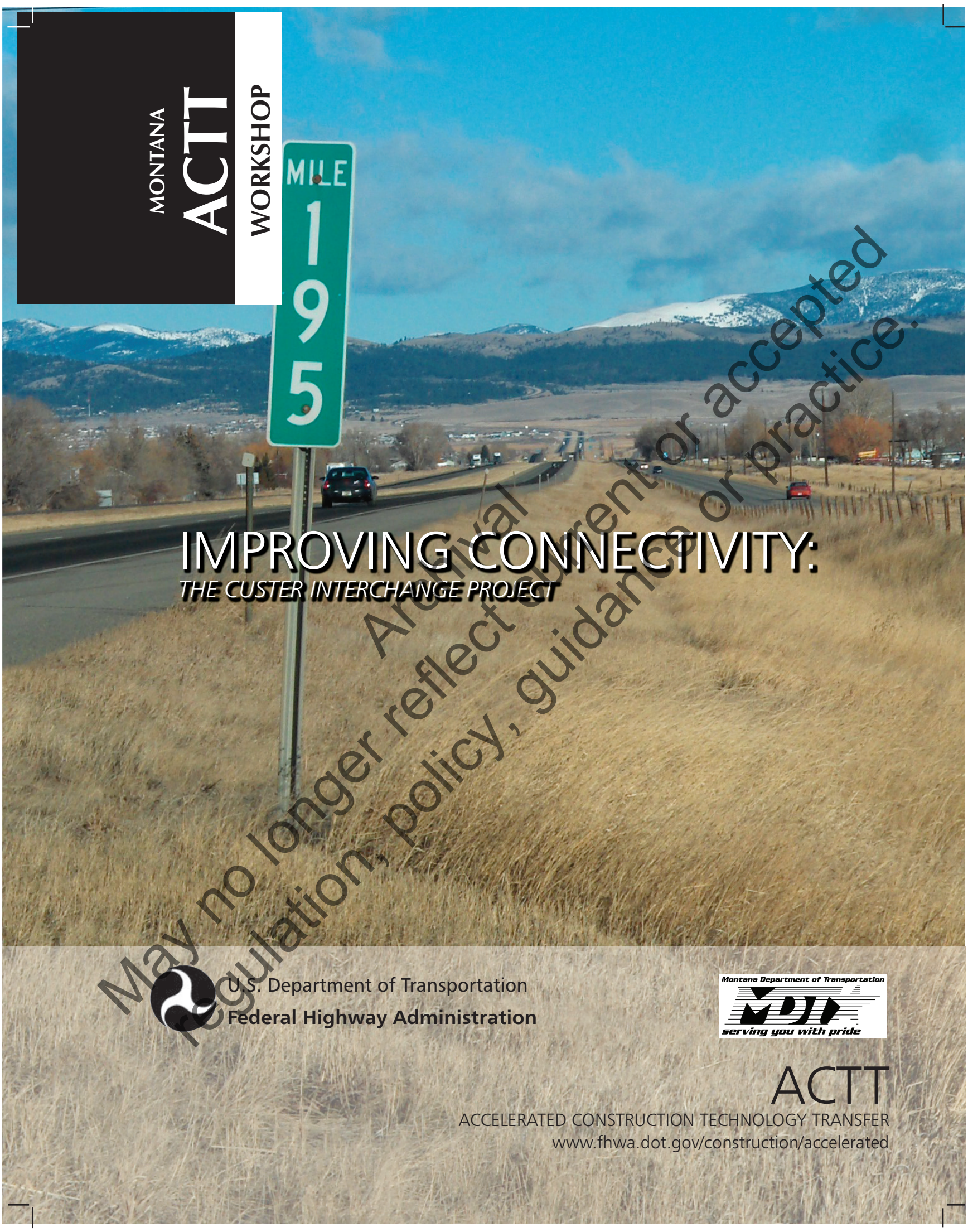

MONTANA
ACTT
WORKSHOP

IMPROVING CONNECTIVITY:

THE CUSTER INTERCHANGE PROJECT

U.S. Department of Transportation
Federal Highway Administration

Montana Department of Transportation
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- ACTT provides a fresh outlook by bringing national experts to your planning table.
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- ACTT works for you and your customer!

How do I ACTT?

- Select a corridor: ACTT is most helpful when applied during the project development phase.
- Make a workshop proposal to ACTT team members, and submit a copy of your proposal to the FHWA Division Office. Include details on the project corridor, timeline and goals.
- Hold a pre-workshop meeting with the ACTT management team.
- Select a meeting site, and coordinate workshop details with the FHWA Division Office.
- Host the workshop.
- Draft a report for submittal to FHWA.
- Incorporate ACTT into project operations.

MONTANA ACTT WORKSHOP

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COVER PHOTO:
I-15 North.

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> "It's a journey with no end; Americans crave mobility, and wheels will always need roads."
>
> – George Constable and Bob Somerville
> *A Century of Innovation: 20 Engineering Achievements That Transformed Our Lives,* 2003
> Source: "The Quotable Interstate," Federal Highway Administration, U.S. Department of Transportation
> http://www.fhwa.dot.gov/interstate/quotable.htm. Accessed May 13, 2008

One of the major challenges many departments of transportation (DOTs) now face is keeping our nation's roadways in top-notch condition, not an easy challenge in light of aging infrastructure, increased congestion and limited transportation dollars.

These are the very issues the Montana Department of Transportation (MDT) is dealing with on the Custer Interchange Project in Helena, Montana.

The $40 million project includes the construction of a new interchange, the widening of an existing roadway, the construction of two auxiliary lanes, and the realignment of another existing roadway, as well as a number of other features. Because the 12-mile corridor serves as a key artery to Helena, traffic disruptions must be kept to a minimum. Stakeholder buy-in and communication are essential to the project's success.

With this in mind, MDT approached the Federal Highway Administration (FHWA) about hosting their second Accelerated Construction Technology Transfer (ACTT) workshop. MDT hosted an ACTT workshop in January 2004 for the US 93 upgrade project between Evaro and Polson in Western Montana and is one of the leading, progressive agencies in the country that has helped the effort to institutionalize ACTT among other agencies. Thanks to the lessons learned in their previous workshop, MDT has effectively applied ACTT in its design development process whenever possible and has adopted the ACTT mindset and process when planning future projects.

Together, FHWA and MDT identified the following skill sets for the Custer Interchange workshop:

- Structures.
- Innovative Financing/Innovative Contracting.
- Traffic Engineering/Safety/Intelligent Transportation Systems (ITS).
- Construction/Innovative Materials.
- Public Relations.
- Roadway/Geometric Design.
- Utilities/ROW.

Each team focused on how the ACTT process applied to its area of expertise. The group as a whole searched for innovative ways to help MDT fund and accelerate construction of the Custer Interchange project.

As the workshop progressed, each team summarized its thoughts and narrowed them to a list of priority recommendations. On the final day, each team presented its suggestions to conference attendees. Now that the workshop is complete, MDT will evaluate the various recommendations and decide which ideas should be implemented as part of the project.

1.1. Opening Session

The Custer Interchange - Helena, Montana ACTT workshop took place January 22-24, 2008, at the Red Lion Colonial Inn located in Helena, Montana.

FHWA Construction & System Preservation Engineer Chris Schneider served as the workshop moderator. MDT Director Jim Lynch and MDT Chief Engineer Loran Frazier welcomed the group. FHWA Division Administrator Kevin McLaury gave a presentation entitled *Building on Success*. Helena City Manager Tim Burton and Lewis & Clark County Commissioner Chair Ed Tinlsey greeted the attendees. The participants introduced themselves. Following a project overview from Mick Johnson (MDT District Administrator for the Great Falls District), John Pavsek (Morrison-Maierle, Inc.), and Mike Duman (FHWA ADA), the group departed on a tour of the project corridor.

1.2. Workshop Process

The MDT workshop followed the traditional ACTT process. On Wednesday morning, the ACTT management team discussed the brainstorming process with workshop attendees. The skill sets teams then broke apart to discuss the project and brainstorm preliminary ideas, reconvening before lunch to share initial thoughts. After lunch, the skill sets teams continued their work, intermingling with other teams to ask questions and share ideas. The teams spent the remainder of the afternoon preparing final recommendations for presentation to the group on Thursday morning.

1.3. Skill Set Goals

Participants in each skill set established a group of goals that was unique to their subject area:

Structures

- Reduce bridge construction time.
- Remove bridge from project critical path.
- Improve quality and durability.
- Minimize disruption to Custer Avenue.
- Reduce costs.

Innovative Financing/Innovative Contracting

- Identify funding sources.
- Provide cost control/savings.
- Compress schedule for entire project and construction activities.
- Minimize user costs and delays.
- Optimize contract packaging.

Traffic Operations/Safety/Intelligent Transportation Systems (ITS)

- Provide traffic management plan.
- Establish construction phasing.
- Manage access.
- Promote safety.
- Establish system level planning.

Construction/Innovative Materials

- Phase construction of project elements.
- Use alternative materials to reduce costs and time of construction.
- Recycle/reuse existing surfacing.
- Consider incentives/disincentives.

Public Relations

- Ensure two way communications.
- Build community support.
- Build community awareness of project challenges.
- Educate the public on the highway development process.
- Keep the public informed throughout project construction.

