APPENDIX E

Open House #2 Handouts

Welcome to the US 6 and Wadsworth Boulevard Environmental Assessment Public Open House #2

Tuesday, February 12, 2008
Lakewood Cultural Center, Lakewood, Colorado

Tonight's Purpose

The purpose of tonight's meeting is to present and explain the design concepts developed for the interchange and Wadsworth Boulevard, and to present the results of the Level 1 (fatal flaw) screening of these concepts. We would like your feedback on the range of concepts considered, the screening criteria, and the screening results.

- Do you agree with the Level 1 fatal flaw screening results?
- What criteria are most important to consider when evaluating the design concepts carried forward?
- Do you have any specific thoughts or ideas about the concepts recommended for further evaluation?

Display boards located in the hallway provide general information about the study, and information about traffic conditions, environmental resources, and water quality features that will be considered for the project. You will find handouts about different aspects of the study at the Reference Materials table in the hallway.

Display boards and handouts located in the Community Room provide information about design concepts for the interchange and Wadsworth Boulevard, and the Level 1 screening process.

Tonight's Agenda

4:00 p.m. to 8:00 p.m. – Sign-In and Public Open House

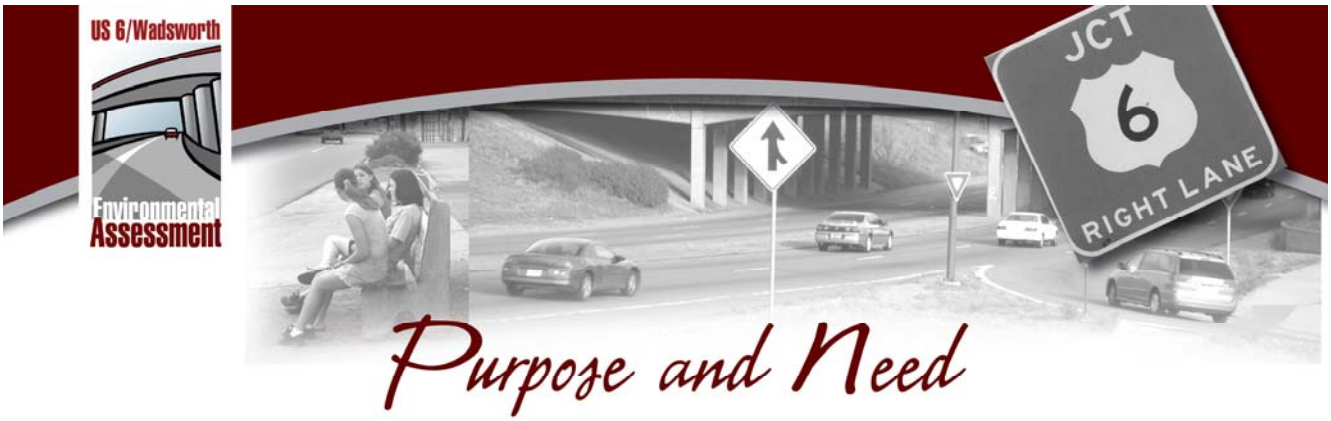
Please view display boards in the hallway and Community Room, familiarize yourself with the study, and learn about the design concepts and screening process. Talk with staff about the study, ask questions, and share your comments.

5:00 p.m. and 7:00 p.m. – Informational Presentations

Please take a seat to listen to a presentation about the progress of the study. Each presentation will be the same and will last approximately 30 to 45 minutes to provide us an opportunity to explain each of the design concepts thoroughly.

Ways to Provide Input

- Talk to one of the project team members at the various stations.
- Fill out an Open House Comment Form and place it in the comment box on your way out (preferred).
- Mail your Comment Form to: US 6 / Wadsworth EA, c/o Colleen Kirby Roberts, CH2M HILL, 535 16th Street, Suite 800, Denver, CO, 80202. Comments received within the next 30 days would be most helpful.
- Submit comments via the project website at www.US6Wadsworth.com.



The project purpose and need identifies the transportation problems and other needs that the project is intended to address. It is defined through information gathered during scoping meetings and data collection activities.

Purpose of the Proposed Action

The purpose of the US 6 and Wadsworth Boulevard project is to improve traffic flow and safety, accommodate high traffic volumes, and increase multi-modal travel options and connections at the US 6 and Wadsworth Boulevard interchange and along Wadsworth Boulevard between 4th Avenue and 14th Avenue.

The project area includes US 6 (also designated as 6th Avenue) and Wadsworth Boulevard (also designated as State Highway 121). The east-west limits along US 6 are from the eastern interchange ramps with Wadsworth Boulevard west to Garrison Street. On Wadsworth Boulevard, the project limits are 4th Avenue to 14th Avenue. This area is a vital regional hub of the western Denver metropolitan area and the heart of the City of Lakewood.

The Colorado Department of Transportation (CDOT), Federal Highway Administration (FHWA), City of Lakewood (City), area residents, businesses, and commuters have prioritized making improvements to fix the transportation problems in the project area through previous planning efforts. CDOT's goal is to identify a proposed action that meets transportation needs, is compatible with local and regional plans, avoids or minimizes environmental harm, and can be implemented within cost constraints.

Need for the Proposed Action

The existing design and configuration of the interchange and roadway within the project limits have not kept pace with traffic and multi-modal travel demands. Improvements are needed to:

- Improve safety for motorists, pedestrians, and bicyclists
- Correct design deficiencies that contribute to safety concerns and operational inefficiencies
- Increase infrastructure capacity to meet current and future traffic volumes
- Support multi-modal connections

For federally-funded transportation projects, the National Environmental Policy Act (NEPA) requires that the environmental impacts of the proposed action be analyzed. This type of study is required before federal funds can be committed to the project. The Federal Highway Administration (FHWA) is the lead federal agency on the US 6 and Wadsworth Boulevard Interchange Environmental Assessment.

Essential Elements of NEPA:

- **Public & Agency Scoping**
- **Purpose & Need**
- **Alternatives Development**
- **Assess Impacts**
- **Determine Mitigation**
- **Prepare Environmental Assessment**
- **Public & Agency Review**
- **Decision Document**

Public & Agency Scoping: This is a public process used to identify environmental issues that need to be studied and to help define the purpose and need for the project.

Purpose & Need: The project purpose and need identifies the transportation problems and other needs that the project is intended to address. It is defined through information gathered during scoping meetings and data collection activities.

Alternatives Development: A range of alternatives will be developed for the design of the US 6 and Wadsworth Boulevard interchange and Wadsworth Boulevard from approximately 4th Avenue to 14th Avenue. A “No Action” Alternative – which would not provide any transportation improvements – will also be considered. The range of alternatives will then be screened to eliminate alternatives that aren’t reasonable, feasible, or that don’t meet the project purpose and need.

Assess Impacts: Transportation, social, and environmental impacts of the remaining alternatives are studied and documented in the Environmental Assessment.

Determine Mitigation: Mitigation measures are developed to avoid or minimize adverse impacts.

Prepare Environmental Assessment: Once impacts are analyzed and mitigation measures are identified, the Environmental Assessment is written and published for review by the public and agencies.

Public & Agency Review: The project team takes comments from the public and agencies during the review period. A public hearing is held to present the information and take formal comments on the document.

