowing more acceleration time/speed.
 - Long-Term Solution: Move the merge traffic light and add length to the acceleration lane on I-70 for merging.
- Install another lane for non-stop southbound right turns to go south from eastbound I-70 and widen the west side of Kipling to accommodate this.
- Need to make the signage clear and visible early enough to react to. The current signage is small, not very descriptive, and not visible over the hill until it's too late to react to.
- The new development north of Target will create a lot of traffic.
- Need three lanes in each direction on Kipling.

- Third northbound lane on Kipling needed past 50th Avenue.
- Worried that cobbling together pieces of improvements will end in something that doesn't solve overall problem.
- Bicycling in the Kipling corridor south of Ridge Road down to Alameda is at best a nightmare. Most bicyclists travel on Garrison. Even if a redone I-70/Kipling intersection became bike-friendly, getting to the intersection would still remain a nightmare. In the long-term, if the Kipling corridor is (or becomes) a candidate as a biking corridor between Ridge Road and Alameda, then a redone 6th Ave. / Kipling interchange plus the new I-70/Kipling interchange plus a continuous roadside bikeway would be necessary to make a trip on Kipling acceptable to cyclists.
- Bicycles won't obey traffic laws.
- The northbound traffic light at I-70 South Service Road & Kipling stays green too long – the backup of stopped cars from the light at I-70 Entrance/Exit intersection fills both lanes AND the intersection at the South Service Road.
 - Immediate Solution: Retime the traffic signal at Kipling & South Service Road to turn red for NB traffic BEFORE the roadway between I-70 entrance/exit ramps and South Service Road fills up—leaving space for at least 3 more cars in each lane to accommodate E-W South Service Road traffic.
 - Long-Term Solution: Retime traffic signal as above and add a right-turn lane to WB South Service Road at Kipling.
- Worried that adding another signal for relocated frontage road will make congestion at 44th even worse.
- One problem that funnels traffic through Kipling is the Greenbelt at Clear Creek, coming from the south, and living between I-70 and Clear Creek, we always go through 44th and Kipling.
- The intersection of I-70 and Kipling doesn't have enough street lighting.
- Tickets should be given for blocking intersections.
- Hope the final decisions are made by the engineering and traffic experts.
- Cost comparisons should include cost of delay and accidents.
- The Garrison Street bridge should be widened first. It causes the most congestion with the Kipling on-ramp and I-76 traffic.
- This was a fascinating exercise. I came in anticipating huge flyovers everywhere. Based on traffic numbers and comparison intersections, I've changed my mind and like some of these ideas better than flyovers, especially the expense part.
- Traffic fix should outweigh property impacts.
- If something goes wrong on I-70, would rather have signals to go through.
- Hard to get close enough to see exhibits – need more people to explain.