Roadway/Geometric Design

- Manage phased construction and maintenance of traffic.
- Address ramp termini/interchange geometry.
- Establish alternative roadway design criteria.

Utilities/ROW

- Use advance right-of-way acquisition.
- Coordinate with utilities throughout project development.
- Clear project area of utilities prior to letting bid.
- Clear project corridors of encroachments prior to letting bid.

2.1. Project Overview

The 12-mile project includes the construction of a new interchange at Custer Avenue, including widening Custer Avenue to four through lanes between North Montana Avenue and North Washington Street. Additional enhancements include median/turn lanes and provisions for bicycles and pedestrians, as well as construction of two auxiliary lanes on I-15. Minor realignment of the east side Frontage Road at Custer Avenue is also part of the proposed improvements.

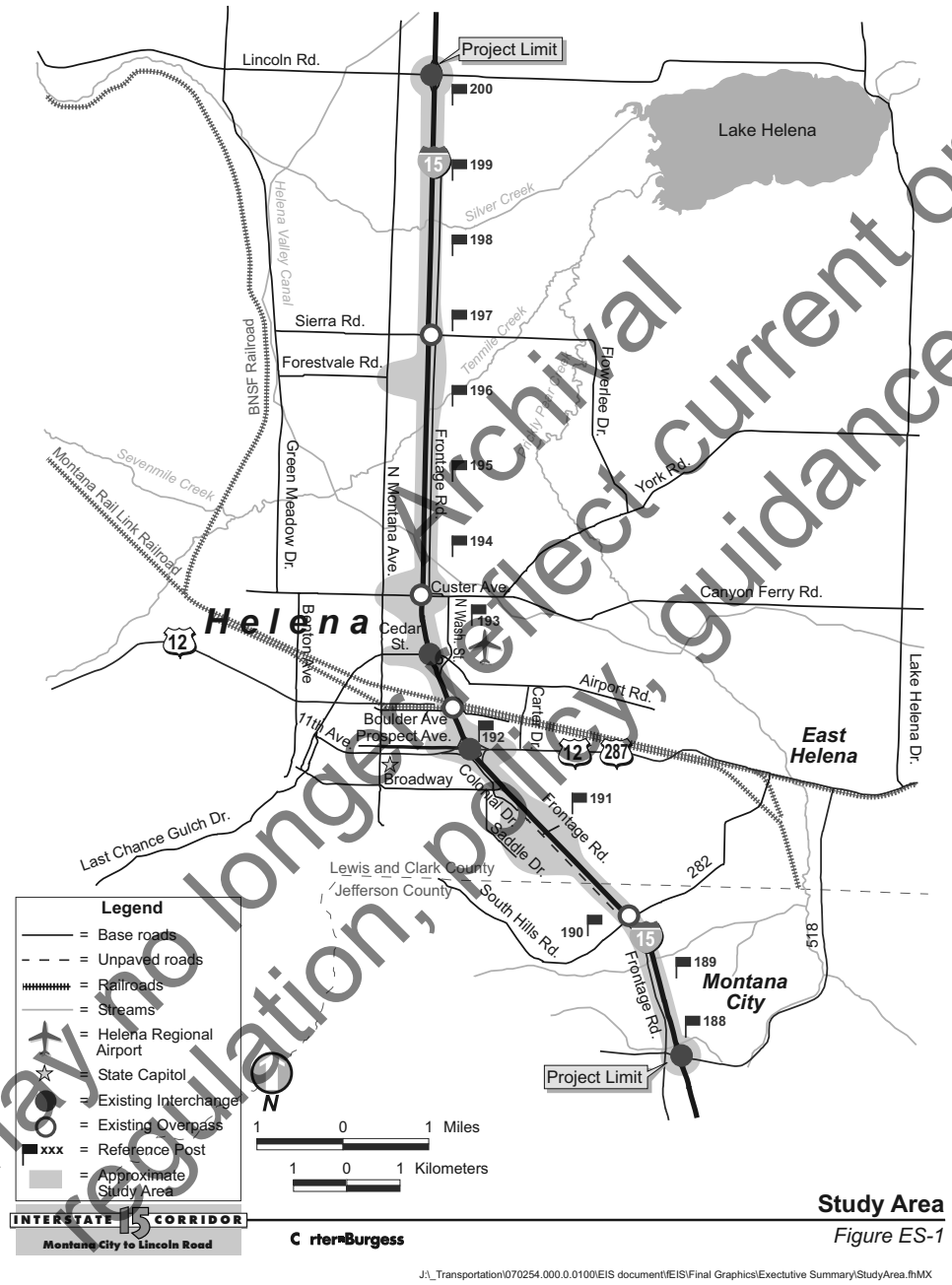

Figure 1: *Project study area, I-15 Corridor, Helena, MT.*

2.2. Project History and Development

The Custer Interchange Project is located within the urban limits of Helena, MT, in Lewis & Clark County along a number of routes. All of the routes within the project area are at least 40 years old: I-15 was initially constructed in 1962; Custer Avenue was constructed in 1955; Cedar Street in 1961; and the initial construction date of Frontage Road is unknown.

Although many of the routes in question have seen improvements over the years, increases in population and changes in land use have resulted in increases in traffic volumes on I-15 and the surrounding roadways. This has decreased the operating efficiency of I-15 and the interchanges, as well as the east-west roadways that serve and cross I-15. Another impact of this increased use has been a 31% higher than average crash rate along the I-15 corridor.

In order to address these issues, MDT has worked extensively with the City of Helena, Lewis & Clark County, Helena Regional Airport Authority, FHWA, and select business owners. In addition, MDT has held 8 public information meetings with local residents since August of 2006.

2.3. Project Purpose

The purpose of the Custer Interchange Project is to improve east-west travel for all modes of transportation, improve emergency services access, improve pedestrian and bicycle facilities, and improve the safety and operational efficiency of I-15, as well as the interchanges and roadways crossing I-15. The Custer Avenue interchange will also provide access to existing and projected land use north of the Capitol and Cedar Interchanges.

2.4. Project Challenges

Due to the location of the project area it is crucial that construction is completed as quickly as possible to minimize the impacts to the traveling public and to nearby businesses, residents, and commuters.

2.5. Project Status

The Final Environmental Impact Statement (FEIS) has been completed, and the FHWA signed the Record of Decision (ROD) in 2004. The preliminary engineering is nearly 50% complete, after which the scope of work will be distributed for comment and approval. Once the scope of work is approved, the project will move into the plan-in-hand design, with a projected ready date of December 1, 2010.

3.1. Structures

The structures skill set offered the following recommendations:

Lateral Skidding/Rolling

- Build bridge alongside on temporary falsework.
- Use new superstructure as temporary bridge.
- Allow traffic to continue on existing bridge until new bridge is moved into place.
- Consider that lateral skidding/rolling requires:
  - 2-3 day minimal roadway closure.
  - Specialized equipment.
  - Temporary falsework.
- Consider that lateral skidding/rolling may increase cost.

Custer Avenue Closure

- Require full 45-90 day closure of Custer Avenue.
- Prefabricate most bridge components to allow for more rapid construction.
- Create safer working conditions with closure.
- Facilitate efficiency in other construction areas with closure, including:
  - Installation of utilities.
  - Reduced traffic control.
  - Completion of inspections.
  - Reduced construction duration.
  - Easier delivery of materials.

Phased Construction

- Use precast elements for the majority of the structure to reduce the duration of each stage.
- Build bridge in one to two construction seasons.
- Realign Frontage Road prior to the rest of the project to allow room for construction.
- Make temporary roadway approach modifications.
- Avoid closure of Custer Avenue.

Offsite Prefabrication

- Complete superstructure before other site work begins.
- Use SPMTs to move superstructure in and out after approaches and substructures have been completed.
- Expect minimal roadway closure.

Structure Depth

- Shorten the proposed bridge span lengths for the purpose of minimizing structure depth.
- Applicable to all previous construction options.
- Use full height abutments to shorten span lengths.
- Lower grade of the Custer Avenue Bridge by approximately 1 foot.
- Offset additional structure cost by approach fill savings.
- Be aware that structure is not as efficient.
- Require larger wingwalls.

Structure Components

- Consider full depth and partial depth precast concrete decks.
  - Reduce cracking and leaking by using pre-tensioned and post-tensioned precast deck panels.
  - Consider cast panels that are approximately half the deck width and connect with a closure pour.
- Use parapets precast with the deck slab or precast separately and grouted to the deck.
  - Consider bolt down barriers similar to the Vermont or New Hampshire Barrier.
  - Build parapets behind temporary Jersey barriers in order to open bridge to traffic more quickly.
- Consider girder options which include:
  - Prestress concrete AASHTO girders.
  - Butted Bulb-T's.
  - Steel girders.
  - Butted box beams.
- Consider bearing options which include:
  - Steel rocker shoes.
  - Elastomeric bearings.
- Consider abutments options which include:
  - Precast integral abutments.
  - Precast full height abutments.

- ❖ Short wingwalls or “flying” wingwalls.
- ❖ Span lengths could be shortened if full height MSE walls are utilized.