Decision Document: After receiving public and agency comments on the Environmental Assessment, FHWA issues a decision document. This document records the decision made by FHWA on the project and, if a construction project is identified, commits to mitigation of impacts.

CDOT follows FHWA regulations and guidelines, and the *CDOT Noise Analysis and Abatement Guidelines* for assessing traffic-related noise. These guidelines establish "noise abatement criteria," that is, noise level standards above which noise-reducing actions should be considered. These standards are used for determining the noise impacts of a project as well as assessing potential mitigation for impacted areas. Noise abatement criteria vary depending on the activity that occurs on a property. The noise abatement criteria for different activity categories are shown in the table below.

CDOT noise abatement criteria are expressed in A-weighted decibels (dBA). An A-weighted decibel is a unit of measure corresponding to the way the human ear perceives the magnitude of sounds at different frequencies.

According to CDOT guidelines, a traffic noise impact at a location occurs when (1) predicted noise levels at that location exceed the noise abatement criteria, shown in the table below or (2) predicted noise levels exceed the current noise level by 10 dBA or more (even though the predicted levels may not exceed noise abatement criteria). This definition reflects the FHWA position that traffic noise impacts can occur under either of two separate conditions: (1) when noise levels are unacceptably high (absolute level); or (2) when a proposed highway project will substantially increase the existing noise environment (substantial increase).

CDOT's guidelines state that noise mitigation should be considered for any property, typically called a receptor in noise studies, where traffic noise impacts will occur according to the criteria explained above. Information about mitigation measures is provided on the back of this page.

CDOT Traffic Noise Abatement Criteria

Activity Category	L_{eq} [(1)] (dBA)	Description of Activity Category
A	56 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	71 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	51 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

(1) Road noise changes from moment to moment, but one can describe the noise energy over time in terms of its "equivalent level" (abbreviated L_{eq}). The L_{eq} is a single level that has the same sound energy as the fluctuating level over a stated time period. The L_{eq} used for the noise abatement criteria is the hourly A-weighted equivalent level for the "noisiest hour" of the day in the design year.

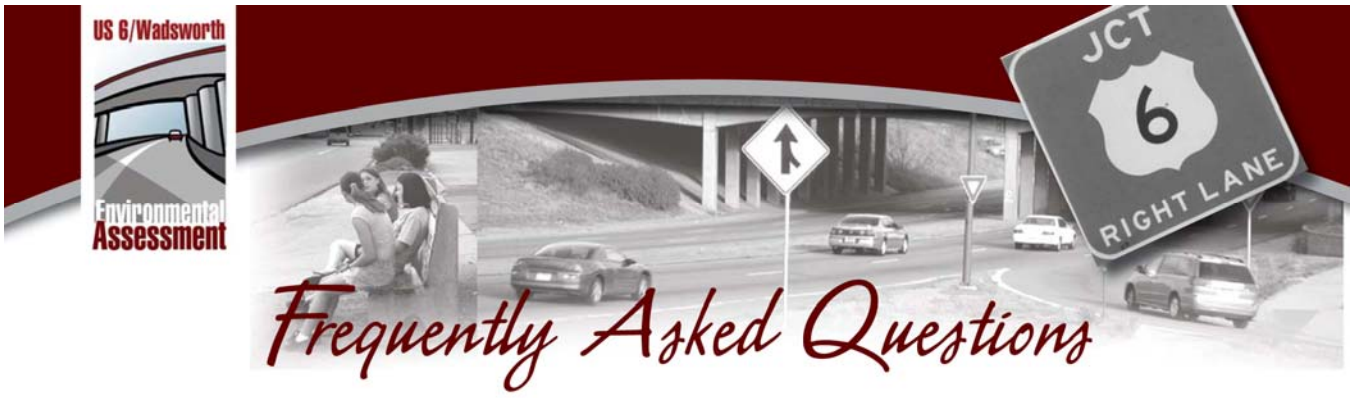
(Continued on back of sheet)

To be included in a project, a proposed noise mitigation measure must first be found to be feasible. A summary of the feasibility criteria is as follows:

- The proposed mitigation measure must be predicted to achieve at least 5 dBA of noise reduction at front row receptors (that is, the row of properties closest to the road).
- The proposed mitigation measure must not create any “fatal flaw” safety or maintenance issues such as reduced sight distances, shadowing of ice-prone areas, interference with snow/debris removal, or crash hazards.
- If the mitigation measure is to be a barrier, such as a wall, it must be possible to construct it in a continuous manner. Gaps in noise barriers, e.g. for driveways, significantly degrade their performance.

If a mitigation measure is found to be feasible, it is then analyzed for its “reasonableness.” A summary of the reasonableness criteria is as follows:

- The cost/benefit index of the proposed measure should not exceed $4,000 per dB of reduction per benefited receptor.
- The predicted design year noise levels should equal or exceed the Noise Abatement Criteria shown in the table on the front of this sheet.
- At least 50% of the affected properties should approve of the proposed measure.
- Land use in the affected area should be at least 50% Category B (refer to the Noise Abatement Criteria table on the front of this sheet).



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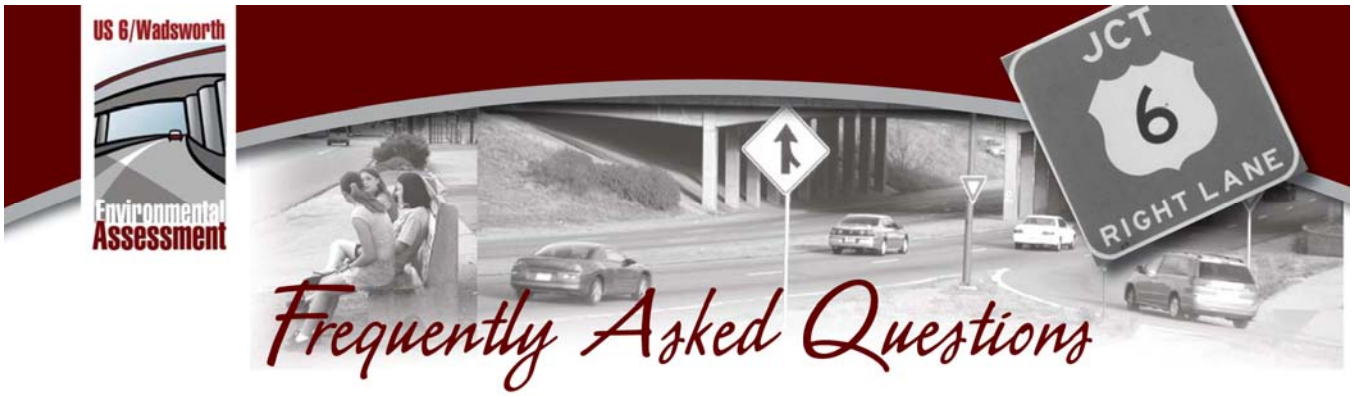


Q-1: Why is CDOT conducting this study?