APPENDIX E
Conceptual Design Plan Set for Recommended Alternatives



ASSUMED ULTIMATE I-70 CROSS SECTION OVER KIPLING



ASSUMED ULTIMATE KIPLING CROSS SECTION

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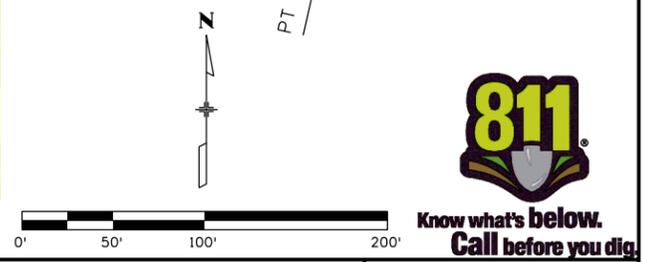
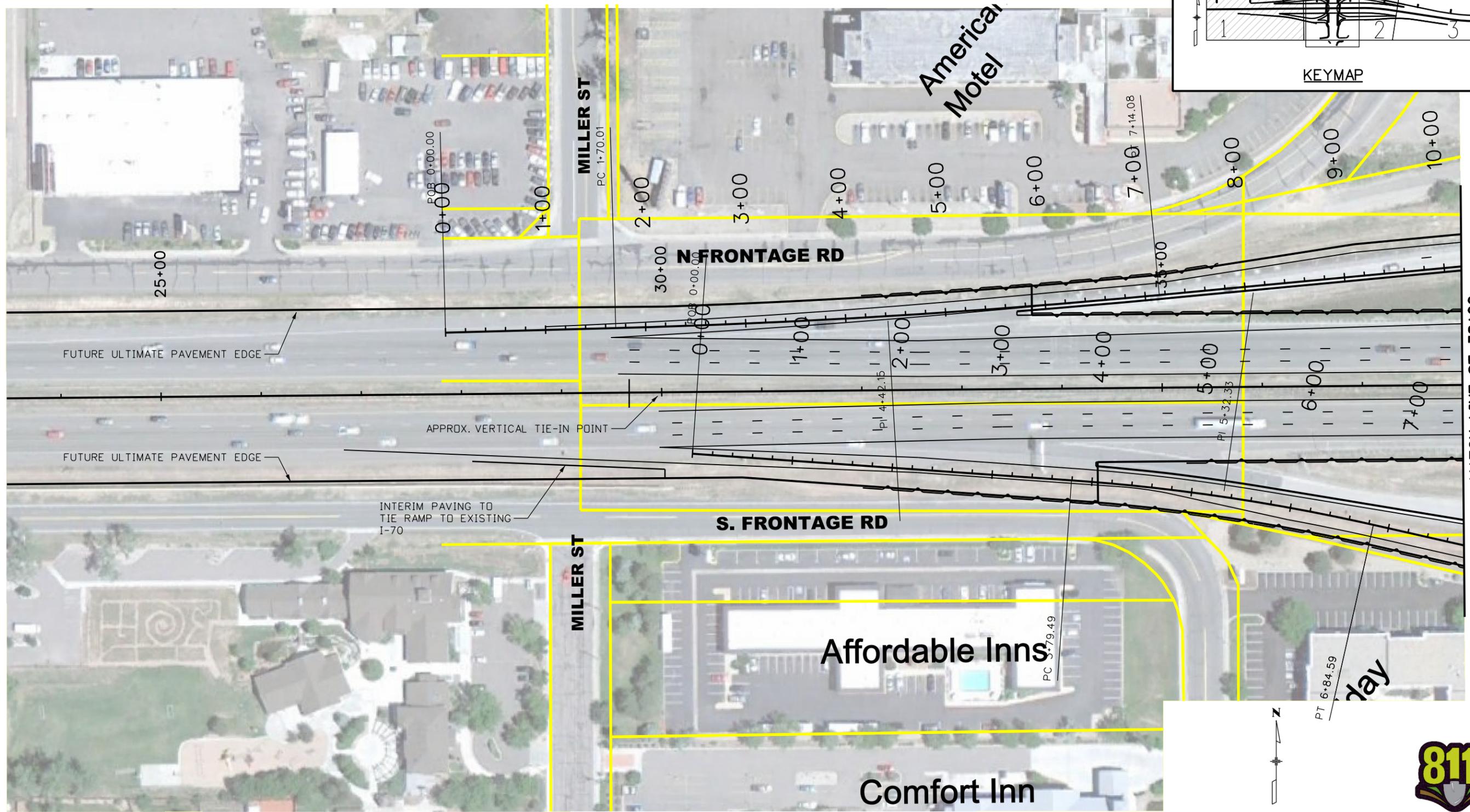
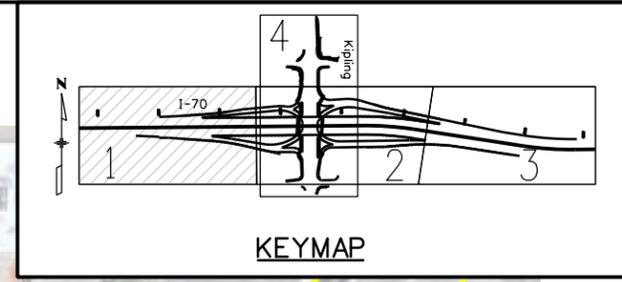
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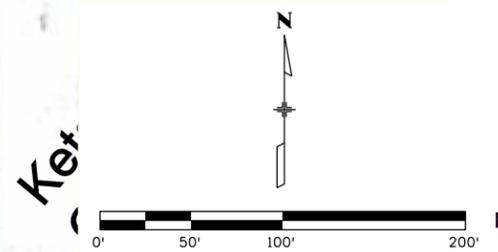
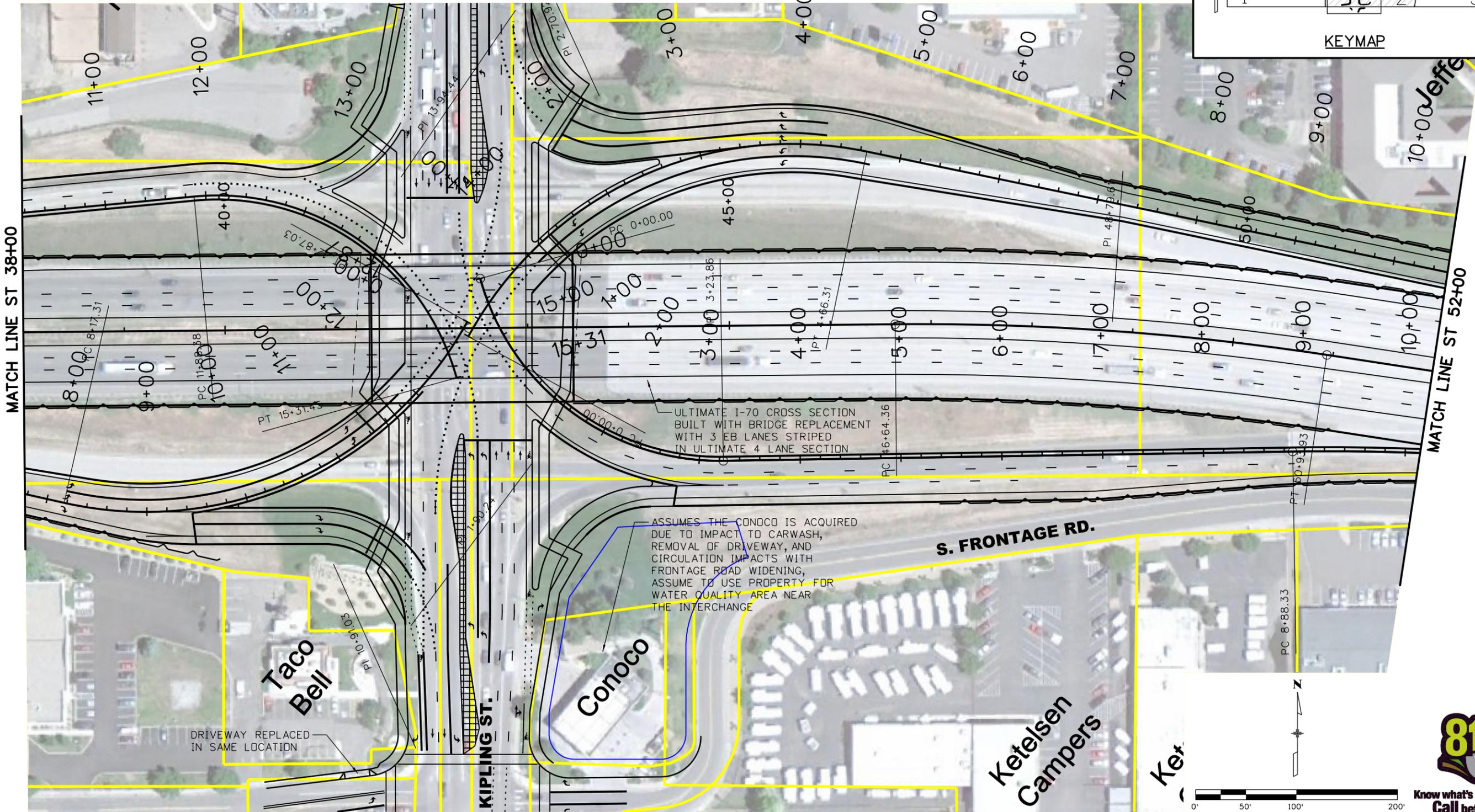
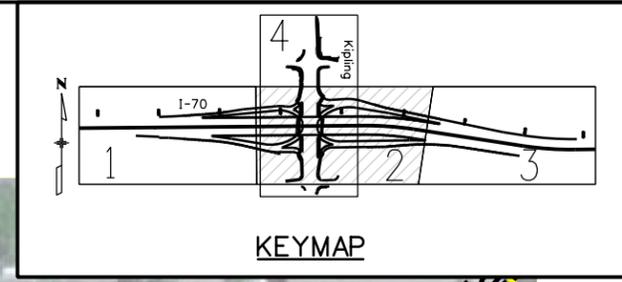
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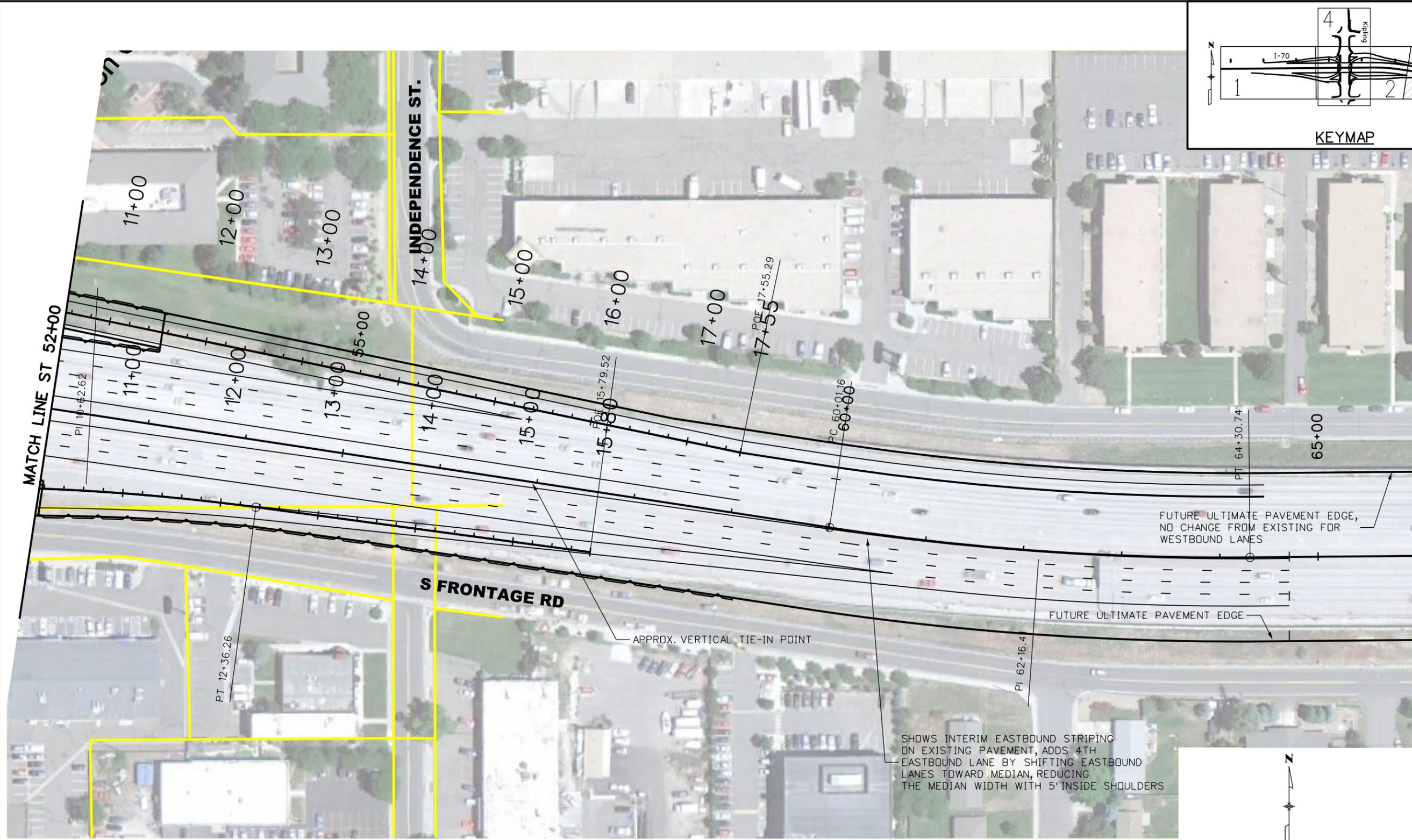
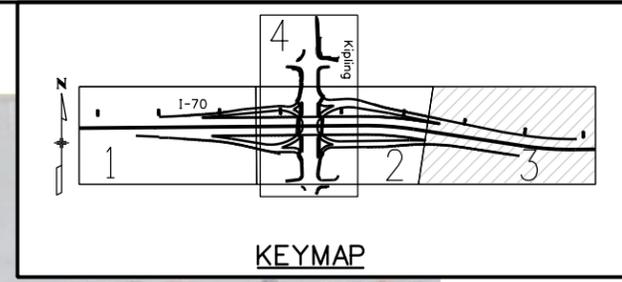
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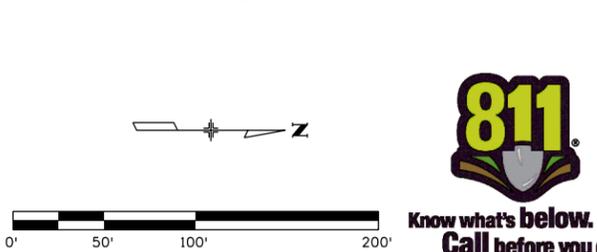
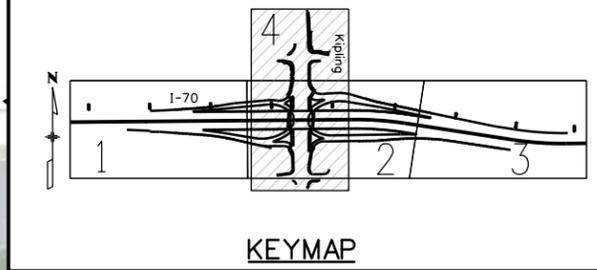
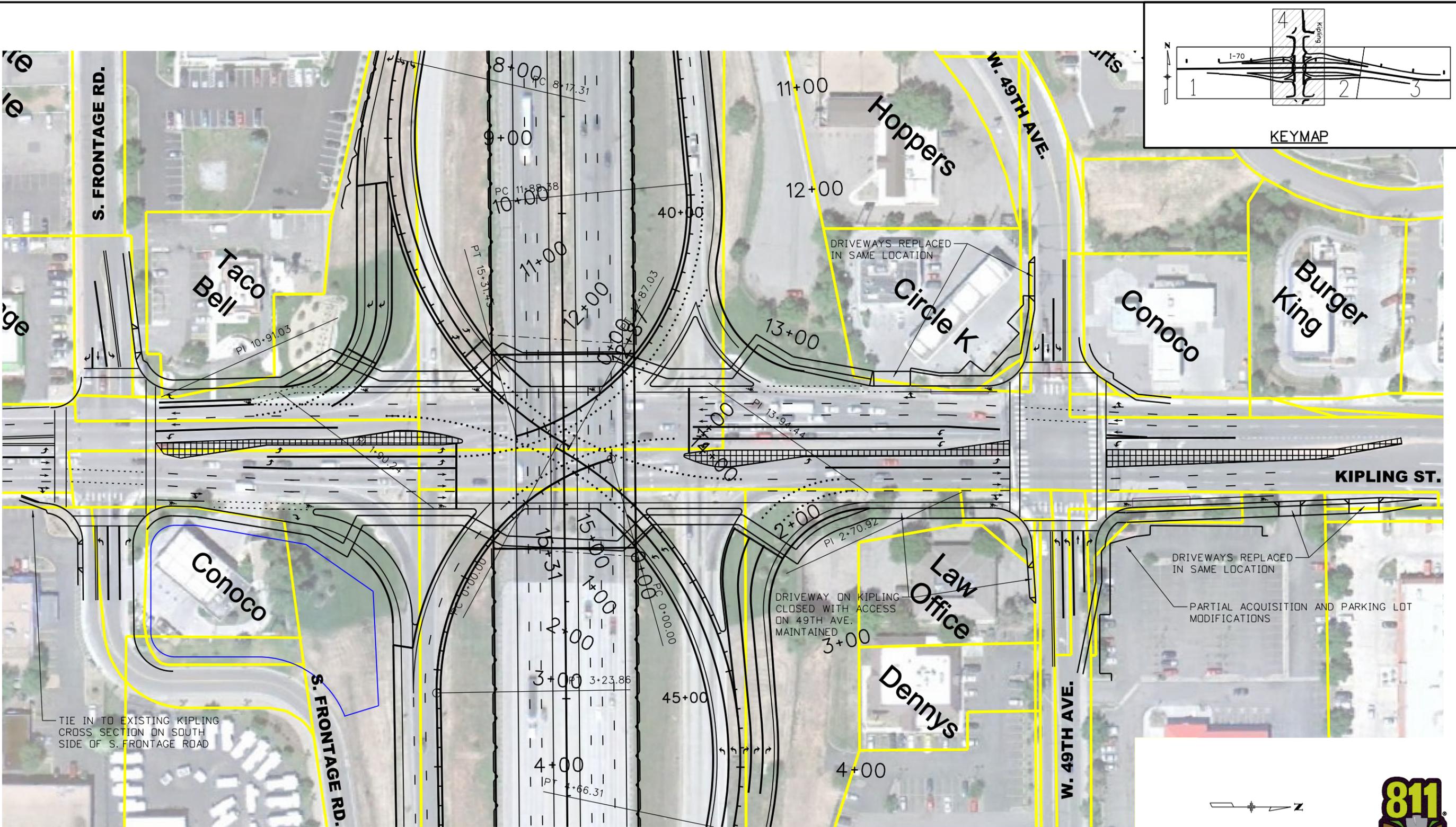
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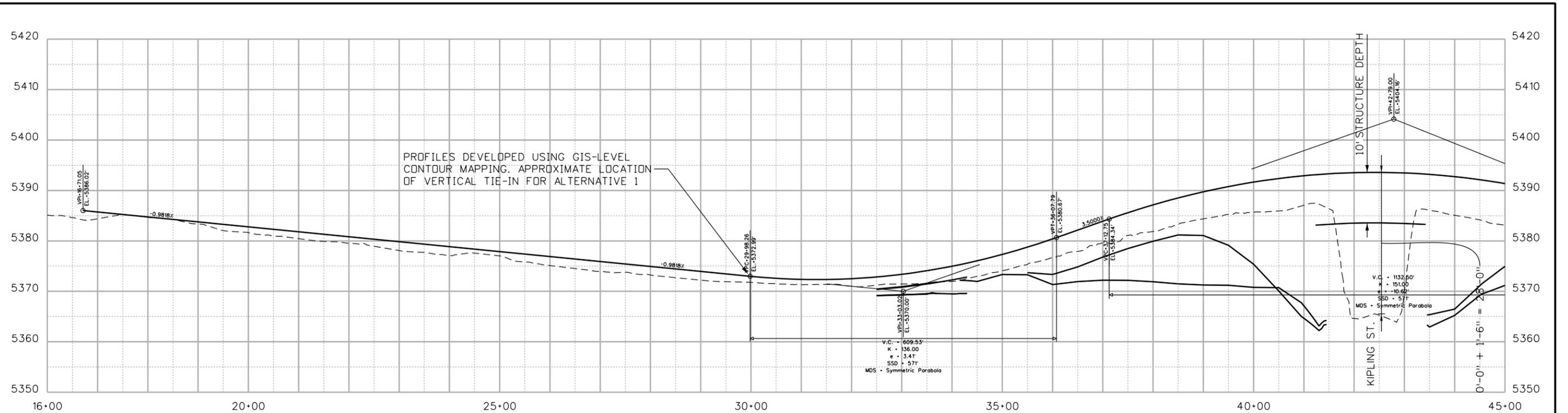
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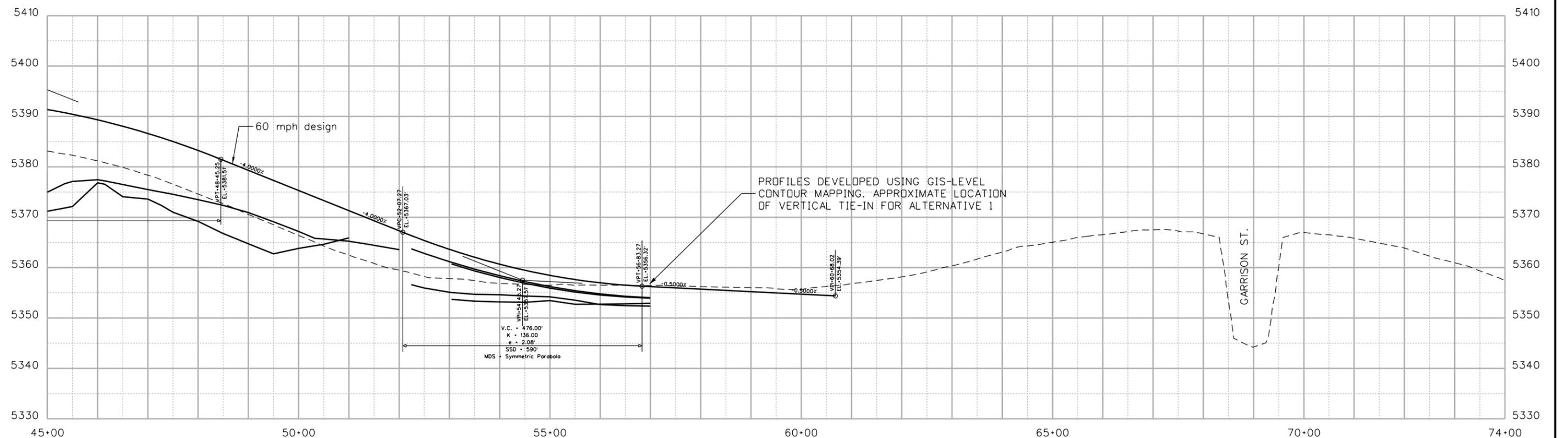
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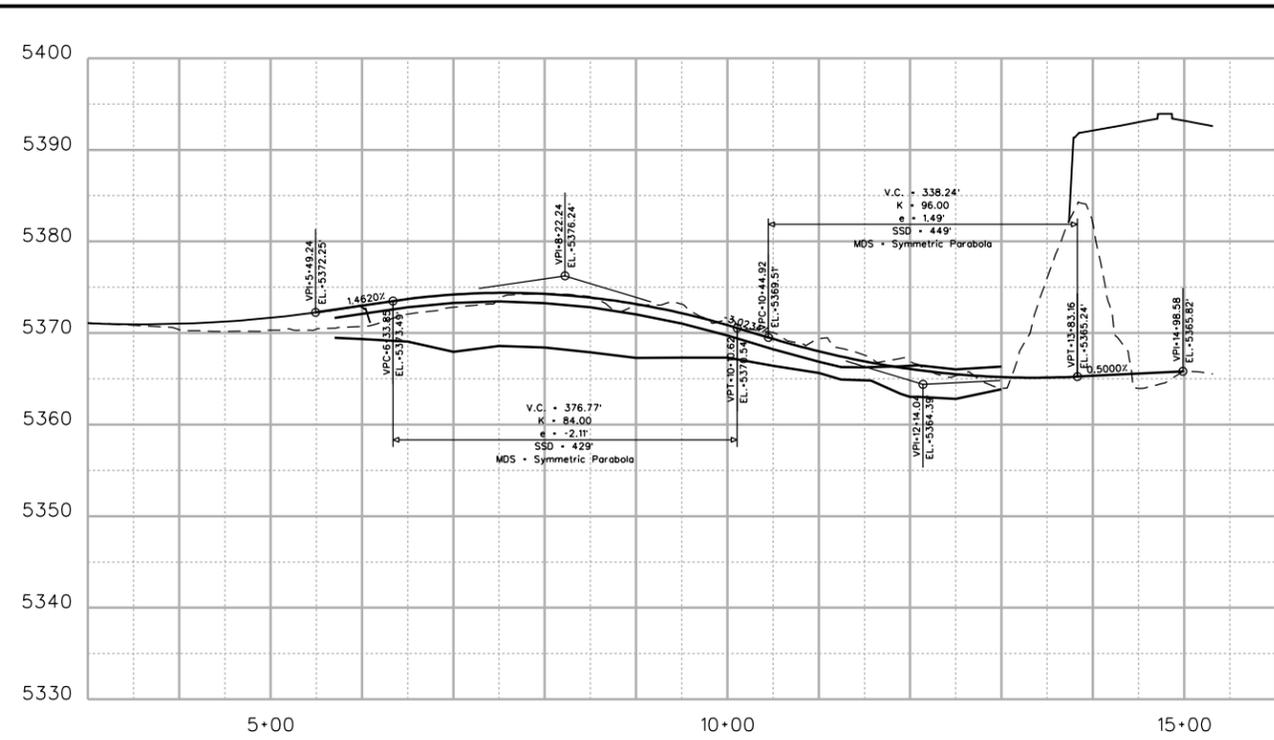
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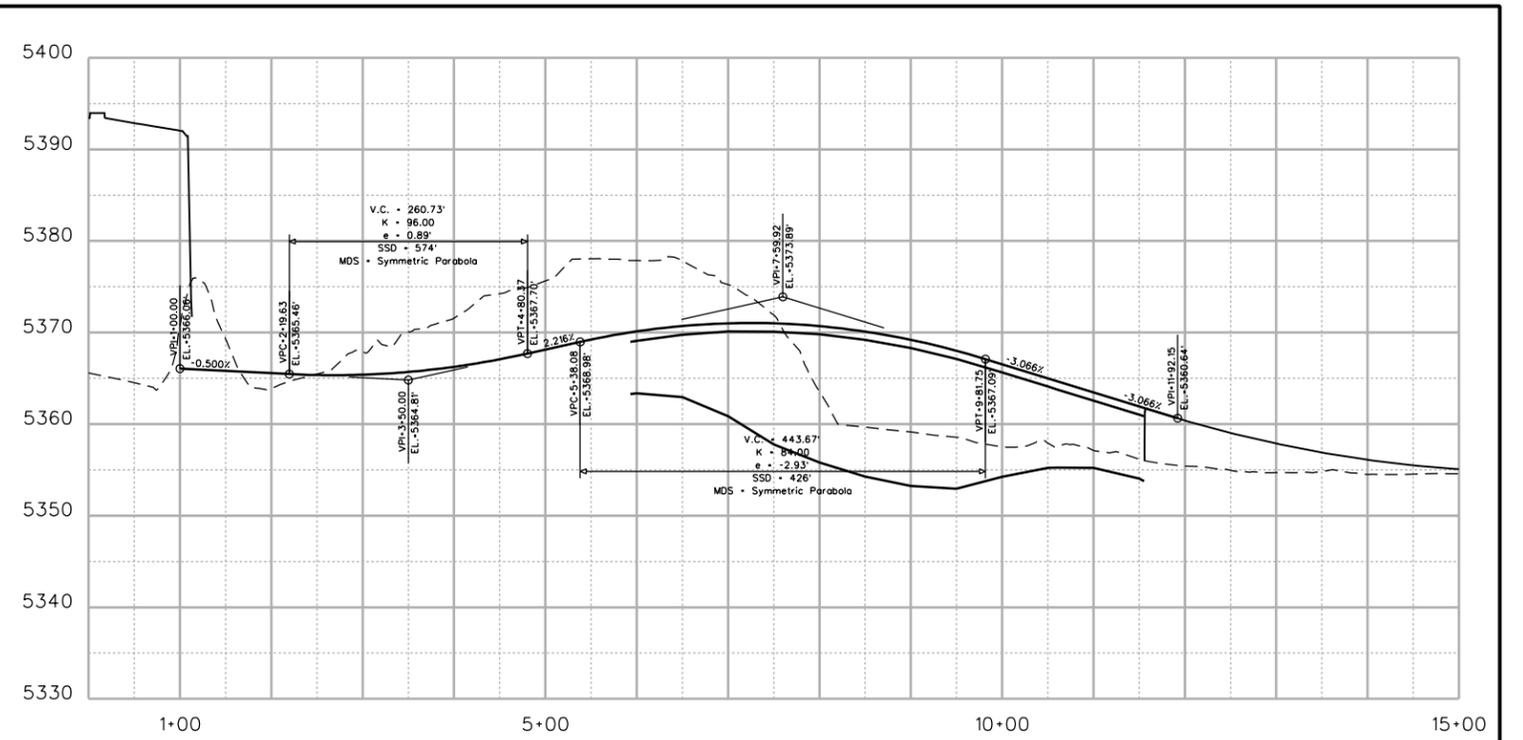
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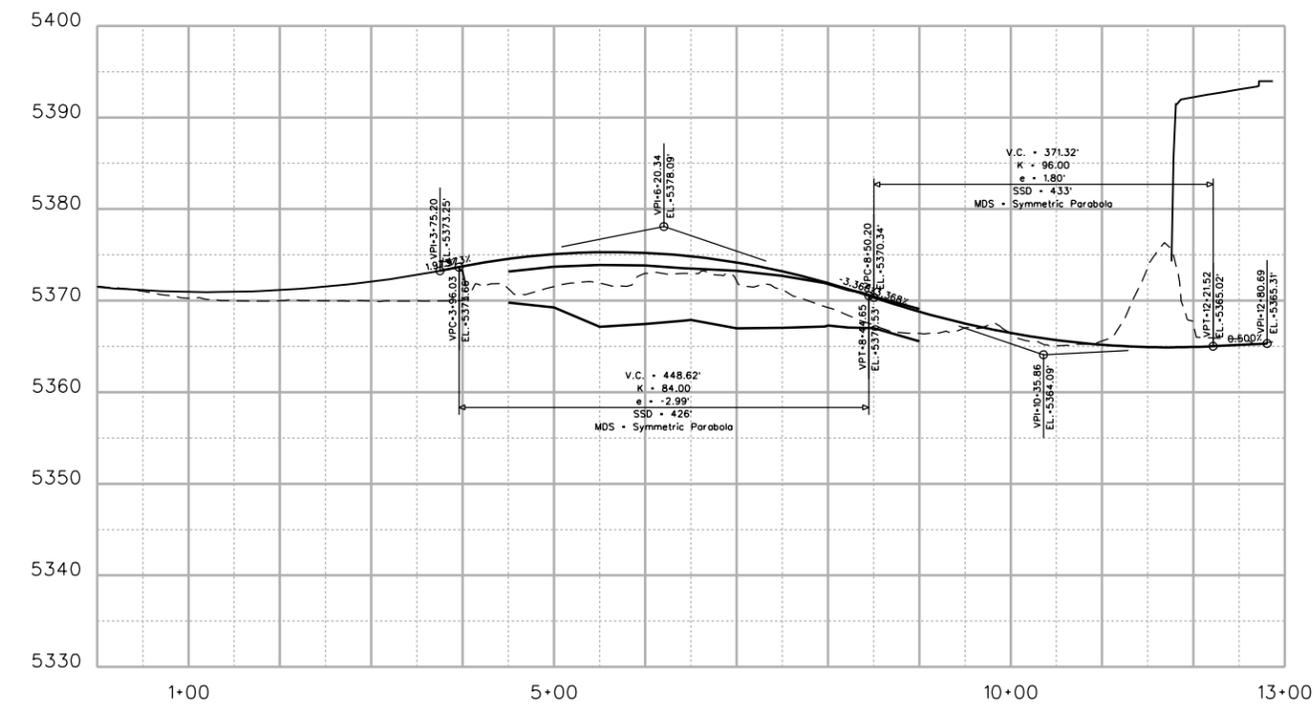
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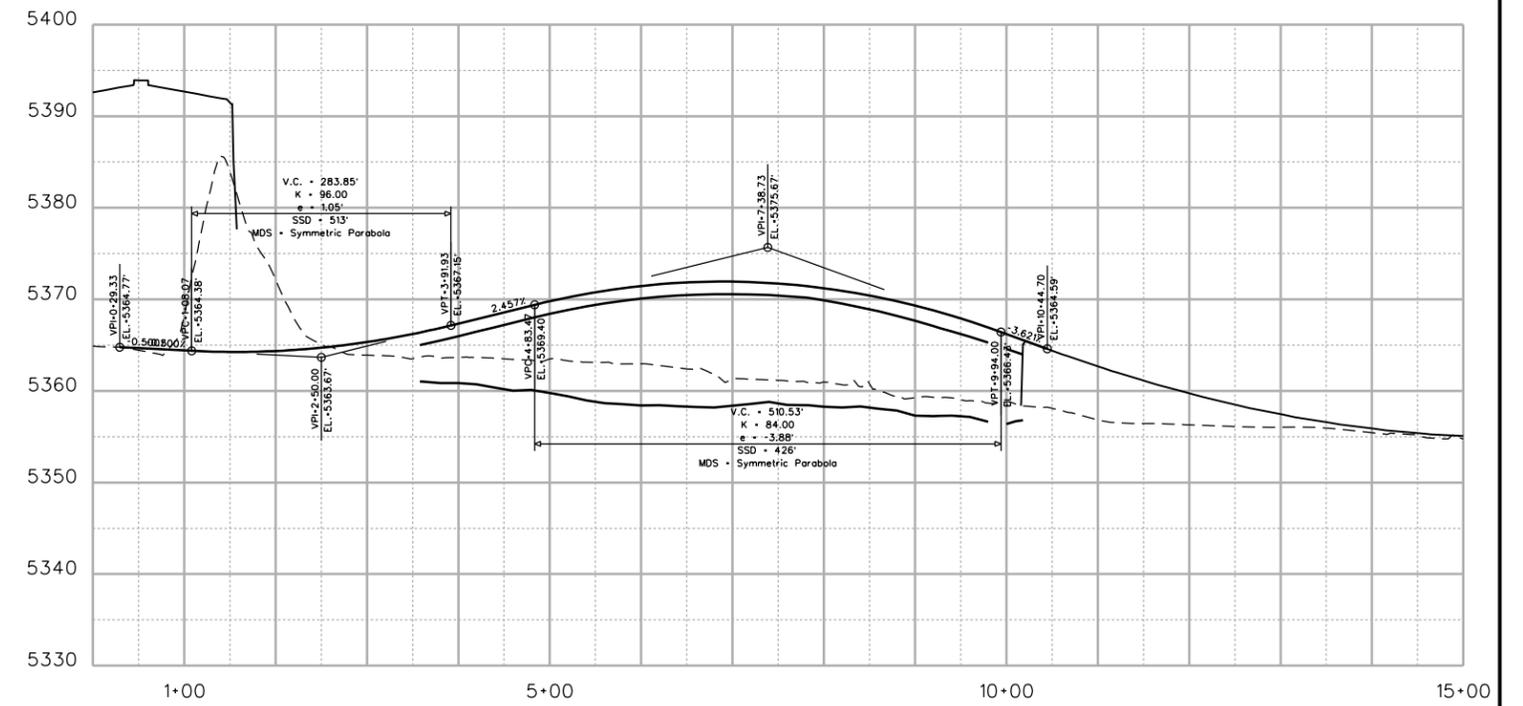
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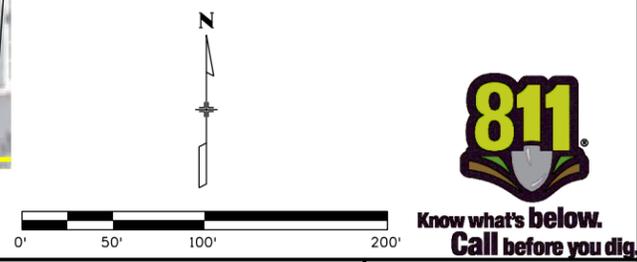
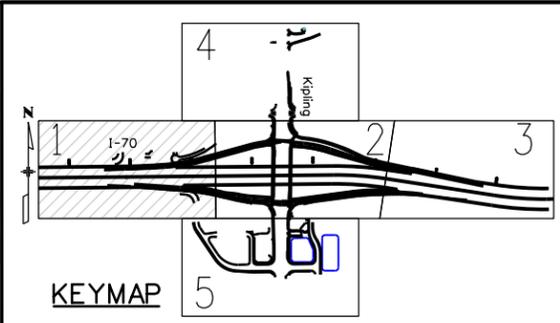
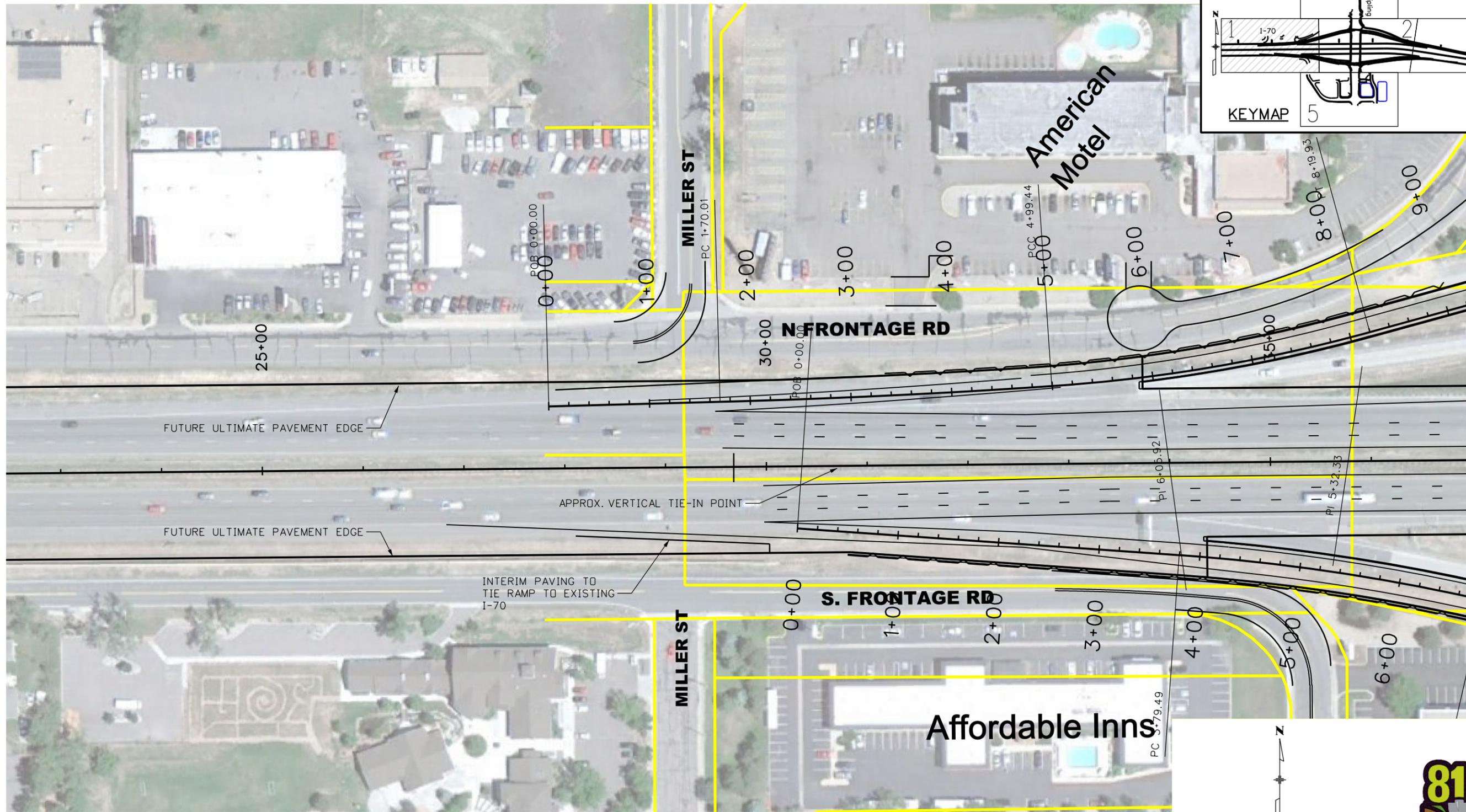
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Unit Information Unit Leader Initials	

