

---

# Appendix A

## Site Visit Meeting Minutes

# I-90 Closure Planning Study Columbus Site Visit #1 Minutes

*Tuesday, March 20, 2018*

*11:00 a.m. – 1:30 p.m.*

*MDT Columbus Maintenance Shop*

## ATTENDEES

- Tom Tilzey (MDT Billings Maintenance Chief)
- Ken Hembree (MDT Billings Maintenance)
- Chris Rasmussen (MDT Columbus Field Maintenance Supervisor)
- Steve Reed (MDT Big Timber Maintenance)
- Shaheen Siddiqui (CDM Smith)
- Jake Gunther (CDM Smith)

## PURPOSE OF MEETING

This meeting served as an opportunity for CDM Smith to meet with the MDT Billings Maintenance District staff to learn how I-90 currently functions within their district during closure incidents.

## TOPICS OF DISCUSSION

### Existing Conditions Discussion

The staff noted that the city of Columbus should be the main turnaround location for westbound traffic since traffic that passes this point generally continues to whatever problem spot is west of Columbus. If traffic was stopped in Columbus, it could limit problems between the cities of Columbus and Livingston.

While the extended interstate closures that occurred during the 2016/2017 winter were noted as abnormal, the problems that those incidences caused were one of the primary drivers behind this study.

MDT Billings Maintenance staff noted that closure incidents within the Billings district are infrequent and primarily occur due to blowing/drifted snow with low-no-visibility conditions.

When wildfires have threatened the interstate, MDT has generally been able to maintain at least one lane of traffic on I-90 in both the eastbound and westbound directions while closing the lane closest to the fire for firefighting operations.

Interstate flooding within their region on I-90 is not an issue, although maintenance staff did identify one location between Big Timber and Bridger Creek where the possibility of flooding does exist.

The flats on either side of Big Timber are known snow drifting locations, which are the most likely areas to force interstate closures within the MDT Billings Maintenance District's territory.

Given that most interstate closures within the Billings District occur due to inclement winter weather, the first step in the typical process to implement a closure requires that maintenance staff cease plowing operations and return to the maintenance shop. Once they arrive back at the shop, they gather the necessary signs, traffic control devices, and barricades and load them into a two-wheel-drive (2WD) pickup truck before heading back out to the interstate to begin implementing the closure. Working in blowing snow with low-to-no visibility conditions, staff risks their safety to manually set up signs and traffic control devices while exposed to traffic.

The 2WD pickup truck is not capable of traveling within the snow-covered median and can get stuck while out on closure missions, so they must remain on the interstate shoulders as they set up the closure. The amount of time required to implement an interstate closure was noted to be between 2-4 hours.

The MDT Billings District has one permanent variable messaging sign (VMS) for westbound traffic located approximately 1 mile east of the city of Columbus, and they have a total of seven portable VMSs between the cities of Hardin and Big Timber, an area covering approximately 130 miles of I-90 between the cities.

Trucks occasionally attempt to take US 191 (P-45), a two-lane road which runs in a northerly direction from the city of Big Timber. This route experiences blowing snow and exposes vehicles to near-continual broadside winds as it is a north-south route with typical westerly winds. As a result, the traffic attempting to circumvent the I-90 closure during a storm is at an increased risk of becoming stuck or getting lost, which further diverts MDT maintenance staff and emergency services resources. There is another road (S-306) that heads towards the town of Rapelje, but it is unpaved and exposes traffic to worse conditions than those on US 191.

Some of the miscellaneous items discussed during the existing conditions portion of the meeting are noted below:

- Staff noted that vehicles traveling on US 212 (P-28) are predominantly heading in an easterly direction and are unlikely to be impacted by interstate closures west of Laurel.
- MDT staff noted that the area near the twin bridges over the railroad and Yellowstone River (approximate RP 398) do not have a workable detour if they get plugged by accidents.
- The following locations were noted as existing truck storage locations during closures: the city of Columbus, the Columbus Rest Area, and the city of Big Timber. The Greycliff rest area is not a good option as it is past where wind events typically occur, and parking trucks on the interstate is ineffectual as they get blown in and immobilized with snow. That said, none of these individual areas, nor all of them collectively, can provide for the amount of traffic that can back up in the hours it takes to implement a closure. Providing additional truck storage locations was not considered to be a practical alternative by maintenance staff, and the city of Billings was identified as the only location that can handle the amount of trucks that can back up during closures.
- MDT staff noted that additional enforcement to ensure that closures are observed by all traffic may be needed.
- Maintenance staff recommended that CDM Smith contact Stefan Streeter directly to get his thoughts/recommendations for improvements.

