

SANDERS GRAVEL PIT

LEVEL 2 TRAFFIC IMPACT STUDY

Project Location: 26650 Wheeler Creek Ln
Routt County, CO

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Sanders Gravel Pit, Routt County, CO
Traffic Impact Study

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1. Introduction

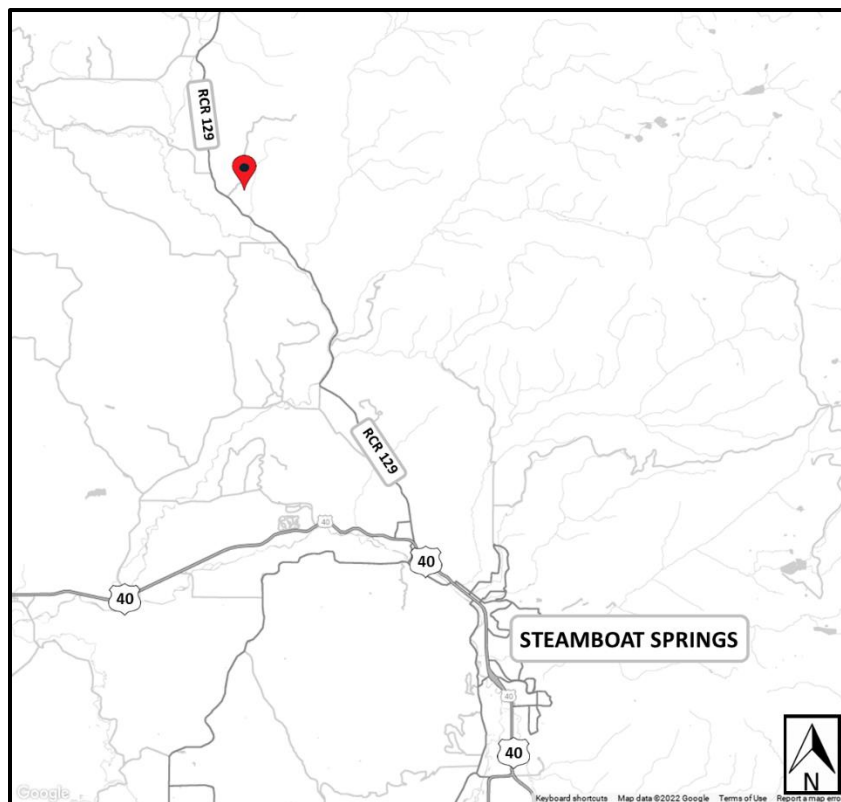
APEX Consulting Engineers, LLC prepared this Traffic Impact Study (Study) for the proposed Sanders Gravel Pit (Project), located at 26650 Wheeler Lane, Routt County, CO, accessing County Road 129 from an existing access west of US Forest Service Trail 1180. The following sections describe the Project, traffic volumes, auxiliary turn lane assessments, access spacing, and sight distance evaluation for this intersection.

2. Project Location and Description

As shown in Figure 1, the proposed Project will be located north of Steamboat Springs, along Routt County Road 129. The Project will include a small gravel pit which will operate year-round with seasonal fluctuations to their production rate. The production rate is expected to be lowest from November to March. The site is expected to produce approximately 67,000 tons per year from 2022 to 2033.

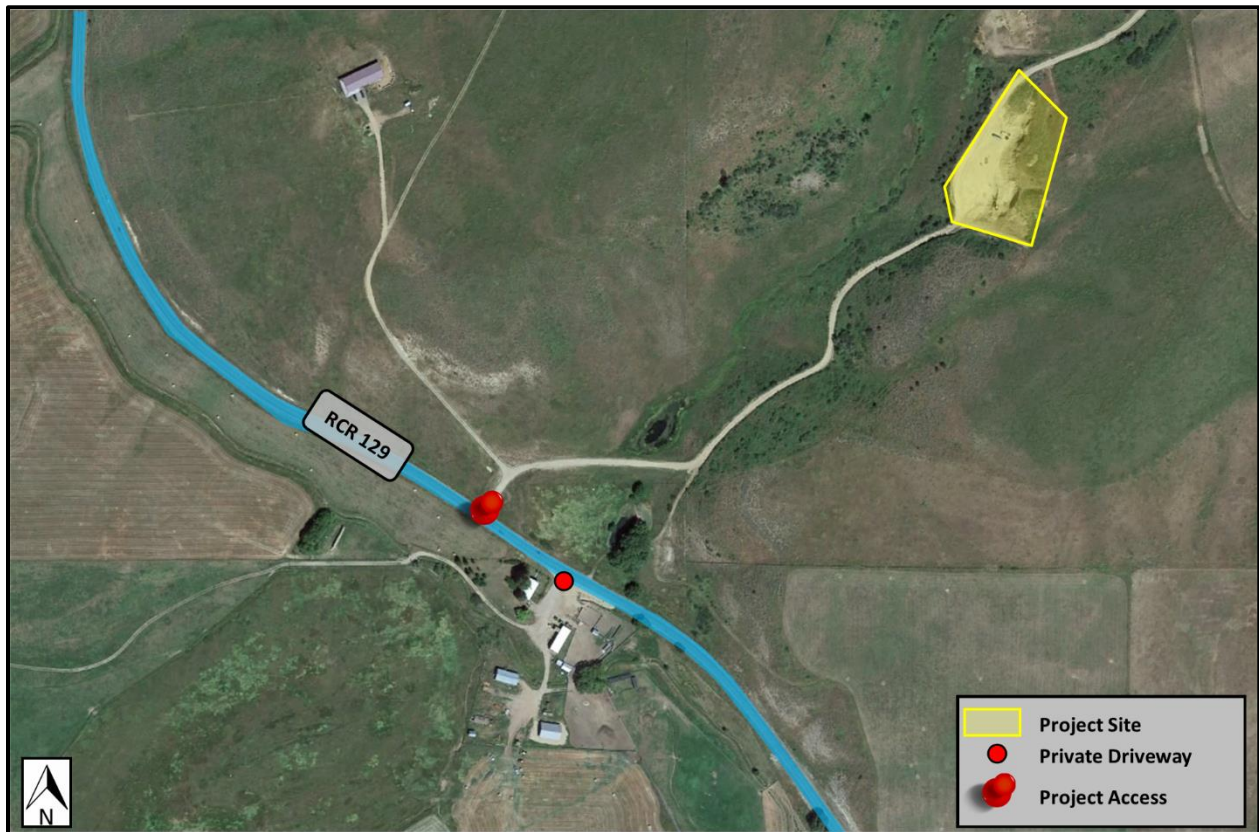
The site is expected to go through two production phases before closure. The first phase is from 2022 through 2027 while the second phase is from 2028 to 2033. Although the production of the gravel pit will likely decrease during phase two, this report will assume the production stays constant for both phases. A detailed Gravel Pit & Mining Production Questionnaire, completed by the operator, is attached in Appendix A.