A-1: Transportation improvements in the study area have been identified as a high priority for CDOT, the City of Lakewood, and area residents, businesses, and commuters. Roadway improvements in the region's West Corridor have been identified in Lakewood's Comprehensive Plan, the Denver Regional Council of Government's (DRCOG's) Regional Transportation Plan, and the 1997 West Corridor Major Investment Study prepared by the Regional Transportation District (RTD). Improvements in the West Corridor, including improvements to the US 6 and Wadsworth interchange, were identified as one of the set of 28 high-priority projects across the state that, in 1996, CDOT committed to completing over the next approximately 25 years. In 1999, Colorado voters approved bonding on CDOT's 28 high-priority projects against future gas tax revenues to complete the projects on an accelerated schedule. CDOT has completed nearly half of the projects of its Strategic Transportation Investment Program, also known as the 7th Pot Program. The US 6 and Wadsworth improvements have been identified as one of the roadway projects needed for the West Corridor, and as such, improvements could be eligible for priority funding.

Q-2: What is an Environmental Assessment (EA)?

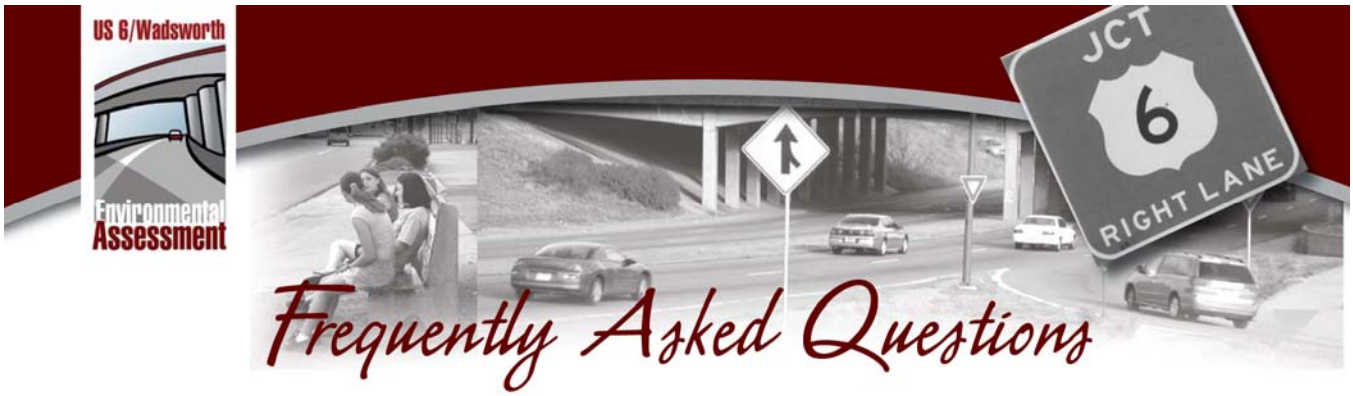
A-2: An EA is a document that describes the effects that a federal action would have on the environment. It also describes the impacts of alternatives to the Proposed Actions and identifies ways to avoid, minimize, or mitigate adverse impacts. The National Environmental Policy Act (NEPA), signed into law on January 1, 1970, established a national policy to protect the environment. Federal agencies are required to integrate the NEPA process into other planning processes to ensure that planning and decisions consider environmental values. Regulations for implementing NEPA established by the President's Council on Environmental Quality (CEQ) require that federal agencies document their consideration of environmental values and provide opportunity for public involvement. The potential for both beneficial and adverse impacts must be considered. EAs are normally prepared for those Proposed Actions whose environmental impacts are unknown. An EA will result in either a Finding of No Significant Impact (FONSI) or a finding of significant impact and a Notice of Intent to prepare an Environmental Impact Statement (EIS) to further study these impacts.

Q-3: Why does this project require an EA?

A-3: An EA is required because the proposed implementation of transportation improvements to US 6 and Wadsworth Boulevard is likely to have environmental impacts, and the extent of these impacts is unknown.

Q-4: How long will the study take?

A-4: The study was initiated in spring 2007 and will be completed in December 2008. If a construction project is identified at the end of the study, the project would then proceed into final design and construction. Final design typically takes 6 to 12 months to complete, and construction typically takes one to two years. The US 6 / Wadsworth study has been identified by CDOT and the Federal Highway Administration (FHWA) as a pilot NEPA streamlining project. It is also a priority project for CDOT and the City of Lakewood. The study is following an accelerated schedule due to the streamlining efforts.



Q-5: What is the role of the public in this study?

A-5: The public has been involved in developing the scope of the study, by providing input on which issues should be included in the study. Ending in August 2007, the scoping, or data-gathering, period also helped define the purpose and need for the project.

CDOT is now asking for input on the development of alternatives for Wadsworth Boulevard and the US 6 and Wadsworth Boulevard interchange. At this stage, we are looking specifically for feedback on the criteria used to evaluate the alternatives, priority of the criteria, and thoughts about the design concepts that have been developed. In the next couple of months, we plan to develop more detailed designs of the concepts recommended for further evaluation. We will be seeking public input on these alternatives.

The public will also be involved in developing and selecting mitigation measures used to avoid or minimize impacts of the Preferred Alternative. The public will then be able to review the EA document and provide formal comments at a public hearing. FHWA will consider these comments when writing its decision document on the project.

Q-6: What is the role of the City of Lakewood in the study?

A-6: The City of Lakewood is a partnering agency on the study. The City is working with CDOT and FHWA to provide a vision for improvements and necessary information and coordination among city departments and staff.

Q-7: How does CDOT's project relate to Lakewood's Station Area Plan and rezoning for the West Corridor Light Rail Station?

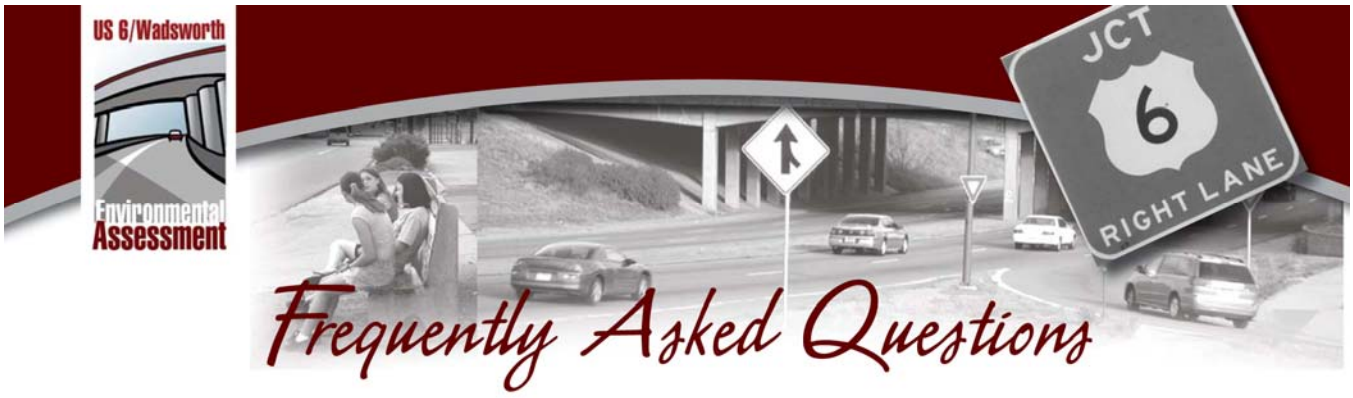
A-7: CDOT has reviewed Lakewood's Station Area Plan to determine whether proposed improvements on Wadsworth Boulevard would conflict with the Plan. Implementation of the Station Area Plan, however, is beyond the scope of this study. The City of Lakewood is a partner with CDOT on the EA.