- ♦ Be aware that wall piers can present difficulties in seismic design.
- ♦ Consider spread and pile footings.

Constructability Study

- ♦ Recommend a constructability study for all options.

3.2. Innovative Financing/Innovative Contracting

The innovative financing/innovative contracting team offered the following recommendations:

Identify Funding Sources

- ♦ Option 1: Fund entire project.
  - ❖ Use GARVEE Bonds (Grant Anticipation Revenue Vehicles).
    - o Expedite current schedule.
    - o Pay bond debt with future federal dollars.
    - o Leverage the fact that current interest rates are lower than the construction inflation rate.
    - o Increase statutory limit pending 2009 legislative action.
- ♦ Option 2: Build project segments as funding becomes available.
  - ❖ Use other possible funding sources for local match.

  Encourage:
    - o City or County impact fees.
    - o Developer Contributions: Fees, Right-of-Way.
    - o Transportation Improvement District.
    - o Hospitality Fees.
- ♦ Consider ideas used elsewhere.
  - ❖ Use public/private partnerships.
    - o Use private activity bonds.
    - o Finance the project through a private entity.
    - o Tax exempt bonding is available for the private company.

Control/Cost Savings

- Employ better early cost estimation.
- Consider additive alternatives.
  - Award based on available funding.
- Explore alternate designs (e.g. bridge design).
- Consider escalation clauses.
  - Shares risk.

Compress Schedule

- Incorporate benefits of design/build.
  - Fast track design and construction.
  - Contractor/constructability reviews.
- Use incentive contracting.
  - A + B (cost plus time).
  - Incentives/Disincentives.
- Consider major detour – build a temporary structure adjacent to the existing structure or to the north of Lowe's.
  - Close Custer structure.
  - Construct north access for emergency response vehicles.
  - Provide cost analysis.

Facilitate Traffic Management

- Exclude work during peak hours.
- Schedule night work.
- Use detailed contract sequencing.
- Use master schedule to coordinate contracts.

Optimize Contract Packaging

- Maximize competition and match funding by splitting into smaller projects.
  - Cedar Street Widening.
  - Frontage Road and Int Improvements.
  - Custer Road and Structure.
  - Ramps.

3.3. - Traffic Operations/ITS/Safety

Prior to offering recommendations, the traffic operations/ITS/safety team shared the following history of the project:

Project History

- Forestvale Road Interchange was the initial project.
- Custer was preferred alternative in EIS.
  - Congested corridor.
  - Extend project limits from Montana to Washington to Kelleher Lane.
  - Existing traffic signals at Sanders and Washington installed by developers.
  - Lack of East-West connectivity.
  - Custer on emergency response route.
  - Current configuration from environmental document.
  - Limits from environmental documents were Montana City to Lincoln Road.
  - Custer to Capital Interchange has improvements planned that are not being addressed within this project.
    - Link between Cedar and Capital is not being updated with new structures.
  - Cedar to Capital – concern about the future level of service with the construction of this project.
  - Cedar functions well in all hours except peak hours.
- Widening of Cedar necessary to provide route during construction.
- Traffic control plan and traffic management plan required in Oregon.
  - Inform public and have traffic expectations.
  - Accelerate construction.
  - Reduce duration from detour, demo, and construction standpoint.
  - Follow Work Zone Safety and Mobility (WZSM) guidance.
  - Implement Traffic Management Plan (TMP).
  - Implement public outreach plan.
  - Manage delay times experienced.
  - Manage mitigation.

- New structure of Custer on a new alignment?
  - Design was not developed with the idea of a structure remaining open.
  - Alignment and grade – potential shift in alignment.
- Phased bridge construction on a new alignment?
- Freeway cross-over for demo of Custer structure (phased demo after auxiliary lane construction).
- Permanent configuration of freeway median is 38’ (from typical section).
  - Does this require a design exception?
  - Existing median is not being narrowed.
  - Auxiliary widening is on outside.
  - Cable barrier has been used in Oregon.
- Signing for auxiliary lanes will be structure mounted.
  - Standard for limited access on ramps.
  - Will extend limited access to Home Depot.
- Raised median from Washington to Montana.
  - ¾ movement at Power Townsend.
  - Ramp signal is very close to Sanders.
  - Queuing analysis shows long term issues with saturation.
  - Tying intersections together has been examined to address queuing issues.
  - Split diamond with limited access Frontage Road?
  - Separate terminals on Interstate.
- Extension of Washington to become Frontage Road, limited access?
  - Approach permit process with development.
  - 90 degree corners on Frontage Road.
  - Not a formal access limitation now.
  - Current design is much safer.
  - Need to realign Frontage Road for construction of ramp.
- If Custer is taken out, Cedar and Washington intersection will operate adequately with possible double right turn, through and left.
- Identify signals on route and flag them for monitoring so timing can be adjusted upon demands.
  - In TMP onsite tech will monitor and adjust timing on signals.
  - Can staff through department, consultant, or contractor.
  - Washington/Custer, Washington/Cedar, Cedar/Montana.
  - Detour would function at saturation.

- ❖ Have variable display for double turns at peak times.
- ❖ Allow certain movements during certain times of the day.
- ❖ Same signal head configuration with a variable display.

- Operational analysis?
  - ❖ No modeling has been done at this time.
  - ❖ Simulation models are critical to pick up interactions that are missed otherwise.
- Minor modifications on detour routes.
  - ❖ Freeway may be reduced to one lane in each direction 24 hours a day.

Traffic Management Plan

- Determine operational improvements needed on detour routes.
  - ❖ Sanders Street extension.
  - ❖ Custer/Montana, Custer/Washington, Cedar/Washington, Cedar/Montana Intersections.
  - ❖ Frontage Road realignment.
- Use dynamic lane utilization/signalization for different times of day.
- Utilize dedicated staff for monitoring and maintenance of traffic signal operations during construction.
- Develop a public information/outreach campaign as a critical component of plan.
  - ❖ Visualization.
  - ❖ Clear single source.
  - ❖ Continuous communication.
  - ❖ Project website (potential camera link).
  - ❖ Courtesy patrol.
- Coordinate with emergency response during detour planning.
  - ❖ Continuous updating during construction.
  - ❖ Consider temporary direct access to I-15.
- Use ITS (wireless cameras) for incident monitoring response.
  - ❖ Discuss expedited response to incidents on detour routes with law enforcement and towing companies.
  - ❖ Establish coordination with MDT traffic staff during incidents and determine clear chain of command for decision making.

Construction Phasing

- Phase 1 Projects:
  - Realign Frontage Road.
  - Widen Cedar Street.
  - Improve detour routes.
  - Extend Sanders Street North and South.
- Phase 2 Projects:
  - Build ramp C3 and auxiliary lane.
  - Build ramp C4 and auxiliary lane.
  - Add fill for ramps C1 and C2.
  - Check traffic patterns at Montana/Custer and Custer/ Washington intersections for interim conditions.
  - Check grades.
- Phase 3 Projects: (Optimal Maintenance of Traffic View - priority order):
  - Rebuild Custer Bridge on new alignment.
  - Rebuild Custer Prefab off-site and replace with 45 to 60 day closure.
  - Rebuild Custer partial width bridge on new alignment.
  - Rebuild Custer on existing alignment with single construction season.
- Utilize incentives/disincentives for critical path/closure periods.

Access Management

- Preserve limited access in interchange area.
  - Critical from the standpoint of safety and operation.
- Limit access between Sanders and Washington through the use of raised median.
- Consider limited access from Montana through Washington.
- Extend Sanders Street north to improve internal circulation and reduce access demand from Custer and north Montana.
  - East-West connections to the existing development needed.
- Remember that closely spaced signals cause coordination, congestion, and safety issues.
  - Additional signals on Custer and Washington should be strongly discouraged.

Safety

- Consider potential use of variable speed limits.
  - Use variable display technology.
- Establish Work Zone Safety Enforcement.

- ❖ Partnership with law enforcement.
- ❖ Potential use of photo radar (legislation is required).

- ♦ Tie wireless cameras to emergency response center.
- ♦ Make Frontage Road design speed 45 miles per hour.
  - ❖ Safety issues on existing Frontage Road.
  - ❖ Serves as a collector roadway.
- ♦ Consider the use of barrier on I-15 for abutment and pier construction (to protect the work site).
- ♦ Consider short weave section between ramps C3 and D4.
  - ❖ Auxiliary lane is necessary to operate.

System Level Planning

- ♦ Prepare detailed funding study and interim condition study.
- ♦ Develop traffic maintenance strategy for future improvements.
  - ❖ Will railroad bridges to south be constructible under future traffic?

3.4. Construction/Innovative Materials

The construction/innovative materials team offered the following recommendations:

CONSTRUCTION

Three Phase Construction

- ♦ Make improvements to:
  - ❖ Cedar Street overlay and widen.
  - ❖ Sanders Street, connections to Custer.
  - ❖ Custer Avenue, west of Sanders Street.
  - ❖ Front Road realignment.
    - o Interstate ramp/aux lanes work.
    - o Custer Avenue structure and approaches.

Custer Avenue – Remain Open

- ♦ Maintain existing alignment and two-way traffic on Custer Avenue with existing structure until permanent structure is complete.
  - ❖ Utilize phased construction.
- ♦ Shift Custer alignment slightly North and maintain two-way traffic on Custer Avenue with existing structure until permanent structure is complete.