Figure 1 - Site Location Map



The existing Project extents and site access location and adjacent private driveways are shown in Figure 2.

Figure 2 – Project Site Access Locations and Adjacent Access Points



3. Trip Generation & Distribution

3.1 Trip Generation

The ITE Trip Generation Manual does not include a land use code and trip data for gravel pit operations. Project trips were estimated from the Gravel Pit & Mining Production Questionnaire provided by the operator. The Project is expected to have two production periods throughout the year. Trip Generation is broken into low production and high production to accurately model the Project as trip distribution is expected to differ from high and low production.

Traffic engineering standards require conversion from trucks to passenger car equivalents (PCE). The following table shows the Project peak hour traffic volume calculation for the final Project phase.

Project Traffic Volume Calculations are summarized in Tables 1, 2 and 3 as passenger car equivalent vehicles per hour (PCE-VPH). Complete calculations are provided in Appendix C. The traffic volumes in the table represent the estimated number of passenger car equivalents per hour of operation. Note that all staff will arrive within the same hour and not staggered throughout the day. Additionally, the number of trips per hour calculation, rounds up to the next integer to be conservative in the peak hour calculations. Additional trips to the site for maintenance, deliveries, fueling, etc. are assumed to occur outside of the peak hour and are not considered in the peak hour trip generation for the Project.

Table 1 – Low Production Project Peak Hour Traffic Volumes (PCE-VPH)

Traffic Type	Period	AM	PM	ADT
Staff	Entry	1	0	1
	Exit	0	1	1
Small Trucks	Entry	-	-	1
	Exit	-	-	1
Medium Trucks	Entry	0	0	0
	Exit	0	0	0
TOTAL		1	1	4



Table 2 – Average Production Project Peak Hour Traffic Volumes (PCE-VPH)

Traffic Type	Period	AM	PM	ADT
Staff	Entry	0	0	4
	Exit	0	4	4
Small Trucks	Entry	-	-	1
	Exit	-	-	1
Medium Trucks	Entry	2	2	14
	Exit	2	2	14
TOTAL		4	8	38

Table 3 – High Production Project Peak Hour Traffic Volumes (PCE-VPH)

Traffic Type	Period	AM	PM	ADT
Staff	Entry	0	0	4
	Exit	0	4	4
Small Trucks	Entry	-	-	2
	Exit	-	-	2
Medium Trucks	Entry	4	4	40
	Exit	4	4	40
TOTAL		8	12	92

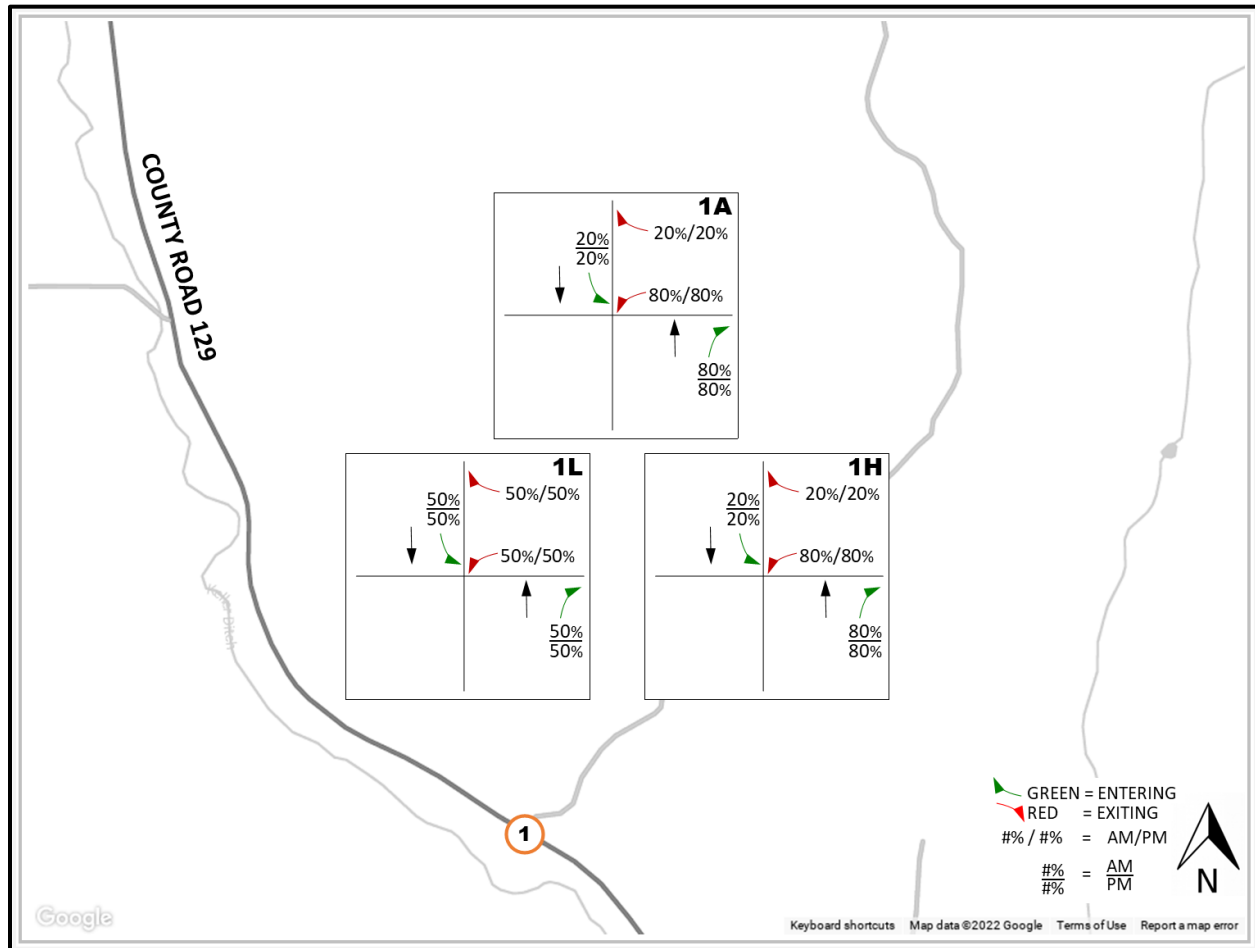
4. Trip Distribution & Assignment

4.1 Determination of Trip Distribution

The Project site had been operating as a gravel pit for a short period of time. Project trip distribution for the gravel pit is assigned to the Project accesses from the Gravel Pit & Mining Production Questionnaire provided by the owner. The detailed Project trip distribution is shown in Figure 3. Note that the L in each figure represents the low production conditions, the A represents average production, and the H represents high production conditions.