Q-8: What is the role of RTD and the West Corridor project in the study?

A-8: RTD is a cooperating agency on the study. RTD has jurisdiction over the West Corridor light rail line and station, which are located in the US 6 / Wadsworth study area. RTD is working with CDOT and FHWA to provide necessary information on the West Corridor project and coordinate between the West Corridor and US 6 / Wadsworth projects.

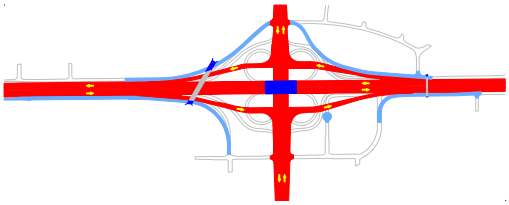
Q-9: Is CDOT involved in the property acquisitions for the West Corridor (east side of Wadsworth between 13th and 14th Avenues)?

A-9: No. The property acquisitions currently occurring along Wadsworth Boulevard between 13th and 14th Avenues are not related to the US 6 / Wadsworth EA.

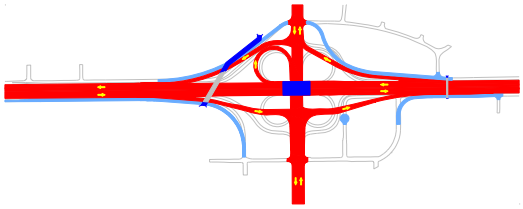


Q-10: What are the options for improvements?

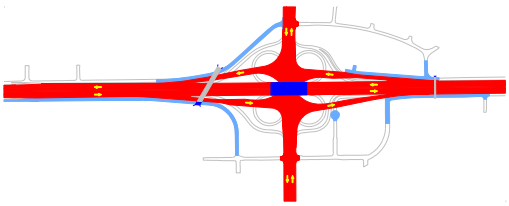
A-10: At this point in the study process, options for improvements include conceptual designs for the US 6 and Wadsworth interchange and for Wadsworth Boulevard between 4th and 14th Avenue. Eight conceptual interchange designs were evaluated for fatal flaws during the Level 1 screening process. CDOT is recommending four of the concepts be carried forward for more detailed evaluation:



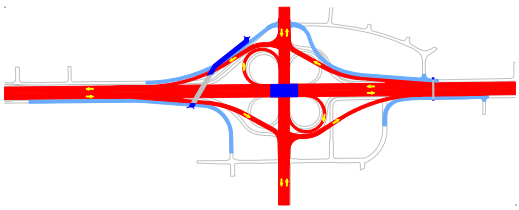
Tight Diamond



Tight Diamond with Loop

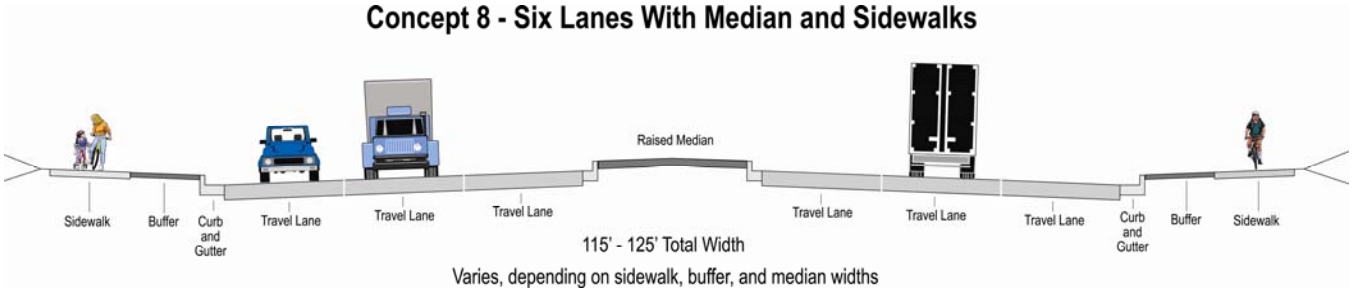


Single Point Urban Interchange (SPUI)



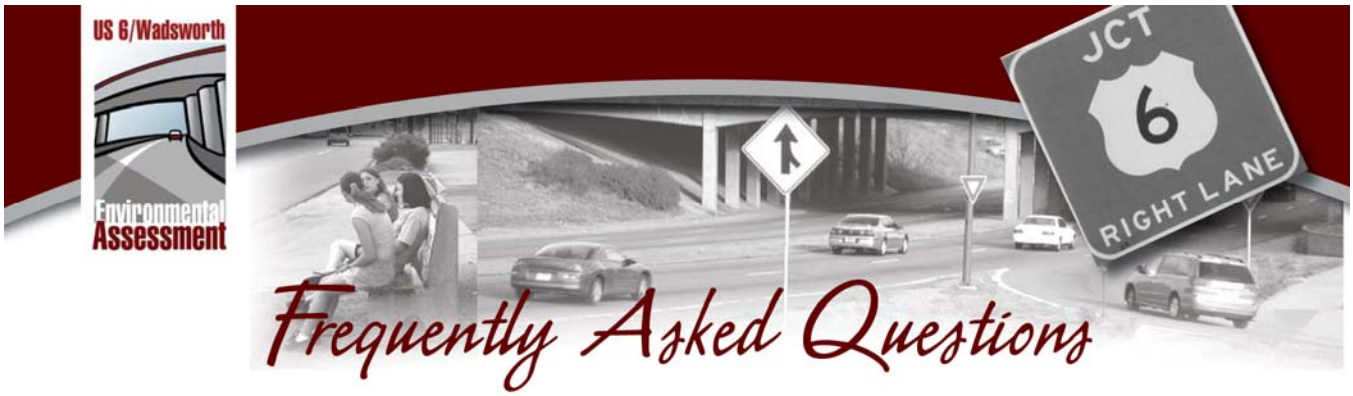
Partial Cloverleaf

Eleven conceptual designs for Wadsworth Boulevard were evaluated for fatal flaws during the Level 1 screening process. One concept is recommended to be carried forward for more detailed evaluation. The basic elements of this concept are shown below. It is likely that multiple alternatives, each varying the different design elements, will be developed out of this concept.



Q-11: Who makes the final decision about project improvements?

A-11: FHWA and CDOT will evaluate the environmental impacts of reconstruction of Wadsworth Boulevard and the interchange and determine which, if any, option should be funded.



Q-12: How will my property be affected? Are you going to take my property?

A-12: At this stage, CDOT has not advanced the design concepts to a point where specific property impacts can be determined. In the next level of evaluation, design of all of the alternatives recommended for detailed study (both for Wadsworth Boulevard and the interchange) will be refined, and individual properties that could be affected by the alternatives will be identified. The type and extent of property impacts will be an important criterion in evaluating and selecting a Preferred Alternative. After the Preferred Alternative is selected, CDOT will individually evaluate each potential property acquisition to determine if the acquisitions can be minimized or avoided. If your property is one identified as a potential acquisition, we will schedule a meeting with you to discuss mitigation options.