- Maintain two-way traffic on Custer Avenue with a temporary structure, i.e., Bailey bridge, detour bridge.

Custer Avenue – Closed

- Close Custer Avenue to replace the structure, which will increase the need for accelerated construction methods, i.e., Self-Propelled Modular Transport (SPMT).

Interstate Structure vs. Custer Avenue Structure

- Build an interstate bridge over the top of Custer paralleling current I-15 alignment.
  - Consider single bridge with concrete barrier rail.
  - Incorporate SPMT.

MATERIALS

Flowable Fill

- Use flowable fill for storm drain, utilities trenches and bridge ends.

Precast Bridge Elements

- Fabricate bridge elements off-site, i.e., caps, deck panels, beams, etc.

Portland Cement Concrete Pavement (PCCP)

- Utilize full depth PCCP or White Topping on Cedar, Custer, and interchange ramps.

Pulverize and Widen Existing Roadway

- Pulverize and widen Cedar and potentially Custer east of Sanders.

A-1-a(0) Borrow

- Utilize special borrow material in the top two feet of the subgrade.

Contract Administration

- Consider the following:
  - Lane Rental.
  - A+B.
  - Incentive/Disincentive (I/D).
  - Internal milestones w/ A+B or I/D.

- ❖ Construction inspection during utility moves.
- ❖ Night work (limited work hours in some areas – see local ordinances).

3.5. Public Relations

The public relations team offered the following overview prior to presenting their recommendations:

- ♦ Maintain two-way communications.
- ♦ Build community support.
- ♦ Build community awareness of project challenges.
- ♦ Educate the public on the highway development process.
- ♦ Keep the public informed throughout project construction.

Market Research

- ♦ Identify target audience based on demographics.
- ♦ Identify audience preferences for the project.
- ♦ Coordinate with other skill set teams to create the questionnaire.
- ♦ Utilize market research results which can benefit design, construction, and public outreach.
- ♦ Develop and administer surveys. Example survey methods include:
  - ❖ Web-based survey.
  - ❖ Telephone survey.
  - ❖ Mail survey.
  - ❖ Door to door.
  - ❖ Focus groups.

Communications Plan

- ♦ Utilize market research.
- ♦ Identify audience, information needs, and expectations of the project.
- ♦ Develop and successfully implement a plan according to survey results and project needs.
- ♦ Develop an information evaluation plan, i.e., how much weight given to results of survey.

Local Business Access

- ♦ Coordinate with businesses to determine the type of access they need; geometric design.
- ♦ Coordinate construction business access.

Branding

- Develop new, positive brand, logo and/or tagline with which the public can easily identify examples include:
  - TREX – Colorado.
  - High Five – Dallas.
  - The People's Way – US 93, Montana.

Selling Points

- Enhances safety.
- Increases mobility.
- Improves bike and pedestrian facilities.
- Improves drainage.
- Improves business exposure.
- Decreases congestion.
  - N. Montana.
  - Custer.
  - Cedar.

Funding

- Make funding issues clear to the public.
- Seek support for alternative funding sources.
- Promote any cost savings of the project.

Internal Information

- Keep MDT employees informed and positive.
- Use the "Interchange" newsletter.
- Encourage internal information exchange – ongoing informational meetings.

Public Outreach

- Secure adequate staffing.
  - Full time dedicated spokesman during design.
- Secure adequate funding.
  - Recommend 1% of project cost.
- Hire community liaison (hired by contractor).
- Identify traditional and alternate media outlets.

Local Employer Communication

- Identify large stakeholders.
- Visit stakeholders about project construction.
- Generate Public Information Officers list.
- Keep Public Information Officers informed throughout the construction process.

Emergency Response

- Establish early coordination with emergency response.
- Find and address relevant issues.
- Create emergency response contact list.

3.6. Roadway/Geometric Design

The roadway/geometric design team offered the following recommendations:

Phased Construction and Maintenance of Traffic

- Consider offset alignment.
  - Construct entire bridge north of existing.
  - Construct half bridge north of existing.
  - Construct new westbound bridge; convert to existing eastbound.
- Move entire Interchange 1500 feet north.
- Widen Custer and build ramps later.

Ramp Termini/Interchange Configuration

- Consider the following alternatives:
  - Roundabouts:
    - Safety.
    - Improve efficiency and mobility.
    - Air quality.
    - Reduce bridge width.
    - Improve access control.
    - Reduce ROW at nodes.
    - Eliminate difficult left turn.
    - Narrow ramp footprint.

- ❖ Single Point Urban Interchange (SPUI).
- ❖ Compressed Diamond.
- ❖ Three level Diamond Roundabout.
- ❖ Southbound off ramp to Sanders.

Roadway Design Criteria

- ♦ Reduce width of Custer between Sanders and Montana.
  - ❖ Eliminate raised median.
- ♦ Lower I-15 clearance to 16 ft. plus future overlay.
- ♦ Lower the Interstate 3 feet.
  - ❖ Reduce fill.
- ♦ Steepen fill slopes 2:1 where appropriate.
- ♦ Raise I-15 over Custer.
- ♦ Investigate weave from Custer to Cedar.
- ♦ Develop 3rd southbound lane with C2.
- ♦ Provide acceleration lane with ramp C3

3.7. Utilities/ROW

The utilities/ROW team offered the following recommendations:

Authorize ROW where Project Limits can be Determined

- ♦ Coordinate with road design for final construction limits.
- ♦ Consider business and landowner concerns.

Require Consultants to Complete all Title Work

- ♦ Acquire title commitments and vesting deeds.
  - ❖ Expedite dealing with national companies.
- ♦ Acquire ownership/lessee identification for permits.
  - ❖ Obtain copies of leases.

Consider ROW Acquisition by MDT

- ♦ Use certificate of survey, amended plat, or ROW plans.
  - ❖ Request ROW funding from FHWA.
  - ❖ Obtain State Transportation Improvement Plan (STIP) approval.
- ♦ Amend cost estimate.
- ♦ Organize group meetings to sign as many construction permits as possible.
- ♦ Prioritize ROW acquisition to expedite utility relocation.
  - ❖ Allows advanced utility moves.

Finalize Frontage Road Design and Location

- Delay caused by potential development.
  - Design ROW based on proposed alignment.
  - Coordination efforts with developer/owner may change alignment.
- Proceed with ROW acquisition on Frontage Road.

Obtain Appraisals

- Utilize same appraiser for sales information and fee appraisals.
  - Appraisers/MDT staff use the same source for data.
  - Appraisals cannot be older than 90 days.
  - Time and cost savings.
  - Fee appraiser provides sales catalog.
- Use waiver valuation appraisal process where appropriate.
  - Time and cost savings.
- Utilize real estate contacts.

Consider Utility Options

- Relocate utilities before construction when possible.
  - Financial feasibility.
  - Most utilities run East – West.
  - Location and depths.
  - Constructability under traffic.
  - Connecting utilities back in.
- Leave utilities in-place and relocate after construction.
  - Cost savings.
  - Constructability.
- Relocate outside the project corridor.
  - Are alternate utility corridors feasible?
  - Time saving during construction.
  - Utilities can be moved before ROW is purchased.
  - Financial feasibility.
- Leave existing utilities in-place/place conduit for utilities in the fill and along the bridge for future use of existing line.
- Allow water and sewer lines to be installed by MDT contractor.
  - Incorporate city's utility plan.
  - Decrease disturbance to traveling public.
- Use Subsurface Utility Engineering (SUE) during development of project to locate and characterize utilities.

Manage Petroleum Line

- Leave petroleum line facility in place.
  - Cost savings of leaving in place.
- Install partial replacement line for future use if needed.
- Place new line early, use old line as conduit if needed.
  - Most expensive option.

Hire Qualified Utility Coordinator

- Make salary responsibility of contractor.
  - Decreases project cost.
- Required by MDT.
  - Included in special provisions.
- Make coordination of meetings between MDT, contractor, City, FHWA, and utilities part of coordinator responsibilities.
  - Inexperienced coordinator increases project cost.

Identify Access Control

- Identify location of access control line early in project development.
- Adjust line inside of ROW where needed to accommodate utilities.
  - FHWA approval needed.
  - Access control resolution needs to be approved by Transportation Commission.

Establish Good Working Relationship with Utilities

- Make utilities part of the project development team.
  - MDT coordinates weekly meetings with all utilities.
- Coordinate, cooperate, and communicate with utilities early and often.
  - Simple concept, but rarely accomplished.
- Encourage utilities to coordinate with each other.

Address Encroachments in the Existing ROW

- Notify property owners and remove early.
  - Consultant to identify and locate encroachments.
- Expedite utility relocations.
  - Cancel landscaping and parking leases.

Secure Temporary Utility Access within the Interstate Corridor.

- ❖ Obtain FHWA approval.
- ❖ Improve safety.
- ❖ Avoid setting a precedent.
- ❖ Secure potential cost saving.
- ❖ Establish traffic control plan.

Consider Retaining Walls to Decrease Utility Conflicts

- ♦ Allow more room for utilities within existing row.
  - ❖ Eliminates some utility conflicts.
  - ❖ May be cost prohibitive.