### **Maintenance Staff Input**

Because MDT Maintenance staff has institutional knowledge through their experience of the issues and problems surrounding the closures, understanding their suggestions was a key component of our meeting. The biggest takeaway was that maintenance staff generally need quicker and safer methods to close the interstate and inform the public of the closures.

The following suggestions from maintenance staff aim to improve the closure of I-90 in the Billings District:

1. **Install interstate closure gate(s) for westbound traffic at the western Big Timber Interchange Exit 367. Install interstate closure gate(s) for eastbound traffic at the eastern Big Timber Interchange Exit 370.** This layout will ensure that interstate traffic in either direction is approaching the closure gates on a tangent section of I-90 with maximum visibility of traffic ahead. It also allows for traffic to maintain the option of exiting at either of the Big Timber interchanges. Gate(s) would be needed on the interstate at either exit, and at the respective on-ramp entrances.
2. **Install interstate closure gate(s) for westbound traffic at the Columbus Interchange Exit 408.** It was noted at the meeting that one gate would be needed on the interstate to force traffic to the

westbound off-ramp and a second gate would be needed at the westbound on-ramp entrance. *Note: After observing the existing Livingston closure gate layouts, consideration of a similar layout here with two gates for the interstate itself and a third for the on-ramp entrance may be warranted.*

3. **Install an interstate closure gate at the westbound on-ramp at the Springtime Interchange Exit (RP TBD).** This would prevent vehicles traveling the frontage road between the city of Columbus and Springtime Interchange from circumventing the interstate closure at the Columbus Interchange.
4. **Install a permanent VMS on the west side of the weigh station west of the city of Laurel, near mile marker 438.** It was not noted at the meeting whether this VMS should be single-sided for westbound traffic only, or whether it should be double-sided to function for traffic in either direction. *Note: If a double-sided sign is used, it may be beneficial to locate the sign within the median near the canal overpass as existing guardrail adjacent to the median in both directions of travel could be utilized to protect the sign.*
5. **Install permanent VMS(s) east of the city of Billings to provide westbound traffic with advanced warning.** Informing westbound traffic with advanced warning of potential closures prior to them reaching Billings will allow for them to consider alternate routes or to make the decision to wait in Billings.
6. **Install a permanent VMS near the town of Park City.** It was not noted at the meeting whether this VMS should be single-sided for westbound traffic only, or if it should be double-sided to function for traffic in either direction.

Additional comments received:

- Improved communications between MDT/Motor Carrier Services and trucking companies during incident events could help minimize impacts.
- Consider adding gates to close the frontage road between Columbus and the Springtime Interchange. The frontage road tends to get clogged up with snow drifts and it could be beneficial to prevent vehicles from trying to circumvent the interstate closure.
- Consider adding gates to close the frontage road on west side of Big Timber and to close the frontage road on east side of Big Timber. The frontage roads become impassable due to snow drifts; it would be beneficial to prevent vehicles from trying to circumvent the interstate closure.

- If possible, an Amber Alert-style warning system would be helpful to quickly get the message out during closure events.
- Google provides real-time traffic information in their Google Map application. Coordinating the closures with Google (and other similar map application companies) to provide Map users interstate closure information could keep them from driving beyond where they should and potentially minimize congestion at the closure areas. Based on discussions with MDT Maintenance staff in Livingston, the inclusion of remotely-controlled blackout signs in advance of interstate closure gates at Columbus and Big Timber would increase the safety of MDT maintenance staff while implementing closures. *Note: This was not discussed at the Billings district meeting.*

# I-90 Closure Planning Study

## Livingston Site Visit #1

### Minutes

*Wednesday, March 21, 2018*

*10:30 a.m. – 12:30 p.m.*

*MDT Livingston Maintenance Shop*

#### **ATTENDEES**

- Kyle DeMars (MDT Bozeman Maintenance Chief)
- Bill Pierce (MDT Bozeman Maintenance Superintendent)
- Larry Chapel (MDT Livingston Field Maintenance Supervisor)
- Shaheen Siddiqui (CDM Smith)
- Jake Gunther (CDM Smith)

#### **PURPOSE OF MEETING**

This meeting was an opportunity to meet with the MDT Bozeman Maintenance District staff to learn how I-90 currently functions within their district during closure incidents.