Q-13: When can I see details on property acquisition, access changes, or other property impacts?

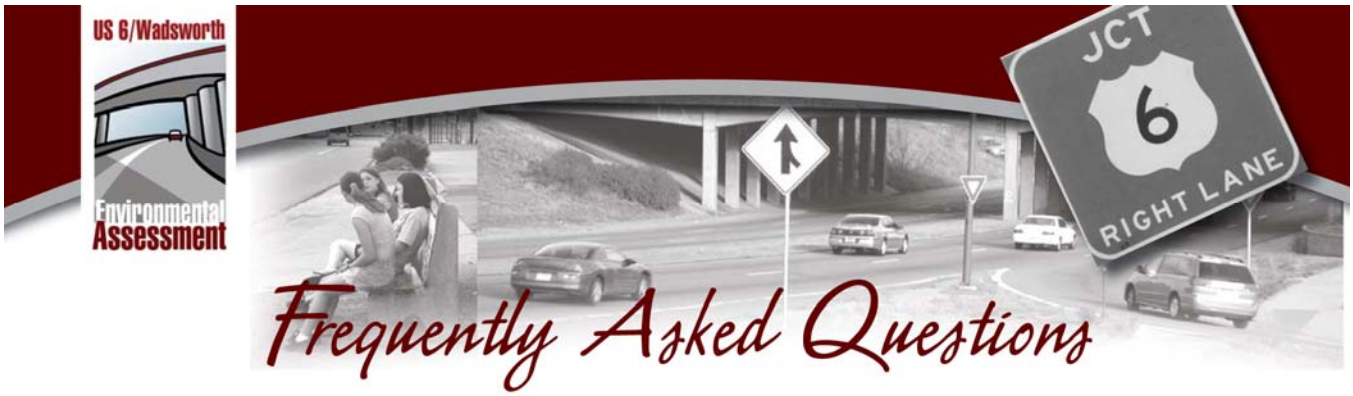
A-13: Preliminary details on property impacts will be available in April 2008. At that time, we will hold another Open House to discuss the results of the detailed alternatives evaluation, including property impacts. We will also be meeting with potentially affected property owners. (Also, see Q-12.).

Q-14: Will the project construct noise walls along 6th Avenue west of Wadsworth?

A-14: If a project is recommended for construction, noise mitigation will be provided for locations where highway noise is higher than acceptable thresholds (66 dBA), and where analysis shows that it is reasonable and feasible to do so.

Q-15: How will the project affect traffic in neighborhoods?

A-15: Designs for the interchange and Wadsworth Boulevard are conceptual at this stage of the study, and the impacts to neighborhood traffic have not been assessed. As the concepts move forward into more detailed evaluation, the impacts to neighborhood traffic will be studied, along with transportation, social, and environmental impacts.



Q-16: Will this study take into account traffic impacts of the light rail station and increased development along the light rail line?

A-16: The study will use DRCOG's approved 2035 travel forecasting model to determine future corridor traffic conditions, as required by NEPA. The DRCOG model incorporates the entire RTD FasTracks program as well as the most current land use forecasts surrounding the Wadsworth Boulevard corridor and the proposed West Corridor Light Rail Transit station. To date, a number of planning efforts have been completed to evaluate the implementation of light rail transit, the transit station, and the potential for changes in land use surrounding the station such as transit-oriented development (TOD). These planning efforts are described below.

Title	Agency	Date	Status
West Corridor Major Investment Study	RTD	1997	Adopted
Final West Corridor Environmental Impact Statement	RTD	2003	Completed
Wadsworth Boulevard Station Area Plan	City of Lakewood	2006	Adopted
Article 22: Mixed Use Zone District Zoning Ordinance	City of Lakewood	2007	Adopted
Wadsworth Boulevard Station Area Implementation Plan	City of Lakewood	2007	Adopted
West Corridor Supplemental Environmental Assessment	RTD	2007	Completed

Q-17: When will the project be constructed?

A-13: The EA must be completed before CDOT can apply for federal funding to construct a project. A typical schedule would include 18 to 24 months for completion of an EA, 6 to 12 months for final design, and one to two years for construction. Because the project is a high priority, construction could start as early as 2010.

Q-13: Will the project be constructed at the same time as other major construction projects in the area?

A-13: If a construction project is identified, the construction timing will be coordinated with other major construction projects in the area. CDOT will work closely with other entities to coordinate construction schedules to minimize disruptions to area residents, businesses, and commuters to the greatest extent possible.

Level 1 Screening Results

Wadsworth Conceptual Designs (Wadsworth from Highland to 14th Avenues)

Open House #2

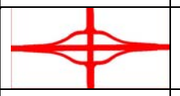
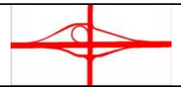
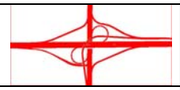
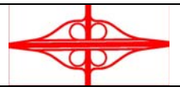
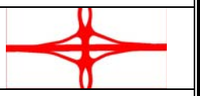
Category	Screening Criteria	NA No Action (4 lane + No Median+ Minimal Sidewalks)	1 Intelligent Transportation System Strategies Only*	2 Intersection Improvements + Median	3 4 Lane + Median + Sidewalks	4 5 Lane + Median + without Sidewalks	5 5 Lane + Median + Sidewalks	6 6 Lane + Median + without Sidewalks	7 6 Lane + No Median + Sidewalks	8 6 Lane + Median + Sidewalks	9 6 Lane + Two Way Left Turn + Sidewalks	10 6 Lane Transit (4 Travel + 2 Dedicated Transit)	11 8 Lane Transit (6 Travel + 2 Dedicated Transit)
Safety/Design	Is the alternative feasible from an engineering perspective?	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Does the alternative decrease access conflicts?	NO	NO	YES	YES	YES	YES	YES	NO	YES	NO	YES	YES
	Can this alternative accommodate safer bicycle and pedestrian travel along and across Wadsworth?	NO	NO	NO	YES	NO	YES	NO	YES	YES	YES	YES	YES
Mobility/Traffic Operations	Can the alternative meet current and future traffic needs?	NO	NO	NO	NO	NO	NO	YES	NO	YES	NO	NO	YES
Local Impacts	Does the alternative provide a means to access residences and businesses along the corridor?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Environmental Impacts	Can environmental impacts be reasonably mitigated? Primary environmental impacts considered during Level 1 Screening include right-of-way, noise, water quality, and Section 4(f).	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
Cost Feasibility	Can the alternative be constructed within 150 percent of estimated costs (i.e., less than $30 million [in 2010 dollars])? Costs include the capital construction and right of way.	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
Implementation	Is the alternative compatible with established local plans and visions?	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO
	Is the alternative compatible with RTD LRT plans?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
SUMMARY OF RESULTS		Carried Forward: Baseline Comparison	Eliminated: infrastructure deficiencies	Eliminated: infrastructure deficiencies	Eliminated: traffic	Eliminated: traffic, pedestrians/ bicyclists	Eliminated: traffic	Eliminated: pedestrians/ bicyclists	Eliminated: access conflicts, traffic	Carried Forward: Level 2 Evaluation	Eliminated: traffic	Eliminated: traffic; does not meet purpose and need	Eliminated: ROW and land use impacts; cost; does not meet purpose and need

* Intelligent Transportation Systems (ITS) (also referred to as Intelligent Traffic Systems, Travel Demand Management, and Transportation Systems Management) apply communications and information technology to provide solutions to congestion and other traffic control issues. ITS include such techniques as providing real-time information about traffic conditions, coordinating traffic signals, and operating reverse direction lanes to accommodate commuter traffic. Specific ITS strategies being considered for this project include ramp metering, arterial variable messaging system or VMS, closed caption television to support corridor surveillance and VMS, and system detection/incident timing. These strategies were included in the screening for the other alternatives but inclusion of ITS did not influence the screening results. Analysis of ITS will be included in the Level 2 evaluation for Conceptual Design #8, which has been forwarded for further evaluation.