4.1. Next Steps

Now that the workshop is complete, MDT is evaluating the recommendations to determine which items will be implemented as part of the Custer Interchange, Helena, Montana Project.

As this report shows, local and national transportation experts came together to brainstorm innovative techniques for financing and delivering a much-needed project on a major urban corridor. Once again, ACTT has proven to be a valuable tool in project planning and success.

GLOSSARY OF FREQUENTLY USED TRANSPORTATION ACRONYMS

ACRONYM	FULL NAME
AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
ACC	Acid Copper Chromate
ACTT	Accelerated Construction Technology Transfer
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
AEP	American Electric Power
AGC	Associated General Contractors of America
ASCE	American Society of Civil Engineers
ASR	Alkali-Silica Reaction
ATB	Asphalt-Treated Base
ATCs	Alternative Technical Concepts
ATMS	Advanced Traffic Management System
BANs	Bond Anticipation Notes
BIMRS	Bridge Incident Management and Response System
BMPs	Best Management Practices
CAD	Computer-Aided Design
CB	Citizen Band
CCTV	Closed Circuit Television
C-D	Collector-Distributor
CDC	Community Development Center
CE	Categorical Exclusion
CIP	Cast-in-Place
CM at Risk	Construction Manager at Risk
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion Mitigation Plan
CPI	Consumer Price Index
CPM	Critical Path Method
CRC/CRCP	Continuously Reinforced Concrete Pavement
CSO	Combined Sewer Overflow
CSS	Context Sensitive Solutions
CTB	Cement-Treated Base
D-B	Design-Build
D-B-B	Design-Bid-Build
DBE	Disadvantaged Business Enterprise
DEIS	Draft Environmental Impact Statement
DMS	Dynamic Message Sign
DOT	Department of Transportation
DRB	Dispute Review Board
EA	Environmental Assessment
EJ	Environmental Justice
EMS	Emergency Management System

EPS	Expanded Polystyrene
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEIS	Final Environmental Impact Statement
FFY	Federal Fiscal Year
FHWA	Federal Highway Administration
FMS	Freeway Management System
FONSI	Finding of No Significant Impacts
FRP	Fiber Reinforced Polymer
GARVEE	Grant Anticipation Revenue Vehicle
GIS	Geographic Information System
GISIGOSO	Get In, Stay In, Get Out, Stay Out
GPS	Global Positioning System
GRS	Geosynthetic Reinforced Soil
HAR	Highway Advisory Radio
HfL	Highways for LIFE
HMA	Hot Mix Asphalt
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HPC	High-Performance Concrete
HPS	High-Performance Steel
ICC	Interagency Coordination Committee
IM	Incident Management
IMTF	Incident Management Task Force
IT/ITS	Intelligent Transportation/Intelligent Transportation Systems
JPCP	Jointed Plain Concrete Pavement
LOS	Level of Service
MDT	Montana Department of Transportation
MIS	Major Investment Study
MOA	Memorandum of Agreement
MOT	Maintenance of Traffic
MOU	Memorandum of Understanding
MPH	Miles per Hour
MPO	Metropolitan Planning Organization
MSE	Mechanically Stabilized Earth
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NHI	National Highway Institute
NPDES	National Pollutant Discharge Elimination System
NS	Norfolk Southern
PAB	Private Activity Bond
PCCP	Portland Cement Concrete Pavement
PCMS	Portable Changeable Message Signs

PIO	Public Information Officer
PMT	Project Management Team
PPP	Public-Private Partnerships
PR	Public Relations
PS&E	Plan Specification & Estimate
PSI	Pounds per Square Inch
QA/QC	Quality Assurance/Quality Control
RAP	Reclaimed Asphalt Pavements
RFP	Request for Proposal
RFQ	Request for Qualifications
RIB	Rail Infrastructure Bank
ROD	Record of Decision
ROW	Right-of-Way
RPMs	Raised Pavement Markers/Markings
RSCH	Repeated Shear at Constant Height
RSS	Reinforced Soil Slopes
RTA	Regional Transit Authority
RWIS	Roadway Weather Information System
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SCC	Self-Consolidated Concrete
SEP	Special Experimental Project
SH	State Highway
SIB	State Infrastructure Bank
SIP	State Implementation Plan
SIP Forms	Stay-in-place Forms
SMA	Stone Matrix Asphalt
SMART	Suburban Mobility Authority for Regional Transportation
SPMTs	Self-Propelled Modular Transporters
STIP	State Transportation Improvement Plan
SUE	Subsurface Utility Engineering
TDM	Traffic Demand Management
TIF	Tax Incremental Financing
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIG	Technology Implementation Group
TMC	Traffic Management Center
TMP	Traffic Management Plan
TRAC	Transportation Review Advisory Committee
TRB	Transportation Research Board
TS&L	Type, Size & Location
TSA	Transportation Security Administration
TSM	Transportation System Management
TSP	Thrift Savings Plan
VE	Value Engineering
VMS	Variable Message Sign

VPD	Vehicles per Day
VPPP	Value Pricing Pilot Program
WiFi	Wireless Fidelity

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SKILLS SET RECORDING FORMS

- **Structures**
- **Innovative Financing/Innovative Contracting**
- **Traffic Operations/Safety/ITS**
- **Construction/Innovative Materials**
- **Public Relations**
- **Roadway/Geometric Design**
- **Utilities/ROW**

Structures Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Lateral Skidding	Bridge will be moved laterally into place using skidding equipment.	The new superstructure will be built alongside the existing structure on temporary supports. The new superstructure will be used as a temporary bridge during demolition of the existing bridge. Construct abutments and center pier prior to repositioning new structure. Moving the new structure into place will require a short closure (2-3 days) of Custer Ave. Lateral skidding requires specialized equipment and contractor. Possibly more expensive than conventional construction.
45 to 90 day Custer Avenue Closure	The Custer Ave. bridge will be closed for 45 to 90 days while the bridge is replaced.	Using precast elements for the majority of the structure elements will allow for more rapid construction. Closing the site to traffic will create safer working conditions. Facilitates efficiency in other construction operations. (Installation of utilities, reduced traffic control, inspections, reduced construction duration, easier delivery of materials). This idea appears to be the most cost effective solution (excluding user costs).
Phased Construction	The project will be constructed in phases without closure of Custer Avenue.	Using precast elements for the majority of the structure elements will reduce the duration of each stage. It would be possible to build the bridge in one to two construction seasons. The Frontage Road would need to be realigned prior to the rest of the project to provide room for construction. Phased construction would require temporary roadway approach modifications. This idea can be used for either conventional or accelerated construction techniques.

Structures Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Offsite Prefabrication	Construction of the superstructure will be completed before or during other site work and will require minimal (weekend) roadway closures.	The superstructure will be constructed off to the side of the project and moved into place after the approaches and substructures have been completed. Self Propelled Modular Transporters (SPMT) will be used to move entire superstructures into and out of place. SPMT's may not be readily available. This idea is more appropriate for superstructure replacement only. The cost of using SPMT's may be high. (additional $1,000,000 for technology).
Structure Depth	Investigate ways to shorten the proposed bridge span lengths for the purpose of minimizing structure depth.	The purpose of this idea is to lower the profile grade and minimize fill heights within the interchange. This idea is applicable to all previous construction options. Consider using full height abutments to shorten span lengths. This idea would lower the grade of the Custer Ave. bridge by approximately 1 ft. Larger wingwalls would be required. Structure is not as efficient. Additional structure cost will need to be offset by approach fill savings.

Structures Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Structure Components	The Structures Skill Set discussed and documented options for all structural components.	Both Full Depth and Partial Depth Precast Concrete Decks were considered. Precast deck panels should be pre-tensioned and post-tensioned to reduce cracking and leaking. Cast panels approximately half the deck width and connect with a closure pour. Parapets could be precast with the deck slab or precast separately and grouted to deck. Bolt down barriers similar to the Vermont or New Hampshire barrier were considered. Parapets could be built behind temporary Jersey Barrier in order to open the bridge to traffic more quickly. Girder options included pre-stress concrete AASHTO girders, butted Bulb-T's, Steel girders, and butted box beams. Bearing options included steel rocker shoes and elastomeric bearings. Abutments options included precast integral abutments and precast full height abutments. Short wingwalls or 'flying' wingwalls could be used at this location. The span lengths could be shortened if full height MSE walls were utilized. Wall piers were discussed but may present difficulties in seismic design. Both spread and pile footings were discussed.
Constructability Study	A Constructability Study is recommended for all options.	All options presented would be fleshed out. All aspects of the project would be considered, not just the bridge. Overall project costs will be calculated. Local concerns may drive final decision.

Innovative Financing/Innovative Contracting Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Fund Entire Project	GARVEE Bonds (Grant Anticipation Revenue Vehicles). Bond debt paid with future federal dollars. Can be used to fund entire project allowing for accelerated project development.	There is a $150 million statutory limit. Increasing this would require a 2009 Legislative Action. State agency may have an aversion to debt. Long term debt should be in conjunction with a capital improvement plan. Current interest rates are lower than the construction interest rate.
Build Project Segments as Funding Becomes Available	Use other possible funding sources for the local match. Encourage: • City or County Impact Fees. • Developer Contributions – Fees, Right-of-Way. • Transportation Improvement District. • Hospitality Fees.	Required local match could be met with these fees. Community/developer cooperation is needed to implement impact fees. Requires extensive community support.
Public/Private Partnerships	Use private activity bonds. A private entity finances the project. Tax-exempt bonding is available for the private company.	This is a new concept in Montana.

