
Level 2 Traffic Assessment

Coyote River Gravel Pit Elam

I-70 North Frontage Road

Dotsero, Colorado



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1 Introduction

TurnKey Consulting prepared this Level 2 traffic assessment study (Study) for the proposed Coyote River Gravel Pit (Project) in Dotsero, Colorado. The following sections describe the Project, traffic volumes, auxiliary turn lane thresholds, access spacing, and sight distance for the Project Site Access point to the North Frontage Road.

2 Project & Access Description

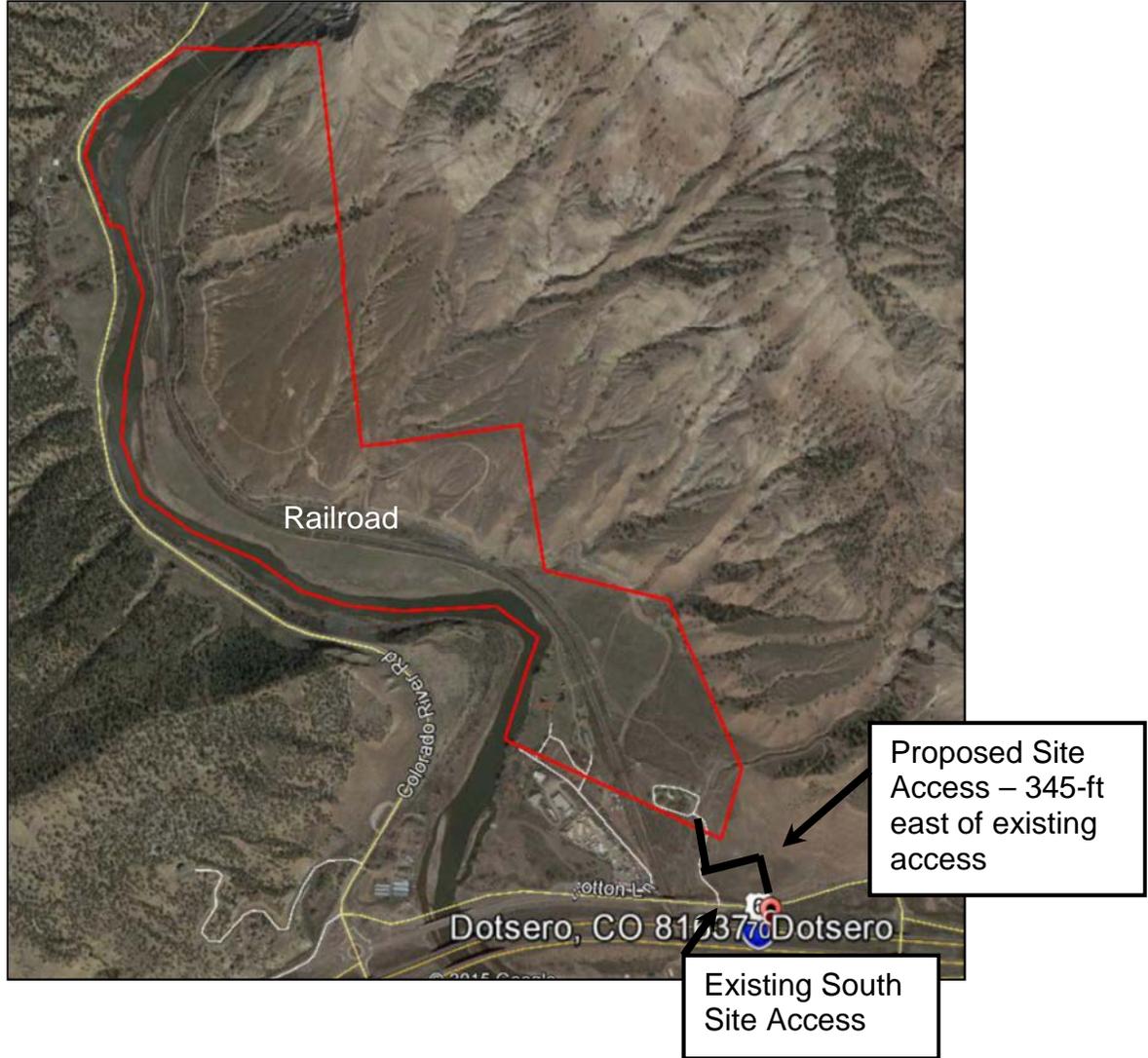
As shown on the following figures, the above referenced project would be located on the north side of the I-70 North Frontage Road in Dotsero Colorado. The Project could be in operation for 25 years with an annual production of 300,000 tons per year. Hours of operation would be 7am to 7pm. Production would vary throughout the year with the peak season being June – September.