#### **TOPICS OF DISCUSSION**

##### **Existing Conditions Discussion**

The discussion primarily considered two topics: frequent closures due to wind events that occur frequently around Livingston itself; and less frequent closures and weather events within the overall Bozeman District's maintenance area.

The MDT maintenance crew described the different types of advisories/detour/closure scenarios that occur in the Livingston area and the process required to implement each Wind event that primarily occur from late October through March are the primary trigger for I-90 warnings/detours/closures in the areas, with the worst events compounded by blowing snow and low-to-no visibility conditions.

On average, two wind events occur every week during the windy season noted above (partial or full detours between Exit 330 and Exit 337), with wind event durations lasting up to two days. There are two critical wind event locations that impact primarily westbound truck traffic. They occur between the west Livingston Exit 330, and the east Livingston Exit 337.

The first problem area is near mile marker 332 east of Livingston Exit 330. The second problem area is near mile marker 334 east of the bridge over the Yellowstone River. Existing wind gauges are installed near each critical wind event location. A third known wind location that does not have a history of truck turnovers occurring along the flats just east of mile marker 336.

The four primary types of incidents in the Livingston area are illustrated in the following Incident Scenarios:

1. *Severe Cross-Winds Warning:* Triggered when wind speed reaches 40 mph.
2. *Partial I-90 Closure between Exit 330 and Exit 337, Trucks/Towing Vehicles must take detour route through Livingston:* Triggered when wind speeds reach 50 mph. During these partial closures truck traffic is closed between exits 330 and 337. MDT staff noted that some trucks ignore these partial closures), and that limited enforcement mechanisms exist for partial closures.
3. *Full I-90 Closure between Exit 330 and Exit 337, All Vehicles must take detour route through Livingston:* Triggered when wind speeds reach 60 mph, or as deemed necessary by the MDT Bozeman Maintenance Superintendent, based on weather conditions. During full closures, the interstate is closed to all traffic between exits 330 and 337. MDT staff noted that they must close I-90 to all traffic to force semi-trucks/towing vehicles off the interstate, even though passenger vehicles would generally be able to safely traverse the high-wind segments.
4. *Full I-90 Closure East (or West) of Livingston, Interstate completely closed to the east or west of Livingston:* This type of incident is rare, and primarily occurs when blowing snow between Livingston and Big Timber creates low-visibility conditions. Closure of the Bozeman pass west of Livingston for similar reasons is even less common but still a possibility. During full closures traffic is routed through Livingston in the same manner as noted under Incident Scenario 3 above. In these situations, drivers must find alternate routes, U-turn, or shelter in place, if room exists, until the closure is lifted.

The process of implementing a detour/closure currently takes between two and five hours from start to finish, depending on weather conditions, and whether partial or full closure is implemented.

Systems that aid in notifying the traveling public of advisories/detours/closures include the dial-in 511 system, MDT's Travel and Weather Information website, and the Highway Advisory Radio (HAR) station



on AM radio station 530. The HAR sign for westbound travel was noted to be within the closed detour segment of I-90, rendering it ineffective. Additionally, the HAR radio signal was noted to be weak and staticky, particularly near the Big Timber area.