Innovative Financing/Innovative Contracting Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Cost Control/Savings	Better early cost estimation.	Use other estimation tools to increase accuracy, such as Monte Carlo Simulation. Involve other disciplines like construction. Perform early constructability reviews.
	Additive alternates.	Have a base bid and one or more alternates. The alternates are awarded based on available funding. Possible projects: Base=Cedar, Alt=Frontage Rd. Base=Bridge, Alt=Ramps
	Alternate designs (e.g. bridge design). Escalation clauses.	Precast, rolled in place, etc. MDT and the contractor share risk. MDT already uses fuel and asphalt, but there may be something else based on when the project(s) are advertised.
Compress Schedule	Use design/build contracting.	Requires that funding be programmed to meet construction schedule. Need to have NEPA in place, ROW complete.
	Incorporate benefits of design/build.	Fast track design and construction by doing more concurrently. Have contractor constructability reviews.
	Incentive Contracting.	A+B (cost plus time). Incentives/Disincentives on milestones. Lane rental.
	Major detour – build a temporary structure adjacent to the existing structure or to the North of Lowe's.	Close Custer structure. This would decrease construction time and decrease traffic control costs. It would provide access to the north for emergency response vehicles. A cost analysis is needed to see if the costs of the temporary structure are less than the savings issues.

Innovative Financing/Innovative Contracting Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Traffic management	Exclude work during peak hours. Night work. Detailed contract sequencing.	Specify non-working hours. There may be some areas that this is not acceptable. The work zone mobility rule should be in place prior to this work, so traffic control should be addressed in the plans. The contractor can submit alternates to the traffic control plan, but there needs to be contract language addressing that this is not eligible as a VE proposal.
Optimize Contract Packaging	Split into smaller projects to maximize competition and match funding.	Possible order: • Cedar Street Widening. • Frontage Road and Int. improvements. • Custer Road and Structure Ramps.

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Concern about structures between Cedar and Capital Interchanges	• Currently 28' twin structures. Hourly volumes will increase. 1400 – 1600 DHV. • No improvements scheduled for this section. • Decisions have been political. • To mitigate issue: Can eliminate queuing by installing temporary ramp metering. • Can get a good balance utilizing modeling. • Roll-in structures. • Very narrow structures, will probably not accommodate two way traffic.	Temporary ramp metering will likely create other issues on arterial streets – Custer, Cedar, and Washington. Roll-in structures are more expensive but have a very short construction duration.
Emergency response capabilities	• Volunteer Fire Department on Forestvale. Helena Fire Department has station located at Civic Center and between the 11th Avenue/Prospect Ave. Couplet. Sierra Road will provide access to east side. • Temporary access on Interstate for emergency response vehicles may be beneficial ambulance route. • Temporary ramp at Forestvale with a gate? • Public outreach for emergency response services.	Can accommodate on west side of interstate with extension of Forestvale from Montana Ave. to Interstate. State owns the Right of Way. Will need to realign Frontage Road on east side of interstate in proximity to Forestvale. There is a process for FHWA to review temporary access requests.

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Controllers on Montana Avenue	• Considering going to new controllers and cabinets. • Maintain compatibility. • Windows based software. • Trying to reuse existing signal equipment. • Closed loop capability will be in place.	Signal timings can be changed immediately from a remote location.
Work Zone Safety	• Reduced speed limit. • With a flagger a 35 mph speed limit will be used. • Consider variable speed sign (change based on type of work and hourly volumes). • Ohio cannot use variable speed limit because of code. • Enforcement plan – empty car, dummy. • Use radar camera in Oregon.	Need to check to see if variable speed limit can be used in Montana. The use of a variable speed sign may encourage better compliance. Highway patrol is not well equipped. Troopers have not been willing to work the project because it is overtime. Work zone safety enforcement is more dangerous.
Raised median on Custer	• Critical from Operational and Safety standpoint. • Tight signal spacing – set access limits from Washington to Montana.	This may not be popular to existing businesses.
Detour	• Traffic control plan discussion with local police. • Consider wireless cameras for emergency response through detour corridor (used on Ohio, Bozeman, Big Sky). • Web-based ITS technology permanent or temporary options.	Can get more effective response to emergencies. Reasonably inexpensive and easy to use.

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Phased Construction	• Phase 1 Projects – Realign Frontage Road. – Widen Cedar Street. – Improve Detour Routes (primarily intersections). – Extend Sanders Street North and South.	With improvements completed, traffic will detour to other less congested routes and routes without construction activity. Will provide an additional north/south route taking pressure off of Montana Avenue.
	• Phase 2 Projects – Ramp C3 and Auxiliary Lane. – Ramp C4 and Auxiliary Lane. – Fill for Ramps C1 and C2. – Check Traffic Patterns at Montana/Custer and Custer/Washington Intersections for Interim Conditions. – Check Grades.	Phase 2 could come after the phase 3 project. Build the bridge first and then the ramps. This is preferred. This may not be beneficial with the detour route for Custer Avenue traffic. Could create more conflicts at Custer/Montana and Custer/ Washington. Needs to be investigated more thoroughly as to its true benefit.
	• Phase 3 From an Optimal Maintenance of Traffic View (Priority Order): – Rebuild Custer Bridge on a New Alignment. – Rebuild Custer Prefab Off-Site and Replace with 45 to 60 Day Closure. – Rebuild Custer Partial Width Bridge on a New Alignment. – Rebuild Custer on Existing Alignment with Single Construction Season.	Bringing fill in for ramps after the bridge is re-opened.
	• Use of Incentives/Disincentives for Critical Path/Closure Periods.	
	• Cedar, Frontage, Ramps, Auxiliary Lanes Night construction will not impact residential areas.	Ramp construction will help with construction equipment traffic.
	• Fill may come from north and east?	
	• Can break project into small parts.	
	• Analysis of Existing Pavement Cross-section on Freeway with Regards to Load Carrying Capacity May Necessitate Construction of Auxiliary Lanes Early.	

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Incentive/Disincentive	• A+B. • Lane rentals. • Portion of contract to have incentive/ disincentive.	
Extension of Sanders as an alternate route for detour	• Sanders can tie into roadway at cemetery. (about 2 blocks) • Sanders extension from Custer to Cedar. • Relocate signal on Cedar from Harris to Sanders.	Landowner may be oppositional to the extension from Custer to Cedar. Post Office main access is off of Harris, may have opposition. Signal at Sanders instead of Harris is better for signal coordination and spacing issues along Cedar Street. Would be better for overall area.
Prefabricate bridge off site		Equipment is hard to get. Requires special contracting. High mobilization costs.
Local community advocates to help sell the project		

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Traffic Management Plan	• Determine Operational Improvements Needed on Detour Routes. – Sanders Street Extension. – Custer/Montana. – Custer/Washington. Cedar/Washington. Cedar/Montana Intersections. – Realignment of Frontage Road.	
	• Use of dynamic lane utilization/signalization for different times of day.	Have not used in Montana before, could create driver confusion. Investigate further.
	• Dedicated Staff for Monitoring and Maintenance of Traffic Signal Operations During Construction.	One concern is resources in traffic engineering. This is a new concept but worth looking into. By the time project is built should have experienced staff to dedicate to the project.
	• Developing a Public Information/Outreach Campaign is Critical. – Visualization. – Clear Single Source. – Continuous Communication. – Project Website (Potential Camera Link). – Courtesy Patrol.	Do we have enough bandwidth?? Will need to be coordinated with ISD.
	• Coordination with Emergency Response During Detour Planning – Continuous Updating During Construction. – Consider Temporary Direct Access to I-15.	This would be the first time it would be implemented in Montana. May be beneficial to try on a project before trying on a corridor wide basis. Once have temporary access, locals may push for permanent emergency access.
	• Use of ITS (wireless cameras) for incident monitoring/response. – Discuss with Law Enforcement and Towing Companies for Expedited Response to Incidents on Detour Routes. – Establish Coordination with MDT Traffic Staff During Incidents and Determine Clear Chain of Command for Decision Making.	Traffic section staff will need to have some authority on the construction project. May not be well received by project manager.

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Access Management	• Preservation of Limited Access in Interchange Area is Critical from the Standpoint of Safety and Operation. • At a Minimum Limited Access Shall be Maintained Between Sanders and Washington Through the Use of Raised Median. • Limited Access Should be Considered From Montana Through Washington. • Extending Sanders St. North Improves Internal Circulation and Reduces Access Demand Off of Custer and North Montana. • East-West Connections from Sanders to the Existing Development to the west is Needed. • Closely Spaced Signals Cause Coordination, Congestion and Safety Issues. • Additional Signals on Custer and Washington Should be Strongly Discouraged.	