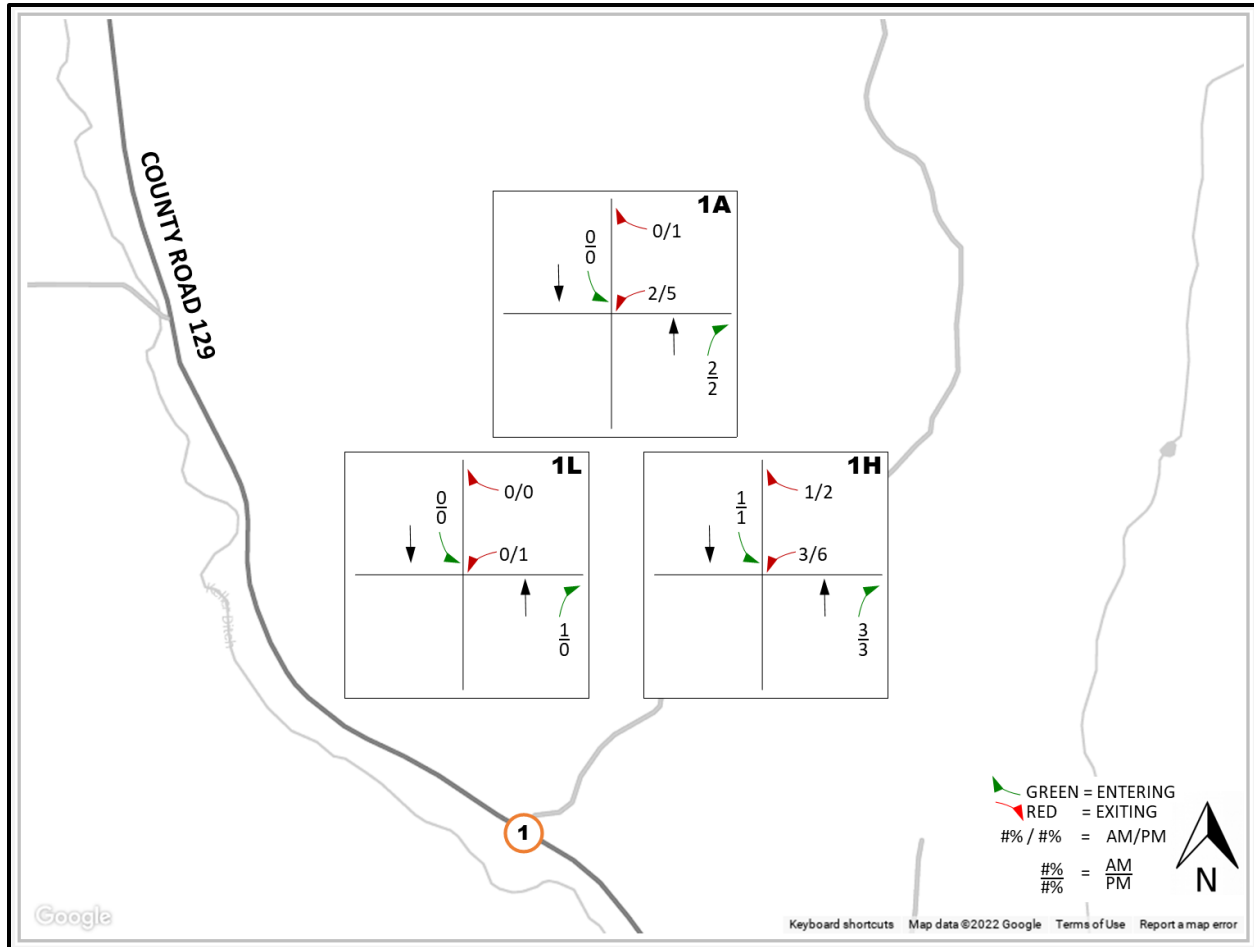
Figure 3 – Project Trip Distribution



4.2 Assignment of Project Traffic

Project traffic determined from the trip generation calculation is assigned to the existing traffic network using the distributions from Figure 3. The resulting Project trip assignment is shown in Figure 4.

Figure 4 – Project Peak Hour Trip Assignment (PCE VPH)



5. Existing & Future Traffic Volumes

Peak hour intersection turning movement counts were conducted at Routt County Road 129 & Project Access on October 26, 2021.

Peak seasonal adjustment of 1.41 was used for existing through volumes for the average and high productivity period on Routt County Road 129 to account for the traffic counts being completed in October. The low productivity period will not use a seasonal adjustment factor.

Table 4 shows the monthly peak seasonal adjustments using a similar roadway with a CDOT continuous counting station.



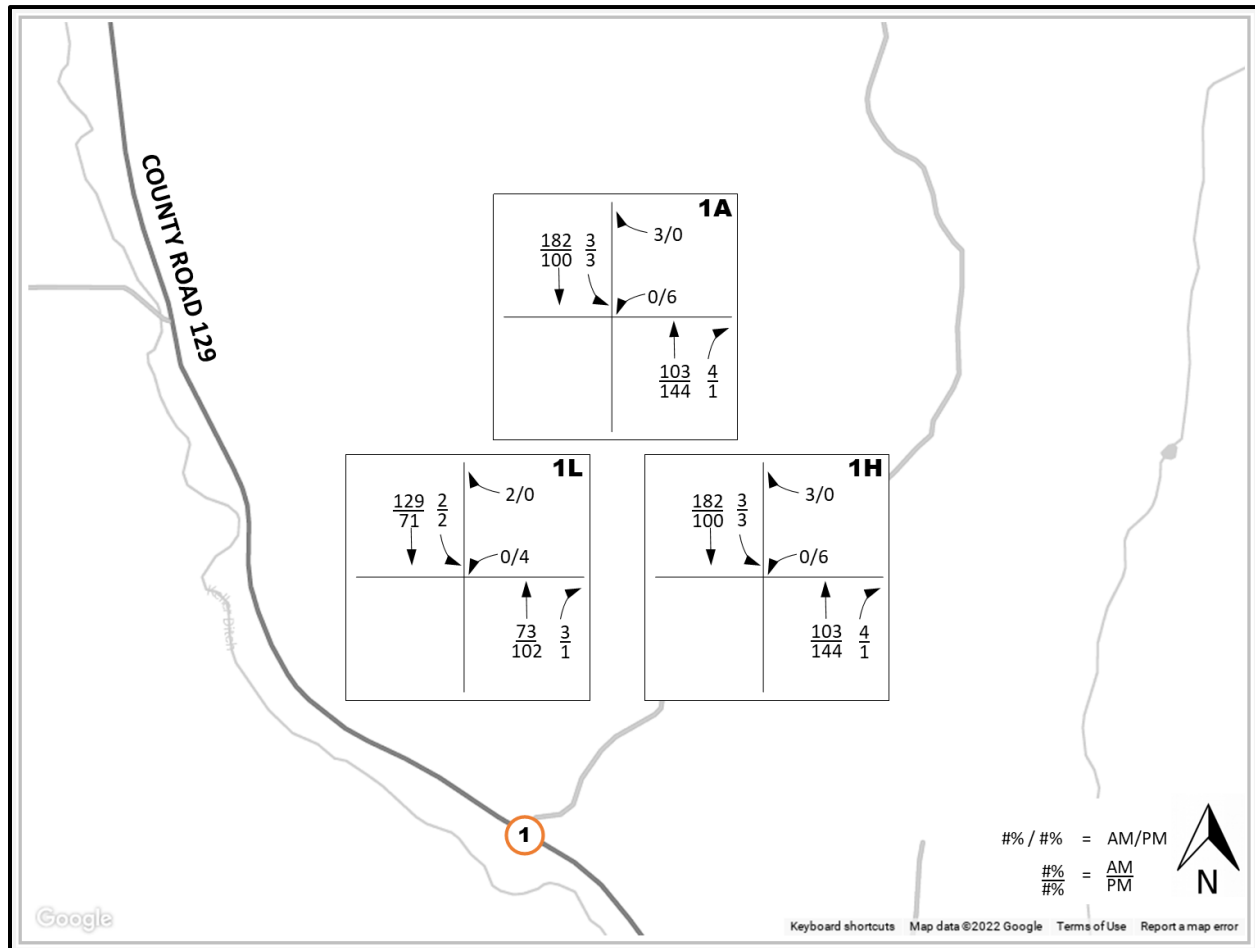
Table 4 – Peak Season Adjustment Factors by Month

