



## MEMORANDUM

**TO:** Jackie White, P.E., City Engineer, Grandview, MO  
**FROM:** David A. Church, P.E., PTOE, Senior Supervising Engineer, WSP USA, Inc.  
**SUBJECT:** Raytown Road Missouri STP Grant Application (2021-2022)  
**DATE:** March 21, 2018

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### INTRODUCTION

Safety and capacity analyses were recently performed on a section of Raytown Road in Grandview, Missouri near Longview Lake. This was performed to facilitate the City's Missouri Surface Transportation Program (STP) application (2021 – 2022) through the Mid-America Regional Council (MARC) for the replacement of two existing corrugated metal pipes (CMP) with two new bridge structures. The existing CMPs were damaged during a flood event in the summer of 2017 (Figure 1). Crash data and traffic counts from the City of Grandview were used to determine the safety and capacity of the existing roadway as well as the anticipated future conditions.



*Figure 1– Photograph of Existing CMP (1 of 2 CMPs) under Northbound Raytown Road  
Source: WSP, March 15, 2018*



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## TRAFFIC SAFETY

Crash data were obtained from the City of Grandview for the segment of Raytown Road from Harry S. Truman Drive to High Grove Road for the most recent four years available (2014-2017). During this period, there were five non-intersection related collisions recorded, as seen in Table 1. Only one of these collisions occurred within 1,000 feet of the location of the existing CMPs, which involved the 2016 collision with parked motor vehicles on Raytown Road. The driver had originally veered towards the median, over corrected and collided with three vehicles parked on the side of the road while their owners were fishing at Longview Lake.

*Table 1 – Types of Non-Intersection Crashes along Raytown Road from Harry S. Truman Drive to High Grove Road (2014-2017)*

Year	Animal (deer)	Non-Fixed Object	Parked Motor Vehicle	Rear-End	Total
2014	-	-	-	-	0
2015	2	-	-	-	2
2016	-	-	1	1	2
2017	-	1	-	-	1
<b>Total</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>5</b>

*Source: City of Grandview, MO*

Crash rates are commonly used to determine the relative safety of street/highway segments compared to similar roadways in other locations in Missouri. The segment of Raytown Road between Harry S. Truman Drive and High Grove Road is considered an “expressway” and has a calculated crash rate of 95.13 crashes per hundred million vehicle miles. Per coordination with MoDOT’s Traffic Liaison Engineer, this is well below the average crash rate for similar expressways in Missouri of 133.29 crashes per hundred million vehicle miles as well as the critical crash rate of 142.96 crashes per hundred million miles. Therefore, compared to similar expressways, this segment of Raytown Road is relatively safe based on past crash occurrences.

It is possible that if no long-term solutions are utilized to address the existing CMPs, that the pavement along the outside lane of the northbound approach will continue to sag as the CMP beneath it transforms, as seen in the photo taken on March 15, 2018 (Figure 2). Raytown Road is also an official bicycle route with signing and markings on the shoulder (Figure 3). Safety related consequences involved in continuous monitoring and maintenance of the existing CMPs effect on the Raytown Road pavement include:

- “Sag” in the northbound Raytown Road outside through lane and shoulder (cyclists)
- Potential location for ponding water during rain events
- Exposure to traffic for City Maintenance personnel while maintaining pavement patch
- Continuous monitoring of future pavement and fill slope movement (Figure 4)



*Figure 2 – Photograph of Northbound Raytown Road Pavement Sagging on Top of Existing CMP  
Source: WSP (March 15, 2018)*



*Figure 3 – Photograph of Northbound Raytown Road Approaching Project Site with Bicycle Symbol on Shoulder  
Source: WSP (March 15, 2018)*



*Figure 4 – Photograph of Northbound Raytown Road Fill Slope Protection  
Source: WSP (March 15, 2018)*

## VOLUMES AND CAPACITY

The City of Grandview, MO provided traffic projections based on 2007 counts grown using an estimated 2.5% annual growth rate. Highway Capacity Software 7 (HCS7) was utilized to calculate the Level of Service (LOS) for the segment of Raytown Road for both 2018 and 2040. HCS7 uses Highway Capacity 6 methodologies to determine the density of passenger cars per mile per lane to compare the vehicular demand to the capacity of the roadway based on the roadway characteristics, free flow speed of the roadway, and average daily traffic. Calculations for the LOS assumed that 10% of daily traffic occurred during the peak hour at a 60/40 directional distribution for northbound/southbound travel. Table 2 compares the volumes, volume to capacity ratio, LOS, and density for this segment of Raytown Road for both 2018 and 2040.

*Table 2 – Current (2018) and Projected 2040 ADT, Volume to Capacity Ratio, LOS, and Density*

Year	Projected ADT/Total Entry Volume (vpd)	ADT per Lane (vpd)	Volume-to-Capacity Ratio	Level of Service	Density (passenger car/mile/lane)
<b>2018</b>	3,600	900	0.04	A	1.8
<b>2040</b>	6,198	1550	0.07	A	3.1



## **CONCLUSIONS**

A review of crashes on Raytown Road between 2014 and 2017 found that this section of expressway has been relatively safe period with minimal crash occurrence as compared to similar expressways in the State of Missouri. Because of the recent flood event in the summer of 2017, which compromised the existing CMPs under Raytown Road, existing safety issues exist until the long-term upgrade of the drainage structures at this location.

The volume and capacity analysis conducted found that the existing Raytown Road cross-section functions with an acceptable LOS in 2018 as well as in 2040 (LOS A) based on the amount of anticipated traffic growth. No additional capacity improvements are needed as part of a CMP replacement project.

## **DISCLAIMER**

23 U.S.C. § 409 protects from discovery and admission into evidence in a court proceeding any reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds.

Use Restricted, 23 U.S.C. 409