Traffic Operations/Safety/ITS Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Safety	• Potential Use of Variable Speed Limits. • Using Variable Display Technology. • Work Zone Safety Enforcement. • Partnership with Law Enforcement. • Potential Use of Photo Radar. • Tie Wireless Cameras to Emergency Response Center. • Frontage Road Design Speed Should Be 45 Miles Per Hour. • Safety Issues on Existing Frontage Road. • Serves as a Collector Roadway. • Consider the Use of Barrier on I-15 for Abutment and Pier Construction (To Protect Work Site). • Short Weave Section Between Ramps C3 and D4.	Legislation required. Coordination with ISD and the city. Landowners and developers will most likely be opposed. Auxiliary lane is necessary to operate.
System Level Planning	• Detailed Funding Study and Interim Condition Study Are Necessary. • Strategy of How Maintenance of Traffic can be Provided for the Future Improvements. • Will Railroad Bridges to South be Constructible Under Future Traffic?	

Construction/Innovative Materials Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
CONSTRUCTION		
3-phase construction	Break project into 3 phases. Improvements to: • Cedar St Overlay and widen. • Sanders St, connections to Custer. • Custer Ave. west of Sanders St. • Frontage Road realignment. Interstate ramp/aux lanes work. Custer Ave. structure and approaches.	• Custer would only be closed or detoured for last phase. • Further alleviate traffic on Cedar, N. Montana and Washington. • Additional time for dissipation of fill settlement. • There is greater leeway to perform work based on funding available. • Provide better alternate route for traffic. • Relieve congestion. • Addresses emergency services, i.e. fire station on Forestvale.
Custer Avenue – Remain Open	Maintain existing alignment and two-way traffic on Custer Ave with existing structure until permanent structure is complete; utilizing phase construction.	• Maintain two-way traffic on Custer Ave. • Alignment shift to North would reduce impacts to utilities on South. • Ease of construction phasing. • Construction of new ramps could be done during the early phases. • May be outside of the originally identified right-of-way footprint. • Added expense. • More construction over the interstate.
	Shift Custer alignment slightly North and maintain two-way traffic on Custer Ave with existing structure until permanent structure is complete.	
	Maintain two-way traffic on Custer Ave with a temporary structure, i.e. Bailey bridge, detour bridge.	
Custer Avenue – Closed	Close Custer Ave to replace the structure, which will increase the need for accelerated construction methods, i.e. Self Propelled Modular Transport (SPMT).	• Cut the total construction time. • Cut costs; road user, traffic control. • Increase safety for motorists and construction personnel. • Establishing the detour route may help to keep traffic flowing. • Public/business relations, impacts.

Construction/Innovative Materials Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Interstate Structure vs. Custer Avenue Structure	Build an Interstate bridge over the top of Cedar paralleling current I-15 alignment; single bridge with concrete barrier rail; SPMT could be incorporated.	• Help to reduce or eliminate utility relocation/ conflicts. • Potentially reduce fill requirements. • Reduced structure costs. • Better pedestrian access across interstate. • Custer Ave. would be at grade or lower (earthwork could be balanced). • Reduce right-of-way needs. • May require permanent and/or temporary MSE walls. • Ramp C2 may require extension of aux lane; vehicles getting up to speed. • Would need to revisit drainage.
MATERIALS		
Flowable Fill	Use flowable backfill for storm drain, utilities trenches and bridge ends.	• Decreased construction time. • Less likely to have settlement at bridge ends. • Reduces settlement of trench backfill and improves pavement performance. • Increased construction costs. • Increased lateral pressure on the backwall.
Pre-cast bridge Elements	Fabricate bridge Elements off-site, i.e. caps, deck panels, beams, etc.	• Accelerate construction. • Better quality product. • Increased costs. • Contractor inexperience.
Portland Cement Concrete Pavement (PCCP)	Full depth PCCP or White Topping, could be used on Cedar, Custer and interchange ramps.	• Longer life cycle of pavement, i.e. maintenance. • Increased construction time; cure time of concrete.

Construction/Innovative Materials Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Pulverize and Widen Existing Roadway	Pulverize and widen Cedar and potentially Custer west of Sanders.	• Longer service life. • Uniform section, more opportunities for better ride. • Increased cost.
A-1-a(0) Borrow	Better borrow material in the top two feet of the sub-grade.	• Reduce surfacing section. • R-60 or better readily available. • May require excavation in thin sections. • May only use on new construction.
CONTRACT ADMINISTRATION		
Contract Administration	• Lane rental. • A+B. • Incentive/Disincentive (I/D). • Internal milestones w/ A+B or I/D. • Construction inspection during utility moves. • Night work; limited work hours in some areas, see local ordinances.	• Potential to reduce construction costs. • Potential to reduce contract time. • Reduce impacts to traffic and the public. • Increase safety due to shorter exposure.

Public Relations Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Market Research	Market research and stakeholder identification. See what the public is actually saying they want done. Need to focus on the public's needs. Main issue - close Custer or keep it open during construction. Public communication plan.	Conduct a public survey early.
Access	Passive access control will be an issue the public and businesses are going to be interested in. Early property owner research – access issues. Take advantage to what is adjacent to the highway – certain land owners. For example – the IR, have them buy in to the project so they know what is going on, on a day to day basis.	
Positive Project Name	Have a new "positive" name for the project. The public doesn't look at it negatively now, they just want it built. Other states have used public/media to help name the project.	
Selling Points	The new interchange will take some traffic volume off of N. Montana and Custer, initially. Use this positive aspect to "sell" the project to the public? Reduce delay. Better facility when project is complete.	
Funding Issues	Community does not understand that we don't have the necessary funding yet to build in 2011. Campaign to tell public how funding works? Seek alternative funding sources? Cost sharing – city/ county?	

Public Relations Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Internal Information	Keep MDT employees informed and positive about the project.	
Public Outreach	Full time public information/designated spokesman officer for the Custer Interchange? Maybe third party to inform public? Make this part of contract? This has been successful in other states as well as Montana. Use radio to update the public. Also, television – morning and nightly news, traffic updates. MDT has used this before. Also, phone number with up to date info about traffic during construction. Mailing list/Newsletter – "sign up here to receive an email about construction/traffic". Chamber of Commerce has been very involved – they should stay involved in the project. Model traffic congestion, so public can see the traffic in action. On our website? Educate students. Go to schools to educate about new interchange construction. Engineering/ construction PR. Need elementary teaching tools for the public to show how highways are built? Accelerated bridge construction has a positive impact on the public. Need to have Public Relation plan. Implement Pre/Post construction surveys? We need a good Custer Interchange website. Questionnaire in newspaper about how public perceives construction/traffic?	

Public Relations Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Local Employer Communication	Biggest business/chamber complaint has been reduced business from area businesses. Determine markets/large businesses that create traffic through the project and keep these key businesses informed throughout the construction of the project.	
Negatives vs. Positives	**Negatives** • Funding – project delay. • Communication to community. • Lack of knowledge. • 2 years to go on design. • 2011 construction date? • 2 season construction project.	**Positives** • Will public and media like alternative bidding methods? • Could be a large national construction firm building the project – We could use alternative bidding process to accelerate construction? • By accelerating construction – We can save the public costs.
Emergency Response	Emergency Response – need to coordinate with them about the construction project. (May not impact Custer. Emergency services do not use Custer now.)	