The impacts of the detour route through the town of Livingston were discussed, with the following items noted:

- During full closure events traffic quickly fills up the entirety of Highway 10 and Park Street/Highway 89. Problems created by the traffic jam include: the inability of cross traffic to navigate through town, and, critically, the ability of ambulances and other emergency service vehicles to safely and efficiently navigate through Livingston, and to/from the Hospital.
- When passing trains cause the gates at the railroad crossing at the Y-intersection between Highway 10 and Park Street to be closed during detour events, traffic on both sides of the crossing comes to a standstill which ripples out to the vehicles that are still backed up onto the interstate. Neither MDT nor state/local police currently possess the ability to stop train traffic during closure events.
- The traffic signals in town do not currently have the flexibility to run in a detour phase, which could more efficiently transport detour traffic through town. The signals can either be run with their normal timing, or they can be switched to a flashing-red, 4-way stop configuration. While the flashing-red configuration can provide some relief, it is inadequate for dealing with the number of vehicles that are backed up in the detour route.
  - MDT Maintenance staff noted that MDT is conducting a traffic signal timing study for daily operations within Livingston. CDM Smith will contact MDT Traffic to determine whether any information pertinent to the incident management study may be obtained.
- During detour events, eastbound traffic on Park Street is limited in making the permitted left-turn maneuver from left turn lane at the Y-intersection between Highway 10 and Park Street due to the lack of a designated signal phase allowing them to cross the steady stream of westbound traffic merging onto Highway 10.
- During hard closure events, where interstate travel eastbound from exit 337 or westbound from exit 330 are closed, the lack of adequate truck storage locations in the town of Livingston further magnifies the issues noted above. Increasing the amount of available truck storage within Livingston was not seen as a feasible option by MDT maintenance staff.
  - Local city/county staff has identified an empty parcel near exit 337 that has potential to be improved to provide increased vehicle storage capacity during closure events,

provided that an agreement could be reached with the landowner. MDT is not involved with this process and further exploration of this item is not within the scope of this study.

Additional comments received:

### **MDT Maintenance Staff Input**

CDM Smith staff was interested in the suggestions of MDT Bozeman Maintenance staff. They have intimate knowledge of the relevant issues in their district and understand some of the best ways to improve the safety of their crews and the traveling public during detour/closure events.

The following input was presented:

1. **Reconfigure the I-90 Westbound off-ramp at Exit 337.** Could help remedy the existing geometry, improve visibility of interstate closure gates, improve visibility of stopped traffic on the off-ramp during detour/closure events, provide additional detour storage capacity, and to more efficiently route traffic through the detour route. An improved off-ramp could increase safety for the traveling public by eliminating the need to make the stop-controlled left turn onto Highway 89 westbound.
  - MDT owns the right-of-way for the old frontage road (no longer in service) on the north side of the interstate between Exit 337 and Exit 340. Utilizing the old roadbed for a reconfigured ramp and connection to the existing Highway 89 westbound would not require additional right-of-way for the reconfigured off-ramp.
  - MDT staff would like to see the reconfigured exit 337 westbound off-ramp pushed as far to the east as practicable to increase the amount of vehicle storage during detour/closure events along a tangent section of road.
  - It was noted that a reconfigured westbound off-ramp would lie on a tangent section of interstate so that approximately 1-3 miles of visibility would be available (depending on the location of the reconfigured off-ramp). The increased visibility could be a significant safety improvement for MDT staff initiating detours/closures, and for the traveling public, who would have better sight lines of stopped traffic on the interstate in advance of the existing condition.
2. **Install an additional permanent double-sided variable messaging sign (VMS) a minimum of two miles west of Exit 330.** The existing permanent VMS is located too close to the Exit 330 eastbound off-ramp and could potentially be a candidate to be relocated further to the west. To allow for a new permanent VMS to be double-sided and serve both directions of travel, it would need to be

located near the east end of the horizontal curve near mile marker 328.5 (only 1.5 miles from Exit 330). Another option may be to install two new single-sided permanent VMS further west of that point where the eastbound and westbound interstate alignments are detached from each other. The first permanent VMS that eastbound traffic traveling from the west of exit 330 reaches should include flashers.