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Colorado Department of Transportation

4670 Holly Street
Denver, CO 80216-6408
Phone: 303-398-6749 FAX: 720-945-1028

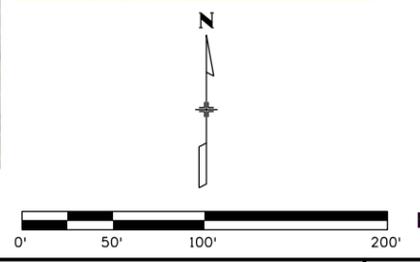
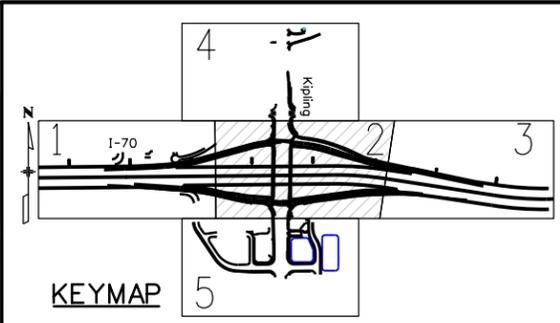
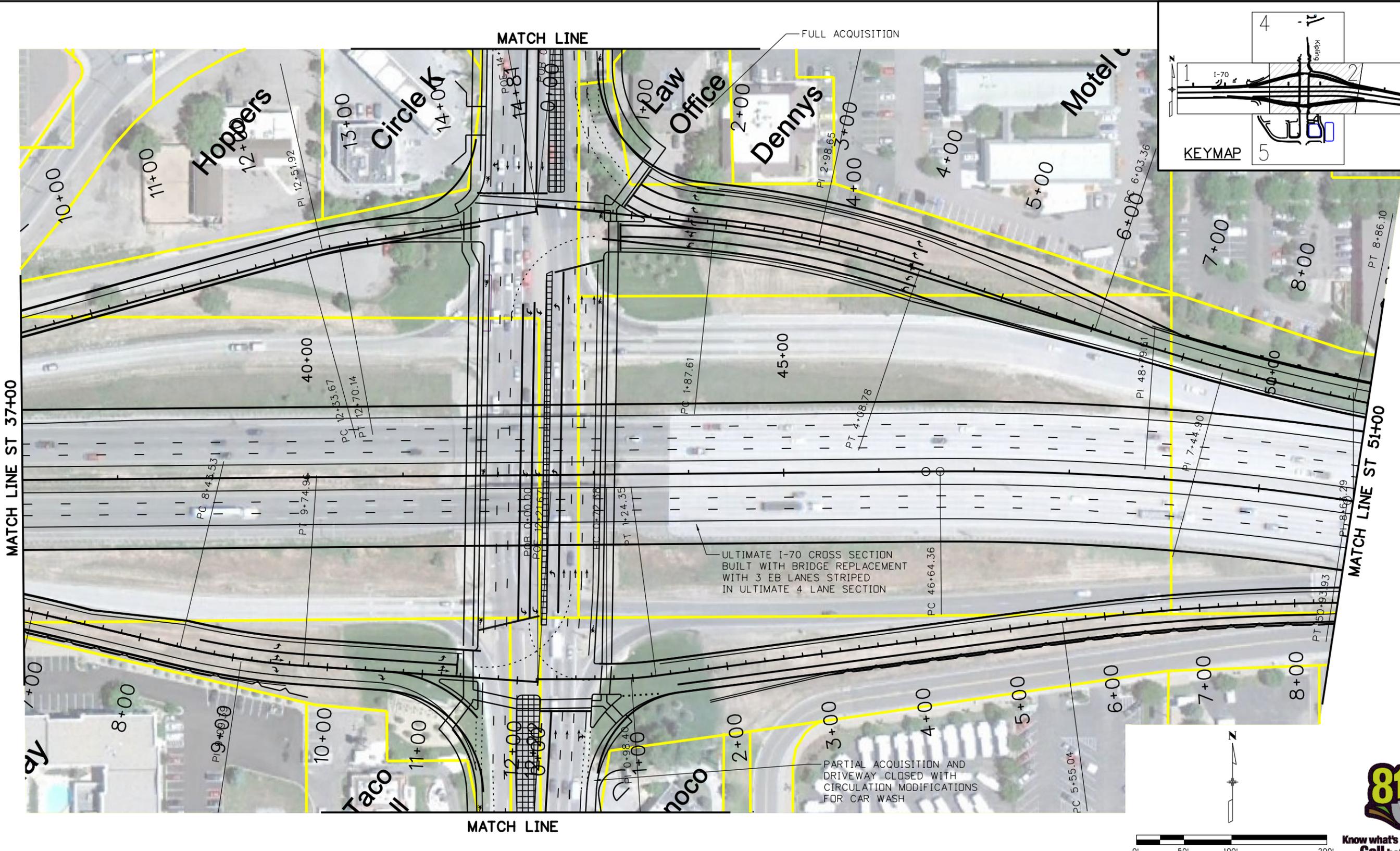
Region 6 DJH

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Designer:	D. Woolfall	Structure Numbers
Detailer:	L. Nichols	
Sheet Subset:	PLAN	Subset Sheets: 1 of 5

Project No./Code
16549
Sheet Number

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Colorado Department of Transportation

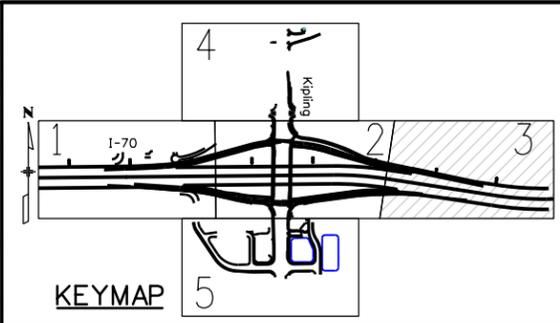
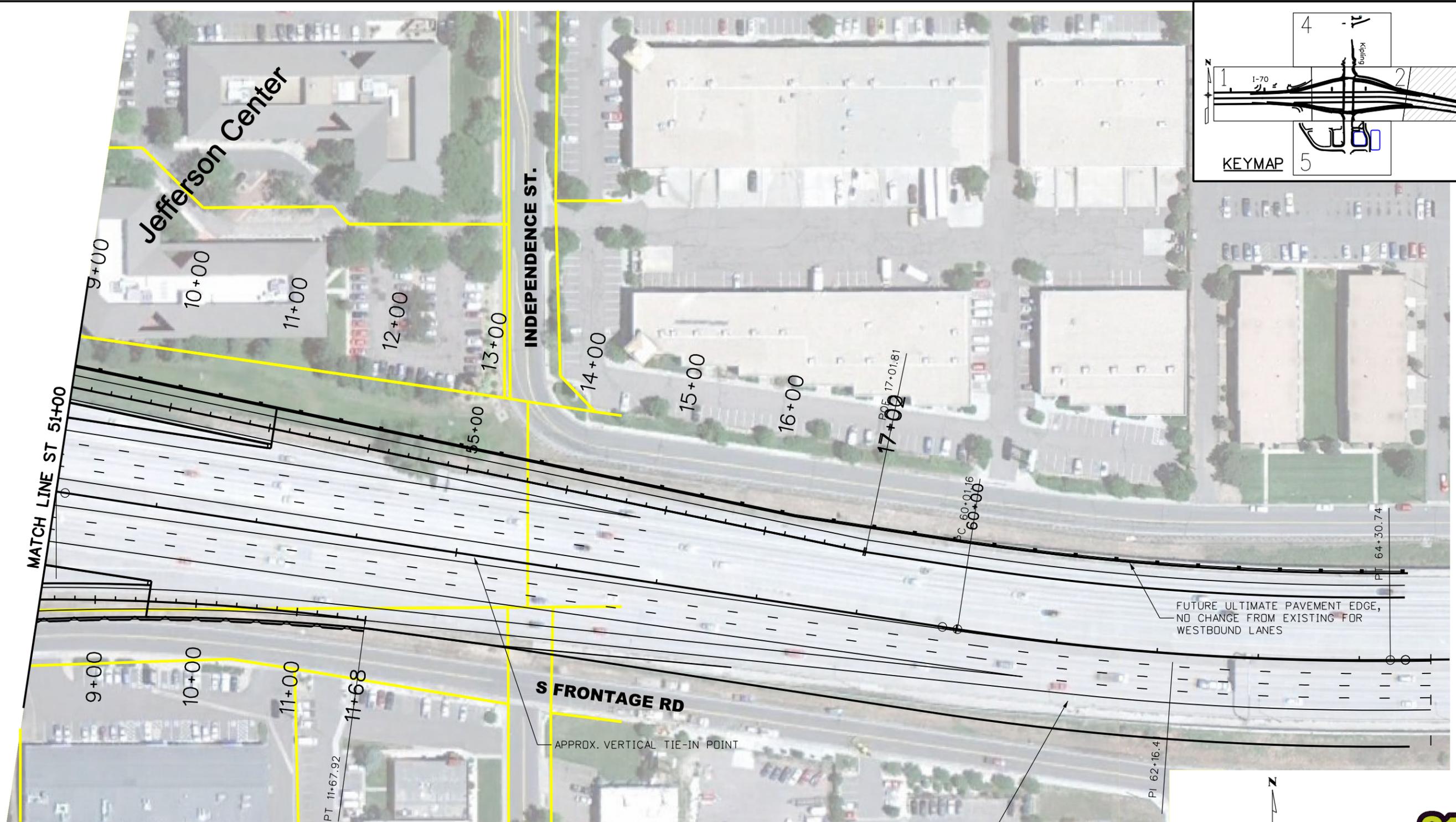
 4670 Holly Street
 Denver, CO 80216-6408
 Phone: 303-398-6749 FAX: 720-945-1028
Region 6 **DJH**

As Constructed
No Revisions:
Revised:
Void:

KIPLING I-70 ALTERNATE 12 - DIAMOND PLAN SHEET		
Designer:	D. Woolfall	Structure Numbers
Detailer:	L. Nichols	
Sheet Subset:	PLAN	Subset Sheets: 2 of 5

Project No./Code
16549
Sheet Number

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SHOWS INTERIM EASTBOUND STRIPING
 ON EXISTING PAVEMENT, ADDS 4TH
 EASTBOUND LANE BY SHIFTING EASTBOUND
 LANES TOWARD MEDIAN, REDUCING
 THE MEDIAN WIDTH WITH 5' INSIDE SHOULDERS



Print Date: 4/3/2013
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Horiz. Scale: 1:100 Vert. Scale: As Noted
Unit Information Unit Leader Initials

Sheet Revisions		
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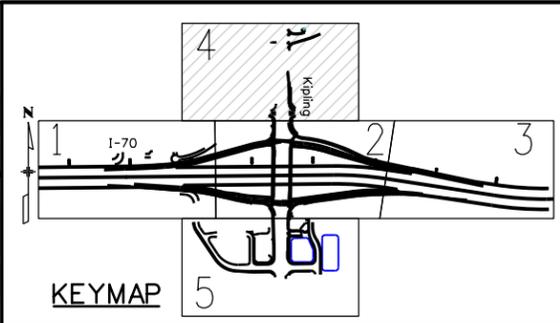
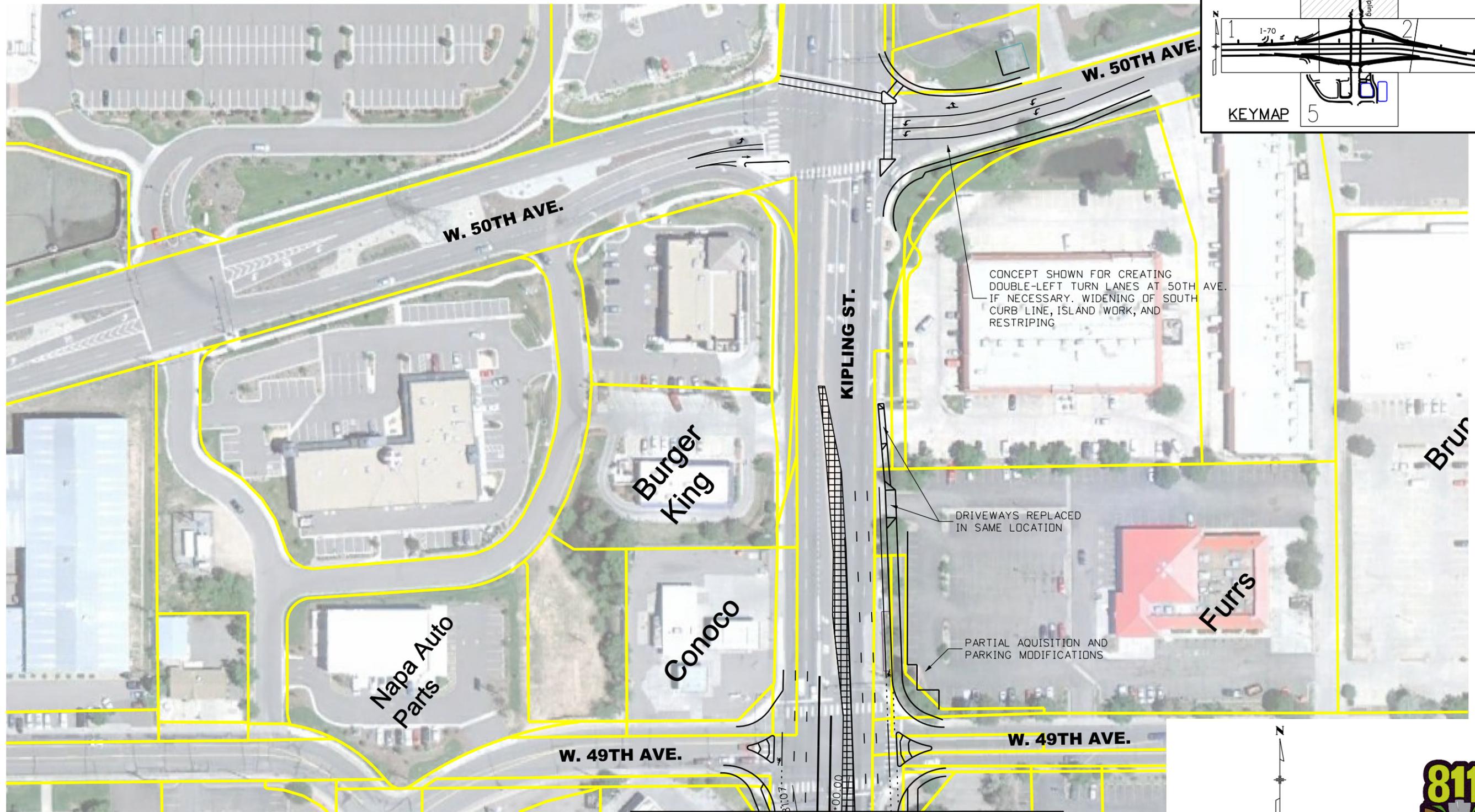
Colorado Department of Transportation

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Region 6 **DJH**

As Constructed
No Revisions:
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Void:

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Designer:	D. Woolfall	Structure Numbers
Detailer:	L. Nichols	
Sheet Subset:	PLAN	Subset Sheets: 3 of 5

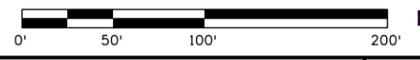
Project No./Code
16549
Sheet Number



CONCEPT SHOWN FOR CREATING DOUBLE-LEFT TURN LANES AT 50TH AVE. IF NECESSARY. WIDENING OF SOUTH CURB LINE, ISLAND WORK, AND RESTRIPIPING

DRIVEWAYS REPLACED IN SAME LOCATION

PARTIAL AQUISTION AND PARKING MODIFICATIONS



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Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation