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Roundabouts	2 lane roundabouts. Roundabouts at both sides at the ramp termini on Custer as well as major intersections Washington and Montana. Phase sections from ramp termini to ramp termini. 5 roundabouts. **Benefits:** • Safety. • Efficiency. • Air quality. • Mobility. • Less R/W. • Improved Access Control. • Narrow up structure by eliminating median turn lane.	**Implementation Details:** • Acceptance from the Chief Engineer. • Public Buy In. • Traffic Modeling. **Barriers:** • R/W might be needed at Montana & Washington. • EIS commitments. • Capacity Concerns. • Close Proximity to Adjacent intersections. **Skill Sets Involved:** • Traffic. • Public Relations. • Roadway Design.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Offset Alignment	Build new bridge to N.; keep traffic on existing. Eliminate need for Cedar detour. Allows phasing under funding constraints.	**Implementation Details:** • Connection to existing road. • Traffic Control. **Barriers:** • MDT and Local agencies desire to widen Cedar. • Introducing curves on Custer. **Skill Sets Involved:** • All. • Public Relations. • Structures.
Project Phasing (when funding is available for each phase)	**Phase 1:** Construct a two lane bridge to the north of the existing bridge and utilize bridge for westbound traffic. Use existing bridge for eastbound traffic. Widen Custer to north. **Phase 2:** Remove existing structure and build second half of ultimate bridge. Use first phase bridge as detour. **Phase 3:** Build interchange ramps and complete Custer. Allows phasing under funding constraints.	**Implementation Details:** • Bridge Design. • Connecting to existing alignment. **Barriers:** • Structural condition of existing bridge. • Seismic condition. • Difference in deck elevations. **Skill Sets Involved:** • All.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Diamond Interchange	Eliminate the C2 loop ramp. Traffic conflicts eliminated with C2 and C3 merges.	**Implementation Details:** • Excess R/W. **Barriers:** • Structural cost. • Left turn phasing will require additional storage Impact traffic operations. • Additional R/W in southwest quadrant. **Skill Sets Involved:** • All.
Compressed Diamond	Eliminate the C2 loop ramp. Traffic conflicts eliminated with C2 and C3 merges. Eliminates left turn storage between ramp terminals. (Single controller runs both ramp signals.)	**Implementation Details:** • Excess R/W. • Retaining walls. **Barriers:** • Structural cost. • Left turn phasing will require additional storage Impact traffic operations. • Additional R/W in southwest quadrant. **Skill Sets Involved:** • All.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Three Level Diamond	Multiple Bridges and single point roundabout. Takes all through movements out of the intersections.	**Implementation Details:** • Design. **Barriers:** • Cost. • Additional bridges. **Skill Sets Involved:** • All.
Custer Avenue Widening	Widen Custer put ramps in later. Immediate reduction in congestion on Custer. Allows phasing under funding constraints. Allows time to secure additional funding and partnerships.	**Implementation Details:** • Department and local agencies buy in. **Barriers:** • Public expectations. • Developer expectation. **Skill Sets Involved:** • All.
Move I-15 Interchange 1500 ft. North	Keep Custer overpass but relocate interchange north of Lowes between Target and Hastings.	**Implementation Details:** • Complete New Design Studies. • Environmental Studies. **Barriers:** • Canal. • Utility. • Cemetery. • Reopening EIS. • Not a direct connection to Custer. **Skill Sets Involved:** • All.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Sanders to Montana	Consider reduced width section, Sanders to Montana. Share sidewalk path on north side only.	**Implementation Details:** • Acceptable widths according to AASHTO guidelines. **Barriers:** • Safety. • Bicyclists. • Pedestrians. • Opposing traffic for bicyclists. **Skill Sets Involved:** • All.
Reduced Vertical Clearance	Lower bridge to 16 ft. plus future overlay allowance to reduce adjacent fill expense. 16 ft. is the AASHTO Guidance. Allowance is included for future overlay.	**Implementation Details:** • Bridge. **Barriers:** • MDT policy 17ft. **Skill Sets Involved:** • Bridge.
Fill Slopes	Reduce fill slopes to 2:1 from Sta. 18+25 to 19+25. Save fill costs. Reduce RAW impacts. Guardrail will be required.	**Implementation Details:** • Design Exception. **Barriers:** • None. **Skill Sets Involved:** • None.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Lower Interstate	Lower the interstate three ft. to match existing bridge deck on Custer.	**Implementation Details:** • Interstate Design. **Barriers:** • Drainage Issues. • Utility. • Interstate traffic control. **Skill Sets Involved:** • All.
Single Point Urban Interchange (SPUI)	Custer Rd. at grade; I-15 crosses over top. SPUI on Custer. Minimize R/W requirements and intersections along the corridor. Increase the capacity on the ramp terminals. Enable left turns to interstate.	**Implementation Details:** • Interstate Design. **Barriers:** • Drainage Issues. • Utility. • Interstate traffic control. • Difficult pedestrian accommodation. **Skill Sets Involved:** • All.
Investigate the Weave from Custer to Cedar Interchange	Use ramp C2 to develop 3rd full lane on I-15 South. Ramp C3 will need acceleration lane. May increase capacity of the weave.	**Implementation Details:** • Design. **Barriers:** • Final Bridge Length. **Skill Sets Involved:** • Road Design. • Traffic.

Roadway/Geometric Design Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Sanders Street	Build Ramp C1 from southbound I-15 to meet with Sanders St. Reduces one traffic signal on Custer.	**Implementation Details:** • Requires change to EIS. **Barriers:** • R/W. • Access Approval. **Skill Sets Involved:** • Road Design.

Utilities/ROW Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Right of Way (ROW) Design	Authorize ROW where project limits can be determined.	Coordinate with road design for final construction limits. Consider business and landowner concerns.
Consultants Complete all Title Work	Acquire title commitments and vesting deeds. Ownership/lessee identification for permits.	Will help dealing with national chains. Obtain copies of leases.
ROW Acquisition done by MDT	Acquire under certificate of survey, amended plat, or ROW plans. Amend cost estimate. A group meeting to sign as many Construction permits as possible. Prioritize ROW acquisition to expedite utility relocation.	Request ROW programming from FHWA. State Transportation Improvement Plan (STIP) approval. Allows advanced utility moves.
Finalize Frontage Road, Design, and Location	Potential development holding up the process. Proceed with ROW acquisition on frontage road.	Design a ROW, with the option to change. Work with developer/owner.
Appraisals	Utilize same appraiser for sales information and fee appraisals. Use waiver valuation appraisal process where appropriate. Utilize real estate contacts. Fee appraiser provide sales catalog.	Everybody uses the same source of data. Appraisals cannot be older than 90 days. Time and cost savings.

Utilities/ROW Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Utilities	Relocate utilities before construction when possible. Consider leaving utilities in-place, relocate after construction. Consider relocating outside the project corridor. Leave existing in-place / place conduit for utilities in the fill and along the bridge for future use of existing line. Water and Sewer lines by MDT contractor. Use SUE during development of project to locate and characterize utilities.	• Financial feasibility. • Most utilities run East – West. • Location and depths. • Constructability under traffic. • Connecting utilities back in. Are alternate utility corridors feasible? Coordinate city's utility plans.
Petroleum Line	Leave petroleum line facility in-place. If needed install partial replacement line for future use. If needed place new line early, use old line as conduit.	Cost savings of leaving in-place. Very costly.
Qualified Utility Coordinator	Paid by contractor. Required by MDT. Daily coordination of meetings between MDT, contractor, city, FHWA, and utilities.	Cost. Included in special provisions. Inexperienced coordinator.

Utilities/ROW Skill Set

Idea Name	Detailed Description	Implementation Details (barriers, skills set coordination, etc.)
Access Control Line	Identify locations early on. Adjust line inside of ROW to accommodate utilities.	FHWA approval needed. Access control resolution needs to be approved by Transportation Commission.
Establish Good Working Relationships with Utilities	Make utilities part of the project development team. Coordinate, cooperate, and communicate with utilities early and often. Encourage utilities to coordinate with each other.	MDT coordinates weekly meetings with all utilities. Simple concept, but rarely accomplished.
Address Encroachments in the Existing ROW	Within the Interstate Corridor.	• FHWA Approval. • Safety. • Precedent. • Potential Cost Saving. • Traffic Control Plan.
Consider Retaining Walls for Bridge to Facilitate Utility Relocates	Allows more room for utilities within existing ROW.	Cost prohibitive, especially if it does not prevent relocation of the petroleum line.

Innovative Financing. The team's primary goals are to align potential financing options with project goals; match anticipated cash flow with project management; and provide options for managing competing priorities for existing resources.

ROW/Utilities/Railroad Coordination. The ROW group's primary role is to ensure that ROW, utilities and railroad work comply with state laws and procedures. They must also consider the numbers and types of businesses and residences impacted by a project and evaluate the ready availability of additional right-of-way.

Geotechnical/Materials/Accelerated Testing. The geotechnical team explores subsurface conditions to determine their impact on the project; pursues options for expediting materials acceptance and contractor payment; and evaluates the use of innovative materials in accordance with project performance goals and objectives.

Traffic Engineering/Safety/ITS. The traffic engineering team strives to enhance safety; improve traffic management; and explore technologies, including ITS systems, that will communicate real-time construction information to the public.

Structures (Bridges, Retaining Walls, Culverts, Miscellaneous). The structures skill set focuses on accelerating the construction of structures. Their task is to identify the most accommodating types of structures and materials that will meet design requirements and minimize adverse project impacts.

Innovative Contracting. The innovative contracting group explores state-of-the-art contracting practices and strives to match them with the specific needs of the project.

Roadway/Geometric Design. The roadway team evaluates proposed geometrics and identifies the most accommodating product with the minimum number of adverse impacts.

Long Life Pavements/Maintenance. The maintenance skill set identifies pavement performance goals and objectives and explores future maintenance issues for the project corridor, including winter service, traffic operations and preventative maintenance.

Construction (Techniques, Automation and Constructability). The construction crew explores techniques that will encourage the contractor to deliver a quality product within a specific timeframe while maintaining traffic.

Environment. The environment team ensures that the scope of work and construction activities reflect local environmental concerns. Their goal is to provide the most accommodating and cost effective product while minimizing natural and socio-economic impacts.

Public Relations. The public relations skill set discusses ways to partner with local entities and effectively inform both local communities and the traveling public about the project before, during and after construction. Their role is to put a positive spin on the project.

Background of ACTT

ACTT is a process that brings together public- and private-sector experts from across the country in a setting that encourages flexibility and innovation. The goal is to recommend technologies that will accelerate construction time while reducing user delay and community disruption. This necessitates a thorough examination of all facets of a highway corridor with the objective of improving safety and cost effectiveness while minimizing adverse impacts to the traveling public.

The ACTT concept was originated by the Transportation Research Board (TRB) in conjunction with FHWA and the Technology Implementation Group (TIG) of the American Association of State Highway and Transportation Officials (AASHTO). Following the completion of two pilot workshops, one in Indiana and one in Pennsylvania, the originating task force, A5T60, passed the concept off to FHWA and TIG to continue the effort. They have done so by coordinating a series of ACTT workshops around the country.

More information on the ACTT program is available online at http://www.fhwa.dot.gov/construction/accelerated/index.htm.

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