Level 1 Screening Results

Open House #2

US 6 and Wadsworth Interchange Conceptual Designs (including Wadsworth from 4th to Highland Avenues)

Category	Level 1 Screening Criteria	NA	A	B	C	D	E	F	G	H
		No Action	Traditional Diamond	Tight Diamond	Tight Diamond w/Loop	Single Point Urban Interchange	Partial Cloverleaf	Partial Cloverleaf w/Directional Ramp	Full Cloverleaf with Collector/ Distributor Roads	Diverging Diamond
		Full Cloverleaf								
Safety/Design	Is the alternative feasible from an engineering perspective?	N/A	YES	YES	YES	YES	YES	YES	YES	YES
	Can this alternative accommodate safer bicycle and pedestrian travel through the interchange?	NO	YES	YES	YES	YES	YES	YES	NO	YES
	Does the alternative improve weaving/merge conditions?	NO	YES	YES	YES	YES	YES	YES	YES	YES
Mobility/Traffic Operations	Can the alternative meet current and future traffic needs?	NO	YES	YES	YES	YES	YES	YES	YES	YES
	Does the alternative address the interaction of the Wadsworth interchange and Carr/Garrison Street ramps?	NO	YES	YES	YES	YES	YES	YES	YES	YES
Local Impacts	Does the alternative provide a means to access residences and businesses along the corridor?	YES	YES	YES	YES	YES	YES	YES	YES	YES
Environmental Impacts	Can environmental impacts be reasonably mitigated? Environmental impacts considered during Level 1 Screening include right-of-way, noise, water quality, and Section 4(f).	N/A	NO	YES	YES	YES	YES	NO	NO	NO
Cost Feasibility	Can the alternative be constructed within 150 percent of estimated costs (i.e., less than $67.5 million [in 2010 dollars])? Costs include the capital construction and right of way.	N/A	YES	YES	YES	YES	YES	NO	NO	YES
Implementation	Is the alternative compatible with established local plans and visions?	NO	YES	YES	YES	YES	YES	YES	NO	NO
SUMMARY OF RESULTS		Carried Forward: Baseline Comparison	Eliminated: ROW impacts	Carried Forward: Level 2 Evaluation	Carried Forward: Level 2 Evaluation	Carried Forward: Level 2 Evaluation	Carried Forward: Level 2 Evaluation	Eliminated: ROW impacts, noise, and cost	Eliminated: ROW impacts; bicyclist and pedestrian conflicts	Eliminated: ROW impacts, reduced travel speed, driver expectations

First Name: _____ Last Name: _____

Address: _____ City: _____ Zip Code: _____

Email Address: _____ ☐ Yes, add me to the US 6/Wadsworth mailing list

Do you agree with the results of the Level 1 screening for the interchange concepts? ☐ Yes ☐ No

Comments?

_____

_____

_____

_____

_____

Do you agree with the results of the Level 1 screening for the Wadsworth Boulevard concepts? ☐ Yes ☐ No

Comments?

_____

_____

_____

_____

_____

Which criteria do you feel are most important in evaluating the design concepts carried forward? Please fill out the checklist on the back of this page, and provide any comments on the criteria in the space provided below.

_____

_____

_____

_____

_____

Do you have any additional comments?

_____

_____

_____

_____

_____

Please take a few minutes to read through the following list and check the criteria you feel are most important in evaluating the alternatives carried forward. **Please check a maximum of five criteria for the interchange alternatives, and a maximum of five criteria for the Wadsworth Boulevard alternatives.** This will help us understand the priorities of stakeholders as we conduct the Level 2 evaluation. Please contact a project team member if you have any questions.

High Priority? (check no more than five)	Interchange Alternatives Evaluation Criteria
☐	Safe pedestrian and bicycle crossings at interchange
☐	Design of ramp entrances
☐	Number of design exceptions (variances from approved design standards)
☐	Number of weave sections (areas where vehicles must cross paths to enter or exit highway)
☐	Congestion on interchange ramps
☐	Spacing between ramp and frontage road intersections
☐	Interchange capacity to accommodate highest volume movements
☐	Local access to/from US 6
☐	Effects to local business access, visibility, or parking
☐	Number of businesses and residences that would require relocation
☐	Number of properties that would be either partially or fully acquired
☐	Number of residences within 66 dBA (decibel) noise contour
☐	Acres of wetlands and waters of the U.S. affected
☐	Total cost of project
☐	Right-of-way cost
☐	Ability of emergency response providers to maintain or improve their response times
☐	Maintenance of traffic during construction
☐	Ability to accommodate future widening of US 6 or Wadsworth

High Priority? (check no more than five)	Wadsworth Boulevard Alternatives Evaluation Criteria
☐	Width of travel lanes
☐	Medians for vehicular and pedestrian safety
☐	Sidewalks for pedestrian and bicycle safety
☐	Number of design exceptions (variances from approved design standards)
☐	Medians for access control
☐	Delay (time) vehicles experience at signalized intersections
☐	Corridor travel time
☐	Neighborhood traffic impacts
☐	Local street access to/from Wadsworth
☐	Number of businesses and residences that would require relocation
☐	Number of properties that would be either partially or fully acquired
☐	Acres of wetlands and waters of the U.S. affected
☐	Number of historic properties and parks affected
☐	Total cost of project
☐	Right-of-way cost
☐	Ability of emergency response providers to maintain or improve their response times
☐	Construction duration
☐	Ability to accommodate future widening of US 6 or Wadsworth

ACCESS SPACING

Signal Spacing

Signals Per Mile	Increase in Travel Time (%)
2	–
3	9
4	16
5	23
6	29
7	34
8	39

Increasing the distance between traffic signals improves the flow of traffic on major arterials, reduces congestion, and improves air quality for heavily traveled corridors. The appropriate spacing between signals for a particular corridor depends greatly upon the speed and flow of traffic, but anything greater than two signals per mile has a significant impact on congestion and safety.