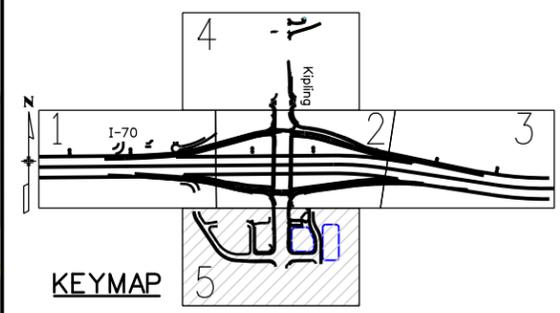
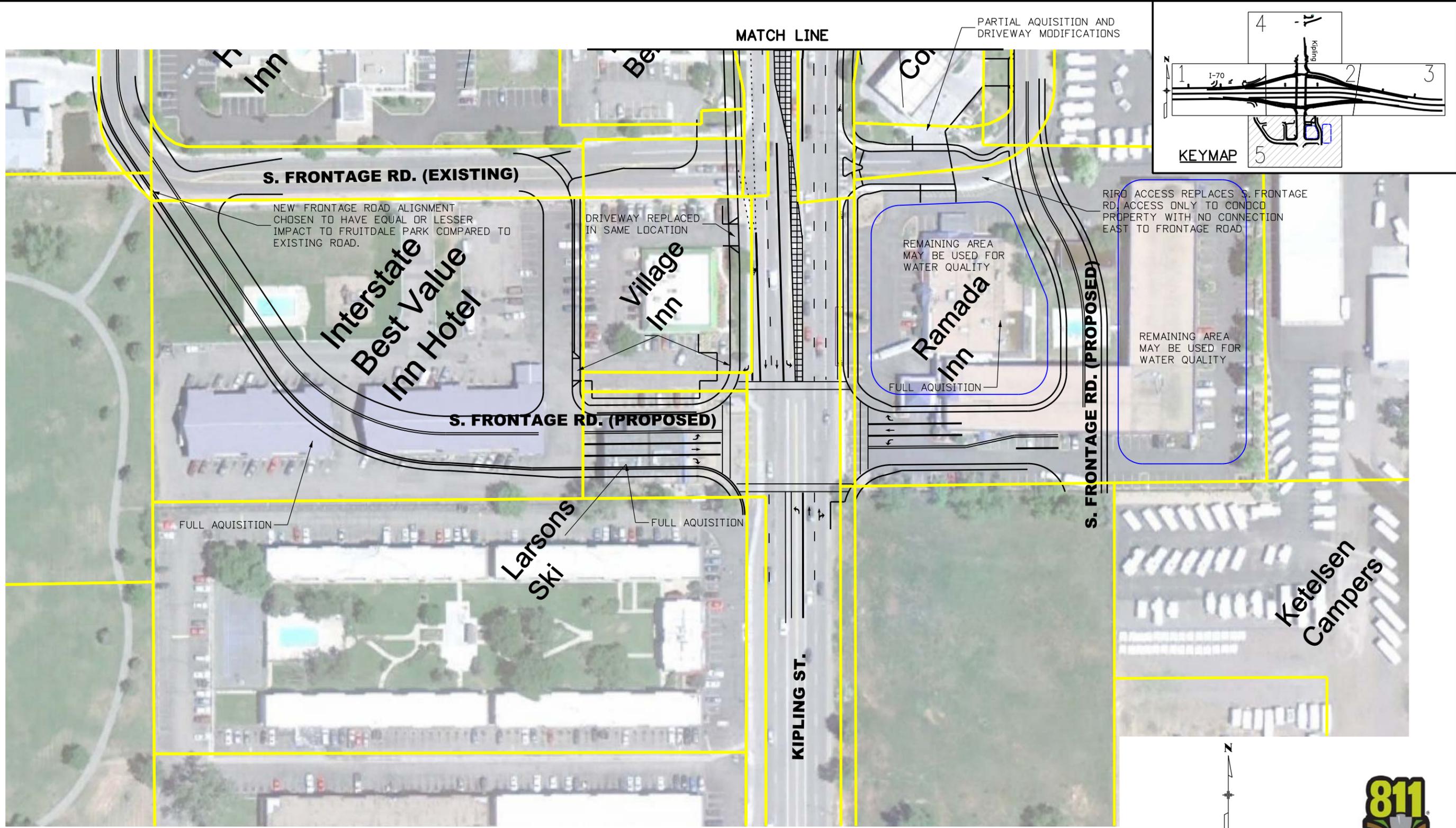
4670 Holly Street
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 Phone: 303-398-6749 FAX: 720-945-1028

Region 6 DJH

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Designer:	D. Woolfall	Structure Numbers	
Detailer:	L. Nichols		
Sheet Subset:	PLAN	Subset Sheets:	4 of 5

Project No./Code
16549
Sheet Number



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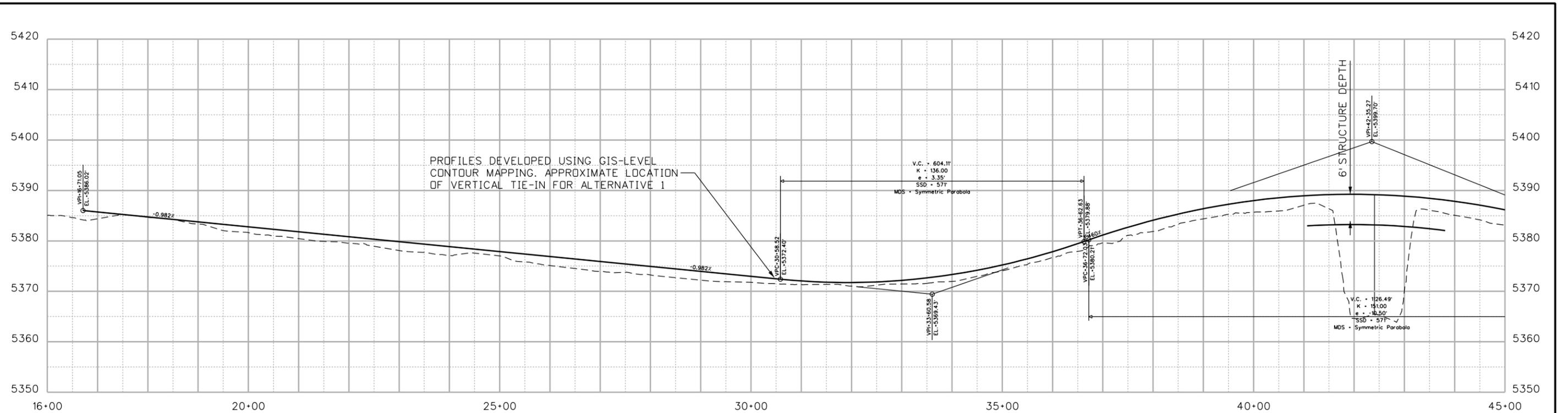
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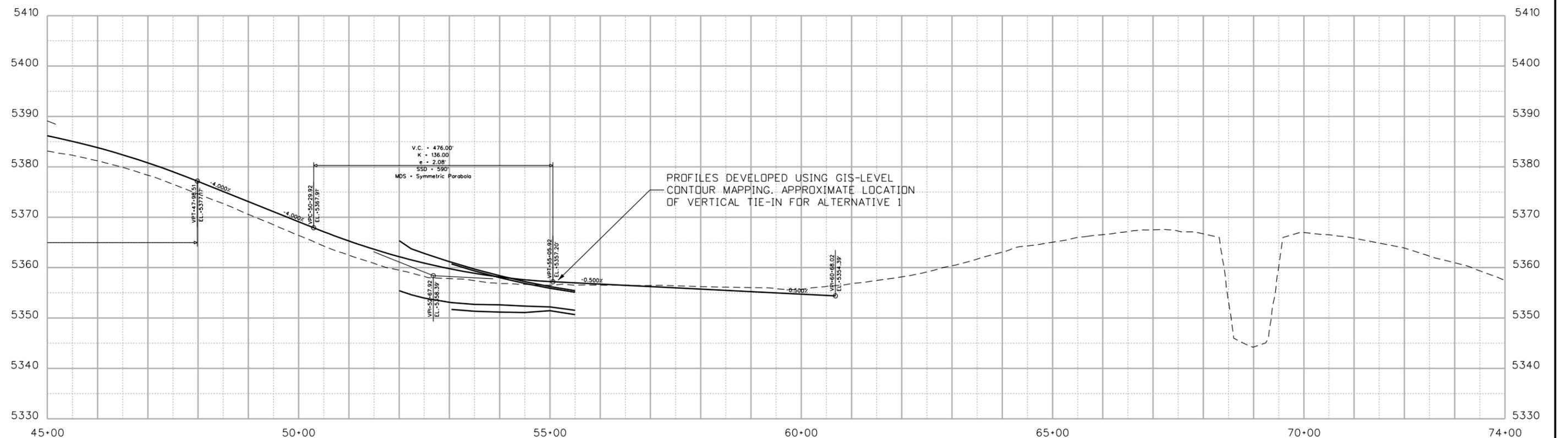
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Designer:	D. Woolfall	Structure Numbers
Detailer:	L. Nichols	
Sheet Subset:	PLAN	Subset Sheets: 5 of 5

Project No./Code
16549
Sheet Number

811
Know what's below.
Call before you dig.



I-70



I-70 CONTINUED

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Unit Information	Unit Leader Initials

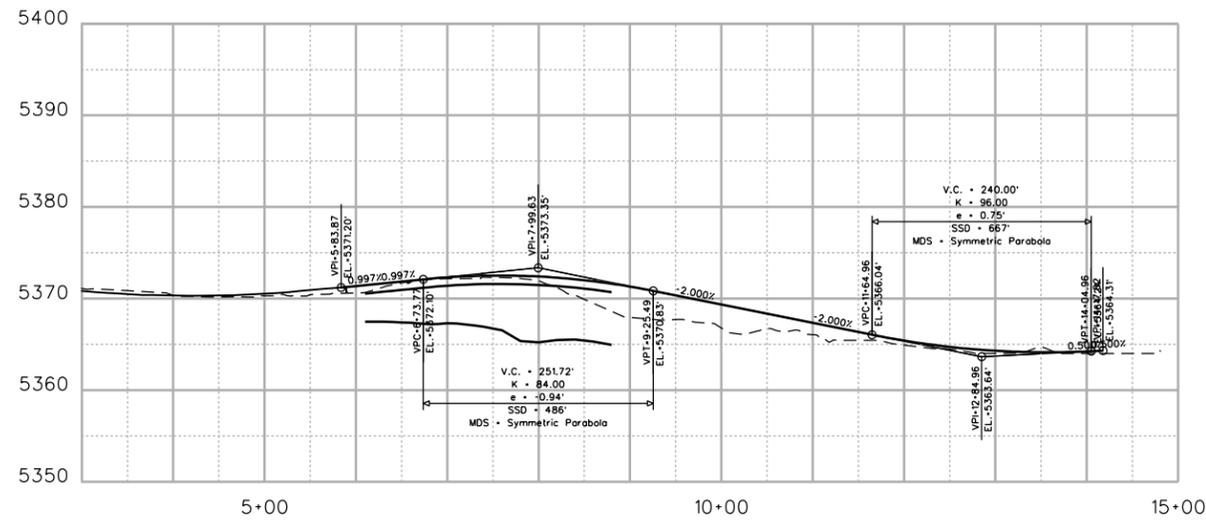
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Date:	Comments	Init.

Colorado Department of Transportation
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 Region 6 DJH

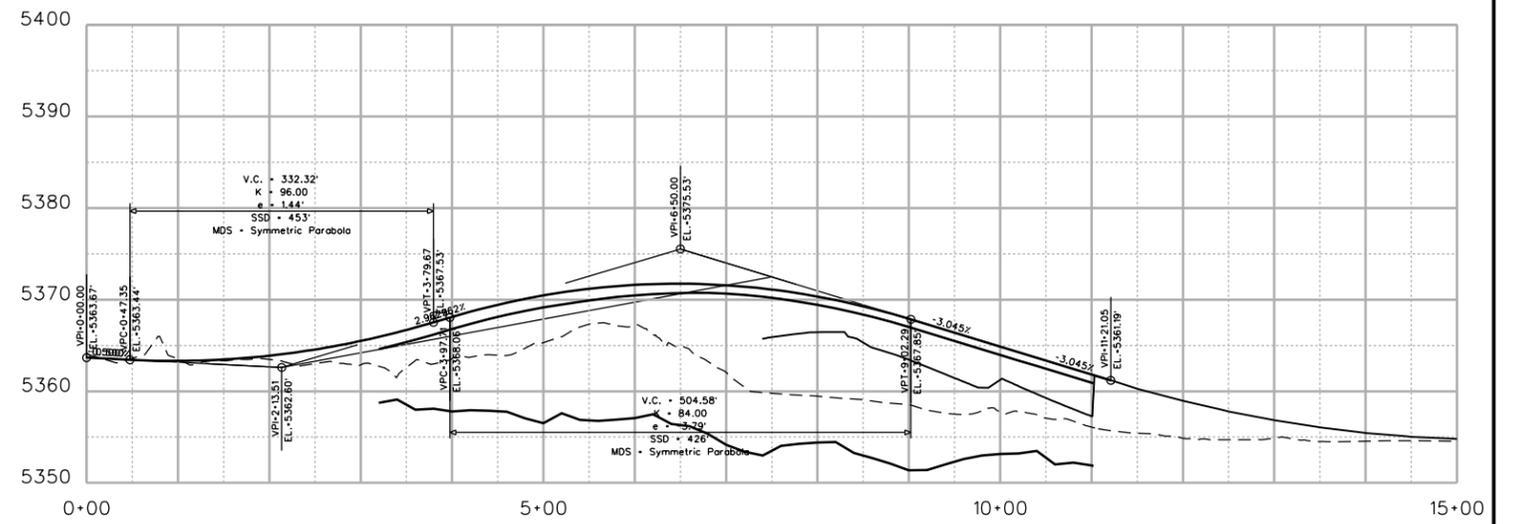
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Revised:
Void:

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Designer:	D. Woolfall	Structure Numbers
Detailer:	L. Nichols	
Sheet Subset:	PROF	Subset Sheets: 1 of 2

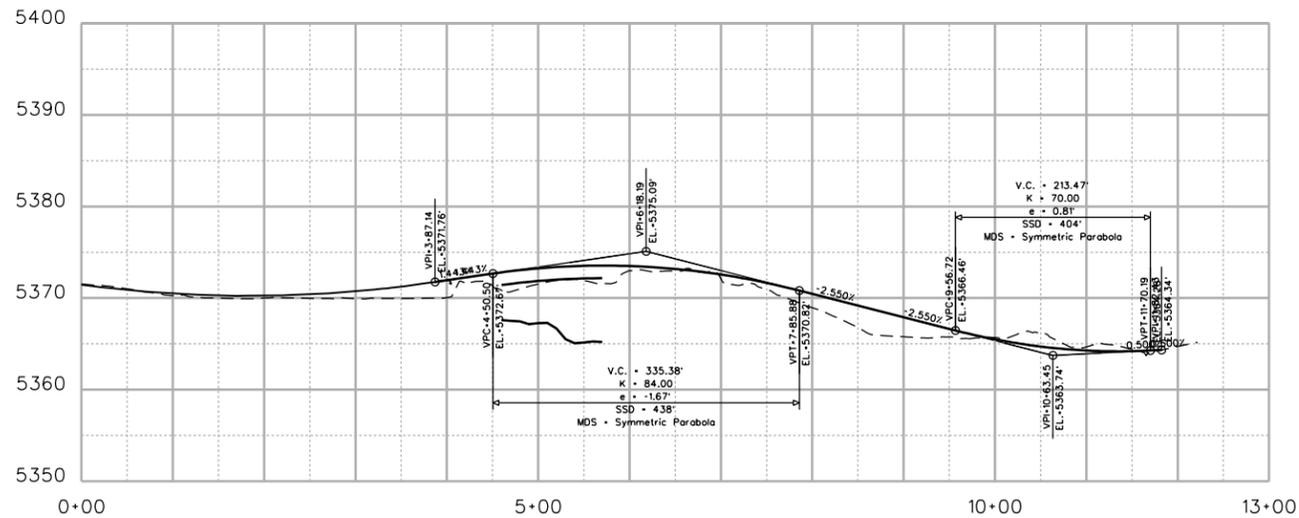
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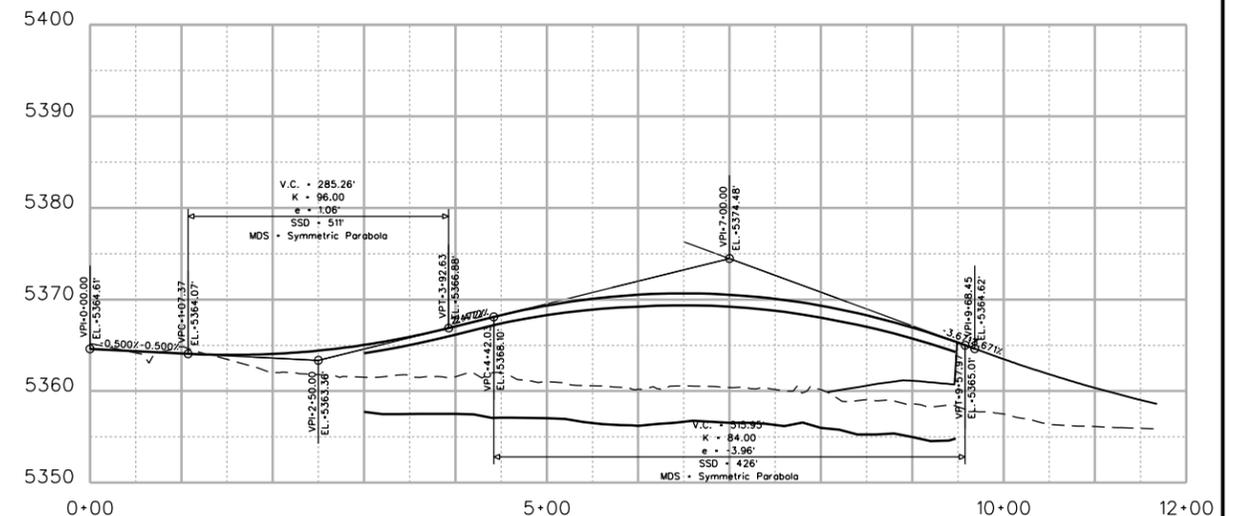
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RAMP NE



RAMP SW



RAMP SE

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 Unit Information Unit Leader Initials



Sheet Revisions		
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 Region 6 DJH

As Constructed
 No Revisions:
 Revised:
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KIPLING I-70
 ALTERNATE 12 - DIAMOND
 PROFILE SHEET
 Designer: D. Woolfall
 Detailer: L. Nichols
 Sheet Subset: PROF