As shown in the following figures, the site currently has one access point to the North Frontage Road (serving one single-family residence). The existing access has sight distance issues and is not acceptable for truck traffic. The owner met with CDOT traffic a couple years ago and identified an access location that would have acceptable sight distance. This is discussed in more detail later.

Figure 1 – Site Location Map



Figure 2 – Existing & Proposed Access to Project Site



3 Adjacent Access Points

The following Figure shows the existing driveways and side roads within 1,000 feet of the existing Site Access, as summarized below.

- (1) 1,000-ft West, Local Road on north side (Cotton Lane)
- (2) 1,150-ft East, North Frontage Road on north side

Figure 3 – Existing Driveways and Side Roads within 1000 feet of North Rd Access



4 Project Trip Generation & Distribution

The ITE Trip Generation Manual does not include a land use code and trip data for gravel pits, due to the extreme difference in production rates. Please see the attached Pit Production Questionnaire for this Project, and the attached trip generation calculation. The Project could be in operation for 25 years with an annual production of 300,000 tons per year. Hours of operation would be 7am to 7pm. Production would vary throughout the year with the peak season being June – October.

Table 1 - Project Trip Generation in Peak Production (VPH-PCE)

Peak Period	In	Out	Total
AM	50	38	88
PM	38	50	88

Trip distribution at the intersection is based on the location of the Project with respect to developed area of Eagle County (mostly to the east). The site is located in the middle of a split-diamond interchange configuration on I-70.

- 20 % to/from west on North Frontage Rd
- 80 % to/from east on North Frontage Rd

When combined, trip generation and trip distribution provide the results on the following table showing Project trip assignment by movement at the access (passenger car equivalents- pce).

Table 2 - Peak-Hour Project Traffic Volumes at Project Access Point (VPH-PCE)

Period	Southbound		Eastbound		Westbound	
	Left	Right	Left	Thru	Thru	Right
AM	30	8	10	0	0	40
PM	40	10	8	0	0	30

5 Existing & Projected Future Traffic Volumes

5.1 Existing Traffic Volumes – Through Movements on North Frontage Road

TurnKey Consulting conducted traffic counts at the existing site access to the North Frontage Road because there is not any CDOT data available for this section of Frontage Road. AM & PM peak period traffic counts were conducted at this intersection on Tuesday 8/11/15 (summary attached). These counts were conducted after CDOT finished a nearby bridge repair project so the count was done under normal traffic conditions.

Table 3 – Existing Peak Hour Traffic Volumes on Frontage Road

Direction on Rd	AM (vph)	PM (vph)
Eastbound	89	90
Westbound	101	93
Total (2-way)	190	183

5.2 Future Background Traffic Volumes on North Frontage Rd (2036)

CDOT OTIS data for I-70 mainline is shown in the following table, and it was used for the North Frontage Road growth calculation (no CDOT projections for Frontage Road).

Table 4 – I-70 Traffic Data East of Dotsero (2015)

ROUTE	REFPT	ENDREFPT	UPDATEYR	OFFPKTRK	YR20FACTOR
070A	134.053	139.533	2015	12.6	1.41

The 20-yr traffic growth factor of 1.41 equates to an average annual growth rate of 1.73%. Existing through traffic on the North Frontage Road was adjusted to reflect background traffic in the 21-year horizon (year 2036). The 1.73% growth rate equates to a 21-year (2015 – 2036) growth factor of 1.43.