Seasonal Adjustments													
CDOT Count Station ID 15: SH 040A Traffic Data - South of Steamboat Springs													
STATION ID	CAL YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
209	2022	8680											
209	2021	8443	8597	9089	7860	9578	12318	14291	11914	11917	9499	8413	8135
209	2020	8857	8695	6700	4600	7169	10503	12590	13276	11639	9694	7485	7795
209	2019	8812	9299	8753	7009	8129	10730	12616	11968	11242	8719	7819	8459
209	2018	8575	9001	9015	7557	7850	9745	11587	11847	10351	8610	7822	8586
209	2017	8017	8765	8710	7364	8539	11665	13180	12078	11207	9264	7887	8392
209	2016	7869	9108	8460	6141	8311	11309	12262	10855	9629	7910	7798	7789
209	2015	7550	8014	8289	7097	7649					8561	6975	7153
209	2014	7111	7438	7711	6345	7642	10334	11791	10689	9498	7942	6573	7342
209	2013	6871	7516	7530	6086	7470	9974	11357	10760	9185	7615	6772	7186
209	2012	6781	6915	7374	6460	7610	9132	8425	9558	9117	7539	6714	6362
209	2011	6756	6827	7196	5848	6706	9242	10800	10456	9277	7561	6365	6987
209	2010	7113	7043	7803	6244	7075	9255	11036	10276	9043	7542	6390	6934
209	2009	7671	7760	7801	6806	7966	10070	11558	10723	9660	7792	6726	7022
209	2008	7817	7709	8114	7001	7978	10535	11974	11263	9994	9028	7397	7738
209	2007	7509	7507	7996	6906	8758	10925	12053	11647	10265	8945	7995	7605
209	2006	7188	7538	7705	6702	8058	10710	11964	10327	9533	8254	7314	7651
209	2005	7290	7482	7506	6373	7782	10187	11770	10804	9652	8066	7009	7217
209	2004	7041	7164	7586	6625	7684	10147	11600	10503	9654	8169	7267	7731
209	2003	7134	6870	7061	6473	7730	10283	11429	10774	9412	8649	6444	7254
Average		7,654	7,855	7,916	6,605	7,878	10,392	11,794	11,095	10,015	8,387	7,219	7,544
% of highest month		65%	67%	67%	56%	67%	88%	100%	94%	85%	71%	61%	64%
Peak Season Factor		1.54	1.50	1.49	1.79	1.50	1.13	1.00	1.06	1.18	1.41	1.63	1.56

The existing peak hour traffic, adjusted for peak season, is represented in Figure 5. Count summaries are included in Appendix B.



Figure 5 – Existing Peak Hour Traffic adjusted for Peak Season
(From counts 8/26/2021)



6. Study Years Traffic Volumes

Future background traffic is determined in this section.

The study years are 2022 and 2033. Routt County Road 129 is assumed to have a similar growth pattern as Highway 40 in Steamboat Springs. The Online Transportation Information System (OTIS) was used to find ADT values for 2019 counts & 2045 projected counts which are the basis for the following road segment growth factors:

Table 5 – Road Segment Growth

Road	Segment	ADT		Period Growth Factor	Avg. Annual Growth Rate	1 - year growth factor (2021-2022)	12 - year growth factor (2021-2033)
		2020	2045				
SH 40	Both Sides	9,200	11,155	1.213	0.78	1.008	1.098

These growth factors were used to determine future peak hour background traffic volumes on Routt County Road 129.

7. Study Period Volumes

Figures 6 and 8 demonstrate the future background traffic volumes by adjusting the traffic in Figure 5 with the growth factors from Table 3. Figures 7 and 9 show total peak hour traffic which consist of future background traffic with Project traffic.

Figure 6 – Background Peak Hour Future Traffic (Year 2022)