Project No./Code
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 Sheet Number
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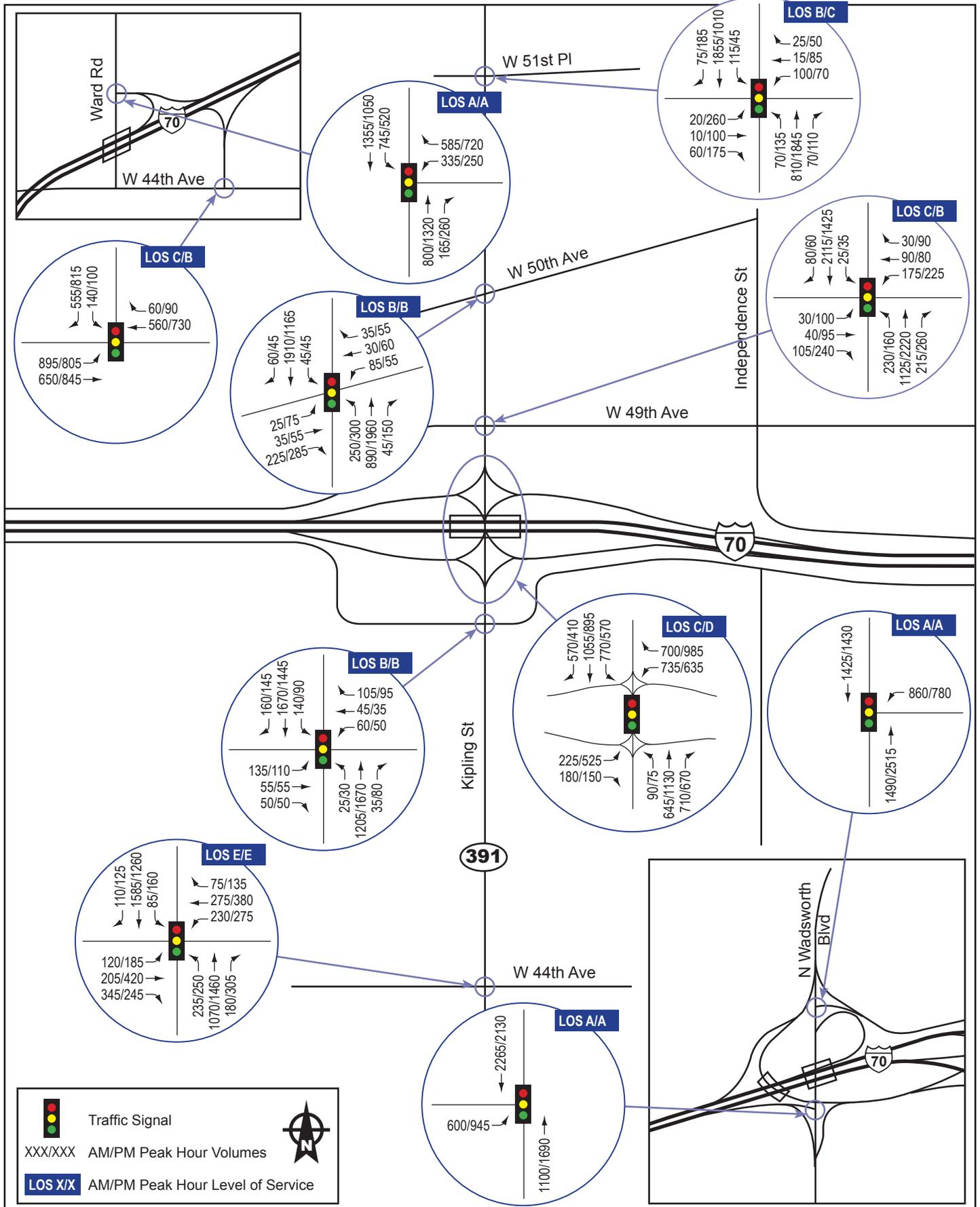
APPENDIX F

Traffic Volumes and Level of Service for Recommended Alternatives

I-70 & Kipling Interchange PEL Study

Year 2035 Alternative 1 Single Point Urban Interchange

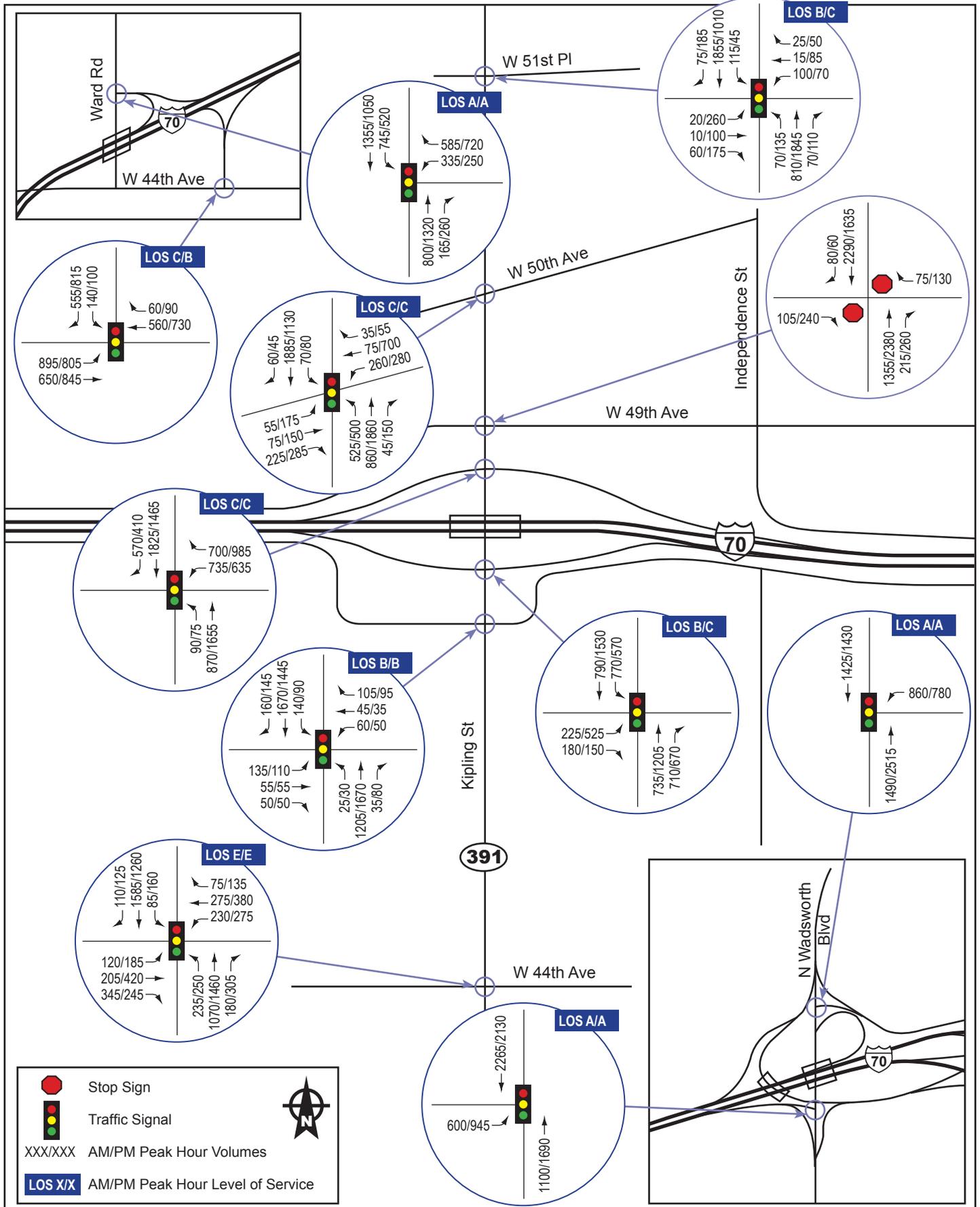
Intersection Traffic Volumes



I-70 & Kipling Interchange PEL Study

Alternative 12 Standard Diamond Interchange

Year 2035 Peak Hour Traffic Volumes and Level of Service



APPENDIX G

Cost Estimates for Recommended Alternatives

I-70/Kipling PEL
 C 0703-333 (16549)
 Conceptual Cost Estimate Alternative 1 - SPU
 Unit Cost Basis: CDOT 2012 Costs

ITEM NO.	QUANTITY ITEMS	UNIT	SPUI		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	16,300	\$4.50	\$73,350.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	51,000	\$6.00	\$306,000.00
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	73,392	\$14.00	\$1,027,488.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING)	TON	6,500	\$70.00	\$455,000.00
608-00006	CONCRETE SIDEWALK (6 INCH)	SY	2,700	\$35.00	\$94,500.00
609-21020	CURB AND GUTTER TYPE 2 (II-B)	LF	4,125	\$13.00	\$53,625.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	23,600	\$40.00	\$944,000.00
412-01300	CONCRETE PAVEMENT (13 INCH) (I-70 MAINLINE)	SY	39,400	\$45.00	\$1,773,000.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	27,000	\$7.00	\$189,000.00
	RETAINING WALLS	SF	57,610	\$60.00	\$3,456,600.00
	BRIDGE OVER KIPLING	SF	29,600	\$160.00	\$4,736,000.00
	TRAFFIC SIGNAL	EA	2	\$250,000.00	\$500,000.00
	TRAFFIC SIGNAL AT SPU INTERSECTION	EA	1	\$500,000.00	\$500,000.00
	DRAINAGE AND WATER QUALITY	LF	13,250	\$150.00	\$1,987,500.00
	TOTAL				\$16,096,063.00

Project Construction Bid Items	Project Dependent		\$16,096,000 (A)
Contingency - Unlisted Items Allowance	(15%-30%) of A	0.3	\$4,828,800 (B)
ITS	(6-10%) of (A+B) Default=6%	0.06	\$1,255,488 (C)
Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03 (Utilities only)	\$627,744 (D)
Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05	\$1,140,402 (E)
Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.25	\$5,987,108 (F)
Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07	\$2,095,488 (G)
Total of Construction Bid Items	(A+B+C+D+E+F+G)		\$32,031,000 (H)
Force Account - Utilities	(1-2%) of H Default=2%	0.02	\$640,620 (I)
Force Account - Misc.	(1-15%) of H Default 2%	0.02	\$640,620 (J)
Subtotal of Construction Cost	(H+I+J)		\$33,312,000 (K)
Total Construction Engineering	22.1% of K	0.221	\$7,361,952 (L)
Total Preliminary Engineering	15% of K	0.15	\$4,996,800 (M)
Total Project Construction Cost			\$45,671,000
Right-of-Way	(Calculated)		\$3,055,353
Total Project Cost with Right-of-Way			\$48,726,000 (P)

I-70/Kipling PEL					
C 0703-333 (16549)					
Conceptual Cost Estimate Alternative 1 - SPUI WB Off Ramp Phase					
Unit Cost Basis: CDOT 2012 Costs					
ITEM NO.	QUANTITY ITEMS	UNIT	SPUI		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	111	\$4.50	\$500.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	6,472	\$6.00	\$38,833.33
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	5,532	\$14.00	\$77,448.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING)	TON	387	\$70.00	\$27,104.00
608-00006	CONCRETE SIDEWALK (6 INCH)	SY	213	\$35.00	\$7,466.67
609-21020	CURB AND GUTTER TYPE 2 (II-B)	LF	1,050	\$13.00	\$13,650.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	9,349	\$40.00	\$373,977.78
412-01300	CONCRETE PAVEMENT (13 INCH) (I-70 MAINLINE)	SY	0	\$45.00	\$0.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	675	\$7.00	\$4,725.00
	RETAINING WALLS	SF	6,663	\$60.00	\$399,780.00
	BRIDGE OVER KIPLING	SF	0	\$160.00	\$0.00
	TRAFFIC SIGNAL	EA	1	\$125,000.00	\$125,000.00
	TRAFFIC SIGNAL AT SPUI INTERSECTION	EA	0	\$500,000.00	\$0.00
	DRAINAGE AND WATER QUALITY	LF	1,600	\$150.00	\$240,000.00
	TOTAL				\$1,308,484.78
	Project Construction Bid items	Project Dependent			\$1,308,000 (A)
	Contingency - Unlisted Items Allowance	(15%-30%) of A	0.3		\$392,400 (B)
	ITS	(6-10%) of (A+B)	0.06		\$102,024 (C)
		(3-10%) of (A+B)			
	Drainage/Utilities	Default=6%	0.03	(Utilities only)	\$51,012 (D)
		(1-5%) of (A+B+C+D)			
	Signing & Striping	Default =5%	0.05		\$92,672 (E)
		(5-25%) of (A+B+C+D+E)			
	Construction Signing & Traffic Control	Default=20%	0.1	adjusted down	\$194,611 (F)
		(4-10%) of (A+B+C+D+E+F)			
	Mobilization	Default =7%	0.07		\$149,850 (G)
	Total of Construction Bid Items	(A+B+C+D+E+F+G)			\$2,291,000 (H)
	Force Account - Utilities	(1-2%) of H Default=2%	0.02		\$45,820 (I)
	Force Account - Misc.	(1-15%) of H Default 2%	0.02		\$45,820 (J)
	Subtotal of Construction Cost	(H+I+J)			\$2,383,000 (K)
	Total Construction Engineering	22.1% of K	0.221		\$526,643 (L)
	Total Preliminary Engineering	15% of K	0.15		\$357,450 (M)
	Total Project Construction Cost				\$3,267,000
	Right-of-Way	(Calculated)			\$0
	Total Project Cost with Right-of-Way				\$3,267,000 (P)

I-70/Kipling PEL

DEA Job Number: CDOT00R60012

ROW Conceptual Cost Estimate Alternative 1 - SPUI

Unit Cost Basis: Jefferson County Assessors website & CDOT R6 ROW Staff

Assessor's Parcel Number	Property Address	Business Name	Property Value	Property Area (sf)	Impact Area (sf)	Percent Impact	\$25/sf for Partial impact	Relocation Cost	Demolition Cost	ROW Impact Cost
39-222-00-004	4700 Kipling St	Ramada Inn		121,557	4,865	4%	\$121,632			\$121,632
39-211-00-010	4775 Kipling St	Village Inn		31,842	2,064	6%	\$51,589			\$51,589
39-211-12-002	4795 Kipling St	Taco Bell		28,358	2,861	10%	\$71,524			\$71,524
39-164-00-021	4885 Kipling St	Circle K		30,490	6,659	22%	\$166,468			\$166,468
39-153-00-013	4890 Kipling St	Law Office		22,015	1,578	7%	\$39,455			\$39,455
39-211-12-002	4900 Kipling St	Furr's		113,030	10,663	9%	\$266,570			\$266,570
39-164-00-007	4901 Kipling St	Conoco		25,178	2,414	10%	\$60,356			\$60,356
39-222-00-003	4750 Kipling St	Conoco	\$1,500,000	21,693	21,693	100%		\$300,000	\$200,000	\$2,000,000

\$2,777,593
+10% Contingency **\$277,759**
Total **\$3,055,353**

I-70/Kipling PEL
 C 0703-333 (16549)
 Conceptual Cost Estimate Alternative 12 Traditional Diamond
 Unit Cost Basis: CDOT 2012 Costs

ITEM NO.	QUANTITY ITEMS	UNIT	DIAMOND INTERCHANGE - TOTAL		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	19,000	\$4.50	\$85,500.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	51,000	\$6.00	\$306,000.00
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	93,402	\$14.00	\$1,307,628.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING AND FRONTAGE ROADS)	TON	9,600	\$70.00	\$672,000.00
608-00006	CONCRETE SIDEWALK (6 INCH) (KIPLING AND FRONTAGE ROADS)	SY	4,120	\$35.00	\$144,200.00
609-21020	CURB AND GUTTER TYPE 2 (II-B) (KIPLING AND FRONTAGE ROADS)	LF	6,460	\$13.00	\$83,980.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	20,900	\$40.00	\$836,000.00
412-01300	CONCRETE PAVEMENT (13 INCH) (I-70 MAINLINE)	SY	39,600	\$45.00	\$1,782,000.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	16,500	\$7.00	\$115,500.00
	RETAINING WALLS	SF	16,895	\$60.00	\$1,013,700.00
	BRIDGE OVER KIPLING	SF	34,930	\$120.00	\$4,191,600.00
	TRAFFIC SIGNALS	EA	3	\$250,000.00	\$750,000.00
	DRAINAGE AND WATER QUALITY	LF	16,740	\$150.00	\$2,511,000.00
	TOTAL				\$13,799,108.00

Project Construction Bid items	Project Dependent		\$13,799,000 (A)
Contingencies - Unlisted Items Allowance	(15%-30% of A)	0.3	\$4,139,700 (B)
ITS	(6-10%) of (A+B) Default=6%	0.06	\$1,076,322 (C)
Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03 (utilities only)	\$538,161 (D)
Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05	\$977,659 (E)
Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.2	\$4,106,168 (F)
Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07	\$1,724,591 (G)
Total of Construction Bid Items	(A+B+C+D+E+F+G)		\$26,362,000 (H)
Force Account - Utilities	(1-2%) of H Default=2%	0.02	\$527,240 (I)
Force Account - Misc.	(1-15%) of H Default 2%	0.02	\$527,240 (J)
Subtotal of Construction Cost	(H+I+J)		\$27,416,000 (K)
Total Construction Engineering	22.1% of K	0.221	\$6,058,936 (L)
Total Preliminary Engineering	15% of K	0.15	\$4,112,400 (M)
Total Project Construction Cost			\$37,587,000
Right-of-Way	Project Dependent		\$10,980,629
Total Project Cost with ROW			\$48,570,000 (P)

I-70/Kipling PEL

DEA Job Number: CDOT00R60012

ROW Conceptual Cost Estimate Alternative 12 Traditional Diamond

Unit Cost Basis: Jefferson County Assessor website and CDOT Region 6 ROW Staff

Assessor's Parcel Number	Property Address	Business Name	Property Value	Property Area (sf)	Impact Area (sf)	Percent Impact	\$25/sf for Partial impact	Relocation Cost	Demolition Cost	ROW Impact Cost
39-164-00-018	10101 I-70 Frontage Rd	American Motel		230,650	7,102	3%	\$177,550			\$177,550
39-211-12-001	10101 I-70 Frontage Rd	Holiday Inn Express		230,650	3,756	2%	\$93,908			\$93,908
39-211-00-005	10200 I-70 Frontage Rd	Comfort Inn		76,491	1,815	2%	\$45,383			\$45,383
39-222-00-003	4750 Kipling St	Conoco		21,693	1,728	8%	\$43,205			\$43,205
39-211-00-010	4775 Kipling St	Village Inn		31,842	8,149	26%	\$203,718			\$203,718
39-211-12-002	4795 Kipling St	Taco Bell		28,358	3,227	11%	\$80,686			\$80,686
39-164-00-021	4885 Kipling St	Circle K		30,490	3,059	10%	\$76,476			\$76,476
39-211-12-002	4900 Kipling St	Furr's		113,030	6,481	6%	\$162,028			\$162,028
39-153-14-011	4990 Kipling St	Strip Mall		95,282	1,558	2%	\$38,953			\$38,953
39-153-00-007	5100 Kipling St	Car wash		16,213	3,278	20%	\$81,940			\$81,940
39-222-00-004	4700 Kipling St	Ramada Inn	\$3,000,000	121,227	121,227	100%		\$750,000	\$300,000	\$4,050,000
39-211-00-011	4715 Kipling St	Larsons Ski Shop	\$500,000	17,705	17,705	100%		\$200,000	\$50,000	\$750,000
39-211-00-009	4735 Kipling St	Interstate Best	\$2,500,000	133,729	133,729	100%		\$750,000	\$300,000	\$3,550,000
39-153-00-013	4890 Kipling St	Law Office	\$700,000	22,015	22,015	100%		\$150,000	\$50,000	\$900,000

\$9,982,390
 +10% Contingency **\$998,239**
Total \$10,980,629

I-70/Kipling PEL					
C 0703-333 (16549)					
Conceptual Cost Estimate Alternative 12 Traditional Diamond - WB Off Ramp Phase					
Unit Cost Basis: CDOT 2012 Costs					
ITEM NO.	QUANTITY ITEMS	UNIT	DIAMOND INTERCHANGE - NORTH SIDE		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	2,072	\$4.50	\$9,325.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	6,072	\$6.00	\$36,433.33
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	9,311	\$14.00	\$130,354.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING)	TON	1,401	\$70.00	\$98,046.67
608-00006	CONCRETE SIDEWALK (6 INCH)	SY	702	\$35.00	\$24,577.78
609-21020	CURB AND GUTTER TYPE 2 (II-B)	LF	3,000	\$13.00	\$39,000.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	9,349	\$40.00	\$373,977.78
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	11,200	\$7.00	\$78,400.00
	RETAINING WALLS	SF	9,848	\$60.00	\$590,880.00
	TRAFFIC SIGNALS	EA	1	\$250,000.00	\$250,000.00
	DRAINAGE AND WATER QUALITY	LF	2,300	\$150.00	\$345,000.00
	TOTAL				\$1,975,994.56
	Project Construction Bid items	Project Dependent			\$1,976,000 (A)
	Contingencies - Unlisted Items Allowance	(15%-30% of A	0.3		\$592,800 (B)
	ITS	(6-10%) of (A+B) Default=6%	0.06		\$154,128 (C)
	Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03	(utilities only)	\$77,064 (D)
	Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05		\$140,000 (E)
	Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.2		\$587,998 (F)
	Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07		\$246,959 (G)
	Total of Construction Bid Items	(A+B+C+D+E+F+G)			\$3,775,000 (H)
	Force Account - Utilities	(1-2%) of H Default=2%	0.02		\$75,500 (I)
	Force Account - Misc.	(1-15%) of H Default 2%	0.02		\$75,500 (J)
	Subtotal of Construction Cost	(H+I+J)			\$3,926,000 (K)
	Total Construction Engineering	22.1% of K	0.221		\$867,646 (L)
	Total Preliminary Engineering	15% of K	0.15		\$588,900 (M)
	Total Project Construction Cost				\$5,383,000
	Right-of-Way	Project Dependent			\$1,182,921
	Total Project Cost with ROW				\$6,570,000 (P)