3. **Install an additional permanent single-sided VMS a minimum of two miles east of Exit 337.** Given that the existing permanent VMS is located around mile marker 338, it may be beneficial to consider locating the new permanent VMS on the east side of Exit 340. Placing the sign near mile marker 341 would provide westbound interstate traffic with warning of advisory/detour/closure events prior to the horizontal curve near the same mile marker which would be a safety benefit in scenarios where traffic has backed up onto the interstate. The first permanent VMS that westbound traffic traveling from the east of Exit 337 reaches should include flashers.
4. **Replace all existing Flip-Signs with electronically controlled Blackout signs capable of being updated remotely from MDT Maintenance shop(s).** Increase the number of blackout warning signs and extend their starting locations further from the closure points. Adding flashing lights on select key blackout signs would draw additional attention to them and should be considered.
5. Add a dedicated portable VMS on Highway 89 near the South Interchange Exit 333 to notify travelers when the eastbound/westbound interstate on-ramps are closed due to the interstate detour.
6. **Upgrade the wind speed gauge near mile marker 334 to enable it to provide real-time data to MDT staff remotely.** The existing wind speed gauge requires that maintenance staff manually download data. Maintenance staff having access to real-time wind-speed data may allow them to initiate and implement closures more efficiently.
7. **Upgrade the interstate closure gates to eliminate the need for 2-3 people to close them during wind events.** MDT Maintenance staff will still need to be physically present to close the gates, but a remote style opening/closing mechanism that would function during high winds without requiring multiple people to close the gates would improve safety and efficiency by allowing for maintenance staff to divide their efforts in multiple locations.
8. **Two new permanent VMS are needed near the Highway 287/Three Forks Exit 274 to provide advanced warnings during detour/closure events.** The VMS west of highway 287 would be single-sided to warn travelers of closures on the Butte Hill. The VMS east of highway 287 would be double-sided to warn travelers about incidents to both the west and the east of the sign.



9. Add a dedicated VMS east of Belgrade's Airway Blvd Interchange to provide warning to eastbound travelers leaving the airport or coming from Jackrabbit Lane/Highway 85.
10. **A double-sided portable VMS may be needed to replace the existing single-sided portable VMS that is located between mile marker 324 and 325.** This would allow for more effective communication for both eastbound and westbound traffic between Bozeman and Livingston.
11. Add a dedicated portable VMS on Highway 89 north of the Wilsall Interchange Exit 340 to inform southbound travelers on Highway 89 of advisories/detours/closures.
12. **Improve the clarity and effectiveness of the Highway Advisory Radio (HAR) on AM Station 530.** The existing radio station is staticky and has a poor signal that grows noticeably weaker near Big Timber. An upgraded radio outreach system should at a minimum maintain clarity between Livingston and Big Timber. **Relocate the existing HAR sign(s) that are currently located within the detoured portion of I-90 between Exit 330 and Exit 337.** The relocated signs should be placed outside of the detoured segment for maximum effectiveness.
13. **Investigate the possibility of constructing 'wind walls' to guide wind gusts above the truck traffic at the two known wind event locations where truck tip-overs frequently occur.** The first problem spot is near mile marker 332 just east of Livingston Exit 330. The second problem spot is near mile marker 334 just east of the bridge over the Yellowstone River. Construction alternatives for potential 'wind walls' could include earthen embankments, sound barrier walls, living walls, other systems, or any combination thereof. *Note: This improvement could drastically decrease the number of partial and full detour closures caused by the risk of truck tip-overs in the wind gust locations.*

Additional considerations:

- Consider ways to improve the existing 511 call-in information system. Statewide communication is currently an issue. There are many passes and valleys where cellular and radio coverage is not available. Statewide fiberoptic cable statewide is too costly for the small amount of traffic. Crowdsourced information such as Google and Waze are also sporadic due to the lack of coverage and lack of "crowds" in a large rural state like Montana. Some states in the Northwest Passage have citizen-reporting systems that allow everyday citizens to call in or use an app to report events and conditions, which could be a consideration.
- Consider studies being conducted by other states on the effectiveness of different colors for VMS and flashing/warning lights that may be more effective/noticeable to the traveling public. Consider informational real-time wind speed signs within the city of Livingston along the detour route. These signs could operate similarly to speed signs that are posted within cities, updating

their message based on wind-speed limits that correspond to MDT's existing closure practices. Three signs could be most effective, with one sign on the west end of Livingston, one in the middle of the detour route, and one on the east end of Livingston.

- MDT Maintenance staff noted that there is an on-going MDT project to upgrade all the lights on MDT system roads to LED. This improvement should enhance safety in the corridor.