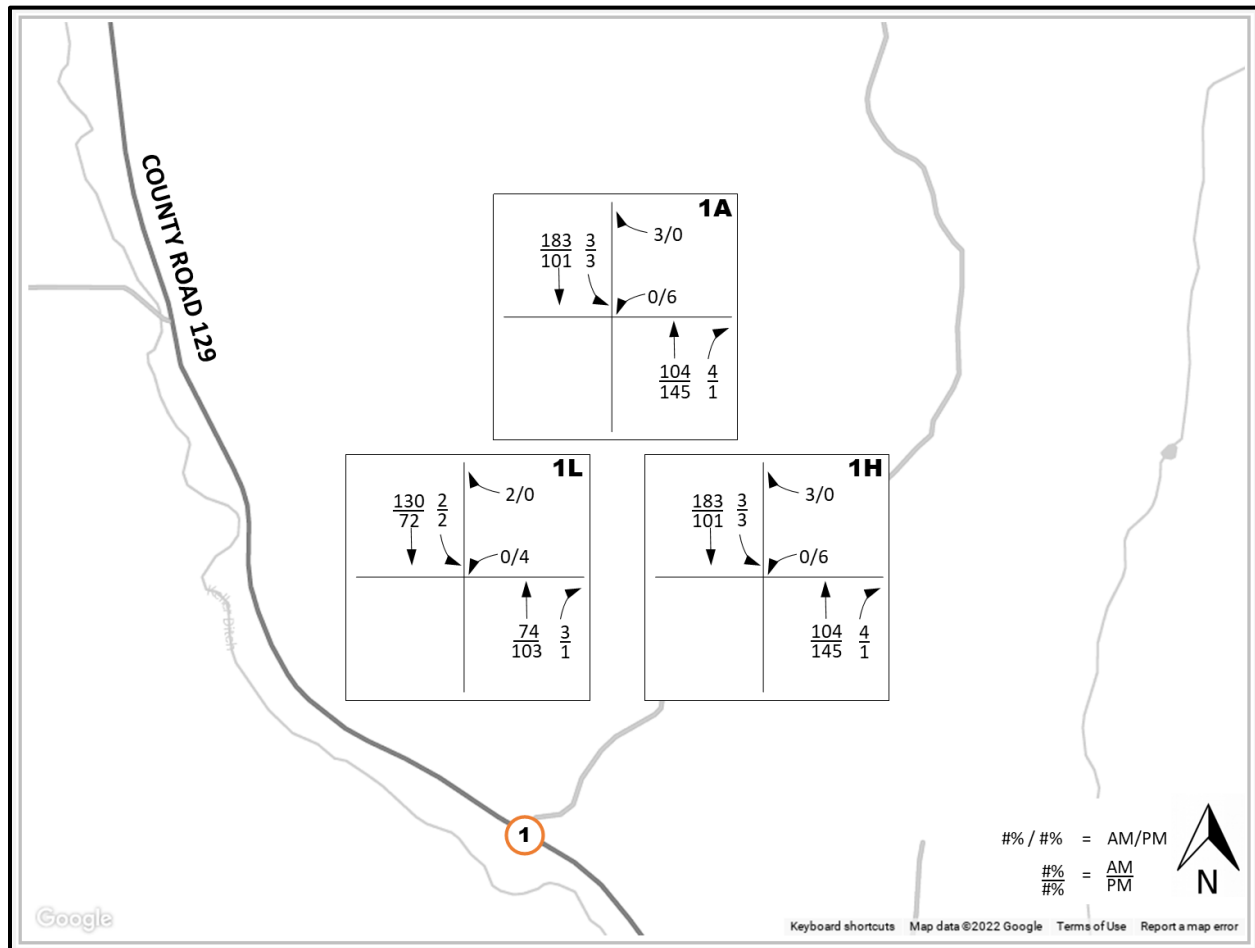
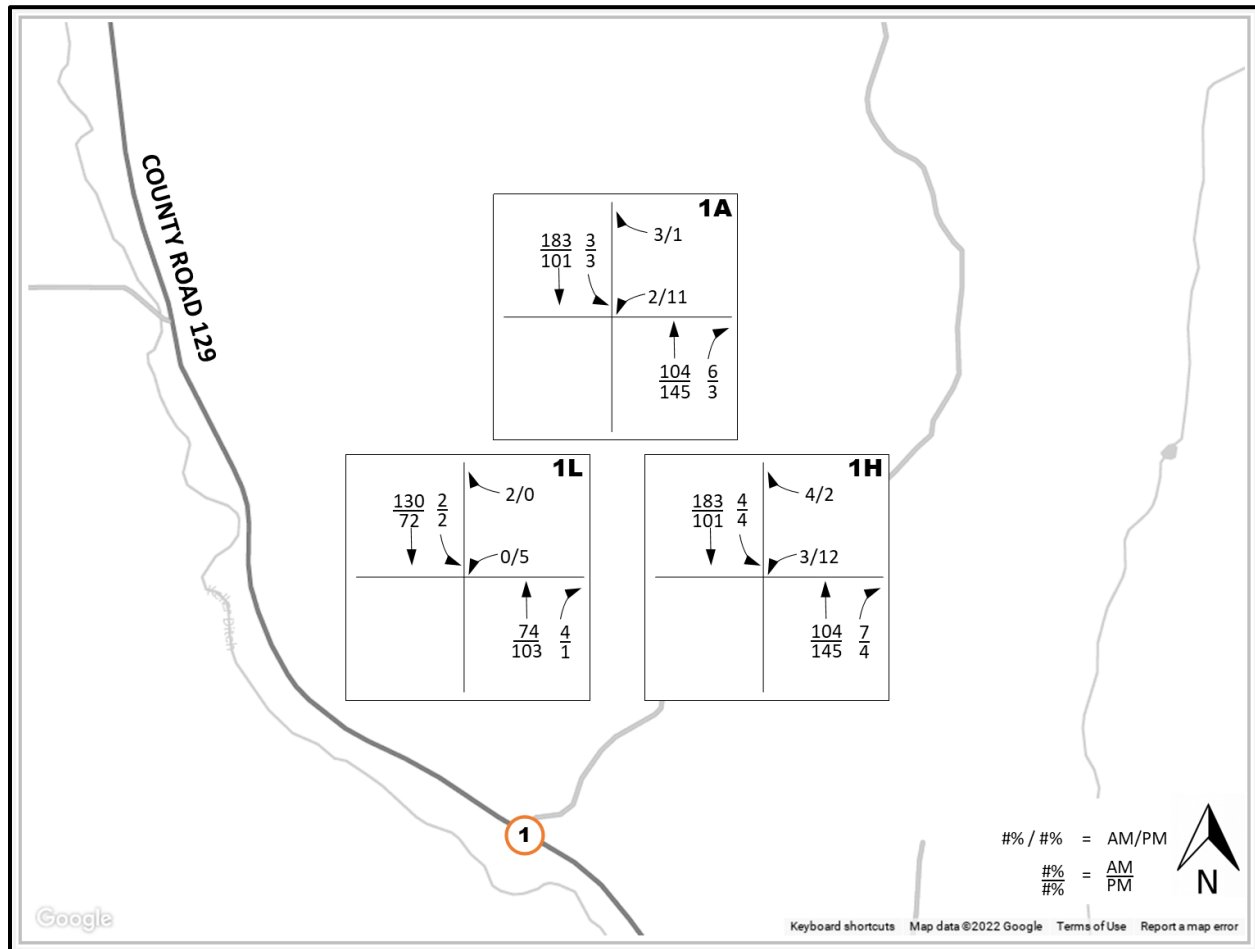


Figure 7 –Total Peak Hour Future Traffic (Year 2022 PCE VPH)



Figures 8 and 9 show the predicted traffic volumes for year 2033.