Table 5 – Future Peak Hour Traffic Volumes On Frontage Rd - 2036

Direction on Rd	AM (vph)	PM (vph)
Eastbound	128	129
Westbound	144	133
Total (2-way)	272	262

5.3 Future Total Traffic Volumes (Background + Project) - 2036

Future total traffic is the sum of project trips and background traffic, as shown in the following table.

Table 6 – 2036 Peak-Hour Traffic Volumes (DHV-PCE) At Project Site Access Point - AM

Condition	Southbound		Eastbound		Westbound	
	Left	Right	Left	Thru	Thru	Right
Future Background Traffic	0	0	0	128	144	0
Project Traffic	30	8	10	0	0	40
Total	30	8	10	128	144	40

Table 7 – 2036 Peak-Hour Traffic Volumes (DHV-PCE) At Project Site Access Point - PM

Condition	Southbound		Eastbound		Westbound	
	Left	Right	Left	Thru	Thru	Right
Future Background Traffic	0	0	0	129	133	0
Project Traffic	40	10	8	0	0	30
Total	40	10	8	129	133	30

6 Auxiliary Turn Lane Evaluation for Access to Frontage Rd

The North Frontage Road has a speed limit of 35 mph and an access classification of F-R. The following table shows recommendations for turn lanes.

Table 8 – Comparison of Turning Volumes to Turn Lane Thresholds

Auxiliary Lane	Total Turning Volume 2036 (VPH-PCE)	Thresholds	Lane Required?
EB Left Turn Deceleration Lane (inbound)	10 vph (AM)	More than 25 vph	No
WB Right Turn Deceleration Lane (inbound)	40 vph (AM)	More than 50 vph	No
SB-EB Left Turn Acceleration Lane (outbound)	40 vph (PM)	May be req'd if benefit to safety and operations. Generally not required if speed < 45 mph	No
SB-WB Right Turn Acceleration Lane (outbound)	10 vph (PM)	More than 50 vph, with speed limit over 40 mph	No

Discussion on Left Turn Deceleration Lane

This lane is not recommended for the same reasons stated for the left turn acceleration lane, but this movement has even lower access volumes.

Discussion on Right Turn Deceleration Lane

This lane is not recommended for the same reasons stated for the left turn acceleration lane (same volume of turning traffic).

Discussion on Left Turn Acceleration Lane

Section 3.5(3) of the State Highway Access Code provides guidance beyond the thresholds shown in the table above. It states:

- (3) If necessary, for specifically identified and documented safety and operation reasons, a left turn acceleration lane may be required when unique location factors such as; highway speed and traffic density, access volume, the volume of commercial trucks, the influence of nearby access, existing highway auxiliary lanes close to the access, nearby traffic control devices, available stopping sight distance, and where other topographic and highway design factors exist that determine the need.

The left turn acceleration lane is not necessary, based upon the combination of the following factors:

- There would not be any other turning traffic within 1,000 ft of the Project Access.
- Highway speed (35 mph) is low - technically classified as a “low speed facility.”
- Traffic density is low. The highest EB through traffic (traveling in same direction as accelerating trucks) volume in year 2036 would be 129 vph. Using a standard lane

capacity of 1,900 vphpl, the volume/capacity ratio would be 7%. On average, this would be about 1 EB through vehicle every 30 seconds.

- Given the 30-second gap and the acceleration characteristics of a loaded WB-50 truck (see attachments), the outbound left turning truck could be traveling up to 19 mph before an oncoming EB through vehicle would reach it. The speed differential would then be only 16 mph.
- Access volume is low. Without consideration of passenger car equivalents, the actual number of left-turning large trucks would be 150 vpd, or 10 vph. On average, this works out to 1 left-turning large vehicle every 6 minutes.
- The sight distance to the east and west would meet CDOT criteria for entering sight distance and stopping sight distance. The North Frontage Road Slopes down to the east at 2% in the area of EB truck acceleration. While not a steep enough slope to warrant reduction in sight distance, it would help the trucks accelerate faster. See the next section for more information on sight distance.

Discussion on Right Turn Acceleration Lane

This lane is not recommended for the same reasons stated for the left turn acceleration lane, but this movement has even lower access volumes.