I-70/Kipling PEL					
C 0703-333 (16549)					
Conceptual Cost Estimate Alternative 12 Traditional Diamond -WB On & Off Ramps Phase					
Unit Cost Basis: CDOT 2012 Costs					
ITEM NO.	QUANTITY ITEMS	UNIT	DIAMOND INTERCHANGE - NORTH SIDE		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	9,500	\$4.50	\$42,750.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	6,900	\$6.00	\$41,400.00
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	10,166	\$14.00	\$142,324.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING)	TON	3,500	\$70.00	\$245,000.00
608-00006	CONCRETE SIDEWALK (6 INCH)	SY	1,658	\$35.00	\$58,030.00
609-21020	CURB AND GUTTER TYPE 2 (II-B)	LF	1,450	\$13.00	\$18,850.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	10,900	\$40.00	\$436,000.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	9,200	\$7.00	\$64,400.00
	RETAINING WALLS	SF	11,149	\$60.00	\$668,940.00
	TRAFFIC SIGNALS	EA	1	\$250,000.00	\$250,000.00
	DRAINAGE AND WATER QUALITY	LF	4,340	\$150.00	\$651,000.00
	TOTAL				\$2,618,694.00
	Project Construction Bid items	Project Dependent			\$2,619,000 (A)
	Contingencies - Unlisted Items Allowance	(15%-30% of A	0.3		\$785,700 (B)
	ITS	(6-10%) of (A+B) Default=6%	0.06		\$204,282 (C)
	Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03	(utilities only)	\$102,141 (D)
	Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05		\$185,556 (E)
	Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.2		\$779,336 (F)
	Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07		\$327,321 (G)
	Total of Construction Bid Items	(A+B+C+D+E+F+G)			\$5,003,000 (H)
	Force Account - Utilities	(1-2%) of H Default=2%	0.02		\$100,060 (I)
	Force Account - Misc.	(1-15%) of H Default 2%	0.02		\$100,060 (J)
	Subtotal of Construction Cost	(H+I+J)			\$5,203,000 (K)
	Total Construction Engineering	22.1% of K	0.221		\$1,149,863 (L)
	Total Preliminary Engineering	15% of K	0.15		\$780,450 (M)
	Total Project Construction Cost				\$7,133,000
	Right-of-Way	Project Dependent			\$1,436,947
	Total Project Cost with ROW				\$8,570,000 (P)

I-70/Kipling PEL					
C 0703-333 (16549)					
Conceptual Cost Estimate Alternative 12 Traditional Diamond - South Half Phase					
Unit Cost Basis: CDOT 2012 Costs					
ITEM NO.	QUANTITY ITEMS	UNIT	DIAMOND INTERCHANGE - SOUTH SIDE		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	9,500	\$4.50	\$42,750.00
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	4,500	\$6.00	\$27,000.00
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	11,622	\$14.00	\$162,708.00
403-34841	HMA (6 INCH THICKNESS) (KIPLING AND FRONTAGE ROADS)	TON	6,100	\$70.00	\$427,000.00
608-00006	CONCRETE SIDEWALK (6 INCH) (KIPLING AND FRONTAGE ROADS)	SY	2,820	\$35.00	\$98,700.00
609-21020	CURB AND GUTTER TYPE 2 (II-B) (KIPLING AND FRONTAGE ROADS)	LF	5,010	\$13.00	\$65,130.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	10,000	\$40.00	\$400,000.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	7,300	\$7.00	\$51,100.00
	RETAINING WALLS	SF	1,915	\$60.00	\$114,900.00
	TRAFFIC SIGNALS	EA	2	\$250,000.00	\$500,000.00
	DRAINAGE AND WATER QUALITY	LF	7,000	\$150.00	\$1,050,000.00
	TOTAL				\$2,939,288.00
	Project Construction Bid items	Project Dependent			\$2,939,000 (A)
	Contingencies - Unlisted Items Allowance	(15%-30% of A	0.3		\$881,700 (B)
	ITS	(6-10%) of (A+B) Default=6%	0.06		\$229,242 (C)
	Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03	(utilities only)	\$114,621 (D)
	Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05		\$208,228 (E)
	Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.2		\$874,558 (F)
	Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07		\$367,314 (G)
	Total of Construction Bid Items	(A+B+C+D+E+F+G)			\$5,615,000 (H)
	Force Account - Utilities	(1-2%) of H Default=2%	0.02		\$112,300 (I)
	Force Account - Misc.	(1-15%) of H Default 2%	0.02		\$112,300 (J)
	Subtotal of Construction Cost	(H+I+J)			\$5,840,000 (K)
	Total Construction Engineering	22.1% of K	0.221		\$1,290,640 (L)
	Total Preliminary Engineering	15% of K	0.15		\$876,000 (M)
	Total Project Construction Cost				\$8,007,000
	Right-of-Way	Project Dependent			\$8,816,901
	Total Project Cost with ROW				\$16,820,000 (P)

I-70/Kipling PEL
 C 0703-333 (16549)
 Conceptual Cost Estimate Alternative 12 Traditional Diamond - South Frontage Road Phase
 Unit Cost Basis: CDOT 2012 Costs

ITEM NO.	QUANTITY ITEMS	UNIT	DIAMOND INTERCHANGE - SOUTH SIDE		
			Quantity	Unit Cost	Total Cost
202-00220	REMOVAL OF ASPHALT MAT	SY	9,245	\$4.50	\$41,600.50
202-00210	REMOVAL OF CONCRETE PAVEMENT	SY	0	\$6.00	\$0.00
203-00060	EMBANKMENT (COMPLETE IN PLACE)	CY	11,093	\$14.00	\$155,308.53
403-34841	HMA (6 INCH THICKNESS) (KIPLING AND FRONTAGE ROADS)	TON	5,276	\$70.00	\$369,292.00
608-00006	CONCRETE SIDEWALK (6 INCH) (KIPLING AND FRONTAGE ROADS)	SY	2,820	\$35.00	\$98,700.00
609-21020	CURB AND GUTTER TYPE 2 (II-B) (KIPLING AND FRONTAGE ROADS)	LF	4,800	\$13.00	\$62,400.00
412-00900	CONCRETE PAVEMENT (9 INCH) (RAMPS)	SY	0	\$40.00	\$0.00
610-00020	MEDIAN ISLAND (MEDIA COVER MATERIAL)	SF	7,300	\$7.00	\$51,100.00
	RETAINING WALLS	SF	0	\$60.00	\$0.00
	TRAFFIC SIGNALS	EA	1	\$250,000.00	\$250,000.00
	buildings/parking/clearing - ramada, larsons, interstate best value				
	DRAINAGE AND WATER QUALITY	LF	4,810	\$150.00	\$721,500.00
	TOTAL				\$1,749,901.03

Project Construction Bid Items	Project Dependent		\$1,750,000 (A)
Contingencies - Unlisted Items Allowance	(15%-30% of A	0.3	\$525,000 (B)
ITS	(6-10%) of (A+B) Default=6%	0.06	\$136,500 (C)
Drainage/Utilities	(3-10%) of (A+B) Default=6%	0.03 (utilities only)	\$68,250 (D)
Signing & Striping	(1-5%) of (A+B+C+D) Default =5%	0.05	\$123,988 (E)
Construction Signing & Traffic Control	(5-25%) of (A+B+C+D+E) Default=20%	0.2	\$520,748 (F)
Mobilization	(4-10%) of (A+B+C+D+E+F) Default =7%	0.07	\$218,714 (G)
Total of Construction Bid Items	(A+B+C+D+E+F+G)		\$3,343,000 (H)
Force Account - Utilities	(1-2%) of H Default=2%	0.02	\$66,860 (I)
Force Account - Misc.	(1-15%) of H Default 2%	0.02	\$66,860 (J)
Subtotal of Construction Cost	(H+I+J)		\$3,477,000 (K)
Total Construction Engineering	22.1% of K	0.221	\$768,417 (L)
Total Preliminary Engineering	15% of K	0.15	\$521,550 (M)
Total Project Construction Cost			\$4,767,000
Right-of-Way	Project Dependent		\$8,816,901
Total Project Cost with ROW			\$13,580,000 (P)

APPENDIX H
Planning and Environmental Linkages (PEL) Questionnaire



**Federal Highway Administration
Planning/Environmental Linkages Questionnaire**

**I-70 & Kipling Interchange Planning and Environmental Linkages (PEL) Study
Date Prepared: 7/19/13**

This questionnaire is intended to act as a summary of the Planning process and ease the transition from planning to a National Environmental Policy Act (NEPA) analysis. Often, there is no overlap in personnel between the planning and NEPA phases of a project, so consequently much (or all) of the history of decisions made in the planning phase is lost. Different planning processes take projects through analysis at different levels of detail. Without knowing how far, or in how much detail a planning study provided, NEPA project teams are not aware of and may often re-do work that has already been done. This questionnaire is consistent with the 23 CFR 450 (Planning regulations) and other FHWA policy on Planning and Environmental Linkages (PEL) process.

The Planning and Environmental Linkages study (PEL Study) is used in this questionnaire as a generic term to mean any type of planning study conducted at the corridor or subarea level which is more focused than studies at the regional or system planning levels. Many states may use other terminology to define studies of this type and are considered to have the same meaning as a PEL study.

At the inception of the PEL study, the study team must decide how the work will later be incorporated into subsequent NEPA efforts. A key consideration is whether the PEL study will meet standards established by NEPA regulations and guidance. One example is the use of terminology consistent with NEPA vocabulary (e.g. purpose and need, alternatives, affected environment, environmental consequences).

1. Background:

a. Who is the sponsor of the PEL study? (state DOT, Local Agency, Other)

Colorado Department of Transportation (CDOT)

b. What is the name of the PEL study document and other identifying project information (e.g. sub-account or STIP numbers, long-range plan or transportation improvement program years)?

I-70 & Kipling Interchange Planning and Environmental Linkages (PEL) Study

CDOT project number: C 0703-333 with subaccount number 16549

Funding for interchange reconstruction: STIP fiscal years 2012-2017

c. Who was included on the study team (Name and title of agency representatives, consultants, etc.)?

City of Arvada, City of Wheat Ridge, Jefferson County, CDOT, Denver Regional Council of Governments (DRCOG), Federal Highway Administration (FHWA), and Regional Transportation District (RTD).

Please see the Acknowledgements section at the beginning of the *PEL Report* for a detailed list of study team participants.

d. Provide a description of the existing transportation facility within the corridor, including project limits, modes, functional classification, number of lanes, shoulder width, access control and type of surrounding environment (urban vs. rural, residential vs. commercial, etc.)

The traffic study area roadways include I-70 from Ward Road to Wadsworth Boulevard, which encompasses the interchanges adjacent to the I-70 and Kipling Street interchange. The traffic study roadways include Kipling Street from 44th Avenue to 51st Place, the major intersections approximately ½ mile north and south of the interchange. The traffic study area also includes 44th Avenue, which was evaluated as a parallel arterial to I-70 with the existing conditions evaluation.

The environmental study area is focused around the area of most likely physical impacts of interchange improvements along I-70 and Kipling Street. To take into account the potential for indirect or secondary effects to community or environmental resources as a result of a proposed action, the environmental study area was extended to the back property line of area parcels.

The I-70 and Kipling Street interchange is located within the City of Wheat Ridge in Jefferson County. The interchange is located in a predominantly urban area and provides access to well-established commercial, residential and light industrial areas, as well as areas identified for urban renewal and new transit-oriented development in Wheat Ridge and Arvada.

I-70 is a major east-west interstate highway that crosses central Colorado and travels through the middle of the Denver metropolitan area. Within the study area, I-70 has six through lanes. East of Kipling Street to Wadsworth Boulevard, I-70 has three through lanes eastbound and four through lanes westbound with the inside through lane merging at the Kipling Street bridge. There is also a westbound continuous auxiliary lane between the Wadsworth and Kipling interchanges. The speed limit along I-70 from the Ward Road interchange through the Wadsworth Boulevard interchange is 65 miles per hour (MPH).

Kipling Street is a principal north-south arterial within the Denver metropolitan area. It is designated State Highway 391 between US 285 in Lakewood and 49th Avenue in Wheat Ridge. Within the study area, CDOT defines the functional classification of Kipling Street as Other – Principal Arterial. Kipling Street has four through lanes and two continuous turn lanes from 44th Avenue to 51st Place with a posted speed limit of 40 MPH. The section north of I-70 contains six lanes with the additional lanes providing continuous auxiliary lanes between the westbound I-70 ramps and 50th Avenue. There are seven traffic signals along Kipling Street within the study area and only the southbound approach at the eastbound I-70 ramps and northbound approach at the 50th Avenue intersection have double left turn lanes.

Also, please see the Introduction section of the *PEL Report* and the full Existing Conditions Report for more detailed information of the existing interchange.

e. Provide a brief chronology of the planning activities (PEL study) including the year(s) the studies were completed.

(Month/year noted below indicates date the activity and documentation was completed.)

- Study initiation – January 2012
- Data collection – February 2012
- Existing conditions assessment – May 2012
- Environmental overview – May 2012
- Purpose and Need development – May 2012

- Alternatives development – July 2012
- Alternative screening – March 2013
- *Final PEL Report* – July 2013

Please also see the Agency and Public Coordination section in the *PEL Report* for dates of meetings held during the study.

f. Are there recent, current or near future planning studies or projects in the vicinity? What is the relationship of this project to those studies/projects?

A number of plans have been developed that relate to the study area, including plans for the adjacent land use, local transportation plans, and statewide plans. Previous local and regional plans that were considered during the alternatives development process include:

- *Envision Wheat Ridge* (2009)
- *City of Wheat Ridge Bicycle and Pedestrian Master Plan* (2010)
- *City of Arvada Comprehensive Plan* (2006)
- *City of Arvada Pedestrian and Bicycle Access Plan* (2009)
- *Jefferson County Countywide Transportation Plan* (2002)
- *Jefferson County Bicycle and Pedestrian Plan* (2012)
- *2035 Metro Vision Regional Transportation Plan* (2011)
- *2035 Statewide Transportation Plan* (2011)

The reconstruction of the I-70 and Kipling Street interchange is consistent with local and regional transportation plans. The project is included in DRCOG’s Fiscally Constrained 2035 Regional Transportation Plan. There are no current transportation improvement projects within the area immediately adjacent to the I-70 and Kipling Street interchange. However, there are a number of engineering and planning efforts taking place in the near term within the larger area surrounding the interchange. These programmed improvements with committed funding sources are described with the No Action alternative in the Alternatives Evaluation Summary section of the PEL Report.

2. Methodology used:

a. What was the scope of the PEL study and the reason for completing it?

The scope of the PEL study is to provide an understanding of the existing conditions of the interchange and work with stakeholders to develop and evaluate a range of improvements to reduce congestion and improve operational performance and safety at the interchange.

b. Did you use NEPA-like language? Why or why not?

Yes, NEPA-like language was used to provide the framework for the implementation of the study recommendations as funding is available and to be used as a resource for future NEPA documentation (future Categorical Exclusions or Environmental Assessment).

c. What were the actual terms used and how did you define them? (Provide examples or list)

The following terms in this PEL study are the same in meaning to those used in NEPA:

- Purpose and Need
- Logical Termini
- Independent Utility
- No Action Alternative
- Preferred Alternative

The term “Recommended Alternative” was used to refer to the alternatives that were recommended by the PEL study to be considered for selection as the Preferred Alternative in the subsequent NEPA process. Based on the alternatives screening conducted in the PEL Study, the recommended alternatives are the alternatives that were determined to meet the Purpose and Need to the highest degree while minimizing environmental and community impacts.

d. How do you see these terms being used in NEPA documents?

The “Recommended Alternative” can be used to refer to the recommendations from the alternatives screening conducted in the PEL Study when identifying the Preferred Alternative in the Alternatives chapter of the NEPA document or when referencing PEL Study recommendations for the NEPA documentation of a project phase.

The other terms in this PEL study will also be used in NEPA documents in the same way as they were used in the PEL study.

e. What were the key steps and coordination points in the PEL decision-making process? Who were the decision-makers and who else participated in those key steps? For example, for the corridor vision, the decision was made by state DOT and the local agency, with buy-in from FHWA, the USACE, and USFWS and other resource/regulatory agencies.

The primary decision-makers in the study process were the agency participants involved in the Technical Team, including City of Arvada, City of Wheat Ridge, Jefferson County, CDOT, DRCOG, FHWA, and RTD. Concurrence was gained at the meetings at the following key study milestones:

Milestone	Schedule	Means of Concurrence
Technical Team Charter	Technical Team Meeting #2 March 2012	Team member signatures
Purpose and Need Statement	Technical Team Meeting #3 April 2012	Team acceptance of meeting notes
Evaluation Criteria	Technical Team Meeting #4 June 2012	Team acceptance of meeting notes
Initial Alternatives Developed & Level 1 Alternatives Screening Results	Technical Team Meeting #5 July 2012	Team acceptance of meeting notes
Level 2 Evaluation Criteria	Technical Team Meeting #6 August 2012	Team acceptance of meeting notes
Level 2 Alternatives Screening Results	Technical Team Meeting #8 November 2012	Team acceptance of meeting notes
Improvement Recommendations	Technical Team Meeting #9 January 2013	Team acceptance of meeting notes
Final Study Recommendations	Technical Team Meeting #10 April 2013 Study Completion July 2013	Team acceptance of meeting notes Team member signatures on a support page Agency support letter and/or Resolution

The study was coordinated with local, State and Federal resource agencies with distribution of information to representatives at two points during the study. Early in the study a letter and study area map were mailed as an introduction to this PEL process and request for input on the existing conditions and concerns within the study area, along with the project Purpose and Need. A second letter was mailed serving as an update on the study following Level 2 alternatives screening. Graphics of the two recommended alternatives and a summary of critical considerations were

enclosed for review to identify potential resource impacts and next steps required for future NEPA process(es). A summary of the resource agency coordination and input is included in Appendix C of the *PEL Report*.

The following input was received from resource agencies:

- Colorado Parks & Wildlife (CPW) indicated they did not foresee the area containing any environmentally sensitive areas or species of concern.
- Colorado State Historic Preservation Office (SHPO) indicated that consultation under Section 106 of the National Historic Preservation Act should be undertaken.
- Colorado Division of Public Health and Environment (CDPHE), Air Pollution Control Division indicated no preference for either Recommended Alternative.
- U.S. Army Corps of Engineers (USACE) indicated that any wetlands in the area are likely non-jurisdictional but requested an approved jurisdictional determination, ongoing coordination regarding drainages, ponds, and a potential aqueduct in the area, and Section 404 permit if necessary.
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service indicated that there is no prime and/or unique farmland in the study area and therefore is not subject to the Farmland Protection Act.
- U.S. Fish and Wildlife Service (USFWS) noted that there are no species listed under the federal Endangered Species Act that will be directly affected by the project. They appreciate efforts to avoid impacts to migratory birds.