A major synthesis of research on access management found that each additional signal over two per mile (i.e., a one-half mile signal spacing) increased travel time by over six percent. [4] A study of an intersection in Cincinnati where a signal was added found a 20 percent increase in peak travel times. [11]

A demonstration project in Colorado revealed that half mile signal spacing and raised medians on a five-mile roadway segment reduced total hours of vehicle travel by 42 percent and total hours of delay by 59 percent, compared to quarter mile signal spacing. [1]

Signals Per Mile	Crashes Per Million VMT
Under 2	3.53
2 to 4	6.89
4 to 6	7.49
6 +	9.11

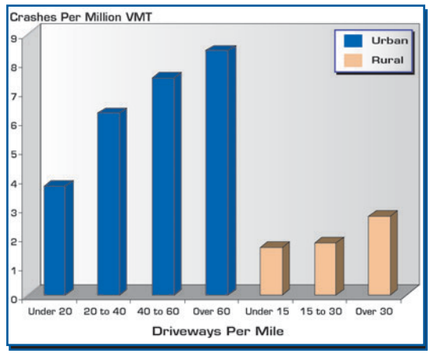
Improved speeds and travel times translate directly into environmental benefits. An ongoing study in Texas found that a ten mile four-lane arterial with one-half mile signal spacing reduced fuel consumption by 240,000 gallons from increased speed and 335,000 gallons from reduced delay, compared to quarter mile signal spacing. [14]

Increasing the distance between signals also reduces the incidence of crashes. A review of crash data from seven states demonstrated that the crash rate increased substantially with additional signals per mile. [4] This is partly related to access spacing, which is presented next.

Driveway Spacing

Appropriate driveway spacing presents another major access issue. Large numbers of driveways increase the potential conflicts on the road. Fewer driveways spaced further apart allow for more orderly merging of traffic and present fewer challenges to drivers.

The congestion impacts of reduced driveways are fairly clear. It is impossible for a major arterial or highway to maintain free flow speeds with numerous access points that add slow moving vehicles. A research synthesis found that roadway speeds were reduced an average of 2.5 miles per hour for every 10 access points per mile, up to a maximum of a 10 miles per hour reduction (at 40 access points per mile). [4] With higher numbers of access points, congestion will increase significantly.



An overabundance of driveways also increases the rate of car crashes. An examination of crash data in seven states indicated found a strong linear relationship between the number of crashes and the number of driveways. Rural areas had a similar, but less strong relationship. [4,7]

RELATED TECHNIQUES

Access management includes more techniques than can be discussed in a single brochure. Some of these techniques are newer and have been researched somewhat less. Frontage roads have been the subject of some debate in the literature, but there is no clear indication of their benefits. Other techniques, such as the relationship between highway interchange spacing and local traffic, are new topics that require more research.

Many cities and states develop access management programs to deal with existing issues of congestion and safety. An active access management program, however, would need to include changes to local land use policies that encourage the rational development of major roads. In newly developing areas, land use and zoning controls that limit the number of access points and leave space for median improvements can save money and effort as these areas develop.

TURNING LANES

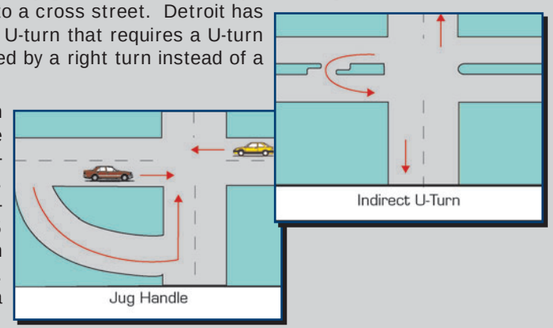
Left Turns

Exclusive turning lanes for vehicles remove stopped vehicles from through traffic. Left-turn lanes at intersections substantially reduce rear-end crashes. A major synthesis of research on left-turn lanes demonstrated that exclusive turn lanes reduce crashes between 18 to 77 percent (50 percent average) and reduce rear-end collisions between 60 and 88 percent. [4]

Left-turn lanes also substantially increase the capacity of many roadways. A shared left-turn and through lane has about 40 to 60 percent the capacity of a standard through lane. [4]. A synthesis of research on this topic found a 25 percent increase in capacity, on average, for roadways that added a left-turn lane. [13]

Indirect Turns

Some of the biggest issues with managing access come at intersections where vehicles must cross traffic. Some states and cities have adopted indirect turns to reduce these conflicts. In New Jersey, the jug-handle left turn requires a right turn onto a feeder street, followed by a left onto a cross street. Detroit has extensively used an indirect U-turn that requires a U-turn past an intersection, followed by a right turn instead of a regular left turn.



Like dedicated left-turn lanes, indirect turns reduce crashes, improve congestion, and add capacity. Crashes decline by 20 percent on average, and 35 percent if the indirect turn intersection is signalized. Capacity typically shows a 15 to 20 percent gain. [4]

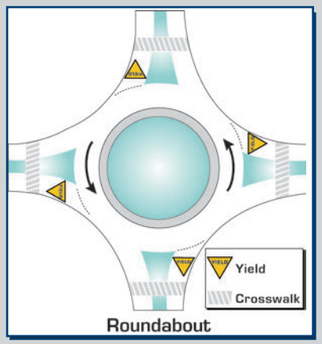
Right Turns

Right-Turning Vehicles Per Hour	Through Vehicles Impacted (%)
Under 30	2.4
31 to 61	7.5
61 to 90	12.2
90 and up	21.8

Right-turn lanes typically have a less substantial impact on crashes and roadway capacity than other types of turn strategies, because there are fewer limitations on right turns. Though there are fewer studies of these impacts, there is a clear relationship between the number of vehicles attempting a right turn in a through traffic lane and its delay to through traffic. This relationship is exponential – each additional car that must wait for a right turn will increase the delay more than the previous car. At intersections with substantial right-turn movements, a dedicated right-turn lane segregates these cars from through traffic and increases the capacity of the road.

Roundabouts

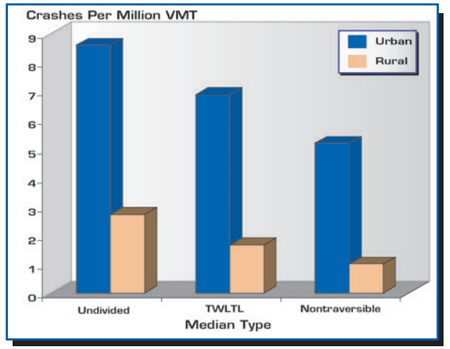
Roundabouts represent a potential solution for intersections with many conflict points. Though not appropriate for all situations, roundabouts reduce vehicle movements across traffic. Only a few studies have examined the safety benefits of roundabouts. One study of four intersections that were replaced with roundabouts in Maryland found a drop in crashes between 18 and 29 percent and a reduction in injury crashes between 63 and 88 percent. The cost of crashes at these locations – one measure of severity – was also reduced by 68 percent. Overall crashes on roundabouts were more minor than those at left turn locations. [9] Another study of roundabouts in several locations found a 51 percent reduction in crashes, including a 73 percent reduction in injury crashes and a 32 percent reduction in property-damage-only crashes for single-lane roundabouts. Multi-lane roundabouts only experienced a 29 percent reduction in crashes. [6]