7 Intersection Sight Distance

The following table shows the required and estimated sight distance for the Project Site access to North Frontage Road. **The recommended location for the proposed access would be 345-ft east from the centerline of the existing access.** Photos on the next page show the sight view from the proposed Project Site Access, prior to clearing. This is a two-lane Road with a speed limit of 35 mph. The design vehicle is a multi-unit truck. The required distance was based on the State Highway Access Code. This segment of North Frontage Road has some horizontal or vertical curvature, as shown on the following images.

Table 9 – Sight Distance Evaluation on North Frontage Road

Field Measured Sight Distance after embankment regrading			Required Sight Distance @ 35 mph	Exceeds Required?
Proposed Site Access to North Frontage Road	To west	625-ft	595-ft – Entering (desirable per AASHTO)	Yes
	To east	725-ft	250-ft – Stopping (minimum per AASHTO)	Yes

As shown on the following images, it would be necessary to lower a portion of the embankment on the north side of the North Frontage Road, to the east of the proposed site access.



Photo #1: NORTH FRONTAGE ROAD – Looking West from Proposed Site Access



Photo #2: NORTH FRONTAGE ROAD – Looking East from Proposed Site Access



8 Recommendations

The proposed Project Site Access shall be located 345-ft east of the existing site access in order to provide adequate sight distance (MP 133.88). Based on a variety of safety and operational factors, exclusive turn lanes are not recommended on the North Frontage Road at the Project Site Access. The access shall have 1 inbound lane and 1 outbound lane and shall be constructed to accommodate turning movements for a WB-50 design vehicle.

The CDOT access permit volume on the Project Site Access should be 88 trips per hour (PCE).

Attachments

- Traffic Count summary – existing access point – AM & PM Peak Hr
- Gravel Pit Production Questionnaire
- Trip Generation calculation
- WB-50 performance chart
- CDOT reference post information

Existing Site Access Traffic Counts

There were not any turns to or from the existing site access during the count

Intersection Turning Movement Count Summary

Project: Coyote River Pit Access Location: Dotsero EB/WB Road: I-70 North Frontage Road NB/SB Road: Site Access																	Counted by: KB Count Date: 8/11/2015 Peak Season Adjust: 1		Tuesday																			
Time	Eastbound (EB)				Westbound (WB)				Northbound (NB)				Southbound (SB)				Total Volume																					
	Left	Through	Right	RTOR	Left	Through	Right	RTOR	Left	Through	Right	RTOR	Left	Through	Right	RTOR																						
7:00 - 7:15	0	15	0	0	0	5	0	0	0	0	0	0	0	0	0	0	20																					
7:15 - 7:30	0	37	0	0	0	20	0	0	0	0	0	0	0	0	0	0	57																					
7:30 - 7:45	0	32	0	0	0	16	0	0	0	0	0	0	0	0	0	0	48																					
7:45 - 8:00	0	16	0	0	0	13	0	0	0	0	0	0	0	0	0	0	29																					
8:00 - 8:15	0	25	0	0	0	29	0	0	0	0	0	0	0	0	0	0	54																					
8:15 - 8:30	0	16	0	0	0	17	0	0	0	0	0	0	0	0	0	0	33																					
8:30 - 8:45	0	20	0	0	0	25	0	0	0	0	0	0	0	0	0	0	45																					
8:45 - 9:00	0	28	0	0	0	30	0	0	0	0	0	0	0	0	0	0	58																					
2hr Totals =	0	189	0	0	0	155	0	0	0	0	0	0	0	0	0	0	344																					
Peak Hour Totals	89				101																																	
Intersection Peak Hour: 8:00 - 9:00 AM																																						
<table border="1" style="width:100%; border-collapse: collapse;"> <tr><td rowspan="4" style="width:15%; text-align: center;">Peak Hour Volumes</td><td style="width:15%;">Intersection</td><td style="width:15%; text-align: center;">190</td><td rowspan="4" style="width:15%; text-align: center;">Peak Hour Factors</td><td style="width:15%;">Intersection</td><td style="width:15%;"></td></tr> <tr><td>EB:</td><td></td><td>EB:</td><td></td></tr> <tr><td>WB:</td><td></td><td>WB:</td><td></td></tr> <tr><td>NB:</td><td></td><td>NB:</td><td></td></tr> <tr><td>SB:</td><td></td><td>SB:</td><td></td></tr> </table>																	Peak Hour Volumes	Intersection	190	Peak Hour Factors	Intersection		EB:		EB:		WB:		WB:		NB:		NB:		SB:		SB:	
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Time	Eastbound (EB)				Westbound (WB)				Northbound (NB)				Southbound (SB)				Total Volume																					
	Left	Through	Right	RTOR	Left	Through	Right	RTOR	Left	Through	Right	RTOR	Left	Through	Right	RTOR																						
4:00 - 4:15	0	23	0	0	0	18	0	0	0	0	0	0	0	0	0	0	41																					
4:15 - 4:30	0	15	0	0	0	17	0	0	0	0	0	0	0	0	0	0	32																					
4:30 - 4:45	0	22	0	0	0	13	0	0	0	0	0	0	0	0	0	0	35																					
4:45 - 5:00	0	24	0	0	0	21	0	0	0	0	0	0	0	0	0	0	45																					
5:00 - 5:15	0	18	0	0	0	20	0	0	0	0	0	0	0	0	0	0	38																					
5:15 - 5:30	0	28	0	0	0	25	0	0	0	0	0	0	0	0	0	0	53																					
5:30 - 5:45	0	19	0	0	0	20	0	0	0	0	0	0	0	0	0	0	39																					
5:45 - 6:00	0	25	0	0	0	28	0	0	0	0	0	0	0	0	0	0	53																					
2hr Totals =	0	174	0	0	0	162	0	0	0	0	0	0	0	0	0	0	336																					
Peak Hour Totals	90				93																																	
Intersection Peak Hour: 5:00 - 6:00 PM																																						