No response was received by the following agencies:

- Jefferson County Parks and Open Space
- Jefferson County Planning and Zoning
- U.S. Environmental Protection Agency (EPA)

In addition, small group meetings were held with individuals representing public agencies and organizations, emergency providers, and others directly affected by the project work to identify likely impacts and help shape the study recommendations. These meetings and presentations occurred as follows:

- Transportation Environmental Resource Council Briefing – February 13, 2012
- Jefferson County Transportation Action and Advocacy Group Presentation –April 11, 2012 and December 12, 2012 and May 8, 2013
- LiveWell Wheat Ridge Meeting – May 22, 2012 and May 14, 2013
- City of Arvada Council Workshop Presentation – November 12, 2012
- Colorado State Patrol and Arvada Fire District Meeting – November 29, 2012
- Wheat Ridge Police Department and Pridemark Paramedic Services Meeting – November 29, 2012
- City of Wheat Ridge Public Works and Community Development Meeting –December 7, 2012 and May 8, 2013
- City of Wheat Ridge Council Presentation – December 17, 2012
- RTD Meeting – February 12, 2013

During coordination with LiveWell Wheat Ridge, the potential for a Health Impact Assessment (HIA) for the study area was discussed. Although a formal HIA was not performed for this study, many of the goals of an HIA were incorporated into the alternatives evaluation process. An overview of the study process related to an HIA is provided in the *Health Impact Assessment Overview, Connections and Strategies Technical Memorandum* in Appendix A of the *PEL Report*.

f. How should the PEL information be presented in NEPA?

The PEL study documentation was prepared consistent with NEPA and allows the future NEPA study effort to readily extract pertinent data from the reports. The PEL alternatives evaluation process included developing screening criteria based on the project Purpose and Need, developing a full range of alternatives, and documenting the elimination of alternatives to all reasonable alternatives in order to limit the need for consideration during future NEPA process(es). Three levels of screening occurred to evaluate alternatives, beginning with 32 alternatives that were considered during the first screening level. The alternatives screening process included public involvement, and outreach efforts were conducted with the local agencies and area stakeholders. The screening process is described in detail in the *Alternatives Development and Analysis Report* and can be directly incorporated into a subsequent NEPA document.

Potential steps for proceeding through the NEPA process include identifying possible actions that could be categorically excluded from development of an environmental assessment (EA) or environmental impact statement (EIS). Possibilities include actions identified in the PEL Study as project phases and early action improvements, such as improvements to the eastbound on ramp continuous lane and westbound off ramp intersection, both of which are consistent with the recommended alternatives. The alternatives screening, environmental overview information, and agency and public coordination completed in the PEL Study can be directly referenced in a Categorical Exclusion (CE) document for a project phase or early action improvement.

Should the NEPA process result in development of an EA for the entire interchange project, the Introduction, Purpose and Need, and Agency and Public Coordination sections of the *PEL Report* can be used to develop the Purpose and Need chapter of the EA. The Alternatives Evaluation Summary and Study Recommendations sections of the *PEL Report* can be used to develop the Alternatives chapter. The Environmental Overview section, appendices, and *Environmental Scan Report* can provide the starting point to develop more in-depth evaluation and descriptions of the affected environment and expected impacts. The *Environmental Scan Report* also identifies next steps to be undertaken for each resource topic, such as such as a Modified Phase I Environmental Site Assessment for hazardous materials.

3. Agency coordination:

a. Provide a synopsis of coordination with federal, tribal, state and local environmental, regulatory and resource agencies. Describe their level of participation and how you coordinated with them.

The study was coordinated with local, State and Federal resource agencies with distribution of information to representatives at two points during the study. Early in the study a letter and study area map were mailed as an introduction to this PEL process and request for input on the existing conditions and concerns within the study area, along with the project Purpose and Need. A second letter was mailed serving as an update on the study following Level 2 alternatives screening. Graphics of the two recommended alternatives and a summary of critical considerations were

enclosed for review to identify potential resource impacts and next steps required for future NEPA process(es). A summary of the resource agency coordination and input is included in Appendix C of the *PEL Report*.

The following input was received from resource agencies:

- Colorado Parks & Wildlife (CPW) indicated they did not foresee the area containing any environmentally sensitive areas or species of concern.
- Colorado State Historic Preservation Office (SHPO) indicated that consultation under Section 106 of the National Historic Preservation Act should be undertaken.
- Colorado Division of Public Health and Environment (CDPHE), Air Pollution Control Division indicated no preference for either Recommended Alternative.
- U.S. Army Corps of Engineers (USACE) indicated that any wetlands in the area are likely non-jurisdictional but requested an approved jurisdictional determination, ongoing coordination regarding drainages, ponds, and a potential aqueduct in the area, and Section 404 permit if necessary.
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service indicated that there is no prime and/or unique farmland in the study area and therefore is not subject to the Farmland Protection Act.
- U.S. Fish and Wildlife Service (USFWS) noted that there are no species listed under the federal Endangered Species Act that will be directly affected by the project. They appreciate efforts to avoid impacts to migratory birds.

No response was received by the following agencies:

- Jefferson County Parks and Open Space
- Jefferson County Planning and Zoning
- U.S. Environmental Protection Agency (EPA)

b. What transportation agencies (e.g. for adjacent jurisdictions) did you coordinate with or were involved during the PEL study?

Coordination occurred between:

- | | |
|-----------------------|---------|
| • City of Arvada | • DRCOG |
| • City of Wheat Ridge | • FHWA |
| • Jefferson County | • RTD |
| • CDOT | |

As part of the Technical Team, each of these agencies had a high level of involvement throughout the PEL study and concurred with each step of the process. Please see the Agency and Public Coordination section of the *PEL Report* for more description of the coordination efforts between transportation agencies.

c. What steps will need to be taken with each agency during NEPA scoping?

Scoping meetings will be conducted during subsequent NEPA process(es) to inform resource and regulatory agencies of the findings of the PEL study and to discuss the anticipated impacts from the NEPA proposed action. Information from the PEL study will be used in scoping, such as the *Environmental Scan Report* data, and the alternatives development and analysis process and findings used to identify the recommended alternatives and/or early action improvements projects.

It will be determined at the scoping meetings if there are additional agency concerns or if there are additional data/information that was not available during the PEL study.

4. Public coordination:

a. Provide a synopsis of your coordination efforts with the public and stakeholders.

Stakeholder involvement was emphasized throughout the PEL process and feedback was solicited from the agency and public partners at key decision points to foster acceptance of recommendations. Please see the Agency and Public Coordination section of the *PEL Report* for a summary of the public and stakeholder involvement process, which included 10 Technical Team meetings, two general public meetings, six community focus group meetings, and 12 small group meetings with individuals representing public agencies and organizations, emergency providers, and others directly affected by the project work.

5. Purpose and Need for the PEL study:

a. What was the scope of the PEL study and the reason for completing it?

The scope of the PEL study was to provide an understanding of the existing conditions of the interchange and work with stakeholders to develop and evaluate a range of improvements to reduce congestion and improve operational performance and safety at the interchange.

b. Provide the purpose and need statement, or the corridor vision and transportation goals and objectives to realize that vision.

Please see the Purpose and Need section of the *PEL Report*. The Purpose and Need was developed in coordination with agency stakeholders with review by the general public. The specific needs are based on the analysis and findings documented in the *Existing Transportation Conditions Report*.

Purpose of the Project

The purpose of the I-70 and Kipling Street interchange project is to reduce congestion, optimize operations, improve safety, and accommodate multimodal connections at the I-70 and Kipling Street interchange.

Need for Interchange Improvements

The existing design and configuration of the interchange no longer accommodates travel demands. Kipling Street is an important transportation corridor supporting mobility and economic activity in Jefferson County, including the cities of Wheat Ridge and Arvada. Improvements are needed to:

- Meet current and future traffic demands
- Improve operational efficiency of the interchange
- Improve traveler safety through the interchange
- Accommodate multimodal connections

c. What steps will need to be taken during the NEPA process to make this a project-level purpose and need statement?

No additional effort is expected to make this a project-level Purpose and Need statement, unless further additional data collection and analysis shows unforeseen changes in conditions that will require the modification of the Purpose and Need statement in the *PEL Report*.

Should future changes or constraints arise, such as limitations to project funding, the project Purpose and Need may need to be modified to reflect a reduced project scope. For example, the

purpose statement currently contains several directives: “The purpose of the I-70 and Kipling Street interchange project is to reduce congestion, optimize operations, improve safety, and accommodate multimodal connections at the I-70 and Kipling Street interchange.” Reduced funding may result in a focus on just one or fewer directives, such as improving safety.

6. Range of alternatives: Planning teams need to be cautious during the alternative screen process; alternative screening should focus on purpose and need/corridor vision, fatal flaw analysis and possibly mode selection. This may help minimize problems during discussions with resource agencies. Alternatives that have fatal flaws or do not meet the purpose and need/corridor vision cannot be considered viable alternatives, even if they reduce impacts to a particular resource. Detail the range of alternatives considered, screening criteria and screening process, including:

a. What types of alternatives were looked at? (Provide a one or two sentence summary and reference document.)

The range of alternatives were developed to address the interchange’s largest issues identified in the Purpose and Need, including the close signal spacing along Kipling Street, the weave movement between the ramp and frontage road intersections, the queuing conditions on the Westbound I-70 Off Ramp, and the merging conditions for the Eastbound I-70 On Ramp. Managed lane configurations were not considered because the scope of this study does not include additional through lane capacity on I-70 or Kipling Street.

The initial alternatives considered for the I-70 and Kipling Street interchange were developed based on input from the Technical Team, public input, and the technical input of the project team. Overall, alternatives focused on interchange alternatives that accommodate high traffic volumes and improve safety within a developed urban area with limited right-of-way (ROW). The No Action alternative was included as a baseline for comparison to the action alternatives.

Please see the *Alternatives Development and Analysis Report* for more details on the range of the alternatives considered. Based on the alternatives screening process, the following four action alternatives meet the project Purpose and Need and are considered reasonable alternatives.

- **Alternative 1 – Single Point Urban Interchange**
This alternative consists of a new interchange configuration with diamond type ramps that intersect at a single signalized intersection on Kipling Street serving all movements to/from the I-70 ramps and the Kipling Street through movements.
- **Alternative 7 – Partial cloverleaf with Loops SW & NE Quadrants**
This alternative consists of a new interchange configuration with a loop ramp in the southwest and northeast quadrants providing free-flow operations for the left turn movements from Kipling Street to eastbound and westbound I-70. The frontage road intersections would require some modification.
- **Alternative 12 – Traditional Diamond**
This alternative consists of the current diamond interchange configuration with diamond type ramps and two signalized intersections on Kipling Street serving the ramps with increased spacing between the ramp traffic signals. The frontage road intersections would require some modification.
- **Alternative 17 – Button Hook Ramps**

This alternative consists of a new interchange layout with the I-70 ramp intersections on the frontage roads and access to Kipling Street via the frontage road traffic signals. The existing ramps on the east side of Kipling Street remain.

b. How did you select the screening criteria and screening process?

The alternatives development and evaluation process included developing screening criteria based on the project Purpose and Need, developing a full range of alternatives, and documenting the elimination of alternatives to limit the need for consideration during future NEPA process(es), leaving all the reasonable alternatives.

General alternative concepts were developed and subjected to a Level 1 “fatal flaw” screening to eliminate alternatives that do not meet the project Purpose and Need. Alternatives from the Level 1 screening that were recommended for further evaluation were refined to complete additional and more detailed analysis to determine whether or not each alternative meets the Purpose and Need, compare how well each alternative would perform, and identify what impacts each alternative would have. The following four alternatives remaining after the Level 2 evaluation and were further refined through conceptual design in the Level 3 evaluation:

- Alternative 1 – SPUI
- Alternative 7 – Partial Cloverleaf with Loops SW & NE Quadrants
- Alternative 12 – Traditional Diamond
- Alternative 17 – Button Hook Ramps

With the Level 3 alternatives evaluation, steps were taken to further narrow the alternative recommendations and to refine the design elements of the alternatives, considering design solutions to minimize costs and community impacts and maximize multimodal benefits. The alternatives were not further narrowed and all four alternatives will be carried forward for further evaluation in future NEPA process(es). The final study recommendations include large-scale interchange improvement alternatives with potential phased elements, as well as separate, early action improvements.

Evaluation criteria were established for the Level 1 and Level 2 screening, prior to the development of alternatives. These criteria were developed by CDOT based on the project Purpose and Need. The project Technical Team, comprised of FHWA, RTD, DRCOG, and the local agencies, were consulted during the development of evaluation criteria and ultimately concurred with the evaluation criteria.

c. For alternative(s) that were screened out, briefly summarize the reasons for eliminating the alternative(s). (During the initial screenings, this generally will focus on fatal flaws)

In the Level 1 screening, alternatives that did not improve operations, improve traveler safety, or accommodate direct multimodal connections through the interchange were eliminated based on not meeting the Purpose and Need. During Level 2 screening, the elimination of alternatives focused on impacts to interchange capacity, driver expectancy, pedestrian and bicycle crossings, ROW, business access, phased construction opportunities, and project costs, with a more detailed evaluation of the project Purpose and Need.

All screening was coordinated with Technical Team members. Please see the *Alternatives Development and Analysis Report* for more detail information about each level of evaluation.

d. Which alternatives should be brought forward into NEPA and why?

The following four action alternatives meet the project Purpose and Need and are considered reasonable alternatives. Therefore, the four action alternatives to be carried forward into future NEPA process(es) with the No Action alternative are:

- Alternative 1 – SPUI
- Alternative 7 – Partial cloverleaf with Loops SW & NE Quadrants
- Alternative 12 – Traditional Diamond
- Alternative 17 – Button Hook Ramps

After a comparison of the four action alternatives against the priority criteria, the SPUI and Traditional Diamond alternatives were determined to meet the Purpose and Need to the highest degree while minimizing environmental and community impacts and they are the recommended alternatives from this PEL study.

Please see the Study Recommendations section of the *PEL Report* for more information about the alternatives to be brought forward into future NEPA process(es).

e. Did the public, stakeholders, and agencies have an opportunity to comment during this process?

Yes, see the Agency and Public Coordination section of the *PEL Report* for overview of the multiple opportunities for the public, stakeholders, and agencies to engage and inform the study process.

f. Were there unresolved issues with the public, stakeholders and/or agencies?

The location for water quality detention for the reconstructed interchange is a concern for the City of Wheat Ridge. This PEL study identified potential locations for water quality detention based on conceptual-level design and property acquisition opportunities as a result of the Kipling Street widening. City staff expressed a desire to locate the water quality detention within the interchange ramps in order to allow the identified properties to redevelop. The design and location of water quality detention will need to be resolved with further design information in later project phases.

7. Planning assumptions and analytical methods:

a. What is the forecast year used in the PEL study?

The forecast year in the PEL Study was 2035.

b. What method was used for forecasting traffic volumes?

The travel forecast modeling for the traffic analysis of alternatives was conducted based on the DRCOG 2035 regional travel demand model with modifications to the socioeconomic data and network based on coordination with DRCOG and the local agencies regarding current and future land use in the study area.

c. Are the planning assumptions and the corridor vision/purpose and need statement consistent with the long-range transportation plan?

Yes, the travel forecast modeling was conducted based on the DRCOG fiscally-constrained model. The project Purpose and Need is consistent with the DRCOG 2035 Regional Transportation Plan and local transportation planning elements.

d. What were the future year policy and/or data assumptions used in the transportation planning process related to land use, economic development, transportation costs and network expansion?

Travel forecast modeling data were based on the DRCOG 2035 fiscally-constrained regional model with modifications to the socioeconomic data and network based on coordination with DRCOG and the local agencies regarding current and future land use in the study area.

8. Environmental resources (wetlands, cultural, etc.) reviewed. For each resource or group of resources reviewed, provide the following:

a. In the PEL study, at what level of detail was the resource reviewed and what was the method of review?

Data collection to identify the existing resources in the area was conducted in the spring of 2012 using readily available resources resulting in data from file searches from agencies with jurisdictions, GIS mapping, a literature review, and windshield surveys. In addition, the study was coordinated with local, State and Federal resource agencies, including:

- CDPHE, Air Pollution Control Division
- CPW
- SHPO
- DRCOG
- Jefferson County Parks and Open Space
- Jefferson County Planning and Zoning
- USACE
- USDA, Natural Resources Conservation Service
- EPA
- USFWS

Information was distributed to representatives at these resource agencies at two points during the study. Early in the study a letter and study area map were mailed as an introduction to this PEL process, along with the project Purpose and Need, and requested input on the existing conditions and concerns within the study area. A second letter was mailed serving as an update on the study following Level 2 alternatives screening. Graphics of the two recommended alternatives and a summary of critical considerations were enclosed for review to identify potential resource impacts and next steps required for future NEPA process(es). A review of each resource included in the *Environmental Scan Report*. A summary of the resource agency input is included in the appendix of the *PEL Report*.

b. Is this resource present in the area and what is the existing environmental condition for this resource?

The *Environmental Scan Report* provides an overview of the existing conditions for air quality, hazardous materials, historical and archaeological resources, parks and recreation, wells, biological resources, noise, and land use resources in the project area. Please see the Environmental Overview section of the *PEL Report* for an overview of the potential impacts presented by each of the recommended alternatives.

c. What are the issues that need to be considered during NEPA, including potential resource impacts and potential mitigation requirements (if known)?

The following presents a summary of the resources potentially impacted by the two recommended alternatives. Additionally, as the Preferred Alternative is identified and refined, avoidance and

minimization through design will need to be documented. Please see the Environmental Overview section of the *PEL Report* for more information.

Resource	Issues to Consider during NEPA
Air Quality	The interchange reconstruction project is included as a funded roadway capacity improvement project in the RTP, so regional conformity for the interchange project has already been demonstrated. Moving forward with the NEPA process, air quality impact analysis would be conducted for the identified Preferred Alternative to conduct local project-level analysis for carbon monoxide and particulate matter. Often a concurrence letter from the Colorado Department of Public Health and Environment, Air Pollution Control Division on conformity is required.
Noise	There are currently areas within the project area with noise exposures that exceed Noise Abatement Criteria (NAC) (e.g., the commercial properties along I-70 west of Kipling Street, where no noise barriers currently exist). The potentially impacted properties are commercial, so interior noise levels may be the only consideration. Mitigation may be warranted as noise levels may increase with either recommended alternative and a noise barrier along I-70 west of Kipling Street may be considered. For Kipling Street south of 51st Place within the study area, noise barriers would probably not be feasible because of the many openings required for intersecting roadways and property access. A detailed noise study will be required during the NEPA process.
Water Wells	Both recommended alternatives could potentially impact six wells clustered around the southeastern corner of I-70 and Kipling Street. The northwestern corner of the SPUI would impact three wells and the Traditional Diamond would impact one well. With the exception of one well categorized for domestic use, all of the other potentially-impacted wells are classified as “other” usages, which means that they are likely used as monitoring wells. Consideration of water well resources during the NEPA process includes a detailed analysis of the impacts to existing water wells; a plan for avoidance of existing wells during and after construction; and identification of the necessary permits for construction activities.
Land Use	A significant portion of the recommended alternatives lies within the I-70/Kipling Corridors Urban Renewal Area, which will guide future development. The Traditional Diamond reaches the border of an existing residential area which could negatively impact those residents. Mitigation measures will need to be evaluated as part of the NEPA process for each business or residence affected by the identified Preferred Alternative. Ongoing conversations with property owners, businesses, and residences potentially affected will also be a critical part of future project development.
Land Use – Neighborhood / Business Displacement	ROW within the study area is generally owned by CDOT and local municipalities, though the two recommended alternatives may also impact local commercial and residential property. During the NEPA process, impacts to neighborhoods, businesses, and individual residences should be identified and avoided where possible. ROW acquisition proceedings must conform to the requirements set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended) and the Uniform Relocation Act Amendments of 1987 (as amended).