Figure 8 – Background Peak Hour Future Traffic (Year 2033)

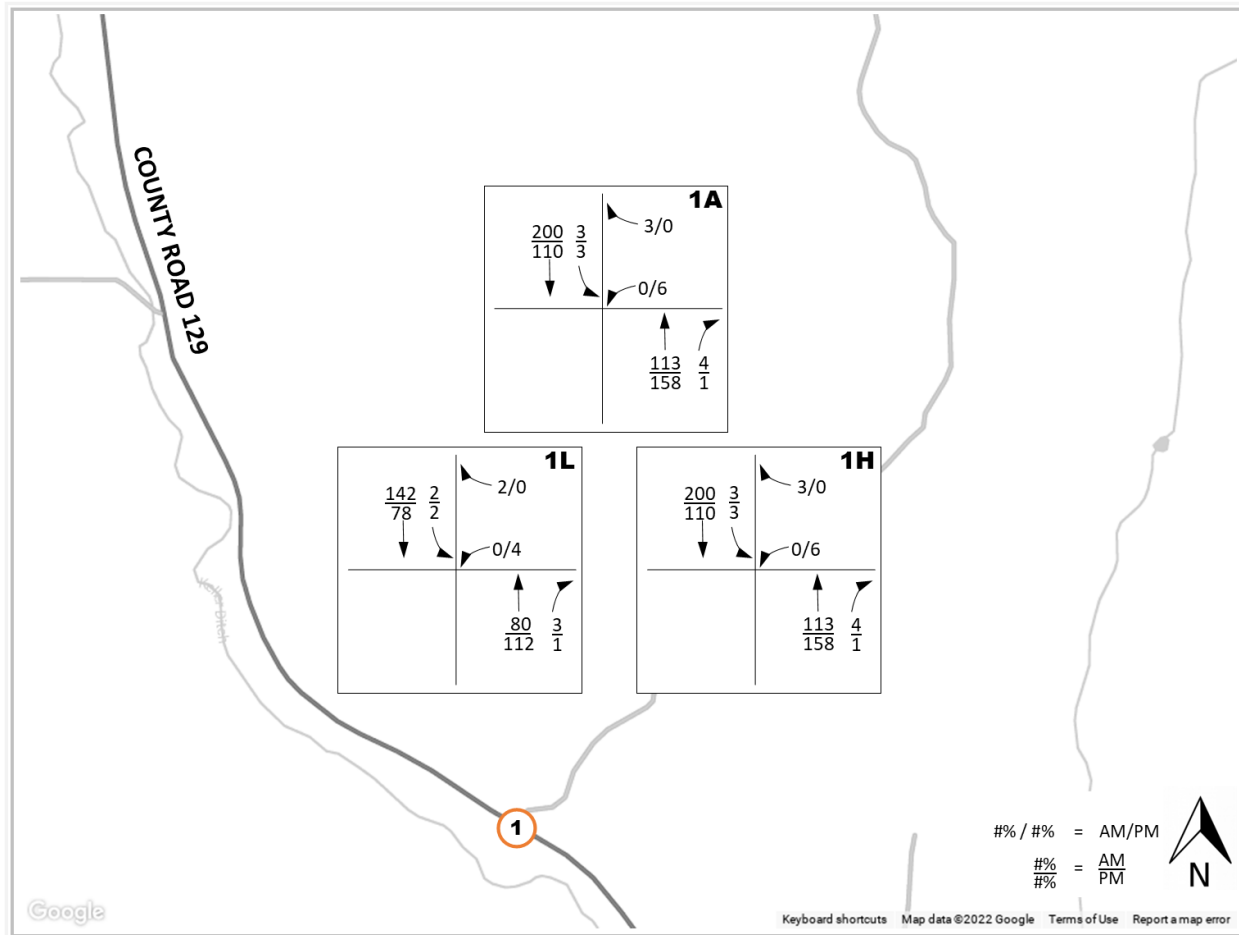
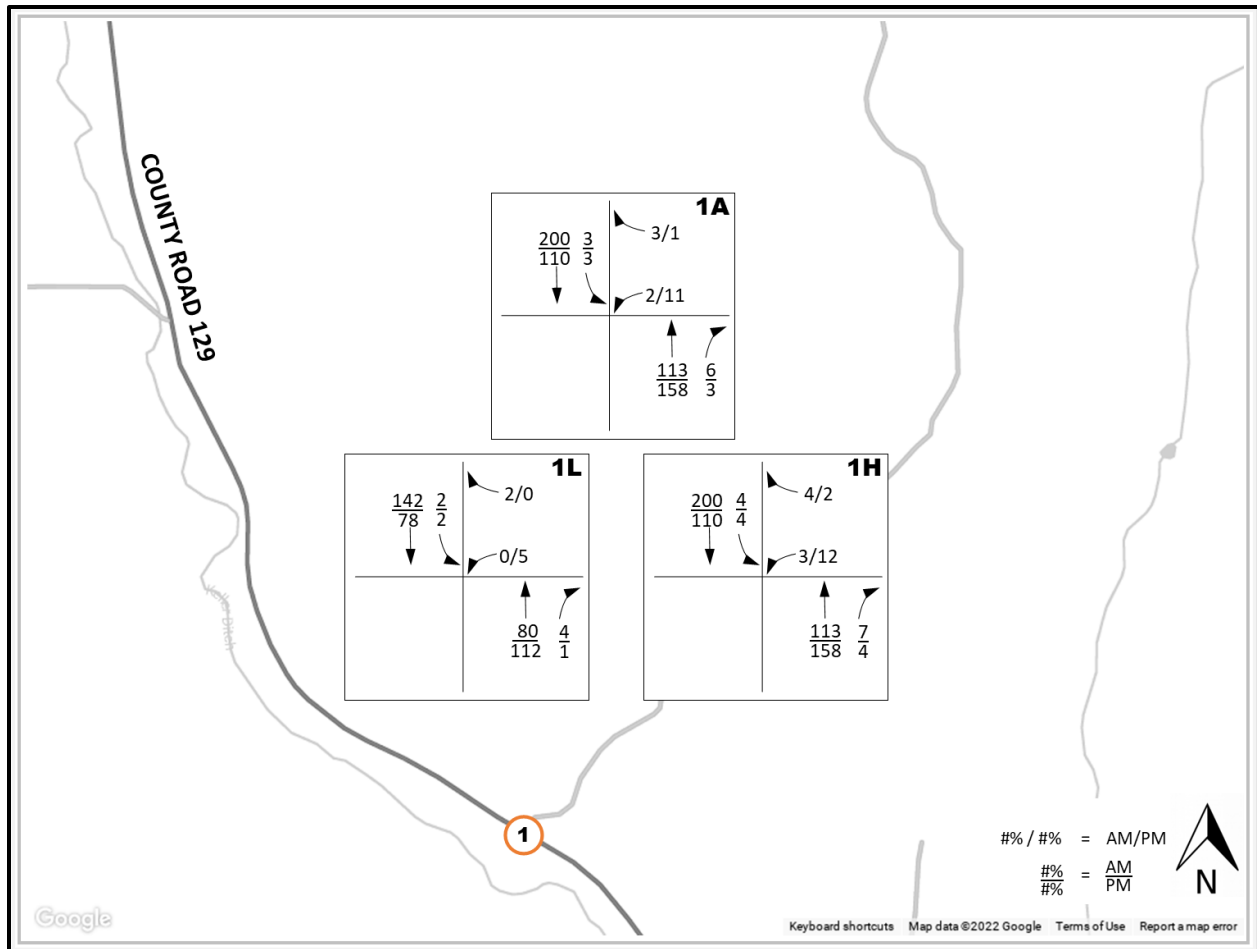


Figure 9 – Total Peak Hour Future Traffic (Year 2033 PCE VPH)



8. Auxiliary Turn Lane Evaluation

Routt County Road 129 is a north south road with milepost markings increasing from south to north and matches the CDOT classification of R-B (Rural Highway).