Gravel Pit & Mining Production Questionnaire

Please provide as much information as possible and attach appropriate documents.

Project Name:

Project Location/Address:

Company Name:

Person Completing this Form: -Name:

-Title:

-Phone Number:

-Date:

Overall Production Schedule

1. How many different production phases will occur before pit closes?
2. What are the years and production amounts?

<u>Phase</u>	<u>Range of Years</u>	<u>Production Amount (Tons per Year)</u>
1	<input style="width: 50px; height: 20px;" type="text" value="1"/> thru <input style="width: 50px; height: 20px;" type="text" value="12"/>	<input style="width: 300px; height: 20px;" type="text" value="230,000"/>
2	_____ thru _____	_____
3	_____ thru _____	_____

Please complete one of the following pages of detailed information for each Phase

Information from Similar Sites

Please provide any information or data from similar sites that could be used to support the information on these data sheets.

Detailed Information – Phase 1

Production Years: thru

Limiting Factor for annual production (permit, etc):
(please attach appropriate document if available)

Air permit (not applied for yet)

Does the Production Rate vary over the course of the year:

Yes

If so, provide the following information for three possible production periods

If not, put your answers in the average column

Months of the year for each period:

Production Periods

Low

Average

High

thru

thru

thru

Daily Trip Generation

Number of on-site workers per day:

On-site worker arrival time (s):

On-site worker departure time (s):

Number of other site visits per day
(Maintenance, deliveries, fueling, customers, supervisors ,etc)

Number of large dump trucks per day
(greater than 40-ft long)

Number of medium dump trucks per day
(between 20-ft & 40-ft long)

Number of small trucks per day (less than 20-ft long)