Resource	Issues to Consider during NEPA
Wetlands and Waters of the U.S.	<p>An irrigation ditch in the southeast corner of the study area would be impacted by both recommended alternatives. This ditch has been identified as a potential wetland.</p> <p>A Section 404 permit would likely be required from the USACE to authorize placement of dredge or fill material in any wetlands and open water features. Prior to application for a permit, a wetland delineation survey will need to be conducted including a jurisdictional determination. This would include documented wetland boundaries and a determination of impacts. CDOT regulates wetlands regardless of USACE jurisdiction. A CDOT Wetland Findings report may be required if permanent wetland impacts exceed 500 square feet or if temporary impacts exceed 1,000 square feet, regardless of whether USACE has jurisdiction.</p>
Noxious Weeds	<p>The eastern terminus of both recommended alternatives would affect the Slough Ditch (located between Oak and Miller Street), which was found to have a noticeable weed infestation. It is expected that additional weeds are present in the project area, so a second site visit and weed mapping are recommended to occur in the growing season.</p> <p>With the NEPA process, CDOT will require the preparation of an Integrated Noxious Weed Management Plan which will include steps to control existing noxious weeds.</p>
Threatened and Endangered Species and Wildlife	<p>Black-tailed prairie dog habitat was observed in the study area in open fields and vacant areas. Although no active prairie dogs were observed, there would be potential for this species to inhabit these areas. Prairie dog habitat and some of the culverts may provide habitat for burrowing owls which are a state Species of Concern and also protected under the Migratory Bird Treaty Act (MBTA). There is potential for the northern leopard frog and the common garter snake, both State Species of Concern, to occur in the wetland habitat ditch that would potentially be impacted by the recommended alternatives.</p> <p>Cliff swallows often nest under bridges and within box culverts and were observed nesting under the I-70 bridges over Garrison Street and Kipling Street. Nesting locations may change from year to year, and areas should be re-surveyed prior to construction.</p>
Hazardous Materials	<p>The SPUI alternative would potentially impact the Circle K gas station in the northwest corner with a partial acquisition and driveway reconstruction. The Conoco gas station in the southeast corner of the interchange is expected as a full acquisition and potential location for water quality retention. The Traditional Diamond alternative would potentially impact the Circle K and Conoco gas stations with partial acquisition and driveway modifications.</p> <p>Moving into the NEPA process, a hazardous materials assessment, such as a Modified Phase I Environmental Site Assessment, would typically be needed as part of future project development. It is anticipated that properties targeted for construction undergo further site assessments and/or preliminary site investigations as part of the ROW acquisition process, and may require remediation prior to acquisition or development.</p>
Historic Resources	<p>The study file search identified only one site, the Colorado Central and Colorado and Southern Railroad, as an Officially Eligible site. The railroad is out of the impact area for both recommended alternatives. The Slough Ditch has been identified as a potentially historic resource, but it was determined that the ditch is not officially eligible as historic.</p> <p>Once the Preferred Alternative is identified, properties adjacent to the project will need to be evaluated for eligibility for the National Register of Historic Places. Any avoidance, minimization, or mitigation measures under Section 106 should be determined in consultation with the SHPO and other consulting parties.</p>
Parks and Recreation	<p>Two potential parks or recreation resources exist within the study area, Fruitdale Park and an unnamed off-street trail along Kipling Street. Neither recommended alternative are expected to impact these potential resources.</p>

d. How will the data provided need to be supplemented during NEPA?

See the Environmental Overview section of the *PEL Report* for a review of what supplemental data is needed for future NEPA process(es). Depending on the timing of future NEPA efforts, certain resources may require an assessment due to new regulations. Data that is time dependent will need to be updated and additional surveys to obtain more detailed information will need to be conducted during NEPA.

Consultations with appropriate agencies will also be required. These tasks are described below.

- Air Quality:
 - Conduct a local project-level air quality impact analysis for carbon monoxide and particulate matter, as required.
 - Coordinate with the Colorado Department of Public Health and Environment, Air Pollution Control Division on local project conformity requirements.
- Noise:
 - Conduct a detailed noise study.
 - Conduct an analysis of interior noise levels at commercial buildings if necessary.
 - Determine whether a noise barrier for homes along Johnson Street is needed.
- Water Wells:
 - Conduct a detailed analysis of the project design impacts to existing water wells.
 - Develop a plan for avoidance of existing wells during and after construction and identify necessary permits for construction activities.
 - Conduct an assessment of the need for groundwater monitoring before, during, and after the project.
 - Coordinate with local planners and other city officials.
- Land Use and ROW
 - Evaluate mitigation measures related to affected business or residences.
 - Ensure that any ROW acquisition proceedings conform to the requirements set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended) and the Uniform Relocation Act Amendments of 1987 (as amended).
- Wetlands and Waters of the U.S.:
 - Conduct an approved jurisdictional determination for any wetlands that could be affected.
 - Obtain a Clean Water Act Section 404 permit to authorize placement of dredge or fill material in any waters of the U.S., including wetlands, if necessary.
 - Develop a CDOT Wetland Findings report, if necessary.
- Noxious Weeds
 - Prepare an Integrated Noxious Weed Management Plan.
- Threatened and Endangered Species and Wildlife:
 - Consultation with the U.S. Fish and Wildlife Service is unlikely as no species listed as protected under the Endangered Species Act were identified; however, an updated data search should be conducted to confirm that this is current.

- Conduct preconstruction surveys following methods set forth by the USFWS, CDOW or CDOT Section 240 Protection of Migratory Birds Standard Specification.
- Conduct surveys for nesting cliff swallows prior to construction.
- Hazardous Materials
 - Conduct a Modified Phase I Environmental Site Assessment to identify potential hazardous materials.
- Historic Resources:
 - Consult with the SHPO under Section 106 regarding potentially eligible historic structures.
 - Consult with SHPO to define an appropriate Area of Potential Effects (APE) for historic and archaeological resources.
 - Identify and invite relevant government agencies, organizations, and tribes to participate as consulting parties in the Section 106 process.
 - Conduct intensive-level field surveys in all areas that may be subject to project impacts. All identified cultural resources will be evaluated or re-evaluated for National Register of Historic Places (NRHP) eligibility and documentation submitted to SHPO for concurrence.
 - Evaluate effects to NRHP-eligible or listed properties from the project by applying federal Criteria of Adverse Effect.
 - Consult with SHPO and other consulting parties to resolve any adverse effects through project redesign/avoidance, minimization of impacts, or mitigation.
 - Document the resolution of any identified adverse effects and mitigation prescriptions in a Memorandum of Agreement signed by FHWA, CDOT, SHPO and if appropriate, consulting parties.
- Parks and Recreation
 - Confirm that a Section 4(f) evaluation for parks and recreation resources is not required.

9. List environmental resources you are aware of that were not reviewed in the PEL study and why? Indicate whether or not they will need to be reviewed in NEPA and explain why.

An environmental resource commonly encountered in an urban arterial corridor that was not considered in this PEL study was Environmental Justice. Socioeconomic data was provided in the Existing Transportation Conditions Report and community impacts were considered in the alternatives development and evaluation process. Consideration of specific Environmental Justice data would not have changed the study recommendations. Environmental Justice within the study area will need to be reviewed in the NEPA process.

Consultation with and concurrence from resource agencies were not conducted as a part of this PEL study and will need to be performed in NEPA.

10. Were cumulative impacts considered in the PEL study? If yes, provide the information or reference where it can be found.

Yes, cumulative impacts were considered in this PEL Study. Please see the *Environmental Scan Report* or the Environmental Overview section of the *PEL Report*. However, additional analysis is expected during the NEPA process. Additional coordination with the resource agencies should be conducted to determine a study area for each resource. A cursory list of past, present, and

reasonably foreseeable future actions was included in the *Environmental Scan Report*. The list should be reviewed, updated, and expanded as necessary, and a cumulative impact analysis should be performed.

11. Describe any mitigation strategies discussed at the planning level that should be analyzed during NEPA.

Mitigation strategies were only developed schematically in this PEL study and are described in with each resource considered in the Environmental Overview section of the *PEL Report*. The detailed mitigation measure for each impacted resource will need further analysis during the NEPA phase. Such mitigation measures may include noise mitigation, wetland replacement, hazardous materials remediation, and/or schedule changes due to wildlife nesting activities.

12. What needs to be done during NEPA to make information from the PEL study available to the agencies and the public? Are there PEL study products which can be used or provided to agencies or the public during the NEPA scoping process?

Relevant planning products that are readily available to a subsequent NEPA process include:

- *Existing Conditions Report* – April 2012
- *Environmental Scan Report* – April 2012
- *Purpose and Need Statement Technical Memorandum* – May 2012
- *Alternatives Development and Analysis Report* - June 2013
- *Final PEL Report* – July 2013

All documentation will be posted on the CDOT website and will also be readily available to the public through the offices of each Technical Team member agency.

13. Are there any other issues a future project team should be aware of?

a. Examples: Controversy, utility problems, access or ROW issues, encroachments into ROW, problematic land owners and/or groups, contact information for stakeholders, special or unique resources in the area, etc.

The recommended interchange alternatives and associated impacts are based on a conceptual level of design. As the Preferred Alternative is identified and the project moves to preliminary design, issues to be addressed include:

- Specific accesses to be closed or reconstructed/maintained
- Interchange drainage accommodations to satisfy water quality requirements
- Construction phasing of the interchange reconstruction while maintaining traffic operations on I-70 and Kipling Street and minimizing impacts to the traveling public

APPENDIX I
Letters of Agency Support



U.S. Department
of Transportation
**Federal Highway
Administration**

Colorado Division

August 26, 2013

12300 W. Dakota Ave., Ste. 180
Lakewood, Colorado 80228
720-963-3000

Steve Olson
Region 1 North Program Engineer
Colorado Department of Transportation
2000 S. Holly Street
Denver, CO 80222

Subject: I-70 and Kipling Planning and Environmental Linkages (PEL)

Dear Mr. Olson:

This letter is to acknowledge the completion of the PEL study initiative undertaken by the Colorado Department of Transportation (CDOT), and David Evans and Associates for the I-70 and Kipling Interchange. We appreciate and commend the efforts the team has undertaken to conduct this corridor planning study in a manner consistent with the Federal Highway Administration (FHWA) PEL guidance which outlines a process similar to that required by the National Environmental Policy Act (NEPA). The benefits of this streamlining effort will undoubtedly be realized in terms of time and cost savings on future NEPA studies conducted within the corridor planning study limits.

The completed PEL Questionnaire submitted to FHWA in July 2013 provides a good summary of the work completed in PEL study and the information that will be needed once projects enter into the NEPA process. In addition, the Alternatives Development and Analysis Report and the PEL Report provide good documentation that can support the next steps of the NEPA process. The strengths of the corridor study include a robust screening process, meaningful local government and public involvement throughout the process, and a detailed look at phasing the recommended alternatives.

CDOT must make a critical decision regarding the next steps for improvements at this interchange. Based on the findings of the PEL study, CDOT could implement interim improvements that may not be compatible with long term improvements but offer immediate operational benefits, phase some of the long term improvements, or implement a solution that would improve the interchange for the long term. FHWA recognizes that this critical decision must be made in light of available funding or forecasted funding.

If you have any questions, please feel free to contact Monica Pavlik, Senior Operations Engineer, at 720-963-3013 or by e-mail at monica.pavlik@dot.gov.

Sincerely,

John M. Cater, P.E.
Division Administrator

By: Monica Pavilk
Senior Operations Engineer

Cc: Kirk Webb, CDOT, Region 1
Chuck Attardo, CDOT, Region 1

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION



Region 1 North Engineering

4670 Holly Street
Denver, Colorado 80216
(303) 398-6764

February 5, 2014

Monica Pavlik, PE
Federal Highway Administration
12300 W. Dakota Avenue, Suite 180
Lakewood, CO 80228

**SUBJECT: I-70/KIPLING INTERCHANGE PLANNING AND ENVIRONMENTAL LINKAGE (PEL) STUDY
SUPPORT FOR STUDY RECOMMENDATIONS**

Dear Monica:

CDOT is proud to have been a participant in the I-70 and Kipling Interchange PEL Study. Our involvement in the study on the Technical Team and through frequent Project Team meetings provided us the opportunity to discuss the significance of this interchange with fellow stakeholders. We applaud the efforts and vision of the study team members and their respective agencies to help define these critical interchange improvements.

This PEL study was completed in accordance with FHWA guidelines, and included both CDOT and FHWA staff at key intervals, where they provided comments and guidance that improved the study. Coordination with state and federal environmental resource agencies, consistent with PEL guidelines, also provided important information that helped in developing the improvement recommendations. Study efforts included extensive and meaningful public and stakeholder involvement, which helped shape the study recommendations.

Recommendations for both early action and ultimate interchange improvements, including separate phased project options, were documented in the *Final Planning and Environmental Linkage Report*. Following review and involvement by our technical staff, we are confident that recommendations have been made that best meet the project Purpose and Need of reducing congestion and improving operational performance and safety at the interchange.

CDOT's intention from both a planning and engineering perspective is to strive to support the recommendations of the study through the NEPA process and into detailed project implementation. We will continue to work with you and the involved local agencies to help facilitate interchange improvements. We encourage all of the agencies involved in the study to continue to partner and work toward collaborative partnerships that will ultimately provide benefits for all.

Sincerely,

Paul Jesaitis
Region 1 Deputy Director of Program Delivery

Copies: Jay Hendrickson, CDOT Region 1 North Resident Engineer
Thanh Ly, CDOT Project Engineer
Stacy Tschuor, David Evans and Associates, Inc.

May 8, 2013

Jay Hendrickson, PE
Resident Engineer, Region 6 North Engineering
Colorado Department of Transportation
4670 Holly Street
Denver, Colorado 80216

**SUBJECT: I-70/KIPLING INTERCHANGE PLANNING AND ENVIRONMENTAL LINKAGE (PEL) STUDY
SUPPORT FOR STUDY RECOMMENDATIONS**

Dear Jay:

The City of Arvada is proud to have been a participant in the I-70 and Kipling Interchange PEL Study. Our involvement in the study on the Technical Team and through (Council/JEFFTAAG) briefings provided us the opportunity to discuss the significance of this interchange with fellow stakeholders. We applaud the efforts and vision of the study team members and their respective agencies to help define these critical interchange improvements for the future.

This planning study included City of Arvada staff at key intervals, where they provided comments and guidance that improved the study. Study efforts included extensive and meaningful public and stakeholder involvement, which helped shape the study recommendations. Recently, recommendations for both early action and ultimate interchange improvements, including separate phased project options, were documented in the *Final Planning and Environmental Linkage Report*. Following review and involvement by our technical staff, we are confident that recommendations have been made that best meet the project Purpose and Need of reducing congestion and improving operational performance and safety at the interchange.

Our intention from both a planning and engineering perspective is to strive to support the recommendations of the study through the NEPA process and into detailed project implementation. We will continue to work with you to help facilitate interchange improvements. We encourage all of the agencies involved in the study to continue to partner and work toward collaborative partnerships that will ultimately provide benefits for all.

Sincerely,



John Firouzi
Transportation Planning Engineer
City of Arvada

Copies: Stacy Tschuor, David Evans and Associates, Inc.



Wednesday, July 10, 2013

Jay Hendrickson, PE
Resident Engineer, Region 6 North Engineering
Colorado Department of Transportation
4670 Holly Street
Denver, Colorado 80216

**SUBJECT: I-70/KIPLING INTERCHANGE PLANNING AND ENVIRONMENTAL
LINKAGE (PEL) STUDY SUPPORT FOR STUDY
RECOMMENDATIONS**

Dear Jay:

The City of Wheat Ridge is proud to have been a participant in the I-70 and Kipling Interchange PEL Study. Our involvement in the study on the Technical Team and through (Council/JEFFTAAG) briefings provided us the opportunity to discuss the significance of this interchange with fellow stakeholders. We applaud the efforts and vision of the study team members and their respective agencies to help define these critical interchange improvements for the future.

This planning study included City of Wheat Ridge staff at key intervals, where they provided comments and guidance that improved the study. Study efforts included extensive and meaningful public and stakeholder involvement, which helped shape the study recommendations. Recently, recommendations for both early action and ultimate interchange improvements, including separate phased project options, were documented in the *Final Planning and Environmental Linkage Report*. Following review and involvement by our technical staff, we are confident that recommendations have been made that best meet the project Purpose and Need of reducing congestion and improving operational performance and safety at the interchange.

Our intention from both a planning and engineering perspective is to strive to support the recommendations of the study through the NEPA process and into detailed project implementation. We will continue to work with you to help facilitate interchange improvements. We encourage all of the agencies involved in the study to continue to partner and work toward collaborative partnerships that will ultimately provide benefits for all.

Sincerely,

A handwritten signature in blue ink that reads "Steve Nguyen". The signature is fluid and cursive, with the first name "Steve" and the last name "Nguyen" clearly legible.

Steve Nguyen
Engineering Manager
City of Wheat Ridge



Board of County Commissioners

Faye Griffin
District No. 1
Casey Tighe
District No. 2
Donald Rosier
District No. 3

May 16, 2013

Jay Hendrickson, PE
Resident Engineer, Region 1 North Engineering
Colorado Department of Transportation
4670 Holly Street
Denver, Colorado 80216

SUBJECT: I-70/KIPLING INTERCHANGE PLANNING AND ENVIRONMENTAL LINKAGE (PEL) STUDY SUPPORT FOR STUDY RECOMMENDATIONS

Dear Mr. Hendrickson:

Jefferson County is proud to have been a participant in the I-70 and Kipling Interchange PEL Study. Our involvement in the study on the Technical Team and through JEFFTAAG briefings provided us the opportunity to discuss the significance of this interchange with fellow stakeholders. We applaud the efforts and vision of the study team members and their respective agencies to help define these critical interchange improvements for the future.

This planning study included Jefferson County staff at key intervals, where they provided comments and guidance that improved the study. Study efforts included extensive and meaningful public and stakeholder involvement, which helped shape the study recommendations. Recently, recommendations for both early action and ultimate interchange improvements, including separate phased project options, were documented in the *Final Planning and Environmental Linkage Report*. Following review and involvement by our technical staff, we are confident that recommendations have been made that best meet the project Purpose and Need of reducing congestion and improving operational performance and safety at the interchange.

Our intention from both a planning and engineering perspective is to strive to support the recommendations of the study through the NEPA process and into detailed project implementation. We will continue to work with you to help facilitate interchange



Jay Hendrickson
May 16, 2013
Page Two

improvements. We encourage all of the agencies involved in the study to continue to partner and work toward collaborative partnerships that will ultimately provide benefits for all.

Sincerely,

BOARD OF COUNTY COMMISSIONERS



Donald Rosier
Chairman of the Board

DR/lhf

Cc: Stacy Tschuor, David Evans and Associates, Inc.

August 14, 2013

Jay Hendrickson, PE
Resident Engineer, Region 6 North Engineering
Colorado Department of Transportation
4670 Holly Street
Denver, Colorado 80216

Subject: I-70/Kipling Interchange Planning and Environmental Linkage (PEL) Study
Support for Study Recommendations

Dear Jay:

The Regional Transportation District (RTD) appreciates being a participant in the I-70 and Kipling Interchange PEL Study. Our involvement in the study on the Technical Team and through (Council/JEFFTAAG) briefings provided us the opportunity to discuss the significance of this interchange with fellow stakeholders. We appreciate the efforts of the study team members and their respective agencies to help define these proposed interchange improvements for the future.

This planning study included RTD staff at key intervals, where they provided comments and guidance that improved the study. Study efforts included public and stakeholder involvement, which helped shape the study recommendations. Recently, recommendations for both early action and ultimate interchange improvements, including separate phased project options, were documented in the *Final Planning and Environmental Linkage Report*. Following review and involvement by our technical staff, we are confident that recommendations have been made that best meet the project Purpose and Need of reducing congestion and improving operational performance and safety at the interchange.

Our intention is to strive to support the recommendations of the study through the NEPA process and into detailed project implementation.

Sincerely,



William C. Van Meter
Assistant General Manager, Planning

cc: Stacy Tschuor, David Evans and Associates, Inc.