The need for auxiliary lanes was based on the turn lane warrants listed in the SHAC for roadways classified as R-B. The following table shows the data and criteria necessary to identify the need for exclusive right-turn and left-turn deceleration lanes at the intersections in the Study area.

Note that all turning volumes are in terms of Passenger Car Equivalents (PCE).

**Table 6 – Comparison of Turning Volumes to
Turn Lane Requirements**

Routt County Road 129 & Project Access Year 2033 Condition Speed Limit = 45 mph			
Auxiliary Lane	Turning Volume (VPH)	CDOT Auxiliary Lane Requirements	Lane Required?
SB Left Turn Deceleration Lane (inbound)	4 (PM)	Greater than 10 vph	NO
NB Right Turn Deceleration Lane (inbound)	7 (AM)	Greater than 25 vph	NO
WB Left Turn Acceleration Lane (outbound)	12 (PM)	May be req'd if benefit to safety and operations. Generally not required if speed < 45 mph	NO
WB Right Turn Acceleration Lane (outbound)	4 (AM)	More than 50 vph, with speed limit over 40 mph	NO

Auxiliary turn lanes are not required for this Project.

9. Intersection Sight Distance

Routt County Road 129 is a 2-lane roadway with a posted speed limit of 45 mph with a varying grade from 0% up to 7%. Although most of the roadway has a grade less than 3%, a reduction in sight distance will be used for the section of road south of the access since it is the only section with grades greater than 3%. The study will not use increases in sight distance that are allowed for grades greater than 3%. The sight distance analysis is based on a single unit truck.

The required sight distance for a vehicle traveling on the highway toward the access is 400 feet for a 45 mph speed limit (from Table 4-1 SHAC). The required sight distance with the adjustment factor is 320 feet. The observed sight distance is greater than 400 feet while travelling north and south to the access. Refer to Images 1 through 4.



Note that the sight distance along the south side of the access is not maintained for the entirety of the roadway. Recommendations on how to improve the existing access are in the next section of this report.

Image 1 – Looking North Along Routt County Road 129



Image 2 – Looking South Along Routt County Road 129



The expected traffic includes less than two multi-unit truck trips per day so the sight distance will use single unit trucks for the evaluation. The required sight distance for single unit trucks entering the roadway with a posted speed limit of 45 mph is 585 feet per SHAC, Table 4-2. The required sight distance with the adjustment factor is 468 feet. The observed sight distance is greater than 585 feet in both directions, shown in Images 3 and 4.

Image 3 – Looking North from Project Access



Image 4 – Looking South from Project Access



10. Summary and Recommendations

- The proposed Project will increase the traffic volumes during peak hours by 11 AM trips and 15 PM trips. Note that these volumes are in Passenger Car Equivalents (PCE).
- Auxiliary turn lanes are not required at the Project Access.
- The tall brush/vegetation circled in Image 1, on the east side of the road and within the right of way, for a distance 400' south of the access, should be cleared to provide a wider view of the access road for northbound traffic.
- Installation of MUTCD sign W8-6 (TURCK CROSSING) or W11-10 (graphic of truck entering) south of the Project Access is recommended to improve the safety of the intersection by providing northbound traffic notice of the upcoming intersection. The location of the sign should be along the section of roadway where sight distance is not maintained, which is roughly 500 feet from the access.



Gravel Pit & Mining Production Questionnaire

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

Project Name: Sanders Gravel Pit

Project Location/Address: 26650 Wheeler Creek Lane
Steamboat Springs, CO 80477

Company Name: Tara Sanders

Person Completing this Form:

Name: Tony Waldron

Title: Project Consultant

Phone Number: 303-263-6902

Date: 9/29/21 Amended 4/20/22

Legal Description
T8N, R85W, S33 in Routt County
Parcel # 924331003

Overall Production Schedule

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

Phase	Range of Years	Production Amount (Tons per Year)
1	<u>2022</u> thru <u>2027</u>	<u>67,000</u>
2	<u>2028</u> thru <u>2033</u>	<u>67,000</u>
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.

Due to site location, weather will likely be a limiting factor for production from November thru MARCH/April. Therefore, most production will occur from April thru October.

Detailed Information – Phase 1

Production Years: 2022 thru 2027

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

Market conditions / Demand / Weather

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

Yes, production will mostly occur from April - October due to weather constraints (snow pack) and construction season

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

NOV thru MARCH APRIL thru OCT MAY thru Sept.

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

<u>0-1</u>	<u>2</u>	<u>4</u>
<u>8:00 AM</u>	<u>7:00 AM</u>	<u>7:00 AM</u>
<u>4:00 PM</u>	<u>5:00 PM</u>	<u>5:00 PM</u>
<u>1/WK</u>	<u>1</u>	<u>2</u>
<u>N/A</u>	<u>0</u>	<u>0</u>
<u>N/A</u>	<u>7</u>	<u>20</u>
<u>N/A</u>	<u>0</u>	<u>0</u>
<u>4</u>	<u>5</u>	<u>5</u>
<u>8</u>	<u>10</u>	<u>10</u>
<u>50%</u>	<u>20%</u>	<u>20%</u>
<u>50%</u>	<u>80%</u>	<u>80%</u>
=100%	=100%	=100%

Detailed Information – Phase 2

Production Years: 2028 thru 2033

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

Limited reserves, Market conditions, Demand, Weather

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

yes, production will mostly occur from April to October due to weather constraints and construction season.

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

If not, put your answers in the average column

	Production Periods		
	Low	Average	High
Months of the year for each period:	<u>Nov thru March</u>	<u>April thru October</u>	<u>May thru Sept</u>
Daily Trip Generation			
Number of on-site workers per day:	<u>0-1</u>	<u>2</u>	<u>4</u>
On-site worker arrival time (s):	<u>8:00 AM</u>	<u>7:00 AM</u>	<u>7:00 AM</u>
On-site worker departure time (s):	<u>4:00 pm</u>	<u>5:00 pm</u>	<u>5:00 pm</u>
Number of other site visits per day (Maintenance, deliveries, fueling, customers, supervisors, etc)	<u>1/WK</u>	<u>1</u>	<u>2</u>
Number of large dump trucks per day (greater than 40-ft long)	<u>N/A</u>	<u>0</u>	<u>0</u>
Number of medium dump trucks per day (between 20-ft & 40-ft long)	<u>N/A</u>	<u>7</u>	<u>20</u>
Number of small trucks per day (less than 20-ft long)	<u>N/A</u>	<u>0</u>	<u>0</u>
Number of Work days per week	<u>4</u>	<u>5</u>	<u>5</u>
Number of Work hours per day	<u>8</u>	<u>10</u>	<u>10</u>
Trip Distribution			
% of trips to/from North	<u>50%</u>	<u>20%</u>	<u>20%</u>
% of trips to/from South	<u>50%</u>	<u>80%</u>	<u>80%</u>
% of trips to/from East			
% of trips to/from West			
	<u>=100%</u>	<u>=100%</u>	<u>=100%</u>