Number of Work days per week

Number of Work hours per day

Trip Distribution

% of trips to/from North

% of trips to/from South

% of trips to/from East

% of trips to/from West

<input type="text" value="4"/>	<input type="text" value="10"/>	<input type="text" value="12"/>
<input type="text" value="7 am"/>	<input type="text" value="7 am"/>	<input type="text" value="7 am"/>
<input type="text" value="7 pm"/>	<input type="text" value="7 pm"/>	<input type="text" value="7 pm"/>
<input type="text" value="0"/>	<input type="text" value="2"/>	<input type="text" value="2"/>
<input type="text" value="7"/>	<input type="text" value="39"/>	<input type="text" value="77"/>
<div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: 80%;">Assuming only 24-ton capacity trucks at this time</div>		
<input type="text" value="1"/>	<input type="text" value="4"/>	<input type="text" value="4"/>
<input type="text" value="6"/>	<input type="text" value="6"/>	<input type="text" value="6"/>
<input type="text" value="12"/>	<input type="text" value="12"/>	<input type="text" value="12"/>
<input type="text" value="80"/>	<input type="text" value="80"/>	<input type="text" value="80"/>
<input type="text" value="20"/>	<input type="text" value="20"/>	<input type="text" value="20"/>
=100%	=100%	=100%

Project Trip Generation Calc

Ref: Coyote PIT - Dotsero

Employees

- 12 people

	In	Out
AM	12	0
PM	0	12

Trucks

- Small (< 20-ft) - ~~site visits~~ ^{Trucks} = 4 per day
 - other visits = 2 per day
 = 6 per day PCE

- Medium (20-40 ft) - None

- Large (> 40-ft) = 77 per day x 3
 = 231 trucks per day PCE

- Total = 237 trucks per day PCE
 = 20 Trucks per hour

12 hr day
(7-7)

	In	Out
AM	20	20
PM	20	20

- Total

	In	Out
AM	32	20
PM	20	32

Loaded WB-50
 12 mph in 18.5 sec.
 over 180-ft
 if 30 second gap
 Then assume speed = 19 mph