MEDIAN TREATMENTS

Medians

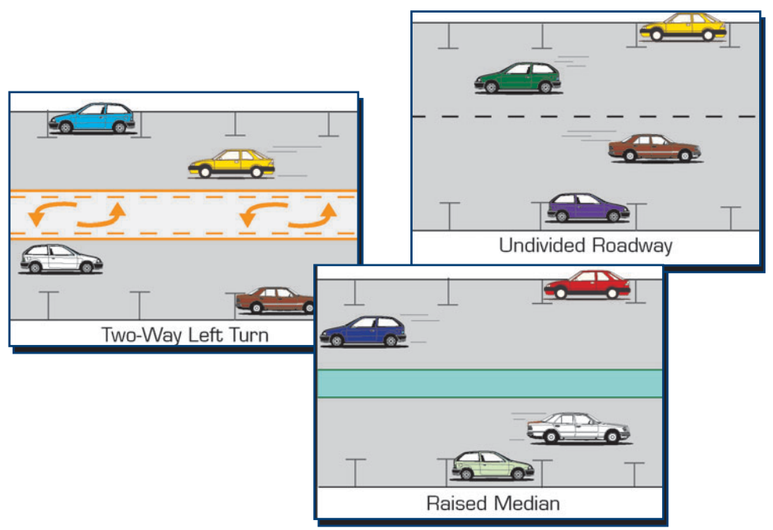
Median treatments for roadways represent one of the most effective means to regulate access, but are also the most controversial. The two major median treatments include two-way left turn lanes (TWLTL) and raised medians.



The safety benefits of median improvements have been the subject of numerous studies and syntheses. Studies of both particular corridors and comparative research on different types of median treatments indicate the significant safety benefits from access management techniques. According to an analysis of crash data in seven states, raised medians reduce crashes by over 40 percent in urban areas and over 60 percent in rural areas. [4]

A study of corridors in several cities in Iowa found that two-way left-turn lanes reduced crashes by as much as 70 percent, improved level of service by one full grade in some areas, and increased lane capacity by as much as 36 percent. [5]

Raised medians also provide extra protection for pedestrians. A study of median treatments in Georgia found that raised medians reduced pedestrian-involved crashes by 45 percent and fatalities by 78 percent, compared to two-way left-turn lanes. [12]



Business Concerns

Installing raised medians often raises serious concerns by the business community that local businesses that depend upon pass-by traffic (especially gas stations and fast-food restaurants [10]) will be adversely affected by medians. Though there are few studies of the actual impacts of medians on business sales, there are several surveys of business owner opinions. Surveys conducted in multiple corridors in Texas, Iowa, and Florida demonstrate that the vast majority of business owners believe there have been no declines in sales, with some believing there are actually improvements in business sales. [2,5,8] One study in Texas indicated that corridors with access control improvements experienced an 18 percent increase in property values after construction. [2]

Location	Owners Report No Decline in Business (%)
Texas (2)	93
Texas (3)	78 to 84
Iowa (5)	67 to 91

PURPOSE OF THE BROCHURE

This brochure serves as a guide to the major benefits of several access management techniques in use across the United States. The purpose of this brochure is to provide a comprehensive and succinct examination of the benefits of access management and address major concerns that are often raised about access management.

The benefits usually identified with access management include improved movement of through traffic, reduced crashes, and fewer vehicle conflicts. Most major concerns about access management relate to potential reductions in revenue to local businesses that depend on pass-by traffic.

This brochure does not describe the precise strategies that transportation departments should follow to implement an access management program, but rather provides an introduction to the key concepts. The brochure may also be a useful tool to distribute at public meetings for both general access management plans and specific applications of access management techniques.

This brochure describes the relevant benefits and issues with three key sets of access management techniques:

1. Access spacing, including spacing between signalized intersections and distance between driveways;
2. Turning lanes, including dedicated left- and right-turn lanes, as well as indirect left turns and U-turns, and roundabouts; and
3. Median treatments, including two-way left-turn lanes and raised medians.

WHAT IS ACCESS MANAGEMENT?

Access management is a set of techniques that state and local governments can use to control access to highways, major arterials, and other roadways. Access management includes several techniques that are designed to increase the capacity of these roads, manage congestion, and reduce crashes.

- Increasing spacing between signals and interchanges;
- Driveway location, spacing, and design;
- Use of exclusive turning lanes;
- Median treatments, including two-way left turn lanes (TWLTL) that allow turn movements in multiple directions from a center lane and raised medians that prevent movements across a roadway;
- Use of service and frontage roads; and
- Land use policies that limit right-of-way access to highways.

State, regional, and local governments across the United States use access management policies to preserve the functionality of their roadway systems. This is often done by designating an appropriate level of access control for each of a variety of facilities. Local residential roads are allowed full access, while major highways and freeways allow very little. In between are a series of road types that require standards to help ensure the free flow of traffic and minimize crashes, while still allowing access to major businesses and other land uses along a road,

CITATIONS

[1] Colorado Department of Highways, 1985, Final Report of the Colorado Access Control Demonstration Project, Colorado.

[2] Eisele, W. E., and W. E. Frawley, 1999, A Methodology for Determining Economic Impacts of Raised Medians: Data Analysis on Additional Case Studies, Research Report 3904-3, Texas Transportation Institute, College Station, Texas, October.

[3] Frawley, W. E., and W. E. Eisele, 1998, A Methodology to Determine Economic Impacts of Raised Medians on Adjacent Businesses, 1998 National Conference on Access Management.

[4] Gluck, J., H. S. Levinson, and V. Stover, 1999, Impacts of Access Management Techniques, NCHRP Report 420, Transportation Research Board.

[5] Iowa Department of Transportation, 1997, Access Management Research and Awareness Program: Phase II Report.

[6] Jacquemart, G., 1998, Synthesis of Highway Practice 264: Modern Roundabout Practice in the United States, National Cooperative Highway Research Program, National Academy Press, Washington, D.C.

[7] Lall, B. K., D. Huntington, and A. Eghtedari, 1996, Access Management and Traffic Safety, Paper presented at the Second Annual Access Management Conference.

[8] Long, G, C.T. Gan, and B.S. Morrison. "Impacts of Selected Median and Access Design Features." Florida Department of Transportation Report, Transportation Research Center, University of Florida, May 1993.

[9] Meyers, E. J., 1999, Accident Reduction with Roundabouts, Paper presented at the 69th Annual ITE Meeting, Las Vegas, Nevada.

[10] Neuwirth, R. M., G. E. Weisbrod, and S. D. Decker. 1993, Methodology for Evaluation Economic Impacts of Restricting Left Turns, Paper presented at the First Annual Access Management Conference.

[11] Pant, P. D., M.D., S. Ula, and Y. Liu, 1998, Methodology for Assessing the Effectiveness of Access Management Techniques, Final Report, prepared for the Ohio Department of Transportation.

[12] Parsonson, P. S., M. G. Waters III, and J. S. Fincher, 2000, Georgia Study Confirms the Continuing Safety Advantage of Raised Medians Over Two-Way Left-Turn Lanes, presented at the Fourth National Conference on Access Management, Portland, Oregon.

[13] S/K Transportation Consultants, Inc., 2000, National Highway Institute Course Number 133078: Access Management, Location, and Design, April.

[14] Texas Transportation Institute, In Progress, An Evaluation of Strategies for Improving Transportation Mobility and Energy Efficiency in Urban Areas, Texas A&M University, Project 60011.

FOR MORE INFORMATION

http: / / www.accessmanagement.gov

FHWA Document Number FHWA-OP-03-066

Benefits of Access Management

U.S. Department of Transportation
Federal Highway Administration