Appendix B – Count Summaries
Intersection Turning Movement Count Summary

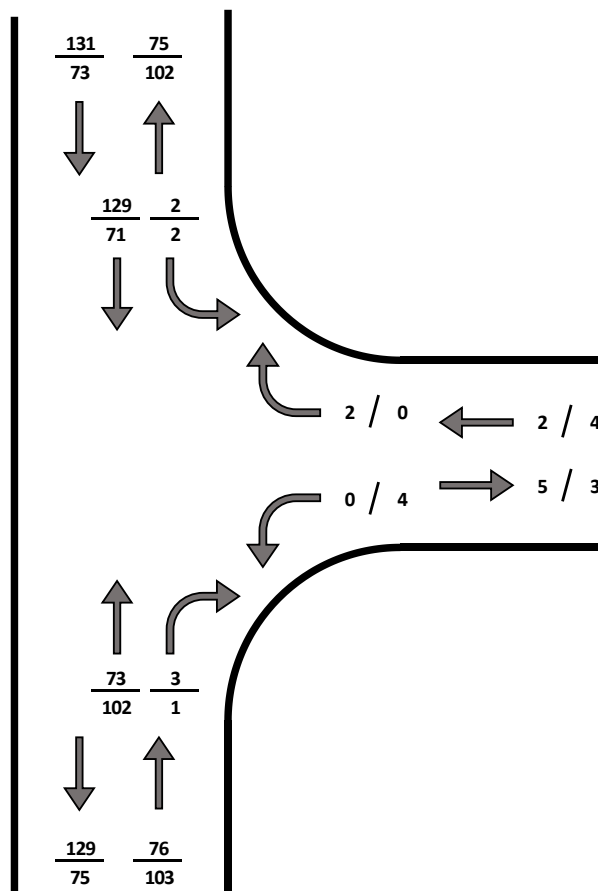
Project: Sanders Gravel Pit
Location: Routt County
EB/WB Road: Project Access
NB/SB Road: Routt County Rd 129

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Counted By: APX
Count Date: 10/27/2021

Intersection 1 - Project Access & Routt County Rd 129

		Project Access - (EB)			Project Access - (WB)			Routt County Rd 129 - (NB)			Routt County Rd 129 - (SB)			Sums
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM	7:00	-	-	-	0	-	0	-	18	0	0	20	-	38
	7:15	-	-	-	0	-	0	-	10	0	0	22	-	32
	7:30	-	-	-	0	-	0	-	19	0	0	49	-	68
	7:45	-	-	-	0	-	0	-	22	3	1	26	-	52
	8:00	-	-	-	0	-	0	-	16	0	1	31	-	48
	8:15	-	-	-	0	-	2	-	16	0	0	23	-	41
	8:30	-	-	-	1	-	1	-	25	0	0	22	-	49
	8:45	-	-	-	0	-	0	-	12	0	0	17	-	29
	Peak	-	-	-	0	-	2	-	73	3	2	129	-	209
	Sums	-	-	-	2	-	-	76	-	-	131	-	-	209
PM	16:00	-	-	-	0	-	0	-	28	0	0	17	-	45
	16:15	-	-	-	0	-	0	-	24	0	0	22	-	46
	16:30	-	-	-	0	-	0	-	19	0	0	19	-	38
	16:45	-	-	-	2	-	0	-	26	1	2	14	-	45
	17:00	-	-	-	2	-	0	-	33	0	0	16	-	51
	17:15	-	-	-	0	-	0	-	28	1	0	11	-	40
	17:30	-	-	-	0	-	0	-	29	0	0	12	-	41
	17:45	-	-	-	0	-	0	-	25	0	0	6	-	31
	Peak	-	-	-	4	-	0	-	102	1	2	71	-	180
	Sums	-	-	-	4	-	-	103	-	-	73	-	-	180



Appendix C – Trip Generation

Low Production Project Average Daily Traffic (ADT) Calculations Hours of Operation 8:00 am -4:00 pm

Trip Information	Purpose		Workers	Other Visits	Material Handling	Total Peak Hour Trips
	Vehicle Type		Passenger Vehicle	Small Trucks <20 ft long	Medium Trucks 20 ft - 40 ft long	
	Passenger Car Equivalent Factor		1	1	2	
Low Production	Number of Vehicles / Day		1	1	N/A	
	PCE Number of Vehicles / Day		1	1	N/A	
	Trucking Hours / Day		N/A	8	8	
	PCE Number of Vehicles / Hour		1	N/A	N/A	
	PCE Number of Trips / Hour		1	-	-	
	AM Peak Period Trip (2 trips/veh)	PCE in	1	-	-	1
		PCE out	0	-	-	0
	PM Peak Period Trips (2 trips/veh)	PCE in	0	-	-	0
		PCE out	1	-	-	1

Average Production Project Traffic Volume Calculations Hours of Operation 7:00 am -5:00 pm

Trip Information	Purpose		Workers	Other Visits	Material Handling	Total Peak Hour Trips
	Vehicle Type		Passenger Vehicle	Small Trucks <20 ft long	Medium Trucks >40 ft long	
	Passenger Car Equivalent Factor		1	1	2	
Low Production	Number of Vehicles / Day		4	1	7	
	PCE Number of Vehicles / Day		4	1	14	
	Trucking Hours / Day		N/A	10	10	
	PCE Number of Vehicles / Hour		4	N/A	2	
	PCE Number of Trips / Hour		4	-	4	
	AM Peak Period Trip (2 trips/veh)	PCE in	0	-	2	2
		PCE out	0	-	2	2
	PM Peak Period Trips (2 trips/veh)	PCE in	0	-	2	2
		PCE out	4	-	2	6

Appendix C – Trip Generation
High Production Project Traffic Volume Calculations
Hours of Operation 7:00 am -5:00 pm

Trip Information	Purpose		Workers	Other Visits	Material Handling	Total Peak Hour Trips
	Vehicle Type		Passenger Vehicle	Small Trucks <20 ft long	Medium Trucks >40 ft long	
	Passenger Car Equivalent Factor		1	1	2	
Low Production	Number of Vehicles / Day		4	2	20	
	PCE Number of Vehicles / Day		4	2	40	
	Trucking Hours / Day		N/A	10	10	
	PCE Number of Vehicles / Hour		4	N/A	4	
	PCE Number of Trips / Hour		4	-	8	
	AM Peak Period Trip (2 trips/veh)	PCE in	0	-	4	4
		PCE out	0	-	4	4
	PM Peak Period Trips (2 trips/veh)	PCE in	0	-	4	4
		PCE out	4	-	4	8