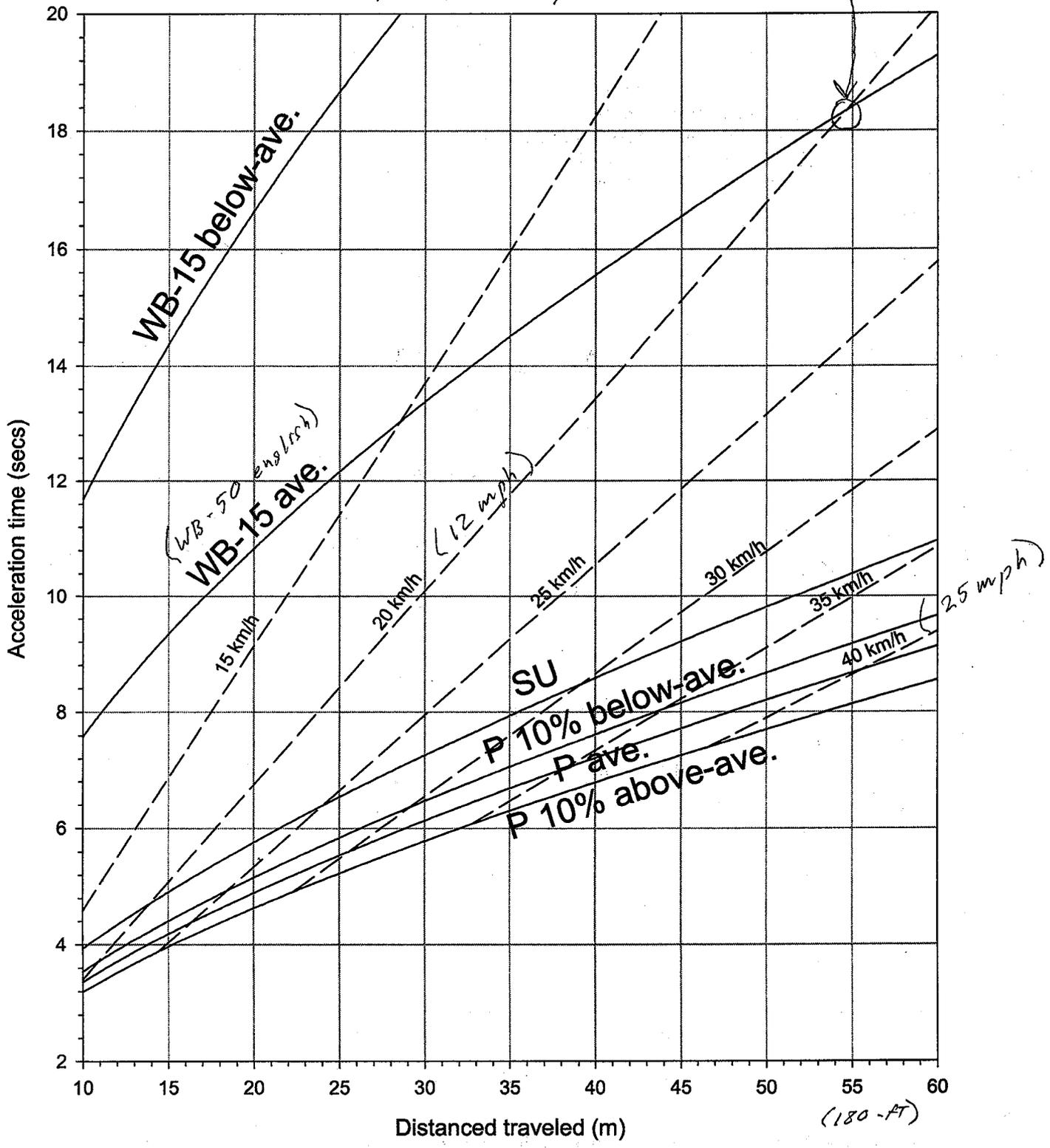


FIGURE 3 Times and Distances from Stop for Recommended Design Accelerations

SH070A	MP	Length	Description	City	County:	Hwy Name	Comments
070A	132.59	0.089	MINORSTR (070A132580BL) UNNAMED DRAINAGE	NONE	EAGLE	I-70	
070A	132.68	0.297	MINORSTR (070A132670BL) FARM ACCESS ROAD	NONE	EAGLE	I-70	
070A	132.98	0.025	MINORSTR (070A132970BL) DRAINAGE	NONE	EAGLE	I-70	
070A	133.00	0.177	MILEPOST 133	NONE	EAGLE		
070A	133.17	0.123	RAMP OFF	NONE	EAGLE	I-70	
070A	133.29	0.092	RAMP ON	NONE	EAGLE	I-70	
070A	133.38	0.022	EXIT 133 / DOTSERO WEST INTERCHANGE STRS (F-08-O) EB AND (F-08-P) WB - RD (SWEETWATER CROSS ROAD) (CO RD 301) (COLORADO RIVER RD) OVERPASS SEPARATIONS	NONE	EAGLE	I-70	070A EXIT(133)COLORADO RIVER RD (N)
070A	133.40	0.005	LEGACY LOCATION MARKER	NONE	EAGLE	I-70	
070A	133.40	0.108	MINORSTR (070A133420EL) DRAINAGE	NONE	EAGLE	I-70	
070A	133.48	0.269	MAJOR STRS (F-08-Q) WB AND (F-08-R) EB AND (F-18-A) FR -- COLORADO RIVER SR	NONE	EAGLE	I-70	
070A	133.77	0.159	MAJOR STR (F-08-S) EB AND (F-08-T) WB AND (F-08-D) FR -- RD N AND S (COTTON LN) (CO RD 720) -- OVERPASS SEPARATION	NONE	EAGLE	I-70	133.77 + 0.11 ----- 133.88 Access M.P.
070A	133.94	0.047	MAJOR STR (F-08-E) DRAW SR	NONE	EAGLE	I-70	
070A	133.99	0.006	MINORSTR (070A134010BL) DRAINAGE	NONE	EAGLE	I-70	
070A	134.00	0.032	MILEPOST 134	NONE	EAGLE	I-70	
070A	134.03	0.018	MINORSTR (070A134040EL) DRAINAGE	NONE	EAGLE	I-70	
070A	134.05	0.023	EXIT 133 / DOTSERO EAST INTERCHANGE STRS (F-08-V) WB AND (F-08-U) EB - RD N AND S (DOTSERO EAST CROSS ROAD) (FRONTAGE RD)	NONE	EAGLE	I-70	070A EXIT(133)DOTSERO EAST

